

**Purpose:**To evaluate the dosimetric impact of variable reproducibility of the Deep Inspiration Breath Hold (DIBH) level for left breast cancer external beam radiotherapy.

**Methods:**Left breast cancer patients went through CT scans at FB and DIBH prior to external beam treatment. Deformable registration between the two data sets was performed using the demons algorithm on a GPU developed by Gu et al. PMB 55(1). With an in-house program using Matlab, the vectors were verified for accuracy and applied to the FB image at 75%, 90% and 110% magnitude, in order to simulate fictional anatomical configurations with different breath hold levels. The new images were saved as DICOM files. These new images represent variable reproducibility of a patients' DIBH level. The new DICOM Files were imported into the treatment planning system (TPS). The DIBH scan and the 75%, 90%, 110% fictitious scans were registered in the TPS based on the breast/chest surface. A treatment plan was created on the DIBH CT scan, and was copied to the registered breath hold images. Dose to the heart was calculated and compared for all the inspiration levels to determine the effect of the reproducibility of DIBH levels on the dose to the heart.

**Results:**Preliminary results show that there is a significant effect on the location of the heart from FB to the various inspiration levels. Normal tissue complication probability decreases greatly from the FB to the breath hold scans, although it is patient dependent. Variation amongst the breath hold levels is less severe.

**Conclusions:**We have developed a tool to quantify the effect of reproducibility of the DIBH level on dose to the heart in left breast cancer radiation treatments. Preliminary results show that the effect of DIBH reproducibility is less severe than the change from FB to DIBH.