AbstractID: 5569 Title: Neutron Spectra Measurements For Fast Neuron Brachytherapy Effective Dose Evaluation

Purpose:
We are developing a miniature neutron generator capable of brachytherapy, contact therapy and perioperative therapy applications. The neutrons are produced at 14MeV in a thermonuclear reactant target located at the end of a needle. The fast neutron effective dose depends on the lineal spectrum of charged particles produced by neutron interactions in tissue. Neutron interaction probabilities, cross sections, vary with neutron energy and the neutron spectra change with transmission through tissue. The change in spectra of initially 14MeV neutrons with tissue depth in brachytherapy is in itself not dramatic because the neutron mean free path is 10cm. But more seriously, the LET of neutron scattered protons increases with the inverse of proton energy and higher LET protons (bellow 120keV/micron) have increased relative biological effectiveness. The measurement of neutron spectra below 2 MeV is therefore important for understanding the mechanism of effective dose. In this paper, we will describe our development of a double scatter neutron spectrometer (DSNS) that has proven effective in low energy neutron spectral measurements.
Method and Materials:
The DSNS consists of detector planes of two liquid organic scintillators separated by 18cm. A neutron that scatters in the first plane starts a timer which is stopped by a coincident neutron detection signal for the same neutron in the second detector plane. Energy of the scattered neutron is determined by time-of-flight over the distance between detectors, which is the incident energy when the source is aligned with the detector axis.
Results:
The useful energy range of the DSNS is 0.3MeV to 5MeV and is dependent on the separation distance of the detector planes.
Conclusion:
The DSNS should be useful for measuring the low energy neutron component of our brachytherapy accelerator based source.

Conflict of Interest (only if applicable):