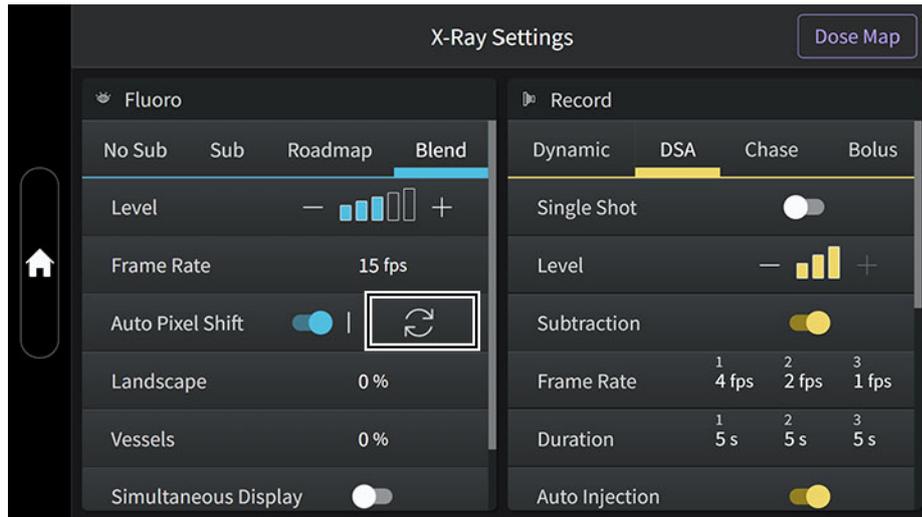


**Figure 10-35 APS Refresh button on the Touch Panel**



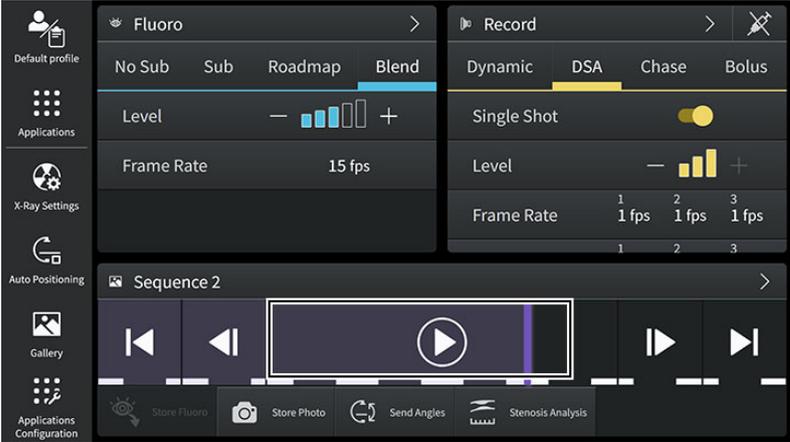
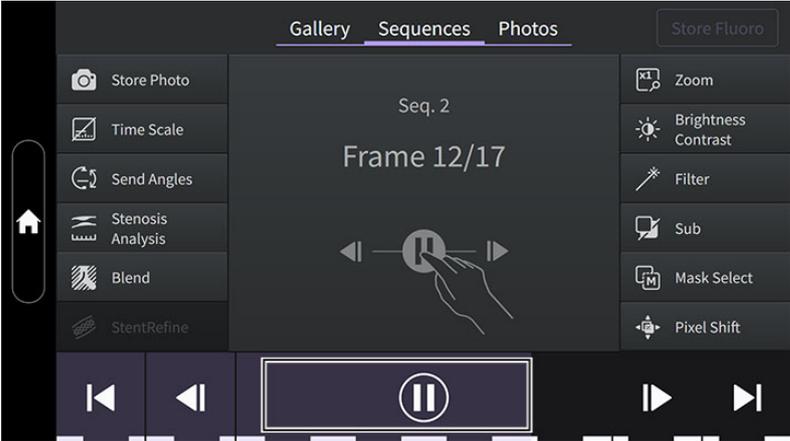
Check registration on the live blended subtracted images. If the subtraction artifacts are corrected, continue. If not, release the pedal, unselect APS or exit and re-enter Blended Roadmap to acquire a new fluoro mask.

To unselect APS, release the pedal first, then toggle the APS button. APS will be canceled for the next fluoro runs.

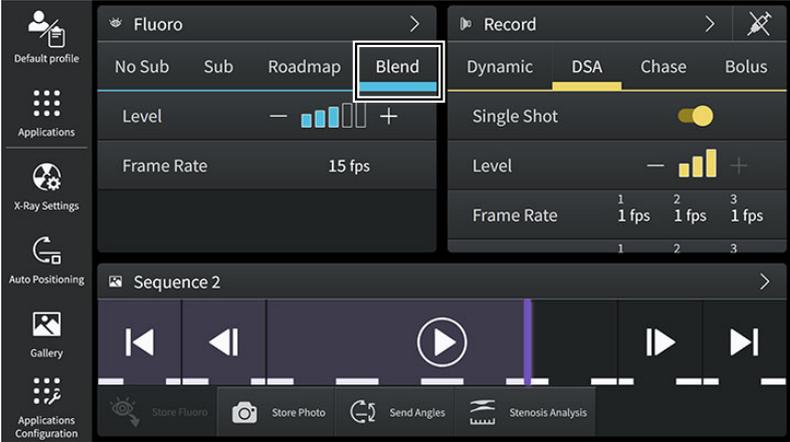
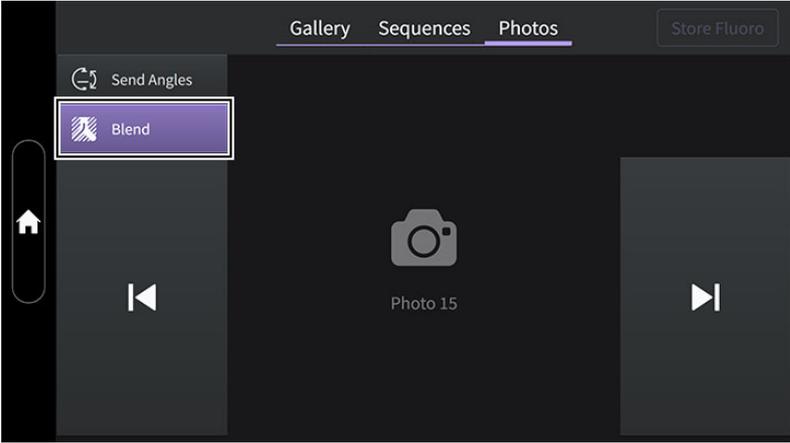
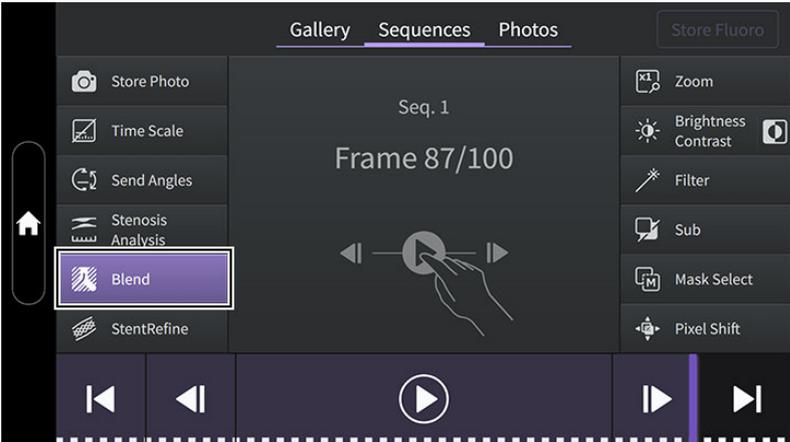
### 10.5.3.4 User Interfaces

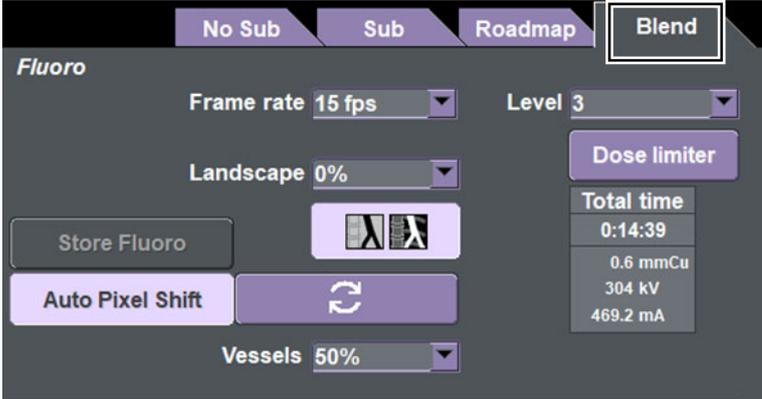
It is possible to control the acquisition from In-room via the Touch Panel and the Control Panel; or from the control room via the DL console, the DL keypad and the Control Panel.

Control group	Description
<b>Step 1.</b>	Review a subtracted record.

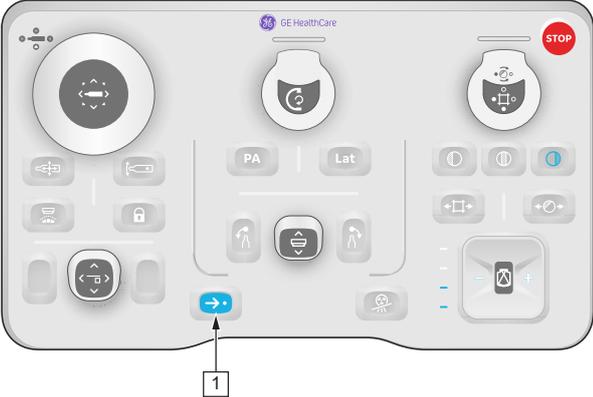
Control group	Description
<p>From exam room:</p> <p><b>Figure 10-36 Touch Panel - Home page</b></p>  <p><b>Figure 10-37 Touch Panel - Sequence page</b></p> 	

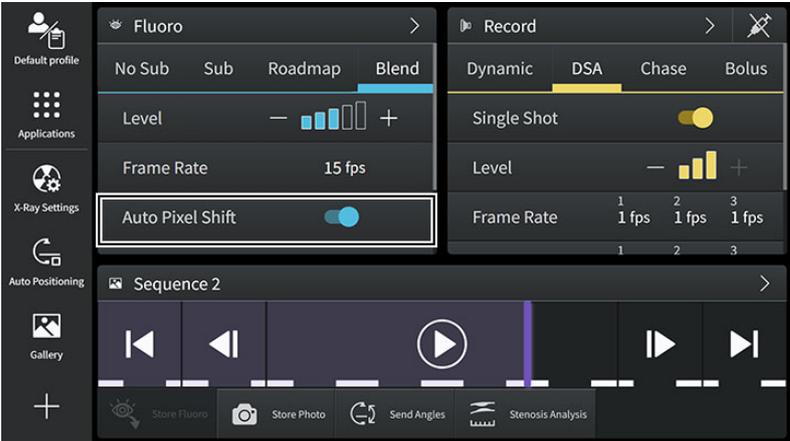
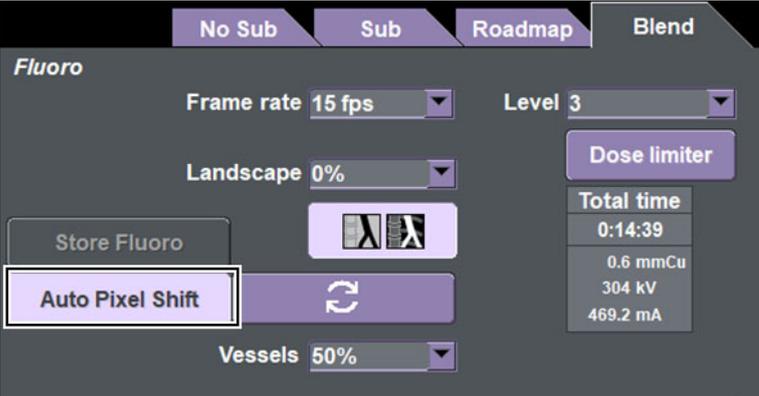
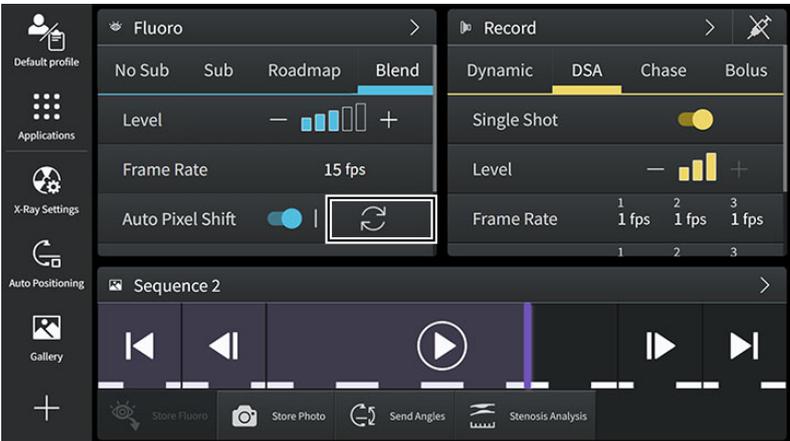
Control group	Description
<p>From control room:</p> <p><b>Figure 10-38 DL Screen</b></p>  <p><b>Figure 10-39 DL Keypad</b></p>  <p><b>Step 2.</b> Enter Blended Roadmap.</p>	

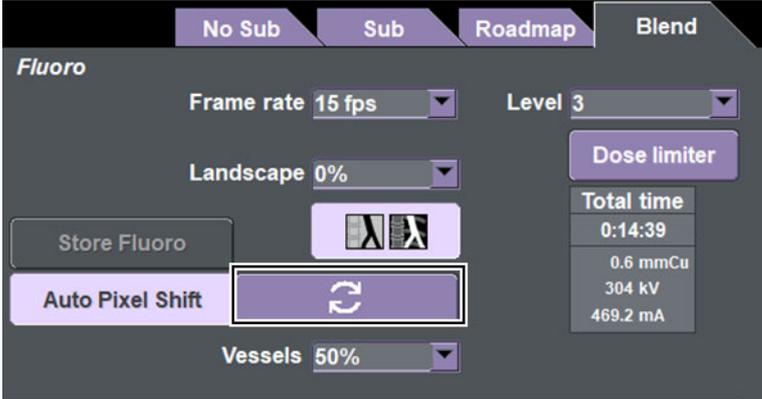
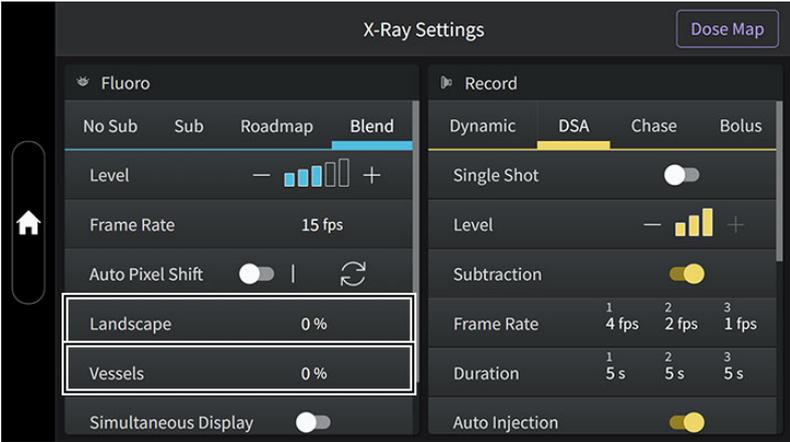
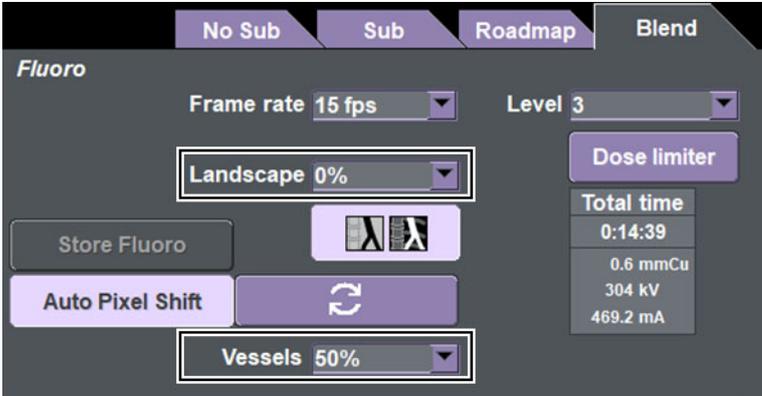
Control group	Description
<p>From exam room:</p> <p><b>Figure 10-40 Touch Panel - Home page</b></p> 	
<p><b>Figure 10-41 Touch Panel - Photo page</b></p> 	
<p><b>Figure 10-42 Touch Panel - Sequence page</b></p> 	

Control group	Description
<p>From control room:</p> <p><b>Figure 10-43 DL Screen</b></p> 	

**Optional Step 3.** Reposition Gantry and Table - if requested by the system.

<p>From exam room and control room:</p> <p><b>Figure 10-44 Control Panel for IGS 5</b></p>  <p><b>Figure 10-45 Control Panel for IGS 7 and IGS 7 OR</b></p> 	<p>Press blinking <b>Move</b> button [1]</p>
---	--

Control group	Description
<p><i>Auto Pixel-Shift</i></p> <p>From exam room:</p> <p><b>Figure 10-46 Touch Panel</b></p>  <p>From control room:</p> <p><b>Figure 10-47 DL Screen</b></p> 	<p>Enable/Disable APS</p>
<p><i>Auto Pixel-Shift refresh</i></p> <p>From exam room:</p> <p><b>Figure 10-48 Touch Panel</b></p> 	<p>Refresh APS during fluoro</p>

Control group	Description
<p>From control room:</p> <p><b>Figure 10-49 DL Screen</b></p> 	
<p><i>Landscape and vessels adjustment</i></p>	
<p>From exam room:</p> <p><b>Figure 10-50 Touch Panel</b></p> 	
<p>From control room:</p> <p><b>Figure 10-51 DL Screen</b></p> 	

### 10.5.3.5 User messages

#### Error messages when trying to enter Blended Roadmap and during fluoroscopic acquisitions

When trying to enter Blended Roadmap, or during fluoroscopic acquisitions, an error message may pop up in the following cases:

Error Message	What is happening?	What to do?
Selection failed; select a not zoomed subtracted record.	Display with focus is black, or displays the IRB.	Select a subtracted DSA, Bolus or subtracted 3D CT sequence.
	Sequence/photo displayed on screen with focus is not a sub DSA, sub Bolus, or sub 3D CT.	
	Sequence/photo displayed on screen with focus is zoomed.	Unzoom the sequence/photo. Refer to FOV management section if a zoom is needed on the vessel sequence.
Selection failed; original sequence deleted.	The sequence from which the vessel image comes is no more on the disk.	Acquire a new DSA, Bolus or Subtracted 3D CT sequence.
Selection failed; patient position mismatched.	Current patient position and patient position with which the vessel image was acquired are different.	Change the patient position set on system and re-select Blended Roadmap tab. If patient position is actually different from the one when acquiring the vessel image, acquire a new subtracted record sequence.
Selection failed; image flip mismatched.	Current image flip and the image flip with which the vessel image was acquired are different.	Change the image flip set on system and re-select Blended Roadmap tab.
Shift not applied. Continue with care.	APS at Blended Roadmap start failed at correcting motion between the two masks.	Continue with care or exit Blended to select another vessel image.
	On demand APS during fluoroscopic acquisitions failed at correcting subtraction artifacts.	Continue with care or exit Blended to acquire a new fluoro mask.

#### Error messages during repositioning of Gantry/Table in Blended Roadmap

System repositioning for Blended Roadmap may fail, be cancelled, or induce an inaccurate roadmap, and an error message may pop up in the following cases:

Error Message	What is happening?	What to do?
Autopos stopped / not allowed. Restart Blended Rdmp to continue.	Case 1: You have not fully performed the repositioning step within 1min after selection of Blended Roadmap mode- time out.	Restart Blended Roadmap and Use Autopos to reposition the system back to where the vessel image was acquired.   <b>NOTE</b> if you start performing the repositioning step but do not finish it, you will have 5 more minutes before Blended Roadmap mode-time out.

Error Message	What is happening?	What to do?
	Case 2: Patient position changed during repositioning phase - mismatch between the vessel image and the current anatomy position.	Blended Roadmap is not available when there is a mismatch between the vessel image and the current patient position. If patient is positioned similarly to the vessel image, change the patient position on the system and restart Blended Roadmap.  If not, this vessel image cannot be used with current patient position.
Near collision, reposition gantry or table to continue Blended roadmap.	A collision made it impossible to reposition the system to the selected vessel image position.	Clear the collision area and move the system out of collision area - Restart Blended Roadmap.
<b>(For Allia IGS 7 OR)</b> Selected DSA or table position not allowed for blended roadmap	Vessel image was acquired with universal tabletop in a different position from the current one.	Acquire a new vessel image and do not move the universal tabletop between vessel image acquisition and fluoro mask acquisition.
<b>(For Allia IGS 7 and Allia IGS 7 OR)</b> Selected DSA / current AGV position not allowed for Blended Roadmap	Case 1: AGV is in parking position	Move AGV to Swivel/panning/back-in/backout trajectories and restart Blended Roadmap.
	Other cases.	Perform Blended Roadmap first run including fluoro mask generation and auto pixel shift. Check registration on the first subtracted Blended Roadmap images, if registration is accurate enough for your purpose, continue.  If not, restart Blended Roadmap or proceed with Fluoro Roadmap.
Accuracy may be suboptimal. Restart Blend or use Fluoro Roadmap	You have fully performed the repositioning step.  The gantry was moved between the vessel image and Blended Roadmap and has been repositioned.  However, system detects that iso-center repositioning is not optimal, which may or may not induce a roadmap inaccuracy.	Perform Blended Roadmap first run including fluoro mask generation and Auto Pixel-Shift. Check registration on the first subtracted Blended Roadmap images, if registration is accurate enough for your purpose, continue.  If not, restart Blended Roadmap or proceed with Fluoro Roadmap.

## 10.5.4 How to perform a Subtracted Fluoroscopy Acquisition

Select subtracted fluoro (see [10.3.1 How to select Fluoroscopy Mode on page 234](#)).



### NOTE

The different fluoro modes can be selected from the Touch Panel, either from the Fluoro widget on the Home page or from the X-Ray settings page: No Sub, Sub, Roadmap and Blend.

When Fluoro Sub is selected, the label Fluoro Sub is displayed on the reference display.

Figure 10-52 Subtracted Fluoro - DL Screen

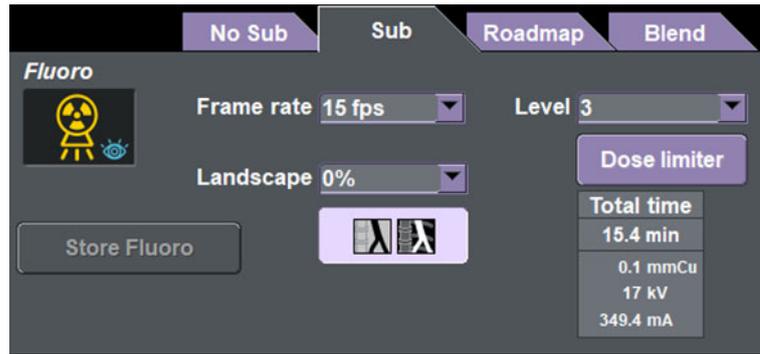
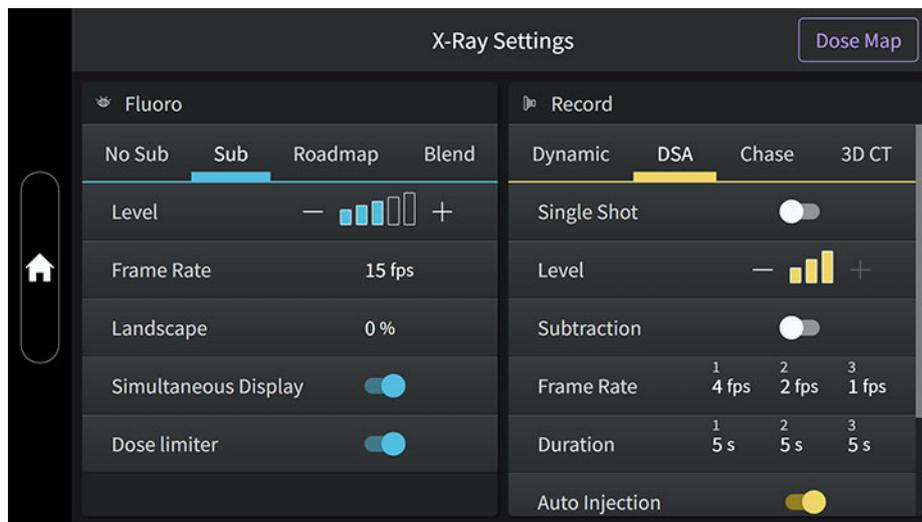


Figure 10-53 Fluoro modes - Touch Panel



- Perform a fluoroscopy depressing the fluoro footswitch.

The **Fluoro** icon  is displayed on the left side of the live display during Fluoro to show that the displayed image is a live fluoroscopic image.

After a short time (1 s when using 30 or 15 fps; 2 s when using 7.5 fps), the image displayed on the live display switches automatically from No Sub to Sub.

- The subtraction level can be adjusted using the LANDSCAPE function. Select an appropriate "Landscape" level in the **Fluoro** window or use the **Landscape** button on the Touch Panel, either from the Fluoro widget on the Home page or from the X-Ray settings page.

**CAUTION**



The fluoro Landscape feature affects only the background visibility of the image. When using sub fluoro with Landscape, never move the table. If so, injected vessels will not match anymore with the anatomy.

The predefined LANDSCAPE values are: 0, 30, 50, 70 and 100%.

A **Landscape** icon  and the level value are displayed on the left side of the live display to show the selected level of landscape.

- At 100% landscape the fluoro images are not subtracted, vessel roadmap is not visible.

- 0% landscape = full subtraction imaging.

**NOTE**

During fluoro, the landscape level can be adjusted from the Touch Panel only.

**NOTE**

During the subtracted fluoroscopy, it is highly recommended not to move the table top and / or the gantry nor change the Field of View, the Fluoro Level, the image flip settings, insert or remove contour filters. If done the image quality will be seriously degraded.

**NOTE**

The mask is lost each time the fluoro footswitch is released.

**NOTE**

When the Subtracted fluoro is deselected, the landscape function is disabled.

## 10.6 How to perform a Record Acquisition

Depending on system configuration and available options, all acquisition modes are available in most of the protocols. (Some Cardiac protocols have only Dynamic and Chase acquisition modes available). Those modes are:

- DSA mode: primary use for general angiography procedures.
- Dynamic mode: primary use for general cardiac procedures.
- InnovaChase™ (Chase) mode: primary use for non subtracted dynamic acquisition over any region of interest.
- InnovaBreeze™ (Bolus) mode: primary use for subtracted lower limbs arteriogram.
- 3D CT mode: primary use for 3D reconstruction and display of any region of interest.
- 3DStent mode: primary use for 3D reconstruction and display of a coronary stent. It is only available in a subset of the cardiac protocols.

Record can be started either using the record footswitch or the handswitch in control room.



The Record icon  is displayed on the left side of the live display during Record acquisition to show that the displayed image is a live image.

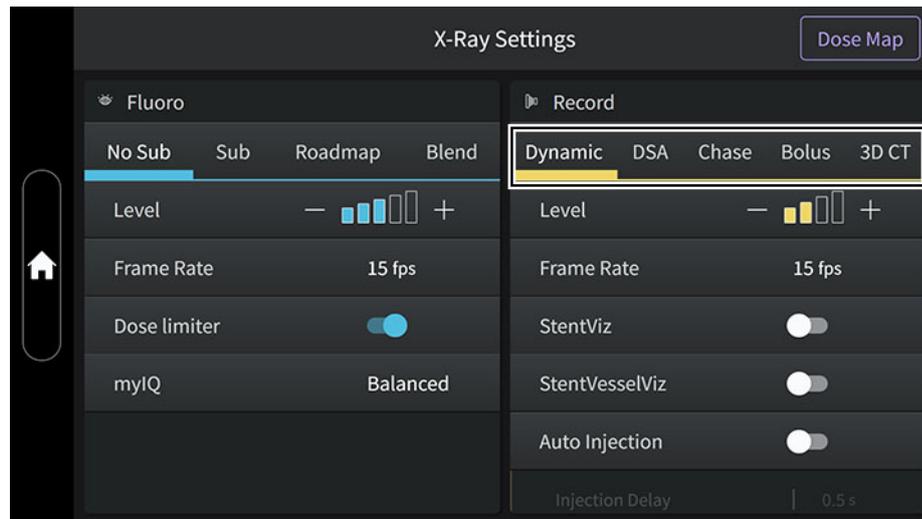


The radiation icon  is displayed at the bottom of the DL screen to show that a record acquisition is in progress.

### 10.6.1 How to select a Record Acquisition Mode

Select a protocol.





Select the Record acquisition mode from the tabs located at the top of the record parameter window of the DL screen or of the Touch Panel.

All Record parameters are automatically set and the system is ready to acquire using the selected mode.

## 10.6.2 DSA Mode

In DSA Mode, Single Shot acquisitions and multile shot acquisitions can be performed. Refer to [10.6.3 Single Shot Acquisitions in DSA Mode on page 269](#).

- **Interv Neuro, Needle, Pediatrics, Surgery** and **Vascular** have most Protocols with DSA as default acquisition mode.



The DSA acquisition is divided into 3 segments. A different frame rate and duration can be set for each of the 3 segments.

- In the Record window of the **DSA** tab, select the frame rate for each of the three segments using the frame rate pull down list between 0.5; 1; 2; 4 or 7.5 fps .
- Select the duration of each segment using the duration pull down list between:
  - 1; 3; 5; 10; 15; 20; 30 s for the first segment.
  - 0; 1; 3; 5; 10; 15; 20; 30 s for the second segment.

For the third segment, the duration list is dynamic and the maximum allowed duration is automatically computed to comply with two limitations:

- Maximum number of frame acquired: 450 frames.
- Maximum total duration of the acquisition: 600 s (10 mn).



### NOTE

To minimize the risk of deterministic effects of radiation, it is recommended to avoid excessive usage of monoplaner 7.5 fps DSA during an exam.



### NOTE

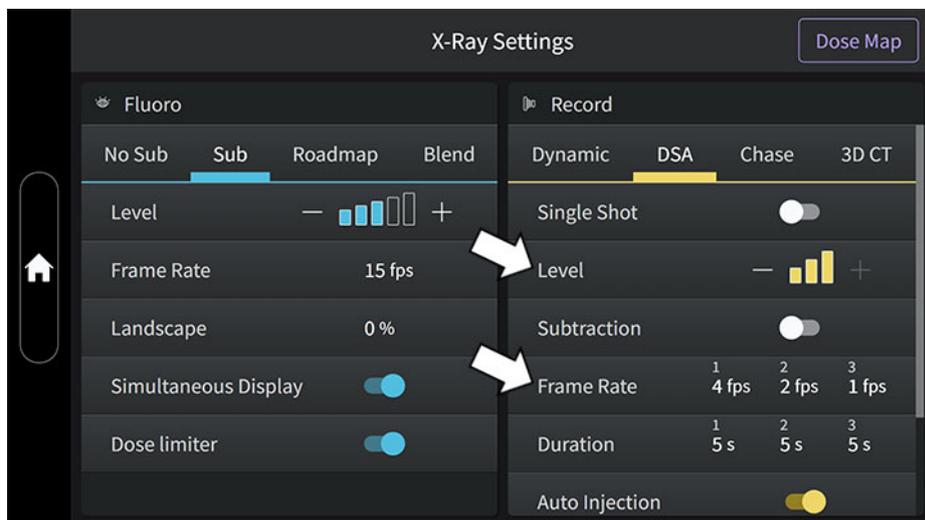
Any modification of the frame rate in the 3 segments or duration of segment 1 and/or 2 will affect the maximum duration allowed for segment 3.

-  **NOTE** In case only one segment is needed, set the duration of segment 2 and 3 to 0. In case only two segments are needed, set the duration of segment 3 to 0.
-  **NOTE** If 7.5 fps is selected, do not select longer acquisition duration than 30 s in case the acquisition needs to be burnt on a CD in order not to exceed the maximum storage capacity of the CD. A single run cannot be burnt on more than one CD.

Figure 10-54 DL Screen



Figure 10-55 Touch Panel



- Select the needed Record Level.
- Select injection parameters

Acquisition can be performed using either Manual or Automatic injection.

In case of Automatic injection selection, the injector is automatically triggered by the system.

When Auto Injection is selected, it is possible to preset an injection delay (X-Ray then Injection start) or X-Ray delay (Injection then X-Ray start) by opening the selected pull down list.

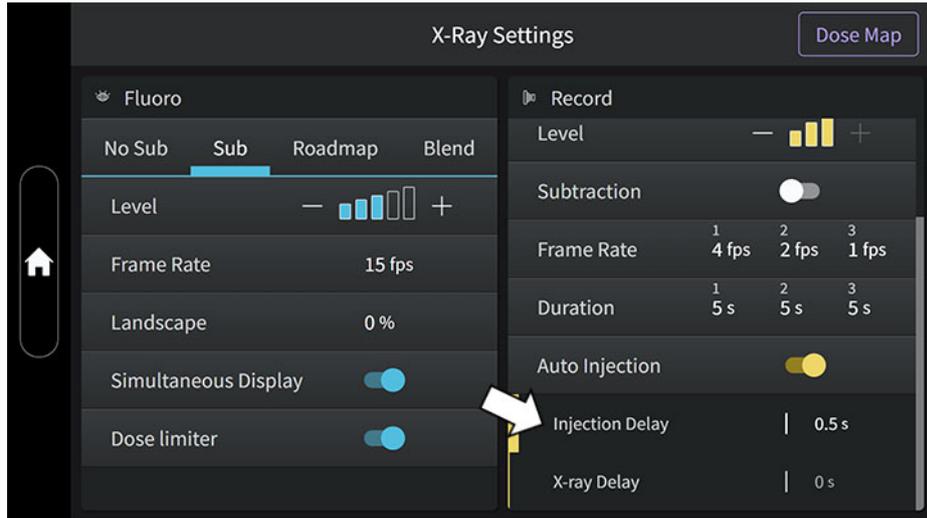
### CAUTION



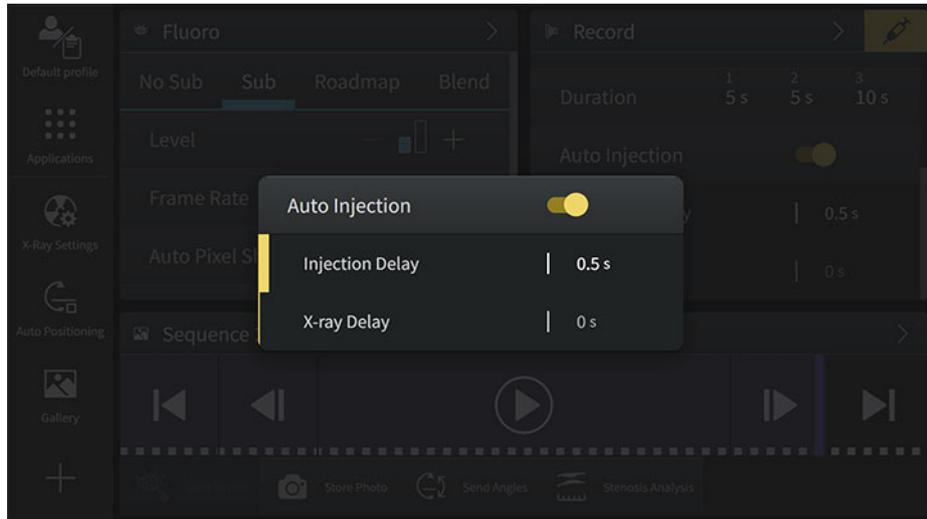
When Auto Inject is selected the X-Ray or Injection Delay must be set (or kept) at Zero on the injector unit. In order to prevent any conflict between the injector unit and the IGS system, X-Ray or Injection Delay must only be selected from IGS system. Setting (or keeping) some X-Ray or Injection Delay on the injector unit itself could cause the acquisition to fail.

Select the injection delay from the DL console or the Touch Panel.

Figure 10-56 Touch Panel

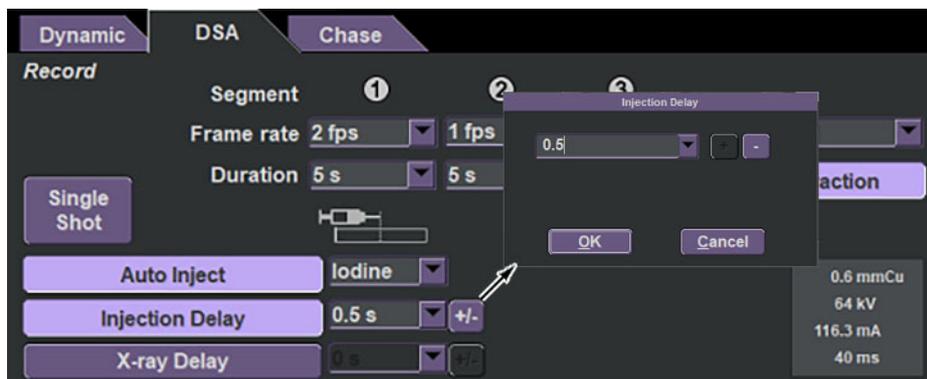


Injection parameters are also directly accessible from Home page with a long press on the syringe button in the top right of the record widget.



Click on the +/- field to open the Injection/X-Ray delay edit window and add/remove new/existing values.

Figure 10-57 DL Screen



From this window, it is also possible to enter a new delay to use for the next acquisition. Just enter the value and click OK to close the edit window and apply the new value. In this case, this new value will not be saved and added to the list.

**NOTE**

New Injection or X-Ray delay must be entered by step of 0.5 s only (i.e. 1 s, 1.5 s, 2 s...).

- Depress and hold the hand/foot switch to initiate the acquisition.

Acquisition parameters are computed from the previous fluoro. In case of table/gantry motion, FOV change, geometry modification... since the previous fluoro, the Record acquisition could be inhibited and a new Fluoro required. In that case, perform a short fluoro (2 s minimum) then depress the acquisition switch again.

**NOTE**

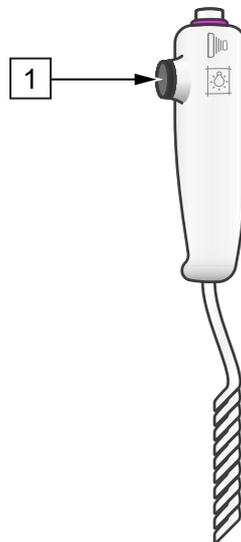
If the expose trigger of the hand/foot switch is released during acquisition, X-Ray and injection will stop.

In case of Manual injection, "Inject" will be displayed on the left side of the live display to inform when injection can start.

The acquisition starts using parameters set for segment 1, then those set for segment 2, then those set for segment 3.

In case it is required to anticipate moving to the next segment, press on the **Skip Segment** button [1] located on the side of the record hand switch.

**Figure 10-58 Record Hand Switch**

**NOTE**

At the beginning of a DSA sequence, the system will automatically check the possibility of the requested run. If the entire run duration is not possible because of thermal limitation (tube too hot), then a 5-seconds long popup is displayed on the frontal live display, informing the user of the maximum possible run duration. If the user does not release the pedal, the run starts and will end when reaching that duration. For more detailed information related to thermal limitations, refer to [How to Check the Heat Unit Informations on page 314](#).

Depending on acquisition parameters computation and available heat units, the system will display a Warning pop up on the frontal live display in case the requested run cannot be completed.

	Item	Description
	[1]	WARNING
	[2]	Available Run Time: 20 Sec
	[3]	Acquisition starts in: 5 Sec
	[4]	Release switch to abort

In this pop up, the computed available run time is displayed and a 5 seconds count down starts to let the user take the decision to perform or not the acquisition, knowing that the run will be ended before its completion.

Keep the hand/foot switch pressed to allow the run to start.

Release the hand/foot switch within 5 seconds (before count down reaches zero) to cancel the acquisition.

If the computed available run time is too low, no acquisition can be performed and a message will inform the user to change to acquisition parameters requiring lower power or wait for the X-Ray Tube to cool down.

**NOTE**  
 After reaching the thermal limits, the subsequent DSA acquisition will have a 10 seconds access time.

**NOTE**  
 The mask of DSA sequence is processed to minimize its contribution to noise. In some conditions an “artificial rendering” may be noticed. If this is annoying, the selection of the second image as a mask will mitigate this rendering.

### 10.6.3 Single Shot Acquisitions in DSA Mode

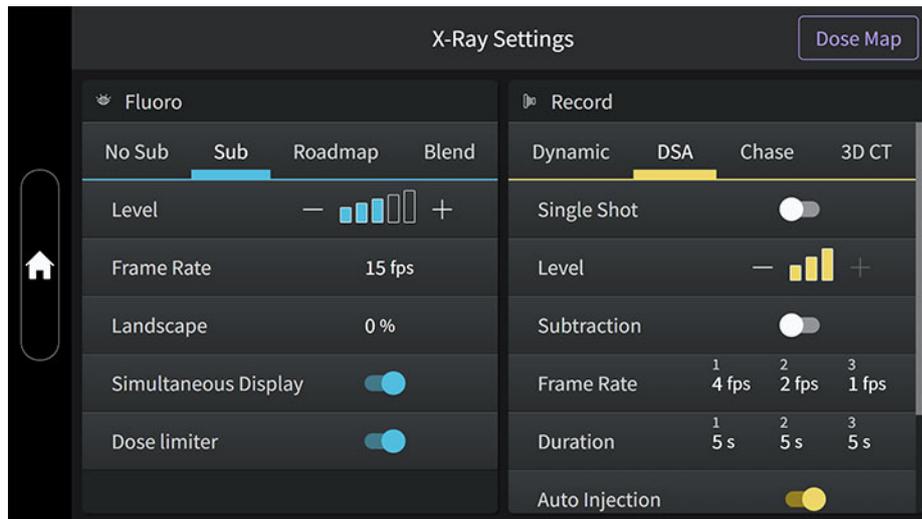
A Single Shot acquisition is a one frame acquisition in non-subtracted mode, with high contrast and spatial resolution. Single Shot can be activated or deactivated on each protocol (refer to [Protocol parameters tuning on page 222](#)).

The Single Shot acquisition can be selected by clicking on the **Single Shot** button available under DSA mode.

The auto-inject and subtracted mode are disabled by default, however the injection can be done manually. Until the button is turned off, Single Shot can be acquired by pressing foot/hand switch repeatedly.

Un-press the **Single Shot** button to perform DSA acquisition back.

For a Single Shot, acquisition parameters are computed from the previous fluoro. Therefore, if any gantry motion, FOV change, or geometry modification happen, Single Shot will not be available and additional fluoro (2 sec) will be required.



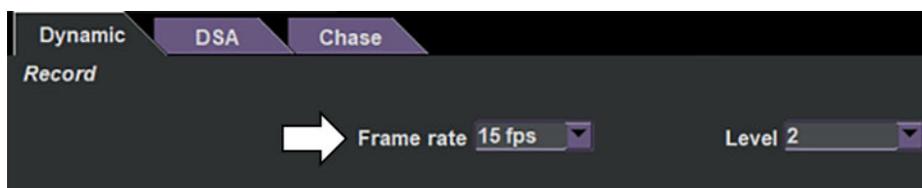
### 10.6.4 Dynamic Mode

**NOTE** Before performing the first cardiac procedure after an angio procedure, check the Heat Units Status window for heat units availability. It should be at least 50% for a diagnostic cardiac case or 70% for an interventional cardiac case. The subsequent cardiac procedures can be performed without any thermal limitation. Fluoroscopy is always fully available.

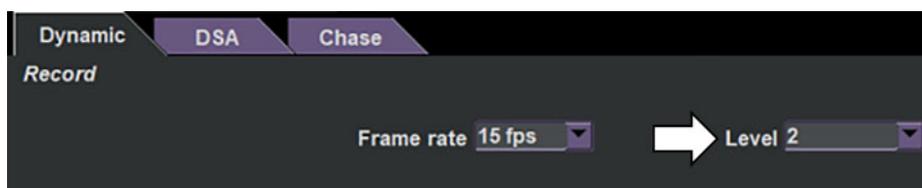
- Protocols from the **Cardiology** category have Dynamic as default acquisition mode. The Acquisition tab confirms the selected acquisition mode.



- In the Record window of the **Dynamic** tab, select the Frame Rate needed using the Frame rate pull down list between 30, 15, 10 or 7.5 fps.



- Select the needed Record Level.



- Select injection parameters.



Select **Auto Inject** to automatically trigger the injector from the IGS system (for more detail, see [10.6.2 DSA Mode on page 265](#)).

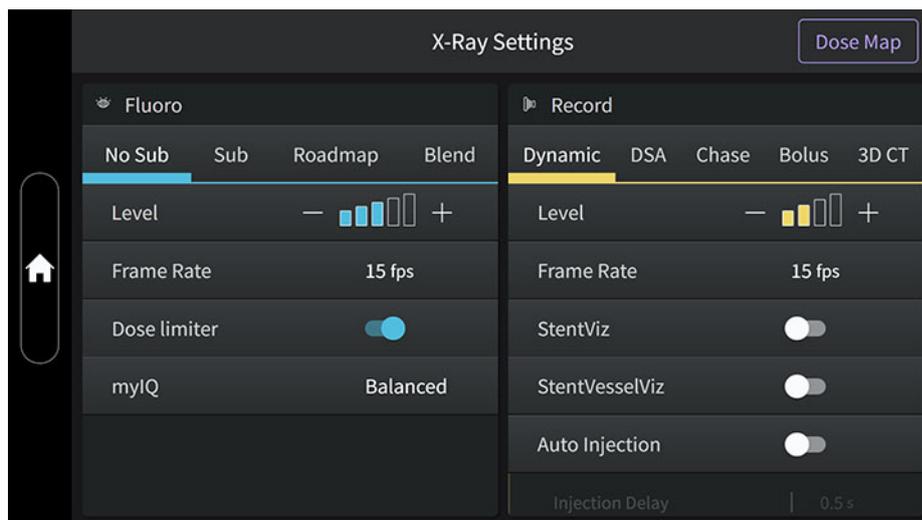


**NOTE**

Record frame rate, level, injection parameters can also be performed on the Touch Panel from the Record widget on the home page or from the X-Ray settings page, using the **Frame Rate**, **Level**, **X-Ray Delay** or **Injection Delay** buttons.

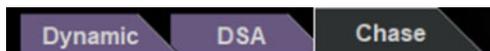
- Perform Dynamic acquisition.

**Figure 10-59 X-Ray Settings page - Touch Panel**



### 10.6.5 InnovaChase™ Mode

- After selection of an angio protocol, select the Chase acquisition mode from the Current Application window located on the left side of the DL Screen. If the selected protocol does not offer this choice, select another protocol from the **Protocols**.



- In the Record window, select the Level and injection parameters.



For more detail about injection parameters, refer to [10.6.2 DSA Mode on page 265](#).

- Perform InnovaChase™ acquisition.  
InnovaChase™ Acquisition uses:
  - 5 fps acquisition frame rate.
  - Large focal spot.
  - Table top manual panning (non subtracted images).

The maximum record duration is limited to 90 s.

## 10.6.6 InnovaBreeze™ Mode (Option)

This option is not available for systems with Omega IV Table.

This option is not available for systems with Magnus Maquet OR Table.

The Bolus chase acquisition mode requires a field of view of at least 30 cm.

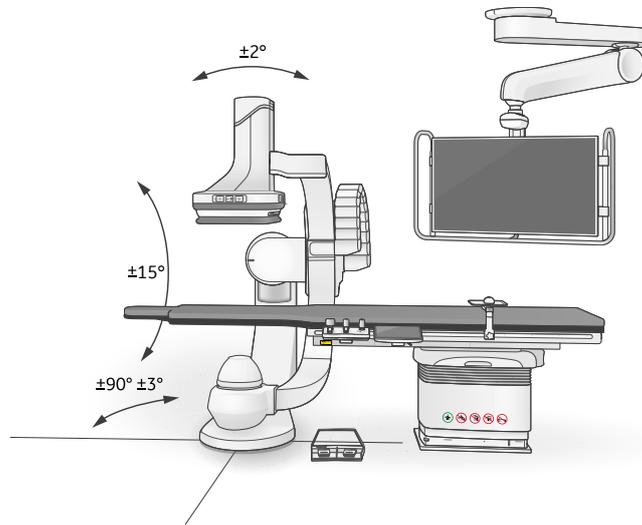
### 10.6.6.1 Application Description

The option is intended to perform subtracted angiography in real time of the lower limbs for diagnostic purpose.

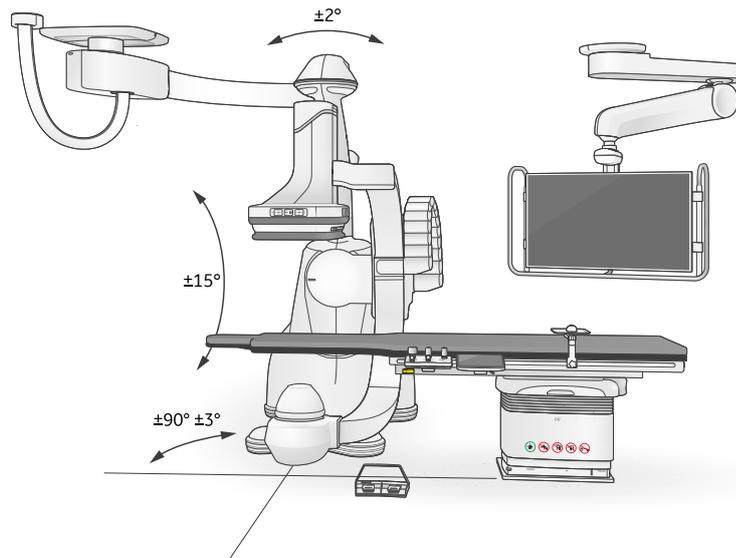
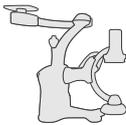
### 10.6.6.2 Before You Start

#### Gantry and table positioning

Allia IGS 5



Allia IGS 7  
Allia IGS 7 OR



- The L (swivel) must be at  $\pm 90^\circ (\pm 3^\circ)$  or **(For Allia IGS 7 and Allia IGS 7 OR)** on the left or right gantry panning trajectories.
- The table-top must be centered (rotation is not allowed).
- The gantry must be in PA relative to the table ( $\pm 2^\circ$  CRA-CAU,  $\pm 15^\circ$  RAO-LAO). If the table is tilted and the system is being used in mechanical mode, toggle to anatomical mode and back to check this.

#### Patient Positioning

- To get the maximum patient coverage, position the patient so that the head is located at head end of the table top.

**NOTE**

**(For IGS 7)** Positioning the gantry along isocenter-panning trajectory allows increasing the coverage towards the patient feet.

The table extender can also be used to extend patient coverage.

- Using Fluoro, check that the patient is aligned with the table top and Detector between Start and End positions.
- Use proper accessories (e.g.: Velcro® straps...) to immobilize the legs/feet of the patient.

**WARNING**

DURING THE BOLUS ACQUISITION, THE TABLE TOP WILL MOVE BETWEEN THE START AND END POSITIONS. ALWAYS CHECK THAT ALL TUBING (INJECTOR, PRESSURE...) CONNECTED TO THE PATIENT WILL BE LONG ENOUGH AND WILL HAVE AN EXTRA LENGTH OF AT LEAST 15 CM WHEN THE TABLE WILL REACH THE START OR END POSITION. FAILURE TO THIS RECOMMENDATION COULD CAUSE SEVERE INJURY TO THE PATIENT AT PUNCTION LOCATION.

**Anticollision Precaution****CAUTION**

Make sure to clear the area before launching the procedure to avoid any activation of the anticollision system that would abort the X-Ray acquisition and injection.

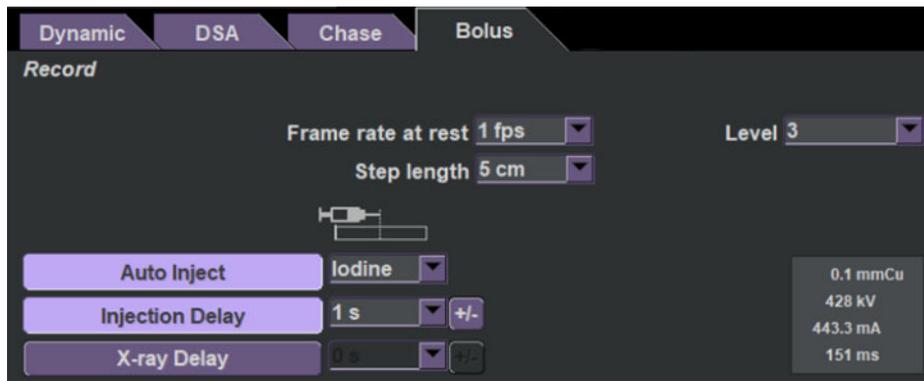
**In the control room**

- After selection of an angio protocol, select the Bolus acquisition mode from the Current Application window located on the left side of the DL Screen. If the selected protocol does not offer this choice, select another protocol from the **Protocols**.

**NOTE**

Any protocol selection performed after the Start/End positions were memorized will lose these positions.

- Select the acquisition parameters
  - Available frame rates at rest (when the table top does not move) are: 1 fps and 2 fps.
  - Step length is fixed to 5 cm.
  - Auto/Manual injection with X-Ray/Injection Delay.
  - Record Level.



### In the exam room

Once the Bolus Chasing mode is selected the **Set Start Position** button will be displayed.

	Item	Description
		[1] Set Start Position



**NOTE**

A 15 minutes time out is allowed between:

- Memorization of Start and memorization of End position.
- Memorization of End position and beginning of bolus acquisition.

### 10.6.6.3 Acquiring images

#### In the Exam Room

- In order to always get the maximum field coverage on the patient even using a small field of view, move the table top up to the end and keep the Digital Detector close to the patient.
- Move the table top to center the patient over the abdomen. The **Set Start Position** button must be lit to allow to store the table position. Press it to memorize the table Start position. The label for this button becomes **Set End Position**.
- Correct centering is checked using fluoroscopy, from the abdomen to the feet.
- Longitudinal movement is the only movement available. When the table top is moved more than 30 cm from the Start position and is in the allowed range, the **Set End Position** button blinks.
- After centering over the feet, press this button to memorize the table End position. The label for this button becomes **Reset**.

**NOTE**

From the time the Start position is memorized to the time the exposure switch is pressed all gantry axis are locked except:

- Table Up/Down.
- Digital Detector Up/Down.
- Longitudinal table top.

Collimation, Contour Filters and Field of View selections are available until the exposure switch is pressed.

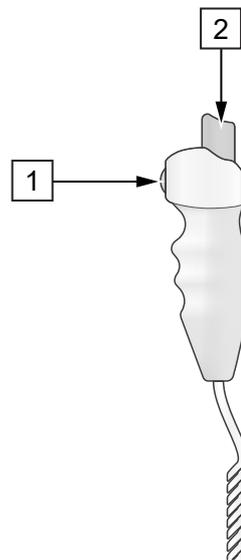
Fluoro is always available until the acquisition starts.

**At the Console**

Expose Handswitch



Bolus Chasing Handswitch



Item	Description
[1]	Bolus Button
[2]	Table Speed

- Press and hold the expose handswitch button.

**NOTE**

Except in case of emergency, this button must NOT be released during the entire Bolus acquisition.

- The table is automatically positioned at the Start position (Abdomen).
- The mask sequence is performed at a fixed frame rate, from the Abdomen to the feet. Two trial shots are performed at low dose (about 25% of nominal dose) prior to each mask acquisition. The table then returns to the Start position and `Depress Bolus button` is displayed in the Status area.
- On the Bolus Chasing handswitch: depress and release the Bolus button (See Figure above).
- The X-Ray Run begins.
- The injection begins after the programmed delay.

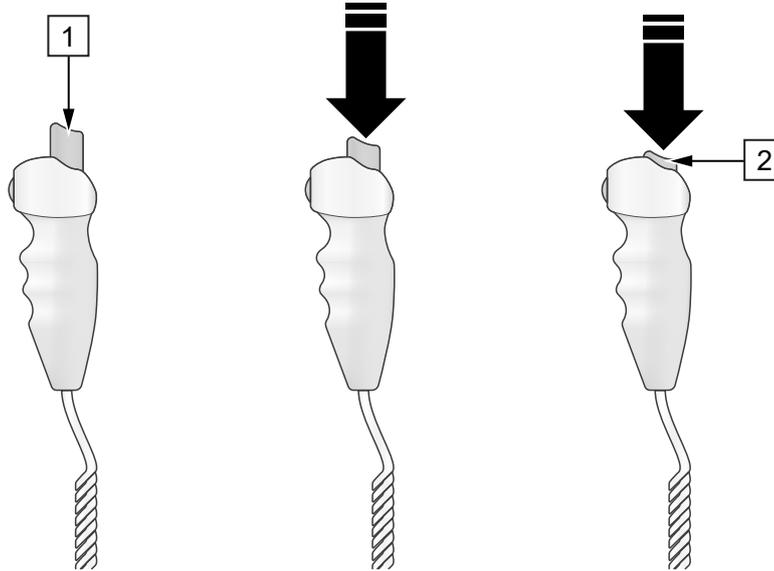
- Use the Table Speed button of the Bolus Chasing handswitch to follow the contrast media.



**NOTE**

In case of image pasting needed after the Bolus acquisition, adapt the table movement to ensure that the central horizontal strip of the acquired images is always well opacified. Ideally, the contrast agent should be visible on at least 75% of the image. If necessary, proceed to separate acquisition for each leg.

- Increase or decrease the speed of the table by pressing more or less firmly on the button.



Item	Description
[1]	Table stopped (button released)
[2]	Maximum speed (button fully pressed)

- When the table speed button is released, the table stops on the next Mask position. Images are then acquired at the frame rate at rest.
- To stop the X-Ray Run:
  - Release the expose handswitch button at any time or,
  - Press then release the Bolus button on the Bolus Chasing handswitch after the table has reached its stop position.



**NOTE**

Until the Bolus Chase protocol is exited or the **Reset** button is depressed to clear the Start and End memorized positions, the system is still ready to perform another identical bolus acquisition.

A 15 minutes time out will automatically clear both memorized table positions if no action is performed on the system after the completion of the bolus.

### 10.6.7 3D CT and 3DStent Modes (Options)

This section describes the “3D CT” and “3DStent” modes. These two modes share many commonalities, and when appropriate, the term “3D” or “3D spin” or “3D acquisition” is used to refer to both “3D CT” and “3DStent” modes.

The 3DStent option is not available on systems equipped with a Magnus Maquet OR table.

### 10.6.7.1 Application Description

3D CT is a software option that reconstruct 3D volumes from rotational radiography acquisition to provide images that assist the physician in diagnosis, surgical planning, interventional procedures and treatment follow-up.

3D CT is intended for imaging vessels, bones and soft tissues as well as other internal body structures.

3DStent is a 3D acquisition mode dedicated to the 3D reconstruction of coronary stents.

#### WARNING



3D IMAGES SHOULD NOT BE USED ON THEIR OWN FOR DIAGNOSIS OR TREATMENT BUT ALWAYS IN COMPLEMENT OF 2D IMAGES (LIVE OR RECENT RECORDED IMAGES).

The 3D reconstruction is carried out on the Advantage Workstation.

All reconstructed 3D models can have 512<sup>3</sup> resolution.

3D models produced can be visualized on the Advantage Workstation using the Volume Viewer software.

The Volume Viewer software offers the ability to:

- Manipulate the 3D model around all three axes.
- Perform distance, and volume measurements.
- Display MPVR (Multi Planar Volume Reconstruction) cross-sections: axial, sagittal, coronal and oblique cross-sections.
- For injected 3D CT acquisitions:
  - Navigate inside vessels.
  - Detect vessels and remove un-wanted structures from the image.

### 10.6.7.2 3D Spin Calibration

The 3D Spin Calibration procedure is performed by using the helix phantom for definition of volume reference points (to be performed once every six months).

Two levels of information message are displayed:

- 6 months-15 days: 3D Calibration near to expire. Call Service to perform 3D Calibration.
- After 6 months: 3D Calibration out of date. Call Service to perform 3D Calibration. 3D acquisitions and reconstructions are still allowed.

A small "\*" will be displayed on the left of the 3D model reconstruction date on the Advantage Workstation.

### 10.6.7.3 3D Spin Image Acquisition

The 3D spin images acquisition specificities are given in the following table:

	3D CT Mode			3DStent Mode	
<b>Rotation speed</b>	40°/s	28°/s	16°/s	20°/s	10°/s
<b>Frame Rate</b>	50 fps			30 fps	
<b>Number of views</b>	244	347	607	291	582

	3D CT Mode			3DStent Mode	
<b>Time of acquisition per spin</b>	5 s	7 s	13 s	10 s	20 s
<b>Subtraction (2 spins)</b>	Yes	Yes	No	No	No

**NOTE**

The number of views and the time of acquisition are given approximately.

**NOTE**

Using more views allows the improvement of the global image quality.

**NOTE**

For 3D CT mode, rotation speeds below 40°/s are only accessible with the 3D CT HD option.

**3D Presets****10.6**

3D spin acquisition parameters are predefined with Preset selection in the 3D CT and 3DStent tabs. The proposed Presets in a given protocol are targeted for anatomy and typical imaging purposes such as vascular, soft tissues, bones, devices visualization or a combination thereof.

3D Presets have default values for the following parameters, that can also be changed by the user:

- The FOV
- The rotation speed
- The percentage of horizontal (top-bottom) and vertical (left-right) collimation in the FOV
- For 3D CT mode only:
  - The dose level
  - The use of subtraction

On top of this, the Presets also set the following parameters that can be changed only with the support of your GE HealthCare medical representative:

- The focal spot
- The SID

**NOTE**

The FOV 30 cm is not available within the 3DStent mode.

**NOTE**

For 3D CT mode, the default activation of Auto/Manual injection with X-Ray Delay is defined, and can be manually edited, at the protocol level.

**Patient Positioning**

The table top shall not be rotated. Rotation brakes shall be locked.

Move the L (swivel) angle to 0°. **(For Allia IGS 7 and Allia IGS 7 OR)** It is possible to position the AGV on the back-in/out trajectories from the working position 0°.

Using Fluoro in PA and Lateral projections, properly center the region of interest (ROI) at isocenter.

**WARNING**

SPECIAL ATTENTION MUST BE PAID TO THE PATIENT IMMOBILIZATION DURING THE 3D SPIN ACQUISITION SEQUENCE. ANY PATIENT MOTION DURING THE FAST ROTATION OF THE GANTRY COULD INJURE THE PATIENT. IT IS ADVISED, PARTICULARLY IF THE PATIENT IS NOT ANESTHETIZED, TO USE APPROPRIATE RESTRAINING DEVICES TO COMPLETELY IMMOBILIZE THE PATIENT (HEAD, ARMS, LEGS) IN ORDER TO KEEP THE PATIENT, AND SO THE REGION OF INTEREST, PERFECTLY STILL THROUGHOUT THE ACQUISITION SEQUENCE. ANY PATIENT MOTION WILL ALSO REDUCE THE QUALITY OF THE IMAGES AND THE 3D RECONSTRUCTION. EXPLAIN THE PROCEDURE TO THE PATIENT AND ASK HIM NOT TO MOVE PRIOR TO PERFORMING A 3D SPIN IMAGES ACQUISITION.

Use appropriate collimation to limit patient radiation and cut raw radiation.

**NOTE**

It is advised to center the anatomy of interest once the desired 3D Preset is selected due to specific FOV selection per Preset.

**NOTE**

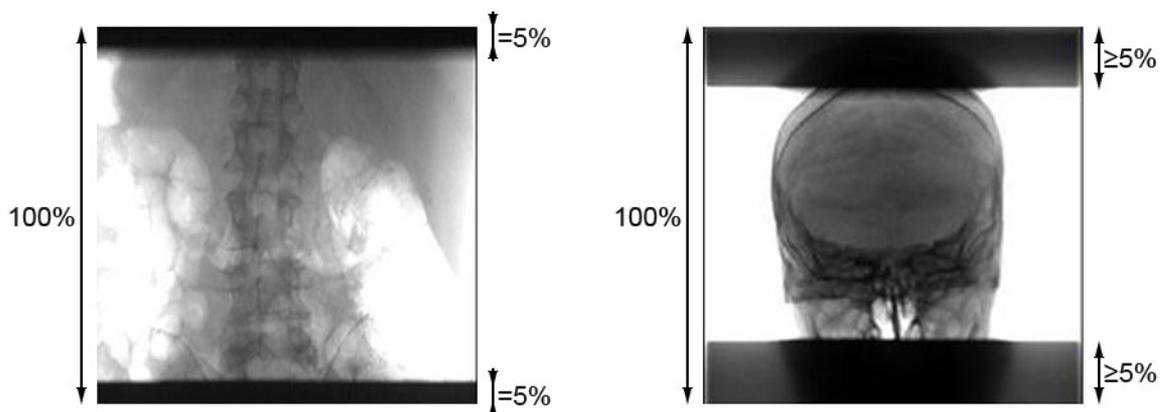
It is advised to position the anatomy of interest with the largest SID; a fast and easy way to achieve is to use the PA and LAT buttons to bring the gantry in PA and lateral positions.

**NOTE**

Because contour filter blades can create artifacts on 3D models, blades are automatically parked as soon as a 3D acquisition mode is selected.

**Scatter Management**

Scattered radiation is inherent to all X-Ray acquisitions. To reduce the impact over 3D reconstruction, use horizontal collimation that decreases the amount of scatter on the detector. When such collimation exceeds 10% of the FOV length, this enables the possibility to activate a dedicated processing for scatter correction at the time of reconstruction on the AW workstation.

**NOTE**

When collimating before the 3D spin, make sure that the anatomical structure you are interested in is still present in the Field of View.

**NOTE**

Default collimation settings are defined for each 3D Preset and applied from the Spin Test phase; manual collimation is advised only if necessary.



**NOTE**

Any default or manual collimation from a 3D Preset is lost when switching to another Record Mode; in this case, the collimation blades are repositioned in order to recover the region of interest (including FOV and collimation) that was used in the last Record Mode used before 3D.

**On the DL Screen and the Touch Panel**

For a 3D CT acquisition, select the 3D CT tab.

For a 3DStent acquisition, select the 3DStent tab.

**CAUTION**



Special attention must be paid to select the appropriate 3D spin mode for the current exam (3D CT versus subtracted 3D CT versus 3DStent mode) to avoid:

- Unnecessary retake causing extra x-ray dose to the patient, and potentially extra injection depending on the situation.
- Or mechanical hazard to clinical staff arising from unexpected gantry movement (when subtracted 3D CT mode is selected instead of 3D CT).

Select the 3D Preset corresponding to the 3D imaging purpose from the available Preset list. The selection of a preset will automatically set the acquisition parameters according to the default values of the selected preset. Refer to section [3D Presets on page 279](#) for a detailed list of the parameters associated to the 3D presets.



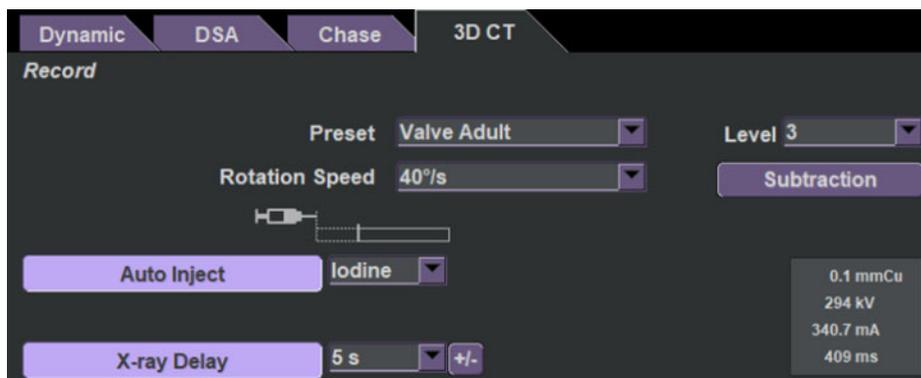
**NOTE**

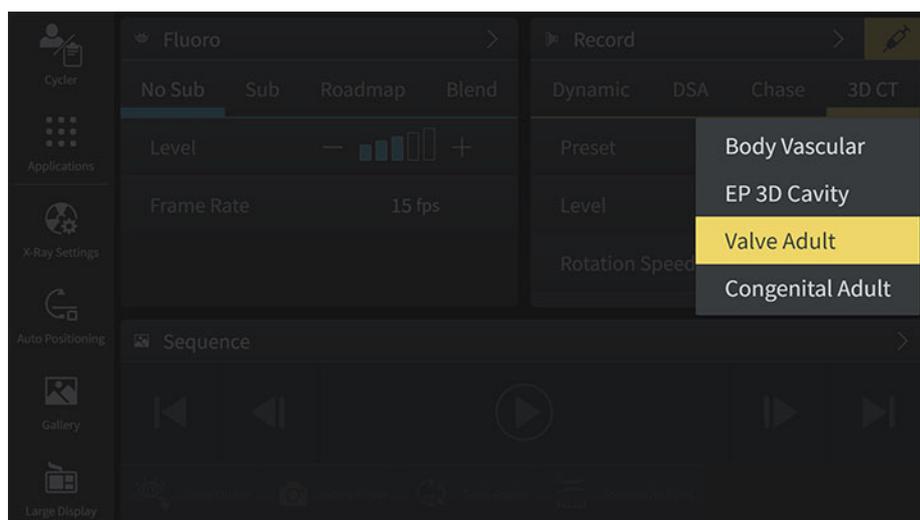
It is advised to ask for Preset customization if such manual editions are required too often.

**CAUTION**



In the case of vessel, or perfusion imaging, use appropriate injection parameters (volume, rate, delay) in order to properly opacify the vessels during the entire image acquisition phase.





## Making an acquisition in 3D Spin

As soon as a 3D Mode is selected, the **Move** button [1] starts to blink and the message Ready for Spin Test is displayed at the bottom left of the live display.





Press and hold the **Move** button.

- The detector moves to the Preset SID.
- The gantry moves from its current position to the End of rotation position.
- All gantry axes are reinitialized.
- The gantry performs its test rotation at 15°/s from End to Start position.

**CAUTION**



Make sure to clear the area before launching the procedure to avoid any activation of the anticollision system that would abort the X-Ray acquisition and injection.

- At the end of the test rotation, the **Move** button goes Off and the message `Ready`. `Clear rotation` area is displayed on the live display.



**NOTE**

From the beginning of the Test Rotation, all motorized table and gantry axis are locked. Pressing on the **Move** button after the completion of the Test Rotation will abort the 3D Spin set up and free all table and gantry axes. If needed, the patient can be repositioned. A new Test Rotation is then required.

Press and hold the expose handswitch button.



**NOTE**

Except in case of emergency, this button must NOT be released during the entire 3D Spin acquisition.

- For subtracted acquisition:
  - The mask X-Ray run, starts at a selected speed. A message `Spin Acquisition in Progress` is displayed in the bottom left corner of the live display.
  - The gantry automatically goes back to the start position at a speed of 30 degree/second. A message `Returning to Start Position` is displayed.
  - The injection starts.

- The second X-Ray run, Contrast, starts after the programmed X-Ray delay. A message *Spin Acquisition in Progress* is displayed in the bottom left corner of the live display.
- The review automatically starts by displaying subtracted images. Mask, Contrast and Subtracted spins can be reviewed separately.
- When the gantry reaches the End position, X-Rays are stopped and the Move button starts to blink again; the system is ready for a new 3D Spin acquisition (new Test Rotation must be performed first).

**NOTE**

Stenosis Analysis is available on the subtracted images.

**NOTE**

The two spins ("Mask" and "Contrast") are concatenated into a single sequence.

All data needed for the 3D reconstruction is saved with the images in the same sequence.

This will allow reconstructing the 3D Spin acquisition whenever needed.

**NOTE**

Information and error messages are displayed in the status and Error Message areas located at the bottom of the live display.

Message	Problem description / What to do
SELECTION NOT ALLOWED. TABLE IS ROTATED.	You tried to enter a 3D mode with Table rotated. This is not allowed. Lock table at rotation = 0° and try again.
APPLY TABLE ROTATION BRAKE TO PERFORM 3D.	You tried to enter a 3D mode with table rotation brake not locked. Lock table at rotation = 0° and try again.
RECORD ACQUISITION NOT ALLOWED, SPIN TEST IS IN PROGRESS.	You tried to perform a record during test phase. This is not allowed. End Test phase and try again.
SPIN SETUP STOPPED.	You got out of a 3D mode before performing spin acquisition. This can happen if: <ul style="list-style-type: none"> <li>• There was a collision between end and start position during test phase.</li> <li>• You selected a new protocol.</li> <li>• 5 minutes have elapsed after the spin test.</li> </ul> Go back to the desired 3D mode and press Test button again.
READY FOR SPIN TEST.	You just entered a 3D mode.
SPIN TEST IN PROGRESS.	Spin safe test is running.
READY. CLEAR ROTATION AREA.	3D acquisition ready to start.

### 10.6.7.4 3D Image Reconstruction

After the 3D acquisition is completed, acquired images are automatically transferred to the Advantage Workstation.

**NOTE**

3D images will always be sent to a predefined specific remote host (AW workstation).

Non 3D images will be sent to the remote host selected in the **Host Selection** screen.

3D images can be sent to 2 different hosts: the specific 3D host (AW workstation) and the host selected in the **Host Selection** screen. In such case, the status of the 3D sequence in the DL Sequence Browser will change to sent only after successful completion of the 3D sequence data transfer to both hosts.

**NOTE**

For detailed information on the use of the reconstruction software, refer to its dedicated User Manual.

### 10.6.7.5 3D Model Display

The 3D model of vessels and/or interventional devices can be analyzed using a range of 3D analysis tools including:

- MIP (maximum intensity projection).
- Volume Rendering.
- MPVR (multi-planar volume reconstruction).
- Axial, sagittal, coronal and oblique cross-sections.
- Electronic scalpel and 3D shutter.
- Distance and volume measurements.
- Navigator (endovascular-like).
- Customized screen layouts.

### 10.6.7.6 3D CT Quick Guide

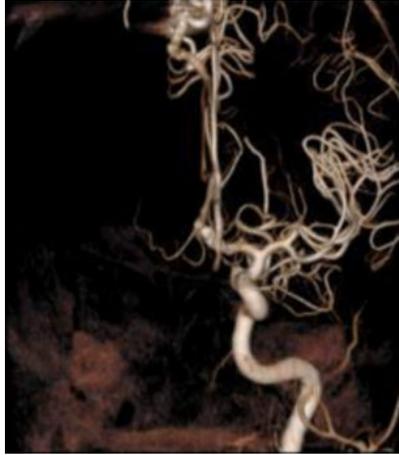
#### 3D CT Acquisition

The table top shall not be rotated. Rotation axis shall be locked.

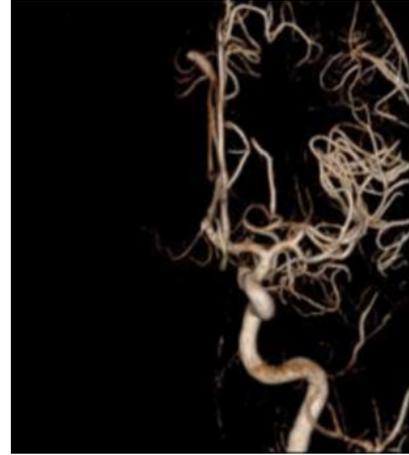
- Center the region to be imaged using lateral and frontal fluoro.
- When using the 30/32 cm FOV, use appropriate collimation to avoid raw radiation, which can degrade the 3D image.
- Use collimator blades as required, but as the 3D image might be slightly smaller than 2D image, make sure to keep an appropriate margin by NOT collimating too tightly.
- For optimum vessel contrast, injection should be as selective as possible.
- Vessels should be completely opacified from the beginning of the injected spin until the end.
  - X-Ray delay: If a DSA series is available, use the **scale** button on the DL keypad to display the time line and measure the delay between injection start and vessel completely filled. Enter this delay as X-Ray delay.
  - Injection parameters: select volume and flow rate such that the injection duration is equal to the above-computed X-Ray delay plus 5 seconds rotation duration.
  - As a guideline, injection parameters should be equal or inferior to the one used for an unsubtracted 3D. Subtracted 3D enables automatic bone removal, one can expect same vessel segmentation and visibility with volume of contrast product inferior to the one used for a no sub 3D.
- Any patient motion during either gantry rotations (mask and/or contrast spin) or in between those two rotations, will degrade the 3D image quality causing artifacts such as streaks or

blurring. Informing the patient about the gantry rotation and instructing the patient not to move, and if possible not to breathe (approximately 20 seconds), during the entire 3D acquisition will help. In case of cerebral procedures, ask the patient to close his/her eyes during the spin/s. If possible with general anesthesia, stop the respirator.

**Figure 10-60 Bone removal with subtracted 3D - Non-Sub 3D**



**Figure 10-61 Bone removal with subtracted 3D - Sub 3D**



- For intracranial vascular studies, it is recommended to use the 20 cm FOV to avoid the presence of skull in the 3D image. This may simplify the 3D processing on the AW and avoid having to remove the skull manually.

### 3D reconstruction

Refer to the reconstruction software User Manual.

### 3D display

When looking at a 3D image, keep in mind that it is a reconstructed image which may also contain reconstruction artifacts. Always compare a 3D image with other patient data in case unexpected structures are discovered.

### Subtracted 3D Display

Single or multiple volume reconstruction and display can be selected.

The "Mask" volume will be useful to see any implanted device such as a stent, coils, or clips.

The "Subtracted" volume will enable injected vessels while removing both background anatomy and implanted devices. Depending on clinical purpose, the comparison or merge of the information brought by both volumes can bring added value as illustrated on the three cases below.

#### **Angio: analysis of stent deployment**

Figure 10-62 3D Mask

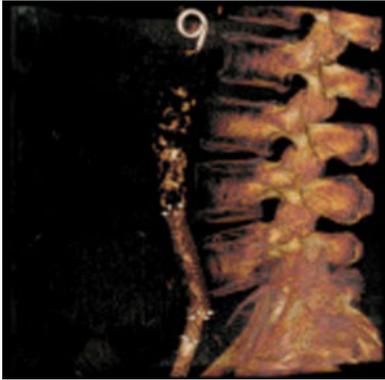


Figure 10-63 Plaque and Stent

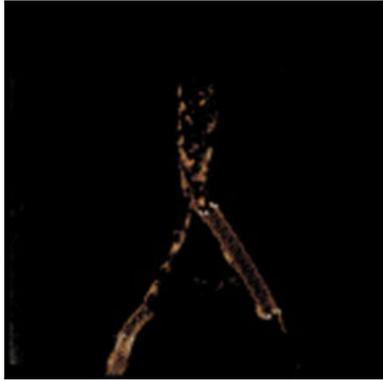


Figure 10-64 "Sub 3D Merge" with Plaque and Stent



Figure 10-65 Non-Sub 3D



Figure 10-66 Sub 3D



Oncology: Quality control after PVE

Figure 10-67 "Non-Sub 3D" after PVE

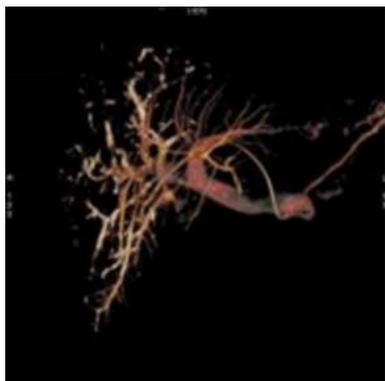


Figure 10-68 Glue only (from mask)

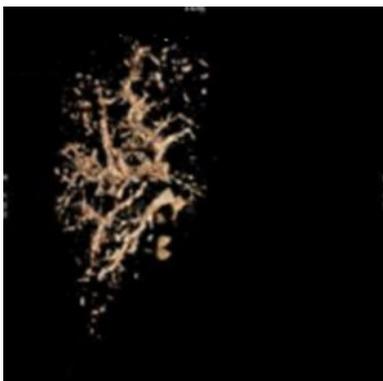


Figure 10-69 Vessels only (from "Sub 3D")



**Figure 10-70 Sub 3D Merge**

Drag & Drop merge showing glue and vessels

### Neuro: analysis of coiled aneurysm

**Figure 10-71 Non Sub 3D****Figure 10-72 Sub 3D****Figure 10-73 Sub 3D Merge**

Drag and Drop merge showing coils

## 10.6.7.7 3DStent Quick Guide

### 3DStent Acquisition



#### NOTE

3DStent is a 3D acquisition mode dedicated to the 3D reconstruction of coronary stents. As the StentViz 2D stent enhancement application, it is based on the automatic detection of the balloon markers in the images to compensate for the motion of the stent. Therefore, the balloon needs to be left in place inside the stent, deflated, during the entire 3DStent acquisition.



#### NOTE

The 3DStent acquisition shall be performed without any contrast media injection. Injecting contrast media during a 3DStent acquisition would compromise the visibility of the balloon markers in the images, which may in turn, affect the image quality of the 3DStent reconstruction.

The table top shall not be rotated. Rotation axis shall be locked.

1. Deflate the balloon and leave it in position inside the stent.
2. A cardiac related protocol with 3DStent tab needs to be selected. On the DL screen or on the Touch Panel, select the 3DStent tab and select the appropriate parameter setting (FOV,

- rotation speed). Modifying the rotation speed will also modify the overall dose of the 3DStent acquisition.
- Center the stent to be imaged using lateral and frontal fluoro. Optimize the arm's position to avoid collisions.
  - Use collimator blades to reduce the dose as required, but as the 3D image might be slightly smaller than 2D image, make sure to keep an appropriate margin by NOT collimating too tightly.
  - The 3DStent application allows to compensate for cardiac and respiratory motion but any significant patient motion during the gantry rotation may compromise the automatic detection of the balloon markers and therefore degrade the image quality of the 3D reconstruction. Inform the patient about the gantry rotation and instruct the patient not to move during the entire 3DStent acquisition.
  - Do NOT inject contrast media during the 3DStent acquisition.

### 3DStent Acquisition Best Practice

The quality of the 3DStent reconstruction might be altered by the following factors:

- Low radiopacity of the stent.
- Low radiopacity of the balloon markers.
- High noise level in the spin images.
- Radiopacity of the guidewire.
- Presence of highly radio-opaque objects in the vicinity of the balloon markers.
- Superimposition of the two balloon markers due to stent orientation in the rotational acquisition plan.
- Presence of more than one balloon in the image.

In particular, check the following:

- Ensure there is only one balloon visible in the field of view.
- Ensure the balloon has only 2 radio-opaque markers.
- Ensure the balloon is correctly positioned in the stent, deflated.
- Ensure the balloon markers are not superimposed with the catheter or with a guidewire tip or with any other highly radio-opaque object or structure.
- Ensure the balloon markers stay in the field of view during the entire 3DStent acquisition.
- Do not move the balloon during the 3DStent acquisition. The only allowable motion is from anatomy.

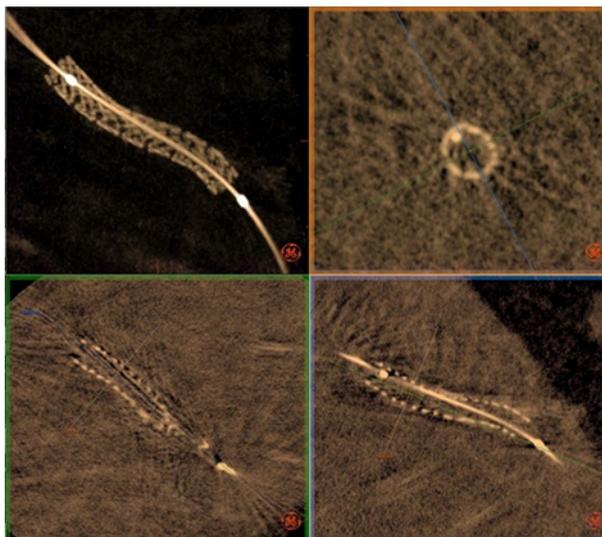
### 3D reconstruction

Refer to the reconstruction software User Manual.

### 3D display

When looking at a 3D image, keep in mind that it is a reconstructed image which may also contain reconstruction artifacts. Always compare a 3D image with other patient data in case unexpected findings are discovered.

For review of the 3DStent reconstructed image, the multi-oblique mode shall be activated in Volume Viewer to make sure that the correct stent cross sections are used to deposit distance measurements.

**Figure 10-74 Analysis of stent deployment in PCI (Percutaneous Coronary Intervention)**

### 10.6.8 InnovaSpin™ (Option)

The InnovaSpin option allows to perform a fast spin rotational angiography. The gantry rotates around its horizontal axis (pivot).

Rotation from RAO to LAO can be performed at up to 40°/s.

Rotation from LAO to RAO can be performed at up to 30°/s.

To prevent any collision during the rotation a test rotation at 10°/s must be performed first.

Time for gantry to speed up and slowdown is included in the rotation trajectory.

#### Safety Recommendations

1. Secure the patient on the table using appropriate restraints to prevent any motion during the gantry rotation.
2. Explain the procedure to the patient and ask him not to move during the gantry rotation.
3. Clear the rotation area to prevent any collision during the rotation.
4. In case of any problem during the rotation, releasing the exposure foot switch will activate the emergency brake of the gantry.

#### Acquisition Procedure and Timing

- Before selecting the InnovaSpin mode, select a protocol where Dynamic or InnovaChase™ acquisition mode is available.
- Position the region of interest (ROI) at isocenter. The table top shall not be rotated and shall be horizontal. The table rotation axis shall be locked.
- Using the Touch Panel, select the **InnovaSpin** button available in the X-Ray Settings page and in the Record widget on the Home page, under Dynamic or InnovaChase™. Then a popup is displayed with the first predefined rotation trajectory selected or the last used trajectory selected.
  - Angles and speed of rotation can be checked on the lower left corner of the live display.
  - Spin is displayed on the right side of the reference display.
  - Ready for Spin Test is displayed in the status area of the live display.

- The **Move** button [1] on the Control Panel flashes.

Allia IGS 5



Allia IGS 7  
Allia IGS 7 OR



- Press and hold the **Move** button. During Test rotation, perform short fluoros to check that the ROI is well isocentered.
  - Spin Test in Progress is displayed in the status area of the live display.
  - The gantry first moves from current position to end of spin position. Manual motion of the table is allowed during this phase (except table rotation and tilt).
  - Then, the gantry moves from end of spin to start of spin position (this phase is the safety test rotation). No manual gantry or table motion is allowed.
  - When the start position is reached, the **Move** button turns OFF and can be released. Ready. Clear Rotation Area is displayed in the status area of the live display.

**NOTE**

- The **Move** button must be depressed within 1 minute of the trajectory selection. After that time, reselect the trajectory to reactivate the **Move** button.
- The test rotation is valid for 5 minutes. After this time, the InnovaSpin mode will be aborted.
- Press on the exposure footswitch. X-Ray starts and the **Move** button goes ON. Perform injection as usual.
  - When contrast media starts to appear on the image, press once on the **Move** button to start the gantry rotation.
    - The **Move** button turns OFF.
    - At the end of the rotation, the gantry motion is stopped and X-Ray can still be performed until the exposure footswitch is released.
  - Releasing the exposure footswitch will exit from the InnovaSpin mode. "Dynamic" or "Chase" is displayed back on the reference display.

**NOTE**

If you choose to keep shooting X-Ray once the InnovaSpin is finished, some gantry vibrations might occur and be visible on the image depending on the trajectory performed.

## Trajectories Settings

Spin trajectories are preloaded in the IGS system.

However, gantry Start position, End position and rotation speed can be modified for each trajectory.

If needed, contact your GE HealthCare Representative for any trajectory modification.

## User Messages

Information and error messages are displayed in the status and Error Message areas located at the bottom of the live display.

Message	Problem Description / What to do
SELECTION NOT ALLOWED, ACQUISITION IS IN PROGRESS	<ul style="list-style-type: none"> <li>• You tried to start the spin test with an X-Ray switch pressed. This is not allowed. Release X-Ray switch and press again <b>Move</b> button.</li> <li>• Or you tried to reselect a trajectory with an X-Ray switch pressed. This is not allowed. Release X-Ray switch and reselect trajectory.</li> </ul>
SELECTION NOT ALLOWED, RELEASE MOVE BUTTON	<ul style="list-style-type: none"> <li>• You tried to enter spin mode with <b>Move</b> button pressed. This is not allowed. Release <b>Move</b> button and restart Spin mode.</li> <li>• Or you tried to reselect a trajectory with <b>Move</b> button pressed. This is not allowed. Release <b>Move</b> button and reselect trajectory.</li> </ul>
SELECTION NOT ALLOWED, TABLE IS ROTATED	You tried to enter spin mode with Table rotated. This is not allowed. Lock table at rotation = 0° and try again.
SELECTION NOT ALLOWED, TABLE IS TILTED	You tried to enter spin mode with table rotated (trendelenburg and/or lateral* tilt). This is not allowed. Put the table horizontal and try again.
RECORD ACQUISITION NOT ALLOWED, SPIN TEST IS IN PROGRESS	You tried to perform a record during test phase. This is not allowed. End Test phase and try again.
RELEASE FLUORO SWITCH FOR SPIN ACQUISITION	You tried to select a new spin position during a Fluoro acquisition. This is not allowed. End fluoro acquisition and try again.

Message	Problem Description / What to do
RELEASE MOVE BUTTON FOR SPIN ACQUISITION	After test phase completed, you tried to start acquisition with <b>Move</b> button already pressed. This is not allowed. End fluoro acquisition and try again.
SPIN SETUP ABORTED, RESELECT TRAJECTORY	You got out of spin mode before performing spin acquisition. This can happen if: <ul style="list-style-type: none"> <li>• There was a user gantry or a table motion between end and start position during test phase.</li> <li>• Or there was a collision between end and start position during test phase.</li> <li>• Or you selected a new protocol.</li> <li>• Or 5 minutes have elapsed after a spin test.</li> </ul> Go back to Spin mode and press <b>Move</b> button again.
SPIN ACQUISITION STOPPED, RESELECT TRAJECTORY	You tried to select another protocol or acquisition mode during the Spin acquisition. This is not allowed and the acquisition has been stopped
READY FOR SPIN TEST	You just entered Spin mode.
SPIN TEST IN PROGRESS	Spin safe test is running.
READY. CLEAR ROTATION AREA	You are ready to start acquisition then launch Spin.
SPIN ACQUISITION IN PROGRESS	The acquisition is started.

\* For system with Magnus Maquet OR Table only.

## 10.7 How to review a Sequence/Photo

### 10.7.1 Browsing from the console

The review of the sequences/photo for each patient in the patients list is possible when no exam is started.



**NOTE**

If you have an active patient's exam started (seen by the Ready displayed at top right corner of DL Screen), you can only review the sequences that have been acquired on the current patient.

To review the images of a patient in the list:

- Click on the **Patients** tab. This brings the PATIENT BROWSER.
- Select the patient you want to review by clicking on it once.
- Click on the **Exams** tab. This brings the EXAM BROWSER of the patient you have selected.