AbstractID: 10602 Title: Concurrent wireless electromagnetic tracking and CT imaging

**Purpose:** Currently, electromagnetic tracking cannot be done inside a CT scanner. We wanted to determine if wireless electromagnetic tracking can be performed accurately in the CT environment.
**Method and Materials:** A research version of the Calypso® 4D Localization System™ (Calypso Medical Technologies, Seattle, WA) was utilized in a Brilliance Big Bore CT scanner (Philips Healthcare, Cleveland OH) with the carbon fiber table removed. Three transponders were oriented vertically (Z orientation) or parallel (Y orientation) to the sensor array and fixed at 20cm below the array. Standard deviation of the positioning data was observed and comparison was made for array position high (toward the top of the gantry) versus low, array gain high versus low, transponder orientation Y versus Z. 60 seconds of tracking data was collected for each measurement. The standard deviation was used to determine precision, and the transponders were imaged with the CT scanner to determine accuracy. Standard deviation below 0.2 cm was considered appropriate for clinical use.
**Results:** The standard deviation became higher when distance between array and transponders increased. The system performed best when array position was low, beacon orientation in the Y axis, and sensor gain set to low. In all cases with the array position low and array gain low, the system met the clinical goal of standard deviation less than 0.2 cm for a 12x12x12 $cm^3$ volume.
**Conclusion:** This work describes the first electromagnetic tracking system that works in a CT environment. Potential applications include using implanted transponders to guide correlated imaging measurements of respiratory motion ('tumor correlated imaging' versus 'respiratory correlated imaging') as well as wireless tools for intervention procedures in the CT bore. Further mechanical work will be necessary to optimize the ergonomics, and signal processing work to optimize the performance, of a combined tracking/imaging system.
**Conflict of Interest:** Calypso Medical