

# Small field dosimetry using a Roos chamber

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# Dose area product measurements

- Integral dose area product
- Use with small radiotherapy fields is *not* a new idea
- In the literature:
  - Large area chambers used
    - PTW Bragg Peak Chamber entrance window diameter is 8.4 cm
  - Measurement of dose area product / dose length product also obtained by scanning the field
- Why do them? Quick and easy.
  - Use for SRS treatment output checks
  - Use to characterise collimator position reproducibility
    - i.e. can this machine do SRS



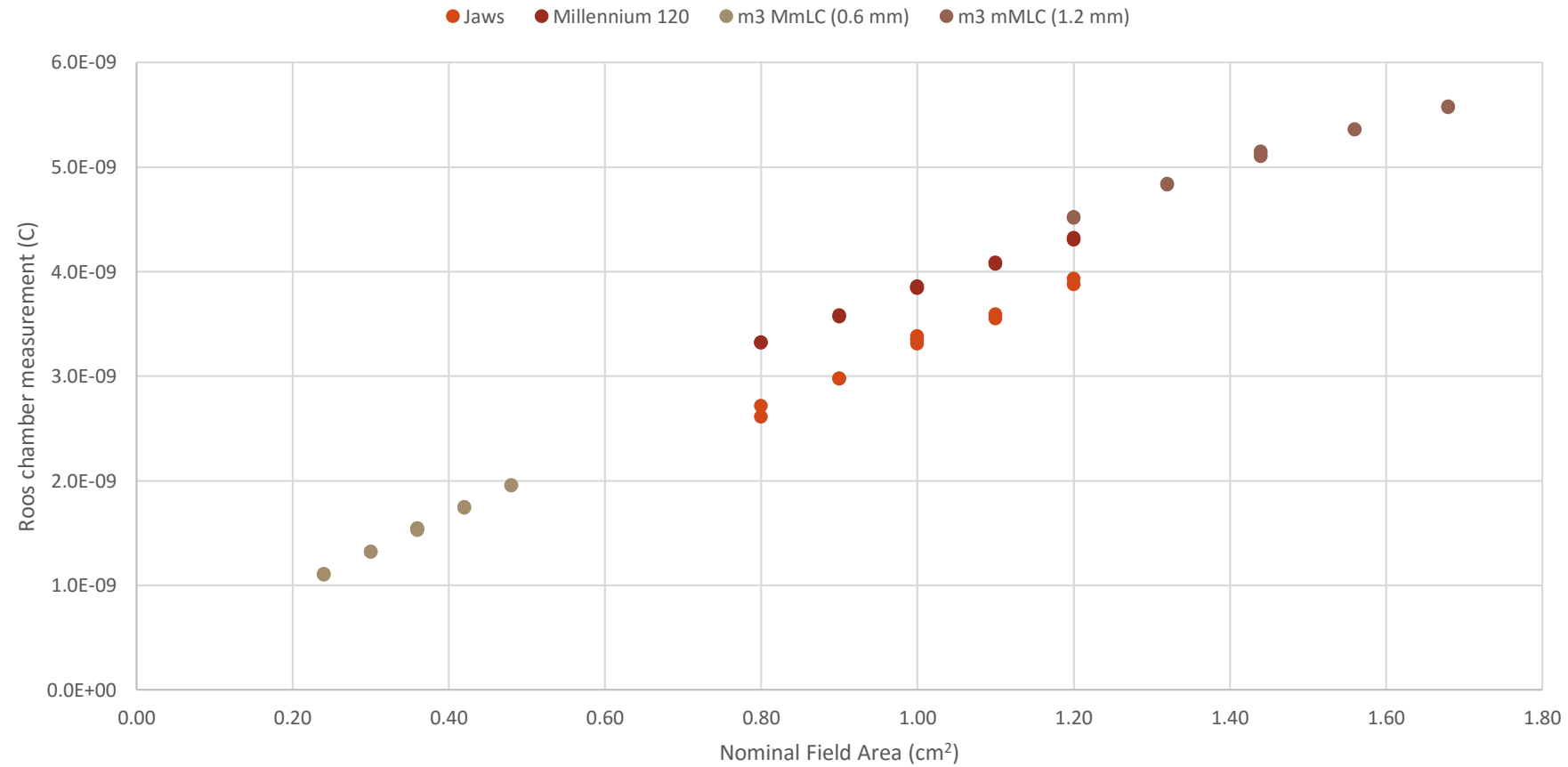
# Experimental setup

- Roos chamber used (our largest parallel plate chamber, other than an interesting survey meter). Roos chamber in solid water slab (thanks JKD!)
- Measurements performed using jaws, Millennium 120 MLC, and m3  $\mu$ MLC
- For MLC fields – jaws were 5mm from leaf edges in direction of motion and 2mm from leaf boundaries orthogonal to direction of motion
- 100 MU delivered, 95 cm SSD, measurement at 5 cm depth, with 10 cm backscatter
- Reproducibility tested before and after irradiations
  - standard deviations approximately 0.2% of mean signal

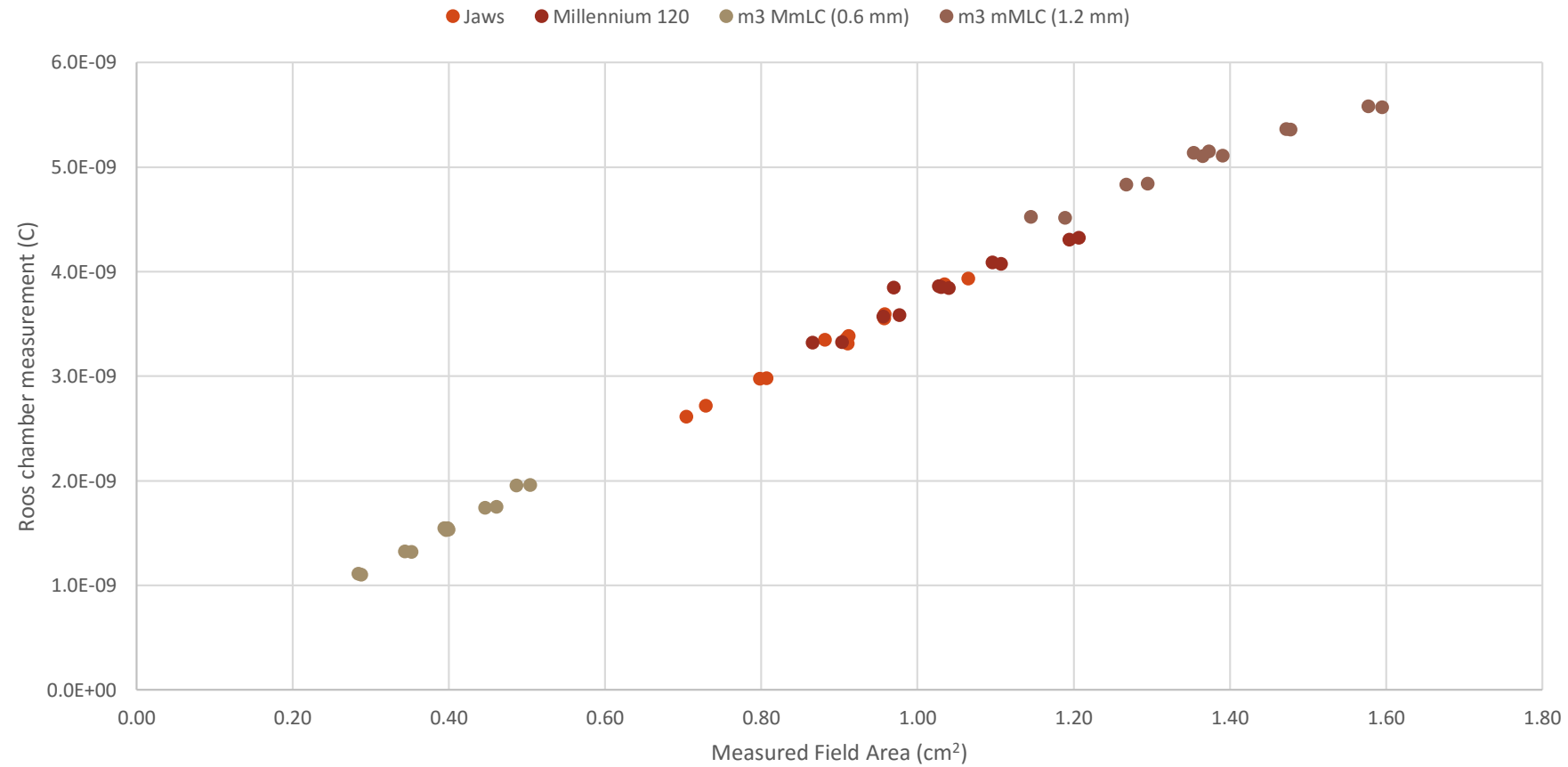
# Experimental procedure

- Drive collimators to a given position (this is an instance), measurements taken, and collimators withdrawn
  - 2 measurements taken for each instance
  - 2 instances for each field size
    - Jaws: 1.0 x 0.8, 1.0 x 0.9, 1.0 x 1.0, 1.0 x 1.1, 1.0 x 1.2 sq. cm
    - M120: 1.0 x 0.8, 1.0 x 0.9, 1.0 x 1.0, 1.0 x 1.1, 1.0 x 1.2 sq. cm
    - m3: 0.6 x 0.4, 0.6 x 0.5, 0.6 x 0.6, 0.6 x 0.7, 0.6 x 0.8, 1.2 x 1.0, 1.2 x 1.1, 1.2 x 1.2, 1.2 x 1.3, 1.2 x 1.4
- Measurements also performed for larger field sizes
- EBT3 film placed on top of chamber, for measuring incident field size
  - Timothy Tang wrote Matlab code to automatically extract FWHM values

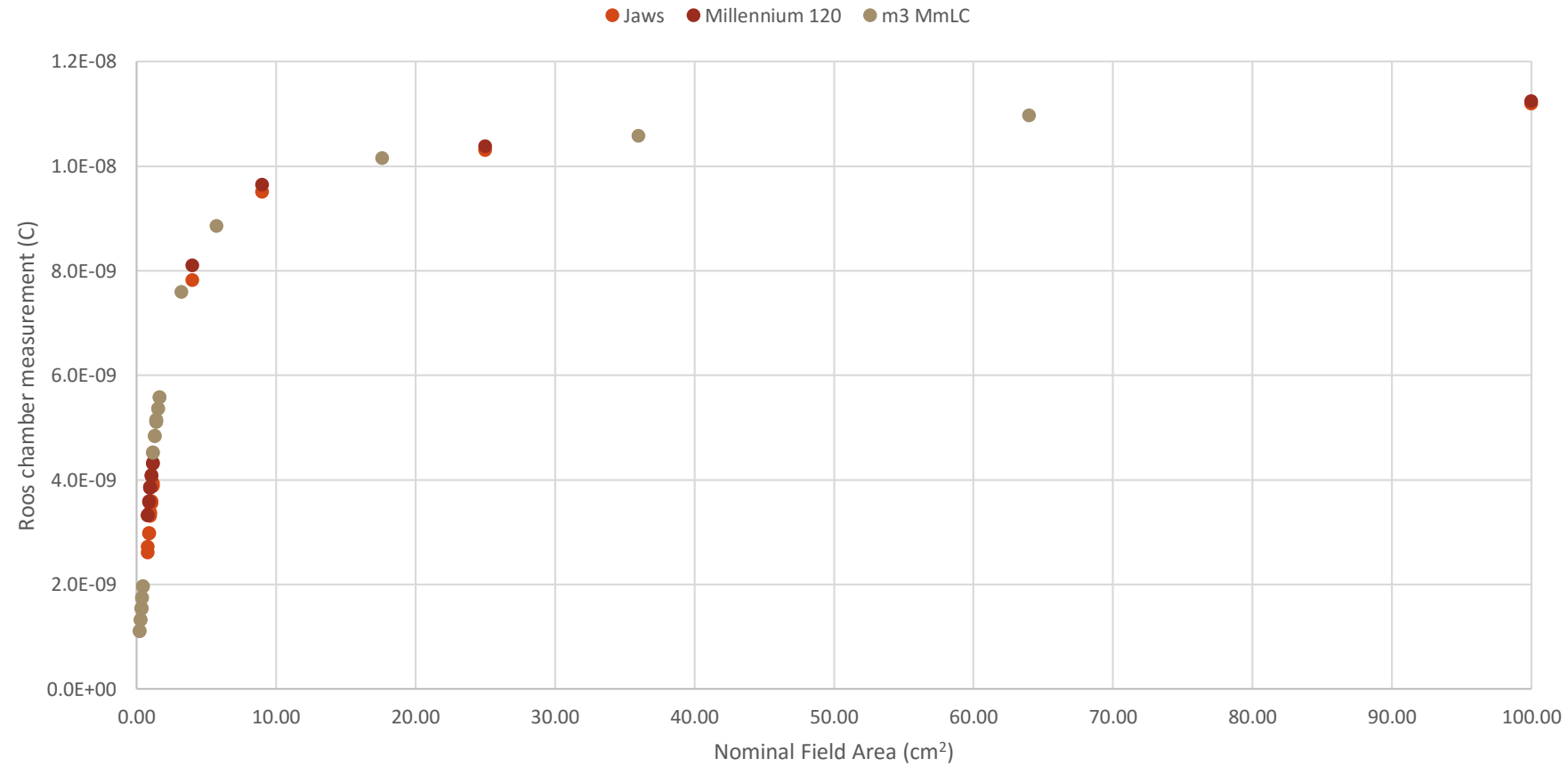
# Results for nominal field sizes



# Results for measured field sizes



# Results for larger field sizes



# Discussion

- Linear relationship between 'output factor' and field size when field edges inside chamber diameter
- Non linear relationship between 'output factor' and field size when field edges outside chamber diameter
- 15 mm collection diameter → max square field edge of 10.6 mm
  - Too small for MLC collimated SRS output checks
- Chamber very sensitive to field size – it would be possible to detect the effect of a 0.25 mm shift in collimator position on dose output
- Possible future work
  - Characterise effect of lateral variations / setup error
  - Steve is making a large area chamber (3D printing!)