Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Supersymmetry in quantum optics and in spin-orbit coupled systems[1] MICHAEL TOMKA, Boston University, MIKHAIL PLETYUKHOV, Institute for Theory of Statistical Physics and JARA - Fundamentals of Future Information Technology, RWTH Aachen, VLADIMIR GRITSEV, Institute of Theoretical Physics, University of Amsterdam — Light-matter interaction is naturally described by coupled bosonic and fermionic subsystems. This suggests that a certain Bose-Fermi duality is naturally present in the fundamental quantum mechanical description of photons interacting with atoms. We reveal submanifolds in parameter space of a basic light-matter interacting system where this duality is promoted to a supersymmetry (SUSY) which remains unbroken. We show that SUSY is robust with respect to decoherence and dissipation. In particular, the stationary density matrix at the supersymmetric lines in parameter space has a degenerate subspace. The dimension of this subspace is given by the Witten index and thus topologically protected. As a consequence of this SUSY, dissipative dynamics at the supersymmetric lines is constrained by an additional conserved quantity which translates some part of information about an initial state into the stationary state subspace. We also demonstrate a robustness of this additional conserved quantity away from the supersymmetric lines.

[1]Swiss National Science Foundation

Michael Tomka
Boston University

Date submitted: 12 Nov 2014 Electronic form version 1.4