Seminar/Talk

Magnon Hydrodynamics in a layered Magnet

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Host: Kimberly Modic

Abstract: Strong interactions between particles can give rise to emergent collective excitations. While well-established in electronic systems, such behavior is also expected in gases of neutral particles, like spin waves (magnons) in a ferromagnet. In the hydrodynamic regime, strongly interacting magnons can form a slow collective density mode—a magnon sound mode—with distinctive low-frequency signatures. Here, we isolate atomically thin ferromagnetic CrCl, where magnon interactions are strong, and probe its collective dynamics using quantum sensors based on nearby nitrogen-vacancy (NV) centers in diamond. We detect anomalous thermal magnetic fluctuations that grow as temperature decreases, a signature of increased damping in a low-energy magnon sound mode. Our analysis links this behavior to enhanced magnon interactions at higher temperatures, revealing the onset of magnon hydrodynamics. Finally, we observe spectroscopic evidence of this 2D sound mode under variable-frequency drive, providing the first experimental glimpse of hydrodynamic magnons and magnon sound.

Tuesday, December 16, 2025 11:00am - 12:00pm

Heinzel Seminar Room/ Ground Floor/Office Building West

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