

decimal Bolus Designer Tutorials

This page provides details and tutorials for common application features of the decimal Bolus Designer.

Launching the decimal Bolus Designer

In order to Launch the decimal Bolus Designer app you must use the [decimal Launcher](#) to run the decimal Bolus Designer. The decimal Launcher is a lightweight standalone application that is the hub for authenticating, installing, managing versions, and running .decimal applications. The decimal Launcher will notify users when a new version is available, allow site managers to review release notes and push out a new application version for all users at their site.

To get started using the decimal Launcher and decimal Bolus Designer:

1. Download and [install the decimal Launcher](#) from [decimal Direct](#).
2. Log in with your .decimal credentials.
3. Find decimal Bolus Designer and download/launch the application.

For further instructions please refer to the [decimal Launcher User Guide](#).

NOTE: Users must use their decimal Direct user Log in to use the decimal Launcher.

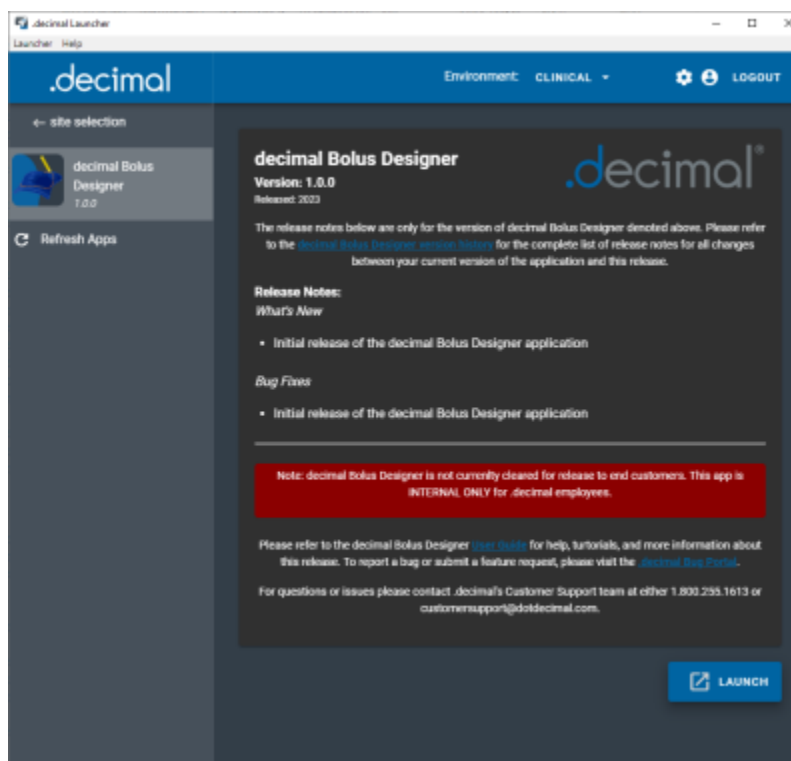


Fig. 1: decimal Bolus Designer within the decimal Launcher

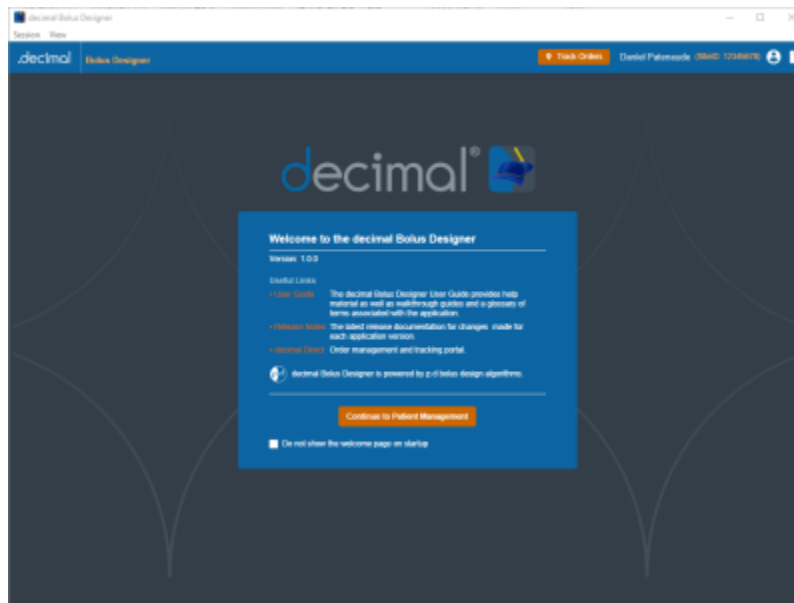


Fig. 2: decimal Bolus Designer Welcome Screen

DICOM Patient Import

In order to begin designing boluses in the decimal Bolus Designer App you must first have patient imaging captured, structure geometries defined, and a treatment plan ready. This information is brought in the Bolus Designer App by importing DICOM CT, Structure Set, and Plan files.

Default Import Directory

The default import directory can be set in the app settings by navigating to View → Settings. This directory will always be the default directory when importing a patient. Users can then further refine the import folder as needed starting from this default level.

Importing a New Patient

If you have a set of CT Images, structures, and a plan you can import them directly into a new patient through the “Import Patients” menu.

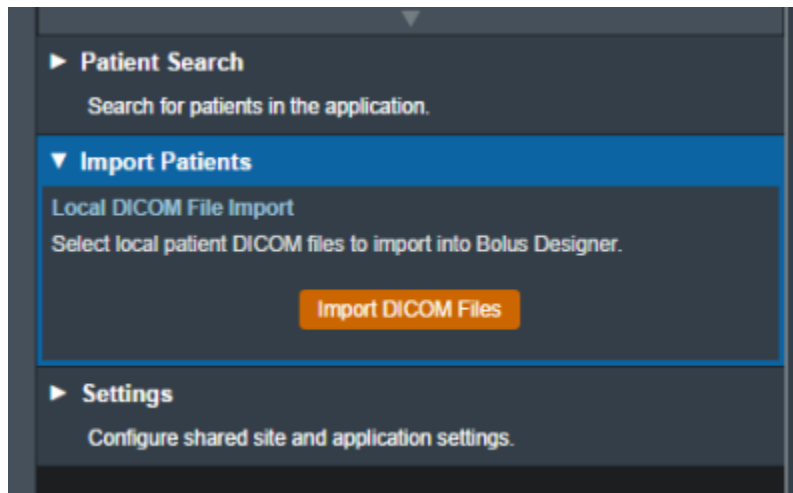


Fig. 3: Import in the Main App Page

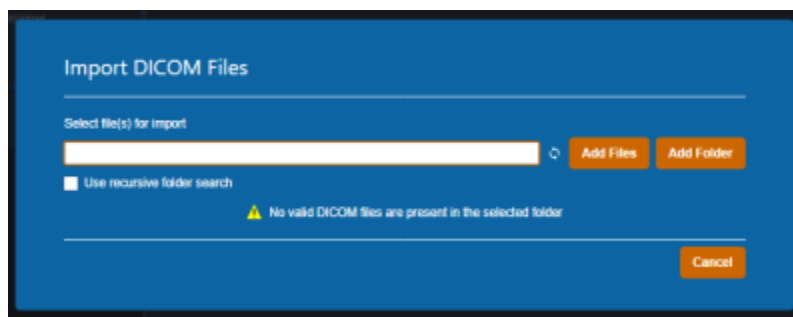


Fig. 4: Import Directory Input

The Import DICOM Files option allows you to either browse your computer or copy the path to the folder that contains the CT images and structures you wish to import. The following options are available for browsing for local files:

- **Refresh:** Will refresh the files in the existing specified directory. This is useful if the files have changed once the directory has been selected and the file list initially populated in the Import DICOM Files window.
- **Add Files:** Browse for individual DICOM file(s) to import into a patient. Note: this option does not make use of the recursive folder search option.
- **Add Folder:** Browse for an entire folder of DICOM files to import into a patient
 - Use recursive folder search: This option can be selected prior to adding a folder to recursively search and add all DICOM files within the selected folder and all sub-folders.

A list of selected DICOM files for import will be displayed and you can choose to add more files for the selected patient or remove any files as desired.

Refer to the [Processing Imports](#) section once files have been selected to import.

Processing Imports

Clicking the Import button will start processing the selected files.

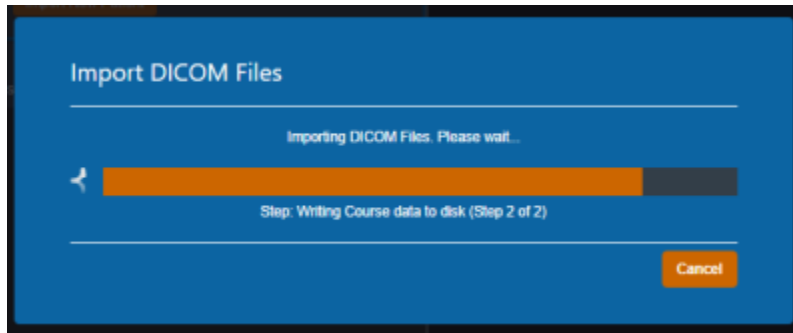


Fig. 5: Import Loading screen

When importing a new patient, the DICOM plan file must have the proper UIDs that reference the structure set in order for the plan to be successfully imported. If there are no Errors while importing you will be taken to the Electron Machine Definition page.

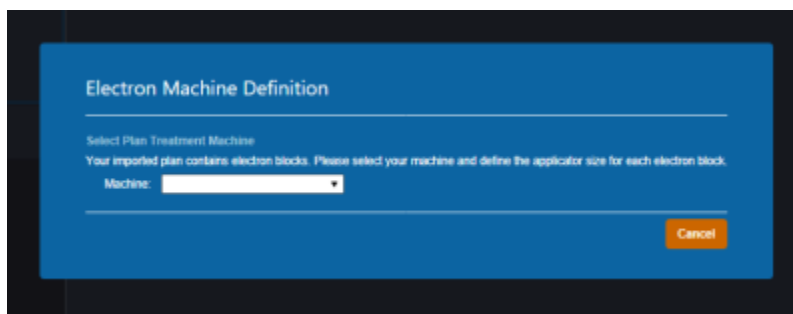


Fig. 6: Electron Machine Definition

If there are errors, please refer to the [Common Errors](#) section below for further details.

Electron Machine Definition

Users must select an electron treatment machine from the current site when importing a new plan into the Bolus Designer app. After a machine is selected, an applicator must be assigned to each beam in the plan.

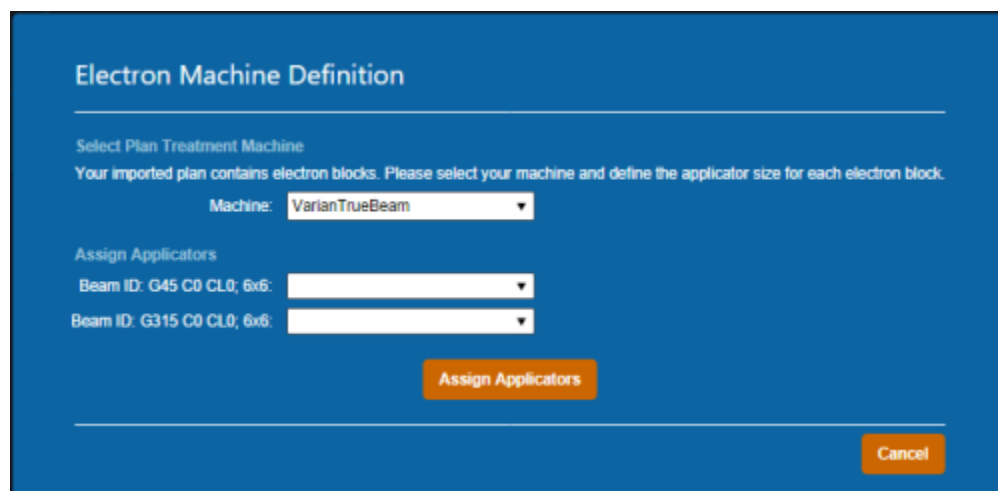


Fig. 7: Assigning Applicators

After every beam has an applicator assigned to it, the import can finish and you will be taken to a confirmation page for your import.

Common Errors

Structures Skipped During Import

Structures can be skipped during Structure Set import if the structures meet the following criteria:

- Non closed planar (e.g.: points or structures where slices are not fully closed)

Structures that are skipped will be denoted at the end of the DICOM import as shown in [figure 8](#).

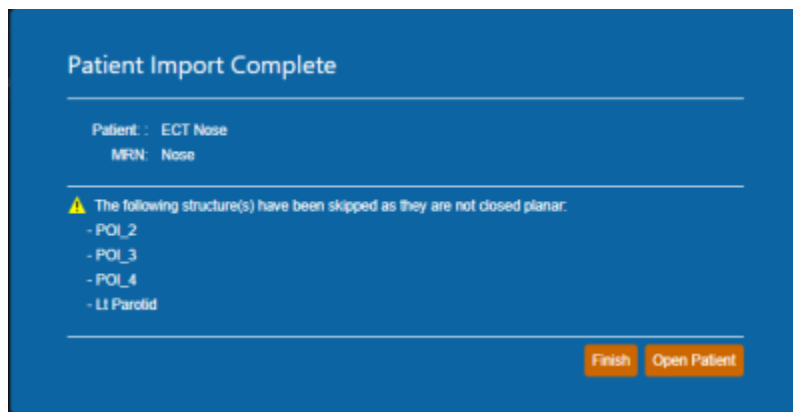


Fig. 8: Import Finalized

Missing CT Images, Structure Set, or Plan File

If the files you have selected to import do not include CT images, a structure set, and a plan file you will receive this error message.

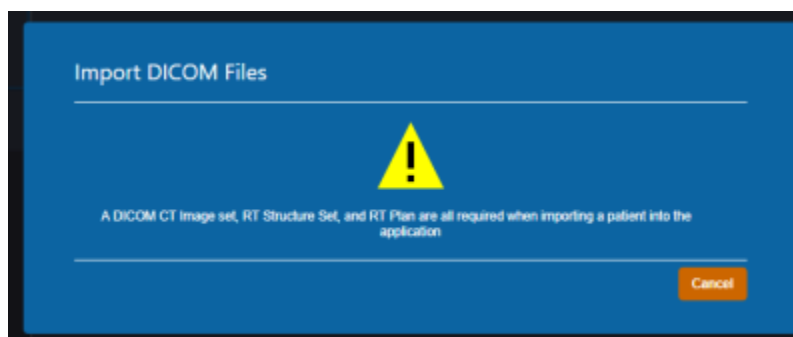


Fig. 9: Missing DICOM Files

You must re-start the DICOM import process and select the all the required files in order to successfully

import a treatment plan.

Bolus Designer Settings

The Bolus Designer App allows users to view and edit app-level configuration settings. The Settings block is located in the main page of the app below the Import Patients block.



Note:

These settings are saved as part of the [shared patient file storage](#) and will be used by all users sharing the patient database.

Export Logs

The Export Logs block allows the user to export a file containing logs of user activity within the app. This .csv file contains data exported from the app database that keeps track of critical user activity, including (but not limited to): opening of patients and plans, plan approvals, DICOM exports, and hardware ordering.

Refer to the [Bolus Designer User Logging](#) guide for details on what actions are logged.

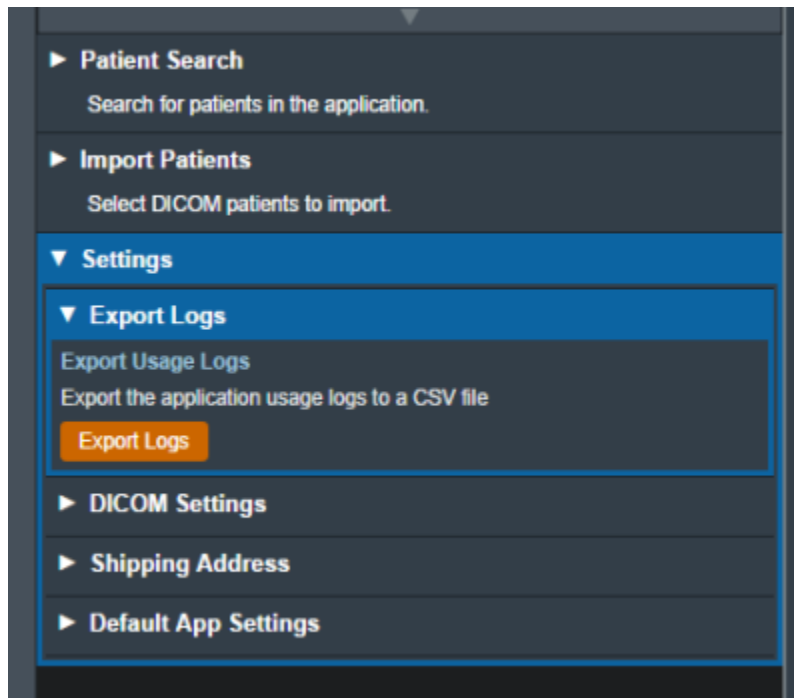


Fig. 10: Export Logs UI

DICOM Settings

The DICOM Settings block allows the user to view and edit settings related to the export of DICOM files. These settings include the default DICOM export directory and a list of DICOM export server AE titles.

These settings are applied and available to all users of the selected Site ID for which the settings are present.

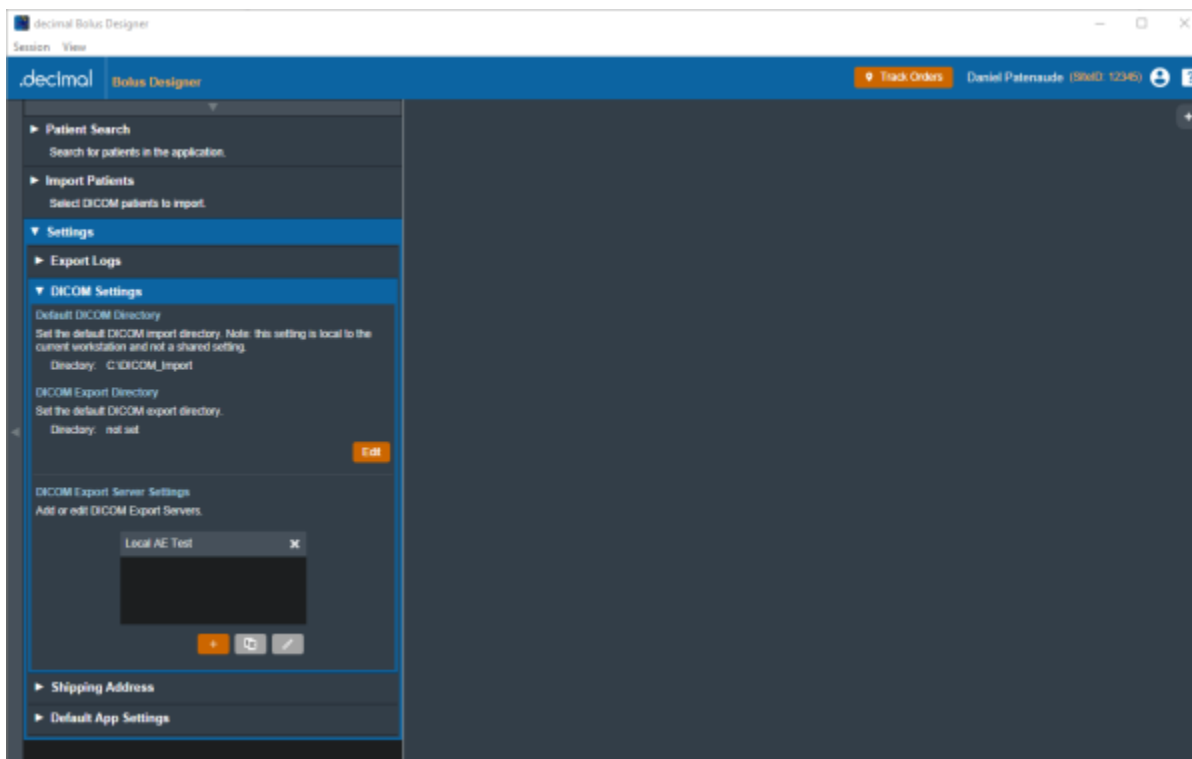


Fig. 11: DICOM Settings UI

DICOM Directories		
Import Directory	Sets the default import folder when exporting DICOM files to disk. This is the same default import directory set in the local application settings . Note: this setting is local to the current workstation and not a shared setting for all users.	
Export Directory	Sets the default export folder when exporting DICOM files to disk.	
DICOM Export Server Settings		
Export Export Servers	A list of DICOM AE titles (DICOM Receivers from another system) that the Bolus Designer app can export to.	
	Server Name:	The name of the DICOM server that will displayed to the user when exporting within the Bous Designer app.
	IP Address:	The local network IP address to which DICOM files will be sent by the Bolus Designer DICOM sender.
	Port:	The local network port on which the DICOM sender should transmit the DICOM files.

Shipping Address Settings

The Shipping Address settings block allows users to view the shipping address set in decimal Direct for the current site. Currently this address can not be changed within the application and must be managed from within [decimal Direct](#).

If an address is edited outside of the application and within decimal Direct, you must either restart the decimal Bolus Designer application or use the *Refresh Address* button to view the new application address within the Bolus Designer.

Note: Only [Site Managers](#) can edit the site address information.

These settings are applied and available to all users of the selected Site ID for which the settings are present.

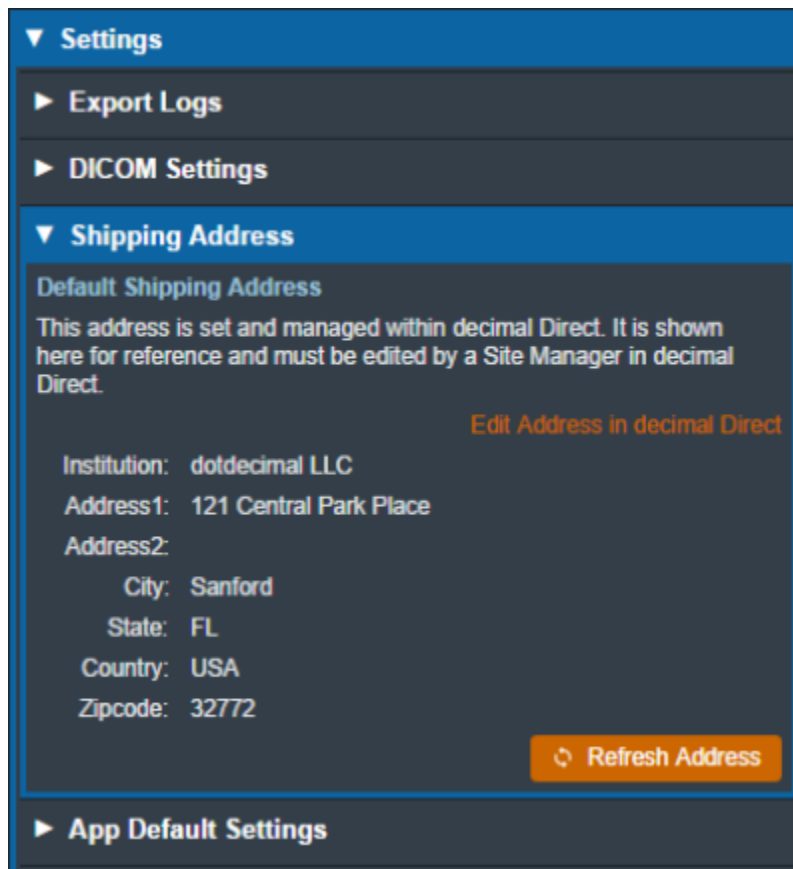


Fig. 12: Address Settings UI

Default App Settings

The App Default Settings block allows users to set default values for controls found in the Bolus Designer app.

Bolus Default Settings

- Trim Bolus By Beam: Determines whether or not the Bolus Designer task trims the bolus by the plan beam(s) by default.

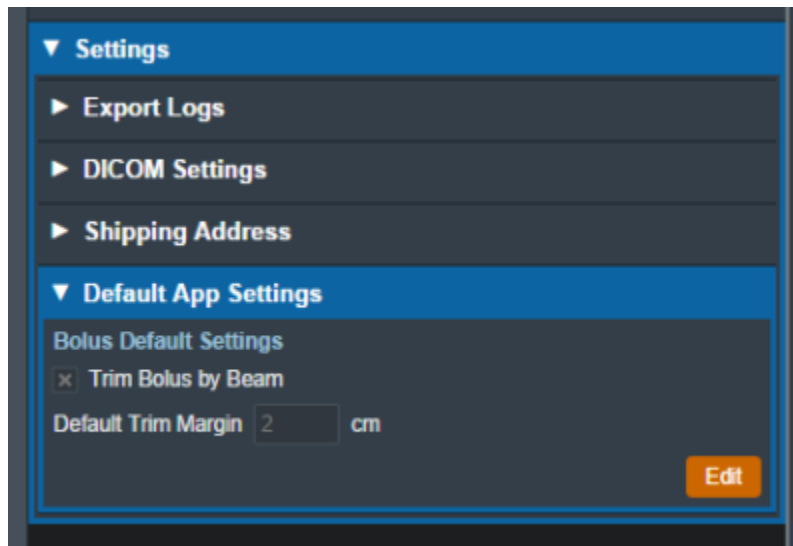


Fig. 13: App Default Settings UI

Patient Management

The Bolus Designer App allows users to manage and search for imported patients in the main page of the app. The Patient Search block allows the user to search for specific patients by matching the search text with patient names, MRN, and birthdates.

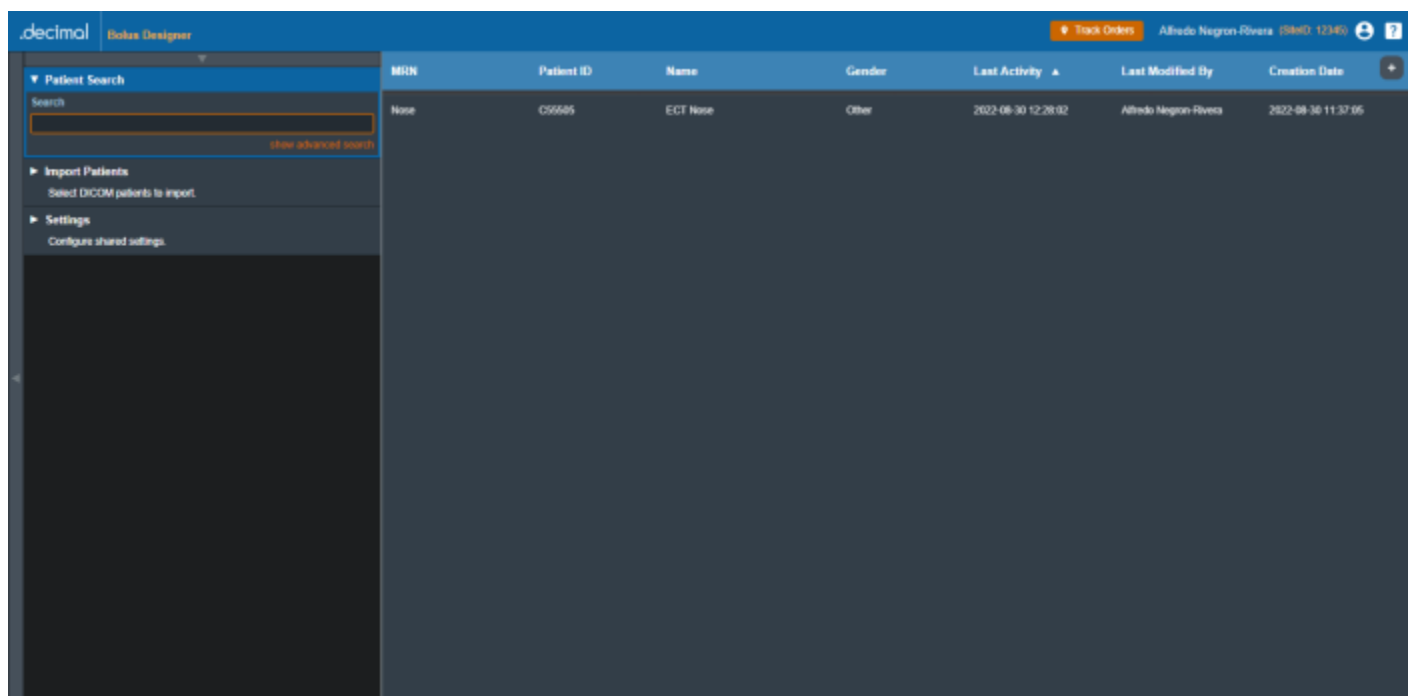


Fig. 14: Patient Search

Advanced Search Options

The user also has the option to use the Advanced Search feature to match multiple search criteria such as patient ID, family name, and gender.

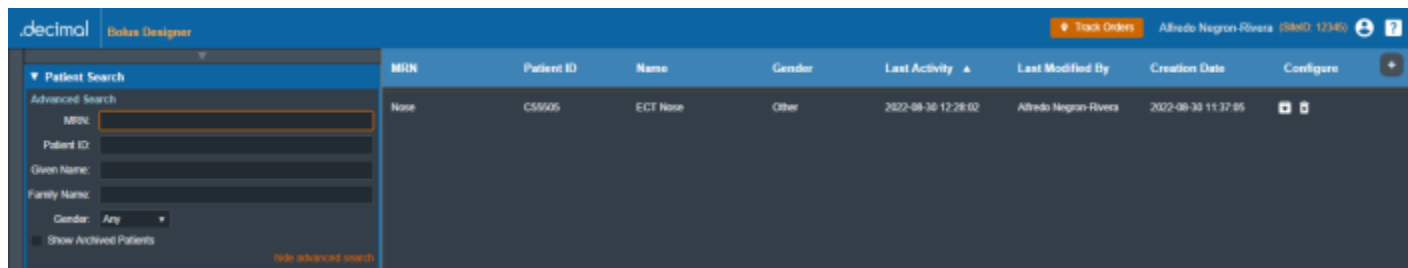


Fig. 15: Advanced Patient Search

Archive Patients

When the Advanced Search feature is enabled, the user has the option to archive a patient. Doing so will remove (hide) the patient from the Patient Search. The user can view archived patients and have the option to make them active again if they click the “Show Archived Patients” check box.

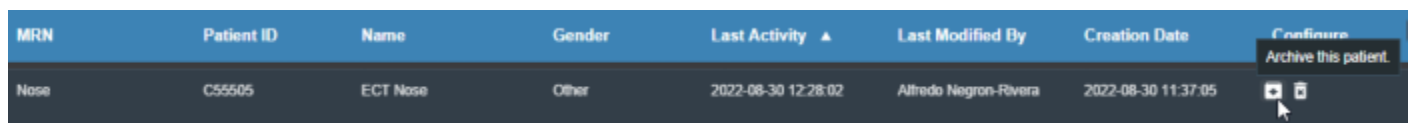


Fig. 16: Archiving a Patient

Delete Patients

The user may also choose to delete a patient when the Advanced Search feature is enabled. Patient Deletion removes the patient from the local database and deletes all local files containing data for the patient. This action cannot be reversed and the user will be warned before the patient is deleted. A patient containing locked plans cannot be deleted.

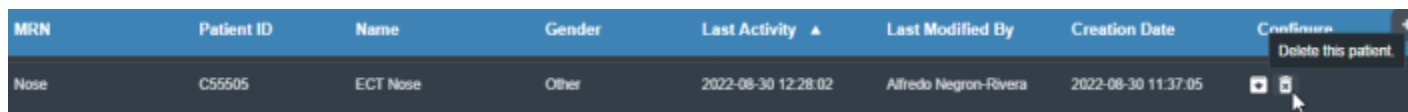


Fig. 17: Deleting a Patient

Treatment Plans

After a DICOM plan is successfully imported, it will appear in the Patient Overview of the patient that it is assigned to. Plans will show up with the following states:

- **Locked Plans:** Lime Green background and automatically sorted to the top of the plan list.

- Refer to [Plan Locking](#) for more details
- **Normal Plans:** Blue background and in the order in which they were imported
- **Inactive Plans:** Red background and in the order in which they were imported

From the Patient Overview plan list, the user has the following options manage their plan list:

- **Inactivate Plans:** Users can choose to make an existing plan inactive. Doing so will remove (hide) the plan from the Patient Overview. The user can view inactive plans and have the option to make them active again if they click the “Show Inactive Items” check box.

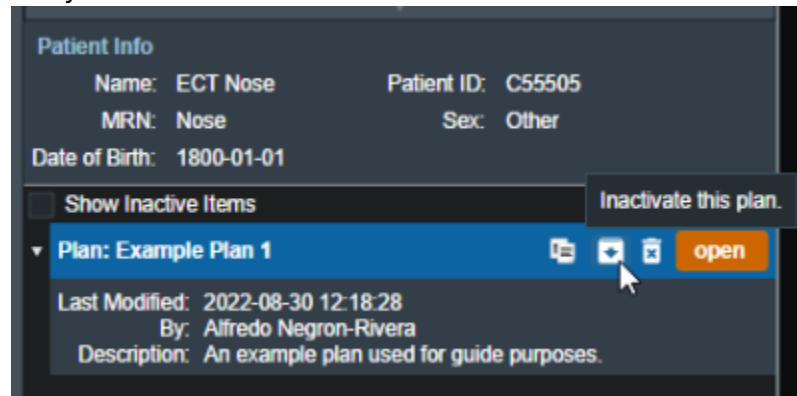


Fig. 18: Making a Plan Inactive

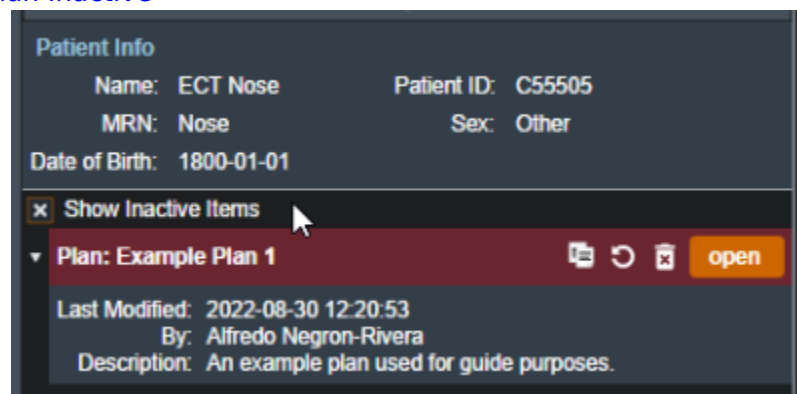


Fig. 19: Viewing Inactive Plans

- **Delete Plans:** The user may also choose to delete a plan from the Patient Overview. Plan Deletion removes the plan from the local database and deletes all local files containing data for the plan. This action cannot be reversed and the user will be warned before the plan is deleted. Locked plans cannot be deleted.

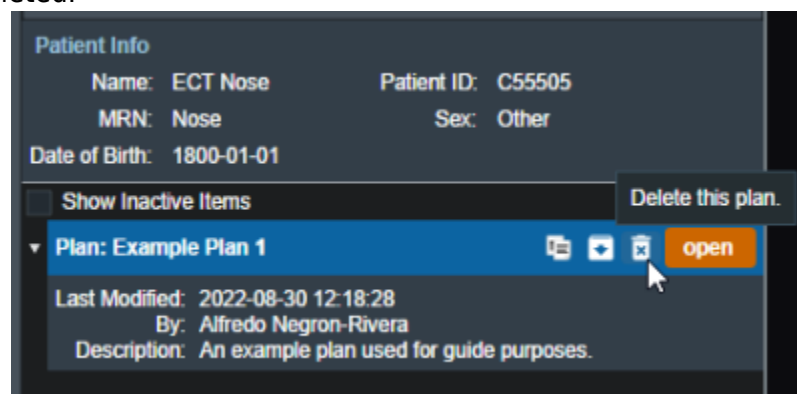


Fig. 20: Deleting a Plan

- **Clone Plans:** The user may also choose to clone a plan from the Patient Overview. Plan cloning copies the plan and all plan data to a new copy. The exact state of the plan will be copied as well.

So any work-in-progress tasks being performed will be copied to the cloned plan. Both unlocked and locked plans can be cloned.

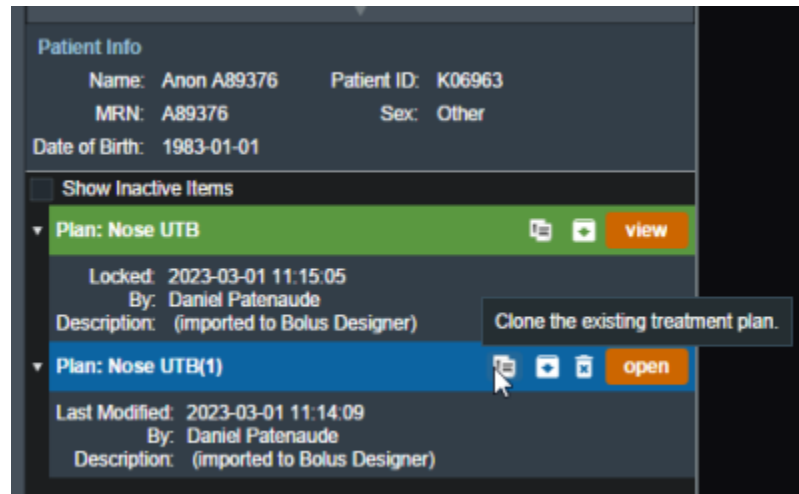


Fig. 21: Cloning a Plan

General Info

The *General Info* block of the plan overview contains information about the plan, including the creation date, user that created the plan, last modified date, and user that last modified the plan. The user can edit the name and description of the plan in this block, as well as lock the plan to prevent further edits to the plan. Refer to [Plan Locking](#) for information on locked plans.

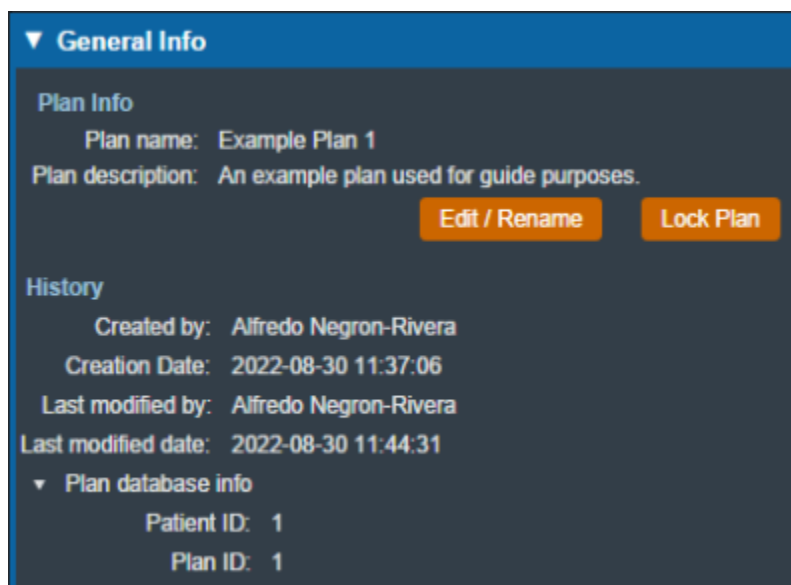


Fig. 22: Plan General Info

Right Hand Side Controls / Options

When viewing, creating, or editing a bolus in a treatment plan, the user can click the column to the right side of the display UI to bring up the right hand side Controls/Options. The right hand side controls

contain tools used for viewing the patient, beams, and devices in the display UI.

General Display

The General Display Options have the following tools:

- **Show Mouse Overlay:** Controls whether or not to show the HU value mouse overlay when moving the cursor over the CT images.
- **BEV Ruler Controls:** Controls whether or not to show the BEV ruler when the Beam's Eye View is in the display UI. Also contains controls for the ruler color, length, scale, and tick interval.
- **Measurement Tool Controls:** Controls whether or not to show the measurement tool in the CT images. When enabled, the user can click 2 locations in one of the sliced CT views and a line with the distance between the 2 points will appear. The user can also change the color of this line.

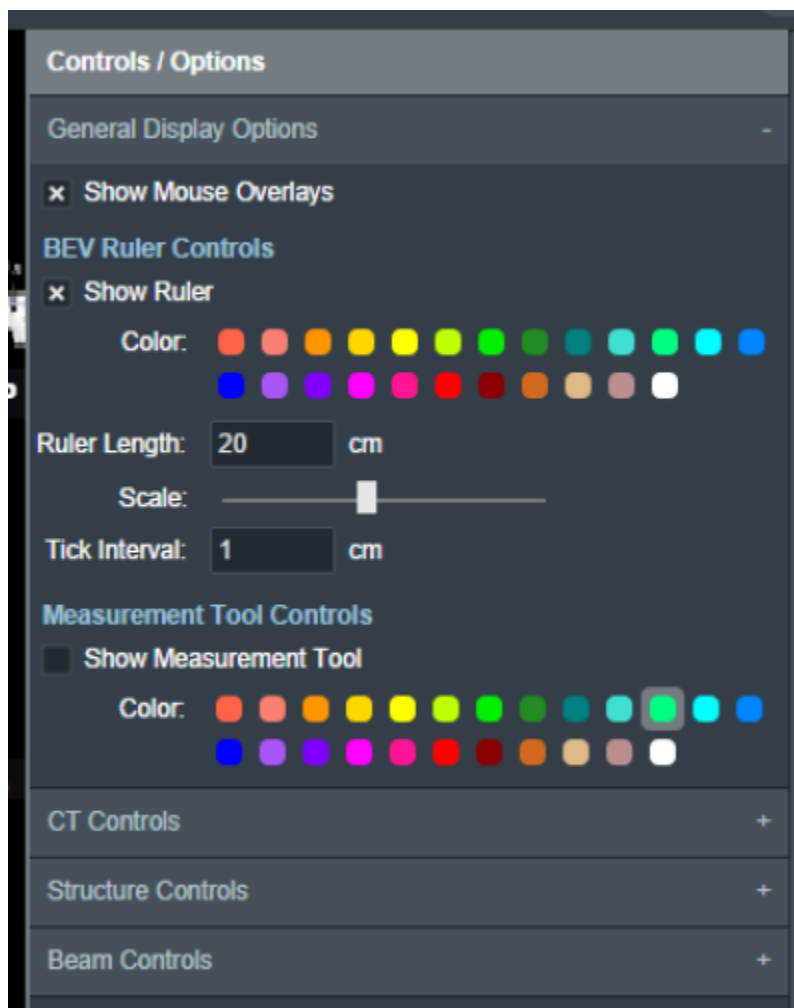


Fig. 23: General Display Options

CT Controls

The CT Controls allow the user to set the Level and Window values of the CT images displayed in the

sliced views of the display UI. There is also an option to set the values according to one of the available presets.

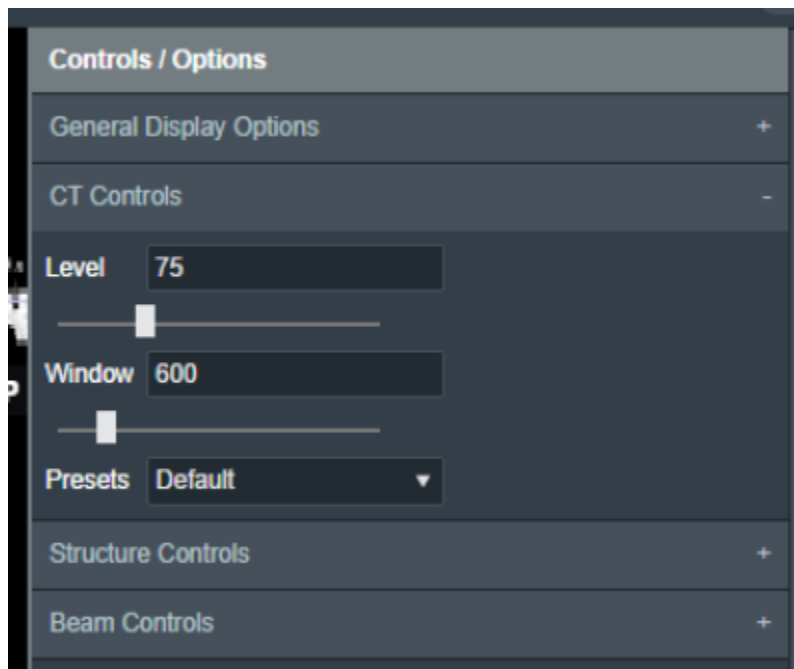


Fig. 24: CT Controls

Structure Controls

The Structure Controls allow the user to:

- Show or hide all of the structures that were successfully imported from the structure set in the display UI (left click the visibility color toggle)
- Display each structure using solid or contour rendering (right click the visibility color toggle)
- Jump to the structure center in the sliced CT view (left click the crosshair icon)
- Edit the opacity of each structure rendered as a solid.

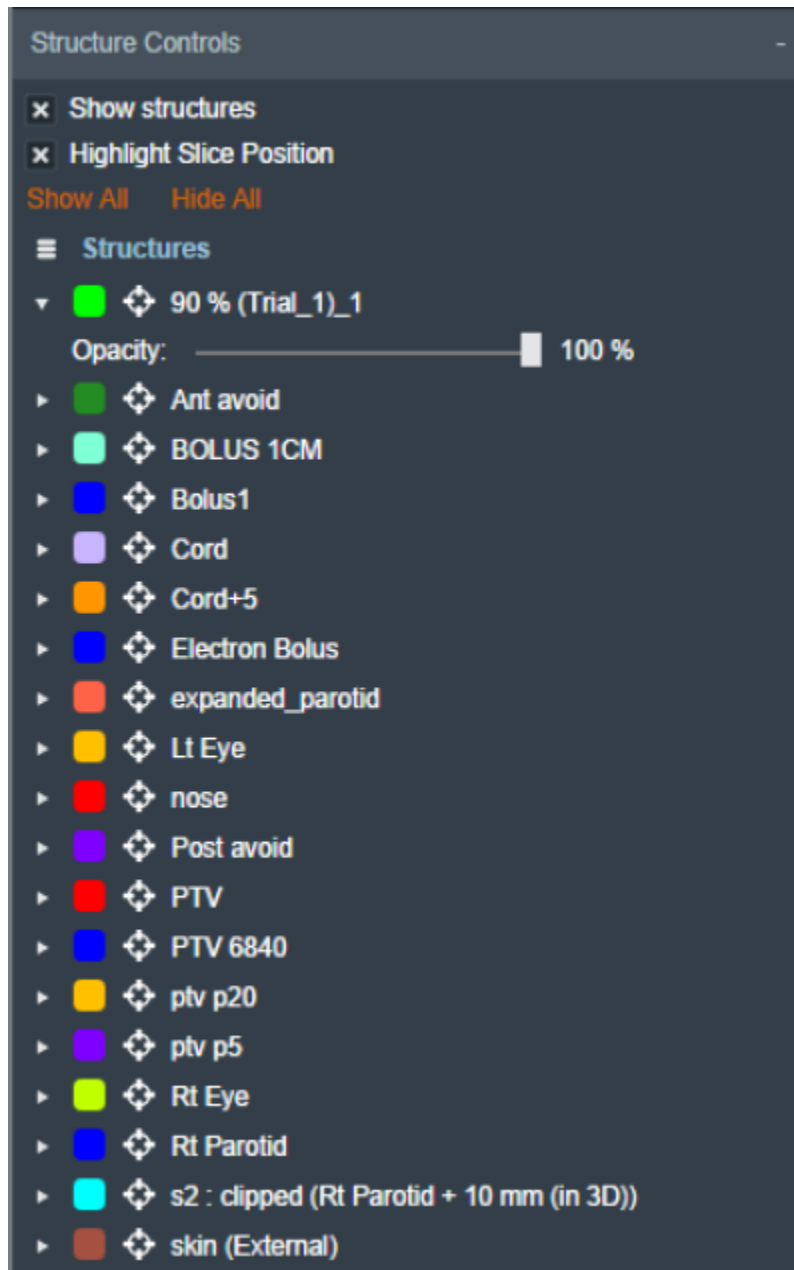


Fig. 25: Structure Controls

Beam Controls

The Beam Controls allow the user to show or hide the projections of all the beams in the plans, as well as any blocks and boluses in those beams. The user also has the option to display each bolus using solid or contour rendering, as well as edit the opacity of each bolus rendered as a solid.

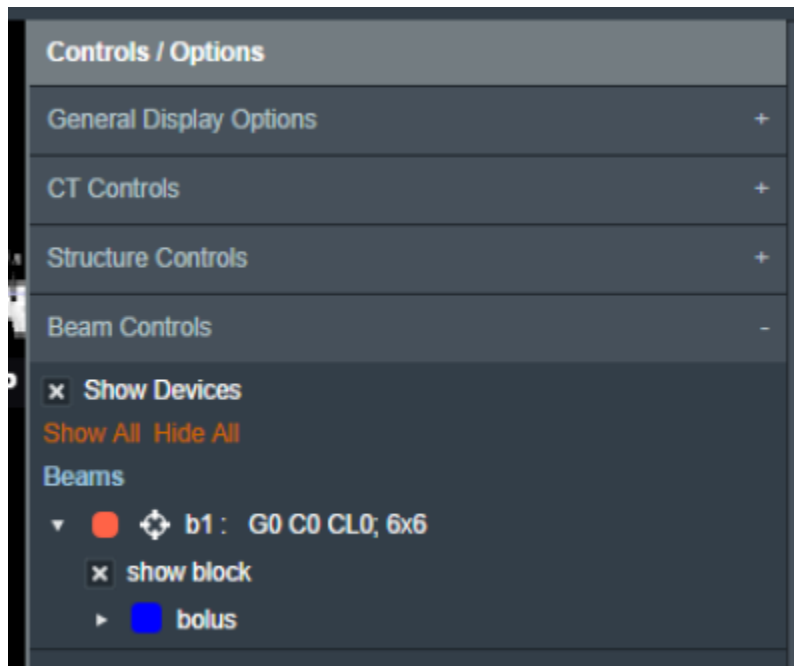


Fig. 26: Beam Controls

Designing a Bolus

The *Bolus Designer* block of the plan overview contains information about the designed bolus that has been added to the plan with the option to edit the bolus. If a bolus designed by the Bolus Designer app has not been added to the plan, the block will not display such information and will allow the user to add such a bolus to the plan.

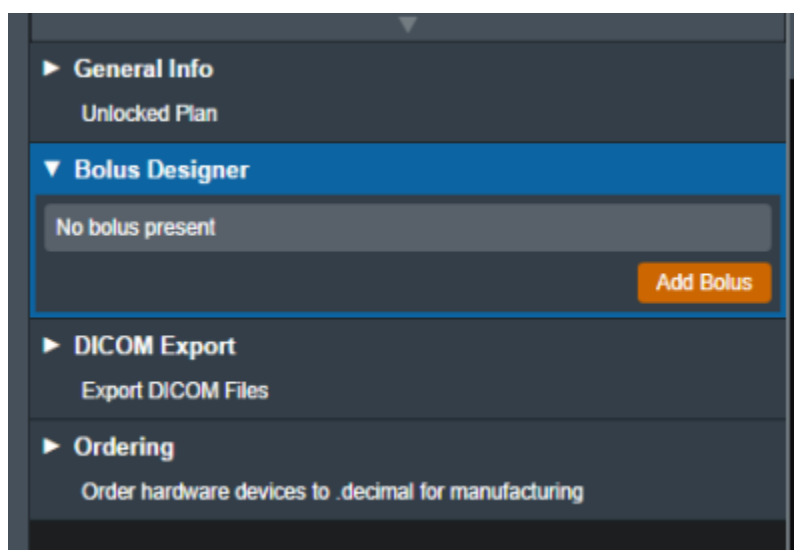


Fig. 27

Creating a Uniform Thickness Bolus

The Create a Uniform Thickness Bolus controls have the following tools:

- **Bolus Material:** The material used to make the bolus device.
- **External Structure:** The DICOM structure to use as the external body, not including the bolus device.
- **Bolus Thickness:** The uniform thickness value of the bolus device.
- **X/Y/Z Extents:** Controls the bounding box that limits the extents of the uniform thickness bolus. The user can also click and drag the sides of the extents box in the sliced views of the display UI.
- **Trim Bolus to Beam(s):** Controls whether or not to trim the bolus according to the projection of the selected beams. If enabled, the user can select either an individual beam or all beams in the plan to trim the bolus and the app calculates a new bolus shaped by the intersection of the bolus structure and the projected beam(s). The trim margin will expand the projected beam shape used in the intersection when it is a positive value or contract the shape when it is a negative value. The Bolus Designer app supports beams using static blocks as well as the following types of MLCs: step and shoot, sliding window, and arc therapy.
- **Smooth Bolus:** Controls whether or not to smooth the bolus using a user-specified “rolling ball” radius.
- **Remove Islands:** If there are small pieces of the bolus that are disconnected, remove them.

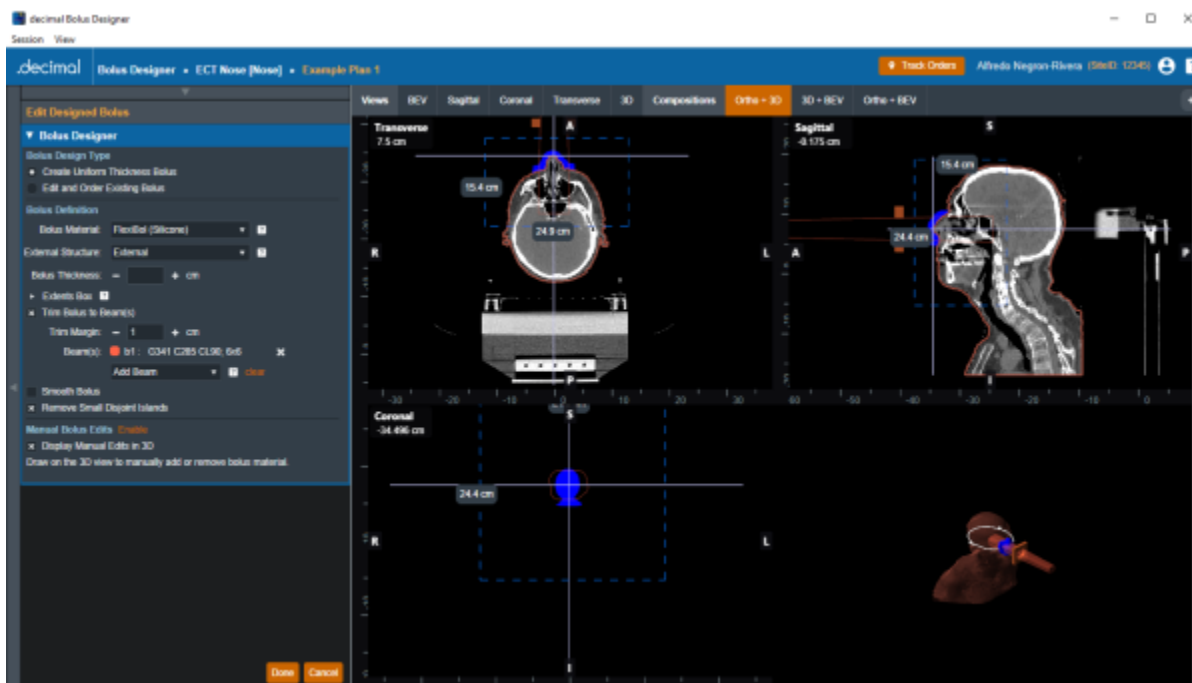
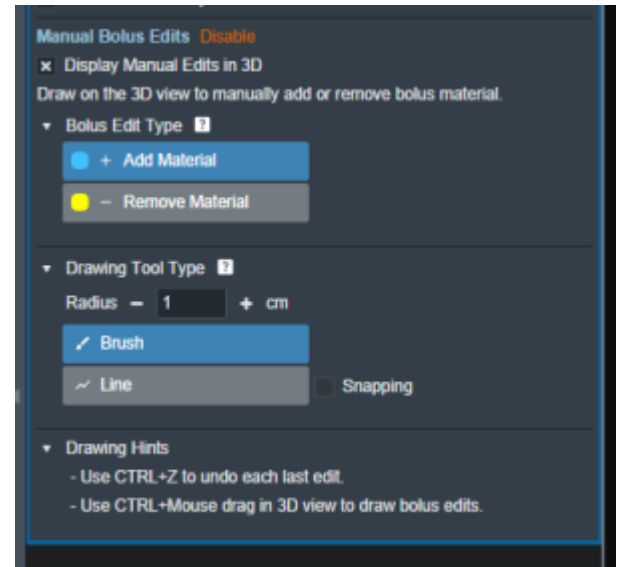


Fig. 28: Uniform Thickness Bolus Controls

Manual Bolus Edits

When enabled, this option will allow the bolus to be modified by drawing in a 3D perspective. If the “Add Material” option is selected, a uniform thickness bolus can be drawn on the external structure directly, by pressing the control key while clicking and dragging. With the “Remove Material” option selected, the bolus may be erased from the external surface.

Fig. 29: Manual Editing Controls



Editing Options Include:

- The "Radius" option sets the size of the brush adding or removing material from the bolus.
- The "Brush" tool will allow clicking and dragging to create a bolus directly under the mouse, while the "Line" tool will draw in thick line segments. Each click with the line tool will end the previous line segment, and begin another.
- The "Snapping" checkbox will allow lines to snap to the perspective of the view in 45 degree increments. This can be useful in conjunction with the CTRL+1 through CTRL+6 hotkeys, which set the 3D view to match the transverse, sagittal, and coronal planes. If lines are drawn when no more line segments to draw, the escape key will disable the tool until it is clicked again.
- The CTRL+Z hotkey will undo the last edit, and the "Clear Edits" button can be used to remove all manual modifications.

Note: Manual modifications can extend past the extents box.

Editing an existing Bolus

Selecting "Add Bolus" in the Bolus Designer block will bring up the Create Designed Bolus task, which gives the user the option to edit and an existing bolus structure imported with the plan.

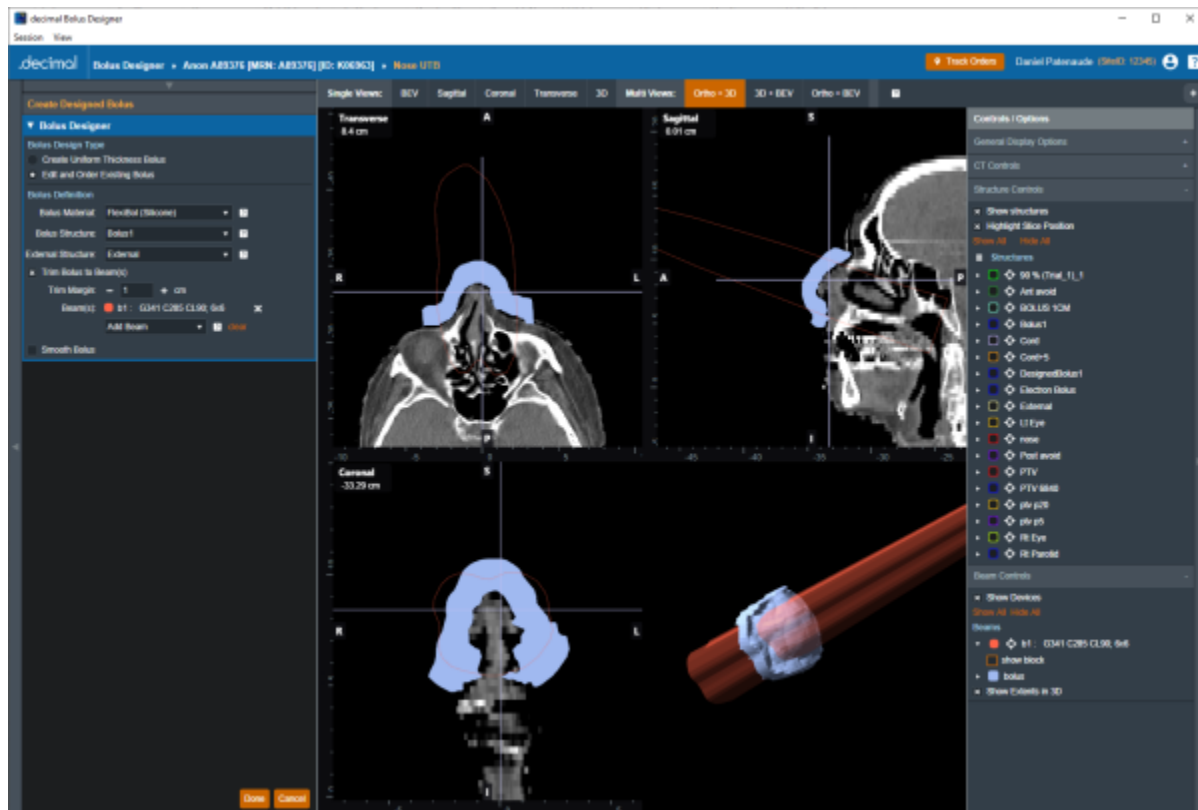


Fig. 30: Bolus Trimming Controls

The Edit Bolus controls have the following tools:

- **Bolus Material:** The material used to make the bolus device.
- **Bolus Structure:** The DICOM structure to use as the base bolus.
- **External Structure:** The DICOM structure to use as the external body, not including the bolus device.
- **Trim Bolus to Beam(s):** Controls whether or not to trim the bolus according to the projection of the selected beams. If enabled, the user can select either an individual beam or all beams in the plan to trim the bolus and the app calculates a new bolus shaped by the intersection of the bolus structure and the projected beam(s). The trim margin will expand the projected beam shape used in the intersection when it is a positive value or contract the shape when it is a negative value. The Bolus Designer app supports beams using static blocks as well as the following types of MLCs: step and shoot, sliding window, and arc therapy.
- **Smooth Bolus:** Controls whether or not to smooth the bolus using a user-specified “rolling ball” radius.

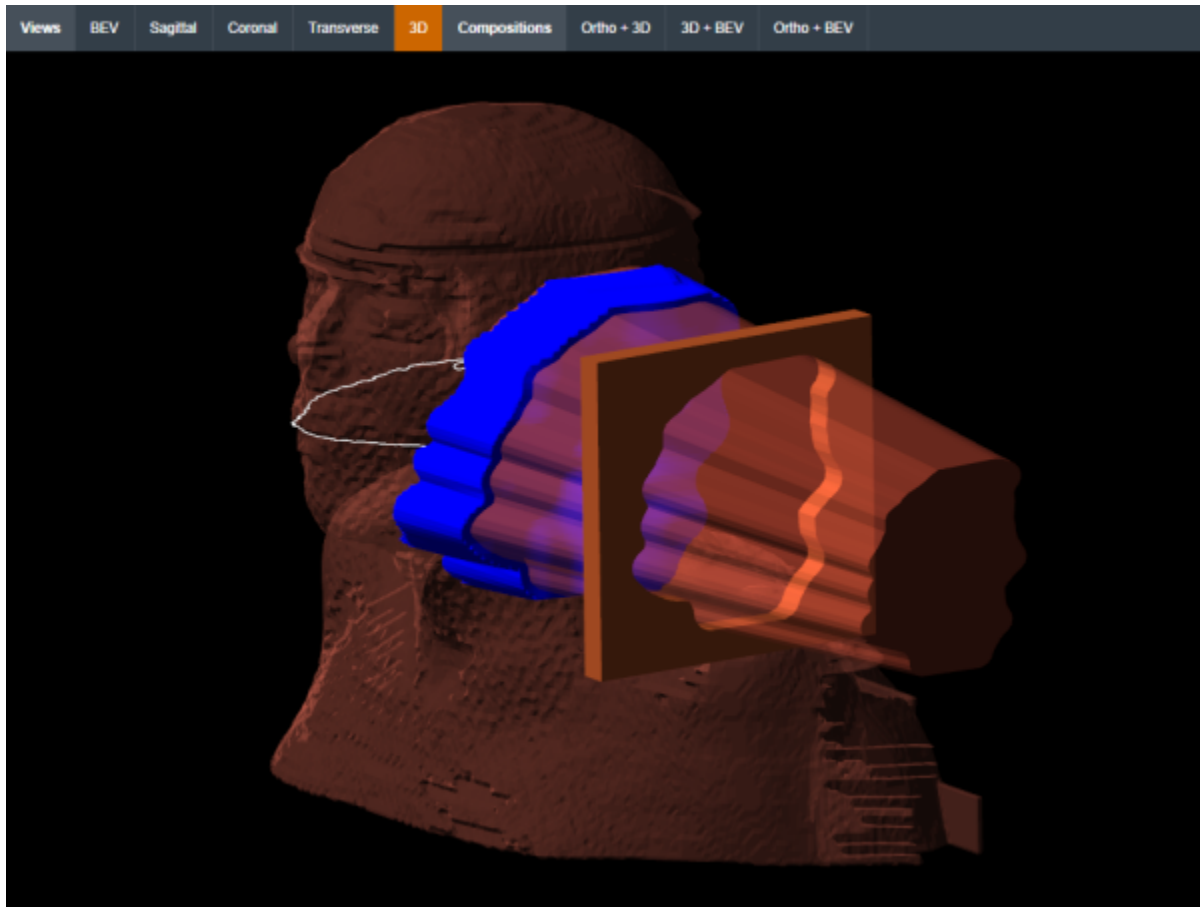


Fig. 31: Trimming a Bolus to a Beam Projection

Common Bolus Design Errors

This section details common bolus design problems and how to resolve them.

Holes in Bolus

Depending on the bolus design options (e.g.: bolus thickness) and the CT slice spacing or geometry, the

bolus can result in holes present in the bolus as shown in [figure 32](#) below.  Add some more details here. These holes will be present on the manufactured .decimal bolus, so the user should review the resulting bolus to ensure there are no unintended holes present.

The following options are available to the user to fill in these holes:

1. Increase the bolus thickness
2. Add a manual material edit to the region with the hole
3. Edit the RT Structure Set structure to provide less drop off along the axial slice direction depending on the bolus design type being used:
 1. Create Uniform Bolus: Edit the selected external structure
 2. Trim Existing Bolus: Edit the selected bolus structure

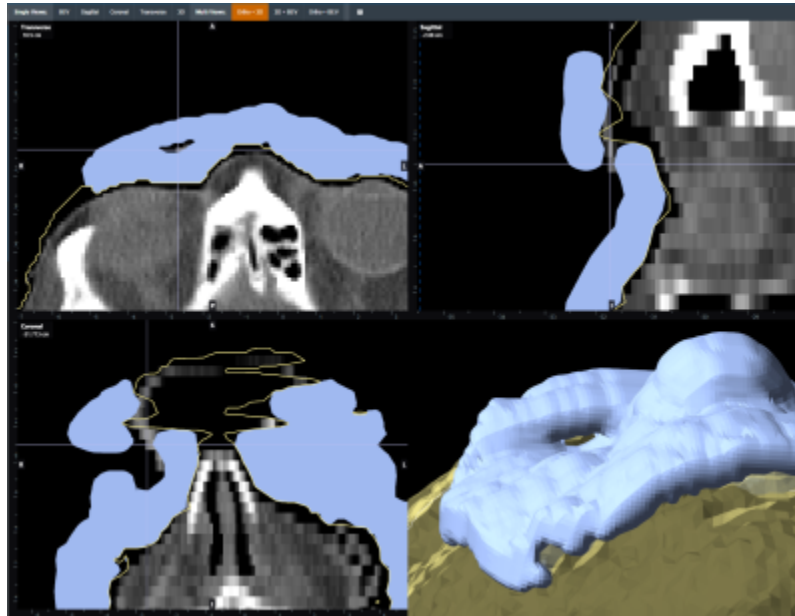


Fig. 32: Holes Present in Bolus

Plan Locking

Plan Locking is a mechanism whereby users can “lock” a plan to prevent further edits or changes. It should also be noted that before users are able to order blocks or boluses in the Bolus Designer app, the plan for those parts must be locked. Note, locked plans cannot be unlocked.

Locked plans differ from unlocked plans in the following ways:

1. They are read only and no treatment plan data can be changed
2. The plan hardware devices are no longer being recomputed in the UI as during locking those items are saved to the patient disk storage to ensure they never change from how they were viewed at the time of the lock.

When a user goes to select a plan for their patient, they will be able to tell if the plan is locked or not. Plans that are green are locked while unlocked plans are the standard blue. Locked plans also state the time they were locked and by which user in order to maintain integrity with the plan.

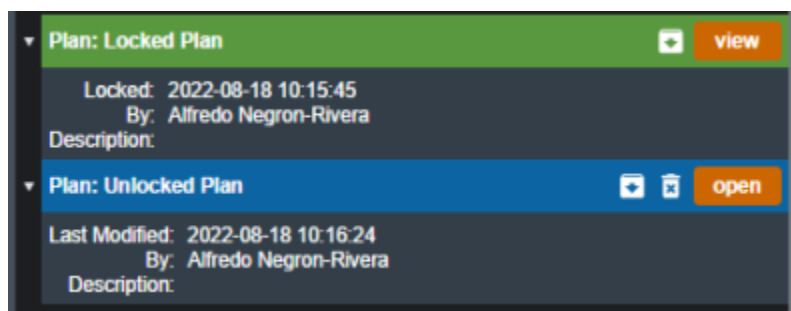


Fig. 33: Plan selection with a locked plan

Locking a plan

In order to lock a plan a user must simply open the plan they wish to lock and select the “Lock” option inside the General Block. NOTE: The option will not be enabled if the plan does not have a designed bolus.

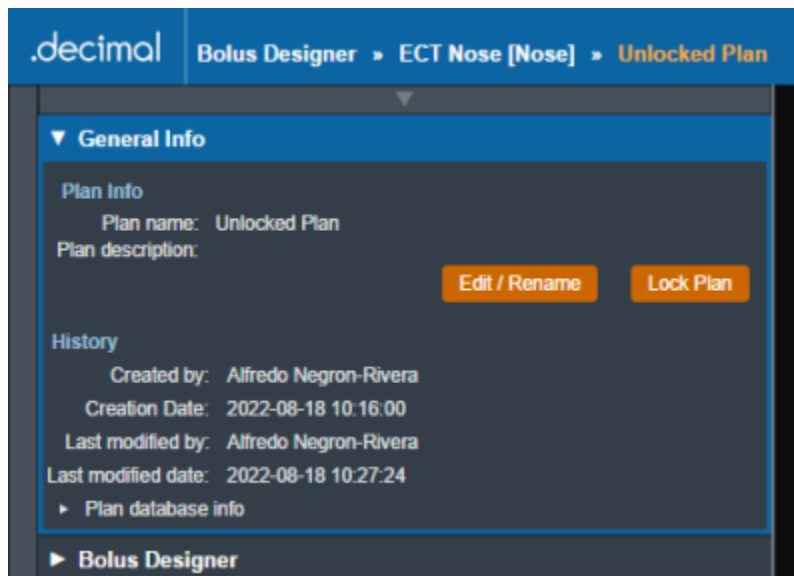


Fig. 34: Lock plan button

After selecting to lock a plan a user must confirm their selection. They will also have a final opportunity to change the Name and/or Description for the final plan.

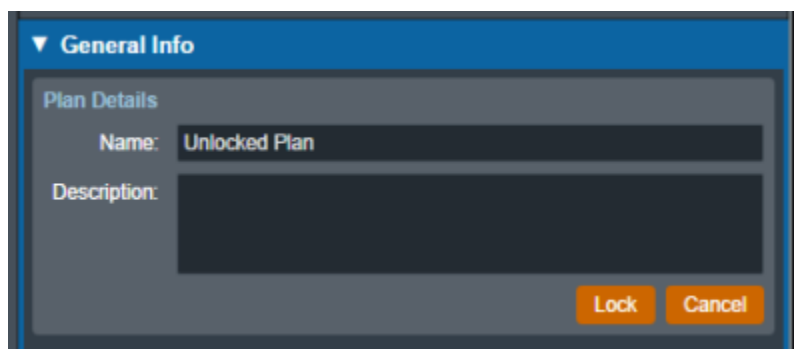


Fig. 35: Plan lock confirmation

A user can also lock a plan when attempting to order devices in an unlocked plan. The UI will show a message and prompt the user to lock the plan before the ordering process can continue. Refer to the [Ordering Devices](#) section for information on device ordering.

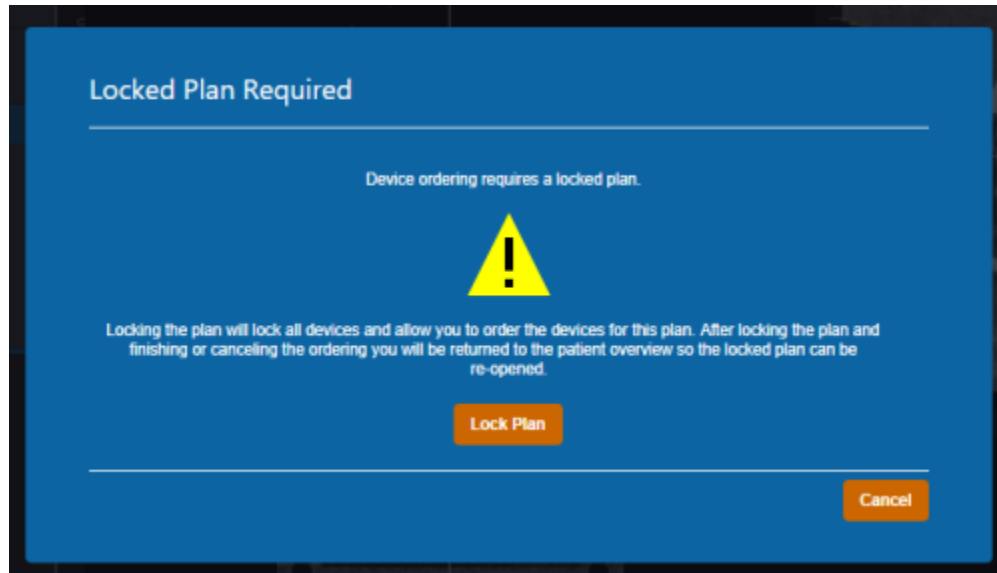


Fig. 36: Ordering block plan locking

When that is completed all users on this environment should see the plan as locked (see [figure 33](#)).

DICOM Export

The Bolus Designer App allows for the export of patient and plan information in the DICOM file format. If the treatment plan is not locked, authorization from a qualified user is required to enable export.

The user can choose to export the CT Images, RT Structure Set, and RT Plan as DICOM files. There are a few considerations to keep in mind for each DICOM file that is exported from decimal Bolus Designer:

- **CT Images:**
 - The Bolus Designer App allows CT Image export for the convenience of end users only. This application does not modify CT Images in any way and the exported CT Image files are exact copies of those imported into the app for the patient course at hand.
- **Structure Set:**
 - Exported RT Structure Sets will be a copy of the imported Structure Set data, with a notable exception:
 - Structure(s) will be added to the Structure Set for any bolus that are present in beams within the treatment plan.

For unlocked plans, new UUIDs will be generated each time the plan is changed and DICOM files are exported. For locked plans, the DICOM UUIDs are fixed and will always be the same each time the DICOM file is exported.

Local Export

The Bolus Designer App allows the export of DICOM files to a local directory. A default DICOM export directory can be set in the [Bolus Designer DICOM Settings](#).

Server Export

The app also allows the export of DICOM files to a DICOM server (AE title). When exporting to a DICOM server, the user can choose to export to a server defined in the [Bolus Designer DICOM Settings](#) or to a custom server.

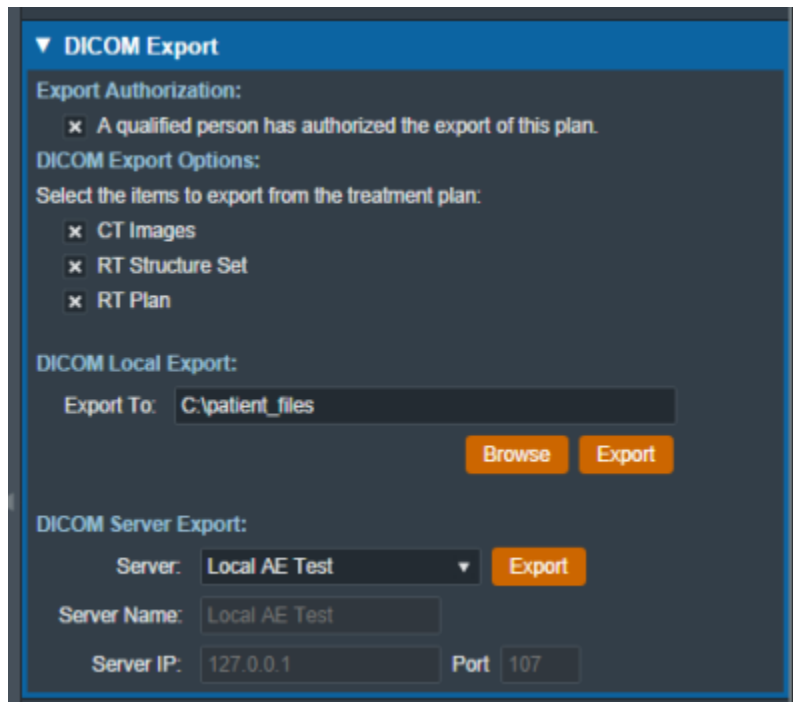


Fig. 37: DICOM Export UI

Ordering Devices

Once a plan has been locked, the user is able to order the devices assigned to the beams in the plan. Ordered devices will be sent to .decimal for manufacturing through [decimal Direct](#) via [secure HTTPS](#).

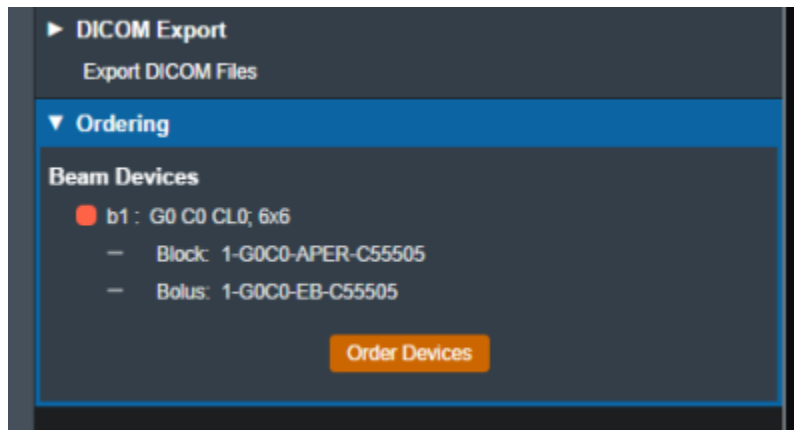


Fig. 38: Part Ordering Example

Select the “Order Devices” option and all devices will be shown to the user along with the beam in the plan that utilizes said Device. If the plan is not locked, the UI will prompt the user to lock the plan before ordering can proceed (see [figure 36](#)). From here users can select which devices they would like to order and move on to the next step.

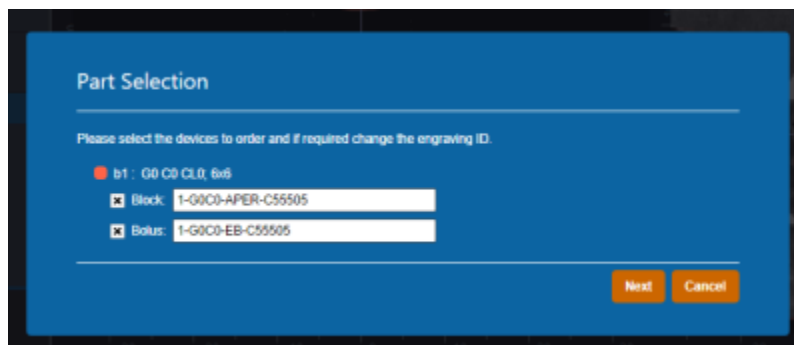


Fig. 39: Part Selection Example

Once the user has decided which devices to order, the following fields will need to be filled out in order to complete the order. The shipping address is set to the address assigned to the current site and can be edited by an Admin user through [decimal Direct](#).

- **Shipping Priority: Standard** (Overnight delivery by end of day) or **Rush** (Overnight delivery before noon).
 - **Note:** Extra charges may apply for Rush delivery.

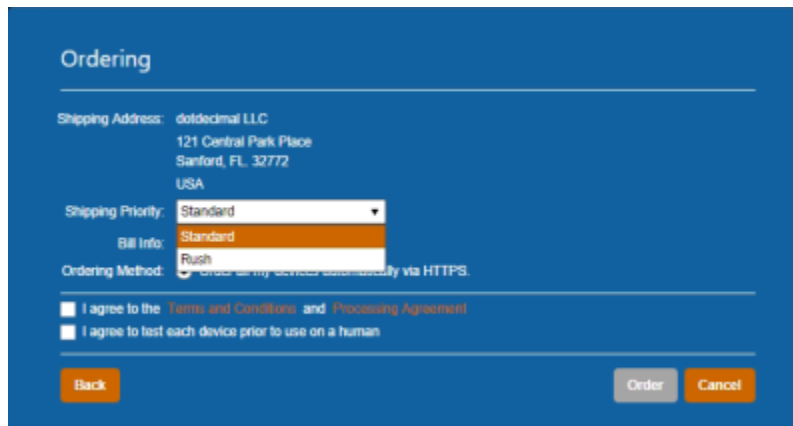


Fig. 40: Shipping Priority Selection

- **Bill Info:** Any additional PO or specific Billing information to be added to the order. This is an optional field.
- **Ordering Method:** Typically, it will be best to order devices automatically via https, however, there is an option to export the order files locally and order them from the [direct](#) order page manually.

Once these fields have been filled the device(s) can be ordered and the user will be provided with a confirmation if the order is completed successfully.

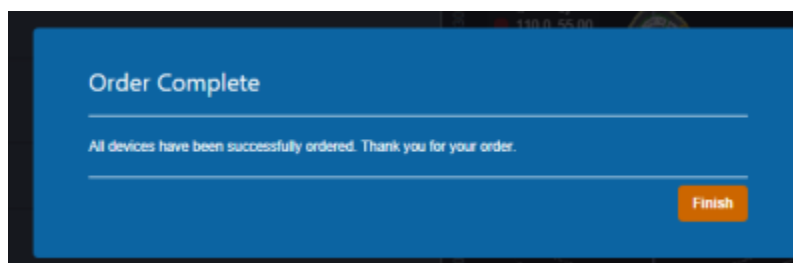


Fig. 41: Order Confirmation

After the order has been placed to [decimal Direct](#) the ordered devices will be noted within the Ordering block. Additionally users can view the order report for that device by selecting the highlighted link. This will take the user to the [decimal Direct](#) page with the order confirmation for that device.

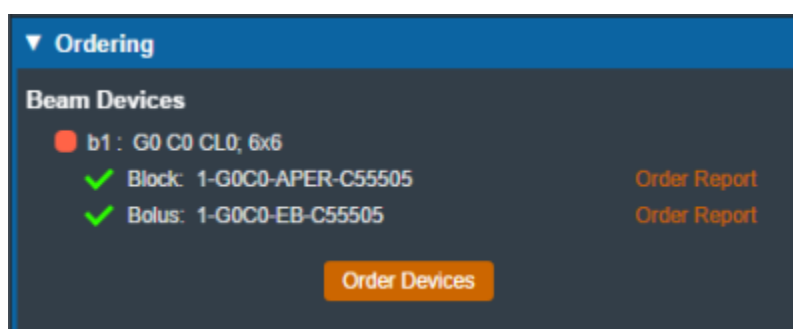


Fig. 42: Access Order Report

Bolus Designer App Settings

The following settings are present within the decimal Bolus Designer settings UI accessed within the View → Settings menu:

**Note:**

These settings are local client settings for the logged in Windows user to the local work station and are not shared with other users.

General Settings

- **Landing Page**
 - Allows the user to specify whether or not to view the application landing page when Bolus Designer is opened.
- **UI Theme**
 - Set the visual theme of the application (Note: the 'blue' theme is the currently supported theme; a 'dark' theme is available, but is a deprecated theme and not routinely updated at this time).

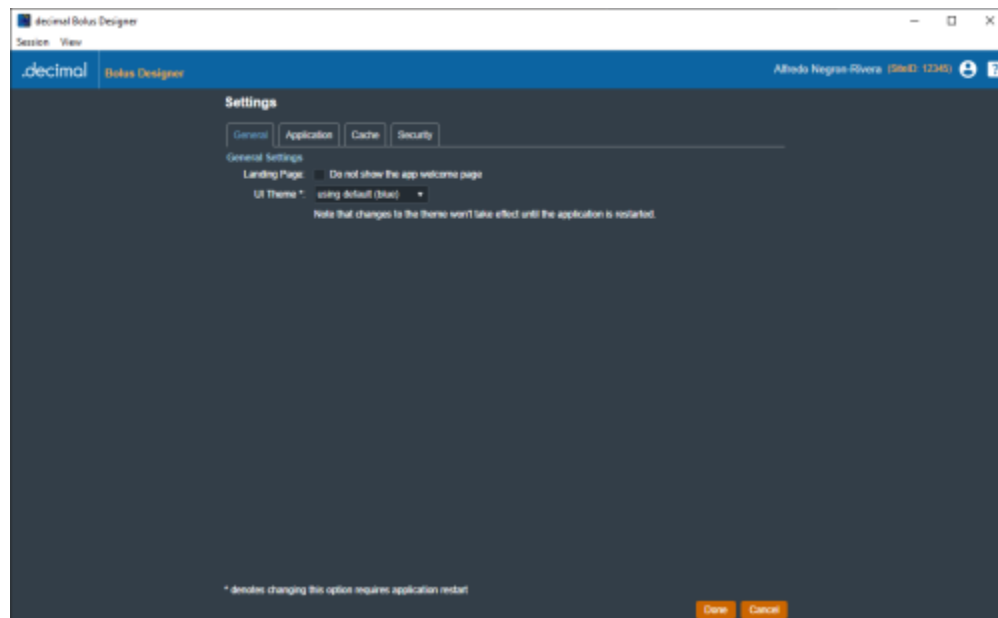


Fig. 43: General Settings

Application Settings

These settings are local to the client work station and are not shared with other users.

- **Patient Storage**

- The directory for the decimal Bolus Designer patient database and file store. The default location is a folder above the application directory installed via the [decimal Launcher](#) on the local workstation. Setting this to a shared network resource allows multiple users to share a common patient database. Refer to [Application Data Management](#) for more information.

- **Default DICOM Directory**

- Sets the default DICOM import directory. This directory will be used each time a DICOM import is attempted.

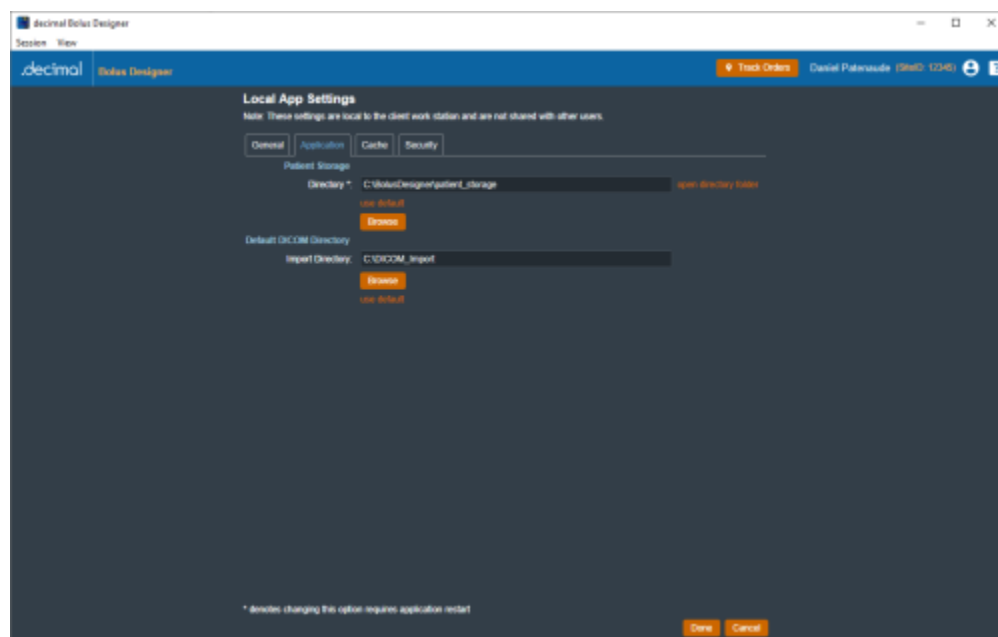


Fig. 44: Application Settings

Cache Settings

- **Local Disk Cache**

- The local disk cache is where calculation results are stored on the client computer. The recommended storage size for this cache is 25GB.

- **Network Disk Cache**

- The network disk cache is where calculation results are stored on a network drive where all users can access. If calculation data is not found on the local client cache, the network cache will be checked for the calculation results. The recommended storage size for this cache is 25GB.

Users can choose to manually clear the disk cache or let it clear oldest data as the cache fills. Refer to [Application Data Management](#) for more information.

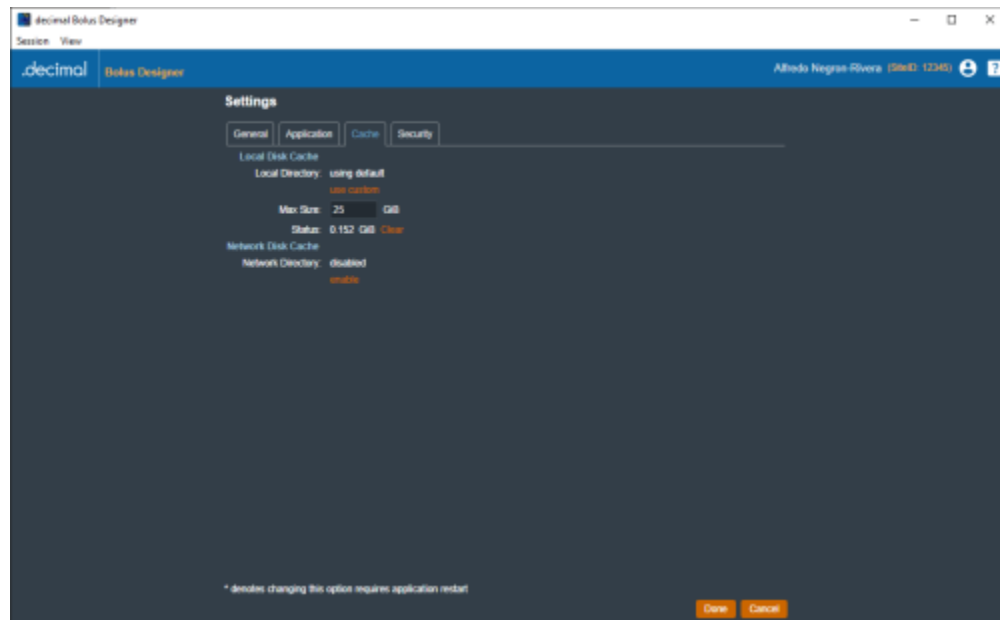


Fig. 45: Cache Settings

Security Settings

- **Inactivity Timeout**

- Specifies the time out period (in minutes) to automatically log the user out of the application. Timeout is based on mouse/keyboard interaction within the user interface. Note: This inactivity timeout is different than the user session token received from the [decimal Launcher](#).

- **SSL Settings**

- Allows the user to disable the app's SSL certificate revocation check. Users with a network proxy may need to enable this option if their proxy configuration is interfering with the SSL certificate revocation checking. **Note: This option is not recommended as it means the application is no longer checking the authenticity of our decimal Direct server and API. This option is provided as a temporary solution to trouble shoot issues with firewalls, proxies, and Web Security Appliances (WSAs).**

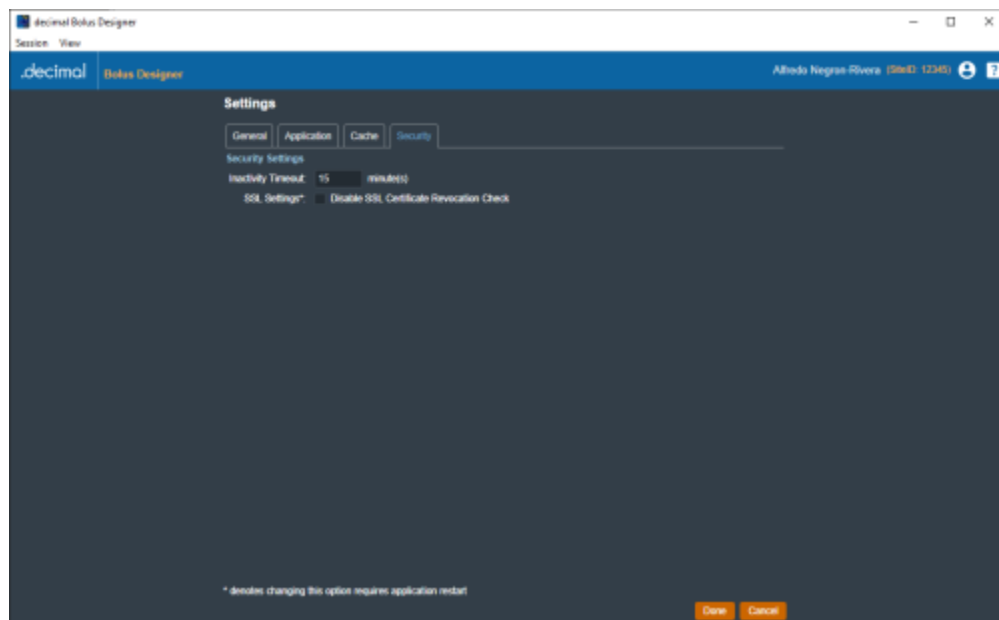


Fig. 46: Security Settings

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Last update: **2023/03/01 20:28**

