Pipeline Processing System

14th ESAC SAS Workshop

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What does PPS stand for ?

PPS stands for Pipeline Processing System:

a standard data reduction pipeline for top-level products

What is the purpose of the pipeline,

- production of top-level scientific products
- serve as quick-look data to users and facilitate scientific exploitation of the data
- ensure an homogeneous level in scientific quality
  - produced with the same SAS software package available for users
  - screened and validated following some standards

The top-level products include,

- data from each **EPIC**, **RGS** and **OM** instruments
  - calibrated clean event files, sky images, source lists, spectra, time series, cross correlation multiwavelength information with archival catalogues (ACDS)

I. PPS Processing

The pipeline infrastructures was developed, maintained and run by the Survey Science Centre (SSC) at University of Leicester, UK

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Since March 1st 2012, the responsibility of running the pipeline has been transferred to the XMM-Newton Science Operations Centre (SOC) at ESAC, Spain

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General Procedure:

1) ODFs are processed by the pipeline at the SOC
2) products are sent to SOC and SSC members for screening
3) validation reports are created
4) made available through the XMM-Newton Science Archive (XSA)

Details under http://xmm.esac.esa.int/external/pipeline

II. PPS Processing

- Only public versions of SAS are used in the pipeline processing, to ensure homogeneity and reproducibility
  - When a new SAS version becomes available, it is implemented in the pipeline
- One bulk reprocessing of all available XMM observations that took place between December 1999 (the mission start) and May 2007.
- The next bulk reprocessing of the data took place in the summer of 2013 and is currently available at the XSA.
  - The current XSA contains data homogeneously processed with SAS12.0.1 or newer

PPS Contents: Scientific Products

The pipeline products include data from each **EPIC**, **RGS** and **OM** instruments.

- Calibrated clean event files
- Background flaring filtering
- Attitude history plots
- Images (with exposure, background and sensitivity maps)
- Source lists
- Source Specific Products
  - Light curves
  - Spectra (with background and ancillary file, no RMF files)
- Multiwavelength cross-correlation information
- Quick look previews
- Processing log
- Screening report

Products come in a number of **FITS**, **ASC**, **PDF**, **PNG**, **URL** and **HTML** formats.

All the information can be accessed from a single file: **index.html**

PPS Contents: index.html

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OBS Summary | PPS Summary | EPIC Summary | OM Summary | RGS Summary | Catalogue Summary

0552270501 Observation Data Summary File

Revolution	Target	Scheduled Length	Observer
1547	V2491 Cyg	39339	Dr Jan-Uwe Ness

Guest Observer Information | Proposal Target Information | Observation Record | Instrument Information | Exposure and Configuration Information

Guest Observer Information

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Proposal Target Information

Target	:	V2491 Cyg
Target RA [hms]	:	19 43 2.10
Taget Dec [dms]	:	32 19 12.80
Proposed Duration [s]	:	38600
Boresight RA [hms]	:	19 43 2.10
Boresight Dec [dms]	:	32 19 12.80
Lower Pos Ang	:	0
Upper Pos Ang	:	360
SC Pos Ang	:	N
AO	:	7
Science Type	:	B

0552270501 PPS Processing Summary

Revolution	Target	Scheduled Length	Observer
1547	V2491 Cyg	39339	Dr Jan-Uwe Ness

EPIC Exposures Processed | OM Exposures Processed | RGS Exposures Processed | Generic Products

EPIC Exposures processed by PPS

Inst.	Exp. Id	Sched	Mode	Datamode	Filter	Position	Duration	Exposure	SrcDet	SSP	Flare Scrn	Actual Start	Actual End
EMOS1	S001	Y	PrimePartialW2	Imaging	MEDIUM	FILTER_C	39013	25792	Y	Y	Y	2008-05-20T14:05:09	2008-05-21T00:55:22
EMOS2	S003	Y	PrimePartialW2	Imaging	MEDIUM	FILTER_C	39018	29692	Y	Y	Y	2008-05-20T14:05:08	2008-05-21T00:55:26
EPN	S002	Y	FastTiming	Timing	MEDIUM		38057	0	N	N	N	2008-05-20T14:24:08	2008-05-21T00:58:25

OM Exposures processed by PPS

Inst	ExpID	Sched	Detector	Mode	Data Mode	Filter	Duration	Actual Start	Actual End
OM	S006	Y	REDUNDANT	Image	Fast, imaging	UVW1	3899	2008-05-20T14:13:21	2008-05-20T15:18:20
OM	S007	Y	REDUNDANT	Image	Fast, imaging	UVW1	4399	2008-05-20T15:23:28	2008-05-20T16:36:47
OM	S010	Y	REDUNDANT	Image	Fast, imaging	UVM2	4400	2008-05-20T19:48:49	2008-05-20T21:02:09
OM	S011	Y	REDUNDANT	Image	Fast, imaging	UVM2	4400	2008-05-20T21:07:16	2008-05-20T22:20:36
OM	S012	Y	REDUNDANT	Image	Fast, imaging	UVW2	4399	2008-05-20T22:25:43	2008-05-20T23:39:02
OM	S013	Y	REDUNDANT	Image	Fast, imaging	UVW2	4399	2008-05-20T23:44:11	2008-05-21T00:57:30

RGS Exposures processed by PPS

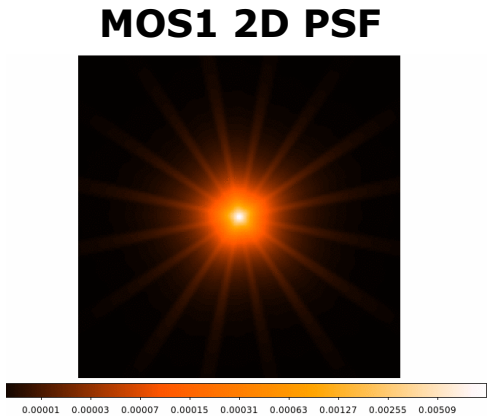
Inst.	Exp. Id	Sched	Mode	Datamode	Event Filtering	Duration	Actual Start	Actual End
RGS1	S004	Y	HighEventRateWithSES	Spectroscopy	rejflags,attGTI,hkGTI	39335	2008-05-20T14:03:53	2008-05-21T00:59:28
RGS2	S005	Y	HighEventRateWithSES	Spectroscopy	rejflags,attGTI,hkGTI	39307	2008-05-20T14:04:25	2008-05-21T00:59:32

Generic Products

Filename	Content
P0552270501OBX000ATTTSR0000.FTZ	ATTITUDE TIME SERIES
P0552270501OBX000CALIND0000.FTZ	CALIBRATION INDEX FILE
P0552270501OBX000CDSLG10000.PNG	CDS LOGO 1
P0552270501OBX000CDSLG20000.PNG	CDS LOGO 2

PPS Contents: what is new ?

- Use of new empirical 2D PSF



- Source products available for sources with > 100 counts
- Extraction regions for EPIC source products have been redesigned.
  - Source region: optimized circular (eregionanalyse)
  - Bkg region: circular with 70% useful area
- Background flaring filtering is done now on a S/N basis rather than using a fix count rate cut. The cut is placed where the S/N peaks.
- Improved astrometric corrections
- RGS spectra computed in wavelength scale
- RGS time series available

PPS Contents: I. Cross-correlation products

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Summary Pages

EPIC sources and their correlations	Correlations of EPIC sources with archival catalogues (sorted by EPIC source number). This page lists a summary of EPIC and catalogue data and provides links to finding charts and detailed catalogue extractions.
Archival content of EPIC field of view	Archival catalogue entries found in EPIC field of view (sorted by right ascension) independently of their correlation with EPIC sources. The list of catalogues searched is a subset of those queried around EPIC positions. This page gives a summary of the archival data and provides links to detailed catalogue extractions.

Archival Catalogues

Catalogues searched	List of all catalogues searched, position error properties (columns used and statistical value) and cross-correlation statistics for the observation. This page provides links to the detailed descriptions of matching catalogues.

Graphical Products

Field of view entries overlayed on an EPIC image	Positions of a selection of archival catalogue entries present in the field of view overlayed on an EPIC image.
EPIC image overlayed on a ROSAT image	XMM images are shown as red contours overlayed on a grey-scale ROSAT image extracted from pointed or survey observations. Green crosses show the positions of EPIC sources. This product is not generated when no ROSAT observation covers the EPIC field of view .

Full Catalogue Extractions

Full catalogue extractions for entries correlating with EPIC sources	All measurements available for archival entries in correlation with EPIC sources. Entries are grouped **by archival catalogue**. Direct link to this page is available from the summary page.
Full catalogue extractions for entries with positions within the EPIC field of view	All measurements available for archival entries with positions within the EPIC field of view (independently of their correlation with EPIC sources). Entries are grouped **by archival catalogue**. Direct link to this page is available from the summary page.

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PPS Contents: II. Cross-correlation products

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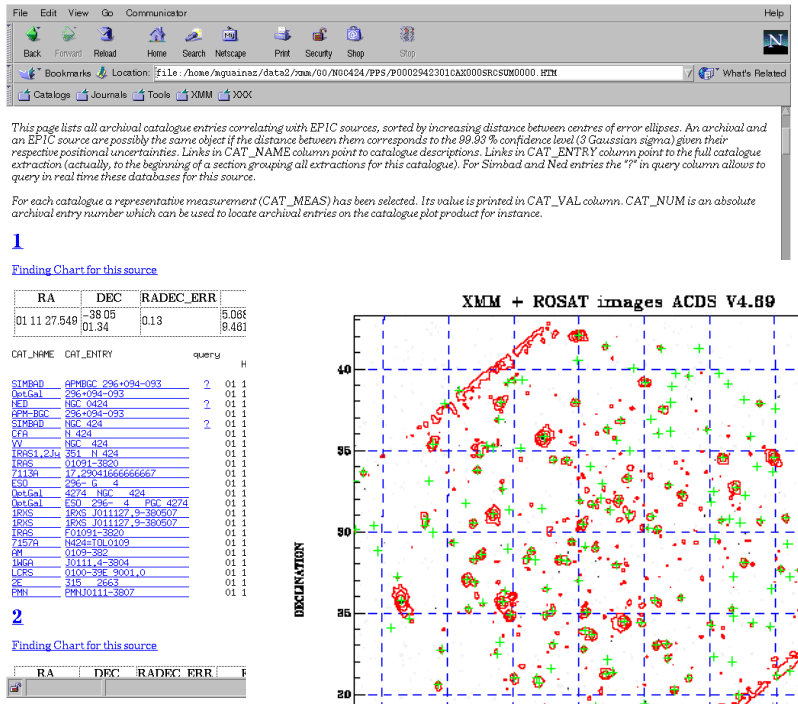


This page lists all archival catalogue entries correlating with EPIC sources, sorted by increasing distance between centres of error ellipses. An archival and an EPIC source are possibly the same object if the distance between them corresponds to the 99.93 % confidence level (3 Gaussian sigma) given their respective positional uncertainties. Links in CAT_NAME column point to catalogue descriptions. Links in CAT_ENTRY column point to the full catalogue extraction (actually, to the beginning of a section grouping all extractions for this catalogue). For Simbad and Ned entries the "?" in query column allows to query in real time these databases for this source.

For each catalogue a representative measurement (CAT_MEAS) has been selected. Its value is printed in CAT_VAL column. CAT_NUM is an absolute archival entry number which can be used to locate archival entries on the catalogue plot product for instance.

1

Finding Chart for this source

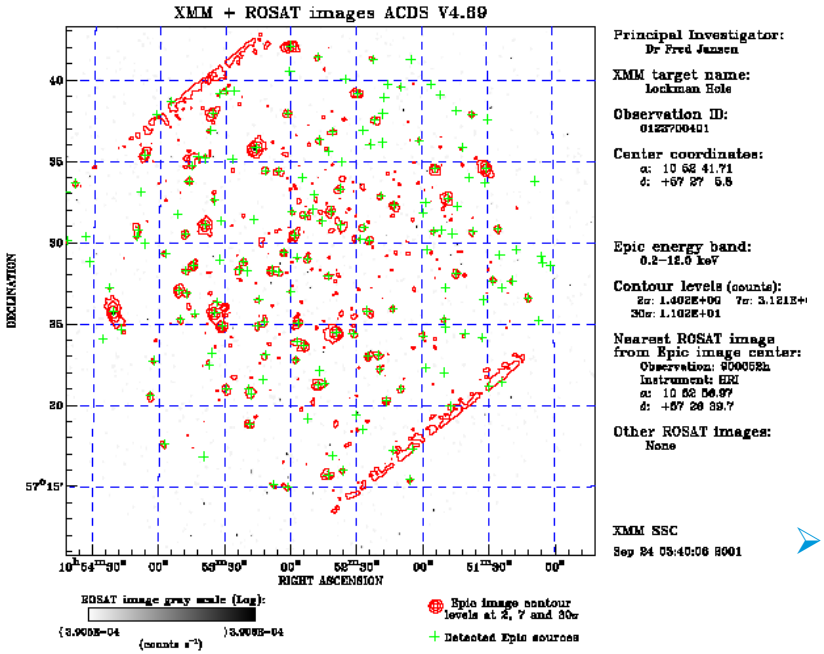
RA	DEC	RADEC_ERR	
01 11 27.549	-38 05 01.34	0.13	5.06 9.46

CAT_NAME	CAT_ENTRY	query	H
SIMBAD	APMBGC 296+094-093	2	01 1
OptGal	296+094-093		01 1
NED	NGC 0424	2	01 1
APM-BGC	296+094-093		01 1
SIMBAD	NGC 424	2	01 1
CFA	N 424		01 1
VV	NGC 424		01 1
IRAS1.2M	351 N 424		01 1
IRAS	01091-3820		01 1
7113A	17.290416666666667		01 1
ESO	296- G 4		01 1
OptGal	4274 NGC 424		01 1
OptGal	ESO 296- 4 PGC 4274		01 1
IRXS	IRXS J011127.9-380507		01 1
IRXS	IRXS J011127.9-380507		01 1
IRAS	F01091-3820		01 1
7157A	N424=TOL0109		01 1
AM	0109-382		01 1
1WGA	J0111.4-3804		01 1
LCRS	0100-39E 9001.0		01 1
2E	315 2663		01 1
PMN	PMNJ0111-3807		01 1

2

Finding Chart for this source

RA	DEC	RADEC_ERR	F



- PPS products available:
  - correlation of EPIC sources with ~100 catalogues (positional coincidence at 99.93% c.l.)
  - archive content of the EPIC field-of-view (independently on EPIC detection) in X-ray catalogues and SIMBAD
  - field-of-view entries overlaid on an EPIC image
  - EPIC image contours and detected sources overlaid on a greyscale ROSAT image
- No cross-correlation for OM sources

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PPS Contents: III. Cross-correlation products

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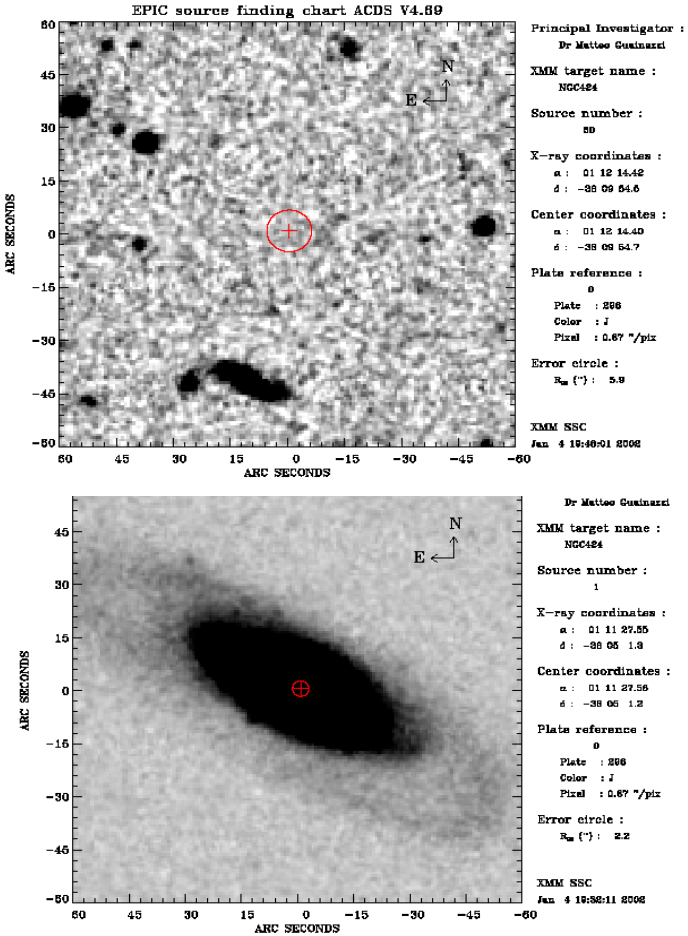

Finding Charts for every EPIC source

- 1 finding chart, 2x2 arcminutes with 1 arcsecond pixel is available for each detected EPIC source, centred on its best position
- EPIC flux contours or error circles are overlayed
- start information for follow-up programs or multiwavelength campaigns

Summary

- The PPS is an easy and good way to start looking at the data
- The products are carefully screened and the events files can be used to extract science products
- Reprocessing is only necessary in special cases
- Great wealth of correlation products and catalogue information that is very difficult to obtain by hand