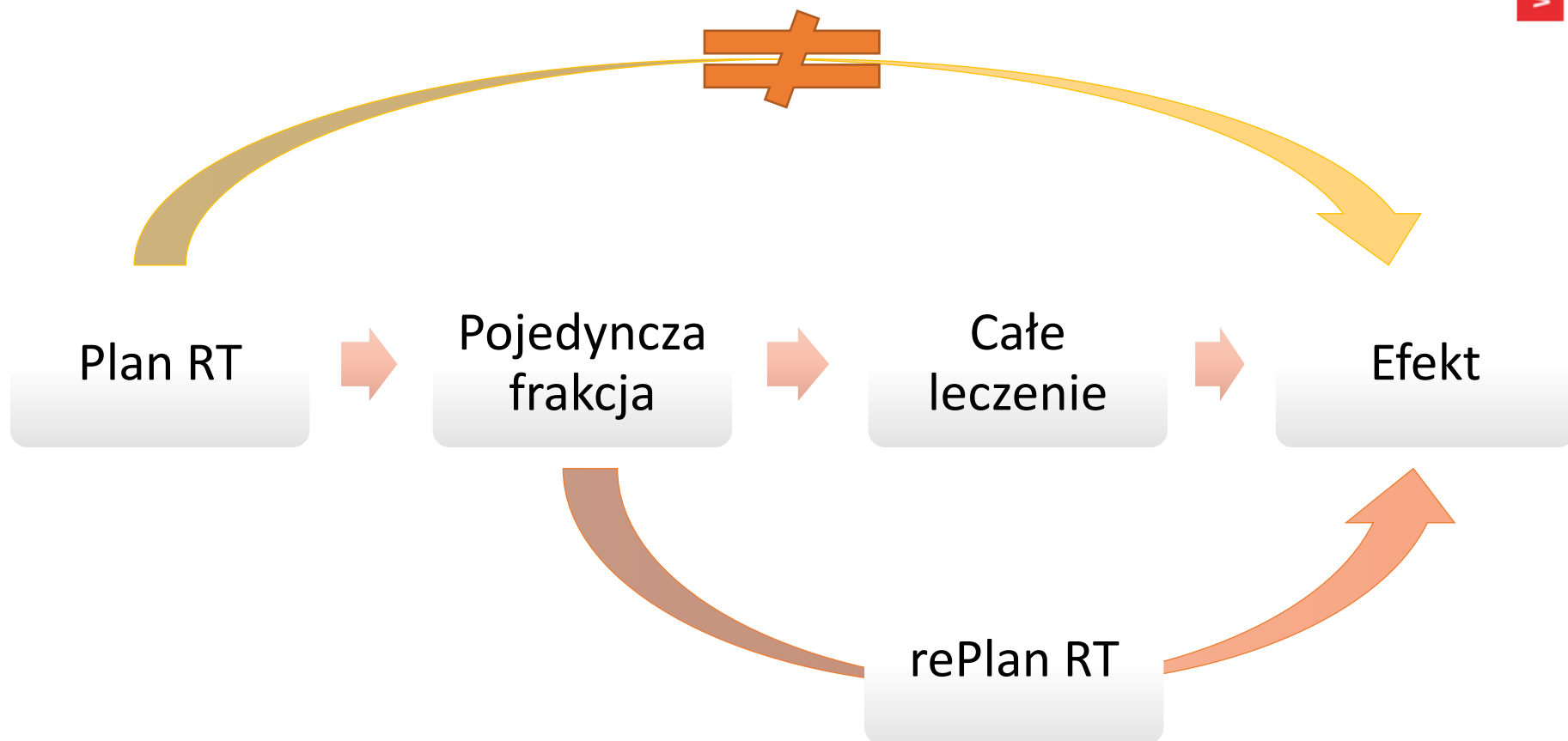


# Problem powtarzalności ułożenia chorego w czasie seansu terapeutycznego.

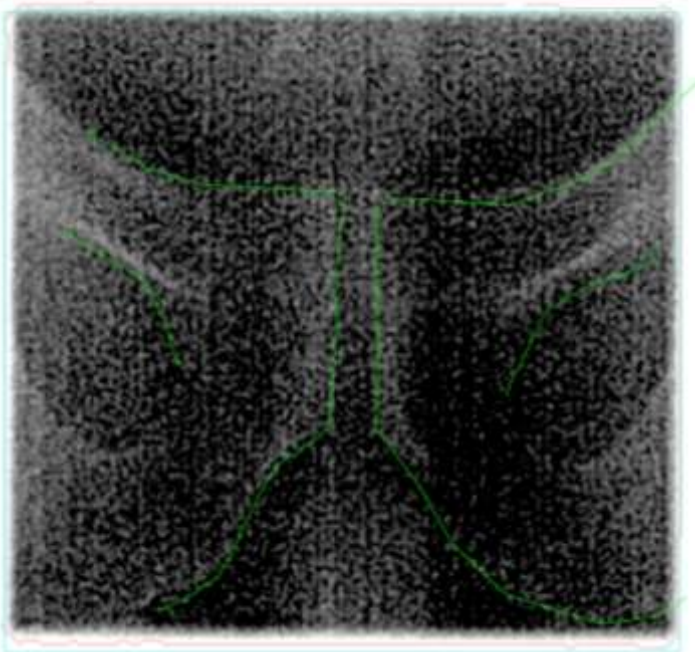
M.Giżyńska, D.Blatkiewicz, A.Cichoński, B.Czyżew, M.Gałecki,  
M.Gil-Ulkowska, M.Kamiński, S.Łukomska, A.Paciorkiewicz,  
M.Piziorska, A.Zaleska, M.Ziemek, J.Żygierewicz, P.Kukołowicz

# Background

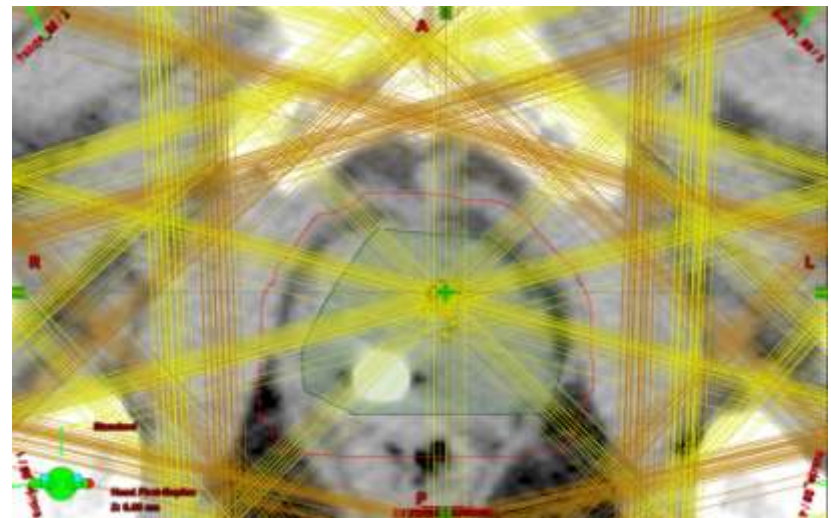
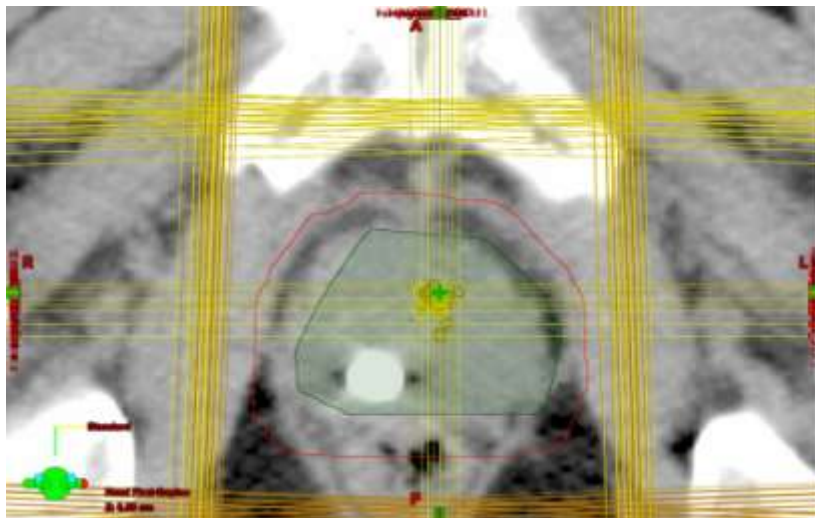


# Influence of the set-up errors on dose distribution.

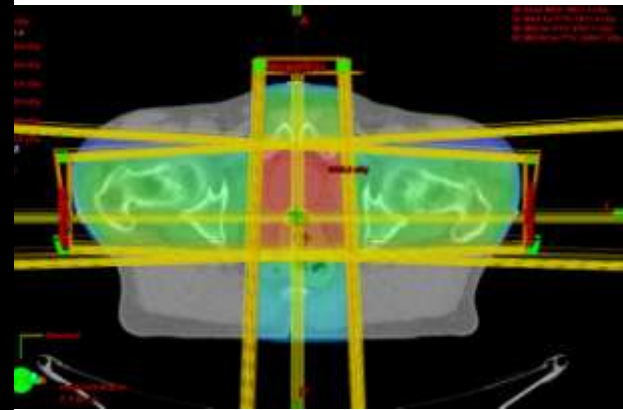
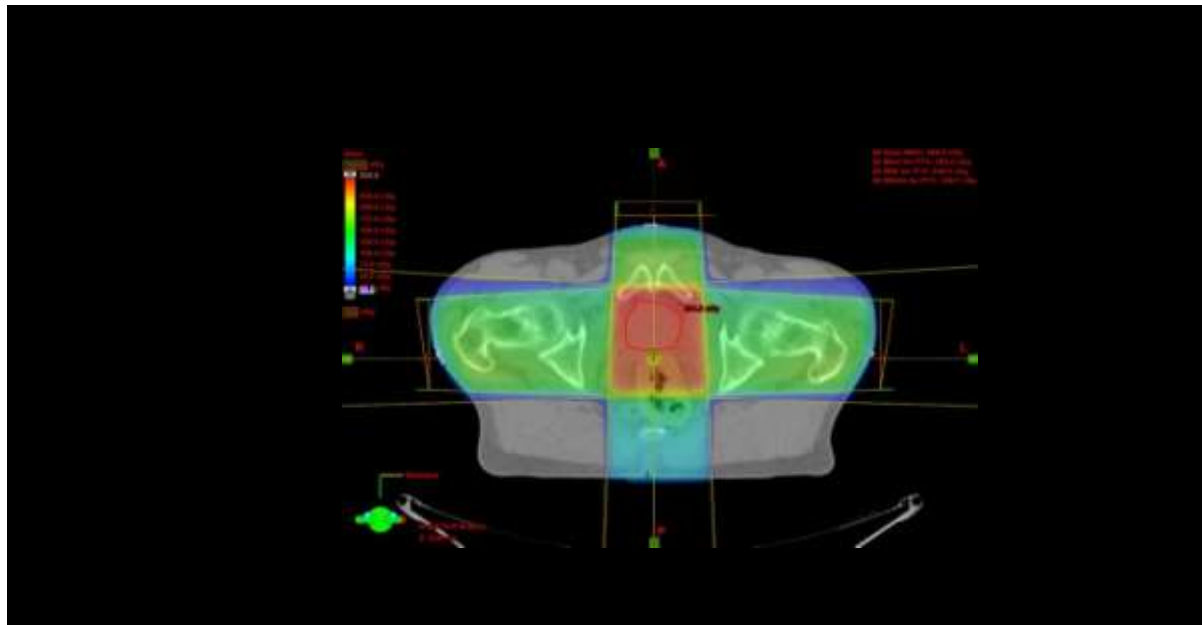
# 1: Record patient setup error



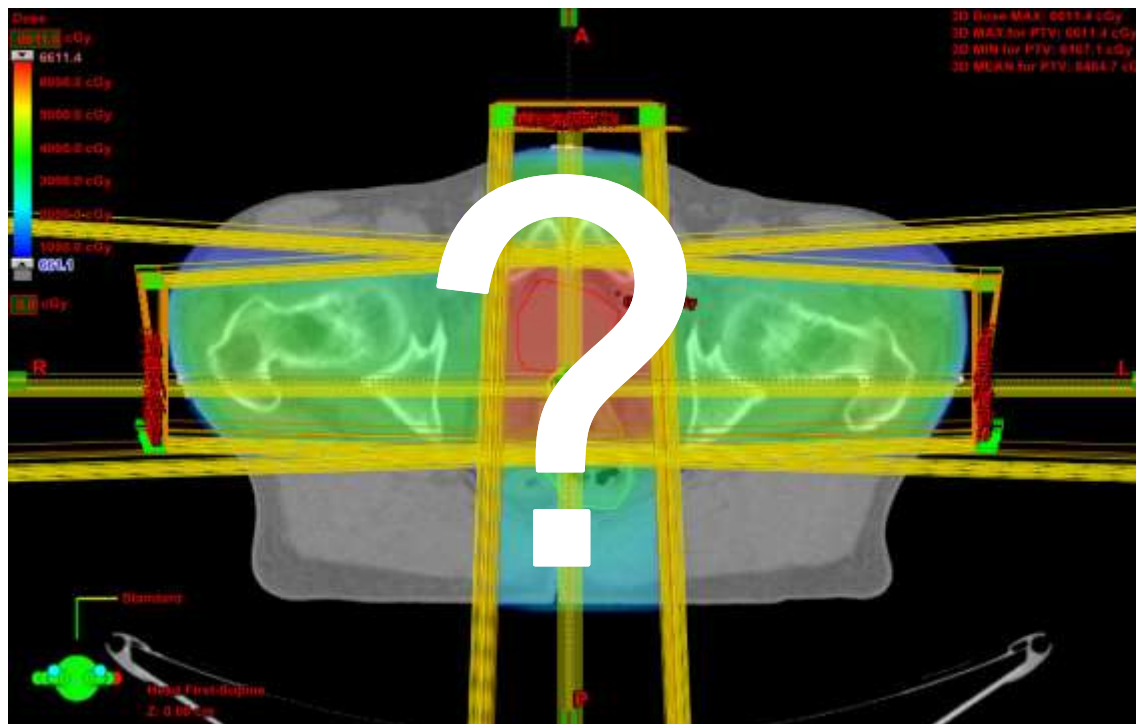
## 2: Calculate Cumulative Dose



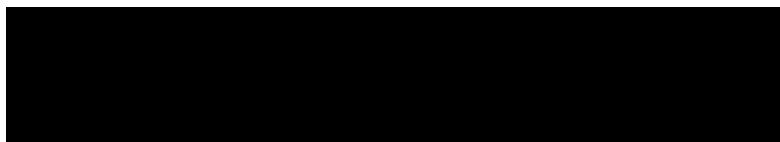
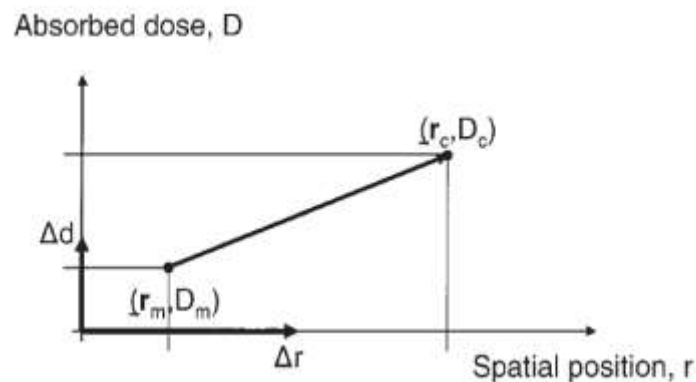
## 2: Calculate Cumulative Dose



# 3: Estimation?



# Gamma comparison





# Gamma comparison

PLAN	-4	-2	0	2	4	6
-4	9,72	13,62	10,30	12,67	14,93	10,37
-2	11,15	13,93	12,70	11,57	13,02	12,54
0	8,14	5,42	7,83	8,57	13,43	12,41
2	12,39	6,34	7,44	12,86	12,05	12,96
4	5,76	14,40	11,42	13,36	7,60	12,31
6	9,92	8,40	14,40	14,88	10,56	6,98

ESTIMAT.	-4	-2	0	2	4	6
-4	7,58	6,48	8,57	8,85	7,35	13,15
-2	5,75	13,32	14,47	14,24	5,77	7,82
0	8,39	6,99	10,23	9,04	7,88	13,44
2	11,05	7,41	7,07	7,88	13,46	10,93
4	10,03	11,37	5,04	7,47	5,70	10,41
6	5,92	12,40	14,71	13,80	8,87	14,71

TEMP	-4	-2	0	2	4	6
-4						
-2						
0						
2						
4						
6						

GAMMA	-4	-2	0	2	4	6
-4						
-2						
0						
2						
4						
6						

# Gamma comparison

PLAN	-4	-2	0	2	4	6
-4	9,72	13,62	10,30	12,67	14,93	10,37
-2	11,15	13,93	12,70	11,57	13,02	12,54
0	8,14	5,42	7,83	8,57	13,43	12,41
2	12,39	6,34	7,44	12,86	12,05	12,96
4	5,76	14,40	11,42	13,36	7,60	12,31
6	9,92	8,40	14,40	14,88	10,56	6,98

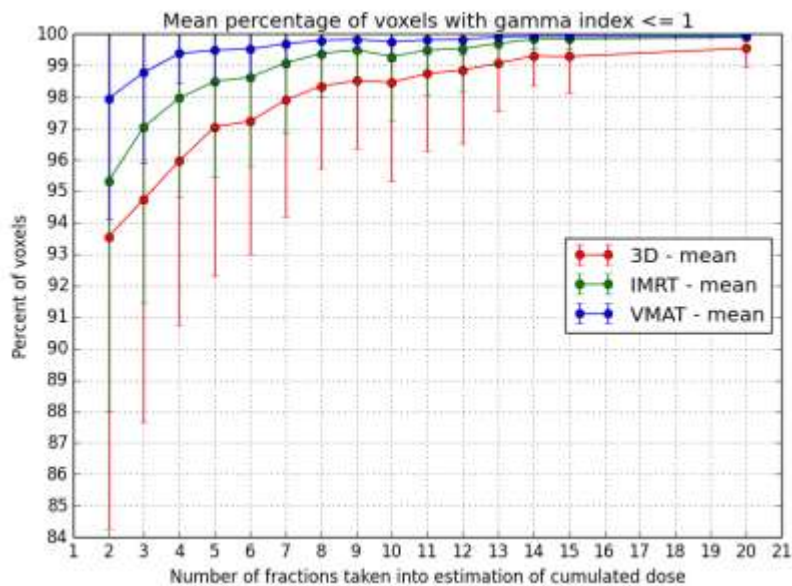
ESTIMAT.	-4	-2	0	2	4	6
-4	7,58	6,48	8,57	8,85	7,35	13,15
-2	5,75	13,32	14,47	14,24	5,77	7,82
0	8,39	6,99	10,23	9,04	7,88	13,44
2	11,05	7,41	7,07	7,88	13,46	10,93
4	10,03	11,37	5,04	7,47	5,70	10,41
6	5,92	12,40	14,71	13,80	8,87	14,71

TEMP	-4	-2	0	2	4	6
-4	1,26	1,08	0,67	0,83	1,29	2,31
-2	1,25	1,61	1,97	1,91	1,25	1,46
0	0,67	0,53	0,87	0,16	0,71	2,10
2	1,17	0,48	0,50	0,36	1,83	1,64
4	1,31	1,24	1,35	0,90	1,55	1,84
6	1,95	1,92	2,44	2,26	1,74	2,98

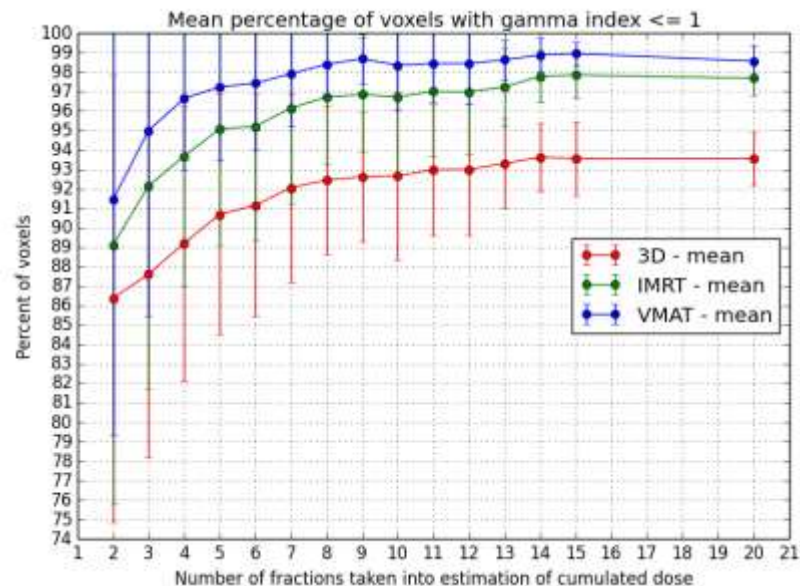
GAMMA	-4	-2	0	2	4	6
-4						
-2						
0			0,71	0,16		
2						
4						
6						

# 3a: Estimate with Mean Shift

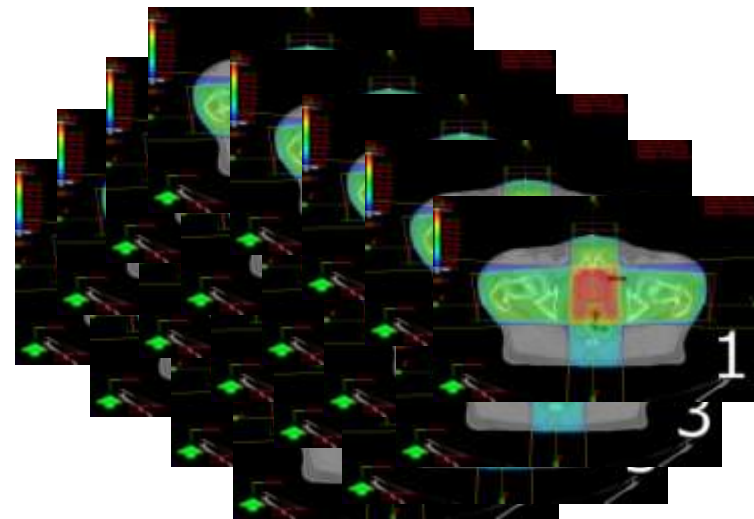
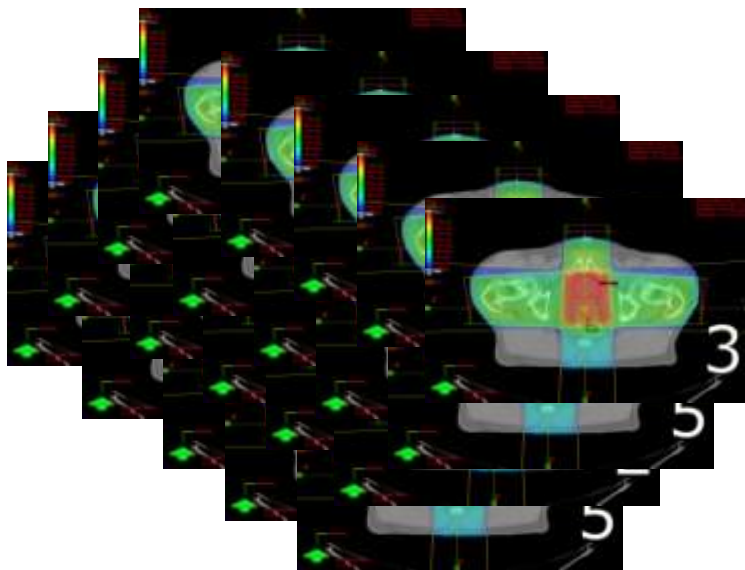
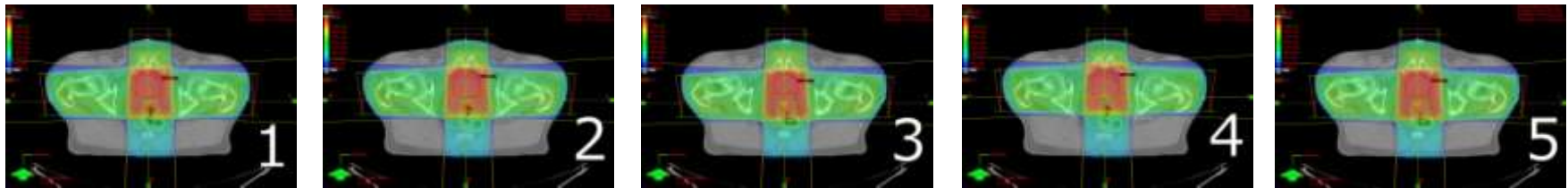
## Gamma 2mm 2% max dose



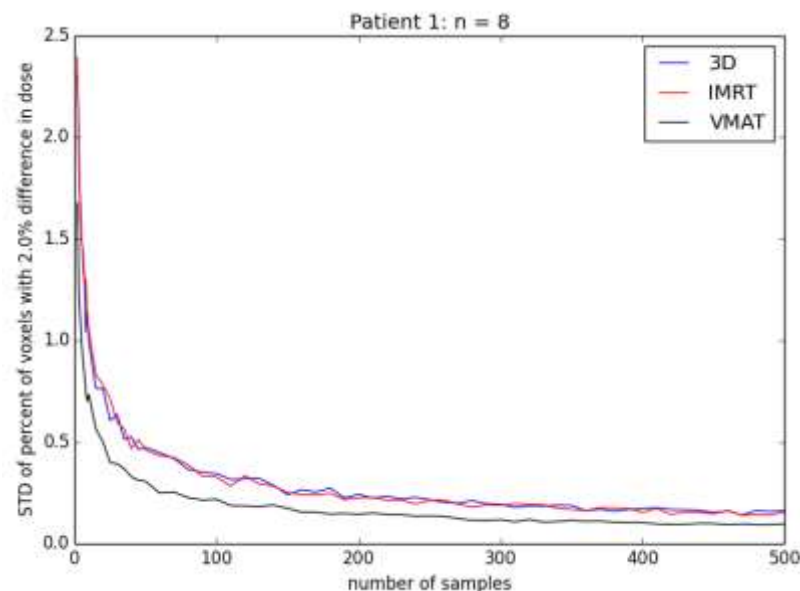
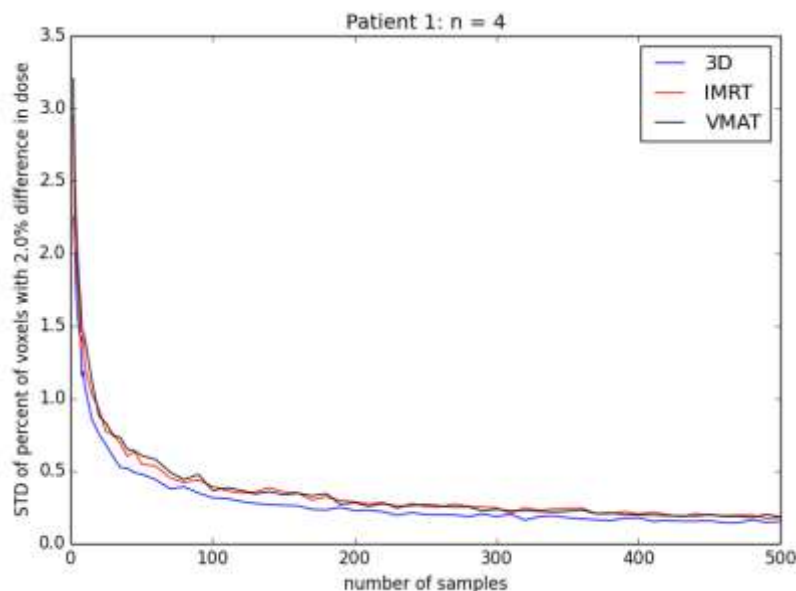
## Gamma 2mm 2% local dose



# 3b: Estimate with bootstrap

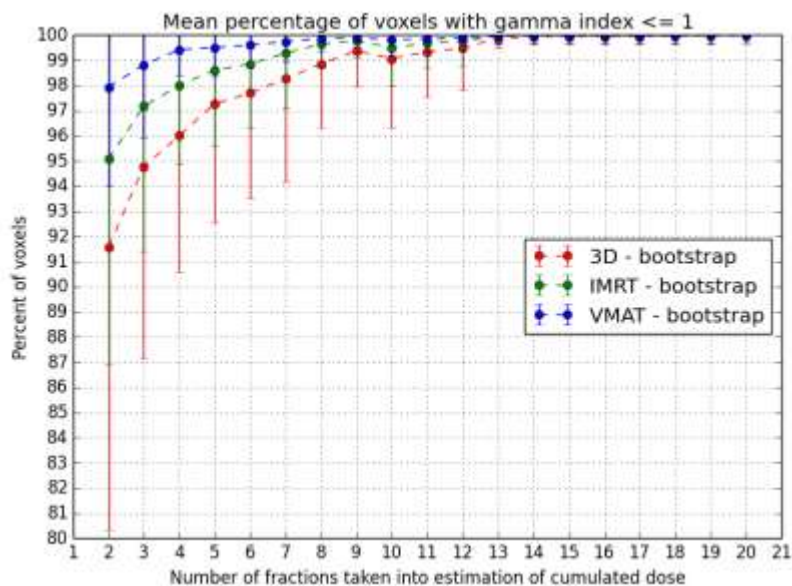


# 3b: Estimate with bootstrap

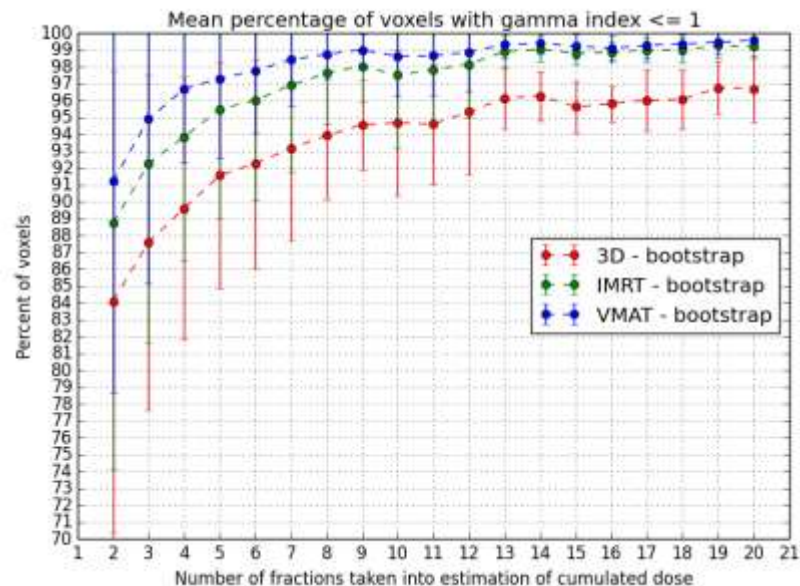


# 3b: Estimate with bootstrap

## Gamma 2mm 2% max dose



## Gamma 2mm 2% local dose

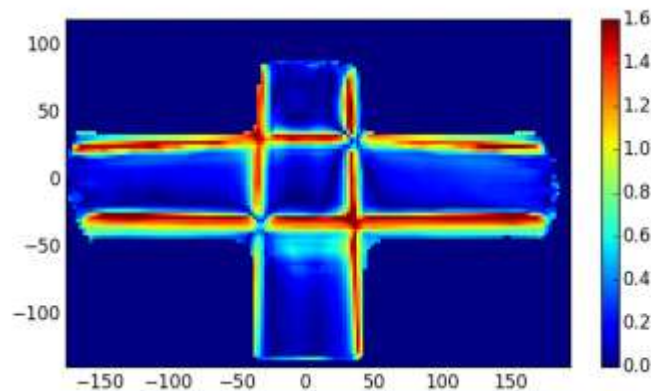




# 3: Bootstrap vs Mean estimation

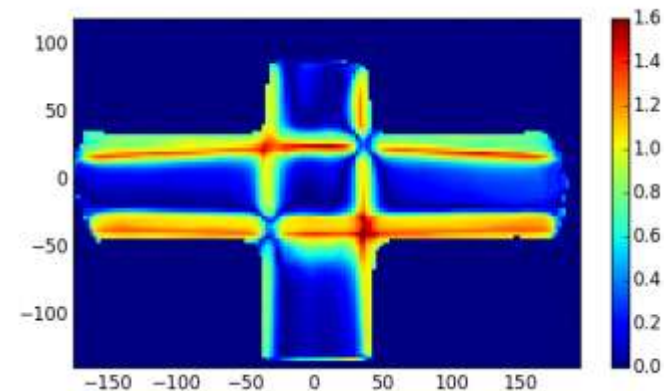
**3D:**

**MEAN: from 4 fractions**



**3D:**

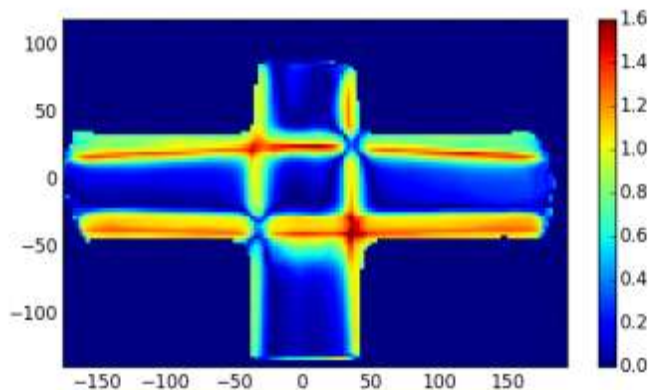
**BOOTSTRAP: from 4 fractions**



# 3: Bootstrap vs Mean estimation

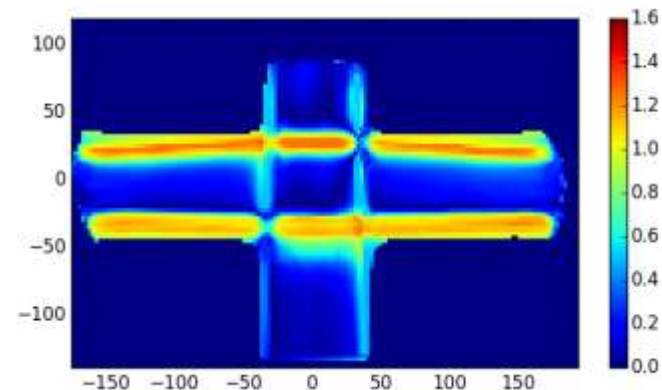
3D:

**BOOTSTRAP: from 4 fractions**



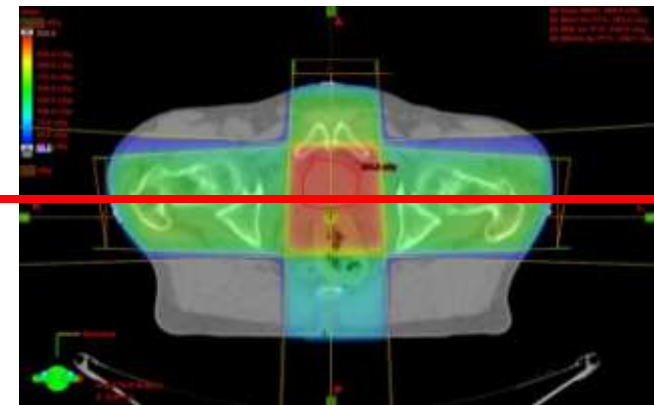
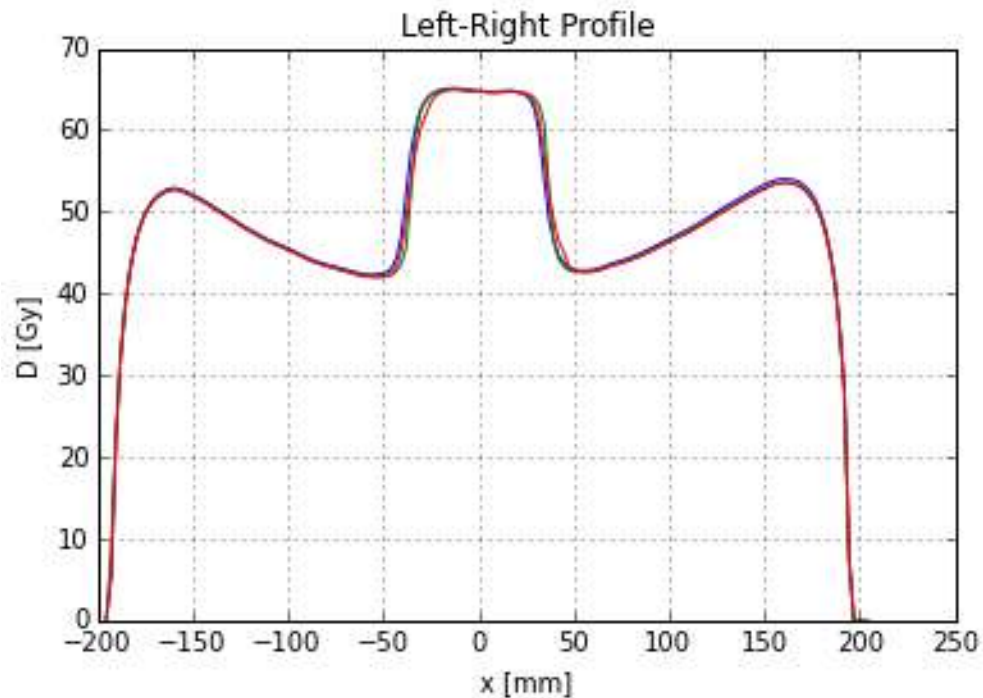
3D:

**BOOTSTRAP: from 8 fractions**

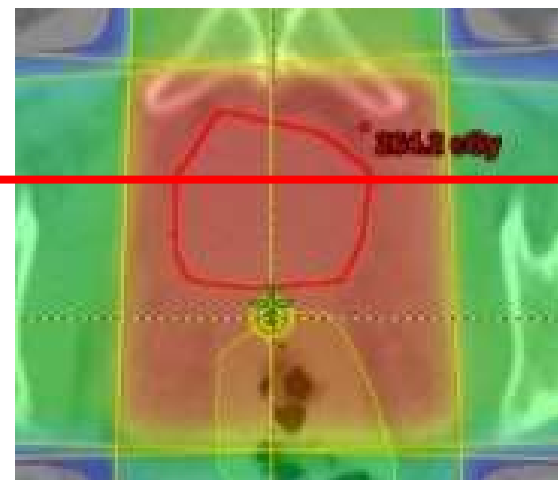
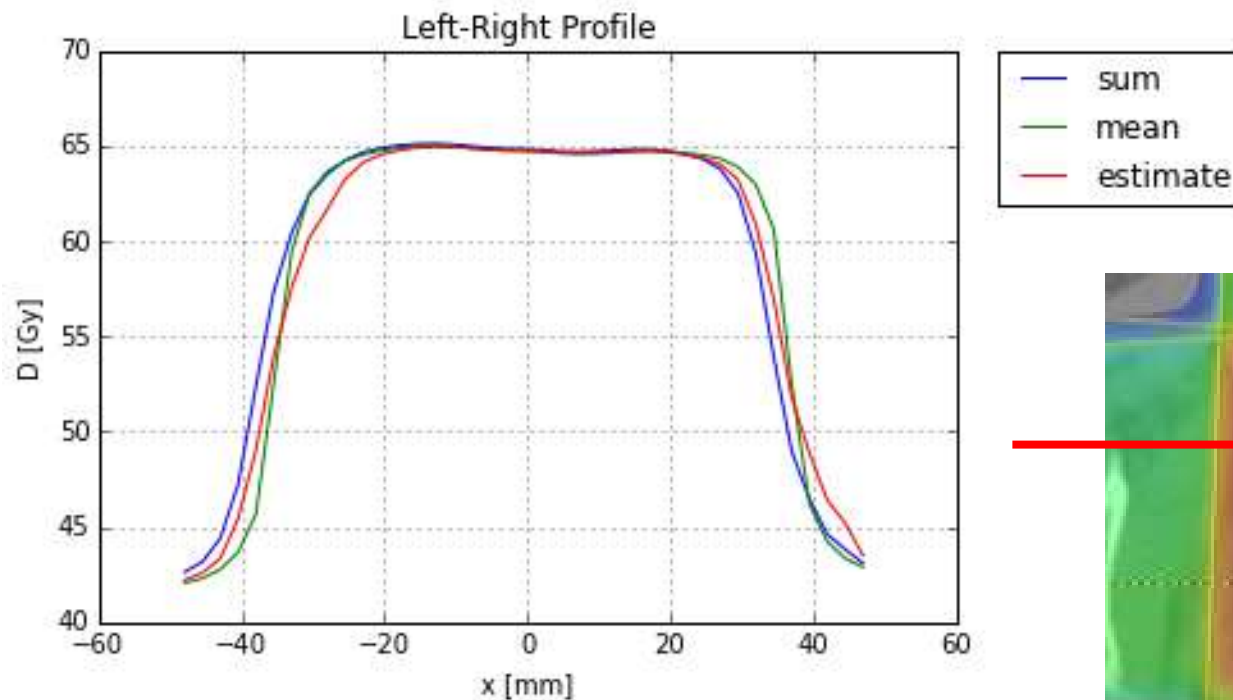




# 3: Bootstrap vs Mean estimation



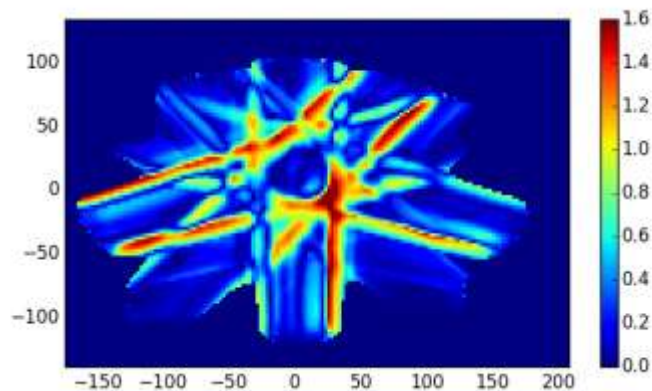
# 3: Bootstrap vs Mean estimation



# 3: Bootstrap vs Mean estimation

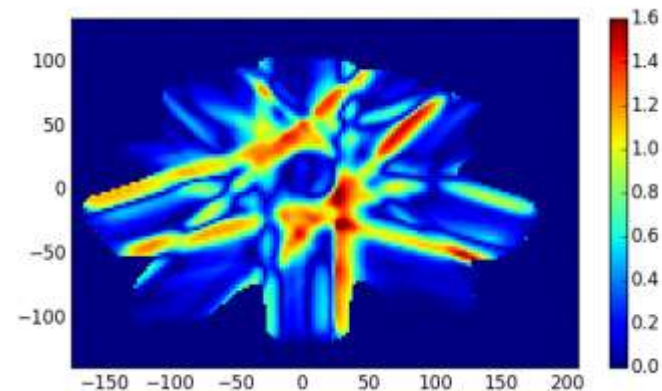
**IMRT:**

**MEAN: from 4 fractions**



**IMRT:**

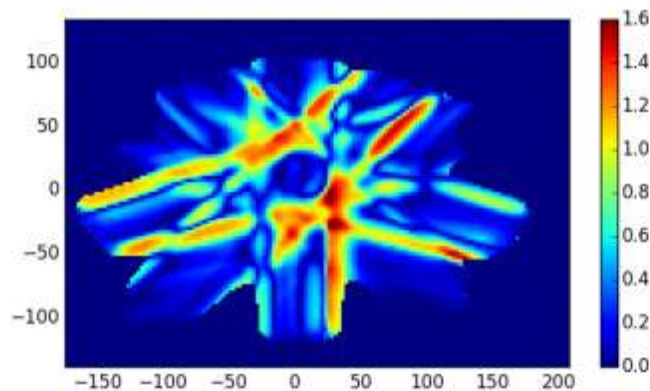
**BOOTSTRAP: from 4 fractions**



# 3: Bootstrap vs Mean estimation

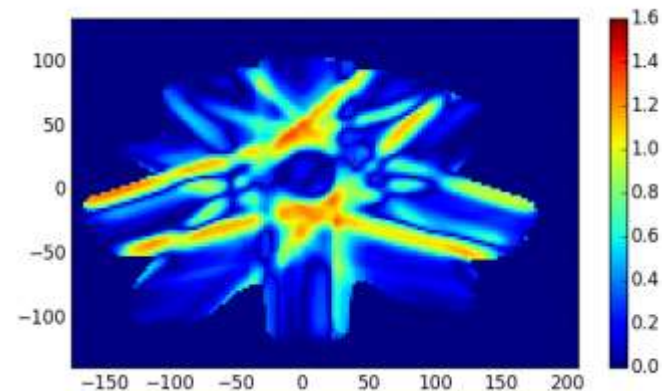
**IMRT:**

**BOOTSTRAP: from 4 fractions**



**IMRT:**

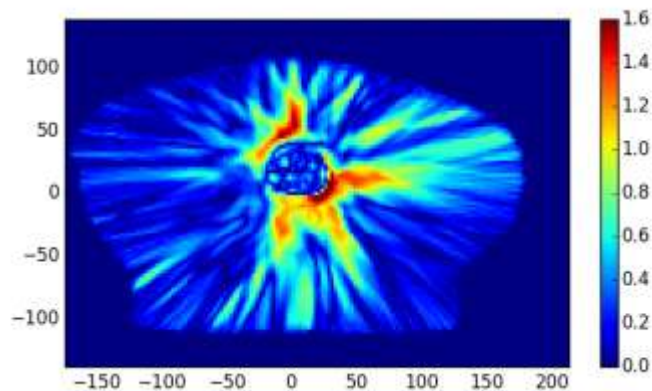
**BOOTSTRAP: from 8 fractions**



# 3: Bootstrap vs Mean estimation

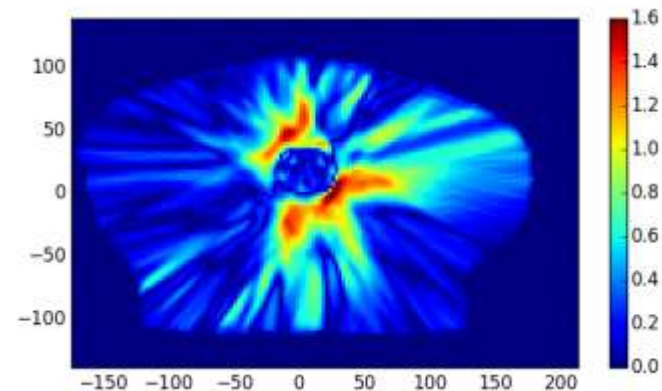
**VMAT:**

**MEAN: from 4 fractions**



**VMAT:**

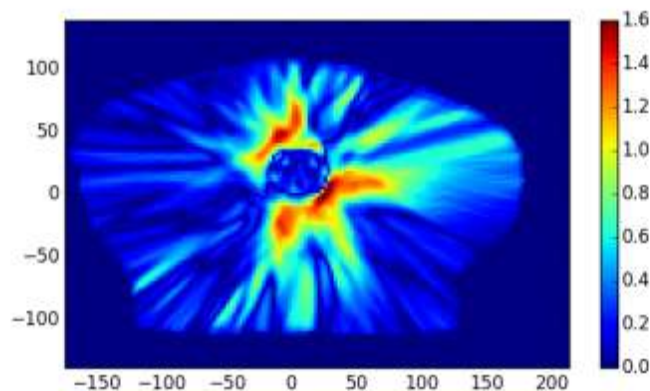
**BOOTSTRAP: from 4 fractions**



# 3: Bootstrap vs Mean estimation

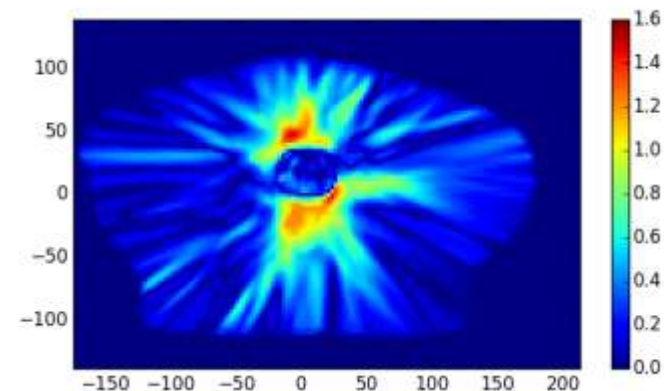
**VMAT:**

**BOOTSTRAP : from 4 fractions**



**VMAT:**

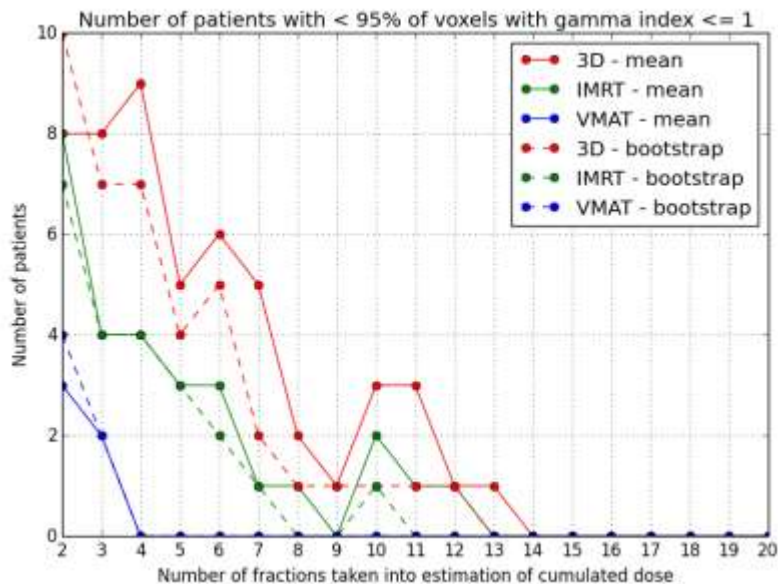
**BOOTSTRAP: from 8 fractions**



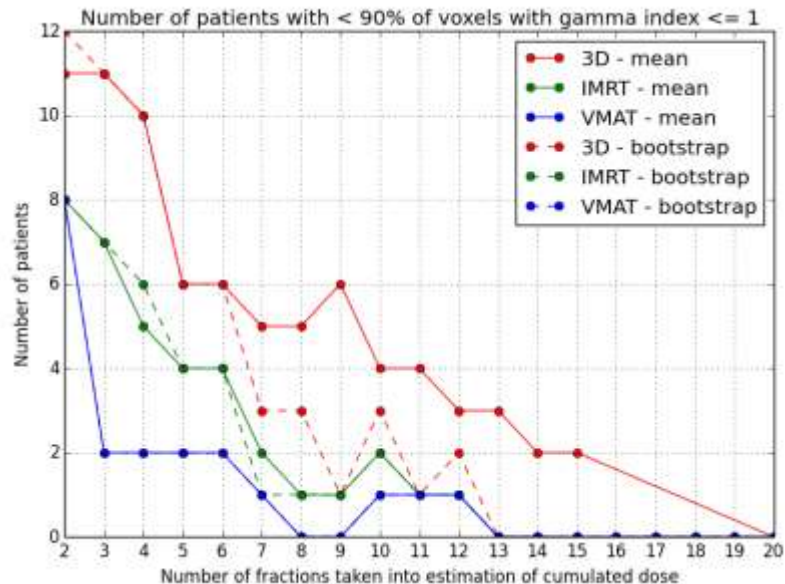


# 3: Bootstrap vs Mean estimation

## Gamma 2mm 2% max dose

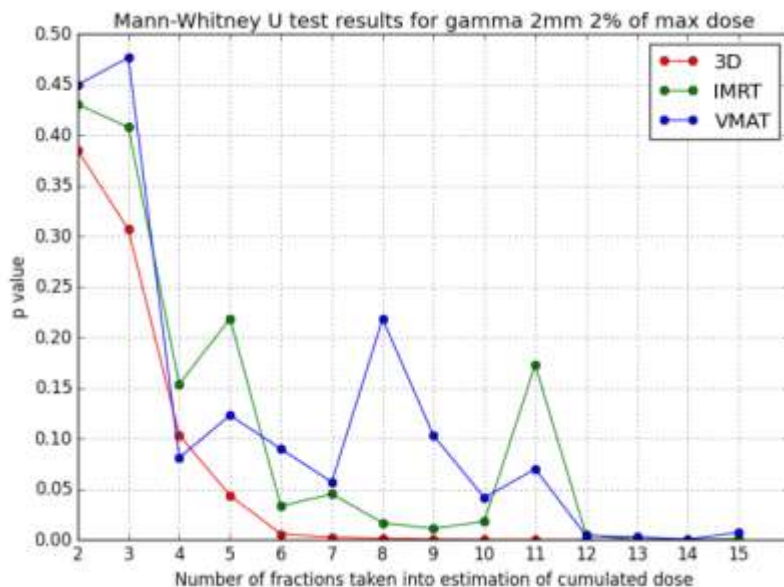


## Gamma 2mm 2% local dose

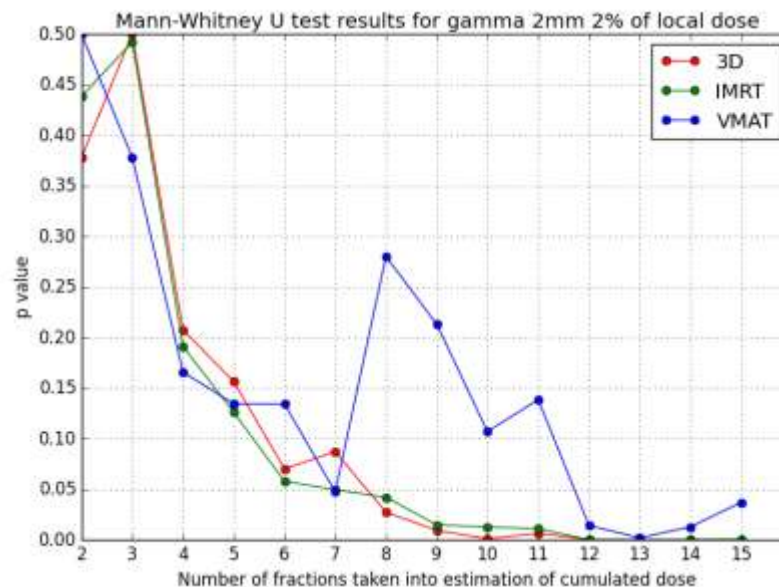


# 3: Bootstrap vs Mean estimation

## Gamma 2mm 2% max dose



## Gamma 2mm 2% local dose

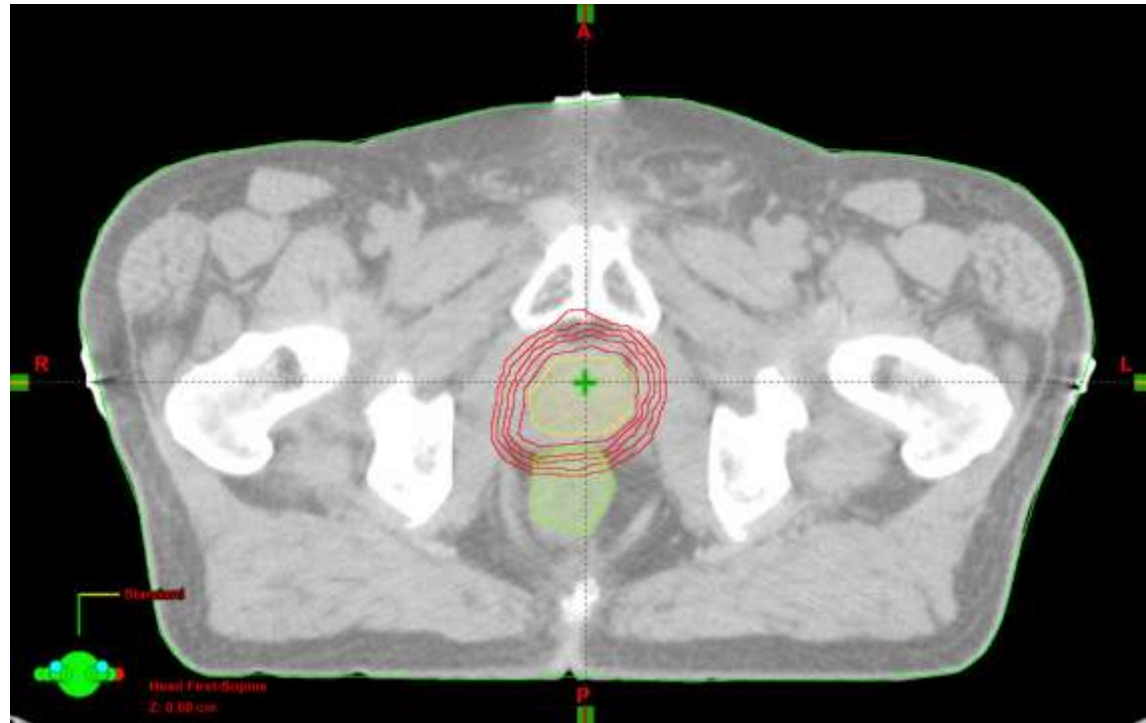




# Can we change the CTV-PTV margin?

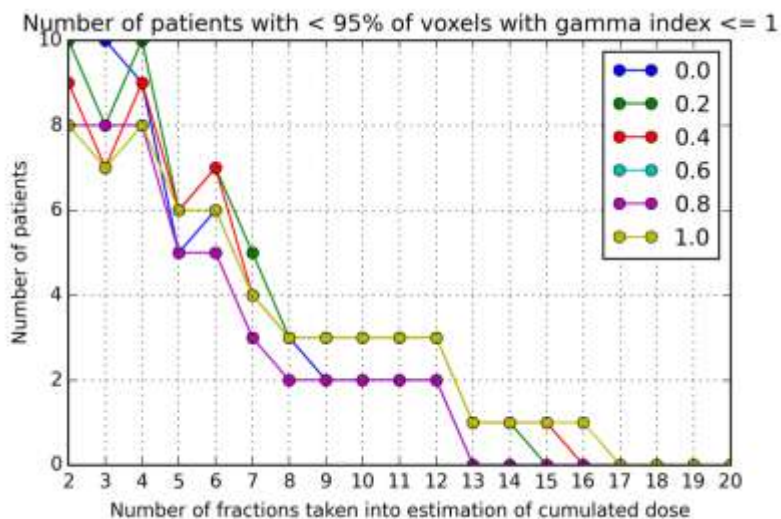
# 4: Test different margins

- 0.0cm
- 0.2cm
- 0.4cm
- 0.6cm
- 0.8cm
- 1.0cm

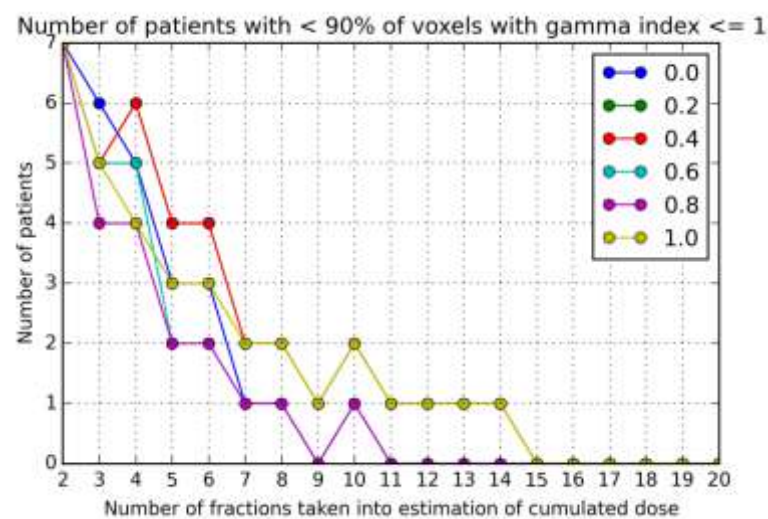


# 4: Test different margins

**Gamma 2mm 2% max dose  
(3D; result < 95%)**

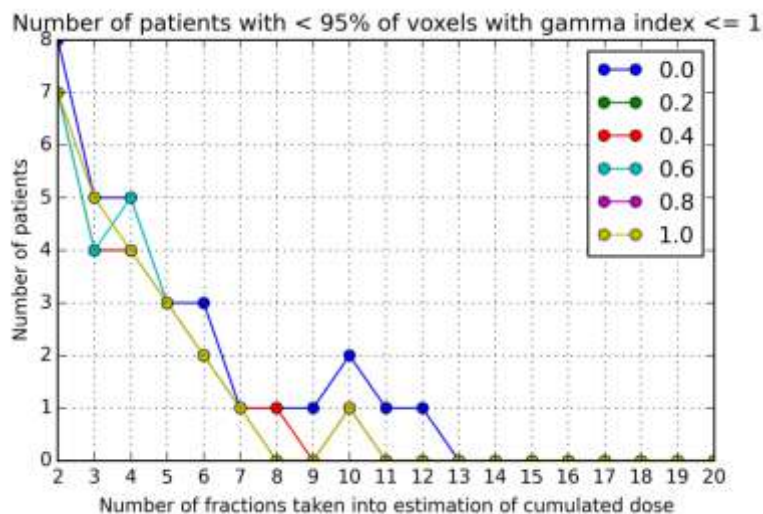


**Gamma 2mm 2% max dose  
(3D; result < 90%)**

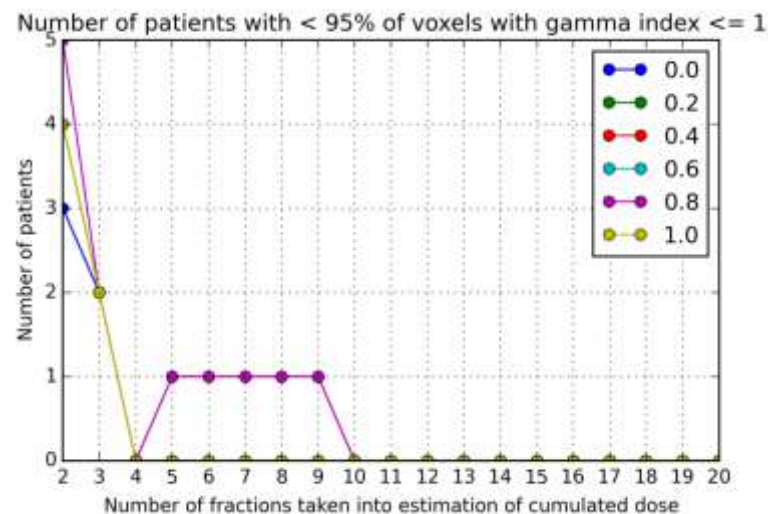


# 4: Test different margins

**Gamma 2mm 2% max dose  
(IMRT; result < 95%)**

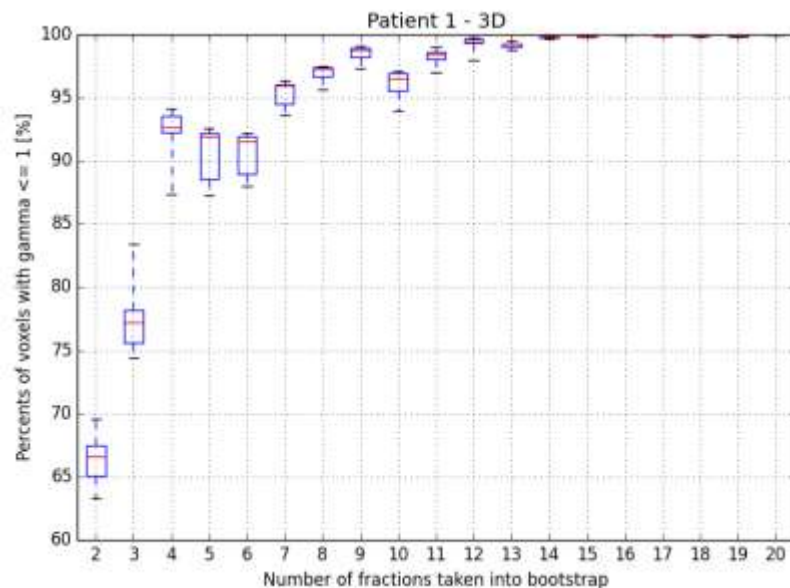


**Gamma 2mm 2% max dose  
(VMAT; result < 95%)**

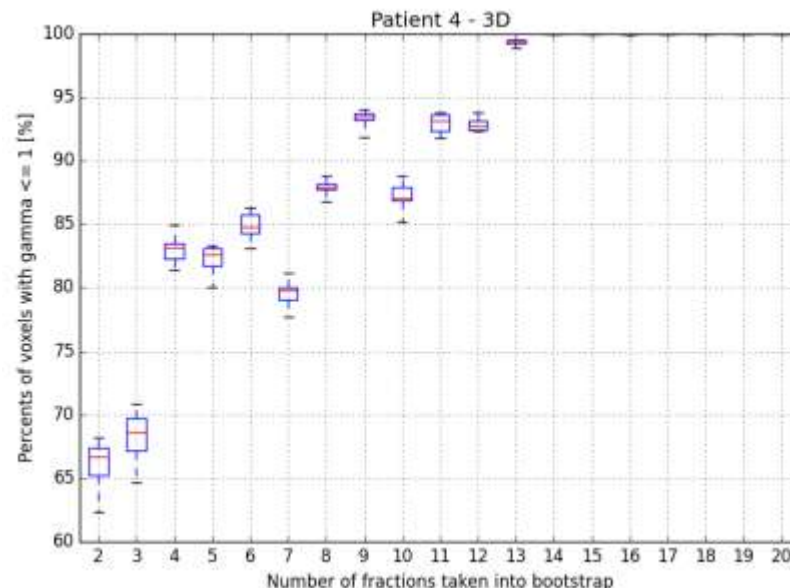


# 4: Test different margins

**Gamma 2mm 2% max dose  
(3D)**

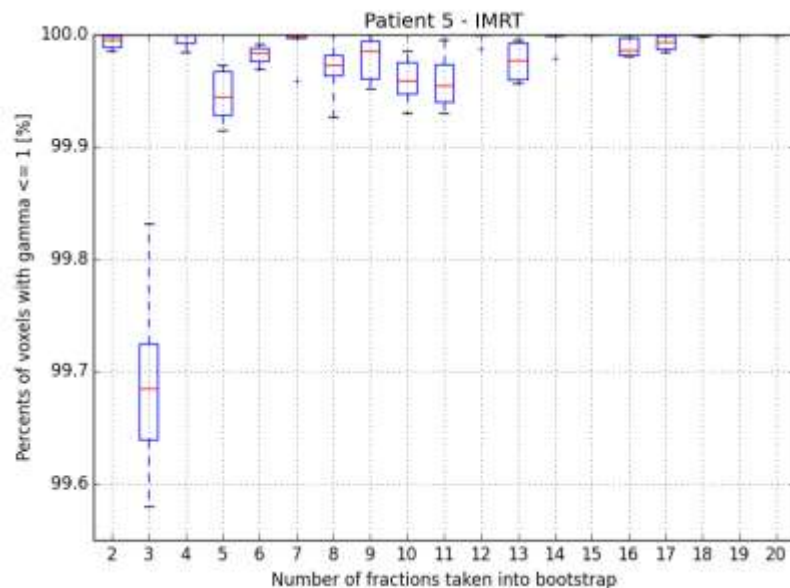


**Gamma 2mm 2% max dose  
(3D)**

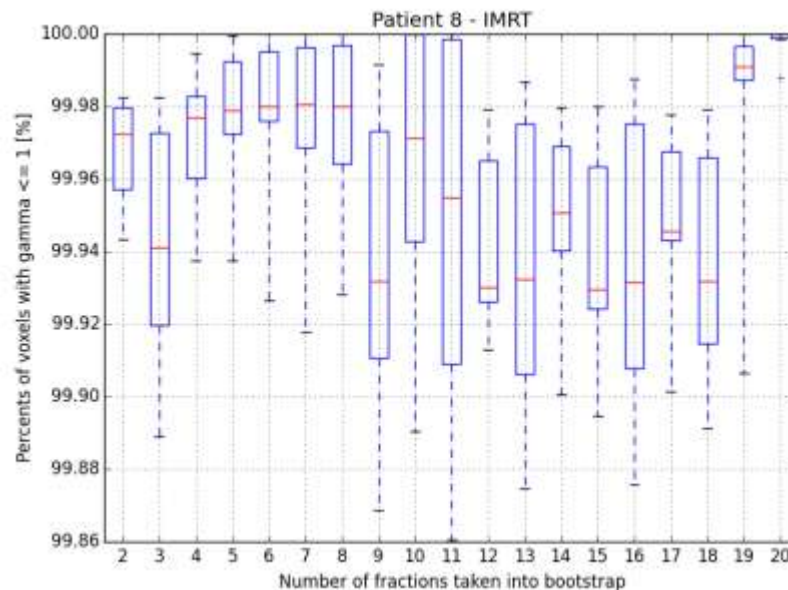


# 4: Test different margins

**Gamma 2mm 2% max dose  
(IMRT)**



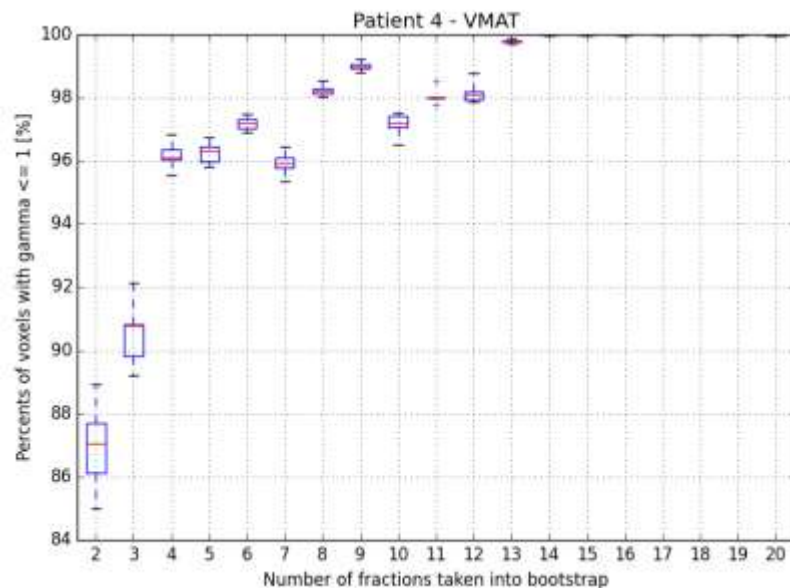
**Gamma 2mm 2% max dose  
(IMRT)**



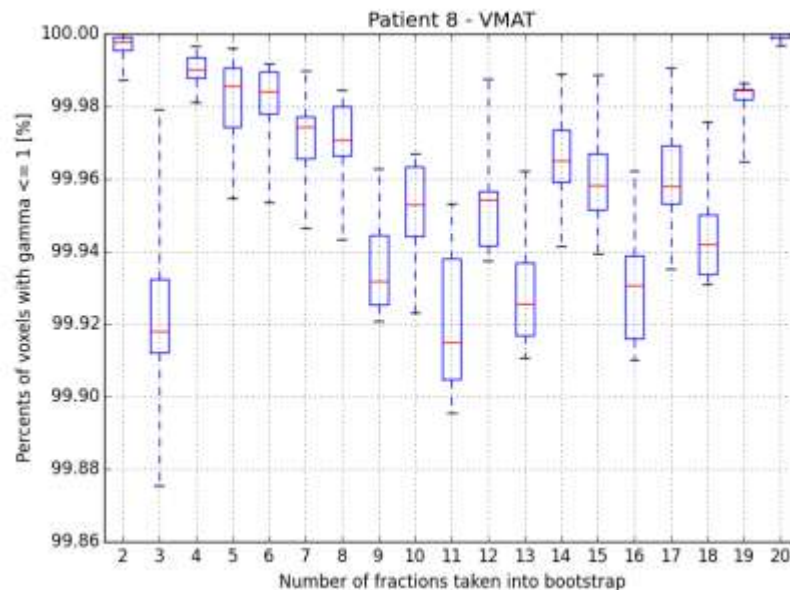


# 4: Test different margins

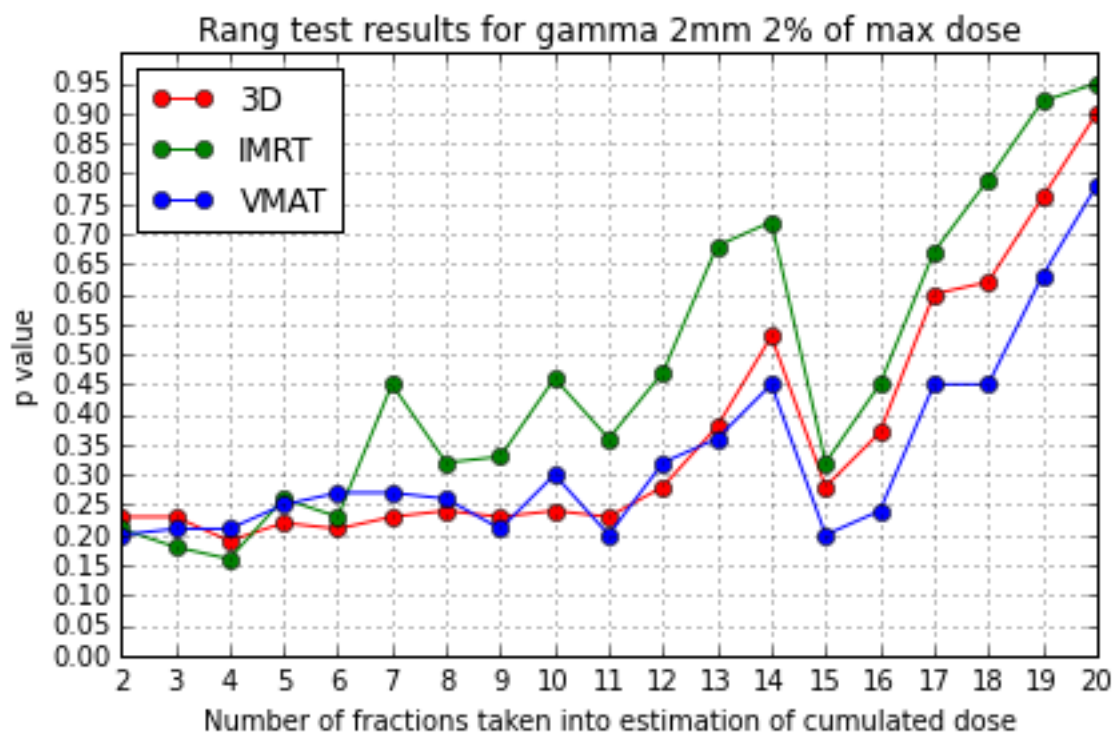
**Gamma 2mm 2% max dose  
(VMAT)**



**Gamma 2mm 2% max dose  
(VMAT)**



# 4: Test different margins

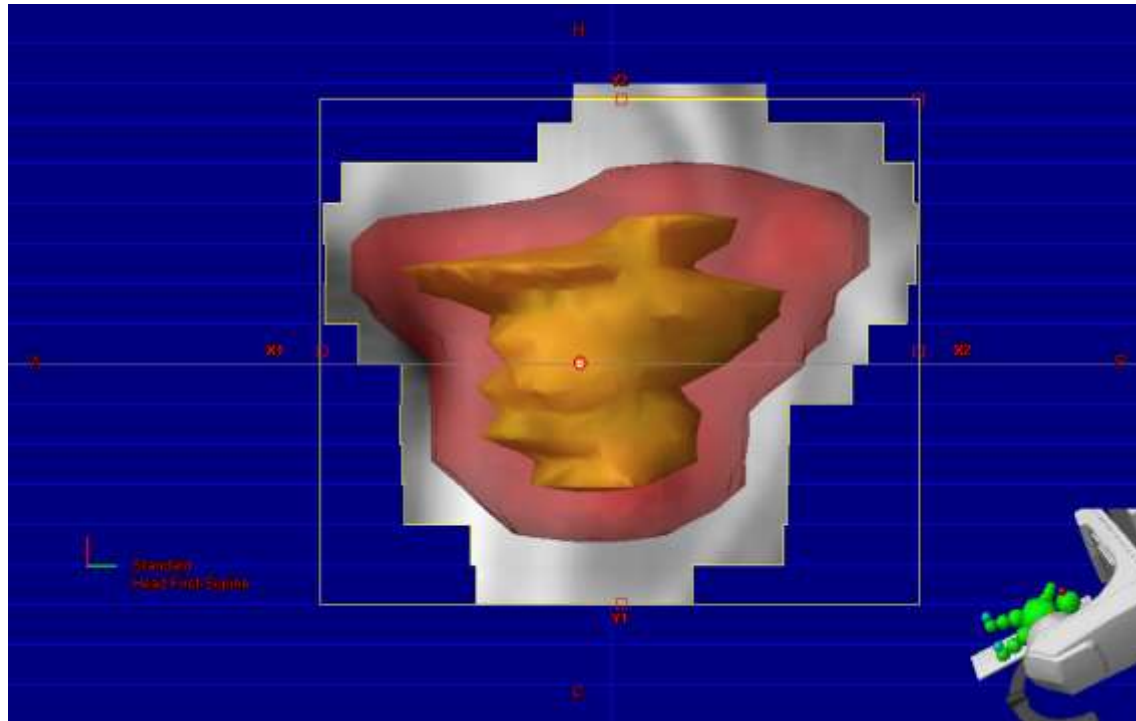




# How to change the dose distribution?

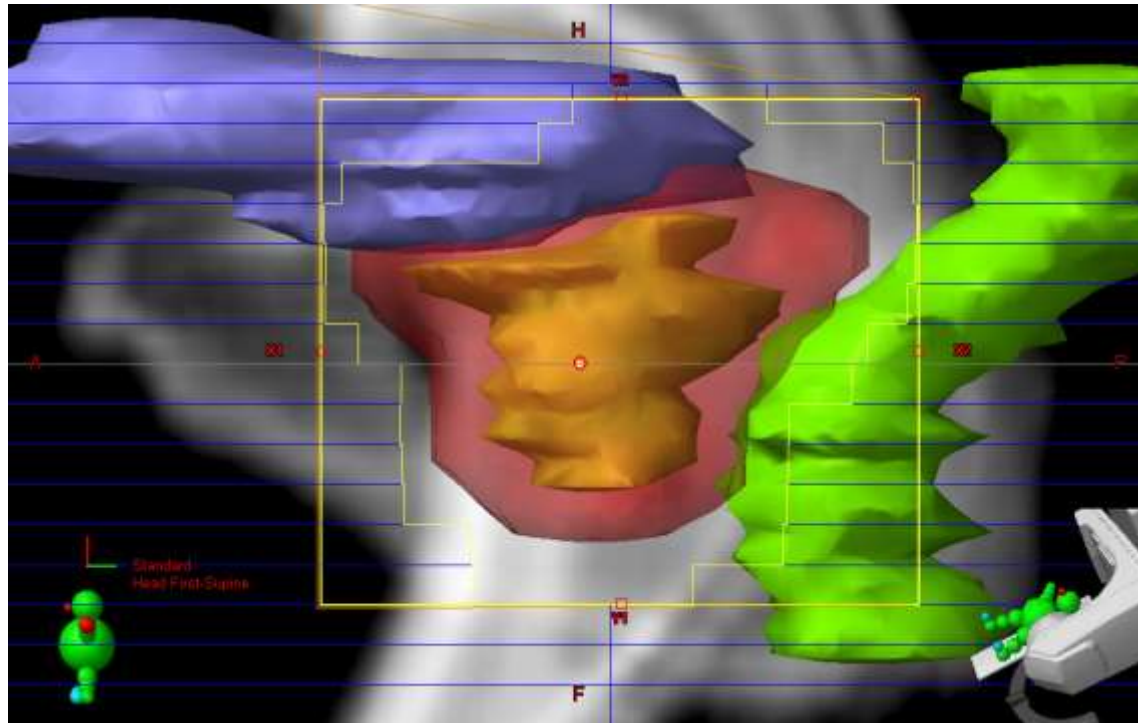
# 5: Individualize Plan

(probably) coming soon 😊



# 5: Individualize Plan

(propably) coming soon 😊



# 5: Individualize Plan

(probably) coming soon 😊

