AbstractID: 9313 Title: An optimal jaw setting for an electron-specific multileaf collimator (eMLC) developed for modulated electron radiation therapy (MERT).

Purpose: This work is aimed at determining an optimal jaw setting for modulated electron radiation therapy (MERT) beam delivery using an electron multileaf collimator (eMLC).

Material and methods: A prototype manual eMLC was used. It consists of 25 tungsten leaf pairs. Each leaf is 0.6cm wide and 2cm thick. It can be mounted to the linac treatment head. Extensive film and ion chamber measurements were performed. Film was used to find the maximal jaw setting for the eMLC and to measure beam penumbra. Leakage measurement was carried out for all possible jaw settings and all electron energies available. Profiles for square fields formed by the eMLC were evaluated. An in-house developed Monte Carlo based inverse treatment planning system was used to generate a plan for a breast phantom. The modulation scaling factor was calculated. The contribution from each electron energy used in the plan was examined specifically.

Results: It was found that a 20x20 jaw setting is the maximum allowable jaw setting. The variation of jaw setting did not show a significant effect on the penumbra except when the jaw setting is so close to the field defined by the eMLC. The maximum leakage observed is only 1.4%. In our test plan the 9MeV energy showed the highest contribution (90.8 %) and the leakage for this energy with the biggest jaw setting is only 0.38%. The highest energy used was 16MeV with < 2% contribution to the plan. The modulation scaling factor for our sample plan was 2. Thus, the total leakage dose would be less than 2.8% even if 100% contributions had been used from the 16MeV.

Conclusion: The setting of the accelerator jaws can remain fixed using the maximal allowable jaw setting. Changing the jaw setting to reduce leakage will not lead to significant improvement.