Multifilter Rotating Shadowband Radiometer (MFRSR)

An Instrument for Measuring Aerosol Optical Properties and Column Water Vapor

INTRODUCTION:

The Multifilter shadow band Radiometer (MFRSR)is a passive radiometric instrument designed to measure global and diffuse solar irradiance in six narrows spectral bands and one broadband channel. The direct solar irradiance is computed from the difference between global and diffuse components.

It plays a key role in determining aerosol optical depth (AOD), water vapor and ozone content in the atmosphere.

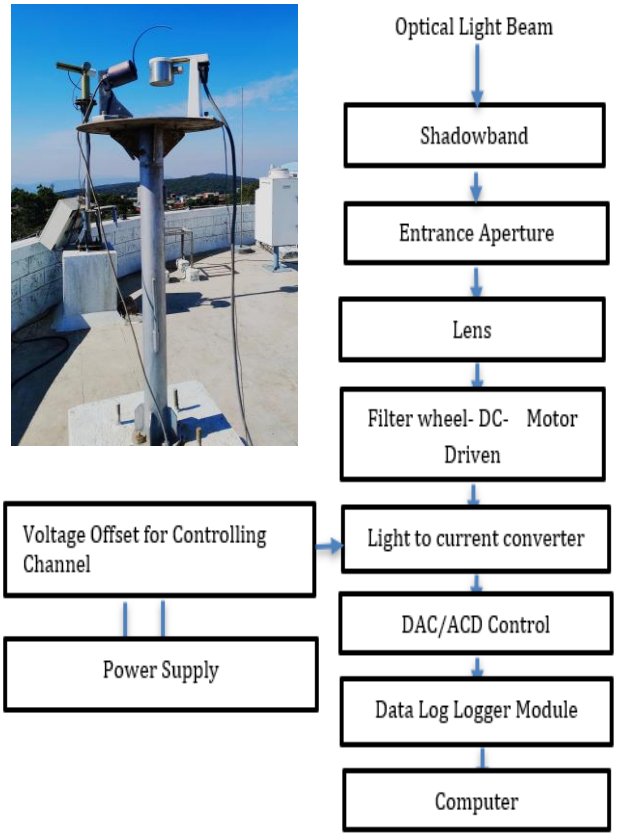
OBJECTIVES:

- **Atmospheric aerosol characterization.**
- **Column water vapor and ozone retrieval**
- **Radiative forcing and climate modelling studies.**
- **Validation of satellite Observation.**

KEY SPECIFICATIONS:

- **Wavelengths :** 415, 500, 615, 673, 870,940 nm + 1 broadband.
- **Measurement Type :** Global, Diffuse, Derived direct Irradiance
- **Input Range** : ±250 mV
- **Input Voltage :** 5 V for thermistors
- **Data Logger** : Campbell Scientific CR1000

FLOW DAIGRAM:



DATA OUTPUT:

- **Global and Diffuse Irradiance (W/m^2).**
- **Calculated Direct Irradiance (W/m^2).**
- **Aerosol Optical Depth (unitless).**
- **Column Water Vapor and Ozone.**

MEASUREMENT AND WORKING PRINCIPLE:

The MFRSR uses a rotating shadow band to alternately block and expose a spectral sensor array, allowing for sequential measurements of global, diffuse, and derived direct irradiance. Measurements are taken through six interference filters (415, 500, 615, 673, 870, and 940 nm) and an open channel. The shadow band rotates through four positions: nadir (home), side-band 1, sun-blocked, and side-band 2.Corrections for cosine response and diffuse contributions are applied during post-processing.

KEY FEATURES:

- **High spectral resolution in UV–NIR**
- **Robust and low-maintenance design**
- **Accurate direct irradiance calculation.**
- **Suitable for long-term atmospheric monitoring**

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