AOS Virtual Cones Guide

Contents

WARNING

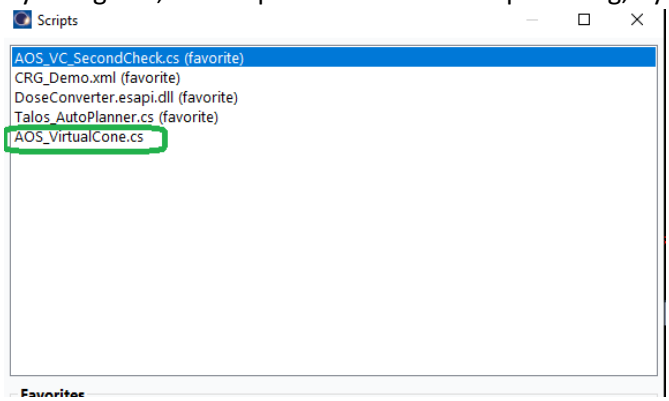
A FULL END-TO-END VALIDATION must be completed for each configuration of beam template, dose rate map, and other settings.

Installation and Setup

1) Unzip the files in a location that has access to Eclipse. A normal location would be a subfolder of Published scripts.
   a. \\SERVER\va_data$\ProgramData\Vision\PublishedScripts\VirtualCone\
2) Once unzipped, locate the AOS_VirtualCones.cs and open it in a text editor.
   a. Change the path the correct location.

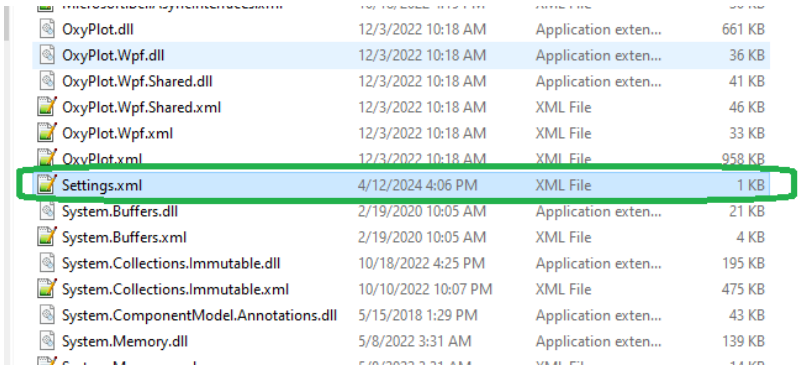
```
// insert path to run here. This way it doesn't have to be local to the root
string path = @"\\SERVER\va_data$\ProgramData\Vision\PublishedScripts\VirtualCone\AOS_VirtualCones.exe";
```

3) Copy (do not cut) the AOS_VirtualCones.cs file into the published scripts parent folder.
   a. \\\SERVER\va_data$\ProgramData\Vision\PublishedScripts\
   b. By doing this, the script to show in the scripts dialog, by default:



4) Next, use a text editor to open the Settings.XML file found in the installation directory.

a.



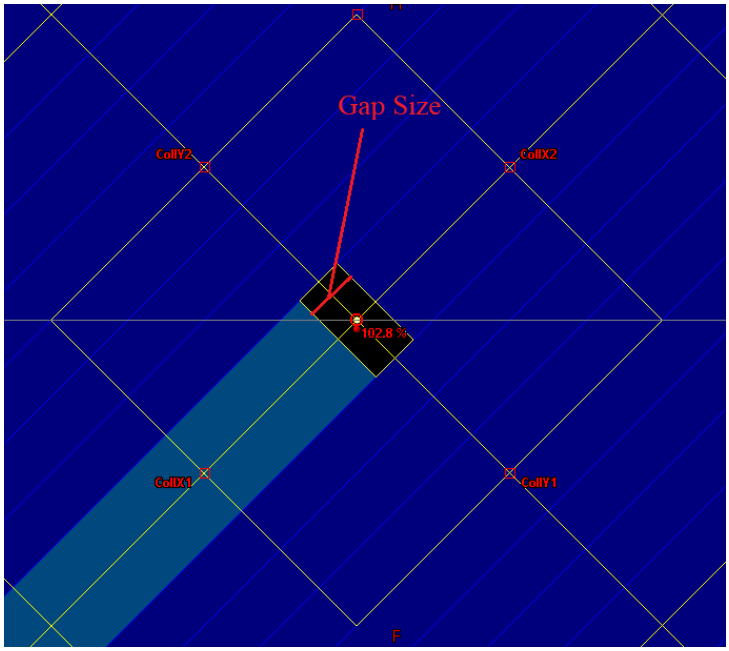
b. Each value is in millimeters.

```
<?xml version="1.0" encoding="utf-8"?>
<GapSettings xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns
  <X>20</X>
  <Y>20</Y>
  <EnableSlidingLeaf>true</EnableSlidingLeaf>
  <SlidingLeafGapSize>2</SlidingLeafGapSize>
  <AvailableGapsMM>
    <GapPair>
      <EnergyMode>6X-FFF</EnergyMode>
      <GapSizeMM>2.5</GapSizeMM>
      <NumberOfLeaves>2</NumberOfLeaves>
    </GapPair>
    <GapPair>
    <EnergyMode>10X-FFF</EnergyMode>
      <GapSizeMM>8</GapSizeMM>
      <NumberOfLeaves>4</NumberOfLeaves>
    </GapPair>
  </AvailableGapsMM>
  <RemoveTempPlan>false</RemoveTempPlan>
</GapSettings>
```

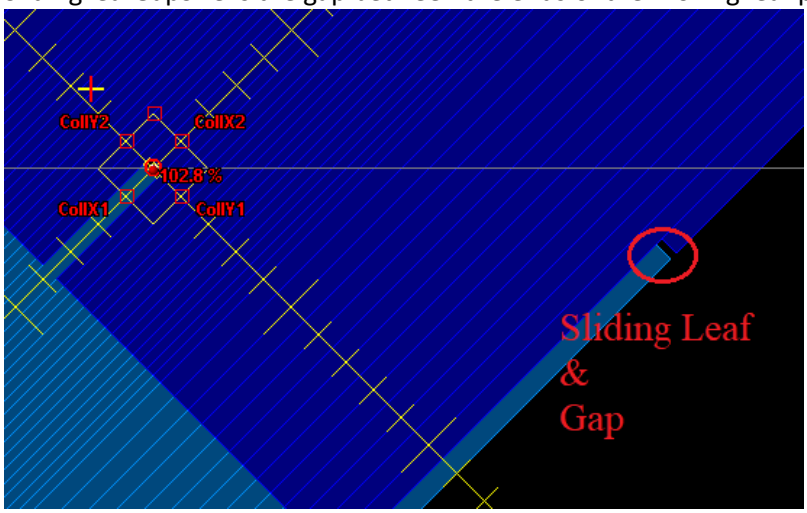
c. *Note: Consider using NotePad++ or Visual Studio to edit these files. Otherwise, NotePad will work.

d. GapPair > GapSize & NumberOfLeaves: The script will create an MLC-defined aperture. The aperture is the central “NumberOfLeaves” MLC pairs by the “GapSize.”

Note: NumberOfLeaves must be even.

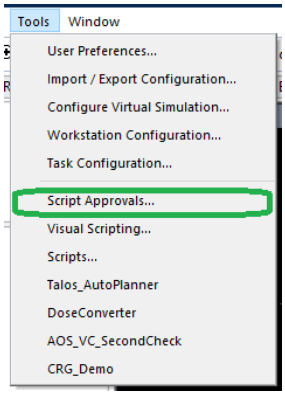


e. "X" and "Y" represent the jaw size. In the above image, X & Y are set to 20 mm.
f. "EnableSlidingLeaf" – The field must have a technique of VMAT to modulate the dose. Setting this to true causes leaf-pair at the very edge to move during treatment.
g. SlidingLeafGapSize is the gap between the ends of the moving leaf pair.

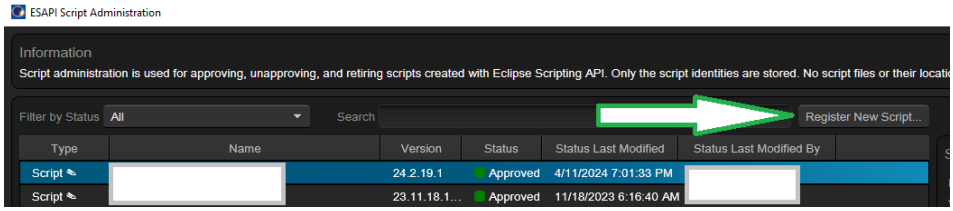


5) Set these values and save the file.
6) Approve the script.

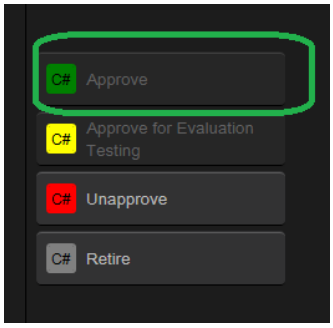
a. In Eclipse, go to Tools > Scripts Approvals.



b. Click Register New Script, and choose the "VC_SecondCheck.exe" from the install folder.



c. Highlight the newly added script and click "Approve"



d. Enter your credentials and click Authorize.

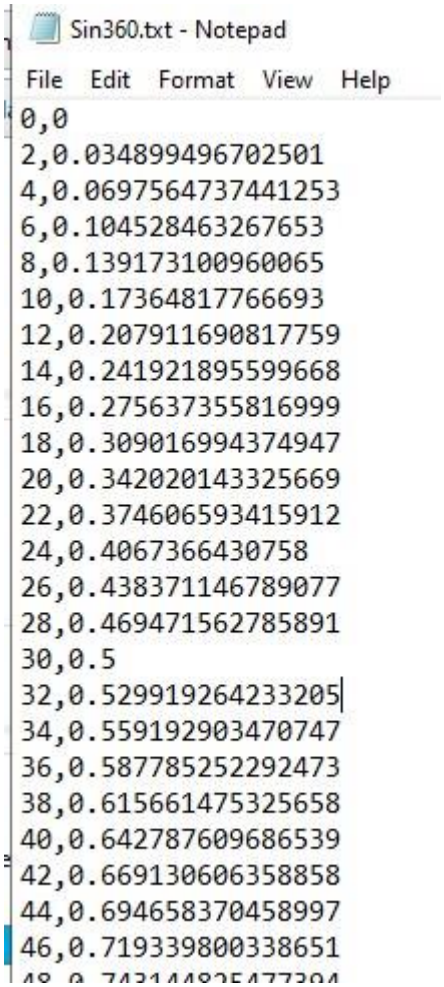
e. Finally, click Apply and then OK.

   i. WARNING: Do NOT click the "X" button to close the screen; it will not save the approval.

Dose Rate Maps

Dose rates are assigned using Gantry vs. Normalized Dose Rate maps found in the "Maps" sub directory.

1) Each row is a comma-separated Gantry Angle and a normalized dose rate pairing.
2) Although not required, it is suggested to enter a value for each 2 degrees, starting with 0 through 360.
3) Save the file as a *.txt file in the Maps subdirectory. The name of the file will be used in the script, so use a descriptive file name.
4) The script will interpolate between map values by Gantry Angle.
5) Here is an example of the first entries of a sinusoidal dose rate map.



Dose Rate Map Tips

Not all dose-rate maps are deliverable. You may need to modify the dose map based on energy, dose rate, arc length, prescription dose, number of beams, etc.

The most likely failure is a too low MU/Deg (i.e. <0.1 MU/Deg for TrueBeam).

Minimum Dose per degree:
TrueBeam: Conformal Arc and VMAT = .1 MU/Deg
C Series: Conformal Arc .3 MU/Deg,, VMAT 0.1 MU/Deg

C-Series Clinac				
	6x-25x	6x-SRS (1000 MU/min)	VMAT/RapidArc	HIM
Min MU/Deg	0.3	0.3	0.1	0.3
Max MU/Deg	20	60	20	60
*Max Gantry Speed (deg/s)	*4.8	*4.8	*4.8	*4.8

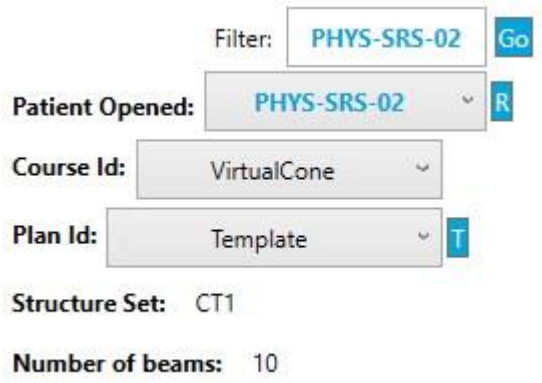
TrueBeam	
	VMAT/ Conformal Arc
Min MU/Deg	0.1
Max MU/Deg	60
Max Gantry Speed (deg/s)	6

NOTE: RapidArc/VMAT Plans are intensity modulated and created in Eclipse using the optimizer (PRO/PO).
Dynamic Conformal Arc Plans are not intensity modulated. This is a 3-D plan in which the field shape adjusts per control point to block normal tissue.

Template Creation

The script can create beams based on a template. One template is provided; however, the user may wish to create different templates.

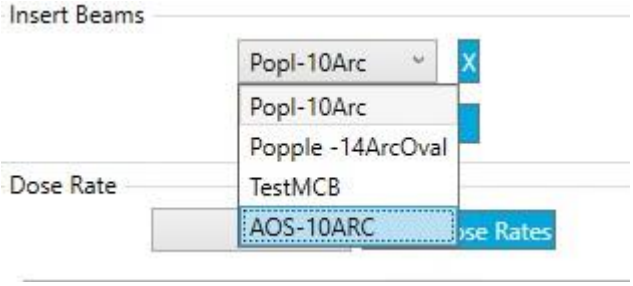
1) In Eclipse, create a plan.
2) Add each beam and set its geometry.
    a. You do not need to set the desired MLC, Energy, Fluence Mode, Dose Rate, or isocenter here.
    b. The beams should be arcs.
3) Set the Field Id's as you would like them to appear in the final plan.
4) With the template plan in the context, open the script.
5) The plan should automatically be selected.



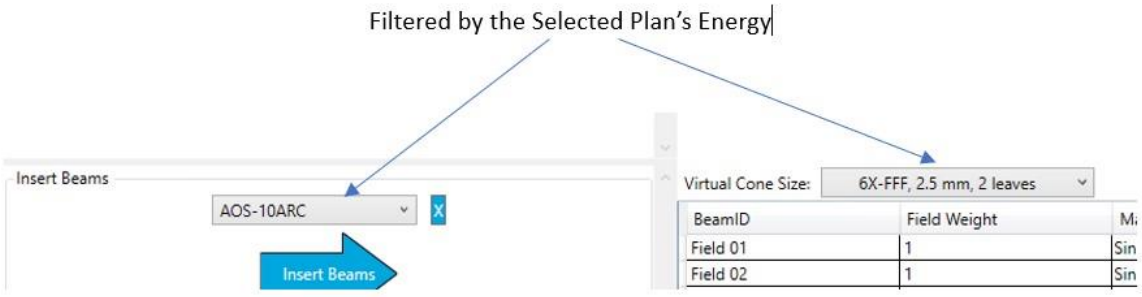
a. Note: If the plan is not selected upon opening the script, you can do so within the script.

6) Enter the name of the new template in the Beam Template Creation section, at the bottom. When ready, click the "Create Beam Template with the Id:" button.

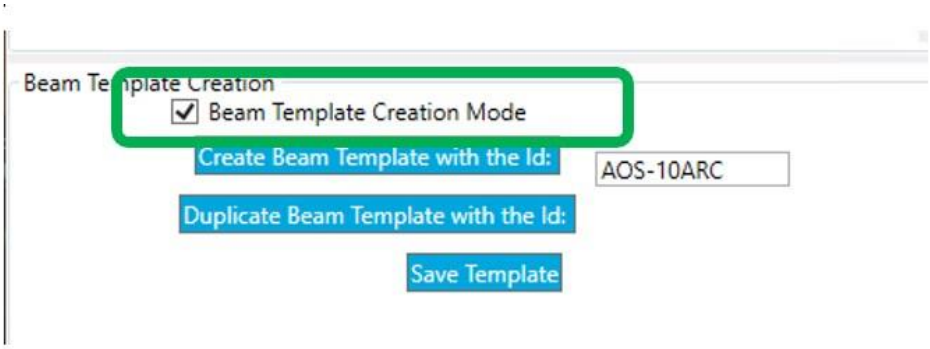
7) The new beam template will be available in the Insert Beams drop down:



8) By default, Virtual Cone Size is filtered by Plan Energy. For example, if the selected plan's first beam has an energy of 6X-FFF, then only Virtual Cone Sizes with 6X-FFF and Beam Templates with 6X-FFF will be available.



a. To remove the filter when building templates, check the box for "Beam Template Creation Mode."



9) Select the virtual cone size.
10) Select the dose rate map and set the field weight for each beam.

Virtual Cone Size: 6X-FFF, 2.5 mm, 2 leaves

BeamID	Field Weight	Map
Field 01	1	Sin360
Field 02	1	Sin360
Field 03	1	Sin360
Field 04	1	Sin360
Field 05	1	Sin360
Field 06	1	Sin360
Field 07	1	Sin360
Field 08	1	Sin360
Field 09	1	Sin360
Field 10	1	Sin360

11) After each action, the beam template collection is saved along with any changes the user has made – even if that template is not currently selected.
    a. Create Beam Template with Id
    b. Duplicate Beam Template with Id
    c. Save Template
12) After making changes, ensure that you have click “Save Template.”

Procedure

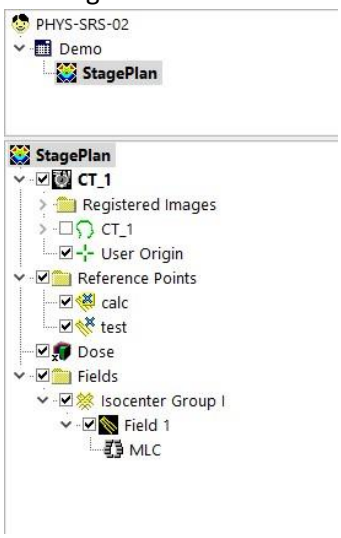
Overview

The user starts by creating a “staging plan.” This plan contains information the script will use to create the Virtual Cone plan. The “Insert Beams” function of the script will insert the selected beams and set their geometries and modulated dose rates.

Staging Plan

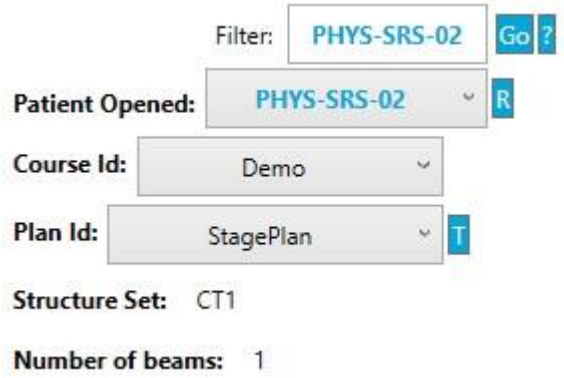
1) Create a staging course and plan.
    a. The prescription from this plan will be copied to the Virtual Cone Plan.

2) Add a beam.
    a. This beam will be used by the script to determine the MLC, Energy, Fluence Mode, Dose Rate, Isocenter, and Machine.
    b. Set each of the following as it should be in the final plan:
        i. MLC
        ii. Energy and Fluence Mode
        iii. Isocenter iv. Machine
    c. Nothing more needs to be done (e.g. do not set blocking).



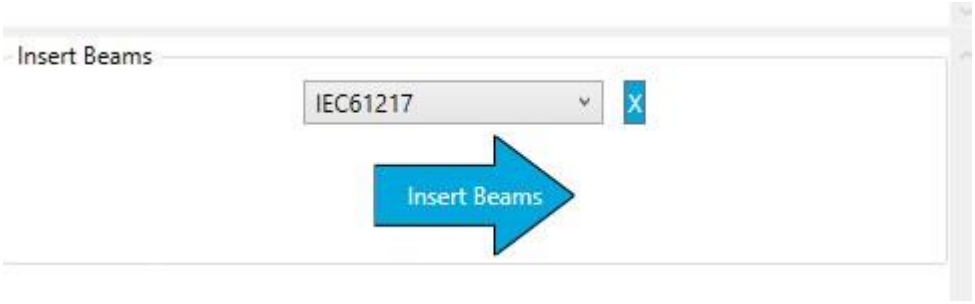
Run Script

1) With the staging plan in context, open the script.
2) The information will be automatically loaded in the script.

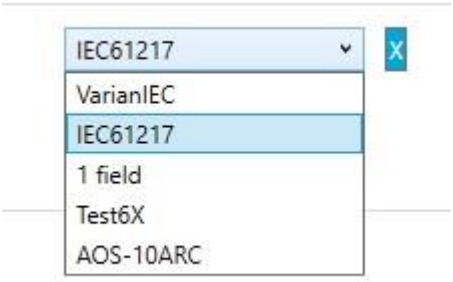


    a. *Note: You can modify machine/course/plan selection in the script if necessary.

Insert Beams



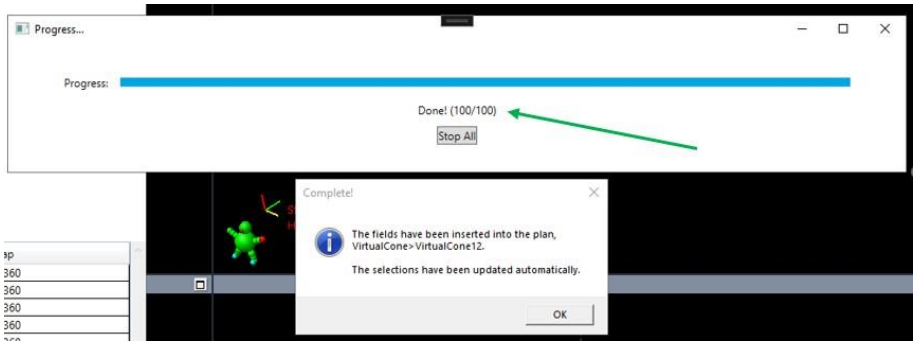
1) Choose the beam template you wish to use.
    a. The script comes with the standard beam configuration.
        i. If your clinic uses Varian-IEC, then use VarianIEC.
        ii. If your clinic uses IEC61217, then use IEC61217



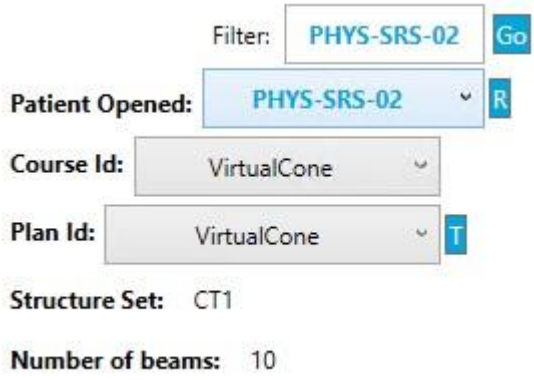
2) Review the Settings.
    a. Settings must be configured in the Settings.xml file.

3) Review the Virtual Cone Size selection, field weightings, and dose rate map selections.
4) Click the “Insert Beams” button.
    a. Using the information from the staging plan and the chosen template, ***a new plan is created.***
    b. If a course with Id of “VirtualCone” is not available, it will create one.
    c. The plan will be placed in **“VirtualCone”** course, with an Id of **“VirtualCone”.**
        i. If the Id is already taken, an integer will be added to the end and incremented as necessary (e.g. VirtualCone, VirtualCone1, VirtualCone2…VirtualCone#). 5) A progress window will pop-up:

6) When complete…..
   a. …The progress window will indicate 100% and say “Done!”
   b. …A Message Box, stating the Course Id and Plan Id, will appear. You may click OK to clear the message.

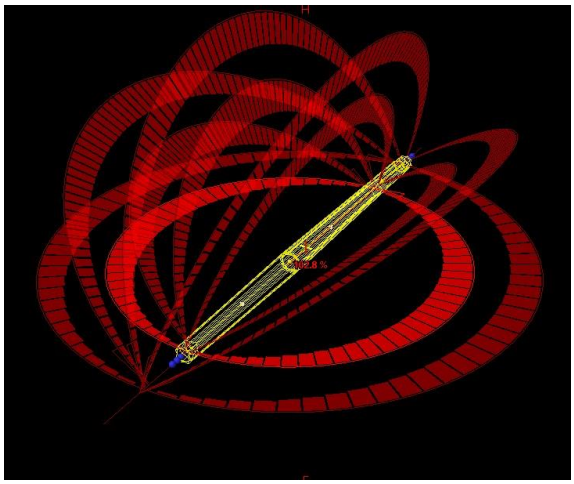


   c. ….. the Course Id and Plan Id in the selection space will be automatically updated.



   d. ***Note: the number of beams also updates. 1) You may click OK and close the script.
2) Reload the patient in Eclipse, and select the new plan.
3) Calculate the dose and follow the review/approval procedures.

4) To quickly check that the script has properly placed the beams and applied dose rates, review the model view. For a sinusoidal dose rate map, a crescent shaped dose-rate track indicates it has been properly applied.



V15.6: As part of the dose rate modulation, the script creates dummy plans. Unfortunately, the API does not allow the script to delete these plans; therefore, the course will contain plans with a root Id of “DNU”. The user should delete these plans manually.