

Description of the MESSENGER Neutron Spectrometer Ground Calibration Data

1.0 Introduction

A description of how the MESSENGER Neutron Spectrometer (NS) calibration data were taken is given in the document titled “MESSENGER Neutron Spectrometer (NS) Calibration Report” [Lawrence *et al.*, 2004]. That document describes the experimental set up of the calibration data, lists the runs that were taken and parameters for each run, and provides an initial analysis of the calibration data. Further details about the NS instrument and data products are given in the MESSENGER Gamma-ray/Neutron Spectrometer (GRNS) instrument paper [Goldsten *et al.*, 2005]. Finally, a detailed analysis of the ground and in-flight calibration data will be written after the first MESSENGER Venus flyby. The remaining portion of this document describes the data files that make up the NS Ground Calibration Data.

2.0 Description of NS Ground Calibration Files

The data for the NS Ground Calibration consists of a set of data for each ground calibration run. Two sets of runs were available: high-energy neutron measurements from the Columbia University Radiological Research Accelerator Facility (RARAF); and lower energy neutron measurements from the Free-air Neutron Source Facility at Los Alamos National Laboratory (LANL).

The data from each run is contained in two files: 1) a header file in ASCII text format; and 2) a data file in binary data format. The names of the files have the following format:

MMDD-HHMMSS.txt and MMDD-HHMMSS.bin.

Here, MMDD is a four-digit identifier for *month/day*. HHMMSS is a six-digit identifier for *hour/minute/second*. These names represent the time in the year 2003 that the data were collected. The files with the .txt extension are the header files; the files with the .bin extension are the binary data files.

The header file gives information about where the data was taken, how it was processed, and what is included in the data file. An example header file is given below:

MESSENGER Neutron Spectrometer Calibration Data from RARAF

Created by: \$Id: cal_idl_to_binary.pro,v 1.4 2004/12/08 22:19:24 dj1 Exp \$
Created from: /n/toaster/u/dj1/messenger/RARAF_calibration/idl_files/0304-144622.idl
Which was generated on: Tue Jun 3 11:38:52 2003

nspectra = 378
nevt data = 96390

Format of binary file (all data values are 32-bit long integer):

nspectra	--> number of spectra
nevt	--> number of elements in event mode data
bp_spectra[nspectra, 64]	--> nspectra by 64 element array of borated plastic spectra
lg1_spectra[nspectra, 32]	--> nspectra by 32 element array of Lithium Glass 1 spectra
lg2_spectra[nspectra, 32]	--> nspectra by 32 element array of Lithium glass 2 spectra
early_spectra[nspectra, 8]	--> nspectra by 8 element array of early time spectra
late_spectra[nspectra, 8]	--> nspectra by 8 element array of late time spectra
prompt[nevt]	--> nevt array of event mode prompt pulses
delay[nevt]	--> nevt array of event mode delay pulses
ttsp[nevt]	--> nevt array of event mode time-to-second pulses values

The first line states whether the data comes from the RARAF or LANL calibration. The next three lines give information about the code that created the file, the data file it was created from, and when the original data file was created. The next two lines show how many spectra are in the given file and how many event mode data values are in the file. The last lines list the contents of the data file. As stated, all data values are given as 32-bin long integers. The data are listed in the file in the order given in the header file.

References

Goldsten, J., MESSENGER GRNS Instrument Description Paper, in preparation, 2005.
Lawrence, D. J., et al., MESSENGER Neutron Spectrometer (NS) Calibration Report, 2004.