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A high-dynamic and accurate electromagnetic radiation and thermal energy detector for planetary studies

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The radio meter has been broadly applied for the study of the Total Solar Irradiance (TSI). As the electromagnetic radiation is the main external climate driving force of our planet: Earth, the Imbalance of the Earth's Radiation Budget (IERB) is a key to better understanding our climate system. The PICARD mission is to study the Sun-Earth's climate connections.

With the opportunity of the PICARD mission, we have developed a Bolometric Oscillation Sensor (BOS), which are currently flying side by side with the radiometer SOlar Variability for Picard (SOVAP-an updated instrument of DIARAD/VIRGO on SOHO) to study the solar constant as well as the radiation of the Earth.

The BOS sensor is composed with two detectors, the light mass detector (m1), which is rapidly response to the thermal-flux change, and the heavy mass detector (m2), which is slowly modulated by the electromagnetic energy. In addition, the m1 detector can stand alone to precisely monitor the ambient temperature.

The original goal of the BOS-PICARD is to study the irradiance of the Sun's and the Earth's. After nearly two year's observations, the variations of Long-Wave radiation of the Earth can be well determined from the BOS measurements. It confirms that the BOS can be applied to measure the electromagnetic radiation near the infrared.

Encouraged by these results, we are now working on a second generation of the BOS sensor for the nano-satellite project and future planetary missions. The new sensor will be able to determine the albedo (visible), infrared radiation as well as to detect the thermal initial of objective target either by the remote sensing on-board satellite or by the in-situ measurement setting up in the Lander.