# Quantum Spin Liquids Unveil the Genuine Mott State


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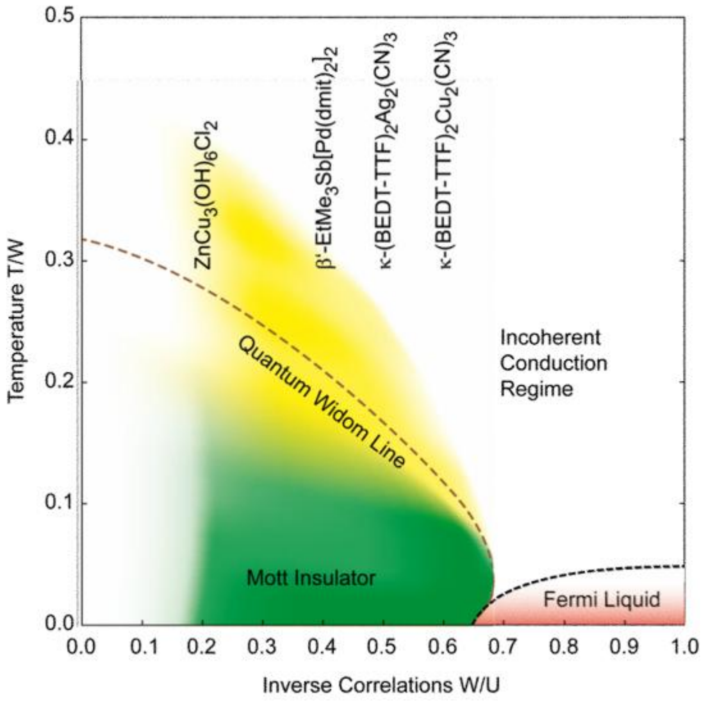
In Mott insulators strong electronic interactions prevent metallic properties. As a paradigm of correlated electron systems, the Mott insulating state is under scrutiny theoretically for more than half a century. Still, the low-temperature behavior evaded experimental exploration because it is typically concealed by an antiferromagnetic phase. In quantum spin liquids, however, no magnetic order is reached, offering the unique possibility to elucidate the pristine Mott state. Here we explore the electrodynamic response of three organic quantum spin liquids with different degrees of effective correlation and frustration. The low-frequency behavior strongly depends on the position in the temperature-pressure phase diagram. In particular in the vicinity of the quantum critical point, metallic fluctuations can be identified at low temperatures. Combining our optical data with pressure-dependent transport studies and theoretical calculations, we can construct a universal phase diagram of the correlation-controlled Mott insulator.


We present comprehensive optical and transport investigations on several organic as well as inorganic Mott insulators, which do not order magnetically down to lowest temperatures and thus are considered as prime examples of quantum spin liquids, such as β′-$EtMe_3Sb[Pd(dmit)_2]_2$, κ-$(BEDT\text{-}TTF)_2Ag_2(CN)_3$, and κ-$(BEDT\text{-}TTF)_2Cu_2(CN)_3$. In addition, we tune through the phase diagram applying chemical pressure and compare our findings with Mott insulators that undergo magnetic order at low temperatures. Finally, we discuss the importance of disorder on the electronic properties as well as on the superconducting and spin liquid states.

**Reference:**


Pustogow et al., arXiv:1710.07241