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SAPHiR: Neutron diffraction and high resolution radiography under high pressure and temperature conditions

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SAPHiR, the Six Anvil Press for High Pressure Radiography and Diffraction belongs to the suite of new instruments that are located in the neutron guide hall east of FRM II. The aim of SAPHiR is to provide extreme pressure and temperature environments for polycrystalline samples, fluids, or melts. The pressure is generated by a three-axis multianvil press with a combined force of 2400 tons (24 MN), which currently generates pressures of up to 15 GPa in samples with volumes of 10-30 mm³. Efforts are under way to increase the pressure to 25 GPa. Applications include phase transformations, reaction kinetics, crystallography of light-element-bearing high pressure phases, high resolution radiography, equations of state, and rheological studies. SAPHiR will use a thermal neutron beam that is focussed on the sample by an elliptic neutron guide. Due to geometrical restrictions by the multianvil press, neutron diffraction employs the time-of-flight method. The detector system combines four wave-length-shifting-fibre detector segments in the backscatter regime and three helium-3 detector banks at 90° from the incident beam and in the forward scatter regime. We are aiming for a diverse user community from materials science and geosciences, solid state physics, and chemistry. User access will commence once the infrastructure in the eastern neutron guide hall is completed, currently projected for 2021. Offline exploratory experiments can already be performed by interested research groups.

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