



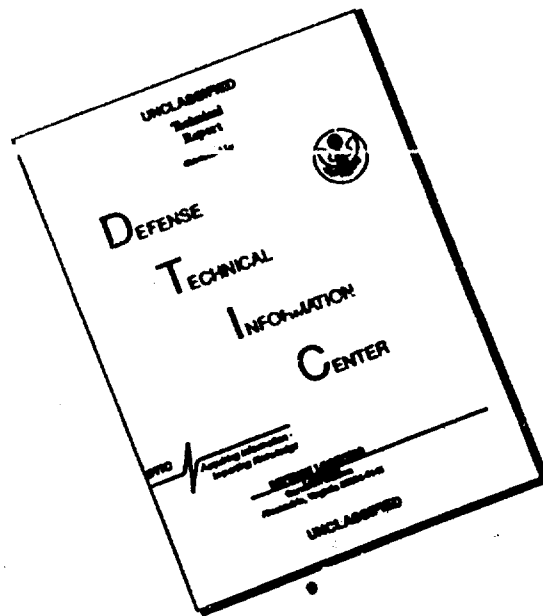
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Absolute, Extreme-Ultraviolet Solar Spectral Irradiance Monitor (AESSIM) prepared and submitted by W. H. Parkinson & Peter L. Smith, December 14, 1991.

The goal of this research program is development of a method for obtaining daily, radiometrically accurate, solar spectral irradiance data at extreme-ultraviolet (EUV) wavelengths. In-orbit radiometric instrumentation recalibration is a fundamental requirement for such measurements. AFOSR-90-0063 supports an extension of earlier conceptual studies of an "Absolute, Extreme-Ultraviolet Solar Spectral Irradiance Monitor" (AESSIM) that is compatible with space-flight opportunities and budgets of the 1990's.

We proposed to investigate, design, and test a smaller and less massive, low-power, in-space version of a 'standard' EUV radiance source, which has been developed for laboratory use and to assess the merits of innovative combinations of rare-gas ionization cells and thin film filters to make absolute measurements of EUV radiation over a number of wavelength bands.

ACTIVITIES

Reviews & Reports

We were invited to participate in the USA-Taiwan Bilateral Workshop on Solar Variability Effects on the Atmosphere and Space Processing in Taipei April 15-17, 1991. During this workshop, we presented a paper entitled, "Absolute, Extreme-Ultraviolet Solar Spectral Irradiance Monitor (AESSIM)". We were invited to a workshop on Solar Terrestrial Impacts on Global Change held in Boulder, CO, May 8-10 during which we presented papers on the AESSIM idea and on the need for continuous long-term measurements of solar EUV inputs to the Earth. We participated in the SOLERS 22 (Solar Electromagnetic Flux Study for Solar Cycle 22) workshop in Boulder, CO, June 3-7, 1991 where we presented the ideas for two methods of in-orbit recalibration; AESSIM plus a hollow cathode EUV Absolute Radiance Standard, and, AESSIM plus an auto-calibrating EUV spectrometer.

The Two AESSIM Concepts

The first and original AESSIM concept comprised one or more spectrometers that would be used to measure and compare the solar

EUV flux and the output from a calibrated 'standard' source of radiance.

The second AESSIM concept is an alternative calibration method that uses absolute detectors (specifically ionization chambers) and filters for regular radiometric calibration of AESSIM. We have explored the alternative method of calibration with G. Schmidtke of the Fraunhofer Institut für Physikalische Messtechnik in Freiburg, Germany.

We are beginning our study of this concept by evaluating the availability of thin film filters. We will discuss this and filter reliability with Dr. J. A. R. Samson of the University of Nebraska. Samson pioneered the use of ionization chambers as absolute EUV radiation detectors.

Thin film filters alone do not define narrow wavelength intervals, but combination of filters and ionization chambers, which have long-wavelength cutoffs at the ionization limits of their working gas, can be used to define a number of relatively narrow bands over which average radiometric efficiency can be determined. We have used filter absorption coefficient data obtained from F. Powell of Luxel Corporation to predict bands over which calibration could be performed.

FORECAST

Our primary activity over the next period will be the evaluation through study and tests of the two AESSIM concepts. We will continue to experiment with the hollow cathodes in order to build experience. We will investigate and evaluate designs of small, fixed-grating spectrographs, equipped with focal-plane array detectors.

PRESENTATIONS & PUBLICATIONS

"Absolute, Extreme-Ultraviolet Solar Spectral Irradiance Monitor (AESSIM)", W. H. Parkinson, Peter L. Smith & Gerhard Schmidtke, in U.S.-Taiwan Bilateral Workshop on Solar Variability Effects on the Atmosphere and Space Processing, Academia Sinica, Taipei, Taiwan 1991, 81.

"Absolute, Extreme-Ultraviolet Solar Spectral Irradiance Monitors (AESSIM)", W. H. Parkinson, Peter L. Smith & Gerhard Schmidtke, in Proceedings of the Workshop on the Solar Electromagnetic Radiation Study for Solar Cycle 22, (Ed. Richard F. Donnelly, Space Environmental Lab, NOAA ERL) July 1992, 332.