Impact ionization in high resistivity silicon induced by an intense terahertz field enhanced by an antenna array - DTU Orbit (27/12/2018)

Impact ionization in high resistivity silicon induced by an intense terahertz field enhanced by an antenna array

We report on the observation of ultrafast impact ionization and carrier generation in high resistivity silicon induced by intense subpicosecond terahertz transients. Local terahertz peak electric fields of several MV cm$^{-1}$ are obtained by field enhancement in the near field of a resonant metallic antenna array. The carrier multiplication is probed by the frequency shift of the resonance of the antenna array due to the change of the local refractive index of the substrate. Experimental results and simulations show that the carrier density in silicon increases by over seven orders of magnitude in the presence of an intense terahertz field. The enhancement of the resonance shift for illumination from the substrate side in comparison to illumination from the antenna side is consistent with our prediction that the back illumination is highly beneficial for a wide range of nonlinear processes.

General information
State: Published
Organisations: Department of Photonics Engineering, Terahertz Technologies and Biophotonics, Plasmonics and Metamaterials
Contributors: Tarekegne, A. T., Iwaszczuk, K., Zalkovskij, M., Strikwerda, A., Jepsen, P. U.
Number of pages: 9
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: New Journal of Physics
Volume: 17
Article number: 043002
ISSN (Print): 1367-2630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.28 SJR 1.653 SNIP 1.102
Web of Science (2017): Impact factor 3.579
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.97 SJR 2.183 SNIP 1.173
Web of Science (2016): Impact factor 3.786
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.8 SJR 2.33 SNIP 1.157
Web of Science (2015): Impact factor 3.57
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.89 SJR 2.917 SNIP 1.335
Web of Science (2014): Impact factor 3.558
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.77 SJR 2.87 SNIP 1.352
Web of Science (2013): Impact factor 3.671
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.4 SJR 3.368 SNIP 1.517
Web of Science (2012): Impact factor 4.063
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 3.99 SJR 3.489 SNIP 1.626
Web of Science (2011): Impact factor 4.177