Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Epsilon-near-Zero Metamaterial to break the FRET distance barrier[1] RAHUL DESHMUKH, The City College of New York and Graduate Center of CUNY, SVEND-AGE BIEHS, Carl von Ossietzky Universitt, EMAAD KHWAJA, Macaulay Honors College at City University of New York, GIRISH AGARWAL, Texas A and M University, VINOD MENON, The City College of New York and Graduate Center of CUNY — Forster Resonance Energy Transfer (FRET) in a donor acceptor pair is a tool widely used as a spectroscopic ruler in biology and related fields. The high sensitivity to distance change in this technique comes at the expense of limitation on the spatial range (10nm) that can be measured. Here we present an alternate approach where the epsilon-near-zero (EnZ) regime in a metamaterial is used to break the FRET distance limit. We show long range (160nm) energy transfer in a donor acceptor pair across the EnZ metamaterial as proof-of-principle. This scheme can be implemented for any donor acceptor pair by tailoring the metal fill-fraction in the metamaterial design appropriately. The experimental data includes change in donor lifetimes as well as increase in the steady state emission of the acceptor. We also show theoretical simulations which suggest that the EnZ regime is the most effective in mediating such long-range energy transfer as compared to Hyperbolic/Elliptical regimes in metamaterials.

[1]NSF DMR 1410249

Vinod Menon
The City College of New York and Graduate Center of CUNY

Date submitted: 11 Nov 2016 Electronic form version 1.4