AbstractID: 10243 Title: Considerations of Reference Level Definition for IMRT Plan Verification and Application of a Three Dimensional Gamma-Index Analysis

Purpose:
A 3D Gamma Index analysis and different local reference levels for the dose axis are evaluated.

Method and Materials:
The Gamma-Index method is usually performed with two spatial dimensions and the dose as variables. In the 3D-Gamma Index method all three spatial dimensions and the dose are used, and different reference level methods (maximum, local dose, predefined dose level) can be chosen.

Results:
When the maximum dose is taken as the reference, the dose half axis of the acceptance ellipsoid becomes larger compared to using the local dose. This kind of reference tends to suppress Gamma-Index failures at low doses. While this may be useful in situations in which the dose modulation in the distribution is comparably smooth, and when no larger dose gradients are to be expected (e.g. prostate treatments with dynamic IMRT techniques), critical areas may be overseen in more complex situations such as H&N plans. The reference to a user-chosen dose level is a method focusing on deviations from a predefined dose-level and can be used to analyze possible errors in the regions of an organs-at-risk. The 3D-Gamma-Index allows for smaller differences in the z-position of the 2D-ARRAY and the planning system. In combination with the reference to the local dose, the critical errors have as well been detected.

Conclusion:
It is shown that that the often used reference to the maximum dose tends to underestimate larger deviations in the low dose regions. Because these regions are often in the projection of organs-at-risk possible impacts may be overseen. We show that reference levels such as the local dose or a pre-defined dose level do not have this drawback.

Conflict of Interest:
This work was performed in cooperation with PTW-Freiburg.