

Linear Mode Photon Counting LADAR Camera Development for the Ultra-Sensitive Detector Program¹

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Advanced LADAR receivers enable high accuracy identification of targets at ranges beyond standard EOIR sensors. Increased sensitivity of these receivers will enable reductions in laser power, hence more affordable, smaller sensors as well as much longer range of detection. Raytheon has made a recent breakthrough in LADAR architecture by combining very low noise ~ 30 electron front end amplifiers with moderate gain >60 Avalanche Photodiodes. The combination of these enables detection of laser pulse returns containing as few as one photon up to 1000s of photons. Because a lower APD gain is utilized the sensor operation differs dramatically from traditional "geiger mode APD" LADARs. Linear mode photon counting LADAR offers advantages including: determination of intensity as well as time of arrival, nanosecond recovery times and discrimination between radiation events and signals. In our talk we will review the basic amplifier and APD component performance, the front end architecture, the demonstration of single photon detection using a simple 4 x 4 SCA and the design of a fully integrated photon counting camera under development in support of the Ultra-Sensitive Detector (USD) program sponsored by the Air Force Research Laboratory at Kirtland AFB, NM.

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