

8<sup>th</sup> International Conference and Exhibition on

# LASERS, OPTICS & PHOTONICS

November 15-17, 2017 | Las Vegas, USA

## Broadband non-linear THz spectroscopy using gas plasma THz source

**Masashi Yamaguchi**

Rensselaer Polytechnic Institute, USA

THz spectroscopy has been playing a crucial role in the characterization of materials and chemical/biological sensing because of the abundance of information can be obtained through the excitations and resonant interactions in THz frequency range. Recent development of bright THz sources made it possible to explore the interaction of THz field and materials beyond the linear regime. So far, most of nonlinear THz spectroscopy has been demonstrated using solid state THz emitter in either low frequency or high frequency side of so called THz gap. This is mainly due to the bandwidth limitations of these solid state THz sources. The laser-induced gas plasma source has intense and broad bandwidth covering entire THz gap region without hindered by the phonon absorption in THz emitter itself. In this presentation, frequency resolved THz z-scan spectroscopy and two-dimensional THz spectroscopy using laser induced gas plasma source are demonstrated and discussed. Electronic and phononic contributions were resolved in broadband THz transmission spectra. The field dependence of the spectra showed the apparent existence of THz nonlinear contributions and these contributions are attributed to the combinational mode of zone boundary LA phonons. Two-dimensional THz spectroscopy in THz gap-region was demonstrated using much lower THz field (100 kV/cm) than previous reported (1MV) for higher frequency range (>20THz) in InSb. The utility of broadband nonlinear THz spectroscopy using laser-induced gas plasma provides a way to inspect and evaluate materials in more details.

### Biography

Masashi Yamaguchi is currently working as an Associate Professor at the Department of Physics, Applied Physics and Astronomy, Rensselaer Polytechnic Institute. He received his PhD from Hokkaido University and performed his Post-doctoral research at University of California Riverside and Massachusetts Institute of Technology. His expertise include research in ultrafast optical, THz and acoustic spectroscopy; current interests include development of gas plasma THz radiation source and its applications to nonlinear THz spectroscopy and phonon transport in periodic nanostructures. He has over 70 publications.

yamagm@rpi.edu

### Notes: