Cluster Active Archive:

Interface Control Document for EFW

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DOCUMENT STATUS SHEET

Issue	Date	Details
1.0	2004-12-13	First issue
2.0	2005-04-23	Second issue, revisions in sec 4 and 5
2.1	2005-05-04	Updated second issue, rev in sec 5
2.2	2005-05-16	Updated again, rev in sec 3, 4 and 5
2.3	2007-01-11	Updated points of contact in sec 2 Included information on high-pass filter in table 1 and sec 4.3.3
3.0	2007-04-30	Removed quantity L2_EF Various corrections and clarifications
3.1	2007-11-07	Added appendices 4, 5 and 6
4.0	2009-05-06	Added Chris Cully in sec 2 Updated lists of quantities in tables 1 and 2, incl description of quality/bitmask Substantial updates of sec 5 Updated appendices 1-3 Added instrument metadata in appendix 4, renamed old appendices 4-6 to 5-7
4.1	2010-08-31	Updated L2_P calculation algorithm Removed Appendices 5 and 7, as all the relevant information is present in the EFW calibration report Appendix 6 renamed to Appendix 5
4.2	2010-10-27	New product: L3_HK Update bit 15 in the E quality bitmask
4.3	2011-01-28	New product: L3_SFIT Updated description of L2/3_P to include quality/bitmask
4.4	2011-04-28	Removed C. P. Escoubet from the contact list Updated figures 3 and 4 Added a separate References section Changed “Probe saturation” to “Probe latchup”
4.5	2012-02-20	New products: L1_IB, L2_P, L2_E, L2_B
4.6	2012-05-09	Move Appendix 5 to the User Guide
4.7	2013-05-10	Remove C. Cully from contacts
4.8	2014-05-19	Re-added P. Escoubet
4.9	2015-11-01	Add bit 16 to the bitmask; correct values of DELTA_PLUS/DELTA_MINUS
4.10	2017-05-18	Added information on new L1 products: L1_P and L1_E Removed C. Cully Noted that L3 data can be produced from LX $5s^{-1}$ data
4.11	2021-05-21	Corrected copy/paste errors for L1_P and L1_E. Removed H. Laakso.

DOCUMENT CHANGE RECORD

Issue	RID/Ref	Details

TABLE OF CONTENTS

1. PURPOSE

The purpose of this document is to provide a broad outline of the archiving of the data from the EFW instrument on Cluster in the ESA Cluster Active Archive (CAA) and to define the agreement of the CAA and PI of EFW on this broad outline.

The scientific rationale underpinning the CAA activities is as follows:

- Maximise the scientific return from the mission by making all Cluster data available to the worldwide scientific community.
- Ensure that the unique data set returned by the Cluster mission is preserved in a stable, long-term archive for scientific analysis beyond the end of the mission.
- Provide this archive as a major contribution by ESA and the Cluster science community to the International Living With a Star programme.

Data archiving activities within the CAA will be based on:

- The archiving in the CAA of the high-resolution data of all the experiments on the Cluster mission,
- The archiving of the CSDS and other browse products such as those generated by CSDSweb,
- The archiving of the essential auxiliary data (orbit, attitude, etc.),

In the case of EFW the main responsibilities will be:

- Provision of unpacked raw data with full time resolution in a readable format, suitable for detailed analysis by persons with intimate knowledge of the measurement principle of double probe electric field instruments
- Provision of scientifically meaningful, calibrated data in physical units at different time resolutions suitable for scientific studies involving the electric field
- Provision of calibration tables, log files, quality information, etc. to supplement the above data sets

2. POINTS OF CONTACT

For the operation of archiving the high-resolution data from EFW the following contacts have been agreed:

- as scientific correspondents, P. Escoubet for the CAA and P.-A. Lindqvist for

EFW,

- as technical correspondents, C. Perry for the CAA and Y. Khotyaintsev for EFW.

- as managerial correspondents, P. Escoubet for the CAA and M. André for EFW.

E-mail and telephone numbers to these individuals are:

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3. INSTRUMENT DESCRIPTION

3.1. Science Objectives

The electric field and wave experiment (EFW) on Cluster is part of the Wave Experiment Consortium (WEC). The scientific objectives of WEC are

- Characterisation of non-linear electrostatic structures. This is achieved by high resolution time domain studies.
- Unambiguous determination of the parameters which characterise plasma turbulence (distribution in the k vectors) and small-scale field-aligned current structures (geometry, current density, etc.) from inter spacecraft correlations of field fluctuations.
- Evaluation of magnetic vorticity, charge separation voltages, etc.
- Assessment of the role played by electric and magnetic fluctuations in the "anomalous" behaviour of critical layers.
- Wave-particle interactions, via correlations performed onboard between wave and particle measurements.
- Determination of source locations from the wave vector measured at various spacecraft positions.
- Role of high frequency waves. Study of their fine structure and its bearings on non-linear wave particle interactions, from wide band data.
- Measurement of the quasi-static E field in the spin plane and of density fluctuations.
- Measurement of plasma density and assessment of its spatial variations.
- Evaluation of spacecraft potential.

The EFW instrument designed to measure the electric field and density fluctuations with sampling rates, on some occasions, up to 36000 samples/s in two channels. Langmuir sweeps can also be made to determine the electron density and temperature. Among the more interesting objectives of the experiment is to study non-linear processes that result in acceleration of plasma. Large scale phenomena where all four spacecraft are needed will also be studied.

To meet the scientific objectives the electric field instrument is capable of measuring, in various modes:

- Instantaneous spin plane components of the electric field vector, over a dynamic range of 0.1 to 700 mV/m, and with variable time resolution down to 0.1 ms.
- The low energy plasma density, over a dynamic range at least 1 to 100 cm^{-3};
- Electric fields and density fluctuations over dynamic ranges of 0.1 to 700 mV/m for the fields and 1 to 50 % for the relative density fluctuations, and with a time resolution of 0.1 ms on some occasions;
- Waves, ranging from electrostatic ion cyclotron emissions having amplitudes as large as 60 mV/m at frequencies as low as 50 mHz, to lower hybrid emissions at several hundred Hz and with amplitudes

as small as a few μV/m;
- Time delays between signals from up to four different antenna elements on the same spacecraft, with a time resolution of 30 μs on some occasions (e.g. during triggered internal burst intervals).
- The spacecraft potential between 1 – 68 Volts.

3.2. Hardware Overview

The detector of the instrument consists of four orthogonal spherical sensors deployed from 50 meter cables in the spin plane of the spacecraft, four deployment units, and a separate main electronics unit as shown in the block diagram in Figure 4 of *Gustafsson et al.* [1997]. The instrument has several important features. The potential drop between two opposing spherical sensors is measured to provide an electric field measurement. The instrument can also be operated as a Langmuir Probe and biased to provide the Langmuir current-voltage curve and, thus, the electron temperature and density. The potentials of the spherical sensor and nearby conductors are controlled by the microprocessor in order to minimise errors associated with photoelectron fluxes to and from the spheres. The output signals from the spherical sensor preamplifiers are provided to the wave instruments (STAFF, WHISPER and WBD) for analysis of high frequency wave phenomena. The instrument has a 1-Mbyte burst memory and two fast A/D conversion circuits for recording electric field wave forms for time resolutions up to 10 kHz. Data gathered in the burst memory is played back through the telemetry stream allocated to the electric field experiment by pre-empting a portion of the real time data gathered by the instrument. On board calculations of least square fits to the electric field data over one spacecraft spin period (4 seconds) provides a baseline of high quality two dimensional electric field components that are always present in the telemetry stream. Incoming data is continuously monitored using algorithms in software to determine if conditions are appropriate for triggering a burst data collection.

Currently the only data provided to the CAA from the EFW instrument are electric field data and probe potential data as obtained regularly through the normal telemetry, as well as the data collected at high time resolution to the internal EFW burst memory (the EFW internal burst data). Instead the data from the Langmuir current-voltage sweeps described above are not foreseen to be archived. The reason for not delivering Langmuir sweep data is mainly driven by lack of resources – it is extremely time-consuming to calibrate the timing of the current and voltage of the sweep data. The spin-averaged data provided to the CAA are based on least-squares fits done on the ground on the full resolution data; the results from the on-board least-squares fits are not included, since they are of inferior quality.

3.3. Probes and Filters

The EFW instrument has four probes configured in two orthogonal probe pairs in the spin plane on each spacecraft, as shown in Figure 1. In the nominal operation modes (NM and BM1) EFW measures individual probe potentials with a sampling frequency of 5 s^{-1}, as well as the potential difference between selected probe pairs with a sampling frequency of 25 s^{-1} or 450 s^{-1} depending on the telemetry mode. A schematic overview of the relevant signal paths is given in Figure 2. The individual probe signals, p1 to p4, are always routed through 7-pole low-pass filters with a cut-off frequency of 10 Hz before sampling. The probe difference signals, p12, p34 and p32 are normally routed through 10 Hz low-pass filters if sampled at 25 s^{-1}, and through 180 Hz low-pass filters when sampled at 450 s^{-1}.

More information on the instrument can be found in *Gustafsson et al.,* [1997, 2001].

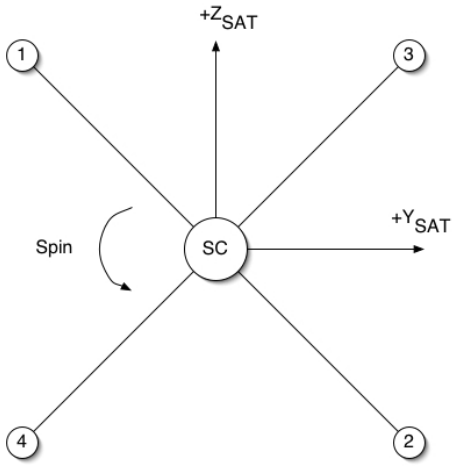

Figure 1. EFW probe configuration

Normally, the full spin plane electric field is computed using the orthogonal signals P12 and P34. However, after some tome a failure occurred on probe 1 on spacecraft 1, 2 and 3 after which it is not possible to use P12, but a workaround was implemented in the flight software to use P32 instead. See the EFW User Guide for more details and finding the exact time intervals of reduced measurements. In the intermediate period (between the probe failures and implementation of P32 in the flight software), full resolution data will not generally be available. The 4 second resolution electric field data is not affected, since it uses data from only one probe pair as input.

The filters are normally connected to the sampled quantities as indicated in Figure 2. However, the 10 Hz filter on probe 3 on spacecraft 2 failed on 25 July 2001. As a workaround for this, we have instead used the 180 Hz filter for the difference signals sampled at 25 s^{-1}, which has no effect on the 4 second resolution data, and only a marginal effect on the full resolution data in those space environments where increased electric field noise is present between 10 and 180 Hz.

In addition to the nominal science data, EFW also collects high-resolution *internal burst* data into the internal 1Mb memory. Collection of the internal burst data is enabled during several hours each orbit, and typically there are two burst intervals decided by a specific burst trigger transmitted to ground. The bursts may contain up to 8 different signals: single and differential probe electrical signals, magnetic signals provided by STAFF-SC sensors. The signals can be sampled using one of the following filters: 10 Hz, 180 Hz, 4kHz and 32 kHz low-pass filters as well as 8kHz band pass filter.

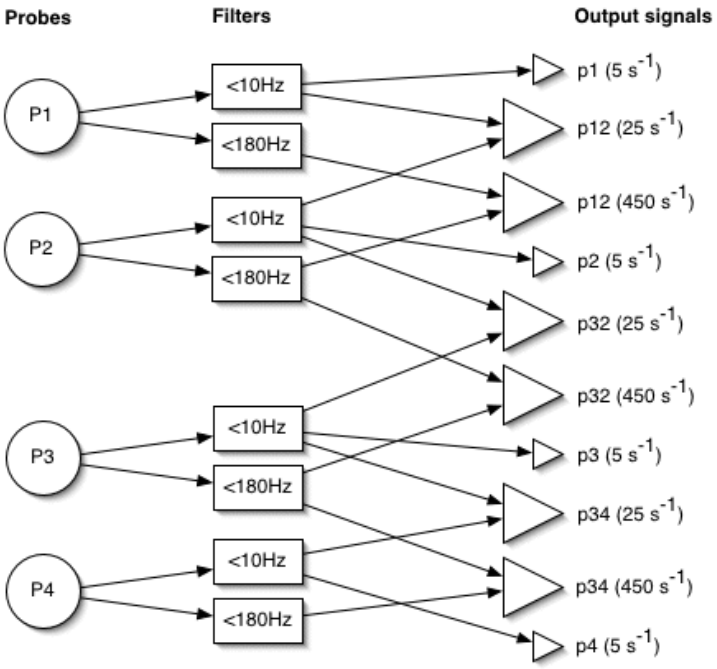

Figure 2. Probes, filters and sampled quantities

3.4. Data Processing Chain

There is no onboard processing performed on EFW data which will be included in the CAA. Ground processing includes decommutation and calibration into physical units of raw data (stored as DDS/RDM files) and is performed by the software package ISDAT (http://www.space.irfu.se/isdat). Further scientific processing includes spin fitting of probe-probe difference signals, determination of ADC offsets (in the raw data), determination of DC offsets in the despun data (sunward and duskward offsets), amplitude correction, and despinning the full resolution data.

3.5. Instrument Data Products Delivered to the CAA

Normally the potential differences are between opposite probes, P12 and P34, except on spacecraft 1, 2 and 3 after the failure of probe 1, where P12 is replaced by P32. Before sampling, the signals are low-pass filtered to avoid aliasing, with a filter frequency of 10 Hz for the signals sampled at 5 or 25 s^{-1} and 180 Hz for 450 s^{-1}. (An exception is on SC2 where the 10 Hz filter is non-operational since August 2001 and the 180 Hz filter has been used instead.)

The electric field is calculated in the spin plane using P12 and P34 (or P32 and P34) and given in the spin-plane oriented coordinate system ISR2, which differs from GSE only due to the few degree tilt of the spacecraft (to avoid shadowing of the probes). The data are given in a reference frame moving with the spacecraft, i.e., the spacecraft-motion-induced electric field $\mathbf{v}_{sc}$ x **B** is not been subtracted before delivery to the CAA.

The internal burst data products are produced in the similar way as the nominal products. One additional step which is performed for the internal burst data is inversion of the analogue filter response, see The Cluster EFW Filter Calibration Report for more details.

Table 1 lists the quantities delivered to the CAA from EFW.

Level	Quantity	Sampling rate	Data format		Description
Raw datasets					
L1	P1*	5 s^{-1}	time_tags	P1 (scalar)	Potential probe 1
L1	P2*	5 s^{-1}	time_tags	P2 (scalar)	Potential probe 2
L1	P3*	5 s^{-1}	time_tags	P3 (scalar)	Potential probe 3
L1	P4*	5 s^{-1}	time_tags	P4 (scalar)	Potential probe 4
L1	P12**	25 s^{-1} or 450 s^{-1}	time_tags	P12 (scalar)	Pot diff probes 12
L1	P34**	25 s^{-1} or 450 s^{-1}	time_tags	P34 (scalar)	Pot diff probes 34
L1	P32**	25 s^{-1} or 450 s^{-1}	time_tags	P32 (scalar)	Pot diff probes 32
L1	P	5 s^{-1}	time_tags	P1..4 (scalar)	Probe potentials
L1	E	25 s^{-1} or 450 s^{-1}	time_tags	E_Vec_xy_INST (vector) Flag_p32 (scalar)	Electric field, flag indicating probes 32 or 12
L1	IB	450, 2250, 4500, 9000 or 18000 s^{-1}	time_tags	Data	Internal burst data
Full-resolution datasets					
L2	P	5 s^{-1}	time_tags	Spacecraft_potential (scalar) P_probes (scalar) ASPOC_status (scalar) P_bitmask (scalar) P_quality (scalar)	Average potential selected probes, full resolution
L2	E	25 s^{-1} or 450 s^{-1}	time_tags	E_Vec_xy_ISR2 (vector) E_bitmask (scalar) E_quality (scalar)	Electric field, full resolution
L2	HK	0.03125 s^{-1}	time_tags	BIAS_P1..4 (4 scalars) PUCK_P1..4 (4 scalars) GUARD_P1..4 (4 scalars)	Instrument bias, puck and guard settings, 32 sec resolution
L2	PB	450, 2250, 4500, 9000 or 18000 s^{-1}	time_tags	Spacecraft_potential (scalar) P_probes (scalar) ASPOC_status (scalar) P_bitmask (scalar) P_quality (scalar)	Average potential selected probes, internal burst
L2	EB	450, 2250, 4500, 9000 or 18000 s^{-1}	time_tags	E_Vec_xy_ISR2 (vector) E_bitmask (scalar) E_quality (scalar)	Electric field, internal burst
L2	BB	450, 2250, 4500, 9000 or 18000 s^{-1}	time_tags	B_Vec_xyz_ISR2 (vector) B_bitmask (scalar) B_quality (scalar)	Magnetic field, internal burst
4-second-resolution datasets					
L3	P	0.25 s^{-1}	time_tags	Spacecraft_potential (scalar) P_probes (scalar) ASPOC_status (scalar) P_bitmask (scalar) P_quality (scalar)	Average potential selected probes, 4 sec resolution
L3	E	0.25 s^{-1}	time_tags	E_Vec_xy_ISR2 (vector) E_sigma (scalar) E_bitmask (scalar) E_quality (scalar)	Electric field and Standard deviation, 4 sec resolution
L3	DER	0.25 s^{-1}	time_tags	dER (vector)	Raw data DC offset, 4 sec resolution
L3	SFIT	0.25 s^{-1}	time_tags	EP12_Vec_xy_ISR2 (vector) EP12_sigma (scalar) EP34_Vec_xy_ISR2 (vector) EP34_sigma (scalar)	Spinfits from the individual probe pairs, 4 sec resolution

Table 1. Quantities delivered from EFW to CAA

* Obsolete, superseded by L1_P.
** Obsolete, superseded by L1_E.

Notes:

1) Time_tag is given as ISO time
2) Electric field vectors L2 E and L3 E are incomplete (the third (spin-axis) component is not available)
3) Electric field vectors are given in the spacecraft frame (before subtracting $\mathbf{v}_{sc}$ x **B**)
4) Raw sampling rates are 5 s^{-1} (independent of bitrate), 25 s^{-1} (in NM), and 450 s^{-1} (in BM)
5) Sampling rate of 0.25 s^{-1} (4 sec resolution) is a result of spin fits
6) Potentials are in V, Electric fields and Standard deviation are in mV/m
7) The 2 components of dER give the raw data dc offset in p12/p32 (1st component) and p34 (2nd component), see also appendix 7

The data quality information E(P)_bitmask and E(P)_quality are to be interpreted as follows. E(P)_quality is a decimal integer value indicating data quality. E(P)_bitmask is a 16-bit bitmask indicating the reason for possibly reduced data quality.

E(P)_quality	Meaning
4	Excellent data which have received special treatment
3	Good for publication, subject to PI approval
2	Survey data, not for publication
1	Known problems, use at your own risk
0	Bad data

E(P)_bit-mask Bit number	Decimal value	Meaning if set	Comment
0	1	Reset	
1	2	Bad bias	
2	4	Probe latchup	
3	8	Low density saturation (-68V)	
4	16	Sweep (collection and dump)	not used for L2/3_P
5	32	Burst dump	not used for L2/3_P
6	64	Non-standard operations (NS_OPS)	not used for L2/3_P
7	128	Manual flag	not used for L2/3_P
8	256	Single probe pair	not used for L3_E, L2/3_P
9	512	Asymmetric mode	not used for L3_E, L2/3_P
10	1024	Solar wind wake correction applied	not used for L2/3_P
11	2048	Lobe wake	not used for L2/3_P
12	4096	Plasmaspheric wake	not used for L2/3_P
13	8192	Whisper operating	
14	16384	Saturation due to high bias current	
15	32768	Bias current DAC not responding correctly	not used for L2/3_P
16	65536	Saturation due to probe shadow	not used for L3_E, L3_P

More information on data quality may be found in the EFW CAA Users Guide.

Note also that Table 2 in section 4.3.3 lists a number of additional quantities, which are produced at the CAA.

4. Data Provision – General Conventions

4.1. Formats

Matlab's internal format is used for local storage of the data. Data products delivered to the CAA are exported into CEF 2 (Cluster Exchange Format version 2.0).

The file names are of the form

C<n>-CP_EFW_<Level>_<Quantity>__yyyymmdd_hhmmss_hhmmss_<version>.cef

where
<n> is the spacecraft number (1, 2, 3 or 4)
<Level> is the data level (L1, L2 or L3, see Table 1 in Sec. 3.5 and Table 2 in Sec. 4.3.3)
<Quantity> is the quantity name (See Table 1 in Sec. 3.5 and Table 2 in Sec. 4.3.3)
yyyymmdd is the date of the data
hhmmss_hhmmss are the start and stop times of the data
<version> is the version number of the file (v01, v02, etc)

4.2. Standards

Time:
Time in the CEF files is formatted according to the requirements of CEF specification v2.0.

Coordinate system:
2-D vector data are provided in the x-y plane of the coordinate system ISR2 (Inverted Spacecraft Reference, which normally differs from GSE only by few degrees) as this is the coordinate system in which EFW measurements are performed. The frame of reference is the frame moving with the spacecraft. Further transformations into an inertial system (i.e., subtraction of the spacecraft motion induced electric field $\mathbf{v}_{sc}$ **x B**) and into GSE will be performed by the CAA.

Units:
All data are provided in V (in case of potentials), mV/m (in case of electric fields), km/s (in case of velocity), nA (in case of currents), or nT (in case of magnetic fields).

4.3. Production Procedures

Generally, the EFW products can be divided into three groups:
- raw data (L1) in physical units, except for the internal burst data,
- products which involve the probe-to-spacecraft potentials, and
- products which involve the electric field.

4.3.1 Raw data

For L1 data (full resolution raw data) the production procedures involves only decommutation and calibration into physical units. The sun reference pulse data necessary to fully interpret these data are available in the Spin Timing dataset (a CAA auxiliary dataset). The sun sensor is located between p2 and p3, 63.8 degrees from the $+Z_{SAT}$ axis (see Figure 1).

The complete housekeeping data from EFW is not archived. Selected housekeeping data (bias, puck and guard settings) are available as L2_HK product at 32 sec resolution.

4.3.2 Spacecraft potential products

The processing of the spacecraft potential from the raw data is quite straightforward. For the full resolution quantity L2_P an average of selected probes is computed. The average is generally taken over all probes which are in the electric field mode of the instrument (as opposed to density mode). In case probe saturation due to high bias current is detected on some of the probes, we switch from the averaging to using maximum of all available probes, which gives the best estimate of the spacecraft potential in this case. The 4 sec resolution quantity L3_P involves time averaging of L2_P over 4 seconds. All these computations are done locally before delivery to the CAA.

4.3.3 Electric field products

The production procedures for electric field products can be split in two parts: local production of products which originate only from EFW data and production of compound products (originating from more than one experiment) at the CAA.

Local production at IRF

The production procedures (local production) for electric field products are presented in Figure 3. First, we do the following to compute the 4 sec resolution (L3) data:

L3.1) spin fitting to raw P12, P34 and/or P32 data (nominally HX - 25/450 samples/sec data, otherwise LX - 5 samples/sec data) available as L3_SFIT, to obtain 4 sec resolution E and ADC offsets. Periods with active whisper sounding are removed from the data sampled with the 180 Hz filter.
L3.2) determine ISR2 offsets (sunward and duskward offsets) and correct for them.

As a result we have 4 sec resolution electric field in the spacecraft spin plane ($\mathbf{Es_x}$, $\mathbf{Es_y}$). Then we compute the full resolution (L2) data:

L2.1) despin using corrections (given in DER dataset) obtained in L3.1 (obtain full resolution E)
L2.2) correct for ISR2 offsets obtained in L3.2 (obtain full resolution corrected E).
[Step L2.3 is no longer used]

As a result we have full resolution electric field in the spacecraft spin plane ($\mathbf{E_x}$, $\mathbf{E_y}$). These data are final products which are made available to the CAA.

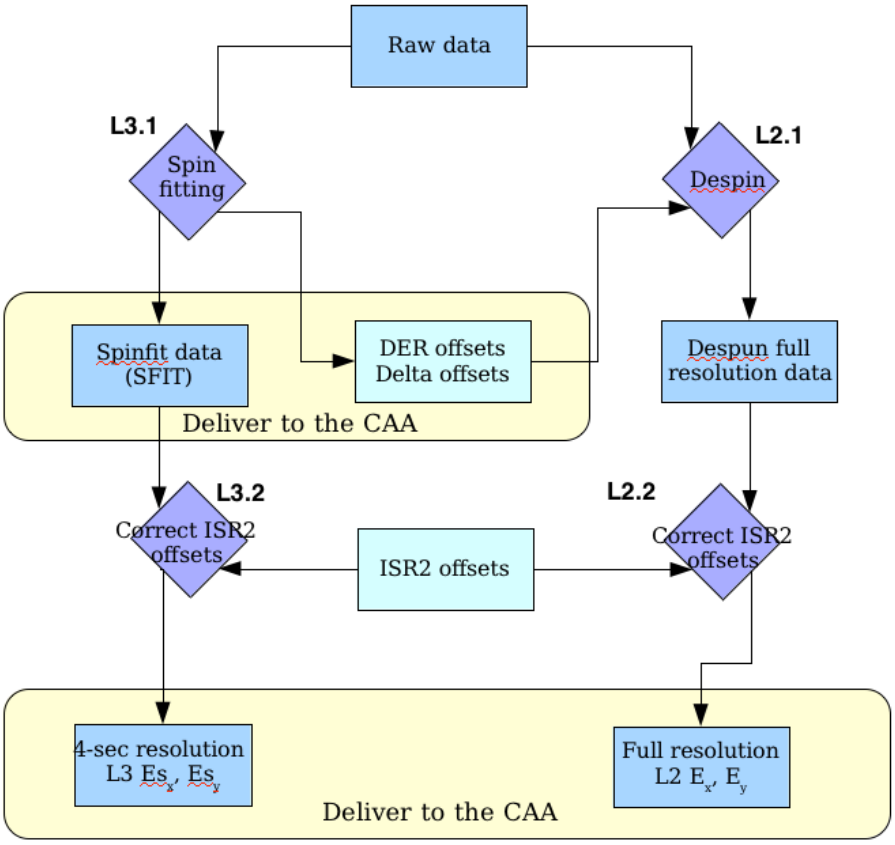

Figure 3. Local data production at IRF: Quantities Es_x, Es_y and E_x, E_y are delivered to the CAA.

Production at the CAA

Production of final electric field products require additional data available at the CAA and therefore will be computed at the CAA. Pipeline for production of the EFW products at the CAA is presented in Figure 4.

L2.4, L3.3) Subtract the electric field induced by the spacecraft motion $\mathbf{v}_{sc} \times \mathbf{B}$ (obtain **E** in the

inertial system). This operation requires the magnetic field **B** and the spacecraft velocity $\mathbf{v}_{sc}$;

L3.4) Compute E_z from the condition **E*****B** = 0 (obtain full vector of **E** in ISR2). This operation requires the magnetic field **B** and a condition telling in which situation such an operation is permitted (a condition on angle between **B** and the spacecraft spin plane);

L3.5) Compute **v** = (**E** x **B**) / $\mathbf{B}^2$ (obtain the full vector of **v** in ISR2). This operation requires the magnetic field B.

L3.6, L3.7) Transform **E** and **v** into GSE (obtain full vectors of **E** and **v** in GSE). This operation requires the spacecraft spin axis orientation in GSE.

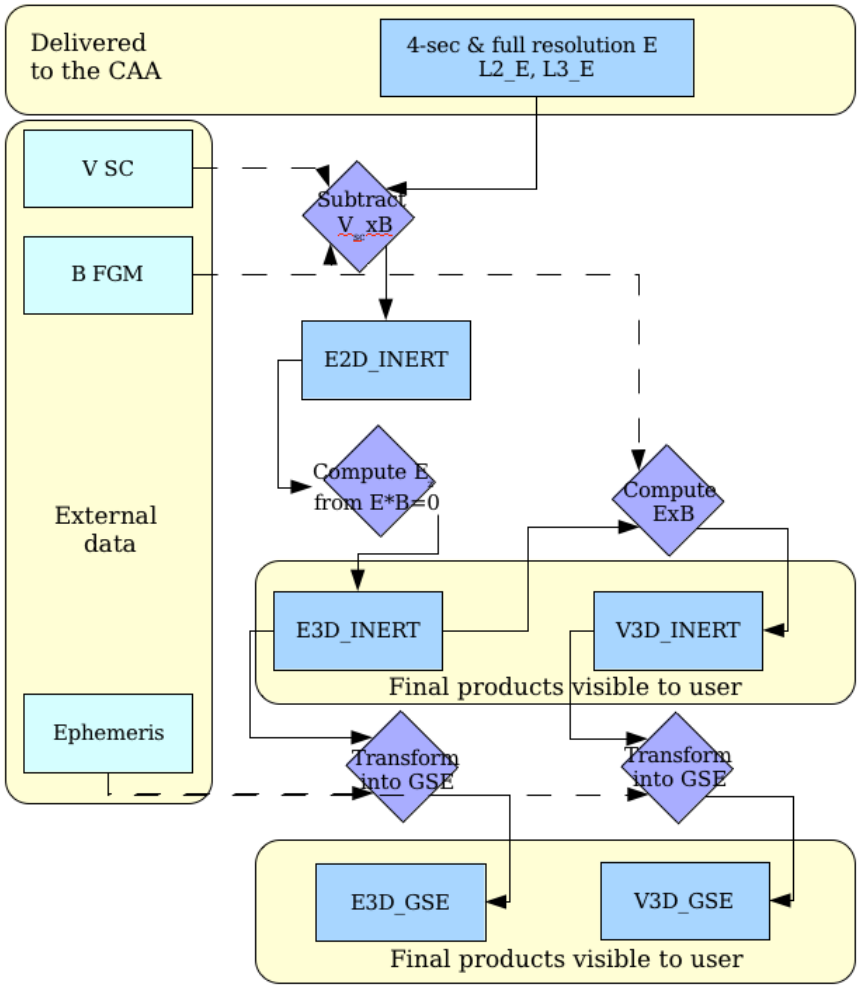

Figure 4. Production at the CAA

As a result we have all products ready for the user.

The dataset production at the CAA requires the end products shown in Figure 3, and the spacecraft velocity $\mathbf{v}_{sc}$, attitude, and the magnetic field **B** which are available within the CAA. In the 4-sec datasets, the CAA FGM 5VPS dataset is used to calculate the average magnetic field for the interval of electric field measurements. For the full-resolution electric field datasets, the full-resolution (22 Hz) CAA FGM dataset is used and a linear interpolation is applied to estimate the magnetic field at the time of electric field measurement. The interpolation is done only when the step between two magnetic field values is less than 0.5 second, otherwise a fill value is used.

The actual operations to be performed are as follows:

1. Subtraction of spacecraft-motion induced electric field

$\mathbf{E}_i$ (in inertial frame) = $\mathbf{E}_{sc}$ (in spacecraft frame) – $\mathbf{v}_{sc}$ (spacecraft velocity) x **B** (magnetic field)

where **E**, $\mathbf{v}_{sc}$, and **B** are vectors. In component form this becomes

$$E_{x,i} = E_{x,sc} - (v_{y,sc} B_z - v_{z,sc} B_y)$$
$$E_{y,i} = E_{y,sc} - (v_{z,sc} B_x - v_{x,sc} B_z)$$
$$E_{z,i} = E_{z,sc} - (v_{x,sc} B_y - v_{y,sc} B_x) \quad \text{(not used)}$$

However, as $E_{z,sc}$ is not measured, the third component of **E**, E_z, is not available, so the third component equation above is not actually used.

2. Computation of E_z from $\mathbf{E} \cdot \mathbf{B} = 0$

$$E_z = -(E_x B_x + E_y B_y) / B_z$$

As seen in Figure 4, this computation is done on the electric field in the intertial frame, after subtraction of **v** x **B**.

3. Computation of convection velocity **E** x **B**

$$\mathbf{v} = (\mathbf{E} \times \mathbf{B}) / |\mathbf{B}|^2$$

or, in component form:

$$v_x = (E_y B_z - E_z B_y) / (B_x^2 + B_y^2 + B_z^2)$$
$$v_y = (E_z B_x - E_x B_z) / (B_x^2 + B_y^2 + B_z^2)$$
$$v_z = (E_x B_y - E_y B_x) / (B_x^2 + B_y^2 + B_z^2)$$

4. Transformations between ISR2 and GSE

This is needed not only for the final dataset production for vectors in GSE but also transforming the spacecraft velocity vectors and magnetic field vectors from GSE to ISR2.

EFW will be actively involved in testing the software and comparing to results obtained by other means outside the CAA.

As a result of the processing within CAA, the additional quantities listed in Table 2 are available to the user as EFW quantities, even though they are actually derived quantities using data from more than one instrument.

Level	Quantity	Sampling rate	Data format	variables	Description	Coordinate system
Full-resolution datasets						
L2	E3D_INERT	25 s^{-1} or 450 s^{-1}	Time_tag	E_Vec_xyz_INERT (vector) delta_Ez_ISR2 (scalar) E_bitmask (scalar) E_quality (scalar)	3D electric field, full resolution	ISR2
L2	V3D_INERT	25 s^{-1} or 450 s^{-1}	Time_tag	V_Vec_xyz_INERT (vector) delta_Ez_ISR2 (scalar) E_bitmask (scalar) E_quality (scalar)	3D convection velocity, full resolution	ISR2
L2	E3D_GSE	25 s^{-1} or 450 s^{-1}	Time_tag	E_Vec_xyz_GSE (vector) delta_Ez_ISR2 (scalar) E_bitmask (scalar) E_quality (scalar)	3D electric field, full resolution	GSE
L2	V3D_GSE	25 s^{-1} or 450 s^{-1}	Time_tag	V_Vec_xyz_GSE (vector) delta_Ez_ISR2 (scalar) E_bitmask (scalar) E_quality (scalar)	3D convection velocity, full resolution	GSE
4-sec-resolution datasets						
L3	E3D_GSE	0.25 s^{-1}	Time_Tag	E_Vec_xyz_GSE (vector) delta_Ez_ISR2 (scalar) E_bitmask (scalar) E_quality (scalar) E_sigma (scalar)	3D electric field, 4 sec resolution	ISR2
L3	E3D_INERT	0.25 s^{-1}	Time_Tag	E_Vec_xyz_ISR2 (vector) delta_Ez_ISR2 (scalar) E_bitmask (scalar) E_quality (scalar) E_sigma (scalar)	3D electric field, 4 sec resolution	ISR2
L3	V3D_GSE	0.25 s^{-1}	Time_Tag	v_drift_GSE (vector) delta_v_ISR2 (vector) E_bitmask (scalar) E_quality (scalar)	3D convection velocity, 4 sec resolution	GSE
L3	V3D_INERT	0.25 s^{-1}	Time_Tag	v_drift_ISR2 (vector) delta_v_ISR2 (vector) E_bitmask (scalar) E_quality (scalar)	3D convection velocity, 4 sec resolution	ISR2

Table 2. Quantities computed in CAA from EFW and other data

Notes:

1. Time_tag is given as ISO time
2. All electric field vectors are given in the inertial frame (after subtracting $\mathbf{v}_{sc}$ x **B**)
3. Raw sampling rates are 25 s^{-1} (in NM), and 450 s^{-1} (in BM)
4. Sampling rate of 0.25 s^{-1} is a result of spin fits
5. Electric fields are in mV/m, Velocity is in km/s
6. For a description of E_bitmask and E_quality, see information following Table 1 in section 3.5

Note that these are additional quantities where EFW data have been combined with other data. Table 1

in section 3.5 lists the main EFW quantities delivered to the CAA.

4.4. Quality Control Procedures

Quality control for EFW products can be divided into two levels:
1) control of raw data quality
2) comparison of final products with data from other instruments measuring the same quantities, such as EDI and CIS.

4.5. Delivery Procedures

EFW products were initially to be delivered on the basis of magnetospheric region. This has subsequently been changed, and the delivery is now in two steps. The first step comprises delivery of all data, regardless of region, in basically chronological order. The second step comprises re-delivery of improved quality data, based on magnetospheric region.

Each file delivered contains one data product, and contains data from one calendar day. Files and compressed using GZIP, and the compressed files are delivered to the CAA using secure FTP.

5. DATA PROVISION – SPECIFIC DESCRIPTIONS

Note that this chapter only contains descriptions of those data which are actually provided by the EFW team to the CAA, i.e., those quantities listed in Table 1.

5.1. Level 1 Data – P

The metadata description in this section applies to the following datasets:
- Cluster 1: C1_CP_EFW_L1_P
- Cluster 2: C2_CP_EFW_L1_P
- Cluster 3: C3_CP_EFW_L1_P
- Cluster 4: C4_CP_EFW_L1_P

5.1.1. Format

See section 4.1.

5.1.2. Standard

See section 4.2.

5.1.3. Production Procedure

See section 4.3.

5.1.4. Quality Control Procedure

See section 4.4.

5.1.5. Delivery Procedure

See section 4.5.

5.1.6. Product Specification

Potential of probes 1..4 relative to spacecraft (V). Full time resolution (5 s-1).

5.1.7. Metadata Specification

5.1.7.1. File information

FILE_NAME = "C1_CP_EFW_L1_P__20010518_044500_095960_V01.cef"

(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.1.7.2. Global Mission Metadata

See Appendix 1.

5.1.7.3. Global Observatory Metadata

See Appendix 2.

5.1.7.4. Experiment Metadata

See Appendix 3.

5.1.7.5. Dataset Metadata

FILE_TYPE = "cef"
START_META = DATA_TYPE
ENTRY = "CP"
END_META = DATA_TYPE
START_META = DATASET_ID
ENTRY = "C1_CP_EFW_L1_P"
(C1, C2, C3 or C4 as appropriate)
END_META = DATASET_ID
START_META = DATASET_TITLE
ENTRY = "Probe 1..4 to spacecraft potential"
END_META = DATASET_TITLE
START_META = DATASET_DESCRIPTION
ENTRY = "This dataset contains measurements of the"
ENTRY = "probes 1..4 to spacecraft potential"
ENTRY = "from the EFW experiment on the Cluster C1 spacecraft"
(C1, C2, C3 or C4 as appropriate)
END_META = DATASET_DESCRIPTION
START_META = TIME_RESOLUTION
ENTRY = 0.2
END_META = TIME_RESOLUTION
START_META = MIN_TIME_RESOLUTION
ENTRY = 0.2
END_META = MIN_TIME_RESOLUTION
START_META = MAX_TIME_RESOLUTION
ENTRY = 0.2
END_META = MAX_TIME_RESOLUTION
START_META = PROCESSING_LEVEL
ENTRY = "Calibrated"
END_META = PROCESSING_LEVEL
DATASET_CAVEATS = "*C1_CQ_EFW_P1"
(C1, C2, C3 or C4 as appropriate)
LOGICAL_FILE_ID = "C1_CP_EFW_L1_P1__20010518_044500_095960_V01"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
VERSION_NUMBER = "01"
(To be updated as appropriate)
FILE_TIME_SPAN = "2001-05-18T04:45:00.192689Z/2001-05-18T09:59:59.947010Z"
VALUE_TYPE = ISO_TIME_RANGE
(To be updated as appropriate)

GENERATION_DATE "2005-04-11T16:13:55.937645Z"
VALUE_TYPE = ISO_TIME
(To be updated as appropriate)

5.1.7.6. Variables

START_VARIABLE = time_tags__C1_CP_EFW_L1_P
(C1, C2, C3 or C4 as appropriate)
VALUE_TYPE = ISO_TIME
DELTA_PLUS = 0
DELTA_MINUS = 0.1
FILLVAL = "9999-12-31T23:59:59Z"
LABLAXIS = "UT"
FIELDNAM = "Universal Time"
END_VARIABLE = time_tags__C1_CP_EFW_L1_P
(C1, C2, C3 or C4 as appropriate)
!
START_VARIABLE = P1__CXXX_CP_EFW_L1_P
(C1, C2, C3 or C4 as appropriate)
PARAMETER_TYPE = "Data"
SIZES = 1
VALUE_TYPE = FLOAT
ENTITY = "Instrument"
PROPERTY = "Probe_Potential"
FLUCTUATIONS = "Waveform"
CATDESC = "Probe 1 to spacecraft potential"
FIELDNAM = "Probe 1 to spacecraft potential"
SI_CONVERSION = "1>V"
UNITS = "V"
FILLVAL = -1000000000.000
QUALITY = 3
SIGNIFICANT_DIGITS= 6
PARAMETER_CAVEATS = ""
LABLAXIS = "P1"
DEPEND_0 = time_tags__C1_CP_EFW_L1_P
(C1, C2, C3 or C4 as appropriate)
END_VARIABLE = P1__C1_CP_EFW_L1_P
! *(C1, C2, C3 or C4 as appropriate)*
!
START_VARIABLE = P2__CXXX_CP_EFW_L1_P
(C1, C2, C3 or C4 as appropriate)
PARAMETER_TYPE = "Data"
SIZES = 1
VALUE_TYPE = FLOAT
ENTITY = "Instrument"
PROPERTY = "Probe_Potential"
FLUCTUATIONS = "Waveform"
CATDESC = "Probe 2 to spacecraft potential"
FIELDNAM = "Probe 2 to spacecraft potential"
SI_CONVERSION = "1>V"
UNITS = "V"
FILLVAL = -1000000000.000
QUALITY = 3
SIGNIFICANT_DIGITS= 6
PARAMETER_CAVEATS = ""
LABLAXIS = "P2"
DEPEND_0 = time_tags__C1_CP_EFW_L1_P
(C1, C2, C3 or C4 as appropriate)
END_VARIABLE = P2__C1_CP_EFW_L1_P

```
!          (C1, C2, C3 or C4 as appropriate)
!
START_VARIABLE      = P3__CXXX_CP_EFW_L1_P
          (C1, C2, C3 or C4 as appropriate)
  PARAMETER_TYPE    = "Data"
  SIZES             = 1
  VALUE_TYPE        = FLOAT
  ENTITY            = "Instrument"
  PROPERTY          = "Probe_Potential"
  FLUCTUATIONS      = "Waveform"
  CATDESC           = "Probe 3 to spacecraft potential"
  FIELDNAM          = "Probe 3 to spacecraft potential"
  SI_CONVERSION     = "1>V"
  UNITS             = "V"
  FILLVAL           = -1000000000.000
  QUALITY           = 3
  SIGNIFICANT_DIGITS= 6
  PARAMETER_CAVEATS = ""
  LABLAXIS          = "P3"
  DEPEND_0          = time_tags__C1_CP_EFW_L1_P
          (C1, C2, C3 or C4 as appropriate)
END_VARIABLE        = P3__C1_CP_EFW_L1_P
!          (C1, C2, C3 or C4 as appropriate)
!
START_VARIABLE      = P4__CXXX_CP_EFW_L1_P
          (C1, C2, C3 or C4 as appropriate)
  PARAMETER_TYPE    = "Data"
  SIZES             = 1
  VALUE_TYPE        = FLOAT
  ENTITY            = "Instrument"
  PROPERTY          = "Probe_Potential"
  FLUCTUATIONS      = "Waveform"
  CATDESC           = "Probe 4 to spacecraft potential"
  FIELDNAM          = "Probe 4 to spacecraft potential"
  SI_CONVERSION     = "1>V"
  UNITS             = "V"
  FILLVAL           = -1000000000.000
  QUALITY           = 3
  SIGNIFICANT_DIGITS= 6
  PARAMETER_CAVEATS = ""
  LABLAXIS          = "P4"
  DEPEND_0          = time_tags__C1_CP_EFW_L1_P
          (C1, C2, C3 or C4 as appropriate)
END_VARIABLE        = P4__C1_CP_EFW_L1_P
!          (C1, C2, C3 or C4 as appropriate)
```

5.2. Level 1 Data – E

The metadata description in this section applies to the following datasets:

- Cluster 1: C1_CP_EFW_L1_E
- Cluster 2: C2_CP_EFW_L1_E
- Cluster 3: C3_CP_EFW_L1_E
- Cluster 4: C4_CP_EFW_L1_E

5.2.1. Format

See section 4.1.

5.2.2. Standard

See section 4.2.

5.2.3. Production Procedure

See section 4.3.

5.2.4. Quality Control Procedure

See section 4.4.

5.2.5. Delivery Procedure

See section 4.5.

5.2.6. Product Specification

Electric field measured by probes 12/32 and 34 (mV/m). Full time resolution (25 s-1 or 450 s-1, depending on telemetry mode).

5.2.7. Metadata Specification

5.2.7.1. File information

FILE_NAME = "C1_CP_EFW_L1_E__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.2.7.2. Global Mission Metadata

See Appendix 1.

5.2.7.3. Global Observatory Metadata

See Appendix 2.

5.2.7.4. Experiment Metadata

See Appendix 3.

5.2.7.5. Dataset Metadata

FILE_TYPE = "cef"
START_META = DATA_TYPE
ENTRY = "CP"
END_META = DATA_TYPE
START_META = DATASET_ID
ENTRY = "C1_CP_EFW_L1_E"
(C1, C2, C3 or C4 as appropriate)
END_META = DATASET_ID
START_META = DATASET_TITLE
ENTRY = "Electric field measured by probes 12/32 and 34"
END_META = DATASET_TITLE
START_META = DATASET_DESCRIPTION
ENTRY = "This dataset contains measurements of the"
ENTRY = "electric field measured by probes 12/32 and 34"
ENTRY = "from the EFW experiment on the Cluster C1 spacecraft."
(C1, C2, C3 or C4 as appropriate)
ENTRY = "Flag_p32 indicates whether P12 (Flag_p32=0) or P32 (Flag_p32=1)"

```
  ENTRY      =   "is used for E12/32."
END_META     =   DATASET_DESCRIPTION
START_META   =   TIME_RESOLUTION
  ENTRY      =   0.04
END_META     =   TIME_RESOLUTION
START_META   =   MIN_TIME_RESOLUTION
  ENTRY      =   0.04
END_META     =   MIN_TIME_RESOLUTION
START_META   =   MAX_TIME_RESOLUTION
  ENTRY      =   0.0022222
END_META     =   MAX_TIME_RESOLUTION
START_META   =   PROCESSING_LEVEL
  ENTRY      =   "Calibrated"
END_META     =   PROCESSING_LEVEL
DATASET_CAVEATS =   "*C1_CQ_EFW_P1"
        (C1, C2, C3 or C4 as appropriate)
LOGICAL_FILE_ID =   "C1_CP_EFW_L1_P1__20010518_044500_095960_V01"
        (C1, C2, C3 or C4 as appropriate)
        (Date, Start time and End time as appropriate)
        (Version to be updated as appropriate)
VERSION_NUMBER =   "01"
        (To be updated as appropriate)
FILE_TIME_SPAN =   "2001-05-18T04:45:00.192689Z/2001-05-18T09:59:59.947010Z"
   VALUE_TYPE =   ISO_TIME_RANGE
        (To be updated as appropriate)
GENERATION_DATE "2005-04-11T16:13:55.937645Z"
   VALUE_TYPE =   ISO_TIME
        (To be updated as appropriate)
```

5.2.7.6. Variables

```
START_VARIABLE = time_tags__C1_CP_EFW_L1_E
        (C1, C2, C3 or C4 as appropriate)
 VALUE_TYPE = ISO_TIME
 DELTA_PLUS = 0
 DELTA_MINUS = 0.1
 FILLVAL = "9999-12-31T23:59:59Z"
 LABLAXIS = "UT"
 FIELDNAM = "Universal Time"
END_VARIABLE = time_tags__C1_CP_EFW_L1_E
        (C1, C2, C3 or C4 as appropriate)
!
START_VARIABLE     = E_Vec_xy_INST__C1_CP_EFW_L1_E
 PARAMETER_TYPE    = "Data"
 SIZES             = 2
 VALUE_TYPE        = FLOAT
 ENTITY            = "Electric_Field"
 PROPERTY          = "Vector"
 FLUCTUATIONS      = "Waveform"
 CATDESC           = "Electric field"
 FIELDNAM          = "Electric field"
 SI_CONVERSION     = "1.0e-3>V m^-1"
 UNITS             = "mV/m"
 FILLVAL           = -1000000000.000
 QUALITY           = 3
 SIGNIFICANT_DIGITS= 6
 COORDINATE_SYSTEM = "Instrument"
 FRAME_VELOCITY    = "Observatory"
 TENSOR_ORDER      = 1
```

```
  REPRESENTATION_1  = "x", "y"
  LABEL_1           = "E12/32", "E34"
  LABLAXIS          = "E"
  DEPEND_0          = time_tags__C1_CP_EFW_L1_E
END_VARIABLE        = E_Vec_xy_INST__C1_CP_EFW_L1_E
!           (C1, C2, C3 or C4 as appropriate)
START_VARIABLE      = Flag_p32__C1_CP_EFW_L1_E
            (C1, C2, C3 or C4 as appropriate)
  PARAMETER_TYPE    = "Support_Data"
  SIZES             = 1
  VALUE_TYPE        = INT
  ENTITY            = "Electric_Field"
  PROPERTY          = "Status"
  CATDESC           = "Probe flag for P12/32 (0=P12, 1=P32)"
  FIELDNAM          = "Probe flag for P12/32 (0=P12, 1=P32)"
  SI_CONVERSION     = "1>unitless"
  UNITS             = "unitless"
  FILLVAL           = 0
  QUALITY           = 0
  SIGNIFICANT_DIGITS= 1
  LABLAXIS          = "P12/32 flag"
  DEPEND_0          = time_tags__C1_CP_EFW_L1_E
            (C1, C2, C3 or C4 as appropriate)
END_VARIABLE        = Flag_p32__C1_CP_EFW_L1_E
!           (C1, C2, C3 or C4 as appropriate)
```

5.3. Level 1 Data – P1, P2, P3, P4

The metadata description in this section applies to the following datasets:

- Cluster 1: C1_CP_EFW_L1_P1, C1_CP_EFW_L1_P2, C1_CP_EFW_L1_P3, C1_CP_EFW_L1_P4
- Cluster 2: C2_CP_EFW_L1_P1, C2_CP_EFW_L1_P2, C2_CP_EFW_L1_P3, C2_CP_EFW_L1_P4
- Cluster 3: C3_CP_EFW_L1_P1, C3_CP_EFW_L1_P2, C3_CP_EFW_L1_P3, C3_CP_EFW_L1_P4
- Cluster 4: C4_CP_EFW_L1_P1, C4_CP_EFW_L1_P2, C4_CP_EFW_L1_P3, C4_CP_EFW_L1_P4

Note: These datasets have been superseded by L1_P and will be eventually removed from the archive.

5.3.1. Format

See section 4.1.

5.3.2. Standard

See section 4.2.

5.3.3. Production Procedure

See section 4.3.

5.3.4. Quality Control Procedure

See section 4.4.

5.3.5. Delivery Procedure

See section 4.5.

5.3.6. Product Specification

Potential of probe 1 (2, 3, or 4) relative to spacecraft (V). Full time resolution (5 s-1).

5.3.7. Metadata Specification

5.3.7.1. File information

FILE_NAME = "C1_CP_EFW_L1_P1__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.3.7.2. Global Mission Metadata

See Appendix 1.

5.3.7.3. Global Observatory Metadata

See Appendix 2.

5.3.7.4. Experiment Metadata

See Appendix 3.

5.3.7.5. Dataset Metadata

FILE_TYPE = "cef"
DATA_TYPE = "CP"
INSTRUMENT_NAME = "EFW1"
(EFW1, EFW2, EFW3 or EFW4 as appropriate)
INSTRUMENT_DESCRIPTION = "EFW Experiment on Cluster C1"
(C1, C2, C3 or C4 as appropriate)
INSTRUMENT_CAVEATS "*C1_CQ_EFW_CAVEATS"
(C1, C2, C3 or C4 as appropriate)
DATASET_ID = "C1_CP_EFW_L1_P1"
(C1, C2, C3 or C4 as appropriate)
DATASET_TITLE = "Probe 1 to spacecraft potential"
DATASET_DESCRIPTION = "This dataset contains measurements of the”
DATASET_DESCRIPTION = “Probe 1 to spacecraft potential"
DATASET_DESCRIPTION = "from the EFW experiment on the Cluster C1 spacecraft"
(C1, C2, C3 or C4 as appropriate)
DATASET_VERSION = 1"
(To be updated as appropriate)
TIME_RESOLUTION = "0.2"
MIN_TIME_RESOLUTION = "0.2"
MAX_TIME_RESOLUTION = "0.2"
PROCESSING_LEVEL "Calibrated"
DATASET_CAVEATS = "*C1_CQ_EFW_P1"
(C1, C2, C3 or C4 as appropriate)
LOGICAL_FILE_ID = "C1_CP_EFW_L1_P1__20010518_044500_095960_V01"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
VERSION_NUMBER = "01"
(To be updated as appropriate)
FILE_TIME_SPAN = "2001-05-18T04:45:00.192689Z/2001-05-18T09:59:59.947010Z"
VALUE_TYPE = ISO_TIME_RANGE
(To be updated as appropriate)
GENERATION_DATE "2005-04-11T16:13:55.937645Z"
VALUE_TYPE = ISO_TIME
(To be updated as appropriate)

5.3.7.6. Variables

START_VARIABLE = time_tags__C1_CP_EFW_L1_P1
(C1, C2, C3 or C4 as appropriate)
VALUE_TYPE = ISO_TIME
DELTA_PLUS = 0
DELTA_MINUS = 0.1
FILLVAL = "9999-12-31T23:59:59Z"
LABLAXIS = "UT"
FIELDNAM = "Universal Time"
END_VARIABLE = time_tags__C1_CP_EFW_L1_P1
(C1, C2, C3 or C4 as appropriate)
START_VARIABLE = P1__C1_CP_EFW_L1_P1
(C1, C2, C3 or C4 as appropriate)
PARAMETER_TYPE = "Data"
SIZES = 1
VALUE_TYPE = FLOAT
ENTITY = "Instrument"
PROPERTY = "Probe_Potential"
FLUCTUATIONS = "Waveform"
CATDESC = "Probe 1 to spacecraft potential"
FIELDNAM = "Probe 1 to spacecraft potential"
SI_CONVERSION = "1>V"
UNITS = "V"
FILLVAL = "-1000000000.000"
QUALITY = "3"
SIGNIFICANT_DIGITS= 6
LABLAXIS = "P1"
DEPEND_0 = time_tags__C1_CP_EFW_L1_P1
(C1, C2, C3 or C4 as appropriate)
END_VARIABLE = P1__C1_CP_EFW_L1_P1
(C1, C2, C3 or C4 as appropriate)

5.4. Level 1 Data – P12

Note: This dataset has been superseded by L1_E and will be eventually removed from the archive.

5.4.1. Format

See section 4.1.

5.4.2. Standard

See section 4.2.

5.4.3. Production Procedure

See section 4.3.

5.4.4. Quality Control Procedure

See section 4.4.

5.4.5. Delivery Procedure

See section 4.5.

5.4.6. Product Specification

Potential difference between probes 1 and 2 (V). Full time resolution (25 s-1 or 450 s-1, depending on

telemetry mode).

5.4.7. Metadata Specification

5.4.7.1. File information

FILE_NAME = "C1_CP_EFW_L1_P12__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.4.7.2. Global Mission Metadata

See Appendix 1.

5.4.7.3. Global Observatory Metadata

See Appendix 2.

5.4.7.4. Experiment Metadata

See Appendix 3.

5.4.7.5. Dataset Metadata

FILE_TYPE = "cef"
DATA_TYPE = "CP"
INSTRUMENT_NAME = "EFW1"
(EFW1, EFW2, EFW3 or EFW4 as appropriate)
INSTRUMENT_DESCRIPTION = "EFW Experiment on Cluster C1"
(C1, C2, C3 or C4 as appropriate)
INSTRUMENT_CAVEATS "*C1_CQ_EFW_CAVEATS"
(C1, C2, C3 or C4 as appropriate)
DATASET_ID = "C1_CP_EFW_L1_P12"
(C1, C2, C3 or C4 as appropriate)
DATASET_TITLE = "Potential difference measured between probes 1 and 2"
DATASET_DESCRIPTION = "This dataset contains measurements of the"
DATASET_DESCRIPTION = "Potential difference measured between probes 1 and 2"
DATASET_DESCRIPTION = "from the EFW experiment on the Cluster C1 spacecraft"
(C1, C2, C3 or C4 as appropriate)
DATASET_VERSION = 1"
(To be updated as appropriate)
TIME_RESOLUTION = "0.04"
MIN_TIME_RESOLUTION = "0.04"
MAX_TIME_RESOLUTION = "0.002222"
(Time resolution is 0.04 s or 0.002222 s depending on telemetry mode)
PROCESSING_LEVEL "Calibrated"
DATASET_CAVEATS = "*C1_CQ_EFW_P12"
(C1, C2, C3 or C4 as appropriate)
LOGICAL_FILE_ID = "C1_CP_EFW_L1_P12__20010518_044500_095960_V01"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
VERSION_NUMBER = "01"
(To be updated as appropriate)
FILE_TIME_SPAN = "2001-05-18T04:45:00.192689Z/2001-05-18T09:59:59.962566Z"
VALUE_TYPE = ISO_TIME_RANGE
(To be updated as appropriate)
GENERATION_DATE "2005-04-11T16:16:14.078668Z"

VALUE_TYPE = ISO_TIME
(To be updated as appropriate)

5.4.7.6. Variables

START_VARIABLE = time_tags__C1_CP_EFW_L1_P12
(C1, C2, C3 or C4 as appropriate)
VALUE_TYPE = ISO_TIME
DELTA_PLUS = 0
DELTA_MINUS = 0
FILLVAL = "9999-12-31T23:59:59Z"
LABLAXIS = "UT"
FIELDNAM = "Universal Time"
END_VARIABLE = time_tags__C1_CP_EFW_L1_P12
(C1, C2, C3 or C4 as appropriate)
START_VARIABLE = P1__C1_CP_EFW_L1_P12
(C1, C2, C3 or C4 as appropriate)
PARAMETER_TYPE = "Data"
SIZES = 1
VALUE_TYPE = FLOAT
ENTITY = "Instrument"
PROPERTY = "Probe_Potential"
FLUCTUATIONS = "Waveform"
CATDESC = "Potential difference measured between probes 1 and 2"
FIELDNAM = "Potential difference measured between probes 1 and 2"
SI_CONVERSION = "1>V"
UNITS = "V"
FILLVAL = "-1000000000.000"
QUALITY = "3"
SIGNIFICANT_DIGITS= 6
LABLAXIS = "P12"
DEPEND_0 = time_tags__C1_CP_EFW_L1_P12
(C1, C2, C3 or C4 as appropriate)
END_VARIABLE = P1__C1_CP_EFW_L1_P12
(C1, C2, C3 or C4 as appropriate)

5.5. Level 1 Data – P34

Note: This dataset has been superseded by L1_E and will be eventually removed from the archive.

5.5.1. Format

See section 4.1.

5.5.2. Standard

See section 4.2.

5.5.3. Production Procedure

See section 4.3.

5.5.4. Quality Control Procedure

See section 4.4.

5.5.5. Delivery Procedure

See section 4.5.

5.5.6. Product Specification

Potential difference between probes 3 and 4 (V). Full time resolution (25 s-1 or 450 s-1, depending on telemetry mode).

5.5.7. Metadata Specification

5.5.7.1. File information

FILE_NAME = "C1_CP_EFW_L1_P34__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.5.7.2. Global Mission Metadata

See Appendix 1.

5.5.7.3. Global Observatory Metadata

See Appendix 2.

5.5.7.4. Experiment Metadata

See Appendix 3.

5.5.7.5. Dataset Metadata

FILE_TYPE = "cef"
DATA_TYPE = "CP"
INSTRUMENT_NAME = "EFW1"
(EFW1, EFW2, EFW3 or EFW4 as appropriate)
INSTRUMENT_DESCRIPTION = "EFW Experiment on Cluster C1"
(C1, C2, C3 or C4 as appropriate)
INSTRUMENT_CAVEATS "*C1_CQ_EFW_CAVEATS"
(C1, C2, C3 or C4 as appropriate)
DATASET_ID = "C1_CP_EFW_L1_P34"
(C1, C2, C3 or C4 as appropriate)
DATASET_TITLE = "Potential difference measured between probes 3 and 4"
DATASET_DESCRIPTION = "This dataset contains measurements of the"
DATASET_DESCRIPTION = "Potential difference measured between probes 3 and 4"
DATASET_DESCRIPTION = "from the EFW experiment on the Cluster C1 spacecraft"
(C1, C2, C3 or C4 as appropriate)
DATASET_VERSION = 1"
(To be updated as appropriate)
TIME_RESOLUTION = "0.04"
MIN_TIME_RESOLUTION = "0.04"
MAX_TIME_RESOLUTION = "0.002222"
(Time resolution is 0.04 s or 0.002222 s depending on telemetry mode)
PROCESSING_LEVEL "Calibrated"
DATASET_CAVEATS = "*C1_CQ_EFW_P34"
(C1, C2, C3 or C4 as appropriate)
LOGICAL_FILE_ID = "C1_CP_EFW_L1_P34__20010518_044500_095960_V01"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
VERSION_NUMBER = "01"
(To be updated as appropriate)
FILE_TIME_SPAN = "2001-05-18T04:45:00.192689Z/2001-05-18T09:59:59.962566Z"

VALUE_TYPE = ISO_TIME_RANGE
(To be updated as appropriate)
GENERATION_DATE "2005-04-11T16:16:14.078668Z"
VALUE_TYPE = ISO_TIME
(To be updated as appropriate)

5.5.7.6. Variables

START_VARIABLE = time_tags__C1_CP_EFW_L1_P34
(C1, C2, C3 or C4 as appropriate)
VALUE_TYPE = ISO_TIME
DELTA_PLUS = 0
DELTA_MINUS = 0
FILLVAL = "9999-12-31T23:59:59Z"
LABLAXIS = "UT"
FIELDNAM = "Universal Time"
END_VARIABLE = time_tags__C1_CP_EFW_L1_P34
(C1, C2, C3 or C4 as appropriate)
START_VARIABLE = P1__C1_CP_EFW_L1_P34
(C1, C2, C3 or C4 as appropriate)
PARAMETER_TYPE = "Data"
SIZES = 1
VALUE_TYPE = FLOAT
ENTITY = "Instrument"
PROPERTY = "Probe_Potential"
FLUCTUATIONS = "Waveform"
CATDESC = "Potential difference measured between probes 3 and 4"
FIELDNAM = "Potential difference measured between probes 3 and 4"
SI_CONVERSION = "1>V"
UNITS = "V"
FILLVAL = "-1000000000.000"
QUALITY = "3"
SIGNIFICANT_DIGITS= 6
LABLAXIS = "P34"
DEPEND_0 = time_tags__C1_CP_EFW_L1_P34
(C1, C2, C3 or C4 as appropriate)
END_VARIABLE = P1__C1_CP_EFW_L1_P34
(C1, C2, C3 or C4 as appropriate)

5.6. Level 1 Data – P32

Note: This dataset has been superseded by L1_E and will be eventually removed from the archive.

5.6.1. Format

See section 4.1.

5.6.2. Standard

See section 4.2.

5.6.3. Production Procedure

See section 4.3.

5.6.4. Quality Control Procedure

See section 4.4.

5.6.5. Delivery Procedure

See section 4.5.

5.6.6. Product Specification

Potential difference between probes 3 and 2 (V). Full time resolution (25 s-1 or 450 s-1, depending on telemetry mode).

5.6.7. Metadata Specification

5.6.7.1. File information

FILE_NAME = "C1_CP_EFW_L1_P32__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.6.7.2. Global Mission Metadata

See Appendix 1.

5.6.7.3. Global Observatory Metadata

See Appendix 2.

5.6.7.4. Experiment Metadata

See Appendix 3.

5.6.7.5. Dataset Metadata

FILE_TYPE = "cef"
DATA_TYPE = "CP"
INSTRUMENT_NAME = "EFW1"
(EFW1, EFW2, EFW3 or EFW4 as appropriate)
INSTRUMENT_DESCRIPTION = "EFW Experiment on Cluster C1"
(C1, C2, C3 or C4 as appropriate)
INSTRUMENT_CAVEATS "*C1_CQ_EFW_CAVEATS"
(C1, C2, C3 or C4 as appropriate)
DATASET_ID = "C1_CP_EFW_L1_P32"
(C1, C2, C3 or C4 as appropriate)
DATASET_TITLE = "Potential difference measured between probes 3 and 2"
DATASET_DESCRIPTION = "This dataset contains measurements of the"
DATASET_DESCRIPTION = "Potential difference measured between probes 3 and 2"
DATASET_DESCRIPTION = "from the EFW experiment on the Cluster C1 spacecraft"
(C1, C2, C3 or C4 as appropriate)
DATASET_VERSION = 1"
(To be updated as appropriate)
TIME_RESOLUTION = "0.04"
MIN_TIME_RESOLUTION = "0.04"
MAX_TIME_RESOLUTION = "0.002222"
(Time resolution is 0.04 s or 0.002222 s depending on telemetry mode)
PROCESSING_LEVEL "Calibrated"
DATASET_CAVEATS = "*C1_CQ_EFW_P32"
(C1, C2, C3 or C4 as appropriate)
LOGICAL_FILE_ID = "C1_CP_EFW_L1_P32__20010518_044500_095960_V01"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)

VERSION_NUMBER = "01"
(To be updated as appropriate)
FILE_TIME_SPAN = "2001-05-18T04:45:00.192689Z/2001-05-18T09:59:59.962566Z"
VALUE_TYPE = ISO_TIME_RANGE
(To be updated as appropriate)
GENERATION_DATE "2005-04-11T16:16:14.078668Z"
VALUE_TYPE = ISO_TIME
(To be updated as appropriate)

5.6.7.6. Variables

START_VARIABLE = time_tags__C1_CP_EFW_L1_P32
(C1, C2, C3 or C4 as appropriate)
VALUE_TYPE = ISO_TIME
DELTA_PLUS = 0
DELTA_MINUS = 0
FILLVAL = "9999-12-31T23:59:59Z"
LABLAXIS = "UT"
FIELDNAM = "Universal Time"
END_VARIABLE = time_tags__C1_CP_EFW_L1_P32
(C1, C2, C3 or C4 as appropriate)
START_VARIABLE = P1__C1_CP_EFW_L1_P32
(C1, C2, C3 or C4 as appropriate)
PARAMETER_TYPE = "Data"
SIZES = 1
VALUE_TYPE = FLOAT
ENTITY = "Instrument"
PROPERTY = "Probe_Potential"
FLUCTUATIONS = "Waveform"
CATDESC = "Potential difference measured between probes 3 and 2"
FIELDNAM = "Potential difference measured between probes 3 and 2"
SI_CONVERSION = "1>V"
UNITS = "V"
FILLVAL = "-1000000000.000"
QUALITY = "3"
SIGNIFICANT_DIGITS= 6
LABLAXIS = "P12"
DEPEND_0 = time_tags__C1_CP_EFW_L1_P32
(C1, C2, C3 or C4 as appropriate)
END_VARIABLE = P1__C1_CP_EFW_L1_P32
(C1, C2, C3 or C4 as appropriate)

5.7. Level 1 Data – IB

5.7.1. Format

See section 4.1.

5.7.2. Standard

See section 4.2.

5.7.3. Production Procedure

See section 4.3.

5.7.4. Quality Control Procedure

See section 4.4.

5.7.5. Delivery Procedure

See section 4.5.

5.7.6. Product Specification

Internal burst data (up to 8 parameters) in telemetry units. Internal burst time resolution (450, 2250, 4500, 9000 or 18000 s-1).

5.7.7. Metadata Specification

5.7.7.1. File information

FILE_NAME = "C1_CP_EFW_L1_IB__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.7.7.2. Global Mission Metadata

See Appendix 1.

5.7.7.3. Global Observatory Metadata

See Appendix 2.

5.7.7.4. Experiment Metadata

See Appendix 3.

5.7.7.5. Dataset Metadata

FILE_TYPE = "cef"
DATA_TYPE = "CP"
INSTRUMENT_NAME = "EFW1"
(EFW1, EFW2, EFW3 or EFW4 as appropriate)
INSTRUMENT_DESCRIPTION = "EFW Experiment on Cluster C1"
(C1, C2, C3 or C4 as appropriate)
INSTRUMENT_CAVEATS "*C1_CQ_EFW_CAVEATS"
(C1, C2, C3 or C4 as appropriate)
DATASET_ID = "C1_CP_EFW_L1_IB"
(C1, C2, C3 or C4 as appropriate)
DATASET_TITLE = "Internal burst"
START_META = DATASET_DESCRIPTION
ENTRY = "This dataset contains measurements of"
ENTRY = "up to 8 parameters (specified in the FILE_CAVEATS)"
ENTRY = "collected during the internal burst"
ENTRY = "of the EFW experiment on the Cluster CXXX spacecraft"
END_META = DATASET_DESCRIPTION
(C1, C2, C3 or C4 as appropriate)
DATASET_VERSION = 1"
(To be updated as appropriate)
START_META = TIME_RESOLUTION
ENTRY = 0.0022222
END_META = TIME_RESOLUTION
START_META = MIN_TIME_RESOLUTION
ENTRY = 0.0022222
END_META = MIN_TIME_RESOLUTION
START_META = MAX_TIME_RESOLUTION
ENTRY = 0.0000555

END_META = MAX_TIME_RESOLUTION
(Time resolution is 0.04 s or 0.002222 s depending on telemetry mode)
PROCESSING_LEVEL "Uncalibrated"
DATASET_CAVEATS = "*C1_CQ_EFW_IB"
(C1, C2, C3 or C4 as appropriate)
LOGICAL_FILE_ID = "C1_CP_EFW_L1_IB__20010518_044500_095960_V01"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
VERSION_NUMBER = "01"
(To be updated as appropriate)
FILE_TIME_SPAN = "2001-05-18T04:45:00.192689Z/2001-05-18T09:59:59.962566Z"
VALUE_TYPE = ISO_TIME_RANGE
(To be updated as appropriate)
GENERATION_DATE "2005-04-11T16:16:14.078668Z"
VALUE_TYPE = ISO_TIME
(To be updated as appropriate)

5.7.7.6. Variables

START_VARIABLE = time_tags__C1_CP_EFW_L1_IB
(C1, C2, C3 or C4 as appropriate)
VALUE_TYPE = ISO_TIME
DELTA_PLUS = 0
DELTA_MINUS = 0
FILLVAL = "9999-12-31T23:59:59Z"
LABLAXIS = "UT"
FIELDNAM = "Universal Time"
END_VARIABLE = time_tags__C1_CP_EFW_L1_IB
(C1, C2, C3 or C4 as appropriate)
START_VARIABLE = Data__C1_CP_EFW_L1_IB
(C1, C2, C3 or C4 as appropriate)
PARAMETER_TYPE = "Data"
SIZES = 8
VALUE_TYPE = INT
ENTITY = "Instrument"
PROPERTY = "Probe_Potential"
FLUCTUATIONS = "Waveform"
CATDESC = "Internal burst"
FIELDNAM = "Internal burst"
SI_CONVERSION = "1>(TM)"
UNITS = "TM"
FILLVAL = -1000000000
QUALITY = 3
SIGNIFICANT_DIGITS= 6
PARAMETER_CAVEATS = "*C1_CP_EFW_L1_IB"
(C1, C2, C3 or C4 as appropriate)
LABLAXIS = "IB"
DEPEND_0 = time_tags__C1_CP_EFW_L1_IB
(C1, C2, C3 or C4 as appropriate)
END_VARIABLE = Data__C1_CP_EFW_L1_IB
(C1, C2, C3 or C4 as appropriate)

5.8. Level 2 Data – P

5.8.1. Format

See section 4.1.

5.8.2. Standard

See section 4.2.

5.8.3. Production Procedure

See section 4.3.

5.8.4. Quality Control Procedure

See section 4.4.

5.8.5. Delivery Procedure

See section 4.5.

5.8.6. Product Specification

Average potential of selected probes relative to spacecraft (V). The probes selected for the average are normally all probes in the electric field mode (as opposed to density mode). Full time resolution (5 s-1).

5.8.7. Metadata Specification

5.8.7.1. File information

FILE_NAME = "C1_CP_EFW_L2_P__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.8.7.2. Global Mission Metadata

See Appendix 1.

5.8.7.3. Global Observatory Metadata

See Appendix 2.

5.8.7.4. Experiment Metadata

See Appendix 3.

5.8.7.5. Dataset Metadata

(C1, C2, C3 or C4 as appropriate)*START_META = DATA_TYPE*
ENTRY = "CP"
END_META = DATA_TYPE
START_META = DATASET_ID
ENTRY = "C1_CP_EFW_L2_P"
END_META = DATASET_ID
START_META = DATASET_TITLE
ENTRY = "Spacecraft potential"
END_META = DATASET_TITLE
START_META = DATASET_DESCRIPTION
ENTRY = "This dataset contains measurements of the"
ENTRY = "negative of the Spacecraft potential"
ENTRY = "from the EFW experiment on the Cluster C1 spacecraft"
END_META = DATASET_DESCRIPTION
START_META = DATASET_CAVEATS
ENTRY = "Level 2 quantity P is the negative of the spacecraft potential,"
ENTRY = "calculated by averaging the Level 1 P1, P2, P3 and P4 quantities."

```
  ENTRY      =  "If all four probes are available, the average is done over all 4 probes."
  ENTRY      =  "If only two or three probes are available, the average is done over 2"
  ENTRY      =  "probes (P1 and P2, or P3 and P4). If only one probe is available, this"
  ENTRY      =  "quantity is the value of that probe."
  ENTRY      =  ""
  ENTRY      =  "For more information on data quality and how the CAA data are processed,"
  ENTRY      =  "please consult the EFW CAA Users Guide and the EFW CAA Interface Control"
  ENTRY      =  "Document (ICD)."
  ENTRY      =  " "
  ENTRY      =  "Detailed quality information is provided as a 16 bit set of
flags"
  ENTRY      =  "in the parameter P_bitmask__C1_CP_EFW_L2_P. The meaning of
"
  ENTRY      =  "the bits is as follows (LSB numbering starting at 0):"
  ENTRY      =  "Bit  0: Reset."
  ENTRY      =  "Bit  1: Bad bias."
  ENTRY      =  "Bit  2: Probe latchup."
  ENTRY      =  "Bit  3: Low density saturation (-68V)."
  ENTRY      =  "Bits 4-12: N/A"
  ENTRY      =  "Bit 13: Whisper operating."
  ENTRY      =  "Bit 14: Saturation due to high bias current."
  ENTRY      =  "Bit 15: N/A"
END_META     =  DATASET_CAVEATS
START_META   =  TIME_RESOLUTION
  ENTRY      =  0.2
END_META     =  TIME_RESOLUTION
START_META   =  MIN_TIME_RESOLUTION
  ENTRY      =  0.2
END_META     =  MIN_TIME_RESOLUTION
START_META   =  MAX_TIME_RESOLUTION
  ENTRY      =  0.2
END_META     =  MAX_TIME_RESOLUTION
START_META   =  PROCESSING_LEVEL
  ENTRY      =  "Calibrated"
END_META     =  PROCESSING_LEVEL
START_META   =  DATASET_VERSION
  ENTRY      =  "3"
END_META     =  DATASET_VERSION
START_META   =  LOGICAL_FILE_ID
  ENTRY      =  "C4_CP_EFW_L2_P__20020101_V00"
END_META     =  LOGICAL_FILE_ID
START_META   =  VERSION_NUMBER
  ENTRY      =  "00"
END_META     =  VERSION_NUMBER
START_META   =  FILE_TIME_SPAN
  VALUE_TYPE =  ISO_TIME_RANGE
  ENTRY      =  2002-01-01T00:00:00.000000Z/2002-01-02T00:00:00.000000Z
END_META     =  FILE_TIME_SPAN
START_META   =  GENERATION_DATE
  VALUE_TYPE =  ISO_TIME
  ENTRY      =  2010-12-01T14:39:55.582061Z
END_META     =  GENERATION_DATE
START_META   =  FILE_CAVEATS
  ENTRY      =  ""
END_META     =  FILE_CAVEATS
```

5.8.7.6. Variables

(C1, C2, C3 or C4 as appropriate)*START_VARIABLE = time_tags__C1_CP_EFW_L2_P*

```
  PARAMETER_TYPE    = "Support_Data"
  VALUE_TYPE      = ISO_TIME
  DELTA_PLUS      = 0.1
  DELTA_MINUS     = 0.1
  FILLVAL         = 9999-12-31T23:59:59Z
  LABLAXIS        = "UT"
  FIELDNAM        = "Universal Time"
END_VARIABLE      = time_tags__C1_CP_EFW_L2_P
!
START_VARIABLE      = Spacecraft_potential__C1_CP_EFW_L2_P
  PARAMETER_TYPE    = "Data"
  SIZES           = 1
  VALUE_TYPE        = FLOAT
  ENTITY          = "Instrument"
  PROPERTY          = "Probe_Potential"
  FLUCTUATIONS      = "Waveform"
  CATDESC           = "Spacecraft potential"
  FIELDNAM          = "Spacecraft potential"
  SI_CONVERSION     = "1>V"
  UNITS           = "V"
  FILLVAL           = -1000000000.000
  QUALITY           = 3
  SIGNIFICANT_DIGITS= 6
  PARAMETER_CAVEATS = "*C1_CP_EFW_L2_P"
  LABLAXIS          = "-Sc pot"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_P
END_VARIABLE        = Spacecraft_potential__C1_CP_EFW_L2_P
!
START_VARIABLE      = P_probes__C1_CP_EFW_L2_P
  PARAMETER_TYPE    = "Support_Data"
  SIZES           = 1
  VALUE_TYPE        = INT
  ENTITY          = "Instrument"
  PROPERTY          = "Status"
  CATDESC           = "Probes used for Spacecraft potential measurement"
  FIELDNAM          = "Probes used for Spacecraft potential measurement"
  SI_CONVERSION     = "1>unitless"
  UNITS           = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 4
  LABLAXIS          = "Probes"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_P
END_VARIABLE        = P_probes__C1_CP_EFW_L2_P
!
START_VARIABLE      = ASPOC_status__C1_CP_EFW_L2_P
  PARAMETER_TYPE    = "Support_Data"
  SIZES           = 1
  VALUE_TYPE        = INT
  ENTITY          = "Instrument"
  PROPERTY          = "Status"
  CATDESC           = "ASPOC status bit (1=active)"
  FIELDNAM          = "ASPOC status bit (1=active)"
  SI_CONVERSION     = "1>unitless"
  UNITS           = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 1
  LABLAXIS          = "ASPOC_ON"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_P
```

```
END_VARIABLE       = ASPOC_status__C1_CP_EFW_L2_P
!
START_VARIABLE     = P_bitmask__C1_CP_EFW_L2_P
  PARAMETER_TYPE   = "Support_Data"
  SIZES            = 1
  VALUE_TYPE       = INT
  ENTITY           = "Instrument"
  PROPERTY         = "Status"
  CATDESC          = "Spacecraft potential measurement quality bitmask"
  FIELDNAM         = "Spacecraft potential measurement quality bitmask"
  SI_CONVERSION    = "1>unitless"
  UNITS            = "unitless"
  FILLVAL          = 0
  SIGNIFICANT_DIGITS= 5
  LABLAXIS         = "Bitmask"
  DEPEND_0         = time_tags__C1_CP_EFW_L2_P
END_VARIABLE       = P_bitmask__C1_CP_EFW_L2_P
!
START_VARIABLE     = P_quality__C1_CP_EFW_L2_P
  PARAMETER_TYPE   = "Support_Data"
  SIZES            = 1
  VALUE_TYPE       = INT
  ENTITY           = "Instrument"
  PROPERTY         = "Status"
  CATDESC          = "Spacecraft potential measurement quality flag (4=best)"
  FIELDNAM         = "Spacecraft potential measurement quality flag (4=best)"
  SI_CONVERSION    = "1>unitless"
  UNITS            = "unitless"
  FILLVAL          = 0
  SIGNIFICANT_DIGITS= 1
  LABLAXIS         = "Quality"
  DEPEND_0         = time_tags__C1_CP_EFW_L2_P
END_VARIABLE       = P_quality__C1_CP_EFW_L2_P
```

5.9. Level 2 Data – E

5.9.1. Format

See section 4.1.

5.9.2. Standard

See section 4.2.

5.9.3. Production Procedure

See section 4.3.

5.9.4. Quality Control Procedure

See section 4.4.

5.9.5. Delivery Procedure

See section 4.5.

5.9.6. Product Specification

Electric field vector in the ISR2 coordinate system (mV/m). The vector is an incomplete vector, with only components x and y (in the spin plane) defined; the z component (along the spin axis) is zero. Full time resolution (25 s-1 or 450 s-1, depending on telemetry mode).

5.9.7. Metadata Specification

5.9.7.1. File information

FILE_NAME = "C1_CP_EFW_L2_E__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.9.7.2. Global Mission Metadata

See Appendix 1.

5.9.7.3. Global Observatory Metadata

See Appendix 2.

5.9.7.4. Experiment Metadata

See Appendix 3.

5.9.7.5. Instrument Metadata

See Appendix 4.

5.9.7.6. Dataset Metadata

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_META    =   DATA_TYPE
  ENTRY       =   "CP"
END_META      =   DATA_TYPE
START_META    =   DATASET_ID
  ENTRY       =   "C1_CP_EFW_L2_E"
END_META      =   DATASET_ID
START_META    =   DATASET_TITLE
  ENTRY       =   "2D E-field, ISR2, spacecraft frame (full resolution)"
END_META      =   DATASET_TITLE
START_META    =   DATASET_DESCRIPTION
  ENTRY       =   "This dataset contains measurements of the"
  ENTRY       =   "Electric field"
  ENTRY       =   "from the EFW experiment on the Cluster C1 spacecraft"
  ENTRY       =   " "
  ENTRY       =   "Detailed quality information is provided as a 16 bit set of flags"
  ENTRY       =   "in the parameter E_bitmask__C1_CP_EFW_L2_E. The meaning of"
  ENTRY       =   "the bits is as follows (LSB numbering starting at 0):"
  ENTRY       =   "Bit  0: Reset."
  ENTRY       =   "Bit  1: Bad bias."
  ENTRY       =   "Bit  2: Probe latchup."
  ENTRY       =   "Bit  3: Low density saturation (-68V)."
  ENTRY       =   "Bit  4: Sweep (collection and dump)."
  ENTRY       =   "Bit  5: Burst dump."
  ENTRY       =   "Bit  6: Non-standard operations (NS_OPS)."
  ENTRY       =   "Bit  7: Manual flag."
  ENTRY       =   "Bit  8: Single probe pair."
  ENTRY       =   "Bit  9: Asymmetric mode."
  ENTRY       =   "Bit 10: Solar wind wake correction applied."
  ENTRY       =   "Bit 11: Lobe wake."
  ENTRY       =   "Bit 12: Plasmaspheric wake."
```

```
  ENTRY     =  "Bit 13: Whisper operating."
  ENTRY     =  "Bit 14: Saturation due to high bias current."
  ENTRY     =  "Bit 15: Bias current DAC not responding correctly."
END_META    =  DATASET_DESCRIPTION
START_META  =  DATASET_CAVEATS
  ENTRY     =  "Level 2 quantity E is the electric field in the spin plane, calculated"
  ENTRY     =  "by despinning the raw data Level 1 quantities P12 or P32 and P34,"
  ENTRY     =  "depending on which quantities are available. If all probes are"
  ENTRY     =  "available, P12 and P34 are used, and E_quality is normally set to 3. If"
  ENTRY     =  "only 3 probes are available, P32 and P34 are used, and E_quality is"
  ENTRY     =  "normally set to 2. If only 2 probes are available, either P12 or P34 is"
  ENTRY     =  "used. The other quantity (P34 or P12, respectively) is set to zero"
  ENTRY     =  "before doing the despin, and E_quality is normally set to 1. In the case"
  ENTRY     =  "of 3 probes, data are automatically treated to remove artificial spin"
  ENTRY     =  "variations. In the case of 2 probes, the despun electric field will have"
  ENTRY     =  "a strong artificial spin variation."
  ENTRY     =  ""
  ENTRY     =  "Various potential problems in the data have been treated automatically"
  ENTRY     =  "in the CAA data processing. Examples are solar wind, lobe, and"
  ENTRY     =  "plasmaspheric wakes. Data quality is indicated by the variable"
  ENTRY     =  "E_quality__C1_CP_EFW_L2_E (4=best quality). Detailed quality"
  ENTRY     =  "information is given in the 16-bit variable E_bitmask__C1_CP_EFW_L2_E."
  ENTRY     =  "Please refer to the DATASET_DESCRIPTION information above for details."
  ENTRY     =  ""
  ENTRY     =  "For more information on data quality and how the CAA data are processed,"
  ENTRY     =  "please consult the EFW CAA Users Guide and the EFW CAA Interface Control"
  ENTRY     =  "Document (ICD)."
  ENTRY     =  ""
  ENTRY     =  "Note that the observations are done in the ISR2 spin plane. The spin"
  ENTRY     =  "axis component is not available, so the resulting measurement is not the"
  ENTRY     =  "full 3D electric field vector."
  ENTRY     =  ""
  ENTRY     =  "The timing can be inaccurate if the TCOR is not applied:"
  ENTRY     =  "*C1_CQ_DWP_TCOR"
END_META    =  DATASET_CAVEATS
START_META  =  TIME_RESOLUTION
  ENTRY     =  0.04
END_META    =  TIME_RESOLUTION
START_META  =  MIN_TIME_RESOLUTION
  ENTRY     =  0.04
END_META    =  MIN_TIME_RESOLUTION
START_META  =  MAX_TIME_RESOLUTION
  ENTRY     =  0.0022222
END_META    =  MAX_TIME_RESOLUTION
START_META  =  PROCESSING_LEVEL
  ENTRY     =  "Calibrated"
END_META    =  PROCESSING_LEVEL

START_META  =  FILE_TYPE
  ENTRY     =  "cef"
END_META    =  FILE_TYPE
START_META  =  DATASET_VERSION
  ENTRY     =  "3"
        (To be updated as appropriate)
END_META    =  DATASET_VERSION
START_META  =  LOGICAL_FILE_ID
  ENTRY     =  "C1_CP_EFW_L2_E__20010201_V00"
        (Date, Start time and End time as appropriate)
```

(Version to be updated as appropriate)
END_META = LOGICAL_FILE_ID
START_META = VERSION_NUMBER
ENTRY = "00"
(To be updated as appropriate)
END_META = VERSION_NUMBER
START_META = FILE_TIME_SPAN
VALUE_TYPE = ISO_TIME_RANGE
ENTRY = 2001-02-01T00:00:00.000000Z/2001-02-02T00:00:00.000000Z
(To be updated as appropriate)
END_META = FILE_TIME_SPAN
START_META = GENERATION_DATE
VALUE_TYPE = ISO_TIME
ENTRY = 2009-01-03T01:42:08.347447Z
(To be updated as appropriate)
END_META = GENERATION_DATE
START_META = FILE_CAVEATS
ENTRY = "2001-02-01T00:00:00.000Z/2001-02-01T00:32:00.000Z Probe pairs p12,p34"
ENTRY = "2001-02-01T00:00:00.000Z/2001-02-01T00:32:00.000Z ISR2 offsets: dEx=0.55 dEy=0.00, dAmp=1.10"
ENTRY = "2001-02-01T00:00:00.000Z/2001-02-01T00:32:00.000Z p12 offset (ISR2): dEx=-0.14 dEy=-0.07"
(To be updated as appropriate)
END_META = FILE_CAVEATS

5.9.7.7. Variables

(C1 may be replaced by C2, C3 or C4 as appropriate)

START_VARIABLE = time_tags__C1_CP_EFW_L2_E
PARAMETER_TYPE = "Support_Data"
VALUE_TYPE = ISO_TIME
DELTA_PLUS = 0
DELTA_MINUS = 0
FILLVAL = 9999-12-31T23:59:59Z
LABLAXIS = "UT"
FIELDNAM = "Universal Time"
END_VARIABLE = time_tags__C1_CP_EFW_L2_E
!
START_VARIABLE = E_Vec_xy_ISR2__C1_CP_EFW_L2_E
PARAMETER_TYPE = "Data"
SIZES = 2
VALUE_TYPE = FLOAT
ENTITY = "Electric_Field"
PROPERTY = "Vector"
FLUCTUATIONS = "Waveform"
CATDESC = "Electric field"
FIELDNAM = "Electric field"
SI_CONVERSION = "1.0e-3>V m^-1"
UNITS = "mV/m"
FILLVAL = -1000000000.000
QUALITY = E_quality__C1_CP_EFW_L2_E
SIGNIFICANT_DIGITS= 6
PARAMETER_CAVEATS = "*C1_CP_EFW_L3_DER"
COORDINATE_SYSTEM = "ISR2"
FRAME_VELOCITY = "Observatory"
TENSOR_ORDER = 1
REPRESENTATION_1 = "x", "y"
LABEL_1 = "Ex", "Ey"

```
  LABLAXIS          = "E"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_E
END_VARIABLE        = E_Vec_xy_ISR2__C1_CP_EFW_L2_E
!
START_VARIABLE      = E_bitmask__C1_CP_EFW_L2_E
  PARAMETER_TYPE    = "Support_Data"
  SIZES             = 1
  VALUE_TYPE        = INT
  ENTITY            = "Electric_Field"
  PROPERTY          = "Status"
  CATDESC           = "Electric field measurement quality bitmask"
  FIELDNAM          = "Electric field measurement quality bitmask"
  SI_CONVERSION     = "1>unitless"
  UNITS             = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 5
  LABLAXIS          = "Bitmask"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_E
END_VARIABLE        = E_bitmask__C1_CP_EFW_L2_E
!
START_VARIABLE      = E_quality__C1_CP_EFW_L2_E
  PARAMETER_TYPE    = "Support_Data"
  SIZES             = 1
  VALUE_TYPE        = INT
  ENTITY            = "Electric_Field"
  PROPERTY          = "Status"
  CATDESC           = "Electric field measurement quality flag (4=best)"
  FIELDNAM          = "Electric field measurement quality flag (4=best)"
  SI_CONVERSION     = "1>unitless"
  UNITS             = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 1
  LABLAXIS          = "Quality"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_E
END_VARIABLE        = E_quality__C1_CP_EFW_L2_E
```

5.10. Level 2 Data – HK

5.10.1. Format

See section 4.1.

5.10.2. Standard

See section 4.2.

5.10.3. Production Procedure

See section 4.3.

5.10.4. Quality Control Procedure

See section 4.4.

5.10.5. Delivery Procedure

See section 4.5.

5.10.6. Product Specification

EFW instrument settings (bias current, puck and guard voltages) for each probe (1 to 4). Full time resolution (1/32 s^{-1}).

5.10.7. Metadata Specification

5.10.7.1. File information

FILE_NAME = "C1_CP_EFW_L2_HK__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.10.7.2. Global Mission Metadata

See Appendix 1.

5.10.7.3. Global Observatory Metadata

See Appendix 2.

5.10.7.4. Experiment Metadata

See Appendix 3.

5.10.7.5. Instrument Metadata

See Appendix 4.

5.10.7.6. Dataset Metadata

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_META    =  DATA_TYPE
  ENTRY       =  "CP"
END_META      =  DATA_TYPE
START_META    =  DATASET_ID
  ENTRY       =  "C3_CP_EFW_L2_HK"
END_META      =  DATASET_ID
START_META    =  DATASET_TITLE
  ENTRY       =  "Instrument bias, puck and guard settings"
END_META      =  DATASET_TITLE
START_META    =  DATASET_DESCRIPTION
  ENTRY       =  "This dataset contains settings (bias current, puck and guard
 voltages)"
  ENTRY       =  "of the EFW experiment on the Cluster C1 spacecraft"
END_META      =  DATASET_DESCRIPTION
START_META    =  DATASET_CAVEATS
  ENTRY       =  "The settings are the commanded ones, not the measured."
END_META      =  DATASET_CAVEATS
START_META    =  TIME_RESOLUTION
  ENTRY       =  32
END_META      =  TIME_RESOLUTION
START_META    =  MIN_TIME_RESOLUTION
  ENTRY       =  32
```

```
END_META      =  MIN_TIME_RESOLUTION
START_META    =  MAX_TIME_RESOLUTION
  ENTRY       =  32
END_META      =  MAX_TIME_RESOLUTION
START_META    =  PROCESSING_LEVEL
  ENTRY       =  "Calibrated"
END_META      =  PROCESSING_LEVEL

START_META    =  FILE_TYPE
  ENTRY       =  "cef"
END_META      =  FILE_TYPE
START_META    =  DATASET_VERSION
  ENTRY       =  "3"
        (To be updated as appropriate)
END_META      =  DATASET_VERSION
START_META    =  LOGICAL_FILE_ID
  ENTRY       =  "C1_CP_EFW_L2_HK__20010201_V00"
        (Date, Start time and End time as appropriate)
        (Version to be updated as appropriate)
END_META      =  LOGICAL_FILE_ID
START_META    =  VERSION_NUMBER
  ENTRY       =  "00"
        (To be updated as appropriate)
END_META      =  VERSION_NUMBER
START_META    =  FILE_TIME_SPAN
  VALUE_TYPE  =  ISO_TIME_RANGE
  ENTRY       =  2001-02-01T00:00:00.000000Z/2001-02-02T00:00:00.000000Z
        (To be updated as appropriate)
END_META      =  FILE_TIME_SPAN
START_META    =  GENERATION_DATE
  VALUE_TYPE  =  ISO_TIME
  ENTRY       =  2010-09-03T01:42:08.347447Z
        (To be updated as appropriate)
END_META      =  GENERATION_DATE
```

5.10.7.7. Variables

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_VARIABLE    = time_tags__C3_CP_EFW_L2_HK
 PARAMETER_TYPE    = "Support_Data"
 VALUE_TYPE      = ISO_TIME
 DELTA_PLUS      = 32
 DELTA_MINUS     = 0
 FILLVAL         = 9999-12-31T23:59:59Z
 LABLAXIS        = "UT"
 FIELDNAM        = "Universal Time"
END_VARIABLE      = time_tags__C3_CP_EFW_L2_HK
!
! Bias
!
START_VARIABLE      = I_BIAS_P1__C3_CP_EFW_L2_HK
 PARAMETER_TYPE    = "Data"
 SIZES           = 1
 VALUE_TYPE        = FLOAT
 ENTITY          = "Instrument"
 PROPERTY          = "Current"
 FLUCTUATIONS      = "Waveform"
 CATDESC           = "Bias current, probe 1"
```

```
  FIELDNAM         = "Bias current, probe 1"
  SI_CONVERSION    = "1.0e-9>A"
  UNITS            = "nA"
  FILLVAL          = -1000000000.000
  QUALITY          = 3
  SIGNIFICANT_DIGITS= 6
  LABLAXIS         = "BIAS1"
  DEPEND_0         = time_tags__C3_CP_EFW_L2_HK
END_VARIABLE       = I_BIAS_P1__C3_CP_EFW_L2_HK
!
(similar for P2, P3 or P4)
!
! Puck
!
START_VARIABLE     = V_PUCK_P1__C3_CP_EFW_L2_HK
  PARAMETER_TYPE   = "Data"
  SIZES            = 1
  VALUE_TYPE       = FLOAT
  ENTITY           = "Instrument"
  PROPERTY         = "Potential"
  FLUCTUATIONS     = "Waveform"
  CATDESC          = "Puck voltage, probe 1"
  FIELDNAM         = "Puck voltage, probe 1"
  SI_CONVERSION    = "1>V"
  UNITS            = "V"
  FILLVAL          = -1000000000.000
  QUALITY          = 3
  SIGNIFICANT_DIGITS= 6
  LABLAXIS         = "PUCK1"
  DEPEND_0         = time_tags__C3_CP_EFW_L2_HK
END_VARIABLE       = V_PUCK_P1__C3_CP_EFW_L2_HK
!
(similar for P2, P3 or P4)
!
! Guard
!
START_VARIABLE     = V_GUARD_P1__C3_CP_EFW_L2_HK
  PARAMETER_TYPE   = "Data"
  SIZES            = 1
  VALUE_TYPE       = FLOAT
  ENTITY           = "Instrument"
  PROPERTY         = "Potential"
  FLUCTUATIONS     = "Waveform"
  CATDESC          = "Guard voltage, probe 1"
  FIELDNAM         = "Guard voltage, probe 1"
  SI_CONVERSION    = "1>V"
  UNITS            = "V"
  FILLVAL          = -1000000000.000
  QUALITY          = 3
  SIGNIFICANT_DIGITS= 6
  LABLAXIS         = "GUARD1"
  DEPEND_0         = time_tags__C3_CP_EFW_L2_HK
END_VARIABLE       = V_GUARD_P1__C3_CP_EFW_L2_HK
!
(similar for P2, P3 or P4)
```

5.11. Level 2 Data – PB

5.11.1. Format

See section 4.1.

5.11.2. Standard

See section 4.2.

5.11.3. Production Procedure

See section 4.3.

5.11.4. Quality Control Procedure

See section 4.4.

5.11.5. Delivery Procedure

See section 4.5.

5.11.6. Product Specification

Average potential of selected probes relative to spacecraft (V). The probes selected for the average are normally all probes in the electric field mode (as opposed to density mode). Internal burst time resolution (450, 2250, 4500, 9000 or 18000 s^{-1}).

5.11.7. Metadata Specification

5.11.7.1. File information

FILE_NAME = "C1_CP_EFW_L2_PB__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.11.7.2. Global Mission Metadata

See Appendix 1.

5.11.7.3. Global Observatory Metadata

See Appendix 2.

5.11.7.4. Experiment Metadata

See Appendix 3.

5.11.7.5. Instrument Metadata

See Appendix 4.

5.11.7.6. Dataset Metadata

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_META    =   DATA_TYPE
  ENTRY       =   "CP"
END_META      =   DATA_TYPE
START_META    =   DATASET_ID
  ENTRY       =   "C1_CP_EFW_L2_PB"
```

END_META = DATASET_ID
START_META = DATASET_TITLE
ENTRY = "Spacecraft potential (internal burst)"
END_META = DATASET_TITLE
START_META = DATASET_DESCRIPTION ENTRY = "This dataset contains measurements of the"
ENTRY = "negative of the Spacecraft potential (internal burst)"
ENTRY = "from the EFW experiment on the Cluster C1 spacecraft"
END_META = DATASET_DESCRIPTION
START_META = DATASET_CAVEATS
ENTRY = "Level 2 quantity P is the negative of the spacecraft potential,"
ENTRY = "calculated by averaging the Level 1 P1, P2, P3 and P4 quantities."
ENTRY = "If all four probes are available, the average is done over all 4 probes."
ENTRY = "If only two or three probes are available, the average is done over 2"
ENTRY = "probes (P1 and P2, or P3 and P4). If only one probe is available, this"
ENTRY = "quantity is the value of that probe."
ENTRY = ""
ENTRY = "For more information on data quality and how the CAA data are processed,"
ENTRY = "please consult the EFW CAA Users Guide and the EFW CAA Interface Control"
ENTRY = "Document (ICD)."
ENTRY = " "
ENTRY = "Detailed quality information is provided as a 16 bit set of flags"
ENTRY = "in the parameter P_bitmask__C1_CP_EFW_L2_PB. The meaning of"
ENTRY = "the bits is as follows (LSB numbering starting at 0):"
ENTRY = "Bit 0: Reset."
ENTRY = "Bit 1: Bad bias."
ENTRY = "Bit 2: Probe latchup."
ENTRY = "Bit 3: Low density saturation (-68V)."
ENTRY = "Bits 4-12: N/A."
ENTRY = "Bit 13: Whisper operating."
ENTRY = "Bit 14: Saturation due to high bias current."
ENTRY = "Bit 15: N/A."
END_META = DATASET_CAVEATS
START_META = TIME_RESOLUTION
ENTRY = 0.0022222
END_META = TIME_RESOLUTION
START_META = MIN_TIME_RESOLUTION
ENTRY = 0.0022222
END_META = MIN_TIME_RESOLUTION
START_META = MAX_TIME_RESOLUTION
ENTRY = 0.0000555
END_META = MAX_TIME_RESOLUTION
START_META = PROCESSING_LEVEL
ENTRY = "Calibrated"
END_META = PROCESSING_LEVEL

START_META = FILE_TYPE
ENTRY = "cef"
END_META = FILE_TYPE
START_META = DATASET_VERSION
ENTRY = "3"
(To be updated as appropriate)
END_META = DATASET_VERSION
START_META = LOGICAL_FILE_ID
ENTRY = "C1_CP_EFW_L2_PB__20010201_V00"
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
END_META = LOGICAL_FILE_ID

START_META = VERSION_NUMBER
ENTRY = "00"
(To be updated as appropriate)
END_META = VERSION_NUMBER
START_META = FILE_TIME_SPAN
VALUE_TYPE = ISO_TIME_RANGE
ENTRY = 2001-02-01T00:00:00.000000Z/2001-02-02T00:00:00.000000Z
(To be updated as appropriate)
END_META = FILE_TIME_SPAN
START_META = GENERATION_DATE
VALUE_TYPE = ISO_TIME
ENTRY = 2010-09-03T01:42:08.347447Z
(To be updated as appropriate)
END_META = GENERATION_DATE

5.11.7.7. Variables

(C1 may be replaced by C2, C3 or C4 as appropriate)

START_VARIABLE = time_tags__C1_CP_EFW_L2_PB
PARAMETER_TYPE = "Support_Data"
VALUE_TYPE = ISO_TIME
DELTA_PLUS = 0
DELTA_MINUS = 0
FILLVAL = 9999-12-31T23:59:59Z
LABLAXIS = "UT"
FIELDNAM = "Universal Time"
END_VARIABLE = time_tags__C1_CP_EFW_L2_PB
!
START_VARIABLE = Spacecraft_potential__C1_CP_EFW_L2_PB
PARAMETER_TYPE = "Data"
SIZES = 1
VALUE_TYPE = FLOAT
ENTITY = "Instrument"
PROPERTY = "Probe_Potential"
FLUCTUATIONS = "Waveform"
CATDESC = "Spacecraft potential (internal burst)"
FIELDNAM = "Spacecraft potential (internal burst)"
SI_CONVERSION = "1>V"
UNITS = "V"
FILLVAL = -1000000000.000
QUALITY = 3
SIGNIFICANT_DIGITS= 6
PARAMETER_CAVEATS = "*C1_CP_EFW_L2_PB"
LABLAXIS = "-Sc pot"
DEPEND_0 = time_tags__C1_CP_EFW_L2_PB
END_VARIABLE = Spacecraft_potential__C1_CP_EFW_L2_PB
!
START_VARIABLE = P_probes__C1_CP_EFW_L2_PB
PARAMETER_TYPE = "Support_Data"
SIZES = 1
VALUE_TYPE = INT
ENTITY = "Instrument"
PROPERTY = "Status"
CATDESC = "Probes used for Spacecraft potential measurement (internal burst)"
FIELDNAM = "Probes used for Spacecraft potential measurement (internal burst)"
SI_CONVERSION = "1>unitless"
UNITS = "unitless"
FILLVAL = 0

```
  SIGNIFICANT_DIGITS= 4
  LABLAXIS          = "Probes"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_PB
END_VARIABLE        = P_probes__C1_CP_EFW_L2_PB
!
START_VARIABLE      = ASPOC_status__C1_CP_EFW_L2_PB
  PARAMETER_TYPE    = "Support_Data"
  SIZES             = 1
  VALUE_TYPE        = INT
  ENTITY            = "Instrument"
  PROPERTY          = "Status"
  CATDESC           = "ASPOC status bit (1=active)"
  FIELDNAM          = "ASPOC status bit (1=active)"
  SI_CONVERSION     = "1>unitless"
  UNITS             = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 1
  SIGNIFICANT_DIGITS= 1
  LABLAXIS          = "ASPOC_ON"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_PB
END_VARIABLE        = ASPOC_status__C1_CP_EFW_L2_PB
!
START_VARIABLE      = P_bitmask__C1_CP_EFW_L2_PB
  PARAMETER_TYPE    = "Support_Data"
  SIZES             = 1
  VALUE_TYPE        = INT
  ENTITY            = "Instrument"
  PROPERTY          = "Status"  CATDESC           = "Spacecraft potential (internal burst) measurement
quality bitma
sk"  FIELDNAM          = "Spacecraft potential (internal burst) measurement quality bitma
sk"
  SI_CONVERSION     = "1>unitless"
  UNITS             = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 5
  LABLAXIS          = "Bitmask"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_PB
END_VARIABLE        = P_bitmask__C1_CP_EFW_L2_PB
!
START_VARIABLE      = P_quality__C1_CP_EFW_L2_PB
  PARAMETER_TYPE    = "Support_Data"
  SIZES             = 1
  VALUE_TYPE        = INT
  ENTITY            = "Instrument"
  PROPERTY          = "Status"  CATDESC           = "Spacecraft potential (internal burst) measurement
quality flag
(4=best)"
  FIELDNAM          = "Spacecraft potential (internal burst) measurement quality flag (4=best)"
  SI_CONVERSION     = "1>unitless"
  UNITS             = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 1
  LABLAXIS          = "Quality"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_PB
END_VARIABLE        = P_quality__C1_CP_EFW_L2_PB
```

5.12. Level 2 Data – EB

5.12.1. Format

See section 4.1.

5.12.2. Standard

See section 4.2.

5.12.3. Production Procedure

See section 4.3.

5.12.4. Quality Control Procedure

See section 4.4.

5.12.5. Delivery Procedure

See section 4.5.

5.12.6. Product Specification

Electric field vector in the ISR2 coordinate system (mV/m). The vector is an incomplete vector, with only components x and y (in the spin plane) defined; the z component (along the spin axis) is zero. Internal burst time resolution (450, 2250, 4500, 9000 or 18000 s^{-1}).

5.12.7. Metadata Specification

5.12.7.1. File information

FILE_NAME = "C1_CP_EFW_L2_EB__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.12.7.2. Global Mission Metadata

See Appendix 1.

5.12.7.3. Global Observatory Metadata

See Appendix 2.

5.12.7.4. Experiment Metadata

See Appendix 3.

5.12.7.5. Instrument Metadata

See Appendix 4.

5.12.7.6. Dataset Metadata

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_META    =   DATA_TYPE
  ENTRY       =   "CP"
END_META      =   DATA_TYPE
START_META    =   DATASET_ID
   ENTRY      =   "C1_CP_EFW_L2_EB"
```

```
END_META     =  DATASET_ID
START_META   =  DATASET_TITLE
  ENTRY      =  "2D E-field, ISR2, spacecraft frame (internal burst)"
END_META     =  DATASET_TITLE
START_META   =  DATASET_DESCRIPTION
  ENTRY      =  "This dataset contains measurements of the"
  ENTRY      =  "Electric field (internal burst)"
  ENTRY      =  "from the EFW experiment on the Cluster C1 spacecraft"
  ENTRY      =  " "
  ENTRY      =  "Detailed quality information is provided as a 16 bit set of flags"
  ENTRY      =  "in the parameter E_bitmask__C1_CP_EFW_L2_EB. The meaning of"
  ENTRY      =  "the bits is as follows (LSB numbering starting at 0):"
  ENTRY      =  "Bit  0: Reset."
  ENTRY      =  "Bit  1: Bad bias."
  ENTRY      =  "Bit  2: Probe latchup."
  ENTRY      =  "Bit  3: Low density saturation (-68V)."
  ENTRY      =  "Bit  4: Sweep (collection and dump)."
  ENTRY      =  "Bit  5: Burst dump."
  ENTRY      =  "Bit  6: Non-standard operations (NS_OPS)."
  ENTRY      =  "Bit  7: Manual flag."
  ENTRY      =  "Bit  8: Single probe pair."
  ENTRY      =  "Bit  9: Asymmetric mode."
  ENTRY      =  "Bit 10: Solar wind wake correction applied."
  ENTRY      =  "Bit 11: Lobe wake."
  ENTRY      =  "Bit 12: Plasmaspheric wake."
  ENTRY      =  "Bit 13: Whisper operating."
  ENTRY      =  "Bit 14: Saturation due to high bias current."
  ENTRY      =  "Bit 15: Bias current DAC not responding correctly."
END_META     =  DATASET_DESCRIPTION
START_META   =  DATASET_CAVEATS
  ENTRY      =  "Level 2 quantity E is the electric field in the spin plane, calculated"
  ENTRY      =  "by despinning the raw data Level 1 quantities P12 or P32 and P34,"
  ENTRY   =  "depending on which quantities are available. If all probes are"
  ENTRY      =  "available, P12 and P34 are used, and E_quality is normally set to 3. If"
  ENTRY      =  "only 3 probes are available, P32 and P34 are used, and E_quality is"
  ENTRY      =  "normally set to 2. If only 2 probes are available, either P12 or P34 is"
  ENTRY      =  "used. The other quantity (P34 or P12, respectively) is set to zero"
  ENTRY      =  "before doing the despin, and E_quality is normally set to 1. In the case"
  ENTRY      =  "of 3 probes, data are automatically treated to remove artificial spin"
  ENTRY      =  "variations. In the case of 2 probes, the despun electric field will have"
  ENTRY      =  "a strong artificial spin variation."
  ENTRY      =  ""
  ENTRY      =  "Various potential problems in the data have been treated automatically"
  ENTRY      =  "in the CAA data processing. Examples are solar wind, lobe, and"
  ENTRY      =  "plasmaspheric wakes. Data quality is indicated by the variable"
  ENTRY      =  "E_quality__C1_CP_EFW_L2_EB (4=best quality). Detailed quality"
  ENTRY      =  "information is given in the 16-bit variable E_bitmask__C1_CP_EFW_L2_EB."
  ENTRY      =  "Please refer to the DATASET_DESCRIPTION information above for details."
  ENTRY      =  ""
  ENTRY      =  "For more information on data quality and how the CAA data are processed,"
  ENTRY      =  "please consult the EFW CAA Users Guide and the EFW CAA Interface Control"
  ENTRY      =  "Document (ICD)."
  ENTRY      =  ""
  ENTRY      =  "Note that the observations are done in the ISR2 spin plane. The spin"
  ENTRY      =  "axis component is not available, so the resulting measurement is not the"
  ENTRY      =  "full 3D electric field vector."
  ENTRY      =  ""
  ENTRY      =  "The timing can be inaccurate if the TCOR is not applied:"
```

```
  ENTRY      =  "*C1_CQ_DWP_TCOR"
END_META     =  DATASET_CAVEATS
START_META   =  TIME_RESOLUTION
  ENTRY      =  0.0022222
END_META     =  TIME_RESOLUTION
START_META   =  MIN_TIME_RESOLUTION
  ENTRY      =  0.0022222
END_META     =  MIN_TIME_RESOLUTION
START_META   =  MAX_TIME_RESOLUTION
  ENTRY      =  0.0000555
END_META     =  MAX_TIME_RESOLUTION
START_META   =  PROCESSING_LEVEL
  ENTRY      =  "Calibrated"
END_META     =  PROCESSING_LEVEL

START_META   =  FILE_TYPE
  ENTRY      =  "cef"
END_META     =  FILE_TYPE
START_META   =  DATASET_VERSION
  ENTRY      =  "3"
        (To be updated as appropriate)
END_META     =  DATASET_VERSION
START_META   =  LOGICAL_FILE_ID
  ENTRY      =  "C1_CP_EFW_L2_PB__20010201_V00"
        (Date, Start time and End time as appropriate)
        (Version to be updated as appropriate)
END_META     =  LOGICAL_FILE_ID
START_META   =  VERSION_NUMBER
  ENTRY      =  "00"
        (To be updated as appropriate)
END_META     =  VERSION_NUMBER
START_META   =  FILE_TIME_SPAN
  VALUE_TYPE =  ISO_TIME_RANGE
  ENTRY      =  2001-02-01T00:00:00.000000Z/2001-02-02T00:00:00.000000Z
        (To be updated as appropriate)
END_META     =  FILE_TIME_SPAN
START_META   =  GENERATION_DATE
  VALUE_TYPE =  ISO_TIME
  ENTRY      =  2010-09-03T01:42:08.347447Z
        (To be updated as appropriate)
END_META     =  GENERATION_DATE
```

5.12.7.7. Variables

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_VARIABLE    = time_tags__C1_CP_EFW_L2_EB
 PARAMETER_TYPE   = "Support_Data"
 VALUE_TYPE       = ISO_TIME
 DELTA_PLUS       = 0
 DELTA_MINUS      = 0
 FILLVAL          = 9999-12-31T23:59:59Z
 LABLAXIS         = "UT"
 FIELDNAM         = "Universal Time"
END_VARIABLE      = time_tags__C1_CP_EFW_L2_EB
!
START_VARIABLE    = E_Vec_xy_ISR2__C1_CP_EFW_L2_EB
 PARAMETER_TYPE   = "Data"
 SIZES            = 2
 VALUE_TYPE       = FLOAT
```

```
  ENTITY          = "Electric_Field"
  PROPERTY        = "Vector"
  FLUCTUATIONS    = "Waveform"
  CATDESC         = "Electric field (internal burst)"
  FIELDNAM        = "Electric field (internal burst)"
  SI_CONVERSION   = "1.0e-3>V m^-1"
  UNITS           = "mV/m"
  FILLVAL         = -1000000000.000
  QUALITY         = E_quality__C1_CP_EFW_L2_EB
  SIGNIFICANT_DIGITS= 6
  PARAMETER_CAVEATS = "*C1_CP_EFW_L3_DER"
  COORDINATE_SYSTEM = "ISR2"
  FRAME_VELOCITY  = "Observatory"
  TENSOR_ORDER    = 1
  REPRESENTATION_1  = "x", "y"
  LABEL_1         = "Ex", "Ey"
  LABLAXIS        = "E"
  DEPEND_0        = time_tags__C1_CP_EFW_L2_EB
END_VARIABLE      = E_Vec_xy_ISR2__C1_CP_EFW_L2_EB
!
START_VARIABLE    = E_bitmask__C1_CP_EFW_L2_EB
  PARAMETER_TYPE  = "Support_Data"
  SIZES           = 1
  VALUE_TYPE      = INT
  ENTITY          = "Electric_Field"
  PROPERTY        = "Status"
  CATDESC         = "Electric field (internal burst) measurement quality bitmask"
  FIELDNAM        = "Electric field (internal burst) measurement quality bitmask"
  SI_CONVERSION   = "1>unitless"
  UNITS           = "unitless"
  FILLVAL         = 0
  SIGNIFICANT_DIGITS= 5
  LABLAXIS        = "Bitmask"
  DEPEND_0        = time_tags__C1_CP_EFW_L2_EB
END_VARIABLE      = E_bitmask__C1_CP_EFW_L2_EB
!
START_VARIABLE    = E_quality__C1_CP_EFW_L2_EB
  PARAMETER_TYPE  = "Support_Data"
  SIZES           = 1
  VALUE_TYPE      = INT
  ENTITY          = "Electric_Field"
  PROPERTY        = "Status"
  CATDESC         = "Electric field (internal burst) measurement quality flag (4=best)"
  FIELDNAM        = "Electric field (internal burst) measurement quality flag (4=best)"
  SI_CONVERSION   = "1>unitless"
  UNITS           = "unitless"
  FILLVAL         = 0
  SIGNIFICANT_DIGITS= 1
  LABLAXIS        = "Quality"
  DEPEND_0        = time_tags__C1_CP_EFW_L2_EB
END_VARIABLE      = E_quality__C1_CP_EFW_L2_EB
```

5.13. Level 2 Data – BB

5.13.1. Format

See section 4.1.

5.13.2. Standard

See section 4.2.

5.13.3. Production Procedure

See section 4.3.

5.13.4. Quality Control Procedure

See section 4.4.

5.13.5. Delivery Procedure

See section 4.5.

5.13.6. Product Specification

Magnetic field vector in the ISR2 coordinate system (mV/m). Internal burst time resolution (450 s^{-1}).

5.13.7. Metadata Specification

5.13.7.1. File information

FILE_NAME = "C1_CP_EFW_L2_BB__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.13.7.2. Global Mission Metadata

See Appendix 1.

5.13.7.3. Global Observatory Metadata

See Appendix 2.

5.13.7.4. Experiment Metadata

See Appendix 3.

5.13.7.5. Instrument Metadata

See Appendix 4.

5.13.7.6. Dataset Metadata

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_META    =  DATA_TYPE
  ENTRY       =  "CP"
END_META      =  DATA_TYPE
START_META    =  DATASET_ID
   ENTRY      =  "C1_CP_EFW_L2_BB"
END_META      =  DATASET_ID
START_META    =  DATASET_TITLE
  ENTRY       =  "B-field, ISR2 (internal burst)"
END_META      =  DATASET_TITLE
START_META    =  DATASET_DESCRIPTION
  ENTRY       =  "This dataset contains measurements of the"
  ENTRY       =  "Magnetic field (internal burst)"
  ENTRY       =  "from the EFW experiment on the Cluster C1 spacecraft"
```

```
  ENTRY      =  " "
  ENTRY      =  "Detailed quality information is provided as a 16 bit set of flags"
  ENTRY      =  "in the parameter B_bitmask__C1_CP_EFW_L2_EB. The meaning of"
  ENTRY      =  "the bits is as follows (LSB numbering starting at 0):"
  ENTRY      =  "Bit  0: Reset."
  ENTRY      =  "Bit  1: N/A."
  ENTRY      =  "Bit  2: Probe latchup."
  ENTRY      =  "Bits 3-15: N/A."
END_META     =  DATASET_DESCRIPTION
START_META   =  DATASET_CAVEATS
  ENTRY      =  "Various potential problems in the data have been treated automatically"
  ENTRY      =  "in the CAA data processing. Examples are solar wind, lobe, and"
  ENTRY      =  "plasmaspheric wakes. Data quality is indicated by the variable"
  ENTRY      =  "B_quality__C1_CP_EFW_L2_BB (4=best quality). Detailed quality"
  ENTRY      =  "information is given in the 16-bit variable B_bitmask__C1_CP_EFW_L2_EB."
  ENTRY      =  "Please refer to the DATASET_DESCRIPTION information above for details."
  ENTRY      =  ""
  ENTRY      =  "For more information on data quality and how the CAA data are processed,"
  ENTRY      =  "please consult the EFW CAA Users Guide and the EFW CAA Interface Control"
  ENTRY      =  "Document (ICD)."
  ENTRY      =  ""
  ENTRY      =  "The timing can be inaccurate if the TCOR is not applied:"
  ENTRY      =  "*C1_CQ_DWP_TCOR"
END_META     =  DATASET_CAVEATS
START_META   =  TIME_RESOLUTION
  ENTRY      =  0.0022222
END_META     =  TIME_RESOLUTION
START_META   =  MIN_TIME_RESOLUTION
  ENTRY      =  0.0022222
END_META     =  MIN_TIME_RESOLUTION
START_META   =  MAX_TIME_RESOLUTION
  ENTRY      =  0.0022222
END_META     =  MAX_TIME_RESOLUTION
START_META   =  PROCESSING_LEVEL
  ENTRY      =  "Calibrated"
END_META     =  PROCESSING_LEVEL

START_META   =  FILE_TYPE
  ENTRY      =  "cef"
END_META     =  FILE_TYPE
START_META   =  DATASET_VERSION
  ENTRY      =  "3"
        (To be updated as appropriate)
END_META     =  DATASET_VERSION
START_META   =  LOGICAL_FILE_ID
  ENTRY      =  "C1_CP_EFW_L2_PB__20010201_V00"
        (Date, Start time and End time as appropriate)
        (Version to be updated as appropriate)
END_META     =  LOGICAL_FILE_ID
START_META   =  VERSION_NUMBER
  ENTRY      =  "00"
        (To be updated as appropriate)
END_META     =  VERSION_NUMBER
START_META   =  FILE_TIME_SPAN
  VALUE_TYPE =  ISO_TIME_RANGE
  ENTRY      =  2001-02-01T00:00:00.000000Z/2001-02-02T00:00:00.000000Z
        (To be updated as appropriate)
END_META     =  FILE_TIME_SPAN
```

```
START_META     =   GENERATION_DATE
  VALUE_TYPE  =   ISO_TIME
  ENTRY       =   2010-09-03T01:42:08.347447Z
        (To be updated as appropriate)
END_META       =   GENERATION_DATE
```

5.13.7.7. Variables

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_VARIABLE    = time_tags__C1_CP_EFW_L2_BB
 PARAMETER_TYPE    = "Support_Data"
 VALUE_TYPE      = ISO_TIME
 DELTA_PLUS      = 0
 DELTA_MINUS     = 0
 FILLVAL         = 9999-12-31T23:59:59Z
 LABLAXIS        = "UT"
 FIELDNAM        = "Universal Time"
END_VARIABLE      = time_tags__C1_CP_EFW_L2_BB
!
START_VARIABLE      = B_Vec_xyz_ISR2__C1_CP_EFW_L2_BB
 PARAMETER_TYPE    = "Data"
 SIZES           = 3
 VALUE_TYPE        = FLOAT
 ENTITY          = "Magnetic_Field"
 PROPERTY          = "Vector"
 FLUCTUATIONS      = "Waveform"
 CATDESC           = "Magnetic field (internal burst)"
 FIELDNAM          = "Magnetic field (internal burst)"
 SI_CONVERSION     = "1.0e-3>T"
 UNITS           = "nT"
 FILLVAL           = -1000000000.000
 QUALITY           = B_quality__C1_CP_EFW_L2_BB
 SIGNIFICANT_DIGITS= 6
 PARAMETER_CAVEATS = "*C1_CP_EFW_L2_BB"
 COORDINATE_SYSTEM = "ISR2"
 FRAME_VELOCITY    = "Observatory"
 TENSOR_ORDER      = 1
 REPRESENTATION_1  = "x", "y", "z"
 LABEL_1           = "Bx", "By", "Bz"
 LABLAXIS          = "B"
 DEPEND_0          = time_tags__C1_CP_EFW_L2_BB
END_VARIABLE        = B_Vec_xyz_ISR2__C1_CP_EFW_L2_BB
!
START_VARIABLE      = B_bitmask__C1_CP_EFW_L2_BB
 PARAMETER_TYPE    = "Support_Data"
 SIZES           = 1
 VALUE_TYPE        = INT
 ENTITY          = "Magnetic_Field"
 PROPERTY          = "Status"
 CATDESC           = "Magnetic field (internal burst) measurement quality bitmask"
 FIELDNAM          = "Magnetic field (internal burst) measurement quality bitmask"
 SI_CONVERSION     = "1>unitless"
 UNITS           = "unitless"
 FILLVAL           = 0
 SIGNIFICANT_DIGITS= 5
 LABLAXIS          = "Bitmask"
 DEPEND_0          = time_tags__C1_CP_EFW_L2_BB
END_VARIABLE        = B_bitmask__C1_CP_EFW_L2_BB
!
```

```
START_VARIABLE      = B_quality__C1_CP_EFW_L2_BB
  PARAMETER_TYPE    = "Support_Data"
  SIZES             = 1
  VALUE_TYPE        = INT
  ENTITY            = "Magnetic_Field"
  PROPERTY          = "Status"
  CATDESC           = "Magnetic field (internal burst) measurement quality flag (4=best)"
  FIELDNAM          = "Magnetic field (internal burst) measurement quality flag (4=best)"
  SI_CONVERSION     = "1>unitless"
  UNITS             = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 1
  LABLAXIS          = "Quality"
  DEPEND_0          = time_tags__C1_CP_EFW_L2_BB
END_VARIABLE        = B_quality__C1_CP_EFW_L2_BB
```

5.14. Level 3 Data – P

5.14.1. Format

See section 4.1.

5.14.2. Standard

See section 4.2.

5.14.3. Production Procedure

See section 4.3.

5.14.4. Quality Control Procedure

See section 4.4.

5.14.5. Delivery Procedure

See section 4.5.

5.14.6. Product Specification

Average potential of selected probes relative to spacecraft (V). The probes selected for the average are normally all probes in the electric field mode (as opposed to density mode). 4 sec time resolution (0.25 s-1), obtained as a time average of the full time resolution data.

5.14.7. Metadata Specification

5.14.7.1. Global Mission Metadata

See Appendix 1.

5.14.7.2. File information

FILE_NAME = "C1_CP_EFW_L3_P__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.14.7.3. Global Observatory Metadata

See Appendix 2.

5.14.7.4. Experiment Metadata

See Appendix 3.

5.14.7.5. Dataset Metadata

```
        (C1, C2, C3 or C4 as appropriate)START_META    =  DATA_TYPE
  ENTRY     =  "CP"
END_META     =  DATA_TYPE
START_META    =  DATASET_ID
  ENTRY     =  "C1_CP_EFW_L3_P"
END_META     =  DATASET_ID
START_META    =  DATASET_TITLE
  ENTRY     =  "Spacecraft potential (4 sec resolution)"
END_META     =  DATASET_TITLE
START_META    =  DATASET_DESCRIPTION
  ENTRY     =  "This dataset contains measurements of the"
  ENTRY     =  "negative of the Spacecraft potential (4 sec resolution)"
  ENTRY     =  "from the EFW experiment on the Cluster C1 spacecraft"
END_META     =  DATASET_DESCRIPTION
START_META    =  DATASET_CAVEATS
  ENTRY     =  "Level 3 quantity P is the negative of the spacecraft potential,"
  ENTRY     =  "calculated by averaging the Level 2 quantity P over 4 seconds."
  ENTRY     =  ""
  ENTRY     =  "For more information on data quality and how the CAA data are processed,"
  ENTRY     =  "please consult the EFW CAA Users Guide and the EFW CAA Interface Control"
  ENTRY     =  "Document (ICD)."
ENTRY     =  " "
  ENTRY     =  "Detailed quality information is provided as a 16 bit set of
flags"
  ENTRY     =  "in the parameter P_bitmask__C1_CP_EFW_L3_P. The meaning of
"
  ENTRY     =  "the bits is as follows (LSB numbering starting at 0):"
  ENTRY     =  "Bit  0: Reset."
  ENTRY     =  "Bit  1: Bad bias."
  ENTRY     =  "Bit  2: Probe latchup."
  ENTRY     =  "Bit  3: Low density saturation (-68V)."
  ENTRY     =  "Bits 4-12: N/A"
  ENTRY     =  "Bit 13: Whisper operating."
  ENTRY     =  "Bit 14: Saturation due to high bias current."
  ENTRY     =  "Bit 15: N/A"
END_META     =  DATASET_CAVEATS
START_META    =  TIME_RESOLUTION
  ENTRY     =  4
END_META     =  TIME_RESOLUTION
START_META    =  MIN_TIME_RESOLUTION
  ENTRY     =  4
END_META     =  MIN_TIME_RESOLUTION
START_META    =  MAX_TIME_RESOLUTION
  ENTRY     =  4
END_META     =  MAX_TIME_RESOLUTION
START_META    =  PROCESSING_LEVEL
  ENTRY     =  "Calibrated"
END_META     =  PROCESSING_LEVEL
START_META    =  DATASET_VERSION
  ENTRY     =  "3"
END_META     =  DATASET_VERSION
START_META    =  LOGICAL_FILE_ID
  ENTRY     =  "C4_CP_EFW_L3_P__20020101_V00"
```

```
END_META      =  LOGICAL_FILE_ID
START_META    =  VERSION_NUMBER
  ENTRY       =  "00"
END_META      =  VERSION_NUMBER
START_META    =  FILE_TIME_SPAN
  VALUE_TYPE  =  ISO_TIME_RANGE
  ENTRY       =  2002-01-01T00:00:00.000000Z/2002-01-02T00:00:00.000000Z
END_META      =  FILE_TIME_SPAN
START_META    =  GENERATION_DATE
  VALUE_TYPE  =  ISO_TIME
  ENTRY       =  2010-12-01T14:40:03.178469Z
END_META      =  GENERATION_DATE
START_META    =  FILE_CAVEATS
  ENTRY       =  ""
END_META      =  FILE_CAVEATS
```

5.14.7.6. Variables

```
        (C1, C2, C3 or C4 as appropriate)START_VARIABLE    = time_tags__C1_CP_EFW_L3_P
  PARAMETER_TYPE    = "Support_Data"
  VALUE_TYPE      = ISO_TIME
  DELTA_PLUS      = 2
  DELTA_MINUS     = 2
  FILLVAL         = 9999-12-31T23:59:59Z
  LABLAXIS        = "UT"
  FIELDNAM        = "Universal Time"
END_VARIABLE      = time_tags__C1_CP_EFW_L3_P
!
START_VARIABLE      = Spacecraft_potential__C1_CP_EFW_L3_P
  PARAMETER_TYPE    = "Data"
  SIZES           = 1
  VALUE_TYPE        = FLOAT
  ENTITY          = "Instrument"
  PROPERTY          = "Probe_Potential"
  FLUCTUATIONS      = "Waveform"
  CATDESC           = "Spacecraft potential (4 sec resolution)"
  FIELDNAM          = "Spacecraft potential (4 sec resolution)"
  SI_CONVERSION     = "1>V"
  UNITS           = "V"
  FILLVAL           = -1000000000.000
  QUALITY           = P_quality__C1_CP_EFW_L3_P
  SIGNIFICANT_DIGITS= 6
  PARAMETER_CAVEATS = "*C1_CP_EFW_L3_P"
  LABLAXIS          = "-Sc pot"
  DEPEND_0          = time_tags__C1_CP_EFW_L3_P
END_VARIABLE        = Spacecraft_potential__C1_CP_EFW_L3_P
!
START_VARIABLE      = P_probes__C1_CP_EFW_L3_P
  PARAMETER_TYPE    = "Support_Data"
  SIZES           = 1
  VALUE_TYPE        = INT
  ENTITY          = "Instrument"
  PROPERTY          = "Status"
  CATDESC           = "Probes used for Spacecraft potential measurement"
  FIELDNAM          = "Probes used for Spacecraft potential measurement"
  SI_CONVERSION     = "1>unitless"
  UNITS           = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 4
```

```
  LABLAXIS         = "Probes"
  DEPEND_0         = time_tags__C1_CP_EFW_L3_P
END_VARIABLE       = P_probes__C1_CP_EFW_L3_P
!
START_VARIABLE     = ASPOC_status__C1_CP_EFW_L3_P
  PARAMETER_TYPE   = "Support_Data"
  SIZES            = 1
  VALUE_TYPE       = INT
  ENTITY           = "Instrument"
  PROPERTY         = "Status"
  CATDESC          = "ASPOC status bit (1=active)"
  FIELDNAM         = "ASPOC status bit (1=active)"
  SI_CONVERSION    = "1>unitless"
  UNITS            = "unitless"
  FILLVAL          = 0
  SIGNIFICANT_DIGITS= 1
  LABLAXIS         = "ASPOC_ON"
  DEPEND_0         = time_tags__C1_CP_EFW_L3_P
END_VARIABLE       = ASPOC_status__C1_CP_EFW_L3_P
!
START_VARIABLE     = P_bitmask__C1_CP_EFW_L3_P
  PARAMETER_TYPE   = "Support_Data"
  SIZES            = 1
  VALUE_TYPE       = INT
  ENTITY           = "Instrument"
  PROPERTY         = "Status"
  CATDESC          = "Spacecraft potential measurement quality bitmask"
  FIELDNAM         = "Spacecraft potential measurement quality bitmask"
  SI_CONVERSION    = "1>unitless"
  UNITS            = "unitless"
  FILLVAL          = 0
  SIGNIFICANT_DIGITS= 5
  LABLAXIS         = "Bitmask"
  DEPEND_0         = time_tags__C1_CP_EFW_L3_P
END_VARIABLE       = P_bitmask__C1_CP_EFW_L3_P
!
START_VARIABLE     = P_quality__C1_CP_EFW_L3_P
  PARAMETER_TYPE   = "Support_Data"
  SIZES            = 1
  VALUE_TYPE       = INT
  ENTITY           = "Instrument"
  PROPERTY         = "Status"
  CATDESC          = "Spacecraft potential measurement quality flag (4=best)"
  FIELDNAM         = "Spacecraft potential measurement quality flag (4=best)"
  SI_CONVERSION    = "1>unitless"
  UNITS            = "unitless"
  FILLVAL          = 0
  SIGNIFICANT_DIGITS= 1
  LABLAXIS         = "Quality"
  DEPEND_0         = time_tags__C1_CP_EFW_L3_P
END_VARIABLE       = P_quality__C1_CP_EFW_L3_P
```

5.15. Level 3 Data – E

5.15.1. Format

See section 4.1.

5.15.2. Standard

See section 4.2.

5.15.3. Production Procedure

See section 4.3.

5.15.4. Quality Control Procedure

See section 4.4.

5.15.5. Delivery Procedure

See section 4.5.

5.15.6. Product Specification

Electric field vector in the ISR2 coordinate system (mV/m). The vector is an incomplete vector, with only components x and y (in the spin plane) defined; the z component (along the spin axis) is zero. 4 sec time resolution (0.25 s-1), obtained by least-squares sine wave fits to the full time resolution data. Also the standard deviation of the least-squares fit is included (mV/m).

5.15.7. Metadata Specification

5.15.7.1. File information

FILE_NAME = "C1_CP_EFW_L3_E__20010518_044500_095960_V01.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.15.7.2. Global Mission Metadata

See Appendix 1.

5.15.7.3. Global Observatory Metadata

See Appendix 2.

5.15.7.4. Experiment Metadata

See Appendix 3.

5.15.7.5. Instrument Metadata

See Appendix 4.

5.15.7.6. Dataset Metadata

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_META    =  DATA_TYPE
  ENTRY       =  "CP"
END_META      =  DATA_TYPE
START_META    =  DATASET_ID
  ENTRY       =  "C1_CP_EFW_L3_E"
END_META      =  DATASET_ID
START_META    =  DATASET_TITLE
  ENTRY       =  "2D E-field, ISR2, spacecraft frame (4 sec resolution)"
END_META      =  DATASET_TITLE
START_META    =  DATASET_DESCRIPTION
```

```
  ENTRY     =  "This dataset contains measurements of the"
  ENTRY     =  "Electric field (4 sec resolution)"
  ENTRY     =  "from the EFW experiment on the Cluster C1 spacecraft"
  ENTRY     =  " "
  ENTRY     =  "Detailed quality information is provided as a 16 bit set of flags"
  ENTRY     =  "in the parameter E_bitmask__C1_CP_EFW_L3_E. The meaning of"
  ENTRY     =  "the bits is as follows (LSB numbering starting at 0):"
  ENTRY     =  "Bit  0: Reset."
  ENTRY     =  "Bit  1: Bad bias."
  ENTRY     =  "Bit  2: Probe latchup."
  ENTRY     =  "Bit  3: Low density saturation (-68V)."
  ENTRY     =  "Bit  4: Sweep (collection and dump)."
  ENTRY     =  "Bit  5: Burst dump."
  ENTRY     =  "Bit  6: Non-standard operations (NS_OPS)."
  ENTRY     =  "Bit  7: Manual flag."
  ENTRY     =  "Bit  8: Not used."
  ENTRY     =  "Bit  9: Not used."
  ENTRY     =  "Bit 10: Solar wind wake correction applied."
  ENTRY     =  "Bit 11: Lobe wake."
  ENTRY     =  "Bit 12: Plasmaspheric wake."
  ENTRY     =  "Bit 13: Whisper operating."
  ENTRY     =  "Bit 14: Saturation due to high bias current."
  ENTRY     =  "Bit 15: Bias current DAC not responding correctly."
END_META    =  DATASET_DESCRIPTION
START_META  =  DATASET_CAVEATS
  ENTRY     =  "Level 3 quantity E is the electric field in the spin plane, calculated"
  ENTRY     =  "from a sine wave least-squares fit to the raw data Level 1 quantity P12"
  ENTRY     =  "or P34, depending on which quantity is available."
  ENTRY     =  ""
  ENTRY     =  "Various potential problems in the data have been treated automatically"
  ENTRY     =  "in the CAA data processing. Examples are solar wind, lobe, and"
  ENTRY     =  "plasmaspheric wakes. Data quality is indicated by the variable"
  ENTRY     =  "E_quality__C1_CP_EFW_L3_E (4=best quality). Detailed quality"
  ENTRY     =  "information is given in the 16-bit variable E_bitmask__C1_CP_EFW_L3_E."
  ENTRY     =  "Please refer to the DATASET_DESCRIPTION metadata for details."
  ENTRY     =  ""
  ENTRY     =  "For more information on data quality and how the CAA data are processed,"
  ENTRY     =  "please consult the EFW CAA Users Guide and the EFW CAA Interface Control"
  ENTRY     =  "Document (ICD)."
  ENTRY     =  ""
  ENTRY     =  "Note that the observations are done in the ISR2 spin plane. The spin"
  ENTRY     =  "axis component is not available, so the resulting measurement is not the"
  ENTRY     =  "full 3D electric field vector."
END_META    =  DATASET_CAVEATS
START_META  =  TIME_RESOLUTION
  ENTRY     =  4
END_META    =  TIME_RESOLUTION
START_META  =  MIN_TIME_RESOLUTION
  ENTRY     =  4
END_META    =  MIN_TIME_RESOLUTION
START_META  =  MAX_TIME_RESOLUTION
  ENTRY     =  4
END_META    =  MAX_TIME_RESOLUTION
START_META  =  PROCESSING_LEVEL
  ENTRY     =  "Calibrated"
END_META    =  PROCESSING_LEVEL

START_META  =  FILE_TYPE
```

```
  ENTRY      =  "cef"
END_META     =  FILE_TYPE
START_META   =  DATASET_VERSION
  ENTRY      =  "3"
        (To be updated as appropriate)
END_META     =  DATASET_VERSION
START_META   =  LOGICAL_FILE_ID
  ENTRY      =  "C1_CP_EFW_L3_E__20010201_V00"
        (Date, Start time and End time as appropriate)
        (Version to be updated as appropriate)
END_META     =  LOGICAL_FILE_ID
START_META   =  VERSION_NUMBER
  ENTRY      =  "00"
        (To be updated as appropriate)
END_META     =  VERSION_NUMBER
START_META   =  FILE_TIME_SPAN
  VALUE_TYPE =  ISO_TIME_RANGE
  ENTRY      =  2001-02-01T00:00:00.000000Z/2001-02-02T00:00:00.000000Z
        (To be updated as appropriate)
END_META     =  FILE_TIME_SPAN
START_META   =  GENERATION_DATE
  VALUE_TYPE =  ISO_TIME
  ENTRY      =  2009-01-03T01:42:27.090717Z
        (To be updated as appropriate)
END_META     =  GENERATION_DATE
START_META   =  FILE_CAVEATS
  ENTRY      =  "2001-02-01T00:00:00.000Z/2001-02-01T00:32:00.000Z Probe pair p34"
  ENTRY      =  "2001-02-01T00:00:00.000Z/2001-02-01T00:32:00.000Z ISR2 offsets: dEx=0.55
dEy=0.00, dAmp=1.10"
  ENTRY      =  "2001-02-01T00:00:00.000Z/2001-02-01T00:32:00.000Z p34 offset (ISR2): dEx=0.00
dEy=0.00"
        (To be updated as appropriate)
END_META     =  FILE_CAVEATS
```

5.15.7.7. Variables

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_VARIABLE   = time_tags__C1_CP_EFW_L3_E
 PARAMETER_TYPE   = "Support_Data"
 VALUE_TYPE     = ISO_TIME
 DELTA_PLUS     = 2
 DELTA_MINUS    = 2
 FILLVAL        = 9999-12-31T23:59:59Z
 LABLAXIS       = "UT"
 FIELDNAM       = "Universal Time"
END_VARIABLE     = time_tags__C1_CP_EFW_L3_E
!
START_VARIABLE     = E_Vec_xy_ISR2__C1_CP_EFW_L3_E
 PARAMETER_TYPE   = "Data"
 SIZES          = 2
 VALUE_TYPE       = FLOAT
 ENTITY         = "Electric_Field"
 PROPERTY         = "Vector"
 FLUCTUATIONS     = "Waveform"
 CATDESC          = "Electric field (4 sec resolution)"
 FIELDNAM         = "Electric field (4 sec resolution)"
 SI_CONVERSION    = "1.0e-3>V m^-1"
 UNITS          = "mV/m"
```

```
  FILLVAL          = -1000000000.000
  QUALITY          = E_quality__C1_CP_EFW_L3_E
  SIGNIFICANT_DIGITS= 6
  COORDINATE_SYSTEM = "ISR2"
  FRAME_VELOCITY    = "Observatory"
  TENSOR_ORDER      = 1
  REPRESENTATION_1  = "x", "y"
  LABEL_1           = "Ex", "Ey"
  LABLAXIS          = "E"
  DEPEND_0          = time_tags__C1_CP_EFW_L3_E
END_VARIABLE        = E_Vec_xy_ISR2__C1_CP_EFW_L3_E
!
START_VARIABLE      = E_sigma__C1_CP_EFW_L3_E
  PARAMETER_TYPE    = "Data"
  SIZES             = 1
  VALUE_TYPE        = FLOAT
  ENTITY            = "Electric_Field"
  PROPERTY          = "Magnitude"
  FLUCTUATIONS      = "Fluctuation_Level"
  CATDESC           = "Electric field standard deviation"
  FIELDNAM          = "Electric field standard deviation"
  SI_CONVERSION     = "1.0e-3>V m^-1"
  UNITS             = "mV/m"
  FILLVAL           = -1000000000.000
  QUALITY           = E_quality__C1_CP_EFW_L3_E
  SIGNIFICANT_DIGITS= 6
  LABLAXIS          = "St dev"
  DEPEND_0          = time_tags__C1_CP_EFW_L3_E
END_VARIABLE        = E_sigma__C1_CP_EFW_L3_E
!
START_VARIABLE      = E_bitmask__C1_CP_EFW_L3_E
  PARAMETER_TYPE    = "Support_Data"
  SIZES             = 1
  VALUE_TYPE        = INT
  ENTITY            = "Electric_Field"
  PROPERTY          = "Status"
  CATDESC           = "Electric field measurement quality bitmask"
  FIELDNAM          = "Electric field measurement quality bitmask"
  SI_CONVERSION     = "1>unitless"
  UNITS             = "unitless"
  FILLVAL           = 0
  SIGNIFICANT_DIGITS= 5
  LABLAXIS          = "Bitmask"
  DEPEND_0          = time_tags__C1_CP_EFW_L3_E
END_VARIABLE        = E_bitmask__C1_CP_EFW_L3_E
!
START_VARIABLE      = E_quality__C1_CP_EFW_L3_E
  PARAMETER_TYPE    = "Support_Data"
  SIZES             = 1
  VALUE_TYPE        = INT
  ENTITY            = "Electric_Field"
  PROPERTY          = "Status"
  CATDESC           = "Electric field measurement quality flag (4=best)"
  FIELDNAM          = "Electric field measurement quality flag (4=best)"
  SI_CONVERSION     = "1>unitless"
  UNITS             = "unitless"
  FILLVAL           = 0
  QUALITY           = 0
```

SIGNIFICANT_DIGITS= 1
LABLAXIS = "Quality"
DEPEND_0 = time_tags__C1_CP_EFW_L3_E
END_VARIABLE = E_quality__C1_CP_EFW_L3_E

5.16. Level 3 Data – DER

5.16.1. Format

See section 4.1.

5.16.2. Standard

See section 4.2.

5.16.3. Production Procedure

See section 4.3.

5.16.4. Quality Control Procedure

See section 4.4.

5.16.5. Delivery Procedure

See section 4.5.

5.16.6. Product Specification

Raw data DC offsets of probe potential difference signals p12/p32 and p34. If 4 probes are available, the 1st component is offset in p12 and the 2nd component is offset in p34. If 3 probes are available, the 1st component is offset in p32 and the 2nd component is offset in p34. See also Appendix 7 for detailed description.

5.16.7. Metadata Specification

5.16.7.1. File information

FILE_NAME = "C1_CP_EFW_L3_DER__20010201_V00.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.16.7.2. Global Mission Metadata

See Appendix 1.

5.16.7.3. Global Observatory Metadata

See Appendix 2.

5.16.7.4. Experiment Metadata

See Appendix 3.

5.16.7.5. Instrument Metadata

See Appendix 4.

5.16.7.6. Dataset Metadata

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_META    =  DATA_TYPE
  ENTRY       =  "CP"
END_META      =  DATA_TYPE
START_META    =  DATASET_ID
  ENTRY       =  "C1_CP_EFW_L3_DER"
END_META      =  DATASET_ID
START_META    =  DATASET_TITLE
  ENTRY       =  "Raw E-field offsets (4 sec resolution)"
END_META      =  DATASET_TITLE
START_META    =  DATASET_DESCRIPTION
  ENTRY       =  "This dataset contains DC offsets of raw (spinning) electric"
  ENTRY       =  "field signal measured by different probe pairs of the EFW"
  ENTRY       =  "experiment on the Cluster C1 spacecraft"
END_META      =  DATASET_DESCRIPTION
START_META    =  TIME_RESOLUTION
  ENTRY       =  4
END_META      =  TIME_RESOLUTION
START_META    =  MIN_TIME_RESOLUTION
  ENTRY       =  4
END_META      =  MIN_TIME_RESOLUTION
START_META    =  MAX_TIME_RESOLUTION
  ENTRY       =  4
END_META      =  MAX_TIME_RESOLUTION
START_META    =  PROCESSING_LEVEL
  ENTRY       =  "Calibrated"
END_META      =  PROCESSING_LEVEL
START_META    =  DATASET_CAVEATS
  ENTRY       =  "*C1_CQ_EFW_DER"
END_META      =  DATASET_CAVEATS

START_META    =  FILE_TYPE
  ENTRY       =  "cef"
END_META      =  FILE_TYPE
START_META    =  DATASET_VERSION
  ENTRY       =  "3"
        (To be updated as appropriate)
END_META      =  DATASET_VERSION
START_META    =  LOGICAL_FILE_ID
  ENTRY       =  "C1_CP_EFW_L3_DER__20010201_V00"
        (Date, Start time and End time as appropriate)
        (Version to be updated as appropriate)
END_META      =  LOGICAL_FILE_ID
START_META    =  VERSION_NUMBER
  ENTRY       =  "00"
        (To be updated as appropriate)
END_META      =  VERSION_NUMBER
START_META    =  FILE_TIME_SPAN
  VALUE_TYPE  =  ISO_TIME_RANGE
  ENTRY       =  2001-02-01T00:00:00.000000Z/2001-02-02T00:00:00.000000Z
        (To be updated as appropriate)
END_META      =  FILE_TIME_SPAN
START_META    =  GENERATION_DATE
  VALUE_TYPE  =  ISO_TIME
  ENTRY       =  2009-01-03T01:42:27.599707Z
        (To be updated as appropriate)
END_META      =  GENERATION_DATE
START_META    =  FILE_CAVEATS
```

```
  ENTRY      =   "2001-02-01T00:00:00.000Z/2001-02-01T00:32:00.000Z Probe pairs p12,p34"
        (To be updated as appropriate)
END_META     =   FILE_CAVEATS
```

5.16.7.7. Variables

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_VARIABLE    = time_tags__C1_CP_EFW_L3_DER
  PARAMETER_TYPE    = "Support_Data"
  VALUE_TYPE      = ISO_TIME
  DELTA_PLUS      = 2
  DELTA_MINUS     = 2
  FILLVAL         = 9999-12-31T23:59:59Z
  LABLAXIS        = "UT"
  FIELDNAM        = "Universal Time"
END_VARIABLE      = time_tags__C1_CP_EFW_L3_DER
!
START_VARIABLE      = dER__C1_CP_EFW_L3_DER
  PARAMETER_TYPE    = "Support_Data"
  SIZES           = 2
  VALUE_TYPE        = FLOAT
  ENTITY          = "Electric_Field"
  PROPERTY          = "Vector"
  FLUCTUATIONS      = "Waveform"
  CATDESC           = "Raw electric field DC offset (p12/32, p34)"
  FIELDNAM          = "Raw electric field DC offset (p12/32, p34)"
  SI_CONVERSION     = "1.0e-3>V m-1"
  UNITS           = "mV/m"
  FILLVAL           = -1000000000.000
  QUALITY           = 3
  SIGNIFICANT_DIGITS= 6
  COORDINATE_SYSTEM = "SC"
  REPRESENTATION_1  = "x", "y"
  LABEL_1           = "p12/32", "p34"
  LABLAXIS          = "E DC offset"
  DEPEND_0          = time_tags__C1_CP_EFW_L3_DER
END_VARIABLE        = dER__C1_CP_EFW_L3_DER
```

5.17. Level 3 Data – SFIT

5.17.1. Format

See section 4.1.

5.17.2. Standard

See section 4.2.

5.17.3. Production Procedure

See section 4.3.

5.17.4. Quality Control Procedure

See section 4.4.

5.17.5. Delivery Procedure

See section 4.5.

5.17.6. Product Specification

Raw data DC offsets of probe potential difference signals p12/p32 and p34. If 4 probes are available, the 1st component is offset in p12 and the 2nd component is offset in p34. If 3 probes are available, the 1st component is offset in p32 and the 2nd component is offset in p34. See also Appendix 7 for detailed description.

5.17.7. Metadata Specification

5.17.7.1. File information

FILE_NAME = "C1_CP_EFW_L3_SFIT__20010201_V00.cef"
(C1, C2, C3 or C4 as appropriate)
(Date, Start time and End time as appropriate)
(Version to be updated as appropriate)
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"

5.17.7.2. Global Mission Metadata

See Appendix 1.

5.17.7.3. Global Observatory Metadata

See Appendix 2.

5.17.7.4. Experiment Metadata

See Appendix 3.

5.17.7.5. Instrument Metadata

See Appendix 4.

5.17.7.6. Dataset Metadata

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_META    =  DATA_TYPE
  ENTRY       =  "CP"
END_META      =  DATA_TYPE
START_META    =  DATASET_ID
  ENTRY       =  "C1_CP_EFW_L3_SFIT"
END_META      =  DATASET_ID
START_META    =  DATASET_TITLE
  ENTRY       =  "Spinfits from the individual probe pairs (4 sec resolution)"
END_META      =  DATASET_TITLE
START_META    =  DATASET_DESCRIPTION
  ENTRY       =  "This dataset contains spinfits of the electric field"
  ENTRY       =  "from the individual probe pairs (4 sec resolution,"
  ENTRY       =  "every point corresponds to a fit of 4 sec-long interval)"
  ENTRY       =  "from the EFW experiment on the Cluster CXXX spacecraft"
  ENTRY       =  "Note that the nominal probe pairs are p12 and p34."
  ENTRY       =  "In case of failed probe 1, p12 is replaced by p32."
END_META      =  DATASET_DESCRIPTION
START_META    =  DATASET_CAVEATS
  ENTRY       =  "The electric field is not corrected for the ISR2 offsets"
  ENTRY       =  "and not validated. Please use CXXX_CP_EFW_L3_E if you"
  ENTRY       =  "need data of scientific quality"
END_META      =  DATASET_CAVEATS
START_META    =  TIME_RESOLUTION
  ENTRY       =  4
```

```
END_META      =  TIME_RESOLUTION
START_META    =  MIN_TIME_RESOLUTION
  ENTRY       =  4
END_META      =  MIN_TIME_RESOLUTION
START_META    =  MAX_TIME_RESOLUTION
  ENTRY       =  4
END_META      =  MAX_TIME_RESOLUTION
START_META    =  PROCESSING_LEVEL
  ENTRY       =  "Calibrated"
END_META      =  PROCESSING_LEVEL

START_META    =  FILE_TYPE
  ENTRY       =  "cef"
END_META      =  FILE_TYPE
START_META    =  DATASET_VERSION
  ENTRY       =  "3"
        (To be updated as appropriate)
END_META      =  DATASET_VERSION
START_META    =  LOGICAL_FILE_ID
  ENTRY       =  "C1_CP_EFW_L3_SFIT__20010201_V00"
        (Date, Start time and End time as appropriate)
        (Version to be updated as appropriate)
END_META      =  LOGICAL_FILE_ID
START_META    =  VERSION_NUMBER
  ENTRY       =  "00"
        (To be updated as appropriate)
END_META      =  VERSION_NUMBER
START_META    =  FILE_TIME_SPAN
  VALUE_TYPE  =  ISO_TIME_RANGE
  ENTRY       =  2001-02-01T00:00:00.000000Z/2001-02-02T00:00:00.000000Z
        (To be updated as appropriate)
END_META      =  FILE_TIME_SPAN
START_META    =  GENERATION_DATE
  VALUE_TYPE  =  ISO_TIME
  ENTRY       =  2010-11-02T10:25:04.070545Z
        (To be updated as appropriate)
END_META      =  GENERATION_DATE
START_META    =  FILE_CAVEATS
  ENTRY       =  "P12 & P34 data."
        (To be updated as appropriate)
END_META      =  FILE_CAVEATS
```

5.17.7.7. Variables

(C1 may be replaced by C2, C3 or C4 as appropriate)

```
START_VARIABLE    = time_tags__C1_CP_EFW_L3_SFIT
 PARAMETER_TYPE    = "Support_Data"
 VALUE_TYPE      = ISO_TIME
 DELTA_PLUS      = 2
 DELTA_MINUS     = 2
 FILLVAL         = 9999-12-31T23:59:59Z
 LABLAXIS        = "UT"
 FIELDNAM        = "Universal Time"
END_VARIABLE      = time_tags__C1_CP_EFW_L3_SFIT
!
START_VARIABLE      = EP12_Vec_xy_ISR2__C1_CP_EFW_L3_SFIT
 PARAMETER_TYPE    = "Data"
 SIZES           = 2
```

```
  VALUE_TYPE        = FLOAT
  ENTITY            = "Electric_Field"
  PROPERTY          = "Vector"
  FLUCTUATIONS      = "Waveform"
  CATDESC           = "Electric field (spinfit p12/p32)"
  FIELDNAM          = "Electric field (spinfit p12/p32)"
  SI_CONVERSION     = "1.0e-3>V m^-1"
  UNITS             = "mV/m"
  FILLVAL           = -1000000000.000
  QUALITY           = 3
  SIGNIFICANT_DIGITS= 6
  COORDINATE_SYSTEM = "ISR2"
  FRAME_VELOCITY    = "Observatory"
  TENSOR_ORDER      = 1
  REPRESENTATION_1  = "x", "y"
  LABEL_1           = "Ex (p12/p32)", "Ey (p12/p32)"
  LABLAXIS          = "E (p12/p32)"
  DEPEND_0          = time_tags__C1_CP_EFW_L3_SFIT
END_VARIABLE        = EP12_Vec_xy_ISR2__C1_CP_EFW_L3_SFIT
!
START_VARIABLE      = EP12_sigma__C1_CP_EFW_L3_SFIT
  PARAMETER_TYPE    = "Data"
  SIZES             = 1
  VALUE_TYPE        = FLOAT
  ENTITY            = "Electric_Field"
  PROPERTY          = "Magnitude"
  FLUCTUATIONS      = "Fluctuation_Level"
  CATDESC           = "Electric field standard deviation (p12/p32)"
  FIELDNAM          = "Electric field standard deviation (p12/p32)"
  SI_CONVERSION     = "1.0e-3>V m^-1"
  UNITS             = "mV/m"
  FILLVAL           = -1000000000.000
  QUALITY           = 3
  SIGNIFICANT_DIGITS= 6
  LABLAXIS          = "St dev (p12/p32)"
  DEPEND_0          = time_tags__C1_CP_EFW_L3_SFIT
END_VARIABLE        = EP12_sigma__C1_CP_EFW_L3_SFIT
!
START_VARIABLE      = EP34_Vec_xy_ISR2__C1_CP_EFW_L3_SFIT
  PARAMETER_TYPE    = "Data"
  SIZES             = 2
  VALUE_TYPE        = FLOAT
  ENTITY            = "Electric_Field"
  PROPERTY          = "Vector"
  FLUCTUATIONS      = "Waveform"
  CATDESC           = "Electric field (spinfit p34)"
  FIELDNAM          = "Electric field (spinfit p34)"
  SI_CONVERSION     = "1.0e-3>V m^-1"
  UNITS             = "mV/m"
  FILLVAL           = -1000000000.000
  QUALITY           = 3
  SIGNIFICANT_DIGITS= 6
  COORDINATE_SYSTEM = "ISR2"
  FRAME_VELOCITY    = "Observatory"
  TENSOR_ORDER      = 1
  REPRESENTATION_1  = "x", "y"
  LABEL_1           = "Ex (p34)", "Ey (p34)"
  LABLAXIS          = "E (p34)"
```

```
  DEPEND_0         = time_tags__C1_CP_EFW_L3_SFIT
END_VARIABLE       = EP34_Vec_xy_ISR2__C1_CP_EFW_L3_SFIT
!
START_VARIABLE     = EP34_sigma__C1_CP_EFW_L3_SFIT
  PARAMETER_TYPE   = "Data"
  SIZES            = 1
  VALUE_TYPE       = FLOAT
  ENTITY           = "Electric_Field"
  PROPERTY         = "Magnitude"
  FLUCTUATIONS     = "Fluctuation_Level"
  CATDESC          = "Electric field standard deviation (p34)"
  FIELDNAM         = "Electric field standard deviation (p34)"
  SI_CONVERSION    = "1.0e-3>V m^-1"
  UNITS            = "mV/m"
  FILLVAL          = -1000000000.000
  QUALITY          = 3
  SIGNIFICANT_DIGITS= 6
  LABLAXIS         = "St dev (p34)"
  DEPEND_0         = time_tags__C1_CP_EFW_L3_SFIT
END_VARIABLE       = EP34_sigma__C1_CP_EFW_L3_SFIT
```

6. REFERENCES

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Gustafsson, G., M. André, T. Carozzi, A.I. Eriksson, C.-G. Fälthammar, R. Grard, G. Holmgren, J.A Holtet, N. Ivchenko, T. Karlsson, Y. Khotyaintsev, S. Klimov, H. Laakso, P.-A. Lindqvist, B. Lybekk, G. Marklund, F. Mozer, K. Mursula, A. Pedersen, B. Popielawska, S. Savin, K. Stasiewicz, P. Tanskanen, A. Vaivads, and J.-E. Wahlund. First results of electric field and density observations by Cluster EFW based on initial months of operation. Ann. Geophys., 19, 1219-1240, 2001.

Stenberg, G, The Cluster EFW Filter Calibration Report, 2002, http://cluster.irfu.se/efw/ops/cal/efwfcal.pdf

APPENDIX 1: GLOBAL MISSION METADATA SPECIFICATION

```
START_META = MISSION
   ENTRY  = "Cluster"
END_META   = MISSION

START_META     = MISSION_TIME_SPAN
   VALUE_TYPE = ISO_TIME_RANGE
   ENTRY      = 2000-08-16T12:39:00Z/2014-12-31T23:59:59Z
END_META       = MISSION_TIME_SPAN

START_META = MISSION_AGENCY
   ENTRY  = "ESA"
END_META   = MISSION_AGENCY

START_META = MISSION_DESCRIPTION
   ENTRY  = "The aim of the Cluster mission is to study small-scale structures of the magnetosphere "
   ENTRY  = "and its environment in three dimensions. To achieve this, Cluster is constituted of four "
   ENTRY  = "identical spacecraft that will flight in a tetrahedral configuration. The separation
distances "
   ENTRY  = "between the spacecraft will be varied between ~40 km and 10 000 km, according to the
"
   ENTRY  = "key scientific regions."
END_META   = MISSION_DESCRIPTION

START_META = MISSION_KEY_PERSONNEL
   ENTRY  = "Philippe Escoubet>Philippe.Escoubet@esa.int >Cluster Project Scientist"
END_META   = MISSION_KEY_PERSONNEL

START_META = MISSION_REFERENCES
   ENTRY  = "The Cluster and Phoenix Missions>Cluster project and instrument teams>Space Sci.
Rev. 79, Nos. 1-2, 1997"
END_META   =  MISSION_REFERENCES

START_META = MISSION_REGION
   ENTRY  = "Solar_Wind"
   ENTRY  = "Bow_Shock"
   ENTRY  = "Magnetosheath"
   ENTRY  = "Magnetopause"
   ENTRY  = "Magnetosphere"
   ENTRY  = "Magnetotail"
   ENTRY  = "Polar_Cap"
   ENTRY  = "Auroral_Region"
   ENTRY  = "Cusp"
   ENTRY  = "Radiation_Belt"
   ENTRY  = "Plasmasphere"
END_META   = MISSION_REGION

START_META = MISSION_CAVEATS
 ENTRY = "*CL"
END_META = MISSION_CAVEATS
```

APPENDIX 2: GLOBAL OBSERVATORY METADATA SPECIFICATION

A2.1 Cluster-1

```
START_META    =   OBSERVATORY
   ENTRY      =   "Cluster-1"
END_META      =   OBSERVATORY

START_META    =   OBSERVATORY_CAVEATS
   ENTRY      =   "*C1_CQ"
END_META      =   OBSERVATORY_CAVEATS

START_META    = OBSERVATORY_DESCRIPTION
   ENTRY      = "Cluster-1 (Rumba)"
   ENTRY      = "Launched: 09 Aug 2000"
   ENTRY      = "ESA Number: 1"
   ENTRY      = "COSPAR ID: 2000-045A"
   ENTRY      = "USSPACECOM catalogue number 26463"
   ENTRY      = "CSDS Code: C1"
   ENTRY      = "ESOC FD code: S1"
   ENTRY      = "ESA Flight Model Number: FM5"
END_META      = OBSERVATORY_DESCRIPTION

START_META    = OBSERVATORY_TIME_SPAN
   VALUE_TYPE = ISO_TIME_RANGE
   ENTRY      = 2000-07-16T12:39:00Z/2014-12-31T23:59:59Z
END_META      = OBSERVATORY_TIME_SPAN

START_META = OBSERVATORY_REGION
   ENTRY  = "Solar_Wind"
   ENTRY  = "Bow_Shock"
   ENTRY  = "Magnetosheath"
   ENTRY  = "Magnetopause"
   ENTRY  = "Magnetosphere"
   ENTRY  = "Magnetotail"
   ENTRY  = "Polar_Cap"
   ENTRY  = "Auroral_Region"
   ENTRY  = "Cusp"
   ENTRY  = "Radiation_Belt"
   ENTRY  = "Plasmasphere"
END_META   = OBSERVATORY_REGION
```

A2.2 Cluster-2

```
START_META    =   OBSERVATORY
  ENTRY       =   "Cluster-2"
END_META      =   OBSERVATORY
!
START_META    =   OBSERVATORY_CAVEATS
  ENTRY       =   "*C2_CQ"
```

```
END_META      =   OBSERVATORY_CAVEATS
!
START_META    = OBSERVATORY_DESCRIPTION
  ENTRY       = "Cluster-2 (Salsa)"
  ENTRY       = "Launched: 16 Jul 2000"
  ENTRY       = "ESA Number: 2"
  ENTRY       = "COSPAR ID: 2000-041B"
  ENTRY       = "USSPACECOM catalogue number: 26411"
  ENTRY       = "CSDS Code: C2"
  ENTRY       = "ESOC FD code: S2"
  ENTRY       = "ESA Flight Model Number: FM6"
END_META      = OBSERVATORY_DESCRIPTION
!
START_META    = OBSERVATORY_TIME_SPAN
  VALUE_TYPE  = ISO_TIME_RANGE
  ENTRY       = 2000-07-16T12:39:00Z/2014-12-31T23:59:59Z
END_META      = OBSERVATORY_TIME_SPAN
!
START_META = OBSERVATORY_REGION
   ENTRY      = "Solar_Wind"
   ENTRY      = "Bow_Shock"
   ENTRY      = "Magnetosheath"
   ENTRY      = "Magnetopause"
   ENTRY      = "Magnetosphere"
   ENTRY      = "Magnetotail"
   ENTRY      = "Polar_Cap"
   ENTRY      = "Auroral_Region"
   ENTRY      = "Cusp"
   ENTRY      = "Radiation_Belt"
   ENTRY      = "Plasmasphere"
END_META   = OBSERVATORY_REGION
```

A2.3 Cluster-3

```
START_META    =   OBSERVATORY
ENTRY     = "Cluster-3"
END_META      = OBSERVATORY

START_META    = OBSERVATORY_CAVEATS
   ENTRY      = "*C3_CQ"
END_META      = OBSERVATORY_CAVEATS

START_META    = OBSERVATORY_DESCRIPTION
   ENTRY      = "Cluster-3 (Samba)"
   ENTRY      = "Launched: 16 Jul 2000"
   ENTRY      = "ESA Number: 3"
   ENTRY      = "COSPAR ID: 2000-041A"
   ENTRY      = "USSPACECOM catalogue number: 26410"
   ENTRY      = "CSDS Code: C3"
   ENTRY      = "ESOC FD code: S3"
   ENTRY      = "ESA Flight Model Number: FM7"
END_META      = OBSERVATORY_DESCRIPTION

START_META     = OBSERVATORY_TIME_SPAN
   VALUE_TYPE  = ISO_TIME_RANGE
   ENTRY       = 2000-07-16T12:39:00Z/2014-12-31T23:59:59Z
END_META       = OBSERVATORY_TIME_SPAN
```

```
!
START_META = OBSERVATORY_REGION
   ENTRY      = "Solar_Wind"
   ENTRY      = "Bow_Shock"
   ENTRY      = "Magnetosheath"
   ENTRY      = "Magnetopause"
   ENTRY      = "Magnetosphere"
   ENTRY      = "Magnetotail"
   ENTRY      = "Polar_Cap"
   ENTRY      = "Auroral_Region"
   ENTRY      = "Cusp"
   ENTRY      = "Radiation_Belt"
   ENTRY      = "Plasmasphere"
END_META   = OBSERVATORY_REGION
```

A2.4 Cluster-4

```
START_META     =   OBSERVATORY
   ENTRY      =   "Cluster-4"
END_META       =   OBSERVATORY

START_META     =   OBSERVATORY_CAVEATS
   ENTRY      =   "*C4_CQ"
END_META       =   OBSERVATORY_CAVEATS

START_META     = OBSERVATORY_DESCRIPTION
   ENTRY      = "Cluster-4 (Tango)"
   ENTRY      = "Launched: 9 Aug 2000"
   ENTRY      = "ESA Number: 4"
   ENTRY      = "COSPAR ID: 2000-045B"
   ENTRY      = "USSPACECOM catalogue number: 26464"
   ENTRY      = "CSDS Code: C4"
   ENTRY      = "ESOC FD code: S4"
   ENTRY      = "ESA Flight Model Number: FM8"
END_META       = OBSERVATORY_DESCRIPTION

START_META     = OBSERVATORY_TIME_SPAN
   VALUE_TYPE = ISO_TIME_RANGE
   ENTRY      = 2000-07-16T12:39:00Z/2014-12-31T23:59:59Z
END_META       = OBSERVATORY_TIME_SPAN

START_META = OBSERVATORY_REGION
   ENTRY  = "Solar_Wind"
   ENTRY  = "Bow_Shock"
   ENTRY  = "Magnetosheath"
   ENTRY  = "Magnetopause"
   ENTRY  = "Magnetosphere"
   ENTRY  = "Magnetotail"
   ENTRY  = "Polar_Cap"
   ENTRY  = "Auroral_Region"
   ENTRY  = "Cusp"
   ENTRY  = "Radiation_Belt"
   ENTRY  = "Plasmasphere"
END_META   = OBSERVATORY_REGION
```

APPENDIX 3: EXPERIMENT METADATA SPECIFICATION

```
START_META    =  EXPERIMENT
  ENTRY       =  "EFW"
END_META      =  EXPERIMENT

START_META    =  EXPERIMENT_DESCRIPTION
  ENTRY       =  "Electric Field and Wave Experiment"
END_META      =  EXPERIMENT_DESCRIPTION

START_META    =  INVESTIGATOR_COORDINATES
  ENTRY       =  "Mats Andre>PI>Mats.Andre@irfu.se"
  ENTRY       =  "Georg Gustafsson>former PI(-2000)>Georg.Gustafsson@irfu.se"
END_META      =  INVESTIGATOR_COORDINATES

START_META    =  EXPERIMENT_REFERENCES
  ENTRY       =  "http://www.cluster.irfu.se/"
END_META      =  EXPERIMENT_REFERENCES

START_META    =  EXPERIMENT_KEY_PERSONNEL
  ENTRY       =  "Mats Andre>PI>Mats.Andre@irfu.se"
  ENTRY       =  "Anders Eriksson>Operations manager>Anders.Eriksson@irfu.se"
  ENTRY       =  "Per-Arne Lindqvist>former archive manager>Per-Arne.Lindqvist@alfvenlab.kth.se"
  ENTRY       =  "Yuri Khotyaintsev>Archive manager>Yuri.Khotyaintsev@irfu.se"
END_META      =  EXPERIMENT_KEY_PERSONNEL

START_META    =  EXPERIMENT_CAVEATS
  ENTRY       =  "*CL_CQ_EFW_CAVEATS"
END_META      =  EXPERIMENT_CAVEATS

START_META    =  INSTRUMENT_TYPE
  ENTRY       =  "Double_Sphere"
END_META      =  INSTRUMENT_TYPE

START_META    =  MEASUREMENT_TYPE
  ENTRY       =  "Electric_Field"
END_META      =  MEASUREMENT_TYPE

START_META    =  CONTACT_COORDINATES
  ENTRY       =  "Mats Andre>PI>Mats.Andre@irfu.se"
END_META      =  CONTACT_COORDINATES

START_META    =  ACKNOWLEDGEMENT
  ENTRY       =  "Please acknowledge the EFW team and ESA CAA in any"
  ENTRY       =  "publication based upon use of these data"
END_META      =  ACKNOWLEDGEMENT
```

APPENDIX 4: INSTRUMENT METADATA SPECIFICATION

A4.1 Cluster-1

```
START_META    =   INSTRUMENT_NAME
  ENTRY       =  "EFW1"
END_META      =   INSTRUMENT_NAME
START_META    =   INSTRUMENT_DESCRIPTION
  ENTRY       =  "EFW Experiment on Cluster C1"
END_META      =   INSTRUMENT_DESCRIPTION
!
START_META    =   INSTRUMENT_CAVEATS
  ENTRY       =  "Events:"
  ENTRY       =  ""
  ENTRY       =  "2001-12-28 03:03 Probe 1 failed"
  ENTRY       =  "2009-10-17 07:00 Probe 4 failed"
  ENTRY       =  ""
  ENTRY       =  "Implications:"
  ENTRY       =  ""
  ENTRY       =  "Before 2001-12-28 C1 EFW uses all probes, and full time resolution"
  ENTRY       =  "vector electric field data are available using 4 probes in the spin"
  ENTRY       =  "plane."
  ENTRY       =  "After 2001-12-28 C1 EFW uses only 3 probes, and full time resolution"
  ENTRY       =  "vector electric field data are available using only 3 probes in the spin"
  ENTRY       =  "plane. The effect is reduced quality in the full time resolution"
  ENTRY       =  "electric field data (25 samples/s in NM, 450 samples/s in BM)."
  ENTRY       =  "Spacecraft potential data and 4-second resolution electric field data"
  ENTRY       =  "are not affected."
  ENTRY       =  "After 2009-10-17 no full resolution data available."
  ENTRY       =  "All products have reduced quality."
END_META      =   INSTRUMENT_CAVEATS
```

A4.2 Cluster-2

```
START_META    =   INSTRUMENT_NAME
  ENTRY       =  "EFW2"
END_META      =   INSTRUMENT_NAME
START_META    =   INSTRUMENT_DESCRIPTION
  ENTRY       =  "EFW Experiment on Cluster C2"
END_META      =   INSTRUMENT_DESCRIPTION
!
START_META    =   INSTRUMENT_CAVEATS
  ENTRY       =  "Events:"
  ENTRY       =  ""
  ENTRY       =  "2001-07-23 13:53 Probe 3 10Hz filter failed"
  ENTRY       =  "2007-05-13 03:24 Probe 1 failed"
  ENTRY       =  ""
  ENTRY       =  "Implications:"
  ENTRY       =  ""
  ENTRY       =  "Before 2001-07-23 C2 EFW operates nominally."
  ENTRY       =  "After 2001-07-23 C2 EFW uses the 180Hz filter (normally used in BM for"
  ENTRY       =  "sampling data at 450 samples/s) instead of the 10Hz filter for NM data"
  ENTRY       =  "sampling at 25 samples/s. The effect is a small risk of aliasing in the"
  ENTRY       =  "full time resolution electric field data in NM (25 samples/s)."
```

```
  ENTRY    =  "Spacecraft potential data and 4-second resolution electric field data"
  ENTRY    =  "are not affected."
  ENTRY    =  ""
  ENTRY    =  "Before 2007-05-13 C2 EFW uses all probes, and full time resolution"
  ENTRY    =  "vector electric field data are available using 4 probes in the spin"
  ENTRY    =  "plane."
  ENTRY    =  "After 2007-05-13 C2 EFW uses only 3 probes, and full time resolution"
  ENTRY    =  "vector electric field data are available using only 3 probes in the spin"
  ENTRY    =  "plane. The effect is reduced quality in the full time resolution"
  ENTRY    =  "electric field data (25 samples/s in NM, 450 samples/s in BM)."
  ENTRY    =  "Spacecraft potential data and 4-second resolution electric field data"
  ENTRY    =  "are not affected."
END_META    =  INSTRUMENT_CAVEATS
```

A4.3 Cluster-3

```
START_META   =  INSTRUMENT_NAME
  ENTRY    =  "EFW3"
END_META    =  INSTRUMENT_NAME
START_META   =  INSTRUMENT_DESCRIPTION
  ENTRY    =  "EFW Experiment on Cluster C3"
END_META    =  INSTRUMENT_DESCRIPTION
!
START_META   =  INSTRUMENT_CAVEATS
  ENTRY    =  "Events:"
  ENTRY    =  ""
  ENTRY    =  "2002-07-29 09:07 Probe 1 failed"
  ENTRY    =  "2011-03-05 18:13 -- 2011-06-01 Wec OFF"
  ENTRY    =  "2011-06-01 09:31 Probe 3 failed"
  ENTRY    =  ""
  ENTRY    =  "Implications:"
  ENTRY    =  ""
  ENTRY    =  "Before 2002-07-29 C3 EFW uses all probes, and full time resolution"
  ENTRY    =  "vector electric field data are available using 4 probes in the spin"
  ENTRY    =  "plane."
  ENTRY    =  "After 2002-07-29 C3 EFW uses only 3 probes, and full time resolution"
  ENTRY    =  "vector electric field data are available using only 3 probes in the spin"
  ENTRY    =  "plane. The effect is reduced quality in the full time resolution"
  ENTRY    =  "electric field data (25 samples/s in NM, 450 samples/s in BM)."
  ENTRY    =  "Spacecraft potential data and 4-second resolution electric field data"
  ENTRY    =  "are not affected."
  ENTRY    =  "After 2011-06-01 no full resolution data available."
  ENTRY    =  "All products have reduced quality."
END_META    =  INSTRUMENT_CAVEATS
```

A4.4 Cluster-4

```
START_META   =  INSTRUMENT_NAME
  ENTRY    =  "EFW4"
END_META    =  INSTRUMENT_NAME
START_META   =  INSTRUMENT_DESCRIPTION
  ENTRY    =  "EFW Experiment on Cluster C4"
END_META    =  INSTRUMENT_DESCRIPTION
!
START_META   =  INSTRUMENT_CAVEATS
```

```
   ENTRY      =   "Events:"
   ENTRY      =   ""
   ENTRY      =   "no events reported yet"
END_META      =   INSTRUMENT_CAVEATS
```