AbstractID: 8997 Title: Correlations between Potential Setup Errors and Dose Gradients when Verifying Patient Specific DQA Plans of IMRT

Purpose
Fourteen cases out of 150 IMRT DQA (dose quality assurance) plans showed measured dose differences of particular fields > ±10%. We investigated the relationship between potential setup errors, and dose gradients and dose differences

Method and materials
A 0.125 cc ion-chamber and a home-made cylindrical phantom were used for verifying patient specific DQA plans of IMRT. We investigated dose gradients within ±3 mm from a verification point along x, y, z axes of 5 DQA plans where dose differences of any fields were within ±5% and of 14 DQA plans where at least one of fields had dose differences of > ±10% at planed delivery dose larger than 10 cGy. Reflecting potential setup errors, we moved the verification point along the axis of the steepest dose gradient and searched the point that dose differences of any fields were within ±10%.

Results
For the DQA plans of dose differences < ±5%, the average dose variation along x, y, z axis was 0.6%, 0.6%, 0.3%, respectively. The same variation for the DQA plans of dose differences > ±10% was 1.6% (3.5 cGy), 1.2% (2.5 cGy), 0.8% (1.8 cGy), respectively. The correlation between those variations of the two groups was statistically significant (p-value: 0.034). Except six cases of 14 DQA plans, all fields showed dose differences smaller than ±8% by shifting the ion-chamber less than 3 mm from the original location. The average of all field dose differences was reduced from 4.7% to 3.6% after shifting.

Conclusions
Due to steep dose gradients, small setup errors less than 3 mm significantly affect the measured doses of individual fields, of which dose differences could be larger than ±10%. Such a large difference at a particular field can occur, even the total dose difference is less than ±3%.