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Emergent Phases in Heavy Fermions: a Magnetic Substitution Study

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Unconventional superconductivity frequently is found as an antiferromagnetic transition is tuned by chemical substitution or applied pressure toward a zero-temperature phase transition, a magnetic quantum-critical point. Different classes of unconventional superconductors (e.g. heavy-fermions, cuprates, and Fe-based) display a collective magnetic excitation in their superconducting state, and a universal relationship exists between the energy of this spin resonance mode and the superconducting gap. In this talk, I will focus on the heavy-fermion family of unconventional superconductors CeTIn$_5$ (T = Co, Rh). I will show evidence for an emergent spin-density wave phase below the superconducting dome in pressurized CeRhIn$_5$ containing small amounts of magnetic substitution in the Ce site. This phase can be understood as the condensation of the spin resonance mode, providing a universal scenario for these materials.