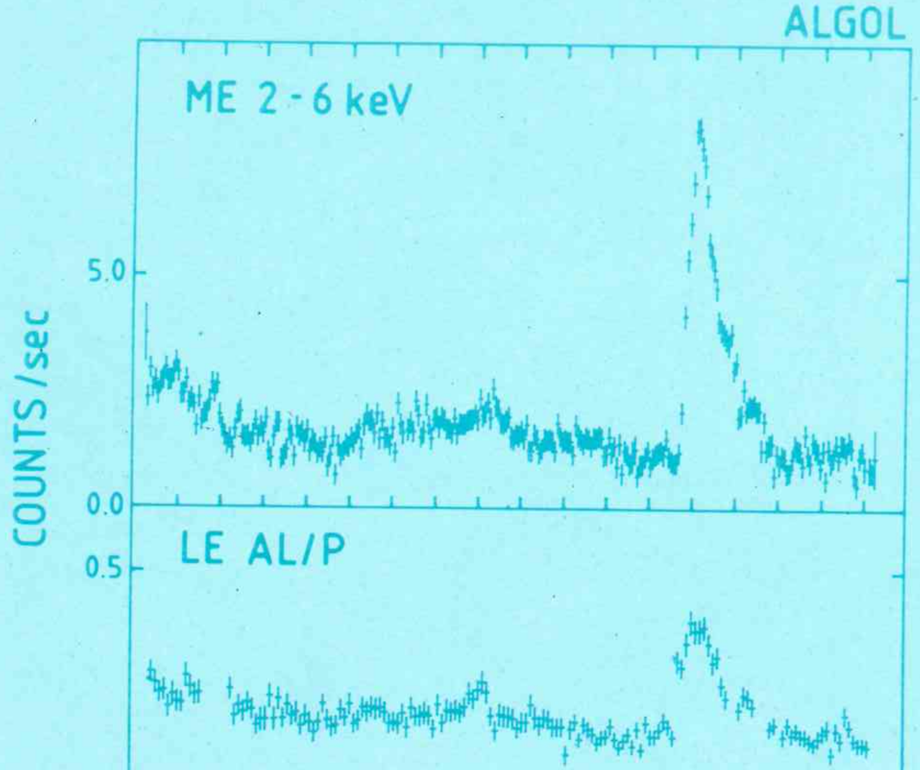
EXOSAT EXPRESS

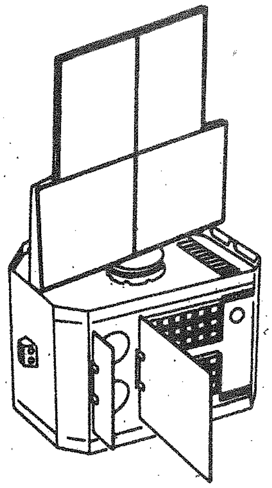


EXOSAT

EUROPEAN X-RAY ASTRONOMY SATELLITE

No. 7

October 1984



esa

EXOSAT EXPRESS

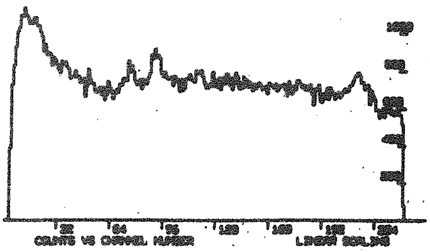


TABLE OF CONTENTS

NO. 7 OCTOBER 1984

Front Cover

A continuous 35 hour X-ray light curve of the stellar system ALGOL, observed by EXOSAT in August 1983, shows an X-ray flare with a peak luminosity and temperature of 10^{31} erg s^{-1} and 60 million degrees respectively. This event most probably occurred in a magnetic loop structure sited on the k subgiant in the system.

Courtesy: N.E. White, J.L. Culhane

FOREWORD

From 1st December 1984 the EXOSAT Interactive Analysis System will be available at the Observatory to enable observers to carry out a more complete scientific analysis of data than has so far been possible. This system is geared principally to the analysis of FOT's from previous observations but near real time analysis of data from current observations will also be supported. A copy of the letter of announcement and system booking form is included in this issue of the Express (p. 43) as a reminder and for the benefit of EXOSAT users who may not be on our P.I. mailing list. Please note that access to the system for both near real time and FOT data analysis is only possible through this booking procedure. P.I.'s attending their observations must request IA system access if near real time analysis is required.

Attention is drawn to a modification of the definition of source nomenclature (p. 13) for 'new' X-ray sources discovered serendipitously by EXOSAT.

As of 31.10.84, EXOSAT has completed 139 orbits, roughly one half of its natural lifetime - ie. on current predictions orbit 283 (April 1986) would be the last complete orbit prior to entry into the dense atmosphere. A strategy for the optimum use of the on-board hydrazine to increase perigee height and extend the lifetime by up to 1 year from April 1986 will be developed during the next few weeks.

AO-3 response is required by 15th November 1984 with programme selection by the Committee on Observation Proposal Selection (COPS) anticipated in early January.

Some information on travel, hotels and restaurants is given on p. 38 for the benefit of possible first-time visitors to the Observatory during AO-3.

EXOSAT EXPRESS

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OBSERVATORY STATUS AS OF 31.10.84

EXOSAT has been operational for 17 months, approximately one half of its natural lifetime as noted in the foreword, with 677 of the 717 approved AO-1 pointings and 236 of the 470 approved AO-2 pointings completed. AO-2 observations together with the small number of outstanding AO-1 pointings will continue until January/February 1985, although the solar constraint and later co-ordinations preclude several AO-2 targets from the formal observation period.

1. Hardware

There have been no changes in the status of the spacecraft or payload hardware.

Measurements of observed star separations in the star tracker field of view compared with the accurately known catalogue positions have shown that a systemtic error in the star tracker calibration reference points (Local Lord Points) exists. Depending on the position of star 1 in the FOV, this can introduce a bias in the pointing direction of the instruments. Typical values would be 2-3" with worst-case figures (star 1 near edge of FOV - 1.5 deg. from centre) of 8". Measures are in hand to determine and correct this bias, in the meantime investigators publishing position data should verify with the Observatory Team the likely maximum error in the result. Note that overall pointing errors are currently quoted as 10", which assumes no contribution from errors in the ST reference point coordinates.

Attempts to re-activate the malfunctioning elements of the LE telescopes have not been successful; PSD1 continues to exhibit rapidly increasing LEP (low energy pulses) very soon after HT switch on, although the initial value is always nominal at ~2 c/s. Temperature cycling and variation of the plate HT's has had no effect on the operation of CMA2. PSD2 has been operated (HT on) a number of times at 0 mb residual pressure with no indication of external breakdown, however regulation pressure operation (1100mb) immediately shows the anomalous behaviour originally observed (high count rates: Emax, Guard and qualified events).

Additional tests will be carried out during the next few weeks on these detectors, namely the activation of a 'glow discharge' in PSD2 (operation in the corona region in an attempt to clean the internal electrodes - ? remove the ubiquitous speck of dust), continuation of the thermal cycling once per orbit on CMA2 and, somewhat dependent on PSD2 results, a relaxation of the safety criterion for PSD1 operation and/or a 'glow discharge'.

A re-calibration of all ME detectors on the CRAB (ref. p.12) has verified the gain variation first reported in Express Issue 6 (p.4). Argon detectors D+G show the strongest trend ($\lesssim$ 12.5% per year) which can, however, at the present rate be adequately compensated throughout the mission by electronic gain adjustment.

2. Performance and Operations

Tables 1 and 2 on p. 7/8 give the current performance parameters of the EXOSAT instruments.

During the period 1/9 to 31/10, loss of observation time (10 hours) occurred on two separate but related occasions when safety mode of the AOCS was triggered, principally because of procedural errors. Certain additional checks have been introduced to reduce the likelihood of re-occurrence. Observation time (~3 hrs) was also lost when a cable short circuit caused a local fire at Vilspa, however prompt action by the Vilspa staff prevented any serious disruption. Ground system procedural problems have caused errors in the OBC software operation leading to a further loss of observation time of approximately 6 hours.

Available power from the solar array has dropped from an average 280 watts to an average 270 watts over the period July 1983 to July 1984, i.e. a rate of decrease of $\lesssim$4%/yr, which would be sufficiently low to maintain operations with an adequate margin for a 4 year mission. Preliminary estimates of fuel consumption (propane) from launch to the present, based on careful logging of a sample of slews, fine pointing and non-routine operations, suggest that the margin may not be sufficient to guarantee operation during the final months of a 4 year mission unless minor measures are taken immediately to conserve fuel (ref. p. 5 under 'Future Plans'). It is emphasised that the figures are provisional and detailed calculations are required on all slews, fine pointing etc., before a definitive statement on fuel usage can be made (an article on this subject will be included in the December issue of the Express).

Since the beginning of the mission, problems have been experienced with Y-axis slews at the highest slew rate (170.7 deg/hr). In some cases, these slews which do not proceed normally (as determined by monitoring of the Y-gyro) are terminated and restarted, leading to unnecessary fuel consumption. Marconi Space Systems (MSS) have performed several hundred slew simulations reproducing this behaviour and have defined a procedure such that interruption of the slew is unnecessary. This is currently being implemented at ESOC. Note, however, that from December 15th, the 170.7 deg/hr slew-rate will not be used (ref. p. 5).

Issue 4 of the Express (p.34) described a problem encountered with the redundant Attitude and Orbit Control Electronics (AOCE 2) which has been in use since August 1983, whereby a spurious value of the gyro drift compensation on the Y-axis can be produced when the star tracker error coordinate changes sign. Offsetting the limit cycle by 5 arcseconds on the Y-axis has 'solved' the problem, but investigations by MSS now show that this anomalous behaviour can be explained by a non-nominal component characteristic which gives rise to an erroneous "read" of the star tracker data.

Also reported in the same issue of the EXPRESS was a phenomenon encountered occasionally during perigee passage when the gyro drift biases (GDB) on the Z- and S-gyros spontaneously change level. An OBC program has been developed to monitor the GDB levels on all gyros and reset them if jumps occur. The program is activated prior to Loss of Signal (LOS) each perigee.

EXOSAT's second eclipse season, covering a period of 12 orbits with eclipses varying in duration from a few minutes to approximately 1 hour, has just ended.

3. On-Board Software

Now that all planned modifications to the on-board software are complete, maintenance of the system, including further development to cover malfunctions or new requirements, will be undertaken within the context of a software maintenance support contract of approximately 0.2 man-year of effort. Emergency situations will be dealt with on an ad hoc basis. Reference is made to the article on p. 30 describing the revised ME Direct mode application program.

4. Observation Output

A recent problem with the tape archiving system on the general Multi-Satellite Support System (MSSS), when approximately 7 hours data was irretrievably lost, serves to encourage P.I's to quickly scan through FOT's on receipt and inform the Observatory promptly of any anomalies. Archiving has been carried out as follows: 1600 bpi archive tapes are produced in real time from the incoming telemetry stream, kept in a cyclic pool for a certain period and then copied to 6250 bpi master archive tapes. Until the present, this system has proved error free but a fault in the copy process discovered after recycling has illustrated an inherent weakness of the system. Steps have been taken to extend the size of the cyclic pool such that tapes have normally been delivered to the P.I. and the auto analysis carried out by the

Observatory prior to recycling. Additional security checks have been implemented in the copying process from real time to master archive tapes. P.I's should nevertheless check their FOT as soon as possible after receipt for any gross structural errors, e.g. expected packets all present etc.

The FOT handbook has been completely revised and extended to include a comprehensive chapter on data processing and scientific analysis. In attempting to present as complete a picture as possible we have regrettably required considerably more time than anticipated but the final document is now ready for despatch.

Note that the majority of modifications to the real time graphics software have been completed and, as for the OBC software, maintenance support only will be available in the future.

5. Future Plans

Preliminary estimates of fuel consumption (propane) from launch to the present suggest that some conservation may be necessary to maintain operations during the last months of a 4 year mission. This presents, of course, a difficult trade-off since the state of the hardware in mid-1987 is not easily predictable, therefore a minimal adjustment to the procedures will be instituted immediately to ensure as far as possible a slightly positive fuel margin extrapolated to May 1987. Refinements to the model and additional calibrations are in progress and may lead to further conservation measures. As from 15.12.84 the following slew strategy will be adopted, pending results of the more detailed calculations:

- no slews at 170.7 deg/hr.
- reduced number of slews at 85.3 deg/hr consistent with maintaining the observation programme.
- Use 42.7 deg/hr as the default slew rate.

On average, manoeuvre durations will be increased by a few minutes as a result of the above.

Now that EXOSAT is half-way through its natural lifetime, a detailed study is in progress to identify an optimum strategy for lifetime extension beyond April 1986 using the hydrazine originally foreseen for orbit modification for occultations. Occultation measurements are not now the prime thrust of EXOSAT although a small number may be carried out during the next year and, in preparation for this, a 'natural' occultation is planned towards the end of this year. Clearly, any use of hydrazine for occultation will reduce the possible lifetime extension and a trade-off must therefore be made. Further details will be given in a future edition of the Express.

P.I's with approved coordinated observations are urged to define as precisely as possible the times of coordination of their EXOSAT observation with other facilities such that the Observatory team can adjust the EXOSAT schedule when necessary and still maintain the actual coordination.

TABLE 1

PERFORMANCE CHARACTERISTICS (LE)

LE1	Characteristics			
Energy Range	0.04-2 keV (6-300 A) CMA* 0.3 - 2 keV PSD			
Energy resolution	Five filters are available for broad-band spectroscopy (CMA) $(\Delta E/E) = 41/E(keV)^{0.5}$ %FWHM (PSD)			
Field of view	2.2° diameter (CMA) 1.5° diameter (PSD)			
Effective area (cm^2)	Thin Lexan Filter	Al/P Filter	Boron Filter	Open position (PSD)
.05 keV	0.4	2.6	-	-
.1 keV	11.1	0.4	-	-
.5 keV	4.5	3.3	0.4	1.9
1.0 keV	3.2	2.5	2.0	13.5
1.5 keV	2.2	1.6	1.8	9.7
2.0 keV	0.6	0.5	0.6	1.9
Spatial resolution (Line spread function HEW)				
On axis :	18 arc sec (CMA) 3 arc min (PSD)			
20 arc minutes off-axis:	40 arc sec (CMA) 3.5 arc min (PSD)			
Average steady residual background**	1.8 cnts/sec/cm^2 (CMA) 0.7 cnts/sec/cm^2/kev (PSD)			

* Subject to UV contamination between 900 - 2600 A
** Background rate subject to flaring

TABLE 2

PERFORMANCE CHARACTERISTICS (ME & GSPC)

Medium Energy Experiment	Characteristics
Total effective area	1500 cm^2 (all quadrants co-aligned)
Effective energy range	1-20 keV (Argon proportional counters) 5-50 keV (Xenon proportional counters)
Energy resolution (E/E)	51/E $(kev)^{1/2}$ % FWHM (Argon counters) 18% for 10 keV$\leq$E$\leq$30 keV (Xenon counters)
Field of view	45 arc minutes FWHM, triangular response with a 3' flat top
Total residual background	4 cnts/sec/keV (2-10 keV Argon counters co-aligned)
Gas Scintillation Counter (GSPC)	
Total effective geometric area	150 cm^2
Effective energy range	2-18 keV or 2-40 keV, depending on gain setting
Energy resolution ($\Delta E/E$)	27/E $(kev)^{1/2}$ % FWHM
Field of view	45 arc minutes FWHM triangular response with a 3' flat top
Total residual background rate	1.3 cnts/sec/keV (2-10 keV)

AO-2 OBSERVATIONS 01.09.84 - 31.10.84

Day (84)	Time	Target	RA			Dec			SAA	Duration h	m	Principal Investigator
245	15.50	H2311+77	23	14	51	+78	22	09	93	1	50	White AO-1
245	20.28	V1223 SGR	18	51	40	-31	15	56	121	6	6	Beuermann
246	05.15	Cyg X-3	20	30	21	+40	47	31	122	10	29	Mason
246	18.15	GX1+4	17	28	48	-24	44	25	103	3	9	Mason
246	23.55	GK Per	03	27	54	+43	46	31	98	3	24	Watson
247	05.46	Cyg X-3	20	30	21	+40	47	27	122	10	7	Mason
247	20.40	VW Hydri	04	09	59	-71	23	43	100	3	30	Pringle
248	21.18	Ar Lac	22	06	26	+45	31	21	126	15	48	Eyles AO-1
249	11.53	3C 120	04	30	39	+05	16	51	95	7	48	Tanzi
249	22.02	GX 17+2	18	13	01	-14	04	45	109	6	34	Sztajno
250	07.01	GX1+4	17	28	48	-24	44	03	99	3	17	Mason
250	12.28	Ophichus Cl.	17	09	35	-23	19	58	94	5	32	Nulsen
250	19.38	GX17+2	18	13	01	-14	04	45	109	7	52	Sztajno
251	05.16	2S1636-536	16	36	39	-53	40	31	91	9	25	Turner
251	16.55	VW Hydri	04	09	29	-71	25	24	100	3	5	TOO
251	23.13	V 603 Aqi	18	46	11	+00	30	18	115	5	18	Metz
252	07.26	VW Hydri	04	10	00	-71	24	18	99	2	54	Pringle
252	11.45	PKS 0637-75	06	37	44	-75	11	19	89	4	17	Zimmermann AO-1
253	09.17	1H0414+009	04	14	24	+00	59	48	103	3	43	Warwick
253	15.00	Feige 24	02	32	35	+03	32	52	128	3	59	Heise
253	22.20	V603 Aqi	18	46	13	+00	30	12	113	6	12	Metz
254	07.30	PKS2005-489	20	05	42	-49	01	00	120	5	35	Warwick
254	15.55	H0416-12	04	16	14	-12	16	57	105	1	14	White AO-1
254	19.27	1702-363	17	02	14	-36	22	47	90	5	32	Van Paradijs
255	02.30	GX1+4	17	28	49	-24	44	05	94	2	58	Mason
255	08.41	Feige 24	02	32	36	+03	32	51	130	2	53	Heise
255	14.25	VW Hydri	04	09	56	-71	24	19	99	3	24	Pringle
255	20.15	3C 371	18	06	53	+69	47	46	90	12	13	Worrall
256	23.29	V442 Oph	17	29	23	-16	06	00	92	5	20	Van d. Woerd
257	06.17	MXB 1728-34	17	27	00	-34	15	26	92	17	23	Foster
258	02.00	V0332+53	03	31	21	+53	02	37	103	3	19	Davelaar
258	07.48	1H0414+009	04	14	25	+00	59	46	108	3	32	Warwick
258	14.16	SS Cyg	21	40	45	+43	21	23	127	6	53	TOO
258	23.40	NGC 1129	02	51	23	+41	25	26	116	5	10	Morini
259	07.15	VW Hydri	04	10	01	-71	24	34	99	3	14	Pringle
259	13.12	SS Cyg	21	40	45	+43	21	22	127	2	28	TOO
259	17.19	3C390.3	18	44	42	+79	42	05	90	3	52	TOO
259	23.50	MKN 1040	02	25	21	+31	07	48	126	5	13	Pounds AO-1
260	18.41	4U2030+40	20	30	24	+40	46	32	119	6	15	Van der Klis
261	03.08	H1829-591	18	35	49	-59	16	37	99	1	53	Lawrence
261	05.53	H1829-591	18	21	00	-59	24	17	97	2	33	"
261	09.10	H1829-591	18	28	45	-59	21	13	98	1	43	"
261	11.44	H1829-591	18	19	44	-59	40	53	97	4	52	"
261	19.01	V0332+53	03	31	17	+53	02	46	106	3	5	Davelaar
262	00.32	SS Cyg	21	40	45	+43	21	23	127	4	28	TOO
262	07.55	CD-42	19	44	06	-42	09	52	113	1	35	Heise AO-1
262	11.43	1758-250	17	57	56	-25	06	32	94	6	58	Van Paradijs

Day (84)	Time	Target	RA	Dec	SAA	Duration h	Duration m	Principal Investigator
262	21.25	VW Hydri	04 09 58	-71 24 16	99	3	26	Pringle
263	03.31	SS Cyg	21 40 45	+43 21 22	127	1	24	TOO
263	07.30	2A 1822-371	18 22 15	-37 10 06	98	16	25	Mason
264	15.18	0335+096	03 36 04	+09 50 16	122	13	8	Schnopper AO-1
265	06.48	H0323+022	03 23 46	+02 16 20	127	5	28	Bradt
265	15.10	SS 433	19 09 13	+04 52 30	108	3	10	Stewart
265	21.00	SS CYG	21 40 45	+43 21 10	126	2	39	Lamb
266	02.43	Beta Hydri	00 25 36	-77 22 20	103	4	53	Dravins
266	10.16	1H0414+009	04 14 26	+00 59 32	115	2	59	Warwick
266	15.42	HD 25940	04 05 09	+47 37 01	108	2	38	Henrichs
266	20.47	VW Hydri	04 10 02	-71 25 00	98	7	12	Pringle
267	06.27	H0323+022	03 23 46	+02 16 18	129	5	49	Bradt
267	14.23	GL 205	05 29 05	-03 40 52	97	4	32	Schmitt
268	10.22	SS 433	19 09 15	+04 51 45	106	3	29	Stewart
268	16.04	BY Dra	18 32 33	+51 39 00	94	9	15	De Jager
269	03.05	V4260PH	18 05 18	+05 49 08	89	4	26	Szkody
269	09.04	SS 433	19 09 15	+04 51 44	105	6	1	Stewart
269	16.58	BY Dra	18 32 33	+51 38 58	94	11	7	De Jager
270	05.56	1820-303	18 20 20	-30 25 28	91	6	25	Ponman
270	14.18	Her X-1	16 55 56	+35 22 34	75	3	46	Voges
270	20.28	VW Hydri	04 10 01	-71 24 19	98	3	25	Van d. Woerd
271	02.06	SS 433	19 09 15	+04 51 43	104	4	17	Stewart
272	08.17	4U0614+09	06 14 31	+09 10 50	91	3	43	Mason
272	14.38	Cyg X-3	20 30 24	+40 46 11	115	6	9	TOO
272	22.16	Am Her	18 14 46	+49 49 18	90	3	30	Heise
273	04.09	V 1017 Sgr	18 28 44	-29 27 46	90	1	10	Heise AO-1
273	07.20	HD 197481	20 41 58	-31 33 15	117	2	20	Pallavicini AO-1
273	11.54	SS 433	19 09 14	+04 52 18	101	3	55	Stewart
273	18.02	VR042.05.01	05 23 29	+43 02 09	102	2	58	Bedford
273	23.00	3C 371	18 06 58	+69 46 52	91	7	14	Worrall
274	09.01	1H0414+009	04 14 26	+00 59 30	122	2	48	Warwick
274	13.51	VW Hydri	04 10 01	-71 25 11	97	3	29	Van d. Woerd
274	19.52	GD 391	20 27 54	+39 02 08	115	3	24	Heise
275	00.43	MV Lyr	19 05 32	+43 54 59	98	2	23	Heise AO-1
275	19.14	SS 433	19 09 21	+04 53 53	99	4	1	Stewart
276	00.40	H1833-077	18 34 41	-07 40 04	90	2	52	Cooke
276	06.36	3C120	04 30 07	+05 16 50	120	11	52	Pounds
276	20.43	A478	04 10 48	+10 22 18	125	5	46	Stewart
277	04.52	NGC 1566	04 19 12	-55 02 51	105	2	52	Alloin
277	10.25	3C120	04 30 07	+05 16 49	121	5	24	Pounds
277	18.01	PK 158+17.1	06 51 38	+55 39 41	91	2	53	De Korte
277	23.00	Aql X-1	19 08 35	+00 28 04	97	5	50	Van Paradijs
278	06.49	VW Hydri	04 10 04	-71 25 08	97	3	14	Van d. Woerd
278	13.02	3C 120	04 30 40	+05 16 48	122	5	32	Tanzi
278	21.35	SS 433	19 09 14	+04 51 54	97	2	29	Stewart
279	17.15	MCG 8-11-11	05 51 20	+46 27 27	102	3	14	Maraschi
279	23.14	G34.6-0.5	18 53 20	+01 14 36	92	11	59	Jones
280	13.48	3C120	04 30 07	+05 17 07	124	6	47	Pounds
280	23.10	Hyades I	04 25 58	+17 22 04	125	3	29	Schnopper AO-1
281	04.00	Hyades II	04 22 35	+16 59 20	126	5	26	" "
281	10.20	Hyades III	04 15 30	+17 09 25	128	7	16	" "

Day (84)	Time	Target	RA	Dec	SAA	Duration h m	Principal Investigator
281	19.46	VW Hydri	04 10 07	-71 25 00	96	4 0	Van d. Woerd
282	01.56	Er Vul	21 00 05	+27 34 44	120	2 32	Heise AO-1
282	06.24	HM Sge	19 39 32	+16 35 14	102	6 05	Cordova
283	13.57	MXB1906+00	19 05 47	+00 02 55	91	10 33	Brinkman
284	03.27	3C120	04 30 06	+05 17 15	128	5 19	Pounds
284	11.15	TAU-C1 F1	04 26 19	+26 06 13	127	9 24	Bleeker AO-1
284	22.55	TAU-C2 F1	04 52 45	+30 33 54	121	15 7	Bleeker AO-1
285	16.50	VW Hydri	04 10 06	-71 24 55	95	2 29	Van d. Woerd
285	20.58	0338-54	03 38 27	-54 19 24	110	2 7	TOO
286	01.27	3C120	04 30 06	+05 17 14	129	5 7	Pounds
286	09.23	1921-293	19 21 35	-29 22 56	89	6 00	Willmore AO-1
287	04.50	1921-293	19 21 34	-29 22 42	88	9 11	Willmore AO-1
287	16.10	PKS2005-489	20 05 39	-49 01 16	92	5 39	Warwick
287	23.32	NGC 6814	19 39 49	-10 29 01	94	6 3	Branduardi
288	07.12	1921-293	19 21 34	-29 22 41	87	6 43	Willmore
288	17.00	Crab Nebula	05 31 38	+22 01 07	118	13 41	ME Cal.
289	10.05	SC 0316-4581	03 16 22	-45 48 21	119	4 18	McKechnie
289	16.00	VW HYDRI	04 10 05	-71 25 20	93	3 59	van der Woerd
289	22.26	V1016 CYG	19 55 10	+39 39 18	101	4 28	Cordova
291	14.58	FAIRALL 9	22 05 03	-59 05 58	111	6 1	Scarsi
291	10.17	PKS0558-504	05 58 51	-50 26 32	96	3 32	Bradt
292	04.10	SMC X-1	01 16 03	-73 44 47	96	6 33	Robba AO-1
292	13.40	V0332+53	03 31 16	+53 02 57	130	2 30	Davelaar
292	19.49	MR 2251-178	22 51 20	-17 53 18	131	7 46	Pounds
293	06.05	VW HYDRI	04 10 01	-71 26 22	94	3 24	van der Woerd
293	11.48	FAIRALL 9	01 22 05	-59 05 57	110	2 52	Scarsi
293	18.11	HD 45314	06 24 34	+14 56 25	109	2 49	Henrichs
293	23.16	N 157B	05 38 30	-69 11 29	90	4 59	Trussoni
294	17.07	PSR0540-69	05 44 44	-68 48 33	90	5 58	Schnopper
295	00.54	E0003.0-7443	00 03 16	-74 45 55	93	9 29	Pye AO-1
295	12.35	FAIRALL 9	01 22 05	-59 05 58	110	5 22	Scarsi
296	03.59	X2127+119	21 27 27	+11 54 50	116	14 26	Redfern
296	21.03	FAIRALL 9	01 22 05	-59 05 58	110	2 52	Scarsi
297	01.02	H0139-68	01 39 57	-68 10 09	100	6 58	Beuermann
297	09.45	H0453-75	04 53 08	-74 59 14	89	6 43	Tuohy
297	17.38	VW HYDRI	04 09 59	-71 25 40	94	4 34	Heise
298	14.29	4U0504-04	05 07 48	-03 46 58	129	2 50	Patterson
298	19.58	4U0550+29	05 52 52	+28 48 45	122	2 42	Patterson
299	01.06	ABELL 15	06 25 11	-25 16 45	104	4 41	Heise
299	08.52	FAIRALL 9	01 22 05	-59 05 58	108	4 28	Scarsi
299	14.39	SMC X-1	01 16 09	-73 44 37	93	5 21	van der Klis
299	23.08	2223-052	22 23 05	-05 14 56	123	3 27	McHardy
300	05.18	1H 2322-269	23 17 00	-27 42 33	123	2 22	Praderie
300	10.55	MR 2251-178	22 51 23	-17 53 37	124	4 40	Pounds
301	00.17	VW HYDRI	04 10 04	-71 25 58	93	10 42	Heise AO-1/TOO
301	14.02	AM HER	18 14 54	+49 48 10	82	3 52	Heise
302	08.05	HD10221	01 38 17	+67 48 27	125	4 23	Ferrari
302	15.03	S 147	05 38 07	+26 46 39	129	8 37	Rothenflug
303	02.00	3A0726-260	07 26 59	-25 59 15	94	2 54	Watson
303	13.12	SMC X-1	01 16 00	-73 44 25	92	4 18	van der Klis

Day (84)	Time	Target	RA	Dec	SAA	Duration h m	Principal Investigator
303	19.37	PG 0834+488	08 35 00	+48 49 43	97	4 42	Cook
304	04.42	SC2059-247	20 59 08	-24 45 48	93	6 06	McKechnie
304	11.19	H0542+51A	04 55 50	+51 57 46	128	3 01	Tuohy
304	17.13	VW HYDRI	04 09 30	-71 26 15	92	2 27	Heise AO-1
304	20.44	NGC 1566	04 19 09	-55 04 07	107	3 11	Alloin
305	02.27	4U0614+09	06 14 23	+09 10 32	122	6 14	Mason
305	10.06	AB DRA	19 51 07	+77 35 17	102	2 18	Mason AO-1

TOO : Target of Opportunity

NB : Observation durations are the time from outer loop closure to outer loop opening and should not be considered as necessarily definitive.

EXOSAT X-RAY SOURCES

'New' X-ray sources are discovered by EXOSAT serendipitously in the FOV of the telescope or in the offset quadrants of the ME or from an analysis of ME/GSPC 'background' data recorded during manoeuvres. We intend to maintain a list of published 'new' sources and readers are encouraged to report 'discoveries'.

It is recommended that the following convention be used when referring to EXOSAT sources in publications; in any case, this format will be adopted for any list maintained by the Observatory Team and is consistent with the recommendations referenced (below) and the Einstein HRI format.

Please note that this convention supercedes and renders obsolete the definition printed in Express issues 4 to 6.

EXOSAT Source Nomenclature

Source Position:	RA	02H	30m	20.5s	(1950)
	DEC	-02D	20m	33.2s	
Name :	EXO 023020-0220.5				

Ref.(1) Dictionary of the Nomenclature of Celestial Objects
M.C. Lortet and F. Spite, Observatoire de Paris, Meudon

(2) IAU Sub-Group on Nomenclature Problems

IAU (EXOSAT) TELEGRAMS

Circular No.	Title	Comment	Authors
3841	Hercules X-1	Anomalous X-ray behaviour	EXOSAT Team
3842	Supernova in NGC 5236	Multi-waveband observations	W. Wamsteker
3850	GK Persei	351s periodicity during an outburst	M. Watson, A. Smith EXOSAT Team
3854	MXB 1730-335	Active, type 1 bursts	G. Pollard, N. White P. Barr, L. Stella
3858	4U 1543-45	Accurate position, ultra-soft spectrum	R. Blissett, EXOSAT Team
3872	GX 1+4	Unexpected low X-ray state: $\lesssim 4$ UFU	R. Hall, J. Davelaar EXOSAT Team
3882	4U1755-33	Periodic dips in intensity	N. White, A. Parmar K. Mason
3887	4U2129+47 = V1727 Cygni	Unexpected low X-ray and optical state	W. Pietsch, H. Steinle M. Gottwald
3893	V0332+53	Accurate position, and flux	J. Davelaar, R. Blissett, L. Stella M. McKay, N. White, J. Bleeker
3902	V0332+53	Discovery of 4.4s period	L. Stella, N. White
3906	V0332+53	Unexpected brightening	A.N. Parmar R.J. Blissett T. Courvoisier L. Chiappetti
3912	V0332+53	Orbital parameters determination	N. White, J.Davelaar, A.N. Parmar, L. Stella M. van der Klis

Circular No.	Title	Comment	Authors
3923	Her X-1	Her X-1 'on' again at 80 Uhuru flux units, 1.24s pulsations (March 1.5 - 1.8)	J. Trümper, P. Kahabka H. Ögelmann, W. Pietsch, W. Voges, M. Gottwald, A. Parmar
3932	2S1254-690	Discovery of type 1 Burst and an absorption 'event'.	T. J.-L. Courvoisier, A. Peacock, M. Pakull
3935	AN URSAE MAJORIS	Serendipitous observation: soft X-ray flux suggests a return to the 'bright' state.	J.P. Osborne
3939	VW HYDRI	Discovery of X-ray pulsations during superoutburst	J. Heise, F. Paerels, H. van der Woerd
3952	2S1254-690	Discovery of a 3.9hr period in the X-ray light curve	T. J.-L. Courvoisier A. Parmar, A. Peacock
3961	4U1323-62	Type I Burst discovered	M. van der Klis, F.A. Jansen, J. van Paradijs, W.H.G. Lewin
3980	TV Columbae	X-ray periodicity discovered in range 1-7 keV.	A.C. Brinkman, J. Schrijver
3996	2S 0142+61	1456 sec Modulation of the X-ray flux	N.E. White, P. Giommi, A.N. Parmar, F.E. Marshall

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Taylor, B.G., Andresen, R.D., Peacock, A. and Zobl, R., The EXOSAT Mision. Space.Sci.Rev. 30, 479 (1981).

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Turner, M.J.L. and Breedon, L.M., Spectral and temporal features in bursts from 2S1636-536 observed with EXOSAT. MNRAS (1984), 208, 29p.

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SCIENTIFIC MEETING OF THE GERMAN ASTRONOMISCHE GESELLSCHAFT MINDEN, SEPTEMBER 1984

The annual scientific meeting of the German 'Astronomische Gesellschaft' was held in Minden/Westfalen on the 11-14th September. Amongst the many presentations, four were devoted to results of EXOSAT observations.

P. Biermann gave a review 'First Results with EXOSAT' in which he highlighted the achievements of EXOSAT's first year in orbit. His summary included many of the exciting results published on X-ray binaries, SNR's, clusters of galaxies and AGN's.

J. Krautter (in collaboration with H. Ögelmann and K. Beuermann) presented EXOSAT observations of Nova Muscae in outburst. This is the first X-ray detection of a nova in outburst.

K. Beuermann gave an overview of results of AM Her type star observations (VW Pup, CW1103+254, 1405-45, An Uma) carried out in collaboration with several colleagues. Implications of the observed X-ray light curves and spectra for emission mechanisms were discussed.

H. Wendker and H. Kähler presented data indicating X-ray emission from regions of the Wolf-Rayet nebula NGC 6888. In a long exposure time observation of 25 hours, faint X-ray structure was detected at a position where the material blown away from the WR-star interacts with the interstellar medium.

Report on the Workshop "The Crab Nebula and Related Supernova Remnants" George Mason University, 11-12th October, 1984

This workshop conveniently took place after the IAU Symposium no. 101 on Supernova Remnants in Venice, 1982. The first day and a half was devoted to reviews and contributed papers on the Crab Nebula.

The implication of recent UV, near-IR and optical data for chemical composition were reviewed. Modelling of the Crab Nebula was discussed showing that present MHD calculations lead to better predictions of the spectrum from X-ray to optical wavelengths. The interpretation of the interpulse in the light curve points to the geometrical arrangement of the emission sites. During the discussion on the evolution, much attention was paid to the possible existence of a shell around the Crab for which, however, there is as yet no observational evidence. Progenitor models focus on the mass range 8-15 $M_{\odot}$ and observational properties were predicted. The only object showing all characteristics of the Crab, the LMC pulsar PSR 0540-69, was discussed on the basis of the X-ray and optical data.

A half day session on Supernova Remnants related to the Crab Nebula was devoted to X-ray and radio observations. Einstein and EXOSAT X-ray observations of the Vela region showed the existence of an extended non-thermal feature coincident with the maximum in radio intensity observations. X-ray spectral data for several objects supplement the radio data. Possible new candidates for Crab-like supernova remnants were indicated on the basis of the radio morphology.

EXOSAT Presentations

G. Hasinger (MPI Garching):
"A New Interpretation of the Crab Pulsar X-Ray Interpulse Emission".

W. Brinkmann, B. Aschenbach, A. Langmeier, G. Hasinger, T. Bork (MPI Garching):
"X-Ray Observations of the Crab Nebula".

J. Davelaar, A. Smith (SSD/ESA):
"EXOSAT Spectral Observations of Crab-like SNR's".

J. Davelaar

SPECIFICATION OF THE COMMONLY USED OBC APPLICATION PROGRAMS

1. GSPC Programs

Direct mode: GDIR (program no. 1)

All channels may be sampled, i.e. energy, burst length and time tag, with flexible sampling rate. The following data combinations are possible -

i) Valid energy values (energy word non-zero) plus a count of invalid energy samples since the last valid energy event are transferred to the output buffer. This allows the time of each event to be determined according to the sampling frequency of the channel.

ii) Valid energy (non-zero) and burst length values are transferred directly to the output buffer.

iii) Valid energy (non-zero) are transferred to the output buffer for those events with a burst length within defined limits.

iv) Valid energy (as before), burst length and time tag values are transferred directly to the output buffer.

A minimum time between transmission of output buffers may be selected in order not to overload the telemetry in the case of high count rates.

- Energy/Burst length histogram mode: GHEBL4 (program no.32)

The energy and the burst length channels may be sampled with a flexible sampling rate.

256 channel energy histograms for all non-zero energy events are formed and transmitted to ground at a flexible preselectable rate.

The following options are available:

i) Either energy or burst length histograms may be formed.

ii) Compression to 128, 64, 32, or 16 channels may be selected such that for the selected transmission rate.

2 x 128 channels
or 4 x 64 "
or 8 x 32 "
or 16 x 16 " will be sent to ground.

iii) Only those valid energy events with a burst length within defined limits will be used to form the histogram.

2. ME Programs

Direct Mode: MDIR2 (program no. 71) ref. p. 30.

The energy channel is sampled at a flexible rate. The number of invalid (zero) samples between valid (non-zero) energy events within a defined energy range is transferred to the output buffer. At 8K telemetry rate, 442 words per second are allocated to the OBC floating telemetry. Continuous transmission of data is possible for events rates $\leqslant$ 600 c/s with 100% telemetry allocated to the ME experiment. A minimum time between transmission of output buffers may be specified in order not to overload the telemetry.

Energy/Identifier histogram modes:

A) MHER4 (program 33)

The energy and detector identifier channels are sampled at a flexible rate. Full resolution (256 channels Ar + Xe) energy histograms are formed for each (Ar+Xe)detector (10 sec integration time), each pair of detectors (5 sec integration time) or for each half-experiment (2.5 sec integration time). Intensity profiles for each detector, pair of detectors or half experiment are also formed. If half experiment data is selected, the following options are also available.

i) Compression to 64, 32, or 8 channel energy histograms may be selected such that 4 x 64 channel
or 8 x 32 "
or 32 x 8 "
histograms will be transmitted in the integration time.

ii) Selection of an energy range for inclusion in energy histograms and intensity profiles may be given (first channel, and number of channels).

B) MHER5 (program 9)

The energy and detector identifier channels are sampled at a flexible rate. For each half experiment, separate Ar and Xe energy histograms are formed, each having separate flexible integration times. 64 energy channels only are used to form the histograms, with the first channel for both Ar and Xe being selectable. Intensity profiles for the Ar data only are formed, with flexible minimum resolution (in units of 31.25 ms). An option to compress the 64 channel histograms to 32 or 8 channel histograms is available.

C) MHER6 (program 70)

The energy and detector identifier channels are sampled at a flexible rate. For each half experiment, intensity profiles are formed using valid energy events from either one or two selectable energy ranges. The length of the intensity profile time bin is flexible and is defined as the number of samples of the energy channels to be used to form the bin e.g. at a 4K s^{-1} sampling rate of the energy channel, 64 or 32 energy samples per time bin correspond to 16 and 8 ms time resolution respectively.

Pulsar modes:

A. MPULS (program 8)

The energy and time-tag channels are sampled at either 4K s^{-1} or at 1K s^{-1}. This mode is used for observations of periodic sources where the period is defined by t x 128 +r, in units of 2^{-17} seconds (7.63 μs). If the exact period of the source cannot be specified thus, r can be updated by ±1 every i periods; t,r and i are selectable.

129 bin intensity profiles of non-zero energy events from the Argon data only are formed. The first 128 time bins are of equal length t, and the 129th is equal to r. The profile can be summed over a number of periods, T.

Energy histograms of valid events are also formed, the integration time being 8 x the intensity profile integration time. The following options exist.

no. of EN histograms	no. of channels per histogram	no. of time bins per energy histograms
129	8	1
33	32	4
9	128	16
9	256	16
17	128	8

B. MPULS2 (program 14)

The energy, detector identifier and time-tag channels are sampled at either 2K s^{-1} or 1K s^{-1}. This mode is also used for observations of periodic sources, where the period is defined as for MPULS, but no updating of r every i periods is available.

This program performs basically the same functions as MPULS, but has the additional feature of checking the detector identifier to determine whether the event originated from the half experiment pointing at the source, or the offset half experiment. 'Source' data is used to form intensity profiles and energy histograms as described in MPULS. 'Background' data is used to form a simple background histogram, with the same number of channels as the source energy histogram. The energy histogram options are as follows:

no. of energy histograms	no. of channels per histogram	no. of time bins per energy histogram
129	8	1
33	32	4
17	64	8
9	128	16
17	128	8

Intensity Mode

MHTR3

The qualified events counter is sampled at a rate selectable between 32 s^{-1} and 4 K s^{-1}. Each sample is transferred to an output buffer, which is transmitted when full. Output buffer size can be selected from one of four values: 256, 512, 1024 and 4096 words. Continuous data is possible according to telemetry and sample rates, otherwise discrete time intervals can be covered depending on the size of the output buffer and sample rate.

Note that this counter integrates the qualified event rates from all detectors and can be electronically conditioned to accept Ar only, Xe only or Ar and Xe events - it is a physically different counter from the housekeeping QE counter.

3. LE Programs

Direct Mode: LDIR2 (program no. 35)

All channels may be sampled, i.e. Energy, Rise Time, Position and Time Tag. The sampling rate is fixed at 512 s^{-1}.

Valid data is selected by checking that the position is non zero, specifically that MSBXY (most significant bits XY) and LSBX (least significant bits X) $\neq 0$. The following data combinations per event are possible.

i) Valid position data (3 bytes) transferred directly to the output buffer.

ii) Valid position data and energy values transferred directly to the output buffer plus the count of invalid samples between events.

iii) All data mode - all channels for a valid event are transferred directly to the output buffer, plus the count of invalid samples between events.

A square shaped or diamond shaped filter to perform background rejection may be applied to any of the above data combinations. A minimum time between transmission of output buffers may be specified in order not to overload the telemetry in the case of high source count rates.

C. Durham

A Guide to the Use of the OBC Programs

The aim of this article is to provide information necessary to define the optimum OBC configuration for a particular observation and to define a number of standard OBC configurations in which observers may choose to conduct their particular observations. Note that the raison d'être of the OBC is to obtain the maximum amount of scientific information with a telemetry stream limited to 8 kbits/second.

Currently, observations are planned with a standard OBC configuration for LE1, a simple choice of GSPC modes (95% of the time = GHEBL4) and a more complicated trade-off of spectral/temporal resolution and telemetry usage for the ME.

For faint ($\lesssim$ 10 cts/sec/half) sources a default configuration shown below is nearly always used:

Instruments	OBC Configuration	Telemetry usage
LE1	LDIR2, t_{min}=22	~ 25%
GSPC	GHEBL4 256 channel spectra every 8 sec.(Gain 2.0 nominal)	4%
ME	MHER4, det. ID, 8 256 channel spectra every 10 secs + intensity profiles every 0.25 secs.	27%
	MHER6, channels 6-24 (2-6 kev, background ~ 10 cts/s/half) 12 ms time resolution	20%
		76%

MHER4 in det. ID mode is the most sensitive ME mode and should always be used for faint sources unless high time resolution is needed. The intensity profiles (8 every 0.25 secs i.e. 1 from each detector) contain data from both Argon and Xenon and are therefore not too sensitive since the background in the Argon chambers is ~40 cts/sec/half while in Xenon it is ~250 cts/sec/half.

Generally observations of a pulsar with a period P require a time resolution of about t = p/10. Since the ME is normally the prime instrument, the above OBC configuration is therefore only useful for pulsars with periods $\gtrsim$ 100 sec. Similarly if a source is thought to be variable or a timescale of q then time resolution with t = q/10 is required.

An alternative OBC configuration with two advantages and two disadvantages is:

Instrument	OBC Configuration	Telemetry Usage
LE1	LDIR2, t_{min} = 22	~25%
GSPC	GHEBL4, t = 8 sec 256 channels	4%
ME	MHER5, 64 + 64 channel spectra every 1 sec. Intensity samples every 31 msec	39%
		68%

The advantages are the higher time resolution of the ME spectra (1 sec) and of the intensity samples (31 msec) and the much improved background in the intensity samples (30 cts/sec/half rather than 300 cts/sec/half) since HER5 puts Argon data only into the intensity samples. The disadvantages are that only 2 spectra are transmitted per sample (ie. one per half rather than 1 per detector) and this can complicate the background subtraction. In addition only 64 channels of Argon and 64 channels of Xenon are transmitted. Normally all the science data is contained within these channels (unless the source is visible in Xenon at $\gtrsim$ 30 keV), however, the data above channel 64 can be useful in checking that the background is stable.

If 1 second spectral data and 31 msec intensity profiles are not sufficient, then the spectral data can be compressed by a factor of 2 to double the time resolution with only a small loss of spectral information. Also, the HER5 intensity profiles can be replaced by HER6 intensity profiles thus:

Instrument	OBC Configuration	Telemetry Usage
LE1	LDIR2, t_{min} = 22	25%
GSPC	GHEBL4, t = 8 sec 256 channels	4%
ME	MHER5, 32+32 channel spectral every 0.44 sec. No intensity profiles	36%
	MHER6, 12 msec intensity profiles for channels 6-24	20%
		85%

85% telemetry usage is an upper limit which allows a margin for solar flares etc. This configuration has a potential problem of CPU usage. For bright sources ($\gtrsim$600 cts in the ME) the CPU usage can become too high causing the OBC to halt with a resulting loss of about 15 minutes of data. Caution should therefore be exercised if the source bursts or flares - the most interesting data could be lost! If there is any possibility of the source being this bright then it is probably better to use MHER5 or MHTR3 to provide the intensity profiles. The disadvantage of this is that the background will be $\sim$ 40 cts/sec with MHER5 or$\sim$80 cts/sec with MHTR3 as opposed to 10 cts/sec/half for channels 6-24 using MHER6.

Other options to consider for higher time resolution are:

1. compress MHER5 spectra to 8 channels (0.125 sec time resolution available).

2. Use MPULS or MPULS2 modes. These provide spectra folded over a given period. The problem with these modes is that if the period is not well known then information can be lost in the folding process.

3. Use MDIR2 mode (ref. p. 30) 125 msec time resolution, over a selectable range of energy channels, for count rates of between 200-600 cts/sec.

GHEBL4 is the standard mode for the GSPC and is appropriate for 95% of all observations. It provides 255 channel energy spectra with 8s time resolution. Higher time resolution and compression of the spectrum are available.

For fine-time resolution spectral studies such as bright source observations, with significant counts in short periods, or observations of pulsars with periods $\lesssim$ 100 s where the data is folded over several periods, use of GDIR is recommended. This provides spectral and timing data per photon to a resolution of the sample interval, typically 0.5 or 1 ms selected according to source strength.

Principal OBC Modes

LE1

LDIR2 Standard LE program.

GSPC A choice of two, viz:

GHEBL4 Standard GS Program. Normally 256 channel spectrum every 8 sec but t can be changed and spectra compressed to increase time resolution.

GDIR An alternative GS program for use with pulsing or rapidly varying bright sources

ME There are a number of programs available for the ME. They either provide spectra or intensity profiles or a combination the two.

MHER4 Standard ME Program. Provides 256 channel spectra with (selectable) det ID, quad ID or det half ID, giving spectra every 10,5, 2.5 sec respectively and intensity profiles. MHER4 in det ID is normally the mode for faint (10 cts/sec/half) observations where high time resolution is not required. Compression possible but not normally used now that MHER5 is available.

MHER5 Principle alternative ME program. Provides higher time resolution than MHER4. 64 channel Argon and 64 channel Xenon spectra only. Compression available to increase time resolution. Time resolution is selectable and limited by telemetry considerations. Typical values are ~1 sec with no compression and .25 sec with compression = 1 (32+32 channels).

MHER6 Provides intensity profiles over a selectable range of channels (normally 6-24 - where the ME is most sensitive) or 2 ranges of channels (ie. hardness ratios).

MHTR3 High time resolution intensity profiles for all of Ar, Xe, or both (Ar only normally used for timing studies). Opt = 3 is the normal mode but in special circumstances use in opt = 1 gives up to .25 msec time resolution non-continuous data. Particularly useful instead of HER6 for observations of bright sources carried out in the coaligned configuration or as a dead time monitor (low sample rate 32 Hz - p. 30).

MDIR2 Direct ME mode (ref. p. 30). Provides high time resolution (up to .125 msec) intensity profiles over a selectable range of channels. For continuous data at a sample rate of 4 K s^{-1} the count rate should be between 200 and 600 cts/sec in the channel range of interest.

MPULS Provides spectra and intensity profiles folded over a given period for bright pulsing X-ray sources. No det ID, so normally only used in coaligned configuration. Normally MPULS and MPULS2 are only necessary for sources with periods $\lesssim$ 1.5 seconds.

MPULS2 As above but used in offset configuration. Data from one half only folded over given period, data from other half is put into background spectra. For use with fainter ($\lesssim$ 100 cts/sec) sources.

Telemetry Usage

A few general formulae to calculate approximate telemetry usage (at 8 kbits s^{-1}).

LDIR2	~ 25%	depending on count rate, whether a diamond filter is used and the value of t_{min}.
	~ 3%	radius = 128; diamond filter.
GHEBL4	4%	with t = 8 sec,
	35%	with t = 1 sec
MHER4	27%	always
MHER5	39%	with t_{AR} = 1 sec, t_{Xe} = 1 sec t_{in} = 1/32 sec. No compression
	50%	with t_{AR} = 0.31 sec, t_{Xe} = 0.31 sec. t_{in} = 8 sec, compression factor = 1.

The telemetry used is given by:

$$\text{tel}\ \% = \frac{500\ (0.015 \times t_{AR} \times t_{Xe} + t_{Xe} \times t_{in} + t_{AR} \times t_{in})}{t_{AR} \times t_{Xe} \times t_{in}}$$

where the t's are in units of software cycles (31.25 ms)
and t_{AR} = Argon accumulation time
t_{XE} = Xenon accumulation time
t_{in} = Intensity samples accumulation time

MHER6	15%	with N_{samp} = 64 (t = 16 msec) and 1 set of channels.
	40%	with N_{samp} = 48 (t = 12 msec) and 2 sets of channels.

The telemetry used is given by:

$$\text{tel}\% = \frac{959}{N_{samp}} \times N_{chan}$$

where N_{chan} = 1 or 2 depending on the number of channel ranges chosen.

MHTR3	15%	For 8 msec, opt 3 data - the default mode.

A.N. Parmar

UPDATES TO THE OBC SOFTWARE

1. MDIR2

MDIR2 is a new OBC program, which is now available for general use. In its normal configuration it can provide intensity samples at a time resolution of 0.25 msec over a selectable range of PHA channels. If all the available telemetry is allocated to the MDIR2 program then the count rates in the selected PHA channels should be $\lesssim$600 cts/sec for the data to be continuous. At higher counting rates the program will still work but the data will no longer be continuous. For each valid event the number of invalid samples since the last valid event is recorded as an 8 bit number, hence at a sampling rate of 4 kHz (the nominal value) if no events are recorded within 255 samples (ie. 62 msec) the counter overflows and is reset. This sets a lower limit to the source strength of $\sim$200 cts/sec over the selected PHA channels for a probability of $\sim 10^{-5}$ per event of an overflow. For lower sampling rates the lower acceptable count rate will of course be less than this value. Currently available Scientific Data Sequencer configurations support MDIR2 at 8, 4 and 2 kHz giving time resolutions of 0.125, 0.25 and 0.5 msec respectively.

Within these constraints MDIR2 is a useful addition to the range of available OBC programs since it provides a higher time resolution than MHTR3 for continuous data with a background counting rate that is $\sim$20 cts/sec for 2-6 keV data compared to 80 cts/sec for MHTR3 Argon data.

2. Scientific Data Sequencer 35

The Scientific data sequencer controls the sampling of the experiment output channels. SDS 35 allows an improved monitoring of the MQE rate, and hence better estimate of the ME dead time, by sampling the MQE (which contains both Argon and Xenon data) at 32 Hz. This takes $\sim$4% of available telemetry and 1% of the CPU processing power. For sources where dead time considerations are important, i.e. bright highly variable sources, use of MHTR3 with this SDS is recommended as a deadtime monitor. For a description of the ME dead times and how they can be corrected using the MQE rate see FOTH Chapter 8.

A.N. Parmar

MODIFICATIONS TO THE GSPC AND ME AUTO ANALYSIS

(1) GSPC

A modification to the GSPC auto analysis has been implemented to improve the background subtraction.

In the analysis set up when slews of more than 600 seconds are defined to scale the background, the background spectrum will be calculated exclusively from the slew data and not from the standard calibration background (the previous background subtraction method was to use the total number of counts above 9 keV in the slew to scale the level of the standard calibration background).

With this method, changes in the shape of the background compared to the standard background (mainly caused by the gain shifts) should no longer affect the quality of the background subtracted spectra.

A second modification in the GSPC auto analysis concerns the spectral fitting procedure. For gain 1 observations the energy interval has been reduced from the full range (Emax $\sim$35 keV) to a limited range with Emax = 24 keV. The reason for this modification is the uncertainty of calibration data for $E > 24$ keV.

(2) ME

The ME Auto Analysis Software now suppports analysis of data from the OBC modes MHER5 and MHER6. No modification of the auto analysis output layout was necessary but a few points are noteworthy:

- Only Argon data are analysed for MHER5.
- For intensity records giving a time resolution >1 sec no intensity analysis is scheduled. In this case the program stops after the spectral fitting procedure.
- Whenever MHER6 is active, in addition to MHER4/MHER5 as the main program, the intensity analysis is scheduled with MHER6 records. For observations where the wsp's of MHER6 define two energy bands the auto analysis results are for the total energy range $\Delta E = \Delta E_1 + \Delta E_2$.

M. Gottwald

LE CCF UPDATE NOTE NO. 2

With reference to the status described in the Guide to the LE CCF (EXOSAT Express No. 3 p.36) and to the CCF Update Note no. 1 (EXOSAT Express No. 4 p.43) the following changes have been applied to the LE Current Calibration Files.

Date Type	Status
B2	The effect of the partial flap deployment has been introduced, as an extra transmission coefficient = 0.735. Consequently the layout number has been changed to 2.
C1	For LE2 only, a minor error has been corrected (points 36 and 37 of the energy grid read 267 instead of 264).
E1	The final values for LE1 are available.
E2	The final values for LE2 and a rough estimate for LE1 are available.
E3	The layout has been modified (and the layout number changed to 2). The new layout is described in the FOT handbook (revised).The final values for LE2 and a rough estimate for LE1 are available.
E4	The final values for LE1 are available.
F1-3	These data types have been removed.

Using the terminology introduced in the original article, this CCF is defined as CCF4. The overall SHF key is set to 1983 day 150, and the "last update of cal history" to 1984 day 257.

CCF4 is being distributed with the latest FOT's and should be used instead of older versions. Users not interested in grating data types can take account of the changes to data types B2 and C1 using the information provided in this note. CCF4 is referenced in the FOT Handbook update (Rev. 2) in preparation.

L. Chiappetti

CHANGES TO THE ME CCF

The ME CCF has recently been updated to include the gain change parameters (Express No. 6 p.25) and background difference spectra supplied by Alan Smith. Users can identify the new CCF by a layout number of 4 for the CB (Channel Boundary) data type and by the presence of a new data type DS (Difference Spectra).

The 1st record of the CB data type is unchanged and the 2nd has the following layout:

Bytes	Content
0 - 63	SHF key of Gain measurements time.
64-127	SHF key of start time of applicability of gain drift parameters.
128-159	Gain drifts, units are per day*10^6.
160-191	Digital Ag's at time of gain measurement.

For a description of the above parameters and how to apply them see Express No. 6, p.25. Note that the gain measurements currently in the CCF were made on 1984 day 86 (SHF = 133574400) and that there is no evidence for any Xenon gain changes.

The layout of data type DS is as follows:

Record	Contents				
1	Argon counter	A,	configuration	(a)	spectrum
2	"	A	"	(b)	"
3	"	B	"	(a)	"
4	"	B	"	(b)	"
.		.		.	
.		.		.	
17	Argon	$half_1$	configuration	(a)	spectrum
18	"	$half_1$	"	(b)	"
19	"	$half_2$	"	(a)	"
20	"	$half_2$	"	(b)	"
21-40	The same for Xenon				

Note that each record contains data for 128 channels. In order to obtain spectra in cts/sec/bin the values stored in the CCF must be multiplied by 10^{-5}. Note that there are no data in the records appropriate to configuration (a) since this is not normally used. Uncertainties are not included in this data type pending investigation of the systematic errors associated with the spectra.

Each of the spectra represent the difference in background counting rate obtained when a detector is fully offset in the +ve direction compared with that obtained when it is co-aligned. See Express No. 5, p.48 for a detailed description of background subtraction techniques and difference spectra. These difference spectra should be subtracted from a background spectrum obtained in a fully positive offset configuration and added to a background spectrum obtained in a fully negative configuration prior to subtraction of the background spectrum from an aligned spectrum to obtain the source spectrum.

Note also that an error was introduced into some recently produced CCF's. Two of the configuration (b) Argon detector C resolution coefficients had become transposed. To check if this is the case on a particular CCF compare the configuration values (a) and (b). If they differ, then the configuration (b) values are wrong! Current CCF's (identified by a time of SHF = 152634849) are correct and also include a better estimate of the detector D Argon gain drift parameters determined in the recent Crab Nebula calibration.

A.N. Parmar

CHANGE TO THE GSPC CCF

The GSPC CCF has been modified to include new effective areas (A_E) as given in EXOSAT Express No. 6. These serve as a basis for deriving new absorption efficiencies (E_A)

The relation between A_E and E_A for energy E is

$$A_E(E) = A_G \cdot A_X(E) \cdot E_A(E) \qquad (1)$$

with A_G = effective geometric area
A_X = X-ray acceptancy

Since the energies E_i, i = 1-50 with defined effective areas $A_E(E_i)$ as given in the Express differ from the energies E_j, j = 1-50 as given in data type 3 (AE) of the GS calibration data, corresponding areas $A_E(E_j)$ were calculated from $A_E(E_i)$ via linear interpolation. Using the existing calibration values for A_G (data type 1 (DC)) and A_X (data type 3 (AE)), ie:

$$A_G = 150 \text{ cm}^2$$
$$A_X(E) = 0.687 + 5.477\ 10^{-2}E - 3.587\ 10^{-3}E^2 + 7.51\ 10^{-5}E^3$$

equ.(1) finally gives 50 pairs of $E_j/E_A(E_j)$.

To avoid a change in the layout of the data type 3 (AE), all values $E_A(E_j)$ are given with an accuracy of 3 digits so that there can be small discrepancies between the original effective areas and the areas derived from equ.(1). These discrepancies are of the order of a few x 0.1% and can therefore be ignored.

M. Gottwald

Note Concerning Subroutine SOLUN

This subroutine, which derives the solar and lunar vectors (for use in correcting event times) was recently distributed on the "AO-2 History Tape". The subroutine contains two common blocks, CBASC and CSOLR, for which the contents are not defined internally. For this reason, the values of the relevant variables are listed here.

```
      COMMON /CBASC/ PI,TWOPI,PIH,DEG,RAD
      COMMON /CSOLR/ SOLPR,ECL,CECL,SECL,XLSUNA,XLSUNB,ECLECC,ECLOM
      PI = 3.14159265358979324D0
      TWOPI = PI+PI
      PIH = PI*.5D0
      DEG = 180.D0/PI
      RAD = PI/180.D0
C   ECL, CECL, SECL= INCLINATION OF THE ECLIPTIC AND ITS COS AND SIN
C   XLSUNA, XLSUNB, ECLECC, ECLOM GIVE WITH A PRECISION OF 0.01 DEG
C   A VALUE FOR THE LONGITUDE OF THE SUN (LS(RAD)) IN THE ECLIPTIC
C   FROM: LM=XLSUNA+XLSUNB*DAY; LS=LM+ECLECC*DSIN(LM-ECLOM)
C   REF: THE ASTRONOMICAL EPHEMERIS 1978, CALCULATED FOR MID 1980.
      ECL = RAD*0.234418185380D+02
      CECL = DCOS(ECL)
      SECL = DSIN(ECL)
```

In addition, please note that the routine, as written, returns coorindates in the 1950.0 system, despite a comment statement suggesting otherwise. To obtain coordinates in the mean geocentric system of date, delete the references to PR50 and PREC.

J.R. Sternberg

OBSERVATORY TEAM

		Ext.
David Andrews	Observatory Manager	705*
Julian Sternberg	Observatory Software	703
Julian Lewis	System Software/HP Computers	702
Nick White	Senior Observatory Scientist	764
Paul Barr	Duty Scientist/Mission Planning	711
Lucio Chiappetti	Duty Scientist	717
Jaap Davelaar	"	710
Paolo Giommi	"	715
Manfred Gottwald	"	758
Julian Osborne	"	714
Arvind Parmar	"	763
Luigi Stella	"	716
Anne Fahey	Mission Planning	707
Paolo Ferri	Observatory Controller	772
Maria Gonano	" "	772
Frank Haberl	" "	715
Geoff Mellor	" "	772
Antonella Nota	" "	716
Mark Sweeney	" "	772
Susanne Ernst	Data Assistant	713
Margit Farkas	" "	709
Grazia Giommi	" "	709
Linda Osborne	" "	713
Sandra Andrews	Secretary	704

*Direct dialling to any extension, prefixed by 886, is possible, eg. 06151-886-705

Personnel Changes (from 01.09.84 to 31.10.84)

- Miss Maria Gonano has been recruited as an Observatory Controller

- Miss Christine Durham (Logica) has taken up a new appointment with Logica.

TRAVEL

- ESOC is located at:

  ROBERT BOSCH STRAßE 5,
  61 DARMSTADT,
  WEST GERMANY.

  (See map on page 39)

- FRANKFURT-AM-MAIN AIRPORT is located approximately 30 km north of Darmstadt.

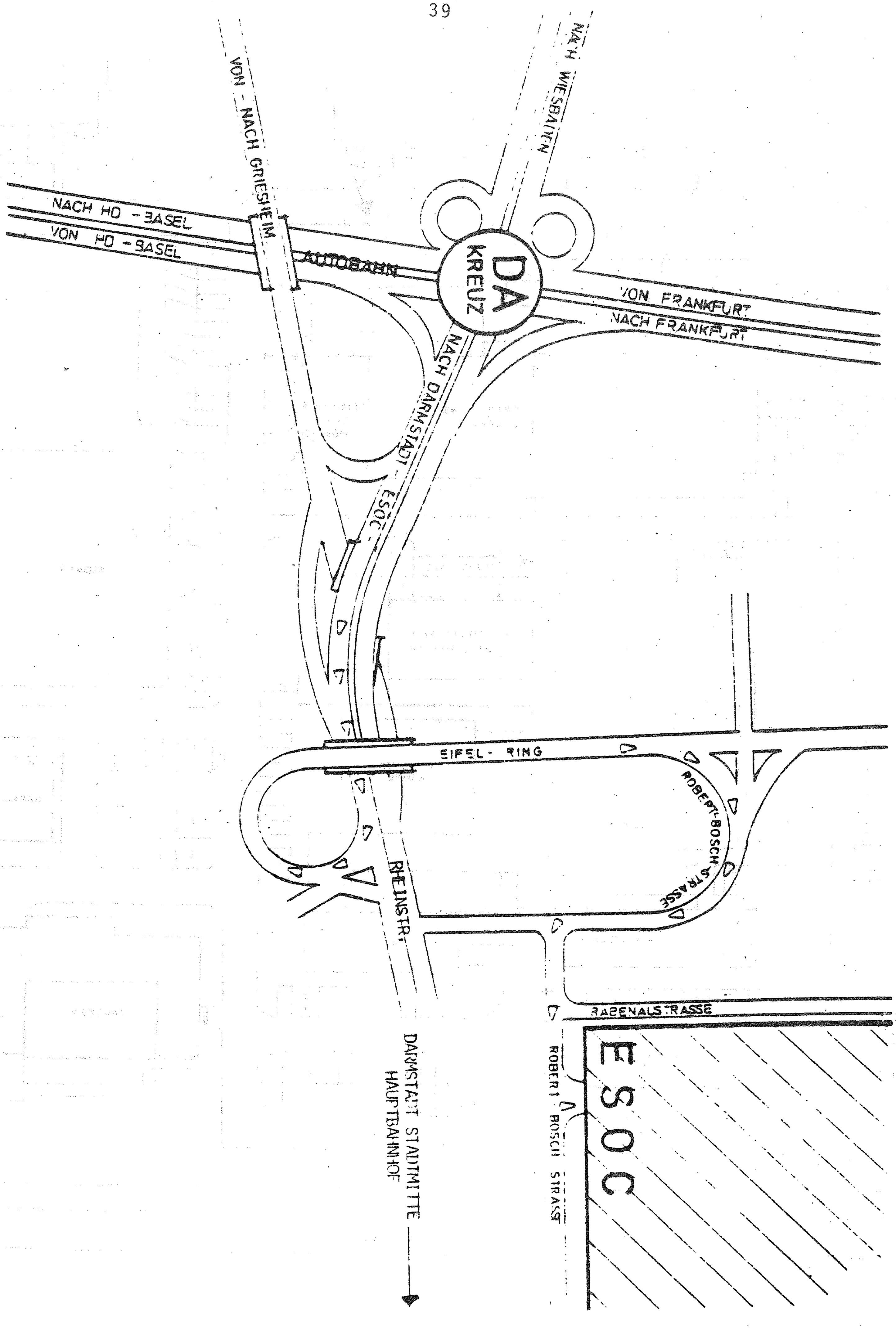
- DARMSTADT HAUPTBAHNHOF is approximately 10 mins brisk walk from ESOC, along the Rheinstrasse and Berliner Allee.

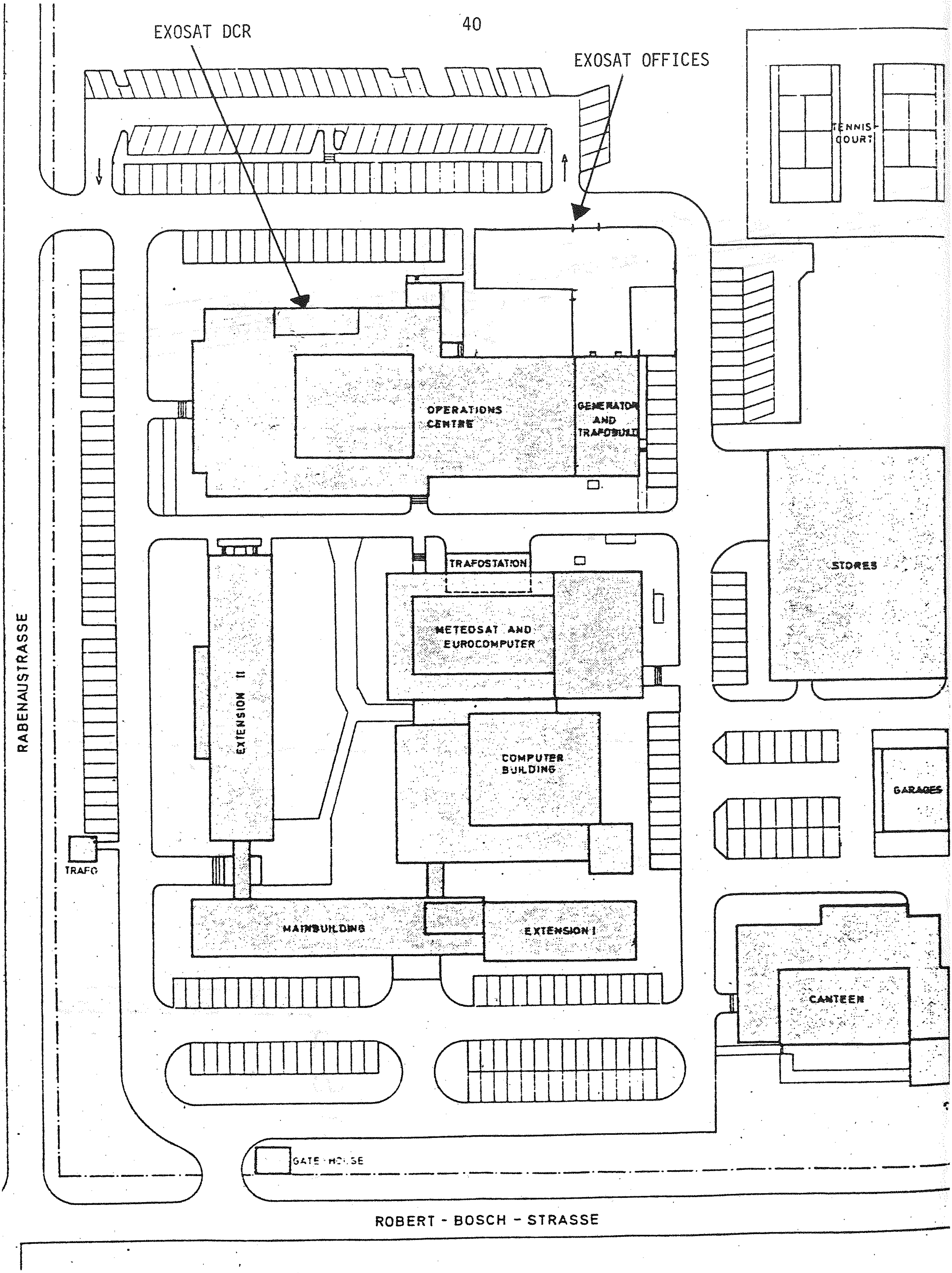
- AUTOBAHN routes 5 (Frankfurt-Basel) and 67

  Intersection at the DARMSTÄDTER KREUZ (about 1 km west of ESOC).

  Take exit DARMSTADT STADTMITTE

- Within ESOC, the Observatory is located in the Operations Department (OD) Building. (See map on page 40).


NACH WIESBADEN
VON - NACH GRIESHEIM
NACH HD - BASEL
VON HD - BASEL
AUTOBAHN
DA KREUZ
VON FRANKFURT
NACH FRANKFURT
NACH DARMSTADT. ESOC
EIFEL - RING
ROBERT-BOSCH-STRASSE
RHEINSTR.
RABENALSTRASSE
ROBERT BOSCH STRASSE
ESOC
DARMSTADT STADTMITTE
HAUPTBAHNHOF


EXOSAT DCR
EXOSAT OFFICES
TENNIS COURT
OPERATIONS CENTRE
GENERATOR AND TRAFOBUILD
STORES
TRAFOSTATION
METEOSAT AND EUROCOMPUTER
EXTENSION II
COMPUTER BUILDING
GARAGES
RABENAUSTRASSE
TRAFO
MAINBUILDING
EXTENSION I
CANTEEN
ROBERT - BOSCH - STRASSE

HOTELS

Name of Hotel	Address	Phone No.	Price - DM single room
Darmstadt		(06151)	
Maritim Hotel	Rhein Str. 105 (Near Hbf)	80041	110-186*
Parkhaus Hotel	Grafen Str. 31	28100	87
Hotel Weinmichel	Schleiermacher Str.10	26822	65-95
Prinz Heinrich	Bleich Str. 48	82888	69-78
City Hotel	Adelung Str. 44	33691/95	55-80
Hotel Müller	Adelung Str. 34	26721/22	50-65
Zentral Hotel	Schuchard Str. 6	26411/12	55-65
Ernst-Ludwig	Ernst-Ludwig Str.14	26011/12	40-68
Darmstadt-Eberstadt		(06151)	
Hotel Zur Sonne	Heidelberger Land Str. 246	55754	59
Darmstädter Hof	Heidelberger Land Str. 249	54222	45-50
Griesheim		(06155)	
Hotel Postkutsche	Flughafen Str. 18	61772	40
Ober-Ramstadt		(06154)	
Hessischer Hof	Shul Str. 14	2151	48-52
Nieder Modau		(06154)	
Zur Krone	Kirch Str. 39	1633	64-74

*If booked via ESOC a special rate can be obtained.

Name of Hotel	Address	Phone No.	Price - DM single room
Seeheim-Jugenhem		(06151)	
Hotel Malchen	Im Grund 21	55031	65-70
Jugenheim		(06257)	
Brandhof	Stettbacher Tal 61	2689	44-50
Hotel Jugenheim	Haupt Str. 54	2005/6	68
Seeheim			
Hotel Tanneck	Sand Str. 79	81364	26-28

Dear Colleague,

EXOSAT INTERACTIVE ANALYSIS SYSTEM

The Observatory is pleased to announce the availability of its interactive analysis (IA) system on a trial basis as from 1st December 1984.

This system will support the following:

- Analysis of FOT's from prior observations.
- near real time interactive analysis (within about 48 hours of the observation).

Priority use will be given to non-hardware group P.I's, the hardware groups being Leiden, Leicester, Milan/Palermo, MSSL, Munich, Utrecht and SSD/ESTEC. During the trial period, the system will be available between the hours of 08.00 and 23.00 everyday with support from the Duty Scientists on a rota basis. It is expected that considerable 'tuning' of the software and facilities will result from the experience of users in the first month or two. Initially, access to the system will be restricted to one user at a time, although in the routine phase analysis of two or three different sets of data should be possible.

Booking will be organised within the Observatory Team by Susanne Ernst, and users are kindly asked to complete the enclosed form when requesting time on the system. No guarantee can be given that system time will be available on the requested dates, however the Observatory Team will strive to accommodate all requests consistent with the above constraints and a minimum period of two weeks between receipt of the completed form and access to the computers. Copies of the relevant FOT's as specified on the form will be available at the Observatory for the period of time allocated. Please note, however, that the tapes will be recycled once the analysis has been completed.

Yours sincerely,

D. ANDREWS

NAME: ....

ADDRESS: ....

....

....

IA analysis required of FOT(s) and/or current observation*

Target Names	Observation day/time/duration
....	....
....	....
....	....
....	....
....	....

*Analysis details: LE/ME/GSPC data
Spectral fitting
Timing
Periodicity

Special requirements ....

....

Planned duration of visit: ....

Preferred dates (give alternatives) ....

....

*delete as appropriate ....

To be completed by Observatory Team and returned to Observer:

	Start	End	Duty Scientist (on call)
Time(s) allocated:			

File ID allocated:

NB: 'File ID' is used as a security code to identify files/observations

QUESTIONNAIRE

☐ There is an error in my name or address on the current mailing list; the correct version is given below.

☐ Please add my name and address (printed below) to the EXOSAT Express mailing list.

☐ Please delete my name and address (printed below) from the EXOSAT Express mailing list.

NAME: ____

ADDRESS: ____

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Tear off the page and return to: EXOSAT Observatory, ESOC, Darmstadt.