Beitrag ID: **138** Typ: **Contributed Talk**

25 years with a large position sensitive detector for high intensity powder diffraction at D20, that's enough!

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D20 at ILL provides highest intensity in constant-wavelength neutron powder diffraction at medium and high resolution. The most critical ingredient to this, besides optical versatility and a high incident neutron flux, is a large position sensitive detector (PSD) that covers the whole range of diffraction angles with sufficient definition. More than a quarter of a century ago, this was very difficult to realise and led to the development of micro-strip gas chamber detectors, a technology that has been used successfully in the current PSD for 25 years. However, the technology suffers from a niche status when it comes to the provision of parts and lacks robustness. At the time-scale of an experiment, the detection stability is very high (which is critical for small signals and high backgrounds, so for small samples, incoherent scattering, small magnetic moments, absorbing samples, high pressure, amorphous and liquid samples). Unfortunately, over longer time-scales, the detection efficiency changes, micro-strips being very sensitive to oxidation by traces of poisoning oxygen in the detector gas. This requires frequent recalibration or acquisition methods like two-theta scans. The earlier is too time-consuming in a tight schedule of an oversubscribed instrument, the latter is not adapted to very fast experiments and invalidating one of the 'selling'arguments of the PSD, its stationarity. Also, it is prone to mechanical and electronic problems, as the PSD needs to move all the time.
Therefore, a new PSD has been built, based on the meanwhile well-proven 'trench'multi-wire proportional counter technology (used on XtremeD and D16). The new PSD has been completed, tested and is ready to replace the former PSD on D20 before reactor operation in 2025.
Some flagship results of 25 years of powder diffraction at D20 shall be presented, D20's particular scientific challenges, the working principles of its current PSD, its problems and how one can overcome them by data acquisition strategies and data reduction. Finally, the respective differences of the new PSD, its working principles, its production and results of first tests shall be shown.

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Sitzung Einordnung: Session 5: Instrumentation & Data Management II (Chairs: Tobias Neuwirth & Artur Gregor Glavic)

Track Klassifizierung: Instrumentation & Data Management