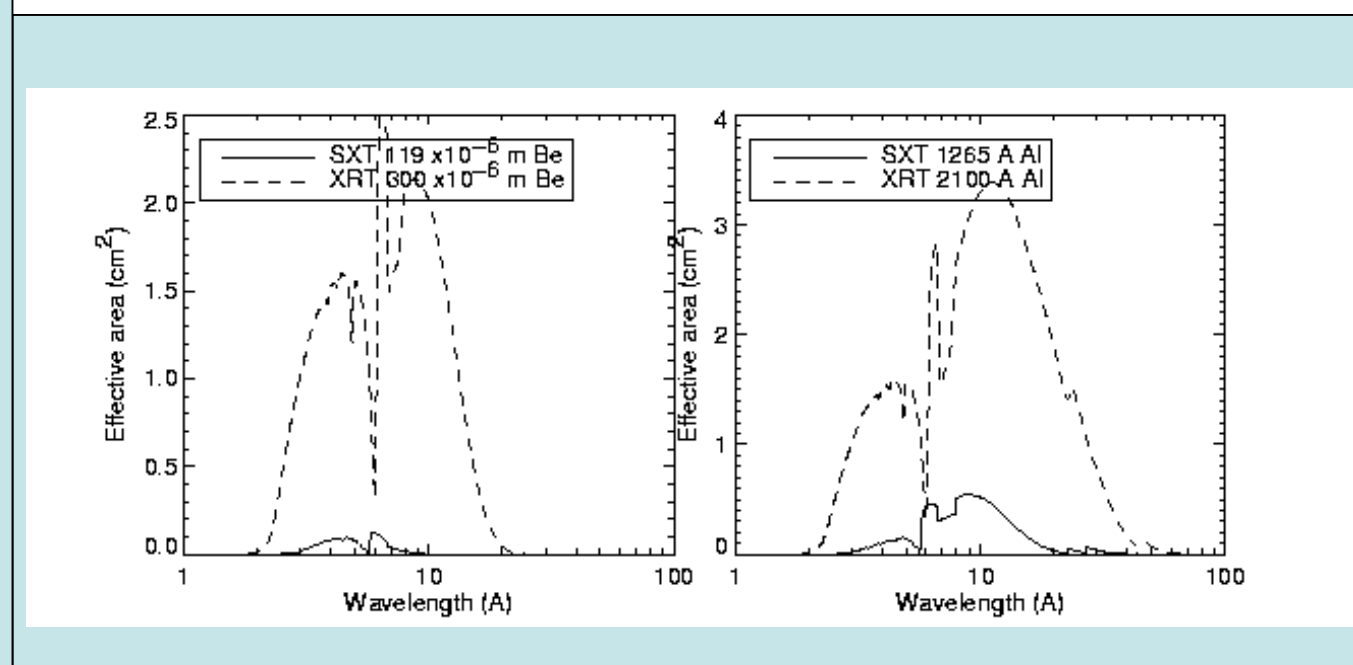
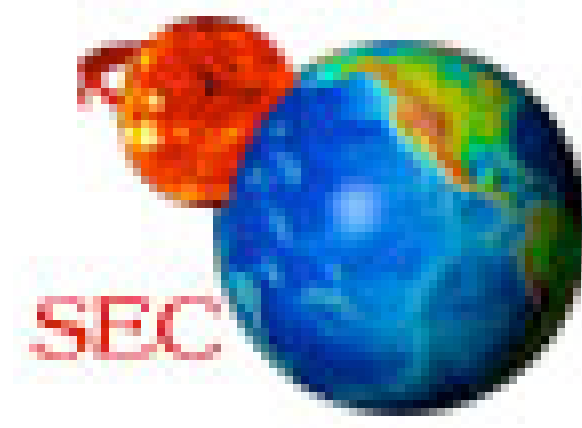


## XRT Instrument and Mission Characteristics

- 1.0 arc second pixels
- 2K\_2K back-illuminated CCD
- High sensitivity, broad temperature coverage
- 9 focal plane analysis filters
- 500 kb continuous data rate
- Polar, sun-synchronous orbit
- Launch date Summer 2006

### Comparison of XRT to SXT

- XRT has higher throughput
- XRT has extended long wavelength (low-T) response
- XRT has extended short wavelength response



# Living With a Star Science with The Solar B X-Ray Telescope



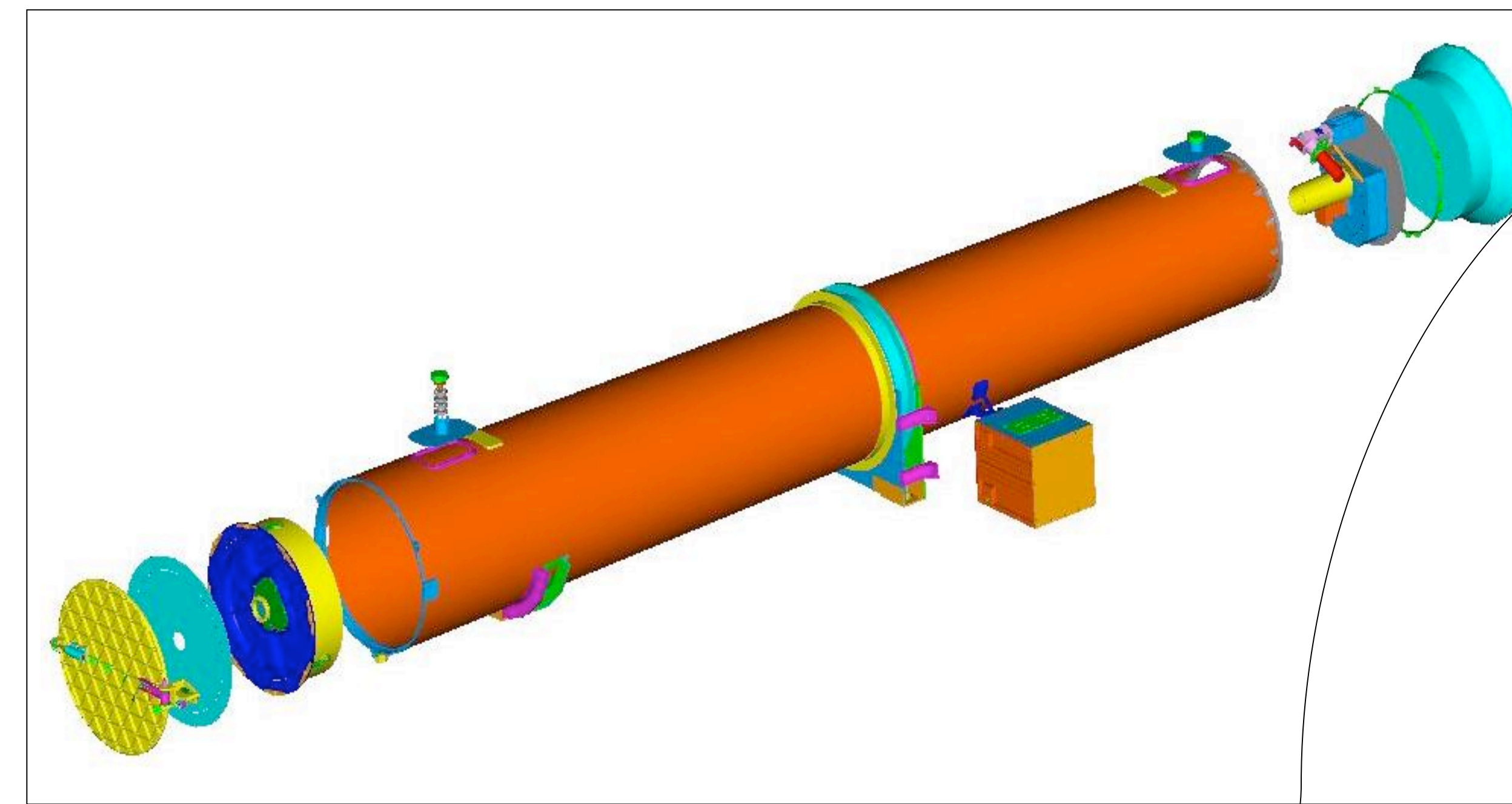
Smithsonian Astrophysical Observatory



### XRT Science Team

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Masumi Shimojo



Requirement	Value	Primary Hardware
Exposure time	4ms (min); 10sec (max)	Shutter
Cadence	2sec (reduced FOV)	Camera/MDP
Temperature range	6.1 < log T < 7.5	Coronal DEM
Temperature resolution	log T = 0.2	Focal Plane Filters
X-ray image resolution	2 arcsec (50% encircled energy)	Mirror
FOV	>30 arcmin	Mirror
White light rejection	>10 <sup>11</sup>	Filters
Data Rate	2.4 MB/sec	MDP
Data Volume	60 MB/orbit	MDP
Spatial co-alignment	1 XRT pixel (XRT X-ray-WL)	Mirror Assembly
Spatial co-alignment	1 XRT pixel (XRT - EIS/SOT)	Structures
Coordinated observing	0.1sec	MDP

### Filters and Mirror

#### Entrance Filters

##### •Requirements

- White Light Transmission < 10<sup>-6</sup>
- Heat Rejection
- 5 year on orbit survival
- X-Ray transmission > 0.7 from 1-60Å

##### •Properties

- 1600 Å Al
- 2500 Å Polyimide

#### Focal Plane Filters

##### •Requirements

- White Light Transmission < 10<sup>-6</sup>
- 5 year on orbit survival
- Temperature Diagnostics from 1 to > 20 MK
- Morphology for T < 1MK

##### •Properties

- Science filters are on polyimide or free standing
- Simple proven design

##### •Testing/Verification

- Environmental
- Transmission

#### Mirror

##### •Optimized Polynomial Design

- Constraints: Focal Length, Pixel Size, FOV, Resolution
- Goal: 2" resolution for the full sun FOV

##### •Low Scattering

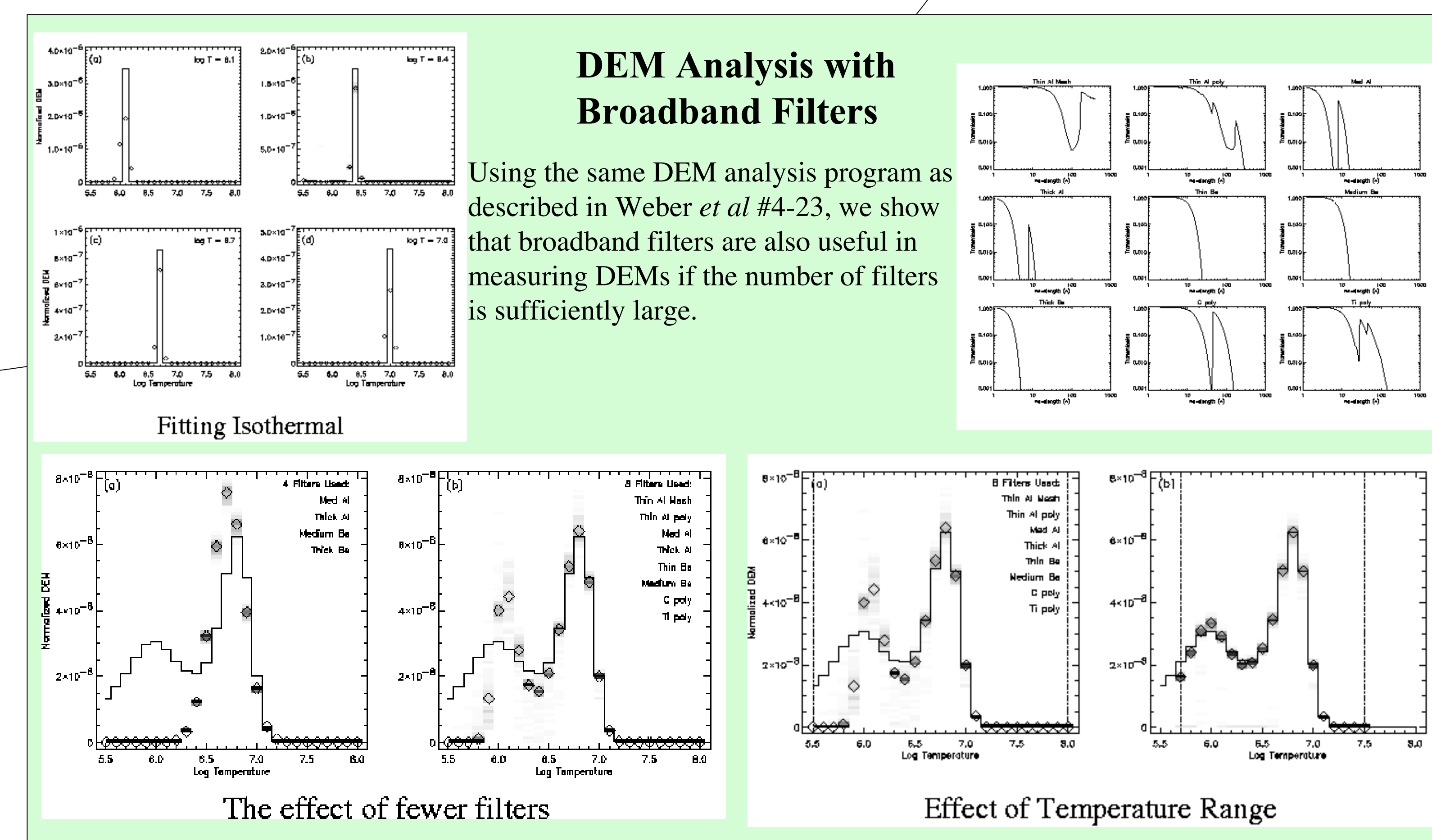
- Surface roughness < 6Å RMS

##### •Extended Temperature sensitivity

##### •Mirror polishing is nearing completion at Goodrich.

##### •We expect the mirror to meet or exceed all requirements.

Order No.	Name	Metal	Metal Thickness (as ordered)	Substrate	Substrate Thickness (as ordered)	Spare Ordered?
1	Thin-Al/Mesh	Al	1600Å	Mesh	N/A	Y
2	Thin-Al/Poly	Al	1250Å	Polyimide	2500Å	Y
3	Thin-Be	Be	9µm	N/A	N/A	N
4	Med-Be	Be	30µm	N/A	N/A	N
5	Thick-Be	Be	1mm	N/A	N/A	N
6	Thick-Al	Al	25µm	N/A	N/A	N
7	Med-Al	Al	12.5µm	N/A	N/A	Y
8	Ti/Poly	Ti	2300Å	Polyimide	2500Å	Y
9	C/Poly	C	1250Å	Polyimide	2500Å	Y
	Entrance	Al	1250Å	Polyimide	2500Å	Y



**DEM Analysis with Broadband Filters**

Using the same DEM analysis program as described in Weber *et al* #4-23, we show that broadband filters are also useful in measuring DEMs if the number of filters is sufficiently large.

LWS Science

#### Fundamental Questions

Understand the stability and dynamics of hot coronal plasmas

Resolve the internal structure and dynamics of coronal loops

Reveal connectivity, energy & mass transport to the solar corona

Topic	Definition/Questions	Instrument Requirement
Coronal Mass Ejection	How are they triggered?	High time resolution
	What is their relation to Magnetic structures?	Large FOV
Flare Energetics	What is the relation between large scale instabilities and the dynamics of small structures?	Broad temperature coverage
	Where and how do flares occur?	High time resolution
Reconnection and Jets	What are the relations to the local magnetic field?	High spatial resolution
	Where does reconnection occur?	Large FOV
Coronal Heating	What are the wave contributions?	Broad temperature coverage
	Do loop-loop interactions cause heating?	High time resolution
Photospheric-Coronal Coupling	Can a direct connection between coronal and photospheric events be established?	High spatial resolution
	How is energy transferred to the Corona?	High time resolution
Emerging Flux	Does the photosphere determine coronal fine structure?	Broad temperature coverage
		Co-ordinated observing EIS/SOT

Topic	Observing plan filename	FOV X	FOV Y	Filter Set ID	Cadence Seconds	FOV X	FOV Y	Filter Set ID	Cadence cycles	#Primary filters	#Secondary filters
AR DEM studies	ar_dem.html	1024	1024	1002	180					6	0
Loop Structure	loop_structure.html	1024	1024	1003	90	1024	1024	1006	10	3	2
Flare Onset	flare_onset.html	1024	1024	1007	60	1024	1024	1008	10	2	3
Filament activation	filaments.html	1024	1024	1003	90					3	0
Field Topology	topology.html	2048	2048	1009	90					3	0
X-Ray Jets	xray_jets.html	768	768	1104	20	1024	1024	1010	10	1	4
X-Ray Bright Points	xray_bp.html	768	768	1011	40	1024	1024	1012	10	4	4
Intensity Waves	inten_waves.html	512	512	1102	10	1024	1024	1015	10	1	4
Emerging Flux	emerg_flux.html	2048	2048	1013	120	2048	2048	1014	10	4	1
AR Moss	ar_moss.html	768	768	1001	80					5	0

ID #	Description	Filter	Number in Set
1001	DEM 5 Filters	Al Poly	5
1001	DEM 5 Filters	C	5
1001	DEM 5 Filters	Thin Be	5
1001	DEM 5 Filters	Med Be	5
1001	DEM 5 Filters	Thick Be	5
1002	DEM 6 Filters	Al Poly	6
1002	DEM 6 Filters	C	6
1002	DEM 6 Filters	Thin Be	6
1002	DEM 6 Filters	Med Be	6
1002	DEM 6 Filters	Thick Al	6
1002	DEM 6 Filters	Thick Be	6
1003	Cool Set, 3-filters	Al Mesh	3
1003	Cool Set, 3-filters	Al Poly	3
1003	Cool Set, 3-filters	C	3
1004	Flare Set 3-filters	Med Be	3
1004	Flare Set 3-filters	Thick Al	3
1004	Flare Set 3-filters	Thick Be	3
1005	Flare short set	Thin Al	2
1005	Flare short set	Thick Be	2
1006	Hot Context	Med Be	2
1006	Hot Context	Thick Be	2
1007	Flare Onset Prime	Thin Be	2
1007	Flare Onset Prime	Thick Be	2
1008	Flare Onset Context	Al Poly	3
1008	Flare Onset Context	C	3
1008	Flare Onset Context	Med Be	3
1009	AR 3-filters	Al Poly	3
1009	AR 3-filters	C	3
1009	AR 3-filters	Thin Be	3
1100	Single Al Mesh	Al Mesh	1
1101	Single Al Poly	Al Poly	1
1102	Single C	C	1
1103	Single Ti	Ti	1
1104	Single Thin Be	Thin Be	1
1105	Single Med Be	Med Be	1
1106	Single Thick Be	Thick Be	1
1107	Single Med Al	Med Al	1
1108	Single Thick Al	Thick Al	1
1010	X-Ray Jet Context	Al Poly	4
1010	X-Ray Jet Context	C	4
1010	X-Ray Jet Context	Med Be	4
1010	X-Ray Jet Context	Thick Be	4
1011	X-Ray BP Prime	C	4
1011	X-Ray BP Prime	Thin Be	4
1012	X-Ray BP Context	Al Poly	4
1012	X-Ray BP Context	Med Be	4
1012	X-Ray BP Context	Thick Be	4
1013	Emerging Flux	Al Poly	4
1013	Emerging Flux	C	4
1013	Emerging Flux	Thin Be	4
1013	Emerging Flux	Med Be	4
1014	Emerging Flux context	Thick Be	1
1015	Intensity Waves context	Al Poly	4
1015	Intensity Waves context	Thin Be	4
1015	Intensity Waves context	Med Be	4
1015	Intensity Waves context	Thick Be	4