URL: http://cxc.harvard.edu/ciao3.4/caveats/acis_keywords.html
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Caveat: ACIS exposure time keywords

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The FITS keywords related to the exposure time of an ACIS observation are correctly described below. Note that the times below are `nominal times' based upon integer multiples of the 10 microsecond ticks of the ACIS clock. The ACIS clock, however, is stable to only 1 part in 10^5, hence `effective values' of these parameters, for a given observation, can be different from the nominal values by approximately this fraction. The time tags of ACIS events, however, are corrected to the spacecraft clock, which in turn is corrected to agree with ground−based clocks. This means, for example, that time tags of events in adjacent ACIS exposure frames can differ from the nominal value of TIMEDEL (described below) by approximately 1 part in 10^5.

For issues regarding the use of these keywords in various versions of the ACIS pipeline processed data, see the Caveats Regarding Ciao and Archive Data.

EXPTIME

The value of this keyword is the "static" exposure time for a frame. This time excludes the time during which charge is moved from the imaging region to the frame store region (0.04104 s). The time is quantized in units of 0.1 s with the shortest EXPTIME = 0.2 s. The standard value of EXPTIME = 3.2 s for TIMED mode ACIS observations. If an observation uses interleaved mode, then there are separate values of EXPTIME for the short and long frames (e.g. 0.2 s and 3.2 s, respectively).

TIMEDEL

The value of the keyword TIMEDEL represents the static exposure time for a frame plus the time required to transfer charge from the image region to the frame store region (0.04104 s):

```
TIMEDEL = EXPTIME + 0.04104 s.
```

For the standard TIMED mode ACIS observation where EXPTIME = 3.2 s, TIMEDEL = 3.24104 s. If an observation uses interleaved mode, then there are separate values of TIMEDEL for the short and long frames (e.g. 0.24104 s and 3.24104 s, respectively).

FLSHTIME

The value of this keyword represents the amount of time required to flush a CCD before a frame of data is obtained. A nonzero preflush is required if the value of EXPTIME is smaller than the time required to read−out one frame of data. In this case, some time is spent flushing the exposed region of the CCD to avoid transferring charge into the frame store region before the frame store has been entirely read out. Events that occur during a

preflush are discarded onboard. Therefore flushes are effectively "dead time." Under most circumstances, the value of FLSHTIME = 0.0 s. If an observation uses interleaved mode, then there are separate values of FLSHTIME for the short and long frames (e.g. 3.17032 s and 0.0 s, respectively).

ONTIMEn

The value of ONTIMEn is the sum of the good time intervals (GTIs) for CCD_ID = n, where n = 0, 1, 2, ..., or 9.

```
ONTIMEn = sum of GTIs
```

The GTIs should be integer multiples of TIMEDEL + FLSHTIME (i.e. integer multiples of the total time per frame). However, constraints on the quality of the aspect solution can lead to GTIs that include fractional portions of TIMEDEL + FLSHTIME. Since the GTIs differ from CCD to CCD, there is one ONTIMEn keyword for each CCD used for an observation. The value of the keyword ONTIME (with no suffix) is the same as the value of ONTIMEn for the CCD at the aim point of the telescope. If an observation uses interleaved mode, then there are separate values of ONTIMEn and ONTIME for the short and long frames.

DTCOR

This keyword is the "dead time" correction factor. It represents the fraction of the total time per frame that can contain useful X−ray data:

```
DTCOR = EXPTIME / (TIMEDEL + FLSHTIME).
```

The value should be greater than 0 and less than 1. If an observation uses interleaved mode, then there are separate values of DTCOR for the short and long frames (e.g. 0.058628 and 0.987337, respectively).

LIVTIMEn

The value of LIVTIMEn for CCD_ID = n, where n = 0, 1, 2, ..., or 9, is the total exposure time (i.e. "live time") for an observation. This time excludes the time it takes to transfer charge from the image region to the frame store region (0.04104 s per frame) and time during preflushes (if they are necessary):

```
LIVTIMEn = DTCOR * ONTIMEn.
```

Since the values of ONTIME can differ from CCD to CCD, there is one LIVTIMEn keyword for each CCD used for an observation. The value of the keyword LIVETIME is the same as the value of the LIVTIMEn of the CCD at the aim point of the telescope. If an observation uses interleaved mode, then there are separate values of LIVTIMEn and LIVETIME for the short and long frames.

EXPOSURn

The value of the keywords EXPOSURn should be identically the same as the value of the keywords LIVTIMEn, where n = 0, 1, 2, ..., or 9 for CCD_ID = n. The value of the keyword EXPOSURE is the same as the value of the keyword LIVETIME. If an observation uses interleaved mode, then there are separate values of EXPOSURn and EXPOSURE for the short and long frames.

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