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Quantum simulations of the Abelian Higgs model with a bosonic ladder[1] JIN ZHANG, Physics and Astronomy, UC Riverside, JUDAH UNMUTH-YOCKEY, Syracuse university, SHAN-WEN TSAI, Physics and Astronomy, UC Riverside, YANNICK MEURICE, Physics and Astronomy, Univ of Iowa — We propose to use a physical ladder of bosonic atoms to quantum simulate a lattice gauge theory called the Abelian Higgs model. We use a spin-1 approximation where the 3 spin states are obtained with the three ways two bosons can be placed on a rung. Ladder structures can be realized experimentally, but generating attractive interactions among the nearest neighbor atoms is more challenging. Recent work by J. Zeiher et al. [Phys. Rev. X 7, 041063 (2017)], shows that these interactions can be manufactured by using Rydberg's atoms. A proof of principle would be to start with a single boson per rung which corresponds to the well studied case of the quantum (spin-1/2) Ising model in a transverse field. If relevant at the time of the conference, we comment on recent experimental progress to realize these ideas.

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