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Qualification campaign of the 50 mK sorption-ADR cooler for SPICA/SAFARI

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SAFARI (SpicA FAR-infrared Instrument) is an infrared instrument planned to be part of the SPICA (SPace Infrared telescope for Cosmology and Astrophysics) Satellite. It will offer high spectral resolution in the 30–210 μm frequency range. SAFARI will benefit from the cold telescope of SPICA and to obtain the required detectors sensitivity, a temperature of 50 mK is required. This temperature is reached thanks to the use of a hybrid sorption–ADR (Adiabatic Demagnetization Refrigerator) cooler presented here. This cooler provides respectively 14 μW and 0.4 μW of cooling power at 300 mK and 50 mK. The cooler is planned to advantageously use two thermal interfaces of the instrument at 1.8 and 4.9 K. One of the challenges that will be discussed is the low power available at each intercept. A dedicated laboratory electronic is being designed based on previous development with a particular focus on the 50 mK readout. Temperature regulation at 50 mK will also be discussed.

This cooler has been designed following flight constraints and will reaches a high TRL, including mechanical and environmental tests at the end of the on going qualification campaign.

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