Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Negative refraction and photonic-crystal optics in cold atomic gases MARINA LITINSKAYA, EVGENY SHAPIRO, University of British Columbia — Negative refraction of light is a fascinating phenomenon, since recently available in artificial solids, but not yet achieved in gases. We have shown that negative refraction can be realized in a periodically modulated cold atomic gas, in the setup similar to the scheme developed for photonic crystals. However, the intuition coming from photonic crystal optics encounters three challenges: poorly defined gas boundary and weak gas-light coupling combined with strong resonant absorption. To account for the indistinct boundary, we derive an analog of the quantum adiabatic theorem for coupled propagation of normally and negatively refracting modes and study the dynamics of energy transfer between them. We demonstrate that, by adjusting the parameters of the zones where light enters and exits the gas cloud, one can realize almost loss-less propagation of negatively refracted light in strongly absorbing gas at experimental parameters currently existing in many labs.

Marina Litinskaya
University of British Columbia

Date submitted: 29 Jan 2020 Electronic form version 1.4