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Trapped atoms along nanophotonic resonators BRIAN FIELDS, MAY KIM, TZU-HAN CHANG, CHEN-LUNG HUNG, Purdue University — Many-body systems subject to long-range interactions have remained a very challenging topic experimentally. Ultracold atoms trapped in extreme proximity to the surface of nanophotonic structures provides a dynamic system combining the strong atom-atom interactions mediated by guided mode photons with the exquisite control implemented with trapped atom systems. The hybrid system promises pair-wise tunability of long-range interactions between atomic pseudo spins, allowing studies of quantum magnetism extending far beyond nearest neighbor interactions. In this talk, we will discuss our current status developing high quality nanophotonic ring resonators, engineered on CMOS compatible optical chips with integrated nanostructures that, in combination with a side illuminating beam, can realize stable atom traps approximately 100nm above the surface. We will report on our progress towards loading arrays of cold atoms near the surface of these structures and studying atom-atom interaction mediated by photons with high cooperativity.

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