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Clamp Cells for Neutron Scattering at the MLZ

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Clamp cells optimized for neutron scattering at low temperatures on the instruments DNS, MIRA, HEiDi, and POLI at the Heinz Maier-Leibnitz Zentrum [1] will be presented. The monobloc cell is available in two variants made of a CuBe alloy and a NiCrAl alloy, operational up to about 1.1 GPa and 1.5 GPa, respectively. Measurements aimed to elucidate magnetic properties are now possible due to the low paramagnetic moment of both alloys.

Tests with neutron radiation were performed to calibrate the load/pressure curve of the CuBe cell, to estimate its neutron absorption and background, and to measure magnetic reflections. In addition, the thermal response of the cells in the instrument cryostat was measured and the experimental findings were complemented by simulations.

A modified version of the cell with the same mechanical properties was developed with an optical access to the inner part of the cell, which enables the use of ruby luminescence to determine the pressure independent from neutrons. The respective load/pressure calibration curves were measured for both cell variants.

These cells are intended for high-pressure measurements on different instruments at MLZ suitable for all available magnets and cryostats down to 1.5 K.

[1] Eich A et al., High Press. Res., 41[1], 88–96 (2021)

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