AbstractID: 9774 Title: Noise Power Estimation for Digital Radiography

The ability of digital imaging systems to detect subtle features is ultimately limited by the stochastic fluctuations in the pixel values of the image. The noise power spectrum (NPS) provides a useful measure of this fundamental imaging characteristic. Like the modulation transfer function, the noise power spectrum is expressed as a function of two orthogonal spatial frequencies. An important use of the noise power spectrum is to calculate the detective quantum efficiency, a widely used measure of imaging detector performance. As digital radiographic systems are becoming widely adopted, noise power estimation is becoming more accessible to a wider range of researchers for several reasons. First, the required digital data is directly available from digital imaging systems, eliminating the need for image digitization. Second, a number of practical guides to NPS methodology continue to be developed. These include a soon-to-be-released report by the AAPM Task Group No. 16 on NPS estimation and part of the work of Committee 62B of the IEC on detective quantum efficiency. In today's brief presentation, the theoretical basis for the NPS will be developed, including the implicit assumptions regarding the stochastic properties of the underlying imaging processes. From this basis, several practical implementations of noise power estimation can be derived. Selected examples, consistent with above-mentioned standards activities, will be described with emphasis on some of the practical considerations that impact the ability to obtain meaningful NPS estimates. The author is an employee of Eastman Kodak Company.

Educational Objectives:

1. To appreciate the theoretical basis for noise power and the assumptions implicit in its estimation.
2. To understand the data requirements and basic methodology needed to estimate noise power spectra.
3. To be able to correctly interpret the resulting spectra.
4. To be familiar with literature sources that provide detailed guidance.