Purpose or Objective: The Calypso 4D Localization System consists in an electromagnetic detection of Implanted Beacon transponders in order to continuously track their moves. The use of this system requires a specific couch top and the introduction in the treatment beam of an electromagnetic array. The purpose of this study is to quantify the dosimetric impact of the new material introduction in photon beams.

Material and Methods: At first, the QFix kVue Calypso couch top and the array attenuation was evaluated by comparing the dose measurements with Eclipse TPS dose prediction for 2 energies (6MV FF and 6MV FFF) and 2 rail configurations (rails in and rails out). Dose measurements at the isocenter were performed with a cylindrical water-equivalent phantom, a 0.125cc ionization chamber, a 10*10cm² field size at 39 gantry angles. The beams between 315 and 45° allowed analyzing the electromagnetic array attenuation. The beams between 90 and 270° were used for couch attenuation. Secondly, the dosimetric impact was analyzed on 20 RapidArc treatment plans of prostate (10 with 6MV FF and 10 with 6MV FFF). Dose distributions were recalculated in the cylindrical phantom and the dose prediction at the isocenter was compared to the dose measurement with the 0.125cc ionization chamber using 2 configurations: classical treatment (with kVue IGRT couch top and rails out) and treatment with Calypso (QFix kVue Calypso couch top, rails out and the electromagnetic array).

Results:

In the configuration of rails out, the mean attenuation of the couch was 2.91% for X6 and 3.45% for X6FFF with a maximum of 12.02% and 13.19% for X6 and X6FFF, respectively. In the configuration of rails in, the mean attenuation was 3.25% for X6 and 3.90% for X6FFF with a maximum of 12.02% and 13.19% for X6 and X6FFF, respectively. Besides, the mean attenuation of the array was 1.15% and 1.67% for X6 and X6FFF, respectively. As regards the impact of the Calypso system on RapidArc treatment plans, the mean deviation with a classical treatment was -0.61% [-0.8%; -0.3%] for X6, and -0.31% [-0.86; 0.43] for X6FFF.

Conclusion: For the fixed beams, the attenuation is not negligible when a beam crosses directly a support rail in particular. The errors in dose calculation can be more of 10%.

Purpose or Objective: Skin electron irradiation is a treatment modality for mycosis fungoides. An overlapping and/or abutting field technique with the patient lying on a stretcher is used with at least two oblique 40x40 cm²; 4 MeV-overlapping fields at 25/335 gantry angles at SSD=170 cm both about 12 cm lateral of patient mid-line. If two fields fail to cover the entire affected skin additional abutting oblique fields are added in cranio-caudal direction. Using 3 pairs of fields, the entire anterior (or posterior) body is covered. During commissioning of a new Elekta Synergy accelerator special attention was given in the search of an optimal angle incidence and field matching.

Material and Methods: A linear array (PTW LA-48) positioned in a polystyrene phantom is used to evaluate longitudinal and lateral dose profiles at 1 and 4 mm depth. Two different angles of incidence (± 25° and ± 30°) and three different abutment gaps (0-32-64 mm; common multipliers of the 8 mm interdetector distance of the LA-48) are evaluated. Prescription dose point is corresponding to the dose value at 4 mm depth of the central axis dose of the most cranial beam pair. Treatment length is defined as the distance between the most cranial and most caudal 90% dose point. Beam spread is calculated over the entire treatment length, beam flatness (1) over 0.9 times the treatment length. (1) Podgorsak p.196

Results: Both gantry angle pairs show a remarkable flat summed dose profile over the entire range of the LA-48 (3.0-3.2% for ± 25°; 2.3.-2.4% for ± 30°). As expected maximal dose levels are decreasing with increasing obliqueness resulting in more depth-related dose homogeneity. Cranio-caudal measurements show a radiation field increase of 1.5-2 cm (50% field dose boundary) compared to the light field. The initial 6 field light field abutment method results in dose spreads of 3.5% and 5.6% (4-1 mm depth) and dose flatness of 4.7% and 6.1%. Introducing 32 mm gaps improves dose data to 2.5% and 2.8% in spread and to 3.3% and 3.8% in flatness. 64 mm gaps result in a spread of 4.3% and 3.6% and a flatness of 7.5% and 6.0% (fig. 1). The corresponding treatment length increases from 168 cm (no gaps) to 178 cm (32 mm gaps) and to 187 mm (64 mm gaps).

Conclusion: The general conclusion is that for mycosis fungoides treatments, using oblique fields with dedicated abutment in cranio-caudal direction the general accepted overall dose homogeneity of ±10% is more than met on a flat surface equivalent to the size of a human body using 6 oblique fields.

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Uncertainties in dose calculations for radiation treatment of breast cancer after mastectomy
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Purpose or Objective: To study dose distributions in chest wall with thickness around or less than 15 mm and to evaluate the accuracy of Eclipse and Oncentra treatment planning algorithms in phantom and patient geometries.

Material and Methods: Measurements by thermo luminescent dosimeters and gafchromic film are performed on a cylindrical phantom with air cavity representing the lung. Tangential 6 MV open beam is applied on the phantom and dose profiles from the surface toward the geometrical center