

<b>UNH</b>	<b>GRO-COMPTEL</b>	Doc: COM-RP-UNH-SIM-057
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Document Title: Incorporating Detector Threshold Modifications into Simulated PSFs

Document ID: COM-RP-UNH-SIM-057

Issue No. : 1

Issue Date: 05-February-1999

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<h1>UNH</h1>	<b>GRO-COMPTEL</b>	Doc: COM-RP-UNH-SIM-057
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## **Introduction**

This document provides information on the procedure used to incorporate new detector threshold information into a simulated PSF.

## **Outline of the Procedure**

The procedure required to incorporate updated detector threshold information into a simulated PSF involves the following steps:

1. Determine the thresholds from real COMPTEL (EVP) data using task IFCTHR. The threshold information that will be required can be found both in the IFCTHR log file and in the BTH dataset that is produced by IFCTHR.
2. Using the threshold information, create a new ISS dataset. The ISS dataset is a COMPASS text file that can be edited by hand.
3. Select a given set of QEV data. QEV data are generated by task SIMGAM for a given photon incidence angle and incident spectrum.
4. Using the new ISS dataset and the chosen QEV data, run task SIMFIN to generate a new set of simulated EVP data. These data now should incorporate the updated threshold information.
5. Run COMPASS task SIMPSF using the new EVP dataset to generate new PSFs (COMPASS datasets IAQ and FAQ).

In order to more clearly demonstrate the process, we provide further details below using a specific example. The example corresponds to the generation of a PSF for mid-July, 1997 – in particular, for viewing period 622.0.

## Determining Thresholds with IFCTHR

Task IFCTHR was developed for the purpose of determining the detector thresholds. It models the threshold of each model with one Gaussian (two if a pedestal is present, which is usually not the case with in-flight data). More specifically, the threshold is fit to the rising edge of a Gaussian. The threshold value is then defined to be that energy corresponding to half the maximum of the Gaussian on its rising (or lower) edge. The FWHM width of the Gaussian is used as a measure of the width of the threshold.

The task parameter table for IFCTHR in this case is shown below. In most cases, the default parameters seem to work ok. The important parameters include the following:

*Start and stop times.* The start time should be set for some point well after the start of the data so as to insure proper instrument status data is available (from the records in the ISD dataset).

*Failed PMT Config.* The user should specify an FPM file containing any failed PMT information required to process any of the processed modules.

*Excluded modules.* In principle, one can select which modules to exclude from the processing, but there is no harm in always including all modules. If the processing fails for one or more modules there is no adverse impact on the other modules.

*Selected event type.* Can be either EVP or EGR data. The user then needs to specify either an EGR filename or an EVP filename. A file list is allowable.

*FBY filename.* The user needs to specify the appropriate FBY file (or file list) for the given time period.

*ISD filename.* Instrument status data. The user needs to specify the appropriate ISD file (or file list) for the given time period.

```

1*****
Task parameters for background task (standard UserShell output)
*****

site PTT_ID number      creation data
user  date      time  status  parameter table descriptor name
-----
UNH IFCTH2 283          MCCNN 27 May 1998 22:18  C      TJD 10624-10636          VP 622.0

Task id Version          Task title
-----
IFCTHR 25                Digital thresholds

number parameter prompt text      index      value
-----
1      Start time                    10624: 10000000
2      End time                        10626:690000000
3      Excluded modules D1              <COMPASS CHARACTER>
4      Excluded modules D2              <COMPASS CHARACTER>
5      Failed PMT config.              RCL-FPM-1          QUALITY: 0 <DATA SET IDENTIFIER>
6      Extended output                  NO
7      Min. pedestal counts            10
8      Smooth window                    3
9      Baseline deviation alert (POS)  -5 5
10     Baseline deviation alert (WID)  -5 5

```

```
11 Gamma events? YES <COMPASS LOGICAL>
12 Digital threshold? YES <COMPASS LOGICAL>
13 Selected event type EVP <COMPASS CHARACTER>
14 BGR inputfile name <SET IDENTIFIER>
15 EVP inputfile name MPE-EVP-38581 QUALITY: 131 <SET IDENTIFIER>
    List members:
      MPE-EVP-36544
      MPE-EVP-36721
      MPE-EVP-36725
      MPE-EVP-36575
      MPE-EVP-36731
      MPE-EVP-36593
      MPE-EVP-36597
      MPE-EVP-36601
      MPE-EVP-36744
      MPE-EVP-36748
      MPE-EVP-36780
      MPE-EVP-36764
      MPE-EVP-36760
      MPE-EVP-36768
      MPE-EVP-36772
      MPE-EVP-36776
      MPE-EVP-38228
      MPE-EVP-38236
      MPE-EVP-38240
      MPE-EVP-38244
      MPE-EVP-37191
      MPE-EVP-37201

16 Baseline BTA file RCL-BTA-100 QUALITY: 0 <DATA SET IDENTIFIER>
17 FBY inputfile name UNH-FBY-4189 QUALITY: 0 <SET IDENTIFIER>
    List members:
      MPE-FBY-25002
      MPE-FBY-25003
      MPE-FBY-25004
      MPE-FBY-25014
      MPE-FBY-25015
      MPE-FBY-25016
      MPE-FBY-25017
      MPE-FBY-25018
      MPE-FBY-25019
      MPE-FBY-25020
      MPE-FBY-25021
      MPE-FBY-25022
      MPE-FBY-25023

18 ISD inputfile name UNH-ISD-4193 QUALITY: 0 <SET IDENTIFIER>
    List members:
      MPE-ISD-25000
      MPE-ISD-25001
      MPE-ISD-25002
      MPE-ISD-25012
      MPE-ISD-25013
      MPE-ISD-25014
      MPE-ISD-25015
      MPE-ISD-25016
      MPE-ISD-25017
      MPE-ISD-25018
      MPE-ISD-25019
      MPE-ISD-25020
      MPE-ISD-25021

19 TIM inputfile name <SET IDENTIFIER>
20 Thresholdenergy output UNH-BTH-1334 <DATA SET IDENTIFIER>
```

\*\*\*\*\*

\*\*\*\*\*

### The important output data includes the following:

```
OEVP-file successfully closed.
OTIM-file successfully closed.
OTotal counts read : *****
OUseful counts for D1-modules: 824515
OUseful counts for D2-modules: *****
OCOUNTS per module:
OModule read-in passed TIM passed FPM selected
D1- 1 285062 285062 264190 107350
D1- 2 298139 298139 273729 112313
D1- 3 312366 312366 286605 120559
D1- 4 295837 295837 275050 114546
D1- 5 358585 358585 334348 148038
D1- 6 277770 277770 258597 106190
D1- 7 293689 293689 271347 115519
D2- 1 0 0 0 0
D2- 2 95995 95995 57225 43150
D2- 3 119183 119183 119183 94814
D2- 4 136540 136540 136540 113593
D2- 5 141653 141653 141653 117327
D2- 6 148612 148612 148612 125531
D2- 7 193666 193666 193666 165843
D2- 8 218586 218586 218586 187180
D2- 9 223643 223643 223643 203278
D2-10 154052 154052 154052 130258
D2-11 112139 112139 79149 63669
D2-12 306470 306470 306470 281495
D2-13 126066 126066 89996 73518
D2-14 144846 144846 95094 76706
```

Maximum number of counts for Detector D1- 1: 1242 at: 60.00 KeV  
 Maximum number of counts for Detector D1- 2: 1307 at: 62.50 KeV  
 Maximum number of counts for Detector D1- 3: 1450 at: 61.25 KeV  
 Maximum number of counts for Detector D1- 4: 1308 at: 56.25 KeV  
 Maximum number of counts for Detector D1- 5: 1724 at: 56.25 KeV  
 Maximum number of counts for Detector D1- 6: 1305 at: 62.50 KeV  
 Maximum number of counts for Detector D1- 7: 1394 at: 60.00 KeV  
 Maximum number of counts for Detector D2- 1: 0 at: -15.00 KeV  
 Not enough counts; module D2- 1 is also excluded!  
 Maximum number of counts for Detector D2- 2: 811 at: 930.00 KeV  
 Maximum number of counts for Detector D2- 3: 1807 at: 765.00 KeV  
 Maximum number of counts for Detector D2- 4: 2741 at: 660.00 KeV  
 Maximum number of counts for Detector D2- 5: 2605 at: 735.00 KeV  
 Maximum number of counts for Detector D2- 6: 3087 at: 660.00 KeV  
 Maximum number of counts for Detector D2- 7: 5406 at: 540.00 KeV  
 Maximum number of counts for Detector D2- 8: 9606 at: 555.00 KeV  
 Maximum number of counts for Detector D2- 9: 19910 at: 540.00 KeV  
 Maximum number of counts for Detector D2-10: 3023 at: 660.00 KeV  
 Maximum number of counts for Detector D2-11: 1260 at: 810.00 KeV  
 Maximum number of counts for Detector D2-12: 28860 at: 525.00 KeV  
 Maximum number of counts for Detector D2-13: 1591 at: 765.00 KeV  
 Maximum number of counts for Detector D2-14: 1684 at: 765.00 KeV

1-----  
 0Summary:

Module D1- 1: 2 Gaussian(s) were attempted to be fit  
 Module D1- 2: 1 Gaussian(s) were attempted to be fit  
 Module D1- 3: 1 Gaussian(s) were attempted to be fit  
 Module D1- 4: 1 Gaussian(s) were attempted to be fit  
 Module D1- 5: 1 Gaussian(s) were attempted to be fit  
 Module D1- 6: 1 Gaussian(s) were attempted to be fit  
 Module D1- 7: 1 Gaussian(s) were attempted to be fit  
 Module D2- 1: was excluded!  
 Module D2- 2: 1 Gaussian(s) were attempted to be fit  
 Module D2- 3: 1 Gaussian(s) were attempted to be fit  
 Module D2- 4: 1 Gaussian(s) were attempted to be fit  
 Module D2- 5: 1 Gaussian(s) were attempted to be fit  
 Module D2- 6: 1 Gaussian(s) were attempted to be fit  
 Module D2- 7: 1 Gaussian(s) were attempted to be fit  
 Module D2- 8: 1 Gaussian(s) were attempted to be fit  
 Module D2- 9: 1 Gaussian(s) were attempted to be fit  
 Module D2-10: 1 Gaussian(s) were attempted to be fit  
 Module D2-11: 1 Gaussian(s) were attempted to be fit  
 Module D2-12: 1 Gaussian(s) were attempted to be fit  
 Module D2-13: 1 Gaussian(s) were attempted to be fit  
 Module D2-14: 1 Gaussian(s) were attempted to be fit

0  
 0Meaning of the variables a(i):  
 0a(1): strength second Gaussian (threshold)  
 a(2): position second Gaussian (threshold)  
 a(3): width second Gaussian (threshold)  
 a(4): strength first Gaussian (pedestal)  
 a(5): position first Gaussian (pedestal)  
 a(6): width first Gaussian (pedestal)

0  
 0Start values: a(1) a(2) a(3) a(4) a(5) a(6)  
 Module D1- 1: 1234.00 55.00 10.00 9.51 5.90 7.50  
 Module D1- 2: 1307.00 62.50 10.00  
 Module D1- 3: 1450.00 57.50 10.00  
 Module D1- 4: 1285.00 51.25 10.00  
 Module D1- 5: 1724.00 57.50 10.00  
 Module D1- 6: 1305.00 58.75 10.00  
 Module D1- 7: 1394.00 60.00 10.00  
 Module D2- 2: 811.00 925.00 40.00  
 Module D2- 3: 1807.00 790.00 80.00  
 Module D2- 4: 2741.00 670.00 40.00  
 Module D2- 5: 2605.00 745.00 40.00  
 Module D2- 6: 3087.00 670.00 40.00  
 Module D2- 7: 5406.00 565.00 40.00  
 Module D2- 8: 9606.00 565.00 40.00  
 Module D2- 9: 19910.00 550.00 40.00  
 Module D2-10: 3023.00 670.00 40.00  
 Module D2-11: 1260.00 805.00 40.00  
 Module D2-12: 28860.00 535.00 40.00  
 Module D2-13: 1591.00 775.00 40.00  
 Module D2-14: 1684.00 790.00 40.00

0  
 0The results are: a(1) a(2) a(3) a(4) a(5) a(6)  
 Module D1- 1: 1234.00 55.92 8.43 4.13 5.90 274.60  
 error: 0.000 0.189 0.168 0.538 0.000 3918.105  
 Module D1- 2: no pedestal detected.  
 Module D1- 2: 1307.00 60.69 7.80  
 error: 0.000 0.148 0.122  
 Module D1- 3: no pedestal detected.  
 Module D1- 3: 1450.00 55.34 8.43  
 error: 0.000 0.143 0.118  
 Module D1- 4: no pedestal detected.  
 Module D1- 4: 1285.00 50.41 8.20  
 error: 0.000 0.169 0.139  
 Module D1- 5: no pedestal detected.  
 Module D1- 5: 1724.00 56.88 7.92  
 error: 0.000 0.146 0.121  
 Module D1- 6: no pedestal detected.  
 Module D1- 6: 1305.00 58.98 8.25  
 error: 0.000 0.178 0.147  
 Module D1- 7: no pedestal detected.  
 Module D1- 7: 1394.00 56.93 8.79  
 error: 0.000 0.132 0.106

```

Module D2- 2: no pedestal detected.
Module D2- 2: 811.00 938.47 86.83
error: 0.000 2.449 1.999
Module D2- 3: no pedestal detected.
Module D2- 3: 1807.00 771.56 53.66
error: 0.000 0.850 0.670
Module D2- 4: no pedestal detected.
Module D2- 4: 2741.00 674.30 50.82
error: 0.000 1.067 0.894
Module D2- 5: no pedestal detected.
Module D2- 5: 2605.00 737.63 53.20
error: 0.000 0.939 0.788
Module D2- 6: no pedestal detected.
Module D2- 6: 3087.00 676.27 51.31
error: 0.000 1.054 0.899
Module D2- 7: no pedestal detected.
Module D2- 7: 5406.00 562.67 47.38
error: 0.000 0.629 0.516
Module D2- 8: no pedestal detected.
Module D2- 8: 9606.00 574.80 26.19
error: 0.000 0.426 0.355
Module D2- 9: no pedestal detected.
Module D2- 9: 19910.00 552.65 23.90
error: 0.000 0.217 0.185
Module D2-10: no pedestal detected.
Module D2-10: 3023.00 664.96 46.63
error: 0.000 0.822 0.697
Module D2-11: no pedestal detected.
Module D2-11: 1260.00 786.23 67.82
error: 0.000 1.356 1.121
Module D2-12: no pedestal detected.
Module D2-12: 28860.00 532.70 34.37
error: 0.000 0.204 0.167
Module D2-13: no pedestal detected.
Module D2-13: 1591.00 749.04 63.26
error: 0.000 0.977 0.791
Module D2-14: no pedestal detected.
Module D2-14: 1684.00 783.26 66.38
error: 0.000 1.413 1.183
0
0-----
  
```

Here are the most important data that we need – the detector threshold data as derived from the Gaussian fits to each individual module. These data can also be obtained from the BTH dataset.

```

1-----
0
                                THRESHOLDS
Module D1- 1      Position      Error      FWHM      Error      Level  P W
Module D1- 2      54.20      0.148      12.98      0.204      6
Module D1- 3      48.33      0.143      14.03      0.197      6
Module D1- 4      43.58      0.169      13.65      0.232      6
Module D1- 5      50.29      0.146      13.19      0.201      6
Module D1- 6      52.11      0.178      13.73      0.244      6
Module D1- 7      49.61      0.132      14.64      0.177      6
Module D2- 1      was excluded.
Module D2- 2      866.17      2.449      144.58      3.328      7      X X
Module D2- 3      726.89      0.850      89.35      1.115      7
Module D2- 4      631.99      1.067      84.61      1.488      7
Module D2- 5      693.34      0.939      88.58      1.312      7
Module D2- 6      633.55      1.054      85.44      1.497      7
Module D2- 7      523.23      0.629      78.89      0.859      7
Module D2- 8      553.00      0.426      43.61      0.591      7
Module D2- 9      532.75      0.217      39.80      0.307      7
Module D2-10      626.13      0.822      77.65      1.160      7
Module D2-11      729.76      1.356      112.93      1.866      7
Module D2-12      504.09      0.204      57.23      0.278      7
Module D2-13      696.37      0.977      105.34      1.316      7
Module D2-14      728.00      1.413      110.53      1.971      7
0-----
  
```

OBTH-file successfully written.

## Threshold Information in the BTH Dataset

The BTH dataset that is created by IFCTHR contains the threshold information. The BTH dataset is a COMPASS text file with a record size of 88 bytes. (The record size is incorrectly given as 80 bytes in the COMPASS VRD/VRS tables.) The contents of UNH-BTH-1334 are shown below. The parameters of interest are the 'threshold' and 'width' parameters for each module.

```

P Dataset name : UNH-BTH-1334
P Produced by : UNH-IFCTH2-283
P Title : TJD 10624-10636
P Time interval: from 10624:010000000 upto 10626:000128000
P
P D1 digital threshold for GAMMA1: 20
P D2 digital threshold for GAMMA1: 55
P D1 digital threshold for GAMMA2: 5
P D2 digital threshold for GAMMA2: 5
P
P Spectra fitted assuming gammal events
P Spectra fitted assuming digital threshold
P
P Module Threshold Error Width Error A S P W
P D1- 1 48.9 0.2 14.0 0.3 6 64
P D1- 2 54.2 0.1 13.0 0.2 6 64
P D1- 3 48.3 0.1 14.0 0.2 6 64
P D1- 4 43.6 0.2 13.6 0.2 6 64
P D1- 5 50.3 0.1 13.2 0.2 6 64
P D1- 6 52.1 0.2 13.7 0.2 6 64
P D1- 7 49.6 0.1 14.6 0.2 6 64
P D2- 1 7 0 X X
P D2- 2 866.2 2.4 144.6 3.3 7 64
P D2- 3 726.9 0.9 89.4 1.1 7 64
P D2- 4 632.0 1.1 84.6 1.5 7 64
P D2- 5 693.3 0.9 88.6 1.3 7 64
P D2- 6 633.5 1.1 85.4 1.5 7 64
P D2- 7 523.2 0.6 78.9 0.9 7 64
P D2- 8 553.0 0.4 43.6 0.6 7 64
P D2- 9 532.7 0.2 39.8 0.3 7 64
P D2-10 626.1 0.8 77.6 1.2 7 64
P D2-11 729.8 1.4 112.9 1.9 7 64
P D2-12 504.1 0.2 57.2 0.3 7 64
P D2-13 696.4 1.0 105.3 1.3 7 64
P D2-14 728.0 1.4 110.5 2.0 7 64
P
P B - Baseline deviation alert
P N - No convergence
P X - was eXcluded

```

## Modifications to the ISS Table

The ISS file contains various pieces of information about the detectors and their configuration that are used by SIMFIN in generating simulated EVP data. In particular, the ISS file includes the following:

1. ToF Resolution Table
2. Energy Resolution Table
3. Event Location Resolution Table
4. Module Status/Threshold Table
5. Veto Software Thresholds Table
6. PSD Model Table (not used)

The ISS table is a text file that can be edited directly. Starting from an existing ISS file and using the threshold information provided by IFCTHR, one can create a new ISS file by modifying the threshold table within the ISS file. A new ISS file can then be created (taking care to insure proper conversions between 'unformatted' and 'formatted' COMPASS text files), along with a new dataset descriptor.

One word of caution. Starting with UNH-ISS-1033, the format of the ISS file was changed significantly to a more user-friendly format. The newer format is shown in the example below (UNH-ISS-1121). Associated with the new format is a new dataset type representation number. When creating a descriptor for the (new format) ISS file, be sure to set the dataset type representation number to 'I'.

For incorporating threshold information, one needs only to modify the module status/threshold table in the ISS file. For each module, only parameters 1, 4, and 5 are actually used by SIM. Parameter 1 indicates the module status (1 = on; 0 = off).  
Parameter 4

(Note that boldface is added to some text in the printout below to more clearly indicate the various tables within the ISS file.)

```

=====
          INSTRUMENT STATUS SIMULATION TABLE (ISS): COMPASS ADJUNCT DATA SET
USER TEXT: THRESHOLDS FOR VP 511 (TJD 10112)
USER TEXT: NONE
=====
TOF RESOLUTION TABLE:
PARAM1: Forward peak TOF 1-sigma Resolution (channels)
PARAM2: Backward peak TOF 1-sigma Resolution (channels)
PARAM3: TOF normalization parameter A
PARAM4: TOF normalization parameter B
PARAM5: UNUSED
PARAM6: UNUSED
MODCOM:  PARAM1:    PARAM2:    PARAM3:    PARAM4:    PARAM5:    PARAM6:
-----
1      4.1000    3.3000    -6.3900    1.0500    0.0000    0.0000
2      3.8000    3.0000    -2.6900    0.9920    0.0000    0.0000
3      3.8000    2.8000    0.5170    0.9540    0.0000    0.0000
4      4.6000    3.7000    1.5200    0.9960    0.0000    0.0000
5      5.9000    3.3000   -12.1000    1.0600    0.0000    0.0000
6      4.2000    3.7000   -10.4000    1.0800    0.0000    0.0000
7      5.1000    3.3000    -8.2400    1.0400    0.0000    0.0000
8      4.2000    2.8000    -0.1870    1.0400    0.0000    0.0000
9      3.8000    3.2000   -1.5500    1.0300    0.0000    0.0000
10     3.8000    3.1000    2.4500    0.9830    0.0000    0.0000
11     4.1000    3.2000    9.3700    0.9540    0.0000    0.0000
12     4.1000    3.2000   -2.7200    1.0200    0.0000    0.0000
13     3.7000    3.2000   -1.9100    1.0500    0.0000    0.0000
14     4.0000    2.6000   -6.4300    1.0700    0.0000    0.0000

```

15	4.3000	3.3000	1.2000	1.0300	0.0000	0.0000
16	4.4000	3.2000	-4.1400	1.0500	0.0000	0.0000
17	4.0000	3.4000	5.5000	0.9460	0.0000	0.0000
18	4.2000	3.0000	13.6000	0.9130	0.0000	0.0000
19	3.8000	3.3000	3.4300	0.9610	0.0000	0.0000
20	3.9000	3.0000	-0.0230	1.0400	0.0000	0.0000
21	4.2000	2.7000	-7.0500	1.0700	0.0000	0.0000
22	4.1000	3.6000	4.1700	1.0400	0.0000	0.0000
23	4.0000	2.5000	7.6000	0.9610	0.0000	0.0000
24	3.6000	3.8000	7.4300	0.9540	0.0000	0.0000
25	5.0000	3.2000	7.5300	1.0000	0.0000	0.0000
26	4.6000	3.5000	-6.8000	1.0900	0.0000	0.0000
27	4.5000	3.1000	3.6800	1.0300	0.0000	0.0000
28	4.4000	3.0000	2.1400	1.0100	0.0000	0.0000
29	4.4000	3.8000	-9.6400	1.1000	0.0000	0.0000
30	4.4000	2.8000	-4.8500	1.0200	0.0000	0.0000
31	4.3000	3.4000	-7.0400	1.0400	0.0000	0.0000
32	3.9000	3.5000	-0.5820	1.0200	0.0000	0.0000
33	4.3000	3.7000	-9.7100	1.0500	0.0000	0.0000
34	4.2000	3.6000	-4.5500	1.0400	0.0000	0.0000
35	4.2000	3.2000	-6.8700	1.0300	0.0000	0.0000
36	3.9000	3.4000	-4.0300	1.0700	0.0000	0.0000
37	4.0000	3.1000	-6.4000	1.0600	0.0000	0.0000
38	4.1000	3.6000	-2.3000	1.0100	0.0000	0.0000
39	4.3000	3.7000	2.7600	1.0100	0.0000	0.0000
40	3.7000	3.5000	-2.7900	1.0000	0.0000	0.0000
41	3.7000	3.8000	-0.0330	1.0200	0.0000	0.0000
42	3.8000	3.0000	-6.8700	1.0600	0.0000	0.0000
43	4.6000	3.7000	-4.4700	1.0300	0.0000	0.0000
44	6.7000	3.3000	-13.3000	1.0900	0.0000	0.0000
45	6.4000	3.9000	-5.8000	1.0100	0.0000	0.0000
46	4.9000	4.4000	3.4100	0.9770	0.0000	0.0000
47	4.4000	3.7000	-4.2300	0.9920	0.0000	0.0000
48	4.4000	3.8000	-0.2950	0.9880	0.0000	0.0000
49	6.6000	4.0000	-14.3000	1.0900	0.0000	0.0000
50	4.8000	3.5000	-5.8700	1.0400	0.0000	0.0000
51	4.6000	3.4000	-4.3800	1.0000	0.0000	0.0000
52	4.3000	3.4000	-1.7700	0.9760	0.0000	0.0000
53	4.8000	4.2000	-6.1200	1.0600	0.0000	0.0000
54	7.3000	4.2000	-15.8000	1.0900	0.0000	0.0000
55	4.4000	3.8000	-4.7200	1.0300	0.0000	0.0000
56	4.3000	3.1000	3.3100	0.9250	0.0000	0.0000
57	4.2000	3.7000	-0.7220	1.0800	0.0000	0.0000
58	4.2000	3.6000	2.4900	1.0200	0.0000	0.0000
59	4.2000	3.4000	2.2300	1.0100	0.0000	0.0000
60	4.1000	3.6000	4.6600	1.0400	0.0000	0.0000
61	4.0000	3.9000	-0.9290	1.0300	0.0000	0.0000
62	4.2000	3.6000	5.9900	1.0100	0.0000	0.0000
63	4.2000	3.4000	1.4700	1.0300	0.0000	0.0000
64	4.6000	3.5000	-8.2900	1.0900	0.0000	0.0000
65	4.3000	3.2000	-9.2600	1.0700	0.0000	0.0000
66	4.4000	3.6000	-8.6800	1.0500	0.0000	0.0000
67	4.0000	4.0000	-3.5100	1.0500	0.0000	0.0000
68	4.2000	3.4000	-7.5700	1.0400	0.0000	0.0000
69	4.2000	3.5000	-2.0100	1.0200	0.0000	0.0000
70	4.3000	3.3000	-5.5800	1.0200	0.0000	0.0000
71	4.6000	3.2000	2.3800	1.0400	0.0000	0.0000
72	4.6000	3.5000	-3.7200	1.0700	0.0000	0.0000
73	4.8000	3.9000	-2.7900	1.0500	0.0000	0.0000
74	5.2000	3.8000	9.8300	0.9740	0.0000	0.0000
75	4.2000	3.0000	5.5300	0.9650	0.0000	0.0000
76	4.4000	3.0000	10.1000	0.9660	0.0000	0.0000
77	4.5000	3.3000	1.4900	1.0200	0.0000	0.0000
78	5.0000	3.6000	1.7300	1.0400	0.0000	0.0000
79	4.1000	3.1000	3.6400	0.9910	0.0000	0.0000
80	4.2000	3.4000	-1.1200	1.0300	0.0000	0.0000
81	5.1000	4.0000	-3.8300	1.1100	0.0000	0.0000
82	4.6000	3.7000	-5.0400	1.0600	0.0000	0.0000
83	3.8000	3.3000	6.9100	0.9770	0.0000	0.0000
84	3.7000	2.7000	8.4200	0.9370	0.0000	0.0000
85	4.3000	3.6000	-3.0700	1.0500	0.0000	0.0000
86	4.1000	3.1000	-1.8900	1.0100	0.0000	0.0000
87	4.3000	3.8000	-6.4700	1.0400	0.0000	0.0000
88	4.9000	3.4000	-9.5400	1.1300	0.0000	0.0000
89	4.6000	3.3000	-7.9900	1.0500	0.0000	0.0000
90	4.0000	3.3000	4.7800	0.9630	0.0000	0.0000
91	4.1000	3.3000	1.6700	0.9760	0.0000	0.0000
92	4.5000	4.0000	-6.3300	1.0500	0.0000	0.0000
93	5.1000	3.4000	-9.6500	1.0500	0.0000	0.0000
94	6.2000	3.6000	-15.3000	1.1000	0.0000	0.0000
95	4.7000	4.2000	-1.3000	1.0100	0.0000	0.0000
96	5.1000	3.6000	-4.1600	0.9820	0.0000	0.0000
97	4.1000	3.3000	5.8300	0.9300	0.0000	0.0000
98	4.7000	3.2000	-7.2100	1.0200	0.0000	0.0000

**ENERGY RESOLUTION TABLE:**

PARAM1: Module energy resolution fit parameter A  
 PARAM2: Module energy resolution fit parameter B  
 PARAM3: UNUSED  
 PARAM4: UNUSED NOTE: D1 SIGE[keV] = A + B\*SQRT(ED1[keV])  
 PARAM5: UNUSED D2 SIGE[keV] = SQRT(A\*\*2\*ED2[keV] + (B\*ED2[keV])\*\*2)  
 PARAM6: UNUSED

MODULE:	PARAM1:	PARAM2:	PARAM3:	PARAM4:	PARAM5:	PARAM6:
D1-01	-1.0217	1.7487	0.0000	0.0000	0.0000	0.0000
D1-02	-7.4805	2.1574	0.0000	0.0000	0.0000	0.0000
D1-03	2.9437	1.7229	0.0000	0.0000	0.0000	0.0000
D1-04	-5.8815	1.9354	0.0000	0.0000	0.0000	0.0000
D1-05	-3.0731	1.8924	0.0000	0.0000	0.0000	0.0000
D1-06	-8.6621	2.0692	0.0000	0.0000	0.0000	0.0000
D1-07	0.0200	1.8900	0.0000	0.0000	0.0000	0.0000
D2-01	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-02	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-03	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-04	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-05	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-06	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-07	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-08	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-09	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-10	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-11	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-12	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-13	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000
D2-14	1.1330	0.0190	0.0000	0.0000	0.0000	0.0000

**EVENT LOCATION RESOLUTION TABLE:**

PARAM1: Number of energy intervals to follow  
 PARAM2: ED1/ED2 energy interval start (keV)  
 PARAM3: ED1/ED2 energy interval end (keV)  
 PARAM4: X-dimension 1-sigma event location resolution (cm)  
 PARAM5: Y-dimension 1-sigma event location resolution (cm)  
 PARAM6: Z-dimension 1-sigma event location resolution (cm)

MODULE:	PARAM1:	PARAM2:	PARAM3:	PARAM4:	PARAM5:	PARAM6:
D1-01	1	0.0001	90000.0000	2.3000	2.3000	2.3000
D1-02	1	0.0001	90000.0000	2.3000	2.3000	2.3000
D1-03	1	0.0001	90000.0000	2.3000	2.3000	2.3000
D1-04	1	0.0001	90000.0000	2.3000	2.3000	2.3000
D1-05	1	0.0001	90000.0000	2.3000	2.3000	2.3000
D1-06	1	0.0001	90000.0000	2.3000	2.3000	2.3000
D1-07	1	0.0001	90000.0000	2.3000	2.3000	2.3000
D2-01	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-02	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-03	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-04	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-05	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-06	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-07	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-08	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-09	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-10	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-11	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-12	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-13	1	0.0001	90000.0000	1.9600	1.9600	1.9600
D2-14	1	0.0001	90000.0000	1.9600	1.9600	1.9600

**MODULE STATUS/THRESHOLD TABLE:**

PARAM1: Module status flag (integer 0/1 = inactive/active)  
 PARAM2: Module hardware threshold setting (integer 0-7) [for user info only]  
 PARAM3: Module software energy threshold (keV)  
 PARAM4: Module hardware threshold energy at half the maximum value (keV)  
 PARAM5: Module hardware threshold FWHM (keV)  
 PARAM6: UNUSED

MODULE:	PARAM1:	PARAM2:	PARAM3:	PARAM4:	PARAM5:	PARAM6:
D1-01	1	6	0.0000	48.9000	14.0000	0.0000
D1-02	1	6	0.0000	54.2000	13.0000	0.0000
D1-03	1	6	0.0000	48.3000	14.0000	0.0000
D1-04	1	6	0.0000	43.6000	13.6000	0.0000
D1-05	1	6	0.0000	50.3000	13.2000	0.0000
D1-06	1	6	0.0000	52.1000	13.7000	0.0000
D1-07	1	6	0.0000	49.6000	14.6000	0.0000
D2-01	0	7	0.0000	0.0000	0.0000	0.0000
D2-02	1	7	0.0000	866.2000	144.6000	0.0000
D2-03	1	7	0.0000	726.9000	89.4000	0.0000
D2-04	1	7	0.0000	632.0000	84.6000	0.0000
D2-05	1	7	0.0000	693.3000	88.6000	0.0000
D2-06	1	7	0.0000	633.5000	85.4000	0.0000
D2-07	1	7	0.0000	523.2000	78.9000	0.0000

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D2-08	1	7	0.0000	553.0000	43.6000	0.0000
D2-09	1	7	0.0000	532.7000	39.8000	0.0000
D2-10	1	7	0.0000	626.1000	77.6000	0.0000
D2-11	1	7	0.0000	729.8000	112.9000	0.0000
D2-12	1	7	0.0000	504.1000	57.2000	0.0000
D2-13	1	7	0.0000	696.4000	105.3000	0.0000
D2-14	1	7	0.0000	728.0000	110.5000	0.0000

=====

**VETO SOFTWARE THRESHOLDS TABLE:**

PARAM1: Veto energy threshold (keV) (events > threshold are flagged)  
PARAM2: Veto mass fraction of active scintillator  
PARAM3: UNUSED  
PARAM4: UNUSED  
PARAM5: UNUSED  
PARAM6: UNUSED

MODULE:	PARAM1:	PARAM2:	PARAM3:	PARAM4:	PARAM5:	PARAM6:
VETO1	1350.0000	0.7190	0.0000	0.0000	0.0000	0.0000
VETO2	1140.0000	0.8720	0.0000	0.0000	0.0000	0.0000
VETO3	1200.0000	0.8550	0.0000	0.0000	0.0000	0.0000
VETO4	948.0000	0.8720	0.0000	0.0000	0.0000	0.0000

=====

**PSD MODEL TABLE:**

PARAM1: UNUSED  
PARAM2: UNUSED  
PARAM3: UNUSED  
PARAM4: UNUSED  
PARAM5: UNUSED  
PARAM6: UNUSED

MODULE:	PARAM1:	PARAM2:	PARAM3:	PARAM4:	PARAM5:	PARAM6:
D1-01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
D1-02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
D1-03	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
D1-04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
D1-05	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
D1-06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
D1-07	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

=====

**END INSTRUMENT STATUS SIMULATION TABLE DEFINITION**

=====

## Generating Simulated EVP Data with SIMFIN

Once the ISS file is appropriately modified and a new ISS file is placed into COMPASS (with the appropriate new dataset descriptor), task SIMFIN can be used to generate a simulated EVP dataset corresponding to the specified thresholds. The COMPASS TPT file for our case is shown below. Important input parameters include (further information can be found in the SIMFIN help text):

*QEV filename.* These are the data generated by SIMGAM corresponding to the input spectrum and incidence angle of interest.

*ISS filename.* The file taht contains the important threshold information.

*Make short event file?* To specify output to an EVP file (which is what we want in this case), enter 'N'. If an SEV file were required (for use in task SIMRSP), then we would specify 'Y' here.

*Run mode.* Must correspond to that used in generating the QEV file (can be found in the corresponding SIMGAM TPT). For normal telescope mode data, this is set to 'r'. If a burst mode is specified, then a PBS file (rather than an EVP or SEV file) is generating. Here, however, we are only interested in telescope mode data.

*Number of events to process.* This number can be used to specify only a fraction of the events in the QEV file to be processed. Usually this is set to the number of events in the QEV file.

*Apply ToF broadening?* The current algorithm in SIMFIN is believed not to be very accurate. Standard SIM processing is done with this parameter set to 'N'.

*Apply PSD broadening?* Although the PSD broaening here is probably ok., the PSD selections can be incorporated into the PSFs via SIMPSF. Standard SIM processing is done with this parameter set to 'N'.

*Random number seed.* Must be between 1 and 200.

```

.....
Task parameters for background task (standard UserShell output)
.....

site PTT_ID number      creation data
user  date             time  status parameter table descriptor name
-----
UNH SIMFN8 2040         MCCONN 24 Sep 1998 14:02  C      qull Range E^(-2) simulation zenith 10 degrees  TJD 10630, VP 622

Task id Version         Task title
-----
SIMFIN 15              COMPTEL Broadened "Simulated" Event Data Generator

number parameter prompt text      index      value      type
-----
1      Physical Events Input Filename  UNH-QEV-7664  QUALITY: 0 <SET IDENTIFIER>
List members:
UNH-QEV-7310
UNH-QEV-7312
UNH-QEV-7325
UNH-QEV-7330
UNH-QEV-7332
UNH-QEV-7333

```

UNH-QEV-7335  
 UNH-QEV-7339  
 UNH-QEV-7340  
 UNH-QEV-7342  
 UNH-QEV-7344  
 UNH-QEV-7346  
 UNH-QEV-7349  
 UNH-QEV-7350  
 UNH-QEV-7352  
 UNH-QEV-7353  
 UNH-QEV-7354  
 UNH-QEV-7356  
 UNH-QEV-7357  
 UNH-QEV-7361  
 UNH-QEV-7363  
 UNH-QEV-7364  
 UNH-QEV-7367  
 UNH-QEV-7370  
 UNH-QEV-7372

2	Processing Definitions Filename	UNH-ISS-1121		QUALITY: 100 <DATA SET IDENTIFIER>
3	Processing Definitions Filename	ROL-PCF-5		QUALITY: 100 <DATA SET IDENTIFIER>
4	Simulated Events Output Filename	UNH-EVP-17749		<DATA SET IDENTIFIER>
5	Simulated Burst Events Output Fil	UNH-PBS-8520		<DATA SET IDENTIFIER>
6	Short EEvent output filename	UNH-SEV-2048		<DATA SET IDENTIFIER>
7	Make short event file? (Y/N)	N		<COMPASS CHARACTER>
8	Selection Set Id for Input File	SELALL		<COMPASS CHARACTER>
9	Run Mode: 0 --> 6 (See Help Text)	1		<COMPASS INTEGER>
10	Number of Events to Process	3000000		<COMPASS INTEGER>
11	Apply TOF Broadening (Y/N)?	N		<COMPASS CHARACTER>
12	Apply PSD Broadening (Y/N)?	N		<COMPASS CHARACTER>
13	Apply Event Location Smearing (Y/	Y		<COMPASS CHARACTER>
14	Random Number Seed (integer)	150		<COMPASS INTEGER>
15	LO-Range Burst Bin (Origin,Width	45.0	9.85	<COMPASS CHARACTER>
16	HI-Range Burst Bin (Origin,Width	-65.0	84.50	<COMPASS CHARACTER>
17	LO-Range Burst Thr. (Position,FWH	100.0	90.00	<COMPASS CHARACTER>
18	HI-Range Burst Thr. (Position,FWH	600.0	150.0	<COMPASS CHARACTER>

Task related output:

<\*\*\*\*\* SIMFIN \*\*\*\*\*>

ACCEPTANCE / REJECTION STATISTICS

NOTE: Events tested in the order listed below.  
 Testing stops as soon as an event is rejected.

Events processed	:3000000
Events accepted (including veto events)	:1629165
Events rejected due to user selection set	: 0
Events rejected due to no interaction(s)	: 0
Events rejected due to D1 module status	: 0
Events rejected due to D2 module status	: 183760
Events rejected due to D1 hardware threshold	: 345689
Events rejected due to D2 hardware threshold	: 841386
Events rejected due to D1 software threshold	: 0
Events rejected due to D2 software threshold	: 0
Events rejected due to VETO (burst mode only):	: 0

VETO REJECTION FLAG STATISTICS

NOTE: Rejection flags are for accepted events ONLY !

V1	V2	V3	V4	Number of Events
0	0	0	0	*****
0	0	0	1	9553
0	0	1	0	18496
0	0	1	1	673
0	1	0	0	39328
0	1	0	1	859
0	1	1	0	107182
0	1	1	1	11878
1	0	0	0	26484
1	0	0	1	435
1	0	1	0	1014
1	0	1	1	59
1	1	0	0	4101
1	1	0	1	122
1	1	1	0	8532
1	1	1	1	1030

<\*\*\*\*\* SIMFIN Completed with no errors \*\*\*\*\*>

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## Generating Simulated PSFs with SIMPSF

Once the simulated EVP file is generated with SIMFIN, the final step is to run task SIMPSF. The COMPASS TPT file for our case is shown below. Important input parameters include (further information can be found in the SIMFIN help text):

*Source Processed Event File.* As generated by SIMFIN.

*Source energy.* Not actually used in the processing. Only used in generating a dataset descriptor. Generally, for a power-law input spectrum, this is set to the power-law index (with minus sign included). For monoenergetic input, this is set to the photon energy.

*Source zenith angle.* This must be set to that angle used in SIMGAM.

*Source azimuth angle.* This must be set to that angle used in SIMGAM.

*Source distance.* For a source at infinity (parallel incident beam), this must be set to '0.0'.

*Number of incident photons.* For a monoenergetic source, this is set to the total number of incident photons generated by SIMGAM. (This important number can be found at the end of the DSD title for the QEV file.) In the case of a continuum (e.g., a power-law) spectrum, the number input here should be set to the total number of incident photons in the energy range for which the PSF is being generated. For example, we often simulate a power-law spectrum from 0.65 – 99.0 MeV. The number found in the QEV DSD title gives the total number of events incident over the entire input energy range (0.65 – 99.0 MeV). If one is creating a PSF for the 1 – 3 MeV energy range, then the user must calculate the total number of incident photons in the 1 – 3 MeV energy band based on the total number in the 0.65 – 99.0 MeV energy band.

*Beam Type.* This should correspond to that used in generating the QEV data (in the SIMGAM TPT). For recent runs, a wide beam simulation is typically used (beam type '11').

*ToF minimum and maximum.* The QEV data typically include some intrinsic distribution of ToF values, even if no ToF broadening was applied in SIMFIN. For example, there is usually some level of backscatter events with ToF near channels 70-80. In order to exclude these events and select only those of interest, the user should select a range above channel 90. A range of 90-150 is used for standard SIM processing.

*PSD minimum and maximum.* Here the user can specify the PSD range to be used in generating the PSF. This information will be applied in one of two ways. If a PCF file is provided (parameter 29), then the PSD range will be used in conjunction with the PCF file to accept events based on the PSD probabilities in the PCF file. This is the proper approach when no PSD broadening is applied to the simulated EVP data

(although it can also be used when such broadening is applied, in which case the broadening is, in essence, ignored). If no PCF file is provided (parameter 29 is left blank), then the PSD selections are based on the input EVP events. In this case, it is imperative that PSD broadening has been applied to the EVP data.

```

1*****
Task parameters for background task (standard UserShell output)
*****

site PTT_ID number      creation data
user  date              time  status parameter table descriptor name
-----
UNH SIMPS4 224         MCCONN 06 Jan 1999 08:02  C      VP 622.0 0.75-1.0 MeV  E^-2 Full Range Simulation Zenith = 10 degs

Task id Version        Task title
-----
SIMPSF 12              SIM: Produce PSF from telescope simulation data

number parameter prompt text      index      value      type
-----
1 Source processed event file      UNH-EVP-17749      QUALITY: 0 <SET IDENTIFIER>
2 Source energy (MeV)              -2.0               <COMPASS REAL>
3 Source zenith angle (degrees)    10.00              <COMPASS REAL>
4 Source azimuth (degrees)         0.0                 <COMPASS REAL>
5 Source distance (meters)         0.0                 <COMPASS REAL>
6 Number of incident photons       160735302           <COMPASS INTEGER>
7 Beam type (1 or 11)              11                  <COMPASS INTEGER>
8 Source type (0=infinite,1=nearby) 0                    <COMPASS INTEGER>
9 Reject Vetoed events (0=no,1=yes) 1                    <COMPASS INTEGER>
10 Phi_geo center of first bin      0.5                 <COMPASS REAL>
11 Phi_geo center of last bin       54.5                 <COMPASS REAL>
12 Phi_geo binsize (degrees)        1.0                  <COMPASS REAL>
13 Phi_bar center of first bin      1.0                  <COMPASS REAL>
14 Phi_bar center of last bin      49.0                 <COMPASS REAL>
15 Phi_bar binsize (degrees)        2.0                  <COMPASS REAL>
16 D1 module indicator              12345678901234      <COMPASS CHARACTER>
17 D2 modules for D1-n              (1) 0111111111111111 <COMPASS CHARACTER>
17 D2 modules for D1-n              (2) 0111111111111111 <COMPASS CHARACTER>
17 D2 modules for D1-n              (3) 0111111111111111 <COMPASS CHARACTER>
17 D2 modules for D1-n              (4) 0111111111111111 <COMPASS CHARACTER>
17 D2 modules for D1-n              (5) 0111111111111111 <COMPASS CHARACTER>
17 D2 modules for D1-n              (6) 0111111111111111 <COMPASS CHARACTER>
17 D2 modules for D1-n              (7) 0111111111111111 <COMPASS CHARACTER>
18 TOF minimum                      90.                  <COMPASS REAL>
19 TOF maximum                      150.                 <COMPASS REAL>
20 PSD minimum                      40.0                 <COMPASS REAL>
21 PSD maximum                      100.0                <COMPASS REAL>
22 Total energy minimum             0.75                 <COMPASS REAL>
23 Total energy maximum             1.00                 <COMPASS REAL>
24 D1 energy minimum                0.07                 <COMPASS REAL>
25 D1 energy maximum                20.0                 <COMPASS REAL>
26 D2 energy minimum                0.650                <COMPASS REAL>
27 D2 energy maximum                30.0                 <COMPASS REAL>
28 Geometry Lower Limit             0.001                <COMPASS REAL>
29 PCF Dataset id (PSD Corrections)  ROL-PCF-5           QUALITY: 100 <DATA SET IDENTIFIER>
30 FPM Dataset id (dead PMT handling) <DATA SET IDENTIFIER>
31 Impose Ratio Cut (VP 2.5)?       .FALSE.              <COMPASS LOGICAL>
32 Control flags                     0000000000          <COMPASS CHARACTER>
33 2-D PSF output dataset            UNH-IAQ-58319        <DATA SET IDENTIFIER>
34 3-D PSF output dataset            UNH-FAQ-58086        <DATA SET IDENTIFIER>

*****
Task related output:
*****
>>>> RDTPT: UTPREV FPM DAT, RC = 10

>>>> RDTPT: No FPM file provided...
>>>> RDTPT: All PMTs are assumed to be on.

BEAM AREA (cm ^2): 19500.3

>>>> ARRSI2: NPHIG = 55 NPHIB= 25

*****
P9GNDV (9005) : (UTPREV) -> end of data
Data Set : UNH-EVP-17749
RETGP : 5
RETNO : 2
*****

*****
PEVPSR (9004) : non-zero ERROR return from CALL to P9GNDV
LUNO : 11
*****

>>> BINPSF: RETGP,RETNO from PEVPSR: 5 2

```

```
>>> BINPSF: 1629165 events read
>>> BINPSF: 22253 events rejected by PSD
>>> BINPSF: 0 events rejected by ratio cut
>>> BINPSF: 0 events excluded by dead PMT regions
>>> BINPSF: 109392 events selected
>>> BINPSF: 109392 events inside dataspace
```

```
>>> IAQGEN: GEOMETRY NORM FCTR FOR EACH PHIGEO
```

```
>>> IAQGEN: JJ, G(JJ) ==> 1 0.460247
>>> IAQGEN: JJ, G(JJ) ==> 2 0.457521
>>> IAQGEN: JJ, G(JJ) ==> 3 0.458242
>>> IAQGEN: JJ, G(JJ) ==> 4 0.467892
>>> IAQGEN: JJ, G(JJ) ==> 5 0.480810
>>> IAQGEN: JJ, G(JJ) ==> 6 0.492374
>>> IAQGEN: JJ, G(JJ) ==> 7 0.497879
>>> IAQGEN: JJ, G(JJ) ==> 8 0.498475
>>> IAQGEN: JJ, G(JJ) ==> 9 0.491955
>>> IAQGEN: JJ, G(JJ) ==> 10 0.479274
>>> IAQGEN: JJ, G(JJ) ==> 11 0.459185
>>> IAQGEN: JJ, G(JJ) ==> 12 0.435742
>>> IAQGEN: JJ, G(JJ) ==> 13 0.411431
>>> IAQGEN: JJ, G(JJ) ==> 14 0.389036
>>> IAQGEN: JJ, G(JJ) ==> 15 0.370260
>>> IAQGEN: JJ, G(JJ) ==> 16 0.354436
>>> IAQGEN: JJ, G(JJ) ==> 17 0.339640
>>> IAQGEN: JJ, G(JJ) ==> 18 0.325992
>>> IAQGEN: JJ, G(JJ) ==> 19 0.313726
>>> IAQGEN: JJ, G(JJ) ==> 20 0.298091
>>> IAQGEN: JJ, G(JJ) ==> 21 0.274581
>>> IAQGEN: JJ, G(JJ) ==> 22 0.247390
>>> IAQGEN: JJ, G(JJ) ==> 23 0.222294
>>> IAQGEN: JJ, G(JJ) ==> 24 0.200369
>>> IAQGEN: JJ, G(JJ) ==> 25 0.182120
>>> IAQGEN: JJ, G(JJ) ==> 26 0.167140
>>> IAQGEN: JJ, G(JJ) ==> 27 0.154742
>>> IAQGEN: JJ, G(JJ) ==> 28 0.143564
>>> IAQGEN: JJ, G(JJ) ==> 29 0.131470
>>> IAQGEN: JJ, G(JJ) ==> 30 0.117872
>>> IAQGEN: JJ, G(JJ) ==> 31 1.02410E-01
>>> IAQGEN: JJ, G(JJ) ==> 32 8.55486E-02
>>> IAQGEN: JJ, G(JJ) ==> 33 7.07300E-02
>>> IAQGEN: JJ, G(JJ) ==> 34 5.87031E-02
>>> IAQGEN: JJ, G(JJ) ==> 35 5.09987E-02
>>> IAQGEN: JJ, G(JJ) ==> 36 4.57109E-02
>>> IAQGEN: JJ, G(JJ) ==> 37 4.15733E-02
>>> IAQGEN: JJ, G(JJ) ==> 38 3.80210E-02
>>> IAQGEN: JJ, G(JJ) ==> 39 3.39677E-02
>>> IAQGEN: JJ, G(JJ) ==> 40 2.85536E-02
>>> IAQGEN: JJ, G(JJ) ==> 41 2.19774E-02
>>> IAQGEN: JJ, G(JJ) ==> 42 1.51974E-02
>>> IAQGEN: JJ, G(JJ) ==> 43 9.19637E-03
>>> IAQGEN: JJ, G(JJ) ==> 44 4.63096E-03
>>> IAQGEN: JJ, G(JJ) ==> 45 1.61622E-03
>>> IAQGEN: JJ, G(JJ) ==> 46 3.19688E-04
>>> IAQGEN: JJ, G(JJ) ==> 47 0.
>>> IAQGEN: JJ, G(JJ) ==> 48 0.
>>> IAQGEN: JJ, G(JJ) ==> 49 0.
>>> IAQGEN: JJ, G(JJ) ==> 50 0.
>>> IAQGEN: JJ, G(JJ) ==> 51 0.
>>> IAQGEN: JJ, G(JJ) ==> 52 0.
>>> IAQGEN: JJ, G(JJ) ==> 53 0.
>>> IAQGEN: JJ, G(JJ) ==> 54 0.
>>> IAQGEN: JJ, G(JJ) ==> 55 0.
```

```
>>> IAQOUT: IAQ BSCALE, BZERO ==> 2.95768E-13 0.
```

```
*****
P9CLOV (9017) : W A R N I N G - validity interval zero
data set : U-IAQ 58319
INTSTA : 0 0
INTEND : 0 0
*****
```

```
>>> FAQOUT: FAQ BSCALE, BZERO ==> 2.01106E-15 0.
```

```
*****
P9CLOV (9017) : W A R N I N G - validity interval zero
data set : U-FAQ 58086
INTSTA : 0 0
INTEND : 0 0
*****
```

```
>>>>SIMPSF: run successfully completed.
```