AbstractID: 8862 Title: Investigation of the relationship between the contrast-detail figure of merit IQFinv and three characteristic parameters of the contrast-detail curve.

Purpose: To investigate the relationship between the figure of merit IQFinv that is estimated by the CDRAD Analyzer software as an overall descriptor of the contrast-detail characteristics of a radiographic image of the CDRAD phantom, and the fitted contrast-detail curve parameters: limiting object size (object diameter below which the threshold contrast must be increased by more than a pre-set value for the object to be detectable), limiting threshold contrast (the threshold contrast of the limiting object size), and large object threshold contrast (the threshold contrast of the object with the largest diameter).

Method and Materials: We analyzed CDRAD phantom images acquired with four different digital radiographic detectors using x-ray beams with HVL of 7.1 and 10.2 mm Al for each detector, and five different radiographic exposures for each beam quality. The IQFinv and a scatter plot of the contrast-detail curve were generated for each image. These plots where best-fitted with S functions, and the contrast-detail curve parameters were determined from these functions.

Results: For a large range of IQFinv (i.e. ~7 to ~2) the limiting object size and the limiting threshold contrast generally increase (in this case, from ~0.5 to ~1.4 mm and ~0.1 to ~0.7% respectively) as IQFinv decreases. For smaller ranges of the IQFinv (i.e. 6.0-8.0 or 3.0-5.0) this relationship for both parameters appears significantly weaker, considering the pool of images from all four detectors. This may be due to the uncertainty in the IQFinv estimate, the selection of the pre-set value in the determination of the limiting object size, and the fitting parameters of the contrast-detail curves. The relationship between IQFinv and large object threshold contrast is less pronounced.

Conclusion: IQFinv becomes a more accurate descriptor/comparator of the contrast-detail characteristics of digital imaging systems if it is combined with the proposed fitted contrast-detail curve parameters.