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Thermal simulation of cavity shape and its impact on solar and terrestrial radiation measurement in space

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In order to upgrade the technology readiness lever of the solar and terrestrial radiation measurement from space, in this paper, we started detailed thermal analysis and modeling of the Bolometric Oscillation Sensor (BOS) using the finite element method (FEM) [1]. Four cavity shapes (cylindrical, conical, inverted conical and hemispherical) are tested to compare their thermal and optical characteristics under different radiation and thermal environment, which helps to gain a better understanding of the mechanisms of BOS. We examined the absorptivity and emissivity of each cavity shape by applying the same amount of radiation power. Especially, when the ambient temperature maintains at a stable and low value, such as 20K, it produces the most accurate reconstruction of the input power. In this presentation, we will introduce the detailed simulation result and how to apply it to correct the ambient thermal radiation on each type of detector.

Reference:

[1] P. Zhu, M. Wild, M. van Ruymbeke, G. Thuillier, M. Meftah, and O. Karatekin. Interannual variation of globe net radiation flux as measured from space. J. Geophys. Res. doi:10.1002/2015JD024112, 121:6877-6891, 2016.

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