

Supplementary Information:

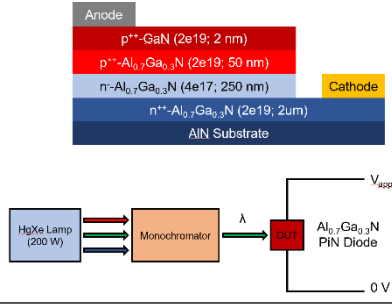


Fig. S1: (Top) Epitaxial stack of AlGaN PiN diode. (Bottom) Schematic of experimental setup.

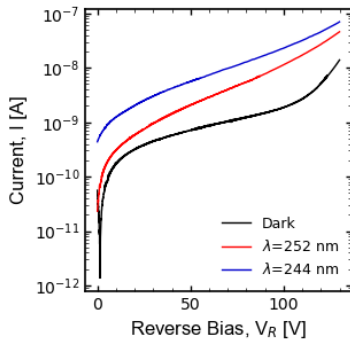


Fig. S2: I-V characteristics of AlGaN PiN diode exposed to 244 nm light (above bandgap), 252 nm light (below bandgap), and no light.

TABLE I. Electron and hole effective masses of GaN, Al_{0.7}Ga_{0.3}N, and AlN used in the FKE model.

Effective mass	GaN	AlN	Al _{0.7} Ga _{0.3} N
$m_e^ $	0.228 m_0	0.381 m_0	0.335 m_0
$m_e^\perp$	0.237 m_0	0.372 m_0	0.331 m_0
$m_{HHB}^ $	1.76 m_0	0.25 m_0	0.703 m_0
$m_{HHB}^\perp$	0.35 m_0	3.53 m_0	2.576 m_0
$m_{LHB}^ $	0.42 m_0	2.94 m_0	2.184 m_0
$m_{LHB}^\perp$	0.51 m_0	0.56 m_0	0.545 m_0
$m_{SO}^ $	0.30 m_0	2.83 m_0	2.071 m_0
$m_{SO}^\perp$	0.68 m_0	0.46 m_0	0.526 m_0

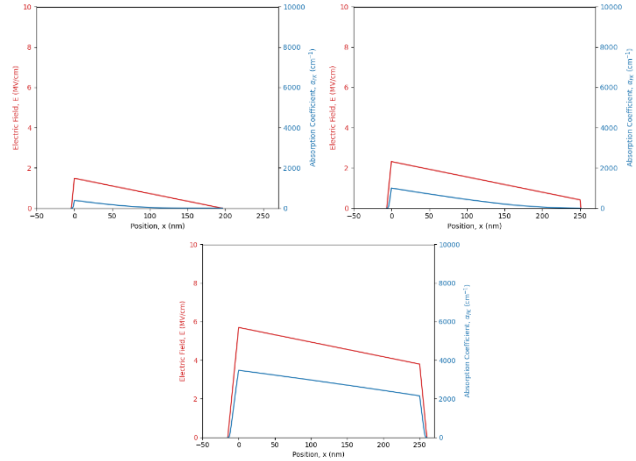
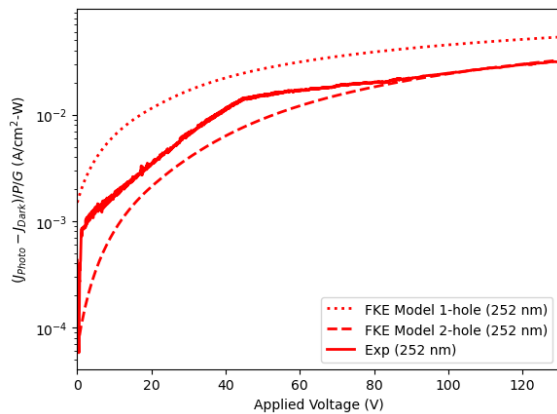


Fig. S3: Electric field profile and absorption coefficient due to FKE (two-hole model) at an applied voltage of (Top Left) 10V, (Top Right) 30V, and (Bottom) 120V.

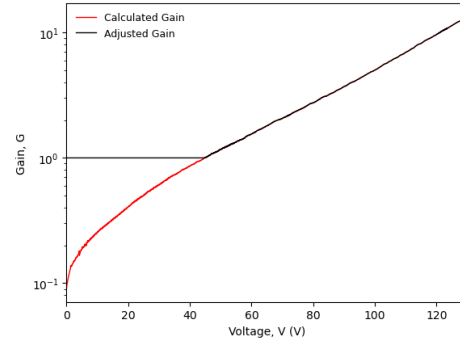


Fig. S4: Calculated and adjusted gain values of AlGaN PiN diode. Gain was calculated using the 244nm photocurrent and dark current data. The adjusted gain was used in the FKE model.

Fig. S5: Measured photocurrent (solid line), calculated photocurrent using one-hole FKE model (dotted line), and calculated photocurrent using two-hole FKE model (dashed line) of AlGaN PiN diode. The measured photocurrent is normalized to the optical power of the incident light and the gain of the diode to clearly show FKE current contribution.