

Total scatter in radiotherapy photon beams is mainly contributed from the linac's treatment head and from within the phantom. The first component, the head scatter factor, is usually measured in air and assumed to be the same inside the phantom. While the second component, the phantom scatter factor, is often determined from total scatter measurements combined with the in air head scatter measurements. Therefore, it would be advantageous to be able to measure the phantom scatter factor directly and to determine the value of the head scatter factor inside the phantom.

In this work, the phantom scatter factor is measured directly according to its basic definition, by varying the phantom size while keeping the collimators opened to a fixed field size of 10 x 10 cm. The x-ray beams are obtained using a Varian 2100C/D linear accelerator. Symmetric and asymmetric field sizes ranging from 4 to 30 cm are investigated. For the smaller field sizes, between 1.2 and 2 cm, representing the diameter of the Stereotactic collimators the output factors are measured using various detectors including gafchromic film, small size ionisation chambers, silicon diodes and diamond detectors. From these data and the in phantom measurements of the total scatter factor, the values of the head scatter factor in phantom are determined which are found to vary from the in air measurements by about 1% for 6 MV beams and about 2% for 18 MV beams.