AbstractID: 13927 Title: Dosimetric effect of using non-flat photon beam to create conventional open fields and standard phantom IMRT plans

Purpose:
Removing the flattening filter from a photon beam creates a forward peaked intensity profile with a higher dose rate at the central axis, which can be an attractive feature for SBRT and IMRT. The purpose of this project is to understand the impact of using unflattened photon beams to create a conventional square field and various standard IMRT phantom plans by comparing those plans using a flattened beam.

Method and Materials:
A conventional 10x10 cm^2 square field was created by a non-flat beam with multiple segments. Furthermore, five standard phantom structure sets from the AAPM TG 119 were downloaded for this study, including multitarget, prostate, head and neck, easy C-Shape, and hard C-Shape. Planning constraints from TG119 were used as a guide for planning, using a 6MV non-flat beam from a Siemens Oncor and a 6MV flat beam from a Siemens Artiste.

Results:
The 10x10 cm^2 open field was matched using a non-flat beam with three segments and 21.7% more monitor units. Using both flat and non-flat beams, all IMRT plans met the plan acceptance criteria of the target coverage and organ at risk sparring. The plan conformality indices were comparable while keeping complexity of the plans (measured by the number of segments) the same. However, non-flat beam plans increased monitor units by 0.5% to 32.0% when compared to the corresponding plans with flat beams. The largest increase in monitor units was observed in the plan with a large “plain” target (multitarget). Plans for a concave “irregular” target (C-Shape) result in similar monitor units.

Conclusion:
A non-flat beam can produce equivalent dose distributions to a traditional flat beam. The increase in monitor units is needed when the pointed dose profile is projected onto a flat target.

Conflict of Interest:
This research is partly supported by Siemens Medical Solutions