

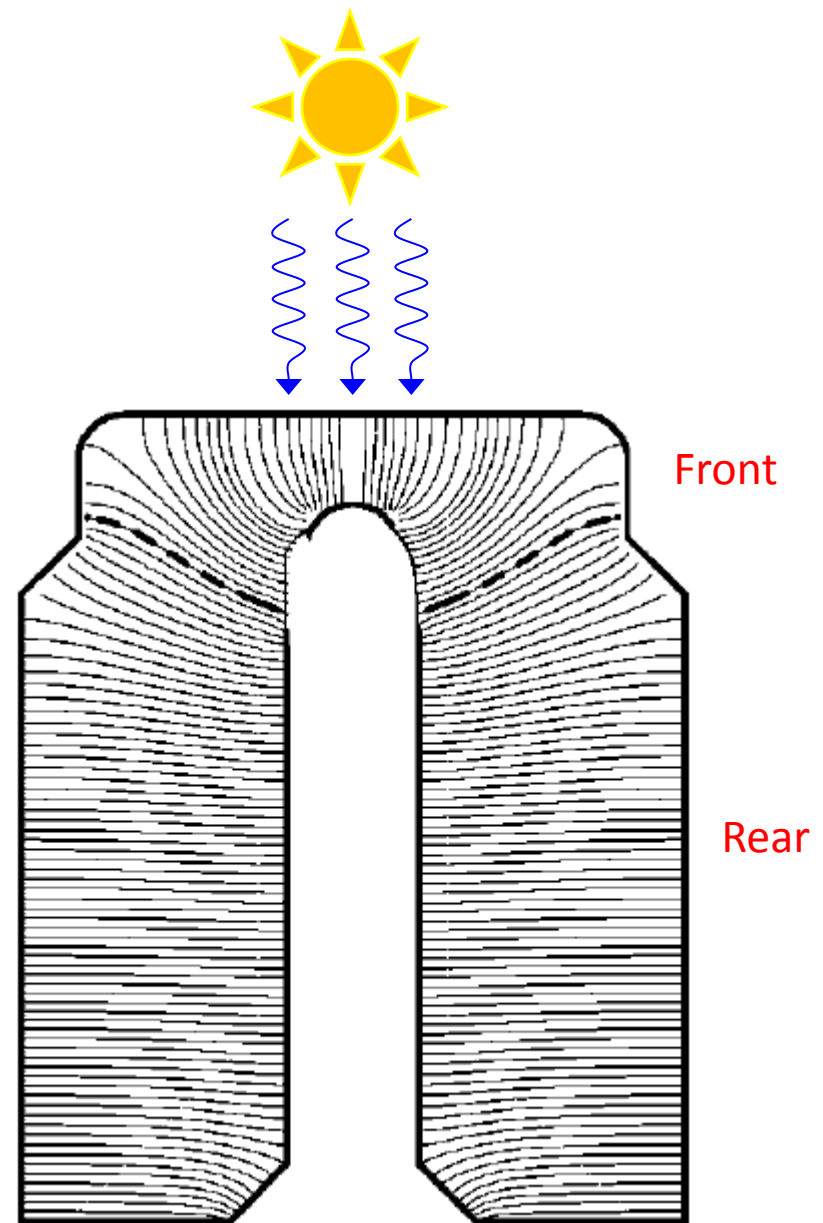
Detector status

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2016 July 27

RHESSI detectors

- Nine coaxial high-purity germanium detectors
- When segmented
 - Front segments for X-ray measurements
 - Rear segments for gamma-ray measurements
- Degraded performance over time
 - Radiation damage
 - Worsened resolution
 - Decreased efficiency
 - Contamination
 - Increased resets and noise

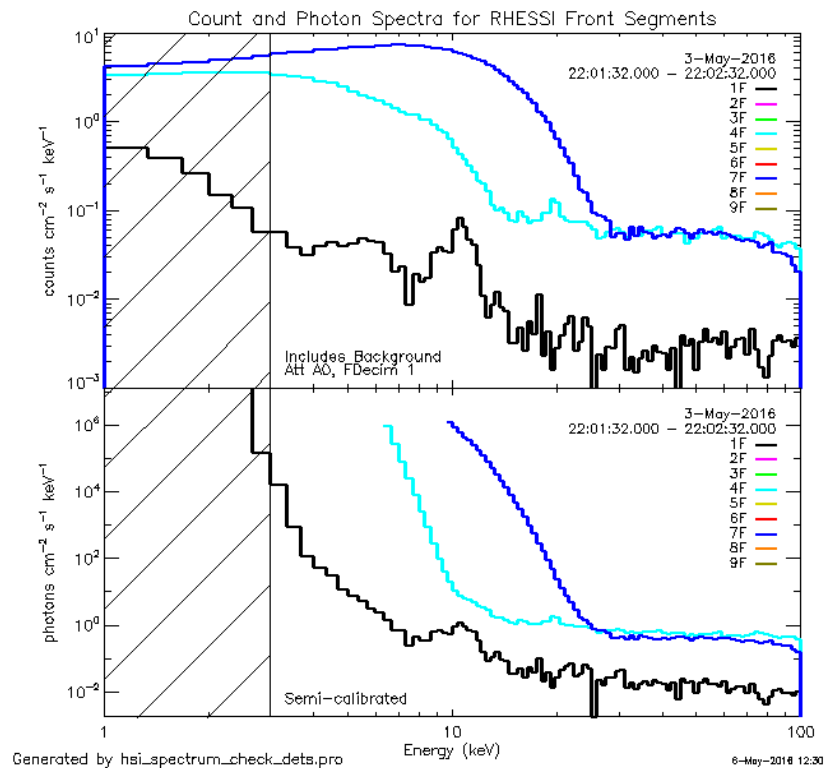


Annealing the detectors

- Heat detectors to $\sim 100^{\circ}\text{C}$ for a week
 - Reduces effects of radiation damage
 - Removes some contamination
- But, also reduces ability of detectors to segment
- Five anneals to date
 - Nov 2007
 - Apr 2010
 - Jan–Feb 2012
 - Jun–Aug 2014
 - Feb–Apr 2016
- Cooldown more difficult each time
 - Aging cryocooler

Segmented versus unsegmented

- Unsegmented detector includes the entire rear volume
 - Increased noise
 - Worse spectral resolution
 - Higher low-energy threshold
 - Increased background
- “Semi-calibrated” units are inaccurate when data is not source-dominated



Current detector performance

Segmented detectors

- Low-energy threshold:
~3 keV
- X-ray spectral resolution:
~1.5 keV FWHM
- Segmented detectors:
 - G1: 2.3"
 - G3: 6.8"
 - G8: 106"
 - G9: 183"

Unsegmented detectors

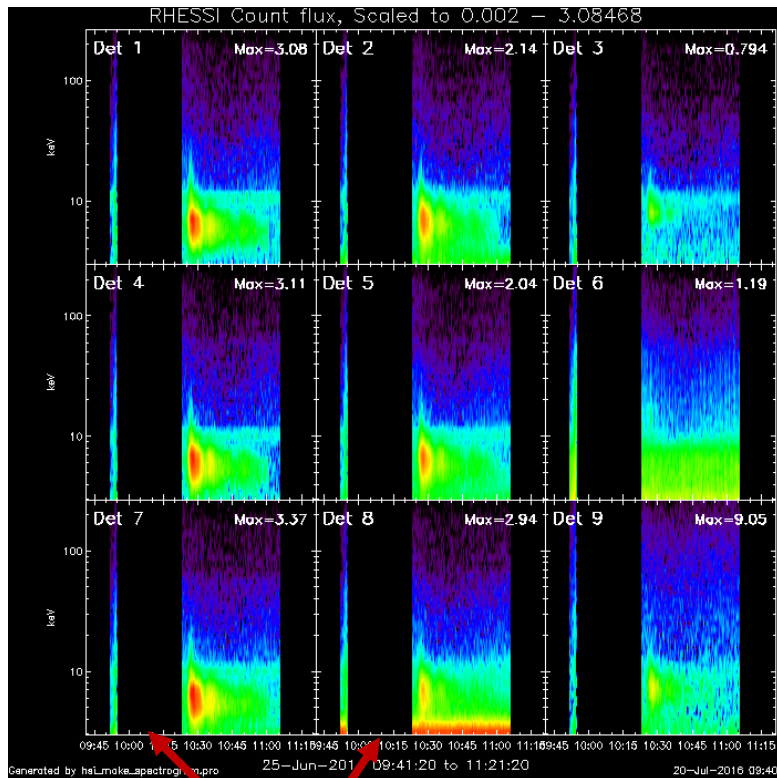
- Low-energy threshold:
>~15 keV
- X-ray spectral resolution:
>~5 keV FWHM
- Unsegmented detectors:
 - G2: 3.9", always difficult
 - G4: 12", difficult since 2012
 - G5: 20", difficult since 2014
 - G6: 35", difficult since 2014
 - G7: 61", difficult since 2014

Temperature considerations

- Want to maintain an operating temperature of $< \sim 135$ K
 - Detectors perform better when colder
 - Cryocooler performs better when colder
- Thermal balance
 - Each detector's readout electronics puts heat into the cryostat
 - Reducing number of operating detectors lets the cryostat get colder
- Old default was to have all nine detectors on
- New default is to have only two detectors on
 - G3: 6.8"
 - G8: 106"
- Detectors to be turned on (or off) as conditions warrant
 - Solar activity
 - Coordinated observations
 - Cryostat temperature

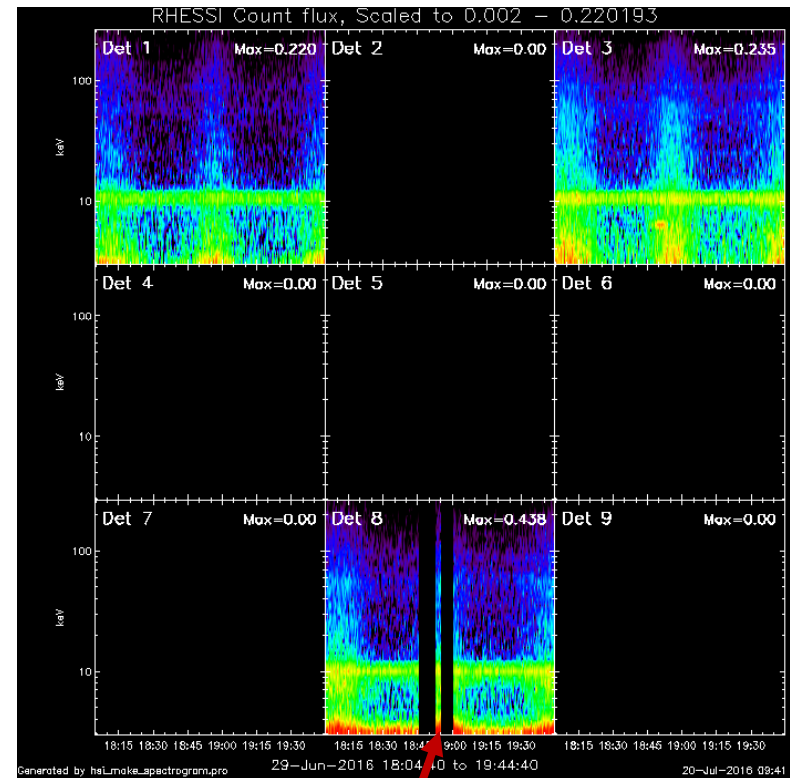
Upcoming plots for Browser

C-flare prior to 2014 anneal



SAA

Background a month ago



antenna dropouts

Additional remarks

- Segmentation
 - It is possible for unsegmented detectors to regain segmentation over time
 - Small possibility for G6, very unlikely for others
- Energy calibration
 - Approach for calibration so far has taken advantage of general stability in calibration
 - Calibration parameters are updated on the time scale of months
 - Calibration may shift noticeably with frequent changes to on/off states, guaranteed if HV settings are different
 - For paper-level analysis of recent data, it's prudent to ask whether calibration is up to date