Purpose: To compare the performance of microLion detector (PTW type 31018, Freiburg, Germany), a new type of micro liquid ionization chamber, with diamond detector (PTW type 60003, Freiburg, Germany) for small photon fields (< 3x3 cm field size) measurements.

Methods: The characteristics of output factor, beam profile and percentage depth dose of the microLion and diamond detectors were studied. The measurements were performed in a MP3 water phantom under 6 MV photon beam generated from a linear accelerator (Clinac 6EX, Varian Medical Systems, Palo Alto, CA). Output factors of field sizes between 0.5x0.5 cm and 10x10 cm were measured at 10 cm depth in water and normalized to 10x10 cm field size with respect to the detectors. Beam profiles were acquired at 10 cm depth in water with field sizes between 0.5x0.5 cm and 10x10 cm. Percentage depth doses of 1x1 cm and 10x10 cm fields were obtained in the central axis of the beam direction in water and normalized at 10 cm depth in water with respect to the detectors.

Results: Both detectors showed nearly the same profiles for 10x10 cm field size, while the beam profile of field size 0.5x0.5 cm with microLion detector was slightly broader. The output factors of microLion detector were slightly higher than the diamond detector in small field size. The peak of the percentage depth dose of both large and small fields for microLion detector was significantly lower than the diamond detector.

Conclusions: This study demonstrated the spatial resolution of microLion detector is superior to the diamond detector for small field measurements, especially for measuring beam profiles. The microLion detector showed lower peaks in both large and small fields which may generally represent its under response.