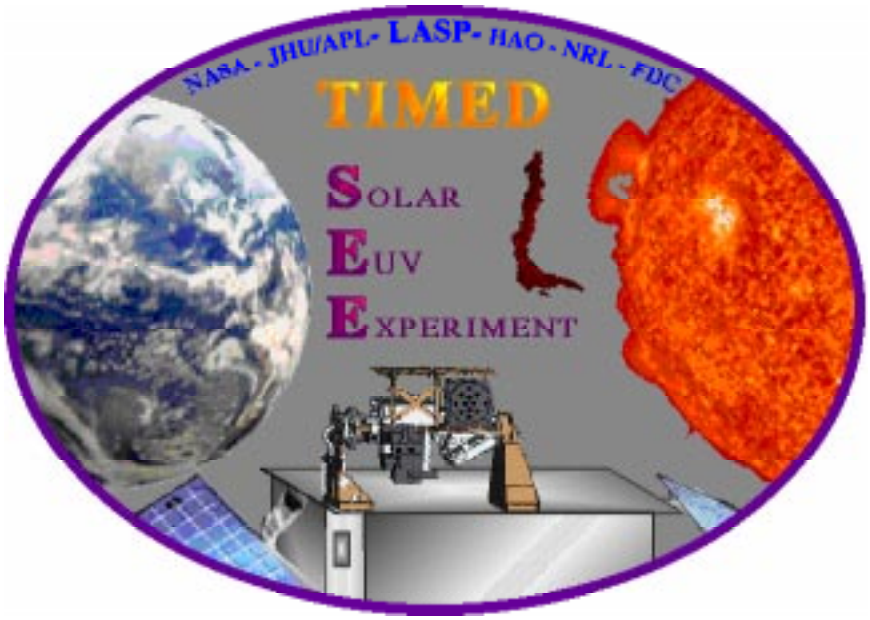



The Solar EUV Experiment (SEE) is one of the four scientific instruments on the NASA Thermosphere-Ionosphere-Mesosphere-Energetics-Dynamics (TIMED) spacecraft. The SEE instrument will determine the irradiance of the highly variable, solar extreme ultraviolet (EUV) radiation, one of the major energy sources for the upper atmosphere. The SEE measurements are fundamental for the TIMED mission's investigation of the energetics in the tenuous, but highly variable, layers of the atmosphere above 60 km.

The SEE instrument is being developed by the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado (CU). The solar sensors are the EUV Grating Spectrograph (EGS) and the XUV Photometer System (XPS).

The TIMED spacecraft is being developed for a shared launch on a Delta vehicle by the Applied Physics Laboratory (APL) at the Johns Hopkins University (JHU). The TIMED mission is being planned as a two year mission with a circular orbit altitude of 600 km and an orbit inclination of 74°.

# Specifications

## SEE System

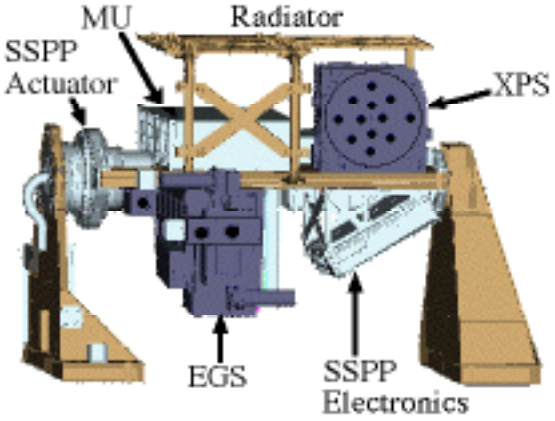
| | |
|---|---|
| Mass: | 27 kg |
| Power: | 27 W (includes 12 W heaters) |
| Data Rate: | 210 bits per second |
| Observations: | solar, 3 min each orbit |
| Solar Pointing: | 2 arc-min control, 1-axis only<br>SSPP = SEE Solar Pointing Platform |
| Processor: | 1750 MU = Microprocessor Unit |
| Accuracy: | 10% (1-σ) |
| Preflight Calibration: | NIST Synchrotron Ultraviolet Radiation Facility (SURF-III) |
| In-flight Calibration: | Redundant channels, and Underflight measurements |

## XUV Photometer System (XPS)

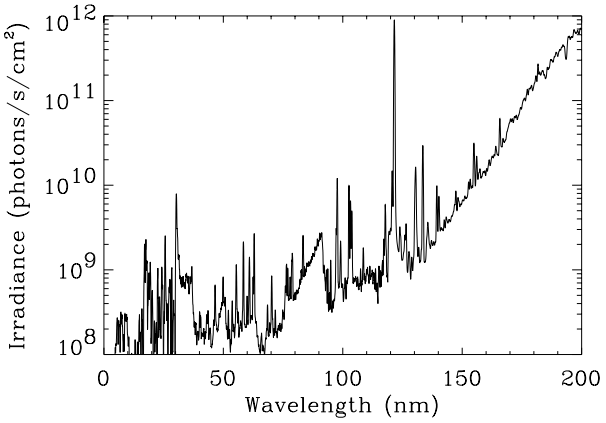
| | |
|---|---|
| Detectors: | 12 XUV silicon photodiodes<br>(Thin film coatings on diodes) |
| Wavelengths: | 0.1 to 40 nm |
| Resolution: | 2-5 nm each |
| Field of View | 20° Diameter |

## EUV Grating Spectrograph (EGS)

| | |
|---|---|
| Spectrograph: | Rowland-circle grating design |
| Detector: | 64 x 1024 CODACON<br>(microchannel plates with coded anode position array) |
| Wavelengths: | 25 to 200 nm |
| Resolution: | 0.4 nm (0.17 nm per anode) |
| Field of View | 6° x 12° |



*The solar VUV irradiance measurement was made by the SEE prototype instrument from a sounding rocket. Emission lines are from the solar chromosphere and corona.*




## SEE Objectives and Data Products

One of the fundamental TIMED mission objectives is to understand the energetics in the mesosphere, lower thermosphere and ionosphere (MLTI). Solar radiation below 200 nm is completely absorbed in the Earth's mesosphere and thermosphere. Changes in the amount of solar radiation, which range from 20% at the longer wavelengths to factors as much as 1000 at the shorter wavelengths, result in corresponding changes in the photochemistry, dynamics, and energy balance of the upper atmosphere. A detailed quantitative understanding of atmospheric radiative processes, including changes in the solar ultraviolet irradiance arising from flares, solar rotation (27 day), or the 11 year solar cycle, is fundamental to the TIMED investigations. The daily measurement of the full-disk solar vacuum ultraviolet (VUV) irradiance by the SEE directly supports the TIMED mission requirement to measure the sources of energy into the MLTI.

The primary science objectives for SEE are to accurately and precisely determine the solar VUV absolute irradiance and variability during the TIMED mission, to study the solar-terrestrial relationships utilizing atmospheric models, and to improve proxy models of the solar VUV irradiance. The VUV range of 0 to 200 nm includes the soft x-ray (XUV) from 0 to 30 nm, the extreme ultraviolet (EUV) from 0 to 120 nm, and the far ultraviolet (FUV) from 120 to 200 nm.

Solar irradiance data will be provided to the TIMED science team and the solar-terrestrial community in general, and will be integrated into the NCAR Thermosphere-Ionosphere-Mesosphere-Electrodynamics General Circulation Model (TIME-GCM) for solar-terrestrial studies. The principle SEE data product is a daily averaged solar irradiance spectrum in 1 nm intervals on 0.5 nm centers. In addition, the irradiances of about 50 bright emission features are listed as part of this SEE data product.

## SEE Description

SEE is an experiment designed to measure the full-disk solar irradiance from 0.1 to 200 nm using a grating spectrograph and silicon photodiodes coated with thin film transmission filters. The spectral resolution of the measurements is 0.4 nm above 25 nm and about 3 nm below 25 nm. The solar sensors are designed to let the Sun drift through their field of view once per orbit, so only a one-axis pointing platform is employed for SEE.

SEE is being designed and built primarily at the LASP Space Technology Building. The only major subcontract for the SEE instrument is to Schaeffer Magnetics, Inc. for the SEE pointing platform hardware.

## SEE Team

**Science**: Tom Woods (CU/LASP), PI
Scott Bailey (CU/LASP)
Frank Eparvier (CU/LASP)
Judith Lean (Naval Research Lab.)
Ray Roble (HAO/NCAR)
Gary Rottman (CU/LASP)
Stan Solomon (CU/LASP)
Kent Tobiska (Fed. Data Corp., JPL)
Dick White (HAO/NCAR)

**System Engineer**: Greg Ucker (LASP)
**Program Manager:** Mike Anfinson (LASP)
**MO&DA Manager**: Gail Tate (LASP)

For more information contact:
Dr. Thomas N. Woods
Telephone: 303-492-4224
FAX: 303-492-6444
University of Colorado
Laboratory for Atmospheric and Space Physics
1234 Innovation Drive
Boulder, CO 80303

or

access the TIMED SEE home page at
http://lasp.colorado.edu/see/

or

access the TIMED Project home page at
http://sd-www.jhuapl.edu/TIMED/