**Quantum Magnetism with Polar Molecules: Tunable Generalized
t-*J* Model** ALEXEY GORSHKOV, California Institute of Technology, SALVA-
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of Colorado, Boulder, EUGENE DEMLER, MIKHAIL LUKIN, Harvard University,
ANA MARIA REY, University of Colorado, Boulder — We show that dipolar inter-
actions between ultracold polar molecules in optical lattices can be used to realize
a highly tunable generalization of the t-J model, which we refer to as the t-J-V-W
model. The "spin" is encoded in the rotational degree of freedom of the molecules,
while the interactions are controlled by applied static electric and continuous-wave
microwave fields. We show that the tunability and the long-range nature of the
interactions in the t-J-V-W model enable enhanced superfluidity in one dimension
and controllable preparation of robust d-wave superfluids in two dimensions. The
latter may provide fundamental insights into high-temperature superconductivity.
[References: Phys. Rev. Lett. 107, 115301 (2011); Phys. Rev. A 84, 033619 (2011);
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