

Standard deviation is used overwhelmingly as the sole descriptor of noise in X-ray CT. However, standard deviation, while easy to measure, provides no information about noise structure (i.e. appearance), has only gross predictive value for object detectability, and lacks direct physical meaning. Noise power spectrum (NPS) provides frequency content information about noise under a given set of input technical parameters, including convolution kernel. In this submission, we demonstrate how NPS information can impact object detectability. We also explore the impact a change in convolution kernel has on MTF versus NPS, which may be exploited to improve task dependent object detectability, particularly low contrast detectability. In order to better define the impact of NPS on detectability, granularity measures calculated from the NPS can characterize the size of the “grains” of noise. This submission demonstrates how granularity measures can also separate reconstruction algorithms based on relative frequency content of noise and physical area to help predict the influence of a given noise circumstance on object detectability. Finally, the noise equivalent quanta (NEQ) can be obtained from the NPS and yields the effective number of photons contributing to noise magnitude, independent of convolution kernel. This physically meaningful value can be used to compare the effect of technical input parameters on noise between protocols across scanners.