#400

ASTP-APOLLO

EUV DATA

75-066A-01A
75-066A-02A

THIS DATA SET HAS BEEN RESTORED. ORIGINALLY IT CONTAINED ONE
9-TRACK, 1600 BPI TAPE WRITTEN IN BINARY. THERE IS ONE RESTORED TAPE.
THE DR TAPE IS A 3480 CARTRIDGE AND THE DS TAPE IS 9-TRACK, 6250 BPI.
THE ORIGINAL TAPE WAS CREATED ON AN IBM 360 COMPUTER AND WAS RESTORED
ON THE MRS. THE DR AND DS NUMBER ALONG WITH THE CORRESPONDING D
NUMBER AND TIME SPANS ARE AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN
DR005623	DS005623	D029597	13	07/16/75 - 07/24/75

This data set has been restored. There was originally one
9-track, 1600 BPI tape written in Binary. There is one restored tape.
The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI.
The original tape was created on an IBM 360 computer and the restored
tape was created on an IBM 9021 computer. The DR and DS numbers along
with the corresponding D number are as follows:

DR#	DS#	D#	FILES	TIME SPAN
DR005907	DS005907	D029954	1 - 9	07/16/75 - 07/24/75

ASTP-APOLLO

EUV DATA ON TAPE

75-066A-01A

75-066A-02A

This data set contains 2 tapes.   They are Binary, 9-track, 1600 BPI,

and were created on an IBM 360 computer.   The format is on the following pages.

The 'D' and 'C' numbers along with the time spans are as follows:

75-066A-01A

D#	C#	FILES	TIME SPAN
D-29597	C-19346	13	07/16/75 - 07/24/75

75-066A-02A

D-29954	C-19347	9	07/16/75 - 07/24/75

APOLLO-SOYUZ TEST PROJECT

SCIENCE EXPERIMENT

MA-083
(EUV TELESCOPE)

DOCUMENTATION FOR ARCHIVAL
SCIENCE DATA TAPES

Submitted by:

Jay Freeman
Space Astrophysics Group
Space Sciences Laboratory
University of California
Berkeley, California 94720

December 1976

Introduction

This documentation is submitted in partial fulfillment of contract NAS9-13799. The documentation describes the merged digital tapes of Apollo-Soyuz Test Project experiment MA-083 scientific data, which are furnished to NSSDC for archival purposes.

Quantity of Tapes: One

Physical Description:

The merged data tape is a standard 2400-foot reel of half-inch computer tape in a cannister. Data are written onto the tape at ~~1600~~ 1600 bits per inch, 9 tracks, odd parity.

Tape Labels:

A gummed label is affixed to the tape reel. The information on the label is as follows:

```
U. C. Berkeley  MA-083  NAS9-13799
Tape 1 of 1
This tape contains 13 files
1600 bits/inch, 9 track, odd parity
First time 197:22:47; Last time 205:16:53
```

The first and last times on the tape, to the nearest minute, are indicated in format DDD:HH:MM, in which DDD is the day of the year 1975, and HH:MM is the Greenwich Time on that day.

Tape Files:

Each separate file is the entire contents of an individual data tape

furnished to U.C. Berkeley by NASA. Each file terminates with a file mark. On any given tape, all files are in the order of increasing time.

Time increases during each file, and from file to file, but inasmuch as experiment MA-083 was not operated continuously during the ASTP mission, there are many time discontinuities during the data.

A few parity errors have crept into the tapes at Berkeley since their receipt from NASA. These are duplicated on the archival tape.

File Format:

Each file contains a large number of physical records. The first and second physical record on each file are identical.* Each consists of 48 BCD characters (288 bits) of mission and experiment identification as follows:

APOLLObSOYUZbTESTbPROJ.bEXPbMA083bbbMMDDYYbRUNbX

In which:

MM/DD/YY = month/day/year of run
RUN X = run number for that day
b = blank

All other physical records contain 30 logical records, each of which contains 18 eight-bit bytes of information. Each such physical record thereby contains 540 bytes.

The format for each logical record is as follows:

BYTE NO.	CONTENTS
1,2	time (days)*
3,4	time (hours)*
5,6	time (seconds)*
7,8	time (milliseconds)*
9	flag bits $(f_1 - f_8)$**
10	all zeros
11	quality reference measurement #1
12	quality reference measurement #2
13	SL 9606 (DAC Register)

* These records may contain questionable data.

BYTE NO.	CONTENTS
14	SL 9607 (Current)
15	SL 9608 (Detector 1 counts)
16	SL 9609 (Detector 2 counts)
17	SL 9782 (Door Bit 1)
18	SL 9783 (Door Bit 2)

[*] Time quantities will be Fortran integer and will be right adjusted within each 16-bit field. Time used will be GMT of frames 1, 6, 11, . . . 46, 1, 6, 11, etc. All data quantities from frames 1-5 will be associated with time of frame 1, data quantities from frames 6-10 will be associated with time of frame 6, etc.

[**] f_1 will be the left-most bit (MSB) and f_8 will be the right-most (LSB) of byte 9. f_1 through f_8 of byte 9 are the flag bits for bytes 11 through 18 respectively.

Whenever a flag bit is on (equal to one), the data contained in the corresponding 8-bit byte is not valid and should not be used. That is, only those data quantities having a corresponding flag bit equal to zero should be used.

During times when MA-083 was on, logical records were obtained at 0.1-s intervals.

Summary Discription of Scientific Measurements:

Detailed interpretation and understanding of the scientific measurements (logical record bytes 13-18) requires other contract documents, such as descriptions of instruments, calibration tables, etc. But in brief:

Byte 13, SL 9606, describes the position and state of motion of a six-element filter wheel in the optical path of MA-083.

[†] SEE LIST OF REFERENCES (FROM BERKELEY) FOR ADDITIONAL INFORMATION REQUIRED TO ANALYZE THIS DATA

Byte 14, SL 9607, describes a measurement of the current consumed by a portion of the MA-083 electronics.

Byte 15, SL 9608, describes the number of counts recorded by MA-083 detector #1 in the preceding 0.1s.

Byte 16, SL 9609, describes the number of counts recorded by MA-083 detector #2 in the preceding 0.1s.

Bytes 17 and 18, SL 9782 and SL 9783, describe the position of the door covering MA-083.

End of Volume:

After the last file on the tape, there are ten consecutive file marks.

APOLLO-SOYUZ TEST PROJECT

SCIENCE EXPERIMENT

MA-088
(HELIUM GLOW DETECTOR)

DOCUMENTATION FOR ARCHIVAL
SCIENCE DATA TAPES

Submitted by:

Jay Freeman
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University of California
Berkeley, California 94720

May 1977

Introduction

This documentation is submitted in partial fulfillment of contract NAS9-13807. The documentation describes the merged digital tapes of Apollo-Soyuz Test Project experiment MA-088 scientific data, which are furnished to NSSDC for archival purposes.

Quantity of Tapes: One

Physical Description:

The merged data tape is a standard 2400-foot reel of half-inch computer tape in a cannister. Data are written onto the tape at 1600 bits per inch, 9 tracks, odd parity.

Tape Labels:

A gummed label is affixed to the tape reel. The information on the label is as follows:

> U. C. Berkeley MA-088   NAS9-13807
> Tape 1 of 1
> This tape contains 9 files
> 1600 bits/inch, 9 track, odd parity

Tape Files:

Each separate file is the entire contents of an individual data tape furnished to U. C. Berkeley by NASA. Each file terminates with a file mark. On any given tape, all files are in the order of increasing time.

Time increases during each file, and from file to file, but inasmuch

as experiment MA-088 was not operated continuously during the ASTP mission, there are many time discontinuities during the data.

A few parity errors have crept into the tapes at Berkeley since their receipt from NASA. These are duplicated on the archival tape.

File Format:

Each file contains a large number of physical records. The first and second physical record on each file are identical. Each consists of 48 BCD characters (288 bits) of mission and experiment identification as follows:

APOLLObSOYUZbTESTbPROJ.bEXPbMA088bbbMMDDYYbRUNbX

In which:

MM/DD/YY = month/day/year of run
RUN X = run number for that day
b = blank

All other physical records contain 30 logical records, each of which contains 24 eight-bit bytes of information. Each such physical record thereby contains 720 bytes.

The format for each logical record is as follows:

BYTE NO.	CONTENTS
1,2	time (days)*
3,4	time (hours)*
5,6	time (seconds)*
7,8	time (milliseconds)*
9	flag bits (f_1 - f_8)**
10	flag bits (f_1 - f_8)**
11	quality reference measurement #1
12	quality reference measurement #2
13	SL 9610 (He tank pressure)
14	SL 9611 (He temp.)
15	SL 9612 (#1 pressure)

BYTE NO.	CONTENTS
16	SL 9613 (Current)
17	SL 9614 (#2 pressure)
18	SL 9615 (Det 1 Count Rate)
19	SL 9616 (Det 2 Count Rate)
20	SL 9617 (Det 3 Count Rate)
21	SL 9618 (Det 4 Count Rate)
22	SL 9784 (Door Bit 1)
23	SL 9785 (Door Bit 2)
24	Unused

* Time quantities will be Fortran integer and will be right adjusted within each 16-bit field. Time used will be GMT of frames 1, 6, 11, ... 46, 1, 6, 11, etc. All data quantities from frames 1-5 will be associated with time of frame 1, data quantities from frames 6-10 will be associated with time of frame 6, etc.

** f_1 will be the left-most bit (MSB) and f_8 will be the right-most (LSB) of byte 9. f_1 through f_8 of byte 9 are the flag bits for bytes 11 through 18 respectively. f_1 through f_3 of byte 10 are not used. f_4 through f_8 are flag bits for bytes 19 through 23 respectively.

Whenever a flag bit is on (equal to one), the data contained in the corresponding 8-bit byte is not valid and should not be used. That is, only those data quantities having a corresponding flag bit equal to zero should be used.

During times when MA-088 was on, logical records were obtained at 0.1-s intervals.

End of Volume:

After the last file on the tape, there are ten consecutive file marks.

UNIVERSITY OF CALIFORNIA, BERKELEY

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SPACE SCIENCES LABORATORY
BERKELEY, CALIFORNIA 94720

May 14, 1982

Ms. Maureen Locke
National Space Science Data Center
Goddard Space Flight Center
Code 601
Greenbelt, MD 20771

Ref: RFM/EUVE/125/82

Dear Maureen:

All apologies for the delay. The relevant documents for use of the EUV would be:

1) Bowyer, S. Margon, B., Lampton, M., Paresce, F., and Stern, R., 1977 Apollo Soyuz Test Project Summary Science Report, NASA SP-412, Vol. 1, pp. 49-70.

2) The enclosed document, of unknown publication location.

3) Lampton, et al. 1976, Ap. J., 203, L71.

4) Margon, et al. 1976, Ap. J., 210, L79.

5) Greenstein, et al. 1977, Astron. Astroph. 54, 623.

6) Cash, et al. 1978, Ap. J., 219, 585.

7) Margon, et al. 1978, Ap. J. 224, 167.

8) Ayres, et al. 1978, Astron. Astroph. 70, 431.

9) Stern, et al. 1979, Ap. J., 230, 755.

10) Crawford, et al. 1979, Astron. Astroph. Suppl. 36, 371.

These documents contain the instrument description that would be needed.

Sincerely, and all the best with all us un-cooperatives!

Roger F. Malina
Space Astrophysics Group

RFM:jg

Encl:

4. EXTREME ULTRAVIOLET SURVEY

EXPERIMENT MA-083

S. Bowyer,[a†] B. Margon,[a] M. Lampton,[a] F. Paresce,[a] and R. Stern[a]

ABSTRACT

A grazing incidence telescope sensitive to radiation in the 5- to 100-nanometer (50 to 1000 angstrom) band was flown in the Apollo service module. On 10 nighttime revolutions, the command and service module was maneuvered to point the instrument at 30 different stellar targets for periods of 1 to 20 minutes, thus constituting the first sensitive search for extreme ultraviolet radiation from nonsolar sources. Several hours of supplementary data were also obtained during nighttime orbits when other experiments in the scientific instrument module bay were operating.

Preliminary analysis of a small fraction of the total data indicates the definite detection of a strong source of extreme ultraviolet radiation during observations made during revolution 109. The source is located in Coma Berenices at $\alpha = 13^h 13^m$, $\delta = +29°$. Positive detections have been made in the 17- to 62-, 11.4- to 15-, and 5.5- to 15-nanometer (170 to 620, 114 to 150, and 55 to 150 angstrom) wavelength bands. The intensity is 4 pW/m^2 (4 X 10^{-9} ergs/cm^{2}sec) in the 17- to 62-nanometer (170 to 620 angstrom) band. The suggested optical identification is the white dwarf HZ 43. If this association is correct, the star has the highest temperature of any known white dwarf. Regardless of the optical identification, however, this object is the first nonsolar source to be detected in the extreme ultraviolet band.

INTRODUCTION

Astronomical observations of nonsolar sources in the extreme ultraviolet (EUV) region of the electromagnetic spectrum (10 to 100 nanometers (100 to 1000 angstroms)) are of profound significance for studies of stellar evolution, stellar atmospheres, and the interstellar medium. The existence of stars producing predominantly ionizing radiation (wavelengths less than 91.2 nanometers (912 angstroms)) has been postulated to explain the ionization state of the interstellar medium. Such stars might represent a very hot phase of stellar evolution (refs. 4-1 and 4-2). Effective surface temperatures greater than 20 000 K have been observed, for example, among O stars, among white dwarfs of classes DAn and DAwk, among the subdwarf OB stars (ref. 4-3), and among the ultraviolet (UV) excess objects observed from the European TD-1A satellite (ref. 4-4). A major deterrent to previous attempts at celestial

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[a]University of California at Berkeley.

[†]Principal Investigator.

EUV observations has been the opacity of the interstellar gas resulting from photoelectric absorption by neutral hydrogen and neutral and singly ionized helium. However, recent spectroscopic studies of interstellar matter toward nearby stars (refs. 4-5 to 4-7) indicate that in many directions neutral hydrogen concentrations are as low as 0.01 to 0.1 atom/cm^3. Then, the absorption cross sections given in reference 4-8 indicate that direct EUV observations of sufficiently hot stars should be possible to distances of 20 to 100 parsecs.

Preliminary surveys at EUV wavelengths have been made from sounding rockets and have set upper limits of approximately 10^{-10} W/m^2 (10^{-7} ergs/cm^{2}sec) for sources in limited regions of the sky (refs. 4-9 to 4-11). However, significant constraints on stellar emission models would require improvements in sensitivity of perhaps two orders of magnitude. The Apollo-Soyuz mission offered the opportunity to make extended observations of numerous candidate stars with an EUV telescope that had the requisite sensitivity. Ten nighttime orbits were used to obtain data on 30 preselected stars, 1 planet, and the EUV background radiation. A preliminary analysis of quick-look data has indicated that one target exhibited a particularly intense EUV flux. A second target was also detected at a statistically significant level above the background. Computer processing of the production data will make weaker flux level targets also detectable.

EQUIPMENT

The EUV telescope (ref. 4-12) consisted of a 37-centimeter-diameter grazing incidence mirror assembly, a continually rotating (10 rpm) six-position filter wheel, and a pair of channel electron multiplier detectors. A schematic view of the instrument is shown in figure 4-1.

The parabolic optics were fabricated from aluminum coated with a nickel alloy and then overcoated with a fine layer of gold. The filter wheel included an opaque filter that permitted nearly continuous monitoring of the detector background during the mission. The field of view of the instrument was circular with selectable diameters of 2.5° or 4.3° full width at half maximum obtained by commanding either detector into the focal position. The detailed construction of the detector modules is described in reference 4-13. The detector not at the focal position was also monitored to establish further the stability of the background count rates. Count rates from both detectors were telemetered each 0.1 second together with the filter wheel position and other auxiliary information.

The entire system was calibrated in the laboratory with collimated radiation at numerous wavelengths between 4.4 and 265 nanometers (44 and 2650 angstroms). Absolute intensities were established by using National Bureau of Standards-calibrated vacuum-photodiode secondary standards above 20 nanometers (200 angstroms) and propane proportional counters below 20 nanometers (200 angstroms). The various filters, in combination with the efficiency characteristics of the mirror assembly and detector, defined the wavelength bands illustrated in figure 4-2. The detailed response of the system is summarized in table 4-I. The filters and their bandpasses at 10 percent of peak transmission, the energy-integrated effective area,

or grasp $G = \int A(E)dE$, and the effective energy $E_e = \dfrac{\int EA(E)dE}{G}$ are given in table 4-I.

The experiment was mounted to a shelf in bay 1 of the service module (SM). A protective cover enclosed the instrument assembly at all times when the experiment was not in operation. At appropriate times in the Flight Plan, the crew activated a switch in the command module (CM) to open the cover. The remaining experiment controls consisted of a POWER ON/OFF switch and a two-position detector-selection switch. Both switches were located in the CM and operated by the crew.

The observing procedure consisted of opening the experiment cover, waiting 10 seconds to permit the ambient pressure in the SM bay to vent to vacuum, and then turning the instrument power on. The crewmember then selected the appropriate detector to ensure that the proper channel multiplier was always in the focal plane. The filter wheel operated automatically and continuously whenever the instrument power was on.

The telescope was oriented at preselected targets by using the spacecraft command module computer (CMC) for guidance and orientation and by using the normal Apollo reaction control system thrusters for maneuverability to point the instrument line of sight at the desired position on the celestial sphere for predetermined lengths of time. The typical target observation sequence consisted of spending equal amounts of time pointing at a target and at two background points located 3° on each side of the target. Any statistically significant differences between the average count rates when observing target and background are then attributable to EUV emission from the object under study. Target observations lasting from 1 to 20 minutes were executed.

RESULTS[1]

The EUV telescope functioned perfectly during the entire mission. The background count rates remained low and reproducible, and analysis of quick-look data shows no evidence of degradation in instrument sensitivity from the laboratory-measured values.

On revolution 65 at 108 hours 26 minutes ground elapsed time, a preplanned raster scan maneuver was executed using a special erasable memory program in the CMC. This maneuver consisted of slewing the telescope in a zigzag pattern back and forth across a star of known brightness in the far UV (~130 nanometers (~1300 angstroms)) where the barium fluoride filter has maximum sensitivity. Because the target position is known in celestial coordinates, a comparison of the time history of the barium fluoride count rates during this maneuver with the known command and service module (CSM) attitude enables the calculation of the actual (in-flight) aline-ment of the experiment with respect to the CM inertial measuring unit. This information could then be used to recompute CSM pointing data for mission targets to

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[1]Also see section 1.

compensate for any changes in alinement from the nominal values caused by vibration or thermal stresses. However, analysis of the revolution 65 raster scan data, obtained on the stars ι Aql and κ Aql, indicated, to an accuracy of 0.3°, that no change from the nominal alinement occurred.

Observation of the targets proceeded normally with occasional small deviations from the observing list caused by time-line anomalies. The rationale for target selection is discussed in reference 4-12. A list of the targets actually observed appears in table 4-II. This list is composed of 30 distinct targets. Seven targets were observed twice during the mission, one target was observed three times, and one target was observed during an extended crew sleep period while the spacecraft was in a fixed inertial attitude. During the mission, considerable real-time planning enabled additional high-quality science data to be obtained. For example, on day 4 of the mission, the American Association of Variable Star Observers advised that the dwarf nova SS Cygni had undergone an optical outburst. As a result, additional observations of this target were obtained on revolutions 80 and 105.

The most interesting target data examined thus far were obtained on revolution 109. As part of the observing schedule, the ultrasoft X-ray source in Coma Berenices (refs. 4-14 to 4-16) was observed for 7 minutes starting July 22, 1975, at 22:26 GMT. After taking background data for 1 minute, a 3° spacecraft roll maneuver brought the center of the instrument line of sight to a point 1° north of the intended target. Thus, the target was just at the edge of the 2° field of view of the instrument. Several roll and pitch motions of approximately 0.5° resulted from spacecraft motion within the attitude dead-band box and moved the field of view off and on the source. Finally, additional sky background data were obtained 3° off the target.

During these maneuvers, obvious increases and decreases in the detector count rates were immediately recognized. A plot of the count rate as opposed to time is shown in figure 4-3 for the 5.5- to 15-, 11.4- to 15-, 17- to 62-, 50- to 78-, and 135- to 154-nanometer (55 to 150, 114 to 150, 170 to 620, 500 to 780, and 1350 to 1540 angstrom) bands with each point representing the average count rate during an 0.8-second time interval. Also shown is the count rate in the opaque filter position, which indicates that the observed instrumental background remained steady at 0.6 count/sec.

A crude estimate of the spectral energy distribution of an object can be made by dividing the observed count rate in each band by the appropriate energy-integrated effective area. Such an estimate is exact for continua having constant photon fluxes per unit frequency. Listed in table 4-I are the observed background-subtracted count rates for the Coma source and the estimated continuum fluxes, both raw and corrected for atmospheric attenuation at E_e based on the Committee on Space Research International Reference Atmosphere 1965 model 2 reference atmosphere, appropriate for the observing conditions. The total energy flux in the 17- to 62-nanometer (170 to 620 angstrom) band is approximately 4 pW/m^2 (4 X 10^{-9} ergs/cm^2 sec).

These intensities have been plotted as a function of wavelength in figure 4-4. Also shown is the 4.4- to 16.5-nanometer (44 to 165 angstrom) detection and 1 kiloelectronvolt upper limit reported in reference 4-16. The data appear compatible and

support the identification of the EUV object with the Coma soft X-ray source. This figure clearly indicates that the spectrum peaks in the EUV band at approximately 30 nanometers (300 angstroms).

A more precise description of the spectrum can be provided by using the observed count rates to constrain parameters of emission models. The simple continuum models chosen for these calculations had photon number per unit energy functions of the following forms: power law, $N(E) = AE^n \exp(-N_H\sigma)$; exponential, $N(E) = AE^{-1} \exp(\frac{-E}{kT}) \exp(-N_H\sigma)$; and blackbody, $N(E) = AE^2 [\exp(\frac{E}{kT})-1]^{-1} \exp(-N_H\sigma)$. In each case, the energy-dependent attenuation cross section per hydrogen atom σ has been taken from reference 4-8 with normal abundances, no ionization, and no molecular hydrogen.

The collected data can be satisfactorily fit by any of these trial spectra provided that the free parameters are appropriately chosen. Figure 4-5 shows the derived parameter constraints for these models. In each case, contours are drawn at the $\chi^2_{min} + 6.25$ level appropriate for 90 percent statistical confidence with three free parameters (ref. 4-17). These constraints are compatible with, but much stricter than, the parameter regions derived from the soft X-ray rocket data given in reference 4-16.

Positional information on this source can be derived from the fact that, as the spacecraft pointing varies, the count rates are occasionally interrupted. Telemetered data on the CSM aspect have been combined with in-flight data on the experiment alinement to obtain four independent position zones for the source. These zones define a common region that is shown in figure 4-6 superposed on the relevant star field.

The Small Astronomy Satellite-3 observations reported in reference 4-15 have given a positional error box for the soft X-ray source that is compatible with the EUV position and is also shown in figure 4-6. It is highly probable that one object is responsible for the soft X-ray and EUV emissions. It has been suggested (ref. 4-15) that the soft X-ray object is the hot white dwarf HZ 43 at $\alpha(1950) = 13^h 14.0^m$, $\delta(1950) = +29°22'$. This object is also marked on figure 4-6, and the EUV position is compatible with this suggestion.

If this identification is correct, it is of interest to determine whether any of the simple EUV spectra in figure 4-5 are compatible with the optical brightness of the star HZ 43. Magnitudes for HZ 43 have been published in reference 4-18 and are given as $V = 12.86$, $B = 12.76$, and $U = 11.62$ where V, B, and U are brightnesses in the standard astronomical photoelectric system. The power law and exponential spectra, if extended to visible wavelengths, would give magnitudes much redder and brighter than observed. However, the blackbody spectra would be compatible at $\simeq 110\,000$ K. If this simple model is correct, the stellar radius is $7800\,D_{100}$ kilometers, where D_{100} is the distance to the star in units of 100 parsecs, and the corresponding luminosity is $17\,D_{100}^2\,L_\odot$, where $L_\odot$ is the solar luminosity,

3.83×10^{33} ergs/sec. These parameters are in reasonable agreement with white dwarf models. Although these data do not uniquely require a blackbody stellar spectrum, with this explanation and identification, HZ 43 has the highest temperature of any known white dwarf.

Additional observations obtained on revolution 109 indicate the probable detection of EUV radiation from an additional target. Although detailed aspect data are still being reduced, it appears that the source may be the M-dwarf star Proxima Centauri. Detections appear in the 5.5- to 15-nanometer (55 to 150 angstrom) band and possibly the 11.4- to 15-nanometer (114 to 150 angstrom) band. Both detections are at an intensity substantially less than the Coma source.

Data from targeted observations on revolutions other than 109 have not been processed but will have sensitivity similar to that described previously. In addition, a substantial volume (several hours) of supplementary data was obtained by the EUV telescope while it was being used with the Helium Glow Detector or the Soft X-ray Experiments. These data will be processed to search for discrete sources of EUV radiation and to derive information on the spectrum, intensity, and isotropy of the ultrasoft X-ray/EUV cosmic diffuse background radiation. The data are the most extensive ever obtained on the latter problem.

SUMMARY

All the primary goals of the EUV Survey Experiment were achieved. Data were obtained on 30 different targets belonging to a variety of different classes of stars. Extensive and sensitive data on the EUV background radiation were also acquired. Preliminary analysis of the data indicates the detection of at least one strong source of EUV radiation, which is the first nonsolar source to be detected in the EUV band and proves the feasibility and value of astronomical observations at the wavelengths indicated in this report.

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TABLE 4-I.- EUV PHOTOMETRIC DATA

Filter material	Bandpass		Grasp, cm^2eV	Effective energy,	Coma source observation count rate,[a] counts/sec	Uncorrected, $ph(cm^2sec\ eV)^{-1}$	Corrected for atmosphere	
	eV	nm (A)					$ph(cm^2sec\ eV)^{-1}$	mfu^b
Parylene N	83 to 225	5.5 to 15.0 (55 to 150)	590	142	22 ± 1	0.037	.039	3.7
Beryllium	83 to 109	11.4 to 15.0 (114 to 150)	60	100	8 ± 0.5	.13	.15	9.9
Aluminum plus carbon	20 to 73	17 to 62 (170 to 620)	270	46	160 ± 3	.59	1.0	30
Tin	16 to 25	50 to 78 (500 to 780)	108	21	<50	<.46	<1.2	<17
Barium fluoride	8.0 to 9.2	135 to 154 (1350 to 1540)	0.47	9	<25	<53	<53	<325

[a] Errors quoted are $\pm 1\sigma$.

[b] $mfu = 10^{-26}\ ergs/cm^2sec\ Hz$.

TABLE 4-II.- TARGETS OBSERVED BY THE ASTP EUV TELESCOPE

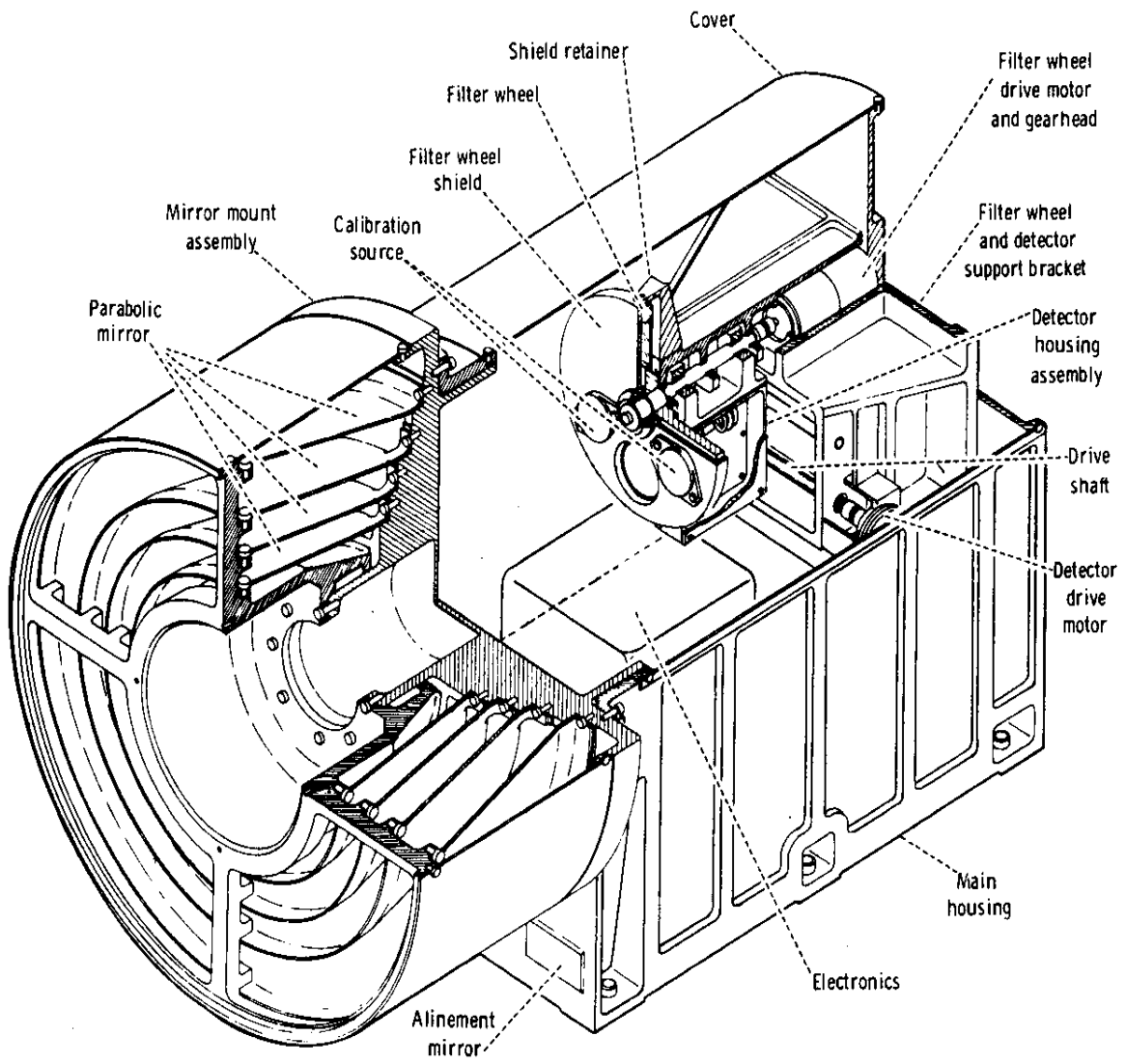| Revolution	Target
72	EV Lac, AE Aqr, NGC 7293, ε Eri
73	VW Cep, DQ Her, 70 Oph, α PsA
80	EV Lac, SS Cyg, DQ Her, θ Oph, α Cen
88	α CMa B
89	NGC 6853, PSR 1929, α Aql, UV Cet, Feige 24
90	SS Cyg, 61 Cyg, BD +24° 4811, Jupiter
94	HZ 29, i Boo, Prox Cen
105	SS Cyg, BD +24° 4811
108	Wolf 424, α Cen, Z Cha, VW Hyi, UV Cet
109	CP 1133, HZ 43, Prox Cen, PSR 1451, β Hyi
113 to 117	Wolf 424

Figure 4-1.- A schematic diagram of the EUV telescope.
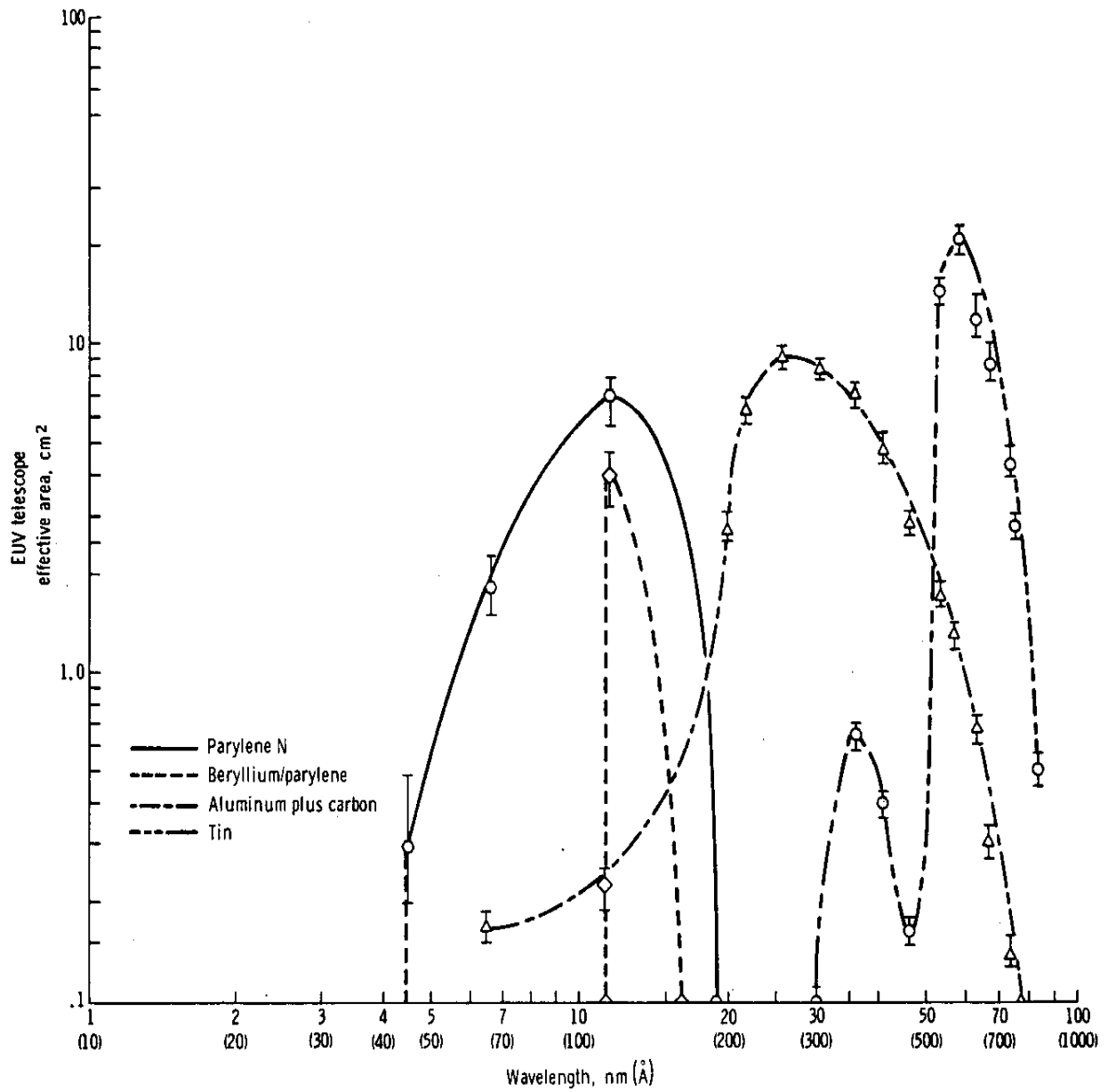
Figure 4-2.- Effective area of the EUV telescope as determined by laboratory calibration data. (The response of the barium fluoride bandpass, which was used primarily for instrument alinement determination, is given in table 4-I.)
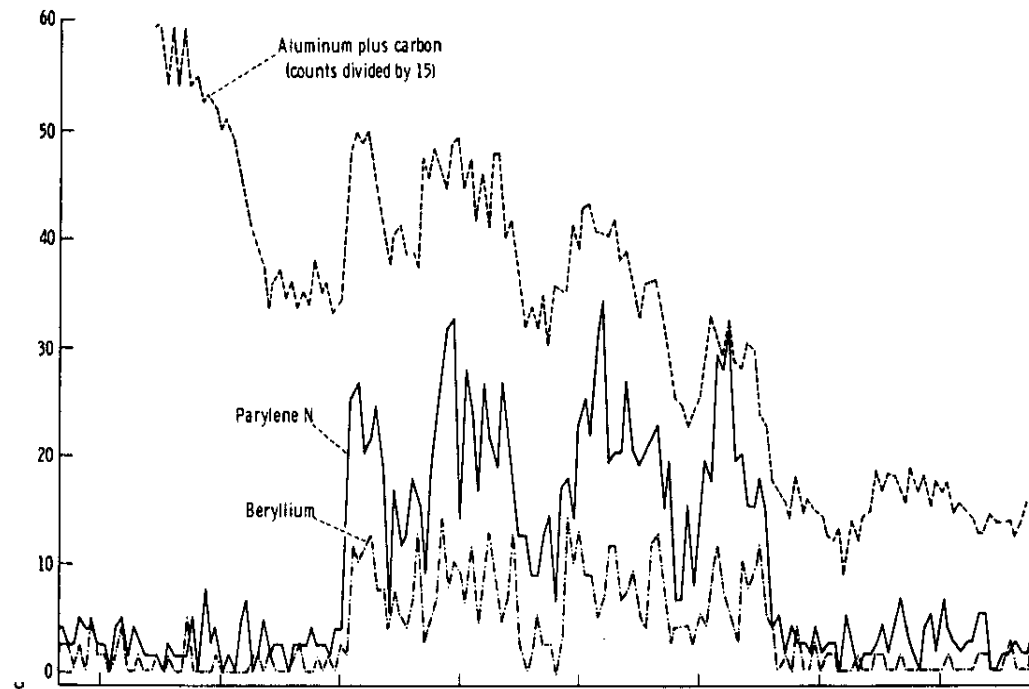
(a) Aluminum plus carbon, parylene N, and beryllium.
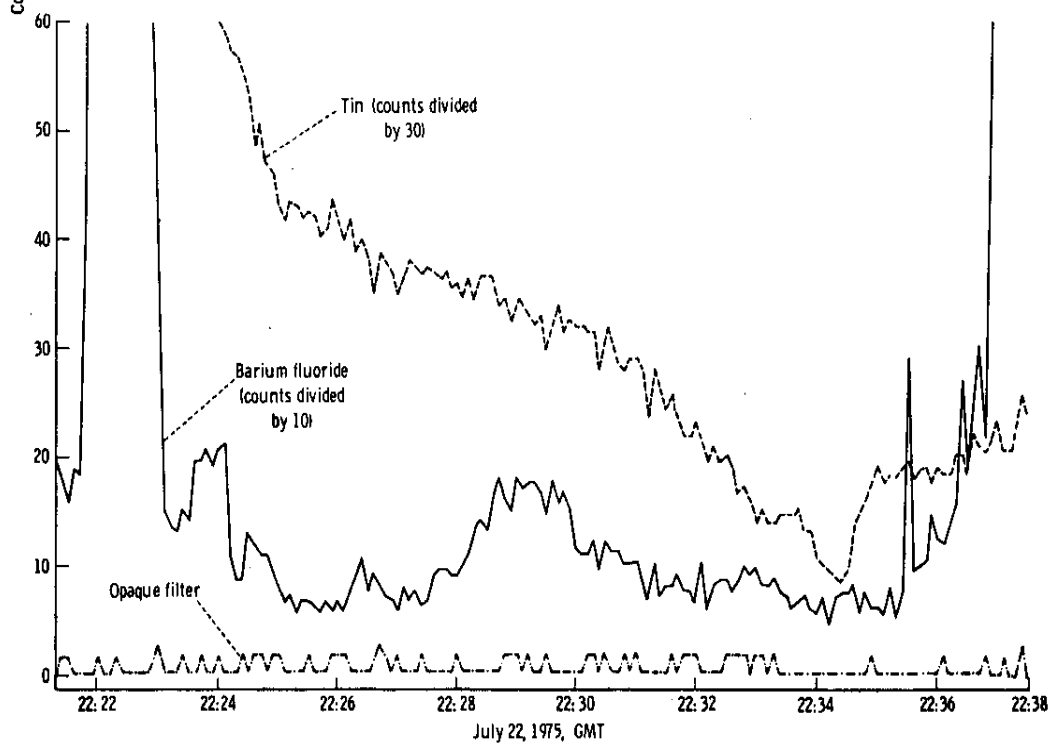
(b) Tin, barium fluoride, and the opaque filter.

Figure 4-3.- The EUV data obtained during a portion of revolution 109. The trends in the aluminum and tin band passes are due to the spatial variations in the geocoronal foreground radiation. This behavior was repeated on numerous orbits. The barium fluoride count rates are dominated by the occasional observations of known blue stars.
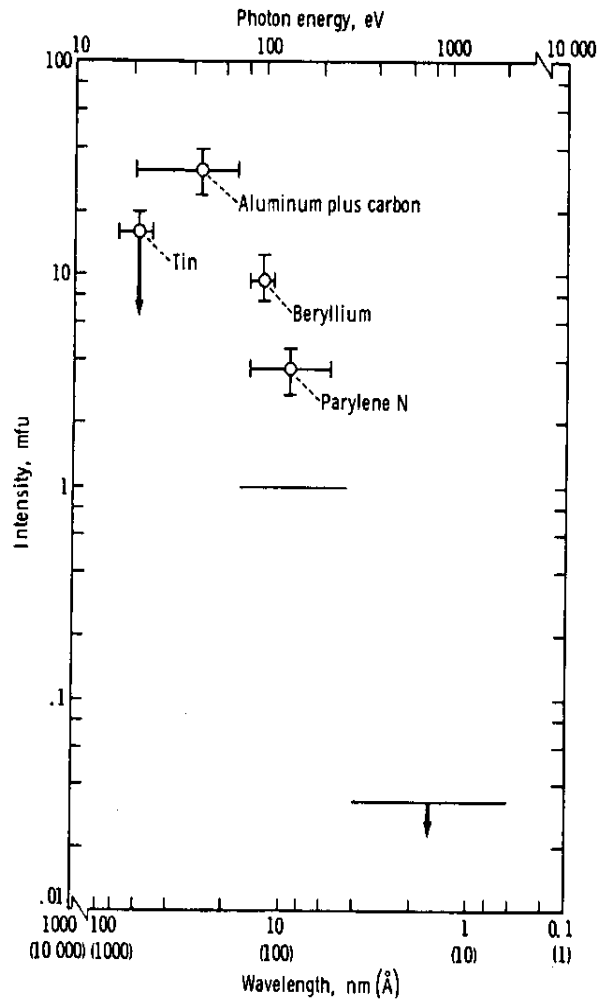
Figure 4-4.- Spectral intensities derived from the EUV data on the source in Coma Berenices. Soft X-ray data (ref. 4-16) are also shown.
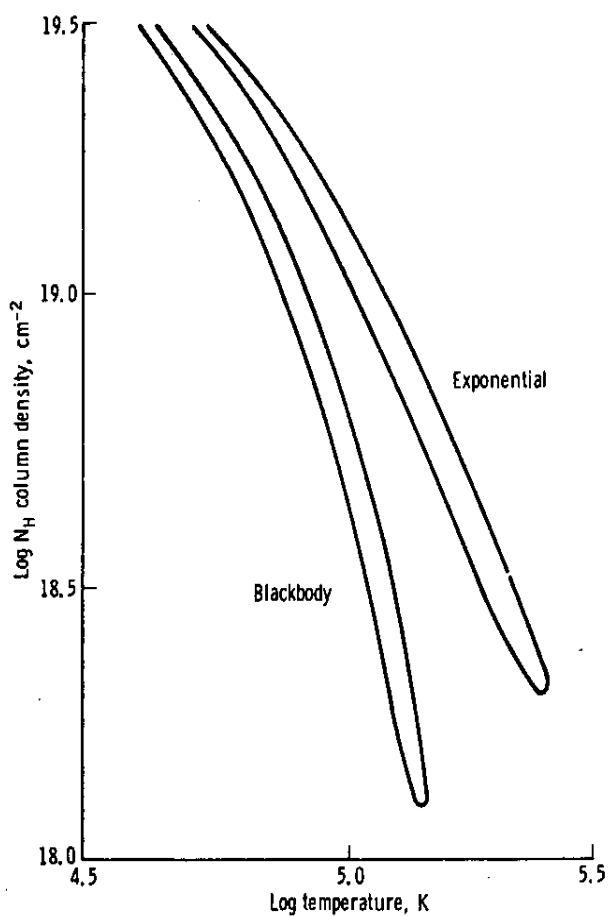
(a) Blackbody and exponential contours.
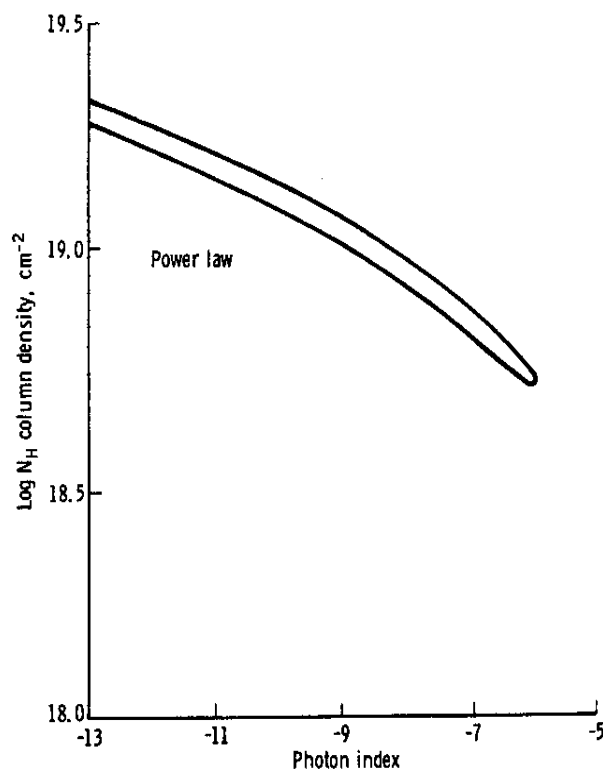
(b) Power law spectra contour.

Figure 4-5.- Contours of constant χ^2 for the fits of blackbody, exponential, and power law spectra. Each contour has been drawn at the $\chi^2_{min} + 6.25$ level appropriate for 90 percent statistical confidence with three adjustable parameters (ref. 4-17).
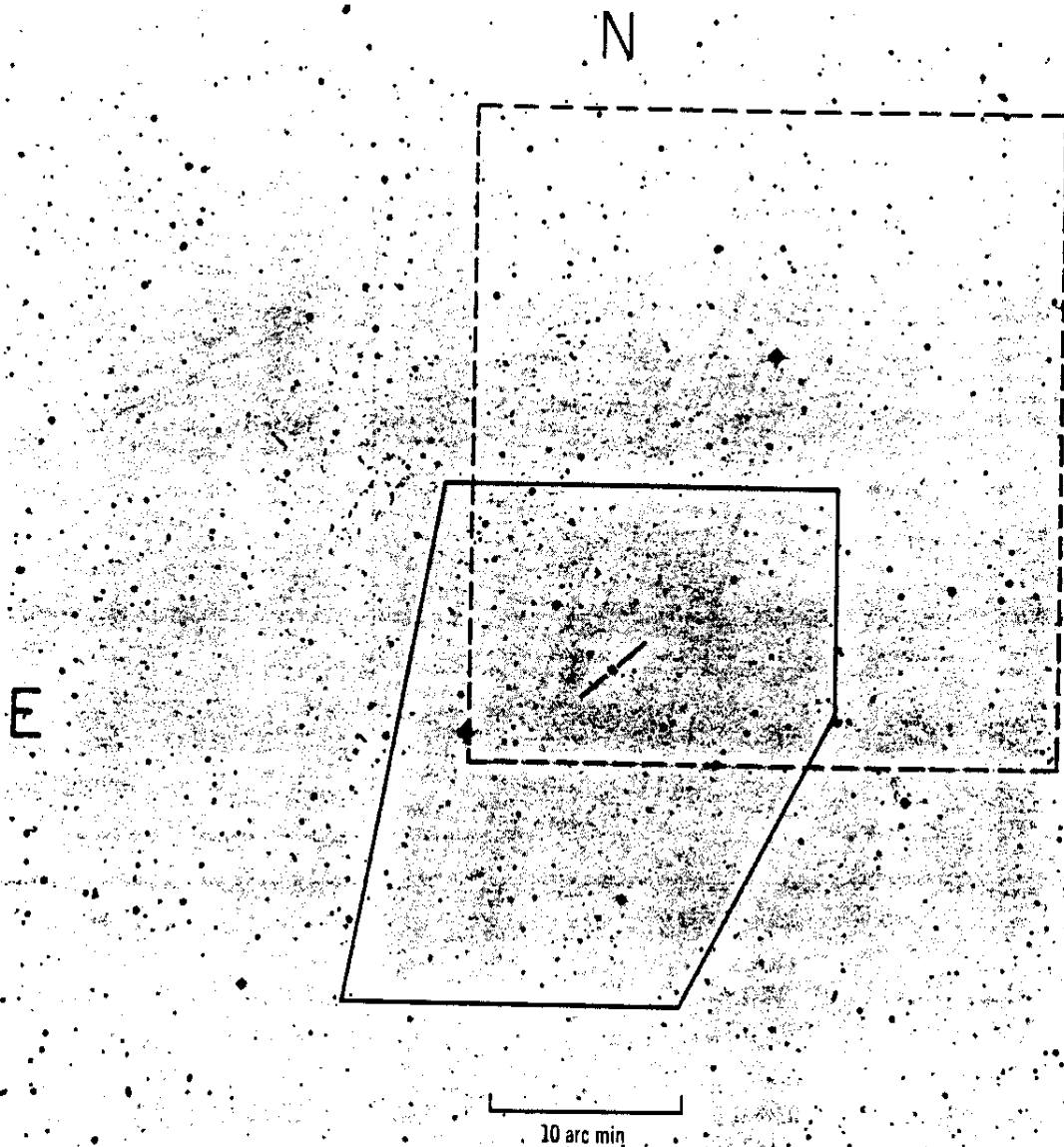
Figure 4-6.- Positional error box for the EUV source in Coma Berenices derived
from the revolution 109 data (solid line). The broken line is the error box
for the soft X-ray source observed from Small Astronomy Satellite-3 (ref.
4-15). The white dwarf HZ 43 is also marked in the center of the photograph.
Enlargement is from the blue Sky Survey plate (copyright by the National
Geographic Society - Palomar Observatory Sky Survey; reproduced by per-
mission of the Hale Observatories).

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        0)   4679A38E    6C329B8D   39C33572   CF09E99A   16F05779   FC911CC8   CF0C3CCC   80811C5C   29D25C01
    FILE  1       RECORD    2       LENGTH   36   BYTES
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    FILE  1       RECORD   259      LENGTH  540   BYTES
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       80)   400027FF    02010E08   CCC1C0C5   00160ECD   01BA40CC   27FFC2C1   CE080001   0CC50016   CE0D021E   40CC27FF
      120)   0201CDC8    000100C5   0C160E0D   02824000   27FFC2C1   CDC80CC1   00C50016   0E0D02E6   400027FF   0201CE08
      160)   0001CCC5    00160E0D   C34A4000   27FF0201   0E080001   0CC50016   0E0D03AE   400027FF   02010D08   CCC1C0C5
      200)   0016CECE    002A4000   27FFC201   0D080CC1   00C50016   CECECC8E   400027FF   02010DC9   000100C5   00160E0E
      240)   CCF24CCC    27FF0201   CDC8C001   00C50016   0E0E0156   4CCC27FF   02010E08   000100C5   00160E0E   C1BA4000
      280)   27FFC2C1    0E080001   CCC50016   0E0E021E   400027FF   02C1CDC8   000100C5   CC160ECE   02824000   27FF0201
      320)   0DC8C0C1    00C50016   CECEC2E6   400027FF   02010EC8   CCC1C0C5   C0160EC8   C34A4000   27FF0201   0EC80001
      360)   00C50016    0E0E03AE   400027FF   02C10DC8   000100C5   CC16CECF   C02A4000   27FF0201   0D080001   00C50016
      400)   0E0FCC8E    400027FF   02010D08   000100C5   00160ECF   CCF24CCC   27FFC2C1   CDC80001   C0C50016   0ECFC156
      440)   400027FF    02010E08   CCC1C0C5   00160ECF   01BA4000   27FFC2C1   CE080001   C0C50016   0E0F021E   4CCC27FF
      480)   02010DC8    000100C5   C0160ECF   02824CCC   27FF0201   CDC8C0C1   00C50016   CE0FC2E6   400027FF   02C10E08
      520)   C0C100C5    00160E0F   C34A4000   27FF0201   CE090001
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       40)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
       80)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      120)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      160)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      200)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      240)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      280)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      320)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      360)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      400)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      440)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      480)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
      520)   FFFFFFFF    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
 FILE  1          # OF DATA RECORDS   260      # SUCCESSFUL READS  26C
        # PERMANENT READ ERRORS   C        # ZERO BYTE ERRORS  2      # SHORT RECORDS   0      # UNDEFINED ERRORS  0
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ASTP-APOLLO
D-29597
7/14/75 -
format only.
not on tape.

D-29597
C-19346

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FILE   1       RECORD    2       LENGTH   36   BYTES
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(   280)    27FFC1C1   0D090001   00CD0011   0A4C0298   400027FF   C1C10DC9   C0010CCD   C0110A4C   02FC4000   27FF0101
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(    40)    0A4EC1C8   400027FF   C1C10D09   000100CD   00110A4E   C16C4000   27FF0101   CDC90001   00CD0011   0A4EC1D0
(    80)    400027FF   01010D09   C00100CD   00110A4E   02344000   27FFC1C1   CD090001   00CD0011   0A4E0298   4CC027FF
(   120)    C1010D09   000100CD   C011CA4E   02FC4000   27FF01C1   CEC9C0C1   00CD0011   0A4E0360   400027FF   01C10D09
(   160)    00010CCD   00110A4E   C3C44000   27FF01C1   0DC90001   CCCD0011   0A4F0040   400027FF   01010D09   CCC100CD
(   200)    C0110A4F   00A44000   27FF0101   0D090001   00CD0011   CA4FC1C8   400027FF   C1010EC9   C00100CD   C0110A4F
(   240)    016C40CC   27FF0101   CD09C001   00CD0011   0A4F0234   4CC027FF   01010D09   000100CD   00110A4F   02FCC000
(   280)    FFFFC1C1   0E090001   C0CDC011   0A4F0360   400027FF   C1C10DC9   000100CD   C0110A4F   C3C47E00   27FEFFFF
(   320)    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
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(   400)    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
(   440)    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
(   480)    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
(   520)    FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF   FFFFFFFF
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