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Interference pattern of colliding composite-boson condensates AURELIA CHENU, LANL, SHIUE-YUAN SHIAU, Academia Sinica, MONIQUE COMBESCOT, Institut des NanoSciences de Paris — All particles consisting of an even number of fermions are boson-like, which bears a strong consequence: they must undergo Bose-Einstein condensation. We predict that, compared to elementary bosons, the interference pattern of two colliding BEC made of atomic dimers must have additional high frequency modes. These new modes being many-body in essence, previous experiments performed with rather dilute condensates only showed interferences ruled by the BECs' momentum difference, a result obtained taking atoms as elementary bosons. The higher frequency modes we predict result from fermion exchanges between condensates and thus constitute a striking signature of the dimer composite nature. We analytically derive the spatial correlation functions and use Shiva diagrams, specific to coboson many-body effects, to identify the physical origin of these modes and determine their experimental observation, using optical lattices. A dimer granularity appears because of Pauli blocking. We anticipate coldatom systems to provide a novel, fully controllable playground to investigate further the unique many-body effects that result from dimensionless fermion exchanges. Recent optical lattices already reach densities high enough for these to be observable, including the signature predicted here.

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