

## AbstractID: 13926 Title: Evaluation of tradeoffs between delivery efficiency and clinical plan quality arising from optimizer and MLC sequencer compromises

### **Purpose:**

Delivery efficiency is an important consideration for IMRT treatment plans. IMRT planning and MLC sequencing schemes can be modified to generate more efficient treatment delivery, but the effect those modifications have on plan quality is often difficult to determine. In this work, we evaluate tradeoffs between delivery efficiency and clinical plan quality which arise from MLC sequencer-related compromises.

### **Method and Materials:**

Treatment plans for a series of prostate and head and neck patients were studied. Optimization was performed for the original plans using an unlimited number of intensity levels. Baseline delivery times were determined with the clinical MLC sequencer, which uses >100 segments, assuring delivered intensities are within 1% of the optimized intensity pattern. To evaluate compromises which MLC sequencers or optimizers make as they limit the number of intensity levels (or segments), each patient's plan was further optimized with successively fewer intensity levels (50, 20, 10, 5). Delivery time was calculated for all plans, and direct evaluation of the tradeoffs between delivery time and plan degradation was performed. Plan degradation was evaluated by a physician using pre-determined acceptability tolerances for relevant clinical plan metrics associated with the plan optimization strategy.

### **Results:**

The range of clinical plan degradation present in the plans depends dramatically on the clinical plan criteria and site: prostate plans were much more easily accomplished with fewer intensity levels (and faster delivery) than more complex head and neck cases. The methodology could be tuned to allow physician and planner to make delivery-time-driven compromises with direct quantitative knowledge of the effect on relevant clinical metrics.

### **Conclusion:**

A quantitative assessment of the tradeoffs in plan quality and delivery time can help make possible the most efficient treatment delivery while maintaining the desired plan metrics with the physician's desired tolerances.

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