



What happened in ObsID 0x50002C6B?

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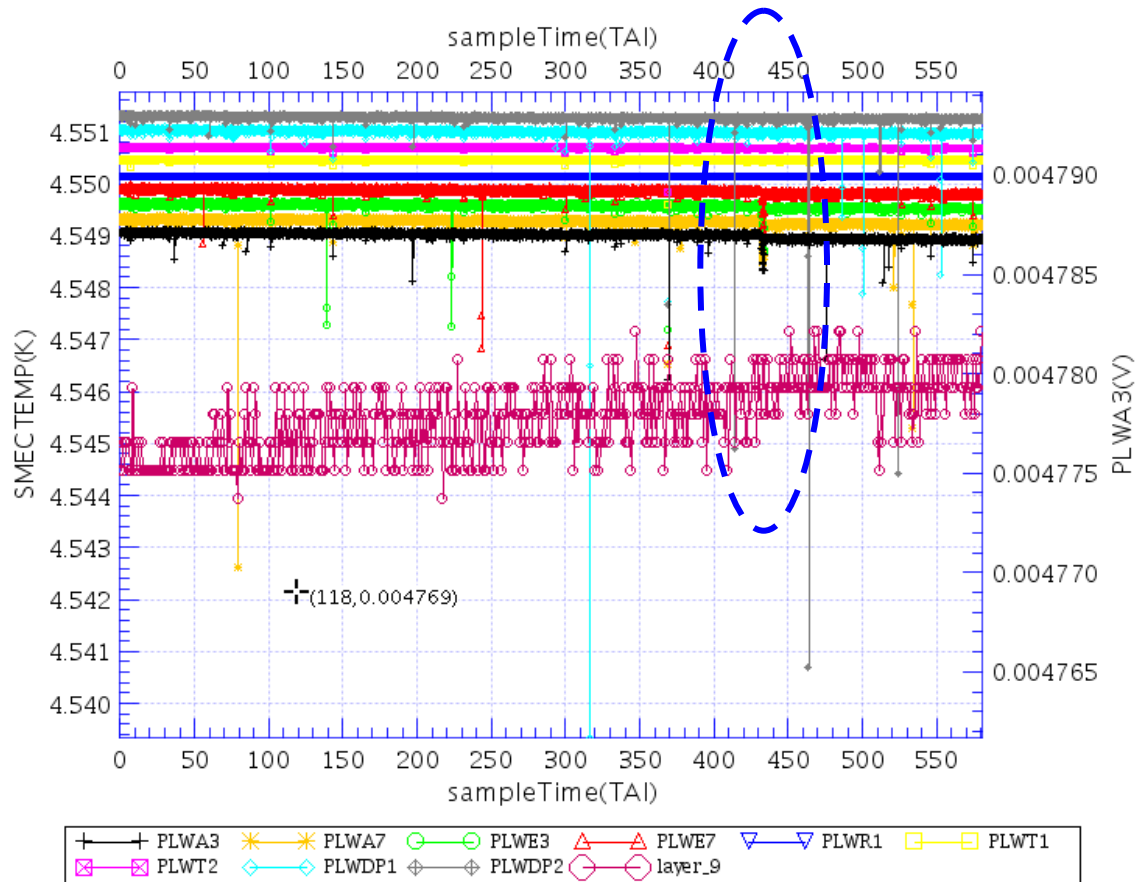


The Observation

- ObsID 0x50002c6b is part of the Hermes GT KP in parallel mode at slow scan speed.
- Hunting for undetected steps in Level 1 data
Mike Zemkov and Gaelen Marsden noticed a strange event.
- A step occurred at the same time in all channels except for dark, thermistors and resistor.
- Preliminary analysis of Level 0.5 and Level 1 timeline data reveals the following:



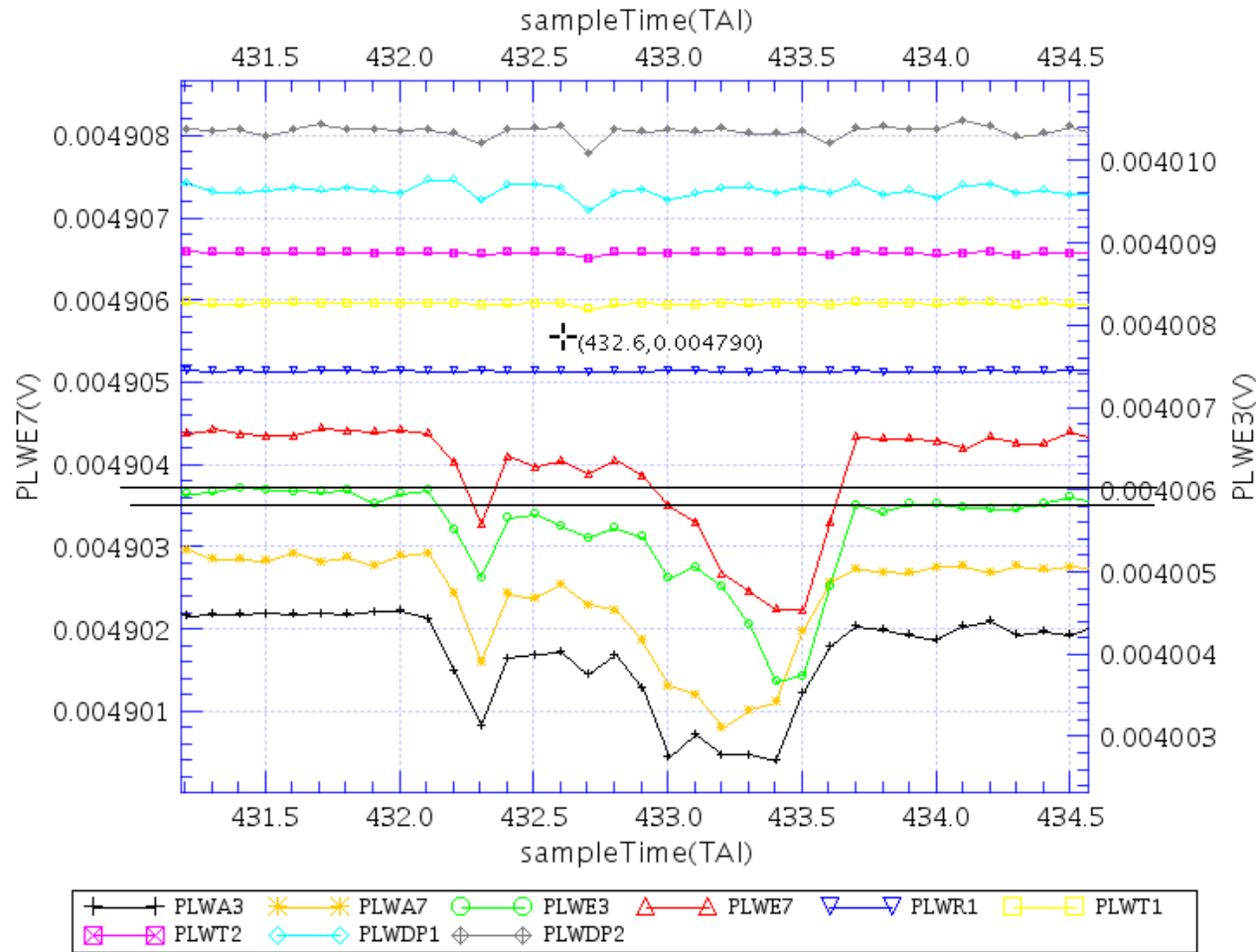
Analysis Level 0.5



- The event shows up as an apparent “Glitch” in building block A103001D followed by a permanent drop of the detector voltage.
- No resistor, thermistor or dark channel is affected.
- The plot shows a selection of PLW detectors, however the same changes are seen in the channels of the other two arrays.
- All Normal HK channels were checked, none shows any significant deviation at the same time.



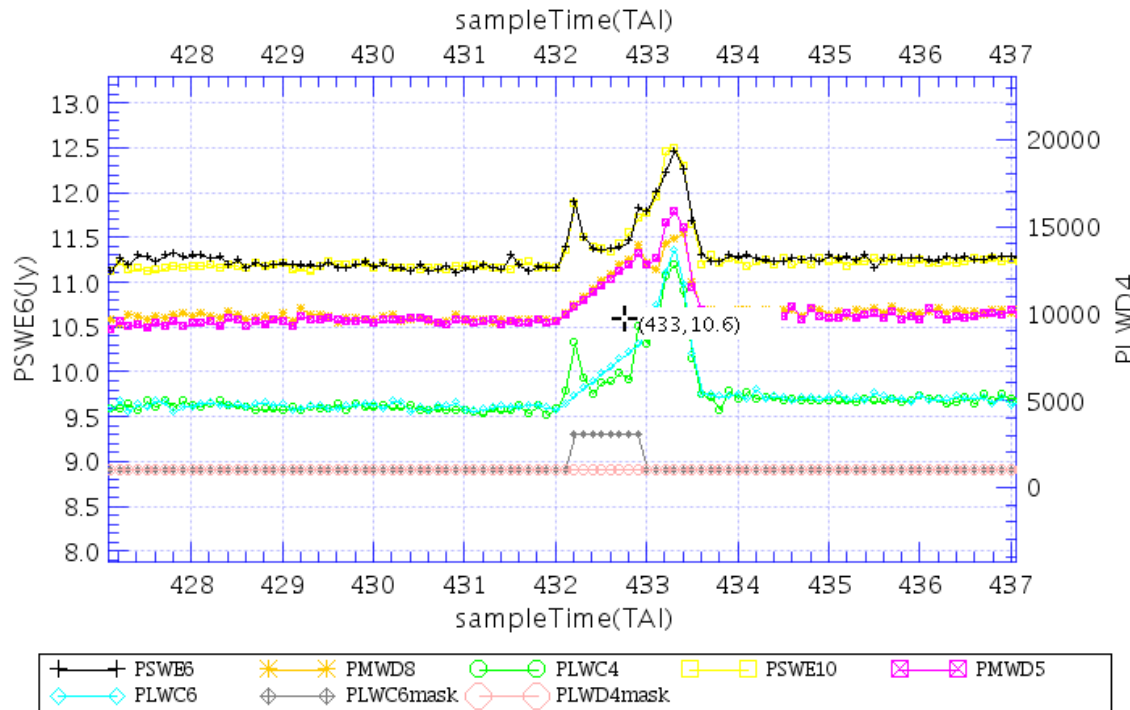
Analysis Level 0.5



- All “seeing” detectors record an event of about 1.7 sec duration.
- The voltage shows a double dip that has the same shape and amplitude in all 3 detector arrays.
- No resistor, thermistor, or even dark channel shows significant contemporary changes.



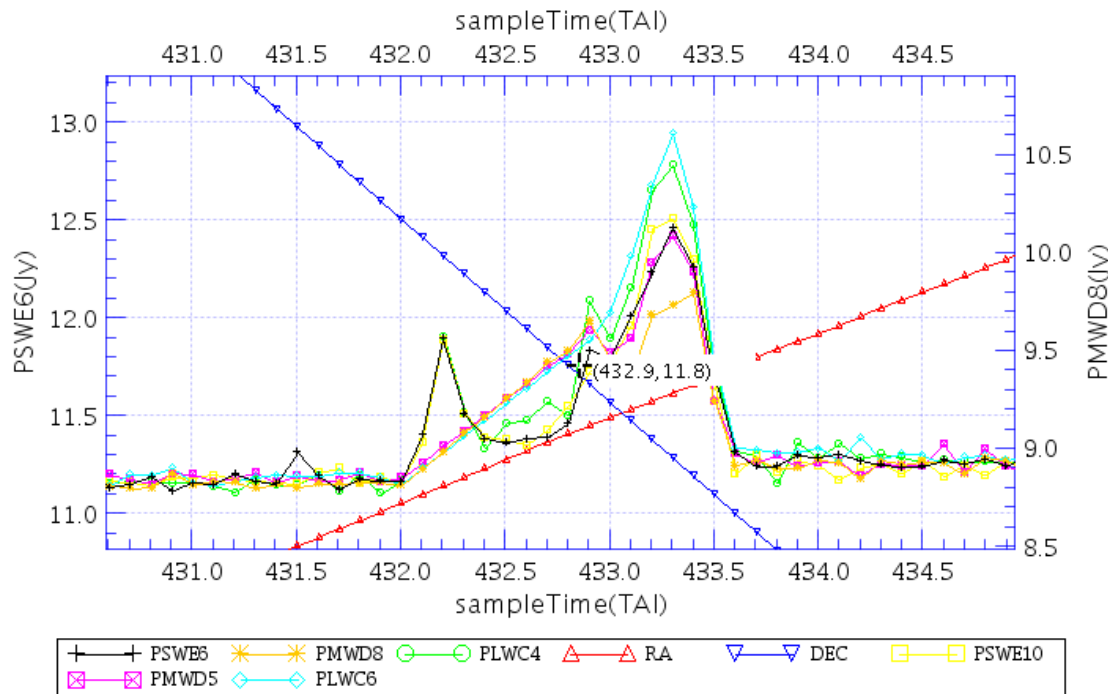
Analysis Level 1



- Level 1 data shows the event transformed into the flux domain.
- The plot shows overplots of two detectors of each array.
- In some cases the deglitcher caught the first peak and replaced that part with an interpolation.
- The mask bits for the PLW timelines (lowest pair) are plotted at the bottom.



Analysis Level 1



- Overplotted fluxes with synchronized scaling:
- The main peak corresponds to a source of 1.0- 1.8 Jy. The PLW flux peak is ~0.5 Jy stronger than the other two arrays.
- The background level rises by about 80-100 mJy.



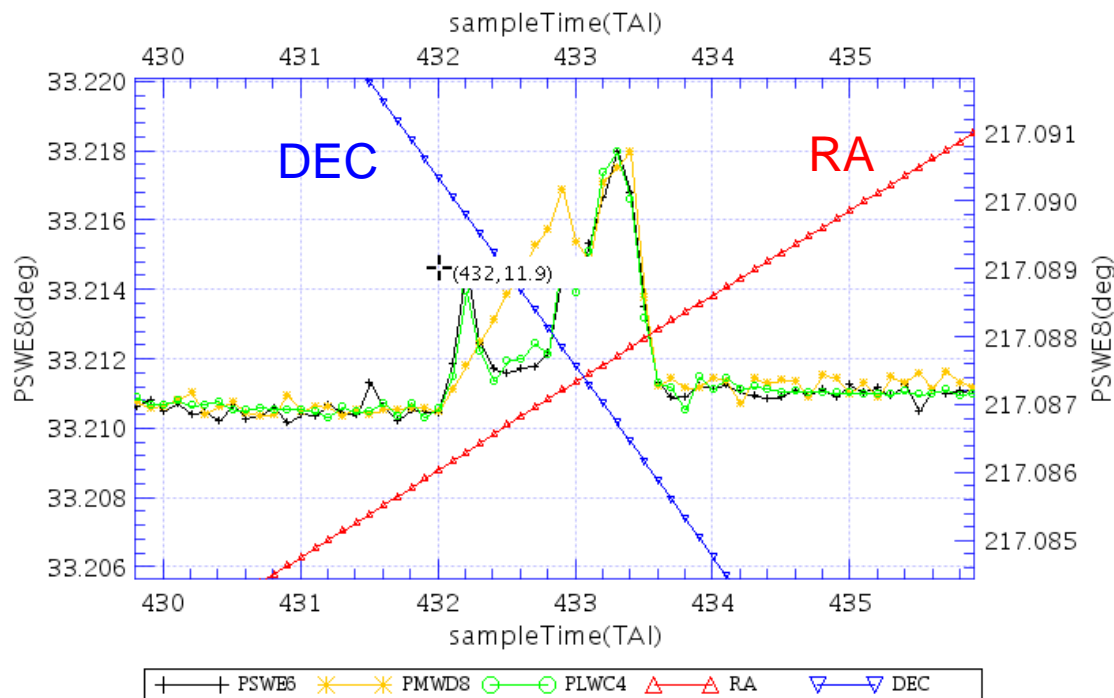
An interesting interpretation

- Could it have been a meteorite impact in the main mirror?
 - A hole in the mirror coating would have a higher emissivity and lead to a higher background
 - We observe a voltage decrease of about $0.2\mu\text{V}$
 - Assuming $S=3.6 \cdot 10^{-8} \text{ V/W}$ yields $5.6 \cdot 10^{-4} \text{ pW}$, which is needed to induce the observed voltage step.
 - A hole of at least 2.7mm in the reflective coating of an 85K primary mirror (depending on hole emissivity) would be required to produce the observed voltage step.
 - The double peaked signal that is recorded by all “seeing” detectors could be the dissipating heat from an impact.
 - Was the satellite pointing affected?
 - Did PACS see a similar event?



Analysis Level 1

- Checking the pointing at the same time reveals no obvious deviations from the scan track.
- The impulse of a meteorite creating a 3mm crater may still be too small to affect the pointing of the 3.25 ton satellite measurably.





Summary

- An unusual event was observed in ObsID 0x50002C6B at BBID A103001D (OD 228, 28-Dec-2009). This is a large parallel mode photometer scan at slow speed.
- All detectors that see the telescope show a double peak of 1-1.8 Jy over 1.7 sec.
- An electronic effect due to high energy radiation seems unlikely as no dark, thermistor or resistor channel show any reaction at the same time.
- A sudden movement of the chopper mirror, or switching on of PCAL or other events in the instrument are unlikely as no NHK channel shows any activity at the time.
- The light source is likely out of focus, as all detectors are evenly illuminated at the same time. A possible source location would be one of the mirrors.
- A meteorite impact into the primary mirror would be a potential explanation.
- A jitter in the pointing is not observed but the mass of Herschel may be too large for an effect and there are enough impact angles resulting in zero torque.
- The 1.7 sec double peak in flux could be from the dissipating heat of an impact.
- A calculation of the expected size of a “black” spot or crater on the mirror yields about 3mm.
- Analysis of contemporaneous parallel mode PACS data is needed.