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1. INTRODUCTION

The FM1 MOS Calibration was carried out on 18 November - 19 December 1997 at the IAS - Station D'Etalonnage, Campus D'Orsay in France.

The data produced by the MOS instrument was archived by the EST EGSE, together with the housekeeping data of the calibration facility and other derived data.

The Raw Archive were processed by the EST Science Console in order to produce a data set written in the EGSE Reduced Data Format to be analysed by the EPIC Data Analysis Team (CDAT).

This lead to populate an Erdf (Epic Reduced Data Files) Archive containing a set of HK and Science data files for each *exposure* (i.e. for each period among two consecutive idle status of the instrument) and a set of HK data files for each *idle* period.

Each exposure was identified by a *Run ID* number and the related files have been archived in the Erdf/Science/ and Erdf/HK subdirectories, grouped by decade of runs.

A summary of the data taking is given in Annex 1.

1.1. Purpose and scope

The aim of the present document is to describe the test configuration set up and the content of the Erdf DAT Tapes containing all the Erdf data produced during the campaign.

The Erdf DAT tapes content list is given in Annex 2.

1.2. Reference documents

[1]   L. Chiappetti, Basic requirements for processing of EPIC science telemetry, EPIC-EST-SP-005, Issue 1

[2]   EMCS Electrical I/F Specification, EPIC-EST-SP-001, Issue 3, August 1996

[3]   Format of the EPIC GSE Reduced Data Files, EPIC-EST-SP-004, Issue 1.4, February 1997

[4]   GSE Basic I/F and Operational Requirements for the EPIC Calibration at Orsay, EPIC-EST-SP-010, Issue 1.4, 22.08.97

[5]   CCOE Man Machine I/F Requirements for the EPIC Calibration at Orsay, EPIC-EST-SP-011, Issue 1.2, 16.09.97

1.3. Change Record

1.0   First issue accompaining the Erdf DAT Tapes, Version 1.

1.4. Definition, acronyms and abbreviations

AIV	Assembly, Integration and Verification
APID	Application Process Identifier
CAL-COE	Calibration Check-Out Equipment
CCOE	Central Check-Out Equipment
CDAT	Calibration and Data Team
EMCS	Epic Mos Camera System

EPCS	Epic Pn Camera System
EPIC	European Photon Imaging Camera
ERDF	EGSE Reduced Data Files
ERMS	Epic Radiation Monitor System
ESA/CCS	European Space Agency Central Check-out System
ETE-COE	End-to-End Check Out Equipment
ETOL	European Test Operation Language
EXP-COE	Experimental Check Out Equipment
FDHS EC	Fast Data Handling Simulator Engineering Console
FDHS LU	Fast Data Handling Simulator Local Unit
FITS	Flexible Image Transport System
FTP	File Transfer Protocol
FWHM	Full Width at Half Maximum
HEW	Half Energy Width
HK	Housekeeping
ISU	Interface Simulator Unit
LAN	Local Area Network
NFS	Network File System
OLA	On-Line Analysis
OOL	Out of Limit
MOVCOE	Movement Checkout Equipment
PCF	Primary Calibration File
QLA	Quick Look Analysis
SID	Structure Identifier
SQL	Structured Query Language
TBD	To Be Defined
TBV	To Be Verified
TBW	To Be Written
TM	Telemetry
XDR	eXternal Data Representation format
XMM	X-ray Multi Mirror

2.   TEST SET UP

2.1.   MOS Camera Head Configuration

The FM1 MOS under test consisted of 7 CCDs. The view from behind the CCD surface is sketched below.
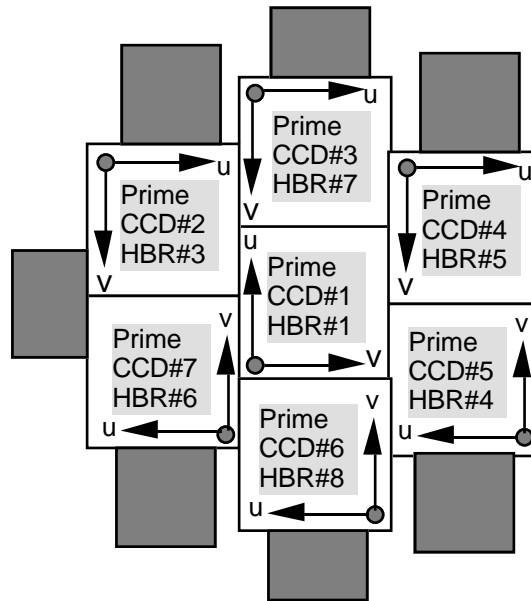
The u_i,v_i node detector coordinates are in pixel. The u coordinate ranges 0 to 609, as it includes two extra regions of 5 pixels on both sides for overscan. The v coordinate ranges 0 to 601, as it includes an extra region of 2 pixels on top.

The coordinates of an event falling in the central pixel of the 5x5 cell used by the EMCR are returned as the coordinates of the top right corner, including the extra pixels (see ref. [1], sect. 1.3.1.1).

2.2. EGSE configuration and data archiving

The data taking was conducted using the EGSE configuration depicted in fig.1 below.
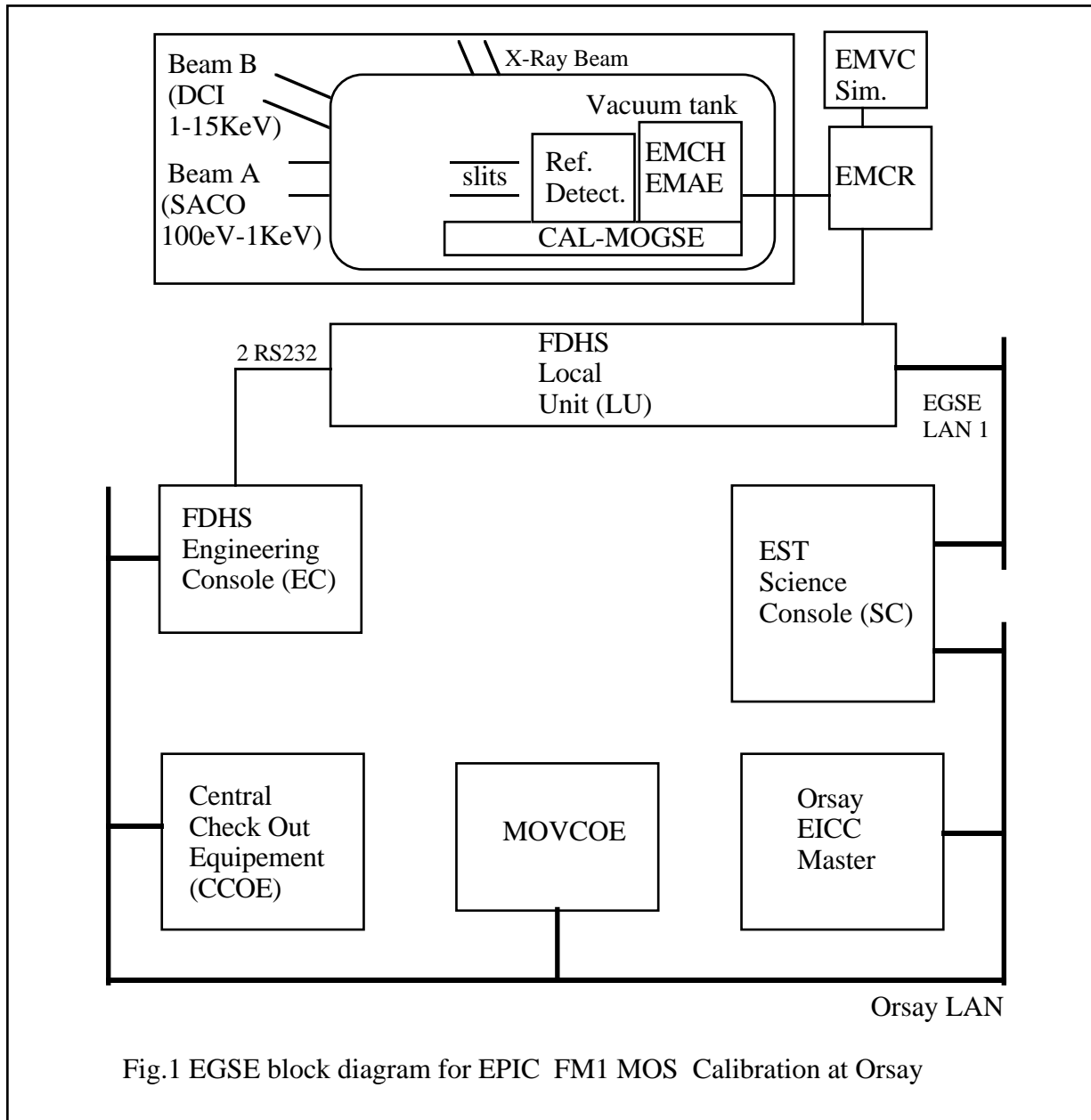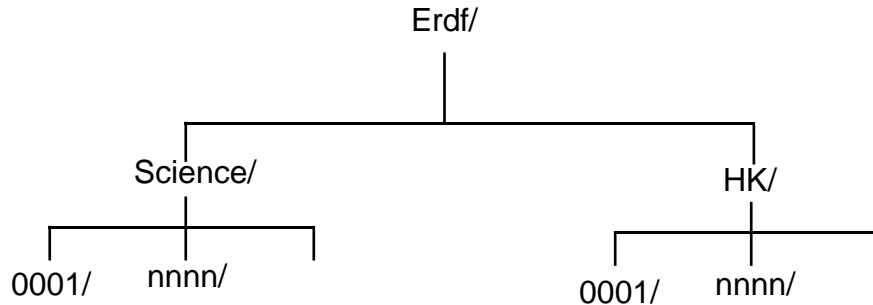
Fig.1 EGSE block diagram for EPIC FM1 MOS Calibration at Orsay

The tests have been conducted from the Central Cechout Equipment (CCOE) which sequenced the operations by means of automated test sequences, implemented as specified in [4] and [5].

The EGSE Reduced Data Files to be included in the DAT tape were stored in the following directory structure :

where:

Science: Egse Reduced Science Data Files, as derived in near-realtime from the Instrument Raw TLM Science data.

HK: Instrument Raw TLM HK data files related to an exposure, copied from the Instrument Raw HK data

            Facility Reformatted HK data files related to an exposure, copied from the Facility Raw HK data files.

The Science and HK files are grouped under subdirectories containing the files related to the Run Id of a given decade, e.g.: 0001/ contains all the files related to Run Id 1,2,3, ...,9,10.

The bulk of the data contained in the Erdf/Science/ subdirectory were the FITS files with the photon lists and the auxiliary information produced for each CCD when operated in imaging mode. Most of the remaning files contain CCD transparent mode data. No exposure have been performed with the CCDs operated in Timing Mode.

The Erdf/Science/ subdirectory were available via NFS to the Off-Line Analysis Workstation as soon as the exposure was completed.

The Instrument Raw TLM HK data include all the HK Packets received from the FDHS Eng. Console. The desired class of packet can be extracted on the basis of the Packet Type and the Packet Subtype information contained in the Data Field Header.

At the Orsay FM1 MOS Calibration, at least the following class of HK packets were present:

	Packet Type	Packet Subtype
Housekeeping Telemetry	1	1

2.3. File Naming

The following file naming was used under the Science/HK/ tree for the HK data produced during the exposure having Run id nnnnn:

ORSnnnnn_YYMMDD_HHMMSS.rhk   for the MOS Instrument HK

ORSnnnnn_YYMMDD_HHMMSS.omh   for the Orsay (Facility) HK

where nnnnn is the Run ID and YYMMDD and HHMMSS are the time and the date of creation, respectively.

The HK data (either MOS Instrument HK or Orsay Facility HK) produced before exposure n was started (IDLE period among n-1 and n) were identified by adding an "_" in their file name. A double "_" in the name, identified the first IDLE period of a measurement session (i.e. started just after the connection with the FDHS).

The file naming under the Erdf/Science tree is described in [3].

In addition, for each event list file, an ASCII file with extension '.dump' contains additional information which allows to trace how the frame have been reconstructed from the Raw data stream. Namely:

- first column: the index in the tlm buffer of the word pertaining to the format identified by the second column: H = header, T = Trailer, E = Event, U = unknown
- column 3-12: the format content in exadecimal format
- column 13-14: *tlm#* is the frame number found in the header/trailer
- column 15-16: *asf#* is the frame number derived accumulating the tlm# and archived in the asf file

  or:

  discarded, in case the trailer was discarded together with the previous events, as its tlm# was different from the tlm# found in the last header
- column 17-18 *t* is the reference time derived from the trailer

In order to verify whether at the start of the exposure any tlm buffer is lost, for the first 10 buffers read from the LAN, a line with a letter *B* in the second column gives the counter incremented by the Science Console every time a new buffer is read from the LAN (*buffer#)* and the counter inserted in the tlm buffer by the FDHS Local Unit (*tlm buffer#*).

2.4. Data Format

The Erdf/Science files have been produced following the FITS format given in [3].

The instrument HK are in the TLM format specified in [2].

The Orsay Facility HK format is provisional. For the time being, each message received from the EICC is filed in a ASCII file as a single row, after having added the Science Console time stamp.

The data acquired from the EICC during the IDLE period, when the Beam is calibrated, is shown in the table below in the case of the SACO beam. The aim of these data is to provide the parameters which characterise the configuration of the Beam and the result of the Beam Calibration performed with the Si(Li) detector before starting the data taking with the EPIC camera.

EICC data with EICC time stamp	SC time stamp	Description
Run_ID = +101500000E-5@22:27:10.226	22:27:17.069	-
B_Line = SACO_Line@22:27:10.576	22:27:17.418	-
Energy = +424562531E-6@22:27:11.077	22:27:17.920	Required (eV)/CCOE
RP-rZ = +750000000E-9@22:27:11.557	22:27:18.400	MOVCOE
RD-tY = +135000000E-6@22:27:12.048	22:27:18.888	"
RD-tZ = +475000000E-7@22:27:12.529	22:27:19.368	"
CS-tZ = +475000000E-7@22:27:13.000	22:27:19.839	"
CH-tY = +200000000E-7@22:27:13.500	22:27:20.339	"
CH-tZ = +585000000E-7@22:27:13.961	22:27:20.799	"
ACK: SACO_Line is ready@22:27:14.311	22:27:21.154	Status
Attenu = +200000000E-8@22:29:28.224	22:29:35.045	Attenuation = 10^{Attenu}
NrjMin = +300000000E-6@22:29:28.735	22:29:35.556	Range of Int. begin (eV)
NrjMax = +150000000E-4@22:29:29.215	22:29:36.036	Range of Int.end, for Si(Li) slow (eV)
CS-tY = +130750000E-6@22:29:48.430	22:29:55.296	Si(Li) position
Absolu = +000000000E-9@22:29:49.231	22:29:56.092	Si(Li) measurement
Synchr = +335700000E-6@22:29:49.732	22:29:56.595	Monitoring Synchrotron current
…………………………………………	……………	…………………
CS-tY = +224500000E-6@23:18:20.188	23:18:27.976	
Absolu = +000000000E-9@23:18:20.658	23:18:28.447	
Synchr = +326900000E-6@23:18:21.429		
ACK: End Of Absolute Scan@23:18:22.050		Status
A C K : S e t E n e r g y C o m p l e t e d AndMovCoeReady@23:20:13.648	23:20:21.445	
23:20:23.935		

The data acquired from the EICC during the EPIC exposure provide the HK related to the beam functioning. The table below shows them in the case of the SACO beam.

EICC data with EICC time stamp	SC time stamp	Description
Run_ID = +101500000E-5@23:22:05.989	23:22:13.774	
SyncCurt = +32690E-2#1@23:22:06.781	23:22:14.576	Synchrotron current
LifeTime = +16860E-3#1@23:22:07.462	23:22:15.249	Lifetime positrons in ring
SyncDiod = +39673E-7#1@23:22:08.062	23:22:15.848	Current on Diode (on SACO only)
……………………………………………	……………	
SyncCurt = +31730E-2#31@23:26:56.637	23:27:04.387	
LifeTime = +17500E-3#31@23:26:57.208	23:27:04.955	
SyncDiod = +39673E-7#31@23:26:57.779	23:27:05.524	

3. THE ERDF DAT TAPES

A procedure has been used in order to produce the Erdf DAT Tape containing the Erdf/ subdirectories related to a given set of decades.

As detailed in the following sections, the procedure analyses all the files contained in the selected decades in order to produce the related summary and log files and to create a tape directory which will be saved in the DAT as the first tar file which summaries the content of the tape itself.

3.1. The summary and log files

As a first step, the procedure takes care of adding into each decade subdirectory of the Erdf/Science and Erdf/HK, the summary and log decade files, namely:

Science/nnnn/instr_sc.sum; Science/nnnn/instr_sc.log

HK/nnnn/instr_hk.sum; HK/nnnn/instr_hk.log

HK/nnnn/facil_hk.sum; HK/nnnn/facil_hk.log.

The *.sum are tabular ASCII files containing summary data separated by Tabs. The *.log contains the list of the files which have been removed, together with the reason of the removal.

The instr_sc.sum file

The procedure searches in the decade subdirectory for all the files related to a given exposure. Hence, from the files pertaining to a given CCD/Quadrant, the procedure extracts and writes in this file the values of the following FITS keywords:

FILENAME, DATATYPE DATE-OBS, TIME-OBS, DATE-END, TIME-END, FRMTIME, WINDOWX0, WINDOWY0, WINDOWDX, WINDOWDY, NFRAME, NEVENT

where:

FILENAME	=	base file name (e.g. 00541_970424_180503.m1*)
NFRAME	=	number of frame as given by the NAXIS2 keyword of the *asf file
NEVENT	=	number of event as given by the NAXIS2 keyword of the *elf file

For the meaning of the remaining keyword refer to EPIC-EST-SP-004.

The instr_sc.log files

In case one of the following values is found:

NFRAME	=	0 in *elf
NEVENT	=	0 in *asf
FRTIME	=	.000000E+00 in the *diag

the related files are removed and an antry is written in this file.

The instr_hk.summary and facil_hk.summary files

These files list the name and the size (in bytes) of each HK file contained in the decade related to the instrument and to the calibration facility (Orsay, Panter) respectively.

The instr_hk.log and facil_hk.log files

These files list the names of the HK files which have been removed as they were empty.

3.2. The tape directory

As second step, the procedure creates the Tapes/Tape.nnn directory, where nnn is the number assigned to the Erdf tape to be produced.

At the time tape production, this directory will be stored in the first tar file of the Erdf DAT Tape in order to allow the user to have a summary on the tape content without having to inspect all the tape.

In this subdirectory, the procedure creates the following files.

The tape_id file

This file contains the ASCII string "TAPEID = nnn" identifying the tape, e.g.:

TAPEID = 001

The tape_files file

The procedure writes into this file one entry for each Erdf subdirectory. Each entry, gives the id of the tape to be created and the sequential number of the tar file where the subdirectory will be saved. E.g.:

TAPEID	FILE #	Tar Dir
001	001	Tapes/Tape.001/

001	002	HK/0040/
001	002	Science/0040/
001	003	HK/0041/
001	003	Science/0041/
001	004	HK/0042/
001	004	Science/0042/

The summary and log files

All the summary and log files contained in each decade are merged and stored in the Tapes/Tape.nnn directory in a file having the same name, i.e.:

instr_sc.sum; instr_sc.log

instr_hk.sum; instr_hk.log

facil_hk.sum; facil_hk.log

contain the information related to the whole tape.

4. DATA DISTRIBUTION

Six Erdf DAT tapes have been produced in order to contain all the data saved in the Erdf/ data tree during the Orsay FM1 MOS Calibration.

The file location of each decade is given Annex 2, were the content of the tape_files files, mentioned in 3 above, is presented.

4.1. How to inspect the Erdf DAT tape and restore the files

The tape can be positioned to the desired tar file using the "*mt*" command and the subdirectory can be extracted using the "*tar*" command.

Some examples (on an DEC OSF Platform) follow (note: the "*no-rewind*" device is specified).

1)   skip the first three End Of File marks :

> *mt -f /dev/nrmt0m fsf 3*

2)   list the content of the next tar file (file # 4 in the DAT Tape):

> *tar tvf /dev/nrmt0m*

drwxr-xr-x   203/650   0 Dec 23 17:52:29 1996 12/
-rwxr-x---   203/650   28800 Dec 4 13:12:34 1996 12/00111_041296_131157.m1ima1elf
-rwxr-x---   203/650   11520 Dec 23 12:06:01 1996 12/00111_041296_131157.m1imaasf
-rwxr-x---   203/650   11520 Dec 4 13:12:41 1996 12/00111_041296_131157.m3ima1elf

-rwxr-x--- 203/650 11520 Dec 4 13:12:41 1996 12/00111_041296_131157.m3imaasf

-rwxr-x--- 203/650 8640 Dec 4 13:11:57 1996 12/00111_041296_131157.m6ima1elf

-rwxr-x--- 203/650 8640 Dec 4 13:11:57 1996 12/00111_041296_131157.m6imaasf

………

3)   skip the End Of File mark of the current file (the file just listed above) and one more End Of File mark in order to position the tape at the beginning of the tar file # 6:

   > *mt -f /dev/nrmt0m fsf 2*

4)   list the content of the next tar file (file # 4 in the DAT Tape):

   > *tar tvf /dev/nrmt0m*

drwxr-xr-x 203/650   0 Dec 23 18:06:04 1996 14/

-rwxr-xr-x 203/650 31680 Dec 4 17:03:46 1996 14/00131_041296_165727.m6ima1elf

-rwxr-xr-x 203/650 11520 Dec 4 17:03:46 1996 14/00131_041296_165727.m6imaasf

-rwxr-xr-x 203/650 192960 Dec 4 17:03:41 1996 14/00131_041296_165727.m1ima1elf

-rwxr-xr-x 203/650 11520 Dec 4 17:03:41 1996 14/00131_041296_165727.m1imaasf

-rwxr-xr-x 203/650 40320 Dec 4 17:03:51 1996 14/00131_041296_165727.m3ima1elf

-rwxr-xr-x 203/650 14400 Dec 4 17:03:51 1996 14/00131_041296_165727.m3imaasf

-rwxr-xr-x 203/650 40320 Dec 4 17:11:06 1996 14/00131_041296_171028.m3ima1elf

………

5)   skip the End Of File mark of the current file (the file just listed above)   in order to position the tape at the beginning of the tar file # 7:

   > *mt -f /dev/nrmt0m fsf*

6)   extract the content of the next tar file (file # 7 in the DAT Tape) restoring all the files in the current directory (i.e. creating the subdirectory 15/):

   tar xvf /dev/nrmt0m

tar: blocksize = 20

x 15/

x 15/00141_051296_091856.m1ima1elf, 8640 bytes, 17 tape blocks

x 15/00141_051296_091856.m1imaasf, 8640 bytes, 17 tape blocks

x 15/00141_051296_091856.m3ima1elf, 8640 bytes, 17 tape blocks

x 15/00141_051296_091856.m3imaasf, 8640 bytes, 17 tape blocks

x 15/00141_051296_091857.m6ima1elf, 8640 bytes, 17 tape blocks

x 15/00141_051296_091857.m6imaasf, 8640 bytes, 17 tape blocks

x 15/00142_051296_094544.m3ima1elf, 9993600 bytes, 19519 tape blocks

x 15/00142_051296_094544.m3imaasf, 72000 bytes, 141 tape blocks

…….

ANNEX 1   Description of RUNs in Orsay

Date	Time	Run ID	Description
			Preliminar tests
18/11/97			
	211542	658	First scan test with sync pulse and DCI beam
	213805	660	2 hours of data taking during night (unattended) with calibration source
19/11/97			
		666	Scan test with sync pulse DCI beam; set scan= 3.8 s and integration time= 4 s
		668	Transparent mode
20/11/97			
	112800	675	Transparent mode
	165743	692	Scan test as in 666
	174558	693	Scan test as in 666 (3.8 s), integr. time= 4.2 s instead of 4 s
	183511	694	Test where the HBR 7/8 have problems
	184041	695	Test where the HBR 7/8 have problems
	195116	696	Test where the HBR 7/8 have problems
	195629	697	Test where the HBR 7/8 have problems
21/11/97			
	142713	706	Test of edge scan procedures, with 3 energies and 2 filter positions. No beam. E1 = 2000 eV, FW1
	143247	707	E1, FW2
	144800	708	E2, FW1
	145328	709	E2 = 1900 eV, FW = 2
	170144	710	Not good, due to local unit failure after the run, during global test procedure.
	181026	711	Same as 706 - 709, with beam and preset scan. E1 = 2000 eV, FW1 = A
	181506	712	E1, FW2 = B
	184503	713	E2 = 1900 eV, FW1 = A
	184937	714	E2 = 1900 eV, FW2 = B
	201947	716	Test of the edge scan procedure with 1 energy and 6 filter positions, with beam and preset scan. E = 1850 eV
	202444	717	FW = B
	202941	718	FW = C
	203438	719	FW = D

	20393	720	FW = open
22/11/97			
	095450	723	First run to check status of the camera after the night.
Various tests with X-ray tube			
	113249	724	Tuning of X-ray tube flux. Slit opened for 1 s. Y-L
	115224	725	X-ray tube tuning (XRTT) - 20 min. data taking, to check spectral purity. - Y-L
	122222	726	XRTT - Cu L, K - CCD1 did not start
	123855	727	XRTT - Cu L, K acceptable at 12 keV- Beam flux tuning -
	124535	728	XRTT - 15 min data - HT = 11 kV
	125757	729	XRTT - Cu L only - Lower HT voltages
	130338	730	XRTT - Cu L clean data - CCD1 lost - stop and restart
		731	XRTT - as above - troubles in starting chain
		732	XRTT - troubles in starting chain
	131946	733	XRTT - Cu L clean data - HT = 5 kV, I = 1.2 mA
	133323	734	XRTT - Al K beam flux tuning
	133727	735	XRTT - Al K clean data run - HT = 4 kV I = 0.6 mA
	181509	752	Run with X-ray tube Y-L line
	182939	753	CCD1 does not start
	183319	754	CCD1 does not start
	183526	755	Y-L line measurement
	184730	756	CCD3 shows strange structure
	185404	757	Y-L line
	191631	758	Y-L line
25/11/97			
	113427	766	RDY pos = 182.5 - E = 2 keV - 30 min
	122350	767	RDY pos = ? - E = 2 kev - 10 min.
	150412	768	Full image E = 2keV - 30 min - to verify homogeneity
26/11/97			
	143526	771	Offset -3°, Int. Time = 30 min; check perpendicularity beam/CCD
	151126	772	Offset -2°, Int. Time = 5 min; check perpendicularity beam/CCD
	151952	773	Offset +0.5°, Int. Time =5 min; check perpendicularity beam/CCD
	152813	774	Offset +3° Int. Time = 5 min; check perpendicularity beam/CCD
	153659	775	Offset -0.5°, Int. Time = 10 min; check perpendicularity beam/CCD
	155558	776	Offset -0.2°, Int. Time =10 min; check perpendicularity beam/CCD
	160920	777	Offset -0.2°, Int. Time = 10 min; check perpendicularity beam/CCD

	162355	778	Offset 0˚ , Int. Time =10 min - perpendicularity with accuracy of at least 0.2˚
	223733	780	No scan - no SACO beam
	225020	781	Scan, but not syncronized
	225411	782	Good scan - 1200 eV
27/11/97	084718	783	E = 2000 eV, Int. Time = 5 min; FW = A, Si(Li) detector in front of the camera
	085721	784	E = 2000 eV, Int. Time = 5 min; FW = D
	091946	785	E = 2000 eV, Int. Time = 5 min; FW = D, shifted camera by -5 mm the CCD camera to center the CCD image on the beam
		786	E = 2000 eV, Int. Time = 5 min; FW = D, shifted camera by +5 mm the CCD camera to center the CCD image on the beam
	094402	787	E = 2000 eV, Int. Time = 5 min; FW = D, shifted camera by +10 mm the CCD camera to center the CCD image on the beam; this is the best position
Si(Li)con edge scan with DCI (2000 - 1860 eV)			
	144608	788	E1 = 2000 eV, Int. Time = 10 min; FW = A; 68200 events in CCD1
	145815	789	E1 = 2000 eV, Int. Time = 10 min; FW = B; 67800 events in CCD1
	151013	790	E1 = 2000 eV, Int. Time = 10 min; FW = C; 65900 events in CCD1
	152213	791	E1 = 2000 eV, Int. Time = 10 min; FW = D;60100 events in CCD1
	153409	792	E1 = 2000 eV, Int. Time = 10 min; FW = open; 694500 events in CCD1
	183709	795	E2 = 1900 eV, Int. Time = 5 min; FW = A; 22585 events in CCD1
	184419	796	E2 = 1900 eV, Int. Time = 5 min; FW = B; 23027 events in CCD1
	185115	797	E2 = 1900 eV, Int. Time = 5 min; FW = C;
	185814	798	E2 = 1900 eV, Int. Time = 5 min; FW = D; 19995 events in CCD1
	190511	799	E2 = 1900 eV, Int. Time = 5 min; FW = open; 23901 events in CCD1
	195737	800	E3 = 1870 eV, Int. Time = 5 min; FW = A; 20707 events in CCD1
	200447	801	E3 = 1870 eV, Int. Time = 5 min; FW = B; 15906 events in CCD1
28/11/97	105936	803	E4 = 1800 eV, Int. Time = 5 min; FW = A; 23940 events in CCD1; new offset table loaded before starting this run
	110645	804	E4 = 1800 eV, Int. Time = 5 min; FW = B; 24088 events in CCD1
	111344	805	E4 = 1800 eV, Int. Time = 5 min; FW = C; 23013 events in CCD1
	112040	806	E4 = 1800 eV, Int. Time = 5 min; FW = D; 20255 events in CCD1
	112742	807	E4 = 1800 eV, Int. Time = 5 min; FW = open; 24396 events in CCD1
	113707	808	E4 = 1800 eV, Int. Time = 5 min; FW = A; 23315 events in CCD1
	133223	809	E5 = 1700 eV, Int. Time = 5 min; FW = A; 17026 events in CCD1
	133933	810	E5 = 1700 eV, Int. Time = 5 min; FW = B; 16947 events in CCD1

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	134627	811	E5 = 1700 eV, Int. Time = 5 min; FW = C;
	135322	812	E5 = 1700 eV, Int. Time = 5 min; FW = D;
	140020	813	E5 = 1700 eV, Int. Time = 5 min; FW = open; 17847 events in CCD1
	141046	814	E5 = 1700 eV, Int. Time = 5 min; FW = A; 16606 events in CCD1
	141754	815	E5 = 1700 eV, Int. Time = 5 min; FW = B; 16876 events in CCD1
	142451	816	E5 = 1700 eV, Int. Time = 5 min; FW = C; 16350 events in CCD1
	143148	817	E5 = 1700 eV, Int. Time = 5 min; FW = D;
	143844	818	E5 = 1700 eV, Int. Time = 5 min; FW = open; 17760 events in CCD1
	160345	819	E6 = 1860 eV, Int. Time = 5 min; FW = A; 18517 events in CCD1
	161054	820	E6 = 1860 eV, Int. Time = 5 min; FW = B; 13933 events in CCD1
	161750	821	E6 = 1860 eV, Int. Time = 5 min; FW = C; 17495 events in CCD1
	162448	822	E6 = 1860 eV, Int. Time = 5 min; FW = D;
	163143	823	E6 = 1860 eV, Int. Time = 5 min; FW = open; 15289 events in CCD1
		Various runs	
		824	SACO internal tests
		825	EICC internal tests
2/12/97			
	160523	830	test with the new EMCR s/w, failed
		831	test with the new EMCR s/w, failed
		832	test with the new EMCR s/w, failed
		833	test with the new EMCR s/w, failed
	174900	834	Xray tube: Mg; 10 KV, 1 mA
	175603	835	Xray tube: Mg; 5 KV, 1 mA
	180035	836	Xray tube: Mg; 5 KV, 0.5 mA
	180307	837	Xray tube: Mg; 3 KV, 0.3 mA
3/12/97			
	114627	839	DCI: test for the scan; sometimes MOGSE stops, 1 after 190 frames, some after 260 frames
4/12/97			
	100836	843	FW = A + 3 steps; ok: no calibration source in the FoV anymore
	101637	844	FW = B + 3 steps; ok: no calibration source in the FoV anymore
	143216	846	FW = B; all thresholds set to 25 instead of 55
	150212	847	FW = B + 3 steps; all thresholds set to 25 instead of 55
	164843	848	FW = closed; all thresholds set to 25 instead of 55
	171336	849	FW = closed; EDU4 and EDU5 thresholds set to 35 instead of 25
		Si(Li)con edge scan with DCI - continued (1850 - 1835 eV)	
5/12/97			

	201431	850	E7 = 1850 eV, Int. Time = 5 min; FW = A
	202131	851	E7 = 1850 eV, Int. Time = 5 min; FW = B
	202831	852	E7 = 1850 eV, Int. Time = 5 min; FW = C
	203531	853	E7 = 1850 eV, Int. Time = 5 min; FW = D
	204229	854	E7 = 1850 eV, Int. Time = 5 min; FW = open
	205257	855	E7 = 1850 eV, Int. Time = 5 min; FW = A; new data taking at the same energy: the previous count rate was not 200 per frame
	205958	856	E7 = 1850 eV, Int. Time = 5 min; FW = B
	210655	857	E7 = 1850 eV, Int. Time = 5 min; FW = C
	211355	858	E7 = 1850 eV, Int. Time = 5 min; FW = D
	212057	859	E7 = 1850 eV, Int. Time = 5 min; FW = open
	223020	860	E8 = 1830 eV, Int. Time = 5 min; FW = A
	223717	861	E8 = 1830 eV, Int. Time = 5 min; FW = B
	224418	862	E8 = 1830 eV, Int. Time = 5 min; FW = C
	225115	863	E8 = 1830 eV, Int. Time = 5 min; FW = D
	225815	864	E8 = 1830 eV, Int. Time = 5 min; FW = open; loss of MOGSE synch.

Note: from runs 850 to 864 inclusive the thresholds on CCDs 4, è were set correctly at 30, but the thresholds on the other CCDs where set at 50 instead of 25

	004234	866	E9 = 1846 eV, Int. Time = 5 min; FW = A
	004933	867	E9 = 1846 eV, Int. Time = 5 min; FW = B
	005631	868	E9 = 1846 eV, Int. Time = 5 min; FW = C
	010331	869	E9 = 1846 eV, Int. Time = 5 min; FW = D
	011029	870	E9 = 1846 eV, Int. Time = 5 min; FW = open
	023750	871	E10 = 1835 eV, Int. Time = 5 min; FW = A
	024450	872	E10 = 1835 eV, Int. Time = 5 min; FW = B
	025148	873	E10 = 1835 eV, Int. Time = 5 min; FW = C
	025848	874	E10 = 1835 eV, Int. Time = 5 min; FW = D
	030550	875	E10 = 1835 eV, Int. Time = 5 min; FW = open

SACO (1 keV)

5/12/97			
	151133	876	E = 1000 eV, Int. Time = 5 min; FW = A; no Si(Li) in HK for this run; is corrupt, flux too high; camera not fully illuminated
	151830	877	E = 1000 eV, Int. Time = 5 min; FW = B
	152532	878	E = 1000 eV, Int. Time = 5 min; FW = C
	153233	879	E = 1000 eV, Int. Time = 5 min; FW = D
	153931	880	E = 1000 eV, Int. Time = 5 min; FW = open; about 60000 events on CCD1

Note: no beam current data from the above 5 runs in the HK

	155408	881	E = 1000 eV, Int. Time = 5 min; FW = A
	160107	882	E = 1000 eV, Int. Time = 5 min; FW = B; 78684 events on CCD1
	160806	883	E = 1000 eV, Int. Time = 5 min; FW = C; 78443 events on CCD1
	161506	884	E = 1000 eV, Int. Time = 5 min; FW = D
	162940	885	E = 1000 eV, Int. Time = 5 min; FW = open; problems with the switching off of the 4 CCD
Si(Li)con edge scan with DCI - continued (1842 - 1839 eV)
	185252	887	E11 = 1842 eV, Int. Time = 5 min; FW = A; sequencers re-loaded
	185950	888	E11 = 1842 eV, Int. Time = 5 min; FW = B
	190650	889	E11 = 1842 eV, Int. Time = 5 min; FW = C; 21247 events on CCD1
	191350	890	E11 = 1842 eV, Int. Time = 5 min; FW = D
	192049	891	E11 = 1842 eV, Int. Time = 5 min; FW = open
	192049	892	E12 = 1838 eV, Int. Time = 5 min; FW = A
	201520	893	E12 = 1838 eV, Int. Time = 5 min; FW = B
	202216	894	E12 = 1838 eV, Int. Time = 5 min; FW = C
	202917	895	E12 = 1838 eV, Int. Time = 5 min; FW = D
	203620	896	E12 = 1838 eV, Int. Time = 5 min; FW = open
	204317	897	E13 = 1840 eV, Int. Time = 5 min; FW = A; 37131 events on CCD1
	220929	898	E13 = 1840 eV, Int. Time = 5 min; FW = B; large % of MOGSE loss synch.
	221621	899	E13 = 1840 eV, Int. Time = 5 min; FW = C
	222319	900	E13 = 1840 eV, Int. Time = 5 min; FW = D
	223020	901	E13 = 1840 eV, Int. Time = 5 min; FW = open; 39625 events on CCD1
	223716	902	E14 = 1839 eV, Int. Time = 5 min; FW = A; 38129 events on CCD1
	233427	903	E14 = 1839 eV, Int. Time = 5 min; FW = B
	234124	904	E14 = 1839 eV, Int. Time = 5 min; FW = C
	234822	905	E14 = 1839 eV, Int. Time = 5 min; FW = D
	235522	906	E14 = 1839 eV, Int. Time = 5 min; FW = open; 40184 events on CCD1
Test with the X-ray tube (Mg, 1250 eV)
8/12/97			
	102030	907	1250 eV (Mg); 2.97 KV, 0.4 mA, FW = open
	104721	908	1250 eV (Mg); 3.52 KV, 0.4 mA, FW = open
	105819	909	1250 eV (Mg); 3.21 KV, 0.4 mA, FW = open
	111018	910	1250 eV (Mg); 3.21 KV, 0.4 mA, FW = open
		911	1250 eV (Mg); 3.21 KV, 0.4 mA, FW = open
	122521	912	1250 eV (Mg); 3.21 KV, 0.4 mA, FW = A
	125809	913	1250 eV (Mg); 3.21 KV, 0.4 mA, FW = B

	142928	915	1250 eV (Mg); 3.21 KV, 0.4 mA, FW = C
	145657	916	1250 eV (Mg); 3.21 KV, 0.4 mA, FW = D
	152427	917	1250 eV (Mg); 3.21 KV, 0.4 mA, FW = open
Full energy range with SACO (800 - 1200 eV)			
9/12/97			
	132435	922	E1 = 900 eV, Int. Time = 9 min; FW = A
	165551	926	E1 = 900 eV, Int. Time = 5 min; FW = A
	170250	927	E1 = 900 eV, Int. Time = 5 min; FW = B
	170948	928	E1 = 900 eV, Int. Time = 5 min; FW = C
	171649	929	E1 = 900 eV, Int. Time = 5 min; FW = D
	172349	930	E1 = 900 eV, Int. Time = 5 min; FW = open
	180456	931	E1 = 900 eV, Int. Time = 5 min; FW = A; Al filter has been put in the beam to reduce the flux
	183148	932	E1 = 900 eV, Int. Time = 5 min; FW = A; in the previous run the Si(Li) was in the FoV, now it has been removed; serious loss of MOGSE synch.
	183846	933	E1 = 900 eV, Int. Time = 5 min; FW = B; serious loss of MOGSE synch.
	184545	934	E1 = 900 eV, Int. Time = 5 min; FW = C; serious loss of MOGSE synch.
	190026	935	E1 = 900 eV, Int. Time = 5 min; FW = D; serious loss of MOGSE synch.
	190757	936	E1 = 900 eV, Int. Time = 5 min; FW = open; serious loss of MOGSE synch.
	222009	937	Stray run
	222851	938	Stray run
	234004	939	E2 = 800 eV, Int. Time = 5 min; FW = A, flux a bit too high in CCD1
	234736	940	E2 = 800 eV, Int. Time = 5 min; FW = B
	235506	941	E2 = 800 eV, Int. Time = 5 min; FW = C
	000236	942	E2 = 800 eV, Int. Time = 5 min; FW = D
	001006	943	E2 = 800 eV, Int. Time = 5 min; FW = open
	002900	944	Test run
	005130	945	E3 = 1100 eV, Int. Time = 5 min; FW = A; wrong setting of CSY
	005901	946	E3 = 1100 eV, Int. Time = 5 min; FW = B; wrong setting of CSY
	010631	947	E3 = 1100 eV, Int. Time = 5 min; FW = C; wrong setting of CSY
	011402	948	E3 = 1100 eV, Int. Time = 5 min; FW = D; wrong setting of CSY
	012132	949	E3 = 1100 eV, Int. Time = 5 min; FW = open; wrong setting of CSY
	014039	950	E3 = 1100 eV, Int. Time = 5 min; FW = A
	014808	951	E3 = 1100 eV, Int. Time = 5 min; FW = B

	015537	952	E3 = 1100 eV, Int. Time = 5 min; FW = C
	020308	953	E3 = 1100 eV, Int. Time = 5 min; FW = D
	021038	954	E3 = 1100 eV, Int. Time = 5 min; FW = open
10/12/97	124836	955	E4 = 1200 eV, Int. Time = 5 min; FW = A; Al introduced during this run and removed again - flux rate about 800 per CCD1 frame
	125606	956	E4 = 1200 eV, Int. Time = 5 min; FW = B
	130336	957	E4 = 1200 eV, Int. Time = 5 min; FW = C
	131110	958	E4 = 1200 eV, Int. Time = 5 min; FW = D
	131839	959	E4 = 1200 eV, Int. Time = 5 min; FW = open
		960	E4 = 1200 eV, Int. Time = 5 min; FW =A; flux rate chosen now constant
	135031	961	E4 = 1200 eV, Int. Time = 5 min; FW = B
	135802	962	E4 = 1200 eV, Int. Time = 5 min; FW = C
	140532	963	E4 = 1200 eV, Int. Time = 5 min; FW = D
	141304	964	E4 = 1200 eV, Int. Time = 5 min; FW = open
	155901	965	E5 = 950 eV, Int. Time = 5 min; FW = A, Al introduced during this run and removed again - flux rate about 800 per CCD1 frame
	160630	966	E5 = 950 eV, Int. Time = 5 min; FW = B
	161400	967	E5 = 950 eV, Int. Time = 5 min; FW = C; problems FDHS - CCOE miscommunication
	164750	968	E5 = 950 eV, Int. Time = 5 min; FW = D; test
		969	E5 = 950 eV, Int. Time = 5 min; FW = open; empty run
Various runs			
11/12/97	185722	970	Cal. source - FW open - EDU coordinates were not set
	190608	971	Cal. source - FW open - EDU coordinates were not set
	191647	972	Cal. source - FW open - EDU coordinates were not set
	192436	973	Cal. source - FW open - EDU coordinates were not set
	112217	974	No beam - FW open - Transparent mode for CCD1 - EDU0
	112836	975	No beam - FW open - Transparent mode for CCD2 - EDU2
	113623	976	No beam - FW open - Transparent mode for CCD5 - EDU3
	114131	977	No beam - FW open - Transparent mode for CCD4 - EDU4
	120350	978	No beam - FW open - Transparent mode for CCD7 - EDU5
	120959	979	No beam - FW open - Transparent mode for CCD3 - EDU6
	121658	980	No beam - FW open - Transparent mode for CCD6 - EDU7
		981	Cal. source - FW open - 40 s
		982	Cal. source - FW open - 40 s

		983	Cal. source - FW open - 40 s
		984	Cal. source - FW open - 5 min
		985	Cal. source - FW open - 1 min
		986	Cal. source - FW open - 1 min
16/12/97			
	114907	996	FW closed - Transparent mode for CCD1 - EDU0
	115014	997	FW closed - Transparent mode for CCD2 - EDU2
	115112	998	FW closed - Transparent mode for CCD5 - EDU3
	115210	999	FW closed - Transparent mode for CCD4 - EDU4
	115311	1000	FW closed - Transparent mode for CCD7 - EDU5
	115411	1001	FW closed - Transparent mode for CCD3 - EDU6
	115508	1002	FW closed - Transparent mode for CCD6 - EDU7
	213332	1012	E = 400 eV, Int. Time = 5 min, FW open; bad synch. due to EoF disconnected
	214342	1013	E = 401 eV, Int. Time = 5 min, FW open; bad synch. due to EoF disconnected
	215148	1014	E = 402 eV, Int. Time = 5 min, FW open; bad synch. due to EoF disconnected
Nitrogen edge scan with SACO (400 - 425 eV)			
	232202	1015	E1 = 425 eV, Int. Time = 5 min; FW=open; with grid low flux thus taken off + 55 min. Before this run, Si(Li) scan calibration performed.
	233037	1016	E2 = 424 eV, Int. Time = 5 min; FW = open
	233843	1017	E3 = 423 eV, Int. Time = 5 min; FW = open
	234625	1018	E4 = 422 eV, Int. Time = 5 min; FW = open
	235416	1019	E5 = 421 eV, Int. Time = 5 min; FW = open
	000205	1020	E6 = 420 eV, Int. Time = 5 min; FW = open
	001026	1021	E7 = 419 eV, Int. Time = 5 min; FW = open
	001934	1022	E8 = 418 eV, Int. Time = 5 min; FW = open
	003512	1023	E9 = 417 eV, Int. Time = 5 min; FW = open
	004424	1024	E10 = 416 eV, Int. Time = 5 min; FW = open
	005434	1025	E11 = 415 eV, Int. Time = 5 min; FW = open
	010315	1026	E12 = 414 eV, Int. Time = 5 min; FW = open, FWHM = 16.19
	011135	1027	E13 = 413 eV, Int. Time = 5 min; FW = open
	013130	1028	E14 = 412 eV, Int. Time = 5 min; FW = open
	013931	1029	E15 = 411 eV, Int. Time = 5 min; FW = open
	014728	1030	E16 = 410 eV, Int. Time = 5 min; FW = open
	015530	1031	E17 = 409 eV, Int. Time = 5 min; FW = open
	020334	1032	E18 = 408 eV, Int. Time = 5 min; FW = open

	021137	1033	E19 = 407 eV, Int. Time = 5 min; FW = open
	021935	1034	E20 = 406 eV, Int. Time = 5 min; FW = open
	030016	1035	E21 = 405 eV, Int. Time = 5 min; FW = open, with grid - flux low and Si(Li) in the FoV
	030845	1036	E22 = 404 eV, Int. Time = 5 min; FW = open, with grid - flux low and Si(Li) in the FoV
	032232	1037	E23 = 403 eV, Int. Time = 5 min; FW = open, with grid - flux low and Si(Li) in the FoV
	033129	1038	E24 = 402 eV, Int. Time = 5 min; FW = open, with grid - flux low and Si(Li) in the FoV
	033939	1039	E25 = 401 eV, Int. Time = 5 min; FW = open, with grid - flux low and Si(Li) in the FoV
	045134	1040	E26 = 400 eV, Int. Time = 5 min; FW = open, with grid - flux low and Si(Li) in the FoV; after this run, one hour of Si(Li) scan
Flat field wih the X-ray tube (Ge-K)			
17/12/97		1041	Energy = Ge-K; FW = open; test run; no HK
	102544	1042	Energy = Ge-K; Int. Time = 37 min; FW = open; source changed during data taking; no HK
	110356	1043	Energy = Ge-K;140705 Int. Time = 30 min; FW = open; source changed during data taking; no HK
	120008	1044	Energy = Ge-K; Int. Time = 50 min; FW = open; disk full but data ok; no HK
DCI full energy range (5890 - 15000 eV)			
	140705	1045	E1 = 8000 eV, Int. Time = 5 min, FW = open.
	191442	1049	E1 = 8000 eV, Int. Time = 5 min, FW = A, after Si(Li) calibration
	192239	1050	E1 = 8000 eV, Int. Time = 5 min, FW = B
	193037	1051	E1 = 8000 eV, Int. Time = 5 min, FW = C
	193834	1052	E1 = 8000 eV, Int. Time = 5 min, FW = D
	194632	1053	E1 = 8000 eV, Int. Time = 5 min, FW = open
	203355	1054	E2 = 3000 eV, Int. Time = 5 min, FW = A
	204153	1055	E2 = 3000 eV, Int. Time = 5 min, FW = B
	204949	1056	E2 = 3000 eV, Int. Time = 5 min, FW = C
	205747	1057	E2 = 3000 eV, Int. Time = 5 min, FW = D
	210544	1058	E2 = 3000 eV, Int. Time = 5 min, FW = open
	225454	1059	E3 = 5890 eV, Int. Time = 5 min, FW = A
	230247	1060	E3 = 5890 eV, Int. Time = 5 min, FW = B
	231047	1061	E3 = 5890 eV, Int. Time = 5 min, FW = C
	231048	1062	E3 = 5890 eV, Int. Time = 5 min, FW = D
	232643	1063	E3 = 5890 eV, Int. Time = 5 min, FW = open

	015253	1064	E4 = 10000 eV, Int. Time = 5 min, FW = A
	020051	1065	E4 = 10000 eV, Int. Time = 5 min, FW = B
	020849	1066	E4 = 10000 eV, Int. Time = 5 min, FW = C
	021647	1067	E4 = 10000 eV, Int. Time = 5 min, FW = D
	022446	1068	E4 = 10000 eV, Int. Time = 5 min, FW = open
	031848	1069	E5 = 15000 eV, Int. Time = 5 min, FW = A
	032647	1070	E5 = 15000 eV, Int. Time = 5 min, FW = B
	033444	1071	E5 = 15000 eV, Int. Time = 5 min, FW = C
	034242	1072	E5 = 15000 eV, Int. Time = 5 min, FW = D
	035040	1073	E5 = 15000 eV, Int. Time = 5 min, FW = open
SACO full energy range (200 - 600 eV)			
18/12/97			
	092206	1074	E1 = 400 eV, Int. Time = 5 min, FW = open., test
	092947	1075	E1 = 400 eV, Int. Time = 5 min, FW = open., test
	104324	1076	E1 = 400 eV, Int. Time = 5 min, FW = A, only half FoV illuminated - CCD 2, 3, 4, 1
	105122	1077	E1 = 400 eV, Int. Time = 5 min, FW = B, only half FoV illuminated - CCD 2, 3, 4, 1
	105922	1078	E1 = 400 eV, Int. Time = 5 min, FW = C, only half FoV illuminated - CCD 2, 3, 4, 1
	110718	1079	E1 = 400 eV, Int. Time = 5 min, FW = D, only half FoV illuminated - CCD 2, 3, 4, 1
	111515	1080	E1 = 400 eV, Int. Time = 5 min, FW = open, only half FoV illuminated - CCD 2, 3, 4, 1
	114220	1081	E1 = 400 eV, Int. Time = 5 min, FW = A, scan corrected now on + grid 142 - 10% flux reduction?
	115013	1082	E1 = 400 eV, Int. Time = 5 min, FW = B
	115809	1083	E1 = 400 eV, Int. Time = 5 min, FW = C
	120605	1084	E1 = 400 eV, Int. Time = 5 min, FW = D
	121404	1085	E1 = 400 eV, Int. Time = 5 min, FW = open
	134328	1086	E2 = 500 eV, Int. Time = 5 min, FW = A, scan on 7 cm
	135124	1087	E2 = 500 eV, Int. Time = 5 min, FW = B
	135922	1088	E2 = 500 eV, Int. Time = 5 min, FW = C
	140721	1089	E2 = 500 eV, Int. Time = 5 min, FW = D
	141522	1090	E2 = 500 eV, Int. Time = 5 min, FW = open
	165848	1091	E3 = 600 eV, Int. Time = 5 min, FW = A
	170637	1092	E3 = 600 eV, Int. Time = 5 min, FW = B
	171435	1093	E3 = 600 eV, Int. Time = 5 min, FW = C
	172234	1094	E3 = 600 eV, Int. Time = 5 min, FW = D

	173032	1095	E3 = 600 eV, Int. Time = 5 min, FW = open
	181216	1096	E4 = 200 eV, Int. Time = 5 min, FW = A
	182014	1097	E4 = 200 eV, Int. Time = 5 min, FW = B
	182812	1098	E4 = 200 eV, Int. Time = 5 min, FW = C
	183610	1099	E4 = 200 eV, Int. Time = 5 min, FW = D
	184408	1100	E4 = 200 eV, Int. Time = 5 min, FW = open
Test of relative position of CH and RD with DCI (15000 eV)			
	191719	1101	E = 15000 eV, Int. Time = 5 min, FW = open
	195236	1102	E = 15000 eV, Int. Time = 5 min, FW = open; after Si(Li) calibration
Oxygen edge with SACO (535 - 563 eV)			
	231358	1103	E = 563 eV, Int. Time = 5 min, FW = open; grid on SACO, flux too low
	235532	1104	E = 563 eV, Int. Time = 5 min, FW = open; after Si(Li) calibration; no grid, flux too high (about 4000 ev/frame); grid on again in the middle of the run (about 400 ev/frame)
	002534	1105	E = 559 eV, Int. Time = 5 min, FW = open
	004017	1106	E = 555 eV, Int. Time = 5 min, FW = open; lost of MOGSE sync.
	004925	1107	E = 551 eV, Int. Time = 5 min, FW = open; lost of MOGSE sync.
	005918	1108	E = 547 eV, Int. Time = 5 min, FW = open
	010731	1109	E = 543 eV, Int. Time = 5 min, FW = open
	011633	1110	E = 539 eV, Int. Time = 5 min, FW = open
	012457	1111	E = 535 eV, Int. Time = 5 min, FW = open
	020202	1112	E = 535 eV, Int. Time = 5 min, FW = open; after Si(Li) calibration

ANNEX 2   Erdf DAT TAPE Content List

TAPEID	FILE #	Tar Dir
001	001	Tapes/Tape.001/
001	002	HK/0066/
001	002	Science/0066/
001	003	HK/0067/
001	003	Science/0067/
001	004	HK/0068/
001	004	Science/0068/
001	005	HK/0069/
001	005	Science/0069/
001	006	HK/0070/
001	006	Science/0070/
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006	007	HK/0110/
006	007	Science/0110/
006	008	HK/0111/
006	008	Science/0111/

| 006 | 009 | HK/0112/ |
| 006 | 009 | Science/0112/ |