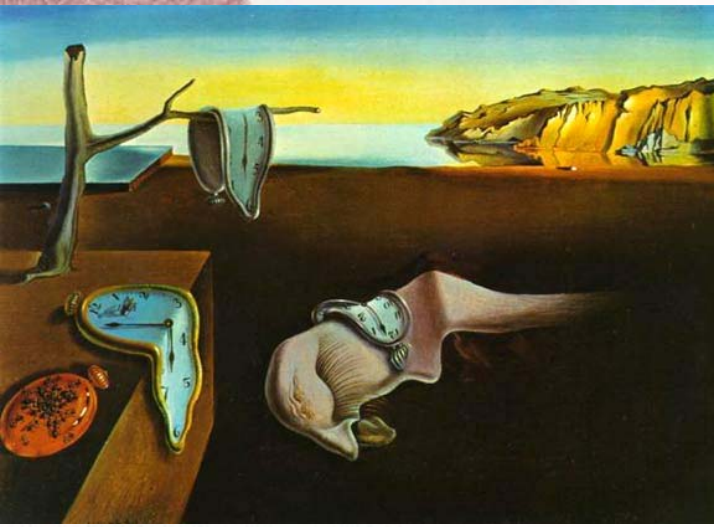


The Problem of Persistence (In HgCdTe Detectors)



Joel Xu

University of Michigan, LSA Physics

July 28th, 2010

What is persistence?

- After exposure to light, a faint image remains on the detector
 - Signal decays rapidly, but persists for ~10 minutes
 - Higher fluxes in illumination generate higher signals
 - Higher well-fills also produce higher signals
- Analogous to viewing bright objects with eye
 - Eye's lingering image due to continued nerve impulses; reason for detector is slightly unclear



Why is this a problem?



- When looking at especially faint stars, persistence interferes heavily
 - Can obscure and overshadow faint sources
 - Severity of persistence varies detector to detector
 - Is a source of systematic error in readout (detector reads out light in the absence of light)
 - Has a very significant effect on successive exposures (short timescales)

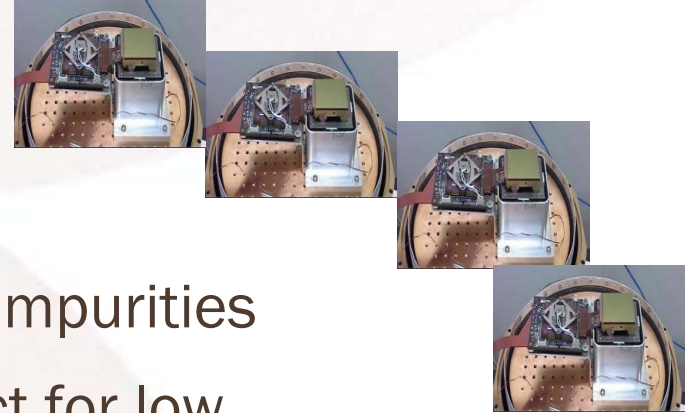
How do we fix it?

- Solution 1: better detectors

- We think that persistence is caused by impurities
- We can make many detectors and select for low persistence, but very expensive

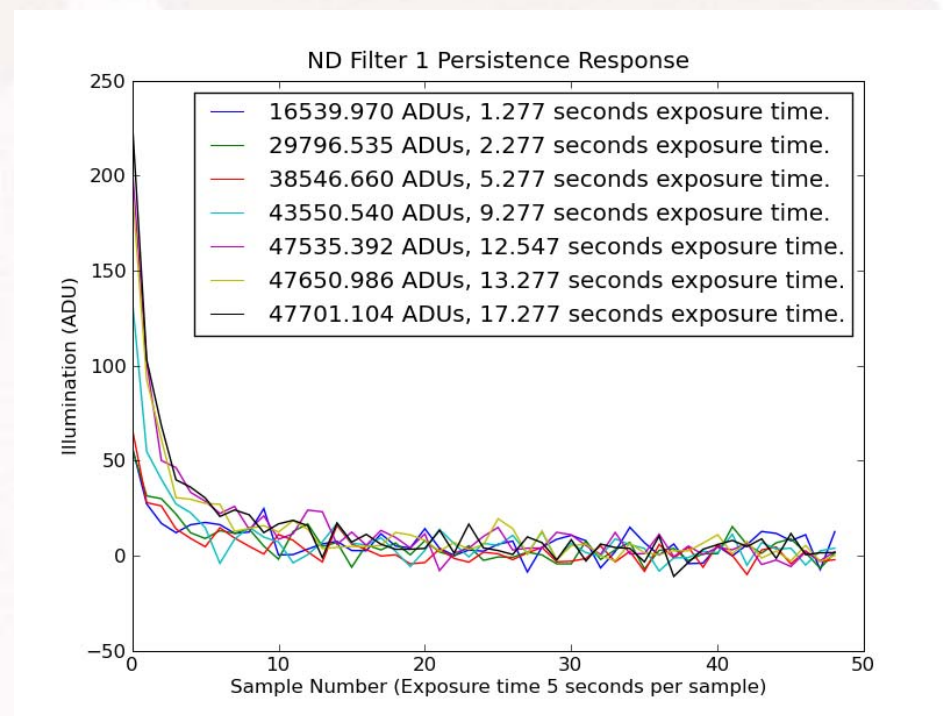
- Solution 2: wait longer

- How long do we have to wait for persistence to become negligible?
- Maybe cooling the device to a lower temperature?
- Or perhaps changing the voltage can help (reverse



What is being done?

- Method to characterize persistence:
 - Measure persistence, record and analyze the data
 - Check the physical model for the cause of persistence



What is yet to be done?

- Develop a comprehensive testing protocol that encompasses all relevant parameters in persistence
 - Requires 5-7 days to acquire data with our automated system
 - Will need a day to analyze data and apply various modifications (smoothing, curve-fitting, etc.)
 - Afterwards we'll sit down and discuss some ideas



- Hopefully then we can improve upon the model for persistence!

After persistence...

- I will be working on my quantum efficiency calibration project for my remaining weeks
- Since I haven't started that yet, Ben will be giving the second part of the talk on quantum efficiency!