Instrument Overview: TIMED-SEE EGS

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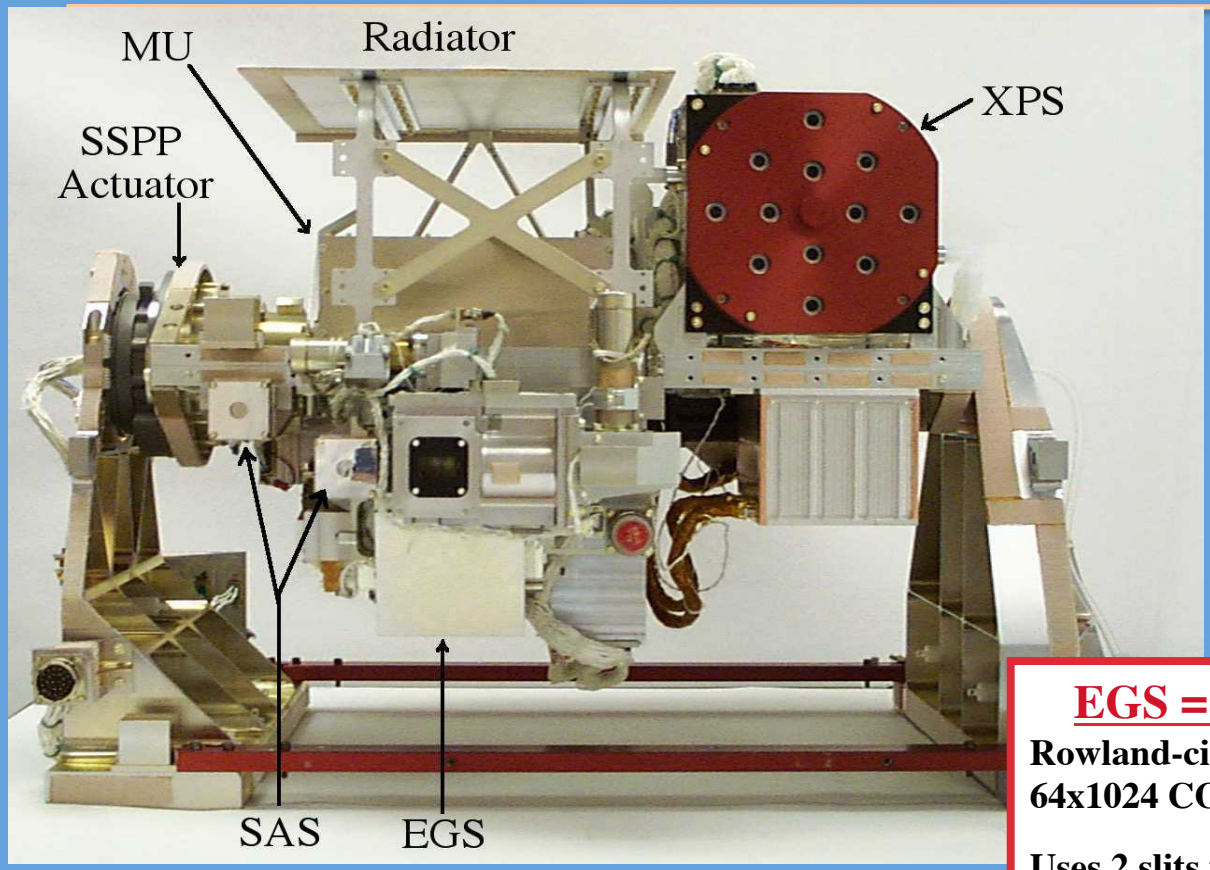
TIMED-SEE Overview



Measures the solar vacuum ultraviolet (VUV) irradiance

Range:

0.1-194 nm

Resolution:

0.4 nm EGS (27-194 nm)

5-10 nm XPS (0.1-34 nm)

Measurement Cadence:

10-sec integrations, but only for 3 min per orbit (96 min)

MU = Microprocessor Unit
SSPP = SEE Solar Pointing Platform
SAS = Solar Aspect Sensor (2)

EGS = EUV Grating Spectrograph

Rowland-circle grating spectrograph with 64x1024 CODACON (MCP-based) detector

Uses 2 slits to provide redundant measurements

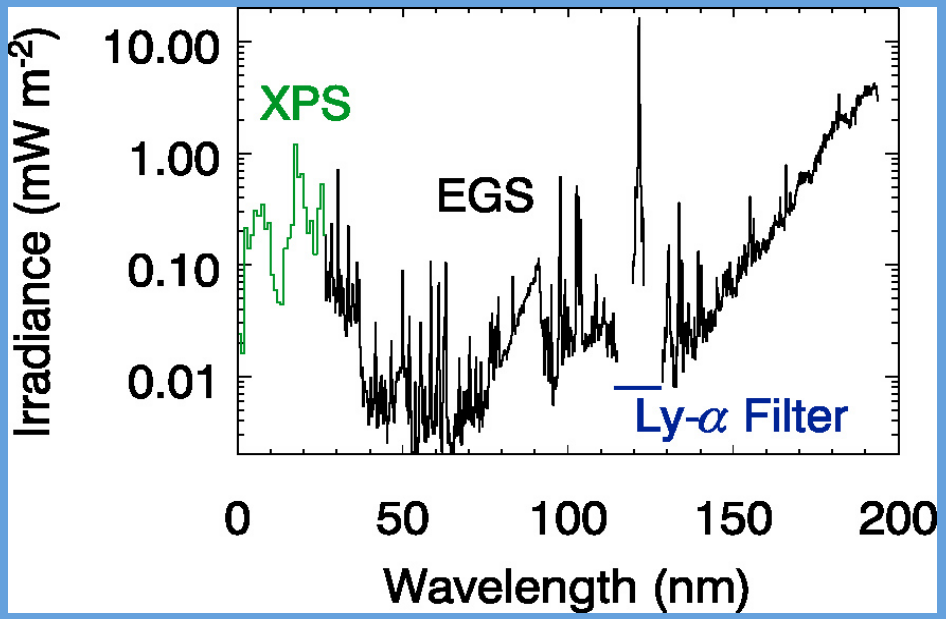
XPS = XUV Photometer System

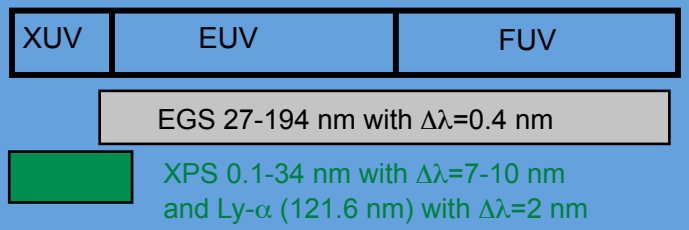
Set of 12 Si photodiodes - 8 for XUV, 1 for Ly-α, and 3 for window calibrations

Includes 3 redundant photodiodes

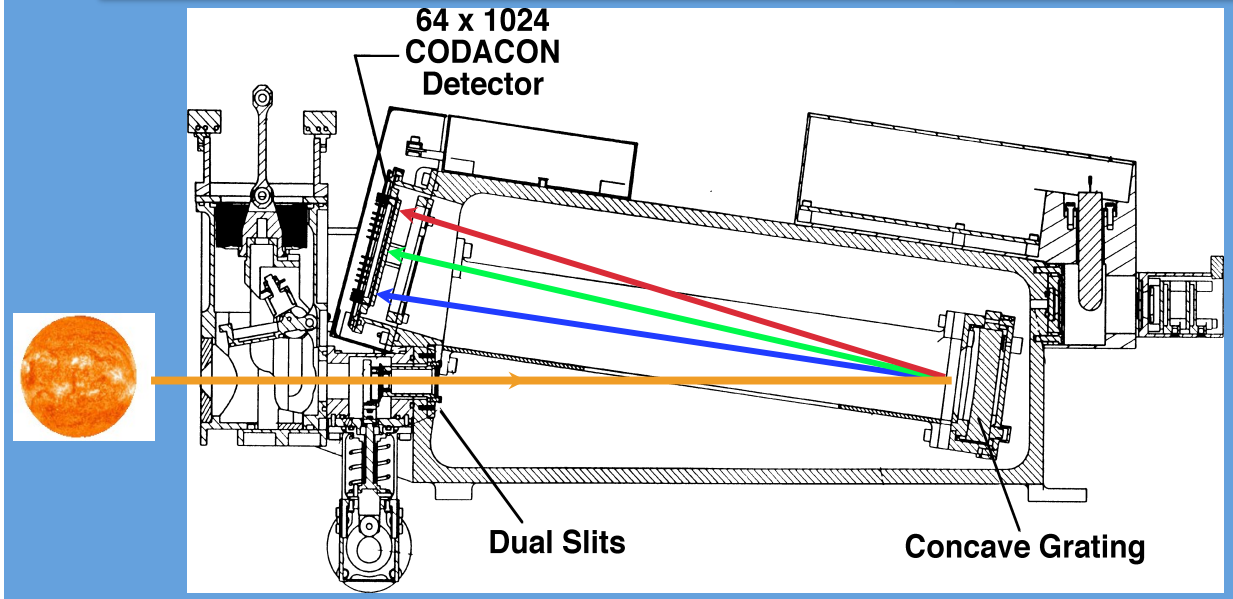
EGS Measures the Solar EUV-FUV

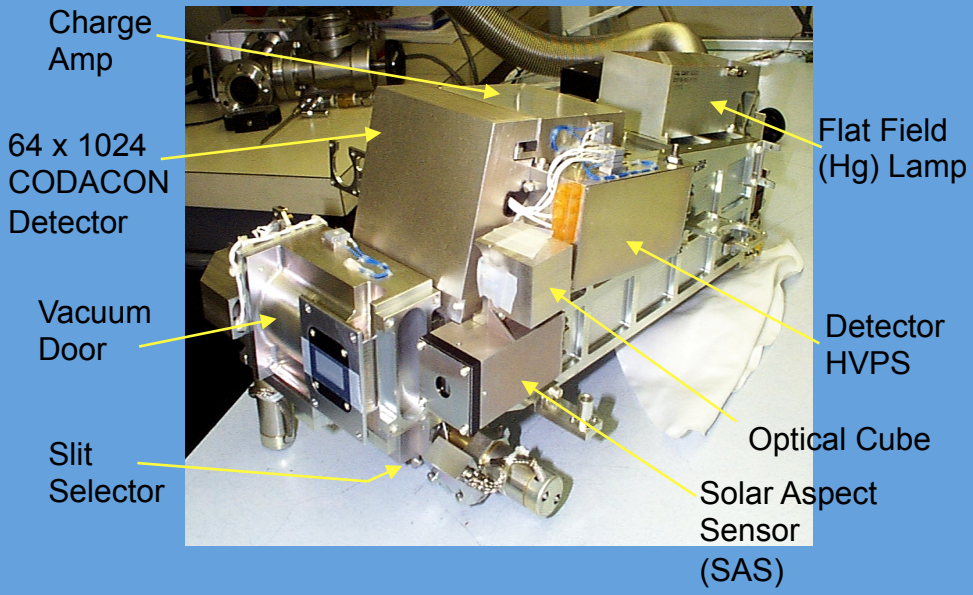
- EUV Grating Spectrograph (EGS)
  - Normal Incidence, 1/4 m Rowland Circle Spectrograph
    - 27-194 nm range
    - $\Delta\lambda$ = 0.4 nm
    - 1024x64 pixels (0.167 nm/pixel)
  - Redundant channel used weekly for tracking degradation
  - Hg Lamp for detector flat fielding



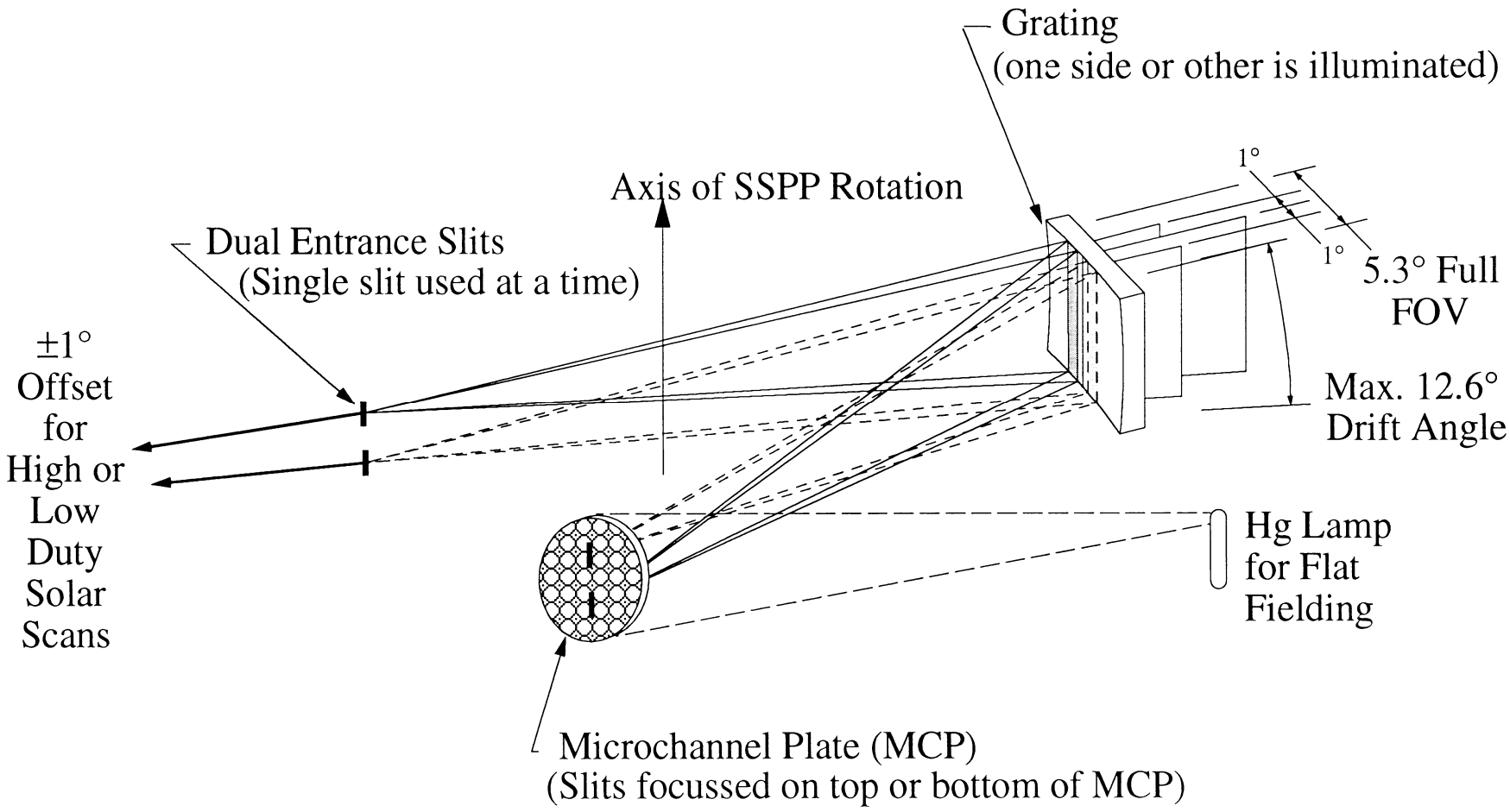


EGS Instrumentation





EGS Optical Layout



EGS Optics and Detector (1)

- **Slits**:
  - 25 micron wide x 1 mm tall
  - Vertically displaced by 3 mm
  - Mechanism selects which slit sees the Sun
- **Grating**:
  - Normal incidence
  - Spherical figure
  - Mechanically ruled
  - Blazed in 5 partitions
  - Gold coated
  - Focuses slits on top and bottom portions of detectors

EGS Optics and Detector (2)

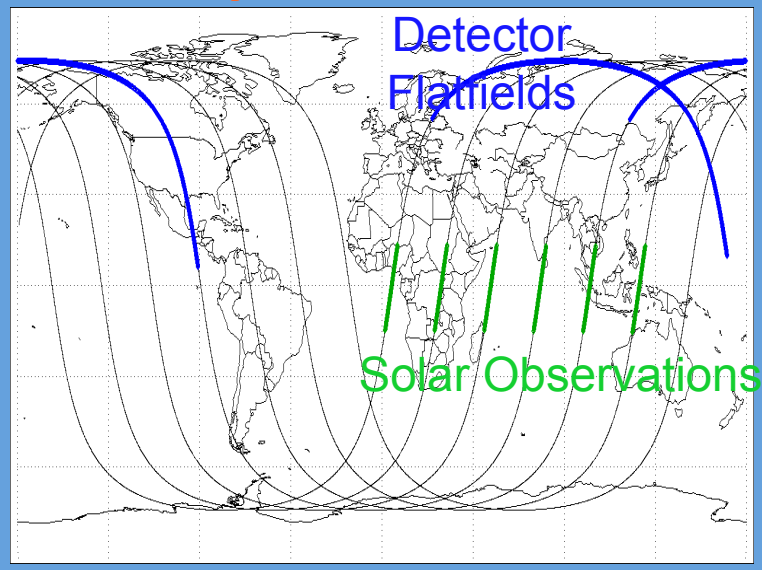
- **Detector**:
  - Microchannel plate chevron stack
  - Gold photocathode
  - CODACON coded anode array readout 1024x64 pixels
  - Summing in cross dispersion (64 pixel) direction is done on-board. 1024 element array is telemetered down.
- **Filters**:
  - MgF_2 window placed over detector where 115-194 nm first order spectrum falls to reduce higher orders and scattered short wavelength light
  - Aluminum coating on top of MgF_2 window covering 115-128 nm range to reduce bright H Lyman-alpha line (eliminates neighboring lines)

SEE Observations

- Obtains ~15 solar measurements per day (one per orbit)
  - Each solar measurement is ~20 contiguous 10-second integrations
  - A solar observation is performed each 96 minute orbit (~3% duty cycle)
  - The sun drifts through the instrument FOV during the observations
- Performs ~3 EGS detector flatfield calibrations per week
  - On-board Hg lamp is flatfield source
- Make redundant channel (calibration) solar observation once a week for tracking degradation
- Spacecraft performs yaw-around ~ every 64 days

SEE has been in normal operations (daily measurements) since Jan. 22, 2002

12 hr Example for SEE Observations



SEE Data Products

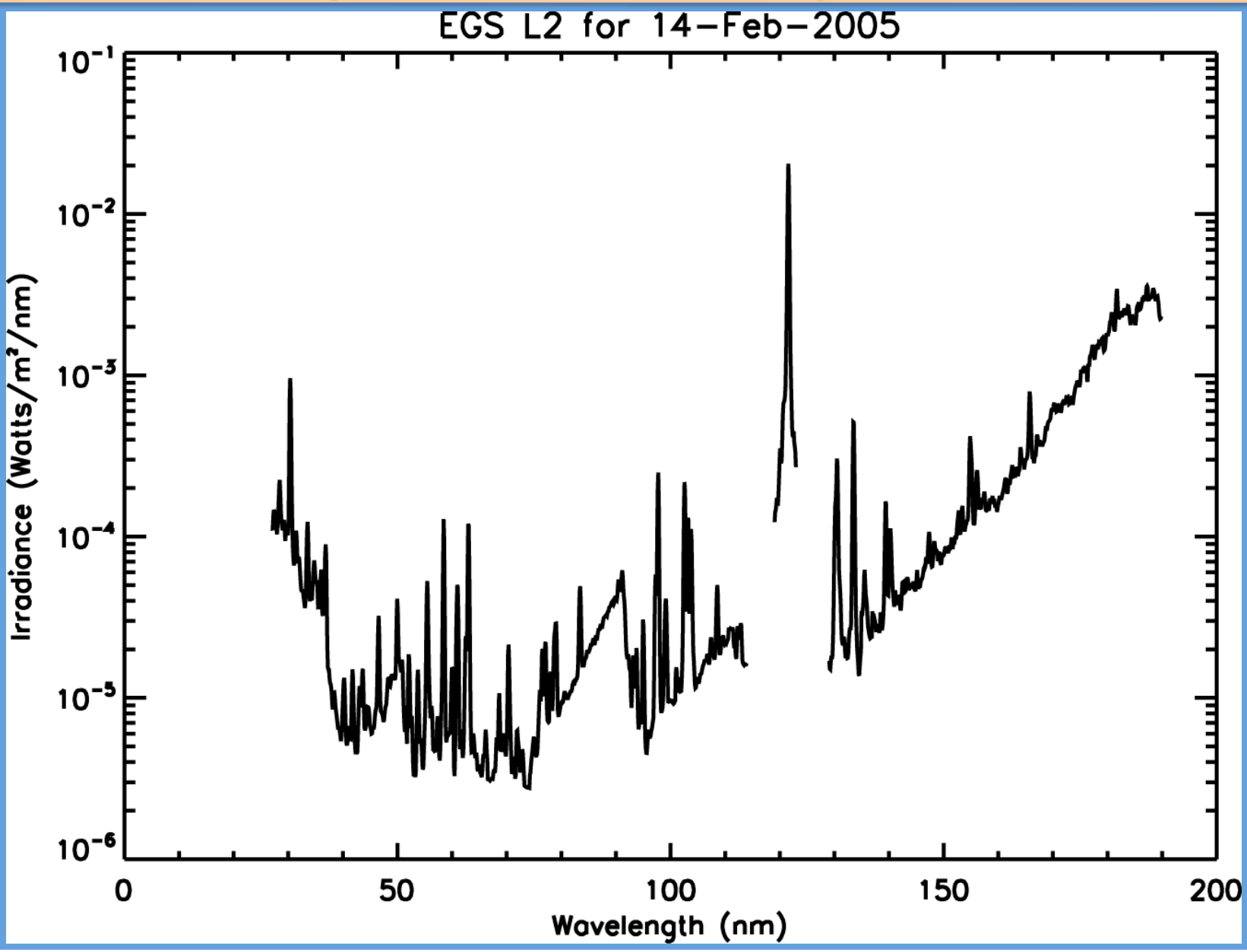
- **SEE products at http://lasp.colorado.edu/see**
  - Version 10 is current public version (V11 pre-released for workshop)
  - Processed daily for previous day (re-processed weekly and monthly for missing data and degradation corrections)

Data Product	Wavelength Range	Time Cadence	Description
EGS L2	27-194 nm	One per day	Daily Median spectra (no flares) at instrument resolution
EGS L2A	27-194 nm	One per orbit	Orbit Average spectra (with flares) at instrument resolution
SEE L3	0-194 nm	One per day	Merged EGS and XPS (model) daily median spectra (no flares) in 1-nm bins and extracted lines
SEE L3A	0-194 nm	One per day	Merged EGS and XPS (model) orbit average spectra (with flares) in 1-nm bins and extracted lines

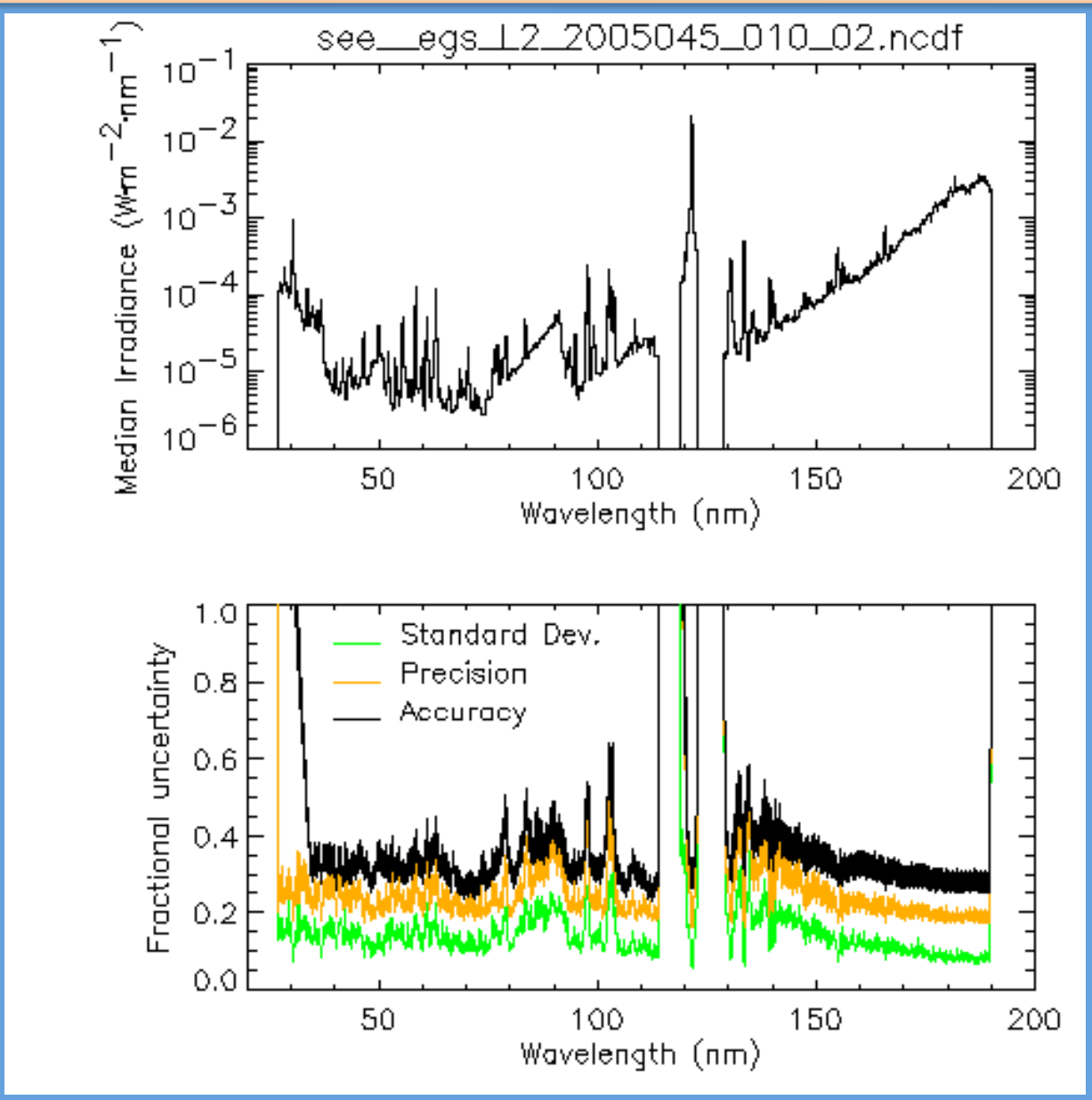
Data Product Notes

- All spectra are in units of Watts-m^{-2}-nm^{-1}.
- Products are accompanied by uncertainties: accuracy, precision, and standard deviation.
- L3 spectra are “filled” with model results from XPS and under Ly-alpha filter.
- Extracted lines have background removed.

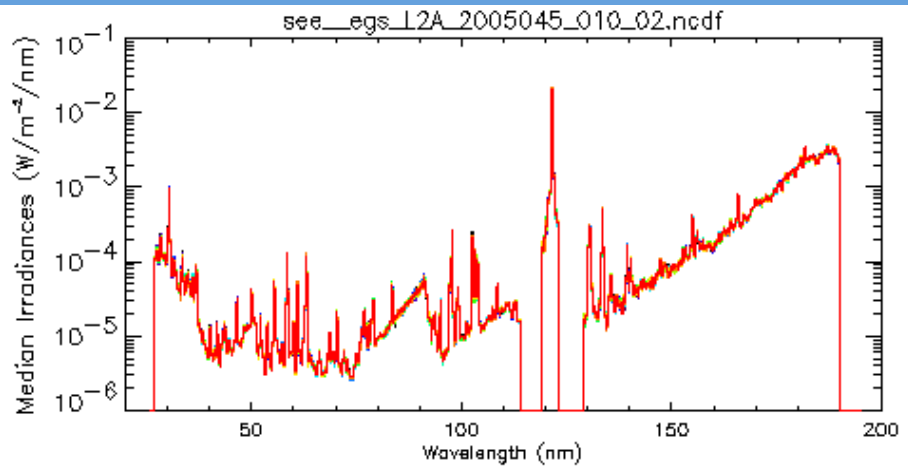
Sample EGS L2 Spectrum

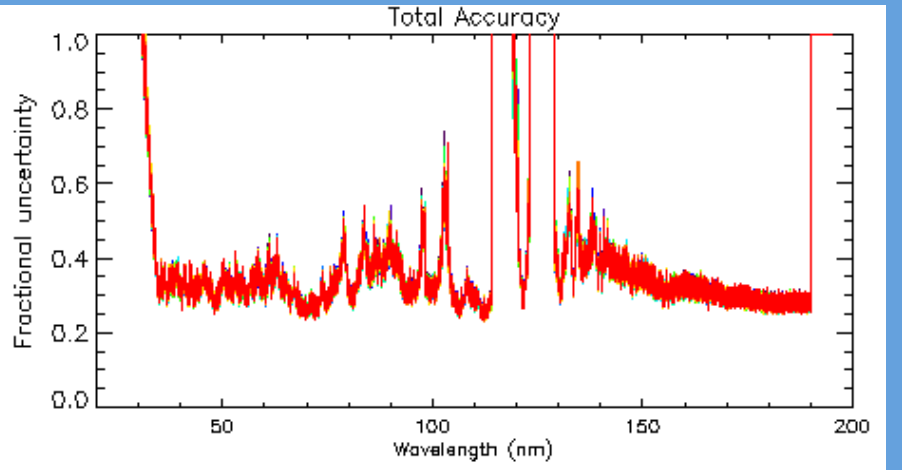


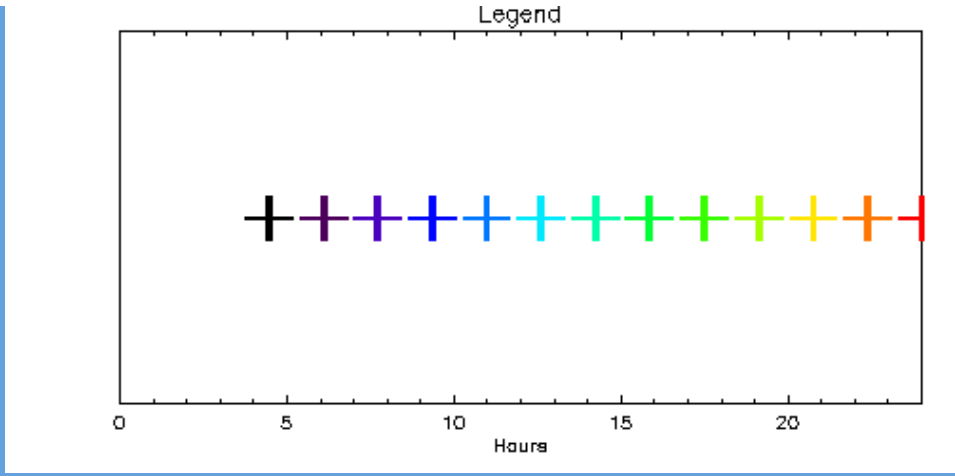
Uncertainties also included



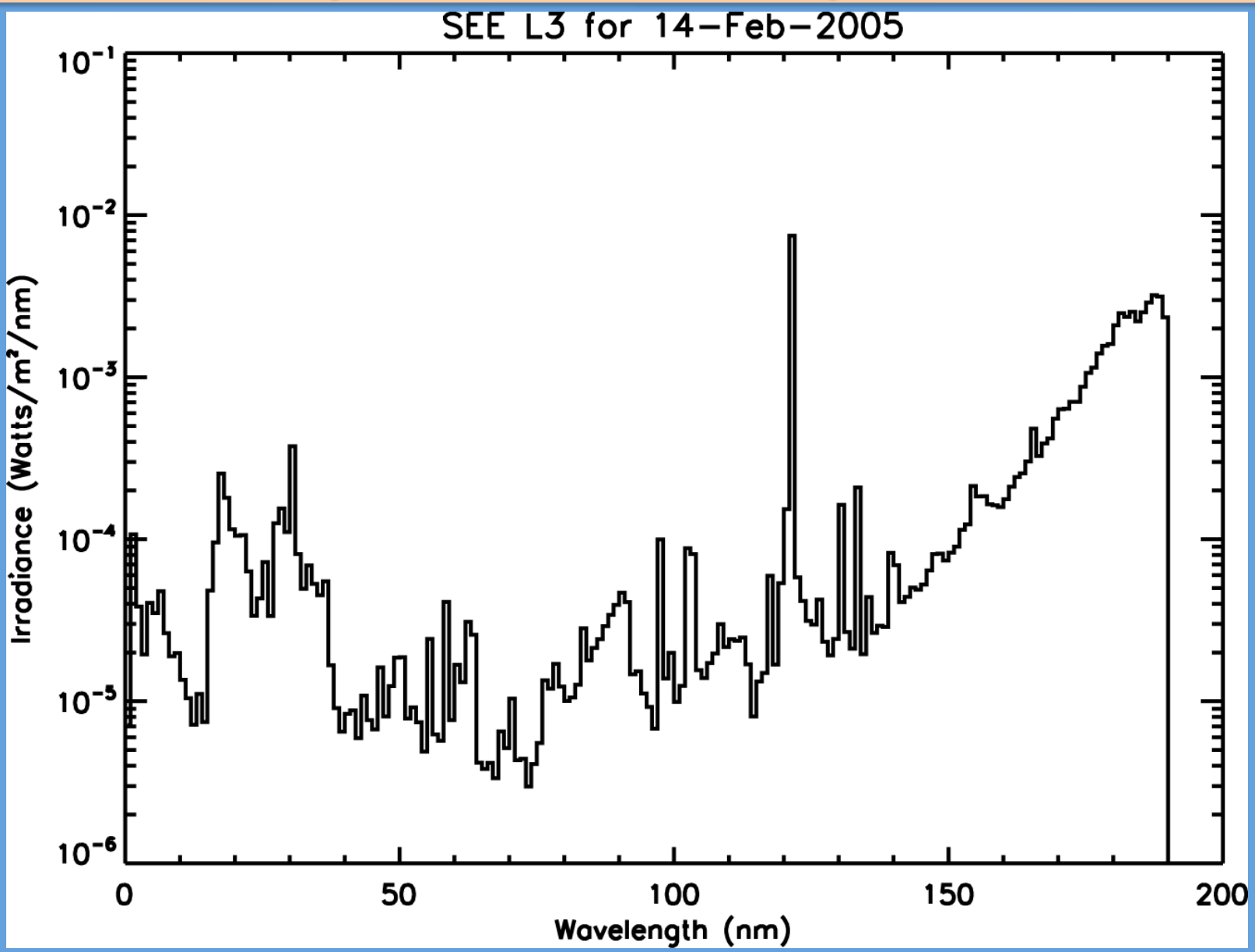
Sample EGS L2A Spectrum







Sample EGS L3 Spectrum



Sample EGS L3 Time Series