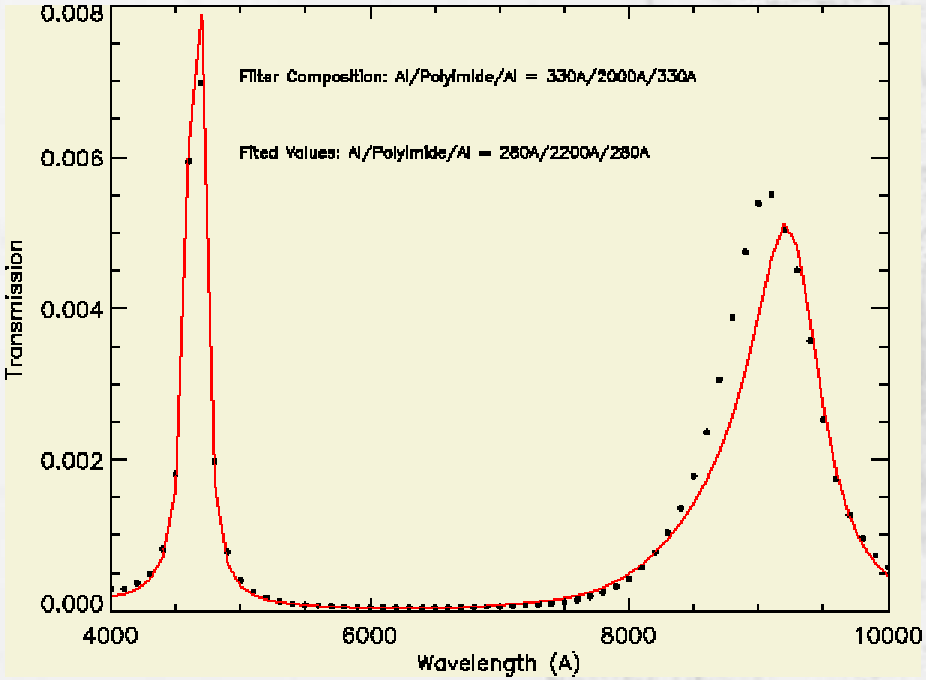
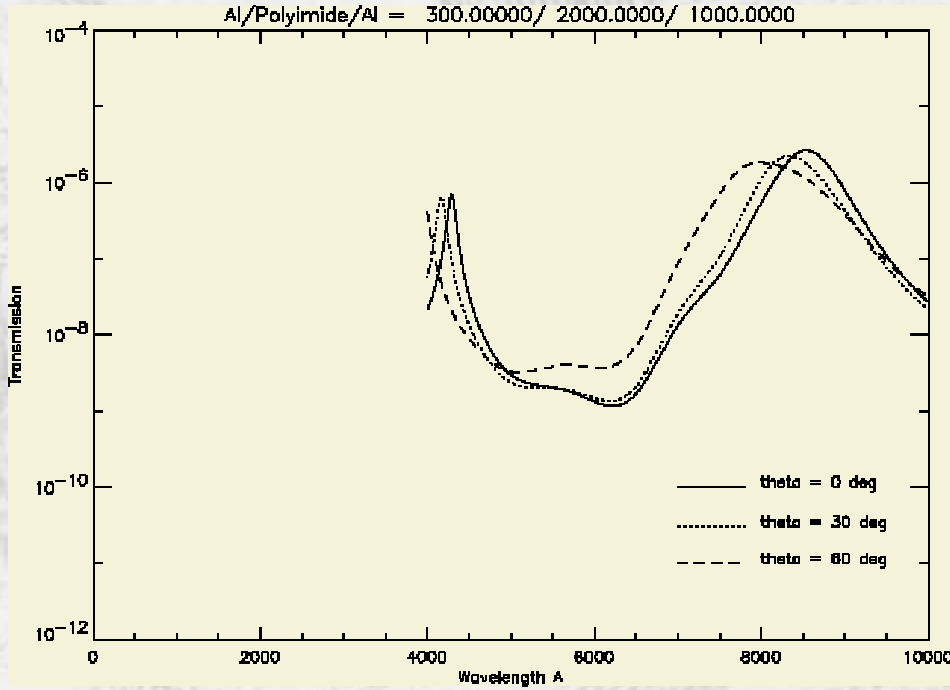
ACIS Optical Sensitivity

Scott J. Wolk
SAO/CXC

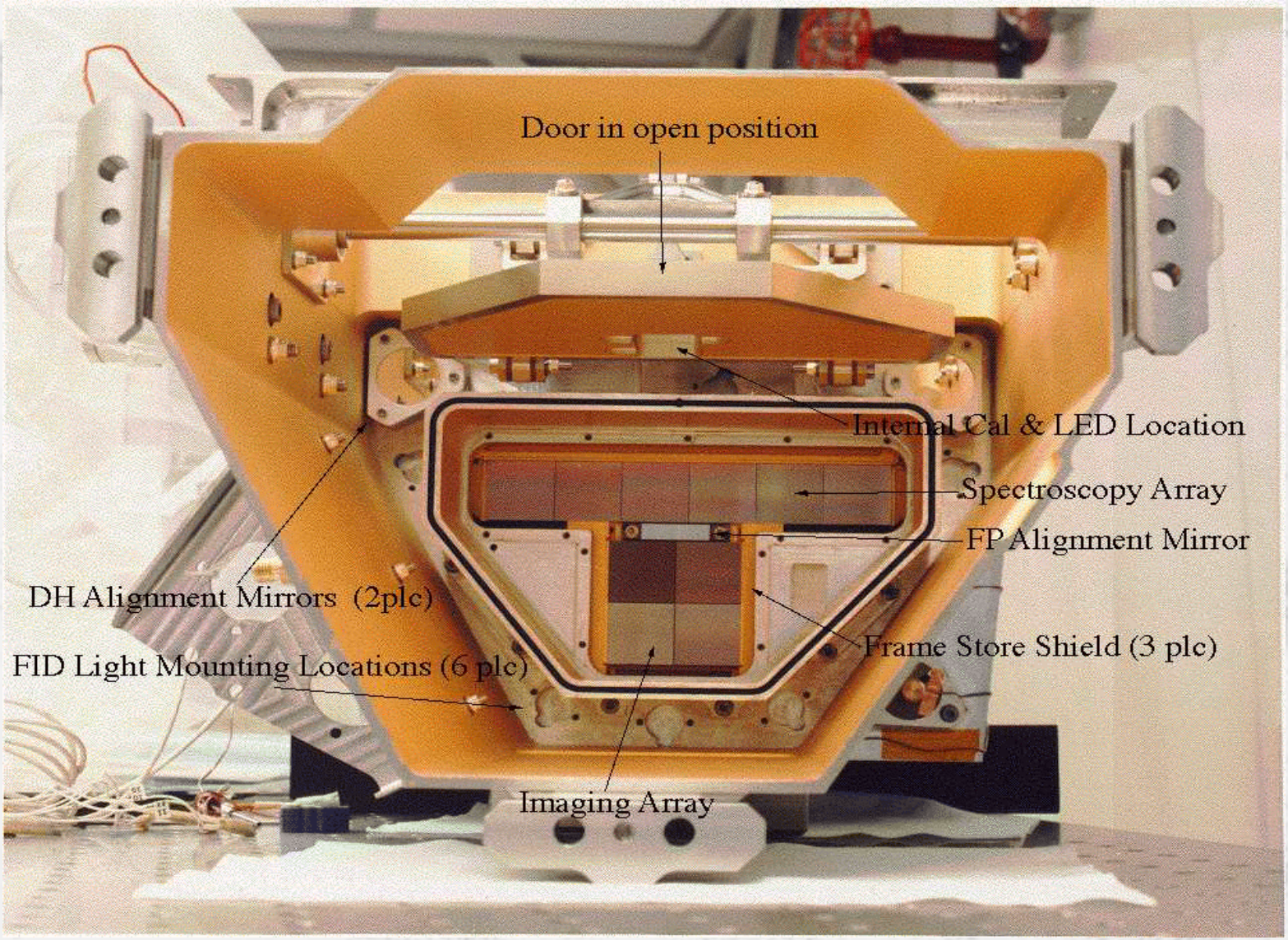
OBF Design

- Optical blocking on both ACIS and HRC is achieved with a polyimide coated on both sides with a thin layer of aluminum
  - ACIS-I Al/Polyimide/Al 1200Å 2000Å 400Å
  - ACIS-S Al/Polyimide/Al 1000Å 2000Å 300Å
- Calibration was performed via analytical methods.
  - Results of the analysis where compared to non-flight filter.

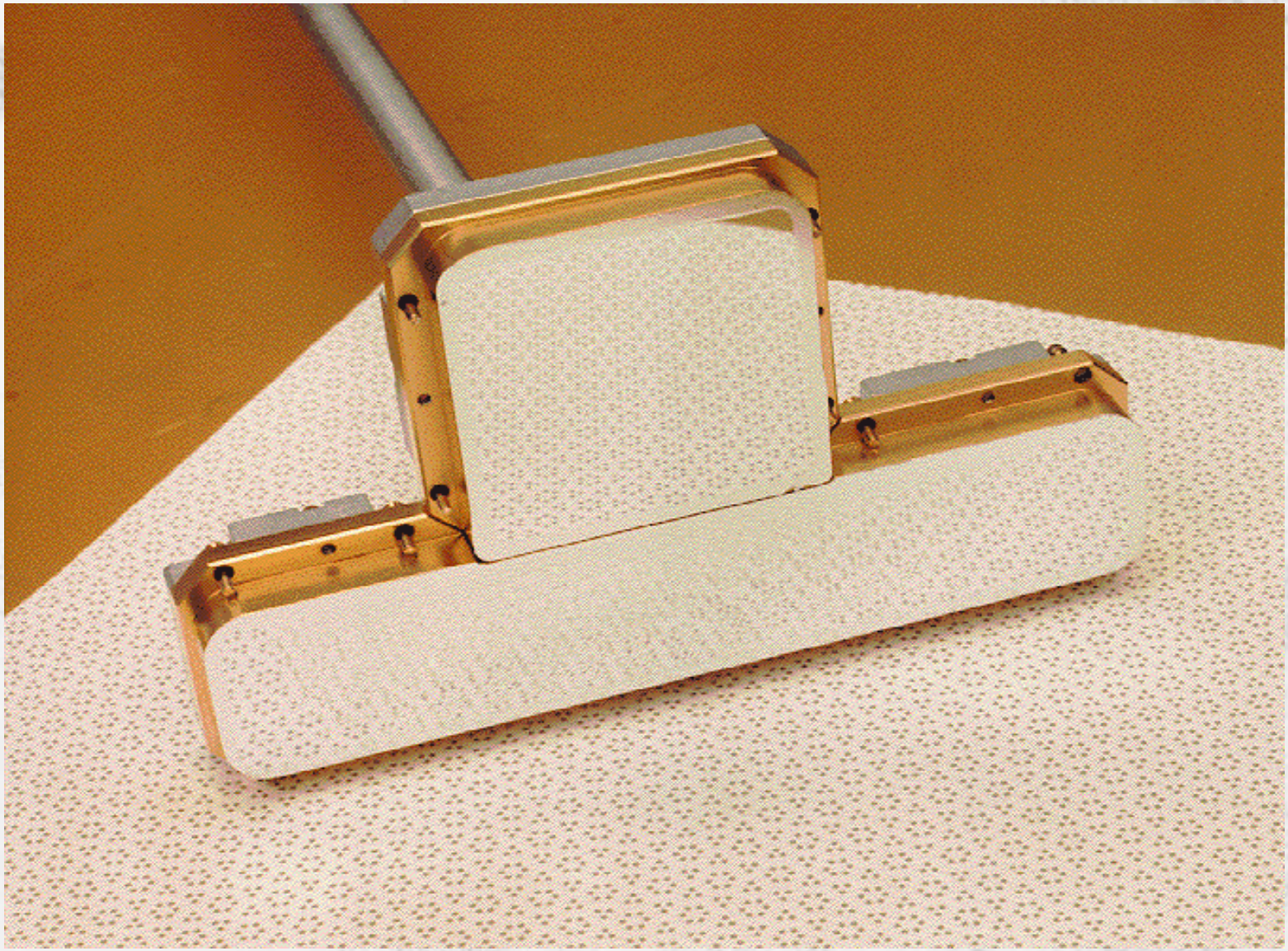




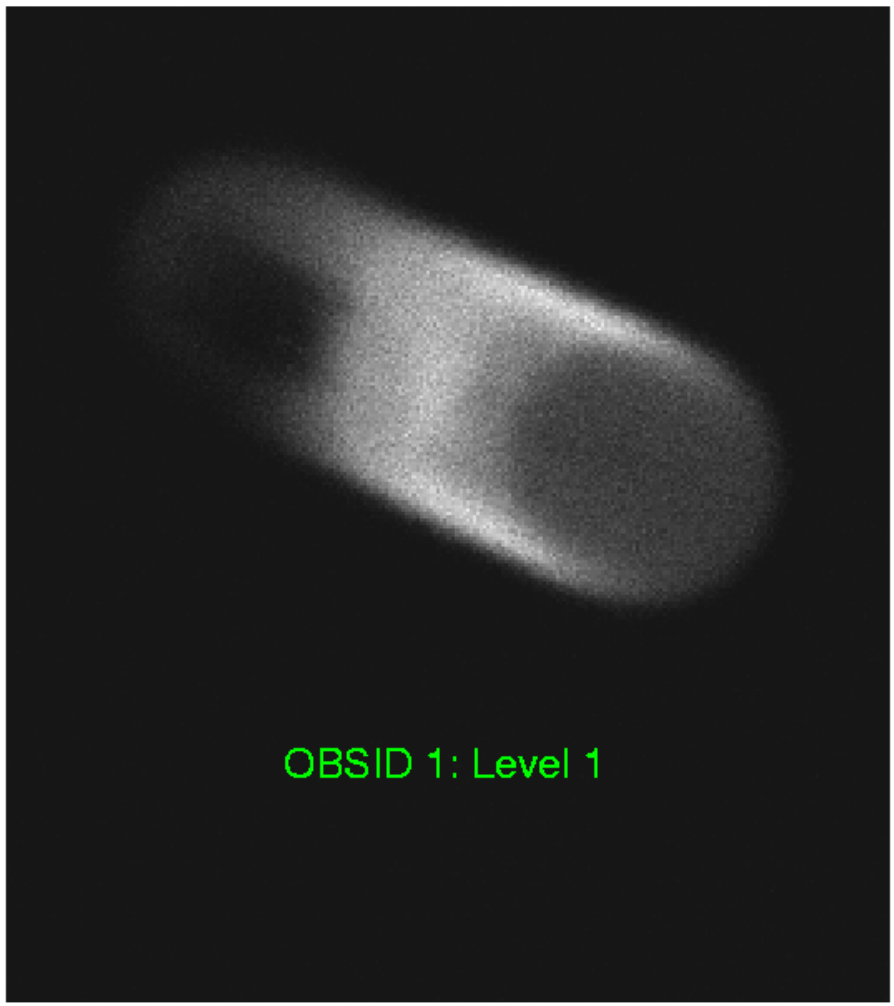
OBF Design


Door in open position
Internal Cal & LED Location
Spectroscopy Array
FP Alignment Mirror
DH Alignment Mirrors (2plc)
Frame Store Shield (3 plc)
FID Light Mounting Locations (6 plc)
Imaging Array

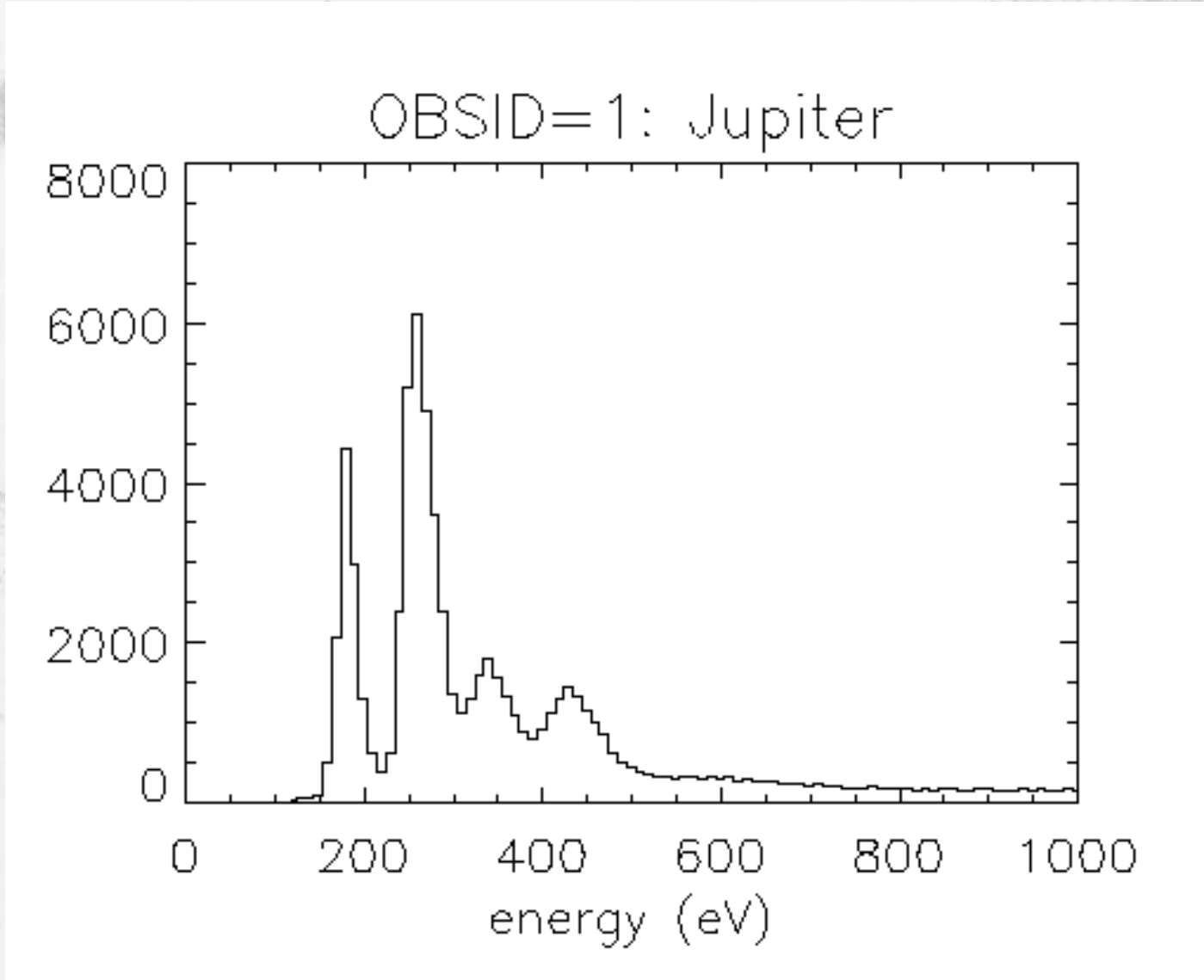
OBF Design



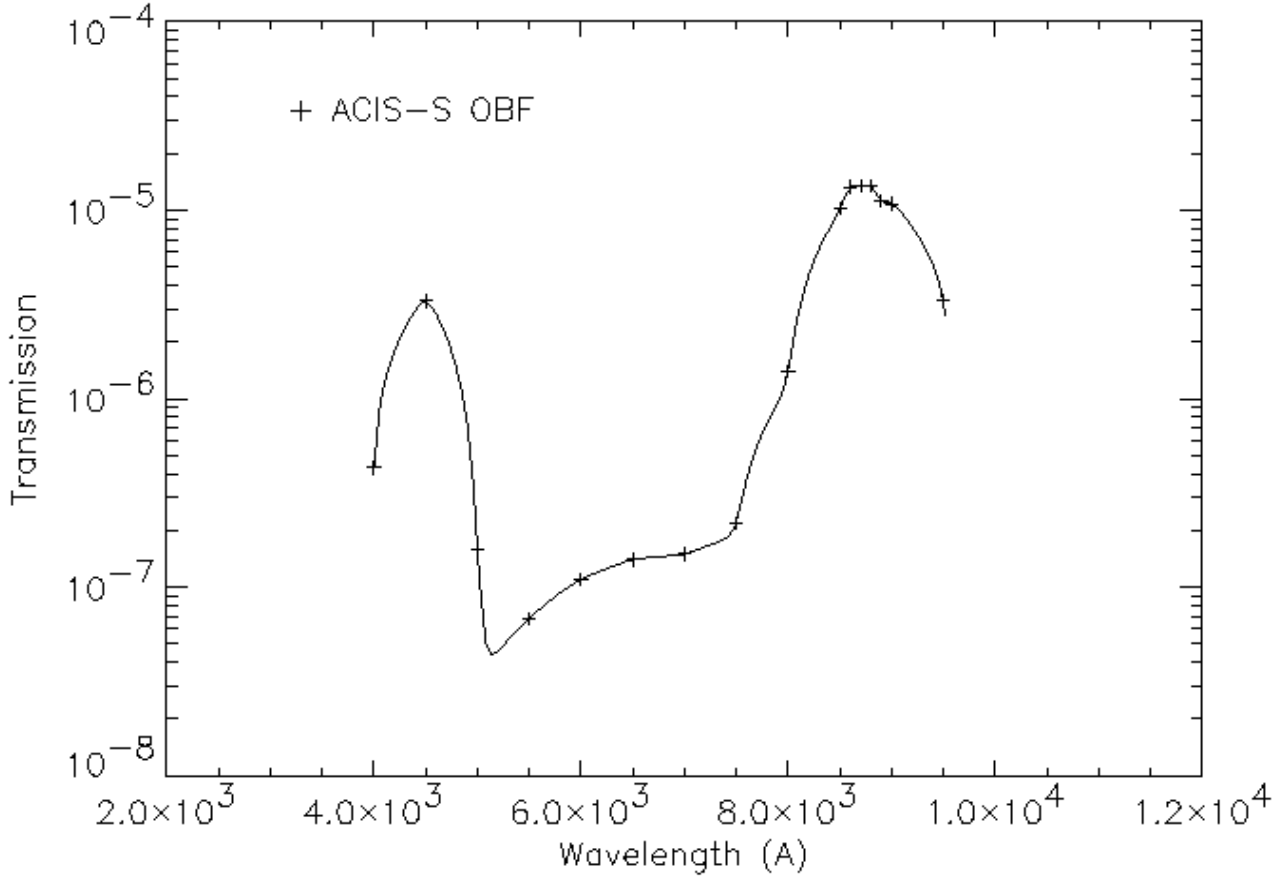
Identification of problem



Identification of problem



Quantification of Problem



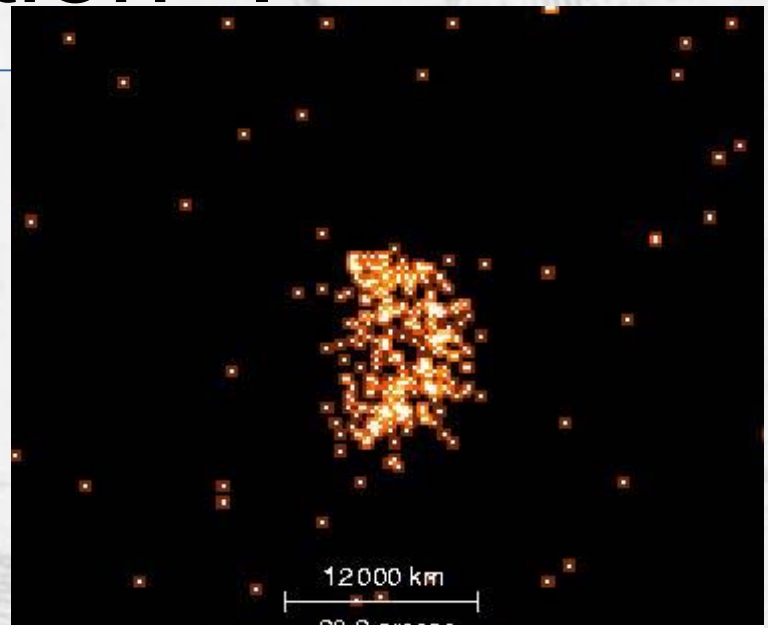
Quantification of Problem

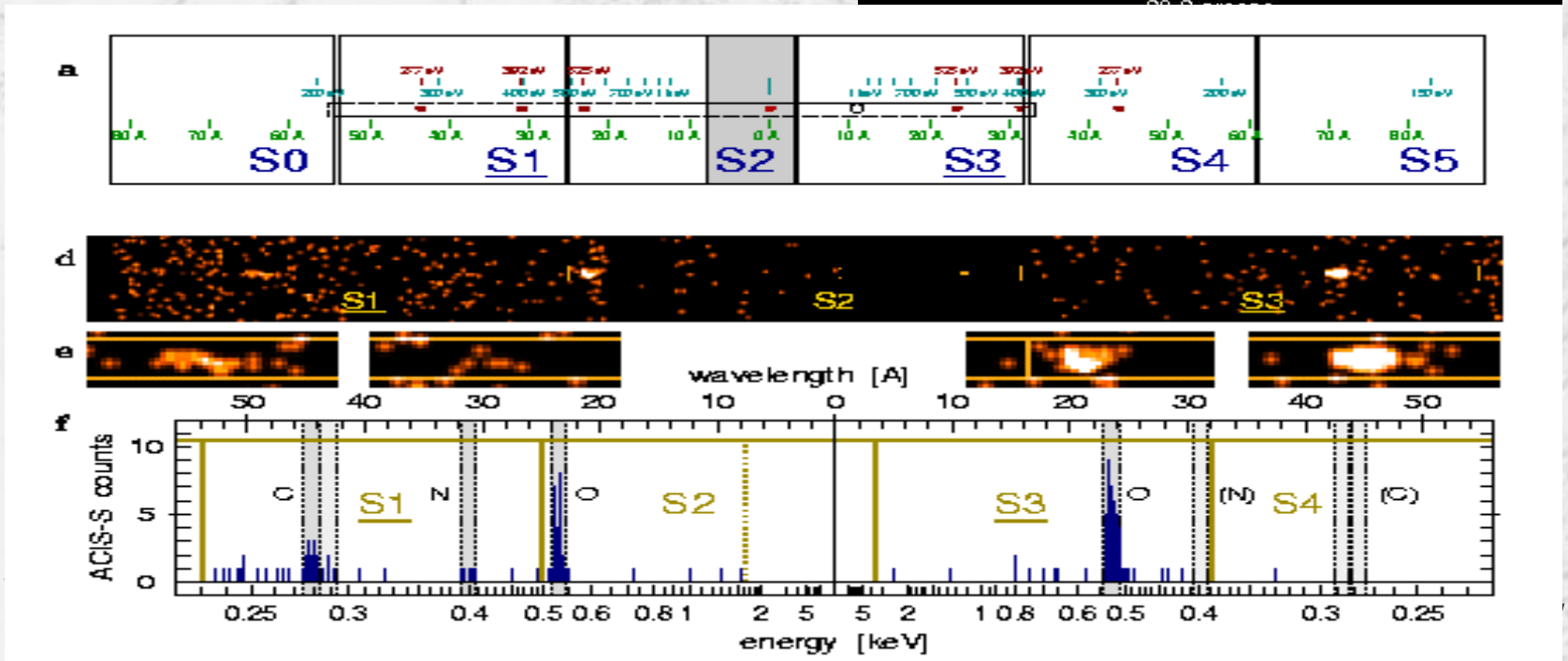
- The problem was traced to an interference effect which enhanced transmission at longer optical wavelengths.
- This conclusion was confirmed by analysis of flight-like OBF spare.
- Stellar magnitude required to produce 1ADU in a 3.3 second ACIS frametime.

Stellar Temperature (K)	BI Chip in S array (V-Magnitude)	FI Chip in I array (V-Magnitude)	
4000	8.1	2.87	
5000	7.93	2.44	
6500	7.73	1.79	
10000	7.66	1.17	
20000	7.6	0.97	

Amelioration -I

- ACIS-I -Mars
- Shorter exposures
- LETG - Venus



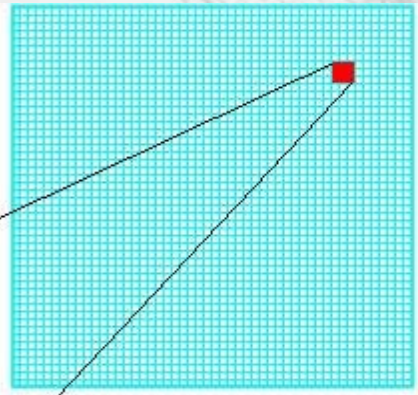


CXC

Amelioration -II

- Need to understand
  - The event island
  - What light leak really does
  - 5x5 (very faint mode)

➔Try Changing the thresholds



Event 1

Nominal
Detect Threshold= 20
Split Threshold = 13

0	0	0	0	0
0	3	42	1	0
0	8	50	1	0
0	12	2	+	0
0	0	0	0	0

ACTSGRADE=64 PHA=92
ASCA GRADE = 2 Energy ~410 eV

With 4 ADU/pix light leak

Not the same if point source

+	+	+	+	+
+	7	46	5	+
+	12	54	5	+
+	16	3	8	+
+	+	+	+	+

ACTSGRADE=65 PHA= 116
ASCA GRADE = 2 Energy ~499 eV

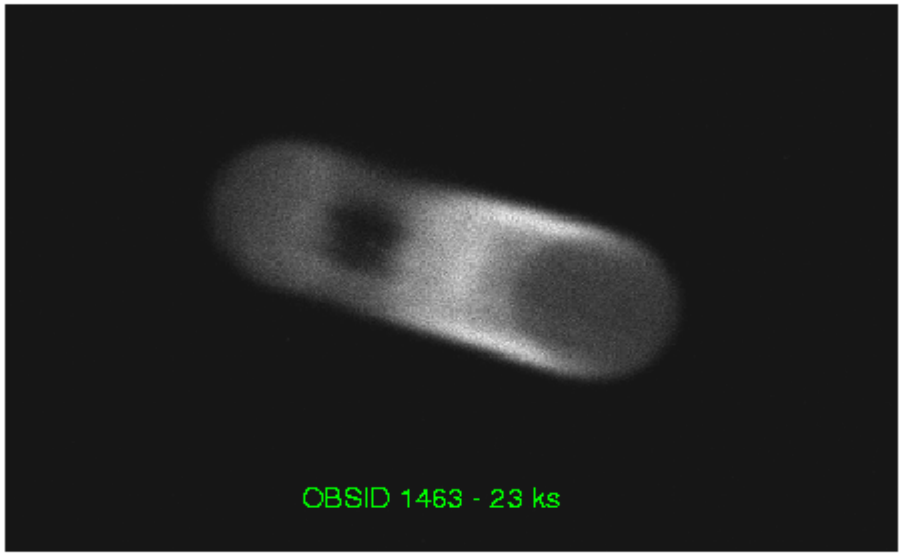
With 12 ADU/pix of light leak

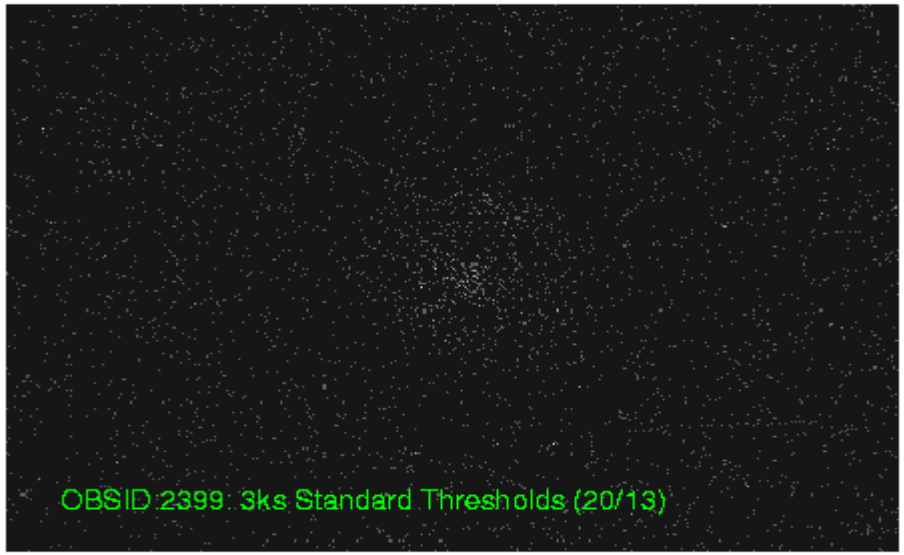
Non–Detection

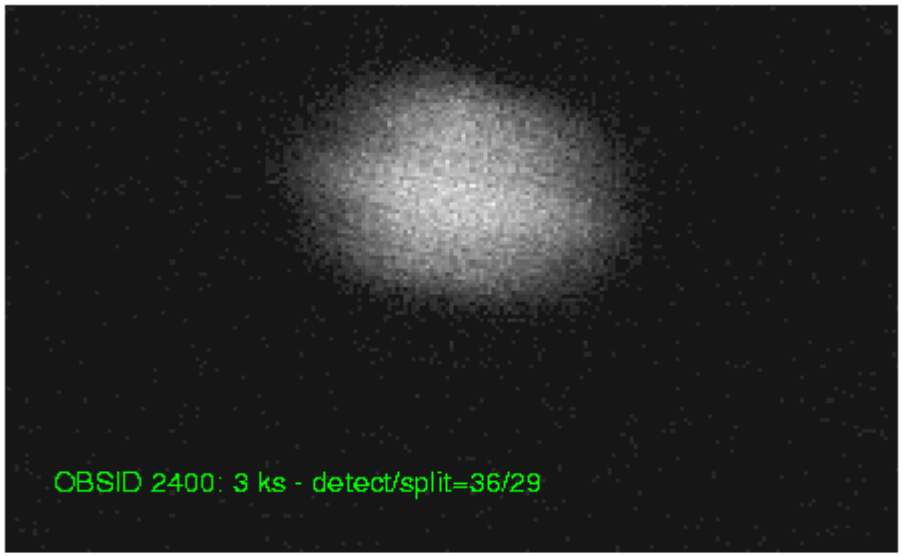
12	12	12	12	12
12	15	54	13	12
12	20	62	13	12
12	24	14	20	12
12	12	12	12	12

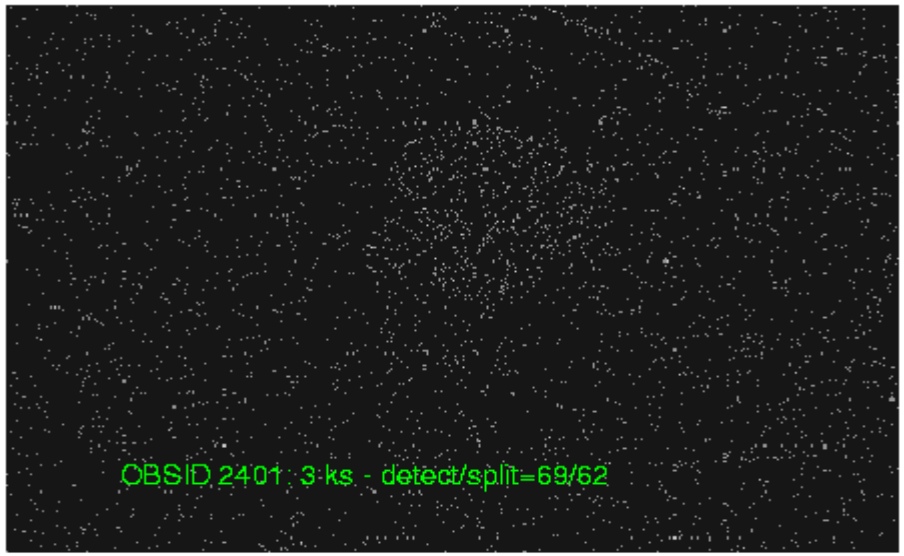
ACTSGRADE=255 PHA= NA
ASCA GRADE = 7 Energy = NA

Jupiter Cal. Observations - AO2

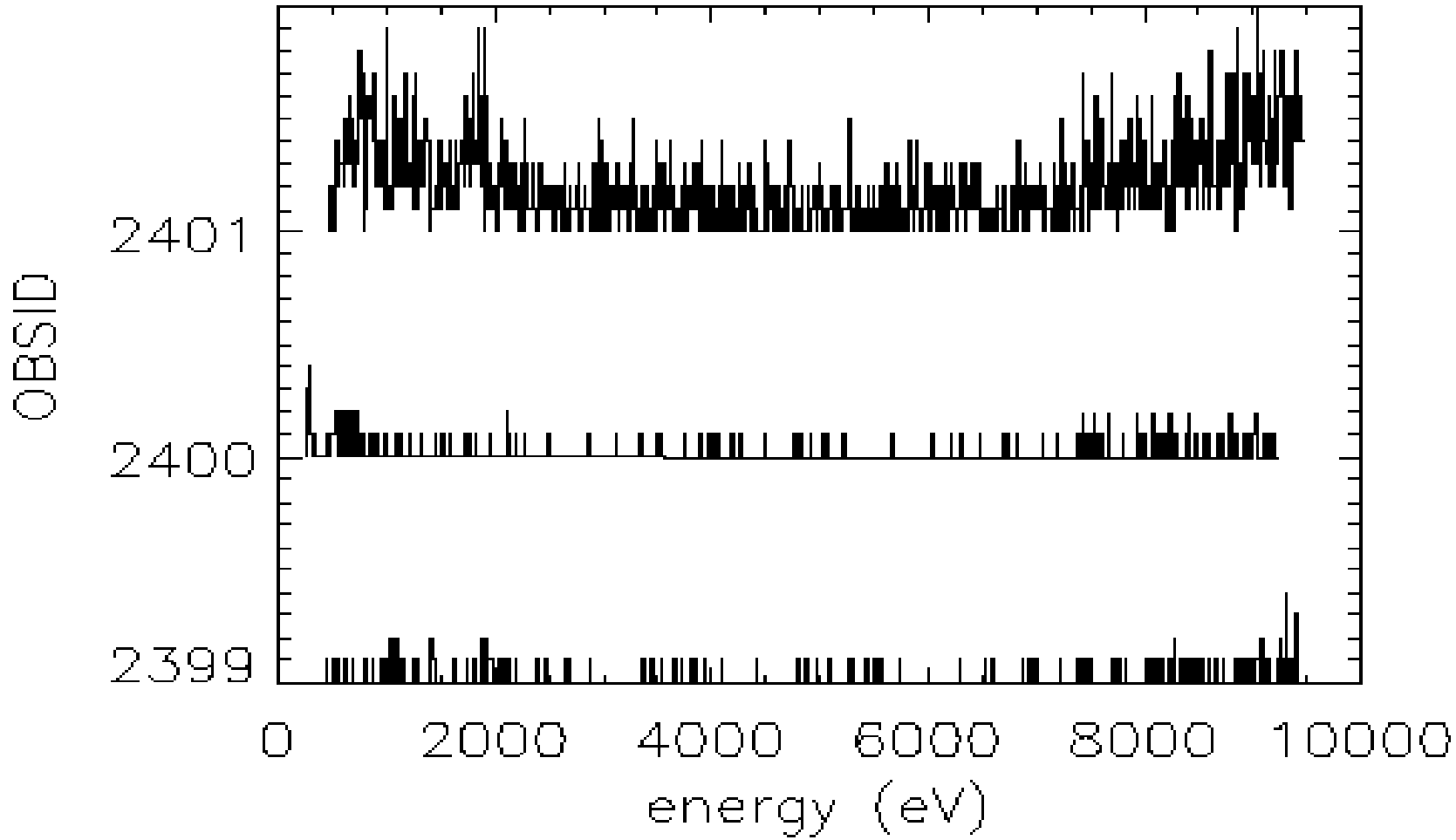








Jupiter Cal. Observations - AO2



Jupiter Cal. Observations - AO2

	Detect Threshold= 20 Split Threshold = 13	Detect Threshold= 36 Split Threshold = 29
Event 1	2 **19** 7 8 **35** 5 **16** 3 9	2 19 7 8 35 5 16 3 9
	ACISGRADE=65 ASCA GRADE = 2 PHA= 70 Energy ~ 329 eV	**Non–Detection**
Event 2	3 **42** 0 + **50** 0 **28** 2 +	3 **42** 0 + **50** 0 **28** 2 +
	ACISGRADE=65 ASCA GRADE = 2 PHA= 120 Energy ~ 514 eV	ACISGRADE=64 ASCA GRADE = 2 PHA= 92 Energy ~ 410 eV