Purpose: The suitability and performance of a mouse-size MOSFET ('Mousefet') phantom is investigated for routine quality assurance (QA) of the Small Animal Radiation Research Platform (SARRP).

Methods: The Mousefet phantom was constructed by custom integration of 5 micro MOSFETS, arranged in a quincunx pattern, within a miniature tissue equivalent phantom. The phantom was designed to facilitate SARRP QA tasks which may warrant daily evaluation: output constancy, isocenter congruency test, and cone beam computed tomography (CBCT) image geometric accuracy. For output constancy the phantom was irradiated with an open field and all 5 micro-MOSFET readings taken. For the isocenter congruency test, an appropriate size collimator was used to irradiate one of the MOSFETS, imaged and positioned at CBCT isocenter. The acquired CBCT image was then used to verify image geometric accuracy and other image quality parameters. Sample data from 10 days in a period of over one month was compared to reference measurements and evaluated for daily variation.

Results: Output constancy measurements showed maximum daily variation of less than 3% for all MOSFETS, in consonance with observations from concurrent ion chamber measurements. The design of the Mousefet phantom allows the output check data to be used for prompt verification of beam energy and cone profile constancy. For the isocenter congruency test, it is demonstrated that the Mousefet Phantom can detect 0.3 mm deviations of the CBCT isocenter from the radiation isocenter. Meanwhile, results for CBCT image geometric accuracy were consistently found to be within 2% of the expected value. Other CBCT image-quality parameters could also be assessed in terms of image intensity constancy, noise and image uniformity.

Conclusions: Overall, the results establish the Mousefet phantom as a simple and time-efficient multipurpose tool that could be employed effectively for routine quality assurance of the SARRP.