RapidArc

CAMPS Meeting

June 24, 2010

RapidArc Parameters

- To deliver a treatment, three parameters are varied:
  - Dose- by moderating dose rate or gantry speed
  - Gantry angle
  - MLC shape
- Clinac moves gantry at maximum speed as much as possible to minimize treatment time
- Dose rate is moderated before gantry speed
- MLC shape is determined by gantry position

Delivery Control

- Delivery is controlled by a series of control points which describe the arc
  - Maximum of 177 control points
  - Each can be thought of as a partial arc segment
  - Each control point knows:
    - Maximum Dose Rate
    - Maximum Gantry Speed
    - Number of MU
    - Starting and ending MLC aperture
- System calculates a linear trajectory varying parameters from starting to ending aperture
  - MU and Gantry angle are monitored 20x/sec.
  - Dose rate or gantry speed will be adjusted as needed

RapidArc STT Files

- Each RapidArc uses two STT files
  - Dose versus Gantry angle
  - Gantry angle versus MLC shape
  - MLC controller controls MLC vs gantry
  - Linac controller controls gantry vs MU
- RapidArc must be moded up through 4DITC so the STT's are transferred correctly
  - Treatment cannot be delivered in Service or through the linac controller

Machine QA Files Provided by Varian

- DMLC Dosimetry- narrow mlc slit to test effect of gravity on leaf position and dosimetry
- Picket Fence vs gantry angle to assess accuracy of DMLC positioning-
  - Stationary and while delivering RapidArc
  - Picket Fence with intentional errors to assess sensitivity of test
- Control of dose rate and gantry speed during delivery
  - 7 combinations of dose rate, gantry range and speed to give equal dose to each strip
- Control of leaf speed during delivery
  - 4 combinations of leaf speed and dose rate to give equal dose to each strip

Treatment

- RapidArc has a special beam icon on 4D and special treatment type on Clinac Console for RTT verification.
- Once a field is moded up, MLC's move with gantry rotation
- No Beam Holds for leaf position catch-up.
  - MLC interlock is invoked requiring RTT action to resume Treatment (clear interlock and Beam ON)
- An interrupted treatment restarts from original start angle
  - Beam ON, gantry rotates, MLC's move, beam turns on when interrupted gantry angle is reached
- Backup timer is too short

Planning

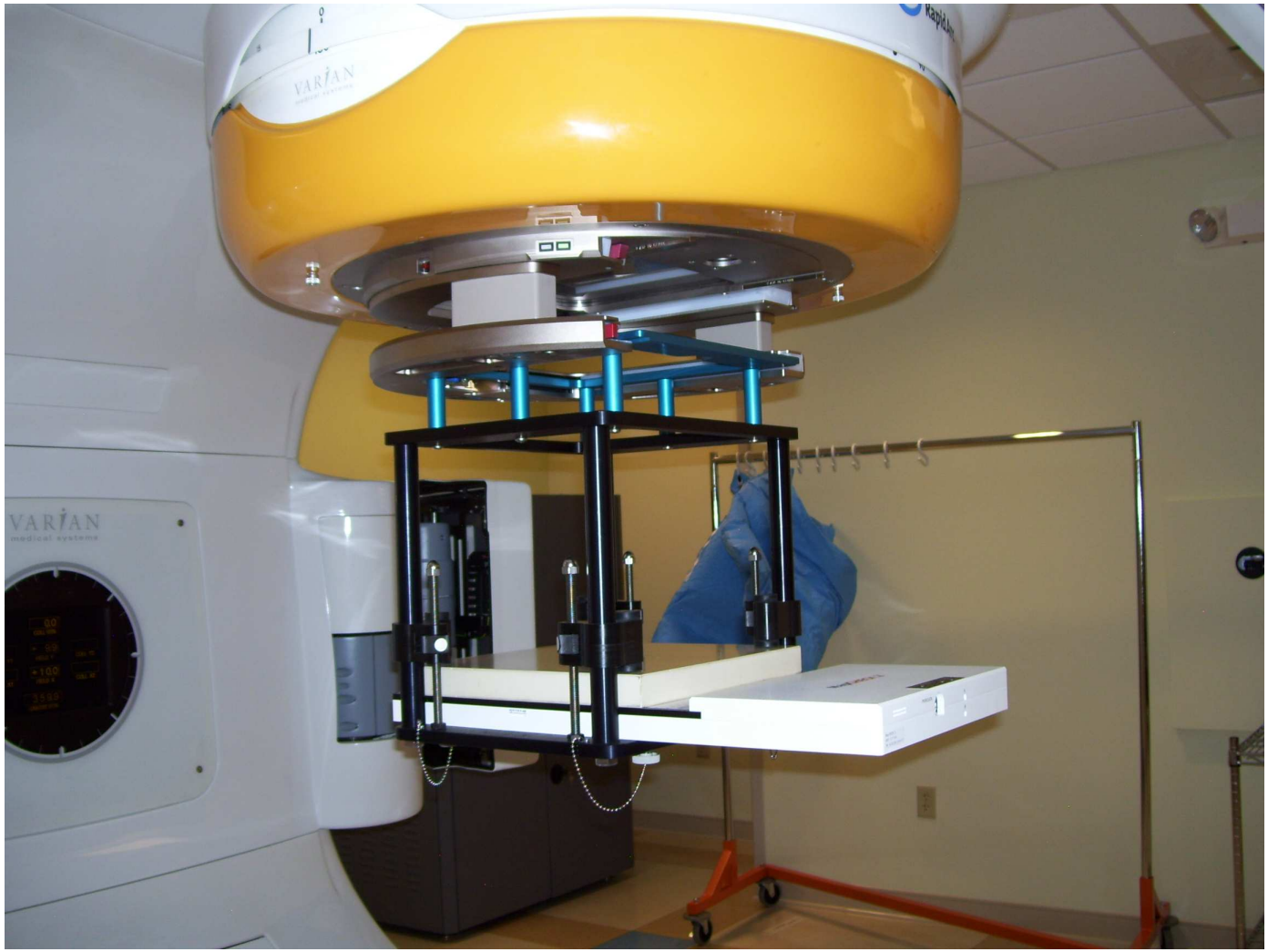
- Don’t be fooled by familiar Optimization GUI
- Optimizer works directly on machine parameters
  - No fluence pattern or separate LMC
  - Optimize then calculate using AAA
- Five Resolution levels
  - 10 angles for first level (low resolution)
  - 2n+1 for subsequent levels
  - Maximum of 177 control points
- Optimization
  - Lower resolution levels have more flexibility to make big changes
  - Allow optimization to complete resolution 1 and 2 to maximize critical structure protection
  - Refine critical structures (Level 3)
  - Work on Targets last (Level 5)
  - NTO

Planning

- Fields
  - 1-10 arcs may be utilized in a plan
  - CW or CCW
  - 30 deg minimum arc
  - 1500 deg maximum total arc
  - Segments may be avoided
  - Collimator angle 35-45 deg is common
- IMRT planning paradigm won’t work
  - Use Tips and Tricks from Varian

Verification

- Similar process to IMRT plan verification
- Verfication Plan Creation
  - Use the same gantry rotation as the clinical plan
  - Select the option to reset beams to gantry zero
- Verification Plan Delivery
  - Deliver using full rotation
- If you have a planar detector like Mapcheck or a fancy rotational detector, use the first option
- If you have an isocentric gantry mount, use the option to reset beam to zero gantry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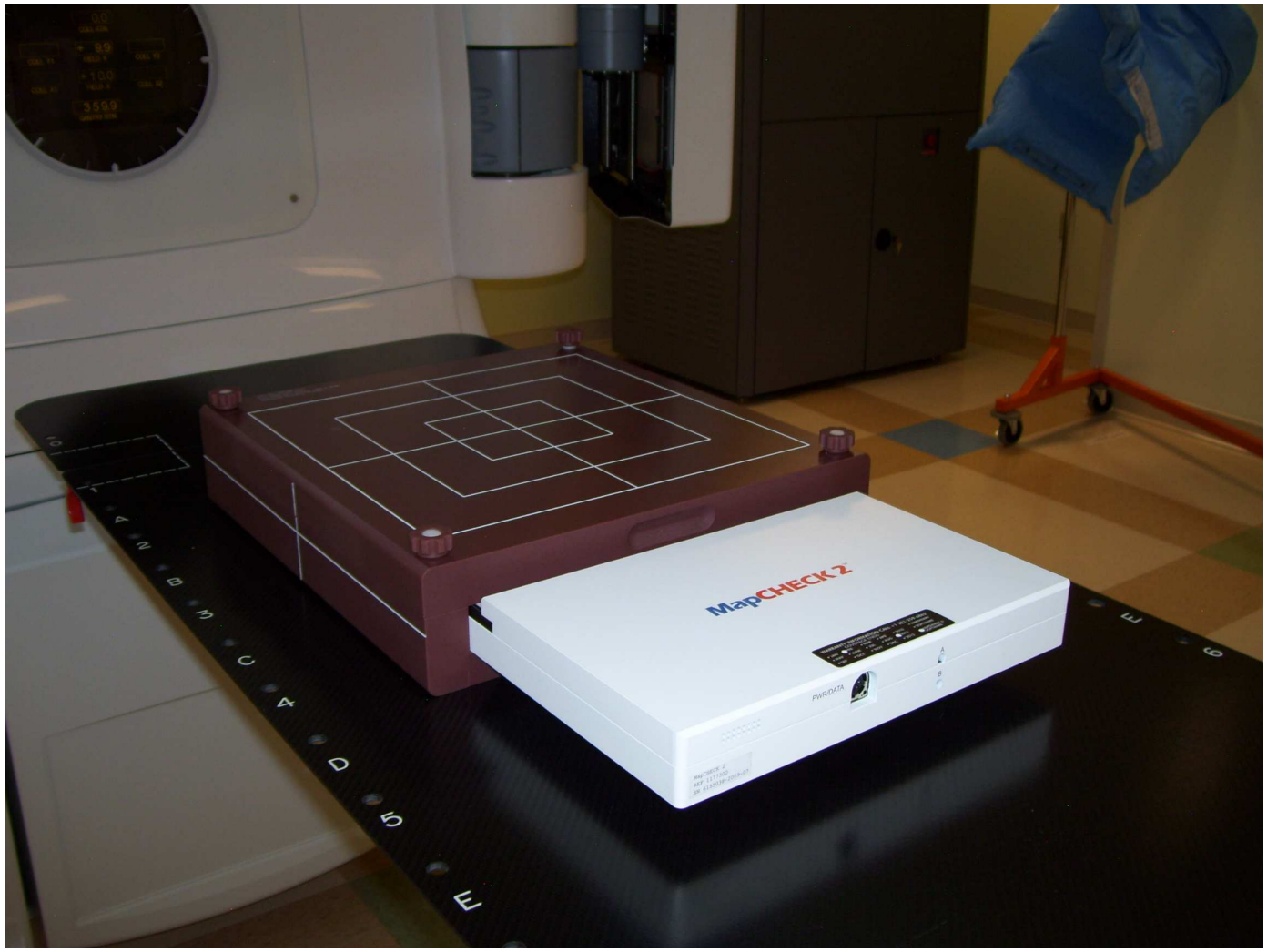
MapCHECK 2
PWR/DATA

Tour Time