iViewDose – dozymetria tranzytowa in vivo

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ELEKTA

Competition

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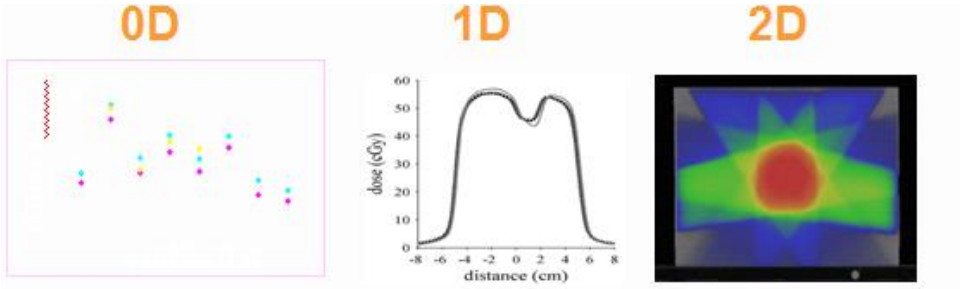
	Elekta iViewDose	Varian Portal Dosimetry	Standard Imaging Adaptivo	SNC PerFRACTION™	Raydose Edose	Dosisoft EPIGRAY
Pre-treatment QA	Yes	Yes	Yes	Yes	Yes	Yes
In-vivo Patient dosimetry	Yes	No	Yes	Yes	Yes	Yes
3D Analysis	Yes	No	Yes	Yes	Yes	Yes
Integration with OIS	Yes	Yes	No	No	No	No

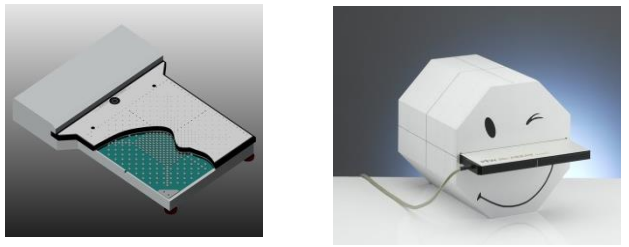
Other players in the Patient QA landscape that are focused on treatment monitoring:

- iRT (Integral Quality Monitor)
- Scandidos (Discovery)
- IBA (Dolphin)

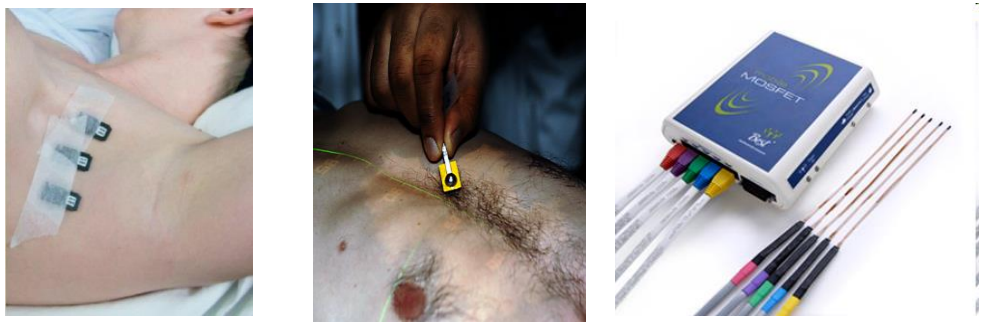
Patient treatment verification



not *3D*



not *IN VIVO*



not EPID

not AUTOMATED

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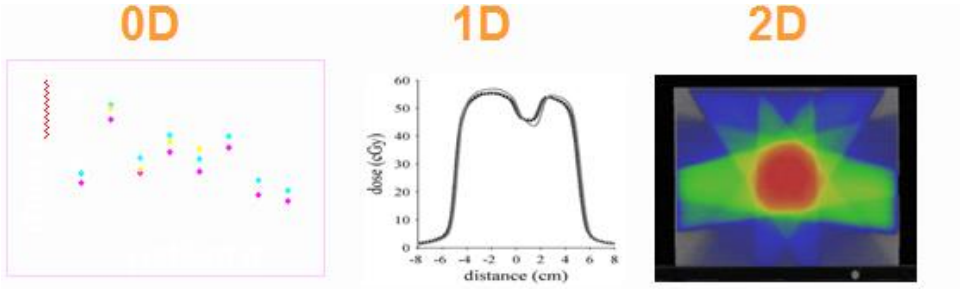
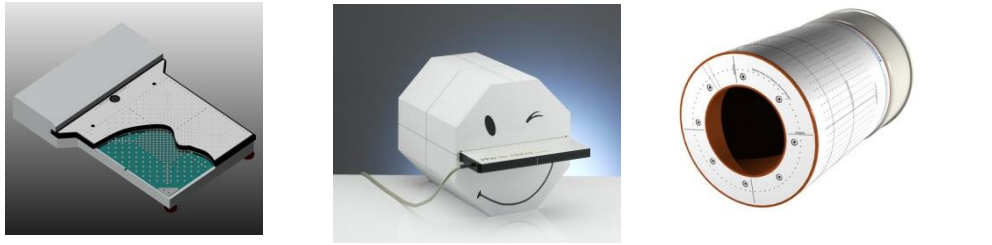
Patient treatment verification

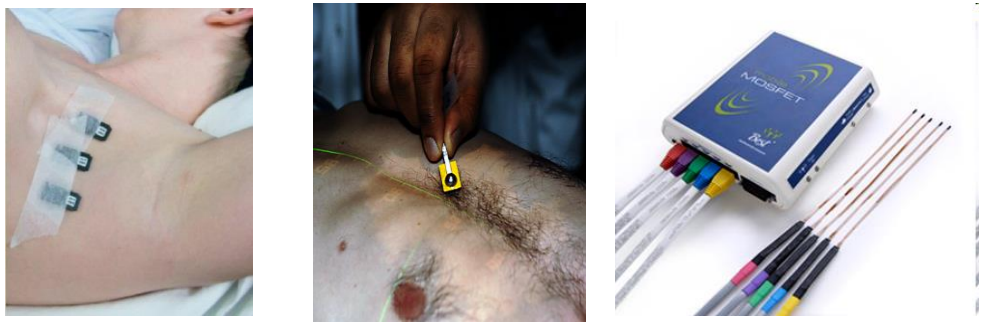


iViewDose

~~not~~ *3D*



~~not~~ *IN VIVO*



~~not~~ *EPID*

~~not~~ *AUTOMATED*

~~not~~ *AUTOMATED indicator of discrepancies*

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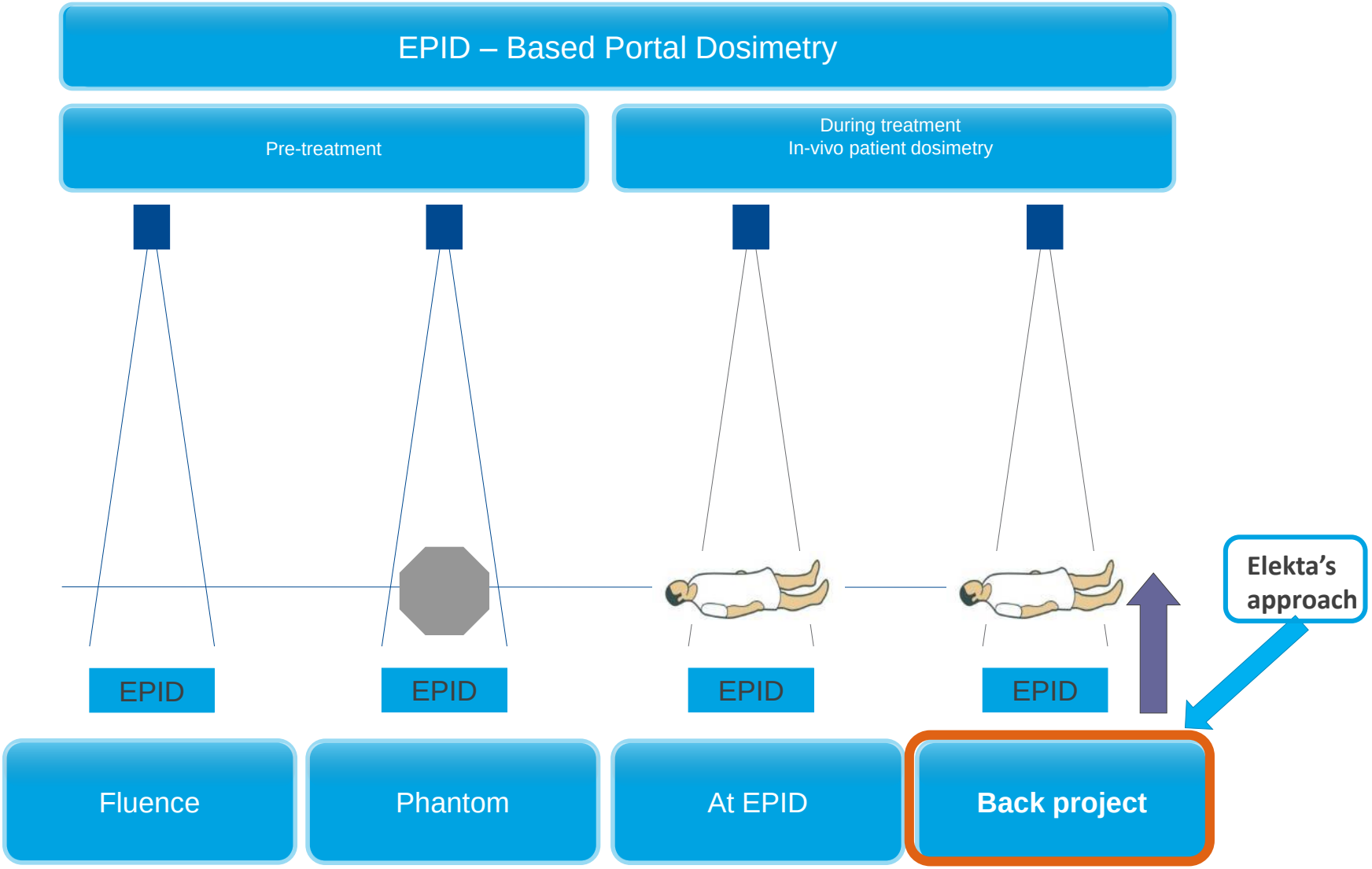
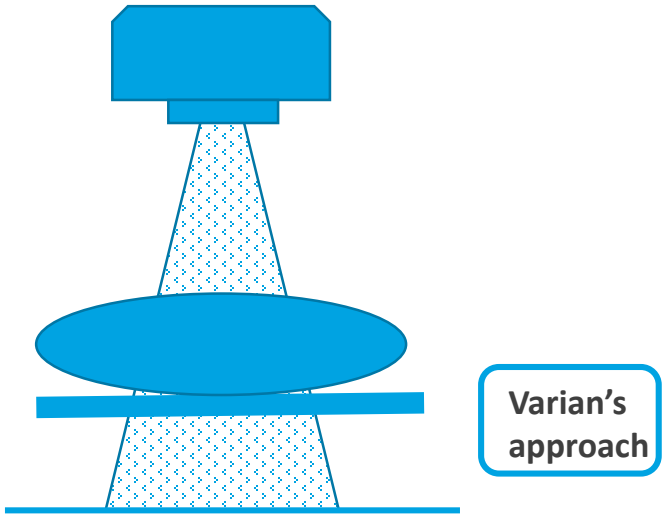
Types of EPID-based Dosimetry



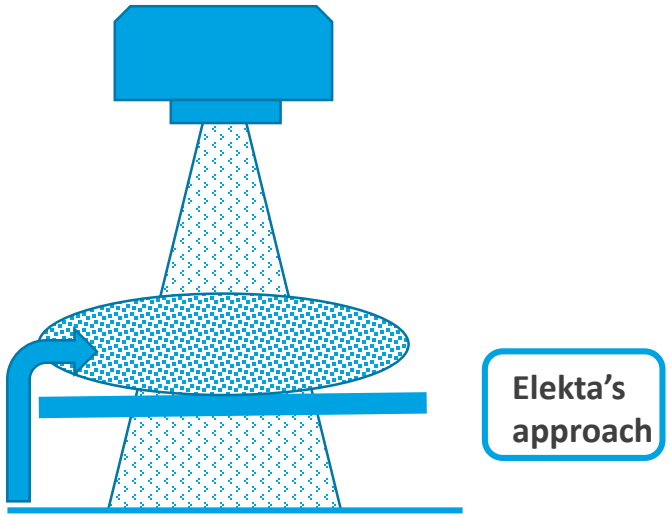
Differences between Varian and Elekta Solution

Portal Dosimetry



X-ray fluence calculated at the level of the imaging panel and compared with the fluence measured with the panel

EPID based In-vivo Dosimetry



Measured fluence back projected onto the CT dataset and compared with the planned dose distribution

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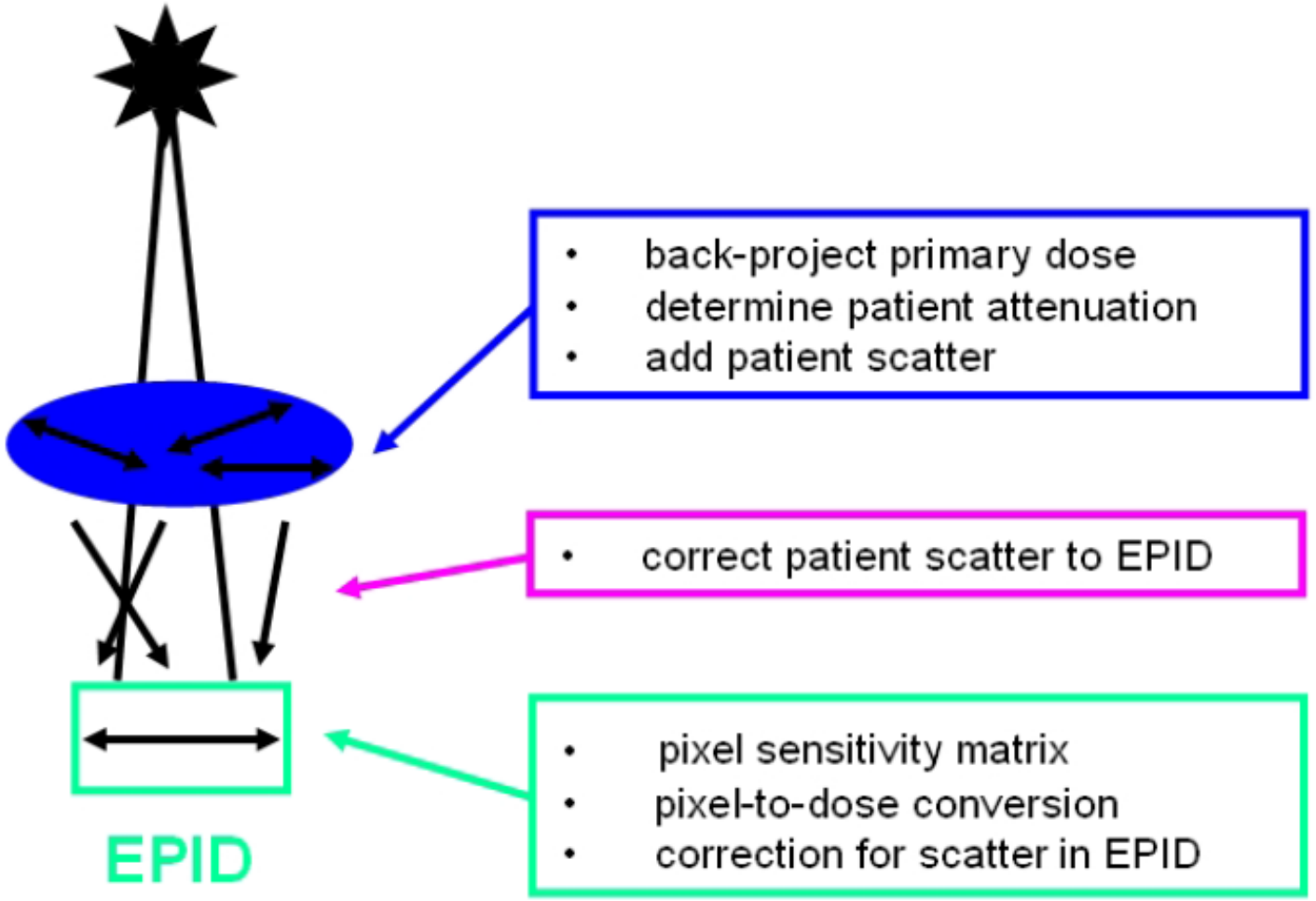
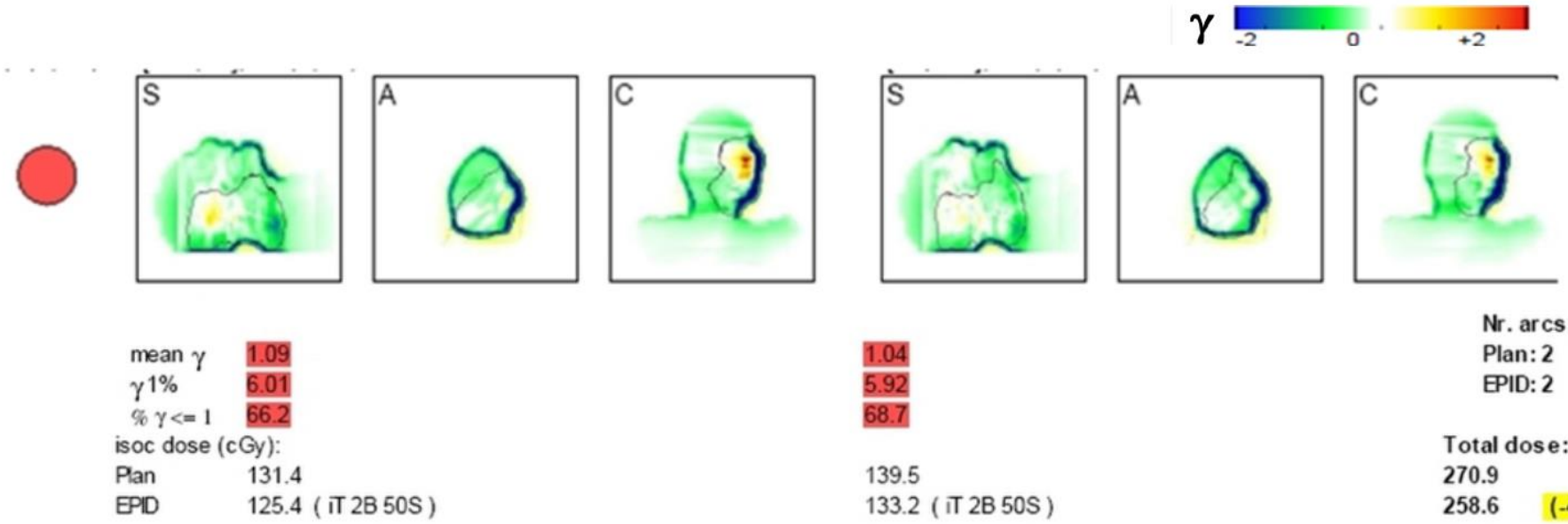


[B. Mijnheer 2013]



[B. Mijnheer 2013]

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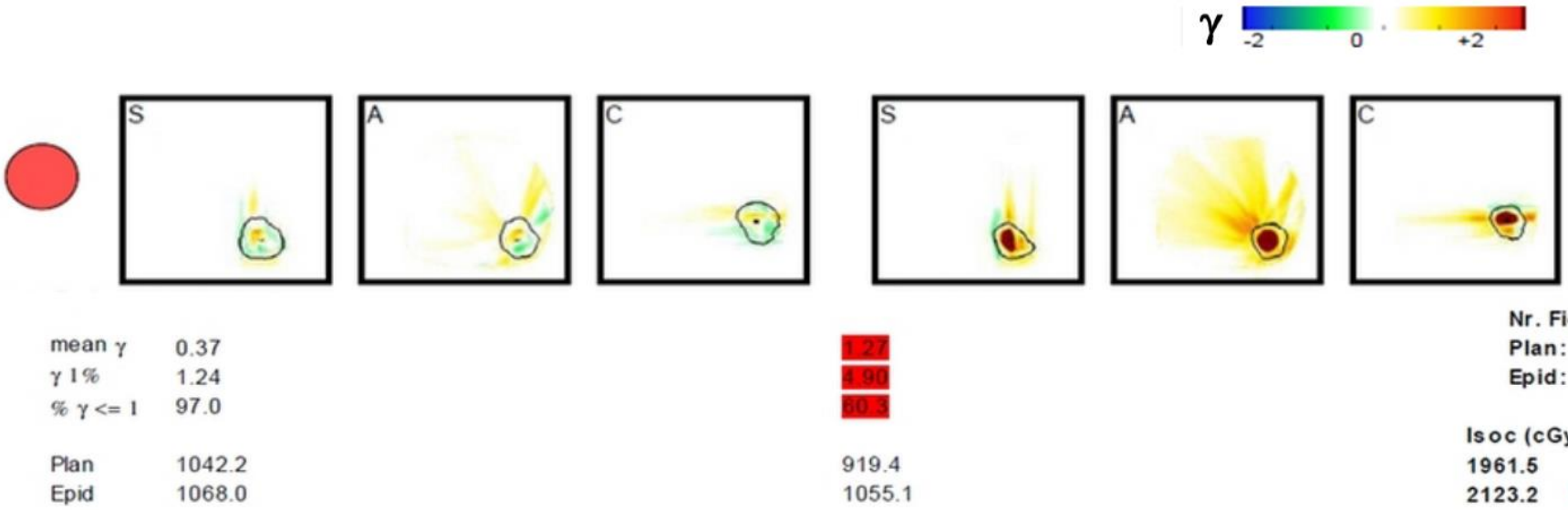

[B. Mijnheer 2013]

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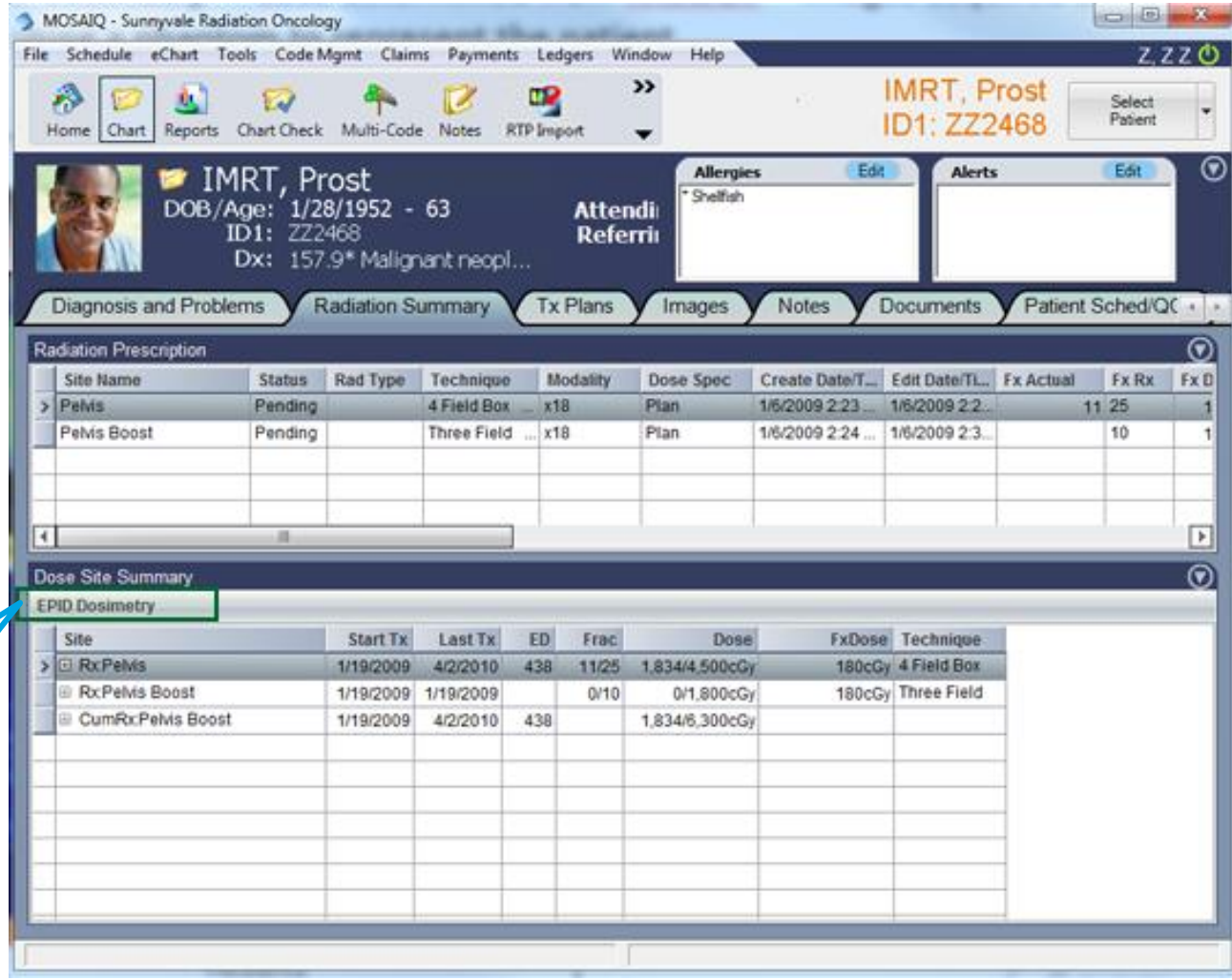
iVD Workflow – MOSAIQ Integration

- After EPID images are acquired, launch iVD
- Integrated in the ‘Dose Site Summary’ pane in MOSAIQ



Dose Site Summary: EPID Dosimetry button

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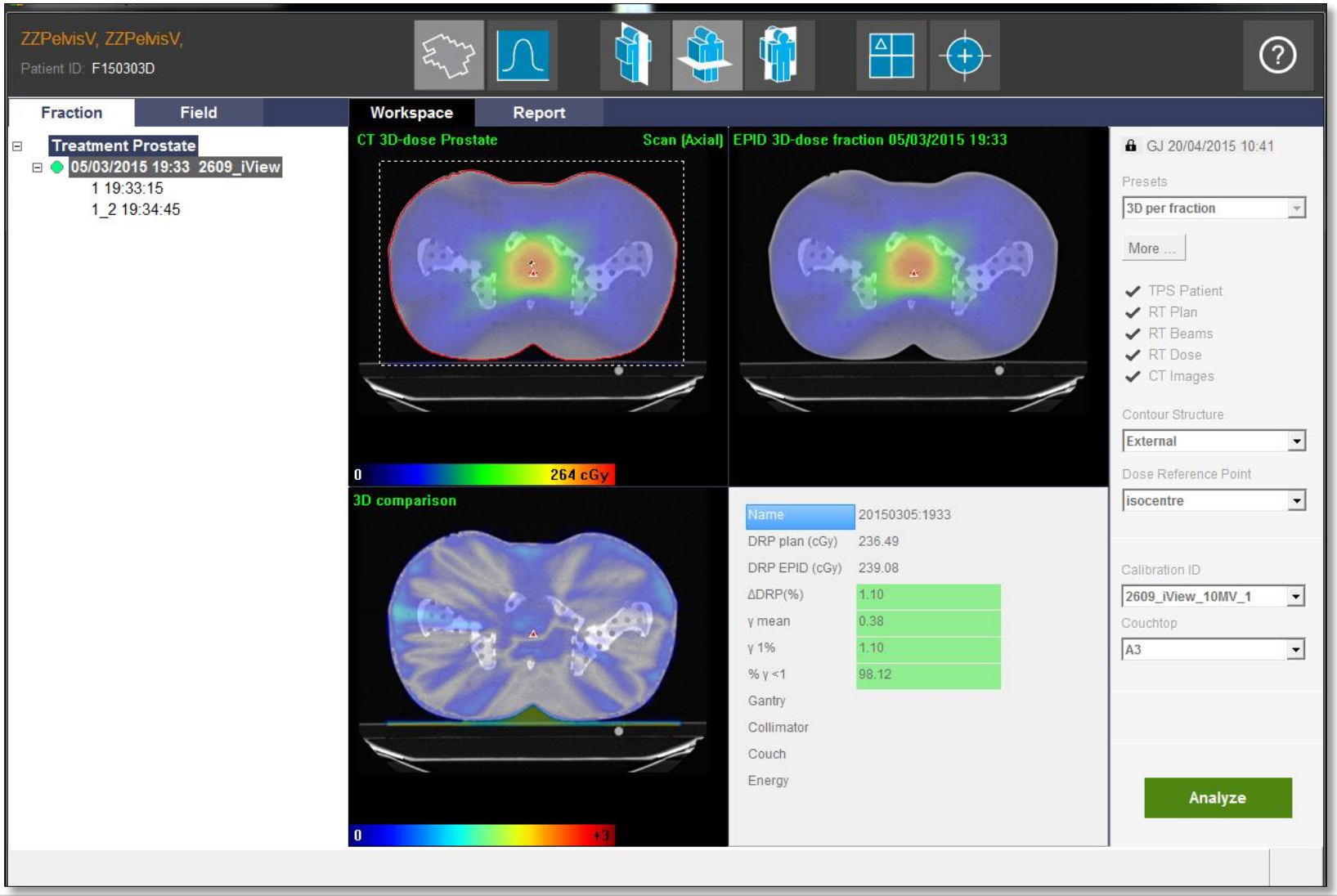
iViewDose Workspace



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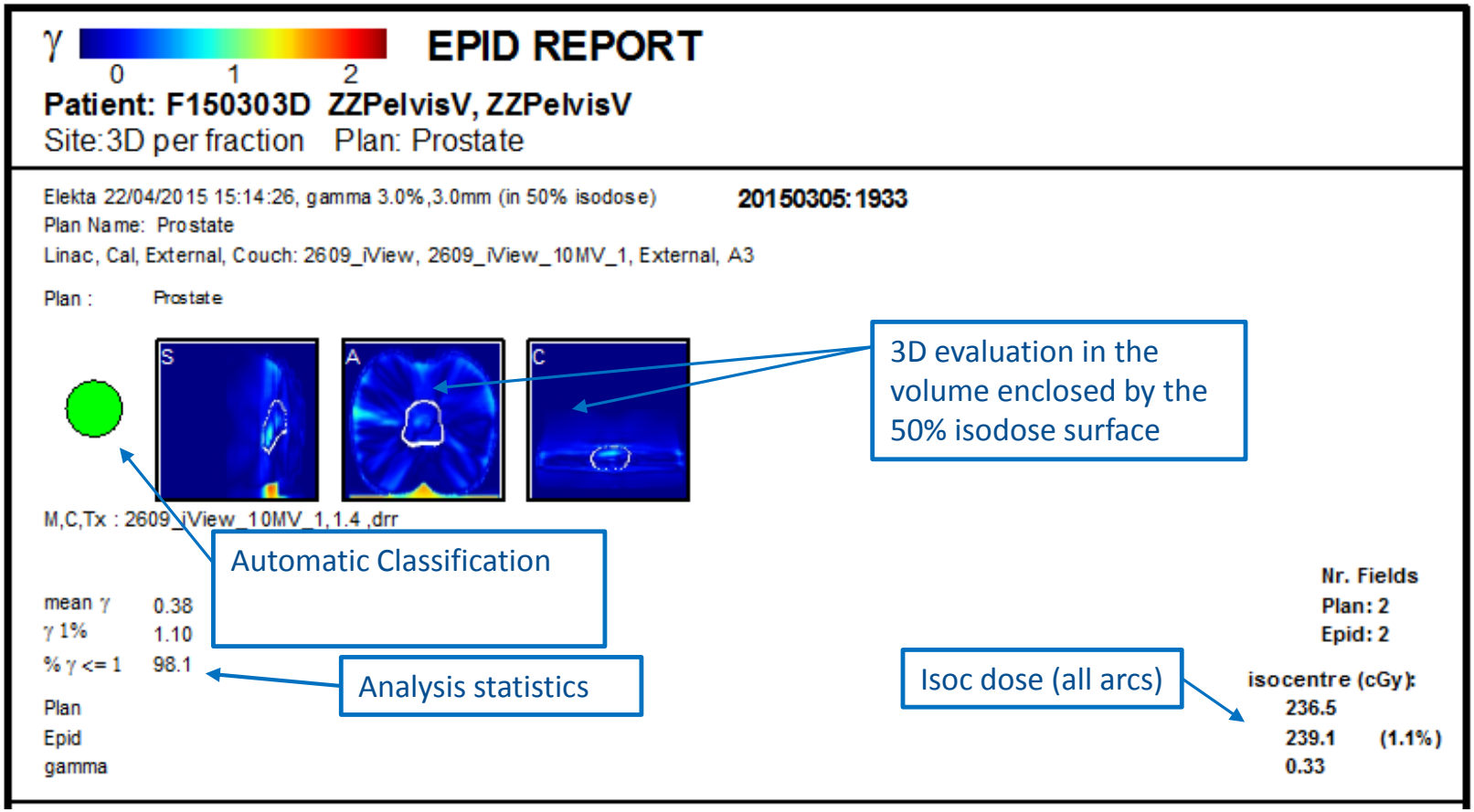
iViewDose Report - VMAT



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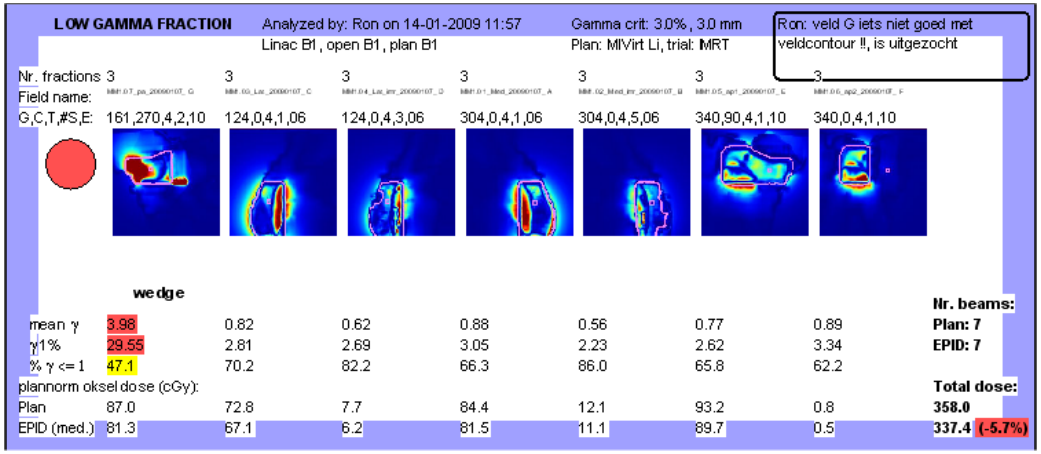
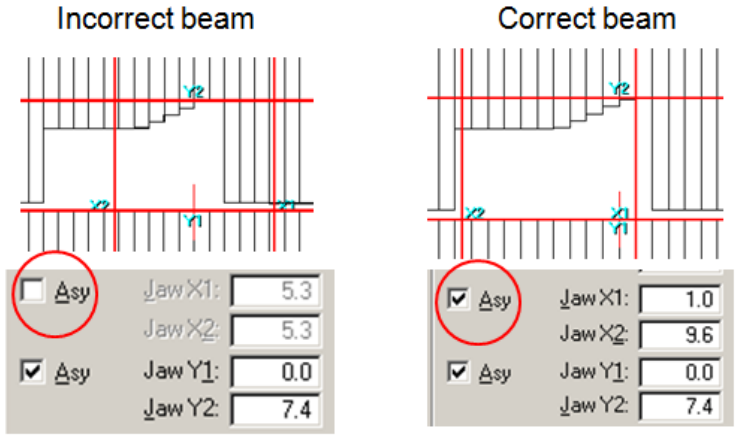
Examples of errors detected - 1





Checkbox accidentally unchecked in MOSAIQ

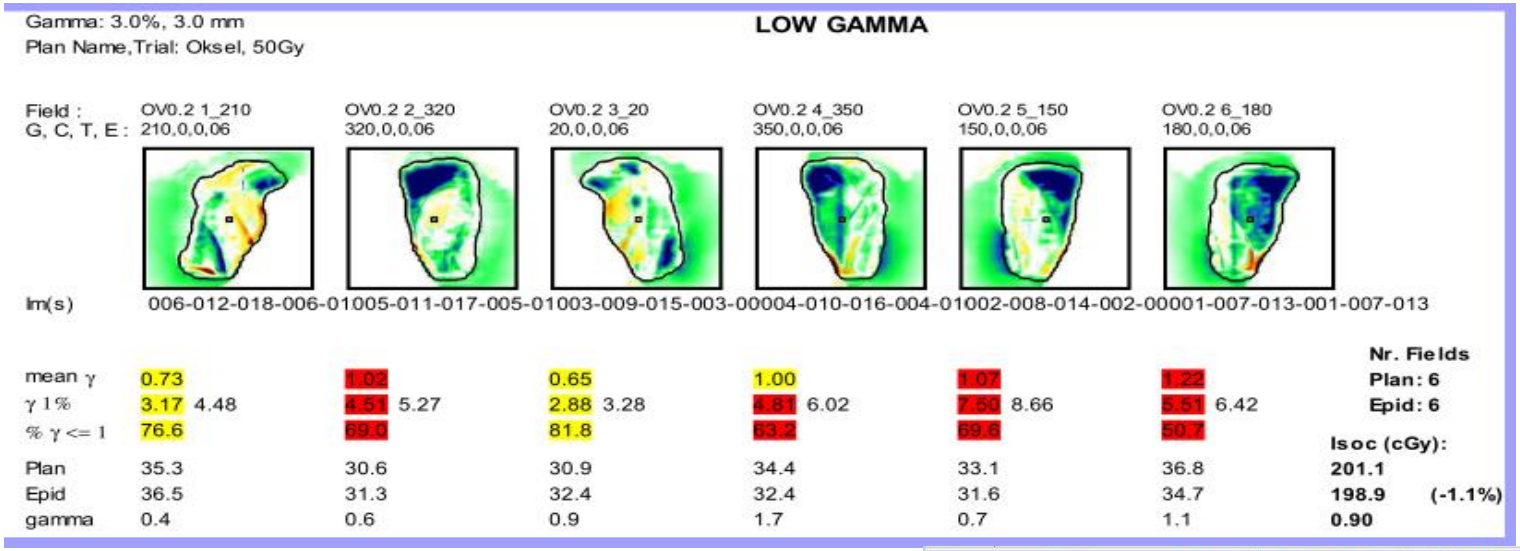
Problem:
A button “asymmetric beam” accidentally deselected, resulting in undesired adjustment of the backup jaws for one beam.
Six fractions were already given (out of 28) resulting in a 10% dose difference for that beam.

Action:
Extra beam for remaining fractions.

Remark: late analysis.

Courtesy of NKI-AvL

Examples of errors detected - 2

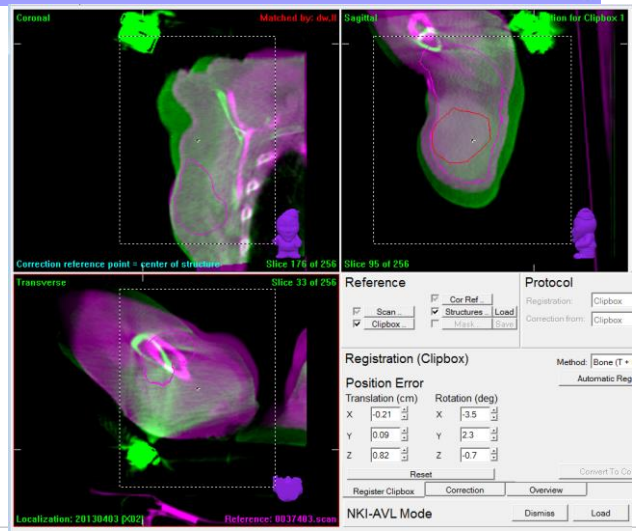


Problem: set-up error

Underdose due to incorrect irradiation through immobilization devices.

Action:

Inform RTTs to make sure setup is made correctly in next fractions. Results were okay afterwards.



Courtesy of NKI-AvL

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Importance of EPID *in vivo* dosimetry

- From 2005-2009 1 in 250 plans[1] showed clinically relevant deviations
- From 2012-2014 1 in 430 plans showed clinically relevant deviations
- Most common error detected using in vivo dosimetry was change to patient anatomy (40% of all errors detected)

[1] Data from NKI-AvL

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The commissioning process

Three levels – Your choice

- Level 1
  - Import of minimum data requirements
  - Set To Work
- Level 2
  - Import of 2D dose matrix to better characterize the linac and the EPID
  - Set To Work
- Level 3
  - Full commissioning, i.e. a full set of measurements per energy, per linac
  - Set To Work

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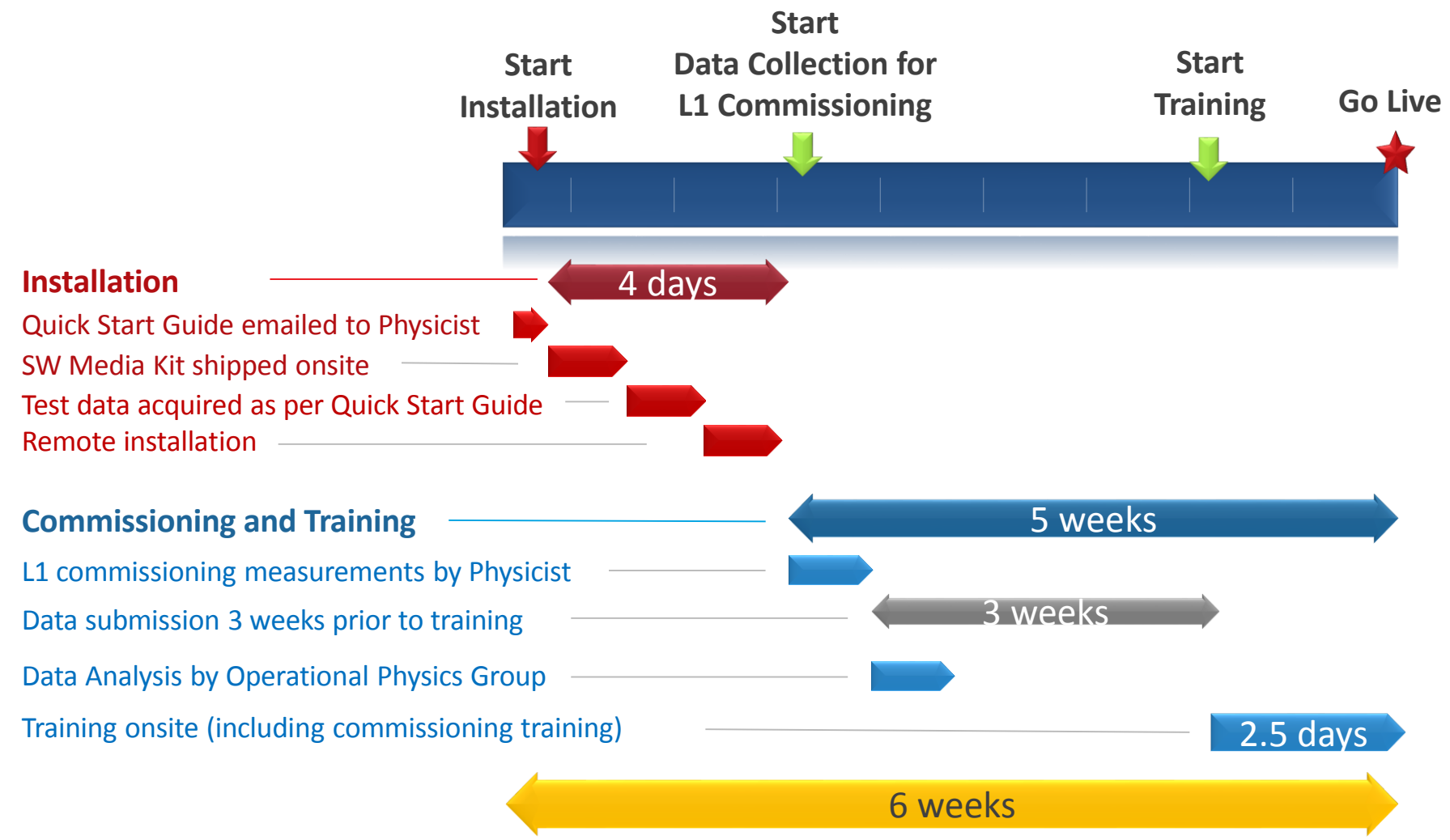
iViewDose - Implementation Timeline



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iViewDose - Main benefits

- Independent verification check – more information
- Detection of adverse events & near misses (gross errors)
- Allows end to end verification of the whole patient treatment workflow
- Possibility of verification of almost ***ALL*** treatments
- Automated offline analysis minimal effort workflow – can be run by non-physicist
- Fully integrated with OIS


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