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POS-55 Response of an Organic Photodiode to a Kilovoltage Photon Beam under Different Bias Conditions

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The response of an organic photodiode to fields of 300 kVp photon beams was measured while varying the bias applied to the diode. A heterojunction photodiode was fabricated by spin coating a blend of P3HT and PCBM on a glass substrate. The bottom contact was ITO and the top contact aluminum. The photodiode was irradiated with an Xstrahl 300 orthovoltage x-ray unit (Xstrahl Ltd., Surrey, UK). All irradiations were performed with a 5 cm diameter, 30 cm length cone with the photodiode placed on top of 10 cm of solid water to allow for backscatter. The photodiode was irradiated in 100 MU increments. For each bias the measurement was repeated 3 times. The diode current was measured using a source measurement unit (Keithley 2614B). All machine outputs were measured with a calibrated ionization chamber. The total charge collected for an increment of dose was determined by integrating the area under the curve of the current as a function of time when the beam was on. The sensitivity of the diode was then calculated by dividing the total charge collected by the dose. The noise was measured by irradiating the setup without the photodiode, but all electrical connections in place and the current measured. With the beam off the measured current was 1 ± 1 pA. With the beam on, but no photodiode in the holder the current increased to 5 ± 1 pA. With a dose rate of 4.1 cGy/s the measured current was 110 ± 10 , 330 ± 30 , 460 ± 30 , and 550 ± 50 pA for applied biases of 0, 1, 1.5, and 2 V, respectively. The calculated sensitivity was 26 ± 2 , 86 ± 8 , 110 ± 7 , and 130 ± 10 pC/cGy for applied biases of 0, 1, 1.5, and 2 V, respectively.

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