

Purpose: To describe a system to evaluate image quality, patient dose, and half-value layer of intraoral x-ray systems via the mail.

Methods: A system has been developed to evaluate intraoral x-ray equipment via the mail for state radiation protection agencies. The state agencies provide a list of facility names, addresses, etc. A kit including an "Analyzer" is mailed to the facility along with a User's Guide and Data Form. The Analyzer consists of a flat cardboard device which unfolds into a box holding a dosimeter, test objects, and a packet of dental film containing both D-speed and E-F-speed dental film (this can also be used with digital dental imaging systems). The exposed dental film is processed by the facility and the film images, or digital images, are returned along with the Analyzer. The film images are digitized and the digitized images (including digital dental images) are evaluated for seven image quality characteristics including image sharpness, contrast, density, base-plus-fog, effective speed, film processor quality, and residual fixer (as appropriate). The patient dose and half-value layer (HVL) are determined from the dosimeter. A summary report is sent to the state radiation protection agency. (Patent # 7503694 applies to the Analyzer and process.)

Results: Several studies relative to the accuracy and precision of the measurements indicate that the dose and HVL can be determined to about 10%. Experience with measurements of over 4,500 intraoral x-ray units indicates issues that must be addressed through education of dental facility staff. These issues include about 25% of the facilities exceeding reasonable patient dose levels; about 80% of facilities still using the low speed D-speed film; and that photographic processing is a major issue.

Conclusions: Evaluation of intraoral dental equipment via the mail is a viable and effective approach for image quality and radiation protection purposes.