

## Additional TBI Patient Dose from Neutrons Due to the Photon Beam Intercepting Steel As Opposed to Concrete

A new treatment room was built, which included an extended treatment distance for TBI irradiation. While the plans showed a 16.4 inch steel plate centered in 32 inches of concrete, the steel plate was placed on the inside of the TBI room for ease of construction. Concern was then expressed over a potential increase in dose to TBI patients from the neutrons produced in the steel from the 23 MV x-ray beam.

Measurements were made with bubble detectors in the old treatment room with its concrete wall as the primary barrier and in the new treatment room with the steel/concrete primary barrier. The in-beam measurements at the extended distance with the steel primary barrier show an increase by approximately a factor of two, from 7 mSv to 12 mSv per photon Gy over the concrete only wall. Measurements at the TBI distances with a phantom again resulted in a factor of two increase in dose on the surface of the phantom close to the wall, 13 mSv per photon Gray as opposed to 7 mSv, when comparing the steel wall to the concrete wall. A two inch thick sheet of polyethylene was added in front of the steel. Measurements were repeated which indicated that the measured dose on the surface of the phantom close to the wall is the same as with the concrete wall.