Calibration aspects in the XMM-Newton Slew Survey

Michael Freyberg, MPE

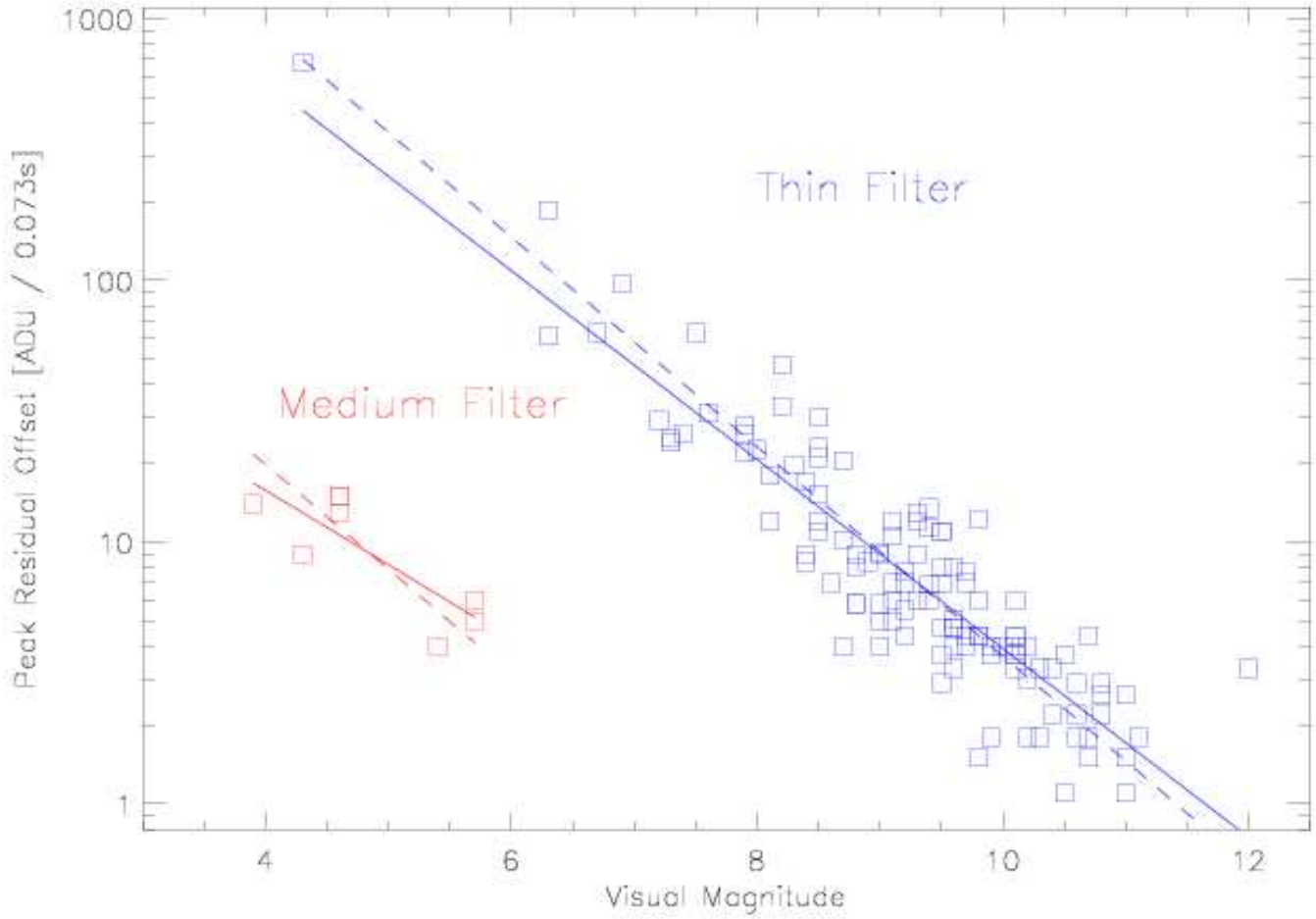
- Optical Loading
- Pattern Pileup / Pseudo-MIPs
- Internal FIFO overflows
- Straylight / PSF
- Background

XMM-Newton Slew Survey: EPIC-pn

- EPIC-pn in same sub-mode as previous science exposure, with Medium filter (may not always be optimal)
- EPIC-MOS too slow (90 arcsec/s, 2.6 s/FT), in CalClosed since Rev.918
- eFF, FF, LW modes (199.2, 73.4, 47.7 ms): 12 CCDs
- SW, TI, BU modes (1 CCD): proposal to use Closed (instead of Medium) filter

Optical Loading

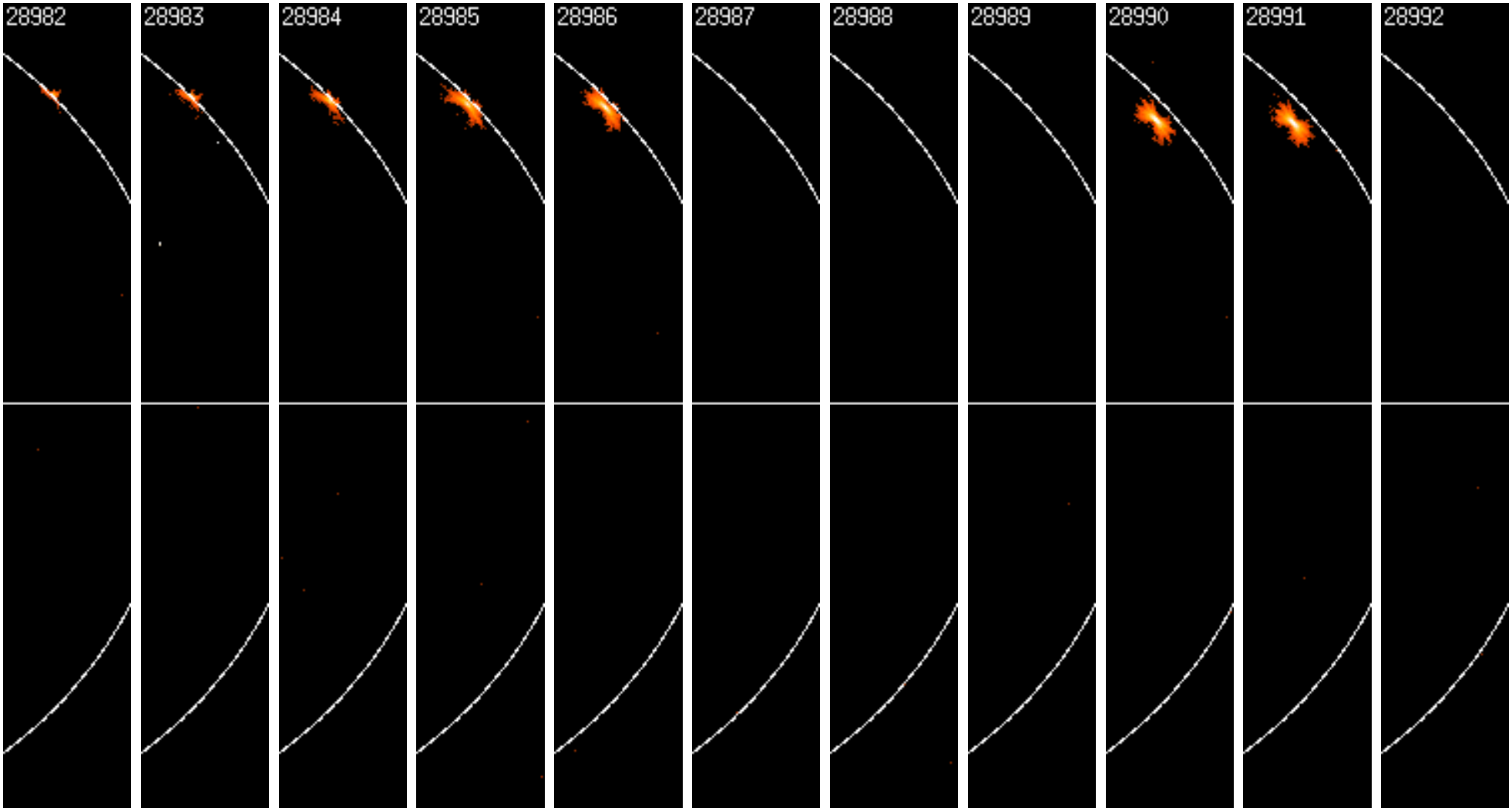
- no correlation of XMMSL1 rate with optical brightness found
- however, such a correlation is expected (XMM-SOC-CAL-TN-0051)



Optical Loading: pattern pileup

- **valid pattern types: S, D, T, Q (PATTERN .le. 12)**
- **however, bright stars may have pattern size .gt. 300 !**
- **movie: Sirius (XIAT-34, Rev.1065)**
- $m_V = -1.47$, **EPIC-pn: 5000 cts/s in FF mode, Medium filter**
- **even bright optical loading sources do NOT show out-of-time events**

Sirius entering FOV (CCD6)



after 1 full frame: 3 – 4 completely empty frames

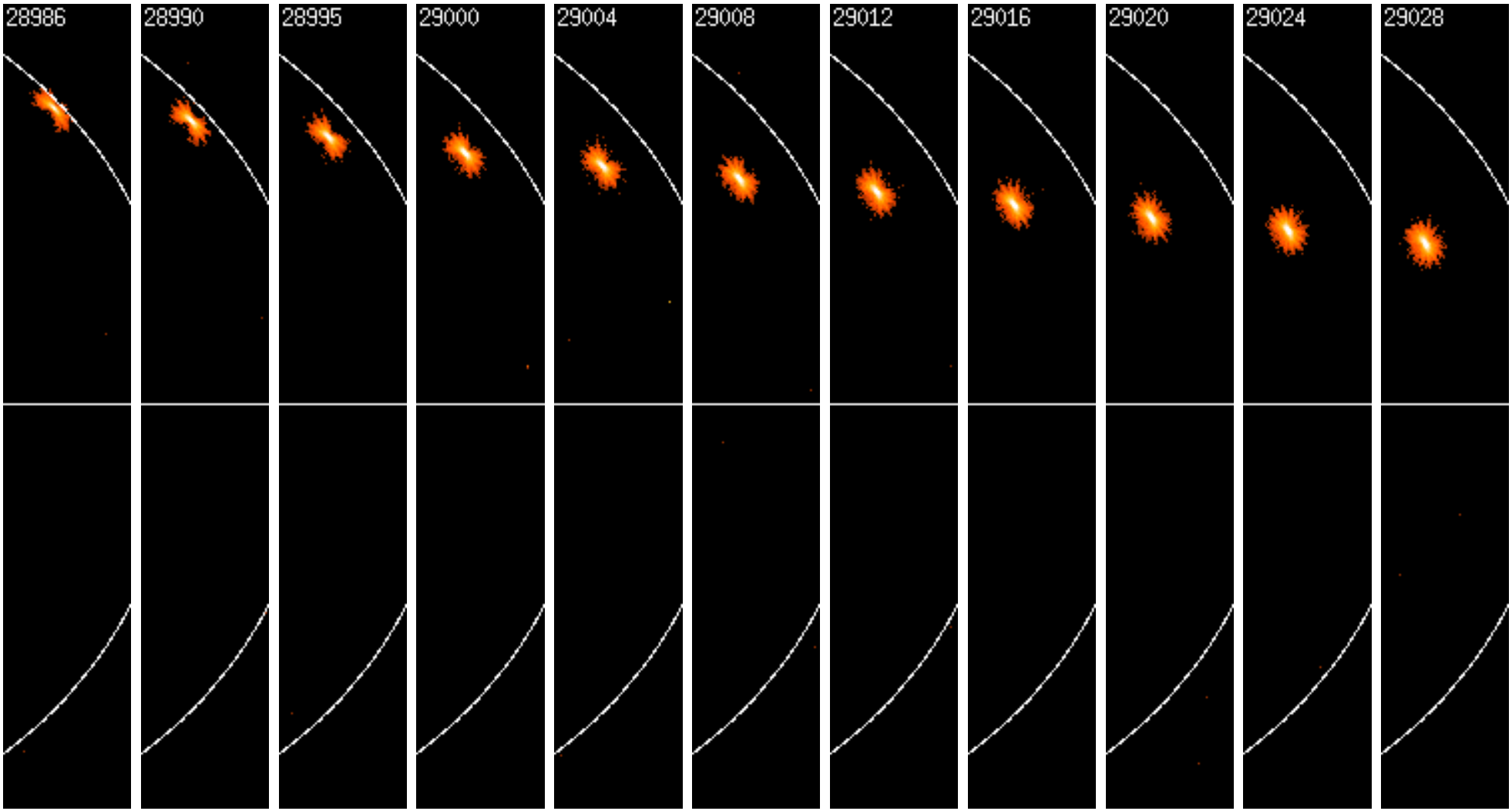
Optical Loading: Out-of-Time Events

- even bright optical loading sources do NOT show out-of-time events
- Sirius ("most on-axis") central pixel: 1700 adu
- total per frame (68 ms): 42000 adu
- 1 adu per cycle time: 5/3.65 optical photons
- lower threshold of 20 adu means: 27.4 photons/pixel
- time below PSF: 68 ms, OoT: 4.8 ms / 200 pixel
- "effective threshold": source with central pixel 58000 adu
- even Sirius factor of 30 too weak (and: MIP threshold 3000 adu)

Internal FIFO overflows: FFFF entries

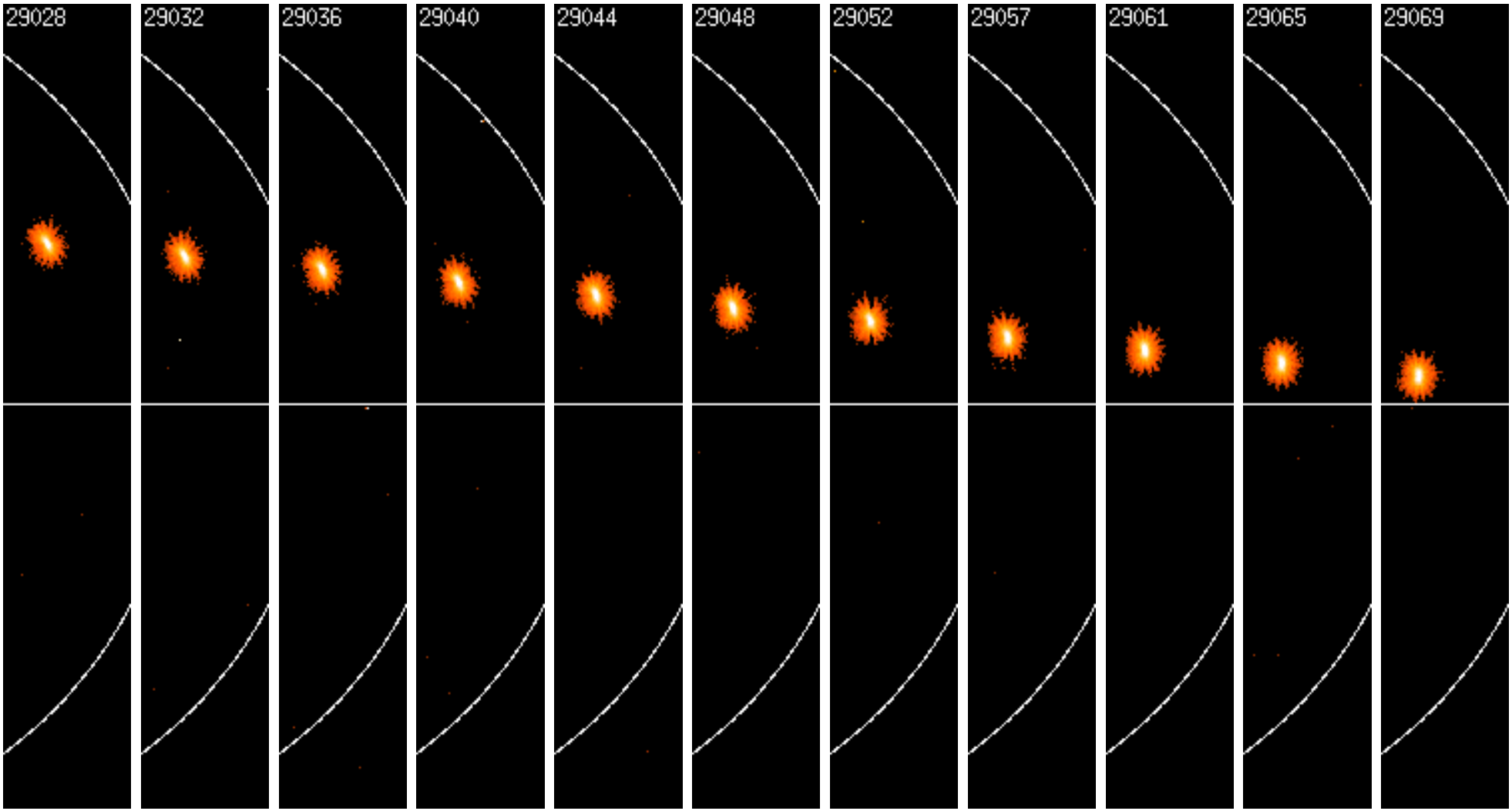
- bright (optical) source: 300 cts/frame
- followed by number of frames without any events
- also following FFFF entries in PNAUX1 FTCOARSE column
- Burwitz et al: TI mode, $\Delta = 76\,\mathrm{ms}$
- FF mode (73 ms) ? Faint source ? Statistics !
- see also: F.Haberl RXJ1856
- SAS does not yet detect short gaps on FT level;
  however, interface for FIFO overflow effects already present in SAS task `epframes`, needs to be calibrated
- movie: Sirius (XIAT-34, Rev.1065)

Sirius passing through FOV: I



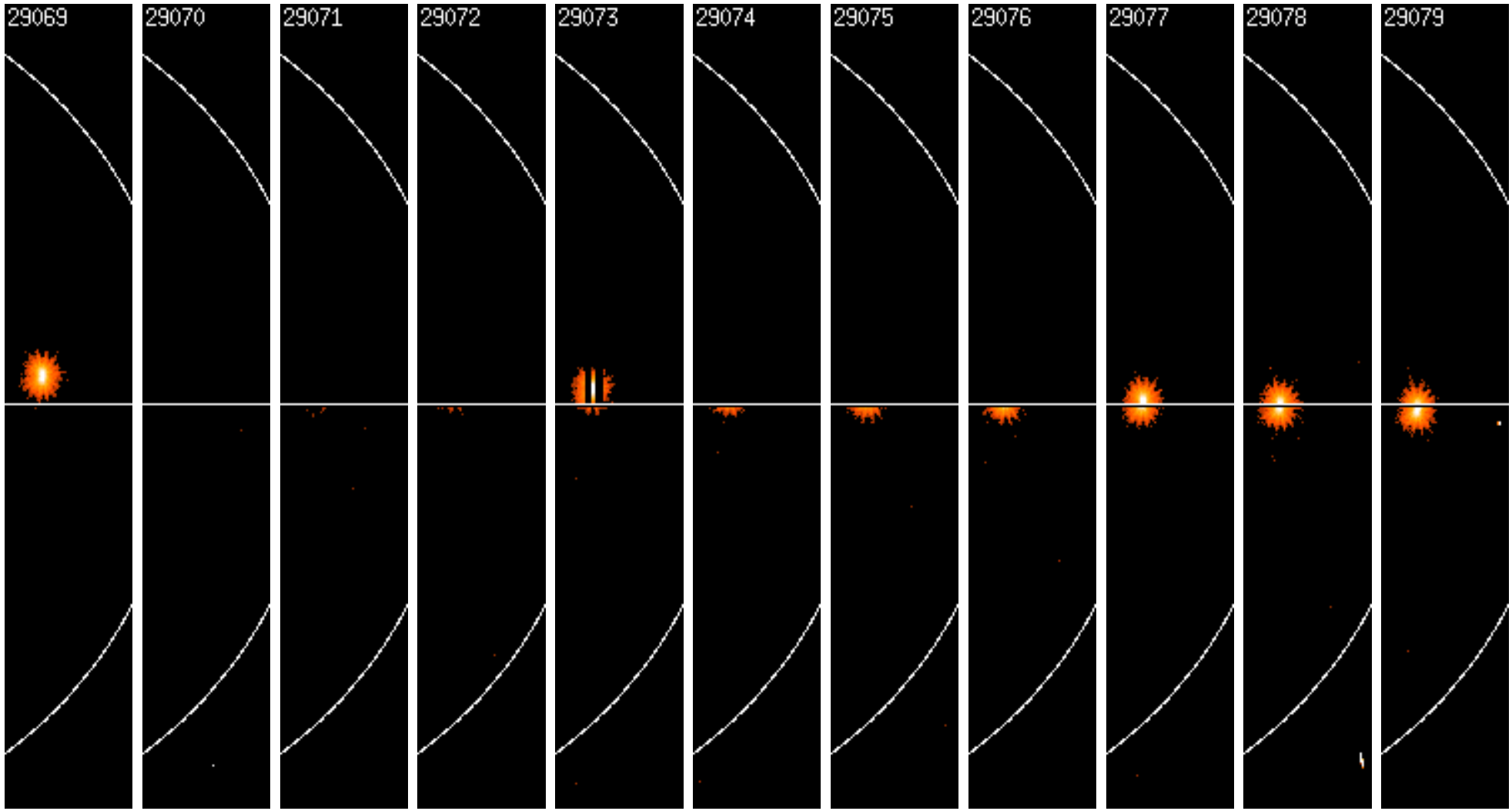
after 1 frame: 3 – 4 completely empty frames

Sirius passing through FOV: II



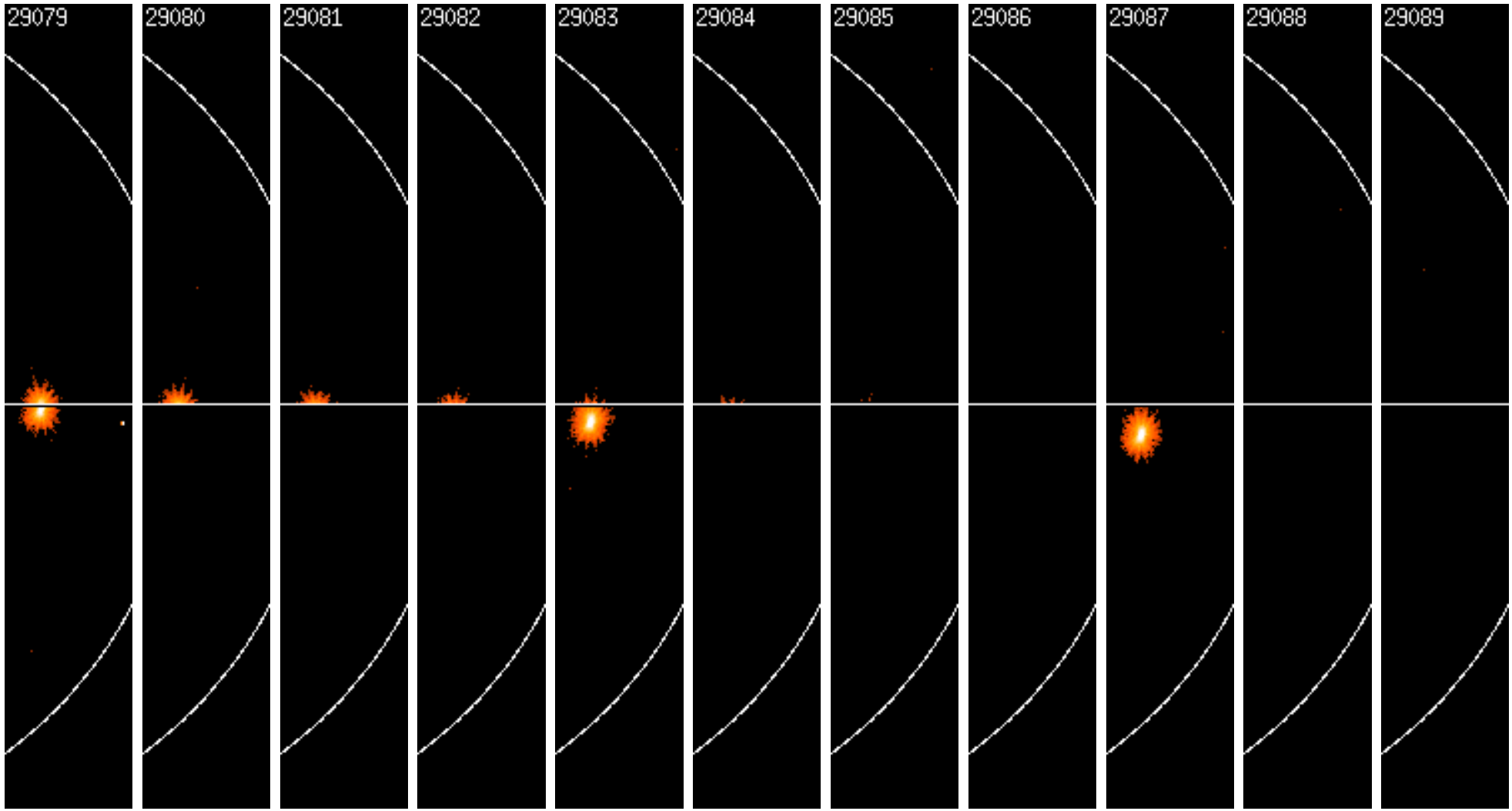
after 1 full frame: 3 – 4 completely empty frames

Sirius passing through FOV: III



after 1 full frame: 3 – 4 completely empty frames

Sirius passing through FOV: IV

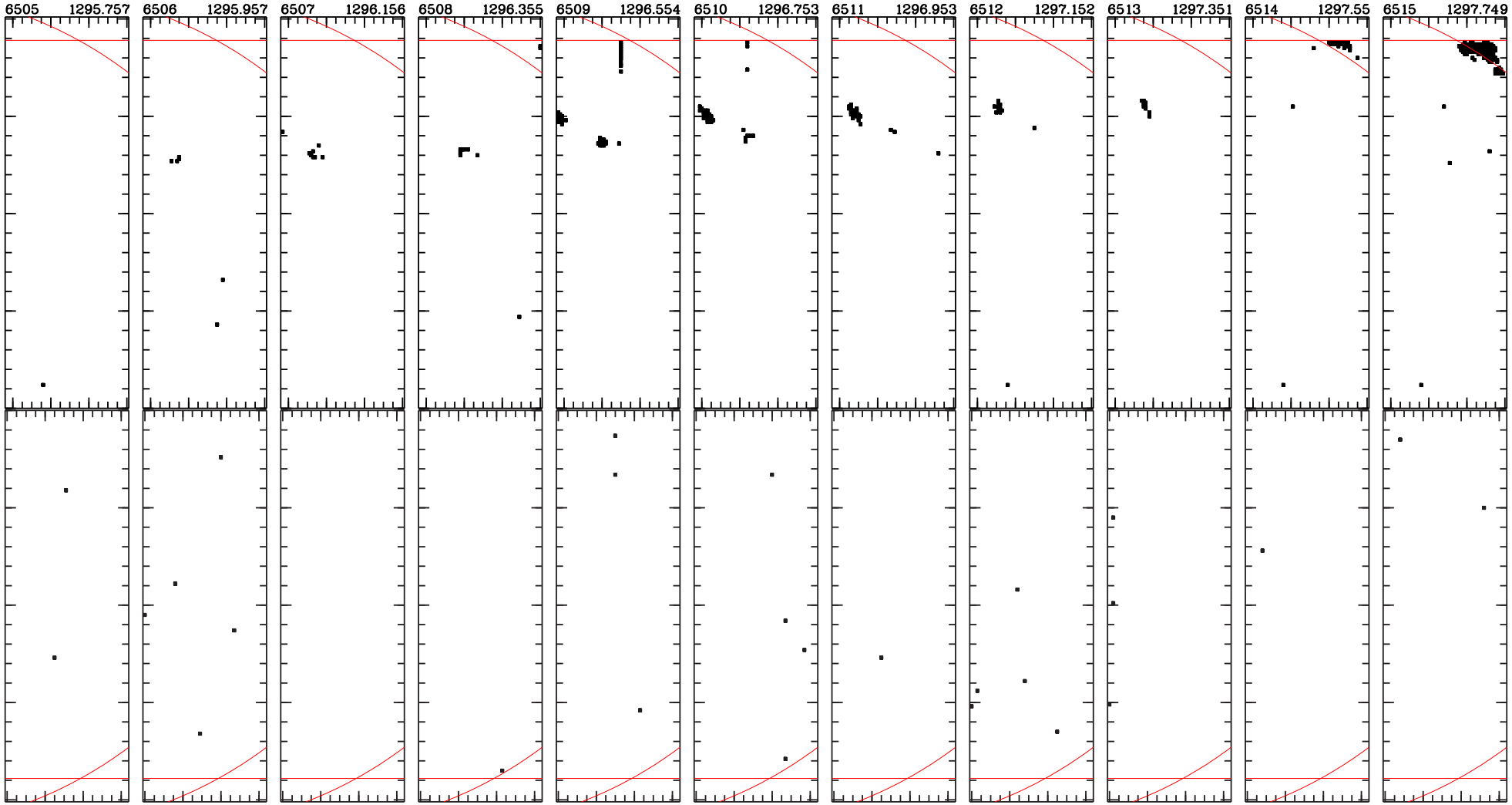


after 1 full frame: 3 – 4 completely empty frames

Straylight + off-axis PSF

- optical/X-ray source: single reflections (hyperbola) ? See EPIC Background Working Group Meeting presentation (mjf@20060502)
- average slew survey PSF: off-axis (impact) parameter
- movie

Star outside FOV (CCD5)



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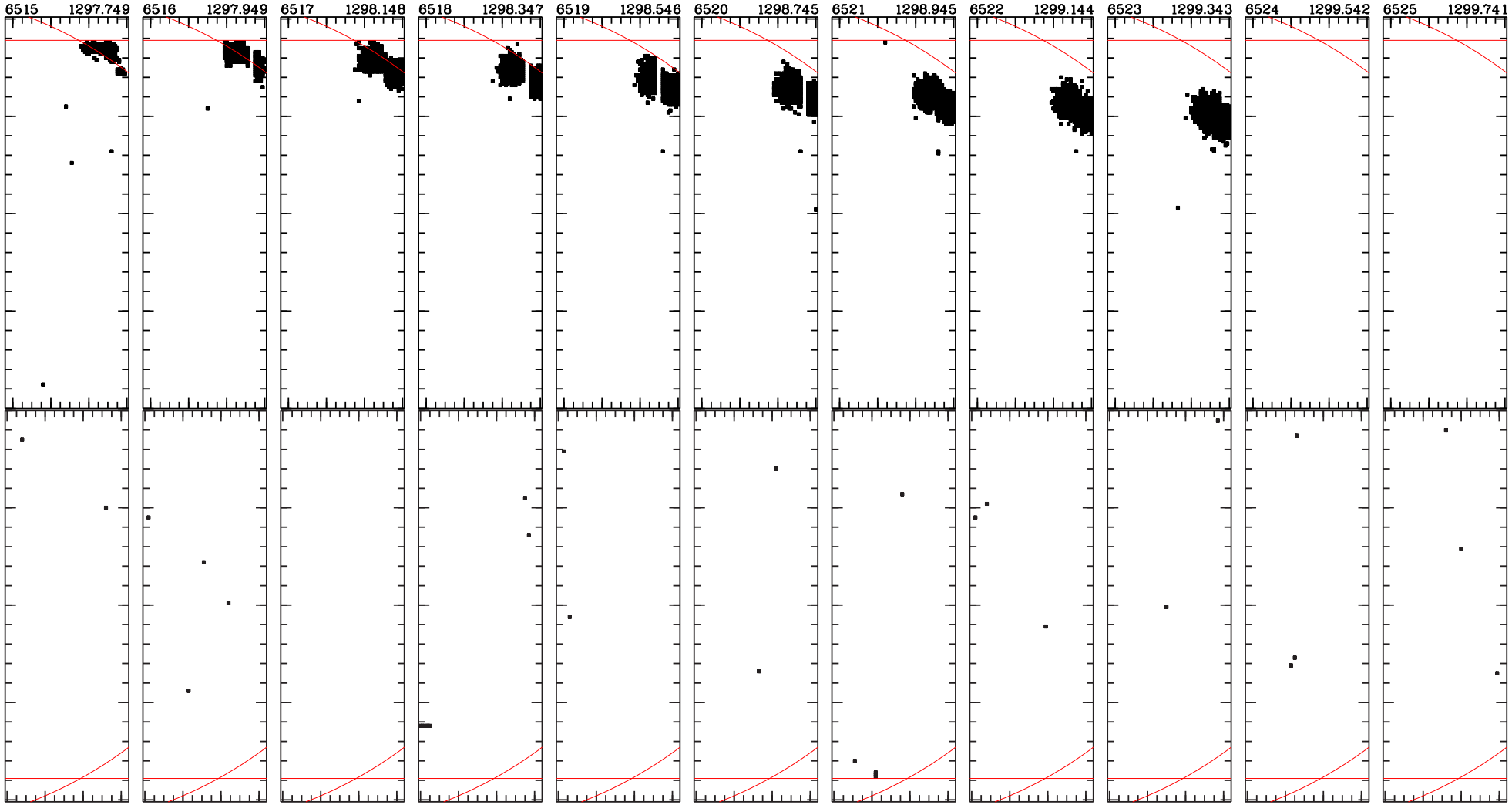
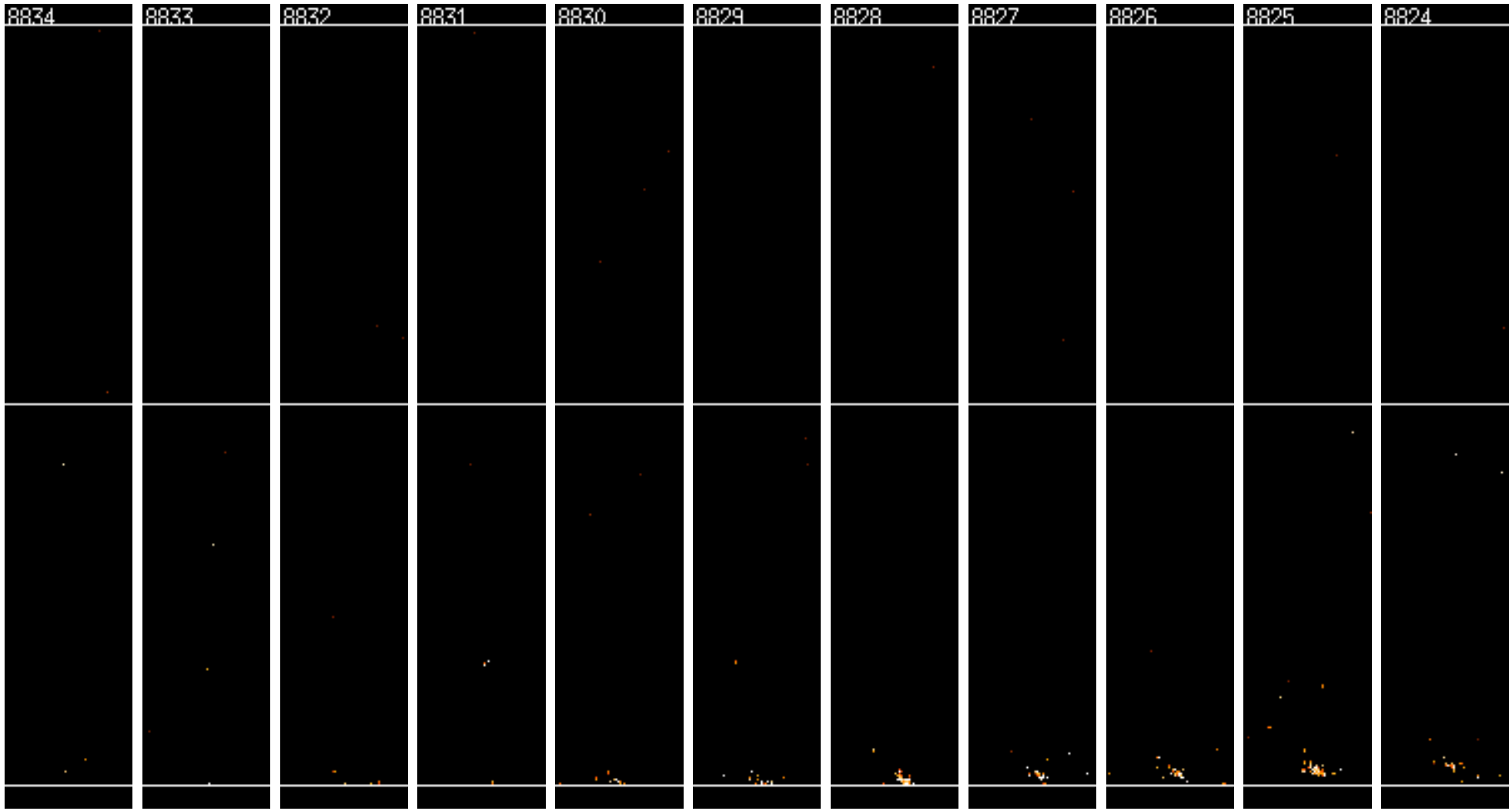
Star inside FOV (CCD5)



Bright X-ray source: pseudo-MIPs

- bright (hard) source: 30 cts/frame
- pile-up in 1 pixel in 1 frame above 3000 adu (15 keV)
- triggers MIP rejection scheme
- central columns of PSF rejected
- movie

Bright X-ray source



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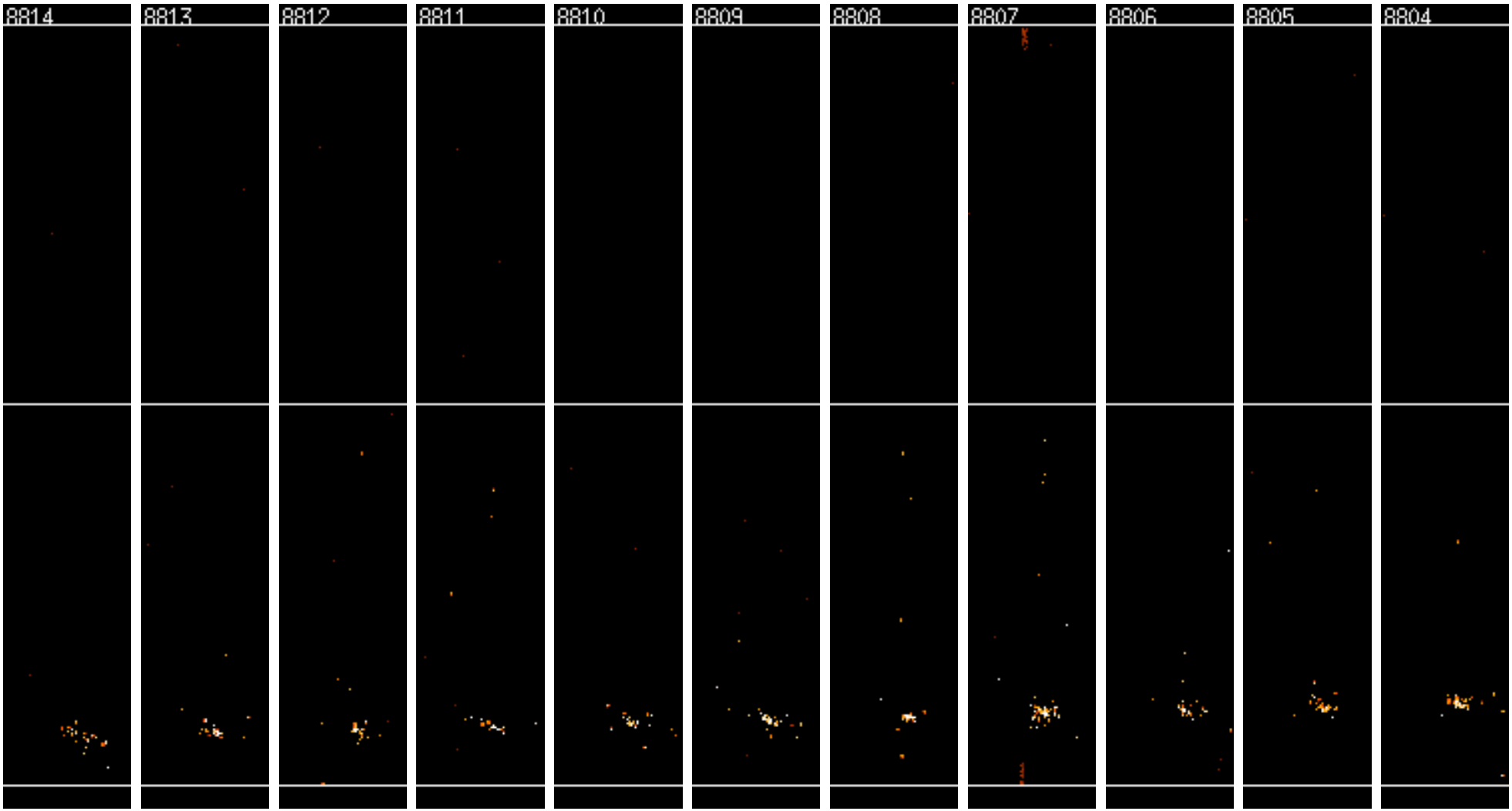
Bright X-ray source

Bright X-ray source



Particle Background

- use Closed + CalClosed exposures: 10 – 12 keV rate vs. time
- be careful of selection/scheduling bias!
- slews in Revs. 918 – 952 CalClosed (first + last slew IDLE)