



RadioOnkologie



Behandeln
Forschen
Lehren

UniversitätsKlinikum Heidelberg

Tomotherapie – MLC QA

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HIRO

Heidelberger Institut
für Radioonkologie

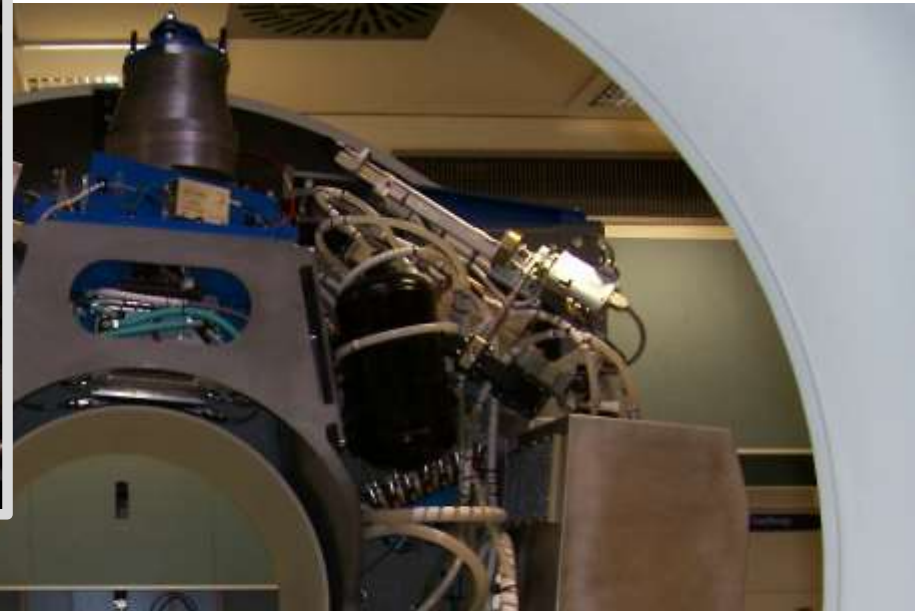
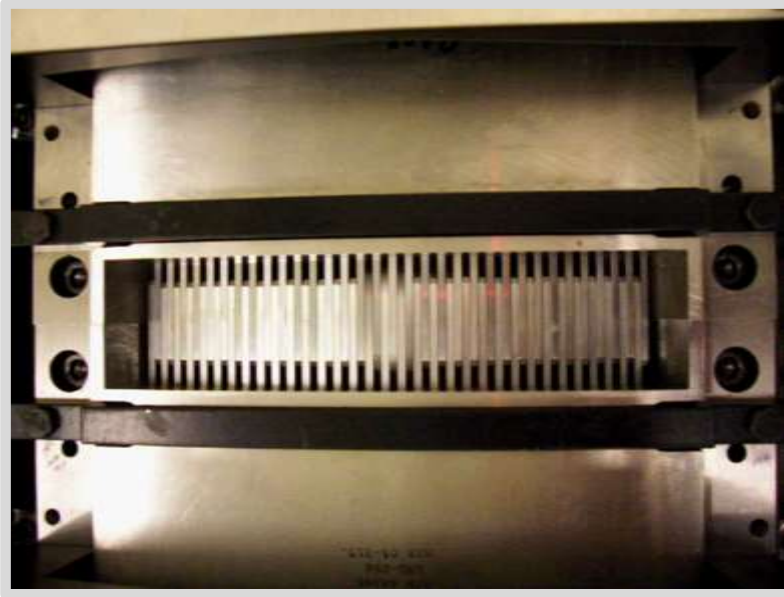
Nationales Zentrum für
Strahlenforschung in der
Onkologie Heidelberg

getragen von:
Deutsches Krebsforschungszentrum
Universitätsklinikum Heidelberg
Heidelberger Ionenstrahl-Therapiezentrum



Tomotherapie

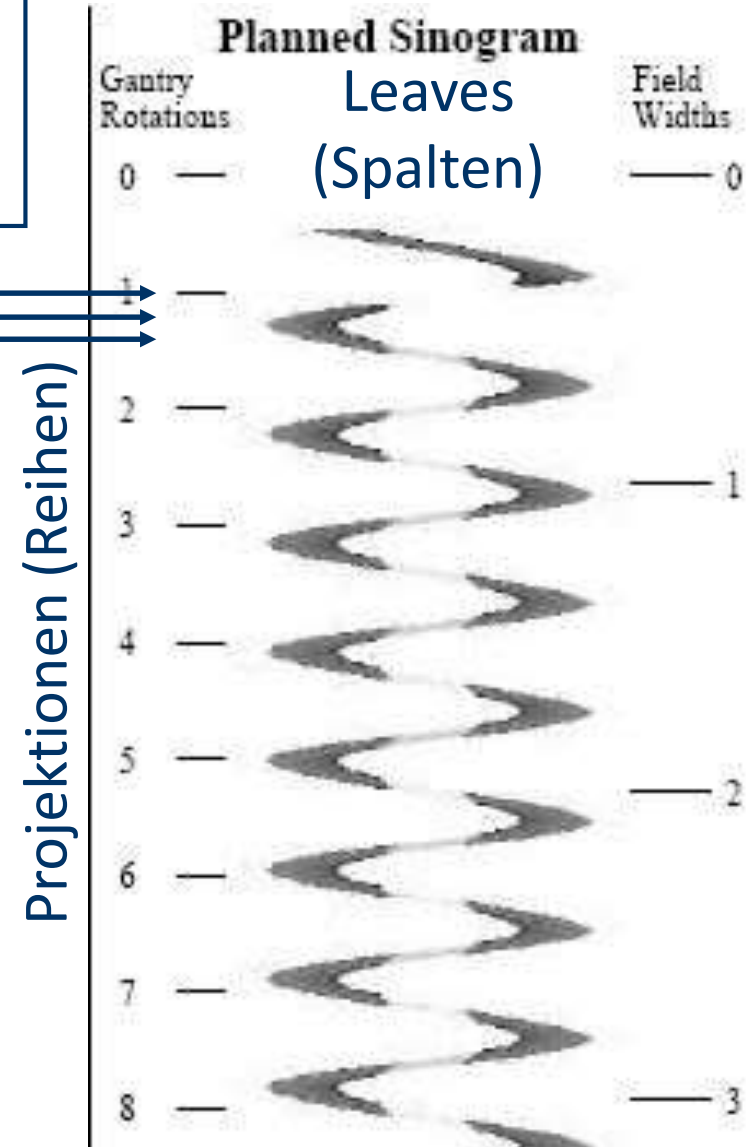
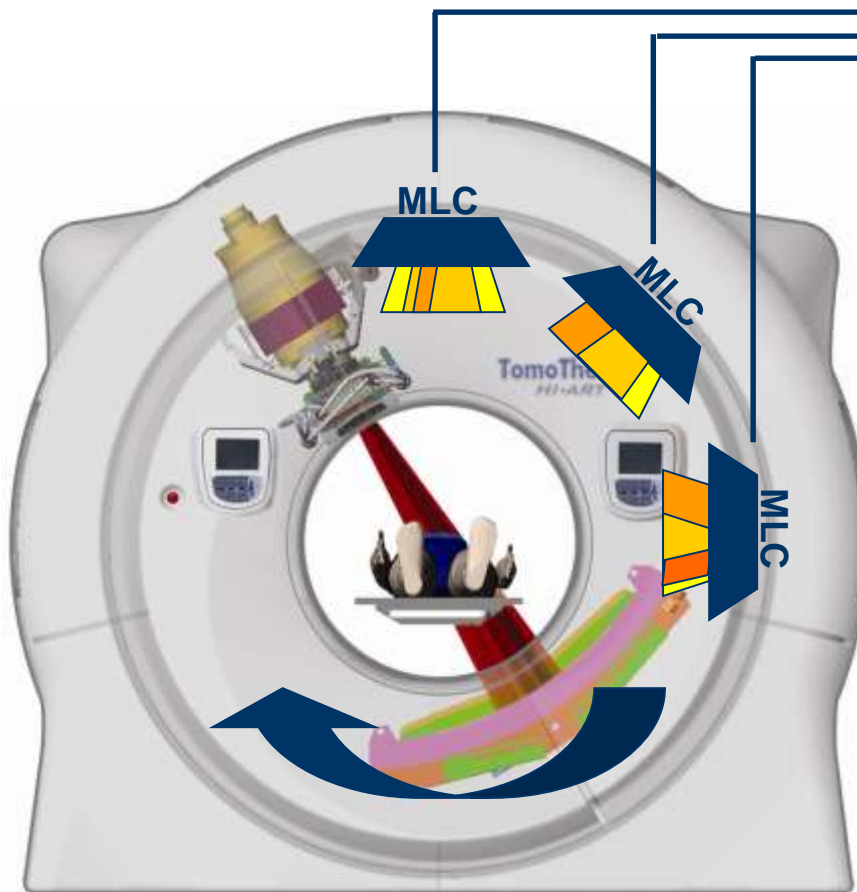
UniversitätsKlinikum Heidelberg





Sinogram

Sinogram beschreibt das Verhalten des MLC in Abhängigkeit des Gantrywinkels



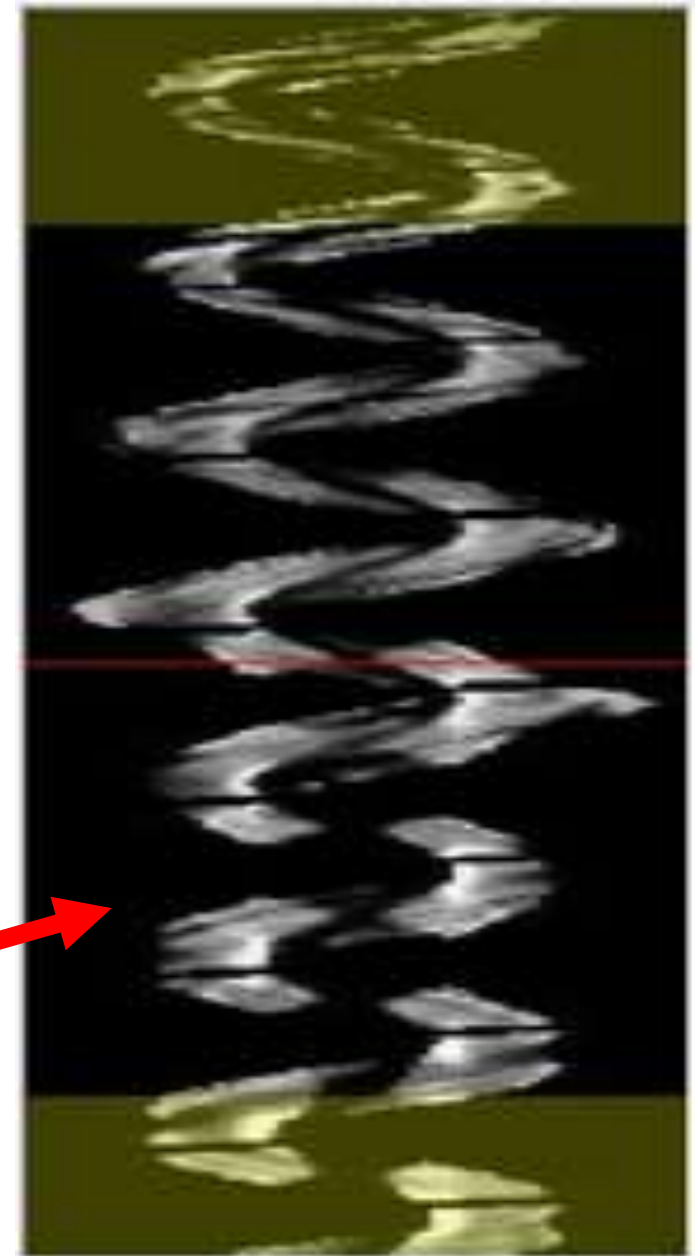
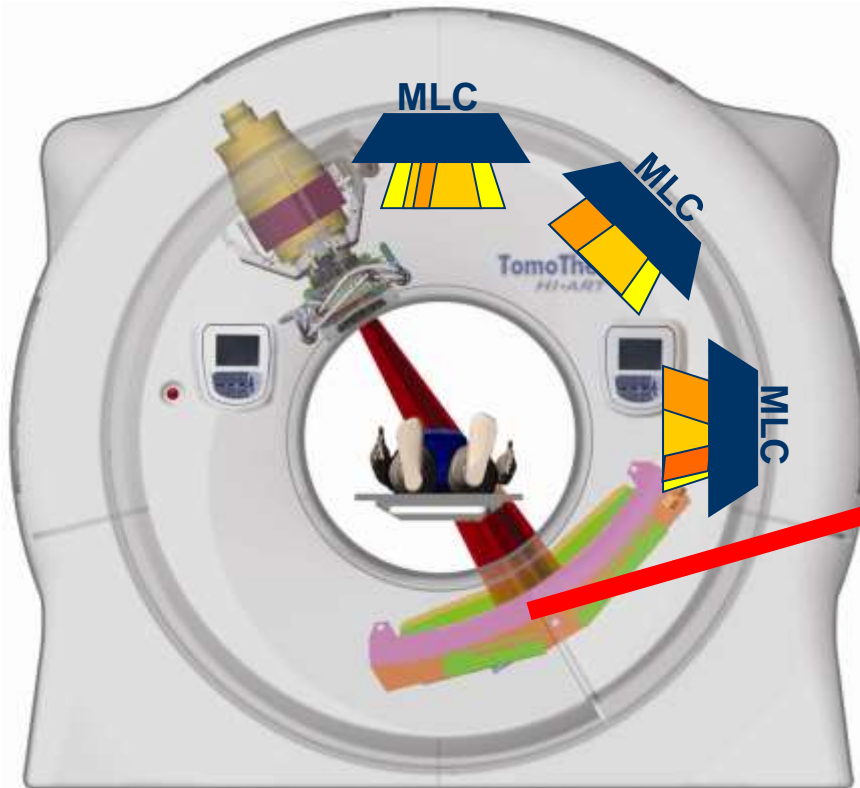


Sinogram

Detektoren (Spalten)

puls-by-pulse > 300 Hz
Projektionsweise > 51 pro Rotation

Projektionen/Pulse (rows)

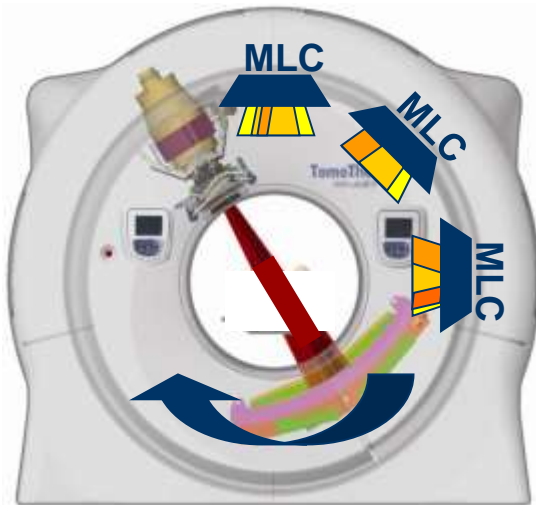




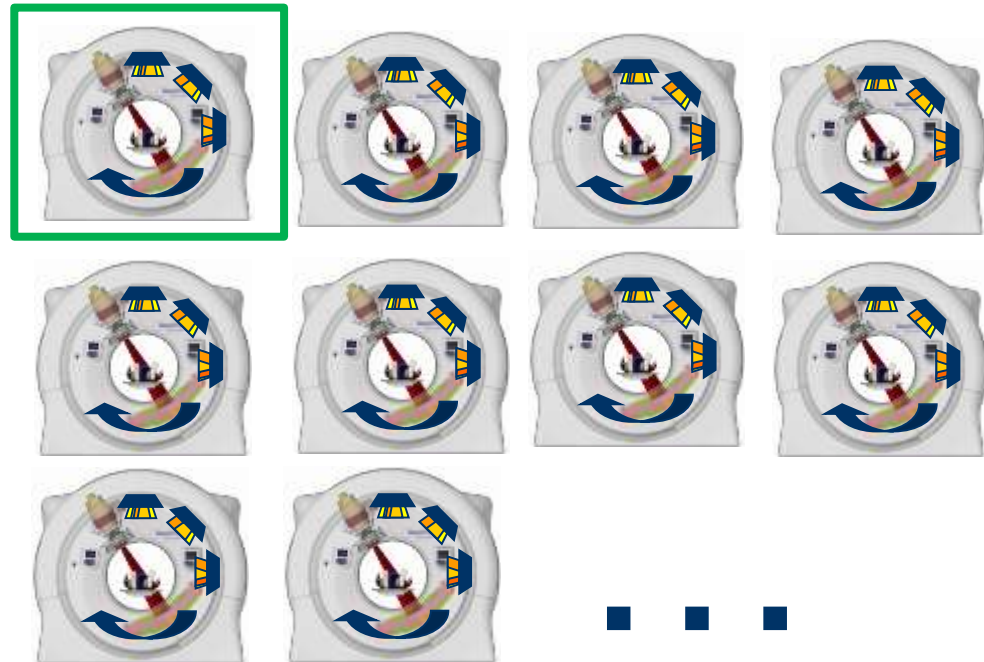
Delivery Analysis

Einsatz von Detektordaten zur Überwachung der Patientenbehandlung

Pre-Treatment

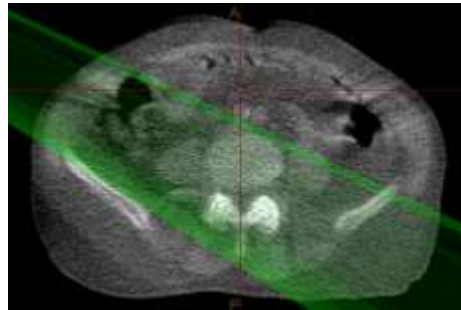


In-Treatment

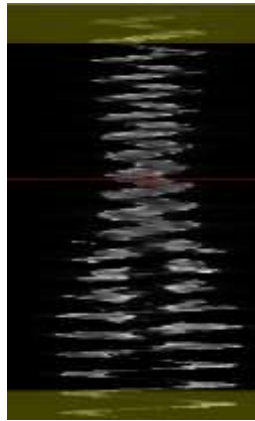




In-Treatment: Delivery



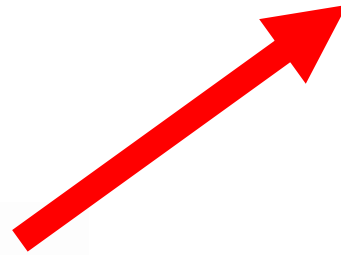
MVCT



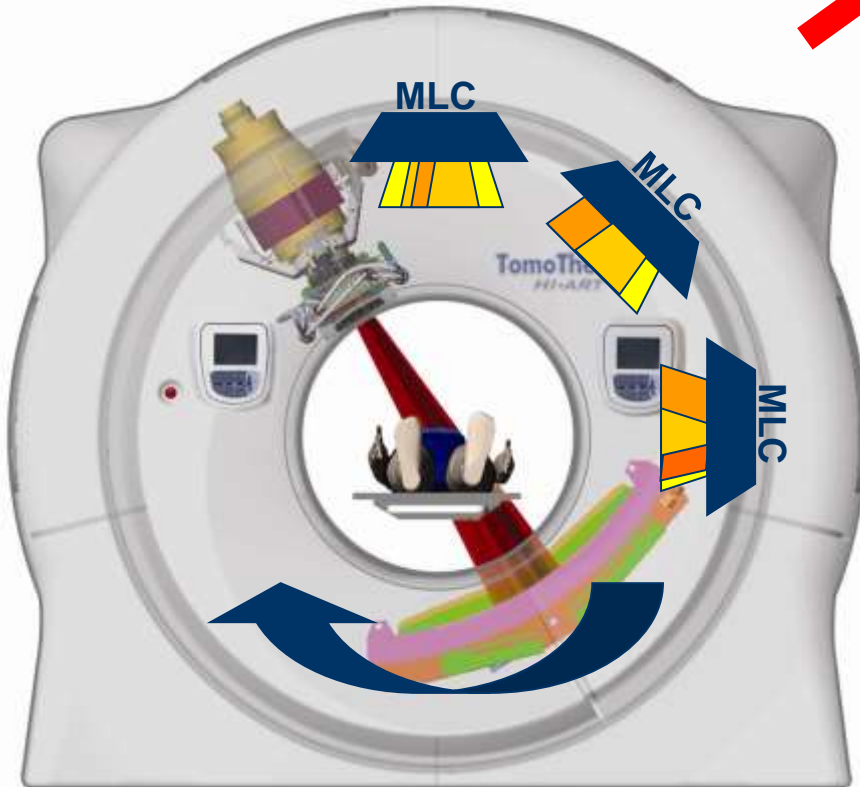
Detector
Sinogram



data

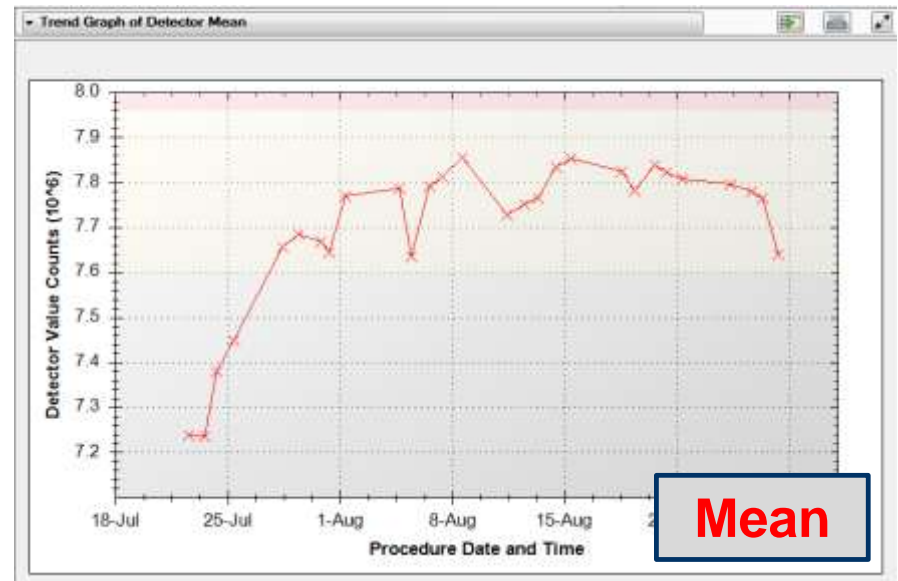
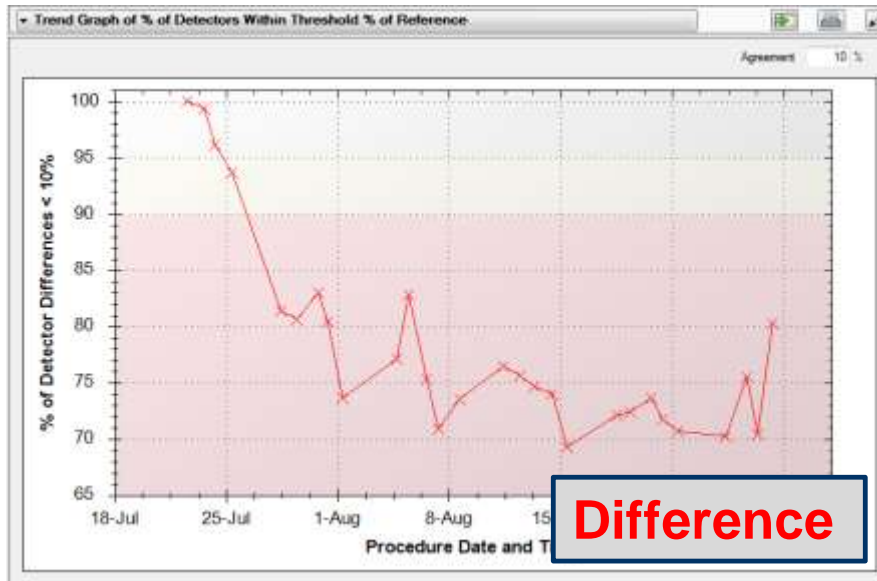
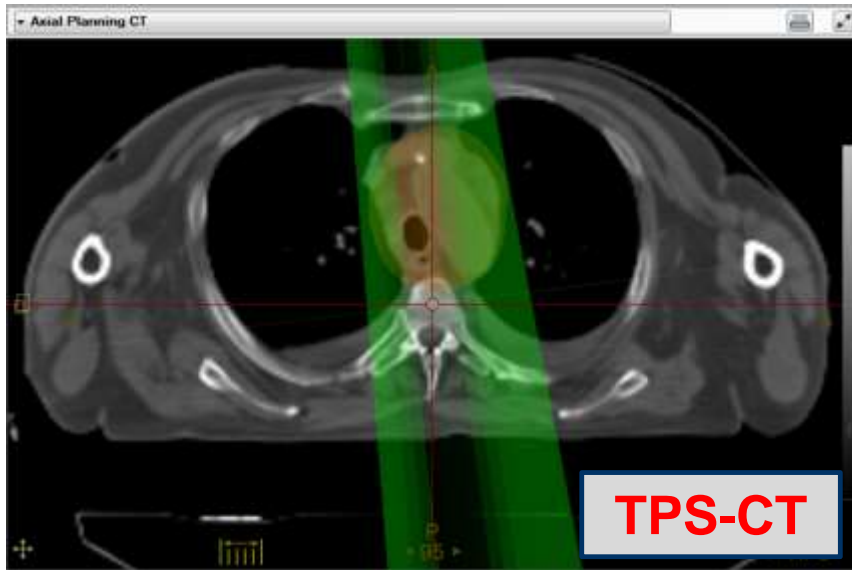


DA workstation





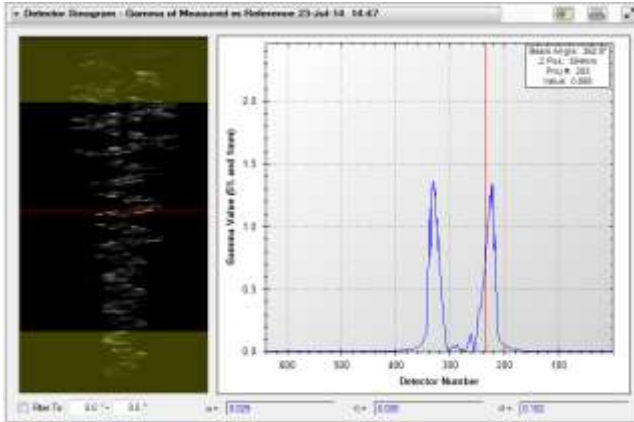
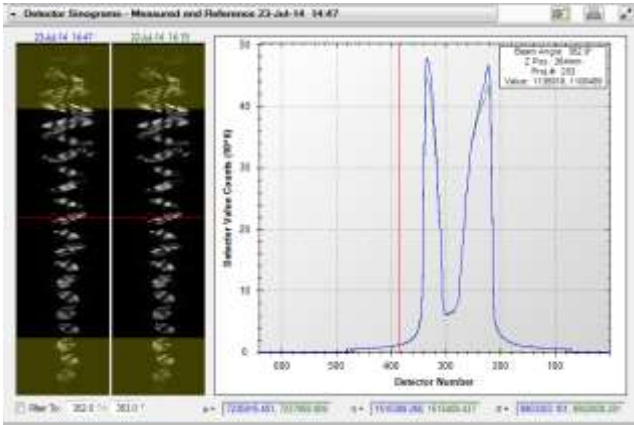
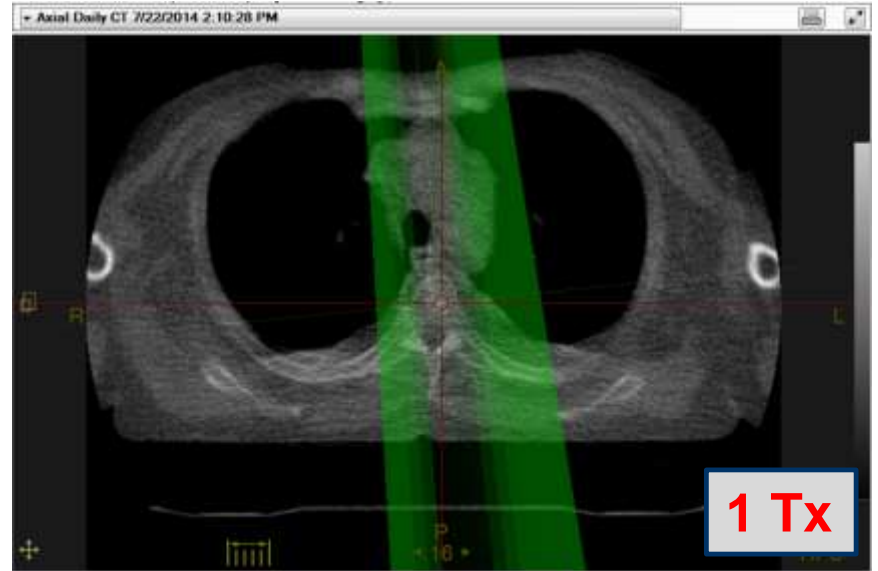
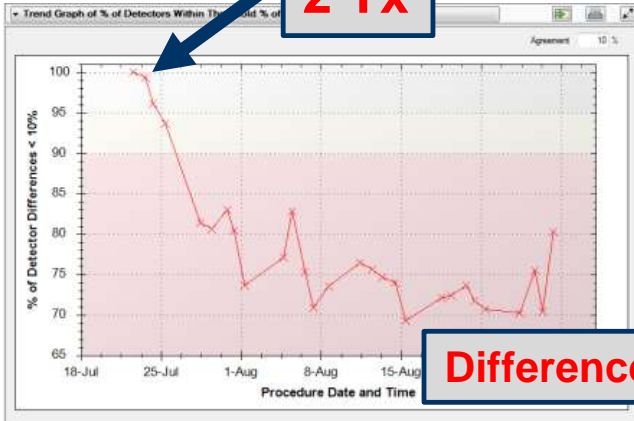
Beispiel: Lunge



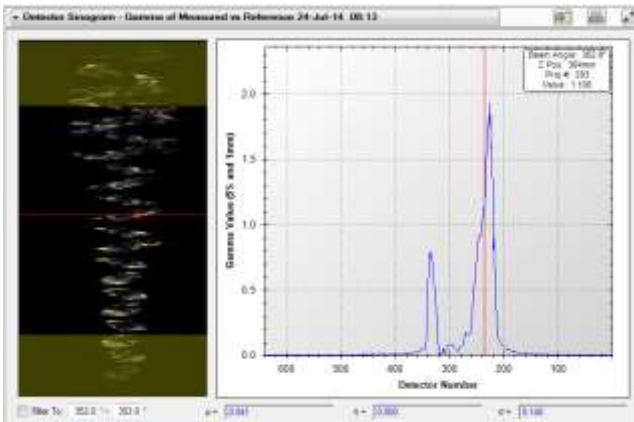
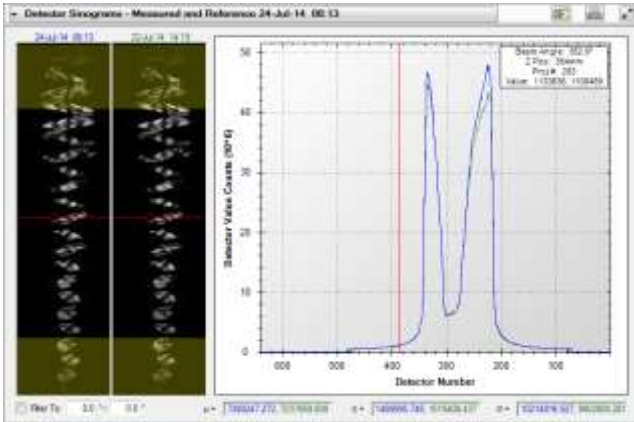
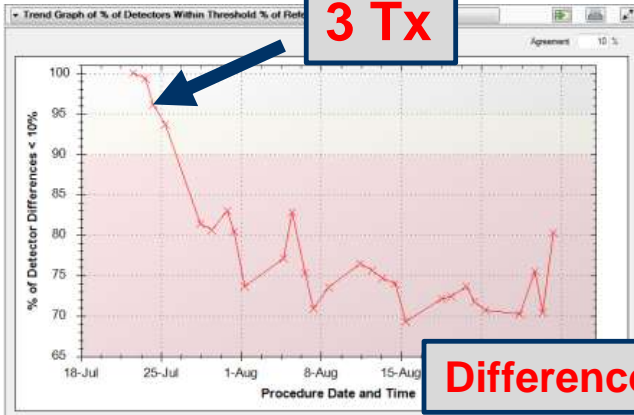
Beispiel: Lunge



2 Tx

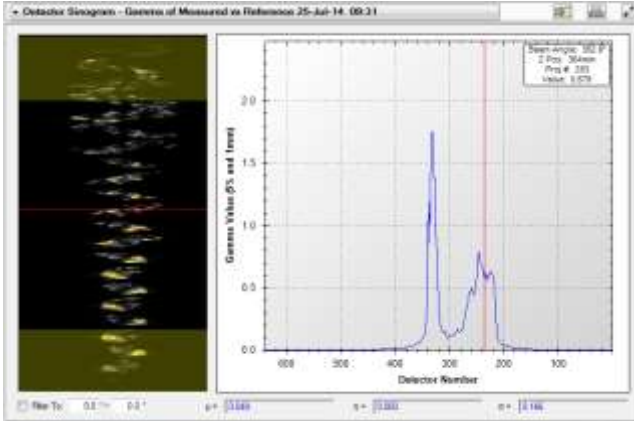
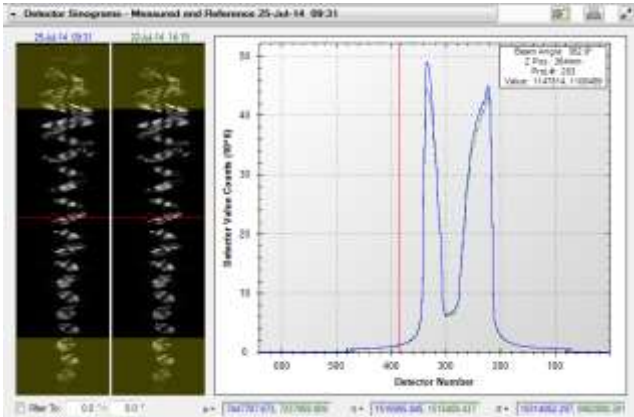
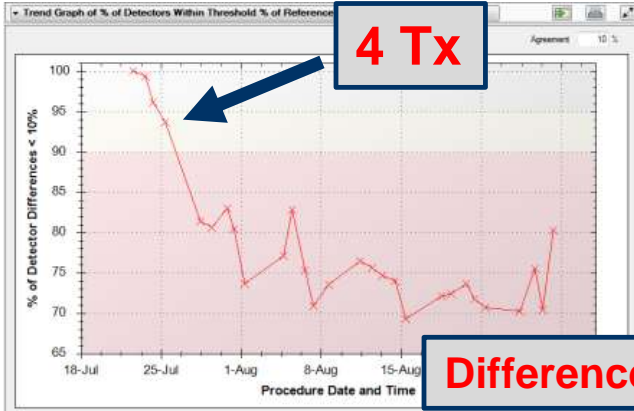


Beispiel: Lunge



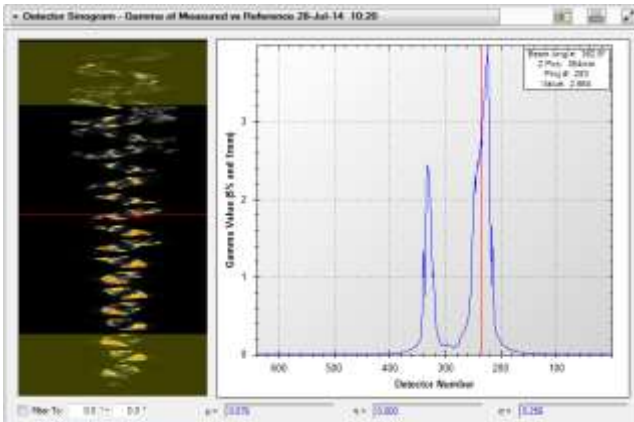
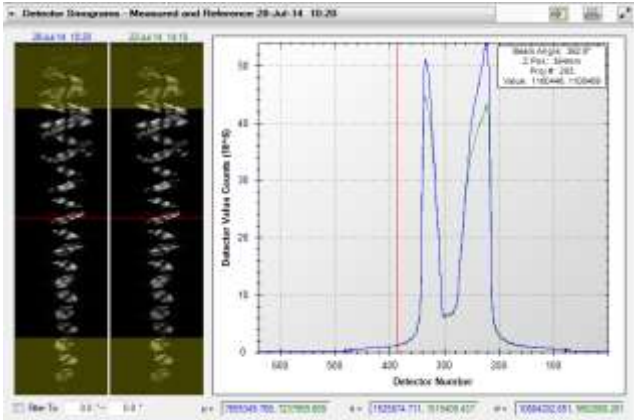
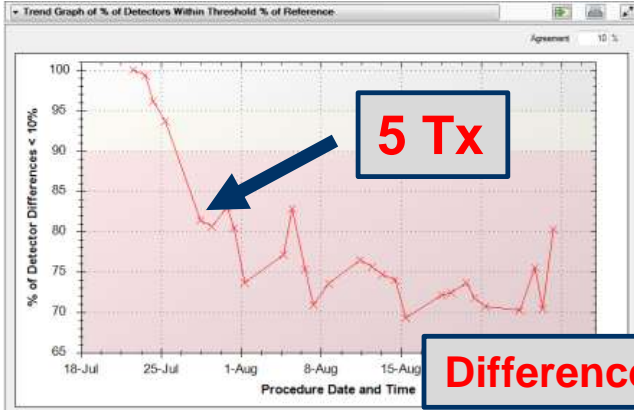


Beispiel: Lunge





Beispiel: Lunge

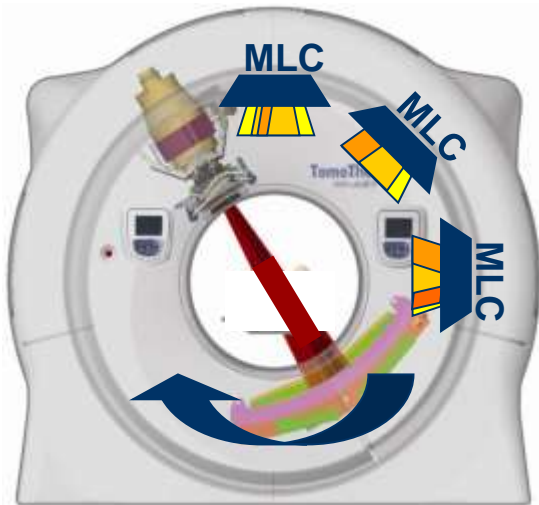




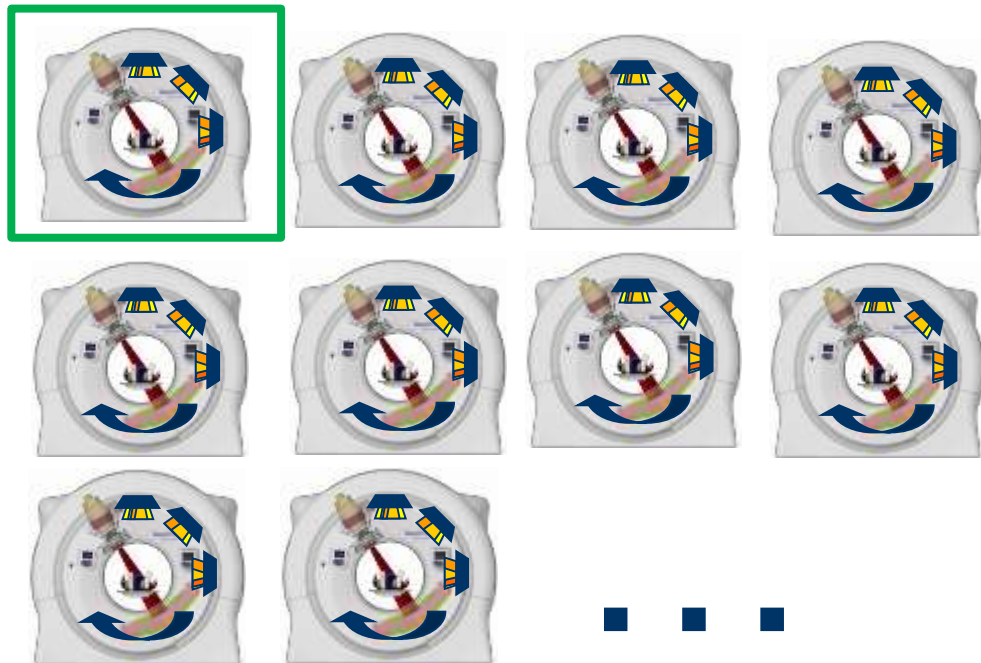
Delivery Analysis

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Pre-Treatment



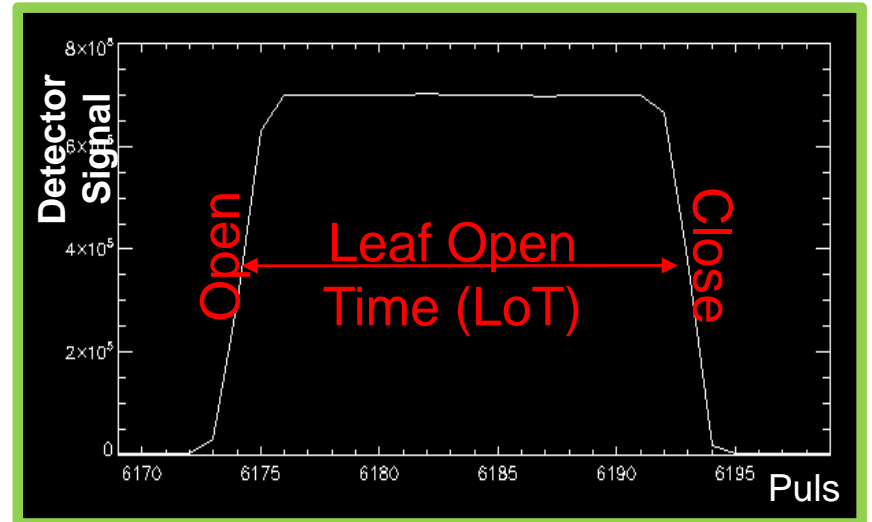
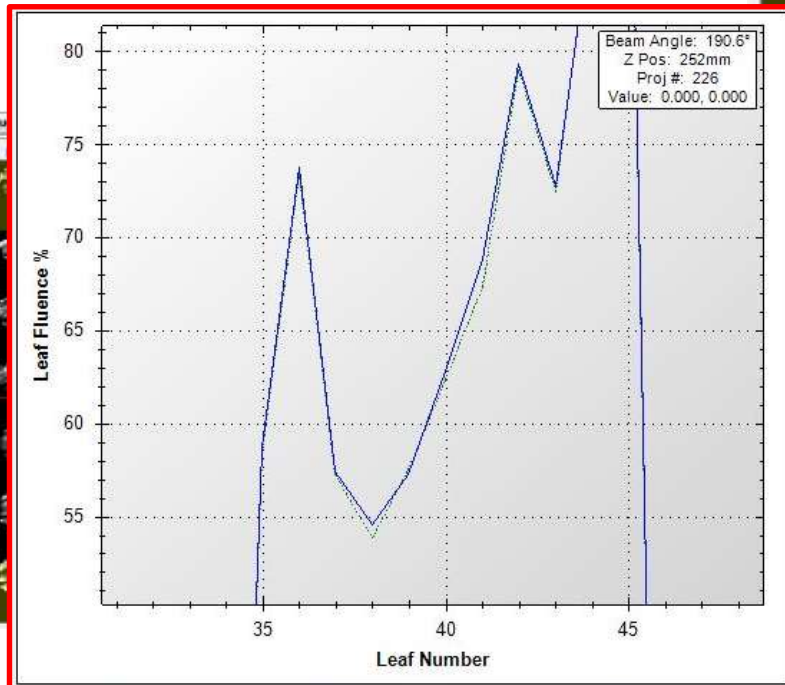
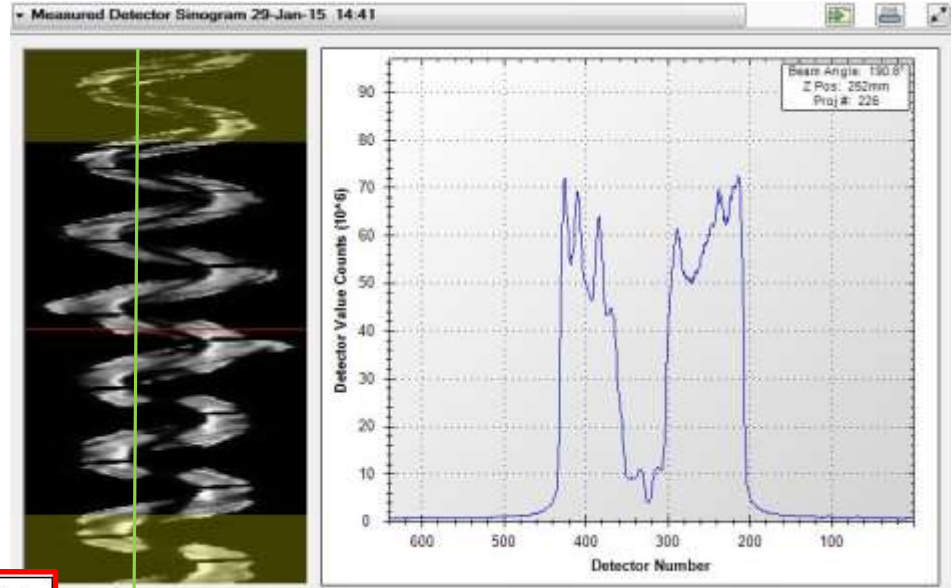
In-Treatment





Pre-Treatment

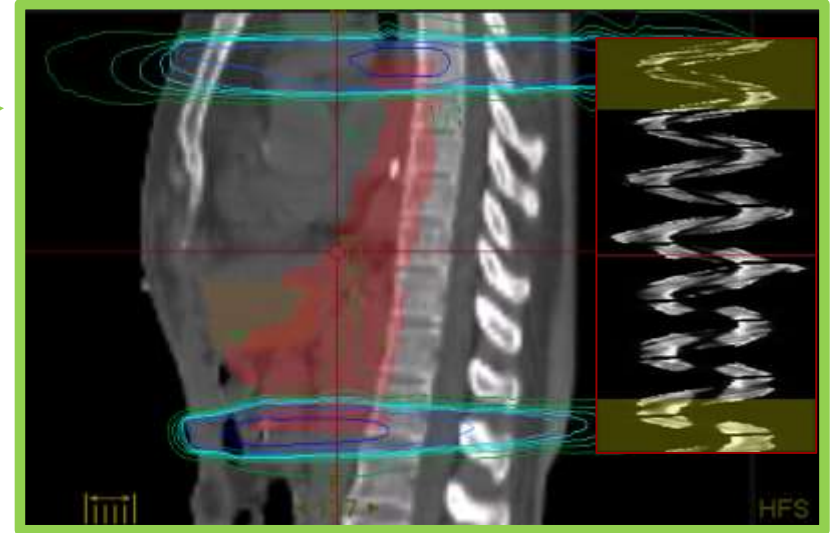
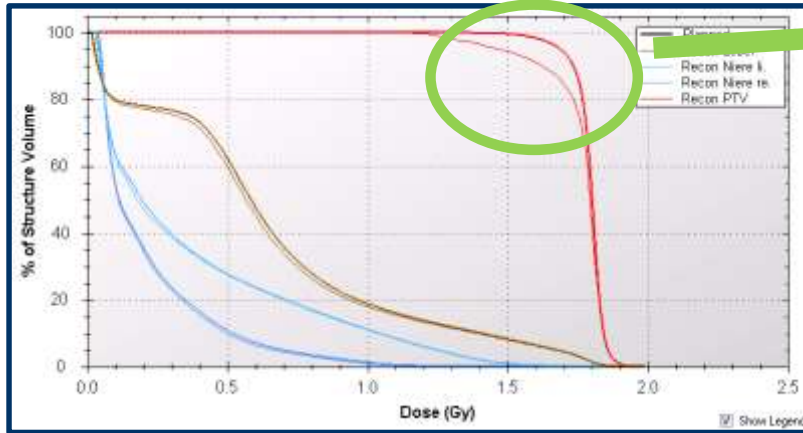
Verifikationsplan ohne Phantom



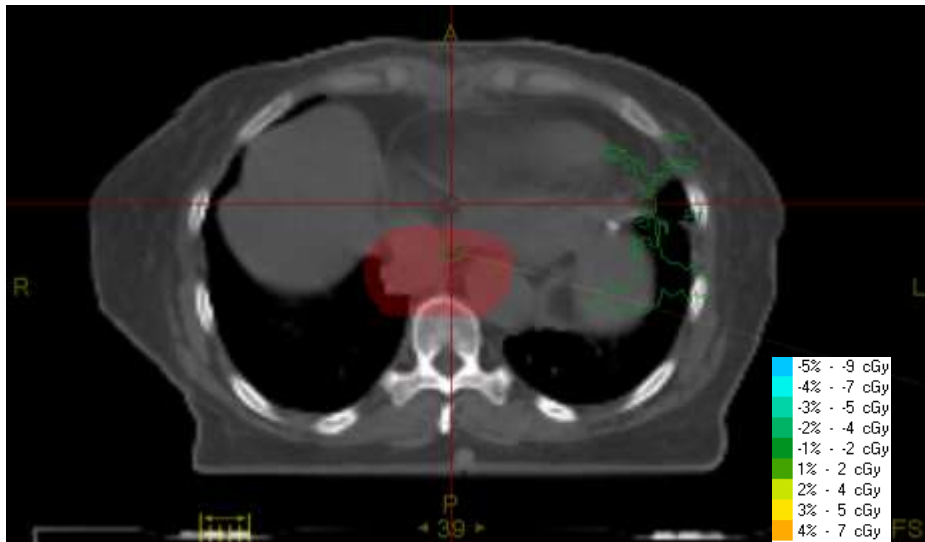


Pre-Treatment

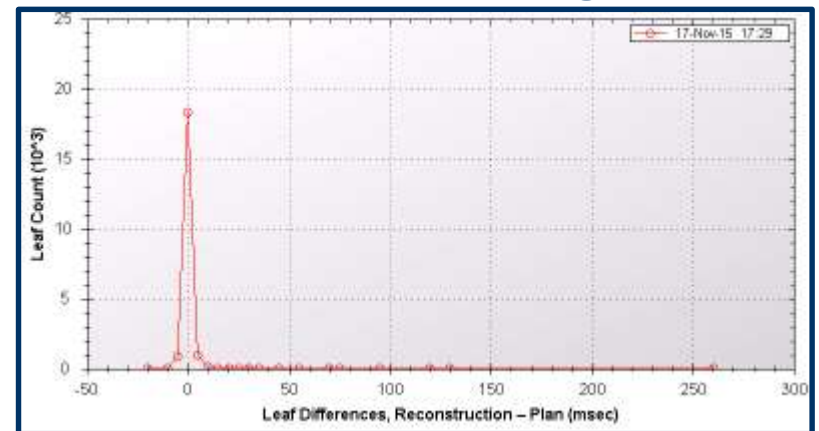
Dose Volume Histogram



Difference Plan vs Recon

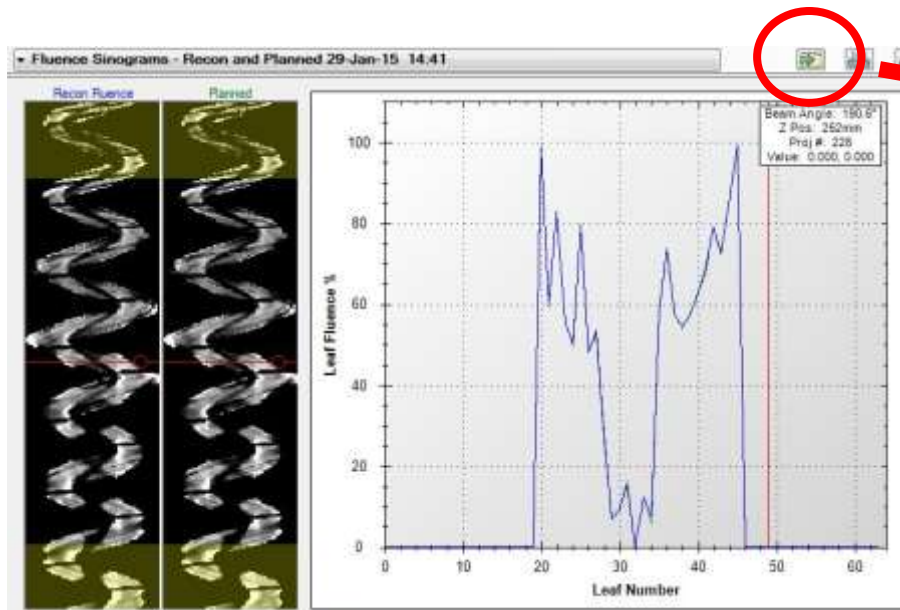


LOT Differences Histogram





Daten



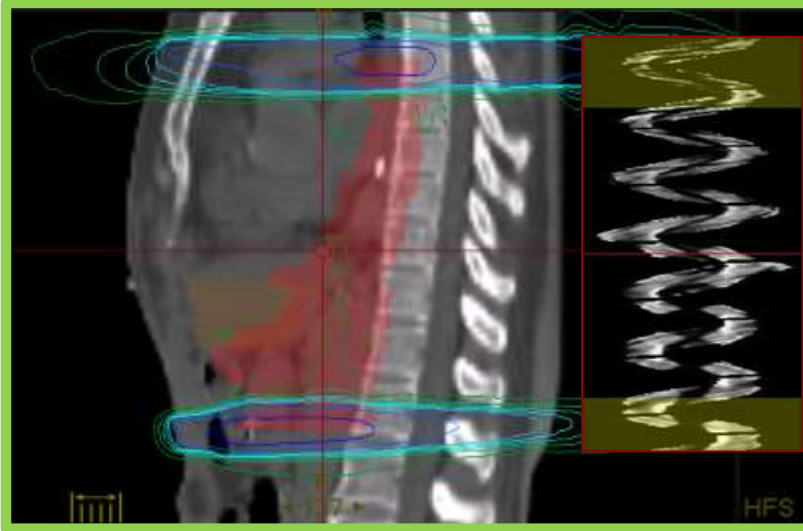
Exportiert gemessene
Leaföffnungszeiten
als .csv-Datei

20 Patienten (12 Kopf-Hals; 8 Prostata)

Gantry Period: 17,7s bis 30,9s (347ms bis 606ms Projektionszeit)



Daten



Auswertung nur im
zentralen Bereich

Berücksichtigte Leaföffnungen
zwischen 1176 und 19498

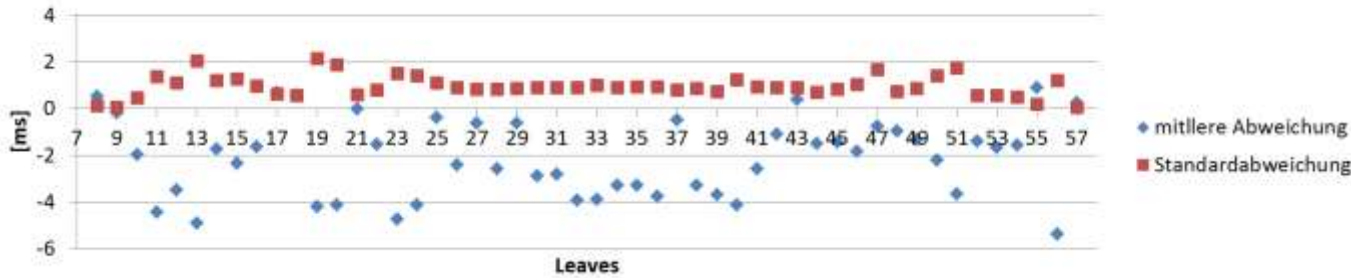
Zusätzlich Daten: Die mittlere Abweichung im
Hochdosisbereich (>80%) der Messung des
Verifikationsplans mit dem Okatviusdetektor



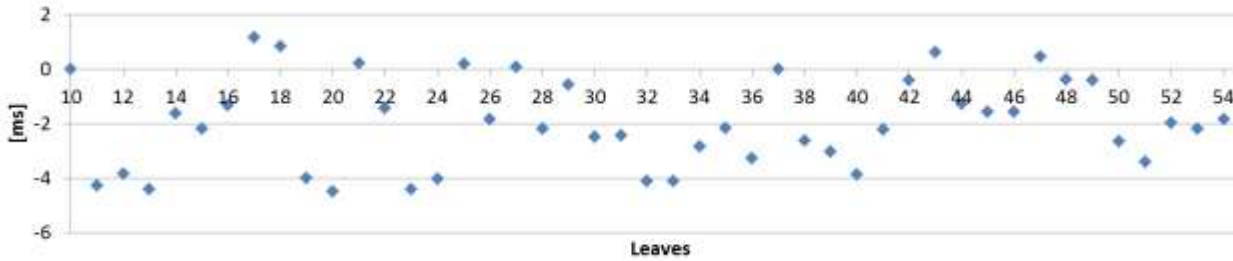
Ergebnisse

Prozentuale Abweichung

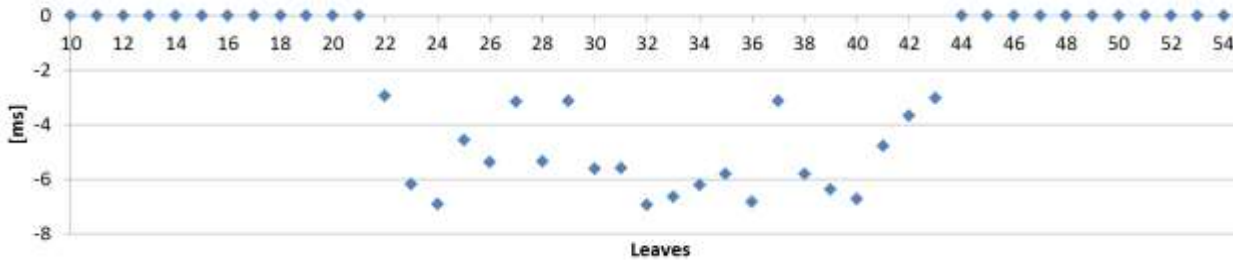
Mittlere Abweichungen der Leaföffnungszeiten



Mittlere Abweichungen der Leaföffnungszeiten



Mittlere Abweichungen der Leaföffnungszeiten

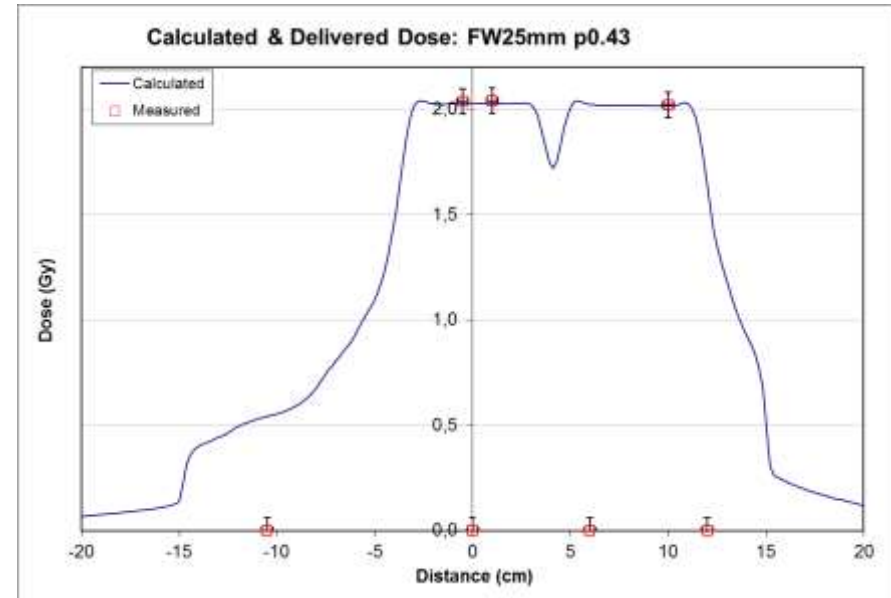
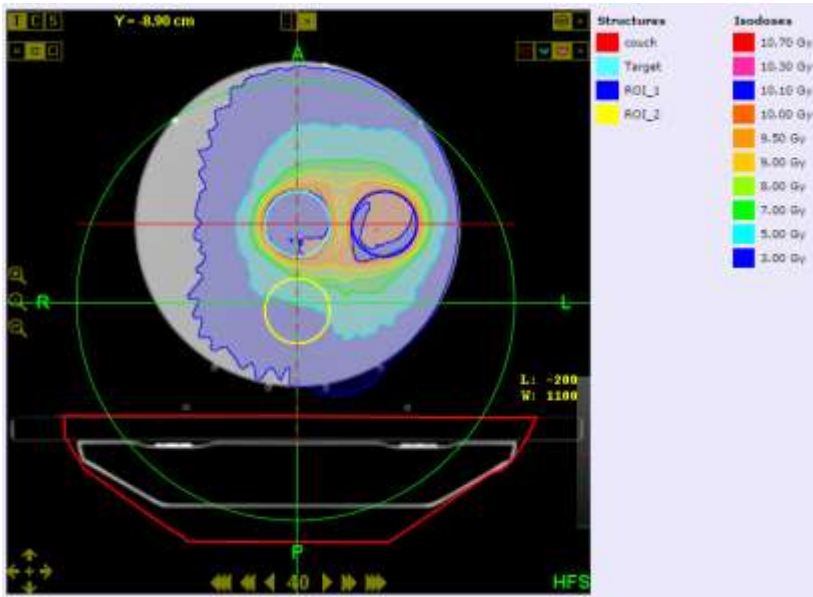


Leaves	DQA
-1,38	-1
-1,08	1,2
-1,31	0
-0,83	-0,5
-0,93	-0,5
-1,45	-0,5
-1,47	-0,4
-1,70	-0,1
-1,66	0,3
-1,81	-0,9
-0,99	-1,5
-1,15	-0,5
-1,97	0,2
-1,13	-0,6
-1,02	0,5
-2,09	1,2
-1,50	-0,5
-0,87	-0,5
-1,24	-1
-1,45	0,7
-1,35	-0,22

Mittelwert



Kalibrierung Tomo-System



Mittlere Abw. Leaföffnungszeiten

TomoPhant 2,5cm -2,1ms -0,9%

TomoPhant 5,0cm -2,9ms -1,3%

Dosimetrische Verifikation

TomoPhant 2,5cm -0,6%

TomoPhant 5,0cm +0,1%

Mittlere Ergebnisse 20 Patienten

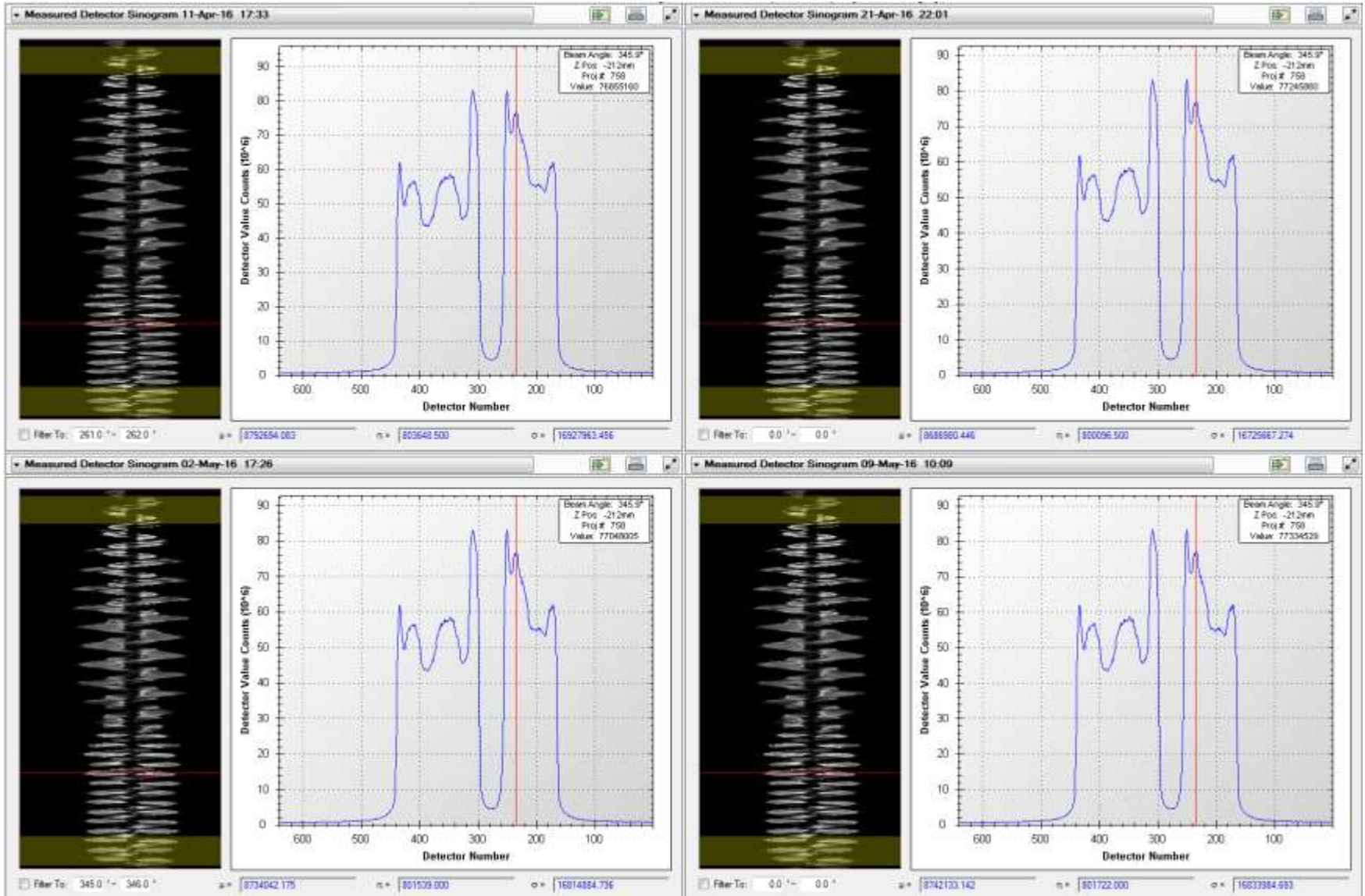
Leaföffnungszeiten -1,35%

DQA Messungen -0,22%



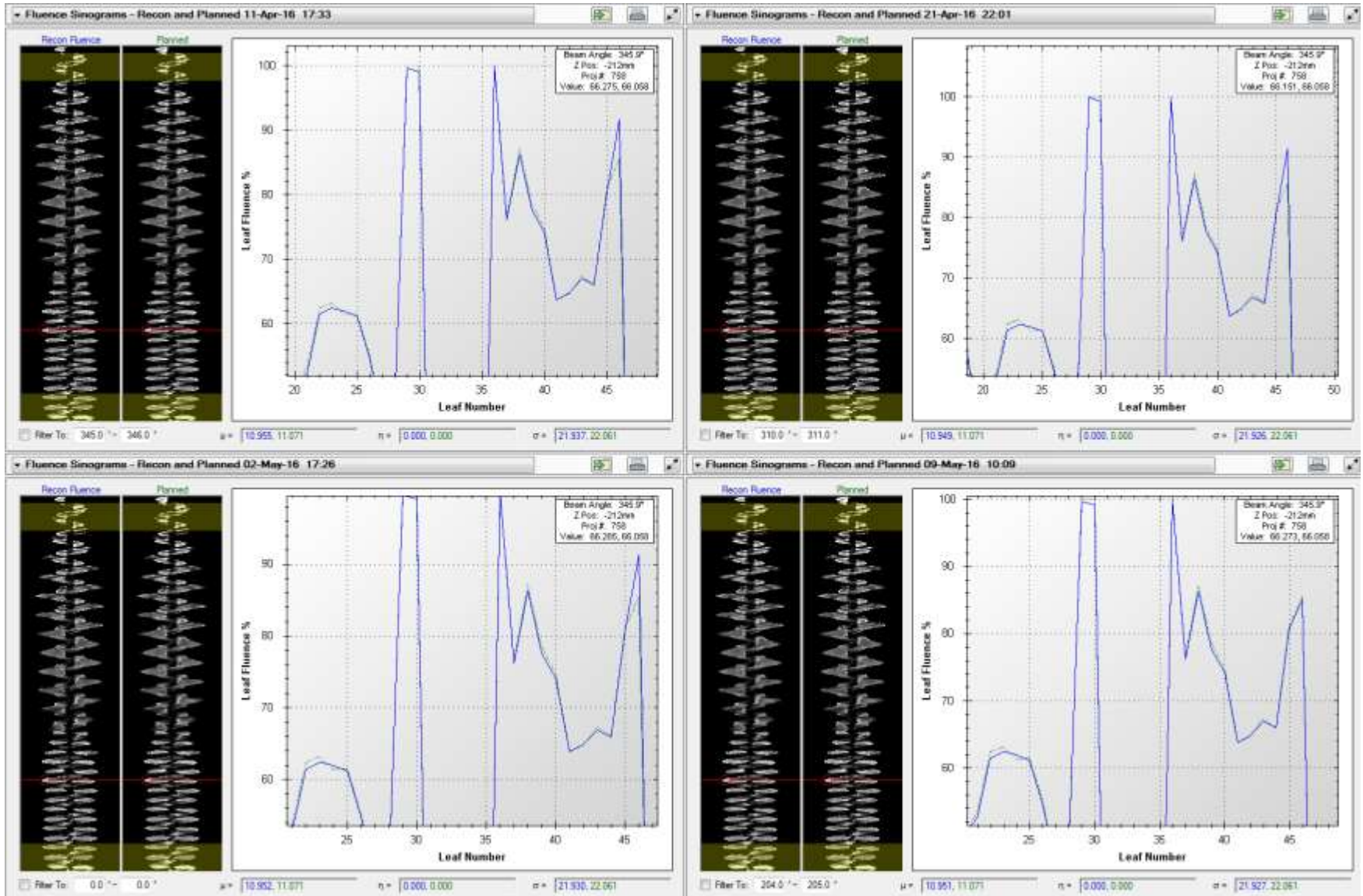


Pre-Treatment als MLC QA



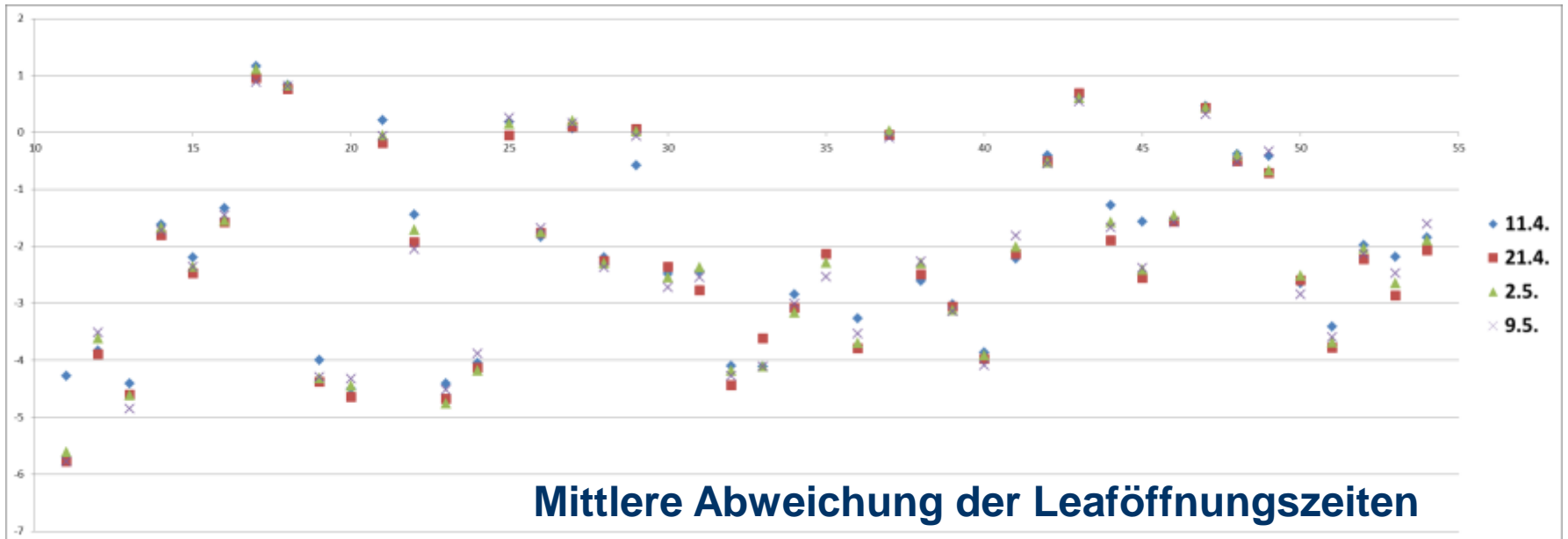
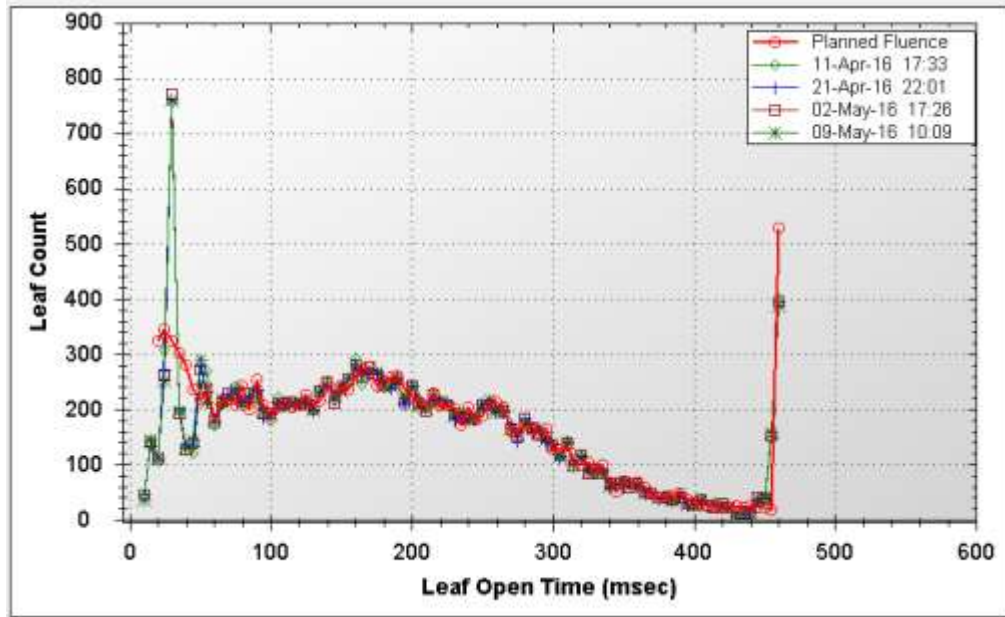


Pre-Treatment als MLC QA





Pre-Treatment als MLC QA





Zusammenfassung

Delivery Analysis: Tool um Patienten während der Behandlung zu überwachen und das Verhalten des MLC zu kontrollieren

Probleme:

- Viele Daten, Analyse nicht einfach
- Daten während der dynamischen Blenden problematisch
- Ausreißer bei Leaföffnungszeiten

Ausblick:

- Wertvolle Ergänzung zu einer unabhängigen Nachberechnung

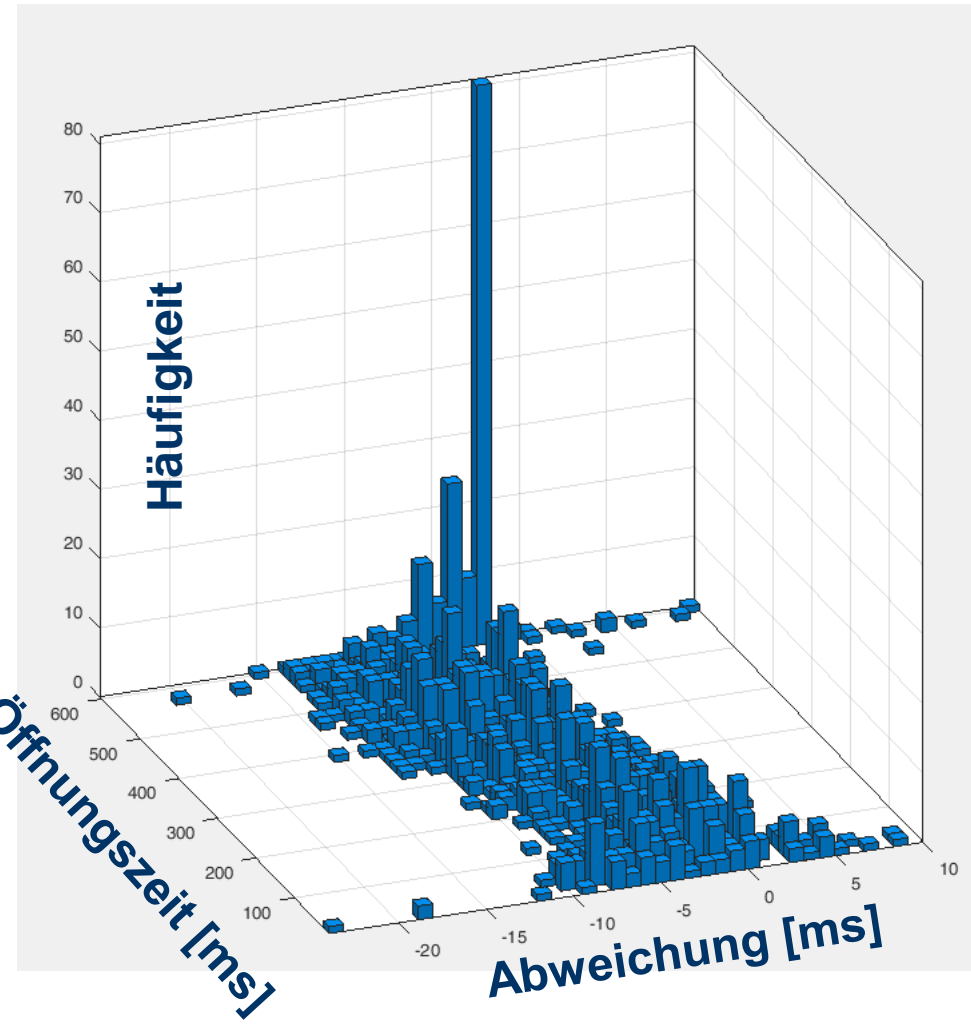
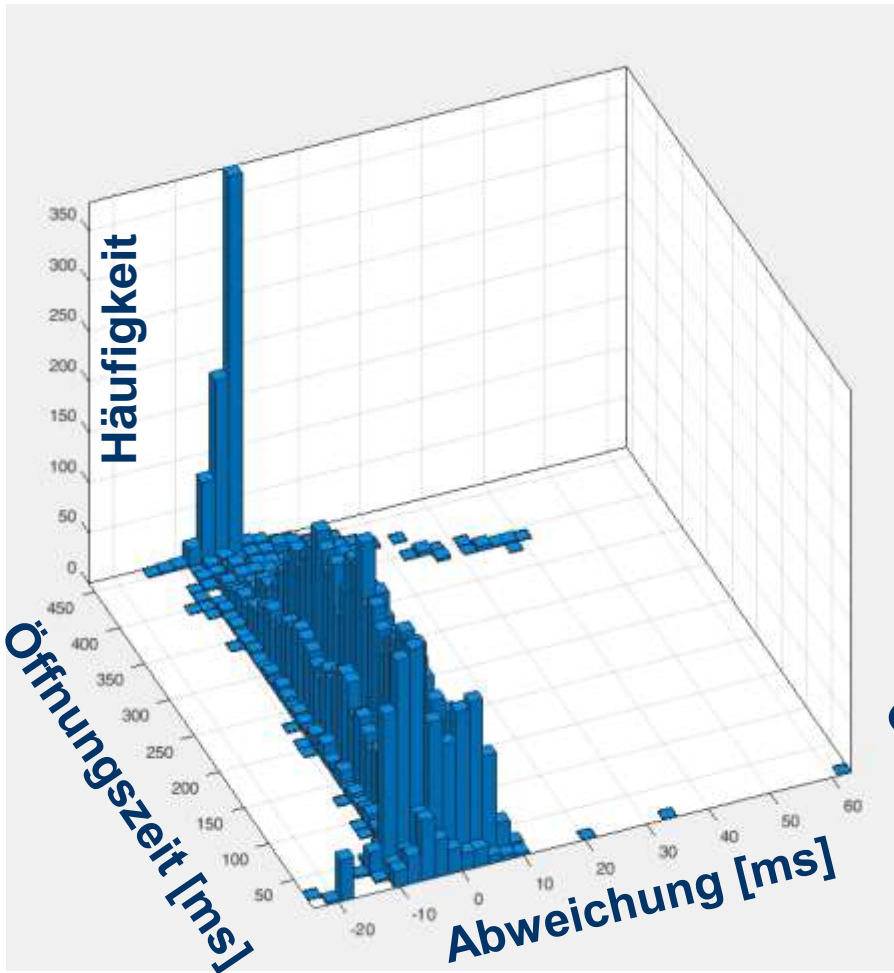


Thank You





Ergebnisse Histogramme





Pre-Treatment als MLC QA

