AbstractID: 3398 Title: Characteristics of neutron equivalent dose around medical linear accelerators

Purpose: To investigate the characteristics of neutron equivalent dose (*NED*) around medical linear accelerators (linac).

Method and Materials: Two types of bubble detectors (BD-100R for fast neutrons and BDT for thermal neutrons) were used to measure the neutron equivalent dose. Most experiments were carried out using a Varian Clinac 2300C/D linac, 18 MV photon beam at two points of measurement: machine isocenter (point I) and on the isocenter axis 1 m off the isocenter (point C).

Results: The *NED* at point I is 12.7 mSv_n/100 MU (10% is from thermal neutron) and this dose decreases to 1.7 mSv_n/100 MU (13%) at point C. The *NED* at point I increases with the increasing field size, whereas the *NED* at point C exhibits the maximum value for a 10×10 cm^2 field. The use of a multileaf collimator (MLC) increases the *NED* at point C but does not show any significant effects for the *NED* at point I. In order to facilitate conversion of *NED* in air to *NED* in tissue so that the patient photoneutron dose can be estimated, a new quantity *NTAR* (neutron tissue-air ratio) is introduced and measured in this work. As well, a *NED* depth dose curve is determined. Inverse square law can not be applied to the *NED* results measured at different positions along the central beam axis.

Conclusions: Photoneutrons produced by a high energy photon beam delivers to the radiotherapy patient a equivalent dose of about 1% of the treatment dose inside the treatment field and 0.1~0.3% outside of the treatment field. The dose inside the field increases with the increasing field size, while the dose outside the field decreases with the increasing field size. *NTAR* provides an easy method for the conversion of *NED* in air to *NED* in tissue.