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A calorimeter for measurements of multilayer insulation at variable cold temperature

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An improved calorimeter cryostat for MLI thermal performance measurements has been designed and put into operation at the TU Dresden. Based on a liquid helium cooled flow cryostat, it allows the setting of any cold level temperature between approx. 30 K and ambient temperature. Thermal shields and all-embracing radiation guards at both ends can be kept at nearly identical temperature. This is done by means of two separate cooling circuits. Both the actual cold test surface temperature and the cooling of the mechanical support and radiation shields can be independently controlled.

Insulation specimens are wrapped around a test cylinder with a surface of 0.9 m². The heat transfer through the MLI is measured by recording the mass flow, the inlet and outlet temperature of the cooling fluid. Measurements both in horizontal and vertical orientation can be performed or compared, respectively. Moreover the effect of an additional vacuum degradation –as it might occur by decreasing getter material performance in real systems at elevated temperatures –can be studied by controlled inlet of an elective gas.

It is reported about the design and the equipment of this cryostat and comparative measurements of a 10 layer MLI specimen at different cold temperatures.

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