SKY SURVEY INSTRUMENTS

A.1 Short Wavelength Scanners

Two of the three survey telescopes, called Scanners A and B, are identical, and operate in two bandpass sections between 100 and 500 Å. They have identical Wolter-Schwarzschild Type I mirrors with gold electroplated surfaces. They have a field of view of about 5°, and a focal ratio of 1.41. A cross sectional diagram of the Short Wavelength Scanner design (Type I) is shown in figure A-1. The scanners' characteristics are summarized in table A-1, and described in more detail in [9], [8], [21], and [29].

Table A-1: EUVE Short Wavelength Scanners

Short Wavelength Mirrors

Focal Length	56.22 cm
f/ratio	1.41
Geometric Area	138.0 cm
Field of View	5° diameter
Average Graze Angles	5°, 5° (primary, secondary)
Surface coating	Au, ~ 1000 Å
FWHM (optical)	1 – –2.4 $\widehat{''}$

Short Wavelength Filters

Quadrants	Material	Bandpass
0,1 (A)/2,3 (B)	Lexan/boron 2400 Å/1000 Å	44–240 Å
2,3 (A)/0,1 (B)	Al/Ti/carbon 2000 Å/250 Å/600 Å	140–360 Å

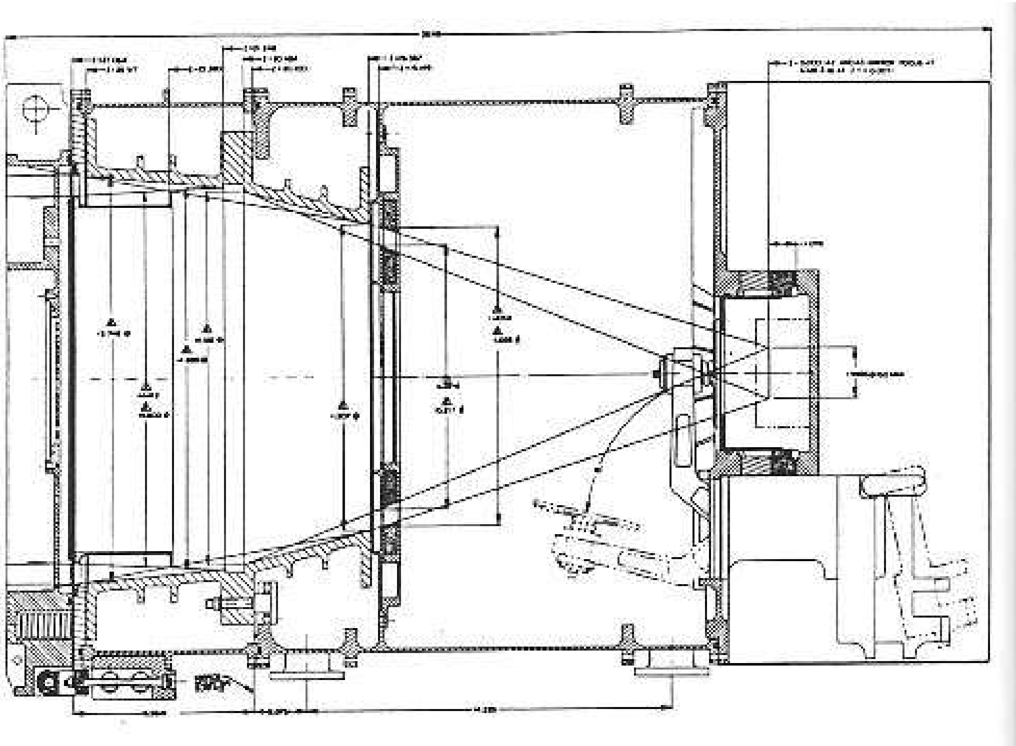

Figure A-1: Cross-sectional diagram of short wavelength scanner.

Because the beam "footprint" at grazing incidence is quite large, the amount of light scattered by a few tens of angstroms' surface roughness in these mirrors can be considerable. Much of the light is scattered within a small angle of the specular direction, but enough lands outside the central image that the difference between the image FWHM and the half energy width (HEW) must be taken into account when processing images. A plot of the scattering histogram for one of the mirrors in shown in figure A-2, where the solid line shows the expected distribution of light from a perfect surface.

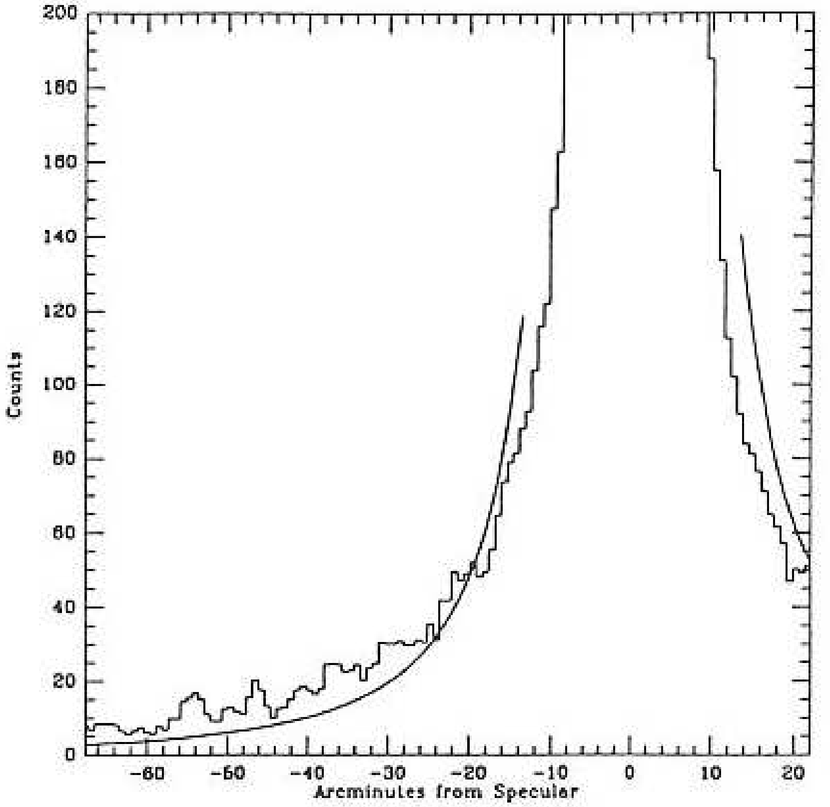

Figure A-2: Scanner mirror scattering histogram.
Solid line is theoretical imaging profile.

The converging beam from each mirror strikes a two-inch diameter MCP detector with a filter divided radially into four quadrants. Two quadrants of the filter are Lexan/boron, with a bandpass similar to those pictured in section 2.3 on the Deep Survey instrument. The boron prevents oxidation and suppresses transmission of Lyman alpha. The other two quadrants are aluminum with a layer of carbon providing a long-wavelength cutoff. Figure A-3 shows the filter configurations and orientations for all three scanners. The detectors have magnesium fluoride (MgF_2) photocathodes deposited on the front channel plates to enhance detection at the shorter wavelengths. See section A.3 for a discussion of scanner effective areas.

Each scanner,including the long wavelength instrument described below, has a magnetic "broom" designed to divert charged particles that enter through the telescope aperture. The broom consists of a solenoid magnet concentric with the optical axis, placed between the primary and secondary mirror sections. It is designed to reject electrons with energies up to 15 keV and heavy thermal ions with energies up to .3 eV.

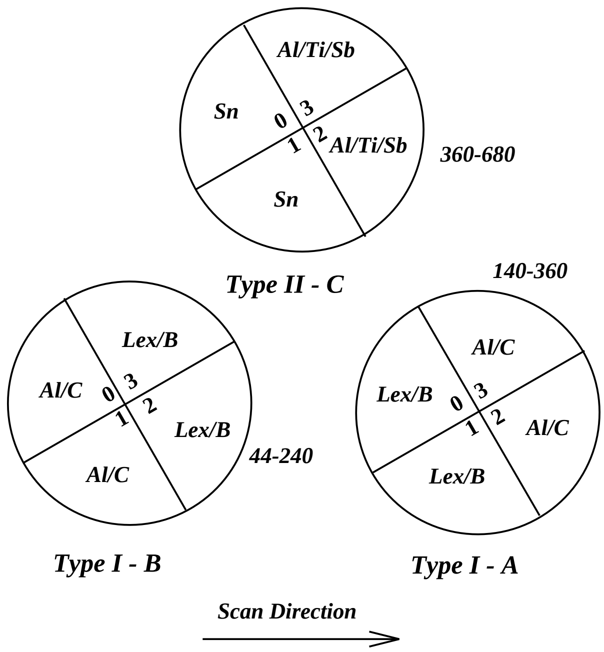

Figure A-3: Scanner filter configuration

A.2 Long Wavelength Scanner

The third survey instrument, often called Scanner C, operates at longer wavelengths between 400 and 900 Å. The mirror design, filter materials and detector photocathode all differ from those of the short wavelength scanners. Figure A-4 shows the long wavelength instrument in cross-sectional view.

Scanner C has a Wolter-Schwarzschild Type II mirror with a diameter of 40 cm and a focal length of 70 cm. The surface is coated with $\sim 13\mu m$ of electroless nickel. Its aperture size is comparable to the short wavelength scanners. It has a 4° field of view, and a geometric area greater than the combined short wavelength scanners. The filters have the same quadrant geometry. Two filter quadrants are made of tin, protected by a thin (100 Å) layer of SiO. The other two quadrants are multilayer "sandwiches" of antimony between layers of titanium, with a layer of aluminum next to the detector. They have been nicknamed "dagwood" filters. The detector has no deposited photocathode. Table A-2 gives characteristics of the long wavelength scanner.

Table A-2: EUVE Long Wavelength Scanner

Long Wavelength Mirror

Focal Length	70.0 cm
f/ratio	1.75
Geometric Area	407.0 cm
Field of View	4° diameter
Average Graze Angles	29°, 21° (primary, secondary)
Surface	$\sim 13\mu$ Nickel
FWHM (optical)	$2.3''$

Long Wavelength Filters

Filter Quadrants	Material	Bandpass (Å)
0,1	Sn/SiO 3484 Å/100 Å	520–750
2,3	Ti/Sb/Al 374 Å/686 Å/1256 Å	400–600

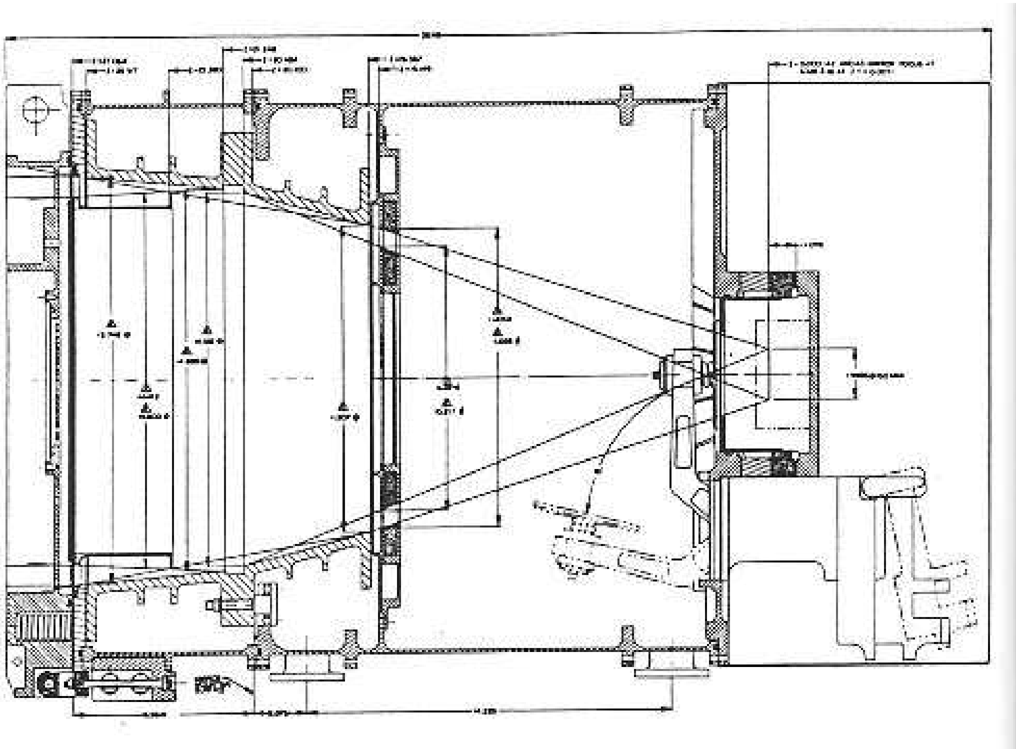

Figure A-4: Cross section of Long Wavelength Scanner (Scanner C)

A.3 Scanner Effective Areas

The effective areas of each of the scanning instruments has been measured in pre-launch calibration and from pointed calibration observations of bright sources. Model fits to the effective areas of the combined short wavelength scanners are shown in figure A-5. Effective area measurements for the long wavelength scanner are shown in figure A-6. Areas for each of the like quadrants in Scanners A and B have been averaged to produce a net effective area each short wavelength bandpass: Lexan/boron, and aluminum/titanium/carbon. Models for the tin/SiO and aluminum/antimony/titanium ("dagwood") filters in the long wavelength scanner are not yet established.

Effective areas are important, but the quality of pointed scanner observations will also depend on detector backgrounds and positioning of the source within the field of view. Optimal pointing will be chosen by the Berkeley operations team to get the best possible focus for each source in each desired bandpass, while avoiding interference from the filter frames near the center of the field of view. Further commentary on the scanner effective areas, background count rates and performance may be found in [16], [20], and [30].

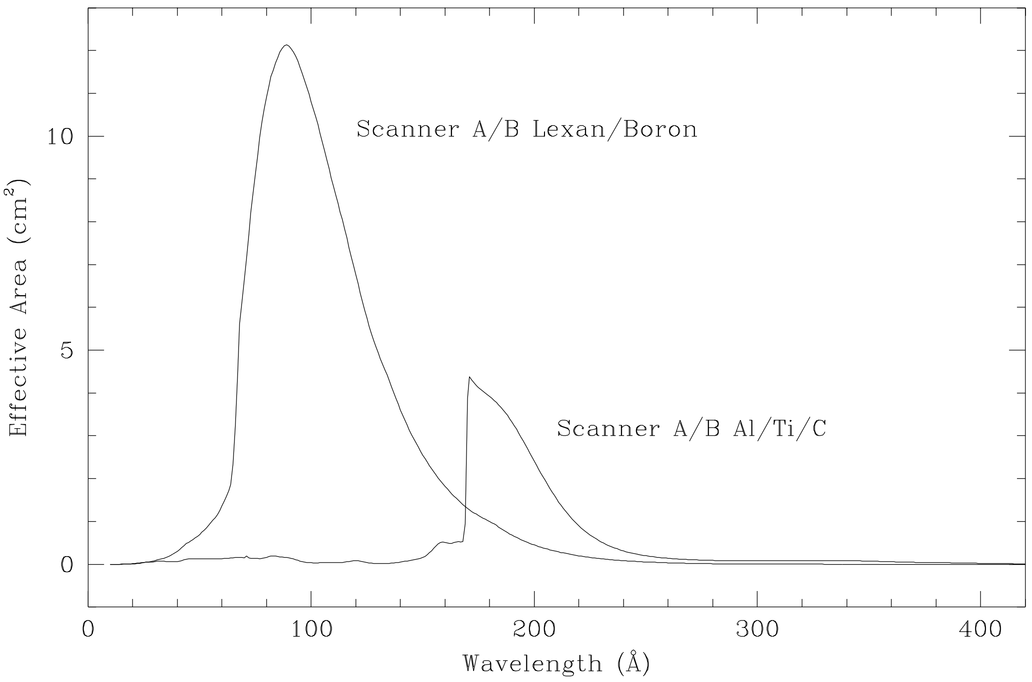

Figure A-5: Effective areas for the short wavelength scanners (Scanners A and B). The short wavelength curve is a model fit to measurements in all quadrants with Lexam/boron filters. The longer wavelength curve is derived from measurements of all the aluminum/titanium/carbon quadrants.

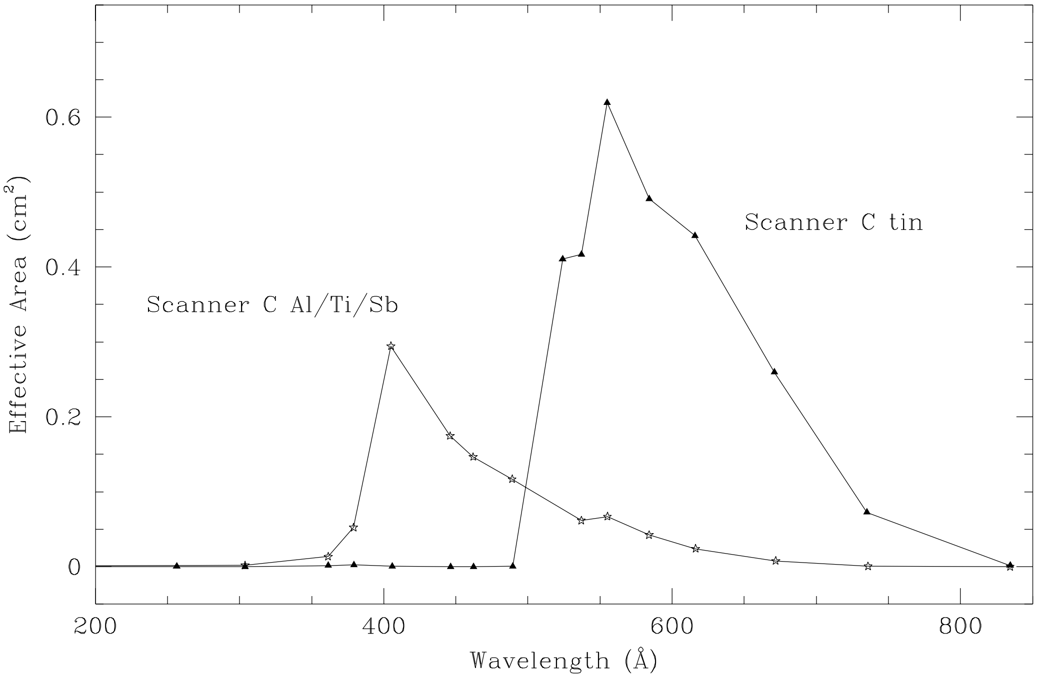

Figure A-6: Effective areas for the long wavelength scanner (Scanner C). The short wavelength curve is a model fit to measurements in quadrants with "Dagwood" filters, of aluminum/titanium/senobium. The longer wavelength curve is derived from measurements of the tin/SiO quadrants.

Appendix B

LIST OF EUVE PROJECT ACRONYMS

ADC	Analog-to-Digital Converter
ADS	(NASA) Astrophysics Data System
C&DH	Command and Data Handler (MMS)
CDP	Command and Data Processor
CEA	Center for Extreme Ultraviolet Astrophysics
DFFS	Digital Fine Sun Sensor
DS/S	Deep Survey/Spectrometer
EA	Effective Area (A_{eff})
EGO	EUVE Guest Observer
EP	Explorer Platform
EUVE	Extreme Ultraviolet Explorer
ESOC	EUVE Science Operations Center
FHST	Fixed Head Star Tracker
FOT	Flight Operations Team (NASA)
FTP	File Transfer Protocol
FWHM	Full Width at Half Maximum
GSFC	(NASA) Goddard Space Flight Center
HEW	Half Energy Width
IRAF	Image Reduction and Analysis Facility
IRU	Inertial Reference Unit
ISM	Interstellar Medium
ISW	Instrument Software
MACS	Modular Attitude Control System
MCP	Microchannel Plate
MDF	Minimum Detectable Flux
MMS	Multi-Mission Spacecraft
MPS	Modular Power Subsystem
NASCOM	NASA Astronomical Satellite Communications
NIST	National Institute of Standards and Technology
PED	Platform Equipment Deck
POCC	Payload Operations and Command Center
QPOE	Quick Position Oriented Event
RIF	Relay Interface
ROSAT	Röntgensatellit
SAA	South Atlantic (Magnetic) Anomaly
SAG	Space Astrophysics Group
TDRSS	Tracking Data Relay Satellite System
TIF	Telescope Interface
TM	Telemetry
TOO	Target(s) of Opportunity
URL	Uniform Resource Locator

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