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**A Dielectric Superfluid of Polar Molecules** SETH RITTENHOUSE, ITAMP, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138, RYAN WILSON, JOHN BOHN, JILA and Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA — We consider the dielectric properties of a dilute Bose-Einstein condensate composed of polarizable molecules. In the strong field regime, the dipoles are fully polarized and produce internal fields that tend to be weak compared to the external field. However, in weaker external fields this is not necessarily the case. In this work, we demonstrate, for a class of molecular species, the dielectric behavior of this system in the weak-field regime, that is, the regime in which the polarization field of the gas plays a role comparable to that of the external field. We derive a set of self-consistent equations for this system and present solutions that behave very differently than those of ordinary dipolar gases. In doing so, we motivate the exploration of this weak-field regime, i.e. the regime of the dielectric superfluid.

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