Purpose: To report the feasibility and clinical validation of an in-house developed MOSFET dosimetry system and describe an integrated non-destructive reset procedure.

Methods: Off-the-shelf MOSFETs are connected to a PC using an 18 bit/analogue-input and 16 bit/output data acquisition card. A reading algorithm was developed defining the zero-temperature-coefficient point (ZTC) to determine the threshold voltage. The reset procedure consists of an internal circuit generating a local heating induced by an electrical current. Sensitivity has been investigated as a function of bias voltage (0–9 V) to the gate. Dosimetric properties have been evaluated for 6 MV and 15 MV clinical photon beams and in vivo benchmarking was performed against TLD for conventional treatments and total body irradiation (TBI).

Results: Sensitivity of 0.08 mV cGy\(^{-1}\) can be obtained for 200 cGy irradiations at 5 V bias voltage. Ten consecutive measurements at 200 cGy yield a SD of 2.08 cGy (1.05%). Increasing the dose in steps from 5 cGy to 1000 cGy yields a 1.00 Pearson correlation coefficient and agreement within 2.0%. Dose rate dependence (160–800 cGy min\(^{-1}\)) was within 2.5%, temperature dependence within 2.0% (25–37° C). Dose response is stable up to 50 Gy (saturation occurs at approximately 90 Gy), which is used as threshold dose before resetting the MOSFET. An average measured-over-calculated dose ratio within 1.05 (SD: 0.04) has been obtained in vivo. TBI midplane-dose assessed by entrance and exit dose measurements agreed within 1.9% with ionization chamber in phantom, and within 1.0% with TLD in vivo.

Conclusions: An in-house developed resettable MOSFET-based dosimetry system is proposed. The system has been validated and is currently used for in vivo entrance dose measurement in clinical routine for open field treatment configurations.