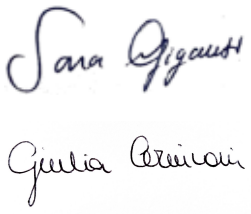
ZEEROmed View

User Manual

MANUFACTURER	O3 ENTERPRISE S.R.L.
MARK	CE 1370 **CE** Mark under Medical Device Regulation EU 2017/745
PROTOCOL	DPR-120
SYSTEM VERSION	5.1
MINOR VERSION	8
LANGUAGE	EN
LABEL	Public

	NAME	DATE	SIGNATURE
Written/modified by	Sara Giganti Giulia Cernivani	22/05/2026	
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MODIFICATIONS FROM PREVIOUS SYSTEM VERSION	
Modifications	**Chapter**
Adding the manufacturer website	1.1 - Manufacturer essential data (INTRODUCTION)
Updating the "Change secondary exam" button	5.1.1 - Information bar (THE VIEWER)
Updating the "Change secondary exam" button	5.4.2 - Comparison with a Previous Study of the Same Patient (THE VIEWER)
Updating the "Change secondary exam" button	6.2 - Change secondary study (PATIENT HISTORY)
Adding the paragraph "Panel synchronization"	7.2.2 - Panel synchronization (GENERAL TOOL)

Adding the "Esc" functionality	7.3.1 - Performing a measurment (GENERAL TOOL)
Updating the zoom level panel	17.4.1 - Zoom levels (ANATOMOPATHOLOGY TOOL)

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1 INTRODUCTION

ZEEROmed View is a software application meant to let properly trained physicians and radiologists view DICOM and non DICOM images, signal and videos, in order to allow diagnoses, reporting and clinical decisions.

1.1 Manufacturer Essential Data

NAME	**O3 ENTERPRISE SRL**
Head Office	AREA Science Park, Padriciano 99, 34149, Trieste, ITALY
Operational Center	AREA Science Park, Padriciano 99, 34149, Trieste, ITALY
Local Unit	• Via Caprin 18, 34170, Gorizia, ITALY; • Via Copernico 38, 20125, Milano, ITALY
VAT Number	01137150320
Website	https://zeeromed.com/

Table 1: Manufacturer Essential Data

1.2 Medical device description and specifications

NAME	**ZEEROMED VIEW**
General description of the device	Stand-alone MDSW web based that displays diagnostic images and clinical data
Intended patient population	There is not a specific intended patient population designated to be treated with this MDSW because of its intended purpose. All patient populations can indirectly benefit from this MDSW if needed
Intended user	Physicians, radiologists, pathologists
Medical Condition	ZEEROmed View is a MDSW thought for all types of medical conditions that needs a visualization of:

	• medical images such as CT, MRI, CT-Scan, PET-CT, Ultrasound; • medical signals related to cardiology • anatomical pathology images It can't be used on the patient to directly treat a medical condition but it permits the diagnosis
Indication for use	ZEEROmed View is intuitive but it should be used with previous training of personnel involved. O3 Enterprise provides training before the installation of the product. O3 Enterprise also provides a User Manual designated for the end-user which can be downloaded from the software itself.
Use Environment	Trained physicians are allowed to use the system both in a hospital environment and at home, if they own an environment suited for reporting according to National Laws (e.g. in Italy regulated by DPR 14 January 1997) concerning minimum structural, technological and organisational requirements to perform medical activities. Also there shall be an internet connection because of the nature of the product (web based software). Monitor spatial resolution must be adapted to the type of studies to be read. See paragraph **1.4 Minimal and recommended technical requirements** for the web browser specifications.
Contraindication	There are **NO contraindications** related to the use of the medical device
Warning	There are **NO warnings** related to the use of the medical device
Side effects	There are **NO side effects** related to the use of the medical device
Lifetime	ZEEROmed View is considered obsolete if it hasn't received any system updates for three years

Table 2: Medical device description and specification

1.3 Information on incidents

The user shall inform the competent authorities of:

- any malfunction or deterioration in the characteristics or performance of a device made available on the market, including use-error due to ergonomic features, as well as any inadequacy in the information supplied by the manufacturer and any undesirable side-effect;

- any incident that directly or indirectly led, might have led or might lead to any of the following:
  - the death of a patient, user or other person;
  - the temporary or permanent serious deterioration of a patient's, user's or other person's state of health;
  - a serious public health threat;
- any adverse event that led to any of the following:
  - death;
  - serious deterioration in the health of the subject, that resulted in any of the following:
    - life-threatening illness or injury;
    - permanent impairment of a body structure or a body function;
    - hospitalisation or prolongation of patient hospitalisation;
    - medical or surgical intervention to prevent life-threatening illness or injury or permanent impairment to a body structure or a body function;
    - chronic disease;
  - foetal distress, foetal death or a congenital physical or mental impairment or birth defect.

Such incidents or adverse events must be reported to O3 Enterprise s.r.l., as the manufacturer of the MD, at the following email addresses:

- qualita@o3enterprise.com;
- claims@o3enterprise.com.

1.4 Minimal and recommended technical requirements

This product incorporates the Pathology Software Development Kit (© 2020 by Koninklijke Philips N.V.) under a license from Philips Medical Systems Nederland B.V.

1.4.1 Minimal server requirements

1.4.1.1 Operating system

The application can run on any 64-bit Linux OS compatible with Docker Engine.

The recommended Linux operating systems are:

- Ubuntu 20.04 LTS or 22.04 LTS;
- RHEL-based OS.

1.4.1.2 Minimal HW requirements

Hardware sizing might slightly vary based on the modalities used by customers and on concurrent users.

CONCURRENT USERS	CPU CORES*	RAM
10	6 cores	12 GB
20	10 cores	20 GB
50	18 cores	36 GB
50+	+1 core per 10 concurrent users	+4 GB per 10 concurrent users

Table 3: Minimal HW requirements

* Equivalent of 7th generation Intel i5 2.4 GHz CPU core.

⚠ **Note**: to ensure optimal performance, digital pathology projects require 1.5 CPU cores per concurrent user

The hardware requirements above refer to a load of fewer than 150 exams per day (each containing 200 images).

The storage is used for software and temporary data cache. At least 50 GB of storage size is recommended.

Since the network bandwidth directly affects opening speed, we recommend at least 100 Mbit/s.

1.4.1.3 Monitors

It is recommended to use a monitor with a minimum resolution of 1280x1024.

For more information, please contact the O3 Enterprise s.r.l. representative.

1.4.2 Client requirements

DESKTOP WEB HTML5	
CPU	Intel i3 4 core CPU or better
RAM	8+ GB of RAM, 256+ MB of video memory
Storage space	10+ GB
Network bandwidth	100+ Mbit/s
Web browsers	Google Chrome 112+**, Microsoft Edge 112+, Mozilla Firefox 112+, Safari 16+

Table 4: Minimal client requirements

** To achieve the best performance, it is recommended to use **Google Chrome**.

1.4.2.1 Minimal LAN/WAN requirements

MINIMAL REQUIREMENTS		
LAN	*minimal*	100+ Mbit/s
	recommended	100+ Mbit/s
WAN	*minimal*	10+ Mbit/s download, 5+ Mbit/s upload
	recommended	50+ Mbit/s download, 20+ Mbit/s upload

Table 5: Minimal LAN and WAN requirements

1.5 User access requirements

The web access is performed by the user through HTTPS protocol (Hypertext Transfer Protocol over Secure Socket Layer).

The access is allowed only with authentication credentials. The credential consists in an authentication code and a key word known only by the users. The password is encrypted.

2 THE DEVICE

It is a web application, meant to run only on computers with the recommended hardware and software characteristics and configuration.

Access to the application must be granted through a suited authentication system.

Considering the rates at which technology progresses and a working system gets obsolete, including both hardware and software, the lifetime of each product version is estimated of 3 years.

For the date of issue or the latest revision of the instructions for use, see the date of approval in the header.

2.1 Device Essential Data

NAME: ZEEROmed View

TYPE: Clinical Data and Picture Viewer

VERSION: 5.1

ZEEROmed View presents the CE labels to the user on request through a dedicated button, in the form of a popup dialog. The following screen-shot shows the information contained therein:

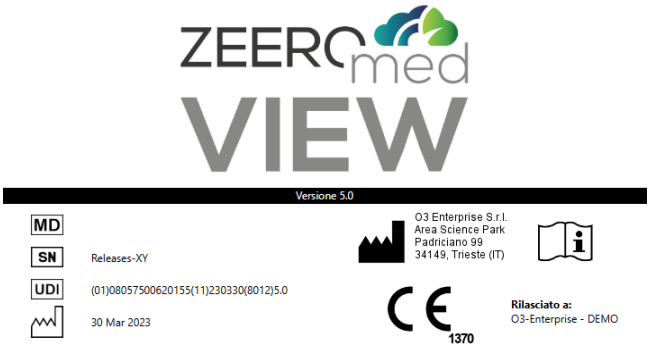


Image 1: Label

> **Note**: the image above is a sample representation of label and may not reflect the actual labelling information. Please refer to the embedded label in the product for its content.

The product label shows symbols taken from CEI EN ISO 15223-1 and the corresponding information. Each label contains:

- The Medical Device logo (different for each trade name)
- The Medical Device symbol
- The CE symbol with the number of the NB
- The date of release
- The Serial Number
- Manufacturer's name and address (Operational site for this software)
- The UDI vector of the device
- The indication to use the Instruction for Use. Clicking on this button the User Manual is provided to the user.

2.2 Intended Purpose

ZEEROmed View is a software application designed to display and manage diagnostic quality DICOM and NON DICOM medical images, signal and video clips. It allows a trained physician to make a diagnosis and to take clinical decisions on those data. The software runs entirely within a web-browser.

The product allows to:

- display medical images in diagnostic quality;
- display the raw data of ECG signals of different formats which can be used for taking diagnostic decisions;
- Reconstruct axial medical images with MPR and Volume Rendering algorithms;
- the display of Anatomo Pathology images (Digital Pathology Slides) which can be used for taking diagnostic decisions.

It is a device intended to be used by physicians to make a direct diagnosis, but it is not intended to monitor physiological parameters.

2.3 Device accuracy

From two points of the same Dicom Image it is possible to calculate the distance in millimetres only if there is information that indicates the relationship between pixels of image and millimetres

In general, this information is present in radiological images (CR and DR), Computerized Tomographies (CT), Magnetic Resonances (MR) and Mammographies (MG), and it is possible to compute the distance between two points of an image using a simple formula.

Measures obtained from radiological images can be considered accurate only if the modality (that has produced the images) has been calibrated. The modality must be considered calibrated only if both PixelSpacing and ImagerPixelSpacing Dicom tags are present and if these values are different. In this case, PixelSpacing contains the calibrated value.

In any case it is possible to compute a measure also if the calibration is absent, but it is not possible to be sure that this measure is valid. In this case the user is warned by a message, as indicated in appropriate chapter (**7.3 Measures**).

An algorithm has been developed in order to calculate the error in a measure. The documentation is available from O3 Enterprise.

2.4 Safety

Respect the current national or international regulation (reporting environment, reporting devices...) is necessary for a safe use and correct medical reporting.

Pay attention to images sorting. The images should be sorted in a way suited to the particular series.

Keep ZEEROmed View updated to the latest version. This is recommended to increase safety and functionality (this is duty of the system administrator).

In case of system performance degradation, please contact the assistance service.

If you have to report a bug or a complaint, contact your system manager. He/she will report the problem to our assistance service.

2.5 Maintenance

Maintenance is the modification of a product after delivery, to correct faults and to maintain/improve performance or other attributes.

Two types of maintenance are expected:

- Planned maintenance;
- Corrective maintenance;

2.5.1 Planned maintenance

O3 Enterprise verifies every 3 months that everything runs properly, according to agreements in the contract with the customer.

2.5.2 Corrective maintenance

Corrective maintenance deals with identifying and fixing faults; it allows bringing ZEEROmed View back to optimal conditions. In case corrective maintenance is needed, please contact the assistance service.

3 SEARCHING FOR EXAMS

Users can find exams through both the:

- "Search Exam" panel;
- "Studylist" page.

3.1 "Search Exams" panel

Panel “Search Exams” allows searching among the exams in DICOM Servers. The panel is shown in the following image:

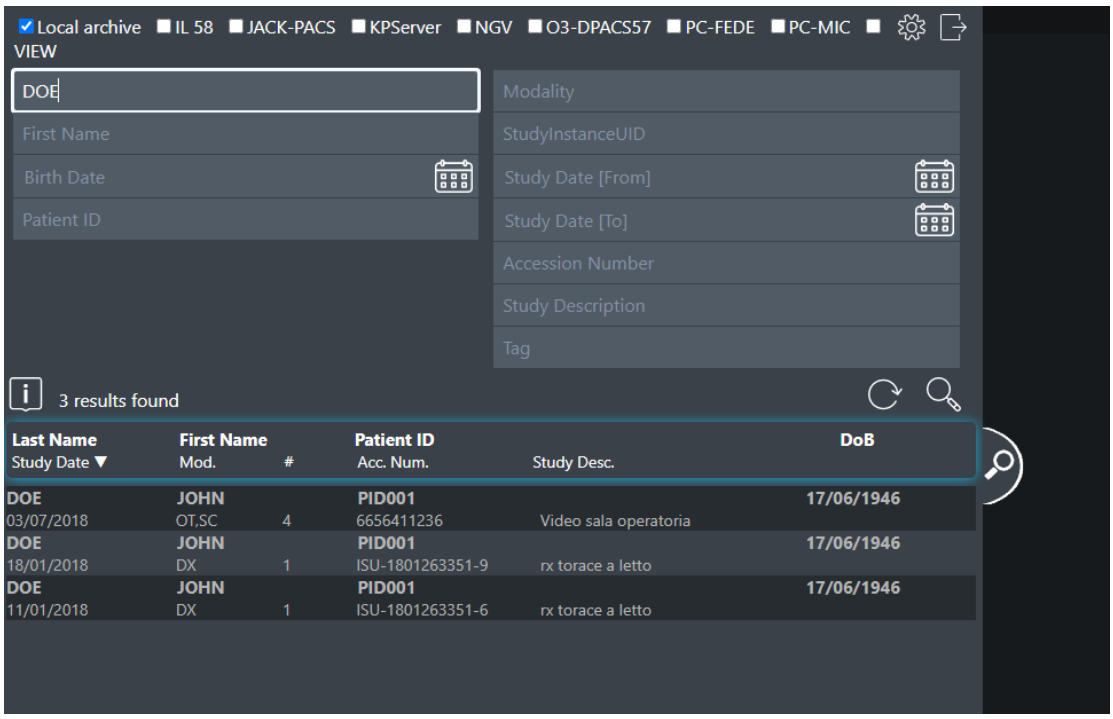


Image 2: Search exams panel

It is divided in two main sections:

- Search section, at the top;
- Results section, at the bottom.

3.1.1 Search Section

Searches for exams can be run from study or patient information.

The following illustration shows the query mask and its available filters:

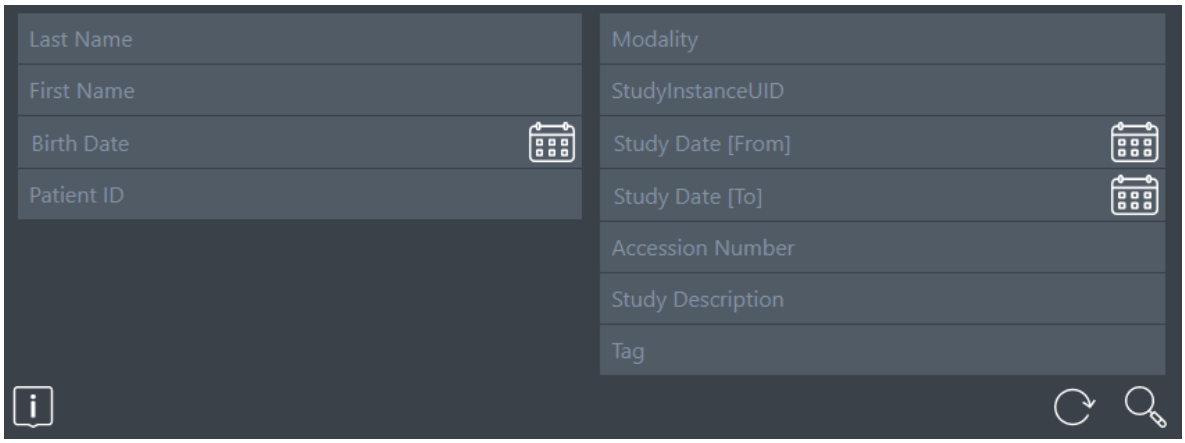


Image 3: Search Section

Searches occur always at study level, so that specifying only last name of the patient, all studies belonging to the matching patient will be returned, each as a row in the table.

3.1.1.1 Search fields

The available fields are:

- **Last Name**: Patient's last name. Free text, * is the wildcard;
- **First Name**: Patient's first name. Free text, * is the wildcard;
- **Birth Date**: Patient's birth date. Clicking on the field a calendar will appear, where the exact date can be chosen;
- **Patient ID**: Patient's unique ID. Free text, * is the wildcard;
- **Ref Phys Name**: Referring physician name [Last name First Name]. Free text, less than 64 characters (see **3.1.1.3 Referring Physician Name**);
- **Modality**: Type (modality) of the exam. Free text;
- **StudyInstanceUID**: Study Instance UID. Free text;
- **Study Date [From]**: Date after which the exams have been done. Clicking on the field a calendar will appear, where the exact date can be chosen. If "Study Date [To]" is not compiled, then "Study Date [From]" indicates the date of exam;
- **Study Date [To]**: Date before which the exams have been done. Clicking on the field a calendar will appear, where the exact date can be chosen;
- **Accession Number**: Accession Number of the study. Free text;
- **Study Description**: Study description. Free text;
- **AeTitle**: AeTitle. Free text, a punctual search: only studies with AeTitle equal to filtered value will be selected. Search for multiple AeTitle (like "AE*") will be denied;
- **Tag**: Tag of the study (see chapter **7.2 Toolbar**).

3.1.1.2 Buttons in the search section

Buttons available in the search section are:

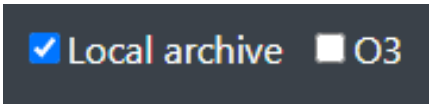
ICON	NAME	DESCRIPTION
	Search on remote nodes	It allows the user to search exams on configured remote nodes
	Logout	It allows the user to logout
	Reset fields	It empties the contents of all query fields
	Search	It allows to search for exams in a PACS
	Information	It allows the visualization of the medical label and the user manual

Table 6: Button available in search section

3.1.1.3 Referring Physician Name

Referring Physician Name is the couple of surname-name or just one of them with "*" character. Because of the multiplicity of physicians with same name or surname, for each study is added a list of details including physician name.

Behaviour of referring physician field depending on search string which is described in the following table:

SEARCH STRING	RESULT ON LOCAL SEARCH	RESULT OF REMOTE SEARCH
LastName FirstName	LastName^FirstName	[NOTHING]
LastName*FirstName	LastName^FirstName	LastName^FirstName

LastName%FirstName	LastName^FirstName	LastName^FirstName
LastName_FirstName	LastName^FirstName	LastName^FirstName
[SPACE]	[NOTHING]	[ALL NOT NULL]
*	[ALL NOT NULL]	[ALL]
LastName	[NOTHING]	[NOTHING]
LastName*	LastName^FirstName	LastName^FirstName
LastName[SPACE]	[NOTHING]	[NOTHING]
[SPACE]LastName	[NOTHING]	[NOTHING]
FirstName	[NOTHING]	[NOTHING]
*FirstName	LastName^FirstName	LastName^FirstName
[SPACE]FirstName	[NOTHING]	[NOTHING]
FirstName[SPACE]	[NOTHING]	[NOTHING]

Table 7: Referring Physician Name

3.1.2 Results section

The Result section contains the results of the search. Each row represents a study.

Results can be sorted through the header. When a label is clicked, the list of results is sorted by that field in descending order and the label is updated, indicating the applied order (with an arrow).

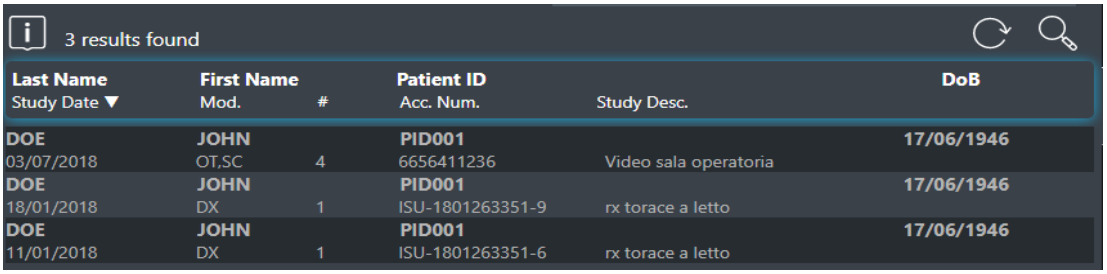


Image 4: Sorting by Last Name

Each study has the “Details” row. Clicking on this line the user can visualize:

- Study Instance UID;
- Last Name;
- First Name;
- Patient ID;
- Birth Date;
- Gender;
- Study Date;
- Study Time;
- Accession Number;
- Study UID;
- Modalities in study;
- Referring Physician Name.

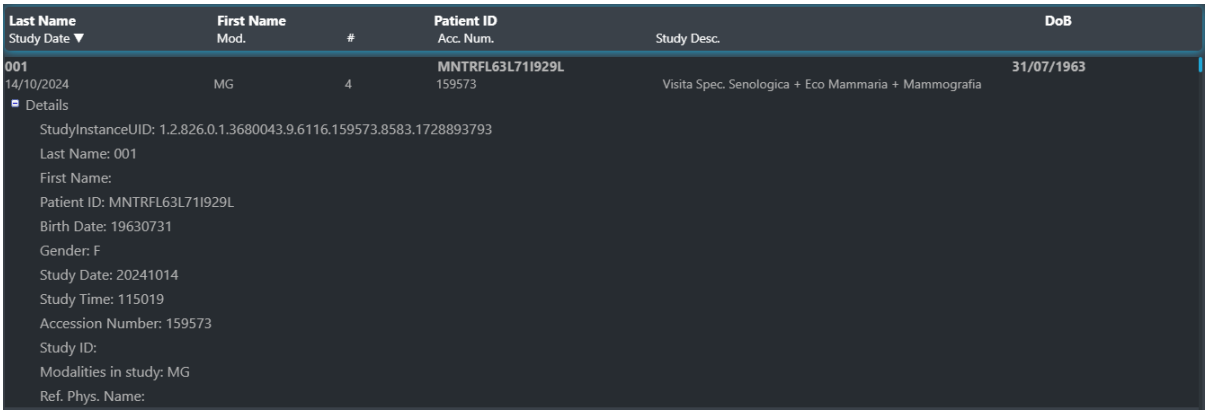


Image 5: Result section, details

A red line on a study provides evidence of an offline study. Clicking (or touching) on that line the user has an indication on how he/she can recover the study.

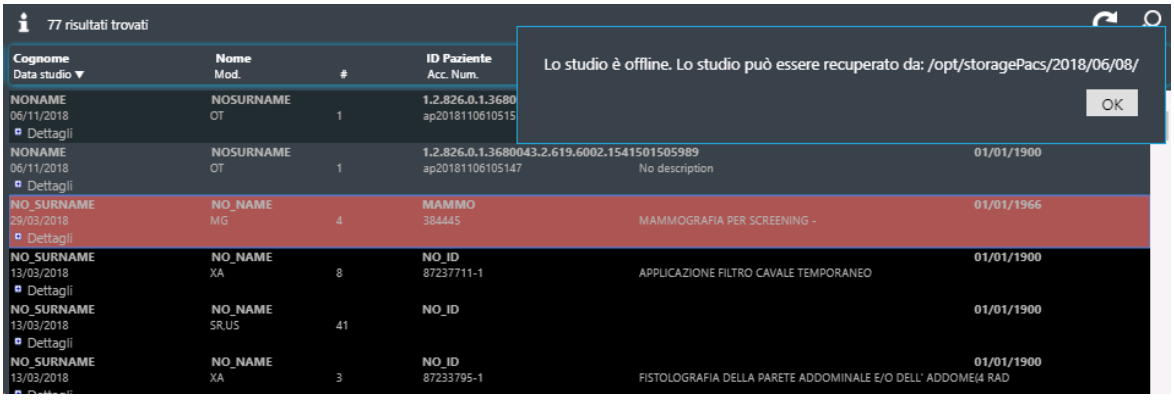


Image 6: An offline study

A black line on a study provides evidence of a nearline study. Clicking (or touching) on that line the user can see the study, but the loading might be slower than an online study.

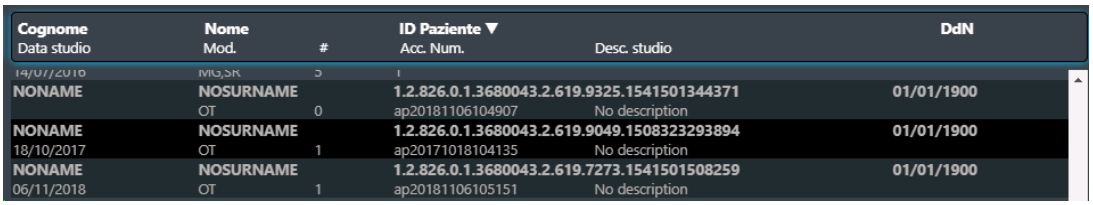


Image 7: A nearline study

Clicking a row, the associated result will be displayed in the viewer. The search panel disappears automatically. It is possible to open it again by clicking on the icon which is always visible on the left of the viewer.

Image 8: The icon of the search panel

3.1.2.1 Cloud icon

The cloud icon in the list results indicates that the study is archived either on a bucket or on a remote node. Hovering the mouse cursor over the icon displays its location.

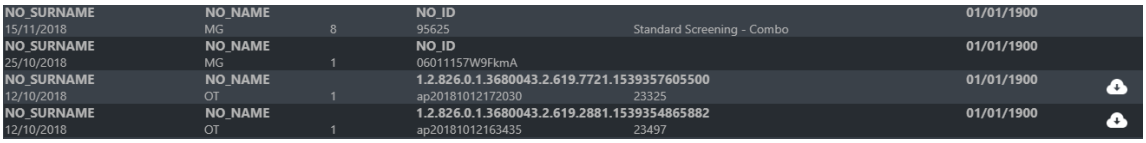


Image 9: Cloud icon

3.2 "Studylist" page

“Studylist” is an external web page linked to the ZEEROmed View, allowing users to search and display exams across DICOM servers. The studylist is shown in the image below:

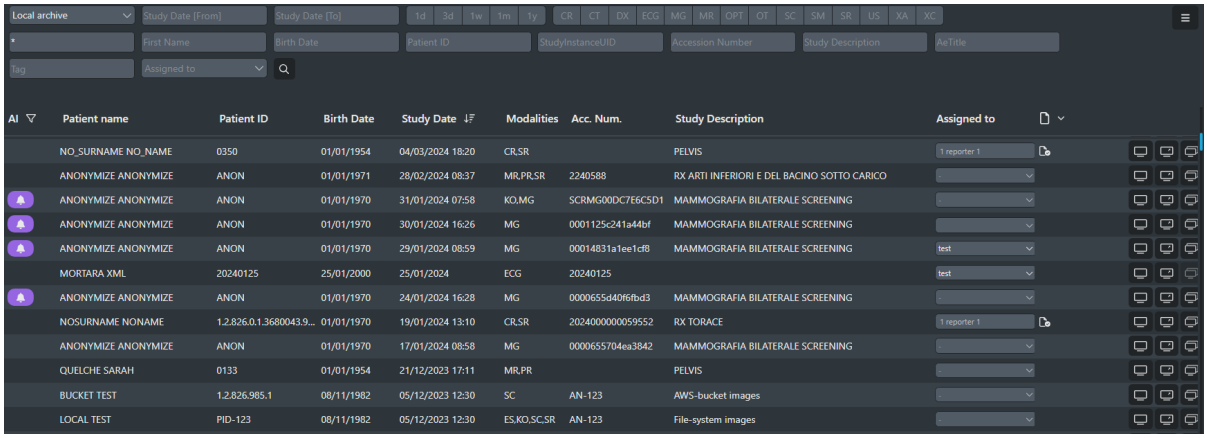


Image 10: Studylist

It is divided in two main sections:

- Search section, at the top;
- Results section, at the bottom.

3.2.1 Search Section

Users can search for both study or patient information.

The following illustration shows the query mask and its available filters:

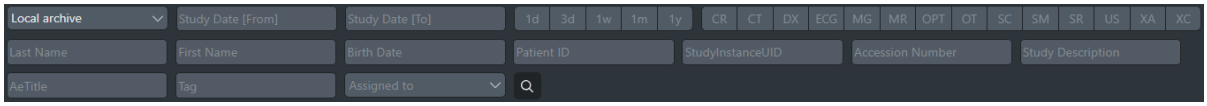


Image 11: Search Section

Searches occur always at study level, so that specifying only last name of the patient, all studies belonging to the matching patient will be returned, each as a row in the table.

3.2.1.1 Search fields

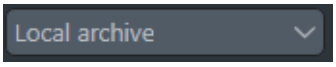
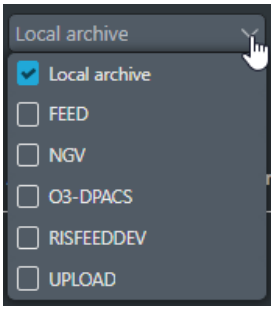
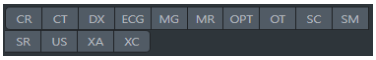
The searching can be configured by the user through the "Configuration Layout" popup ( ). Available filters include:

- **Last Name**: Patient's last name. Free text, * is the wildcard;
- **First Name**: Patient's first name. Free text, * is the wildcard;
- **Birth Date**: Patient's birth date. Clicking on the field a calendar will appear, where the exact date can be chosen;
- **Patient ID**: Patient's unique ID. Free text, * is the wildcard;

- **StudyInstanceUID**: Study Instance UID. Free text;
- **Study Date [From] - [To]**: Studies time range. If “Study Date [To]” is not compiled, then “Study Date [From]” indicates the date of exam.Alternatively, user can click on the "**1d**", "**3d**", "**1w**", "**1m**", "**1y**" buttons to easily select the date range (see **3.2.1.2 Buttons in the search section**).
- **Modality**: Interactive buttons to filter between the different exam modalities (see **3.2.1.2 Buttons in the search section**);
- **Accession Number**: Accession Number of the study. Free text;
- **Study Description**: Study description. Free text;
- **AeTitle**: AeTitle. Free text, a punctual search: only studies with AeTitle equal to filtered value will be selected. Search for multiple AeTitle (like “AE*”) will be denied;
- **Tag**: Tag of the study (see chapter **7.2 Toolbar**);
- **Assigned to**: physician assigned to the reporting of the study.

3.2.1.2 Buttons in the search section

Buttons available in the search section include:

BUTTON	NAME	DESCRIPTION
	Search on remote nodes	It allows the user to search exams on configured remote nodes. It is possible to select one or more nodes at the same time. 
	Date range	It allows the user to quickly select a range date to the current date. Clicking the buttons automatically fills in the "Study Date [From]" and "Study Date [To]" filters.
	Modality	They allow to filter between the different exam modalities. It is possible to filter for more than one modality at the same time.

	Search	It allows to search for exams in an archive
	Open the configuration menu	It allows to open the following configuration menu (icons are described in the rows below): 
	Configure layout	It allows the user to choose which search fields, results columns, opening modes and exams modalities to display. See **3.2.1.3 Studylist layout configuration**
	Open administrator configurations	(only for an administrator user) It opens the configuration page of the ZEEROmed View
	Information	It allows the visualization of the medical label and the user manual
	Log out	It allows the user to log out
	Close the configuration menu	It closes the configuration menu

Table 8: Buttons available in search section

3.2.1.3 Studylist layout configuration

Clicking the "Configure layout" icon  opens the corresponding panel, allowing the user to select:

- Search filters;
- Columns of the results section;
- Opening modes (see **3.2.2.2 Buttons in the result section**);
- Exam modalities (e.g. CR,CT, DX, ECG,...),

to display in the search and results section.

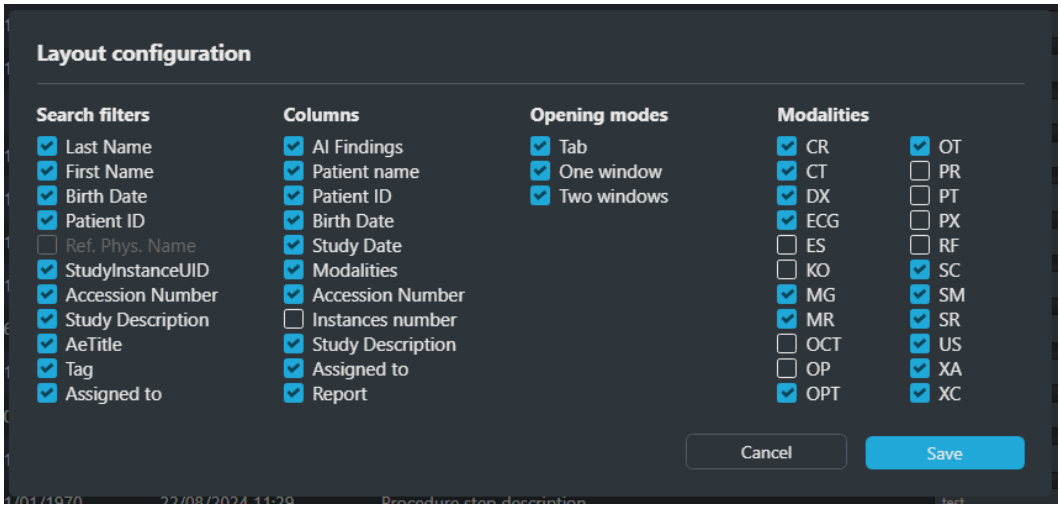


Image 12: Studylist layout configuration

To save the settings, click the "Save" button.

3.2.2 Results section

The Result section contains the results of the search. Each row represents a study.

Results can be sorted through the header. When a label is clicked, the header is highlighted and the list of results is sorted by that field in ascending/descending order (which is indicated by the light blue icon).

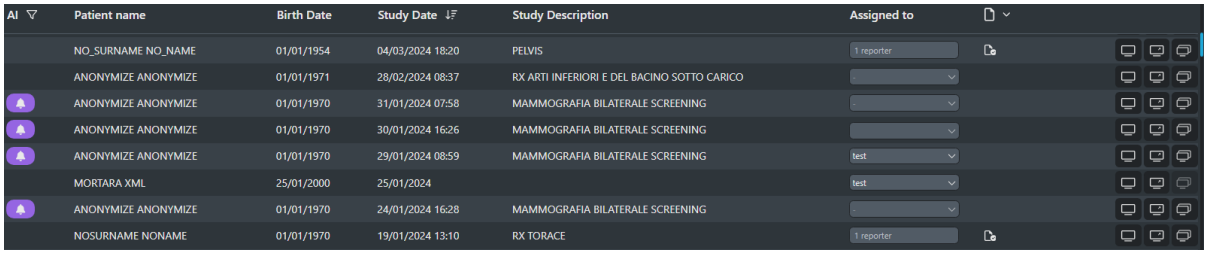


Image 13: Studies results

3.2.2.1 Result rows

Each row contains information regarding the study, including:

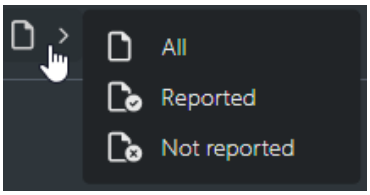
- (If AI is implemented) The finding score generated by the artificial intelligence algorithm, along with the AI icon (see chapter **3.2.2.3.1 Artificial Intelligence and finding scores**);
- Patient name;
- Patient ID;
- Birth Date of the patient;

- Study Date;
- Modality;
- Accession Number;
- Instances number;
- Study Description;
- Presence of a medical report (see **3.2.2.3 Icons in the result section**);
- Study storage location, either on the cloud or on a remote node (indicated by the cloud icon , in which case the study must be moved to be opened) ;
- Study opening modalities: in a new tab, in a new window or across two monitors (see chapter **3.2.2.2 Buttons in the result section**).

These columns can be configured by the user via the "Configure Layout" icon .

3.2.2.2 Buttons in the result section

In the result section, the following buttons are available:

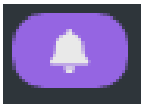
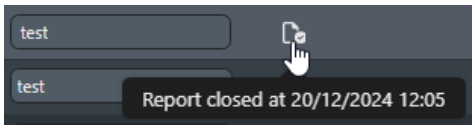
BUTTON	NAME	DESCRIPTION
	Filter	It allows to display only the exams with a "finding score" generated by the Artificial Intelligence software (see paragraph **3.2.2.3.1 Artificial Intelligence and finding scores**)
	Reporting filter	It allows to filter for: • All studies • Reported studies • Not reported studies 
	Retrieve this study	It allows downloading of the study. The study will be queued for download

	Open study in a tab	It opens the study in a new tab
	Open study on a single window	It opens the study in a new window
	Open study on a two windows (multi-monitor)	It opens the study using two monitors

Table 9: Buttons available in the result section

3.2.2.3 Icons in the result section

In the result section, the following icons are available:

ICON	DESCRIPTION
	It informs the user of the availability of a "finding score" generated by the Artificial Intelligence software (see paragraph **3.2.2.3.1 Artificial Intelligence and finding scores**)
	It indicates the presence of a closed report for the associated study. Hovering over it will display information regarding the date and time the report was closed: 
	It indicates that the study is available on a bucket or a remote node and must be downloaded to be viewed
	It indicates that the download of the study will start shortly. Once it starts, a pop-up will show the progress of the download, as shown in the following image.

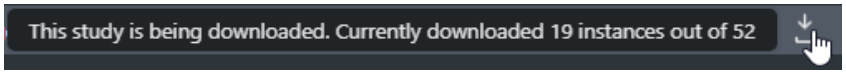
	
	It indicates that the study has been downloaded successfully

Table 10: Icons available in the result section

3.2.2.3.1 Artificial Intelligence and finding scores

If a third party Artificial Intelligence software is integrated, the icon  in the corresponding AI column indicates the availability of a finding score.

By hovering the mouse cursor over the icon, the finding score is displayed:

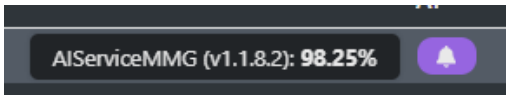


Image 14: Finding score provided by the AI software

To display only exams with a finding score, click on the following icon  , present in the header of the "AI" column.

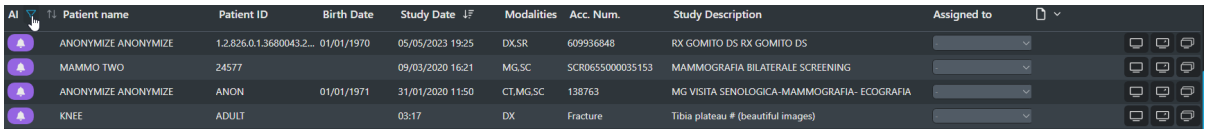


Image 15: Filtering studies by findings scores

3.2.2.4 Preview panel

Clicking a row displays the associated study with information, including the description, modality, number of instances and a preview at the bottom down.

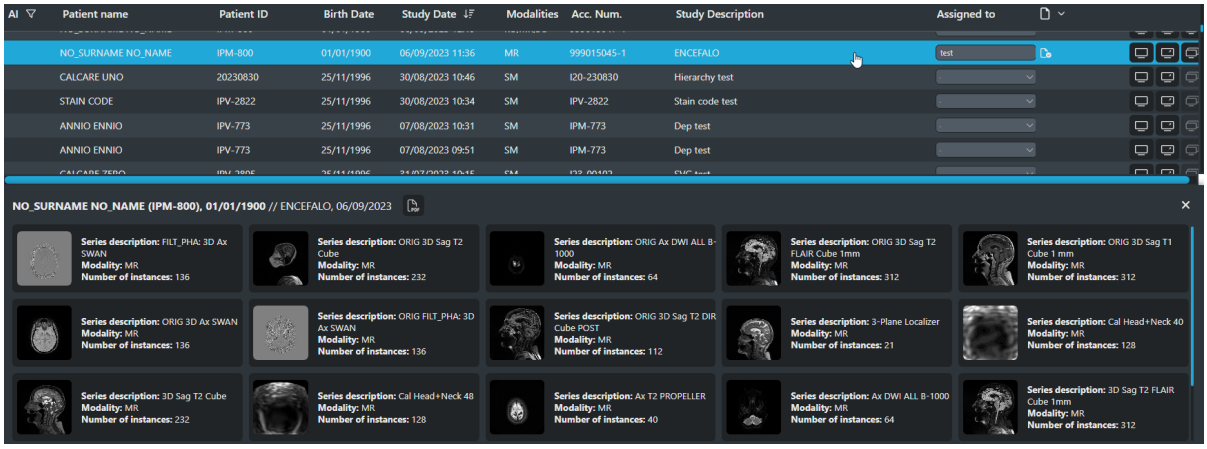


Image 16: Study Preview

A study report is indicated by the "PDF" icon in the study preview. By clicking on it, the medical report is displayed. More than one medical report can be saved per study.

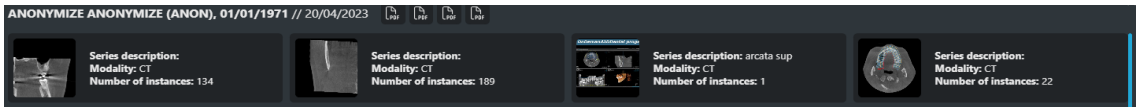


Image 17: Medical reports in the study preview

For more information on medical reports, refer to the chapter **7.7.1 Reporting via the "Create Report" Button**.

4 DIRECT ACCESS

In some integrations, the user can have direct access to the exams.

This is only possible if configured by the system administrator.

In this case the viewer opens directly the selected exam (see **5 The Viewer**).

In the event that two or more studies have the same access number, ZEEROmed Viewwill open both simultaneously.

The user can select the desired exam and then scroll through the exams with the same accession number through the navigation arrows that are displayed in the toolbar.

ICON	TOOLTIP	FUNCTIONALITY
	Go to next exam	It allows the user to switch to the next exam with the same accession number
	Go to previous exam	It allows the user to switch to the previous exam with the same accession number

Table 11: Next and previous exam

An alert informs the user about the selected exam.

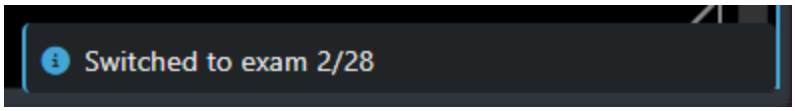


Image 18: Alert which informs the user about the selected exam

5 THE VIEWER

The viewer can be set in horizontal preview mode or in vertical preview mode, depending on the needs. In this manual, we will explain the features in vertical preview mode, but the same considerations apply for the horizontal preview mode.

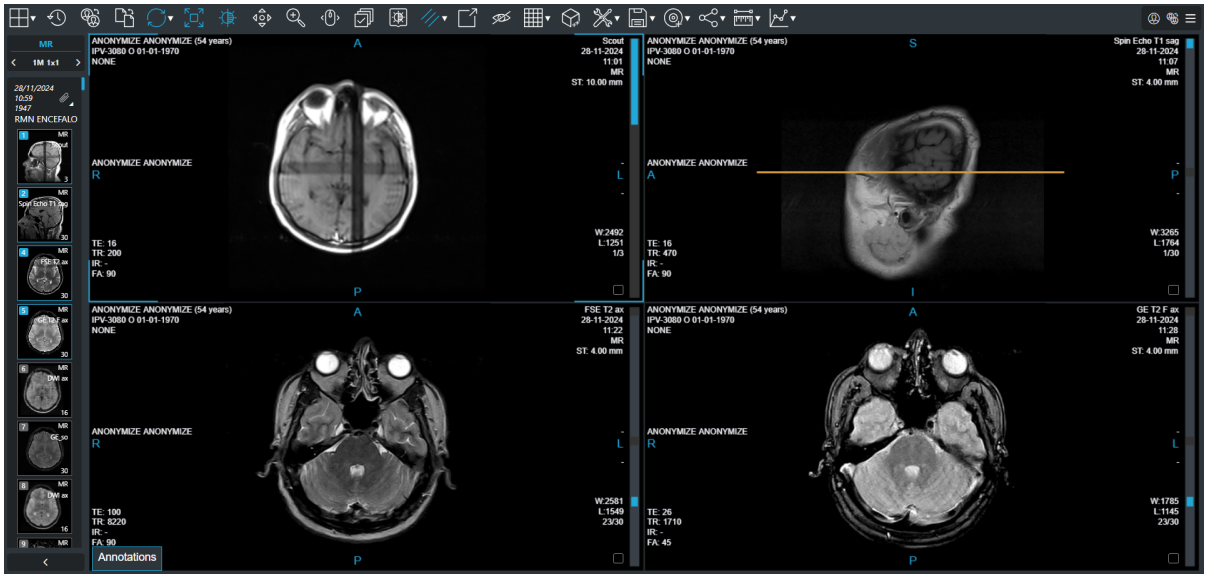


Image 19: Vertical preview mode

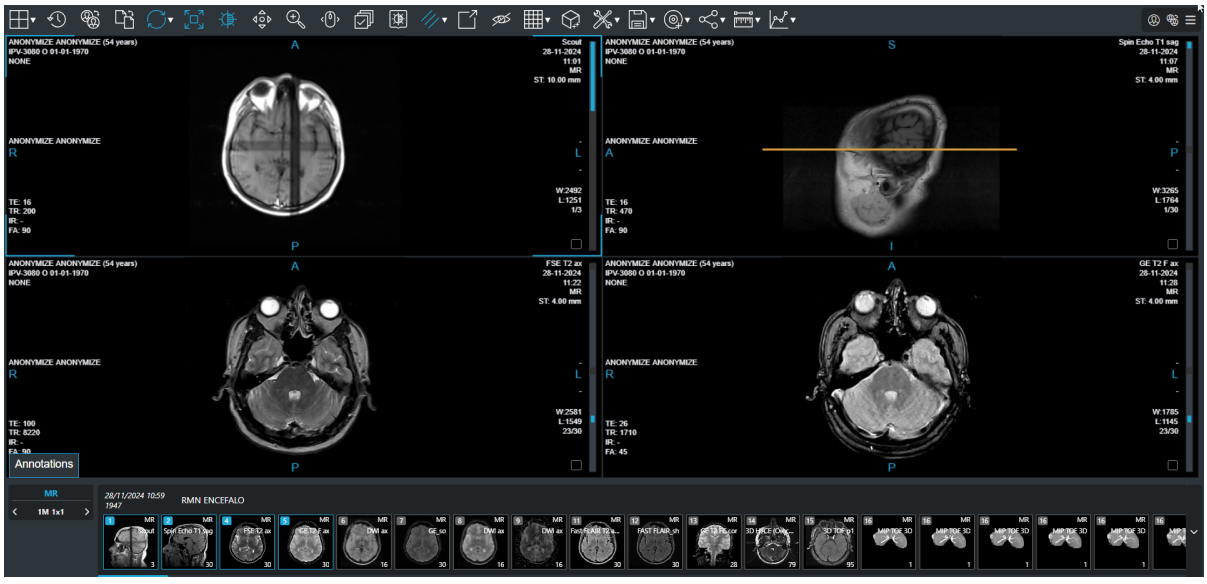


Image 20: Horizonal preview mode

5.1 General Description

The viewer displays an exam (images and metadata) allowing operations such as window level, zoom, pan, scrolling among images of a sequence.

The word “sequence” indicates a group of images. In case of CTs or resonances, a sequence matches the concept of a DICOM series. In case of other types of images, a sequence groups images, which have been identified by the viewer (using protocols), as belonging to a same group. In exams such as traditional radiographies, a sequence is a single image.

When opening an exam, some sequences will be brought in foreground applying rules (“Hanging Protocols”, see paragraph **5.1.2.1 Hanging Protocol navigation component**), others will be left in a side bar “Preview of other sequences”.

The image viewer is made of three main sections:

- Information bar: at the top right (paragraph **5.1.1 Information bar**);
- Toolbar: at the top left (paragraph **7.2 Toolbar**);
- Preview series panel: on the left (paragraph **5.1.2 Preview series panel**).

5.1.1 Information bar

The information bar displays the following icons:

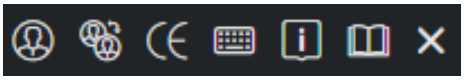


Image 21: Information bar

ICON	NAME	FUNCTIONALITY
	Patient history	Opens the patient’s history and allows for changing the current study. For more information, refer to **6 Patient history**
 /	Change secondary exam	Opens the patient’s history and allows for changing the secondary study. By activating this mode, user can compare the current study with the selected secondary study. The presence of any previous exams is highlighted by a blue box, which displays the number of available exams inside. For more details, refer to **5.4 Primary and secondary studies** and **6 Patient history**

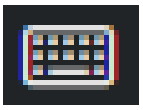
 /	CE/R&D mode	Alert the user whether the system is in diagnostic mode.
	Show keyboard shortcuts	Opens the keyboard shortcuts pop-up. See **18 Key Bindings Summary Table**
	Information	Displays the pop-up with the label, which includes CE marking information and system version. See **2.1 Device Essential Data**).
	Open the user guide directly	Allows the user to open the user guide directly
	Close header panel	Closes the information bar

Table 12: Header

5.1.2 Preview series panel

The "Preview series panel" consists of three sections:

- Hanging Protocol navigation component (paragraph **5.1.2.1 Hanging Protocol navigation component**);
- Information related to the exam (paragraph **5.1.2.2 Exam information**);
- Previews of all the exam sequences (paragraph **5.1.2.3 Sequences preview**).

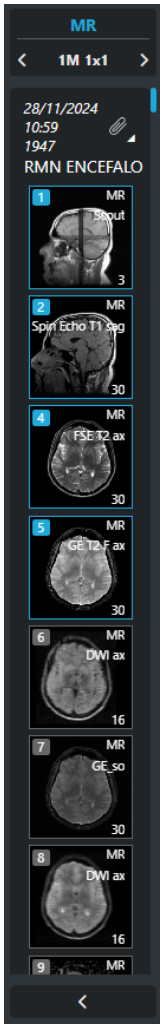


Image 22: Preview of series

5.1.2.1 Hanging Protocol navigation component

The Hanging Protocol (HP) navigation component provides information about the currently displayed HP and allows users to scroll through its various views.

The navigation component includes the following elements:

- HP name (at the top, e.g. '*CR*'),
- Currently displayed view name (at the bottom, e.g. '*1M 2x1*'),
- Navigation arrows < > .

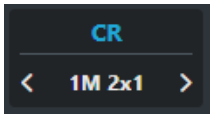


Image 23: HP navigation component

5.1.2.1.1 Changing the Displayed View

To change the currently displayed view, the user can:

- use the navigation arrows to browse through the available views;
- use the keyboard arrows ← →;
- click on the view name and select the desired view from the drop-down menu.

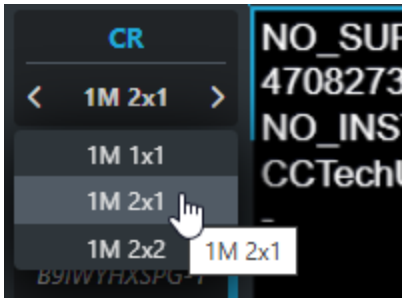


Image 24: View selection from the drop-down menu

5.1.2.1.2 Navigation in Mammography exams

For mammography exams, if a view with **Quadrant Zooming** is available (see paragraph **11.2 Quadrant zoom**), the HP navigation component allows navigation between different quadrants. The view name is updated accordingly to reflect the selected quadrant (e.g. QZ → Q1 → Q2 → Q3 → Q4).

5.1.2.2 Exam information

In the "Exam information" section of the sequence preview, the following are reported:

- Timestamp label (see **5.4 Primary and secondary studies**)
- Date and time of the study
- Accession Number
- Study description
- Any attachments associated with the study:

ICON	NAME
	PDF

	GSPS
	KOS
	Attachment NOTE: this icon is present when multiple attachments are associated with the same study and allows opening the pop-up with all attachments:  *Image 25: Pop-up with the attachments associated with the study*

Table 13: Attachments associated with the study

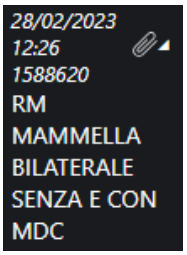


Image 26: Exam information

5.1.2.3 Sequences preview

In the “Sequences preview” all sequences are displayed.

For each sequence, the following information is shown:

- Series number (*top left*) *;
- Modality (*top right*);
- Series description (*center right*) **;
- Number of instances of the sequence (*bottom right*).

Image 27: Sequence preview

Additionally, the sequences currently being displayed in the system ZEEROmed View are highlighted with a light blue border.

* *NOTE 1*: in cases where instances from multiple series are grouped together following the application of a Hanging Protocol, a '+' symbol will be shown.

Image 28: '+' symbol for grouping from different series

** *NOTE 2*: if the study description is too long, it is cut and a tooltip appears by placing the mouse on the preview.

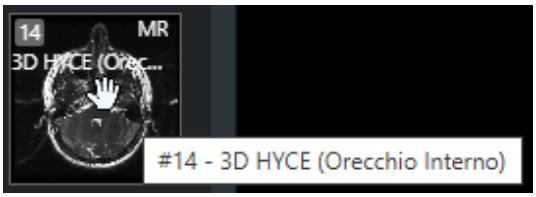


Image 29: Description tooltip

5.1.2.3.1 Sequence visualization from the series preview

A sequence can be brought in the foreground by dragging it over one currently in foreground.

5.2 Select Images

The user can select images through the bottom right triangle, and print the selected images in pdf format or insert them in the report.

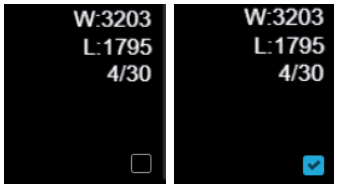


Image 30: Select images

5.3 Foreground sequences

When opening a study, the sequences are displayed in foreground according to the applied HP.

To view another sequence, drag it from the sequence preview .

To change the display grid, use the 'Layout' button (see paragraph **7.1.1 Displaying more images of one sequence**) or apply another HP view (see paragraph **5.1.2.1 Hanging Protocol navigation component**).

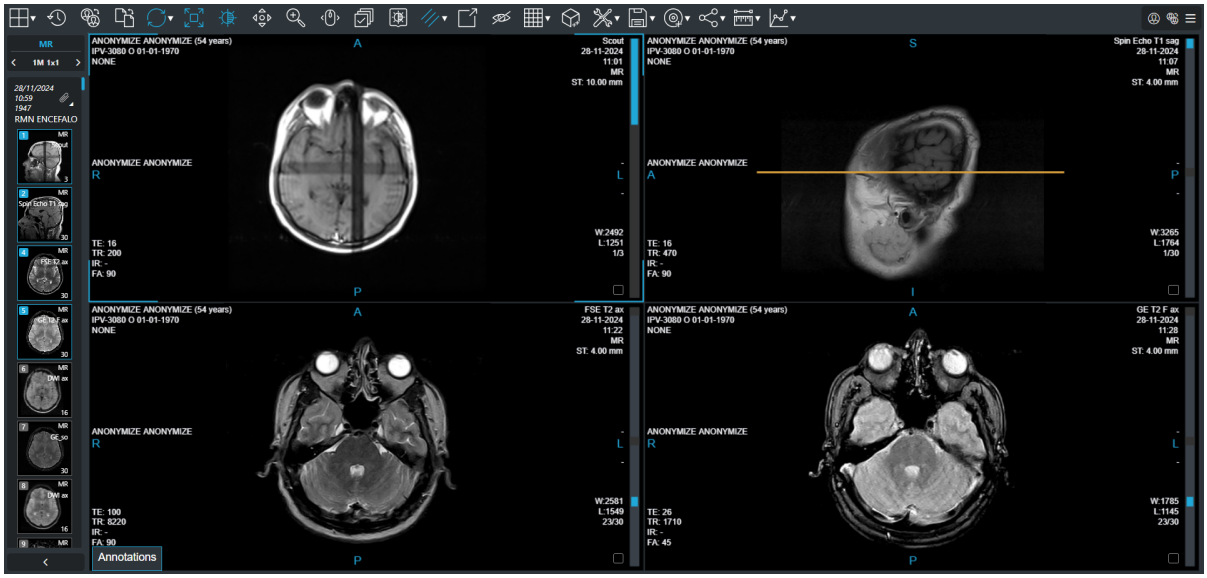


Image 31: Foreground sequences

In a sequence, the user can see the following items:

- The image;
- Patient information;
- Image information;
- The side bar (right), which shows the position of the image currently displayed within a sequence.

The user can choose the position of patient information and image information.

5.4 Primary and secondary studies

Primary or current and secondary studies are available in the preview of the series of the viewer.

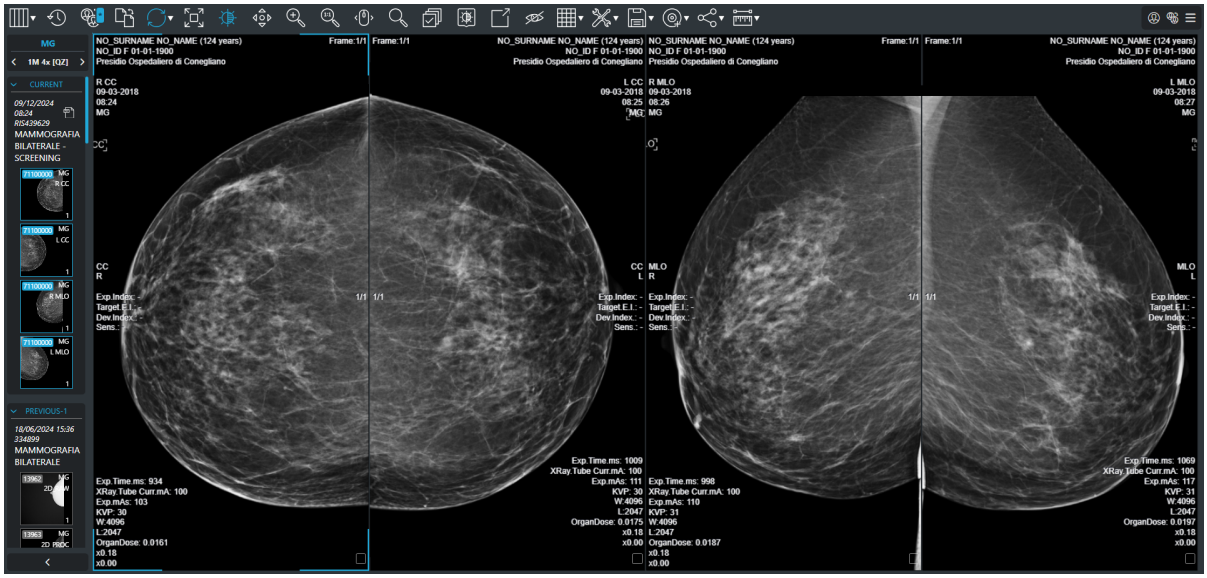


Image 32: Primary and secondary studies in the series preview

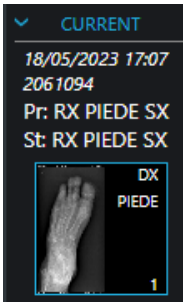
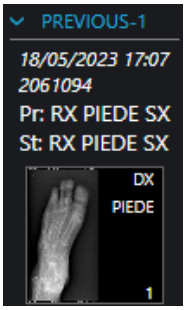
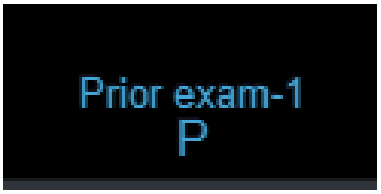
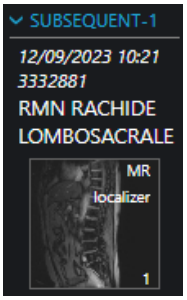
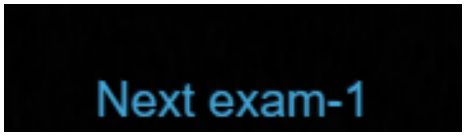
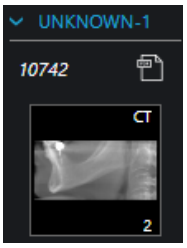
A secondary study is any patient study that can be viewed alongside the current study.

To perform the comparison, the user can:

- Click on the "Change patient history" icon , or
- Modify the display protocols.

Primary and secondary studies are identified in the Sequence Preview through the following "timestamp labels":

TIMESTAMP LABELS	DEFINITION
Current	Current or primary study

	
Previous 	Previous secondary study to the primary one  *Image 33: Previous secondary study*
Subsequent 	Subsequent secondary study to the primary one  *Image 34: Subsequent secondary study*
Unknown 	Secondary study without a date

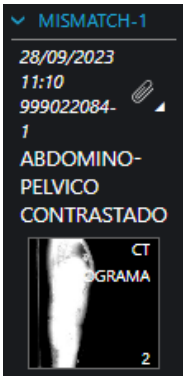
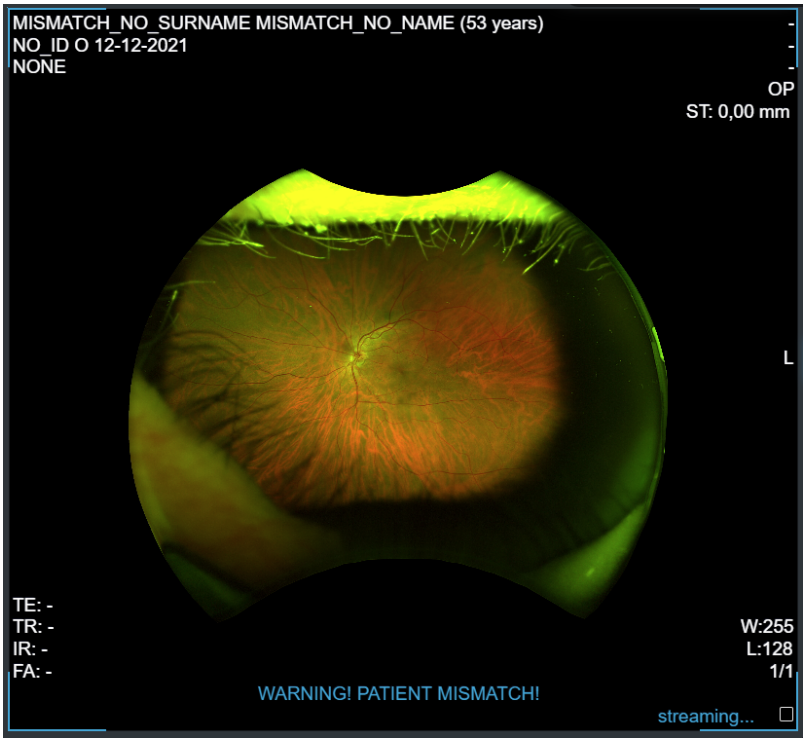
Mismatch 	Secondary study from another patient (same Patient ID but different demographic details):  *Image 35: Alert different patient*

Table 14: Timestamp labels assocaited with primary and secondary studies

5.4.1 Displaying sequences on a dual monitor

When using a dual-monitor setup, sequences displayed on one monitor are highlighted on the other monitor with a dashed blue box, as shown in the image below.

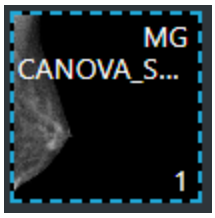


Image 36: Dashed blue box indicating that the sequences are displayed on the other monitor

5.4.2 Comparison with a Previous Study of the Same Patient

Any previous patient exams are highlighted by the "Change secondary exam" icon and the number inside the blue box, which indicates the number of available exams  .

Depending on the number of monitors available and the viewing configurations, the previous study obtained with the same modality can be viewed in the following ways:

MONITOR	AUTOMATIC/MANUAL	HOW TO DO
One	Automatic*	Previous and current exams on the same monitor
	Manual	Smart comparison, see **7.2.1 Smart comparison between two exams**
		Comparison through patient history, see **6 Patient history**
Two	Automatic*	Current exam on main monitor, previous exam on the secondary monitor
		Both previous and current exams on both monitors
	Manual	Comparison through patient history, see **6 Patient history**

Table 15: Comparison with a previous study possibilities

*: according to the viewing protocols.

5.5 Operations on selected sequences

The grid always has a “selected” sequence, identified by a blue border. The following table shows how it is possible to perform basic operations on the selected sequence:

FEATURE	OPERATION	PRE-CONDITIONS
Window level	“Drag” on the image	Active Operation (*): “Window Level”
Pan	“Drag” on the image	Active Operation (*): “Pan”
	“Drag” on the image with middle mouse button (if configured)	

Zoom	“Drag” on the image	Active Operation (*): “Zoom”
	“Drag” on the image with right mouse button (if configured)	
	“Up arrow” and “Down arrow” on keyboard can be configured to perform zoom	
Scroll of images	“Drag” on the image	Active Operation (*): “Scroll”
	“Drag” on the sidebar	
	“Drag” on the image with right mouse button (if configured)	
	Mouse wheel	
	“Up arrow” and “Down arrow” on keyboard can be configured to perform scroll	
	Warning: The use of "Drag" on the image or sidebar in a quick way may not show the intermediate images. To have a punctual scrolling of the images it is advisable to use the mouse wheel or, if properly configured, "Up arrow" and "Down arrow" of the keyboard.	
Selection	Click a different sequence than the currently selected	
	Perform an action on a different sequence than the currently selected	
Context menu	Touch the currently selected sequence	
(*) “Active Operation” is selected through the context menu or the toolbar (see below)		

Table 16: Basic operations

5.6 Diagnostic and non-diagnostic quality images

5.6.1 Diagnostic quality images

By default, ZEEROmed View displays images with high diagnostic quality, allowing the user to report on them.

During series reloading, a blue "streaming" label appears in the bottom-right corner of the screen, indicating that the current image quality is low but will shortly be replaced by the diagnostic-quality series.

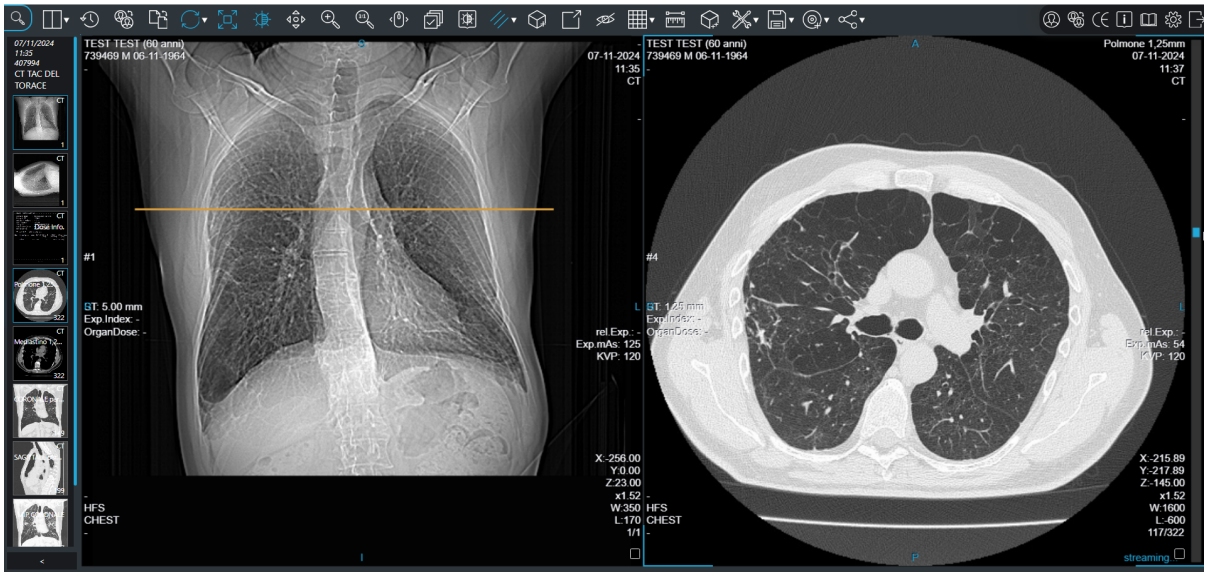


Image 37: Diagnostic quality series and "streaming" label

5.6.2 Non diagnostic quality images

For reducing the bandwidth requirements, ZEEROmed View can be configured to open studies in "low quality" mode.

Non-diagnostic quality images are indicated by the "NOT DIAGNOSTIC" label in the bottom-right corner of the screen.

> ⚠ **Warning**: non-diagnostic quality images are NOT intended for diagnostic use.

To view the series in diagnostic-quality mode, the user can click the "HQ" button HQ located in the top-right corner of the screen. When selected, the button turns blue.

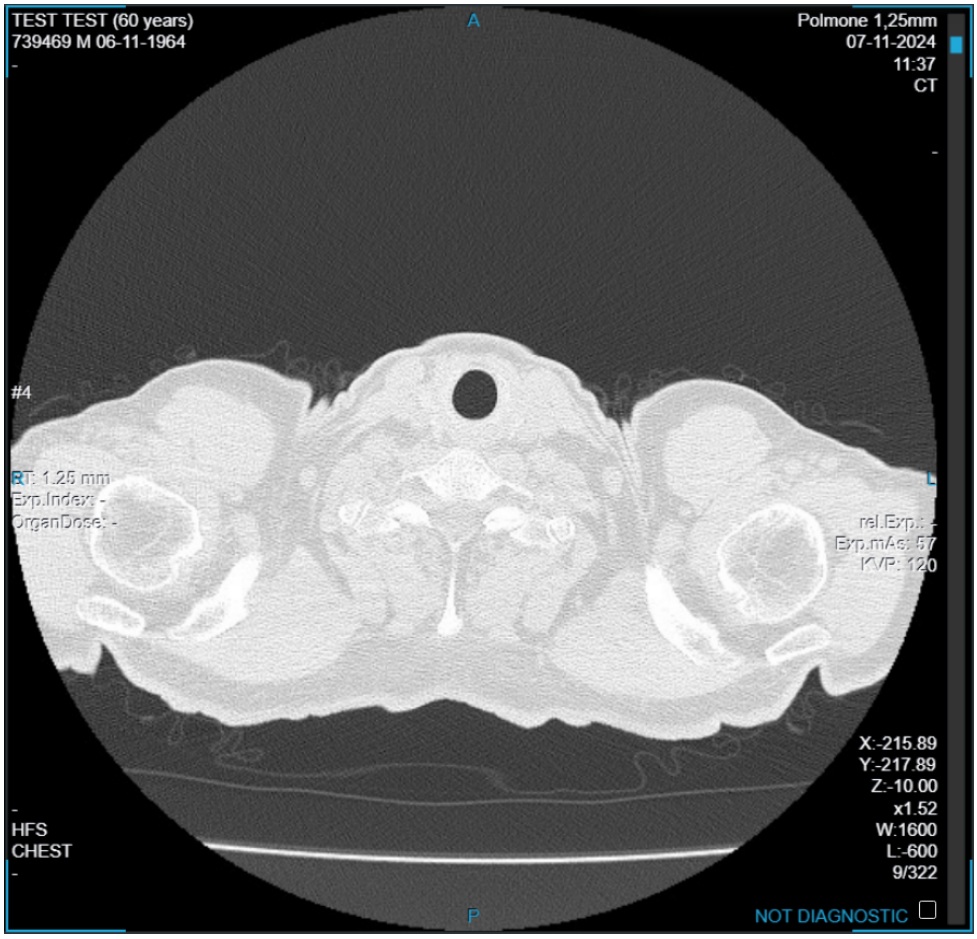


Image 38: "Not diagnostic" label

6 PATIENT HISTORY

ZEEROmed View allows the user to view and compare all of the patients' studies.

6.1 Patient History icon

By clicking the "Patient History" icon  , the user can select and view a study form the "History of patient" pop-up.

The studies can be filtered by node or modality, using the respective drop-down menu.

Displayed studies are highlighted in blue, while other studies appear in gray.

Image 39: "History of patient" for changing the current study

For each study, the pop-up shows information about:

- Modality;
- Study description;
- Date.

A yellow tooltip in the top left warns the user of any demographics mismatch.

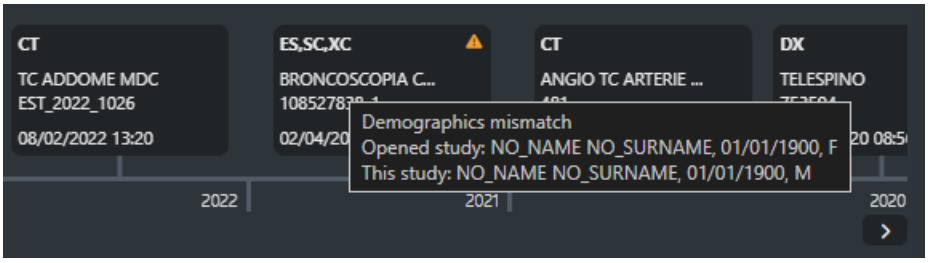


Image 40: "Demographich mismatich" tooltip

6.2 Change secondary study

By clicking the "Change secondary study" icon , the user can open the "History of patient" pop-up and select a secondary study to compare with the current one.

If previous exams are available, this icon will feature a blue box showing the number of prior exams available .

This allows both studies to be viewed simultaneously:

- The primary or current study, which is labeled with the timestamp "Current";
- The secondary study (or studies, depending on the display configuration), which is labeled with one of the following timestamp: previous, subsequent, unknown, mismatch (for more information about secondary studies, refer to the chapter **5.4 Primary and secondary studies**).

The studies can be filtered by node or modality, using the respective drop-down menu.

Displayed studies are highlighted in blue, while other studies appear in gray.

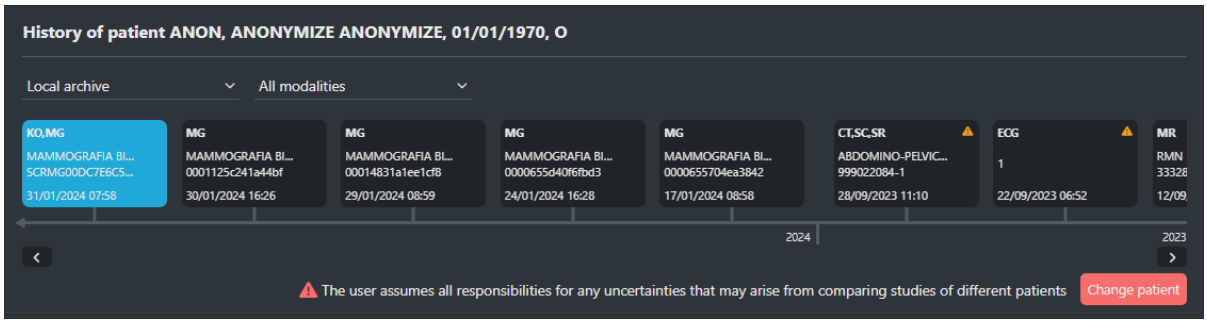


Image 41: "History of patient" pop-up for comparing current and secondary studies

For each study, the pop-up shows information about:

- Modality;
- Study description;
- Date.

A yellow tooltip in the top left warns the user of any demographics mismatch.

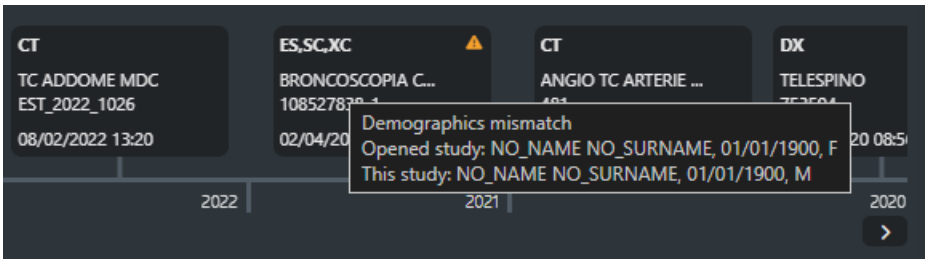


Image 42: "Demographich mismatich" tooltip

Additionally, ZEEROmed View allows the comparison of the current study with one from another patient. To proceed, the user must click on the "Change patient" button, assuming full responsibility for the arising potential risks.

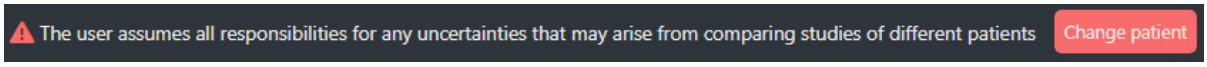


Image 43: "Change patient" button fro comparing studies from different patients

6.2.1 Opening incompatible studies

If the "History of patient" pop-up, accessed through the "Change secondary study" icon, includes ECG or Anatomo pathology (AP o SM) exams, they will be displayed in a new window, if using a single monitor, or in a new tab if using two monitors.

7 GENERAL TOOLS

7.1 Context menu

The following image and table describe the general context menu of the selected sequence:

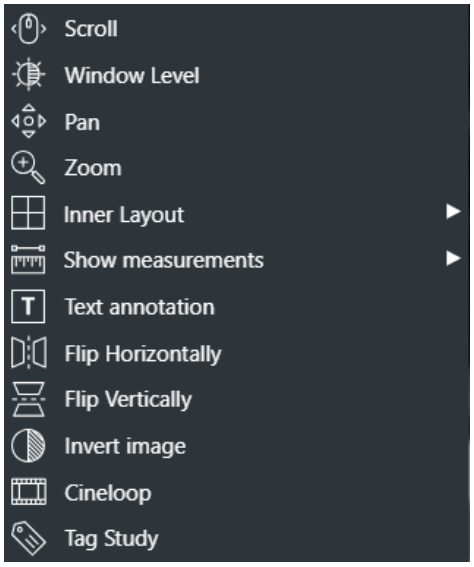


Image 44: Context menu

ICON	FEATURE
Scroll	It allows scrolling the images, as shown in **5.3 Foreground sequences** Mutually exclusive to “Window Level”, “Pan”, “Zoom”. Sets “Scroll” as active operation.
Window level	It allows window level, as shown in **5.3 Foreground sequences** Mutually exclusive to “Scroll”, “Pan”, “Zoom”. Sets “Window Level” as active operation.
Pan	It allows “pan” of the images, as shown in **5.3 Foreground sequences** Mutually exclusive to “Window Level”, “Scroll”, “Zoom”. Sets “Pan” as active operation.
Zoom	It allows “zoom” of the images, as shown in **5.3 Foreground sequences**

	Mutually exclusive to “Window Level”, “Pan”, “Scroll”. Sets “Zoom” as active operation. It could be activated also pressing “**Z**”.
Inner Layout	Displays the “Sequence Layout” menu. It allows changing the number of images displayed at the same time in the selected sequence. See **7.1.1 Displaying more images of one sequence**
Show measurements	Opens the measurements menu, which includes: • 'Measurement Panel' • Calibration tool • Measurement tools such as: ◦ Hounsfield point value ◦ Linear measurement ◦ Circular measurement ◦ Polygon measurement ◦ Freehand measurement ◦ Angle measurement ◦ Angle between lines Further information at **7.3 Measures**
Text annotations	It allows writing an annotation on an image, in relation to a point of interest. See **7.1.2 Text annotation**
Flip Horizontally	It allows the user to flip right/left the selected series
Flip Vertically	It allows the user to flip up/down the selected series
Cineloop	In the case of a multiframe image or of a sequence with an appropriate number of instances, the system allows the user to view them as a cineloop. See **7.1.3 Cineloop** It could be activated also pressing “**P**”.

Table 17: Context menu

7.1.1 Displaying more images of one sequence

Through the “Sequence Layout” context menu you can change the number of images displayed at the same time for one sequence:

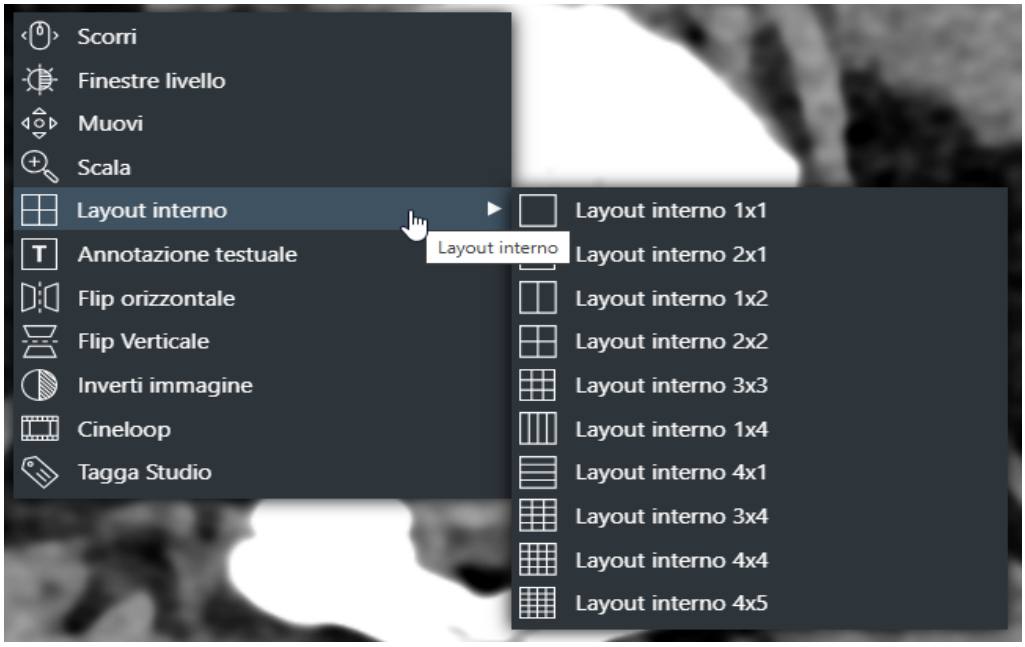


Image 45: Sequence Layout

ICON	FEATURE
1x1	It allows the visualization in 1x1
2x1	It allows the visualization in 2x1
1x2	It allows the visualization in 1x2
2x2	It allows the visualization in 2x2
2x3	It allows the visualization in 2x3
3x2	It allows the visualization in 3x2
3x3	It allows the visualization in 3x3
1x4	It allows the visualization in 1x4
4x1	It allows the visualization in 4x1
4x3	It allows the visualization in 4x3

4x4	It allows the visualization in 4x4
5x4	It allows the visualization in 5x4

Table 18: Inner layout tooltip

The image below shows an exam where two sequences are in foreground, one in 1x2 mode, the other 2x2:

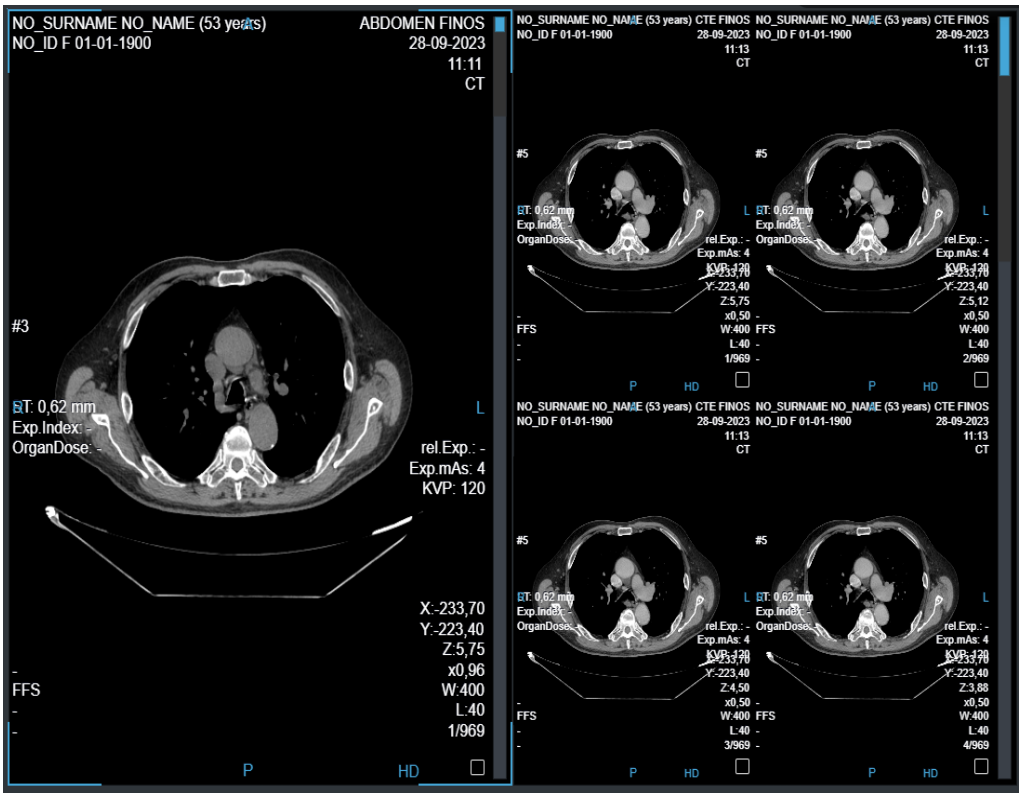


Image 46: Sequence Layout

7.1.2 Text annotation

Through the “Text Annotation”  context menu you can write an annotation on an image, in relation to a point of interest.

Image 47: Annotation in progress

7.1.2.1 Deleting a text annotation

To remove a textual annotation, highlight the annotation with the left mouse button and press the "Canc" key on the keyboard

7.1.2.2 Moving a text annotation

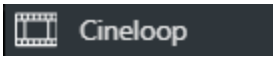
To move a textual annotation, highlight the annotation with the left mouse button and drag it to the point of interest.

7.1.3 Cineloop

ZEEROmed View allows viewing multiframes images or instances in a sequence as a cineloop.

7.1.3.1 Instances cineloop

ZEEROmed View allows viewing sequences with an appropriate number of instances as a cineloop.

To start the cineloop, click on the "Cineloop" button from the context menu 

or the "P" key from the keyboard and wait for the instances to preload. Once completed, cineloop automatically starts.

To disable the cineloop modality, press the "ESC" key from the keyboard.

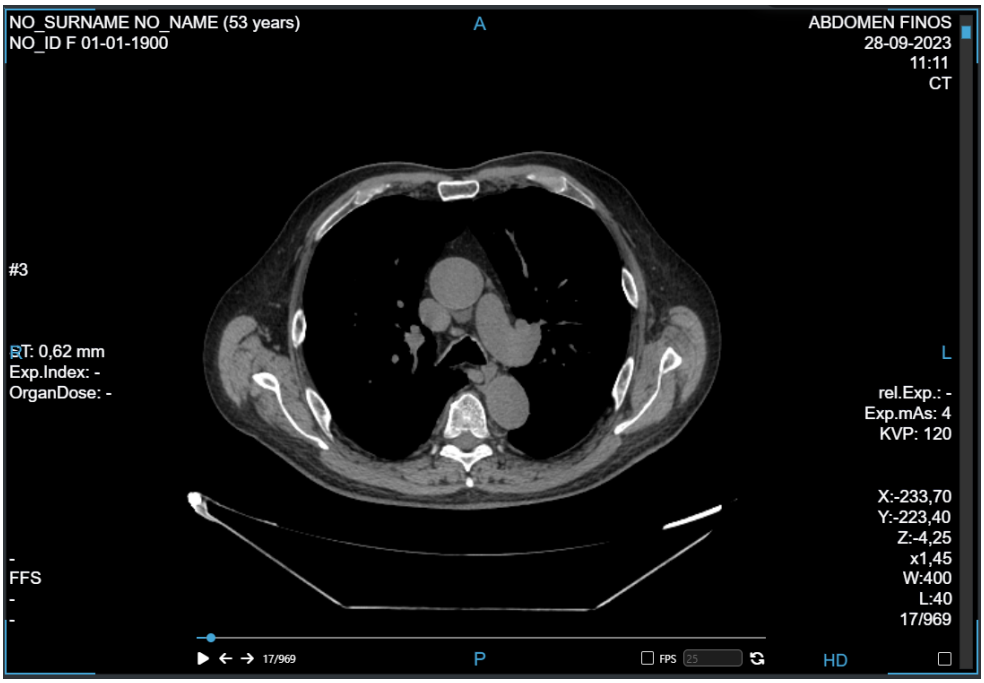


Image 48: Cineloop

The context menu is always available and working during the video.

Toolbar to control the cineloop is displayed at the bottom of the screen. Functionalities are described in the table below.

Image 49: Cineloop toolbar

ICON	FUNCTIONALITY
/	Play and pause the cineloop. This functionality is also available by pressing “P” key on the keyboard.
/	Move the cineloop to the previous or next instance. Note: if the cineloop is playing, clicking on the arrows pauses the cineloop to visualize the chosen instance.
/	Manually course instances: • Drag the mouse pointer on the timeline  • Drag the mouse pointer on the scroll bar 
	Adjust the cineloop frame rate. First, select the "FPS" checkbox and then modify the value in the text box: 
	Replay the cineloop from the beginning
	Replay the cineloop in both directions (from the first to the last and, then, from the last to the first instance)

Table 19: Cineloop icons and functionalities

7.1.3.2 Multiframes cineloop

ZEEROmed View allows viewing multiframe instances as a cineloop.

Cineloop is automatically available for a multiframes instance.

To start the cineloop, click on the "Play" button or insert the "P" key from the keyboard and wait for the instances to preload. Once completed, cineloop automatically starts.

To disable the cineloop modality, press the "ESC" key from the keyboard.

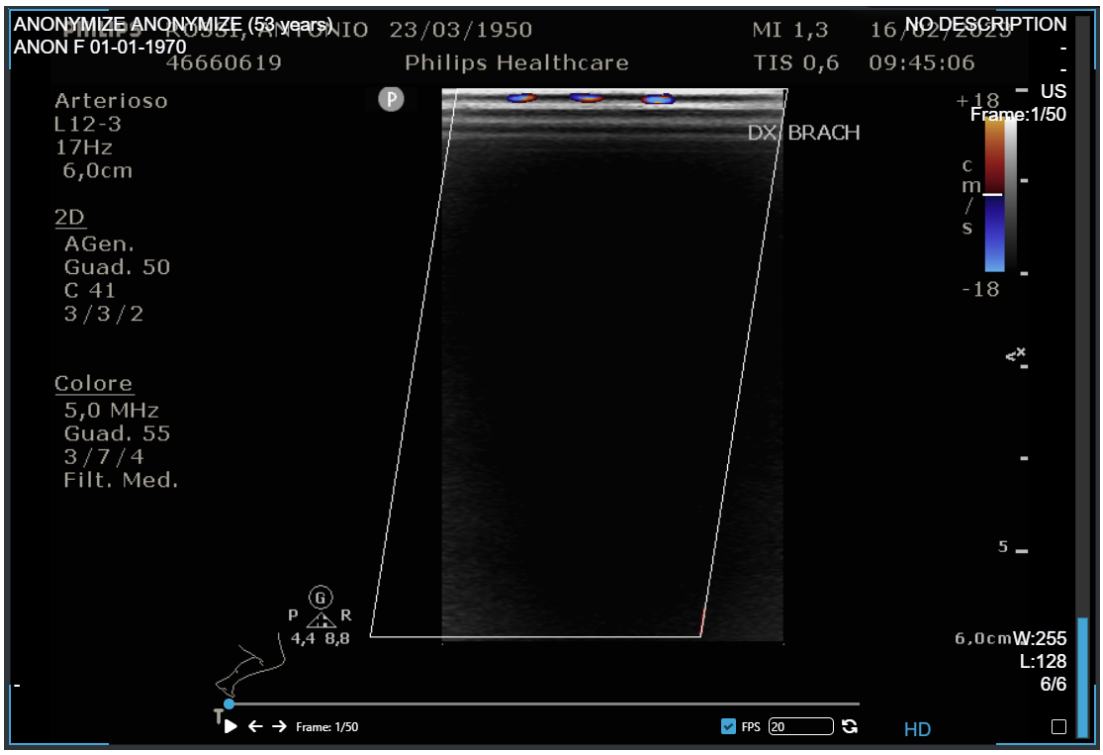


Image 50: Cineloop

The context menu is always available and working during the cineloop.

Toolbar to control the cineloop is displayed at the bottom of the screen. Functionalities are described in the table below.

Image 51: Cineloop toolbar

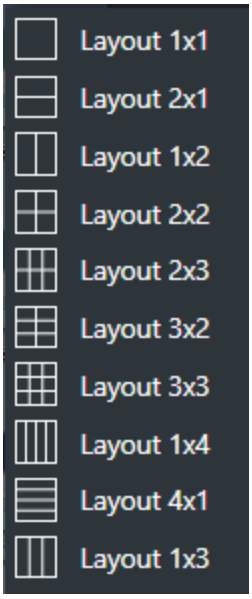
ICON	FUNCTIONALITY
/	Play and pause the cineloop. This functionality is also available by pressing “P” key on the keyboard.

	Move the cineloop to the previous or next frame. Note: if the cineloop is playing, clicking on the arrows pauses it to visualize the chosen frame.
/	Manually course frame by dragging the mouse pointer on the timeline 
	Adjust the cineloop frame rate. First, select the "FPS" checkbox and then modify the value in the text box: 
	Replay the cineloop from the beginning
	Replay the cineloop in both directions (from the first to the last and, then, from the last to the first frame)

Table 20: Cineloop icons and functionalities

7.2 Toolbar

The toolbar exposes the basic operations of the viewer:

ICON	TOOLTIP	FEATURE
	Layout	It allows changing the number of sequences displayed in foreground. Clicking the button shows another set of buttons, from which to choose the desired layout:  For more information see **7.1.1 Displaying more images of one sequence**
	Reset	Resets the exam to its initial visualization state.
	Start smart comparison (not available with two monitors)	It allows the user to open the last previous exam of the same modality, in order to make a comparison. See **7.2.1 Smart comparison between two exams**

	Start comparison (mutually exclusive with the previous, not available with two monitors)	It allows the user to open patient history, in order to make a comparison
	Link Panels	It opens the panel synchronization menu, as shown in **7.2.2 Panel Synchronization**
	Fit to window	It adapts the scale of visualization of the active sequence so that its image fits the containing panel. It could be activated also pressing "**F**".
	Window level	It allows window level, as shown in **5.3 Foreground sequences** Mutually exclusive to "Pan" and "Zoom". Sets "Window Level" as active operation.
	Pan	It allows "pan" the images, as shown in **5.3 Foreground sequences** Mutually exclusive to "Windows Level" and "Zoom". Sets "Pan" as active operation.
	Zoom	It allows "zoom" the images, as shown in **5.5 Operations on selected sequences**Mutually exclusive to "Windows Level" and "Pan". Sets "Zoom" as active operation. It could be activated also pressing "**Z**".
	Zoom x1	It allows "zoom" the imagesat scale 1 with a single click.
	Scroll	It allows scrolling the images, as shown in **5.5 Operations on selected sequences** Mutually exclusive to "Window Level", "Pan", "Zoom". Sets "Scroll" as active operation It could be activated also pressing the right mouse button.
	Next image	Shows the next image(s) of the active sequence. The number of images is the same as the number displayed in the sequence.

	Previous image	Shows the previous image(s) of the active sequence.
	Select/deselect all images	It allows to select/ deselect all images in the study. See **7.2.3 Select/deselect all**
	Window level presets	It allows to choose from a list of default Window Level values through a pop up.
	Secondary Capture	It saves a secondary capture, which is the current visualization of the active image/frame.
	Send current image to RIS	It allows to send the current image to ZEEROmed RIS
	Hide/show label	Allows the user to hide labels in order to see the images better.
	Open external web page	It opens an external web page, which can be set by the system administrator.

	Tools section	It opens the specific tools section. It contains the following tools.

			*Rotate clockwise:* It allows the clockwise rotation of the image. Each click allows to rotate CR and DX by 45°, as sillustrations, MR by 90°
			*Rotate anti-clockwise:* It allows the anti- clockwise rotation of the image. Each click allows to rotate CR and DX by 45°, as sillustrations, MR by 90°
			*Create KOS:* It allows the user to create a KOS with the selected images. See **7.2.4.1 Key Image Note (KIN) or Key Object Selection (KOS)**
			*Create Report:* Allows to write a report, which is attached to the exam. See **7.7.1 Reporting via the "Create Report" Button**
			*View DICOM Tags:* It allows to visualize all DICOM tag of a selected instance.
			*Add tag to study:* Allows the user to add a tag to the study. Each tag can be search in the search interface.
			*Add reference image:* Allows the user to add a reference image

			*Show graphic annotations:* Enables/ disables the visualization of graphic annotation (see **7.5.2 Displaying the graphic annotation present in the SR**). This function can also be toggled by pressing the "**G**" key on the keyboard. If that there are no graphic annotation in the study, the button will be disabled automatically.
	Export section	It opens the saving tools section. It contains the following tools.	
			*Export:* saves the selected sequence in JPG format. It saves the current visualization of the active image.
			*Export (ZIP archive):* Exports a zip archive of key images or videos (see **7.2.5.1 Local export (ZIP archive)**)
			Print selected images: Allows to print selected images. See **7.2.5.2 Print images**
			*Perform DICOM Move of the exam:* Allows to move an exam to a known node. See **7.2.5.3 DICOM move**

	Sharing tools	It opens the sharing tools section. It contains the following tools.	
			*Highlight marker:* It allows to draw on the images with a transparent yellow thicker brush.
			*Remove highlight:* It removes all markers.
			*Share the current exam with someone else:* shares the current session with another user. See **7.2.6 Share Exam**
	CD Tools	It opens the CD tools section. It contains the following tools.	
			*Start CD upload:* it allows to import CD from ZEEROmed Upload (if configured)
			*Download patient CD ISO file:* it allows to download a Patient CD ISO.
			*Burn this study to a disc:* It allows to burn the exam to a CD.
	Show measurements	When selected, it opens the section related to measurements. See **7.3 Measures**	
			*Measurements panel:* Opens the measurement panel
			*Hounsfield point value:* Returns the Hounsfield value of the selected point. Alternatively, it can be activate by pressing the

			"**H**" key
			*Linear measurement:* Allows a linear measurement. Alternatively, it can be activate by pressing the "**R**" key
			*Circular measurement:* Returns the area, mean Hounsfield value and standard deviation of a circular region. Alternatively, it can be activate by pressing the "**O**" key
			*Polygon measurement:* Returns the area, mean Hounsfield value and standard deviation of a polygon region
			*Freehand measurement:* Returns the area, mean Hounsfield value and standard deviation of a region drawn by the user
			*Angle measurement:* Returns the angle in degrees between two lines originating from the same vertex
			*Angle between lines:* Return the angle in degrees between two lines
			*Calibrate:* Allows custom calibration
			*Remove measurements:* Removes existing measurements from the image

Table 21: Toolbar

7.2.1 Smart comparison between two exams

The user can select another exam of the same patient or an exam of a different patient, in order to make a comparison.

ICON	MEANING	FEATURE
	A previous exam match with the same Hanging Protocol	Comparison start with the most recent exam that matches the Hanging Protocol. Selection of other exams in the second session should be possible with the history button. Refer to **6 Patient history**.
	A previous exam does not match the Hanging Protocol	The comparison is possible but with different exams. If pressed the history bar appears. Refer to **6 Patient history**.
	No previous exams	If pressed, comparison with same exam starts. Refer to **6 Patient history**.

Table 22: Exam comparison

7.2.2 Panel Synchronization

By clicking on the "Link Panels" icon  , the user can activate the synchronization of the displayed sequences or studies. Clicking the button opens the following menu:

ICON	NAME	FUNCTIONALITY
	Unlink Panels	Removes synchronization between panels
	Link Panels except Window Level	Synchronizes zoom, pan and scroll performed between the displayed sequence. Window Level will not be synchronized.
	Link Panels	Synchronizes zoom, pan, window level and scroll operations between the displayed sequences. **NOTE**: if applied while comparing different studies, it does not allow scroll synchronization. To activate it, use the "Link panels with different studies".

	Link panels with different studies	Synchronizes zoom, pan, window level and scroll operations on sequences sharing the same reference axis and belonging to different studies. **NOTE 1**: this button is only available when comparing exams or in multi-monitor modality. **NOTE 2**: unlike the "Link Panels" button, it allows to synchronize the scrolling of sequences belonging to different studies. For more information, please refer to section **7.2.2.1 Panel synchronization: comparing different studies**

Table 23: Panel synchronization

7.2.2.1 Panel synchronization: comparing different studies

The "Link panels with different studies" icon  enables the scroll synchronization (along with all other operations) for different coplanar studies (i.e. acquired along the same reference axis).

This feature is available when comparing two exams (section **7.2.1 Smart comparison between two exams**) or in multi-monitor mode.

To activate it:

1. Select the instances of the two different studies to compare;
2. Click the "Link panels with different studies" icon  .

If the synchronization is applicable, any positioning offset between the instances selected in step 1 will be maintained while scrolling through the sequences.

⚠ **Nota**: in a multi-monitor configuration, the studies to be compared and synchronized must be placed on the two different monitors

7.2.3 Select/deselect all

The “Select/deselect” all button allows the user to select all objects in the study (video and images) which are selectable from the viewer.

The objects out of viewer (i.e. PDFs, other reports, KO) will not be selected.

ICON	FEATURE
	It allows to select all images. Some images can be manually selected.

	It allows to deselect all images. All images have been selected.

Table 24: Selection / deselection

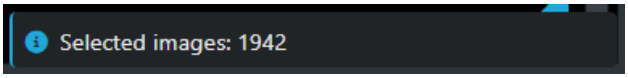


Image 52: Selected images alert

7.2.4 Tools section

7.2.4.1 Key Image Note (KIN) or Key Object Selection (KOS)

The user can create a new Key Object Selection / Key Image Note and view those created previously. KIN creation happens through the Create Key Object button on the toolbar  .

The user can choose the category of the KIN, insert a custom text and decide whether to automatically deselect the selected images once created the KIN.

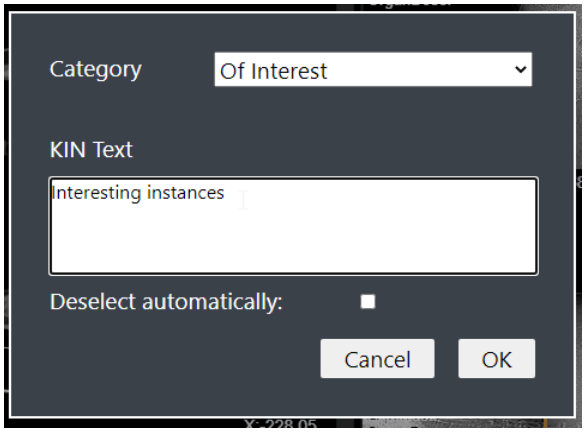


Image 53: KOS creation

NOTE: pressing Enter does not move to a new line, but creates the KOS.

The categories in which the user can choose are shown in the following illustration:

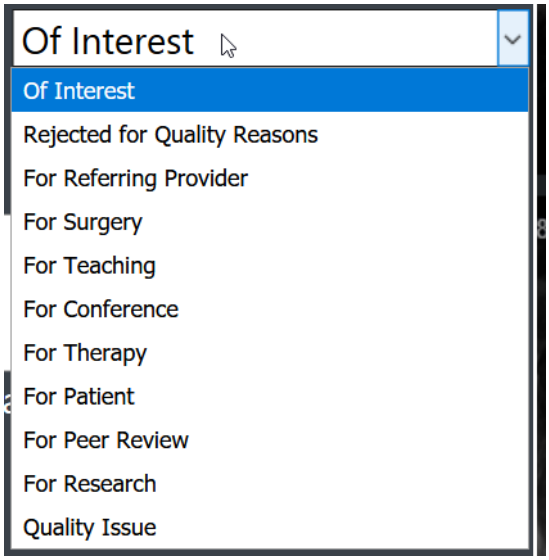


Image 54: Categories for KOS creation

Once the user has created the KIN, ZEEROmed View notifies the correct creation.

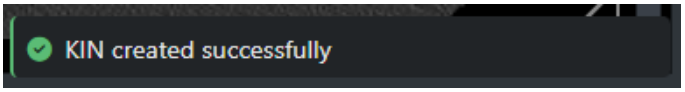


Image 55: KIN created successfully message

7.2.4.1.1 Viewing Key Image Note (KIN) or Key Object Selection (KOS)

If a Key Image Notes has been attached to images, the user can see them in the "Preview of series" by clicking on the"KOS" icon .
In the event that multiple attachments are associated with the same study, it is necessary to first select the "Attachment" icon and then the "KOS" icon .

Image 56: Key Image Note icons

7.2.5 Export section

7.2.5.1 Local export (ZIP archive)

The user can download images, single frames or videos which have been selected, through the Export ZIP archive. It has to choose in which format export and if export the whole exam or only the

selected images.

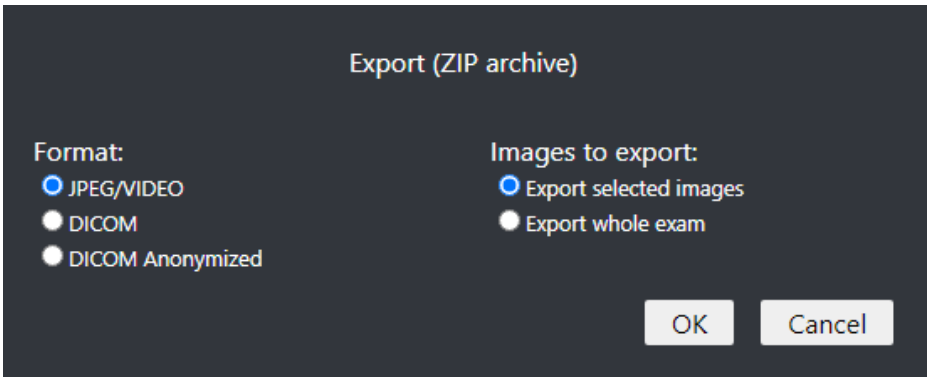


Image 57: Local export (ZIP archive)

The file extension, if the DICOM format is chosen, will be .dcm

A blue notification at the bottom right highlights the export progress status.

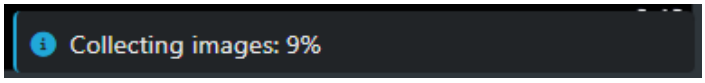


Image 58: Export status notification

7.2.5.2 Print images

The selected images/frames can be printed both in pdf format and using the DICOM protocol.

The print button opens a window which allows the user to choose the print size: number of images in one page, whether add the header and image labels and the possibility of a DICOM print.

Selecting the desired images layout, the images are printed.

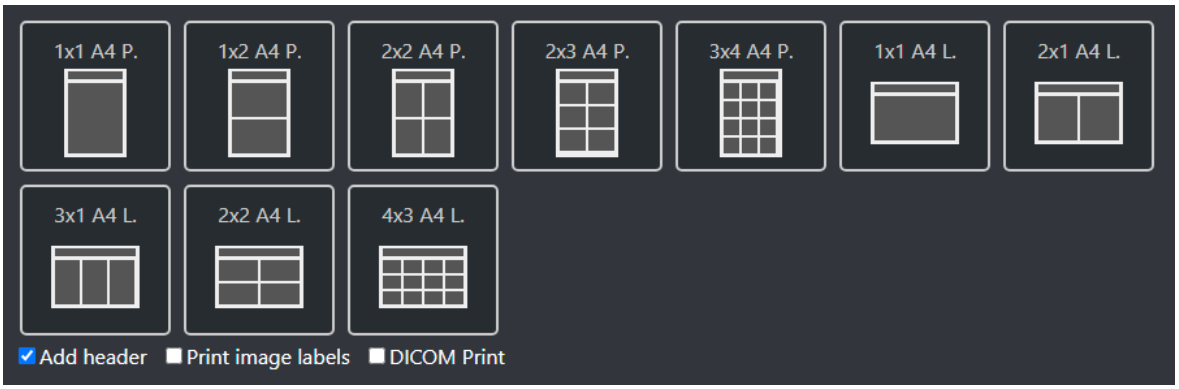


Image 59: Print images

ZEEROmed View allows the user to specify layout of page, size of sheet and images per page.

Selecting the DICOM Print checkbox, the user can select the following layouts:

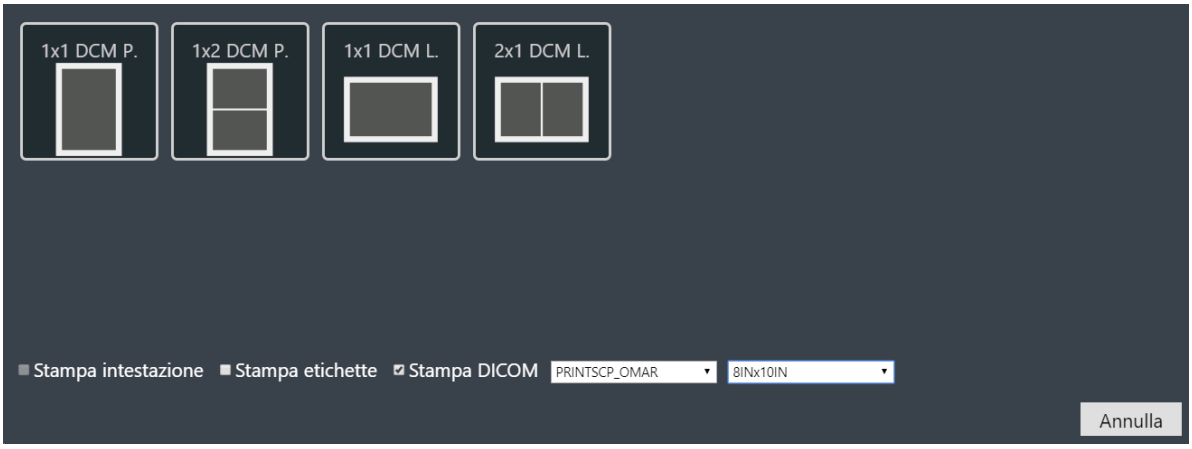


Image 60: DICOM print

> ⚠ **Warning**: printing from the product is not for diagnostic purpose

7.2.5.3 DICOM move

It allows moving the whole study or one series or the selected images (DICOM move) to a DICOM node which the user can select in a list.

The DICOM move button opens a popup in which you can select a known node and send to it the examination / the series / the selected images. The user can search between nodes or filter them by type.

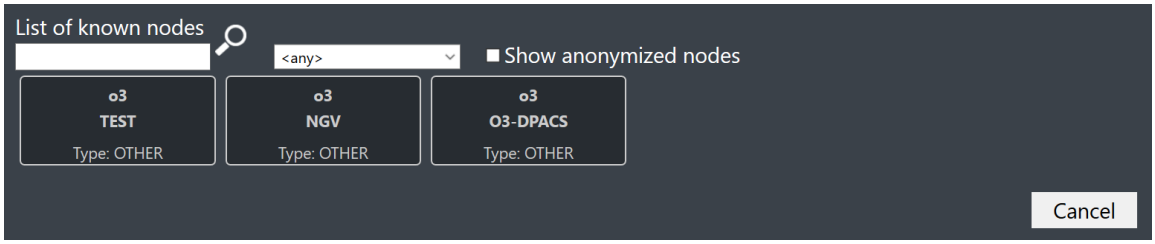


Image 61: Move the whole study to a DICOM node

If the user wants to move one series, he/she has to choose the interested one, as in the following illustration.

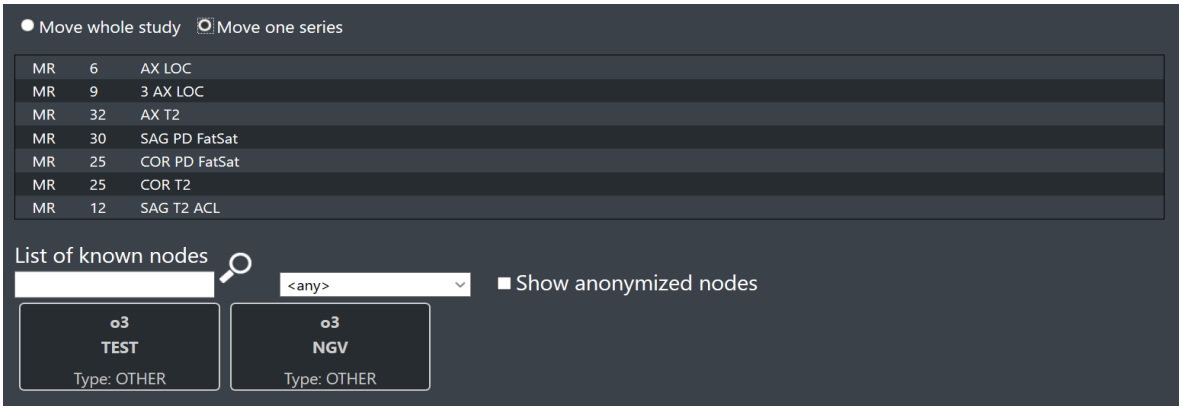


Image 62: Move one series to a DICOM node: choose the series

The user can choose to move the exam/series/selected images to an anonymized node simply by setting the checkbox, as in the following illustration.

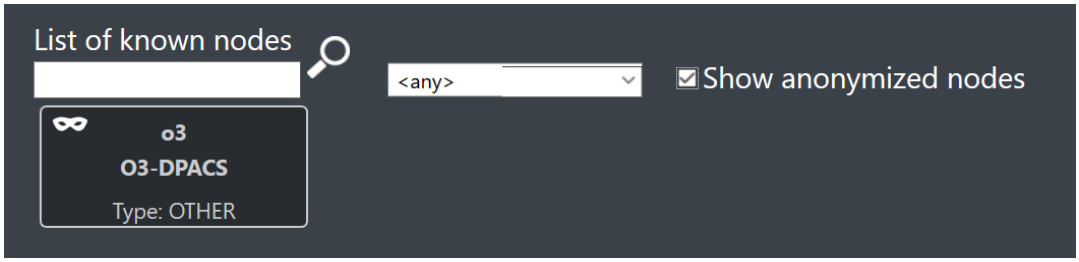
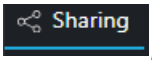


Image 63: Move the whole study to an anonymized node

7.2.6 Share Exam

By selecting the "Share exam" button  , the user can start sharing the session (**7.2.6.1 Sharing**) or allow selected users to view the exam for a limited period of time (**7.2.6.2 Second Opinion**).

7.2.6.1 Sharing

By selecting the icon 

, the user can share the session with desired users.

To share the session, the user can:

- Select "*Link*," copy the URL in the "*Sharing URL*" section by using the icon "*Copy to clipboard*", and share it with users;
- Select "*Email*" and fill in the required fields to send an email with the session link:

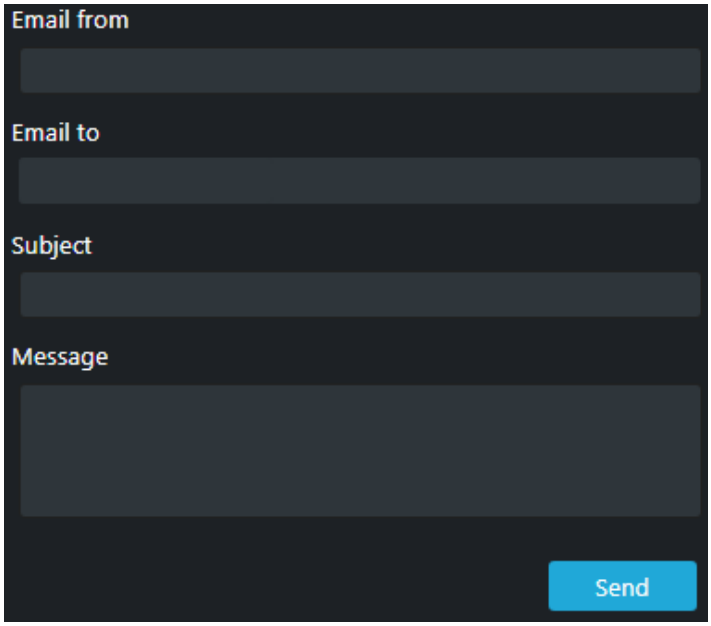


Image 64: Panel to send the session link

- Display and share the "QR Code";
- Select "WhatsApp" to view the QR code and share the link via WhatsApp.

At this point, the user can start the session by clicking the blue icon "Start session".

To end the session, the main user must select the yellow icon "Close session".

If the main user ends the session, all other users are excluded from it.

7.2.6.1.1 Session sharing options

In the sharing panel, the main user can enable or disable the interaction of other users and allow the display of patient data. The sharing options in the panel are as follows:

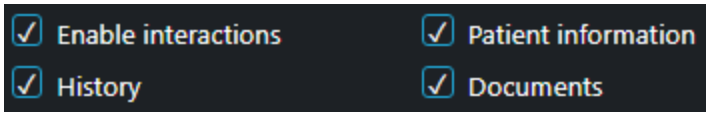


Image 65: Sharing options

7.2.6.1.2 Session sharing messages

During the session sharing, he user can send vocal and text messages, as shown in the following table.

ICON	FEATURE

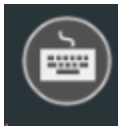
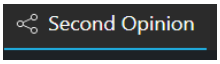
	It allows to play the vocal messages
	It allows to record vocal messages
	It allows to send textual messages

Table 25: Sharing messages icons

7.2.6.2 Second Opinion

The user can **temporarily** share the exam by selecting the icon 

and manually entering the contact's email address. The displayed screen is as follows:

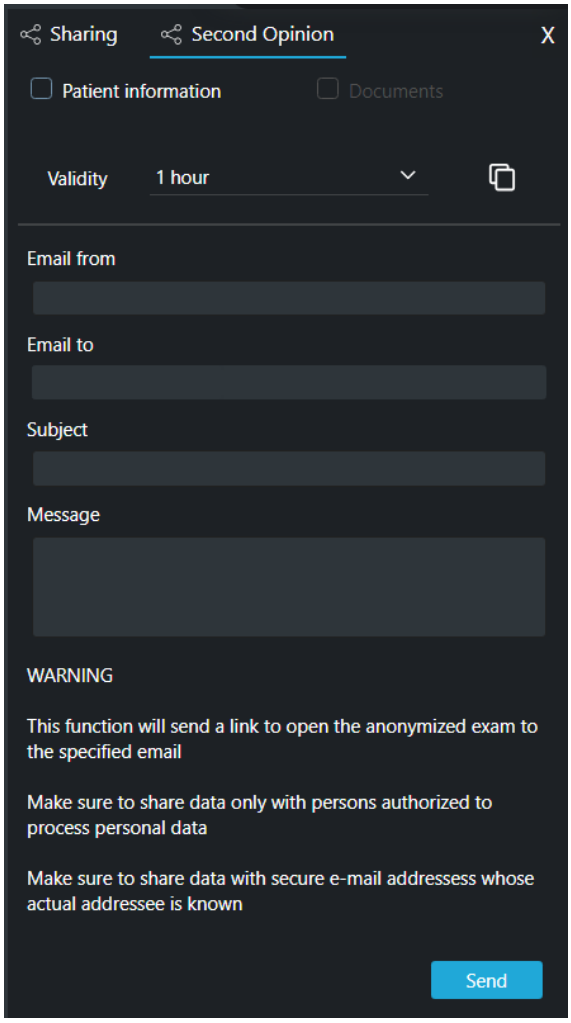


Image 66: Second opinion

⚠ **Read the disclaimer**: share the exam only with authorized data processing subjects and secure email addresses

7.3 Measures

Measures in ZEEROmed View conform to the document “DICOM correction Item CP-586 Pixel spacing and calibration in projection radiography”.

If images are created by non-calibrated modalities (CR, DR, XA, MG and DX), the user is notified through an appropriate message, which appears in the status bar of the application:

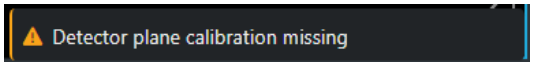


Image 67: Alert "calibration missing"

If measures are imprecise beyond a configurable error threshold (default=0%), the error will be shown near the measured value:

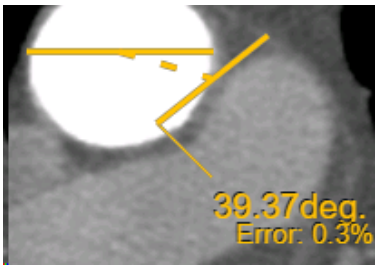


Image 68: Measures

By clicking the 'Show measurements' button  in the toolbar, the user can:

- Perform a new measurement;
- Edit an existing measurement;
- View saved measurement values and optionally modify their properties (such as color, thickness or label);
- Remove existing measurements.

7.3.1 Performing a measurement

To perform a measurement, click the 'Show Measurements' button  in the toolbar and select the desired measurement tool from the dropdown menu.

MEASUREMENT TOOL	ICON	PROCEDURE
Hounsfield point value		Click on the point of interest Alternatively, it can be activate by pressing the "**H**" key
Linear measurement		Hold down the left mouse button from the start to the end of the measurement. Alternatively, it can be activate by pressing the "**R**" key
Circular measurement		Click on a vertex of the area to be measured and drag the mouse diagonally to cover the region of interest. Alternatively, it can be activate by pressing the "**O**" key

Polygon measurement		Click on the first vertex of the area to be measured and trace the shape by holding the left mouse button and releasing it at each vertex. The last vertex must coincide with the first to complete the polygon.
Freehand measurement		Trace the shape by holding the left mouse button. The last vertex must coincide with the first to complete the polygon.
Angle measurement		Click on the vertex of the angle to be measured and draw the two lines (see '***Linear Measurement***')
Angle between lines		Draw the two lines of interest (see '***Linear Measuremen***') to calculate the angle **NOTE**: in this case, the lines are not required to intersect and the starting point of the second line is not constrained.

Table 26: Measurement Tools Settings

To interrupt the measuring operations, press the **Esc** key.

To modify properties such as color and thickness of the measurement *to be inserted*, refer to section **7.3.2.5 Modifying Measurement Style**.

By default, measurements are deleted upon closing the study. To save measurements, refer to section **7.3.3 Saving a Measurement**.

7.3.2 Operations on measurements

OPERATION	PROCEDURE
7.3.2.1 Selection	Click on the measurement or its numerical label. The measurement's vertices (except for the '*Hounsfield Point Value*') will be highlighted, and the numerical label will be temporarily hidden.

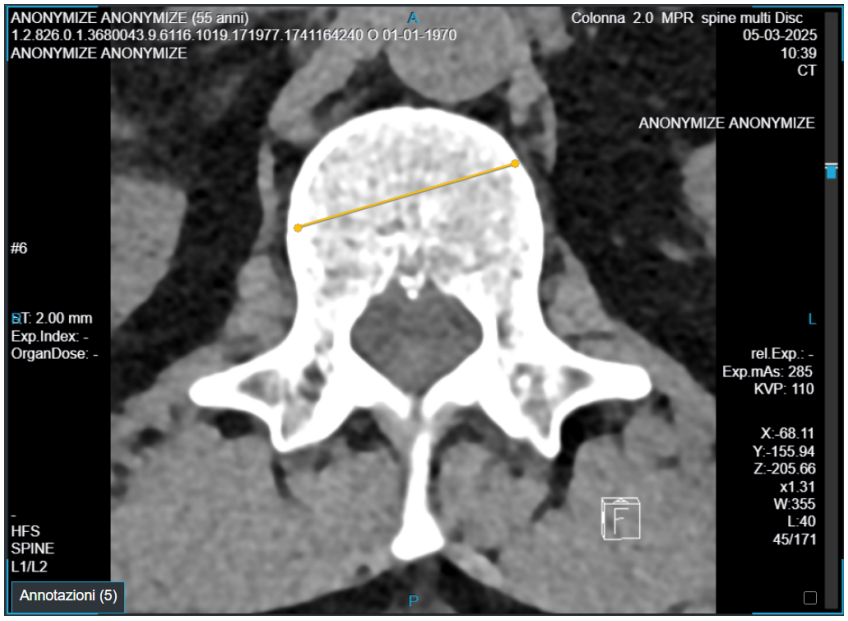


Image 69: Measurement selection

7.3.2.2 Moving a measurement

Select the measurement and drag it while holding down the left mouse button.

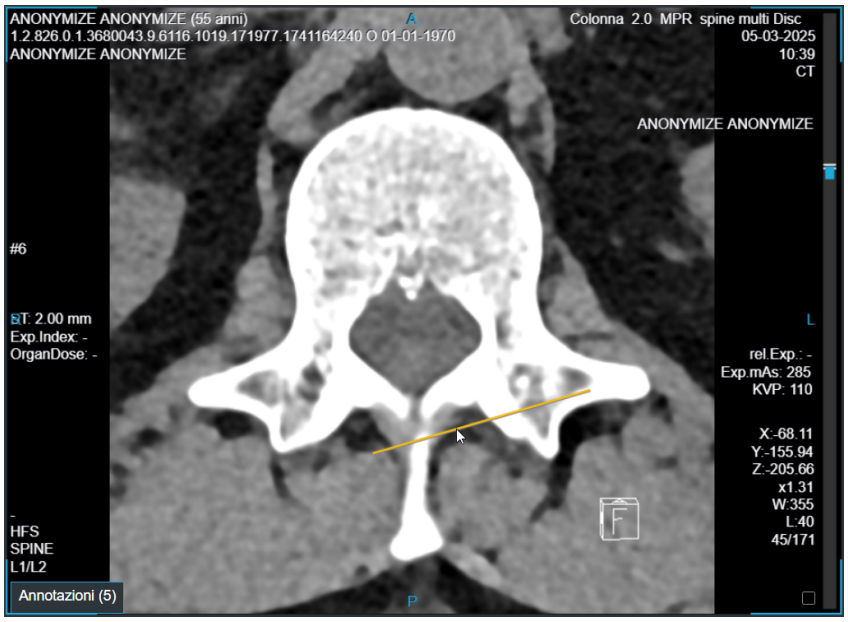


Image 70: Moving a measurement

NOTE: a measurement cannot be dragged outside the image area; if

this occurs, the measurement is highlighted in red.

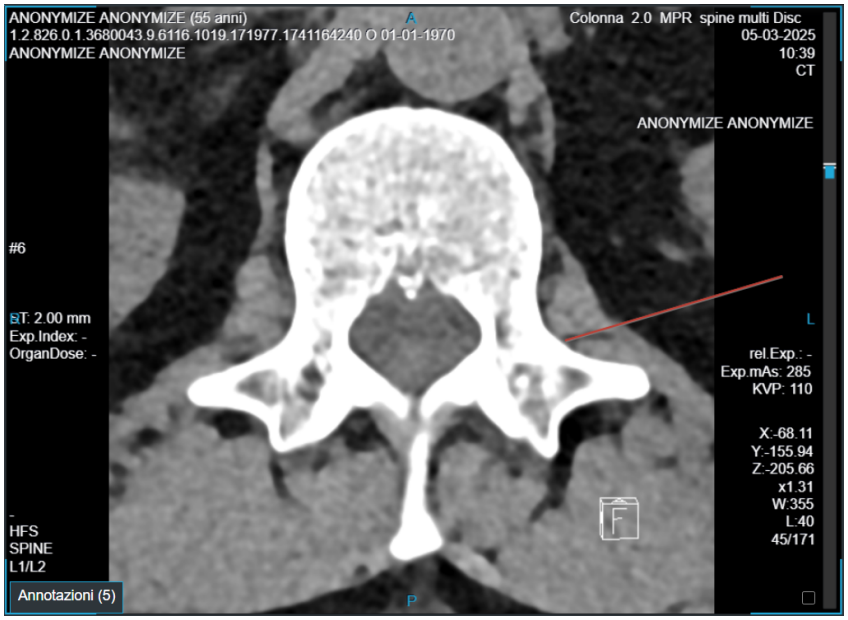


Image 71: Moving a measurement outside the image area

7.3.2.3 Moving the label

Select the measurement and drag its numerical label to reposition it

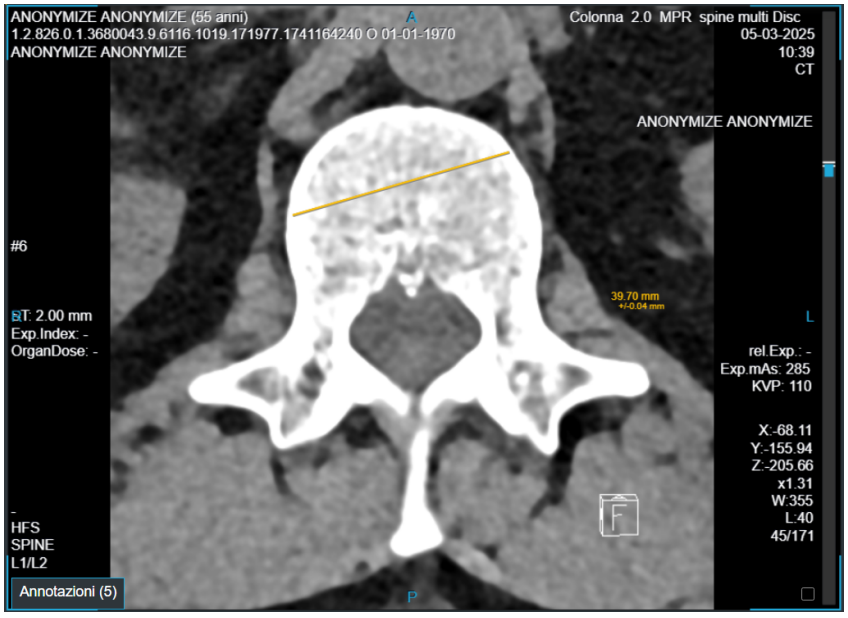


Image 72: Moving the label

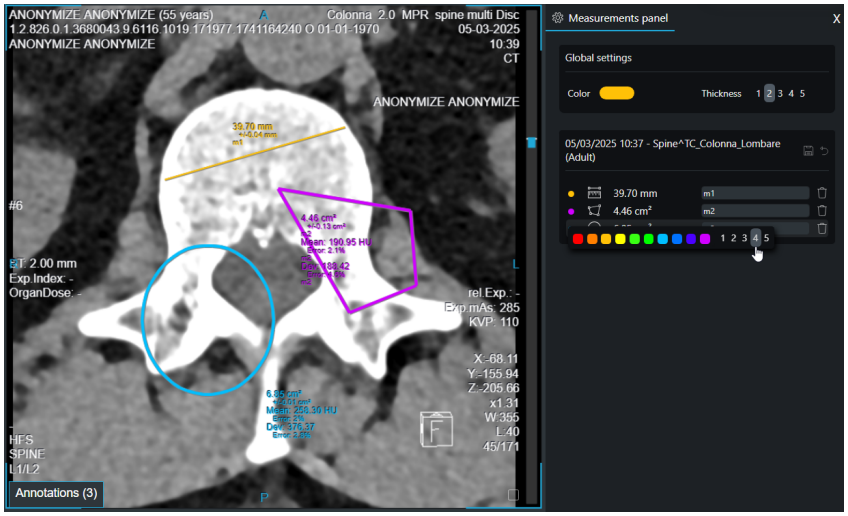
7.3.2.4 Editing a measurement	Select the measurement and move its vertices to change its shape
7.3.2.5 Modifying Measurement Style	1. Open the 'Measurements panel' by clicking the corresponding button  ; 2. Click on the colored dot next to the measurement to be modified; 3. Select the desired color and thickness (1-5) from the dropdown menu.  *Image 73: Modifying Measurement Style*

Table 27: Operations on measurements

7.3.3 Saving a Measurement

> ⚠ **Warning**: by default, any measurements added are deleted when the study is closed

To save a measurement:

1. Open the 'Measurement Panel' using the dedicated button  ;
2. Assign a name to the measurement in the appropriate field;
3. Click the 'Save measurements' 

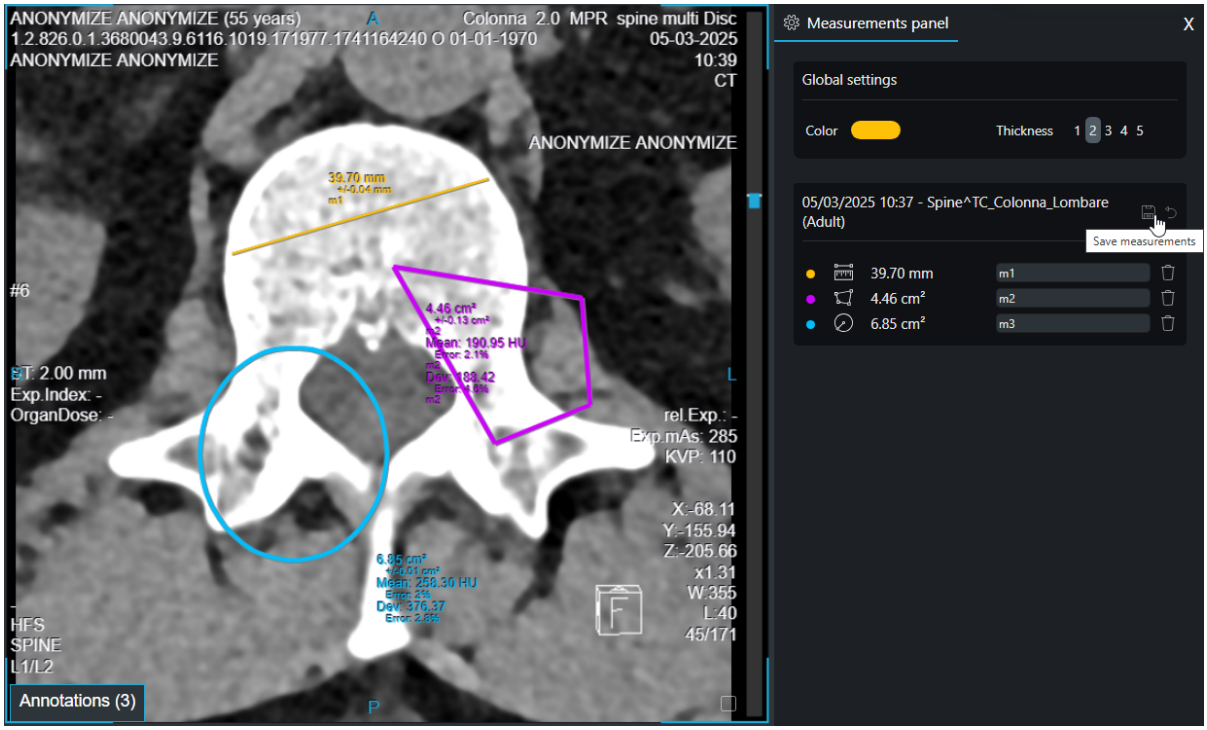


Image 74: Saving a measurement

Clicking the 'Rollback measurements to the last save point' icon will delete the current unsaved measurement.

7.3.4 Viewing Measurements

To view saved or inserted measurements, open the 'Measurements Panel' using the dedicated button

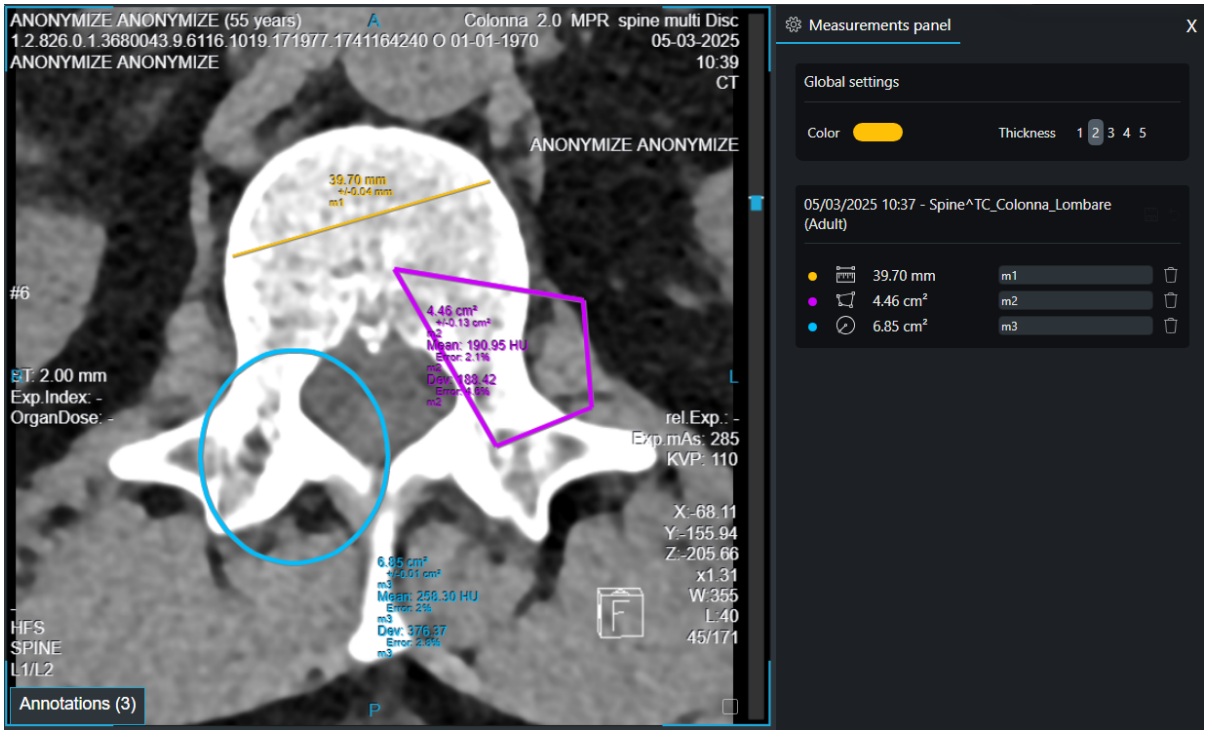


Image 75: Measurements Panel

Clicking on the relevant measurement, ZEEROmed Viewwill bring the user to the image or instance where it was placed.

In this panel, it's also possible to change the measurement's color or thickness, as described in section **7.3.2.5 Modifying Measurement Style**.

7.3.4.1 Viewing a Measurement in a Series Instance

If the measurement was placed in an instance within a series, a marker on the series scrollbar will indicate the relevant instance.

Clicking the marker will return the user to the instance where the measurement was performed.

The marker remains visible until the study is closed or, if the measurement was saved, until it is deleted.

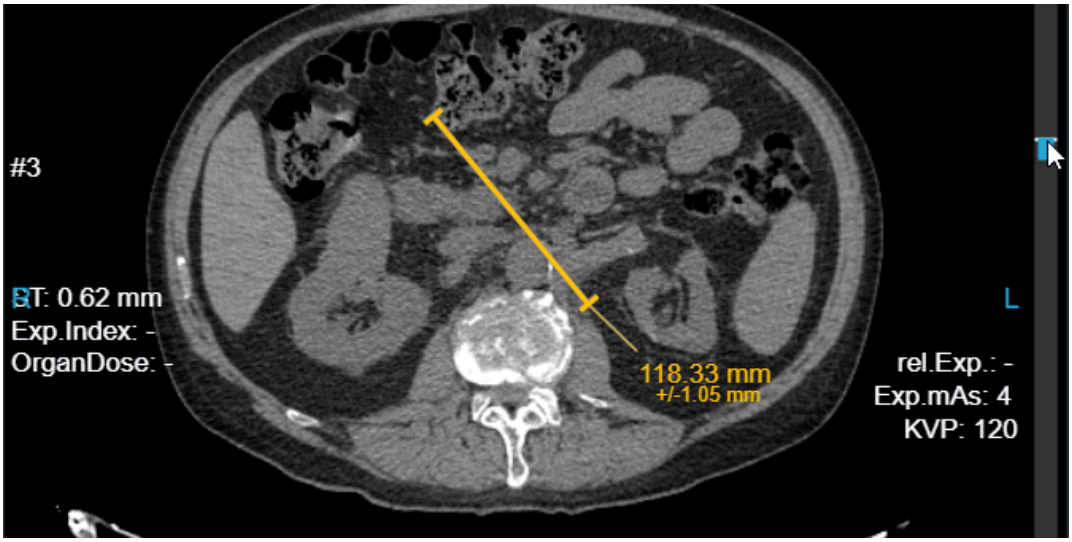


Image 76: Notch in the scrollbar to highlight a measure in an instance

7.3.5 Deleting a measurement

NOTE: unsaved measurements are automatically deleted when the study is closed.

A measurement can be deleted via:

- the Measurement Panel (see **7.3.5.1 Deleting a Measurement from the Measurements Panel**);
- the '**Canc**' key on the keyboard;
- the 'Remove measurements' button

> ⚠ **Warning**: clicking the 'Remove Measurements' button will delete all measurements in the current image or instance

7.3.5.1 Deleting a Measurement from the Measurements Panel

To delete a measurement from the panel:

1. Open the 'Measurements Panel'using the dedicated button ;
2. Click the 'Delete Measurement' icon next to the measurement to be removed.

7.4 Advanced Annotation Management

Annotation Dashboard is visible only if enabled, in this case when a user perform a measure he/she can save it.

When opening a study, the number of annotations present is visible on the Annotation Dashboard label - also if minimized.

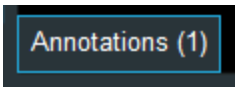


Image 77: Annotation panel minimized

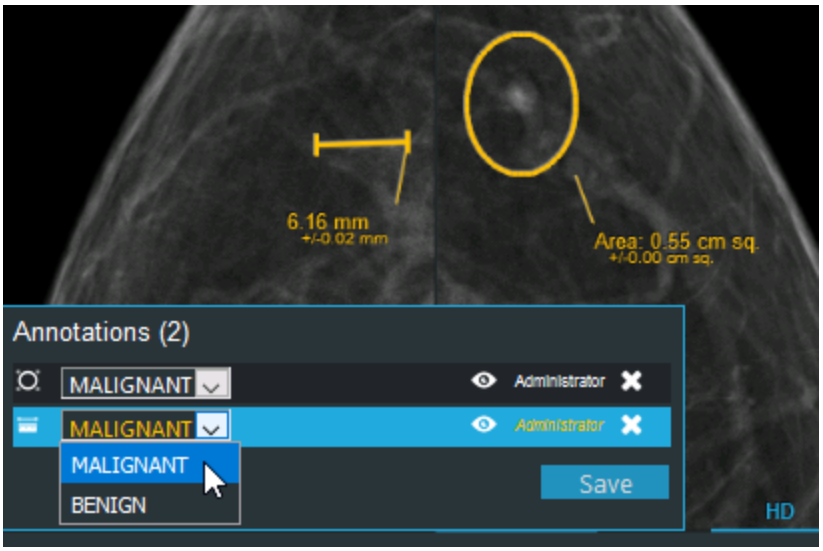
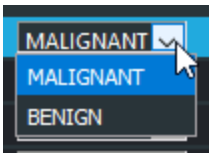


Image 78: Annotations panel

Each annotation panel contains the following parts:

ICON	DESCRIPTION
	The first colum represents the type of the annotation (measurement)
	The user can choose if Benign or Malignant

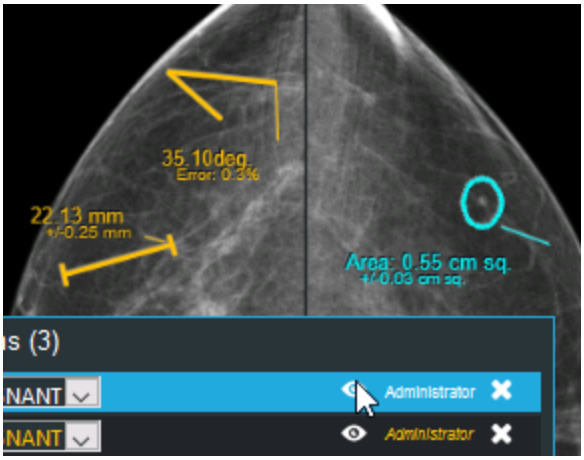
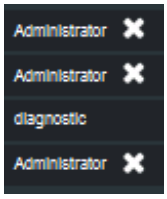
	The eye icon allows the user to show the selected annotation
	Each user can see all annotations, but he/she can edit or delete only him/hers annotations
	It allows the user to save the annotation(s)
	The annotation panel contains the annotation of all the opened studies (even if previous ones). They are placed after the annotation of the main study, and they cannot be saved or deleted

Table 28: Annotation icons

7.5 DICOM Structured Report

ZEEROmed View encompasses support for DICOM Structured Report (SR) files, including any graphical annotations embedded within.

SR files are a specialized format within the DICOM standard, specifically tailored for the comprehensive exchange of clinical data and observations.

Specifically, ZEEROmed View supports the visualization of the following:

1. SR content;
2. Graphical annotations embedded within the SR.

7.5.1 Displaying the content of an SR

To access a DICOM SR within a study, left-click on the SR file instance, as can be seen in the image below.

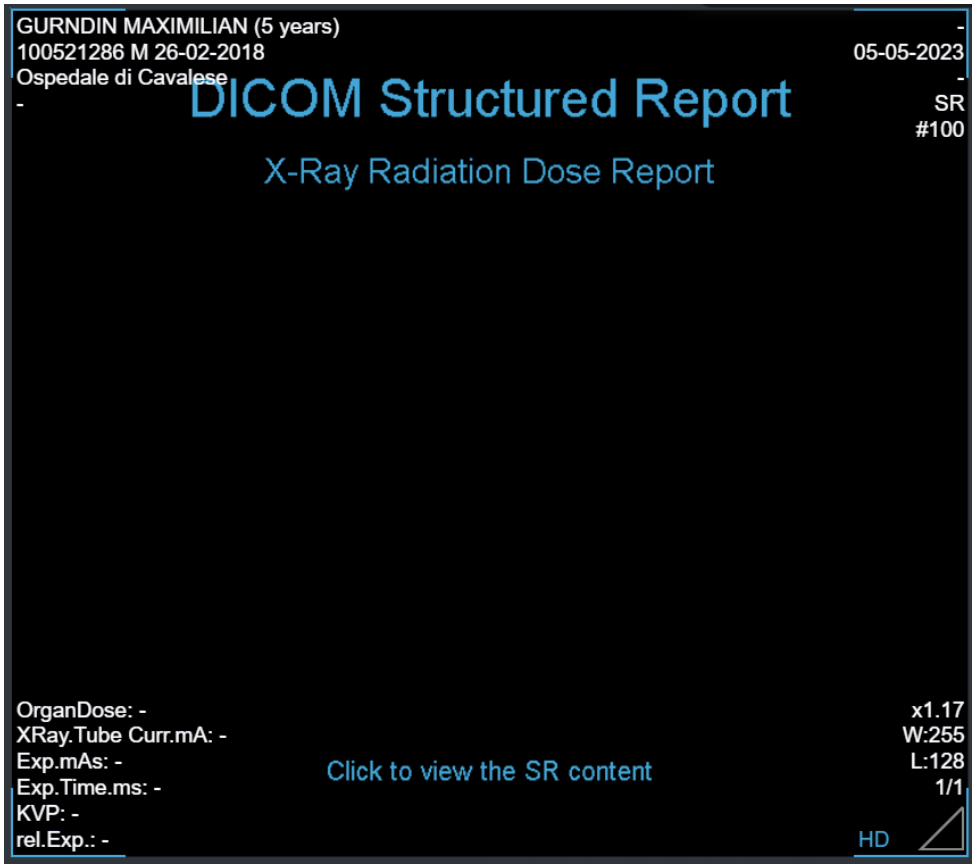


Image 79: Preview of the DICOM SR

Once opened, the file is displayed as follows:

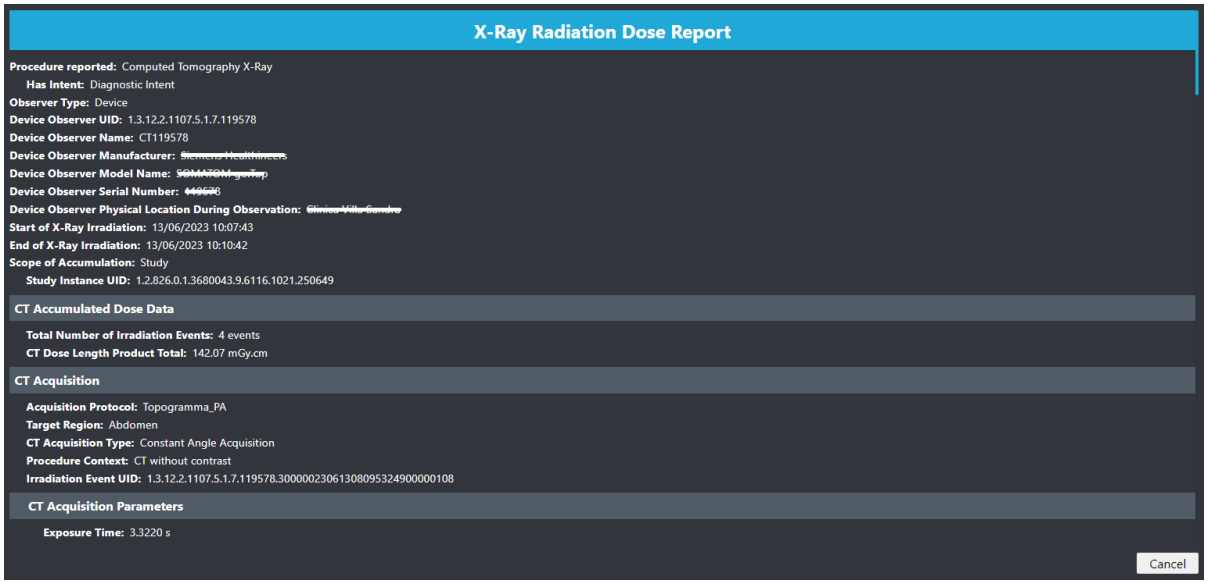


Image 80: DICOM SR

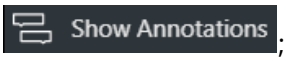
As depicted in the image, all information is conveyed through individual content items, organized as name-value pair.

To close the SR, simply click on the "Cancel" button.

7.5.2 Displaying the graphic annotation present in the SR

All two-dimensional graphic elements within a SR are represented as "Graphic Annotation" in the ZEEROmed View.

To display the graphic annotation, user can either:

- Click on the "Show graphic annotation" icon 

;
- Press the "**G**" key on the keyboard.

The icon and the "G" key automatically enable all graphic annotations present within the study.

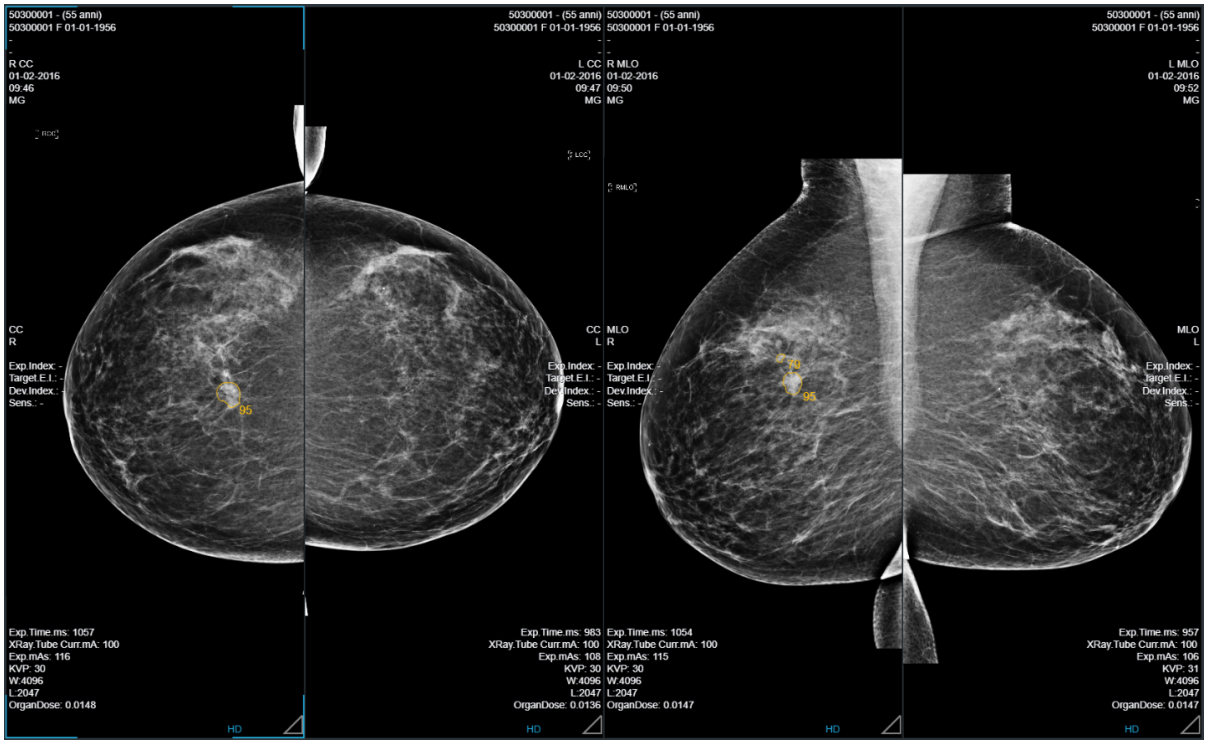


Image 81: Graphic annotation

7.6 GSPS Objects

ZEEROmed View supports the "Shutter Module" of Grayscale Softcopy Presentation State (GSPS).

GSPS is a DICOM object comprising a collection of data that delineates display instructions for radiological imaging in grayscale on a softcopy display.

Specifically, the "Shutter module" defines the region of interest (ROI) or masks to apply during the visualization of radiological imaging, enabling the hiding of non-relevant regions or highlighting of specific structures.

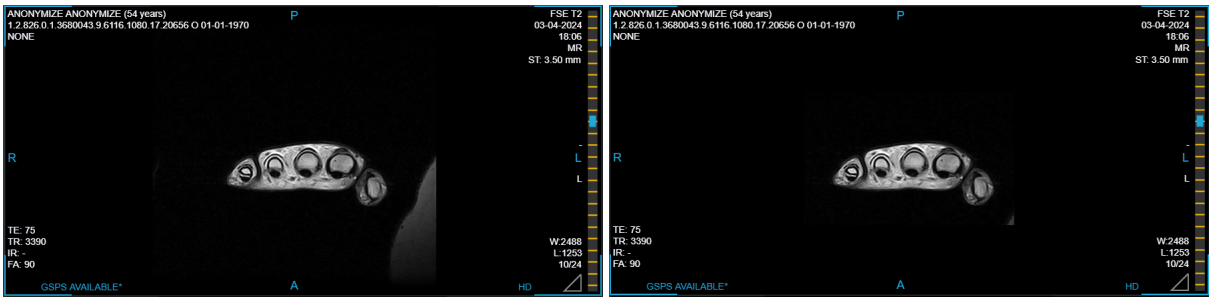


Image 82: Usage of the "Shutter Module"

7.6.1 Indication of "GSPS Availability"

The presence of a GSPS for the currently visualized image is indicated by the light blue label "GSPS AVAILABLE*" in the lower left region of the image.

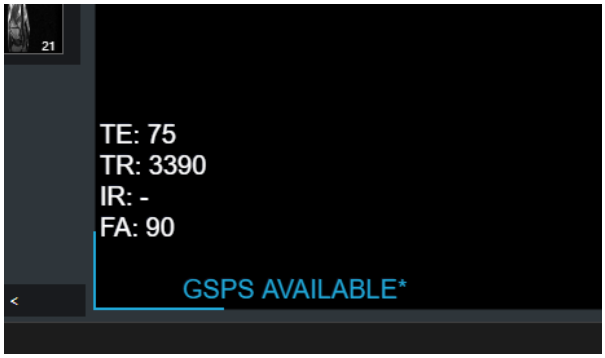


Image 83: Label for GSPS availability notification

A notch on the sequence scroll bar indicates the presence of a GSPS for the specific image. Clicking on the notch navigates the sequence to the instance referenced by the GSPS.

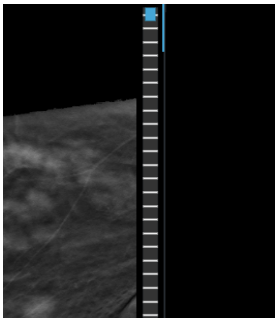


Image 84: Notch in the scroll bar for quickly accessing images with available GSPS

7.6.2 Activation of the GSPS

By default, GSPS are disabled.

To enable or disable GSPS, click the "GSPS" icon in the "Preview series panel" section.

If multiple attachments are present, left-click the "Attachment" icon to open the pop-up and select the "GSPS" icon. There will be as many icons as there are GSPS; to enable the GSPS for a specific series, click its corresponding icon.

Image 85: Pop-up with the "GSPS" icon

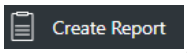
7.7 Reporting

ZEEROmed View allows reporting of the medical exam through:

- "Create Report" button in the toolbar (paragraph **7.7.1 Reporting via the "Create Report" Button**);
- Study preview panel in the Studylist (paragraph **7.7.2 Reporting in the Studylist**). **Warning**: ONLY for "reporter" users.

7.7.1 Reporting via the "Create Report" Button

7.7.1.1 Report creation

Using the "Create Report" 

, the user can generate the study report through the dedicated text panel:

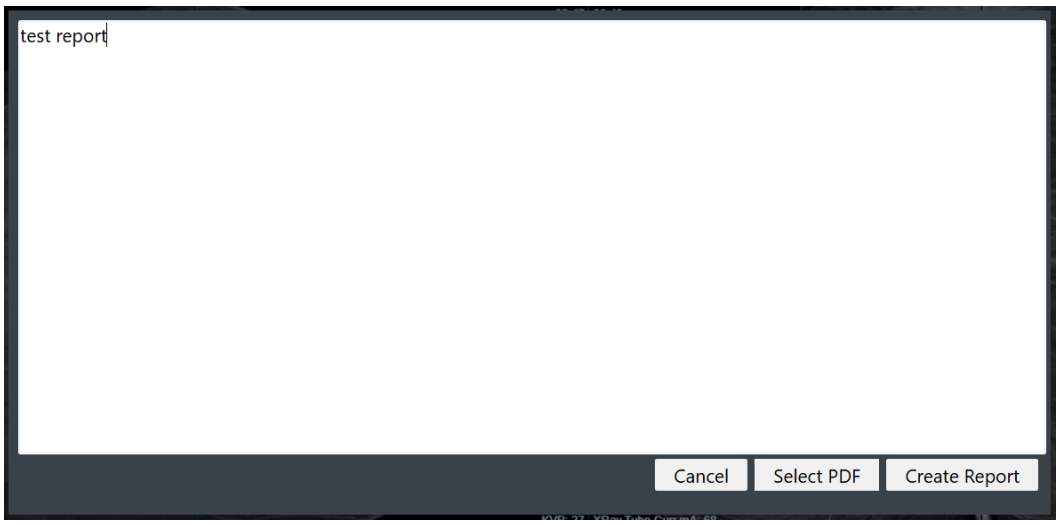


Image 86: Report creation

To **import** a PDF, click on the "Select PDF" button.

To **save and close** the report, click on "Create Report".

If images or frames have been selected (see **5.2 Select Images**), they will be included in the report according to the layout chosen via a pop-up. The user must select the report format and decide whether to display headers and labels for each image.

Image 87: Report format setting window

The report is generated and attached to the exam.

7.7.1.2 Report viewing

To view the generated report, click on the "PDF" icon in the "Preview of series" section.

If multiple attachments are associated with the same study, first select the "Attachment" icon and then the "PDF" icon. In this case, the most recent report will be highlighted with blue borders and a star icon.

Image 88: PDF reports

7.7.2 Reporting in the Studylist

Users who access the Studylist to view studies can perform study reporting directly from the series preview panel of the Studylist.

7.7.2.1 Report Creation

> ⚠ **Warning**: this feature is available only for users defined as "reporters" during product configuration.

A "reporter" user can create a report for a study only if:

- The study has been assigned to the user itself (see section **7.7.2.1.1 Study assignment**), and
- The study has been opened at least once during the session by the user.

In this case, the reporting panel will automatically open within the series preview panel in the Studylist:

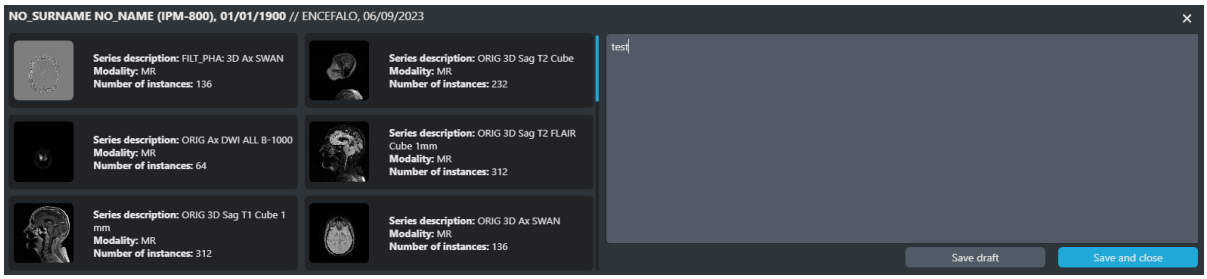


Image 89: Creating a report in the Series Preview Panel of the Studylist

To **save the report as a draft**, click the "Save draft" button.

To **save, sign and close the draft**, click the "Save and close" button and confirm the operation in the "Report Closure" pop-up.
Once the operation is completed, the "Report saved and closed successfully" toaster and the "PDF" tooltip icon, containing information about the date and time the report was closed, will be displayed.

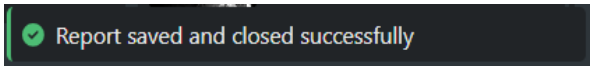


Image 90: "Report saved and closed successfully" toaster

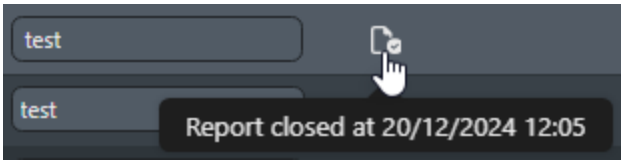


Image 91: PDF tooltip icon

7.7.2.1.1 Study assignment

A study must be assigned to a "reporter" user.

Any user with the role of "reporter" can assign a study to himself or another reporter.

To assign a study to a reported, select the desired name from the dropdown menu in the "Assigned to" column in the Studylist results section.

The name of the user currently logged in and assigned to the study will be highlighted compared to other users.

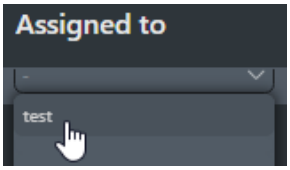


Image 92: Exam assignment

7.7.2.1.2 Study reassignment

An exam that has already been assigned but whose report has not been completed can be reassigned to any other reporter by confirming the operation in the "Reassigning Study " pop-up.

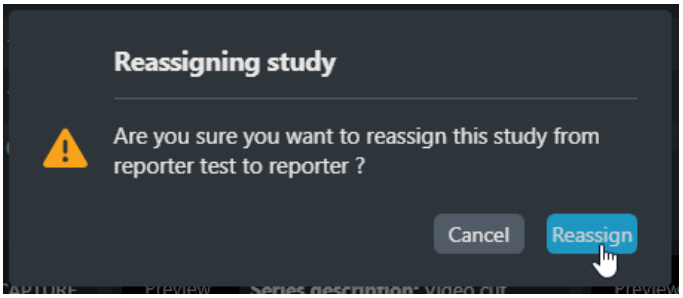


Image 93: "Reassigning study" pop-up

7.7.2.2 Viewing the report

To view the generated report, click on the "PDF" icon in the study preview panel, as shown in the image below.

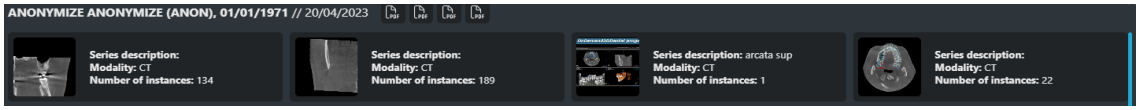


Image 94: Medical reports in the study preview

8 RADIOLOGICAL TOOLS (CR, DX)

8.1 Additional buttons in the context menu

ICON	NAME	FEATURE
	Invert image	It allows the user to invert black and white in the selected image
	Flip horizontally / vertically	It allows the user to flip the selected image
	Goniometric measure	It allows the user to measure the length of the femur and tibia, and the angle between them. Note 1: to perform a goniometric measurements, select "Show measurement" form the context menu Note 2: this tool is specific for anthropometric measurements of the thigh and leg

Table 29: Additional buttons in the context menu

8.1.1 Images inversion feature

The images inversion feature inverts bits of the image, as shown in figure.

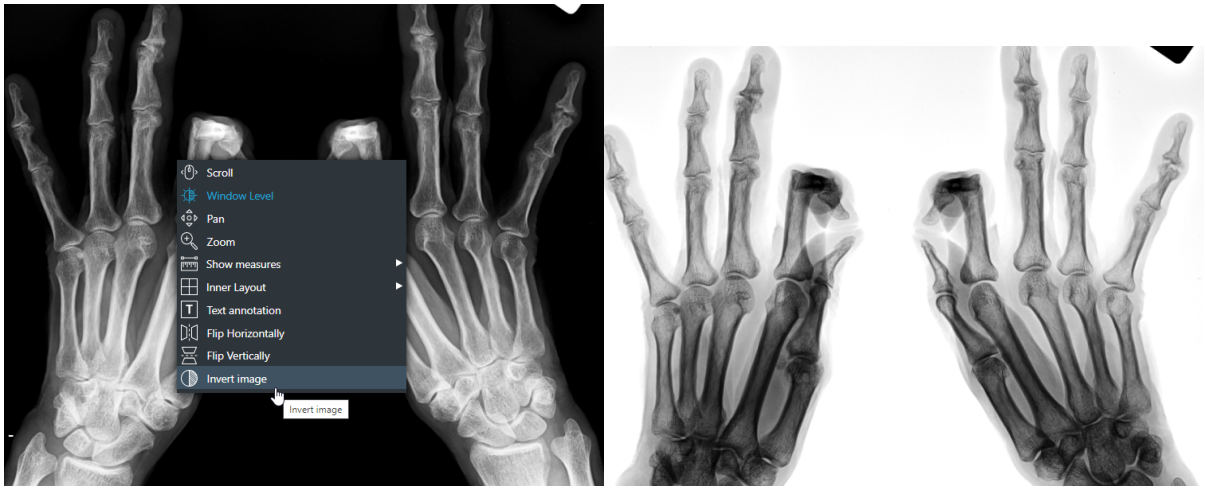


Image 95: Bit inversion

8.1.2 Images rotation

The images rotation allows both the clockwise and the anti-clockwise rotation of the image. Each click allows to rotate CR and DX by 45°, as shown in the following illustrations, MR by 90°.

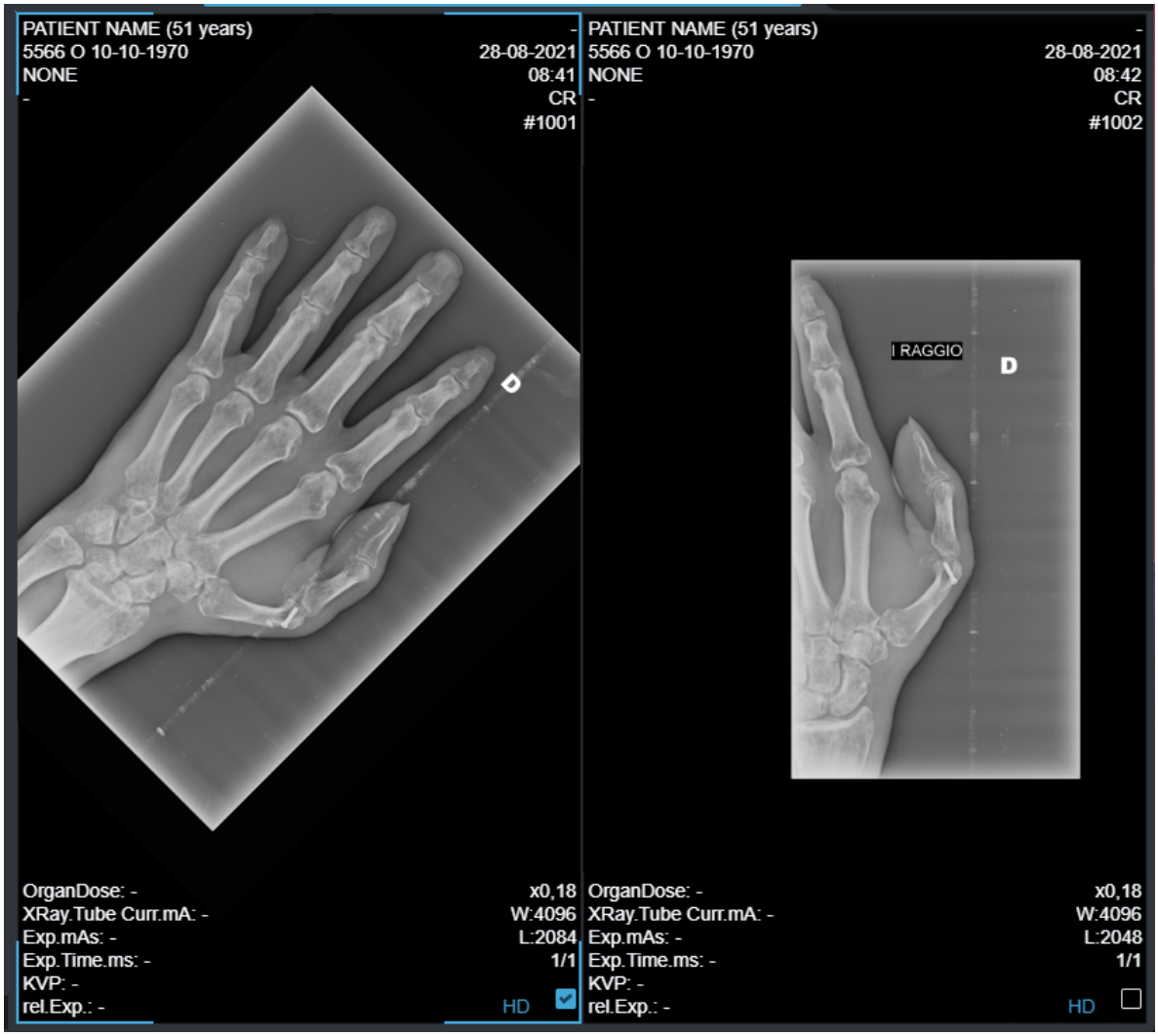


Image 96: Images rotation (45° clockwise)

8.1.3 Perform a goniometric measurement

> ⚠ **Warning**: this tool is specific for anthropometric measurements of the thigh and leg

The "*Goniometric measure*" icon allows the user to measure the length of the femur and tibia, as well as angular deformities between the femur and tibia (knee varus and valgus).

Steps to follow for a goniometric measurement:

1. Select the "*Goniometric measure*" icon in the "Show measurement" section of the context menu.

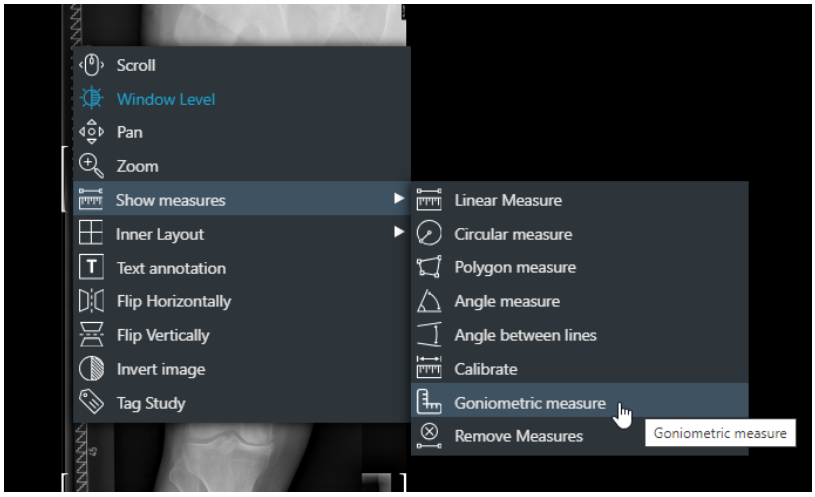


Image 97: Goniometric measure icon

2. Draw a circle around the femoral head to define its center.
NOTE: draw the circle starting from the center of the femoral head and move the mouse cursor towards the edge.

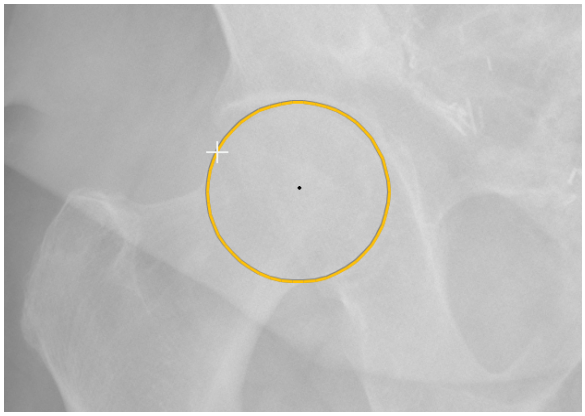


Image 98: Draw a circle around the femoral head

3. Draw the knee transverse line at the level of the tibial plateau to identify the center of the knee.
NOTE: start from one end to the other of the knee (from the lateral end of the knee towards the medial, or vice versa).

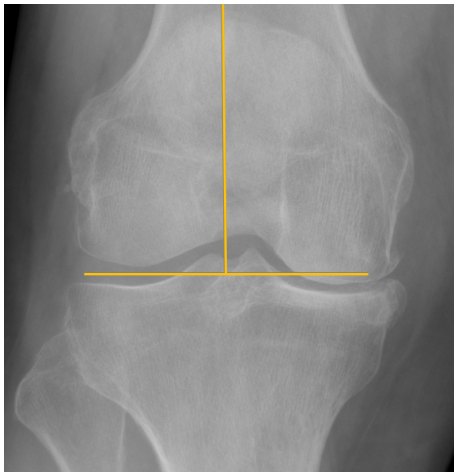


Image 99: Draw the knee transverse line

4. Draw the line at the level of the ankle joint. NOTE: start form one end to the other of the ankle (from the lateral malleolus towards the medial, or vice versa).

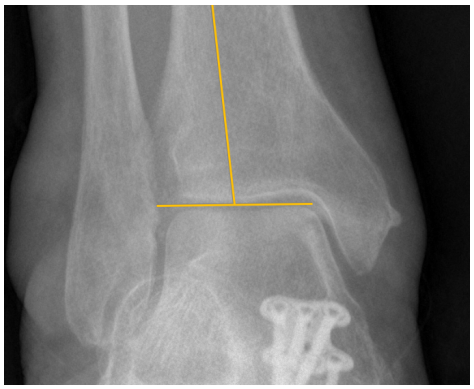


Image 100: Draw the ankle line

At this point, ZEEROmed View provides:

- length of the femur;
- length of the tibia;
- total length of tibia and femur;
- angle between the axis of the femur and that of the tibia.

*NOTE: the reported measurement includes any potential error.

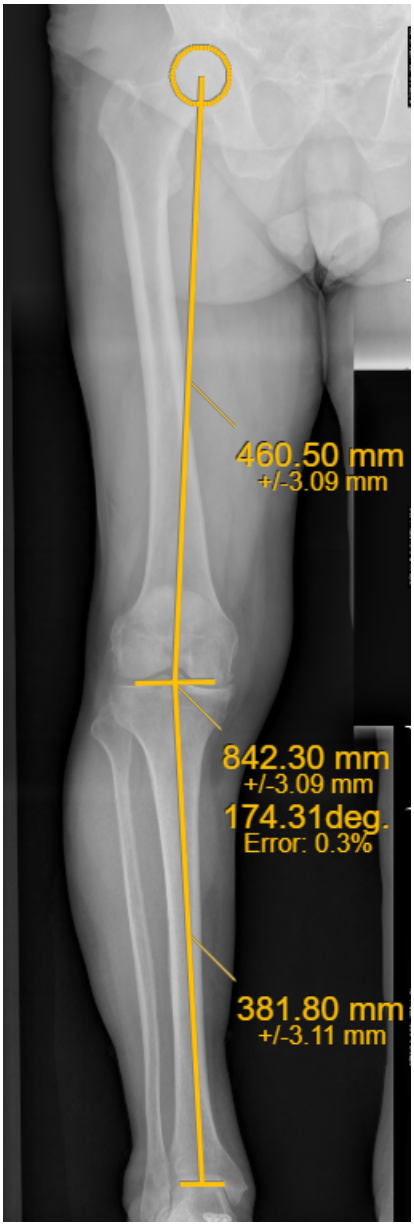


Image 101: Example of goniometric measurement

If necessary, user can move the circle around the femoral head or the transverse lines at the knee and ankle by dragging the elements with the left mouse button. Their dimensions cannot be modified; to update the value, delete the measurement from the context menu.

9 CT TOOLS

9.1 Additional toolbar

The toolbar exposes the basic operations of the viewer:

ICON	TOOLTIP	FEATURE	
	Reference lines	Shows the reference lines to all sequences. When selected it opens a menu:	
			It shows all reference lines of a sequence (“stack” modality)
			It shows the reference lines of the selected image (single modality)
			It disables reference lines
	MPR	See Annex I, if available	
	Enables/Disables space locator	It allows the user to locate a point in space. Selecting a spot on an axial image, the tool shows the user the same point in the associated coronal and sagittal images.	

Table 30: Additional CT toolbar

9.1.1 Window Level presets

A pre-set of Window Level values is available to the user.

The default WL values have been associated with the keyboard keys 1-9.

In order to help the user in choosing the right WL value, the user can open a popup helper with WL configurations associated. He/she can open the popup in two ways:

- Clicking on the WL presets button, in the toolbar
- With the '**?**' keyboard key

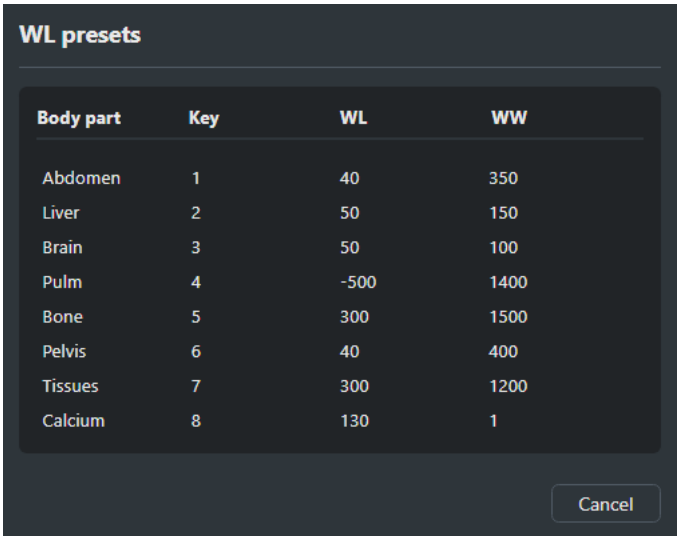


Image 102: WL presets values

The WL is applied both clicking on the highlighted lines and using the referenced keyboard key.

9.1.2 Reference Lines

The Reference Lines button, if activated, allows to show yellow lines (plane projection's line) over all shown sequences, as like in left side preview sequences.

When single reference lines are enabled, viewing multiple images draws a line on other images.

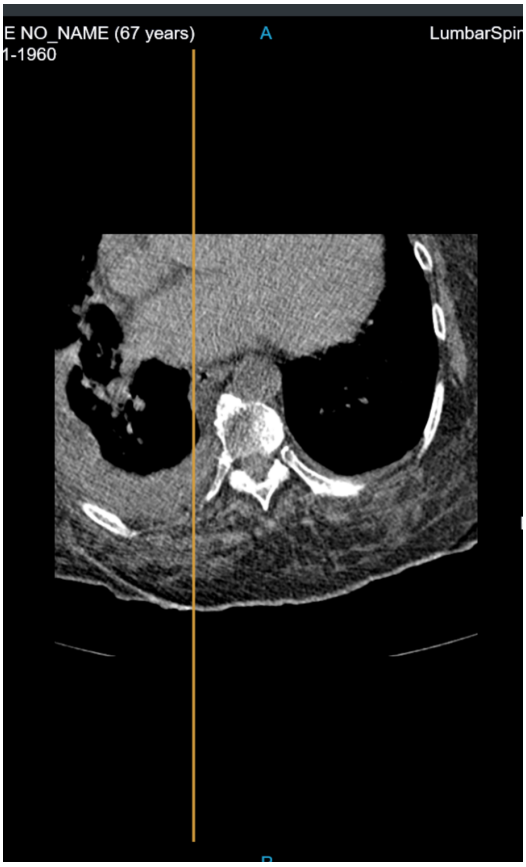


Image 103: Plane reference lines

When stack modality is enabled, viewing multiple images draws a stack of line on other images. They represent the projections of all slices of the selected sequence. The most intense line represents the current view.

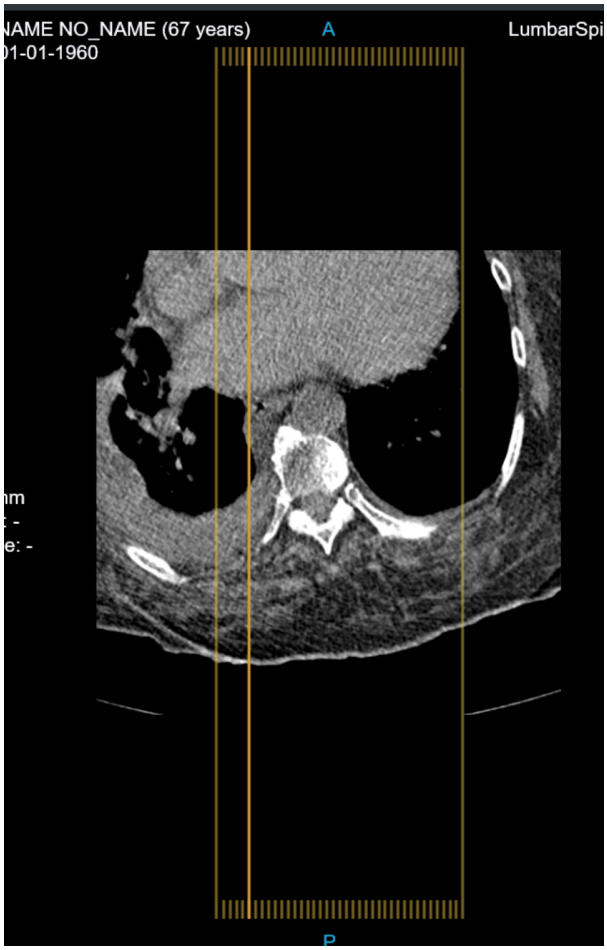


Image 104: Stack reference lines

10 MULTI PLANAR RECONSTRUCTION

ZEEROmed View, if configured, allows the user to visualize multiplanar reconstruction of the exams.

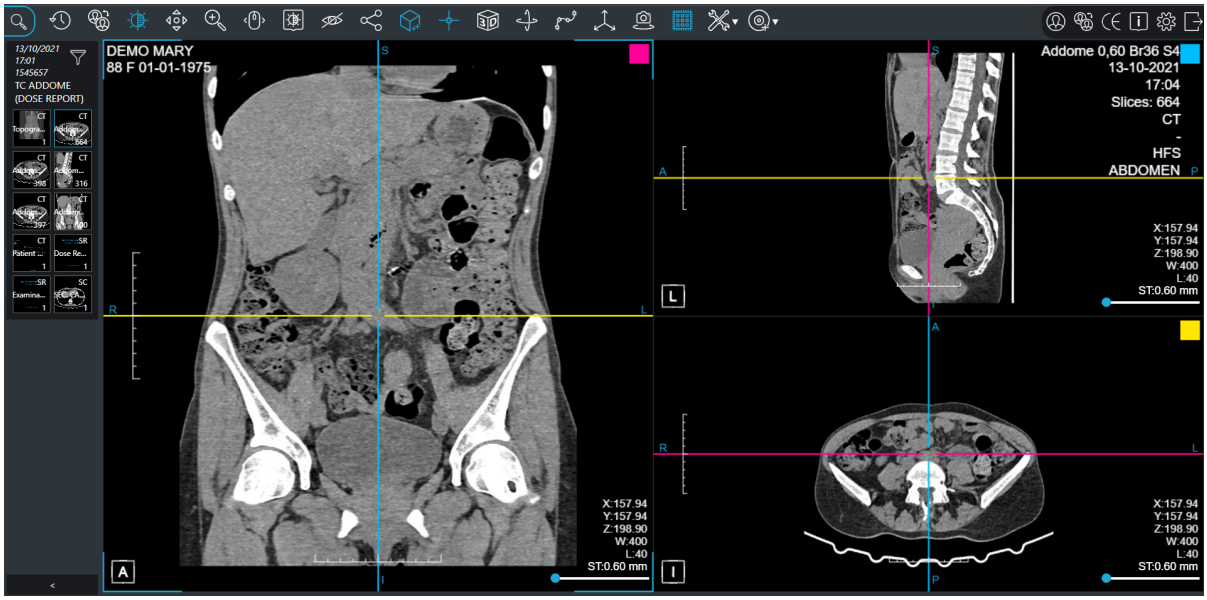


Image 105: MPR viewer

The reconstruction viewer displays the multiplanar reconstruction (MPR, images and metadata) allowing operations such as window level, zoom, pan, scrolling among images of a sequence.

In order to start a reconstruction, the user should select the MPR reconstruction button in the side-bar or press the space bar.

When the MPR reconstruction button is clicked a progress bar will appear, showing progress of reconstruction opening. When slices downsampling is done, the MPRviewer will be shown.

Image 106: MPR reconstruction button

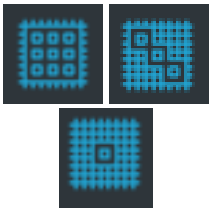
The MPR reconstruction viewer is made of four main sections:

- Patient's data (at the top)
- Axial, Sagittal and Coronal MPR (in the middle)

- Preview of other sequences (on the left)
- Toolbar (on the right)

10.1 Toolbar

ZEEROmed View, if configured, allows the user to visualize three-dimensional reconstruction of the exams.

ICON	NAME	FEATURE
	Exit MPR reconstruction	It allows to exit the MPR reconstruction
	MaxIP, MeanIP, MinIP	Switch between MaxIP, MeanIP, MinIP. See **10.1.1 MaxIP, MeanIP, MinIP**
	It opens the specific tools section. It contains the following tools.	
	Volume rendering	It allows the volume rendering of the series. See **10.4 Volume Rendering**
	Show/Hide MPR axis	It allows to show/hide MPR axis.
	Orthogonal axis	It allows to make perpendicular the axes, and to block them. If it is disabled, axes move independently.
	Lock/Unlock follow camera	It allows to lock/unlock follow camera. See **10.1.2 Follow Camera**

	CPR	It allows the user to perform the curved reconstruction. See **10.6 Curved Planar Reconstruction (CPR)**

Table 31: MPR tools

10.1.1 MaxIP, MeanIP, MinIP

Pressing three times the same button the system visualizes:

ICON	FEATURE
	Maximum Intensity Projection (MIP)
	Mean Intensity Projection o Average Intensity Projection (AIP)
	Minimum Intensity Projection (MinIP)

Table 32: MaxIP, MeanIP, MinIP buttons

10.1.2 Follow Camera

Follow Camera is a feature selected by default.

When the user moves the centre of the plane on a view, the remaining views get updated: their camera will be centred on the intersection of the planes.

When the user deselects Follow Camera, the other views keep the same image locations, while only the plane lines change: camera will not follow the centre of the planes.

10.2 Context Menu

The following image and table describe the MPR context menu.

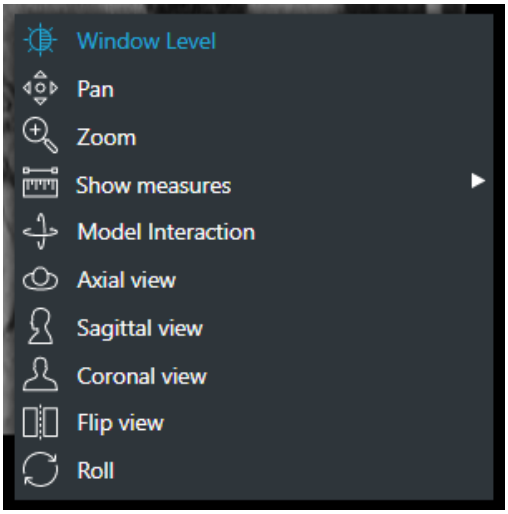


Image 107: MPR context menu

ICON	FEATURE
Coronal view	These buttons allow the user to choose which projection they want. They could be activated pressing: "**C**" for Coronal view "**S**" for Sagittal view "**A**" for Axial view
Sagittal view	
Axial view	
Flip view	It allows to flip the plane, inverting the projection on normal.
Roll	It allows the user to correct the orientation of the projection (for example to rotate a few degrees a distorted view).
Interaction with 3D model	It allows to change the inclination of a plane in one projection. It allows to move one axis if the mouse moves horizontally, the other if the mouse moves vertically.

Table 33: Context menu icons

10.2.1 Measures

Measures in ZEEROmed View conform to the document "DICOM correction Item CP-586 Pixel spacing and calibration in projection radiography".

The following image shows the context menu for measures. The following table explains how to take each different type of measure.

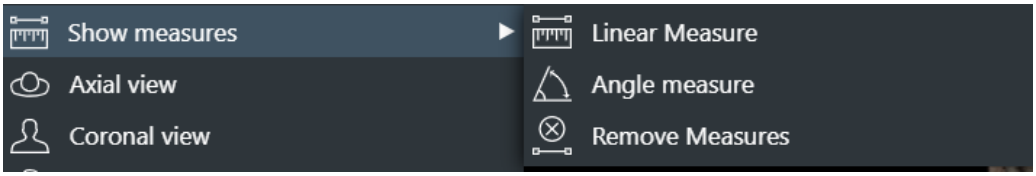


Image 108: Measures menu

NAME	FEATURE
Show measures	It could be activated also pressing "**R**". Click on the starting point of the measure. Drag to the ending point of the measure and release.

Table 34: MPR measures

If measures are imprecise beyond a configurable error threshold (default=0%), the error will be shown near the measured value.

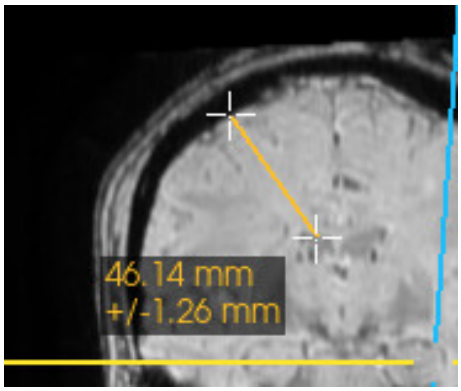


Image 109: Linear measures

10.3 MPR planes

Multiplanar Reconstruction (MPR) allows images to be created from the original axial plane in either the coronal and sagittal plane. Visualised panes represent the MPR planes:

1)Coronal plane

a) The first panel, it is identified by the pink square in top right of the panel;

b) In the second and third panel, the user can see it represented from a pink line;

c) The coronal plane passes through the body from left to right and divides it into anterior and posterior sections.

2)Sagittal plane

a) The second panel, it is identified by the blue square in top right of the panel;

b) In the first and third panel, the user can see it represented from a blue line;

c) The sagittal plane passes through the body from anterior to posterior and divides it into left and right sections.

3)Axial plane

a) The third panel, identified by the yellow square in top right of the panel;

b) In the first and second panel, the user can see it represented from a yellow line;

c) The axial plane passes through the body from anterior to posterior and divides it into superior and inferior sections.

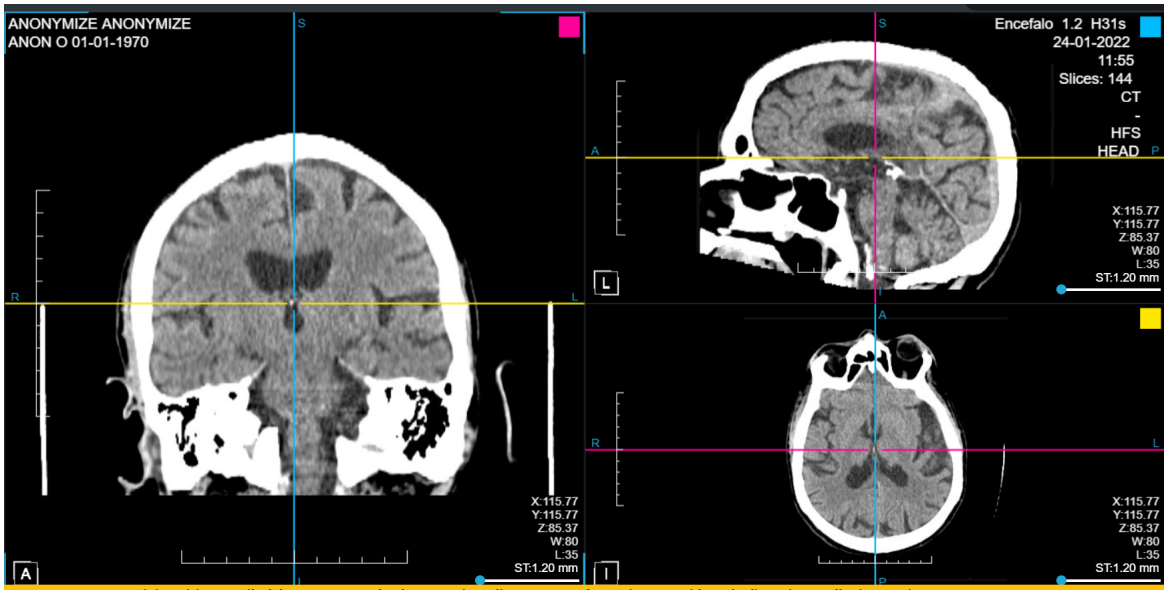


Image 110: MPR planes

In each projection, the user can visualize:

- the reconstruction;
- Window level value and coordinates of the current plan;
- The orientation widget (see **10.3.2 Orientation cube**);
- Slice thickness (see **10.3.3 Slice thickness**);
- A ruler (see **10.3.4 Ruler**);
- Left/right/superior/inferior/anterior/posterior references;
- the plane colours.

Reconstruction is also possible in non-axial series, all projections are allowed.

10.3.1 Rotation of axes

The user can rotate the axes in each panel and can move the centre of the axes by clicking the centre and moving the mouse.

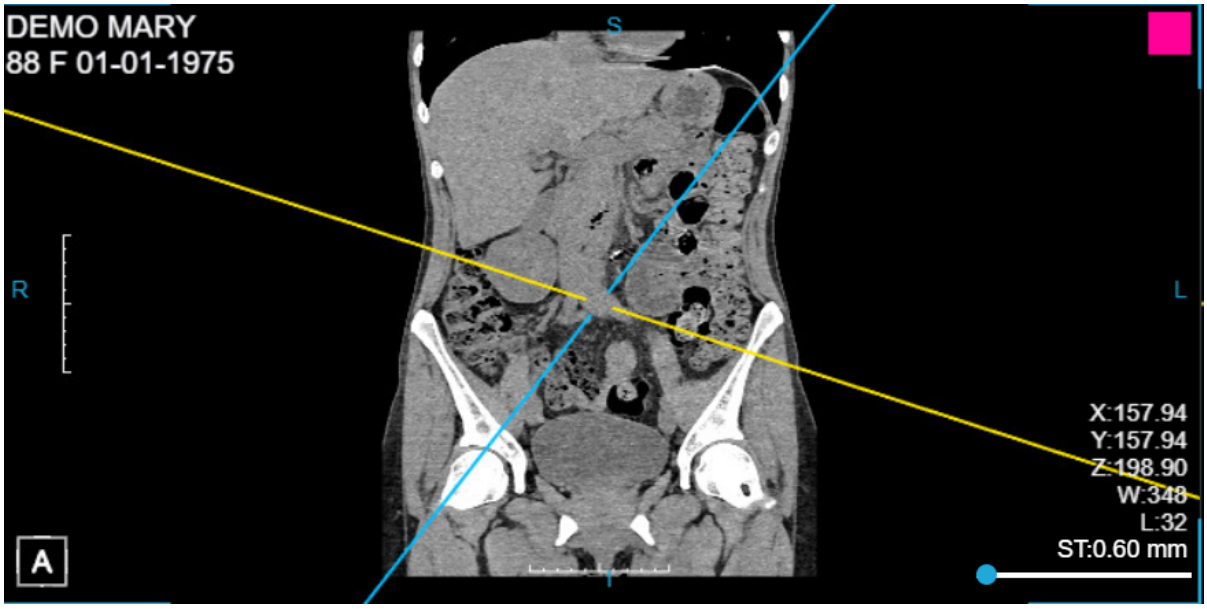


Image 111: Rotate the axes

10.3.2 Orientation cube

The orientation cube located low-left in the image, automatically updates its orientation when the user move axis. The six faces of the cube have the following icons:

ICONS	FUNCTION
	Anterior face
	Inferior face

	Left face
	Right face
	Superior face
	Posterior face

Table 35: Orientation cube

10.3.3 Slice thickness

Slice thickness can be set individually for each view, through the Thickness bar.

Image 112: Slice thickness bar

Image 113: Slice thickness bar modified

10.3.4 Ruler

A ruler is available to the sides of the image.

It has a length of 10cm and 10 ticks: each tick has 1cm.

Image 114: Ruler

10.3.5 Reformat series from MPR

The "*Save reformatted series*" button allows users to reformat series (axial/coronal/sagittal) from an MPR projection and save them in the storage (PACS/ Feed).

Image 115: Save reformatted series button

10.3.5.1 Procedure for reformatting a series from MPR Steps to reformat a series:

1. During the MPR session, press the "Save reformatted series" button ;
2. A pop-up will appear, allowing the user to enter the following parameters:
   - *Series Description*: series description of the new series (default: "REFORMATTED" followed by the original series description);
   - *Start slice*: number of slices before the center of the MPR axis (default: -10);
   - *Stop slice*: number of slices after the center of the MPR axis (default: 10);
   - *Interval between slice (mm)*: (default:10, range [0:200]).

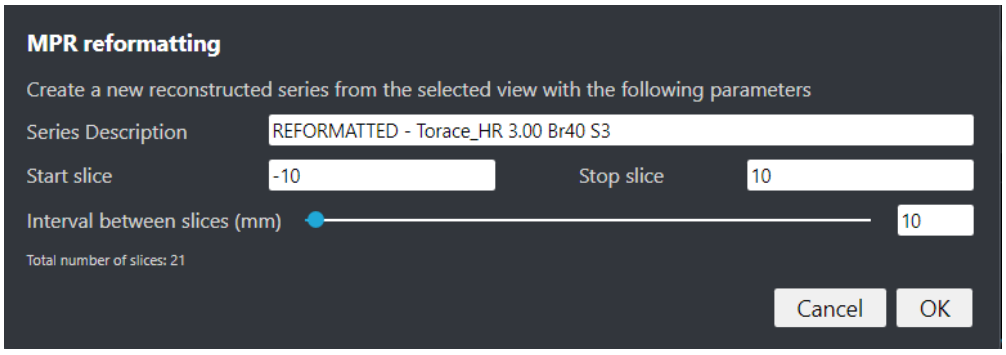


Image 116: MPR reformatting pop-up

Reference lines related to the user-set parameters are displayed in the views and updated in

real-time, as can be seen by the following image

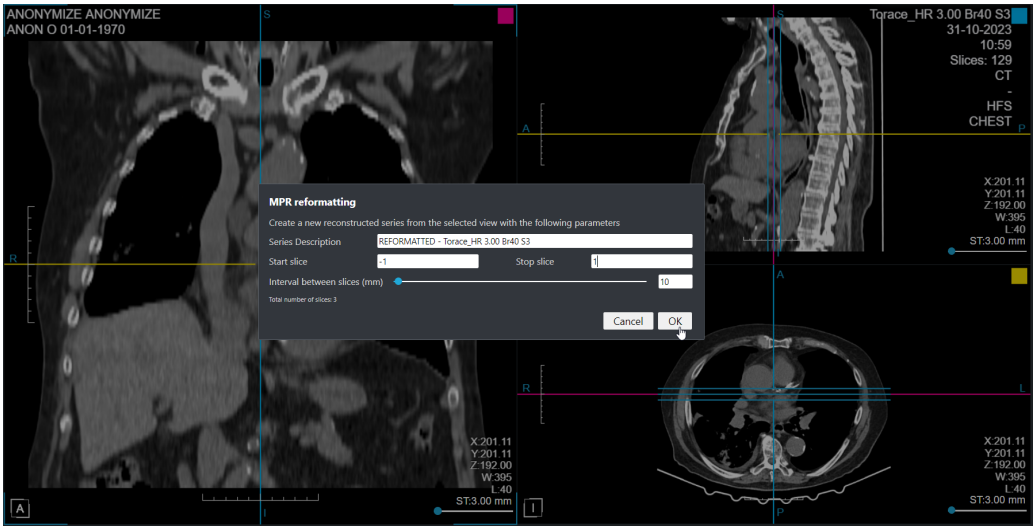


Image 117: View with the MPR reformatting setting and the related reference lines

3. Press "Ok" to store the new reconstructed series in the system. The pop-up is closed and the reference lines are hidden.
4. The new series, containing the reconstructed slice and a scout image displaying the reference lines, is displayed. The modality of the new series is SC (Secondary Capture).

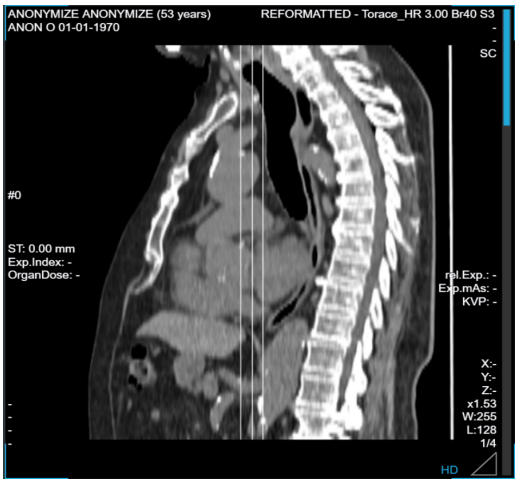


Image 118: Scout image produced by the MPR reformatting

In the new series, slices are automatically fitted into the output image size, while window level, slab mode and slice thickness are maintained.

> ⚠ **Warning**: the new series is NOT intended for diagnostic use and for further reconstruction.

10.4 Volume Rendering

Through the Volume Rendering button, the user can open a panel with volume rendering, which allows zoom, pan, cut and camera interact.

Image 119: Volume Rendering button

On the bottom of the panel, it is possible to change the transfer function via a drop-down menu located at the bottom right of the screen in which the 3D image is presented. In particular, the following menu will be shown:

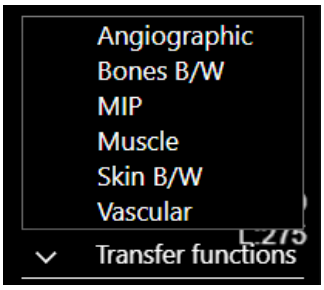


Image 120: Transfer Function

ICON	FEATURE
MIP	MIP reconstruction, which allows the user to see a 3D volume rendering of the MIP
Vascular and Angiographic	Vessels reconstruction, which allows the user to see vessels at best
Bones B/W	Bones reconstruction, which allows the user to see bones at best
Muscles	Muscler reconstruction, which allows the user to see muscolar bundles

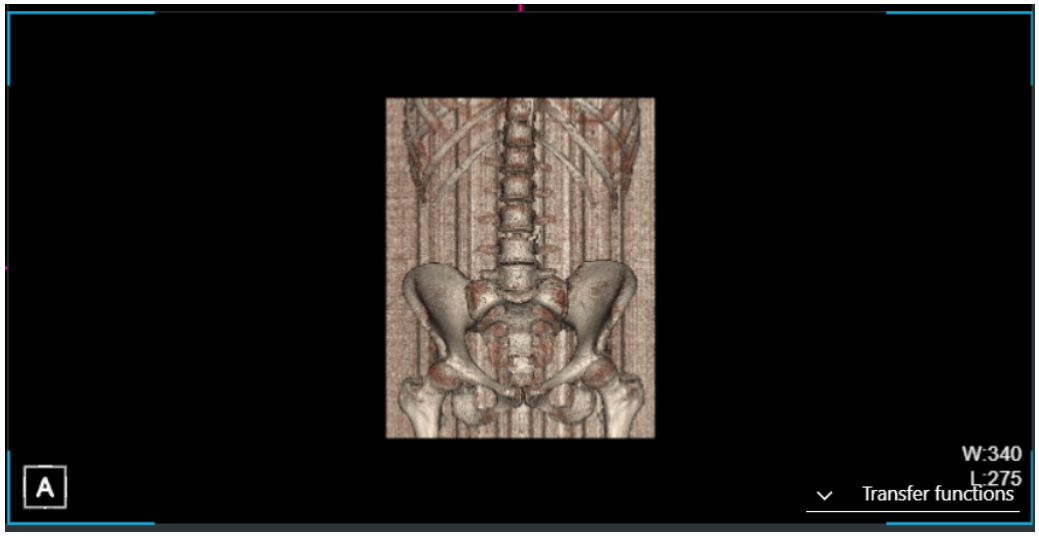


Image 121: Volume rendering

Table 36: Volume rendering functionalities

10.4.1 Volume rendering context menu

The volume rendering context menu has more buttons than MPR:

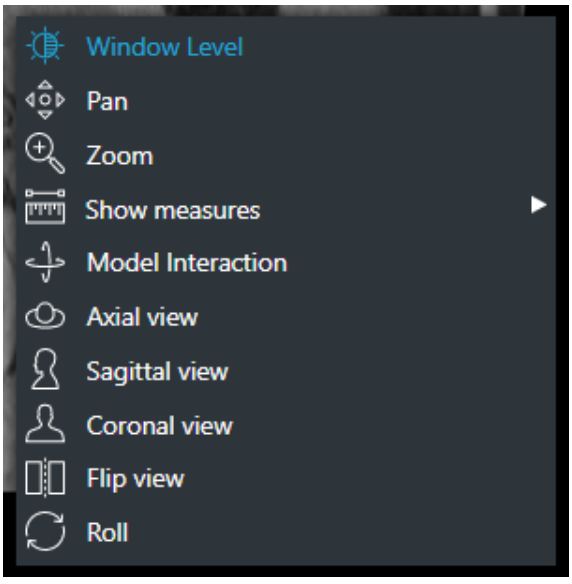


Image 122: Volume rendering context menu

TOOLTIP	FEATURE
Scissors	The scissors tool allows the user to select only the interested volume. (See **10.4.2 Scissors**)
Cube	Allows the user to change the size of the cube that contains the 3D reconstruction and allows to cut a portion by changing the size of the cube

Table 37: Volume Rendering context menu tools

10.4.2 Scissors

The scissors tool allows the user to select only the interested volume. The user should select the scissors tool, swipe/drag over the volume and press the cut button.

By clicking on the right mouse button and on the scissors button you will find the cropping tools:

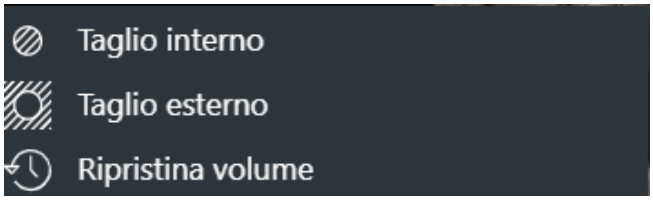


Image 123: cropping tools

On the bottom of the panel, three buttons are available:

ICON	FEATURE
	Cut inside button: the region outside the trace is removed
	Cut outside button: the region inside the trace is removed
	Cancel button: the operation is aborted

Table 38: Cropping tool functionalities

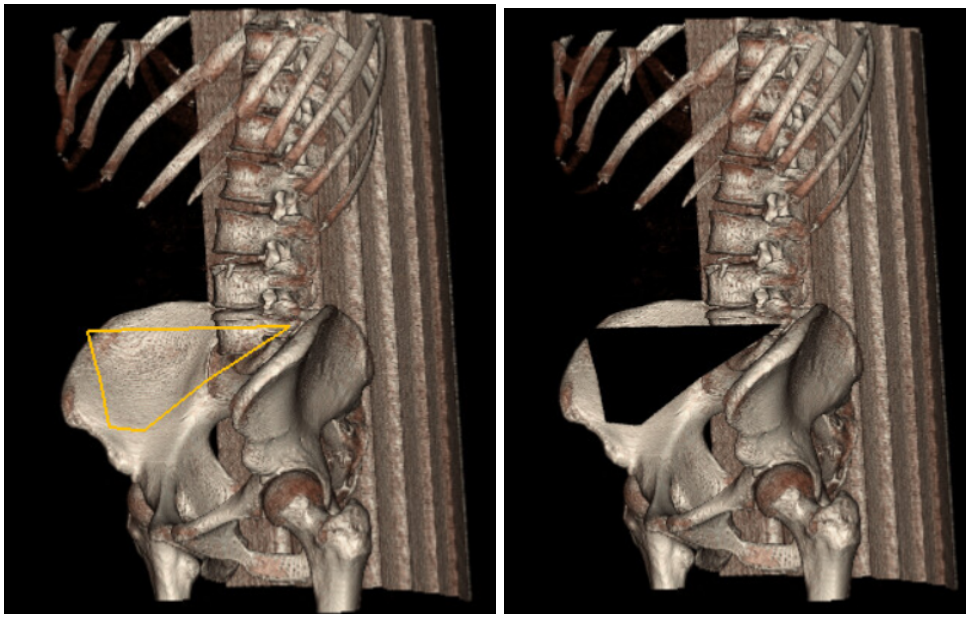


Image 124: Cut inside operation

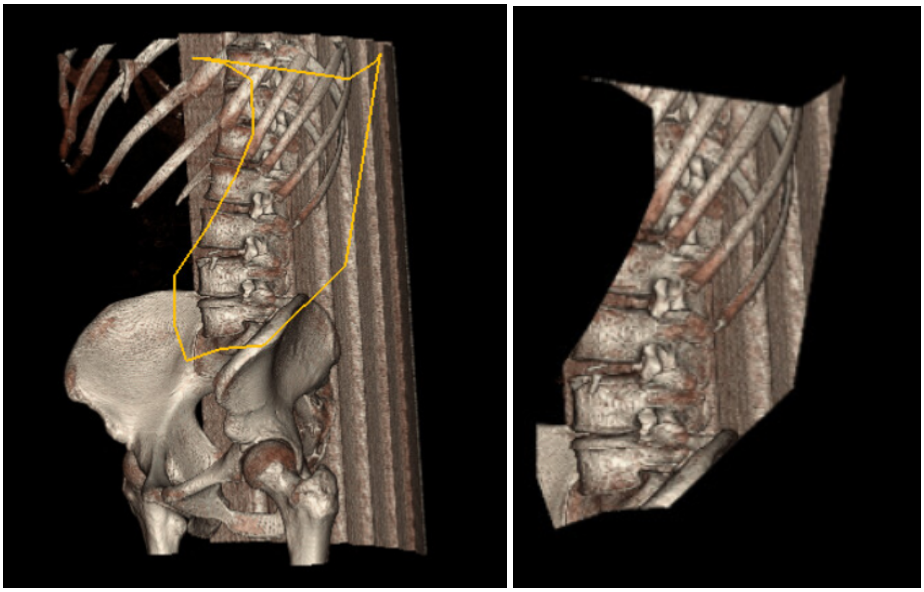


Image 125: Cut outside operation

10.4.3 Reformat series from Volume Rendering

The "Save reformatted series" button allows users to reformat series (axial/coronal/sagittal) from a VR view and save them in the storage (PACS/ Feed).

Image 126: Save reformatted series button

10.4.3.1 Procedure for reformatting a series from VR

1. During the VR session, press the "Save reformatted series" button;
2. A pop-up will appear, allowing the user to enter the following parameters:
   - *Series Description*: series description of the new series (default: "REFORMATTED" followed by the original series description);
   - *Rotation*: volume rotation angle (180° or 360°);
   - *Direction*: volume rotation direction (horizontal or vertical);
   - *Angle between frames (degrees)*: (default:1, range [1:45]).

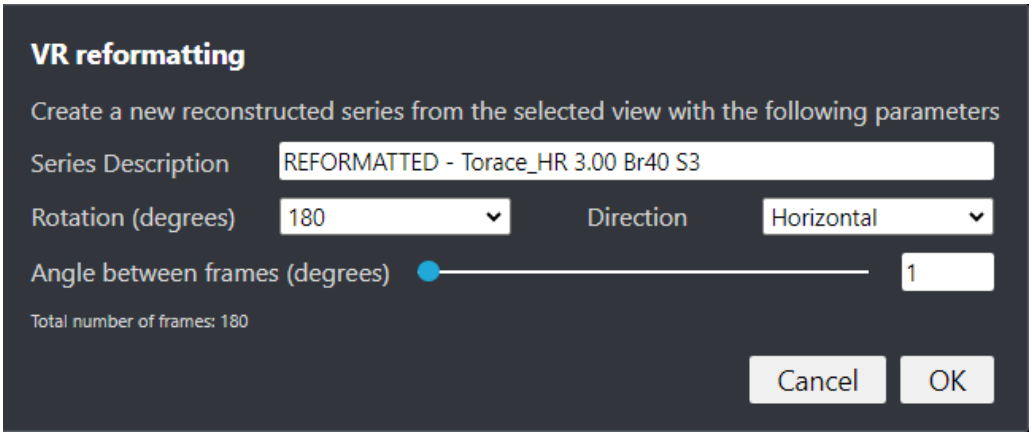


Image 127: VR reformatting pop-up

3. Press "Ok" to store the new reconstructed series in the system. The pop-up is closed.
4. The new series, containing the reconstructed slice, is displayed. The modality of the new series is SC (Secondary Capture).

In the new series, volume is automatically fitted into the output image size, while window level, transfer function, original orientation and volume cuts are maintained.

10.5 Warning "Gantry Tilt"

In some cases, when you click on the MPR, the following message appears:

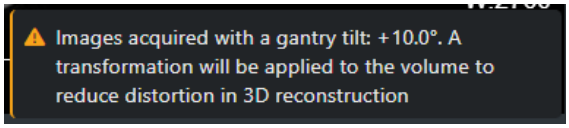


Image 128: Warning "Gantry tilt"

The device automatically makes improvements to the image that allow it to be displayed correctly in 3D.

10.6 Curved Planar Reconstruction (CPR)

The CPR allows to follow the course of a tortuous vessel for longer distances as it changes direction. It requires the centerline to be tracked correctly.

> ⚠ **Warning**: inaccurate centerline tracking may cause artifactual lesions

The user performs it manually clicking on the image and scrolling to follow the vessel.

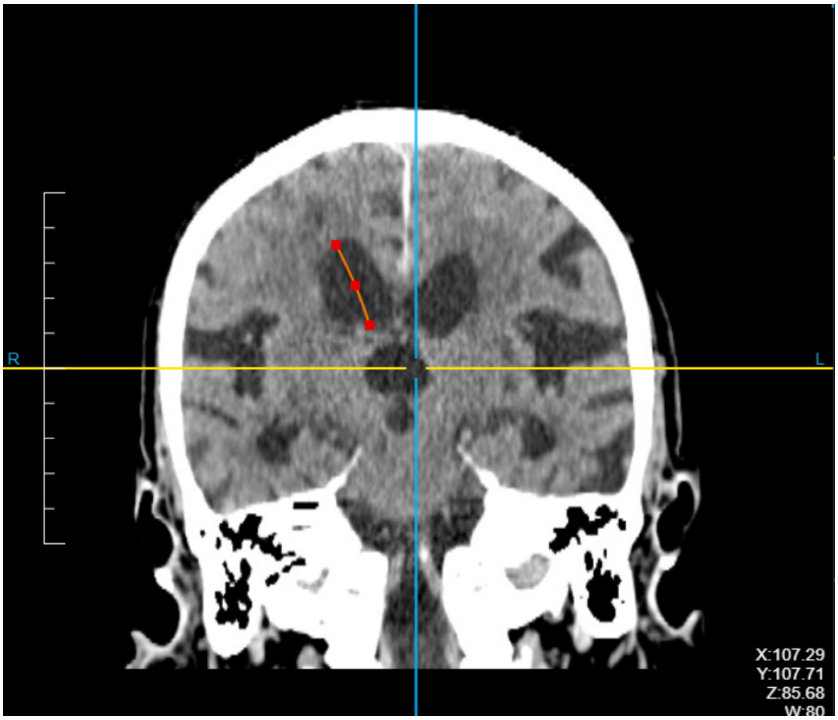


Image 129: The manual tracking

Once the user has followed the entire vessel, he/she can start the CPR pressing “Enter”.

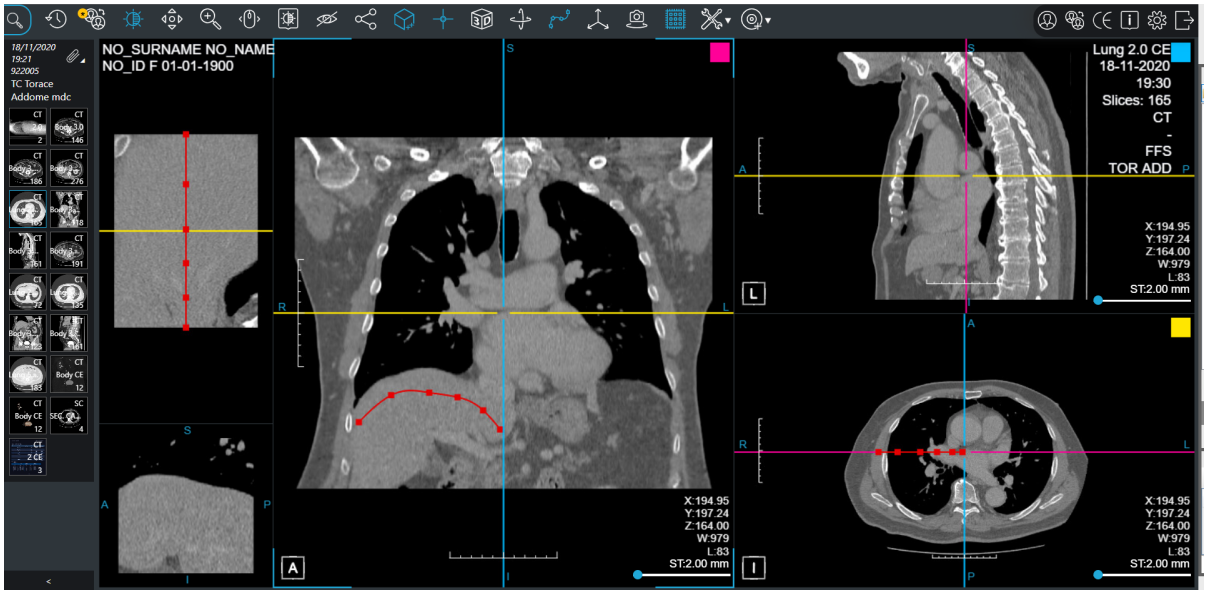


Image 130: The curved reconstruction

The CPR view consists of five sections:

- Axial, Sagittal and Coronal MPR (on the right)
- CPR view: the entire vessel (on the top left)
- CPR slice: the axial slice for each single point of the vessel

Both the CPR view and slice can be scrolled and rolled in a synchronized way.

The user can click on the red points on the vessel: the CPR slice shows that slice and the reference line on the CPR view is updated.

The user can add linear measures to each section.

11 MAMMOGRAPHIC TOOLS

11.1 Additional toolbar

ICON	TOOLTIP	FEATURE
	Toggles magnifier tool	It allows “zoom” a specific part of the image
	Invert B&W	It could be activated also pressing “**I**”. It allows the user to invert the black and white bits of the image
	Flip image	It allows the user to flip horizontally/vertically the selected image
	No tooltip	This icon allows the user to understand where is the slice.

Table 39: Additional toolbar

11.1.1 Magnifier

The user can select the Magnifier tool in order to enable a magnifying glass, which moves following the mouse pointer. The user can perform all actions allowed by ZEEROmed View with the magnifier opened.

Magnifier could also be enabled through the “M” key.

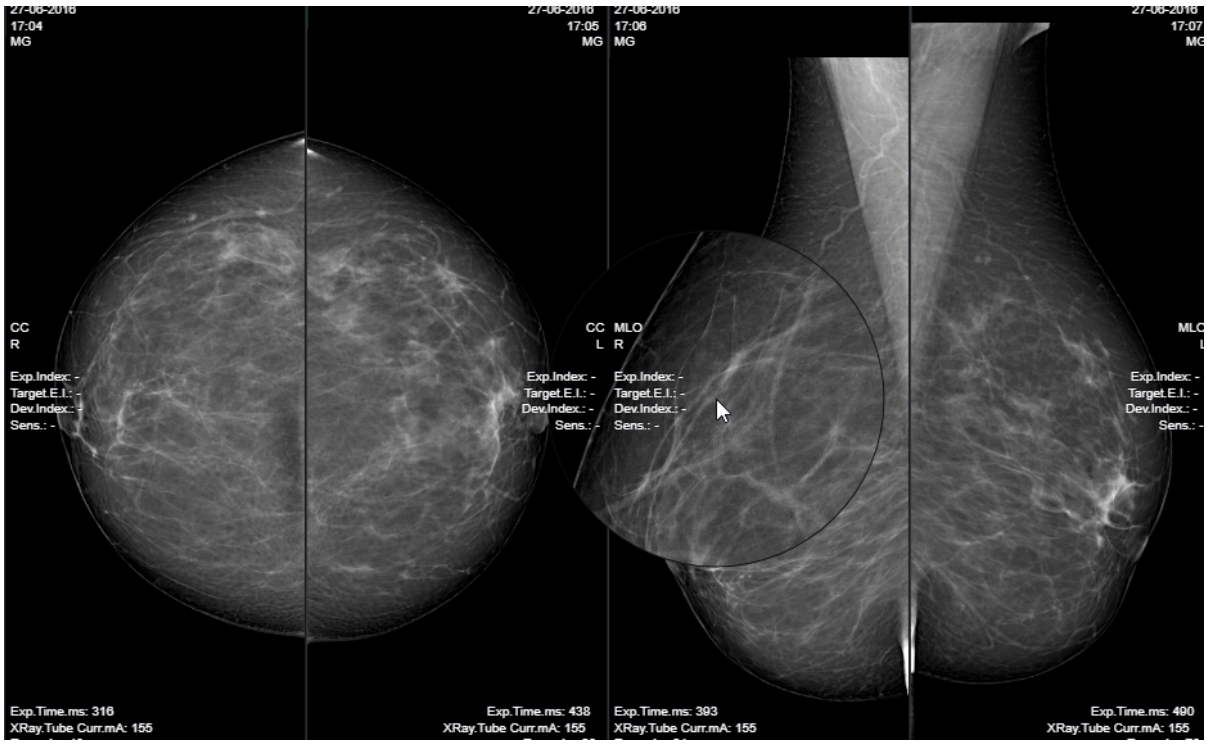


Image 131: Magnifier

11.2 Quadrant zoom

If enabled the user can navigate thorugh Hanging Protocols and view Q0, Q1, Q2, Q3 and Q4 per each instance, as below.

To navigate between the different quadrants of the view, use the HP navigation component (paragraph **5.1.2.1 Hanging Protocol navigation component**).

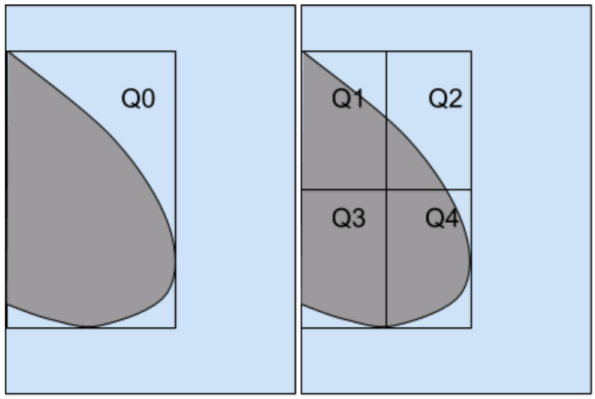


Image 132: Quadrant zooming

It can be enabled per user, per role or for everyone.

11.2.1 Studies processed with Artificial Intelligence (not always implemented)

If enabled, there is the possibility of using artificial intelligence software that, according to to the mammographic image, it provides a score that indicates the probability that the patient may or may not have breast cancer. This score makes it possible to distinguish images NOT processed with artificial intelligence from those processed that have a low "finding score" (low score, not relevant).

The score is shown below the patient and image information:

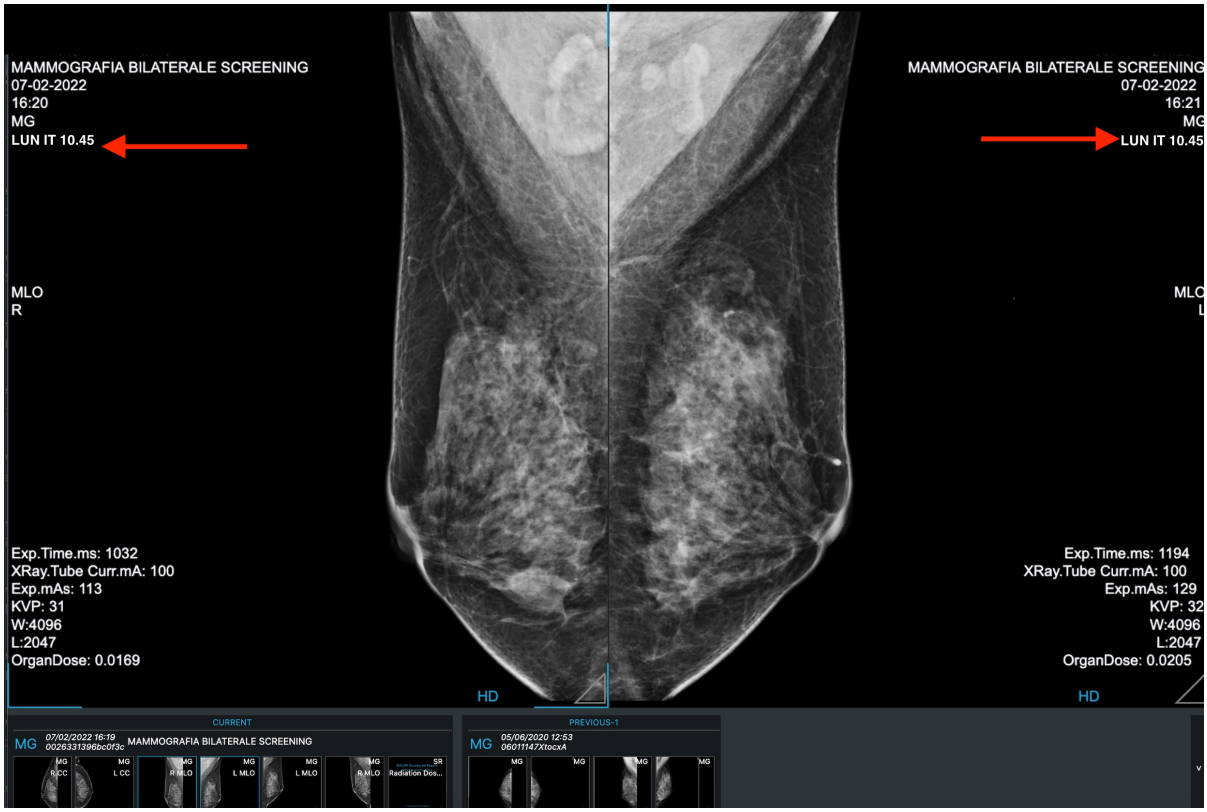


Image 133: image with finding score

Once the image is open it is possible to configure the insertion of a label score on the image. The score is evaluated by the artificial intelligence algorithm.

ICON	NAME	DESCRIPTION
AI: -	Empty label	Label showed on the image when there is no AI score
AI: LunaticAI 95.04%	Label with name	Label showed on the image when there is an AI score

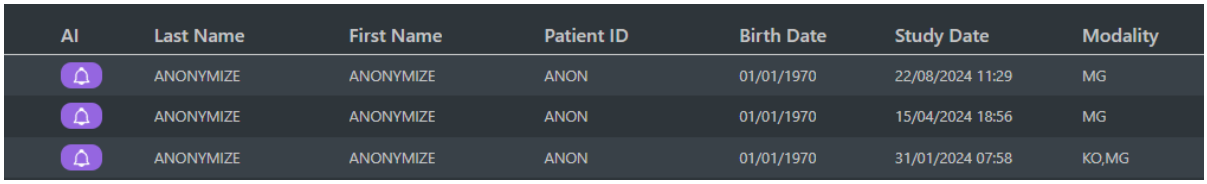
Table 40: AI label score

11.2.2 Studylist results section

The studylist is present after login and after choosing the studies to visualize.

In the results section, thanks to the "AI" field, it is possible to discriminate the studies that present a finding produced by the artificial intelligence algorithm based on an abnormality score (abnormality score) from those that have not been processed with Artificial Intelligence software. Furthermore, it is possible to choose an abnormality threshold used to decide which alerts to show and which not.

In case of integration with artificial intelligence software it will look like this:



AI	Last Name	First Name	Patient ID	Birth Date	Study Date	Modality
	ANONYMIZE	ANONYMIZE	ANON	01/01/1970	22/08/2024 11:29	MG
	ANONYMIZE	ANONYMIZE	ANON	01/01/1970	15/04/2024 18:56	MG
	ANONYMIZE	ANONYMIZE	ANON	01/01/1970	31/01/2024 07:58	KO,MG

Image 134: studylist with AI

12 MAGNETIC RESONANCE TOOLS

12.1 Additional buttons in the context menu

ICON	NAME	FEATURE
	Invert image	It allows the user to invert black and white in the selected image
	Flip horizontally	It allows the user to flip horizontally the selected series
	Flip vertically	It allows the user to flip vertically the selected series
	Reverse image order	It allows the viewer to reverse the order of the instances

Table 41: Additional buttons in the context menu

12.2 Additional toolbar

The toolbar exposes the basic operations of the viewer:

ICON	TOOLTIP	FEATURE	
	Reference lines	Shows the reference lines to all sequences. When selected it opens a menu:	
			*Show all reference lines* It shows all reference lines of a sequence (“stack” modality)

			*Show single reference line* It shows the reference lines of the selected image (single modality)
			*Disable reference lines* It disables reference lines
	MPR	See **10 Multi Planar Reconstruction**	
	Enables/Disables space locator	It allows the user to locate a point in space. Selecting a spot on an axial image, the tool shows the user the same point in the associated coronal and sagittal images.	

Table 42: Additional toolbar

12.2.1 Reference Lines

The Reference Lines button, if activated, allows to show yellow lines (plane projection's line) over all shown sequences, as like in left side preview sequences.

When single reference lines are enabled, viewing multiple images draws a line on other images.

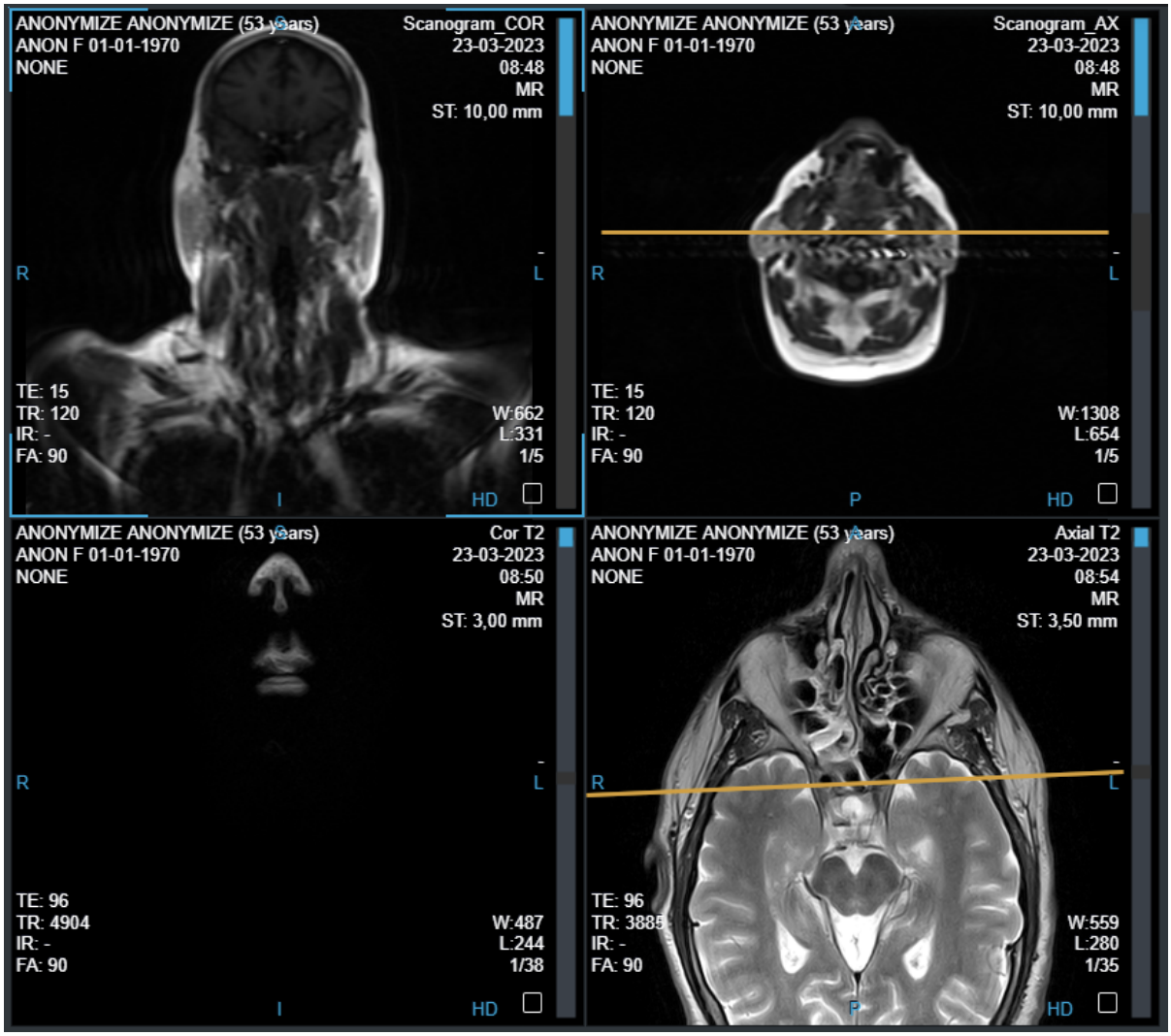


Image 135: Plane reference lines

When stack modality is enabled, viewing multiple images draws a stack of line on other images. They represent the projections of all slices of the selected sequence. The most intense line represents the current view.

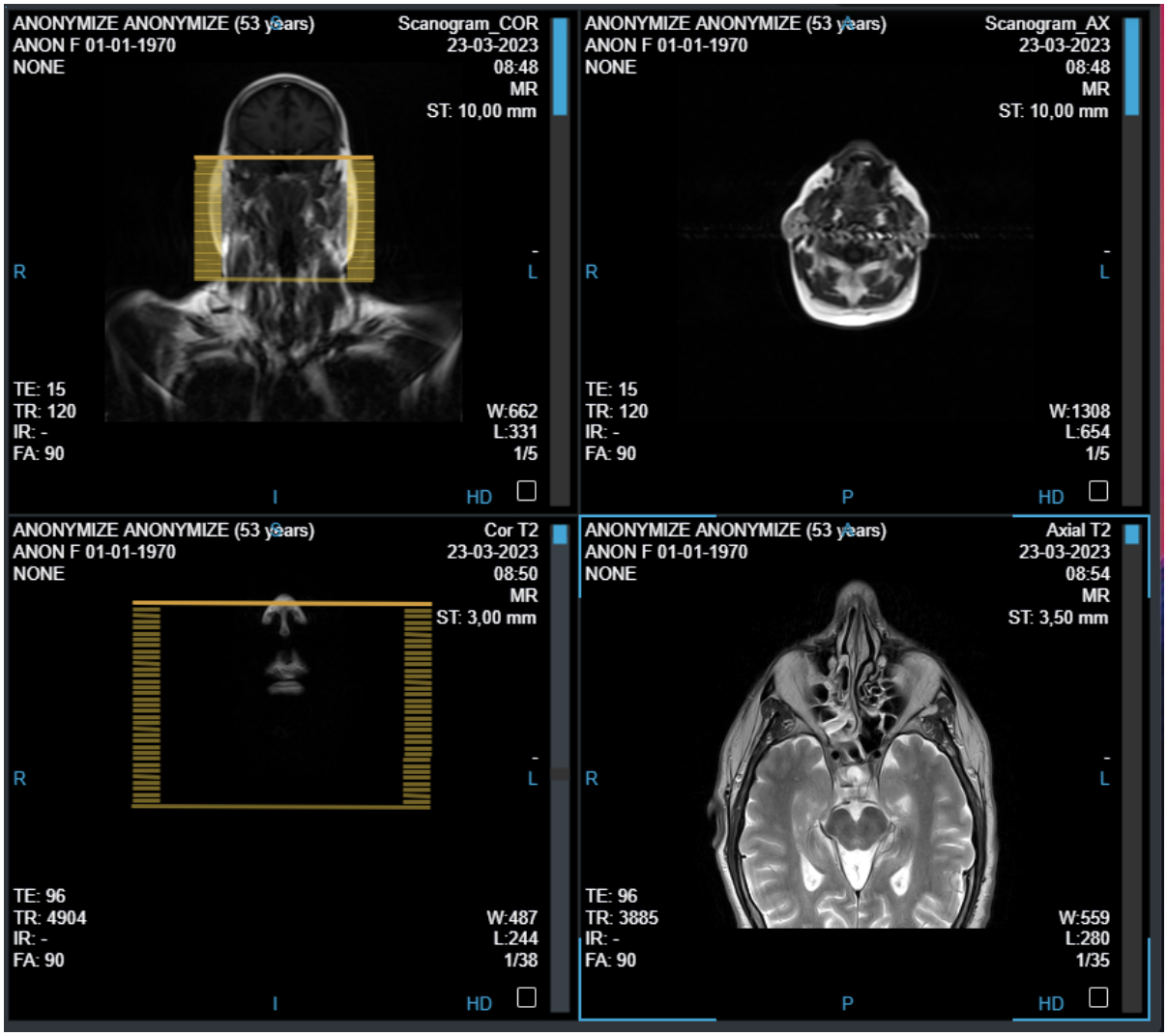


Image 136: Stack reference lines

12.3 Time-Intensity Curve (TIC)

The user can generate Time-Intensity Curves from dynamic Magnetic Resonance sequences.

12.3.1 Toolbar TIC

ICON	TOOLTIP	FEATURE

	Time- Intensity Curve Tools	It allows the user to open the tools menu for creating and displaying the Time-Intensity Curve on the screen:	
			*Open multiple sequences* It opens multiple sequences and allows selection of the study (up to 9 sequences)
			*Circular measure* It allows adding a single circular measurement
			*Time-intensity curve* It displays the Time-Intensity Curve

Table 43: TIC Toolbar

12.3.2 TIC creation workflow

The Time-Intensity Curve is displayed on the screen by following these steps:

1. Click on the bottom 
2. Click on  to select the study (if more than one has been opened) and the sequences that need to be opened (up to 9):

Image 137: Opening multiple sequences

By clicking on the 'OK' button, the system will closed the pop-up and open the selected sequences, displaying them with the correct layout.

3. The user can add a single circular measurement at the location of the lesion that has to be analyzed.The circular measurement can be added in three ways:
   - Using the dedicated button in the Time-Intensity Curve menu 
   - Pressing the 'O' key on the keyboard (if the shortcut is enabled)
   - Using the dedicated button in the context menu for circular measurement
4. Press the button  to display the curve on the screen:

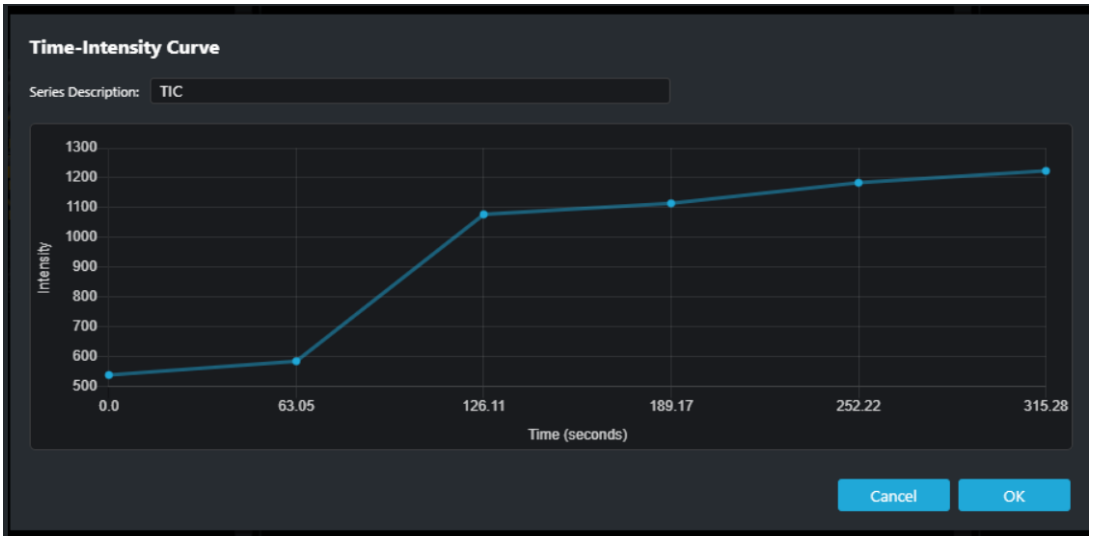
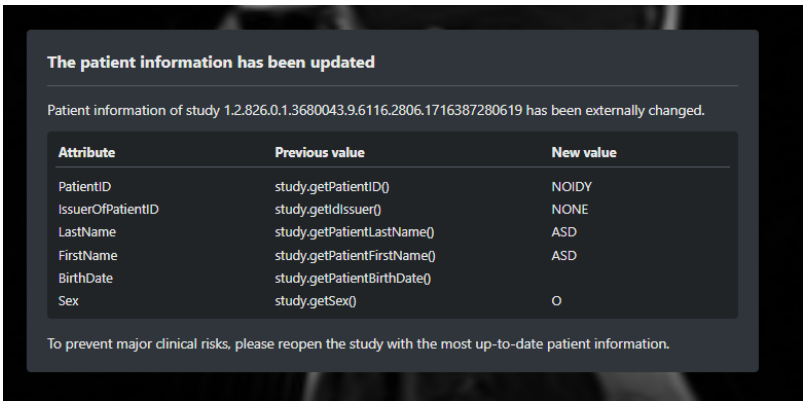
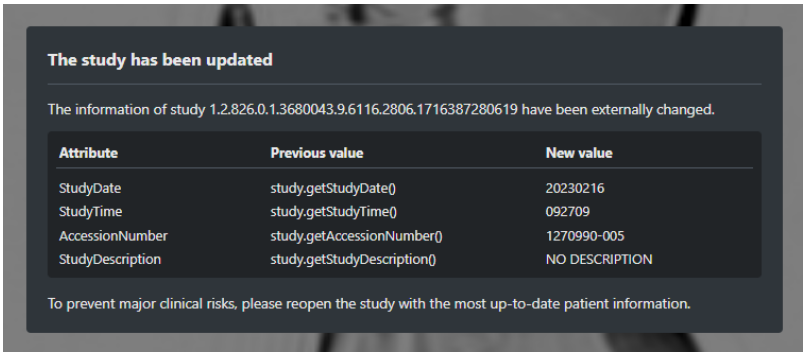


Image 138: Time-intensity Curve

13 INFORMATION UPDATE - POP UP

Updating the study's information triggers the display of various pop-ups in the ZEEROmed View, depending on the changes made.

The following table describes the pop-ups that will be displayed.

POP-UP	DESCRIPTION
Updating patient information  *Image 139: Update of the displayed study's patient information*	It notifies the user that the patient information of the currently displayed study has been updated in the storage system (e.g. update of the PatientID, First/Last Name, Birth date, sex, issuer of PatientID,...). The user is invited to reopen the study with the most up- to- date patient information to prevent major critical risks.
Updating study information  *Image 140: Update of the displayed study's information*	It notifies the user that the information of the currently displayed study has been updated in the storage system (e.g. Study date, Study time, Accession Number, Study description,...). The user is invited to reopen the study with the most up- to- date study information to pre-vent major critical risks.
Removing instances	It notifies the user that

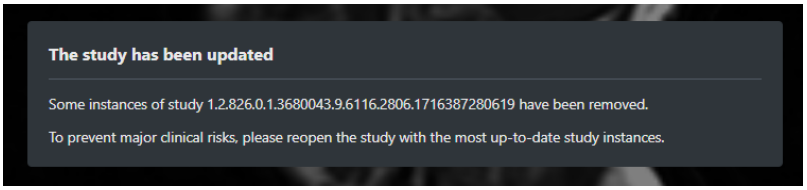


Image 141: Removal of instances from the displayed study

some instances of the currently displayed study have been removed from the storage system.

The user is invited to reopen the study with the most up- to- date study instances to prevent major critical risks.

Adding new instances

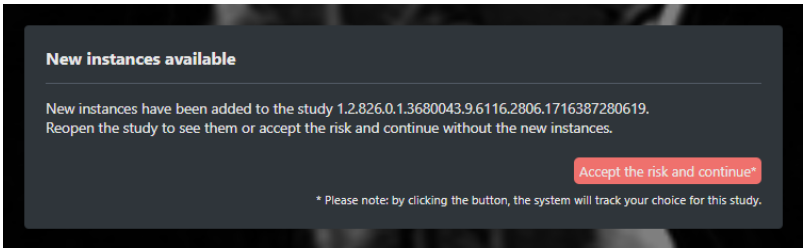


Image 142: Addition of instances to the displayed study

It notifies the user that new instances have been added to the currently displayed study.

To prevent major critical risks, the user is invited to reopen the study.

Alternatively, the user can accept the risk by clicking on the "Accept the risk and continue" button, and continue visualizing the study without the new instances. In this case, the system tracks the user's choice and informs the user accordingly:

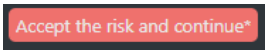


Image 143: "Accept the risk and continue" button

Table 44: Information update pop-up

14 OPHTALMOLOGY TOOLS

There are two modes that can be written in the "modality" field:

- OPT which refers to the OCT exam (Optical Coherence Tomography);
- OP which refers to Fundus Photography.

If there is a photograph of the fundus (OP) once the study has been opened by the studylist, by clicking on Layout 1x2:

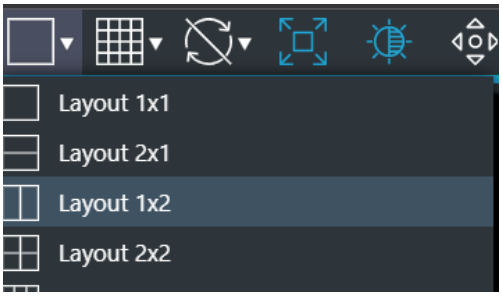


Image 144: Layout 1x2

It is possible to see the reference line (yellow) that allows you to understand in which part of the network retina you are scrolling in the OPT image.

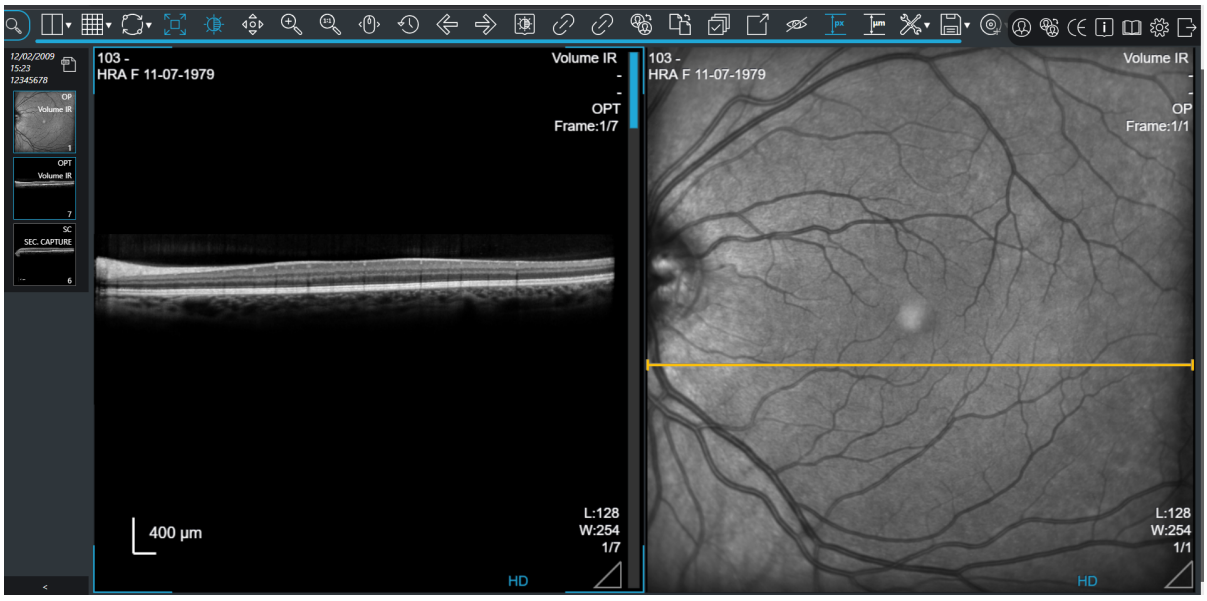


Image 145: Reference line (Yellow)

14.1 Additional toolbar

Since the pixels of the ophthalmology image are rectangular, the following tools are required:

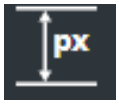
ICONS	TOOLTIP	DESCRIPTION
	PAR (Pixel Aspect Ratio)	Shows the image with rectangular pixels
	Uniformed PAR in line with the scale	It allows to smooth out the pixels making them squares

Table 45: Ophtalmology tools

The scale that is used for Ophthalmology images is 400 µm and is shown below left in the image.

14.2 Measures

Possible measures are:

- Linear;
- Circular;
- Rectangular.

There is no angular measure.

14.3 RGB channels filter

The "Channels picker" icon in the toolbar  allows the user to highlight a color component or a combination of two color components in an OP (*fundus oculi*) image.

Clicking the icon opens a pop-up that allows to isolate a single channel or a combination of them and display them in a grayscale color map. Users can select the following color(s):

- Red: only the red channel;
- Green: only the green channel;
- Blue: only the blue channel;
- Yellow: sum of red and green channels;
- Magenta: sum of red and blue channels;
- Cyan: sum of green and blue channels.

When a channel is enabled, the button icon will be highlighted in the color of the selected channel. This allows the user to immediately identify the active channel for any given image. For example, when the green channel is selected, the icon will be highlighted in green: .

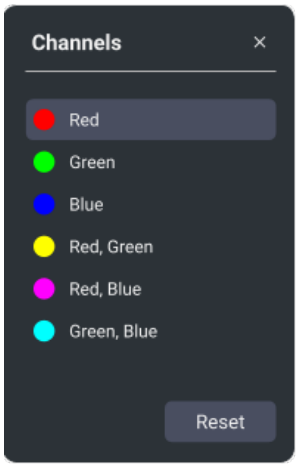


Image 146: "Channels picker" pop-up

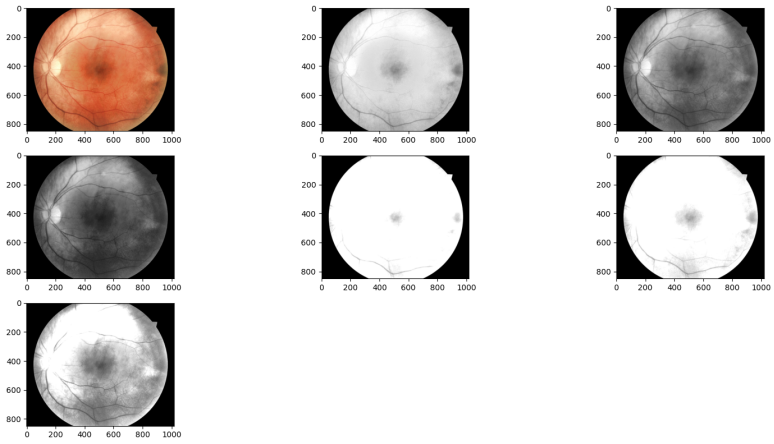


Image 147: Example of RGB filters

To restore the original image without channel isolation, click the "Reset" button.

15 TOOLS TO VIEW AND EDIT VIDEOS

ZEEROmed View allows viewing videos encapsulated in DICOM format.

Videos within in the sequence are displayed as previews in the main screen.

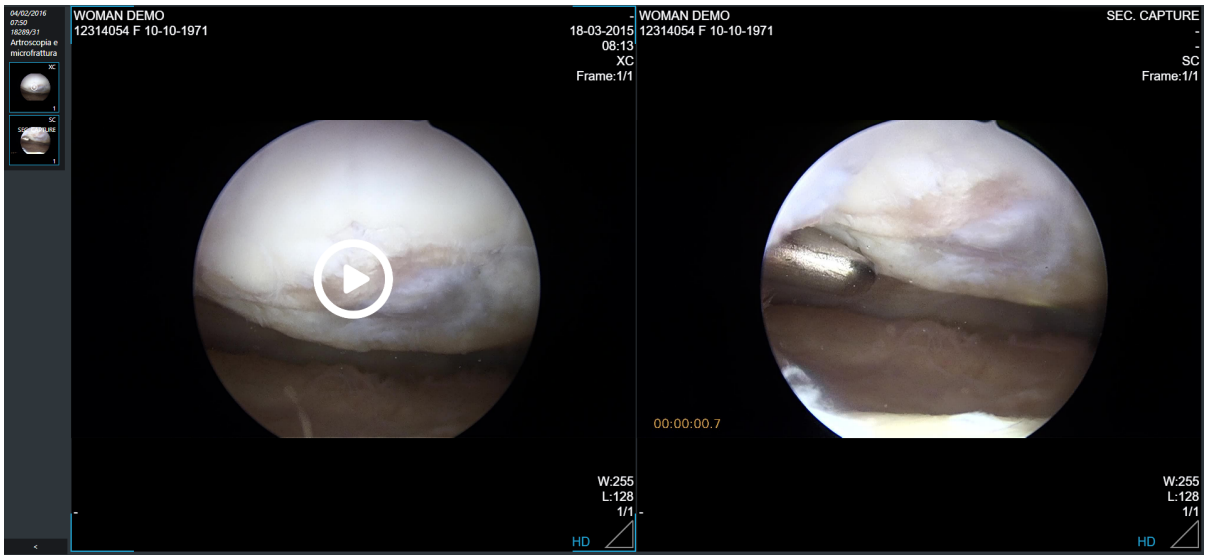


Image 148: Video preview

The "Play" icon in the video preview enables to play and edit the video:

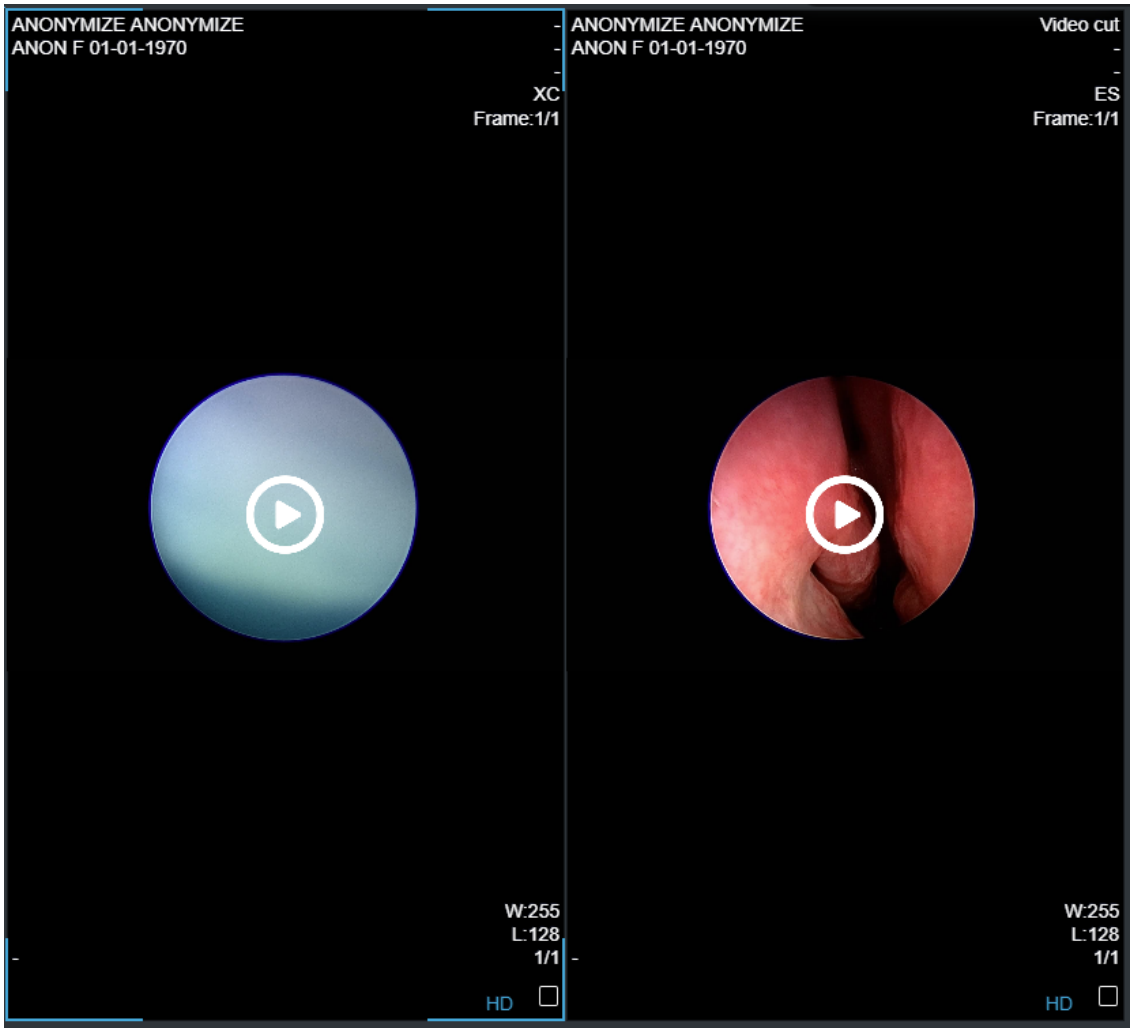


Image 149: Video tools

To navigate quickly to a specific frame of the video, the user can drag the mouse pointer or click on the specific frame of the timeline

Image 150: Navigating into the timeline

Additionally, the "Left" and "Right" arrow key from the keyboard move 10 seconds backward and forward from the current time.

The video tools are present in the toolbar below the video (as can be seen by the image) and they include:

Image 151: Video toolbar

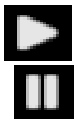
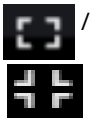
ICON	NAME	FEATURE
	Play / Pause video	Plays and pauses the video. Also the "Space" key on the keyboard toogles the "Play/Pause button".
	Volume	Turns the volume "On" and "Off". To adjust the volume, the user can drag the mouse pointer or click on the desired volume level on the volume bar 
	Full-screen mode	Expands the video to full-screen. Pressing “ESC” or the proper button exits full-screen mode. The"f" key on the keyboard toogles full-screen mode.
	Take a snapshot	Captures a snapshot of the video. See chapter **15.1 Taking a snapshot** for more information
	Cut selected range	Cuts the video. See chapter **15.2 Cutting a video** for more information

Table 46: Video toolbar buttons

15.1 Taking a snapshot

Clicking on the "Take a snapshot" icon  allows the user to save a snapshot of the video.

Upon clicking on the icon, a pop-up appears on the right of the screen, enabling the user to save ("Save" button) or delete ("Clear all") the snapshot taken.

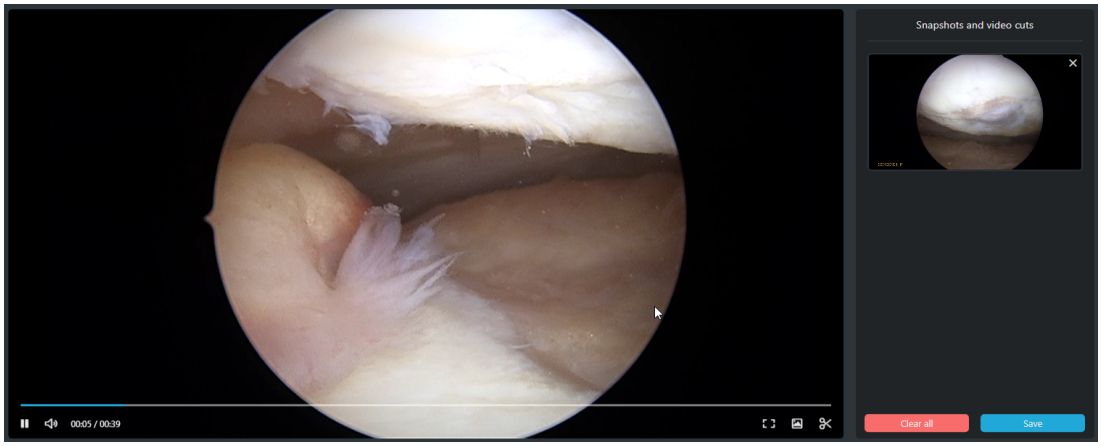


Image 152: Video editing: taking a snapshot

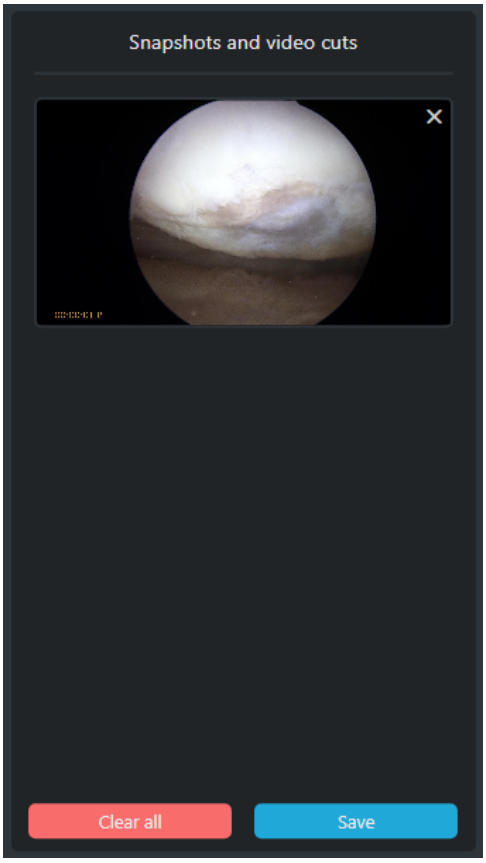


Image 153: Video editing: taking a snapshot panel

Clicking the "Save" button saves the secondary capture (SC) in DICOM format. A timestamp of the frame (seconds from the start of the video) is added to the bottom left on the saved snapshot.

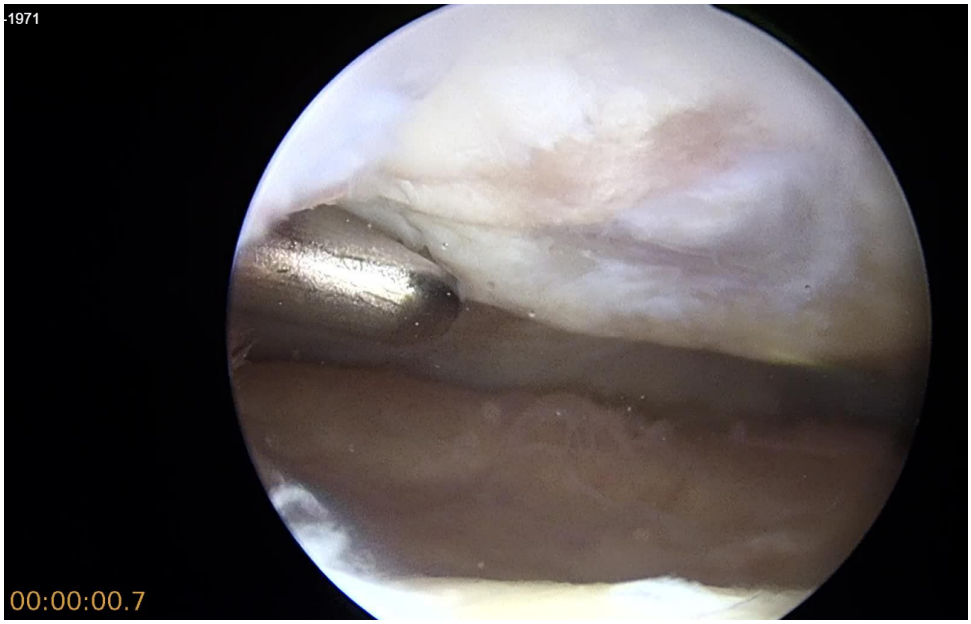


Image 154: Secondary Capture (SC)

15.2 Cutting a video

Clicking on the "Cut selected range" icon allows the user to cut a portion of the video and save the remaining part as a "video cut" file (ES).

Upon clicking the icon, a pop-up appears, allowing the user to choose the resolution of the video to be cut (original or lower) and save the settings.

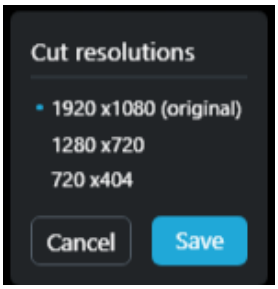


Image 155: Setting for video cutting

Then the "Snapshot and video cuts" pop-up is displayed on the right of the screen, allowing the user to save ("Save" button) or delete ("Clear all") the video portion. A preview of video is displayed in the pop-up.

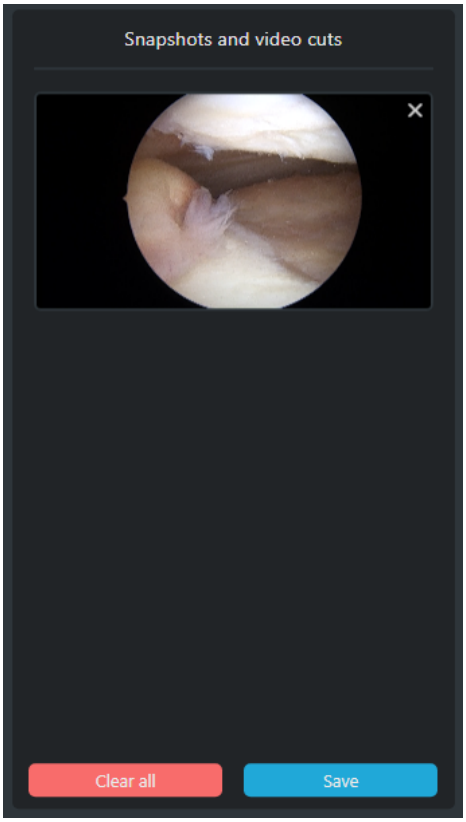


Image 156: Video editing: cutting the video

16 CARDIOLOGICAL TOOLS

ZEEROmed View, if configured, allows the user to visualize two-dimensional DICOM ECG.

The ECG panel includes the following sections:

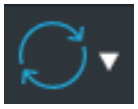
- Menu with additional tools in the upper toolbar (see chapter **16.1 Additional toolbar**);
- Patient data in the top-left corner;
- Exam data in the top-right corner;
- ECG trace in the center of the screen;
- ECG parameters in the bottom toolbar (e.g. PR, QRSd, QT, QTc, RR, FREQ, ST, PRT Axes, NiBP, HRV RMSSD*, BRT*);
- Reports in the lower section of the screen.

**Only if provided by third parties.*

Image 157: ECG viewer

16.1 Additional toolbar

In the ECG menu, the user can see different buttons than in the classical view:

ICON	NAME	FEATURE
	Send report	It allows the user to send report to the Information System (if configured)
	Save report	It allows the user to save the report in a selected folder on the server.
	Start comparison	It displays side by side two different exams, in order to make a comparison. Comparing ECGs provides synchronization by default, and sync: • Pan • View (NxM) • Applied filter • Applied voltage
	Link panels	When selected it propagates to all sequences the operations of filtering, visualization, applied voltage, zoom and pan performed on the active sequence
	Fit to window	It adapts the scale of visualization of the active sequence so that its image fits the containing panel
	Pan	Mutually exclusive to “Zoom”. Sets “Pan” as active operation
	Zoom	Mutually exclusive to “Pan”. Sets “Zoom” as active operation.

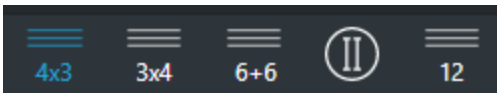
	Measures	It allows the user to take measurements in ms and mV. See **16.1.1 Taking a measurement**
	Visualization layout	It allows the user to view leads in different layouts (4 rows and 3 columns, 3 rows and 4 columns, 6 rows and 2 columns, 12 rows and 1 column).
	Visualization of track II	It allows the visualization of the long signal. It visualizes only one the track II.
	Vertical scale	It allows the user to decide the values of the vertical scale in mm / mV (5, 10, 20 or 40 mm / mV)
	Filter	Enable or disable a 25, 40, 150 or 300 Hz filter. A notch filter at 50Hz/60Hz (it depends on the geographic installation of the system) is always present.
	Report export (PDF)	Allows to export a report in pdf format, see **16.3 PDF report creation and sending**

Table 47: ECG tools

16.1.1 Taking a measurement

16.1.1.1 Measuring an interval (ms)

To measure an interval in ms:

1. Click the 'ECG measurement' button 
2. Drag the mouse horizontally from the beginning to the end of the desired interval

Image 158: Interval measurement (ms)

16.1.1.2 Measuring an amplitude (mV)

To measure the amplitude of a waveform in mV:

1. Click the 'ECG measurement (Amplitude)' button
2. Drag the mouse vertically to measure the desired amplitude

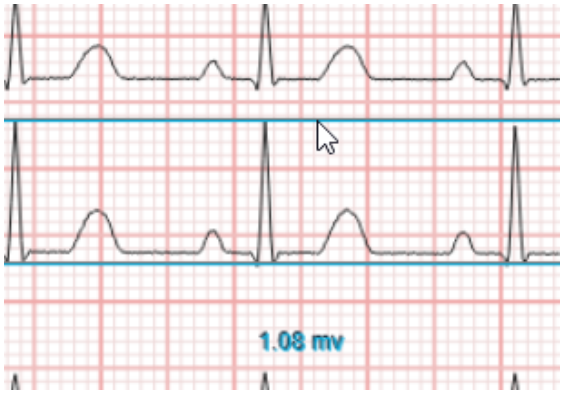


Image 159: Amplitude of a waveform in mV

16.2 Modying ECG parameters (RR, QT, QRS, PR, ST)

> **Note**: when a study is opened, ZEEROmed View automatically displays the parameters provided by the electrocardiograph

To modify a parameter:

1. Select the parameter to be edited from the lower toolbar (it will be highlighted in blue):

Image 160: Parameter selection

2. Drag the cursor from the start to the end point of the interval to be adjusted

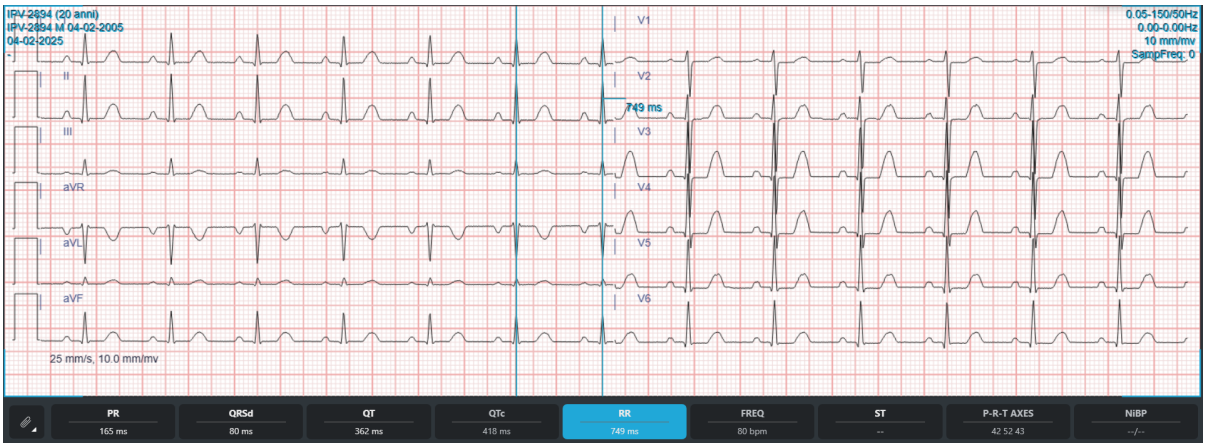


Image 161: Parameter modification

ZEEROmed View automatically updates the related parameters.

> ⚠ **Warning**: to correctly display the **QTc** of an interval, both the RR and QT values must be adjusted

16.2.1 Selecting, editing and moving an interval

To view and select the interval endpoints, click inside the interval.

To adjust an endpoint, select the interval and drag the endpoint holding down the left mouse button.

To move the entire interval, select the interval and drag it using the left mouse button.

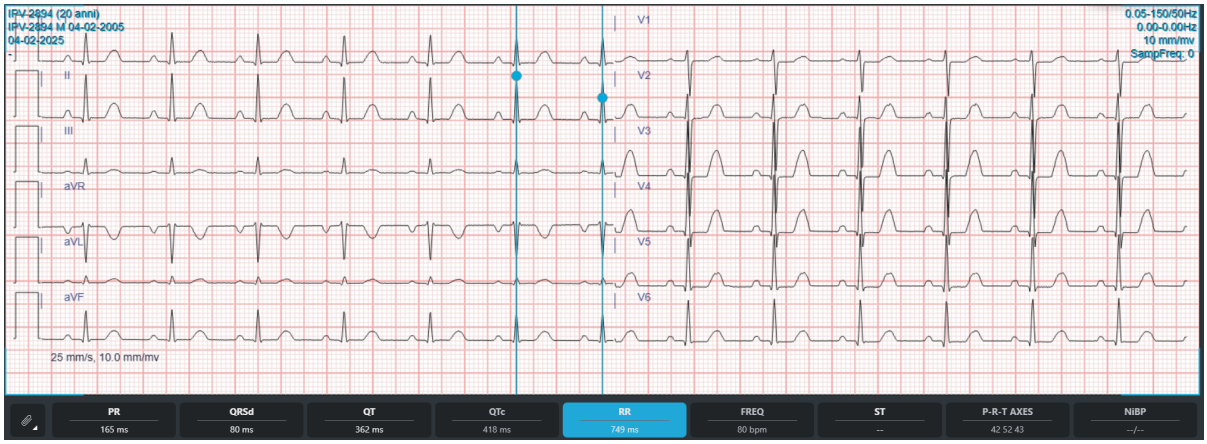


Image 162: Range measurement endpoints

16.3 PDF report creation and sending

The user can create pdf report. The writing part is available on the bottom: it is a text area in which the user can write a text. It will be inserted in the PDF report.

This report is structured as follows:

- In the top:
  - logos and data of the customer;
  - patient data (name, surname, brithdate, sex, age);
  - exam date and time, visualization scale and eventual applied filter;
- In the lower part:
  - ECG signal;
  - measures (PR, QRSD, QT, QTC, RR, Freq, ST, QRS axis);
- On the bottom:
  - medical report;
  - report creation date and time.

Image 163: Pdf report

16.3.1 Reporting macro

If configured ZEEROmed View allows a communication with the Information System.

The user can choose the configuration of ZEEROmed View:

- whether visualise the automatic interpretation of the electrocardiogram: if no the initial report is empty;
- whether insert macros: the user can insert some macros, which are composed which are composed of a title and text. The title appears on the buttons displayed on the bottom left , see **Image 164: Macros configuration**, the text is automatically added clicking on the corresponding button.

If a previous closed report is available, that report is visualised and the user will be not able to modify it.

Image 164: Macros configuration

16.4 Holter/Stress test Viewer

ZEEROmed View, if configured, allows the user to visualize holter and stress tests in PDF format.

The HOLTER/STRESS panel has three sections:

- Navigator trough the study holter/stress history in the top centre of the screen
  - The mouse cursor on the PDF icon allows the user to see a tooltip with date and time of the report;
  - A click on the yellow arrows allows the user to navigate through the various report of the study;
- Patient history and label in the top right of the screen;
- PDF viewer in the middle.

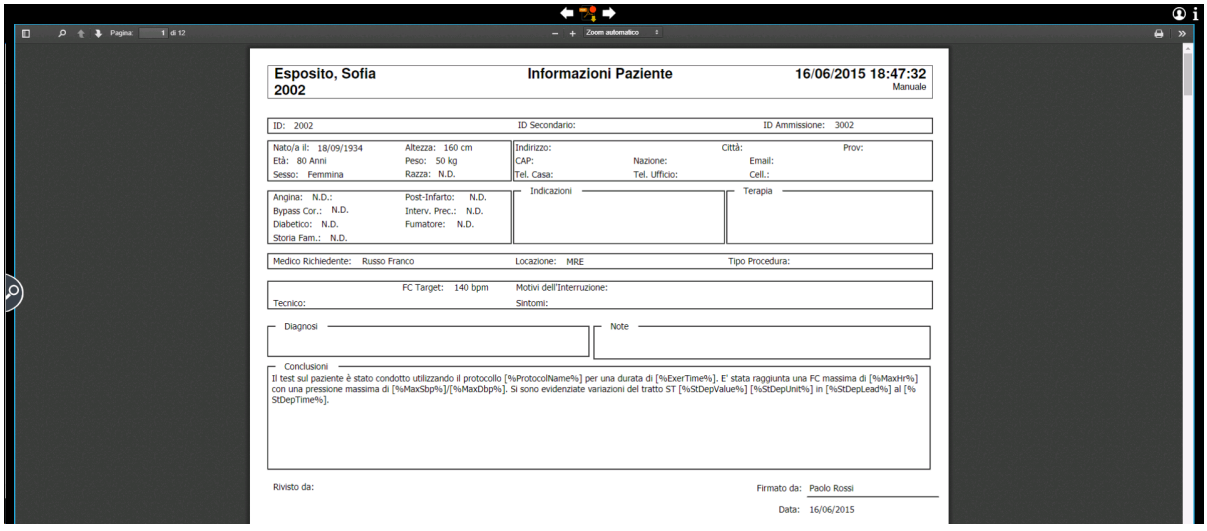


Image 165: Holter/stress test

17 ANATOMO PATHOLOGY TOOLS

ZEEROmed View allows the user to visualize anatomo pathology images.

The following image shows the dashboard of the digital pathology module of the viewer:

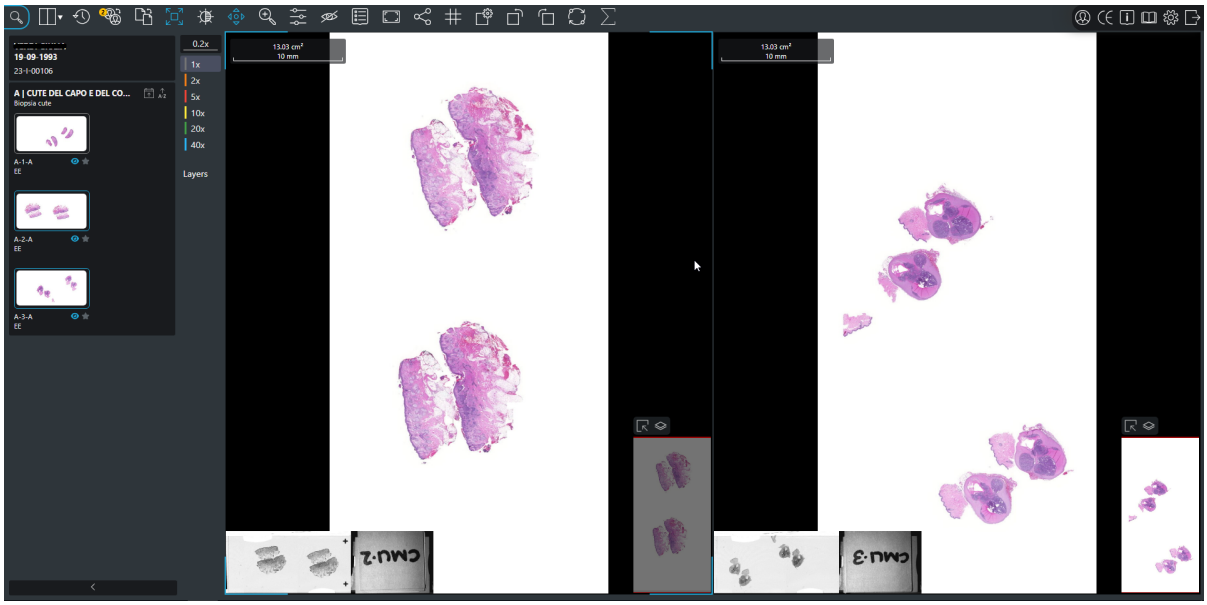


Image 166: Anatomo-Pathology Tools

In the upper left is shown the toolbar while on the left there is the "Virtual tray" (for more information check the paragraph **17.2 Virtual Tray**).

In the image of the slide, on the bottom left, there are the macro (photograph) and the label of the slide, which are essential to uniquely identify it (paragraph **17.1.4 Layout configuration**); finally, in the lower right there is the navigation map that allows the user to have information on the portion of the slide displayed (paragraph **17.4 Navigation map**).

The following paragraphs describe the features mentioned above.

17.1 Features

The toolbar is displayed in the top left of the main screen:

Image 167: Toolbar

The table describes the main functionalities and characteristics of the icons present in the toolbar:

ICON	NAME	DESCRIPTION
	Research	Return to the product home screen and select another patient or study
	Layout	Displays the "*sequence layout*" menu; allows to view one or more images (up to 12 images) at the same time and change their layout (paragraph **7.1.1 Displaying more images of one sequence**)
	Reset	Reset the studio's initial display status
	Start smart comparison	Allows to make a comparison the last examination of the patient obtained with the same modality (paragraph **7.2.1 Smart comparison between two exams**) . NOTE: this button is not present in case of double monitor
	Start comparison (mutually exclusive with the previous)	Displays the patient history and choose the exam to open for comparison (paragraph **7 General Tools**). NOTE: this button is not present in case of double monitor
	Fit to screen	Change the display scale of the selected sequence to fit the image size to the panel. Can be activated by pressing the button "**F**"
	Show/Hide color correction window	Opens a panel that allows the user to correct the range, the brightness and contrast, and to balance the color of the image (paragraph **17.1.5 Color correction**
	Show/Hide labels	Allows the label and navigation map to be displayed in the lower section
	View DICOM Tag	Displays the DICOM Tags of the selected instance

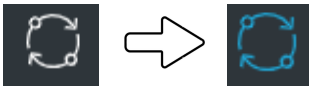
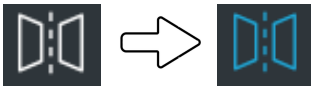
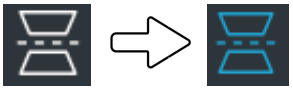
	Export displayed region	Save a secondary capture of the visualized image (paragraph **17.7 ROI - Snapshot**)
	Share the current exam with someone else	Opens the sharing section of the study (**7.2.6 Share Exam**)
	Align images	Grid for manually aligning images in the screen (paragraph **17.1.3 Images alignment**)
	Show/Hide layout configuration win-dow	Allows the user to displays the layout configuration menu (paragraph **17.1.4 Layout configuration**)
	Rotate left 90°	Allows the image to rotate counterclockwise (para-graph **17.1.2 Images rotation**)
	Rotate right 90°	Allows the image to rotate clockwise (paragraph **17.1.2 Images rotation**)
	Link panels	It enables the panels synchronization. By default, the images are not synchronized (the icon is gray); by clicking the button, the images synchornize and the icon turns blue (paragraph **17.1.1 Link panels**)
	Cell counter (Open the cell counter popup)	It automatically returns the number of cells manu-ally highlighted by the user. By activating the icon, a pop-up opens and the number of selected cells present in the slide or in a specific area defined by the user is displayed (paragraph **17.1.6 Cell counter**)
	Flip Horizontally	It enables the horizontal flip of the slide. It is a toogle-style button; once selected, the icon turns blue and the slide is flipped right/left
	Flip Vertically	It enables the vertical flip of the slide. It is a toogle-style button; once selected, the icon turns blue and the slide is flipped up/down

Table 48: Anatomo Pathology tools

In the following paragraphs, some of the features in the table above are specifically described.

17.1.1 Link panels

User can choose to synchronize the images in the panel.

By default, images are not synchronized and the icon present in the toolbar appears grey  Zoom, slide navigation and images rotation are not synchronized and they are applied only to the selected image.

By clicking the button, the icon turns blue  , the images are synchronized and all the functionalities are automatically applied to both slides.

17.1.2 Images rotation

ICON/KEY	FUNCTION
	Rotate 90° clockwise
	Rotate 90° counterclockwise
→	Rotate 15° clockwise
←	Rotate 15° counterclockwise

Table 49: Icons and keys for image rotation

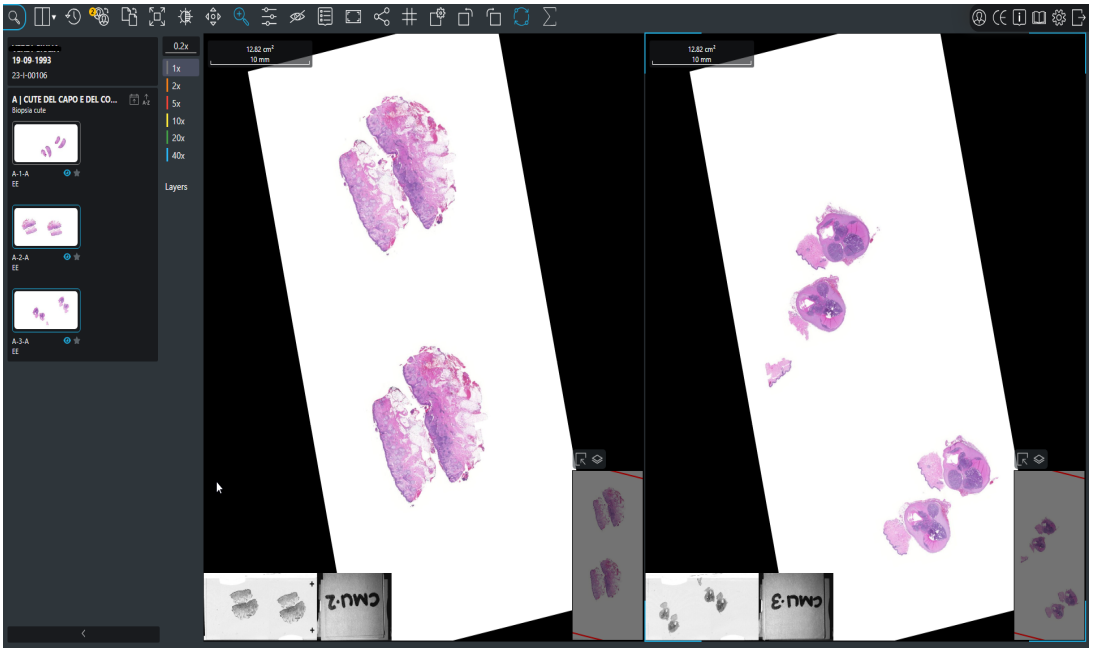


Image 168: Images rotation

17.1.3 Images alignment

ZEEROmed View allows the simultaneous display of multiple digital slides belonging to the same case, up to a maximum of 12 images. The images in the different panels are not synchronized and can be aligned manually by clicking on the icon # present in the toolbar.

By selecting this button, the user, with the help of the blue reference grid, can align the images manually (dragging and/or rotating the image).

Deselecting the icon will preserve the alignment introduced between the images.

NOTE: to proceed with image alignment, user must ensure that the panel synchronization icon is deactivated (gray).

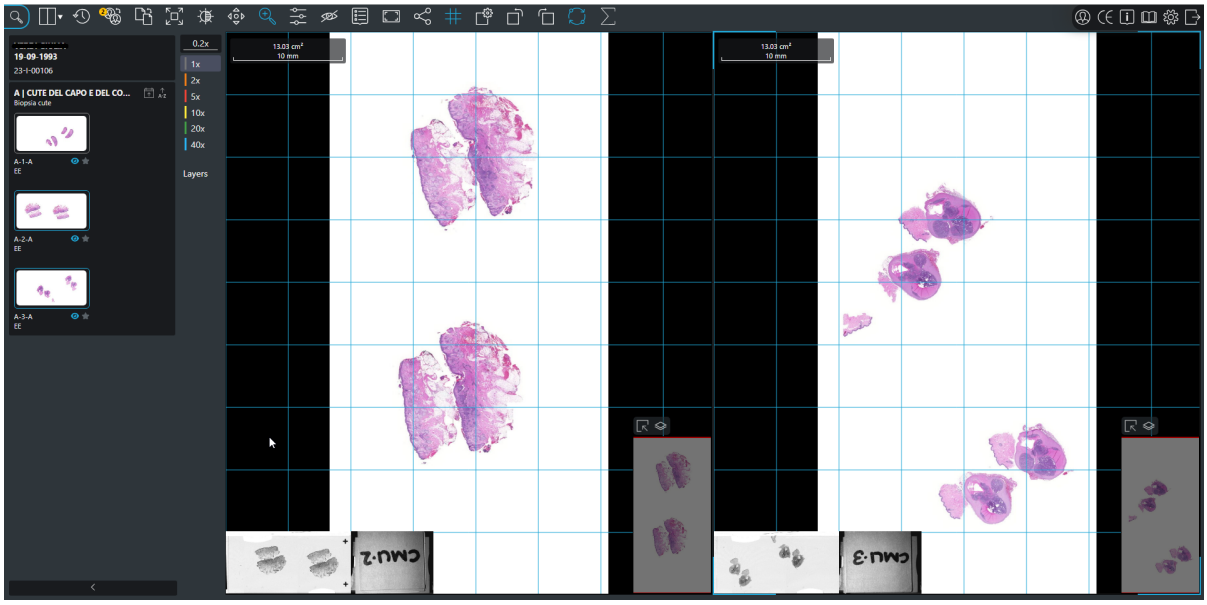


Image 169: Images alignment

17.1.4 Layout configuration

Clicking on the icon  in the toolbar, the user visualize the configuration layout panel:

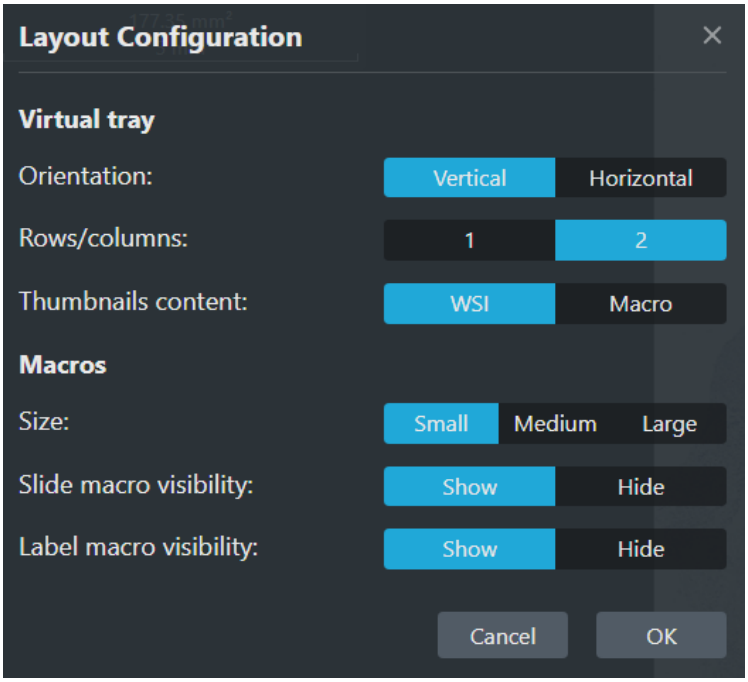


Image 170: Configuration layout panel

In the configuration panel the user can change the layout of the virtual tray (described in the paragraph **17.2 Virtual Tray**), specifying the orientation (horizontal or vertical), the number of rows or columns on which slides should be placed and the preference in displaying slides (WSI) or macros.

In addition, the user can:

- Configure the macro and/or slide size by selecting the "small", "medium", "large" button;
- Enable/disbilitate slide macro display;
- Enable/disable the label macro.

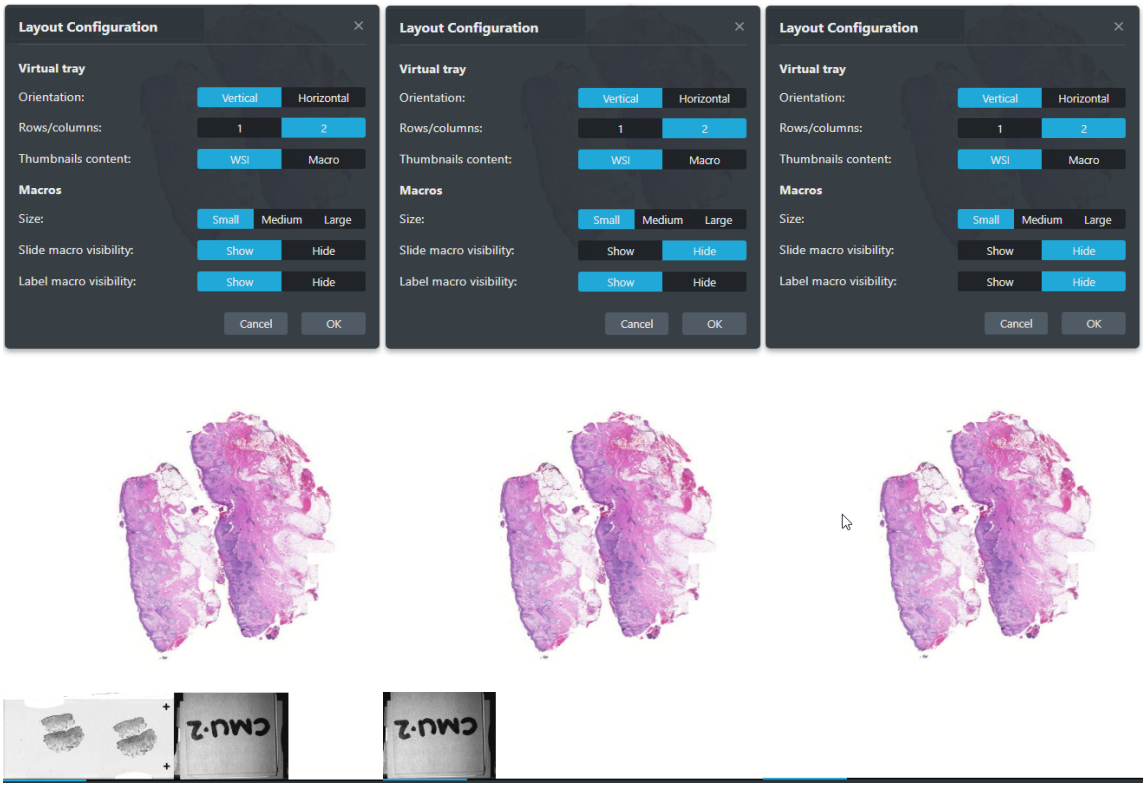


Image 171: Various layout configurations

Going into detail, the table below summarizes the functionality of each user-configurable option:

	OPTION	FUNCTIONALITIES
Virtual Tray	Orientation	User can choose whether to display slides horizontally or vertically
	Number of slides per row / column	User can choose the number of slides to display for each row or column.

		This number can be 1 or 2.
	Preview content	User can choose whether to display slides or labels in previews
Macros	Dimension	User can choose the magnification level (large, medium or small) of the label/slide at mouse hover
	Macro slide visibility	User can decide whether to display the slide macro in the bottom left
	Label slide visibility	User can decide whether to display the slide label on the bottom left

Table 50: Layout configuration

⚠ **Warning**: these changes are saved on the system and apply whenever the user opens a studio withZEEROmed View. They can be changed again at any time

17.1.5 Color correction

17.1.5.1 ICC Profile

For SVS slides containing ICC profiles, ZEEROmed View automatically applies the embedded ICC profile.

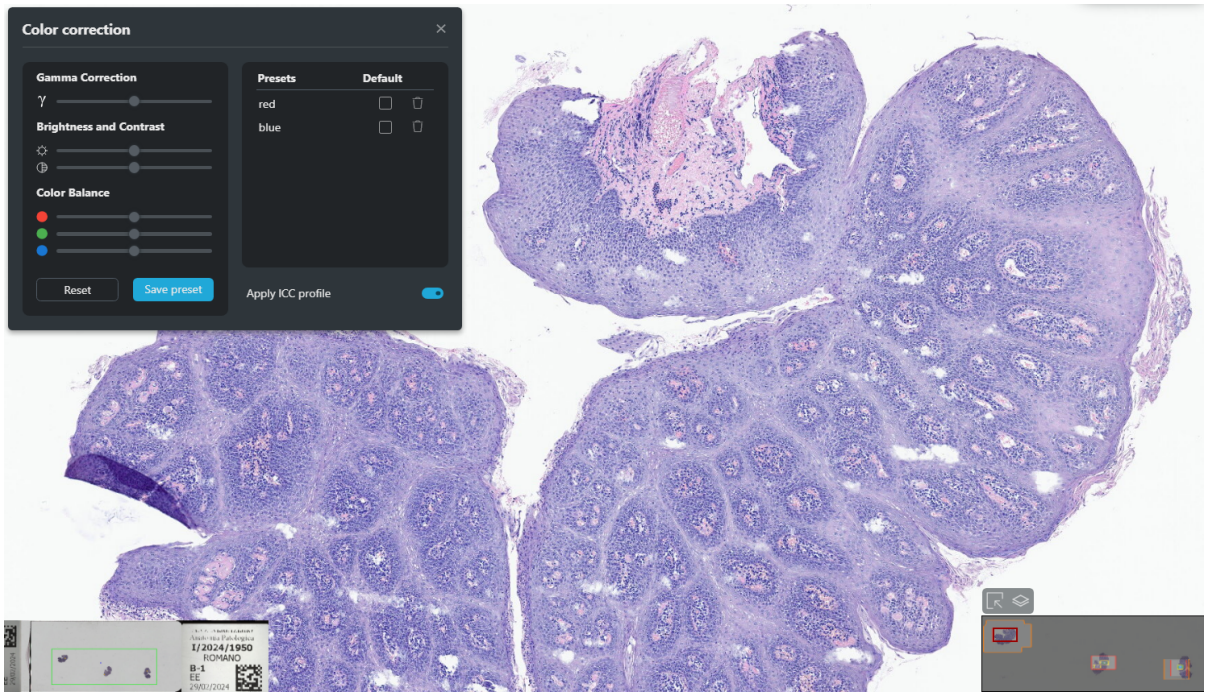


Image 172: Application of ICC profile

To disable the ICC profile:

1. Click the 'Show/Hide Color Correction window' button to open the 'Color correction' panel;
2. Deselect the 'Apply ICC profile' option.

This setting remains in effect only for the current slide and until the study is closed.

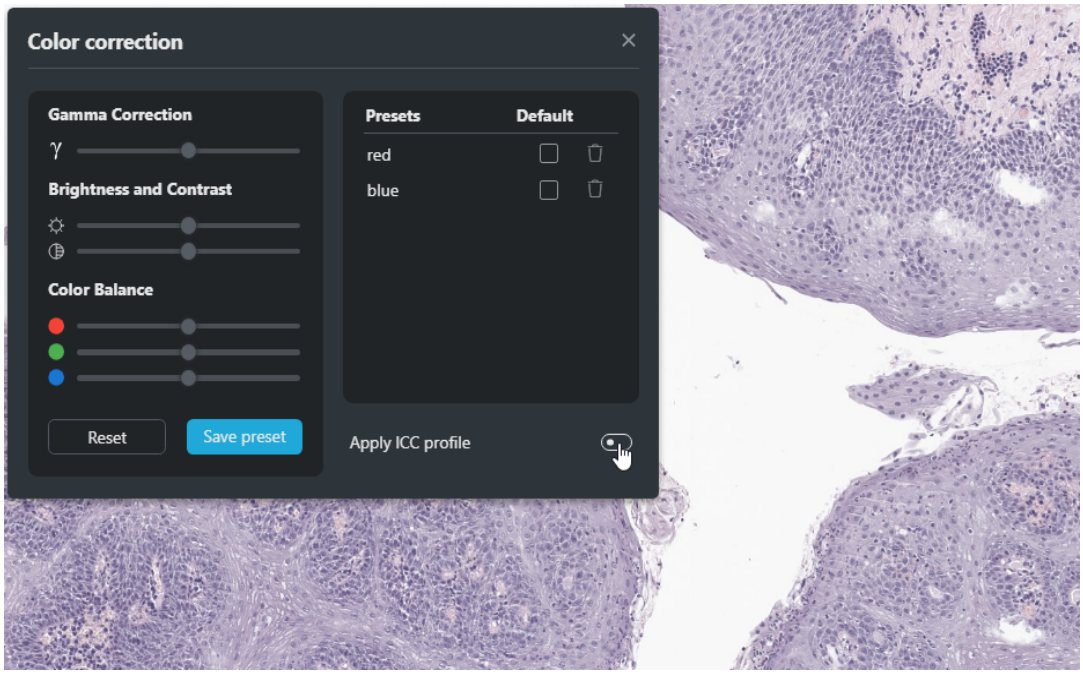


Image 173: ICC profile disabling

17.1.5.2 Temporary color correction

The ZEEROmed View allows the user to make some temporary changes to the image.

Selecting the "Show/Hide Color Correction window" button on the toolbar , user can correct brightness and contrast, red, green and blue color balance and perform gamma correction.

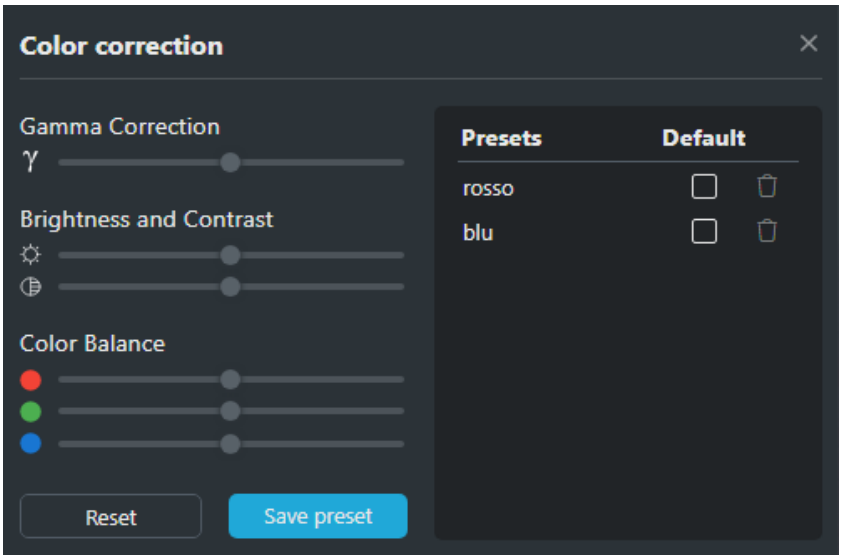


Image 174: Colour window panel

> ⚠ **Warning**: Changes remain active until the end of the session on the specific slide

In case the user wants to restore the image to the initial condition, he can select the "*Reset*" button of the panel itself or the "*Reset*" icon of the toolbar .

17.1.5.3 Save a preset

1. Set the desired levels of gamma correction, brightness and contrast, and color balance;
2. Click on the "*Save preset*" button;
3. Assign a unique name to the *preset* in the provided pop-up: 
4. Press the "Enter" key to save the preset or the "Esc" key to cancel the operation.

The following toaster will notify the user that the preset has been saved:

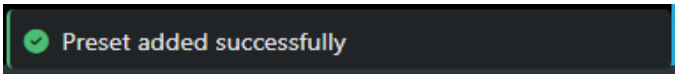


Image 175: Toaster "Preset added"

17.1.5.4 Apply a saved preset to another slide

To apply the color correction parameters to another slide, simply select the corresponding preset from the panel. The ZEEROmed View will automatically apply the parameters to the image.

In case the user wants to restore the image to the initial condition, he can select the "*Reset*" button of the panel itself or the "*Reset*" icon of the toolbar .

17.1.5.5 Default color correction application

User can also save color correction presets and mark them as "*default*" to automatically apply these setting to all other anatomopathology images in every case. In this situation, the color profile is applied at the user level rather than at the "case" level. The following toaster will inform the user that a present has been automatically applied to the images.

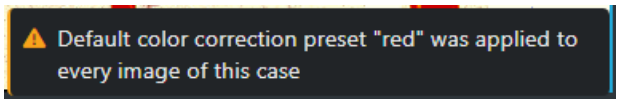


Image 176: Toaster "Filter applied"

To mark a preset as "default" and apply it to all images, check the box in the "Default" column of the panel.

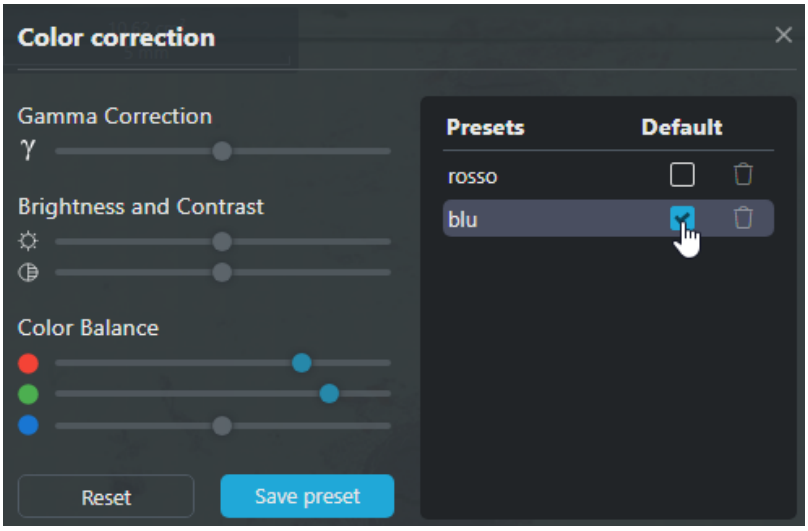


Image 177: Marking a preset as "default"

17.1.5.6 Delete a preset

1. In the panel, click on the "*Delete*" icon in the row of the preset to be deleted;
2. Click on the "Delete" button in the respective pop-up

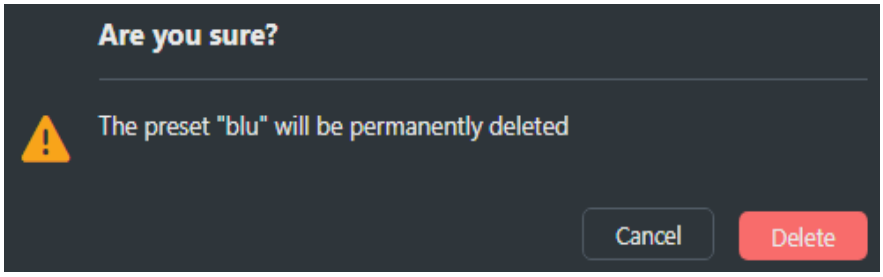


Image 178: DIDASCALIA

17.1.6 Cell counter

The "*Cell counter*" tool of the viewer automatically returns the number of markers manually placed by the user in a portion of the image.

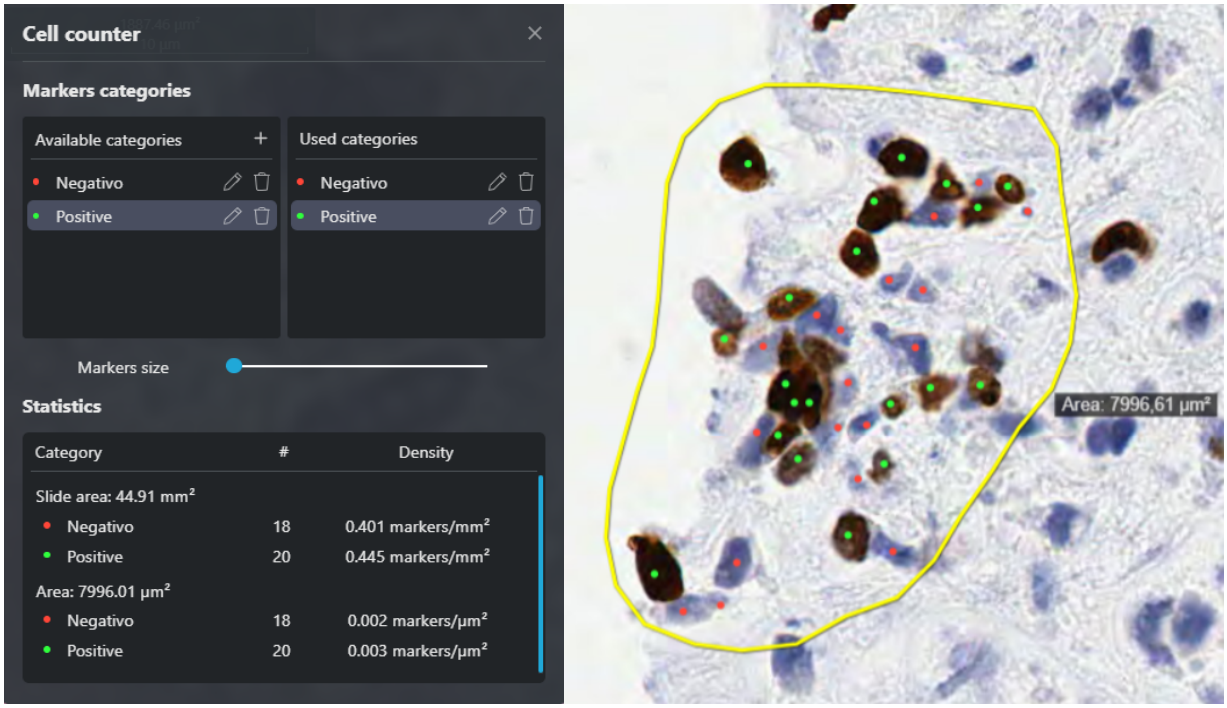


Image 179: Cell counter tool

17.1.6.1 Definitions

- *Marker*: a single point placed on an image;
- *Category*: unique grouping of markers defined by a name and color customizable by the user. There are two types of categories: "available" and "used".
  - *Available categories*: contain the types of markers defined by the user; by default the categories present are Positive and Negative
  - *Used categories*: contain the types of markers present on the selected image.

17.1.6.2 Operations on "Categories"

The table below outlines the main steps to customize the "Categories".

ICON	NAME	FUNCTIONALITY
	Create a new marker category	User can add a new category to the list of available categories. As soon as the icon is selected, a pop-up opens to enter the category name and the color to be used.

		 To save the new category, it is necessary to click on the "*Save Changes*" icon, while to cancel, click on the 'Revert changes' button. ⚠ **Attention**: both fields, name and color, must be filled to save the new marker category.
	Update category	**Available categories**: by clicking on the icon of an "*Available categories*", the user can update the name and/or color of the selected category. ⚠ **Attention**: this operation **does not imply**the update of markers already positioned on the images; only the "new" markers will have the updated name and color. To save the changes, it is necessary to click on the "*Save Changes*" icon, while to discard them and restore the initial state, click on the "*Revert changes*" button.
		Used categories: by clicking on the icon of an "*Used categories*", the user can update the name and/or color of the selected category. ⚠ **Attention**: this operation **implies** updating the name and/or color of markers previously placed on the image. To save the changes, it is necessary to click on the "Save Changes" icon, while to discard them and restore the initial state, click on the "Revert changes" button.
	Delete category	**Available categories**: by clicking on the icon of an "Available categories" the selected category is deleted. ⚠ **Attention**: this operation **does not imply** the deletion of markers already placed on the images.

		Used categories: by clicking on the icon of an "Used categories", the selected category is deleted **along** with all markers already placed on the current image. ⚠ **Attention**: this operation **does not imply** the deletion of markers from this category previously placed on other images.

Table 51: Cell counter buttons

17.1.6.3 How to place a Marker

1. Select the "*Open the cell counter popup*" icon  .
2. Choose the marker's category from the "Available categories" or "Used categories" list.
3. Click on the image point where the user wants to place the marker.

At this point, the "Statistics" section of the popup will automatically populate with information regarding the number of markers present and cell density.

⚠ **Warning**: it is not possible to delete individual marker, but only the associated category (see paragraph **17.1.6.2 Operations on "Categories"** Operations on "Categories").

Additionally, it is not possible to modify the placement of markers

17.1.6.4 Marker grouping with Area Measurement

Once markers have been places (see paragraph **17 Anatomo Pathology tools**), it is possible to group them using any area measurement (see paragraph **17 Anatomo Pathology tools**: circular measure, rectangular measure, polygon measure, free hand measure). This operation updates the "Statistics" panel in the popup:

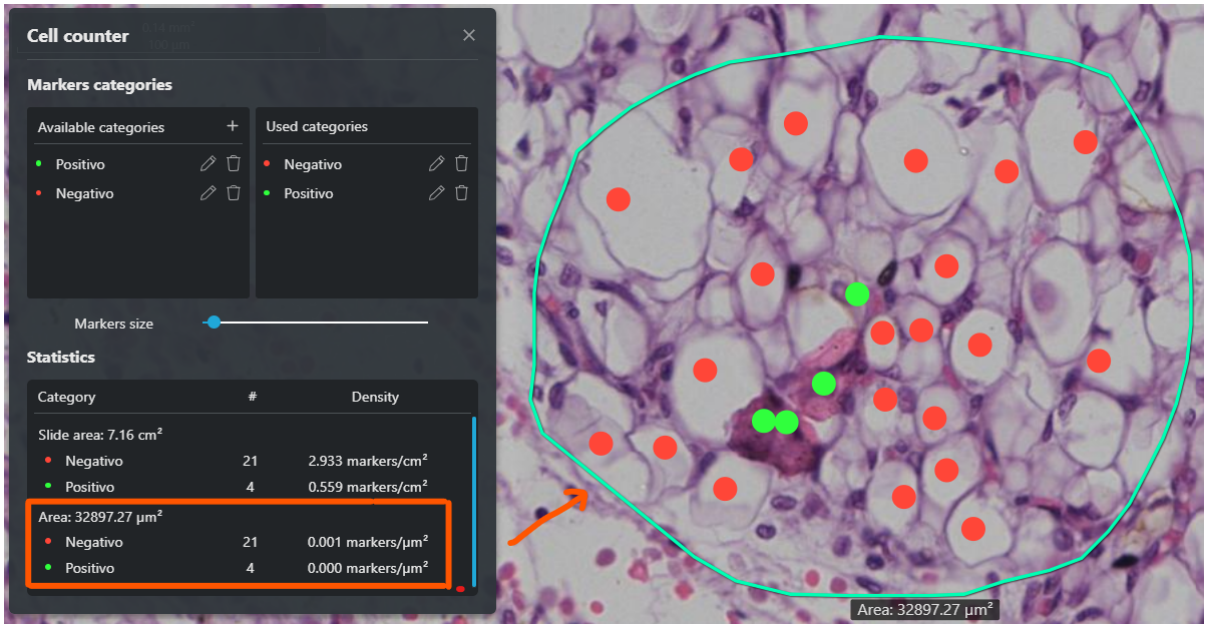


Image 180: Cell counter statistics

Each row in the "Statistics" panel contains the following data grouped by area measurements:

- Category: name and color of the category;
- # : number of markers contained within the area;
- Density: density of markers within the area (unit of measurement:*markers/area unit*).

NOTE: the "*Slide area*" measurement, corresponding to the total slide area, is always available. All placed markers are automatically grouped under this measurement as well.

All measurements are interactive: clicking on them automatically shifts the viewer to the corresponding area of interest.

17.2 Virtual Tray

The virtual tray, present in the left portion of the screen, allows the user to select the digital slides to be displayed.

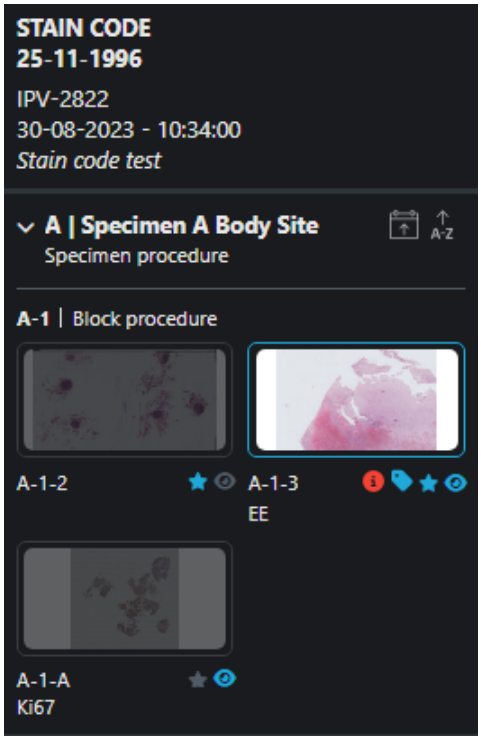
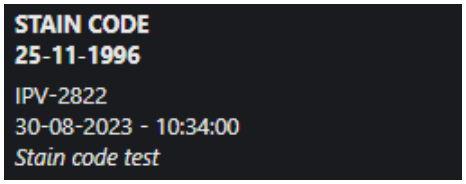
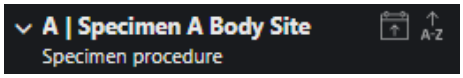
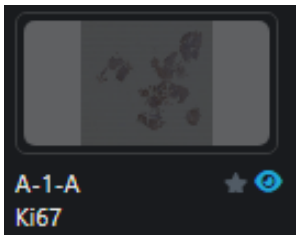


Image 181: Virtual Tray

As shown in the image, the slide previews of the case are organised according to hierarchical levels *Specimen / Block / Slide* or *Part / Slide* (for cytology).

The virtual tray allows viewing:

ELEMENT	ICON
• Surname, first name and date of birth of the patient • Accession Number of the case	
• Specimen: ◦ Code (e.g. "A") ◦ Topography (e.g. "Specimen A Body Site") ◦ Description (e.g. "Specimen procedure") NOTE: this section of the virtual tray can be "collapsed" using the relative icon	

• Block: ◦ Code (e.g. "A-1") ◦ Description (e.g. "Block procedure")	
• Slide: ◦ Identification code (e.g. "A-1-A") ◦ Colour used (e.g. "Ki-67")	

By clicking on the preview of each slide, the user can view the digital image in the navigation panel (layout 1x1); otherwise the user can drag the slide with the left mouse button.

As can be seen in the image **17.1.4 Layout configuration**, the displayed slide is highlighted in virtual tray while an opacity filter is applied to any slide not currently shown in any panel.

The table below defines the functionality of all icons in the virtual tray:

ICON	FUNCTIONALITY
	It allows you to sort the slide previews according to the date of the slide scan; the sorting can be ascending or descending. The user can view the scan date by hovering over the slide preview.
	It allows to sort the slide previews according to the slide identification; the sorting can be ascending or descending. The user can view the identifier by hovering over the slide preview.

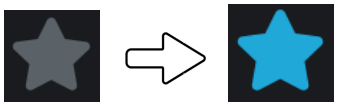
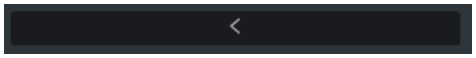
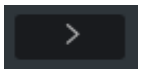
	It allows to mark one or more slides deemed to be of interest as "Favorites"; by clicking on the gray star icon, this will be colored blue and the slide will be added to favorites.
	Hide the virtual tray from the user
	Displays the virtual tray

Table 52: Virtual tray icons

It is possible to change the organization of the virtual tray via the icon in the toolbar; for more information, see the **17.1.4 Layout configuration** .

17.2.1 Keeping track of image opening

The "Review status" icon  allows the user to track the status of image viewing. Three statues can be associated with the icon:

STATUS	DESCRIPTION	ICON
Not viewed	This status is assigned to every slide if no operations have ever been performed on it	
Started	This status is automatically triggered when any operation is performed by the user on a slide	
Completed	This status is manually assigned by the user by clicking on the icon; to revert to the "started" status, click on the icon again	

Table 53: Image viewing tracking

17.3 Slide navigation

The digital slide can be viewed by the user by double-clicking the left mouse button from the digital tray preview or by dragging the preview with the left mouse button.

Once the image has been opened, the user can use the **mouse** to navigate through the slide. In particular:

- Mouse scroll: adjust magnification (zoom in/zoom out);
- Left-click: Move inside the slide;
- Double left-click: zoom with a factor of 1.5x.

Alternatively, use the **WASD controls** and **keyboard arrows**:

KEY	FUNCTIONALITY
W	Move up (North)
S	Move down (South)
D	Move right (East)
A	Move left (West)
↑	Zoom in
↓	Zoom out

Table 54: Arrow keys to navigate within the slide

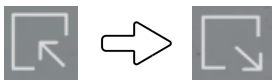
17.4 Navigation map

The navigation map shows a low resolution overview from the whole slide, displayed at the bottom right of the panel, to help navigation.

The navigation map allows the user to:

- Know the position, inside the slide, of the currently displayed portion of the image;
- Move quickly inside the slide;
- Keep track of the image portions already displayed and the magnification level used (using color coding used for discrete magnification levels in the vertical toolbar).

In the upper right corner of the map there are two buttons:

ICON	FUNCTIONALITY
	It allows to zoom in and out of the map

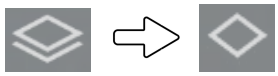
	Allow to hide and display tracking

Table 55: Navigation map tools

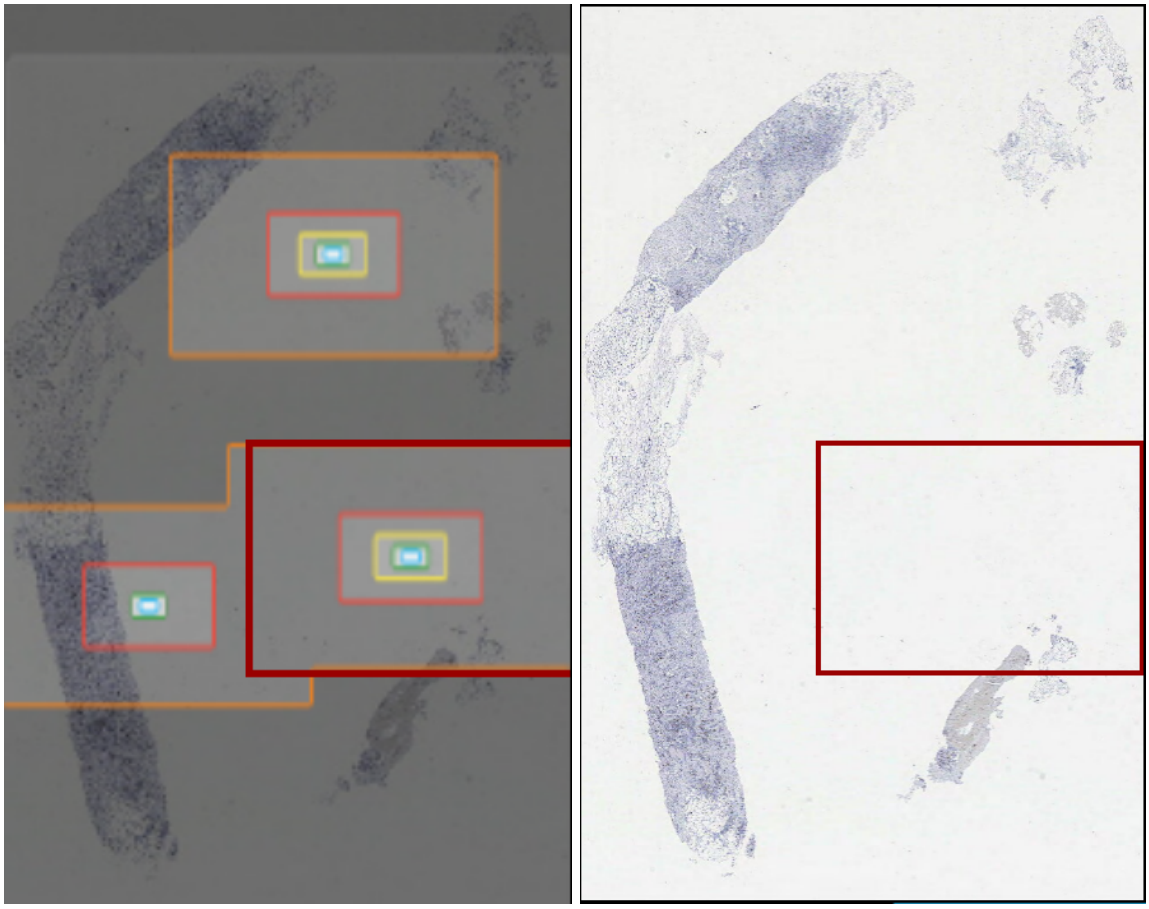


Image 182: Map enlarged with and without tracking

17.4.1 Zoom Levels

The zoom panel, located to the right of the virtual tray, includes:

- **Current magnification**: displays the currently applied zoom level;
- **1:1 button**: allows the image to be viewed at the acquisition magnification level (and therefore at the maximum possible resolution);
- **Preset buttons (1x, 2x, 5x, 10x, 20x, 40x)**: allow the user to quickly scale the slide magnification to the corresponding values.

Image 183: Zoom Panel

The color code identifying the image magnification level is reproduced for the tracking in the navigation map.

NOTE: Using the mouse scroll, the user can enlarge the image to the maximum allowed resolution plus 10%.

17.4.2 Scale and area indicator

In the top left of the navigation panel are shown the scale indicator and the area currently displayed.

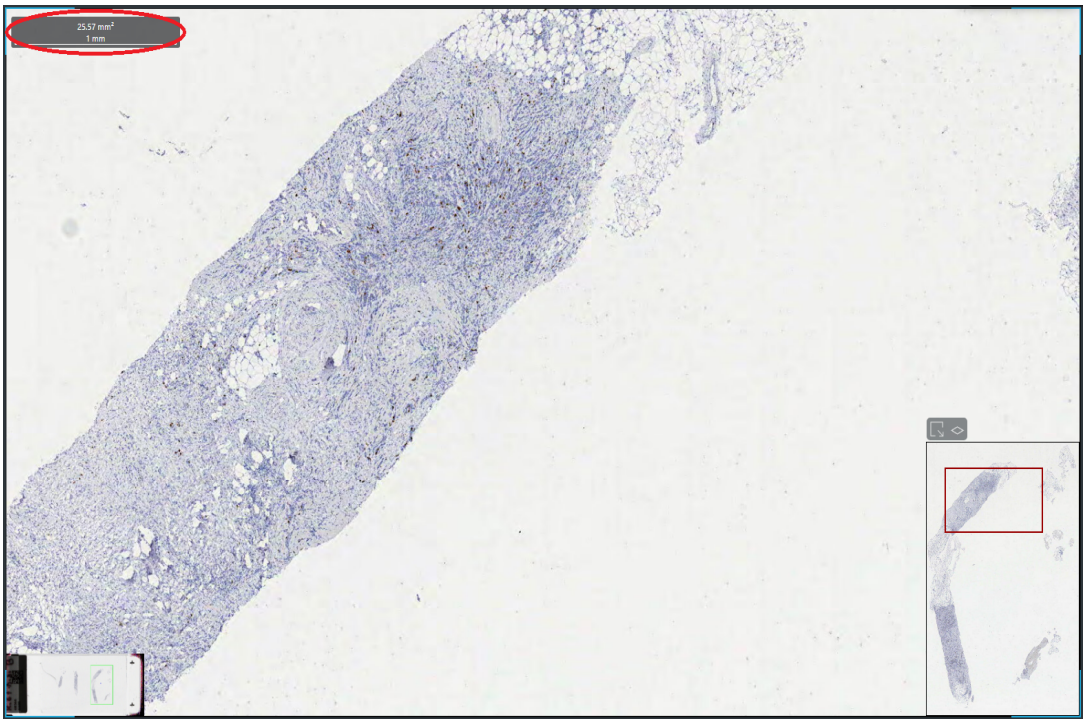


Image 184: Focus on the scale indicator and the currently visualized area

17.5 Measures and annotation

17.5.1 Measures

By right-clicking on the image the user can access the context menu that allows to insert measurements and annotations.

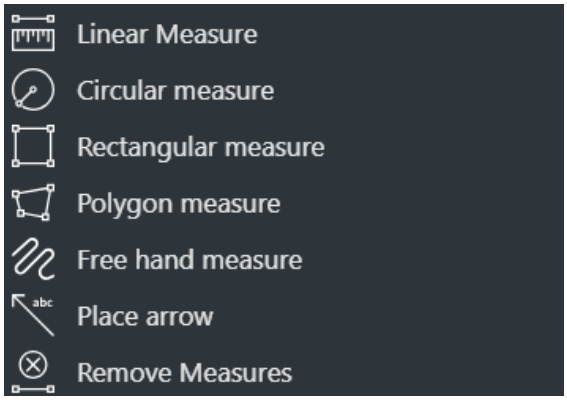


Image 185: Context menu

The available sizes are:

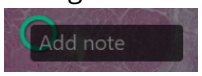
- Linear measure;
- Circular measure;
- Rectangular size;
- Polygon measure;
- Free hand measure;
- Place arrow.

To enter the type of measurement chosen, simply hold down the left mouse button; the viewer will automatically calculate the length or area of the drawn figure. The figure can also be edited and moved by the user at a later time, always holding down the left mouse button.

17.5.2 Annotations

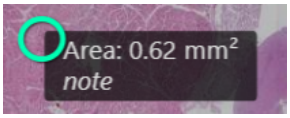
17.5.2.1 Adding a text note

1. Add a measurement (any measurement from the contenx menu: linear measure, circular measure, rectangular measure, polygon measure, free hand measure);

2. Left-clicking within the box displaying the measurement value; the popup that opens is as follows: 

3. Write the note and click the "*Enter*" key on the keyboard.

The text note is inserted in italics below the measurement value, as shown in the following figure.



17.5.2.2 Deleting a text note and/or a measurement

1. Right-click any point on the image;
2. Select "*Remove Measures*" from the context menu.

Alternatively, user can click the "*Revert changes*" icon on the vertical toolbar.

> **Warning**: it is not possible to delete a single measurement, but all measurements that belong to the same layer are removed simultaneously (see paragraph **17.5.3 Layer**).

Measurements and/or annotations can be saved using the "*Save layer*" icon on the vertical toolbar (see paragraph **17.5.3 Layer**).

17.5.3 Layer

A layer is a grouping of measurements and annotations saved in the slide image.

The table below summarizes the main functionality of the icons related to the layers of an image.

ICON	FUNCTIONALITY / DESCRIPTION
	Allows the user to save layer in processing
	Allows the user to undo changes made

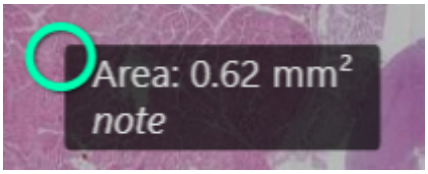
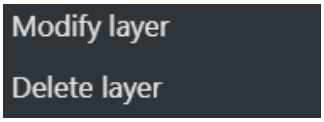
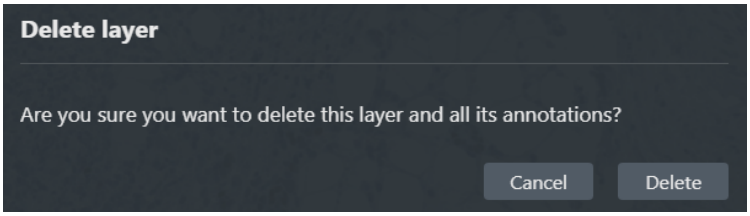
	By clicking on the label of the measurement, the user can add a text note (see paragraph **17 Anatomo Pathology tools**
	By clicking on the icon corresponding to the level you can view or hide the measurements and annotations of that level. By re-enabling the display of a layer, the system automatically positions itself on its image area. The mouse movement over the icon allows viewing information about the user and the date and time of its creation
	A click on the layer icon with the right mouse button opens the menu that allows to: **Modify level**: allows the user to add new measures, modify/delete existing ones and update their description. At the end of the changes the user will need to click on the icon  to save the changes. **Delete level**: allows the user to remove all measures and annotations related to the specific layer. A confirmation pop-up appears and the operation is **irreversible**.  *Image 186: Confirmation Pop-up "Delete level"* ⚠ **Attention**: Edit/delete layer entries are only enabled for the user who created those specific measurements and annotations.

Table 56: Layer tools

17.6 Apply a custom TAG to a wholeslide

To streamline the search for a wholeslide in the "Search Exams panel", the user can assign a custom tag to it.

17.6.1 Assigning a custom tag to a slide

1. Right-click on the slide to open the contextual menu and select the option "*Tag image*"

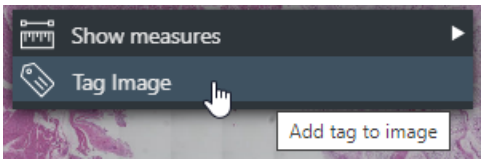


Image 187: Opening the contextual menu and selecting the option "Tag image"

2. Enter the tag name in the specific field of the pop-up and press the "*Add*" bottom to save it.

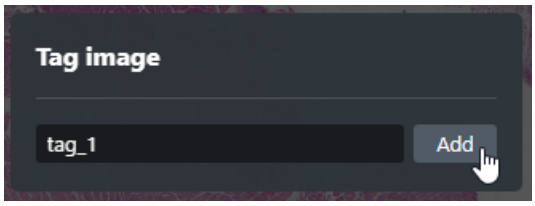


Image 188: Adding the tag to the slide

> ⚠ **Warning**: the allowed number of characters is limited to 64.

3. To close the pop-up, left-click anywhere on the slide.

The assigned tag can be viewed by moving the mouse cursor over the selected image preview.

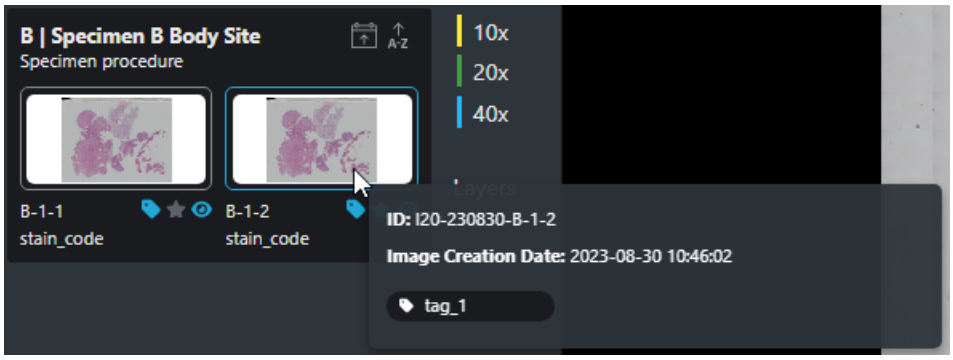


Image 189: Viewing the tag in the virtual tray

Additional tags can be assigned to the same slide. The displayed screen will be as follows:

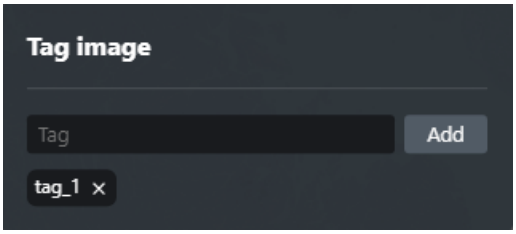


Image 190: Pop-up for assigning a second tag to the slide

17.6.2 Tag deletion

1. Open the contextual menu and select the "*Tag image*" option.
2. Press the "X" icon of the tag to be removed 

3. Click on the "Delete" icon in the tag removal pop-up:

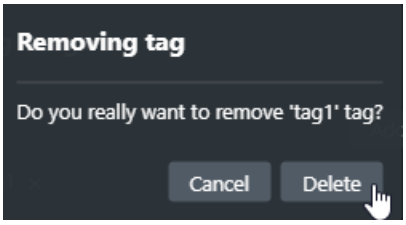


Image 191: Tag removal pop-up

17.6.3 Searching for a slide by tag

Introducing tags significantly streamlines the search for the slide. User can simply enter the tag name in the "*Tag*" field of the "Search Exams" panel.

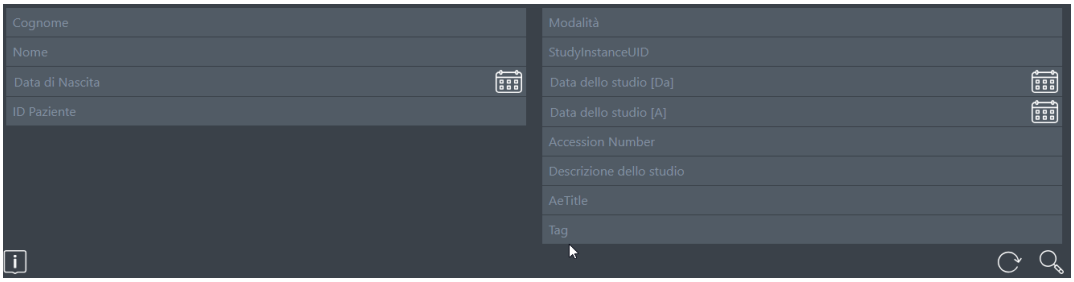


Image 192: Searching for a slide by tag

17.7 ROI - Snapshot

The button "*Export region displayed*"  in the toolbar allows the user to capture the currently displayed image portion; the latter can be invited to the LIS to be inserted in the body of the report or be saved locally in JPEG format.

After pressing the appropriate button, the following screen opens which allows the user to enter an image description and decide where to send the ROI (to the LIS or locally).

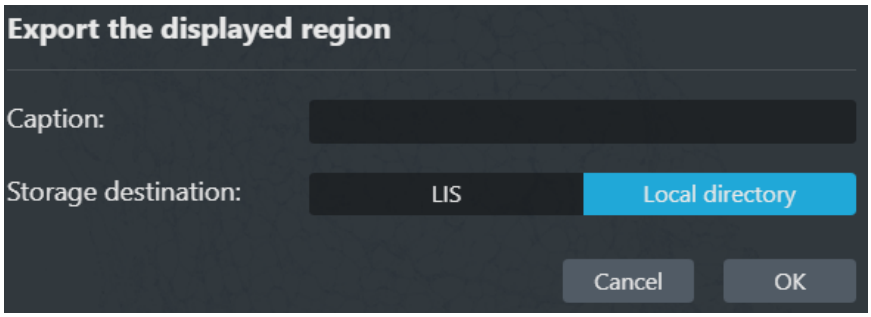


Image 193: Export panel of the displayed region

When a portion of the image is exported, the system tracks it by displaying a new icon in the "ROI" section (Region Of Interest) of the vertical toolbar 

and a black box in the navigation map as shown in the image below.

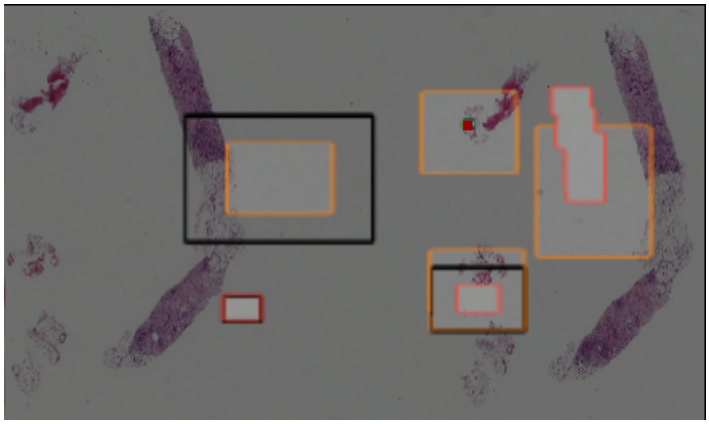


Image 194: Black box in navigation map after ROI acquisition

Dragging the mouse over the ROI icon 

it is displayed information about the date and time of creation, the user, the magnification used, the area and the caption, and highlights in blue the relevant box in the navigation map.

In addition, by clicking on the icon, the viewer automatically repositions on the region of interest by setting the same magnification level used during export.

According to the project specification, the user permissions can be configured so that the user can view only the measurements/annotations and ROI saved by him/her or all the measurements/annotations and ROI associated with a given image, regardless of the user who entered them.

18 KEY BINDINGS SUMMARY TABLE

To view the list of shortcuts directly from ZEEROmed View, click on the 'Show keyboard shortcuts'  from the 'Information bar' (chapter **5.1.1 Information bar**).

Note: the displayed shortcuts are related to the currently open study.

Below is a summary table of the keyboard shortcuts:

KEY	OPERATION
↑	Zoom in
Pag↑	Previous page
Pag↓	Next page
←	Previous protocol
→	Next protocol
↓	Zoom out
O	Circular measurement
R	Linear measurement
G	Show graphic annotations
H	Activation of Hounsfield Point Value
Space	Start multiplanar reconstruction (hydra)
Volume cut	Volume cut
A	Axial view
C	Coronal view

S	Sagittal view
L	Enable/Disable spatial locator
M	Toogles magnifies tool
F	Fit
?	Open Window Level (WL) configuration
P	Start/Stop the cineloop
Z	Set 'Zoom' as active tool
I	Invert image (white/black)
K	Send current image to the RIS
D	View DICOM Tags
0...9	Window Level (WL) preset

Table 57: Key binding table