MS21-2-2 Incommensurately modulated charge-density wave phase transition in $EuAl_2Ga_2$
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Abstract
Rare-earth-based intermetallics show superconductivity, magnetic order, and heavy fermionic behaviour due to 4f electrons [1]. In Eu-based intermetallics, Eu offers two types of valance states of Eu^{2+} (magnetic) and Eu^{3+}(nonmagnetic) due to an unstable 4-f shell. $EuAl_4$ shows the charge density wave (CDW) at T_{CDW}= 140 K and orders antiferromagnetically below T_N = 15.4 K; however, $EuGa_4$ represents the characteristic of CDW above 1GPa, not at ambient pressure, and orders antiferromagnetically below T_N = 16.4 K [2],[3]. A recent study on $EuAl_2Ga_2$ shows an out-of-plane CDW below ~ 51 K while the magnetic propagation vector lies in-plane below T_N = 19.5 K [4].
The present study reports on the incommensurately modulated charge density wave in $EuAl_2Ga_2$. We have performed a Single-crystal X-ray diffraction (SXRD) experiment at beamline P24 of PETRA-III at DESY (Hamburg, Germany) in the temperature range of 300 K – 20 K. $EuAl_2Ga_2$ possesses tetragonal symmetry with space group I4/mmm at room temperature. Temperature-dependent SXRD experiment reveals the presence of satellite reflections below T_{CDW} with a 1-D modulation vector (0, 0, 0.113). These satellites are used to study the incommensurately modulated charge density wave transition in the material. Our recent study on $EuAl_4$ shows the tetragonal to incommensurately modulated orthorhombic CDW phase transition [5]. We will present the CDW modulated crystal structure as a function of temperature in $EuAl_2Ga_2$.

References
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