newsiam

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Abstract

Generate new SIAM from the current SIAM and a set of offset pointing angles

1 Instruments/Modes

Not applicable

2 Use

Not applicable.

3 Description

The SIAM is used to point the satellite such that a nominal on-axis source position is imaged onto a specific point on the detectors. Due to the development of bad pixels in the imaging instruments, it will likely be necessary in future to slightly modify this prime pointing. The purpose of this task is to calculate new SIAM elements from existing SIAM and requested angular rotations about the space-craft axis.

New angles for the SIAM are calculated from shifts of the pointing of the instrument given in parameter `Instrument` relative to the pointing obtained by using the SIAM that is specified by parameter `siamset`.

The star-tracker attitude is calculated for a given bore-sight of the chosen instrument of Ra=0, Dec=0, APos=0 (similar to *strbs*/**ccftools**). Using this, the positions of 5 test sources in the FOV of the instrument are calculated. The test sources have celestial positions of

Source Number	Ra (arcmin)	Dec (arcmin)
1	0	0
2	15	0
3	−15	0
4	0	15
5	0	−15

This establishes the position of a set of sources in the FOV of the instrument (similar to *srcinfov*/**ccftools**). The FOV angles for these test sources are shifted by the intended offsets (parameters `ry` and `rz`). These values are used as further reference.

The angles of the SIAM are iteratively modified and the calculations of `strbs` and `srcinfov` are repeated, until the spatial distances of these newly calculated FOV angles to those of the reference FOV angles is minimal.

Test sources close to the limit of the FOV are necessary to also constrain the rotation of the third angle of the SIAM (rotation around X). Obviously some redundant is included at marginal extra cost on computing time.

The output can directly pasted into the SIAM.

4 Parameters

This section documents the parameters recognized by this task (if any).

Parameter	Mand	Type	Default	Constraints
siamset	yes	string	/data/cerd/CCF/ccfdev/packages/xmm-siam/XMM_BORESIGHT_for_siam.matrix0005.CCF	

DataSet containing the SIAM angles in BoreSight CCF format. (see comments)

ry	yes	float	0	−3600–3600

shift of source in the FOV of the instrument corresponding to a rotation of the space-craft around the Y-axis in arcsec

rz	yes	float	0	−3600–3600

shift of source in the FOV of the instrument corresponding to a rotation of the space-craft around the Z-axis in arcsec

5 Errors

This section documents warnings and errors generated by this task (if any). Note that warnings and errors can also be generated in the SAS infrastructure libraries, in which case they would not be documented here. Refer to the index of all errors and warnings available in the HTML version of the SAS documentation.

InstrNotFound *(error)*
The SIAM-set does not contain a set of angles for the given instrument. Probably this SIAM-set is incomplete.

6 Input Files

1. SIAM matrix, but formatted as a BoreSight constituent.

7 Output Files

None

8 Algorithm

```
read input parameters
find angles of the SIAM corresponding to current instrument

STATT:
calculate pointing of the star-tracker for ref attitude

SRCinFOV:
calculate FOV positions of 5 test sources

intended FOV positions:
add offsets (ry,rz) to FOV positions of 5 test sources

minimize distance of "intended FOV positions" from SRCinFOV positions
   by of iteration SIAM angles and re-calculating STATT and SRCinFOV.

print resulting angles
```

9 Comments

- Example: The SIAM should be changed such that the RGS angle of incidence onto the gratings α is increased by 10 arcsec. Due to the focusing of the XRT, thus amounts to an off-axis angle of
$$\frac{L}{F}\,\Delta\alpha = \frac{67}{75} \times 10 = 8.9333$$
The dispersion of the RGS is along the Z-axis, and the gratings are arranged such that an increase of α is achieved by a rotation of the spacecraft around the Y-axis in positive sense. Hence the task is called with
`newsiam ry=8.9333`
- occasionally the minimization fails at the SLATEC level (SLATEC error from `DNLS1E`). This cannot be circumvented, but slightly different values of one of the input parameters remedy this.

9.1 Procedure for Generating a new SIAM

This is the procedure to be used:

1. execute **newsiam** to obtain the rotation angles
2. store these angles into the CCF package `xmm-siam`, file `siam.dat`
3. `make` creates the SIAM CCF, that has to be sent to VILSPA
4. in `siam.desc` you need to change the type from `siam` to `boresight`
5. in `siam.dct` change the name of the table from `SIAM` to `BORESIGHT`
6. execute `make`, which generates a CCF with the structure of a BORESIGHT file
7. execute *ccfextseq*/**ccftools** `--sets=boresightfile`, where `boresightfile` is the name of the file you just generated in the previous step
8. execute **siamgen** `--ccffiles=boresightfile > siam.matrix`*nnnn*; this is the SIAM matrix that needs to be sent to flight-dynamics

References