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Compact Clamp Cells for High Pressure Neutron Scattering at Low Temperatures and High Magnetic Fields at MLZ

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The combination of high pressure, low temperature and high magnetic fields with neutron scattering is of great interest for the study of a wide range of materials, e.g. quantum phenomena where competing magnetic interactions are tuned by pressure. The basic requirement for such experiments is the availability of suitable pressure devices. The most common type of device for high-pressure neutron experiments is the *clamp cell*: the pressure is applied and fixed *ex-situ*, allowing an independent use of the same cell/sample in various setups.

Here we report on the development of dedicated compact clamp cells for neutron scattering experiments in the closed-cycle cryostats and high-field magnets on the beamlines DNS, MIRA, and POLI. The cell has been produced in CuBe and in NiCrAl variants, working up to about 1.1 GPA and 1.5 GPa, respectively, in good agreement with theoretical predictions. The use of nonmagnetic materials allows measurements of magnetic properties of the sample in both cells even using polarized neutrons.
First tests in the CuBe cell have been successfully performed for the load/pressure calibration curve, cell attenuation and background measurement both with cold and hot neutrons, and to test thermal behavior, measuring magnetic reflections at very low temperatures. The results of these tests will be presented. The new cells are well suited for high pressure measurements at ultra-low temperatures and in combination with an applied magnetic field.

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