AbstractID: 3828 Title: Determination of output, percentage depth dose (PDD) and effective source to skin distance (SSDeff) for irregular electron fields

Purpose:
The sector integration method (SIM) has been described in the literature as a simple alternative to calculate the output for irregular electron fields. However, full characterization of the electron beam data (output and PDD) is necessary for the clinical use. The purpose of this work is to develop and commission new software using the SIM to calculate the output, PDD and SSD_{eff} for irregular electron fields, compare the results with pencil beam algorithm calculation and measured data.

Method and Materials:
A Clinac 2300CD (Varian) with energies of 6, 9, 12, 15, 18 and 22 MeV was used. A set of circular electron cut-outs, of different radios, were made for applicator sizes of 6x6 cm. and 15x15 cm. Measurements were done with a PTW Markus ionization chamber, an automatic phantom (Scanditronix-Wellhofer) for PDD and a standard water phantom for output and SSD_{eff} determination. Software was developed using Delphi 6.0. This software divides the irregular field in sectors (4, 8, 16, 32) and average the contribution for each one. A set of 15 cut-outs (square, rectangular and irregular) were build for verification. For each cut-out and electron energy the output, PDD and SSD_{eff} were calculated with the new software and compared to chamber measurements. The treatment planning system (TPS) CadPlan (Varian) was used to calculate PDD.

Results:
The measured and calculated output differences for rectangular and squares fields were less than 1% and for irregular fields less than 3%. The PDD variations between measured and new software calculated were smaller than 2mm. The new software PDD agrees within 2mm with the TPS and ion chamber measurements, except for 6MeV were the differences were less than 3mm.

Conclusion:
The new software offers a simple and exact tool to calculate output and PDD curves for irregular electron fields with errors clinically acceptable.