Abstract Submitted
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Quantum melting of a von Neumann lattice of rotating dipole-blockaded bosons in the fractional quantum Hall regime[1] SZU-CHENG CHENG, Department of Optoelectric Physics, Chinese Culture University, SHIH-DA JHENG, Institute of Physics, National Chiao Tung University, TING-WEI CHEN, Department of Electrophysics, National Chiayi University — A novel type of vortex lattice, referred to as a bubble crystal, which was discovered in rapidly rotating Bose gases with dipole-blockaded interactions [Sci. Rep. **6**, 31801 (2016)]. Bubble crystals are clustered periodically and surrounded by multiple vortices. It was demonstrated that von Neumann lattices well described the physical properties of bubble crystals [Sci. Rep. **6**, 31801 (2016)]. The behavior and stability of a von Neumann lattice of rotating dipole-blockaded bosons are investigated via finding the elastic moduli and Tkachenko modes of this lattice. We can then calculate the mean square of the displacement vector of von Neumann lattices. The critical filling factor υ, above which the lattice state is expected, is evaluated at absolute zero temperature by use of the Lindeman's criterion. We find that the von Neumann lattice is locally stable for $\upsilon<1$, when the integral number of flux quanta per unit cell of the lattice is greater than 3. For rapidly rotating Bose gases with dipole-blockaded interactions, we show that a vortex lattice with an integral number of flux quanta per unit cell can be stable in the fractional quantum Hall regime.

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Szu-Cheng Cheng
Department of Optoelectric Physics, Chinese Culture University

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