

Initial Evaluation of the Integral Quality Monitor (IQM)

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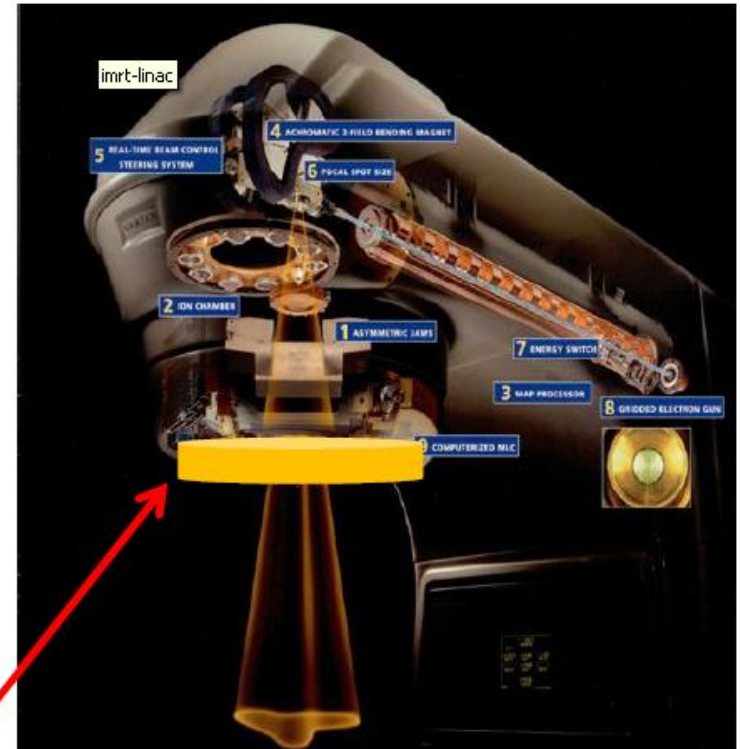
Purpose of IQM

A Dosimetric Checksum System integrated into the beam delivery path to validate the accuracy of the beam during the treatment

as well as

to validate the accuracy and integrity of the treatment data transfer from the TPS through the R&V System to the Linac

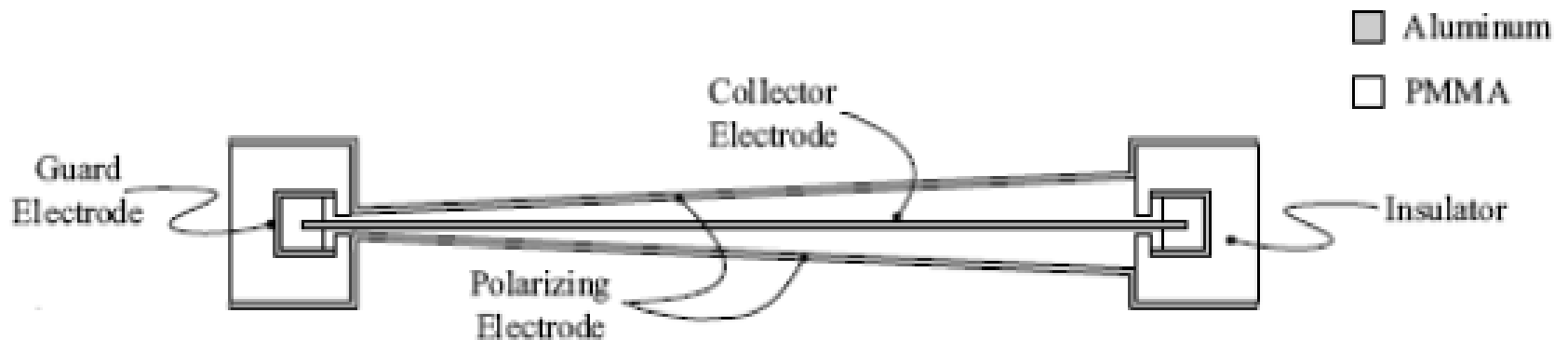
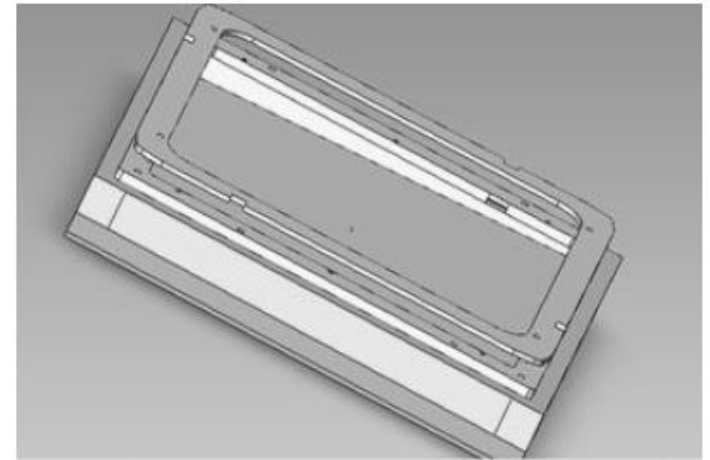
Integral Quality Monitor
IQM



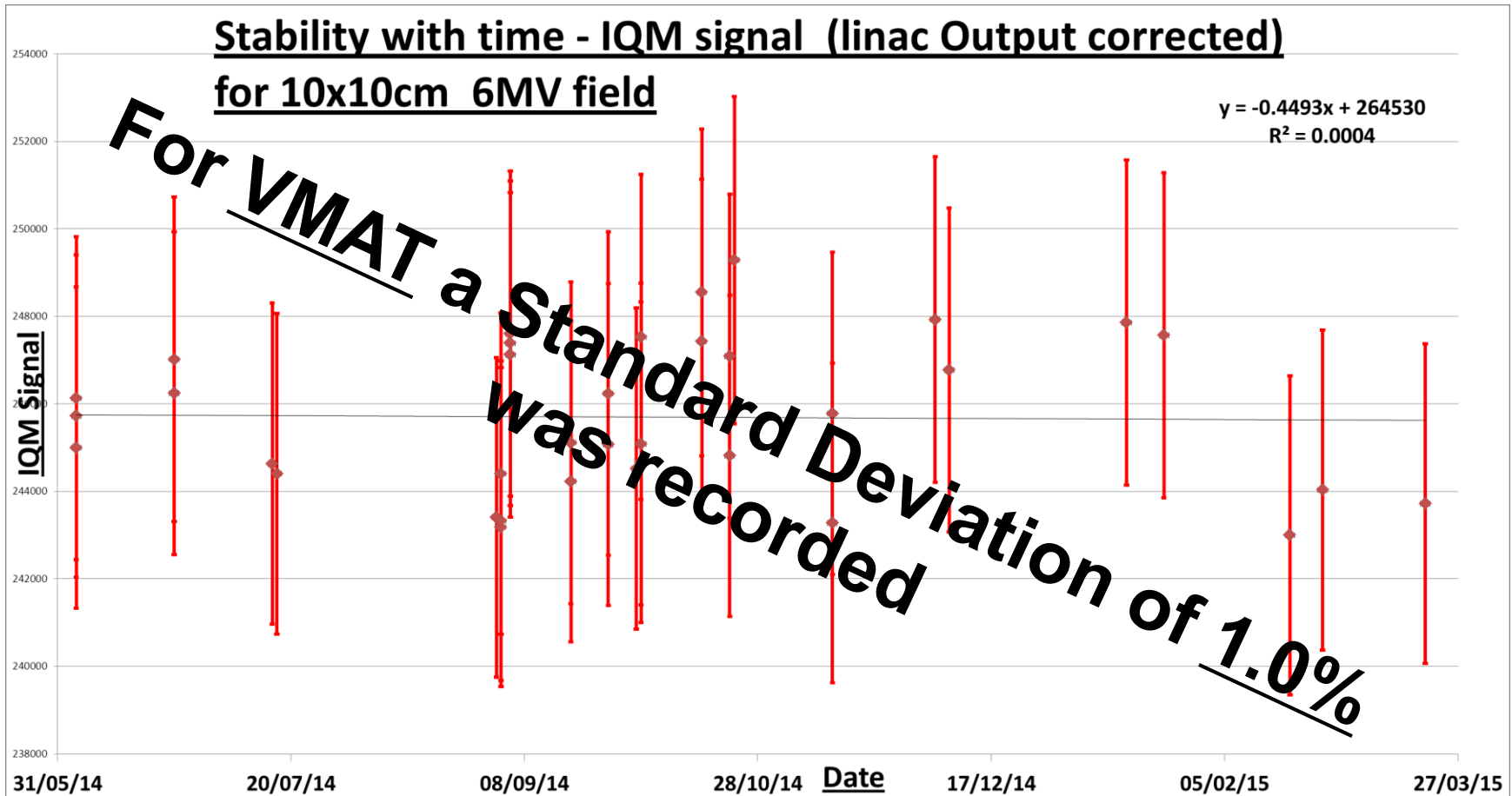
IQM design

Hardware Design (Prototype)

- ✓ Large Area Ion Chamber (550cc)
- ✓ Electrode plates made of 2mm Aluminum
- ✓ Enclosure made of PMMA
- ✓ Sensitive Area: 26cm x 26cm
- ✓ Max. Field Size: 40cm x 40cm

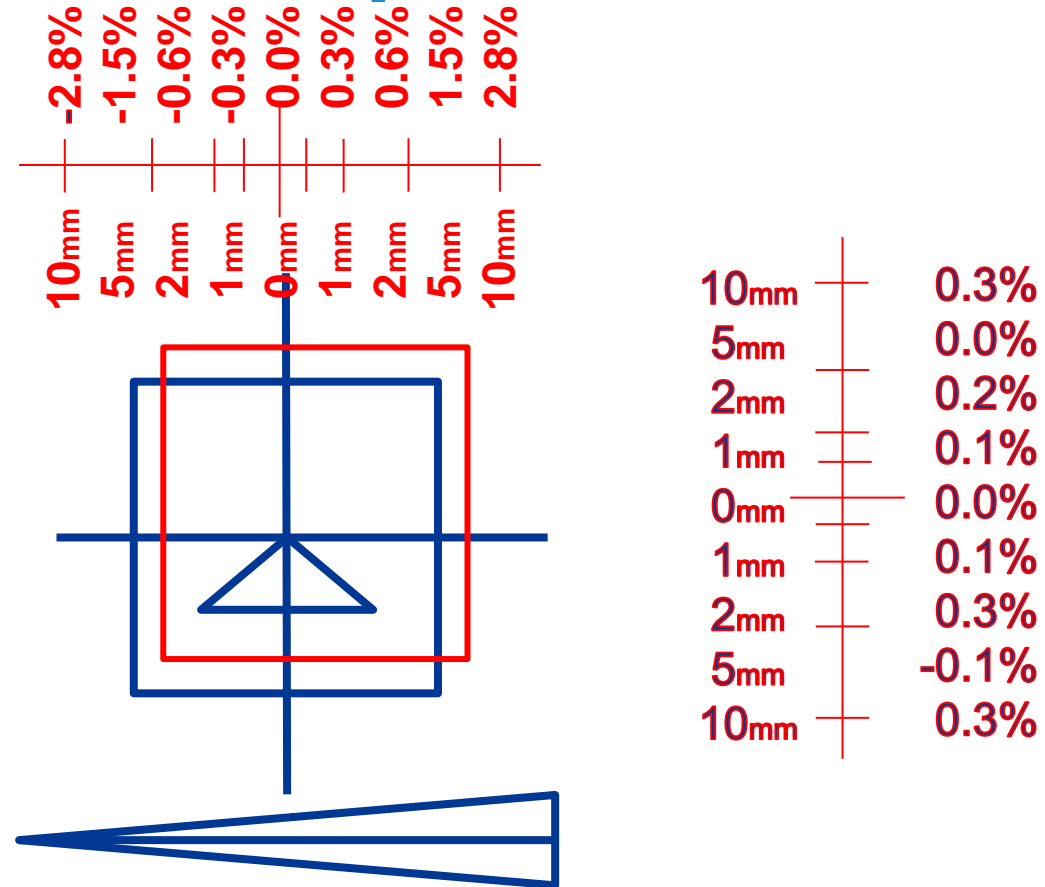


Reliability & Stability of IQM



IQM: Detection of potential errors

1: Field mis-positioned

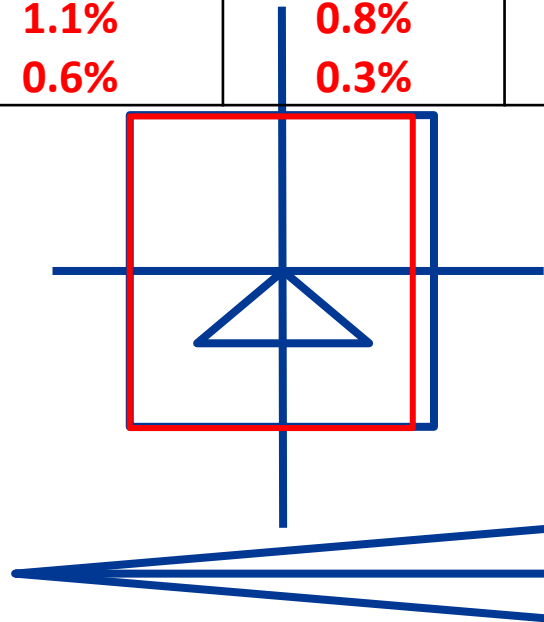


IQM: Detection of potential errors

2:MLC mis-calibration

Jaw miss-calibrated in different directions, hence field size changing

<u>(cm)</u>	<u>%IQM Signal change/mm</u>			
	<u>X1</u>	<u>X2</u>	<u>Y1</u>	<u>Y2</u>
<u>4x4cm</u>	2.3%	2.0%	2.4%	2.5%
<u>10x10cm</u>	1.1%	0.8%	1.1%	1.1%
<u>22x22cm</u>	0.6%	0.3%	0.5%	0.5%



IQM: Detection of potential errors

3: Incorrect Energy

- Changing from 6MV to 10MV or visa-versa

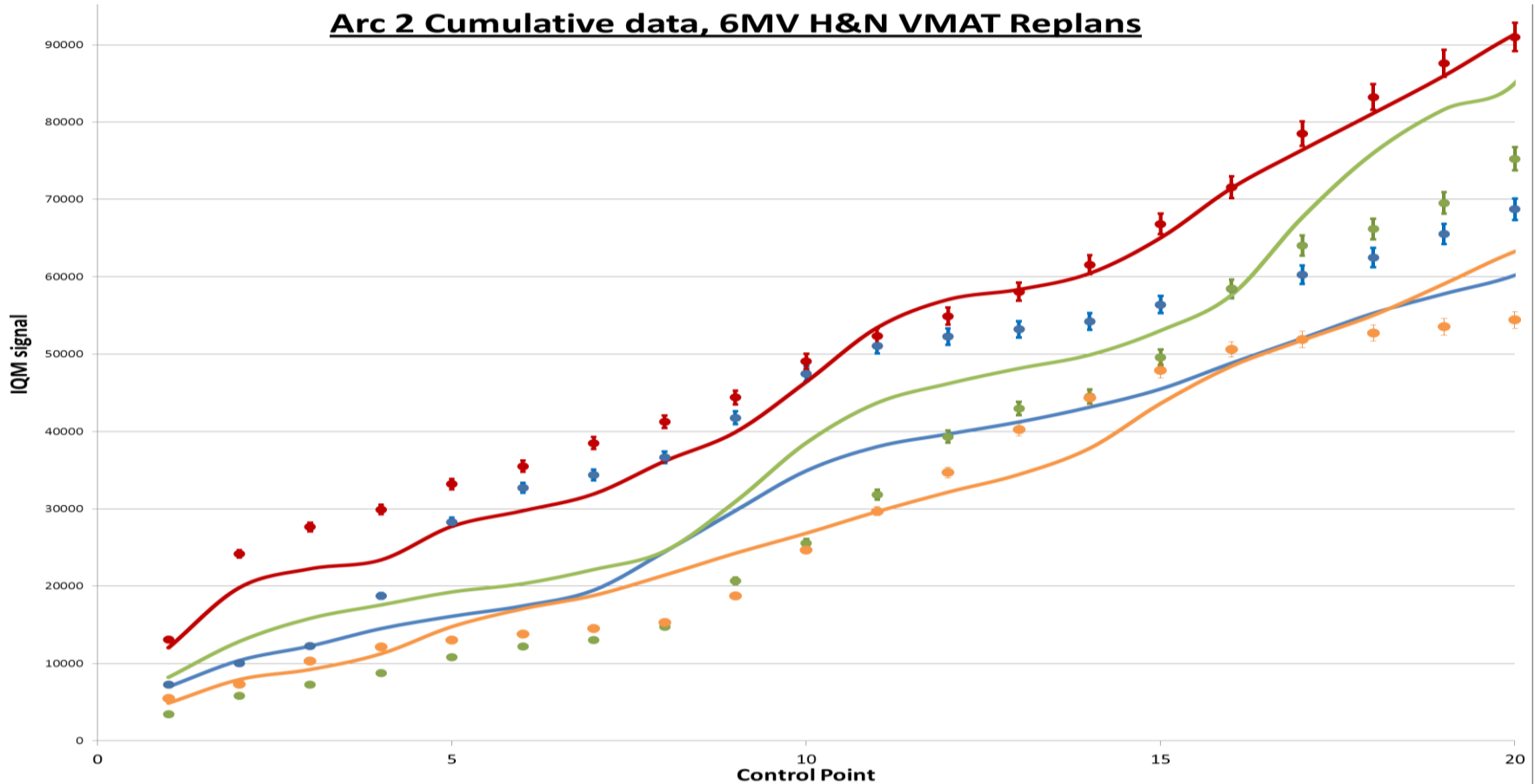
	Percentage difference (Ion chamber @10cm)	Percentage difference (IQM)
Static fields	9.5±0.5%	6±0.5%
Conformal Arcs	9.5±0.5%	6±0.5%
Step & Shoot	9.5±0.5%	6±0.5%
VMAT	13-15%	2-3.5%



IQM: Detection of potential errors

4: Incorrect Plan

Arc 2 Cumulative data, 6MV H&N VMAT Replans



Conclusions

- The IQM is stable, reliable & easy to use
- IQM can identify...
 - Incorrect MU's & Energy
 - Significant MLC mis-calibration
 - Incorrect plans
- It has a limited ability to identify errors in the non-gradient direction, however other techniques can be used to compensate for this.



Conclusions

- As a tool to validate the correct delivery of daily fractions the IQM is effective and reliable
- Further work to use the IQM to validate the **first fraction** (Treatment plans), and to use the IQM as a Linac QC tool are progressing rapidly

