

Rubin Observatory

Readout Time Optimization Aaron Roodman

PST Meeting | December 8, 2021



Focal Plane Optimizations

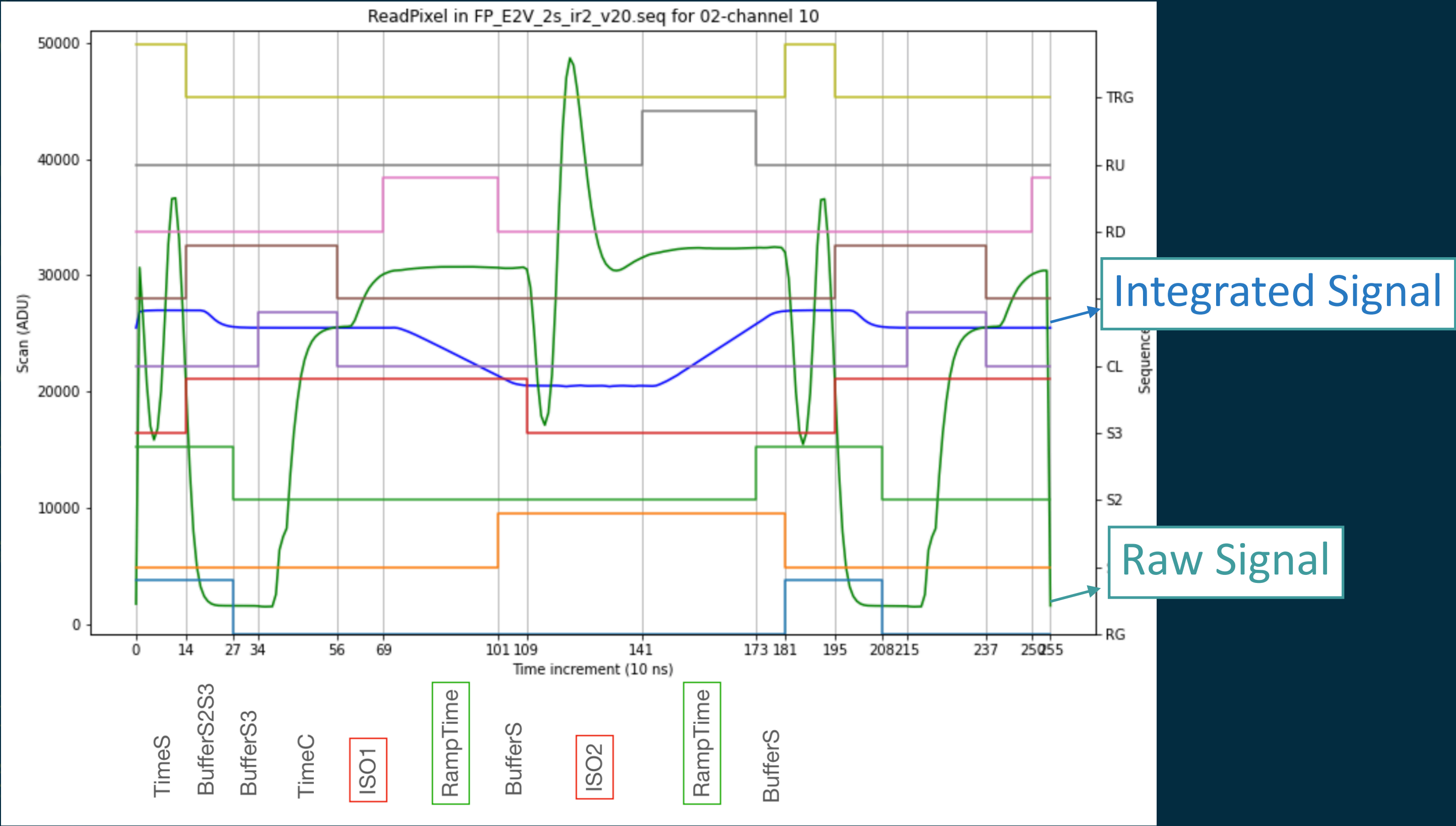
- CCD Clock & Bias Voltages
- Sequencer File: Clocking & Readout
- Optimized for:
 - Tearing Mitigation
 - Row-by-row Gain variations & long-range correlations
 - Effects of Serial Flush during exposure
 - Gain stability
 - Bias stability
 - *ReadNoise & Readout Time: Serial Clocks & Digitization*
 - *Full Well & Readout Time: Parallel Transfer*

Choose Nominal Operating Conditions and Use throughout the remainder of EO testing, with Goal of maintaining through Commissioning & Operations

Readout Time

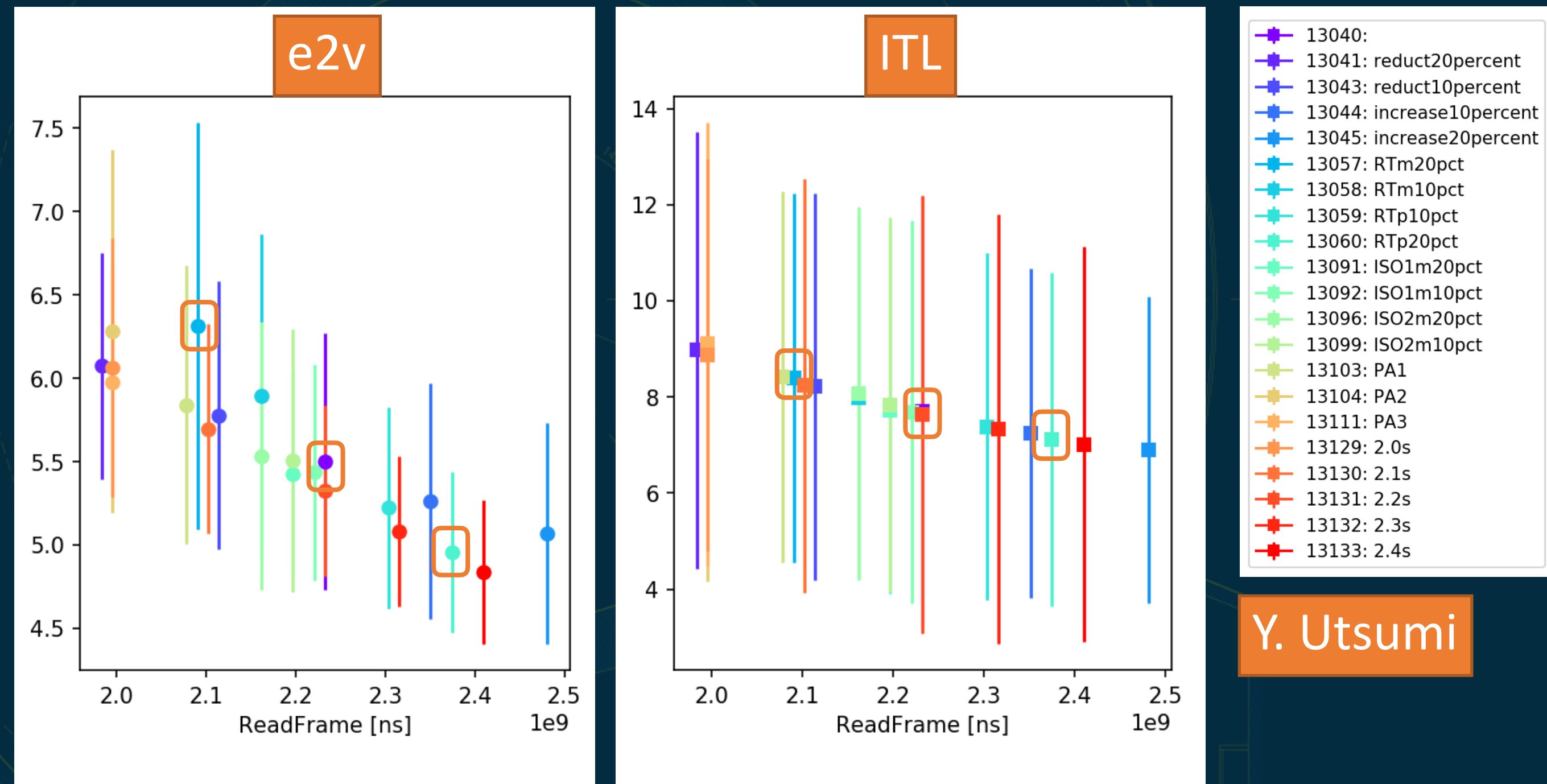
- Readout time set by controller commands in *Sequencer File*

	Time (Allotment)	Time (Measured)
Shutter	2 * 0.980	2 * 0.901
Integration	2 * 15.000	2 * 15.000
Readout	2.000	prior Raft & BOT testing = 2.232
CCS/ Overheads	0.040	being evaluated
optional Clear between Snaps	0.000	~0.060
Total	34.000	

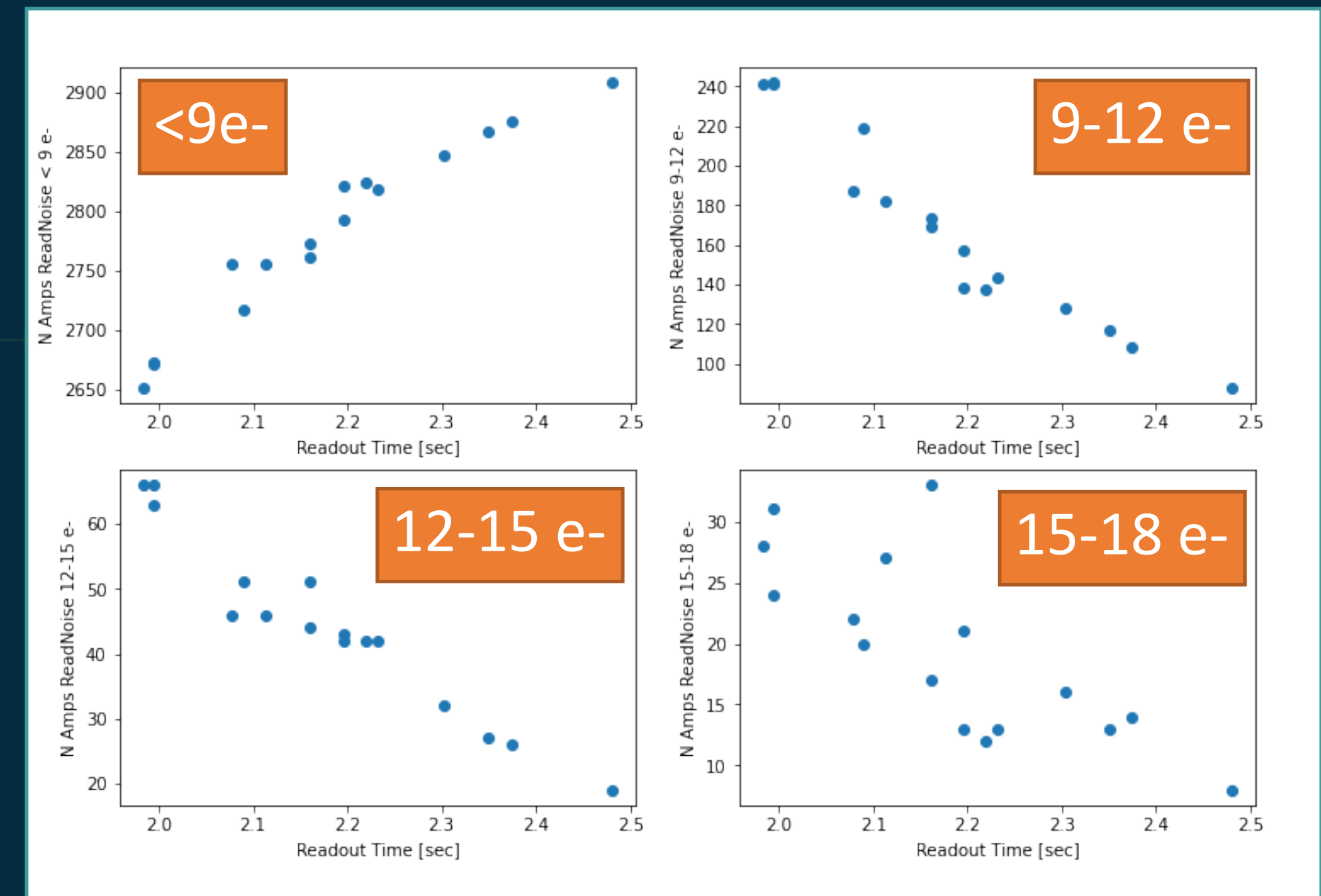


ReadNoise vs. Readout Time

- ReadNoise [e-] vs. Readout Time



Number of Amps in Noise ranges

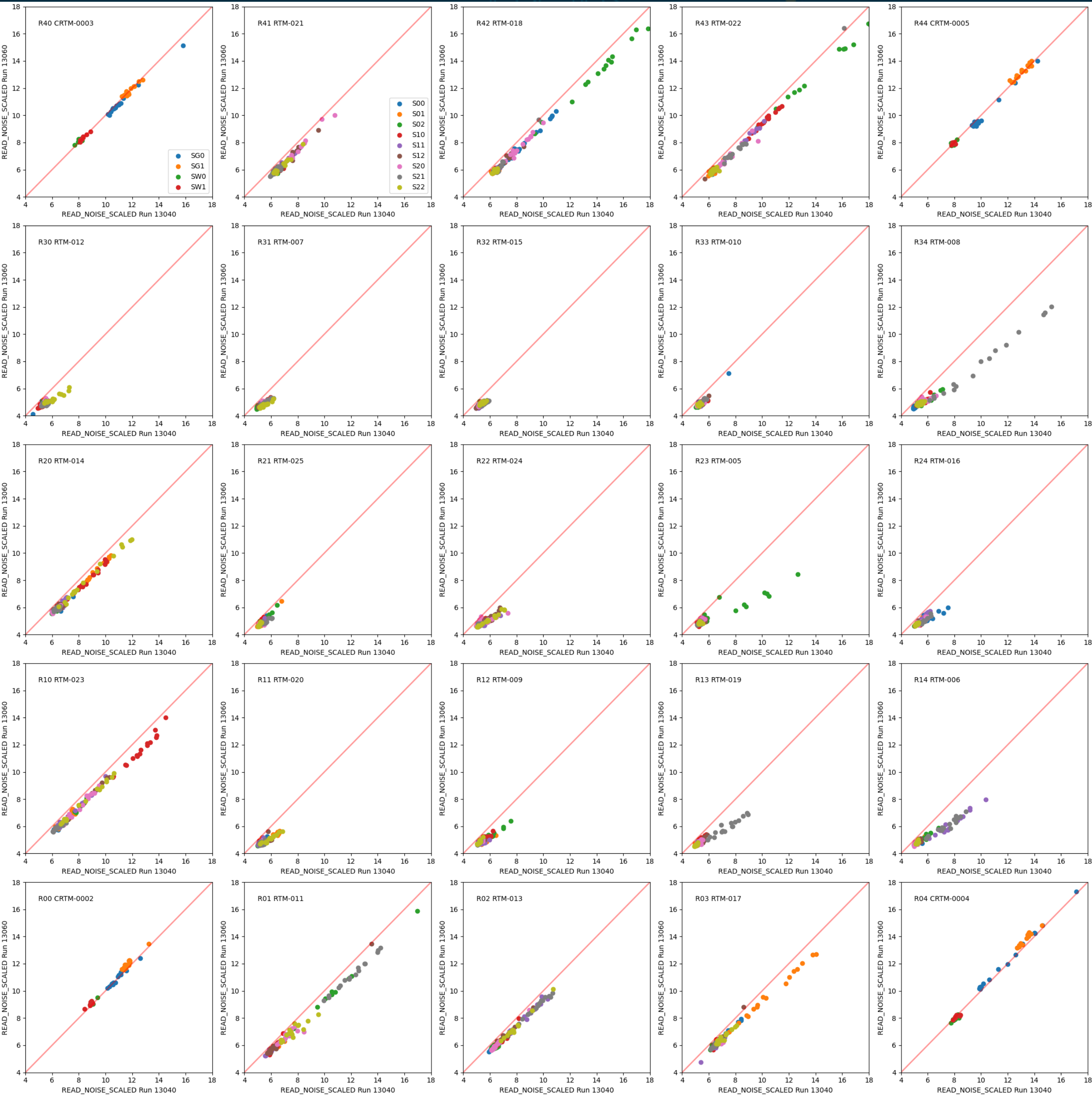


Y. Utsumi

- Noise per Amplifier at 3 Readout Times (2.090, 2.232, 2.374) used for limiting magnitude study, what is $dPerformance/dTime$?
- No other impact seen from changing readout time (eg CTE essentially the same)

ReadNoise comparison

Run 13060, 2.374sec

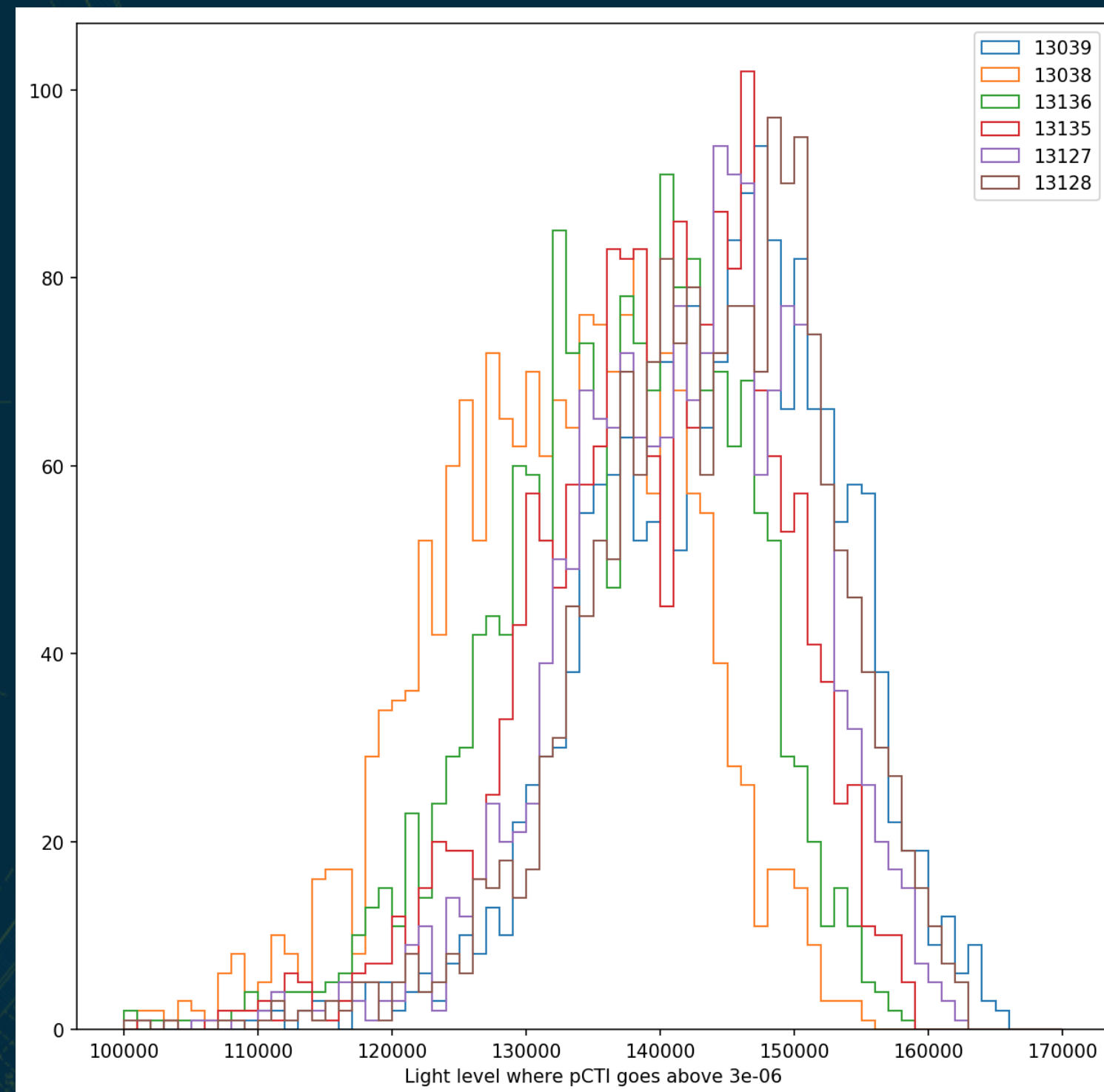
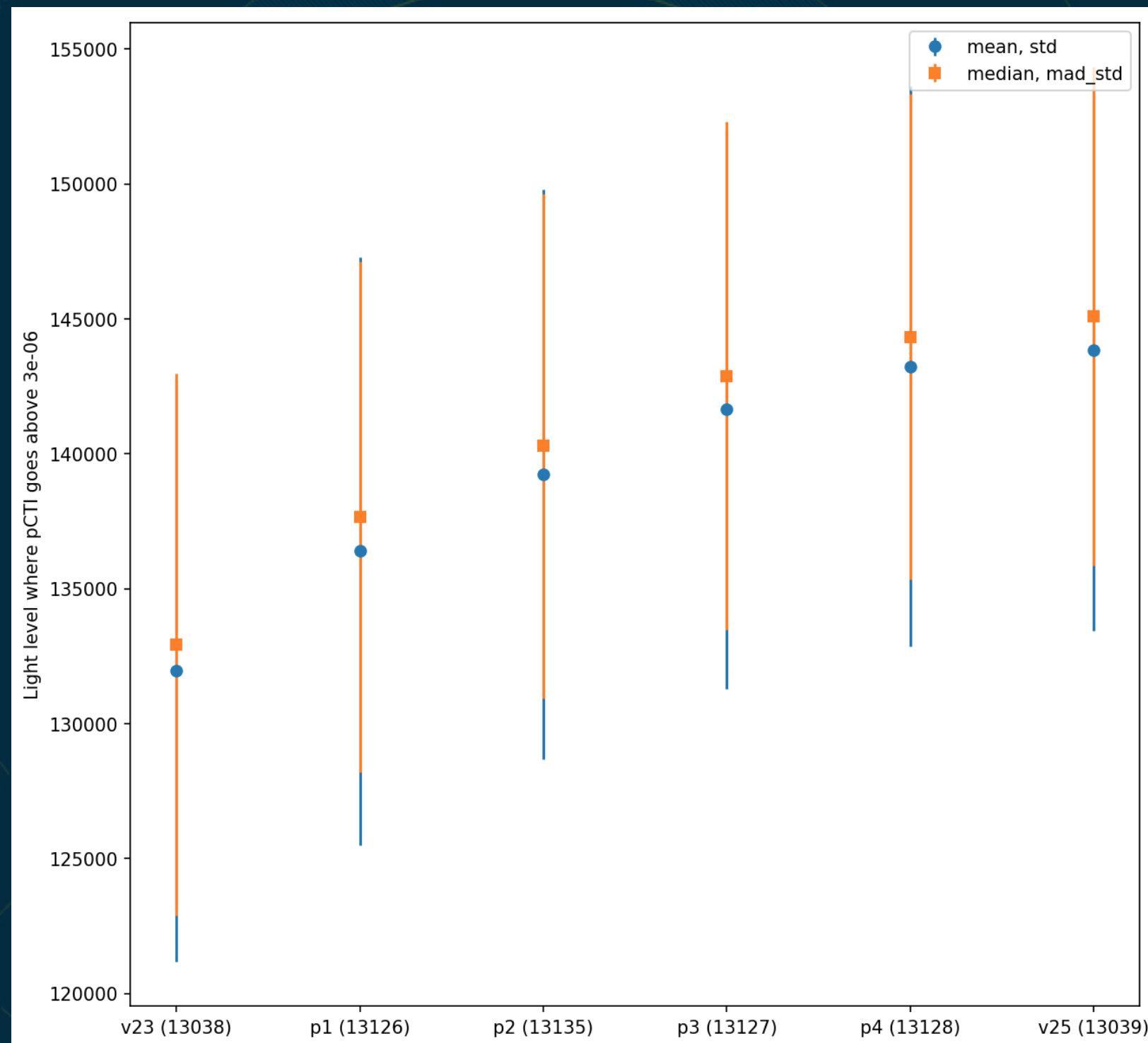


Run 13040, 2.232sec



Full well & CTE vs. Parallel Transfer Time

- Longer Parallel Transfer Time increases Full Well and CTE uniformity in e2v sensors



Y. Utsumi
C. Juramy

- Increase Parallel Transfer by ~ 30 msec from previous nominal, to gain most of this improvement

Comments & Conclusions

- also planning to study much longer readout times of 3,4,5 seconds, as part of EO test plan, expect only small additional improvements in Noise
- Net Gain in m5 from slightly longer readout time
- Take as nominal:
 - Serial readout based on 2.374 sec readout
 - Parallel transfer extended by ~ 30 msec
- Recommendation: Total Frame readout time of proposed nominal Sequencer File = 2.407sec
- Implication is that total Camera Visit time would be ~ 34.25 instead of 34.00 seconds