Purpose: To increase the generalized NEQ (GNEQ) for the new high-resolution Microangiographic Fluoroscope (MAF) by using the increased tube-loading capacity of the medium focal spot compared to the small focal spot.

Methods: Generalized MTF (GMTF), generalized NNPS (GNNPS) and GNEQ were calculated for the MAF at a fixed object magnification of 1.11 for the medium and small focal spots on the central axis and the medium focal spot on the anode side. Due to increased tube-loading capacity of the Toshiba Infinix system for the 0.5-mm medium focal spot compared to the 0.3-mm small focal spot, the 2D NNPS was calculated at 3.125 times higher dose on the central axis and 2.85 times higher dose on the anode side (considering a 9% reduction in intensity due to the Heel effect) for the medium spot.

Results: The GNEQ ratio of medium-to-small focal-spot at the central axis is much greater than 1.0 at low frequencies, with a rapid drop at higher frequencies in the tube axis direction, becoming less than 1.0 above 7 cycles/mm. The GNEQ of medium focal spot at the anode side is higher at nearly all frequencies below the Nyquist due to the reduced effective focal spot size, becoming less than 1.0 above 9 cycles/mm.

Conclusions: Improvements in GNEQ can be obtained for the MAF using the medium focal spot as compared to the small focal spot at the central axis position at low frequencies, whereas the GNEQ is improved for almost all frequencies for the medium focal spot at the anode side. There is a clear benefit to utilizing the increased tube output for the medium focal spot, while decreasing the effective anode angle to reduce focal spot size but maintain sufficient FOV for the MAF.
Support: NIH Grants R01-EB008425, R01-EB002873