In total 34 centers and 61 linacs were departments participated in the BELdART dosimetry audit over a period of 3 years (2009 – 2011). All Belgian radiotherapy centers and the local physicists will perform both planning and delivery. The easy-cube (sun nuclear) will be used as phantom and custom made slabs preloaded with the alanine pellets and gafchromic films will be inserted for the different steps in the QA protocol to limit the amount of manipulation involved in the process and reduce the user-dependent uncertainty. Beside checks of the treatment delivery in homogeneous and inhomogeneous setting an extra check where the electron density reconstructed by the treatment planning will be compared to the known values of the easy cube.

**Conclusions:** We think our program is able to detect large momentary MLC errors during VMAT delivery even if DVFs can't detect these errors. In addition, our program provides many users ease for quality assurance of MLC because our program can visualize the MLC motion during VMAT delivery.

**Materials and Methods:**

**Purpose/Objective:** The aim of this study is to evaluate the performance of the treatment planning algorithm in the determination of dose distributions for non-standard breast cancer treatments (arctherapy and Accelerated Partial Breast Irradiation -APBI-), by means of in-phantom TLD dosimetry.

**Materials and Methods:** TLD-100 chips were used to determine the absorbed dose at different points in the surface an anthropomorphic female thorax phantom, as well as at the center of the simulated tumor, inside the lung and at the interface between lung (polystyrene foam, \(\rho=0.19\) e/cm\(^3\)) and tissue (mixture of glycerin and gelatin, \(\rho=1.125\) e/cm\(^3\)). Dose measurements were compared to the results obtained with the XiO® V4.62 using the FFT convolution algorithm. The APBI treatment included 6 beams of 6 MV, 4 of which were non-coplanar with a mean field size of about 4x4 cm\(^2\). The arc treatment was performed using 6 beams of 6 MV and one of 15 MV beams, 2 of them were arcs. Both treatments were planned using forward planning.

**Results:** It was found that tumor dose measurements, for arctherapy exhibited a mean variation of 5% under the TPS values and of 13% for the APBI case. In both treatments the dose at the surface was consistently overestimated by the algorithm, 6% in the archeontherapy case and 18% for the APBI treatment. Lung measurements presented larger deviations in both techniques.

**Conclusions:** Arctherapy measurements, in general, agreed better with the calculated results. This was expected considering the higher complexity of the APBI technique. The relatively large deviations observed for the tumor can be explained by the reduced size of the phantom’s breast, which made difficult to locate the detectors under equilibrium conditions and far from high dose gradients. There was a marked trend of TPS overestimation of the dose in tissue interphases, consistent with the absence of epithelitis in patients treated with these techniques.

**Purpose/Objective:** Past incidents in radiotherapy centers both in Belgium and in surrounding countries have shown the need for an extensive quality audit program in radiotherapy. In Belgium these audits were first commissioned by the Federal Agency for Nuclear Control (FANC) and performed as a voluntary national audit (BELDART). It was the first national audit program using L-\(\alpha\)-alanine-EMR dosimetry at such large scale. All Belgian radiotherapy departments participated in the BELDART dosimetry audit over a period of 3 years (2009 – 2011). In total 34 centers and 61 linacs were audited and were confirmed to work within optimal levels. At the end of 2012 the College of Medicine - Radiotherapy gave the permission to start with a national mailed audit program involving more complex radiation therapy techniques.

**Materials and Methods:** All clinical radiation units in Belgium (> 91) will be audited in a period of 4 years using 2 independent dosimetric techniques. The audit is designed for more complex treatment techniques, i.e. IMRT, arc therapy, Tomotherapy, Ciberknife, ... Absolute measurements will be performed using L-\(\alpha\)-alanine-EMR dosimetry and EBRT film dosimetry will be used for the measurement of 2D dose distributions. Irradiations will be performed at the hospital centers and the local physicists will perform both planning and delivery. The easy-cube (sun nuclear) will be used as phantom and custom made slabs preloaded with the alanine pellets and gafchromic films will be inserted for the different steps in the QA protocol to limit the amount of manipulation involved in the process and reduce the user-dependent uncertainty. Beside checks of the treatment delivery in homogeneous and inhomogeneous setting an extra check where the electron density reconstructed by the treatment planning will be compared to the known values of the easy cube.

**Results:** The first round of auditing for basic conditions have shown that it was possible with alanine to reach an accuracy similar to the golden standard ionization chamber with an uncertainty of 1% (k=1) for doses down to 4 Gy. Preliminary audits will be performed in cooperation with university hospitals in Belgium to assess the realistic achievable quality of IMRT implementation in Belgium.

**Conclusions:** In view of the development of new techniques of radiation dose delivery that brings new difficulties even at the level of reference dosimetry, auditing programs using completely independent dosimeters are of the utmost importance to insure safe and high quality treatments at the national level.