



Cranial SRS on a Siemens Artiste™ using the BrainLab iPlan® treatment planning system

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Outline

- SRS workflow
- Siemens and BrainLab equipment
- System interdependence
- Bumps on the road
- Experience at AGH
- Conclusion



Objectives

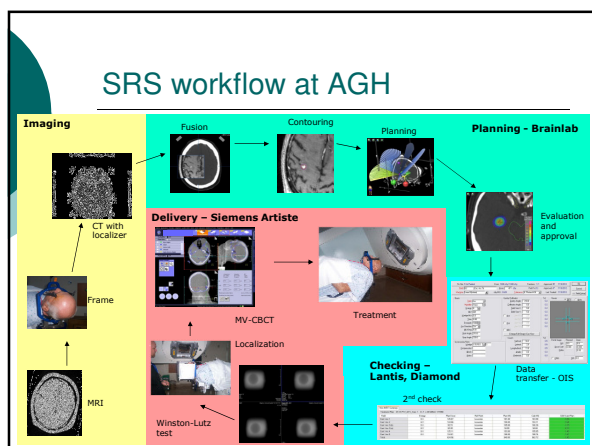
- To assess the safety and usefulness of a multivendor solution for cranial SRS
- To understand the commissioning and QA steps of a Siemens Artiste/BrainLab iPlan hybrid system for cranial SRS
- To understand the limitations of the hybrid system

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SRS workflow at AGH

Team work

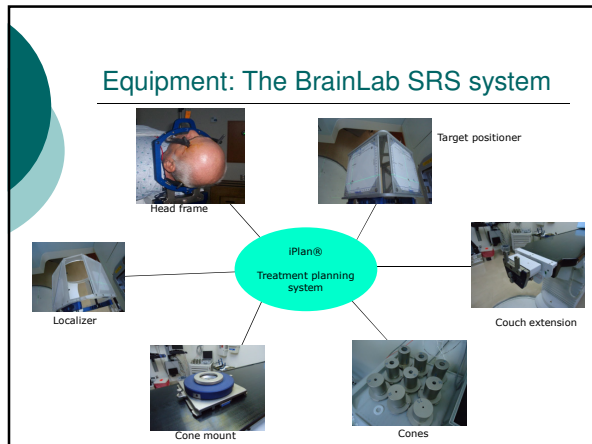
	MRI	Frame	CT	Fusion	Contour Rx	Plan	Eval	Data transfer	2 nd check	QA	Treat
Patient											
Neuro surgeon											
Radiation Oncologist											
Physicist											
Radiology											
Therapist											

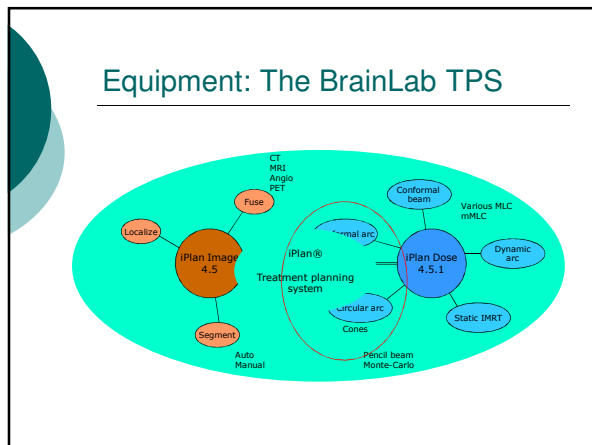
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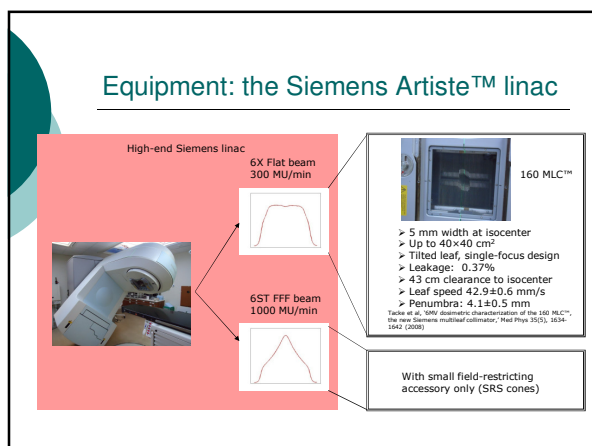
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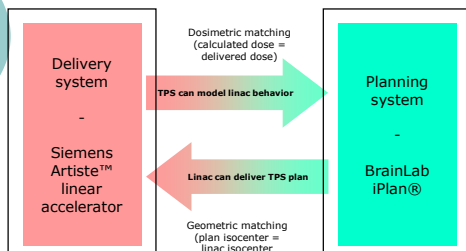
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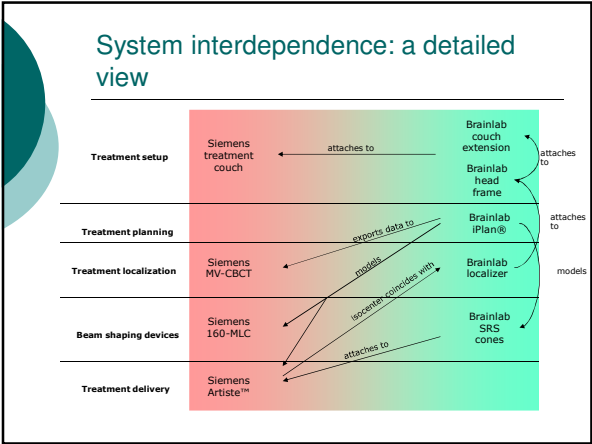
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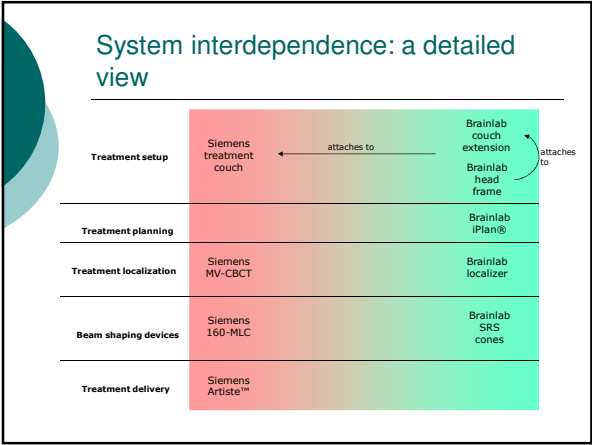
System interdependence: a simplistic view



Can linac perform in SRS environment?

System dedicated to SRS





Treatment couch

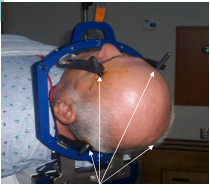
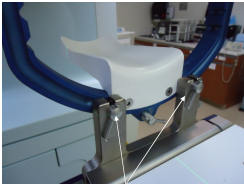
Siemens 550 TxT TT-S treatment couch

BrainLab couch extension

Locking mechanism

Max load	550lb / 250kg
Isocentric displacement	<1mm
Isocentric rotation	±115°
Absolute position accuracy	±0.5mm (±1.0mm vert)
Corrective position accuracy	±0.2mm (±1.0mm vert)

BrainLab head frame

Immobilization of head in frame

Immobilization of frame on couch extension (linac isocenter)

Head frame = frame of reference
Isocenter calculated in frame of reference

System interdependence: a detailed view

Treatment setup	Siemens treatment couch	← attaches to	Brainlab couch extension Brainlab head frame	← attaches to
Treatment planning			Brainlab iPlan®	
Treatment localization	Siemens MV-CBCT	models	Brainlab localizer	
Beam shaping devices	Siemens 160-MLC		Brainlab SRS cones	
Treatment delivery	Siemens Artiste™			

Data acquisition for the 160 MLC

FBrain.AR Beam Measurement
Pencil Beam (Siemens 160 MLC)

1 Purpose
This document provides specific information about the test size settings for the beam data acquisition for the Siemens 160 MLC. It is a guide for setting up the beam data acquisition using the Pencil Beam Measurement (PBM) software.

2 Scope
This document is intended for use by the medical physicist responsible for the treatment planning system (TPS) and the beam data acquisition system (BDAS).

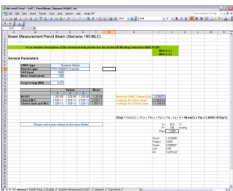
3 Verification
After the successful completion of your beam data 1 is the responsibility of the physicist to verify the accuracy of the beam data acquisition results. This

(2) Perform measurements

- Output
- Leakage
- PDD/TMR
- Scatter factors
- Diagonal radial profiles
- Transversal profiles

BrainLab-provided Excel template

(1) Read instructions

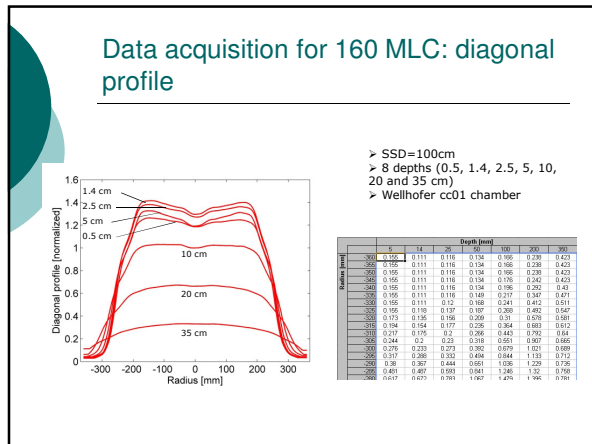


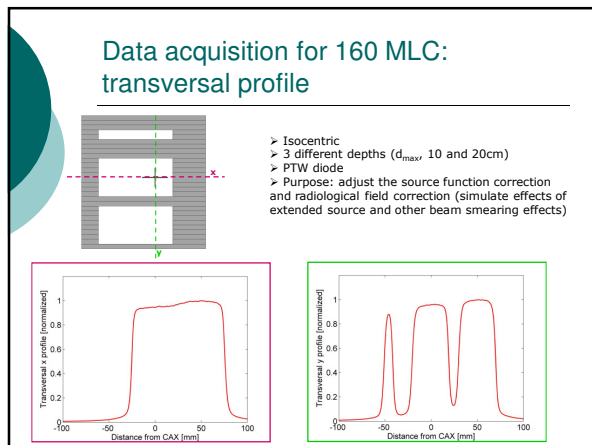
(3) Send to BrainLab for verification and consistency

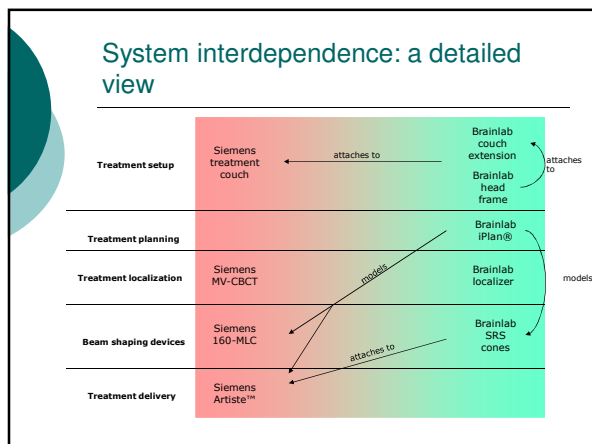
(4) Enter in Beam Profile Editor

(5) Take verification measurements

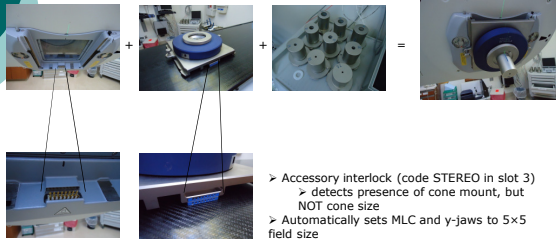




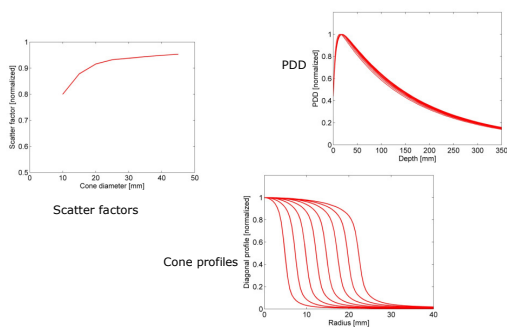




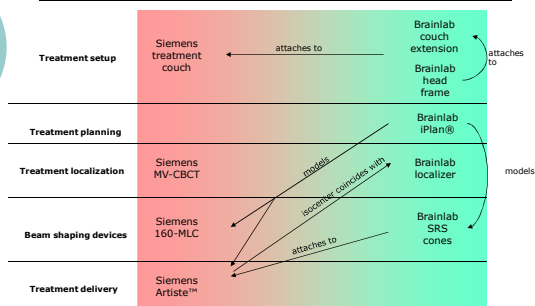
BrainLab cones on the Siemens Artiste



Data acquisition for BrainLab cones

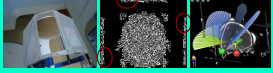


System interdependence: a detailed view

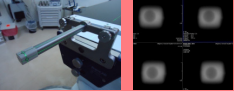


Isocenter verification


Plan isocenter defined with respect to head frame using BrainLab localizer




Room lasers point to linac isocenter – verified by Winston-Lutz test




Target positioning sheets point to physical location of plan isocenter in frame of reference

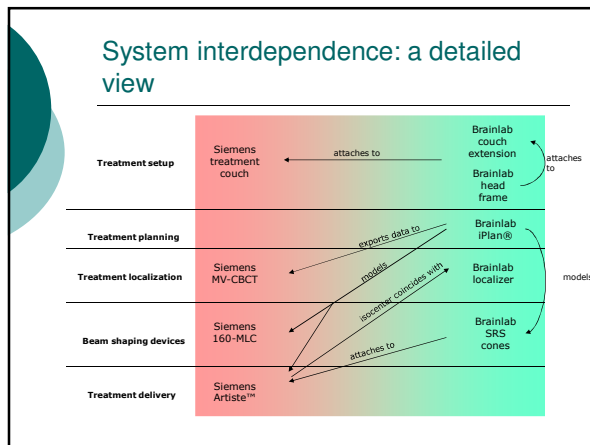


Align to lasers

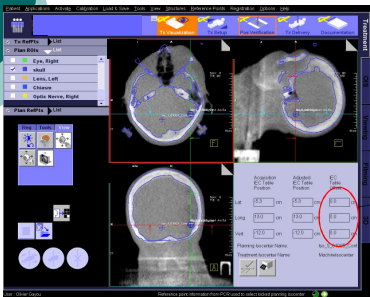


End-to-end accuracy: 1.2mm





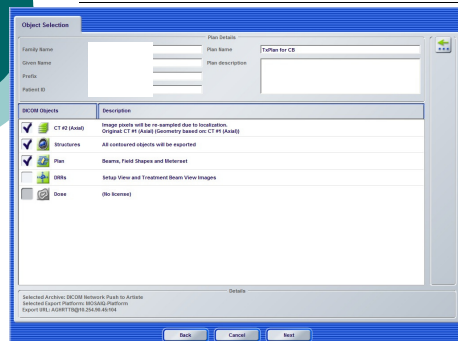
Frame/anatomy integrity verification



> Register MV-CBCT with planning CT
 • Skull contour from TPS
 • Align to MV-CBCT
 > Verifies head position in head frame

No shift = no displacement

Frame/anatomy integrity verification



Full export
DICOM
license

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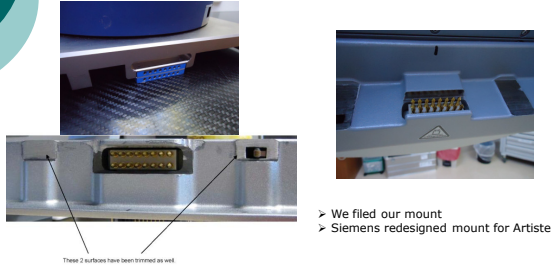
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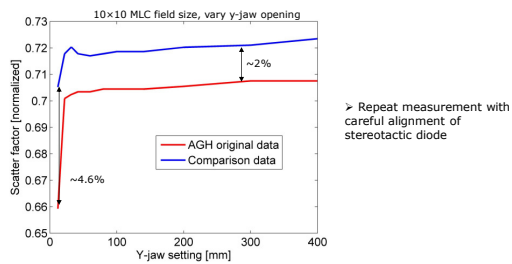
Bumps on the road...

(1) Original design of accessory mount on Artiste™: the cone mount could not be inserted



Bumps on the road...

(2) Small field size scatter factor measurement inconsistent with other sites



Cone size safety interlock

- Linac has no knowledge of cone size
- Potential major radiation error
- 2 person check of cone size
- User defined pause
- Prompt team to switch cone size



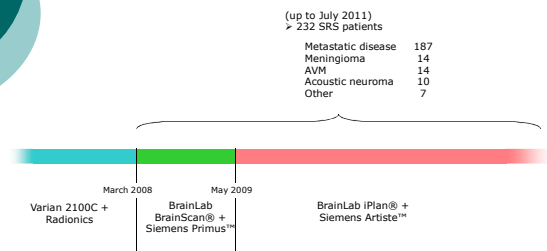
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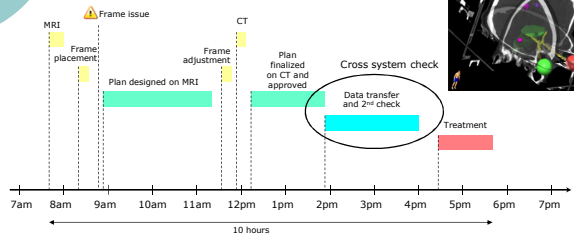
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Artiste + BrainLab SRS experience at AGH

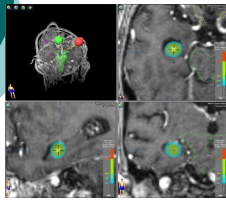


Case example

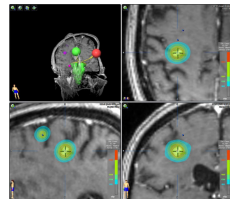
- 75 year old Caucasian male patient
- Stage IV, T3N3M1b adenocarcinoma of the left lower lobe of the lung with associated bilateral mediastinal and hilar disease
- 3 brain metastases
- Whole brain radiation therapy 4/12 followed by palliative chemoradiation to the thorax (5/12)
- Treated with SRS boost to brain mets (July 2012)



Case example



- Right temporal
- Right superior parietal
- Right inferior parietal
- 1600 cGy, 80% isodose line
- 1 mm PTV margin



Conclusion



- ✓ Take advantage of industry standards (DICOM, etc...)
- ✓ Requires careful cross checking of information between systems
- ✓ Centrality of physicist role in proper use of multiplatform system
- ✓ "Rigidity" of cranial SRS treatment well suited for multivendor system
 - what you see is what you get
 - no need for adaptive
 - no need for real time adjustment

Acknowledgements

- Physicists, especially
 - Mark Johnson, MS
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- Therapists
- The whole department...
