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CHARM –A fast, high resolution curved 3He-based Multiwire- Proportional Chamber for the powder diffractometers DMC and ERWiN

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The upcoming high-intensity powder diffractometer ERWIN at MLZ and the cold-neutron powder diffractometer DMC at the Paul Scherrer Institut, Switzerland, will be equipped with new fast and high-resolution two-dimensional position-sensitive curved 3He-based Multi-Wire Proportional Chambers (MWPC) covering 130° horizontal and 14° vertical acceptance. The fully modular design is adopted from a development at Brookhaven National Laboratory (BNL) and consists of nine individual MWPC segments mounted seamlessly inside a common pressure vessel filled with a gas mixture of 6.5 bar 3Helium + 1.5 bar CF4. The device with a radius of curvature R = 800 mm is aiming at 75% detection efficiency for thermal neutrons, 1.6 mm x 1.6 mm position resolution (FWHM) and about 200 kHz count rate capability per MWPC segment at 10% event loss. Single channel induced charge readout using a Time-over-Threshold detection method is applied to the 1152 x 1152 individual cathode wires and strips, respectively. For each detected neutron a FPGA-based signal processing electronics developed in-house will provide 2D-position information applying a Centre-of-Gravity algorithm and time stamping with 80 ns time resolution.

First results of measurements performed with a 30°-prototype using a collimated beam of 4.73 Angstrom neutrons at the TREFF instrument at FRM II and the present status of the construction of the full size detectors will be presented.

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