

AbstractID: 12991 Title: Development of respiration verification program and procedure for 4-Dimensional Stereotactic Body Radiation Therapy

**Purpose:** In order to verify the behavior of tumor motion caused by breathing, respiration & tumor motion verification procedure was designed and its feasibility was tested. **Method and Materials:** Visual software was developed using LabView 7.0 to analyze respiration by detecting peak/valley points from RPM signals. The software displays the number of detected peaks/valleys, peak/valley locations, amplitude of signals, and 2<sup>nd</sup> order differential coefficients at each data points. It calculates mean, standard deviation, variance, maximum and minimum of all detected peak/valley points. It can analyze data for user defined intervals and exports the results in excel file. The program performance was tested using known RPM signals which were sine waves with period of 3 and 6 sec with amplitude of 1 and 2 cm. Also irregular signals obtained from patient's breathing were used to generate irregular respiratory signals by moving a phantom and the software performance was tested. In clinical application, the analyzed respiratory data were converted into tumor motion by applying scaling factor defined by tumor-motion amplitude to respiration amplitude. To determine the scaling factor, gated On-Board-Image (OBI)s were acquired at 0% and 50% of respiratory phases and the imaging times were recorded. From the RPM file, the respiratory signal values at imaging times were read and displacement of tumor was measured from the OBI images. The scaling factor was, then, determined as the ratio of tumor displacement between 0% and 50% phases to difference of two respiratory signals values at corresponding phases. **Results:** The computed results by the software were extremely consistent with true values within 0.1% difference for regular and irregular motions. **Conclusion:** Developed software was proven to have sufficient accuracy for clinical application. The proposed method has advantages of non-invasive, fine temporal resolution without extra radiation, thereby providing a useful tool for 4-dimensional body stereotactic radiotherapy.