AbstractID: 10109 Title: Effects of Tissue Density on Organ Dose in Accelerated Partial Breast Electronic Brachytherapy

**Purpose:** To establish a model for organ dose calculation with tissue density correction for Accelerated Partial Breast Electronic Brachytherapy.

**Materials and Methods:** The radial dose function for X-ray point source (S700 Axxent™) in a water phantom (30 x 30 x 30 cm³) was calculated using GEANT4 Monte Carlo code. An in-house semi spherical breast phantom (radius = 7.5 cm) with ICRU-44 tissue density and composition was used. Bone (1 cm thick) was imbedded in muscles (2 cm thick) followed by 5 cm thick lung. A source was placed 1.7 cm anterior to chest wall. To quantify organ doses of breast, skin, rib and lung, 34 Gy was prescribed to PTV. The PTV covers tissue all around the balloon up to 1 cm away from balloon surface. Doses were calculated from the nipple to lung at 1mm interval.

**Results:** Our simulated radial dose function agrees well with the commissioning data with <3% deviation. The simulated bone dose with tissue heterogeneity was 5.7 times higher than that without heterogeneity. This agrees well with expected prediction of \((Z_{\text{eff}}/Z_{\text{water}})^3\). The lung dose behind the bone was found < 5 Gy. Detailed results will be presented.

**Conclusions:** This study provides the importance of utilizing tissue density correction in dose calculation for breast cancer treatment plan with low energy X-ray source. The unit density dose calculation underestimates rib dose by a factor of 5. To avoid possible normal tissue complication, dose calculation with tissue heterogeneity is recommended.