RadiAnt DICOM Viewer

User manual

Version 5.5.0
10/26/2019

https://www.radiantviewer.com

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1 Welcome to RadiAnt DICOM Viewer

RadiAnt DICOM Viewer is an application for processing and displaying medical images in DICOM format (Digital Imaging and Communications in Medicine).

The viewer allows users to open studies from CD/DVD/BluRay disks, flash memory, local and network folders, and PACS locations.

Studies obtained from different imaging modalities can be displayed in RadiAnt DICOM Viewer:

- Digital Radiography (CR, DX)
- Mammography, Digital Breast Tomosynthesis (MG)
- Computed Tomography (CT)
- Magnetic Resonance (MR)
- Positron Emission Tomography PET-CT (PT)
- Ultrasonography (US, IVUS)
- Digital Angiography (XA)
- Gamma camera, Nuclear medicine (NM)
- Secondary Pictures and Scanned Images (SC)
- Endoscopy (ES)
- Microscopy (SM, GM)
- Structured Reports (SR)
- Encapsulated PDF Documents (OT)

The viewer can handle many types of DICOM images:

- Monochromatic (e.g. CR, CT, MR) and color (e.g. US, 3D reconstruction)
- Static images (e.g. CR, MG, CT) and dynamic sequences (e.g. XA, US)
- Uncompressed and compressed (RLE, JPEG Lossy, JPEG Lossless, JPEG 2000, JPEG-LS)
- MPEG2/MPEG4 compressed video files

RadiAnt DICOM Viewer is not a medical product. It has no FDA/CE or any other certifications and is not intended for diagnostic purposes.

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1.1 Features

- Opening DICOM studies from CD/DVD/BluRay disks and local or network folders.
- Searching and downloading DICOM studies from PACS locations (servers, workstations, modalities).
- Storing DICOM studies in a local database.
- A simple and intuitive interface with full-screen mode.
- Multi-touch support for Windows 8/8.1/10 enabled devices.
- Excellent performance – 64-bit version available, multi-core and multi-processor support, asynchronous reading (you can browse images while they are being opened), advanced memory management system which facilitates concurrent opening of studies with thousands of images. All provided within a compact application (installer size is just around 5MB).
- Image operations:
  - Fluid zooming and panning.
  - Brightness and contrast adjustment, and negative mode.
  - Preset window settings for Computed Tomography (lung, bone, etc.).
  - Rotations (90 and 180 degrees), and flips (horizontal and vertical).
  - Image filters: sharpen, smooth, edge, emboss
- Regions of Interest (ROIs):
  - Measurement of segment length.
  - Measurement of mean, minimum and maximum parameter value (e.g. density in Hounsfield Units in Computed Tomography) within circle/ellipse and its area.
  - Measurement of angle value (normal and Cobb angle).
  - Measurement of deviation.
  - Pen tool for freehand drawing.
- Browsing of several series concurrently in multiple panels with automatic synchronization between series with images acquired in the same plane (e.g. Computed Tomography series before and after contrast media administration) or manual synchronization between series from different studies with similar patient orientation and cross reference lines in series with different image planes (e.g. Magnetic Resonance study).
- 3D cursor tool
- Display of dynamic sequences/series (CINE) with adjustment of frames per second.
- 2D (orthogonal) Multi-planar Reconstruction (2D MPR).
- 3D (oblique) Multi-planar Reconstruction (3D MPR) with MIP (maximum intensity projection), MinIP (minimum intensity projection) and Avg (average) modes.
- 3D Volume Rendering (VR).

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- 3D snapshots for saving and restoring 3D VR views.
- Export of 3D models to STL files.
- Creation of quick movies (simple rotations) and advanced 3D snapshot-based videos with volume-rendered objects.
- GPU acceleration for 3D VR and 3D MPR views (for Nvidia GPUs).
- Fusion of series with different modalities (e.g. PET-CT) or with different protocols (e.g. MR T1/T2 – DWI).
- Time-intensity curves (TIC, e.g. for Breast MRI).
- Support for DICOM overlays (annotations or graphic overlays included in the file).
- Export of DICOM images to JPEG and BMP picture formats and DICOM series/sequences to movies in WMV or MP4 formats.
- Display DICOM file structure with searchable DICOM tags, their descriptions and values.

1.2 System requirements

Minimum system requirements:

- Microsoft Windows system (XP SP3, Vista, Windows 7, Windows 8, Windows 8.1 and Windows 10 are supported)
- Intel or AMD 1GHz or faster processor (multicore Intel processor recommended)
- 512MB of RAM (2GB recommended)
- 9MB of available hard-disk space for installation; additional free space required for image caching
- 1024x768 screen resolution

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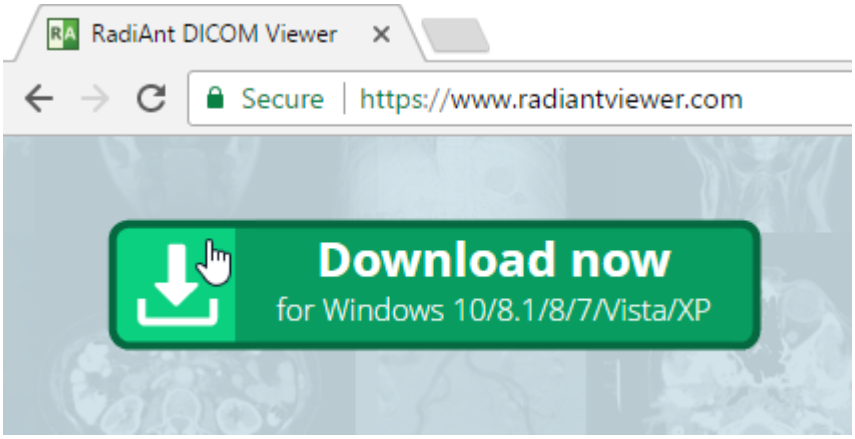
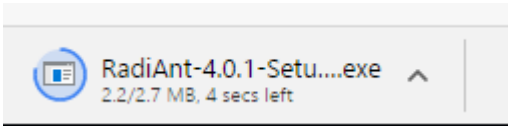
1.3 Installation

Download RadiAnt DICOM Viewer from https://www.radiantviewer.com

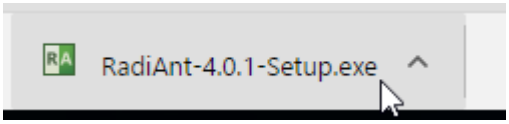


Save the file to your computer - depending on your connection speed, the software may require between one second and one minute to download in full.

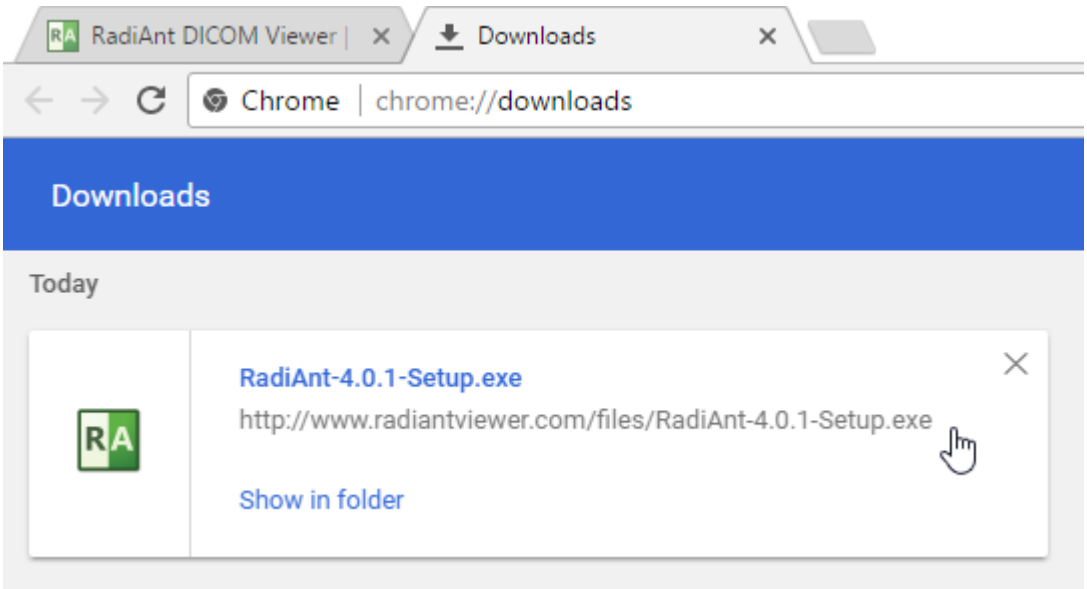


Click the downloaded file to run the installer.

In the bottom download bar:



or in Downloads:



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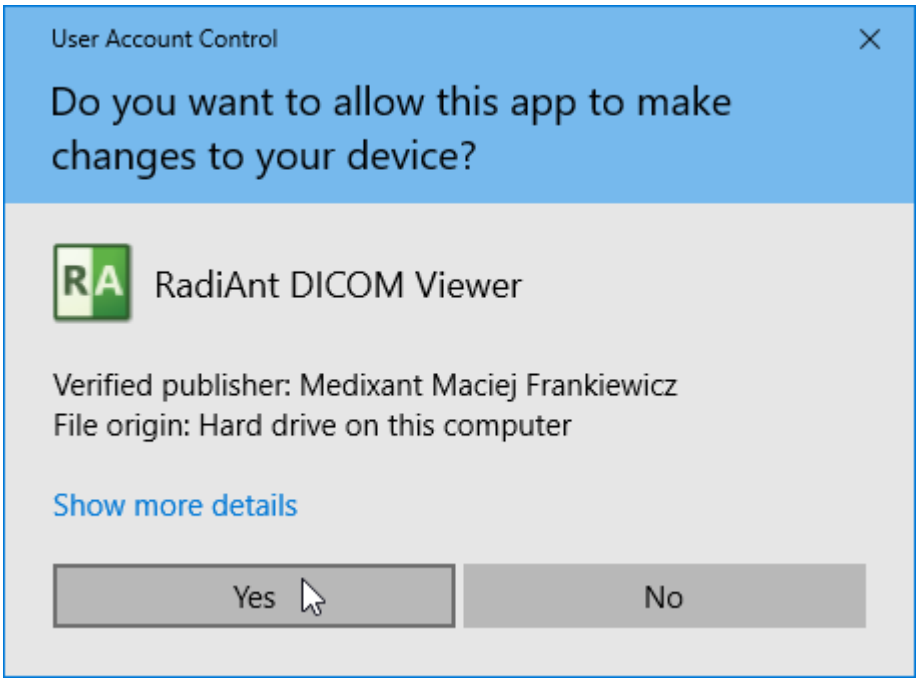
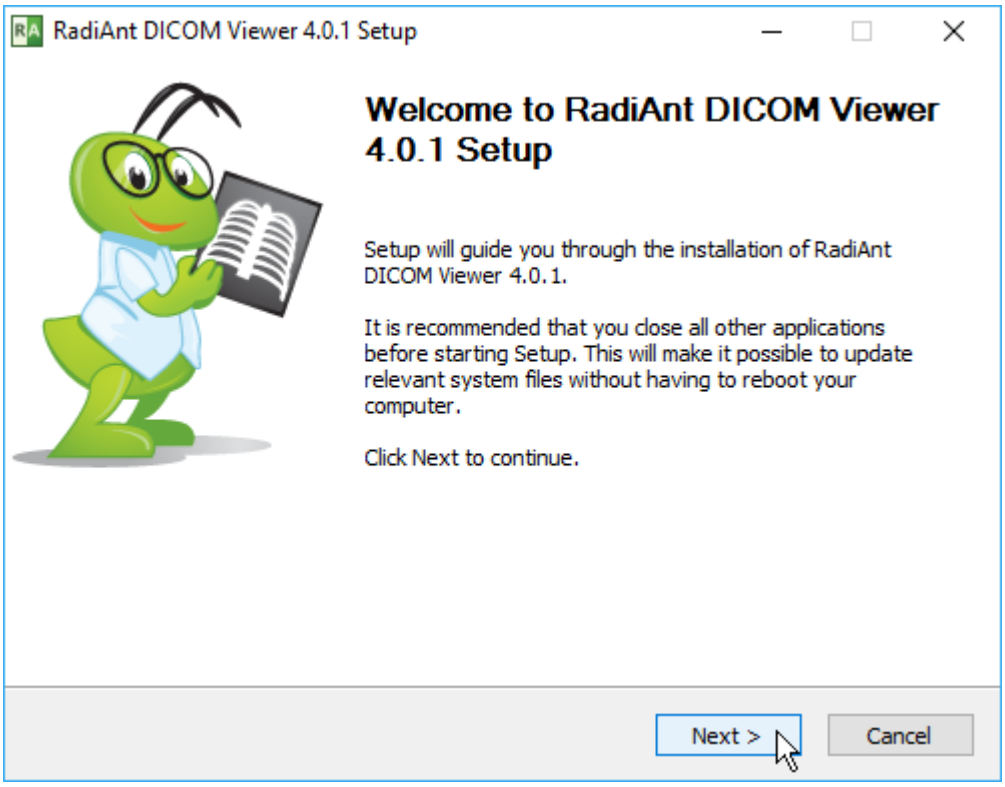
Windows 7, Windows 8/8.1 and Windows 10 users may be prompted with a "User Account Control" alert; if so, select **Yes** or **Continue** to proceed with the installation.



If you answer **No**, RadiAnt DICOM Viewer will be installed only for the current user.

Follow the steps outlined by the setup wizard to complete the installation.



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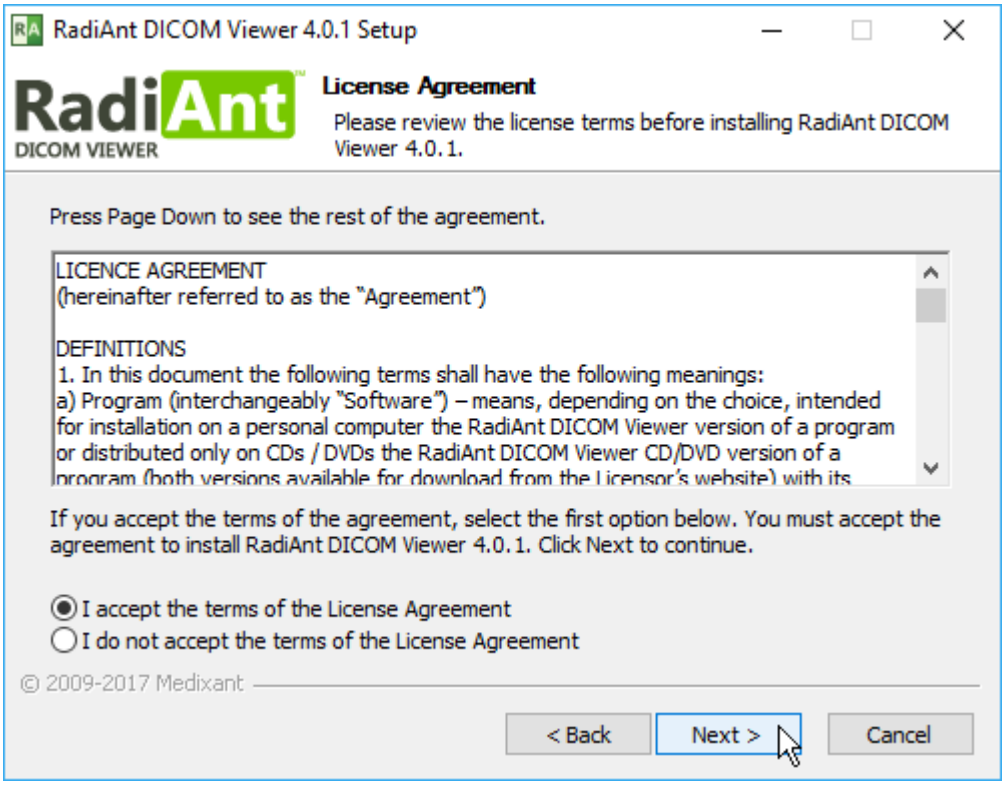
RadiAnt DICOM Viewer 4.0.1 Setup
RadiAnt
DICOM VIEWER
License Agreement
Please review the license terms before installing RadiAnt DICOM Viewer 4.0.1.
Press Page Down to see the rest of the agreement.
LICENCE AGREEMENT
(hereinafter referred to as the "Agreement")
DEFINITIONS
1. In this document the following terms shall have the following meanings:
a) Program (interchangeably "Software") – means, depending on the choice, intended for installation on a personal computer the RadiAnt DICOM Viewer version of a program or distributed only on CDs / DVDs the RadiAnt DICOM Viewer CD/DVD version of a
If you accept the terms of the agreement, select the first option below. You must accept the agreement to install RadiAnt DICOM Viewer 4.0.1. Click Next to continue.
I accept the terms of the License Agreement
I do not accept the terms of the License Agreement
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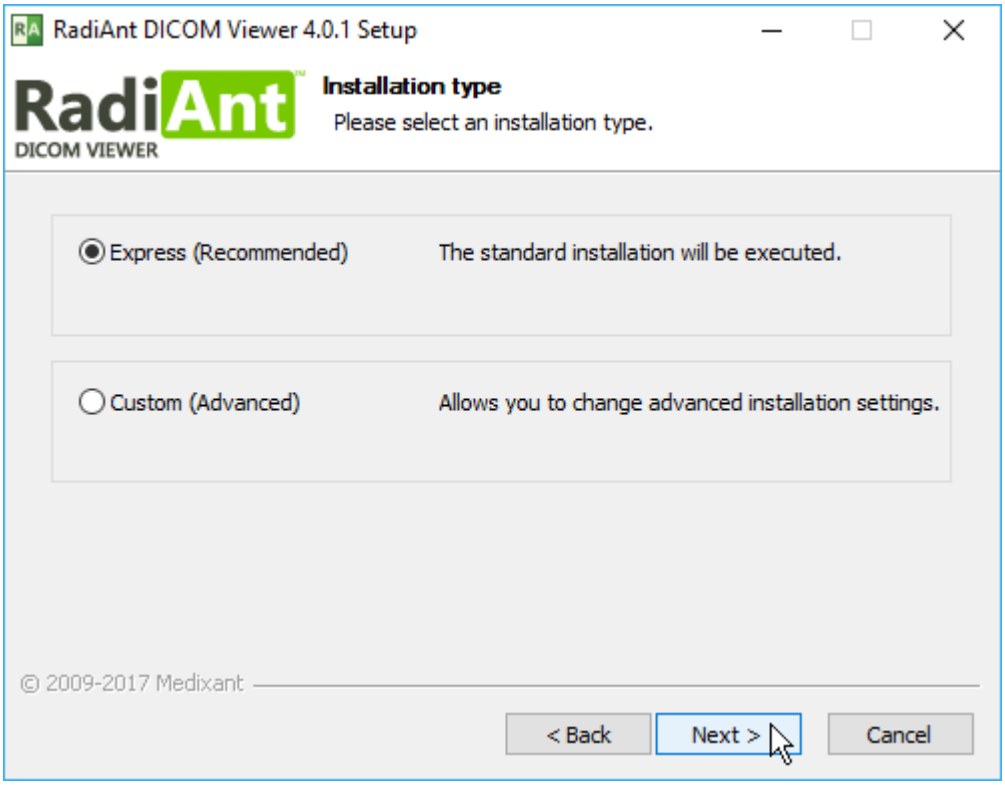
< Back
Next >
Cancel


RadiAnt DICOM Viewer 4.0.1 Setup
RadiAnt
DICOM VIEWER
Installation type
Please select an installation type.
Express (Recommended)
The standard installation will be executed.
Custom (Advanced)
Allows you to change advanced installation settings.
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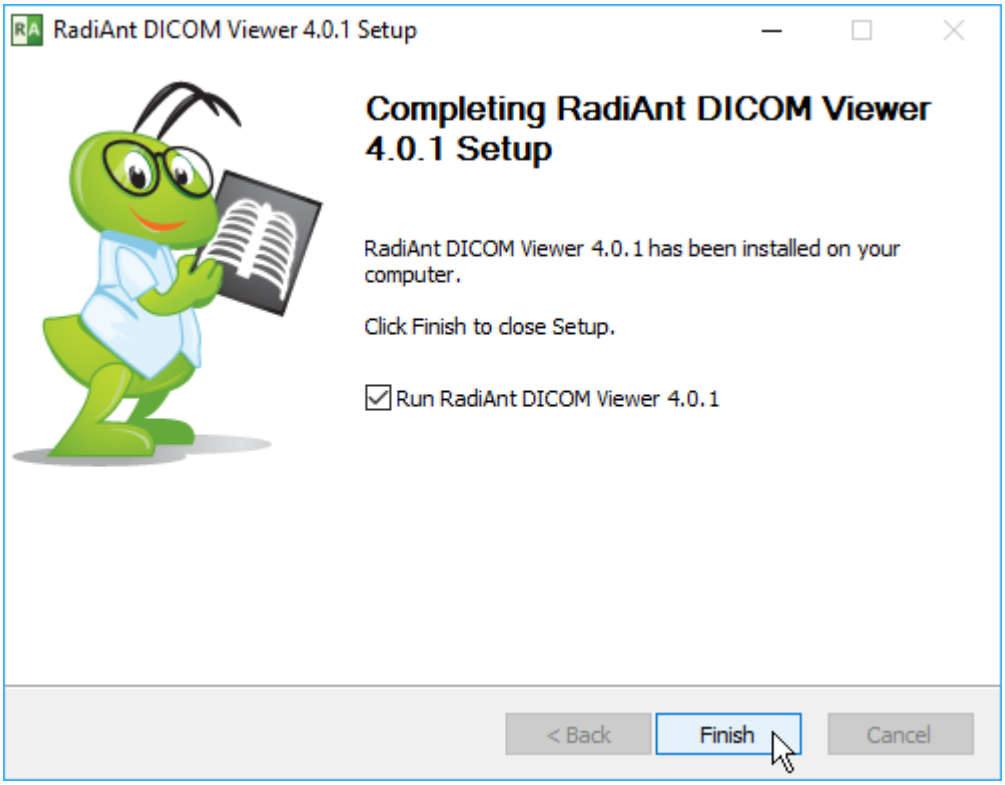
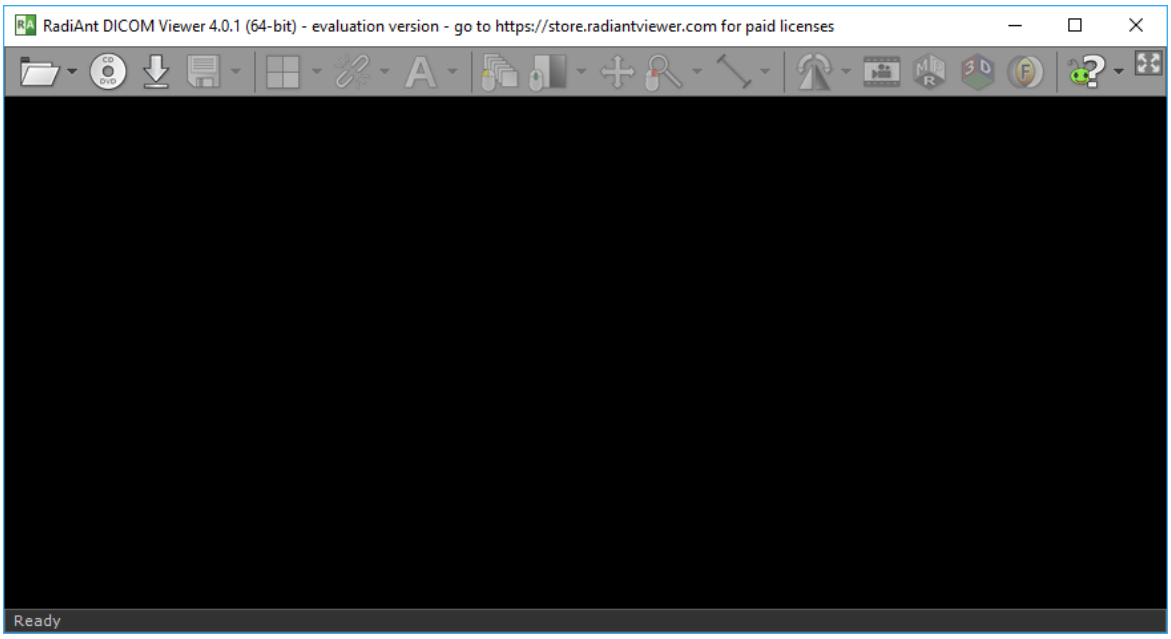
< Back
Next >
Cancel



Once the setup has completed, your software is installed.
If this is your first time installation, you will need to activate the software. Otherwise, RadiAnt DICOM Viewer will start automatically.



The next time you want to use RadiAnt DICOM Viewer, simply double-click its desktop icon to begin using the software immediately!

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1.4 Security considerations

Unless they are anonymized or non-medical, DICOM files usually include very sensitive information about the patient (name, age, ID number, birth date, weight, etc.) and contain the medical image, which itself is of an extremely sensitive nature. Special care must be taken to ensure that this information stays private and is not susceptible to unauthorized access. Before taking any further actions, make sure that you are authorized to view and store specific DICOM files on your machine.

When you store DICOM files on your computer:

- Apply physical security measures (locks, security alarms, monitoring, etc.) to prevent unauthorized persons from accessing your computer that stores DICOM files.
- Use full disk encryption (e.g., Microsoft BitLocker) with a strong password to render data unreadable even if an unauthorized person were to gain access to your computer.
- Use firewall and antivirus software to prevent intrusion and to detect infected files that might compromise the security of your computer, and thereby enable unauthorized file access.
- Protect access to your Windows account with a strong password. Use a minimum length of 8 or more characters. Include different types of characters: numbers, symbols, capital letters, and lower-case letters.
- Log off or power off when leaving your computer unattended.
- Delete the DICOM files from your computer when they are no longer necessary.

When you search and download studies from PACS locations, keep in mind:

- The PACS client module that you use to search for and download studies (DICOM files) communicates over unencrypted TCP connections. Make sure the network connection is secure and there is no possibility for an unauthorized user to eavesdrop on the data.
- On less secure networks, or when two networks are connected through WAN, the data transfer must be made private. Set up VPN tunnel (e.g., IPsec IKEv2, OpenVPN) to encrypt the connection between the PC where RadiAnt DICOM Viewer is installed and the other PACS location.
- The same security rules apply to any computer on which RadiAnt DICOM Viewer is installed and the PACS connection is configured. This way, unauthorized persons can be prevented from searching and downloading studies from configured PACS locations.

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1.5 Activation

Activation (trial license)

What is activation (trial license)?

Activation in trial mode allows you to use a fully functional version of RadiAnt DICOM Viewer during the evaluation period.

How often do I need to activate RadiAnt DICOM Viewer (trial license)?

The evaluation version expires after a predetermined period of time (displayed after activation). After expiration, the installation needs to be reactivated for further evaluation.
Old versions may not qualify for the evaluation. In that case, you can purchase a license if you want to continue to use the old version or download the most recent version from RadiAnt's website and activate it in trial mode.

Activation (paid license)

What is activation (paid license)?

Product activation is the process of verifying the validity of a product's license. Once the product is activated, the user can access the software.
The product activation process protects both your rights as a consumer and the rights of Medixant as a software developer.
It verifies that you have installed genuine RadiAnt DICOM Viewer software and that the product has not been activated on more computers than those permitted by the EULA.

How often do I need to activate RadiAnt DICOM Viewer (paid license)?

For paid licenses, the activation is permanent.
You will only need to reactivate when you transfer your RadiAnt DICOM Viewer license to another computer or when you renew your Update & Support subscription.

How can I transfer the license to another computer?

First, you need to deactivate the license on your "old" computer. After successful deactivation, the license can be activated on a new machine.
Please note, a license can be transferred only once in a 90-day period.

I have purchased N licenses. Can I install RadiAnt DICOM Viewer on more than N computers?

No, you need a separate license for each computer (or terminal) on which RadiAnt DICOM Viewer is installed (or used).

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Deactivation

What is deactivation?

Deactivation lets you transfer your RadiAnt DICOM Viewer paid license to another computer.

How often can I deactivate a license?

A single license can be deactivated only once in 90 days.
A license key valid for N licenses can be deactivated N times during a 90-day period.

Can the same computer be deactivated and reactivated many times?

Deactivation is intended for situations in which you no longer plan to use RadiAnt DICOM Viewer on your "old" computer.
It is not designed for transferring the paid license back and forth between two computers that are in active use. As such, the software can only be deactivated on the same computer twice.
When this limit is reached, you will not be able to deactivate the license.

Is it possible to deactivate a license if the computer cannot be accessed anymore? (stolen, broken, etc.)

Please log in to "My Licenses" account with the email address provided when purchasing the license. You will be able to deactivate your old computer there.

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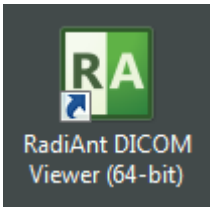
1.5.1 Trial license activation

Automatic activation

The steps below illustrate the process by which you can activate RadiAnt DICOM Viewer in the evaluation mode on computers that are connected to the Internet.
If your computer has no Internet connection, you can activate the software manually.

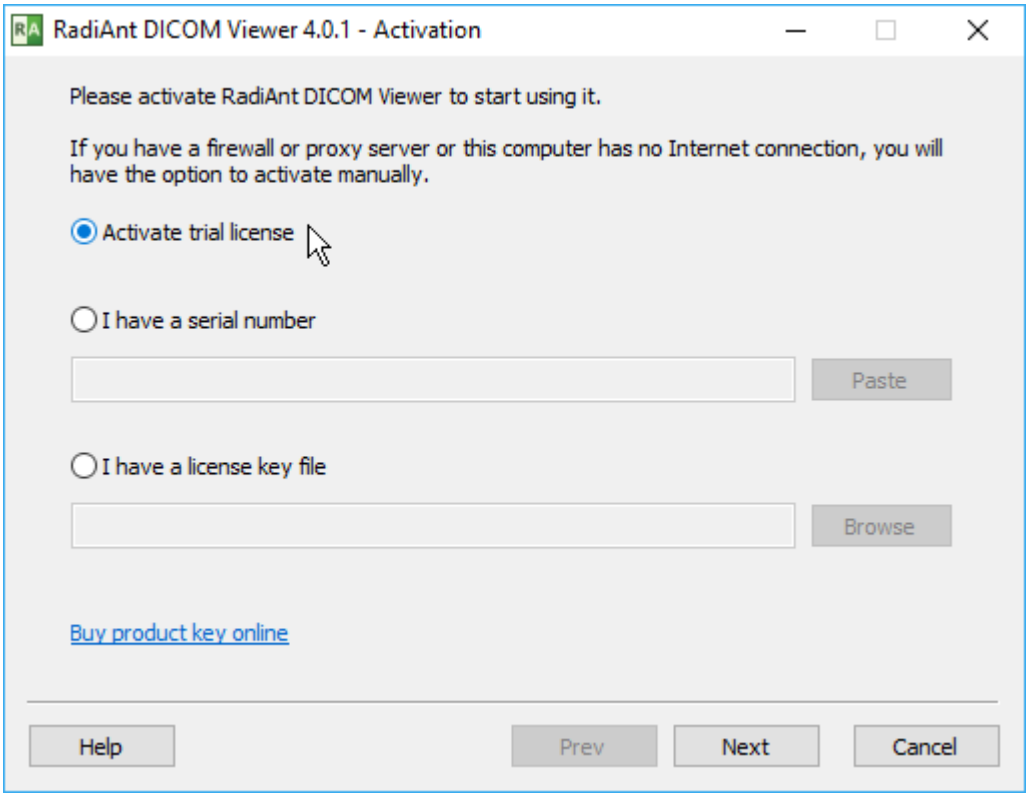
To activate your software:

1. Launch RadiAnt DICOM Viewer by clicking on the product icon on your desktop.



2. On the Activation screen, choose the following option:

   - `Activate trial license`.



3. Click the `Next` button. RadiAnt DICOM Viewer will attempt to connect to the license server.

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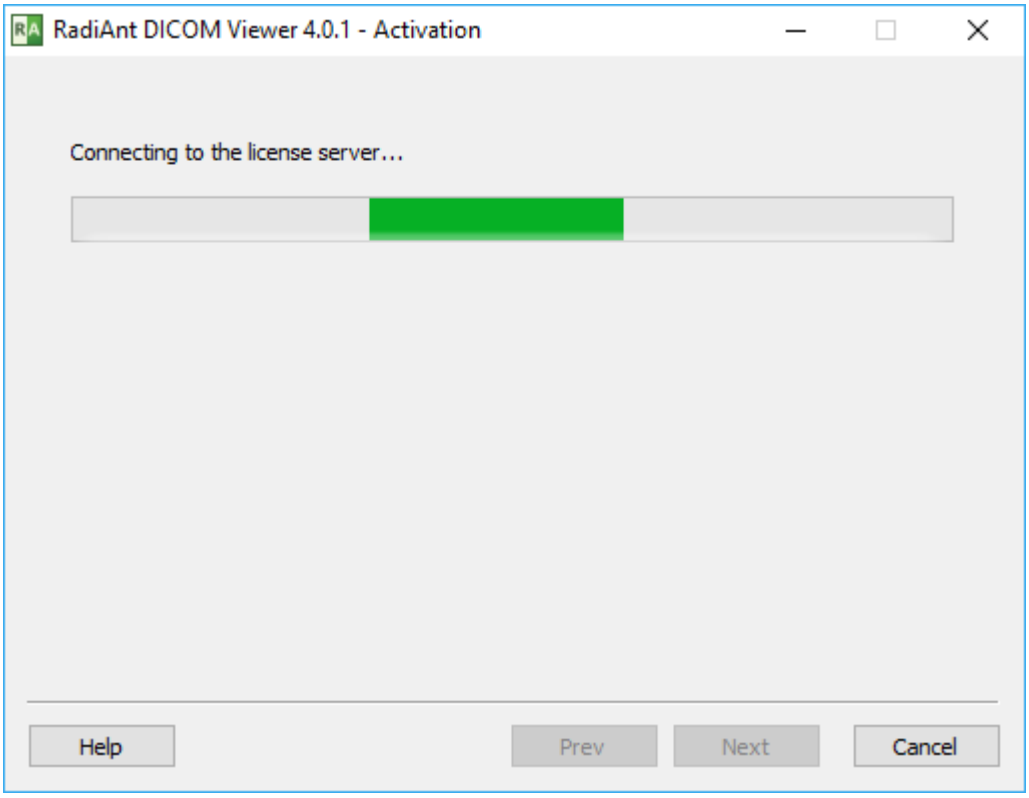
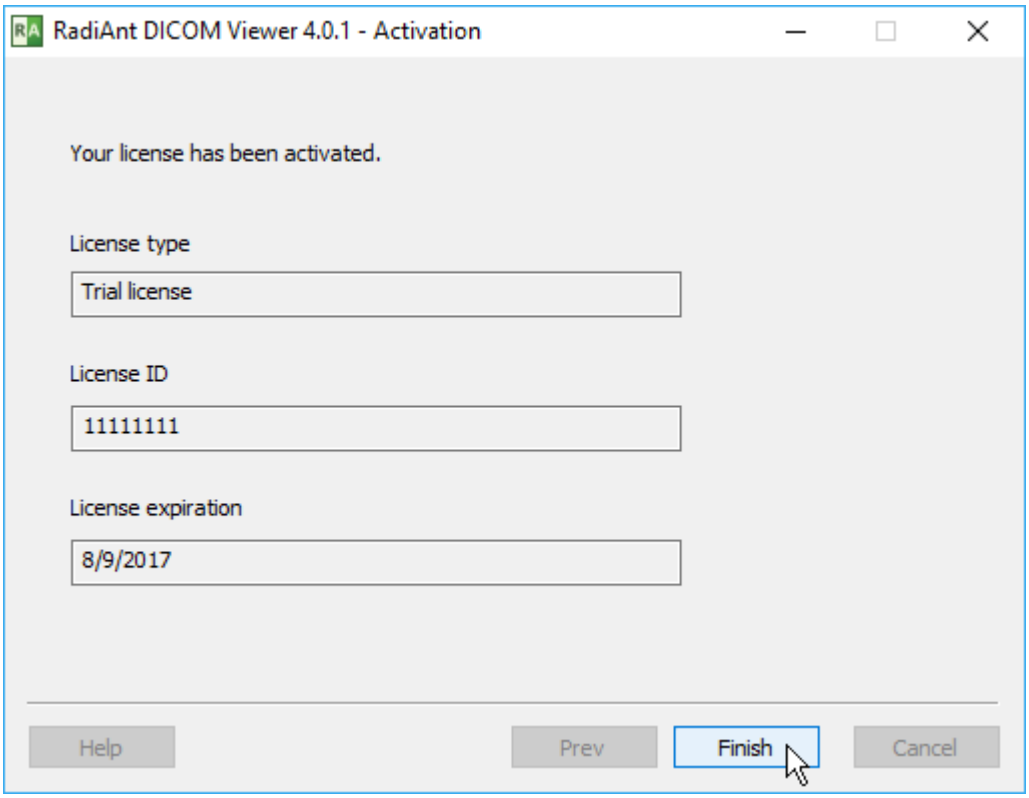


4. When you see the Activation info screen, activation is complete.



5. Click the **`Finish`** button to start using the software.

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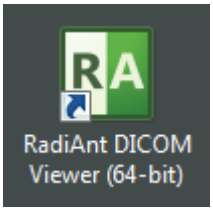
Manual activation

The process by which you can activate RadiAnt DICOM Viewer in the evaluation mode on computers that are not connected to the Internet is described below.

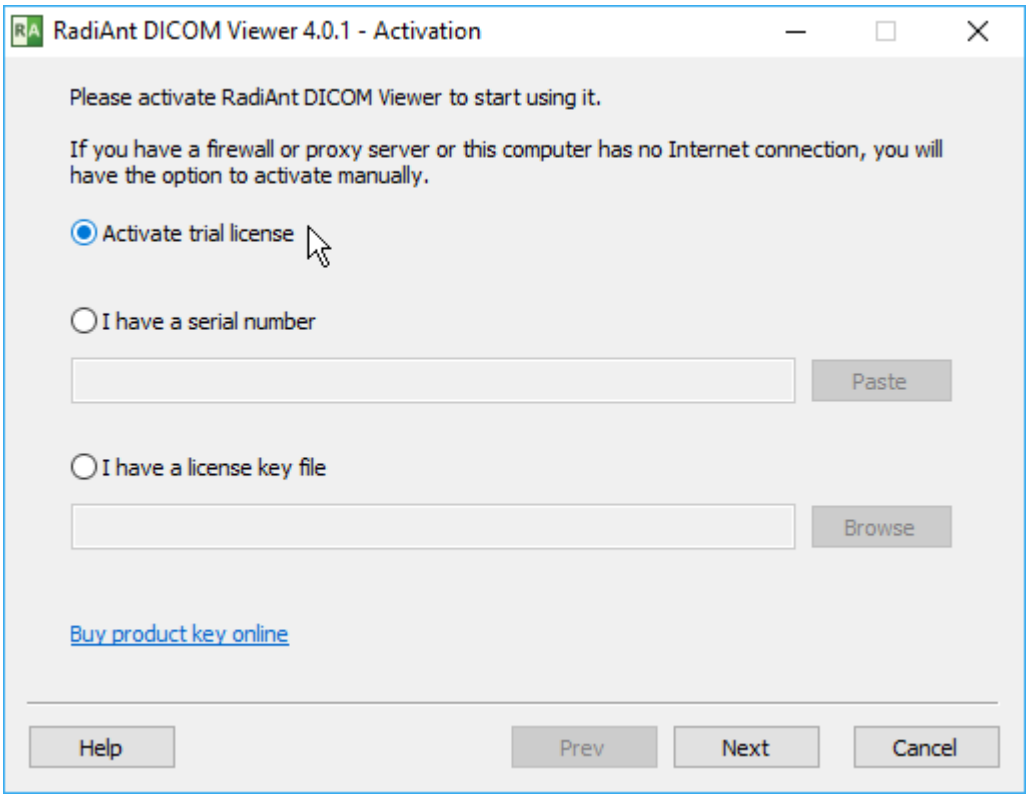
To activate your software:

1. Launch RadiAnt DICOM Viewer by clicking on the product icon on your desktop.



2. On the Activation screen, choose the following option:

   - `Activate trial license`.



3. Click the `Next` button. After a failed attempt to connect to the license server, the offline activation screen will be displayed.

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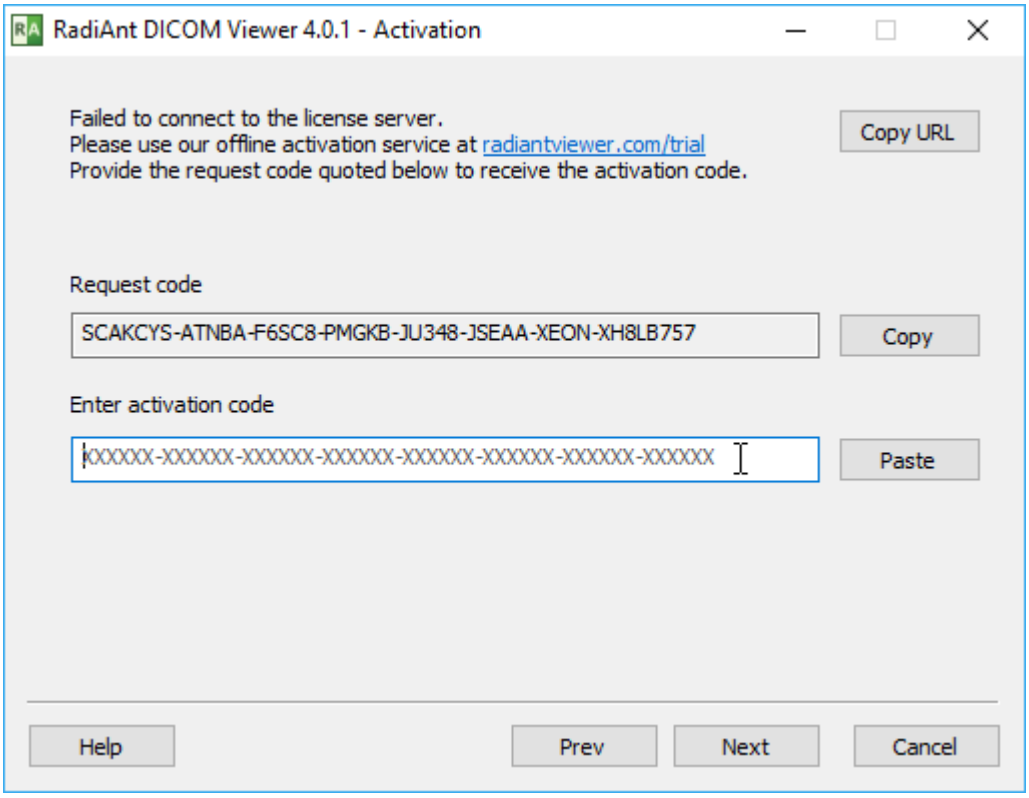
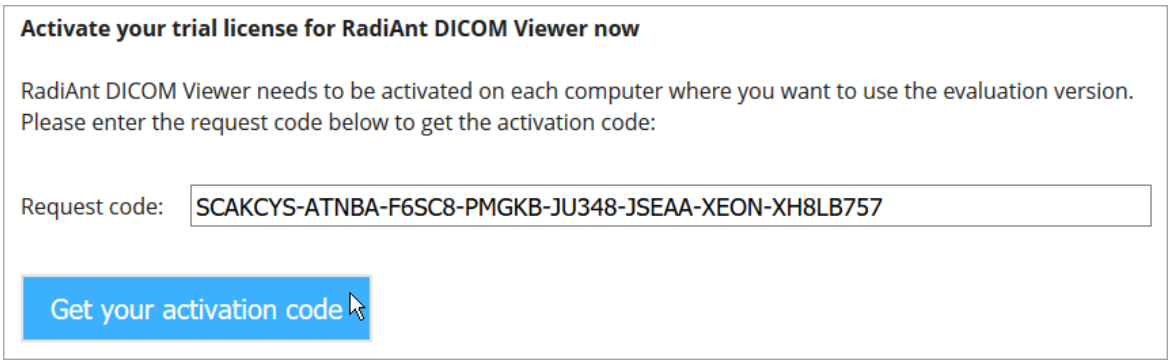
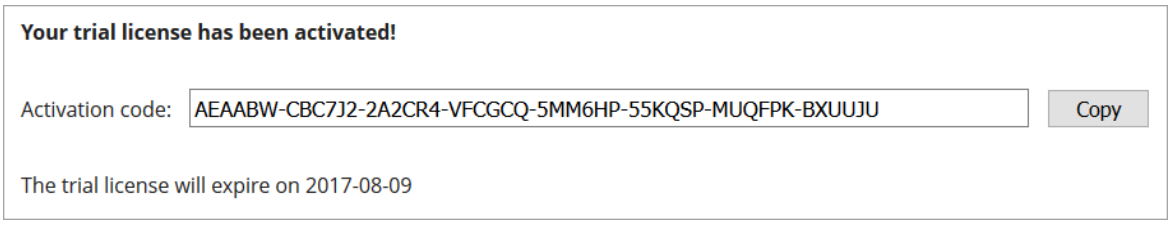


4. Go to https://radiantviewer.com/trial and complete the form with the request code. Click the **`Get your activation code`** button.



5. The trial activation code will be displayed.



6. Enter this code in the appropriate field on the RadiAnt DICOM Viewer offline activation screen and press the **`Next`** button.

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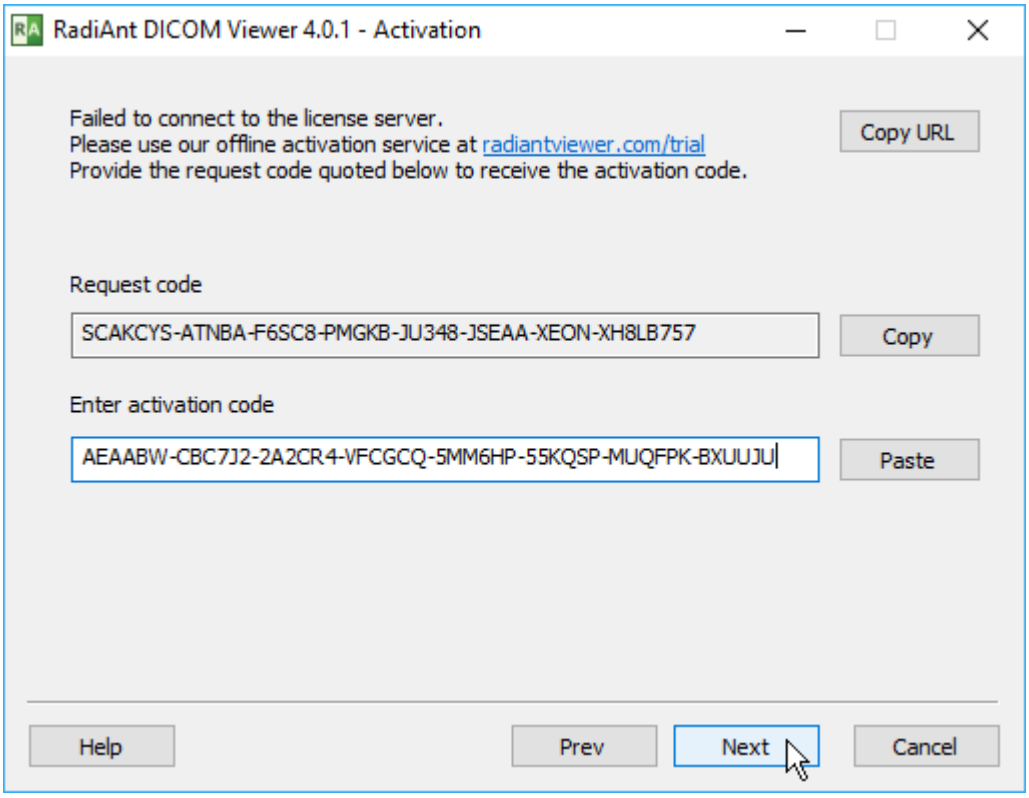
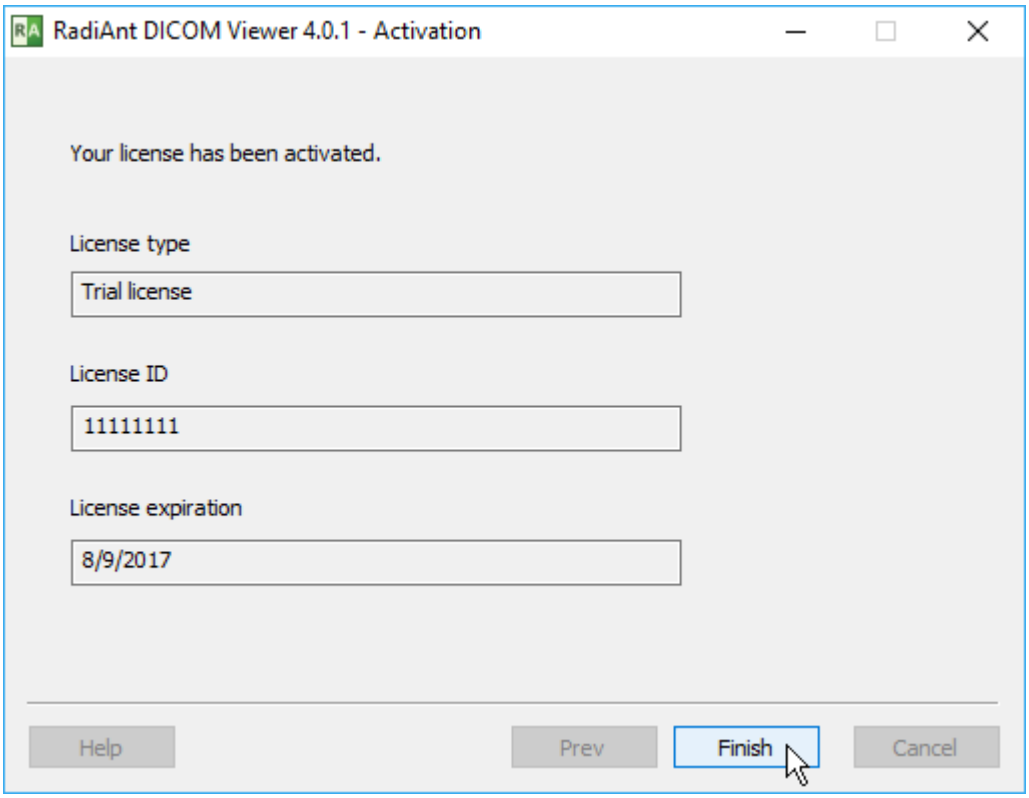


7. When you see the Activation info screen, activation is complete.



8. Click the **`Finish`** button to start using the software.

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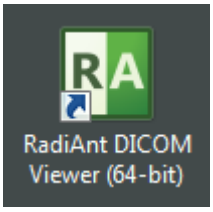
1.5.2 Paid license activation

Automatic activation

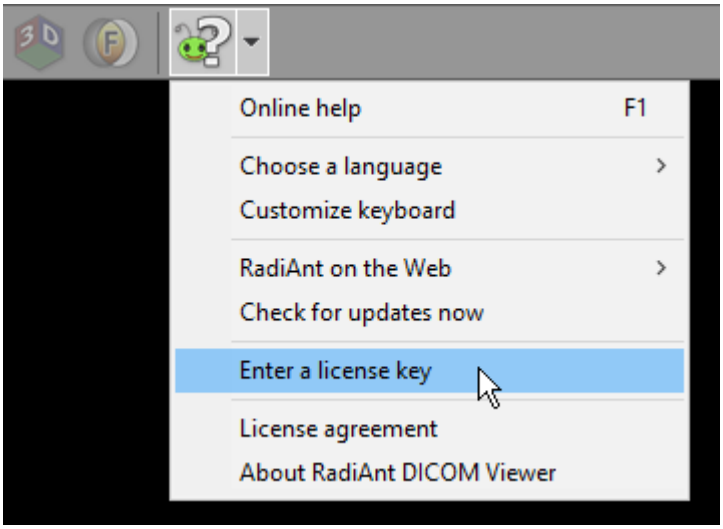
The steps below illustrate the process by which you can activate RadiAnt DICOM Viewer on computers that are connected to the Internet.
If your computer has no Internet connection, you can activate the software manually.

To activate your software:

1. Launch RadiAnt DICOM Viewer by clicking on the product icon on your desktop.



If you have previously activated the software in trial mode, click the arrow next to the **Help** button on the toolbar and select Enter a license key.



Alternatively, you can click Update your license if your RadiAnt DICOM Viewer installation was activated with the paid license and you have now purchased Update & Support renewal.

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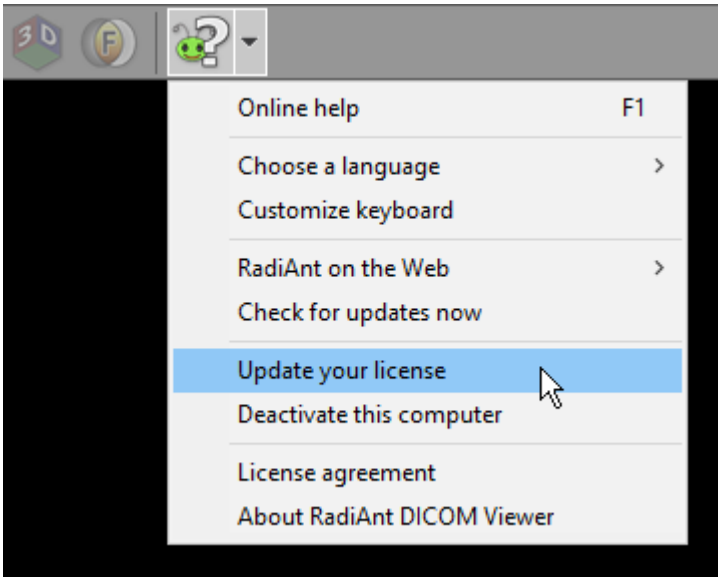
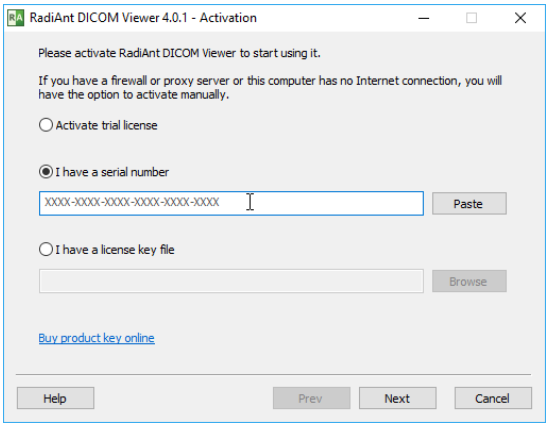
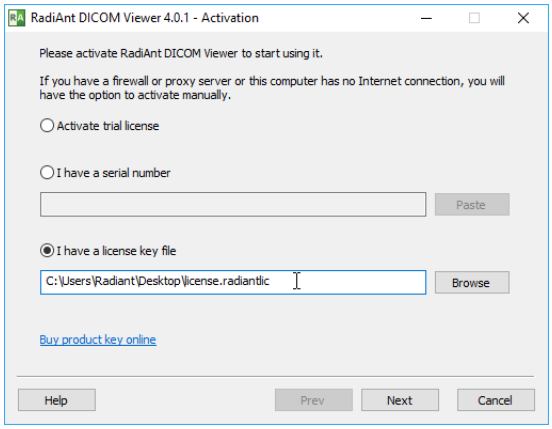


2. On the Activation screen, choose one of the following options:

- **`I have a serial number`**. Use this option if you received serial number information in your confirmation email.
- **`I have a license key file`**. Use this option if you have a legacy license key file (purchased for software versions <= 3.X).





3. Enter your serial number or browse for the license key file and click the **`Next`** button. RadiAnt DICOM Viewer will attempt to connect to the license server.

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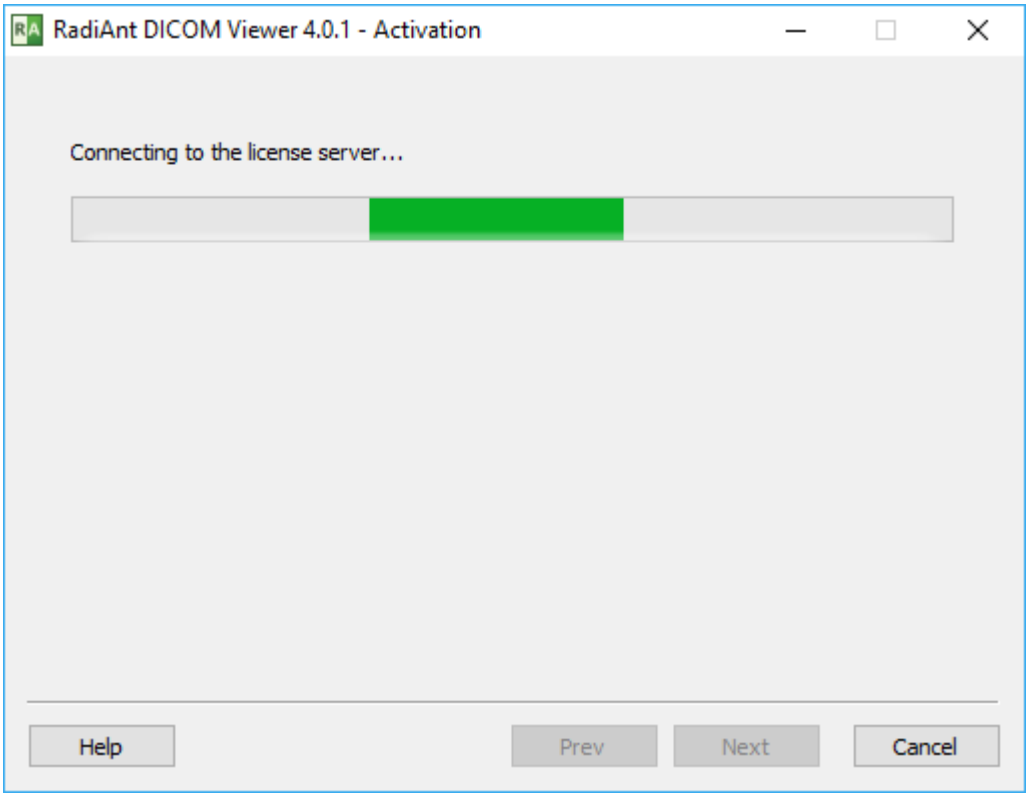
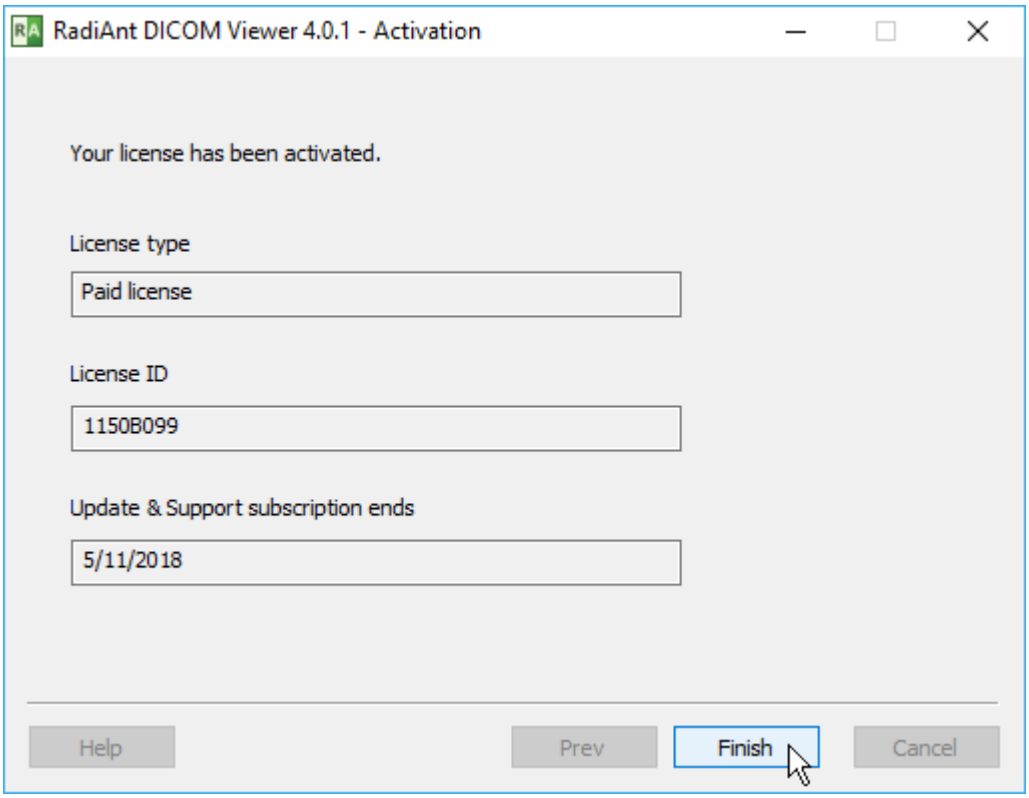


4. When you see the Activation info screen, activation is complete.



5. Click the **`Finish`** button to start using the software.

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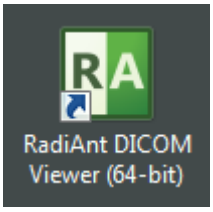
Manual activation

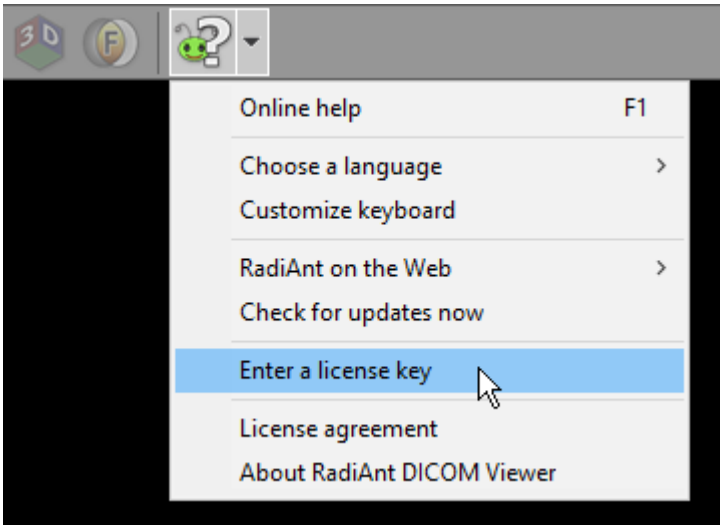
The steps below illustrate the process by which you can activate RadiAnt DICOM Viewer on computers that are not connected to the Internet.

To activate your software:

1. Launch RadiAnt DICOM Viewer by clicking on the product icon on your desktop.



If you have previously activated the software in trial mode, click the arrow next to the **Help** button on the toolbar and select Enter a license key .



Alternatively, you can click Update your license if your RadiAnt DICOM Viewer installation was activated with the paid license and you have now purchased Update & Support renewal.

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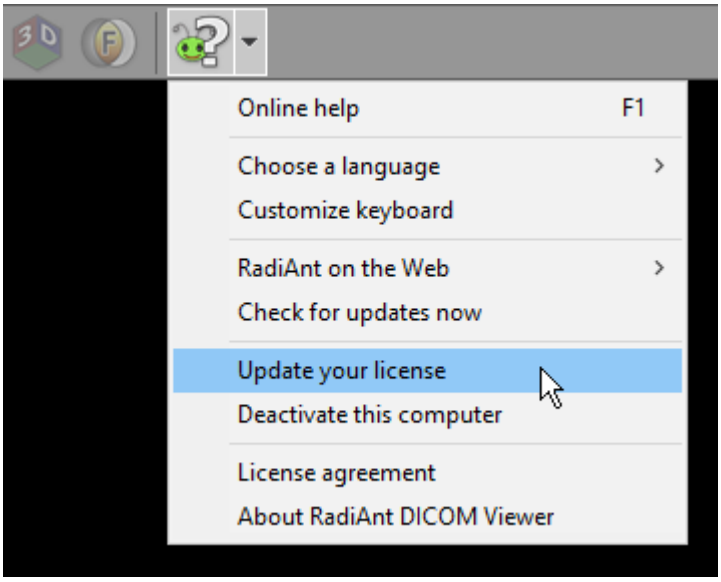
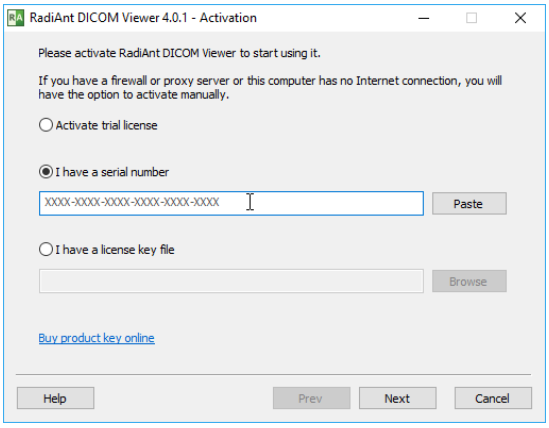
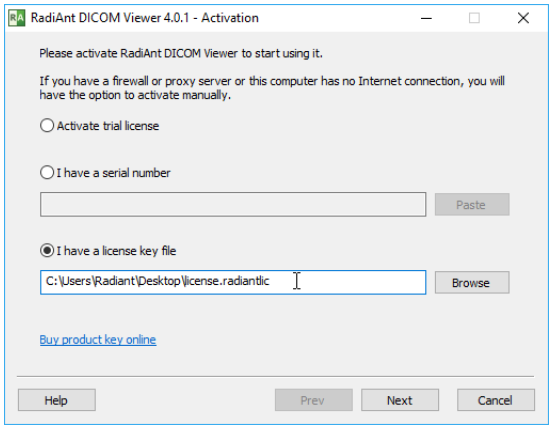


2. On the Activation screen, choose one of the following options:

- **`I have a serial number`**. Use this option if you received serial number information in your confirmation email.
- **`I have a license key file`**. Use this option if you have a legacy license key file (purchased for software versions <= 3.X).





3. Enter your serial number or browse for the license key file and click the **`Next`** button. After a failed attempt to contact the license server, the offline activation screen will be displayed.

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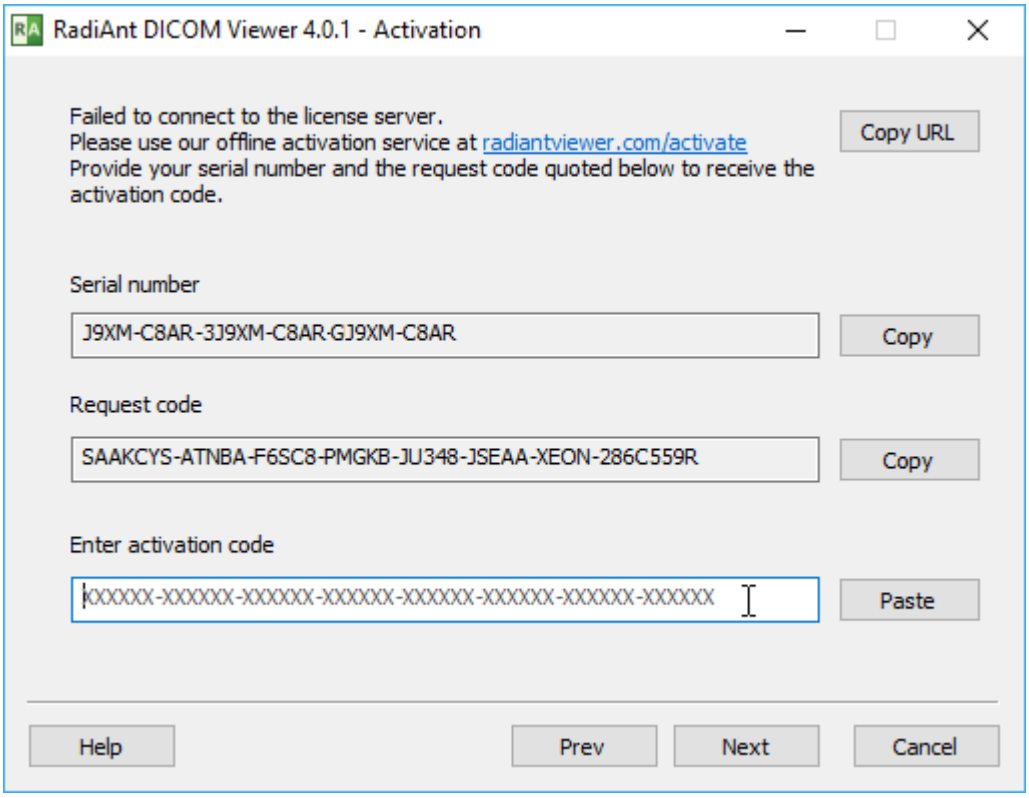
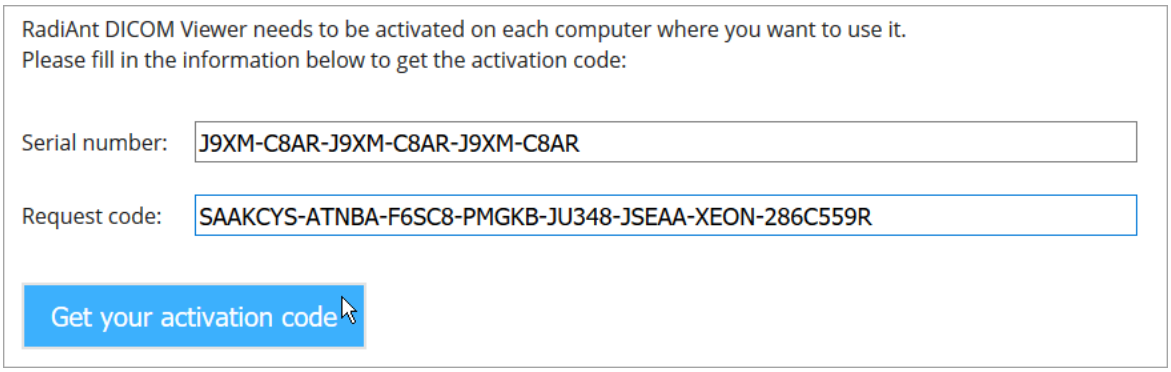
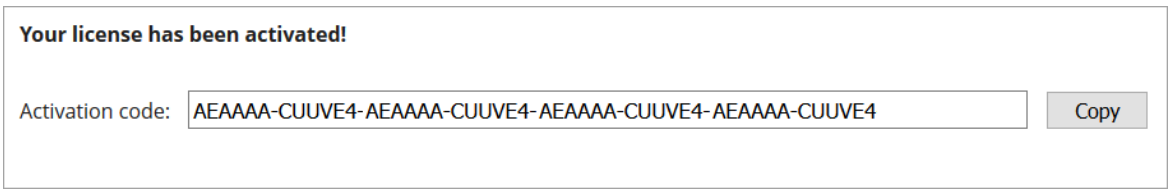


4. Go to https://radiantviewer.com/activate and fill in the form with the serial number and request code. Click the **`Get your activation code`** button.



5. After the license is validated, the activation code will be displayed.



6. Enter this code in the appropriate field on the RadiAnt DICOM Viewer offline activation screen and press the **`Next`** button.

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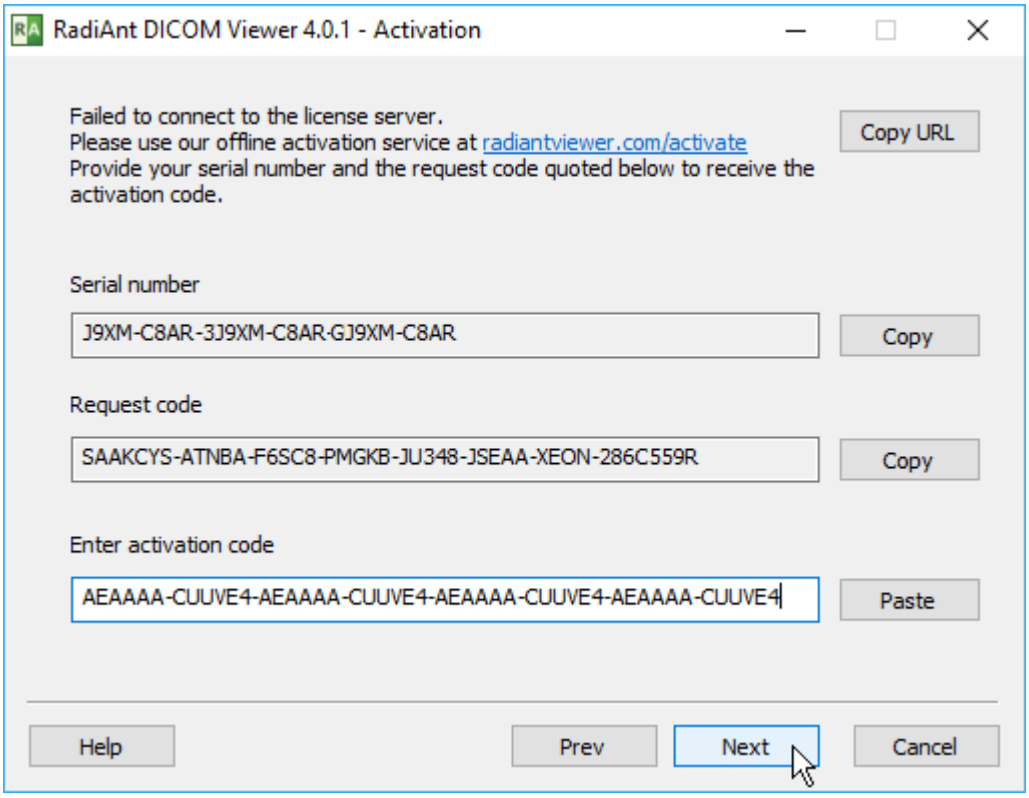
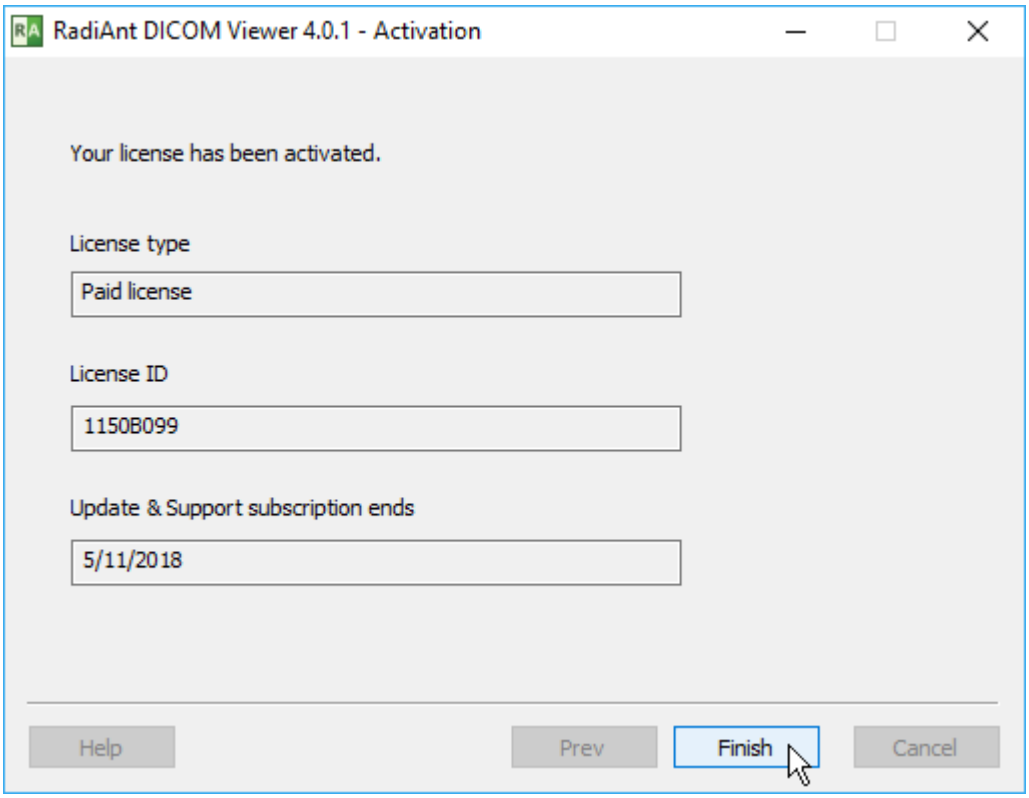


7. When you see the Activation info screen, activation is complete.



8. Click the **`Finish`** button to start using the software.

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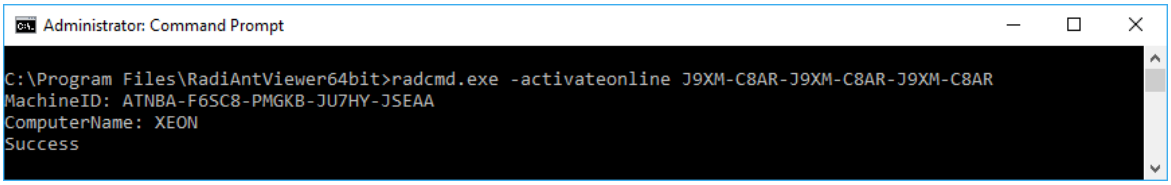
Automatic command-line activation

RadiAnt DICOM Viewer can be activated automatically on local and remote computers using the command-line tool located in the installation folder (radcmd.exe):

1. Execute the following command: `radcmd.exe -activateonline SERIALNUMBER`

2. The output of the command above includes the machine ID, the computer name and the result. After successful activation, radcmd.exe returns the exit code 0.



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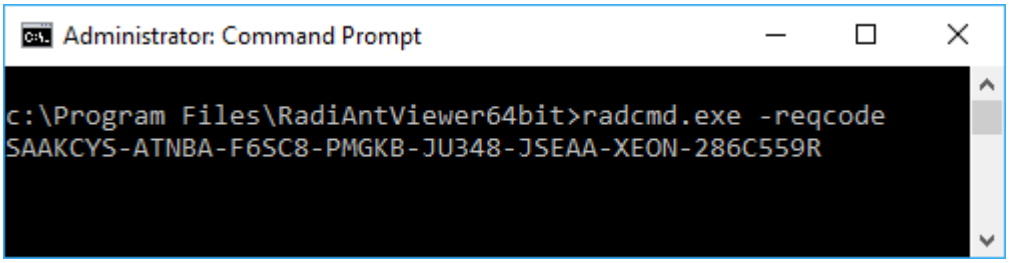
Manual command-line activation

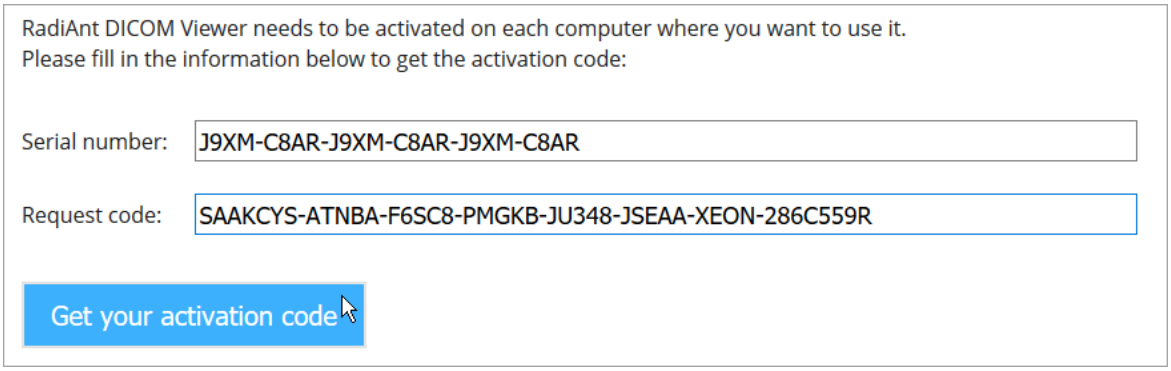
RadiAnt DICOM Viewer can be activated manually on local and remote computers using the command-line tool located in the installation folder (radcmd.exe):

1. Get the request code from the computer you want to activate by executing the following command: radcmd.exe -reqcode

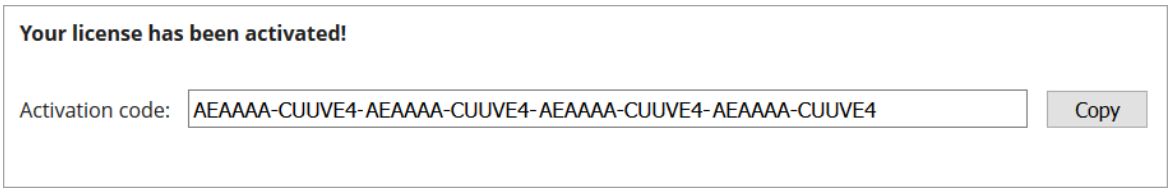
2. The output of the command above includes the request code in one line.



3. Use your serial number and the request code to activate your license at https://radiantviewer.com/activate



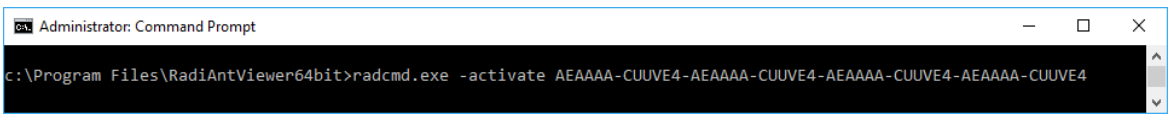
4. After the license is validated, the activation code will be displayed.



5. Execute the command below to complete the activation process:

radcmd.exe -activate ACTIVATION_CODE

(replace ACTIVATION_CODE with the activation code obtained in the previous step)



6. After successful activation, radcmd.exe returns the exit code 0.

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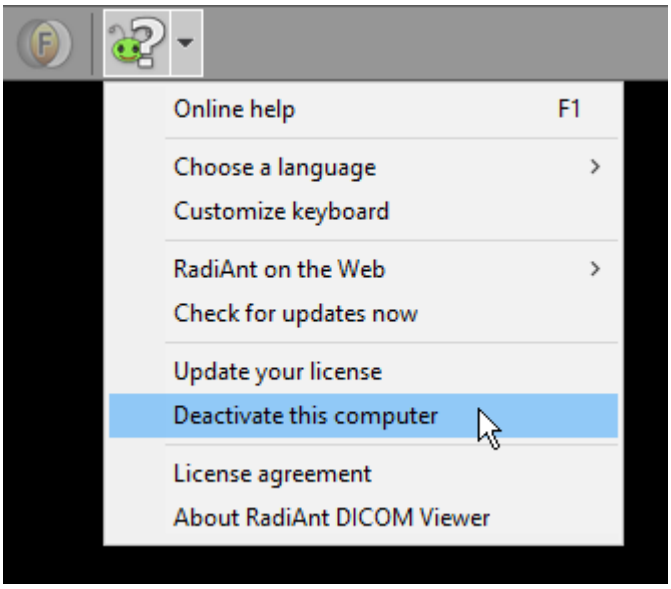
1.5.3 Deactivation

Automatic deactivation

The steps outlined below illustrate the process by which you can deactivate RadiAnt DICOM Viewer on computers that are connected to the Internet.
If your computer is not connected to the Internet, you can deactivate the software manually.

To deactivate your software:

1. Select Deactivate this computer from the drop-down menu next to the help button.



2. On the deactivation screen, check the `I want to deactivate this computer` checkbox.

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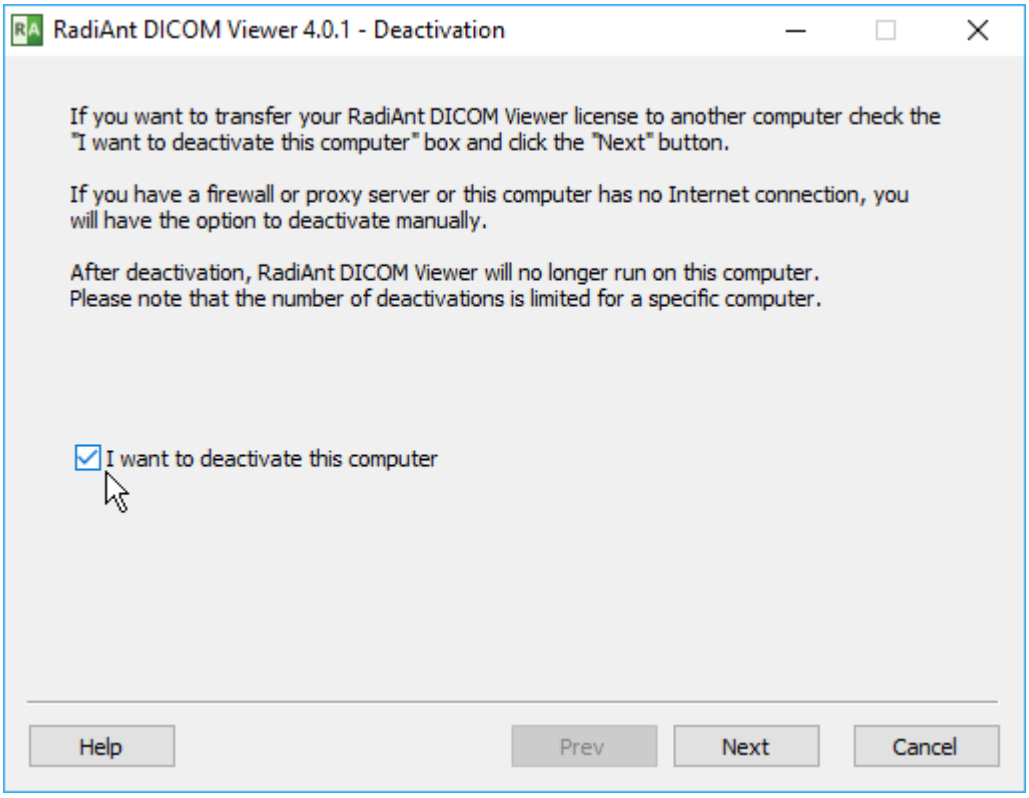
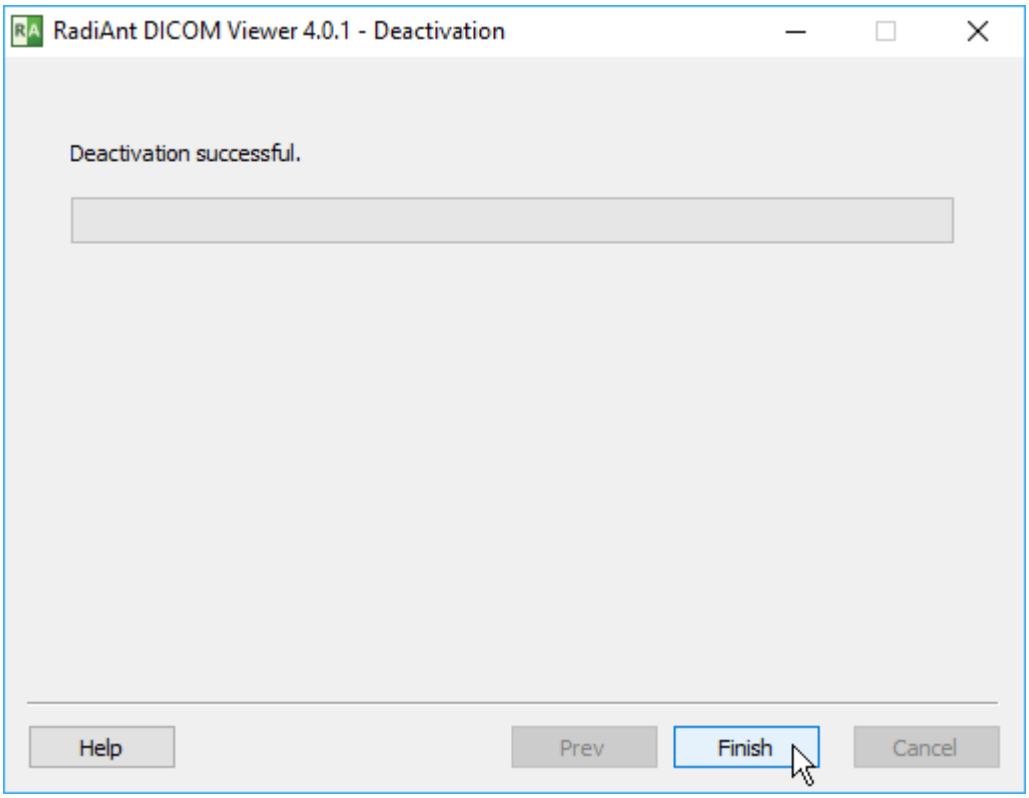


3. Click the **`Next`** button. RadiAnt DICOM Viewer will attempt to connect to the license server. When you see the confirmation message, deactivation is complete.



4. Click the **`Finish`** button to close the software.

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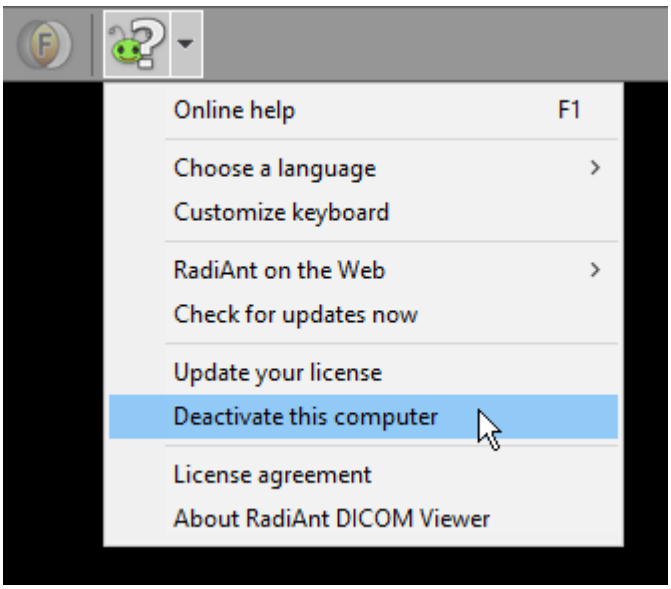
Manual deactivation

The steps below illustrate the process by which you can deactivate RadiAnt DICOM Viewer on computers that are not connected to the Internet.

To deactivate your software:

1. Select Deactivate this computer from the drop-down menu next to the help button.



2. On the deactivation screen, check the `I want to deactivate this computer` checkbox.

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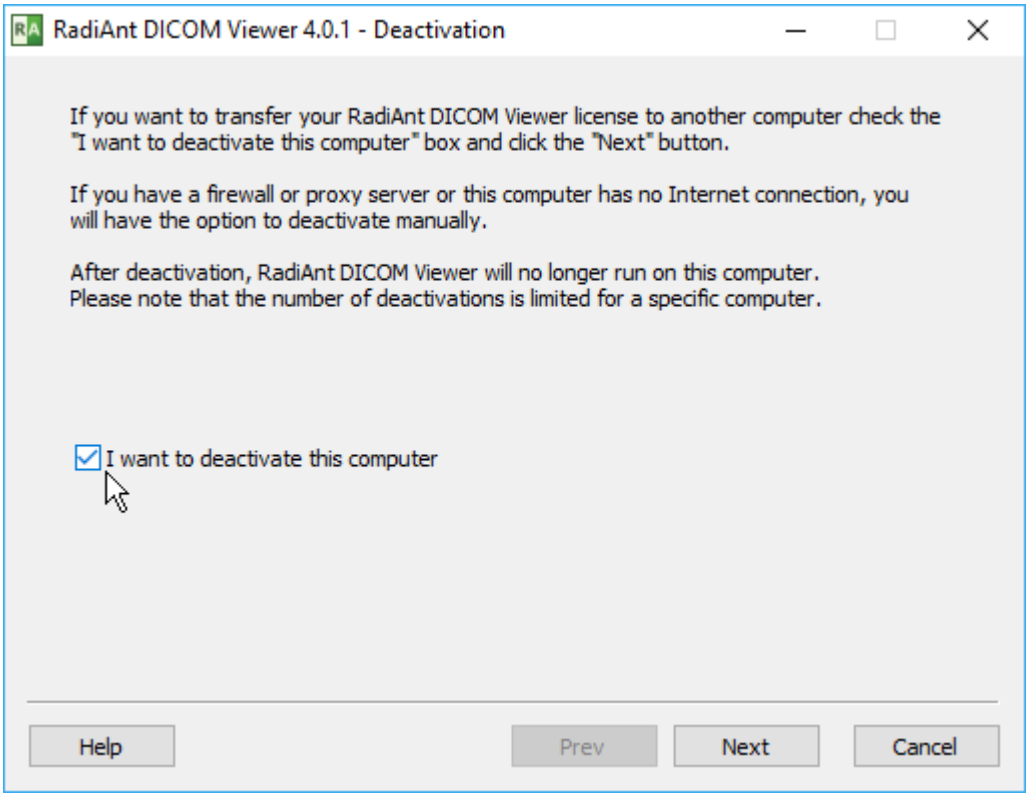
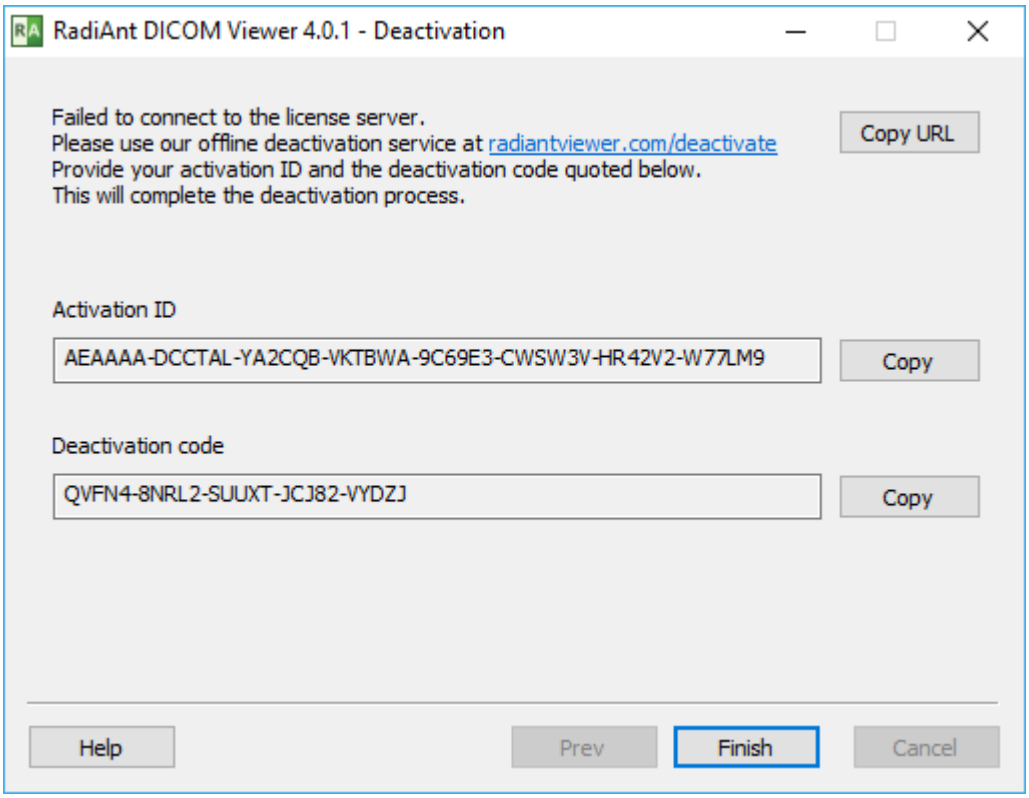


3. Click the **`Next`** button. After a failed attempt to contact the license server, the offline deactivation screen will be displayed.



4. Go to https://radiantviewer.com/deactivate, and complete the form with the activation ID and deactivation code. Click the **`Complete the deactivation process`** button.

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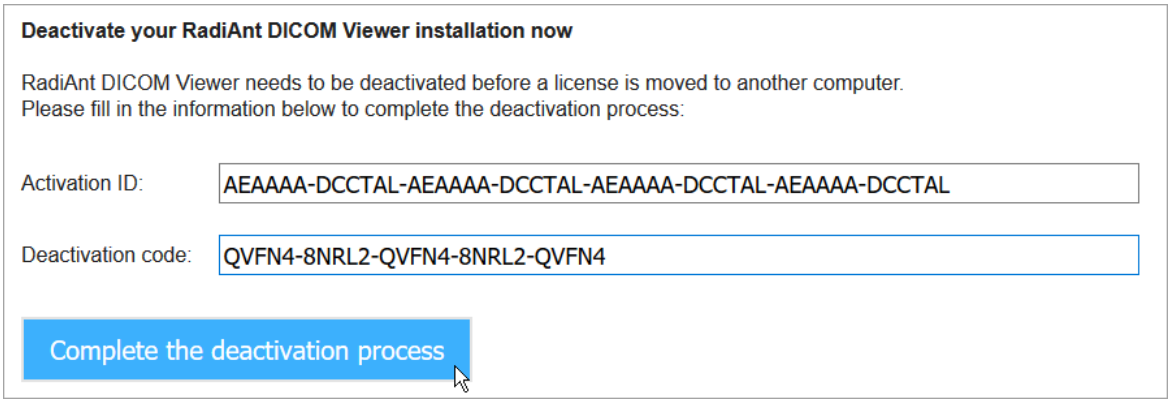
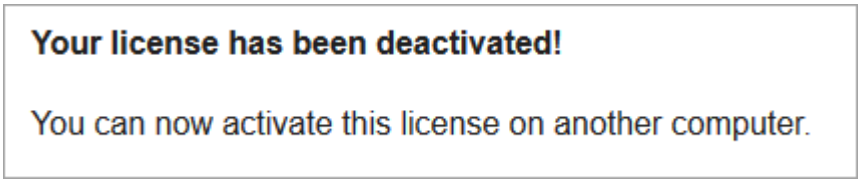


5. Your deactivation is now confirmed.



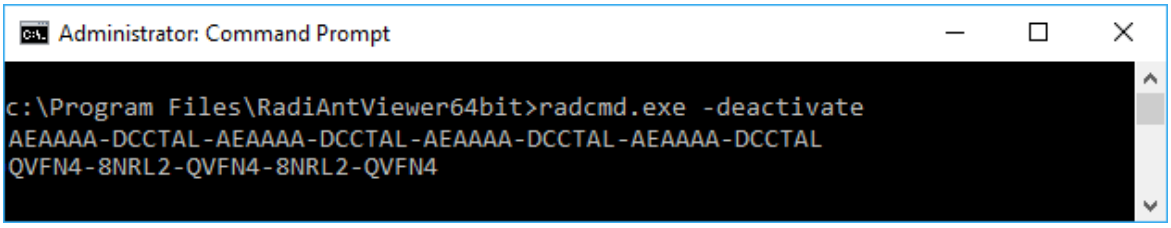
6. Click the **`Finish`** button to close the software.

Manual command-line deactivation

RadiAnt DICOM Viewer can be deactivated on local and remote computers using the command-line tool located in the installation folder (radcmd.exe):

1. Execute the following command: `radcmd.exe -deactivate`

2. The output of the command above includes the activation ID and the deactivation code in two lines.



3. Go to https://radiantviewer.com/deactivate, and complete the form with the activation ID and deactivation code obtained in the previous step. Click the **`Complete the deactivation process`** button.

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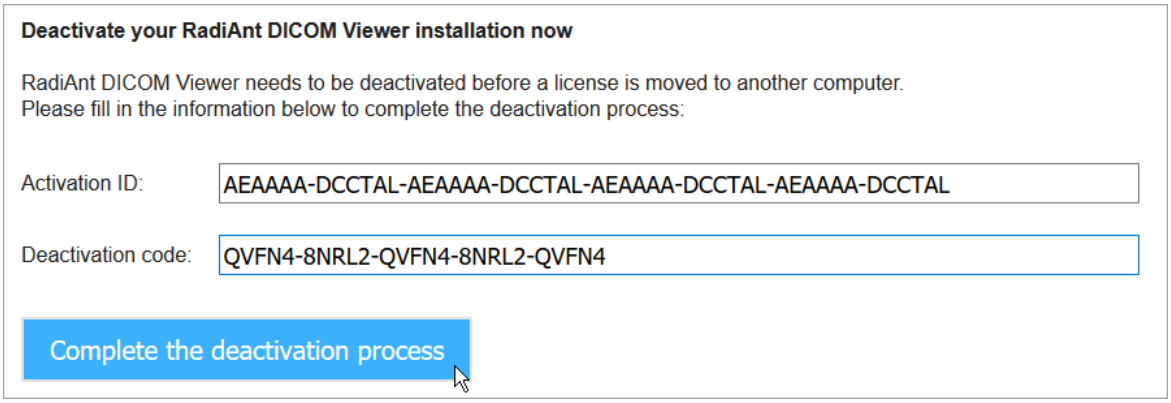
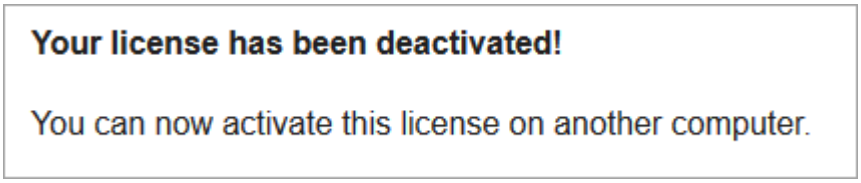


4. Your deactivation is now confirmed.



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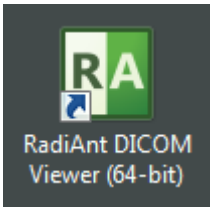
2 Basic Topics

2.1 Opening a DICOM study from a CD/DVD

1. Insert a disk with a DICOM study into a CD/DVD drive. If the default viewer is automatically started from the CD, close it in order to obtain better reading speeds in RadiAnt DICOM Viewer.

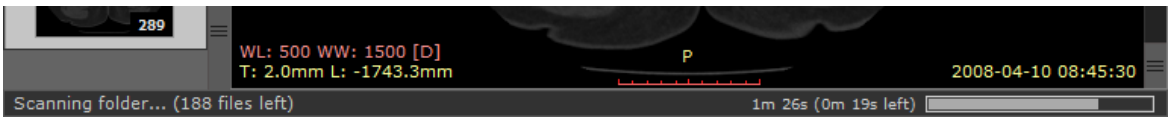
2. Run RadiAnt DICOM Viewer by double-clicking its desktop icon.



3. Click the **CD/DVD** button on the toolbar in main window (this button is hidden when no CD/DVD drive is detected), or use shortcut **Ctrl + Alt + O** .

4. The process of disk scanning will start. You can browse images of the study as soon as they begin appearing in the series preview bar.

5. The status bar shows the number of remaining files, elapsed time and estimated time to finish.



6. Remove the disk from the CD/DVD drive only when you finish viewing the study. (Ejection will render images unavailable for viewing.)

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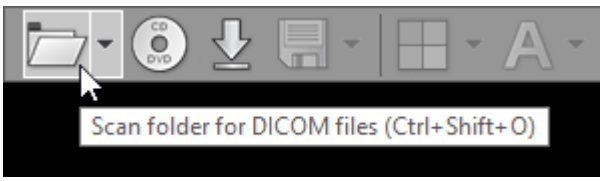
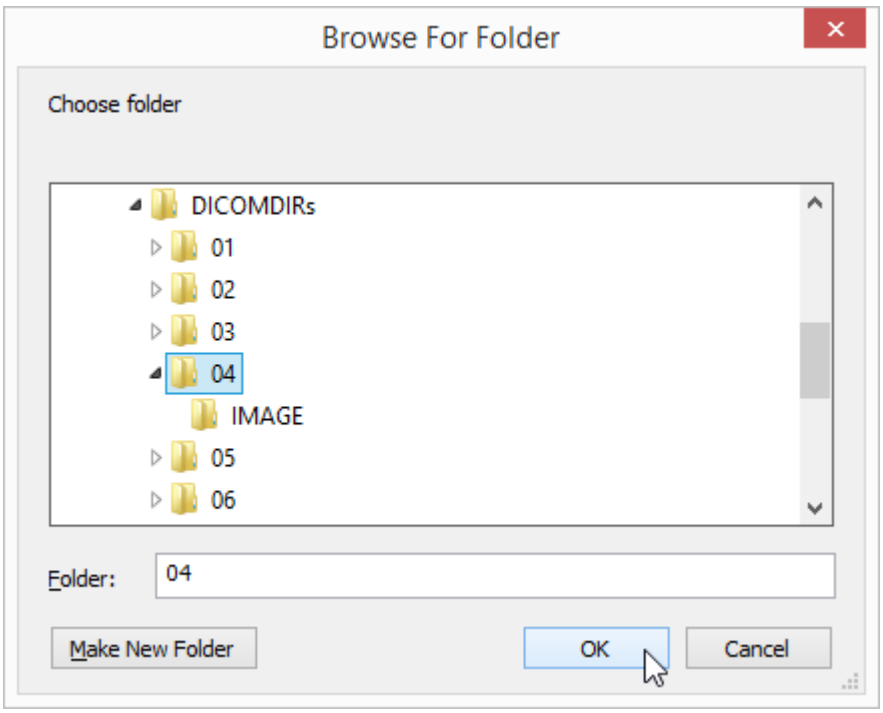
2.2 Opening a DICOM study from a folder

1. Run RadiAnt DICOM Viewer by double-clicking its desktop icon.

2. Click the `Folder` button on the toolbar in main window, or use the shortcut `Ctrl + Shift + O` .



3. Find the folder you want to scan for DICOM files, select it, and then click `OK` .



4. The process of scanning will start. You can browse images of the study as soon as they begin appearing in the series preview bar.

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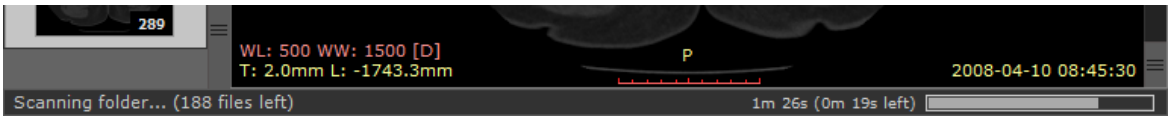
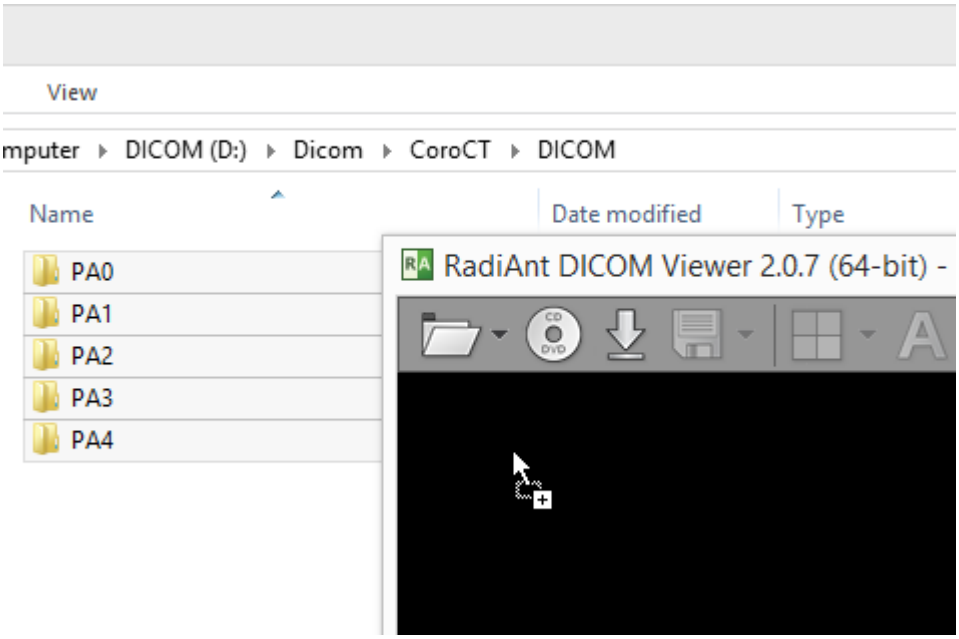
5. The status bar shows the number of remaining files, elapsed time, and estimated time to finish.

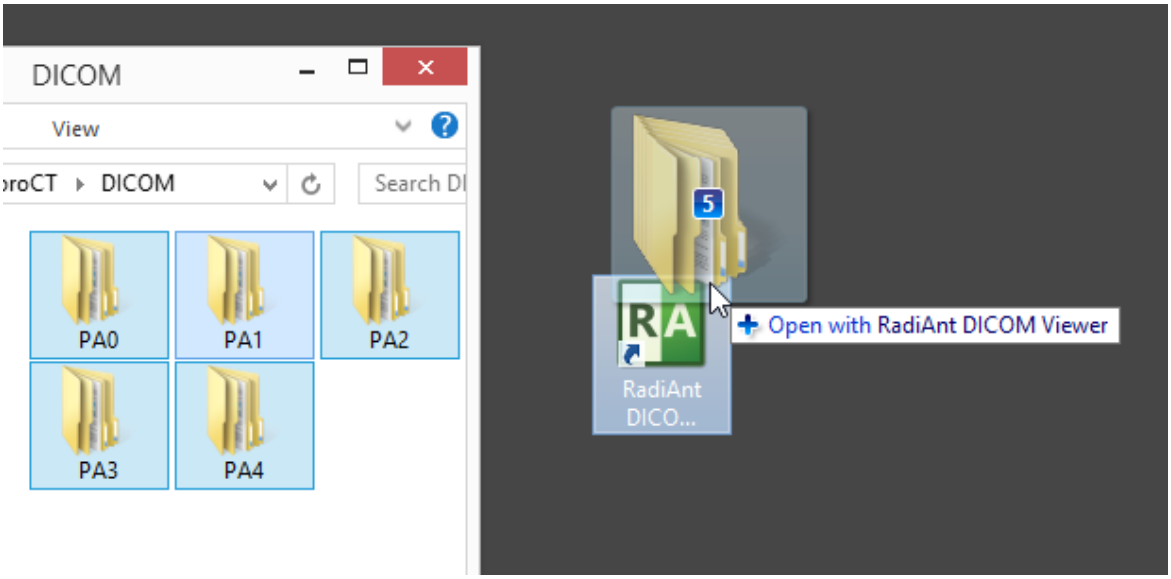


You may also use two other, faster methods:

1. Drag & drop the selected folder(s) onto either RadiAnt DICOM Viewer main window:



Or, to its desktop icon:



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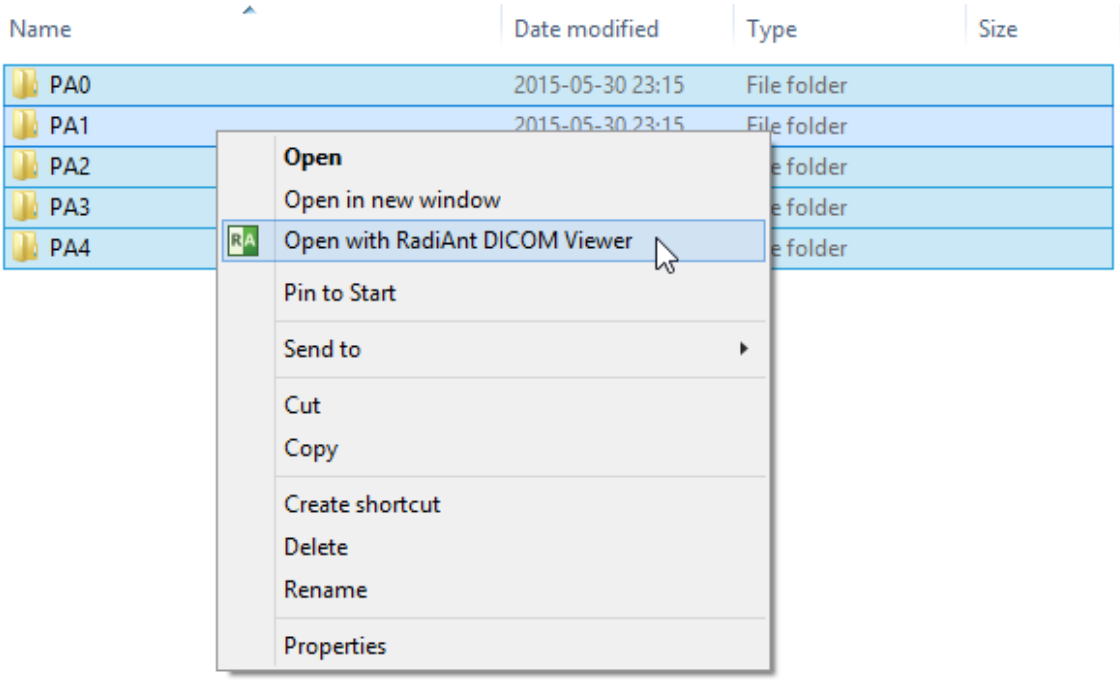
2. Right-click the context menu on the selected folder(s) and choose Open with RadiAnt DICOM Viewer.



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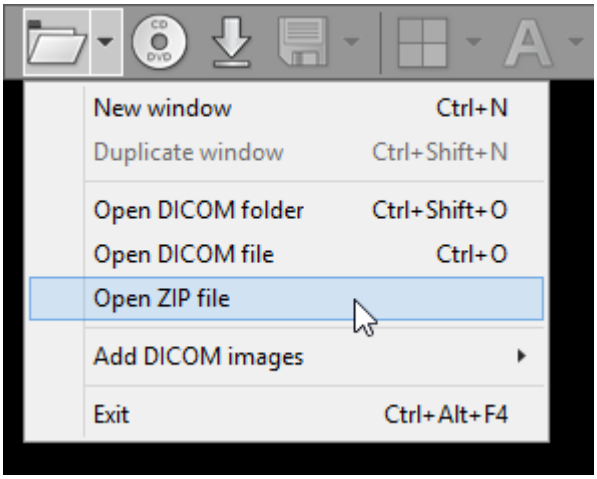
2.3 Opening a DICOM study from a ZIP archive

1. Run RadiAnt DICOM Viewer by double-clicking its desktop icon.

2. Click the arrow next to the folder icon on the toolbar in the main window.

3. Click Open ZIP file.



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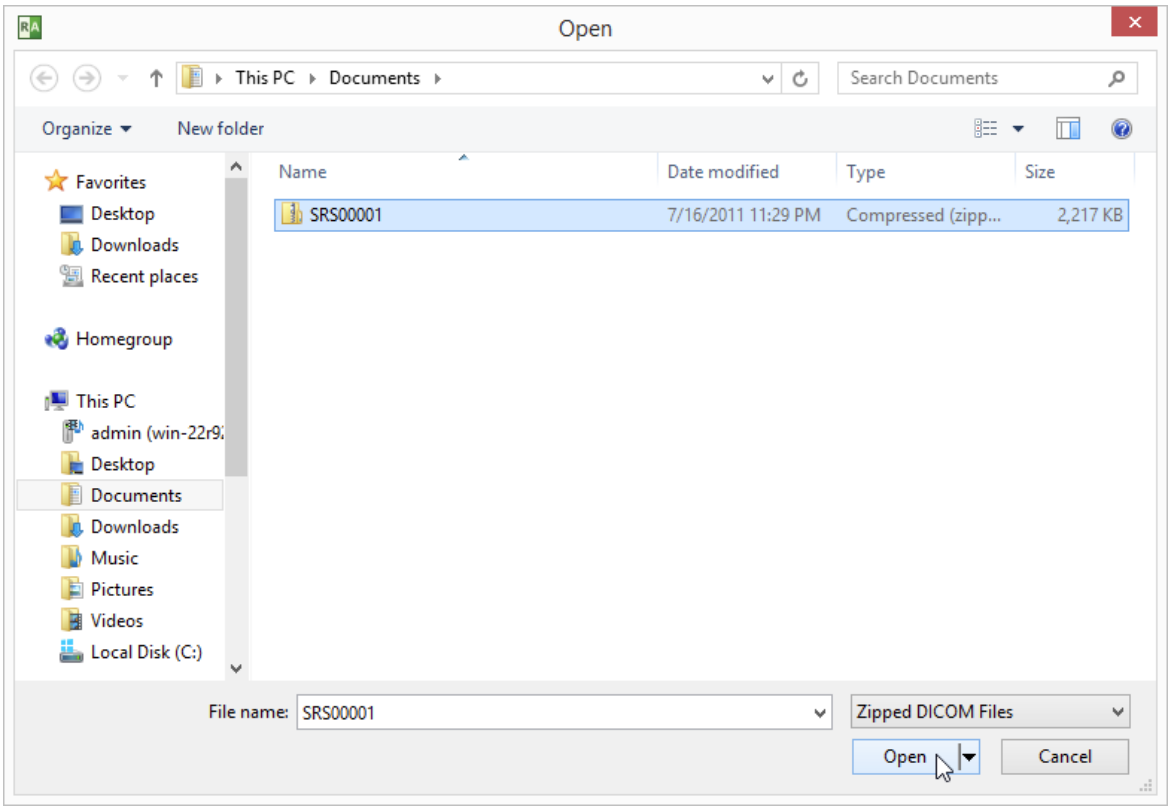
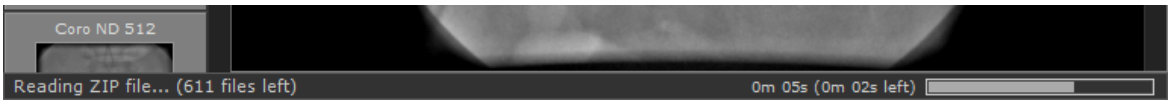
4. Find the zip archive, select it, and click **Open**.



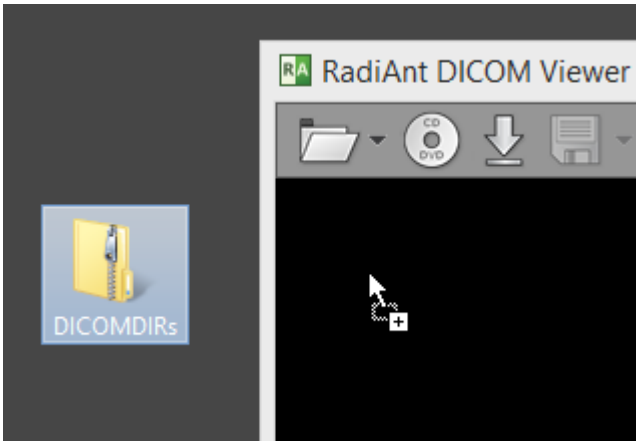
5. The process of unpacking and file scanning will start. You can browse images of the study as soon as they begin appearing in the series preview bar.

6. The status bar shows the number of remaining files, elapsed time and estimated time to finish.



You can also use two other, faster methods:

1. Drag & drop selected ZIP archive onto either RadiAnt DICOM Viewer main window:



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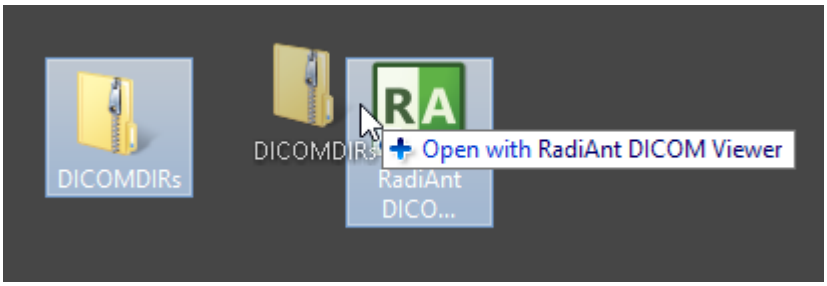
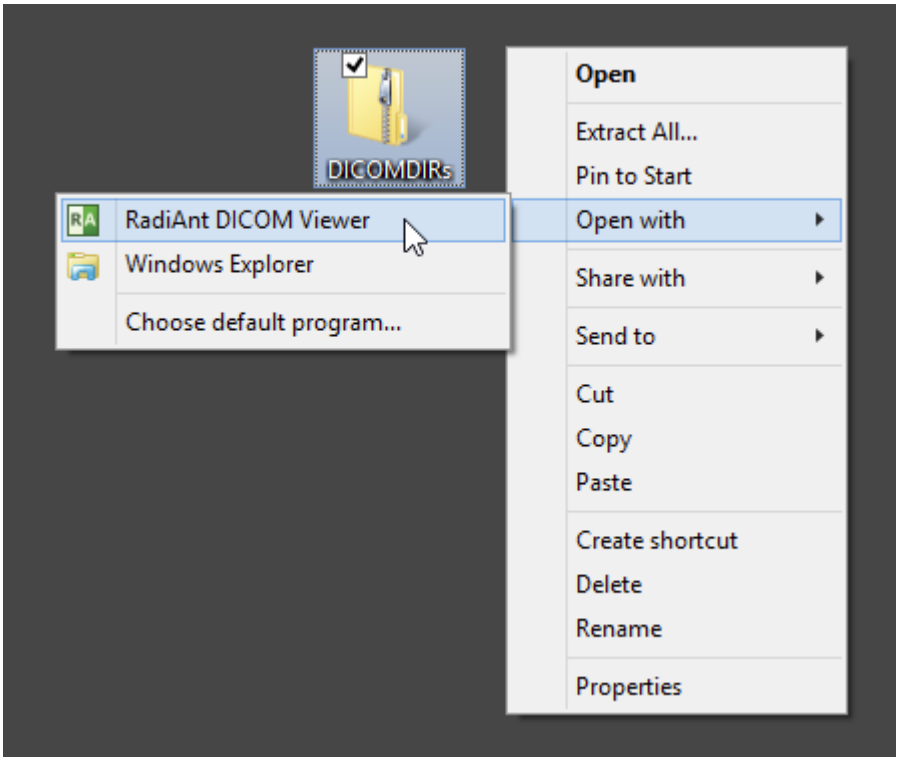
Or, to its desktop icon:



2. Use right-click context menu on the selected ZIP archive and click Open with / RadiAnt DICOM Viewer.



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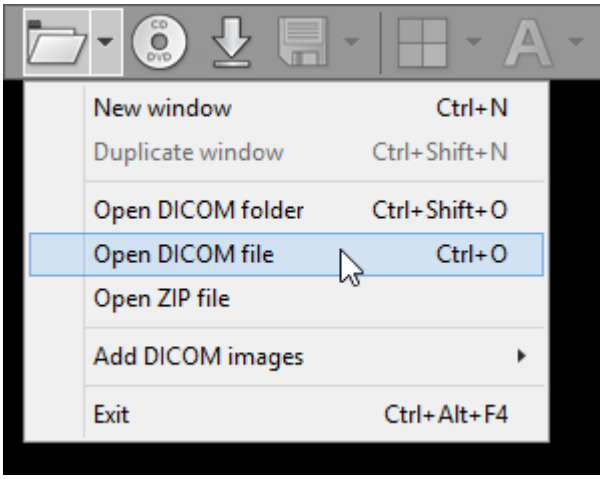
2.4 Opening specific DICOM file(s)

1. Run RadiAnt DICOM Viewer by double-clicking its desktop icon.

2. Click the arrow next to folder icon on the toolbar, or use the `Ctrl + O` keyboard shortcut.

3. Click Open DICOM file.



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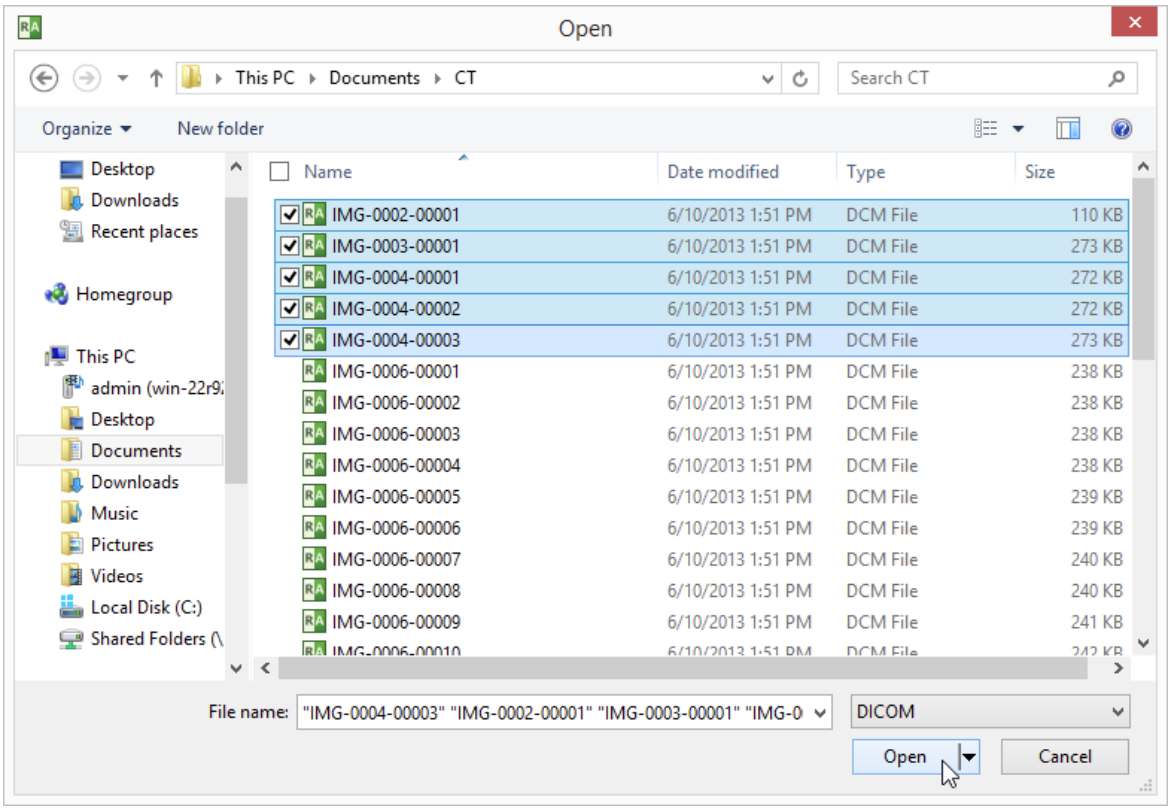
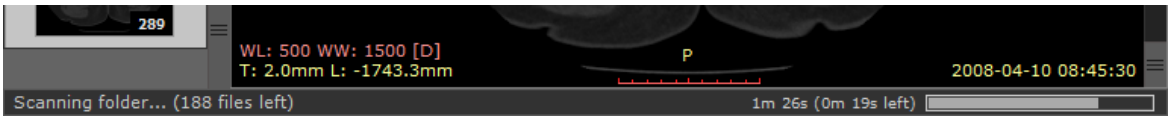
4. Find the DICOM file(s), make your selection, and click **Open**.



5. The process of loading will start. You may browse images of the study as soon as they begin appearing in the series preview bar.

6. The status bar shows the number of remaining files, elapsed time, and estimated time to finish.



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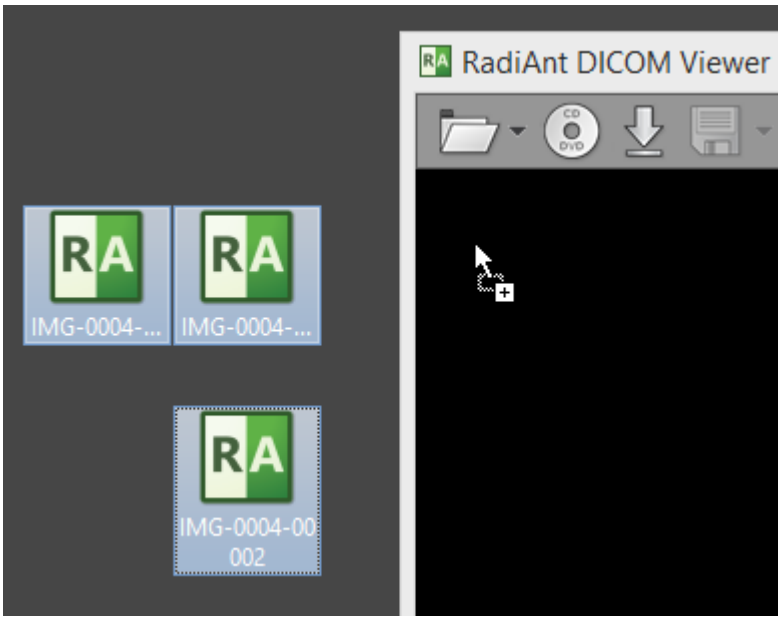
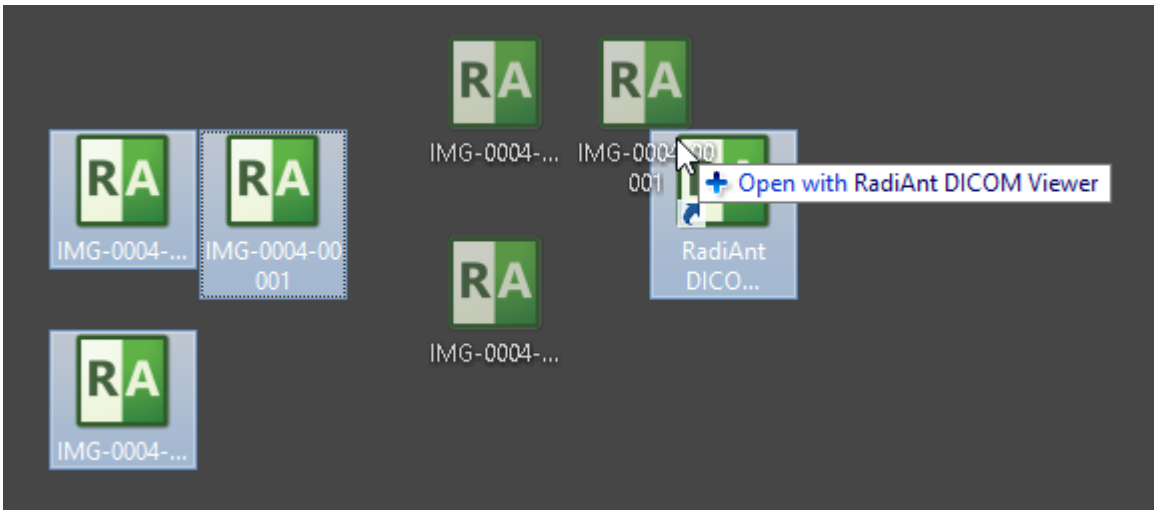
You can also use a faster method:

1. Drag & drop the selected DICOM file(s) onto either RadiAnt DICOM Viewer main window:



or to its desktop icon:



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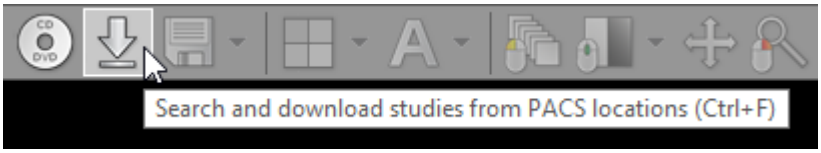
2.5 Opening a study from a PACS server

The RadiAnt DICOM Viewer PACS client feature lets you search and download studies from PACS hosts (Picture Archiving and Communication System).

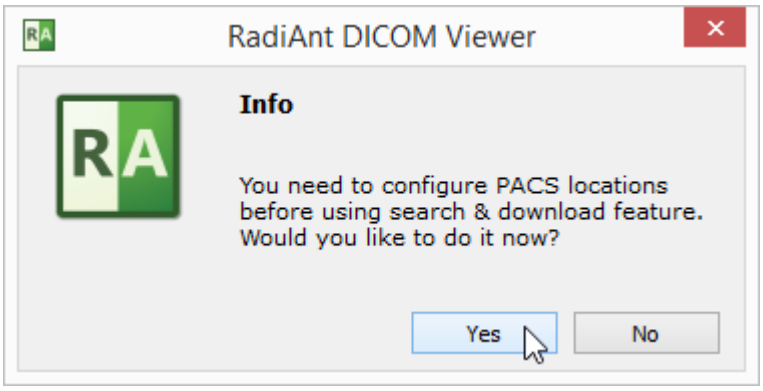
Before you begin, you need to make sure that your PACS server and RadiAnt are properly configured. Please refer to the advanced section of this manual for configuration instructions. Sometimes the configuration process may be quite complicated or even impossible without the technical support from the vendor of your PACS server.

1. Run RadiAnt DICOM Viewer by double-clicking its desktop icon.

2. Click the **Download** button on the toolbar in the main window, or press **Ctrl + F**.



3. If the PACS host was not yet configured, you will see the message asking you to add a new PACS host. Please refer to the advanced section of this manual.



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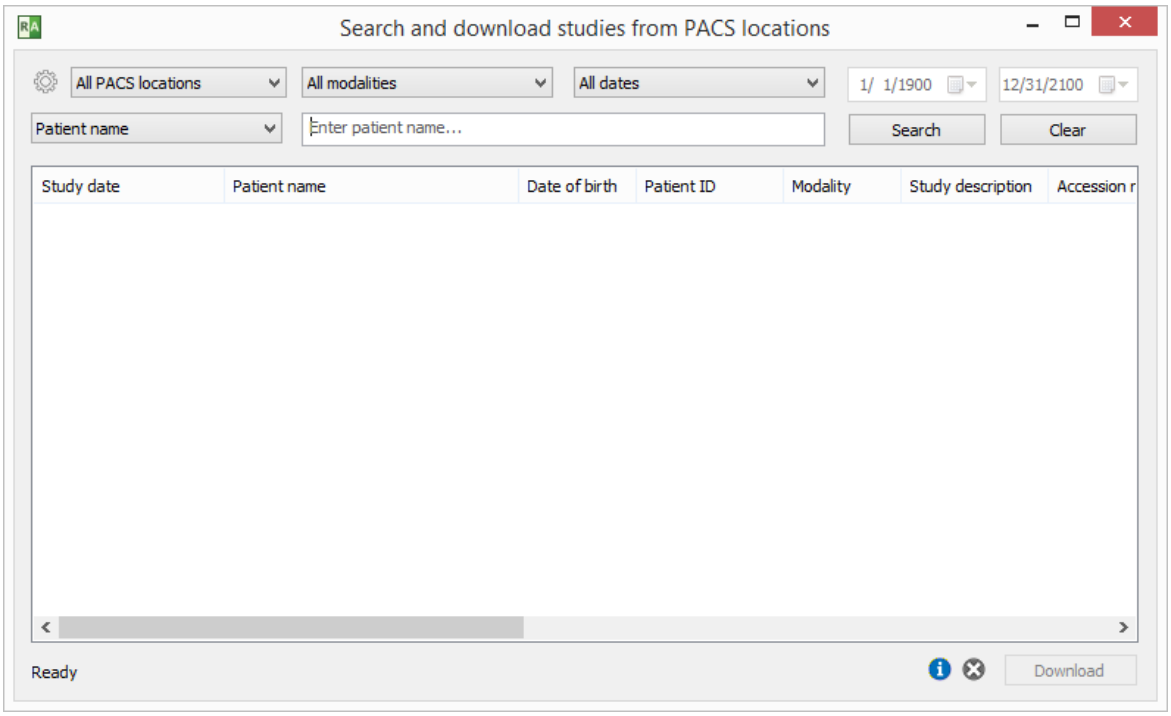
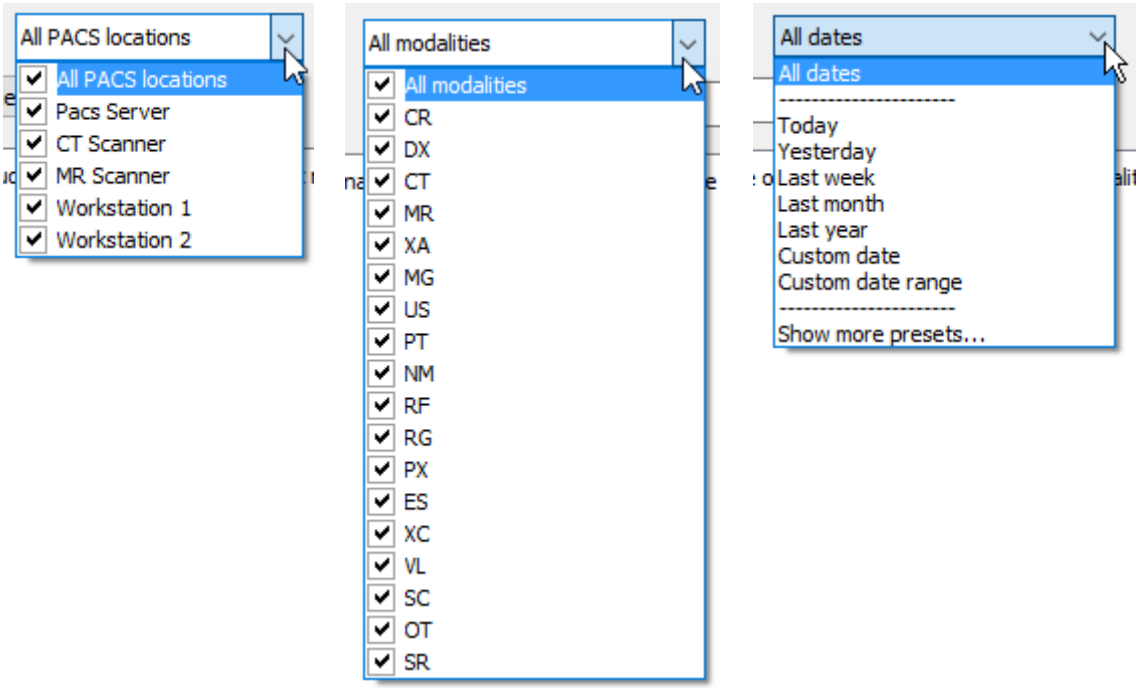
4. Once the configuration is finished, you will see the PACS search window.



5. Select the PACS location(s), modality(ies) and date range.



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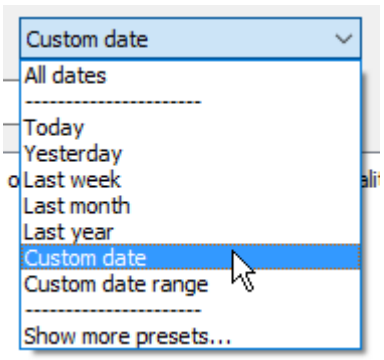
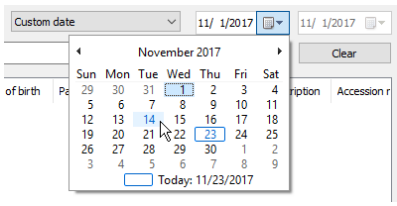
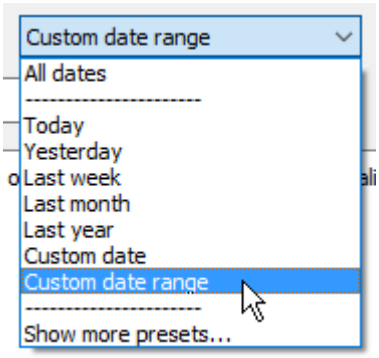
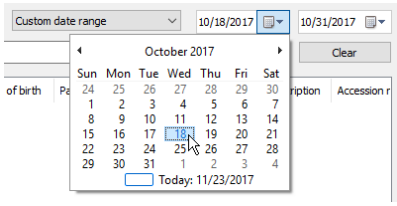
Preset, specific date or specific begin and finish dates can be chosen - just select Custom date or Custom date range.

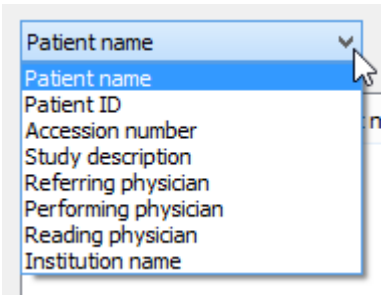


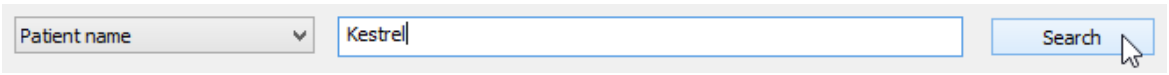






6. You can choose one of the following main search field types: Patient name, Patient ID, Accession number, Study description, Referring physician, Performing physician, Reading physician, Institution name. Enter the text into the field and press Enter or click the **Search** button.





Custom main search fields can be added in the options.xml file.

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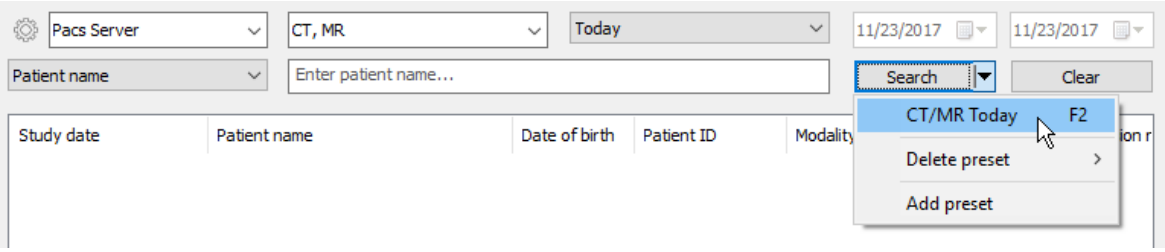
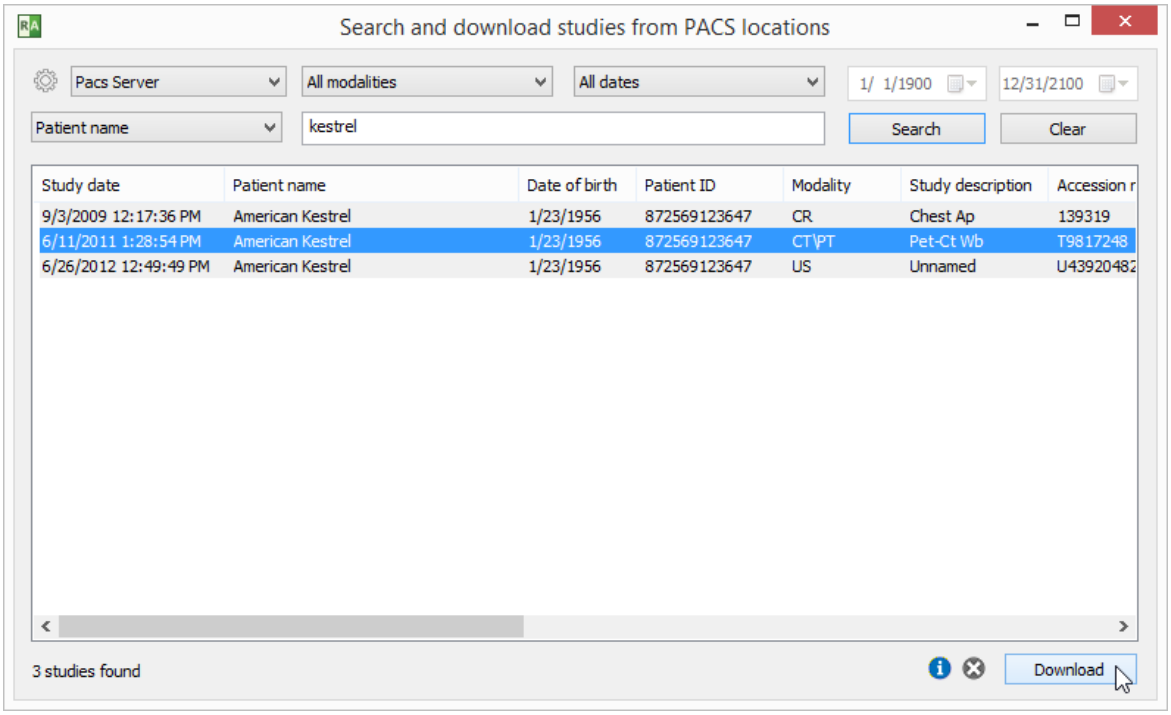
7. Search parameters that are used on a frequent basis can be saved as search presets so that they can be quickly accessed from the drop-down menu located next to the **Search** button or via keyboard shortcuts.



8. The results coming from the server will start appearing in the list. The number of studies found will be displayed in the lower left corner. Select the study you want to download from the list and click the **Download** button or press **Enter**. You can also just double-click the study to start the download process. You can browse images of the study as soon as they begin appearing in the series preview bar.



9. The status bar shows the number of received files, the transfer speed, elapsed time, and estimated time to finish.

By default, the study will be downloaded to the active viewer window (if another study was previously opened in this window, it will be closed). Other download modes are available from the pop-up menu displayed after clicking the right mouse button on the selected study/studies. Click Add to active window or press **Shift + Enter** to download the study to the active window without clearing previous study. Click Download to new window or press **Ctrl + Enter** to open a new window and start downloading the study to it. Click Download to

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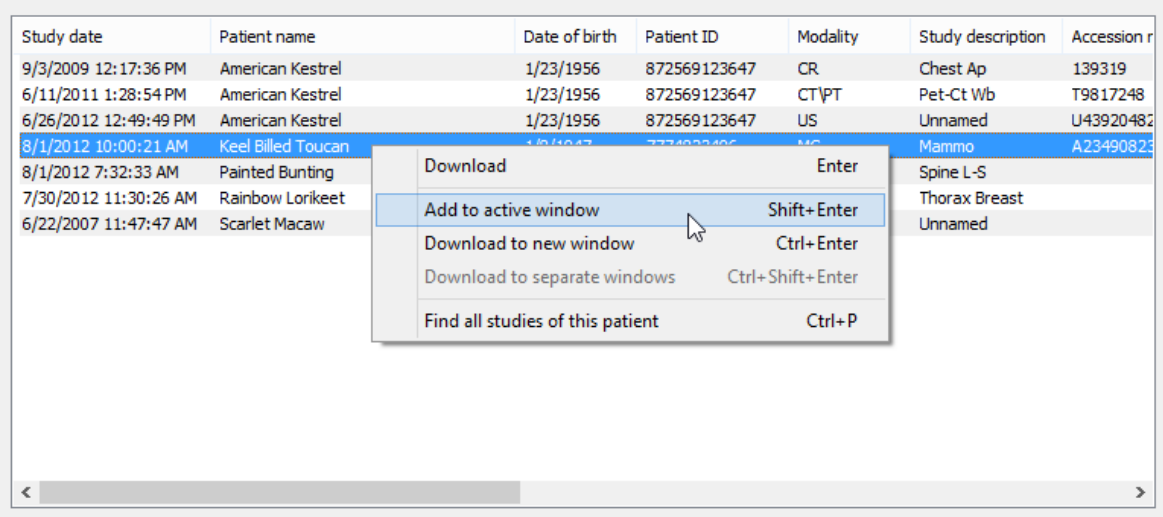
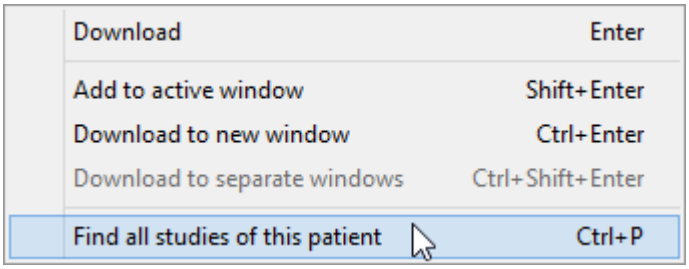
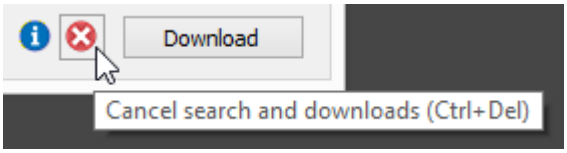
separate windows or use the shortcut **Ctrl + Shift + Enter** to download each of the selected studies to a new window.



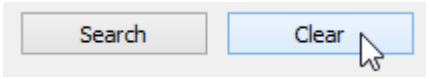
You can search all studies of the selected patient (that is, studies that have the same Patient ID field) by clicking Find all studies of this patient in the pop-up menu or pressing **Ctrl + P**.



You can stop the download process at any time by clicking the stop icon or using the shortcut **Ctrl + Del**.



To reset the search fields, click the **Clear** button.



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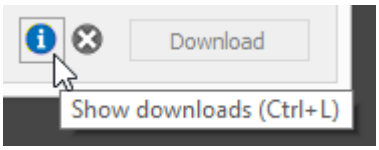
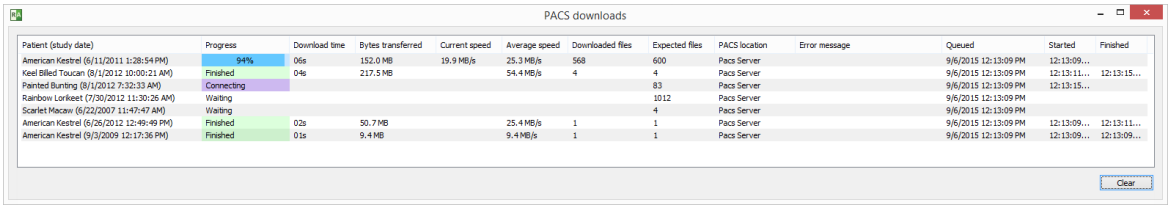
Press the Info icon or use the shortcut `Ctrl + L` to show the list of active and finished downloads along with detailed statistics and status messages.

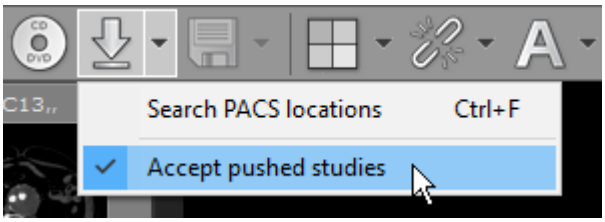




2.5.1 Displaying pushed studies

By default, unsolicited (not requested specifically via PACS search window) studies received from other PACS locations are stored in the default local database.

If you want to be able to push studies from other PACS locations to RadiAnt and display them immediately in a viewer window, then you have to enable the Accept pushed studies option.



This option can be enabled in only one viewer window at a time, being reset after the program is closed and reopened.
You can permanently enable this option by editing the options.xml file.

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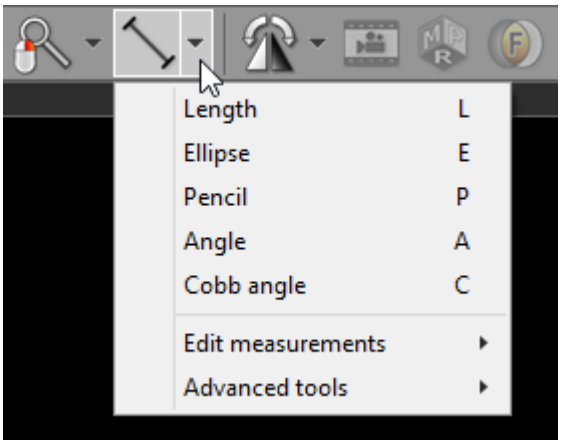
2.6 Using basic tools

In the middle of the toolbar there are five buttons.

They represent basic tools which are available in RadiAnt DICOM Viewer:

- Browse series
- Adjust image window
- Pan image
- Zoom image
- ROI tools:
    - Length
    - Ellipse
    - Angle
    - Cobb angle
    - Pencil
    - Deviation

The default ROI tool is length measurement. The ROI tool can be changed by clicking the arrow on the right side of the button and choosing specific tool from the drop-down menu.



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Each tool can be assigned to one of three basic mouse buttons or two extended mouse buttons. Just click the tool button with the left, middle, right, back (4th) or forward (5th) mouse button. The current assignment is represented by a mouse icon with one (or more) buttons highlighted: **left**, **middle** or **right**.

By default the following tool assignment is used:

Mouse button	Default tool
Left	Browse series
Middle	Brightness and contrast adjustment (windows level / width)
Right	Zoom in/out
Back (4th)	Pan
Forward (5th)	Length measurement

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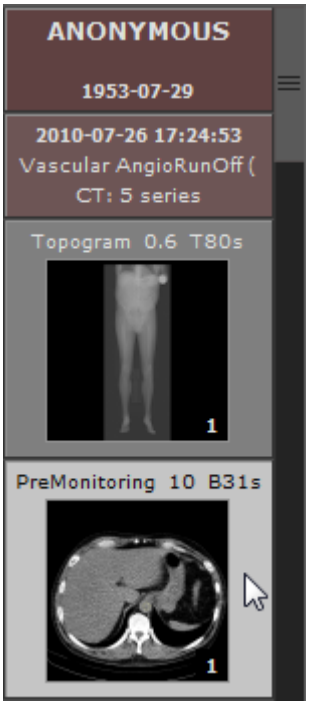
2.6.1 Browsing series and images

Browsing series



Click the thumbnail image in the series preview bar to load the desired series and browse its images.

You can easily switch between series by pressing the `Left Arrow` or `Right Arrow` keys.

Alternatively, while hovering over the image panel, horizontal mouse wheel can be used for changing series.

The series displayed in the active panel is highlighted in the preview bar.

The first series of a study is preceded by two colored boxes with patient and study data:

- Patient name
- Patient birth date

- Study date and time
- Study description
- Modality and number of series

Each series thumbnail image has a series description as a caption, and in its bottom right corner, the total number of images in the series is displayed.

The list can be scrolled either using a scrollbar or by dragging it with one finger on multi-touch devices.

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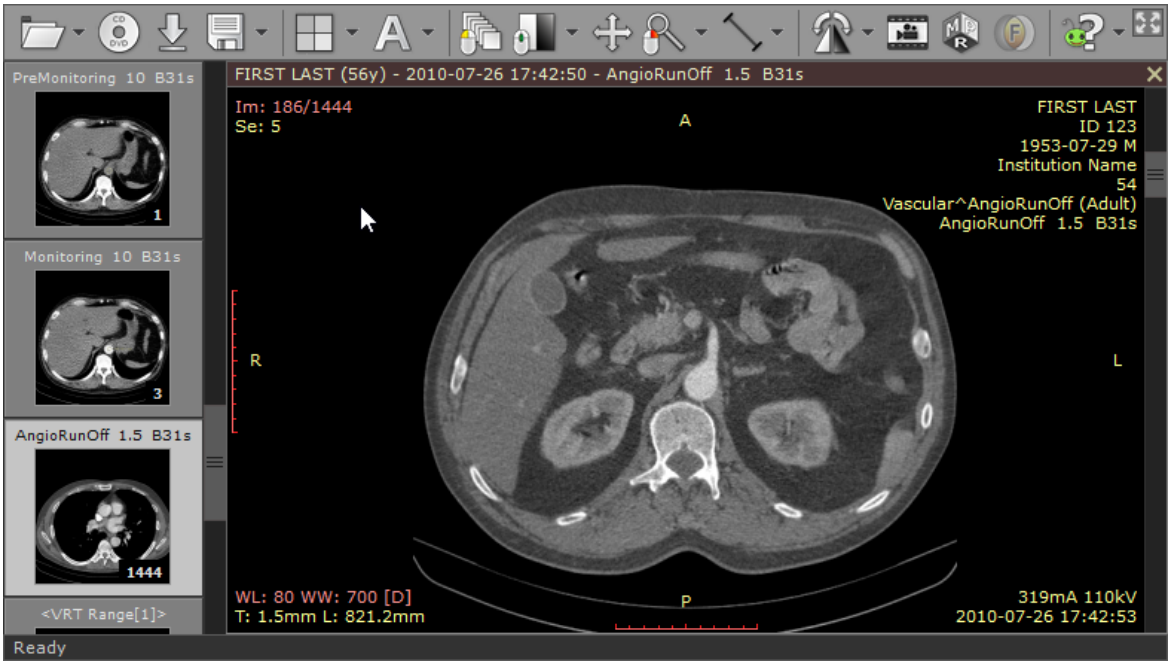
Browsing images

As soon as the images start appearing in the panel you may begin browsing them.



There are several different ways of paging through the images of the series:

1. Click the **Browse series** button on the toolbar (or press the **B** key). Next, press the left mouse button over the image, and drag the mouse up or down to browse a series in both directions.

2. Turn the mouse wheel while the cursor hovers over the panel with the image.

3. Use the scrollbar on the right side of the panel.

4. Press the **Up Arrow** or **Down Arrow** on the keyboard to return to the previous image, or move on to the next.

5. Press **Page Up** or **Page Down** to move 10 images backward or forward.

6. On a multi-touch device, touch the image with one finger and drag it up or down. (The tool must be associated with the left mouse button - if it is not, touch the "Browse series" tool button.)

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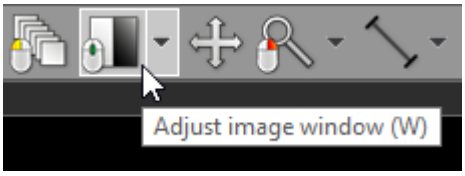
2.6.2 Changing brightness / contrast

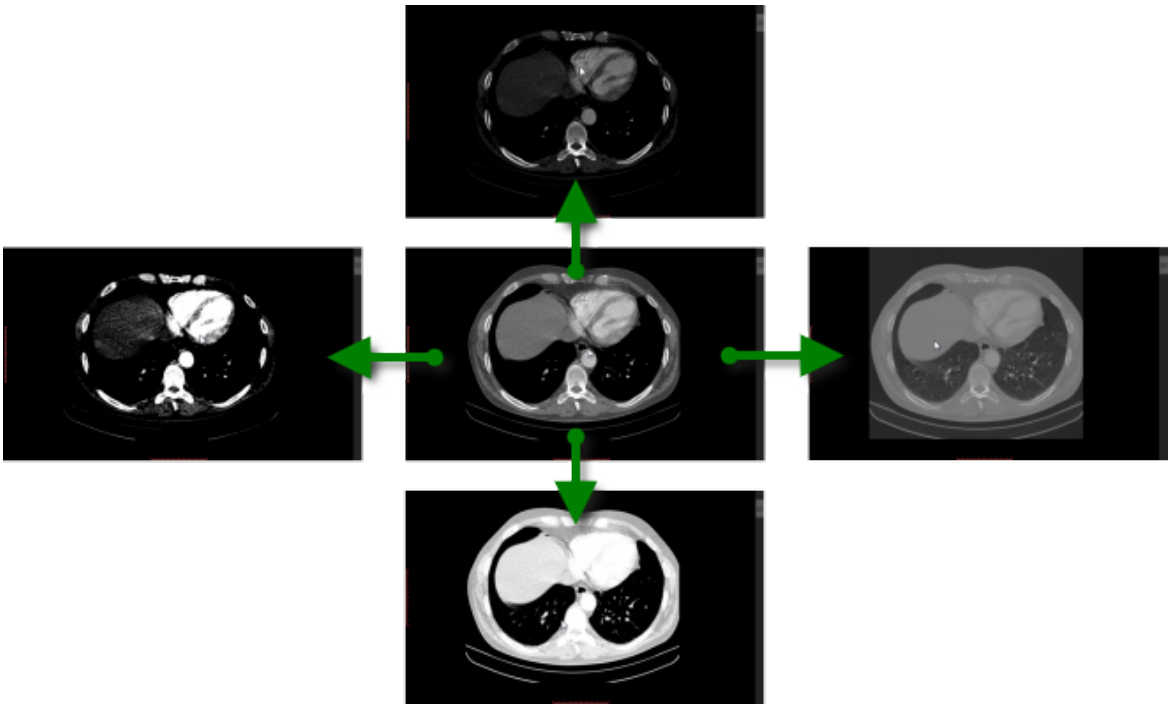
Click the **Adjust image window** button on the toolbar (or press the **W** key).



Next, press the left mouse button over the image and drag the mouse to change brightness (window level - WL), or contrast (window width - WW):

- Up to decrease brightness (window level goes up)
- Down to increase brightness (window level goes down)

- Left to increase contrast (window width shrinks)
- Right to decrease contrast (window width expands)



By default, the windowing tool is associated with the middle mouse button.
Press the **Ctrl** key and drag the mouse with the left button down, and the windowing tool will be active regardless of current association.

On multi-touch devices, touch the image with three fingers and drag them in the directions described above to adjust window level and width.

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Window presets

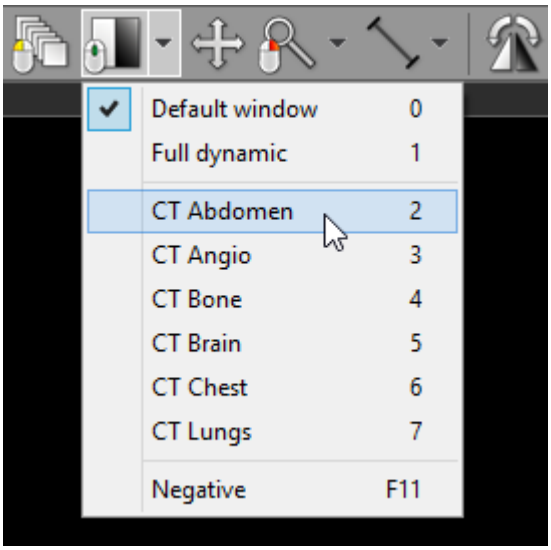
Different window presets can be quickly applied by pressing 0 through 9 .

0 Default window for the current image.
1 Full dynamic window (pixel with lowest value is displayed as black, whereas pixel with the highest value is displayed as white).

2 - 9 set different WL/WW depending on image modality. In the table below presets for CT images are shown.

Key	Preset	WL	WW
2	CT Abdomen	60	400
3	CT Angio	300	600
4	CT Bone	300	1500
5	CT Brain	40	80
6	CT Chest	40	400
7	CT Lungs	-400	1500

These presets are also available from the Adjust image window drop down menu.



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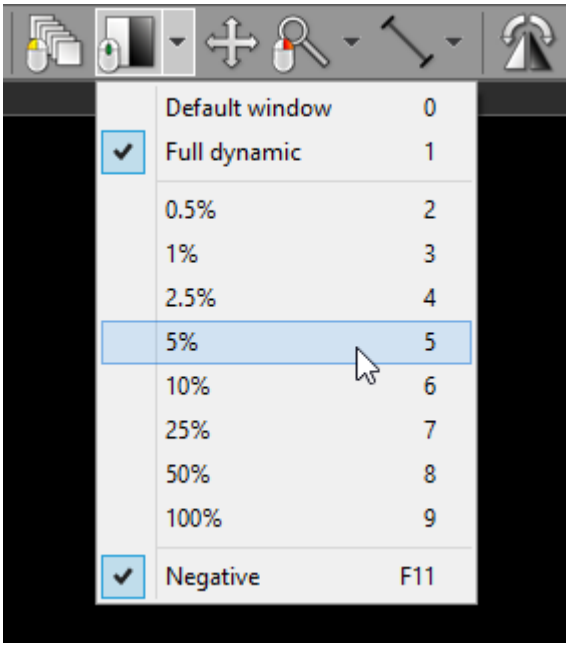
The preset values for PET (Positron Emission Tomography) series apply to the maximum value of the displayed range and are presented as the percent of the highest value in the entire image series.

Key	Displayed range maximum value (as % of the highest value in series)
2	0.5%
3	1%
4	2.5%
5	5%
6	10%
7	25%
8	50%
9	100%



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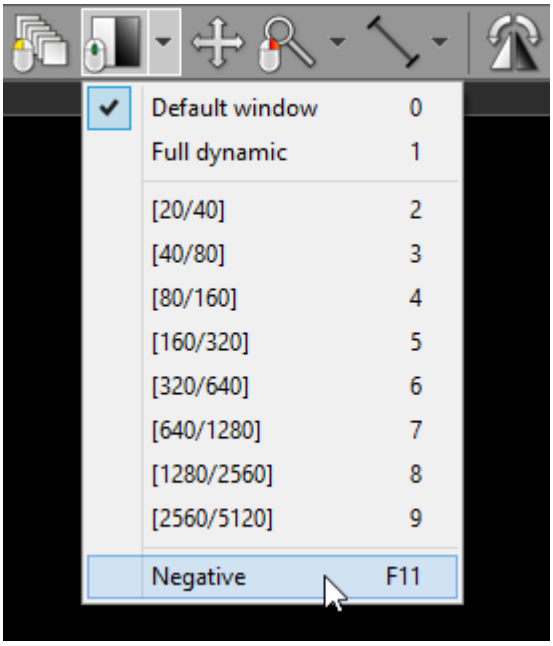
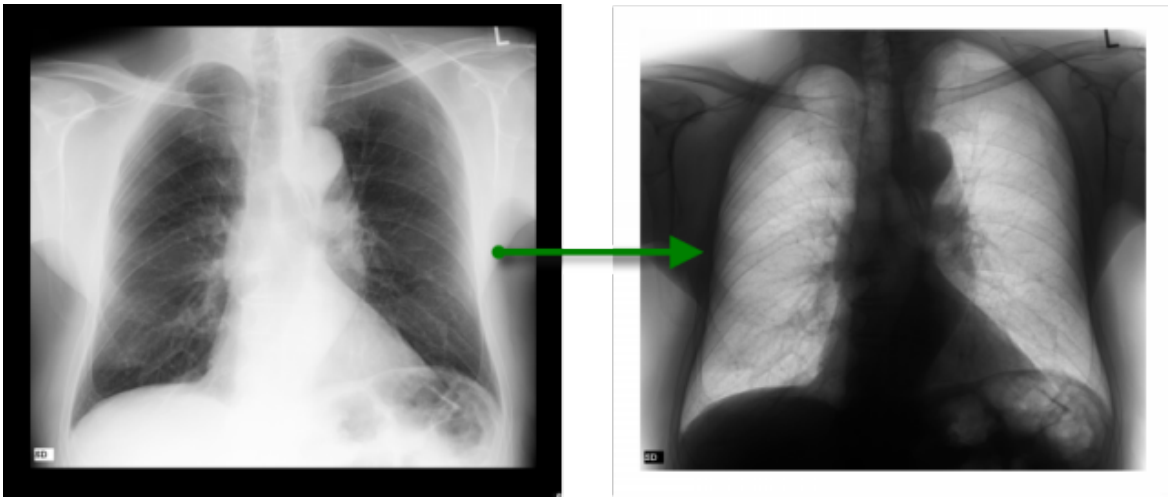
Negative mode

Press the **F11** key or click the Negative menu item to toggle negative mode for the image.





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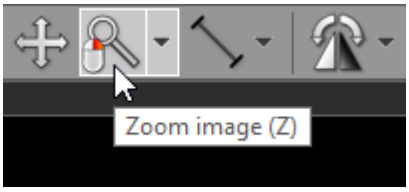
2.6.3 Changing zoom level / position

Image zooming

Click the `Zoom image` button on the toolbar (or press the `Z` key).



Next, press left mouse button over the image and drag the mouse Up to zoom in or Down to zoom out.

By default, the zooming tool is associated with the right mouse button.

Another way to zoom is to place the cursor over the image, press the `Ctrl` key, and turn the mouse wheel in both directions to zoom in or out.
Alternatively, the `Ctrl + Plus (+)` and `Ctrl + Minus (-)` keyboard shortcuts can be used to zoom.

On multi-touch devices, touch the image with two fingers and drag them apart to zoom in, or toward each other to zoom out.

Different zoom presets can be quickly applied by pressing `Ctrl + 0-4`

Key	Preset
`Ctrl + 0`	Fill viewport with image
`Ctrl + 1`	100% (1 image pixel = 1 screen pixel)
`Ctrl + 2`	200% (1 image pixel = 2 screen pixels)
`Ctrl + 3`	400% (1 image pixel = 4 screen pixels)
`Ctrl + 4`	800% (1 image pixel = 8 screen pixels)

These presets are also available from the Zoom image drop down menu.

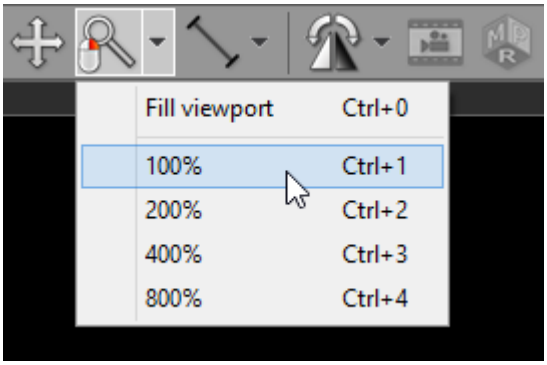


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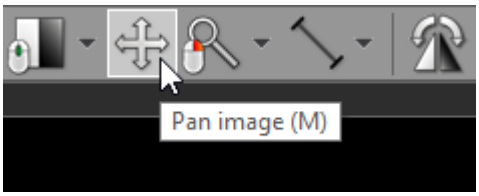
Image panning

When an image is zoomed in, panning can be used to reveal areas lying outside the viewing panel.

Click the **Pan image** button on the toolbar (or press the **M** key).



Next, press the left mouse button over the image and drag the mouse to move image around the screen.

By default, the image panning tool is associated with the back (4th) mouse button.

Press the **Shift** key and drag mouse with the left button down, and the panning tool will be active regardless of the current left mouse button association.

Alternatively, **Ctrl + Arrows (Up, Down, Left or Right)** can be used to pan.

On multi-touch devices, touch the image with two fingers and drag them across the panel to move image. Keep the distance between the fingers unchanged to maintain the current zoom ratio.

Press **Ctrl + 0** to revert the zoom and pan settings and fill the viewport with the image.

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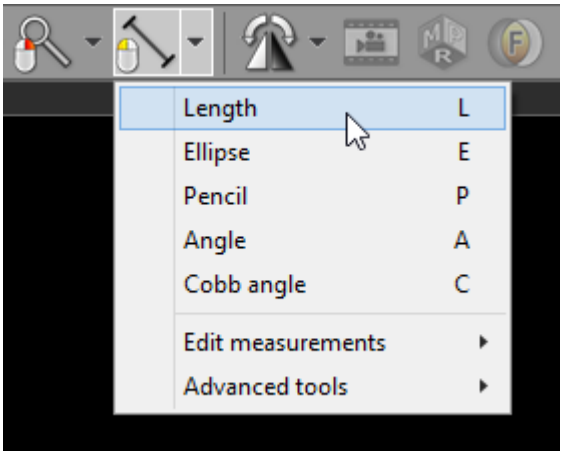
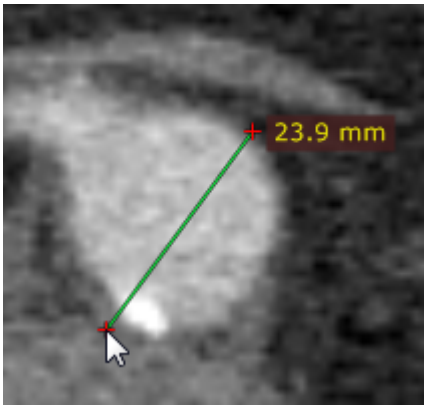
2.7 Taking measurements

2.7.1 Length

Select Length from the Measurements drop down menu (or press the L key).



Place the cursor over the starting point, then press left mouse button and drag the mouse to draw a segment with length measurement. Release the button to finish drawing.



The distance value will be shown in either millimeters or pixels (when the calibration data is not included in the image file).

You can move the entire segment or one of its endings by dragging while pressing the left mouse button.
The label may be also dragged to a more convenient place if necessary.

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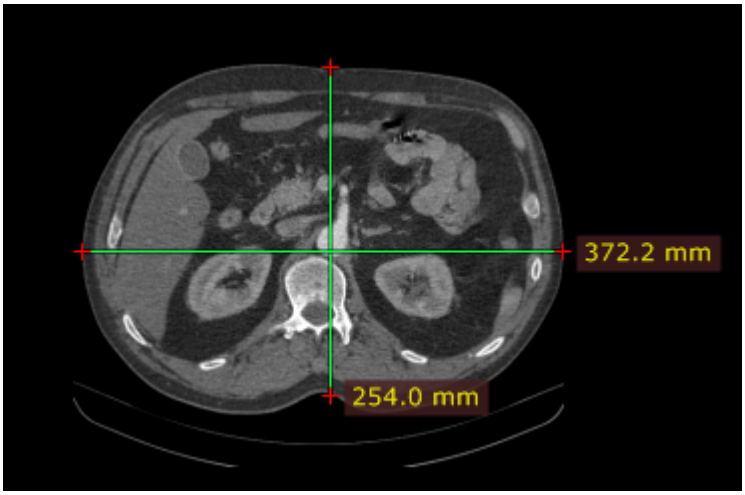
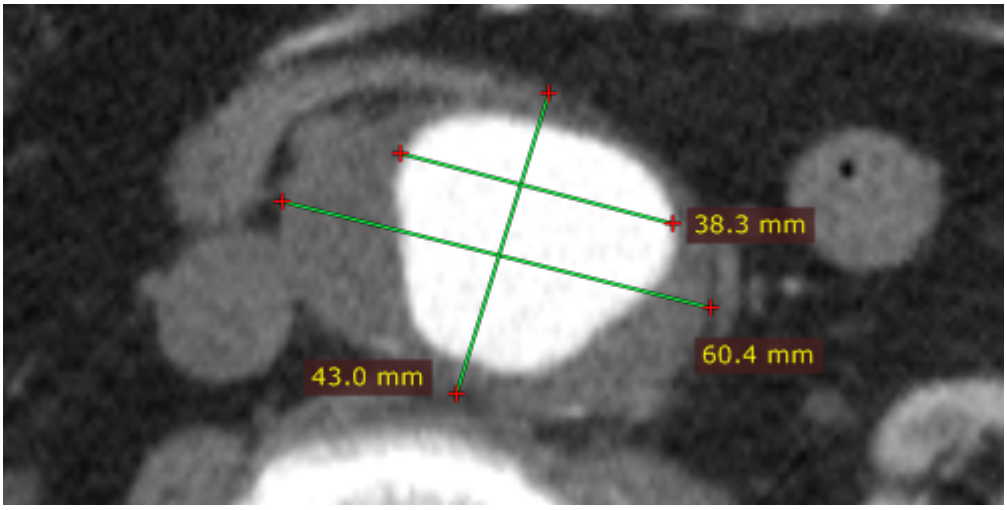
Press **Shift** while drawing the segment to make it either vertical or horizontal.



By default, the length measurement tool is associated with the forward (5th) mouse button.

Calibration of measurements

Depending on the source of the calibration data, the label with a measurement will be displayed in different colors:



Measured distance is calibrated (the pixel spacing element is present).

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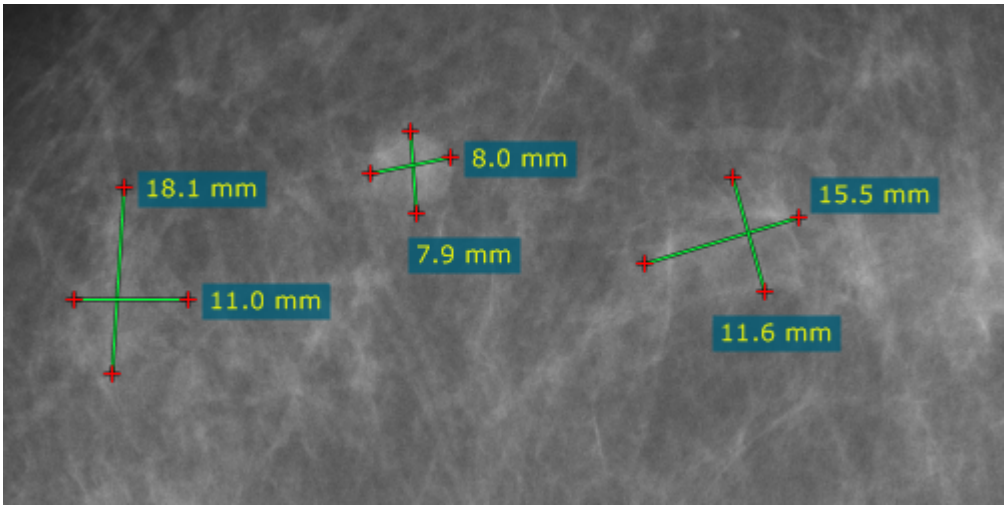
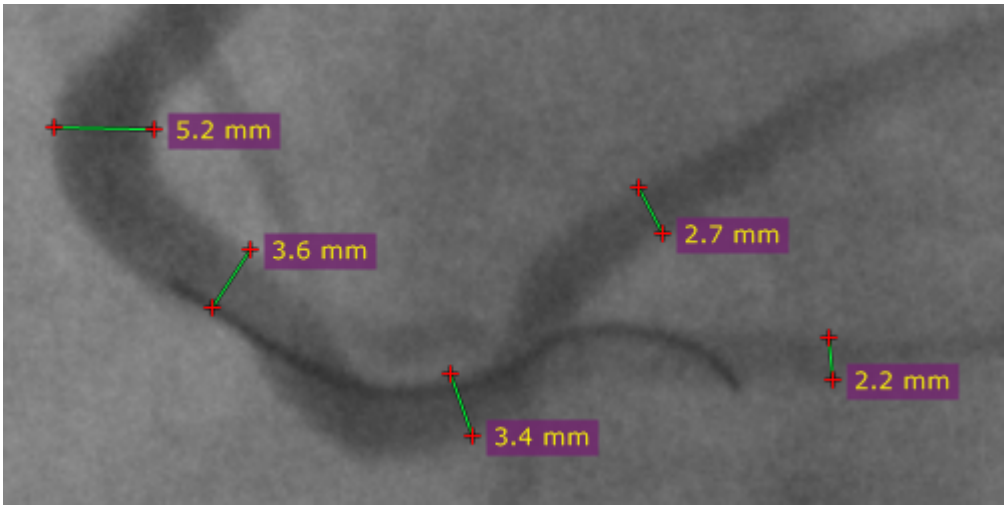
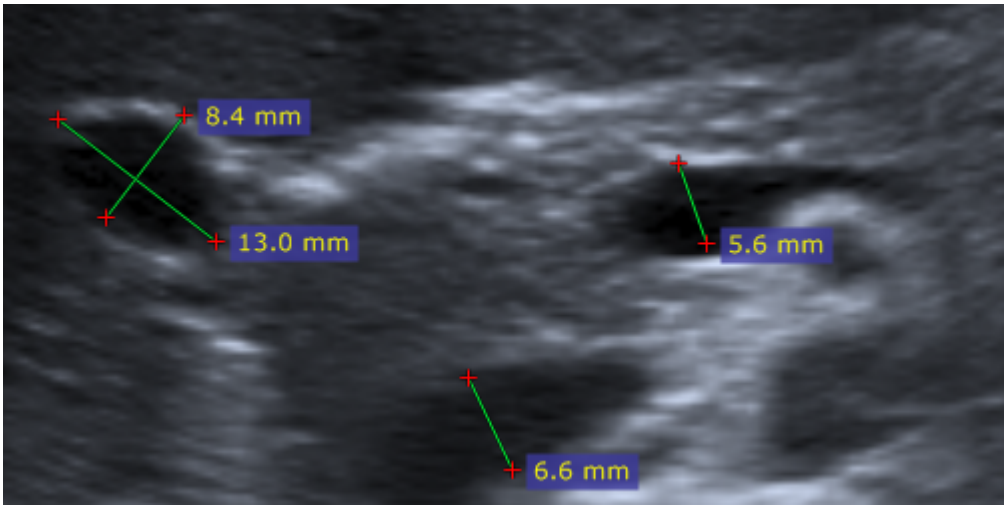


The distance is calculated using the estimated radiographic magnification factor.



The distance is measured at the detector plane.



Ultrasound region calibration is used.

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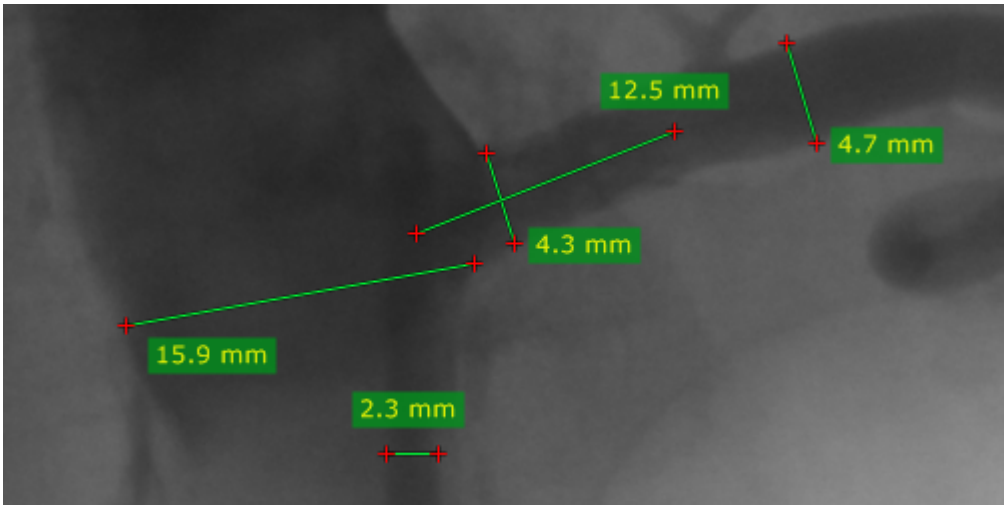
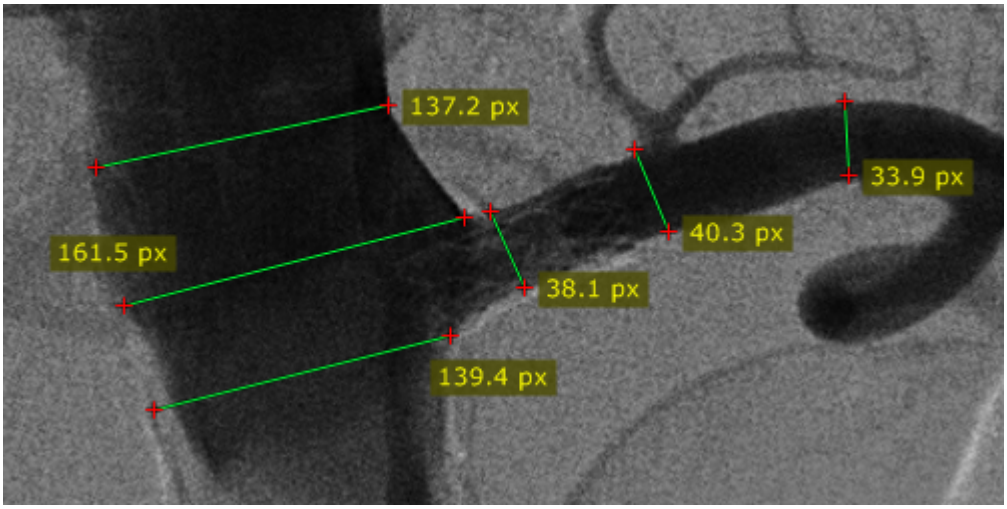


Manual calibration was performed by a user.



There is no calibration data available (measurement in pixels of the source DICOM image).

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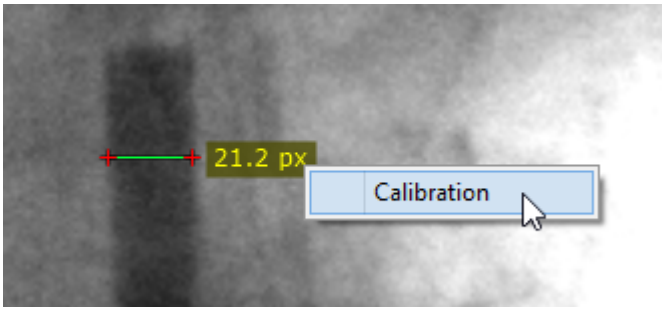
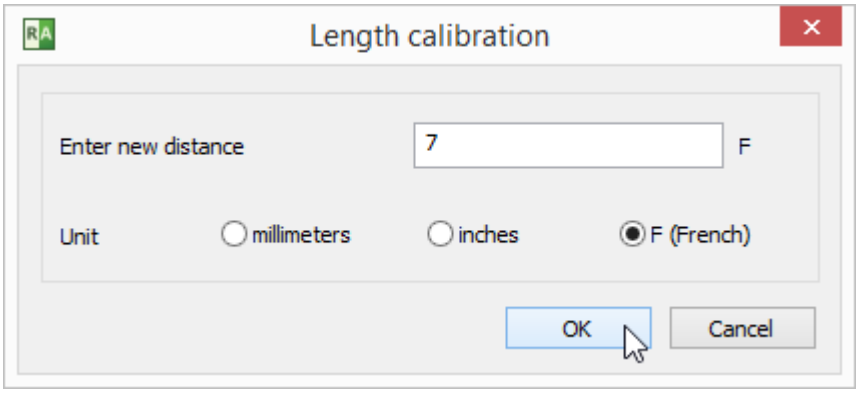
Manual calibration

The image can be manually calibrated (if no calibration data was present in the DICOM file) or recalibrated.

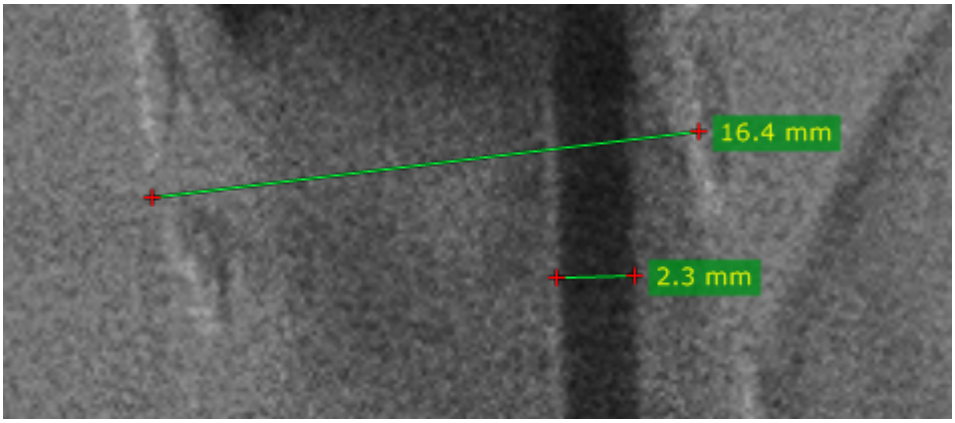
1) Measure the object with a known size, and then right-click the segment or its label to show a pop-up menu.



2) Click Calibration to open the dialog window. Enter the distance and select the units (millimeters, inches or French sizes), click OK to recalibrate the image.



3) Now the measurements will be taken with the manual calibration data and shown in millimeters.



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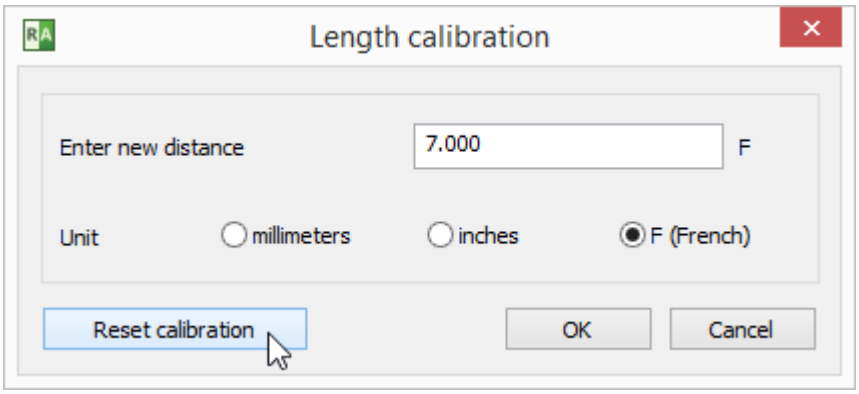
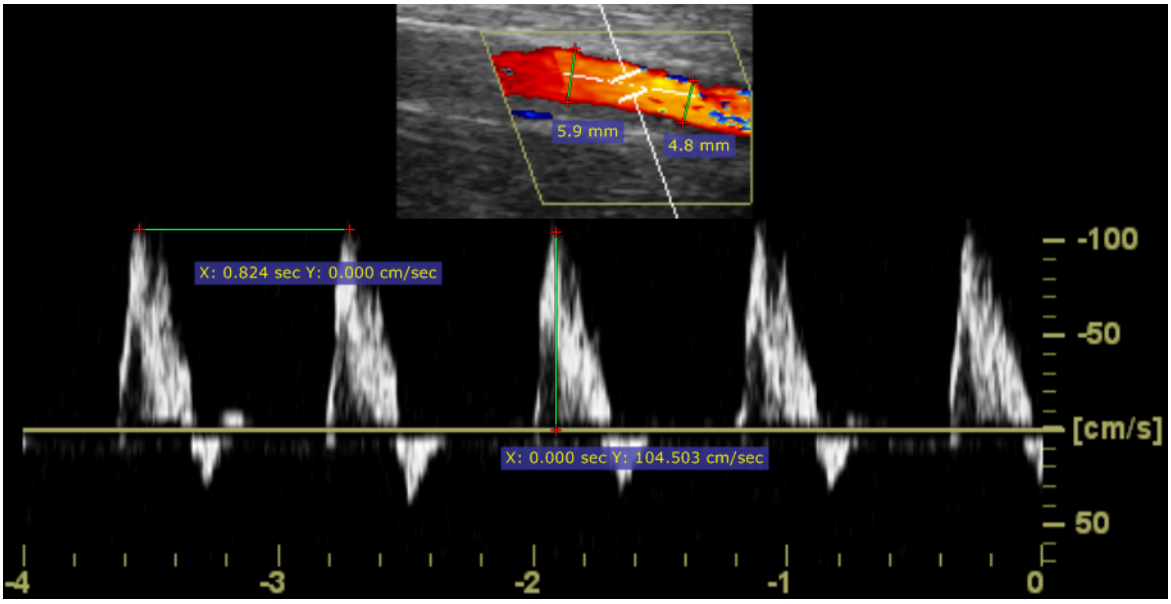
To revert the manual calibration show the "Calibration" window and click the **`Reset calibration`** button.



Measurements in US (ultrasound) images

DICOM images coming from the ultrasound devices often include calibrated regions. Depending on the region type, different parameters can be measured.

Below is the sample screenshot showing the measurement of distance, velocity and time.



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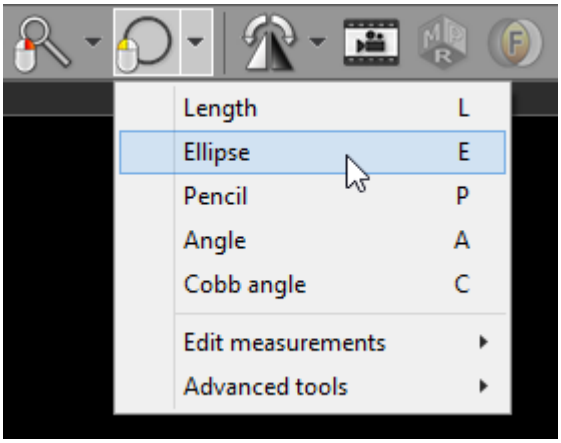
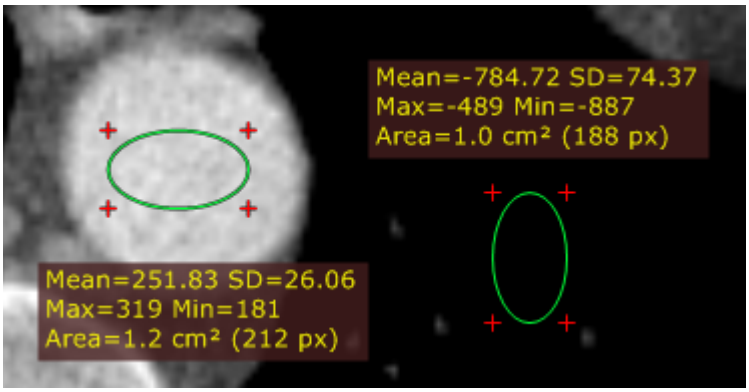
2.7.2 Ellipse

Select Ellipse from the Measurements drop down menu (or press the E key).



Press left mouse button and drag the mouse to draw an ellipse with pixel value measurement. Release the button to finish drawing.



The values measured are:

Name	Description
Mean	Mean pixel value (Hounsfield Units for CT images)
SD	Standard deviation
Max	Maximum pixel value
Min	Minimum pixel value
Area (px)	Area in square centimeters and the number of pixels used for calculations

You can move the ellipse or change its size by dragging it or the surrounding cross-marks with the left mouse button pressed.
The label may also be dragged to a more convenient place if necessary.

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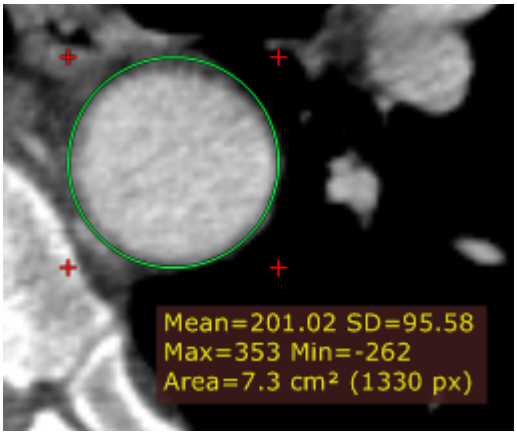
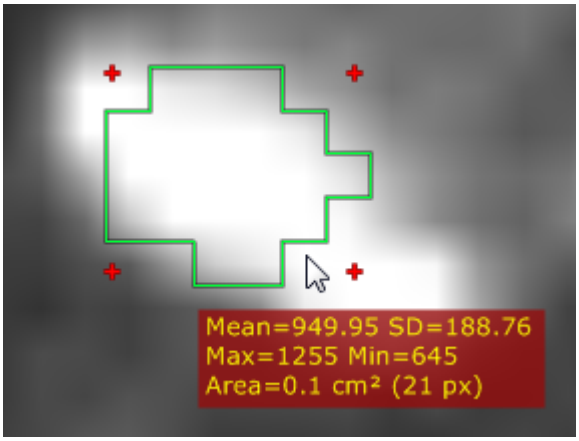
Press **Shift** while drawing the ellipse to make it a perfect circle.



When drawing an ellipse in a magnified image, you can press the **Ctrl** key to show the boundary of actual pixels taken into account in calculations.



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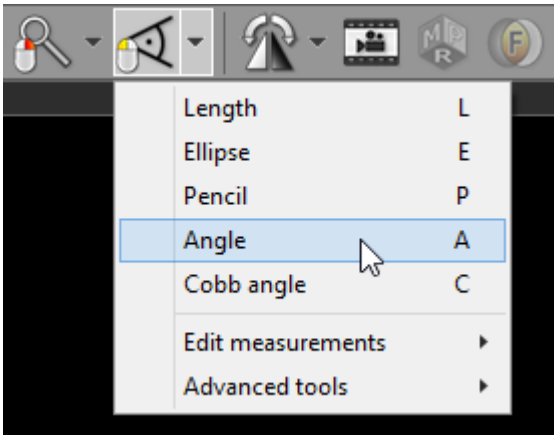
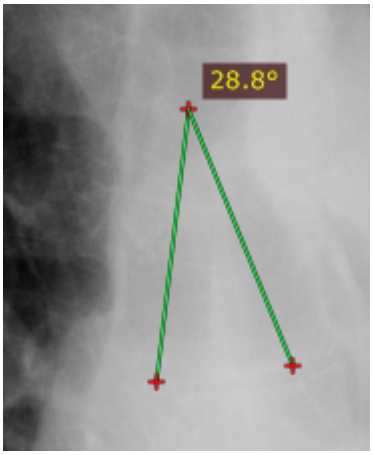
2.7.3 Angle

Select Angle from the Measurements drop down menu (or press the A key).



Press the left mouse button and drag the mouse to draw the first arm of the angle. Release the button and move the mouse to draw the second arm. Click the left button to finish drawing the angle.



The angle value is displayed in degrees.

You can move the entire angle or one of its endings by dragging it or the cross-marks with the left mouse button pressed.
The label may also be dragged to a more convenient place if necessary.

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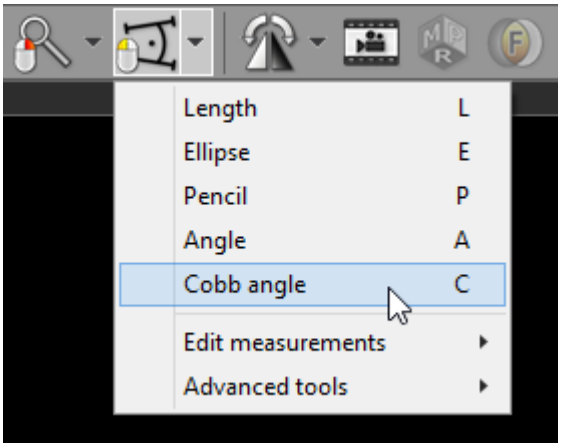
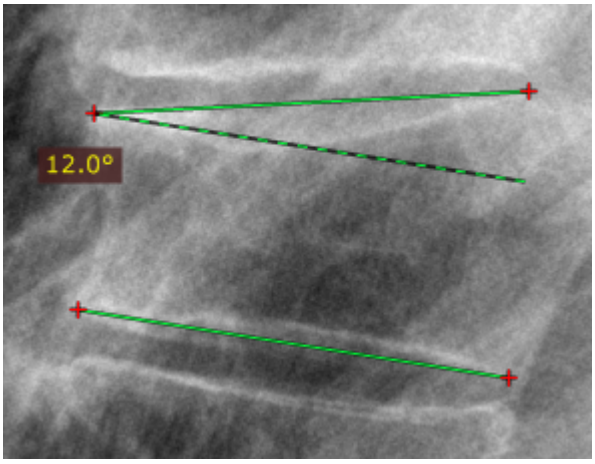
2.7.4 Cobb angle

Select Cobb angle from the Measurements drop down menu (or press the C key).



Press the left mouse button and drag the mouse to draw the first segment of the Cobb angle, and then release the button. To draw the second segment, again press the left mouse button and drag the mouse. Release the button to finish drawing the angle.



The Cobb angle value is displayed in degrees.

You can move the segments of the Cobb angle or one of their endings by dragging the segment or the cross-marks with the left mouse button pressed.
The label may also be dragged to a more convenient place if necessary.

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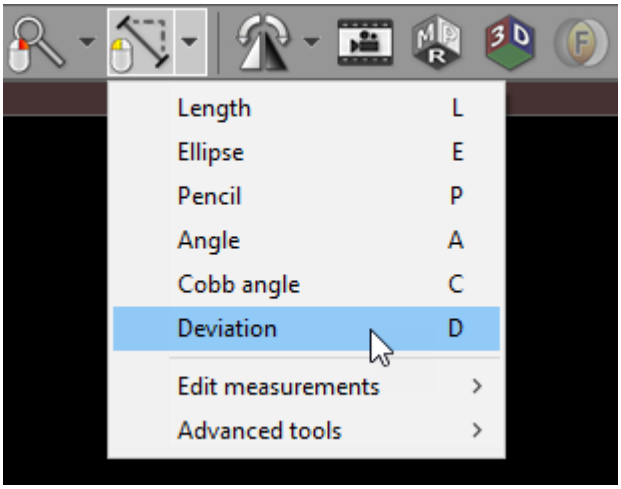
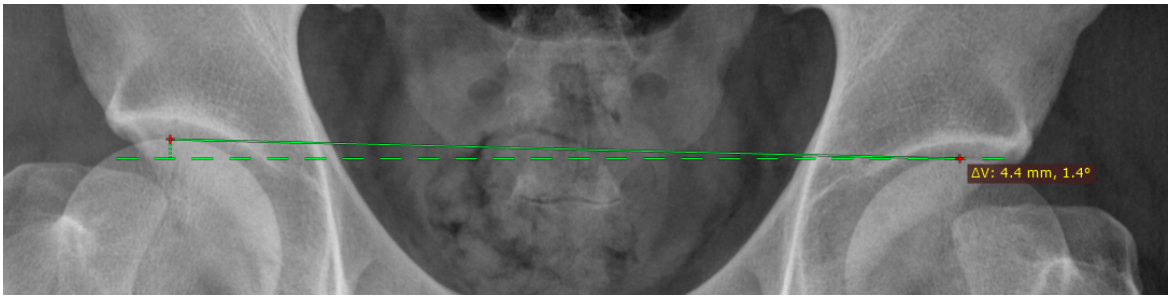
2.7.5 Deviation

Select Deviation from the Measurements drop down menu (or press the D key).



Place the cursor over the starting point, then press left mouse button and drag the mouse to draw a segment. Release the button to finish drawing.



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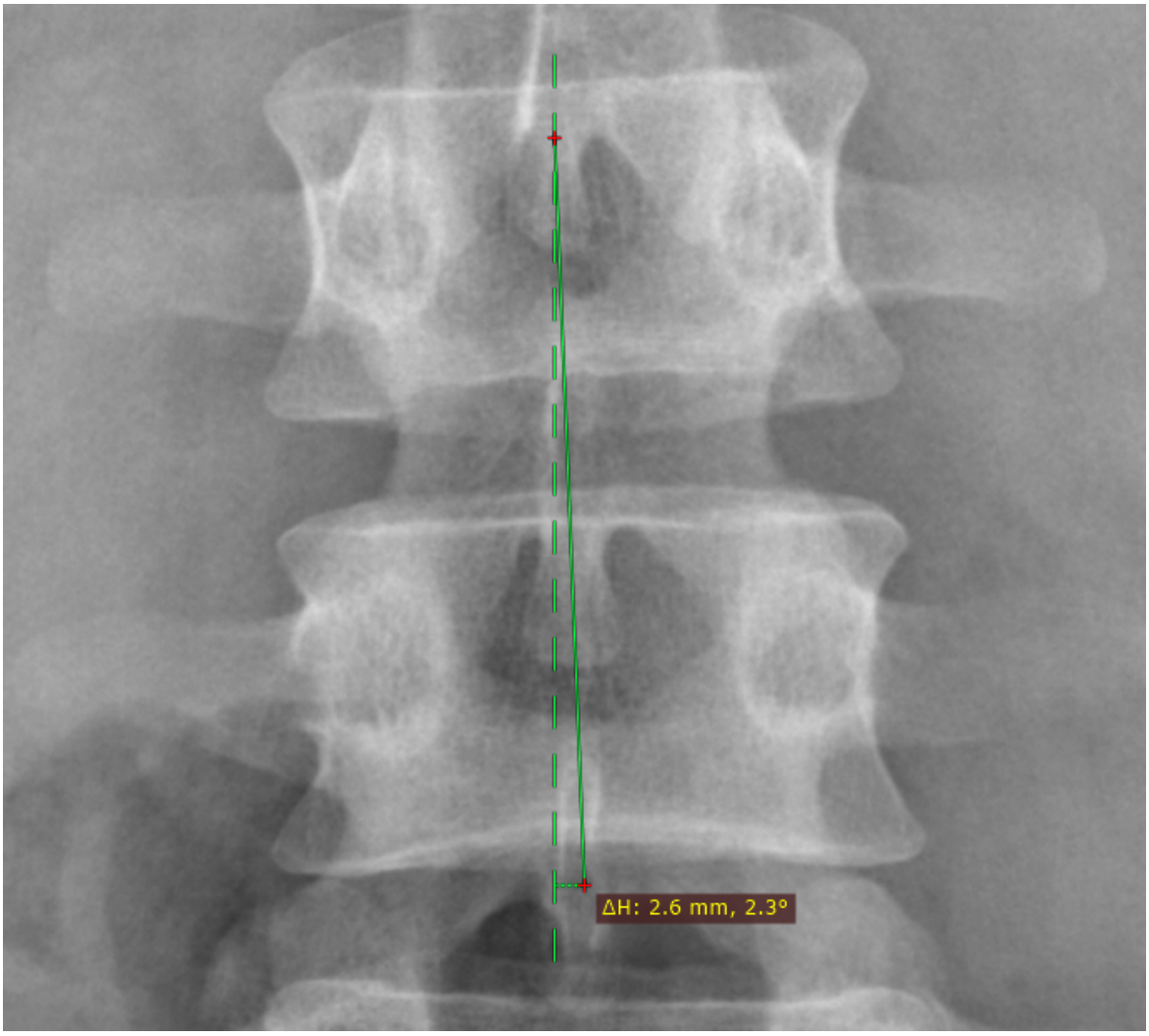

The distance value in millimeters measured from one end of the segment to the straight line (either horizontal or vertical) intersecting the other end of the segment will be shown.
The second displayed value is the angle (in degrees) between the segment and the straight line intersecting one of its ends.

You can move the entire segment or one of its endings by dragging it or the cross-marks with the left mouse button pressed.
The label may also be dragged to a more convenient place if necessary.

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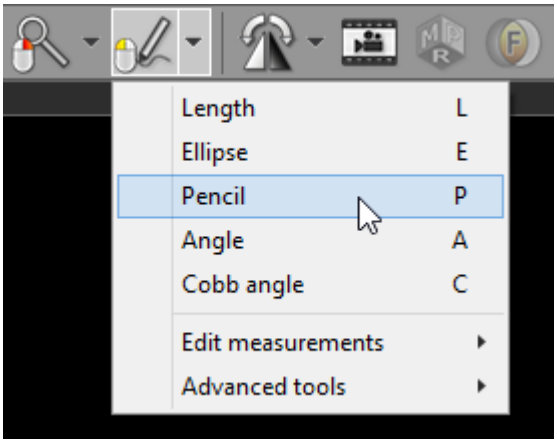
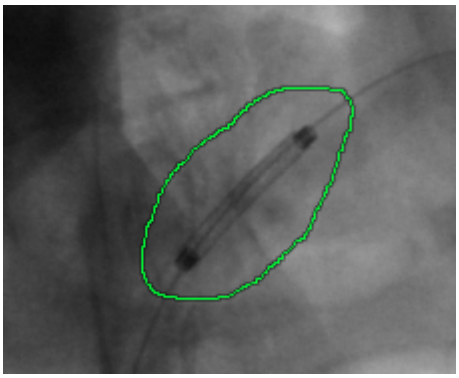
2.7.6 Pencil tool

Select Pencil from the Measurements drop down menu (or press the P key).



Press the left mouse button and drag the mouse to draw with a pencil. Release the button to finish drawing.



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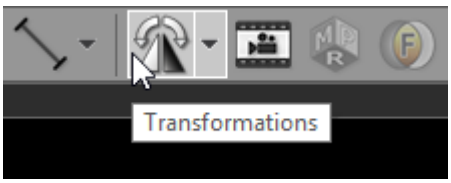
2.8 Flips / Rotations

Original image

Rotations

- Click on the left side of the `Transformations` button, or use the `Ctrl + [` shortcut to rotate the image 90 degrees counter-clockwise.



- Click on the right side of the `Transformations` button, or use the `Ctrl + ]` shortcut to rotate the image 90 degrees clockwise.

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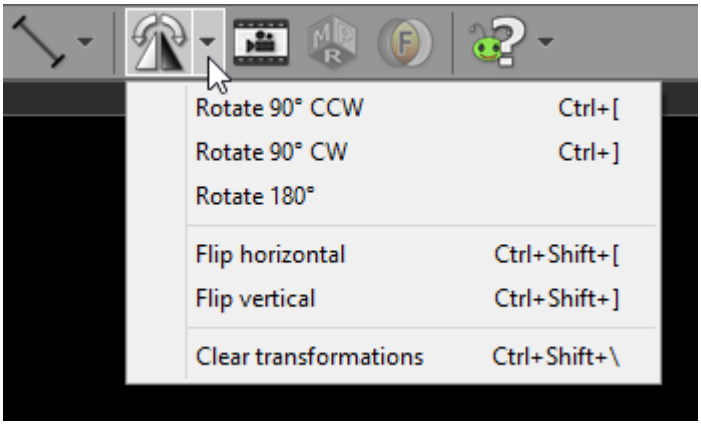
Flips

- To flip an image horizontally, select Flip horizontal from the Transformations drop down menu, or use `Ctrl + Shift + [`

- To flip an image vertically select Flip vertical from the Transformations drop down menu, or use `Ctrl + Shift + ]`

You can also apply rotations and flips from a drop-down menu.



Multiple rotations and flips can be applied to the image to obtain desired orientation.

Select Clear transformation (or use `Ctrl + Shift + \`) to restore the original orientation.

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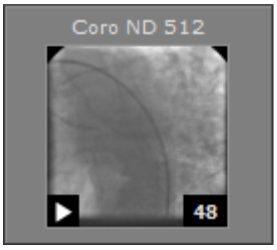
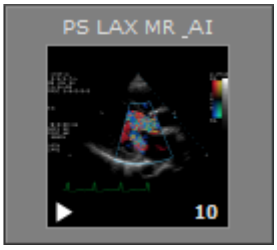
2.9 Cine mode

Dynamic sequences such as ultrasound (US, IVUS) or digital angiography (XA) are started automatically in cine (movie) mode upon loading.
Thumbnails representing such series have a little "play" icon in the lower left corner.





Cine mode can be also enabled manually for multi-image series such as computer tomography (CT) or magnetic resonance (MR).

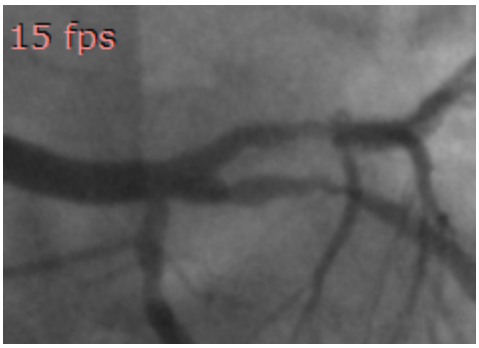
Press the `Cine` toolbar button or use the **Space** key to start/stop cine mode.

While cine mode is enabled and the cursor hovers over the image, the cine bar is overlaid at the bottom of the image.

Click its buttons to:

- go to the previous series
- go to the previous frame
- start/stop playing
- go to the next frame
- go to the next series
- change the frame rate (in frames per second)

The actual frame rate is displayed in the top left corner of the image.
Other annotations are hidden during cine run.



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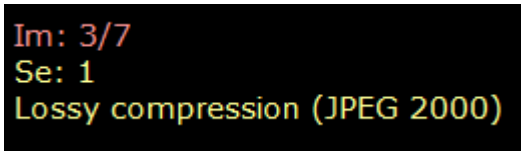
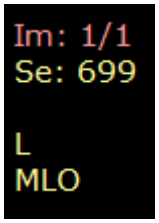
2.10 Annotations

DICOM files contain a lot of information stored in tags associated with the image.
The most important data is overlaid on top of the image displayed, grouped in the corners.
Depending on image modality, some fields may be missing.

Top left

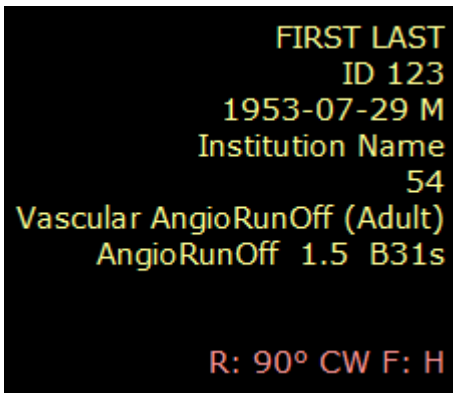


- Number of displayed image and total number of loaded images
- Series number
- Compression info (displayed only when lossy compression is used)



The following additional fields are presented only for MG modality (mammography):
- Image laterality
- View position

Top right



- Patient first and last name
- Patient ID
- Patient birth date and sex
- Institution name
- Study ID
- Study description
- Series description
- Image comments

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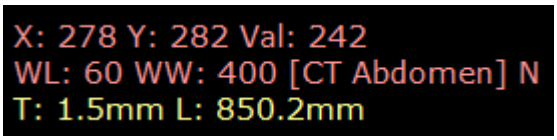
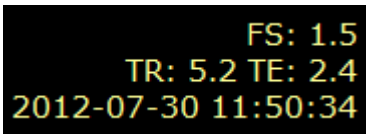
- Study comments
- Rotation/flip (if applied)

Bottom left

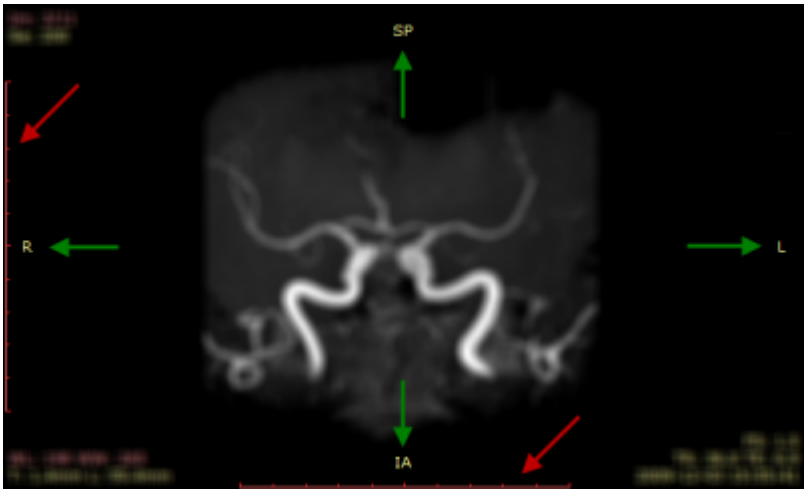


- Mouse cursor position (coordinates of the pixel in displayed DICOM image) and value of the pixel
- Window level and window width (brightness and contrast), name of window preset, negative mode indicator
- Thickness and location of the slice (e.g. CT and MR modalities) or rotation and tilt of x-ray lamp (XA modality)

Bottom right



- Field strength (FS, only for MR modality)
- Repetition time, Echo time (TR, TE, only for MR modality)
- Date and time of image acquisition



If the DICOM image contains scale information (pixel spacing), two 10cm rulers with 1cm marks are displayed along left and bottom edges of the panel (red arrows).

If the DICOM image contains information about patient orientation in space, there is a letter (or combination of letters) symbolizing the patient's sides displayed at the center of each panel's edge (green arrows).

- A – anterior
- P – posterior

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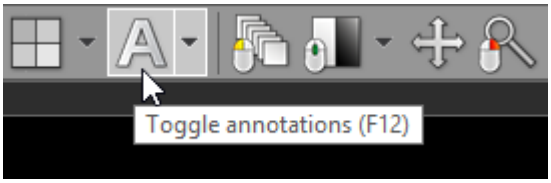
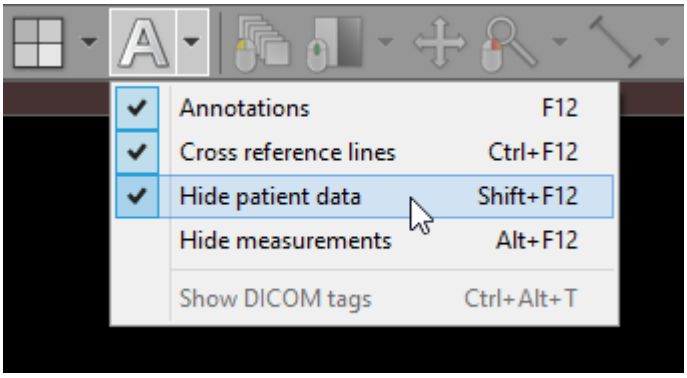
- L – left
- R – right
- S – superior
- I - inferior

Annotations can be turned off and on by clicking the **Annotations** button on the toolbar or pressing **F12** key.



To hide all patient data (in series preview bar, panel title bar, overlaid annotations) click Hide patient data menu item or use the **Shift + F12** shortcut.



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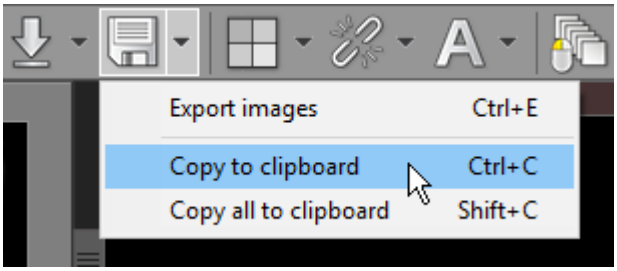
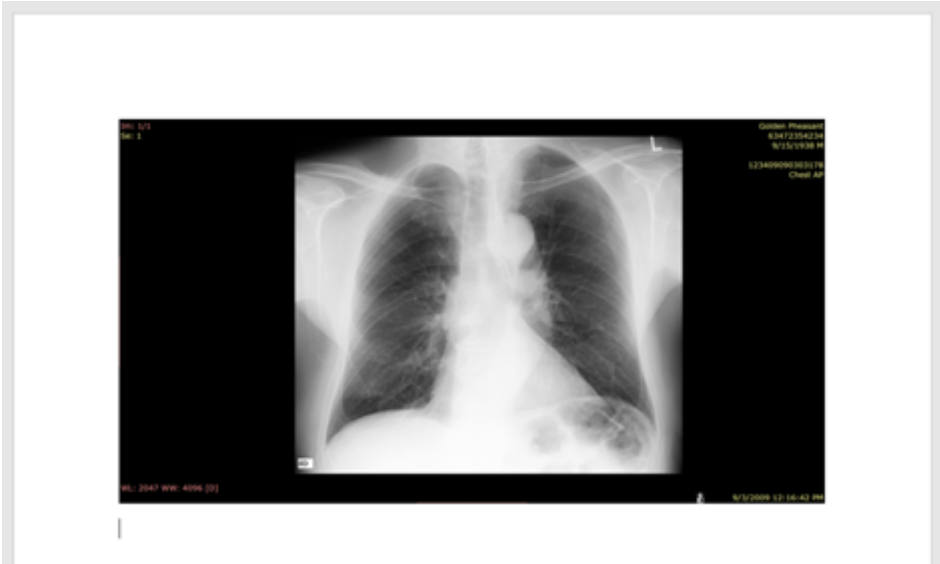
2.11 Copying to the clipboard

Image displayed in the active panel can be easily copied to the Windows clipboard and then pasted into other Windows application such as Microsoft Word, PowerPoint, etc.

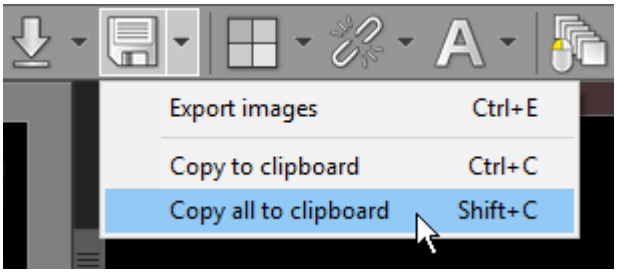
Click the Copy to clipboard in the Export drop-down menu or use the `Ctrl + C` shortcut.



Switch to the application where you want to paste the image and press `Ctrl + V`



To copy all visible panels to the Windows clipboard, press `Shift + C` or click the Copy all to clipboard in the Export drop-down menu.



Switch to the application where you want to paste the image and press `Ctrl + V`

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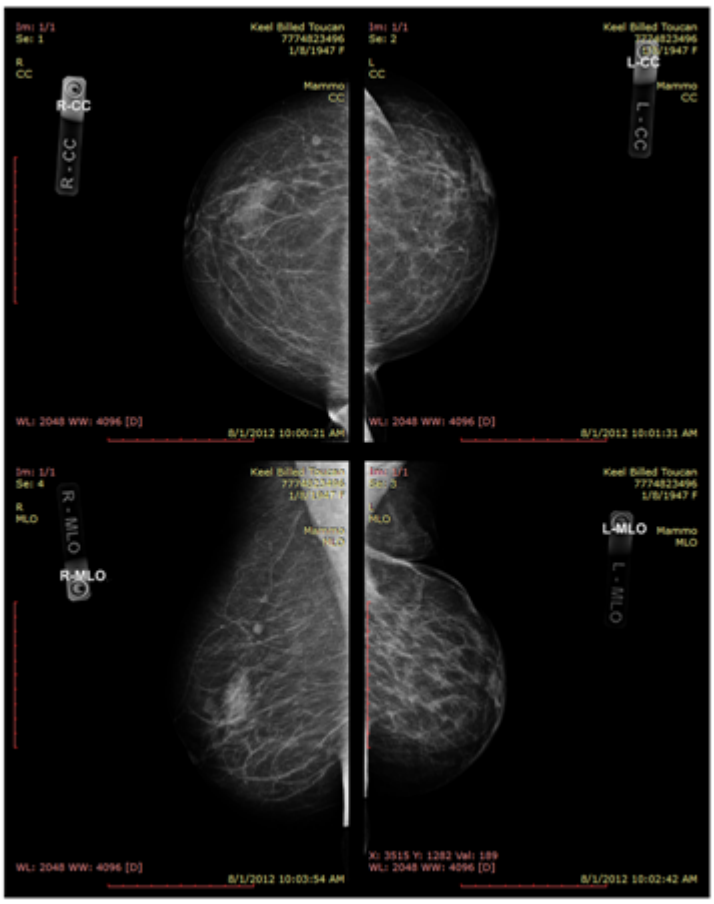

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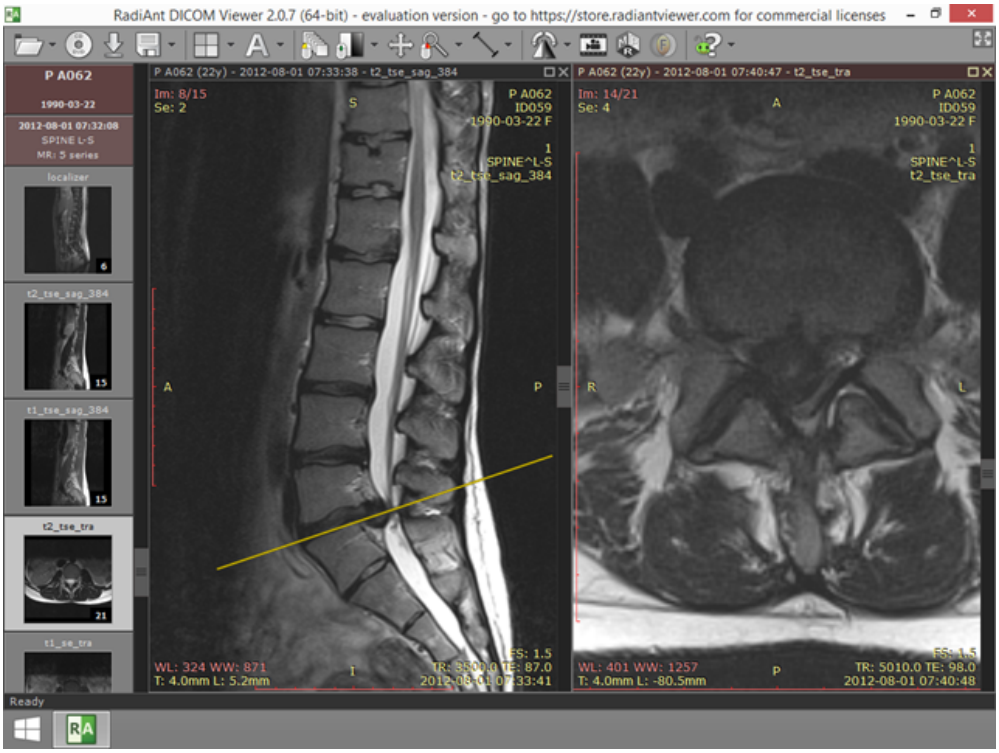
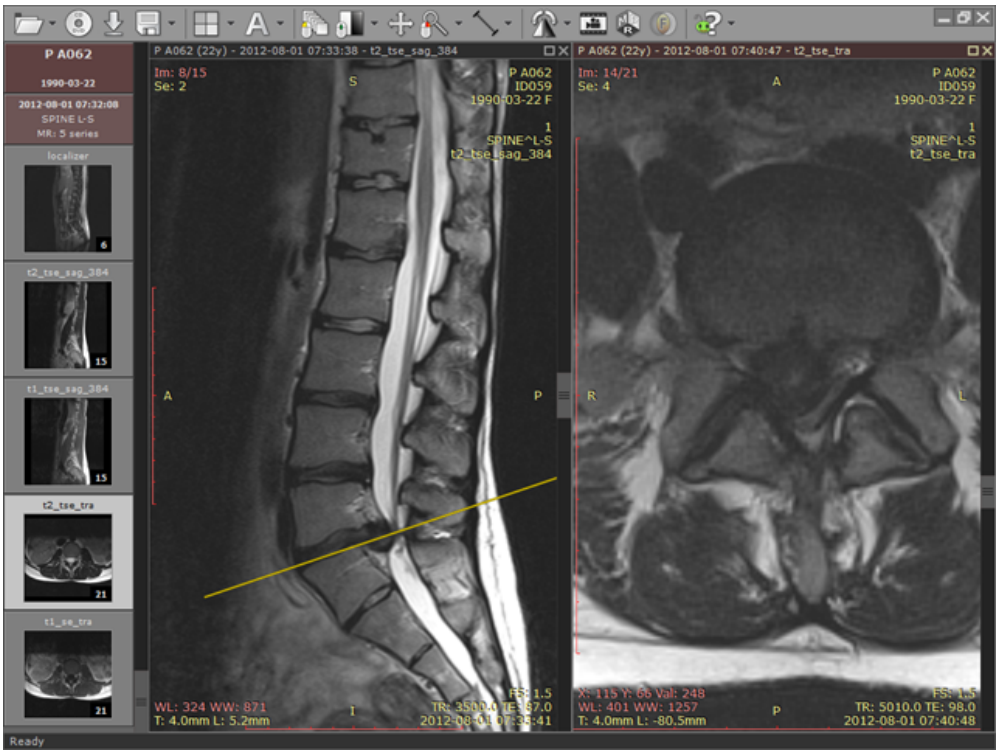
2.12 Full-screen mode

Full-screen mode allows you to hide the frame of the window and increase the viewing area.



Normal mode



Full-screen mode

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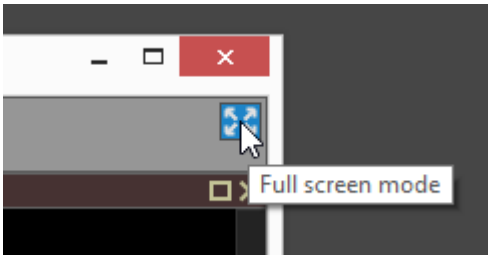
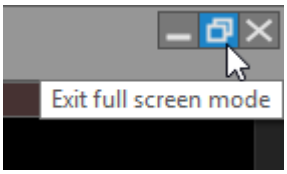
Click the **Full screen mode** button located on the right side of the toolbar or press **F**.



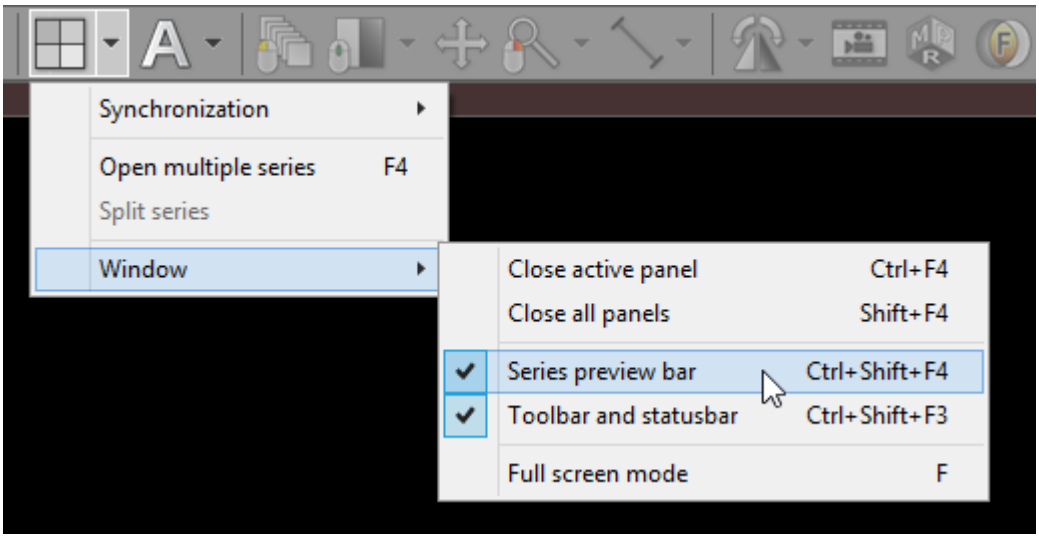
To restore the normal window, use the **Exit full screen mode** toolbar button or again press the **F** key.



Switching between full screen and window modes can be also achieved by double-clicking the toolbar area.

To maximize the viewing area, both the series preview bar and the toolbar with the status bar can be temporarily hidden.

Click Window / Series preview bar menu item or use **Ctrl + Alt + F2** to toggle preview bar visibility.
Click Window / Toolbar and status bar menu item or use **Ctrl + Alt + F3** to toggle toolbar and status bar visibility.



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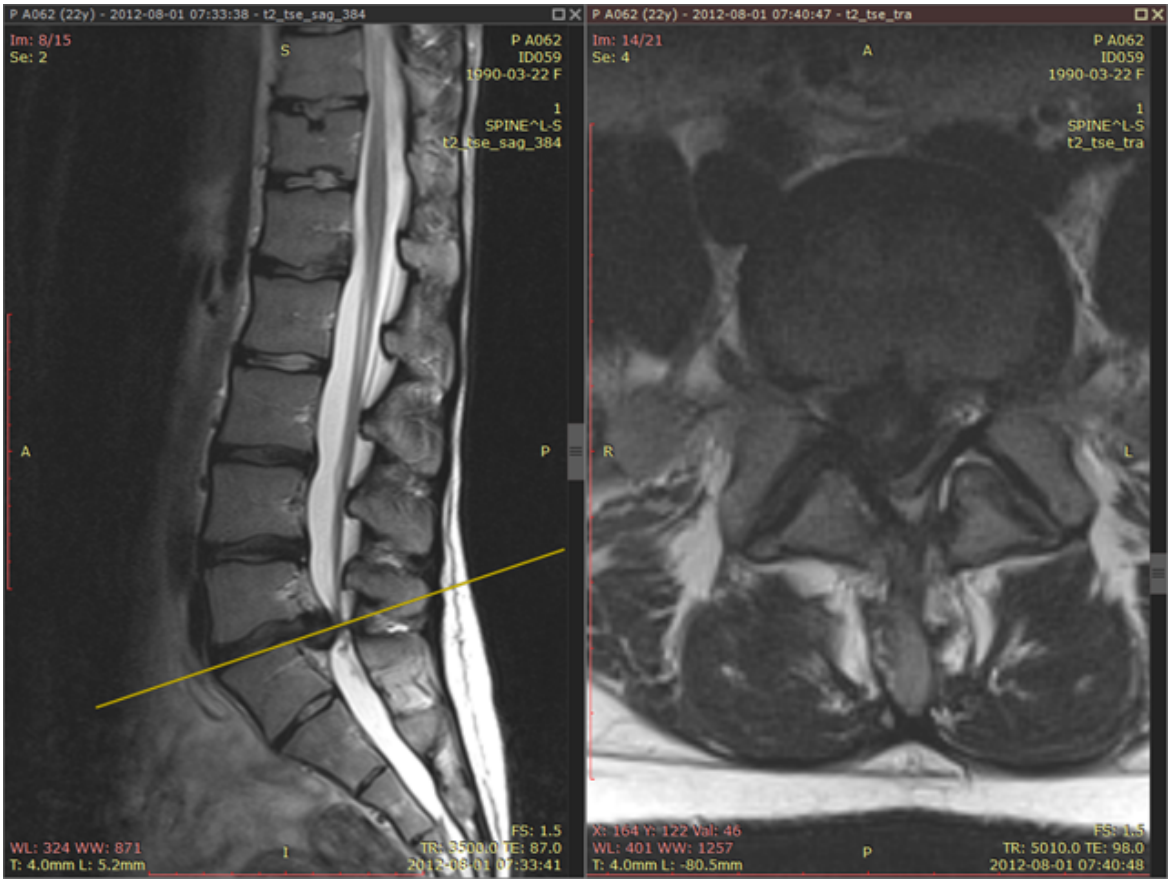

Full-screen mode with hidden toolbar, series bar and status bar

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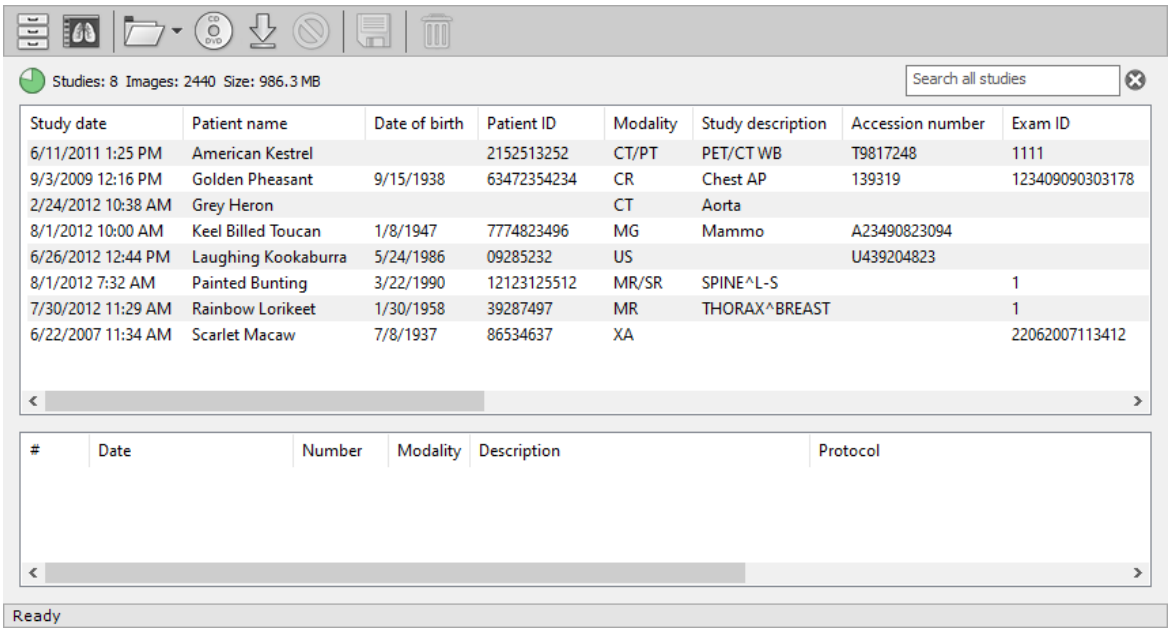
3 Advanced Topics

3.1 Local archive

The local archive feature allows you to import DICOM studies from CD/DVD discs, USB flash drives, local and network folders or PACS servers, and store them on your local hard drive so that they can be easily accessed at a later date.
The local archive can be helpful in situations in which the original media is no longer available, or you would like to open the study without the need to repeatedly retrieve it from a PACS server.
You can also access the database to organize and quickly find studies in your collection of DICOM files that are stored on the hard drive.



Make sure that you familiarize yourself with the security considerations before you import DICOM files (often containing sensitive information) to your computer.

Remember to back up your database regularly to ensure you are protected against hard drive failures and data corruption.

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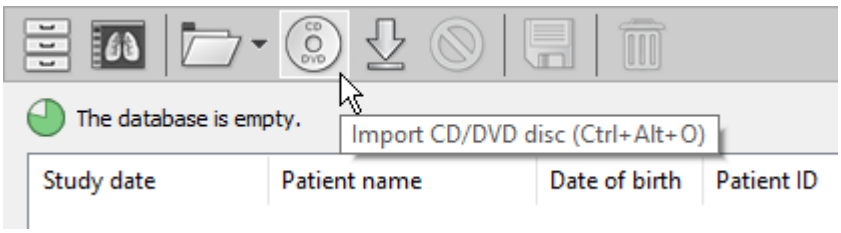
3.1.1 Importing DICOM CD/DVD

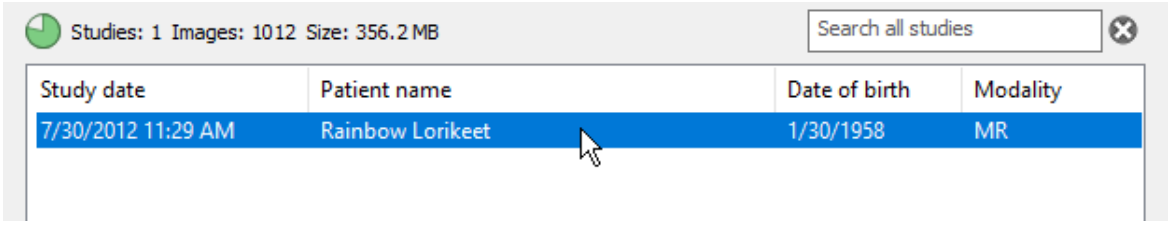
1. Insert a disc with a DICOM study into a CD/DVD drive. If the default viewer is automatically started from the CD, close it, as this will enable you to obtain better reading speeds in RadiAnt DICOM Viewer.

2. Click the `Local archive` button on the toolbar in the main window or use the `F8` shortcut.

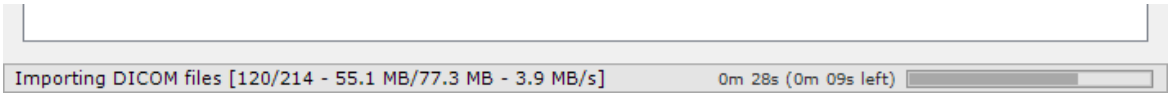
3. Click the `CD/DVD` button on the toolbar in the local archive window (this button is hidden when no CD/DVD drive is detected) or use the `Ctrl + Alt + O` shortcut.



4. The disc importing process will commence. You can open the study by double-clicking on the item as soon as it appears in the list.



5. The status bar shows the number of imported files, total number of files, imported data size, total data size, importing speed, elapsed time, and estimated time to finish.



6. Remove the disc from the CD/DVD drive.

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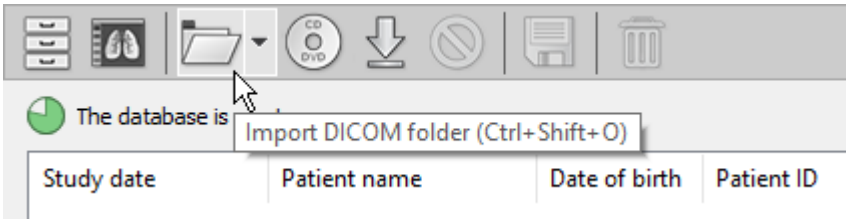
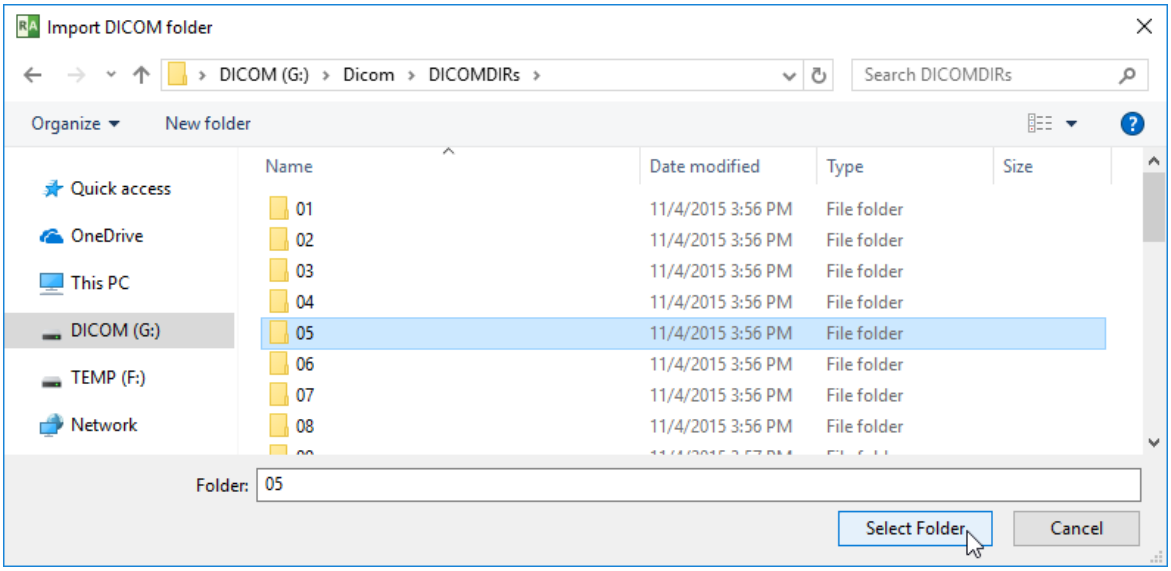
3.1.2 Importing DICOM folder

1. Click the **Local archive** button on the toolbar in the main window or use the **F8** shortcut.

2. Click the **Folder** button on the toolbar in the local archive window or use the **Ctrl + Shift + O** shortcut.



3. Find the folder you want to import the DICOM files from, select it, and then click **Select Folder**.



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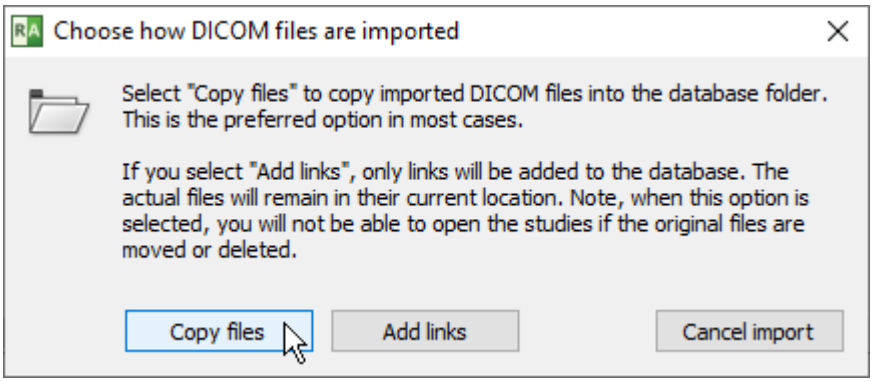
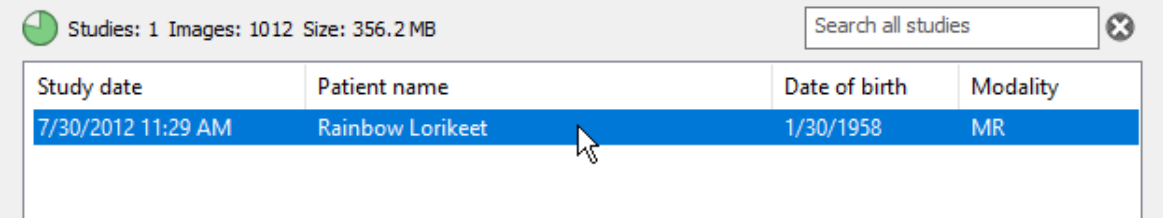
4. Choose how the DICOM files will be imported. You will typically use the **`Copy files`** option. This ensures the imported files are stored in the database folder.

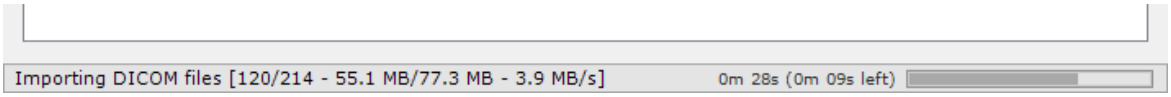


If you want to store the DICOM files in their original location and simply add links to the database, click **`Add links`**. Use this method if you store the DICOM files in a structured folder tree on your hard disk drive.

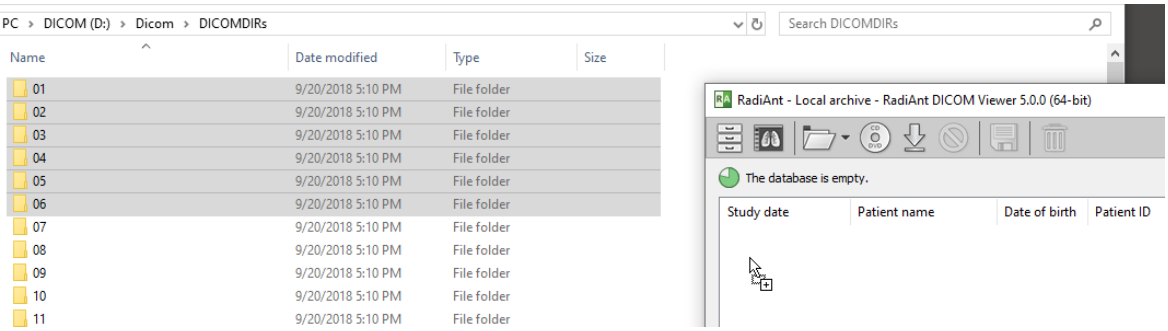
5. The folder importing process will commence. You can open the study by double-clicking on the item as soon as it appears in the list.



6. The status bar shows the number of imported files, total number of files, imported data size, total data size, importing speed, elapsed time, and estimated time to finish.



You can also import the folders by dragging and dropping them onto the local archive window.



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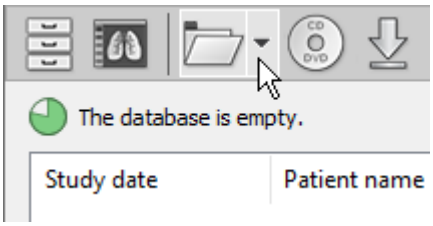
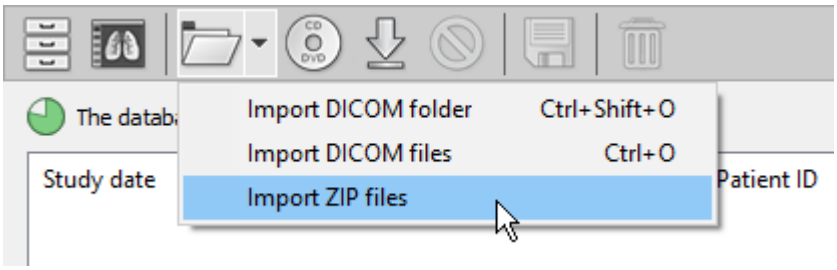
3.1.3 Importing DICOM ZIP archive

1. Click the **Local archive** button on the toolbar in the main window or use the **F8** shortcut.

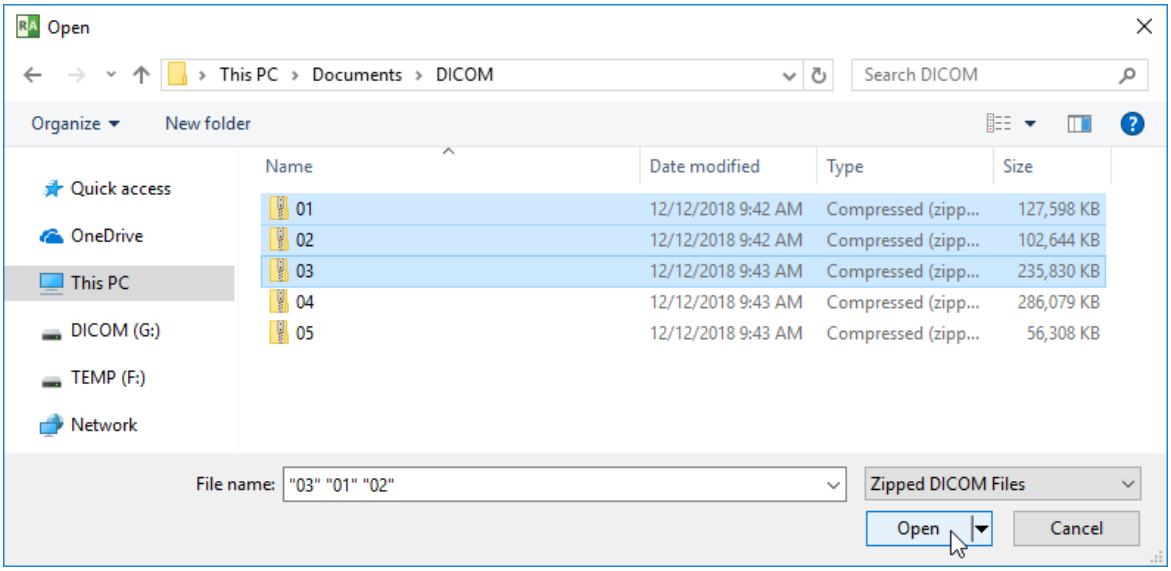
2. Click the arrow next to the folder icon on the toolbar in the local archive window.



3. Click Import ZIP files.



4. Find the zip archive(s), select the files you want to import, and click **Open**.



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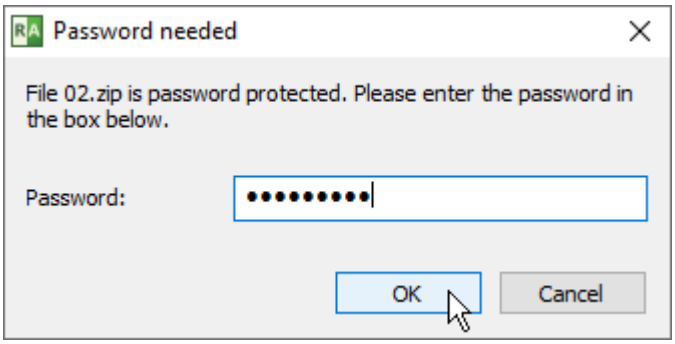
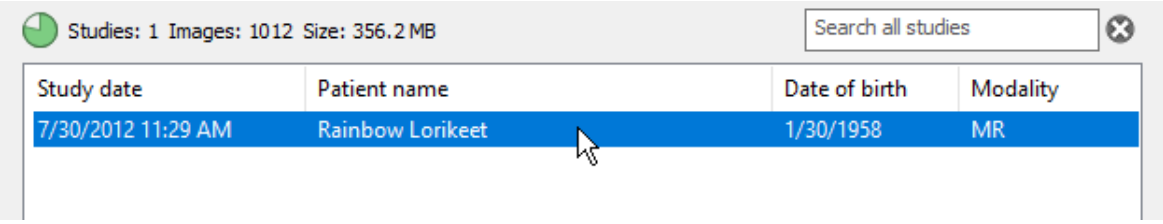
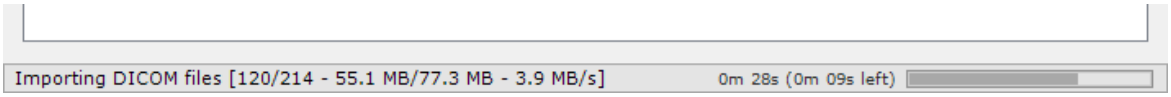
5. If the archive is encrypted, a password prompt will be displayed.



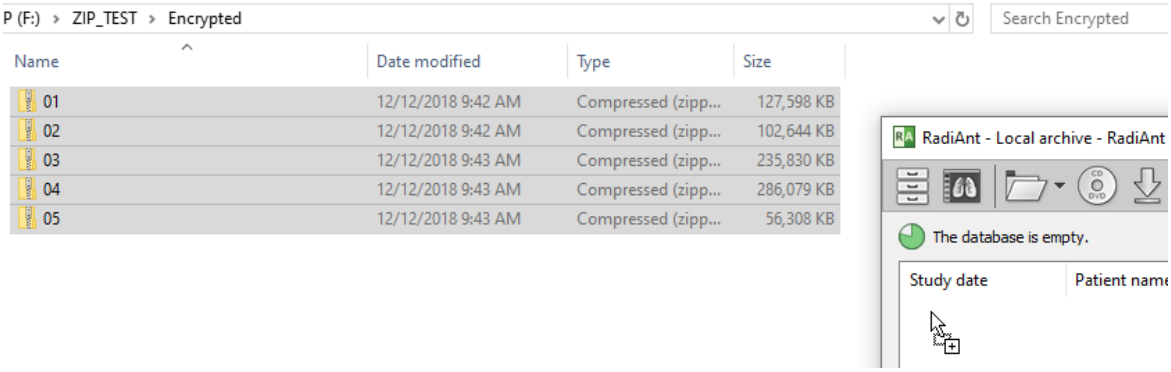
6. The file unpacking and importing process will commence. You can open the study by double-clicking on the item as soon as it appears on the list.



7. The status bar shows the number of imported files, total number of files, imported data size, total data size, importing speed, elapsed time, and estimated time to finish.



You can also import the ZIP files by dragging and dropping them onto the local archive window.



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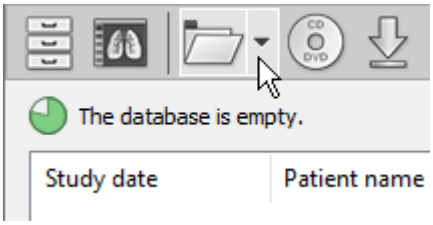
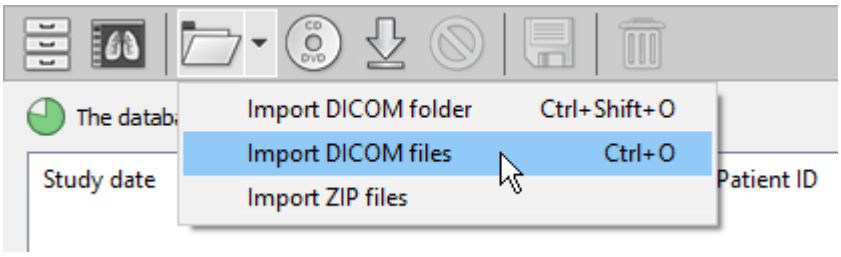
3.1.4 Importing DICOM file(s)

1. Click the **Local archive** button on the toolbar in main window or use the **F8** shortcut.

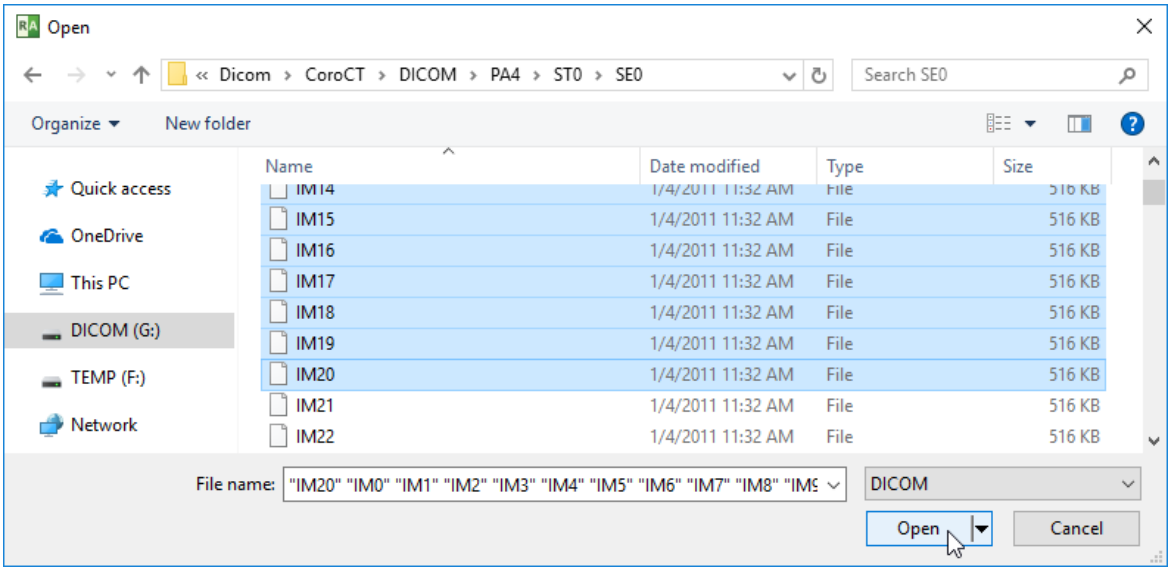
2. Click the arrow next to the folder icon on the toolbar in the local archive window.



3. Click Import DICOM files, or use the **Ctrl + O** shortcut.



4. Find the DICOM file(s), select the files you want to import, and click **Open**.



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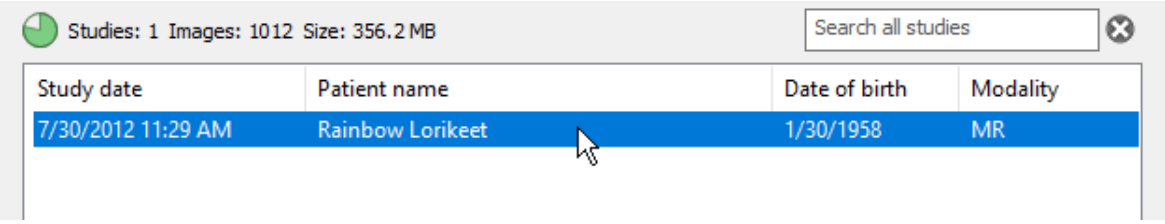
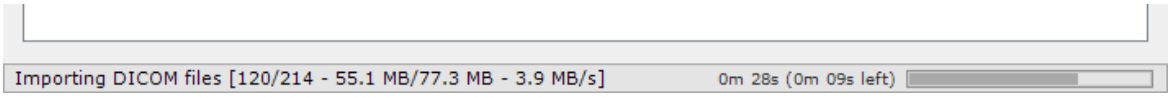
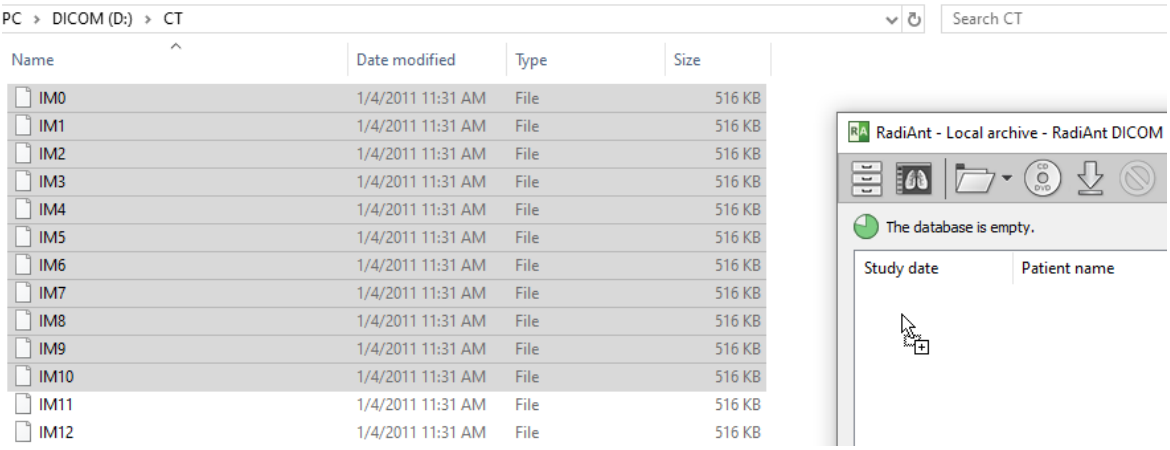
5. The file importing process will commence. You can open the study by double-clicking on the item as soon as it appears in the list.



6. The status bar shows the number of imported files, total number of files, imported data size, total data size, importing speed, elapsed time, and estimated time to finish.



You can also import the relevant DICOM file(s) by dragging and dropping them onto the local archive window.



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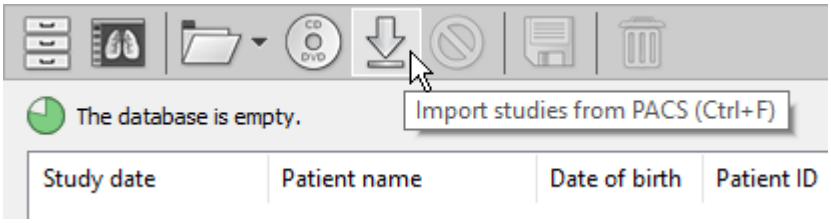
3.1.5 Importing studies from PACS servers

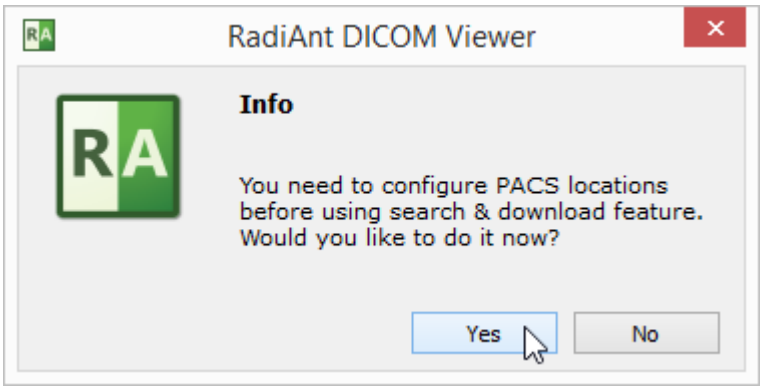
Before you commence, you should verify that the PACS server and RadiAnt are properly configured. Please refer to the advanced section of this manual for configuration instructions. Sometimes, the configuration process may be quite complicated or even impossible without the technical support of the vendor of your PACS server.

1. Click the **Local archive** button on the toolbar in the main window or use the **F8** shortcut.

2. Click the **PACS import** button on the toolbar in the local archive window or use the **Ctrl + F** shortcut.



3. If the PACS host is not yet configured, a pop-up message will appear that asks you to add a new PACS host. Please refer to the advanced section of this manual.



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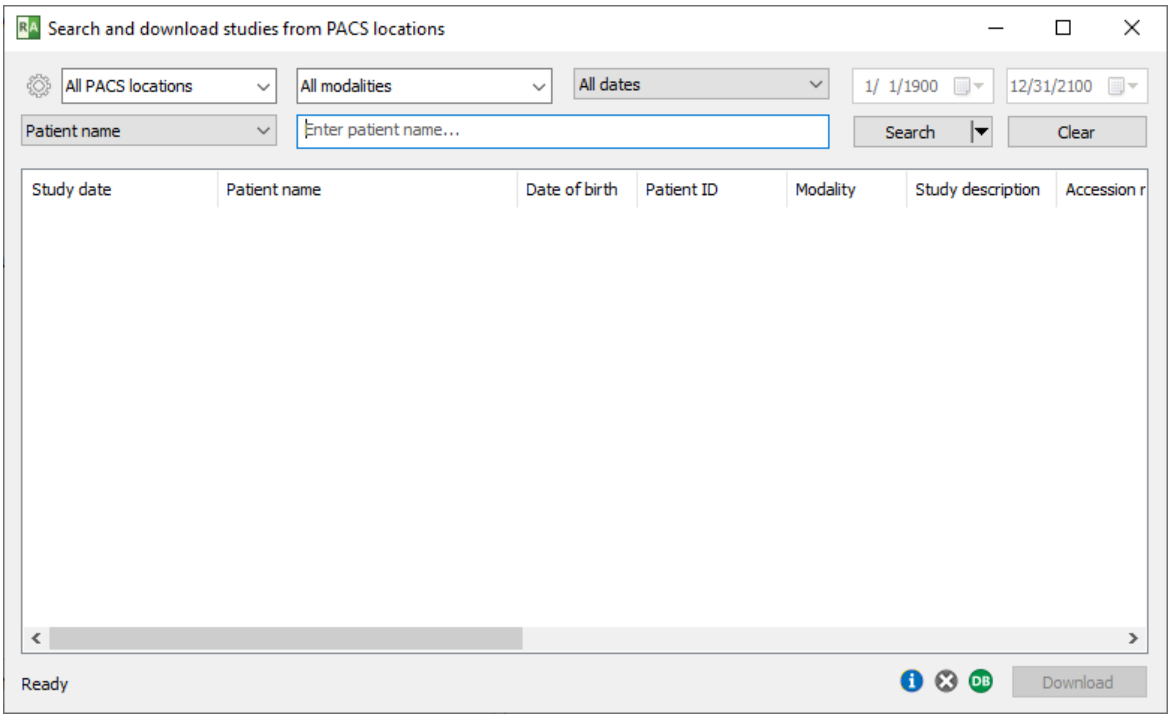
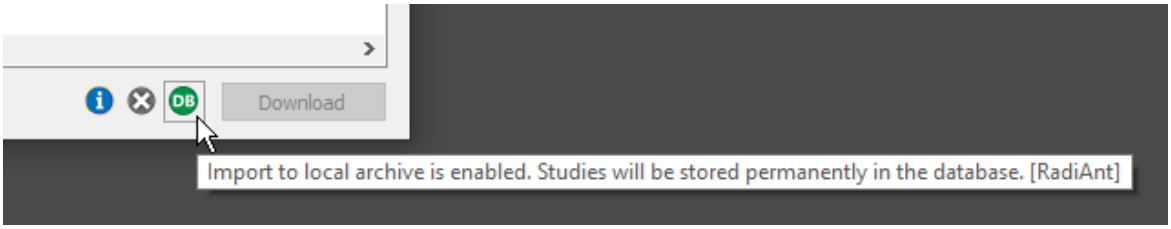
4. Once the configuration is complete, the PACS search window will appear.



5. Ensure that the option to import to database is enabled (green DB icon in the bottom-left corner).



6. Enter the relevant search parameters and click the **Search** button.

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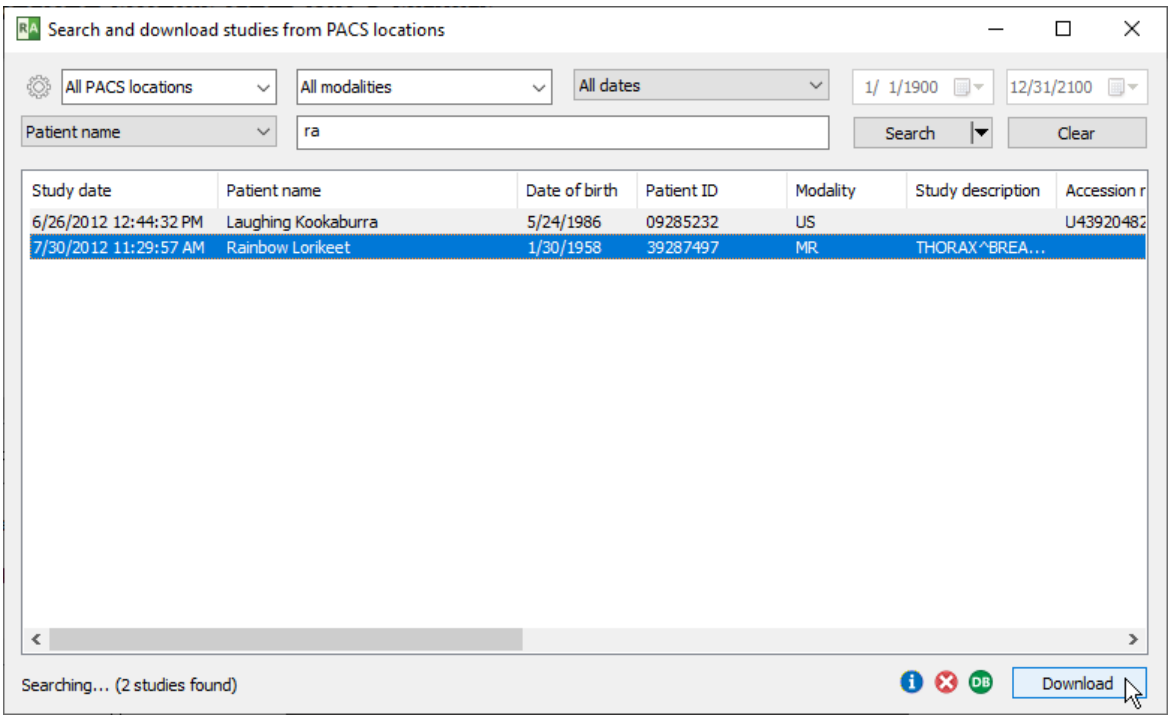
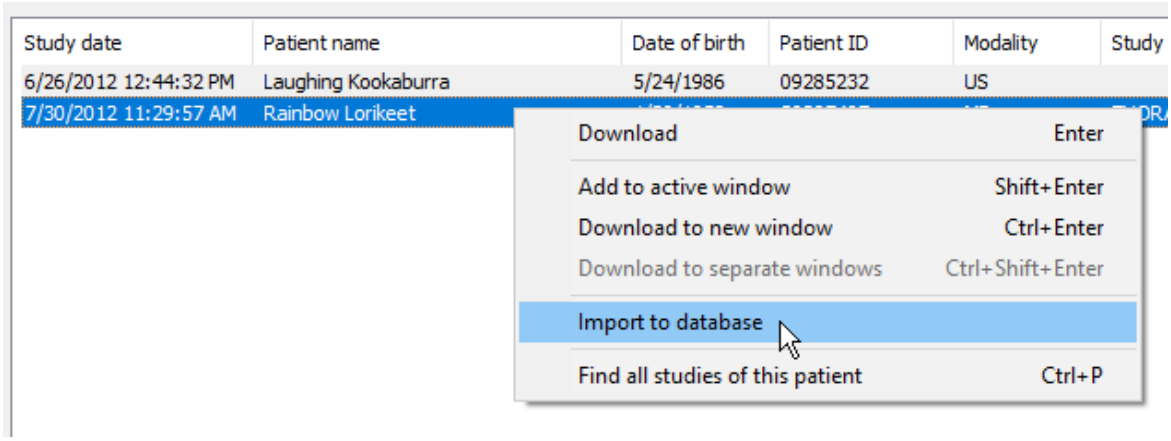
7. The results of the search will start appearing in the list. The number of studies found will be displayed in the lower-left corner. Select the study you want to download from the list and click the **Download** button or press **Enter**. You can also simply double-click the study to start the download process. Images of the study will be added to the database and displayed in a viewer window at the same time.



If you prefer to import studies to the database without immediately opening them in a viewer, right-click the selected study/studies. Select Import to database.



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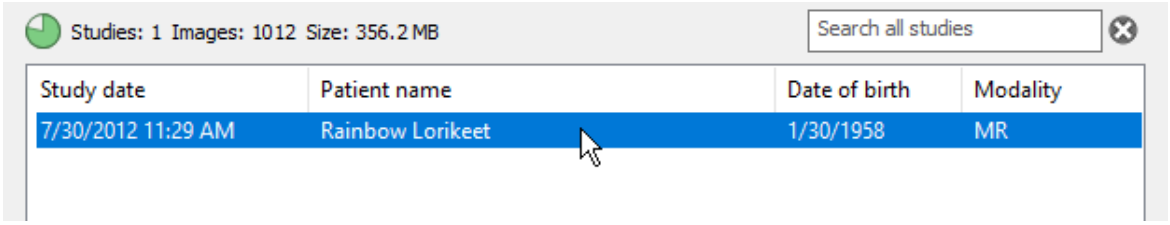
3.1.6 Opening studies

1. Click the **Local archive** button on the toolbar in the main window or use the **F8** shortcut.

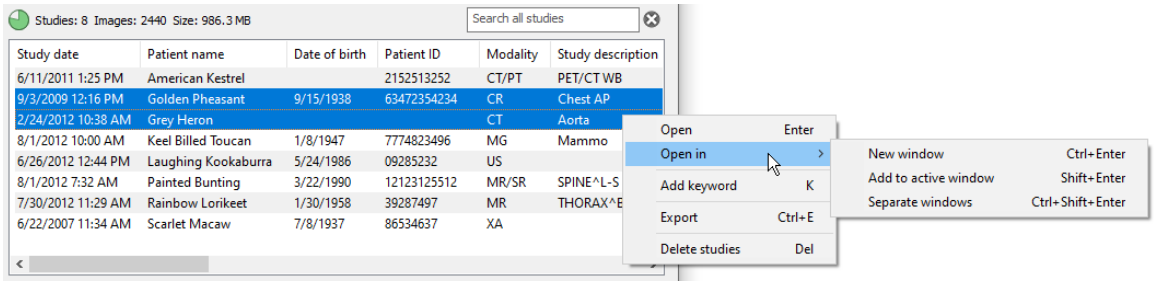
2. Double-click the study to open it in a viewer window.



You can also press **Enter** to open the selected study.

By default, the study is opened in the active viewer window (or a new one if no viewer window is opened) and the previously opened study is cleared.

Right-click on the selected study/studies to open the study per your preferences. The options are as follows:



Select New window or press **Ctrl + Enter** to open the study in a new window.

Select Add to active window or press **Shift + Enter** to add the study to the current window.

Select Separate windows or press **Ctrl + Shift + Enter** to open each study in a separate window.

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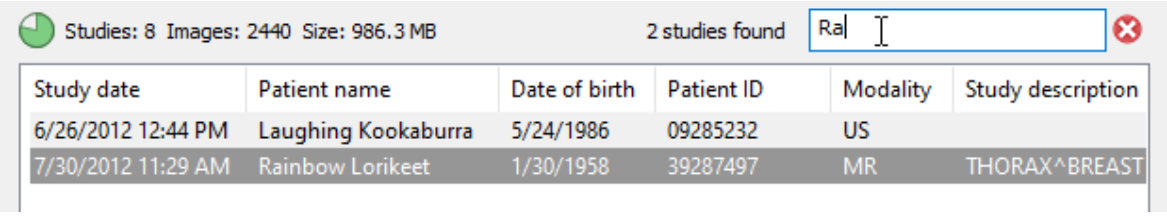
3.1.7 Searching studies

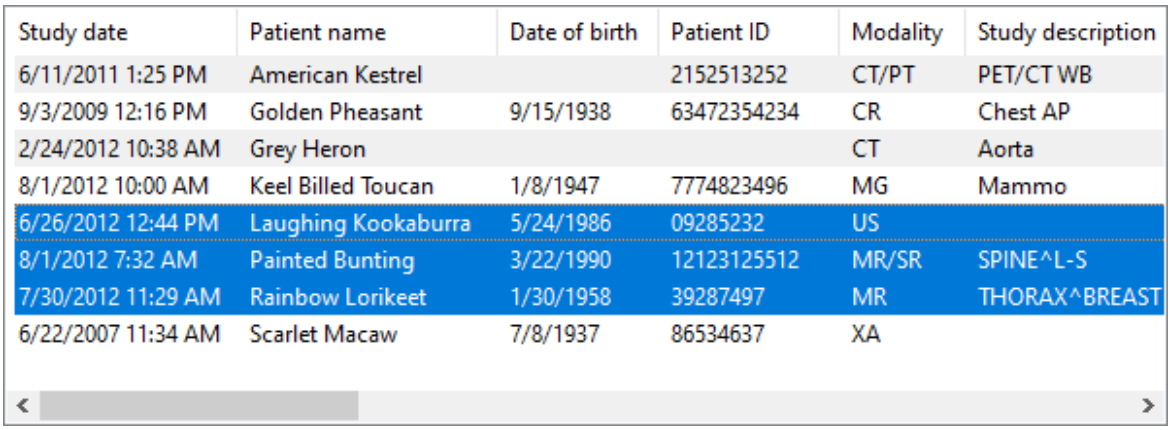
Studies stored in the database can be quickly searched.
As soon as you start entering text in the search box above the list of studies, the results will appear in the results list.



To clear the filter press `Esc` or click on .

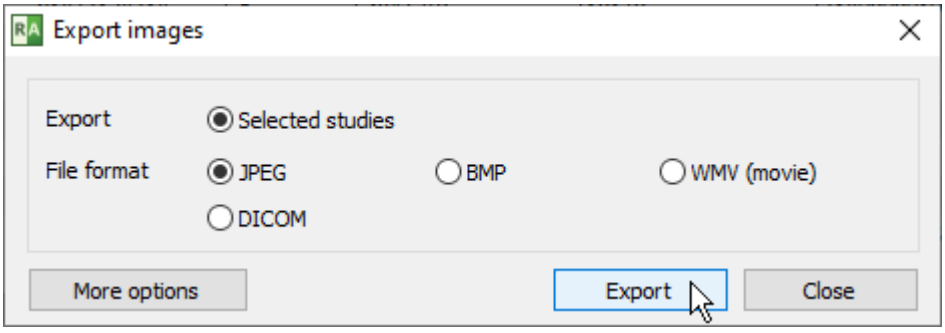
3.1.8 Exporting studies

1. Select the studies that you want to export.



2. Click the `Export` button on the toolbar or use `Ctrl + E` to access the export window.

The export window will open, and you can subsequently choose the destination format:



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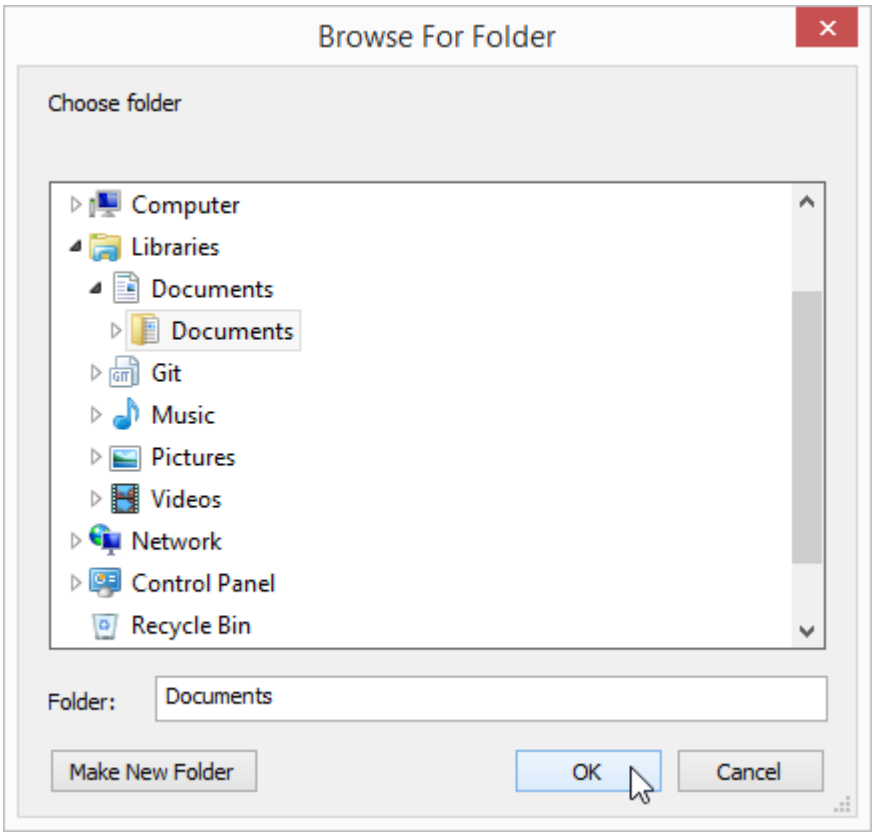
Click **Export** to browse the system and select the destination folder.

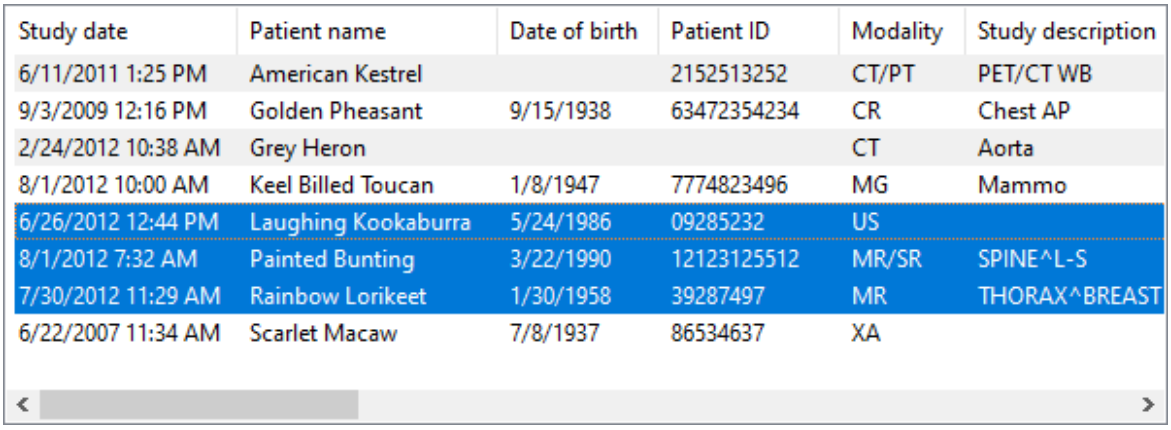


Click **OK**, and the export process will start.

Refer to the Exporting images section to learn more about the various options that are available in the export window.

3.1.9 Deleting studies

1. Select the studies that you want to delete.



Study date	Patient name	Date of birth	Patient ID	Modality	Study description
6/11/2011 1:25 PM	American Kestrel		2152513252	CT/PT	PET/CT WB
9/3/2009 12:16 PM	Golden Pheasant	9/15/1938	63472354234	CR	Chest AP
2/24/2012 10:38 AM	Grey Heron			CT	Aorta
8/1/2012 10:00 AM	Keel Billed Toucan	1/8/1947	7774823496	MG	Mammo
6/26/2012 12:44 PM	Laughing Kookaburra	5/24/1986	09285232	US	
8/1/2012 7:32 AM	Painted Bunting	3/22/1990	12123125512	MR/SR	SPINE^L-S
7/30/2012 11:29 AM	Rainbow Lorikeet	1/30/1958	39287497	MR	THORAX^BREAST
6/22/2007 11:34 AM	Scarlet Macaw	7/8/1937	86534637	XA	

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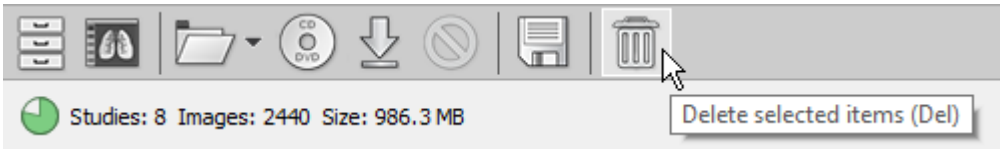
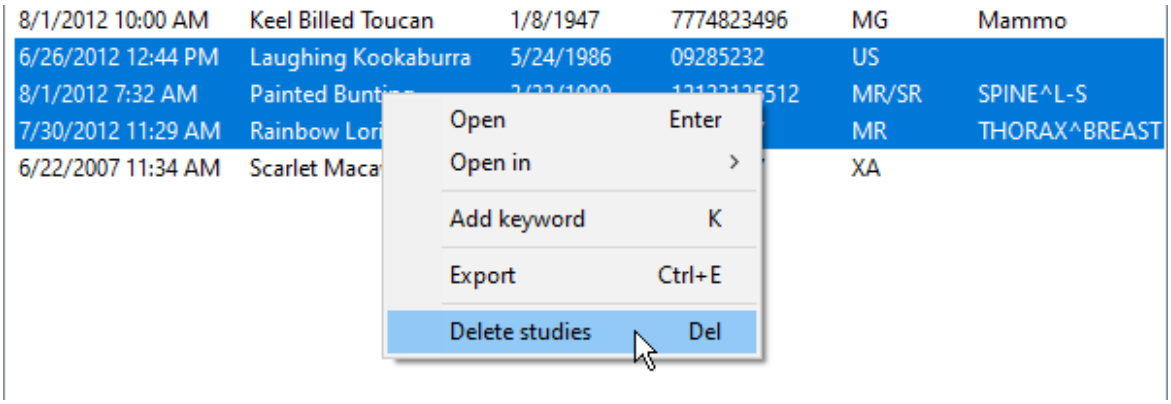
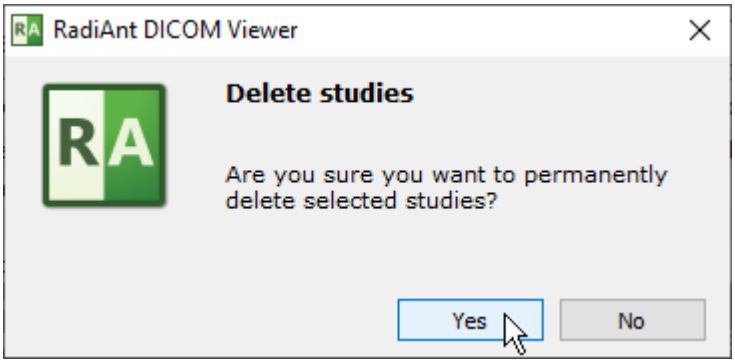
2. Click the **Delete** button on the toolbar or press **Del**.



You can also select the study, right-click, and choose Delete studies from the menu options.



3. Click **Yes** to confirm that you want to delete the selected studies.



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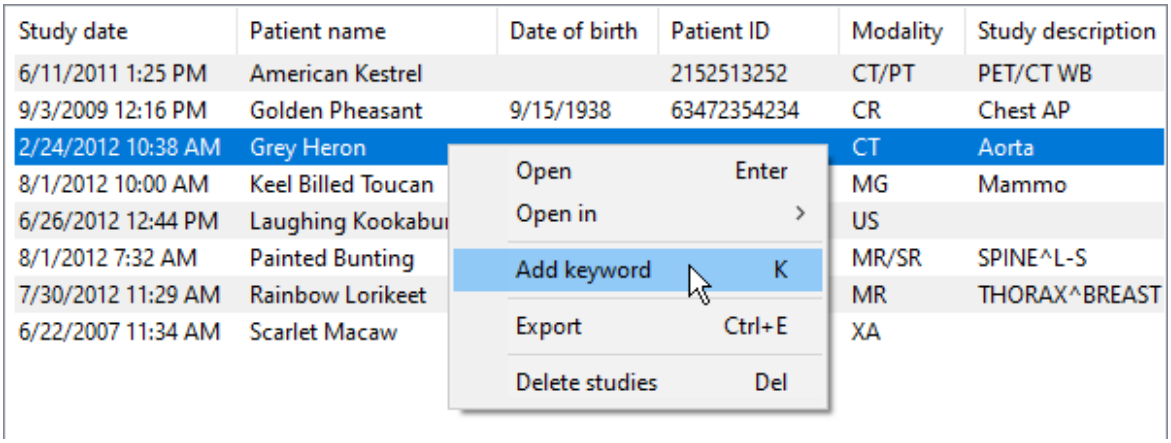
3.1.10 Keywords

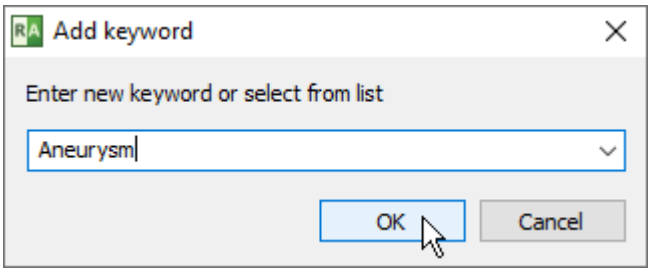
You can use keywords to organize your collection of studies and quickly search for studies with the assigned label.

Adding Keywords

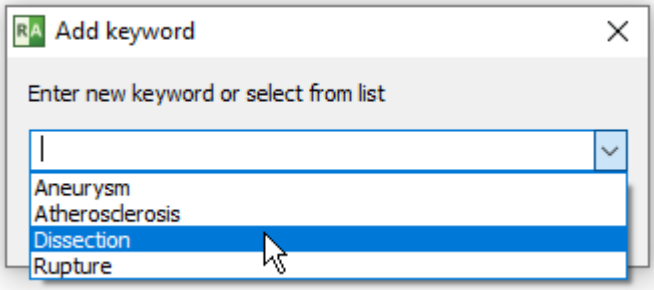
To add a keyword to selected studies, right-click and select Add keyword or press **K**.



Enter the keyword and click **OK**.



You can also select the keyword from the list if it was previously added to the database.



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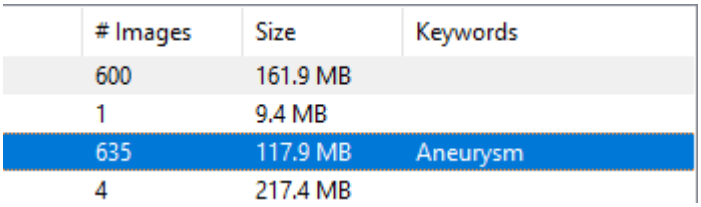
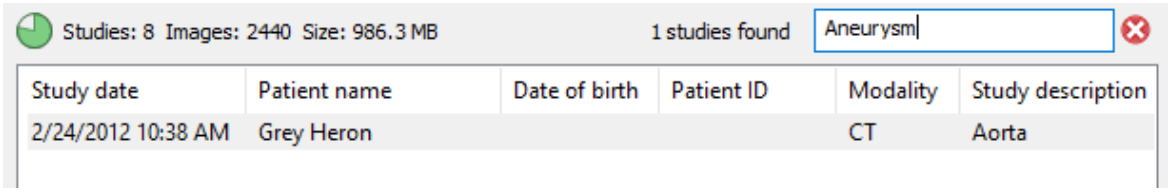
Searching Keywords

Assigned keywords are visible in the "Keywords" column of the study list.

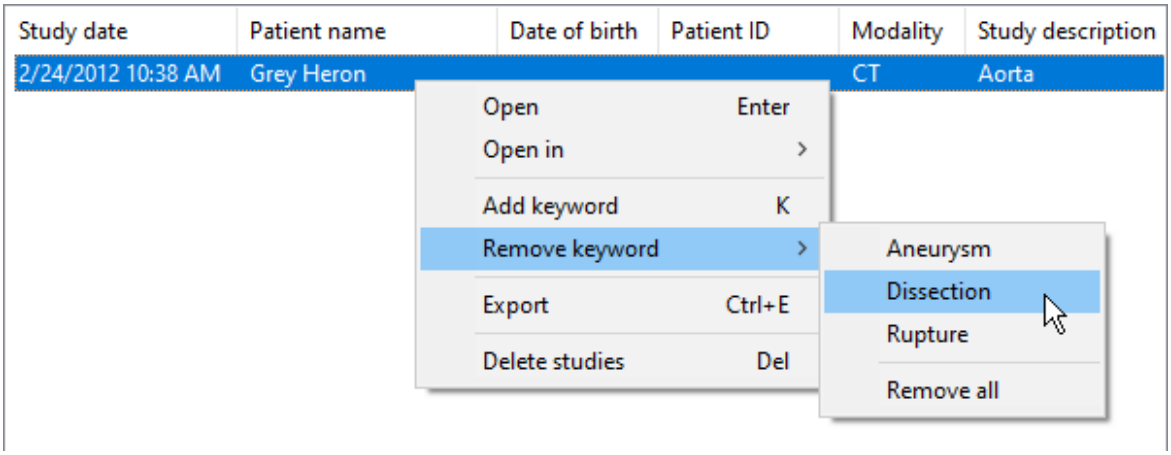


Enter a keyword in the search box to display studies with the assigned label.



Deleting Keywords

To remove a keyword from selected studies, right-click, select Remove keyword, and then choose the keyword you want to delete.
You can also click Remove all, to clear all keywords for the selected studies.



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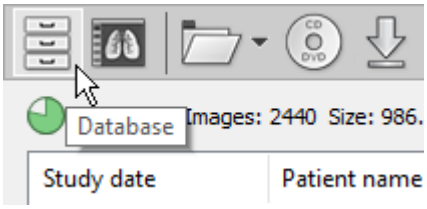
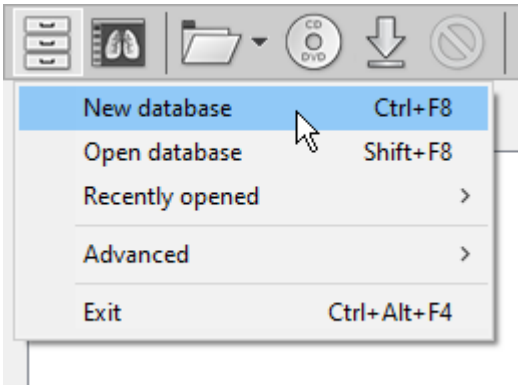
3.1.11 Multiple databases

Create a New Database

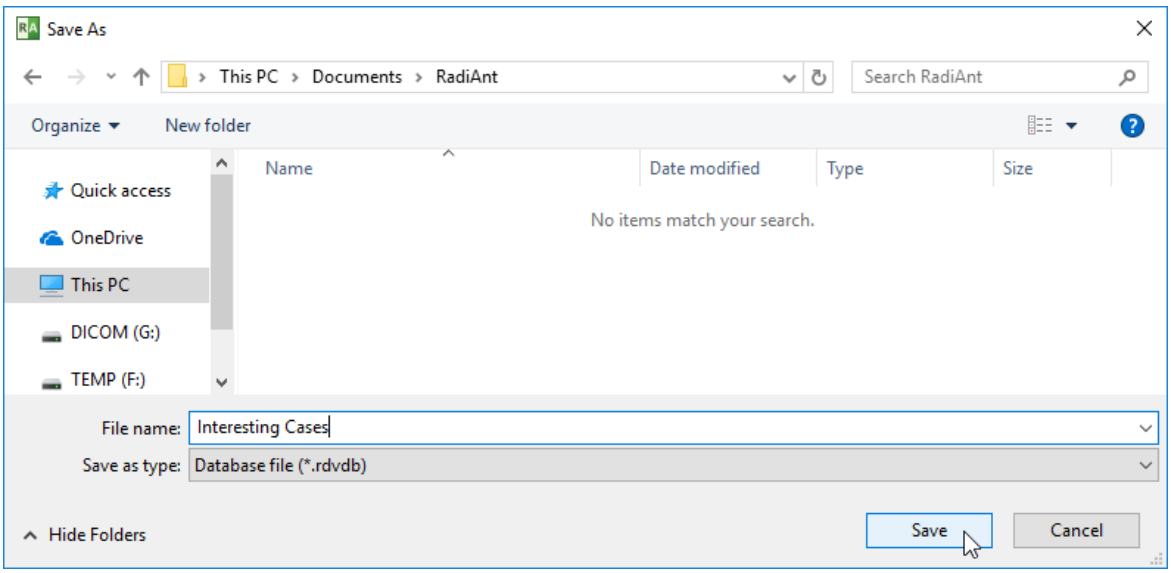
To create a new database, click the **Database** button in the local archive window.



Then select New database. You can also use the **Ctrl + F8** shortcut.



Choose the location and name of the database. You are advised to create the database file in a new empty folder.



Click **Save**. The database will open in a new window. The name of the database is visible on the title bar. The location is presented in the tooltip box over the free space indicator icon.

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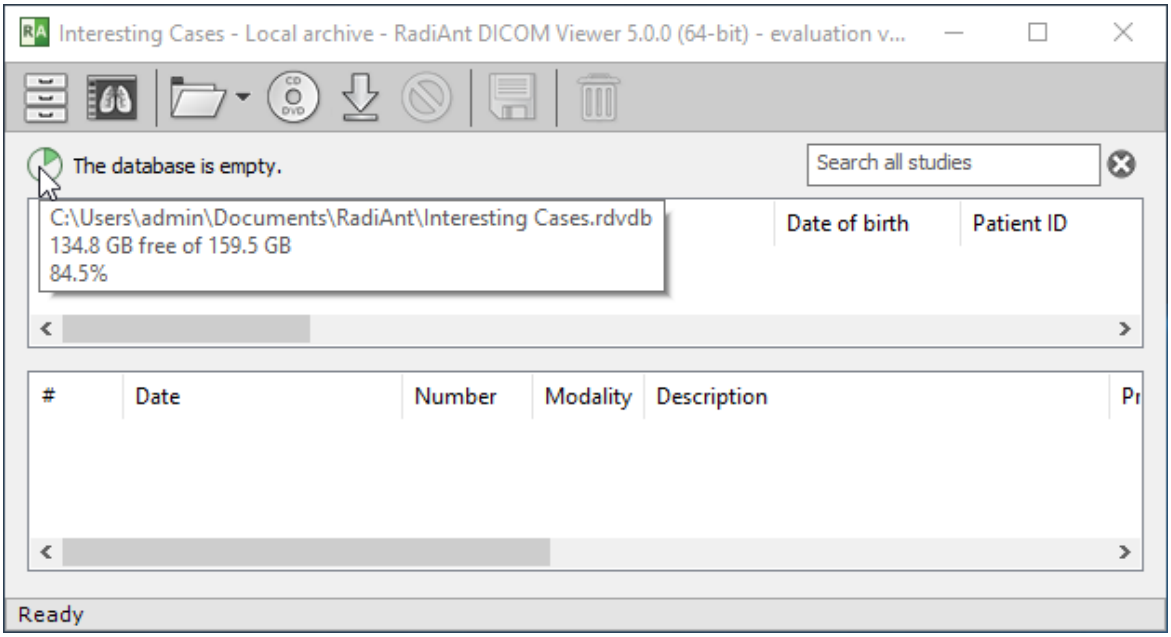
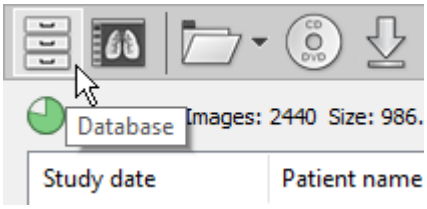
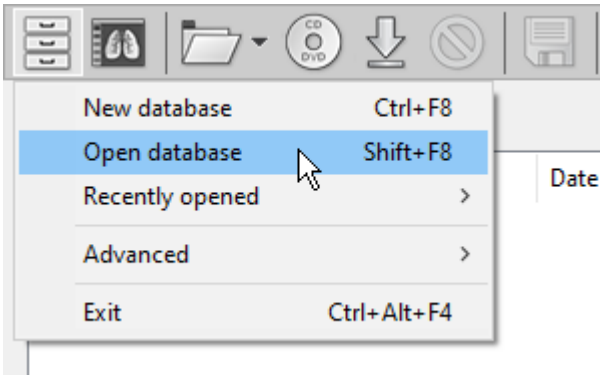


Open Database

To open an existing database, click the **Database** button in the local archive window.



Then select Open database. You can also use the **Shift + F8** shortcut.



Browse for the database file and click **Open**. The database will open in a new window.

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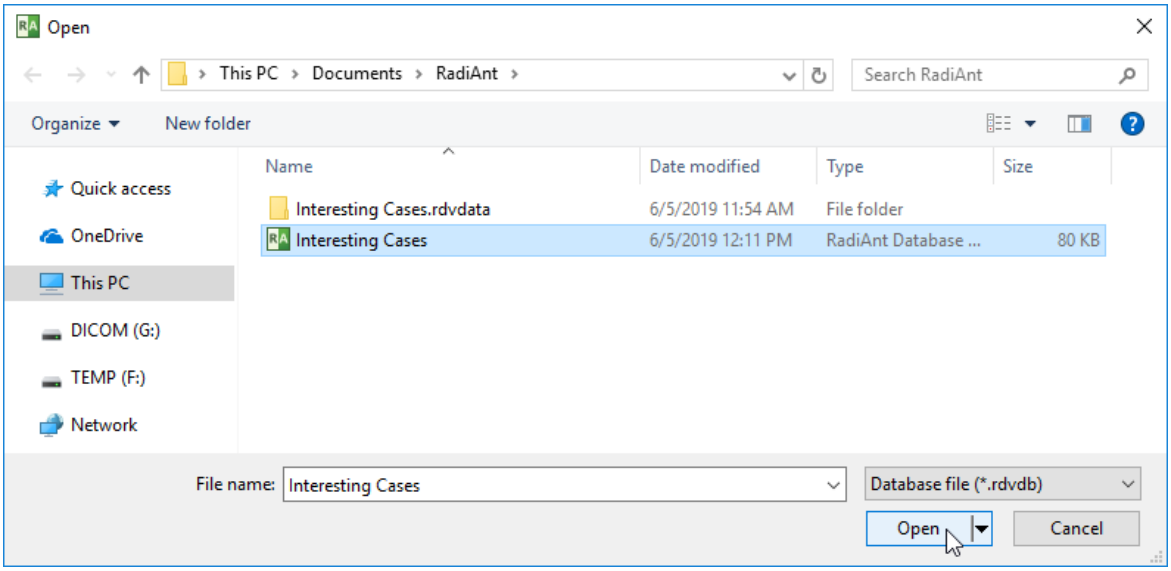
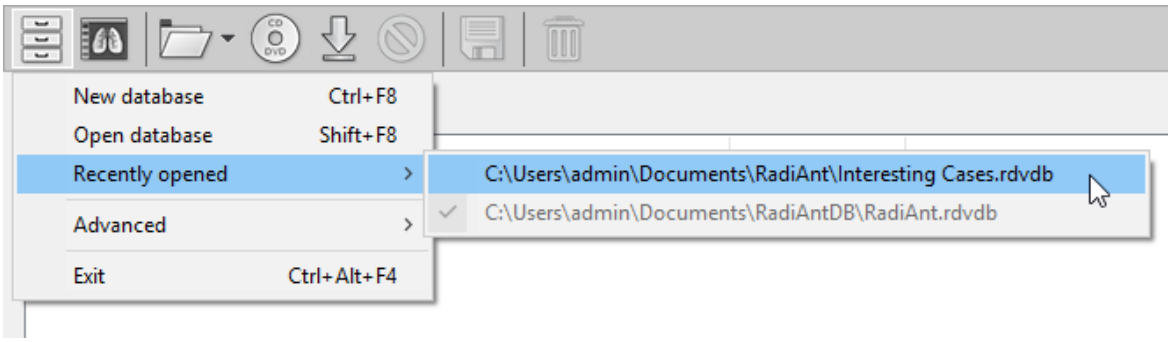


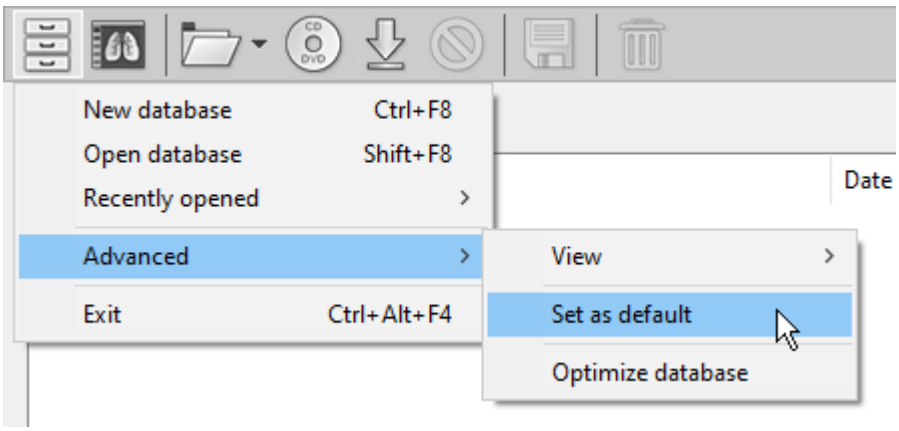
To quickly access recently opened databases, click the Recently opened menu item.



Default Database

The default database is created automatically in the Documents\RadiAntDB folder.
This database is loaded automatically after RadiAnt is started.
Studies received from PACS locations are automatically stored in the default database.

You can choose an alternative database as the default by clicking Advanced -> Set as default - in the menu under the Database button on the local archive window toolbar.



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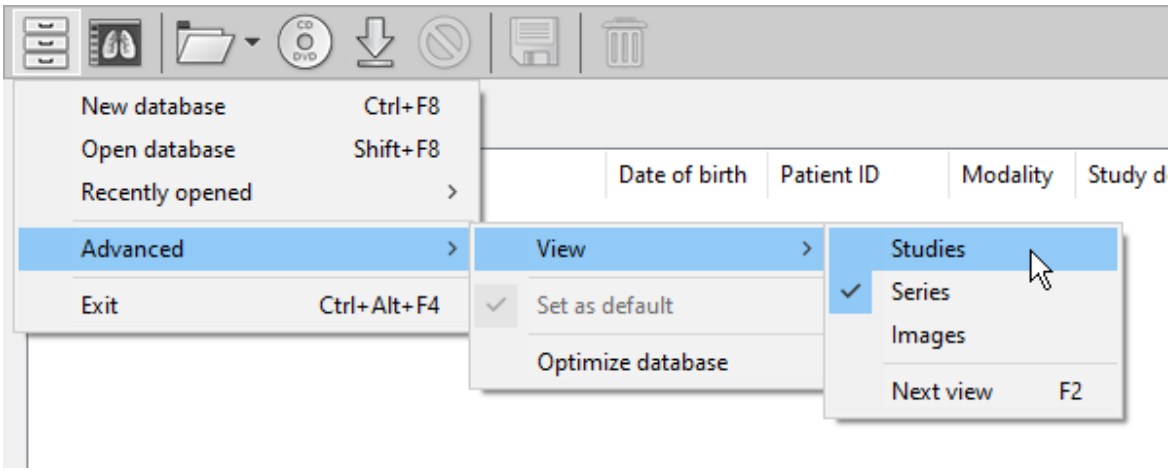
3.1.12 Database window configuration

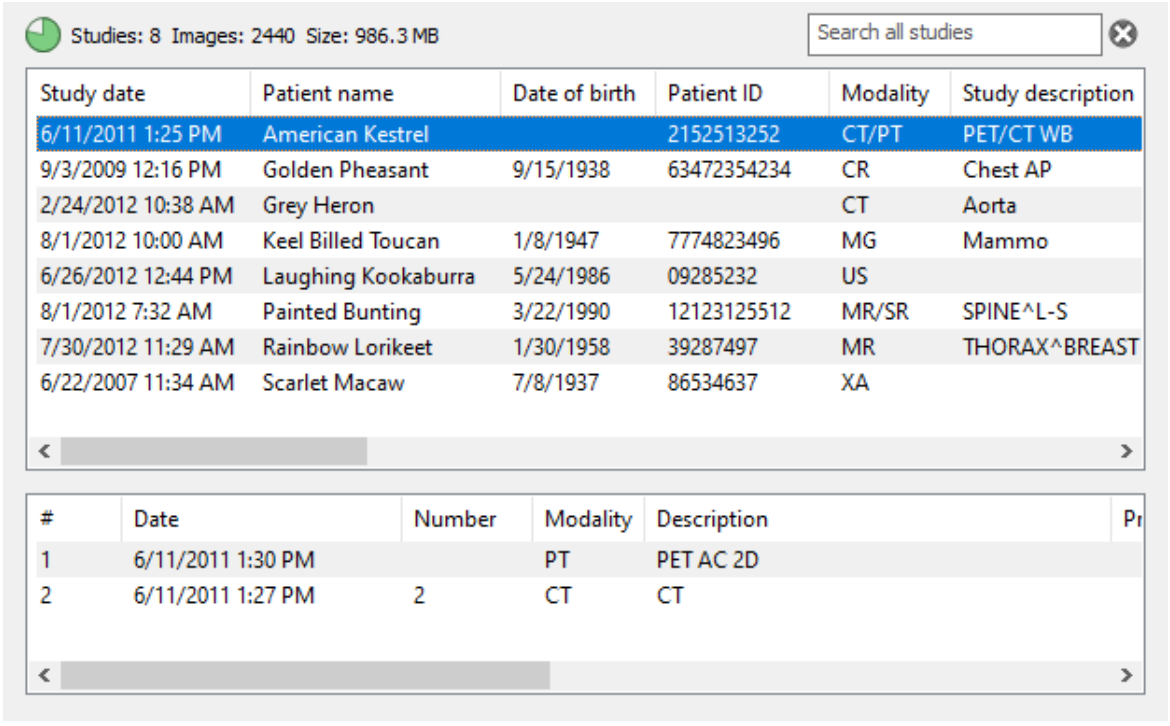
Database Views

The default local archive view ("Series") shows the list of studies and below that the list of series in a selected study.
The "Studies" view shows only the list of studies and, the "Images" view shows the list of studies, list of series in a selected study, and list of images in a selected series.

You can change the default view by clicking Advanced -> View in the menu under the Database button in the local archive window and selecting Studies, Series or Images.



To quickly cycle views, use the F2 shortcut.



Series View (default)

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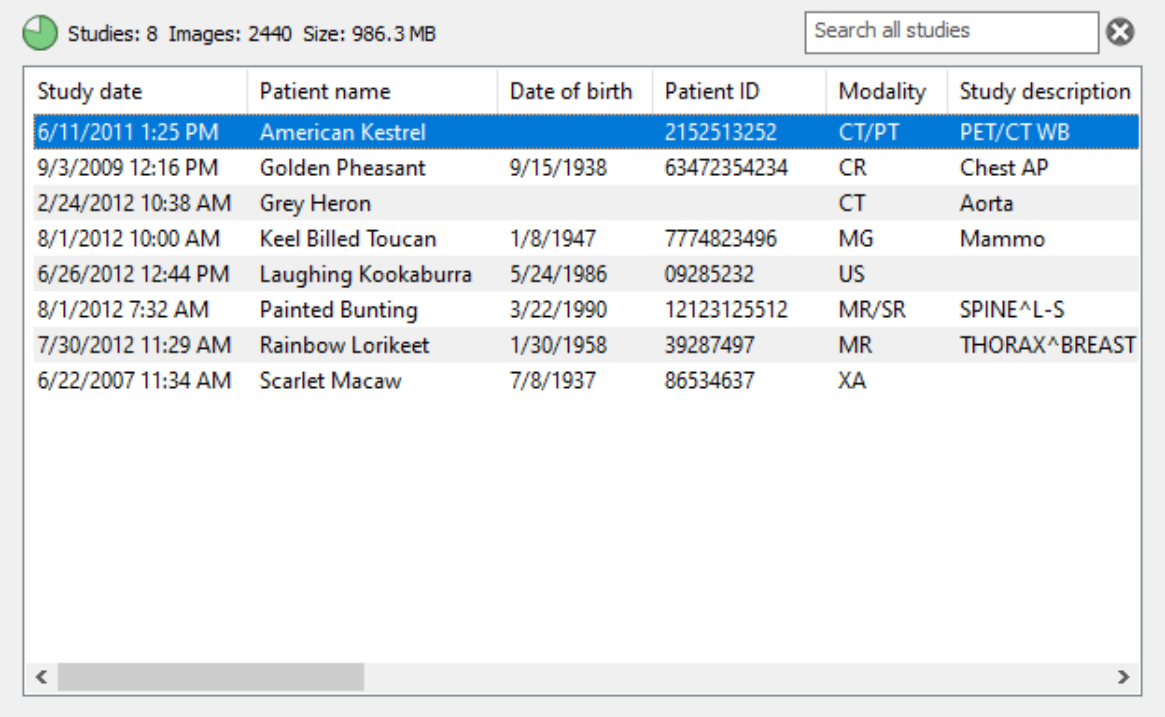
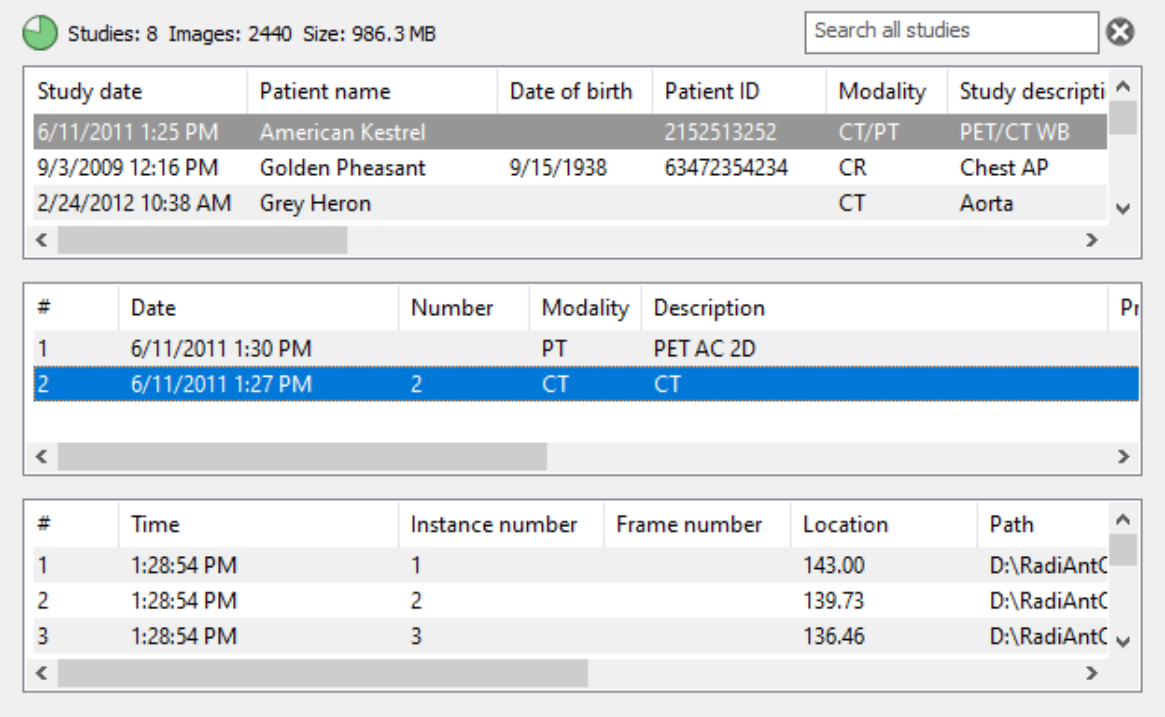


Studies View



Images View

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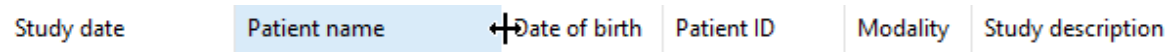
Column Configuration

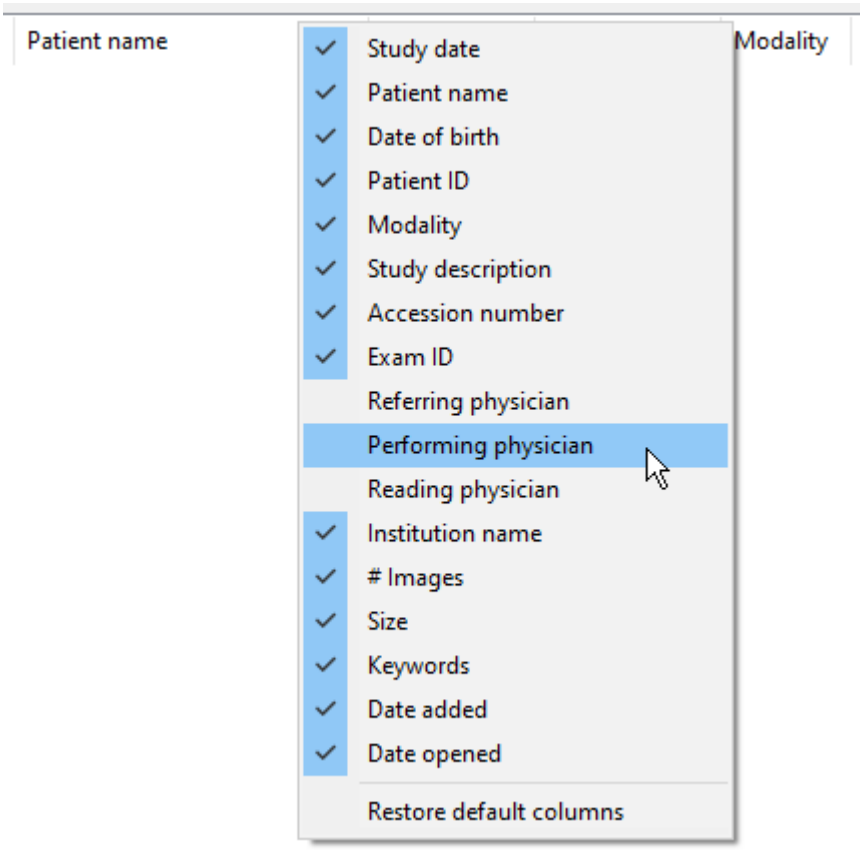
Columns in the list of studies can be set as per your preferences.

To change the order in which the columns appear, drag their headers to the desired location:

To change the width of the columns, drag the dividers between the column headers:



To hide or show specific columns, right-click on the column header and select the desired column to toggle its visibility.



To revert to the factory settings, click Restore default columns.

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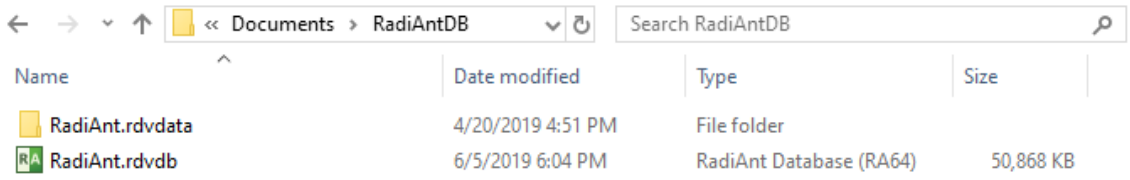
3.1.13 Backing up databases

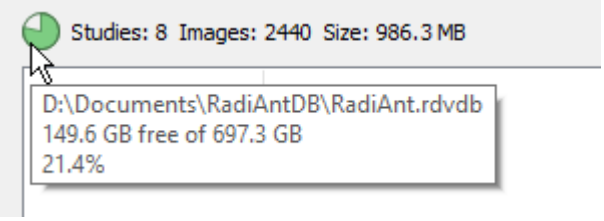
Hard drive failure, files encrypted by ransomware, inadvertent file deletion—these are only a few scenarios that may render your data unavailable.
To mitigate the implications, you are advised to perform regular backups of your database. Ideally, those backups should be encrypted, since DICOM files often include sensitive information.

Which files and folders should I back up?

The database consists of a database file (with the "rdbdb" extension) and a database folder (with the ".rdvdata" extension). These are located in the same folder:



You can view the location of the database file by hovering the mouse cursor over the hard disk free space indicator.



Both the database file and folder need to be included in the backup.

Note: If some studies were added to the database via the "Add links" import mode, you also need to back up any folders that contain the DICOM studies that are located outside the RadiAnt database folder.

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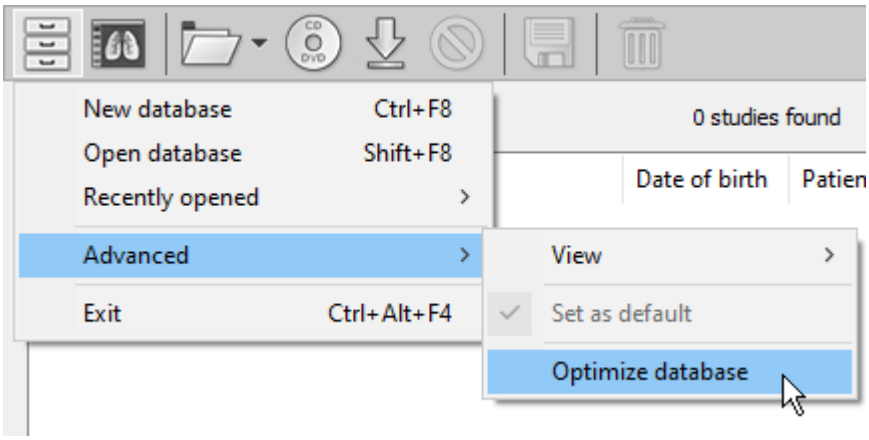
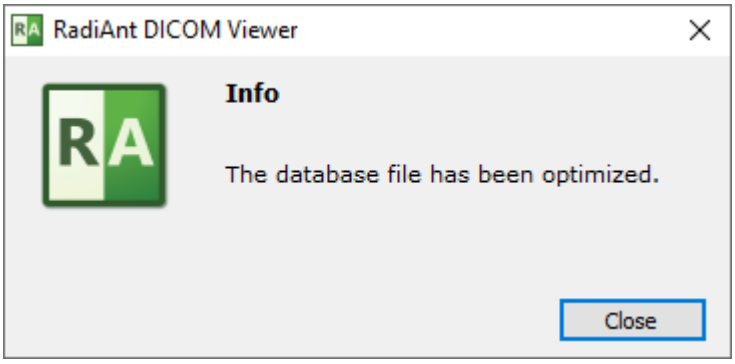
3.1.14 Database maintenance

When you regularly add studies to the database and later delete them, the size of the database grows in size, the indexes and tables become fragmented, and the performance decreases.
To address these issues, you should regularly optimize the database files.

Click the Database button in the local archive window and select Advanced -> Optimize database.



Wait until the operation is complete. Click `Close`.



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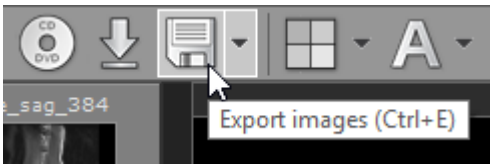
3.2 Exporting images

RadiAnt DICOM Viewer can export opened images or series to the following formats:

- JPEG
- BMP
- WMV (movie)
- MP4 (movie) - available on Windows 7 and newer systems
- DICOM

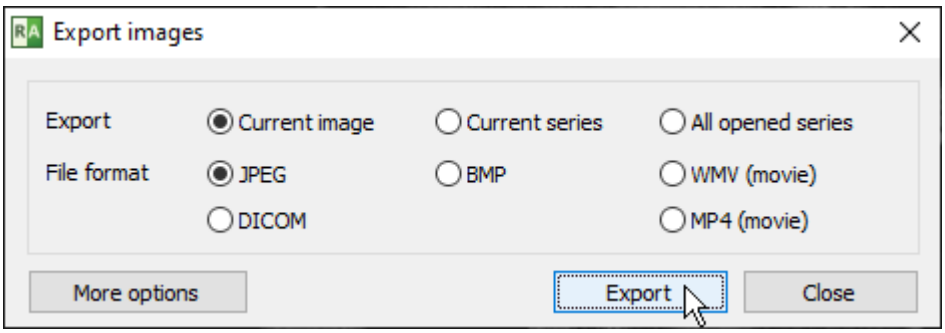
Basic export

Click `Export` tool button or use `Ctrl + E` to show the export window.



The export window will be opened so you can choose the destination format and source images:

- Current image (image displayed in active panel)
- Current series (all images displayed in active panel)
- All opened series (all series visible in the series preview bar)



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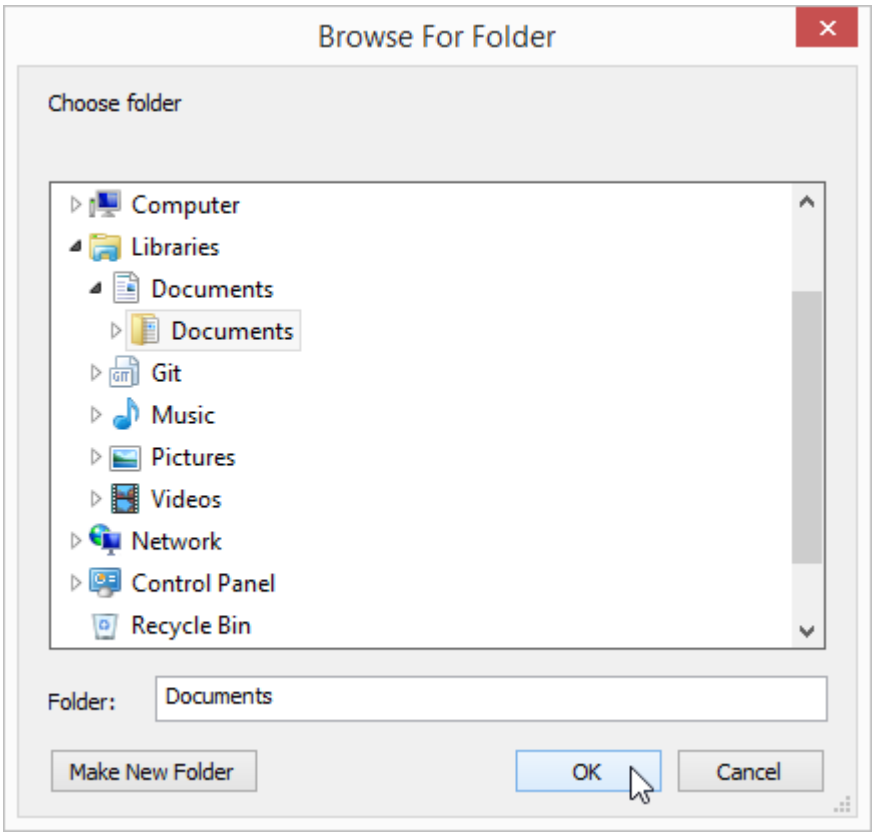
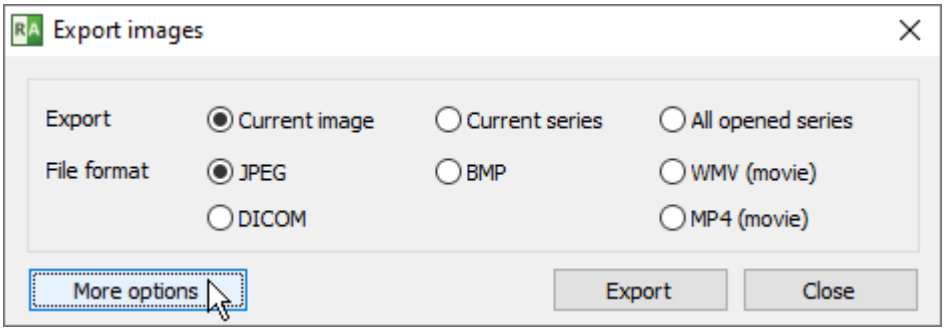
Click **Export** to browse for the destination folder.



After clicking **OK**, the process will start.
The progress of the export will be shown on the status bar.

Advanced export

For advanced settings click **More options** before starting the export.



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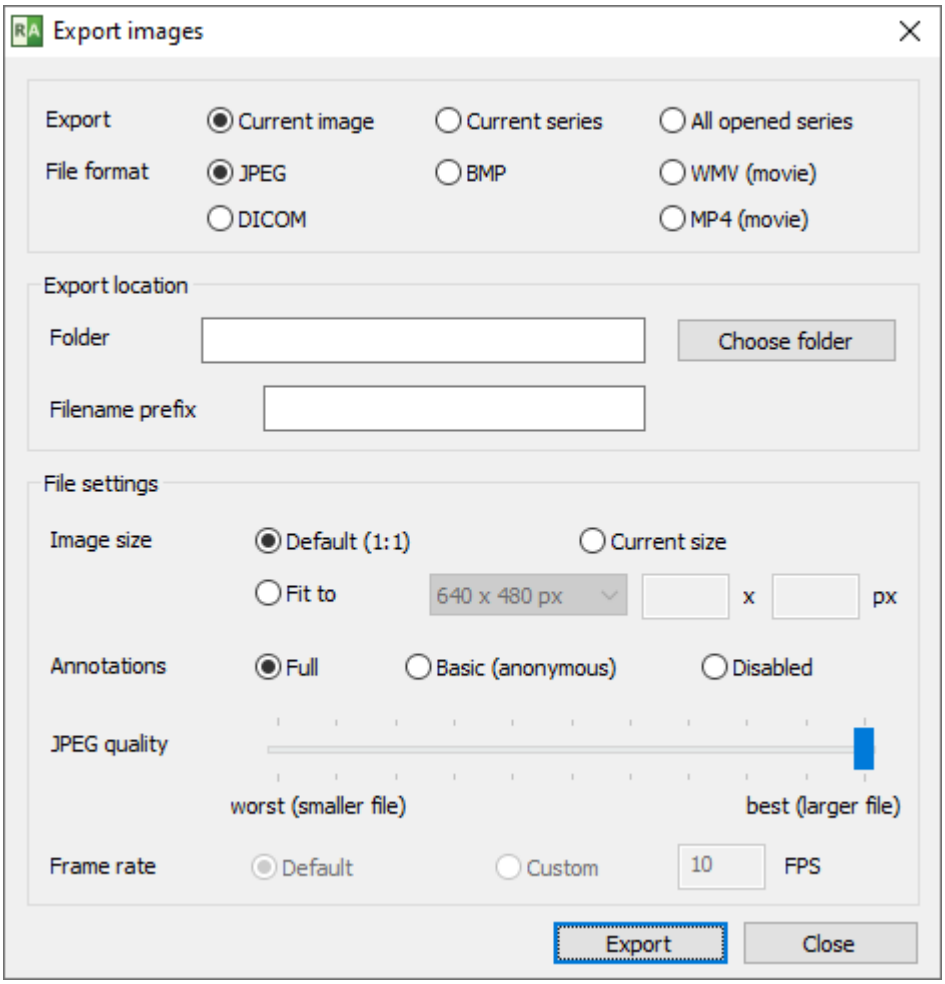
Additional controls will become visible (some may be inactive, depending on the destination file format).



Export location

Folder - click "Choose folder" to browse for the destination folder.
Filename prefix - a string that will precede each exported file's name.

File settings

Image size

- Default (1:1) - the size of the exported image will exactly match the source image in DICOM file.
- Current size - the size of the exported image will be exactly as seen in the panel.
- Fit to - the size of the exported image can be chosen from the list of dimensions or set to custom values.

Annotations

- Full - all annotations will be visible in exported images.
- Basic (anonymous) - patient name and ID will be hidden.
- Disabled - no annotations will be visible in exported images.

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JPEG/Movie Quality - move the slider left to reduce the destination file size (worse quality), or right for larger destination files (better quality).

Frame rate (available only for WMV/MP4 export)

- Default - the destination movie frame rate will match the source DICOM image default frame rate.
- Custom - the frame rate can be set to custom value.

DICOM to DICOM export

Source files are copied directly to the destination folder when DICOM is chosen as destination format.
Export to DICOM files is unavailable for secondary images obtained with the use of either MPR (Multiplanar Reconstruction), Fusion, or TIC (Time-intensity curve) tools.

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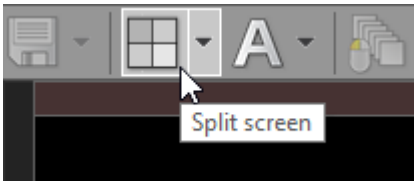
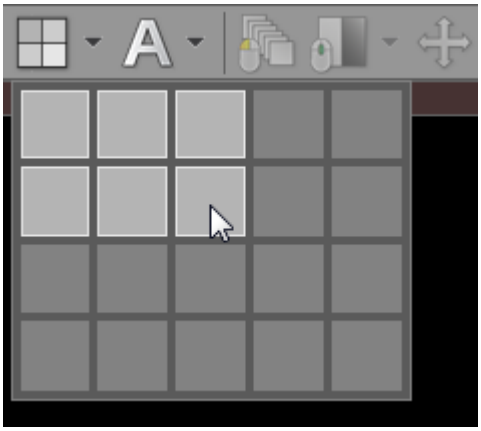
3.3 Multiple series viewing

Multiple series of either one or several studies can be concurrently opened in multiple panels for comparison purposes.

Click the **`Split screen`** button:

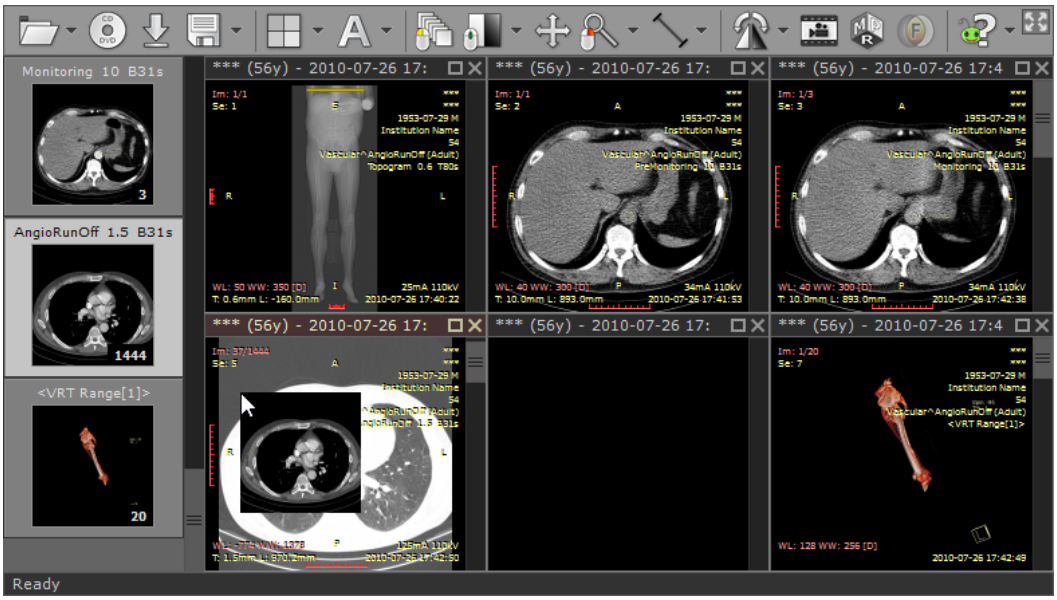


Move the cursor over the "cells" symbolizing the image panels:



Click again to select the splitting template (a maximum of five columns and four rows of panels can be selected).

Using the left mouse button, drag and drop thumbnails from the series preview bar into the panels to load the chosen series.



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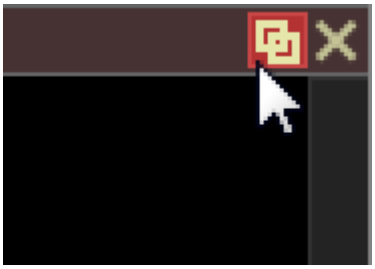
Another way of opening a series in new panel is to click its thumbnail while pressing the **Ctrl** key.
All panels will be automatically repositioned and new series will be loaded in the last panel.

Maximizing/restoring/closing panel

A panel can be quickly maximized by double-clicking the image it contains, or by pressing the **Maximize** button on the title bar of the panel or using **Ctrl + M** .

Press the **Restore** button, double-click the image it contains, or press **Ctrl + M** to restore the panel to its normal size and view all panels again.



Use the **Tab** key to switch between opened panels in maximized mode.

Click the **Close** button on the panel's title bar to close it or use **Ctrl + F4** .
If you hold the **Ctrl** key and click the **Close** button the panel will be cleared instead of being closed.

To close all visible panels, use **Shift + F4** .

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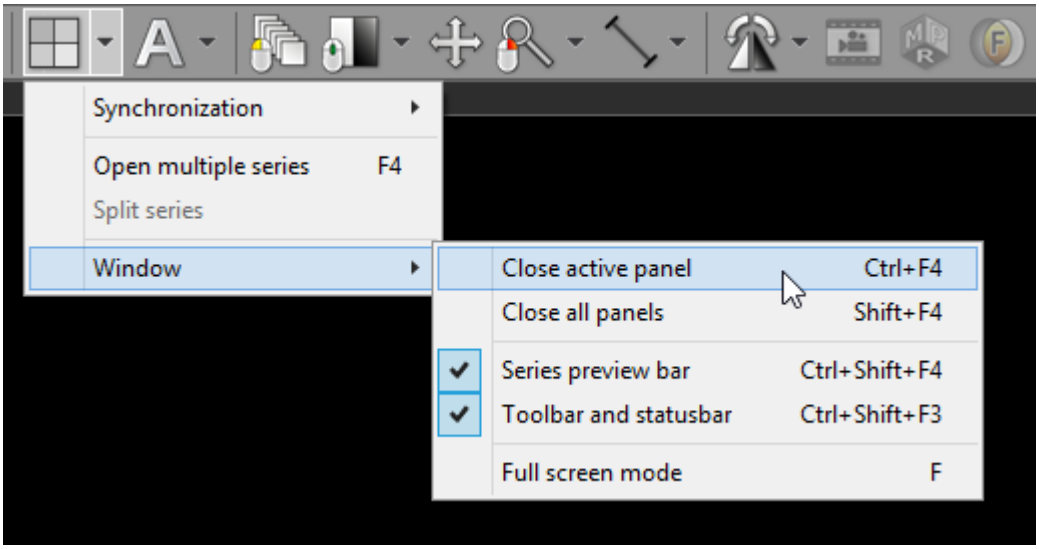
The above actions are also available in the Window drop-down menu.



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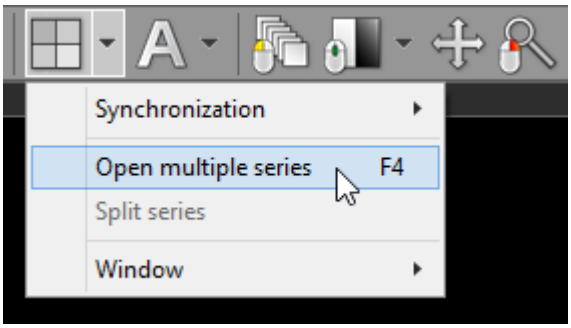
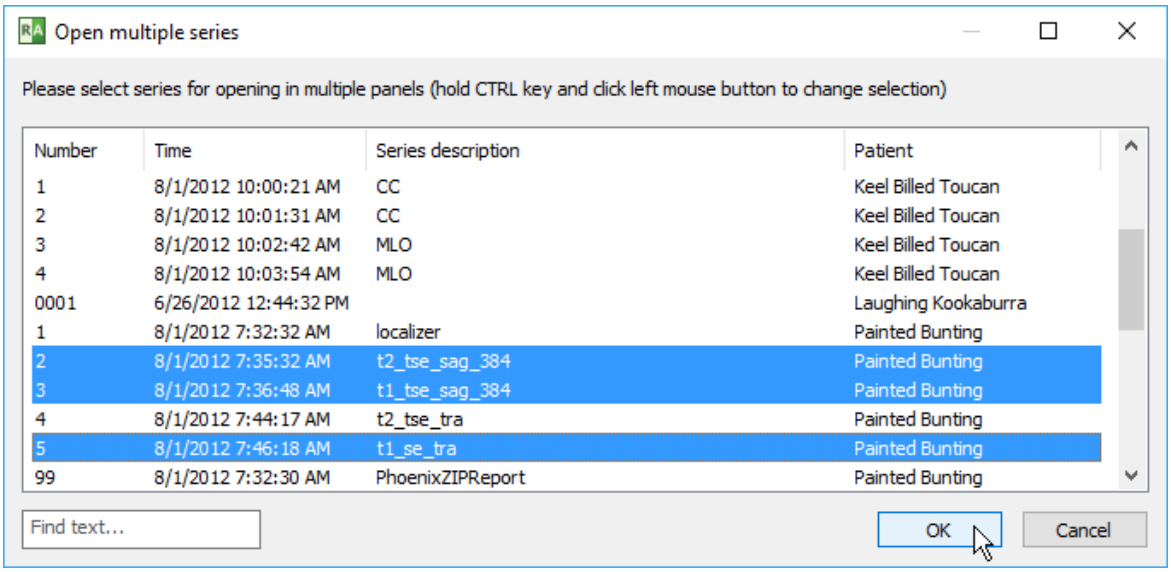
To quickly open multiple series

To speed up the process of opening more than one series at the same time, click the Open multiple series menu item or press the F4 key.



A window with the list of loaded series will appear.



Hold the Ctrl key and select series to opening by clicking them with left mouse button. Click OK to open the chosen series in multiple panels. All previously opened panels will close automatically.

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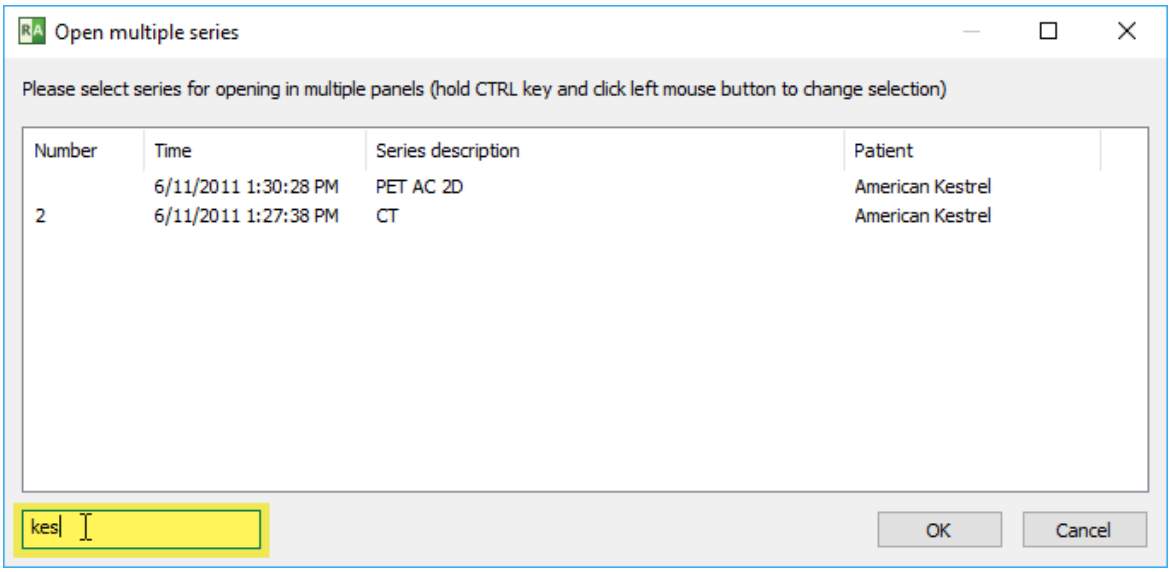
To quickly filter the series list, start typing in the text field located in the lower-left corner of the window.



Press **Enter** to load the first of the displayed filtered series.

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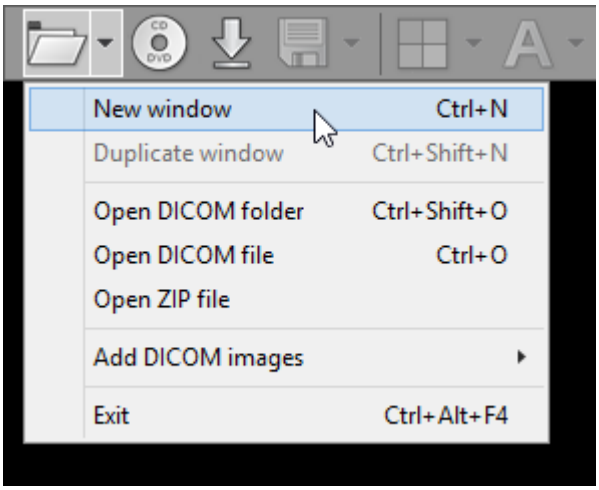
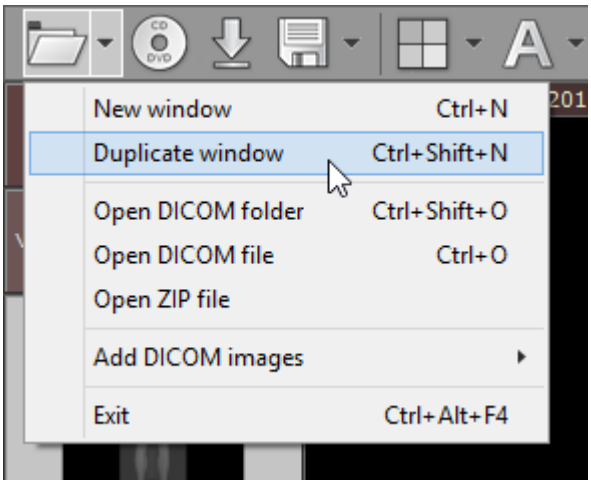
3.3.1 Multiple windows

You can open up to 16 viewer windows. These windows can be placed on the same or different monitors.

To show a new empty window, press `Ctrl + N` or click New window in the pop-up menu under the folder icon. Double clicking the RadiAnt icon on the Desktop is another way to open a new window.



Use the duplicate window feature to open a new window with the series displayed in the active window. Click Duplicate window or use the shortcut `Ctrl + Shift + N`.



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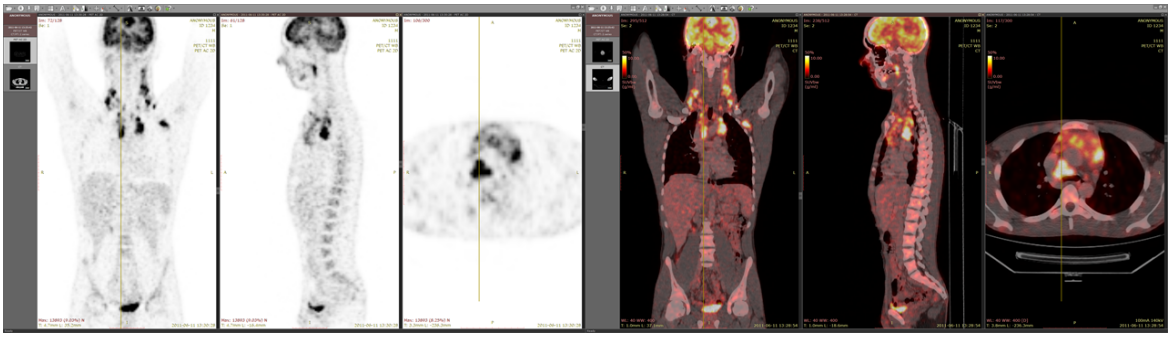
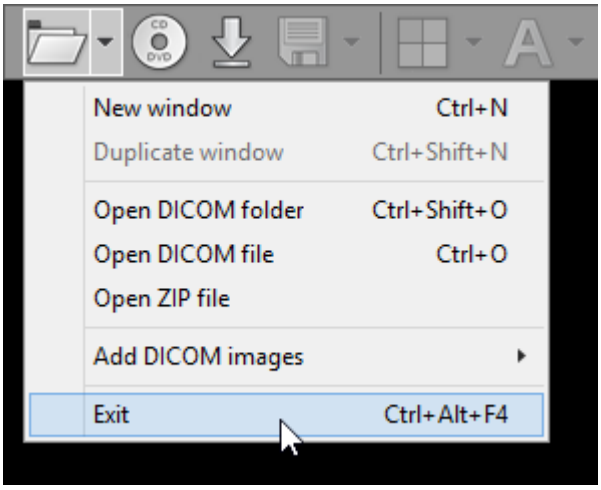
When the series from the same study are opened in two different windows, they are auto-synchronized; also, the cross-reference lines are displayed, if applicable. Finally, a fusion of images is possible too. This can be helpful when browsing series of the same study in a multi-monitor setting.



PET-CT fusion displayed on two monitors

Press `Alt + F4` to close the active window. To exit the application when multiple viewer windows are opened, press `Ctrl + Alt + F4` or click Exit in the pop-up menu under the folder toolbar icon. You can also press `Ctrl` while clicking the close button in one of the viewer windows.



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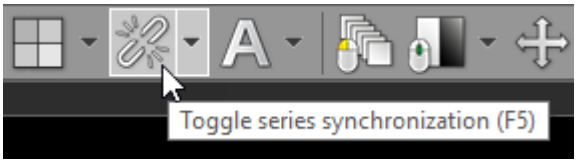
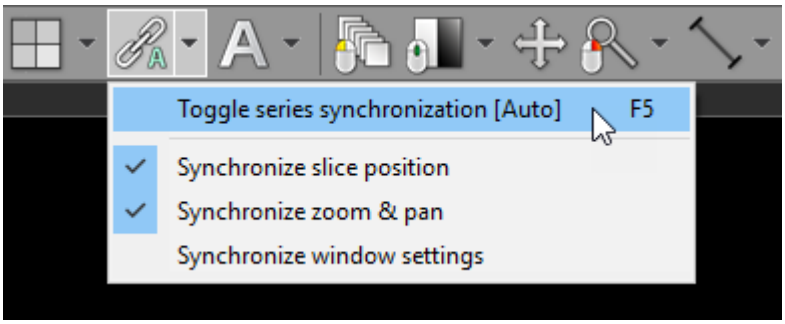
3.3.2 Synchronization

The synchronization feature lets you apply the same settings (slice position, zoom & pan, window) to the series of images opened in multiple panels.

There are three synchronization modes available in RadiAnt DICOM Viewer: Auto , Manual and Disabled .
You can switch between these modes by clicking the **`Toggle series synchronization`** button on the toolbar.



The synchronization mode can by also toggled by clicking the Toggle series synchronization drop-down menu item or by pressing the **F5** shortcut key.



In the same menu you will also find items controlling the options of synchronization:

- Synchronize slice position
- Synchronize zoom & pan
- Synchronize window settings (disabled by default)

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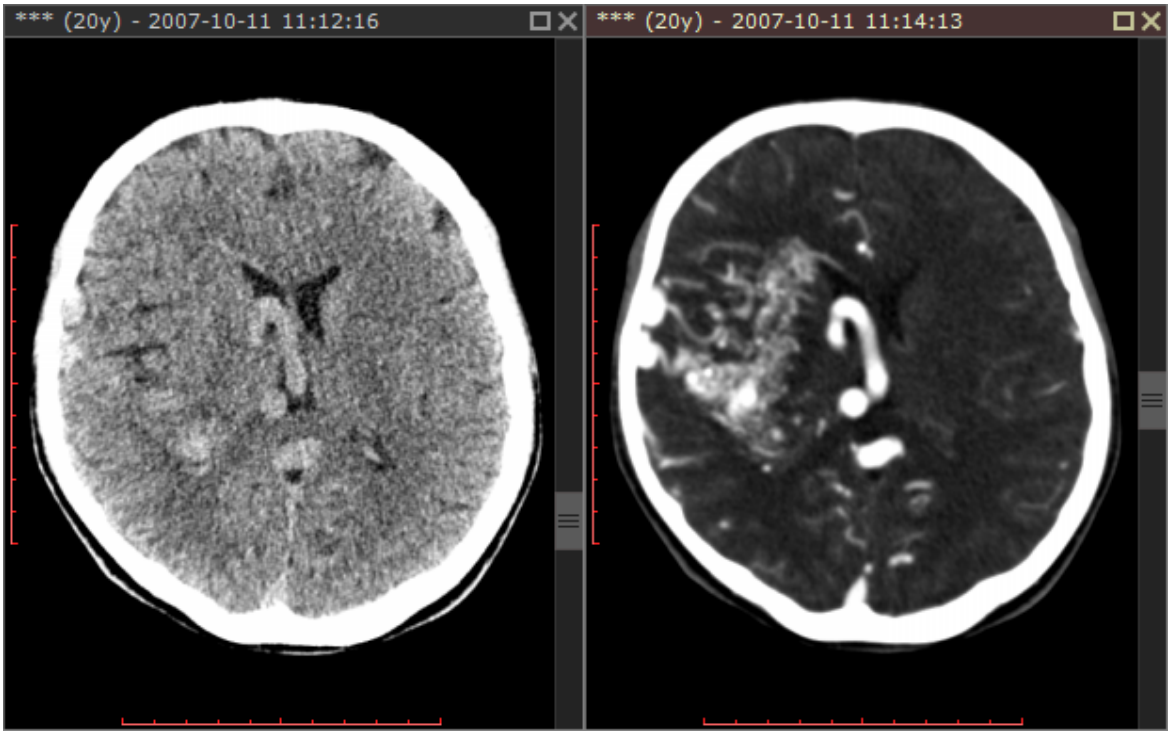
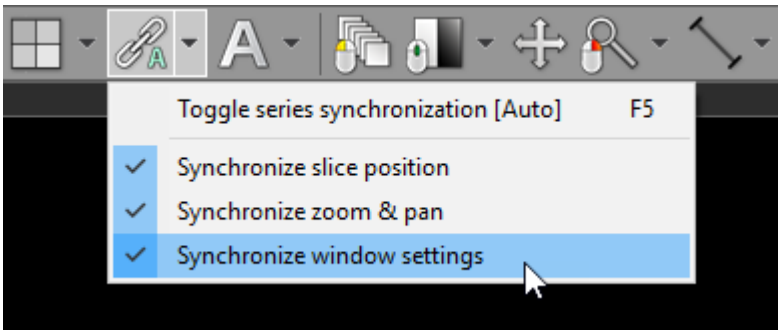
3.3.2.1 Auto synchronization

Series consisting of images that have been acquired in the same plane (or in similar planes, with the dihedral angle up to 5 degrees), within the same study (e.g. Computed Tomography series before and after administration of the contrast medium) are automatically synchronized by default (slice location, zoom level).



The toolbar button shows when the automatic synchronization mode is enabled.
You can disable the synchronization by pressing this button or by using the **F5** shortcut key.

By default only slice position and zoom & pan settings are synchronized.
To enable the synchronization of window settings click Synchronize window settings.



Note that after the synchronization is enabled you have to change a setting to apply it to other series. E.g. you have to scroll series in one panel to synchronize the position of slices in other panels.

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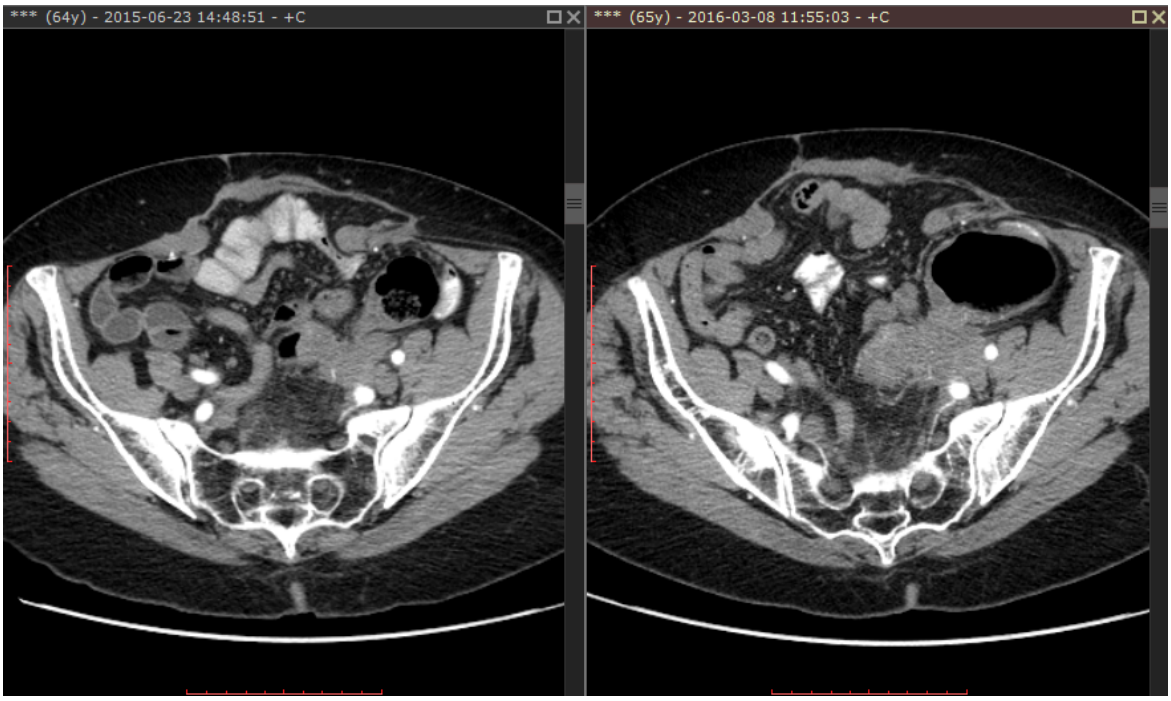
3.3.2.2 Manual synchronization

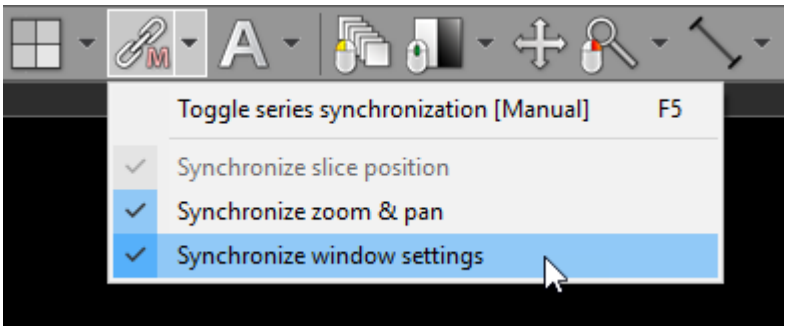
Series acquired in similar planes (with the dihedral angle up to 30 degrees) belonging to the same or different studies (of the same or different patients) can be synchronized manually.



To enable manual synchronization, scroll series opened in different panels to the same level (e.g. the bifurcation of the aorta), pan images so that they are positioned similarly in viewports and click the `Toggle series synchronization` button or press **F5**.

The toolbar button shows when the automatic synchronization mode is enabled.

By default only slice position and zoom & pan settings are synchronized.
To enable the synchronization of window settings click Synchronize window settings.



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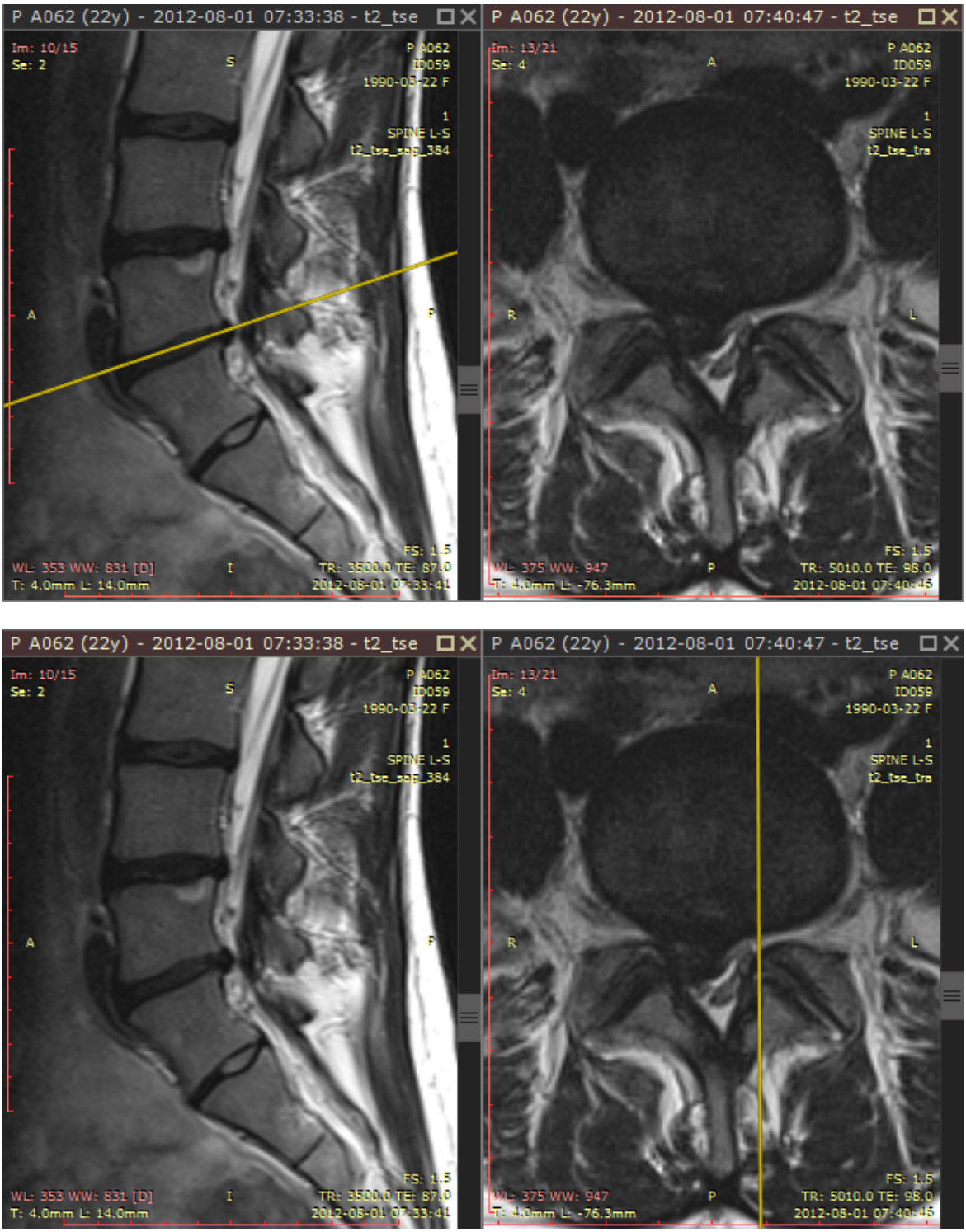
3.3.3 Cross-reference lines

Cross-reference lines are displayed for better correlation of the anatomy when browsing series with different image planes (e.g. Magnetic Resonance study). They are visible as yellow lines that mark the intersection of the image planes.



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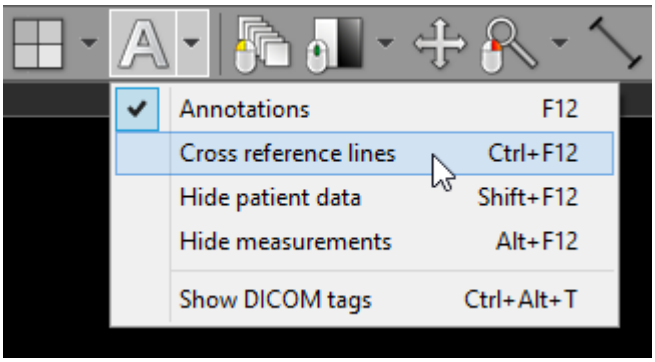
Cross-reference lines are always displayed in inactive panels (those with gray title bars) as a reference for the image in the active panel (brown title bar).
To change the reference source, activate the other panel by either clicking on its title bar or the image it contains.

Cross-reference lines can be switched off and on by clicking the Cross reference lines menu item or by using `Ctrl + F12` .



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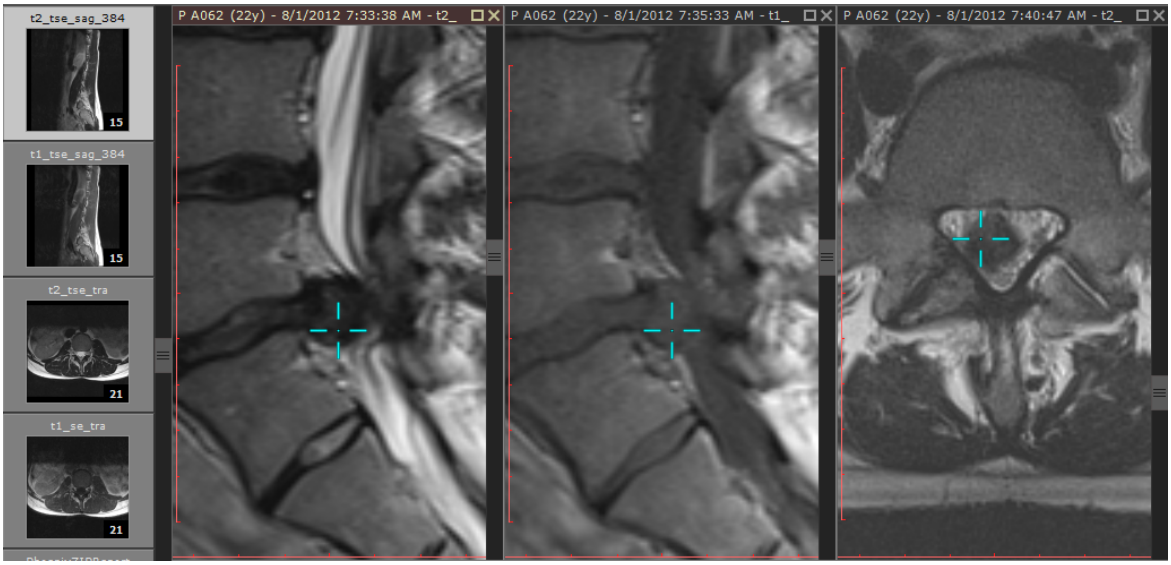
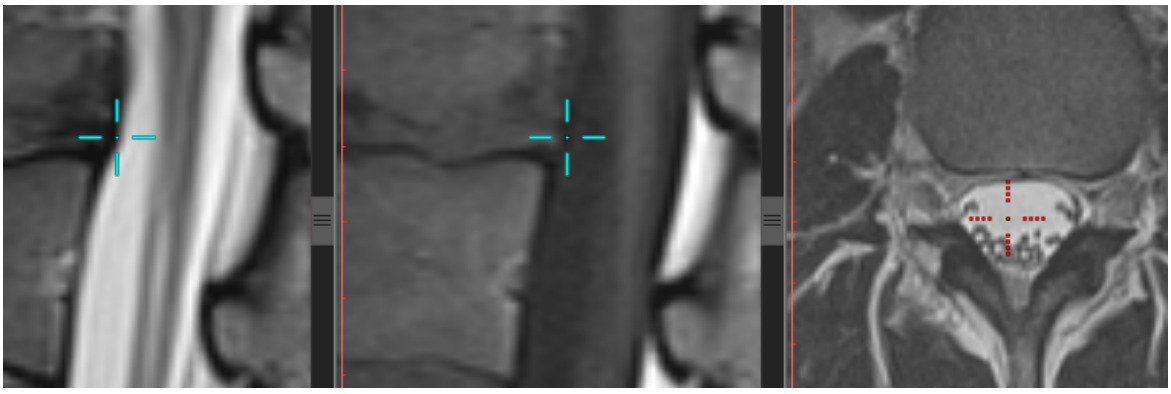
3.3.4 3D Cursor

The 3D Cursor tool can be displayed for better correlation of the anatomy when browsing series with different image planes (e.g. Magnetic Resonance study). It is visible as a blue cross-hair cursor that marks the same point in 3D space on all images.



Hold **Ctrl + Shift** and press the left mouse button to show the 3D Cursor. Drag the mouse, with its left button pressed to change the position of the cursor in the active viewport. Images in other viewports will be scrolled automatically so that the displayed image plane is closest to the 3D cursor. The cursor disappears when the mouse button is released. Reference lines are temporarily hidden when the 3D Cursor is active. When Cine mode is enabled, the 3D Cursor cannot be activated.

If the cursor is located at some distance from the image plane (and no image with a closer plane can be found), it will be displayed in the red color.



The 3D Cursor tool can be permanently assigned to the left mouse button by choosing it from the toolbar menu or by pressing the **Q** key.

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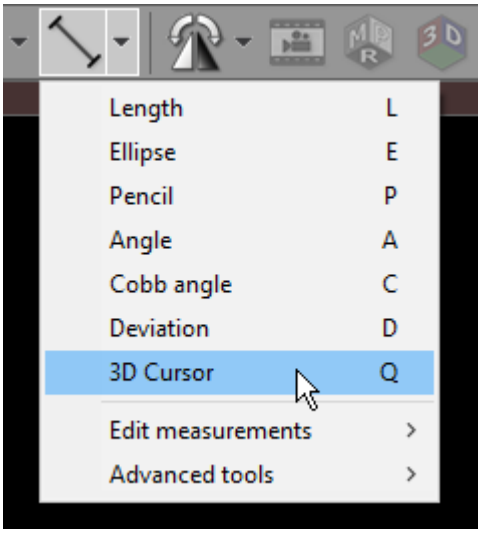
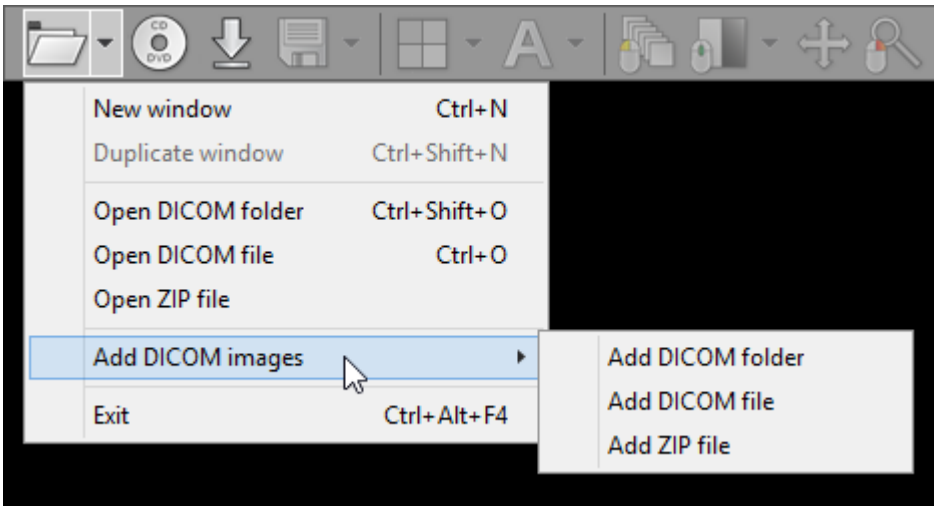


3.3.5 Adding more studies

When a new study is opened, all images in panels and the series preview bar are cleared.
To add new images from different location use the Add DICOM images drop-down menu.



New images can be added from a folder, selected files, or decompressed from a ZIP archive.

Notice that you cannot open directly two or more DICOM CD/DVD disks at the same time - when the first one is ejected, the images become unavailable for viewing. If you want to open more than one disk at the same time, first you need to copy their contents to a folder on your hard drive and then scan the folder for DICOM files.

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3.3.6 Splitting series

Sometimes a single series of DICOM images obtained from a given modality contains multiple volumes. This is where the split series feature comes in handy.
It detects all the volumes contained in one series (e.g. arterial/venous post-contrast, PD/T2, DWI or cardiac CT multi-phase) and opens them in separate panels.
This makes simultaneous display and synchronization of images between such series possible.

Open a multi-sequence series and click the arrow next to the split screen icon on the toolbar in the main window, then click Split series or press `Ctrl + F5`.

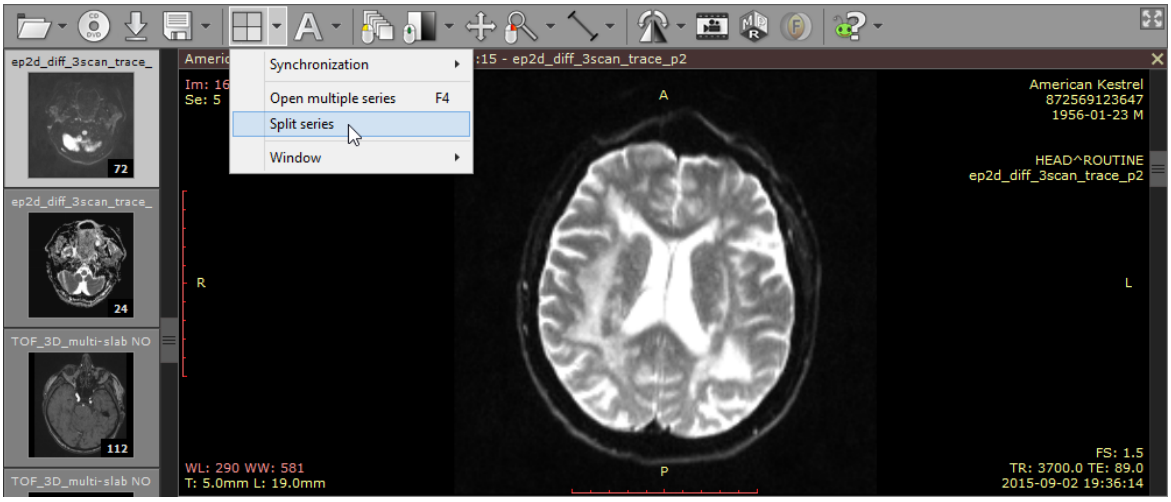
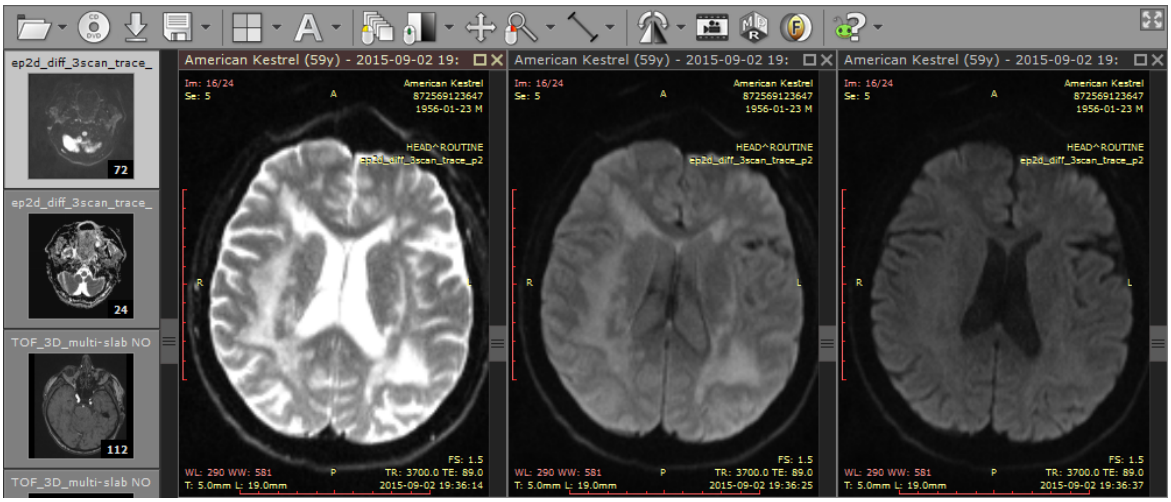


Image series containing three DWI sequences with different b-values.

Each of the volumes from the original series will be opened in a separate panel.



A single DWI sequence in each panel.

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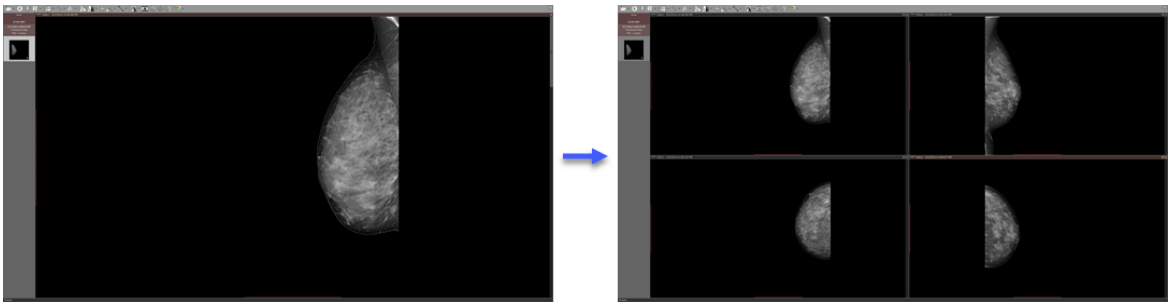
If the split series feature is used on a series containing non-volumetric images (CR, DX, MG, US, XA, etc.), each of the images of the series will be opened in a separate panel (up to 20 panels at the same time).



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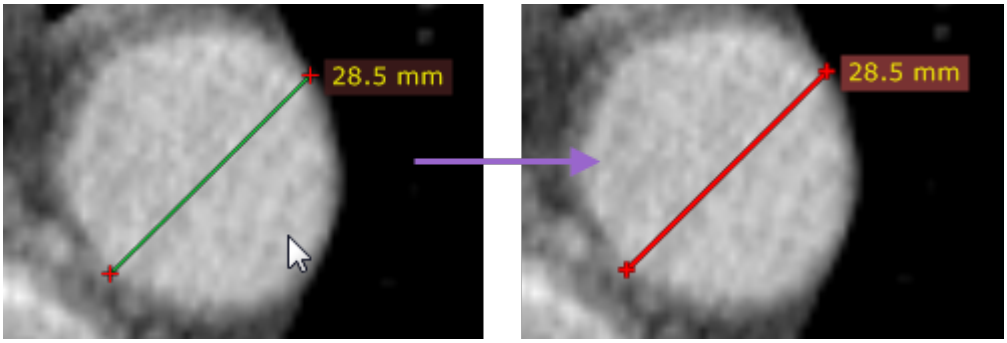
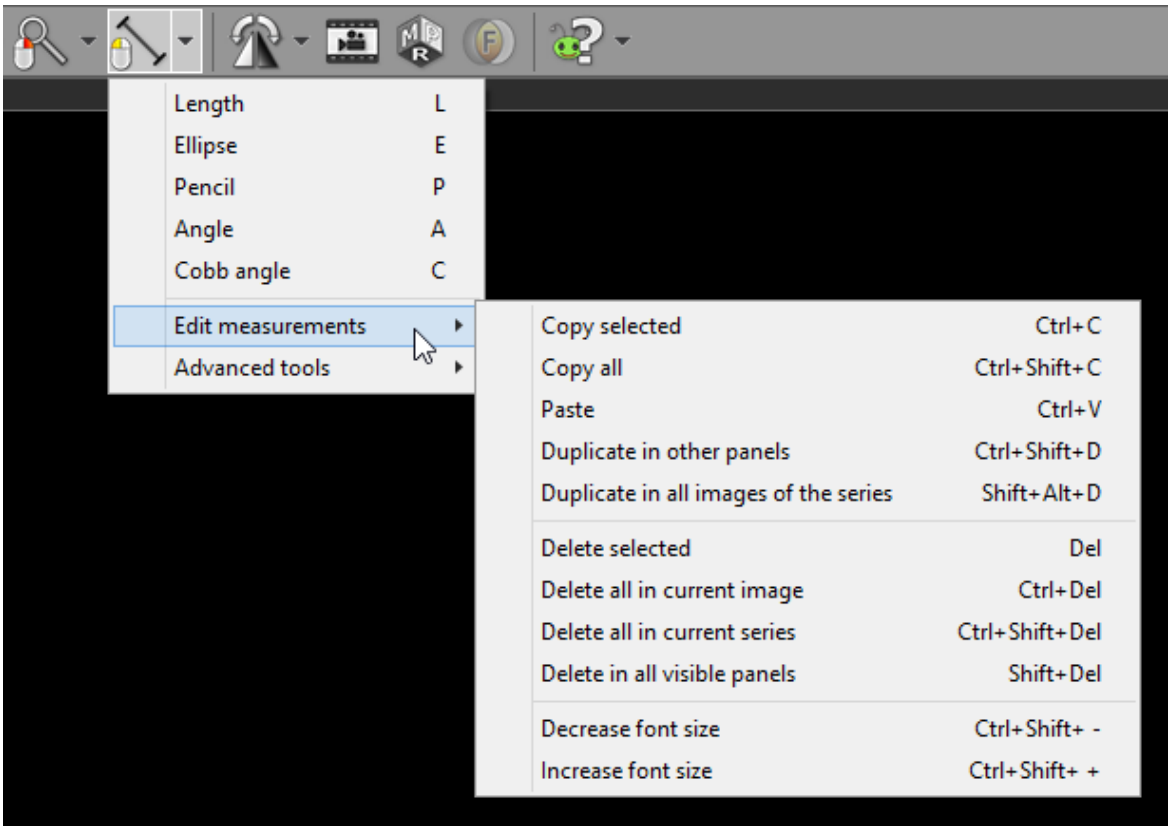
3.4 ROI operations

Select an object (segment, ellipse, angle, etc.) by clicking it with left mouse button. The object will turn red after it is selected.



Use the Edit measurements drop down menu to copy, paste or duplicate objects.



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Menu item	Keyboard shortcut	Description
Copy selected	Ctrl + C	Copies selected object in active panel.
Copy all	Ctrl + Shift + C	Copies all objects in displayed image from active panel.
Paste	Ctrl + V	Pastes copied object(s) into image displayed in active panel.
Duplicate in other panels	Ctrl + Shift + D	Duplicates selected object in active panel to other, inactive panels.
Duplicate in all images of the series	Shift + Alt + D	Duplicates selected object in active panel, to all other images of the same series.
Delete selected	Del	Deletes selected object in active panel.
Delete all in current image	Ctrl + Del	Deletes all objects in image displayed in active panel.
Delete all in current series	Ctrl + Shift + Del	Deletes all objects from the series displayed in active panel.
Delete in all visible panels	Shift + Del	Deletes all objects from all visible images.
Decrease font size	Ctrl + Shift + Minus (-)	Makes text in ROI labels smaller.
Increase font size	Ctrl + Shift + Plus(+)	Makes text in ROI labels larger.

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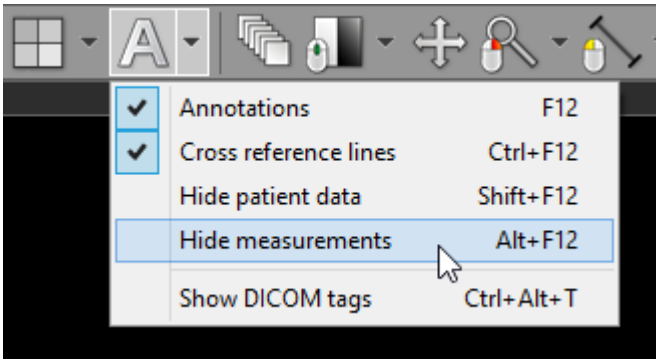
To hide (and show) measurements (objects) in active panel click Hide measurements menu item or use `Alt + F12` .



Once you start drawing an object in a panel with hidden measurements, all the objects will become visible again.

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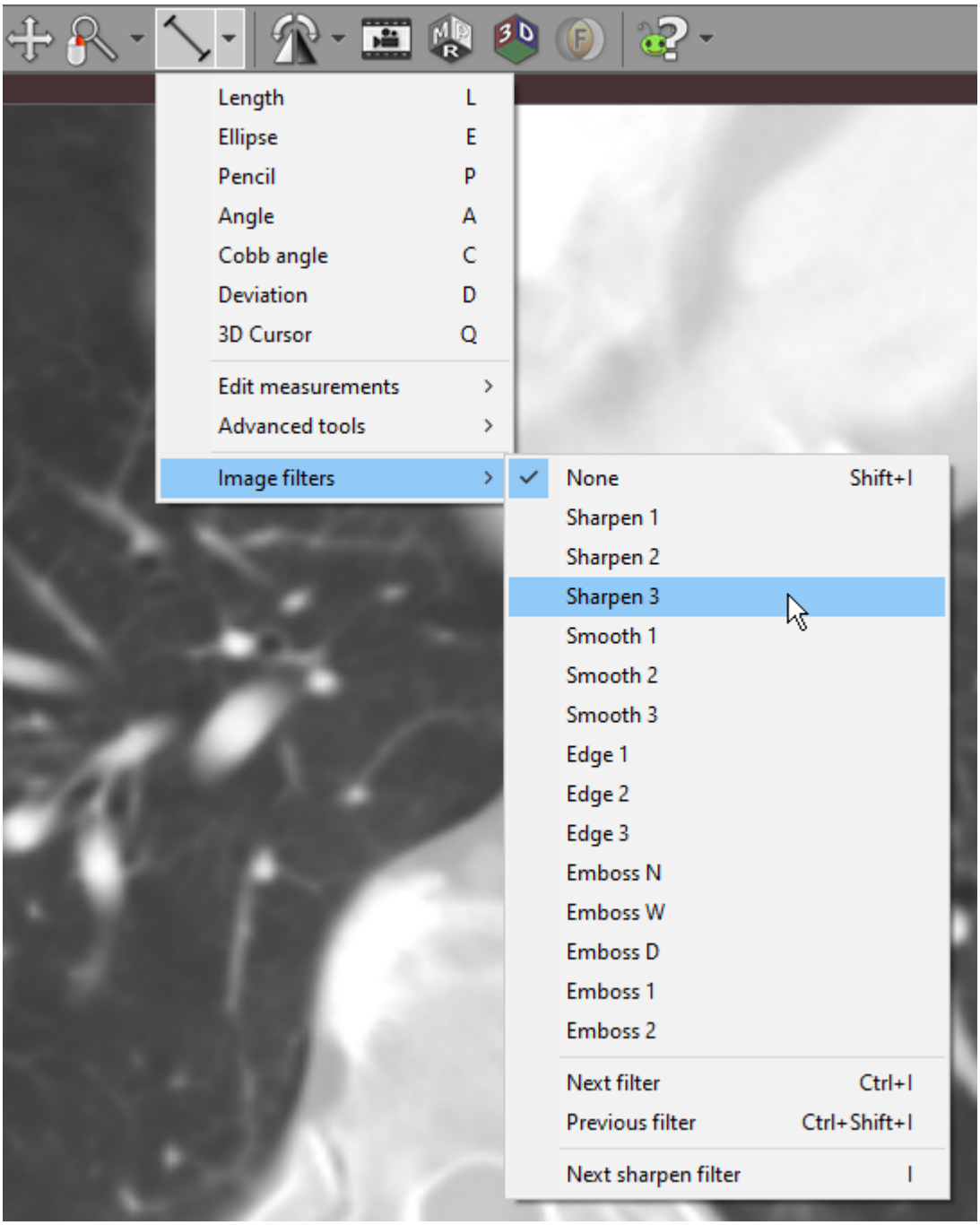
3.5 Image filters

The following image filters can be enabled for images displayed in the 2D viewer:

- Sharpen (1, 2, 3)
- Smooth (1, 2, 3)
- Edge (1, 2, 3)
- Emboss (N, W, D, 1, 2)

Select the Image filters drop-down menu and choose the desired filter.



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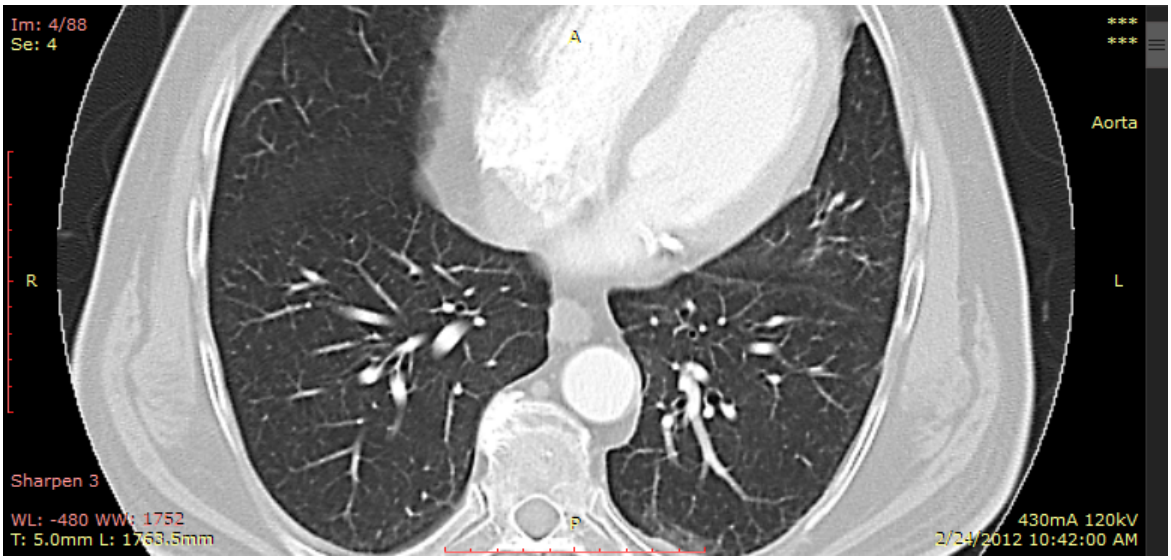
The filter will be applied to the entire series of images.



To disable filters, select None or use the **Shift + I** shortcut.

To cycle through all available filters, select Next filter / Previous filter or press **Ctrl + I** / **Ctrl + Shift + I**.

To cycle through sharpen filters only, select Next sharpen filter or press **I**.

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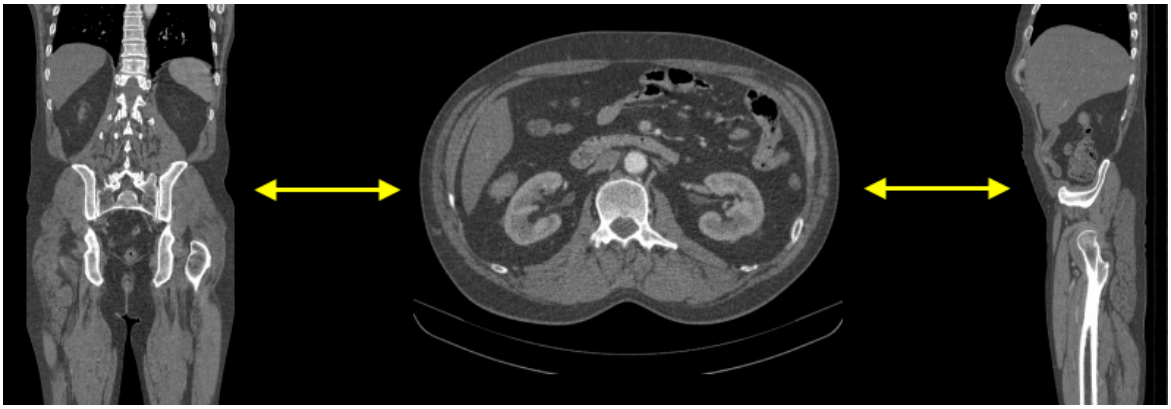
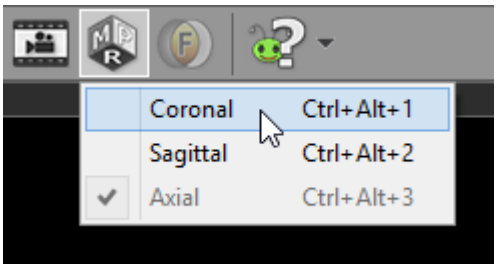
3.6 2D Multiplanar reconstruction (MPR)

The MPR tool provided within the RadiAnt DICOM Viewer can be used to reconstruct images in orthogonal planes (coronal, sagittal, axial or oblique, depending on what the base image plane is). This can help to create a visualization of the anatomy which was not possible using base images alone.



Click the **MPR** button on the toolbar, and select the plane you would like the series to be reconstructed to (the current plane of source series is checked and grayed out).



Alternatively, keyboard shortcuts below can be used to switch planes.

Keyboard shortcut	MPR plane
Ctrl + Alt + 1	Coronal
Ctrl + Alt + 2	Sagittal
Ctrl + Alt + 3	Axial

This process takes 1-2 seconds on a fast machine, but can be substantially slower on computers with less memory.

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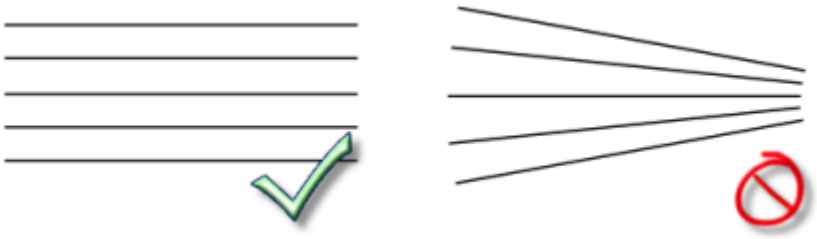
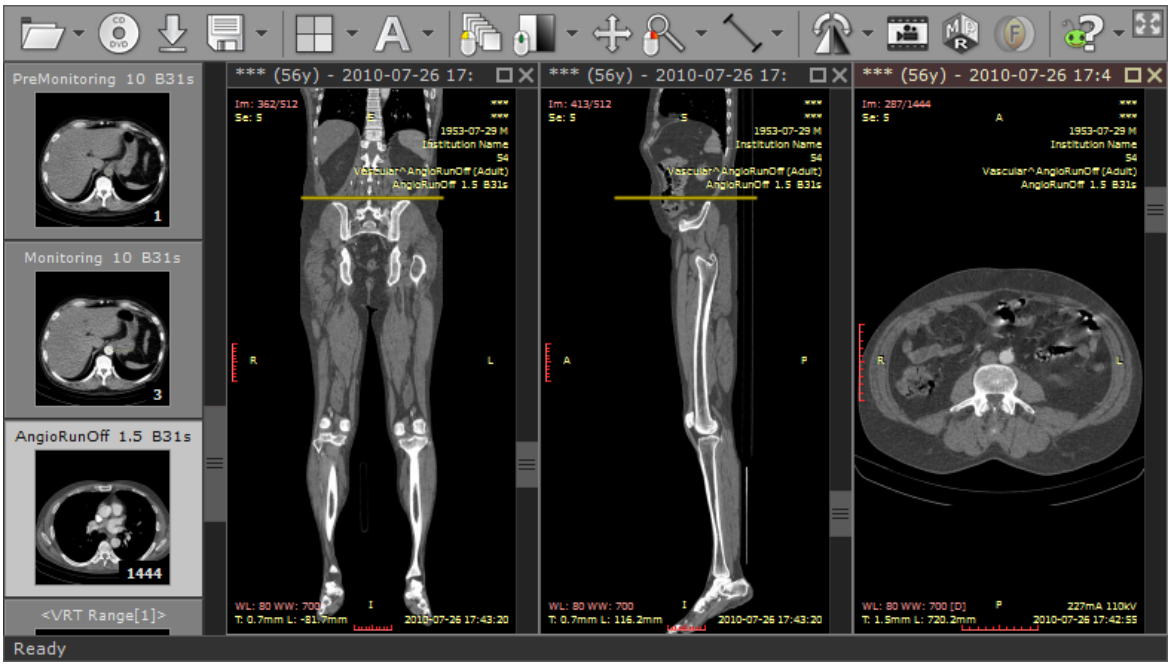
If the button is grayed out, the MPR tool cannot be applied to the series (e.g. in case of images with nonparallel planes).



One series can be reconstructed in three planes in order to easily localize an area of interest thanks to cross-reference lines.
Use the screen splitting tool to open three panels, and drag the source series thumbnail into each of them.
Click first panel to activate it, and then select the new image plane using the MPR tool. Repeat this step for the second panel.



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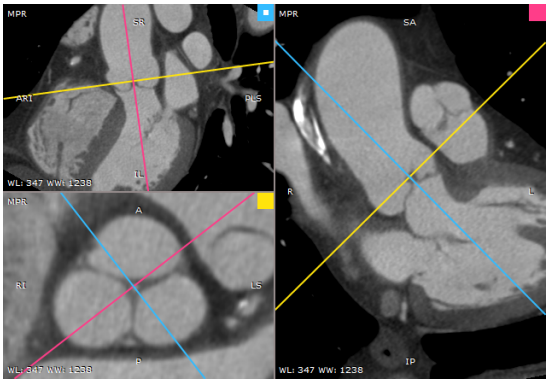
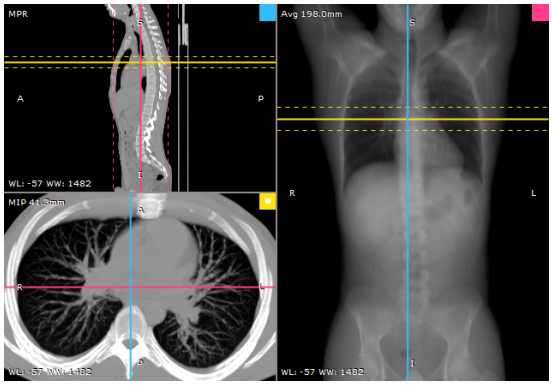
3.7 3D Multiplanar reconstruction (MPR)

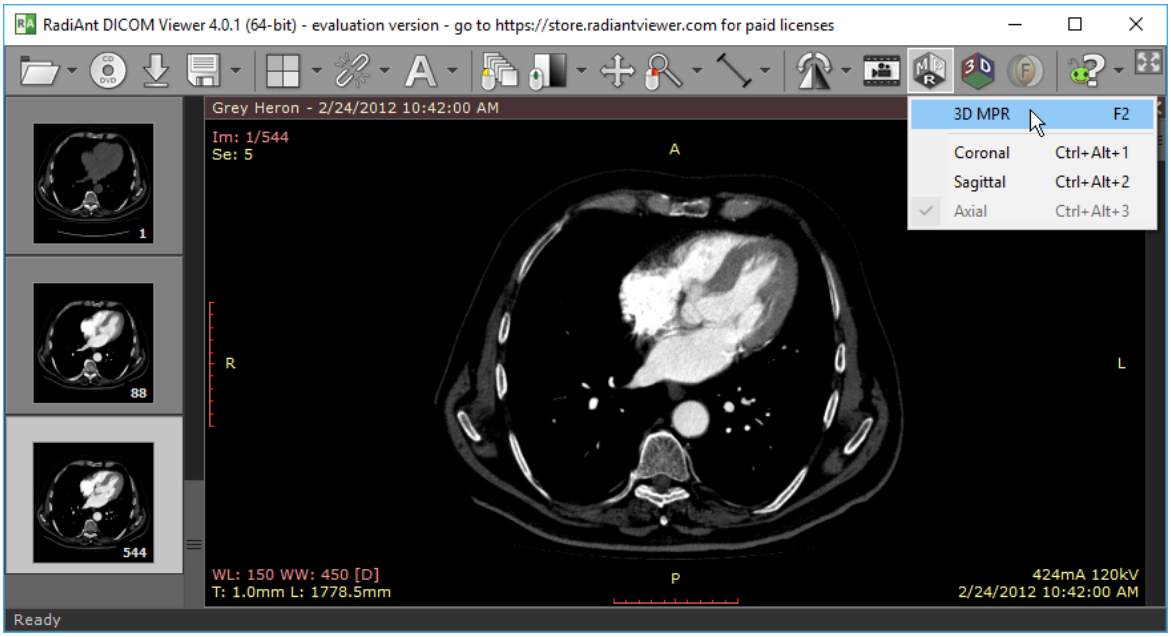
The 3D MPR tool provided within the RadiAnt DICOM Viewer can be used to reconstruct images in arbitrary planes (oblique). This can help to create a visualization of the anatomy that would not be possible using base images alone.





Opening the 3D MPR window

1. Open the volume series in the 2D viewer window and click the **MPR** button on the toolbar and then 3D MPR. Alternatively, you can use the **F2** shortcut.



2. After the series is loaded into memory and preprocessed, the 3D MPR representation will be displayed in a new window. This process can take a few seconds on slower systems.

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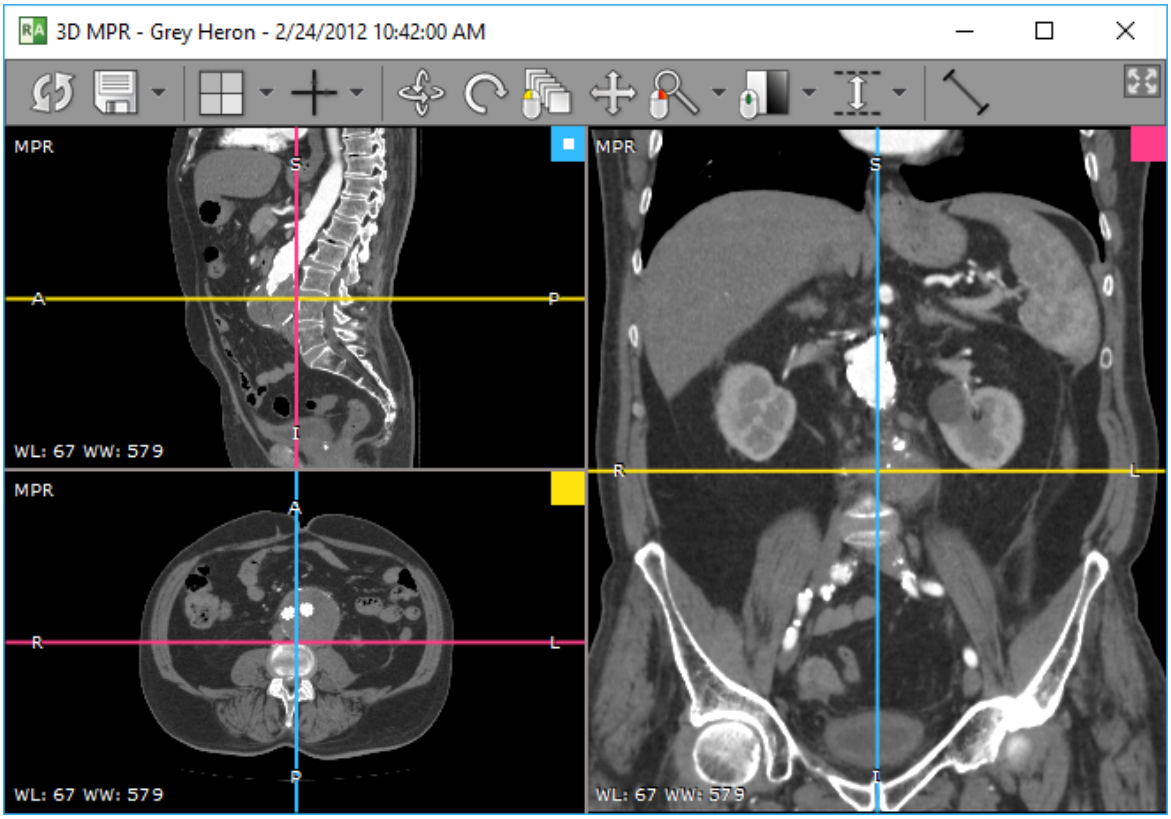
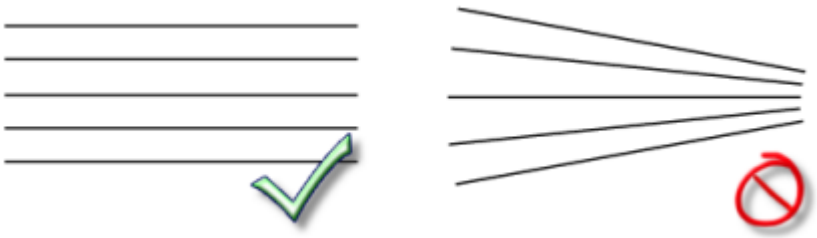


Some series cannot be used with the 3D MPR tool (e.g., images with nonparallel planes).



If the images are not spaced evenly within the volume, the missing slices will be interpolated, and some visual artifacts may appear in presentation and measurements.

Note, some larger series (e.g., >2000 CT images) require more than 1GB of free memory and the 64-bit RadiAnt DICOM Viewer version to load successfully.

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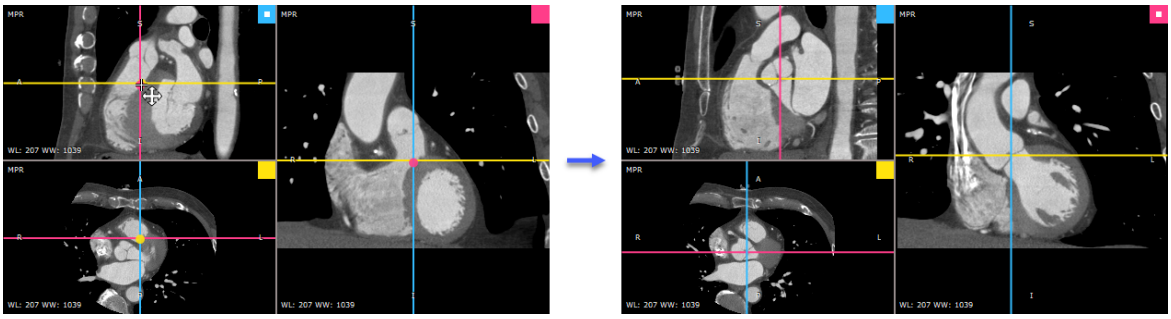
3.7.1 Changing the viewing plane

There are three viewports in the 3D MPR window; each shows the image reconstructed in a plane perpendicular to the other two viewports. In each viewport, there are two axes overlaid on the image. These axes represent intersections of planes from the other two viewports with the specific viewport's image plane. The color of the axis is consistent with the color code of the source viewport (small square in the top-right corner).

Initially, the viewports are set to the default planes (sagittal, axial, coronal). The orientation of those planes can be changed by rotating the axes, whereas the position of the plane is changed by dragging the intersection of the axes.

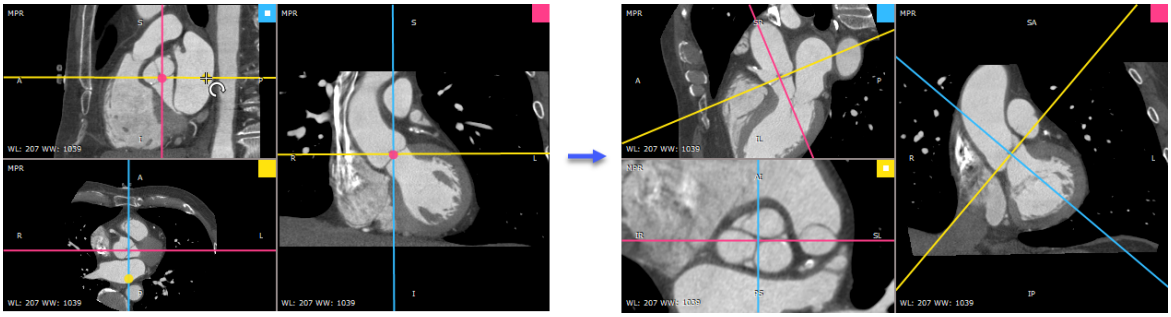
Moving axes

Place the mouse cursor over the intersection of the axes, press the left mouse button and drag the intersection to change the position of the planes in the two other viewports.



Rotating axes

Place the mouse cursor over the axis arm, press the left mouse button and rotate the axes to change the orientation of the planes in the two other viewports.



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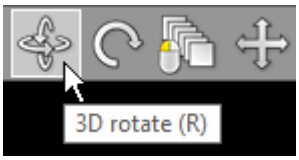
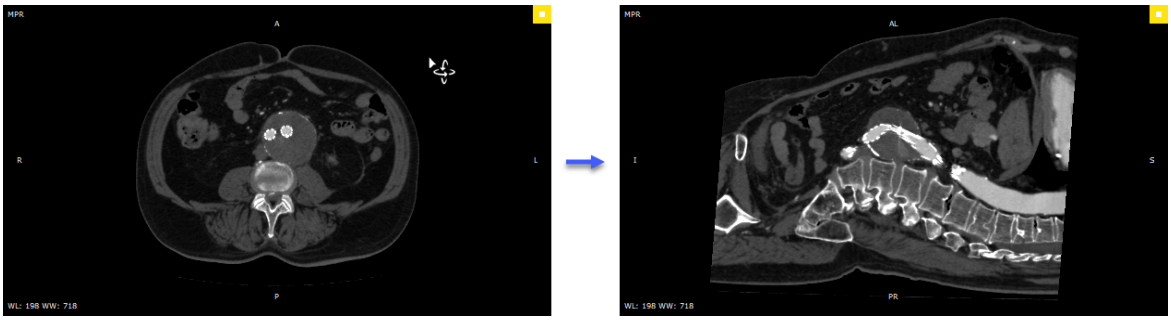
3D rotation

The image plane can also be changed directly in a specific viewport.

Click the `3D rotate` button on the toolbar (or press the `R` key).



Next, press the left mouse button over the image and drag the mouse to rotate the image plane around the X and Y axes (parallel to the viewing plane).



Press the `Alt` key and drag the mouse with the left button depressed. The 3D rotation tool will be active regardless of the current left mouse button association.

Alternatively, the 3D rotation can be performed using `Alt + Arrows (Up, Down, Left or Right)`.

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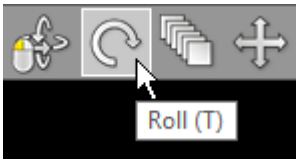
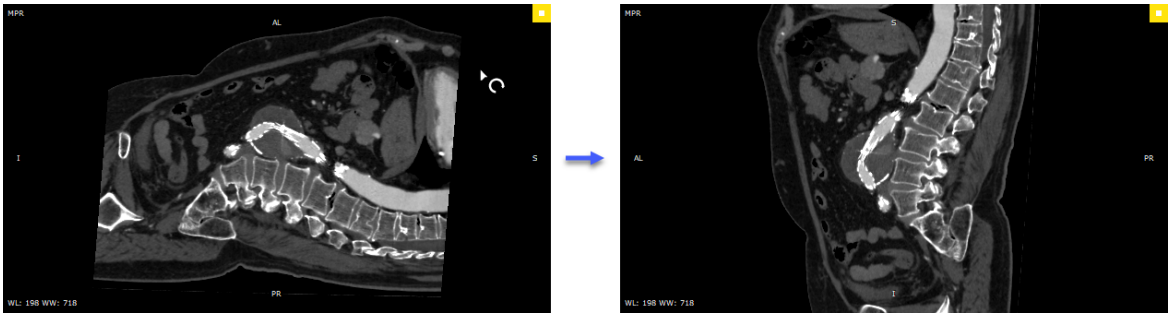
Roll

Click the **Roll** button on the toolbar (or press the **T** key).



Next, press the left mouse button over the image and drag the mouse to rotate the image plane around the Z axis (perpendicular to the viewing plane).



Press the **Ctrl + Alt** key and drag the mouse with the left button depressed. The roll tool will be active regardless of the current left mouse button association.

Alternatively, press the **Left Arrow** or **Right Arrow** keys.

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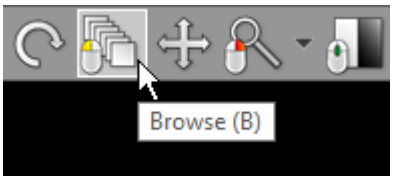
3.7.2 Browsing volume

There are several different methods by which you can page through the volume (moving the viewing plane to front or back without changing the orientation of the image plane):

1. Click the **Browse** button on the toolbar (or press the **B** key). Next, press the left mouse button over the image, and drag the mouse up or down to browse a volume in both directions.



By default, the browse tool is associated with the left mouse button.

2. Press the **Up Arrow** or **Down Arrow** on the keyboard to move to back or front in small steps.

3. On a multi-touch device, touch the image with one finger and drag it up or down. (The tool must be associated with the left mouse button, if it is not, touch the **Browse** tool button.)

4. Press the left mouse button on the intersection of the axes in some other viewport and drag it up/down or left/right.

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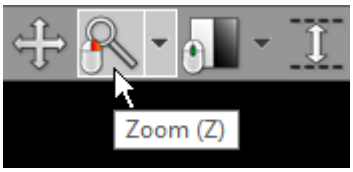
3.7.3 Changing zoom level and position

Image zooming

Click the **Zoom** button on the toolbar (or press the **Z** key).



Next, press the left mouse button over the image and drag the mouse up to zoom in or down to zoom out.

By default, the zooming tool is associated with the right mouse button.

Alternatively, the **Ctrl + Plus (+)** and **Ctrl + Minus (-)** keyboard shortcuts can be used to zoom.

On multi-touch devices, touch the image with two fingers and drag them apart to zoom in, or toward each other to zoom out.

Click Fill viewport or press **Ctrl + 0** to revert the zoom and pan settings and fill the viewport with the image.

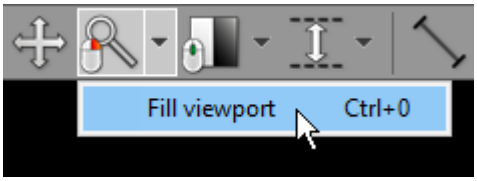


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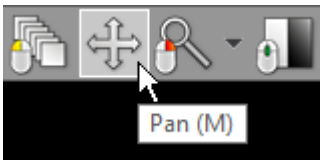
Image panning

When an image is zoomed in, panning can be used to reveal the areas lying outside the viewing panel.

Click the **Pan** button on the toolbar (or press the **M** key).



Next, press the left mouse button over the image and drag the mouse to move the image around the screen.

By default, the image panning tool is associated with the back (4th) mouse button.

Press the **Shift** key, and drag mouse with the left button depressed and the panning tool will be active, regardless of the current left mouse button association.

Alternatively, you can use **Ctrl + Arrows (Up, Down, Left or Right)** to pan.

On multi-touch devices, touch the image with two fingers and drag them across the panel to move the image. Keep the distance between the fingers unchanged to maintain the current zoom ratio.

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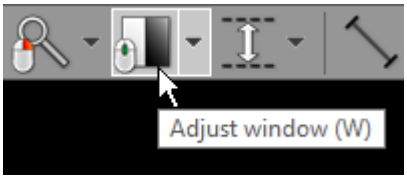
3.7.4 Changing brightness / contrast

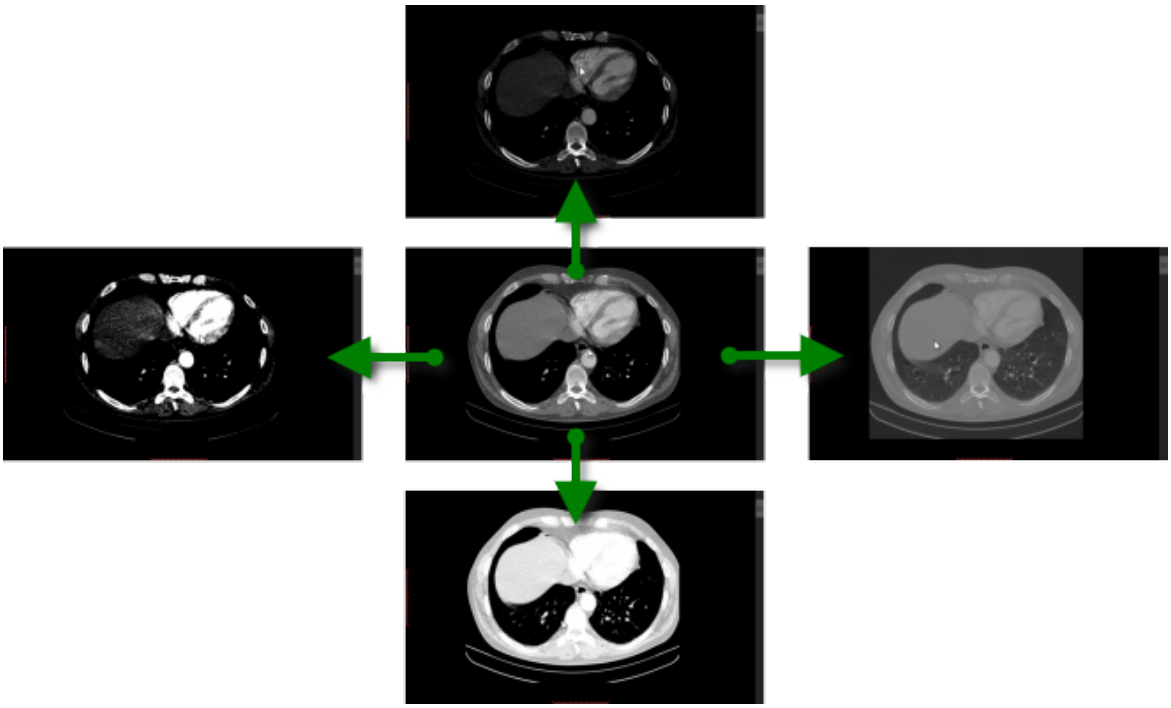
Click the **Adjust image window** button on the toolbar (or press the **W** key).



Next, press the left mouse button over the image and drag the mouse to change brightness (window level - WL) or contrast (window width - WW):

- Up to decrease brightness (window level goes up)
- Down to increase brightness (window level goes down)

- Left to increase contrast (window width shrinks)
- Right to decrease contrast (window width expands)



By default, the windowing tool is associated with the middle mouse button.
Press the **Ctrl** key and drag the mouse with the left button down and the windowing tool will be active, regardless of the current association.

On multi-touch devices, touch the image with three fingers and drag them in the directions described above to adjust the window level and width.

Press **0** to set the default window for the loaded series.

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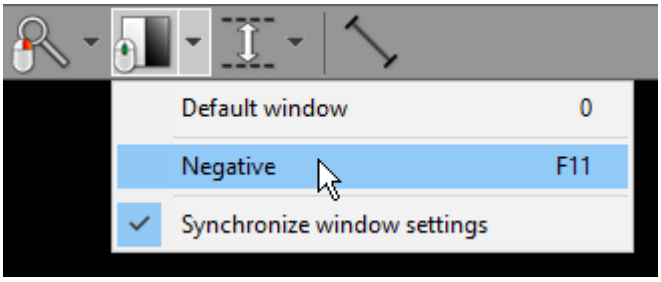
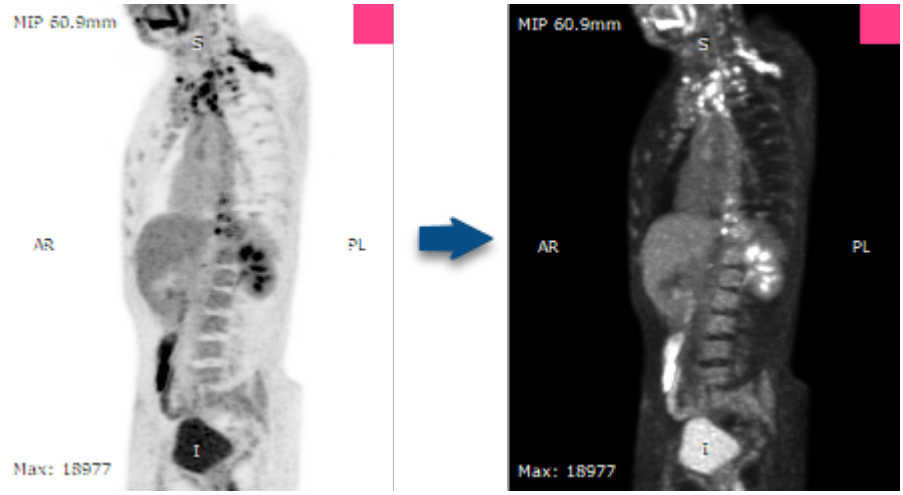
Negative mode

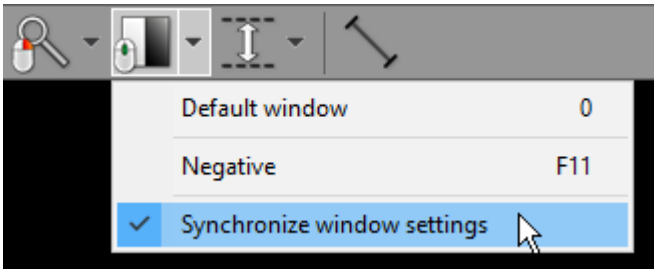
Press the F11 key or click the Negative menu item to toggle the negative mode for the image.





Synchronization

Window settings are synchronized in all viewports by default.
To toggle the synchronization, click the Synchronize window settings menu item.



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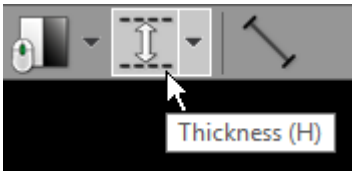
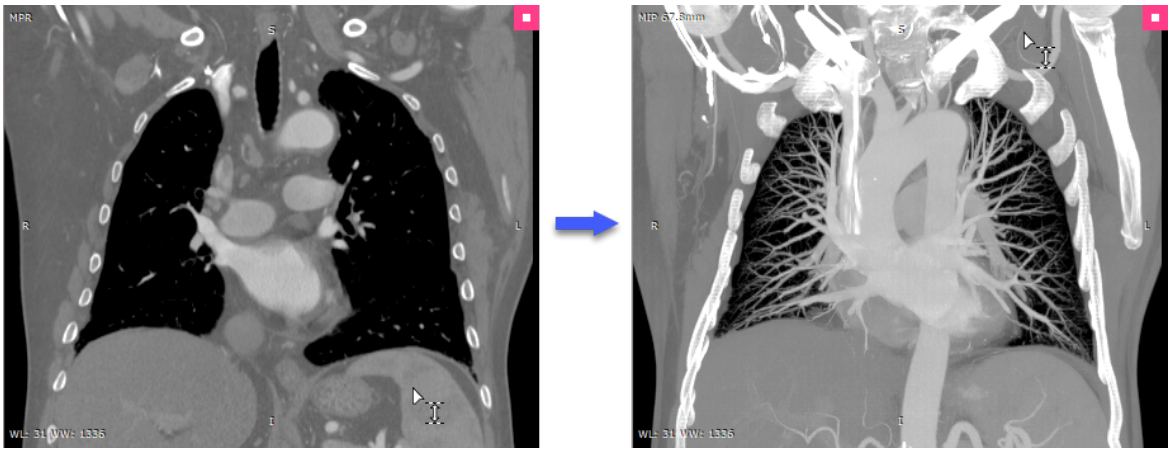
3.7.5 Changing thickness (MIP/MinIP/Avg)

Thickness

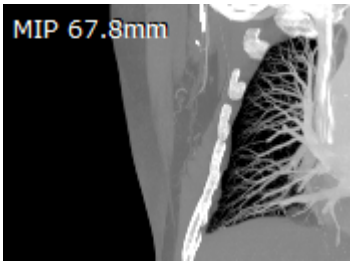
Click the **Thickness** button on the toolbar (or press the **H** key).



Next, press the left mouse button over the image and drag the mouse up to increase thickness or down to decrease thickness.



The value of the slab thickness in millimeters (and the rendering mode) is displayed in the top-left corner.



Press the **Ctrl + Shift** key and drag the mouse with the left button depressed, and the thickness tool will be active regardless of the current left mouse button association.
Alternatively, the **Plus (+)** and **Minus (-)** keys can be used to change thickness.

On multi-touch devices, touch the image with four fingers and drag them up or down to change thickness.

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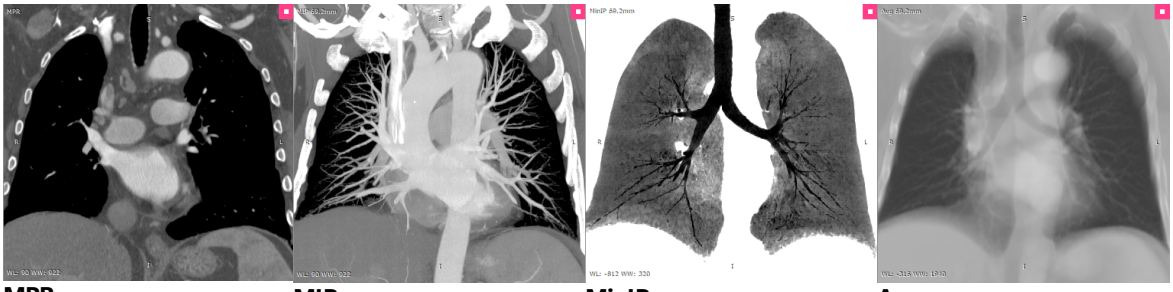
Rendering modes (MIP/MinIP/Avg)

Immediately after the 3D MPR windows is opened, the images are displayed with minimal possible thickness (in accordance with the size of the voxels in the volume).

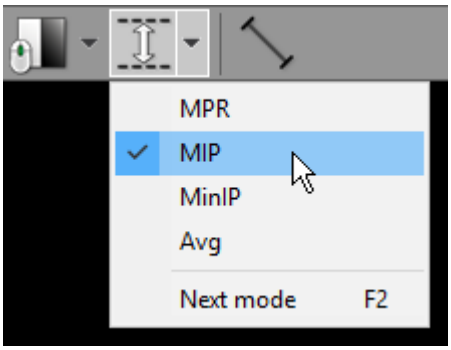
When the thickness is increased, images are rendered in one of the following modes:

- MIP (Maximum Intensity Projection)
- MinIP (Minimum Intensity Projection)
- Avg (Average)



MPR **MIP** **MinIP** **Avg**

To quickly switch the applied rendering mode, press **F2**.
You can also click the rendering mode indicator in the top-left corner.
Alternatively, these modes are available from the Thickness drop-down menu.



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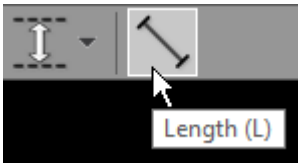
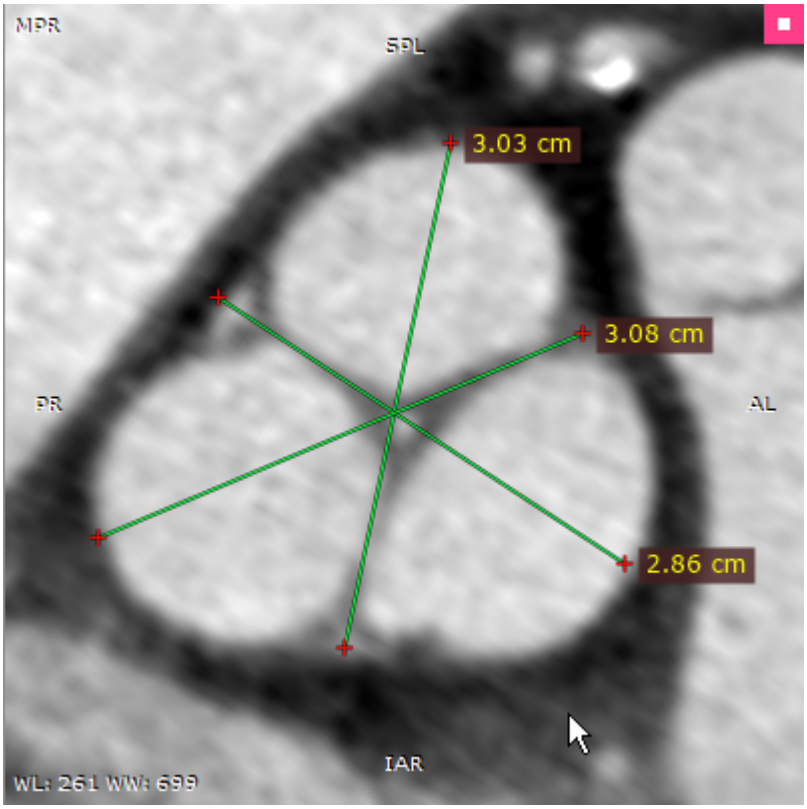
3.7.6 Length measurement

Click the **Length** button on the toolbar (or press the **L** key).



Place the cursor over the starting point, then press left mouse button and drag the mouse to draw a segment with length measurement. Release the button to finish drawing.



The distance value will be shown in centimeters (or millimeters).
Note, for thick slabs (MIP, MinIP, Avg), the length is measured in the viewing plane, which means that the different depths of the structures are not taken into account.

You can move the entire segment or one of its endings by dragging while pressing the left mouse button.
The label may also be dragged to a more convenient place if necessary.

By default, the length measurement tool is associated with the forward (5th) mouse button.

Press **Shift** while drawing the segment to make it either vertical or horizontal.

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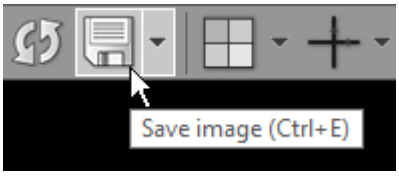
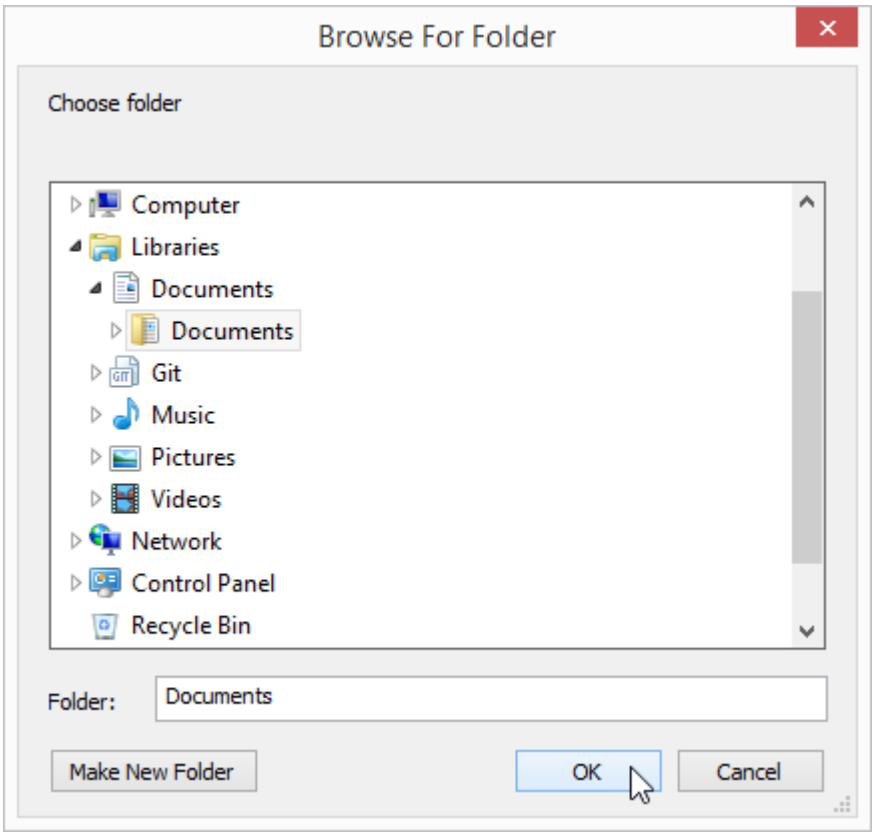
3.7.7 Exporting images

Saving JPEG images

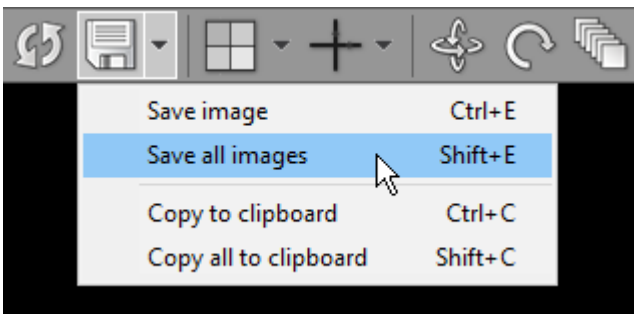
Click the `Export` button or use `Ctrl + E` to save the image in the active viewport as a JPEG file.



Browse for the destination folder and click `OK` to save the image.



Click the Export all images in the Export drop-down menu or use the `Shift + E` shortcut to save images from all three viewports combined in one JPEG file.



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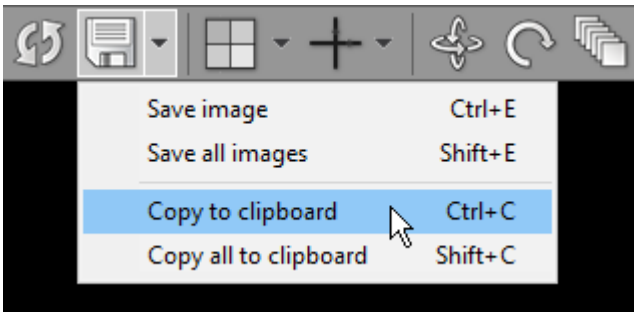
Copying to the clipboard

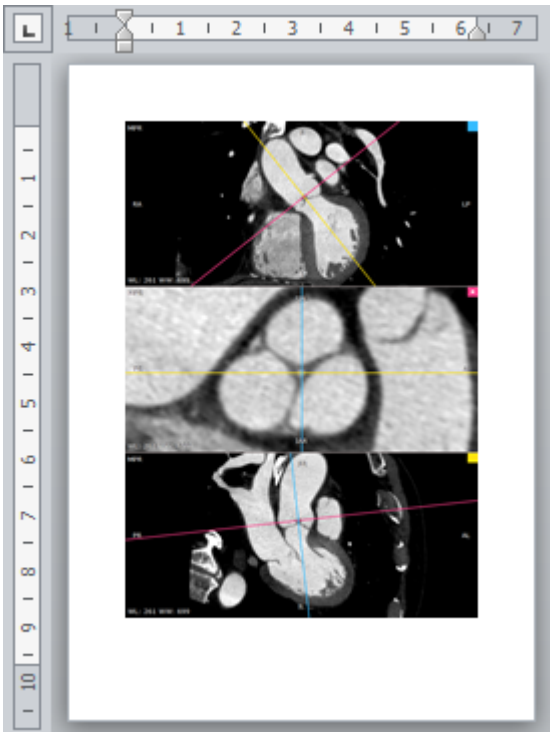
The image displayed in the active viewport can be easily copied to the Windows clipboard and then pasted into other Windows applications such as Microsoft Word, PowerPoint, etc.

Click the Copy to clipboard in the Export drop-down menu or use the `Ctrl + C` shortcut.



To copy images from all three viewports combined into one bitmap, click the Copy all to clipboard in the Export drop-down menu or use the `Shift + C` shortcut.

Switch to the application where you want to paste the image and click `Ctrl + V`.



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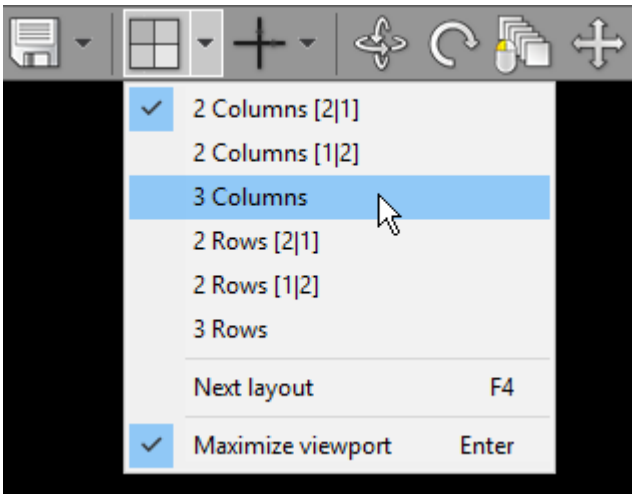
3.7.8 Window configuration

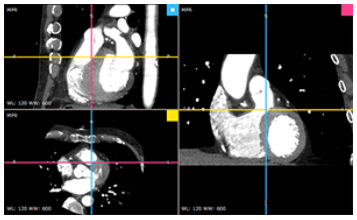
Viewport layout

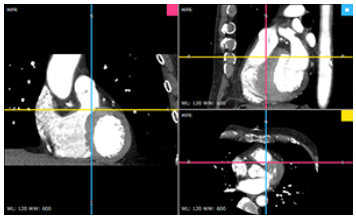
The default position of viewports in the 3D MPR window can be changed from the Viewport layout drop-down menu.

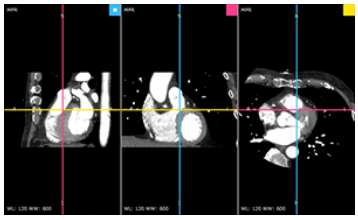


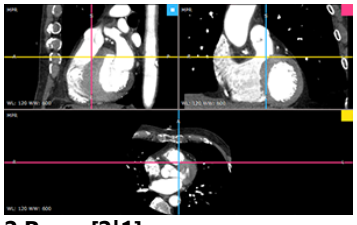
Alternatively, press the F4 to switch to the next viewport layout.

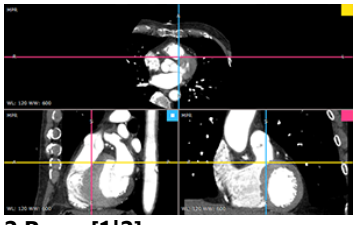
There are six viewport layouts available.

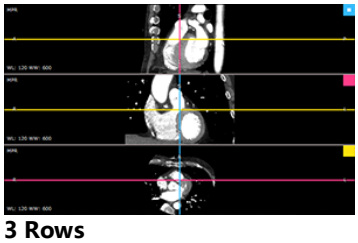

2 Columns [2|1]


2 Columns [1|2]


3 Columns


2 Rows [2|1]


2 Rows [1|2]


3 Rows

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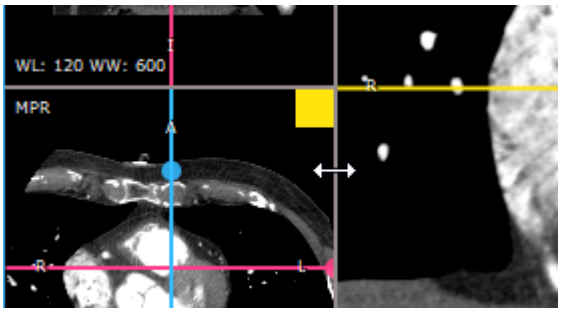
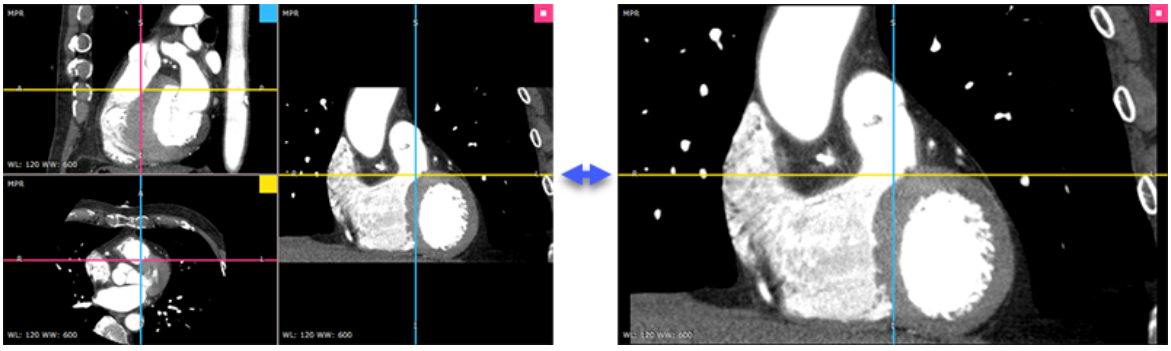
The size of the viewports can be changed by dragging the borders between them.

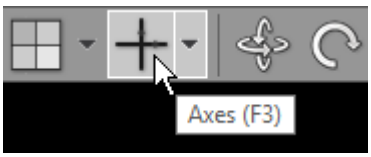


To temporarily maximize the active viewport, press **Enter** or double-click on the viewport. Repeat this process to restore the viewport to its original size.

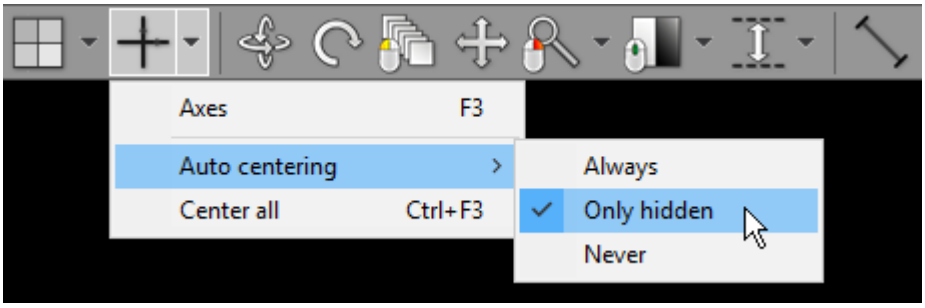


Axes

Click the **Axes** button on the toolbar (or press the **F3** key) to toggle the visibility of the axes in the viewports.



The auto centering mode for the intersection of the axes can be set in the Axes drop-down menu.



- Always: Centering is performed whenever the intersection is moved off the center.
- Only hidden: Centering is performed only when the intersection is moved outside the viewport.
- Never: Centering is disabled.

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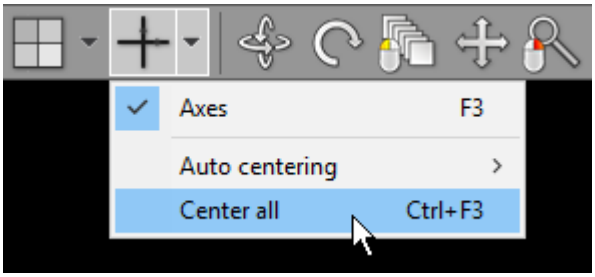
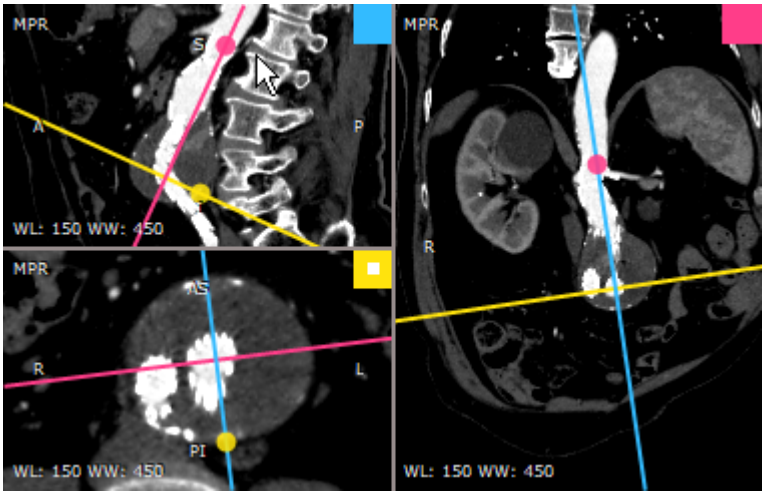
To center all axes manually, press **Ctrl + F3** or click the Center all menu item.

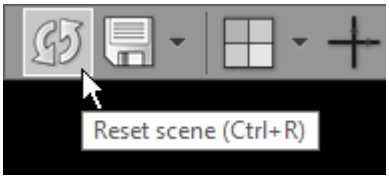


As you move the mouse cursor over viewports, the position of location markers (color dots projected on axes) is updated.
The location markers of the same color represent the same point in the volume and, thus, help identify structures in different viewports.



Resetting scene

Click the **Reset scene** button on the toolbar (or press **Ctrl + R**) to restore the initial view in the 3D MPR window.



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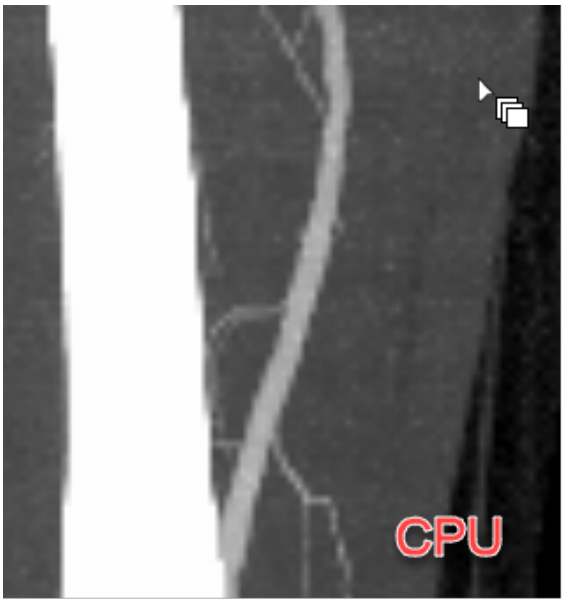
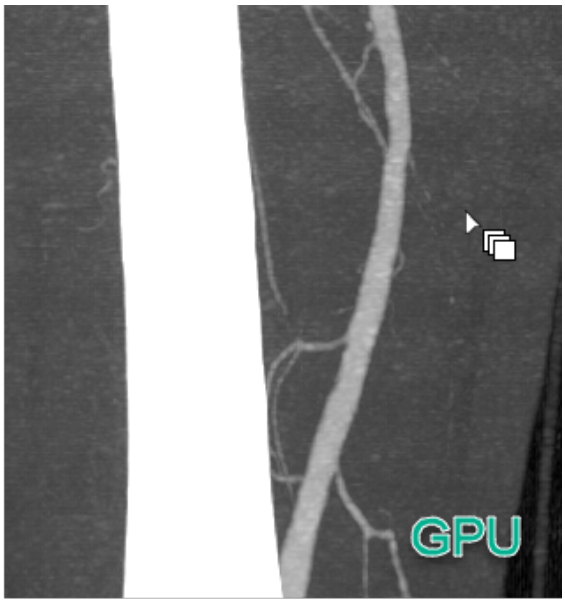
3.7.9 Settings

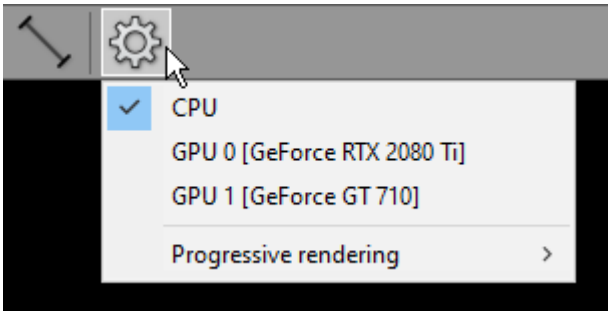
Enabling GPU acceleration

The GPU acceleration feature allows you to utilize modern Nvidia GPU to make more fluid and detailed interactions in the 3D MPR window.



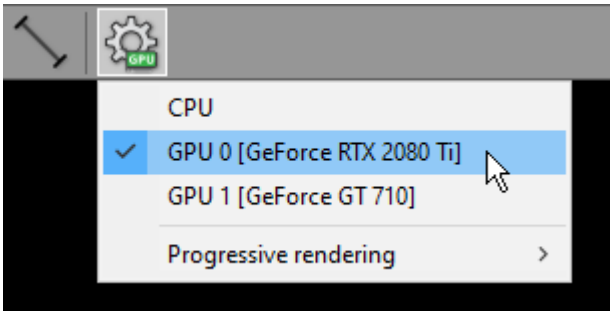


Click the `Settings` button to show the CPU/GPU mode selection menu.



If a compatible Nvidia GPU is detected in your system, you will be able to select it from the list.

After GPU is successfully enabled, there will be a green GPU indicator overlaid on the settings toolbar button.



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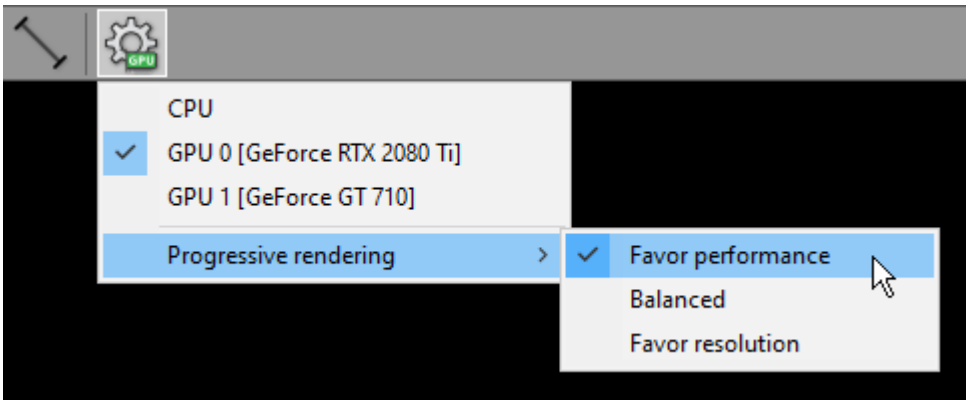
Select CPU when you want to switch back to CPU rendering mode.

Progressive rendering

To maintain fluid interactions in the 3D MPR window when the MIP/MinIP/Avg modes are enabled, progressive rendering is implemented. This means that the image quality is worse during interactions and progressively improves as soon as the interactions are finished.

By default, the most fluid mode is used (with the lower image quality during interactions). You can change this and get better image quality with less responsive interactions being the trade-off.

Click the `Settings` button and select Progressive rendering. Select Favor performance, Balanced, or Favor resolution to set your desired mode.



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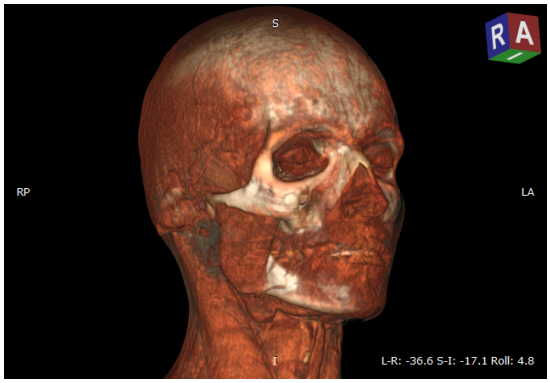
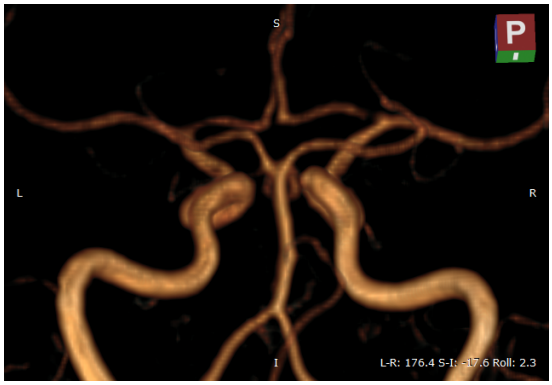
3.8 3D Volume Rendering (VR)

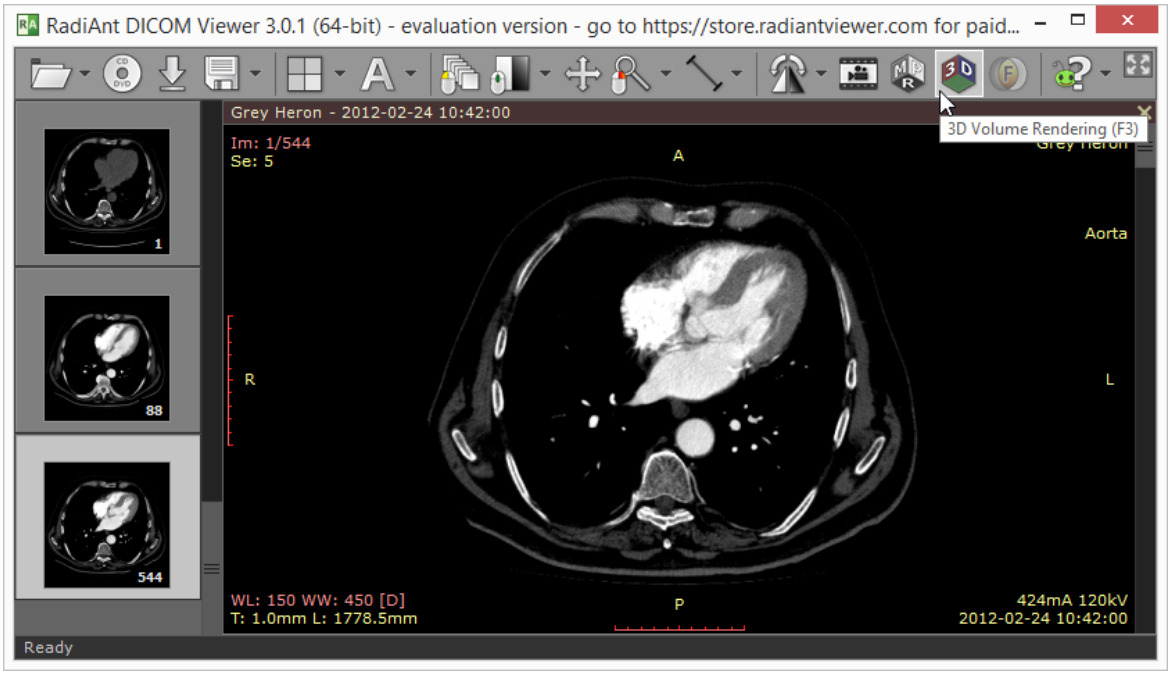
The 3D Volume Rendering tool provided by RadiAnt DICOM Viewer can be used to visualize large volumes of data generated by modern CT/MR scanners in three dimensional space. The different aspects of the data set can be interactively explored in the 3D VR window.





Opening the VR window

1. Open the volume series in the 2D viewer window and click the `3D Volume Rendering` button on the toolbar, or use the **F3** shortcut.



2. After the series is loaded into memory and preprocessed the VR representation will be displayed in a new window. This process can take a few seconds on slower systems.

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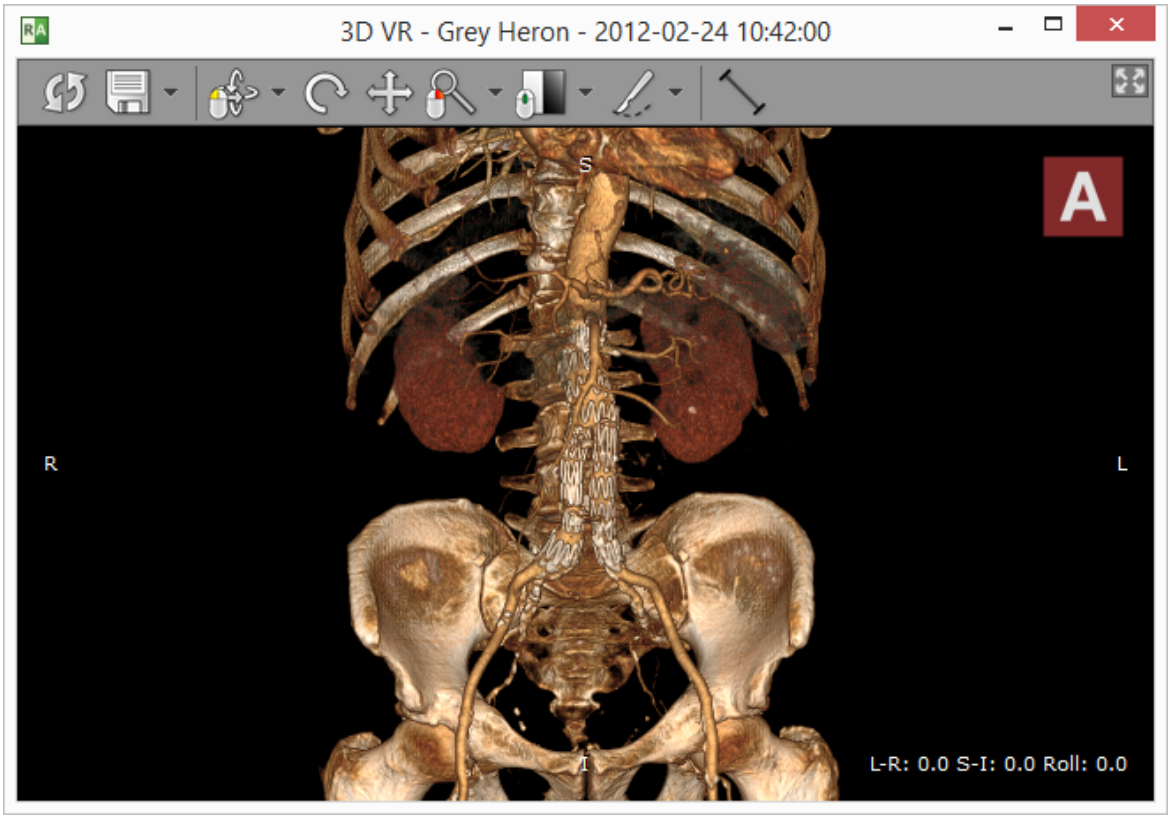
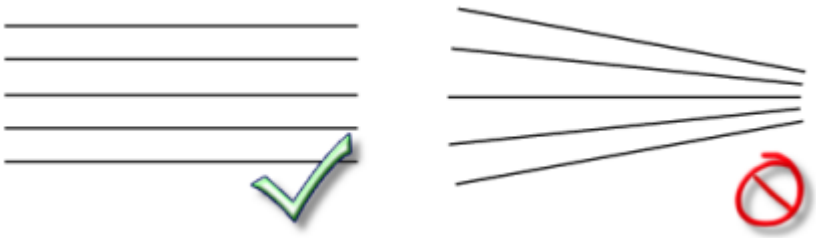


Some series cannot be used with the VR tool (e.g. in case of images with nonparallel planes).



If the images are not spaced evenly within the volume, the missing slices will be interpolated and some visual artifacts may appear in presentation and measurements.

Note that some larger series (e.g. >2000 CT images) require more than 1GB of free memory and 64-bit RadiAnt DICOM Viewer version to be loaded successfully.

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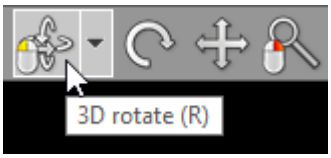
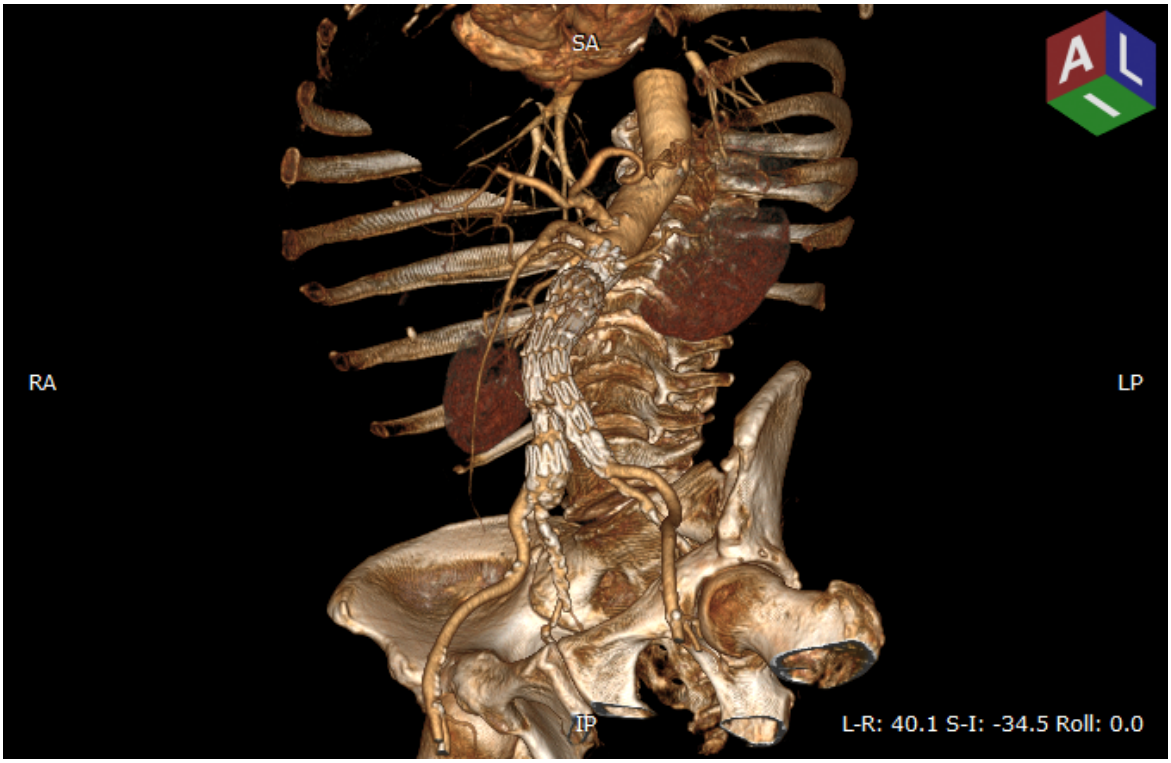
3.8.1 Rotations

3D rotation

Click the `3D rotate` button on the toolbar (or press the `R` key).



Next, press the left mouse button over the image and drag the mouse to rotate the volume around the X and Y axes (parallel to the viewing plane).



By default, the 3D rotate tool is associated with the left mouse button.

On multi-touch devices, touch the image with one finger and drag it to rotate the volume.

Alternatively, `Arrows (Up, Down, Left or Right)` can be used to perform the 3D rotation.

The orientation cube shown in the upper right corner shows the position of planes facing the viewer.
The rotation angles are presented in the lower right corner.

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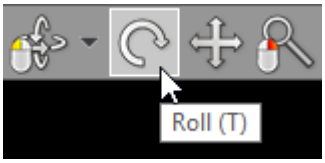
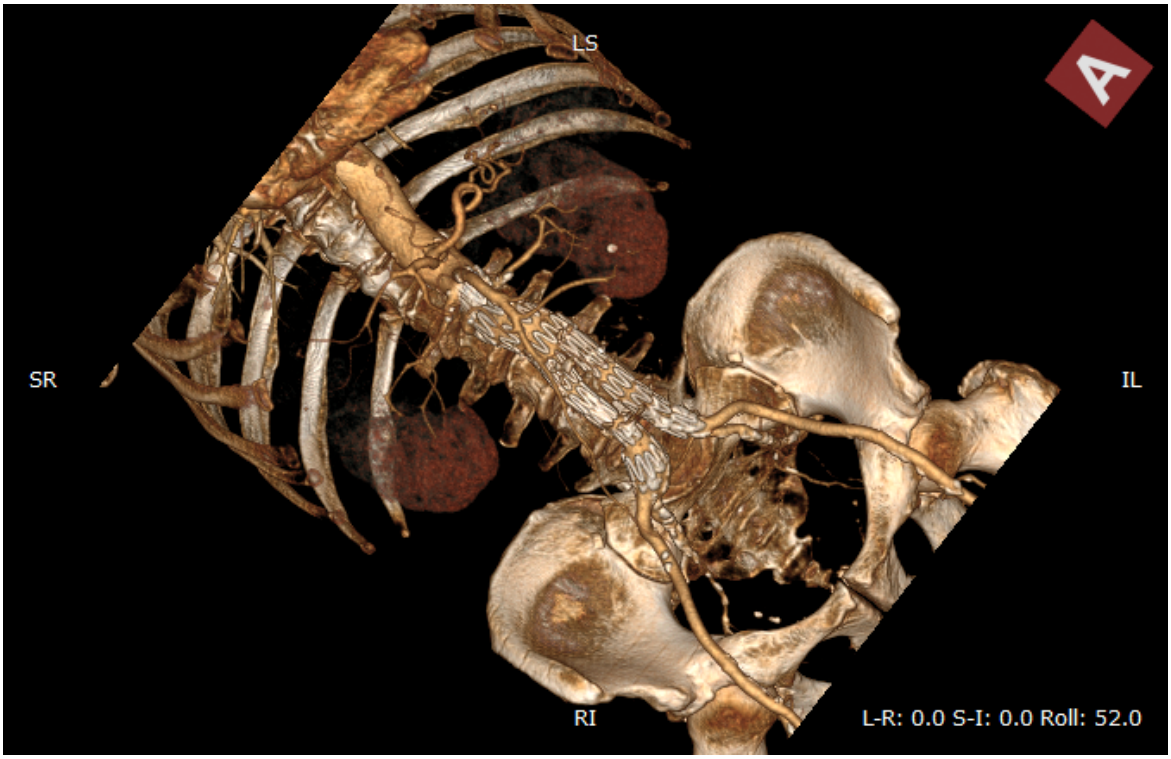
Roll

Click the `Roll` button on the toolbar (or press the `T` key).



Next, press the left mouse button over the image and drag the mouse to rotate the volume around the Z axis (perpendicular to the viewing plane).



Press the `Ctrl + Alt` keys and drag mouse with the left button down, and the roll tool will be active regardless of the current left mouse button association.

On multi-touch devices, touch the image with two fingers and rotate them to roll the volume.

Alternatively, press the `< or >` keys.

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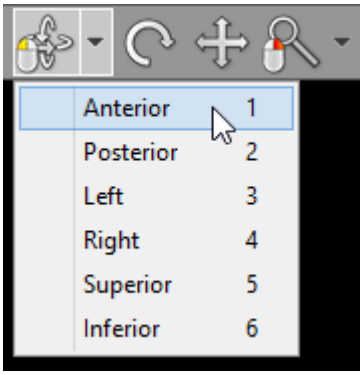
Rotation presets

Different rotation presets can be quickly applied by pressing 1 through 6 .

Key	Preset
1	Anterior (front)
2	Posterior (back)
3	Left
4	Right
5	Superior (top)
6	Inferior (bottom)

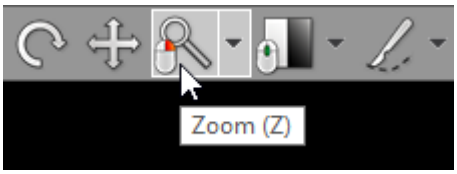
These presets are also available from the 3D rotate drop down menu.



3.8.2 Changing zoom level and position

Image zooming

Click the Zoom button on the toolbar (or press the Z key).



Next, press left mouse button over the image and drag the mouse Up to zoom in or Down to zoom out.

By default, the zooming tool is associated with the right mouse button.

Alternatively, the Ctrl + Plus (+) and Ctrl + Minus (-) keyboard shortcuts can be used to zoom.

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On multi-touch devices, touch the image with two fingers and drag them apart to zoom in, or toward each other to zoom out.

Click Fit volume or press **Ctrl + 0** to revert the zoom and pan settings and fill the viewport with the image.

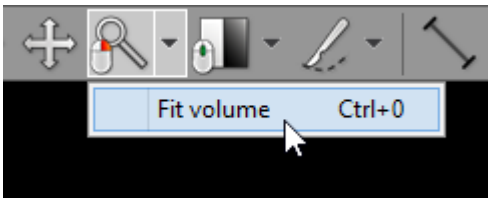
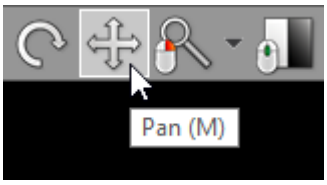


Image panning

When an image is zoomed in, panning can be used to reveal areas lying outside the viewing panel.

Click the **Pan** button on the toolbar (or press the **M** key).



Next, press the left mouse button over the image and drag the mouse to move image around the screen.

By default, the image panning tool is associated with the back (4th) mouse button.

Press the **Shift** key and drag mouse with the left button down, and the panning tool will be active regardless of the current left mouse button association.

Alternatively, **Ctrl + Arrows (Up, Down, Left or Right)** can be used to pan.

On multi-touch devices, touch the image with two fingers and drag them across the panel to move image. Keep the distance between the fingers unchanged to maintain the current zoom ratio.

3.8.3 Changing color and opacity

Click the **Adjust window** button on the toolbar (or press the **W** key).

Next, press the left mouse button over the image and drag the mouse to change the range of displayed voxel values.

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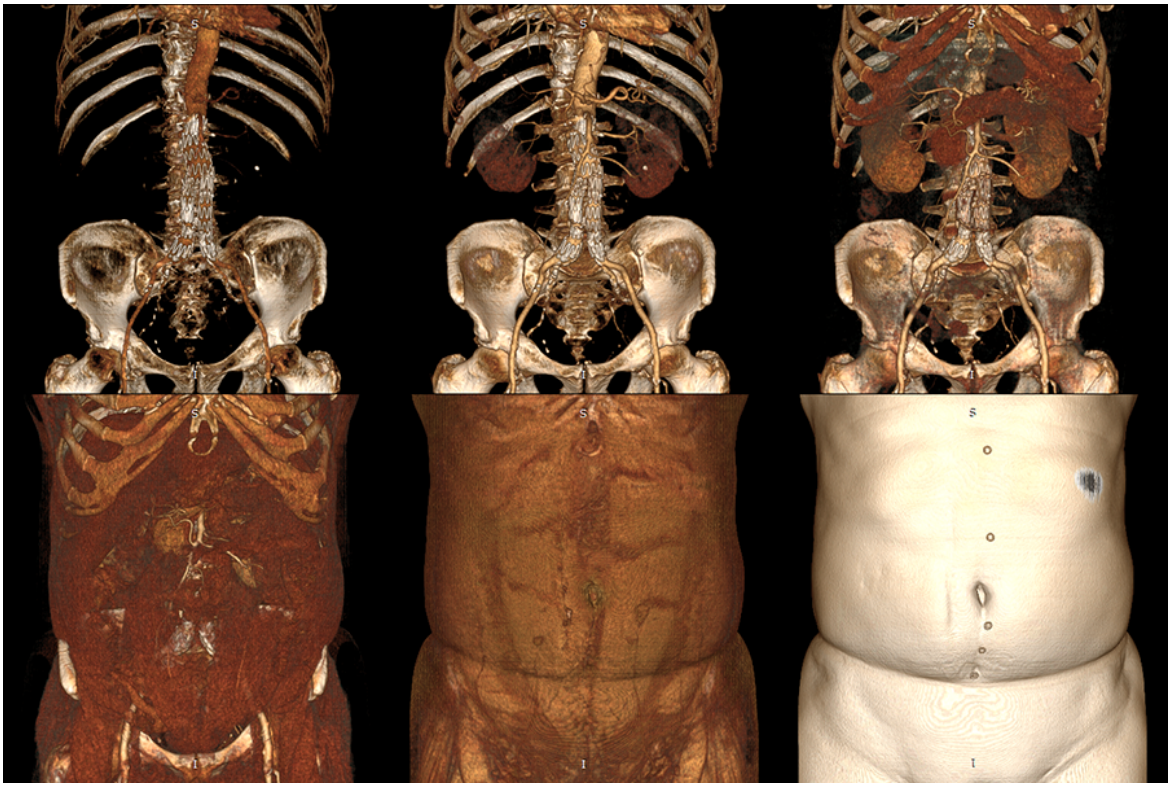
- Up to display voxels with higher density/intensity values
- Down to display voxels with lower density/intensity values

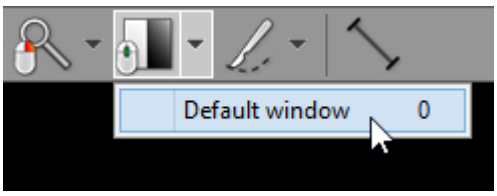
- Left to shrink the range of displayed voxel values
- Right to expand the range of displayed voxel values



By default, the windowing tool is associated with the middle mouse button.
Press the `Ctrl` key and drag the mouse with the left button down, and the windowing tool will be active regardless of current association.

On multi-touch devices, touch the image with three fingers and drag them in the directions described above to adjust window level and width.

Click Default window or press `0` to set default window for the current volume.



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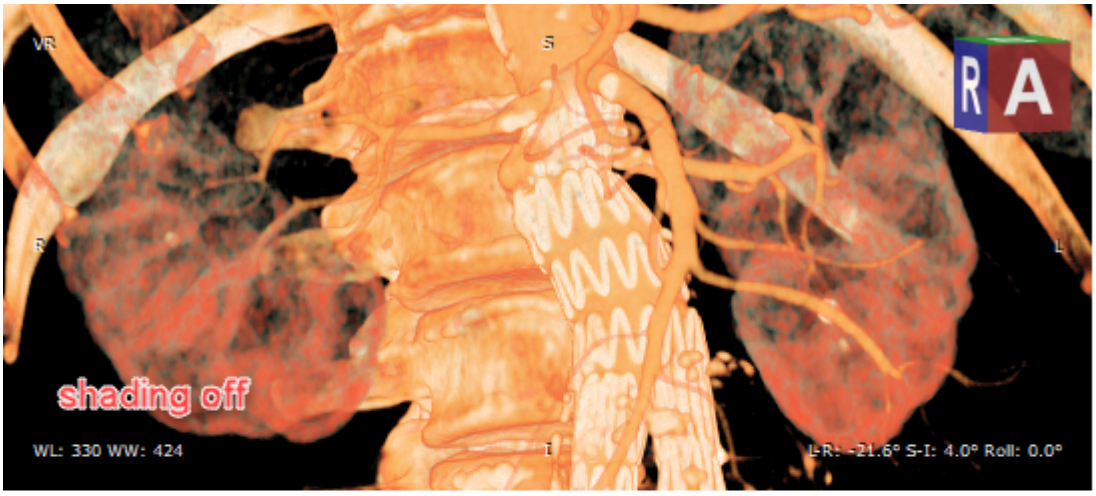
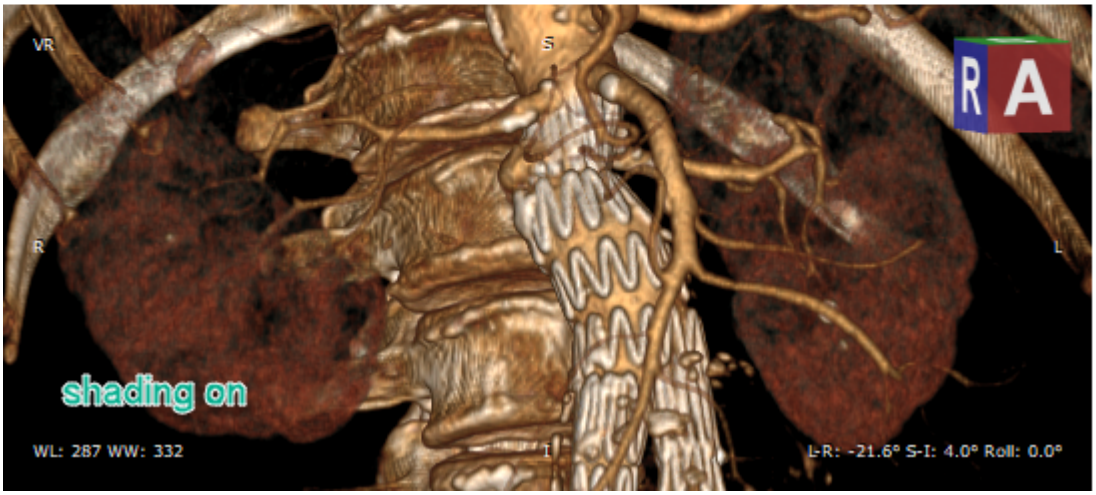
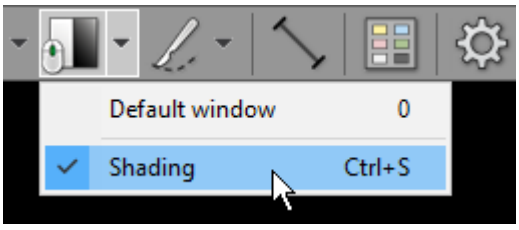
Shading

Shading allows you to visualize volume with a better perception of 3D space.





To toggle shading click Shading or press `Ctrl + S`.



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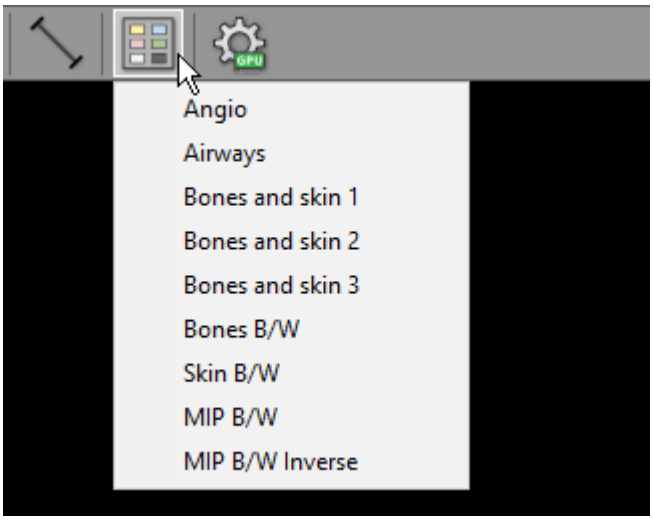
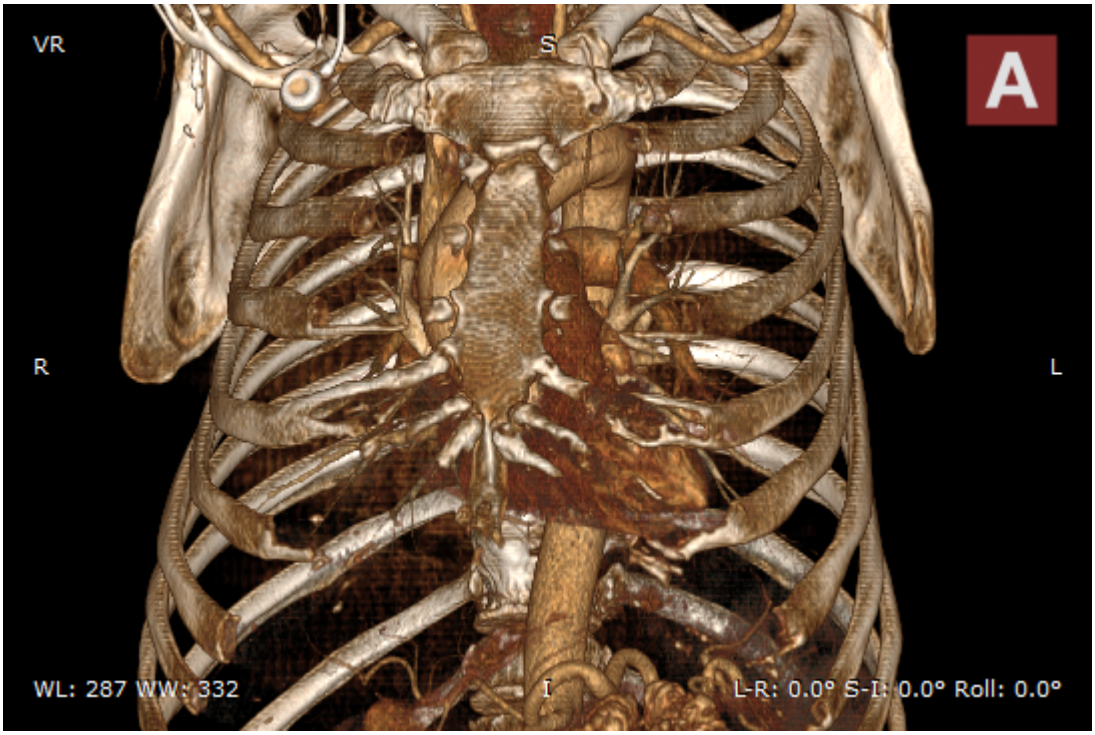
3.8.4 3D presets

Click the `3D presets` button on the toolbar to show the menu with different image presets, which can be applied to the displayed volume.



Select one of the presets to change the way volume that is visualized.



Angio

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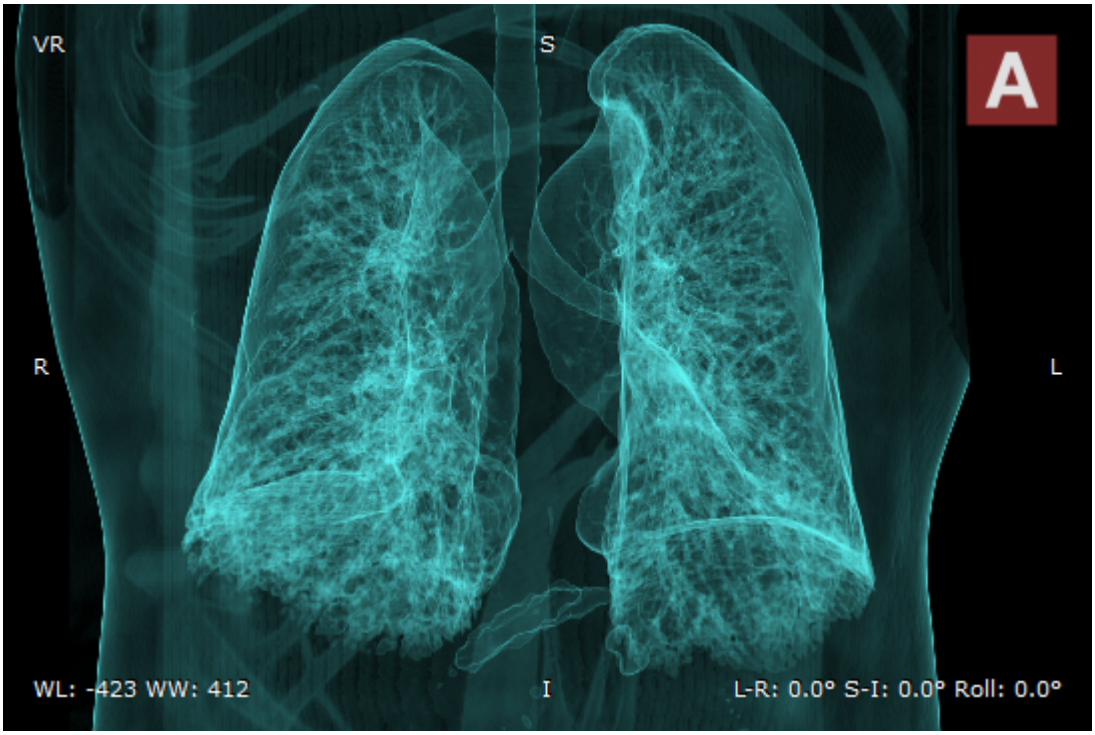
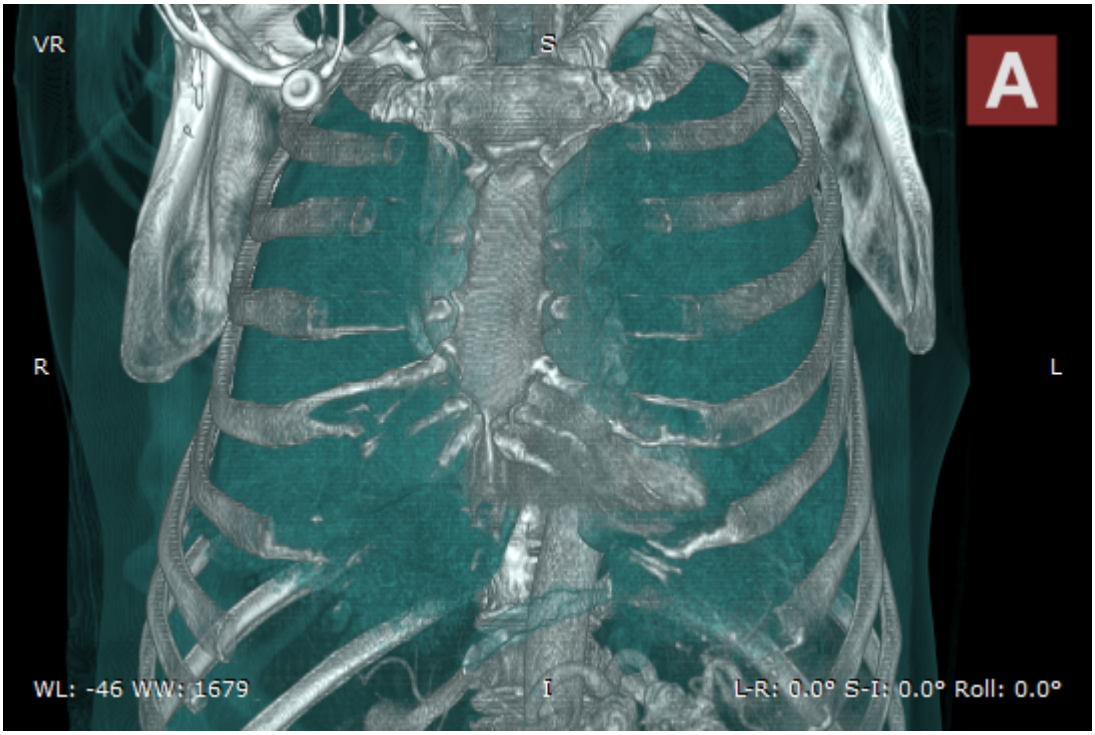


Airways



Bones and skin 1

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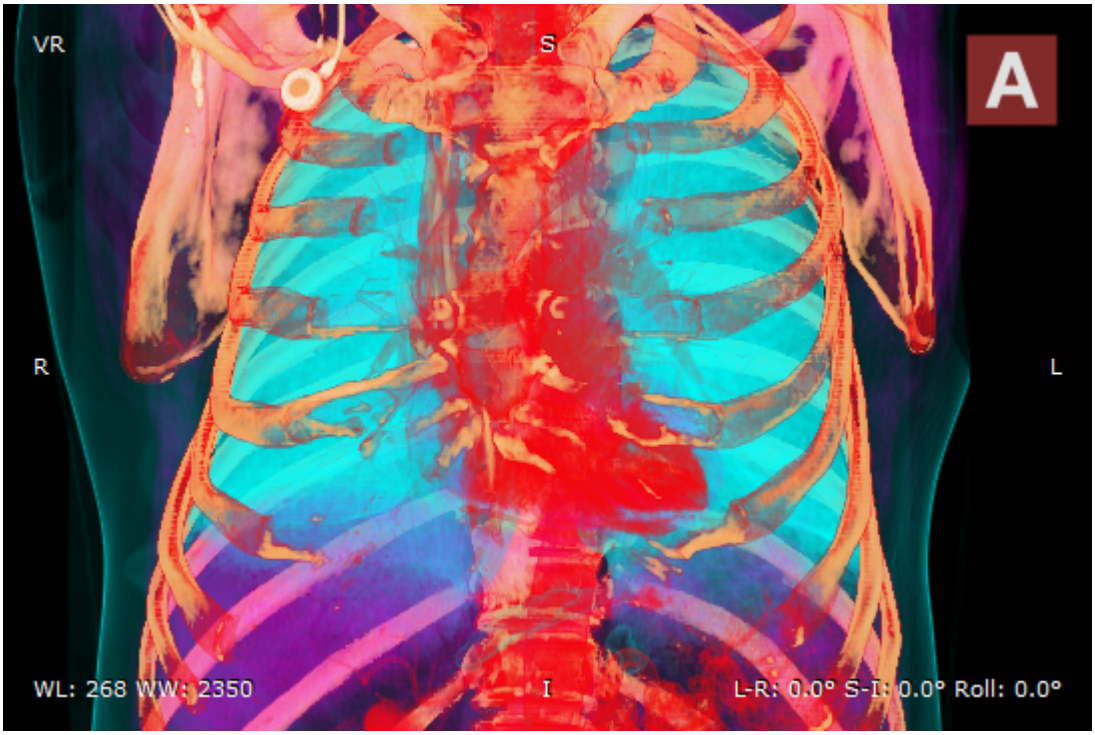
Bones and skin 2



Bones and skin 3

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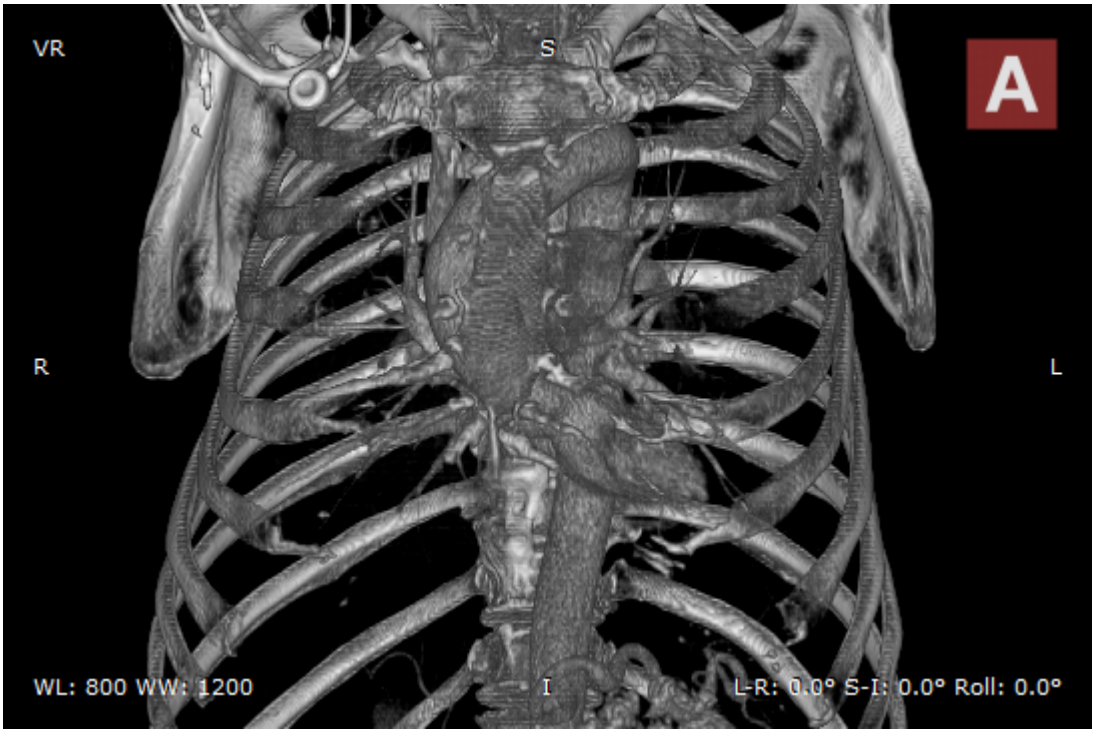
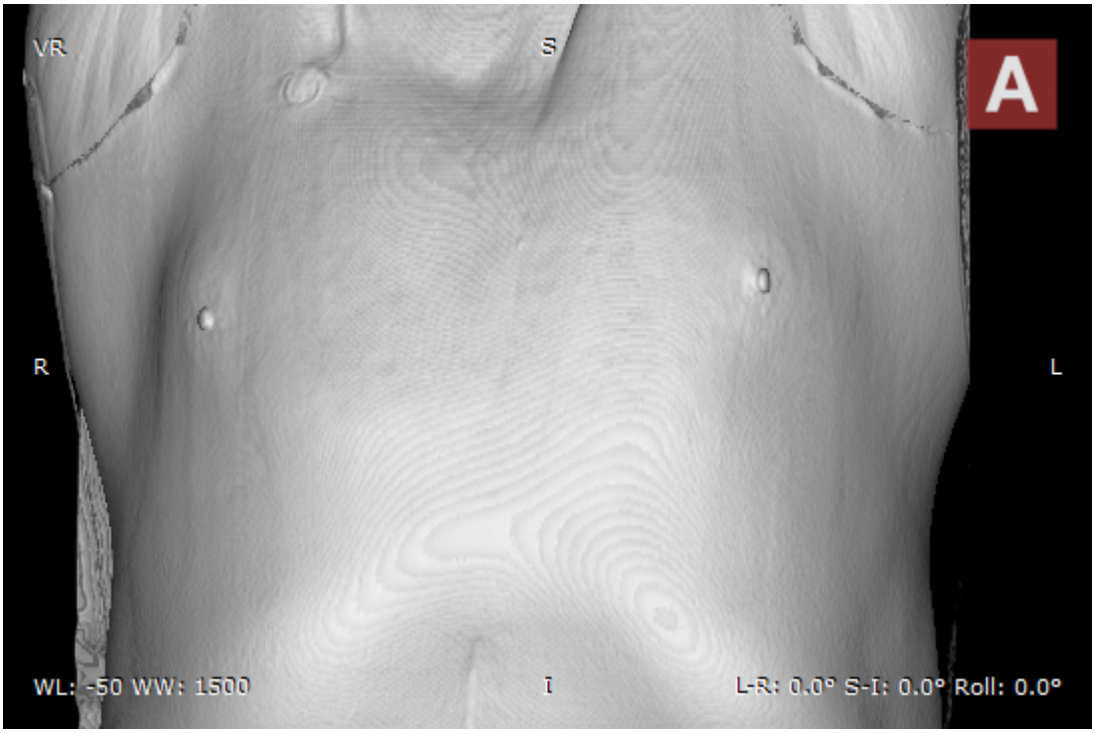


Bones B/W



Skin B/W

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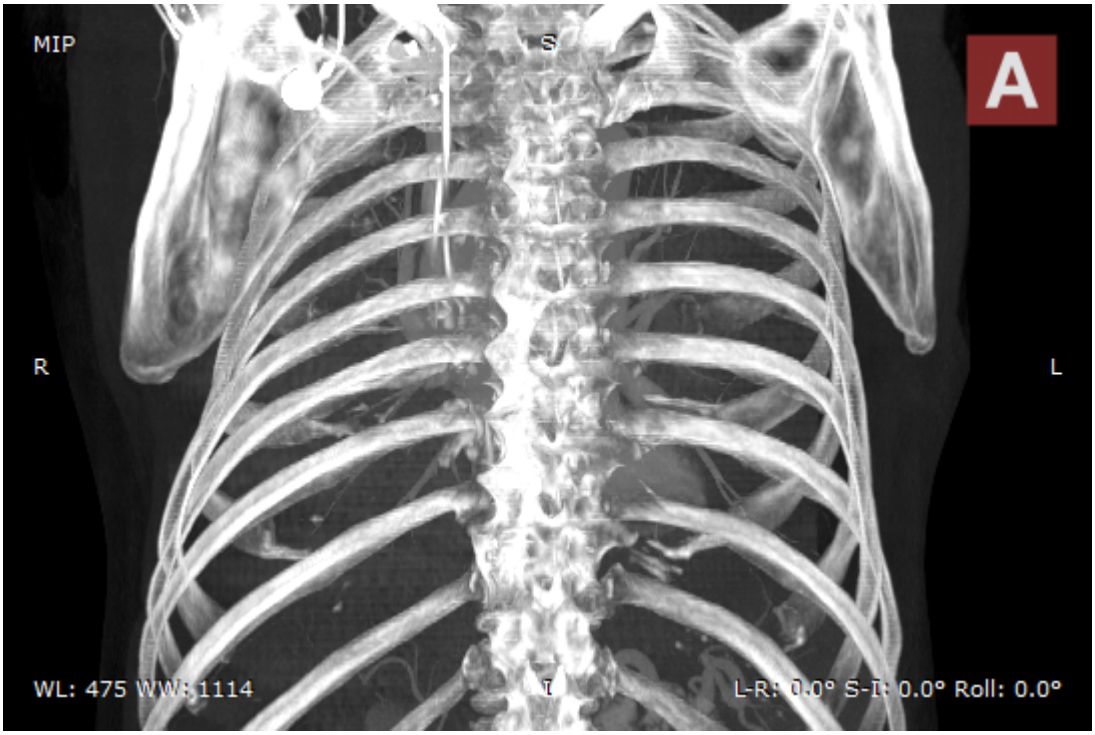
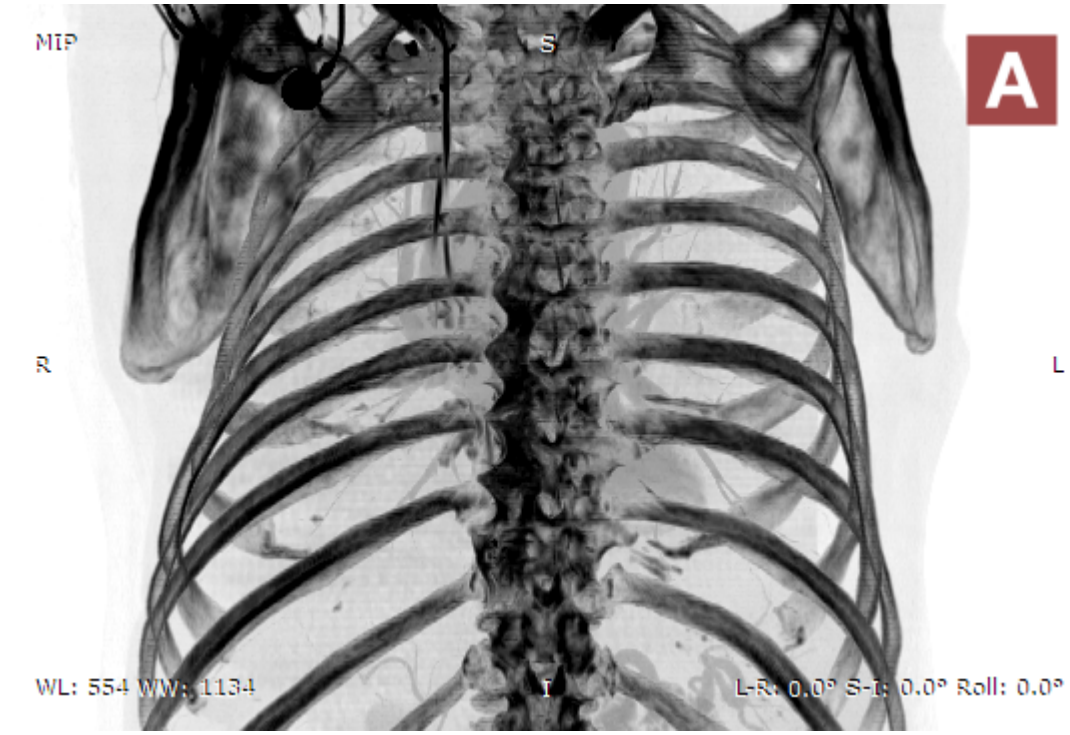


MIP B/W



MIP B/W Inverse

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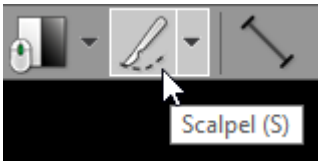
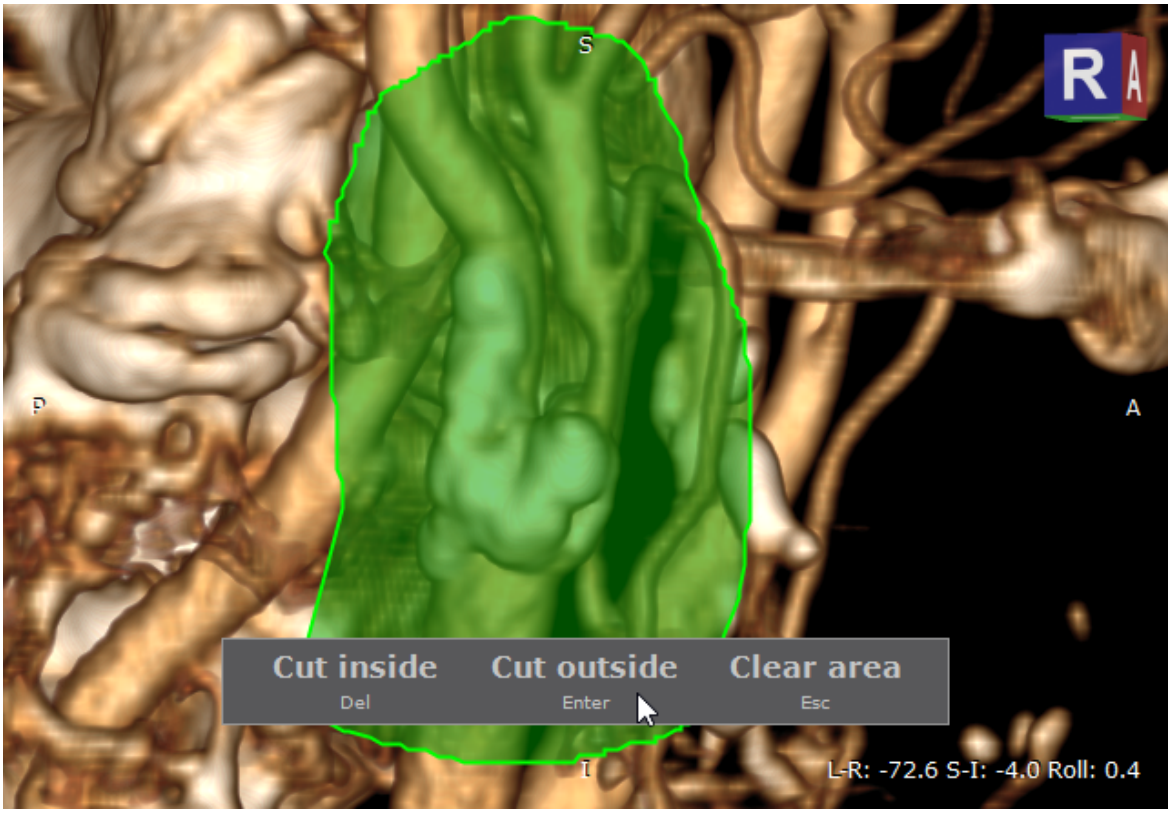
3.8.5 Removing unwanted structures

Click the **Scalpel** button on the toolbar (or press the **S** key).



Next, press the left mouse button over the image and draw the area.



- Press **Del** or click the **Cut inside** button to delete structures inside the area.
- Press **Enter** or click the **Cut outside** button to delete structures outside the area.
- Press **Esc** or click the **Clear area** button to clear the area.

Rotate the volume and make additional cuts to remove all unwanted structures from the image.

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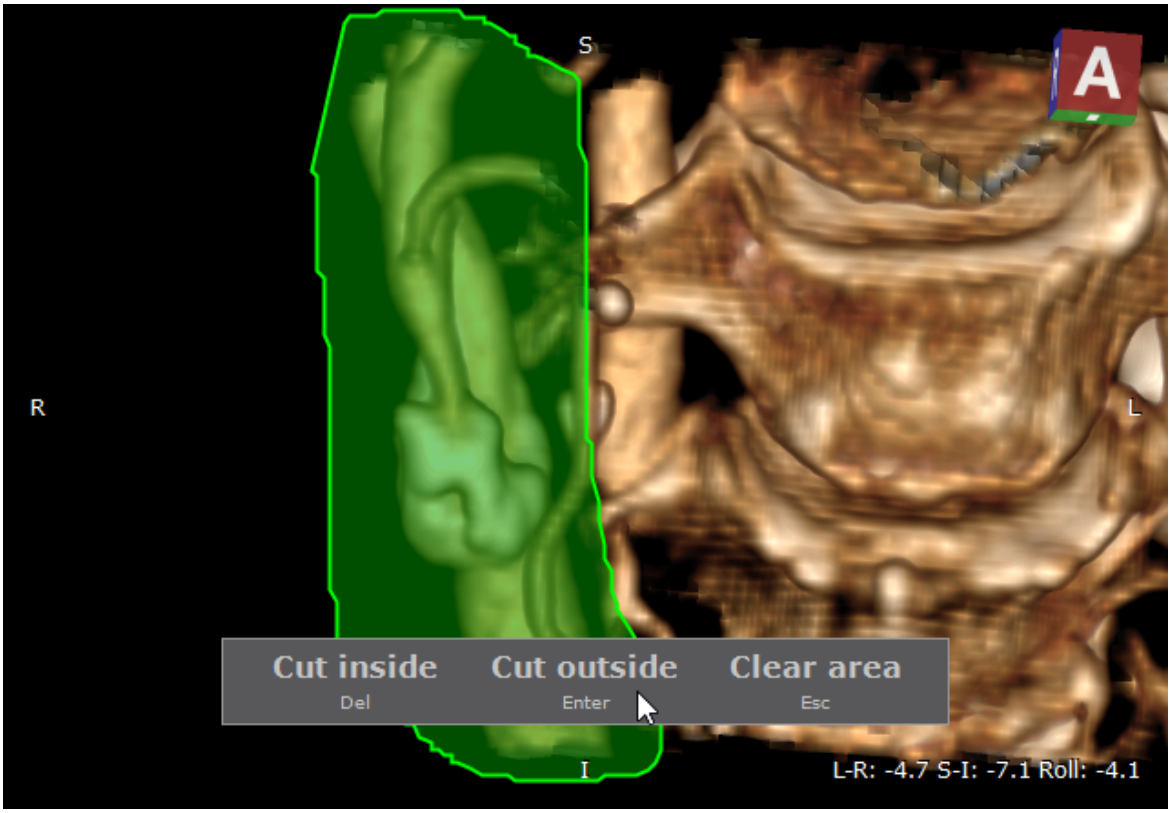

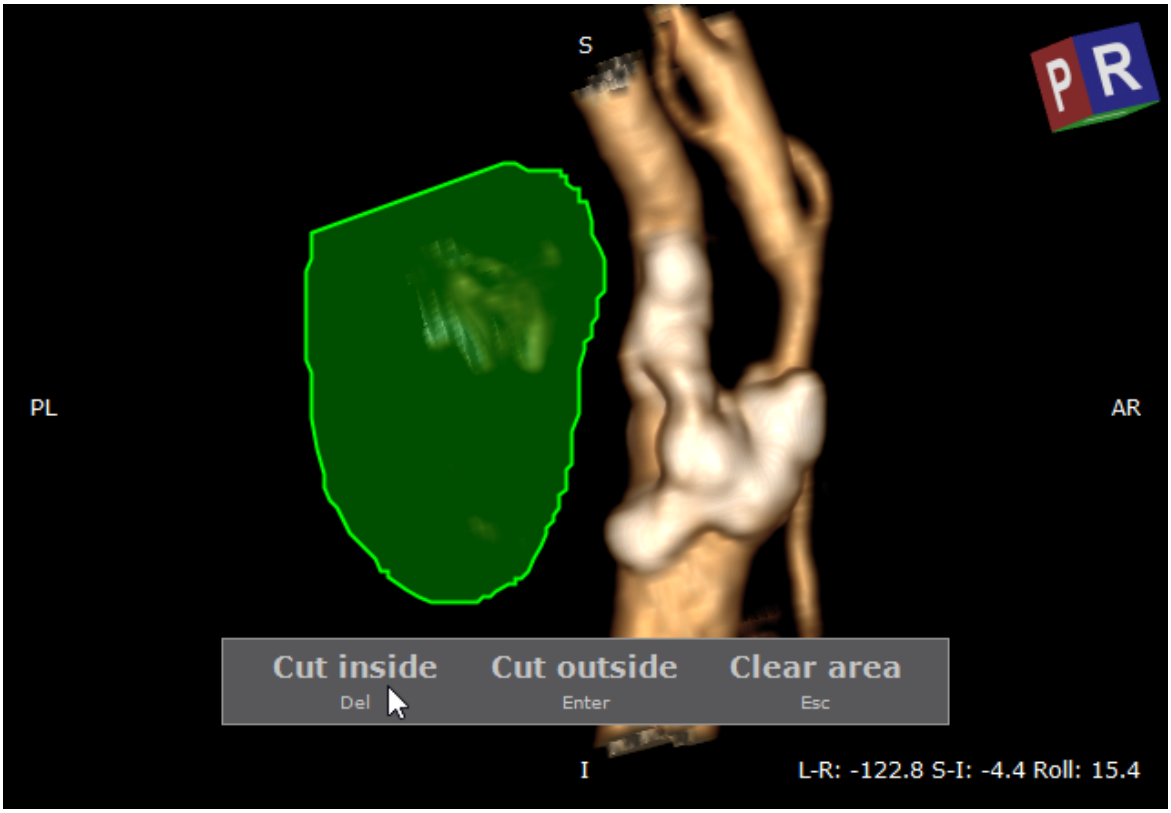

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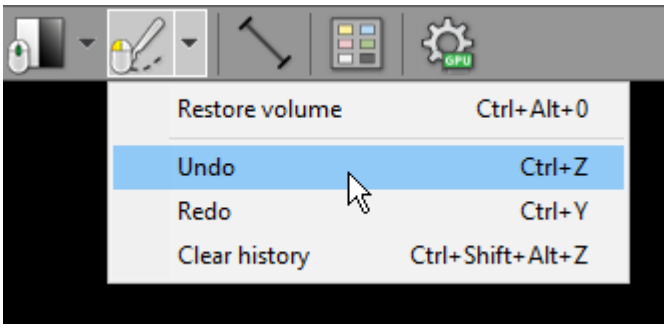
Press the **Alt** key and drag the mouse with the left button down, and the scalpel tool will be active regardless of current association.

On multi-touch devices, a pen is associated with the scalpel tool by default.

Press **Ctrl + Z** to undo last scalpel action. Press **Ctrl + Y** to redo the scalpel action. Multiple scalpel operations can cause increased memory consumption by the scalpel undo tool. Press **Ctrl + Shift + Alt + Z** to clear scalpel history.
The above operations are also available from the Scalpel drop-down menu.



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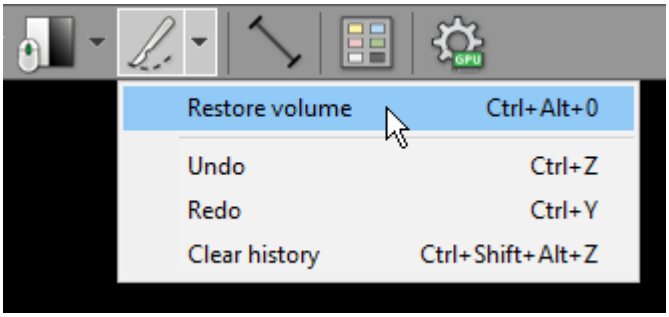
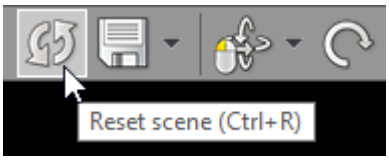
Click Restore volume or press `Ctrl + Alt + 0` to cancel all scalpel actions.



To revert all changes made while exploring the volume (position, zoom, window, scalpel actions) click the `Reset scene` button on the toolbar, or use the `Ctrl + R` shortcut.



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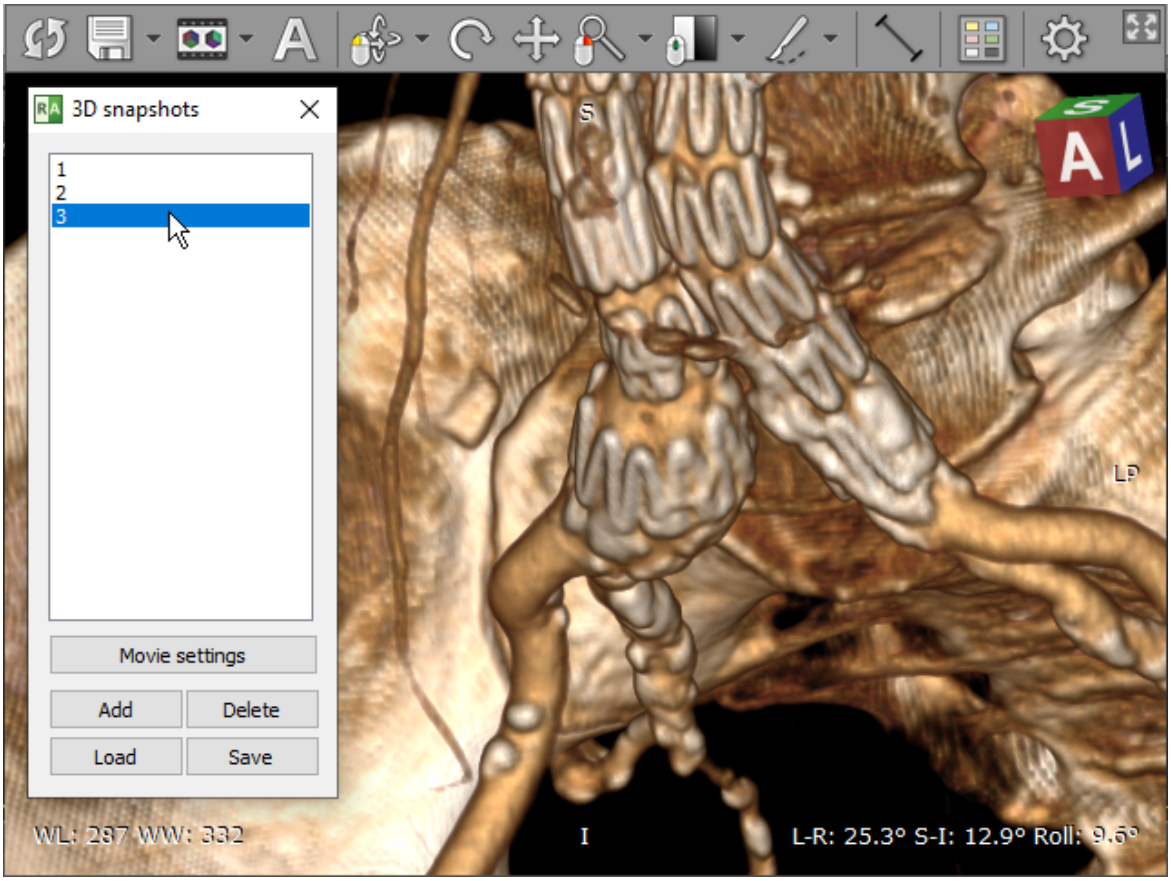
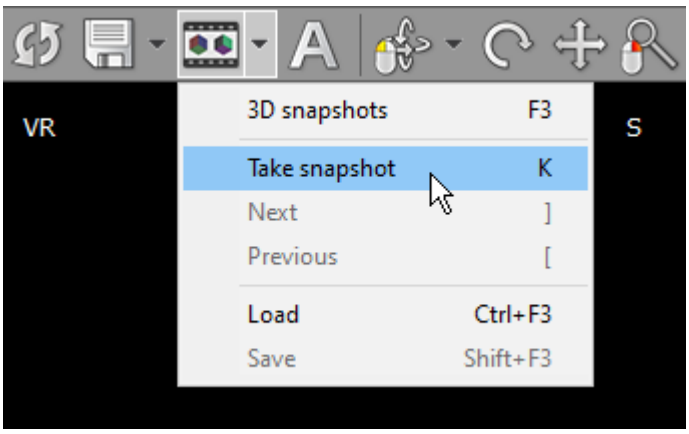
3.8.6 3D snapshots

3D snapshots allow for saving the current state of the 3D VR (Volume Rendering) viewer and a quick restore. The following image settings are stored in a 3D snapshot: position and rotation of the object, zoom factor, scalpel actions, 3D preset (color look-up table), and the range of displayed values (window settings).
These can also be used to create scenarios for advanced VR movies.



To store a 3D snapshot, press K or select Take snapshot from the drop-down menu.



To quickly restore and switch between snapshots, press] / [or select Next / Previous from the drop-down menu.

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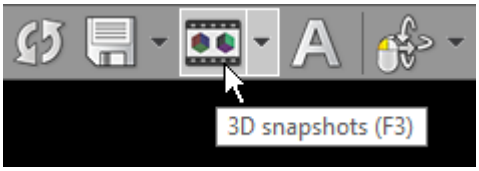
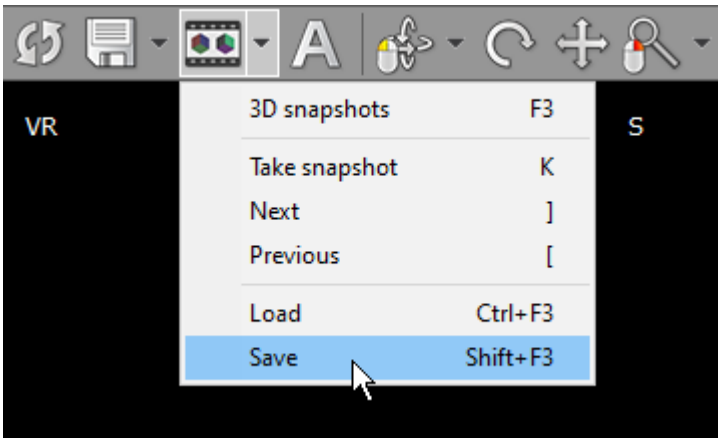
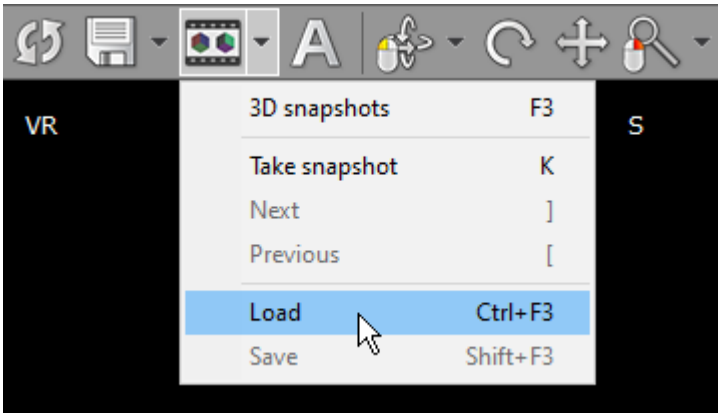
To show the list of stored 3D snapshots, click the `3D snapshots` toolbar button or use the `F3` shortcut.



3D snapshots are stored in memory and cleared as soon as the VR window is closed. To store them permanently in a file, select Save or press `Shift + F3`. Then select the snapshots file location and press `Save`.



Next time you want to restore the saved snapshots, press `Ctrl + F3` or select Load from the 3D snapshots menu. Then browse to the file and click `Open`.



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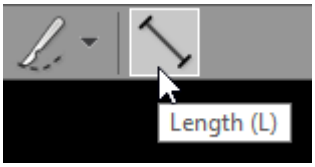
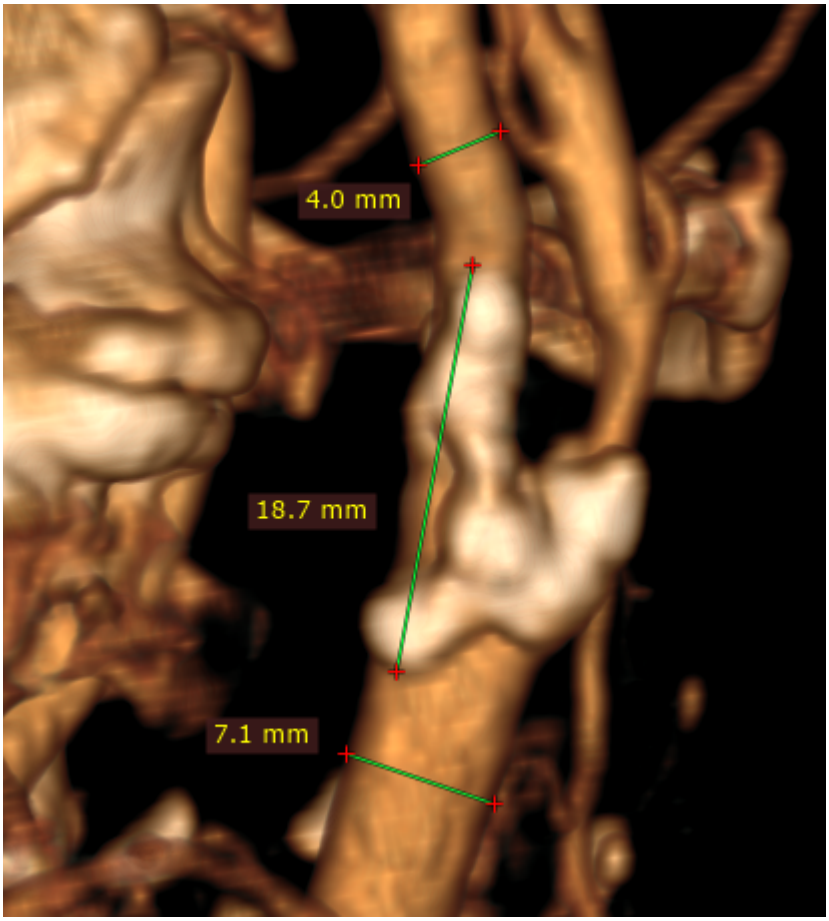
3.8.7 Length measurement

Click the **Length** button on the toolbar (or press the **L** key).



Place the cursor over the starting point, then press left mouse button and drag the mouse to draw a segment with length measurement. Release the button to finish drawing.



The distance value will be shown in millimeters.
Note that the length is measured in the viewing plane, which means that different depths of the structures are not taken into account.

You can move the entire segment or one of its endings by dragging while pressing the left mouse button.
The label may be also dragged to a more convenient place if necessary.

By default, the length measurement tool is associated with the forward (5th) mouse button.

Press **Shift** while drawing the segment to make it either vertical or horizontal.

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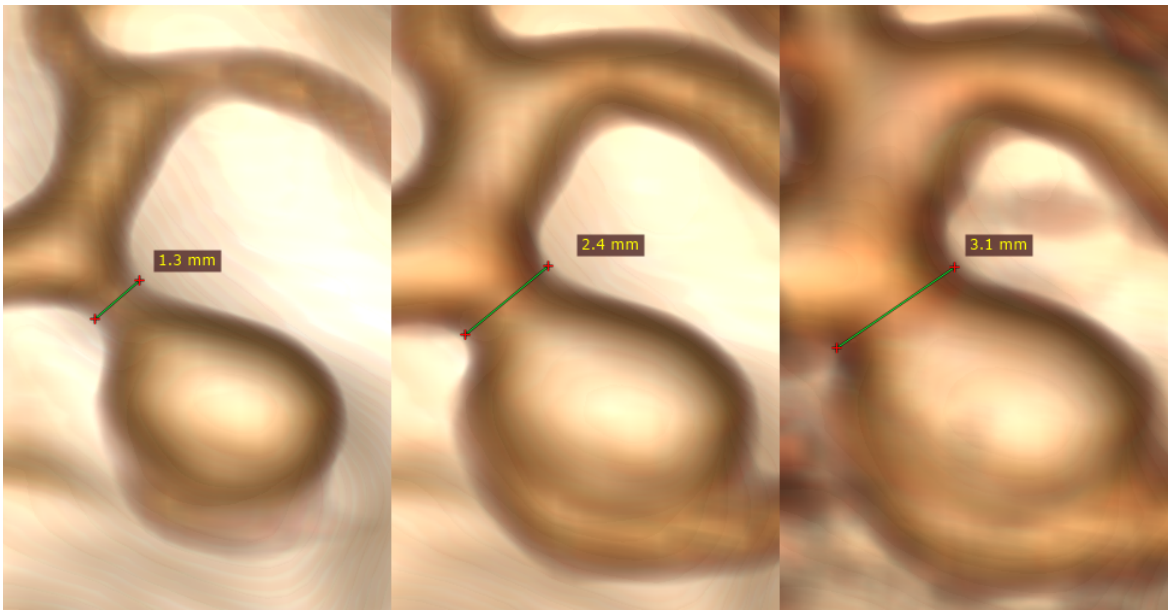
Caveats

The structures may appears thinner or thicker, depending on the window (color and opacity) adjustment.



The distance is measured between points lying in the plane parallel to the viewing plane. If the points are located at different depths, the displayed length is shorter than the actual distance.

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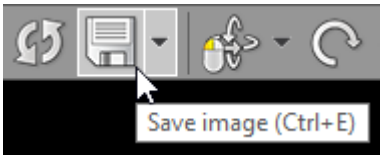
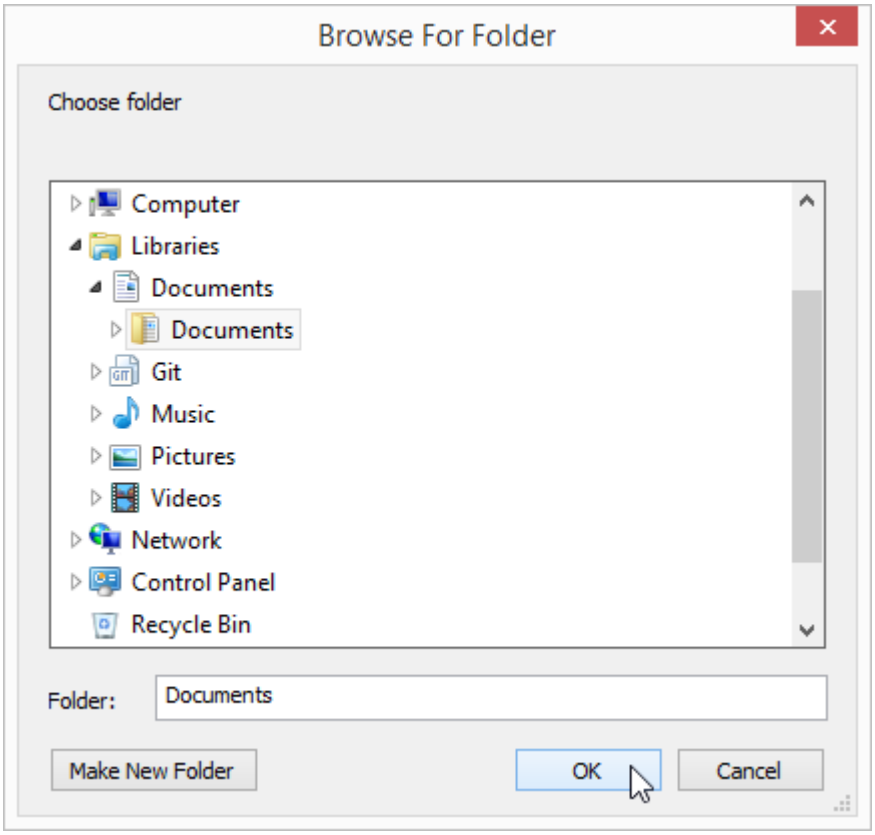
3.8.8 Exporting images

Saving JPEG images

Click the `Export` button or use `Ctrl + E` to save the displayed image as a JPEG file.



Browse for the destination folder and click `OK` to save the image.



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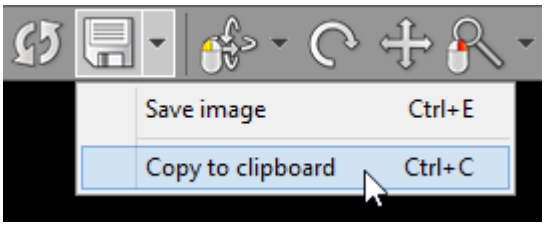
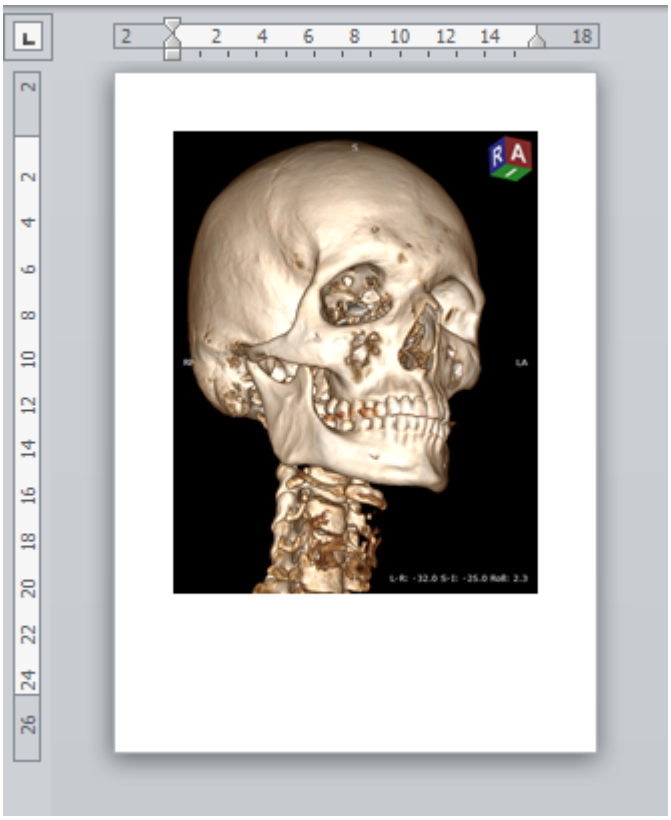
Copying to the clipboard

The displayed image can be easily copied to the Windows clipboard and then pasted into other Windows application such as Microsoft Word, PowerPoint, etc.

Click the Copy to clipboard in the Export drop-down menu or use the `Ctrl + C` shortcut.

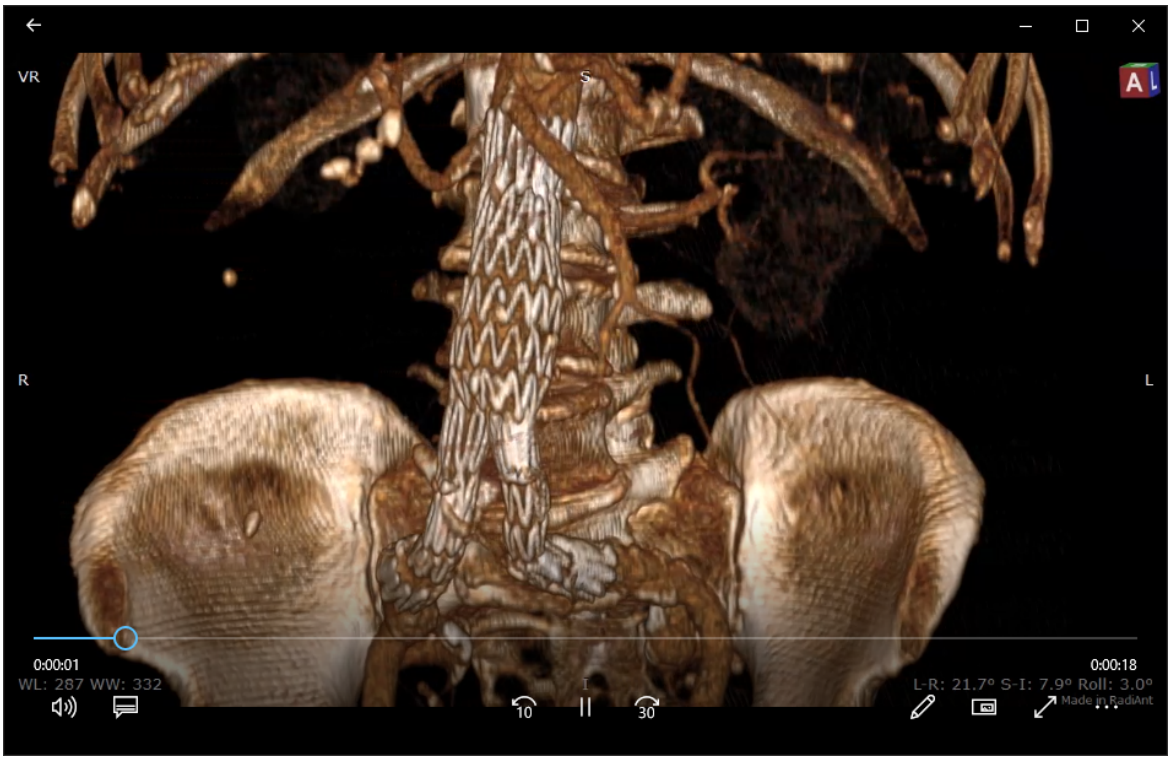


Switch to the application where you want to paste the image and click `Ctrl + V`



3.8.9 Exporting movies

3D volume-rendered objects can be animated and exported as movies.



Two types of movie creators are available:

Quick movie – allows for exporting movies with 360/180 horizontal/vertical object rotations.

Advanced movie – facilitates movie creation with arbitrary object rotations and other transitions based on 3D snapshots.

Movies can be exported to MP4 files on Windows 7 and newer systems. On Windows XP, only the WMV file format is available.

4K (3840 x 1920) resolution is available only on Window 10 systems. Older systems allow for exporting videos in maximum FullHD (1920 x 1080) resolution.

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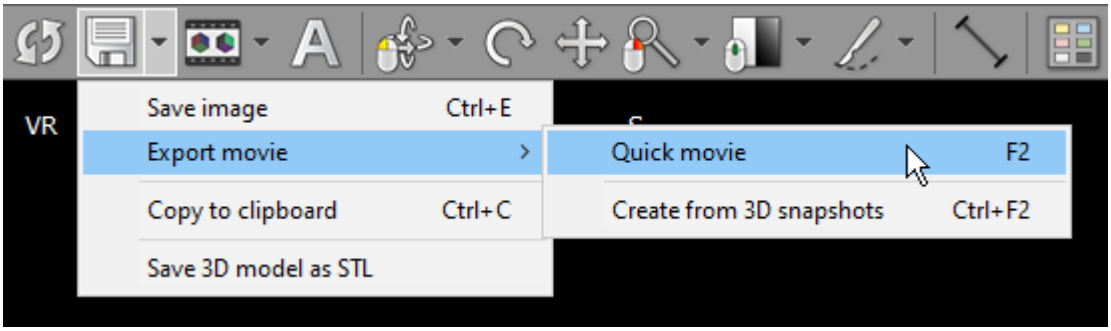
3.8.9.1 Quick movie

Select Export movie / Quick movie from the menu under the export button or press **F2**.

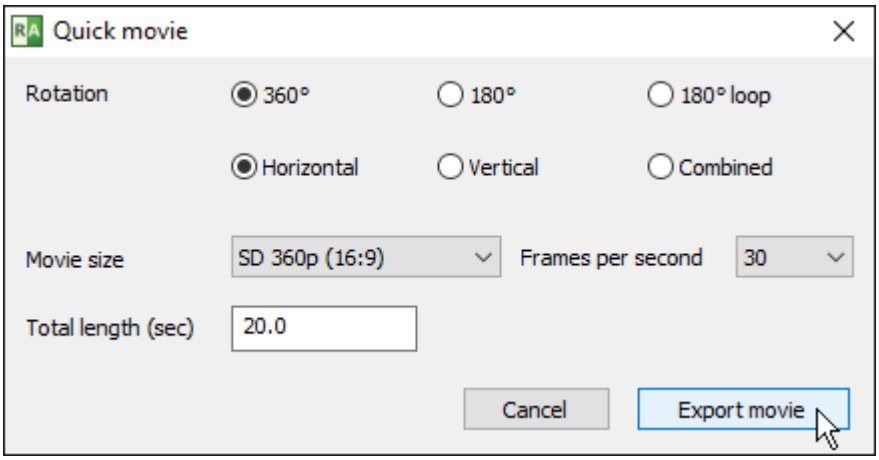


Choose the desired rotation range and plane:

- 360 – a full rotation is performed, starting from the current view
- 180 – the object is rotated 180 degrees, with its current view in the middle of the rotation
- 180 loop – the object is rotated 90 degrees, starting from the current view, then a 180-degree rotation in the opposite direction is performed before a 90-degree rotation then returns the object to its initial position

- Horizontal – object is rotated in the horizontal plane
- Vertical – object is rotated in the vertical plane
- Combined – object is first rotated in the horizontal and then in the vertical plane

Select movie resolution and speed (frames per second). Enter total movie length in seconds and click **Export movie**.



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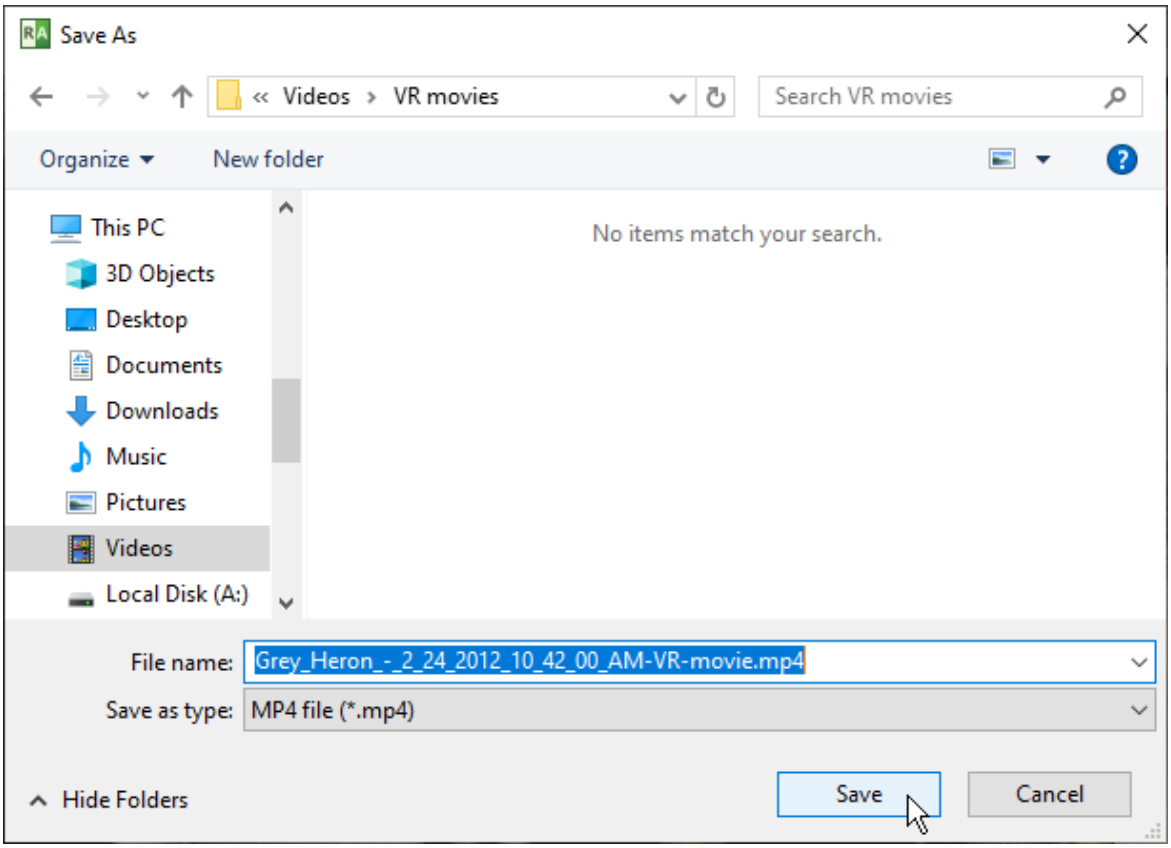
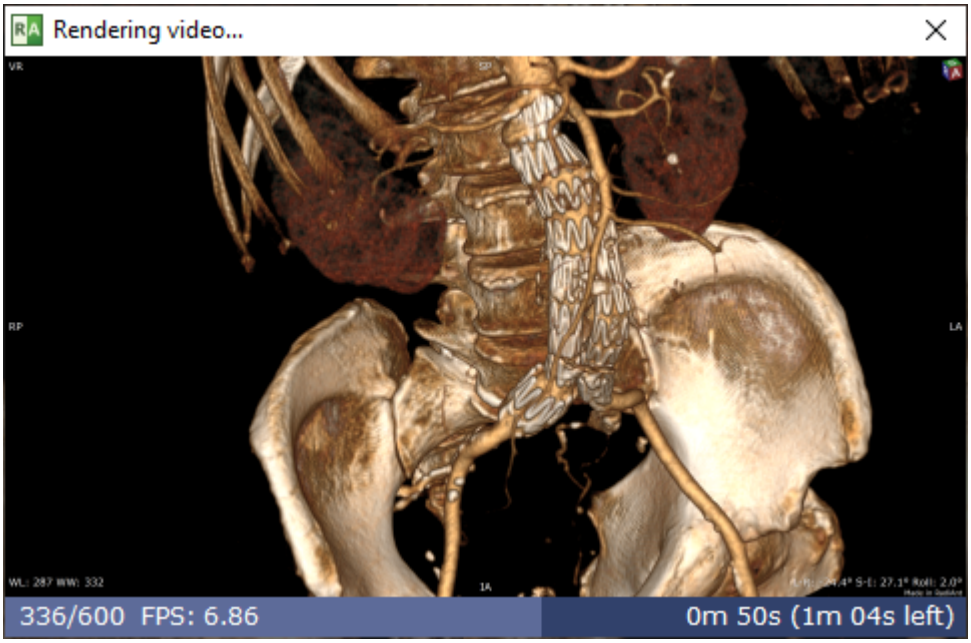
Choose the exported file location and name, then click **Save**.



The preview window will show export progress and the estimated finish time.



Note: on slower systems without GPU acceleration, when a high-resolution movie with many image frames is exported, the process may take many hours (or even days!) to finish.

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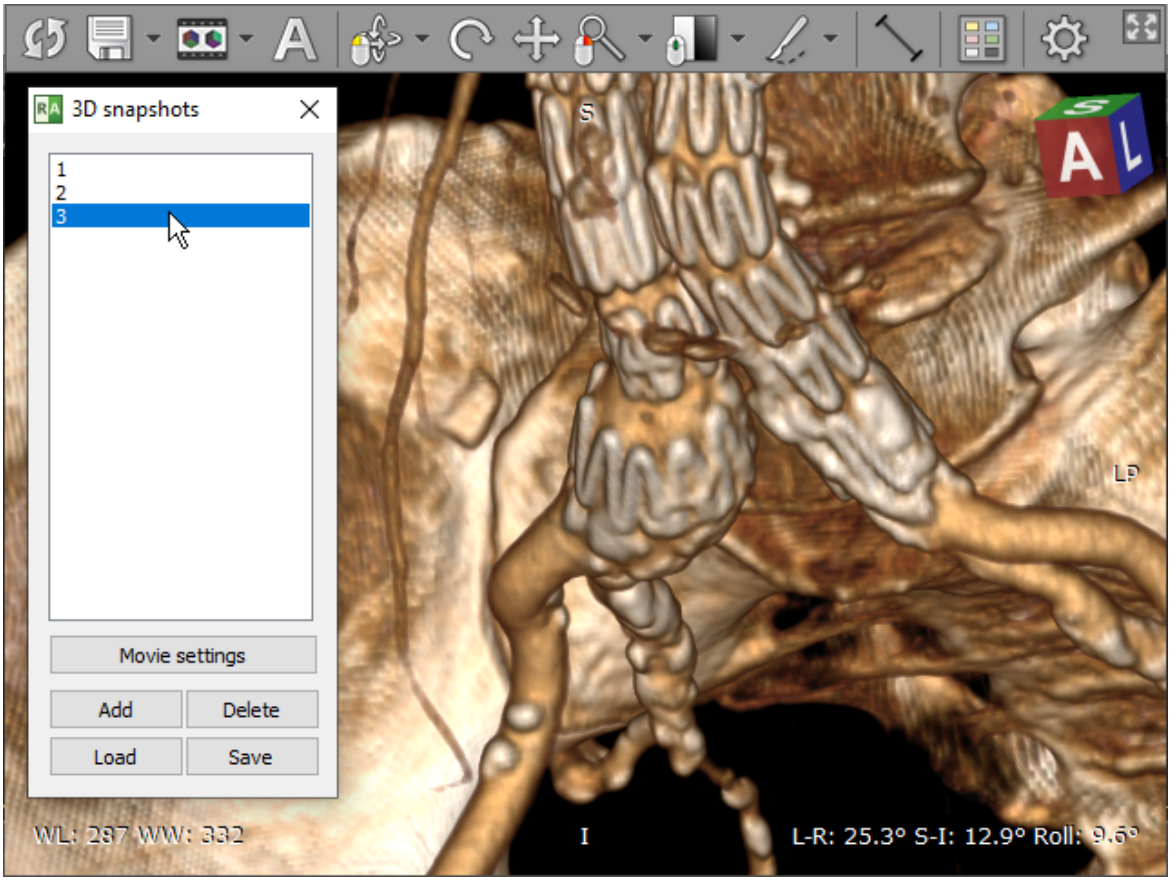
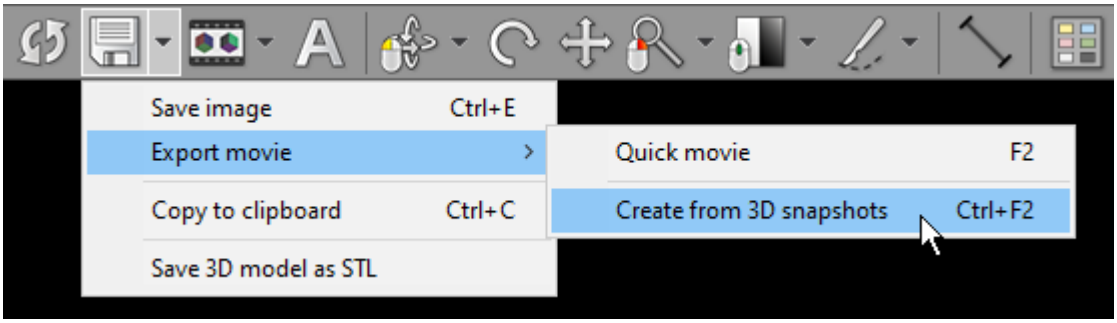
3.8.9.2 Advanced movie

Begin with creating the 3D snapshots that will serve as key-frames in your VR movie. The position, rotation, zoom settings, object colors and scalpel actions will be interpolated so that the transitions appear smooth in your movie.



Select Export movie / Create from 3D snapshots from the menu under the export button or press `Ctrl + F2`.



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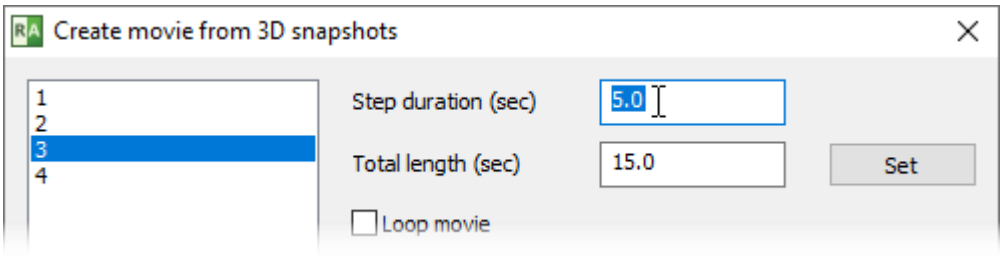
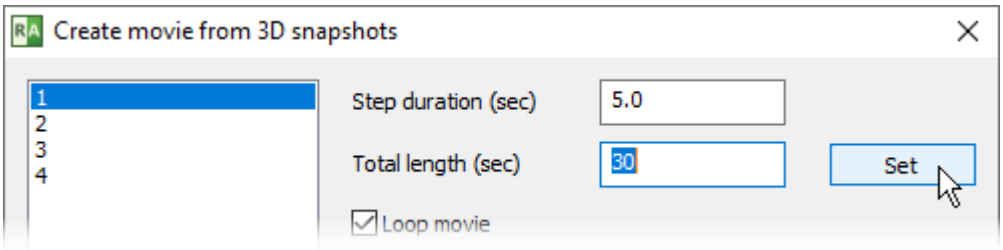
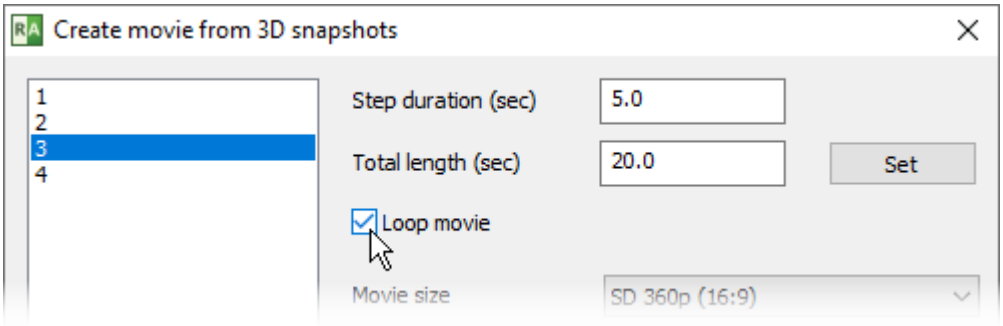
Adjust the length of each step by clicking the snapshot and entering the step duration value in seconds (5 seconds by default).



Enter the total movie length in seconds and click **`Set`**. The individual steps duration will be proportionally scaled to their original values.



To make the video end with the same image as it begins with, select **`Loop movie`**.



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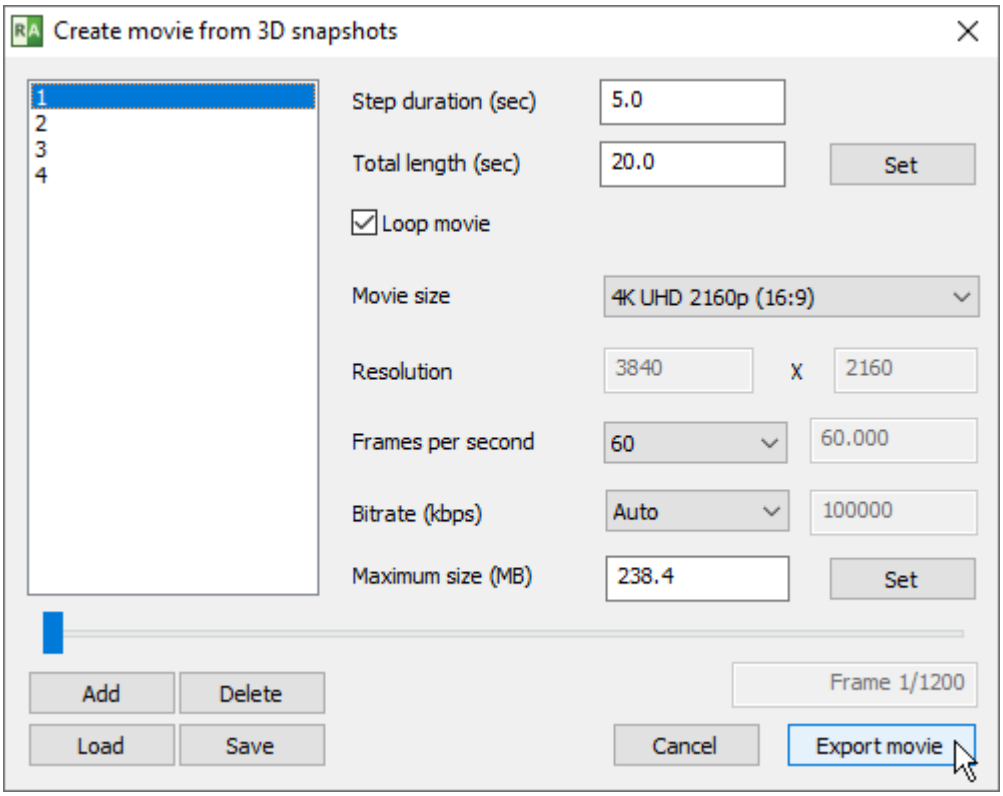
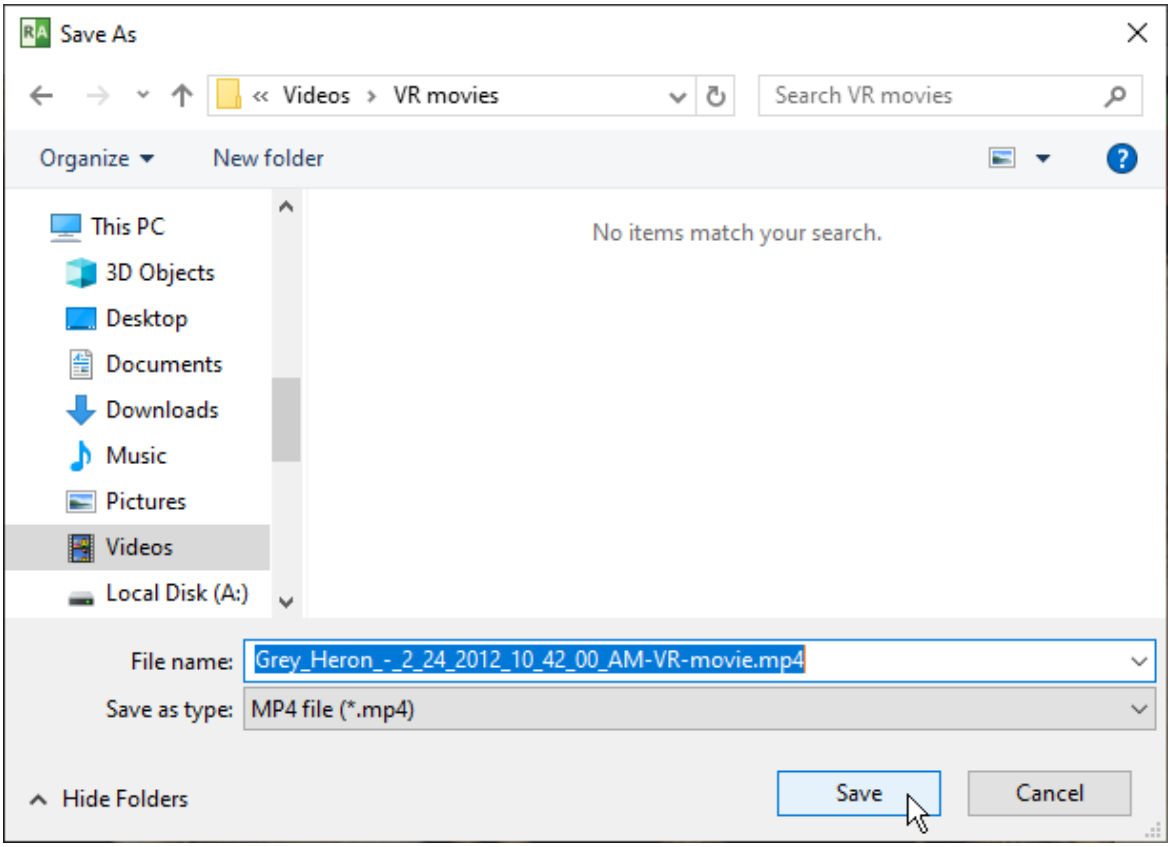
Select movie resolution, speed (frames per second) and bitrate (kilobits per second), then click **`Export movie`**.



Choose the exported file location and name, then click **`Save`**.



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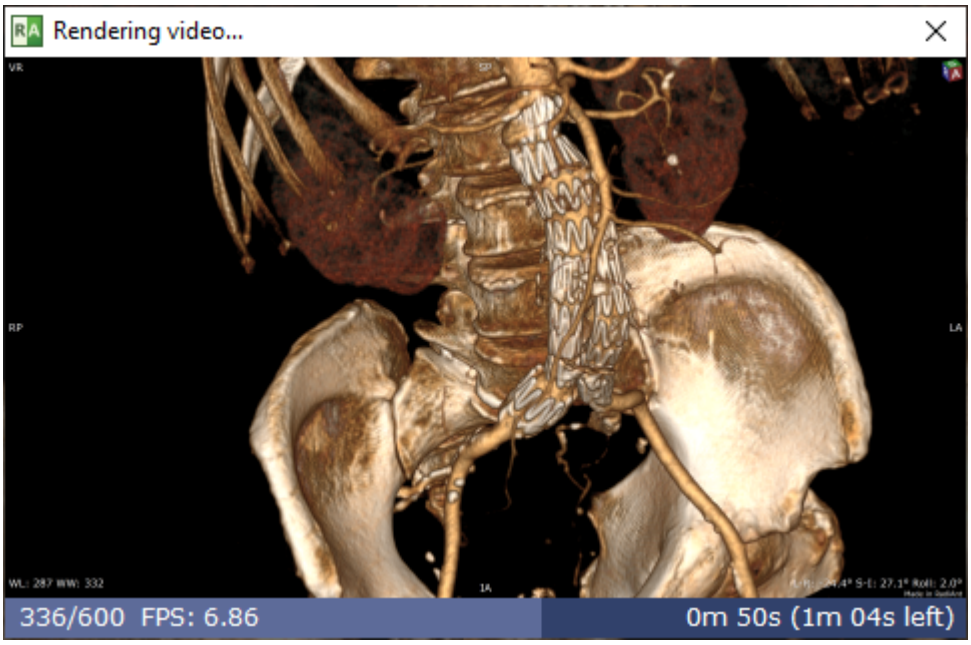
The preview window will show export progress and the estimated finish time.



Note: on slower systems without GPU acceleration, when a high-resolution movie with many image frames is exported, the process may take many hours (or even days!) to finish.

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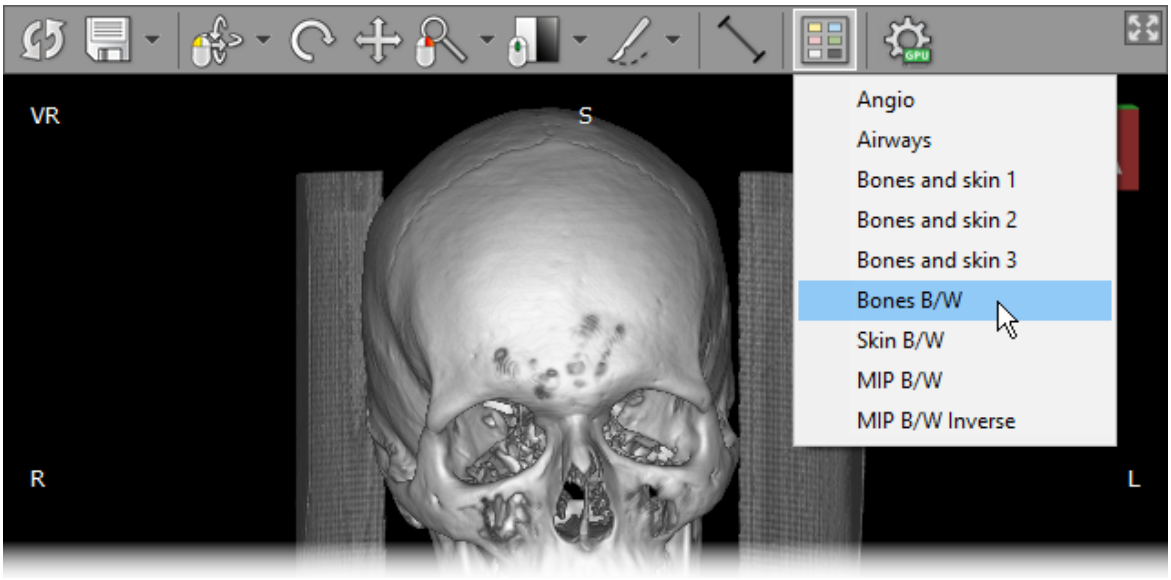
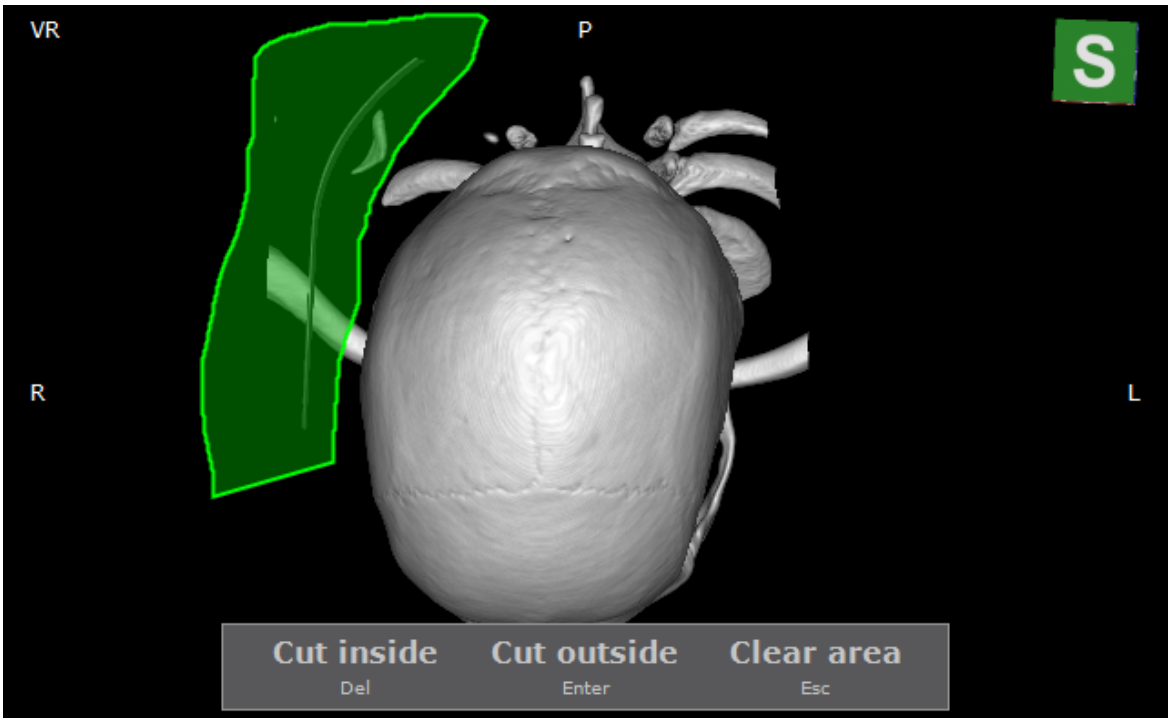
3.8.10 Exporting 3D models

3D models created in RadiAnt can be exported to STL files, which can be opened in alternative 3D modeling software and used for 3D printing.

1. Set the 3D preset to either Bones B/W or Skin B/W.



2. Adjust the window parameters and remove any unwanted elements. All visible objects will be included in the STL file.



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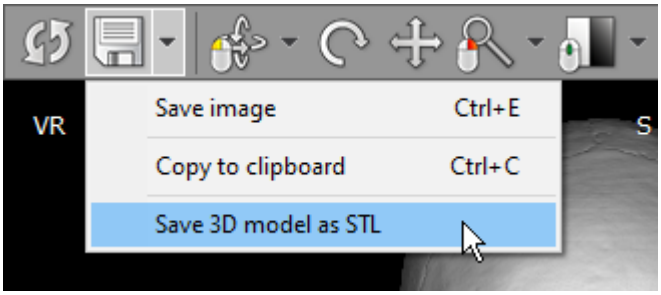
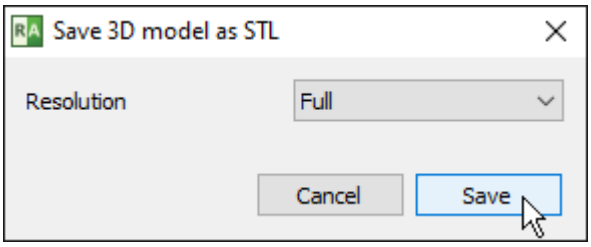
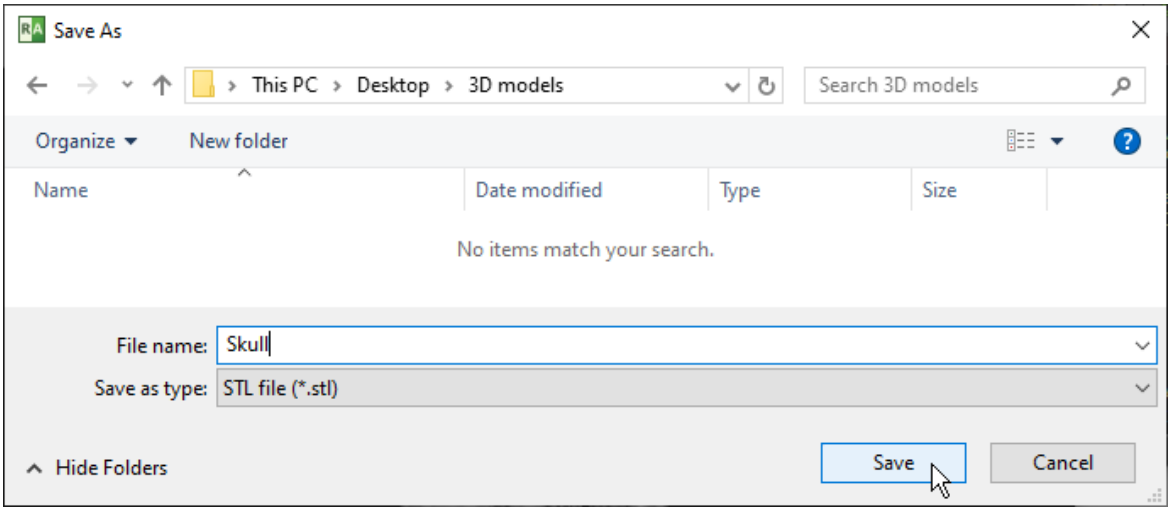
3. Click the **Export** button and select the Save 3D model as STL option.



4. Select the resolution of the exported object and click **Save**.



5. Select the destination folder and enter the file name. Click **Save**.



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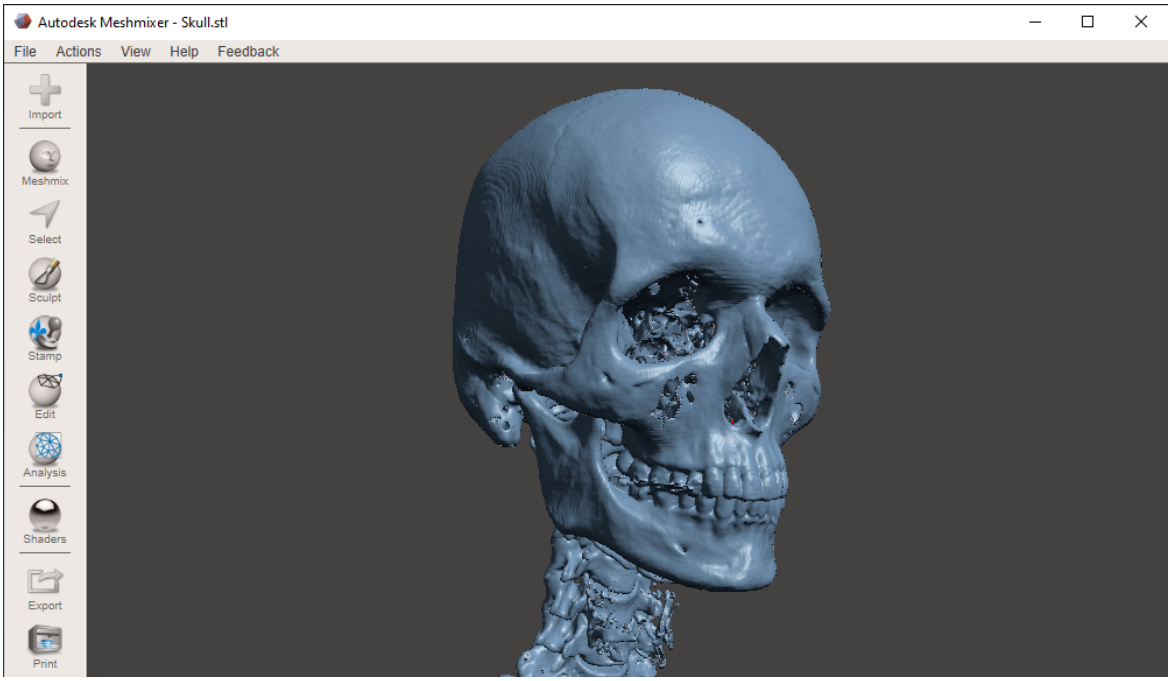
6. You can now open the exported file in third-party 3D modeling/printing software.



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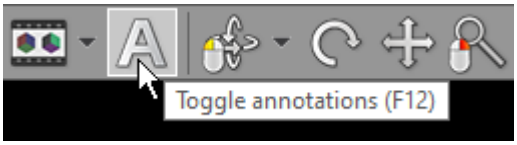
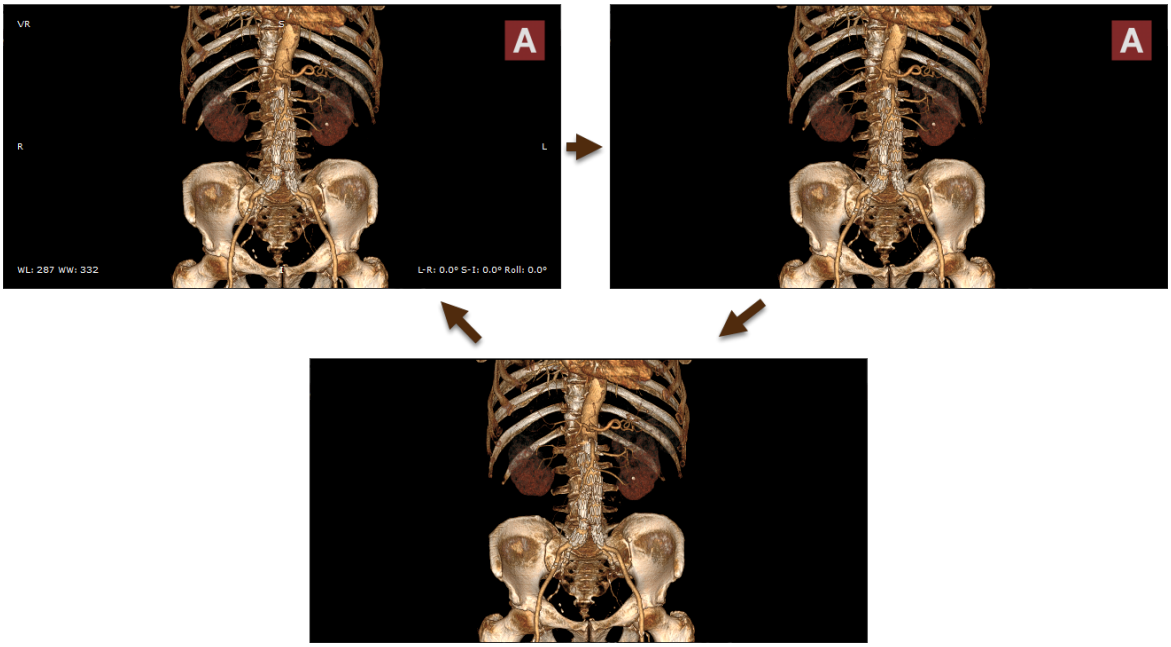
3.8.11 Annotations

Annotations and the direction cube can be turned off and on by clicking the **Annotations** button on the toolbar or pressing **F12** key.



Click the button once to hide annotations, click again to hide the direction cube and leave only the volume-rendered object. To restore the default view, click the button once again.



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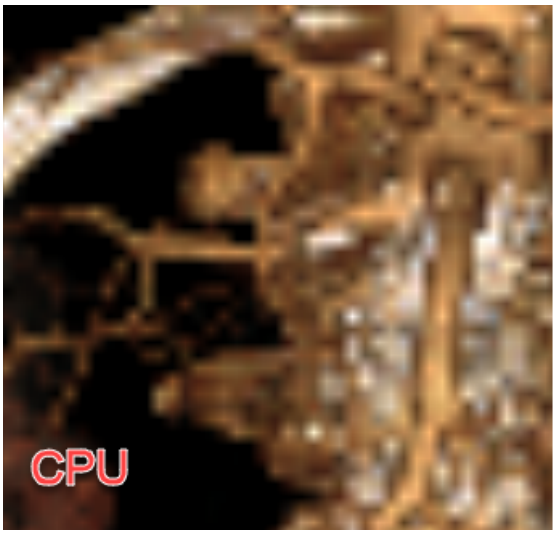
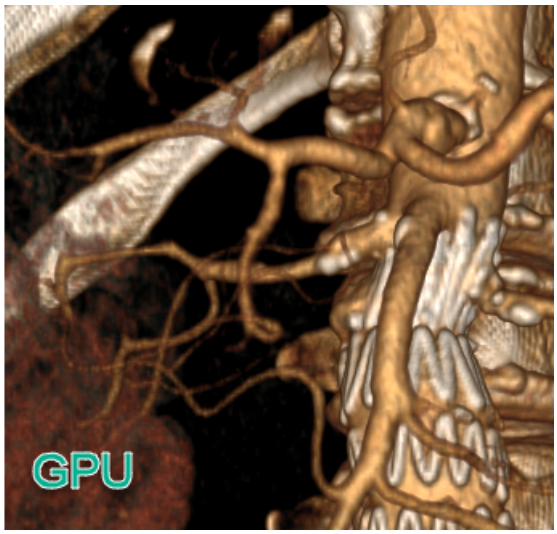
3.8.12 Settings

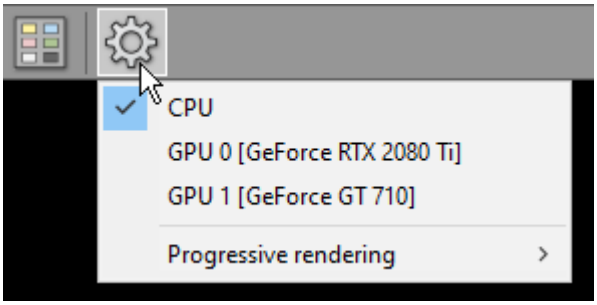
Enabling GPU acceleration

The GPU acceleration feature allows you to utilize modern Nvidia GPU to make more fluid and detailed interactions in the 3D VR window.



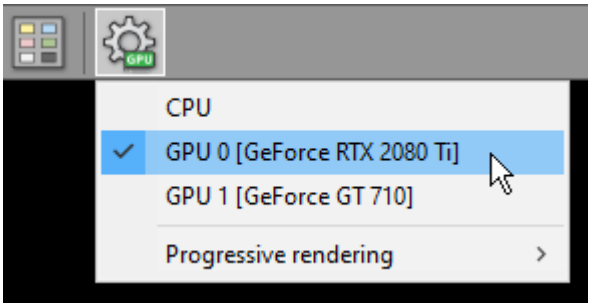


Click the `Settings` button to show the CPU/GPU mode selection menu.



If a compatible Nvidia GPU is detected in your system, you will be able to select it from the list.

After GPU is successfully enabled, there will be a green GPU indicator overlaid on the settings toolbar button.



Select CPU when you want to switch back to CPU rendering mode.

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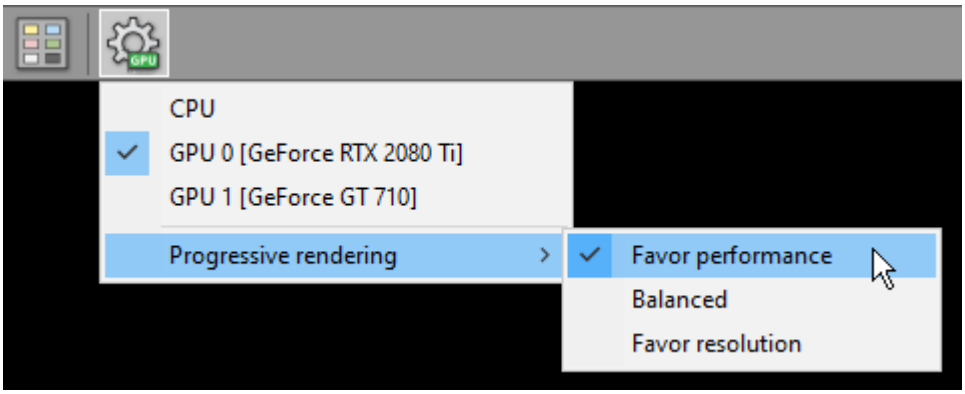
Progressive rendering

To maintain fluid interactions with the volume-rendered object, progressive rendering is implemented. This means that the image quality is worse during interactions and progressively improves when the object is static.

By default, the most fluid mode is used (with the lower image quality during interactions). You can change this and get better image quality with less responsive interactions being the trade-off.

Click the **Settings** button and select Progressive rendering. Select Favor performance, Balanced, or Favor resolution to set your desired mode.



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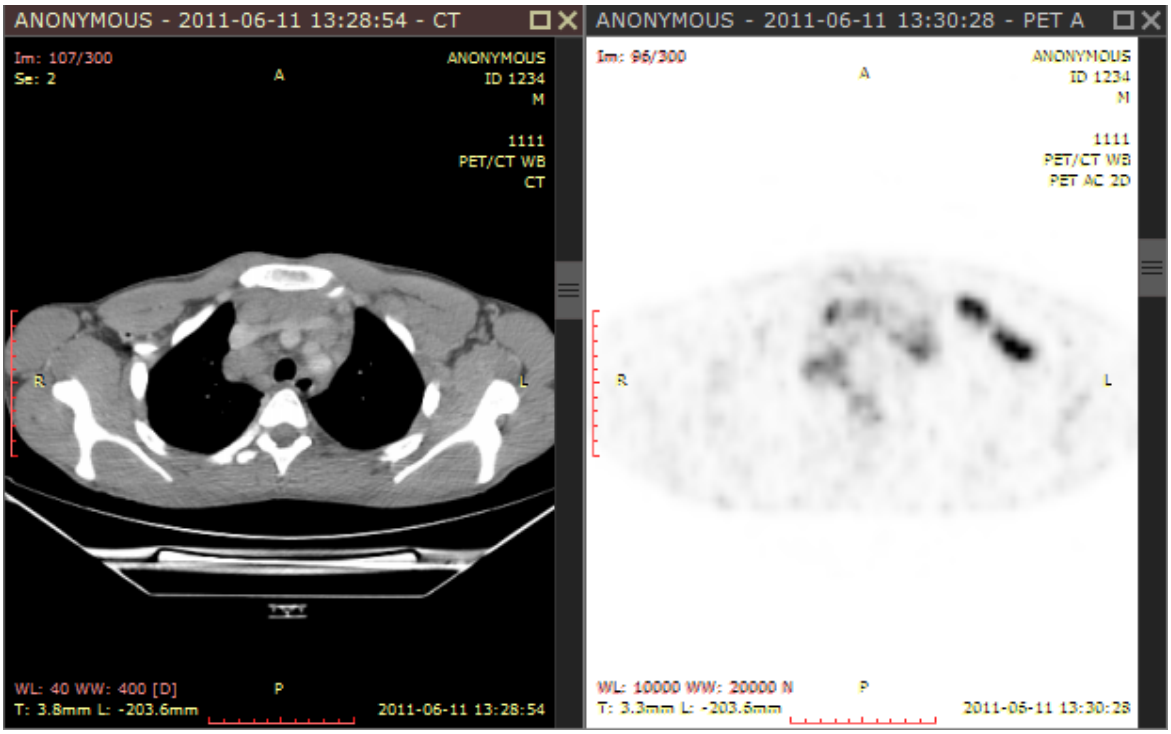
3.9 Image fusion (PET-CT)

Image fusion allows you to overlay a color-mapped PET image onto a CT scan in order to obtain anatomical references for regions with increased FDG (fluorodeoxyglucose) uptake values.
This tool can also be applied to other imaging modalities, such as Magnetic Resonance, (e.g., DWI images can be fused with T1 or T2-weighted scans).

Enabling fusion

1) Use the screen splitting tool to open CT and PET series in two panels.

2) Activate the panel with CT series by clicking the image it contains or its title bar.



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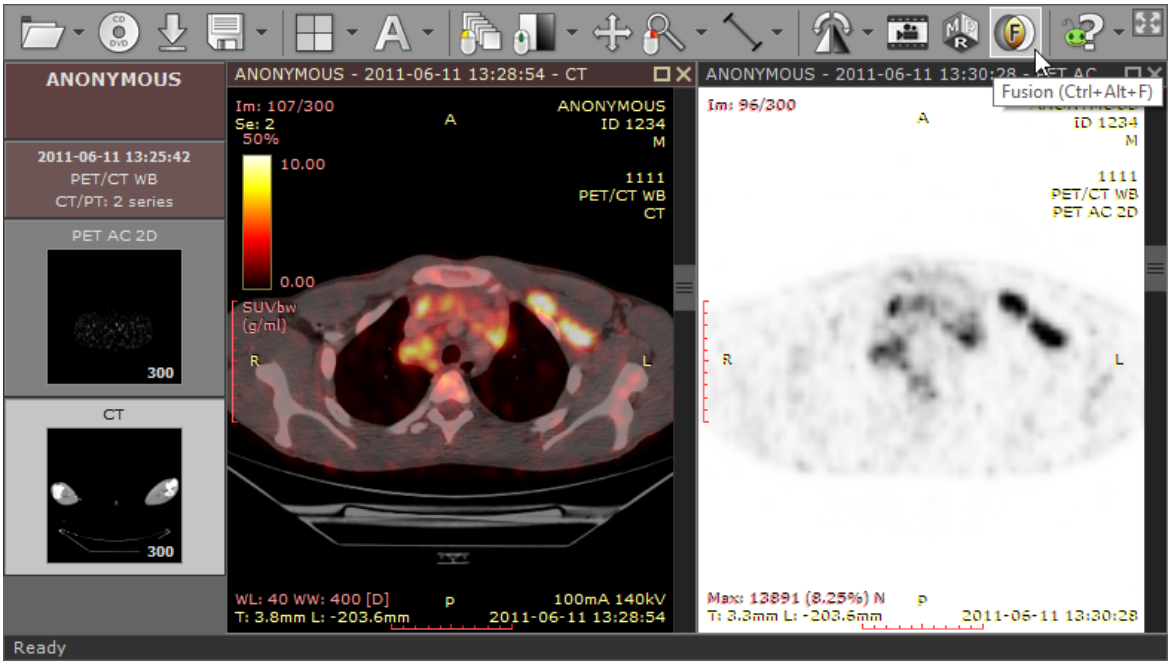
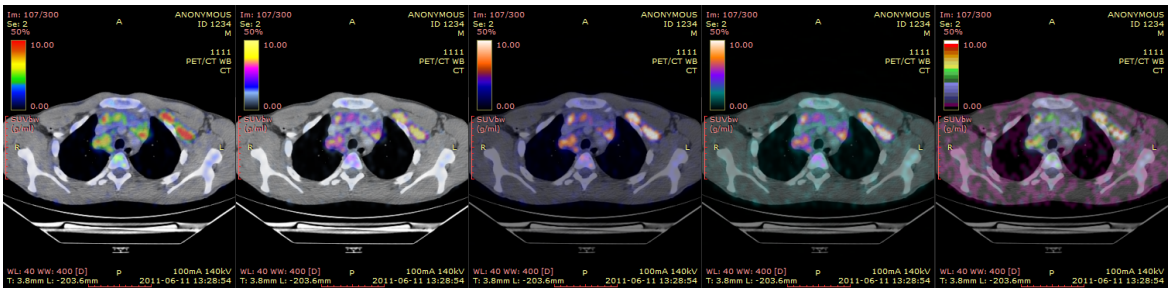
3) Click the `Fusion` button on the toolbar or use the `Ctrl + Alt + F` shortcut.



Color scale

The default color scale used for rendering a fused image is set to "Hot iron". It can be changed by clicking a bar with a color scale to the left side of the image.



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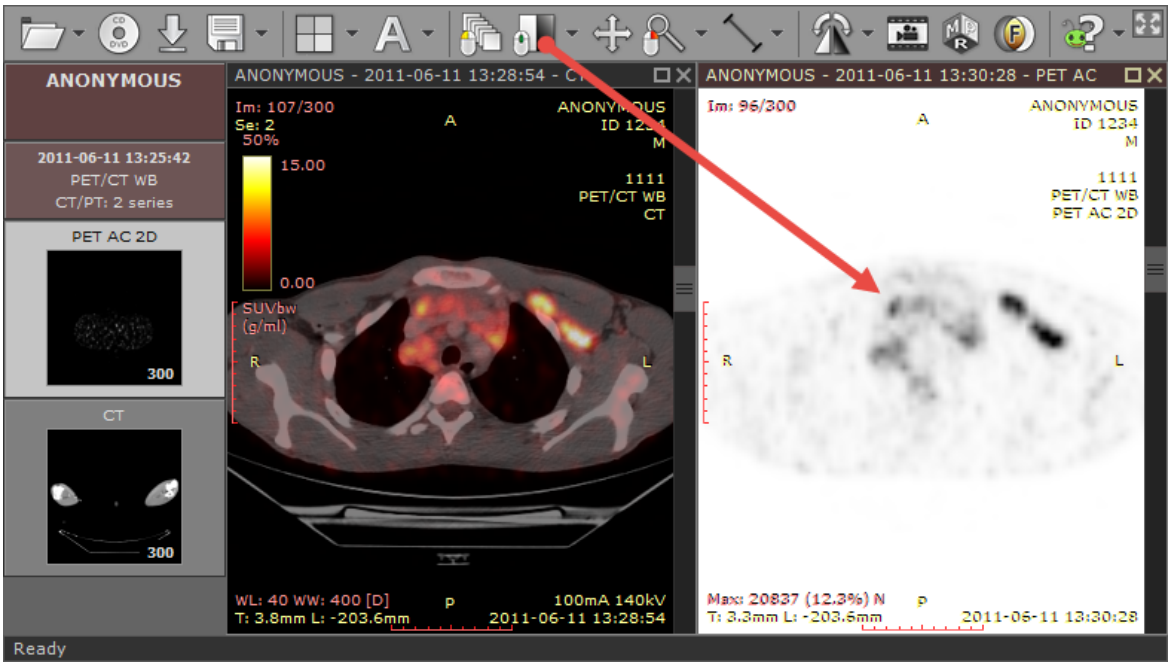
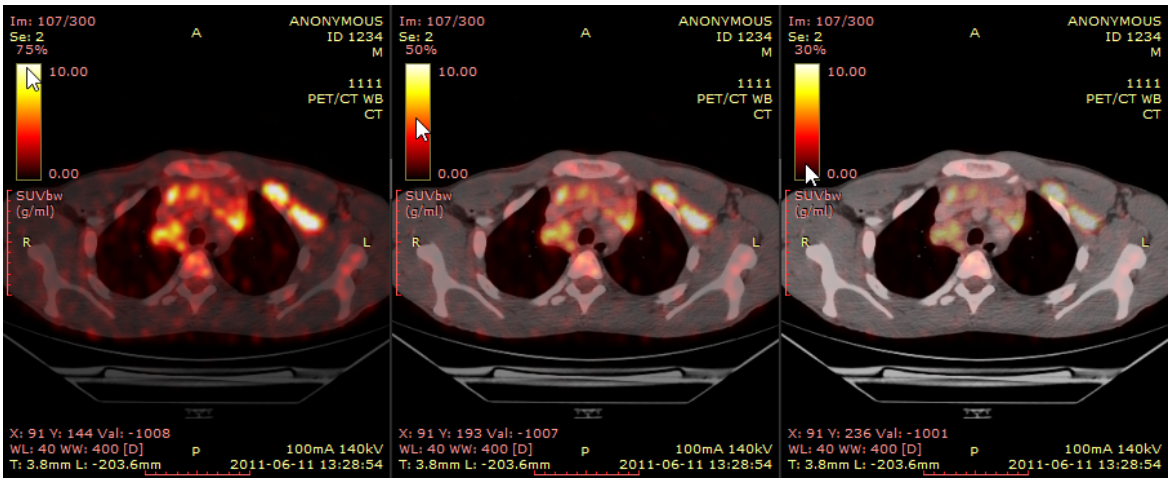
The range of values represented on a color scale is adjusted by using the windowing tool in the panel with the series used as overlay (PET).



The opacity of fused images is adjusted by pressing the left mouse button over a color scale bar and dragging the mouse up to increase opacity or down to make the fused image more transparent.



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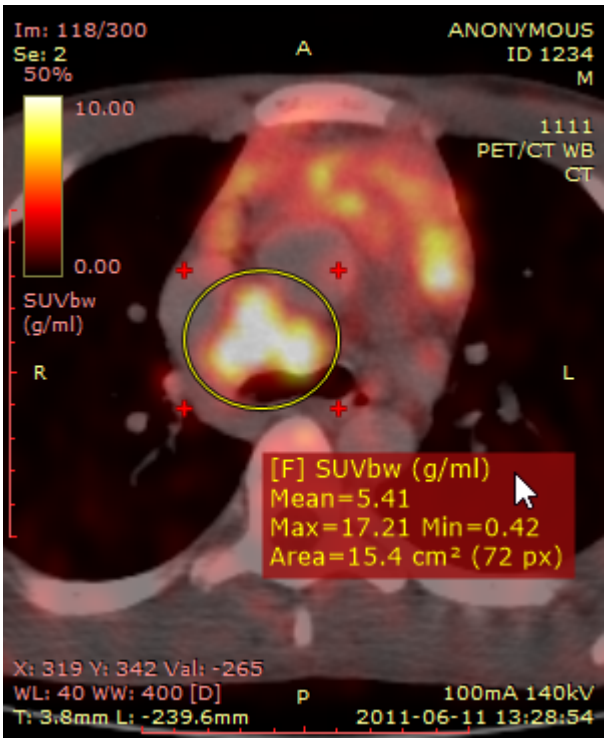
SUV measurement

Use the ellipse tool in the panel with fused images to measure maximum, minimum and average values of SUVbw (Standardized Uptake Value calculated using body weight) for a specified area.



The SUV measurement is possible only when there is necessary data included in the DICOM files (patient weight, radio pharmaceutical dose and time, etc.), otherwise, the ellipse tool will show the uptake measured in Bq/ml (or in other units specified in the 0054,1001 DICOM tag).

The SUV calculation is based on the formula below:

$$SUV_{bw} = \frac{A_c}{D * 2^{\left(\frac{-\Delta t}{T_{\frac{1}{2}}}\right)}} * W$$

Ac	Activity concentration (Bq/ml)
D	Injected dose (Bq)
W	Body weight (g)
Δt	Delay between the injection time and the scan start time (s)
$T_{1/2}$	Half-life of the radionuclide (s)

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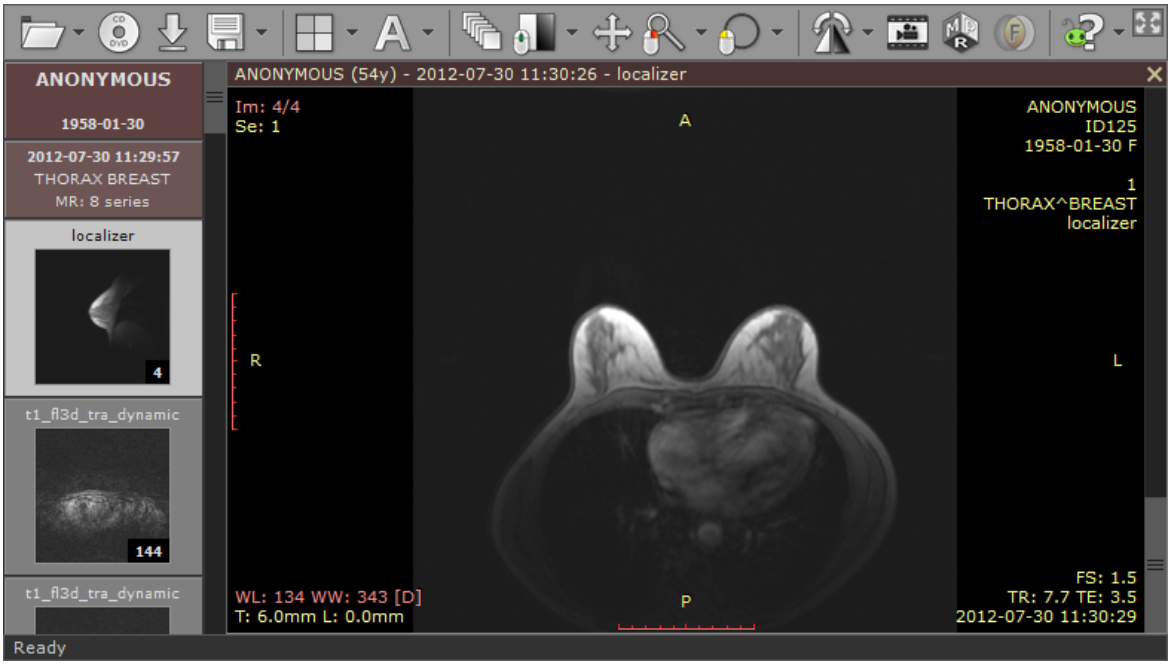
3.10 Time-intensity curves (TIC)

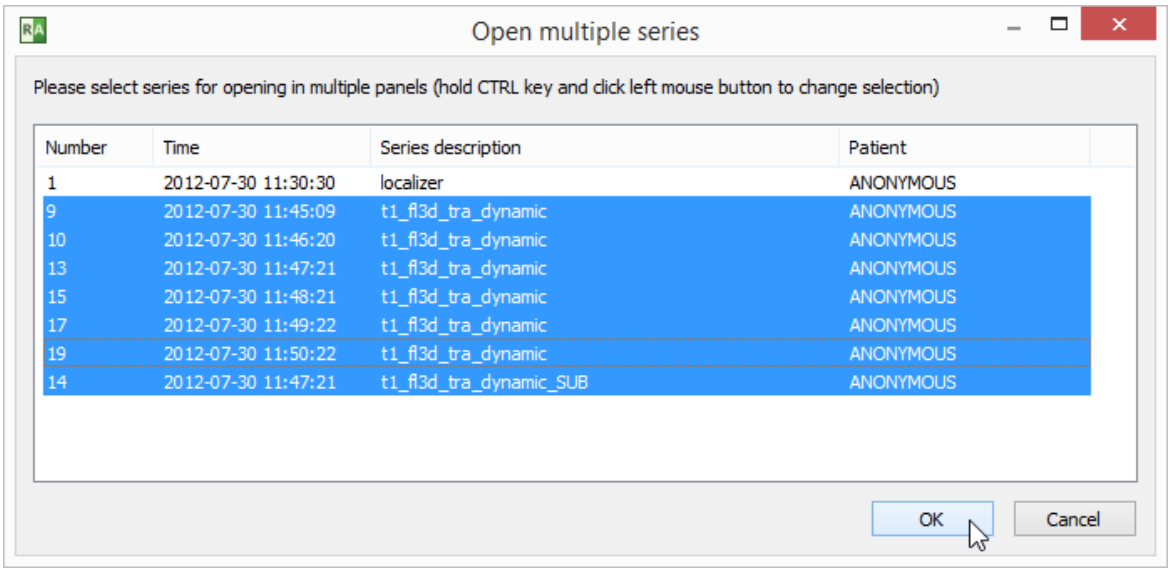
The time-intensity curve tool allows you to visualize the lesions' enhancement behavior (e.g. in Breast MRI) by plotting the signal intensity values over time after the administration of contrast material.

Plotting time-intensity curve

1) Open a study with dynamic sequences.



2) Press **F4** to show the "Open multiple series" window, select the dynamic series (including the unenhanced one). A series with subtraction enabled will also come handy to quickly localize lesions.



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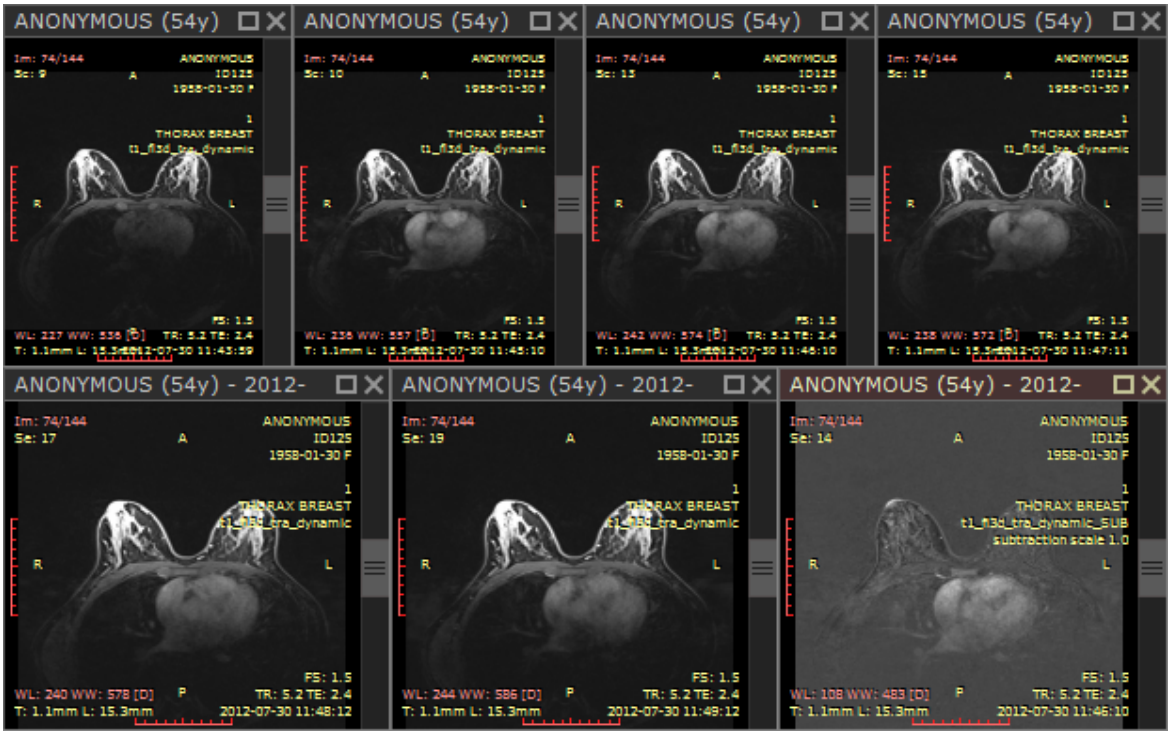
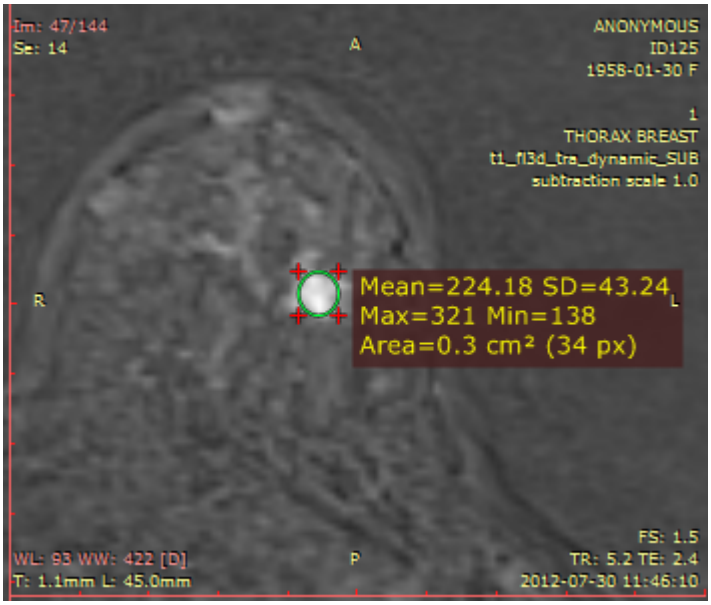


3) Find a lesion that you would like to analyze and draw an ellipse over it.



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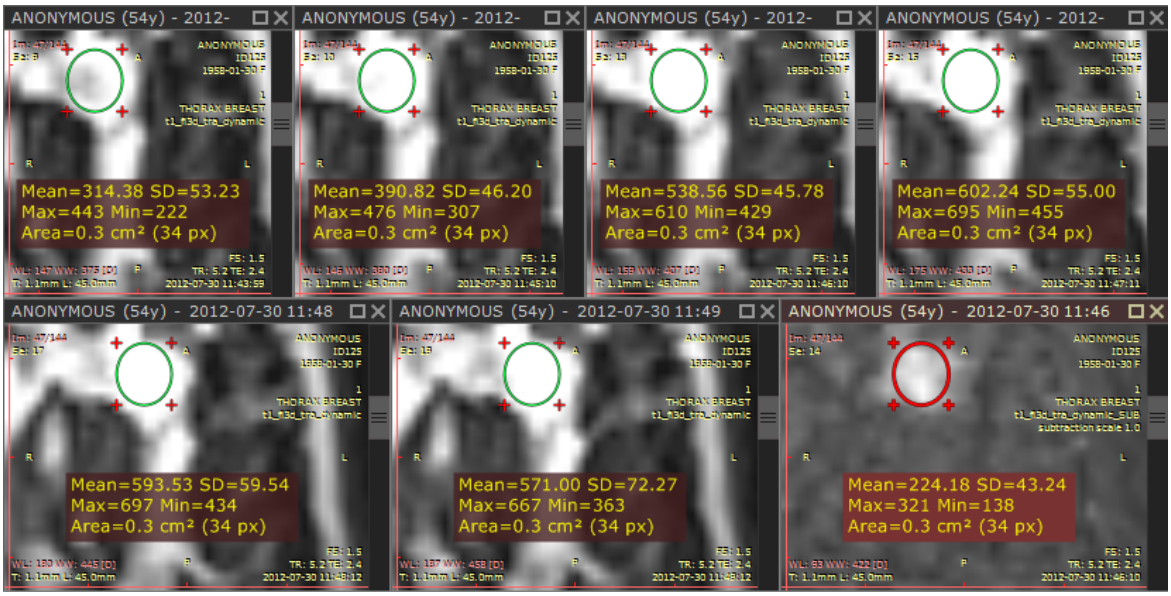
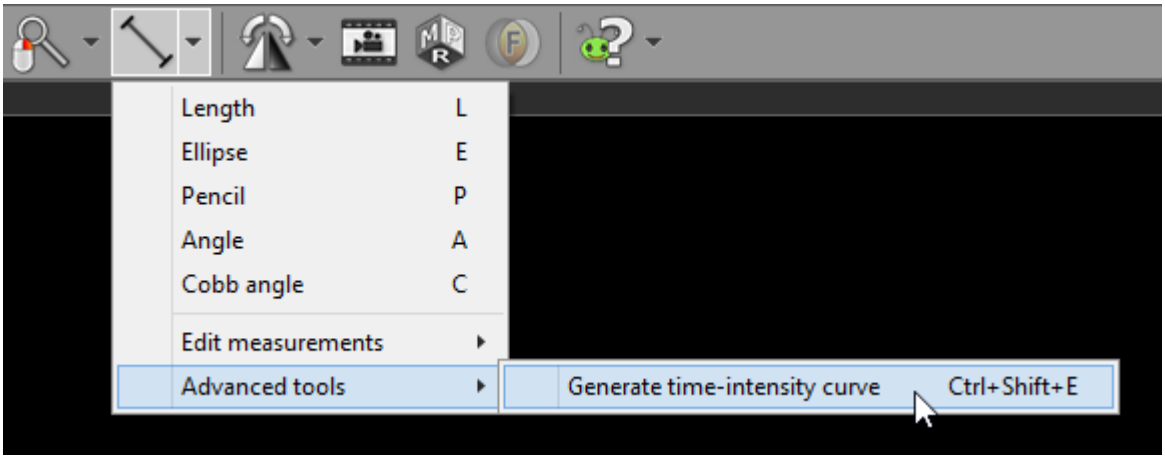
4) Quickly duplicate the ellipse ROI into other series by using the `Ctrl + Shift + D` shortcut.



5) Select Time-intensity curve from Advanced tools or use `Ctrl + Shift + E` .



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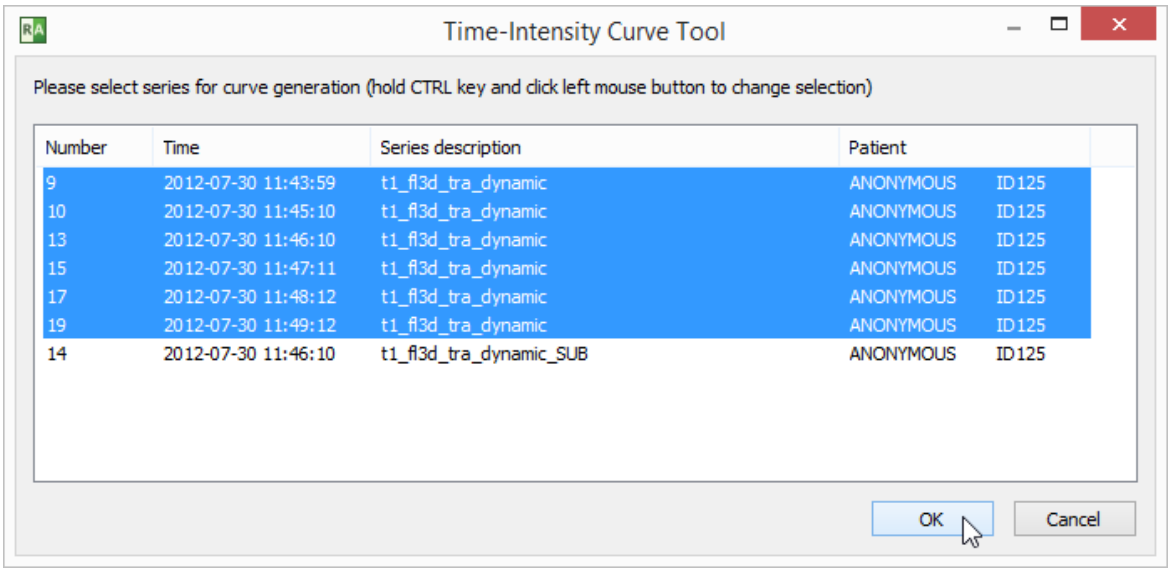
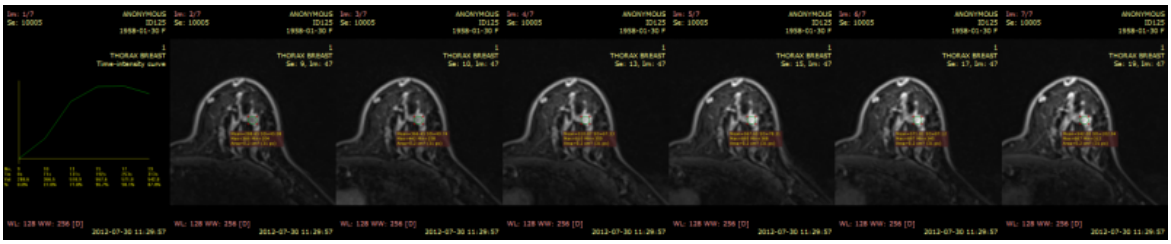
6) RadiAnt DICOM Viewer selects the series for curve generation automatically.
Make changes to the selection if you want to use other series. Click **OK** to confirm the selection and generate curve.



7) A new panel will be added. It contains the time-intensity curve and screen captures of the region in dynamic series used for calculations.



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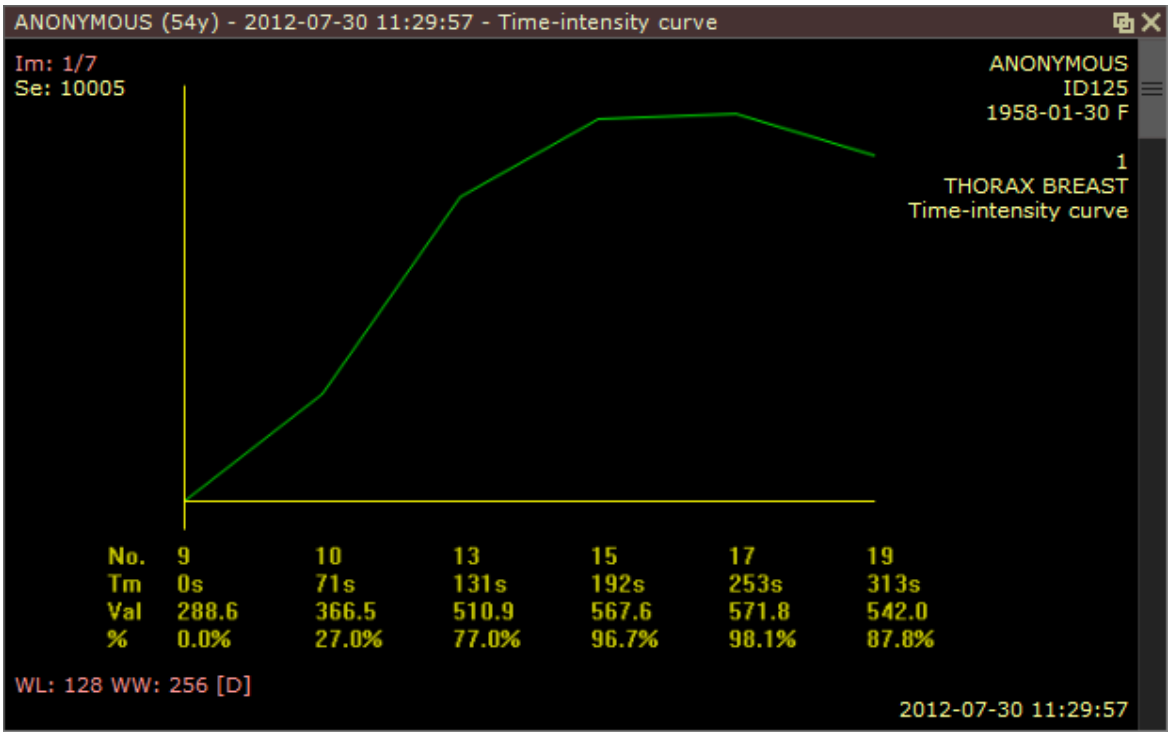
8) Maximize the panel (double-click it) to see the detailed curve.



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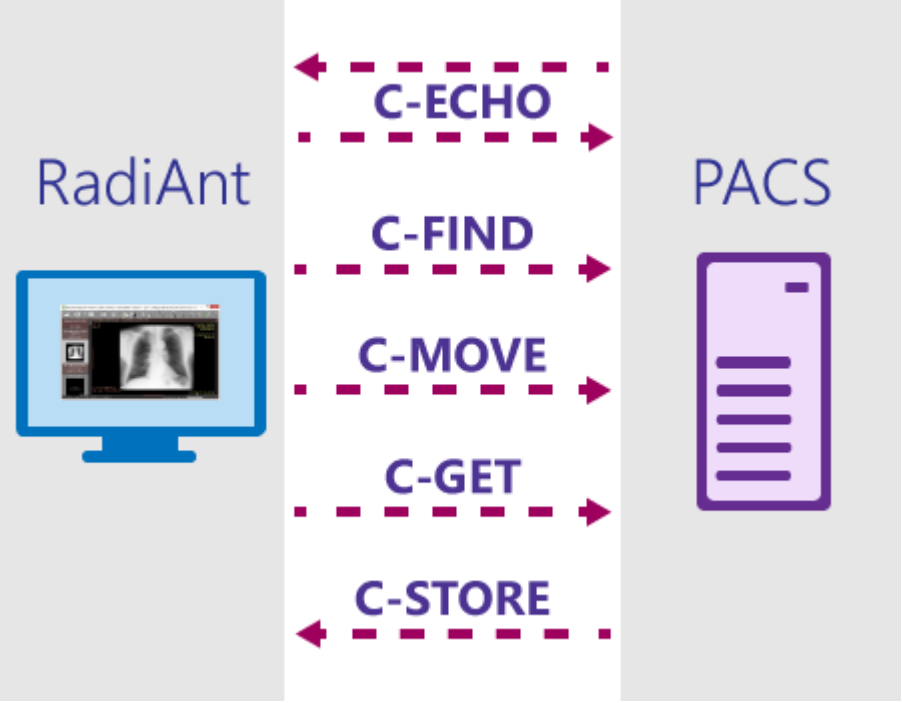
3.11 PACS connectivity

The PACS (Picture Archiving and Communication System) client feature lets the RadiAnt DICOM Viewer query and retrieve studies from other PACS hosts.

Supported service class users/providers are:

- C-ECHO SCU
- C-ECHO SCP
- C-FIND SCU
- C-MOVE-SCU
- C-GET-SCU
- C-STORE-SCP (Only transfers initiated from the RadiAnt DICOM Viewer are accepted. If you try to send studies from other PACS nodes without searching them first and starting the download in RadiAnt, they will be ignored).

Received DICOM files can be stored either in a local database or in a temporary folder (in such case the files are deleted when RadiAnt closes).



- Searching and downloading studies
- Configuration
- Troubleshooting

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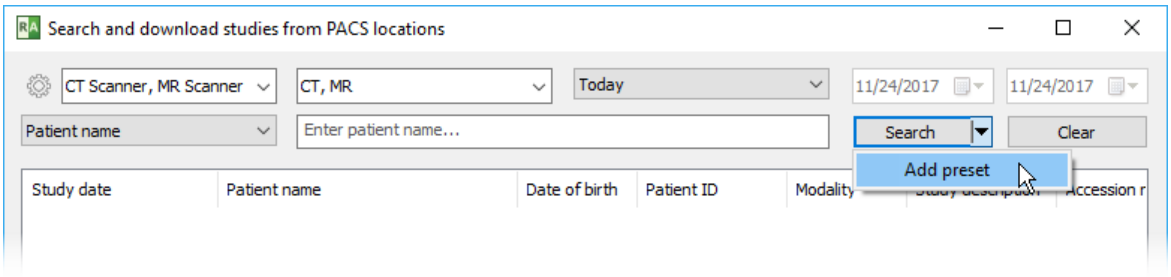
3.11.1 PACS search presets

The parameters of any searches you perform on a frequent basis can be saved as presets.

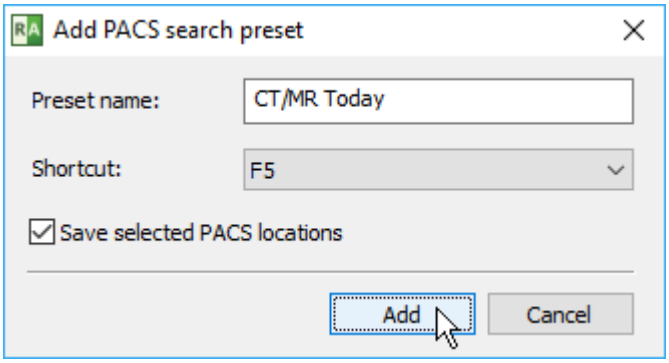
To add a search preset, choose the parameters you want to save (PACS locations, modalities, dates), click the arrow next to the **Search** button, and select Add preset.



Enter the name of the preset you would like to see displayed in the drop-down menu under the **Search** button.
You can also assign a keyboard shortcut so that you can quickly perform a search with a chosen preset by pressing the **F2 - F12** keys.

Check the Save selected PACS locations box so that the currently chosen PACS locations are saved within the preset.
If you leave this box unchecked, the PACS locations will not be changed after the preset is clicked.

Press **Add** to save the search preset. If you hold the **Shift** key down while adding the preset, a spacer will be added before the preset in the drop-down menu.



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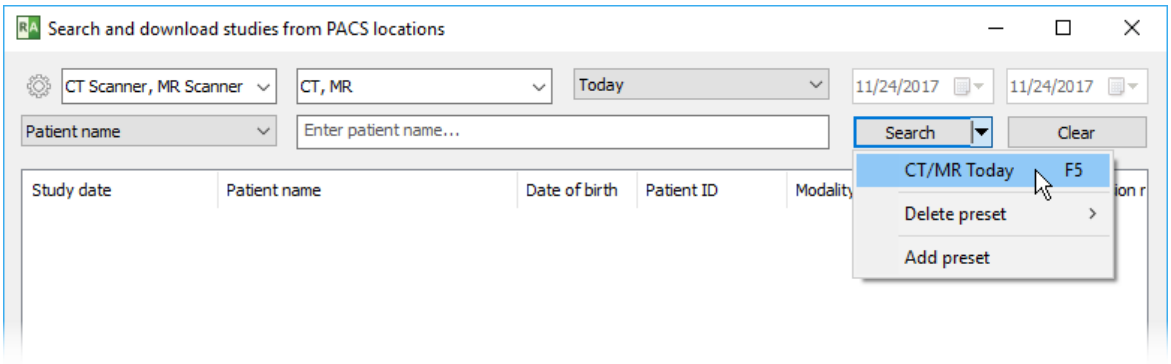
To perform a search using a saved preset, click the arrow next to the **Search** button and select it from the menu.
You can also use a keyboard shortcut if it was assigned when adding the preset.



To delete a preset, select Delete preset from the drop-down menu and then click the name of the preset you want to remove.

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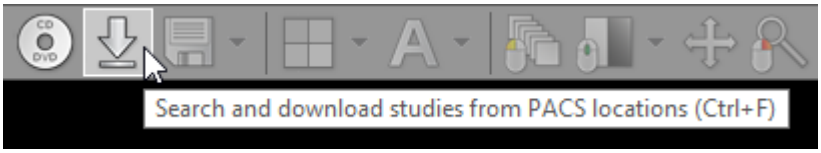
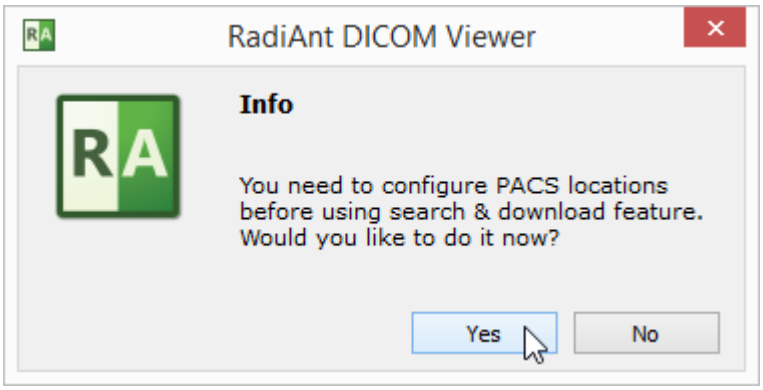
3.11.2 PACS configuration

Basic settings

Open the PACS search and download window:

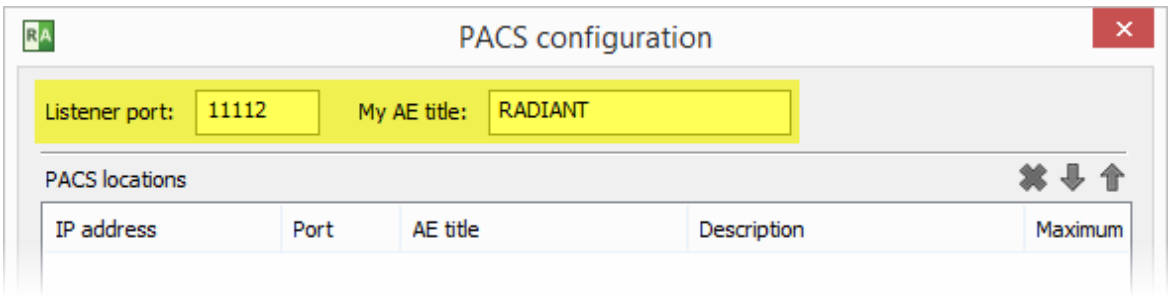


If you do this for the first time, you will be asked to configure PACS settings:



If the configuration was already performed, you have to click the options icon or use the shortcut `Ctrl + O` to change PACS settings.

Each networked DICOM application is characterized by three basic parameters: IP address, port and AE (Application Entity) title. The IP address is configured via system network settings. The port on which RadiAnt listens for PACS connections and the AE title are configured in RadiAnt. By default, the port is set to 11112 and the AE title to RADIANT.



Remember to configure your PACS server with the IP, port and AE title of RadiAnt DICOM Viewer. Otherwise, you will not be able to search and download studies to RadiAnt from this server.

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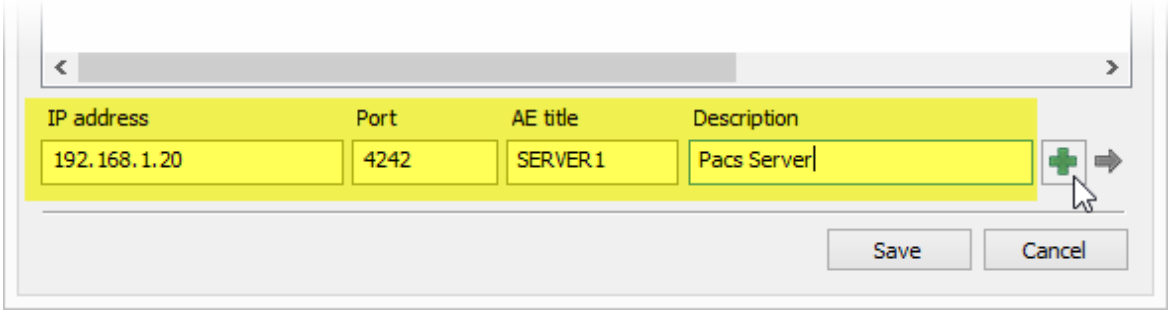
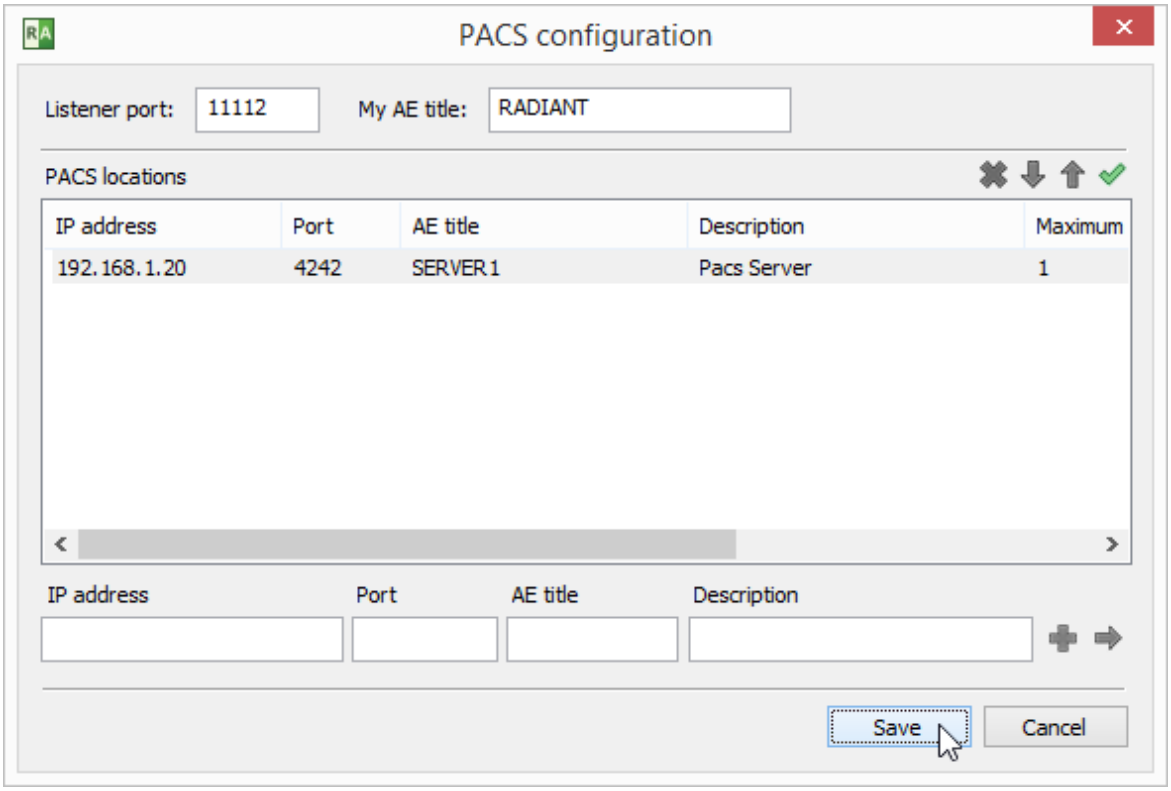
Adding a PACS host

To add a new PACS location, the AE parameters (IP, port and title) of the server are needed. Enter them in the fields below, add a description and press **Enter** or click **Add**.



After clicking **Save**, you are ready to perform your first search and download.



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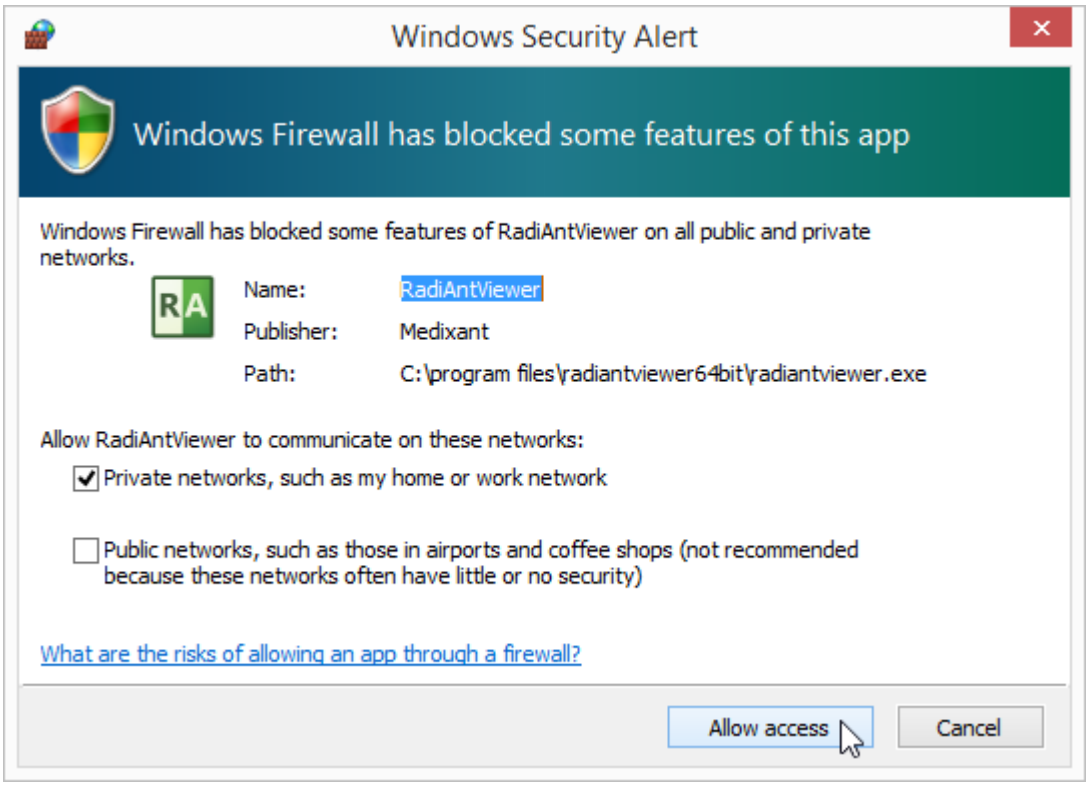
If this is your first configuration and Windows Firewall is enabled, you will be asked to unblock network communication for RadiAnt. Click **Allow access**; otherwise, you will not be able to download DICOM studies from PACS locations.



Verifying PACS hosts (C-ECHO)

After a new PACS location is added to the list, a proper configuration and network connectivity can be verified using the C-ECHO DICOM service.

Click the button or press **F2** to perform a DICOM ping (C-ECHO) on all hosts in the list.
The locations awaiting verification will be presented with a yellow background.
After positive verification, the host's background becomes green.
If the connection and association with a host cannot be established, the background turns red.

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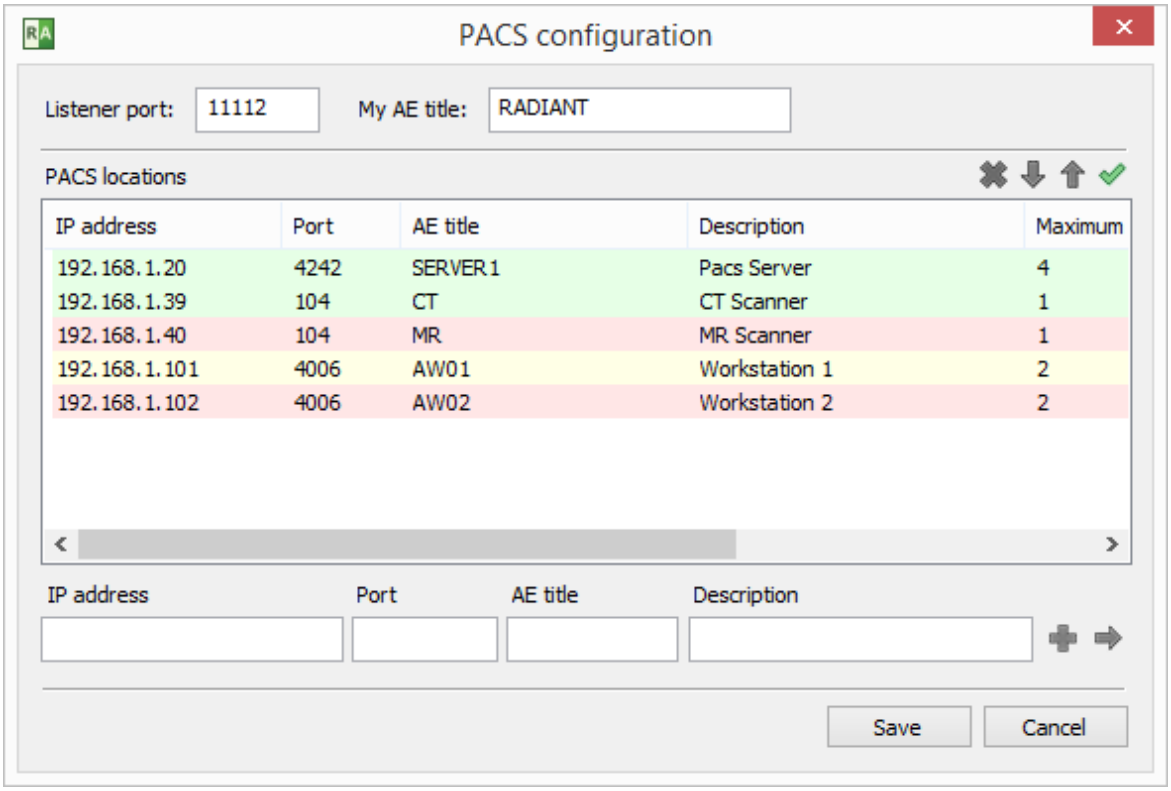


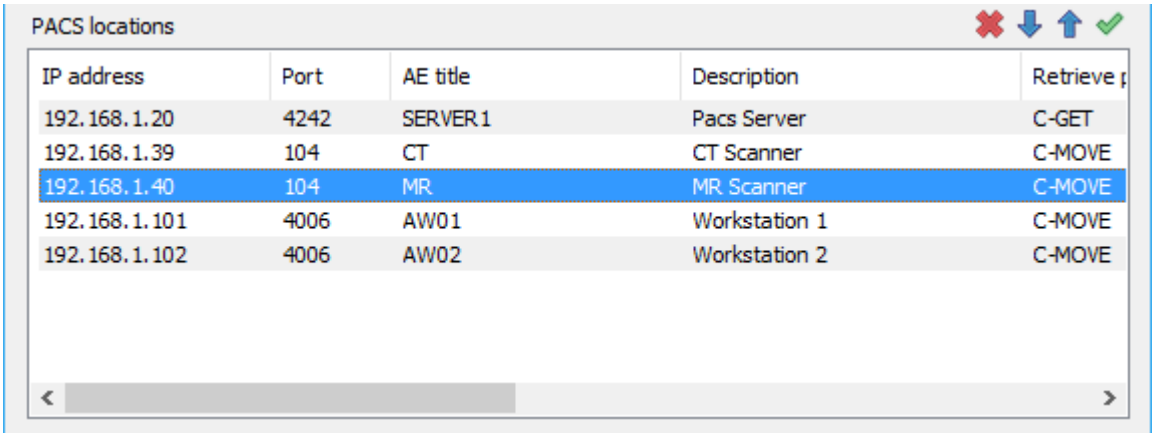
Modifying PACS hosts

To change some parameters of a PACS location, select it in the list, change the desired field and press `Enter` or click the arrow icon .

When you have several PACS location configured, you can change their priority in search by selecting them and clicking the up and down arrows (or using the shortcuts `Ctrl + Up` or `Ctrl + Down`).

If several locations are searched at the same time and give results with studies having the same study UID, the location with higher priority will be used to download the study.

To delete the selected location, click the button or press `Ctrl + Del`.



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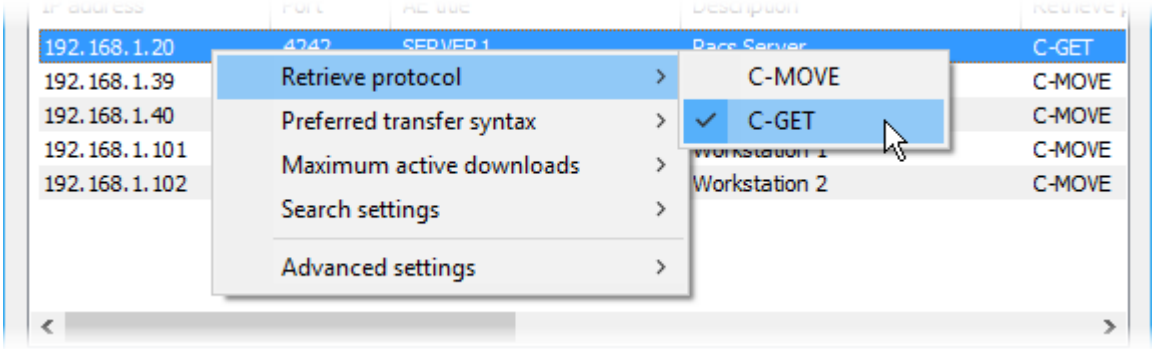
Advanced settings

Click the right mouse button on the selected PACS location to display the pop-up menu.

Select Retrieve protocol to switch between C-MOVE and C-GET protocols to retrieve studies from PACS locations.



By default, the C-MOVE protocol is used. It requires that:

- RadiAnt is able to listen to and accept inbound connections.
- The firewall allows such inbound connections.
- The NAT (if used) is configured to forward the inbound connections to RadiAnt.
- The PACS location is configured with RadiAnt's AE title, port, and IP address (since only the RadiAnt's AE title is sent in the C-MOVE request).

Whereas with the C-GET protocol:

- RadiAnt does not need to be able to respond to inbound connections.
- You do not have to configure firewalls to allow inbound connection or perform NAT.
- There is no need to configure the PACS location so that it knows RadiAnt's AE title, port, and IP address (only if required for access control).

Due to the above advantages, the C-GET protocol can be suitable for use beyond the firewall or NAT; however, unfortunately, it is not commonly implemented in PACS servers.

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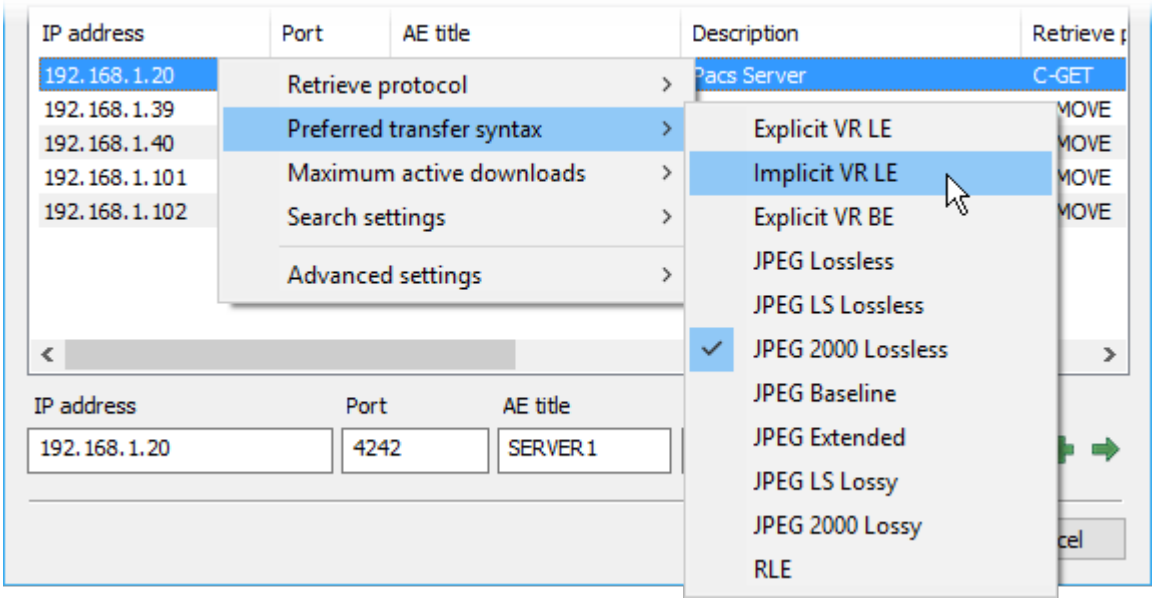
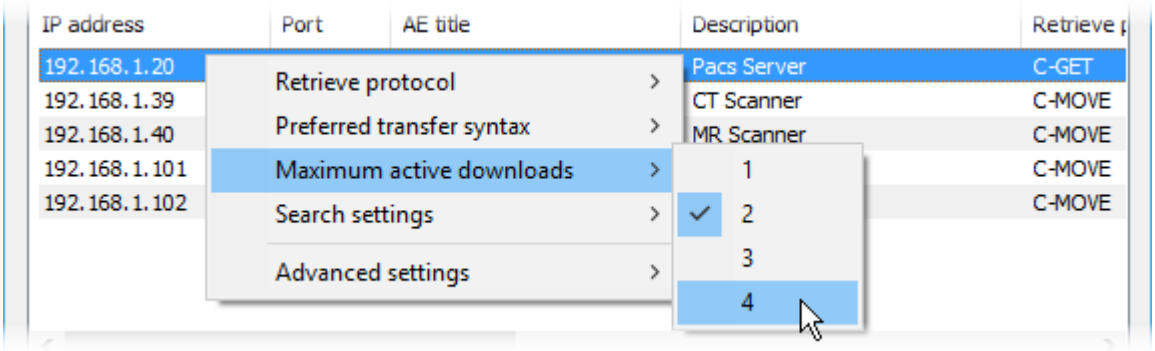
Select Preferred transfer syntax to change the encoding used when communicating with a PACS host. By default, the Explicit VR Little Endian transfer syntax is used. However, you may try other encodings if some problems with communication are encountered.



The Maximum active downloads option lets you set the limit of concurrent downloads from one PACS host. The default value is 1. Usually, when set to a larger value, it will speed up the transfer of multiple studies. However, changing this value may also lead to connection timeouts and errors, depending on specific PACS server implementation.



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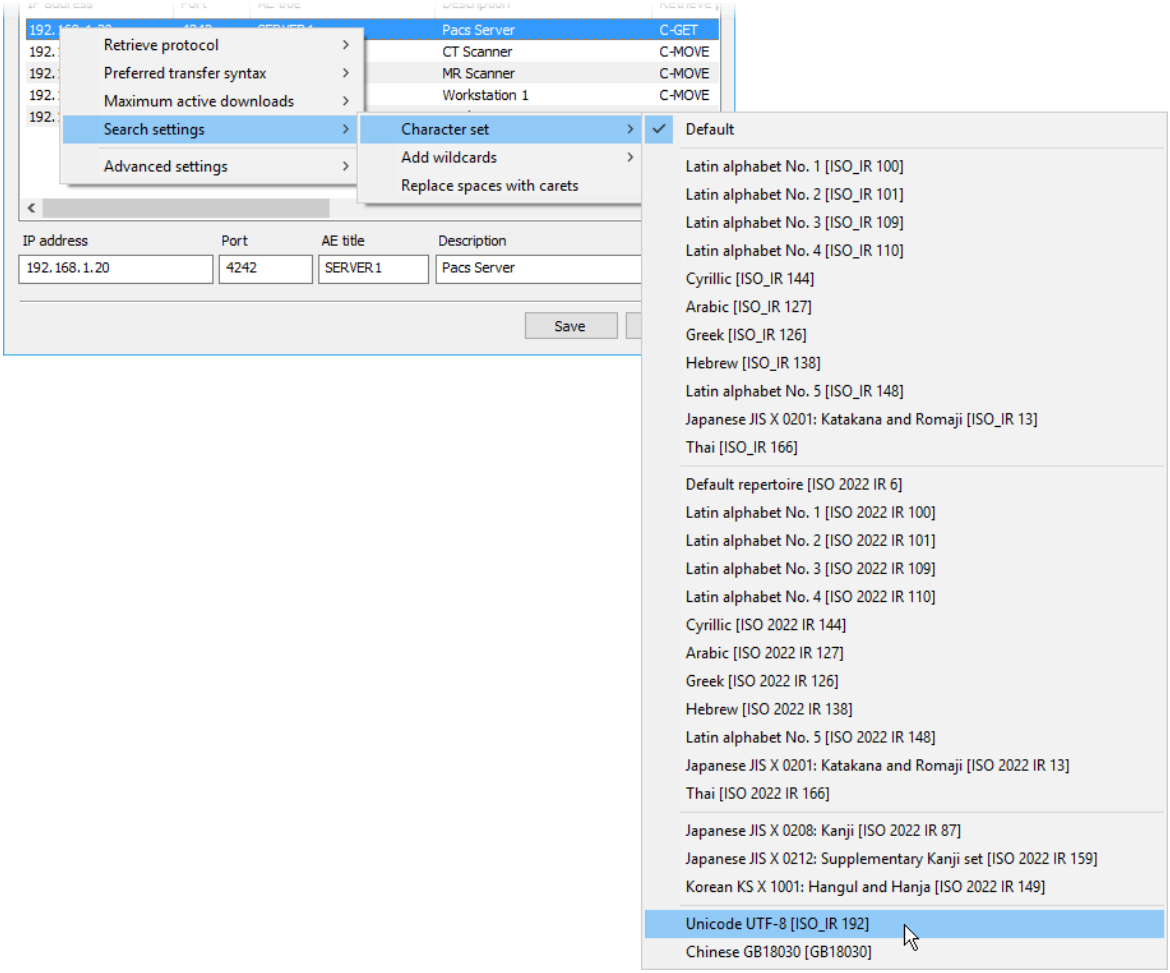
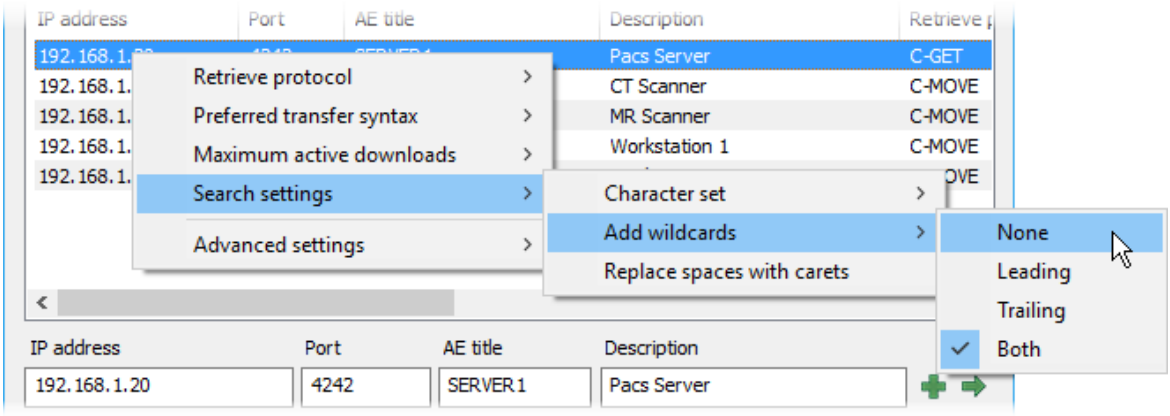
Select Search settings > Character set to choose the character encoding used in PACS search queries. By default, searches are performed using the standard ASCII character set. This option allows you search names using non-English characters (note that your PACS server also has to support the chosen character set).



When searching for studies on PACS locations leading and trailing wildcards (*) are automatically added to your queries. This means you only need to type part of the name to view all the results that include the text you entered. This behavior can be changed by using the Search settings > Add wildcards option.



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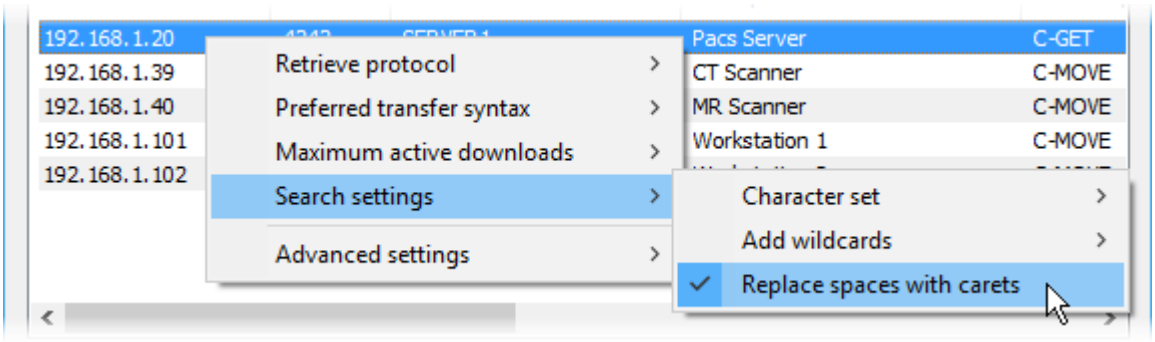
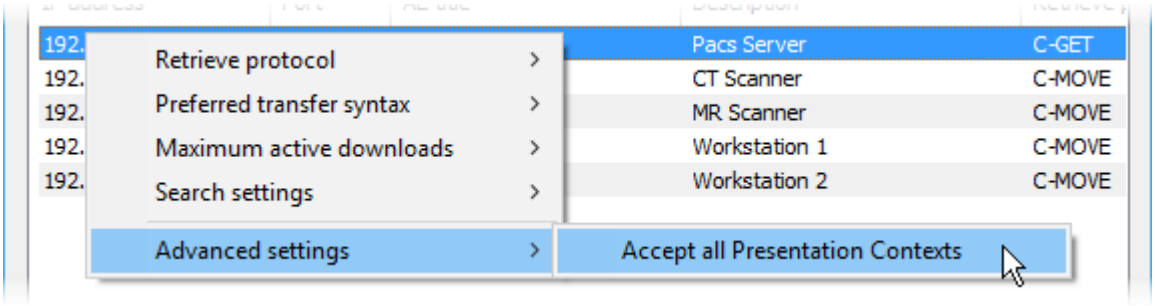
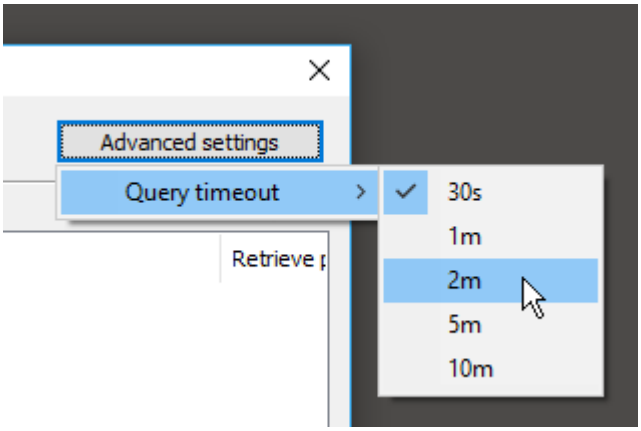
Select Search settings > Replace spaces with carets to replace spaces with carets (^) in your PACS queries. This option is disabled by default.



Select Advanced settings > Accept all Presentation Contexts to disable rejection of unsupported abstract syntaxes during association negotiation. This option may be required for RadiAnt DICOM Viewer to work with some specific PACS server implementations. It is disabled by default.



Click the **`Advanced settings`** button and select Query timeout to change the maximum wait time for the incoming data after the PACS download is started. Some PACS servers may require a longer time before they retrieve the study from cold storage and start sending it.



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3.11.3 PACS troubleshooting

Many different variables can lead to issues with PACS connectivity. However, the symptoms generally fall into two groups:

1. PACS search does not work (and, consequently, neither do downloads)
2. PACS search yields results; however, trying to download studies always fails. In this group. we can define two subgroups, depending on the retrieve protocol chosen for the PACS location:
   a. PACS locations using C-MOVE protocol (default)
   b. PACS locations using C-GET protocol

Click the appropriate scenario to see the checklist for your problem.

If the problems with the connection persist, use a local IT support that specializes in the PACS field, as resolving the connectivity problems usually requires direct access to your local network and your PACS server configuration.

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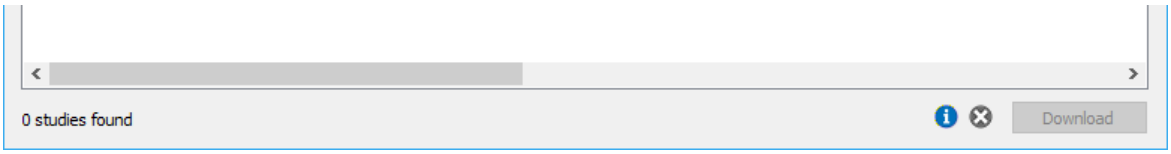
When I press the search button in the PACS Search window, the results area is empty.



1. Check for general network connectivity errors, such as an unplugged network cable, incorrect IP address, network downtime, or similar problem. You should be able to ping one machine from the other.
2. Verify the connectivity between RadiAnt and a PACS host using the C-ECHO service. The connection has to be verifiable in both directions: From RadiAnt to the PACS host, and vice versa. Otherwise, you will not be able to search and download studies from the PACS host.
3. You have to you use the proper parameters of your PACS server (IP, port, AE title) in the PACS host configuration.
4. Make sure that your PACS server is configured with your RadiAnt computer's IP, port, and AE title.
5. The port and AE title used in RadiAnt must be unique, which means that you cannot have another DICOM viewer installed on the same machine with the same parameters. You also cannot use the same AE title for DICOM viewers installed on different machines.
6. A fixed IP address has to be assigned to your RadiAnt computer. If you connect from a remote site via a cable or DSL connection with a dynamic IP address, you will not be able to receive DICOM studies.
7. There must be no firewall that blocks the communication:
   a. From the RadiAnt computer to the configured port on the server.
   b. From the server to the RadiAnt listener port configured in PACS options.

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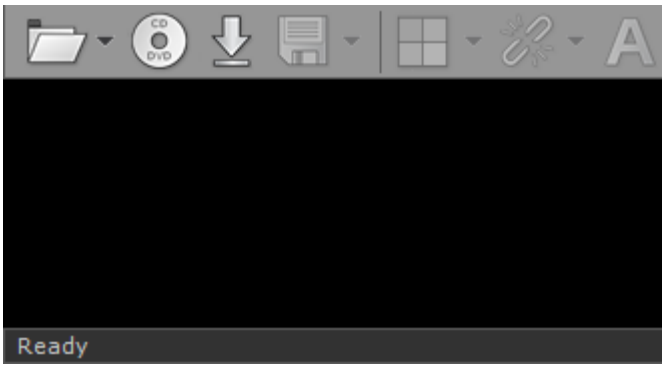
I can search studies, but when I try to download a study, no images are displayed in the viewer window.
The C-MOVE retrieve protocol is selected for the PACS location.



Make sure that the selected retrieve protocol is C-MOVE:

IP address	Port	AE title	Description	Retrieve protocol
192.168.1.20	4242	SERVER1	Pacs Server	C-MOVE

1. Verify the connectivity between RadiAnt and a PACS host using the C-ECHO service. The connection has to be verifiable in both directions: from RadiAnt to the PACS host and vice versa. Otherwise, you will not be able to search and download studies from the PACS host.
2. Make sure that your PACS server is configured with your RadiAnt computer's IP, port and AE title.
3. The port and AE title used in RadiAnt must be unique, which means that you cannot have another DICOM viewer installed on the same machine with the same parameters. You also cannot use the same AE title for DICOM viewers installed on different machines.
4. A fixed IP address has to be assigned to your RadiAnt computer. If you connect from a remote site via a cable or DSL connection with a dynamic IP address, you will not be able to receive DICOM studies.
5. There must be no firewall that blocks the communication from the server to the RadiAnt listener port configured in PACS options.
6. You can try changing the preferred transfer syntax used in communication with the specific PACS host in RadiAnt PACS settings.
7. You may want to try and set the Accept All Presentation Contexts option for the specific PACS host in RadiAnt PACS settings.

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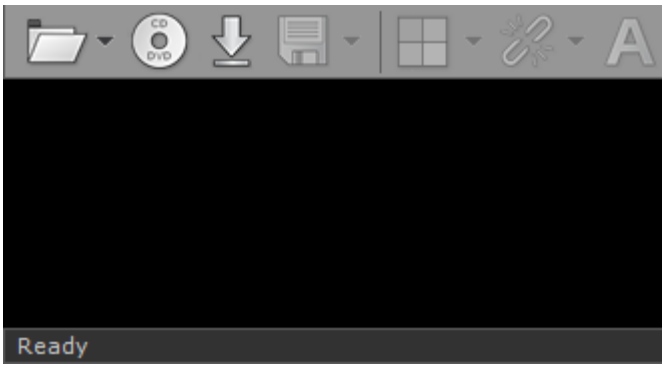
I can search studies, but when I try to download a study, no images are displayed in the viewer window.
The C-GET retrieve protocol is selected for the PACS location.



Make sure that the selected retrieve protocol is C-GET:

IP address	Port	AE title	Description	Retrieve protocol
192.168.1.20	4242	SERVER1	Pacs Server	C-GET

1. Make sure that your PACS server supports the C-GET protocol. It is not as commonly implemented as the C-MOVE protocol. The following servers/workstations have been verified to work with RadiAnt using C-GET protocol: DCM4CHEE, DCMTK (dcmqrdb), Horos, Osirix.
2. Make sure that RadiAnt's PC (IP, AE title) is allowed to retrieve studies from your PACS server (check the configuration of the server).
3. You can try changing the preferred transfer syntax used in communication with the specific PACS host in RadiAnt PACS settings.

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3.11.4 PACS integration

RadiAnt DICOM Viewer can be integrated with other systems via command line arguments or radiant:// URL protocol. You can launch the viewer, start downloading specific DICOM studies and display them using simple commands or by clicking specially crafted radiant:// links in web browsers.

Use the argument "-pstv" followed by one or more pairs of tag ID/value:

```
radiantviewer.exe -pstv 00080050 "1412-14-ACCESSION-NUMBER"
```

```
radiant://?n=pstv&v=00080050&v=%221412-14-ACCESSION-NUMBER%22
```

1. To download a specific study (StudyUID needs to be passed)

```
radiantviewer.exe -pstv 0020000D "1.4.24.2.1107.StudyUID"
```

```
radiant://?n=pstv&v=0020000D&v=%221.4.24.2.1107.StudyUID%22
```

2. To download a specific series (StudyUID and SeriesUID need to be passed)

```
radiantviewer.exe -pstv 0020000D "1.4.24.2.1107.StudyUID" 0020000E "1.4.24.2.1107.SeriesUID"
```

```
radiant://?n=pstv&v=0020000D&v=%221.4.24.2.1107.StudyUID%22&v=0020000E&v=%
221.4.24.2.1107.SeriesUID%22
```

3. To download a specific image (StudyUID, SeriesUID and SOPInstanceUID need to be passed)

```
radiantviewer.exe -pstv 0020000D "1.4.24.2.1107.StudyUID" 0020000E "1.4.24.2.1107.SeriesUID"
00080018 "1.4.24.2.1107.SopInstanceUID"
```

```
radiant://?n=pstv&v=0020000D&v=%221.4.24.2.1107.StudyUID%22&v=0020000E&v=%
221.4.24.2.1107.SeriesUID%22&v=00080018&v=%221.4.24.2.1107.SopInstanceUID%22
```

By default, all PACS nodes configured in RadiAnt are searched. You can define only one PACS node by using "-paet" and its AE title:

```
radiantviewer.exe -paet MYPACSAETITLE -pstv 00100020 "23874623-PATIENTID"
```

```
radiant://?n=paet&v=MYPACSAETITLE&n=pstv&v=00100020&v=%2223874623-PATIENTID%22
```

Downloading multiple studies/series/images

Multiple studies/series/images can be downloaded using only one command by passing several -pstv arguments.

1. Two studies

```
radiantviewer.exe -pstv 0020000D "STUDYUID1" -pstv 0020000D "STUDYUID2"
```

```
radiant://?n=pstv&v=0020000D&v=%22STUDYUID1%22&n=pstv&v=0020000D&v=%
22STUDYUID2%22
```

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2. Two series of the same study

```
radiantviewer.exe -pstv 0020000D "STUDYUID1" -pstv 0020000E "SERIESUID1" -pstv 0020000E "SERIESUID2"
```

```
radiant://?n=pstv&v=0020000D&v=%22STUDYUID1%22&n=pstv&v=0020000E&v=%22SERIESUID1%22&n=pstv&v=0020000E&v=%22SERIESUID2%22
```

3. Different series from two different studies

```
radiantviewer.exe -pstv 0020000D "STUDYUID1" -pstv 0020000E "SERIESUID1" -pstv 0020000E "SERIESUID2" -pstv 0020000D "STUDYUID2" -pstv 0020000E "SERIESUID3" -pstv 0020000E "SERIESUID4"
```

```
radiant://?n=pstv&v=0020000D&v=%22STUDYUID1%22&n=pstv&v=0020000E&v=%22SERIESUID1%22&n=pstv&v=0020000E&v=%22SERIESUID2%22&n=pstv&v=0020000D&v=%22STUDYUID2%22&n=pstv&v=0020000E&v=%22SERIESUID3%22&n=pstv&v=0020000E&v=%22SERIESUID4%22
```

4. Several images from different series of the same study

```
radiantviewer.exe -pstv 0020000D "STUDYUID1" -pstv 0020000E "SERIESUID1" -pstv 00080018 "INSTANCEUID1" -pstv 00080018 "INSTANCEUID2" -pstv 0020000E "SERIESUID2" -pstv 00080018 "INSTANCEUID3" -pstv 00080018 "INSTANCEUID4"
```

```
radiant://?n=pstv&v=0020000D&v=%22STUDYUID1%22&n=pstv&v=0020000E&v=%22SERIESUID1%22&n=pstv&v=00080018&v=%22INSTANCEUID1%22&n=pstv&v=00080018&v=%22INSTANCEUID2%22&n=pstv&v=0020000E&v=%22SERIESUID2%22&n=pstv&v=00080018&v=%22INSTANCEUID3%22&n=pstv&v=00080018&v=%22INSTANCEUID4%22
```

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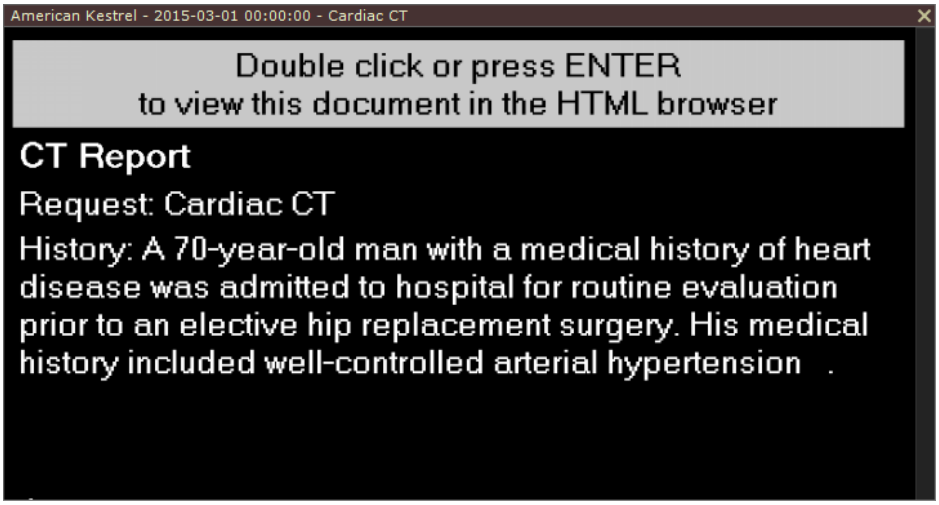
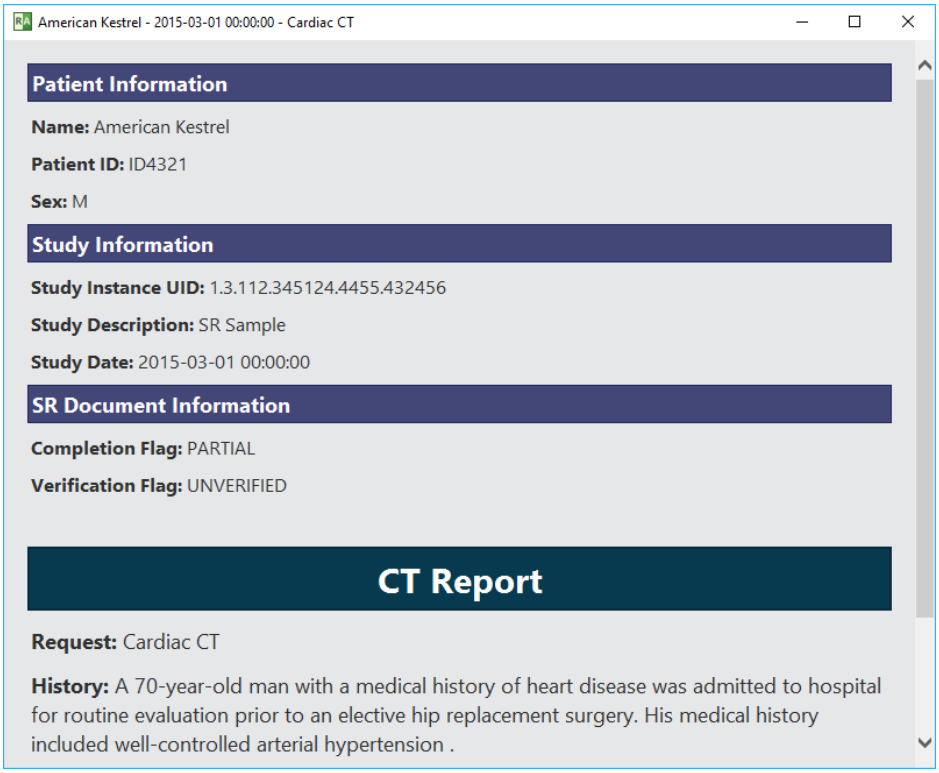
3.12 Special types of DICOM files

3.12.1 Structured report (SR)

Structured report (SR) files are special type of DICOM files designed for exchanging clinical information and findings.
They are rendered in the viewport as images, but they can be also browsed more conveniently as text.



Press **Enter** or double click the panel with the SR document to open it in the HTML browser.
Press **Ctrl + Enter** or double click the panel with the SR document with the Ctrl key pressed to open it in the external web browser so that the report can be easily printed or saved in the HTML file.



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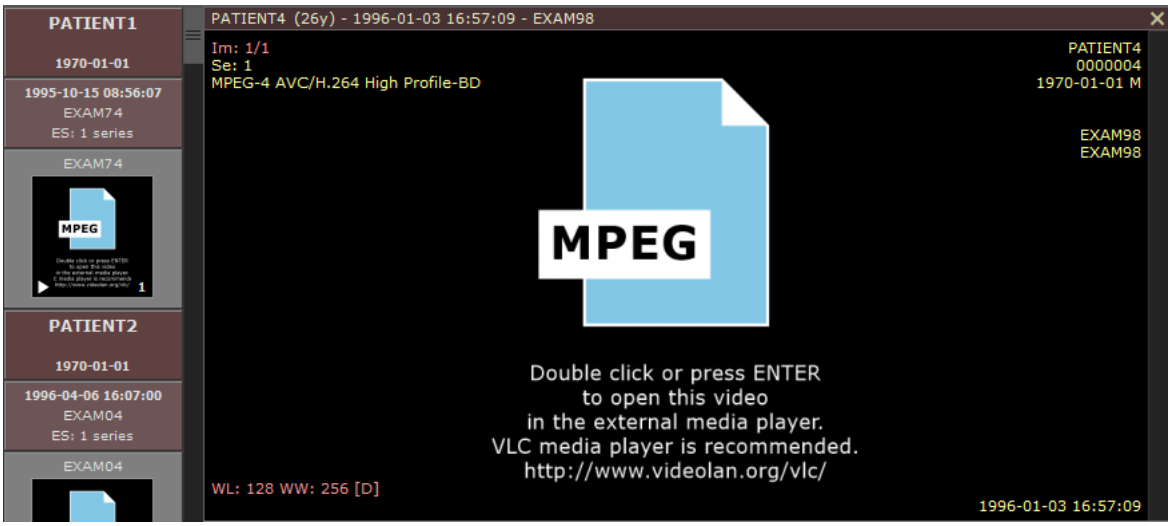
3.12.2 MPEG2/4 video

RadiAnt DICOM Viewer can read DICOM files containing video and audio compressed with either MPEG2 or MPEG4 codecs:

Transfer syntax UID	Transfer syntax name
1.2.840.10008.1.2.4.100	MPEG-2 Main Profile Main Level
1.2.840.10008.1.2.4.101	MPEG-2 Main Profile High Level
1.2.840.10008.1.2.4.102	MPEG-4 AVC/H.264 High Profile / Level 4.1
1.2.840.10008.1.2.4.103	MPEG-4 AVC/H.264 BD-compatible High Profile / Level 4.1

They are opened using an external media player. Not all formats can be played using the default Windows media player, hence VLC media player (http://www.videolan.org/vlc/), which can play all video formats, is recommended.



Press **Enter** or double click the panel with the video document to open it in the external media player.

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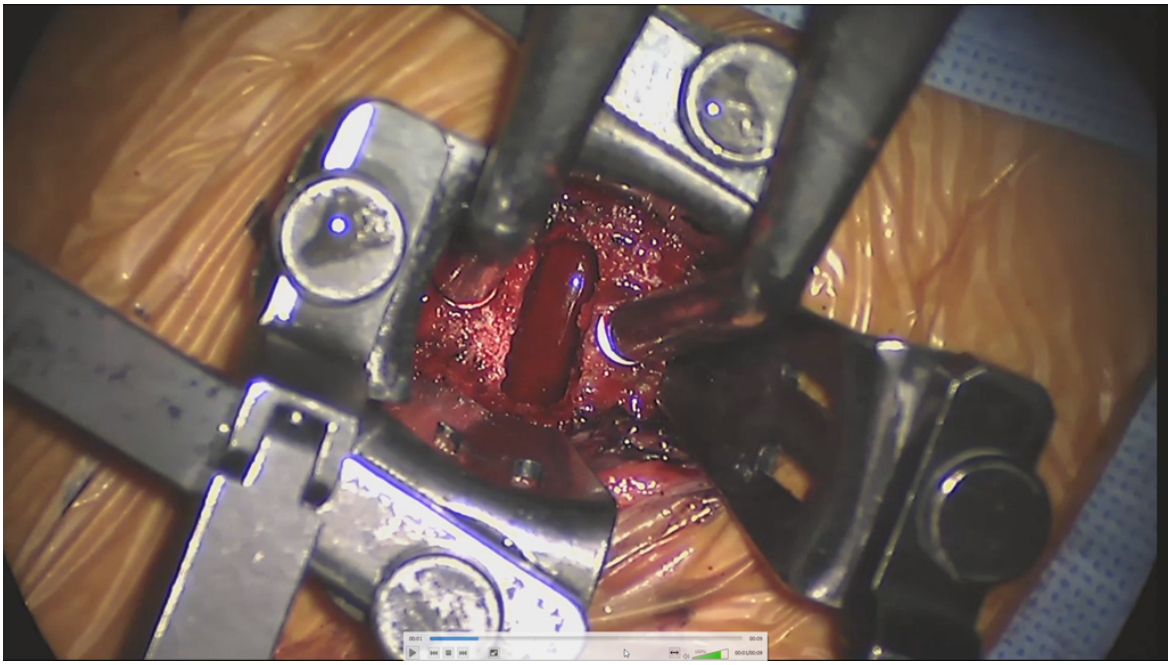

The preview images of video files can be displayed in the series preview pane and in the viewport with the help of the FFMPEG tool.
Just download the static build from https://ffmpeg.zeranoe.com/builds/ and copy the ffmpeg.exe file to the RadiAnt DICOM Viewer program folder (the location where the RadiAntViewer.exe file was installed).

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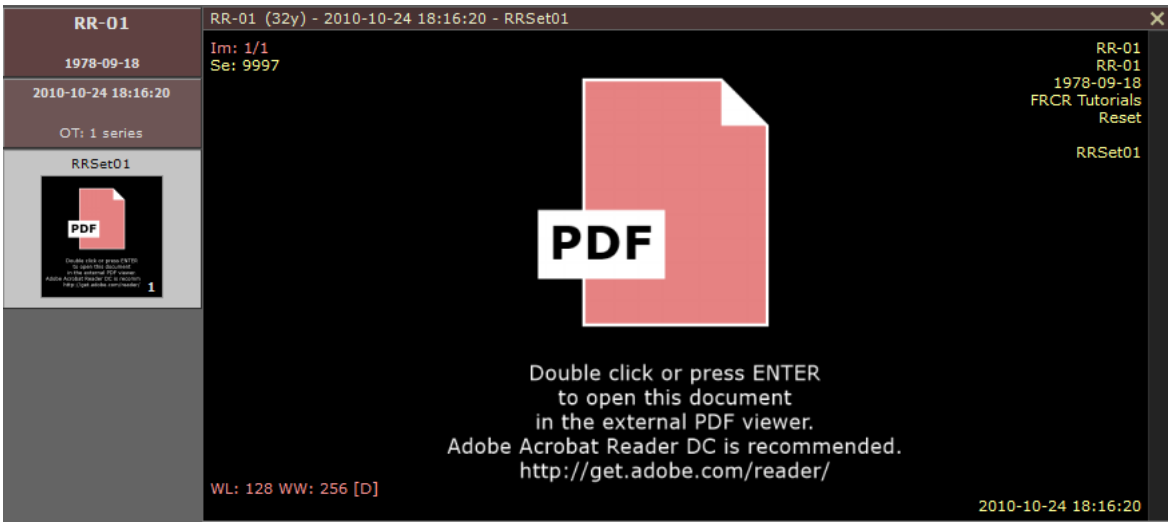
3.12.3 Encapsulated PDF

The encapsulated PDF documents (SOP Class 1.2.840.10008.5.1.4.1.1.104.1) can be opened in an external PDF viewer.



Adobe Acrobat Reader DC (http://get.adobe.com/reader/) is recommended.

Press **Enter** or double click the panel with the PDF document to open it in the external viewer.

3.12.4 DICOMDIR

DICOMDIR is a special DICOM file usually found in the root folder of the CD/DVD media with DICOM studies.
This file includes paths to the DICOM files found on the media.
RadiAnt DICOM Viewer uses DICOMDIRs to quickly generate thumbnail images of all series found on the media.

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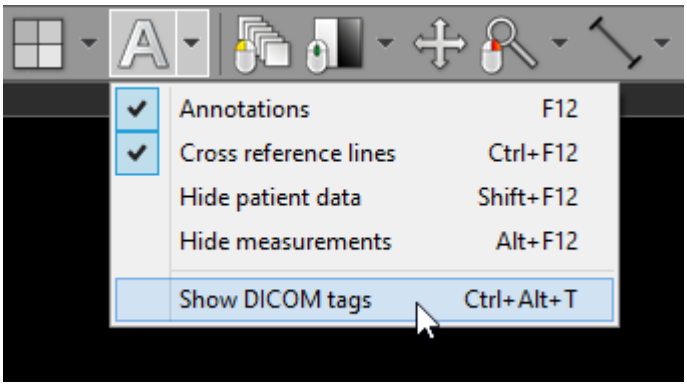
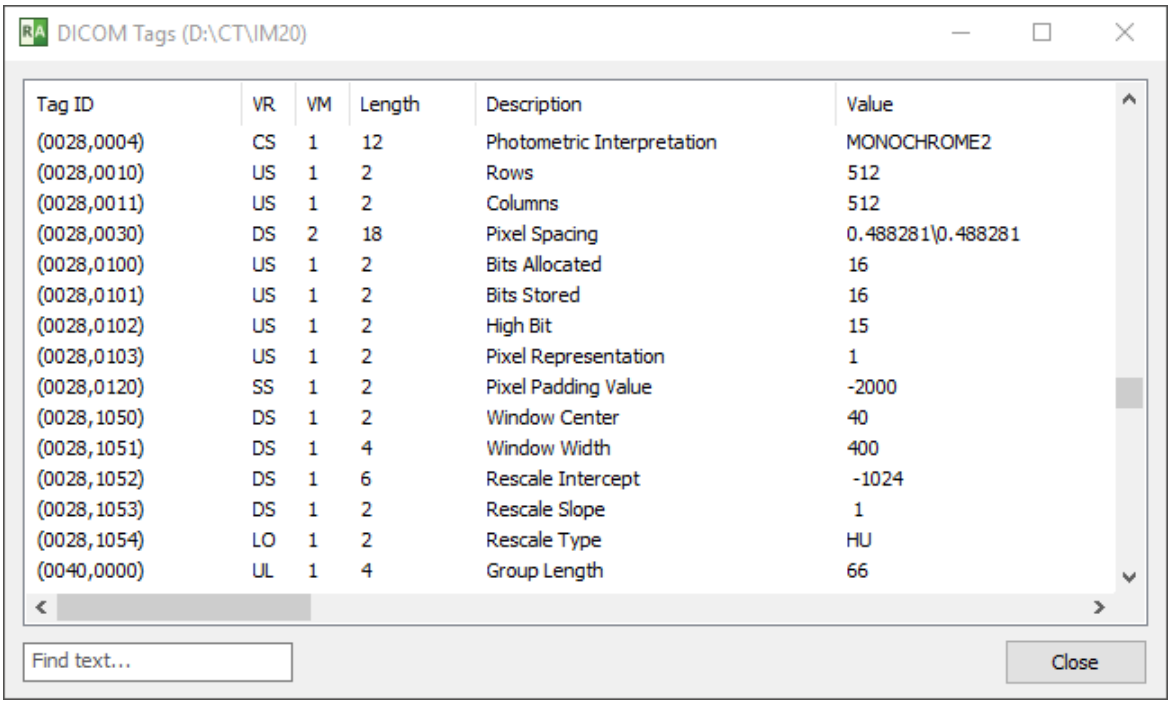
3.13 DICOM tags

Each DICOM file contains much more information than can be displayed as annotations on the image.
To view the DICOM tags associated with the image displayed click Show DICOM tags menu item or use `Ctrl + Alt + T` .



A complete list of DICOM tags, their descriptions and values will be displayed.
The file path of the analyzed DICOM file is displayed on the title bar.



Tag ID	VR	VM	Length	Description	Value
(0028,0004)	CS	1	12	Photometric Interpretation	MONOCHROME2
(0028,0010)	US	1	2	Rows	512
(0028,0011)	US	1	2	Columns	512
(0028,0030)	DS	2	18	Pixel Spacing	0.488281\0.488281
(0028,0100)	US	1	2	Bits Allocated	16
(0028,0101)	US	1	2	Bits Stored	16
(0028,0102)	US	1	2	High Bit	15
(0028,0103)	US	1	2	Pixel Representation	1
(0028,0120)	SS	1	2	Pixel Padding Value	-2000
(0028,1050)	DS	1	2	Window Center	40
(0028,1051)	DS	1	4	Window Width	400
(0028,1052)	DS	1	6	Rescale Intercept	-1024
(0028,1053)	DS	1	2	Rescale Slope	1
(0028,1054)	LO	1	2	Rescale Type	HU
(0040,0000)	UL	1	4	Group Length	66

You can search the list of tags for a specific text by entering it in the "Find text..." box in the lower left corner.
The following fields are searched: Tag ID, Description and Value.

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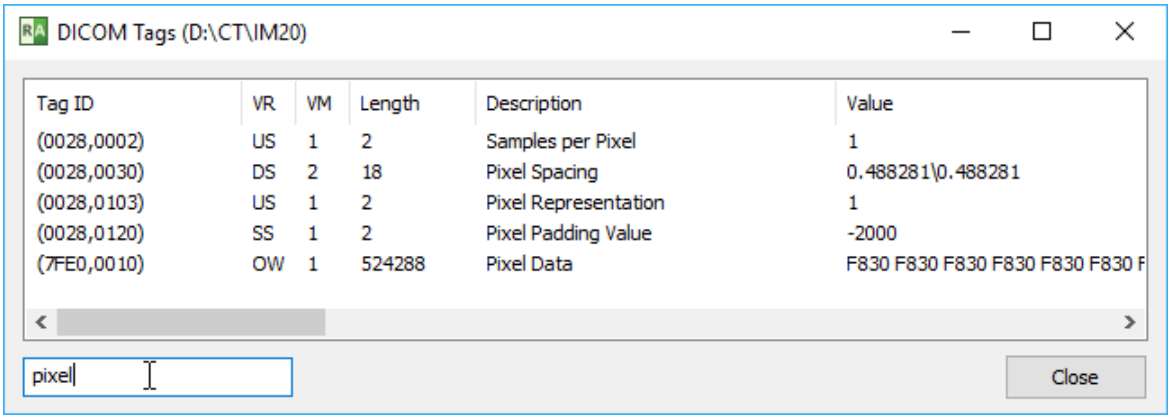
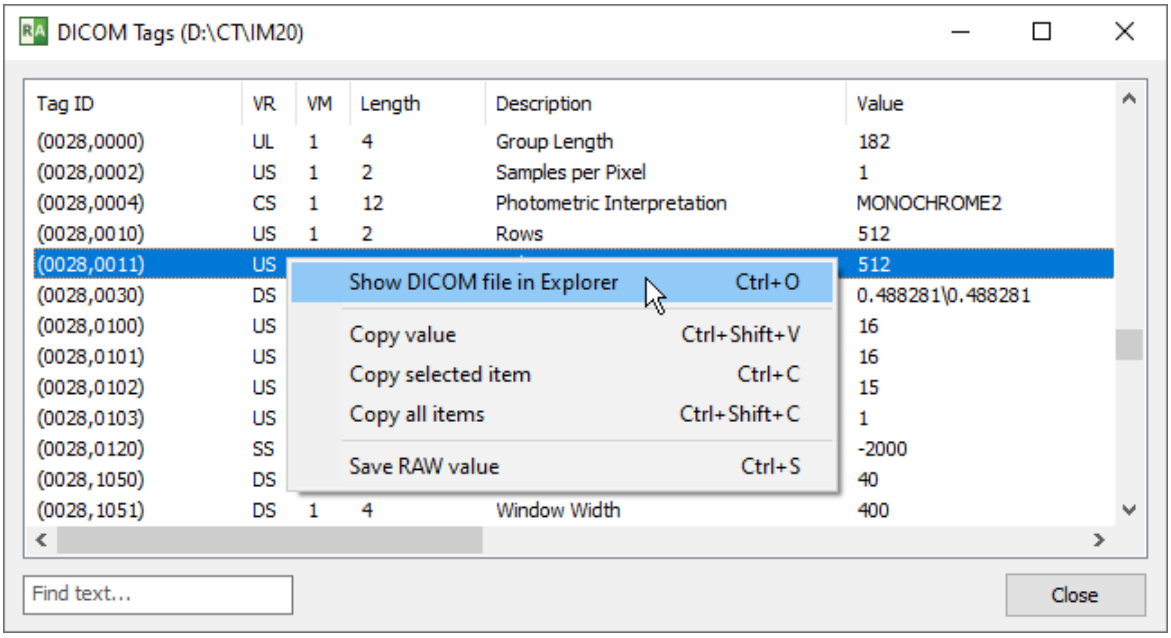
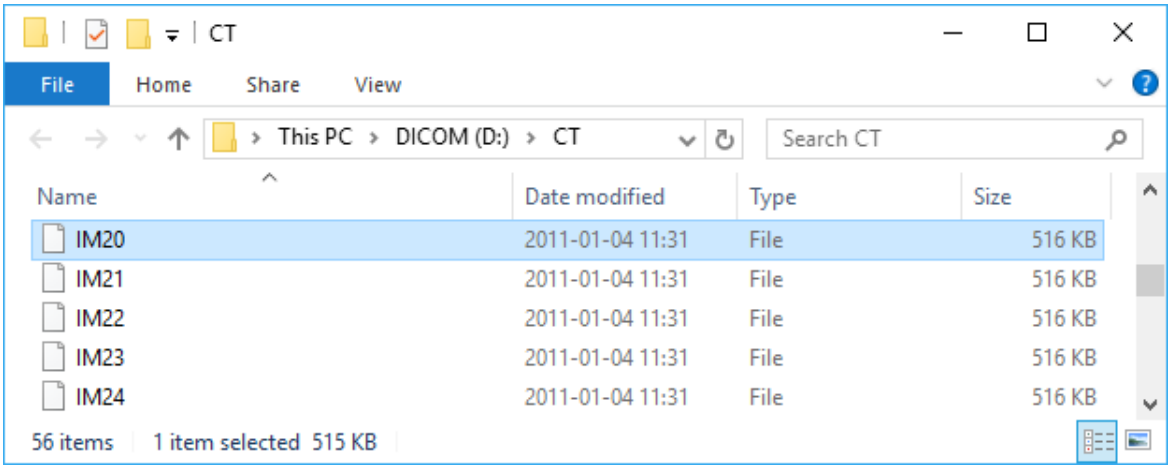


Press **Enter** to clear the text box and show all tags once again.

Click right mouse button on the tag list to show the pop-up menu.



Select Show DICOM file in Explorer or press **Ctrl + O** to show the folder with the selected DICOM file in Windows Explorer.



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The value of a tag can be copied to clipboard by selecting an item and pressing **Ctrl + Shift + V** or by selecting Copy value from the pop-up menu.
To copy all fields of the selected tag, press **Ctrl + C** or click Copy selected item.
The entire structure of the file can be copied to clipboard by pressing **Ctrl + Shift + C** or by selecting Copy all items.

The RAW value (the exact bytes as stored in the source DICOM file) of the selected tag(s) can be saved to a file by pressing **Ctrl + S** or by clicking Save RAW value.

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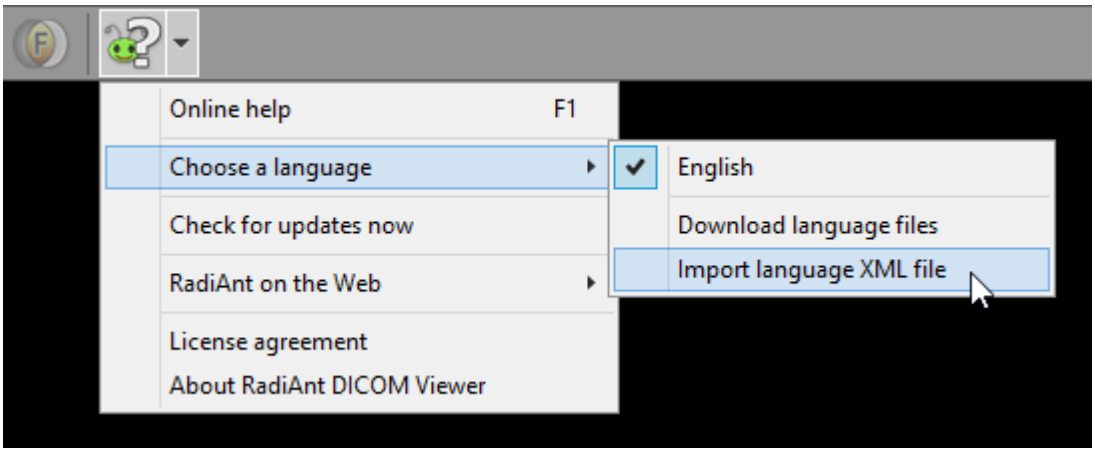
3.14 Changing language

Thanks to our community, RadiAnt DICOM Viewer has been translated into more than 30 languages. The language files (in XML format) are available for download from https://www.radiantviewer.com/translations/ page.

Dutch/Flemish	Renaat Van den Broeck	2011-04-01	0.35.1.894	Download	Edit	All versions
French	ISIS SAS	2012-10-10	1.1.8.4646	Download	Edit	All versions
German	Jens Weber	2012-05-03	1.0.4.4439	Download	Edit	All versions
Greek	Matsaridis Dimitrios	2013-05-13	1.1.8.4646	Download	Edit	All versions
Hungarian	Kelemen Kornél	2013-05-29	1.8.6.6744	Download	Edit	All versions
Indonesian	Jainu	2011-08-24	0.50.2.2501	Download	Edit	
Italian	Tommaso Bartalena	2013-05-30	1.8.6.6744	Download	Edit	All versions
Korean	하종만	2012-08-10	1.0.4.4439	Download	Edit	
Persian	Mahyar Taghizadeh Nouei	2012-08-16	1.0.4.4439	Download	Edit	
Polish	Maciej Frankiewicz	2012-05-02	1.0.4.4439	Download	Edit	All versions
Portuguese	Ricardo Freitas	2011-04-16	0.35.1.894	Download	Edit	
Romanian	Constantin JEMNA	2013-05-13	1.1.8.4646	Download	Edit	
Russian	Anonymous	2013-05-13	1.0.4.4439	Download	Edit	All versions

Download and save the translation file into a known location.

Click an arrow next to the **Help** button and then the menu item Choose a language / Import language XML file.



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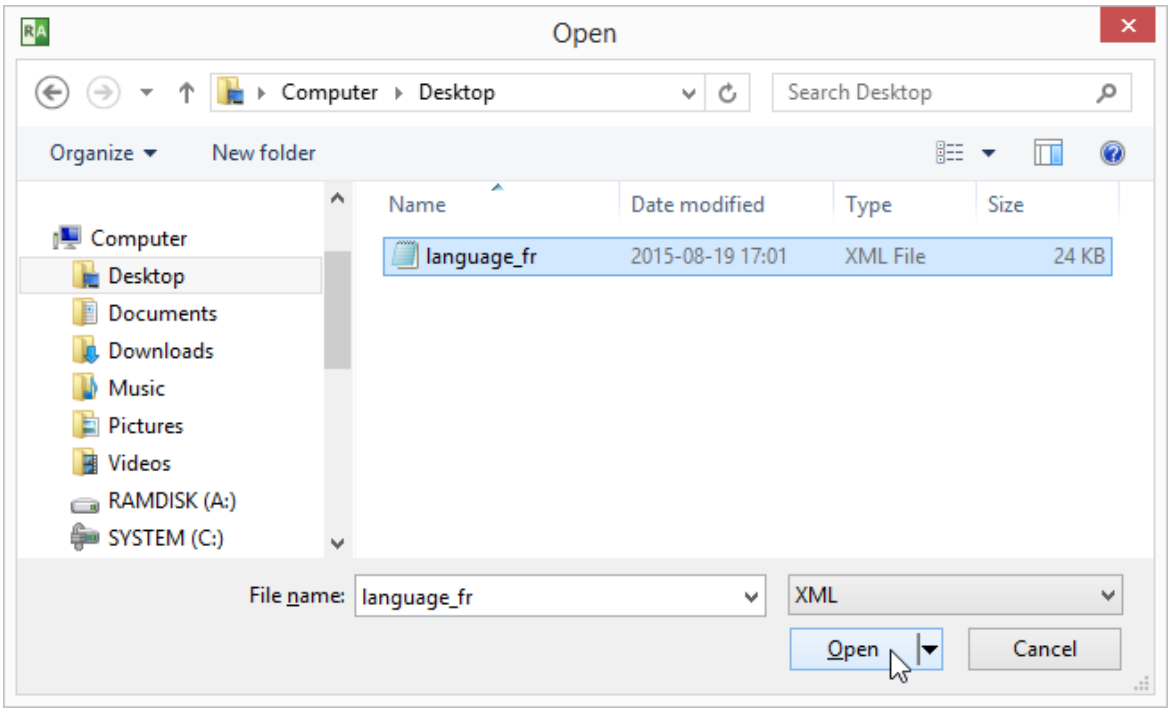
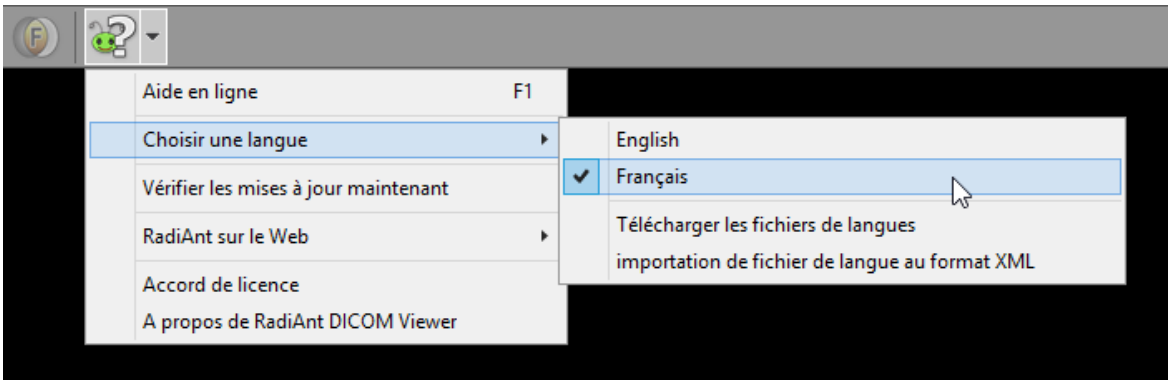
Find the downloaded language file and click **Open**.



The new language will be applied after restarting RadiAnt DICOM Viewer.



Keep in mind that not all translations are updated for the latest versions of RadiAnt DICOM Viewer. If you use an older one, some texts may remain in English.
Translation files can be edited/updated using the online tool available at http://www.radiantviewer.com/translation.

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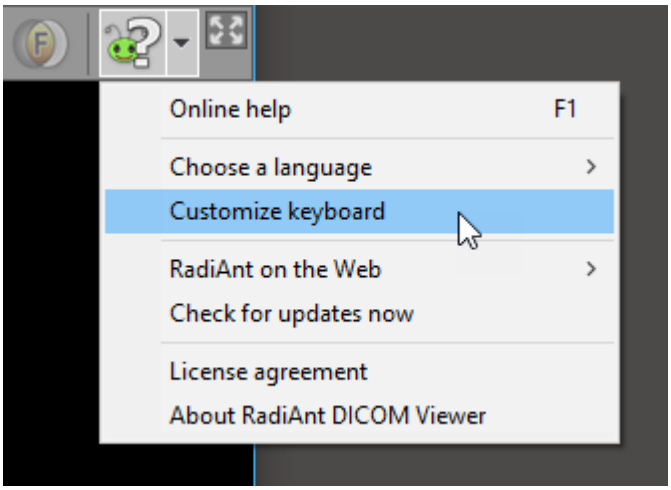
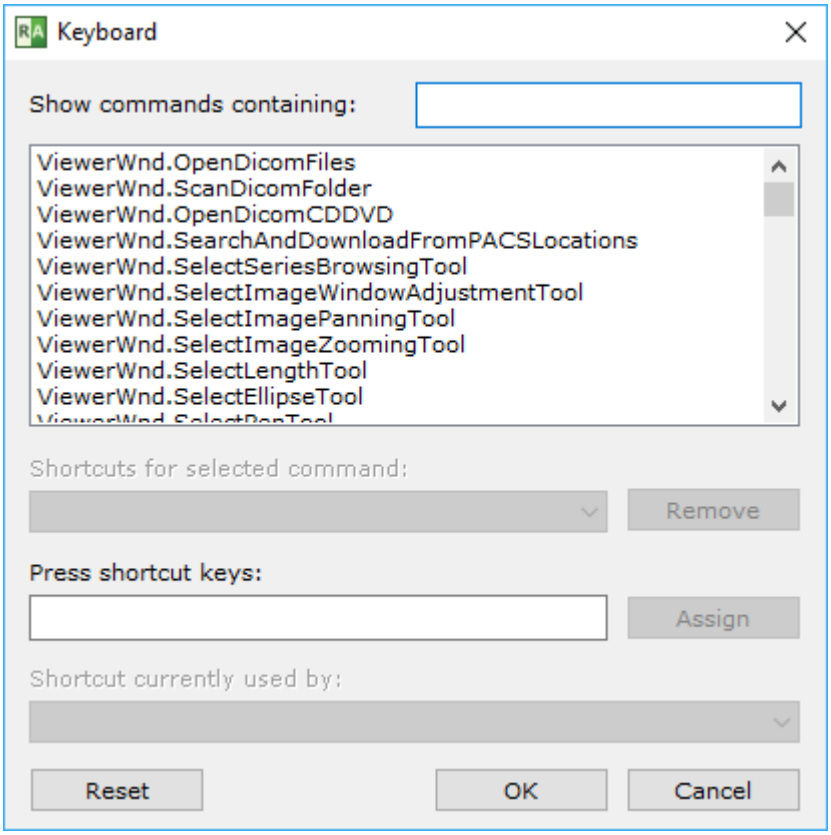
3.15 Keyboard customization

Most of the keyboard shortcuts used in RadiAnt DICOM Viewer can be customized to user's preference.
Click an arrow next to the **Help** button and then the menu item Customize keyboard.



The keyboard customization window will be opened.



Select the command from the list. You can also use the text box to display only commands containing a specific text.

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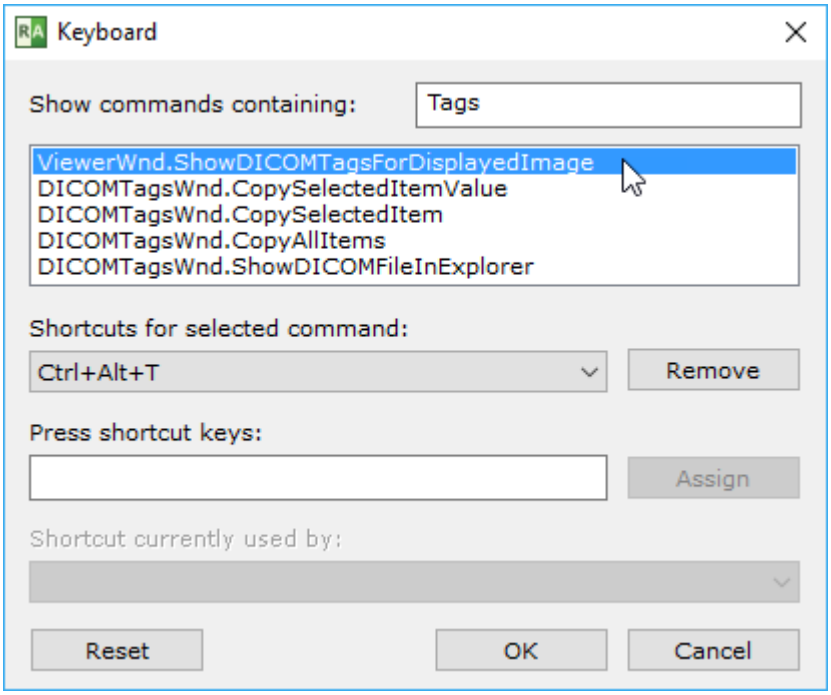
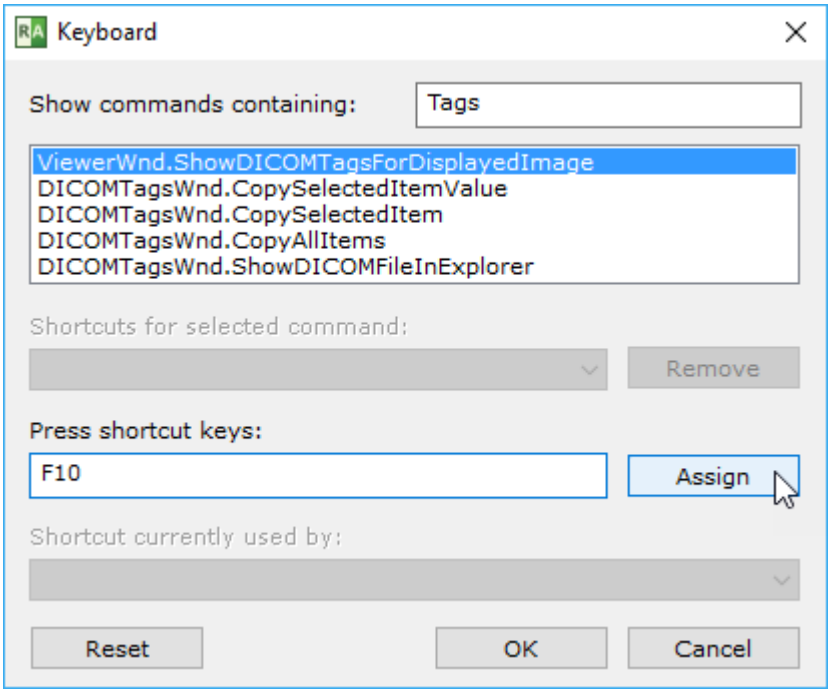


If you want to remove previously associated shortcut just click **Remove**.

Place the cursor in the field under "Press shortcut keys:" and press the new shortcut key(s). Then click the **Assign** button.



When you're done, remember to click **OK** to save the new shortcuts.

You can always restore the default shortcuts by pressing **Reset**.

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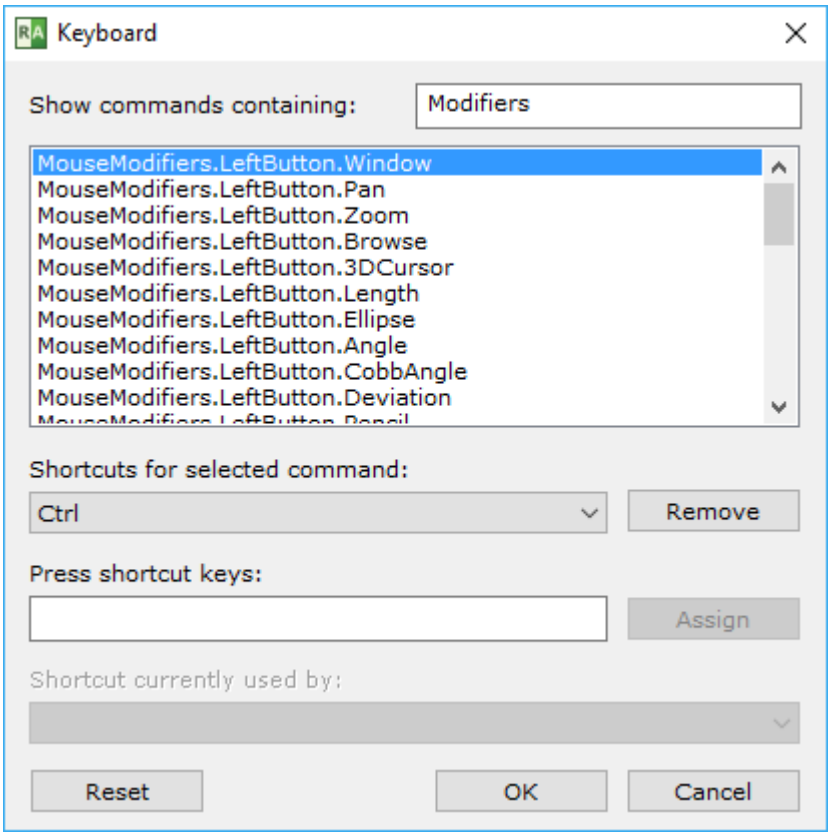
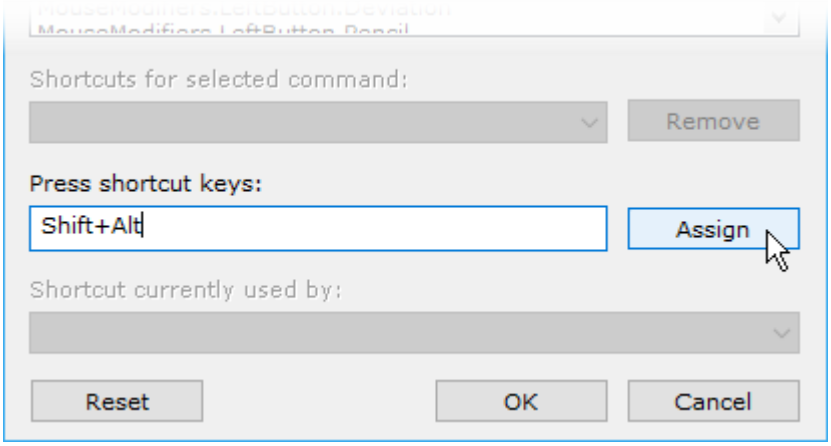
Modifier keys for mouse buttons

The functions associated with mouse buttons can be changed by pressing a modifier key (e.g. Ctrl + Left mouse button – adjusts WW/WL). Check the list of default modifiers.
These modifiers can be customized in the keyboard customization window. Just enter "Modifiers" into the search box and the list of all available mouse actions will be displayed.



To change a modifier, select specific action, remove its current modifier and press **Ctrl**, **Alt**, **Shift** or their combination in the "Press shortcut keys" text box. Then press **Assign**.



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4 Appendix

4.1 Keyboard shortcuts

2D Viewer window - global keyboard shortcuts	
Ctrl + O	Open DICOM file(s)
Ctrl + Shift + O	Scan DICOM folder
Ctrl + Alt + O	Open DICOM CD/DVD
Ctrl + F	Search and download studies from PACS locations
B	Select series browsing tool
W	Select image window (brightness/contrast) adjustment tool
M	Select image panning tool
Z	Select image zooming tool
L	Select length tool
E	Select ellipse tool
P	Select pen tool
A	Select angle tool
C	Select Cobb angle tool
D	Select deviation tool
Ctrl + Shift + E	Time-intensity curve tool
Ctrl + Shift + Plus (+)	Increase ROI font size
Ctrl + Shift + Minus (-)	Decrease ROI font size
F12	Toggle annotations
Shift + F12	Toggle all patient data visibility
Ctrl + F12	Toggle cross reference lines
F5	Toggle series synchronization mode
F	Toggle full screen/window mode
Ctrl + Alt + F3	Toggle toolbar and status bar visibility
Ctrl + Alt + F2	Toggle series preview bar visibility
Ctrl + E	Show export to JPEG/BMP/WMV window
F4	Open multiple series
Shift + F4	Close all panels
F1	Show online help

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F8	Open default database
Ctrl + F8	Create new database
Shift + F8	Open existing database
Ctrl + N	Open new window
Ctrl + Shift + N	Duplicate window
Ctrl + Alt + F4	Exit RadiAnt

2D Viewer window - local keyboard shortcuts (sent to the active panel)	
Tab	Activate next panel
Shift + Tab	Activate previous panel
Ctrl + F4	Close active panel
Ctrl + M	Maximize/restore active panel
Left Arrow	Display previous series
Right Arrow	Display next series
Home	Display first series
End	Display last series
Up Arrow	Go to previous image
Down Arrow	Go to next image
Page Up	Go 10 images back
Page Down	Go 10 images forward
Ctrl + Arrows	Pan image
Ctrl + Plus (+)	Zoom in
Ctrl + Minus (-)	Zoom out
Ctrl + 0	Fit image into panel
Ctrl + 1	Set zoom to 100% (1 image pixel = 1 screen pixel)
Ctrl + 2	Set zoom to 200%
Ctrl + 3	Set zoom to 400%
Ctrl + 4	Set zoom to 800%
0	Default window (brightness/contrast) setting
1	Full dynamic brightness/contrast
2	2nd window preset (Abdominal for CT images)
3	3rd window preset (Angio for CT images)

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4	4th window preset (Bone for CT images)
5	5th window preset (Brain for CT images)
6	6th window preset (Chest for CT images)
7	7th window preset (Lung for CT images)
8	8th window preset
9	9th window preset
F11	Negative
Space	Start/stop cine
Ctrl + C	Copy selected ROI Copy displayed image to clipboard
Ctrl + Shift + C	Copy all ROIs in displayed image
Ctrl + V	Paste ROI(s)
Ctrl + Shift + D	Duplicate ROI in corresponding series
Shift + Alt + D	Duplicate ROI in all images of the series
Del	Delete selected ROI
Shift + Del	Delete ROIs in all visible images
Ctrl + Del	Delete all ROIs in displayed image
Ctrl + Shift + Del	Delete all ROIs in displayed series
Esc	Deselect ROI
Alt + F12	Toggle ROI visibility
Ctrl + [	Rotate image 90 degrees counter clockwise
Ctrl +]	Rotate image 90 degrees clockwise
Ctrl + Shift + [	Flip horizontal
Ctrl + Shift +]	Flip vertical
Ctrl + Shift + \	Clear transformations
Ctrl + I	Next image filter
Ctrl + Shift + I	Previous image filter
I	Next sharpen filter
Shift + I	Disable filters
Ctrl + Alt + 1	Coronal MPR
Ctrl + Alt + 2	Sagittal MPR
Ctrl + Alt + 3	Axial MPR
F3	3D Volume Rendering

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Ctrl + Alt + F	Toggle image fusion
Ctrl + Alt + T	Show DICOM tags for displayed image
Ctrl + F5	Split series
Shift	Hold it during ellipse drawing to make it a circle, hold it while drawing a segment to make it horizontal or vertical
Ctrl	Hold it during ellipse drawing to show actual pixels used for calculations (only in magnified image)
Enter	Open displayed SR (Structured Report) document in the HTML browser Open displayed MPEG2/4 video in the external media player Open displayed PDF in the external browser

Local archive window

Ctrl + Shift + O	Import DICOM folder
Ctrl + O	Import DICOM file(s)
Ctrl + Alt + O	Import CD/DVD DICOM disc
Ctrl + F	Search and import studies from PACS servers
Ctrl + E	Export selected studies
Del	Delete selected studies
K	Add keyword to selected studies
Enter	Open selected studies in the active window
Ctrl + Enter	Open selected studies in a new window
Shift + Enter	Add selected studies to the active window
Ctrl + Shift + Enter	Open selected studies in separate windows
Ctrl + F8	Create new database
Shift + F8	Open existing database
Ctrl + N	Open new viewer window
Alt + F	Filter studies
F2	Cycle view (studies/series/images)

3D Volume Rendering window

Left / Right Arrow	Rotate volume around the Y axis
Up / Down Arrow	Rotate volume around the X axis

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< / >	Rotate volume around the Z axis (roll)
Ctrl + Arrows	Pan image
Ctrl + Plus (+)	Zoom in
Ctrl + Minus (-)	Zoom out
Ctrl + 0	Fit volume into panel
0	Default window (color/opacity) setting
Ctrl + S	Toggle shading
Ctrl + R	Reset scene
Ctrl + Alt + 0	Restore volume
R	Select 3D rotate tool
T	Select roll tool
W	Select image window (color/opacity) adjustment tool
M	Select image panning tool
Z	Select image zooming tool
S	Select scalpel tool
Ctrl + Z	Undo scalpel
Ctrl + Y	Redo scalpel
Ctrl + Shift + Alt + Z	Clear scalpel history
L	Select length tool
1	Anterior view
2	Posterior view
3	Left view
4	Right view
5	Superior view
6	Inferior view
Ctrl + C	Copy displayed image to clipboard
Ctrl + E	Save image to JPEG file
F2	Create quick movie
Ctrl + F2	Create advanced movie
Del	Delete selected ROI Cut inside area
Enter	Cut outside area
Esc	Deselect ROI

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	Clear area
F12	Toggle annotations/direction cube
F	Toggle full screen/window mode
Ctrl + Alt + F3	Toggle toolbar visibility
F3	Show 3D snapshots
K	Take 3D snapshot
]	Next 3D snapshot
[	Previous 3D snapshot
Ctrl + F3	Load 3D snapshots from file
Shift + F3	Save 3D snapshots to file

3D MPR window	
Left / Right Arrow	Rotate view around the Z axis (roll)
Up / Down Arrow	Browse volume to back / front
Alt + Up / Down Arrow	Rotate image plane around the X axis
Alt + Left / Right Arrow	Rotate image plane around the Y axis
Ctrl + Arrows	Pan image
Ctrl + Plus (+)	Zoom in
Ctrl + Minus (-)	Zoom out
Ctrl + 0	Fill viewport
0	Default window (color/opacity) setting
F11	Negative
Ctrl + R	Reset view
B	Select browse tool
R	Select 3D rotate tool
T	Select roll tool
W	Select image window adjustment tool
M	Select image panning tool
Z	Select image zooming tool
L	Select length tool
H	Select thickness tool
Plus (+)	Increase thickness

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Minus (-)	Decrease thickness
F2	Switch rendering mode
F3	Toggle axes visibility
Ctrl + F3	Center all axes
F4	Next viewport layout
Tab	Activate next viewport
Shift + Tab	Activate previous viewport
Ctrl + C	Copy image to clipboard
Shift + C	Copy all images to clipboard
Ctrl + E	Save image to JPEG file
Shift + E	Save all images to JPEG file
Del	Delete selected ROI
Enter	Maximize / restore active viewport
Esc	Deselect ROI
F	Toggle full screen/window mode
Ctrl + Alt + F3	Toggle toolbar visibility

PACS search window

Enter	Download selected study/studies to the active viewer window (clears previously opened study)
Shift + Enter	Add selected study/studies to the active viewer window
Ctrl + Enter	Download selected study/studies to the new viewer window
Ctrl + Shift + Enter	Download and show selected study/studies in separate windows
Ctrl + P	Find all studies of the selected patient
Ctrl + Del	Cancel all active downloads and searches
Ctrl + O	PACS configuration
Ctrl + L	Show the list of active and finished downloads along with detailed statistics and status messages
F2 - F12	Perform PACS search using saved presets

PACS configuration window

Ctrl + Up	Increase the priority of the selected PACS location

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Ctrl + Down	Decrease the priority of the selected PACS location
Del	Delete selected PACS location
F2	Verify PACS locations (C-ECHO)

DICOM tags window	
Ctrl + O	Show DICOM file in Explorer
Ctrl + C	Copy selected tag to clipboard
Ctrl + Shift + C	Copy all tags to clipboard
Ctrl + Shift + V	Copy tag value to clipboard
Ctrl + S	Save RAW value(s) of the selected tag(s) to a file

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4.2 Mouse functions

2D Viewer window	
Left mouse button + mouse move	Browse images of the series [default setting]
Middle mouse button + mouse move	Adjust image window (brightness/contrast) [default setting]
Right mouse button + mouse move	Zoom image in/out [default setting]
Back (4th) mouse button + mouse move	Pan image [default setting]
Forward (5th) mouse button + mouse move	Length measurement [default setting]
Ctrl + left mouse button click on a thumbnail	Open series in new panel
Ctrl + left mouse button + mouse move	Adjust image window (brightness/contrast)
Shift + left mouse button + mouse move	Pan image
Ctrl + vertical mouse wheel	Zoom image in/out
Vertical mouse wheel	Browse images of the series
Horizontal mouse wheel	Go to previous/next series

3D Volume Rendering window	
Left mouse button + mouse move	3D rotate volume [default setting]
Middle mouse button + mouse move	Adjust image window (color/opacity) [default setting]
Right mouse button + mouse move	Zoom image in/out [default setting]
Back (4th) mouse button + mouse move	Pan image [default setting]
Forward (5th) mouse button + mouse move	Length measurement [default setting]
Ctrl + left mouse button + mouse move	Adjust image window (color/opacity)
Shift + left mouse button + mouse move	Pan image
Ctrl + Alt + Left mouse button + mouse move	Roll

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Alt + left mouse button + mouse move	Draw area with the scalpel tool

3D MPR window	
Left mouse button + mouse move	Browse volume back/front [default setting]
Middle mouse button + mouse move	Adjust image window [default setting]
Right mouse button + mouse move	Zoom image in/out [default setting]
Back (4th) mouse button + mouse move	Pan image [default setting]
Forward (5th) mouse button + mouse move	Length measurement [default setting]
Ctrl + left mouse button + mouse move	Adjust image window
Shift + left mouse button + mouse move	Pan image
Alt + left mouse button + mouse move	3D rotate
Ctrl + Alt + left mouse button + mouse move	Roll
Ctrl + Shift + left mouse button + mouse move	Change thickness

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4.3 Multi-touch operations

2D Viewer window	
Drag one finger over series preview bar	Scroll series list.
Drag one finger over image	Tool chosen in the toolbar (browsing series by default).
Two fingers over image	Pinch to zoom, drag to pan image.
Three fingers over image	Drag up/down to change brightness, drag left/right to change contrast.
Double tap on image	Maximize/restore panel.

3D Volume Rendering window	
Drag one finger over image	Tool chosen in the toolbar (3D rotate by default).
Two fingers over image	Pinch to zoom, drag to pan image, rotate to roll image.
Three fingers over image	Drag up/down/left/right to change color/opacity.
Double tap on image	Toggle full-screen mode.

3D MPR window	
Drag one finger over image	Tool chosen in the toolbar (browse volume by default).
Two fingers over image	Pinch to zoom, drag to pan image, rotate to roll image.
Three fingers over image	Drag up/down/left/right to change window level and width (WL/WW).
Four fingers over image	Drag up/down to change slab thickness.
Double tap on image	Toggle full-screen mode.

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4.4 Configuration files

4.4.1 Options.xml

The **options.xml** file can be used to set RadiAnt DICOM Viewer default preferences.

It is located either in the "C:\ProgramData\RadiantViewer" (Windows 10, 7, 8, Vista) or "C:\Documents and Settings\All Users\Application Data\RadiantViewer" (Windows XP) folder.

When RadiAnt DICOM Viewer is used as a patient CD/DVD viewer, the options.xml file can be also placed in the "COMMON" folder on the CD/DVD media.

Default options.xm file:

```
<?xml version="1.0" encoding="utf-8" ?>
<options>

	<zoom>
		<toregion>0</toregion>		<!-- zoom-to-region mode (0 - disabled, 1 - enabled) -->
		<offcenter>0</offcenter>  <!-- the image region pointed by mouse cursor (when zooming is started) retains its position on screen (0 - disabled, 1 - enabled) -->
	</zoom>

	<browse>
		<scrollwrap>1</scrollwrap> <!-- "endless" scrolling (0 - disabled, 1 - enabled) -->
	</browse>

	<window>
		<presets>			<!-- window settings - presets -->
			<!-- <i m="CT" i="8" n="Preset 1" ww="70" wl="30"/> --> <!-- m - modality (CR, CT, MR, XA, MG, etc.), i - shortcut key (2-9), n - preset name, ww - window width, wl - window level -->
			<!-- <i m="CT" i="9" n="Preset 2" ww="32" wl="30"/> -->
		</presets>
	</window>

	<synchronization>
		<enabled>1</enabled> <!-- automatic synchronization (0 - disabled, 1 - enabled) -->
		<slice>1</slice> <!-- synchronize slice location (0 - disabled, 1 - enabled) -->
		<zoom>1</zoom> <!-- synchronize zoom&pan (0 - disabled, 1 - enabled) -->
		<window>0</window> <!-- synchronize window settings (0 - disabled, 1 - enabled) -->
	</synchronization>

	<updates>
		<notify>1</notify> <!-- notify about new updates (0 - disabled, 1 - enabled) -->
	</updates>

	<tools> <!-- tools assigned to mouse buttons (1 - browse series, 2 - zoom, 3 - pan, 4 - change WW/WL, 5 - ROI) -->
		<lmb>1</lmb> <!--  left mouse button -->
		<mmb>4</mmb> <!--  middle mouse button -->
```

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```
		<rmb>2</rmb> <!--  right mouse button -->
		<x1mb>3</x1mb> <!--  back mouse button -->
		<x2mb>5</x2mb> <!--  forward mouse button -->
		<mw>1</mw> <!-- mouse wheel (vertical) - valid tools: browse series (1) or zoom (2)
-->
		<mwh>1</mwh> <!-- mouse wheel (horizontal) - disabled (0), change series (1) -->
	</tools>

	<vr>
		<penscalpel>0</penscalpel> <!-- associate the scalpel tool with pen (0 - disabled, 1 -
enabled) -->
	</vr>

	<mpr>
		<autocenter>1</autocenter> <!-- auto center axes in viewports (0 - disabled, 1 -
enabled) -->
		<axisthkpts>0</axisthkpts> <!-- display thickness regulation points on the axis (0 -
disabled, 1 - enabled) -->
	</mpr>

	<cine>
		<autorun>1</autorun> <!-- Cine mode is started automatically for XA and US series
-->
		<fps>10</fps> <!-- default frames-per-second rate for series without predefined FPS
-->
	</cine>

	<loading>
		<autoshow>1</autoshow> <!-- mode of showing first image in viewport (0 - user has
to click a series to show it, 1 - first scanned image file is shown, 2 - after scanning all files, first series
from the preview bar is shown) -->
		<ussep>0</ussep> <!-- show separate thumbnails for single frame ultrasound images
belonging to the same DICOM series (0 - disabled, 1 - enabled) -->
		<desc>0</desc> <!-- study sorting mode (0 - ascending date, 1 - descending date) -->
		<primaryfirst>0</primaryfirst> <!-- add PRIMARY images before DERIVED as
separate series (0 - disabled, 1 - enabled) -->
		<nonimage>0</nonimage> <!-- load non-image DICOM files: PR,KO, etc. (0 -
disabled, 1 - enabled) -->
		<acceptpushed>0</acceptpushed> <!-- accept and display studies pushed from PACS
locations (0 - disabled, 1 - enabled) -->
		<sernum>0</sernum> <!-- show series numbers on thumbnail images (0 - disabled, 1
- enabled) -->
	</loading>

	<disabled>
		<!-- disabled features and toolbar buttons -->
		<!-- <folders/> -->
		<!-- <cddvd/> -->
		<!-- <pacs/> -->
		<!-- <export/> -->
		<!-- <db/> -->
	</disabled>

	<screen>
```

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```
		<split c="0" r="0"/> <!-- default split screen preset c - columns, r - rows -->
		<clp>0</clp>	<!-- close panel button behavior (0 - closes panel, 1 - clears panel) --
>
		<!-- default position of the viewer window (w - width, h - height, l, t - top left corner's
coordinates, m - window state: 0 - normal, 1 - maximized, f - full screen: 0 - disabled, 1 - enabled) -->
		<!--
		<windows>
			<viewer w="800" h="600" l="0" t="0" m="0" f="0"/>
		</windows>
		-->
	</screen>

	<i18n>
		<!-- <fiso>ISO_IR 192</fiso> --> <!-- define specific character set which overrides
value defined in (0008,0005) SpecificCharacterSet tag for all DICOM files -->
	</i18n>

	<pacs>
		<!-- define additional PACS search fields -->
		<srcfields>
			<!-- <i id="00081070" n="Operators&amp;apos; name" h="Enter operators&amp;apos;
name..." la="1" ta="1"/> --> <!-- id - DICOM tag id, n - name, h - hint, la - add leading asterisk, ta -
add trailing asterisk -->
		</srcfields>
	</pacs>

	<roi>
		<length>
			<units>0</units> <!-- measurement units (0 - automatic units, 1 - mm, 2 -
cm, 3 - m, 4 - um, 5 - nm) -->
			<precision>2</precision> <!-- number of decimal places displayed -->
			<divide>0</divide> <!-- 1 - a mark is drawn in the middle of the segment -->
		</length>
		<ellipse>
			<center>0</center> <!-- 1 - a mark is drawn in the center of the ellipse -->
		</ellipse>
	</roi>

	<srdocs>
		<imgheader>0</imgheader> <!-- 1 - display image in the header of Structured
Reporting HTML docs (image path: PROGRAMDATA\RadiAntViewer\srlogo.png) -->
	</srdocs>

	<db>
		<showonstart>0</showonstart> <!-- after program is started show: 0 - empty viewer
window, 1 - database window -->
		<autoviewer>0</autoviewer> <!-- automatically display imported files in the viewer: 0
- none, 1 - CD/DVD disc  -->
		<autoeject>0</autoeject> <!-- 1 - automatically eject CD/DVD disc after import is
finished -->
	</db>

</options>
```

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4.4.2 Overlay.xml

The **overlay.xml** file can be used to change the default annotations displayed over images in RadiAnt DICOM Viewer.

It is located either in the "C:\ProgramData\RadiantViewer" (Windows 7, 8, Vista) or "C:\Documents and Settings\All Users\Application Data\RadiantViewer" (Windows XP) folder.

When RadiAnt DICOM Viewer is used as a patient CD/DVD viewer, the overlay.xml file can be also placed in the "COMMON" folder on the CD/DVD media.

Sample file:

```
<?xml version="1.0" encoding="utf-8" ?>
<sets>
	<set>
		<tl>
			<i r="0" s="1" c="1"/>
			<i r="1" s="2"/>
			<i r="2" s="3"/>
		</tl>
		<tr>
			<i r="0" a="1" s="4"/>
			<i r="1" a="1"><e k="1" i="00100020"/></i>
			<i r="2" s="5"/>
			<i r="3"><e k="1" i="00080080"/></i>
			<i r="4"><e k="1" i="00200010"/></i>
			<i r="5"><e k="1" i="00081030"/></i>
			<i r="6"><e k="1" i="0008103E"/></i>
			<i r="7"><e k="1" i="00204000"/></i>
			<i r="8"><e k="1" i="00324000"/></i>
			<i r="9" s="6" c="1"/>
		</tr>
		<bl>
			<i r="0" s="A"/>
			<i r="1" s="D" c="1"/>
			<i r="2" s="C" c="1"/>
		</bl>
		<br>
			<i r="0" s="9"/>
		</br>
	</set>

	<set c="1">
		<tl>
			<i r="0" s="e" c="1"/>
		</tl>
	</set>

	<set m="MR" e="1">
		<br>
```

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```
                        <i r="1" s="7"/>
                        <i r="2" s="8"/>
                </br>
        </set>

        <set m="CT" e="1">
                <br>
                        <i r="1" s="F"/>
                </br>
        </set>

        <set m="MG" e="1">
                <tl>
                        <i r="3"><e k="1" i="00200062"/></i>
                        <i r="4"><e k="1" i="00185101"/></i>
                </tl>
        </set>

</sets>

<!--

<set>           a collection of annotations grouped in four corners of the image panel

<set> attributes:
"m"             modality (a set is considered as default if the "m" attribute is missing)
"c"             c="0" - set defined for static images, c="1" - set defined for CINE mode
"e"             e="0" - set overwrites default set, e="1" - set extends default set

<tl>            top left corner
<tr>            top right corner
<bl>            bottom left corner
<br>            bottom right corner

<i>             single row - can be one of the predefined annotations or a collection of elements (texts
and DICOM tag values)

<i> attributes:
"r"             row index (0 ... n), starting from the panel border (0 - a row closest to the border)
"a"             1 - the row is hidden when anonimization is enabled
"c"             font color: 0 - yellow, 1 - red
"d"             1 - the row is hidden when the included DICOM element(s) is missing

"s"             if present, one of the predefined annotations is used:

01              Current image number and total number of images in the viewport (e.g. "3/237")
02              Current series number (e.g. "Se: 4")
03              Lossy image compression info (e.g. "Lossy compression (JPEG 2000)")
04              Patient name (without ^^^)
05              Patient birthday and sex (e.g. "1952-02-09 M")
06              Rotation/flip info (e.g. "R: 90° CCW F: H")
07              MRI TE and TR times (e.g. "TR: 540.0 TE: 14.0")
08              MRI strength of field (e.g. "FS: 1.5")
```

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09 Image acquisition date and time (or study date and time if acquisition timestamp is not available) (e.g. "2009-12-03 19:23:12")
0A Thickness and location of the image (e.g. "T: 5.0mm L: -68.7mm")
0B Positioner angles (e.g. "LAO: 9 CRA: 27")
0C Mouse cursor position (in DICOM image coordinates) and value of the DICOM pixel under cursor (e.g. "X: 139 Y: 281 Val: 105")
0D Window width and level info, window preset, negative mode (e.g. "WL: 40 WW: 80 [CT Brain]")
0E Current real FPS (frames per second) value during CINE run (e.g. "15 fps")
0F X-ray tube current in mA and peak kilovoltage output of the x-ray generator(e.g. "330mA 120kV")
10 3D cursor position in milimeters (e.g. "X: 28.94mm Y: -6.12mm Z: -487.03")

<e> single element (a text or a DICOM tag value)
<e> attributes:
"k" 1 - DICOM tag value, 2 - text element
"i" DICOM tag ID (group and element hex values), valid only if k="1"
"t" a text, valid only if k="2"

an example of a row consisiting of the text element and the DICOM tag value:
<e k="2" t="Body part examined: "/><e k="1" i="00180015"/>

-->

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4.5 Command-line arguments

radiantviewer.exe	
-f	Open DICOM files (radiantviewer.exe -f "file1" "file2" "file3")
-fl	Open DICOM files listed in a text file, one file path in each line (radiantviewer.exe -fl "filelist.txt")
-d	Open DICOM files from folders (radiantviewer.exe -d "folder1" "folder2" "folder3") This parameter, when used with the CD/DVD autorun version, defines only specific folders for scanning on the CD/DVD media.
-b	Show expanded subfolders tree after starting RadiAnt DICOM Viewer (radiantviewer.exe -b "rootfolder")
-cl	Close all other opened windows of RadiAnt DICOM Viewer (radiantviewer.exe -cl)
-pstv	Start downloading studies that match a specific DICOM tag/value pair (radiantviewer.exe -pstv 00080050 "1412-14-ACCESSION-NUMBER" or radiantviewer.exe -pstv 0020000D "1.4.24.2.1107.STUDYUID")
-paet	Start downloading studies from the specific PACS host(s), matched by the AE title (radiantviewer.exe -paet MYPACSAETITLE -pstv 00100020 "23874623-PATIENTID")
-wp	Set main window position and size (radiantviewer.exe -wp X Y W H F) X,Y - position, W,H - size, F - flags (1 - W&H specify client area size)
-sp	Set default split screen preset (radiantviewer.exe -sp colnum rownum)
-sf	Hide specific interface elements (radiantviewer.exe -sf F) F - flag (hidetoolbar = 0x0001, hideseriesbar = 0x0002, hidestatusbar = 0x0004)
-tg	Export DICOM meta data to text files (radiantviewer.exe -d "folder_in" -tg "folder_out")
FILENAME	Open DICOM file(s) (radiantviewer.exe "file1")
FOLDERNAME	Open DICOM folder(s) (radiantviewer.exe "folder1")
ZIPARCHIVE.zip	Open DICOM zip archive (radiantviewer.exe "samplearchive.zip")
DATABASE.rdvdb	Open RadiAnt database(s) (radiantviewer.exe "mycases.rdvdb")

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radcmd.exe	
-activateonline	Activate RadiAnt DICOM Viewer automatically with the serial number (radcmd.exe -activateonline SERIALNUMBER)
-reqcode	Get the request code required for manual activation (radcmd.exe -reqcode)
-activate	Activate RadiAnt DICOM Viewer with the code generated in the manual activation service (radcmd.exe -activate ACTIVATION_CODE)
-deactivate	Deactivate RadiAnt DICOM Viewer installation and get codes required in the manual deactivation service (radcmd.exe -deactivate)

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4.6 URL protocol

Local RadiAnt DICOM Viewer installation can be controlled using the **radiant://** URL protocol.
By clicking special links in web browsers, all actions available via command-line arguments can be executed.

How can I create radiant:// URLs?

You have to pass command-line arguments (their names and values) via the URL query parameters "n" and "v" respectively.
Special characters (e.g., quotes, spaces) have to be URL encoded.

Sample command-line to URL translations:

```
radiantviewer.exe -d "folder1" "folder2" "folder3"
```

```
radiant://?n=d&v=%22folder1%22&v=%22folder2%22&v=%22folder3%22
```

```
radiantviewer.exe -pstv 0020000D "1.4.24.2.1107.STUDYUID"
```

```
radiant://?n=pstv&v=0020000D&v=%221.4.24.2.1107.STUDYUID%22
```

```
radiantviewer.exe -paet MYPACSAETITLE -pstv 00100020 "23874623-PATIENTID"
```

```
radiant://?n=paet&v=MYPACSAETITLE&n=pstv&v=00100020&v=%2223874623-PATIENTID%22
```

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4.7 Setup arguments

Setup command-line arguments	
/S	Enable silent installation mode
/D	Destination folder (it must be the last parameter used in the command line and must not contain any quotes, even if the path contains spaces)
/LANGFILE	Language XML file path
/LANGUAGE	Setup language (overrides system locale, eg. `/LANGUAGE=1033`)
Sample syntax	radiantsetup.exe /S /LANGFILE="D:\language_es.xml" /D=C:\Program Files\RadiAnt

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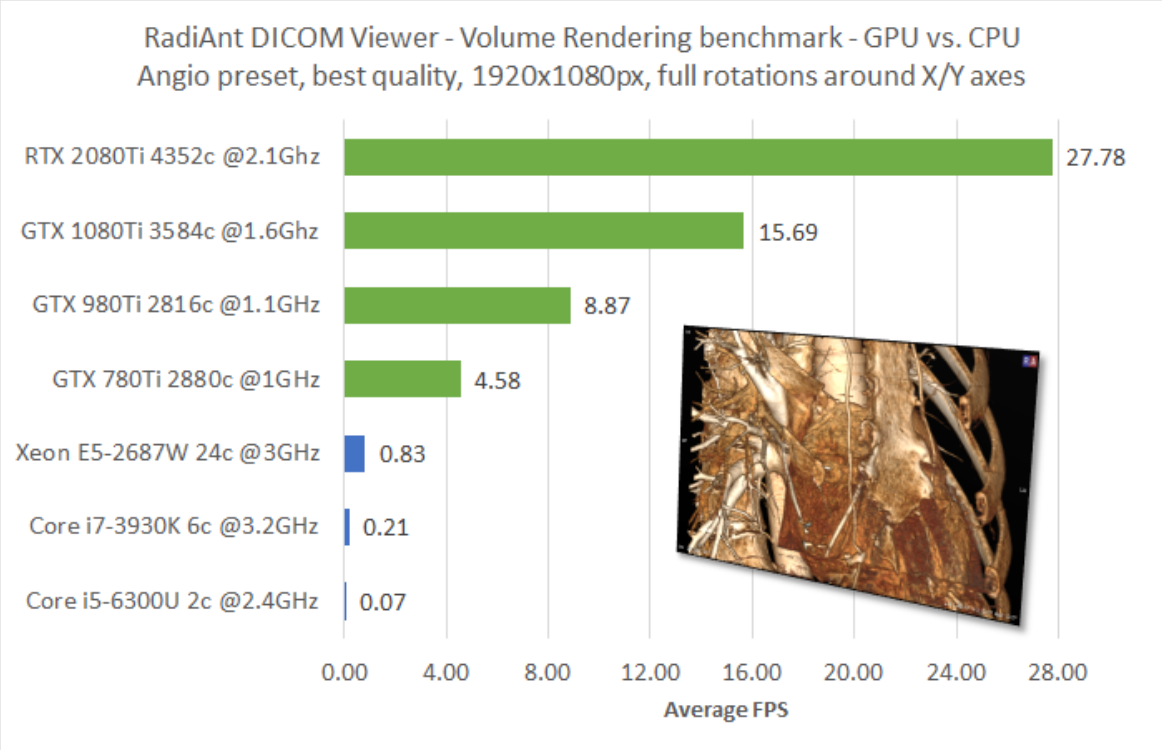
4.8 GPU acceleration

Recent years have brought tremendous advancements in Graphics Processing Units development. The computing power of the current top-of-the-line graphics cards reaches more than 10 TFLOPS, which is about 100 times more than the average modern desktop CPU.



Three-dimensional reconstruction modes available in RadiAnt DICOM Viewer (3D Volume Rendering; 3D Multiplanar Reformation) are based on algorithms that require tens of billions of mathematic operations per one frame of reconstructed image. When CPU is used for such calculations, progressive rendering has to be used to facilitate the fluidity required for smooth interactions. Only when a user stops volume manipulation can the final image be rendered in best quality. However, if a compatible GPU card is detected in the system, it can be used by RadiAnt DICOM Viewer to crunch the numbers at much faster rates, so that smooth interaction with volume can be achieved at best rendering quality.

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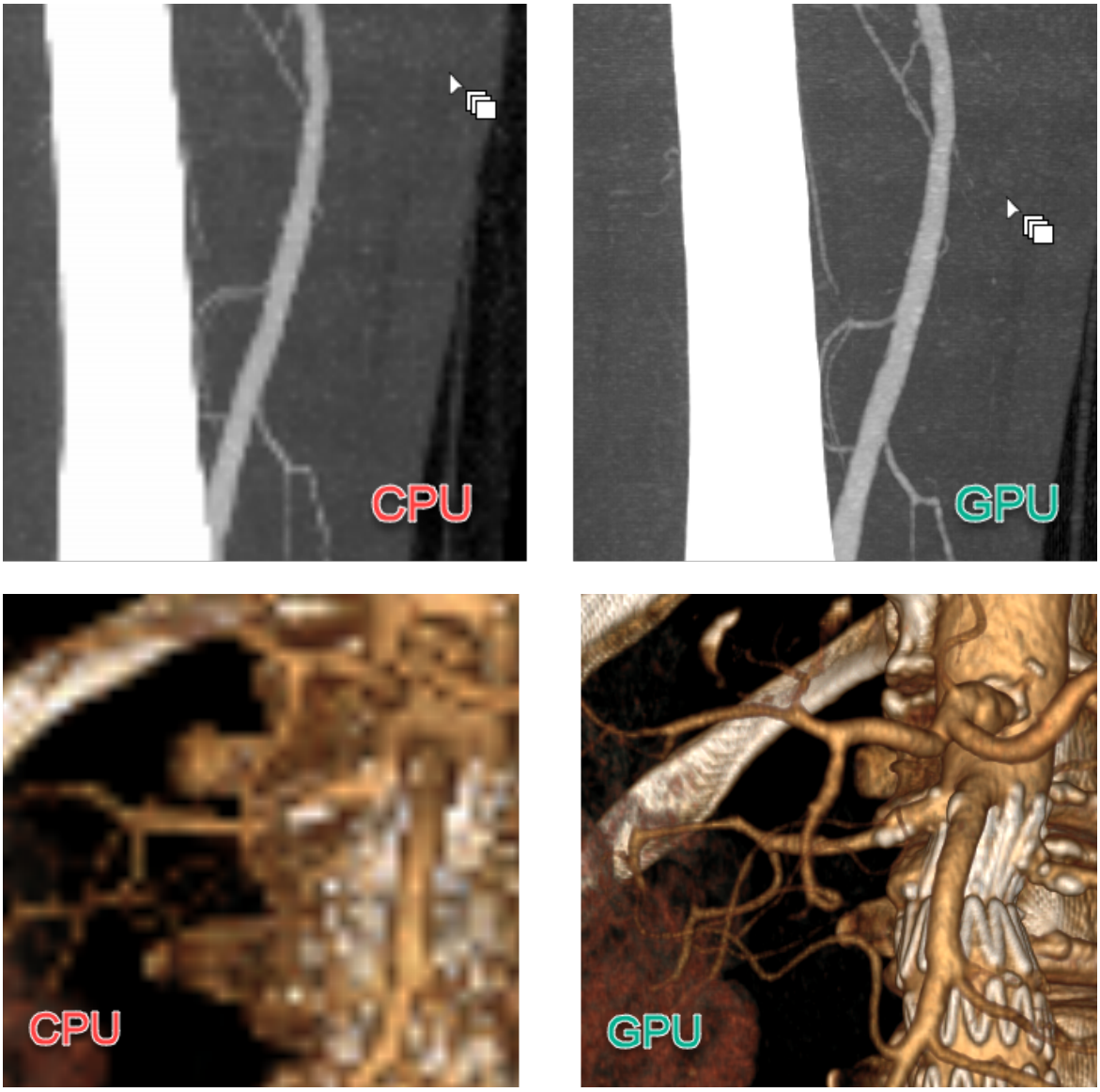

GPU rendering mode is automatically enabled in 3D VR and 3D MPR windows when a fast Nvidia graphics card is detected. If a slower card is detected, GPU mode has to be enabled manually.

Prerequisites

- A 64-bit version of RadiAnt DICOM Viewer is required to make use of GPU-accelerated rendering, this mode is not supported in the 32-bit version of the viewer.
- The latest Nvidia drivers should be installed (http://www.nvidia.com/Download/index.aspx).
- Nvidia CUDA compatible GPU is required with the compute capability version 3.0 or later:

  GeForce GTX 770, GeForce GTX 760, GeForce GT 740, GeForce GTX 690, GeForce GTX 680, GeForce GTX 670, GeForce GTX 660 Ti, GeForce GTX 660, GeForce GTX 650 Ti BOOST, GeForce GTX 650 Ti, GeForce GTX 650, GeForce GTX 880M, GeForce GTX 780M, GeForce GTX 770M, GeForce GTX 765M, GeForce GTX 760M, GeForce GTX 680MX, GeForce GTX 680M, GeForce GTX 675MX, GeForce GTX 670MX, GeForce GTX 660M, GeForce GT 750M, GeForce GT 650M, GeForce GT 745M, GeForce GT 645M, GeForce GT 740M, GeForce GT 730M, GeForce GT 640M, GeForce GT 640M LE, GeForce GT 735M, GeForce GT 730M, GeForce GTX Titan Z, GeForce GTX Titan

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Black, GeForce GTX Titan, GeForce GTX 780 Ti, GeForce GTX 780, GeForce GT 640 (GDDR5), GeForce GT 630 v2, GeForce GT 730, GeForce GT 720, GeForce GT 710, GeForce GT 740M (64-bit, DDR3), GeForce GT 920M, GeForce GTX 750 Ti, GeForce GTX 750, GeForce GTX 960M, GeForce GTX 950M, GeForce 940M, GeForce 930M, GeForce GTX 860M, GeForce GTX 850M, GeForce 845M, GeForce 840M, GeForce 830M, GeForce GTX Titan X, GeForce GTX 980 Ti, GeForce GTX 980, GeForce GTX 970, GeForce GTX 960, GeForce GTX 950, GeForce GTX 750 SE, GeForce GTX 980M, GeForce GTX 970M, GeForce GTX 965M, Nvidia TITAN Xp, Titan X, GeForce GTX 1080 Ti, GTX 1080, GTX 1070 Ti, GTX 1070, GTX 1060, GTX 1050 Ti, GTX 1050, GT 1030, MX150, NVIDIA TITAN V, NVIDIA TITAN RTX, GeForce RTX 2080 Ti, RTX 2080, RTX 2070, RTX 2060, GeForce GTX 1660 Ti, GTX 1660, GTX 1650, Quadro K5000, Quadro K4200, Quadro K4000, Quadro K2200, Quadro K2000, Quadro K2000D, Quadro K600, Quadro K420, Quadro K500M, Quadro K510M, Quadro K610M, Quadro K1000M, Quadro K2000M, Quadro K1100M, Quadro K2100M, Quadro K3000M, Quadro K3100M, Quadro K4000M, Quadro K5000M, Quadro K4100M, Quadro K5100M, NVS 510, Quadro K6000, Quadro K5200, Quadro K1200, Quadro K620, Quadro M2000M, Quadro M1000M, Quadro M600M, Quadro K620M, NVS 810, Quadro M6000 24GB, Quadro M6000, Quadro M5000, Quadro M4000, Quadro M2000, Quadro M5500, Quadro M5000M, Quadro M4000M, Quadro M3000M, Quadro P6000, Quadro P5000, Quadro P4000, Quadro P2000, Quadro P1000, Quadro P600, Quadro P400, Quadro P5000(Mobile), Quadro P4000(Mobile), Quadro P3000(Mobile), Quadro GV100, Quadro RTX 8000, Quadro RTX 6000, Quadro RTX 5000, Quadro RTX 4000, Quadro T2000, Quadro T1000

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4.9 Citations

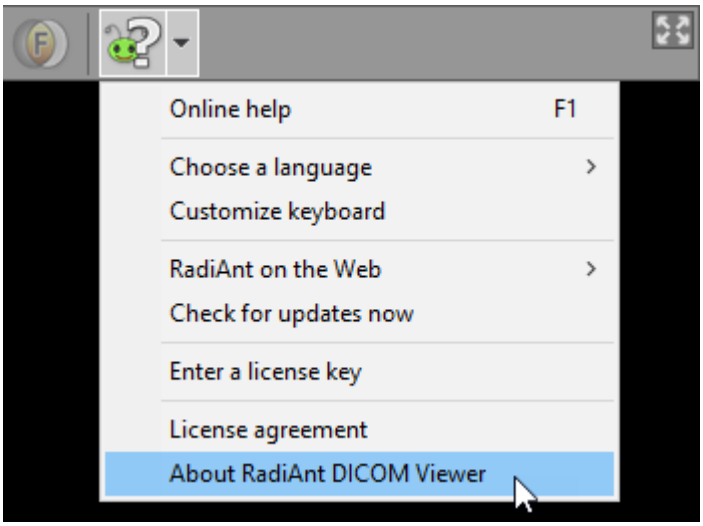
How to cite RadiAnt DICOM Viewer in academic publications:

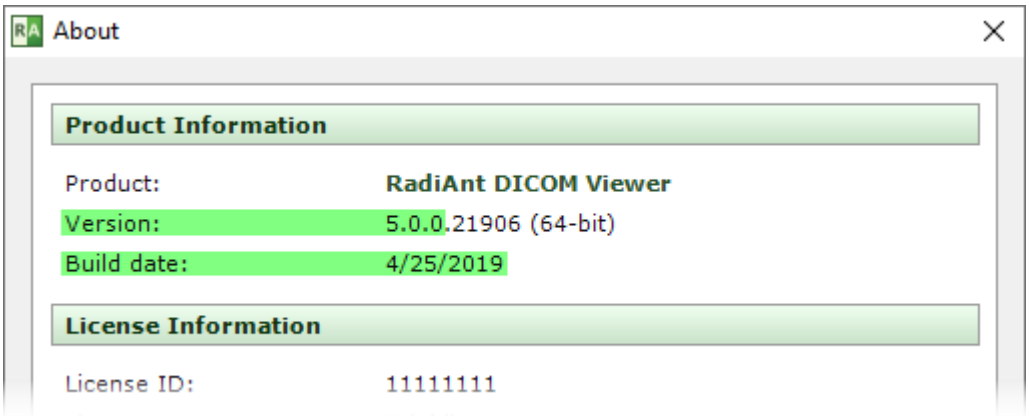
Medixant. RadiAnt DICOM Viewer [Software]. Version 5.0.0. Apr 25, 2019. URL: https://www.radiantviewer.com

BibTeX:

```
@software{radiant,
  author = {{Medixant}},
  title = {RadiAnt DICOM Viewer},
  url = {https://www.radiantviewer.com},
  version = {5.0.0},
  date = {2019-04-25},
}
```

The publication date and version entries have to be changed to match the version of software you are using. From within the software, click the arrow next to the **Help** button and then select About RadiAnt DICOM Viewer to find the version information and the date of build.





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4.10 CD/DVD Autorun Package

RadiAnt DICOM Viewer CD/DVD is available as the autorun package, it is intended for distribution as a patient CD/DVD viewer on CD/DVD media with a DICOM study.

The contents of the zipped archive after unpacking should be placed in the root folder of a CD/DVD media. You need your own hardware and software to transfer the autorun package contents to the media (e.g. a disc publisher).

The package contains 32-bit (RA32 folder) and 64-bit (RA64 folder) versions of RadiAnt DICOM Viewer CD/DVD.
There is also the "COMMON" folder, which contains the following subfolders and files:

- "LANG" - the language XML files with RadiAnt DICOM Viewer CD/DVD translations may be placed in this folder.
- "LICENSE" - a folder with the license agreements for RadiAnt DICOM Viewer CD/DVD and used open source libraries.
- "logo.jpg" - this file may be replaced with your custom logo image (JPEG, 650x300px).
- "options.xml" - this file may be edited to change the default settings of the RadiAnt DICOM Viewer CD/DVD.
- "overlay.xml" - this file may be edited to change the default annotations overlayed over the images.

After the purchase you will receive a license key (one key per one recording device).
The license key file ("license.radiantlic", which name may be changed to "license.rlc" for the sake of compatibility with the ISO 9660 Level 1 file system) must be copied to the "COMMON" folder.

After inserting media, the "autorun.inf" file automatically opens RadiAnt DICOM Viewer CD/DVD which performs a search for DICOM files placed on the media. This search can be narrowed down to the specific folders defined as command-line parameters (-d) in the "autorun.inf" file:

[AutoRun.Amd64]
LABEL=RadiAnt DICOM Viewer 64-bit
ICON=RA64\viewer64.exe,0
OPEN=RA64\viewer64.exe ***-d IMAGES***

[AutoRun]
LABEL=RadiAnt DICOM Viewer 32-bit
ICON=RA32\viewer32.exe,0
OPEN=RA32\viewer32.exe ***-d IMAGES***

The viewer may be also started manually with the "run.bat" file. It opens the "RA32/launcher.exe" tool which, depending on user's operating system versions, runs either 32-bit or 64-bit version of RadiAnt DICOM Viewer CD/DVD.

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RadiAnt DICOM Viewer CD/DVD can be opened with a chosen interface language (provided that the specific translation xml file is present in the LANG folder).
You have to pass the language code after the "-lang" parameter to launcher.exe
Just replace the contents of the "autorun.inf" file with:

[AutoRun.Amd64]
LABEL=RadiAnt DICOM Viewer 64-bit
ICON=RA64\viewer64.exe,0
OPEN=RA32\launcher.exe ***-lang es***

[AutoRun]
LABEL=RadiAnt DICOM Viewer 32-bit
ICON=RA32\viewer32.exe,0
OPEN=RA32\launcher.exe ***-lang es***

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