

AbstractID: 12787 Title: Partial Volume Characteristics of Ionization Chambers in kilovoltage x-ray Exposure Measurements.

**Purpose:** The study is designed to evaluate partial volume response of ionization chambers used for measuring radiation exposure in quality control in radiology.

**Materials and Methods:** A diagnostic x-ray unit(Philip Super 80 CP) was used to measure partial volume response of 15cm<sup>3</sup>, 150cm<sup>3</sup> and 600cm<sup>3</sup> chambers for 81kVp, 400mA, and 0.25s. The beam output was measured using a monitor chamber (Radcal 6.0cm<sup>3</sup>) placed close to the collimator. A slit of 2.0mm wide made in a lead sheet of 3.2mm thick and size of 30×30cm<sup>2</sup> was placed on the ionization chamber and moved in an increment of 2.0mm over the entire length of the chamber. For the measurements of the ionization chamber of 10 cm<sup>3</sup>(CT chamber), the beams of 120kVp, 200mA and 0.2s were generated, and a slit of 5mm wide was made in a similar lead sheet that was moved in an increment of 5.0mm. All measurements were made at source to chamber distance of 1.0meter.

**Results:** Keithley 15cm<sup>3</sup> Model 96035 B ion chamber exhibits a narrow region(30–50mm) from the edge of the chamber of increased sensitivity. Beyond the region the exposure measurement decreases relative to the chamber position exhibiting a partial volume effect. Keithley 150cm<sup>3</sup> Model 96020C, the center of the chamber 55mm to 90mm shows an area of increased sensitivity with sensitivity decreases at the edges. Keithley 600cm<sup>3</sup> Model96050, and Keithley Computed Tomography Chamber(10cm<sup>3</sup>) Model 500-200: the response of the chambers is uniform along its axis. However, the sensitivity decreases at the edges(1cm from either side) of the ion chambers.

**Conclusion:** The spatial dependence of ion chambers sensitivity varies from chamber to chamber. It is therefore, important that ion chamber behavior and the manufacturer's specification should be strictly adhered such as dose and dose rate changes, operating voltage, x-ray energy and/or spectral characteristics.