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Upgrades of the hot diffractometer HEiDi for more efficiency and new challenges

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HEiDi is one of only two single crystal diffractometers (SCD) using hot unpolarized neutrons worldwide. Many scientific topics on compounds in battery or information technology with light and/or highly absorbing elements profit from comprehensive structure analysis up to high Q as well as experiments using absorbing sample environments like pressure cells. In order to maximize the large versatility of HEiDi a small 2D position sensitive detector (PSD) is currently under construction (BMBF grant 05K19PA2). It will expand its efficiency concerning fast and detailed detection of Bragg and diffuse scattering as well as modulated background.

The large available Q range fits also perfectly to pair distribution function (PDF) analysis as new field of research at MLZ, focusing on short-range order phenomena and complementing existing research on the aforementioned topics. Various groups have recently confirmed its high potential for magnetic studies on powders (mPDF, e.g. [1]) and studies on single crystals (3D-PDF, e.g. [2]). Thus, we propose a large PSD as upgrade covering an angular range > 125°. This offers a Q range above 20 Å^{-1} sufficient for PDF studies on magnetic or structural features. A combination with an also proposed radial collimator will allow for powder studies to very high Q on top. Conceptual details will be shown during the meeting.

[1] Frandsen et al. (2017); Phys. Rev. Mat. 1(7), 074412
[2] T. Weber and A. Simonov; J. Appl. Cryst. 47 (2014), 1146-1152

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