



# **IQM verification for breast VMAT treatments**

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*IQM Webinar series*  
*6/4/2025*

ziekenhuisnetwerk  
**kempen** >>>



# Radiotherapy AZ Turnhout



2 Elekta Versa HD  
Somatom Definition AS Open  
LDR brachytherapie



5 (+1) RO  
4 (+1) MPE  
3 MPA  
15 RTT



1500 patients / year  
65000 fractions / year





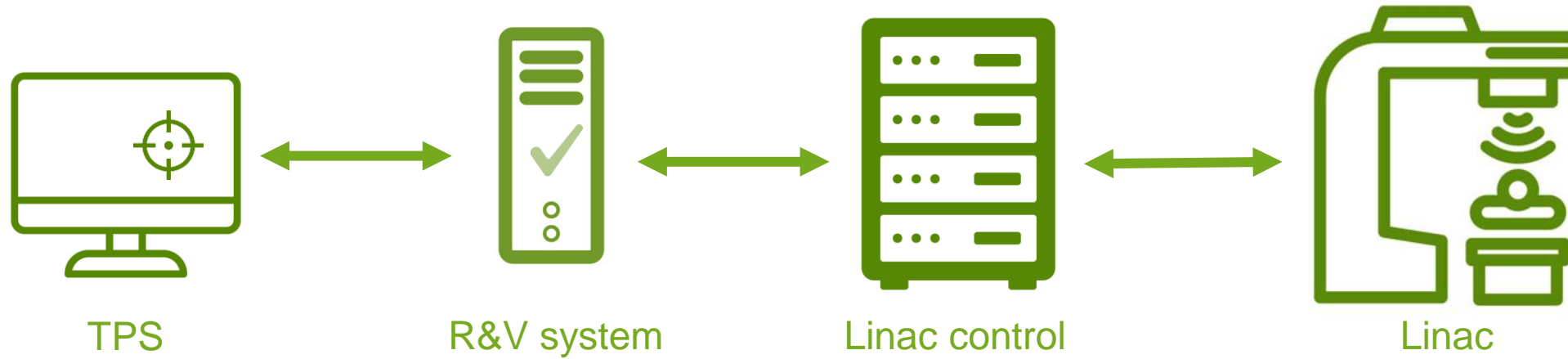
# Contents

1. IQM @ AZ Turnhout
2. Breast VMAT & IQM
3. Conclusions

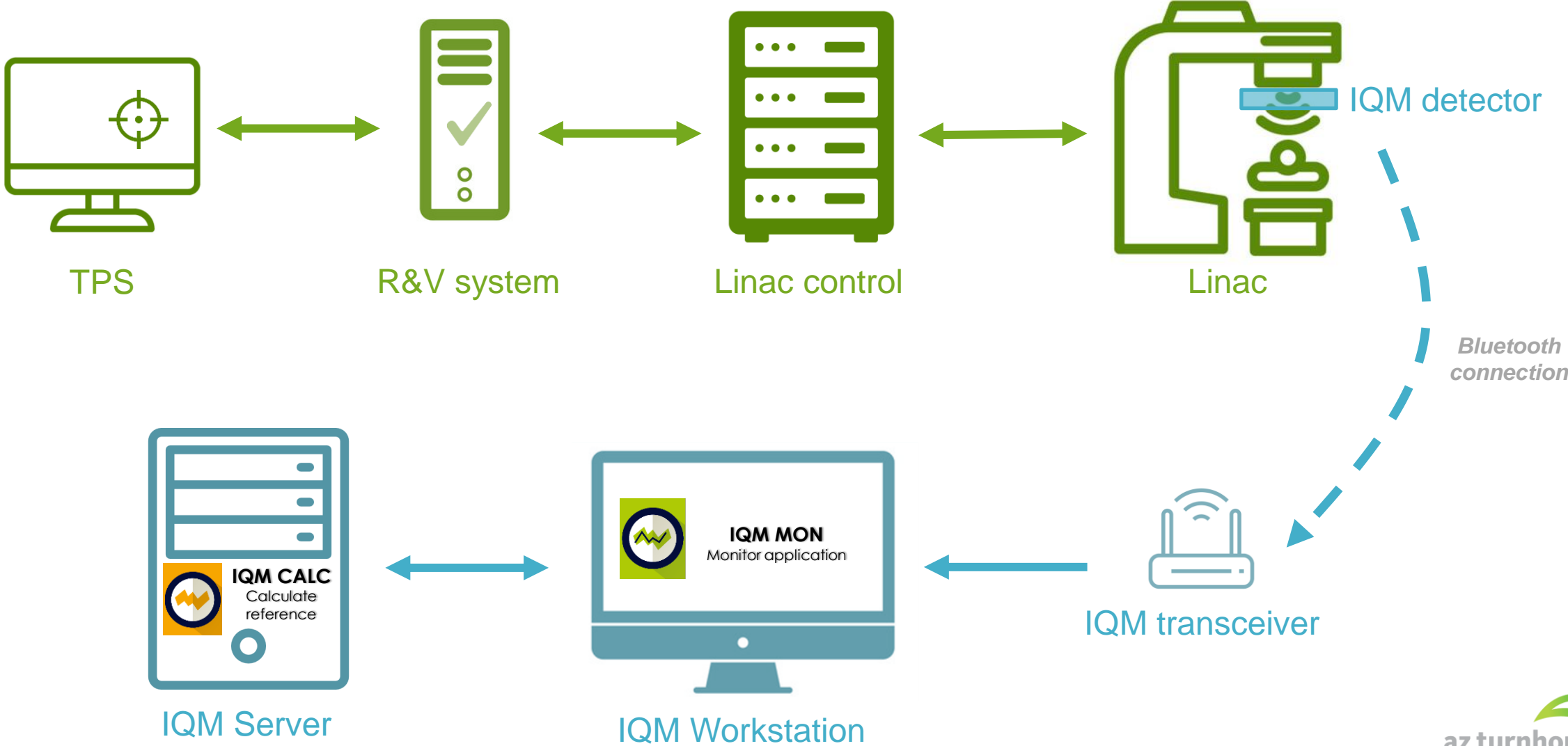
Part 1

# **IQM @ AZ Turnhout**

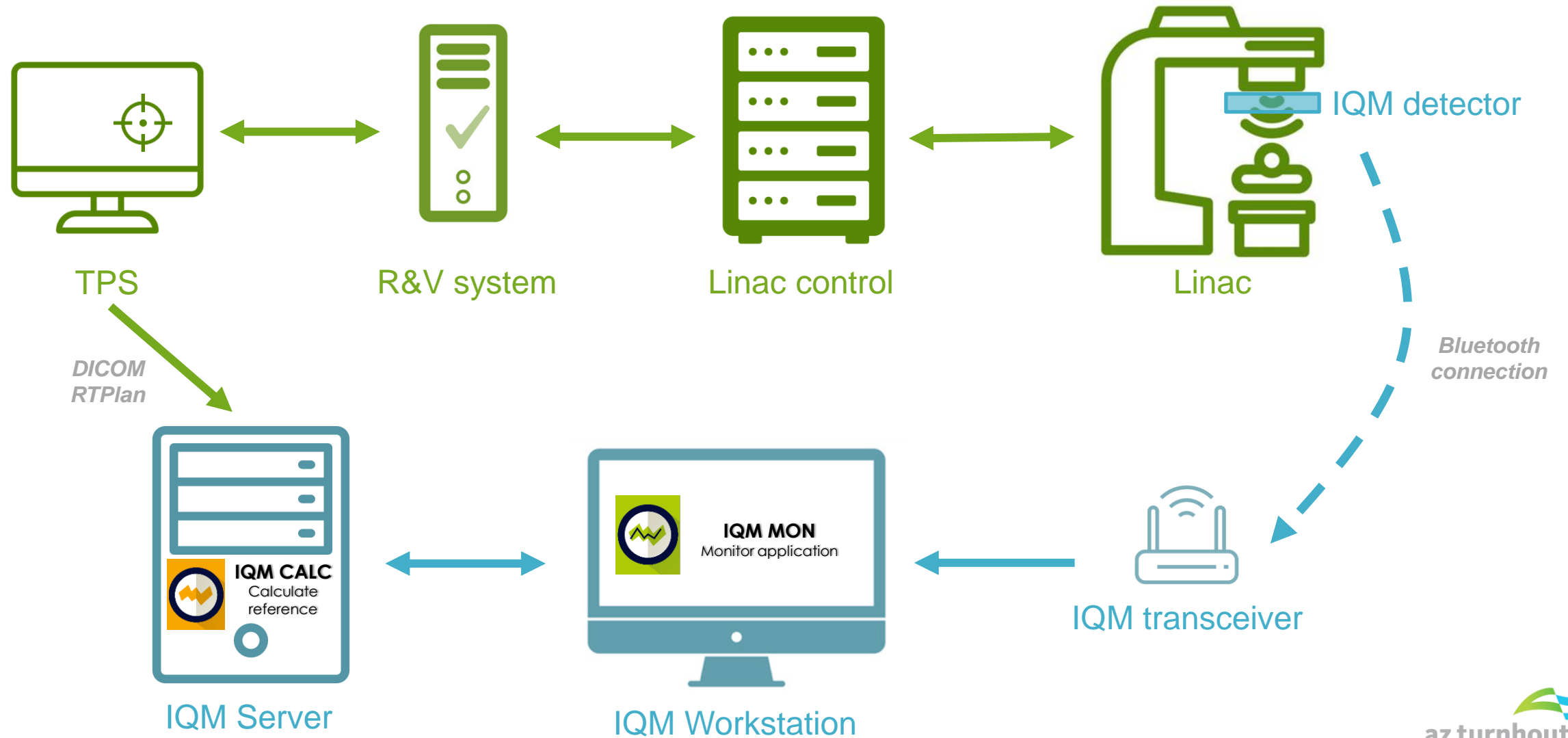
# IQM system integration



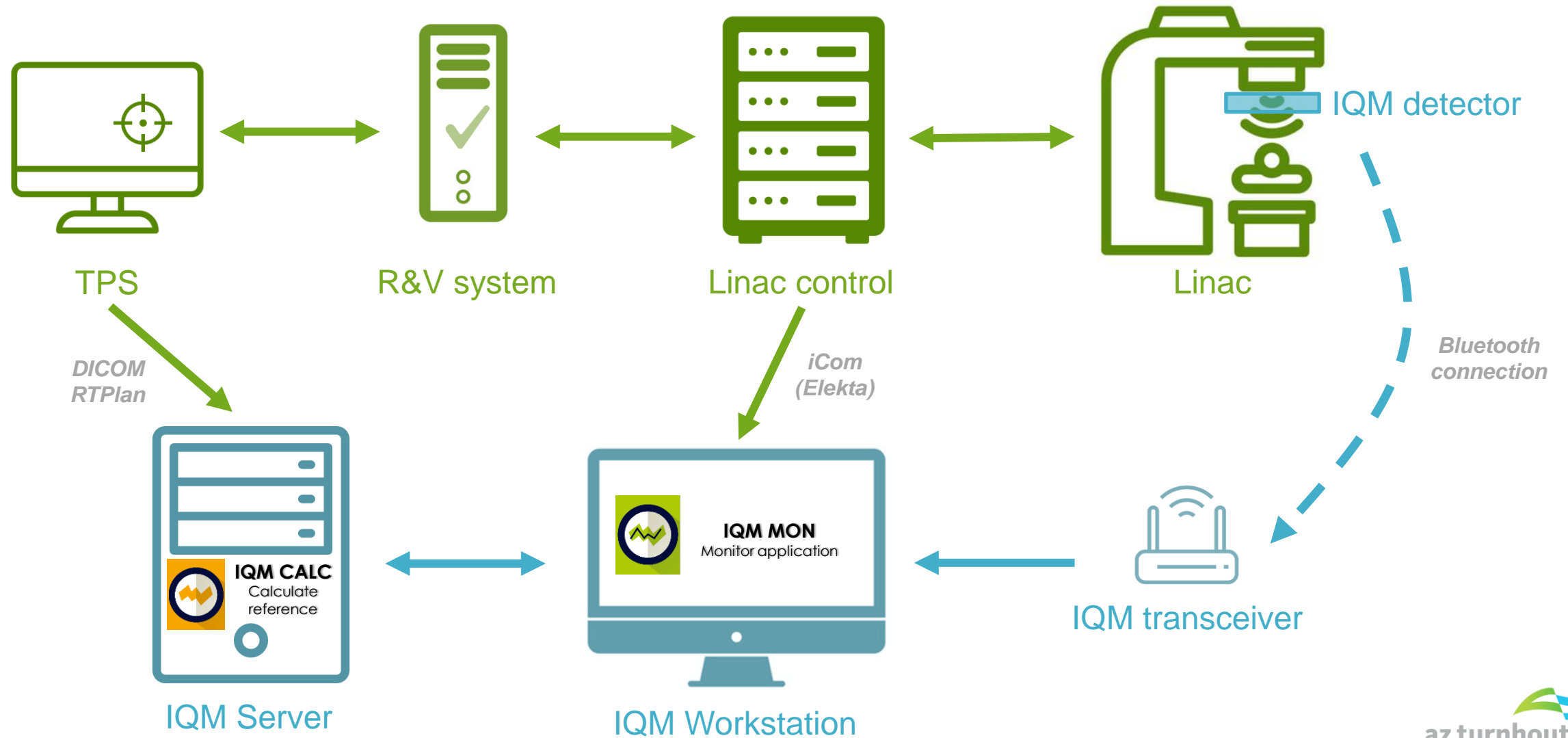
# IQM system integration



# IQM system integration



# IQM system integration





# IQM workflow @ AZ Turnhout

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Treatment  
planning



# IQM workflow @ AZ Turnhout

Treatment planning



**IQM**

## IQM Calculation Report

Patient Name:

Patient ID:

Birthdate:

### Plan Overview

Plan Name	Plan Label	Plan Creation Date and Time	Planned Treatment Machine Name	# Fractions Planned
Orl33fx	01_AOrl33fx	28-Aug-2024 14:30	Onyx	33

Calculation events:  
N/A

### Field Overview

Field ID	Field Description	Treatment Machine Name	IQM Detector Serial	Field MU/Fraction	Field Gantry Angle [°]	Field Energy [MV]	Total Reference Signal
1:1	Part ARC CCW	Perla	0908101318	349.4	150.0 - 0.0	6	257 795
1:1	Part ARC CCW	Onyx	0807101325	349.4	150.0 - 0.0	6	260 373

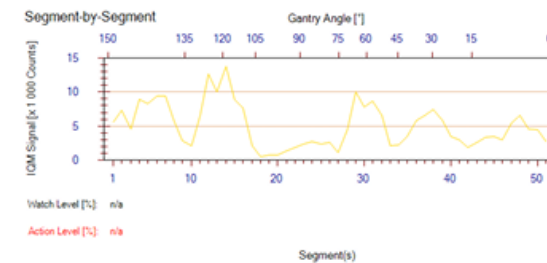
### Field Details for Field 1:1 (Part ARC CCW)

Field Description	Treatment Machine Name	MU/Fraction	Gantry Angle [°]	Energy [MV]	# Control Points	# Segments
Part ARC CCW	Perla	349.4	150.0 - 0.0	6	52	51

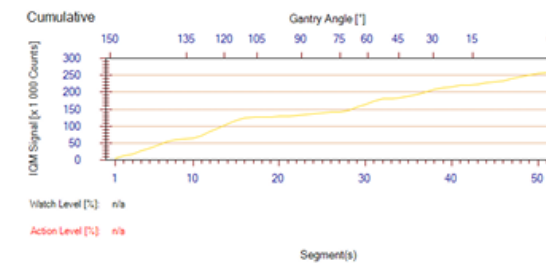
### Setup

IQM Calculator Software: v1.9.14.3

### Calculated Reference Signal (Segment-by-Segment)



### Calculated Reference Signal (Cumulative)



# IQM workflow @ AZ Turnhout

Treatment planning



**IQM**

## IQM Calculation Report

Patient Name: Patient ID: Birthdate:

### Plan Overview

Plan Name	Plan Label	Plan Creation Date and Time	Planned Treatment Machine Name	# Fractions Planned
Orl33fx	01_AOrl33fx	28-Aug-2024 14:30	Onyx	33

Calculation events:  
N/A

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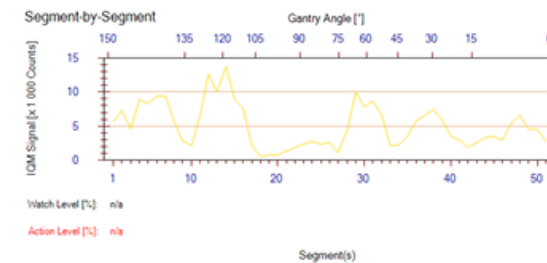
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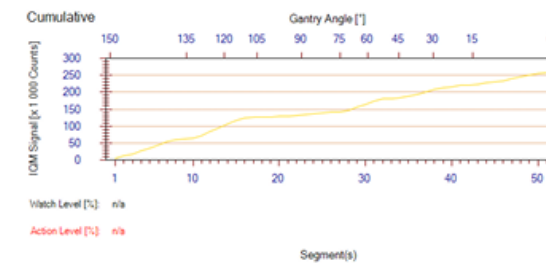
### Setup

IQM Calculator Software: v1.9.14.3

### Calculated Reference Signal (Segment-by-Segment)



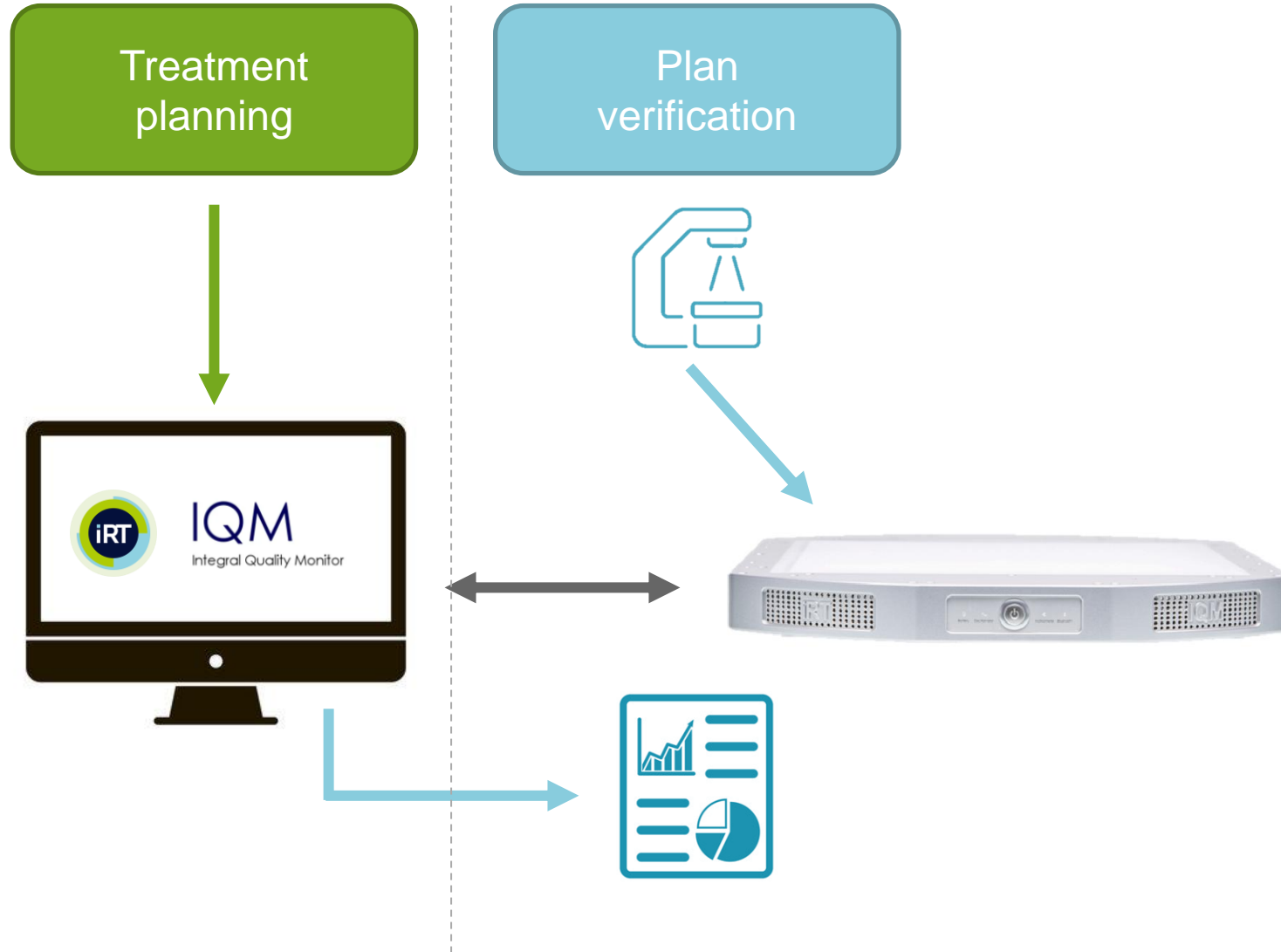
### Calculated Reference Signal (Cumulative)



Tolerances?  
Class solution



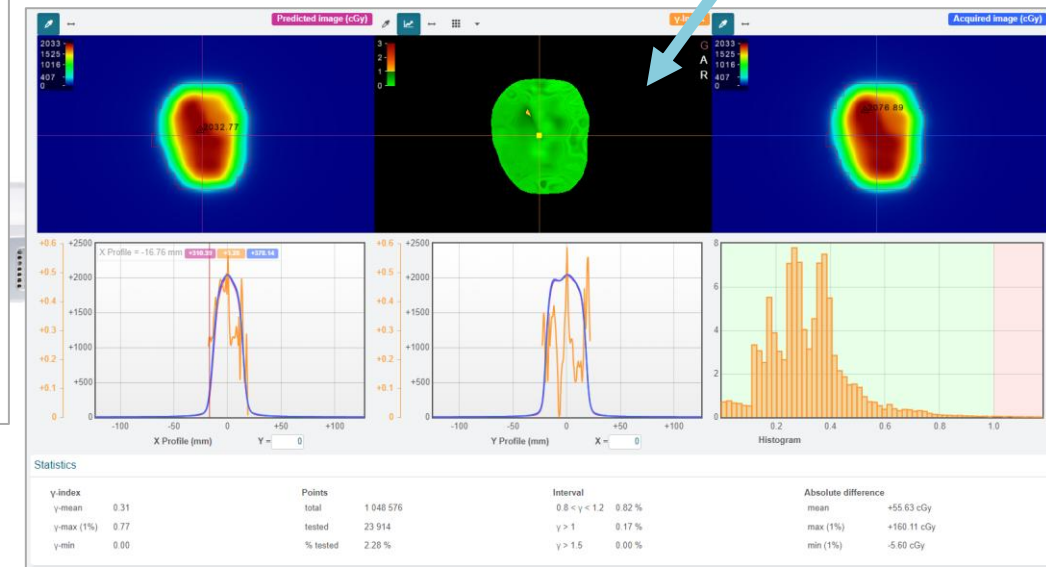
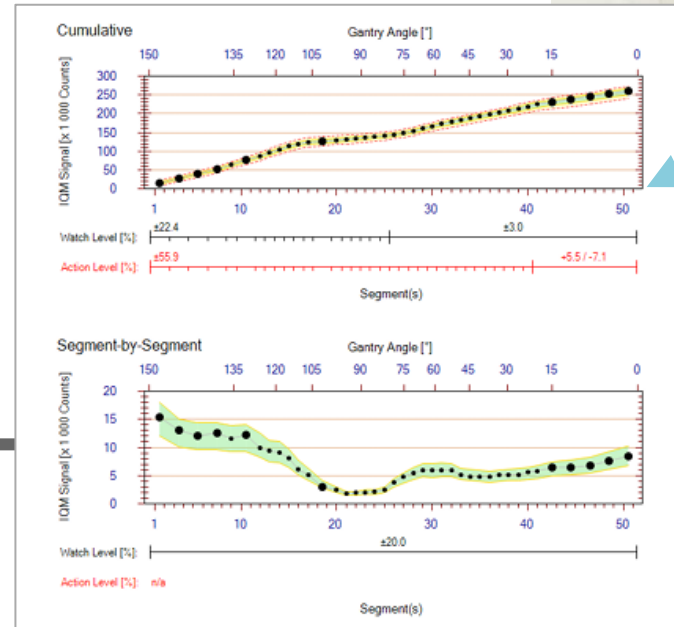
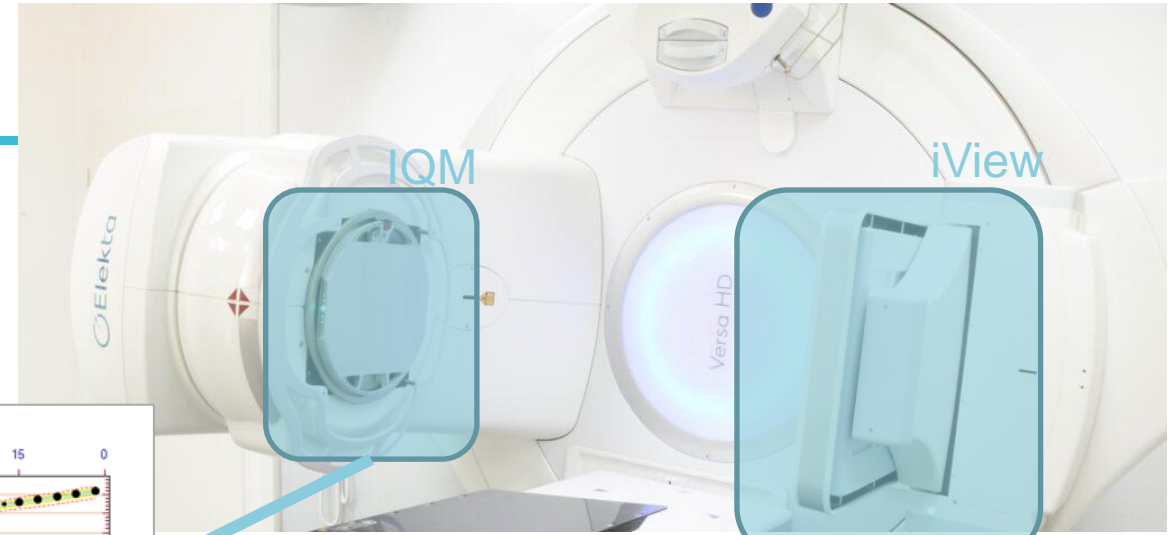
# IQM workflow @ AZ Turnhout



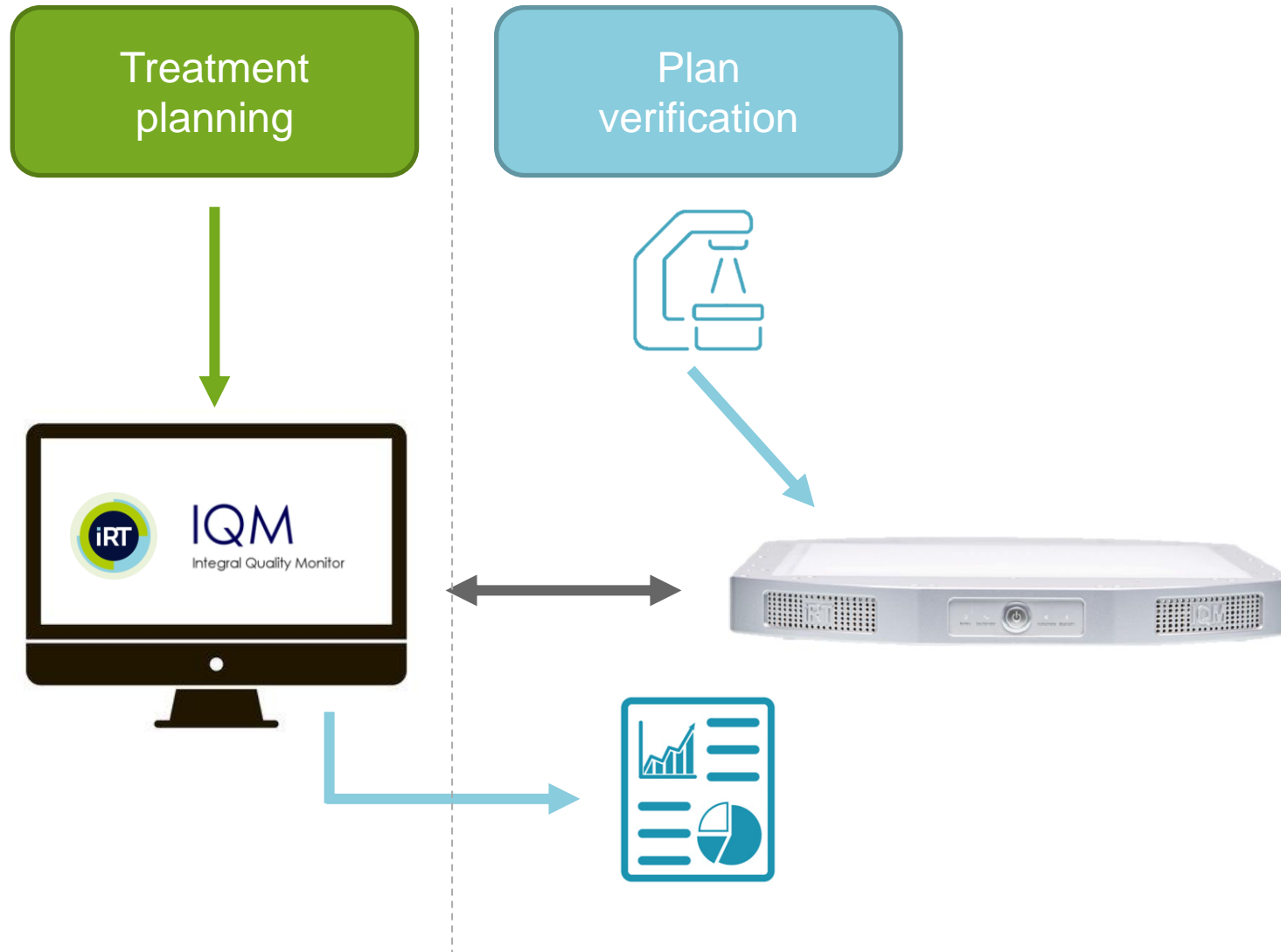
# IQM workflow @ AZ Turnhout

Treatment planning

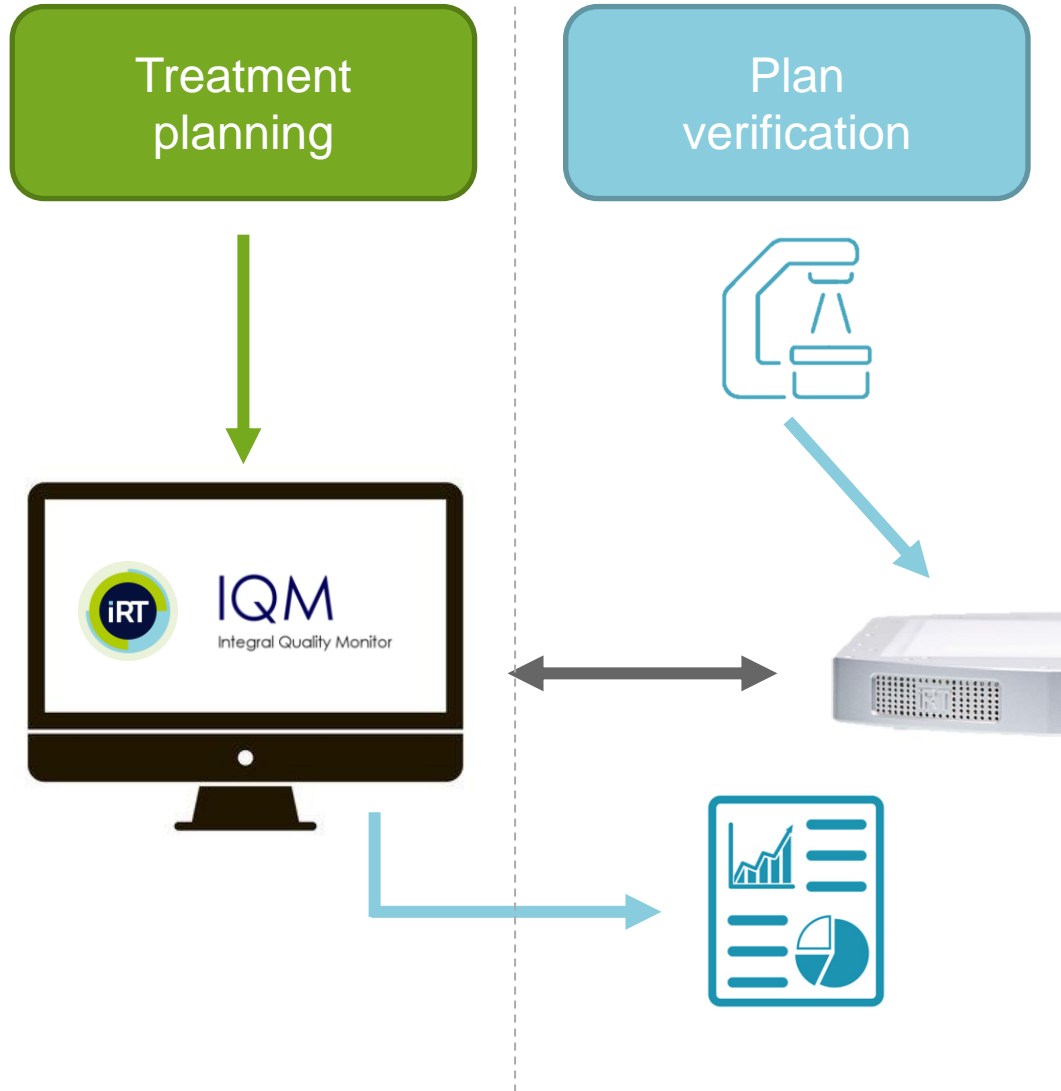
Plan verification



# IQM workflow @ AZ Turnhout



# IQM workflow @ AZ Turnhout



**IQM Patient Plan Daily Report**  
28-Aug-2024

**IQM Patient Plan Daily Report**

Patient Details		Plan Details	
Name		Plan Name	Or133fx
Patient ID		Field IDs	1:1
Date Of Birth		Technique	VMAT
Gender		Planned MU/Fraction	349.4

Treatment Details				
Session #	Treatment Time	Detector Serial	Treatment Machine	DOC Factor
1	16:17:52 - 16:20:05	0807101325	Ornyx	1.0000

Aggregated Signal Deviation Scores for All Sessions			
28-Aug	+0.4		
Pass			
C	100/100		
Cumulative Watch SPR	100%	Pass	
Segment-by-Segment Watch SPR	100%	Pass	
Final Cumulative Deviation	+0.4%	Pass	

**Aggregated Evaluation For Related Field Verifications:**

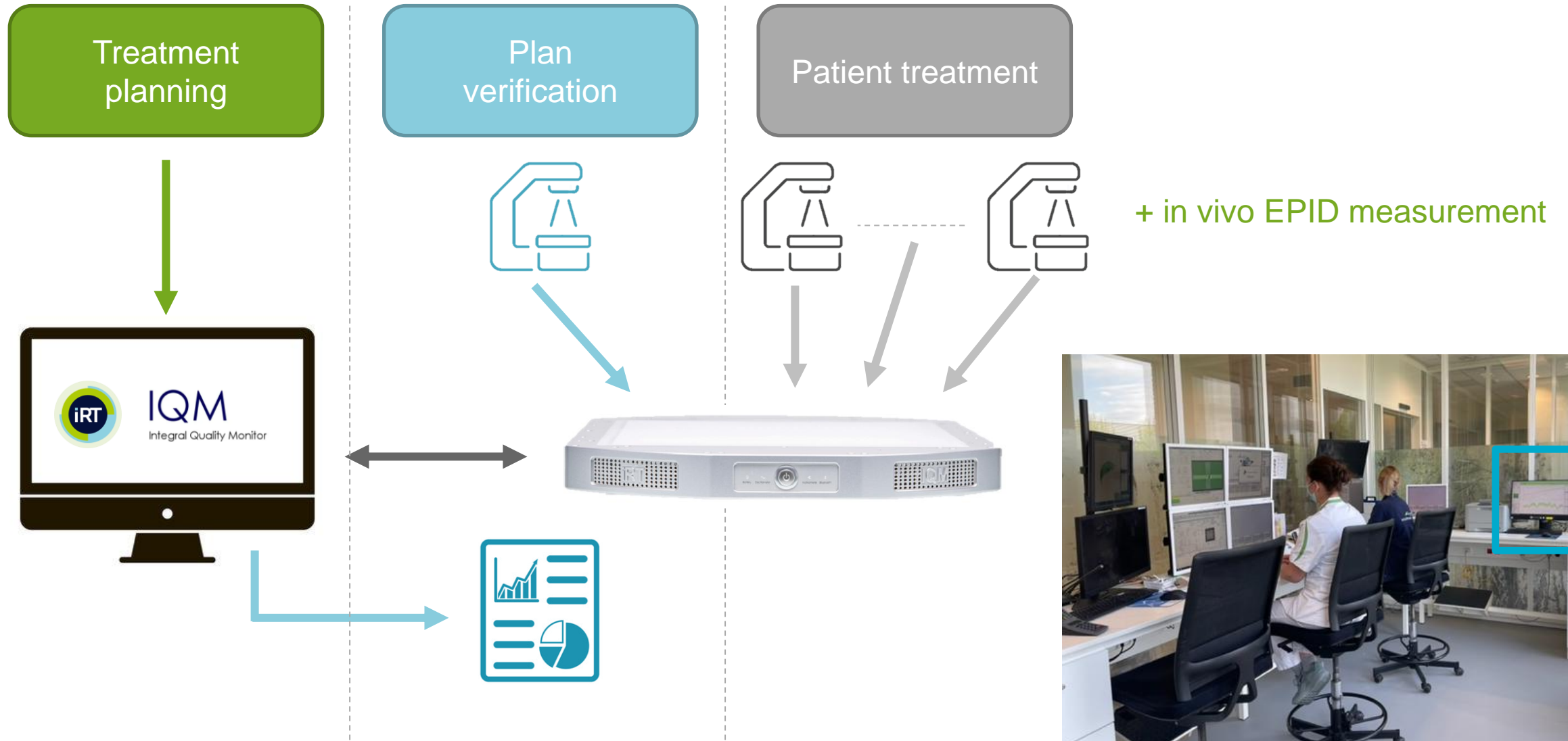
VMAT Calculated Reference					
Field(s) with ID(s) 1:1 was/were compared against a					
Cumulative Results:					
Cumu. Watch SPR	100%	Pass			
Cumu. Action SPR	100%	Pass			
Final Cumu. Deviation	+0.4%	Pass			

Field Evaluation Results					
Total Deviation [%]	Cumulative Watch SPR [%]	Cumulative Action SPR [%]	Seg-by-Seg Watch SPR [%]	Seg-by-Seg Action SPR [%]	Overall Field Result
0.4	100	100	100	N/A	Pass

**Cumulative**

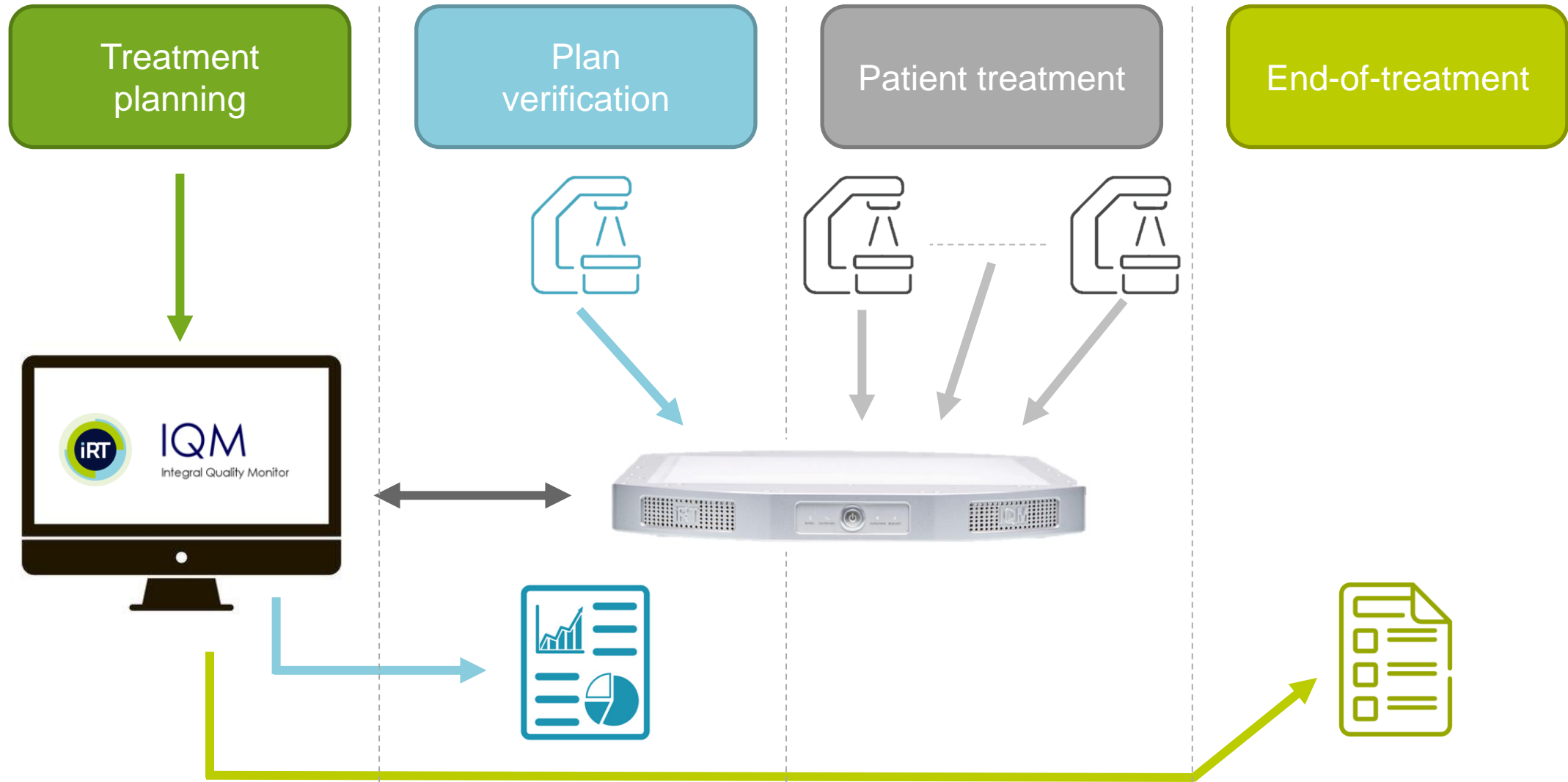
**Segment-by-Segment**

# IQM workflow @ AZ Turnhout





# IQM workflow @ AZ Turnhout



# IQM workflow @ AZ Turnhout

Treatment planning

End-of-treatment



Verification

**IQM** IQM Patient Plan Summary Report

**IQM Patient Plan Summary Report**

Patient Details		Plan Details	
Name		Plan Name	Orl33fx
Patient ID		Field IDs	1:1
Date Of Birth		Technique	Vmat
Gender		Planned MU	349.4
		Planned Fractions	33

August 2024						
Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
26	27	28 +0.4 Pass C 100/100	29	30	31	

September 2024							
Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.	
2	3	4	5	6 +1.0 Pass C 100/100	7	8	
9 +0.7 Pass C 100/100	10 +0.5 Pass C 100/100	11 +0.6 Pass C 100/100	12 +0.6 Pass C 100/100	13 +0.5 Pass C 100/100	14	15	
16 -0.4 Pass C 100/100	17 +0.1 Pass C 100/100	18 -0.6 Pass C 100/100	19 -0.3 Pass C 100/100	20 -0.3 Pass C 100/100	21	22	
23 +0.4 Pass C 100/100	24 +0.5 Pass C 100/100	25 +0.5 Pass C 100/100	26 +0.7 Pass C 100/100	27 +0.4 Pass C 100/100	28	29	
30 +0.3 Pass C 100/100							

October 2024						
Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
	1 +0.2 Pass C 100/100	2 -0.1 Pass C 100/100				

Legend	
Date of Session	Cumulative deviation [%]
<b>Pass / Watch / Action</b>	
Reference Type	Watch Cumu. / Sbs SPR [%] or Action Cumu. / Sbs SPR [%]**
*) Action SPRs are displayed in place of Watch SPRs if any Action SPR fails, resulting in "Action" outcome for the day.	

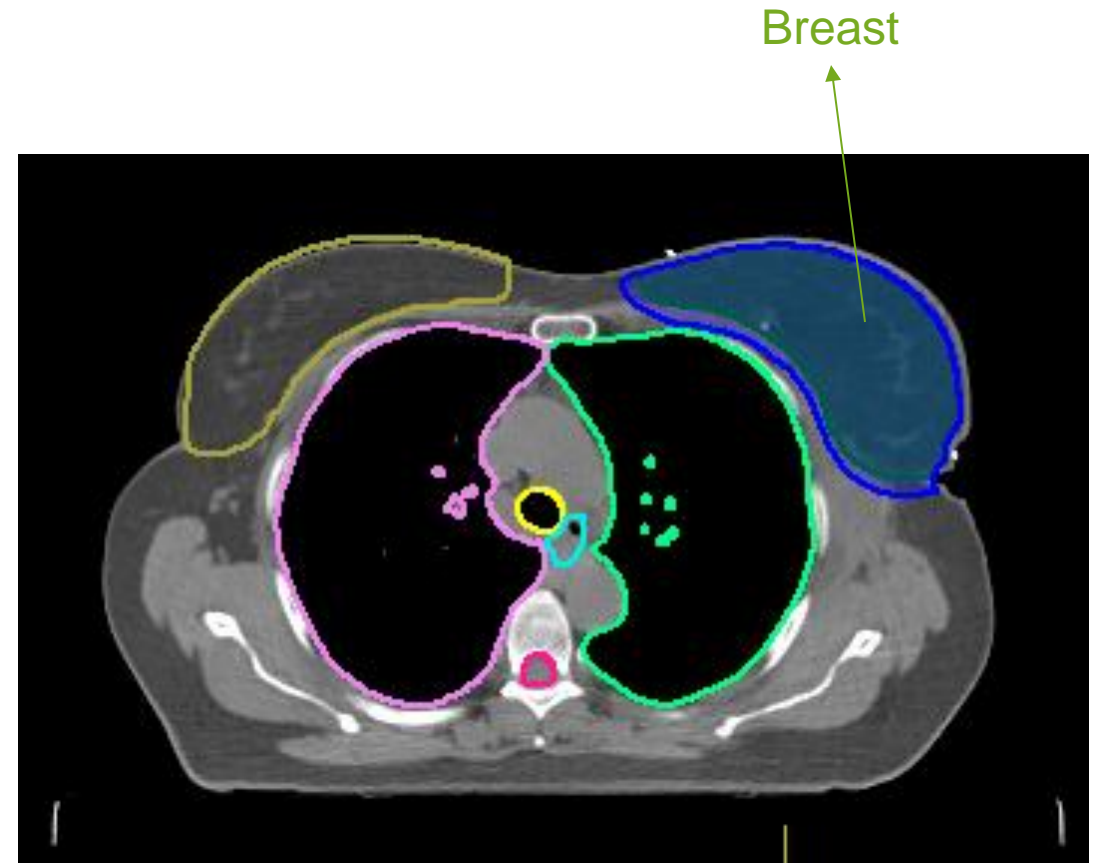


Part 2

# **IQM & VMAT breast treatments**

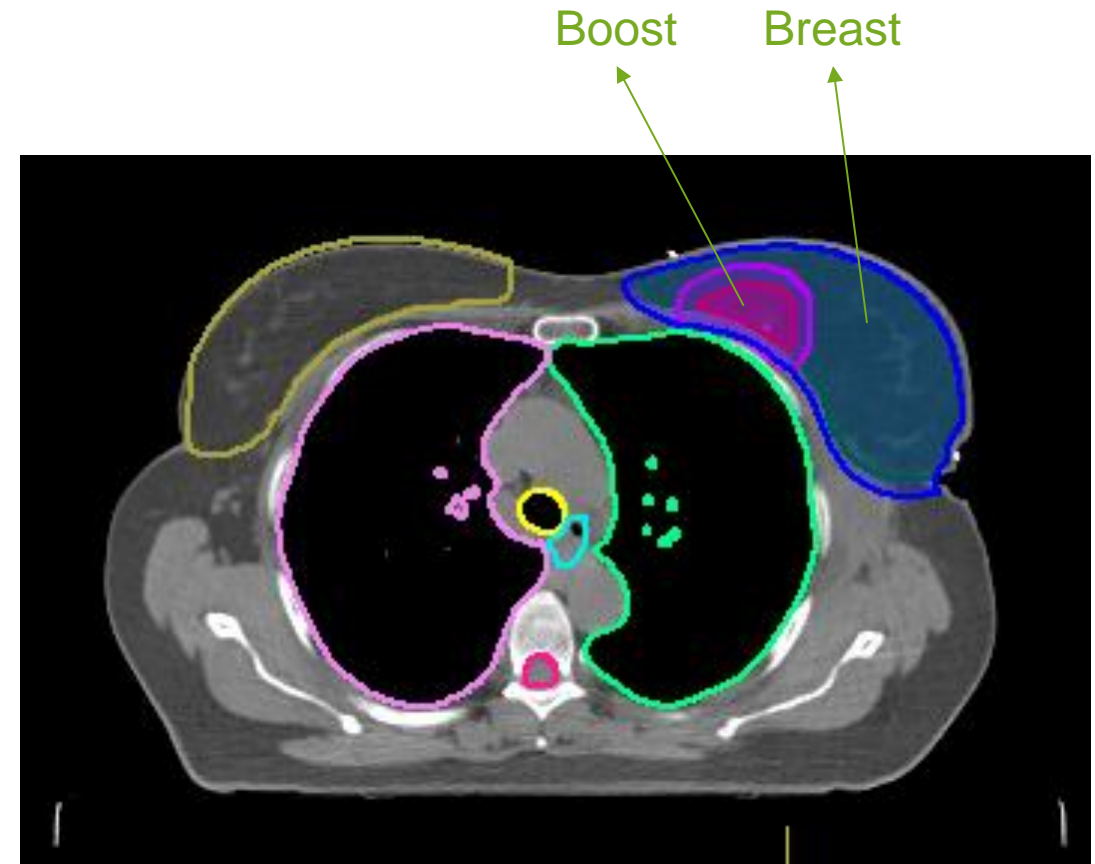
# Breast treatments @ AZT

- Fractionation regimens (uni-/bilateral)
  - 5 x 5,20Gy
  - 15 x 2,67Gy
  - 19 x 2,30Gy



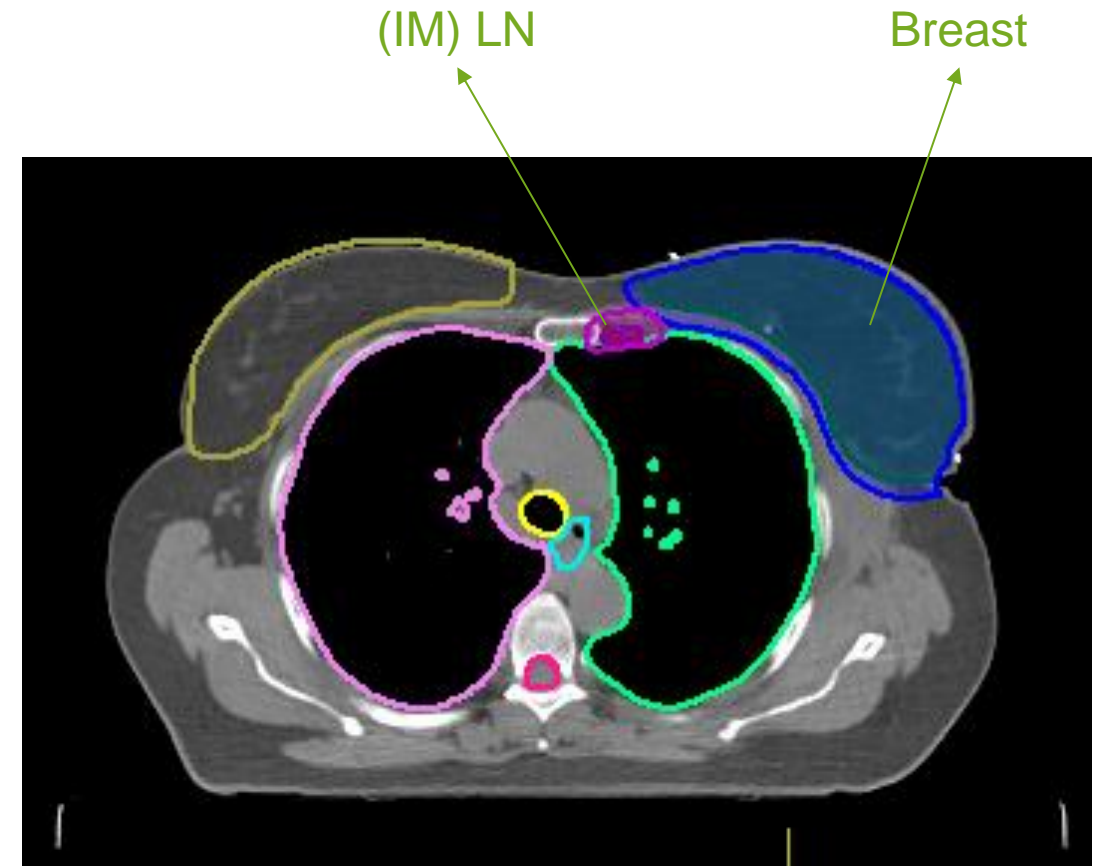
# Breast treatments @ AZT

- Fractionation regimens (uni-/bilateral)
  - 5 x 5,20Gy (+ 4/6 x 2,65Gy)
  - 15 x 2,67Gy
  - 19 x 2,30Gy



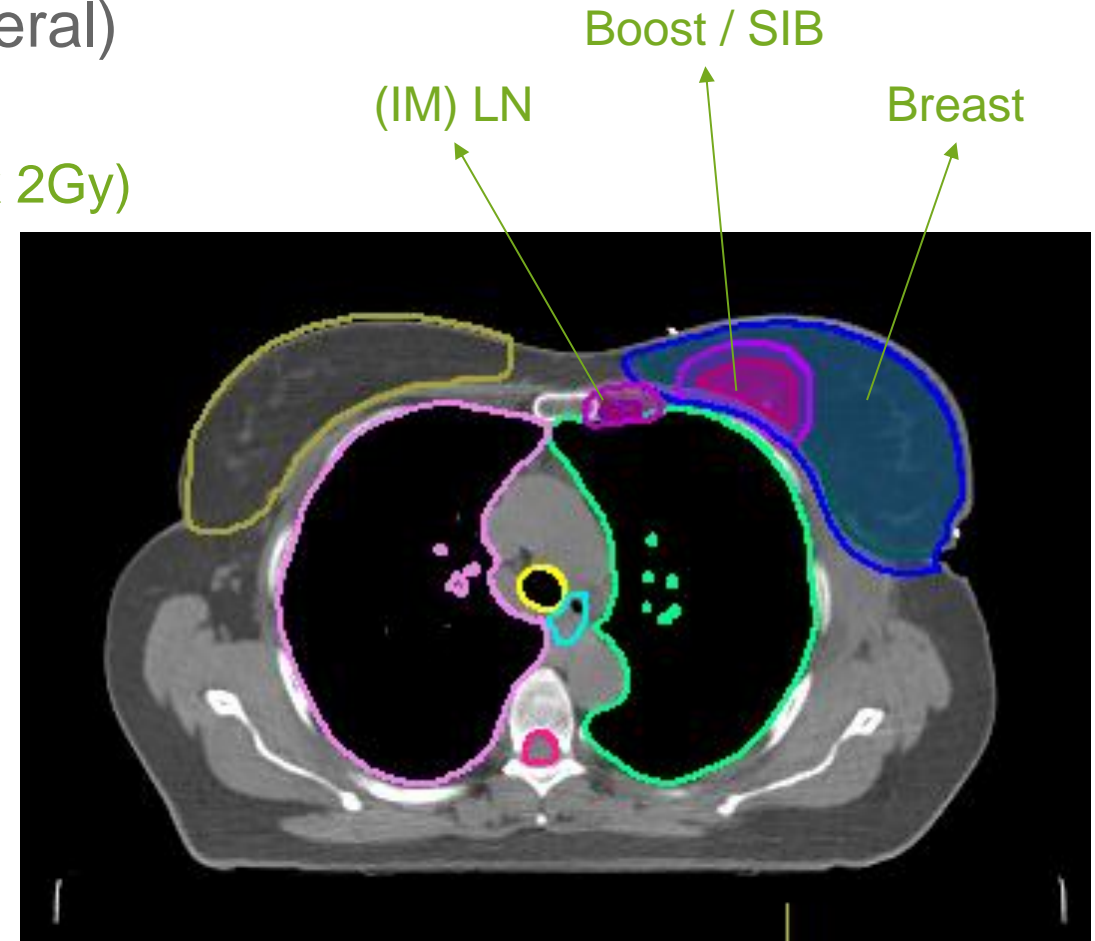
# Breast treatments @ AZT

- Fractionation regimens (uni-/bilateral)
  - 5 x 5,20Gy (+ 4/6 x 2,65Gy)
  - 15 x 2,67Gy
  - 19 x 2,30Gy



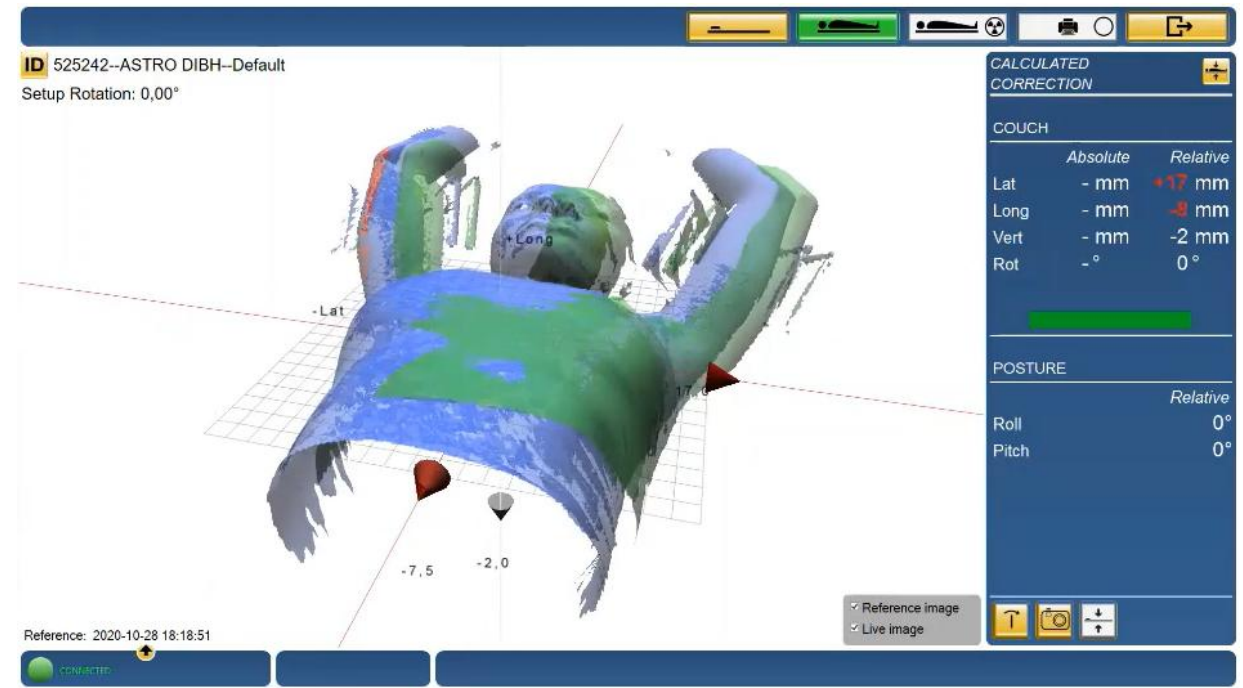
# Breast treatments @ AZT

- Fractionation regimens (uni-/bilateral)
  - 5 x 5,20Gy (+ 4/6 x 2,65Gy)
  - 15 x 2,67Gy (+ 4/6 x 2,67Gy or + 8 x 2Gy)
  - 19 x 2,30Gy (- 2,67Gy SIB)



# Breast treatments @ AZT

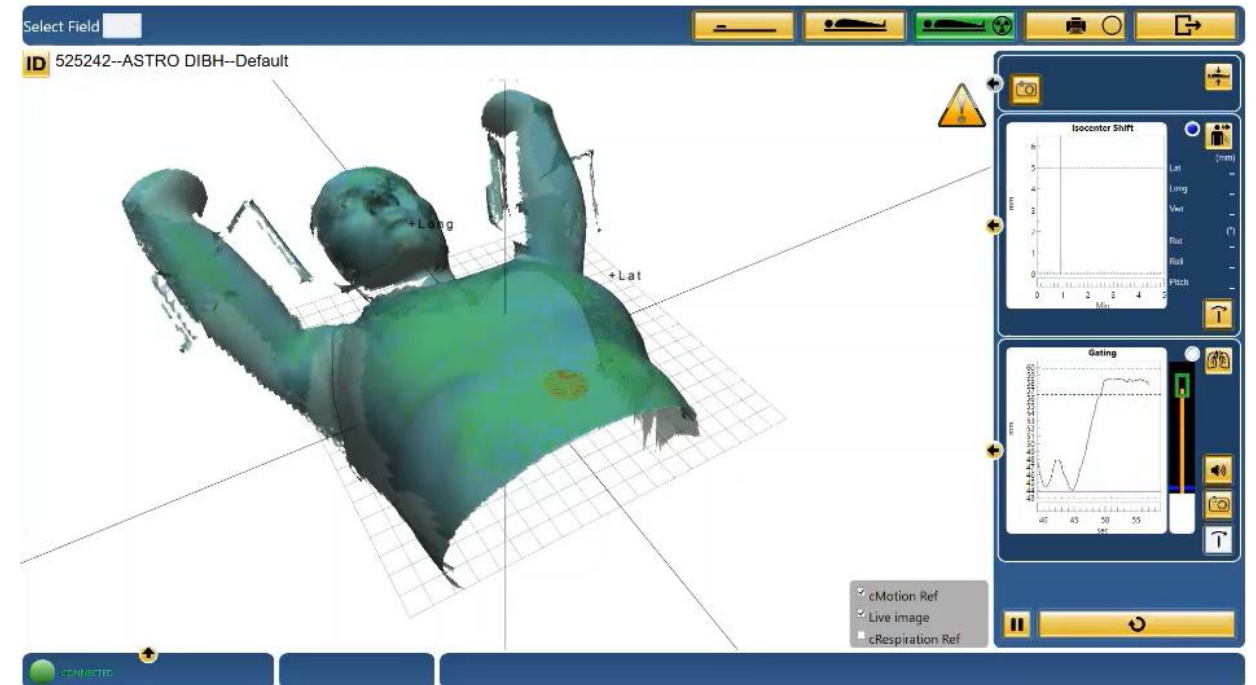
- Fractionation regimens (uni-/bilateral)
  - 5 x 5,20Gy (+ 4/6 x 2,65Gy)
  - 15 x 2,67Gy (+ 4/6 x 2,67Gy or + 8 x 2Gy)
  - 19 x 2,30Gy (- 2,67Gy SIB)
- Surface scanning
  - Initial positioning
  - Intra-fraction motion management
  - DIBH





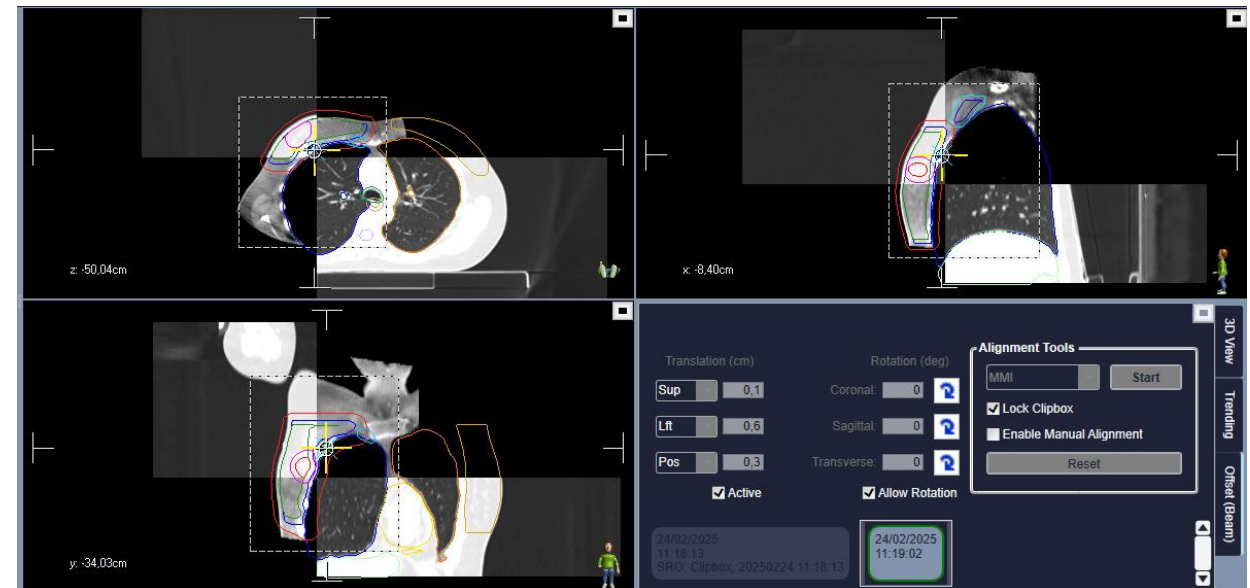
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- Fractionation regimens (uni-/bilateral)
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  - 19 x 2,30Gy (- 2,67Gy SIB)
- Surface scanning
  - Initial positioning
  - Intra-fraction motion management
  - DIBH

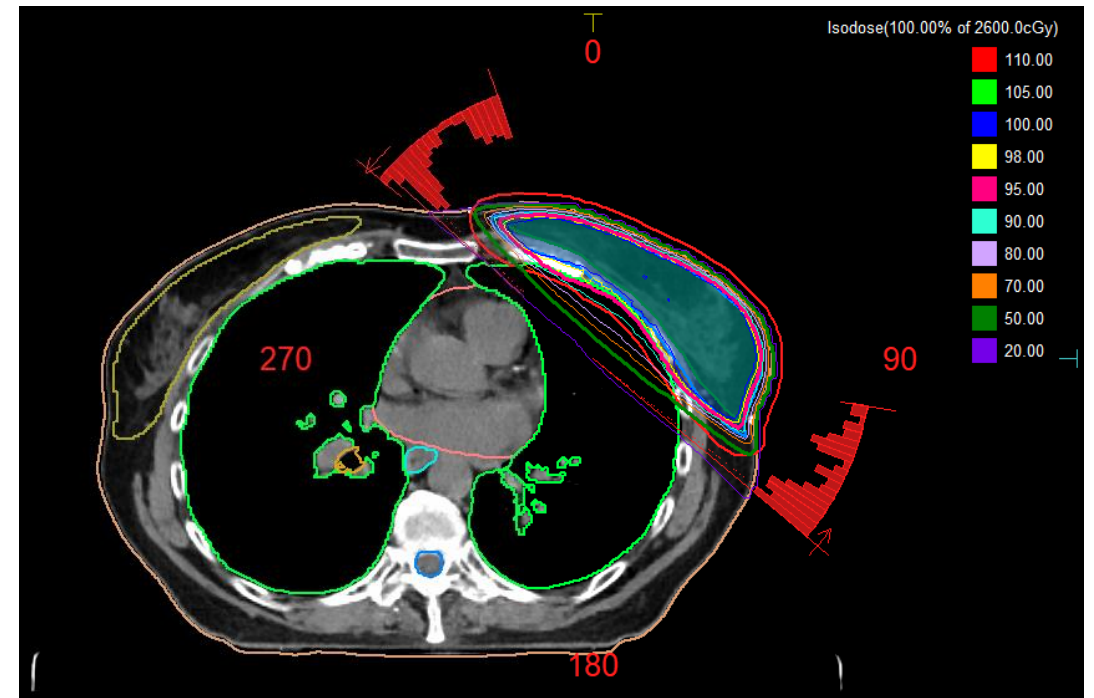
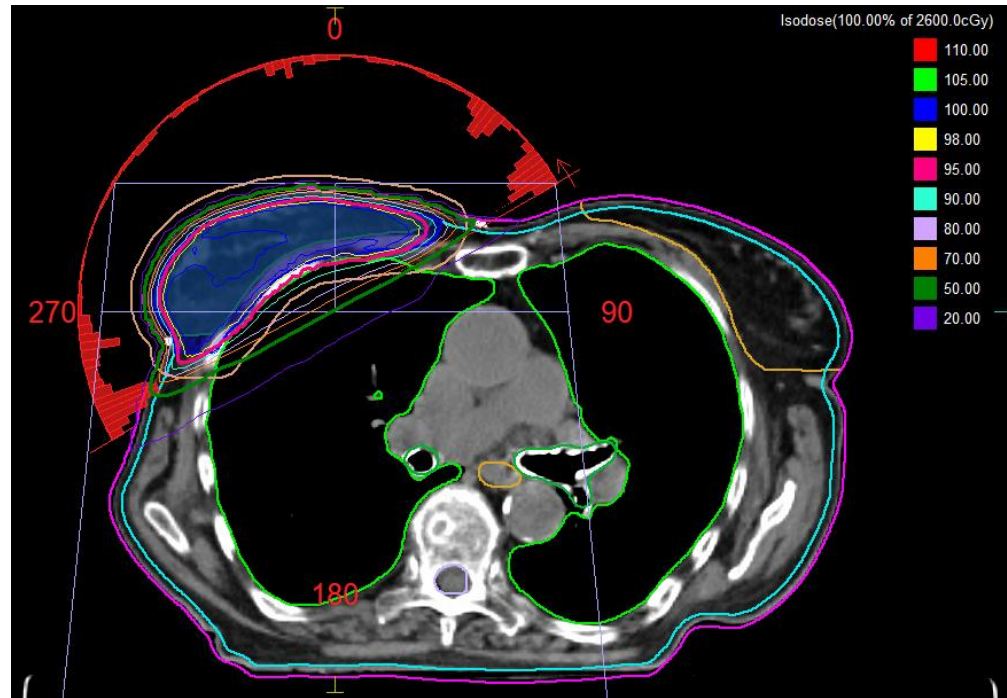


# Breast treatments @ AZT

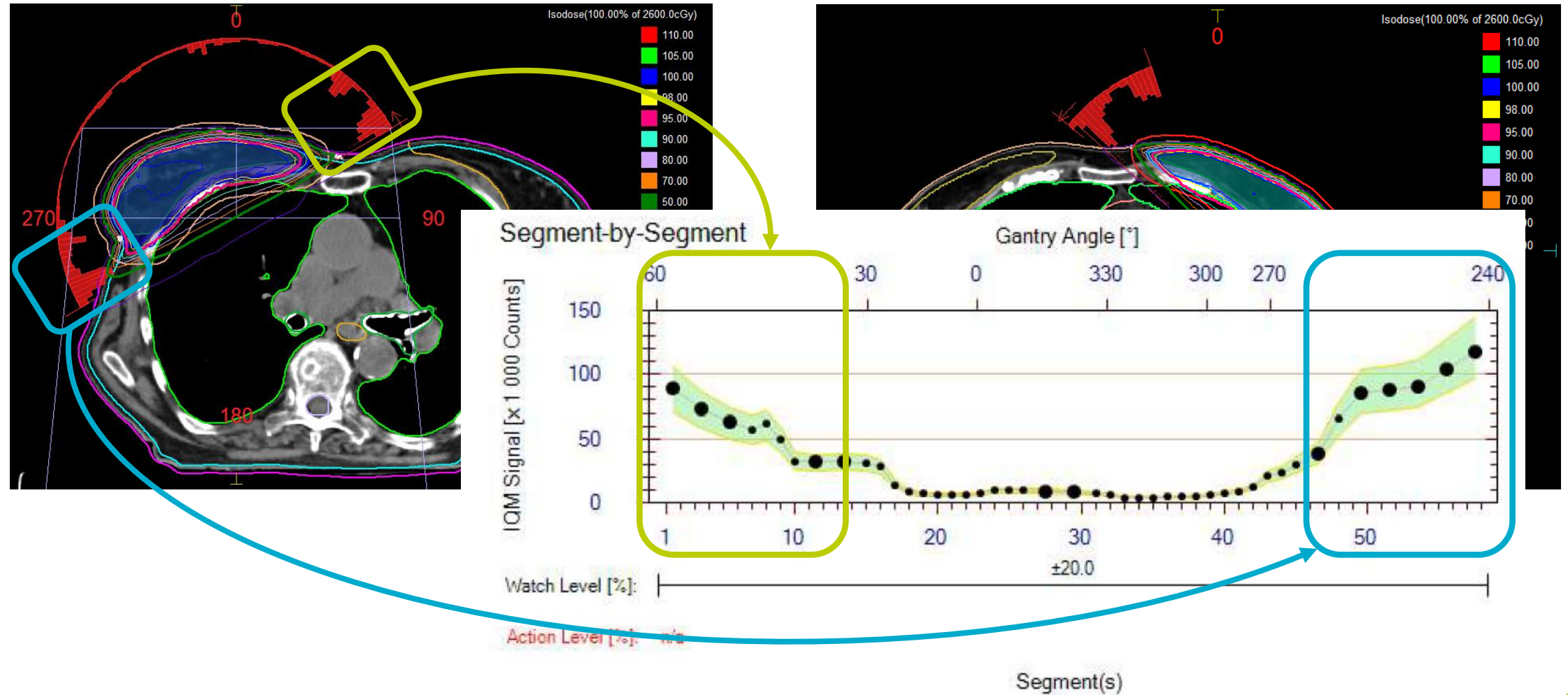
- Fractionation regimens (uni-/bilateral)
  - 5 x 5,20Gy (+ 4/6 x 2,65Gy)
  - 15 x 2,67Gy (+ 4/6 x 2,67Gy or + 8 x 2Gy)
  - 19 x 2,30Gy (- 2,67Gy SIB)
- Surface scanning
  - Initial positioning
  - Intra-fraction motion management
  - DIBH
- Daily CBCT imaging



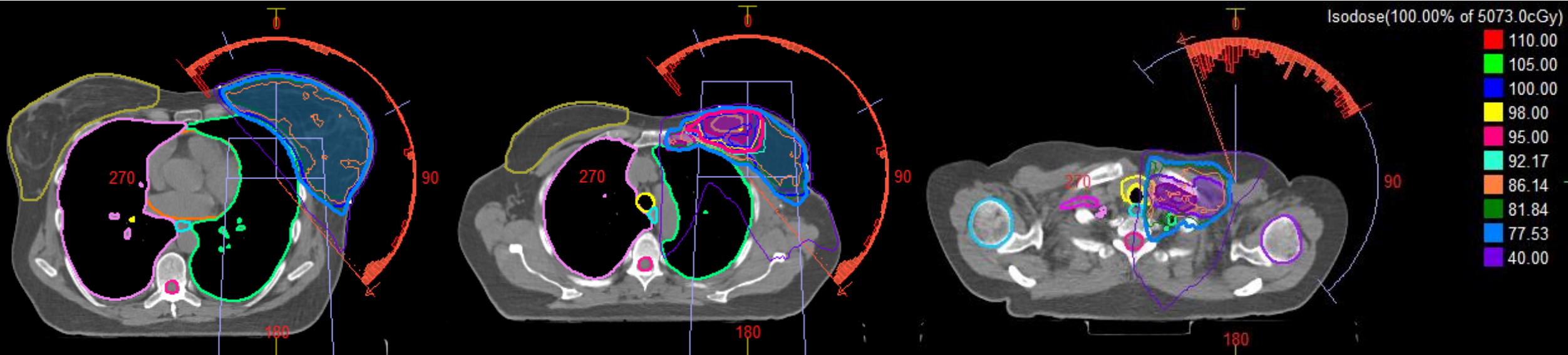
# Breast VMAT treatment technique



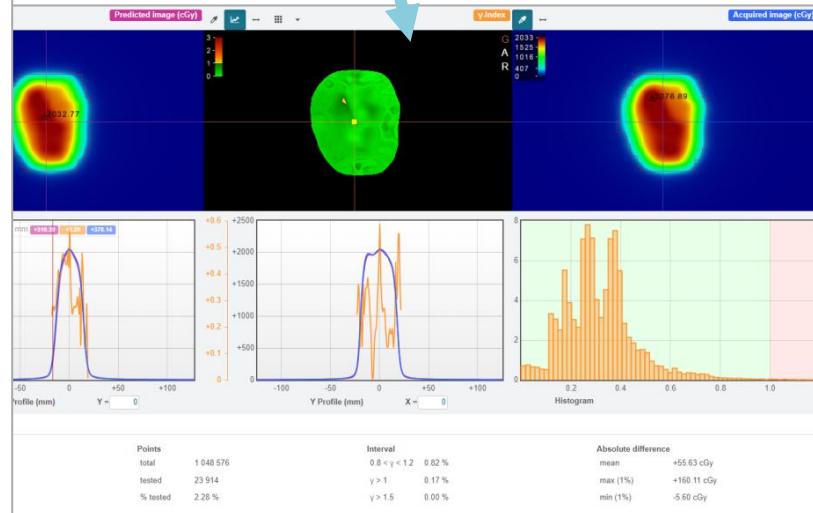
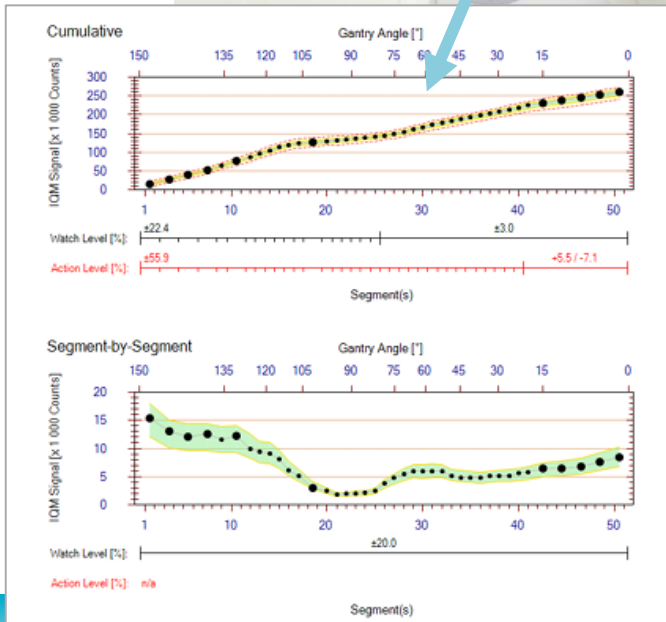
# Breast VMAT treatment technique



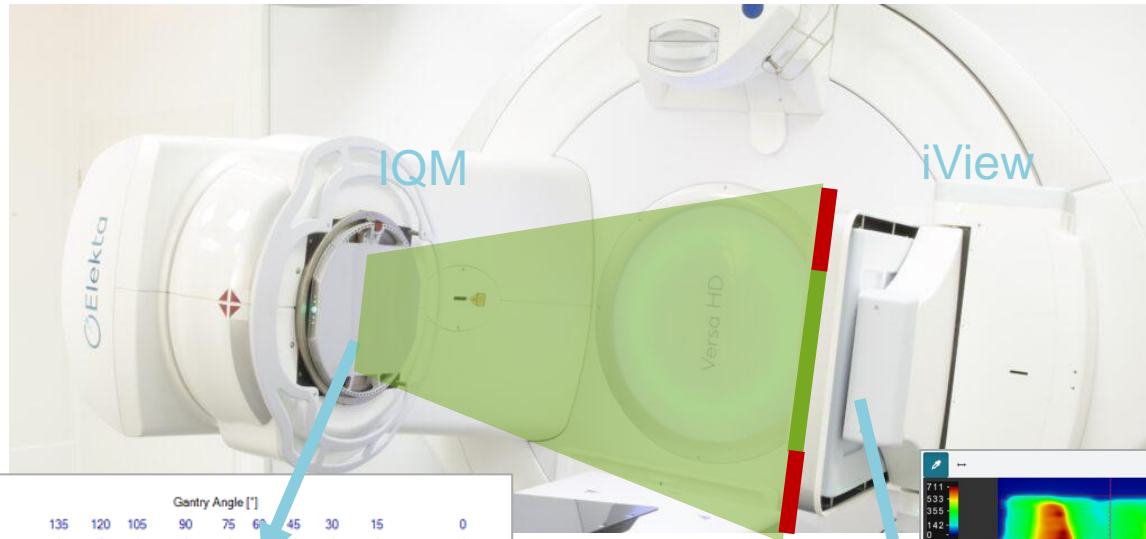
# Breast VMAT treatment technique



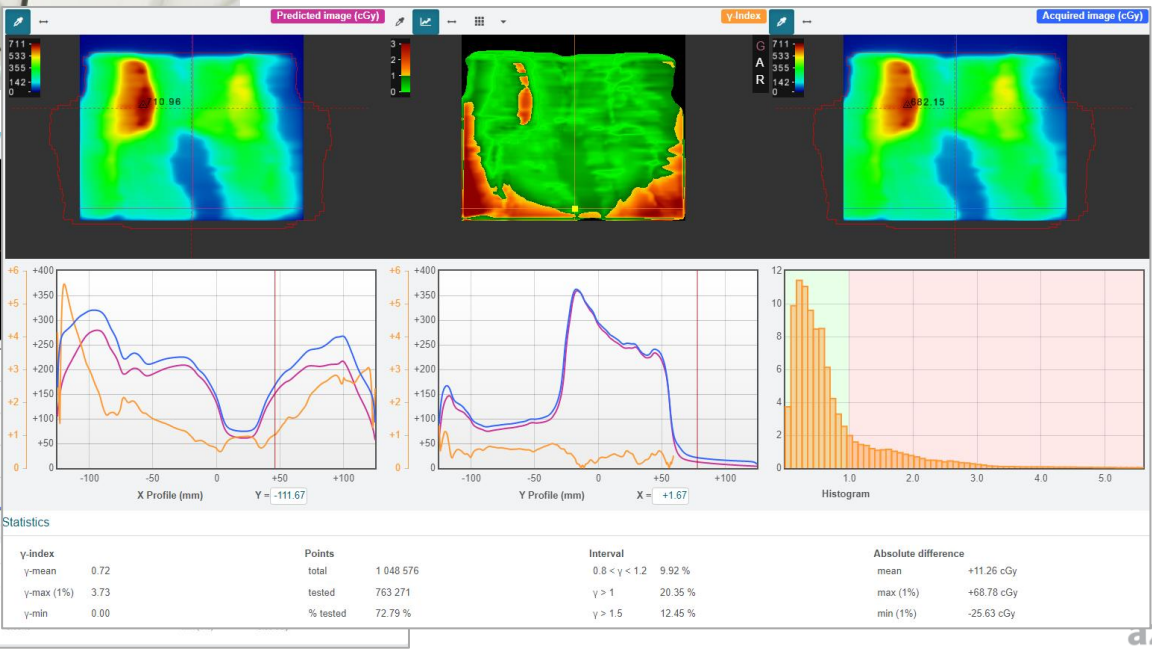
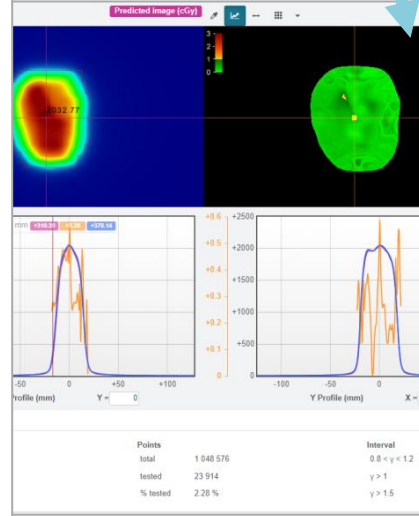
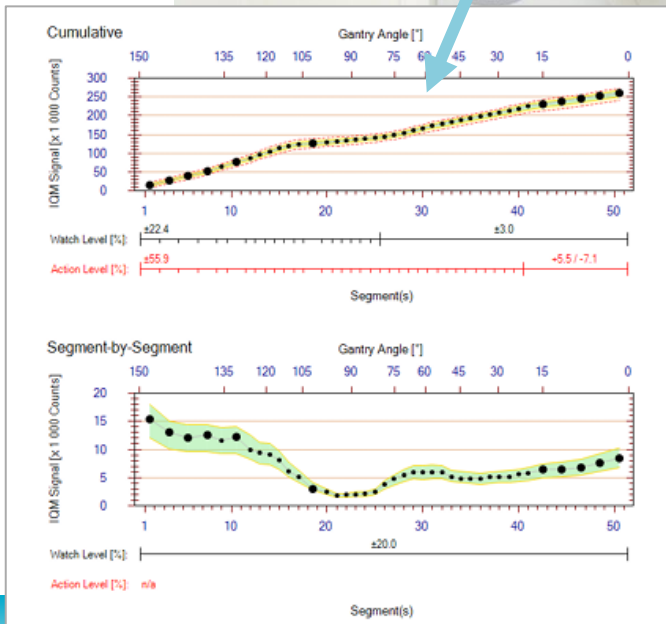
# Plan verification



# Plan verification



EPID measurements limited by field dimensions!



# Plan verification



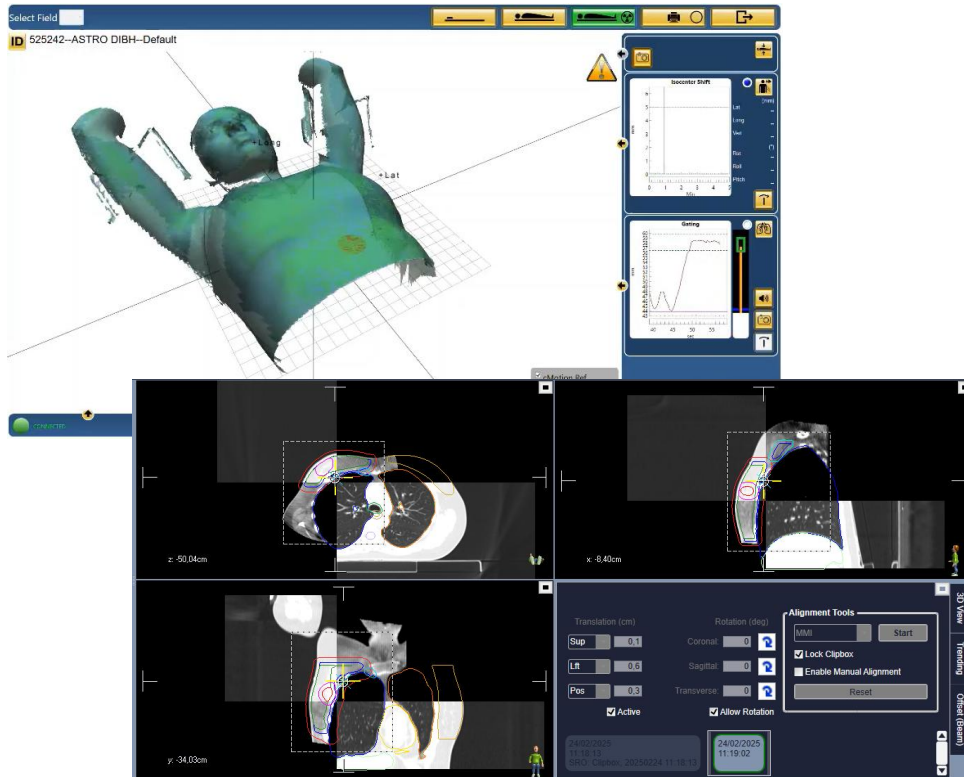
	<b>IQM</b>	<b>Octavius</b>
TPS time	/	10 min + calc time
Setup time	/	10 min
Beam run time	2 min	2 min
Analysis time	/	10 min
Report to EPD	2 min	5 min
<b>Overall time</b>	<b>4 min</b>	<b>37 min</b>



Part 3

**To conclude...**

# IQM for breast VMAT verification – Conclusions



## Limitations

- Only QA of machine behaviour; patient factor not monitored
- No gamma analysis
- No monitoring of electron treatments



# IQM for breast VMAT verification – Conclusions

## Assets

- Easy set up, no set-up errors
- Quick measurements
- Automated workflows
- Feasible for all field sizes & photon treatment types
- HUGE time savings



# Questions?

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