

Baselining a Beam

'Baselining' means giving approval for treatment.

Treatment beams must be baselined before you will be able to proceed to treatment.

A beam that is not baselined is identified by the (✎) icon.

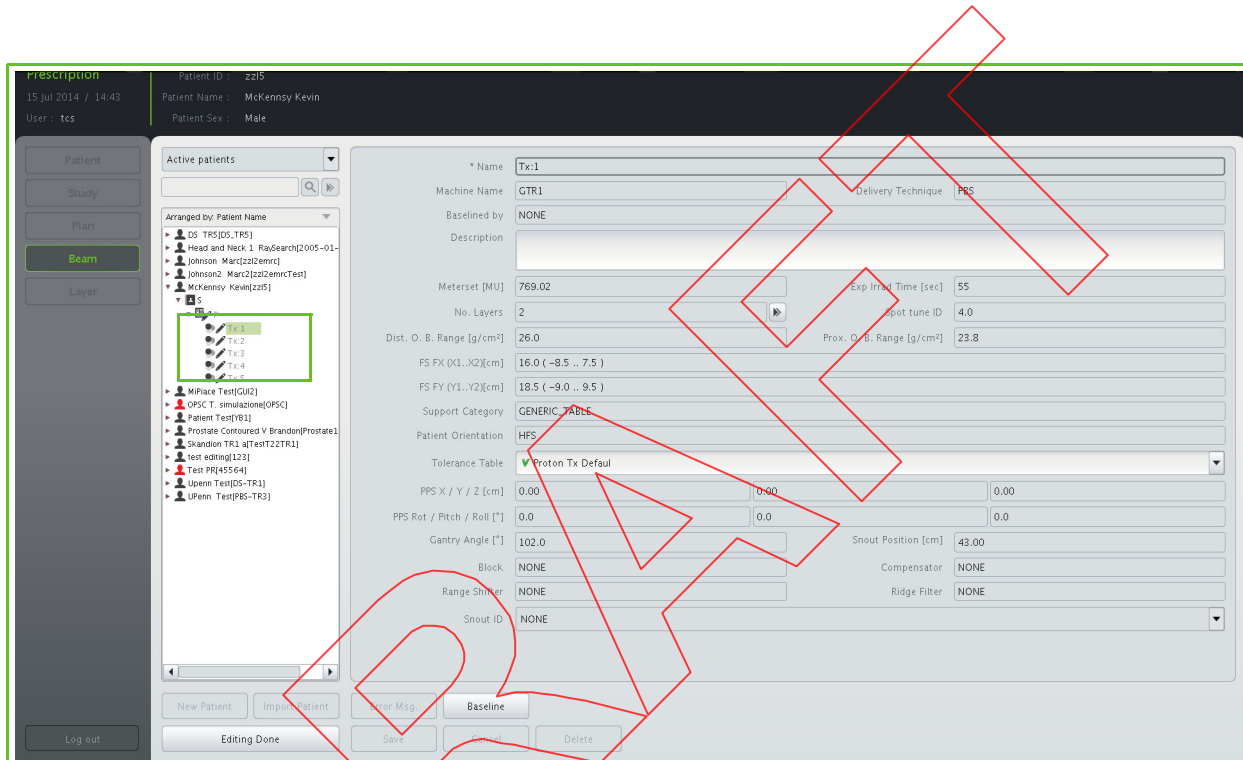


Figure 29-7. Unbaselined Beams

To baseline a beam:

1. Click **Edit Patient**.
2. Verify all beam data.
3. If all beam data is OK, click **Baseline**.

Confirming Baseline in PBS

When you are baselining a beam in the **Pencil Beam Scanning** treatment mode, the BEAM BASELINE CONFIRMATION appears (see Figure 29-8).

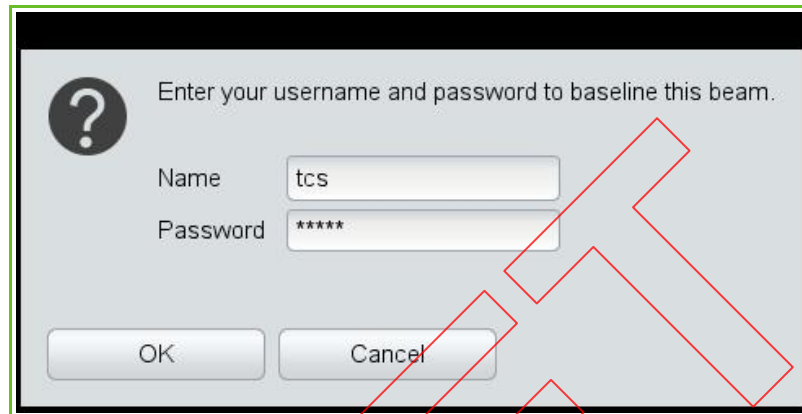


Figure 29-8. Beam Baseline Confirmation
Pencil Beam Scanning

Confirming Excessive MUs

When baselining a beam and the amount of Monitor Units (MU) is outside the specified clinical range, adaPTprescribe prompts you to override the configured value in order to proceed with the baselining process.

The clinical range is configured using adaPTprescribe in **Administration** mode (refer to section "Managing MU Clinical Ranges" on page C-5).

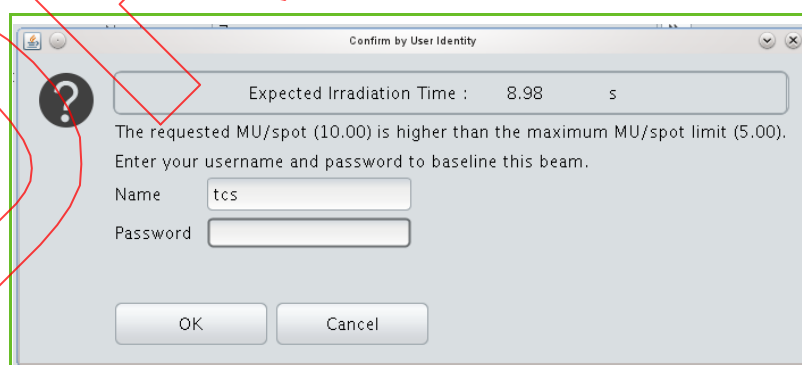


Figure 29-9. MU Override Confirmation

Receiving the Baseline Notification

Confirm the baseline action by entering your name and password.

A notification appears momentarily to inform you that the baseline action has been performed successfully. The notification disappears after a few seconds.

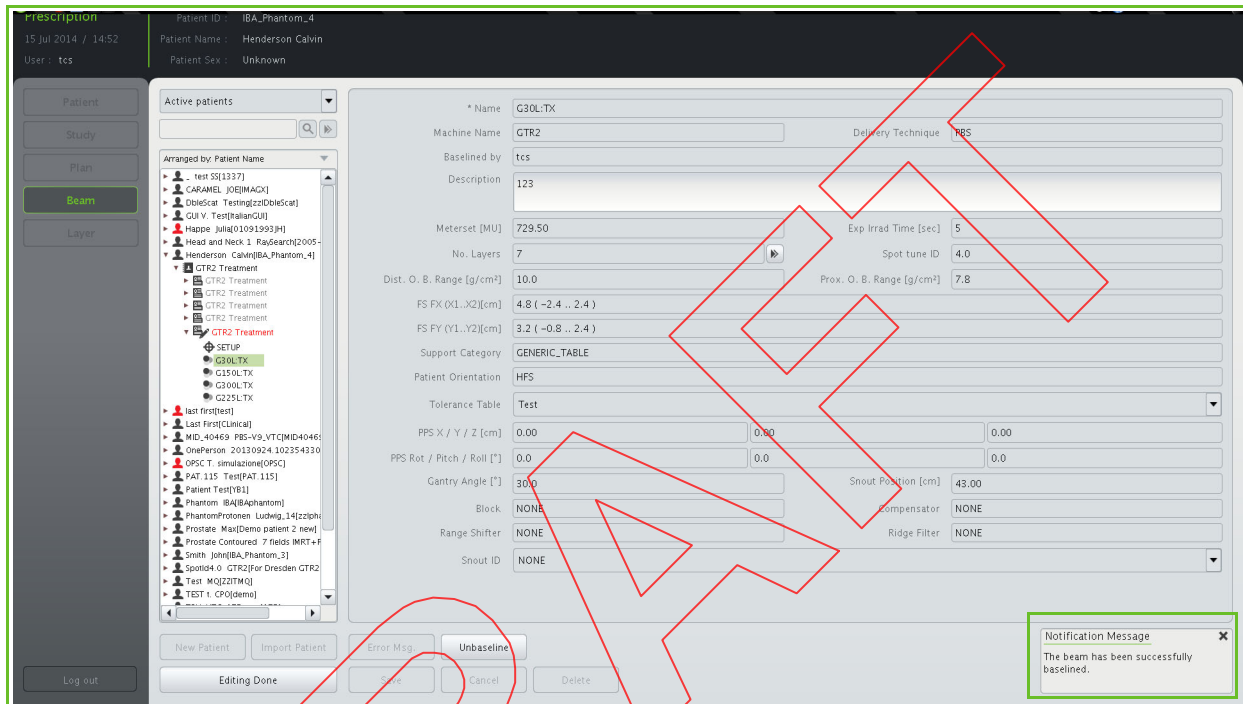


Figure 29-10. Beam Baseline Notification

You can unbaseline a beam as long as it has not passed irradiation. To unbaseline a beam, click **Unbaseline**.

Note: To unbaseline a beam of a baselined plan, you must unbaseline that plan first.

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Chapter 30

Using QA Features of adaPTprescribe

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In adaPT*prescribe*, a distinction is made between different kinds of patients, plans, and plan intents, as follows:

Table 30-1. Types of Patients, Plans, and Plan Intents

Type of Patient	Type of Plan	Plan Intent
Clinical	CLINICAL	CURATIVE PALLIATIVE PROPHYLACTIC VERIFICATION
QA	MACHINE_QA	MACHINE_QA

As illustrated in Table 30-1:

- CLINICAL plans may have a CURATIVE, PALLIATIVE, PROPHYLACTIC or VERIFICATION plan intent and can only belong to clinical patients.
- MACHINE_QA plans have a MACHINE_QA plan intent and can only belong to QA patients. It is forbidden to have a MACHINE_QA plan in a clinical patient.

In adaPT*prescribe*, QA patients, plans with MACHINE_QA and VERIFICATION intent are displayed in red. QA patients are virtual patients used for QA purposes only.

QA patients, MACHINE_QA plans and beams belonging to MACHINE_QA plans are mainly managed as clinical patients, plans and beams belonging to CLINICAL plans. However, any such patients, plans and beams offer you some additional features designed for you to be able to perform the QA tasks required in your proton therapy center. These features, particular to this kind of patients, plans and beams, are explained in detail in this chapter.

Managing QA patients

QA patients can be managed similarly to clinical patients. Refer to Chapter 26 for more details on how to:

- View patient data
- Search for a patient
- Arrange patients
- Select a patient
- Import a patient using DICOM
- Edit a patient
- Activate or deactivate a patient
- Unlock a patient
- Create a study
- Obtain irradiation reports

Managing MACHINE_QA plans

MACHINE_QA plans can be managed similarly to CLINICAL plans. Refer to Chapter 28 for more details on how to:

- Search for a plan
- View a plan
- Baseline a plan
- Copy and paste a plan
- Activate or deactivate a plan

In addition to those features, which are common to both CLINICAL and MACHINE_QA plans, from the plan details panel of MACHINE_QA plans it is possible to:

- Modify the treatment machine
- Create a new PBS beam from scratch

Modifying the Treatment Machine

Modifying the treatment machine of a given plan is possible for all patients (regardless of the type), for plans with any plan intent (not specific to MACHINE_QA), for all delivery techniques. However, in order for you to be able to modify the treatment machine of a given plan, the plan needs to meet the following conditions:

- The plan should be an internal plan (i.e., it has either been copied-pasted or created from scratch using adaPTprescribe). This functionality is not available if the plan was imported (using the Batch Importer, adaPTprescribe's import feature or the OIS).
- The plan must not have been treated before (i.e., there is no treatment record associated with the plan).

In order to modify the treatment machine of a given plan, proceed as follows:

1. From the list of patients, studies, plans and beams on the left of the screen, select the plan for which you want to modify the treatment machine.

The details of the selected plan appear on the right of the screen.

2. Use the drop-down menu in the 'Treatment Machine' field to select the room in which you want the plan to be delivered.

Note: After the treatment machine of a plan is changed, a series of checks is performed. It may be the case that the plan is not valid for the room configuration of the new treatment machine selected (e.g., changing from a GTR to a FBTR may require to modify the gantry angle, or the snout position might become invalid if the snout is different). It is your responsibility as a Radiation Therapy Technologist (RTT) to consider the impact of changing the treatment machine of a plan.

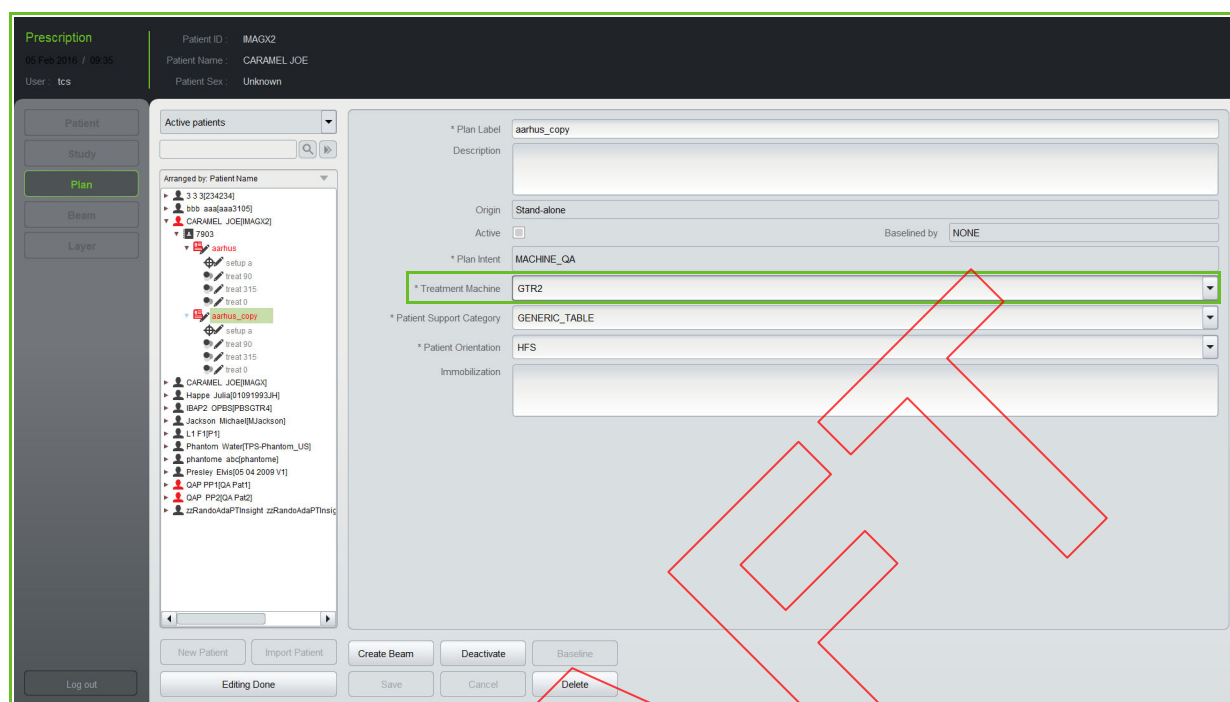


Figure 30-1. Treatment Machine Field

Creating a New PBS Beam from Scratch

You may create a new PBS beam in a MACHINE_QA plan.

In order to create a new PBS beam proceed as follows:

1. Click on the **Create Beam** button at the bottom left of the PLAN DISPLAY SCREEN.

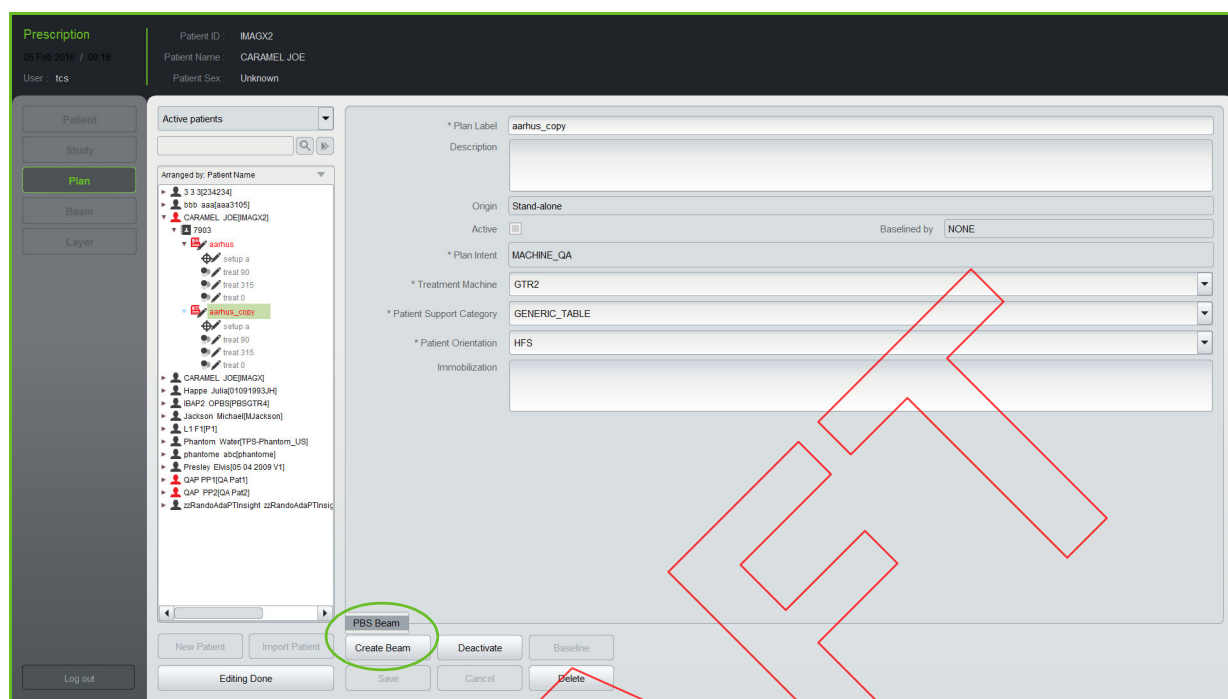


Figure 30-2. Plan Display Screen

2. Select the type of beam that you want to create (in this case, a PBS beam).
The LAYER-EDITING SCREEN appears.
3. Proceed as explained in section *Editing Layer and Spot Details On the Layer Editing Screen* in order to add layers and spots to the newly created PBS beam.

Managing Beams Belonging to MACHINE_QA Plans

Beams belonging to MACHINE_QA plans can be managed similarly to beams belonging to plans with other intents. Refer to Chapter 29 for more details on how to:

- View a beam
- Copy and paste a beam
- Access layer details
- View layer details
- Baseline a beam

In addition to those features, from the beam details panel of beams belonging to MACHINE_QA plans it is possible to:

- Edit layer and spot details of PBS beams using the LAYER EDITING SCREEN.
- Import PLD (PBS Layer Definition) files to create new PBS beams.

Note: The two options above are only possible for PBS beams belonging to a plan with plan intent 'MACHINE_QA'.

Note: Once a beam is baselined it is no longer possible to edit the corresponding layer and spot information.

Note: For PBS beams that do not belong to a plan with plan intent 'MACHINE_QA', it is possible to view the layer and spot information, but not to edit it.

Editing Layer and Spot Details On the Layer Editing Screen

Important	After each modification of layer or spot information, a translation check against the delivery machine capabilities (i.e. Scanalco) is performed to ensure that the modification is valid. If it is not (the chosen beam parameters may be found to be 'undeliverable'), a notification message appears (Beam parameters not valid) and the Error Msg button is enabled to see the detail of the error. If the user keeps on modifying the layer or spot without correcting the error, the notification message is NOT shown again but the Error Msg button is still enabled to show the problem. However, if the user corrects the error, a notification message appears (Beam parameters valid) and the Error Msg button is disabled.
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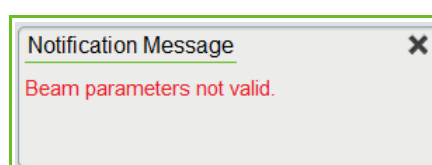


Figure 30-3. Notification Message
Beam Parameters Not Valid

Note: Layer details are specific to the Pencil Beam Scanning treatment mode. The LAYER EDITING SCREEN is only available for Pencil Beam Scanning.

To access the layer editing screen, click the  button next to the No. Layers field. The LAYER EDITING SCREEN appears.

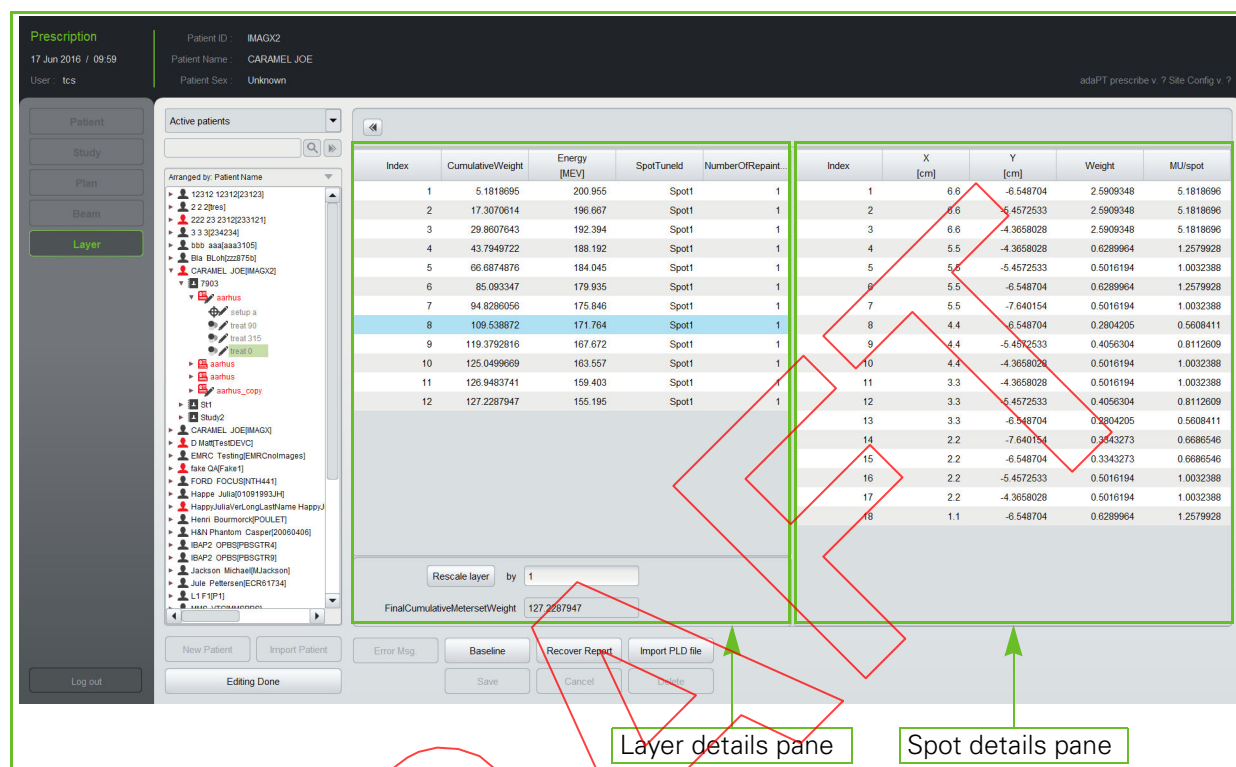


Figure 30-4. Layer Editing Screen

The LAYER EDITING SCREEN contains the following elements:

- Layer details pane:** this is a list of the layers of the selected beam. For each layer, the following information is listed:
 - Index: this is automatically assigned and cannot be edited.
 - Cumulative Weight: the weight of the current layer summed to the total weight of all previous layers. This field cannot be edited.
 - Energy (MeV): the energy of each layer can be edited.
 - Number of paintings: the number of paintings to be performed for each layer can be edited. For detailed information, refer to section "Repainting Modes" on page 20-5.

At the bottom of the layer details pane, there is a **Rescale layer** button next to the word 'by' and an editable field. You may select a layer and use the editable field to write down the factor by which you want to multiply the weight of all the spots in the selected layer.

Click on the **Rescale layer** button and the weight of all the spots in the selected layer is scaled.

This is an alternative to manually editing each field in the spot detail lines and may save you some time.

Below the **Rescale layer** button, the 'Final Cumulative Meterset Weight' field displays the sum of the weights of all the layers in the beam.

Note: Each beam is planned to deliver a total number of MUs. Each spot of the beam is assigned a certain weight, which is a percentage of the total number of MUs. The cumulative meterset weight of the layer is the sum of the weight of each spot from this layer and the previous ones.

Note: The 'Final Cumulative Meterset Weight' number logically corresponds to the number in the 'Cumulative Weight' field of the last layer in the beam.

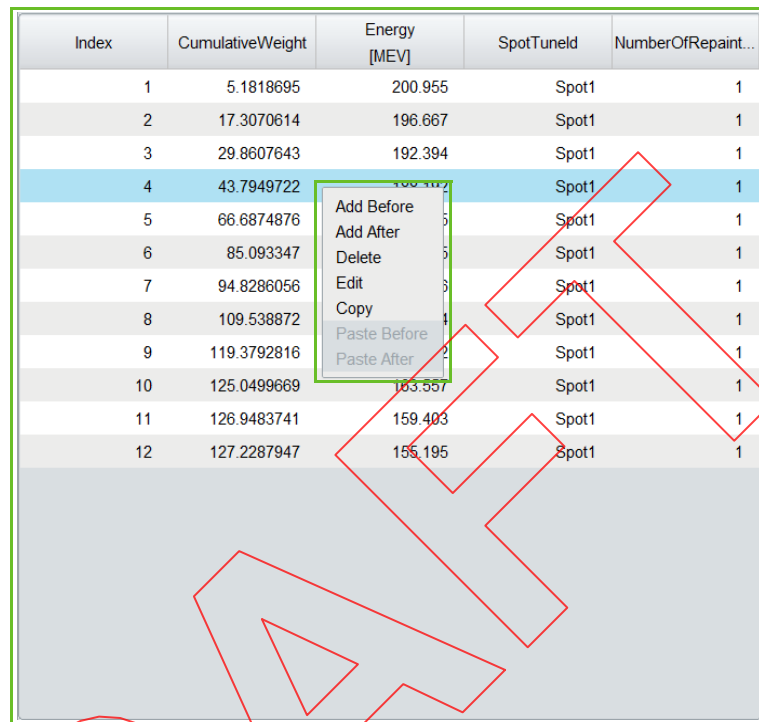
- **Spot details pane:** this is a list of the spots in the selected layer. For each spot, the following information is listed:
 - Index: this is automatically assigned and cannot be edited.
 - X [cm]: the spot position along the X (IEC) axis. This field can be edited.
 - Y [cm]: the spot position along the Y (IEC) axis. This field can be edited.
 - Weight: the weight of the current spot. This field can be edited.
 - MU/Spot: this is the number of MUs to be deposited in the current spot. This field cannot be edited.

Some characteristics of the layer list panel:

- You can modify the width of the columns in the panel, if desired.
- If a column is not wide enough to display all data, four dots appear to indicate that more precise data is available. Extend the width of the column to view the complete data.

Editing Layer Details Using the Layer Editing Menu

In the Layer Details Pane, right click on a given layer. The LAYER EDIT MENU appears:



Index	CumulativeWeight	Energy [MEV]	SpotTuneld	NumberOfRepaint...
1	5.1818695	200.955	Spot1	1
2	17.3070614	196.667	Spot1	1
3	29.8607643	192.394	Spot1	1
4	43.7949722	188.112	Spot1	1
5	66.6874876	183.557	Spot1	1
6	85.093347	159.403	Spot1	1
7	94.8286056	155.195	Spot1	1
8	109.538872		Spot1	1
9	119.3792816		Spot1	1
10	125.0499669		Spot1	1
11	126.9483741		Spot1	1
12	127.2287947		Spot1	1

Figure 30-5. Layer Edit Menu

Using this menu, you may perform the following actions on the layer on which you have right-clicked:

- Add a new layer before or after the selected layer.
- Delete the selected layer.
- Edit the selected layer.
- Copy the selected layer.
- Paste a previously copied layer before or after the selected layer.

Using Keyboard Shortcuts to Edit Layers

After selecting a given layer, instead of using the LAYER EDIT MENU, you may use the following keyboard shortcuts:

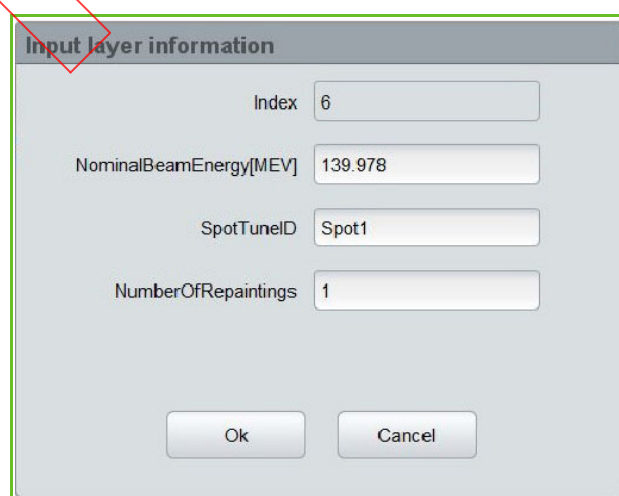
Table 30-2. Keyboard Shortcuts - Edit Layer Details

Press this key...	To...
Ctrl+I	Add before
Shift+I	Add after
Shift+V	Paste before
Ctrl+V	Paste after
Del	Delete
Ctrl+E	Edit
Ctrl+C	Copy

Adding Layers

You can add one or more layers to the selected beam. In order to add layers to the selected beam, proceed as follows:

1. In the Layer Details Pane, right click on the layer line before or after which you want to add a new layer. The LAYER EDIT MENU appears.
2. Select the desired option from the LAYER EDIT MENU (either 'Add Before' or 'Add After'). The INPUT LAYER INFORMATION DIALOGUE appears.



Input layer information

Index 6

NominalBeamEnergy[MEV] 139.978

SpotTuneID Spot1

NumberOfRepaintings 1

Ok Cancel

Figure 30-6. Input Layer Information Dialogue

3. Fill in the fields in the INPUT LAYER INFORMATION DIALOGUE. The 'Index' field is not editable.
4. Click the **OK** button to save the new layer or the **Cancel** button to cancel the creation of the new layer.

Deleting a Layer

You can delete one or more layers of the selected beam. In order to delete a given layer of the selected beam, proceed as follows:

1. In the LAYER DETAILS PANE, right click on the layer line that you want to delete. The LAYER EDIT MENU appears.
2. Select the 'Delete' option from the LAYER EDIT MENU.

Editing a Layer

You can edit the layers of the selected beam. In order to edit a given layer of the selected beam, proceed as follows:

1. In the LAYER DETAILS PANE, right click on the layer line that you want to edit. The LAYER EDIT MENU appears.
2. Select the 'Edit' option from the LAYER EDIT MENU. The INPUT LAYER INFORMATION DIALOGUE appears.

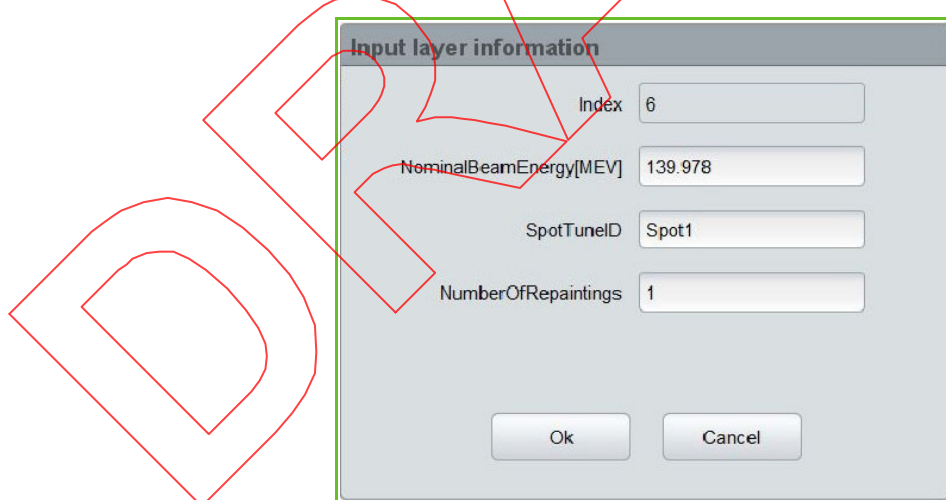


Figure 30-7. Input Layer Information Dialogue

3. Modify the fields in the INPUT LAYER INFORMATION DIALOGUE. The 'Index' field is not editable.
4. Click the **OK** button to save the changes done to the layer or the **Cancel** button to cancel the changes done to the layer.

Copying a Layer

You can copy a layer of the selected beam. In order copy a layer of the selected beam, proceed as follows:

1. In the LAYER DETAILS PANE, right click on the layer line that you want to copy. The LAYER EDIT MENU appears.
2. Select the 'Copy' option from the LAYER EDIT MENU.

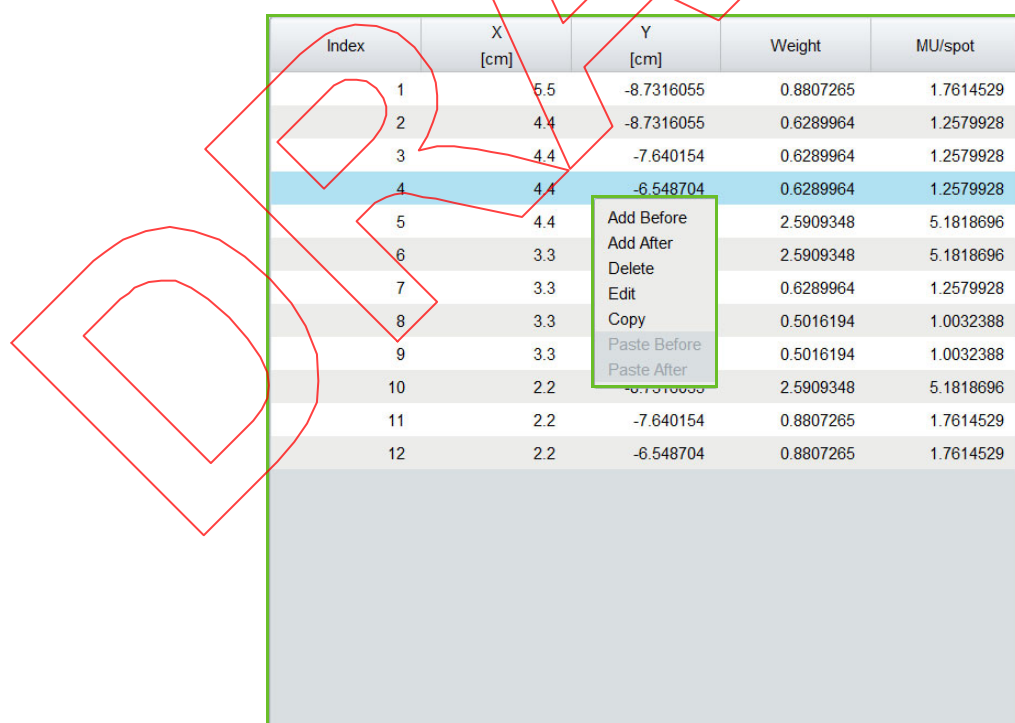
Pasting a Layer

You can paste a previously copied layer in the selected beam. In order to paste a layer in the selected beam, proceed as follows:

1. In the LAYER DETAILS PANE, right click on the layer line before or after which you want to paste the previously copied layer. The LAYER EDIT MENU appears.
2. Select the desired option from the LAYER EDIT MENU (either 'Paste Before' or 'Paste After').

Editing Spot Details Using the Spot Editing Menu

In the Spot Details Pane, right click on a given spot. The SPOT EDIT MENU appears:



The screenshot shows a table with 5 columns: Index, X [cm], Y [cm], Weight, and MU/spot. The table contains 12 rows of data. A context menu is open over the table, listing options: Add Before, Add After, Delete, Edit, Copy, Paste Before, and Paste After. The 'Copy' option is highlighted. Red lines indicate the sequence of actions: right-clicking on row 4, then clicking on 'Copy' in the menu.

Index	X [cm]	Y [cm]	Weight	MU/spot
1	5.5	-8.7316055	0.8807265	1.7614529
2	4.4	-8.7316055	0.6289964	1.2579928
3	4.4	-7.640154	0.6289964	1.2579928
4	4.4	-6.548704	0.6289964	1.2579928
5	4.4	-6.548704	2.5909348	5.1818696
6	3.3	-6.548704	2.5909348	5.1818696
7	3.3	-6.548704	0.6289964	1.2579928
8	3.3	-6.548704	0.5016194	1.0032388
9	3.3	-6.548704	0.5016194	1.0032388
10	2.2	-6.548704	2.5909348	5.1818696
11	2.2	-7.640154	0.8807265	1.7614529
12	2.2	-6.548704	0.8807265	1.7614529

Figure 30-8. Spot Edit Menu

Using this menu, you may perform the following actions on the spot on which you have right-clicked:

- Add a new spot before or after the selected spot.
- Delete the selected spot.
- Edit the selected spot.
- Copy the selected spot.
- Paste a previously copied spot before or after the selected layer.

Using Keyboard Shortcuts to Edit Spots

After selecting a given spot, instead of using the SPOT EDIT MENU, you may use the following keyboard shortcuts:

Table 30-3. Keyboard Shortcuts - Edit Spot Details

Press this key...	To...
Ctrl+I	Add before
Shift+I	Add after
Shift+V	Paste before
Ctrl+V	Paste after
Del	Delete
Ctrl+E	Edit
Ctrl+C	Copy

Adding Spots

You can add one or more spots to the selected layer. In order to add spots to the selected layer, proceed as follows:

1. In the Spot Details Pane, right click on the spot line before or after which you want to add a new spot. The SPOT EDIT MENU appears.
2. Select the desired option from the SPOT EDIT MENU (either 'Add Before' or 'Add After'). The INPUT SPOT INFORMATION DIALOGUE appears.

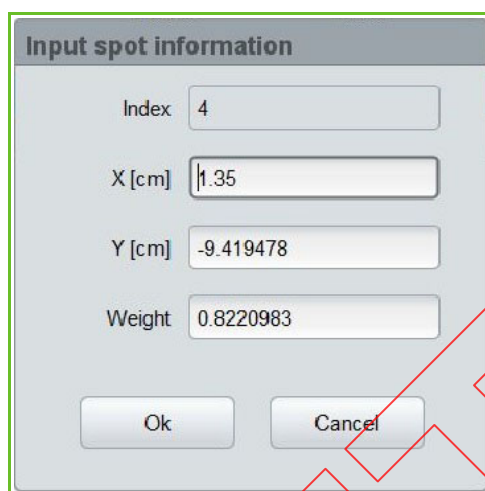
A screenshot of a software dialog box titled "Input spot information". It contains four input fields: "Index" with the value "4", "X [cm]" with the value "1.35", "Y [cm]" with the value "-9.419478", and "Weight" with the value "0.8220983". At the bottom are two buttons: "Ok" and "Cancel". The dialog box is highlighted with a green border, and there are red geometric shapes overlaid on the right side of the image.

Figure 30-9. Input Spot Information Dialogue

3. Fill in the fields in the INPUT SPOT INFORMATION DIALOGUE. The 'Index' field is not editable.
4. Click the **OK** button to save the new spot or the **Cancel** button to cancel the creation of the new spot.

Deleting a Spot

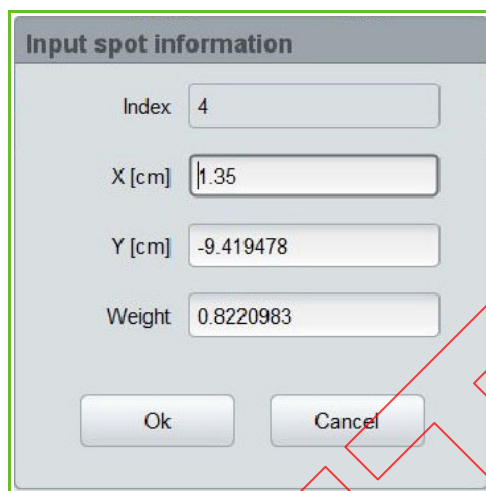
You can delete one or more spots of the selected layer. In order to delete a given spot of the selected layer, proceed as follows:

1. In the SPOT DETAILS PANE, right click on the spot line that you want to delete. The SPOT EDIT MENU appears.
2. Select the 'Delete' option from the SPOT EDIT MENU.

Editing a Spot

You can edit the spots of the selected layer. In order to edit a given spot of the selected layer, proceed as follows:

1. In the SPOT DETAILS PANE, right click on the spot line that you want to edit. The SPOT EDIT MENU appears.
2. Select the 'Edit' option from the SPOT EDIT MENU. The INPUT SPOT INFORMATION DIALOGUE appears.



The image shows a dialog box titled "Input spot information". It contains four input fields: "Index" with the value 4, "X [cm]" with the value 1.35, "Y [cm]" with the value -9.419478, and "Weight" with the value 0.8220983. At the bottom of the dialog are two buttons: "Ok" and "Cancel". The dialog box is highlighted with a green border, and there are red geometric shapes overlaid on the right side of the image.

Figure 30-10. Input Spot Information Dialogue

3. Modify the fields in the INPUT SPOT INFORMATION DIALOGUE. The 'Index' field is not editable.
4. Click the **OK** button to save the changes done to the spot or the **Cancel** button to cancel the changes done to the spot.

Copying a Spot

You can copy a spot of the selected layer. In order copy a spot of the selected layer, proceed as follows:

1. In the SPOT DETAILS PANE, right click on the spot line that you want to copy. The SPOT EDIT MENU appears.
2. Select the 'Copy' option from the SPOT EDIT MENU.

Pasting a Spot

You can paste a previously copied spot in the selected layer. In order to paste a spot in the selected layer, proceed as follows:

1. In the SPOT DETAILS PANE, right click on the spot line before or after which you want to paste the previously copied spot. The SPOT EDIT MENU appears.
2. Select the desired option from the SPOT EDIT MENU (either 'Paste Before' or 'Paste After').

Importing a PLD (PBS Layer Definition) File

Using the **Import PLD file** button at the bottom right of the LAYER EDITING SCREEN, you may import an existing PLD file. Then you may proceed to modify the imported data using the editable fields described in section *Editing Layer and Spot Details On the Layer Editing Screen*.

In order to import a PLD file proceed as follows:

1. From the LAYER EDITING SCREEN or the BEAM DISPLAY SCREEN, click the **Import PLD file** button, located at the bottom right of the screen.
2. Using the 'Please select a PLD file' pop-up dialogue, browse for the required PLD file on the disk and click the **Open** button to import the file.

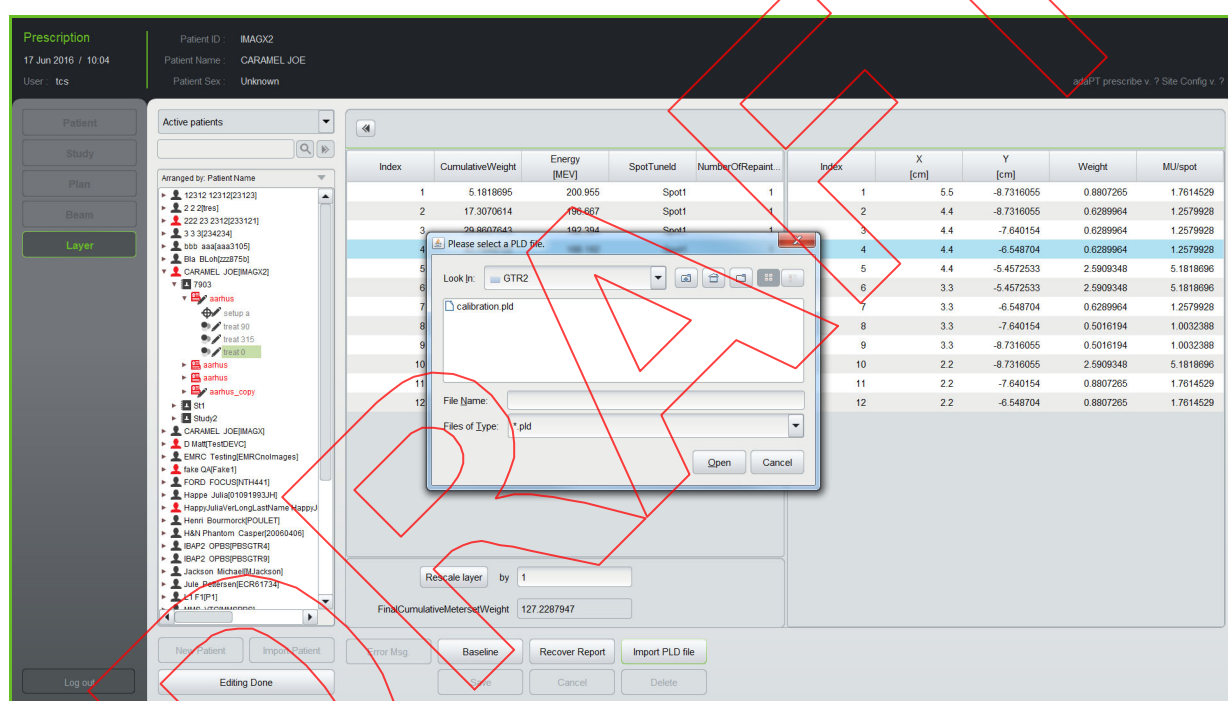


Figure 30-11. Import PLD File

Understanding PLD files

Using the PBS beam delivery mode, the PTS is able to deliver dose at any requested position within the treatment volume by adapting the beam energy and the field in the scanning magnets. This means that in order to perform an irradiation, the system needs information about what has to be delivered. This information is contained in a PLD file (.pld).

Note: For more details on the PBS delivery mode, refer to **Part IV** of this manual.

A PLD file contains a detail of the energy required for each layer and, for each layer, the number of MUs and the position of each spot to be irradiated. From these data, the system is able to calculate the setpoint to apply to the different system components (such as the scanning magnets, accelerator, etc.) for each layer as well as the threshold for all the checks that are done during the irradiation.

Note: Note that a PLD file only contains information about the spots/layers. Information about the table/gantry/snout positions, beam name etc., should be input manually in the beam information panel.

A PLD file looks as follows:

```
Beam, Patient ID, Name, Patient Initial, Firstname, Plan Label, Beam Name, 14, 7, 2
Layer, Spot1, 185, 2, 4, 5
Element, 10, 10, 0, 0.0
Element, 10, 10, 1, 0.0
Element, 20, 20, 0, 0.0
Element, 20, 20, 1, 0.0
Layer, Spot1, 120, 7, 4, 5
Element, 40, 40, 0, 0.0
Element, 40, 40, 2, 0.0
Element, 50, 50, 0, 0.0
Element, 50, 50, 3, 0.0
```

Figure 30-12. PLD File (Typical)

- The first line is the header: it contains information about the patient. The last 3 numbers are:
 - Red number: total of MUs to be delivered (also called beam meterset). The amount of MUs that will be delivered in a spot is then equal to its meterset weight multiplied by the total number of MUs and divided by the final cumulative meterset weight.
 - Blue number: cumulative meterset weight, that is to say, the sum of the meterset weight of each spot.
 - Green number: number of layers in the beam.
- The second line is the 'header' of the first layer. The line starts with the word 'Layer', then 'Spot1' which is the spotID. For the same beam energy, it is possible to have different beam line settings in order to have different spot sizes at isocenter, the spotID tag is then used to differentiate the different spot size that are available. The last four numbers are:
 - The beam energy at the nozzle exit without beam modifier (without range shifter or ridge filter), expressed in MeV.
 - The red number is the sum of the meterset weight of the spots contained in this layer and all the spots of the previous layer(s).

- The blue number is the number of elements contained in the layer. There are 2 elements per spot, so this third number is 2 times the number of spots to be irradiated.
 - The last number (green) is the number of paintings, meaning the number of times that the layer will be irradiated. The total number of MUs to be delivered on a spot is then divided by the number of paintings in order to keep the total number of MUs the same. Changing the number of paintings will not have any impact on the number of delivered MUs. Repainting techniques are used for proton therapy to be less sensitive to organ motion.
- After this line, there is a list of all the spots contained in the layer. Each line starts with the word 'Element', then in red the position expected in X (IEC coordinate system) in the isocenter plane and in blue the Y coordinate in the isocenter plane.

The green number is the meterset weight of this spot. Each spot requires two elements, the first one with a meter set weight equal to 0 and a second one with the requested meterset weight.

The last parameter of the line is the meterset rate and is set at 0 in case of Spot scanning (meaning that the spot is not moving during the irradiation). In case of active scanning (beam moved during the irradiation), this parameter represents the speed at which the meterset weight needs to be delivered on this element.

When loading a PLD file into the PTS database, the BMS performs a translation on this data to check that the final cumulative meterset weight is equal to the sum of all the meterset weights, that the number of layers in the map is equal to the number of layers defined in the header, etc.



Part V

Using adaPTdeliver

DRAFT

Chapter 31

Introducing adaPTdeliver

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Introduction

adaPTdeliver can be used in the following modes:

- **Standalone mode using the batch importer and full standalone** mode (see section "Using adaPTdeliver in Standalone Mode" on page 31-1)
- **Worklist** (OIS DEVC) mode, using the APPOINTMENT SELECTION SCREEN (see section "Using adaPTdeliver in Worklist Mode" on page 31-3)

Using adaPTdeliver in Standalone Mode

adaPTdeliver is the program that is used to:

- define a treatment session among a list of patients, studies, plans, and beams
- select the beam to be irradiated within the treatment session
- prepare the equipment for the selected beam
- proceed to the irradiation of the selected beam

In full standalone mode or in standalone mode using the batch importer, all data relevant to patients, studies, plans, and beams are coming from the PTS database.

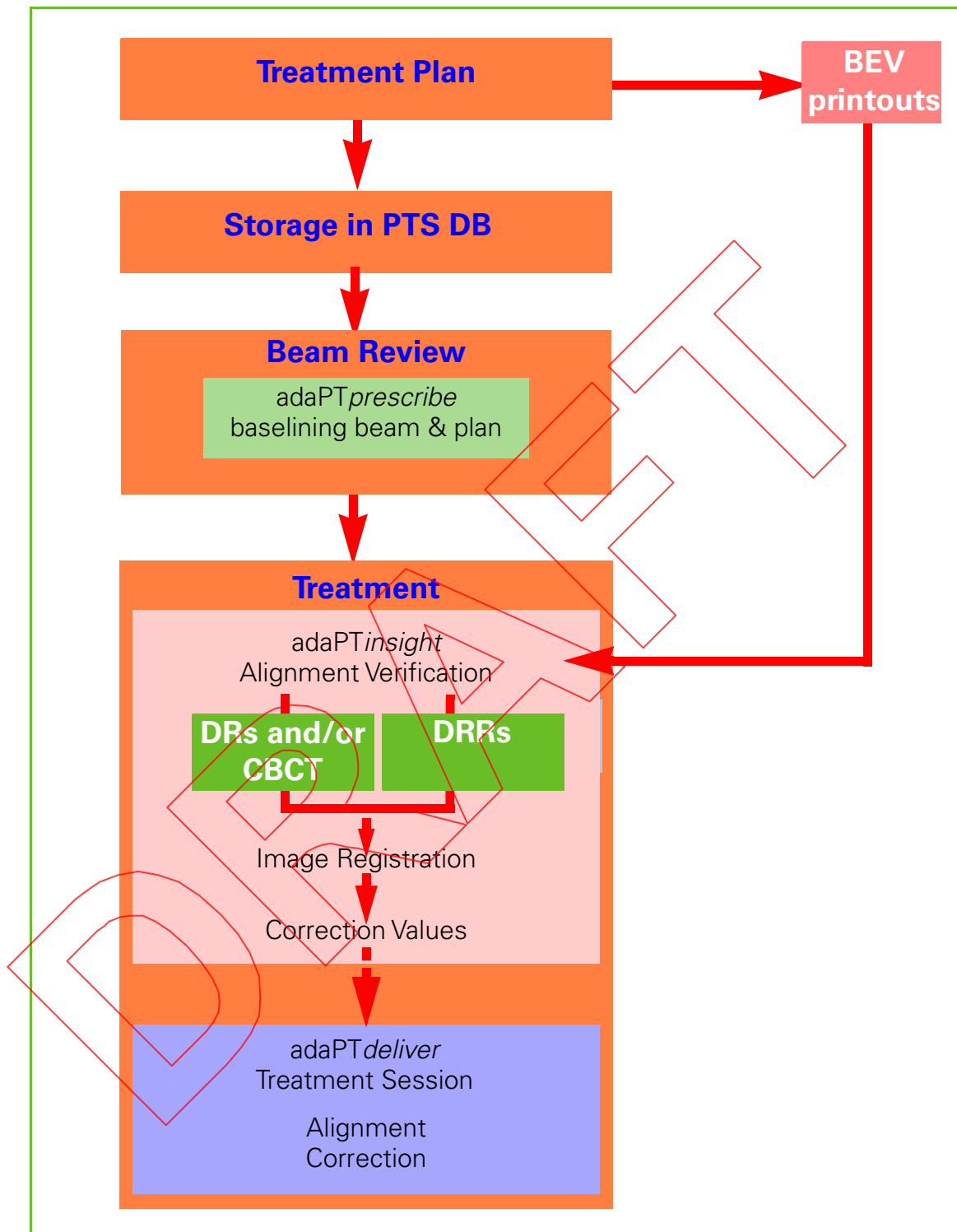


Figure 31-1. Treatment Flow - Standalone Mode
(Full Standalone Mode, Using the Batch Importer or adaPTprescribe Import Feature)

Using adaPT~~deliver~~, you are able to select one or several beams of a given patient for inclusion in one treatment session; next you can process each beam through the subsequent steps of beam selection, preparation, and treatment.

Using adaPT~~deliver~~ in Worklist Mode

adaPT~~deliver~~ is the program that is used to:

- select the work item or appointment to be retrieved from OIS
- select the beam to be irradiated within the treatment session
- prepare the equipment for the selected beam
- proceed to the irradiation of the selected beam

In **Worklist** mode, all data relevant to patients, studies, plans, and beams is coming from the OIS.

Note: The terms “Worklist mode” and “DEVC mode” are used interchangeably in the manual.

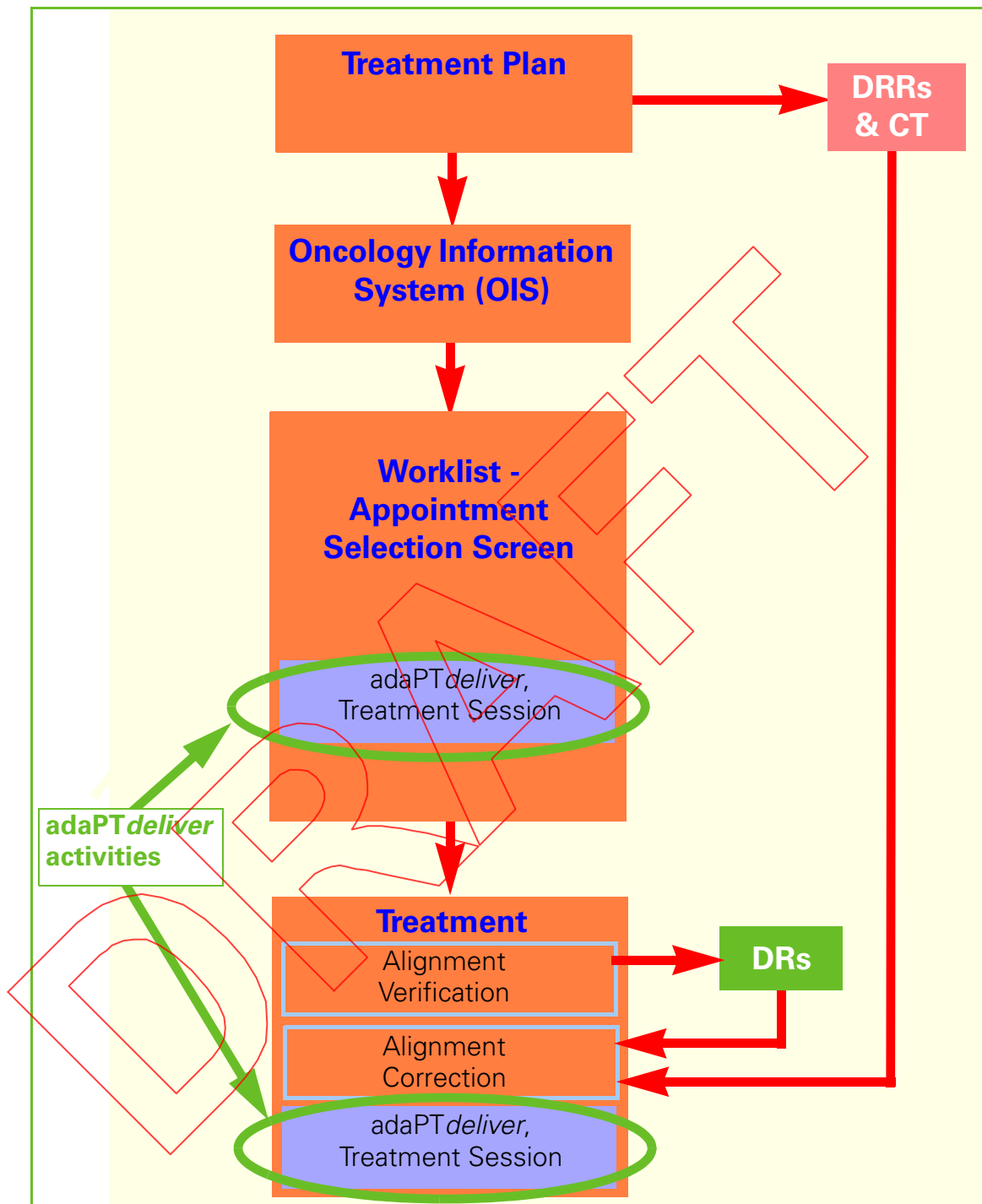


Figure 31-2. adaPTdeliver Activities
Worklist Mode

Starting adaPT~~deliver~~

Click the adaPT~~deliver~~ icon on the desktop in the Treatment Control Room (TCR) and in the Treatment Room (TR) to start up adaPT~~deliver~~ and a set of programs required in the treatment room.

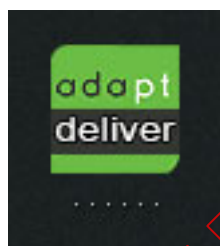


Figure 31-3. Start adaPT~~deliver~~ Icon

Upon startup, the ADAPTDELIVER LOGO SCREEN briefly appears.



Figure 31-4. adaPT~~deliver~~ Logo Screen

After a few seconds, the ADAPTDELIVER LOGIN SCREEN appears (see Figure 31-5).

Stopping adaPT*deliver*

Whenever you want to stop adaPT*deliver*:

1. Logout from adaPT*deliver*, as described in Section “*Logging Out From adaPTdeliver*” on page 31-8.
2. Click **Exit** from the ADAPTDELIVER LOGIN SCREEN (see Figure 31-5).

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Logging into adaPTdeliver

Upon startup of adaPTdeliver, the ADAPTDELIVER LOGIN SCREEN appears.

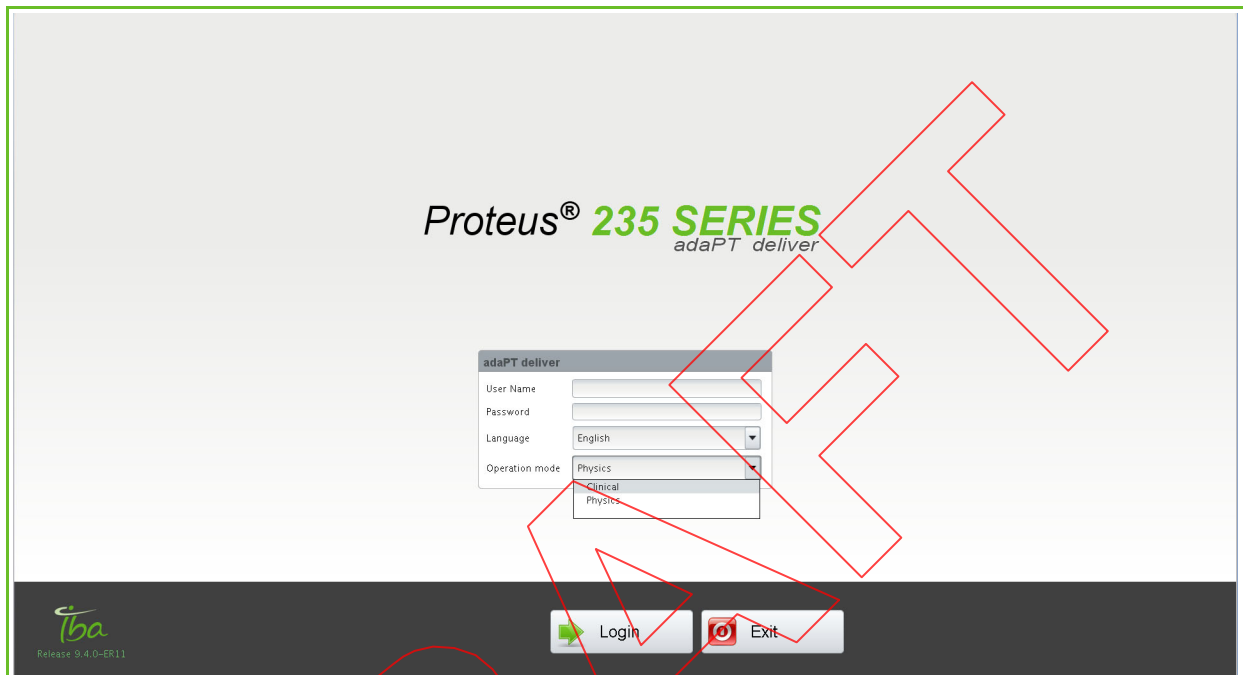


Figure 31-5. adaPTdeliver Login Screen
(Typical)

Enter your user name and password; both are case sensitive.

In addition, select the following:

- your language.
- the mode in which you want to operate: Clinical or Physics.

Note: On the adaPTdeliver screens, and therefore throughout this manual, the terms **Clinical mode** and **Treatment session** are used. Both terms have exactly the same meaning.

Click **OK** and any of the following screens appears, depending on the mode you are using:

- **Standalone mode:** the SESSION DEFINITION SCREEN appears (see Figure 31-9).
- **Worklist mode:** the APPOINTMENT SELECTION SCREEN appears (see Figure 40-1).

In case you enter a wrong name or password the Login failed pop-up message appears.

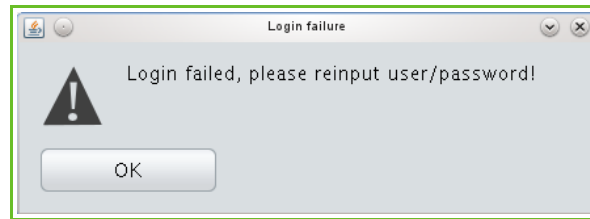


Figure 31-6. adaPTdeliver - Login Error

Click **OK** to remove the message box, and enter your correct user name and password.

Should you want adaPTdeliver to stop running, click **Exit** from the ADAPTDELIVER LOGIN SCREEN.

Logging Out From adaPTdeliver

You can logout from adaPTdeliver by clicking **Logout** left at the bottom of any of the following screens, depending on the mode you are using:

- **Standalone mode:** the SESSION DEFINITION SCREEN (see Figure 31-9).
- **Worklist mode:** the APPOINTMENT SELECTION SCREEN (see Figure 40-1).

Operation Mode: Clinical

From the ADAPTDELIVER LOGIN SCREEN you may select to start the application in Clinical mode. The chapters that follow focus on the use of adaPTdeliver in Clinical Mode.

Screen Layout

adaPTdeliver screens are intuitive to use and have a uniform layout.

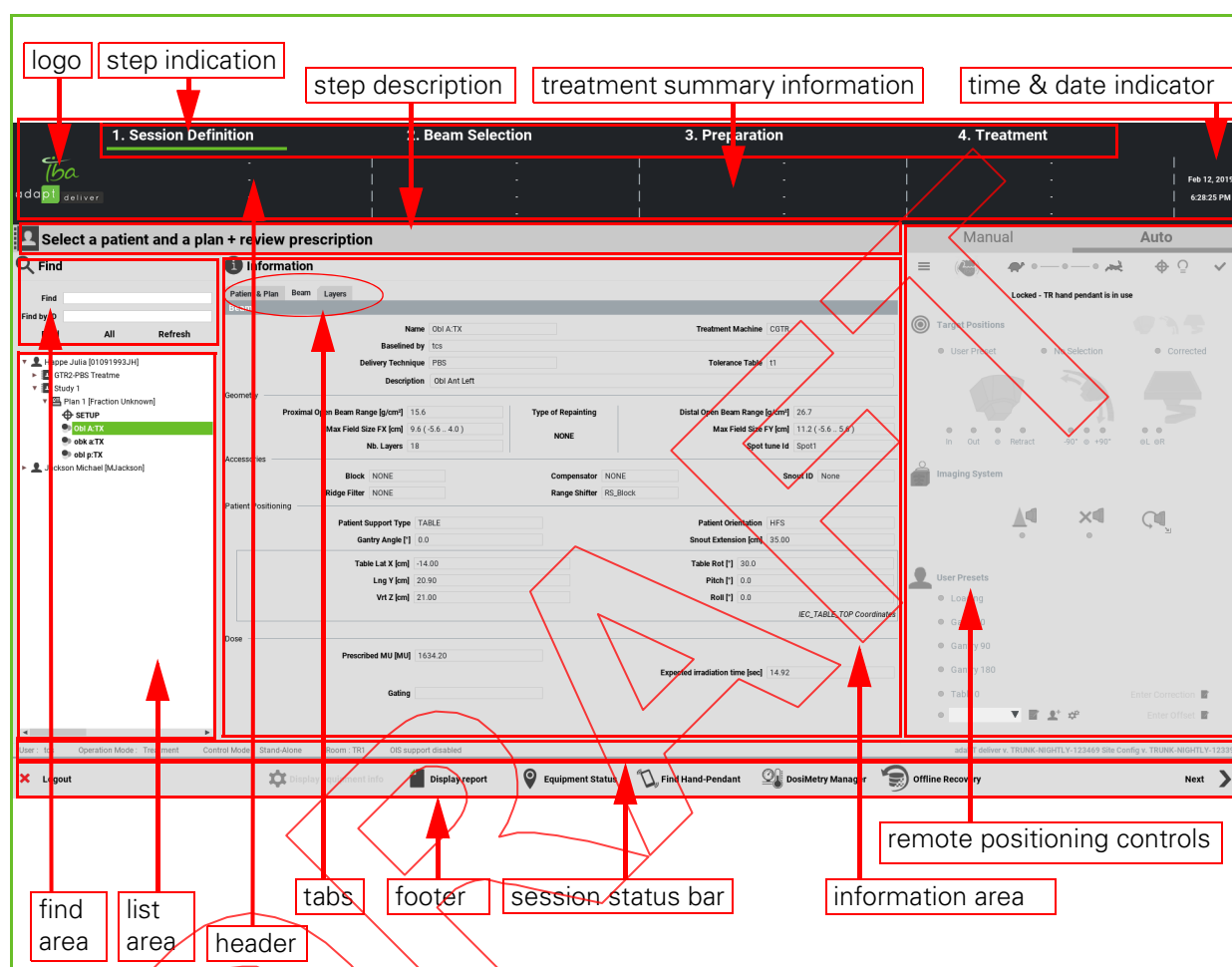


Figure 31-7. Typical adaPTdeliver Screen

Major screen components are:

- **Header:** this panel gives an overview of essential treatment data; the following fields are available:
 - Logo
 - Step indication: the background color provides a status indication, as follows:
 - white: not yet finished
 - dark green: the currently selected step
 - light green: successfully completed

- Treatment summary information: this area provides the identification of the patient, plan, and beam, delivery mode and PBS repainting type, along with some essential equipment (i.e., accessories, if any) and session information.

WARNING



Be aware that long patient names may not appear in full because they are truncated in the Patient Name field of the header. Truncated patient names are indicated by the ellipsis (i.e., ...) at the end.

To see the full name, mouse over the Patient Name field.

- Time & date indicator
- Step description: a short description of the function of the currently selected treatment session step
- **Data panel:** depending on the treatment session step that you have selected, this panel can contain a variety of elements:
 - Find area: enables you to enter parameters to find a (list of) specific patient(s).
 - List area: displays the list of patients that correspond to the parameters that you entered from the find area. The scroll bar at the bottom enables you to scroll the list horizontally.
 - Information area: contains detailed information on the currently selected step.
 - Tabs: some steps have multiple tabs that can be clicked to view or enter various details.
 - Remote positioning controls: enable you to control patient positioning devices from the Treatment Control Room.
 - Usage status bar: displays information such as the current user, type of session, treatment room ID, and beam status.
- **Footer:** this panel contains the Button bar, which contains buttons such as **Next** (to proceed to the next step) or **Logout**, and various other functions, depending on the current step.

Dealing With Error Messages

adaPTdeliver can report messages back to you in the form of pop-up windows.

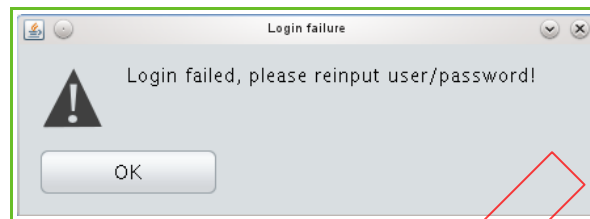


Figure 31-8. adaPTdeliver - Typical Error Message

Click OK and the pop-up window disappears.

Standalone Mode Specific: Selecting a Patient, Study, Plan, or Beam

From the SESSION DEFINITION SCREEN you can perform the following functions:

- **Find a patient:** for detailed information, refer to Section "Finding a Patient" on page 31-13.
- **Select the desired patient, study, plan, and one or multiple beams from the list:** for detailed information, refer to section "Working With Patients, Studies, Plans, or Beams in the List" on page 31-14.
- **Review clinical data:** for detailed information, refer to section "Reviewing Clinical Prescriptions - for PBS".

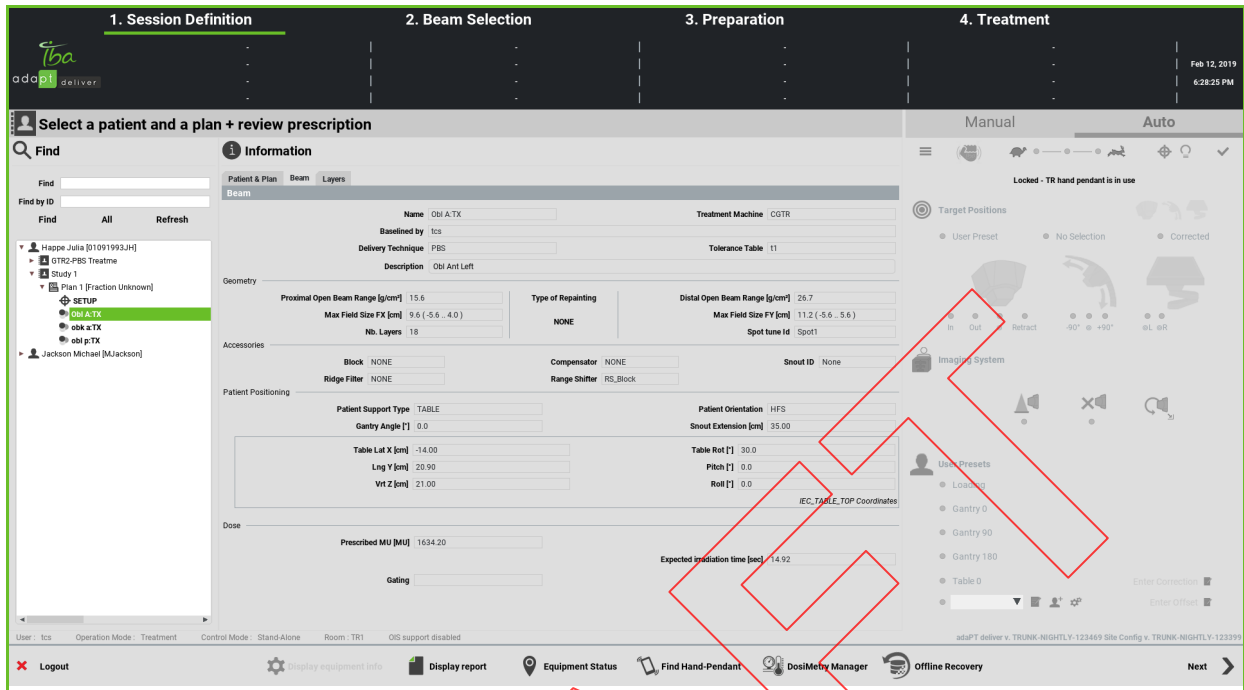


Figure 31-9. Session Definition Screen

Data corresponding to selections that you make from the list area appear in the information area.

Finding a Patient

You can quickly find the required patient or list of patients by entering some find parameters.

The options to find a patient are:

- by name: fill out the name of the patient, in full or in part. You can use the patient's name, first name, initials, or any combination of these, but only in this order.
- by ID: fill out the ID of the patient in full or in part.

Click **Find**. The corresponding list of patients appears, sorted alphabetically on the last name.

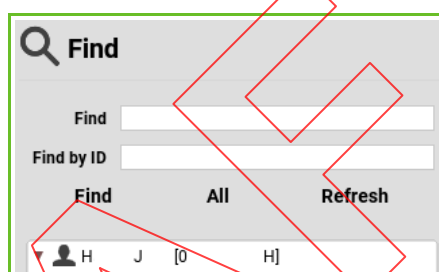


Figure 31-10. Find Criteria and Patient List

Note: To search for a patient with a partial entry of the patient name, the search is performed on any individual part of the name, i.e., first name, middle name, or surname.

If the desired patient does not appear in the patient list, either retry with different find criteria, or click **All** to display the list of all patients.

Note: Be aware that the patient list displays both patients and QA patients.

To ensure that the latest information on the selected patient is on display, click **Refresh** to update the information in the list area.

Working With Patients, Studies, Plans, or Beams in the List

When you enter find parameters and click **Find**, or when you click **All** or **Refresh** from the Find area, the corresponding list of patients appears in the List area.

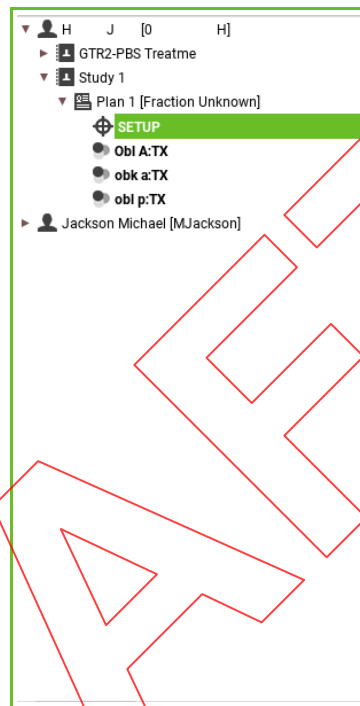


Figure 31-11. List Area

From the list area you can successively expand or collapse the list to the following levels:

Patient	
Study	
Plan	
Setup Beam	
Treatment Beam	

A patient can have multiple studies; a study can have multiple plans; a plan can have multiple beams, and a beam can have multiple layers.

The irradiation status of a beam is indicated as follows:

Successfully delivered	
Partially delivered	
Not yet delivered	blank

Expanding or Collapsing an Instance

To expand or collapse an instance on any of the patient, study, or plan levels, proceed in any of the following ways:

- Click the arrow to the left of the instance. The following convention applies:
 - Horizontal arrow (): the instance is collapsed and has contents on a lower level.
 - Vertical arrow (): the instance is expanded and shows contents on a lower level.
 - No arrow: there is no contents beyond the currently opened level.
- Click the ID or the icon of the required instance.

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Part VI

Using adaPT*deliver* in Standalone Mode

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Chapter 32

Introducing adaPTdeliver Operating in Standalone Mode

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Note: Screen representations throughout this chapter and throughout this part may show 'Control Mode: EMR-Centric' or 'Control Mode: DEV-Centric' at the bottom. When working in Standalone mode, you will notice that the Control Mode indication reads 'Stand-Alone'.

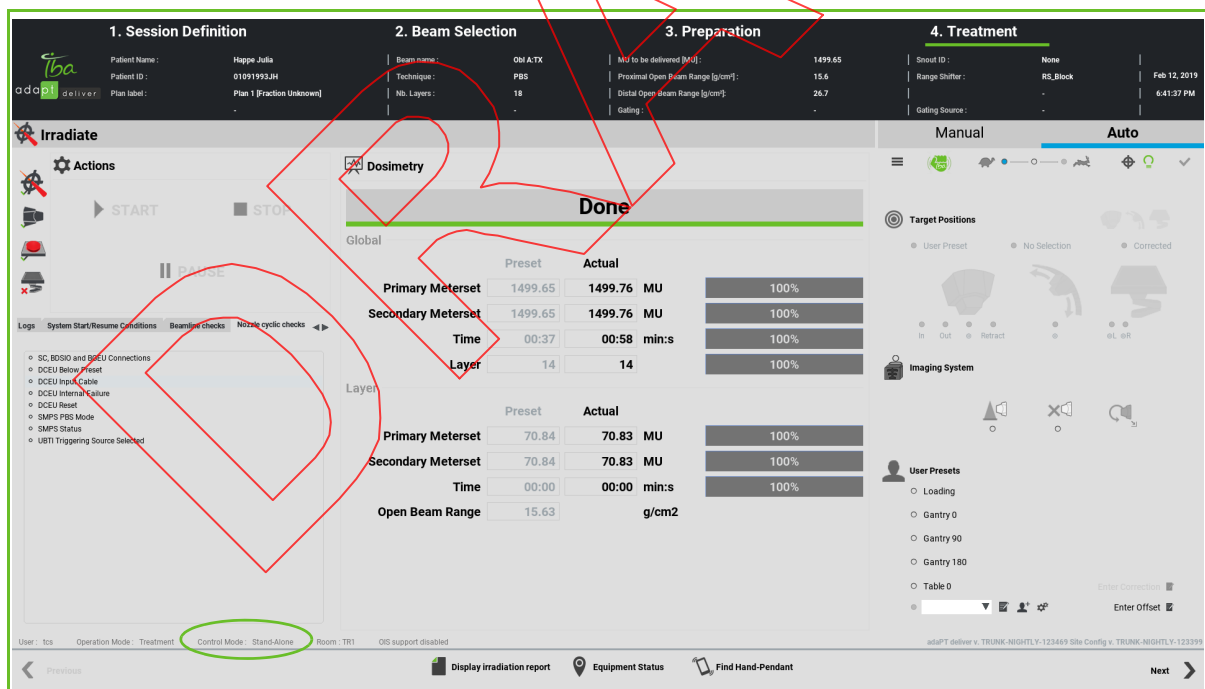


Figure 32-1. Mode Indication (OIS/Standalone) on adaPTdeliver Screens

Introduction

When you are logged into adaPT*deliver* in a Treatment session, you can monitor and control the actual preparation and treatment of a patient.

For information on how to start and log into adaPT*deliver*, refer to Chapter 31, "Introducing adaPT*deliver*".

Using adaPT*deliver* in a **Treatment** session, you are able to select one or several beams of a given patient for inclusion in one treatment session; next you can process each beam through the subsequent steps of beam selection, preparation, and treatment.

WARNING

In the absence of an OIS, it is required that the clinical operator of the Proton Therapy Center uses a paper-based Patient Chart and keeps paper records of the delivered fractions.

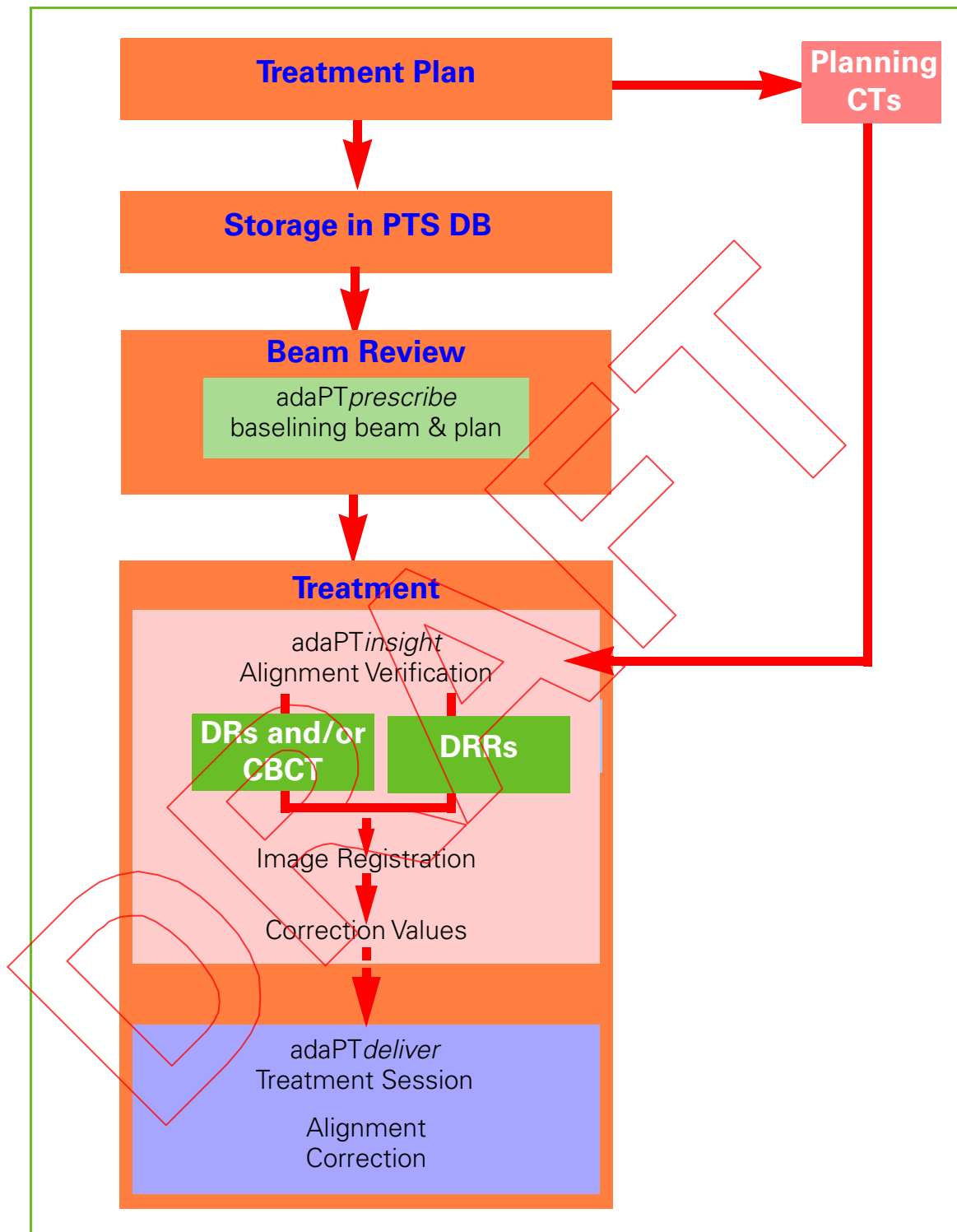


Figure 32-2. Treatment Flow - Standalone Mode
(Full Standalone Mode, Using the Batch Importer or adaPT~~prescribe~~ Import Feature)

Upon selection of a patient, study, and plan, you can specify one or more beams for selection into the treatment session. For detailed information on how to select a patient, study, plan, and beam, refer to Chapter 33 “Including One or More Beams into a Session”.

WARNING

In the nominal workflow, patient and beam are automatically selected in synchronization with the Radiation Therapy System (e.g., the Treatment Session Manager adaPT~~deliver~~) and the Oncology Information System (OIS).

The manual selection of patient data using the patient workflow may cause the use of data inconsistent with data stored in the OIS.

In Case an Error Message Appears ...

WARNING

In case an error message (from the clinical GUI) appears, prior to the startup of a treatment, warning you that a major issue with the IC cyclo related equipment has been detected, you should contact an IBA Operator and request to verify the structural integrity and the proper functioning of the IC cyclo related equipment, i.e., IC cyclo, BIREU (Beam Intensity Redundant Electronic Unit), BAEU (Beam Absence Electronic Unit), and related electrical wiring, immediately.

If the maintenance operation cannot be performed immediately as recommended, you have the option to postpone the maintenance operation and to proceed with the treatment (by entering a specific password).

However, verification must be performed the same day.

CAUTION

In case an error message (from the clinical GUI) appears, while performing a RF lookup table generation, warning you that a major issue with the IC cyclo related equipment has been detected, you should contact the maintenance team and request them to verify the structural integrity and the proper functioning of the IC cyclo related equipment, i.e., IC cyclo, BIREU (Beam Intensity Redundant Electronic Unit), BAEU (Beam Absence Electronic Unit), and related electrical wiring.

Chapter 33

Including One or More Beams into a Session

.....

Note: Screen representations throughout this chapter and throughout this part may show 'Control Mode: EMR-Centric' or 'Control Mode: DEV-Centric' at the bottom. When working in Standalone mode, you will notice that the mode indication reads 'Stand-Alone'.

Introduction

From the list area you can select one or several baselined beams and include them into the treatment session. All selected beams must belong to the same plan.

Note: Beams that are not baselined are **not** listed.

Performing General Activities on Screen

Selecting an Individual Beam

To select individual beams into the session:

1. Expand the list until a required beam is on display.
2. Double-click (or press **Control** and click) that beam. The beam is displayed in bold in the list and the **Next** button in the rightmost corner at the bottom of the screen becomes activated.
3. Repeat Step 1 and Step 2 to include any other beam that you want to include in the treatment session.

A beam that is not selected, i.e., a beam that is not listed in bold, cannot be displayed on the BEAM SELECTION SCREEN.

Any beam that you selected already to be included in the session can still be deselected. To deselect any such beam, double-click that beam.

As you proceed with the treatment process, adaPT*deliver* will successively display treatment session steps 2 (Beam Selection), 3 (Preparation), and 4 (Treatment) for each of the beams that you have selected for inclusion into the session in treatment session step 1 (Session Definition).



To remove a selected beam from your selection, double-click the bold beam and the beam is listed in plain again.

Selecting Some or All Beams

You can quickly specify some or all beams that belong to a plan by repeatedly double-clicking that plan. Three quick selection options exist:

- No beam selected
- All beams selected
- All previously selected beams selected

Figure 33-1 illustrates the quick selection options at plan level. Selected beams appear in bold.

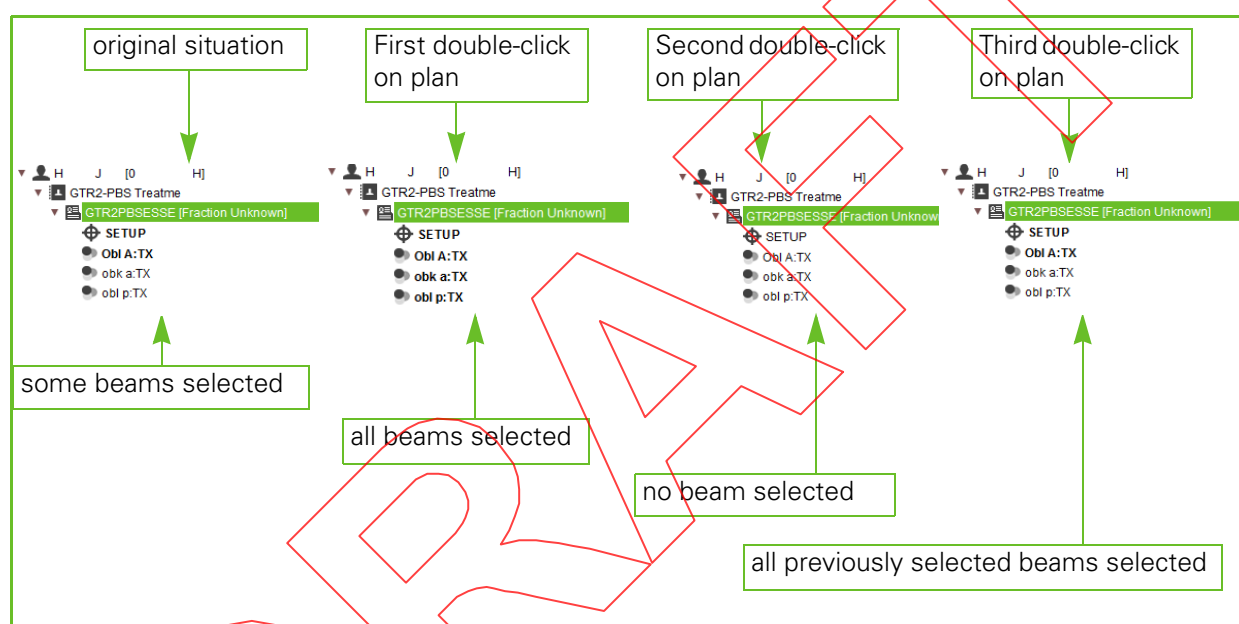


Figure 33-1. Quick Selection Options

Displaying Information in the Information Area

To actually display information in the information area on any of the listed instances, you have to **click on that instance** in the list.

Note: Clicking the arrows () does not display any information.

Select a patient, study, plan, or beam and the associated data appears in the information area.

This information area has the following tabs available:

- **Patient & Plan:** contains the patient, study, and plan details. For detailed information refer to Section “*Reviewing Patient, Study, and Plan Information*” on page 33-5.

- **Beam:** contains clinical data on the selected beam. For detailed information refer to (the) section(s) “*Reviewing Clinical Prescriptions*”.
- **Layer:** contains clinical data on the selected layer. For detailed information refer to Section “*Displaying Layer Information*”.

Note: *The information on these tabs is for display only.*

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Reviewing Patient, Study, and Plan Information

From the Information area, select the *Patient and Plan* tab and the data on the selected patient, study, and plan appear.

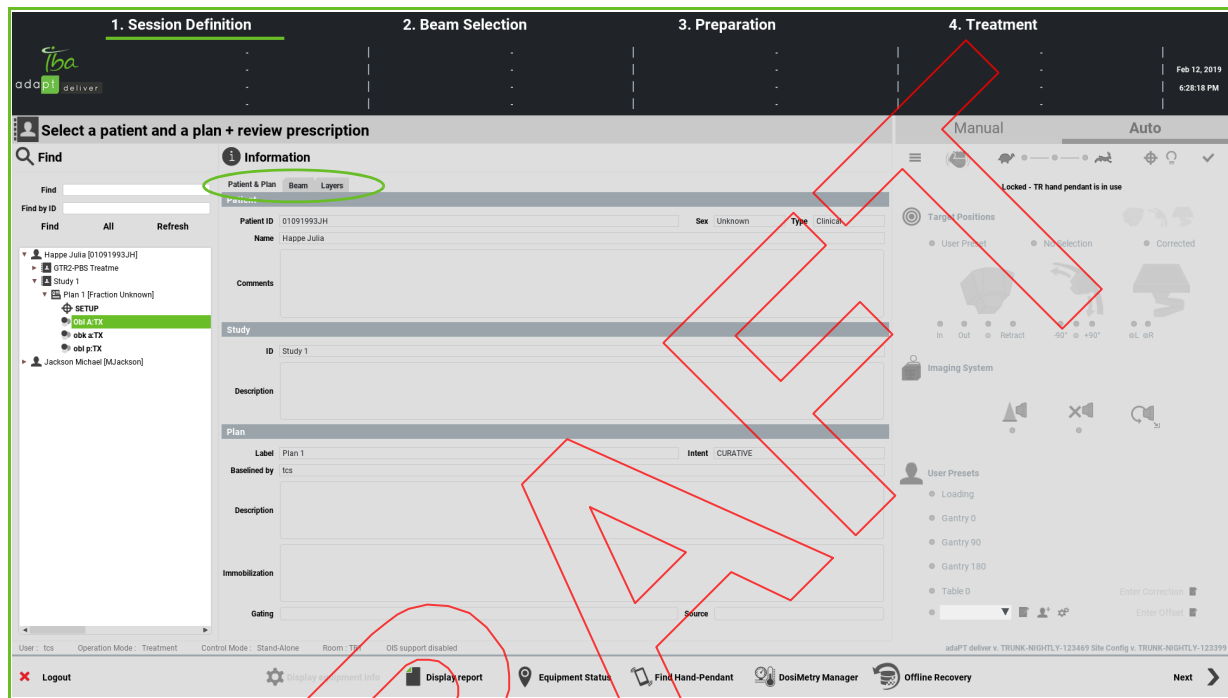


Figure 33-2. Patient, Study, and Plan Information

The **Patient** panel contains the following information:

- Patient ID
- Sex
- Name
- Comments

The **Study** panel contains the following information:

- ID
- Description

The **Plan** panel contains the following information:

- Label
- Baseline by: the name of the user who baselined the plan.

- Intent: this is an indication of the intended use of the plan. The options are:
 - Curative: an actual treatment plan.
 - Verification: a QA prescription for a patient.
 - Machine_QA: a dummy prescription for a QA patient (i.e., a virtual patient).
- Description
- Immobilization

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Reviewing Clinical Prescriptions - for PBS

From the Information area, select the *Beam* tab and the clinical data on that beam appear. This is the clinical data that is prescribed in the treatment plan.

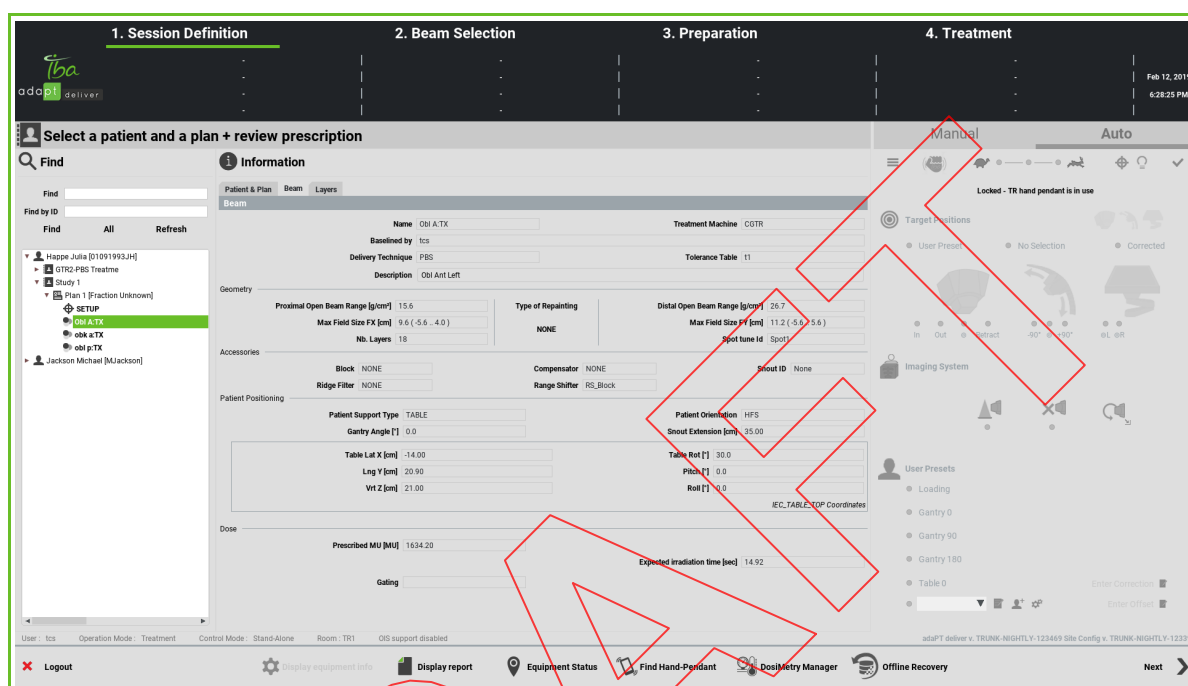


Figure 33-3. Beam Information - Pencil Beam Scanning

The clinical data is as follows:

■ Beam:

- Name
- Treatment Machine: the ID of the treatment room
- Baseline by: the name of the user who baselined the beam.
- Tolerance table
- Delivery technique
- Description

■ Geometry:

- Proximal Open Beam Range (g/cm^2)¹: the range of the proton beam close by the nozzle, without any beam modifying accessories (range shifter, block, range compensator, etc.).
- Maximum Field Size FX (cm): in PBS, extension of the beam along the X-axis, specified by means of parameters FX, X1, X2, expressed in cm.

- Maximum Field Size FY (cm): in PBS, extension of the beam along the Y axis, specified by means of parameters FY, Y1, Y2, expressed in cm.
 - FX, FY are the difference in Xg and Yg coordinates between the center of the two extreme spots.
 - X1, X2, Y1, Y2 are the edges spot center positions expressed in IEC Beam Limiting Device CS.

Example:

Field Size FX (X1..X2) [cm] 4.8 (-2.6 .. +2.2) ;

Field Size FY (Y1..Y2) [cm] 4.8 (-2.0 .. +2.8).

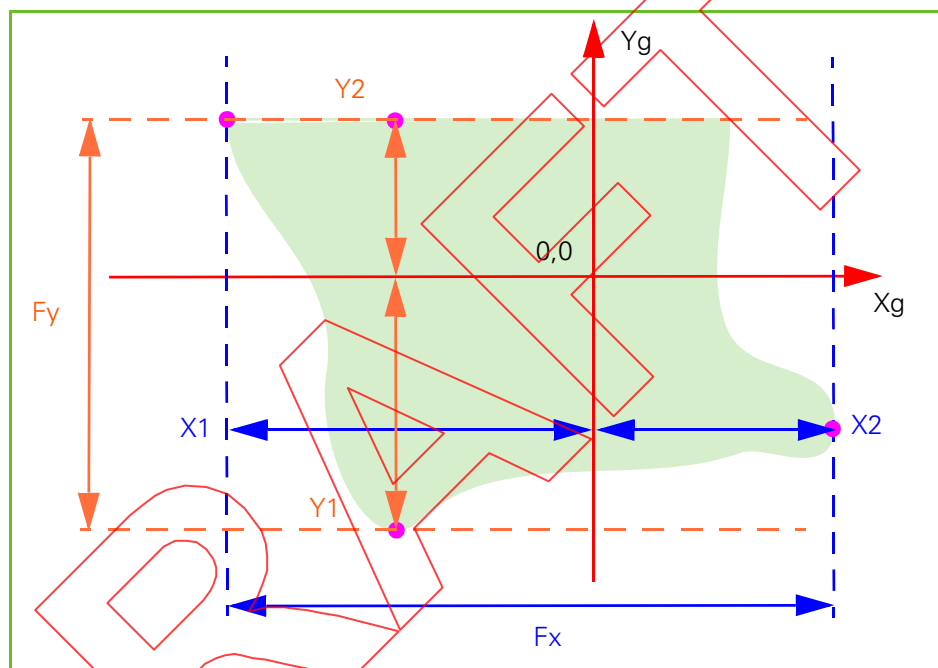


Figure 33-4. Maximum Field Size

- Number of Layers
- Type of repainting: to view the name of the repainting type in addition to the icon, hover the mouse pointer over this field. A popup appears with the name of the repainting type.

For detailed information on multiple repainting types, refer to Chapter 22, "PBS Multiple Repainting".

1. The Distal Open Beam range and Proximal Open Beam range values are defined according to ICRU49 (International Commission on Radiation Units and Measurements - Report 49).

Geometry		Type of Repainting		
Proximal Open Beam Range [g/cm ²]	13.8	 In-Layer repainting	Distal Open Beam Range [g/cm ²]	15.2
Max Field Size FX [cm]	7.8 (-3.6 .. 4.2)		Max Field Size FY [cm]	4.9 (-1.8 .. 3.1)
Nbr. Layers	3		Spot tune Id	3.0

- Distal Open Beam Range (g/cm²)¹: the range of the proton beam farthest away from the nozzle, without any beam modifying accessories (range shifter, block, range compensator, etc.).

■ Accessories:

- Block: identifier of the block (optionally used).
- Compensator: identifier of the range compensator (optionally used).
- Snout ID
- Ridge Filter: identifier of the ridge filter (optionally used).
- Range Shifter: identifier of the range shifter (optionally used).

Note: At least one accessory must be present.

■ Patient Positioning:

- Patient Support Type: as specified in the beam; possible entries are:
 - ☐ Chair
 - ☐ Table
- Patient Orientation: as specified in the beam; possible entries are:
 - ☐ Sitting
 - ☐ HFP: Head First-Prone
 - ☐ HFDR: Head First-Decubitus Right
 - ☐ FFDR: Feet First-Decubitus Right
 - ☐ FFP: Feet First-Prone
 - ☐ HFS: Head First-Supine
 - ☐ HFDL: Head First-Decubitus Left
 - ☐ FFDL: Feet First-Decubitus Left
 - ☐ FFS: Feet First-Supine
- Gantry angle (deg): as obtained from the prescription.

Note: The gantry angle is always defined in the IEC 61217 fixed coordinate system.

- Snout Extension (cm): as defined in the beam, as the distance between isocenter and the face of the block downstream the beam, or when there is no block, the face of the range shifter or range compensator upstream the beam (whether the beam definition comes from the DICOM plan created in TPS or is set internally by the batch importer).

With the snout in the 10 cm position (i.e., the minimum position), a 10 cm thick range compensator brings its edge at isocenter.

■ PPS:

- X (cm): position along the X-axis.
- Y (cm): position along the Y-axis.
- Z (cm): position along the Z-axis.
- Rotation (°): rotation of the PPS versus the beam line, expressed in degrees.
- Pitch (°): a positive value indicates an increase, a negative value indicates a decrease of the height of the treatment end of the couch, expressed in degrees.
- Roll (°): To tilt the couch top. A positive value for the roll angle is defined as the direction that tilts the couch top counterclockwise when the PPS is in the home position and viewed while facing the patient enclosure, expressed in degrees.

Note: These coordinates are expressed in the IEC Table Top coordinate system.

■ Dose:

- Prescribed MU (MU): the number of MU as prescribed in the treatment plan.
- MU to be Delivered (MU): required MU count to be delivered to the treatment site.
- Expected irradiation time (sec): the irradiation is expected to take this long. This value is used to perform a periodic check on the duration of the irradiation.

Displaying Layer Information

Note: Layer details are specific to the Uniform Scanning and Pencil Beam Scanning treatment modes.

From the Information area, select the *Layer tab* and the clinical data on the layers of the selected beam appear. This is the clinical data that is prescribed in the treatment plan.

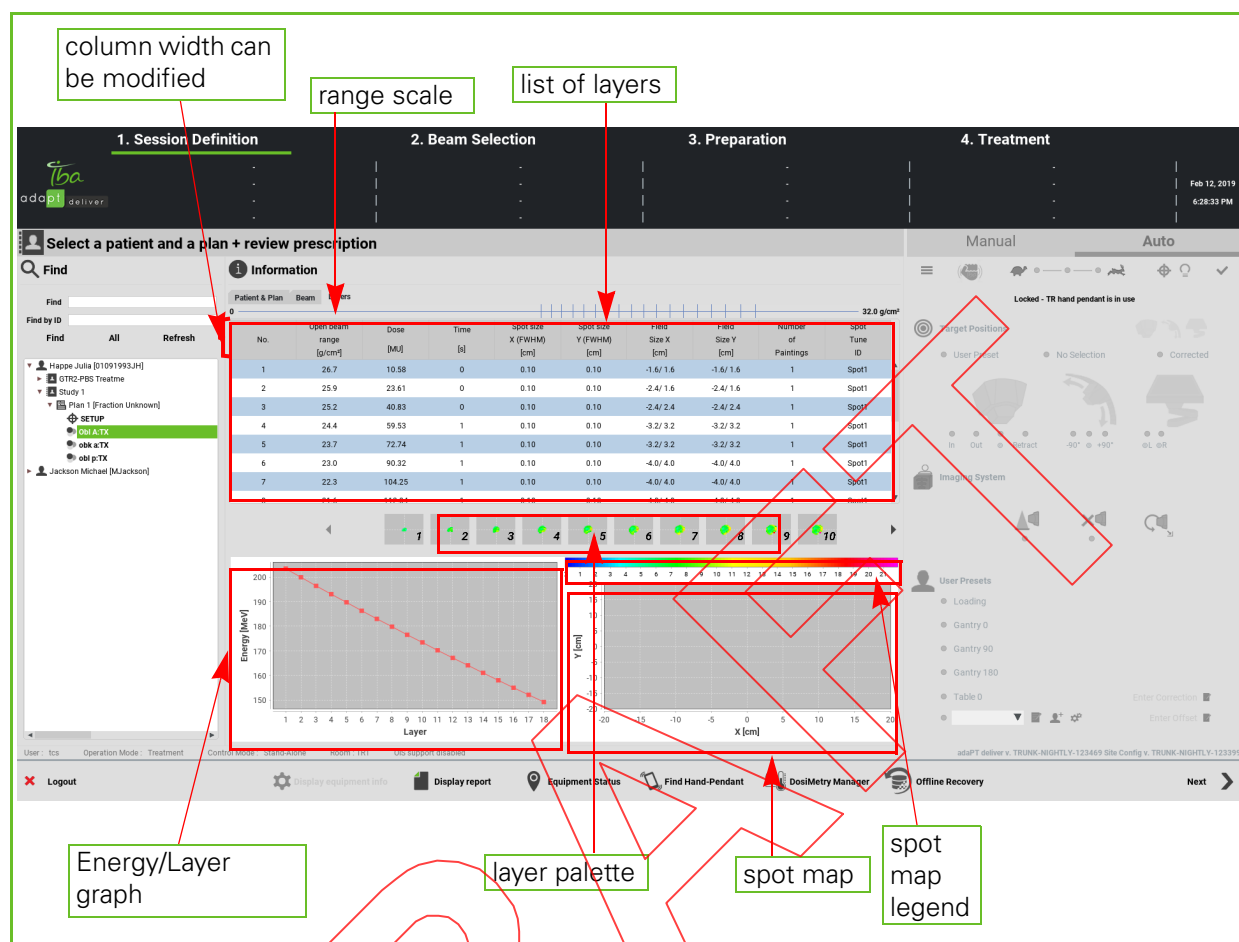


Figure 33-5. Layer Information (Sample)

The information area contains the following elements:

- **Range scale:** this is a graphic representation of the Range values listed in the list of layers. Possible ranges are between 0.5 and 32g/cm².
- **List of all layers:** this is the list of all layers, from the most distal layer (#1) till the most proximal layer (e.g., in the sample illustrated by Figure 33-5: #7).

For each layer, the following information is listed:

- Range (g/cm²)¹
- Dose (MU): in addition to the value of the dose, a graphic representation is also given in the form of a colored bar.
- Time (s)
- Spot Size X (FWHM) (cm): this is a parameter that defines the width of the Gaussian distribution of the beam along the X-axis, at Full Width at Half Maximum.
- Spot Size Y (FWHM) (cm): this is a parameter that defines the width of the Gaussian distribution of the beam along the Y-axis, at Full Width at Half Maximum.

Note: The Spot Size X and Spot Size Y fields remain empty if the TPS does not communicate the correct values.

- Field Size X (cm)
- Field Size Y(cm)
- Number of paintings: for detailed information, refer to Chapter 22 "PBS Multiple Repainting".

- **Layer palette:** a visual representation of all layers, in sequential order. Each layer is identified by its sequence number; the layer also displays a miniature version of the spot map.

The sequence number of the current layer is enlarged (layer 6 in Figure 33-5).

- **Energy/Layer graph:** this graph illustrates the energy of the particles of each layer.

The sequence number of the current layer is represented by a white square (layer 6 in Figure 33-5).

- **Spot map:** a visual representation of the selected layer, along with the dose and the spot map legend.

Note: The Spot Size, Field Size, and spot map axes are expressed in the IEC coordinate system.

To select a layer you either click it on the range scale or on the list of layers. The selected layer appears on a dark green line.

If desired, you can modify the column width in the list of layers. To do so, position the cursor on the border between adjacent columns and drag the border as desired.

1. The Distal range and Proximal range values are defined according to ICRU49 (International Commission on Radiation Units and Measurements - Report 49).

Visualizing Layers

Click any of the listed layers and a visual representation of that layer appears in the spot map.

Note: You can also click the desired layer from the range scale.

In addition, the position of the layer in the entire beam is represented by the thick vertical green bar in the range scale. The most distal layer is positioned at the right.

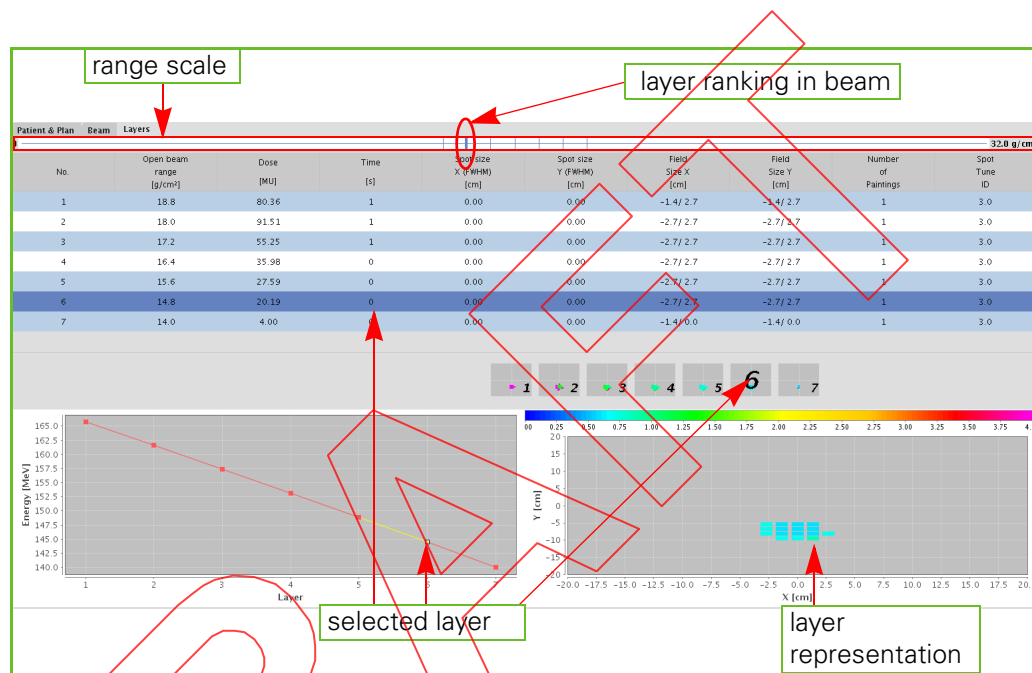


Figure 33-6. Layer Information - details

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Chapter 34

Proceeding to Beam Selection

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Note: Screen representations throughout this chapter and throughout this part may show 'Control Mode: EMR-Centric' or 'Control Mode: DEV-Centric' at the bottom. When working in Standalone mode, you will notice that the mode indication reads 'Stand-Alone'.

Introduction

As soon as a beam appears in bold in the selection area, you can proceed to the next step in the irradiation process, i.e., to actually select it for preparation for treatment. When a beam is selected, the **Next** button in the rightmost corner at the bottom of the screen becomes activated.

Click **Next** and you proceed to the Beam Selection step. For information, refer to section "Selecting a Beam" on page 34-2.

Proceeding With an Incomplete Plan

Whenever you want to proceed without having selected all the baselined beams of the plan (only baselined beams are visible at this stage), a pop-up message prompts you for confirmation.



Figure 34-1. Beam Selection Confirmation Prompt

Click **OK** if you want to proceed with your selection, else click **Cancel**.

Reporting Functions

History reports typically get created automatically at completion of the irradiation. Each completed beam has a history report.

Selecting a Beam

From the BEAM SELECTION SCREEN you can select one or multiple beams to be included in the current session; selected beams are indicated in bold.

When you have selected all beams to be included in the session, click **Next** to actually proceed to the next treatment session step: the actual beam selection. The BEAM SELECTION SCREEN appears.

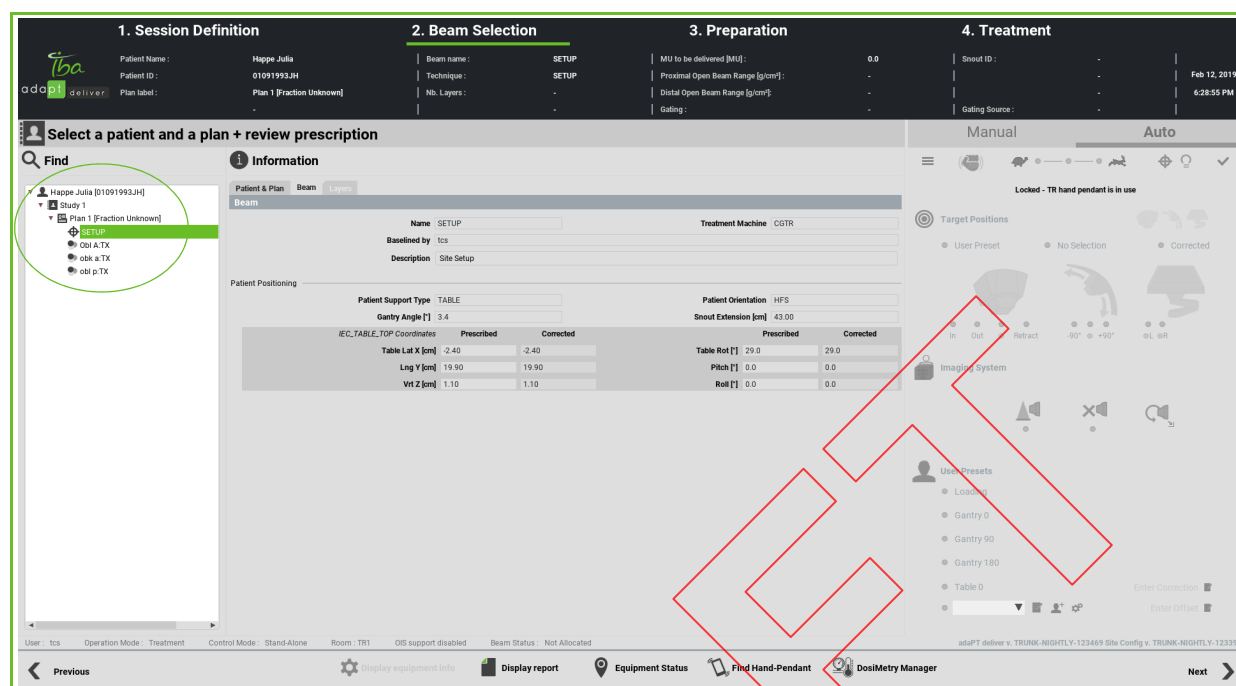


Figure 34-2. Beam Selection Screen

The header now displays the type of accessory, if any, and its identifier, as follows:

- Pencil Beam Scanning:
 - No accessory: no accessory type
 - One accessory: accessory type and identifier

The list area is now filled with the beam(s) that you selected from the SESSION DEFINITION SCREEN.

If there are multiple beams in the list, click the beam that you want to process first. The selected beam appears in a highlighted box.

The associated data appear in the information area. You have to complete all remaining treatment session steps with this beam and then you can select a next beam from the list area.

Important



In treatment mode, the approval to deliver a treatment beam to the patient is under the responsibility of the Radiation Therapy Technologist (RTT) as at Proton Therapy System (PTS) level no distinction can be made between a calibrated/approved and a non-calibrated/non-approved beam.

Similar to the SESSION DEFINITION SCREEN, the Patient & Plan, Beam, and Layers tabs are also available on the information area of the BEAM SELECTION SCREEN.

Initially, most of the fields in the information area of the BEAM SELECTION SCREEN are blank; only the patient name, study, plan, and beam are listed in the list area. To have the fields in the information area filled out, click the required beam in the list area. Fields are filled in up to the lowest level that you select in the list area. E.g., if you click the plan in the list area, only the patient, study, and plan information appear, not the beam information.

To proceed to the next step in the irradiation process, i.e., to actually prepare the equipment for irradiation, double-click the desired beam (or click the beam and click **Next** in the rightmost corner at the bottom of the screen). You will proceed to the Preparation step. For more information, refer to chapter “*Preparing the Equipment for Irradiation*” on page 35-1.

WARNING

The action of clicking on 'Next' in the Beam Selection phase of the workflow entails the approval of the information related to the patient treatment. The user shall make sure they read all treatment information carefully before approving it by clicking on 'Next' and proceeding to treatment.

Chapter 35

Preparing the Equipment for Irradiation

.....

Note: Screen representations throughout this chapter and throughout this part may show 'Control Mode: EMR-Centric' or 'Control Mode: DEV-Centric' at the bottom. When working in Standalone mode, you will notice that the mode indication reads 'Stand-Alone'.

Getting Started With Equipment Preparation

To proceed with the equipment preparation, do any of the following:

- Double-click the desired beam.
- Click the beam from the List area of the BEAM SELECTION SCREEN and click **Next**

Process

Now you enter the third treatment session step: the preparation of the equipment. The EQUIPMENT PREPARATION SCREEN appears.

Equipment preparation for a setup beam and a treatment beam is different:

- **Setup beam:** refer to Section "Equipment Preparation for a Setup Beam" on page 35-2.
- **Treatment beam:** refer to Section "Equipment Preparation for a Treatment Beam" on page 35-8.

Equipment Preparation for a Setup Beam

From the EQUIPMENT PREPARATION SCREEN you have to enter the positioning corrections and confirm the corrections to indicate that preparation has finished.

As long as the colored state bar does not read *Ready* (indicated by the orange color), you will not be able to proceed to irradiation.

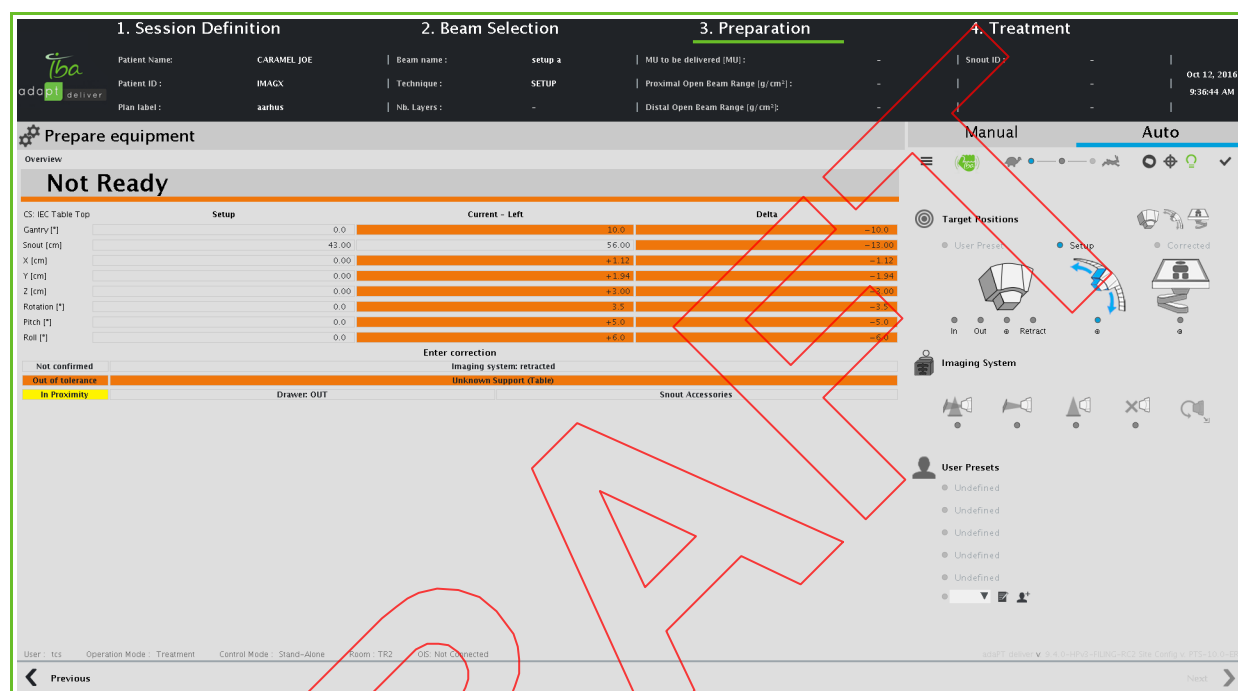


Figure 35-1. Equipment Preparation Screen (Setup Beam)

The EQUIPMENT PREPARATION SCREEN indicates the coordinate system in which the listed positioning parameters are expressed.

Note: Parameters that are irrelevant for this treatment room are grayed out.

The listed positioning parameters are:

- Gantry (°)
- Snout (cm)
- X (cm)
- Y (cm)
- Z (cm)
- Rotation (°)
- Pitch (°)

- Roll (°)

For detailed information on how to interpret the positioning values, refer to Section “*Interpreting Positioning Values*” on page 35-4.

In addition, the panel indicates the inserted or extracted position of Flat panel A, Flat panel B, and the retractable X-ray tube.

The EQUIPMENT PREPARATION SCREEN displays the following status indications on accessories:

Note: *In the case of treatment beams, these status indications indicate that the devices are present and the indicators show the actual state of these devices. In the case of Setup beams, these devices need not be present to proceed.*

- **Table:** if a couch is specified in the prescription, indicates that the proper couch type has been installed.
- **Accessories drawer:** the treatment plan identifies a number of accessories to be used. In the case of the PBS dedicated nozzle, if an accessory is required, the drawer must be in the beam path. If no accessory is required, the drawer must be out of the beam path. A white background indicates that the drawer is in position with regard to the prescription; otherwise the background is yellow.

Note: *If you are preparing for treatment using a Universal Nozzle, the accessories drawer option is grayed out on the screen as there is no drawer in this case.*

- **Snout accessories:** the snout is equipped with a number of interlocks to ensure safety. If all snout interlock safety signals are present, this field has a white background; if any interlock signal is missing, the background is yellow.

‘Snout accessories’ is actually an interlock group name for the following interlocks:

- Compensator present
- Compensator doors locked
- Block present; depending on the snout type, multiple blocks can be required. There is an interlock for each of them.
- Block doors locked
- Snout locking jack

In addition, the EQUIPMENT PREPARATION SCREEN displays the following status indications:

- **No correction vector available:** the correction vector needs to be computed using the PPVS software; for detailed information, refer to Section “*Entering Corrections*” on page 35-6.
- **Enter correction:** the correction vector has been computed using the PPVS software; you need to enter the computed values from the BEAM CORRECTION SCREEN.

- **In tolerance:** all listed positioning parameters are within tolerance, also indicated by the green background of the status indication.
- **Out of tolerance:** at least one of the listed positioning parameters is out of tolerance, also indicated by the orange background of the status indication.

Note: Should you want to perform setup with one or more positioning parameters out of tolerance, you can do so but you will be prompted to sign an acknowledgment first.

- **Not confirmed:** the position has not been confirmed yet using the wireless hand-pendant or the remote positioning controls.
- **Confirmed:** the listed positioning parameters have been implemented in the treatment room using the wireless hand-pendant or the remote positioning controls, and the position has then been confirmed.

Note: The positioning parameters can be the result of a Manual motion or a correction from the PPVS, not necessarily the exact values as received from the plan.

- **No proximity:** verification by the proximity control software acknowledges that no device proximity hazard exists.
- **No collision:** variations in PPS load cell readings are below the allowed limits.
- **Alignment devices retracted:** the green check mark appears only if both flat panels have been retracted.

Interpreting Positioning Values

Patient alignment is performed in the Treatment Room using the PPS, wireless hand-pendant or remote positioning controls, and the PPVS software, among others. For detailed information on how to align a patient in the Gantry Treatment Room, refer to Chapter 49, "Aligning a Patient in the GTR".

The EQUIPMENT PREPARATION SCREEN (for **setup** beams) and the PMS INTERFACE PANEL (PMS = Positioning Management System) of the EQUIPMENT PREPARATION SCREEN (for **treatment** beams) display values for various positioning parameters.

These screens appear on a monitor in the Treatment Control Room and on both monitors aside from the gantry in the Gantry Treatment Room. The monitors aside from the gantry display the positioning parameters only.

Note: The appearance of the screens on these monitors may be slightly different; the displayed information, however, is identical.

CS: IEC Table Top	No target	Current - Right	Delta
Gantry [°]		10.0	
Snout [cm]		56.00	
Table Lat X [cm]		+1.00	
Lng Y [cm]		+2.00	
Vrt Z [cm]		+3.00	
Table Rot [°]		4.0	
Pitch [°]		0.0	
Roll [°]		0.0	

Figure 35-2. PMS Interface Panel
Positioning Parameter Values

All positioning parameter values appear in three columns:

- **Target:** the position that is currently selected: 'SETUP', 'TREATMENT', 'LOAD', 'Gantry 270', etc. Positioning preparation will only be complete if the SETUP or TREATMENT position is confirmed (and acknowledged, if out of tolerances).
- **Current:** the current position.
- **Delta:** these are the differences between the currently selected **Target** position and the actual (i.e., **Current**) position.

Note: During PPS motion, the delta is continuously updated and shows the remaining corrections.

Values can appear with the following background colors:

- **White:** within tolerance
- **Yellow:** out of tolerance; if you want to proceed to treatment with this value you will have to sign an acknowledgment.

If the **Delta** value has a yellow background, this means that the currently selected Target is not yet reached.

If the **Current** value has a yellow background, this means that the **Current** position is out of tolerance compared to the SETUP or TREATMENT position received from adaPT~~deliver~~.

Note: The SETUP or TREATMENT position is not always identical to **Target**, e.g., if a target other than SETUP or TREATMENT is selected, such as CORRECTED.

Target is not always the value from the plan as it is influenced by previous alignments: e.g., from alignments made on previous days for the first beam of a fraction (setup or treatment), or from a previous setup alignment in the same fraction when preparing a treatment beam.

Entering Corrections

The Patient Position Verification System (PPVS) software is used to perform the correction vector calculation.

For detailed information on how to use adaPT~~insight~~, refer to the related documentation listed in chapter “About this Manual”.

When the correction vector is calculated, it is sent directly from adaPT~~insight~~ to the patient positioner. However, the user also has the option to manually enter a correction vector. In order to do so, click **Enter correction** from the EQUIPMENT PREPARATION SCREEN and enter the corrections that are obtained from the PPVS software in the corresponding fields on the BEAM CORRECTION SCREEN.

Figure 35-3. Beam Correction Screen

Click **Apply** and the correction values appear on the EQUIPMENT PREPARATION SCREEN.

Note: The position of the PPS is NOT verified against the treatment plan. However, its position is recorded in the irradiation report.

Validating the Positioning Parameters

When, as a therapist, you are confident that the patient has been positioned correctly, click the **Confirm preparation** button to validate the positioning parameters.

Note: It may take a few iterations to get to the desired position.

The colored state bar reads *Ready* (indicated by the green color).

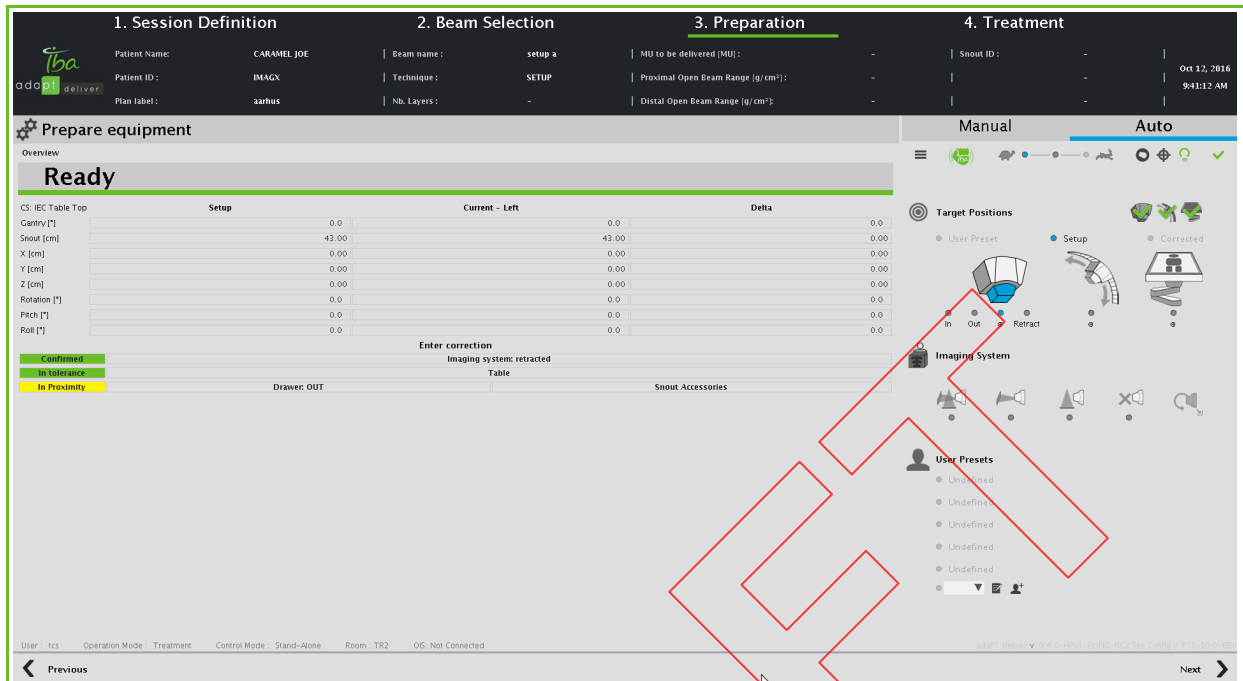


Figure 35-4. Equipment Preparation Screen (Completed)

Click the **Back to selection** button to select another beam from the list area of the BEAM SELECTION SCREEN.

Setup beams for which preparation has been successfully completed appear with the green checkmark (✓) adjacent to the beam icon in the list area of the BEAM SELECTION SCREEN.

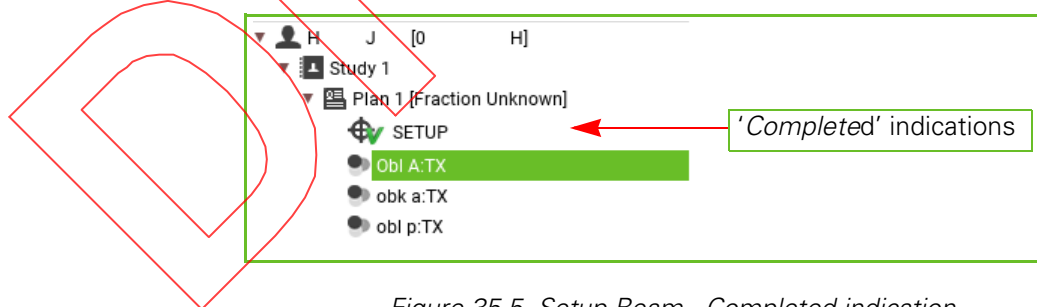


Figure 35-5. Setup Beam - Completed indication

Equipment Preparation for a Treatment Beam

Preparing the Treatment Room

Before starting an irradiation, the following final preparations shall be completed in the Treatment Room (TR):



1. When treating in PBS: move the PBS Dedicated snout to ensure patient safety and install the block and the range compensator (refer to Chapter 14, "Installing and Removing Accessories into/from the Accessory Drawer or PBS Dedicated Snout").

When the block and range compensator are installed, the corresponding interlocks are cleared.

2. Move the equipment to the **Treatment** target position using the Auto mode on the wireless hand pendant or the remote positioning controls.
3. Confirm the position.

WARNING



As a Radiation Therapy Technologist (RTT) it is your responsibility to verify that no foreign equipment remains in the beam path before starting an irradiation (e.g. SD~~X~~ spirometry system, immobilization device, etc.).

4. Ensure that no one other than the patient is in the TR (that is, search the TR area) and press the TR search button.

WARNING



Strictly adhere to the procedures established by your Administration for searching the Treatment Room (TR) before proceeding to irradiation.

5. Leave the room within the required period of time. If you do not shut the TR doors within this time, you will need to perform the search again.

Preparing the Equipment for Treatment - PBS Dedicated Nozzle

The EQUIPMENT PREPARATION SCREEN is composed of four panels.

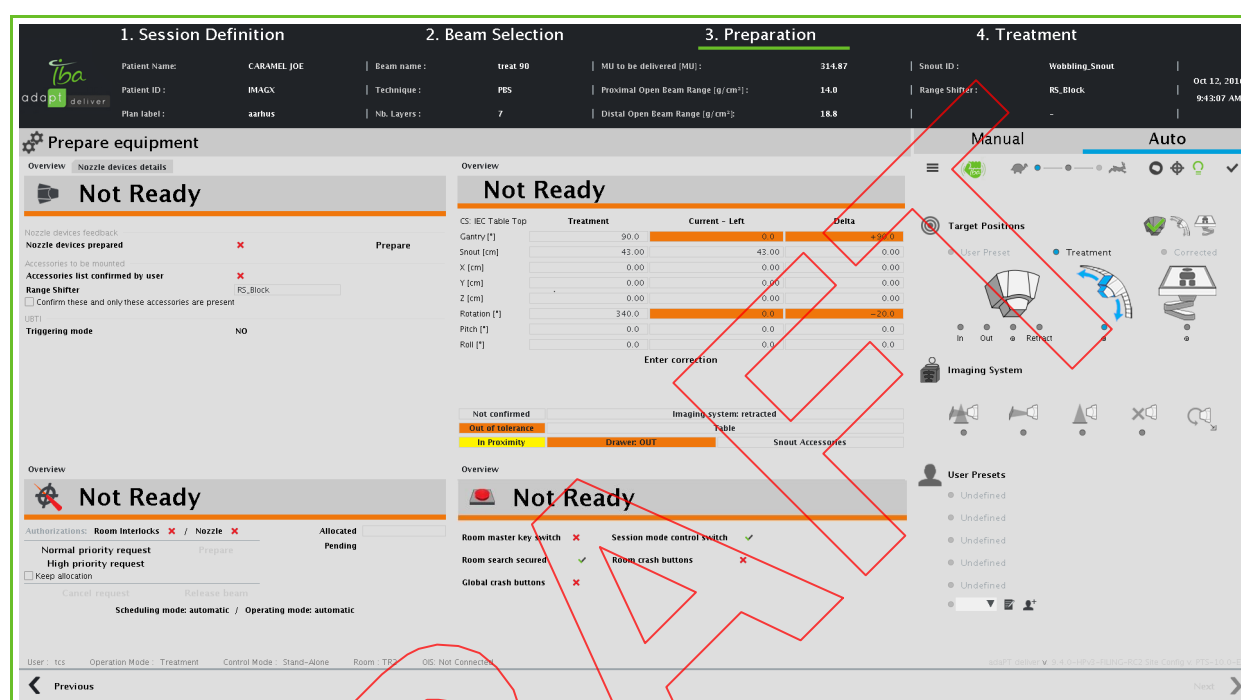


Figure 35-6. Equipment Preparation Screen
PBS Dedicated Nozzle (Treatment Beam)

Each individual panel has a colored state bar. Initially, most of these colored state bars are orange, indicating that some conditions exist that prevent you from proceeding with the intended irradiation. You can only proceed to the actual irradiation when all these colored state bar are green. To enable any given colored state bar to become green you must eliminate any red cross marks that may exist on that panel. It is acceptable to have some fields with an orange background on the PMS interface panel.

The panels are the following:

- **Nozzle:** to control nozzle devices of the **PBS dedicated** nozzle; for detailed information, refer to section "Verifying the PBS Dedicated Nozzle" in this chapter.
- **Position of devices:** to manage positioning and alignment; for detailed information, refer to section "Verifying the PBS Dedicated Nozzle" in this chapter.
- **Beam:** to launch a beam request; for detailed information, refer to section "Requesting Beam" in this chapter.

- **Room Interlocks:** to monitor room interlocks; for detailed information, refer to section “*Verifying the Room Interlocks*” in this chapter.

The order in which the panels become valid is irrelevant. The beam request will be submitted only when all the panels are **Ready**.

DRAFT

Verifying the PBS Dedicated Nozzle

The PBS DEDICATED NOZZLE PANEL of the EQUIPMENT PREPARATION SCREEN displays two different tabs:

- *Overview*: for information, refer to section “Overview” on page 35-11.
- *Nozzle Devices Details*: for information, refer to section “Nozzle Devices Details” on page 35-14.

Overview

On the OVERVIEW tab you have to ensure that all nozzle devices are present and correctly set to ensure adequate treatment.

In addition, you have to ensure that all desired accessories, and only those accessories, are present.

As long as the colored state bar reads *Not Ready* (indicated by the orange color), you will not be able to proceed to irradiation.

When all positioning information is available to enable irradiation, the colored state bar reads *Ready* (indicated by the green color).

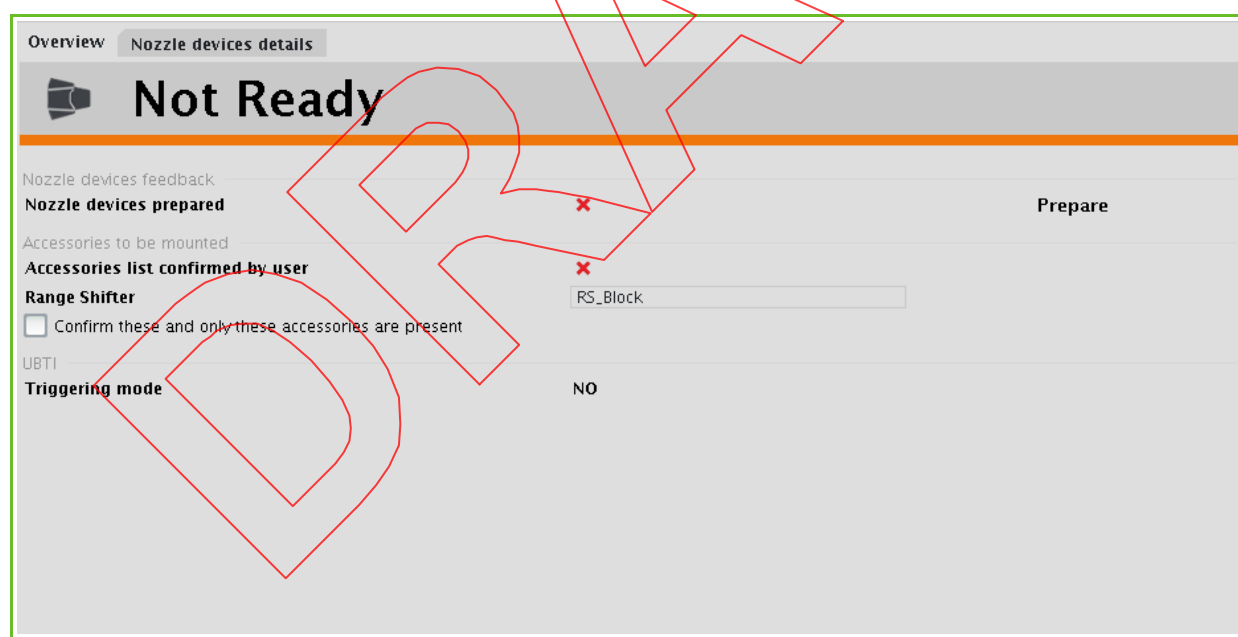


Figure 35-7. PBS Dedicated Nozzle Panel
Overview tab

The OVERVIEW tab contains the following feedback information:

- For nozzle devices:

- Nozzle devices prepared
- For accessories:
 - Accessories list confirmed by user: the checkmark is present when you have put a checkmark in the checkbox at the bottom of the tab, to confirm that these and only these accessories are present.

From the PBS DEDICATED NOZZLE PANEL you can click any of the following buttons:

- **Prepare:** to acknowledge that all nozzle devices are present and that the desired accessories are present to ensure a successful treatment. Click **Prepare** when no red cross marks remain on this tab.

Note: Be aware that you must confirm the presence of the range shifter, ridge filter, block, and range compensator if you want to proceed.

After clicking **Prepare**, you can still unconfirm the presence of the range shifter.

WARNING	Before allowing patient irradiation to start, check to see that the proper irradiation accessory is installed on the nozzle Using a different accessory than the one prescribed will result in mistreatment of the patient.
	

- **Unprepare:** press this button if you wish to revert your previously taken decision to acknowledge the nozzle condition.

Make sure that all required nozzle elements and accessories are present and click **Prepare**. The colored state bar reads *Ready* (indicated by the green color).

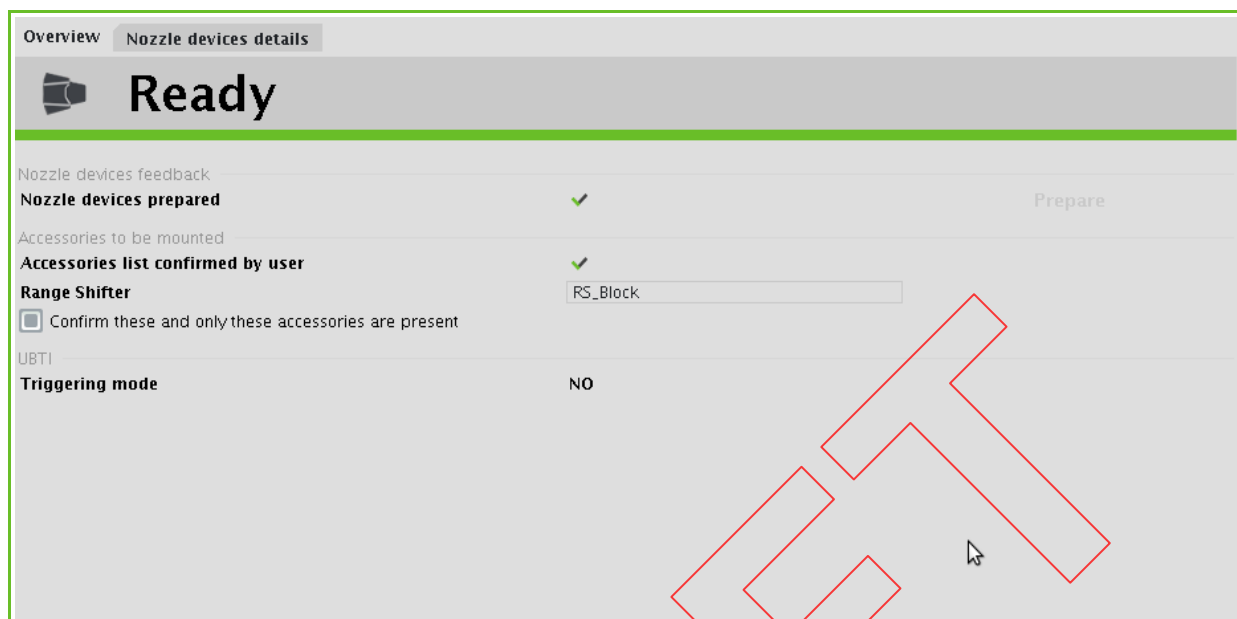


Figure 35-8. Nozzle Panel
(Ready)

Nozzle Devices Details

The NOZZLE DEVICES DETAILS tab provides detailed feedback information on some equipment states and operational modes, such as TCU, ISEU, etc.

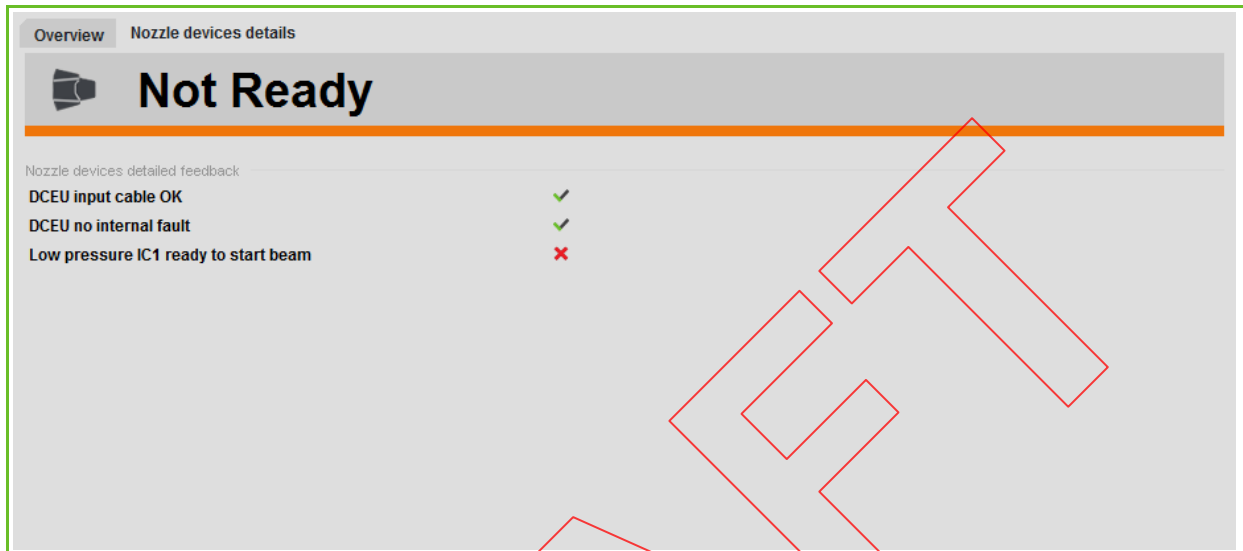


Figure 35-9. PBS Dedicated Nozzle Panel
Nozzle Devices Details tab

When all feedbacks have the proper state, the colored state bar reads *Ready* (indicated by the green color).

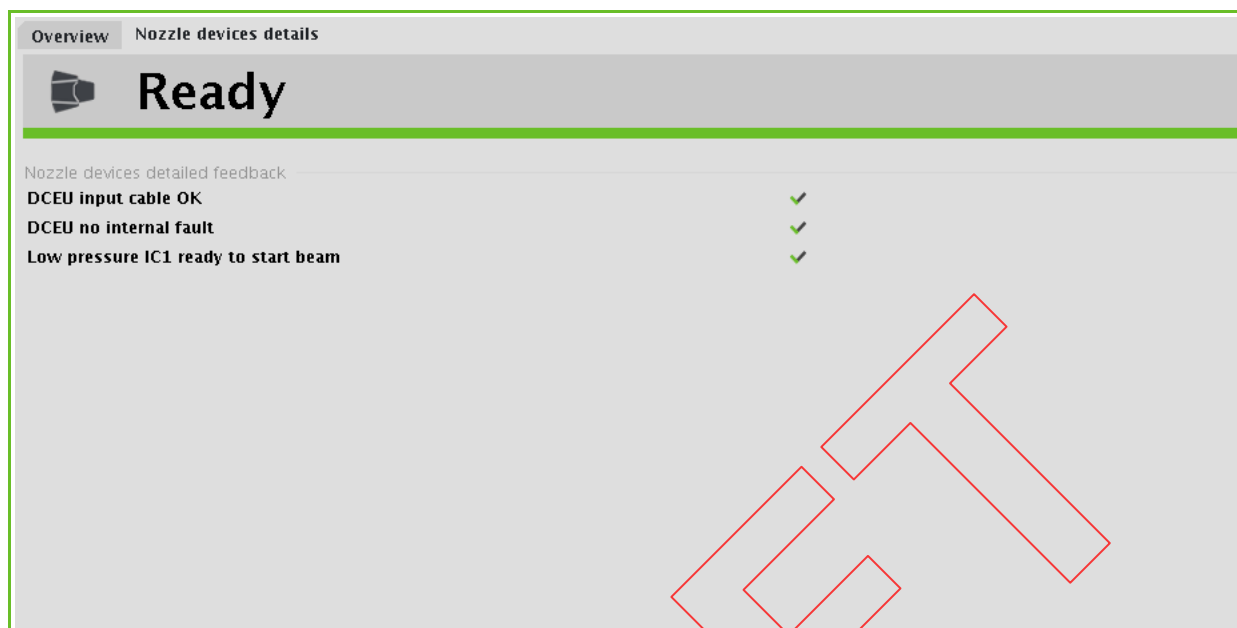


Figure 35-10. PBS Dedicated Nozzle Panel
Nozzle Devices tab (Ready)

Intentionally left blank

Verifying the Position of Devices

From the PMS INTERFACE PANEL you have to enter the positioning corrections to indicate that positioning preparation has finished.

Note: The optional position corrections that you can perform on the setup beam influence the initial Prescribed value of the next treatment beam(s). For detailed information, refer to Section “Influence of Setup Position Corrections on a Subsequent Treatment Beam” on page 35-19.

As long as the colored state bar reads *Not ready* (indicated by the orange color), you will not be able to proceed to irradiation.

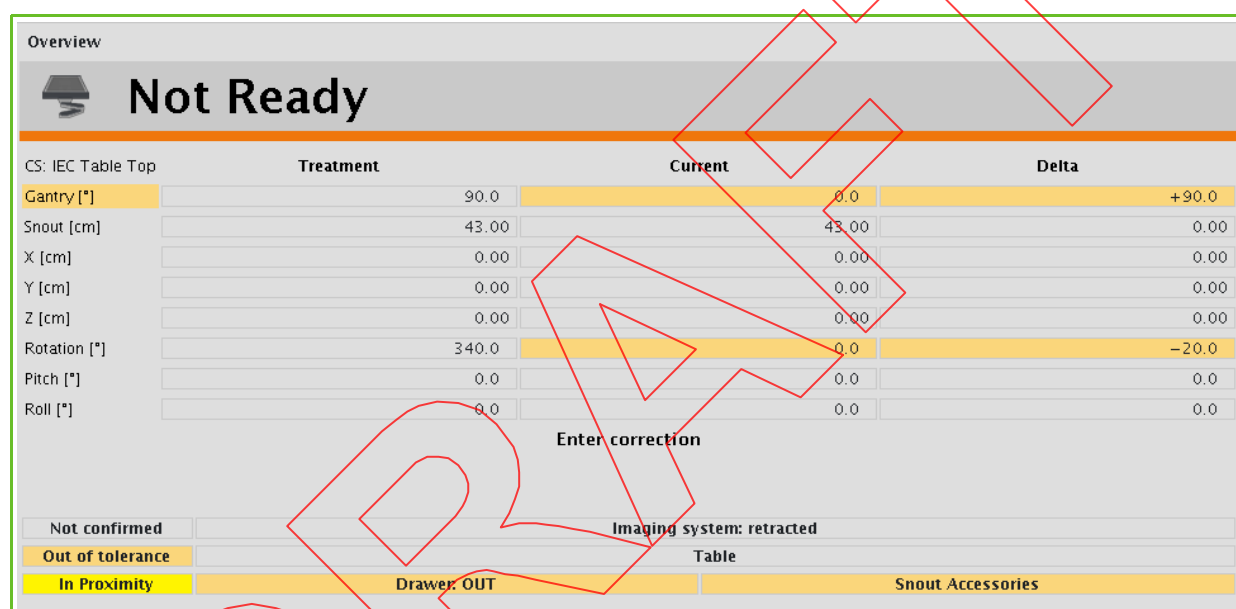


Figure 35-11. PMS Interface Panel

The PMS INTERFACE PANEL indicates the coordinate system in which the listed positioning parameters are expressed.

Note: Parameters that are irrelevant for this treatment room are grayed out.

The listed positioning parameters are:

- Gantry (°)
- Snout (cm) (grayed if no snout is present)
- X (cm)
- Y (cm)
- Z (cm)

- Rotation (°)
- Pitch (°)
- Roll (°)

For detailed information on how to interpret the positioning values, refer to Section “*Interpreting Positioning Values*” on page 35-4.

In addition, the panel indicates the inserted or extracted position of Flat panel A, Flat panel B, and the retractable X-ray tube.

The PMS INTERFACE PANEL displays the following status indications on accessories:

Note: *these status indications are applicable to treatment beams only.*

- **Table:** if a couch is specified in the prescription, indicates that the proper couch type has been installed.
- **Accessories drawer:** the treatment plan identifies a number of accessories to be used. In the case of the PBS dedicated nozzle, if an accessory is required, the drawer must be in the beam path. If no accessory is required, the drawer must be out of the beam path. A white background indicates that the drawer is in position with regard to the prescription; otherwise the background is yellow.

WARNING



Before allowing patient irradiation to start, check to see that the proper irradiation accessory is installed on the nozzle.

Using a different accessory than the one prescribed will result in mistreatment of the patient.

In addition, the PMS INTERFACE PANEL displays the following status indications:

- **No correction vector available:** the correction vector needs to be computed using the PPVS software (i.e., adaPT~~insight~~); for detailed information, refer to Section “*Entering Corrections*” on page 35-20.
- **Enter correction:** the correction vector has been computed using the PPVS software (i.e., adaPT~~insight~~).

If the PPVS is connected to the PTS and configured to do it, the correction vector is transmitted automatically. Else you can enter the computed values from the BEAM CORRECTION SCREEN.

- **In tolerance:** all listed positioning parameters are within tolerance, also indicated by the green background of the status indication.

- **Out of tolerance:** at least one of the listed positioning parameters is out of tolerance, also indicated by the orange background of the status indication.

Note: Should you want to perform treatment with one or more positioning parameters out of tolerance, you can do so but you will be prompted to sign an acknowledgment first.

CAUTION 	The tolerance between configured and intended position of the snout is 5 mm according to the system's specifications. Please consider this tolerance between configured and intended position of the snout.
---	---

- **Not confirmed:** the position has not been confirmed yet using the wireless hand-pendant or the remote positioning controls.
- **Confirmed:** the listed positioning parameters have been implemented in the treatment room using the wireless hand-pendant or the remote positioning controls, and the position has then been confirmed.
- **No proximity:** verification by the proximity control software acknowledges that no patient or device proximity hazard exists.
- **No collision:** variations in PPS load cell readings are below the allowed limits.
- **Alignment devices retracted:** the green check mark appears only if both flat panels have been retracted.

Influence of Setup Position Corrections on a Subsequent Treatment Beam

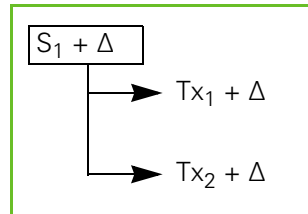
Any correction to a Setup beam influences the initial Prescribed value of (a) subsequent treatment beam(s).

When you perform an Auto motion to the **Setup** or **Treatment** target positions using the wireless hand-pendant or the remote positioning controls, the values of the Setup or Treatment position are loaded.

An Adjusted Setup Beam followed by multiple Treatment Beams

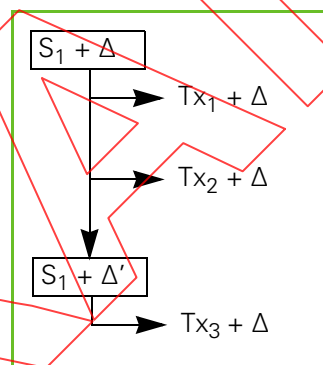
You can still adjust the prescribed Setup position (S_1) if needed. These adjusted positions (i.e., the values of the Setup position plus one or more adjustments - Δ) form the new basis for the subsequent treatment beam (Tx_1).

If yet another treatment beam (Tx_2) is necessary, the adjusted Setup beam (S_1 plus Δ) is taken as a basis, NOT the adjusted previous treatment beam (Tx_1 plus Δ).



An Adjusted Setup Beam followed by multiple sets of Treatment Beams

If a Setup beam (S_1) and one (Tx_1) or more (Tx_2) treatment beams are followed by another Setup beam, the original adjusted Setup beam (S_1 plus Δ) is again taken as a basis for a potentially following treatment beam (Tx_3). That basis, again, can also have its own adjustments (hence $S_1 + \Delta'$).



Entering Corrections

The Patient Position Verification System (PPVS) (i.e., adaPT~~insight~~) is used to perform the correction vector calculation.

For a detailed description on how to use the PPVS system, refer to the following:

- adaPT~~insight~~: refer to Chapter 49, "Calculating Corrections Using adaPT~~insight~~".

If the PPVS is connected to the PTS and configured to do it, the correction vector is transmitted automatically. Else you can enter the computed values from the BEAM CORRECTION SCREEN.

To manually enter a correction vector, click **Enter correction** from the PMS INTERFACE PANEL and enter the corrections that are obtained from the PPVS software (i.e., adaPT~~insight~~) in the corresponding fields on the BEAM CORRECTION SCREEN that appears.

Figure 35-12. Beam Correction Screen

Click **Apply** and the correction values appear on the PMS INTERFACE PANEL.

Validating the Positioning Parameters

Implement the positioning parameters using the wireless hand-pendant or the remote positioning controls.

The colored state bar reads *Ready* (indicated by the green color). The *Confirmed* status is also indicated by the green checkmark (✓) adjacent to the tabletop icon, and the *Preparation confirmed* status.

Overview

Ready

CS: IEC Table Top

	Treatment	Current	Delta
Gantry [°]	90.0	90.0	0.0
Snout [cm]	43.00	43.00	0.00
X [cm]	0.00	0.00	0.00
Y [cm]	0.00	0.00	0.00
Z [cm]	0.00	0.00	0.00
Rotation [°]	340.0	340.0	0.0
Pitch [°]	0.0	0.0	0.0
Roll [°]	0.0	0.0	0.0

Enter correction

Confirmed

In tolerance

In Proximity

Imaging system: retracted

Table

Drawer: IN

Snout Accessories

Figure 35-13. PMS Interface Panel (Completed)

Requesting Beam

On the Beam panel of the EQUIPMENT PREPARATION SCREEN you have to launch your beam request.

As long as the colored state bar does not read *Ready* (indicated by the green color), you will not be able to proceed to irradiation.

When beam is allocated and successfully prepared, be it automatically or by the MCR operator, the colored state bar reads *Ready* (indicated by the green color).

 **Not Ready**

Authorizations: Room Interlocks  / Nozzle 

Allocated

Pending

Normal priority request Prepare

High priority request

☐ Keep allocation

Cancel request Release beam

Scheduling mode: manual / Operating mode: manual

Figure 35-14. Beam Panel

Obtaining Authorizations

First of all you have to make sure that the required authorizations are present. These authorizations are listed immediately under the state bar:

- **Room Interlocks:** if the state of the interlocks is not OK, perform the operations as described in Section “*Verifying the Room Interlocks*” on page 35-25.
- **Nozzle:** if the state of the nozzle is not OK, perform the operations as described in Section “*Verifying the PBS Dedicated Nozzle*” on page 35-11.

Both the room interlocks and the nozzle must be **Ready**.

Note: Before executing a beam request, make sure that the patient is correctly positioned and that the Position Management System is prepared. Perform this verification before each beam request in a treatment session.

Making a Beam Request

Note: Before making your actual beam request, you have the option to select **Keep allocation**: when you select this option, the beam will remain allocated to your treatment room for the next treatment beam of the same patient. If you have one or more subsequent beams for the current patient and you do not select this option, the beam may be allocated to another treatment room by the time that you need it.

Select one of the following beam request types:

- **Normal priority request:** any such request is added at the back of the list of normal requests.
- **High priority request.**
 - any such request jumps ahead of all normal priority requests in the list.
 - when beam is already allocated to another room that issued a normal priority request, that room will be requested to release the beam in favor of this high priority request.

Your request appears in the **Pending** list.

Note: The PTS takes into account beam requests in the scheduler queue at the latest possible moment, i.e., when all user actions to prepare for irradiation have been performed.

In practice, this means that all of the following conditions must exist:

- entire nozzle preparation is complete
- treatment room has been secured
- positioning preparation is complete
- the OIS is authorizing irradiation: in OIS mode and the OIS cooperates with the PTS working in EMR (Electronic Medical Record) Centric mode

Select the desired type of request. The state in the colored state bar changes into :

- **Beam Requested:** indicating that the room interlocks are not ready.
- **Beam Allocated:** indicating that the room interlocks are ready. The beam will be prepared automatically without any further intervention from your side.

Note: If the automatic beam preparation fails, a popup message appears (see Figure 35-15). Press the **Prepare** button from the BEAM PANEL of the EQUIPMENT PREPARATION SCREEN to request the beam preparation manually.

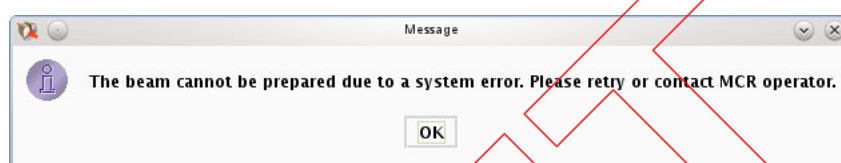


Figure 35-15. Beam Preparation Failure Message

To the right of the buttons two further indications about the beam allocation are provided:

- **Allocated:** indicates the treatment room to which the beam is currently allocated.
- **Pending:** this is the list of pending beam requests.

Note: When you request beam, the beam allocation will become visible on the BEAM PANEL only after the treatment room is secured, i.e., when the doors to the treatment room have been closed. When you secure the treatment room prior to requesting the beam, the allocation will become visible immediately upon allocation.

Should you not be satisfied with the beam allocation, click **Release beam** to remove your request from the queue.

At all times, you can click any of the following buttons:

- **Cancel request:** to remove your beam request from the list.
- **Release beam:** to release the beam that is already allocated to your treatment room.

At the bottom of the screen the following indications are provided:

- **Scheduling mode:** beam scheduling is performed from the Automatic Beam Scheduling (ABS) panel of the Beam Operation Manager (BOM), which is running in the Main Control Room (MCR).

The scheduling mode can be **Automatic** or **Manual**.

- **Operating mode:** the actual switching of magnet power supplies to direct the beam to a specific treatment room is performed from the Energy Selection and Beam Transport System (ESBTS) panel of the Beam Operation Manager (BOM), which is running in the Main Control Room (MCR).

The scheduling mode can be **Automatic** or **Manual**.

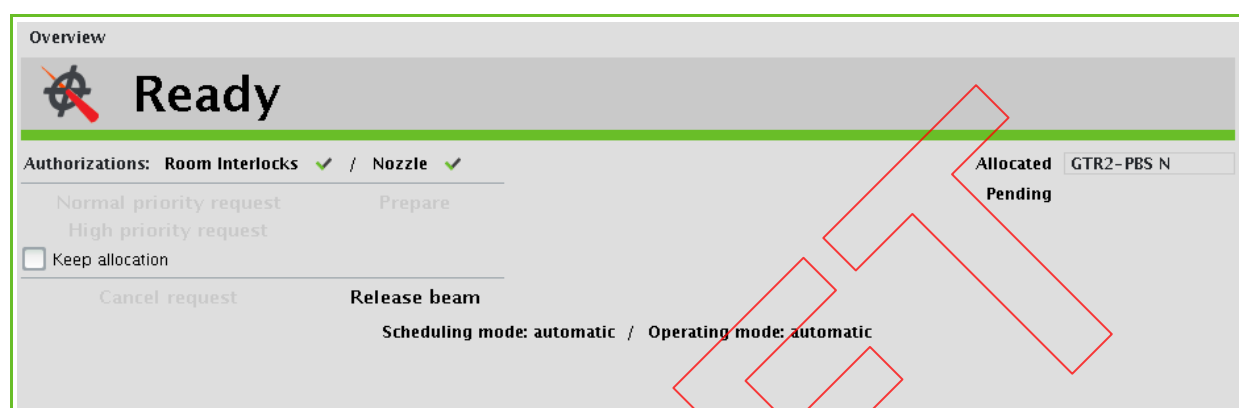


Figure 35-16. Beam Panel (Prepared)

When requesting beam, the state in the colored state bar successively proceeds through the following states:

1. Not Ready
2. Beam Requested: this means the treatment room doors are not yet closed. Upon closing the doors, the state bar will proceed to the next state.
3. Beam Request Pending (only when working in manual scheduling mode)
4. Waiting Preparation
5. Preparing Beam
6. Ready

Verifying the Room Interlocks

When the room interlocks are OK, on the ROOM INTERLOCKS PANEL - NOT READY of the EQUIPMENT PREPARATION SCREEN you receive a confirmation that all required safety measures are in place to ensure safe treatment.

As long as the colored state bar does not read *Ready* (indicated by the green color), you will not be able to proceed to irradiation.

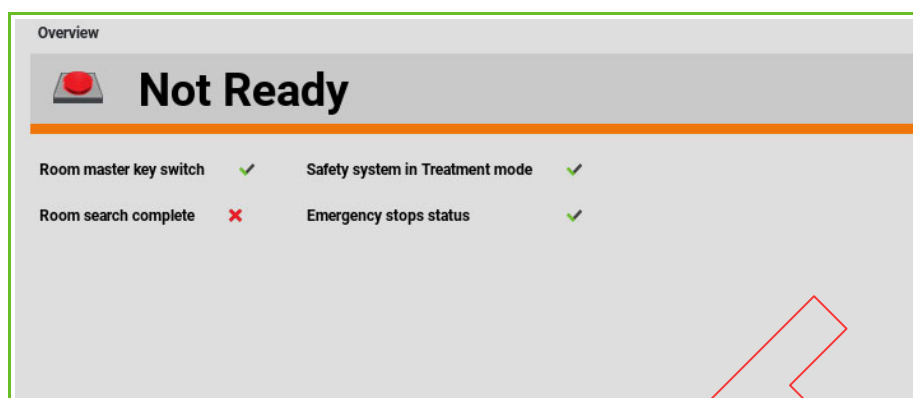


Figure 35-17. Room Interlocks Panel - Not Ready

When all room interlock information is available to enable irradiation, the colored state bar reads *Ready* (indicated by the green color).

The ROOM INTERLOCKS PANEL - NOT READY indicates the status of the following safety devices:

- **Room master key switch:** the master key is inserted in the key switch on the MCR Control Panel and the key switch is turned on.
- **Room search complete:** the treatment room is properly searched and the door to the treatment room is closed.
- **Safety system in Treatment Mode:** the TCR master key is inserted in the key switch on the TCR Control Panel and the key switch is turned on.
- **Emergency stops status:** all emergency stop buttons the entire PT system are reset.

Make sure that all safety signals are present. The colored state bar reads *Ready* (indicated by the green color).

CAUTION 	In case an error message (from the clinical Graphical User Interface (GUI)) has warned you (while attempting to prepare a treatment beam) that a major issue with the IC cyclo related equipment has been detected, you shall request (from the maintenance team) a verification of the structural integrity and the proper functioning of the IC cyclo related equipment (i.e. IC cyclo related electrical wiring). It will not be possible to proceed with treatment until the issue is fixed and preparation succeeds.
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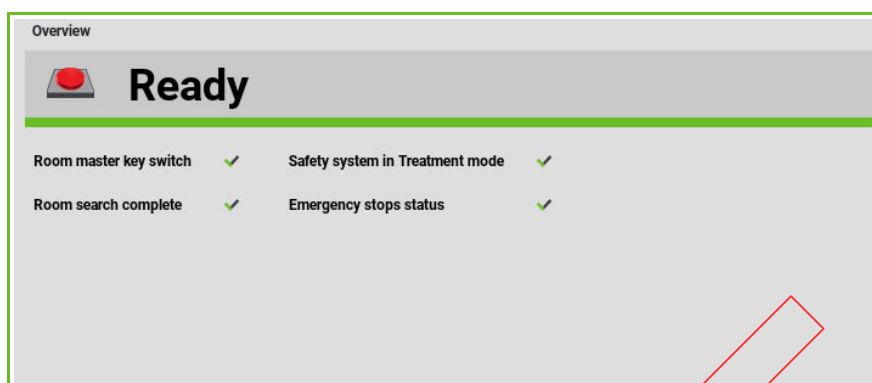


Figure 35-18. Room Interlocks Panel - Ready

Proceeding to Treatment

When the color of the state bars of all four panels on the EQUIPMENT PREPARATION SCREEN is green, the **Next** button at the bottom of the screen is enabled, which means you can proceed to the last step, Irradiation.

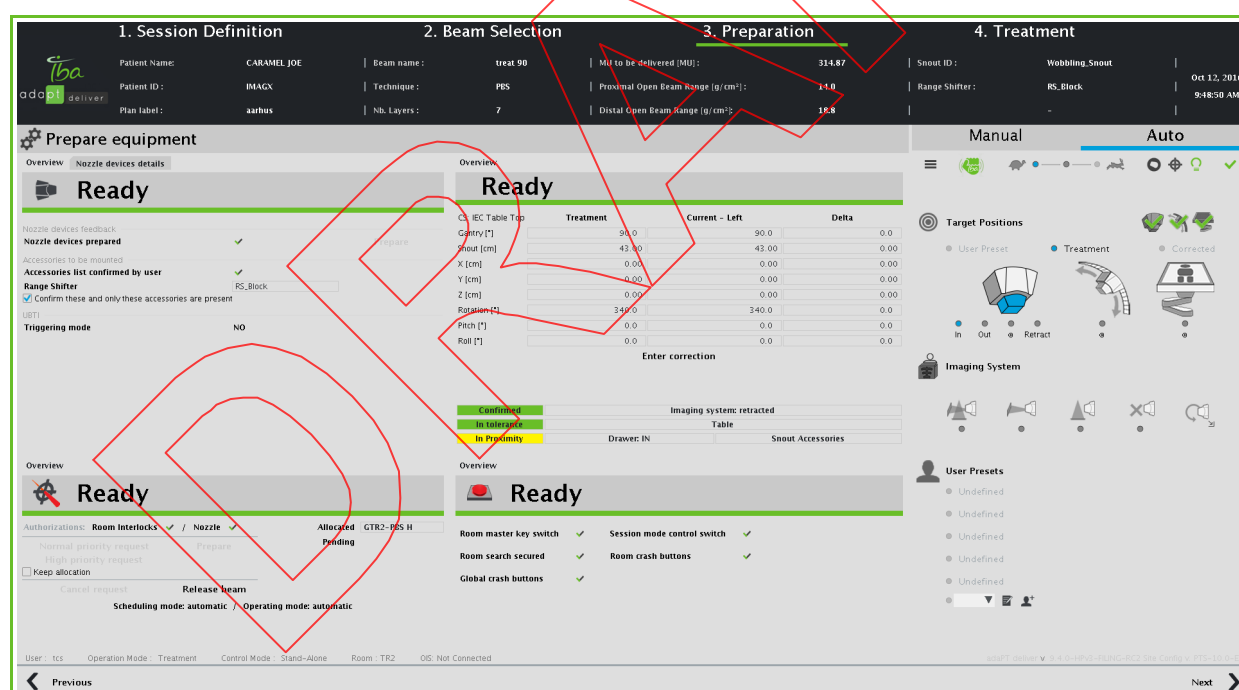


Figure 35-19. Equipment Preparation Screen (Validated)

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