

spi_psd_algopars

User Manual

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Note to the user

This software has been written to analyse data of the SPI telescope onboard INTEGRAL. Particular care has been taken in making the software user friendly and well documented. If you appreciated this effort, and if this software and User Manual were useful for your scientific work, the author would appreciate a corresponding acknowledgment in your published work.

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1 Introduction

The executable `spi_psd_algopars` is part of the SPI PSD analysis package. It creates a PSD algorithm parameters structure of type `SPI.-ALGO-PSD` and a compatible PSD discrimination parameters structure of type `SPI.-DISC-PSD` on basis of the specified task parameters. PSD algorithm parameters are uplinked together with PSD library templates to the PSD sub-assembly, and the `SPI.-ALGO-PSD` data structure holds a precise copy of the uplinked parameters. PSD discrimination parameters are needed for pulse shape discrimination optimisation, and the created data structure reflects the onboard discrimination parameters that can be used as default parameters for onground pulse shape discrimination.

The executable `spi_psd_algopars` is written in the ANSI C++ language. It has been developed under ISDC support platform 4.1 and requires `spi_psdlib` 1.6.0 and `spi_toolslib` 1.8.0 or higher.

2 Getting started

Before installing `spi_psd_algopars`, make sure that the ISDC support platform 4.1 or higher is installed on your system, and that you have installed the libraries `spi_psdlib` 1.6.0 and `spi_toolslib` 1.8.0 or higher.

After downloading the `spi_psd_algopars.tar.gz` file, step into a directory that should hold the distribution, move the `spi_psd_algopars.tar.gz` file into this directory and type:

```
$ gunzip spi_psd_algopars.tar.gz
$ tar xvf spi_psd_algopars.tar
```

The first command uncompresses the distribution file, the second unpacks the files.

Before configuration, the distribution needs to be reset to a clean state. To do this, type

```
$ make distclean
```

Then, configure the distribution. It is assumed here that you have previously installed the ISDC support platform, thus you should type

```
$ ~/bin/ac_stuff/configure
```

Finally, build the distribution by typing

```
$ make global_install
```

To perform a unit test, type

```
$ make test
```

3 Parameter file

```
#####
#
#           Centre d'Etude Spatiale des Rayonnements           #
#           (in collaboration with ISDC)                       #
#
#           SPI PSD ANALYSIS                                   #
#
# -----#
#
# File:      spi_psd_algorithms.par                            #
# Version:   1.2.0                                            #
# Component: analysis                                         #
#
# Author:    Juergen Knoedlseder                              #
#            knodlseder@cesr.fr                               #
#            CESR                                             #
#
# Purpose:   Parameter file of the SPI PSD algorithm parameter #
#            setting executable                               #
#
# History:   1.2.0 21-Aug-2002 First ISDC delivery (Rev. 2)  #
#
#####
#
# Output DOLs
#=====
algDOL,s,ql, "algo.fits",,,"PSD algorithm parameters filename"
disDOL,s,ql, "disc.fits",,,"PSD discrimination parameters filename"
#
# Task parameters
#=====
useset,i,ql, -1,-1,1, "Use template set 0 or 1 (-1: use both)"
#
# Algorithm parameters
#=====
ntplib00,    i, h,    25,  0,    38, "Det. #00 : Number of templates in library"
ntplib01,    i, h,    26,  0,    38, "Det. #01 : Number of templates in library"
ntplib02,    i, h,    24,  0,    38, "Det. #02 : Number of templates in library"
ntplib03,    i, h,    27,  0,    38, "Det. #03 : Number of templates in library"
ntplib04,    i, h,    25,  0,    38, "Det. #04 : Number of templates in library"
ntplib05,    i, h,    25,  0,    38, "Det. #05 : Number of templates in library"
ntplib06,    i, h,    25,  0,    38, "Det. #06 : Number of templates in library"
ntplib07,    i, h,    25,  0,    38, "Det. #07 : Number of templates in library"
ntplib08,    i, h,    25,  0,    38, "Det. #08 : Number of templates in library"
ntplib09,    i, h,    25,  0,    38, "Det. #09 : Number of templates in library"
ntplib10,    i, h,    25,  0,    38, "Det. #10 : Number of templates in library"
ntplib11,    i, h,    25,  0,    38, "Det. #11 : Number of templates in library"
ntplib12,    i, h,    25,  0,    38, "Det. #12 : Number of templates in library"
ntplib13,    i, h,    26,  0,    38, "Det. #13 : Number of templates in library"
ntplib14,    i, h,    25,  0,    38, "Det. #14 : Number of templates in library"
ntplib15,    i, h,    25,  0,    38, "Det. #15 : Number of templates in library"
```

```

ntplib16,      i, h,    24,  0,   38, "Det. #16 : Number of templates in library"
ntplib17,      i, h,    24,  0,   38, "Det. #17 : Number of templates in library"
ntplib18,      i, h,    24,  0,   38, "Det. #18 : Number of templates in library"
ttpfirst00,    i, h,     6,  0,   80, "Det. #00 : First template TTP"
ttpfirst01,    i, h,     6,  0,   80, "Det. #01 : First template TTP"
ttpfirst02,    i, h,     6,  0,   80, "Det. #02 : First template TTP"
ttpfirst03,    i, h,     6,  0,   80, "Det. #03 : First template TTP"
ttpfirst04,    i, h,     6,  0,   80, "Det. #04 : First template TTP"
ttpfirst05,    i, h,     6,  0,   80, "Det. #05 : First template TTP"
ttpfirst06,    i, h,     6,  0,   80, "Det. #06 : First template TTP"
ttpfirst07,    i, h,     6,  0,   80, "Det. #07 : First template TTP"
ttpfirst08,    i, h,     6,  0,   80, "Det. #08 : First template TTP"
ttpfirst09,    i, h,     6,  0,   80, "Det. #09 : First template TTP"
ttpfirst10,    i, h,     6,  0,   80, "Det. #10 : First template TTP"
ttpfirst11,    i, h,     6,  0,   80, "Det. #11 : First template TTP"
ttpfirst12,    i, h,     6,  0,   80, "Det. #12 : First template TTP"
ttpfirst13,    i, h,     6,  0,   80, "Det. #13 : First template TTP"
ttpfirst14,    i, h,     6,  0,   80, "Det. #14 : First template TTP"
ttpfirst15,    i, h,     6,  0,   80, "Det. #15 : First template TTP"
ttpfirst16,    i, h,     6,  0,   80, "Det. #16 : First template TTP"
ttpfirst17,    i, h,     6,  0,   80, "Det. #17 : First template TTP"
ttpfirst18,    i, h,     6,  0,   80, "Det. #18 : First template TTP"
nstartbins,   i, h,    25,  0,   79, "Number of bins in start block"
nendbins,     i, h,    25,  0,   79, "Number of bins in end block"
timemid,      i, h,    50,  0,   79, "Mean time bin"
pulsedurmin,  i, h,    20,  0,   79, "Minimum pulse duration"
pulsedurmax,  i, h,    50,  0,   79, "Maximum pulse duration"
baseavgfract, r, h,   0.0, 0.0, 1.0, "Baseline averaging fraction"
baseoutlier,  i, h,   255,  0,  255, "Baseline outlier"
baseoutliermax, i, h,    0,  0,  255, "Maximum number of baseline outliers"
minbase,      i, h,    15,  0,  511, "Minimum baseline"
maxbase,      i, h,    75,  0,  511, "Maximum baseline"
minpulse,     i, h,     0,  0, 65535, "Minimum pulse area"
maxpulse,     i, h, 65535,  0, 65535, "Maximum pulse area"
pulsesaturate, i, h,   510,  0,   511, "Pulse saturation value"
thresfract,   r, h,  0.002, 0.0, 1.0, "Threshold fraction"
energy0,      i, h,     0,  0, 65535, "Energy #0"
energy1,      i, h,   250,  0, 65535, "Energy #1"
energy2,      i, h,   500,  0, 65535, "Energy #2"
energy3,      i, h,  1000,  0, 65535, "Energy #3"
energy4,      i, h,  1500,  0, 65535, "Energy #4"
energy5,      i, h,  2000,  0, 65535, "Energy #5"
energy6,      i, h,  3000,  0, 65535, "Energy #6"
energy7,      i, h,  4000,  0, 65535, "Energy #7"
energy8,      i, h,  6000,  0, 65535, "Energy #8"
energy9,      i, h,  8000,  0, 65535, "Energy #9"
dttpmin,      i, h,     3,  0,   255, "Minimum delta TTP"
dttpmax,      i, h,     3,  0,   255, "Maximum delta TTP"
maxthrneg,    r, h,   0.40, 0.0, 1.0, "Maximum threshold for negative DTTP"
maxthrpos,    r, h,   0.40, 0.0, 1.0, "Maximum threshold for positive DTTP"
#
# Standard parameters
#=====

```

clobber, b, h, no,,, "Overwrite existing data structure ?"

The following parameters have to be specified:

- **algDOL**: specifies the output DOL of the algorithm parameters. Note that the extension [SPI.-ALGO-PSD] is not required and one can simply specify the filename.
- **disDOL**: specifies the output DOL of the discrimination parameters. Note that the extension [SPI.-DISC-PSD] is not required and one can simply specify the filename. The discrimination parameters may reside in the same file as the algorithm parameters.
- **useset**: specifies for which template set the algorithm and discrimination parameters should be created. If -1 is specified, identical parameters are created for both sets.
- **ntplibn**: specifies the number of library templates for each detector
- **ttfirstn**: specifies the TTP value of the first template for each detector. It is assumed that the subsequent templates have no TTP value gaps, hence that the TTP values subsequently increase by one.
- **nstartbins**: specifies the number of pulse bins that should be used for the front baseline determination (unique value for all 19 detectors)
- **nendbins**: specifies the number of pulse bins that should be used for the rear baseline determination (unique value for all 19 detectors)
- **timemid**: specifies the time in units of 10 ns that separates between front and rear baseline determination. If the pulse peaks before this time, the rear baseline information is used. If the pulse peaks after this time the front baseline information is used (unique value for all 19 detectors)
- **pulsedurmin**: specifies the minimum pulse duration (unique value for all 19 detectors)
- **pulsedurmax**: specifies the maximum pulse duration (unique value for all 19 detectors)
- **baseavgfract**: specifies the fraction of the baseline that is determined by averaging over the last received pulse shapes. If 0.0 is specified, no baseline averaging is selected and this is the recommended configuration (unique value for all 19 detectors)
- **baseoutlier**: specifies the difference between the average baseline and the baseline of the actual pulse in units of digitisation steps (digits) that leads to a baseline outlier event (unique value for all 19 detectors)
- **baseoutliermax**: specifies the maximum number of subsequent baseline outliers that leads to a reset of the baseline average (unique value for all 19 detectors)
- **minbase**: specifies the minimum baseline level (unique value for all 19 detectors)
- **maxbase**: specifies the maximum baseline level (unique value for all 19 detectors)
- **minpulse**: specifies the minimum pulse area (unique value for all 19 detectors)
- **maxpulse**: specifies the maximum pulse area (unique value for all 19 detectors)
- **pulsesaturate**: specifies the pulse saturation value (unique value for all 19 detectors)
- **thresfract**: specifies the pulse threshold fraction that is employed for pulse start and end determination (unique value for all 19 detectors)

- **energy n** : specifies the energy bins for pulse shape discrimination in units of pulse area. The onboard discrimination scheme allows for an energy dependent onboard discrimination and these values determine the 10 energy bins. The algorithm always uses the discrimination parameters that correspond to the closest energy bin (unique value for all 19 detectors)
- **dttpmin**: maximum time-to-peak difference that leads to a single site event in case the the time-to-peak difference is negative (unique value for all 19 detectors)
- **dttpmax**: maximum time-to-peak difference that leads to a single site event in case the the time-to-peak difference is positive (unique value for all 19 detectors)
- **maxthrneg**: maximum smaller peak amplitude that leads to a single site event in case the the time-to-peak difference is negative (unique value for all 19 detectors)
- **maxthrpos**: maximum smaller peak amplitude that leads to a single site event in case the the time-to-peak difference is positive (unique value for all 19 detectors)
- **clobber**: standard parameter (see Common User Manual)
- **mode**: standard parameter (see Common User Manual)

4 Interface definition

`spi_psd_algopars` creates two data structures (`SPI.-ALGO-PSD` and `SPI.-DISC-PSD`) that may reside in a single file. If the file exists already on entry, the content of the data structures is replaced.

5 Algorithm

No special algorithm is defined so far.

6 Error codes

7 Error codes

The ISDC error code domain of `spi_psd_algopars` is defined from `-230300` to `-230399`, yet no proper error code has been defined in `spi_psd_algopars` so far. However, `spi_psd_algopars` may return errors of ISDC support libraries (e.g. DAL, PIL, or RIL) or `spi_psdlib` or `spi_toolslib` error codes.