Guiding and focusing light at THz frequencies by using a plasmonic metawire

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One of the promises made for the future is that photons will replace electrons in miniaturized photonic circuits. In principle, a metal cylindrical wire is an ideal device to send light signals as this structure can sustain the propagation of light along its surface via the excitation of a type of surface electromagnetic waves called surface plasmons (SPs). However, there is a basic problem: SPs offer subwavelength confinement at the surface only at light frequencies close to the plasma frequency of the metal. Our idea to overcome this limitation for microwave or THz frequencies is to create a kind of metal metawire by corrugating its surface with a periodic array of radial grooves [1]. In this way, the propagation characteristics of the SPs can be controlled by the geometry of the array, opening the way to many important applications as superfocusing of light at the tip of a conical corrugated wire.

[1] S.A. Maier, S.R. Andrews, L. Martin-Moreno, and F.J. Garcia-Vidal, Phys. Rev. Lett. **97**, 176805 (2006).