ROOM TEMPERATURE RADIOMETER FOR TSI MEASUREMENT

Adriany Rodrigues Barbosa[1], Luis Eduado Antunes Vieira[1], Franciele Carlesso[1]

[1] *Brazilian National Institute for Space Research (INPE); São José dos Campos, São Paulo, Brasil*

Abstract: Total solar irradiance (TSI) is the principal energy that drives Earth's climate system. The TSI varies with time and, over long time scales, this change can contribute to variations in Earth's climate. Due to its essential part in Earth-climate research, space-borne missions have been continuously measuring the TSI since 1978. However, different instruments have variations in the TSI average value due to instrument-calibration uncertainty. Although accurate measurement provided by new missions and instruments has improved, the long-term TSI variability and its effects have not yet been established. To contribute to the international effort to understand how our nearby Star works and its influence on Earth, the Brazilian National Institute for Space Research (INPE) started a program to develop instruments for solar observations. One of the devices is an Electrical Substitution Radiometer (ESR). In parallel, the research group has endeavored for new technological alternatives to overcome the limitations still found in traditional radiometers. One design aims to develop a thermo-optic detector that employs a Mach–Zehnder Interferometer (MZI) of lithium niobate crystals. Another design is based on the pyroelectric effect of lithium niobate crystals. The thermo-optical sensor can reduce or eliminate some limitations that affect ESR measurements, as high thermal noises and relatively low signal-to-noise ratio (SNR).

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