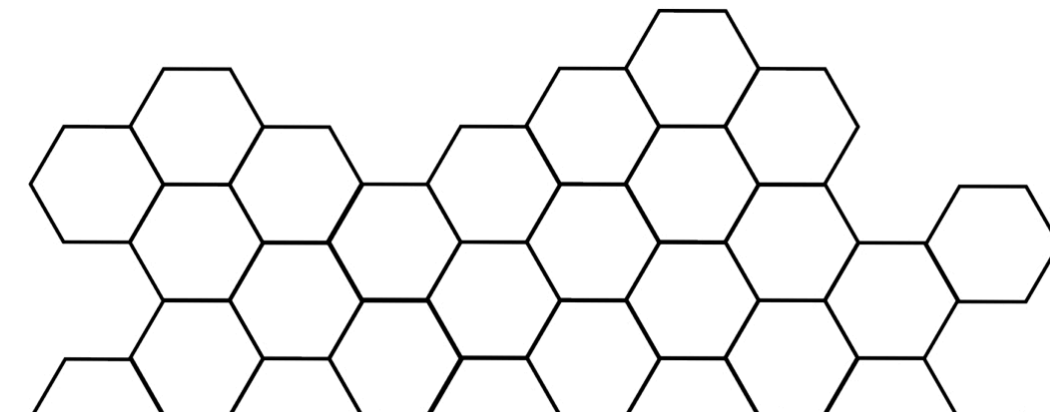


Measurement of Radiation-Induced Air Scintillation with An On-Board EMCCD Camera for Quality Assurance in Small-Animal Cabinet Irradiators

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INTRODUCTION

Small animal cabinet irradiators are commonly used for evaluating novel radiation techniques in animal models.

Some facilities with these irradiators do not have dedicated physics support and may have inaccurate dosimetry which would affect the quality of studies.

Developing a simple method of measuring dose output would improve the quality of pre-clinical studies.

AIM

To investigate the ability to use a EMCCD camera for simple daily QA for pre-clinical radiation therapy studies.

To measure radiation-induced air scintillation in a small animal cabinet irradiator.

METHOD

Measurements were made on an X-Rad SmART cabinet irradiator with an Andor EMCCD camera.

Air scintillation measurements were acquired using 225 kVp x-rays at various mA settings with a 25 mm square collimator.

Each measurement consisted of a series of 20 images each with an exposure time of 1 s.

The images was median filtered and the mean of a fixed ROI in the high signal region was measured.

An optical image of the setup lasers was overlaid on a scintillation image to test radiation-to-laser coincidence.

RESULTS

Figure 1 – Air scintillation images taken at 225 kVp with 20, 18, 15 and 5 mA.

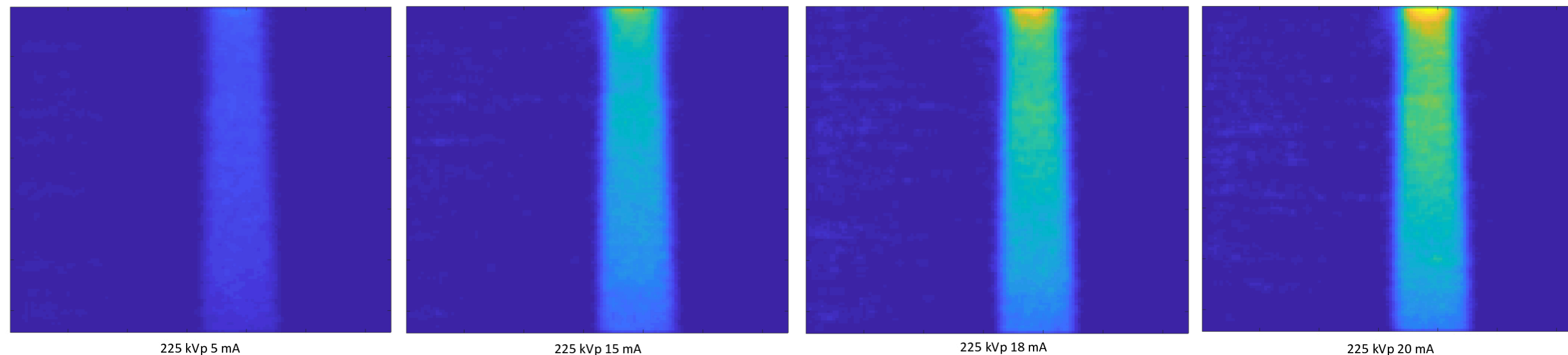


Figure 2 – Plot of integral ROI signal as a function of mA.

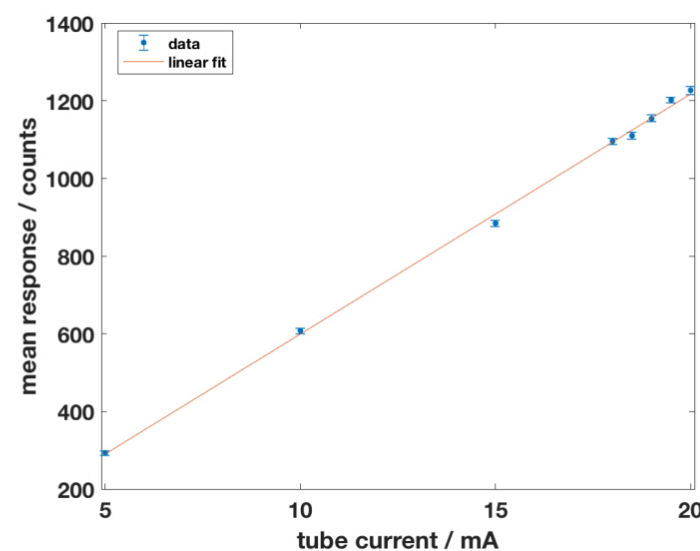
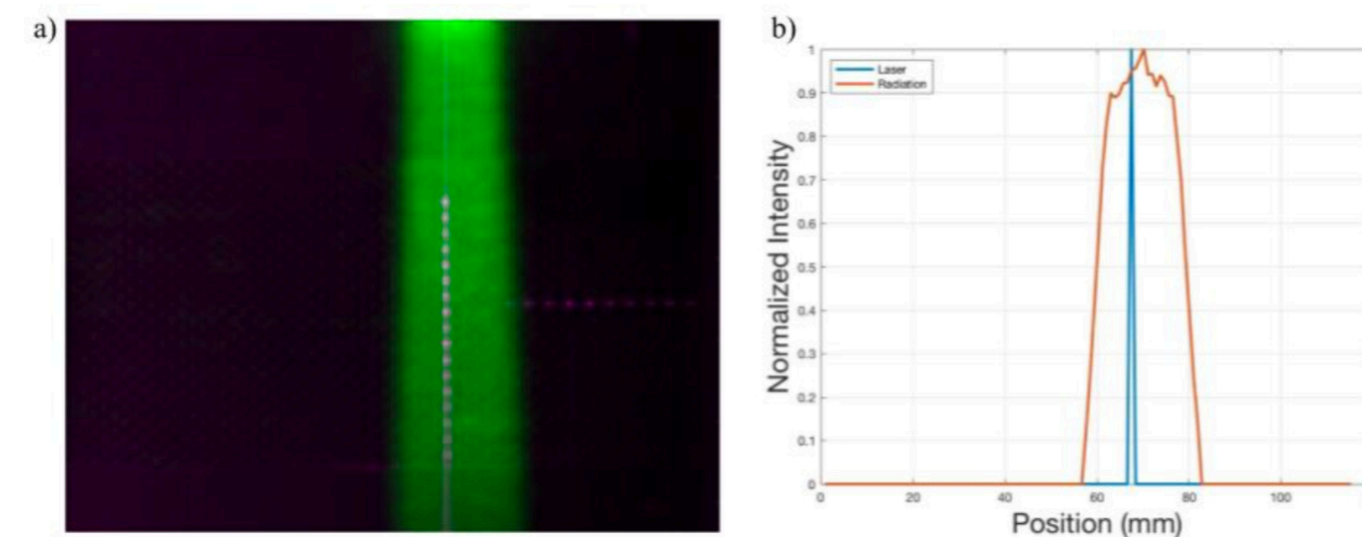


Figure 3 – a) Scintillation image of the radiation field overlaid with the setup lasers. b) Crossplane profiles of the radiation field and the setup lasers.



CONCLUSIONS

A linear relationship between the integral scintillation signal and mA was observed.

The center of the radiation field was measured to be 2.25 mm away from the setup lasers.

Air scintillation measurements have the potential to provide an easy tool for dose output monitoring of small animal x-ray platforms.

Scintillation images and setup lasers can be used to determine radiation-laser isocenter coincidence.

CONTACT INFORMATION

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