Purpose: Quantitatively determine the patient thickness for which the use of an anti-scatter grid is no longer necessary for digital radiographic (DR) abdomen exams.

Methods: A DR system was used with 100cm SID, 35.5cm x 33cm field size, and 80kVp, typical for adult abdomen exams. The grid ratio and line frequency were 12:1 and 70 lines/cm, respectively. Solid Water® was used as a scatter phantom to simulate abdomens ranging from 5 to 23cm. The scatter to primary ratio (SPR) was measured using the graduated beam stop method for 23cm of phantom, determined to be the average adult abdomen thickness, with an anti-scatter grid. Images were acquired using AEC without beam stops, and the closest fixed mAs compared to the AEC mAs was used to acquire images with the beam stops. SPR was plotted with respect to beam stop diameter and fit to an exponential function. The extrapolated zero diameter SPR, SPR<sub>0</sub>, was used as the benchmark for determining the phantom thickness for which the same SPR<sub>0</sub> was achieved without using a grid. The experiment was repeated using smaller field sizes, 23cm x 30cm and 18cm x 21cm, for thin patients.

Results: The SPR<sub>0</sub> for the 23cm phantom with a grid was 0.89. The patient thickness that most closely matched this SPR<sub>0</sub> without a grid was 5cm with SPR<sub>0</sub> of 0.92. Using a smaller field (23cm x 30cm) the closest matching thickness increased to 10 cm with SPR<sub>0</sub> of 0.95.

Conclusions: Many values have been proposed for the patient thickness cut-off for grid use. By measuring the SPR we have determined that for DR abdomen exams performed at 80kVp, SPR<sub>0</sub> is equivalent or better for patients of 10cm thickness using clinical field sizes. Further evaluation should consider reducing the kVp for smaller patients, however, reducing kVp will increase entrance dose.