

CTI change from 2003 October CME events

from Catherine Grant, MIT

- Large solar flares and coronal mass ejections occurred in late October, 2003.
- For reference, a CTI change of 1×10^{-6} corresponds to a maximum pulseheight change of about 0.1% at 5.9 keV and about twice that at 1.5 keV.
- The top panel of fig 1 shows the I-array CTI since January 2000 after removing the background correlation. The vertical dotted line marks the approximate time of the series of large CMEs. The bottom panel zooms in on the year 2003. The line is simple model for the CTI jump which takes the mean of data before and after the CME. The same number of CTI observations were used in both sets of data. Based on this model, the CTI increased by $(2.5 \pm 0.4) \times 10^{-6}$ or 1.8%.
- There is some uncertainty in this measurement because the cosmic ray background, which produces most of the sacrificial charge in the CCD, is much lower than before the CMEs. The particle background, as measured by the S3 high energy reject rate, is shown in Fig 2 over the same time periods. Once the particle environment returns to a more normal level, the CTI increase can be measured more accurately.
- Fig 3 is the same as Fig 1 only for the BI CCD S3. Based on this model, the CTI increased by $(1.0 \pm 0.2) \times 10^{-6}$ or 5.7%.

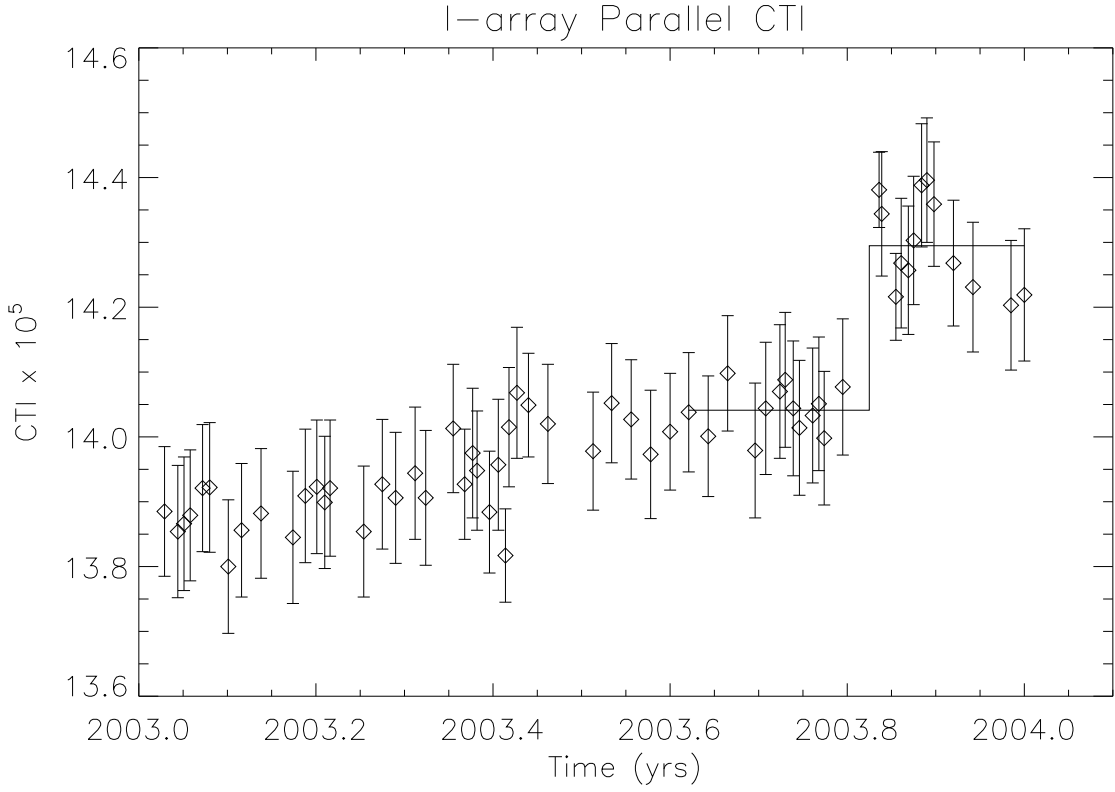
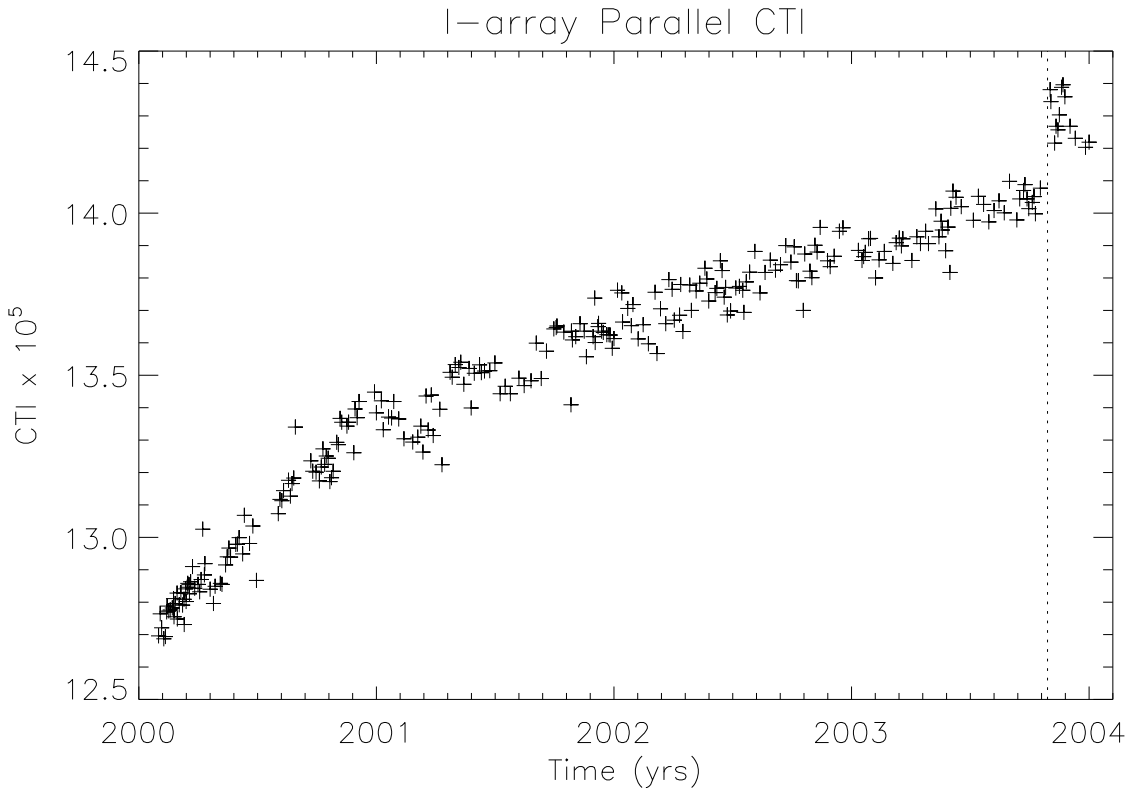
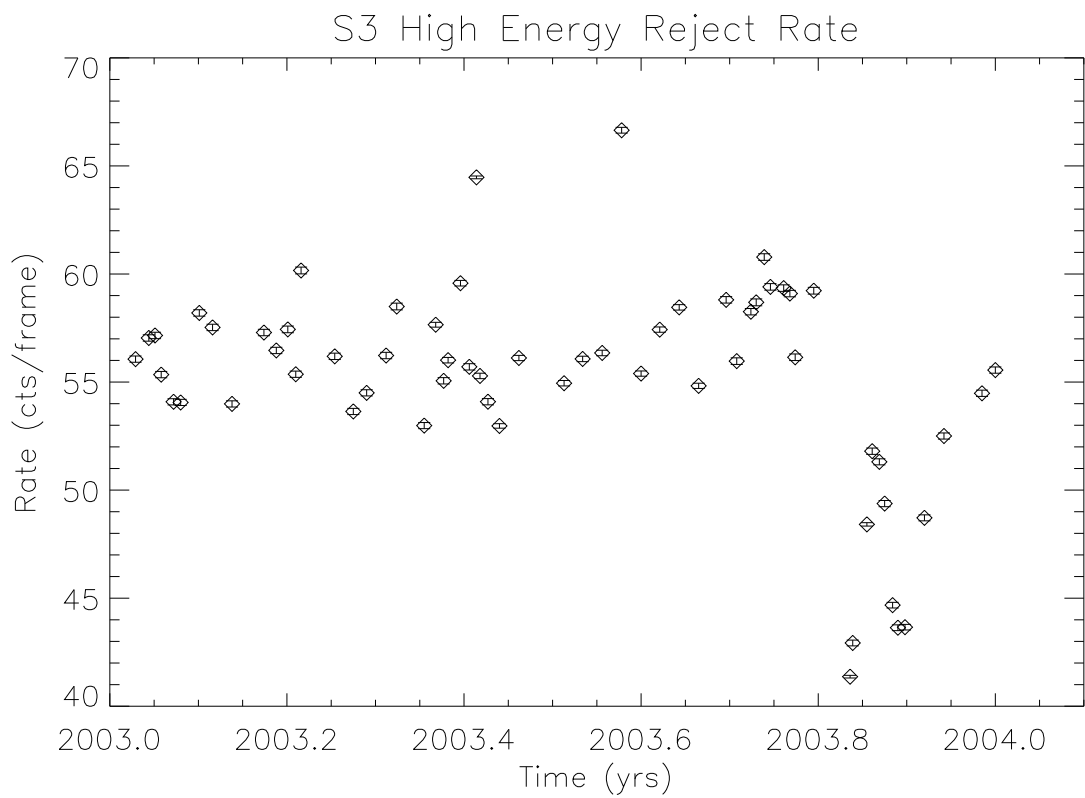
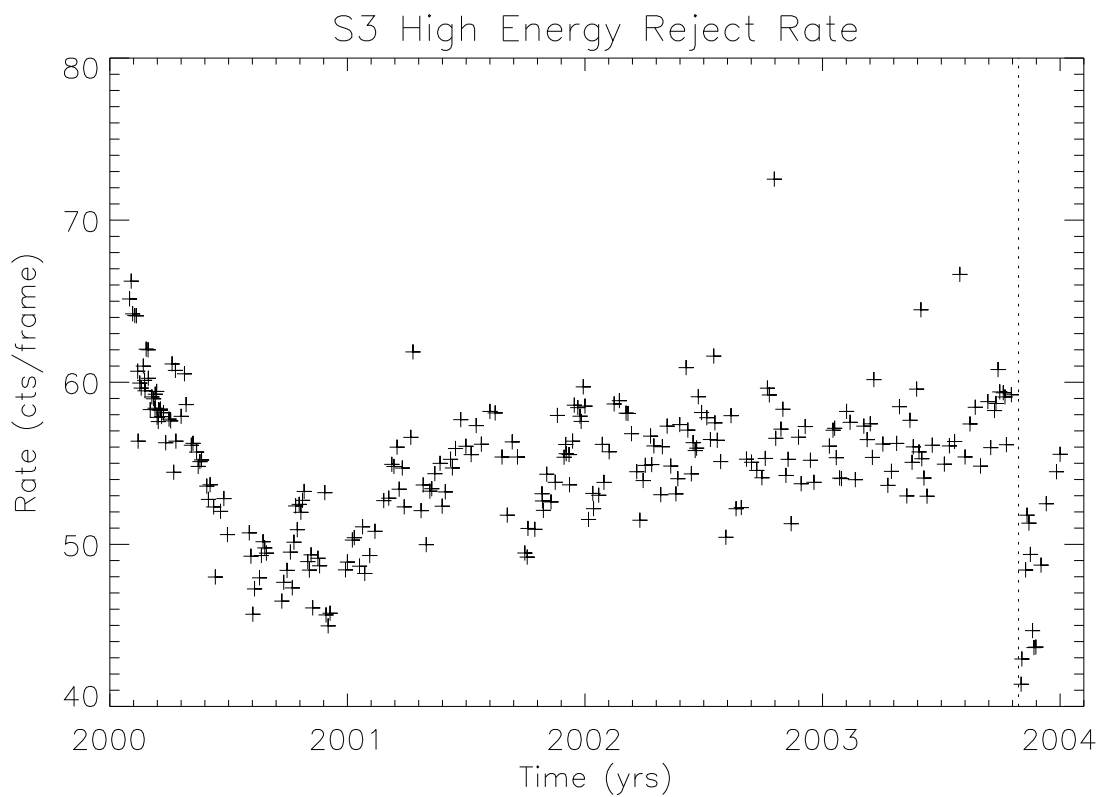


Figure 1: I-Array CTI (detrended).

Figure 2: Change in the S3 high-amplitude reject rate (a measure of the cosmic ray rate on ACIS).



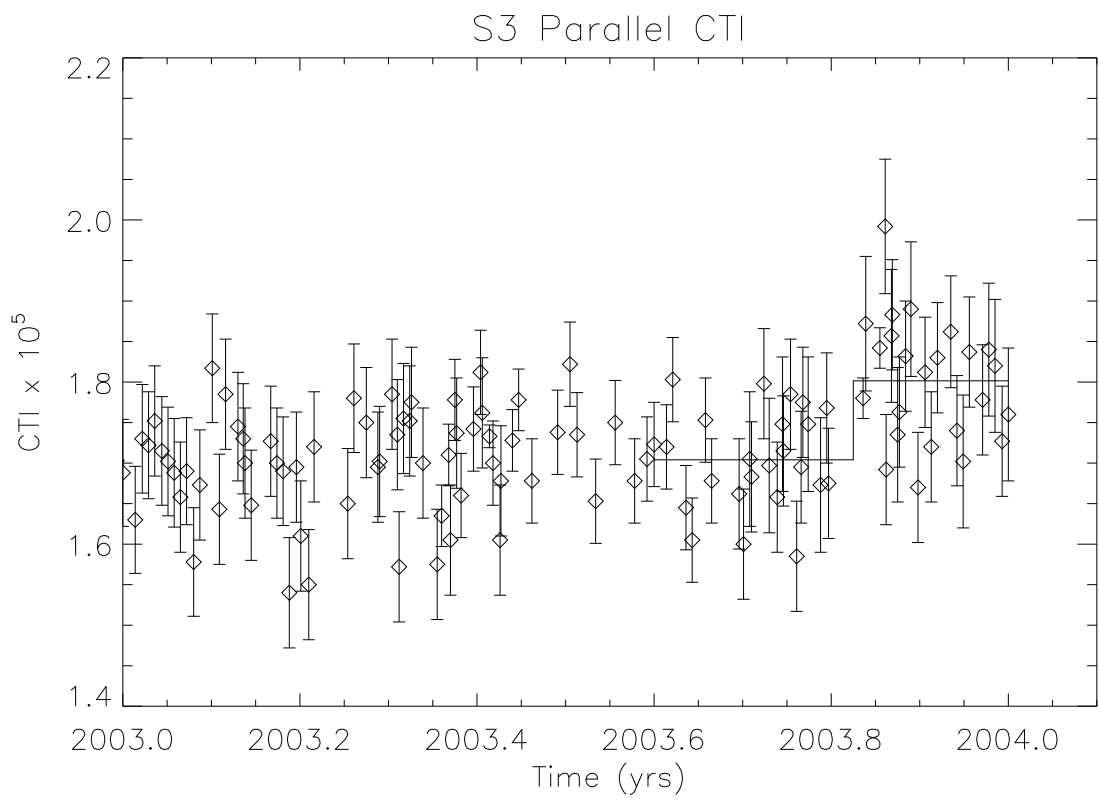
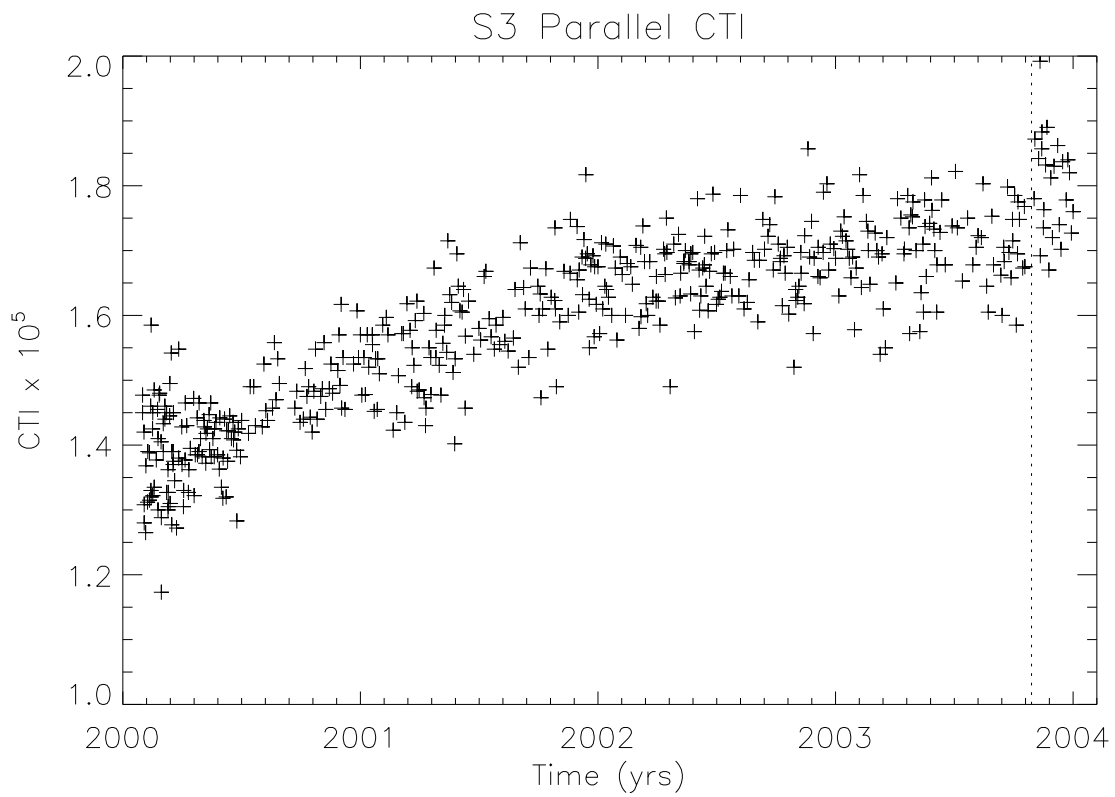


Figure 3: S3 CTI (detrended).

FEF, Gain, and Trap Map updates

30 October 2001

FEF files:

- Off-by-one error in `mkrmf` fixed, requiring new S3 FEF file.
- New S3 FEF file also includes more data points around the Si K edge (1.5–2.2 keV). This allows more accurate modeling of the jump discontinuities in instrument performance at this edge.
- Should be released in January 2004 CALDB release.

Gain:

- Time-dependent gain introduced into `acis_process_events`.
- Requires quarterly “Epoch” calibrations.
- So far, line widths are not changing measurably.

- New Epoch beginning declared for October 29, 2003 due to CME event.

CTI Trap Maps:

- CXC learning to generate new trap maps from the MIT PI team.
- New trap maps may or may not be needed in the event of a bakeout.