RadiAnt DICOM Viewer

User manual

Version 1.9.10
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http://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, and local and network folders.

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

- Digital Radiography (CR, DX)
- Mammography (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)

The viewer can handle many types of DICOM images:

- Monochromatic (e.g. CR, CT, MR) and color (e.g. US, 3D reconstructions)
- Static images (e.g. CR, MG, CT) and dynamic sequences (e.g. XA, US)
- Uncompressed and compressed (RLE, JPEG Lossy, JPEG Lossless, JPEG 2000)

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.
- A simple and intuitive interface with full-screen mode.
- Multi-touch support for Windows 8 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 over 2MB).
- 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).
- 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).
  - 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) and cross reference lines in series with different image planes (e.g. Magnetic Resonance study).
- Display of dynamic sequences/series (CINE) with adjustment of frames per second.
- Multi-planar Reconstructions (MPR).
- 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 format.
- Display DICOM file structure with DICOM tags, their descriptions and values.

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1.2 System requirements

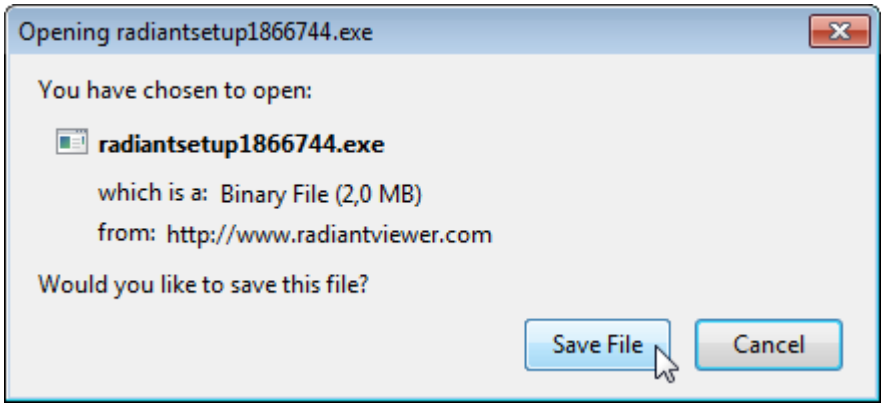
Minimum system requirements:

- Microsoft Windows system (XP SP2 or SP3, Vista, Windows 7 and Windows 8 are supported)
- Intel or AMD 1GHz or faster processor (multicore Intel processor recommended)
- 512MB of RAM (2GB recommended)
- 5MB of available hard-disk space for installation; additional free space required for image caching
- 800x600 screen resolution (at least 1024x768 recommended)

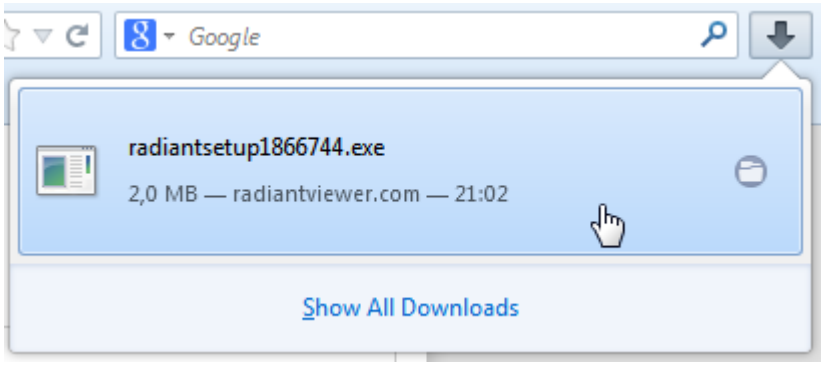
1.3 Installation

Download RadiAnt DICOM Viewer from http://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.



Double-click the downloaded file to run the **installer**.



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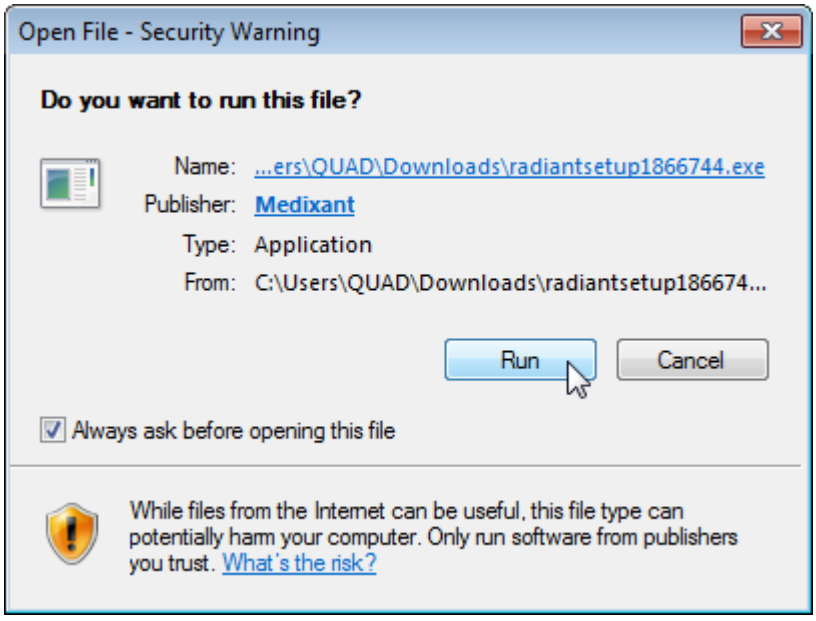
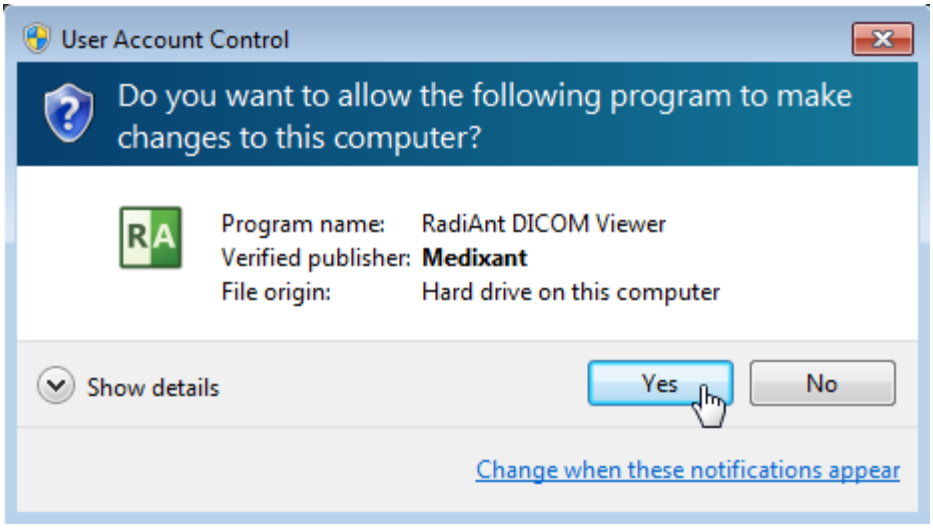
Click Run in the Security Warning dialog window.



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



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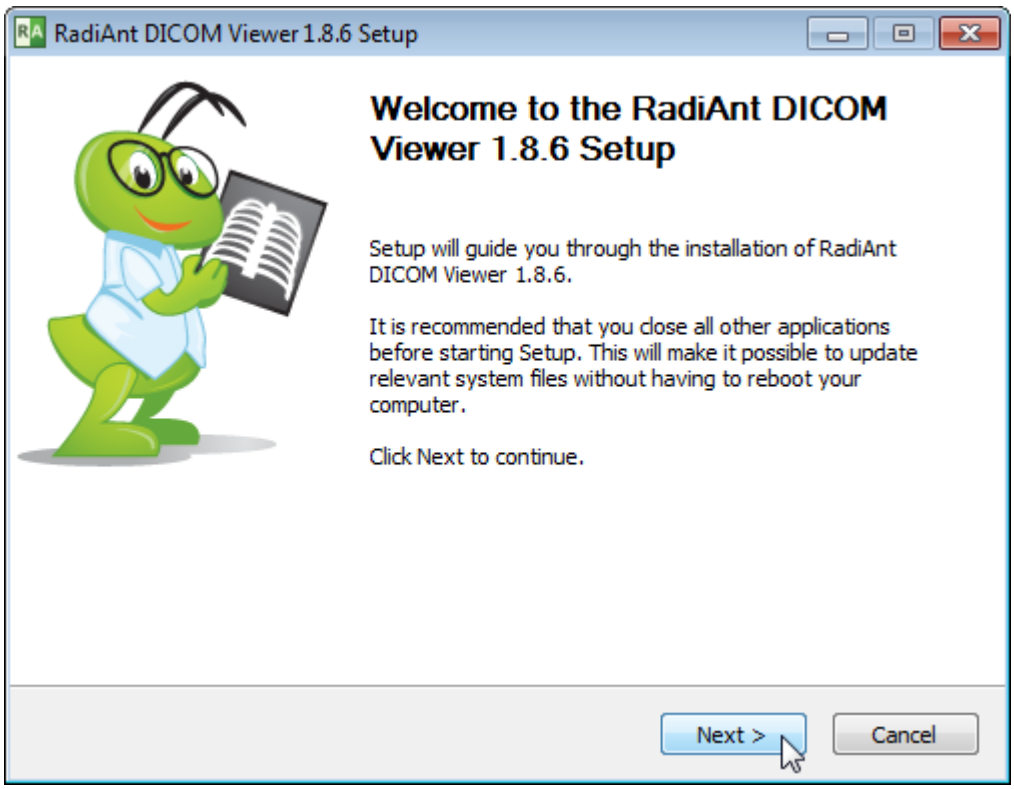
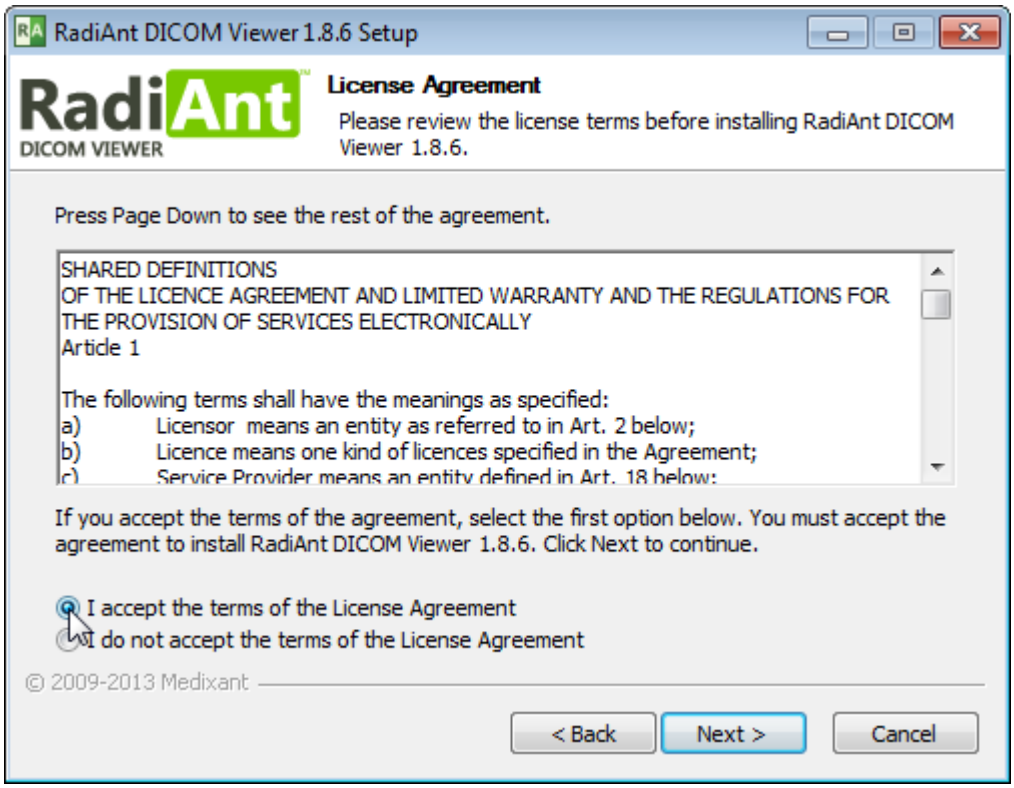
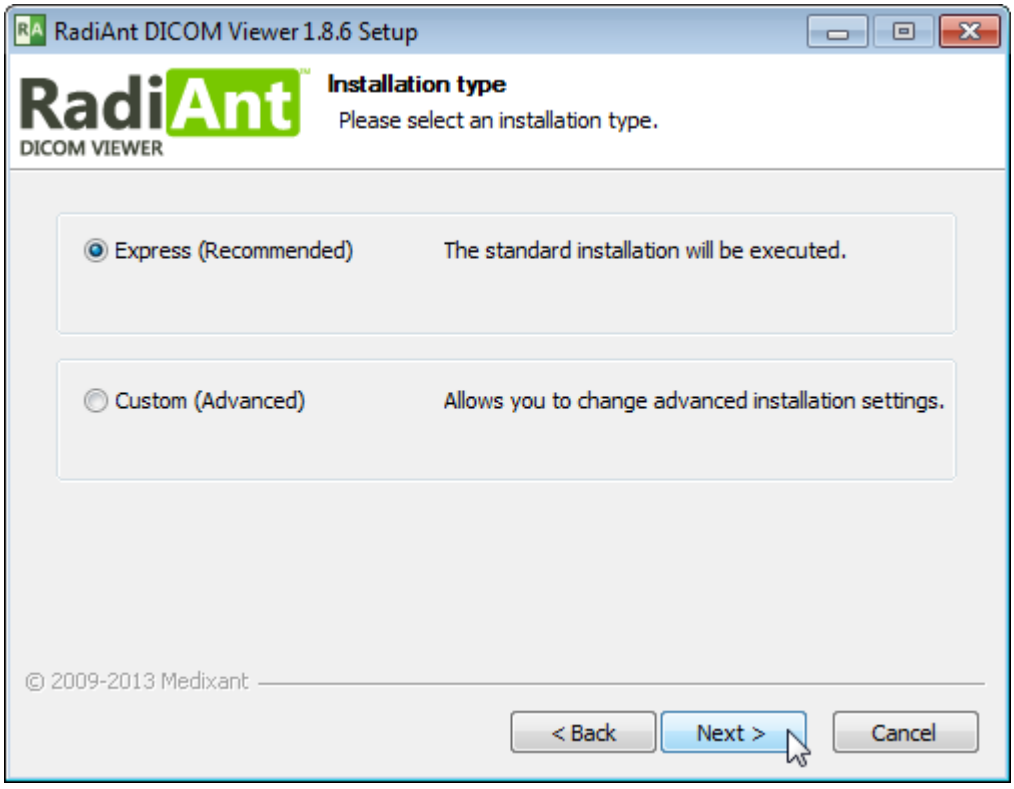
Follow the steps outlined by the **setup wizard** to complete the installation.






RadiAnt DICOM Viewer 1.8.6 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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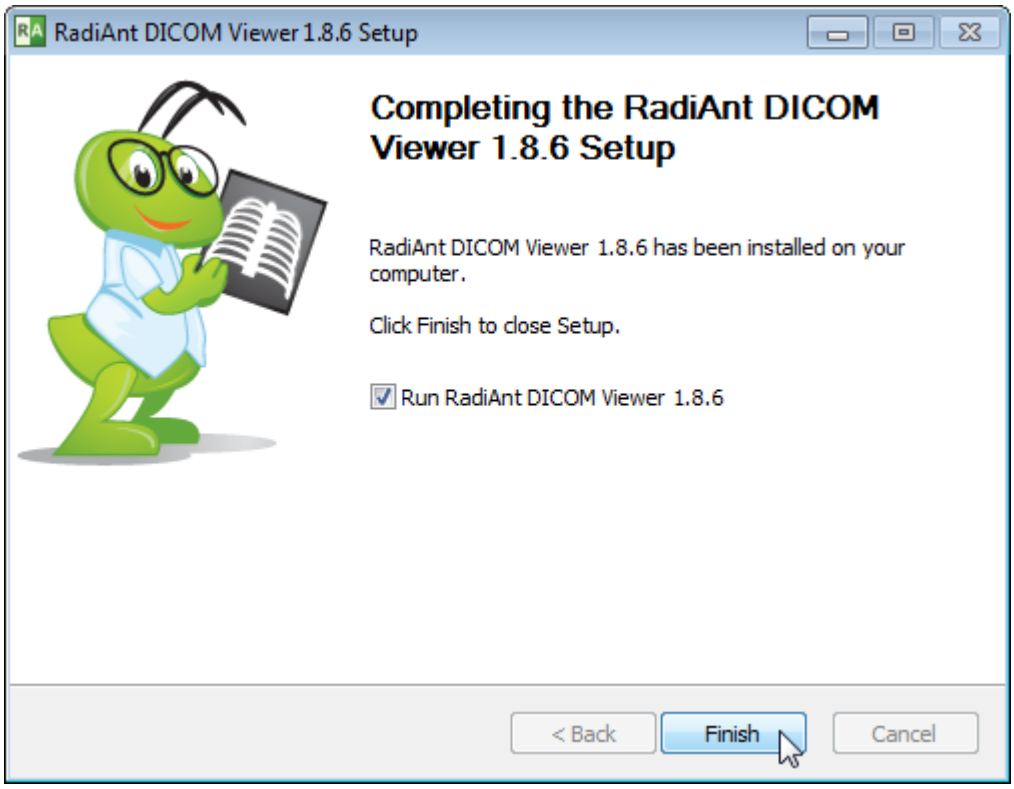
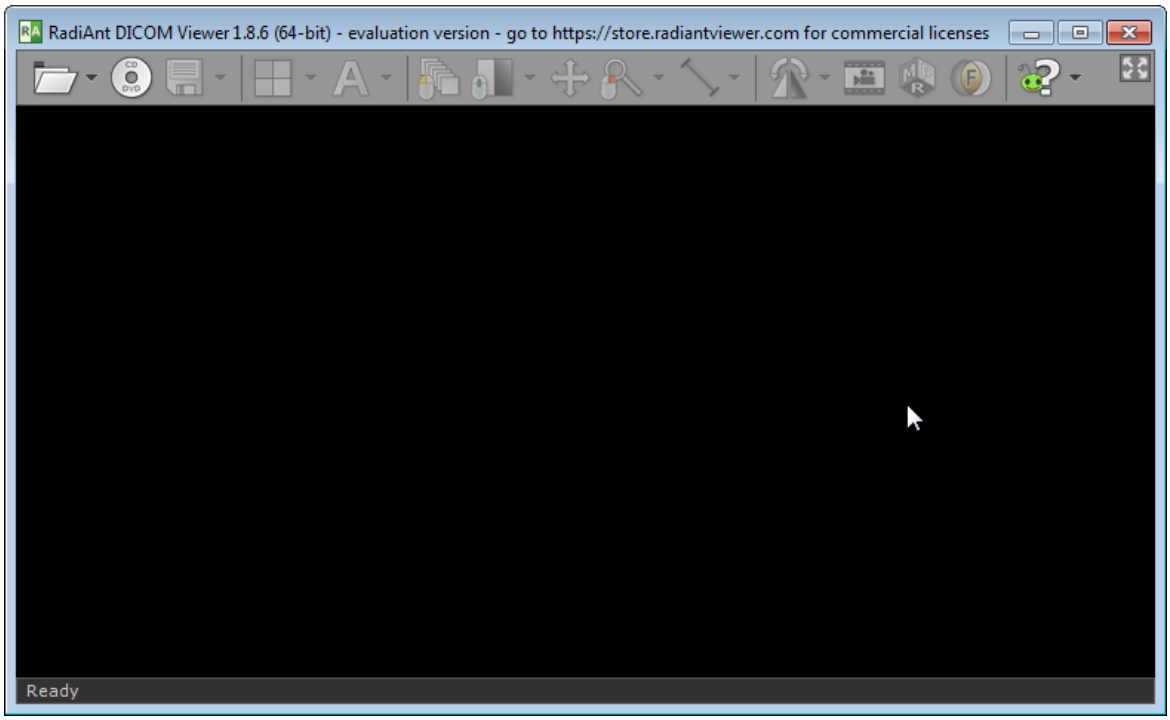
< Back
Next >
Cancel


RadiAnt DICOM Viewer 1.8.6 Setup
Completing the RadiAnt DICOM Viewer 1.8.6 Setup
RadiAnt DICOM Viewer 1.8.6 has been installed on your computer.
Click Finish to close Setup.
Run RadiAnt DICOM Viewer 1.8.6
< Back
Finish
Cancel

Once the setup has **completed**, your software is installed and 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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2 Basic Topics

2.1 Opening a DICOM study from a CD/DVD

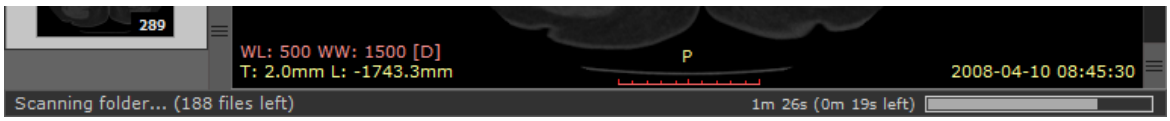
1. Insert a disk with a DICOM study into a CD/DVD drive. If the default viewer is automatically started from the CD, close it in order to obtain better reading speeds in RadiAnt DICOM Viewer.

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

3. Click the CD/DVD icon on the toolbar in main window (this icon 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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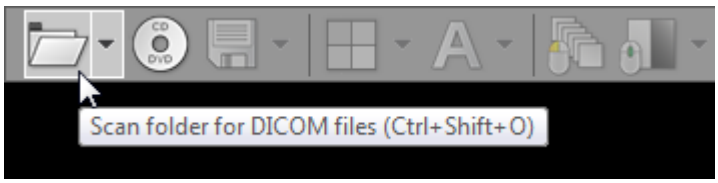
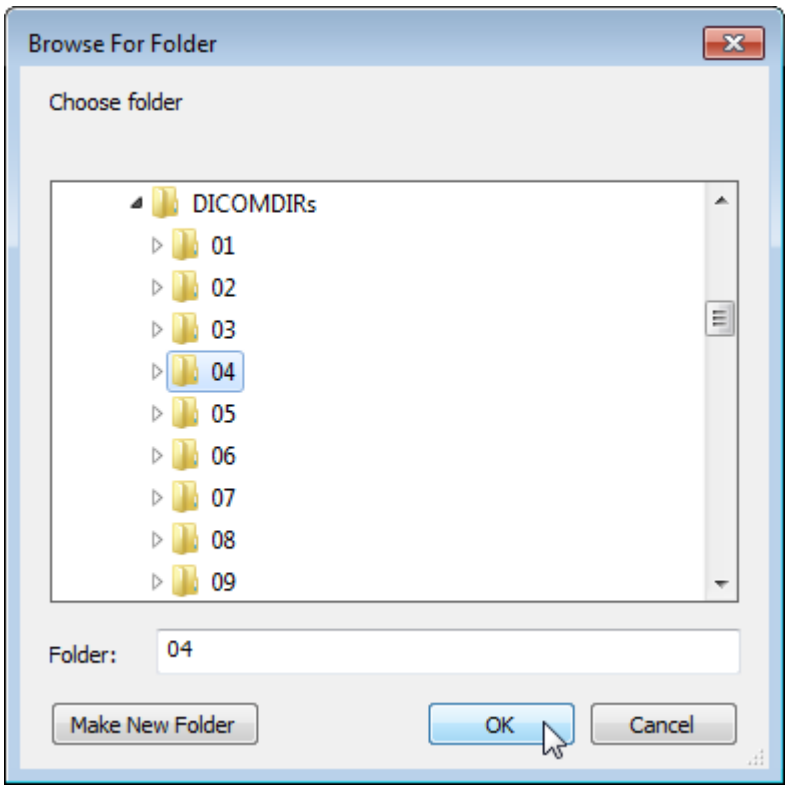
2.2 Opening a DICOM study from a folder

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

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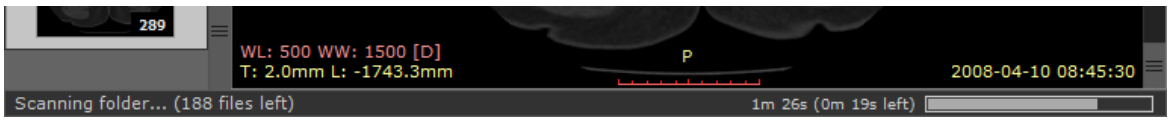
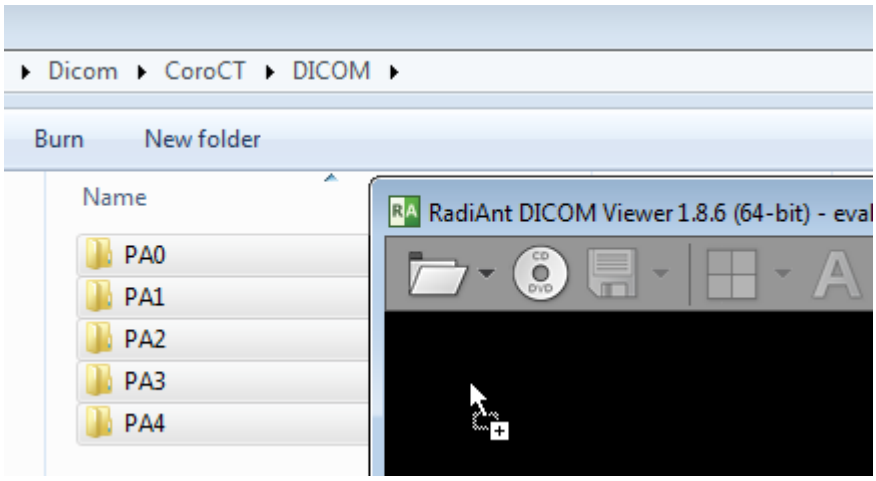
5. The status bar shows the number of remaining files, elapsed time, and estimated time to finish.

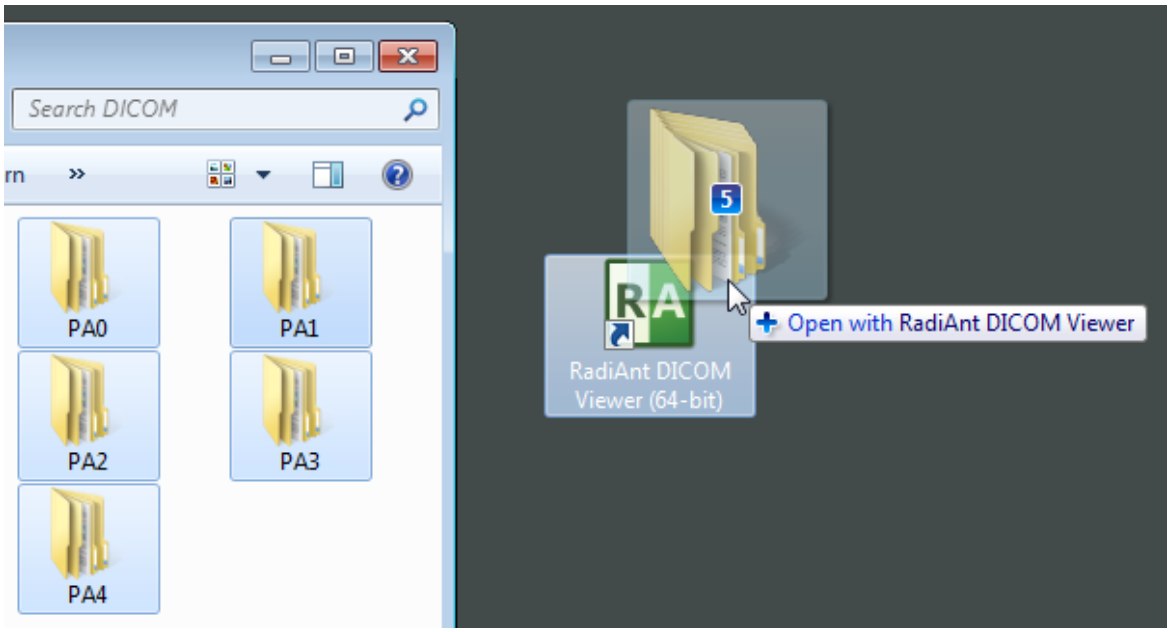


You may also use two other, faster methods:

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



Or, to its desktop icon:



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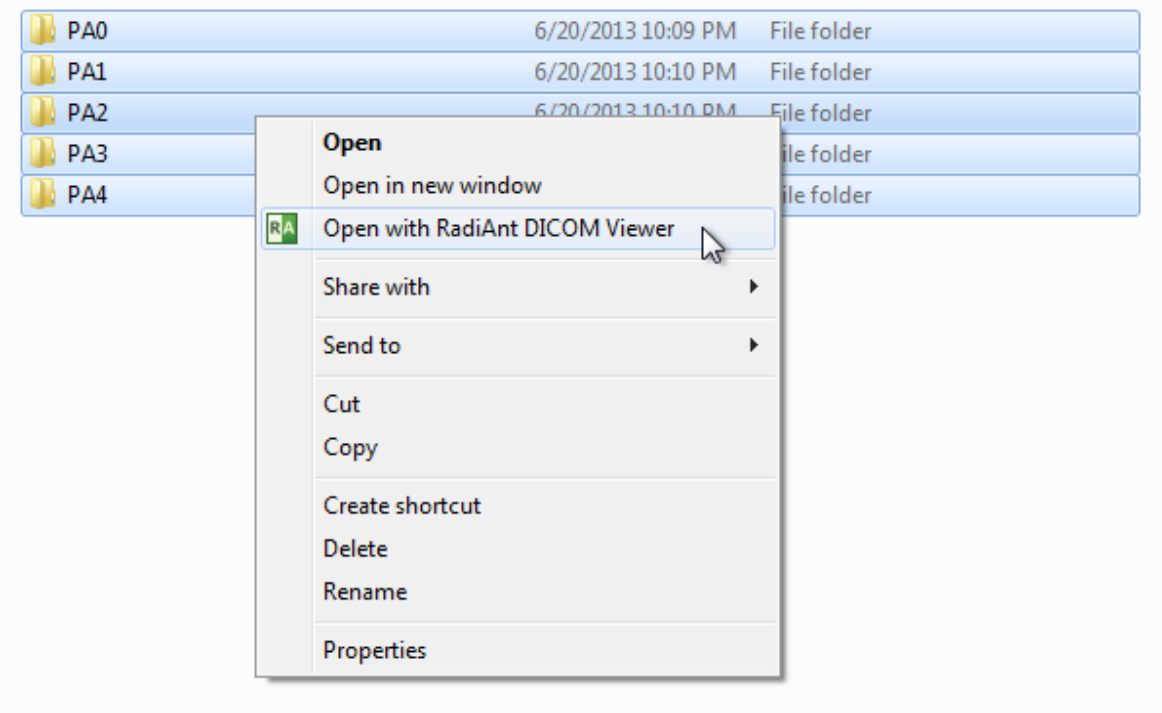
2. Right-click the context menu on the selected folder(s) and choose "Open with RadiAnt DICOM Viewer".



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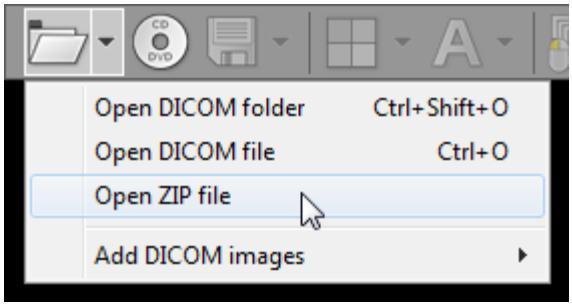
2.3 Opening a DICOM study from a ZIP archive

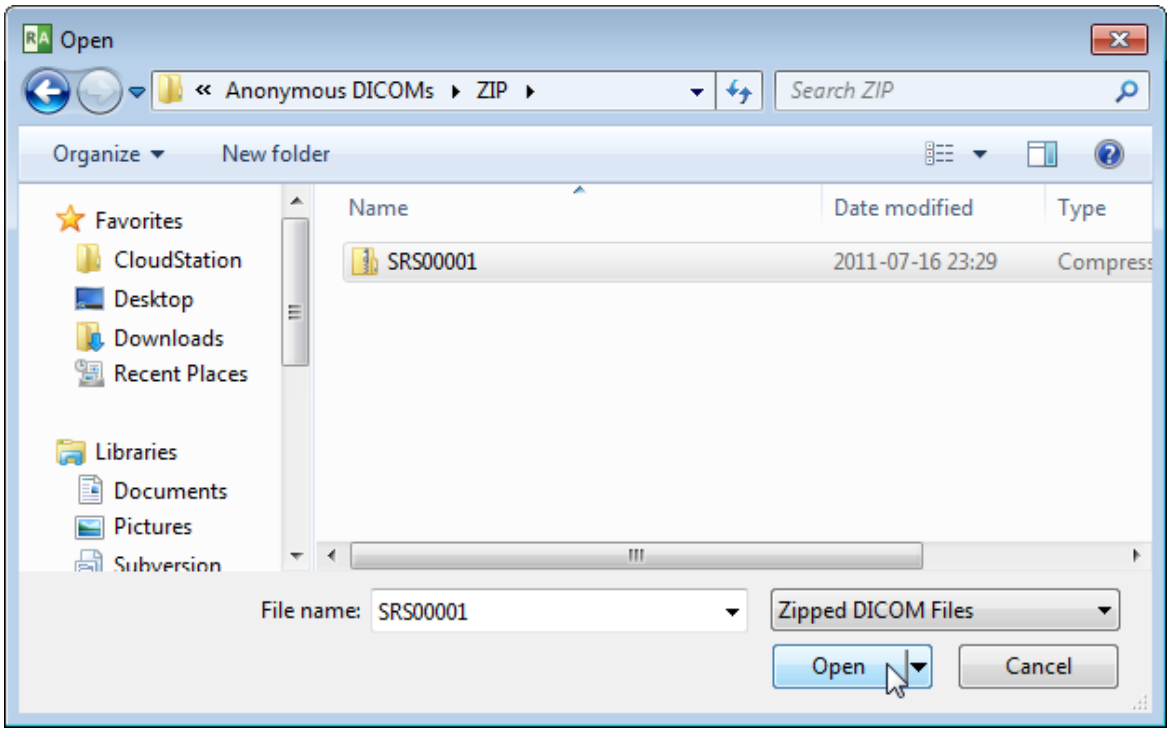
1. Run RadiAnt DICOM Viewer by double-clicking its desktop icon.

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

3. Click "Open ZIP file".



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



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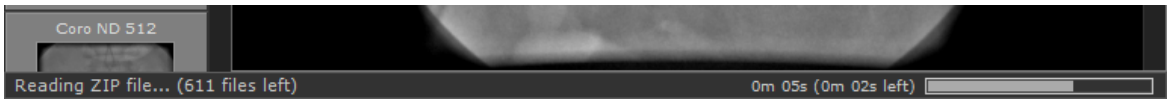
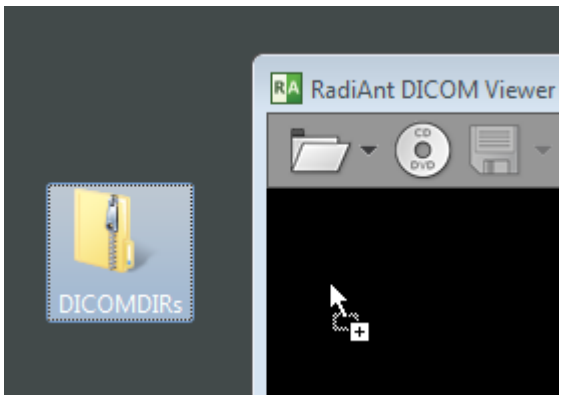
5. The process of unpacking and file scanning will start. You can browse images of the study as soon as they begin appearing in the series preview bar.

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

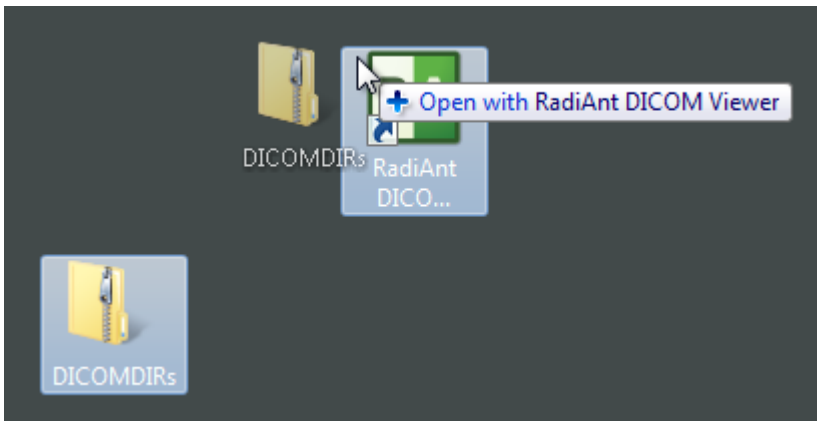


You can also use two other, faster methods:

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



Or, to its desktop icon:



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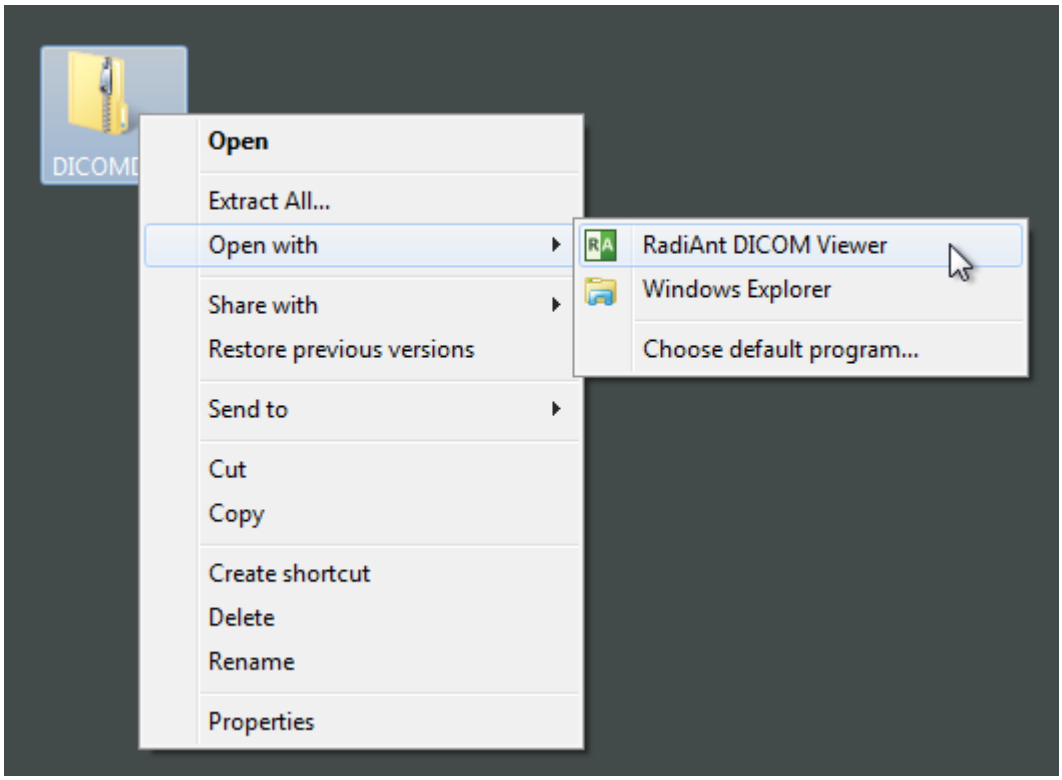
2. Use right-click context menu on the selected ZIP archive and click "Open with" / "RadiAnt DICOM Viewer".



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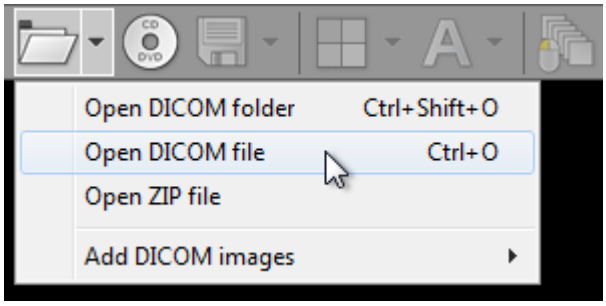
2.4 Opening specific DICOM file(s)

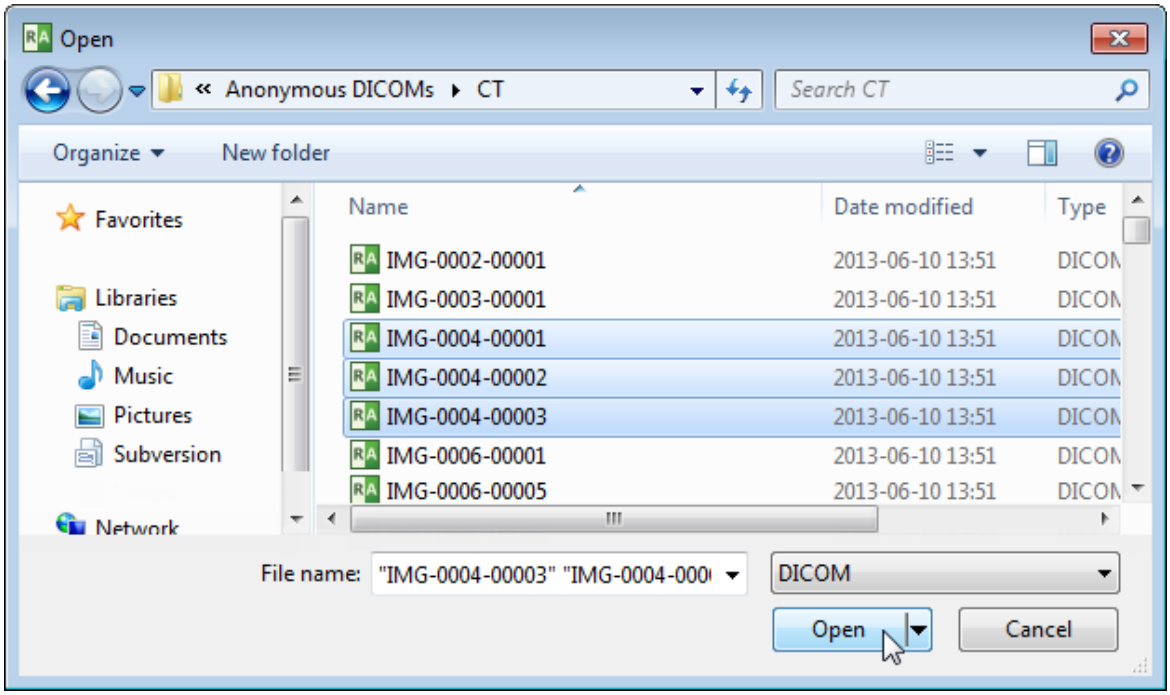
1. Run RadiAnt DICOM Viewer by double-clicking its desktop icon.

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

3. Click "Open DICOM file".



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



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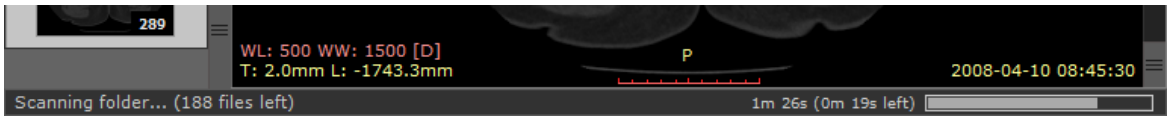
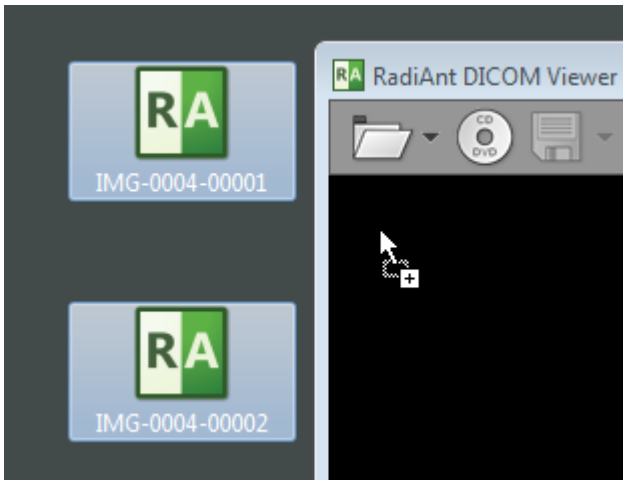
5. The process of loading will start. You may browse images of the study as soon as they begin appearing in the series preview bar.

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

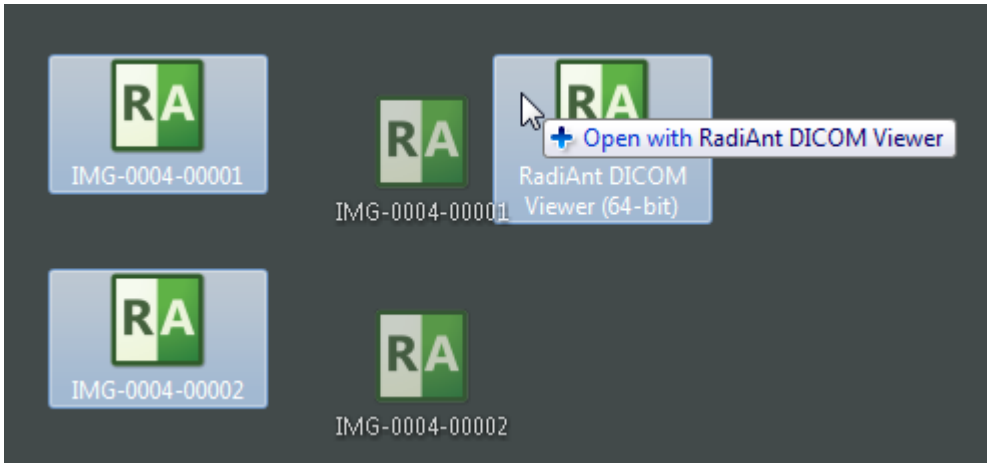


You can also use a faster method:

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



or to its desktop icon:



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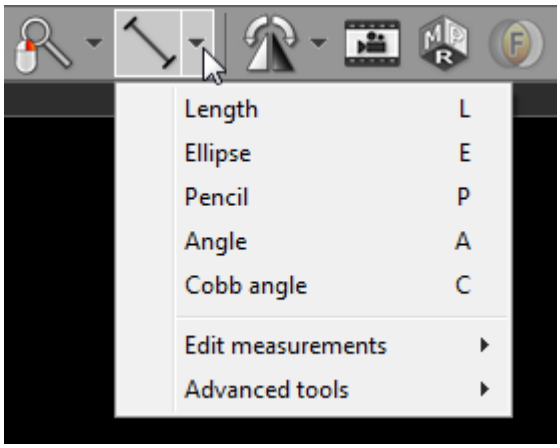
2.5 Using basic tools

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

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 mouse buttons. Just click the tool button with the left, middle or right mouse button. The current assignment is represented by a mouse icon with one (or more) buttons highlighted: **left**, **middle** or **right**.

By default the left mouse button is assigned to the "Browse" tool. The middle button controls brightness and contrast (window level / width), and the right mouse button is used for zooming in or out.

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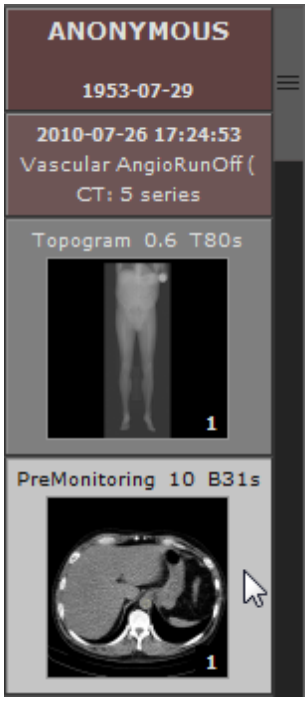
2.5.1 Browsing series and images

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.

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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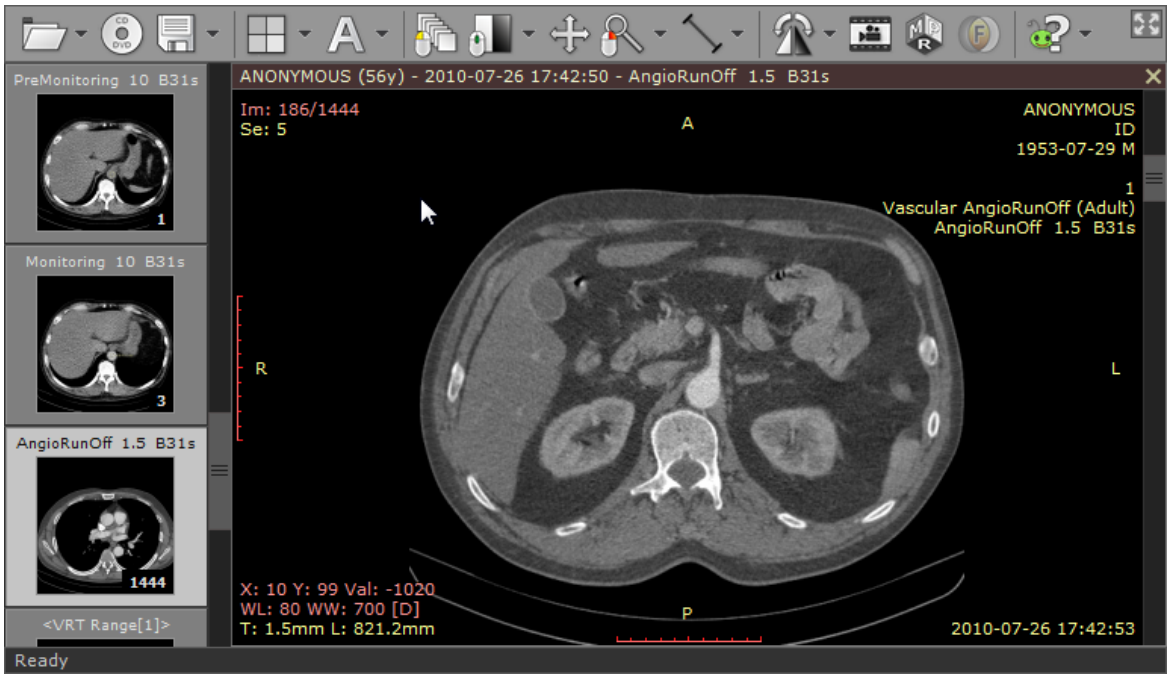
Browsing images

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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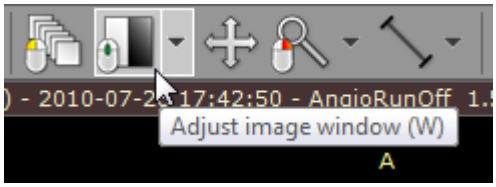
2.5.2 Changing brightness / contrast

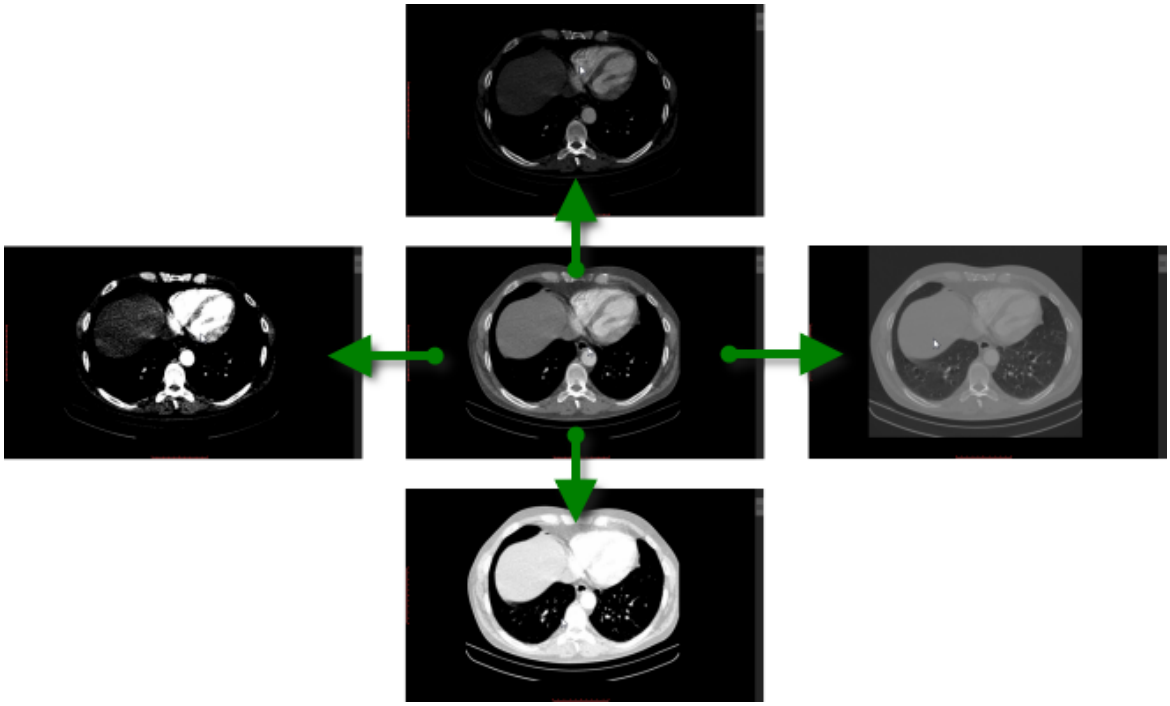
Click the "Adjust image window" button on the toolbar (or press the W key).



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

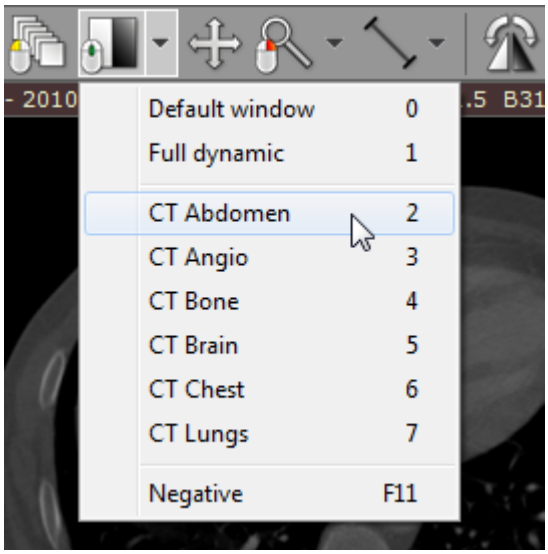
Different window presets can be quickly applied by pressing 0 through 9 .

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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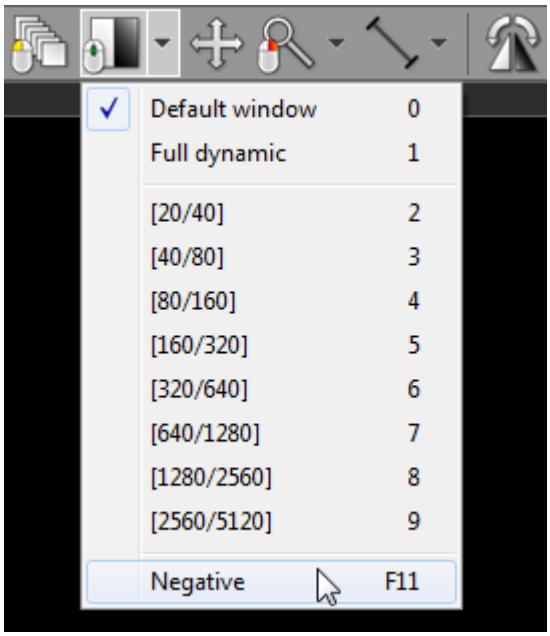
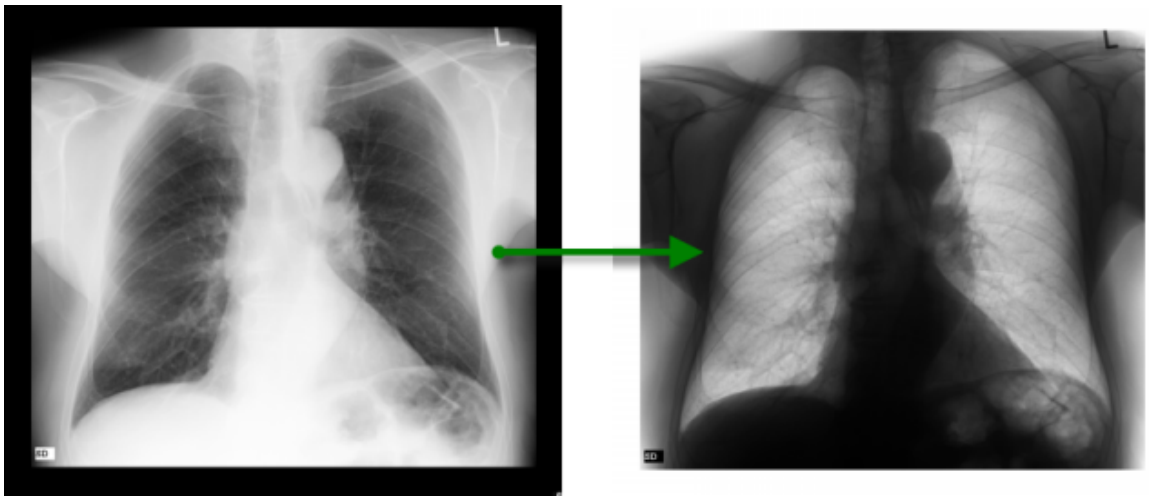
Negative mode

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





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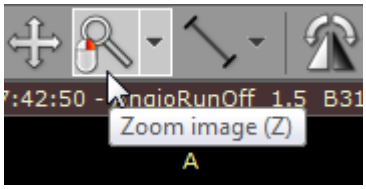
2.5.3 Changing zoom level / position

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.

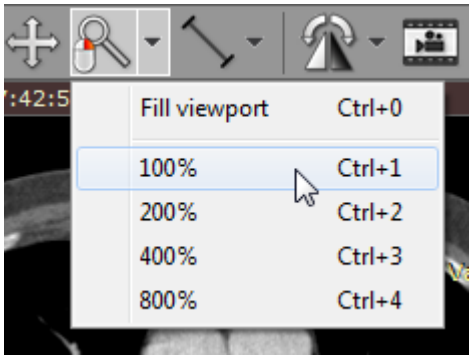


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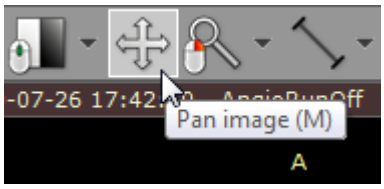
Image panning

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.

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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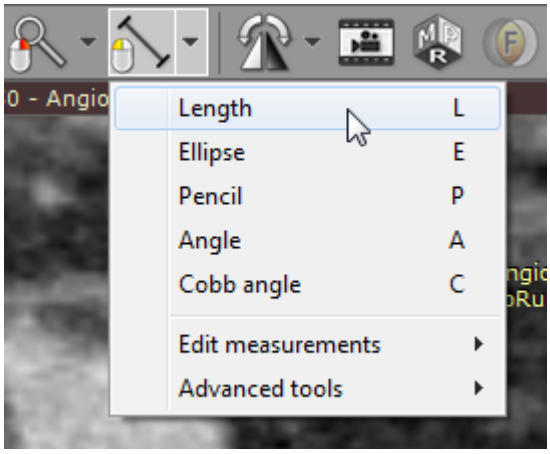
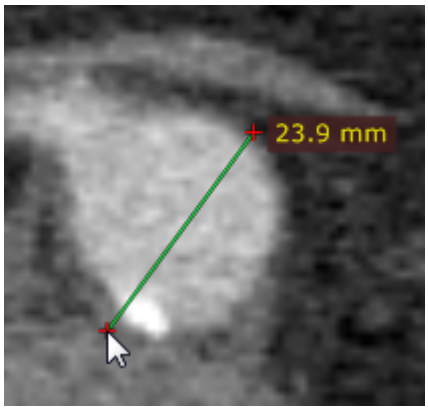
2.6 Taking measurements

2.6.1 Length

Select "Length" from 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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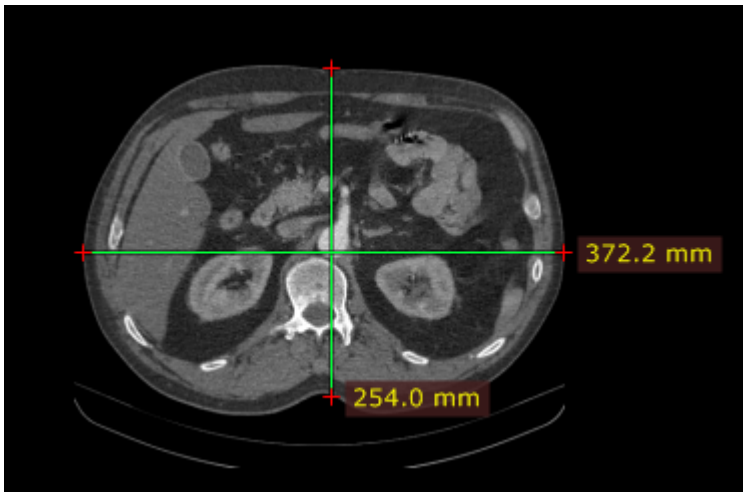
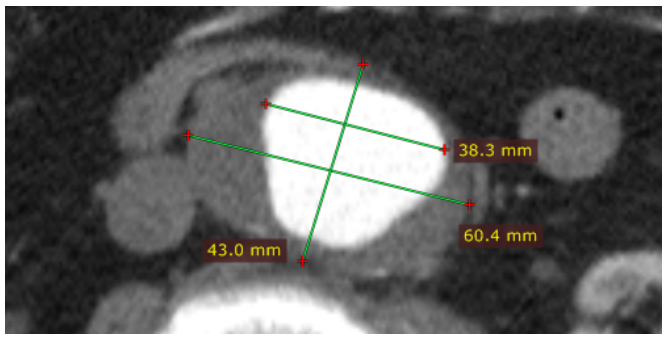
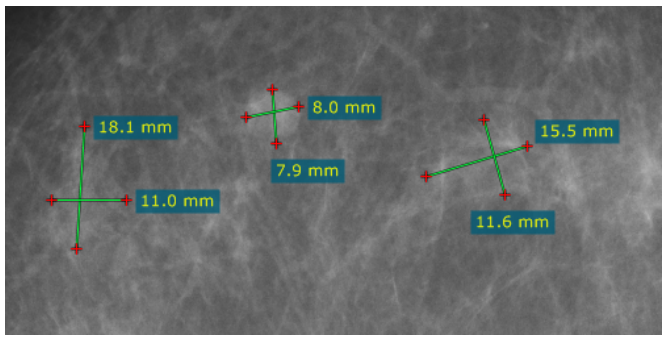
Press SHIFT while drawing the segment to make it either vertical or horizontal.



Calibration of measurements

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

Calibration mode	
Measured distance is calibrated (the pixel spacing element is present).	
The distance is calculated using the estimated radiographic magnification factor.	

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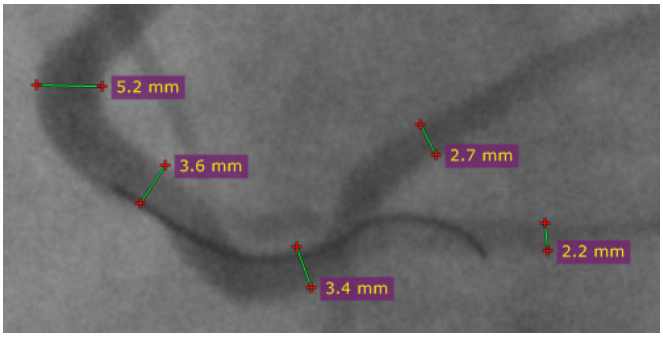
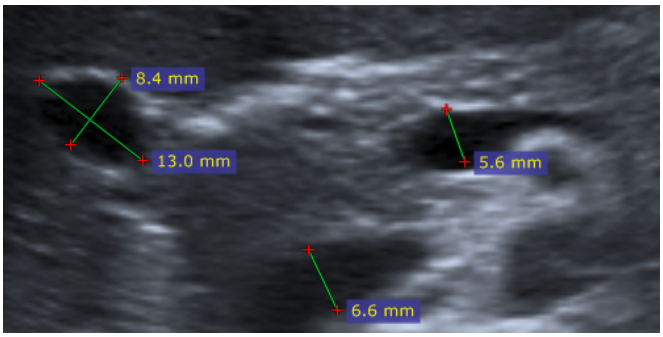
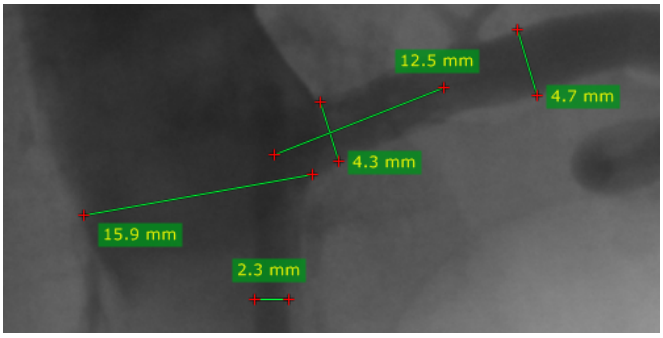
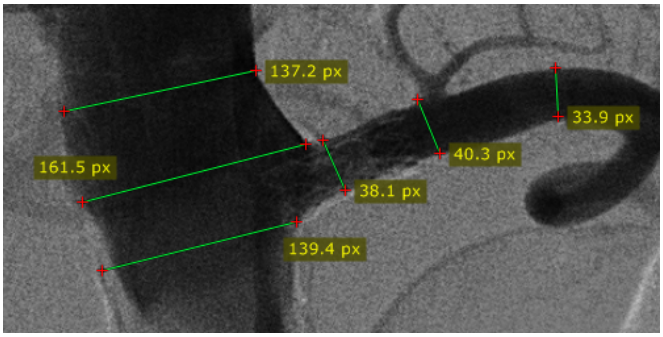
The distance is measured at the detector plane.	
Ultrasound region calibration is used.	
Manual calibration was performed by a user.	
There is no calibration data available (measurement in pixels of the source DICOM image).	

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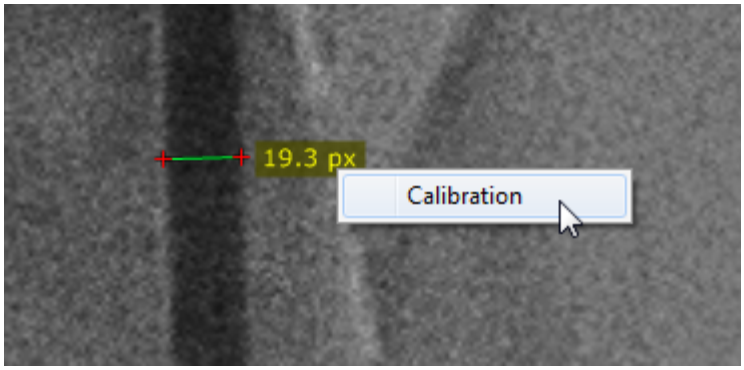
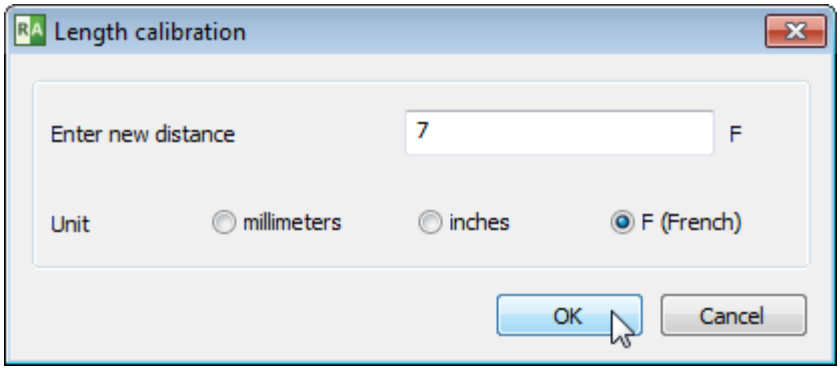
Manual calibration

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

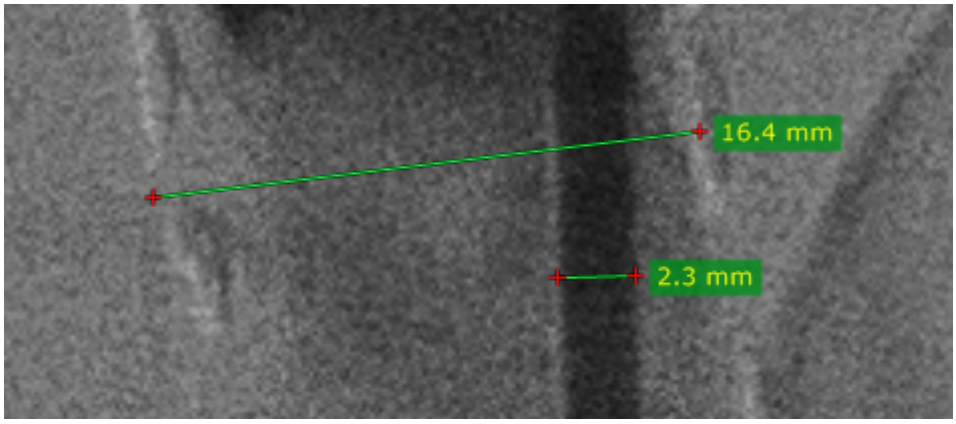
1) Measure the object with a known size, and then right-click the segment or its label to show a pop-up menu.



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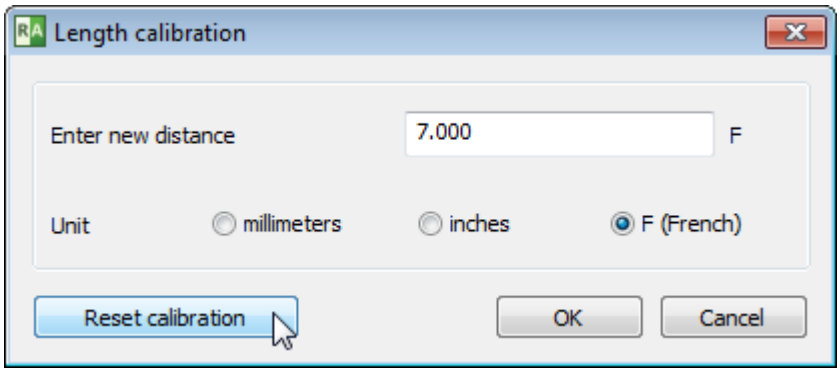
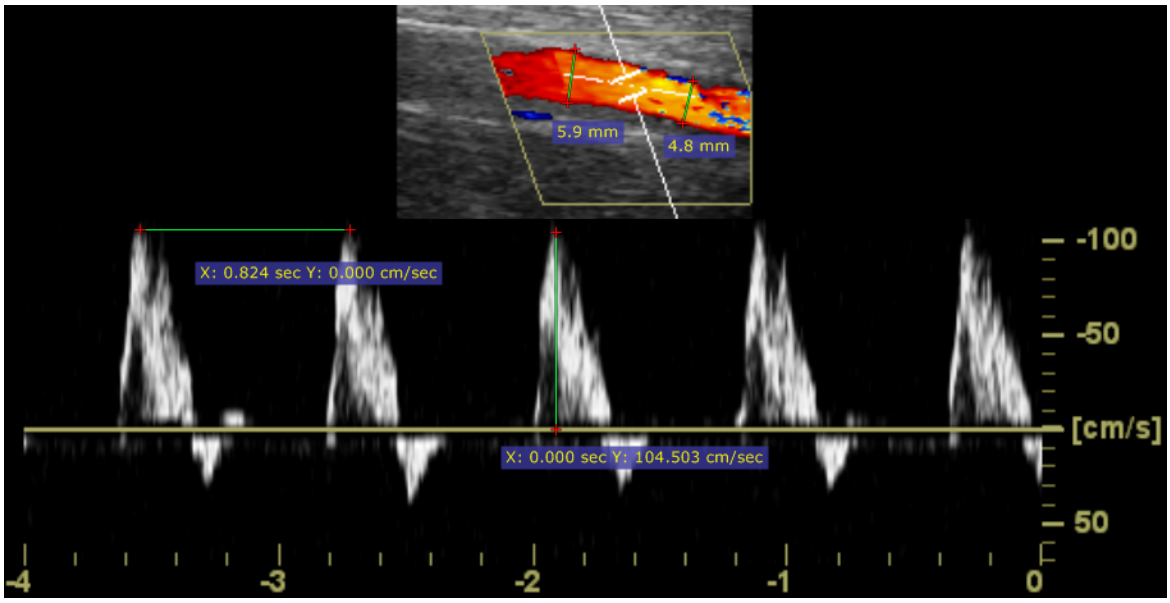
To revert the manual calibration show the "Calibration" window and click the "Reset calibration" button.



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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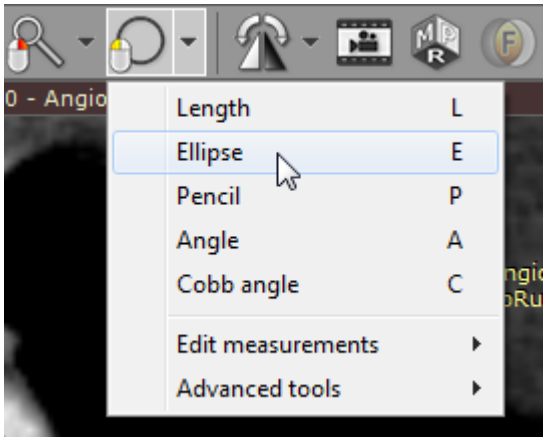
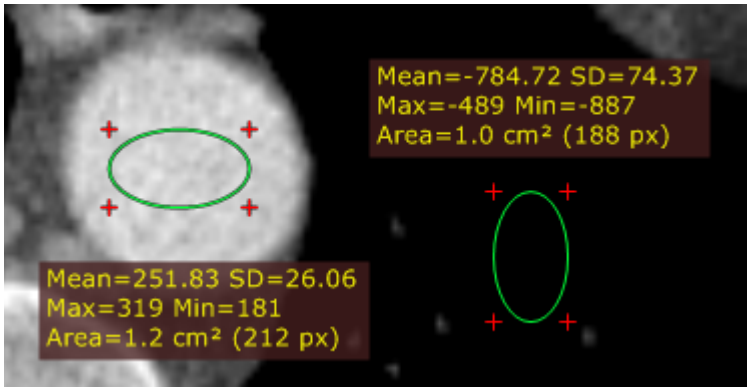
2.6.2 Ellipse

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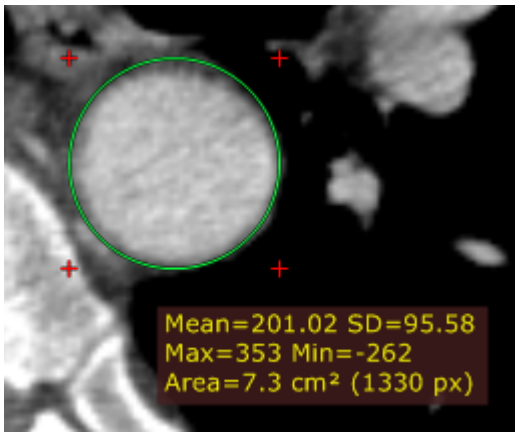
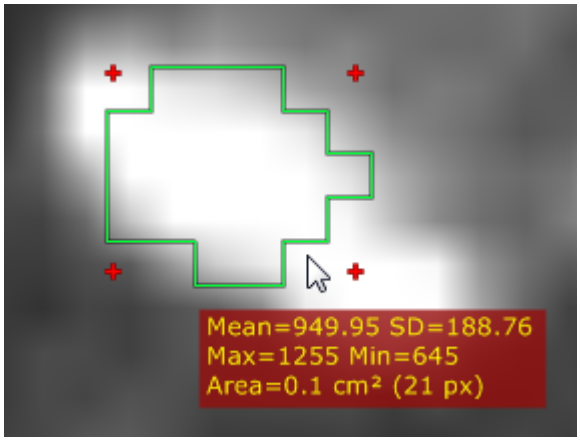
Press **SHIFT** while drawing the ellipse to make it a perfect circle.



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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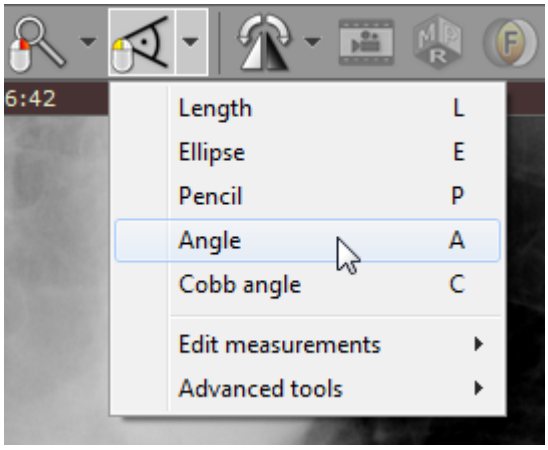
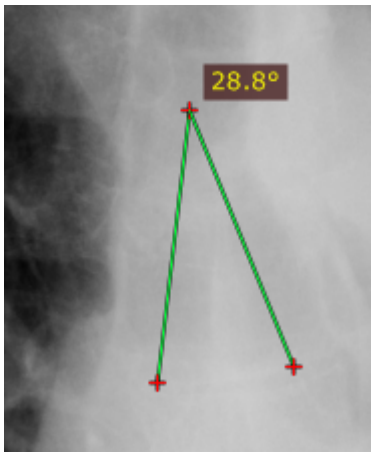
2.6.3 Angle

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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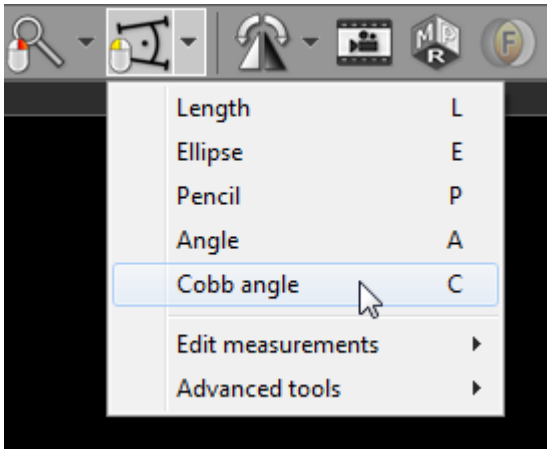
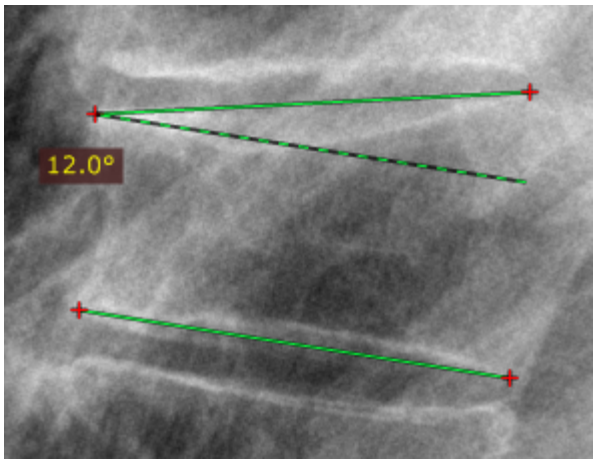
2.6.4 Cobb angle

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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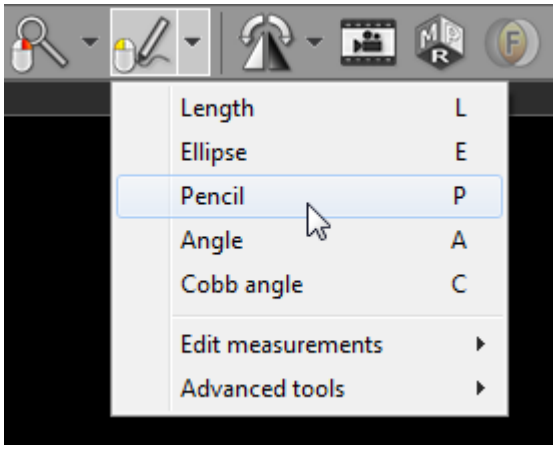
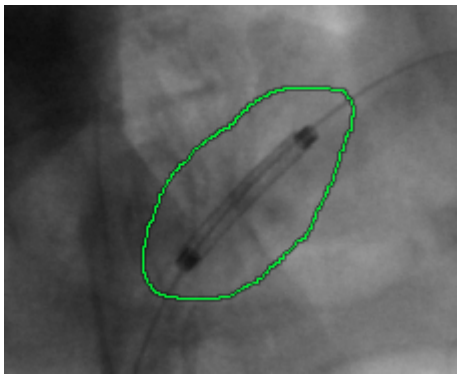
2.6.5 Pencil tool

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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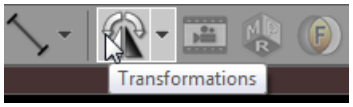
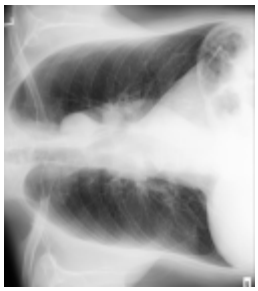
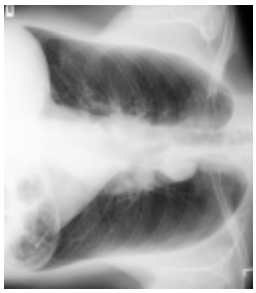
2.7 Flips / Rotations

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.
	Original image	
		

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 + ]`
	Original image	

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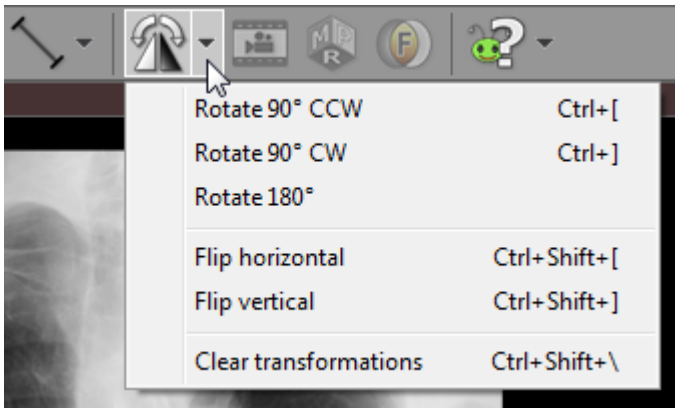
You can also apply rotations and flips from a drop-down menu.



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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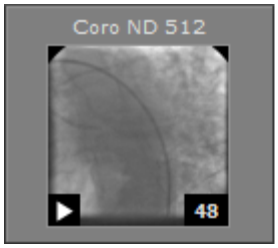
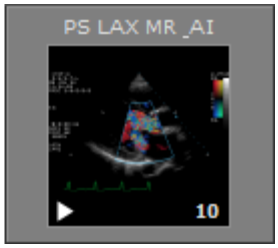
2.8 Cine mode

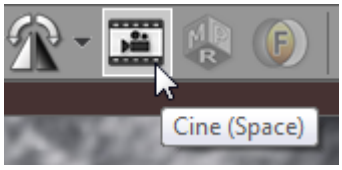
Dynamic sequences such as ultrasound (US, IVUS) or digital angiography (XA) are started automatically in cine (movie) mode upon loading.
Thumbnails representing such series have a little "play" icon in the lower left corner.





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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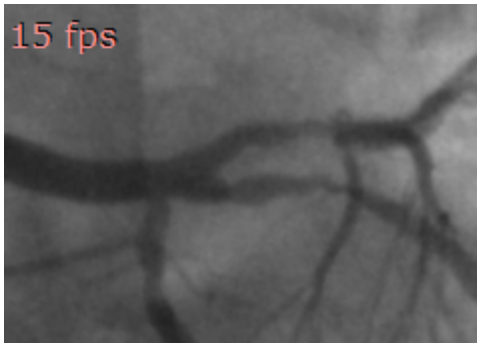

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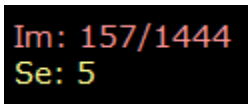
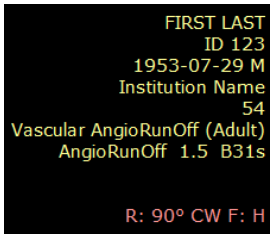
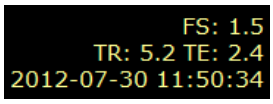
2.9 Annotations

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
Top right		• Patient first and last name • Patient ID • Patient birth date and sex • Institution name • Study ID • Study description • Series description • Image comments • 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

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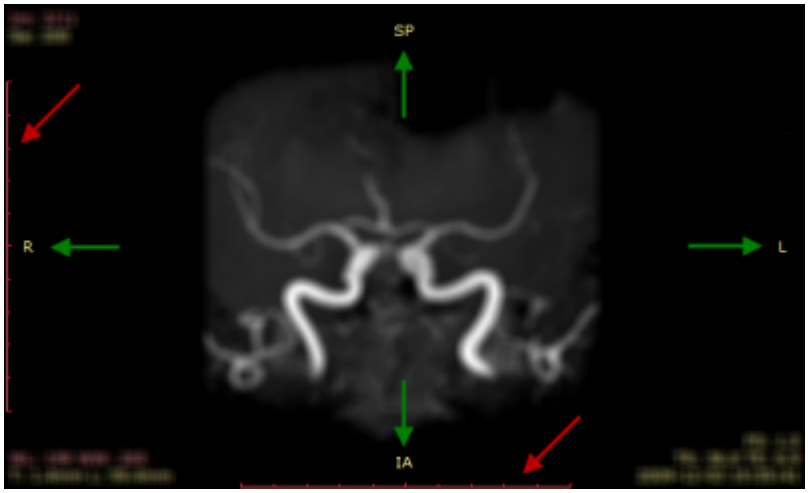
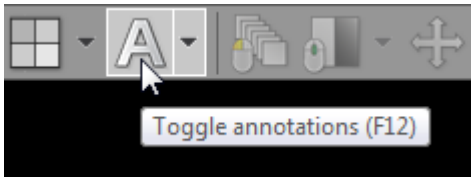


If the DICOM image contains scale information (pixel spacing), two 10cm rulers with 1cm marks are displayed along left and bottom edges of the panel (red arrows).

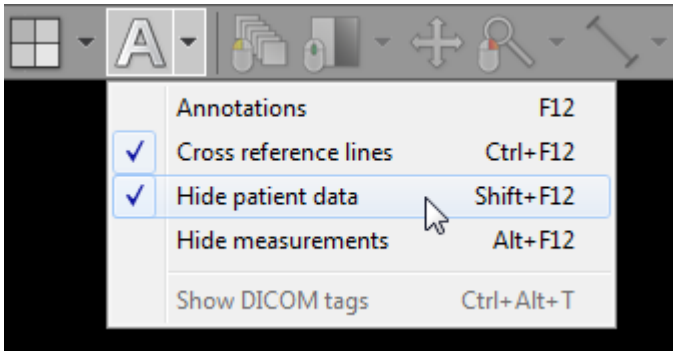
If the DICOM image contains information about patient orientation in space, there is a letter (or combination of letters) symbolizing the patient's sides displayed at the center of each panel's edge (green arrows).

- A – anterior
- P – posterior
- 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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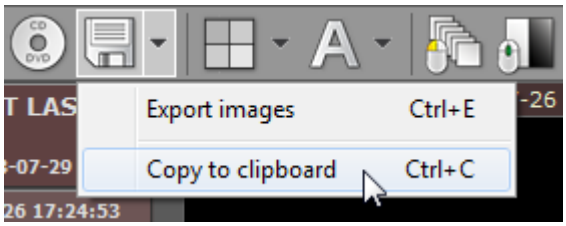
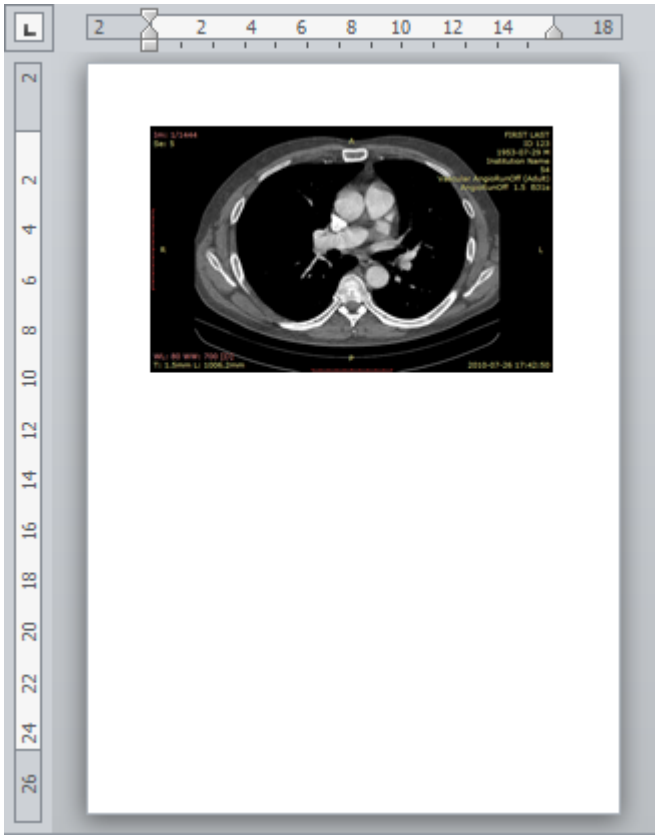
2.10 Copying to the clipboard

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 click **CTRL + V**



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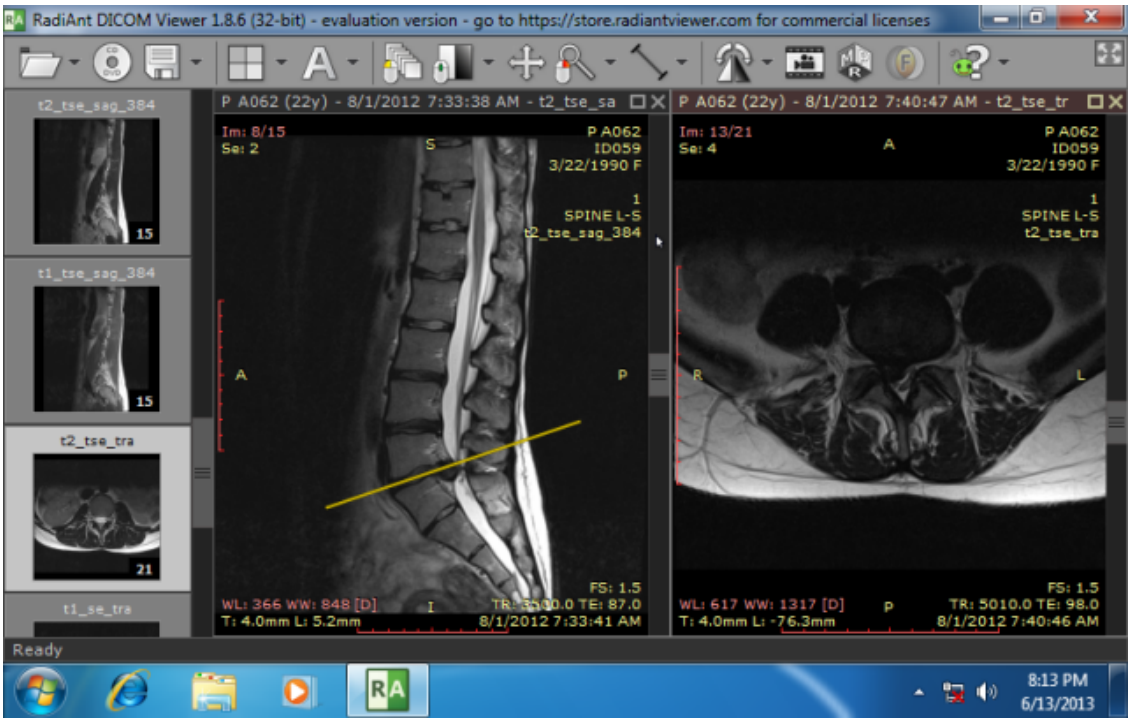
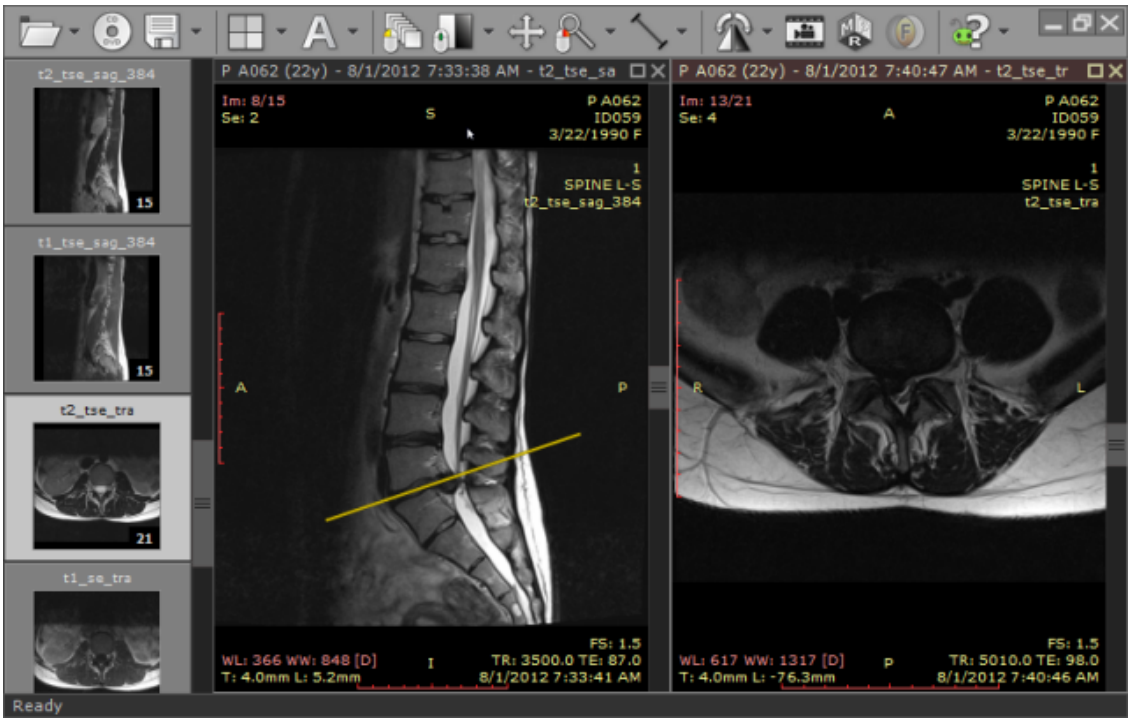
2.11 Full-screen mode

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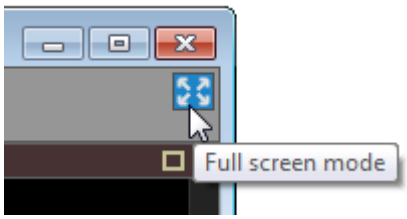
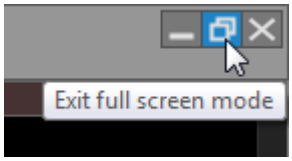
Click the "Full screen mode" button located on the right side of the toolbar or press the **F** key.



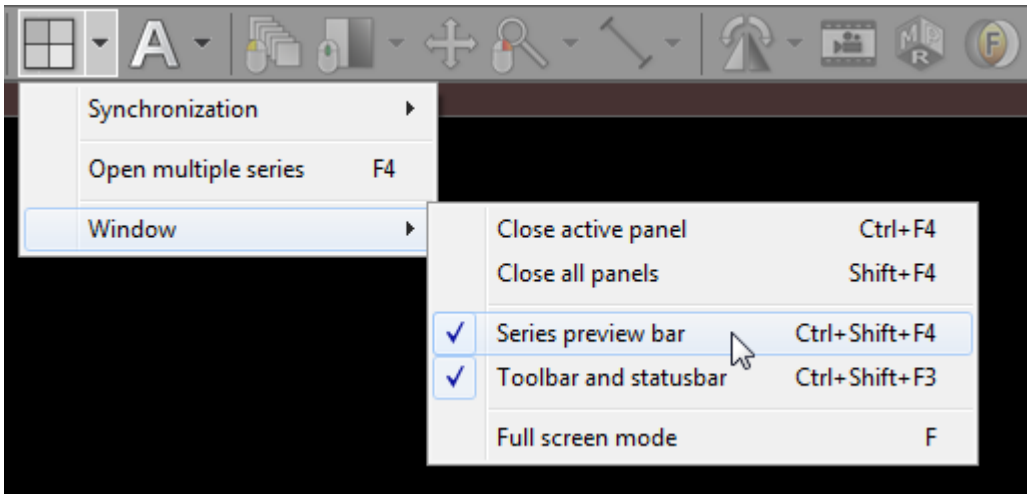
To restore the normal window, use the "Exit full screen mode" toolbar button or again press the **F** key.



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 + SHIFT + F3** to toggle preview bar visibility.
Click "Window / Toolbar and status bar" menu item or use **CTRL + SHIFT + F4** to toggle toolbar and status bar visibility.



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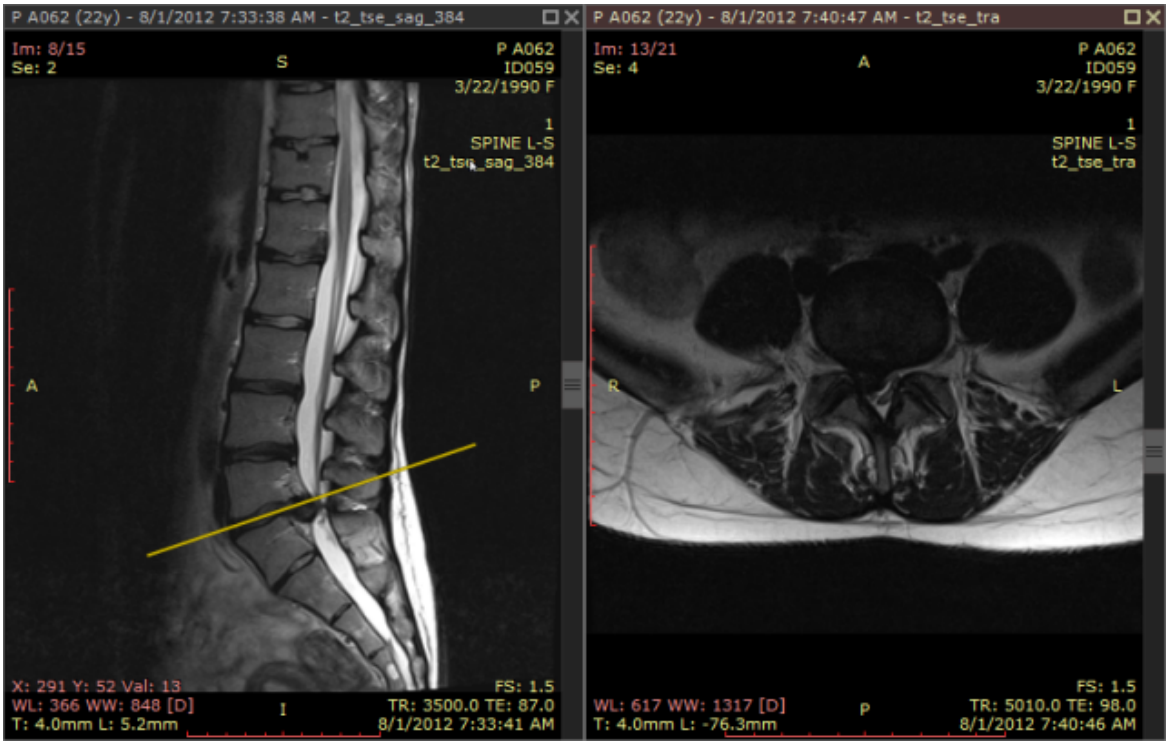

Full-screen mode with hidden toolbar, series bar and status bar

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3 Advanced Topics

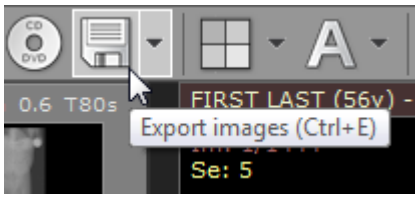
3.1 Exporting images

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

- JPEG
- BMP
- WMV (movie)
- DICOM

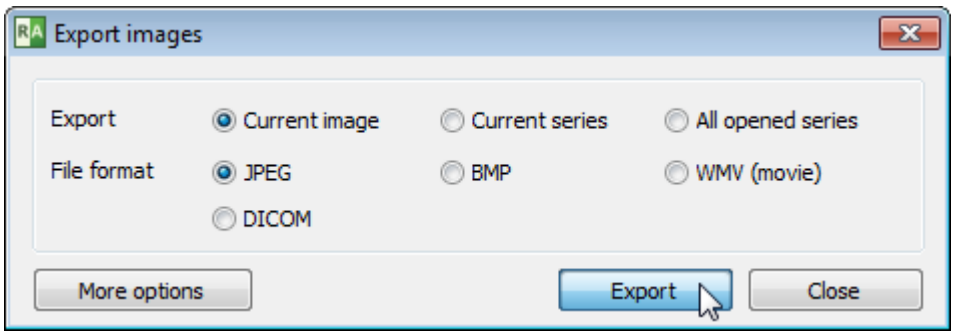
Basic export

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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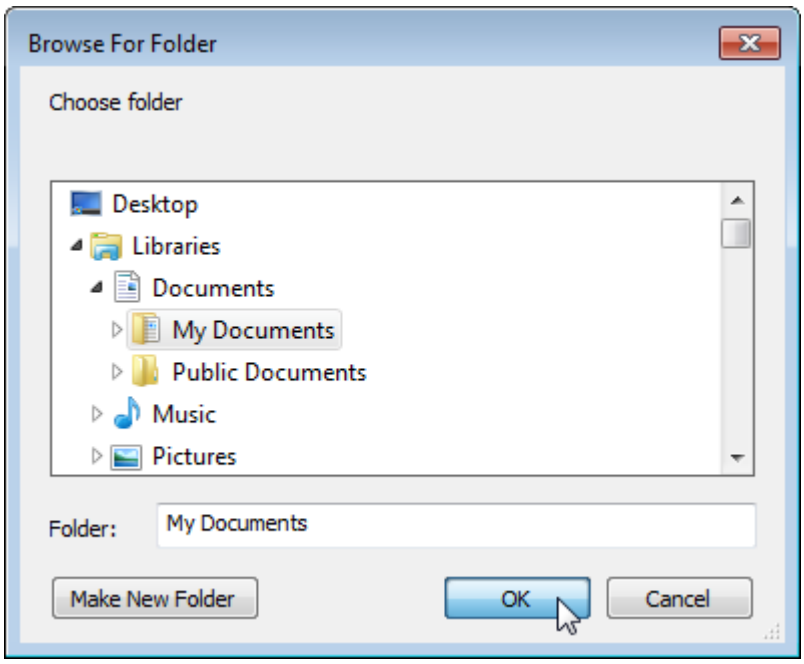
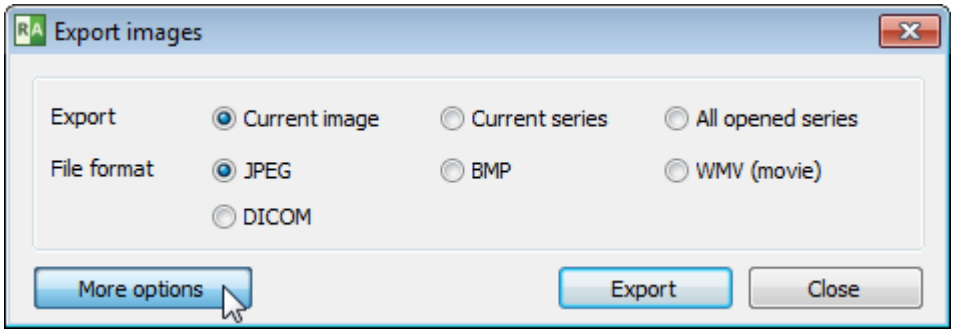
Click export to browse for the destination folder.



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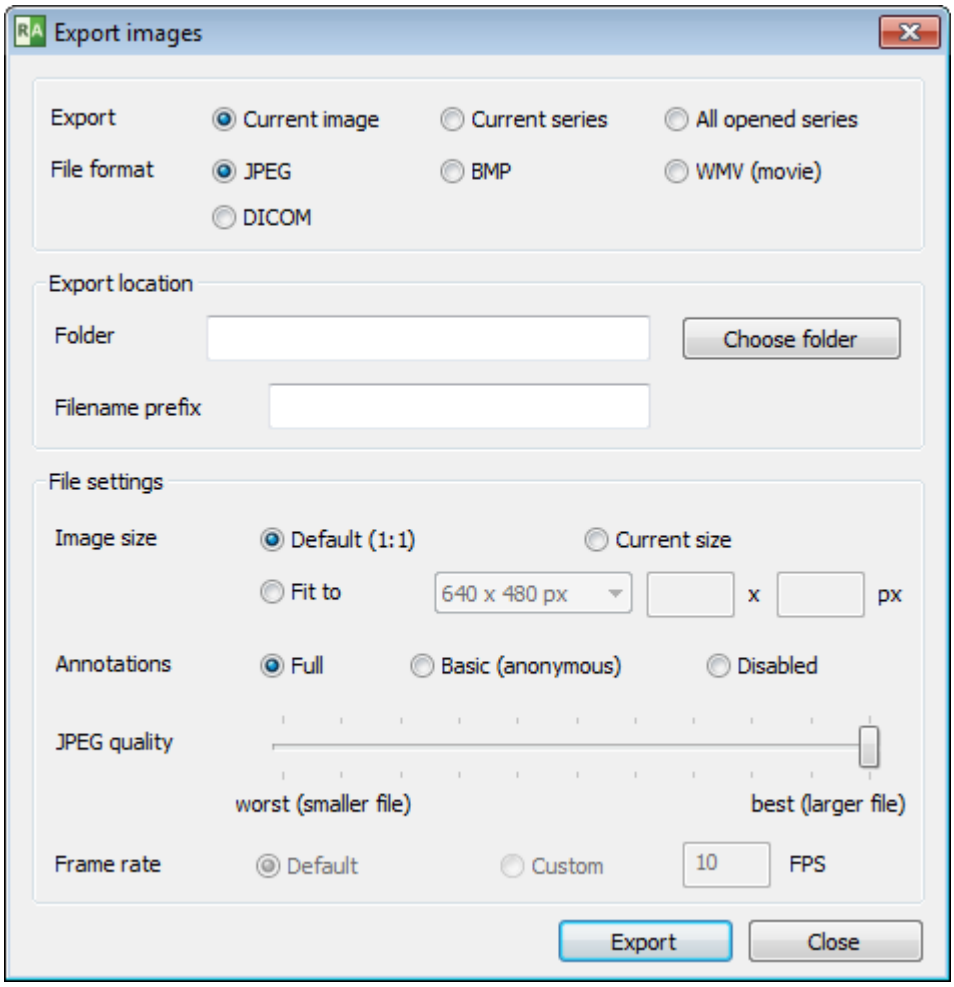
Additional controls will become visible (some may be inactive, depending on the destination file format).



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/WMV 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 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 Reconstructions), Fusion, or TIC (Time-intensity curve) tools.

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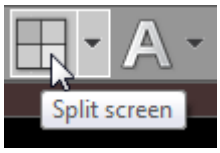
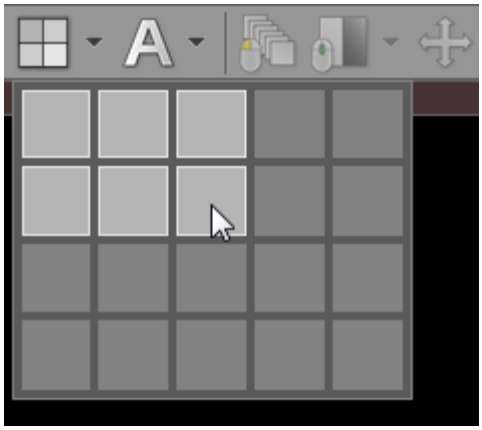
3.2 Multiple series viewing

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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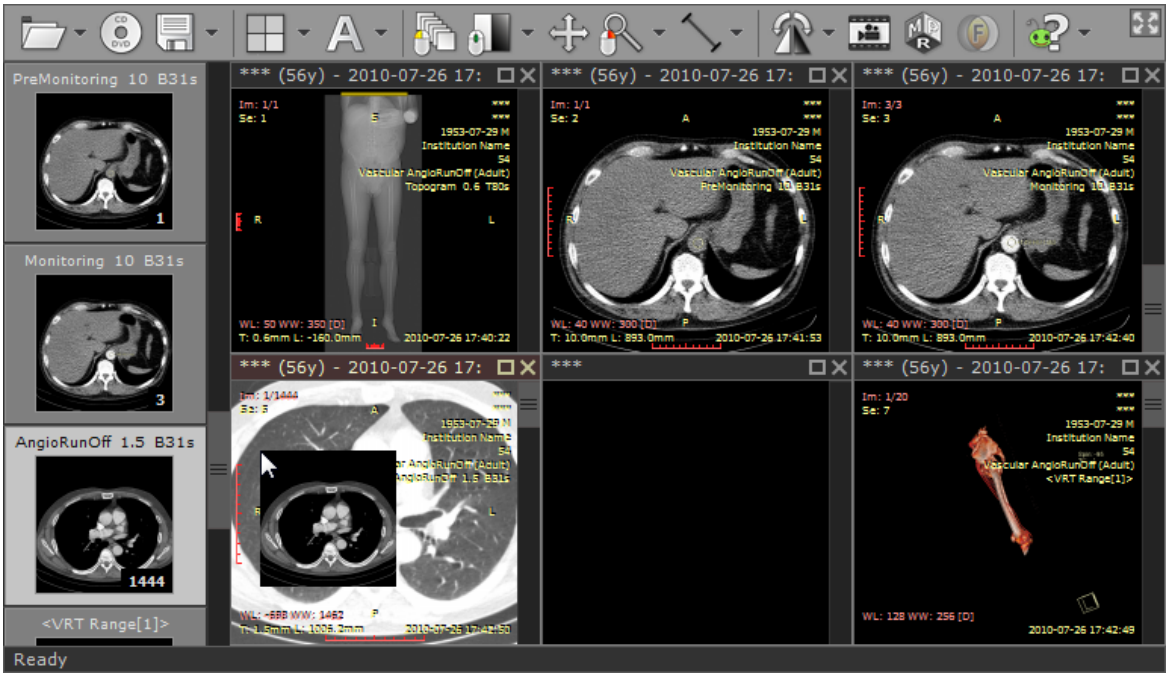
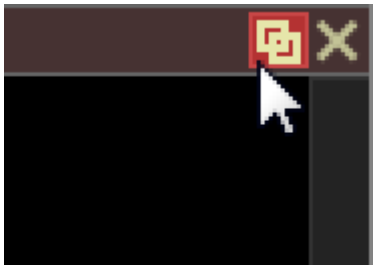


Another way of opening a series in new panel is to click its thumbnail while pressing the **CTRL** key.
All panels will be automatically repositioned and new series will be loaded in the last panel.

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.

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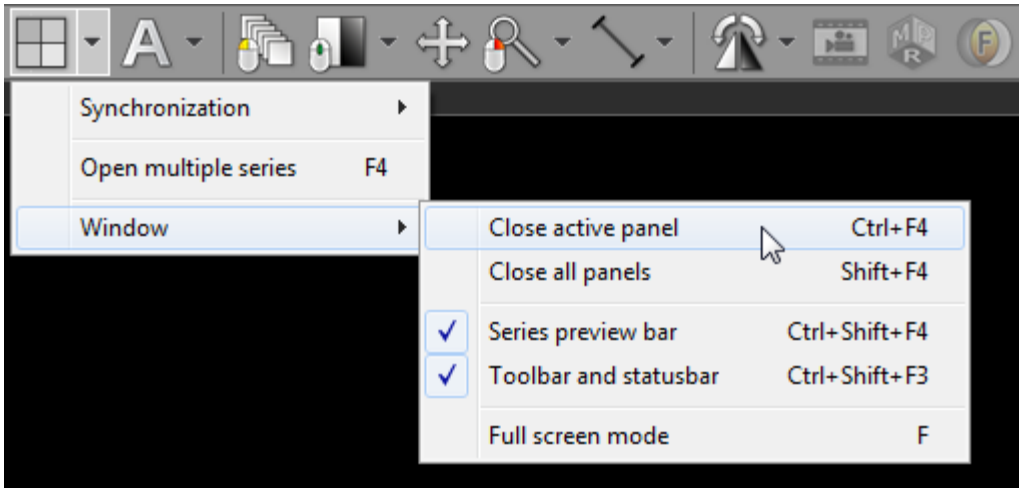
Click the "Close" button on the panel's title bar to close it or use **CTRL + F4** .
If you hold the **CTRL** key and click the "Close" button the panel will be cleared instead of being closed.

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

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



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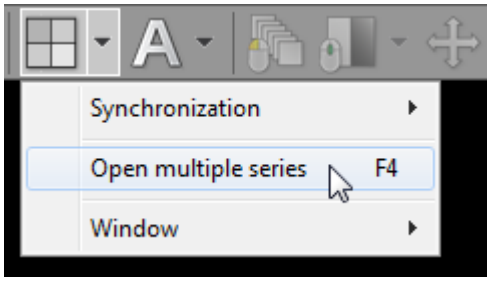
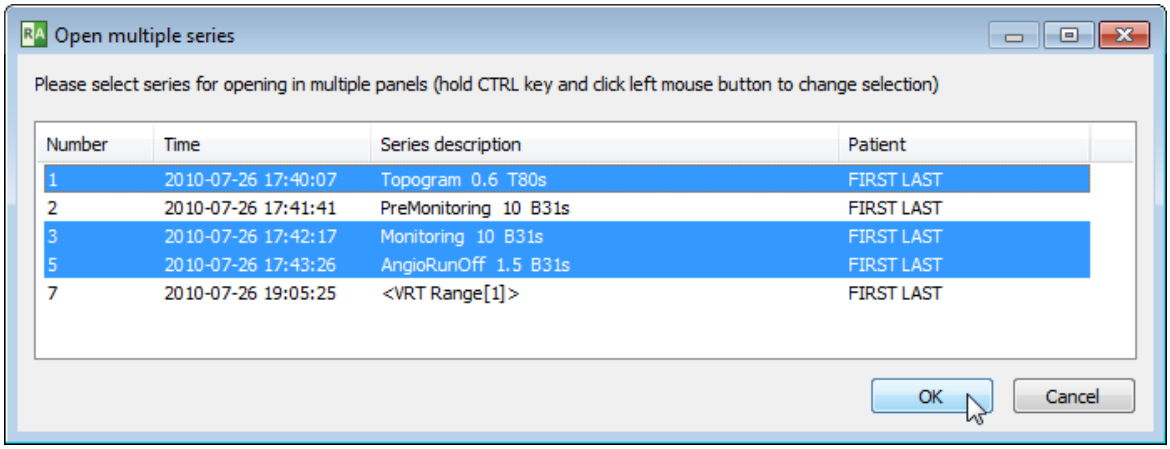
To quickly open multiple series

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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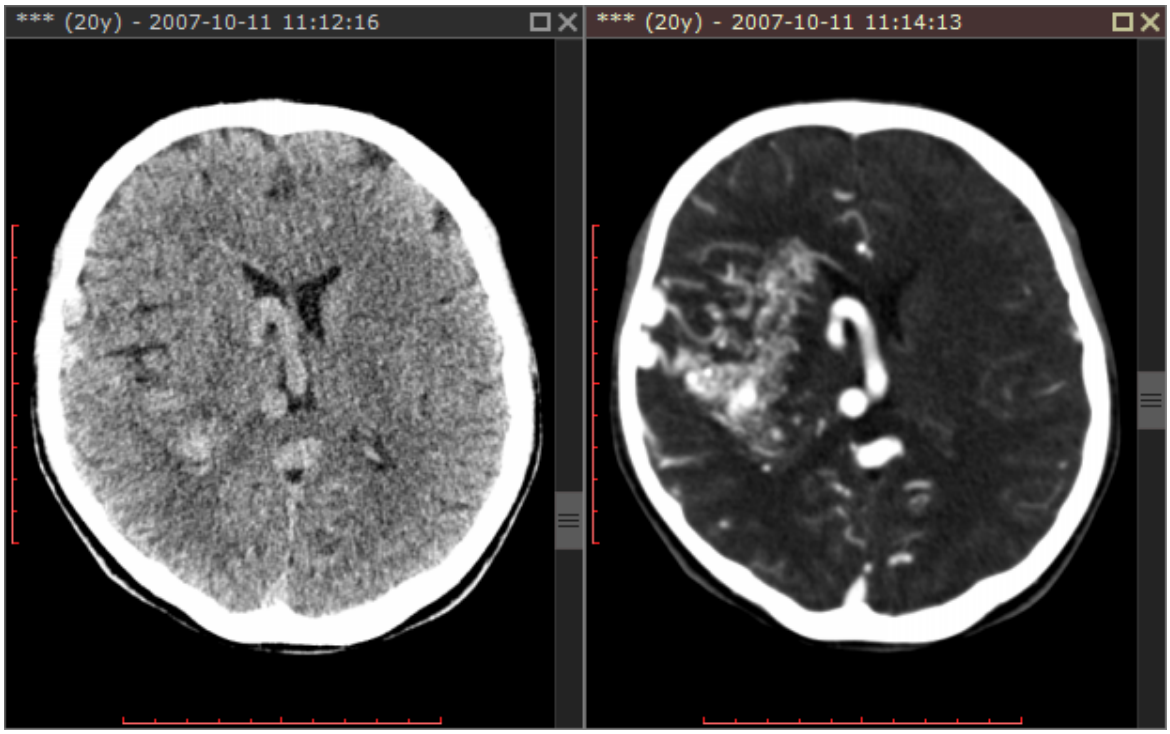
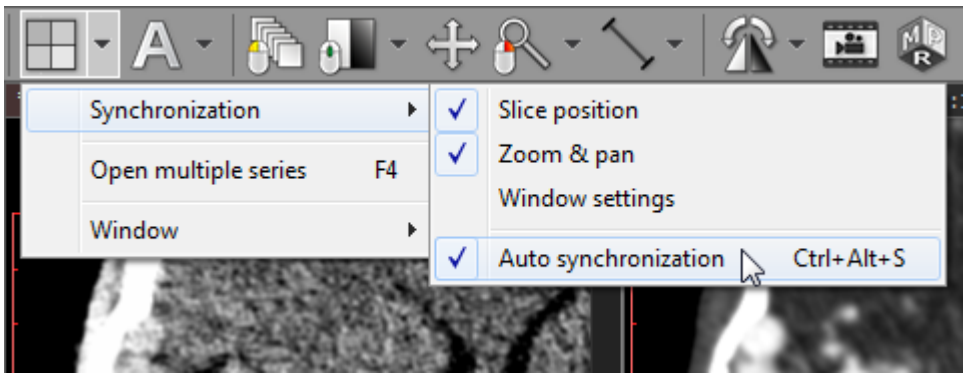
3.2.1 Synchronization

Series consisting of images that have been acquired in the same plane, 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).



Automatic synchronization can be disabled / enabled by clicking the "Synchronization" / "Auto synchronization" drop-down menu item or by using `CTRL + ALT + S` .



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

- Slice position
- Zoom & pan
- Window settings (disabled by default)

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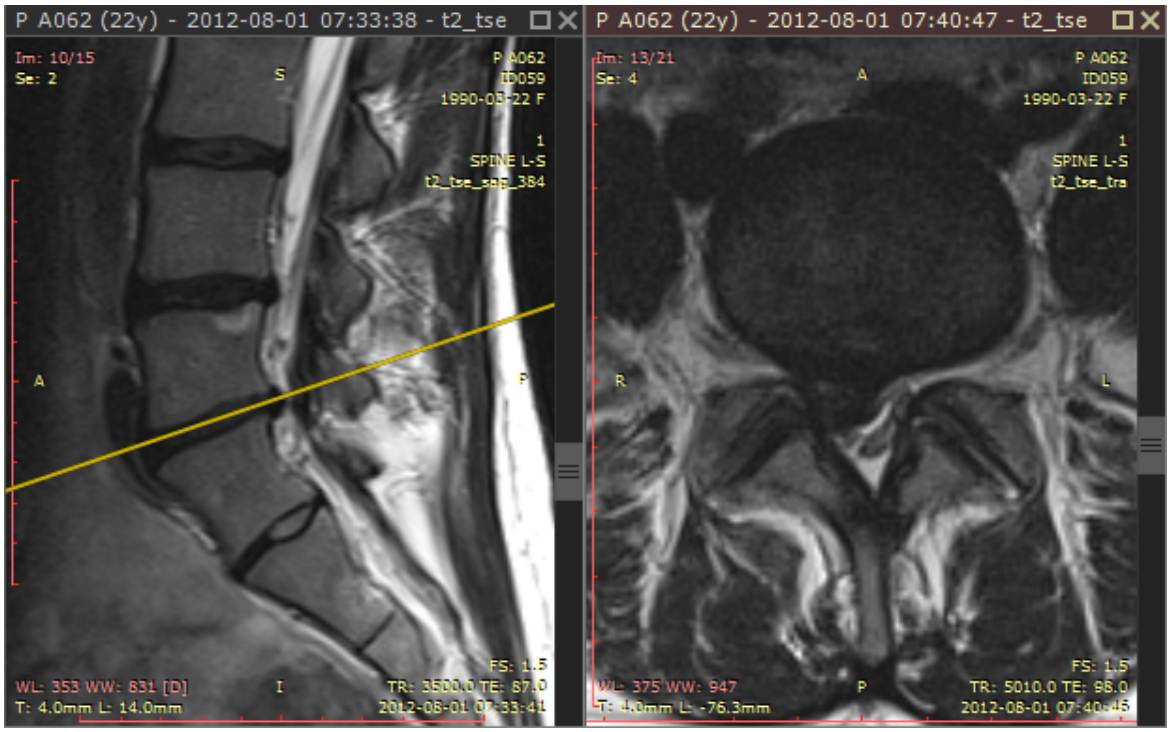
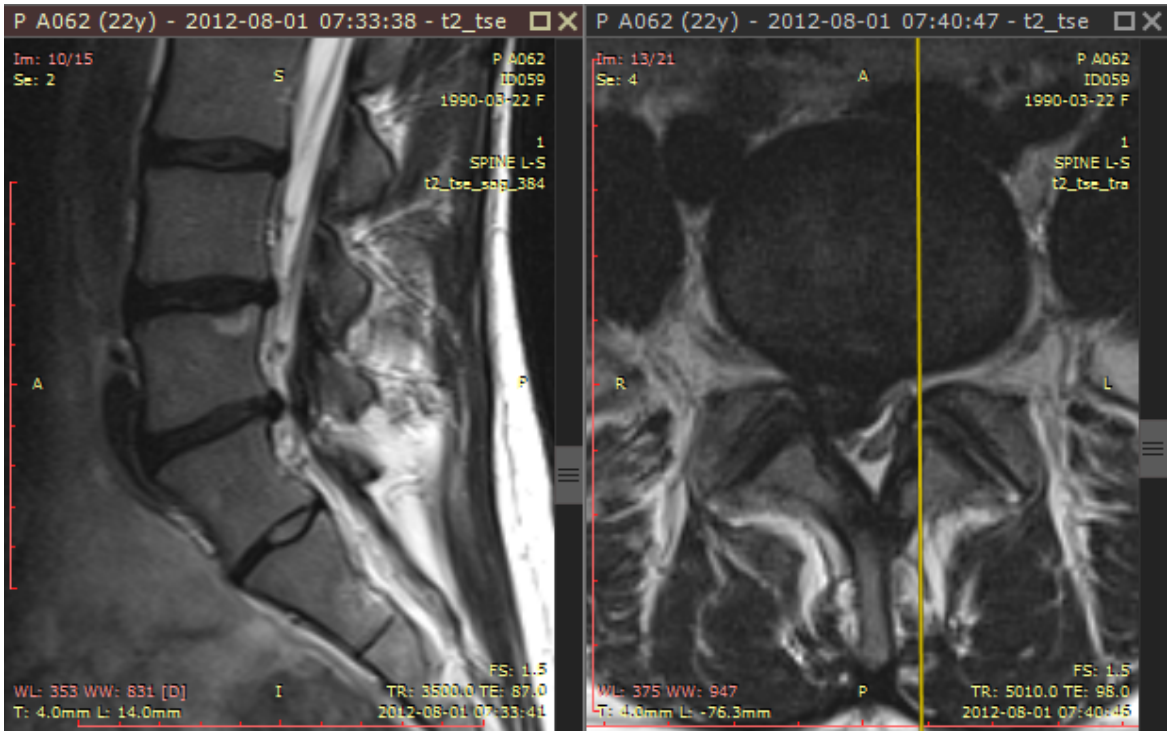
3.2.2 Cross-reference lines

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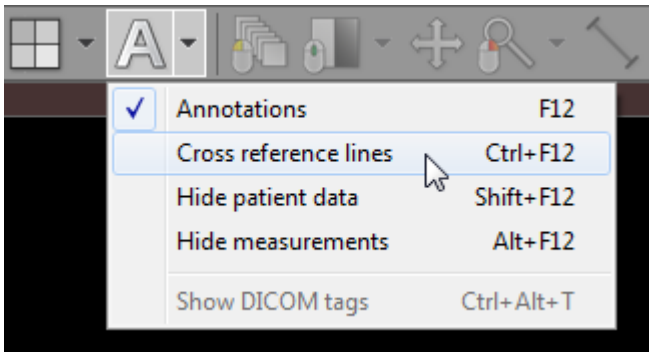
Cross-reference lines are always displayed in inactive panels (those with gray title bars) as a reference for the image in the active panel (brown title bar).
To change the reference source, activate the other panel by either clicking on its title bar or the image it contains.

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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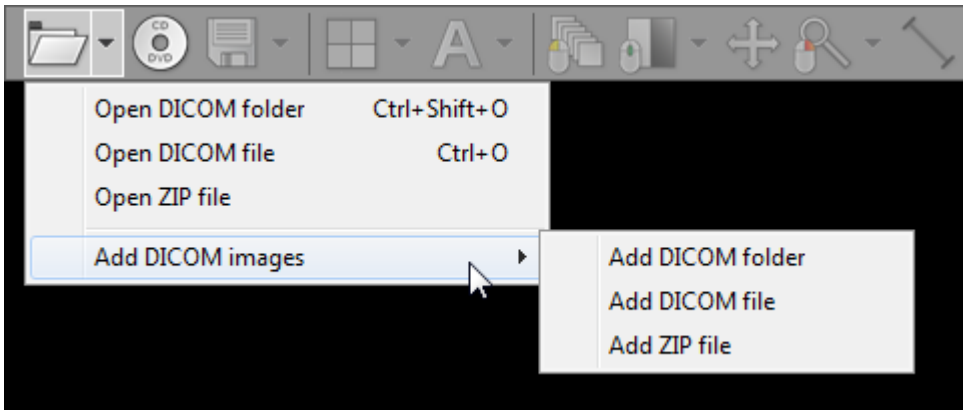
3.2.3 Adding more studies

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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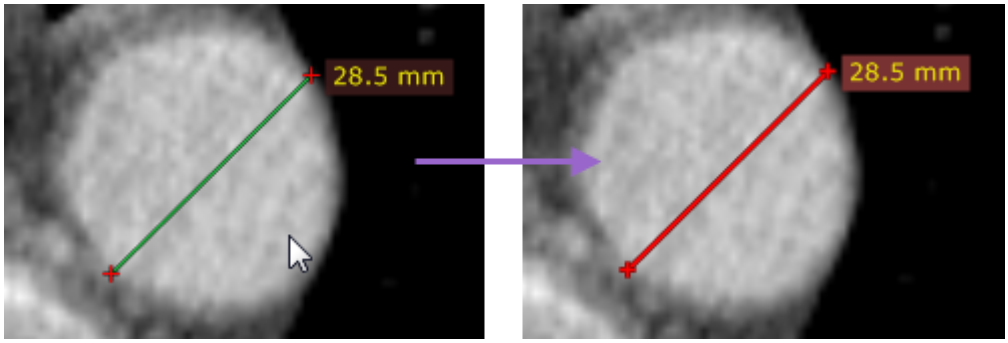
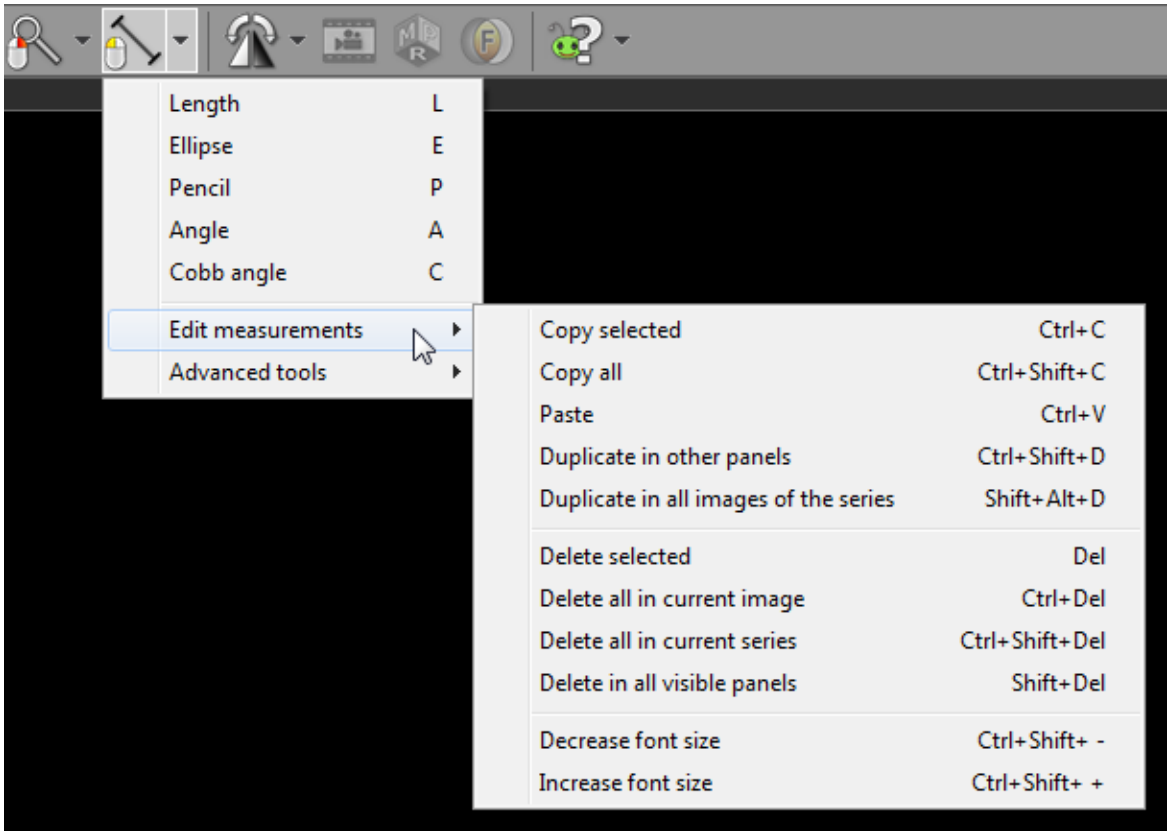
3.3 ROI operations

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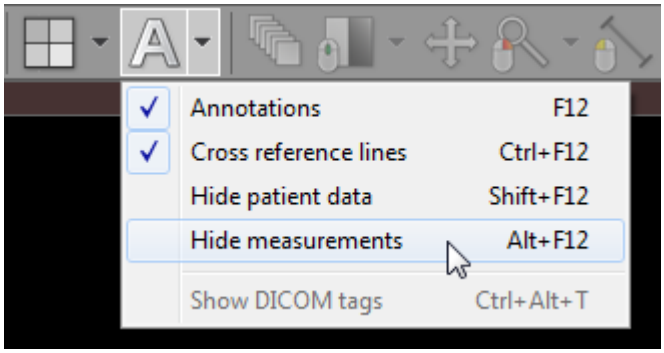
To hide (and show) measurements (objects) in active panel click "Hide measurements" menu item or use `ALT + F12` .



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

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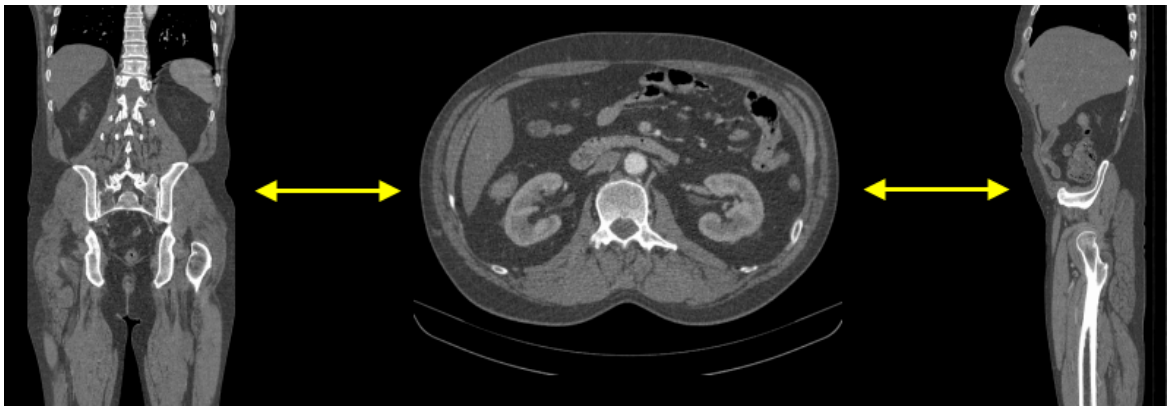
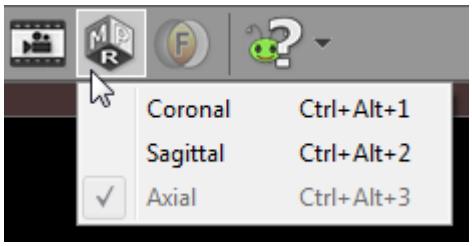
3.4 Multiplanar reconstructions (MPR)

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 "Multiplanar reconstructions" 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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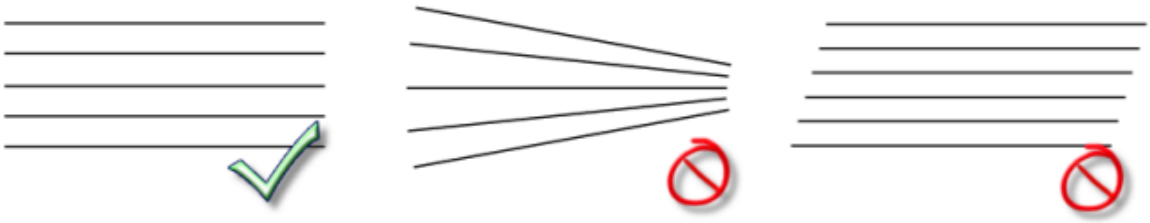
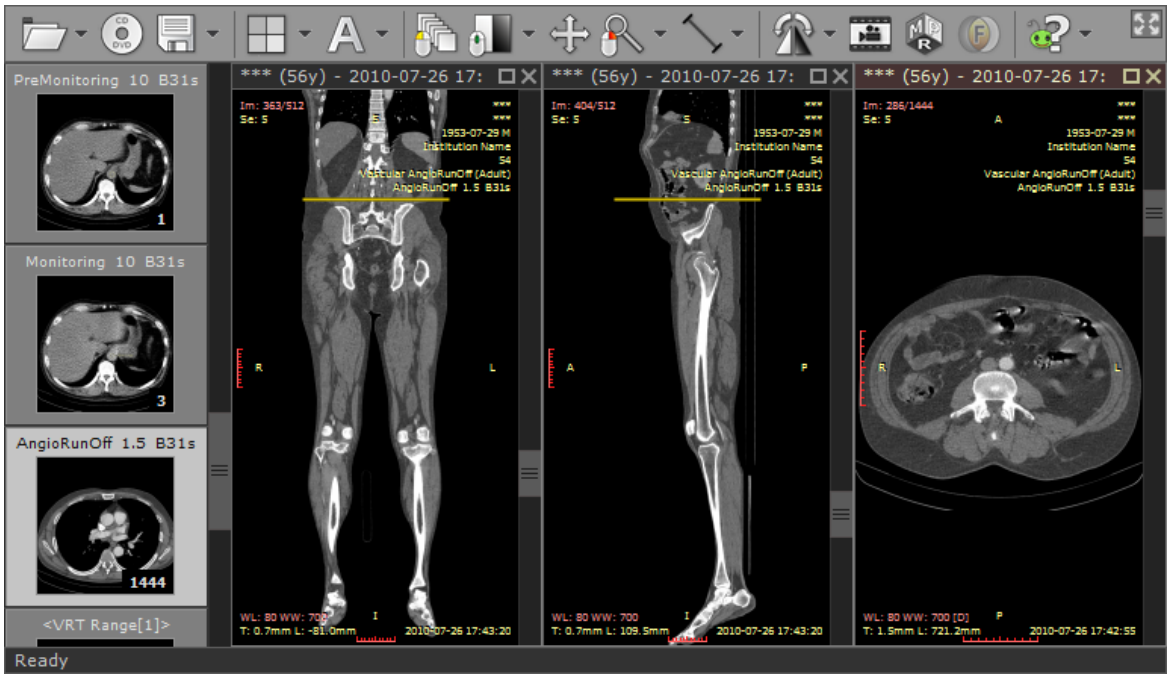
If the button is grayed out, the MPR tool cannot be applied to the series (e.g. in case of images with nonparallel planes or images not lying directly one above other).



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.



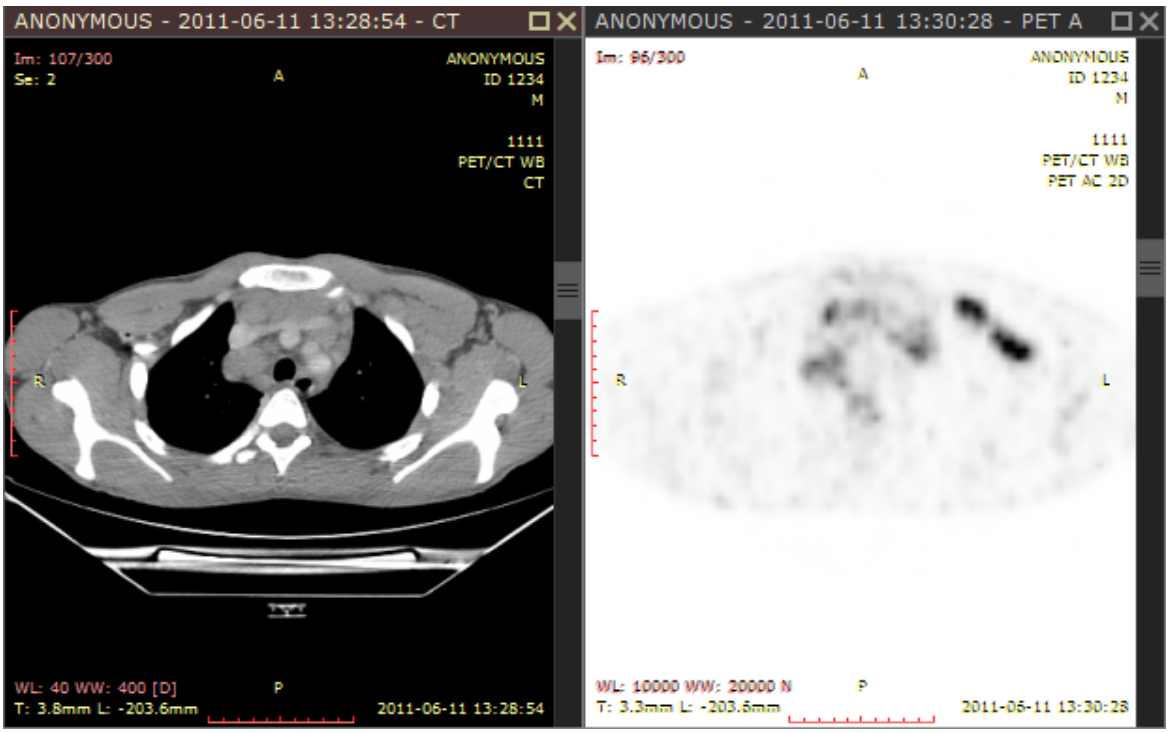
3.5 Image fusion (PET-CT)

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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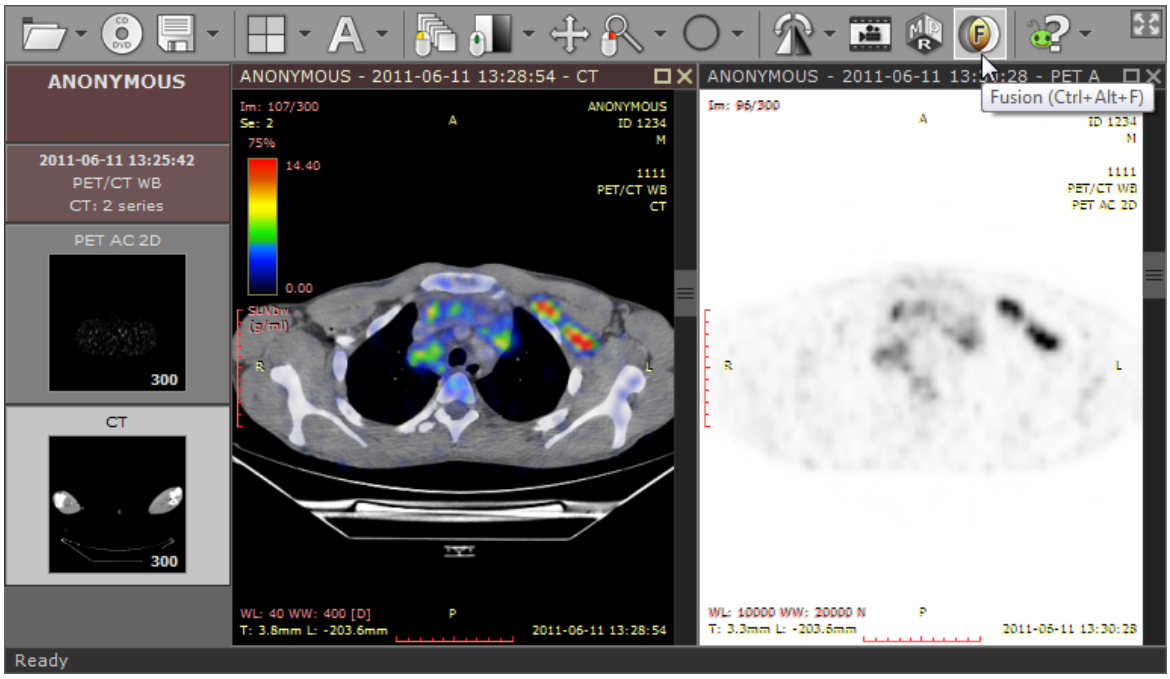
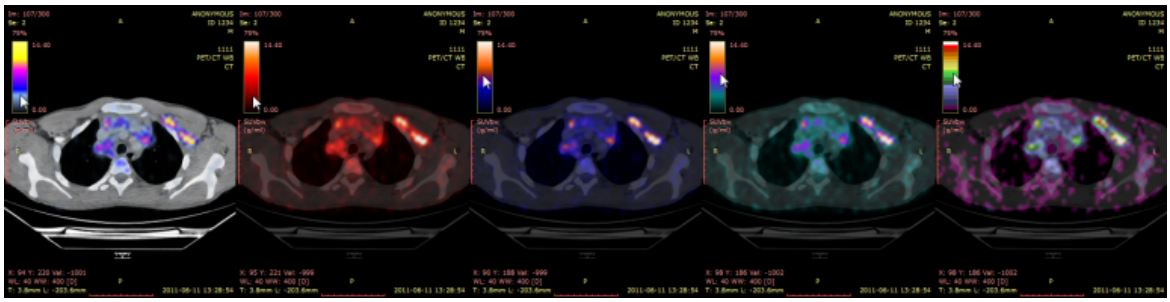
3) Click the "Fusion" button on the toolbar or use the `CTRL + ALT + F` shortcut.



Color scale

The color scale used for rendering a fused image can be changed by clicking a bar with a color scale to the left side of the image.



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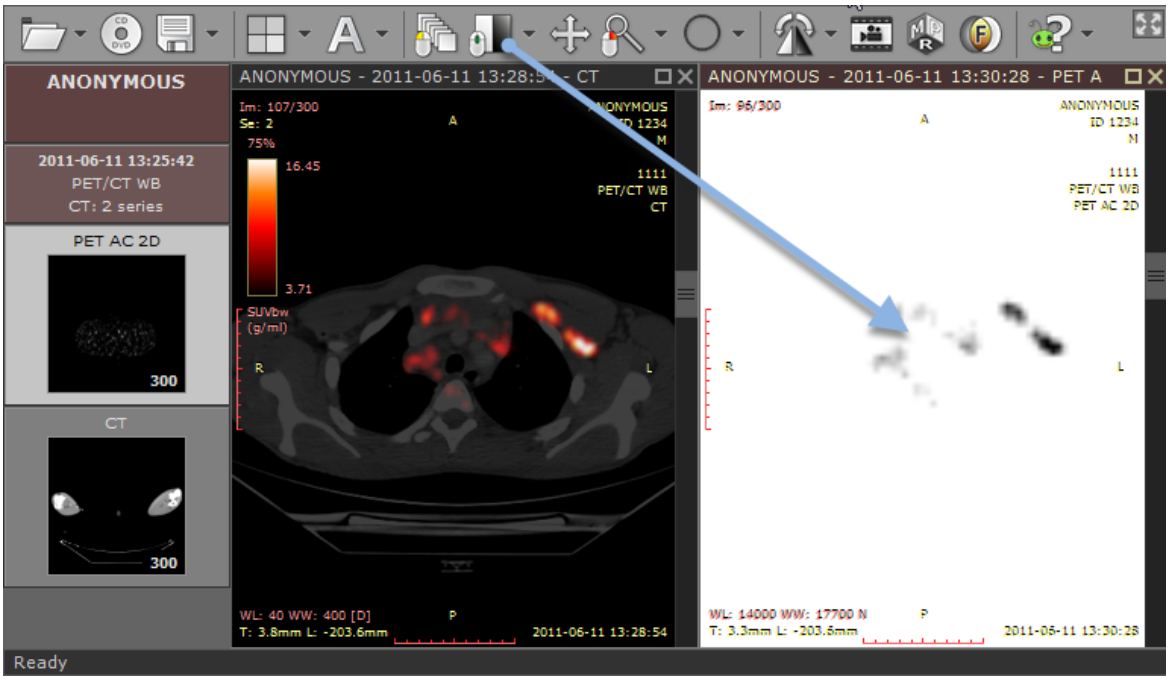
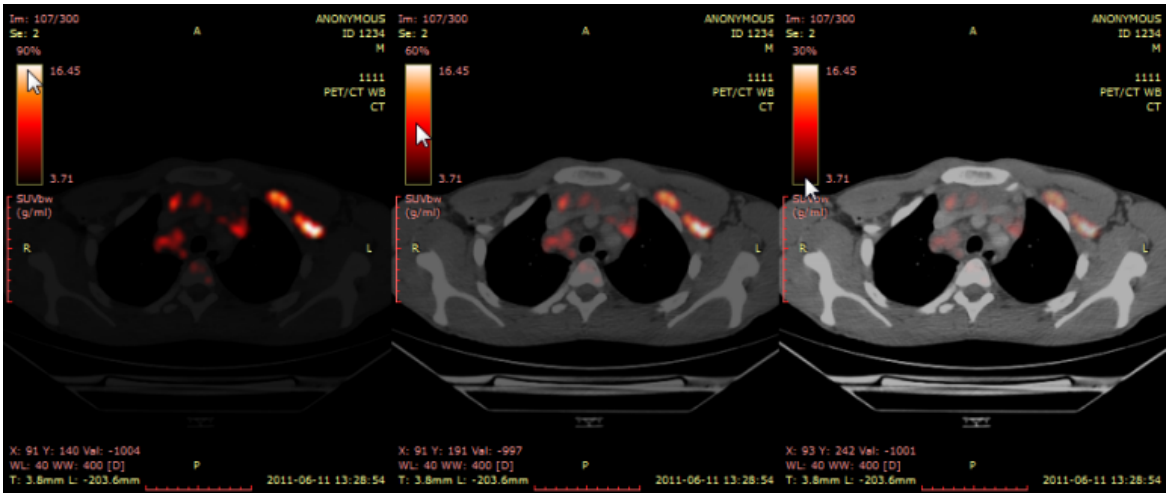
The range of values represented on a color scale is adjusted by using the windowing tool in the panel with the series used as overlay (PET).



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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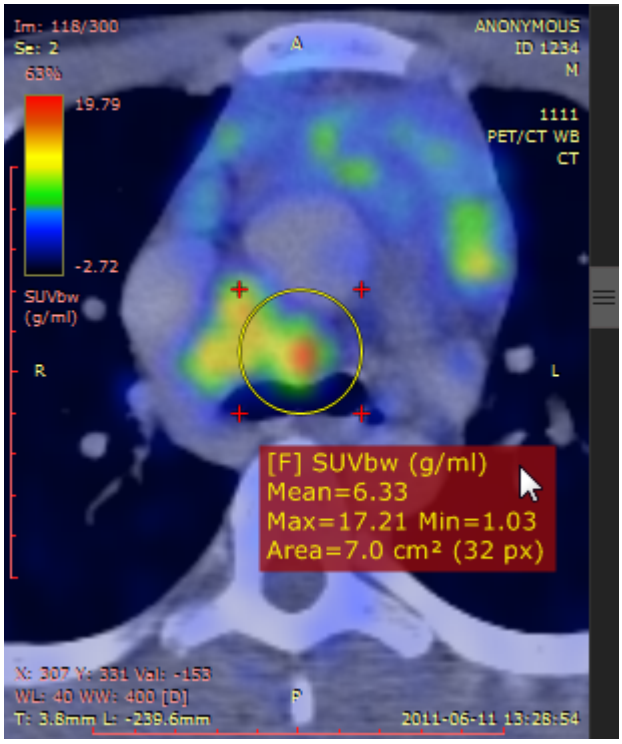
SUV measurement

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.

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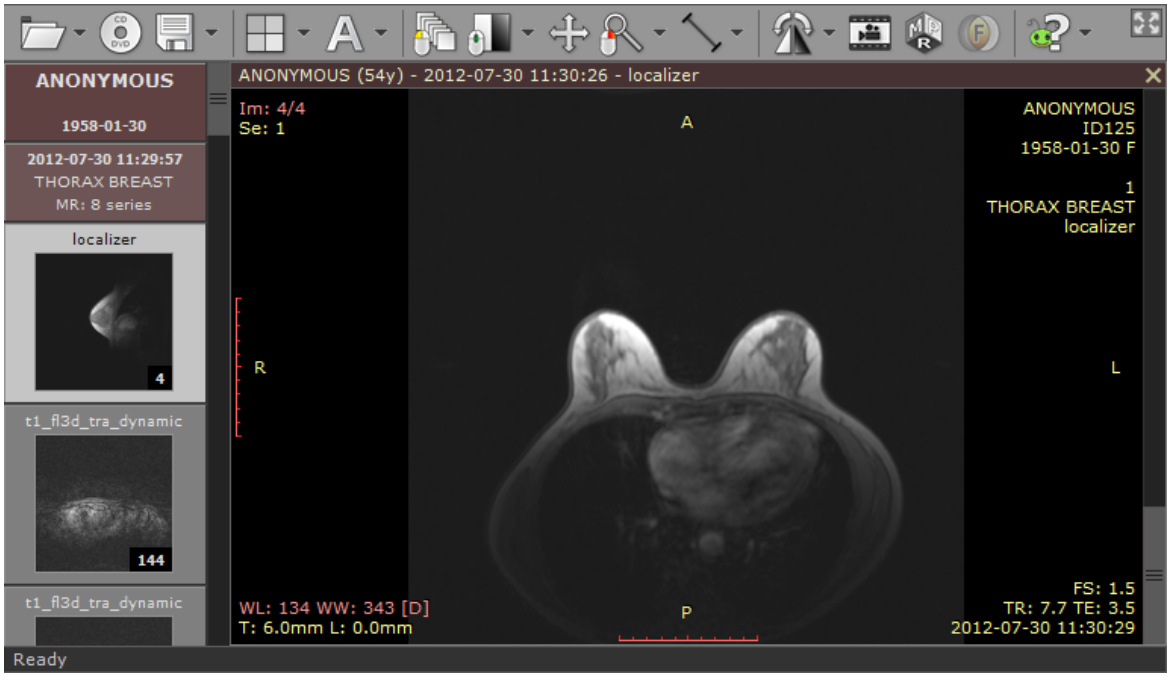
3.6 Time-intensity curves (TIC)

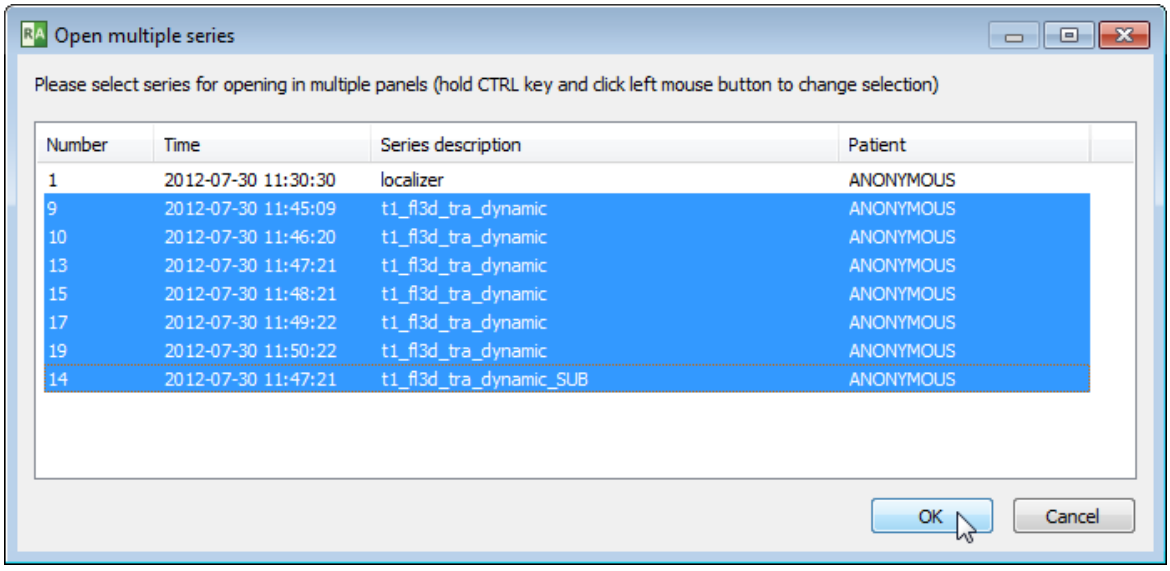
The time-intensity curve tool allows you to visualize the lesions' enhancement behavior (e.g. in Breast MRI) by plotting the signal intensity values over time after the administration of contrast material.

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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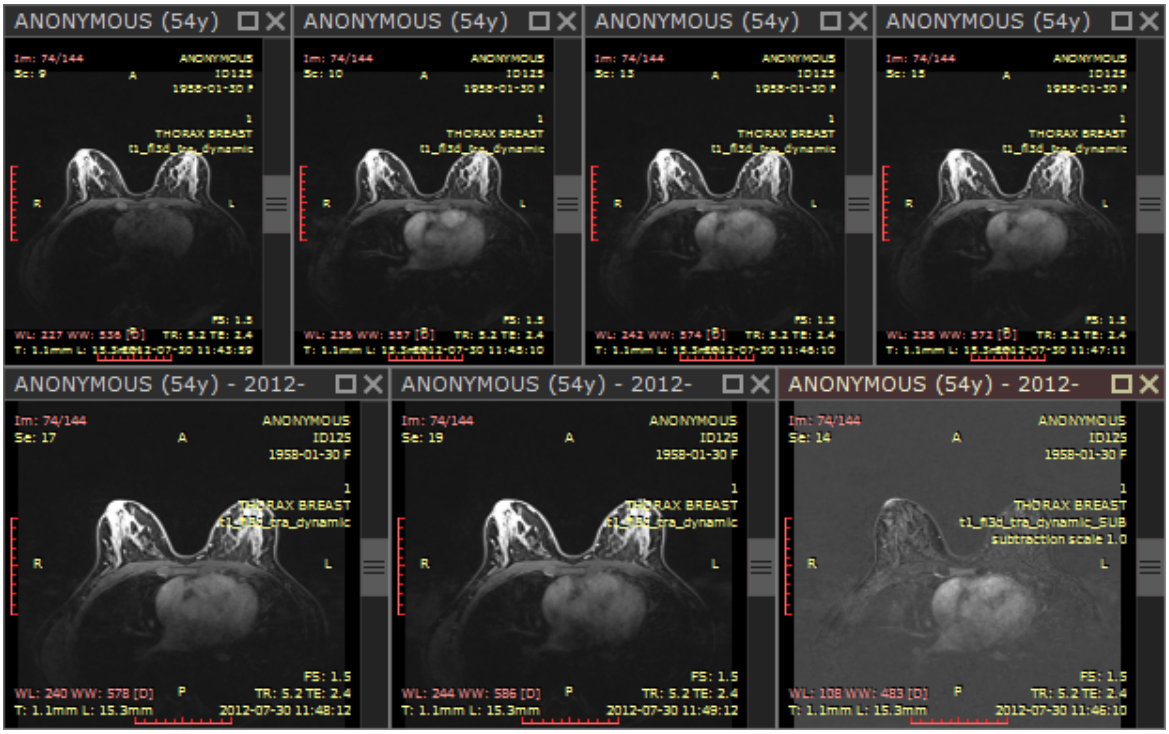
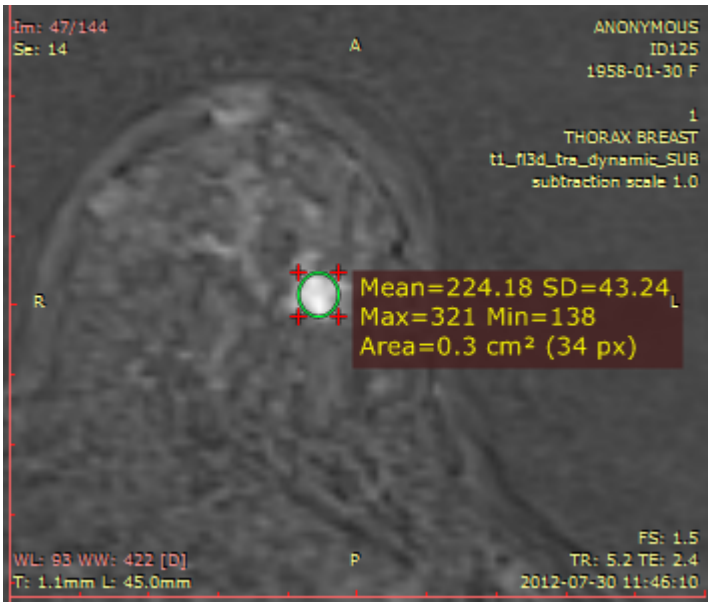


3) Find a lesion that you would like to analyze and draw an ellipse over it.



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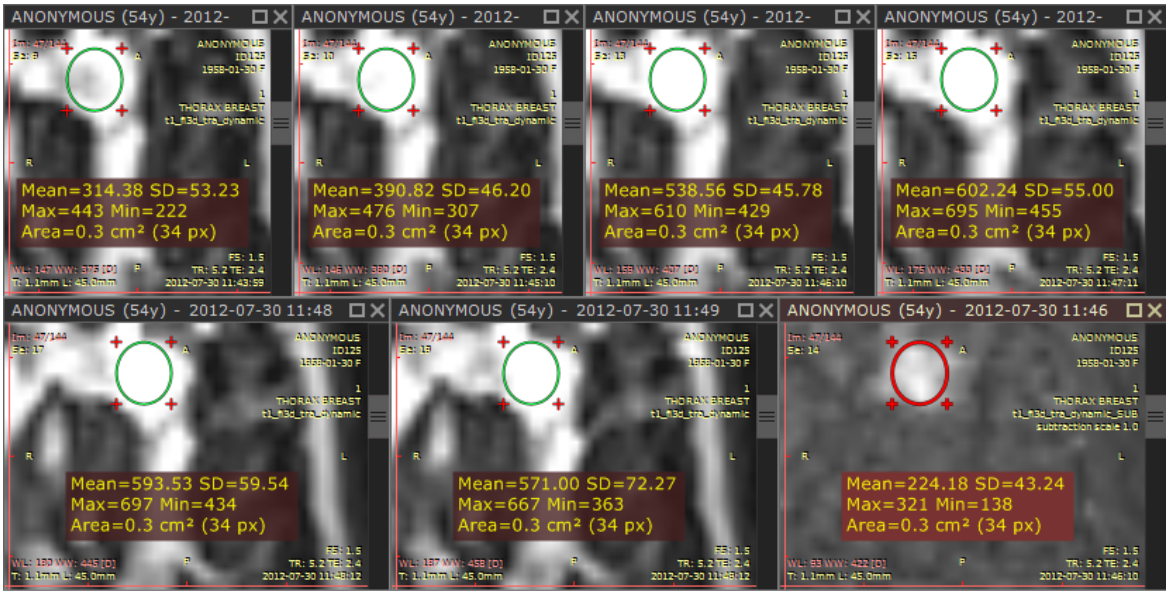
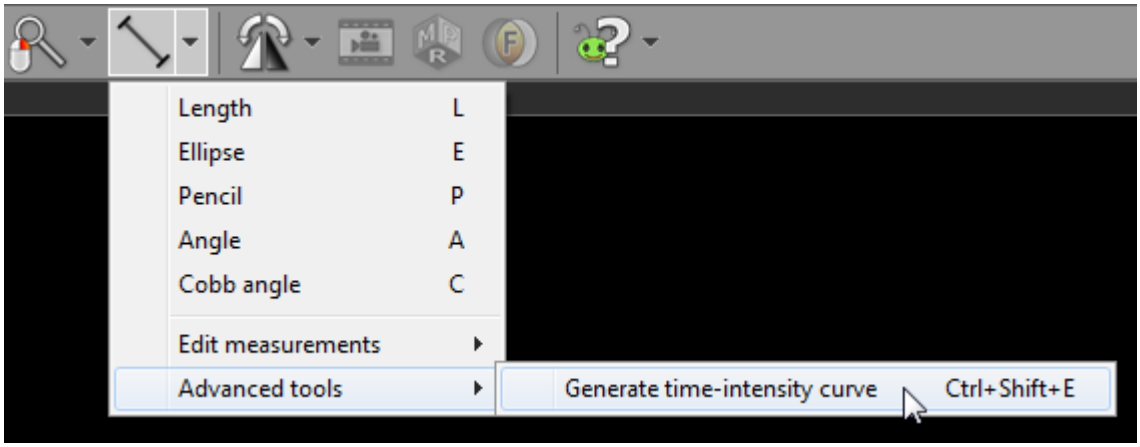
4) Quickly duplicate the ellipse ROI into other series by using the `CTRL + SHIFT + D` shortcut.



5) Select "Time-intensity curve" from "Advanced tools" or use `CTRL + SHIFT + E` .



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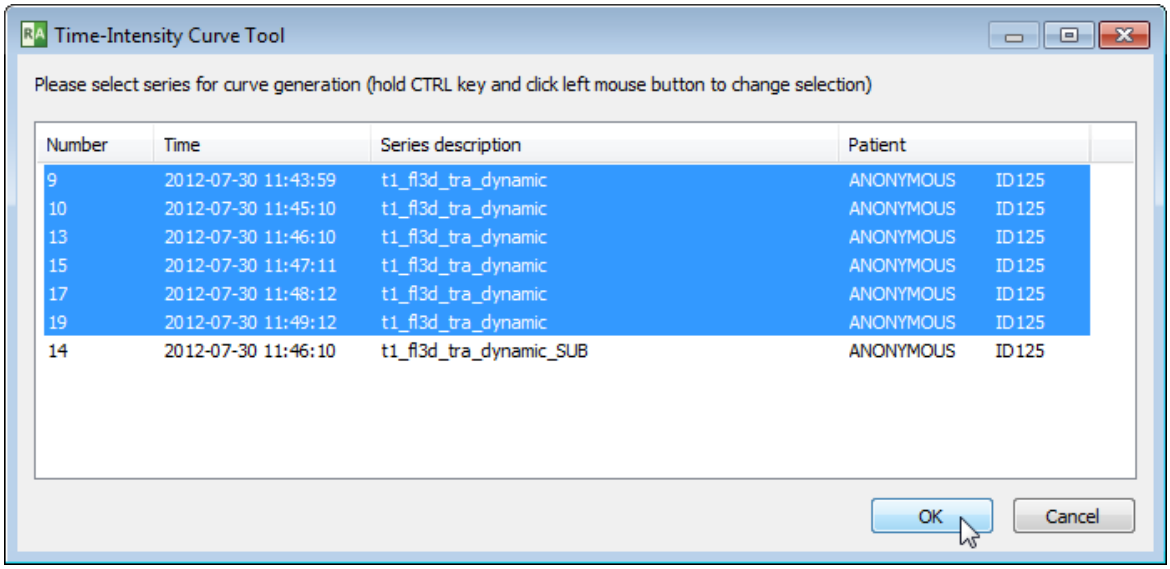
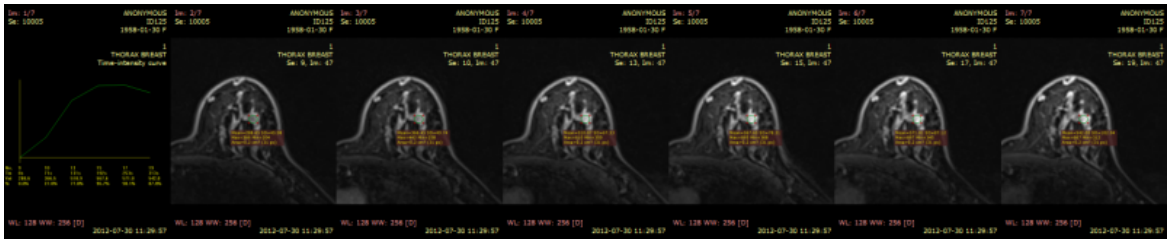
6) RadiAnt DICOM Viewer selects the series for curve generation automatically.
Make changes to the selection if you want to use other series. Click OK to confirm the selection and generate curve.



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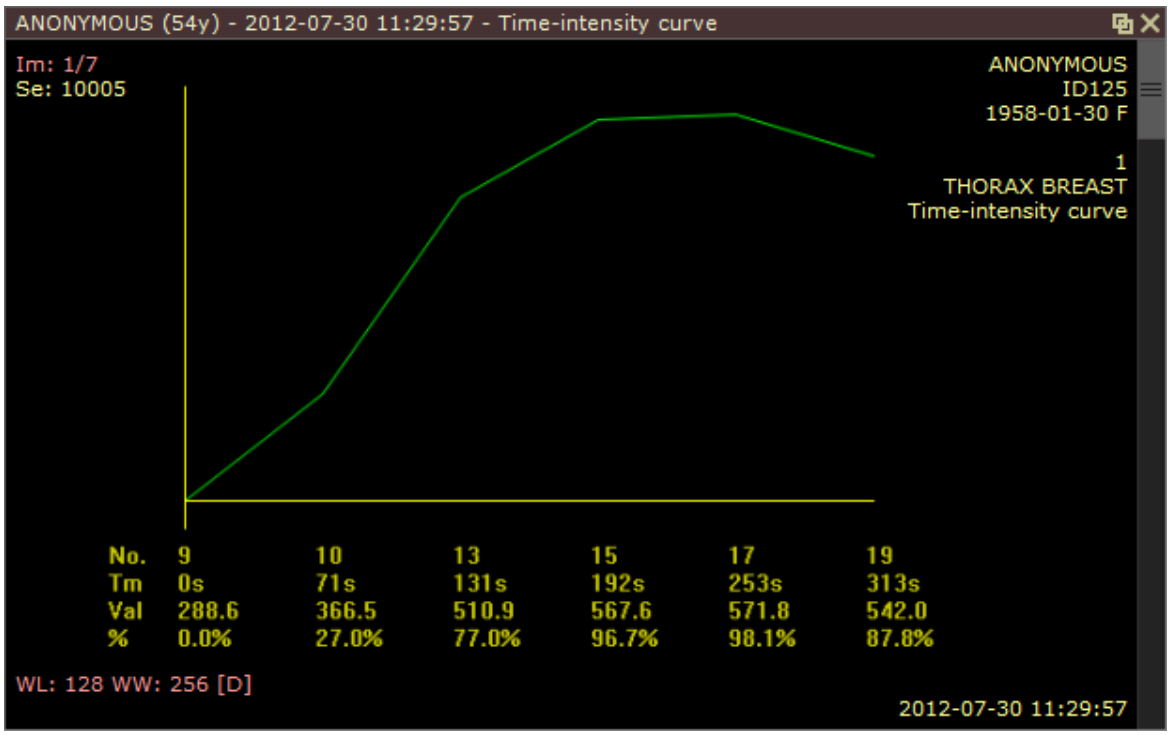
8) Maximize the panel (double-click it) to see the detailed curve.



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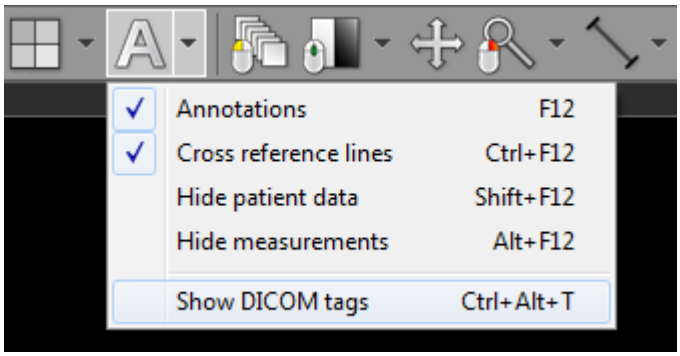
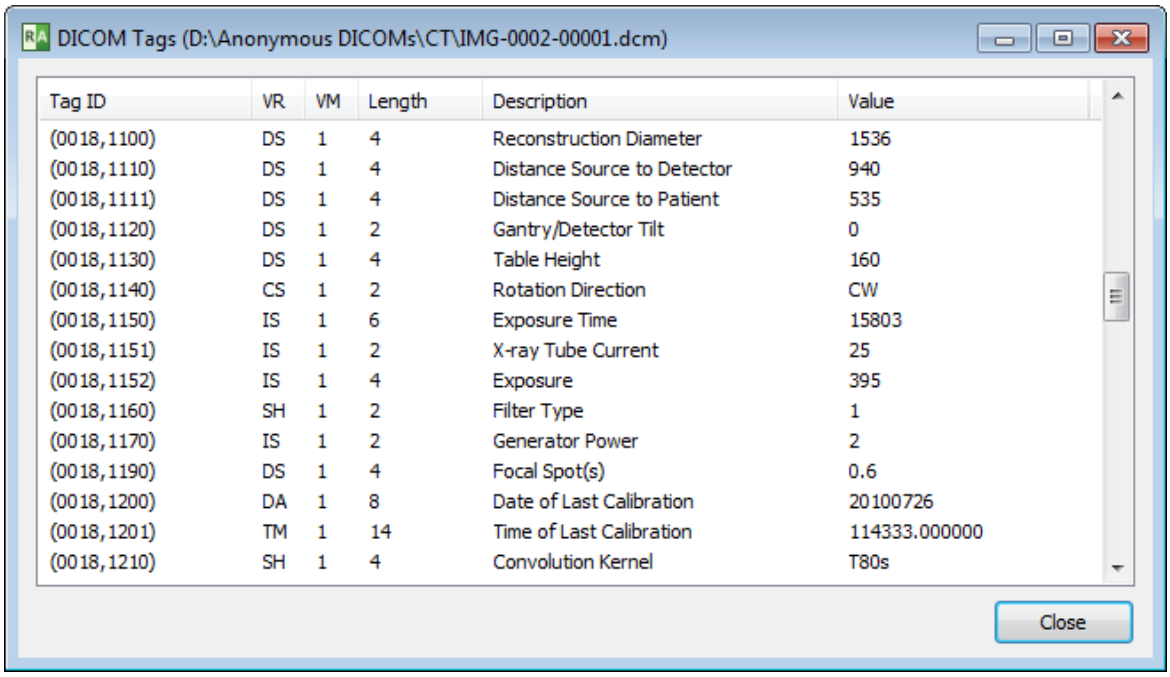
3.7 DICOM tags

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
(0018,1100)	DS	1	4	Reconstruction Diameter	1536
(0018,1110)	DS	1	4	Distance Source to Detector	940
(0018,1111)	DS	1	4	Distance Source to Patient	535
(0018,1120)	DS	1	2	Gantry/Detector Tilt	0
(0018,1130)	DS	1	4	Table Height	160
(0018,1140)	CS	1	2	Rotation Direction	CW
(0018,1150)	IS	1	6	Exposure Time	15803
(0018,1151)	IS	1	2	X-ray Tube Current	25
(0018,1152)	IS	1	4	Exposure	395
(0018,1160)	SH	1	2	Filter Type	1
(0018,1170)	IS	1	2	Generator Power	2
(0018,1190)	DS	1	4	Focal Spot(s)	0.6
(0018,1200)	DA	1	8	Date of Last Calibration	20100726
(0018,1201)	TM	1	14	Time of Last Calibration	114333.000000
(0018,1210)	SH	1	4	Convolution Kernel	T80s

The value of a tag can be copied to clipboard by selecting an item and pressing **CTRL + C** .

(0018,1140)	CS	1	2	Rotation Direction	CW
(0018,1150)	IS	1	6	Exposure Time	15803
(0018,1151)	IS	1	2	X-ray Tube Current	25

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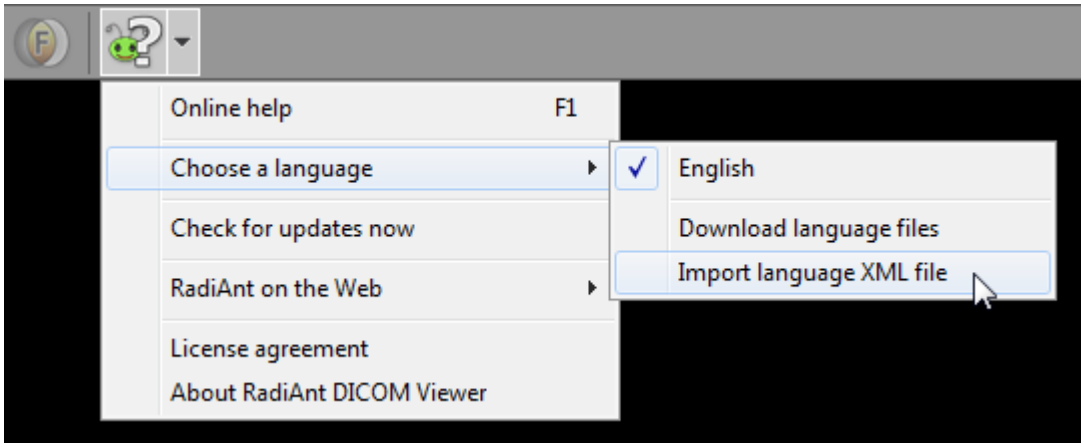
3.8 Changing language

Thanks to our community, RadiAnt DICOM Viewer has been translated into more than 20 languages.
The language files (in XML format) are available for download from http://www.radiantviewer.com/translation 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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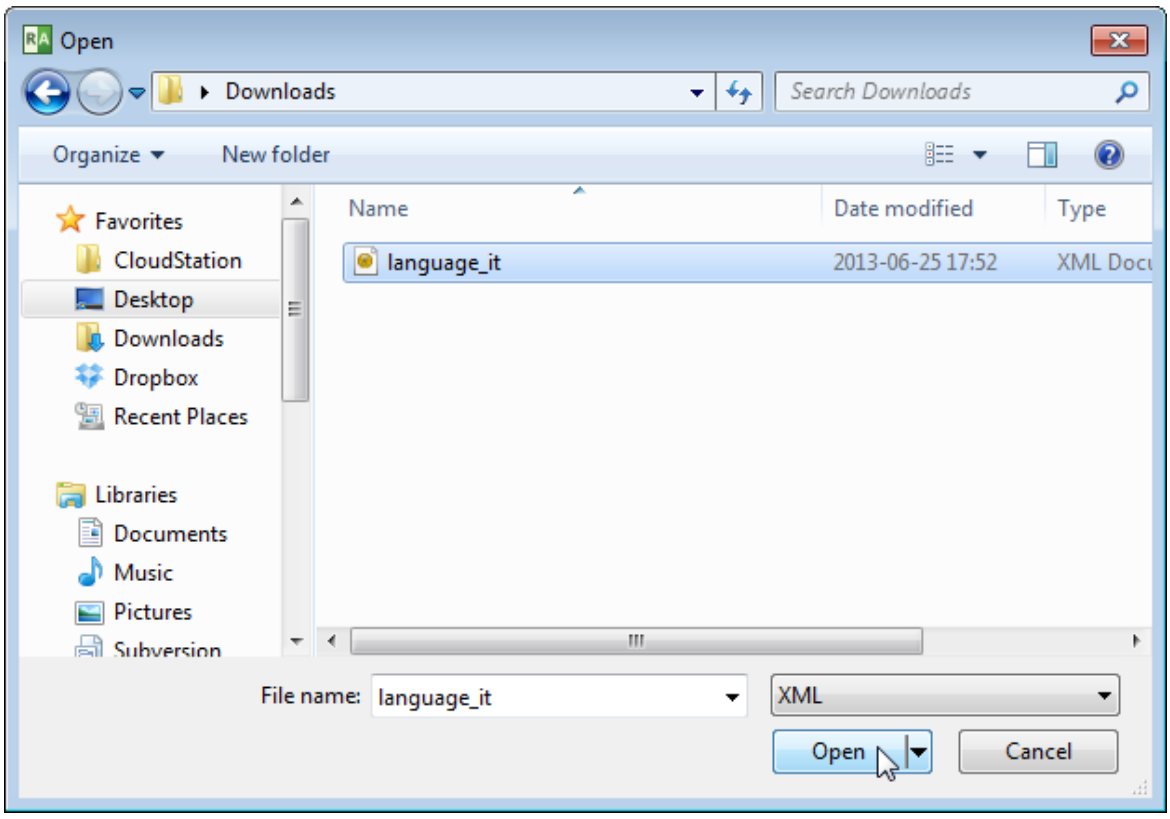
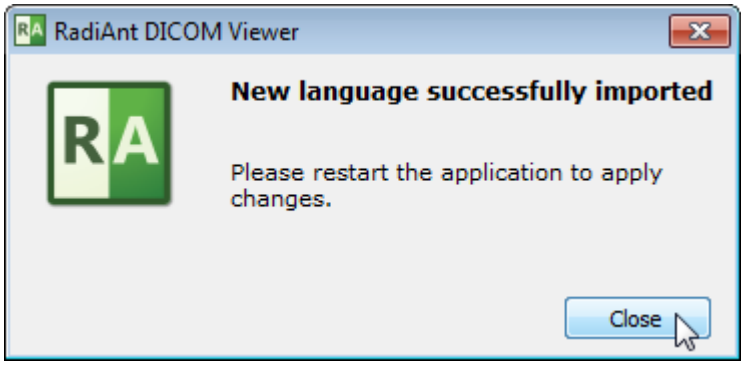
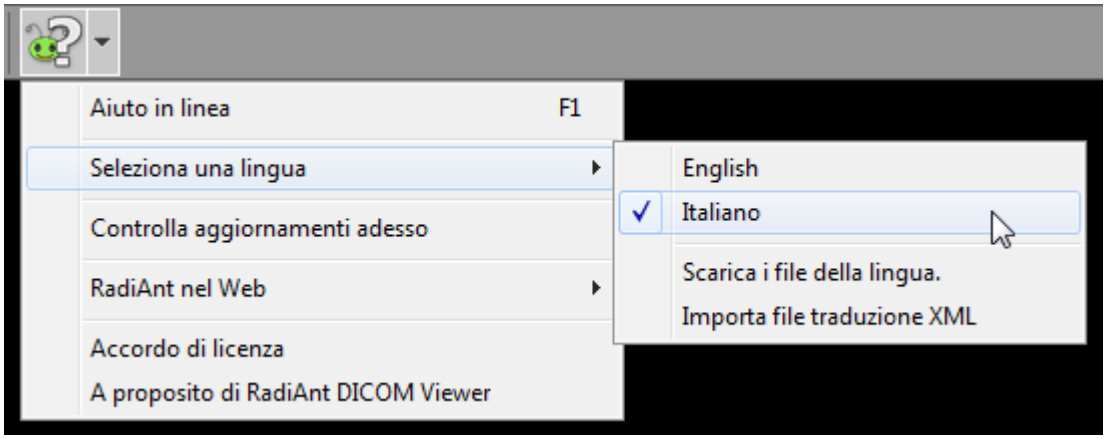
Find the downloaded language file and click Open.





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



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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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4 Appendix

4.1 Keyboard shortcuts

Global keyboard shortcuts	
CTRL + O	Open DICOM file(s)
CTRL + SHIFT + O	Scan DICOM folder
CTRL + ALT + O	Open DICOM CD/DVD
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
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
CTRL + ALT + S	Toggle auto synchronization
F	Toggle full screen/window mode
CTRL + SHIFT + F3	Toggle toolbar and status bar visibility
CTRL + SHIFT + F4	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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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)
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

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SPACE	Start/stop cine
CTRL + C	Copy selected ROI
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 + C	Copy displayed image to clipboard
CTRL + ALT + 1	Coronal MPR
CTRL + ALT + 2	Sagittal MPR
CTRL + ALT + 3	Axial MPR
CTRL + ALT + F	Toggle image fusion
CTRL + ALT + T	Show DICOM tags for displayed image
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)

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4.2 Mouse functions

Mouse functions	
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 + mouse wheel	Zoom image in/out
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]

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4.3 Multi-touch operations

Multi-touch operations	
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 finger over image	Drag up/down to change brightness, drag left/right to change contrast.
Double tap on image	Maximize/restore panel.

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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 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.

Sample 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 -
```

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```
change WW/WL, 5 - ROI) -->
                <lmb>1</lmb> <!--  left mouse button -->
                <mmb>4</mmb> <!--  middle mouse button -->
                <rmb>2</rmb> <!--  right mouse button -->
                <mw>1</mw> <!-- mouse wheel - valid tools: browse series (1) or zoom (2) -->
        </tools>

        <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) -->
        </loading>

</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>

</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")
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")
```

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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")

<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

Command-line arguments	
-f	Open DICOM files (radiantviewer.exe -f file1 file2 file3)
-d	Scan folders for DICOM files (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 running instances of RadiAnt DICOM Viewer (radiantviewer.exe -cl)
-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)
-tg	Export DICOM meta data to text files (radiantviewer.exe -d folder_in -tg folder_out)

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4.6 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)
/LICENSE	License key file path
/LANGFILE	Language XML file path
/LANGUAGE	Setup language (overrides system locale, eg. `/LANGUAGE=1033`)
Sample syntax	radiantsetup.exe /S /LICENSE="D:\license.radiantlic" /LANGFILE="D:\language_es.xml" /D=C:\Program Files\RadiAnt

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4.7 CD/DVD Autorun Package

RadiAnt DICOM Viewer 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.
There is also the "COMMON" folder, which contains the following subfolders and files:

- "LANG" - the language XML files with RadiAnt DICOM Viewer translations may be placed in this folder.
- "LICENSE" - a folder with the license agreements for RadiAnt DICOM Viewer 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.
- "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 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***

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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.

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