

# Special Lecture at Keio University (Yagami campus)

【2019/12/18 (Wed.) 13:00-15:00】 @[16-A 棟\(厚生棟\)](#) 3F 大会議室

## Terahertz light fields, THz light-matter interactions, and THz nonlinear spectroscopy

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### Abstract

The development of tabletop sources of intense terahertz (THz) pulses has enabled rapid advances in nonlinear THz spectroscopy and novel THz field control over molecules and materials. Terahertz fields can be used to drive collective and molecular electronic, vibrational, and spin responses as well as gas-phase molecular rotations. In some cases, far-from-equilibrium responses including electronic and structural phase transitions and drastic changes in electronic energetics and spectra can be induced by THz fields.

Generation and enhancement of strong THz fields will be discussed briefly, and THz light-matter interactions will be reviewed. Examples of highly nonlinear responses to THz electric fields, including transient or permanent phase transitions in several prototype quantum materials, electroluminescence and colossal Stark shifts of quantum dots, and will be shown. Localized and collective spin responses to THz magnetic fields and nonlinear THz electron paramagnetic spectroscopy (EPR) of magnons will also be illustrated. Measurement of THz-induced responses using THz, optical, and x-ray probes will be presented.

### References

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- [3] B. C. Pein, C. K. Lee, L. Shi, J. Shi, W. Chang, H. Y. Hwang, J. Scherer, I. Coropceanu, X. Zhao, X. Zhang, V. Bulović, M. G. Bawendi, A. P. Willard, and K. A. Nelson, "Terahertz-Driven Stark Spectroscopy of CdSe and CdSe-CdS Core-Shell Quantum Dots," [Nano Lett.](#) **19**, 8125 (2019).
- [4] X. Li, T. Qiu, J. Zhang, E. Baldini, J. Lu, A. M. Rappe, and K. A. Nelson, "Terahertz field-induced ferroelectricity in quantum paraelectric SrTiO<sub>3</sub>," [Science](#) **364**, 1079 (2019).