AbstractID: 5343 Title: A Novel Tomotherapy Design for the Breast

Purpose: Previous work on partial breast irradiation in the prone position has lead to the development of a new treatment modality made specifically for the breast. Current methods often utilize a modified two-tangent approach meaning beams are delivered around the body. This device, on the other hand, takes advantage of the unique geometry of the prone breast by rotating around it to deliver a highly targeted dose to the PTV, while sparing the normal breast tissue and other non-breast structures. This device will involve helical tomotherapy but on a rotated axis. This will allow many more angles to be utilized compared to the standard methods.
Method and Materials: Several technical and clinical aspects of this device have been explored. The technical aspects include the design of a new target, shielding requirements, and energy fluence distributions. The clinical aspects researched include dose distribution comparisons from several different potential energies and the determination of patient selection criteria.
Results: These investigations have shown that a 4MV x-ray beam created from a beryllium target would be the optimal design. Since the breast is a thin structure, a higher energy is not need. However if the energy is any lower, the skin dose will increase. Beryllium targets are ideal for this machine since the forward output is roughly 70% that of tungsten for field sizes up to 10 cm, but the lateral energy fluence is significantly less. **Conclusions**: This machine is able to produce brachytherapy like PBI dose distributions that consist of highly conformal doses to the target and low doses to the non-target structures. It is also able to achieve this without the additional surgery required for brachytherapy procedures. In addition, a large percentage of breast patients would be eligible for this treatment, since it is able to deliver dose close to the chestwall.