

Additive Manufacturing as an Enabler for New Thermal Solutions

Baptiste Lascombes, Airbus Defence and Space, France

In the framework of the currently running ESA project « Development of Embedded Thermal Function in Structural Parts using 3D Printing », two metallic demonstrators are being designed, manufactured and tested. Demonstrator 1 is a two-phase-structure focal plane together with its radiator for instrument application. The use of a two-phase structure manufactured by 3D printing will allow an increase of the thermal conductance of such a metal and consequently allow limiting the thermal gradient between the detectors as well as between the detector barrel and the radiator while still ensuring limited thermal distortion. Demonstrator 2 is a cold plate. The standard design for current cold plates consists in a pipe system which is mounted with the means of bolts and brackets on a plate or encased between two plates. This design, being easily calculable and fairly inexpensive to produce in conventional manufacturing, is being used widely in current projects but it also poses several technical issues. Heat transfer from the active surface to the cooling fluid is less than ideal, having several material changes in between. The concrete expected thermal performance in frame of this project is to considerably enhance the heat transfer within the plate while maintaining its structural properties.

Initial samples have been manufactured by Poly-Shape and tested at EHP to assess design driver properties in order to predict and design the demonstrator. The Invar focal plan has been manufactured and assembled successfully as well as the aluminium cold plates. Tests are being prepared and first performances results of the demonstrators will come in the coming 2020 spring