WP 15: High-energy events (HEE)

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Overview

» Tasks
» Deliverables
» Progress in last 6 months
» Next steps
» Open points
» Tasks:

• Statistics of HIFI SEUs in different subunits
• Identify data anomalies from "glitches", develop mitigation routines
• Search for showers in WBS:
  ○ individual pixels
  ○ readout lines
  ○ identify other false signals
  ○ develop routines for identification close to noise level
• Correlate with space weather, SREM readouts
• Lab tests for energy-dependence → dropped
  ○ Identification of critical energy for different subsystems/events

» Deliverables

• Glitch correction routine in pipeline
• Report
Progress in the last 6 months

- Post-He tests provided 168038 WBS zero scans
- First analysis of warm tests and cold zero scans
WBS CCD as HEE detector

» CCDs are high-energy event detectors by design
**Zero scans**

Detection of spikes

- Structure of zero speckles prevents detection of signals ≤ 4

Thresholds for GLITCH detection in pipeline:
- 8.0 for WBS-H,
- 7.6 for WBS-V

1342227409 WBS-V
Zero scans

» Speckle pattern strongly affected by optics temperature

Time series of all cold WBS-H zero spectra

• In total 54585 usable spectra per WBS
  • Less than 100 spectra unusable

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October 21-25, 2013
Post-He tests

- Much more homogeneous and stable conditions

Time series of all post-He WBS-H zero spectra

- Reference data set of 168038 high quality spectra

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Remove speckle pattern

- Subtract gliding average

- Non-trivial
  - Based on nearest neighbours in time
  - Excellent results for post-He data
Remove speckle pattern

» Subtract gliding average

- Non-trivial
  - Based on nearest neighbours in time
  - Excellent results for post-He data
Event detection

» Statistics of spikes (outliers) above a given threshold:

- Speckle subtraction extends the dynamic range of HEE detection to < 0.5 counts
  - Significant exponential tail of low-energy events
  - Significance limit not fully clear yet: 0.2…0.8
“Normal” zero scans

» Tricky because of many data issues
  • Ongoing work

• Example:
  • Screwed up ordering of scans in two ObsIds

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“Normal” zero scans

» Tricky because of many data issues

• Needs more manual treatment of outlier scans
Event detection

» Statistics of spikes (outliers) above a given threshold:

- Should allow to flag about 1000 cold zero scans per WBS with HEEs
  - Limit still to be determined
Outcome of zero-scan analysis

» About 3000 clear events for further analysis

» GLITCH limit in current pipeline
  • Definition is safe
  • No false detections
  • But overlooking many small events
  • Rather calibration table of affected scans/channels (?)

» Energy statistics of events needs further analysis
  • Much input for detailed statistics
  • Full interpretation would require better CCD characterization
    → probably impossible due to lack of resources
» Progress in the last 6 months
  • Post-He tests provided 168038 WBS zero scans
  • First analysis of warm tests and cold zero scans

» Next steps
  • Identify criteria for WBS hits to be used in pipeline (glitch limit/cal. table)
  • Describe full statistics of hits
  • Create statistics and correlation of ICU, SEU events, and SREM data
  • Digest space weather statistics

» Open points:
  • Analysis of comb scans and overlapping subband parts?
  • Collaboration with ESA SEU analysis
  • Information on bitflips in other EDACs on board