



Contribution ID: 275

Type: **Talk (25 + 5 min)**

A new generation of ^3He curved detectors based on the trench-MWPC design

Wednesday 22 March 2023 16:00 (30 minutes)

Curved ^3He detectors used on single crystal and powder diffractometers are among the most advanced detectors in neutron scattering science. They provide high detection efficiency, low gamma background, and high position resolution, with no parallax error in the plane perpendicular to the detector axis. 6 of these detectors are currently in operation worldwide: D19, D20, and D1B at ILL, HRPT at PSI, WAND at HFIR, and Wombat at ANSTO. Those used at the ILL have been developed in-house, while the 3 others have been developed by BNL and CERCA, which are not active anymore in this field.

A new generation of curved ^3He detectors is being developed by FRM-II and ILL for upgrading several instruments (D20 and D16 at ILL; DMC at PSI), and to equip new ones (XtremeD at ILL, ERWIN at FRM-II). The XtremeD and D16 detectors will be mounted on the instruments at the end of 2022, and the D20 detector in 2024. They are based on the trench-MWPC, which provides better uniformity and higher counting rate capability compared to a standard MWPC. Furthermore, the absence of cathode wires makes them easier to assemble, in particular for replacing an anode wire, as it is sometimes needed during the fabrication phase. Some results obtained on the CT2 test beam line, as well as with an AmBe neutron source, will be presented. The local counting rate measured on CT2 with the XtremeD detector is 4 kHz/mm² (@ 10% pile-up rejection); this is 3 times better than what we measured with an equivalent MWPC.

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Session Classification: Imaging & Neutron Detection

Track Classification: Neutron Instrumentation, Optics, Sample Environment, Detectors, and Software