



iViewDose – dozymetria tranzytowa in vivo

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Competition



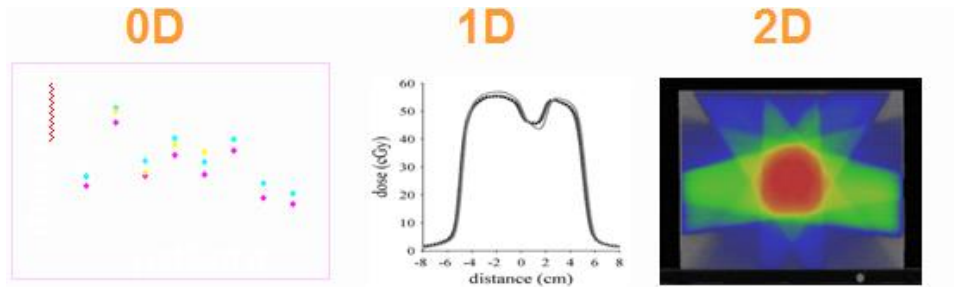
Competition

	Elekta iViewDose	Varian Portal Dosimetry	Standard Imaging Adaptivo	SNC PerFRACTI ON™	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

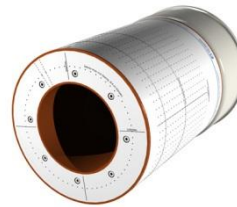
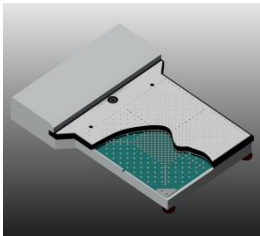
Other players in the Patient QA landscape that are focused on treatment monitoring:

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

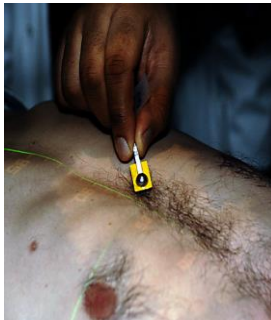
Patient treatment verification



not 3D



not *IN VIVO*



not EPID

not AUTOMATED

Patient treatment verification

iViewDose

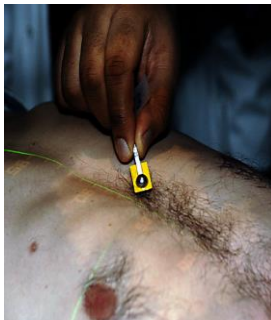
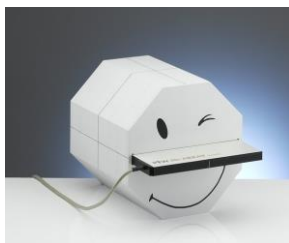
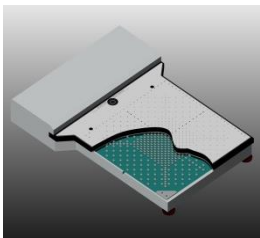
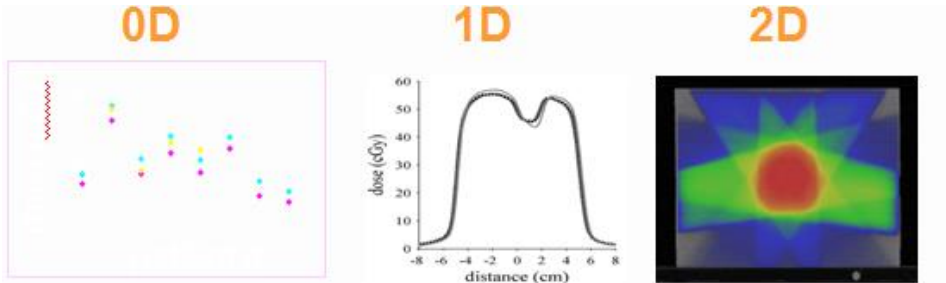
not 3D

not *IN VIVO*

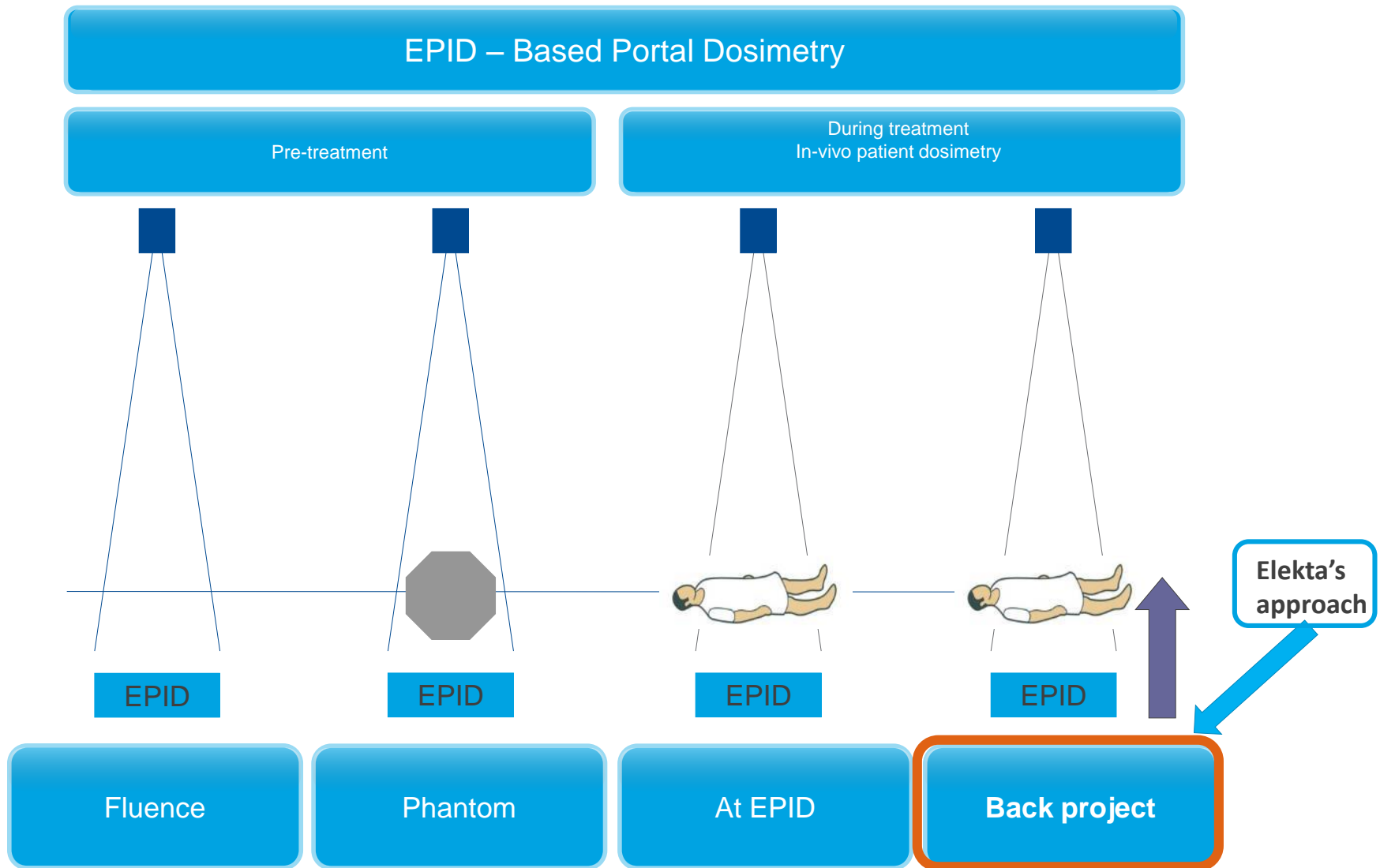
not *EPID*

not *AUTOMATED*

not *AUTOMATED* indicator of discrepancies

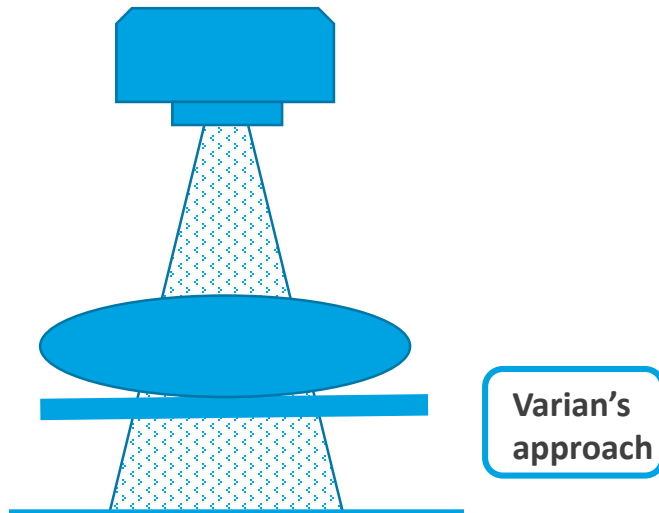


Types of EPID-based Dosimetry



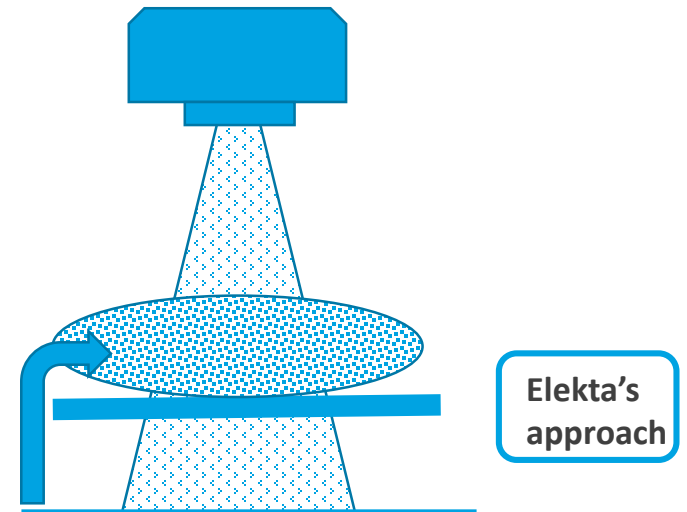
Differences between Varian and Elekta Solution

Portal Dosimetry

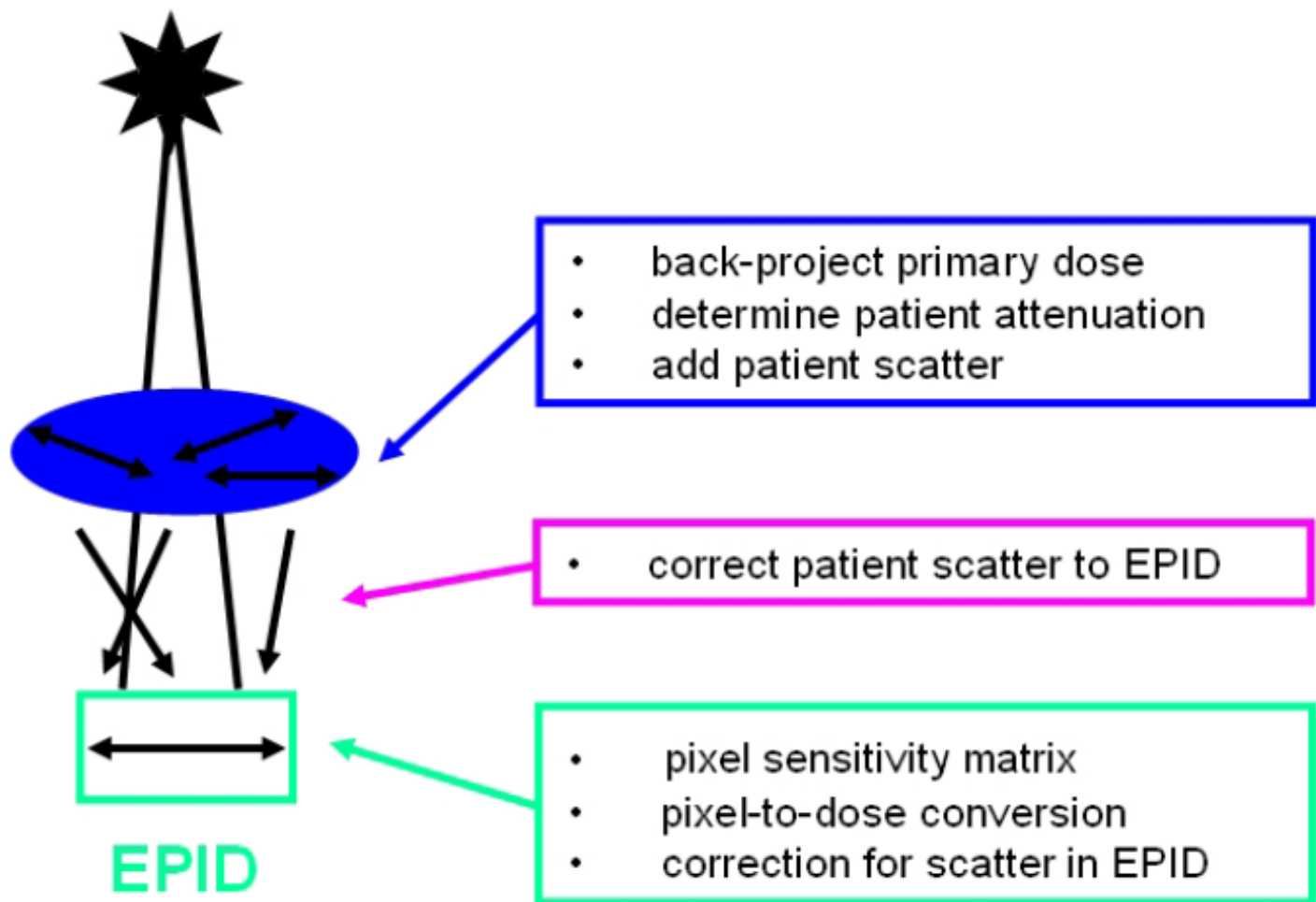


X-ray fluence calculated at the level of the imaging panel and compared with the fluence measured with the panel

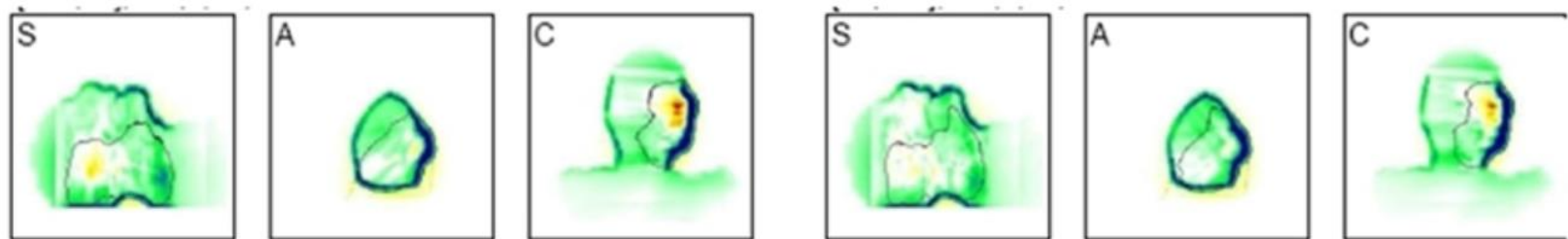
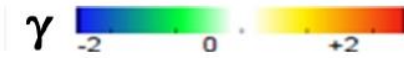
EPID based In-vivo Dosimetry



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



[B. Mijnheer 2013]



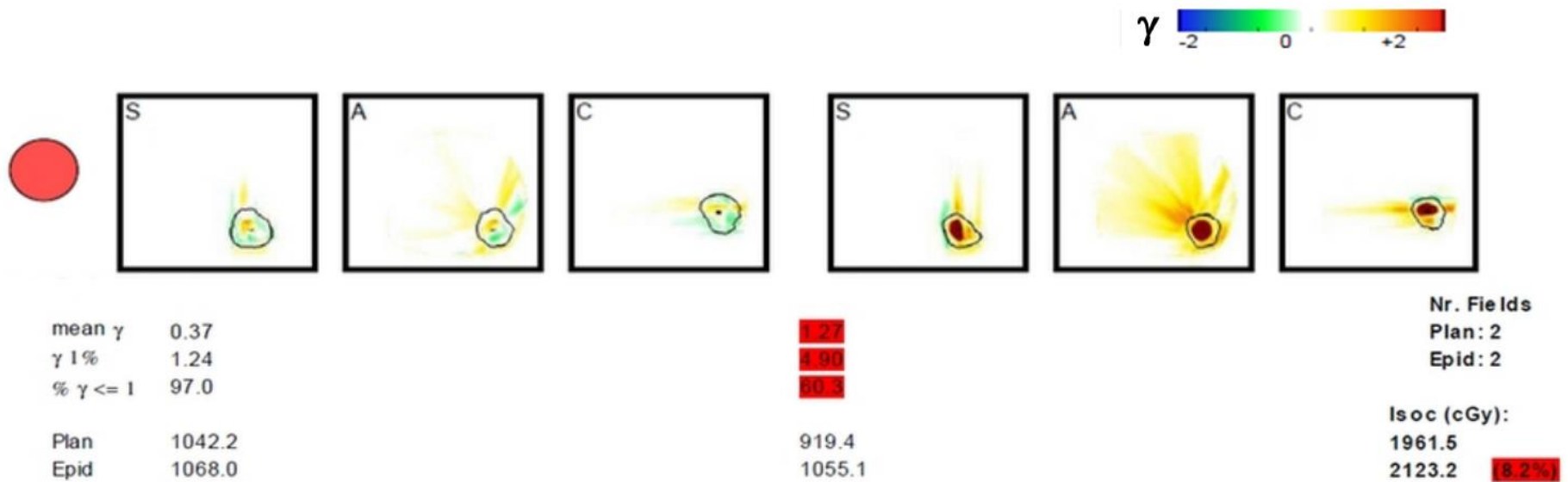
mean γ 1.09
 γ 1% 6.01
% $\gamma \leq 1$ 66.2
isoc dose (cGy):
Plan 131.4
EPID 125.4 (iT 2B 50S)

1.04
5.92
68.7
139.5
133.2 (iT 2B 50S)

Nr. arcs:
Plan: 2
EPID: 2

Total dose:
270.9
258.6 (-4.6%)

[B. Mijnheer 2013]



[B. Mijnheer 2013]

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

MOSAIQ - Sunnyvale Radiation Oncology

File Schedule eChart Tools Code Mgmt Claims Payments Ledgers Window Help

Home Chart Reports Chart Check Multi-Code Notes RTP Import

IMRT, Prost
DOB/Age: 1/28/1952 - 63
ID1: ZZ2468
Dx: 157.9* Malignant neopl...

Attend Referri

Allergies Edit
Shelfish

Alerts Edit

Diagnosis and Problems Radiation Summary Tx Plans Images Notes Documents Patient Sched/QC

Radiation Prescription

Site Name	Status	Rad Type	Technique	Modality	Dose Spec	Create Date/T...	Edit Date/TL...	Fx Actual	Fx Rx	Fx D
> Pelvis	Pending		4 Field Box ...	x18	Plan	1/6/2009 2:23 ...	1/6/2009 2:2...	11 25		1
Pelvis Boost	Pending		Three Field ...	x18	Plan	1/6/2009 2:24 ...	1/6/2009 2:3...	10		1

Dose Site Summary

EPID Dosimetry

Site	Start Tx	Last Tx	ED	Frac	Dose	FxDose	Technique
> Rx Pelvis	1/19/2009	4/2/2010	438	11/25	1,834/4,500cGy	180cGy	4 Field Box
Rx Pelvis Boost	1/19/2009	1/19/2009		0/10	0/1,800cGy	180cGy	Three Field
CumRx Pelvis Boost	1/19/2009	4/2/2010	438		1,834/6,300cGy		

iViewDose Workspace

ZZPelvisV, ZZPelvisV,
Patient ID: F150303D

Fraction **Field** **Workspace** **Report**

Treatment Prostate

- 05/03/2015 19:33 2609_iView
 - 1 19:33:15
 - 1_2 19:34:45

CT 3D-dose Prostate **Scan (Axial)** **EPID 3D-dose fraction 05/03/2015 19:33**

0 264 cGy

3D comparison

0 13

Name	20150305:1933
DRP plan (cGy)	236.49
DRP EPID (cGy)	239.08
Δ DRP(%)	1.10
γ mean	0.38
γ 1%	1.10
% γ <1	98.12
Gantry	
Collimator	
Couch	
Energy	

Presets
3D per fraction

More ...

- ✓ TPS Patient
- ✓ RT Plan
- ✓ RT Beams
- ✓ RT Dose
- ✓ CT Images

Contour Structure
External

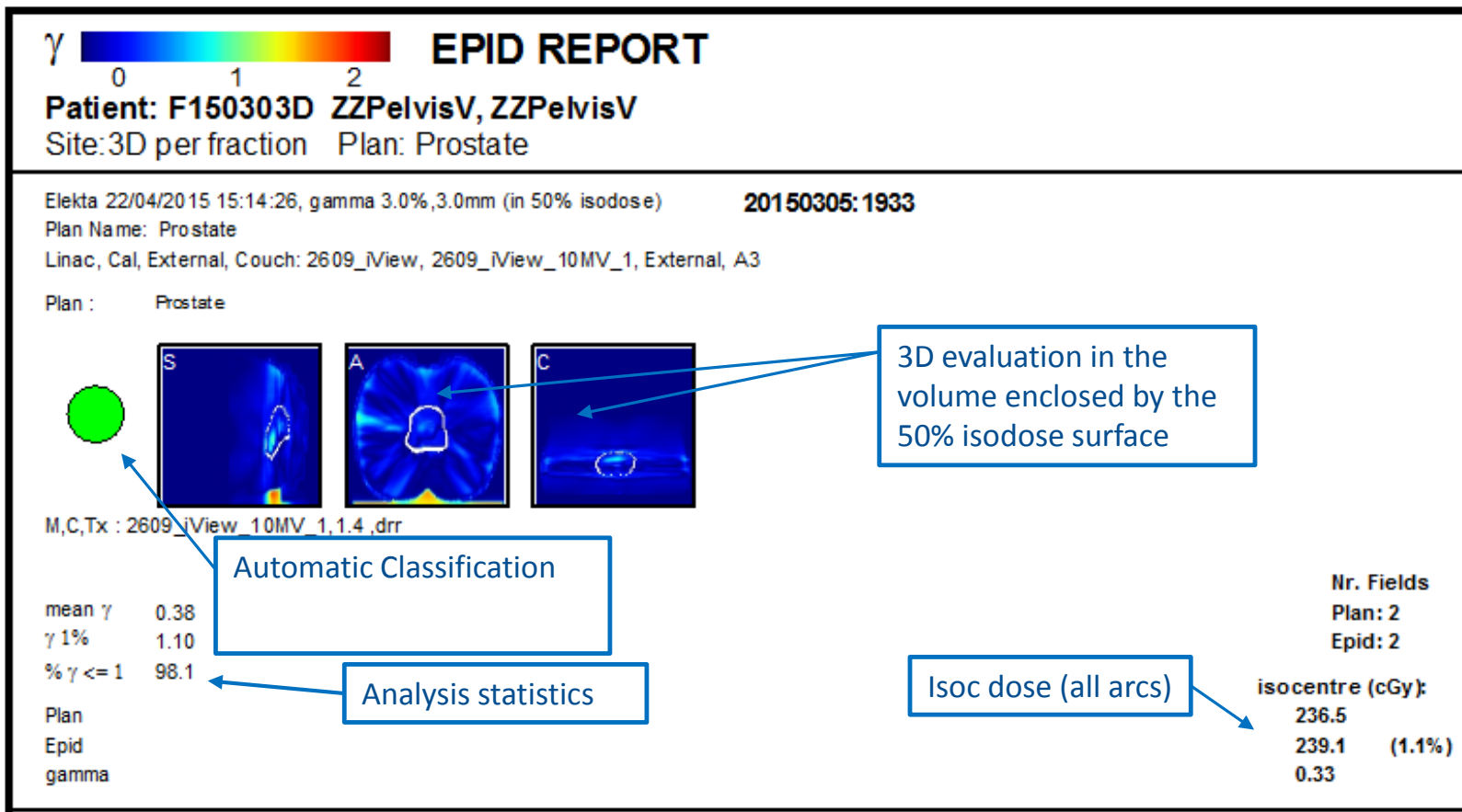
Dose Reference Point
isocentre

Calibration ID
2609_iView_10MV_1

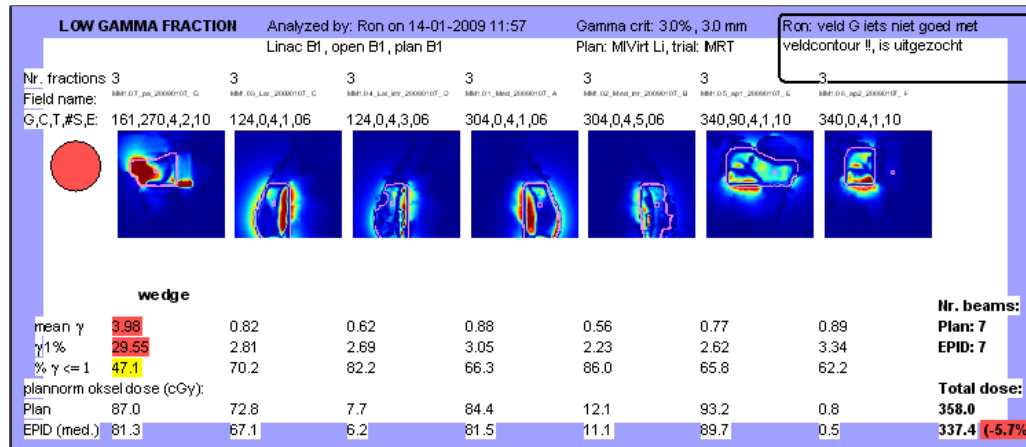
Couchtop
A3

Analyze

iViewDose Report - VMAT

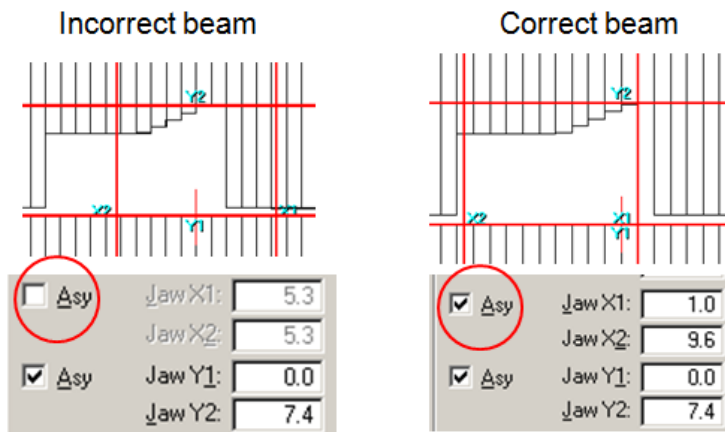


Examples of errors detected - 1



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.



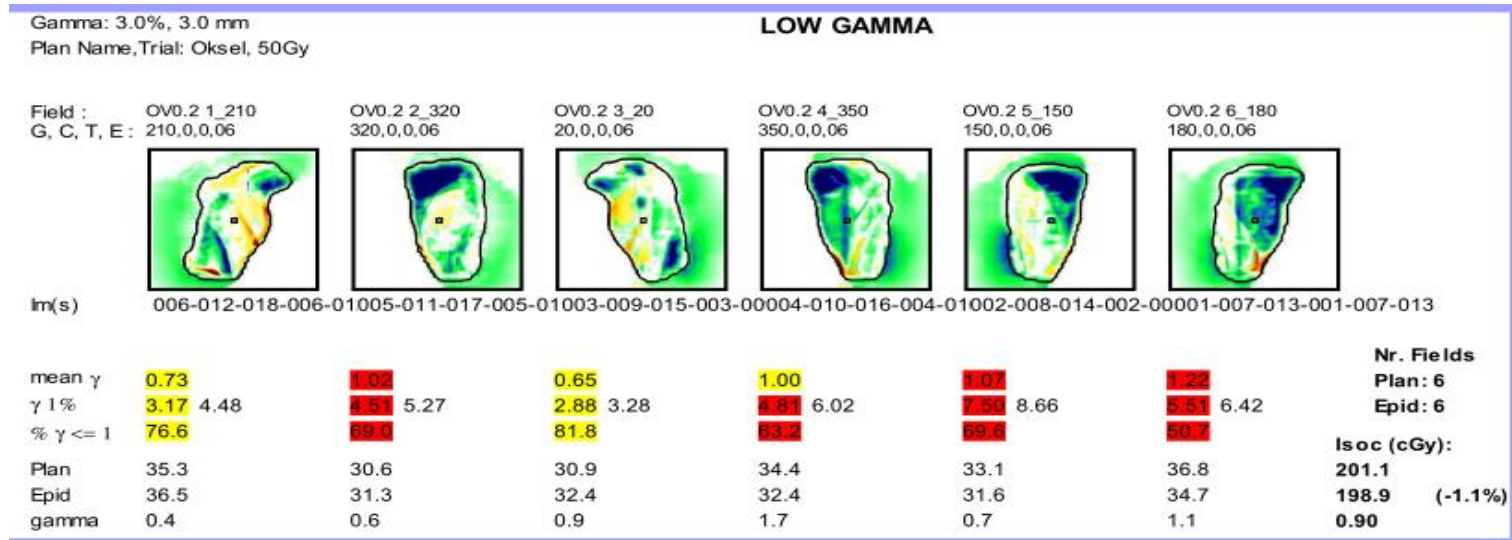
Action:

Extra beam for remaining fractions.

Remark: late analysis.

Checkbox accidentally unchecked in MOSAIQ

Examples of errors detected - 2

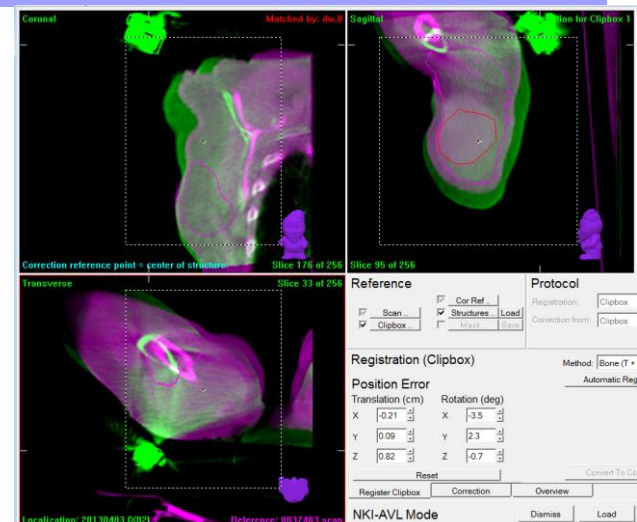


Problem: set-up error

Underdose due to incorrect irradiation through immobilization devices.

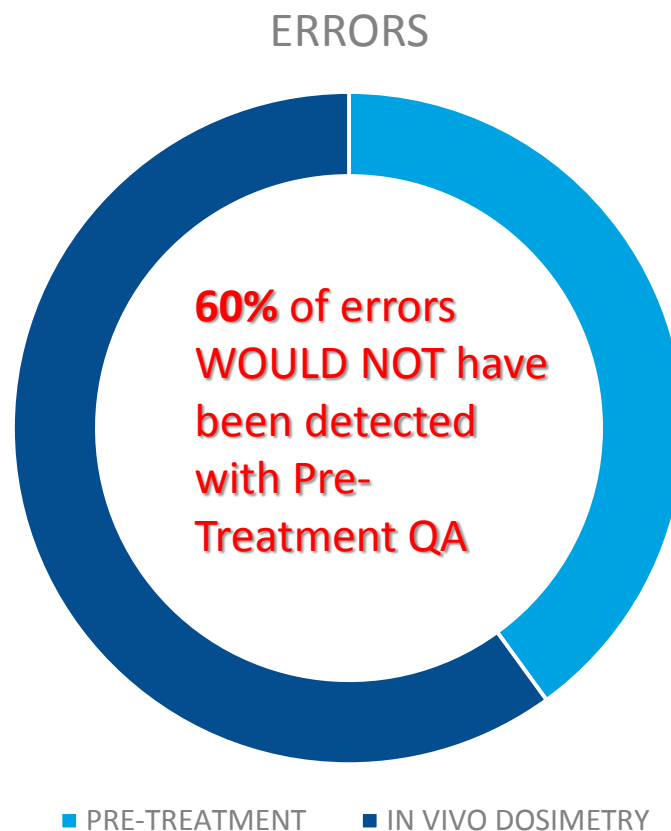
Action:

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



Importance of EPID *in vivo* dosimetry

- From 2005-2009 1 in 250 plans¹ 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)

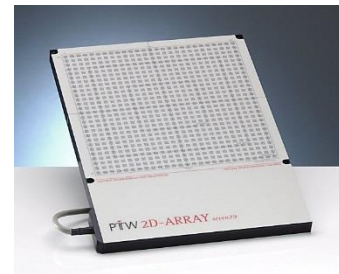


¹ Data from NKI-AvL

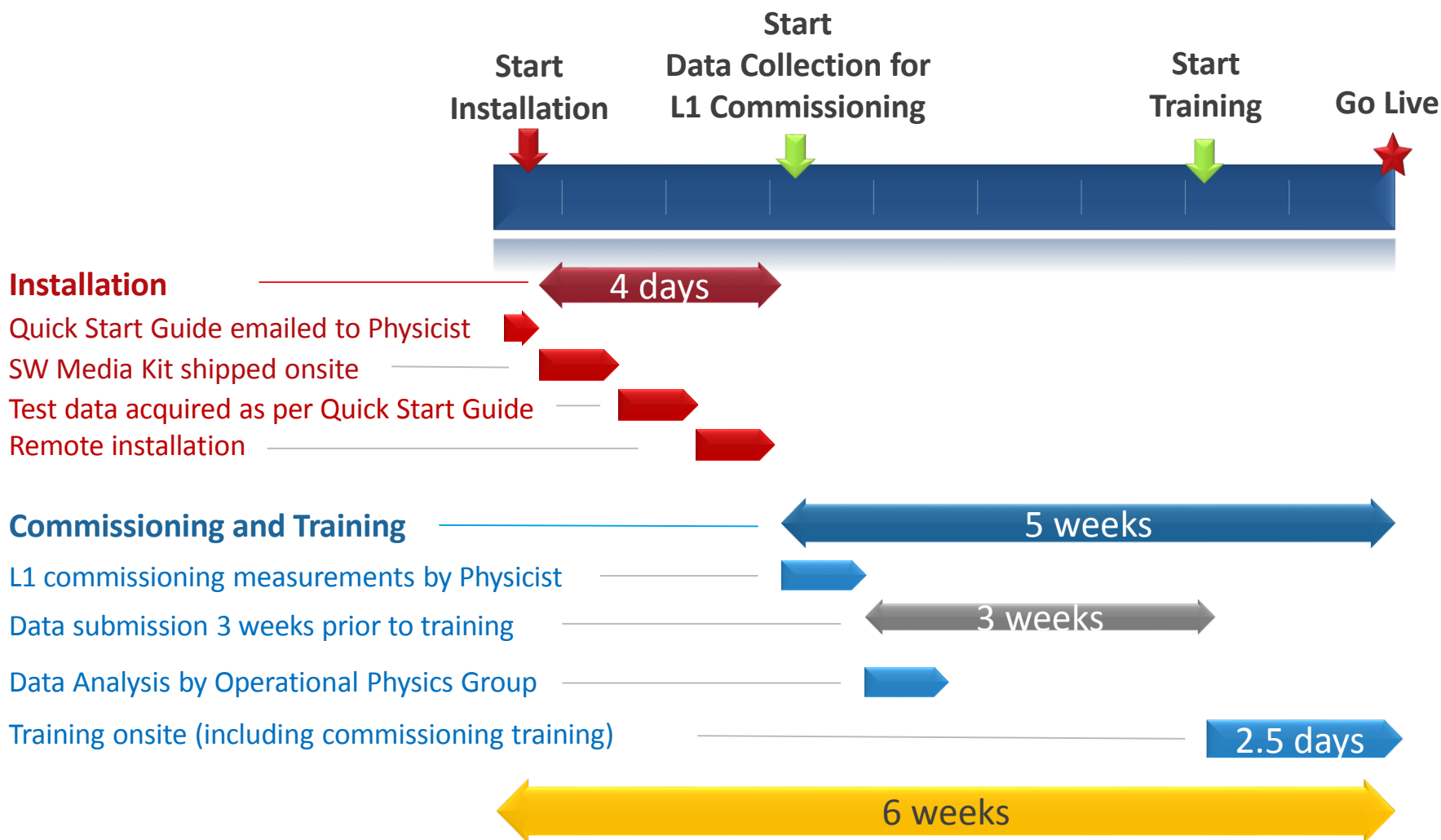
The commissioning process

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



iViewDose - Implementation Timeline



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

