# AbstractID: 3860 Title: Accuracy and precision of implantable radiofrequency transponder localization measurements conducted using multislice CT

**Purpose:** Accurate localization and monitoring of prostate position during radiation therapy is critical for the precise and safe delivery of dose-escalated treatments, but is challenging due to substantial internal-organ motion. A novel method for tracking prostate position using implantable radiofrequency markers has been developed by Calypso® Medical. An important consideration for these transponders is localization accuracy using computed-tomography (CT) imaging. We evaluated the accuracy and precision of transponder localization using multislice CT scanning.

**Method and Materials:** A tissue-equivalent pelvis phantom with three implanted transponders and external alignment markers was used. The relative transponder positional accuracy was 0.1mm, while the positional accuracy of the transponders relative to the phantom surface was 0.5mm. The phantom was placed on a computer-controlled linear stage and multiple scans were acquired using a Philips Brilliance 16-slice CT scanner, varying the detector size, slice thickness, and pitch. Scans were repeated with the phantom moved 0.5mm longitudinally between scan acquisitions to assess position-measurement accuracy at different locations within a reconstructed CT slice thickness. The transponders were identified and localized on the reconstructed CT images automatically using in-house image processing software.

**Results**: The mean error of the transponder localization was less than 0.4 mm in anterior-posterior and lateral-medial directions, and increased to 0.8mm in longitudinal direction primarily due to the uncertainty introduced in the initial slice identification. The predicted longitudinal shift between each consecutive scan followed the actual shift amount accurately with a mean error of 0.014mm and a standard deviation of 0.08mm.

**Conclusion:** Our investigations have demonstrated the high accuracy of the transponder localization using a multislice CT scanner. The initial results indicate that the accuracy of such a system is sufficient for prostate localization and position monitoring in clinics.

**Conflict of Interest:** This work is supported in part by Calypso® Medical