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Regional Selection with Skipper CCDs for Astronomical Applications

The Skipper CCD, through the use of a floating gate output stage, allows for multiple, non-destructive charge measurements per pixel and thus, a tunable readout noise level which has been shown to reach down to .04 e- rms. In the next coming months, a Skipper CCD composed focal plane is planned to replace the current conventional CCD detector at the SOAR Integral Field Spectrograph (SIFS) with the goal of targeting both confirmed and potential faint, strong gravitational lensing systems, making this the first application of Skipper CCDs in astronomy. However, the drastic reduction in readout noise with Skipper CCDs comes at the cost of increased readout time - time which could alternatively be used to collect more photons from the already faint system. In this work, we construct a smart readout procedure which can use pre-identified regions of interest (ROIs), estimated through precursor observations, to reduce readout time and moreover, aid in optimizing the signal-to-noise ratio. Specifically, we (1) build a tool that can, on the fly, construct the sequence of instructions associated with selecting a particular set of ROIs and (2) build a predictive model which can correct for transient noise artifacts incurred by regional selection and thus calibrate the baseline for *any* set of ROIs. We show that, given stability of the system over time, the predictive model can robustly mitigate noise transients and we outline future steps required to implement regional selection at SIFS as a first proof-of-concept in a real observing scenario.

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