



F4 Dosimetric Testing of a Hand-Held Dental Radiation Source: Implications for Correct and Practical Use in a Forensic Setting

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After attending this presentation, attendees will be aware of the dosimetric testing of a hand-held dental x-ray device in both its use in a clinical setting and on skeletal remains. Proper radiation hygiene relative to the use of these devices will be reviewed so that the attendee will be able to safely use these devices in a forensic setting such as a mortuary and in the field in multiple fatality incident situations.

It has been shown that hand-held dental radiation generators emit very little radiation to the operators when used as directed by the manufacturers; however, the pattern of radiation emission when being used in a traditional forensic setting where multiple adjacent persons might be working in close quarters has yet to be plumbed. This dosimetric study will impact the forensic science community by showing that while the device is perfectly safe when used as directed, the safety of this machine does not obviate the need for prudent simple radiation hygiene measures.

A dosimetric verification human phantom with head with the oral cavity prepared to hold dental image receptors was used to provide a realistic test object for the measurement of scattered x-radiation in-vitro. An image receptor was placed in the radiation phantom's oral cavity and the collimator was aligned in the standard fashion so that the central ray was perpendicular to the plane of the film. All measurements were performed at 60kV, 2.5mA and 1 second exposure (390mR) to provide a high enough primary exposure such that the accuracy of measurement of any scatter radiation could be maximized. Operator exposure could then

be scaled by dividing the exposure time by a suitable factor for various film or digital image receptors. The phantom was placed in a dental chair in a dental operatory that had lead-lined walls. An 1800cc air chamber and a 2026 C control unit in "integrate" mode with recent calibration was used to measure exposure. The ion chamber was placed at various locations relative to the x-ray generator. Extremely low occupational exposures (7,000 images per year using F speed film) were observed for the hand holding the x-ray generator 0.06mSv; a hand placed on top of the phantom's head 0.8 mSv; the operator's eye 0.02mSv; and the operator's groin 0.03mSv. Higher measurements were observed to the operator's groin if no lead apron was used on the phantom 45mSv; and for personnel standing opposite the primary beam behind the patient 26mSv; or at ninety degrees relative to the primary beam 0.4mSv. It is therefore recommended that an operator use the device while standing in its protective cone and not use the device with an assistant that cannot be positioned behind them within this protective cone. The device, like most x-radiation devices is safe when used according to manufacturers instructions. It is important that in a multiple fatality situation or in forensic case work that both the operator and any assistants obey simple rules of radiation hygiene as well as manufacturer's instructions.

Dental Radiology, Dosimetry, Safety