

AbstractID: 7305 Title: A new quantitative quality assurance evaluation parameter (gamma plus) and its clinical assessment

Purpose: To extend existing gamma index by including biological effect dose information and propose a new index called gamma plus.

Method and Materials: A new quality assurance index, gamma plus, is proposed based on the theoretical concept of the gamma evaluation presented by the Low *et al.* The dose difference including the biological dose information (Biological Uniform Dose BUD was used in this study) is used instead of the physics dose difference when performing the gamma plus calculation. An in-house software was developed to compare the dose distribution based on the gamma plus concept. A test pattern for two-dimensional dose comparison was done using the developed software platform. The gamma plus was also tested on planar dose exported from Pinnacle Treatment Planning System (TPS) and film dose distributions acquired in a solid water phantom for one clinical case.

Results: The preliminary result showed that the gamma plus index can exhibit the similar result as the gamma index. At the same time, the gamma plus index showed differences from the gamma index for the test pattern analysis since it considers biological dose information. For the clinical case, it is observed that the gamma plus index varies for different treatment parameters (e.g. dose per fraction), which indicates that treatment outcome is considered in the gamma plus index.

Conclusion: The gamma evaluation is widely accepted for the quality control of IMRT treatment. The gamma plus proposed in this study is based on the gamma index theory and also considers the biological effect. Like gamma evaluation, gamma plus index combines the dose difference and the spatial shift. Furthermore, gamma plus index includes biological effective dose information, which can help to understand the biological effect difference for the quality assurance result.