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Z_3 parafermions without superconducting backscattering from the 2/3 fractional quantum Hall state[1] YAHYA ALAVIRAD, DAVID CLARKE, AMIT NAG, JAY SAU, Univ of Maryland-College Park — Parafermions, which are a generalization of Majorana modes, are a novel set of excitations that are predicted to occur from the combination of the fractional quantum Hall effect and superconductivity. Such parafermions have a non-Abelian statistics that are somewhat richer than Majorana modes. Despite substantial experimental progress, we argue that backscattering between fractional quantum Hall edges through a superconductor is a challenging milestone to reach. We propose a superconducting quantum dot array structure on a fractional quantum Hall edge that can lead to parafermions from coherent superconducting forward scattering on a quantum Hall edge. Such coherent forward scattering has already been demostrated in recent experiments. We show that even for proximity from a spin-singlet superconductor on a 2/3 fractional quantum edge with an appropriately tuned array of gates of size of the order of ten should allow one to systematically tune into a parafermion degeneracy.

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