Modified field enhancement and extinction by plasmonic nanowire dimers due to nonlocal response

We study the effect of nonlocal optical response on the optical properties of metallic nanowires, by numerically implementing the hydrodynamical Drude model for arbitrary nanowire geometries. We first demonstrate the accuracy of our frequency-domain finite-element implementation by benchmarking it in a wide frequency range against analytical results for the extinction cross section of a cylindrical plasmonic nanowire. Our main results concern more complex geometries, namely cylindrical and bow-tie nanowire dimers that can strongly enhance optical fields. For both types of dimers we find that nonlocal response can strongly affect both the field enhancement in between the dimers and their respective extinction cross sections. In particular, we give examples of blueshifted maximal field enhancements near hybridized plasmonic dimer resonances that are still large but nearly two times smaller than in the usual local-response description. For the same geometry at a fixed frequency, the field enhancement and cross section can also be significantly more enhanced in the nonlocal-response model.