

Abstract Submitted  
for the MAR17 Meeting of  
The American Physical Society

**Symmetry enriched U(1) quantum spin liquids** LIUJUN ZOU, CHONG WANG, Harvard University, T. SENTHIL, Massachusetts Institute of Technology — We classify and characterize three dimensional U(1) quantum spin liquids (deconfined U(1) gauge theories) with time reversal and SO(3) spin rotational symmetries. We find there are 15 distinct such quantum spin liquids based on the properties of bulk excitations, and we show how to interpret them as gauged symmetry-protected topological states (SPTs). By examining the properties of the monopoles of an SO(3) gauge field to which the quantum spin liquid can couple, we identify 11 other anomalous states that can be categorized into 3 classes. When the surface properties of these quantum spin liquids are also of interests, the classification is further enriched by weakly coupling these quantum spin liquids to bosonic SPTs with the same symmetry. Taking this into account, we find all distinct such U(1) quantum spin liquids.

Liujun Zou  
Harvard University

Date submitted: 10 Nov 2016

Electronic form version 1.4