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P2.71: Detective quantum efficiency of double-layered detectors for dual-energy x-ray imaging

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A sandwich-like, double-layered detector can perform dual-energy imaging (DEI) at a single shot of x-ray exposure without object-motion artifacts. The energy separation between the measurements from two (front and rear) detector layers can be further adjusted by inserting an x-ray beam-attenuating material between them. However, the design of the interdetector filter highly impacts the dose efficiency by changing the number of x-ray photons reaching the rear detector layer in the sandwich detector. We develop a cascaded-systems model to assess the signal and noise propagation in the sandwich DE detector and estimate the DE detective quantum efficiency (DQE) in terms of filter designs. We validate the developed DE-DQE model by comparing it to the measurements. The developed model will be helpful for better design and operation of sandwich detectors.

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