



## Onsite calibration of radiochromic film using laser-accelerated protons

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We carried out the onsite calibration of a radiochromic film (RCF) using a laser-accelerated proton source. RCF is widely used for proton dosimetry and imaging spectroscopy of laser-accelerated protons. Due to batch-to-batch variations and different scanning conditions, it is necessary to calibrate when using the RCF for the characterization of absolute proton numbers. Traditionally, the calibration has been carried out using proton sources from conventional accelerators. We have highlighted important aspects of laser-accelerated protons, e.g., their broad spectrum and divergence, and presented their viable use for the calibration of RCF. By using a specially designed calibration detector assembly (Fig. a), the proton beam was divided into separate beamlets. Protons with low energy and high fluence are filtered out, while protons with a specific energy range deposit their energies in the active layer of the RCF. The absolute proton spectrum in the target-normal direction was measured using a Thomson parabola spectrometer and used as reference spectrum. Proton spectra of each beamlet are assumed to follow Boltzmann distribution. A CR-39 detector plate was installed behind the RCF for the measurement of absolute number of protons near the cutoff region of the spectrum in each beamlet. Spectrum in each beamlet was obtained by using the CR-39 measurement and the normalized reference spectrum. We compared our calibration results (Fig. b) with the previously published data [1, 2] and found them in good agreement [3]. Our method provides alternative way for the calibration of radiochromic films, and eliminates the necessity of a dedicated accelerator facility.

## References

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