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THE SPACE QUALIFICATION OF LAPAN'S IR CAMERA EQUIPPED WITH TWO MICRO BOLOMETER DETECTORS

Abstract

An Infra Red (IR) camera equipped with a micro bolometer detector is a research project being lasted since two years ago at Satellite Technology Center LAPAN-Indonesia. The research becomes more important since it was decided to be an experimental payload of LAPAN's micro satellite in the beginning of this year. For that reason Iteration process has been applied in order to review all achieved results, i.e., from its missions, spectral analysis, through its design analysis such as illumination analysis, mechanical, structure / thermal, and final design. After several months, we would like to present our new space qualification of IR camera equipped with two micro bolometer sensors reinforced on innovations either technology or approaches, reduce cost, and user needs where all of them are our qualification strategy. Operationally the IR camera uses dual bands spectral, 3-4 m and 8-12m, with its optics share the same aparture. In order to avoid the emergence of problem and to enhance the IR camera system due to utilizing two micro bolometer in one aparture , we employed optical dual band coating for anti reflection. Moreover, coatings are also expected to reduce stray light problem in space environment, an harsh condition. In term of mission, each band has difference objective, wherein 3-4 m tends to detect and sense of peat fire and volcano activity, and the rest for Sea Surface temperature (SST). These missions actually have been analyzed not only by Planck's Law, but also expanded the analysis by new approaches, i.e., Wien's Law Displacement, Temperature Responsivity (TR), and sub-pixel response. We exploited some commercial software for analysis as well, such as Zemax for illimunation, Thermal Desktop and Sinda Fluint for structure / thermal, and Solid edge for mechanical. Meanwhile, ground calibration process has been also engaged in order to cultivate the IR camera system. Overall design, both several magnitudes and charts analysis, indicates that the space qualification of LAPAN's IR camera equipped with two micro bolometer detectors is on the right track. The dual coatings will raise the reflection, and the design meet all requirements and specifications so that the produced image of the IR camera will have good quality.