AbstractID: 12783 Title: Use of Line-Focus Principle to Increase the Beam Intensity while Maintaining a High Generalized MTF for the Microangiographic Fluoroscope (MAF) System

Purpose: Achieving superior GMTF for the micro-angiographic fluoroscope (MAF) system requires a small focal spot which could limit the range of possible beam intensities. We take advantage of the Line-Focus Principle by using the medium focal spot viewed from the anode side rather than the small focal spot at the central axis to enable increased tube loading with no compromise in resolution. **Method and Materials:** We have calculated the GMTF at five different positions along the anode-cathode direction parallel to the tube axis for the newly developed high resolution MAF (35 micron pixel). Focal spot measurements were done with a pin-hole assembly using the same technique parameters at all positions. Small and medium focal spots and different object magnifications were used for GMTF comparisons. X-ray intensity was determined at different positions parallel to the tube axis. **Results:** The comparison between the small focal spot at the center and the medium focal spot toward the anode direction demonstrated that there was only as small difference in resolution between these locations with only a 20% decrease in x-ray intensity toward the anode side. Despite this decrease in x-ray intensity due to the Heel effect, since the maximum tube loads were 500 and 160 mA for the two focal spots, respectively, the total increase in intensity for the medium focal spot can be a factor of 2.5 times that of the small focal spot. Focal spot blooming with the higher tube current for the medium focal spot was found to be negligible. **Conclusions:** This work demonstrates that by using the Line-Focus Principle and a medium focal spot instead of a small focal spot at the center, a substantial increase in x-ray output can be realized with minimal loss of total system spatial resolution or GMTF.

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