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Conceptual design of a low noise lab-scale He-II supply unit for Q-factor measurements of cryogenic suspensions in GRAVITHELIUM

The ERC project GRAVITHELIUM investigates full-scale cryogenic mirror suspensions for ET-LF, including a novel concept using static superfluid helium (He-II) inside a titanium marionette suspension tube. To investigate the possible dissipative contribution of the superfluid to the quality factor of the suspension, a low-noise lab-scale He-II supply unit, capable of delivering 400 mW of cooling capacity at 1.8 K through a 5 m long transfer line, is required. The conceptual design featuring novel heat exchangers promises significant system performance improvements to state-of-the-art He-II bath cryostats. The transient cool-down process, initiated with supercritical helium flow and completed via pumping on a helium bath, allows for fast cool-down cycles in less than one day, depending on the experimental set-up in the cryostat.

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