Reducing the Read Noise of HAWAII-2RG Detector Systems with Improved Reference Sampling and Subtraction (IRS²)

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ABSTRACT

IRS² is a Wiener-optimal approach to using all of the reference information that Teledyne's HAWAII-2RG detector arrays provide. Using a new readout pattern, IRS² regularly interleaves reference pixels with the normal pixels during readout. This differs from conventional clocking, in which the reference pixels are read out infrequently, and only in a few rows and columns around the outside edges of the detector array. During calibration, the data are processed in Fourier space, which is close to the noise's eigenspace. Using IRS², we have reduced the read noise of the James Webb Space Telescope Near Infrared Spectrograph by 15% compared to conventional readout. We are attempting to achieve further gains by calibrating out recently recognized non-stationary noise that appears at the frame rate.