

# AbstractID: 10245 Title: Adaptive Warning and Alarm Levels for Error Detection with the DAVID System

## **Purpose:**

A method to determine adaptive warning and alarm levels is developed in order to enhance the error detection capability of the DAVID system.

## **Method and Materials:**

So far fixed warning and alarm levels are implemented in the software controlling the DAVID system. This new method takes the intrinsic fluctuation or noise associated with the measured signal into consideration. As an example a head and neck IMRT plan was irradiated repeatedly, and the adaptive warning and alarm level were derived from the computed standard deviation of each measurement channel. For evaluation, the example IMRT plan was modified by introducing errors into the MLC positions and simulating a sudden change of energy fluence.

## **Results:**

The relative standard deviation was found to increase with decreasing signal magnitude. Assuming that the measured signal follows a normal distribution, the adaptive warning and alarm levels were set to two and three times of the standard deviation respectively, which covers 95% respectively 99% of the distribution.

The adaptive levels were able to pin-point the errors of modified IMRT sequences where the MLC leaf pairs were mis-positioned by approximately 2 mm. The adaptive warning and alarm levels were activated in the channels in almost all the modified segments, whereas some of these errors remained undetected when using fixed levels.

## **Conclusion:**

The adaptive levels were able to detect artificial errors better than the fixed default level while suppressing deviations that are not clinically relevant. This method overcomes the limitations of the fixed warning and alarm levels currently implemented in the software.