Plasmonic Effects for Enhanced Optical Mixing in view of THz Signal Generation

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First various graphene realizations of electronic circuitry examples are described. These represent application examples for the new material graphene.

Then compact THz sources are presented involving optical laser mixing, where resonant plasmonic structures at THz and optical frequencies are used to locally enhance the electromagnetic fields. Of additional particular interest is the usage here of graphene, which is optically transmitting and which is either a semimetal or which can be transformed into a semiconductor by reducing the width of its strips to several tens of nm, opening a band gap in the meV to tens of meV range. Continuous-wave THz photomixers were fabricated using Ag nanowires with diameters of 60 nm or 120 nm on low-temperature-grown (LTG) GaAs covered by graphene sheets and increased THz emission power was obtained due to these plasmonic effects.. In order to obtain acceptable power levels of such components, matrices of components in series and in parallel have to be implemented.

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