AbstractID: 3395 Title: Optimized sampling pattern for step and shoot IMRT QA with a diode array.

**Purpose:**
Diode arrays with sparse detector density are now widely used for IMRT QA. The goal of this work is to quantify and optimize the sampling of dose maps prior to the measurement in order to insure optimum sensitivity to potential delivery errors.

**Method and Materials:**
The diode pattern was first overlaid with the dose map and the fractional area sampled by at least one diode was separated into low and high gradient regions. The area sampled by a diode depended of the local dose gradient, which should not exceed a user-defined threshold. The number of leaf and jaw positions sampled by at least one diode was also obtained from the area of gradient sampled and the known segment shapes. The dose map and the collimator sampling were optimized using a simulated annealing algorithm to select the position of the diode array in the beam. The sampling improvement with multiple measurements at optimized detector positions was also studied.

**Results:**
For a 7 beam head and neck IMRT plan and the diode array centered on the central axis, the average fraction of the high and low gradient regions sampled at least by one diode was 13.9% and 79.6% respectively. In average, 85.8% and 83.5% of the leaf and jaw positions were sampled with a minimum reaching 58%. The optimization of the detector position improved the collimator sampling to more than 94% for all beams. The use of two array positions per beam improved the sampling in the high gradient areas.

**Conclusion:**
This method allows to identify the beams for which conventional diode array sampling would be suboptimal. The optimization of the detector position and the number of measurements insure adequate sensitivity to delivery errors related to dose and collimator calibration.

**Conflict of interest:**
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