

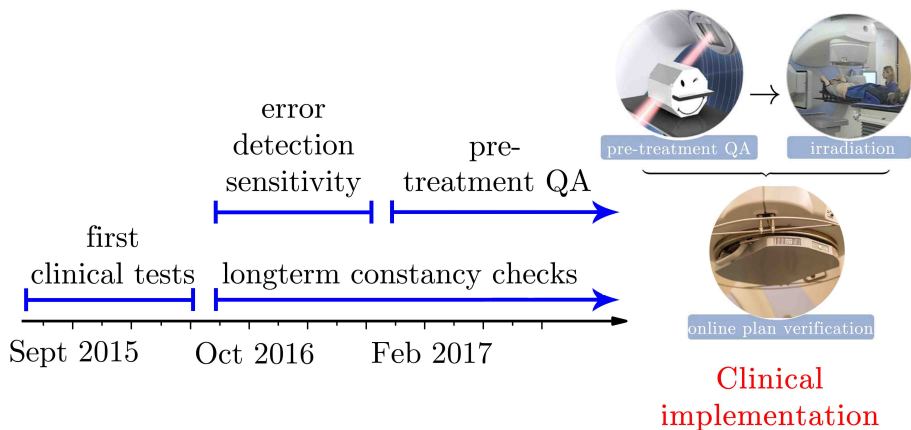
Online dosimetry with the **Integral Quality Monitor**

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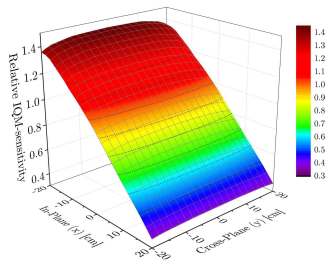
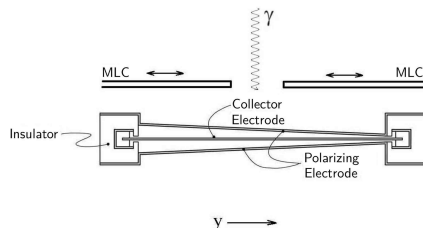
6. May 2017

Overview



IQM-Detektor in general

- **one** ionization chamber
- \Rightarrow **loss** of distinct spacial resolution of dose distribution
- one signal per segment
- \Rightarrow online intra-fraction plan verification



IQM user interface ("MonitorApp")

IQM Monitor Application - IQM v1.3.0-beta (r1392) [Release] <x86> --- RESEARCH ONLY/BETA; NOT FOR CLINICAL USE

Patent ID:
111112

Patient Name:
IQM*VMATHN**

Date of Birth:

Linac Name:
Wendelgard

Monitoring Mode: Verification

Field ID: HN11A

Monitoring Status: In progress

Reference Signal: Calculated Signal (2017-02-17 11:54:05)

Cumulative Signal

Segment	Reference	Measured	Delta	Delta (%)
71	490 575	487 688	7113	1.48
72	491 723	490 371	8648	1.80
73	489 417	497 672	8255	1.69
74	505 222	511 824	6601	1.31
75	506 758	513 669	6911	1.36
76	508 290	515 111	6821	1.34
77	509 825	517 527	7702	1.51
78	525 117	535 283	10166	1.94
79	543 445	550 902	7458	1.37
80	545 296	552 374	7088	1.30
81	547 180	554 556	7376	1.35
82	549 408	556 717	7308	1.33
83	551 073	561 811	8778	1.58
84	569 650			

Planned Geometry:

Field ID: HN11A
Segment: #83

Gantry: 212.0°
Collimator: 35.0°

Linac Communication: OK

IQM Detector Status: Monitoring

Air Pressure (mmHg): max: 790, min: 730

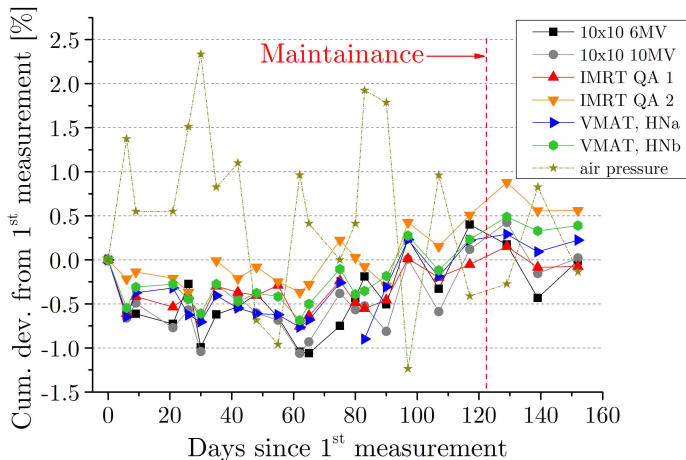
Temperature (°C): max: 35, min: 15

Battery (hours): 19:57 hours

Cumulative

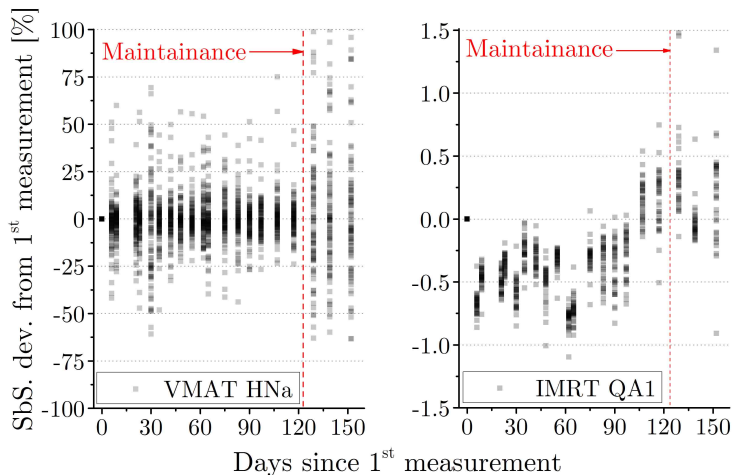
Segment-by-Segment

Long-term signal stability (cumulative)



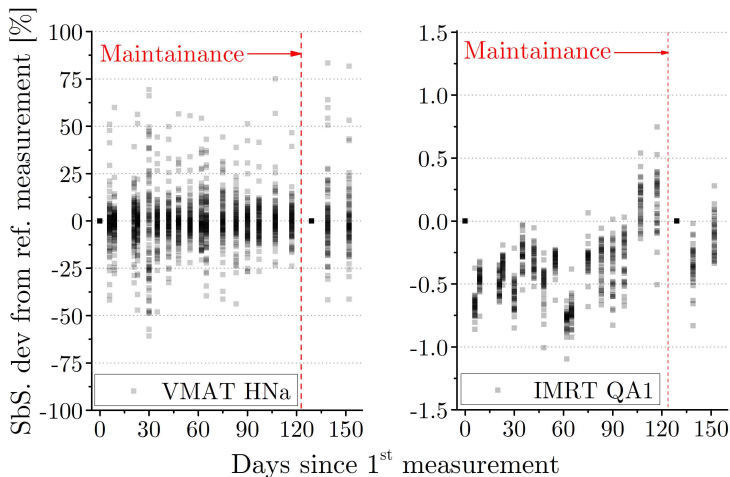
- Maximum deviations: $\pm 1\%$ & no systematic long-term trend
- \implies for clinical use: good stability of cumulative signals

Long-term signal stability (segment-by-segement)



- After linac maintenance: signal deviations per segment increase

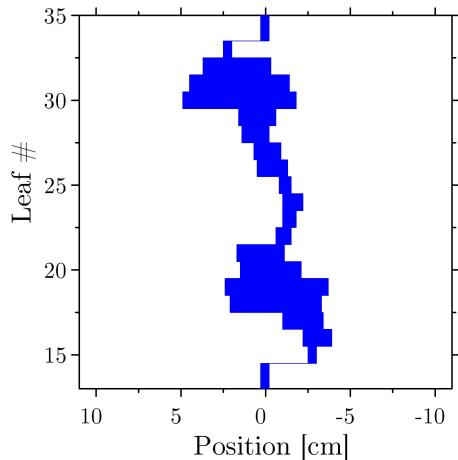
Long-term signal stability (segment-by-segement)



- \implies Definition of new reference, after maintainance

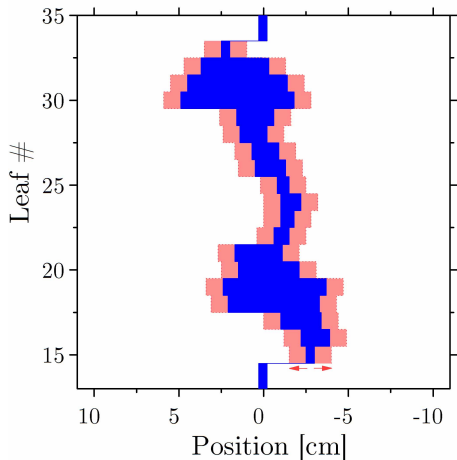
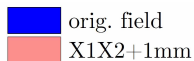
Error detection sensitivity: introducing plan errors

■ orig. field



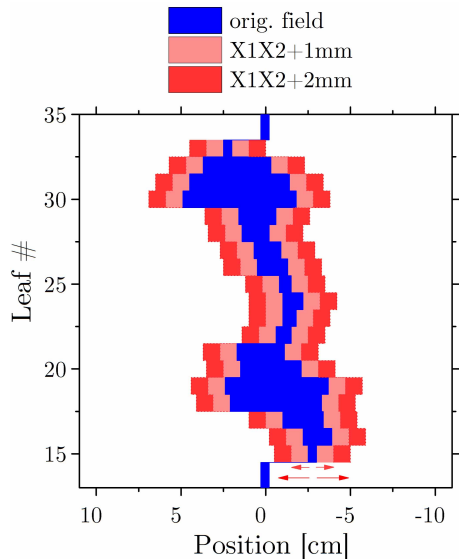
⇒ IQM-reference

Error detection sensitivity: introducing MLC-errors



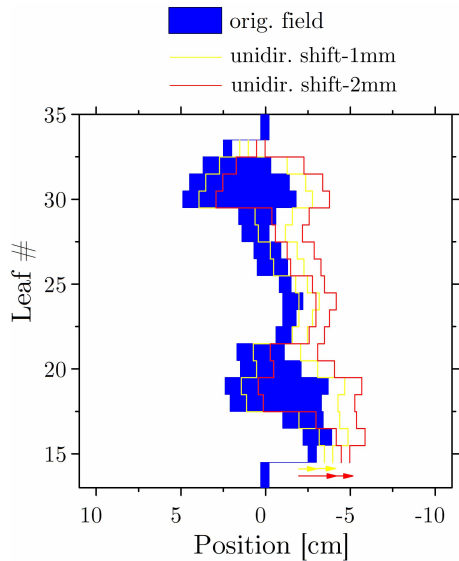
\Rightarrow IQM-signal?

Error detection sensitivity: introducing MLC-errors



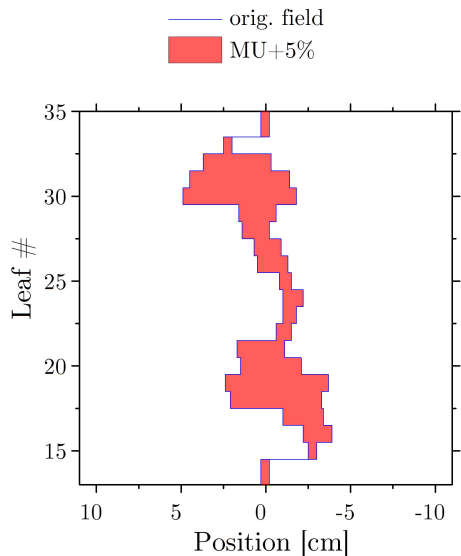
\Rightarrow IQM-signal?

Error detection sensitivity: introducing MLC-errors



\Rightarrow IQM-signal?

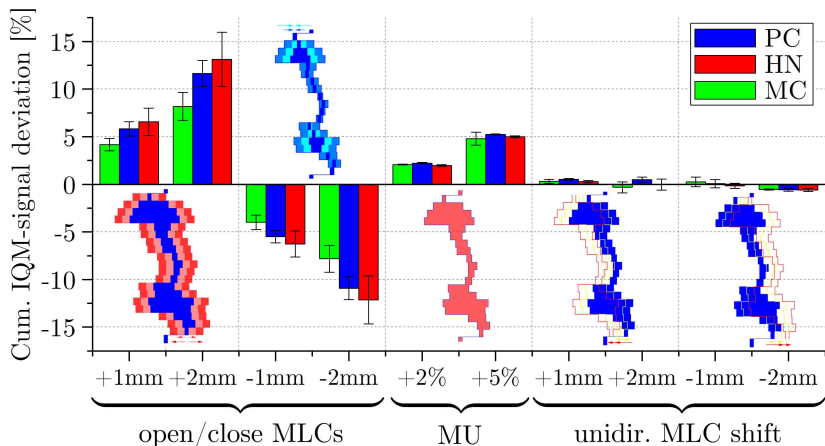
Error detection sensitivity: introducing dosimetric errors



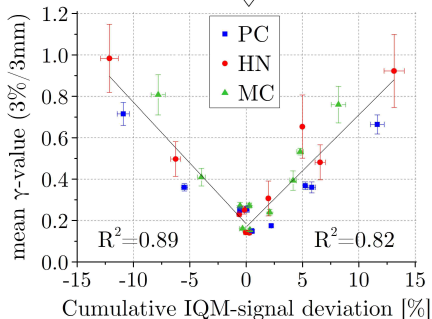
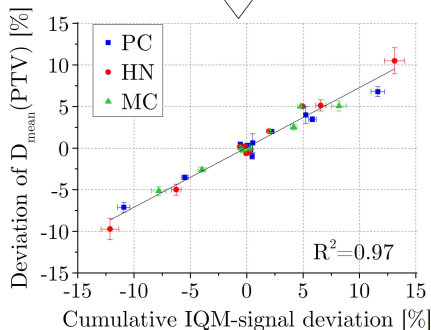
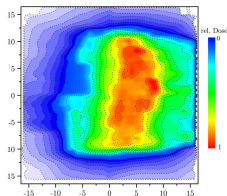
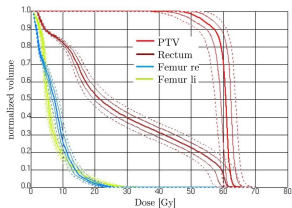
\Rightarrow IQM-signal?

Impact of errors on IQM-signals

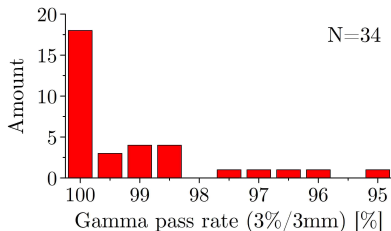
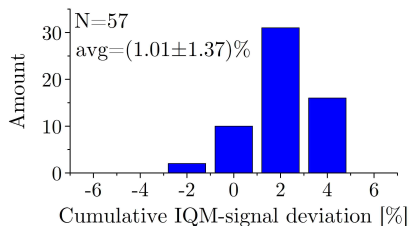
- 15 VMAT-plans: 5 prostate (PC), 5 breast (MC), 5 head-and-neck (HN)
- 10 different errors over all segments, each



Correlation: IQM vs. $D_{\text{mean}}(\text{PTV})$ bzw. γ (3% / 3 mm)



Treatment plan verification (cumulative)



- calculation vs. measurement
- baseline shift of IQM-signal deviations indicates slight systematic miscalculation
- → all plans were verified with the 2D array + octavius phantom

Conclusion and outlook

- IQM can potentially replace 2D-array plan verification
 - very good dosimetric properties and sensitivity
 - calculated signal needs to be improved
-
- definition of error tolerances
 - comparison of the IQM with other transmission detectors