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Fractionalization of Faraday lines in generalized compact quantum electrodynamics models in three dimensions[1] OLEXEI MOTRUNICH, SCOTT GERAEDTS, Department of Physics, California Institute of Technology — Motivated by ideas of fractionalization and topological order in bosonic models with short-range interactions, we consider similar phenomena in formal lattice gauge theory models. Specifically, we show that a compact quantum electrodynamics (CQED) in (3+1)D can have, besides familiar Coulomb and confined phases, additional unusual confined phases where excitations are quantum lines carrying fractions of the elementary unit of electric field strength. We construct a model that has N-tupled monopole condensation and realizes 1/N fractionalization of the quantum Faraday lines; this phase has another excitation which is a Z_N particle that picks up a phase of $e^{i2\pi/N}$ when going around the fractionalized electric field line excitation. Alternatively, we can introduce a conventional bosonic field and condense bound states of monopoles and bosons. This can lead to fractionalization of both Faraday lines and bosons, as well as a quantized transverse response. We compare and contrast with bosonic topological insulators in (3+1)D.

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