surement period. However, with an external monitor chamber, the output variability was reduced to less than 0.05% (1 sd). For each beam quality, the relative standard deviation for the measured k_Q factors for the seven ionization chambers was about 0.07%.

Conclusions. The study demonstrates the feasibility of highly reproducible MV calibrations at the level of a secondary standards laboratory, and the closeness of agreement ($sd < 0.1\%$) among the seven ionization chambers supports that generic k_Q -factors may be adequate for the tested ionization chamber model. Ongoing work focuses on characterization of additional ionization chambers models (PTW30013, PTW31021, and NE2571) and on an improved estimation of the uncertainty related to establishing traceability to primary standards. The latter work includes direct use of water calorimetry in the specific accelerator beams of the laboratory.

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[OA029] Optimization of phase space files from clinical linear accelerators

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Purpose. This project proposes a methodology inspired by the gradient descent algorithm [1] to manipulate existing IAEA phase space files (PSF) of an Elekta Precise linear accelerator (linac) head, in order to produce a new fine-tuned PSF for an Elekta Synergy linac head.

Methods. An Elekta Synergy coupled with an Elekta Agility multi leaf collimator was modeled in Geant4. Due to unavailability of detailed geometric information of the Synergy head, the IAEA PSF for the Elekta Precise [2] linac was used as initial benchmark. As the geometry of the aforementioned linac heads differs, discrepancies between measured and simulated PDD and lateral profiles in water were quantified in terms of cost value. The Elekta Precise PSF was divided into a grid of squared elements in the x-y plane, each of them holding information on respective particles' initial parameters, such as energy and momentum directions. For each element, small perturbations to the parameters were introduced independently and interim PSFs were generated. Profiles were simulated using the perturbed PSFs and the cost values were updated, yielding a correlation between the cost function and the perturbation. The parameters that produce the minimum cost value were then found iteratively.

Results. The influence of particles' energies and momentum on the cost function has been evaluated. By finding a minimum value of cost, optimal parameters can be determined. The final PSF containing optimal values is being validated and an overview of the results will be presented.

Conclusions. A methodology for optimization of existing PSF was developed, enabling the generation of fine-tuned, machine-specific PSF without requiring knowledge of linac's head geometry.

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[OA030] Improved dose sensitivity of N-(isobutoxymethyl) acrylamide polymer gel dosimeters for radiation therapy

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Purpose. A new and very low dose sensitivity of polymer gel dosimeter containing N-(isobutoxymethyl) acrylamide was introduced (Salah et al., 2017). A significant increase in dose response as well as dose sensitivity of N-(isobutoxymethyl) acrylamide polymer gel dosimeter has been reported in this study.

Methods. The N-(isobutoxymethyl) acrylamide (NIBMA) gels were fabricated under a fume hood in normal atmospheric conditions. Gels were irradiated by X-ray beams of a medical linear accelerator. The irradiated gel dosimeters were evaluated using nuclear magnetic imaging (NMR) techniques in terms of relaxation time (T_2) of hydrogen protons within the water molecule.

Results. The dose response as well as dose sensitivity were significantly increased by increasing NIBMA concentration. Slight effects of dose rate, beam energy and post-irradiation stability were noticed on the performance of NIBMA polymer gel dosimeters.

Conclusions. High dose sensitivity with low toxicity polymer gel dosimeters containing N-(isobutoxymethyl) acrylamide (NIBMA) were developed for radiotherapy treatment planning system.

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[OA031] Imaging dose assessment for image guided radiotherapy using a state of the art large-bore CT

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Introduction. Medical imaging has become an essential element of radiotherapy. Imaging techniques improve and are used extensively. This development also leads to an increase in dose exposure of 'extra-target' volume. It is recommended [1] to assess the imaging dose and to optimize the procedures.

Materials and methods. The imaging dose of radiotherapy procedures using a state of the art large bore CT (computed tomography) for virtual simulation and 6 MV (mega voltage) on-board planar imaging for position verification was measured. In the presented work the peripheral dose from imaging of the pelvic region and the head and neck region were assessed. The absorbed dose to water was measured using an anthropomorphic phantom and individually calibrated thermoluminescence detectors (TLDs). The positions for TLD placement were selected to cover clinically relevant organ positions at two anatomically interesting locations (pelvis and head and neck area).

Results. The imaging dose of two different devices was assessed: a large bore CT and MV planar imaging detector at