

## AbstractID: 13828 Title: Volumetric Ultrasound Guided Online Adaptive Partial Breast Irradiation

**Purpose:** To develop and innovative Volumetric Ultrasound guided Online Adaptive Partial Breast Irradiation system (VUSABI) for the improvement of the precision of the delivery of prescribed radiation dose to the target volume while sparing the adjunct normal breast tissues.

**Method and Materials:** The VUSABI system consists of a volumetric breast ultrasound (VBUS) scanning system and an online adaptive replanning system. The VBUS system developed for early breast cancer detection is a non-ionizing radiation, non-compression, and operator-free imaging system. It can provide real-time, high quality volumetric breast images in pendant position with low cost. A GPU-based innovative supercomputing online adaptive replanning environment (SCORE) was developed for general-purpose online adaptive radiotherapy (ART). The major components of SCORE system are: image registration, dose calculation, plan re-optimization, and treatment plan user interface. We are integrating VBUS and SCORE into the whole VUSABI system by hardware integration and software adaptation. In this paper, we report on our progress of the VUSABI system development.

**Results:** The performance of VBUS system was evaluated with both breast phantoms and patients. With the VBUS scanner, a 3D ultrasound breast image can be acquired in ~18 sec and reconstructed in ~ 5 sec. the overall performance are satisfactory. The initial PBI treatment plan was generated with Eclipse planning system. The major components of SCORE system were developed and evaluated with digital phantom data and clinical patient data. The whole replanning process can be accomplished in ~10 second using a NVIDIA Tesla C1060 GPU platform.

**Conclusion:** We are in the progress of developing VUSABI system. According to the initial results, the VUSABI system will be able to produce an optimized treatment plan based on a VBUS scan within 2 minutes when considering human intervention such as contour modification.