

# Treatment planning with MMCTP

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# Layout

- 1 Setup
  - McGill RT import
  - Linac Configuration
  - CT to Density
- 2 TPS
  - Treatment Planning Window
  - External beam options
- 3 MCTP
  - BEAMnrc
  - BEAMnrc CM auto-scripts
  - EGSnrc
  - DOSXYZnrc



# Patient Import Steps

- 1 File > Import > RT Patient
- 2 Select import format
- 3 MMCTP will browse the selected folder
- 4 Populate the import listbox with patient name and ID
- 5 Select the patient and press transfer (it takes time to transfer)
  - 1 Raw DICOM read
  - 2 DICOM RT class read
  - 3 DICOM to McGill RT
  - 4 Write McGill RT
- 6 Patient is displayed in McGill lisbox



# Patient Import Window

- File > Import > RT Patient

The screenshot shows a software window titled "Patient Import Window". At the top left, there is a label "Import Format" followed by a dropdown menu set to "DICOM". Below this is a table with two columns: "Patient name" and "Patient ID". The first row contains the text "RANDO BREAST" and "000000251". The table has several empty rows below. To the right of the table is a window titled "McGill Patients" containing a list of patient entries: "▶ A A A B", "▶ BREAST RANDO 000000251", and "▶ C B 3". Below the table and the "McGill Patients" window are three buttons: "Transfer ->", "Physics", and "Close". At the bottom left, there is a file path: "Data:Users:andrew:Documents:MMCTP-Programming:RT-Imports:DICOM:04-TomoTherapy:jason\_plan:". At the bottom right, there is another file path: "Data:Users:andrew:Documents:MMCTP-Programming:McGillIRT:". In the bottom right corner of the slide, there is a red shield logo with a white cross and four red quadrants, each containing a white symbol.

Patient name	Patient ID
RANDO BREAST	000000251

McGill Patients

- ▶ A A A B
- ▶ BREAST RANDO 000000251
- ▶ C B 3

Data:Users:andrew:Documents:MMCTP-Programming:RT-Imports:DICOM:04-TomoTherapy:jason\_plan:

Data:Users:andrew:Documents:MMCTP-Programming:McGillIRT:

# DICOM header browser

- Task > DICOM header

DICOM file : RTPLAN\_1.2.826.0.1.3680043.2.200.262933318.134.5361.2230

Tag a	Tag b	VR	VM	Info	Value	Byte Position	Byte Length
0008	0000	UL	1	Identifying Group Length	322	0	4
0008	0012	DA	1	Instance Creation Date	20110214	12	8
0008	0013	TM	1	Instance Creation Time	083028	28	6
0008	0016	UI	1	SOP Class UID	1.2.840.10008.5.1.4.1.1.481.5	42	30
0008	0018	UI	1	SOP Instance UID	1.2.826.0.1.3680043.2.200.262933318...	80	50
0008	0020	DA	1	Study Date	20101220	138	8
0008	0030	TM	1	Study Time	120307	154	6
0008	0050	SH	0	Accession Number		168	0
0008	0060	CS	1	Modality	RTPLAN	176	6
0008	0070	LO	1	Manufacturer	TomoTherapy Incorporated	190	24
0008	0090	PN	0	Referring Physician's Name		222	0
0008	1010	SH	1	Station Name	0210037	230	8
0008	1030	LO	1	Study Description	TomoTherapy Patient Disease	246	28
0008	103E	LO	1	Series Description	TomoTherapy Plan	282	16
0008	1070	PN	1	Operator's Name	Kathy	306	6
0008	1090	LO	1	Manufacturer's Model Name	Hi-Art	320	6
0010	0000	UL	1	Patient Group Length	78	334	4
0010	0010	PN	1	Patient's Name	RANDO ^BREAST	346	14
0010	0020	LO	1	Patient's ID	00000251	368	10
0010	0030	DA	1	Patient's Birth Date	19550101	386	8
0010	0040	CS	1	Patient's Sex	O	402	2
0010	1010	AS	1	Patient's Age	055Y	412	4
0018	0000	UL	1	Acquisition Group Length	32	424	4
0018	1020	LO	1	Software Version(s)	HiArt4_0_3_Apps 4.0.3.80	436	24
0020	0000	UL	1	Relationship Group Length	206	468	4
0020	000D	UI	1	Study Instance UID	1.2.826.0.1.3680043.2.200.78065334...	480	48
0020	000E	UI	1	Series Instance UID	1.2.826.0.1.3680043.2.200.79416575...	536	48
0020	0010	SH	1	Study ID	BREL	592	4
0020	0011	IS	1	Series Number	1222150128	604	10
0020	0013	IS	1	Instance 'formerly Image' Nu...	5	622	2
0020	0052	UI	1	Frame of Reference UID	1.2.840.113704.1.111.1212.12899397...	632	38
0020	1040	LO	0	Position Reference Indicator		678	0



# DICOM Classes

- 1 Four MMCTP DICOM classes: images, structure, plan and dose
- 2 Each class contains variables pertinent to the function of each type
- 3 Sequence and nested sequences within each class
- 4 Total of 27 MMCTP DICOM classes
- 5 MMCTP DICOM classes simplify reading, import, export and writing of DICOM



# MLC Configuration

- File > Configurations > MLC tab

The screenshot shows the MMCTP Configurations window with the MLC Properties tab selected. The window title is 'MMCTP Configurations'. The top menu bar includes 'Beam Configurations', 'MLC', 'CT to Density', 'Monte Carlo Settings', 'Shell Refresh', 'Shell Run', 'Shell Download', 'Shell Login', 'Preferences', and 'Dose Stats'. Below the menu bar, there are buttons for 'Add MLC' and 'Delete MLC'. The 'MLC Properties' section contains the following fields and options:

- MLC Name: Varian 120M
- Type leafpairs (selected) / Type binary leaves
- Number of leafpairs or binary leaves: 60
- Abutting leaf air gap (cm): 0
- Parse Sinogram: Do nothing (selected), Simple Parser
- Leaf Direction: Parallel X (selected), Parallel Y

A table displays the MLC leaf positions:

Bounds	Value (cm)
1	-20
2	-19
3	-18
4	-17
5	-16
6	-15
7	-14
8	-13
9	-12
10	-11
11	-10
12	-9.5
13	-9
14	-8.5
15	-8
16	-7.5
17	-7
18	-6.5
19	-6
20	-5.5
21	-5
22	-4.5
23	-4
24	-3.5
25	-3
26	-2.5
27	-2
28	-1.5
29	-1
30	-0.5



# Linac Configuration

- File > Configurations > Beam tab

The screenshot shows the MMCTP Configurations application window with the following settings:

- Beam Mode:** PHOTON
- Linac Name:** CL21EX-A
- Beam Energy:** 6
- Linac Properties:**
  - Beam Mode: PHOTON
  - Linac name: CL21EX-A
  - Energy: 6
  - Type:  Varian  Siemens  Tomotherapy  Other
- MLC:** MLC Name: Varian 120M
- MC Settings:**
  - BEAMnrc particle density: 500,000
  - BEAMnrc input file (wth ext): BEAM\_CL21X\_6X\_DYNJAW\_DYNVMLC.egsinp
  - BEAMnrc pegs file (no ext): MLCicru
- Electron Applicators:**
  - Number of Applicators: 0
  - Table with columns: Number, Size #x#
- Dynamic Wedge:** Varian 60 deg Dynamic Wedge STT file: GoldenSTTfile-6MV.txt
- Physical Photon Wedges:**
  - Number of Wedges: 4
  - Wedge: 1 - 15
  - Wedges Angle: 15
  - Number of wedge orientations: 4
  - Table with columns: Index, Orientation

Shell	BEAMnrc folder name	DOSXYZnrc dose value	V
160		1.43809e-14	
q		1.43809e-14	
Cutout		1.43809e-14	
8Eunahs		1.43809e-14	
MPU-MMCTP_BEAM_6X_DYNJAWS_DYNVMLC		1.43809e-14	
xIntelFort		1.43809e-14	
elaine-Clumeq	BEAM_Photon_CL21X_6X	1.43809e-14	
Tanner		1.e+0	
macbook-be...		1.e+0	

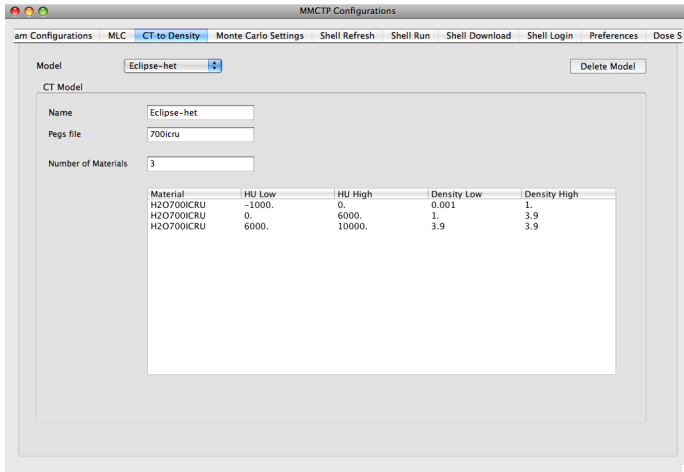
Index	Orientation
1	Left
2	Right
3	In
4	Out





# CT to Density

- File > Configurations > CT to Density tab



MMCTP Configurations

am Configurations MLC **CT to Density** Monte Carlo Settings Shell Refresh Shell Run Shell Download Shell Login Preferences Dose S

Model: Eclipse-het [Delete Model]

CT Model

Name: Eclipse-het

Pegs file: 700icru

Number of Materials: 3

Material	HU Low	HU High	Density Low	Density High
H2O700ICRU	-1000.	0.	0.001	1.
H2O700ICRU	0.	6000.	1.	3.9
H2O700ICRU	6000.	10000.	3.9	3.9



# CT to Density

- Only used in EGSPphant create
- User can override each contour to exclude CT2Density
- User selects which curve to use
- Linear interpolation between points
- The default peps file is assumed for EGSPphant file when selecting a curve



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  - EGSnrc
  - DOSXYZnrc



## MMCTP

- Treatment planning window
  - External beam properties
  - Visualization properties
  - DVH tools
  - Dose profiles
  - MC tools
- Contouring window

ID	Descript...	Machine/Energy	Weight	Gantry Rtn	Coll Rtn	Couch Rtn	Wedge	Field X (cm)	X1 (cm)	X2 (cm)	Field Y (cm)	Y1 (cm)	Y2 (cm)	X (cm)	Y (cm)	Z (cm)	SS
1	New M...	CL21DX-DYNMML	1.	0.	0.	0.		15.	7.5	7.5	15.	7.5	7.5	0.	-13.	23.2	0.
2	OK Me...	CL21DX-DYNMML	1.	0.	0.	0.		15.	7.5	7.5	15.	7.5	7.5	0.	-13.	23.2	0.



# External beams

- Options within treatment planning window
- Advanced options within the beam properties window
- General tab
- Beam weight, MUs, Tx number all used in MC dose normalization

Beam Properties

Beam Number: 1

General | Geometry | Accessories | Electron

Linac Properties

Beam modality: PHOTON

Treatment machine: CL21EX-DYNVMLC

Beam energy: 6MV

Beam applicator:

Applicator Type:

Beam description: New Method

Beam type:

Prescription

Beam weight: 1

Dose Rate:

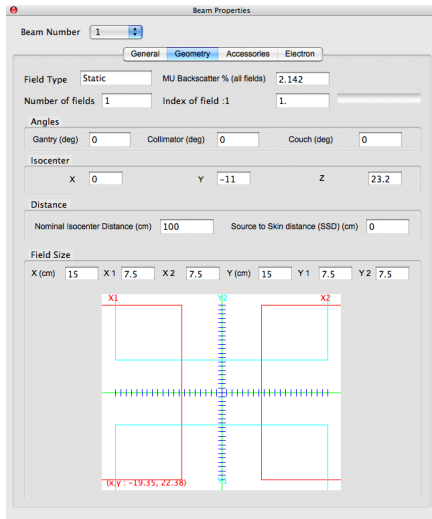
MUs: 100

No of Tx: 1



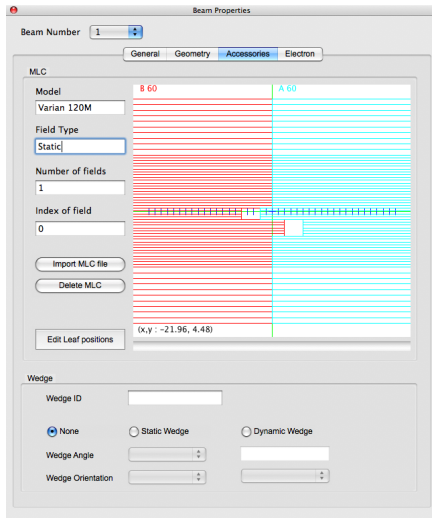
# External beams

- Geometry tab
- Settings class per field (static, step and shoot, dynamic)
- Nominal isocenter distance is used to place phsp file



# External beams

- Accessories tab
- MLC (static, step and shoot, dynamic) and wedge (static, dynamic) options



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# BEAMnrc within MMCTP

- Idea is to include all BEAMnrc functionality within MMCTP
- BEAMnrc header information, including sources (limited)
- BEAMnrc CM variables (limited)
- EGSnrc input options
- Variables are edited manually or automatically through scripts
- BEAMnrc classes are coded within MMCTP to read, write, edit, transfer and submit input files
- BEAMnrc classes loaded dynamically per user selected plan



# BEAMnrc tab

- External beams are listed by row
- User check box to queue beam submissions
- Progress is displayed in second column
- BEAMnrc status text box report below
- Double click on row to open BEAMnrc properties

McGill Monte Carlo Treatment Planning - A.A.

Plans  
▶ 01

Name: A.1  
PatientID: A\_StackID\_1  
E: 100 cm - 120.72 cm  
X: 0 cm - 120.72 cm  
Y: 122.21 cm - 122.21 cm  
Z: 0 cm - 120.72 cm

Name: B.2  
PatientID: A\_StackID\_1  
E: 100 cm - 120.72 cm  
X: 0 cm - 120.72 cm  
Y: 122.21 cm - 122.21 cm  
Z: 0 cm - 120.72 cm

Name: B.3  
PatientID: A\_StackID\_1  
E: 100 cm - 120.72 cm  
X: 0 cm - 120.72 cm  
Y: 122.21 cm - 122.21 cm  
Z: 0 cm - 120.72 cm

External Beams | **BEAMnrc** | Cutout | DOSXYZnrc | View | DVH | Dose | Dose Profiles | VMC

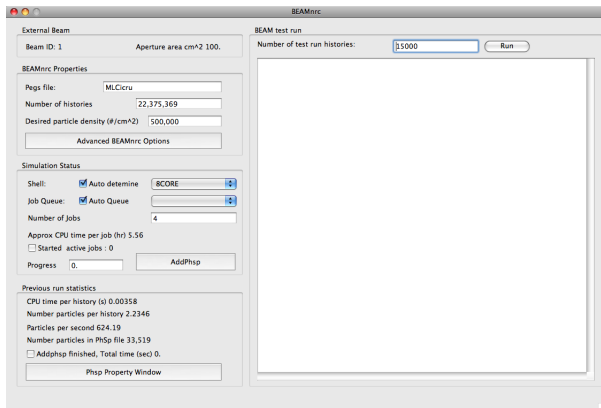
Calculate Beam	BEAMnrc Progress	BEAMnrc Status
01_1		Not Started
01_2		Not Started

Error: beam 2 is not defined within the list of linacs



# BEAMnrc properties per beam

- Summary of basic BEAMnrc properties, simulation status and previous run statistics
- Output text box for BEAMnrc test run
- Force addphsp run button
- Phsp property window
- Advanced BEAMnrc options window





# Phsp database

- Summary of beam properties
- Summary of beam phsp status
- Total list of phsp files located on all shells and BEAMnrc folders
- MMCTP will attempt to link current simulation within DB

Phase Space Information

Beam Properties		Phase Space Properties	
Beam Number	1	File Name	A_p01b1.egsphsp1
Beam Mode	PHOTON	File Found	Yes
Linac Name	CL21EX	Phase Space Size Bytes	938,560
Beam Energy	6MV	Phsp Linked	No
X Jaws	10	Linked file	
Y Jaws	10		
Wedge			

BEAMnrc folder **Phsp Database**

Filter  Find Match

Replace  < with >

Mode	File Name	Beam Energy	F.	Linac Name	Shell	Jaw Opening (x1,x2,y1,y2)	WEDGE	APPLICA
PHOTON	0099757_S_p01b3	6		CL21EX-A	SCORE	9.3,-0.1,5.6,10.3		
PHOTON	0099757_S_p01b5	6		CL21EX-A	SCORE	12.3,0.5,8,10.5		
PHOTON	0099757_S_p01b8	6		CL21EX-A	SCORE	1.2,13.5,5.8,10.5		
PHOTON	0099757_S_p01b4	6		CL21EX-A	SCORE	3.9,8.5,8,10.3		
PHOTON	0099757_S_p01b9	6		CL21EX-A	SCORE	7.7,5.3,6.,10.5		
PHOTON	0099757_S_p01b10	6		CL21EX-A	SCORE	-1.5,13.5,6.,10.5		
PHOTON	0099757_S_p01b11	6		CL21EX-A	SCORE	8.8,4.5,6.,10.5		
PHOTON	0099757_S_p01b12	6		CL21EX-A	SCORE	-0.6,9.5,6.,10.5		
PHOTON	0099757_S_p01b13	6		CL21EX-A	SCORE	12.8,1.8,5.8,10.3		
PHOTON	0099757_S_p01b14	6		CL21EX-A	SCORE	1.9,12.8,5.8,10.3		
PHOTON	0099757_S_p01b7	6		CL21EX-A	SCORE	12.3,2.5,5.8,10.5		
PHOTON	0099757_S_p01b6	6		CL21EX-A	SCORE	3.8,8.8,5.8,10.5		
PHOTON	1257981_146342_p01b1	6		CL21EX-A	SCORE	2.75,2.75,2.75,2.75		
PHOTON	1257981_146342_p01b2	6		CL21EX-A	SCORE	2.75,2.75,2.75,2.75		
PHOTON	1257981_146342_p01b3	6		CL21EX-A	SCORE	2.75,2.75,2.75,2.75		
PHOTON	1257981_146342_p01b4	6		CL21EX-A	SCORE	2.75,2.75,2.75,2.75		
PHOTON	1257981_146342_p01b5	6		CL21EX-A	SCORE	2.75,2.75,2.75,2.75		
PHOTON	1257981_146342_p01b6	6		CL21EX-A	SCORE	2.75,2.75,2.75,2.75		
PHOTON	1257981_146342_p01b7	6		CL21EX-A	SCORE	2.75,2.75,2.75,2.75		
PHOTON	QA_PHANTOMNEW_37943.p...	6		CL21EX-A	MPU-MMCTP	5.,5.,5.,5.		
PHOTON	A_p01b1	6		CL21EX-A	SCORE	5.,5.,5.,5.		

Close



# Advanced BEAMnrc options

- BEAMnrc header, CM and EGSnrc input access
- Only updated after a BEAMnrc test run or production run

Advanced BEAM Properties

Title: A\_p01b1 BEAMnrc Simulation

Medium: AIR700ICRU

IWATCH Output: none

RNG Seed Options: store RNG at start of each batch

Run Options: first time

Output Options: phase-space output at each scoring plane

Store Data Array: no

LATCH Options: inherited latch - set by interactions

Score Last Z: no

Initial RNG seed 1: 533

Initial RNG seed 2: 769

Max CPU Hours: 1000

Bremstrahlung Splitting: directional

Split electrons or photons at CM: none

Incident particle: electron

Source Number: 19: Elliptical Beam with Gaussian...

Global electron cutoff energy - ECUT (MeV): 0.7

Global photon cutoff energy - PCUT (MeV): 0.01

Electron range rejection: on with set ECUTRR

Global electron cutoff (ESAVE\_GLOBAL, range rejection, MeV): 1

Photon forcing: off

Number of scoring planes: 1

Z of front of 1st CM to reference plane (cm): -0.04890

CMs

CM number	CM title	Identifier
1	SLABS	TARGET
2	CONSR	PRIMCOLL
3	SLABS	WINDOW
4	FLATFILT	FLATTENF
5	CHAMBER	CHAMBER
6	SLABS	MIRROR
7	PYRAMIDS	SHIELD
8	DYNJAWS	Powerjaws
9	DYNVMLC	MLC
10	SLABS	AIRSLAB

Buttons: Reload default, Save as default, Open egslst file, Close, Edit EGSnrc Inputs



## BEAMnrc header

- Readable source numbers and auto DBS option
- Generally BEAMnrc source are not modified within MMCTP (exception of spectrum paths)
- Determine phsp scoring plane

BEAMnrc Source #	GUI
0	Yes
1	Yes
3	Yes
19	Yes
21	Yes

- DBS auto radius size,  
$$R_{cm} = (FS_x^2 + FS_y^2)^{0.5} + 5$$



# BEAMnrc CMs

CM	Read	Auto-scripts*	GUI
JAWS	Yes	Yes	Yes
DYNJAWS	Yes	Yes	Yes
WEDGE	Yes	Yes	Yes
DYNVMLC	Yes	Yes	Yes
VARMLC	Yes	Yes	Yes
MLC	Yes	No	Yes
TOMOMLC	Yes	Yes	Yes
APPLICAT	Yes	Yes	Yes
BLOCK	Yes	Yes	Yes
SLAB	Yes	No	Yes
FLAT	Yes	No	No

\* Auto-scripts are linked to particular linac manufactures and CM inputfile flags





## BEAMnrc input file

- BEAMnrc classes are loaded dynamically per user selected plan
- For each external beam there is a BEAMnrc input file class
- First attempt to read input file from plan folder
- Second attempt to read input file from BEAMnrc-Setting folder, template input file for MMCTP linac
- Once found, the Z value of last scoring plane is read-in and stored as a parameter to be passed to DOSXYZnrc
- Last scoring plane must be a BLOCK or SLAB CM
- Input files are updated if the linac name or beam energy is changed



# BEAMnrc Simulations user control

- 1 Turn on BEAMnrc auto run and auto refresh (Configurations Window)
- 2 Turn on global auto run and auto refresh (Configurations Window)
- 3 Check-on a BEAMnrc run (Treatment Planning Window)



# BEAMnrc Simulations system control auto-run

- 1 If phsp database on, search database for match
- 2 If auto-shell on, determine shell
- 3 Generate input file, remove any previous input files on shell, upload new input files to shell
- 4 Run test run to determine particle per history density and CPU time per history
- 5 Calculate the required number of histories and update the estimated simulation time
- 6 Generate input file, remove any previous input files on shell, upload new input files to shell
- 7 Summit job to shell queueing system



# BEAMnrc Simulations system control auto-refresh

- 1 Search for lock file, read progress
- 2 If lock file not found, search for `_w` log files
- 3 If all `_w` log files exist and contain “Simulation finished” run `addphsp`
- 4 `Addphsp` script is generated locally, transferred to shell and submitted to queueing system
- 5 Search for `addphsp` log for “Done”
- 6 Run `BEAMDP` on new `phsp` file, read number of photons and particles
- 7 Update `phsp` database
- 8 Remove `_w` files



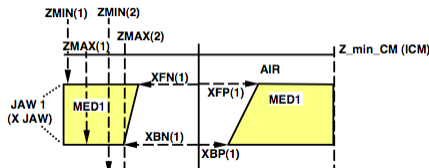
# Auto-script CM JAWS

```

x1=-gRTOG.Plan(Plan_Index).Beam(beam_number).Collimator.fields(0).X1
x2=gRTOG.Plan(Plan_Index).Beam(beam_number).Collimator.fields(0).X2
y1=-gRTOG.Plan(Plan_Index).Beam(beam_number).Collimator.fields(0).Y1
y2=gRTOG.Plan(Plan_Index).Beam(beam_number).Collimator.fields(0).Y2
if cm.JAWS.XY_Choice(i-1)="Y" Then
  zytop=cm.JAWS.ZMIN_JAWS(i-1)
  zybot=cm.JAWS.ZMAX_JAWS(i-1)
  cm.JAWS.XFP_JAWS(i-1)=zytop*y2/100
  cm.JAWS.XBP_JAWS(i-1)=zybot*y2/100
  cm.JAWS.XFN_JAWS(i-1)=zytop*y1/100
  cm.JAWS.XBN_JAWS(i-1)=zybot*y1/100
if cm.JAWS.XY_Choice(i-1)="X" Then
  zxtop=cm.JAWS.ZMIN_JAWS(i-1)
  zxbot=cm.JAWS.ZMAX_JAWS(i-1)
  cm.JAWS.XFP_JAWS(i-1)=zxtop*x2/100
  cm.JAWS.XBP_JAWS(i-1)=zxbot*x2/100
  cm.JAWS.XFN_JAWS(i-1)=zxtop*x1/100
  cm.JAWS.XBN_JAWS(i-1)=zxbot*x1/100

```

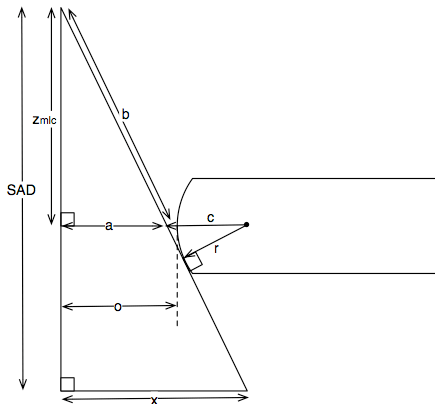
## JAWS



# Auto-script CM DYNVMLC

MLC field is defined at isocenter, required to convert the MLC leaf projections at isocenter to the MLC leaf positions within BEAMnrc.

Back-projection is complicated by rounded leaf ends of the MLC.



# Auto-script CM DYNVMLC

- Varian Script is defined within the methods of the class BEAM, under the title `egs_Input_CM_DYNVMLC_MLC2BEAM_Varian`.
- This script is unique to Varian millennium type MLCs with rounded leaf ends.
- In the event that the MMCTP beam does not contain a MLC pattern, a default retracted MLC position of 20.3 cm is used for each leaf.



# Auto-script CM APPLICAT

- Values are not edited
- The whole CM section is replaced with an APPLICAT file
- Each linac applicator is linked to an APPLICAT file
- APPLICAT files are stored within the MMCTP BEAMnrc folder
- Same approach for WEDGE CM

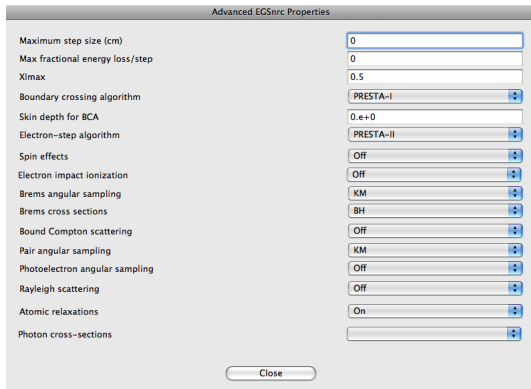
```
**** start of CM APPLICAT with ident  
27, RMAX  
5x5 applicator  
78.54, ZBACK  
2, 0, #SCRAPERS, SQUARE  
63.75, 1.65, 3.58, 4.42, 0, 0  
76.5, 2.025, 3.305, 4.695, 0, 0  
0.521, 0.01, 0, 0,  
BISNICRU700  
BISNICRU700
```





# EGSnrc settings

- Accessible for both BEAM/DOS
- Read-in from template input file
- MMCTP does not auto edit these settings



# DOSXYZnrc Main Window

- ability to start calculation
- progress bars for dose calculation status
- access to DOSXYZ input parameters
- access to EGSPphant creation tools

McGill Monte Carlo Treatment Planning - QA\_phantom\_NEW

Plans  
▶ 01 MMCTP-Test

Name: QA\_phantom\_NEW  
PatientID: QA\_PHANTOMNEW, StudyID: 3794, SeriesNumber: 3  
Z (56/111): -56.8 cm  
X (292/512): 4.16 cm  
Y (333/512): 15.95 cm

Name: QA\_phantom\_NEW  
PatientID: QA\_PHANTOMNEW, StudyID: 3794, SeriesNumber: 3  
X: 0 cm (257/512)  
Y: -14.4 cm (73/512)  
Z: -64.53 cm (-80/111)

Name: QA\_phantom\_NEW  
PatientID: QA\_PHANTOMNEW, StudyID: 3794, SeriesNumber: 3  
Y: 7.1 cm (257/512)  
X: -20.92 cm (-79/512)  
Z: -62.06 cm (-72/111)

External Beams | BEAMnrc | Cutout | DOSXYZnrc | View | DVH | Dose | Dose Profiles | VM

Beam Number	3mmHC (0.)
1	✓ 85. %
2	0. %
3	0. %
4	0. %

EGSPphant file : QA\_PHANTOMNEW\_37943\_3mmHC.egspant loaded (voxels not loaded)

# DOSXYZnrc

- Source linking to BEAM
- Elementary parameters + access to advanced parameters
- Calibration dose and monitor backscatter correction
- Previous run stats
- Test Run access and output

DOSXYZnrc Properties, EGPhant : 3mmHC, Beam : 1

BEAMnrc Simulation

Use phase space?  Use lib source?  Other source?

Phsp # Particles :0 Phsp # Photon :0, 0.3%

DOSXYZnrc Simulation

PECS file 700icru Desired Uncer (%) 1.

Number of histories 1,877,229 Number of jobs 4

Total CPU time estimate 14.86 (min)

Calibration dose 1.43809e-14 Dose to water 1.

MU backscatter correction % 102.483  Auto Shell MPU-New

Auto queue Advanced Options

Previous Run Stats

Started 3-Jun-11 12:13:05 PM active jobs 4

3ddose created on

Total CPU time for run 1.9 (sec)

Number of histories: 1000 CPU time per history (s) 0.0019

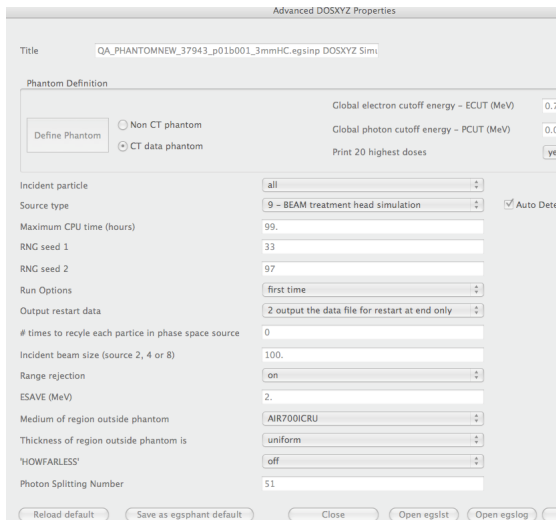
Average % error of doses > 0.5 of max dose: 43.327%  3ddose downloaded

Close



# DOSXYZnrc

- Phantom definition
- Edit dosxyznrc parameters
- Source definition access
- Variance reduction techniques access



# DOSXYZnrc - source type definition

- Automatically determines values from the External Beam tab information
- Values are determined upon test run

Source 9 options

Exclude Fat Photons from DBS

BEAM sim with no LATCH filter

BEAM sim with latch

1 BIT FILTER=0

Isocenter (x,y,z)    -0.07    56.34    -6.73

Angles (theta,phi,coll)    0.    0.    0.

Distance from source to isocenter    30.

BEAM simulation:    BEAM\_6X\_DYNJAWS\_DYNVMLC

input file:    QA\_PHANTOMNEW\_37943\_p01b1

pegs data:    MLCicru

e split    51

Close



# DOSXYZnrc - source type definition - link to external beam definition

- Automatically determines values from the External Beam tab information
- Values are determined upon test run

Beam Properties

Beam Number: 1

General | **Geometry** | Accessories | Electron

Field Type: MU Backscatter % (all fields) 2.483

Number of fields: 1 Index of field: 1

Angles

Gantry (deg): 0 Collimator (deg): 0 Couch (deg): 0

Isocenter

X (cm): -0.071 Y (cm): 6.7333 Z (cm): -56.34

Distance

Nominal Isocenter Distance (cm): 100 Source to Skin distance (SSD) (cm): 0

Field Size

X (cm): 10 X1: 5 X2: 5 Y (cm): 10 Y1: 5 Y2: 5

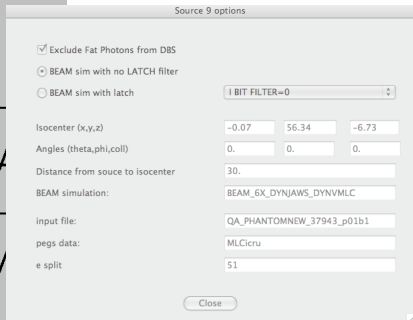
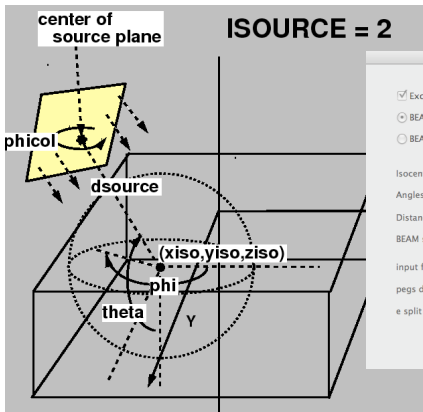
Diagram showing field size parameters X1, X2, Y1, Y2.

Patient Information:

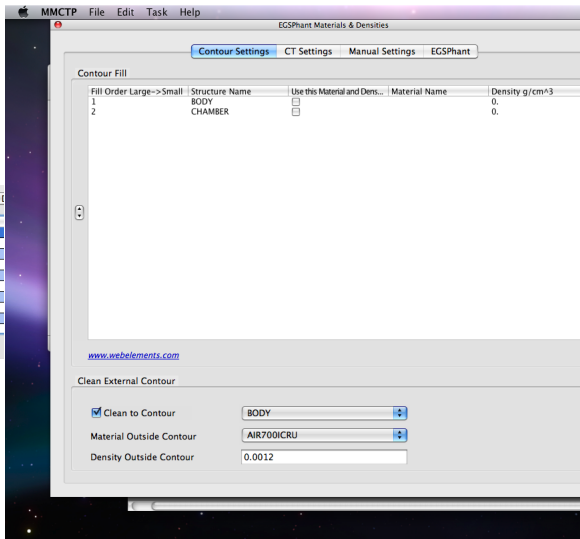
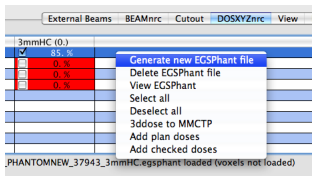
Name: Q4 phantom  
PatientID: 05 PHANTOM  
Y: 7.1 cm (337/512)  
X: -11.43 cm (259/512)  
Z: -63.47 cm (-76/111)

H	Dose	Dose Profiles
(cm)	Y2 (cm)	X (cm) Y (cm)
5.	-0.07	6.
5.	-0.07	6.
8.	-0.07	6.
5.	-0.07	6.

# DOSXYZnrc - source type definition - link to external beam definition



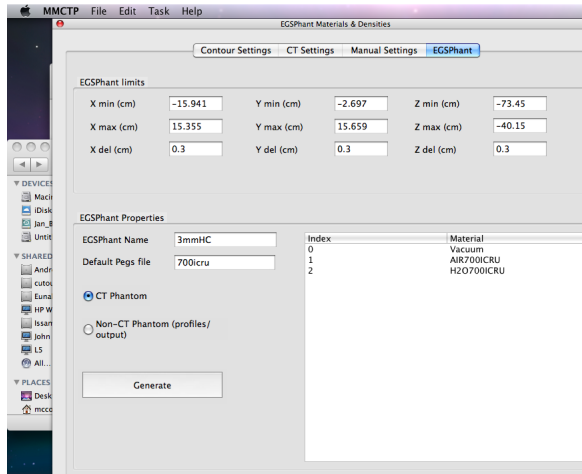
# DOSXYZnrc - phantom creation





# DOSXYZnrc - phantom creation

- Selection of resolution and boundaries
- Selection of material data set
- Selection of name (Note: length)
- Possibility to generate mathematical phantom



# DOSXYZnrc - phantom creation

- Contour filling and material assignment
- Regions are assigned by specifying material + density

