AbstractID: 1967 Title: Dynamic accuracy of an AC magnetic 4D localization system prototype

The purpose of this study is to characterize the performance in a dynamic environment of an electromagnetic implantable fiducial tracking system currently under commercial development (Calypso Medical Technologies, Seattle WA). A dynamic-test phantom was developed to quantify the accuracy of target localization from the embedded moving fiducial transponders. The phantom rotates on a transponder-holder assembly containing 1–3 transponders placed in different orientations relative to the detector array, at selected speeds, and is intended to simulate target motion expected during patient treatment due to internal physiological motion, treatment-table translations, and general patient setup movement. Three sets of data were gathered, with the transponders oriented in the vertical plane, at speeds of 0.1 cm/s; 1.0 cm/s; and 3.0 cm/s, simulating the range of target motion expected during patient treatment. Samples were measured in cycles of approximately 90 ms of integration time with an average update interval of 124 ms. Using least squares fit data to a circle in 3 dimensions dynamic accuracy measured at variable speeds: (1) 0.044 cm RMS at slow speed, 0.045 cm RMS at fast speed and 0.054 cm RMS at very fast speed. Results showed (1) qualitatively, target accuracy does not degenerate at high speeds (1.0 - 3.0 cm/s), (2) the system remains accurate at tracking transponders with rates up to 3 cm/s in a circular motion with nominal radius of 5 cm, and (3) target accuracy at these speeds does not significantly affect system specified accuracy of 0.2 cm. This work supported by Calypso Medical Technologies.