

## AbstractID: 1593 Title: Automatic Detection of IMRT Delivery Errors Using a Quantitative 2D Dosimetric Verification System

The feasibility of automatically detecting delivery errors using a 2D transverse dose measurement of the complete treatment plan was investigated. Techniques involving the gamma function and the normalized agreement test (NAT) index were used to reduce the agreement between measured and computed dose distributions to scalar metrics. A database of approximately 300 IMRT film verifications was compared to simulated delivery errors calculated using Philips Pinnacle<sup>3</sup> treatment planning software. It was found that setting an action level that flags the 5% of patient verifications with the worst agreement results in detecting 100% of beam energy changes, 94% of a different patient's plan being delivered, 50% of rotating one beam's collimator setting by 90°, 44% of rotating one beam's gantry angle by 10°, and was unable to detect changing one beam's MU setting by 10%, shifting the phantom 5 mm, or omitting one beam (due to the design of the NAT index). While using other scalar metrics changed results for individual delivery errors, the NAT index using the gamma function with 5% and 3 mm criteria yielded the best overall results. Although the phantom shift could not be detected by the small change it made in the dose pattern, our aut positioning algorithm clearly identified the spatial anomaly. It can be concluded that delivery errors affecting only one beam cannot be automatically detected using a 2D measured distribution of the entire treatment and the detection of positioning shifts should be handled by an automatic registration program.