Graphene in Space

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Loop Heat Pipes (LHP) are passive heat transfer devices used in thermal control of spacecraft equipment and instruments [1]. Graphene, deposited on the porous structure known as *capillary pump* [2], is a suitable means to increase the LHP operation stability and start-up reliability[1,3]. We collected over 30 minutes data during parabolic flights, Fig.1, in microgravity conditions [4]. These tests are a key step towards space qualification, allowing us to understand the characteristics of flow and boiling for the working fluid inside LHPs in conditions similar to orbital ones, paving the way for the use of graphene in space based applications. The plan is to demonstrate a long term (>4 months) operational graphene based LHP in Earth's Orbit as a proof of In-Orbit Demonstration (IOD). A prototype, capable to fit a 1U [5] nanosatellite has been designed taking into consideration the volume, mass, data and power. This will comply with near future spaceflight opportunities, such as the ESA Space Rider and Vega C maiden flights, as well as other technological demonstrator platforms.

References

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Figures

Figure 1: A310 zero-G aircraft.

Figure 2: Graphene LHP test setup in the aircraft.