



# Standard file format guidelines

S. Bourdarie (ONERA - France)  
B. Blake (Aerospace Corporation – USA)  
J.B. Cao (CSSAR – China)  
R. Friedel (LANL – USA)  
Y. Miyoshi (STELAB – Japan)  
M. Panasyuk (MSU – Russia)  
C. Underwood (U. Of Surrey – UK)



**Standard file format guidelines**

I. Introduction .....	3
II. File format .....	3
II.1 File naming convention .....	3
II.2 Global attributes .....	4
II.3 Variables.....	8
II.3.1 Data .....	8
II.3.2 Support_Data.....	11
II.3.3 Metadata .....	17
III. Reading the cdf files .....	19
IV. Exemple .....	20

### I. Introduction

The purpose of this document is to provide guidelines to produce standard radiation belt files to facilitate data exchange between different groups involved in the field and tools development that will use these data sets.

Data acquired in different countries/institutes/agencies are usually stored in various format (cdf, hdf, ascii, binary, idl saveset, ...) more or less exotic with no standard header, information, description ... This current status makes life difficult to cross-compare different data sets (it is always necessary to develop dedicated routines usually done several times throughout the world, ...).

Guidelines is needed from the worldwide community of developers of space radiation data bases to permit standardization of data file format and therefore minimise efforts for data user's.

### II. File format

An easy to use and flexible file format must be selected. To include data as well as relevant informations attached to the data, self described file format are the most convenient. One widely used by now is cdf (Common Data File). We then strongly suggest to follow ISTP/IACG guidelines ( <http://cdf.gsfc.nasa.gov/> ). In this section we recall what those guidelines are and we add one more layer to ensure that any cdf file produced will be done along the same philosophy. We concentrate here only on particles measurements in space. Note that all text in italic originates from the NASA ISTP web site: .



where authors and curators are

*Mona Kessel*, [mona.kessel@gsfc.nasa.gov](mailto:mona.kessel@gsfc.nasa.gov), (301)286-6595

Code 632, NASA Goddard Space Flight Center

Greenbelt, MD 20771, USA

*A CDF data set using ISTP/IACG guidelines, by definition forms a logically complete and self-sufficient whole (data and descriptions). The goal is to make the resulting CDF data set correctly and independently usable by the science community. These guidelines have been adopted by a wide SEC community (<http://pwg.gsfc.nasa.gov/istp/collaborating/>).*

A CDF file is composed of global attributes which provide descriptions of the whole data set. Then variables have to be defined as well as their attributes.

#### II.1 File naming convention

The ISTP file naming convention is the following:



Standard file format guidelines

- One file per day is generated
- The file name has to be like:  
 SPACECRAFT\_\*\*\_INSTRUMENT\_yyyymmdd\_V++.cdf where:
  - o SPACECRAFT is the name of the spacecraft in capital letters
  - o \*\* can either be "Hn>High Resolution data" for certified data of higher resolution than Key Parameters. n can run from 0 to 9 to allow for more than one kind of data product. For Cluster/CSDS this can either be "SP>Summary Parameter" or "PP>Prime Parameter". Other possible data types may be defined in future. If any of these data sets are modified or used to produce derived products, the data type should be, e.g., "Mn>Modified Data n", where n is from 0 to 9.
  - o INSTRUMENT is the name of the instrument in capital letters
  - o yyyy being the year
  - o mm being two digit month (integer)
  - o dd being two digit day of month
  - o ++ indicates the file version number (two digits) and can run from 00 to 99!

II.2 Global attributes

Global attributes are used to provide information about the data set as an entity. Together with variables and variable attributes, the global attributes make the data correctly and independently usable by someone not connected with the instrument team, and hence, a good archive product. The global attributes can also be used by any software, one popular example being the CDAWeb Display and Retrieval system (<http://cdaweb.gsfc.nasa.gov/cdaweb/>).

The required Global Attributes are listed here with example values. Note that CDF attributes are case-sensitive and must **exactly** follow what is shown here.

ATTRIBUTE	EXAMPLE VALUE
"Project"	{ "ISTP>International " - "Solar-Terrestrial Physics" }.
"Source_name"	{ "GEOTAIL>Geomagnetic Tail" }.
"Discipline"	{ "Space Physics>Magnetospheric Science" }.
"Data_type"	{ "H0>High time resolution" }.
"Descriptor"	{ "EPI>Energetic Particles" - " and Ion Composition" }.
"Data_version"	{ "1" }.
"Logical_file_id"	{ "GE_H0_EPI_19920908_V01" }.
"PI_name"	{ "D. Williams" }.
"PI_affiliation"	{ "JHU/APL" }.
"TEXT"	{ "reference to journal article, URL address" }.
"Instrument_type"	{ "Magnetic Fields (space)" }.
"Mission_group"	{ "Geotail" }.
"Logical_source"	{ "GE_H0_EPI" }.
"Logical_source_description"	{ "Geotail Magnetic Field Key Parameters" }.

### Standard file format guidelines

*The Global Attribute Definitions are provided below in alphabetical order*

#### Acknowledgement--- recommended

*Text string at PI disposal allowing for information on expected acknowledgment if data is citable.*

#### ADID\_ref --- recommended

*This attribute stores the control authority identifier associated with the detached SFDU label. If no control authority identifier has been assigned, then the identifier associated with the ISTP/IACG Guidelines (NSSD0241) or with CDF (NSSD0110) can be used.*

#### Data\_type --- required

*This attribute identifies the data type of the CDF data set. Both a long name and a short name are given. For ISTP exchangeable data products the values are "Kn>Key Parameter" for approximately minute averaged survey data, and "Hn>High Resolution data" for certified data of higher resolution than Key Parameters. \$n\$ can run from 0 to 9 to allow for more than one kind of data product. For Cluster/CSDS this can either be "SP>Summary Parameter" or "PP>Prime Parameter". Other possible data types may be defined in future. If any of these data sets are modified or used to produce derived products, the data type should be, e.g., "Mn>Modified Data n", where n is from 0 to 9.*

#### Data\_version --- required

*This attribute identifies the version of a particular CDF data file for a given date, e.g., the file POLAR\_H0\_CEPPAD\_19960923\_V01 is the first version of data for 1996 September 23. **Each time** this particular data file is reproduced - for recalibration or other reasons - the Data\_version is incremented by 1. Data\_version always starts at `1'.*

#### Descriptor --- required

*This attribute identifies the name of the instrument or sensor that collected the data. Both a long name and a short name are given. An example for ISTP is "EPI>Energetic Particles and Ion Composition". The short name should be limited to from 2 to 4 characters for consistency with ISTP. This attribute should be single valued.*

#### Discipline --- required

*This attribute describes both the science discipline and subdiscipline. More than one entry is allowed. The list for space physics is:*

- "Space Physics>Magnetospheric Science"
- "Space Physics>Interplanetary Studies"

#### Generated\_by --- recommended

*This attribute allows for the generating data center/group to be identified.*

#### Generation\_date --- recommended

*Date stamps the creation of the file using the syntax yyyyymmdd, e.g., "19920923". This is distinct from the date in "validate" below which records the times of later validation processes.*



### Standard file format guidelines

#### HTTP\_LINK, LINK\_TEXT and LINK\_TITLE --- recommended

This attribute stores the URL for the PI or CoI web site holding on-line data. This attribute is used in conjunction with "LINK\_TEXT" and "LINK\_TITLE". There can be up to 5 entries for each - there MUST be a corresponding entry of "LINK\_TEXT" and "LINK\_TITLE" for each "HTTP\_LINK" entry. As an example CDAWeb will then link to the URL given by "HTTP\_LINK" using the "LINK\_TITLE" and the description in "LINK\_TEXT", on the CDAWeb Data Explorer page. For example

- "LINK\_TEXT" = 3-sec MGF magnetic field 1 Sep 1993 through 30 Sep 1997 available at
- "LINK\_TITLE" = ISAS DARTS
- "HTTP\_LINK" = <http://www.darts.isas.ac.jp/spdb/index.html>

will give the following link:

3-sec MGF magnetic field 1 Sep 1993 through 30 Sep 1997 available at ISAS DARTS

#### Instrument\_type --- required

This attribute is used to facilitate making choices of instrument type. More than one entry is allowed. The following list contains the valid values.

- Particles (space)
- Plasma and Solar Wind

#### Logical\_file\_id --- required

This attribute stores the name of the CDF file using the ISTEP naming convention (source\_name / data\_type / descriptor / date / data\_version), e.g., POLAR\_H0\_CEPPAD\_19960923\_V01. This attribute is required (1) to allow storage of the full name on IBM PCs, and (2) to avoid loss of the original source in the case of accidental (or intentional) renaming. For CDFs created on the ISTEP CDHF, the correct Logical\_file\_id will be filled in by an ICSS support routine.

#### Logical\_source --- required

This attribute carries source\_name, data\_type, and descriptor information.

#### Logical\_source\_description --- required

This attribute writes out the full words associated with the encrypted Logical\_source above, e.g., "POLAR CEPPAD High resolution particle data".

#### Mission\_group --- required

This attribute has a single value and is used to facilitate making choices of source. Valid values include (but are not restricted to) :

- Geotail
- IMP8
- Wind
- Geosynchronous Investigations

#### MODS --- recommended

This attribute is an NSSDC standard global attribute which is used to denote the history of modifications made to the CDF data set. The MODS attribute should contain a description of

### Standard file format guidelines

*all significant changes to the data set. This attribute is not directly tied to Data\_version, but each version produced will contain the relevant modifications. This attribute can have as many entries as necessary to contain the desired information.*

#### Parents --- optional

*This attribute lists the parent CDF(S) for files of derived and merged data sets. Subsequent entry values are used for multiple parents. The syntax for a CDF parent would be e.g. "CDF>logical\_file\_id".*

#### PI affiliation --- required

*This attribute value should include a recognizable abbreviation.*

#### PI name --- required

*This attribute value should include first initial and last name.*

#### Project --- required

*This attribute identifies the name of the project and indicates ownership. For ISTP missions and investigations, the value used is "ISTP>International Solar-Terrestrial Physics". For the Cluster mission, the value is "STSP Cluster>Solar Terrestrial Science Programmes, Cluster".*

#### Rules of use --- recommended

*Text containing information on, e.g. citability and PI access restrictions. This may point to a World Wide Web page specifying the rules of use.*

#### Skeleton version --- optional

*This is a text attribute containing the skeleton file version number. This is a required attribute for Cluster, but for IACG purposes it exists if experimenters want to track it.*

#### Software version --- optional

*This is a required attribute for Cluster, but for IACG purposes it exists if experimenters want to track it.*

#### Source name --- required

*This attribute identifies the mission or investigation that contains the sensors. For ISTP, this is the mission name for spacecraft missions or the investigation name for ground-based or theory investigations. Both a long name and a short name are provided. This attribute should be single valued. Examples:*

- "GEOTAIL>Geomagnetic Tail"
- "WIND>Wind Interplanetary Plasma Laboratory"
- "GOES\_7>Geostationary Operational Environmental Satellite 7"
- "IMP-8>Interplanetary Monitoring Platform"
- "LANL1989\_046>Los Alamos National Laboratory 1989"
- "C1>Cluster Satellite No 1".

#### TEXT --- required

*This attribute is an NSSDC standard global attribute which is a text description of the experiment whose data is included in the CDF. A reference to a journal article(s) or to a World Wide Web page describing the experiment is essential, and constitutes the minimum*



### Standard file format guidelines

*requirement. A written description of the data set is also desirable. This attribute can have as many entries as necessary to contain the desired information.*

Time\_resolution --- required

*specifies time resolution of the file in seconds, e.g., "3 seconds".*

TITLE --- optional

*This attribute is an NSSDC standard global attribute which is a title for the data set, e.g., "POLAR CEPPAD High Resolution Data".*

Validate --- optional

*Details to be specified. This attribute is written by software for automatic validation of features such as the structure of the CDF file on a simple pass/fail criterion. The software will test that all expected attributes are present and, where possible, have reasonable values. The syntax is likely to be of the form "test>result>where-done>date". It is not the same as data validation.*

## II.3 Variables

*In this section we define data variables, support\_data variables, and metadata variables including their dimensionality and what is needed for their correct display.*

*We have identified three types of variables to be included in ISTP/IACG CDF files: **data** variables of primary importance (e.g., `particle_flux`), **support\_data** variables of secondary importance (e.g., `time`, `energy_bands` associated with `particle_flux`) and **metadata** variables (e.g., a variable holding "xGEO,yGEO,xGEO" to label spacecraft position). Variables are defined with CDF specifications and required attributes. Data variables also have attached variables for time and dependencies (`support_data`) and labels (`metadata`). The `support_data` variables can be attached to data variables via `DEPEND_i` variable attributes. Metadata variables can be attached to data variables via `LABL_PTR_i` variable attributes (see below).*

**NOTE:** *ISTP/IACG now encourages the use of zVariables which carry their own dimensionality.*

The complete variable description is provided next.

### II.3.1 Data

*These are variables of primary importance (e.g., `particle_flux`). Data variables are completely defined with the combination of CDF specifications, variable attributes, and attached variables such as time and dependencies (`support_data`) and labels (`metadata`).*

One of the goal of these guidelines is to use the same variable names across spacecraft/instruments to ease data exchange and software development. Note that having the same data type throughout all spacecraft/instrument is highly recommended, i.e. all real variables are CDF\_REAL4 and all integer variables are CDF\_INT2. This variable types guaranty enough precision for the quantities stored in the cdf files.





## Standard file format guidelines

*The following CDF variable specifications are required.*

*Data is always either Real or Integer type. Data is always time (record) varying, but can be of any dimensionality. Real or Integer data are always defined as having one element. In order to not make huge files, requiring large data space or large memory we suggest to use only REAL4 and INT2 data type. This provides enough precision for particle measurements and associated geographic and magnetic parameters.*

*The following variable attributes are required. See section II.3 for more details.*

- *CATDESC*
- *DEPEND\_0 = Epoch*
- *DEPEND\_i*
- *DISPLAY\_TYPE (time\_series, spectrogram, stack\_plot, image)*
- *FIELDNAM*
- *FILLVAL*
- *FORMAT/FORM\_PTR*
- *LABLAXIS/LABL\_PTR\_i*
- *UNITS/UNIT\_PTR*
- *VALIDMIN*
- *VALIDMAX*
- *VAR\_TYPE = data*

*The need for DEPEND\_i (other than DEPEND\_0) and either LABLAXIS or LABL\_PTR\_i depends on the data itself and how it will be displayed.*

The list of variables that must be present in cdf files is the following:

- Position: Position is a three-dimensional variable which provide spacecraft position in geographic cartesian coordinates – Units: km. Var type = CDF\_REAL4
- B\_Calc: Calculated magnetic field strength where the internal field being DGRF/IGRF and the external field being Olson-Pfitzer quiet magnetic field models – Units: nT. Var type = CDF\_REAL4
- B\_Eq: Calculated magnetic field strength at magnetic equator where the internal field being DGRF/IGRF and the external field being Olson-Pfitzer quiet magnetic field models – Units: nT. Var type = CDF\_REAL4
- L: Calculated L McIlwain's L parameter where the internal field being DGRF/IGRF and the external field being Olson-Pfitzer quiet magnetic field models. Var type = CDF\_REAL4
- L star: Calculated Roederer's L\* parameter where the internal field being DGRF/IGRF and the external field being Olson-Pfitzer quiet magnetic field models. Var type = CDF\_REAL4
- I: Calculated adiabatic invariant (second invariant) where the internal field being DGRF/IGRF and the external field being Olson-Pfitzer quiet magnetic field models. Full definition of I can be found in Roederer, J. G., Dynamics of the geomagnetically trapped radiation, Springer New York, pp. 48, 1970. Var type = CDF\_REAL4



Standard file format guidelines

- MLT: Calculated Magnetic Local Time – Units: hours. Var type = CDF\_REAL4
- Alpha: Local pitch angle the instrument is looking at (often assume to be 90° for large viewing angle – omni-directional instrument) – Units: degrees. Var type = CDF\_REAL4
- Alpha\_Eq: Computed equatorial pitch angle the instrument is looking from Alpha, B\_Calc and B\_Eq – Units: degrees. Var type = CDF\_REAL4

Now depending on what the instrument is measuring the following variables described next have to be present. Note that if directional fluxes are available omni-directional fluxes should

be added and computed from directional fluxes:  $J = \frac{\int_0^{\pi} j \cdot \sin \alpha \cdot d\alpha}{\int_0^{\pi} \sin \alpha \cdot d\alpha}$ , the resulting omni-flux

being per-steradian to ease inter-comparisons with others instruments which have different field of view.

- FPDO: Omni-directional Differential Proton Flux – units: MeV<sup>-1</sup> cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4
- FPIO: Omni-directional Integral Proton Flux – units: cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4
- FEDO: Omni-directional Differential Electron Flux – units: MeV<sup>-1</sup> cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4
- FEIO: Omni-directional Integral Electron Flux – units: cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4
- FADO: Omni-directional Differential Alpha Flux – units: MeV<sup>-1</sup> cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4
- FAIO: Omni-directional Integral Alpha Flux – units: cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4
- FIDO: Omni-directional Differential Heavy Ion Flux – units: MeV<sup>-1</sup> cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4
- FIIO: Omni-directional Integral Heavy Ion Flux – units: cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4
- FPDU: Directional Differential Proton Flux – units: MeV<sup>-1</sup> cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4
- FPIU: Directional Integral Proton Flux – units: cm<sup>-2</sup> s<sup>-1</sup> sr<sup>-1</sup>. Var type = CDF\_REAL4



### Standard file format guidelines

- FEDU: Directional Differential Electron Flux – units:  $\text{MeV}^{-1} \text{cm}^{-2} \text{s}^{-1} \text{sr}^{-1}$ . Var type = CDF\_REAL4
- FEIU: Directional Integral Electron Flux – units:  $\text{cm}^{-2} \text{s}^{-1} \text{sr}^{-1}$ . Var type = CDF\_REAL4
- FADU: Directional Differential Alpha Flux – units:  $\text{MeV}^{-1} \text{cm}^{-2} \text{s}^{-1} \text{sr}^{-1}$ . Var type = CDF\_REAL4
- FAIU: Directional Integral Alpha Flux – units:  $\text{cm}^{-2} \text{s}^{-1} \text{sr}^{-1}$ . Var type = CDF\_REAL4
- FIDU: Directional Differential Heavy Ion Flux – units:  $\text{MeV}^{-1} \text{cm}^{-2} \text{s}^{-1} \text{sr}^{-1}$ . Var type = CDF\_REAL4
- FIIU: Directional Integral Heavy Ion Flux – units:  $\text{cm}^{-2} \text{s}^{-1} \text{sr}^{-1}$ . Var type = CDF\_REAL4

To make things even more general, flux for any measurements can be provided from a fit function which can depend on several parameters. Then the logic to store such measurements into common cdf file format is only composed of metadata and support data. So in this case the corresponding guidelines are provided in the support data and metadata sections.

### II.3.2 Support\_Data

*These are variables of secondary importance (e.g., time, energy\_bands associated with particle\_flux, Quality\_flags).*

*The following CDF variable specifications are required.*

*Support\_data is always either Real or Integer type. Support\_data is usually time invariant, but can be time varying.*

*If a support\_data variable is attached to a data variable via DEPEND\_i, then it must be of the same size as the dimension i. Real or Integer data are always defined as having one element.*

*The following variable attributes are required.*

- CATDESC
- DEPEND\_0 = Epoch (if time varying)
- FIELDNAM
- FILLVAL (if time varying)
- FORMAT/FORM\_PTR
- UNITS/UNIT\_PTR
- VALIDMIN (if time varying)
- VALIDMAX (if time varying)
- VAR\_TYPE = support\_data

## Standard file format guidelines

The list of support data that must be present in cdf files is the following:

- **Epoch:** *"Epoch" should be the first variable in each CDF data set. All time varying variables in the CDF data set will depend on the "Epoch" variable (or on a CDF\_EPOCH type variable) - more than one CDF\_EPOCH type variable is allowed in a data set to allow for more than one time resolution. For ISTP the time value of a record refers to the center of the accumulation period for the record if the measurement is not an instantaneous one. Epoch allows for a scalar representation of time which provides for seamless crossings of day and year boundaries. Epoch time is simply the time in milliseconds A.D. CDF toolkit programs will display and expect CDF\_EPOCH values in the format dd-mmm-yyyy hh:mm:ss.ccc where dd is the day of the month, mmm is the month, yyyy is the year, hh is the hour, mm is the minute, ss is the second and ccc is the millisecond (e.g., 01-Aug-1992 10:30:05.025). "Epoch" will be monotonically increasing so that the attribute MONOTON should be defined as "INCREASE". (Note: All CDF data sets using the Epoch variable should use the subroutines provided in the CDF toolkit for making the conversion between this value and year, month, day, etc. These routines are available as black boxes from NSSDC. To determine Epoch time it is only necessary to call the subroutine compute\_Epoch(year, month, day, hour, minute, second, msec, Epoch) with arguments as shown. for making the conversion between this value and year, month, day, etc. This ensures that all users use the same conversion when generating their CDF data sets and will therefore have the same view of the effects of the various calendar changes that have occurred over the last two thousand years.)* . Var type = CDF\_EPOCH
- **Position Quality:** Position Quality Flag – time dependent (0 means highest quality, 1 means bad quality) . Var type = CDF\_INT2
- **FPDO Energy:** Energy levels for FPDO fluxes – Units: MeV. Var type = CDF\_REAL4
- **FPDO Quality:** Quality Flag for FPDO fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- **FPDO Crosscalib:** Intercalibration values for FPDO fluxes. Var type = CDF\_REAL4
- **FPIO Energy:** Energy levels for FPIO fluxes – Units: MeV. Var type = CDF\_REAL4
- **FPIO Quality:** Quality Flag for FPIO fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- **FPIO Crosscalib:** Intercalibration values for FPIO fluxes. Var type = CDF\_REAL4
- **FEDO Energy:** Energy levels for FEDO fluxes – Units: MeV. Var type = CDF\_REAL4



### Standard file format guidelines

- FEDO Quality: Quality Flag for FEDO fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FEDO Crosscalib: Intercalibration values for FEDO fluxes. Var type = CDF\_REAL4
- FEIO Energy: Energy levels for FEIO fluxes – Units: MeV. Var type = CDF\_REAL4
- FEIO Quality: Quality Flag for FEIO fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FEIO Crosscalib: Intercalibration values for FEIO fluxes. Var type = CDF\_REAL4
- FADO Energy: Energy levels for FADO fluxes – Units: MeV. Var type = CDF\_REAL4
- FADO Quality: Quality Flag for FADO fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FADO Crosscalib: Intercalibration values for FADO fluxes. Var type = CDF\_REAL4
- FAIO Energy: Energy levels for FAIO fluxes – Units: MeV. Var type = CDF\_REAL4
- FAIO Quality: Quality Flag for FAIO fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FAIO Crosscalib: Intercalibration values for FAIO fluxes. Var type = CDF\_REAL4
- FIDO Energy: Energy levels for FIDO fluxes – Units: MeV. Var type = CDF\_REAL4
- FIDO Quality: Quality Flag for FIDO fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FIDO Crosscalib: Intercalibration values for FIDO fluxes. Var type = CDF\_REAL4
- FPDU Energy: Energy levels for FPDU fluxes – Units: MeV. Var type = CDF\_REAL4
- FPDU Alpha: Local pitch-angles for FPDU fluxes – Units: Degree. Var type = CDF\_REAL4



### Standard file format guidelines

- FPDU Alpha Eq: Equatorial pitch-angles for FPDU fluxes, computed from FPDU\_Alpha, B\_Calc and B\_Eq- Time dependent – Units: Degree. Var type = CDF\_REAL4
- FPDU Quality: Quality Flag for FPDU fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FPDU Crosscalib: Intercalibration values for FPDU fluxes. Var type = CDF\_REAL4
- FPIU Energy: Energy levels for FPIU fluxes – Units: MeV. Var type = CDF\_REAL4
- FPIU Alpha: Local pitch-angles for FPIU fluxes – Units: Degree. Var type = CDF\_REAL4
- FPIU Alpha Eq: Equatorial pitch-angles for FPIU fluxes, computed from FPIU\_Alpha, B\_Calc and B\_Eq- Time dependent – Units: Degree. Var type = CDF\_REAL4
- FPIU Quality: Quality Flag for FPIU fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FPIU Crosscalib: Intercalibration values for FPIU fluxes. Var type = CDF\_REAL4
- FEDU Energy: Energy levels for FEDU fluxes – Units: MeV. Var type = CDF\_REAL4
- FEDU Alpha: Local pitch-angles for FEDU fluxes – Units: Degree. Var type = CDF\_REAL4
- FEDU Alpha Eq: Equatorial pitch-angles for FEDU fluxes, computed from FEDU\_Alpha, B\_Calc and B\_Eq- Time dependent – Units: Degree. Var type = CDF\_REAL4
- FEDU Quality: Quality Flag for FEDU fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FEDU Crosscalib: Intercalibration values for FEDU fluxes. Var type = CDF\_REAL4
- FEIU Energy: Energy levels for FEIU fluxes – Units: MeV. Var type = CDF\_REAL4
- FEIU Alpha: Local pitch-angles for FEIU fluxes – Units: Degree. Var type = CDF\_REAL4



### Standard file format guidelines

- FEIU\_Alpha Eq: Equatorial pitch-angles for FEIU fluxes, computed from FEIU\_Alpha, B\_Calc and B\_Eq- Time dependent – Units: Degree. Var type = CDF\_REAL4
- FEIU\_Quality: Quality Flag for FEIU fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FEIU\_Crosscalib: Intercalibration values for FEIU fluxes. Var type = CDF\_REAL4
- FADU\_Energy: Energy levels for FADU fluxes – Units: MeV. Var type = CDF\_REAL4
- FADU\_Alpha: Local pitch-angles for FADU fluxes – Units: Degree. Var type = CDF\_REAL4
- FADU\_Alpha Eq: Equatorial pitch-angles for FADU fluxes, computed from FADU\_Alpha, B\_Calc and B\_Eq- Time dependent – Units: Degree. Var type = CDF\_REAL4
- FADU\_Quality: Quality Flag for FADU fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FADU\_Crosscalib: Intercalibration values for FADU fluxes. Var type = CDF\_REAL4
- FAIU\_Energy: Energy levels for FAIU fluxes – Units: MeV. Var type = CDF\_REAL4
- FAIU\_Alpha: Local pitch-angles for FAIU fluxes – Units: Degree. Var type = CDF\_REAL4
- FAIU\_Alpha Eq: Equatorial pitch-angles for FAIU fluxes, computed from FAIU\_Alpha, B\_Calc and B\_Eq- Time dependent – Units: Degree. Var type = CDF\_REAL4
- FAIU\_Quality: Quality Flag for FAIU fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FAIU\_Crosscalib: Intercalibration values for FAIU fluxes. Var type = CDF\_REAL4
- FIDU\_Energy: Energy levels for FIDU fluxes – Units: MeV. Var type = CDF\_REAL4
- FIDU\_Alpha: Local pitch-angles for FIDU fluxes – Units: Degree. Var type = CDF\_REAL4



### Standard file format guidelines

- FIDU Alpha Eq: Equatorial pitch-angles for FIDU fluxes, computed from FIDU\_Alpha, B\_Calc and B\_Eq- Time dependent – Units: Degree. Var type = CDF\_REAL4
- FIDU Quality: Quality Flag for FIDU fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FIDU Crosscalib: Intercalibration values for FIDU fluxes. Var type = CDF\_REAL4
- FIIU Energy: Energy levels for FIIU fluxes – Units: MeV. Var type = CDF\_REAL4
- FIIU Alpha: Local pitch-angles for FIIU fluxes – Units: Degree. Var type = CDF\_REAL4
- FIIU Alpha Eq: Equatorial pitch-angles for FIIU fluxes, computed from FIIU\_Alpha, B\_Calc and B\_Eq- Time dependent – Units: Degree. Var type = CDF\_REAL4
- FIIU Quality: Quality Flag for FIIU fluxes – time dependent (0 denotes highest quality, 1 denotes problem with time resolution, 2 denotes contamination, 3 denotes saturation, 4 denotes any other problem and 10 is the default values while data have not been yet filtered). Var type = CDF\_INT2
- FIIU Crosscalib: Intercalibration values for FIIU fluxes. Var type = CDF\_REAL4

When flux for any measurements are computed from a fit function which can depend on several parameters the following support data must be present (note that FFEDO stands for Omnidirectional Differential Electron Flux Fit, FFEIO stands for Omnidirectional Integral Electron Flux Fit, FFPDO stands for Omnidirectional Differential Proton Flux Fit, FFPIO stands for Omnidirectional Integral Proton Flux Fit):

- FFEDO Energy Range: Energy range within which the fit function (provided in the metadata FFEDO) can be evaluated – Units: MeV. Var type = CDF\_REAL4
- FFEDO Parameter: Parameters to evaluate the fit function FFEDO – time dependent (this is an array where the number of dimension as the size of the number of input parameters for the fit function). Var type = CDF\_REAL4
- FFEDO Quality: Quality flag for the fit function FFEDO. The use of the quality flag must be precised in the VAR\_NOTES attribute. Var type = CDF\_REAL4
- FFEIO Energy Range: Energy range within which the fit function (provided in the metadata FFEIO) can be evaluated – Units: MeV. Var type = CDF\_REAL4
- FFEIO Parameter: Parameters to evaluate the fit function FFEIO – time dependent (this is an array where the number of dimension as the size of the number of input parameters for the fit function). Var type = CDF\_REAL4



### Standard file format guidelines

- **FFEIO Quality**: Quality flag for the fit function FFEIO. The use of the quality flag must be precised in the VAR\_NOTES attribute. Var type = CDF\_REAL4
- **FFPDO Energy Range**: Energy range within which the fit function (provided in the metadata FFPDO) can be evaluated – Units: MeV. Var type = CDF\_REAL4
- **FFPDO Parameter**: Parameters to evaluate the fit function FFPDO – time dependent (this is an array where the number of dimension as the size of the number of input parameters for the fit function) . Var type = CDF\_REAL4
- **FFPDO Quality**: Quality flag for the fit function FFPDO. The use of the quality flag must be precised in the VAR\_NOTES attribute. Var type = CDF\_REAL4
- **FFPIO Energy Range**: Energy range within which the fit function (provided in the metadata FFPIO) can be evaluated – Units: MeV. Var type = CDF\_REAL4
- **FFPIO Parameter**: Parameters to evaluate the fit function FFPIO – time dependent (this is an array where the number of dimension as the size of the number of input parameters for the fit function) . Var type = CDF\_REAL4
- **FFPIO Quality**: Quality flag for the fit function FFPIO. The use of the quality flag must be precised in the VAR\_NOTES attribute. Var type = CDF\_REAL4

### II.3.3 Metadata

*These are variables of secondary importance e.g., a variable holding "xGEO,yGEO,zGEO" to label spacecraft position.*

*The following CDF variable specifications are required.*

*Metadata is always character type. Metadata is always time invariant if it is used to label a data variable. Metadata can be time varying if it is NOT used as a label.*

*If a metadata variable is attached to a data variable via LABL\_PTR\_i, then it must be of the same size as the dimension i.*

*Character metadata must define the number of elements to be the same as the number of characters used in its value.*

*The following variable attributes are required.*

- CATDESC
- DEPEND\_0 = Epoch (if time varying)
- FIELDNAM
- FILLVAL (if time varying)
- FORMAT/FORM\_PTR
- VAR\_TYPE = support\_data

The list of metadata that must be present in cdf files is the following:

- **Position\_LABL\_1**: Position variable labels. Var type = CDF\_CHAR



### Standard file format guidelines

- FPDO\_LABL\_1: Energy labels for FPDO fluxes. Var type = CDF\_CHAR
- FPIO\_LABL\_1: Energy labels for FPIO fluxes. Var type = CDF\_CHAR
- FEDO\_LABL\_1: Energy labels for FEDO fluxes. Var type = CDF\_CHAR
- FEIO\_LABL\_1: Energy labels for FEIO fluxes. Var type = CDF\_CHAR
- FADO\_LABL\_1: Energy labels for FADO fluxes. Var type = CDF\_CHAR
- FAIO\_LABL\_1: Energy labels for FAIO fluxes. Var type = CDF\_CHAR
- FIDO\_LABL\_1: Energy labels for FIDO fluxes. Var type = CDF\_CHAR
- FIIO\_LABL\_1: Energy labels for FIIO fluxes. Var type = CDF\_CHAR
- FPDU\_LABL\_1: Energy labels for FPDU fluxes. Var type = CDF\_CHAR
- FPDU\_LABL\_2: Local pitch-angle labels for FPDU fluxes. Var type = CDF\_CHAR
- FPIU\_LABL\_1: Energy labels for FPIU fluxes. Var type = CDF\_CHAR
- FPIU\_LABL\_2: Local pitch-angle labels for FPIU fluxes. Var type = CDF\_CHAR
- FEDU\_LABL\_1: Energy labels for FEDU fluxes. Var type = CDF\_CHAR
- FEDU\_LABL\_2: Local pitch-angle labels for FEDU fluxes. Var type = CDF\_CHAR
- FEIU\_LABL\_1: Energy labels for FEIU fluxes. Var type = CDF\_CHAR
- FEIU\_LABL\_2: Local pitch-angle labels for FEIU fluxes. Var type = CDF\_CHAR
- FADU\_LABL\_1: Energy labels for FADU fluxes. Var type = CDF\_CHAR
- FADU\_LABL\_2: Local pitch-angle labels for FADU fluxes. Var type = CDF\_CHAR
- FAIU\_LABL\_1: Energy labels for FAIU fluxes. Var type = CDF\_CHAR
- FAIU\_LABL\_2: Local pitch-angle labels for FAIU fluxes. Var type = CDF\_CHAR
- FIDU\_LABL\_1: Energy labels for FIDU fluxes. Var type = CDF\_CHAR
- FIDU\_LABL\_2: Local pitch-angle labels for FIDU fluxes. Var type = CDF\_CHAR
- FIIU\_LABL\_1: Energy labels for FIIU fluxes. Var type = CDF\_CHAR
- FIIU\_LABL\_2: Local pitch-angle labels for FIIU fluxes. Var type = CDF\_CHAR

When flux for any measurements are computed from a fit function which can depend on several parameters the following metadata must be present (note that FFEDO stands for Omnidirectional Differential Electron Flux Fit, FFEIO stands for Omnidirectional Integral

### Standard file format guidelines

Electron Flux Fit, FFPDO stands for Omnidirectional Differential Proton Flux Fit, FFPIO stands for Omnidirectional Integral Proton Flux Fit):

- **FFEDO:** Omnidirectional Differential Electron Flux Fit. This metadata has the string type and describe in IDL language the fit function. The use in the formula of  $E_k$  for the kinetic energy in MeV is highly recommended and also the variable name `FFEDO_Parameter(0)`, `FFEDO_Parameter(1)`, ... Note that the flux unit should be provided in  $\#/(MeV\ cm^2\ s\ sr)$ . Var type = CDF\_CHAR
- **FFEIO:** Omnidirectional Integral Electron Flux Fit. This metadata has the string type and describe in IDL language the fit function. The use in the formula of  $E_k$  for the kinetic energy in MeV is highly recommended and also the variable name `FFEIO_Parameter(0)`, `FFEIO_Parameter(1)`, ... Note that the flux unit should be provided in  $\#/(cm^2\ s\ sr)$ . Var type = CDF\_CHAR
- **FFPDO:** Omnidirectional Differential Proton Flux Fit. This metadata has the string type and describe in IDL language the fit function. The use in the formula of  $E_k$  for the kinetic energy in MeV is highly recommended and also the variable name `FFPDO_Parameter(0)`, `FFPDO_Parameter(1)`, ... Note that the flux unit should be provided in  $\#/(MeV\ cm^2\ s\ sr)$ . Var type = CDF\_CHAR
- **FFPIO:** Omnidirectional Integral Proton Flux Fit. This metadata has the string type and describe in IDL language the fit function. The use in the formula of  $E_k$  for the kinetic energy in MeV is highly recommended and also the variable name `FFPIO_Parameter(0)`, `FFPIO_Parameter(1)`, ... Note that the flux unit should be provided in  $\#/(cm^2\ s\ sr)$ . Var type = CDF\_CHAR

### III. Reading the cdf files

In this section, the logic to read the cdf files, and to take advantages of all information in there is provided. The logic is provided here for Omni-directional Differential Electron Flux but it can be easily extended to any type of flux provided in the files.

- 1- Retrieve FEDO flux variables. This variable should contain original data provided by the PI and should not have been modified at all. This guaranty that anyone can re-plot the data as he has provided them without any extra modification. Retrieve the UNITS attribute for FEDO will provide the flux units.
- 2- Retrieve FEDO\_Energy. This support\_data should contain the energy ranges for all channels provided in FEDO. Retrieve the UNITS attribute for FEDO\_Energy will provide the energy units.
- 3- Retrieve FEDO\_LABL\_1. This metadata should contain the energy labels provided as strings.
- 4- Retrieve FEDO\_Quality. This support\_data should contain quality information for the data (FEDO) and allows any future user to filter the data according to the data quality he wants. Note that the safer being to filter the data when FEDO\_Quality is set to 0.



Standard file format guidelines

- 5- Retrieve FEDO\_Crosscalib. This support\_data should contain inter-calibration factor to apply to each FEDO in order to ensure that all data across all spacecraft/instrument are consistent. Flux=FEDO\*FEDO\_Crosscalib.

Now the logic is provided for Omni-directional Differential Electron Flux Fit (FFEDO) but it can be easily extended to any type of flux fit provided in the files.

- 1- Retrieve FFEDO flux fit function. This metadata should contain the IDL fit function. Retrieve the UNITS attribute for FFEDO will provide the flux units.
- 2- Retrieve FFEDO\_Energy\_Range. This support\_data should contain the energy ranges within which the fit function can be evaluated. Retrieve the UNITS attribute for FFEDO\_Energy\_Range will provide the energy units.
- 3- Retrieve FFEDO\_Parameter. This support\_data should contain the parameters needed to evaluate the fit function. It is recommended to retrieve this support data under the name FFEDO\_Parameter as it should appear in the FFEDO formula.
- 4- Retrieve FFEDO\_Quality. This support\_data should contain information on how far can we believe in the fit function. This support\_data should allow to filter only times when the fit is accurate and therefore ensure a good use of the evaluated flux.
- 5- If step 1 to 4 have been followed properly then it should be straightforward to evaluate FFEDO fit function with IDL just setting an array of energy at which the fluxes have to be computed (Ek).

IV. Example

In this example we provide a skeleton table for POLAR CEPPAD data where there are electron and proton data, omni-directional and directional data.

```
! Skeleton table for the "POLAR_H0_CEPPAD_19990101_V01" CDF.
! Generated: Friday, 05-May-2006 01:14:09
! CDF created/modified by CDF V2.7.1
! Skeleton table created by CDF V2.7.2

#header

                CDF NAME: POLAR_H0_CEPPAD_19990101_V01
DATA ENCODING: NETWORK
MAJORITY: ROW
                FORMAT: SINGLE

! Variables  G.Attributes  V.Attributes  Records  Dims  Sizes
! -----  -
!          0/38           25           24         0/z     0

#GLOBALattributes

! Attribute      Entry      Data
! Name           Number     Type       Value
! -----
"Project"       1:        CDF_UCHAR  { "ISTP>International " -
```

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

```

        "Solar-Terrestrial Physics" }
.
"Source_name"      1:  CDF_UCHAR  { "POLAR>Polar" } .
"Discipline"      1:  CDF_UCHAR  { "Space " -
        "Physics>Magnetospheric " -
        "Physics" } .
"Data_type"       1:  CDF_UCHAR  { "H0>High Time Resolution" } .
"Descriptor"      1:  CDF_UCHAR  { "CEPPAD>Comprehensive " -
        "Energetic Particle and " -
        "Pitch Angle Distribution" } .
"Data_version"    1:  CDF_UCHAR  { "01" } .
"PI_name"         1:  CDF_UCHAR  { "J. Bernard Blake " -
        "(JBernard.Blake@aero.org)" }
.
"PI_affiliation"  1:  CDF_UCHAR  { "The Aerospace Corporation" }
.
"TEXT"           1:  CDF_UCHAR  { "CEPPAD is the energetic " -
        "particle suite flown on " -
        "the NASA POLAR satellite " -
        "consisting of the IES, IPS " -
        "and HIST detectors, " -
        "covering electrons and " -
        "protons from 10s of Kev to" -
        " several MEV. Details are " -
        "given in J. B Blake et " -
        "al., CEPPAD: Comprehensive" -
        " energetic particle and " -
        "pitch angle distribution " -
        "experiment on Polar. Space" -
        " Sci. Rev., 71, 531-562, " -
        "1995. The instruments are " -
        "Solid State Energetic " -
        "Particle Telescopes " -
        "(space)" } .
"Instrument_type" 1:  CDF_UCHAR  { "Particles (space)" } .
"Mission_group"   1:  CDF_UCHAR  { "POLAR" } .
"Logical_source"  1:  CDF_UCHAR  { "POLAR_H0_CEPPAD" } .
"Logical_file_id" 1:  CDF_UCHAR  { "POLAR_H0_CEPPAD_19990101_V01"
} .
"Logical_source_description"
        1:  CDF_UCHAR  { "High resolution energetic " -
        "particle data from the " -
        "CEPPAD instrument onboard " -
        "the NASA Polar satellite" } .
"Time_resolution" 1:  CDF_UCHAR  { "24 seconds" } .

```



### Standard file format guidelines

```

"Rules_of_use"      1:   CDF_UCHAR   { "Distribute freely." } .
"Generated_by"     1:   CDF_UCHAR   { "LANL" } .
"Generation_date"  1:   CDF_UCHAR   { "20060504" } .
"Acknowledgement" 1:   CDF_UCHAR   { "acknowledge PAPCO and " -
    "ONERA/DESP Mag Library " -
    "(Reiner Friedel, Josef " -
    "Koller at LANL; Sebastien " -
    "Bourdarie at ONER) and " -
    "original PI. Please " -
    "contact PI before any " -
    "publication or " -
    "presentation of data." } .

"MODS"             1:   CDF_UCHAR   { "20060504 Automatic " -
    "generation" } .

"ADID_ref"         1:   CDF_UCHAR   { "NSSD0110" } .

"LINK_TEXT"       1:   CDF_UCHAR   { "Cammice, Ceppad and Rapid " -
    "Web Page" } .

"LINK_TITLE"      1:   CDF_UCHAR   { "CCR Home Page" } .

"HTTP_LINK"       1:   CDF_UCHAR   { "http://leadbelly.lanl.gov/" -
    "ccr/" } .

"Parents"         1:   CDF_UCHAR   { "none" } .
    
```

### #VARIABLEattributes

```

"AVG_TYPE"
"CATDESC"
"DEPEND_0"
"DEPEND_1"
"DEPEND_2"
"DICTIONARY_KEY"
"DISPLAY_TYPE"
"V_PARENT"
"FIELDNAM"
"FILLVAL"
"FORM_PTR"
"FORMAT"
"LABLAXIS"
"LABL_PTR_1"
"QUALITY_VAR"
"SCAL_PTR"
"SCALETYP"
"SI_conversion"
"UNITS"
"UNIT_PTR"
"VALIDMIN"
"VALIDMAX"
"VAR_TYPE"
"VAR_NOTES"
    
```



Standard file format guidelines

#variables

! No rVariables.

#zVariables

! Variable ! Name ! -----	Data Type ----	Number Elements -----	Dims ----	Sizes -----	Record Variance -----	Dimension Variances -----
---------------------------------	----------------------	-----------------------------	--------------	----------------	-----------------------------	---------------------------------

"Epoch"	CDF_EPOCH	1	0		T	
---------	-----------	---	---	--	---	--

! Attribute ! Name ! -----	Data Type ----	Value -----
----------------------------------	----------------------	----------------

"CATDESC"	CDF_UCHAR	{ "Default time" }
"DICT_KEY"	CDF_UCHAR	{ "time>Epoch" }
"FIELDNAM"	CDF_UCHAR	{ "Epoch" }
"FILLVAL"	CDF_UCHAR	{ "-1.0E31" }
"SCALETYP"	CDF_UCHAR	{ "linear" }
"SI_conversion"	CDF_UCHAR	{ "1.0e3>s" }
"UNITS"	CDF_UCHAR	{ "ms" }
"VALIDMIN"	CDF_UCHAR	{ "CDF_PARSE_EPOCH(01-Jan-1950 " - "00::00::00.000)" }
"VALIDMAX"	CDF_UCHAR	{ "CDF_PARSE_EPOCH(31-Dec-9999 " - "23::59::59.999)" }
"VAR_TYPE"	CDF_UCHAR	{ "support_data" }
"VAR_NOTES"	CDF_UCHAR	{ "Epoch, UT" } .

! RV values were not requested.

! Variable ! Name ! -----	Data Type ----	Number Elements -----	Dims ----	Sizes -----	Record Variance -----	Dimension Variances -----
---------------------------------	----------------------	-----------------------------	--------------	----------------	-----------------------------	---------------------------------

"Position"	CDF_REAL4	1	1	3	T	T
------------	-----------	---	---	---	---	---

! Attribute ! Name ! -----	Data Type ----	Value -----
----------------------------------	----------------------	----------------

"AVG_TYPE"	CDF_UCHAR	{ "standard" }
"CATDESC"	CDF_UCHAR	{ "Position of the satellite in " - "geographic coordinates" }
"DEPEND_0"	CDF_UCHAR	{ "Epoch" }
"DICT_KEY"	CDF_UCHAR	{ "position>geographic" }
"DISPLAY_TYPE"	CDF_UCHAR	{ "time_series" }
"FIELDNAM"	CDF_UCHAR	{ "Satellite position (GEO)" }
"FILLVAL"	CDF_UCHAR	{ "-1.0E31" }
"FORMAT"	CDF_UCHAR	{ "F6.3" }
"LABL_PTR_1"	CDF_UCHAR	{ "Position_LABL_1" }



Standard file format guidelines

```
"SCALETYP"      CDF_UCHAR      { "linear" }
"SI_conversion"  CDF_UCHAR      { "1.0e-3>m" }
"UNITS"         CDF_UCHAR      { "km" }
"VALIDMIN"     CDF_UCHAR      { "[-1.0E31, -1.0E31, -1.0E31]" }
"VALIDMAX"     CDF_UCHAR      { "[1.0E31, 1.0E31, 1.0E31]" }
"VAR_TYPE"     CDF_UCHAR      { "data" }
"VAR_NOTES"    CDF_UCHAR      { "Origin = Earths center of mass. X = " -
    "Intersection of Greenwich meridian and" -
    " geographic equator. Z = Geographic " -
    "North Pole. Y = completes a " -
    "right-handed Cartesian triad" } .
```

! RV values were not requested.

```
! Variable      Data      Number      Record      Dimension
! Name         Type      Elements    Dims      Sizes      Variance    Variances
! -----
```

```
"Position_LABL_1"
      CDF_CHAR      4      1      3      F      T
```

```
! Attribute      Data
! Name          Type      Value
! -----
```

```
"CATDESC"      CDF_UCHAR      { "Position labels" }
"DICT_KEY"     CDF_UCHAR      { "label>position" }
"FIELDNAM"    CDF_UCHAR      { "Position_LABL_1" }
"FORMAT"      CDF_UCHAR      { "A4" }
"VAR_TYPE"    CDF_UCHAR      { "metadata" } .
```

! NRV values follow...

```
[1] = { "Xgeo" }
[2] = { "Ygeo" }
[3] = { "Zgeo" }
```

```
! Variable      Data      Number      Record      Dimension
! Name         Type      Elements    Dims      Sizes      Variance    Variances
! -----
```

```
"Position_Quality"
      CDF_INT2      1      0      T
```

```
! Attribute      Data
! Name          Type      Value
! -----
```

```
"CATDESC"      CDF_UCHAR      { "Position Quality flag" }
"DEPEND_0"     CDF_UCHAR      { "Epoch" }
"DICT_KEY"     CDF_UCHAR      { "flag>quality" }
"FIELDNAM"    CDF_UCHAR      { "Position_Quality" }
"FILLVAL"     CDF_UCHAR      { "-32767" }
"FORMAT"      CDF_UCHAR      { "I11" }
"LABLAXIS"    CDF_UCHAR      { "Quality" }
"UNITS"       CDF_UCHAR      { "none" }
```





Standard file format guidelines

```
"VALIDMIN"    CDF_UCHAR    { "-32767" }
"VALIDMAX"    CDF_UCHAR    { "32767" }
"VAR_TYPE"    CDF_UCHAR    { "support_data" }
"VAR_NOTES"   CDF_UCHAR    { "0 denotes highest quality." } .
```

! RV values were not requested.

! Variable ! Name ! -----	Data Type ----	Number Elements -----	Dims ----	Sizes -----	Record Variance -----	Dimension Variances -----
---------------------------------	----------------------	-----------------------------	--------------	----------------	-----------------------------	---------------------------------

"B_Calc"	CDF_REAL4	1	0		T	
----------	-----------	---	---	--	---	--

! Attribute ! Name ! -----	Data Type ----	Value -----
----------------------------------	----------------------	----------------

```
"AVG_TYPE"    CDF_UCHAR    { "standard" }
"CATDESC"     CDF_UCHAR    { "Calculated magnetic field strength" }
"DEPEND_0"    CDF_UCHAR    { "Epoch" }
"DICT_KEY"    CDF_UCHAR    { "magnetic_field>amplitude" }
"DISPLAY_TYPE" CDF_UCHAR    { "time_series" }
"FIELDNAM"    CDF_UCHAR    { "Magnetic field strength" }
"FILLVAL"     CDF_UCHAR    { "-1.0E31" }
"FORMAT"      CDF_UCHAR    { "E10.3" }
"LABLAXIS"    CDF_UCHAR    { "B" }
"SCALETYP"    CDF_UCHAR    { "linear" }
"SI_conversion" CDF_UCHAR    { "1.0e9>T" }
"UNITS"       CDF_UCHAR    { "nT" }
"VALIDMIN"    CDF_UCHAR    { "0.0" }
"VALIDMAX"    CDF_UCHAR    { "1.0E31" }
"VAR_TYPE"    CDF_UCHAR    { "data" }
"VAR_NOTES"   CDF_UCHAR    { "Calculated using ONERA-DESP library " -
    "Internal field: DGRF/IGRF External " -
    "field: Olson & Pfitzer quiet" } .
```

! RV values were not requested.

! Variable ! Name ! -----	Data Type ----	Number Elements -----	Dims ----	Sizes -----	Record Variance -----	Dimension Variances -----
---------------------------------	----------------------	-----------------------------	--------------	----------------	-----------------------------	---------------------------------

"B_Eq"	CDF_REAL4	1	0		T	
--------	-----------	---	---	--	---	--

! Attribute ! Name ! -----	Data Type ----	Value -----
----------------------------------	----------------------	----------------

```
"AVG_TYPE"    CDF_UCHAR    { "standard" }
"CATDESC"     CDF_UCHAR    { "Calculated magnetic field strength at " -
    "magnetic equator" }
"DEPEND_0"    CDF_UCHAR    { "Epoch" }
"DICT_KEY"    CDF_UCHAR    { "magnetic_field>amplitude" }
"DISPLAY_TYPE" CDF_UCHAR    { "time_series" }
```



Standard file format guidelines

```
"FIELDNAM"    CDF_UCHAR    { "Equatorial magnetic field strength" }
"FILLVAL"     CDF_UCHAR    { "-1.0E31" }
"FORMAT"      CDF_UCHAR    { "E10.3" }
"LABLAXIS"    CDF_UCHAR    { "B_Eq" }
"SCALETYP"    CDF_UCHAR    { "linear" }
"SI_conversion"
                CDF_UCHAR    { "1.0e9>T" }
"UNITS"       CDF_UCHAR    { "nT" }
"VALIDMIN"    CDF_UCHAR    { "0.0" }
"VALIDMAX"    CDF_UCHAR    { "1.0E31" }
"VAR_TYPE"    CDF_UCHAR    { "data" }
"VAR_NOTES"   CDF_UCHAR    { "Calculated using ONERA-DESP library " -
                "Internal field: DGRF/IGRF External " -
                "field: Olson & Pfitzer quiet" } .
```

! RV values were not requested.

! Variable ! Name	Data Type	Number Elements	Dims	Sizes	Record Variance	Dimension Variances
! -----	----	-----	----	-----	-----	-----

"L"	CDF_REAL4	1	0		T	
-----	-----------	---	---	--	---	--

! Attribute ! Name	Data Type	Value
! -----	----	-----

```
"AVG_TYPE"    CDF_UCHAR    { "standard" }
"CATDESC"     CDF_UCHAR    { "Calculated McIlwains L parameter " -
                "(Earths radii)" }
"DEPEND_0"    CDF_UCHAR    { "Epoch" }
"DISPLAY_TYPE"
                CDF_UCHAR    { "time_series" }
"FIELDNAM"    CDF_UCHAR    { "McIlwains L parameter" }
"FILLVAL"     CDF_UCHAR    { "-1.0E31" }
"FORMAT"      CDF_UCHAR    { "E10.3" }
"LABLAXIS"    CDF_UCHAR    { "L" }
"SCALETYP"    CDF_UCHAR    { "linear" }
"SI_conversion"
                CDF_UCHAR    { "1.5696e-7>m" }
"UNITS"       CDF_UCHAR    { "R_E" }
"VALIDMIN"    CDF_UCHAR    { "0.0" }
"VALIDMAX"    CDF_UCHAR    { "1.0E31" }
"VAR_TYPE"    CDF_UCHAR    { "data" }
"VAR_NOTES"   CDF_UCHAR    { "Calculated using ONERA-DESP library " -
                "Internal field: DGRF/IGRF External " -
                "field: Olson & Pfitzer quiet" } .
```

! RV values were not requested.

! Variable ! Name	Data Type	Number Elements	Dims	Sizes	Record Variance	Dimension Variances
! -----	----	-----	----	-----	-----	-----

"L_star"	CDF_REAL4	1	0		T	
----------	-----------	---	---	--	---	--

! Attribute	Data
-------------	------

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

```
! Name          Type          Value
! -----
"AVG_TYPE"     CDF_UCHAR    { "standard" }
"CATDESC"     CDF_UCHAR    { "Calculated Roederers L* parameter " -
"(Earths radii)" }
"DEPEND_0"    CDF_UCHAR    { "Epoch" }
"DISPLAY_TYPE"
CDF_UCHAR     { "time_series" }
"FIELDNAM"    CDF_UCHAR    { "Roederers L* parameter" }
"FILLVAL"     CDF_UCHAR    { "-1.0E31" }
"FORMAT"      CDF_UCHAR    { "E10.3" }
"LABLAXIS"    CDF_UCHAR    { "L*" }
"SCALETYP"    CDF_UCHAR    { "linear" }
"SI_conversion"
CDF_UCHAR     { "1.5696e-7>m" }
"UNITS"       CDF_UCHAR    { "R_E" }
"VALIDMIN"    CDF_UCHAR    { "0.0" }
"VALIDMAX"    CDF_UCHAR    { "1.0E31" }
"VAR_TYPE"    CDF_UCHAR    { "data" }
"VAR_NOTES"   CDF_UCHAR    { "Calculated using ONERA-DESP library " -
"Internal field: DGRF/IGRF External " -
"field: Olson & Pfitzer quiet" } .

! RV values were not requested.
```

```
! Variable      Data      Number      Record      Dimension
! Name          Type      Elements    Dims      Sizes      Variance    Variances
! -----
```

```
"I"            CDF_REAL4    1          0          T
```

```
! Attribute     Data
! Name          Type          Value
! -----
```

```
"AVG_TYPE"     CDF_UCHAR    { "standard" }
"CATDESC"     CDF_UCHAR    { "Adiabatic invariant (bounce)" }
"DEPEND_0"    CDF_UCHAR    { "Epoch" }
"DISPLAY_TYPE"
CDF_UCHAR     { "time_series" }
"FIELDNAM"    CDF_UCHAR    { "Adiabatic invariant (bounce)" }
"FILLVAL"     CDF_UCHAR    { "-1.0E31" }
"FORMAT"      CDF_UCHAR    { "E10.3" }
"LABLAXIS"    CDF_UCHAR    { "I" }
"SCALETYP"    CDF_UCHAR    { "linear" }
"SI_conversion"
CDF_UCHAR     { "none" }
"UNITS"       CDF_UCHAR    { "none" }
"VALIDMIN"    CDF_UCHAR    { "0.0" }
"VALIDMAX"    CDF_UCHAR    { "1.0E31" }
"VAR_TYPE"    CDF_UCHAR    { "data" }
"VAR_NOTES"   CDF_UCHAR    { "Calculated using ONERA-DESP library " -
"Internal field: DGRF/IGRF External " -
"field: Olson & Pfitzer quiet" } .
```

! RV values were not requested.

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

```

! Variable          Data          Number          Record          Dimension
! Name             Type           Elements  Dims  Sizes  Variance  Variances
! -----          -
"MLT"              CDF_REAL4      1           0                T

! Attribute        Data
! Name             Type           Value
! -----          -
"AVG_TYPE"         CDF_UCHAR      { "angle_hour" }
"CATDESC"          CDF_UCHAR      { "Calculated Magnetic Local Time (hours)" }
"DEPEND_0"         CDF_UCHAR      { "Epoch" }
"DISPLAY_TYPE"    CDF_UCHAR      { "time_series" }
"FIELDNAM"         CDF_UCHAR      { "Magnetic Local Time" }
"FILLVAL"          CDF_UCHAR      { "-1.0E31" }
"FORMAT"           CDF_UCHAR      { "E10.3" }
"LABLAXIS"         CDF_UCHAR      { "MLT" }
"SCALETYP"         CDF_UCHAR      { "linear" }
"SI_conversion"    CDF_UCHAR      { "2.778e-4>s" }
"UNITS"            CDF_UCHAR      { "h" }
"VALIDMIN"         CDF_UCHAR      { "0.0" }
"VALIDMAX"         CDF_UCHAR      { "24.0" }
"VAR_TYPE"         CDF_UCHAR      { "data" }
"VAR_NOTES"        CDF_UCHAR      { "Calculated using ONERA-DESP library " -
                    "Internal field: DGRF/IGRF External " -
                    "field: Olson & Pfitzer quiet" } .

```

! RV values were not requested.

```

! Variable          Data          Number          Record          Dimension
! Name             Type           Elements  Dims  Sizes  Variance  Variances
! -----          -
"Alpha"            CDF_REAL4      1           0                T

! Attribute        Data
! Name             Type           Value
! -----          -
"AVG_TYPE"         CDF_UCHAR      { "angle_degrees" }
"CATDESC"          CDF_UCHAR      { "Pitch angle" }
"DEPEND_0"         CDF_UCHAR      { "Epoch" }
"DICT_KEY"         CDF_UCHAR      { "angle>pitch" }
"DISPLAY_TYPE"    CDF_UCHAR      { "time_series" }
"FIELDNAM"         CDF_UCHAR      { "Pitch angle" }
"FILLVAL"          CDF_UCHAR      { "-1.0E31" }
"FORMAT"           CDF_UCHAR      { "E10.3" }
"LABLAXIS"         CDF_UCHAR      { "Alpha" }
"SCALETYP"         CDF_UCHAR      { "linear" }
"SI_conversion"    CDF_UCHAR      { "57.296>rad" }
"UNITS"            CDF_UCHAR      { "degrees" }
"VALIDMIN"         CDF_UCHAR      { "0.0" }

```

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

```
"VALIDMAX"    CDF_UCHAR    { "180.0" }
"VAR_TYPE"    CDF_UCHAR    { "data" }
"VAR_NOTES"   CDF_UCHAR    { "Calculated using ONERA-DESP library " -
    "Internal field: DGRF/IGRF External " -
    "field: Olson & Pfitzer quiet" } .
```

! RV values were not requested.

! Variable ! Name ! -----	Data Type ----	Number Elements -----	Dims ----	Sizes -----	Record Variance -----	Dimension Variances -----
---------------------------------	----------------------	-----------------------------	--------------	----------------	-----------------------------	---------------------------------

"Alpha_Eq"	CDF_REAL4	1	0		T	
------------	-----------	---	---	--	---	--

! Attribute ! Name ! -----	Data Type ----	Value -----
----------------------------------	----------------------	----------------

```
"AVG_TYPE"    CDF_UCHAR    { "angle_degrees" }
"CATDESC"     CDF_UCHAR    { "Equatorial pitch angle" }
"DEPEND_0"    CDF_UCHAR    { "Epoch" }
"DICTIONARY"  CDF_UCHAR    { "angle>pitch" }
"DISPLAY_TYPE" CDF_UCHAR    { "time_series" }
"FIELDNAM"    CDF_UCHAR    { "Equat. Pitch angle" }
"FILLVAL"     CDF_UCHAR    { "-1.0E31" }
"FORMAT"      CDF_UCHAR    { "E10.3" }
"LABLAXIS"    CDF_UCHAR    { "Alpha(Eq)" }
"SCALETYP"    CDF_UCHAR    { "linear" }
"SI_conversion" CDF_UCHAR    { "57.296>rad" }
"UNITS"       CDF_UCHAR    { "degrees" }
"VALIDMIN"    CDF_UCHAR    { "0.0" }
"VALIDMAX"    CDF_UCHAR    { "180.0" }
"VAR_TYPE"    CDF_UCHAR    { "data" }
"VAR_NOTES"   CDF_UCHAR    { "Calculated using ONERA-DESP library " -
    "Internal field: DGRF/IGRF External " -
    "field: Olson & Pfitzer quiet" } .
```

! RV values were not requested.

! Variable ! Name ! -----	Data Type ----	Number Elements -----	Dims ----	Sizes -----	Record Variance -----	Dimension Variances -----
---------------------------------	----------------------	-----------------------------	--------------	----------------	-----------------------------	---------------------------------

"FPDO"	CDF_REAL4	1	1	32	T	T
--------	-----------	---	---	----	---	---

! Attribute ! Name ! -----	Data Type ----	Value -----
----------------------------------	----------------------	----------------

```
"AVG_TYPE"    CDF_UCHAR    { "log" }
"CATDESC"     CDF_UCHAR    { "Omnidirectional Differential Proton Flux"
}
"DEPEND_0"    CDF_UCHAR    { "Epoch" }
"DEPEND_1"    CDF_UCHAR    { "FPDO_Energy" }
"DICTIONARY"  CDF_UCHAR    { "particle_flux>proton-differential-omni" -
```



Standard file format guidelines

```

                                "-directional" }
"DISPLAY_TYPE"
CDF_UCHAR { "time_series" }
"V_PARENT" CDF_UCHAR { "FPDU" }
"FIELDNAM" CDF_UCHAR { "FPDO" }
"FILLVAL" CDF_UCHAR { "-1.0E31" }
"FORMAT" CDF_UCHAR { "E10.3" }
"LABL_PTR_1" CDF_UCHAR { "FPDO_LABL_1" }
"QUALITY_VAR" CDF_UCHAR { "FPDO_Quality" }
"SCALETYP" CDF_UCHAR { "log" }
"SI_conversion" CDF_UCHAR { "1.602e-17>m^-2 s^-1 sr^-1 J^-1" }
"UNITS" CDF_UCHAR { "cm^-2 s^-1 sr^-1 MeV^-1" }
"VALIDMIN" CDF_UCHAR { "-1.0E31" }
"VALIDMAX" CDF_UCHAR { "1.0E31" }
"VAR_TYPE" CDF_UCHAR { "data" }
"VAR_NOTES" CDF_UCHAR { "Dimension 1 holds channels." } .

```

! RV values were not requested.

! Variable ! Name ! -----	Data Type ----	Number Elements -----	Dims ----	Sizes -----	Record Variance -----	Dimension Variances -----
---------------------------------	----------------------	-----------------------------	--------------	----------------	-----------------------------	---------------------------------

"FPDO_Energy"	CDF_REAL4	1	2	32 2	F	T T
---------------	-----------	---	---	------	---	-----

! Attribute ! Name ! -----	Data Type ----	Value -----
----------------------------------	----------------------	----------------

```

"CATDESC" CDF_UCHAR { "Energy levels for FPDO" }
"DICT_KEY" CDF_UCHAR { "energy>band" }
"FIELDNAM" CDF_UCHAR { "FPDO Energy" }
"FILLVAL" CDF_UCHAR { "-1.0E31" }
"FORMAT" CDF_UCHAR { "F8.3" }
"LABLAXIS" CDF_UCHAR { "Energy" }
"SI_conversion" CDF_UCHAR { "6.242e12>J" }
"UNITS" CDF_UCHAR { "MeV" }
"VALIDMIN" CDF_UCHAR { "0.0" }
"VALIDMAX" CDF_UCHAR { "1.0E31" }
"VAR_TYPE" CDF_UCHAR { "support_data" }
"VAR_NOTES" CDF_UCHAR { "Energy levels are a combination of IPS" -
                        " and HISTp" } .

```

! NRV values follow...

```

[1,1] = 0.017
[1,2] = 0.021
[2,1] = 0.021
[2,2] = 0.028
[3,1] = 0.028
[3,2] = 0.037
[4,1] = 0.037
[4,2] = 0.050
[5,1] = 0.050

```



Standard file format guidelines

```

[5,2] = 0.066
[6,1] = 0.066
[6,2] = 0.088
[7,1] = 0.088
[7,2] = 0.118
[8,1] = 0.118
[8,2] = 0.161
[9,1] = 0.161
[9,2] = 0.221
[10,1] = 0.221
[10,2] = 0.303
[11,1] = 0.303
[11,2] = 0.417
[12,1] = 0.417
[12,2] = 0.574
[13,1] = 0.574
[13,2] = 0.791
[14,1] = 0.791
[14,2] = 1.091
[15,1] = 1.091
[15,2] = 1.505
[16,1] = 1.505
[16,2] = 2.000
[17,1] = 1.000
[17,2] = 3.000
[18,1] = 3.000
[18,2] = 3.740
[19,1] = 3.740
[19,2] = 4.650
[20,1] = 4.650
[20,2] = 5.790
[21,1] = 5.790
[21,2] = 7.210
[22,1] = 7.210
[22,2] = 8.970
[23,1] = 8.970
[23,2] = 11.170
[24,1] = 11.170
[24,2] = 13.910
[25,1] = 13.910
[25,2] = 17.320
[26,1] = 17.320
[26,2] = 21.560
[27,1] = 21.560
[27,2] = 26.850
[28,1] = 26.850
[28,2] = 33.430
[29,1] = 33.430
[29,2] = 41.620
[30,1] = 41.620
[30,2] = 51.820
[31,1] = 51.820
[31,2] = 64.510
[32,1] = 64.510
[32,2] = 80.320
    
```

! Variable	Data	Number		Record	Dimension
! Name	Type	Elements	Dims	Variance	Variances



Standard file format guidelines

```

! -----
"FPDO_LABL_1"  CDF_CHAR      21      1      32      F      T

! Attribute      Data
! Name           Type           Value
! -----
"CATDESC"      CDF_UCHAR     { "Energy labels for FPDO" }
"DICTIONARY"   CDF_UCHAR     { "label>energy" }
"FIELDNAM"     CDF_UCHAR     { "FPDO_LABL_1" }
"FORMAT"       CDF_UCHAR     { "A21" }
"VAR_TYPE"     CDF_UCHAR     { "metadata" } .

! NRV values follow...

[1] = { " 0.017 - 0.021 MeV" }
[2] = { " 0.021 - 0.028 MeV" }
[3] = { " 0.028 - 0.037 MeV" }
[4] = { " 0.037 - 0.050 MeV" }
[5] = { " 0.050 - 0.066 MeV" }
[6] = { " 0.066 - 0.088 MeV" }
[7] = { " 0.088 - 0.118 MeV" }
[8] = { " 0.118 - 0.161 MeV" }
[9] = { " 0.161 - 0.221 MeV" }
[10] = { " 0.221 - 0.303 MeV" }
[11] = { " 0.303 - 0.417 MeV" }
[12] = { " 0.417 - 0.574 MeV" }
[13] = { " 0.574 - 0.791 MeV" }
[14] = { " 0.791 - 1.091 MeV" }
[15] = { " 1.091 - 1.505 MeV" }
[16] = { " 1.505 - 2.000 MeV" }
[17] = { " 1.000 - 3.000 MeV" }
[18] = { " 3.000 - 3.740 MeV" }
[19] = { " 3.740 - 4.650 MeV" }
[20] = { " 4.650 - 5.790 MeV" }
[21] = { " 5.790 - 7.210 MeV" }
[22] = { " 7.210 - 8.970 MeV" }
[23] = { " 8.970 - 11.170 MeV" }
[24] = { " 11.170 - 13.910 MeV" }
[25] = { " 13.910 - 17.320 MeV" }
[26] = { " 17.320 - 21.560 MeV" }
[27] = { " 21.560 - 26.850 MeV" }
[28] = { " 26.850 - 33.430 MeV" }
[29] = { " 33.430 - 41.620 MeV" }
[30] = { " 41.620 - 51.820 MeV" }
[31] = { " 51.820 - 64.510 MeV" }
[32] = { " 64.510 - 80.320 MeV" }

! Variable      Data      Number      Record      Dimension
! Name          Type      Elements    Dims      Sizes      Variance    Variances
! -----
"FPDO_Quality" CDF_INT2      1          1          32          T          T

! Attribute      Data
! Name           Type           Value

```





Standard file format guidelines

```
! -----          -----          -----

"CATDESC"          CDF_UCHAR      { "FPDO Quality flag" }
"DEPEND_0"        CDF_UCHAR      { "Epoch" }
"DEPEND_1"        CDF_UCHAR      { "FPDO_Energy" }
"DICT_KEY"         CDF_UCHAR      { "flag>quality" }
"FIELDNAM"        CDF_UCHAR      { "FPDO_Quality" }
"FILLVAL"         CDF_UCHAR      { "-32767" }
"FORMAT"          CDF_UCHAR      { "I11" }
"LABLAXIS"        CDF_UCHAR      { "Quality" }
"LABL_PTR_1"      CDF_UCHAR      { "FPDO_LABL_1" }

"UNITS"           CDF_UCHAR      { "none" }
"VALIDMIN"        CDF_UCHAR      { "-32767" }
"VALIDMAX"        CDF_UCHAR      { "32767" }
"VAR_TYPE"        CDF_UCHAR      { "support_data" }
"VAR_NOTES"       CDF_UCHAR      { "0 denotes highest quality. 1 denotes " -
                                     "problem with time resolution. 2 " -
                                     "denotes possible contamination. 3 " -
                                     "denotes saturation. 4 denotes any " -
                                     "other problem and 10 denotes that data" -
                                     " have not been qualified" } .
```

! RV values were not requested.

```
! Variable          Data          Number          Record          Dimension
! Name              Type           Elements  Dims  Sizes  Variance  Variances
! -----          -----          -----          -----          -----          -----          -----
```

```
"FPDO_Crossscalib"
                                CDF_REAL4      1          1          32          F          T
```

```
! Attribute          Data
! Name              Type           Value
! -----          -----          -----

"CATDESC"          CDF_UCHAR      { "Crosscalibration factors for FPDO" }
"DEPEND_0"        CDF_UCHAR      { "FPDO_Energy" }
"DICT_KEY"         CDF_UCHAR      { "ratio>particle_flux" }
"FIELDNAM"        CDF_UCHAR      { "FPDO Crossscalib" }
"FILLVAL"         CDF_UCHAR      { "-1.0E31" }
"FORMAT"          CDF_UCHAR      { "F5" }
"LABLAXIS"        CDF_UCHAR      { "Crosscalibration factors" }
"SI_conversion"   CDF_UCHAR      { "none" }
"UNITS"           CDF_UCHAR      { "none" }
"VALIDMIN"        CDF_UCHAR      { "0.0" }
"VALIDMAX"        CDF_UCHAR      { "1.0E31" }
"VAR_TYPE"        CDF_UCHAR      { "support_data" }
"VAR_NOTES"       CDF_UCHAR      { "none" } .
```

! NRV values follow...

```
[1] = 1.0
[2] = 1.0
[3] = 1.0
[4] = 1.0
[5] = 1.0
```



Standard file format guidelines

```
[6] = 1.0
[7] = 1.0
[8] = 1.0
[9] = 1.0
[10] = 1.0
[11] = 1.0
[12] = 1.0
[13] = 1.0
[14] = 1.0
[15] = 1.0
[16] = 1.0
[17] = 1.0
[18] = 1.0
[19] = 1.0
[20] = 1.0
[21] = 1.0
[22] = 1.0
[23] = 1.0
[24] = 1.0
[25] = 1.0
[26] = 1.0
[27] = 1.0
[28] = 1.0
[29] = 1.0
[30] = 1.0
[31] = 1.0
[32] = 1.0
```

```
! Variable      Data      Number
! Name          Type      Elements Dims  Sizes  Record  Dimension
! -----      ----      -
!              Type      Elements Dims  Sizes  Variance Variance
```

```
"FPDU"          CDF_REAL4      1      2      9 32      T      T T
```

```
! Attribute      Data
! Name           Type      Value
! -----      ----      -
```

```

"AVG_TYPE"      CDF_UCHAR      { "log" }
"CATDESC"       CDF_UCHAR      { "Unidirectional Differential Proton Flux"
}
"DEPEND_0"      CDF_UCHAR      { "Epoch" }
"DEPEND_1"      CDF_UCHAR      { "FPDU_Energy" }
"DEPEND_2"      CDF_UCHAR      { "FPDU_Alpha" }
"DICT_KEY"      CDF_UCHAR      { "particle_flux>proton-differential-dire" -
"ctional" }
"DISPLAY_TYPE"  CDF_UCHAR      { "time_series" }
"FIELDNAM"     CDF_UCHAR      { "FPDU" }
"FILLVAL"      CDF_UCHAR      { "-1.0E31" }
"FORMAT"       CDF_UCHAR      { "E10.3" }
"LABL_PTR_1"   CDF_UCHAR      { "FPDU_LABL_1" }
"QUALITY_VAR"  CDF_UCHAR      { "FPDU_Quality" }
"SCALETYP"     CDF_UCHAR      { "log" }
"SI_conversion" CDF_UCHAR      { "1.602e-17>m^-2 s^-1 sr^-1 J^-1" }
```

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

```
"UNITS"          CDF_UCHAR      { "cm^-2 s^-1 sr^-1 MeV^-1" }
"VALIDMIN"       CDF_UCHAR      { "-1.0E31" }
"VALIDMAX"       CDF_UCHAR      { "1.0E31" }
"VAR_TYPE"       CDF_UCHAR      { "data" }
"VAR_NOTES"      CDF_UCHAR      { "Dimension 1 holds channels." } .
```

! RV values were not requested.

```
! Variable          Data          Number          Record          Dimension
! Name              Type           Elements        Dims            Sizes           Variance        Variances
! -----          -
```

```
"FPDU_Energy"      CDF_REAL4      1              2              32 2           F              T T
```

```
! Attribute         Data
! Name              Type           Value
! -----          -
```

```
"CATDESC"          CDF_UCHAR      { "Energy levels for FPDU" }
"DICT_KEY"          CDF_UCHAR      { "energy>band" }
"FIELDNAM"         CDF_UCHAR      { "FPDU Energy" }
"FILLVAL"          CDF_UCHAR      { "-1.0E31" }
"FORMAT"           CDF_UCHAR      { "F8.3" }
"LABLAXIS"         CDF_UCHAR      { "Energy" }
"SI_conversion"    CDF_UCHAR      { "6.242e12>J" }
"UNITS"            CDF_UCHAR      { "MeV" }
"VALIDMIN"         CDF_UCHAR      { "0.0" }
"VALIDMAX"         CDF_UCHAR      { "1.0E31" }
"VAR_TYPE"         CDF_UCHAR      { "support_data" }
"VAR_NOTES"        CDF_UCHAR      { "Energy levels are a combination of IPS" -
" and HISTp" } .
```

! NRV values follow...

```
[1,1] = 0.017
[1,2] = 0.021
[2,1] = 0.021
[2,2] = 0.028
[3,1] = 0.028
[3,2] = 0.037
[4,1] = 0.037
[4,2] = 0.050
[5,1] = 0.050
[5,2] = 0.066
[6,1] = 0.066
[6,2] = 0.088
[7,1] = 0.088
[7,2] = 0.118
[8,1] = 0.118
[8,2] = 0.161
[9,1] = 0.161
[9,2] = 0.221
[10,1] = 0.221
[10,2] = 0.303
[11,1] = 0.303
[11,2] = 0.417
[12,1] = 0.417
```



Standard file format guidelines

```
[12,2] = 0.574
[13,1] = 0.574
[13,2] = 0.791
[14,1] = 0.791
[14,2] = 1.091
[15,1] = 1.091
[15,2] = 1.505
[16,1] = 1.505
[16,2] = 2.000
[17,1] = 1.000
[17,2] = 3.000
[18,1] = 3.000
[18,2] = 3.740
[19,1] = 3.740
[19,2] = 4.650
[20,1] = 4.650
[20,2] = 5.790
[21,1] = 5.790
[21,2] = 7.210
[22,1] = 7.210
[22,2] = 8.970
[23,1] = 8.970
[23,2] = 11.170
[24,1] = 11.170
[24,2] = 13.910
[25,1] = 13.910
[25,2] = 17.320
[26,1] = 17.320
[26,2] = 21.560
[27,1] = 21.560
[27,2] = 26.850
[28,1] = 26.850
[28,2] = 33.430
[29,1] = 33.430
[29,2] = 41.620
[30,1] = 41.620
[30,2] = 51.820
[31,1] = 51.820
[31,2] = 64.510
[32,1] = 64.510
[32,2] = 80.320
```

```
! Variable      Data      Number      Record      Dimension
! Name         Type      Elements    Dims      Sizes      Variance    Variances
! -----      ----      -
```

```
"FPDU_Alpha"   CDF_REAL4      1      2      9 2      F      T T
```

```
! Attribute    Data
! Name        Type      Value
! -----      ----      -
```

```
"CATDESC"     CDF_UCHAR      { "Local pitch angle bins for FPDU" }
"DICT_KEY"    CDF_UCHAR      { "angle>pitch" }
"FIELDNAM"    CDF_UCHAR      { "FPDU Alpha" }
"FILLVAL"     CDF_UCHAR      { "-1.0E31" }
"FORMAT"      CDF_UCHAR      { "F5" }
"LABLAXIS"    CDF_UCHAR      { "Local pitch angle" }
```

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

```
"SI_conversion"      CDF_UCHAR      { "0.0174533>rad" }
"UNITS"              CDF_UCHAR      { "degrees" }
"VALIDMIN"           CDF_UCHAR      { "0.0" }
"VALIDMAX"           CDF_UCHAR      { "180.0" }
"VAR_TYPE"           CDF_UCHAR      { "support_data" }
"VAR_NOTES"          CDF_UCHAR      { "10 degree pitch angle bins based on " -
                        "the assumption of gyrotropy." } .
```

! NRV values follow...

```
[1,1] = 0.0
[1,2] = 20.0
[2,1] = 20.0
[2,2] = 40.0
[3,1] = 40.0
[3,2] = 60.0
[4,1] = 60.0
[4,2] = 80.0
[5,1] = 80.0
[5,2] = 100.0
[6,1] = 100.0
[6,2] = 120.0
[7,1] = 120.0
[7,2] = 140.0
[8,1] = 140.0
[8,2] = 160.0
[9,1] = 160.0
[9,2] = 180.0
```

! Variable ! Name ! -----	Data Type -----	Number Elements -----	Dims -----	Sizes -----	Record Variance -----	Dimension Variances -----
---------------------------------	-----------------------	-----------------------------	---------------	----------------	-----------------------------	---------------------------------

"FPDU_Alpha_Eq"	CDF_REAL4	1	2	9 2	T	T T
-----------------	-----------	---	---	-----	---	-----

! Attribute ! Name ! -----	Data Type -----	Value -----
----------------------------------	-----------------------	----------------

"CATDESC"	CDF_UCHAR	{ "Equatorial pitch angle bins for FPDU" }
"DEPEND_0"	CDF_UCHAR	{ "Epoch" }
"DICT_KEY"	CDF_UCHAR	{ "angle>pitch" }
"FIELDNAM"	CDF_UCHAR	{ "FPDU Alpha Eq" }
"FILLVAL"	CDF_UCHAR	{ "-1.0E31" }
"FORMAT"	CDF_UCHAR	{ "F5" }
"LABLAXIS"	CDF_UCHAR	{ "Equatorial pitch angle" }
"SI_conversion"	CDF_UCHAR	{ "0.0174533>rad" }
"UNITS"	CDF_UCHAR	{ "degrees" }
"VALIDMIN"	CDF_UCHAR	{ "0.0" }
"VALIDMAX"	CDF_UCHAR	{ "180.0" }
"VAR_TYPE"	CDF_UCHAR	{ "support_data" }
"VAR_NOTES"	CDF_UCHAR	{ "10 degree pitch angle bins based on " - "the assumption of gyrotropy." } .

! RV values were not requested.



Standard file format guidelines

```

! Variable           Data           Number           Record           Dimension
! Name              Type           Elements        Dims           Sizes           Variance         Variances
! -----           -
"FPDU_LABL_1"      CDF_CHAR       21              1              32              F                T

! Attribute         Data
! Name              Type           Value
! -----           -
"CATDESC"          CDF_UCHAR      { "Energy labels for FPDU" }
"DICT_KEY"          CDF_UCHAR      { "label>energy" }
"FIELDNAM"          CDF_UCHAR      { "FPDU_LABL_1" }
"FORMAT"            CDF_UCHAR      { "A21" }
"VAR_TYPE"          CDF_UCHAR      { "metadata" } .

! NRV values follow...

[1] = { " 0.017 - 0.021 MeV" }
[2] = { " 0.021 - 0.028 MeV" }
[3] = { " 0.028 - 0.037 MeV" }
[4] = { " 0.037 - 0.050 MeV" }
[5] = { " 0.050 - 0.066 MeV" }
[6] = { " 0.066 - 0.088 MeV" }
[7] = { " 0.088 - 0.118 MeV" }
[8] = { " 0.118 - 0.161 MeV" }
[9] = { " 0.161 - 0.221 MeV" }
[10] = { " 0.221 - 0.303 MeV" }
[11] = { " 0.303 - 0.417 MeV" }
[12] = { " 0.417 - 0.574 MeV" }
[13] = { " 0.574 - 0.791 MeV" }
[14] = { " 0.791 - 1.091 MeV" }
[15] = { " 1.091 - 1.505 MeV" }
[16] = { " 1.505 - 2.000 MeV" }
[17] = { " 1.000 - 3.000 MeV" }
[18] = { " 3.000 - 3.740 MeV" }
[19] = { " 3.740 - 4.650 MeV" }
[20] = { " 4.650 - 5.790 MeV" }
[21] = { " 5.790 - 7.210 MeV" }
[22] = { " 7.210 - 8.970 MeV" }
[23] = { " 8.970 - 11.170 MeV" }
[24] = { " 11.170 - 13.910 MeV" }
[25] = { " 13.910 - 17.320 MeV" }
[26] = { " 17.320 - 21.560 MeV" }
[27] = { " 21.560 - 26.850 MeV" }
[28] = { " 26.850 - 33.430 MeV" }
[29] = { " 33.430 - 41.620 MeV" }
[30] = { " 41.620 - 51.820 MeV" }
[31] = { " 51.820 - 64.510 MeV" }
[32] = { " 64.510 - 80.320 MeV" }

! Variable           Data           Number           Record           Dimension
! Name              Type           Elements        Dims           Sizes           Variance         Variances
! -----           -
"FPDU_LABL_2"      CDF_CHAR       12              1              9                F                T
    
```



Standard file format guidelines

```
! Attribute      Data
! Name          Type      Value
! -----      -
"CATDESC"      CDF_UCHAR { "Pitch-angle labels for FPDU" }
"DICT_KEY"     CDF_UCHAR { "label>angle" }
"FIELDNAM"     CDF_UCHAR { "FPDU_LABL_2" }
"FORMAT"       CDF_UCHAR { "A12" }
"VAR_TYPE"     CDF_UCHAR { "metadata" } .
```

! NRV values follow...

```
[1] = { "PA 0 - 20" }
[2] = { "PA 20 - 40" }
[3] = { "PA 40 - 60" }
[4] = { "PA 60 - 80" }
[5] = { "PA 80 - 100" }
[6] = { "PA 100 - 120" }
[7] = { "PA 120 - 140" }
[8] = { "PA 140 - 160" }
[9] = { "PA 160 - 180" }
```

```
! Variable      Data      Number      Record      Dimension
! Name          Type      Elements    Dims      Sizes      Variance    Variances
! -----      -
"FPDU_Quality" CDF_INT2      1          2      9 32      T          T T
```

```
! Attribute      Data
! Name          Type      Value
! -----      -
"CATDESC"      CDF_UCHAR { "FPDU Quality flag" }
"DEPEND_0"     CDF_UCHAR { "Epoch" }
"DEPEND_1"     CDF_UCHAR { "FPDU_Energy" }
"DICT_KEY"     CDF_UCHAR { "flag>quality" }
"FIELDNAM"     CDF_UCHAR { "FPDU_Quality" }
"FILLVAL"      CDF_UCHAR { "-32767" }
"FORMAT"       CDF_UCHAR { "I11" }
"LABLAXIS"     CDF_UCHAR { "Quality" }
"LABL_PTR_1"   CDF_UCHAR { "FPDU_LABL_1" }
"UNITS"        CDF_UCHAR { "none" }
"VALIDMIN"     CDF_UCHAR { "-32767" }
"VALIDMAX"     CDF_UCHAR { "32767" }
"VAR_TYPE"     CDF_UCHAR { "support_data" }
"VAR_NOTES"    CDF_UCHAR { "0 denotes highest quality. 1 denotes " -
    "problem with time resolution. 2 " -
    "denotes possible contamination. 3 " -
    "denotes saturation. 4 denotes any " -
    "other problem and 10 denotes that data" -
    " have not been qualified" } .
```

! RV values were not requested.

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

```

! Variable          Data          Number          Record          Dimension
! Name             Type           Elements        Dims            Sizes           Variance        Variances
! -----          -
"FPDU_Crosscalib"
                                CDF_REAL4      1              1              32             F              T

! Attribute        Data
! Name             Type           Value
! -----          -
"CATDESC"          CDF_UCHAR     { "Crosscalibration factors for FPDO" }
"DEPEND_0"        CDF_UCHAR     { "FPDU_Energy" }
"DICT_KEY"        CDF_UCHAR     { "ratio>particle_flux" }
"FIELDNAM"        CDF_UCHAR     { "FPDU Crosscalib" }
"FILLVAL"         CDF_UCHAR     { "-1.0E31" }
"FORMAT"          CDF_UCHAR     { "F5" }
"LABLAXIS"        CDF_UCHAR     { "Crosscalibration factors" }
"SI_conversion"
                                CDF_UCHAR     { "none" }
"UNITS"           CDF_UCHAR     { "none" }
"VALIDMIN"        CDF_UCHAR     { "0.0" }
"VALIDMAX"        CDF_UCHAR     { "1.0E31" }
"VAR_TYPE"        CDF_UCHAR     { "support_data" }
"VAR_NOTES"       CDF_UCHAR     { "none" } .

! NRV values follow...

[1] = 1.0
[2] = 1.0
[3] = 1.0
[4] = 1.0
[5] = 1.0
[6] = 1.0
[7] = 1.0
[8] = 1.0
[9] = 1.0
[10] = 1.0
[11] = 1.0
[12] = 1.0
[13] = 1.0
[14] = 1.0
[15] = 1.0
[16] = 1.0
[17] = 1.0
[18] = 1.0
[19] = 1.0
[20] = 1.0
[21] = 1.0
[22] = 1.0
[23] = 1.0
[24] = 1.0
[25] = 1.0
[26] = 1.0
[27] = 1.0
[28] = 1.0
[29] = 1.0
[30] = 1.0
[31] = 1.0

```





Standard file format guidelines

[32] = 1.0

```
! Variable      Data      Number      Record      Dimension
! Name         Type      Elements    Dims     Sizes    Variance    Variances
! -----      ----      -
"FEDO"         CDF_REAL4    1          1        24        T          T

! Attribute      Data
! Name         Type      Value
! -----      ----      -
"AVG_TYPE"     CDF_UCHAR    { "log" }
"CATDESC"      CDF_UCHAR    { "Omnidirectional Differential Electron " -
"Flux" }
"DEPEND_0"     CDF_UCHAR    { "Epoch" }
"DEPEND_1"     CDF_UCHAR    { "FEDO_Energy" }
"DICT_KEY"     CDF_UCHAR    { "particle_flux>electron-differential-om" -
"ni-directional" }
"DISPLAY_TYPE"
"CDF_UCHAR    { "time_series" }
"V_PARENT"     CDF_UCHAR    { "FEDU" }
"FIELDNAM"     CDF_UCHAR    { "FEDO" }
"FILLVAL"      CDF_UCHAR    { "-1.0E31" }
"FORMAT"       CDF_UCHAR    { "E10.3" }
"LABL_PTR_1"   CDF_UCHAR    { "FEDO_LABL_1" }
"QUALITY_VAR"  CDF_UCHAR    { "FEDO_Quality" }
"SCALETYP"     CDF_UCHAR    { "log" }
"SI_conversion"
"CDF_UCHAR    { "1.602e-17>m^-2 s^-1 sr^-1 J^-1" }
"UNITS"        CDF_UCHAR    { "cm^-2 s^-1 sr^-1 MeV^-1" }
"VALIDMIN"     CDF_UCHAR    { "-1.0E31" }
"VALIDMAX"     CDF_UCHAR    { "1.0E31" }
"VAR_TYPE"     CDF_UCHAR    { "data" }
"VAR_NOTES"    CDF_UCHAR    { "FEDO, Dimension 1 holds channels." } .
```

! RV values were not requested.

```
! Variable      Data      Number      Record      Dimension
! Name         Type      Elements    Dims     Sizes    Variance    Variances
! -----      ----      -
"FEDO_Energy"  CDF_REAL4    1          2        24 2        F          T T

! Attribute      Data
! Name         Type      Value
! -----      ----      -
"CATDESC"      CDF_UCHAR    { "Energy levels for FEDO" }
"DICT_KEY"     CDF_UCHAR    { "energy>band" }
"FIELDNAM"     CDF_UCHAR    { "FEDO Energy" }
"FILLVAL"      CDF_UCHAR    { "-1.0E31" }
"FORMAT"       CDF_UCHAR    { "F5" }
"LABLAXIS"     CDF_UCHAR    { "Energy" }
"SI_conversion"
```



### Standard file format guidelines

```
"UNITS"          CDF_UCHAR    { "6.242e12>J" }
"VALIDMIN"       CDF_UCHAR    { "MeV" }
"VALIDMAX"       CDF_UCHAR    { "0.0" }
"VALIDMAX"       CDF_UCHAR    { "1.0E31" }
"VAR_TYPE"       CDF_UCHAR    { "support_data" }
"VAR_NOTES"      CDF_UCHAR    { "Energy levels are a combination of IES" -
" and HISTe" } .
```

! NRV values follow...

```
[1,1] = 0.0185
[1,2] = 0.0305
[2,1] = 0.0305
[2,2] = 0.0425
[3,1] = 0.0425
[3,2] = 0.0585
[4,1] = 0.0585
[4,2] = 0.0805
[5,1] = 0.0805
[5,2] = 0.1105
[6,1] = 0.1105
[6,2] = 0.1525
[7,1] = 0.1525
[7,2] = 0.2125
[8,1] = 0.2125
[8,2] = 0.2945
[9,1] = 0.2945
[9,2] = 0.4065
[10,1] = 0.4065
[10,2] = 0.4265
[11,1] = 0.656734
[11,2] = 0.700186
[12,1] = 0.700186
[12,2] = 0.743639
[13,1] = 0.743639
[13,2] = 0.980043
[14,1] = 0.980042
[14,2] = 1.15826
[15,1] = 1.15826
[15,2] = 1.42174
[16,1] = 1.42174
[16,2] = 1.69826
[17,1] = 1.69826
[17,2] = 2.10174
[18,1] = 2.10174
[18,2] = 2.77826
[19,1] = 2.77826
[19,2] = 3.48174
[20,1] = 3.48174
[20,2] = 4.57826
[21,1] = 4.57826
[21,2] = 5.68174
[22,1] = 5.68174
[22,2] = 7.17825
[23,1] = 7.17826
[23,2] = 8.94174
[24,1] = 8.94174
[24,2] = 11.2783
```

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

```
! Variable      Data      Number
! Name         Type      Elements  Dims   Sizes  Record  Dimension
! -----      ----      -

```

```
"FEDO_LABL_1"  CDF_CHAR    21      1     24      F       T
```

```
! Attribute    Data
! Name         Type      Value
! -----      ----      -

```

```
"CATDESC"     CDF_UCHAR   { "Energy labels for FEDO" }
"DICT_KEY"    CDF_UCHAR   { "label>energy" }
"FIELDNAM"    CDF_UCHAR   { "FEDO_LABL_1" }
"FORMAT"      CDF_UCHAR   { "A21" }
"VAR_TYPE"    CDF_UCHAR   { "metadata" } .
```

! NRV values follow...

```
[1] = { " 0.019 - 0.030 MeV" }
[2] = { " 0.031 - 0.042 MeV" }
[3] = { " 0.042 - 0.059 MeV" }
[4] = { " 0.059 - 0.080 MeV" }
[5] = { " 0.081 - 0.111 MeV" }
[6] = { " 0.111 - 0.152 MeV" }
[7] = { " 0.152 - 0.213 MeV" }
[8] = { " 0.212 - 0.294 MeV" }
[9] = { " 0.295 - 0.406 MeV" }
[10] = { " 0.406 - 0.426 MeV" }
[11] = { " 0.657 - 0.700 MeV" }
[12] = { " 0.700 - 0.744 MeV" }
[13] = { " 0.744 - 0.980 MeV" }
[14] = { " 0.980 - 1.158 MeV" }
[15] = { " 1.158 - 1.422 MeV" }
[16] = { " 1.422 - 1.698 MeV" }
[17] = { " 1.698 - 2.102 MeV" }
[18] = { " 2.102 - 2.778 MeV" }
[19] = { " 2.778 - 3.482 MeV" }
[20] = { " 3.482 - 4.578 MeV" }
[21] = { " 4.578 - 5.682 MeV" }
[22] = { " 5.682 - 7.178 MeV" }
[23] = { " 7.178 - 8.942 MeV" }
[24] = { " 8.942 - 11.278 MeV" }
```

```
! Variable      Data      Number
! Name         Type      Elements  Dims   Sizes  Record  Dimension
! -----      ----      -

```

```
"FEDO_Quality" CDF_INT2    1      1     24      T       T
```

```
! Attribute    Data
! Name         Type      Value
! -----      ----      -

```

```
"CATDESC"     CDF_UCHAR   { "FEDO Quality flag" }
"DEPEND_0"    CDF_UCHAR   { "Epoch" }
"DEPEND_1"    CDF_UCHAR   { "FEDO_Energy" }
```



Standard file format guidelines

```
"DICT_KEY"      CDF_UCHAR      { "flag>quality" }
"FIELDNAM"     CDF_UCHAR      { "FEDO_Quality" }
"FILLVAL"      CDF_UCHAR      { "-32767" }
"FORMAT"       CDF_UCHAR      { "I11" }
"LABLAXIS"     CDF_UCHAR      { "Quality" }
"LABL_PTR_1"   CDF_UCHAR      { "FEDO_LABL_1" }
"UNITS"        CDF_UCHAR      { "none" }
"VALIDMIN"     CDF_UCHAR      { "-32767" }
"VALIDMAX"     CDF_UCHAR      { "32767" }
"VAR_TYPE"     CDF_UCHAR      { "support_data" }
"VAR_NOTES"    CDF_UCHAR      { "0 denotes highest quality. 1 denotes " -
"problem with time resolution. 2 " -
"denotes possible contamination. 3 " -
"denotes saturation. 4 denotes any " -
"other problem and 10 denotes that data" -
" have not been qualified" } .
```

! RV values were not requested.

```
! Variable      Data      Number      Record      Dimension
! Name          Type      Elements    Dims      Sizes      Variance    Variances
! -----
```

```
"FEDO_Crosscalib"
      CDF_REAL4      1      1      24      F      T
```

```
! Attribute      Data      Value
! Name          Type      -----
! -----
```

```
"CATDESC"      CDF_UCHAR      { "Crosscalibration factors for FEDO" }
"DEPEND_0"     CDF_UCHAR      { "FEDO_Energy" }
"DICT_KEY"     CDF_UCHAR      { "ratio>particle_flux" }
"FIELDNAM"    CDF_UCHAR      { "FEDO Crosscalib" }
"FILLVAL"     CDF_UCHAR      { "-1.0E31" }
"FORMAT"      CDF_UCHAR      { "F5" }
"LABLAXIS"    CDF_UCHAR      { "Crosscalibration factors" }
"SI_conversion"
      CDF_UCHAR      { "none" }
"UNITS"       CDF_UCHAR      { "none" }
"VALIDMIN"    CDF_UCHAR      { "0.0" }
"VALIDMAX"    CDF_UCHAR      { "1.0E31" }
"VAR_TYPE"    CDF_UCHAR      { "support_data" }
"VAR_NOTES"   CDF_UCHAR      { "none" } .
```

! NRV values follow...

```
[1] = 1.0
[2] = 1.0
[3] = 1.0
[4] = 1.0
[5] = 1.0
[6] = 1.0
[7] = 1.0
[8] = 1.0
[9] = 1.0
[10] = 1.0
```



Standard file format guidelines

```
[11] = 1.0
[12] = 1.0
[13] = 1.0
[14] = 1.0
[15] = 1.0
[16] = 1.0
[17] = 1.0
[18] = 1.0
[19] = 1.0
[20] = 1.0
[21] = 1.0
[22] = 1.0
[23] = 1.0
[24] = 1.0
```

```
! Variable      Data      Number      Record      Dimension
! Name         Type      Elements    Dims      Sizes      Variance    Variances
! -----
```

```
"FEDU"         CDF_REAL4      1          2          9 24          T          T T
```

```
! Attribute      Data
! Name          Type          Value
! -----
```

```
"AVG_TYPE"     CDF_UCHAR      { "log" }
"CATDESC"      CDF_UCHAR      { "Unidirectional Differential Electron " -
"Flux" }
"DEPEND_0"     CDF_UCHAR      { "Epoch" }
"DEPEND_1"     CDF_UCHAR      { "FEDU_Energy" }
"DEPEND_2"     CDF_UCHAR      { "FEDU_Alpha" }
"DICT_KEY"     CDF_UCHAR      { "particle_flux>electron-differential-di" -
"rectional" }
"DISPLAY_TYPE" CDF_UCHAR      { "time_series" }
"FIELDNAM"     CDF_UCHAR      { "FEDU" }
"FILLVAL"      CDF_UCHAR      { "-1.0E31" }
"FORMAT"       CDF_UCHAR      { "E10.3" }
"LABL_PTR_1"   CDF_UCHAR      { "FEDU_LABL_1" }
"QUALITY_VAR"  CDF_UCHAR      { "FEDU_Quality" }
"SCALETYP"    CDF_UCHAR      { "log" }
"SI_conversion" CDF_UCHAR      { "1.602e-17>m^-2 s^-1 sr^-1 J^-1" }
"UNITS"        CDF_UCHAR      { "cm^-2 s^-1 sr^-1 KeV^-1" }
"VALIDMIN"     CDF_UCHAR      { "-1.0E31" }
"VALIDMAX"     CDF_UCHAR      { "1.0E31" }
"VAR_TYPE"     CDF_UCHAR      { "data" }
"VAR_NOTES"    CDF_UCHAR      { "FEDU, Dimension 1 holds channels, " -
"Dimension 2 holds pitch angles." } .
```

```
! RV values were not requested.
```

```
! Variable      Data      Number      Record      Dimension
! Name         Type      Elements    Dims      Sizes      Variance    Variances
! -----
```



Standard file format guidelines

```
"FEDU_Energy"    CDF_REAL4      1      2      24 2      F      T T

! Attribute      Data
! Name           Type      Value
! -----      -
!
! "CATDESC"      CDF_UCHAR    { "Energy levels for FEDU" }
! "DICT_KEY"     CDF_UCHAR    { "energy>band" }
! "FIELDNAM"     CDF_UCHAR    { "FEDU Energy" }
! "FILLVAL"      CDF_UCHAR    { "-1.0E31" }
! "FORMAT"       CDF_UCHAR    { "F5" }
! "LABLAXIS"     CDF_UCHAR    { "Energy" }
! "SI_conversion" CDF_UCHAR    { "6.242e12>J" }
! "UNITS"        CDF_UCHAR    { "MeV" }
! "VALIDMIN"     CDF_UCHAR    { "0.0" }
! "VALIDMAX"     CDF_UCHAR    { "1.0E31" }
! "VAR_TYPE"     CDF_UCHAR    { "support_data" }
! "VAR_NOTES"    CDF_UCHAR    { "Energy levels are a combination of IES" -
!                  " and HISTe" } .

! NRV values follow...

[1,1] = 0.0185
[1,2] = 0.0305
[2,1] = 0.0305
[2,2] = 0.0425
[3,1] = 0.0425
[3,2] = 0.0585
[4,1] = 0.0585
[4,2] = 0.0805
[5,1] = 0.0805
[5,2] = 0.1105
[6,1] = 0.1105
[6,2] = 0.1525
[7,1] = 0.1525
[7,2] = 0.2125
[8,1] = 0.2125
[8,2] = 0.2945
[9,1] = 0.2945
[9,2] = 0.4065
[10,1] = 0.4065
[10,2] = 0.4265
[11,1] = 0.656734
[11,2] = 0.700186
[12,1] = 0.700186
[12,2] = 0.743639
[13,1] = 0.743639
[13,2] = 0.980043
[14,1] = 0.980042
[14,2] = 1.15826
[15,1] = 1.15826
[15,2] = 1.42174
[16,1] = 1.42174
[16,2] = 1.69826
[17,1] = 1.69826
[17,2] = 2.10174
[18,1] = 2.10174
```

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

```
[18,2] = 2.77826
[19,1] = 2.77826
[19,2] = 3.48174
[20,1] = 3.48174
[20,2] = 4.57826
[21,1] = 4.57826
[21,2] = 5.68174
[22,1] = 5.68174
[22,2] = 7.17825
[23,1] = 7.17826
[23,2] = 8.94174
[24,1] = 8.94174
[24,2] = 11.2783
```

```
! Variable      Data      Number      Record      Dimension
! Name          Type      Elements    Dims      Sizes      Variance    Variances
! -----      -
```

```
"FEDU_Alpha"    CDF_REAL4      1      2      9 2      F      T T
```

```
! Attribute      Data
! Name           Type           Value
! -----
```

```
"CATDESC"      CDF_UCHAR      { "Local pitch angle bins for FEDU" }
"DICTIONARY"   CDF_UCHAR      { "angle>pitch" }
"FIELDNAM"     CDF_UCHAR      { "FEDU Alpha" }
"FILLVAL"      CDF_UCHAR      { "-1.0E31" }
"FORMAT"       CDF_UCHAR      { "F5" }
"LABLAXIS"     CDF_UCHAR      { "Local pitch angle" }
"SI_conversion"
CDF_UCHAR      { "0.0174533>rad" }
"UNITS"        CDF_UCHAR      { "degrees" }
"VALIDMIN"     CDF_UCHAR      { "0.0" }
"VALIDMAX"     CDF_UCHAR      { "180.0" }
"VAR_TYPE"     CDF_UCHAR      { "support_data" }
"VAR_NOTES"    CDF_UCHAR      { "10 degree pitch angle bins based on " -
"the assumption of gyrotropy." } .
```

! NRV values follow...

```
[1,1] = 0.0
[1,2] = 20.0
[2,1] = 20.0
[2,2] = 40.0
[3,1] = 40.0
[3,2] = 60.0
[4,1] = 60.0
[4,2] = 80.0
[5,1] = 80.0
[5,2] = 100.0
[6,1] = 100.0
[6,2] = 120.0
[7,1] = 120.0
[7,2] = 140.0
[8,1] = 140.0
[8,2] = 160.0
[9,1] = 160.0
```

# Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

## Standard file format guidelines

[9,2] = 180.0

```
! Variable      Data      Number      Record      Dimension
! Name         Type      Elements    Dims    Sizes    Variance    Variances
! -----      ----      -
" FEDU_Alpha_Eq"
CDF_REAL4      1      2      9 2      T      T T

! Attribute      Data
! Name         Type      Value
! -----      ----      -
"CATDESC"      CDF_UCHAR { "Equatorial pitch angle bins for FEDU" }
"DEPEND_0"     CDF_UCHAR { "Epoch" }
"DICT_KEY"     CDF_UCHAR { "angle>pitch" }
"FIELDNAM"     CDF_UCHAR { "FEDU Alpha Eq" }
"FILLVAL"      CDF_UCHAR { "-1.0E31" }
"FORMAT"       CDF_UCHAR { "F5" }
"LABLAXIS"     CDF_UCHAR { "Equatorial pitch angle" }
"SI_conversion"
CDF_UCHAR      { "0.0174533>rad" }
"UNITS"        CDF_UCHAR { "degrees" }
"VALIDMIN"     CDF_UCHAR { "0.0" }
"VALIDMAX"     CDF_UCHAR { "180.0" }
"VAR_TYPE"     CDF_UCHAR { "support_data" }
"VAR_NOTES"    CDF_UCHAR { "10 degree pitch angle bins based on " -
"the assumption of gyrotropy." } .
```

! RV values were not requested.

```
! Variable      Data      Number      Record      Dimension
! Name         Type      Elements    Dims    Sizes    Variance    Variances
! -----      ----      -
" FEDU_LABL_1"
CDF_CHAR       21      1      24      F      T

! Attribute      Data
! Name         Type      Value
! -----      ----      -
"CATDESC"      CDF_UCHAR { "Energy labels for FEDU" }
"DICT_KEY"     CDF_UCHAR { "label>energy" }
"FIELDNAM"     CDF_UCHAR { "FEDU_LABL_1" }
"FORMAT"       CDF_UCHAR { "A21" }
"VAR_TYPE"     CDF_UCHAR { "metadata" } .
```

! NRV values follow...

```
[1] = { " 0.019 - 0.030 MeV" }
[2] = { " 0.031 - 0.042 MeV" }
[3] = { " 0.042 - 0.059 MeV" }
[4] = { " 0.059 - 0.080 MeV" }
[5] = { " 0.081 - 0.111 MeV" }
[6] = { " 0.111 - 0.152 MeV" }
[7] = { " 0.152 - 0.213 MeV" }
[8] = { " 0.212 - 0.294 MeV" }
```





Standard file format guidelines

```
[9] = { " 0.295 - 0.406 MeV" }
[10] = { " 0.406 - 0.426 MeV" }
[11] = { " 0.657 - 0.700 MeV" }
[12] = { " 0.700 - 0.744 MeV" }
[13] = { " 0.744 - 0.980 MeV" }
[14] = { " 0.980 - 1.158 MeV" }
[15] = { " 1.158 - 1.422 MeV" }
[16] = { " 1.422 - 1.698 MeV" }
[17] = { " 1.698 - 2.102 MeV" }
[18] = { " 2.102 - 2.778 MeV" }
[19] = { " 2.778 - 3.482 MeV" }
[20] = { " 3.482 - 4.578 MeV" }
[21] = { " 4.578 - 5.682 MeV" }
[22] = { " 5.682 - 7.178 MeV" }
[23] = { " 7.178 - 8.942 MeV" }
[24] = { " 8.942 - 11.278 MeV" }
```

```
! Variable      Data      Number      Record      Dimension
! Name          Type      Elements    Dims      Sizes      Variance    Variances
! -----      ----      -
```

```
"FEDU_LABL_2"  CDF_CHAR      12          1          9          F          T
```

```
! Attribute      Data
! Name          Type      Value
! -----      ----      -
```

```
"CATDESC"      CDF_UCHAR      { "Pitch-angle labels for FEDU" }
"DICT_KEY"      CDF_UCHAR      { "label>angle" }
"FIELDNAM"      CDF_UCHAR      { "FEDU_LABL_2" }
"FORMAT"        CDF_UCHAR      { "A12" }
"VAR_TYPE"      CDF_UCHAR      { "metadata" } .
```

! NRV values follow...

```
[1] = { "PA 0 - 20" }
[2] = { "PA 20 - 40" }
[3] = { "PA 40 - 60" }
[4] = { "PA 60 - 80" }
[5] = { "PA 80 - 100" }
[6] = { "PA 100 - 120" }
[7] = { "PA 120 - 140" }
[8] = { "PA 140 - 160" }
[9] = { "PA 160 - 180" }
```

```
! Variable      Data      Number      Record      Dimension
! Name          Type      Elements    Dims      Sizes      Variance    Variances
! -----      ----      -
```

```
"FEDU_Quality" CDF_INT2      1          2          9 24      T          T T
```

```
! Attribute      Data
! Name          Type      Value
! -----      ----      -
```

```
"CATDESC"      CDF_UCHAR      { "FEDU Quality flag" }
```



Standard file format guidelines

```

"DEPEND_0"    CDF_UCHAR    { "Epoch" }
"DEPEND_1"    CDF_UCHAR    { "FEDU_Energy" }
"DICT_KEY"    CDF_UCHAR    { "flag>quality" }
"FIELDNAM"    CDF_UCHAR    { "FEDU_Quality" }
"FILLVAL"     CDF_UCHAR    { "-32767" }
"FORMAT"      CDF_UCHAR    { "I11" }
"LABLAXIS"    CDF_UCHAR    { "Quality" }
"LABL_PTR_1"  CDF_UCHAR    { "FEDU_LABL_1" }
"UNITS"       CDF_UCHAR    { "none" }
"VALIDMIN"    CDF_UCHAR    { "-32767" }
"VALIDMAX"    CDF_UCHAR    { "32767" }
"VAR_TYPE"    CDF_UCHAR    { "support_data" }
"VAR_NOTES"   CDF_UCHAR    { "0 denotes highest quality. 1 denotes " -
    "problem with time resolution. 2 " -
    "denotes possible contamination. 3 " -
    "denotes saturation. 4 denotes any " -
    "other problem and 10 denotes that data" -
    " have not been qualified" } .
    
```

! RV values were not requested.

```

! Variable      Data      Number      Record      Dimension
! Name          Type      Elements    Dims      Sizes      Variance    Variances
! -----
    
```

```

"FEDU_Crosscalib"
                CDF_REAL4      1          1          24          F           T
    
```

```

! Attribute      Data      Value
! Name          Type      -----
! -----
    
```

```

"CATDESC"       CDF_UCHAR    { "Crosscalibration factors for FEDU" }
"DEPEND_0"     CDF_UCHAR    { "FEDU_Energy" }
"DICT_KEY"     CDF_UCHAR    { "ratio>particle_flux" }
"FIELDNAM"     CDF_UCHAR    { "FEDU_Crosscalib" }
"FILLVAL"      CDF_UCHAR    { "-1.0E31" }
"FORMAT"       CDF_UCHAR    { "F5" }
"LABLAXIS"     CDF_UCHAR    { "Crosscalibration factors" }
"SI_conversion" CDF_UCHAR    { "none" }
"UNITS"        CDF_UCHAR    { "none" }
"VALIDMIN"     CDF_UCHAR    { "0.0" }
"VALIDMAX"     CDF_UCHAR    { "1.0E31" }
"VAR_TYPE"     CDF_UCHAR    { "support_data" }
"VAR_NOTES"    CDF_UCHAR    { "none" } .
    
```

! NRV values follow...

```

[1] = 1.0
[2] = 1.0
[3] = 1.0
[4] = 1.0
[5] = 1.0
[6] = 1.0
[7] = 1.0
[8] = 1.0
    
```

## Panel on Radiation Belt Environment Modeling (PRBEM)



V1.1

### Standard file format guidelines

```
[9] = 1.0  
[10] = 1.0  
[11] = 1.0  
[12] = 1.0  
[13] = 1.0  
[14] = 1.0  
[15] = 1.0  
[16] = 1.0  
[17] = 1.0  
[18] = 1.0  
[19] = 1.0  
[20] = 1.0  
[21] = 1.0  
[22] = 1.0  
[23] = 1.0  
[24] = 1.0
```

#end