
Contribution ID: **70** Type: **Poster**

# POLI: Multifunctional Single Crystal Diffractometer with Polarized Neutrons at MLZ

*Monday 17 September 2018 17:45 (15 minutes)*

POLI is a versatile two axes single crystal diffractometer, mostly dedicated to the investigation of magnetic structures of single crystals using neutron spin polarization.[1] Unlike other short-wavelength polarized neutron diffractometers with Heusler-alloy monochromator for both polarization and monochromatization, POLI employed non-polarized double-focusing monochromators in combination with high-efficiency polarizers. This results in the enhanced intensity of the polarized neutron flux and improved resolution. Also the studies with both polarized and non-polarized neutron diffraction on the same sample under the same conditions (e.g. wavelength, resolution, sample positioning etc.) can be performed. A number of discrete wavelength values from hot (0.29 Å) to near thermal neutrons (1.15 Å) are available by using Cu (220) and Si (311) monochromators on POLI. 3He spin filter cells are used both to produce and to analyze neutron polarization. This polarization technique is especially efficient for the hot neutrons. For the thermal part of the spectrum, a new dedicated supermirror bender polarizer was developed and is under implementation.
POLI is very versatile and flexible instrument which offers different measuring techniques. Namely: (1) polarize neutron diffraction PND (flipping-ratio measurements) using high magnetic field[2], (2) zero-field spherical neutron polarimetry SNP using the third generation Cryopad[3], and (3) classical single crystal neutron diffraction in extreme environments like high magnetic fields, very low/high temperatures, high voltage, pressure cells etc. and their combinations. Rather high flux of hot polarized neutron makes POLI attractive also for the experiments in nuclear physics [4] and even in medical research.
In this report, we will show the design of the whole instrument with the emphasis on the polarization components and extreme environments. Several examples of applications in resolving different challenging aspects in crystal, magnetic and domain structure of complex magnetic materials like multiferroics, superconductors, heavy fermion compounds and frustrated systems will be shown.

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**Session Classification:** Poster session 1

**Track Classification:** P1 Instrumentation and methods