

AbstractID: 3705 Title: A comparison of techniques for effective SSD measurements and evaluation of data for accelerators from different manufactures

Purpose: Investigating and comparing the effective SSDs of electron beams measured by ionization chamber and electron diode for Elekta linear accelerators.

Method and Materials: The effective SSDs for different energies and field sizes are measured for three Elekta linear accelerators. In order to measure effective SSD (SSD_{eff}), two methods are used. The first method is placing a Farmer ionization chamber in a solid water phantom. The second method is using an electron diode placed on top surface of a solid water phantom.

Results: The data shows that effective SSDs are energy and insert field size dependent. For both ionization chamber and electron diode measurements, the effective SSDs of three Elekta linear accelerators, 1) increase with increasing of energy and insert field sizes which can be explained by less lateral scattering with higher energy and more lateral scattering equilibrium with larger field sizes, 2) agree well between the ionization chamber and diode measurements except for under the combinations of low energy and small field size. In most cases, the diode measurements are about 8 to 12 percent lower than ion chamber measurements for the same energy and insert field, except low energy and small insert combinations. Interestingly, for small field size, the effective SSD of diode measurement is larger than that of ion chamber measurement.

Conclusions: The effective SSDs of three Elekta Linear accelerators agree well under most conditions except low energy and small insert field size combinations. The data also indicate that ion chamber measurements give a more accurate measurement over diode measurement and we recommend that ionization chamber should be used to measure effective SSD. The data also show that effective SSDs for Elekta accelerators are different but comparable to that of Varian machines.