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DEMAND (HB-3A), a Dimensional Extreme Magnetic Neutron Diffractometer at the High Flux Isotope Reactor

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A two-dimensional (2D) Anger camera detector has been used at the HB-3A four-circle single-crystal neutron diffractometer at the High Flux Isotope Reactor (HFIR) since 2013. The 2D detector has enabled the capabilities of measuring sub-mm crystals and spin density maps, enhanced the efficiency of data collection and phase transition detection, and improved the signal-to-noise ratio. Recently, the HB-3A four-circle diffractometer has been undergoing a detector upgrade towards a much larger area, magnetic-field-insensitive, Anger camera detector. The instrument will become capable of doing single-crystal neutron diffraction under ultra-low temperatures (50 mK), magnetic fields (up to 8 T), electric fields (up to 11 kV/mm), and hydrostatic high pressures (up to 45 GPa). Furthermore, half-polarized neutron diffraction is also available to measure weak ferromagnetism and local site magnetic susceptibilities. With the new high-resolution 2D detector, the four-circle diffractometer has become more powerful for studying magnetic materials under extreme sample environment conditions; hence, it has been given a new name: DEMAND.

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