



Total Participants ~ 400  
From ~ 55 countries

# Left Breast + LNs

15	Vanessa Magliari	89.4	Rush-Copley	USA	IMRT	Eclipse	Var-TrueB
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# What is in my pocket?



## -Eclipse version 13.6

## -AcurosXB

Particle Type	Calculation Type	Calculation Model	Algorithm
Photon	Volume Dose	AcurosXB_13.6.23	Acuros External Beam (Version 13.6.23)
	Point Dose	AAA_13.6.23	Anisotropic Analytical Algorithm (Version 13.6.23)
	DVH Estimation	DVH Estimation Algorithm [13.6.23]	DVH Estimation Algorithm (Version 13.6.23)
	Irregular Surface Compensator	DVO_13.6.23	Dose Volume Optimizer (Version 13.6.23)
	Stereotactic Dose	ECDC_13.6.23	Eclipse Cone Dose Calculation (Version 13.6.23)
	Portal Dose	PDIP_13.6.23	Portal Dose Image Prediction (Version 13.6.23)
	Beam Angle Optimization	PGO_13.6.23	Plan Geometry Optimizer (Version 13.6.23)
	VMAT Optimization	Photon Optimizer 13.6.23	Photon Optimizer (Version 13.6.23)
	IMRT Optimization	Photon Optimizer 13.6.23	Photon Optimizer (Version 13.6.23)

## - Truebeam with Millenium 120

Estimate DVH ?

**Plan Information**

▶ General Plan Competition FEB-2016 (AhmadPC LT BREAST)/C1/VMbeams6

▶ Dose Prescription 5000 cGy

▼ Treatment Unit

ID TrueBeam

Energy 10X, 6X

Dose Rate 300

▼ MLC

ID Millennium 120

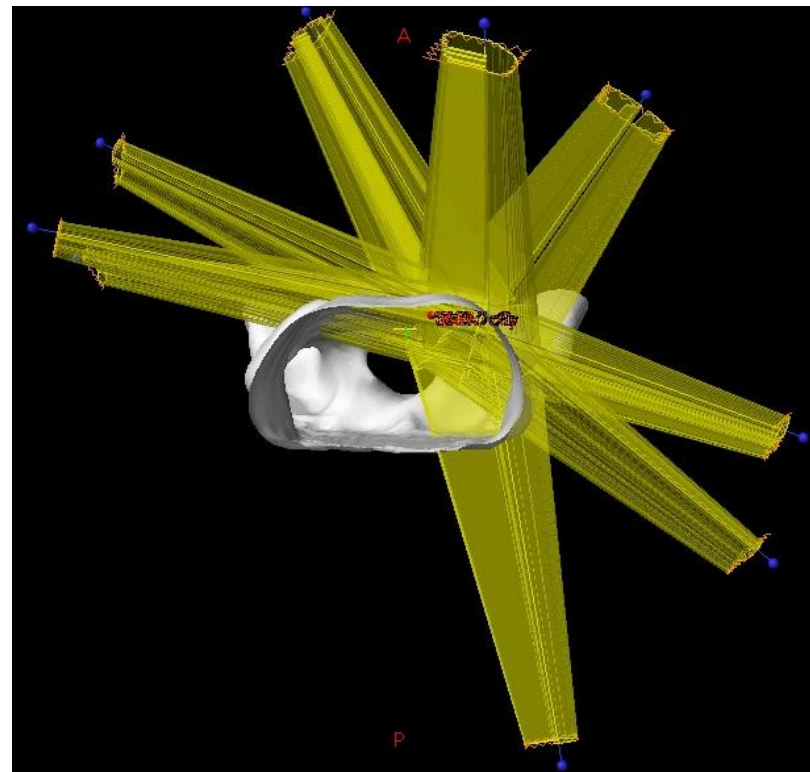
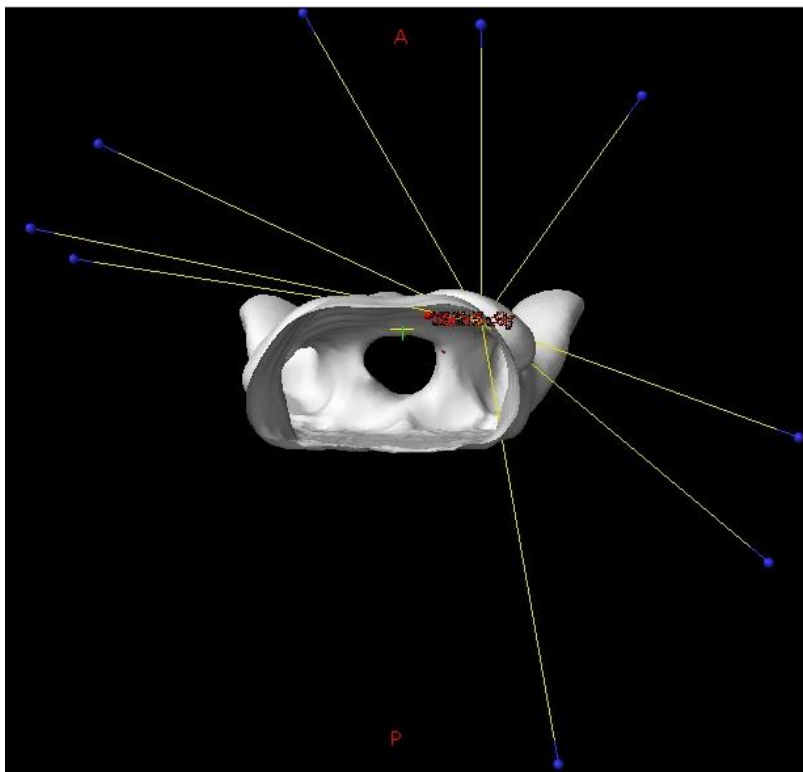
Manufacturer Varian Medical Systems

Model Millennium 120

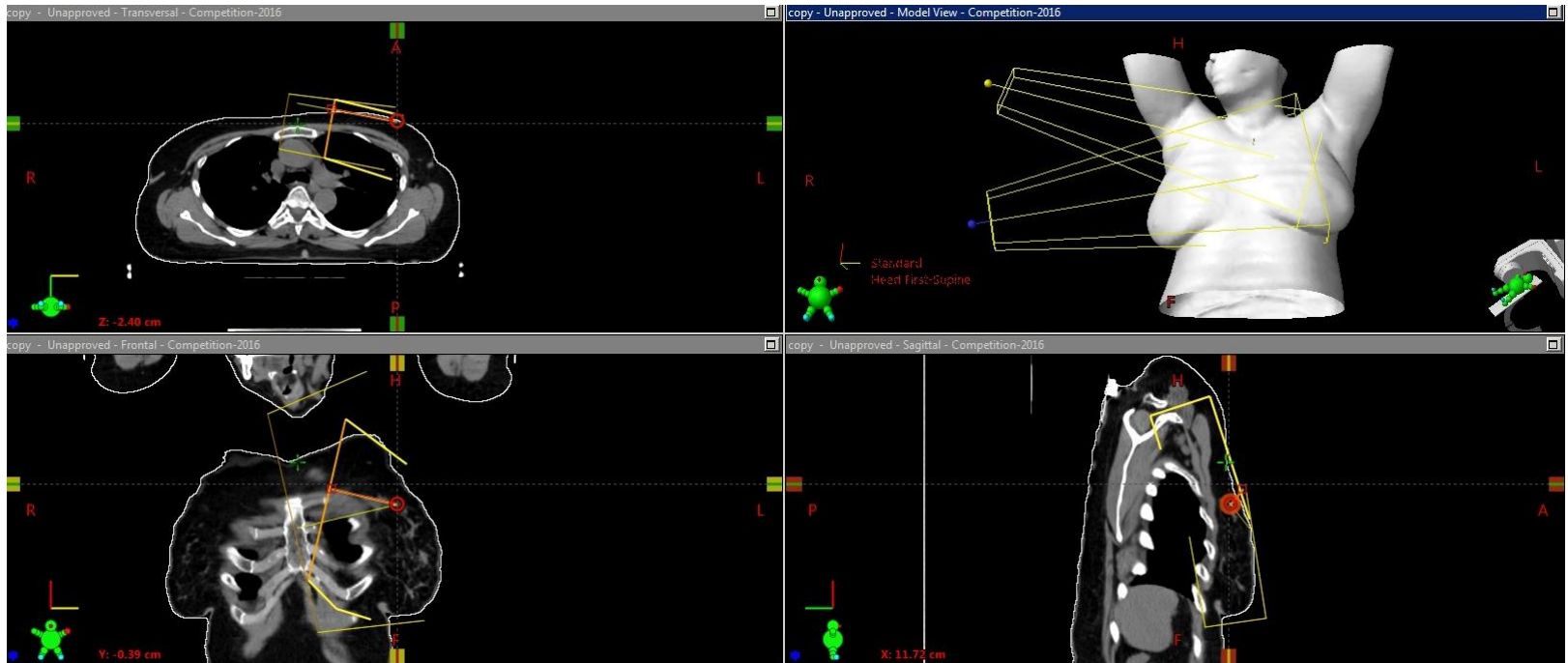
# Which Technique?

IMRT

# The most important for an IMRT : How to setup your beams?



# The most important for an IMRT : How to setup your beams?



Gantry colli couch

<input checked="" type="checkbox"/>	1ncTang	STATIC-1	TrueBeam - 10X	1.000	IEC61217	280.0	7.0	347.0
<input checked="" type="checkbox"/>	2ncTang	STATIC-1	TrueBeam - 10X	1.000	IEC61217	280.0	20.0	13.0
<input type="checkbox"/>	1Tang	STATIC-1	TrueBeam - 10X	1.000	IEC61217	280.0	10.0	0.0

# The most important for an IMRT : How to setup your beams?



Gantry colli couch

<input checked="" type="checkbox"/>	3ncFH	STATIC-I	TrueBeam - 10X	1.000	IEC61217	45.0	66.0	90.0
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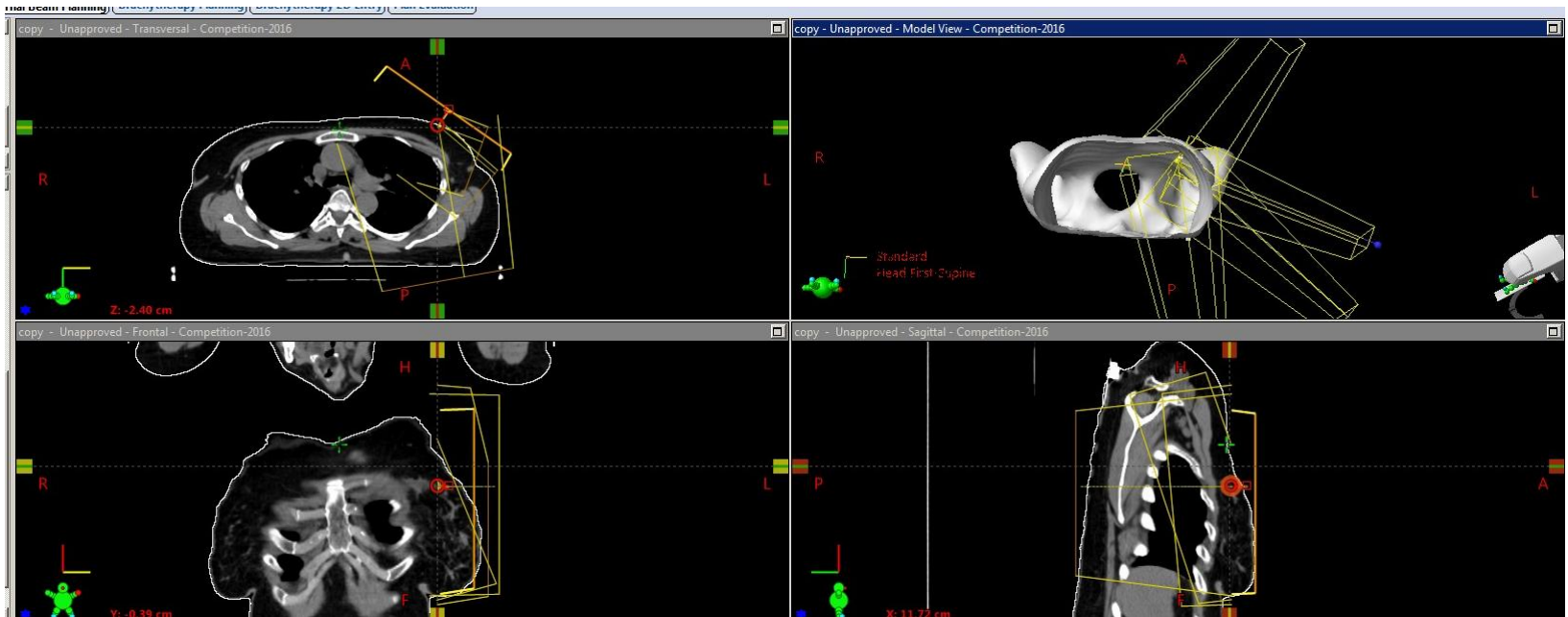
# The most important for an IMRT : How to setup your beams?



Gantry    colli    couch

<input checked="" type="checkbox"/>	4Tang	STATIC-1	TrueBeam - 10X	1,000	IEC61217	295.0	18.0	0.0
<input checked="" type="checkbox"/>	5	STATIC-1	TrueBeam - 10X	1,000	IEC61217	330.0	14.0	0.0

# The most important for an IMRT : How to setup your beams?

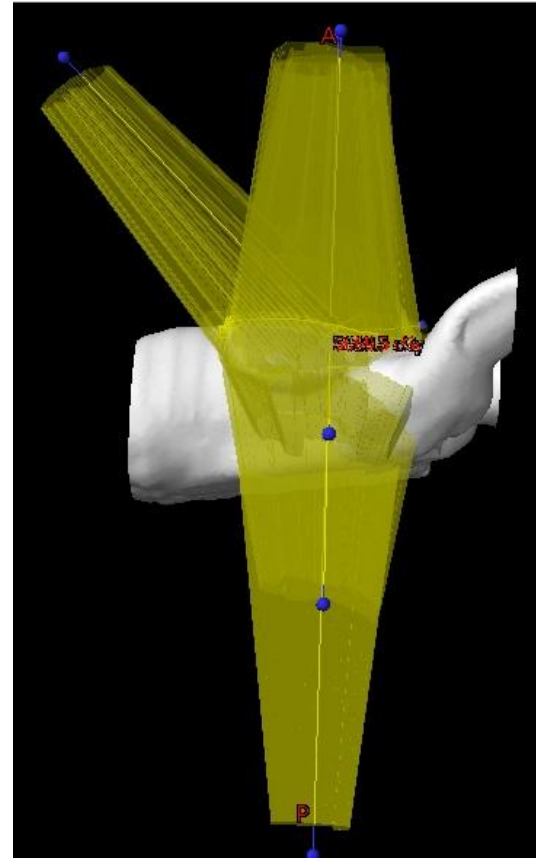
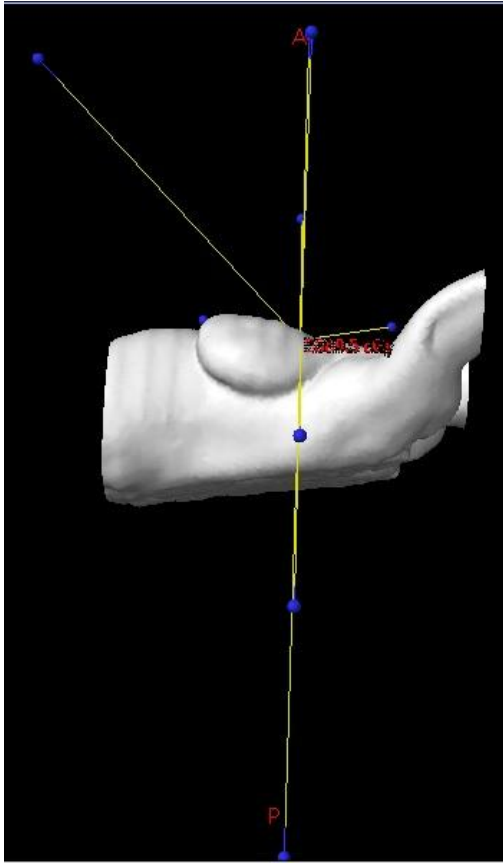


Gantry    colli    couch

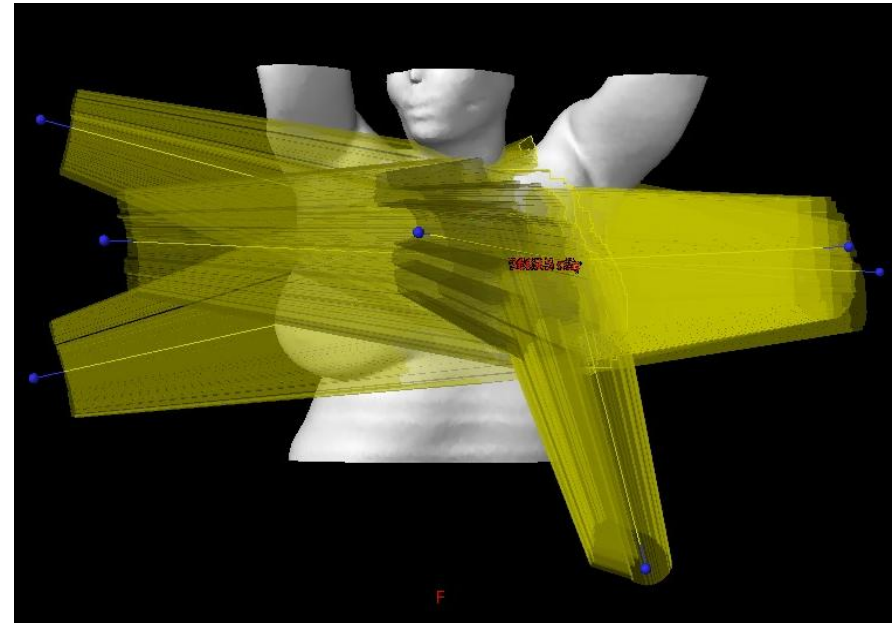
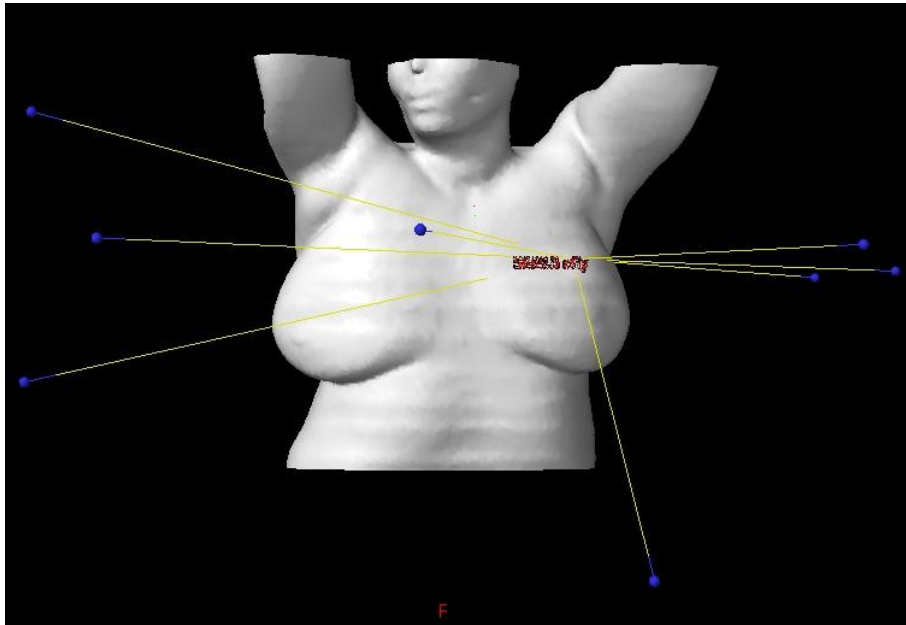
<input checked="" type="checkbox"/>	6	STATIC-1	TrueBeam - 6X		1.000	IEC61217	35.0	96.0	0.0
<input checked="" type="checkbox"/>	7	STATIC-1	TrueBeam - 10X		1.000	IEC61217	110.0	355.0	0.0
<input checked="" type="checkbox"/>	8	STATIC-1	TrueBeam - 10X		1.000	IEC61217	130.0	345.0	0.0
<input checked="" type="checkbox"/>	9	STATIC-1	TrueBeam - 10X		1.000	IEC61217	170.0	0.0	0.0



# The most important for an IMRT : How to setup your beams?



# The most important for an IMRT : How to setup your beams?

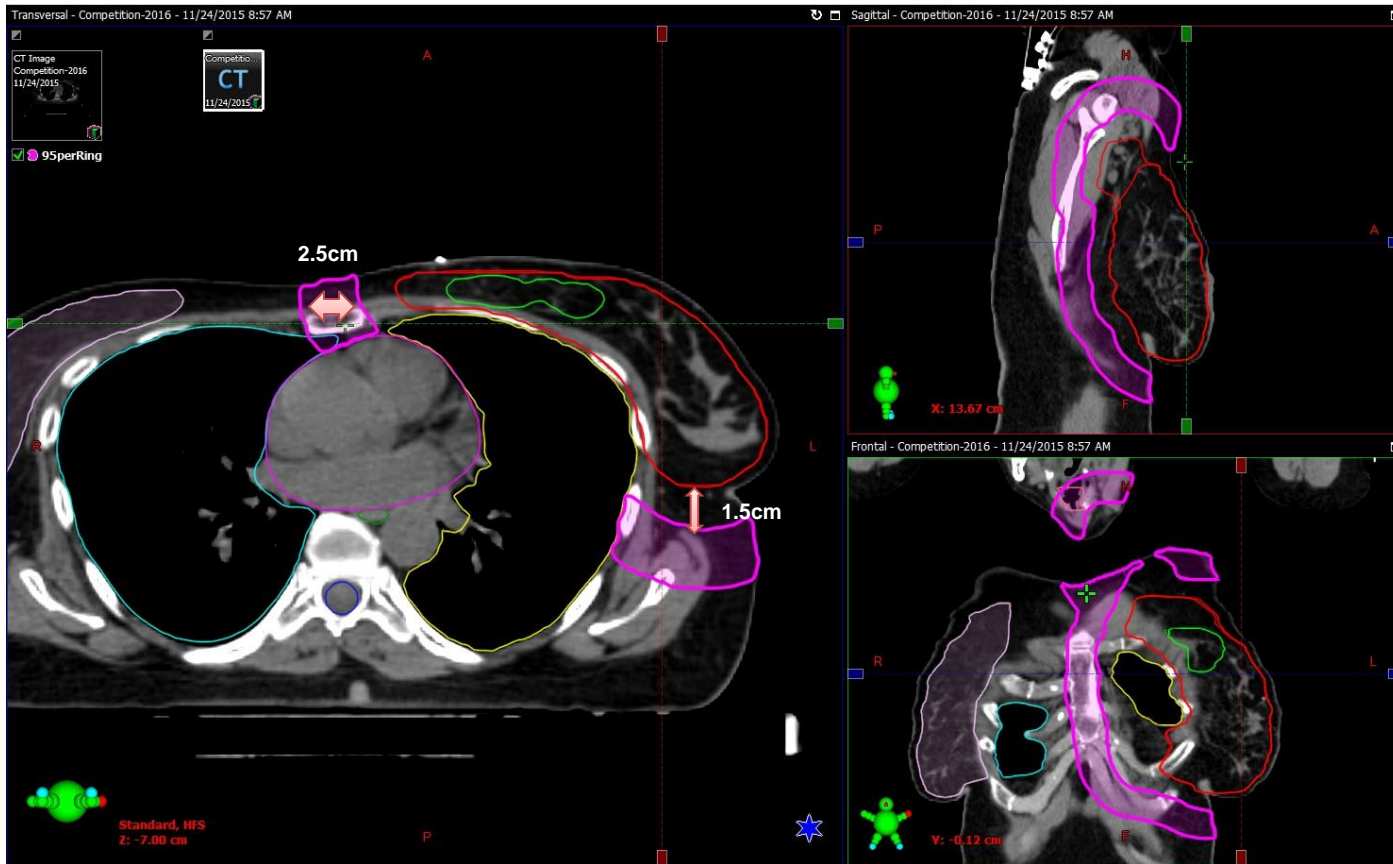


# The most important for an IMRT : How to setup your beams?

Field ID	Technique	Machine/Energy	MLC	Field Weight	Scale	Gantry Rtn [deg]	Coll Rtn [deg]	Couch Rtn [deg]	Wedge	Field X [cm]	X1 [cm]	X2 [cm]	Field Y [cm]	Y1 [cm]	Y2 [cm]	X [cm]	Y [cm]	Z [cm]	Calculated SSD [cm]	MU
3ncFH	STATIC-I	TrueBeam - 10X	Dose Dynamic	1.000	IEC61217	45.0	66.0	90.0	None	22.5	-11.8	+10.8	13.5	-10.0	+3.5	11.72	-0.56	-4.88	97.1	311
1ncTang	STATIC-I	TrueBeam - 10X	Dose Dynamic	1.000	IEC61217	280.0	7.0	347.0	None	7.4	-5.4	+2.0	29.9	-13.9	+16.0	11.72	-0.56	-4.88	88.9	145
2ncTang	STATIC-I	TrueBeam - 10X	Dose Dynamic	1.000	IEC61217	280.0	20.0	13.0	None	7.3	-5.8	+1.5	26.0	-13.0	+13.0	11.72	-0.56	-4.88	92.9	201
4Tang	STATIC-I	TrueBeam - 10X	Dose Dynamic	1.000	IEC61217	295.0	18.0	0.0	None	8.5	-7.0	+1.5	28.8	-13.0	+15.8	11.72	-0.56	-4.88	96.2	147
5	STATIC-I	TrueBeam - 10X	Dose Dynamic	1.000	IEC61217	330.0	14.0	0.0	None	13.5	-10.0	+3.5	28.0	-13.0	+15.0	11.72	-0.56	-4.88	98.4	161
6	STATIC-I	TrueBeam - 6X	Dose Dynamic	1.000	IEC61217	35.0	96.0	0.0	None	21.8	-12.8	+9.0	18.5	-9.5	+9.0	11.72	-0.56	-4.88	98.7	206
7	STATIC-I	TrueBeam - 10X	Dose Dynamic	1.000	IEC61217	110.0	355.0	0.0	None	9.3	-2.3	+7.0	26.0	-14.0	+12.0	11.72	-0.56	-4.88	95.3	130
8	STATIC-I	TrueBeam - 10X	Dose Dynamic	1.000	IEC61217	130.0	345.0	0.0	None	8.0	-1.3	+6.7	27.0	-13.0	+14.0	11.72	-0.56	-4.88	92.1	127
9	STATIC-I	TrueBeam - 10X	Dose Dynamic	1.000	IEC61217	170.0	0.0	0.0	None	19.5	-7.2	+12.3	24.0	-13.0	+11.0	11.72	-0.56	-4.88	82.7	439

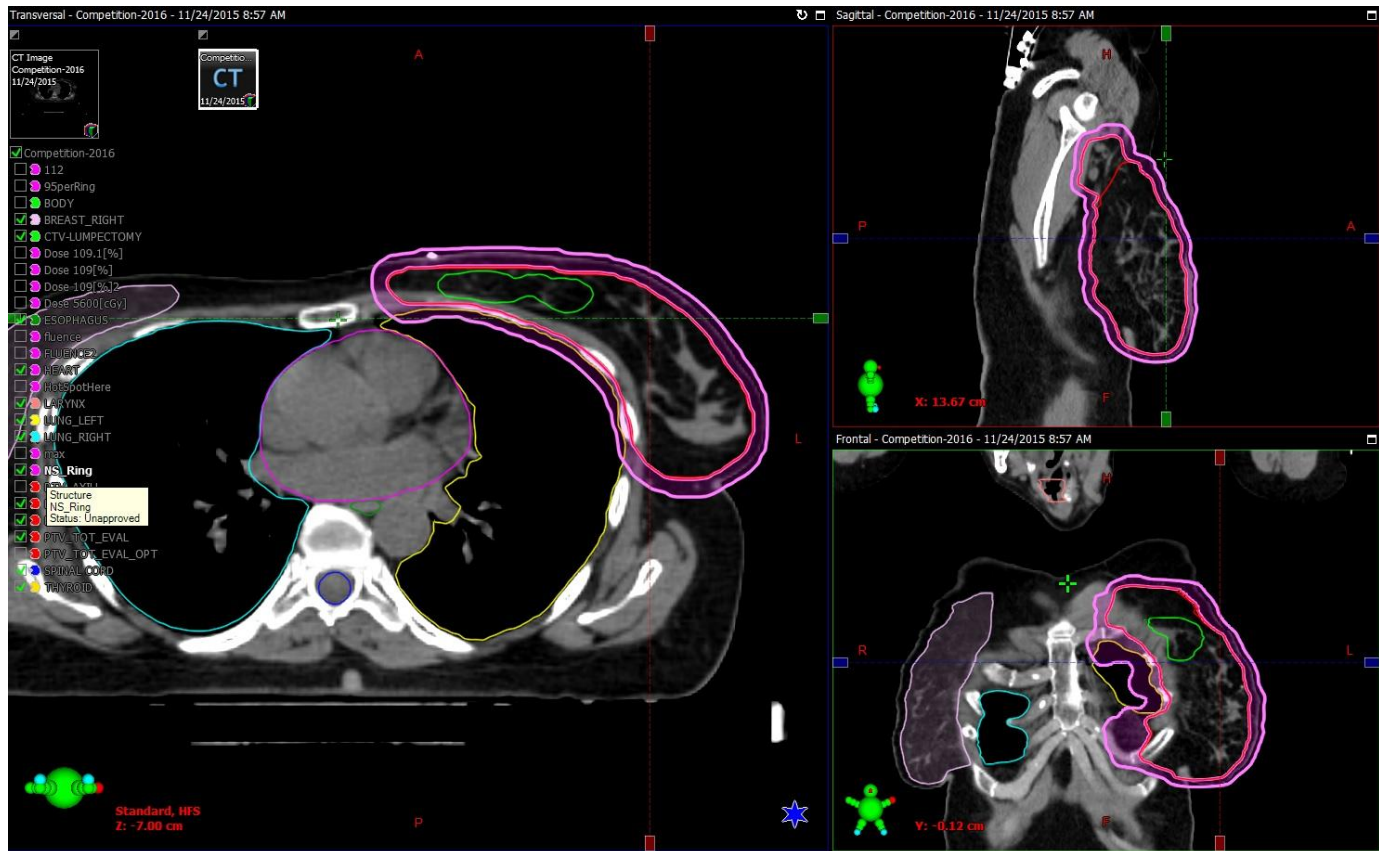
# Optimization contours

95 per Ring : 2.5cm -(Heart+Lung) at 1.5cm from the target



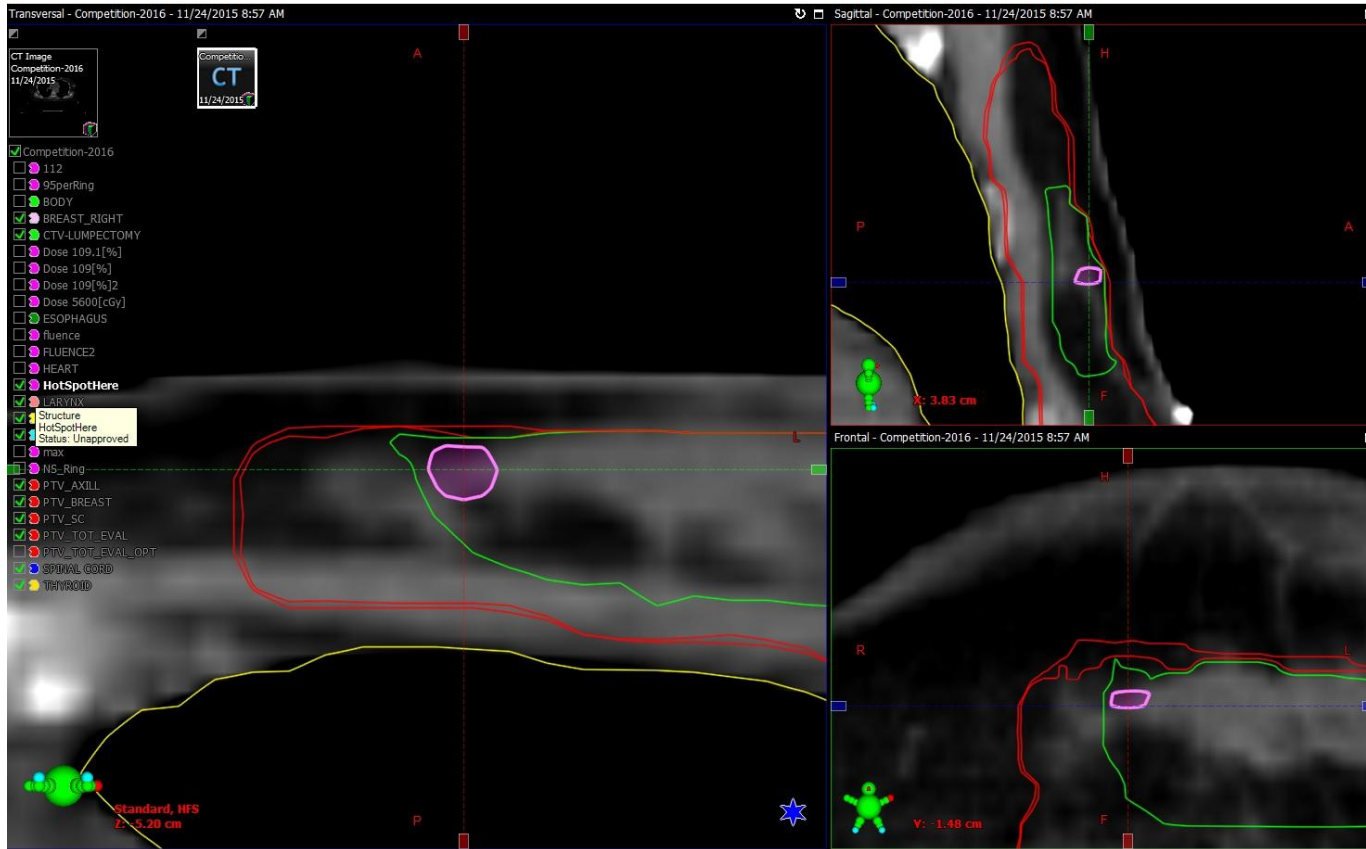
# Optimization contours

## NS-Ring : 0.8cm



# Optimization contours

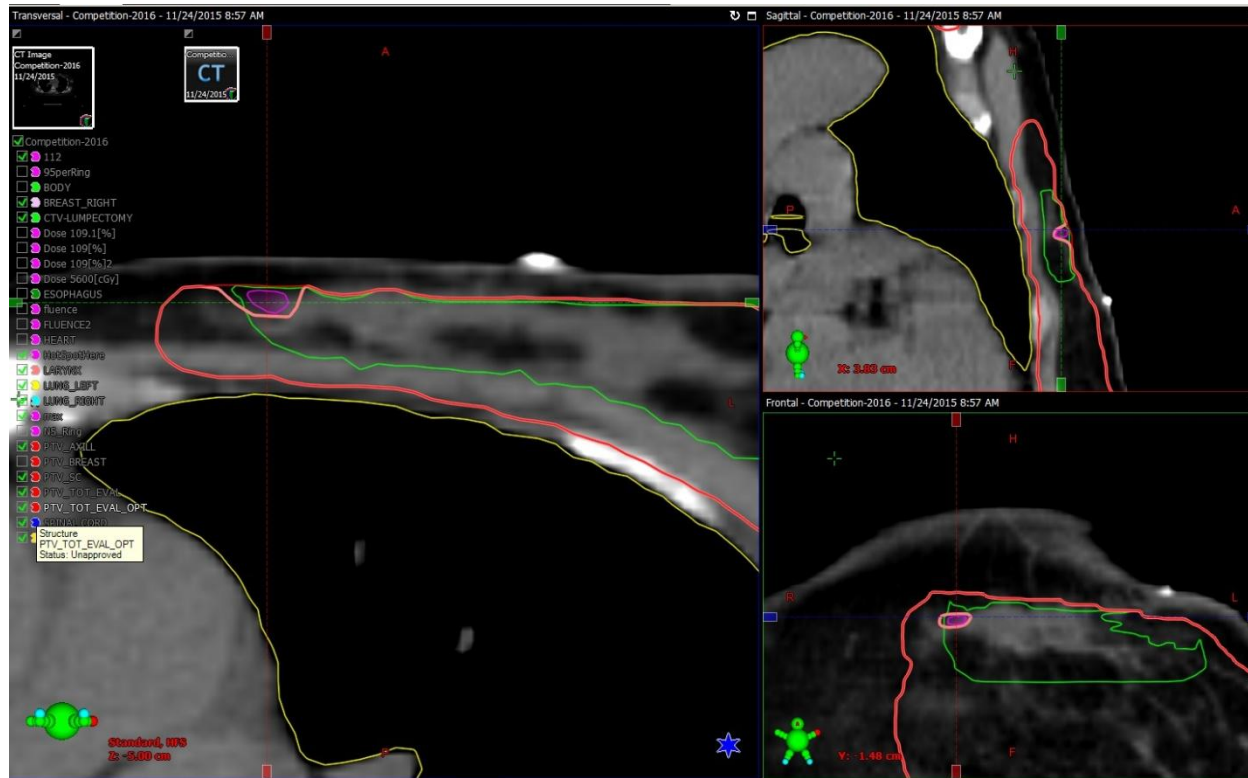
## HotSpotHere



# Optimization contours

## PTV TOT EVAL OPT :

### (PTV TOT EVAL – HotSpotHere)



# Optimization constraints

▼ Settings

Maximum Iterations	<input type="text" value="2000"/>
Maximum Optimization Time	<input type="text" value="6000"/> s
Resolution	<input type="text" value="Normal (2.5 mm)"/>



# Optimization constraints

Optimization - Plan Competition, FEB-2016 (AhmadPC LT BREAST) / C1 / VMbeams6

ID/Type	Vol[cm <sup>3</sup> ]	Vol [%]	Dose [cGy]	Actual Dose [cGy]	Priority	gEUD a
HotSpotHere	0.0					
Lower		100.0	5520	5392	100	x
PTV_TOT_EVAL_OPT	1094.2					
Upper		0.0	5150	5597	130	x
Lower		100.0	5050	2931	140	x
95perRing	1575.7					
Upper		0.0	4760	5234	100	x
BREAST_RIGHT	892.0					
Upper		0.0	749	1392	100	x
Upper		1.6	140	351	120	x
Dose 109.1[%]	2.4					
Upper		0.0	5485	5608	180	x
Dose 109[%]	6.3					
Upper		0.0	5485	5584	180	x
Dose 109[%]2	3.6					
Upper		0.0	5485	5584	180	x
HEART	688.3					
Upper		0.5	1700	3299	80	x
Upper		3.0	1100	1588	80	x

Normal Tissue Objective: 85/Manual  
 Base Dose Plan: None  
 Settings: 2000/6000s/Normal (2.5 mm)

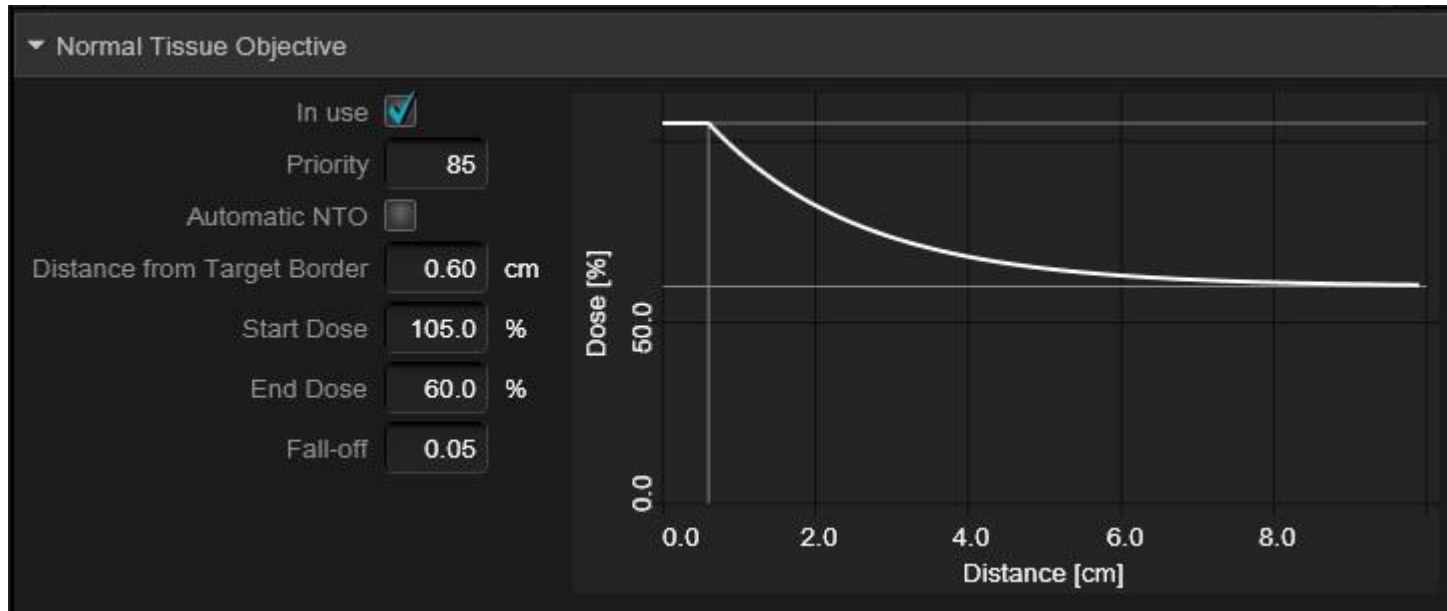
Optimization - Plan Competition, FEB-2016 (AhmadPC LT BREAST) / C1 / VMbeams6

ID/Type	Vol[cm <sup>3</sup> ]	Vol [%]	Dose [cGy]	Actual Dose [cGy]	Priority	gEUD a
HEART	688.3					
Upper		0.5	1700	3299	80	x
Upper		3.0	1100	1588	80	x
Upper		15.0	330	592	90	x
LUNG_LEFT	1181.1					
Upper		43.0	230	670	110	x
Upper		21.0	740	1463	105	x
Upper		8.0	1750	2815	90	x
Upper		3.0	2958	3773	65	x
Upper		0.0	4429	5268	60	x
LUNG_RIGHT	1350.0					
Upper		3.6	324	243	80	x
Upper		0.0	447	871	80	x
NS_Ring	719.0					
Upper		0.0	5300	5608	150	x
SPINAL CORD	52.1					
Upper		0.0	670	897	135	x
112	0.8					
BODY	27328.4					

Normal Tissue Objective: 85/Manual  
 Base Dose Plan: None  
 Settings: 2000/6000s/Normal (2.5 mm)

# Optimization constraints

## NTO



# Calculation Options

Model AcurosXB\_13.6.23: Acuros External Beam (version 13.6.23)  
AcurosXB: dose calculation algorithm for photon beams.

Acuros calculation options

Calculation grid size in CM	0.25
Field normalization type	100% to isocenter
Dose reporting mode	Dose to medium
Heterogeneity correction	ON
Plan dose calculation	ON
Automatic high density material	Bone
Maximum automatic high density volume in CM3	0.5

**Calculation grid size in CM**  
Calculation grid size in centimeters. Minimum 0.1 cm, maximum 0.3 cm.

**Plan Quality Scoresheet: 2016Competition-BodyMax**

This is the Plan Quality results spreadsheet for Plan Quality Algorithm: 2016Competition-BodyMax.

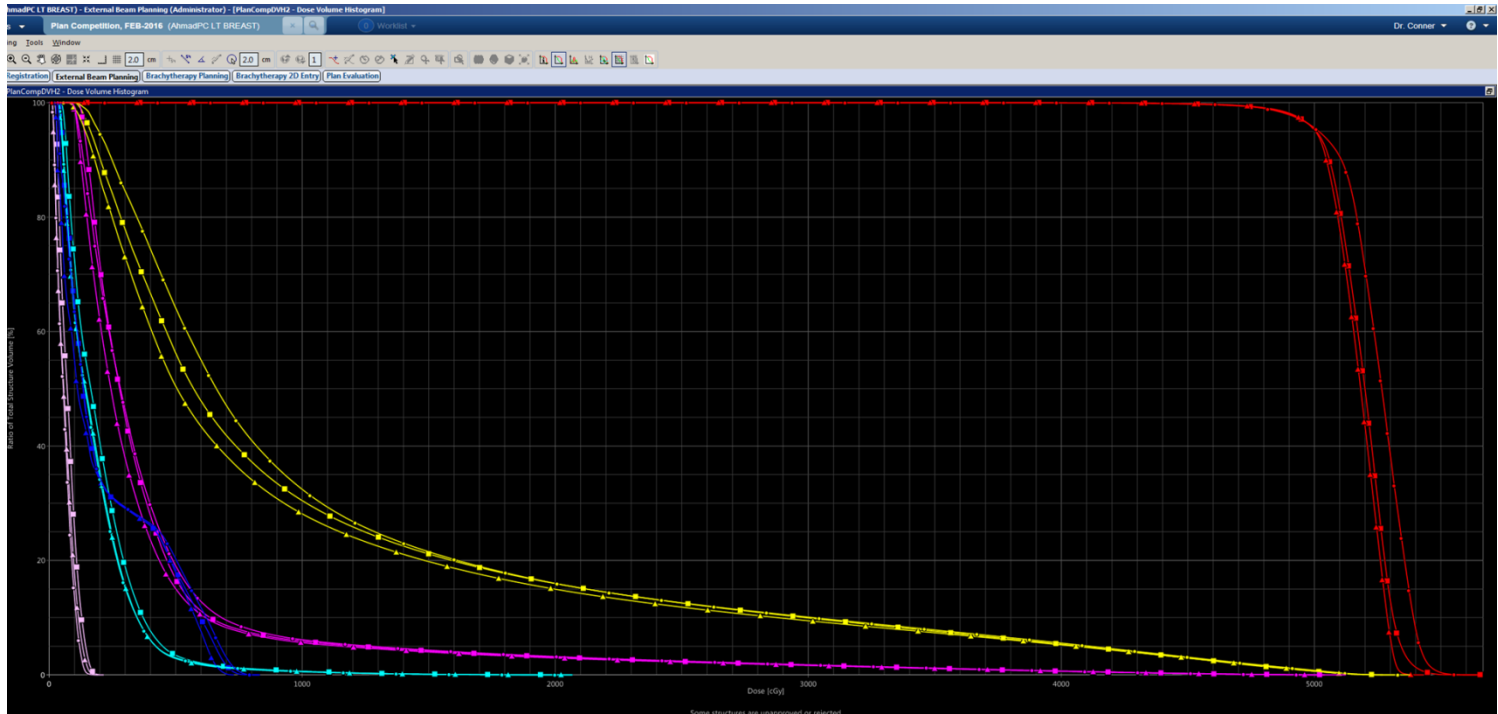
Raw PQM / Max PQM: 89.44 / 100.00 PQM (%): 89.4%

Plan Quality Metric Component	Objective(s)	Result	Raw Score	Max Score	Performance
[PTV_TOT_EVAL] D[99.0%] (Gy)	> 45 [≥ 47.5]	48.1812	15.00	15.00	100.0%
[PTV_TOT_EVAL] D[95.0%] (Gy)	> 45 [≥ 50]	49.9381	4.94	5.00	98.8%
[PTV_TOT_EVAL] D[50.0%] (Gy)	< 54 [≤ 52]	51.7974	5.00	5.00	100.0%
[PTV_TOT_EVAL] D[0.3cc] (Gy)	< 57 [≤ 55]	55.3899	4.03	5.00	80.5%
[HEART] Mean dose (Gy)	< 5 [≤ 4]	4.0568	9.43	10.00	94.3%
[HEART] V[15.0Gy] (%)	< 20 [≤ 15]	3.4080	5.00	5.00	100.0%
[HEART] D[5.0%] (Gy)	< 25 [≤ 20]	11.9199	5.00	5.00	100.0%
[BREAST_RIGHT] D[0.3cc] (Gy)	< 3 [≤ 2]	9.4238	0.00	2.00	0.0%
[BREAST_RIGHT] D[5.0%] (Gy)	< 3 [≤ 2]	2.2452	3.02	4.00	75.5%
[SPINAL_CORD] D[0.03cc] (Gy)	< 20 [≤ 8]	8.7460	4.69	5.00	93.8%
[LUNG_RIGHT] V[5.0Gy] (%)	< 6 [≤ 3]	0.3485	5.00	5.00	100.0%
[LUNG_LEFT] Mean dose (Gy)	< 15 [≤ 9]	9.4876	4.59	5.00	91.9%
[LUNG_LEFT] V[20.0Gy] (%)	< 20 [≤ 15]	14.5613	5.00	5.00	100.0%
[LUNG_LEFT] V[10.0Gy] (%)	< 40 [≤ 30]	30.7774	4.61	5.00	92.2%
[LUNG_LEFT] V[5.0Gy] (%)	< 70 [≤ 50]	52.3165	3.31	4.00	82.6%
[PTV_TOT_EVAL] Homogeneity Index [50.0Gy]	< 0.2 [≤ 0.08]	0.1243	2.71	5.00	54.3%
[PTV_TOT_EVAL] Conformation Number [47.5Gy]	> 0.6 [≥ 0.9]	0.7704	3.11	5.00	62.2%
Global Max Location (ROI)	[BODY]	BODY	5.00	5.00	100.0%
Total [18 Metrics]			89.44	100.00	89.4%

Generated By: Ahmad Nobah [ King Faisal Specialist Hospital and Research Centre ] 5/30/2016 10:38:37 AM

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# Dose calculation algorithm differences



- AAA
- AcurosXB
- ▲ Collapsed Cone

In this comparison the original plan was calculated using Collapsed Cone algorithm on a Varian IX machine with Millenium 120 MLC. The plan and dose were imported into Eclipse. The plan was copied and recalculated with fixed MU and then normalised to 95% coverage at prescription dose with both AAA and AcurosXB

# **Thank you !**

**To Ahmad for his amazing work,  
time and effort so we can learn  
and evolve together!**