AbstractID: 5389 Title: Evaluation of dual-energy subtraction of digital mammography images under conditions found in a commercial unit

Purpose:
Radiological contrast-to-noise ratio (CNR) has been calculated for subtracted images of calcifications after dual-kVp subtraction combining beams available in a Senographe 2000D.

Method:
2002 Lemacks' et al. formalism has been used in the CNR calculations. Assumed spectra were from 1997 Boone et al. parameterization and the study was limited to a lowest 25 kV Mo/Mo and a highest 40 kV Rh/Rh beams, and 1R total exposure.

Results:
For a standard case combining 25 kVp Mo/Mo and 40 kVp Rh/Rh beams (total mean glandular dose about 2.5 cGy) predicted maximum CNR for 300 μm calcification in 5 cm thick, 50% glandular, breast is about 1.2, below Rose's criterium for visualization. for standard case. The effect that input factors might have on predictions has been evaluated. Choice between alternative spectra can affect CNR by 50%, assumed calcification composition leads to differences of 67% in calculated CNR, and assumed breast tissue composition can alter CNR by 45%; these results are weakly dependent on calcification or breast thickness, or on the assumed fraction of glandular tissue. CNR values are related to detected spectra effective energy. Calculations predict that above 37 kVp Mo/Mo beams are more energetic than Rh/Rh at same kVp, due to beam hardening.

Conclusions:
This work has found differences of the order of 40-70% in calculated CNR depending on the choice of any of the following model parameters: initial spectra, calcification composition, and breast tissue composition. The evaluation gives modest results for the CNR (values smaller than the Rose's criterium) in the subtracted microcalcification images using the equipment beams, but improvements could be attained by hardening the high-energy exposure beam.