# AbstractID: 8953 Title: Dosimetric error from inter-fraction tumor motion variation in phase based gating

**Purpose:** To characterize dosimetric errors from inter-fraction tumor motion variation for phase-based gated treatments that use strain gauge systems.

**Method and Materials:** An ionization chamber in a Quasar Respiratory Motion Phantom was irradiated in a 6 MV 5x5 field, while moving with various amplitudes for both a sinusoidal waveform and a patient's respiratory trace. The resulting ionizations were compared to that for a stationary setup to determine the under-dose. For each amplitude of the patient's respiratory trace, the Anzai gating system was operated at various gating phases to find the phase trigger that reduced the under-dose below 1%.

**Results:** The gating system gain and position settings affected the under-doses, and for the worst case settings, a full motion range (FMR, 2x amplitude) of 12.5 mm for the patient trace, gated from 80% exhale to 80% inhale, had an under-dose of 0.3%. FMRs of 18.8, 25 and 30 mm had under-doses of 0.6, 3.7, and 7.2%, respectively. These FMRs correspond to gated motion ranges (GMR, motion during irradiation) of 10, 15, 20, and 24 mm. The under-doses for sinusoidal waveforms were higher (6.4% for GMR = 20 mm), since the chamber spent less time at full exhale. The under-doses for the patient trace are reduced to around 0.5% when the percentage phase trigger (80%) is multiplied by the ratio of the planned FMR (12.5 mm) to the observed FMR, so that an observed FMR of 25 mm requires a percentage phase trigger of 40%.

**Conclusion:** Under-doses are waveform dependent. A 20 mm lesion with a motion range of 10 mm can experience around a 5% under-dose for an increase in motion of 10 mm. Errors can drop below 1% by reducing the gating phase trigger.