

Solar Wind Around Pluto

SWAP

PRINCIPAL INVESTIGATOR
Dave McComas, Princeton University

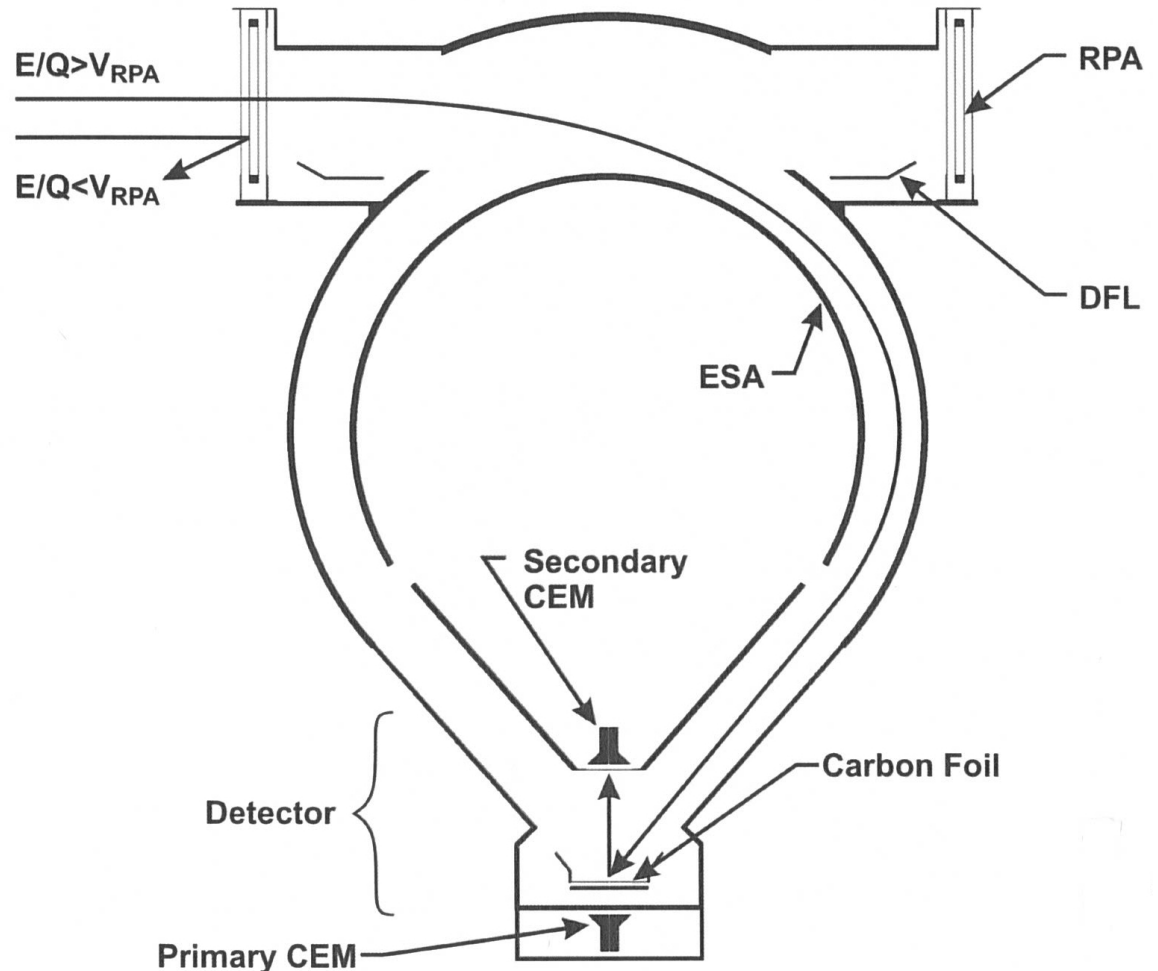
DESCRIPTION
Low Energy Plasma Instrument

ENERGY RANGE
30 eV - 7.7 keV

FIELD OF VIEW
270 deg x 10 deg
(deflection angles up to +15 deg)

ENERGY RESOLUTION
1 eV (< 2 keV); 9% (> 2 keV)

SPECIES
All Ions



New Horizons SWAP Data Sets

RAW Data Sets:

nh-p-swap-2-pluto-v3.0

CALIBRATED Data Sets:

nh-p-swap-3-pluto-v3.0

New Horizons SWAP Data Set Evaluation Tools

Staging and Evaluation -

Machine: Dell Precision T3400

Operating System: Fedora 18 linux

Data Processing -

Machine: Sun Ultra-350

Operating System: Sun Solaris OS 5.9

Staging and Minor Diagnostics -

Machine: IBM lenovo T60p ThinkPad

Operating System: Fedora 25 linux

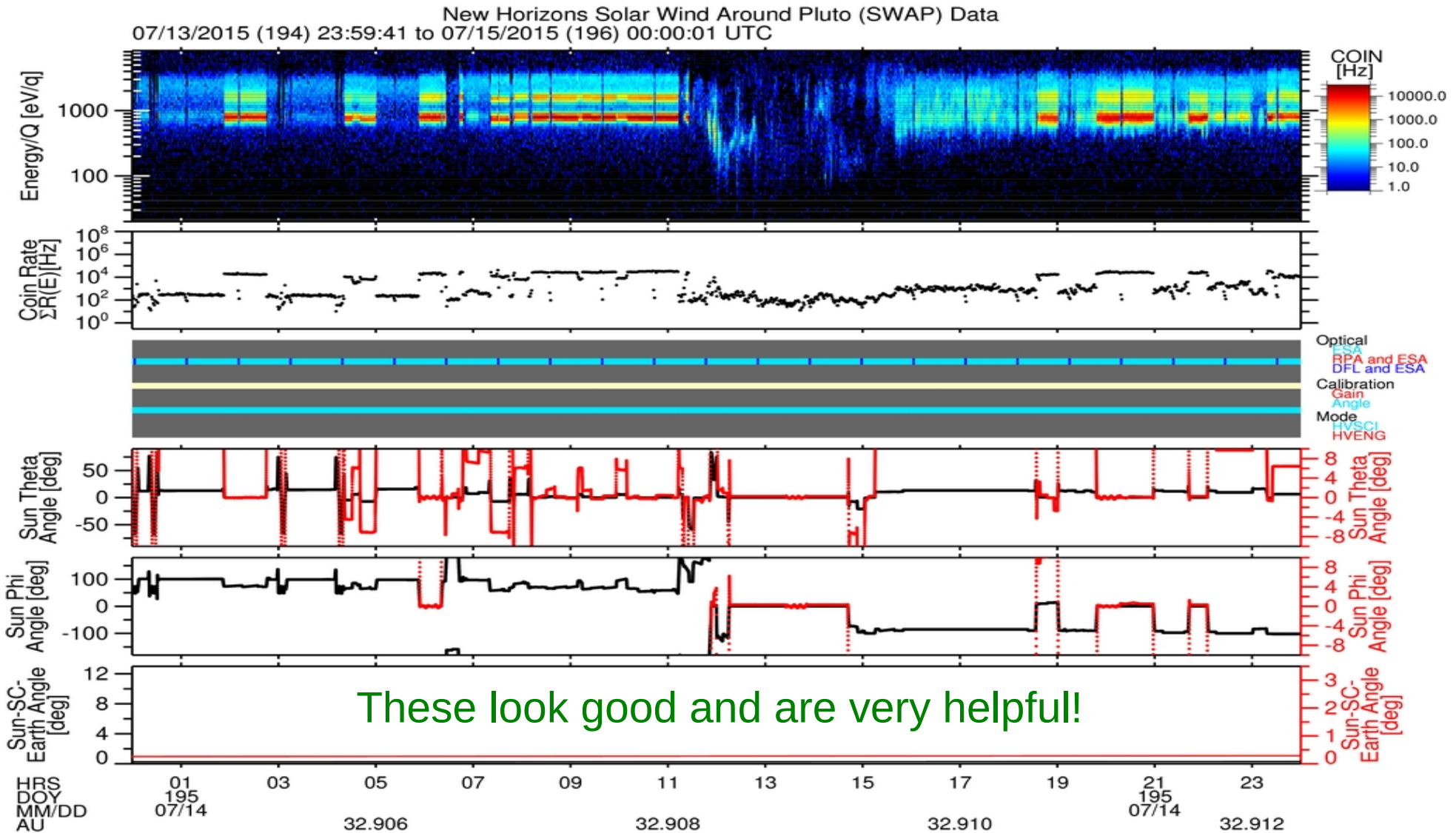
SWAP Documentation Evaluation

nh-p-swap-2-pluto-v3.0
nh-p-swap-3-pluto-v3.0
introdoc.pdf

Unable to locate this file in directory tree;
however, it was available as a download to the
reviewer.

Minor notes sent to PDS.

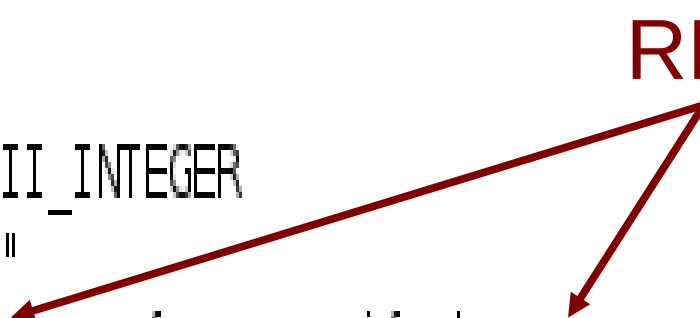
nh-p-swap-2-pluto-v3.0/document/ nh-p-swap-3-pluto-v3.0/document/ data_summary_plots/



nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
background_009_dac.tbl

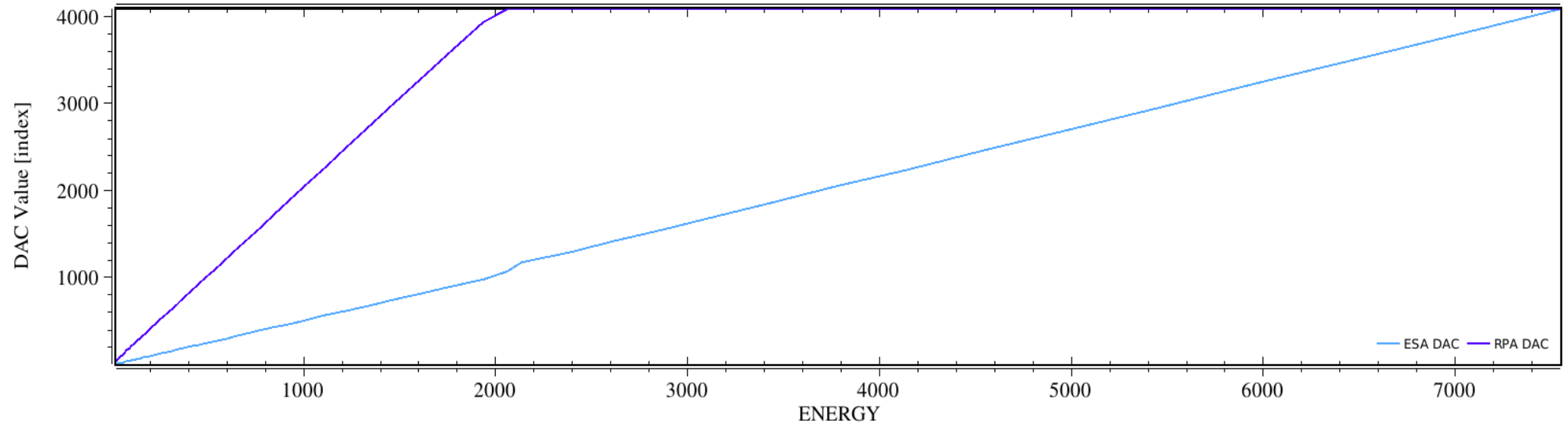
```
OBJECT                = COLUMN
  NAME                = "RPA_DAC"
  START_BYTE          = 21
  BYTES               = 8
  COLUMN_NUMBER       = 3
  DATA_TYPE          = ASCII_INTEGER
  FORMAT              = "I8"
  DESCRIPTION         = "RSA DAC for row; if the RSA_DAC value for one
                        of a pair of rows being used for
                        interpolation is zero, use the background
                        for the other member of the pair."
                        "
END_OBJECT            = COLUMN
```

RPA

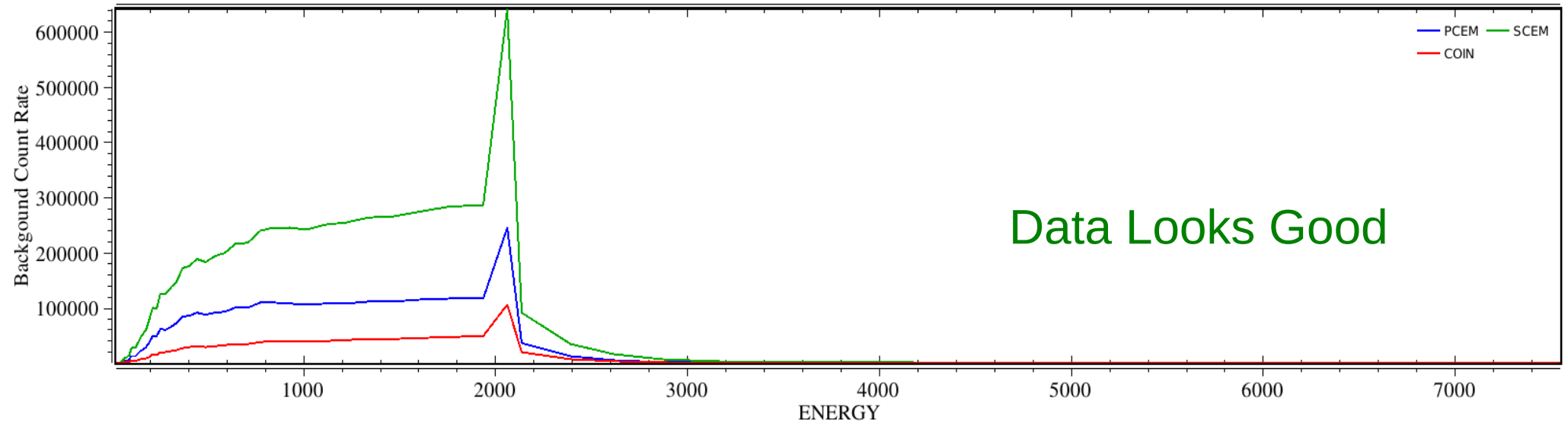


nh-p-swap-2-pluto-v3.0/calib nh-p-swap-3-pluto-v3.0/calib background_009_dac.tab

SWAP background_009_dac.tab: Plan 3, Sweep 3



SWAP background_009_dac.tab: Plan 3, Sweep 3




Data Looks Good

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
background_009_dac_jup.tbl

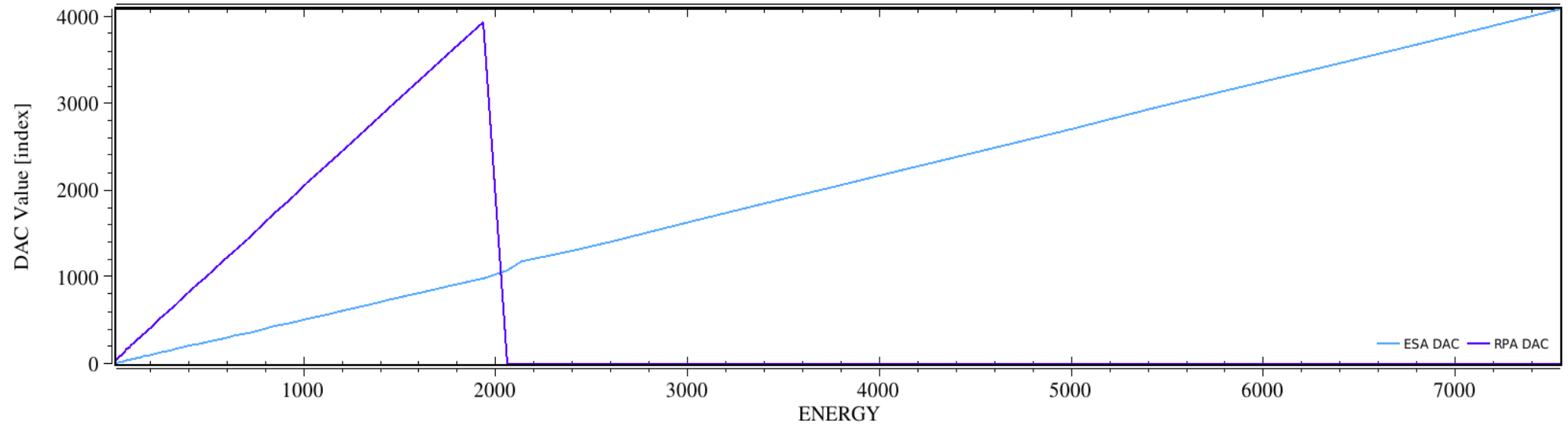
```
OBJECT          = COLUMN
NAME           = "RPA_DAC"
START_BYTE     = 21
BYTES         = 8
COLUMN_NUMBER  = 3
DATA_TYPE      = ASCII_INTEGER
FORMAT        = "I8"
DESCRIPTION    = "RSA DAC for row; if the RSA_DAC value for one
                  of a pair of rows being used for
                  interpolation is zero, use the background
                  for the other member of the pair."
END_OBJECT     = COLUMN
```

RPA

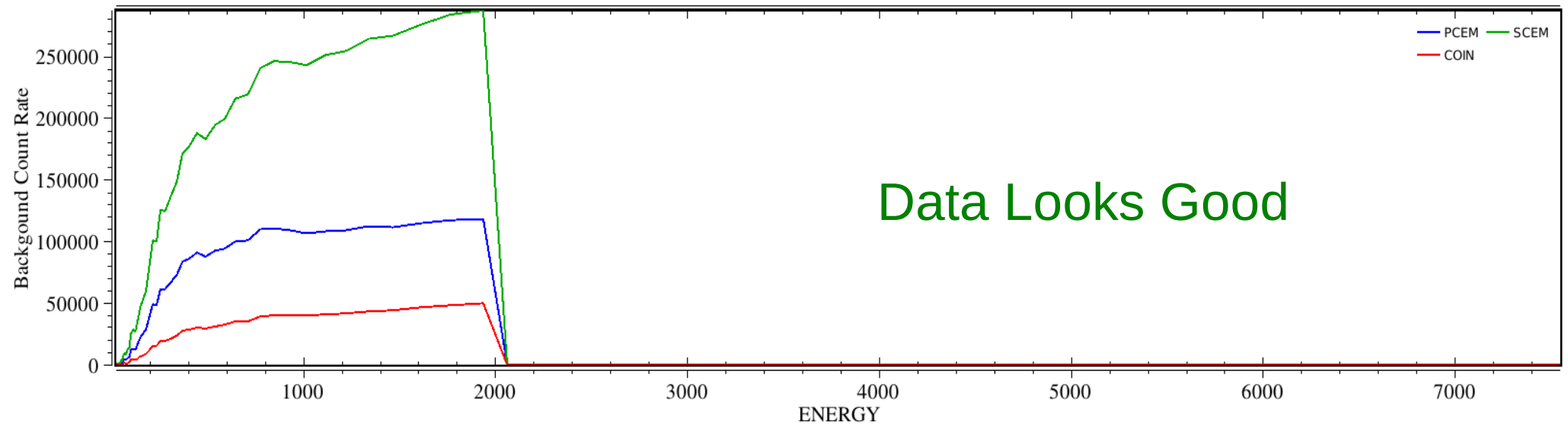


nh-p-swap-2-pluto-v3.0/calib nh-p-swap-3-pluto-v3.0/calib background_009_dac_jup.tab

SWAP background_009_dac_jup.tab: Plan 0, Sweep 0



SWAP background_009_dac_jup.tab: Plan 0, Sweep 0



Data Looks Good

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
esa_rpa_v16_energy_binsf_new.tbl – 1 of 4

ICD defines RPA_LVL0 and RPA_LVL1, but does not mention an RSA

SWAP_RT.RPA_LVL0	←	RPA level during first half-second
SWAP_RT.DFL_LVL0		DFL level during first half-second
SWAP_RT.ESA_LVL0		ESA level during first half-second
SWAP_RT.RPA_LVL1	←	RPA level during first half-second

Calibration files refer to an RSA....This must be an error...

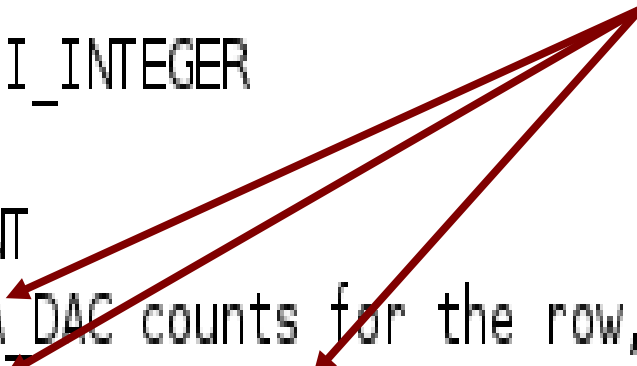
RPA

Use the PLAN_ID, SWEEP_ID, ESA_LVL0 and RSA_LVL0 of a row in an observed real-time (raw) count rate measurement file as a lookup to match the PLAN_ID, SWEEP_ID, ESA_DAC, and RPA_DAC, respectively, columns in this table to select the row in this table that determines the nominal energy of solar wind that was focused by the SWAP electro-optics onto the counters to generate the counts in the first half-second represented by that row in the raw data. Do the same with PLAN_ID, SWEEP_ID, ESA_LVL1 and RSA_LVL1 to get the nominal energy for the counts in the second half-second of that row.

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
esa_rpa_v16_energy_binsf_new.tbl – 2 of 4

OBJECT	= COLUMN
NAME	= "RPA_DAC"
START_BYTE	= 25
BYTES	= 8
COLUMN_NUMBER	= 4
DATA_TYPE	= ASCII_INTEGER
FORMAT	= "I8"
UNIT	= COUNT
DESCRIPTION	= "RPA_DAC counts for the row, to match the RPA_LVLO or RPA_LVL1 count value in an observed count rate measurement." "
END_OBJECT	= COLUMN

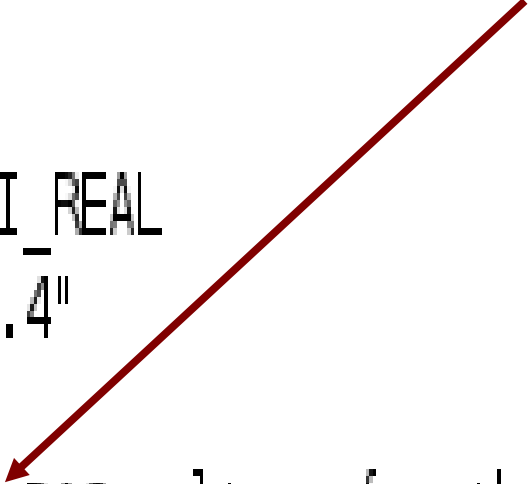
RPA



nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
esa_rpa_v16_energy_binsf_new.tbl – 3 of 4

```
OBJECT          = COLUMN
NAME           = "VRPA"
START_BYTE     = 45
BYTES         = 12
COLUMN_NUMBER  = 6
DATA_TYPE      = ASCII_REAL
FORMAT        = "F12.4"
UNIT          = VOLT
DESCRIPTION    = "RSA_DAC voltage for the row."
END_OBJECT     = COLUMN
```

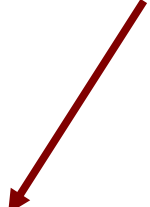
RPA



nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
esa_rpa_v16_energy_binsf_new.tbl – 4 of 4

OBJECT	= COLUMN
NAME	= "CROSSING"
START_BYTE	= 57
BYTES	= 12
COLUMN_NUMBER	= 7
DATA_TYPE	= ASCII_REAL
FORMAT	= "F12.4"
UNIT	= "VOLT / EV"
DESCRIPTION	= "Number related to ratio of RSA voltage to ESA Center energy. This is not an exact ratio of any two values in this row. This value is not used in any part of data calibration, and may be ignored."
END_OBJECT	= COLUMN

RPA

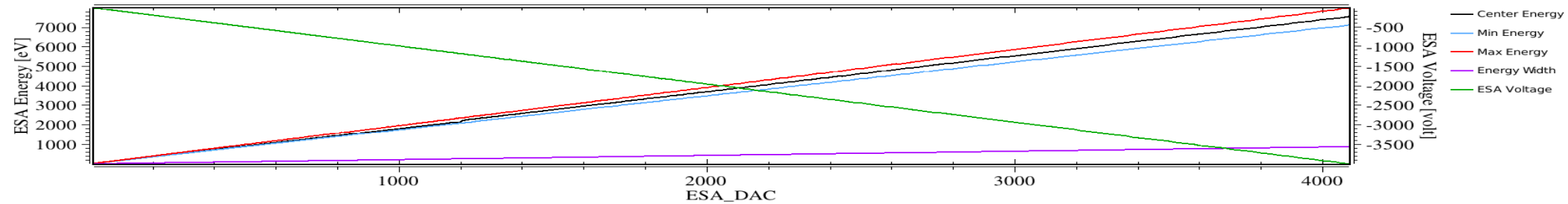


nh-p-swap-2-pluto-v3.0/calib

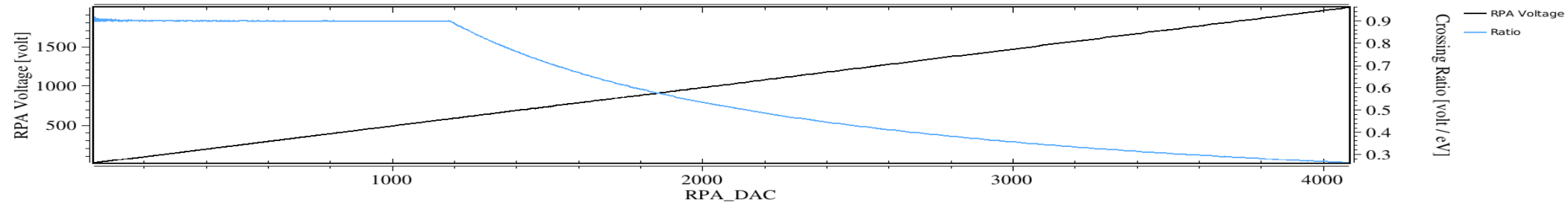
nh-p-swap-3-pluto-v3.0/calib

esa_rpa_v16_energy_binsf_new.tab

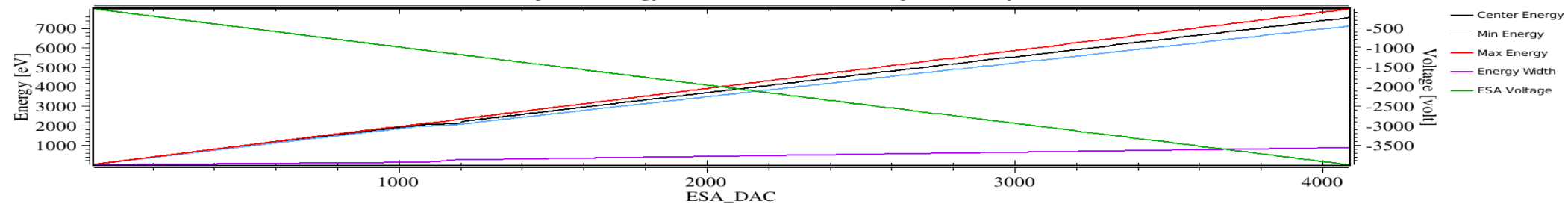
SWAP esa_rpa_v16_energy_binsf_new.tab: Plan 0, Sweep 0, 1st Entry



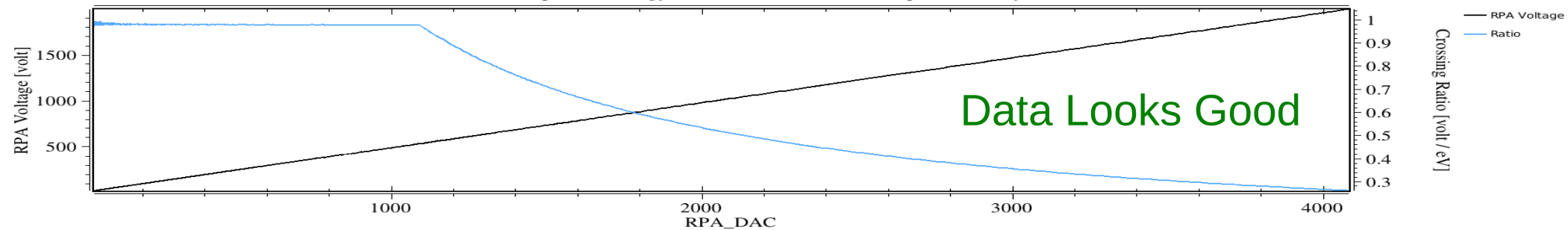
SWAP esa_rpa_v16_energy_binsf_new.tab: Plan 0, Sweep 0, 1st Entry



SWAP esa_rpa_v16_energy_binsf_new.tab: Plan 0, Sweep 0, 2nd Entry



SWAP esa_rpa_v16_energy_binsf_new.tab: Plan 0, Sweep 0, 2nd Entry



nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
esa_rpa_v18_energy_binsf_new.tbl – 1 of 3

RPA

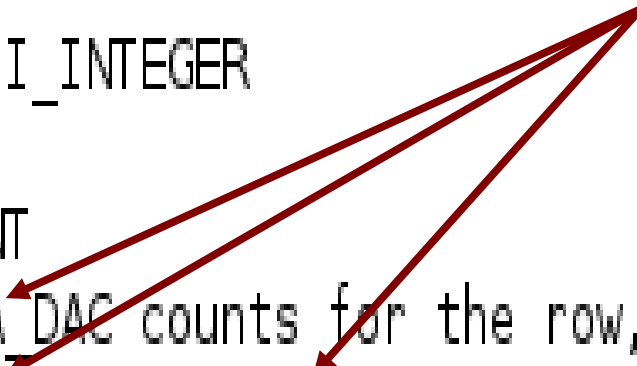


Use the PLAN_ID, SWEEP_ID, ESA_LVL0 and RSA_LVL0 of a row in an observed real-time (raw) count rate measurement file as a lookup to match the PLAN_ID, SWEEP_ID, ESA_DAC, and RPA_DAC, respectively, columns in this table to select the row in this table that determines the nominal energy of solar wind that was focused by the SWAP electro-optics onto the counters to generate the counts in the first half-second represented by that row in the raw data. Do the same with PLAN_ID, SWEEP_ID, ESA_LVL1 and RSA_LVL1 to get the nominal energy for the counts in the second half-second of that row.

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
esa_rpa_v18_energy_binsf_new.tbl – 2 of 3

OBJECT	= COLUMN
NAME	= "RPA_DAC"
START_BYTE	= 25
BYTES	= 8
COLUMN_NUMBER	= 4
DATA_TYPE	= ASCII_INTEGER
FORMAT	= "I8"
UNIT	= COUNT
DESCRIPTION	= "RPA_DAC counts for the row, to match the RPA_LVLO or RPA_LVL1 count value in an observed count rate measurement." "
END_OBJECT	= COLUMN

RPA

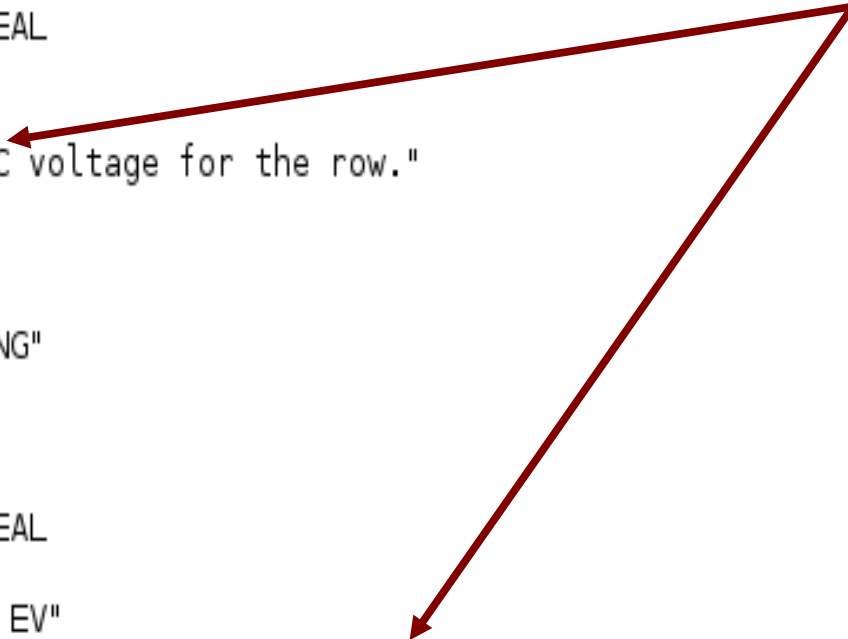


nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
esa_rpa_v18_energy_binsf_new.tbl – 3 of 3

```
OBJECT          = COLUMN
NAME            = "VRPA"
START_BYTE     = 45
BYTES          = 12
COLUMN_NUMBER  = 6
DATA_TYPE      = ASCII_REAL
FORMAT        = "F12.4"
UNIT          = VOLT
DESCRIPTION    = "RSA_DAC voltage for the row."
END_OBJECT

OBJECT          = COLUMN
NAME            = "CROSSING"
START_BYTE     = 57
BYTES          = 12
COLUMN_NUMBER  = 7
DATA_TYPE      = ASCII_REAL
FORMAT        = "F12.4"
UNIT          = "VOLT / EV"
DESCRIPTION    = "Number related to ratio of RSA voltage to
                  ESA Center energy. This is not an exact
                  ratio of any two values in this row. This
                  value is not used in any part of data
                  calibration, and may be ignored."
END_OBJECT
```

RPA

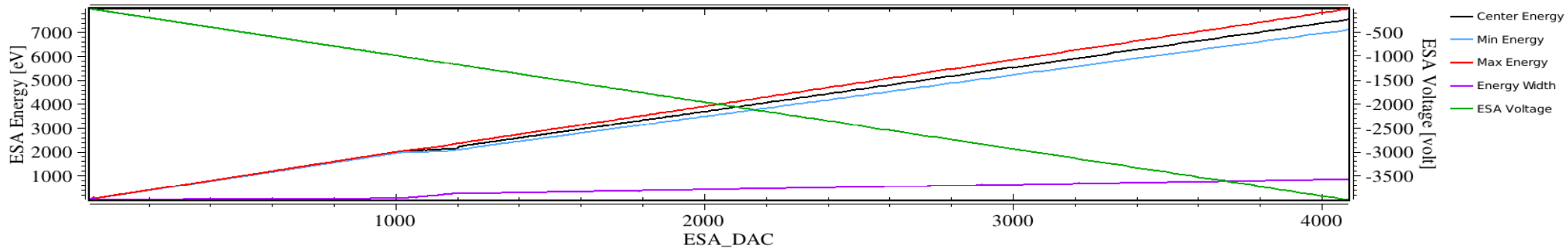


nh-p-swap-2-pluto-v3.0/calib

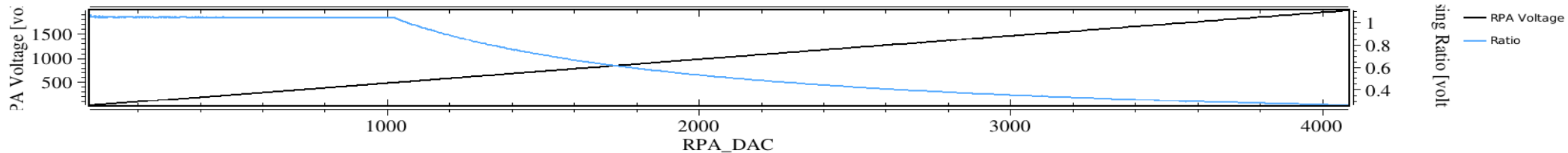
nh-p-swap-3-pluto-v3.0/calib

esa_rpa_v18_energy_binsf_new.tab

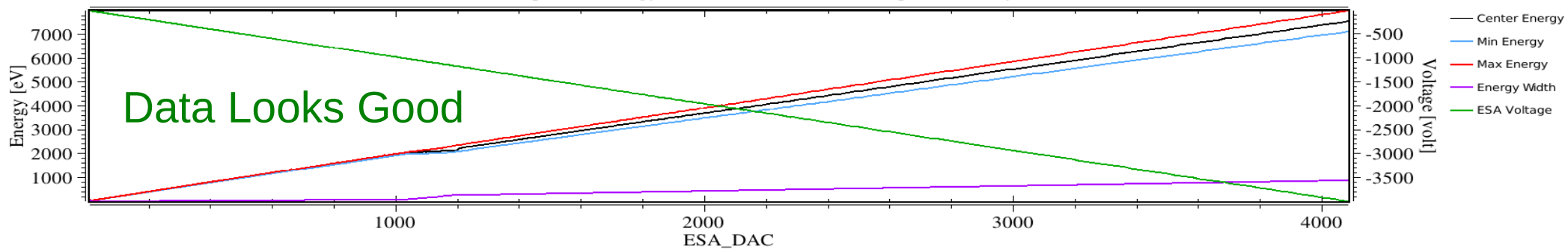
SWAP esa_rpa_v18_energy_binsf_new.tab: Plan 3, Sweep 3, 1st Entry



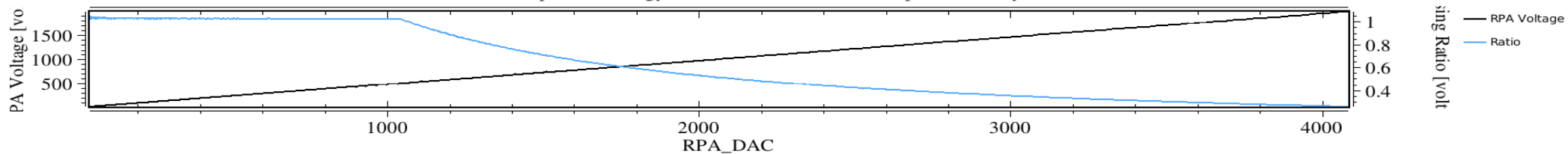
SWAP esa_rpa_v18_energy_binsf_new.tab: Plan 3, Sweep 3, 1st Entry



SWAP esa_rpa_v18_energy_binsf_new.tab: Plan 4, Sweep 4, 2nd Entry



SWAP esa_rpa_v18_energy_binsf_new.tab: Plan 4, Sweep 4, 2nd Entry



nh-p-swap-2-pluto-v3.0/calib nh-p-swap-3-pluto-v3.0/calib esa_rpa_v19_energy_binsf_new2.tbl – 1 of 2

Use the PLAN_ID, SWEEP_ID, ESA_LVL0 and RSA_LVL0 of a row in an observed real-time (raw) count rate measurement file as a lookup to match the PLAN_ID, SWEEP_ID, ESA_DAC, and RPA_DAC, respectively, columns in this table to select the row in this table that determines the nominal energy of solar wind that was focused by the SWAP electro-optics onto the counters to generate the counts in the first half-second represented by that row in the raw data. Do the same with PLAN_ID, SWEEP_ID, ESA_LVL1 and RSA_LVL1 to get the nominal energy for the counts in the second half-second of that row.

RPA

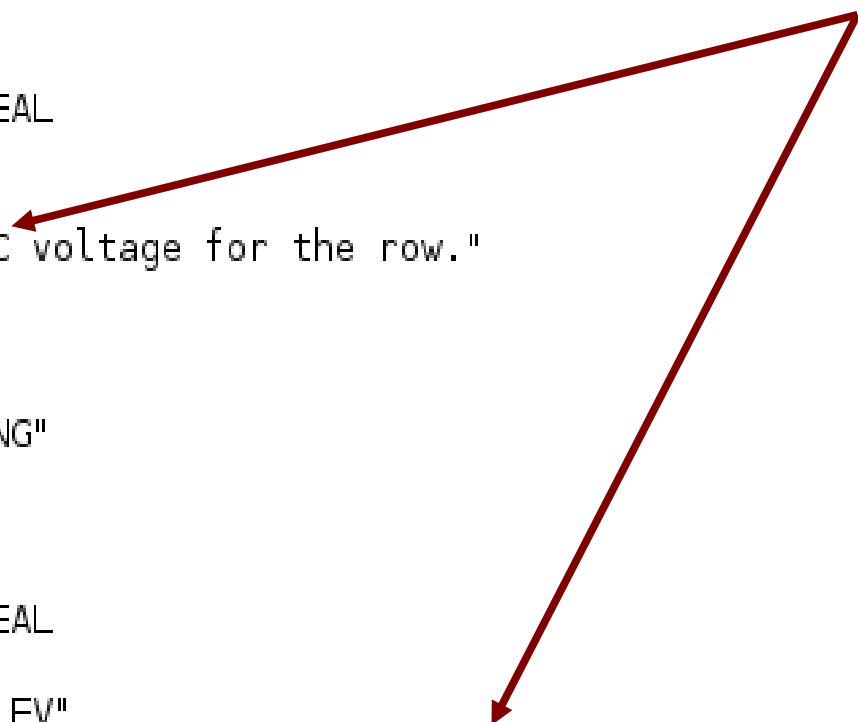
OBJECT	= COLUMN
NAME	= "RPA_DAC"
START_BYTE	= 25
BYTES	= 8
COLUMN_NUMBER	= 4
DATA_TYPE	= ASCII_INTEGER
FORMAT	= "I8"
UNIT	= COUNT
DESCRIPTION	= "RSA_DAC counts for the row, to match the RSA_LVL0 or RSA_LVL1 count value in an observed count rate measurement." "
END_OBJECT	= COLUMN

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
esa_rpa_v19_energy_binsf_new2.tbl – 1 of 2

```
OBJECT          = COLUMN
NAME            = "VRPA"
START_BYTE     = 45
BYTES          = 12
COLUMN_NUMBER  = 6
DATA_TYPE      = ASCII_REAL
FORMAT        = "F12.4"
UNIT          = VOLT
DESCRIPTION    = "RSA_DAC voltage for the row."
END_OBJECT     = COLUMN
```

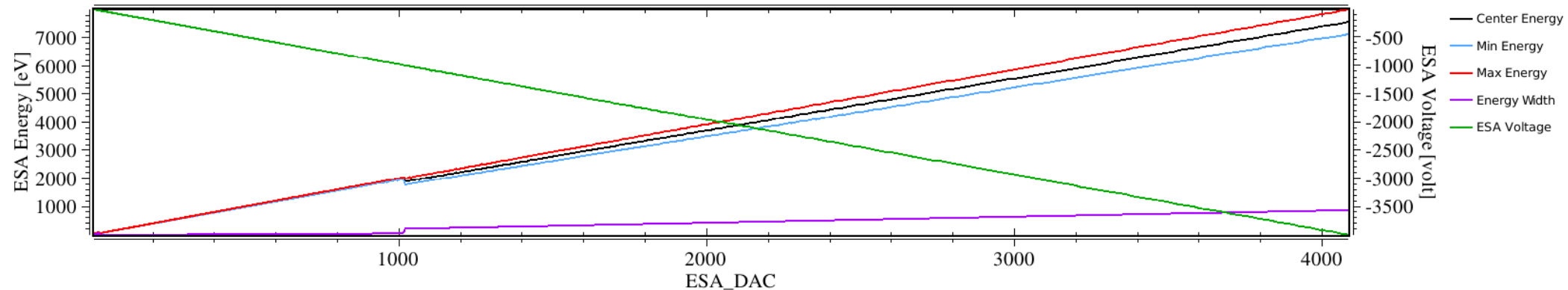
```
OBJECT          = COLUMN
NAME            = "CROSSING"
START_BYTE     = 57
BYTES          = 12
COLUMN_NUMBER  = 7
DATA_TYPE      = ASCII_REAL
FORMAT        = "F12.4"
UNIT          = "VOLT / EV"
DESCRIPTION    = "Number related to ratio of RSA voltage to
                  ESA Center energy. This is not an exact
                  ratio of any two values in this row. This
                  value is not used in any part of data
                  calibration, and may be ignored."
END_OBJECT     = COLUMN
```

RPA

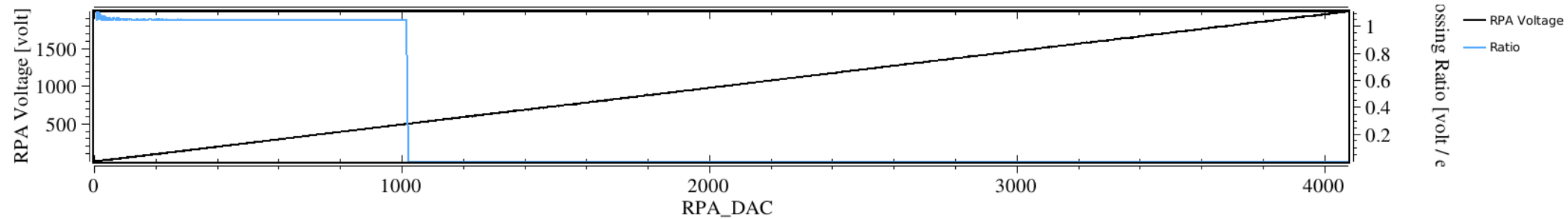


nh-p-swap-2-pluto-v3.0/calib nh-p-swap-3-pluto-v3.0/calib esa_rpa_v19_energy_binsf_new2.tab – 1 of 2

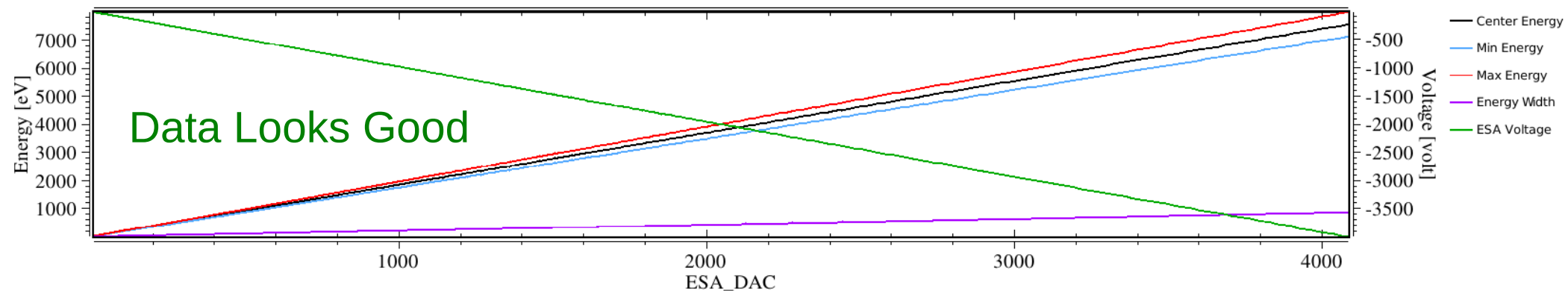
SWAP esa_rpa_v19_energy_binsf_new2.tab: Plan 0, Sweep 0, 1st Entry



SWAP esa_rpa_v19_energy_binsf_new2.tab: Plan 0, Sweep 0, 1st Entry

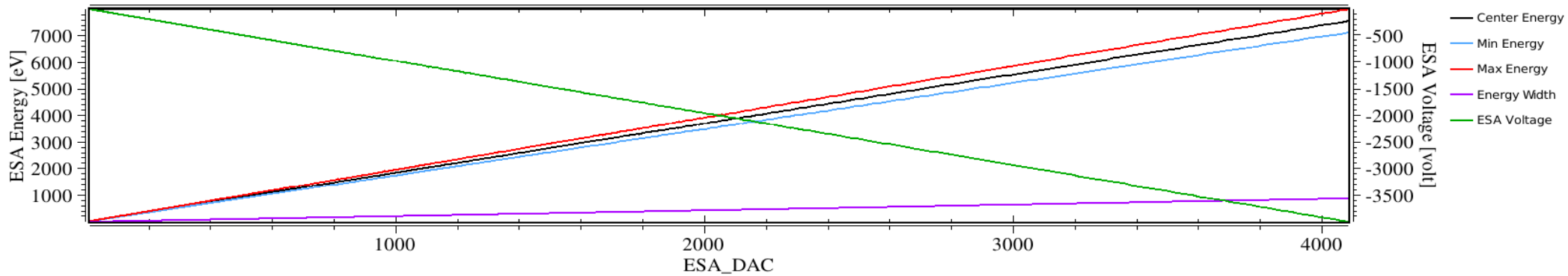


SWAP esa_rpa_v19_energy_binsf_new2.tab: Plan 5, Sweep 5, 2nd Entry

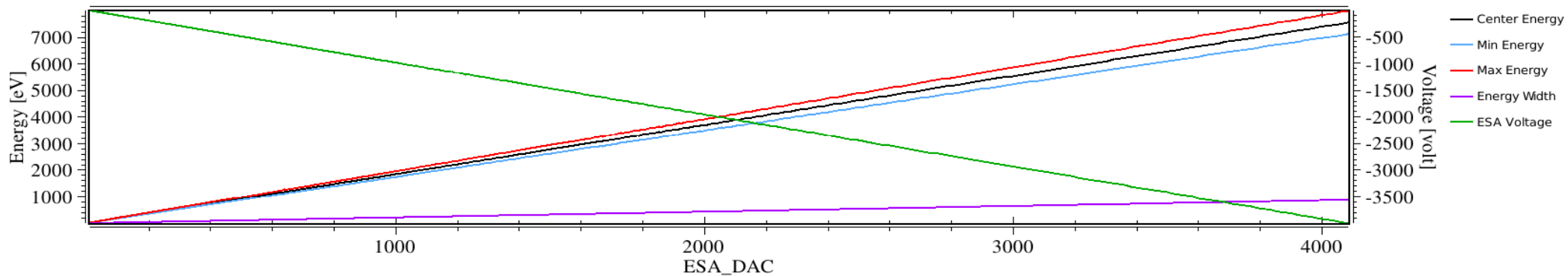


nh-p-swap-2-pluto-v3.0/calib nh-p-swap-3-pluto-v3.0/calib esa_rpa_v19_energy_binsf_new2.tab – 2 of 2

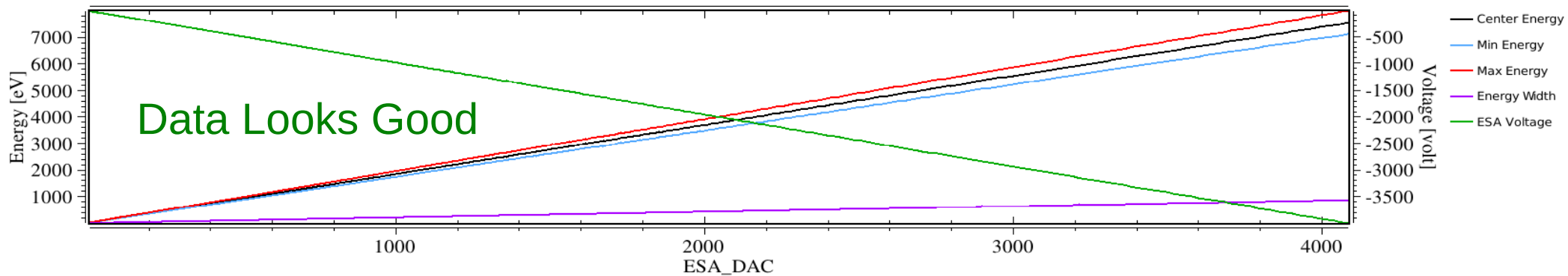
SWAP esa_rpa_v19_energy_binsf_new2.tab: Plan 2, Sweep 2, 3rd Entry



SWAP esa_rpa_v19_energy_binsf_new2.tab: Plan 12, Sweep 10, 4th Entry

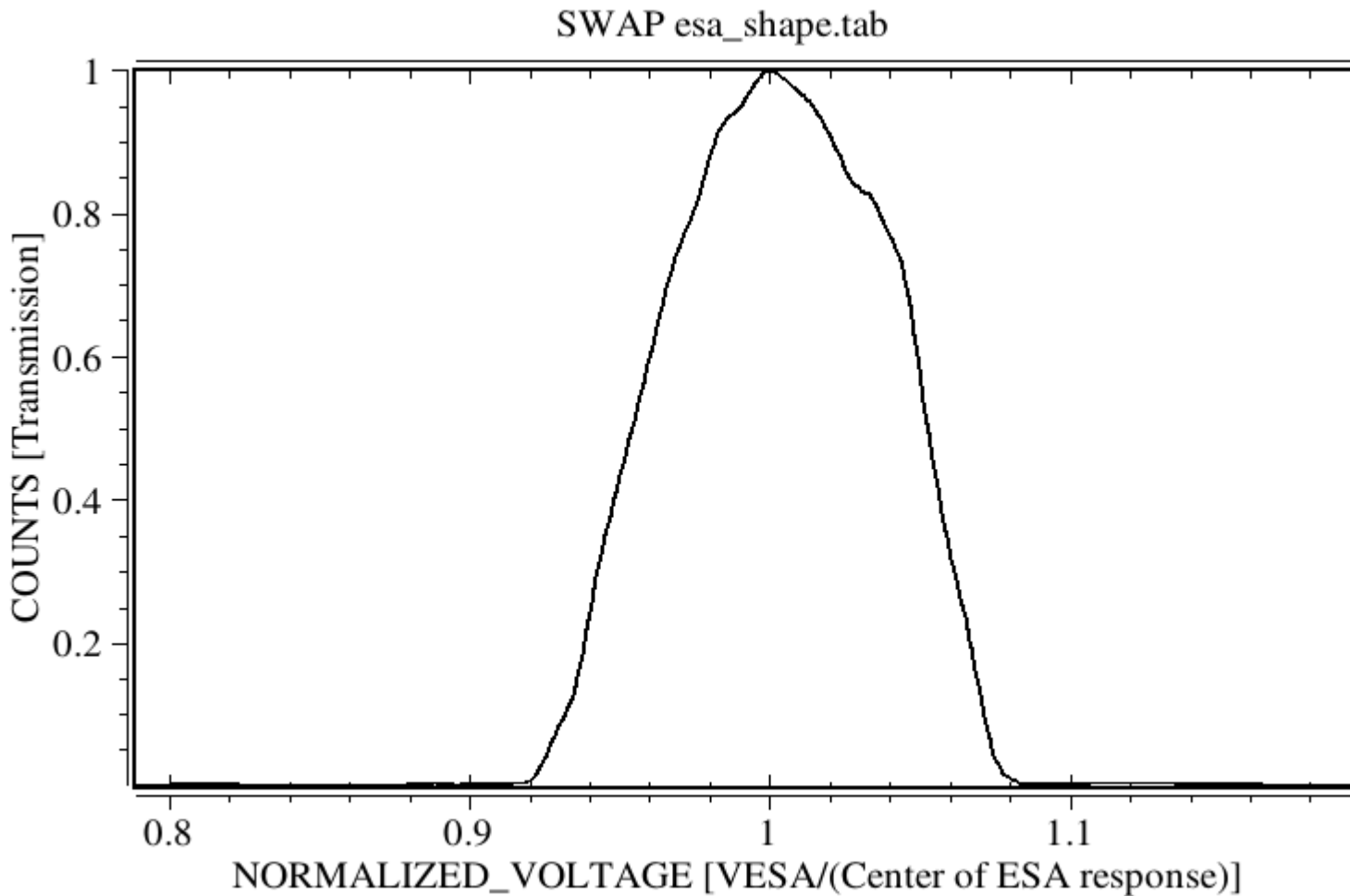


SWAP esa_rpa_v19_energy_binsf_new2.tab: Plan 12, Sweep 11, 5th Entry



Data Looks Good

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
esa_shape.tbl & esa_shape.tab



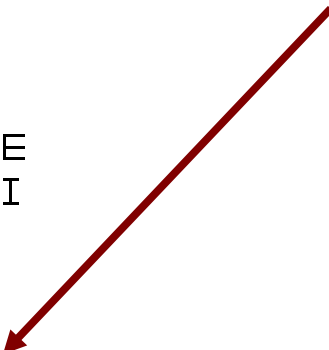
Plot created by SDDAS/gPlot - J. Mukherjee, et al. Generated on Sat Jun 3 18:52:36 2017.

Data Looks Good

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
rpa_shape.tbl

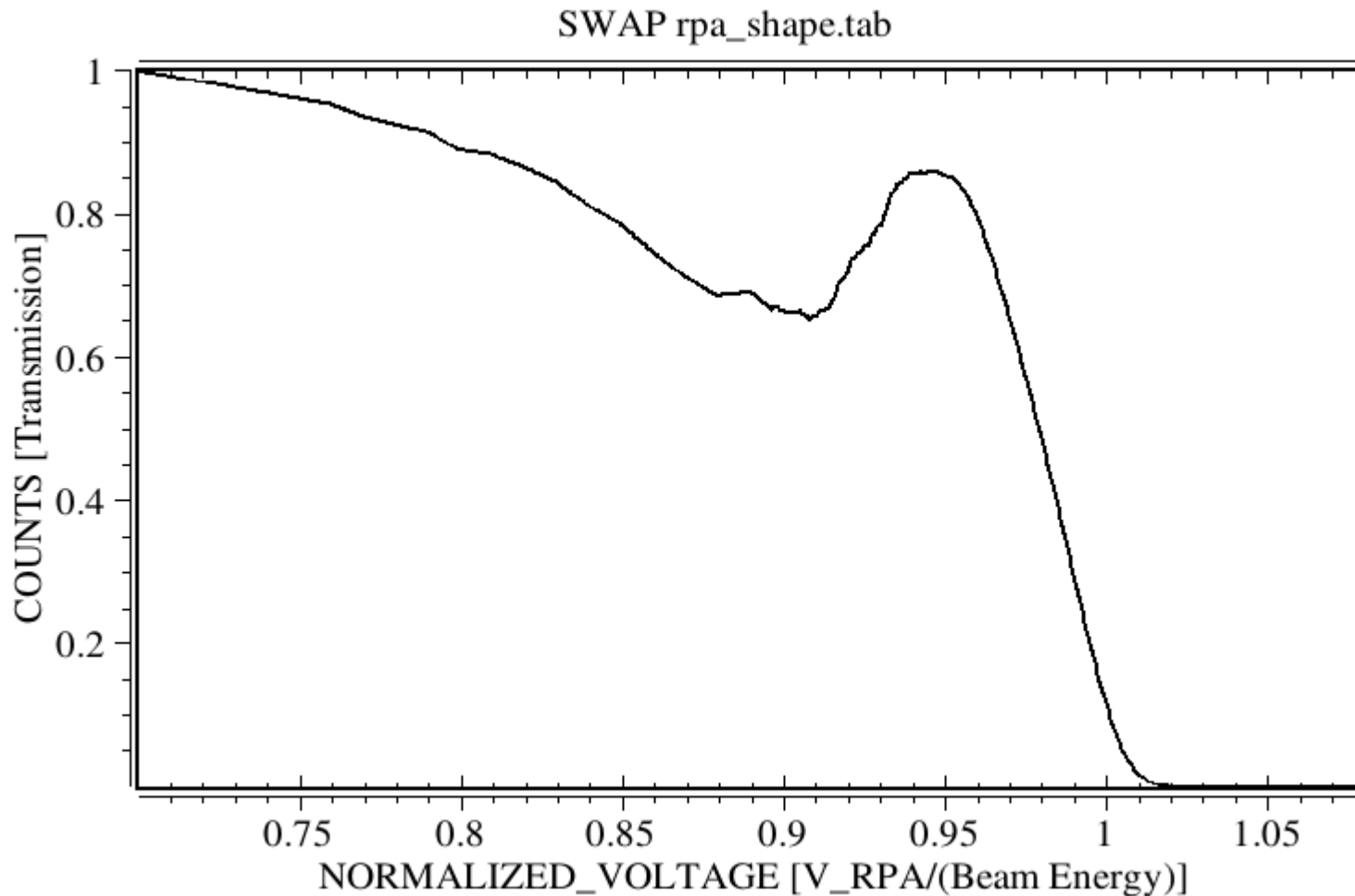
This is the RPA response Curve, not the ESA response curve

```
OBJECT                = TABLE
INTERCHANGE_FORMAT    = ASCII
ROWS                  = 760
COLUMNS              = 2
ROW_BYTES             = 25
NAME                  = "ESA Response Curve"
DESCRIPTION           = "
    RPA Response function: Normalized counts versus RPA voltage
    normalized by the RPA voltage at the peak response"
```



```
OBJECT                = COLUMN
NAME                  = NORMALIZED_VOLTAGE
START_BYTE            = 1
BYTES                 = 8
COLUMN_NUMBER         = 1
DATA_TYPE             = ASCII_REAL
FORMAT                = "F8.6"
UNIT                  = COUNT
DESCRIPTION           = "V_RPA/(Beam Energy)"
END_OBJECT            = COLUMN
```

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
rpa_shape.tbl

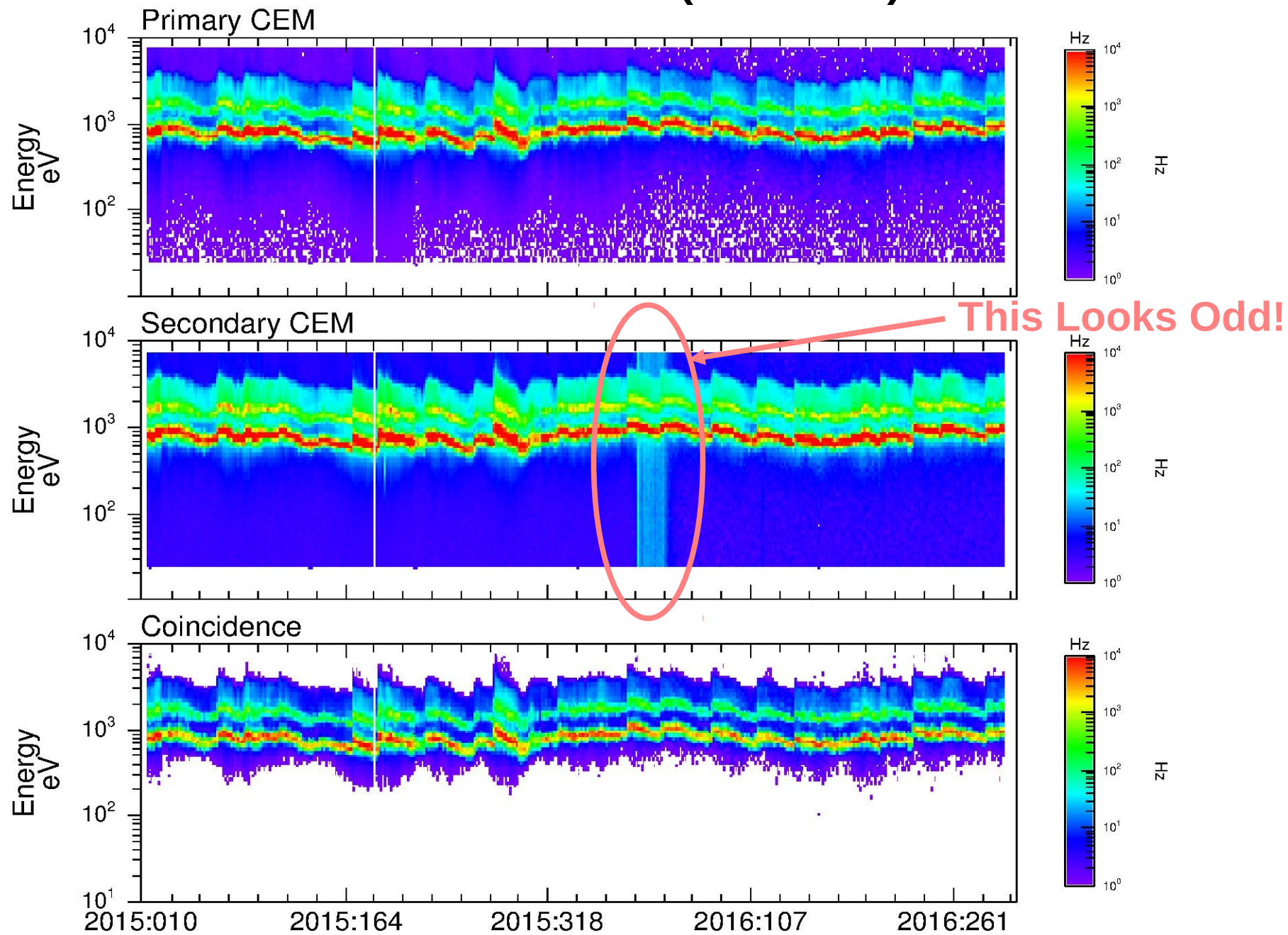


Plot created by SDDAS/gPlot - J. Mukherjee, et al. Generated on Sat Jun 3 19:02:10 2017.

Data Looks Good

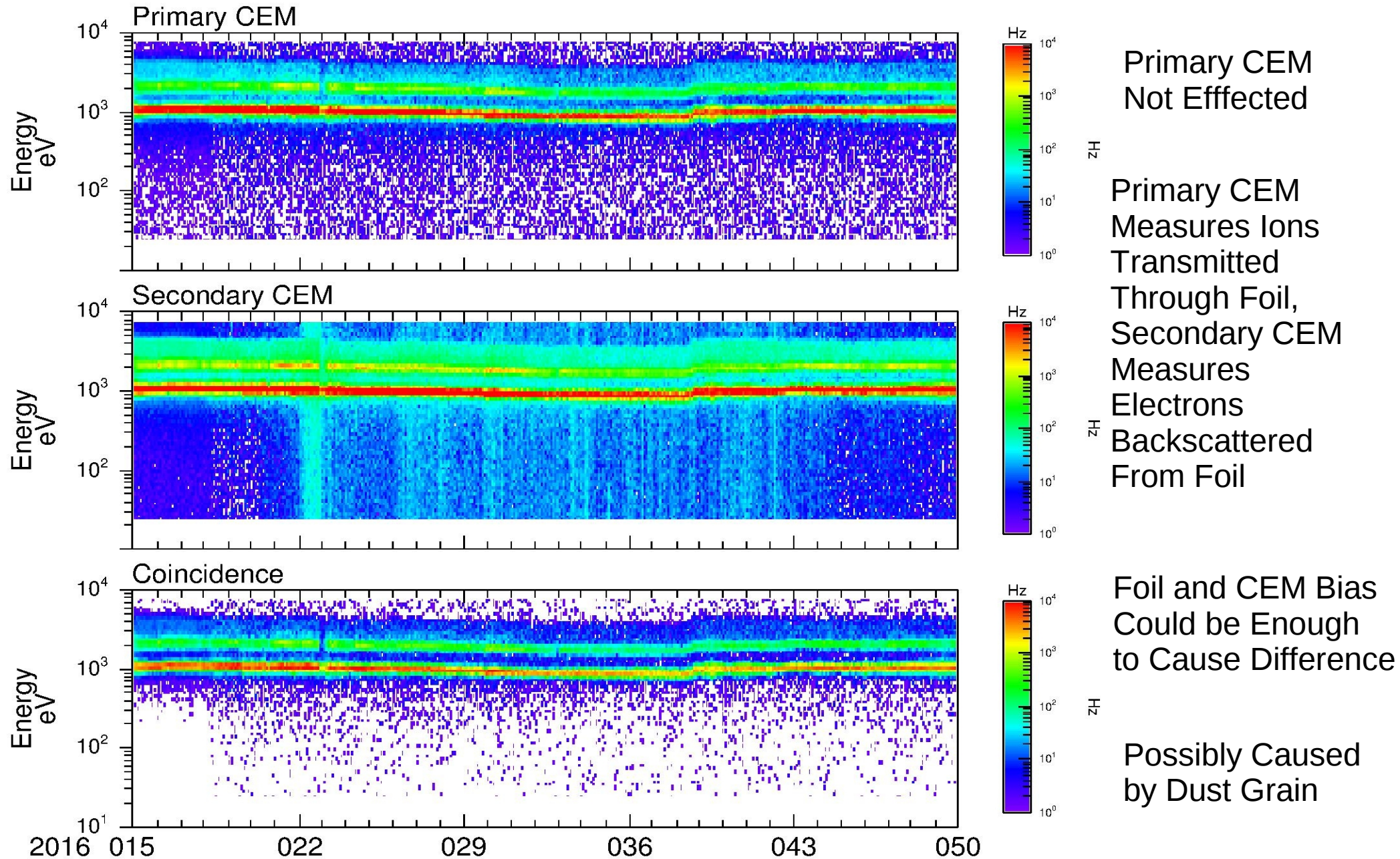
SWAP Data Evaluation

nh-p-swap-3-pluto-v3.0/data Science Data (0x584)



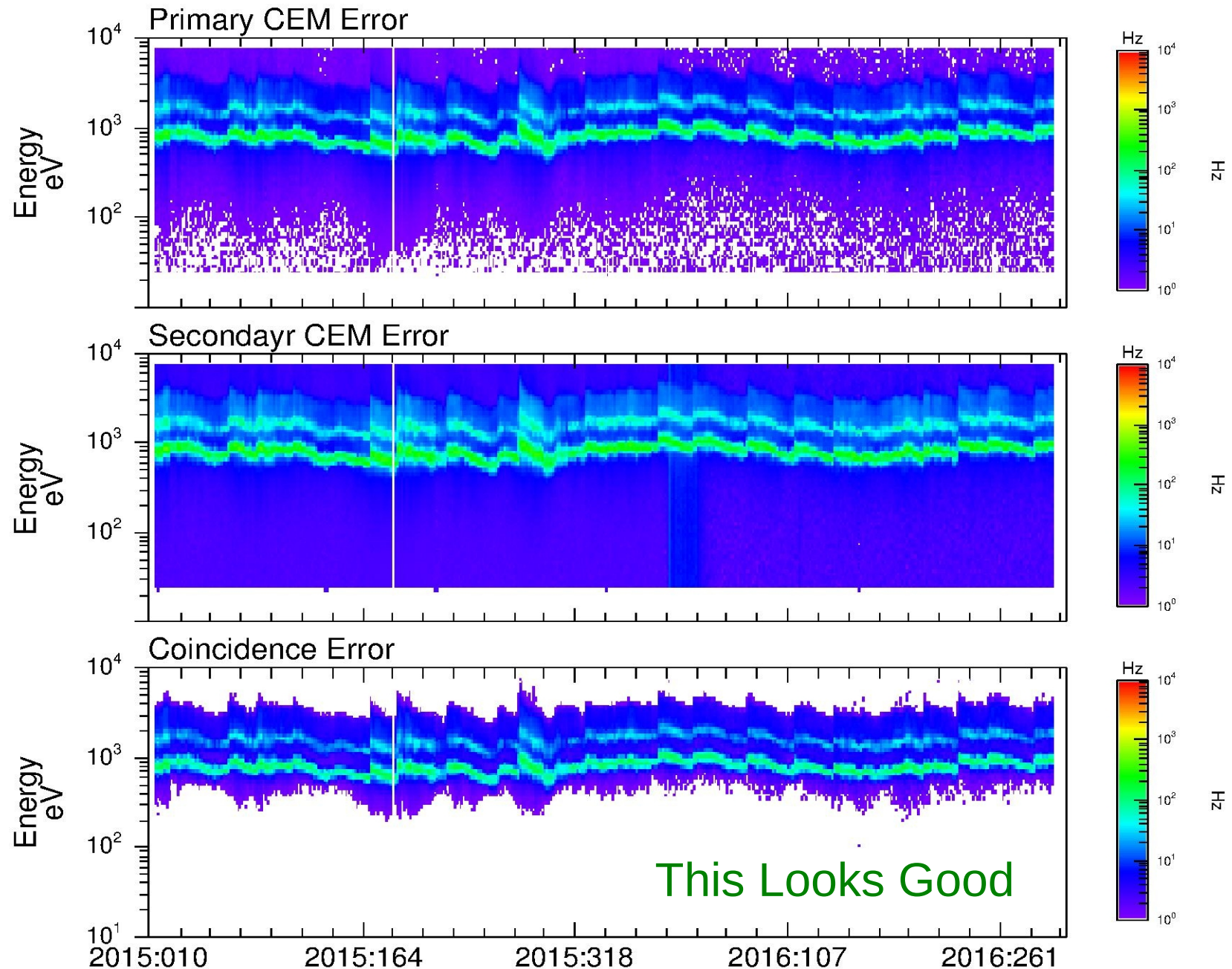
nh-p-swap-3-pluto-v3.0/data

Blow-up of Odd Secondary CEM



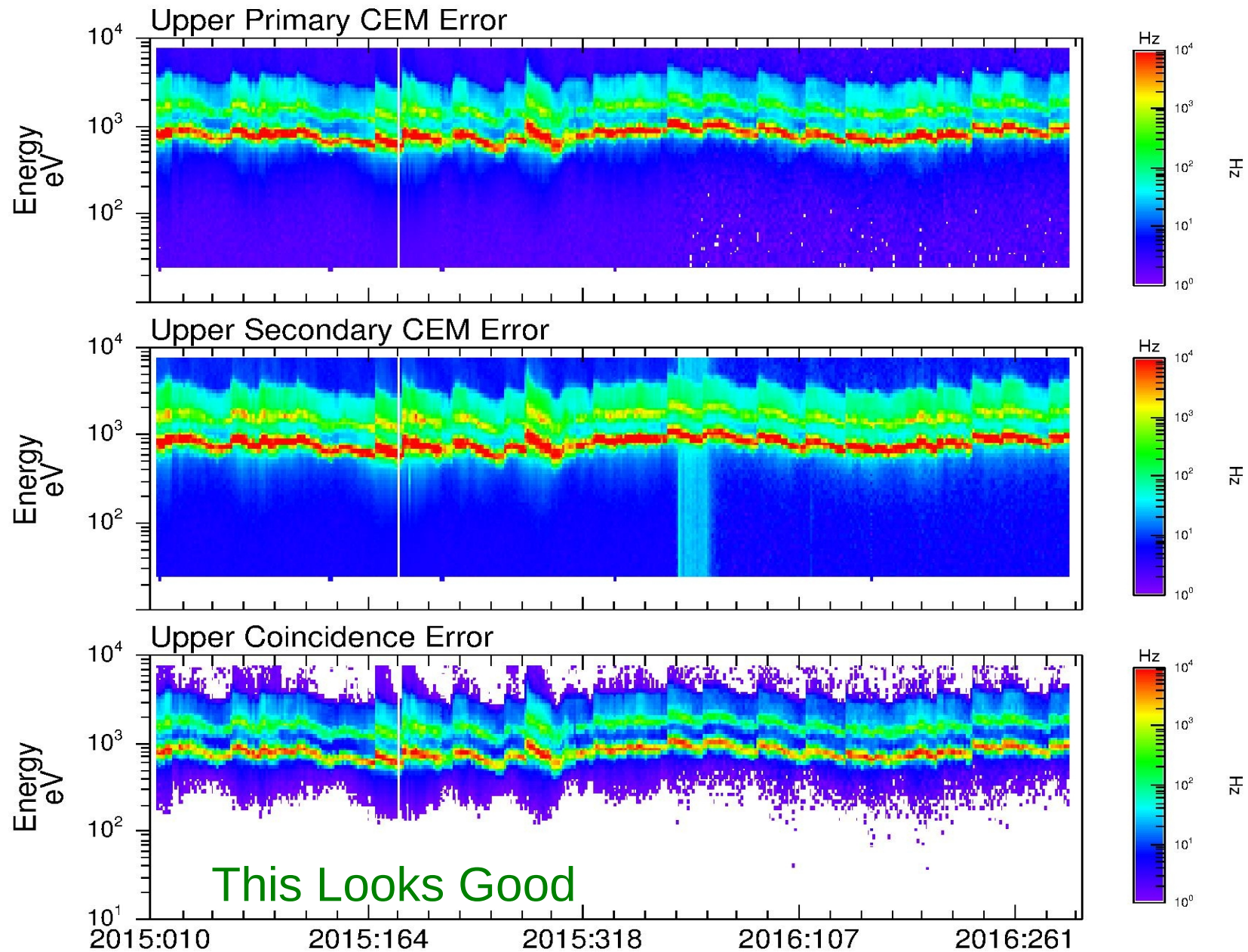
nh-p-swap-3-pluto-v3.0/data

Relative Uncertainty



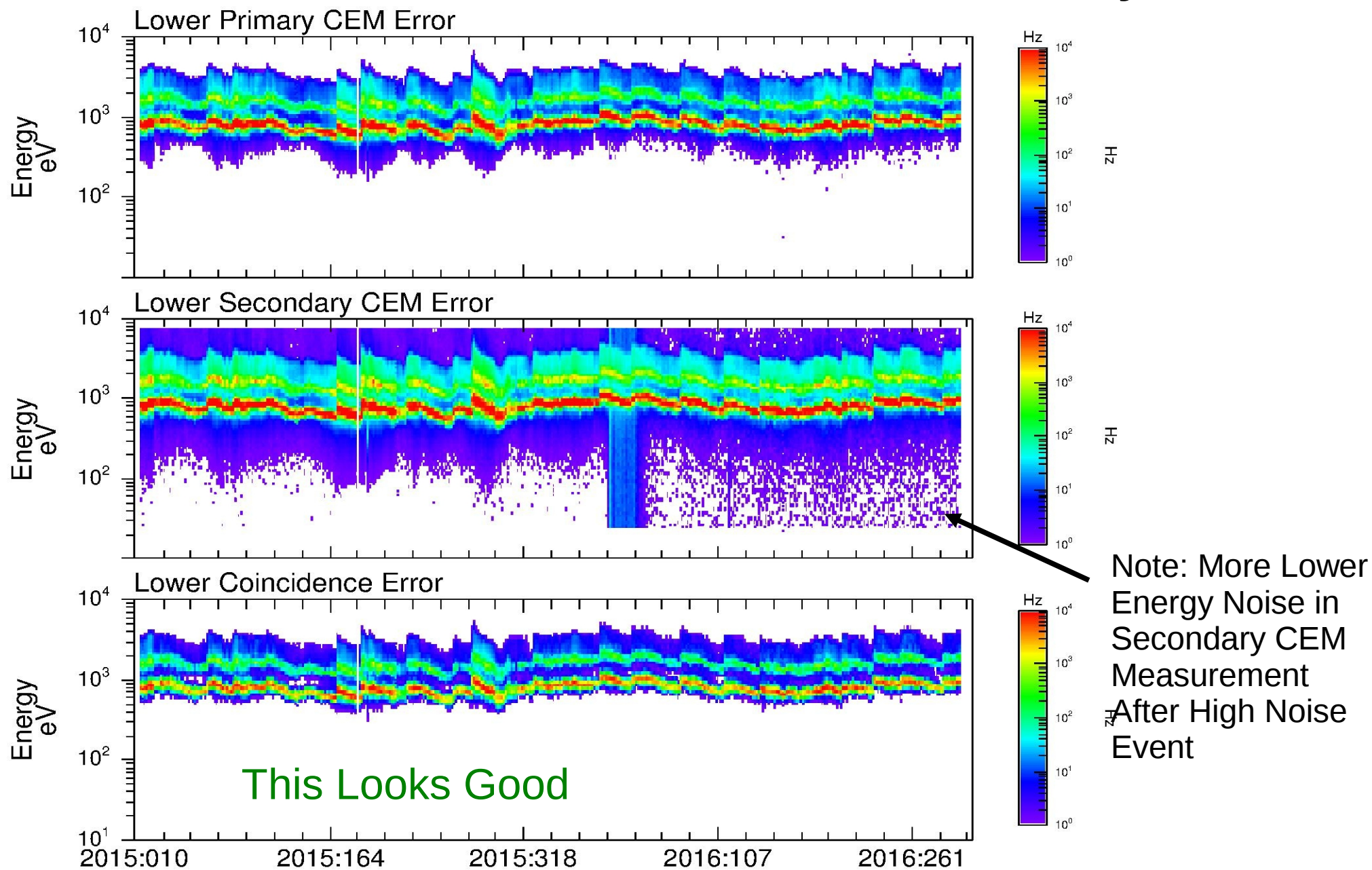
nh-p-swap-3-pluto-v3.0/data

Absolute Maximum Uncertainty

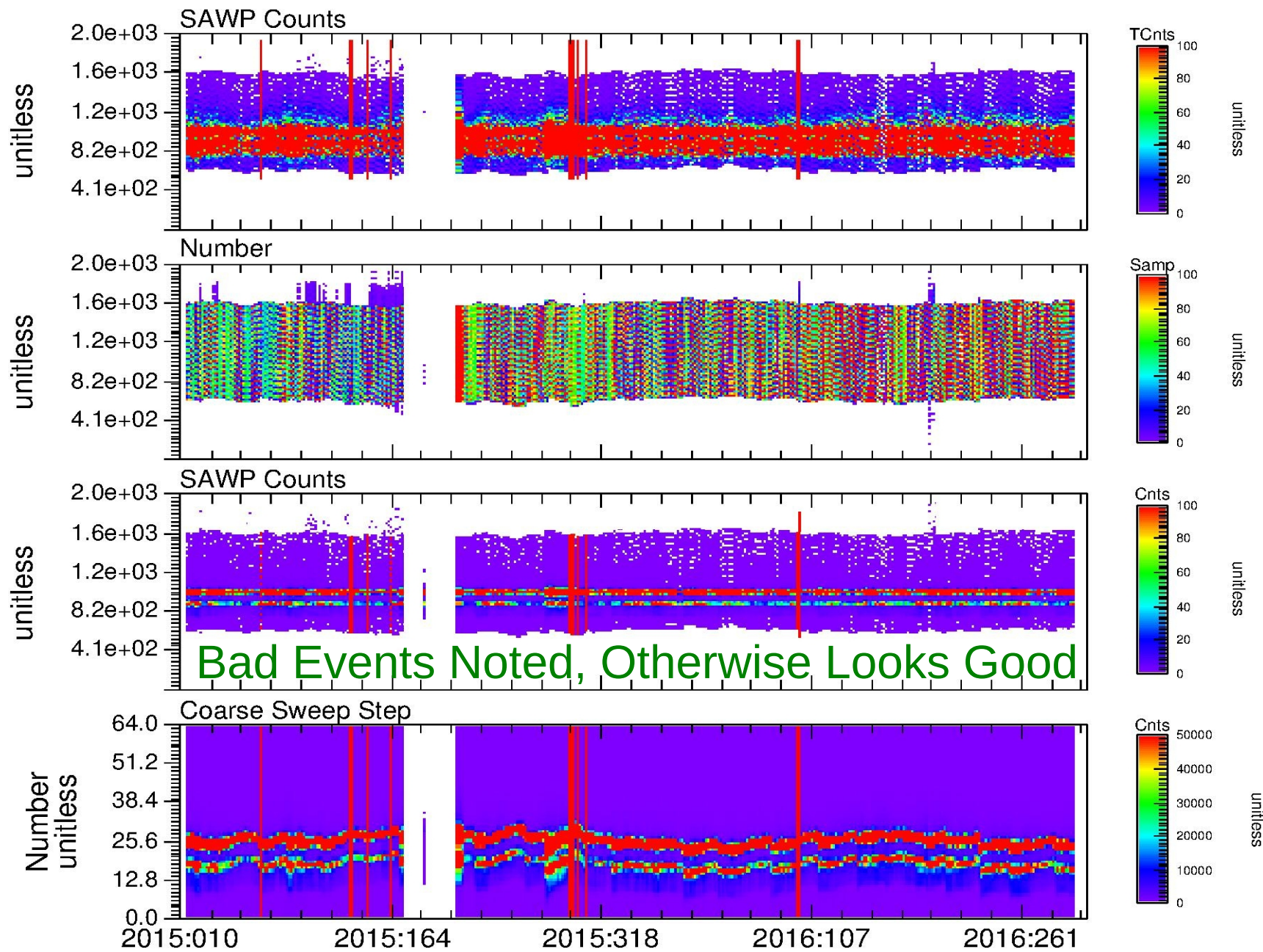


nh-p-swap-3-pluto-v3.0/data

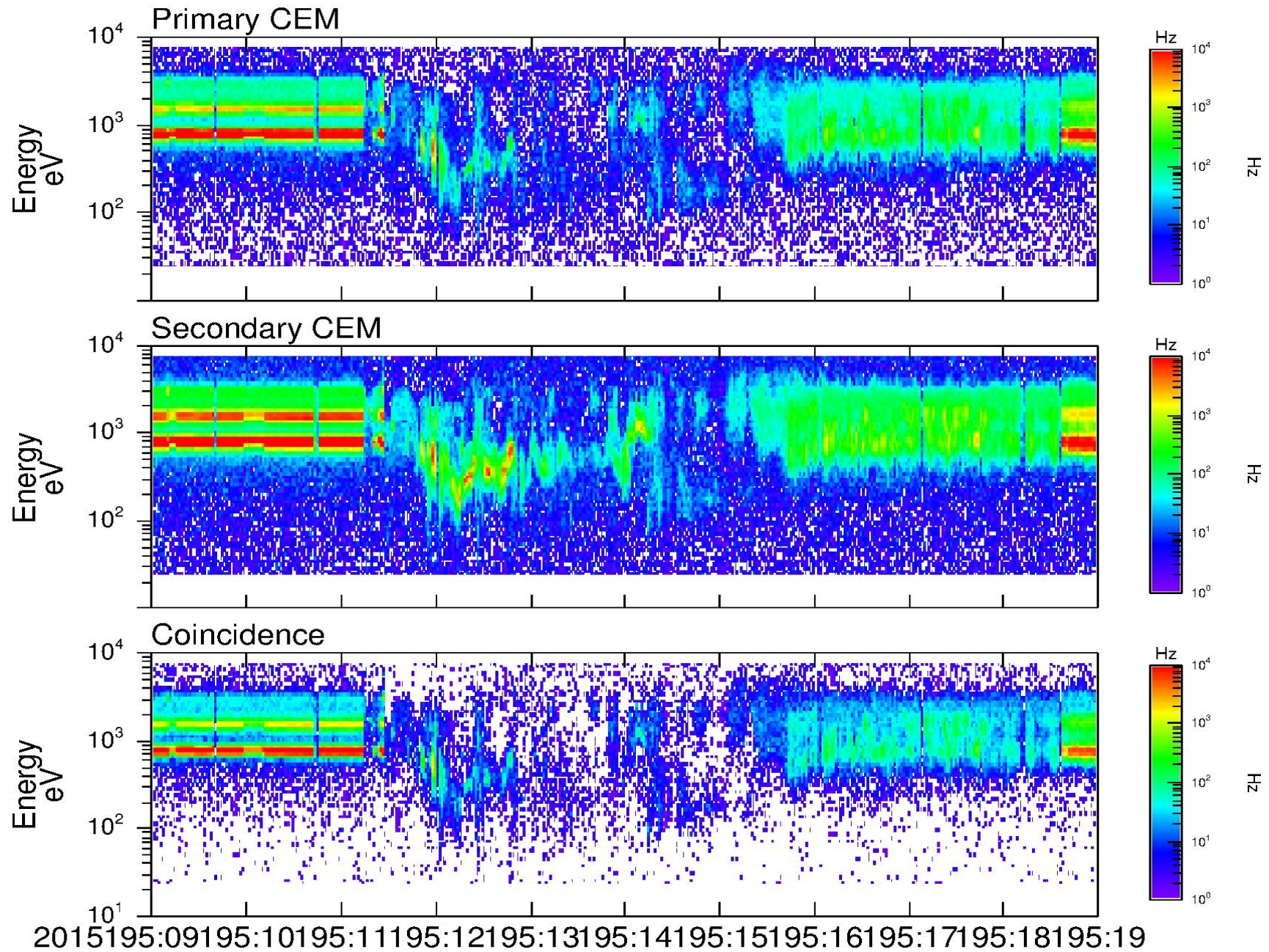
Absolute Minimum Uncertainty



nh-p-swap-3-pluto-v3.0/data Histogram Data (0x586)



nh-p-swap-3-pluto-v3.0/data Pluto Encounter



Certification

These data are certifiable once the minor documentation errors are corrected.

BACK-UP SLIDES

nh-p-swap-2-pluto-v3.0
nh-p-swap-3-pluto-v3.0
aareadme.txt

GOOD

nh-p-swap-2-pluto-v3.0
nh-p-swap-3-pluto-v3.0
voldesc.cat

GOOD

nh-p-swap-2-pluto-v3.0/catalog
nh-p-swap-3-pluto-v3.0/catalog
catinfo.txt

GOOD

nh-p-swap-2-pluto-v3.0/catalog
nh-p-swap-3-pluto-v3.0/catalog
dataset.cat

Minor notes sent to PDS.

nh-p-swap-2-pluto-v3.0/catalog
nh-p-swap-3-pluto-v3.0/catalog
nh.cat

GOOD

nh-p-swap-2-pluto-v3.0/catalog
nh-p-swap-3-pluto-v3.0/catalog
nhsc.cat

GOOD

nh-p-swap-2-pluto-v3.0/catalog
nh-p-swap-3-pluto-v3.0/catalog
ref.cat

GOOD

nh-p-swap-2-pluto-v3.0/catalog
nh-p-swap-3-pluto-v3.0/catalog
swap.cat

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
aareadme_bu.txt

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
docinfo.txt

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
codmac_level_definitions.lbl
codmac_level_definitions.pdf

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
nh_fov.lbl & nh_fov.pdf

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
lunineetal1995.tbl & lunineetal1995.pdf

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
payload_ssr.lbl & payload_ssr.pdf

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
swap_ssr.lbl & swap_ssr.pdf

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
seq_swap_pluto.tbl & seq_swap_pluto.tab

GOOD

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
fov_mask_2d.tbl & fov_mask_2d.tab

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
swap_cal.tbl

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
swap_cal.pdf

Minor errors sent to PDS

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
soc_inst_icd.tbl & soc_inst_icd.pdf

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
nh_met2utc.lbl & nh_met2utc.pdf

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
nh_mission_trajectory.tbl
nh_mission_trajectory.tab

GOOD

nh-p-swap-2-pluto-v3.0/document
nh-p-swap-3-pluto-v3.0/document
 quat_axyz_instr_to_j2k.lbl
 quat_axyz_instr_to_j2k.asc

GOOD

nh-p-swap-2-pluto-v3.0/document/traj
nh-p-swap-3-pluto-v3.0/document/traj
trajinfo.txt

GOOD

nh-p-swap-2-pluto-v3.0/document/traj
nh-p-swap-3-pluto-v3.0/document/traj
traj.fmt

GOOD

nh-p-swap-2-pluto-v3.0/document/traj
nh-p-swap-3-pluto-v3.0/document/traj
traj_2006_2015_1d.tbl & traj_2006_2015_1d.tab

GOOD

nh-p-swap-2-pluto-v3.0/document/traj
nh-p-swap-3-pluto-v3.0/document/traj
traj_pluto_flyby.lbl & traj_pluto_flyby.tab

GOOD

nh-p-swap-2-pluto-v3.0/document/
nh-p-swap-3-pluto-v3.0/document/
data_summary_plots/swap_pluto_datasumm.lbl

GOOD

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
calinfo.txt

GOOD

nh-p-swap-2-pluto-v3.0/calib
nh-p-swap-3-pluto-v3.0/calib
list_energy_files.lbl & list_energy_files.tab

GOOD

nh-p-swap-2-pluto-v3.0/index
nh-p-swap-3-pluto-v3.0/index
indxinfo.txt

GOOD

nh-p-swap-2-pluto-v3.0/index
nh-p-swap-3-pluto-v3.0/index
index.lbl & index.tab

GOOD

nh-p-swap-2-pluto-v3.0/index
nh-p-swap-3-pluto-v3.0/index
checksum.tbl & checksum.tab

GOOD

nh-p-swap-2-pluto-v3.0/index
nh-p-swap-3-pluto-v3.0/index
slimindx.tbl & slimindx.tab

GOOD