Contribution ID: **82** Type: **Poster**

# A Numerical Investigation of Enhanced Second-Harmonic Generation in One-Dimensional PIM/NIM Structure

In this paper, we demonstrate a numerical investigation of an enhanced second-harmonic generation (SHG) effect in a one-dimensional positive-index material/negative-index material (1D-PIM/NIM) structure with nonlinear deep grating. The 1D-PIM/NIM structure composed of common linear PIM layers and NIM layers, whose electric permittivity and magnetic permeability are described by Lorentz dispersion model for allowing negative refractive index behavior, doped with nonlinear chi(2) material in periodically arrangement. To model SHG phenomenon, we develop a completed set of nonlinear coupled-mode equations (NCMEs) by perturbing nonlinear wave equation by a small factor with appropriate scale following a way of multiple-scale analysis (MSA). Then, we solve the NCMEs to obtain the second-harmonic output fields and conversion efficiency. We also discuss a backward phase-matching (BPM) condition, which is satisfied by tuning a fundamental frequency (FF) in a negative refractive index region and second-harmonic (SH) frequency in a positive refractive index region, and band-edge field enhancement condition, which is created by rearranging PIM and NIM layers in optimal periodic fashion. By using both conditions, a conversion efficiency of SHG can be dramatically improved comparing with SHG conversion efficiency of an equivalent length generic nonlinear NIM structure.

**Author:** WICHARN, Surawut

**Presenter:** WICHARN, Surawut

**Track Classification:** Theory and simulation related to nanosystem