5.6.2.2.4.3 ACIS_CCD_MON mta

ACIS_CCD_MON

Description: This tool creates and monitors ACIS grade and pha distribution files. This is the first portion of CTI trending.

Open Issues:

1. The time ranges for differencing are TBR.

Inputs:

- Level 0 ACIS event Files. SEE ACIS Level 0 ICD
- Level 1 ACIS event Files. SEE ACIS Level 1 ICD

Outputs:

- ACIS PHA histogram plots.(To web pages)
- ACIS grade distribution plots.(To web pages)
- Fits Files of weekly grade/PHA distributions.
- Fiducial file names:

```
acis<f><timestamp>N<reprocssnumber>_<CCDID>_<FEPID>_<fileType><level>.fits


     For Level 0 files [CCD 1, FEP 2]

  acisf01231237N000_1_2_pha0.fits
  acisf01231237N000_1_2_rawpha0.fits
  acisf01231237N000_1_2_crnpha0.fits
  acisf01231237N000_1_2_grade0.fits

     For Level 1 files [CCD 1]

  acisf01231237N000_1_energy1.fits
```

```
acisf01231237N000_1_pha1.fits
acisf01231237N000_1_crnpha1.fits
acisf01231237N000_1_grade1.fits
acisf01231237N000_1_pi1.fits
```

Control Parameters:

- Time: start day, stop day or stack of obs_IDs (lower priority).
- Instrument: CCDID (including all).
- Instrument: FEP (including all).
- Level: 1, 0.
- make_plot= yes, no

Algorithm:
This tool monitors the distributions of PHAs and Grades to determine sticky bits, and CTI (charge tansfer inefficenciey) problems.

1. **Level 0 PHA distribution**:

   - Open each *evt0.fits in the parameter range and extract Raw_phas, fltgrade, corn_pha,pha.
   - create four 1-D arrays: 1) 0 to 4096 for CORN_PHA and 2) 0 to max value of all PHAs. 3) 0 to 4096 for RAW_PHAs 4) FLTGRADE (0-255).
   - Raw PHA is an array of 1 to 25 members. Treat each member as an individual measurments.
   - Eor each mesument, increment the value of the array which corresponds to the member. (i.e. if PHA_RAW(i) =2039, then increment the value of the PHA_RAW histogram element 2039 by one).
   - Write each array as a separate fits file.
   - If Makeplot is true create the following plots:

```
                    L0  CCD_ID  FEP_ID            L0  CCD_ID  FEP_ID
                   |                                |
Number events      |                             N  |
                   |                                |
                   |                                |
                   +------------------              +------------------
                   0                 4096           0                ?
                       RAW PHA                             PHA


                    L0  CCD_ID  FEP_ID           L0  CCD_ID  FEP_ID
                   |                               |
Number events      |                            N  |
                   |                               |
                   |                               |
                   +------------------             +------------------
                   0                 255           0                 4096
                        FLTGRADE                       CORNER PHA
```

2. **Level 1 distributions**:

    - Open each *evt1.fits in the parameter range and extract FLTGRADE, PHA, PI, ENERGY and CORN_PHA. Note that not all columns are available in all ACIS modes.
    - create Four 1-D arrays 1) 0 to 4096 for CORN_PHA and 2) 0 to max value of all PHAs. 3) PI (0- max value) 4) energy (0-1,000,000), 5) FLTGRADE (0-255). Set all values to zero.
    - For each PHA (corn_pha, PI and ENERGY), increment the value of the array which corresponds to tha value.
    - Write each array as a separate fits file.
    - If Makeplot is true create the following plots:

```
                  L1 CCD_ID  FEP_ID           L1  CCD_ID  FEP_ID
                  |                           |
Number events     |                       N   |
                  |(<--logscale-->)           |
                  |                           |
                  +-------------------        +-------------------
                  0                 1E6       0                 ?
                        ENERGY                         PHA


                   L1 CCD_ID  FEP_ID      L1  CCD_ID  FEP_ID
                  |                           |
Number events     |                       N   |
                  |                           |
                  |                           |
                  +-------------------        +-------------------
                  0                 255       0                   4096
                       FLTGRADE                    CORNER PHA
```

```
                 L1  CCD_ID  FEP_ID
                 |
Number events    |
                 |
                 |
                 +-----------------
                 0                ?
                          PI
```

3. **Trending procedure**:

   Do the following once per seven day:

   - For L1 there are 6 modes and 10 CCDs to deal with. For each mode and CCD, find all the data for a given CCD associated with that mode for each mode create 5-6 (x10) files (NOTE THAT THE MONTHLY FILE IS ABOUT THE SAME SIZE AS ANY GIVEN OBI FILE) col1 = pha (or crnpha or rawpha or grade) going from tlmin to tlmax step by one. col2 = number of occurrences of that value.
   - The Monthlies are created by adding column 2 of the last 4 (or less) like monthly files. We keep the monthlies in this case. *Yes this does break the paradigm. (What's a good paradigm if you don't break it?)*
   - Differences are created by subtracting the column 2 of last month from this month.
   - The Annuals are created by adding column 2 of the last 12 (or less) like monthly files.

     Do the following once per 28 days:

   - L0 is handled exactly the same way L1 is except instead of 6 possible modes there are about 360 possible L0 files (#FEP X #CCDs X #modes). Only a few of these will occur in a given Month. We update only those files and images.

The following products will be created on a routine basis and posted to the events web page. The associated fits files are to be archived.

- ALL 9 of the above graphs for all mission time (Called “Mission” file produced once/7 days)
- ALL 9 of the above graphs for the past 7 days (Called “weekly” file produced once/7 days)
- ALL 9 of the above graphs for the past 28 days.(Called “Monthly” file produced once/7 days)
- ALL 9 of the above graphs produced by differencing the last two “monthly files”.(Called “Monthly Diff” file produced once/7 days)

Directory structure:

```
TRENDS
   photons
      Weekly
         ACIS
L1
  CCDS0
                      TE-f
                      TE-f-w/B
                      TE-VF
                      TE-G
                      CC-F
                      CC-G
   CCDS1
                      ....
 CCDI3
      Monthly
         ACIS
L1
                  TE-f,
                  TE-f-w/B,
                  TE-VF,
                  TE-G,
```

```
                CC-F,
                CC-G
              L0
CCDS0
  FEP0
                    TE-f,
                    TE-f-w/B,
                    TE-VF,
                    TE-G,
                    CC-F,
                    CC-G
                  FEP1
                    TE-f,
                    TE-f-w/B,
                    TE-VF,
                    TE-G,
                    CC-F,
                    CC-G

....
       CCDI3
         ...
         FEP5
                    TE-f,
                    TE-f-w/B,
                    TE-VF,
                    TE-G,
                    CC-F,
                    CC-G
      Monthly difference
```

```
Special keywords in the Primary Header
CREATOR = 'acis_ccd_mon - Version 0.0'
INSTRUME= 'ACIS    '              / HRC, ACIS, EPHIN, S/C subsystems
Detname = 'ACIS    '            / HRC-I or HRC-S
END
```

```
                      Principal HDU (HRC) keywords

EXTNAME = 'ACIS_CCD_MON'           / EXTNAME, usually identical to HDUNAME
CHECKSUM= '0000000000000000'   / ASCII encoded HDU checksum
DATASUM = '         0'         / Data unit checksum written in ASCII

HDUNAME = ''ACIS_CCD_MON'           / Dataset name; usually identical to EXTNAME
HDUSPEC = ''ACIS_CCD_MON specification Revision 0.2'
HDUDOC  = 'ASC-FITS-1.2: McDowell, Rots: ASC FITS File Designers Guide'
HDUVERS = '1.0.0   '
HDUCLASS= 'ASC     '
HDUCLAS1= 'SPACIALDATA'
HDUCLAS2= 'DOSE '
HDUCLAS3= 'ACIS'
CONTENT = 'ACIS_DOSE_TE-f'     / TE-f, TE-f-w/B, TE-VF, TE-G, CC-F, CC-G
if L0 then include
CCDID   ='I4'                  / CCDID (if specified)
FEPID   =                    3 / FEPID (if specified)
```

Release: 4

Group: SCIOPS

Analysis Domain: Spatial

DS Tool Class: 2

DS Tool Category: Monitoring

Spec Name: acis_ccd_mon.tex

Spec Category: New

Code Type: ASCDS

Code Source: New

This Revison: 0.2 - by SJW

Change control: 0.1 to 0.2 - Tried to better explain trending

Last Edit: April 6, 1999