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Topological superradiance in a degenerate Fermi gas JIAN-SONG PAN, University of Science and Technology of China, XIONG-JUN LIU, Peking University, WEI ZHANG, Renmin University of China, WEI YI, GUANG-CAN GUO, University of Science and Technology of China, YI'S GROUP TEAM, LIU'S GROUP TEAM, ZHANG'S GROUP TEAM — We predict the existence of a topological superradiant state in a two-component degenerate Fermi gas in a cavity. The superradiant light generation in the transversely driven cavity mode induces a cavity-assisted spin-orbit coupling in the system and opens a bulk gap at half filling. This mechanism can simultaneously drive a topological phase transition in the system, yielding a topological superradiant state. We map out the steady-state phase diagram of the system in the presence of an effective Zeeman field, and identify a critical tetracritical point beyond which the topological and the conventional superradiant phase boundaries separate. We propose to detect the topological phase transition based on its signatures in either the momentum distribution of the atoms or in the cavity photon occupation.

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