Solar Low Energy X-ray Spectrometer (SoLEXS) onboard Aditya-L1

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Abstract

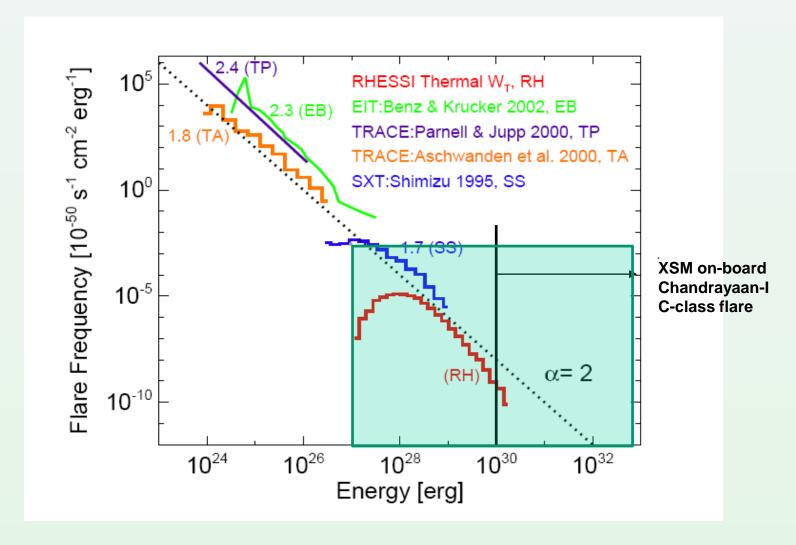
A soft X-ray spectrometer is being developed to study the solar flare spectra in the energy range of 1 - 30keV. The objective of this instrument is to obtain the sun-as-astar flare spectra for all classes of flare using a single instrument with a moderate spectral resolution (< 4% at 6keV) allowing us to model the coronal physical parameters including abundances with better accuracy compared to RHESSI. The instrument will utilize the high count rate capability of Silicon Drift Detector (SDD) to look at the Sun. This instrument is also designed to provide flare trigger to other instruments on-board Aditya-L1 to optimize their observing mode. The status of this instrument and its scientific goals will be discussed in this paper.

Parameter	Value	Design Requirement	 Instrument Parameters Energy Range: 1 - 30 keV with > 5% efficiency Energy Resolution: 250eV at 6keV Flare coverage: A-class to X-class Aperture Area used: 0.1mm² for > C-class; 10mm² for < C-class; Identical detector behind each Aperture Temporal Resolution ~ few seconds for C-class (large aperture) & X-class (small aperture) One second spectra during flare and 2sec spectra during quiet Fast channel with 100msec during flare and 500msec during quiet Flare trigger to other payloads FOV of the payload (< 4 deg limited by collimation) Non-imaging (sun as a star) Sun - pointing within about 0.5 deg
Low energy cut-off		 Thin Be window (~ 8-12.5µm) Low noise electronics Low temperature operation for low leakage current (~-20degC) 	
High Energy cut-off	30 keV with > 5% efficiency	•Thick detector (400 - 500 micron) •High voltage for large depletion (~150V)	
Spectral Resolution	<250ev at 6keV	 Low noise electronics & low temperature(-20 deg C) Low channel binning (~60eV) 	
Flare Coverage	< A-class to X-class flare	 High dynamic range detector Two detector to cover the dynamic range 	
Temporal	~ few sec	•Enough area to have good SNR	
Time stamping	~ a second	~ 100msec	

SoLEXS Design Requirement

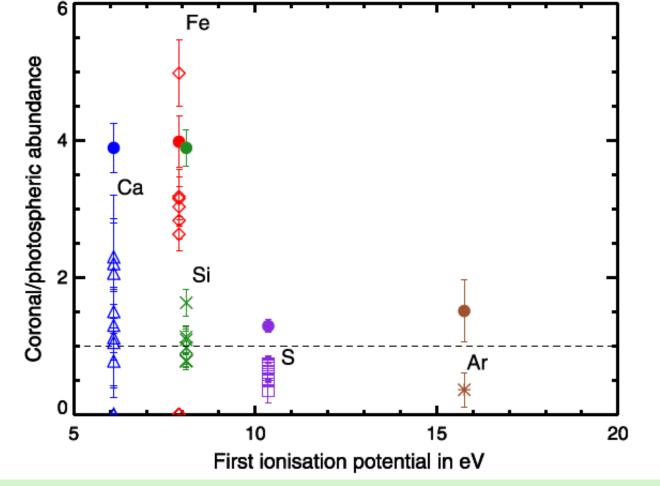
Major Science Goals

• Flare Studies (A - Class to X - Class Flares): • DC Heating Mechanism

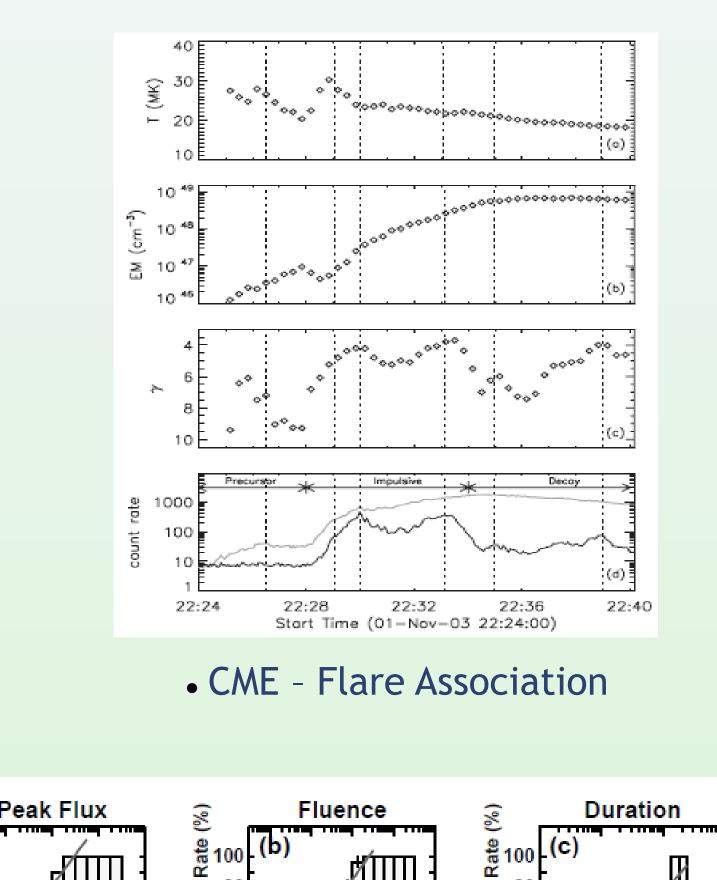


Coronal Studies:

Coronal Abundances

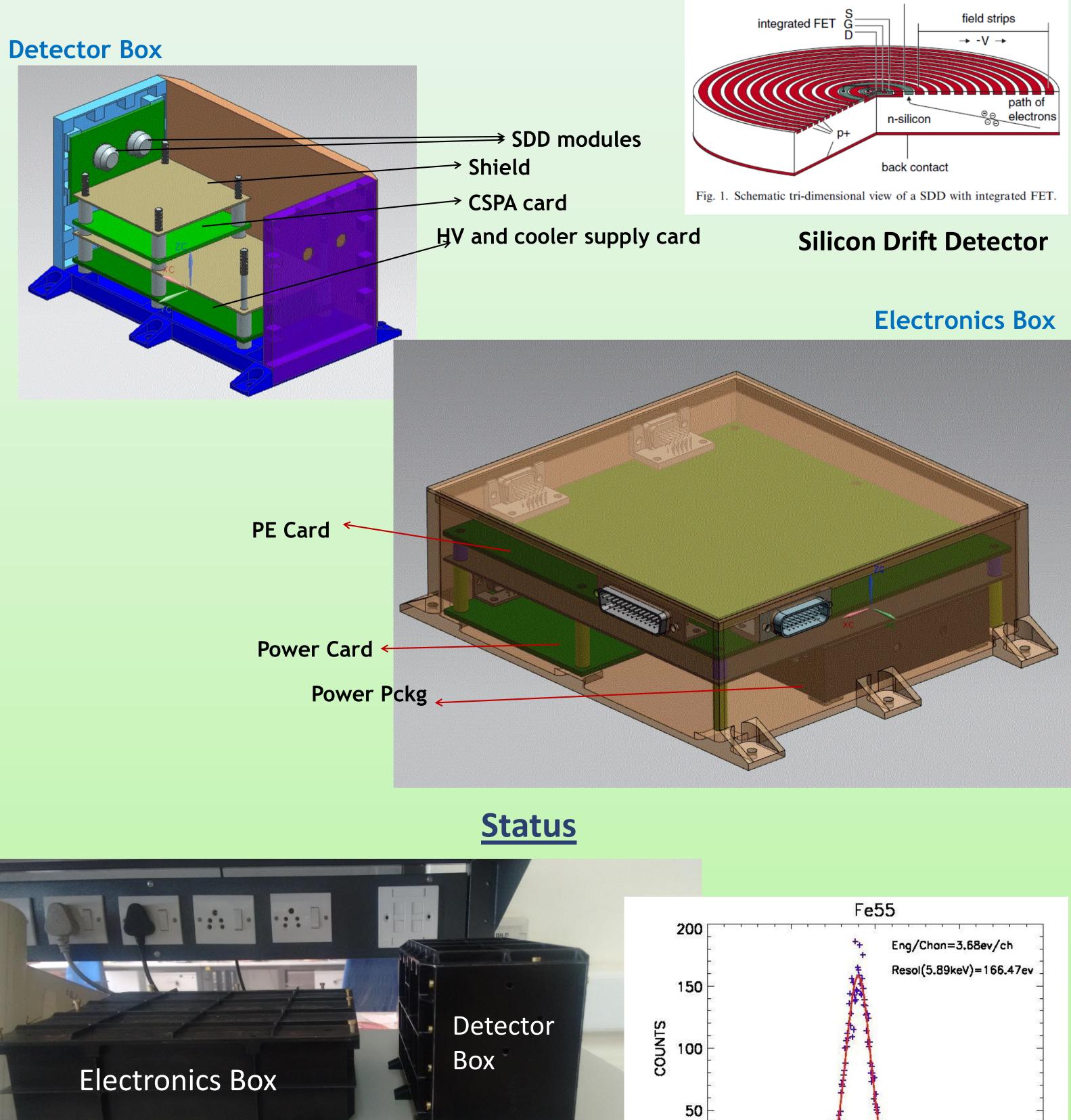


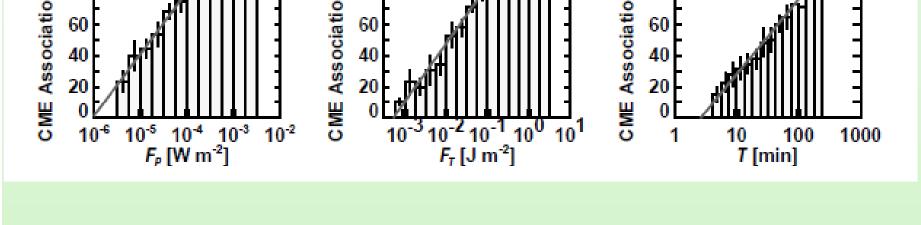
• Pre-cursor Activities



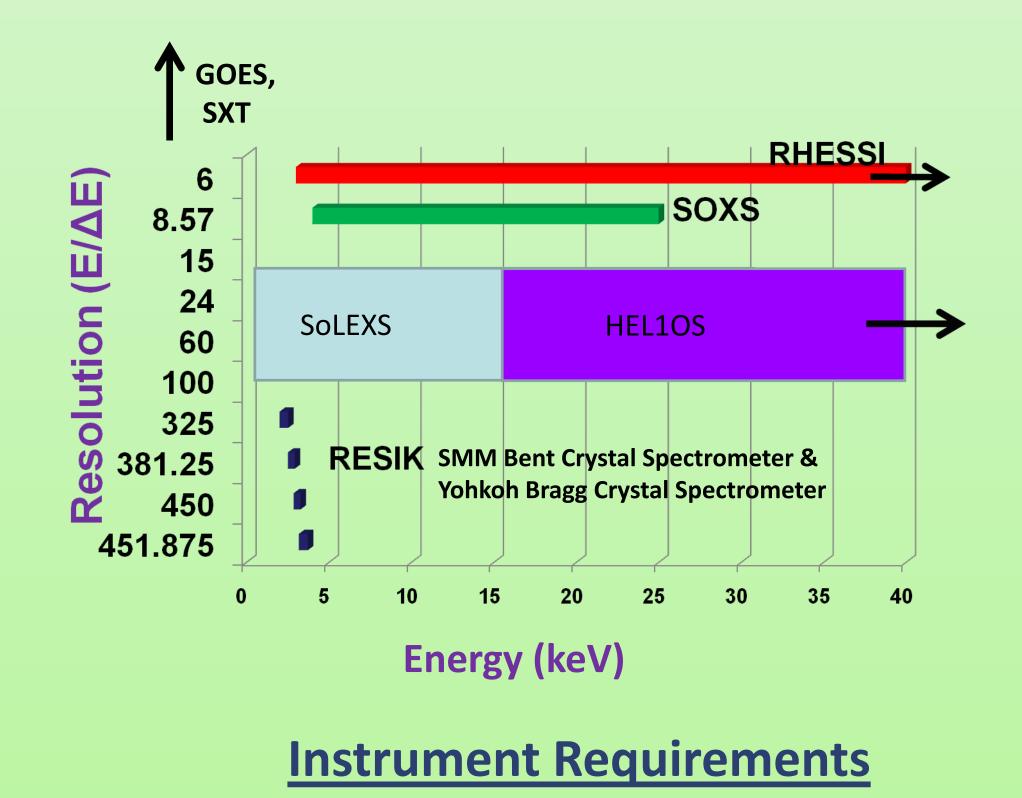
Instrument Configuration

•Instrument Configured as two packages: (i) Detector Package and (ii) Electronics Package •Silicon Drift Detector is used as the detector to utilize the high count rate capability •Two identical detectors are used along with two different apertures to cover the dynamic range





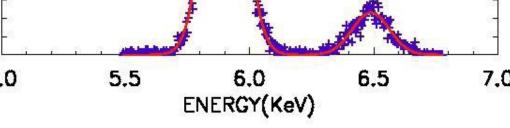
Solexs' Spectroscopic Capabilities & Other Missions'



Critical Inst. Requirements Remarks Science Goals

Flare Studies - Heating	 Energy Range: 1-30keV Flare Coverage: <a-class li="" to="" x-class<=""> </a-class>	•GOES Imager •SUIT Complement •RHESSI - cut-off at 6keV
Flare Studies - Pre- cursor activities	•Spectral resolution < 500eV at 6keV	•RHESSI - Only Few Flares •SUIT Complement
Coronal Studies - Abundances	 Spectral Resolution: < 250keV at 6keV Energy Range: 1 - 10keV Timing: Few Seconds 	•XSM - Chandryaan - I •RESIK - poor continuum
Coronal Studies - Flare-CME Association	•Timing: Few Seconds •Flare Coverage: < A-class to X-class	 Coronagraph Continuum Channel First time both Flare and CME instrument together on a single mission





•Laboratory testing of the CSPA and DPP is tested and achieved the performance •Engineering Model is under way: Electronics box completed both mechanical as well as PCB cards

•Engineering model is being tested currently •Detector box mechanical completed; PCB cards under fabrication •EM end-to-end testing expected during March 2016

Acknowledgements

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