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Utilization of an Electron Multiplying CCD camera for applications in quantum information processing MONIKA PATEL, JIAN CHEN, JONATHAN HABIF, Raytheon BBN Technologies — Electron Multiplying Charge-Coupled Device (EMCCD) cameras utilize an on-chip amplification process which boosts low-light signals above the readout noise floor. Although traditionally used for biological imaging, they have recently attracted interest for single-photon counting and entangled state characterization in quantum information processing applications. In addition, they exhibit some photon number-resolving capacity, which is attractive from the point-of-view of several applications in optical continous-variable computing, such as building a cubic phase gate. We characterize the Andor Luca-R EMCCD camera as an affordable tool for applications in optical quantum information. We present measurements of single-photon detection efficiency, dark count probability as well as photon-number resolving capacity and place quantitative bounds on the noise performance and detection efficiency of the EMCCD detector array. We find that the readout noise floor is a Gaussian distribution centered at 500 counts/pixel/frame at high EM gain setting. We also characterize the trade-off between quantum efficiency and detector dark-count probability.

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