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# “Coherent control of metamaterial functions in standing waves”

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University of Southampton)**

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場所：東京大学理学部1号館2階201A号室

## Abstract

Metamaterials, artificial materials with engineered subwavelength nanostructures, can possess optical functions unavailable for natural materials. Tuning these functions is highly desired in many applications. Although various methods have been reported, they often have limited performance in switching speed, energy consumption, and modulation depth. In this talk, I will present our recent results on a new control method, coherent control, which allows for switching at THz frequency and single-photon level with near-unity modulation. The method uses coherent light beams to create standing waves with various electromagnetic field configurations. We have demonstrated in both theory and experiment several possible applications including optical computation [1,2], multipole spectroscopy [3], and polarization-sensitive detection [4].

## References

- [1] X. Fang, M. L. Tseng, J. Y. Ou, K. F. MacDonald, D. P. Tsai & N. I. Zheludev. Ultrafast all-optical switching via coherent modulation of metamaterial absorption. *Appl. Phys. Lett.* 104, 141102 (2014).
- [2] X. Fang, K. F. MacDonald & N. I. Zheludev. Controlling light with light using coherent metadevices: all-optical transistor, summator and inverter. *Light: Sci. & Appl.* 4, e292 (2015).
- [3] X. Fang, M. L. Tseng, D. P. Tsai & N. I. Zheludev. Coherent excitation-selective spectroscopy of multipole resonances. *Phys. Rev. Appl.* (accepted).
- [4] X. Fang, E. Plum, K. F. MacDonald & N. I. Zheludev. Coherent control of light-matter interactions in polarization standing waves (under review).

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