

An artistic illustration of the ESA Cluster mission. It shows four spacecraft orbiting Earth, which is visible in the lower-left corner. The spacecraft are connected by a network of thin lines, representing the magnetic field lines. A large, bright sun is in the upper-right corner, and the background is filled with stars. The title 'The ESA Cluster Active Archive' is centered in the upper half of the image.

# The ESA Cluster Active Archive

C.H. Perry, T. Eriksson, P. Escoubet, S. Esson, H. Laakso, S. McCaffrey, S. Sanderson, H. Bowen, A. Allen and C. Harvey

- Overview
- Standards – data formats and metadata
- Infrastructure – hardware and network
- Products – raw data, processed data
- Tools and information systems
- Web based data access
- Availability for beta testing
- Summary

## *Aims of the CAA:-*

- The CAA should contain (all) the Cluster high resolution data
- The data should be of the best (achievable) quality
- The data should be suitable for detailed science investigations
- Data should be publicly accessible (no data rights)
- Need to start now while expertise still available

ESA providing support to instrument teams to ensure this

In addition the CAA will hold ancillary products and support information including

- Auxiliary data (such as orbit and attitude)
- Survey data and plots
- CSDS data including JSOC parameters
- Documentation



## The CAA Metadata working group has developed the CAA Metadata Dictionary (CAA-CDPP-TN-0002)

- Metadata provides a standard machine readable way of storing descriptions of the data
- The metadata is used to aid the consistent location and handling of all data products and in particular the digital parameter (science) data
- There has been much iteration between CAA and instrument teams. A minor update (v2.02) of the MDD is due out shortly
- Interoperability issues being addressed in conjunction with SPASE (Space Physics Search and Exchange)

# Standards – Digital Parameter Data

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The CAA Data Formats working group has developed the Cluster Exchange Format (DS-QMW-TN0010)

- ASCII format suitable for long term archival
- Simple tabular, comma separated format
- Self describing via CAA metadata header
- Standard gzip compression used for efficient storage

CAA also plan to allow receipt and delivery of data in binary NASA CDF format

- CAA will translate CDF data to CEF for long term storage

Conceptually the files making up a dataset are treated as a single time series.

# Standards – Digital Parameter Data

```
!----- CEF ASCII FILE -----
FILE_NAME           = "C1_JP_PSE_20001001_V13.cef"
FILE_FORMAT_VERSION = "CEF-2.0"
END_OF_RECORD_MARKER = "$"
!-----
START_META          = LOGICAL_FILE_ID
  ENTRY             = "C1_JP_PSE_20001001_V13"
END_META            = LOGICAL_FILE_ID
START_META          = VERSION_NUMBER
  ENTRY             = "13"
END_META            = VERSION_NUMBER
START_META          = FILE_TIME_SPAN
  VALUE_TYPE        = ISO_TIME_RANGE
  ENTRY             = 2000-10-01T00:00:00Z/2000-10-31T22:22:14Z
END_META            = FILE_TIME_SPAN
START_META          = GENERATION_DATE
  VALUE_TYPE        = ISO_TIME
  ENTRY             = 2000-09-22T13:29:00.000Z
END_META            = GENERATION_DATE
!-----
INCLUDE             = "C1_CH_PSE_CSDSPP.cef"
!-----
DATA_UNTIL = EOF
2000-10-01T00:15:19.068Z , "DZ" , 41 , "3" , 0.814000 , -33.7000 , 21.9000 , -60781.2 , 51415.6 , -37972.4 $
2000-10-01T00:16:05.077Z , "MZ" , 41 , "3" , 0.814000 , -33.8000 , 21.9000 , -60717.5 , 51351.9 , -37972.4 $
2000-10-01T04:03:11.067Z , "CY" , 41 , "3" , 0.880000 , -54.4000 , 22.4000 , -33767.4 , 39310.3 , -43642.7 $
2000-10-01T07:52:56.084Z , "TL" , 41 , "I" , 0.947000 , -83.0000 , 2.60000 , 1146.80 , 16947.4 , -37144.1 $
2000-10-01T09:07:05.067Z , "CZ" , 41 , "4" , 0.970000 , -58.8000 , 8.80000 , 12806.1 , 6180.10 , -28224.4 $
2000-10-01T09:35:00.081Z , "QL" , 41 , "I" , 0.978000 , -45.3000 , 9.40000 , 16565.1 , 1720.20 , -23254.9 $
2000-10-01T10:05:00.086Z , "VL" , 41 , "I" , 0.986000 , -27.6000 , 9.80000 , 19750.7 , -3185.60 , -16628.8 $
```

## CAA Hardware/Software Status

Room at ESTEC has been refurbished (air con etc)

System hardware was delivered during August 2004

Basic configuration (operating system and most third party software, CVS, web server etc) complete

System is running Debian version of Linux

MySQL Database installed

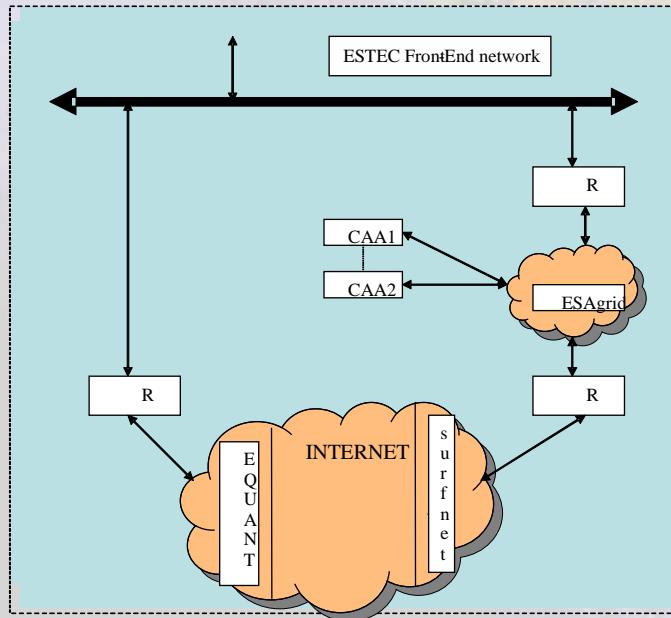
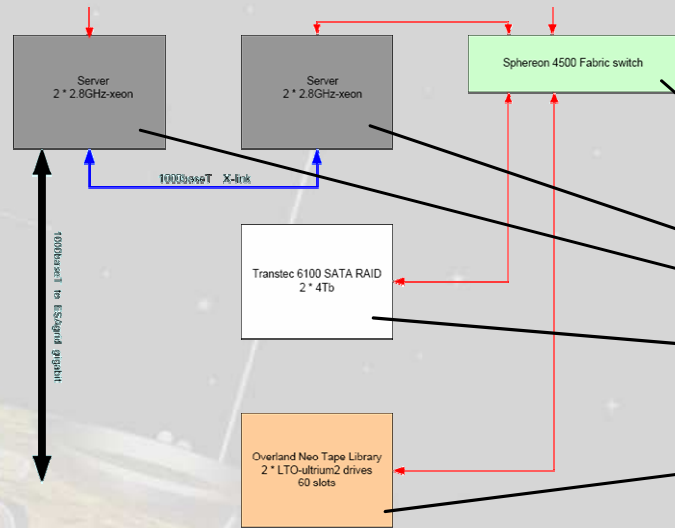
High speed network connection via ESAGrid (1 Gbit/s)

Data ingestion, cataloguing and basic web access (developed by Sinead McCaffrey) capability in place (limited to data fetch)



# CAA Infrastructure – System/Network

## System



Data	Address	Average Speed KB/s
EDI	mpe.mpg.de	750
ASPOC	rhea.iwf.oeaw.ac.at	250
CIS	cis.cesr.fr	95
WBD	cassini.physics.uiowa.edu	120
EFW	<a href="http://www.cluster.ifu.se">www.cluster.ifu.se</a>	200
RAPID	sun2.mpae.gwdg.de	850
PEACE	mssl.knmslucbaa.uk	200
WHISPER	www.lpce.cnrs.leans.fr	770
RAL	www.cluster.rl.ac.uk	650
ESOC	cdds.esoc.ops.esa.int	90

## Network

## Overview of instrument deliveries

Task Name	Start	Finish	2001												2002											
			J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
			[Gantt chart showing delivery bars for each task across the months of 2001 and 2002]																							
CEF Delivery/Ingestion Overview	Tue 02/01/01	Tue 31/12/02	[Gantt bar from Jan 2001 to Dec 2002]																							
ASPOC	Tue 02/01/01	Sat 30/06/01	[Gantt bar from Jan 2001 to Jun 2001]																							
CIS	Tue 02/01/01	Sun 30/06/02	[Gantt bar from Jan 2001 to Jun 2002]																							
DWP	Thu 01/02/01	Thu 01/02/01	[Gantt bar in Feb 2001]																							
EDI	Tue 02/01/01	Tue 31/12/02	[Gantt bar from Jan 2001 to Dec 2002]																							
EPW	Fri 02/02/01	Mon 31/12/01	[Gantt bar from Feb 2001 to Dec 2001]																							
FGM	Sat 03/02/01	Tue 01/05/01	[Gantt bar from Feb 2001 to May 2001]																							
PEACE	Tue 02/01/01	Mon 31/12/01	[Gantt bar from Jan 2001 to Dec 2001]																							
RAPID	Tue 02/01/01	Sat 30/06/01	[Gantt bar from Jan 2001 to Jun 2001]																							
STAFF	Thu 04/01/01	Mon 31/12/01	[Gantt bar from Jan 2001 to Dec 2001]																							
WHISPER	Fri 02/02/01	Fri 31/08/01	[Gantt bar from Feb 2001 to Aug 2001]																							
WBD	Sat 03/02/01	Mon 31/12/01	[Gantt bar from Feb 2001 to Dec 2001]																							

- So far for 2001:
  - About 75 datasets per spacecraft
  - More than 1 TB of CEF data in 200,000 files
- Several more TB of raw, binary Level-1 and graphical products still to be ingested.

## Products – Cluster Science Data System

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### Cluster Science Data System Prime and Summary Parameter Data.

- The CSDS PP/SP will also be ingested into the CAA
- Data will be translated from CDF to CEF
- More importantly metadata will be translated to the CAA MDD
- Availability will track provision of high resolution products
  
- Original CDF versions of the PP/SP will continue to be available from the national data centres
- PP intervals ingested into the CAA are likely also to be available as public data from the national data centres
- Updates to PP/SP will also be added to CAA but there will be a lag compared to availability via CSDS.

For the Cluster extended mission raw data delivery on CD-ROM from ESOC will cease.

- CAA will provide RDM data accessible over the network.
- DDS access will continue unchanged.
- A web based system for data retrieval has been put in place and has been undergoing testing over the last month.
- Requests can be made for just the portions of the RDM directory structure that are required, thus saving network bandwidth.
- Support for automated transfers is provided via the standard wget utility.
- Details of the interface and examples are available on the CAA technical forum.
- The operational system is expected to be available for testing next week.

### A number of tools already available to handle CEF data

- CAAtools (developed by Tobias Eriksson) provides a set of low level tools including verification of CEF syntax (CEFpass), generating XML metadata descriptions(CEF2XML) and for combining, splitting and extracting intervals from one or more files (CEFcombine)
- QSAS complete data visualisation and analysis package developed by Imperial College and Queen Mary University of London
- A set of generic IDL functions for reading CEF data are under production
- The CIS team are updating their CI visualisation package to support CEF data products
- A working group is being set up to coordinate these efforts



**esa**

## Cluster Active Archive

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### WELCOME TO THE CLUSTER ACTIVE ARCHIVE

The CAA is a database which will contain all the Cluster high resolution and other science data, together with auxiliary (orbit, attitude, command history etc) data, survey data, CSDS data and plots selected JSOC data (predicted and identified events, geometric and magnetic positions).

This temp site is currently under construction and will be released in May 2005. If you would like to register to view the pre-release version of the site (for testing/feedback purposes) please register using the link on the side menu to participate in the pre-release trials.

# CAA – Web Access

http://caa.estec.esa.int/caa\_stage/search.xml - Microsoft Internet Explorer

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Address http://caa.estec.esa.int/caa\_stage/search.xml Go

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**REGISTER**

Register for access to search utility

**CAA LOGIN**

Please enter username/password

User:

Pass:

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Forgotten User / Password?

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**WELCOME TO THE CLUSTER ACTIVE ARCHIVE**

**Error - Login Required.**

You are not logged in. Your session may have expired, or you have logged out. Please log in to search the Cluster Active Archive database.



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**CLUSTER ACTIVE ARCHIVE REGISTRATION**

Email:   
Password:   
Confirm Password:   
Surname:   
Firstname:   
Institute:   
Reason for access:   
LOGIN

If you have any problems with registration please contact us [contact us](#)  
(\*Please note any quotation marks will be removed from names.text entered)

CAA HOME > REGISTRATION  
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# CAA – Web Access

Select by time range, spacecraft, experiment, type or any combination

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### CLUSTER ACTIVE ARCHIVE SEARCH PAGE

Select search parameters below..

**Start Time** [SEARCH](#)  
(Year:Month:Day::Hour:Minute:Second)

:  :  ::  :  :

**Stop Time**  
(Year:Month:Day::Hour:Minute:Second)

:  :  ::  :  :

**Observatory**

- Cluster-1
- Cluster-2
- Cluster-3
- Cluster-4

**Experiment**

- ASPOC
- CIS
- DWP
- EDI
- EFW
- FGM
- PEACE
- RAPID
- STAFF
- WBD
- WHISPER

**Measurement Type**

- Activity\_Index
- Electric\_Field
- Energetic\_Particles
- Instrument\_Status
- Ion\_Composition
- Magnetic\_Field
- Neutral\_Atom\_Images
- Neutral\_Gas
- Particle\_Correlator
- Radio\_and\_Plasma\_Waves
- Radio\_Soundings
- Spacecraft\_Status
- Thermal\_Plasma

**Instrument Type**

- Antenna
- Channeltron
- Data\_Processing\_Unit
- Double\_Sphere
- Electron\_Drift
- Electrostatic\_Analyser
- Faraday\_Cup
- Flux\_Feedback
- HF\_Radar
- Langmuir\_Probe
- Long\_Wire
- Magnetometer
- Mass\_Spectrometer
- Micro-channel\_Plate
- Monopole
- Quadrispherical\_Analyser
- Resonance\_Sounder
- Search\_Coil
- Spacecraft\_Potential\_Control
- Spectral\_Power\_Receiver
- Waveform\_Receiver

[SEARCH](#)

**SEARCH**

**Datasets**  
Expand/Collapse

- ▼ Cluster-1
  - ▶ CIS-CODIF1
  - ▼ CIS-HIA1
    - ▶ C1\_CP\_CIS-HIA\_HS\_MAG\_IONS\_CS (3D Ion distributions for CIS-HIA, High-Sensitivity, Magnetospheric Mode)
    - ▶ C1\_CP\_CIS-HIA\_HS\_MAG\_IONS\_PEF (3D Ion distributions for CIS-HIA, High-Sensitivity, Magnetospheric Mode)
    - ▶ C1\_CP\_CIS-HIA\_HS\_MAG\_IONS\_PF (3D Ion distributions for CIS-HIA, High-Sensitivity, Magnetospheric Mode)
    - ▶ C1\_CP\_CIS-HIA\_HS\_MAG\_IONS\_RC (3D Ion distributions for CIS-HIA, High-Sensitivity, Magnetospheric Mode)
  - ▶ EDI1
  - ▼ EFW1
    - ▶ C1\_CP\_EFW\_L1\_P1 (Probe 1 to spacecraft potential)
    - ▶ C1\_CP\_EFW\_L1\_P12 (Potential difference measured between probes 1 and 2)
    - ▶ C1\_CP\_EFW\_L1\_P2 (Probe 2 to spacecraft potential)
    - ▶ C1\_CP\_EFW\_L1\_P3 (Probe 3 to spacecraft potential)
    - ▶ C1\_CP\_EFW\_L1\_P34 (Potential difference measured between probes 3 and 4)
    - ▶ C1\_CP\_EFW\_L1\_P4 (Probe 4 to spacecraft potential)
    - ▶ C1\_CP\_EFW\_L2\_EF (Electric field (high-pass filtered))
    - ▶ C1\_CP\_EFW\_L2\_P (Spacecraft potential)
    - ▶ C1\_CP\_EFW\_L3\_P (Spacecraft potential (spin resolution))
  - ▼ FGM1
    - ▶ C1\_CP\_FGM\_5VPS (Magnetic field, 5 vectors/second resolution)

http://caa.estec.esa.int/caa\_stage/tmp\_xml/C1\_CP\_FGM\_5VPS.CE...  
http://caa.estec.esa.int/caa\_s

**DATASET INFORMATION**

**Dataset**

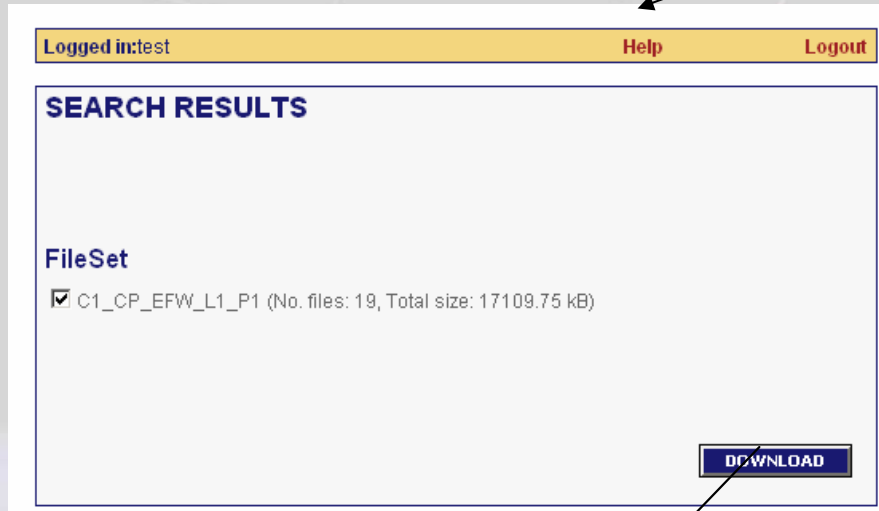
Dataset Name:	C1_CP_FGM_5VPS
Data Type:	CP>CAA Parameter
Dataset Title:	Magnetic field, 5 vectors/second resolution
Dataset Description:	This dataset contains 5 vectors/second resolution measurements of the magnetic field vector from the FGM experiment on the Cluster C1 spacecraft
CONTACT_COORDINATES:	Elizabeth Lucek>PI>e.lucek@imperial.ac.ukElizabeth Lucek>PI>e.lucek@imperial.ac.uk
TIME_RESOLUTION:	0.2000000.200000
MIN_TIME_RESOLUTION:	0.2000000.200000
MAX_TIME_RESOLUTION:	0.2000000.200000
PROCESSING_LEVE:	Calibrated
DATASET_CAVEATS:	*C1_CQ_FGM_CAVF*C1_CQ_FGM_CAVF
ACKNOWLEDGEMENT:	Please acknowledge the FGM team and ESA Cluster Active Archive in any publication based upon use of this data. Please acknowledge the FGM team and ESA Cluster Active Archive in any publication based upon use of this data.

**Parameters**

Parameter:	time_tags__C1_CP_FGM_5VPS
Parameter Type:	Support_Data
Category Description:	Interval centred time tag
Units:	s
SI_CONVERSION:	1.0>s
VALUE_TYPE:	ISO_TIME
SIGNIFICANT_DIGITS:	24
FILLVAL:	9999-12-31T23:59:59Z
FIELDNAM:	Universal Time

# CAA – Web Access

Select products to download



Logged in: test Help Logout

### SEARCH RESULTS

FileSet

C1\_CP\_EFW\_L1\_P1 (No. files: 19, Total size: 17109.75 kB)

DOWNLOAD



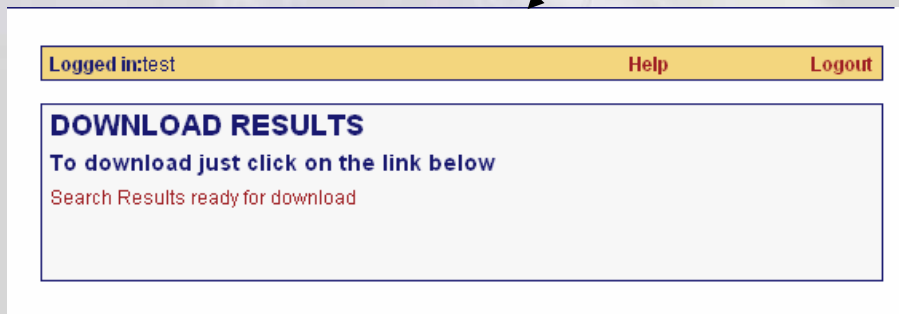
Logged in: test Help Logout

### CLUSTER ACTIVE ARCHIVE SEARCH PAGE

Select search parameters below..

You have attempted to download size of [32556584.96kB] The maximum allowed is [100000kB]

Size of single download is restricted



Logged in: test Help Logout

### DOWNLOAD RESULTS

To download just click on the link below

Search Results ready for download

Files returned in Zip file, one file per selected dataset

## CAA – Beta Testing

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The CAA web interface will be available for registration and beta testing from Monday 26<sup>th</sup> September and is expected to last for several months.

**<http://caa.estec.esa.int/>**

General caveats during the beta testing activity:-

- The system will be undergoing ongoing development and enhancement that may result in it being offline at short notice.
- There are known issues with some data products. All data retrieved should be treated with caution and instrument teams should be consulted before these data are used for serious scientific investigations.
- An inter-calibration technical working group (led by Harri Laakso) is being set up to look at areas for improvement in data quality.
- Please provide feedback either via the technical forum or e-mail the CAA team at [caateam@rssd.esa.int](mailto:caateam@rssd.esa.int)

# CAA Information Systems

Further information from <http://caa.estec.esa.int>

Technical Forum: <http://www.cluster.rl.ac.uk/caa-bin/yabb/YaBB.pl>

LiveLink: <http://www.rssd.esa.int/llink/livelink> (requires login)



Cluster Active Archive - Microsoft Internet Explorer

Address: <http://caa.estec.esa.int/Links.htm>

Cluster Active Archive

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- Instrument Teams
- Other Data Centres

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- Register for pre-release access to site

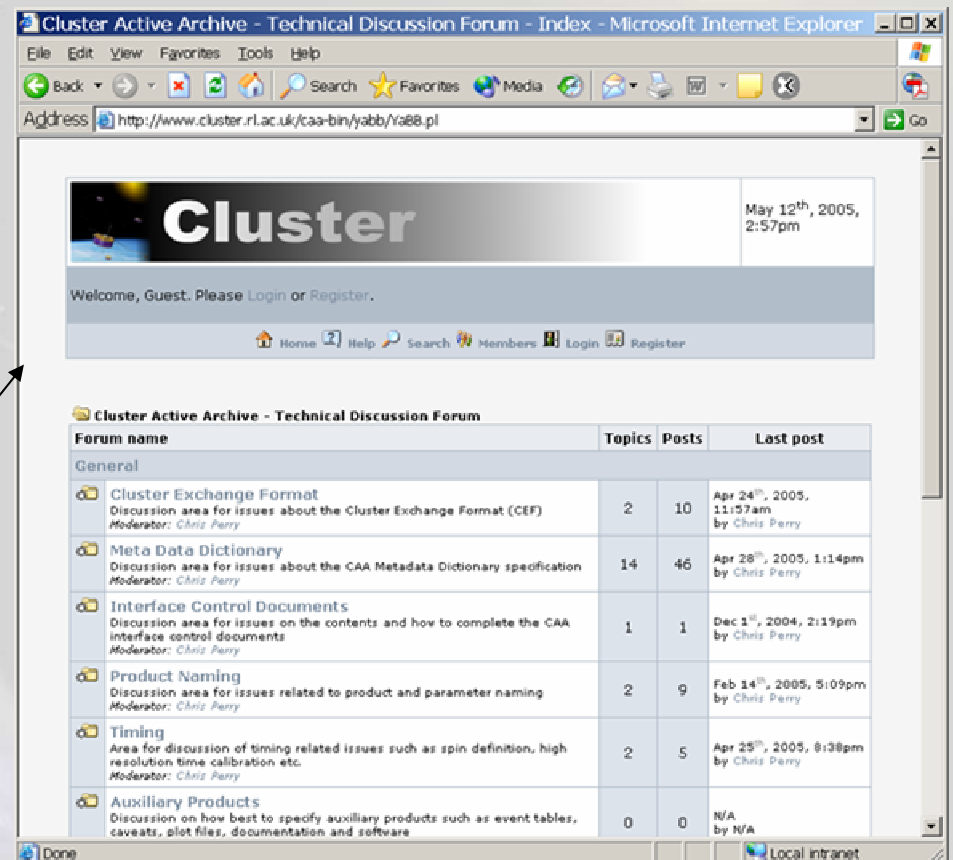
Cluster Active Archive Links

CAA documentation can be viewed by those with authorisation to **LIVELINK**.

Ongoing technical discussions can be accessed at the **Technical Discussion Forum**.

RSSD Cluster Web Pages can be viewed here

If you would like your web page referenced here please click here to contact us.



Cluster Active Archive - Technical Discussion Forum - Index - Microsoft Internet Explorer

Address: <http://www.cluster.rl.ac.uk/caa-bin/yabb/YaBB.pl>

Cluster

May 12<sup>th</sup>, 2005, 2:57pm

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**Cluster Active Archive - Technical Discussion Forum**

Forum name	Topics	Posts	Last post
<b>General</b>			
<b>Cluster Exchange Format</b> Discussion area for issues about the Cluster Exchange Format (CEF) Moderator: Chris Parry	2	10	Apr 24 <sup>th</sup> , 2005, 11:57am by Chris Parry
<b>Meta Data Dictionary</b> Discussion area for issues about the CAA Metadata Dictionary specification Moderator: Chris Parry	14	46	Apr 28 <sup>th</sup> , 2005, 1:14pm by Chris Parry
<b>Interface Control Documents</b> Discussion area for issues on the contents and how to complete the CAA interface control documents Moderator: Chris Parry	1	1	Dec 1 <sup>st</sup> , 2004, 2:19pm by Chris Parry
<b>Product Naming</b> Discussion area for issues related to product and parameter naming Moderator: Chris Parry	2	9	Feb 14 <sup>th</sup> , 2005, 5:09pm by Chris Parry
<b>Timing</b> Area for discussion of timing related issues such as spin definition, high resolution time calibration etc. Moderator: Chris Parry	2	5	Apr 25 <sup>th</sup> , 2005, 8:38pm by Chris Parry
<b>Auxiliary Products</b> Discussion on how best to specify auxiliary products such as event tables, caveats, plot files, documentation and software	0	0	N/A by N/A

## Summary

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- High resolution data from most of the Cluster instruments is starting to become available from the CAA.
- Ongoing data delivery and ingestion activities will extend the coverage and number of products available.
- Ongoing development of the user interface will concentrate on provision of access to graphical products and on demanding plotting.
- The CAA will open for beta testing next week – anyone wishing to participate in this activity is welcome to do so.

**<http://caa.estec.esa.int/>**

For further information contact: *caateam@rssd.esa.int*