CMOS Active Pixel Sensor Specific Performance Effects on Star Tracker/Imager Position Accuracy

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This presentation gives the status of theoretical and experimental efforts at *JPL* in the development of environmentally robust (Rad Hard and Rad Tolerant), ultra-low power, high performance CMOS active pixel sensor (APS) imagers for star tracker/imager applications. The work explores the effect of imager performance (i.e. read noise, pixel and column fixed pattern noise, photon response non-uniformity, dark current nonuniformity, and *dark* current shot noise) on star position accuracy, specifically examining the performance of JPL designed APS imagers. Accuracy is estimated as a function of star magnitude for a nominal star tracker optical design. Using these APS sensors, which have wide dynamic range and no blooming, simultaneous imaging of widely differing *star* magnitudes during the same observation is possible. It is shown that prototype Rad Hard APS imagers already meet many next generation, star tracker/imager mission performance requirements when operated at reduced temperatures. These images also provide excellent performance at cryogenic operating temperatures appropriate to some anticipate flight missions. APS imagers with their high level of integration, on-chip timing and control, ultra-low power, and environmental robustness are excellent candidates for NASA's earth observing, interplanetary and deep space exploration missions.