1137-65-306 **Vrushali A Bokil*** (bokilv@math.oregonstate.edu), **Yingda Cheng**, **Yan Jiang**, **Fengyan Li** and **Puttha Sakkaplangkul**. *High Spatial Order Energy Stable FDTD Methods for Maxwell's Equations in Nonlinear Optical Media.*

We consider electromagnetic (EM) wave propagation in nonlinear optical media in one spatial dimension, modeled by the time-dependent Maxwell's equations coupled with a system of nonlinear ordinary differential equations (ODEs) for the response of the medium to the EM waves. The nonlinearity in the ODEs describes the instantaneous electronic Kerr response and the residual Raman molecular vibrational response. The ODEs also include the single resonance linear Lorentz dispersion. For this model, we will design and analyze fully discrete finite difference time domain (FDTD) methods that have arbitrary (even) order in space and second order in time. We present novel modifications of second-order leap-frog and trapezoidal temporal schemes within the framework of FDTD methods. We present fully discrete modified leap-frog FDTD methods which are proved to be stable under appropriate CFL conditions. These method can be viewed as an extension of the Yee-FDTD scheme to this nonlinear Maxwell model. We also design fully discrete trapezoidal FDTD methods which are proved to be unconditionally stable. The performance of the fully discrete FDTD methods are demonstrated through numerical experiments involving kink, antikink waves and third harmonic generation in soliton propagation. (Received February 06, 2018)