Evaluation of the Delta^4 Phantom+ for QA of SBRT treatment fields

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Our motivation

- Growing SBRT program
  - 16.6% of our patients treated in 2015 were SBRT
  - RapidArc VMAT (AcurosXB) or Dynamic Conformal Arcs (iPlan)
  - Varian Truebeam STx
  - Primary sites: Pancreas, liver, spine, LN, lung
- Pre-treatment, patient specific VMAT QA:
  - Sun Nuclear ArcCHECK®cylindrical diode array
  - 3%/3mm, 10% threshold, 90% of pixels passing
- Observed failure of VMAT QA

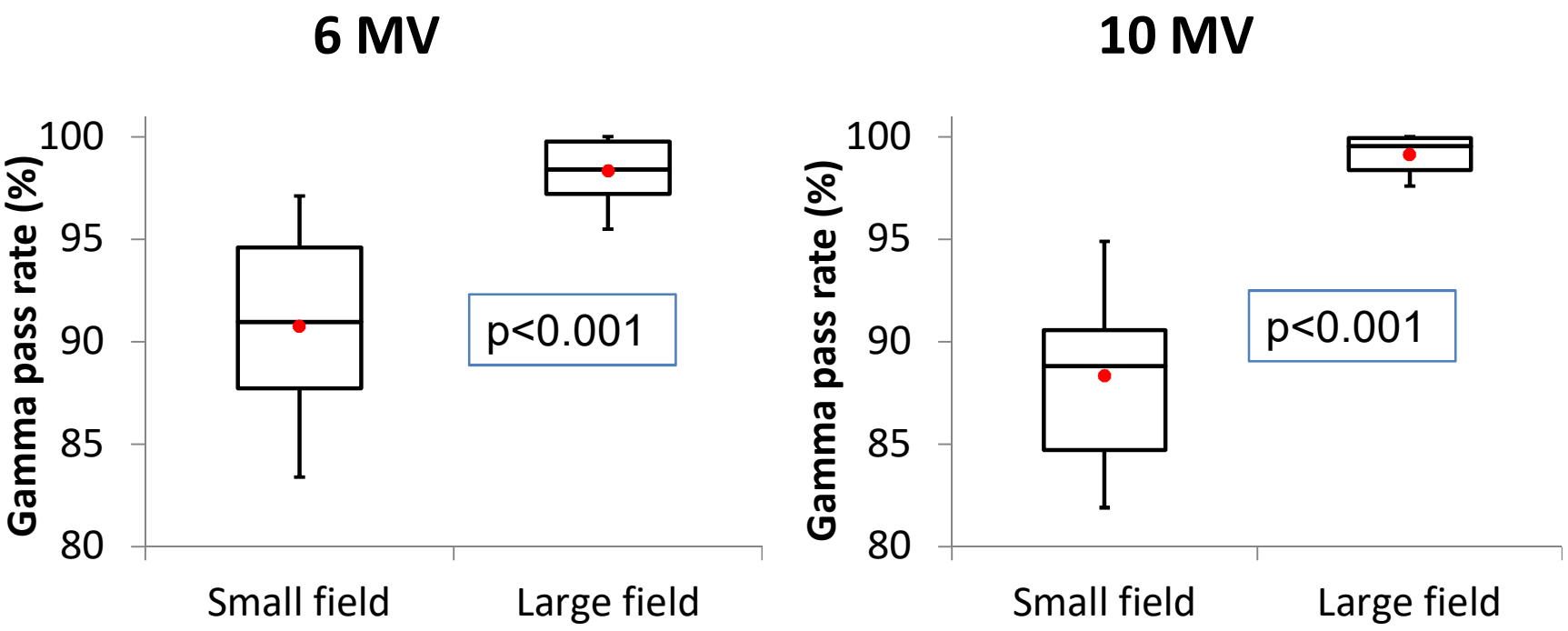
Challenges with SBRT patient-specific QA

- Observed failure of VMAT QA
  - Eclipse AcurosXB dose calculations
  - Smaller field sizes
  - No correlation with plan modulation
- AcurosXB down-samples transport grid resolution away from target
- For small fields, measurements away from isocenter may be in a region of decreased accuracy

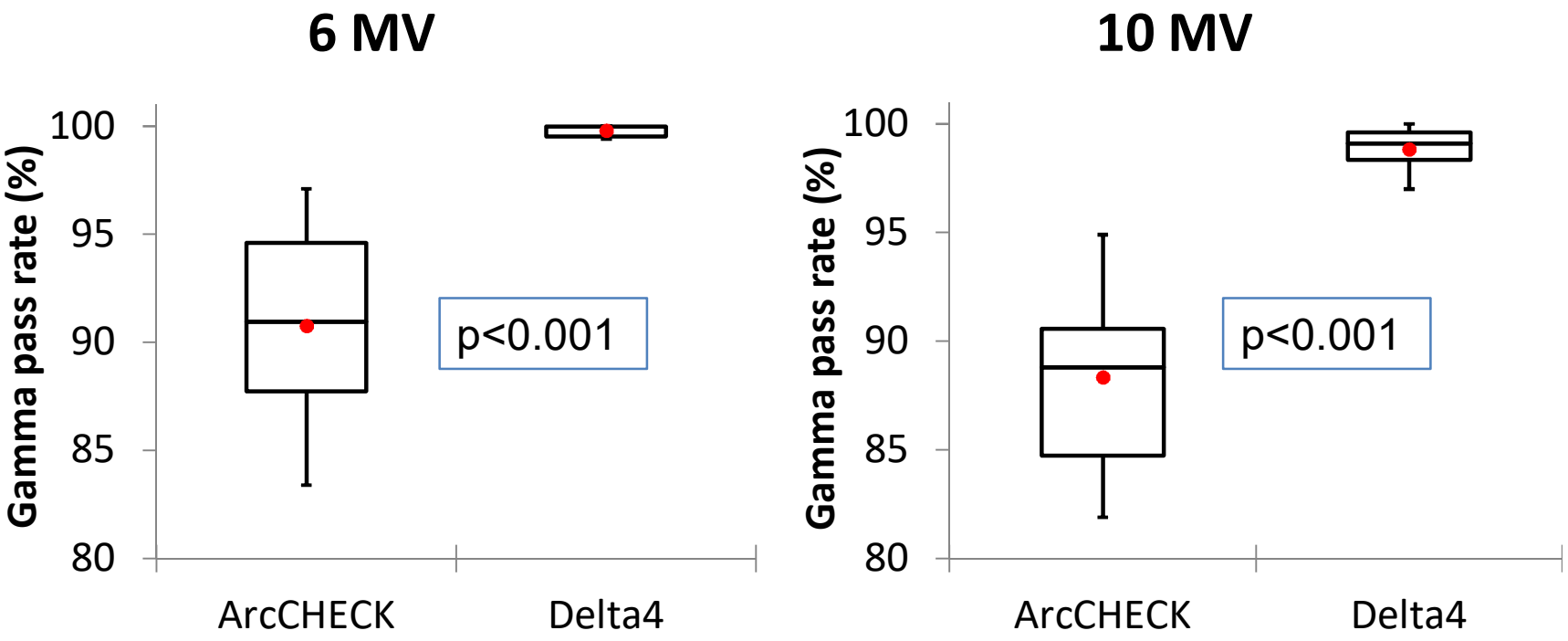
Study design

- Clinical treatment plans (N=20)
  - Previously treated on STx
  - Various treatment sites
    - (Brain, pancreas, LN, Liver, BOT, Sacrum, CW, Optic Nerve, Pelvis)
  - 10 small field (<5x5 cm^2)
  - 10 large field (>10x10 cm^2)
  - All computed with AcurosXB, 2 mm dose calculation grid
  - All computed with both 6 MV and 10 MV beams

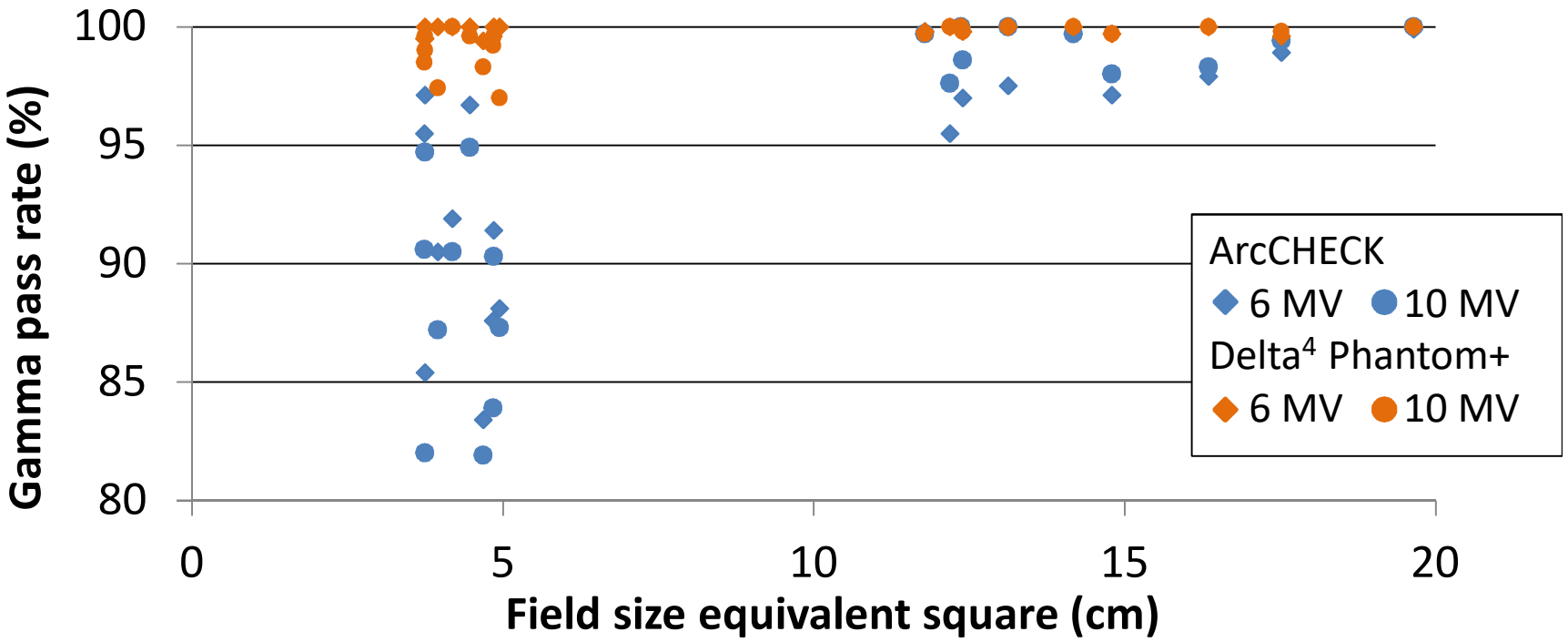
Small vs. Large fields



Small fields: ArcCHECK® vs. Delta^4 Phantom+ diode arrays

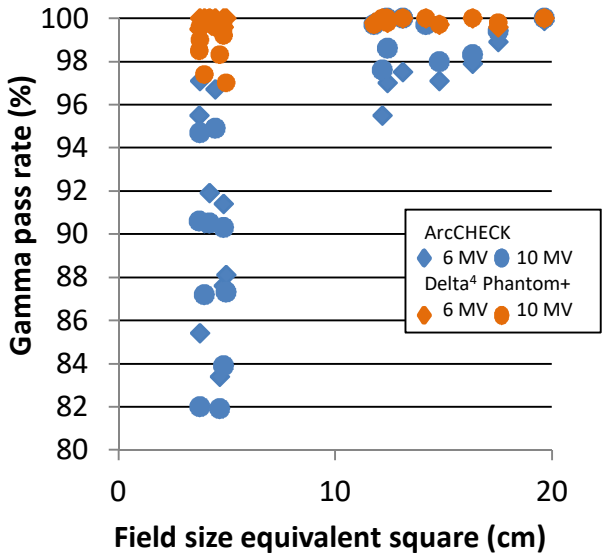


Field size vs. gamma pass rate



Conclusions

- AcurosXB transport grid down-sampling away from target can impact off-isocenter measurements of small SBRT fields
- Delta^4 Phantom+ allows for measurement at isocenter with fine detector resolution (5 mm diode spacing)
- Varying approaches to 3D gamma index analysis contribute to differences in pass rates



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