AbstractID: 9429 Title: Single Field IMRT QA is Insensitive to Dosimetric Errors

**Purpose:**

To assess the sensitivity of single field planar dosimetry in detecting IMRT dosimetric errors.

**Method and Materials:**

Based on ion chamber measurements of the total plan in a cylindrical phantom, three IMRT plans were found to be calculated accurately. Each plan was then re-optimized with aggressive dose constraints so that the new treatment fields were highly modulated. Highly modulated fields are calculated less accurately in our planning system, and ion chamber measurements confirmed these plans contained significant dosimetric errors. All six plans (three clinical, three faulty) were analyzed with two means of individual field planar dosimetry – portal dose imaging with an EPID and a commercial ion chamber array. Gamma analysis was performed with 2%/2mm and 3%/3mm criteria to determine a score which would detect the three flawed IMRT plans.

**Results:**

With the EPID and 2%/2mm criteria, the fraction of pixels passing gamma were between 0.94 and 0.96 for both the acceptable and flawed IMRT plans. (Standard deviation = 0.02 to 0.03) With the ion chamber array and 2%/2mm criteria, the acceptable plans had gamma scores from 0.92 to 0.95 (standard deviation = 0.04 to 0.05) and the flawed plans had scores from 0.87 to 0.98 (standard deviation = 0.01 to 0.07). The difference between acceptable and faulty plans was diminished further when gamma criteria were expanded to 3%/3mm. No threshold was found for any analysis which could predict dosimetric accuracy.

**Conclusion:**

Deconstruction of an IMRT plan for field-by-field QA requires complex analysis methods such as the gamma function. Distance to agreement, a component of the gamma function, has clinical meaning in a composite plan, but when applied to individual, highly modulated fields, it can mask real dosimetric errors. While planar dosimetry may comprise one facet of an effective QA protocol, it is insensitive to dosimetric inaccuracies.