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## Design and Thermal Solutions for Cryogenic Payload Cooling at ARC Laboratory

The Amaldi Research Center (ARC) at Sapienza University of Rome will host the first experimental implementation of a cooling system for a full-scale cryogenic payload cooled via solid conduction. The payload will be housed in a 3-meter-tall cryostat, which is scheduled for completion in 2025. To shield the payload from room temperature radiation, we will utilize the Rigid Multi-Layer (RML) system, composed of thin aluminum layers separated by insulating spacers.

In terms of mechanics, our main directives are to limit the weight of the RML, control the thickness of the layers, and streamline the overall assembly process, all constrained by the limited available space in the laboratory. Modal simulations of the RML are crucial during the design phase to prevent, or at least minimize, the transmission of unwanted vibrations caused by seismic and technical disturbances affecting the inner thermal shield.

However, in this thermal/mechanical design, thermal modeling and experimental characterization of the RML prototype are essential to achieve the necessary radiation shielding and reach the target mirror temperature within a reasonable timeframe. This work presents the initial thermal simulations of the complete system, supported by experimental testing of the thermal properties of key components.

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