Carrier concentration dependence of the tunability of the dipole resonance peak in optically excited metamaterials IOANNIS CHATZAKIS, LIANG LUO, JIGANG WANG, NIAN HAI SHEN, THOMAS KOSCHNY, COSTAS SOUKOULIS, Department of Physics and Astronomy and Ames Laboratory, Iowa State University, Ames, Iowa 50011, USA — Currently, there is strong interest to explore the dynamic control of the electromagnetic properties of metamaterials, which have important implications on their optoelectronic applications. While the design, fabrication and photo-doping of metamaterial/semiconductor structures have been actively pursued, some fundamental issues related to highly photo-excited states, their dynamic tuning and temporal evolution remain open. Using optical-pump terahertz probe spectroscopy, we report on the pump fluence dependence of the electric dipole resonance tunability in metamaterials. We find a previously undiscovered large non-monotonic variation on the strength of the dipole resonance peak with the photo-injected carrier concentration.

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