

# IFMP Seminar

**Date:** Tuesday, December 14, 2021, at 14:50

**BigBlueButton:**

<https://selfservice.zih.tu-dresden.de/link.php?m=156754&p=76518538> (TUD)

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**Speaker:** **Jaime Moya**  
*Rice University, Texas, USA*

**Title:** **Incommensurate magnetic orders and possible field-induced skyrmions in the square-net centrosymmetric  $\text{EuGa}_2\text{Al}_2$  system**

**Abstract:** Noncollinear and noncoplanar spin textures in solid-state materials have recently been extensively explored as a source of emergent phenomena associated with quantum Berry phase or relativistic spin-orbit couplings. One representative example is the emergence of short-period topological multiple- $q$  spin textures such as skyrmions in centrosymmetric materials that provide a platform for future quantum information processing and storage. Here we investigate the potential of square-lattice compound  $\text{EuGa}_2\text{Al}_2$  as a host for such topological spin textures. Our magnetization and transport measurements identify a new phase region that shows nonzero topological Hall effect, which points to the possible existence of skyrmions. Neutron diffraction measurements reveal the existence of multiple incommensurate magnetic textures (including helical and cycloidal orders) in the zero-field limit, reminiscent of many known skyrmion hosts. In  $\text{EuGa}_2\text{Al}_2$ , we also identify the presence of an out-of-plane (OOP) charge density wave (CDW) below  $\sim 51$  K while the magnetic propagation vector lies in plane below  $\sim 19$  K. This behavior is in sharp contrast to the emergence of CDW and spin density wave in the isostructural analogue  $\text{GdRu}_2\text{Si}_2$ , where the origin of CDWs was attributed to the effective spin-channel interaction in the framework of spin-charge coupling mechanism. Our results suggest a new route through OOP CDW to realizing in-plane noncollinear and noncoplanar spin textures in square-lattice systems.