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Chaotic electrodes in photoconductive antenna for the enhancement of coherent terahertz beam DONG HO WU, BENJAMIN GRABER, LOUIS PECORA, CHRISTOPHER KIM, Naval Research Laboratory — In a curved waveguide trajectories of a particle (or eigenmodes of a wavefunction) diverge or converge exponentially with time so that the Lyapunov coefficient becomes larger or smaller than zero. Hence particles (or wave functions) tend to spread out with a convex waveguide or to concentrate with a convex shape waveguide. With a rippled waveguide containing both convex and concave shapes, one can control such divergent and convergent dynamic behavior of particles to modulate and concentrate them in particular locations. For the development of a new terahertz photoconductive antenna, we exploited such chaotic dynamics. A pair of chaotic electrodes in the photoconductive antenna drives thermal electrons away from the surface plasma producing a primary terahertz beam and makes the electrons to concentrate in locations slightly away from the plasma. While it minimizes the thermal electrons disrupting the plasma, the localized and concentrated electrons can be stimulated by the primary terahertz beam, and generate additional, spontaneous, coherent terahertz radiations through the process known as the Dicke superradiance. Hence our new photoconductive antenna with a pair of chaotic electrodes generates a noticeably enhanced coherent terahertz beam.

Dong Ho Wu
Naval Research Laboratory

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