

AbstractID: 5479 Title: Preliminary Investigations into Combined CT/SPECT Imaging Onboard Therapy Machines

Purpose: Functional and molecular (F&M) imaging onboard radiation therapy machines would allow for targeting of functional tumor volume, and avoiding of healthy tissue, by guiding and modifying radiation beams, in the treatment room, based on real-time F&M information. This capability might be particularly critical when tumor is located within deformable internal organs. When deformable structures do not present adequate contrast in the CT image, precise localization of tumor and healthy-tissue can be difficult using onboard CT alone. Also, since some F&M properties can change on the time scale of an hour, onboard F&M imaging may be important for its temporal proximity to therapy. Given the benefits of onboard F&M imaging and the essentiality of onboard CT, the purpose of this study is to investigate the feasibility of using flat-panel detectors (FPDs) to accomplish both CT and SPECT onboard therapy machines.

Method and Materials: A 10 mCi point source of Tc99m was placed 100 cm from a bar phantom, with a FPD immediately behind the phantom. Data were acquired for 10 seconds. A signal-to-noise ratio (SNR) was computed with signal given by difference in mean activities in the exposed and bar-covered regions and noise given by standard deviation of amplitudes in the 0.776-mm-wide exposed-region pixels.

Results: The bar phantom was clearly visualized. The measured SNR was 4.

Conclusion: Additional experiments will be required to evaluate FPD SPECT when radiotracer is distributed over an extended source and a collimator is employed. Since FPDs have not been designed for SPECT, only limited SPECT performance can be expected. However, these initial characterizations of FPD SPECT may support FPD design modifications, such as thicker scintillators, that enable combined SPECT/CT imaging using FPDs mounted onto therapy machines.

Conflict of Interest (only if applicable):