

AbstractID: 7626 Title: A Practical Filmless Technique of Determining CT Beam Width

Purpose: To develop a filmless technique for the measurement of CT beam width for QA.

Method and Materials: Images of pre-patient collimated CT beams were acquired using Fuji computed radiography (CR) cassettes and direct-exposure film (DF). CR cassettes were exposed using 80kV, 10mAs to avoid signal saturation. The DF was exposed at 80kV, 30mAs to achieve a proper optical density. The DF image was digitized then linearized. To achieve a proper signal range for CR, various plate-reading protocols were evaluated. An IDL program was developed to automatically handle both the digitized film and a variety of CR image sizes. "Unprocessed" logarithmic CR data were linearized, which is critical to validate the FWHM. The program executes in an interactive fashion, whereby the user selects the beam to analyze. The program determines the background signal for subtraction then samples multiple cross-beam profiles to form an averaged profile. The profile is smoothed and the FWHM is determined.

Results: Under proper conditions of image acquisition, results show both DF and CR are appropriate techniques for beam width measurements. The CR technique demonstrated a high level of reproducibility with a coefficient of variation below 0.5%. Also, the CR results were within 0.3mm of specifications. Using various sizes of CR cassettes had a minimal effect on the results. However, if the properly exposed image is saturated due to an inappropriate CR plate reading protocol, the inaccuracy is substantial (>1mm). The technique worked well for annual tests of six GE scanners. Over a wide range of beam width configurations, all measurements were within 0.9mm of specifications.

Conclusion: A technique for determination of CT beam width in a filmless environment was developed and tested. The results obtained using CR yield accurate measurements of CT beam profile width. The technique is effective, practical, and has proven to be robust.