XRS requirements

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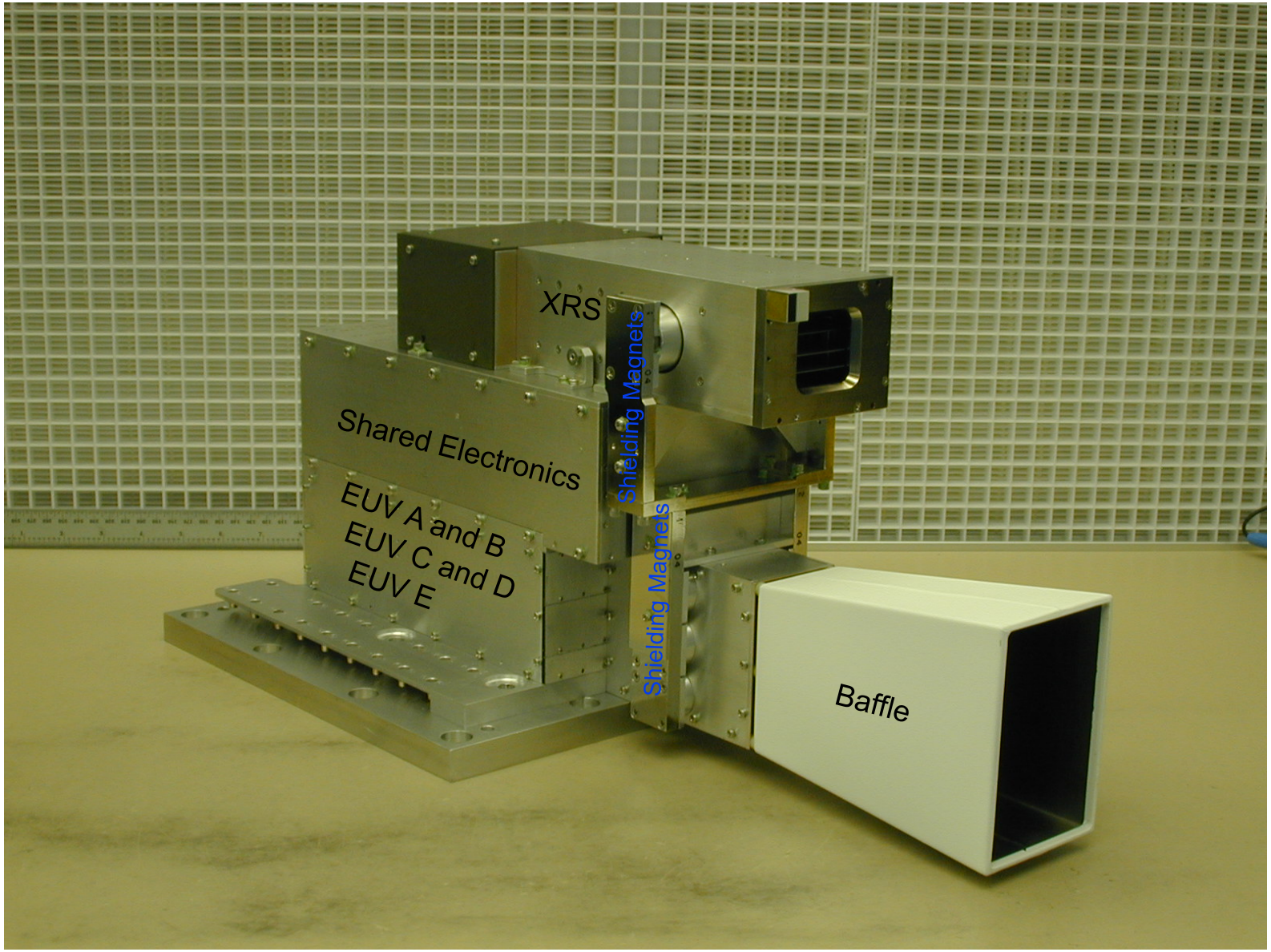
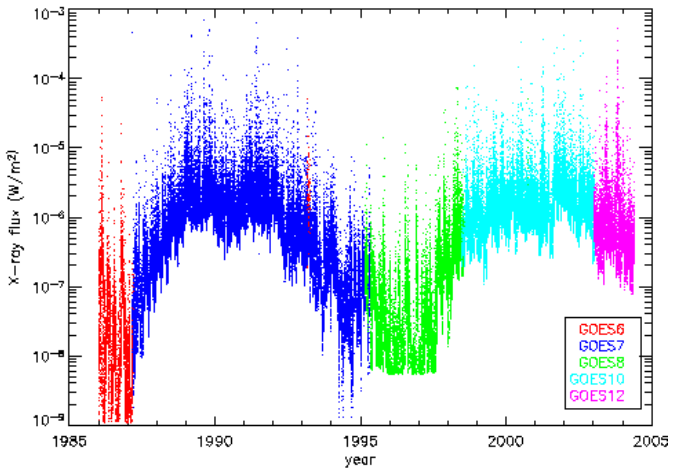
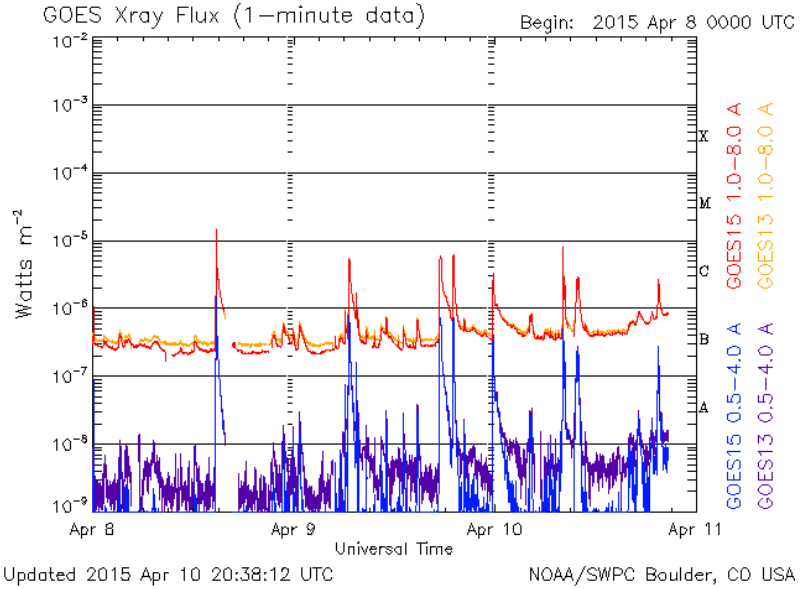
GOES NOP Extreme Ultra-Violet Sensor (EUVS) and X-Ray Sensor (XRS)



XRS Background

- Solar flare X-rays arrive at Earth in 8 minutes, modify the ionosphere, disrupt communication
- Associated SEPs arrive at Earth in 15 min– 24 hrs, modify ionosphere, ionizing radiation, impacts astronauts and can cause satellite failures
- XRS measures irradiance in two X-ray channels: A (.05 – 0.4 nm) and B (0.1-0.8nm)
  - » Measurements since 1974

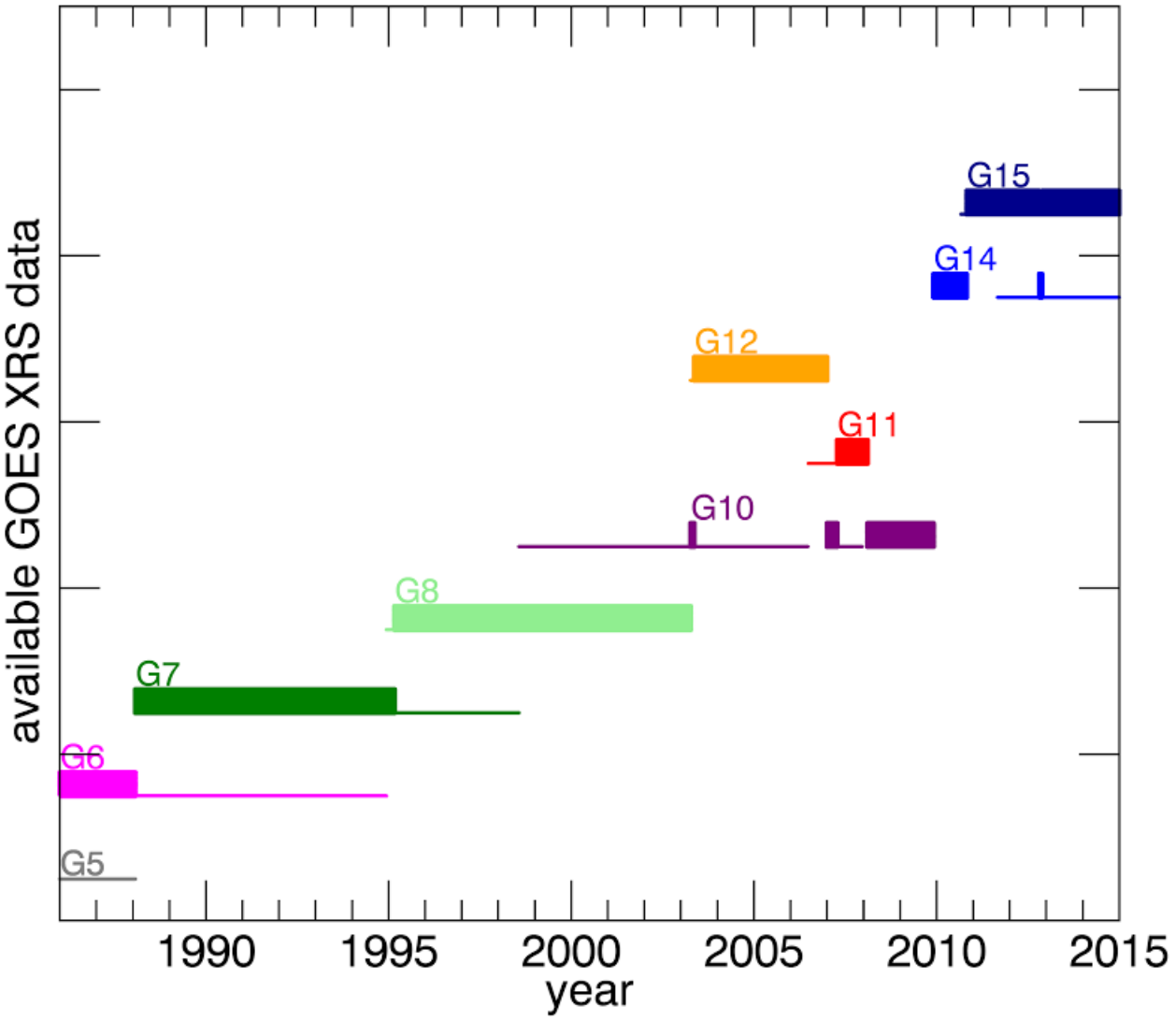




XRS Status

- GOES 13:
  - Launched in Mid 2006
  - Currently operating as Secondary XRS and EUVS
  - XRS failed during Post Launch Test (PLT)… but has now recovered.
- GOES 14:
  - Launched in Early 2009
  - Currently in Storage
  - XRS working well
- GOES 15:
  - Launched in Late 2009
  - Currently operating as Primary XRS and EUVS
  - XRS working well
- GOES R:
  - Launch ready in 2016

GOES XRS Coverage



Solar X-ray Flux requirements

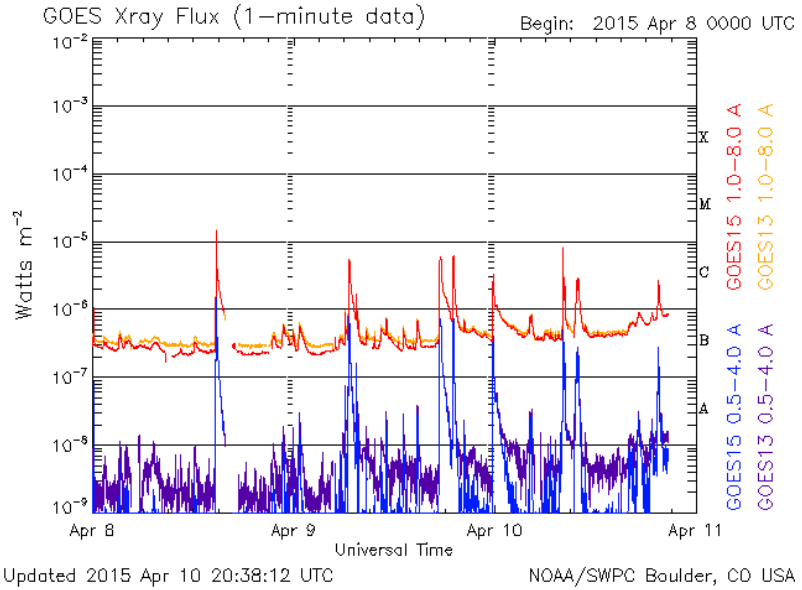
Spatial Coverage: 0 to 1.3 R_{sun}

Irradiance Coverage: $5e^{-9}$ to $2e^{-3}$ W/m^2

Spectral Bands: 0.05 to 0.4 nm and 0.1 to 0.8 nm

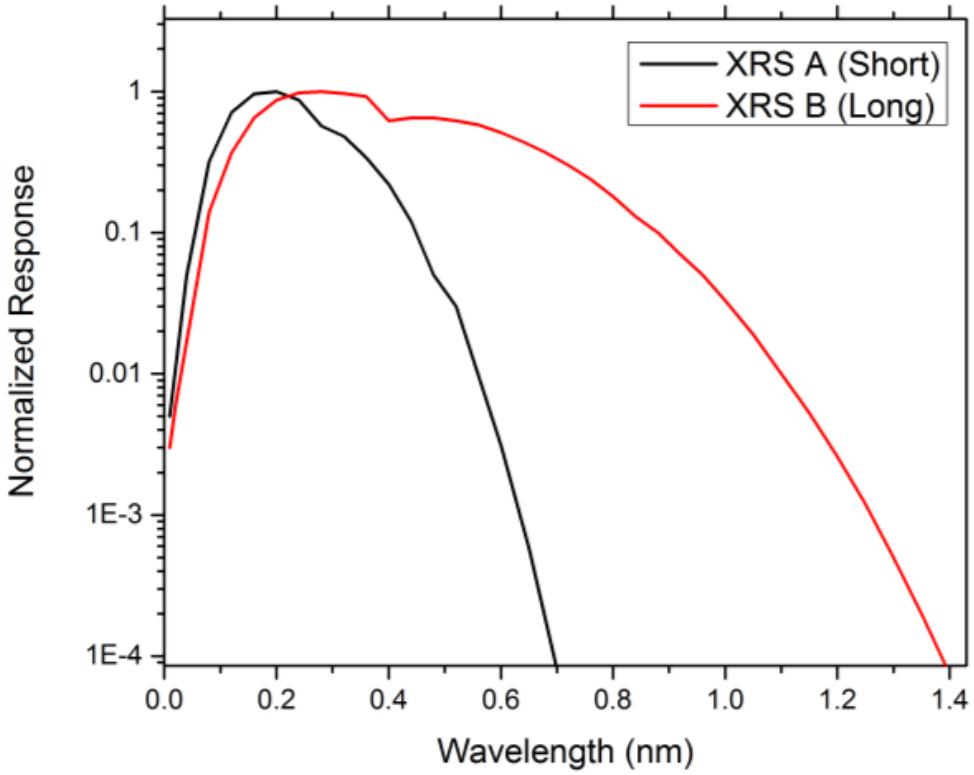
Cadence: 3 Seconds
Latency: 10 seconds

Accuracy: 10%
Stability: 5% over mission



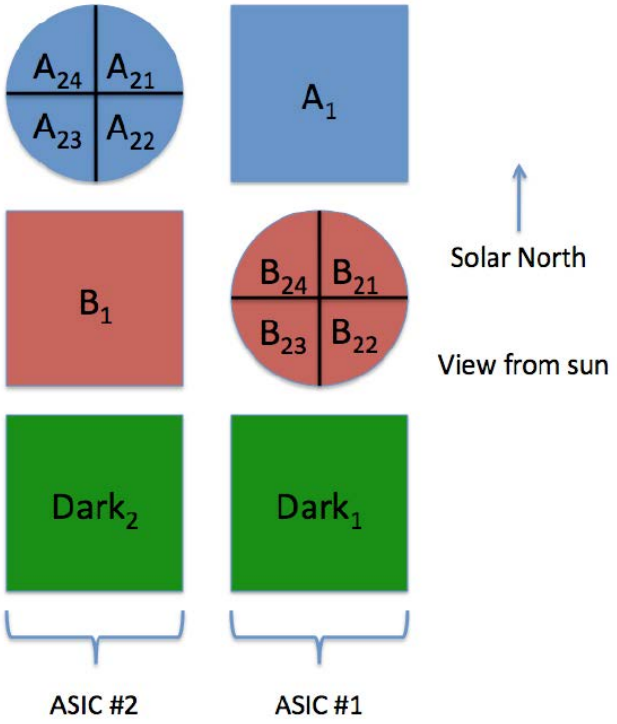
GOES-15 and earlier

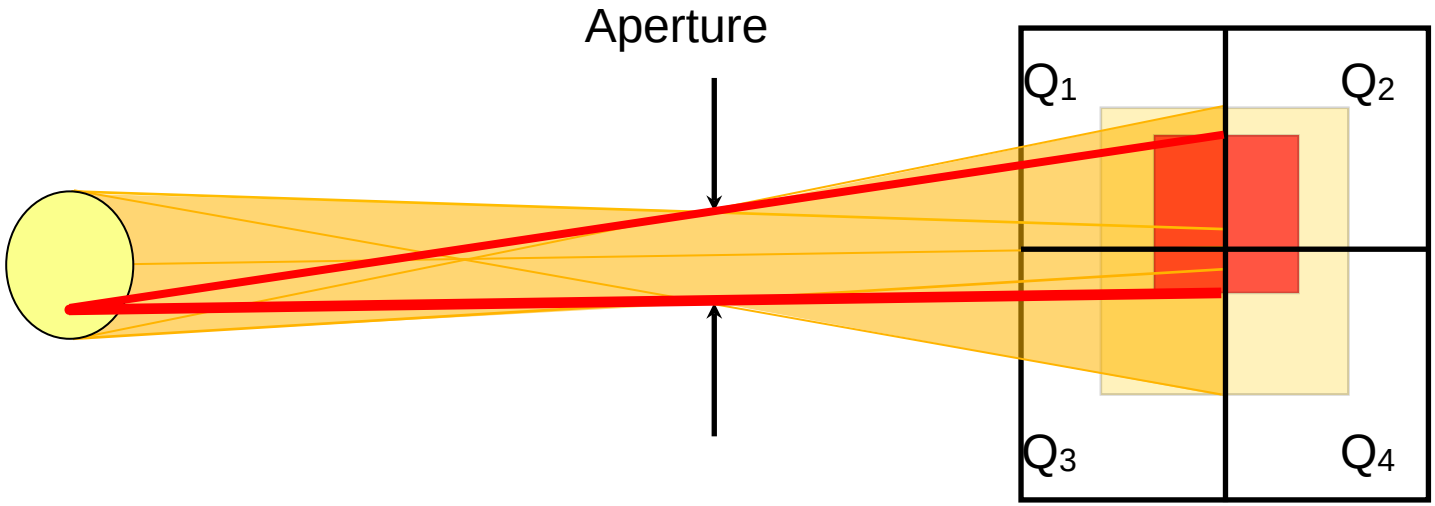
- GOES 8-15 have ion cell detectors with Be filters, so spectral bandpasses are nearly identical
- Short wavelength cutoff defined by ion cell, long wavelength cutoff defined by thickness of Be filter



GOES-R XRS design

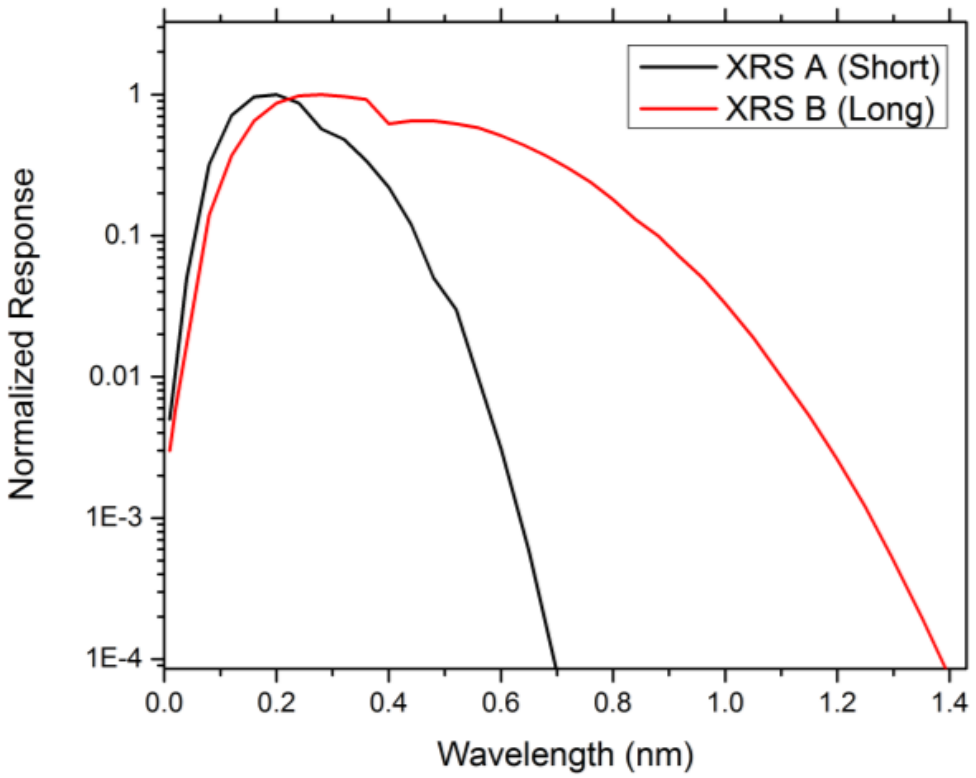
- Part of EUV and X-Ray Irradiance Sensors (EXIS)
- Designed and developed by LASP
- Ionization chambers replaced by silicon photodiodes
- One “solar min” detector and one “solar max/flare” quad-diode detector
  - » Allows greater dynamic range
  - » Quad-diode provides flare location information




Aperture
Q1
Q2
Q3
Q4

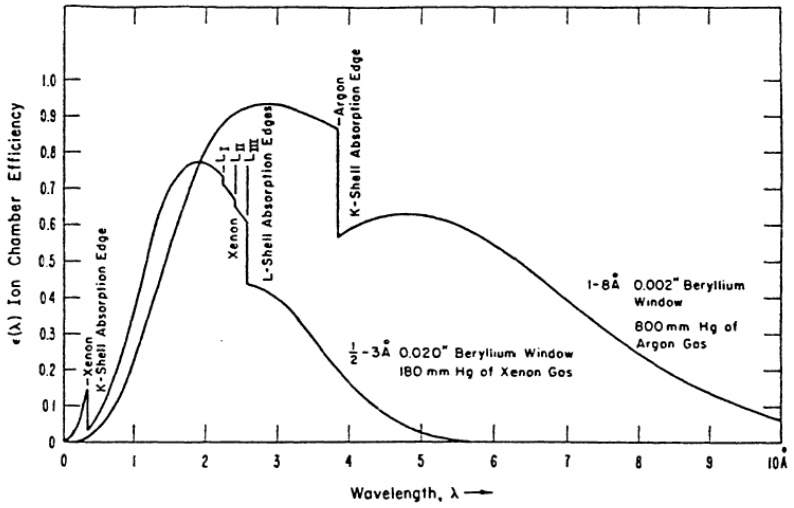
- **EXISPORD78:** The normalized wavelength response for each of the two XRS channels **shall** be within the upper and lower limits for the wavelengths specified in the XRS Wavelen

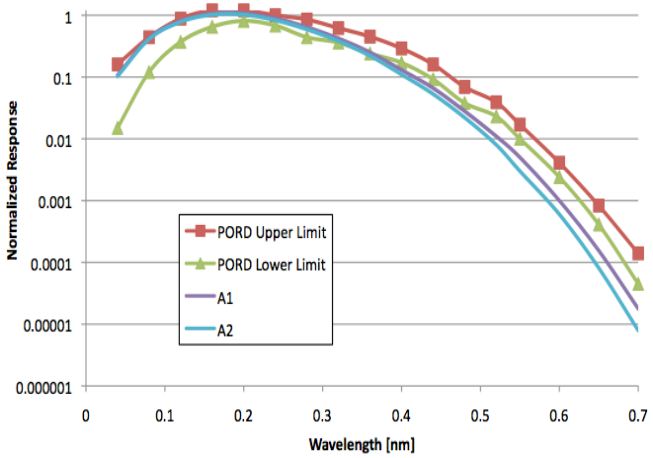
Wavelength [nm]	Preferred	Lower Limit
0.04	0.05	0.07
0.08	0.32	0.26
0.12	0.71	0.48
0.16	0.96	0.67
0.20	1.00	0.77
0.24	0.87	0.79
0.28	0.57	0.77
0.32	0.48	0.70
0.36	0.34	0.56
0.40	0.22	0.49
0.44	0.12	0.49
0.48	0.05	0.48
0.52	0.03	0.45
0.55	0.013	0.39
0.60	0.0031	0.34
		0.28

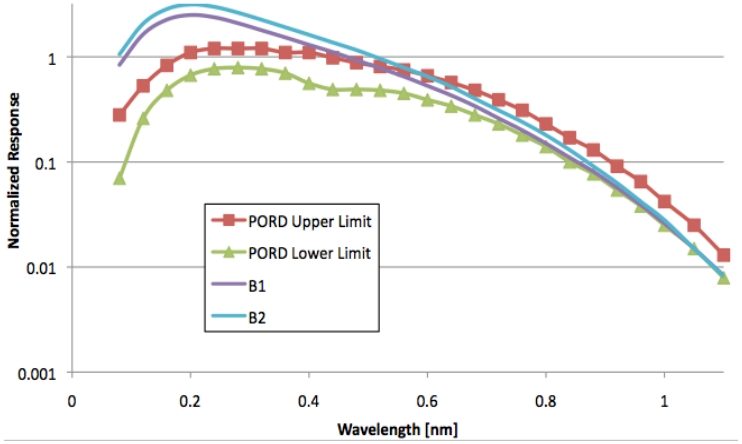


XRS response

- PORD requirement stated response to match previous XRS instruments
- Most solar signal comes from longer wavelengths
- Bottom line: continuity of measurement is most important







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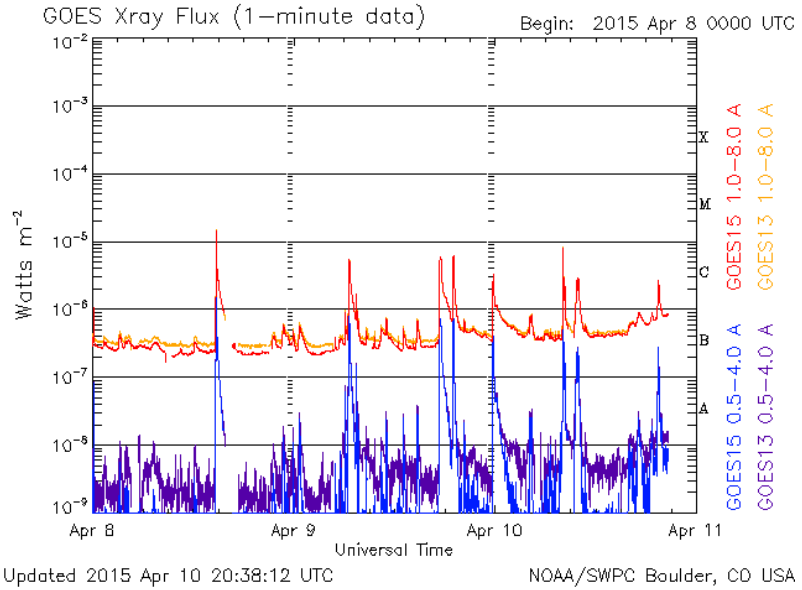

- Combining with the solar spectra for the short (left) and long (right) channels
- Much of the signal comes from long wavelengths