

AbstractID: 14040 Title: Rapid evaluation of x-ray/light field alignment for digital radiographic systems

**Purpose:** This study investigated the development of a device to rapidly quantify x-ray and light field alignment. The device is a useful alternative to traditional measurement techniques requiring film and is particularly useful for all-digital facilities that no longer have film processors. The system that is investigated provides rapid and accurate evaluation of the difference between x-ray and light fields.

**Method and Materials:** A fiber-optic coupled (FOC) dosimetry system was adapted to evaluate the misalignment between the light and x-ray fields of mammography imaging systems. An FOC detector element providing a variable output as a function of exposed dosimeter length is used to measure the deviation of each side of the X-ray/light field. Each detector element incorporates two FOC dosimeters which were constructed by coupling plastic scintillator fibers, 500 microns in diameter, one 2mm and the other 5cm in length, to sensitive photomultiplier tubes (PMTs). The detector element is positioned such that the 5 cm dosimeter intersects the edge of the light and X-ray fields. The second dosimeter (2mm) is positioned entirely in the X-ray field to provide a relative measure of beam intensity. Characterization involved varying the length of the 5 cm dosimeter exposed within the x-ray field.

**Results:** The system consistently demonstrated linearity with tube output and exposed length. Trials have shown a linear response of detected counts to length of scintillation material in the light field over the range of interest. The system's spatial resolution is evaluated and characterized for a variety of exposure parameters.

**Conclusion:** Multiple PMTs allow all edges of the light field to be evaluated simultaneously, permitting x-ray/light field alignment for a typical digital mammography system to be completed in approximately ten minutes. The time savings and improved accuracy over current alternatives makes the device an attractive tool for digital mammography quality control.