Imager Functional Tests Description
HSI-MI&T-IMGR-FTD

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HESSI Functional Test Procedure Description

1   Introduction

1.1   Purpose

The following paper describes the parameter tables used for the imager functional tests as described in HSI-MI&T-IMGR-FT, gives examples of the results and the allowed limits of rms noise, and offset values of SAS and RAS

2   Description of Parameter files

Parameter files can be generated using the programs on SSL SolarSoftTree using his_as_ptedit:

2.1   How to Start ADP Parameter table Editor

On sunbeam as hessiops:

procs

cd INST/INTONLY

idl

IDL>hsi_as_ptedit

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2.2 Dark Level/ Sensitivity Modes

This mode images are produced and the mode is used to check noise immunity of SAS / RAS. The bin size is 0.5mV/ch. There are two rates: low rate (52kbyte/sec) and high rate (77kbyte/sec). The mode should be used in all possible configuration, especially for RAS in the cold mode.

PROC v6s0r0_001: Image Mode, Dark level /sensitivity low rate

SAS Image 8Hz,Mode 0 (0.5mV/ch); RAS image int time =220 (~8.8msec), image ratio 10 (11 images/sec) Mode 0 (0.5mV/ch)

PROC v6s0r0_001: Image Mode :Dark level /sensitivity high rate

SAS Image 20Hz,Mode 0 ; RAS image int time =220 (~8.8msec), image ratio 6 (18 images/sec) Mode 0 (0.5mV/ch)

2.3 Offset level mode

In this mode images are generated in low rate mode measuring the offset of RAS/SAS in 2mV/ch sensitivity. This mode should be run periodically to check the stability of the system. For RAS it important to now also in cold conditions, since it is used in orbit to adjust the Earth shine threshold.

PROC v6s3r6_001: Image Mode, offset level low rate

SAS Image 8Hz,Mode 3 (2mV/ch); RAS image int time =220 (~8.3msec), image ratio 10 (11 images/sec) Mode 6 (2mV/ch)

2.4 Internal LED Mode of SAS and RAS

In this mode internal LEDs are fired. Images are collected in the same low/high mode as above. For SAS ever every image should have an "LED peak, for RAS only every 16th images before applying the image ratio (10 in low rate mode, 6 in high rate mode). The mode can be used to check the response of RAS SAS. It will have large odd/even effect and fluctuation due to of LED power variation.

PROC v6s4r4_001: Image Mode, internal LED low rate

SAS Image 8Hz,Mode 4 (0.5mV/ch); RAS image int time =220 (~8.3msec), image ratio 10 (11 images/sec) Mode 4 (0.5mV/ch)

PROC v6s4r4_001 :Image Mode, internal LED high rate

SAS Image 128Hz ratio 2, Mode 4 (LED, 0.5mV/ch) ;RAS image int time =220 (~8.3msec), image ratio 6 (18 images/sec) Mode 4 (every 16th frame before division LED on, 0.5mV/ch)

2.5 Communication mode

This mode is used in case of problems. It checks the communication between the RAS/SAS and the ADP. See plots for details

PROC v6s6r7_001: Image Mode, Communication Test Mode

SAS Image 8Hz,Mode 6 (5A5A pattern) ; RAS image int time =220 (~8.3msec), image ratio 10 (11 images/sec) Mode 7 (channels 0 to 1023 counts 1 to 1023 and channels 1024 to 2047 counts 1 to 1023)

2.6 RAS/SAS event/limb Mode, Orbit Simulation

This mode generates a realist orbit situation, using for SAS the internal LEDs and for RAS an external laser for star generation (20msec duration, 10Hz) and 2 sec on, 2 sec off LED generated Earth shine. After Earth shine a ~0.4sec "after glow reading is introduced. Therefore events

should be on every 4 sec for about 1.6 sec. Images are acquired with a reduction factor of 1:1000, Needs RAS GSE! See above how to operate.

PROC v6s0r0ES_001: **SAS dark level, RAS Star Test with Earth shine**

No SAS, RAS int. time =220 (8.3msec) Threshold=250, Mode:0, Image ratio:1/1000 (~1 image in 11sec), event global threshold 250,ES Thr=16, after glow reading =30

PROC v6s0r0ES_002: SAS dark level, RAS Star Test with Earth shine

SAS Image 8Hz,Mode 0 (0.5mV/ch); RAS int. time =220 (8.3msec) Threshold=250, Mode:0, Image ratio:1/1000 (~1 image in 11sec), event global threshold 250,ES Thr=16, after glow reading =30

PROC v6s0r0ES_003: **SAS dark level, RAS Star Test with Earth shine**

SAS Image 128Hz,ratio 2,Mode 0 (0.5mV/ch); RAS int. time =220 (8.3msec) Threshold=250, Mode:0, Image ratio:1/1000 (~1 image in 11sec), event global threshold 250,ES Thr=16, after glow reading =30

3 Analysis of the Data and Acceptance Limits

The *.ssr files are SSR header stripped and the resulting *.dat files sync stripped. The resulting *.bin files are analyzed with the wave program **ana_rs3.pro** by Sam Krucker or PSI (AZ). Sample plots of the different modes are given in the appendix.

3.1 Acceptance limits of the dark level/ sensitivity functional tests

The dark level / sensitivity analysis is done with mode=3 of the **ana_rs3** program and selection for RAS the channel limits [10,2000], (SAS default value [1,2047])

The acceptance limits are given in the following table:

Acceptance Table of RAS/SAS dark level and RMS values:. Listed are the nominal values. The measured values must be in a +- 20% range of the given values. Note 0.5mV/ch

Item	Mean Dark Level [ch]	Mean RMS [ch]
SAS 0	**0.14**	**0.43**
SAS 1	**0.94**	**0.61**
SAS 2	**0.00**	**0.47**
RAS (T=~25C)	**120 (strongly T dependent)**	**0.75**
RAS (T~17 C)	**82-85**	**0.75**

RAS: "Noise star counts': Nominal <0.5counts/sec, limit < 1c/sec

Definition: RAS count rate 5 channels above mean value (5 channels corresponds approximately a m=3 star, that means full sensitivity for m=2 stars). Expected average stars detected per sec ~5, therefore 'noise star count' with 1c/s about 20% of telemetry.

3.2 Offset Mode

The offset analysis is done with mode=3 of the **ana_rs3** program and selection for RAS the channel limits [10,2000], (SAS default value [1,2047])

The acceptance limits are given in the following table:

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Acceptance Table of RAS/SAS offset level and RMS values:. Listed are the nominal values. The measured values must be in a +- 20 channel range of the given values. Note 2 mV/ch. **SAS 2 is at is upper limit, careful monitoring.**

Item	Mean Offset Level in [ch]	Mean RMS [ch]
SAS 0	834.0	0.48
SAS 1	815.1	0.48
SAS 2	926.0	0.49
RAS (T housing =~23C)	711.8	0.3
RAS (T=17C)	723.9	0.2

3.3   Communication Mode

The communication mode analysis is done with mode=3 of the **ana_rs3** program and selection of the default channel limits for RAS/SAS [1,2047]

The histograms are given in the appendix, the RMS deviation must be 0.0 for RAS and SAS.

3.4   RAS/SAS Event/Limb Mode, Orbit simulation

The analysis of this data is quit complicated and should be done at PSI

4 Appendix Figures

## 4.1 Dark Level / Sensitivity Mode

Taken "quiet conditions" at 25C

4.1.1 SAS 0
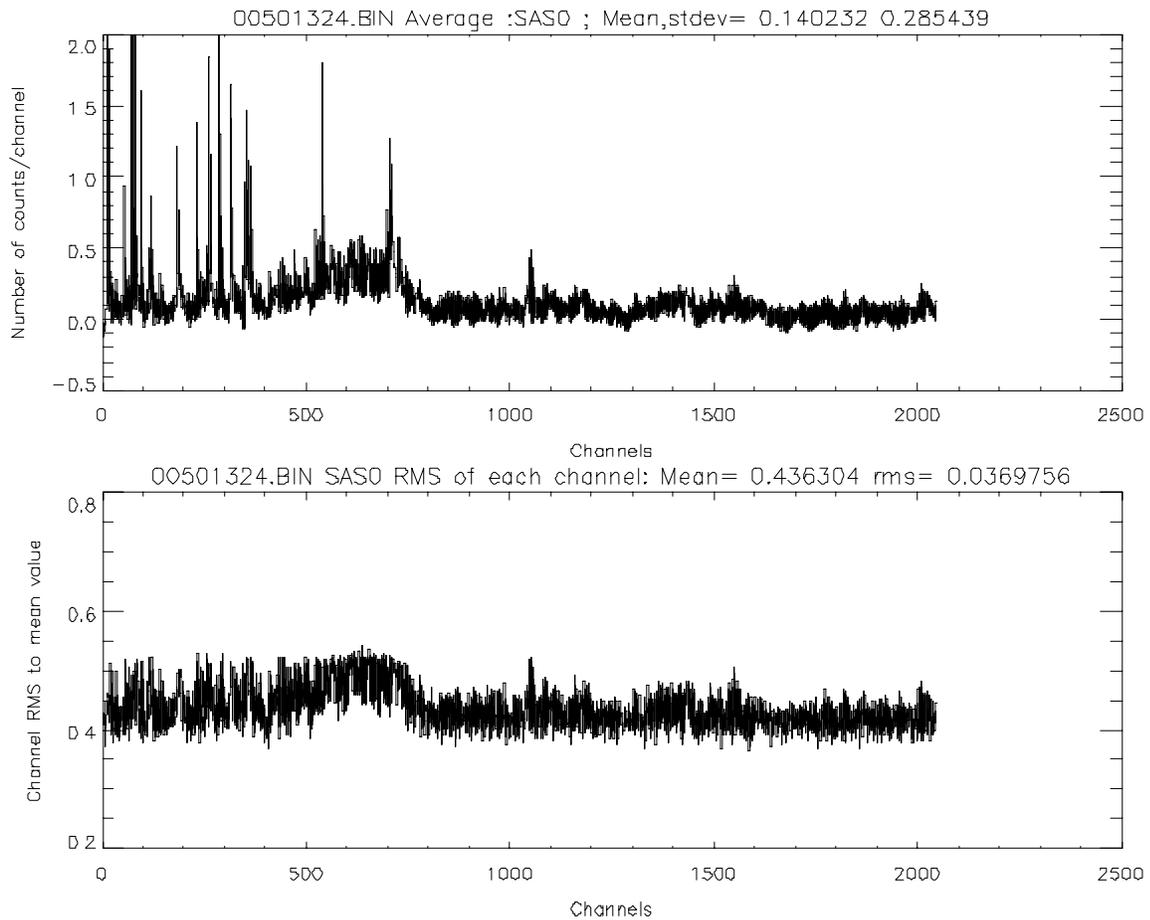
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4.1.2 SAS 1

4.1.3
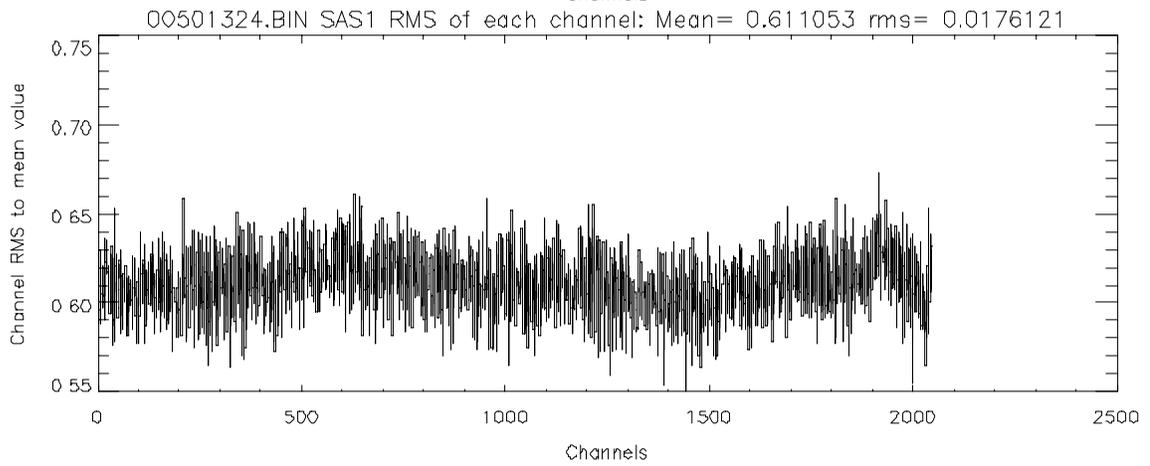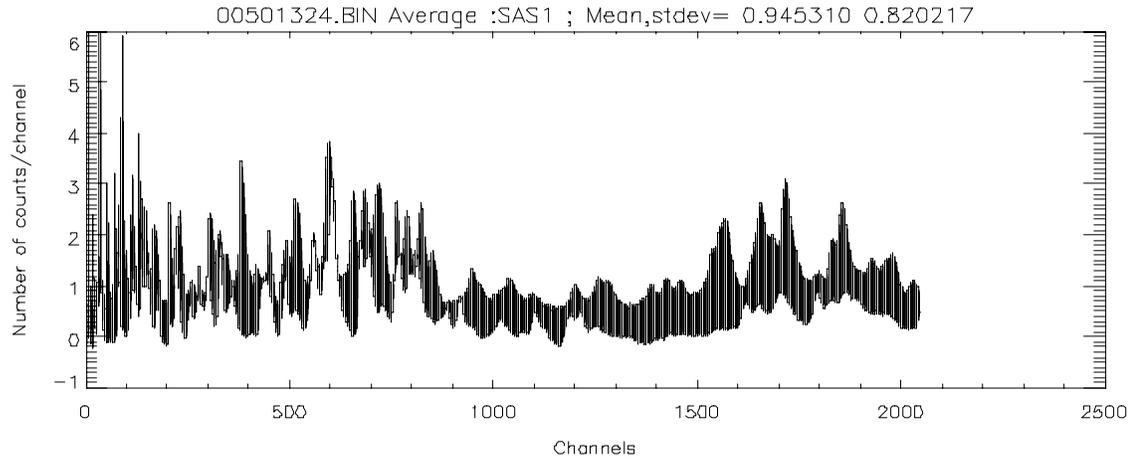
SAS 2

00501324.BIN Average :SAS2 ; Mean,stdev= −0.000369536 0.491939

00501324.BIN SAS2 RMS of each channel: Mean= 0.471566 rms= 0.0369971
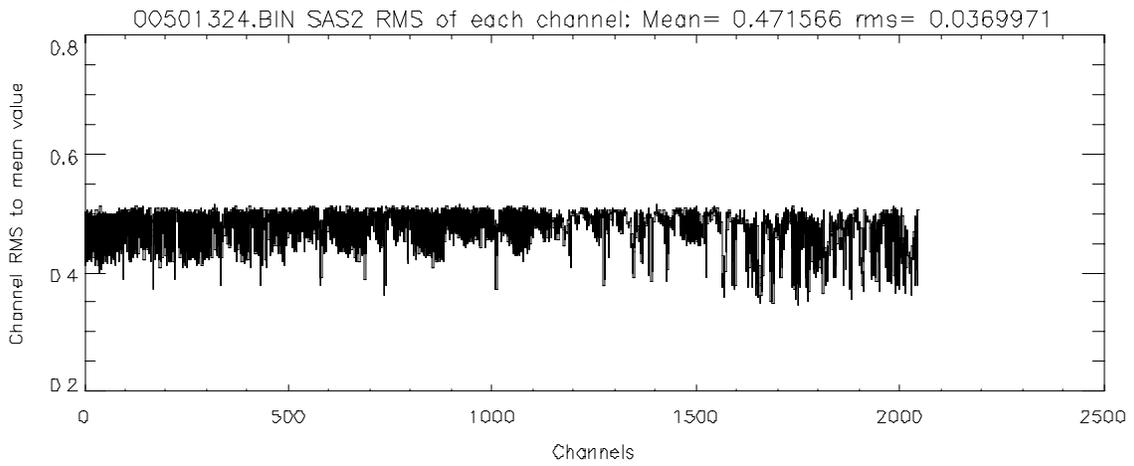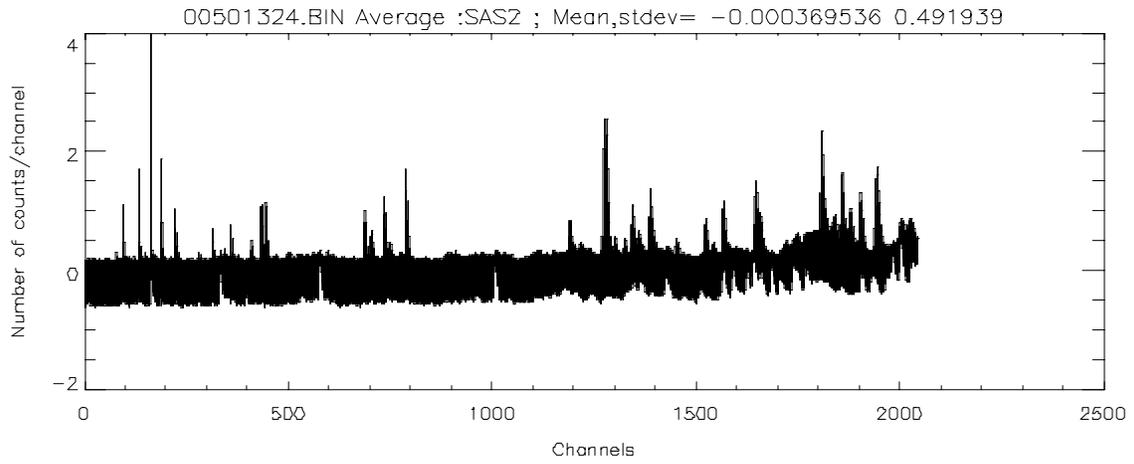
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RAS

Dark level /RMS taken at ~25C, will be different in cooled environment

4.1.4 RAS at 23C

Dark level /RMS taken at ~25C, will be different in cooled environment

00501324.BIN Average :RAS ; Mean,stdev= 119 700 1 93367

00501324.BIN RAS RMS of each channel: Mean= 0.753990 rms= 0.0179461
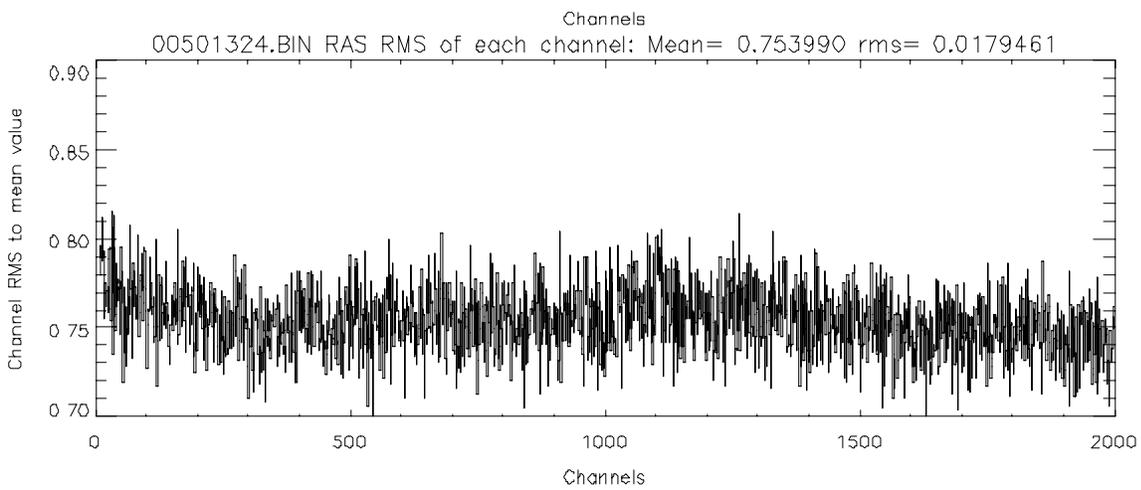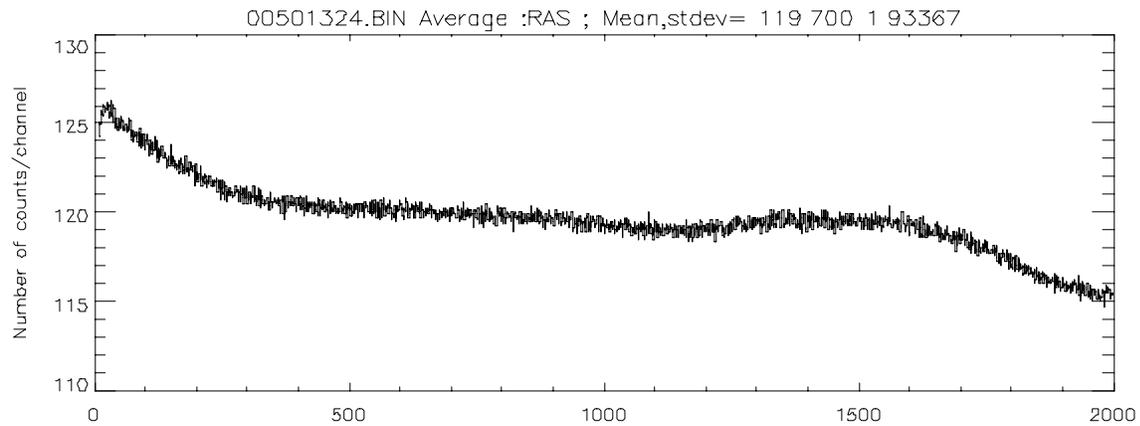
4.1.5 RAS (17C)

Dark level /RMS taken at 17C, will be different in cooled environment

00531515.BIN Average :RAS ; Mean,stdev= 85.3574 1.22141

00531515.BIN RAS RMS of each channel: Mean= 0.731019 rms= 0.0162727
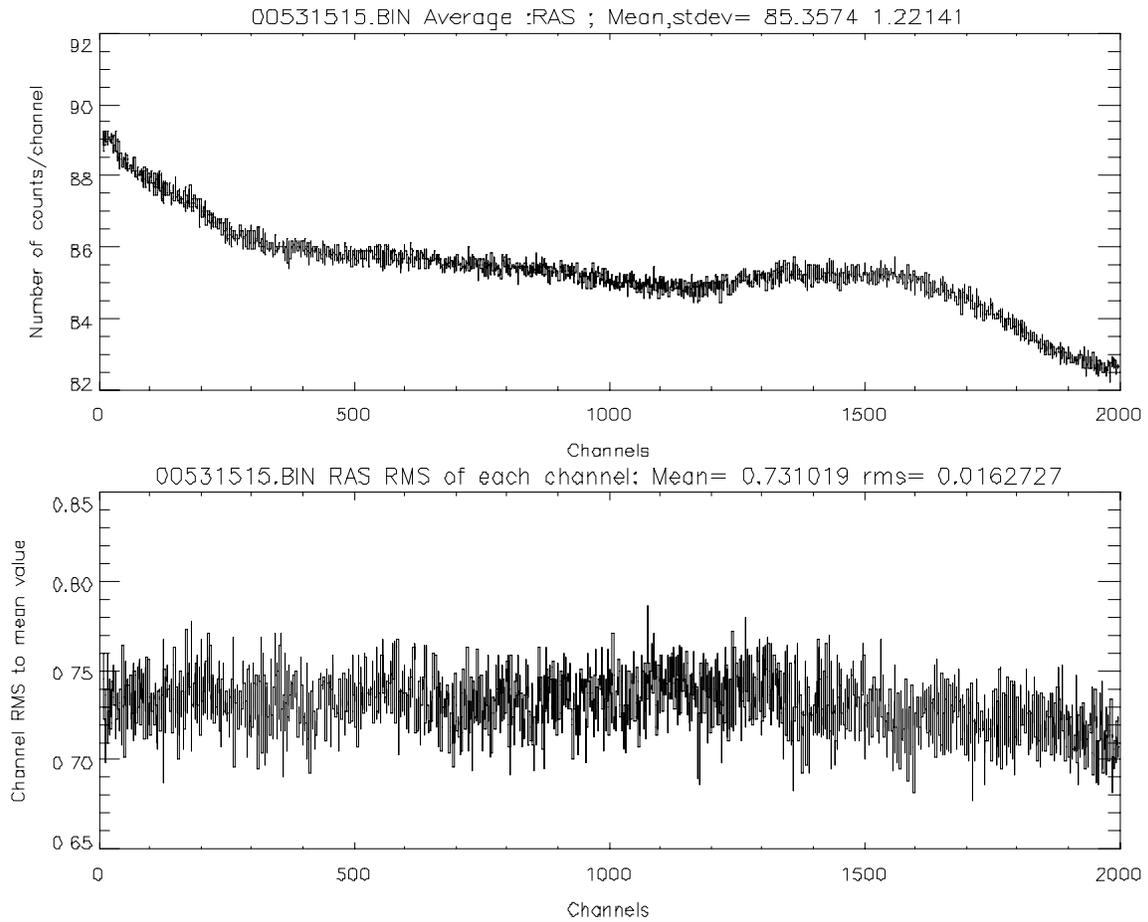
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RAS Noise distribution in channels, Assumed trigger in space 5 channel above mean, should have less than 1 c/s
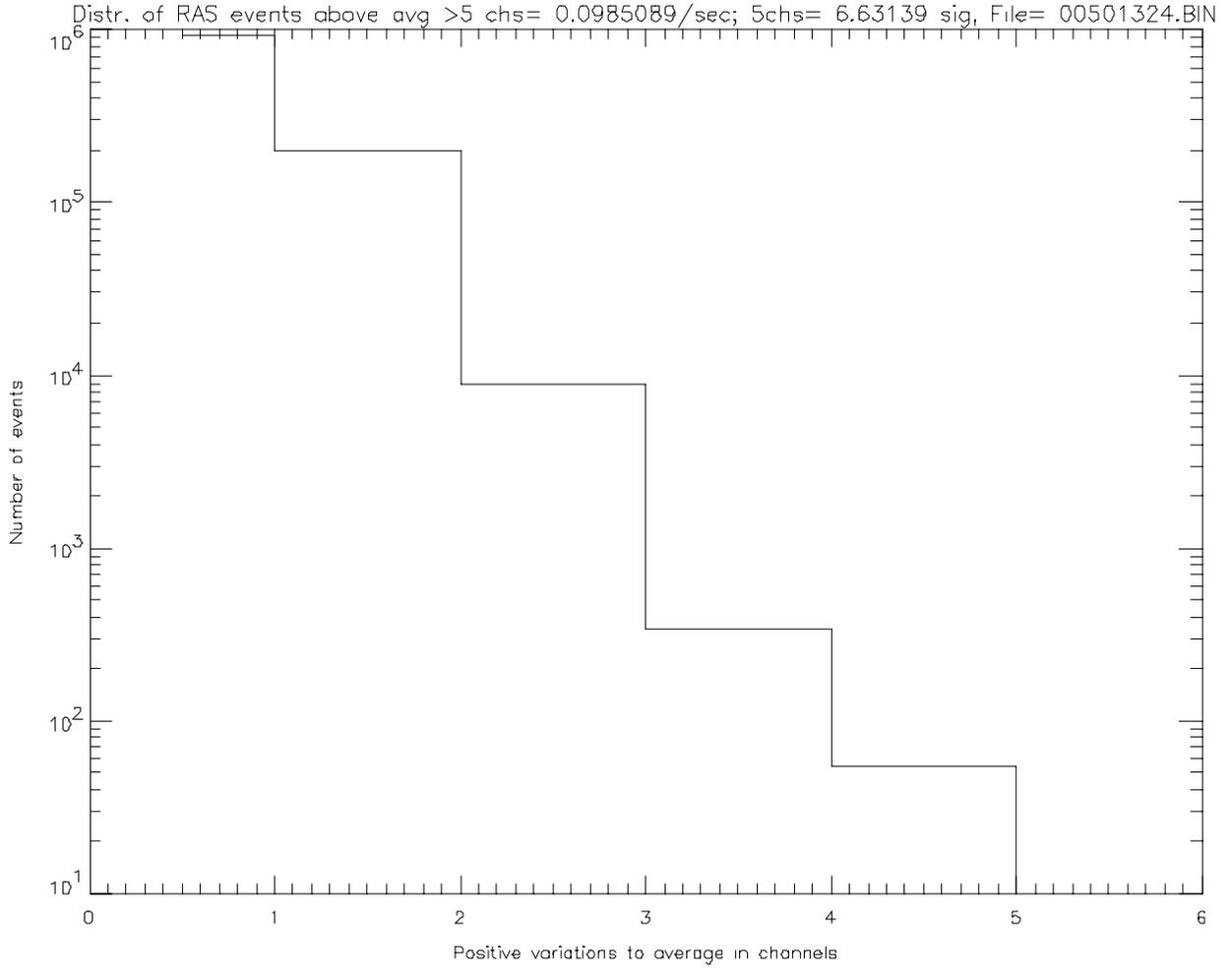
Distr. of RAS events above avg >5 chs= 0.0985089/sec; 5chs= 6.63139 sig, File= 00501324.BIN

4.2   Communication Mode

4.2.1   SAS 0,1,2

RMS must be 0, that mean all images the same
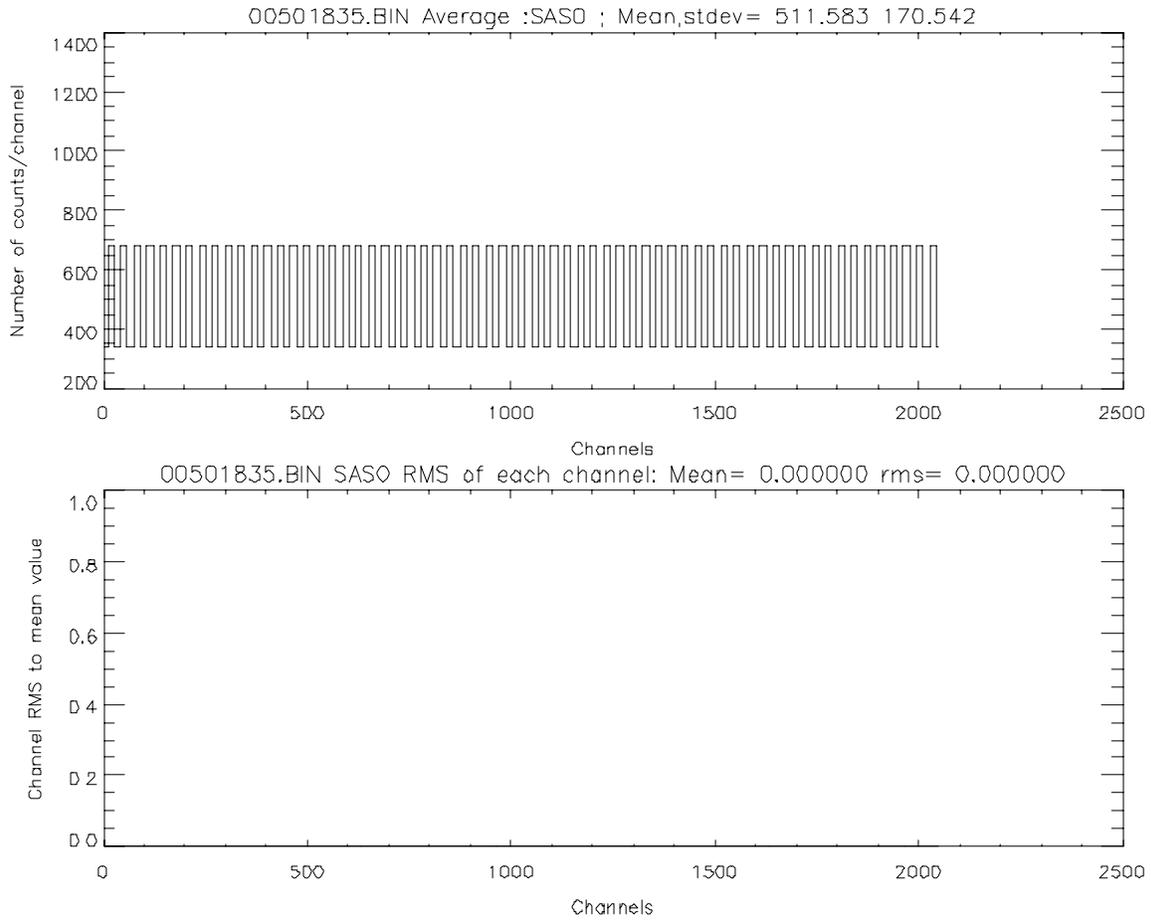
4.2.2 RAS

RMS must be 0, that means all images the same