

## ***Topological plasmons in a dimerized chain of metallic nanoparticles***

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We consider a dimerized chain of metallic nanoparticles, each supporting a localized surface plasmon, and study the quantum properties of the collective plasmons resulting from the near-field dipolar interaction between the nanoparticles. We analytically investigate the dispersion, the effective Hamiltonian, and the eigenstates of the collective plasmon.

At the edge of the Brillouin zone, the spectrum is of a quasi-relativistic nature similar to that present in the electronic band structure of polyacetylene. We derive the effective Dirac Hamiltonian for the collective plasmons and show that the corresponding spinor eigenstates represent one-dimensional Dirac-like massive bosonic excitations. Therefore, we uncover similar effects to those found for electrons in 1D Dirac materials, such as the ability for transmission with suppressed backscattering, due to Klein tunnelling.

In analogy with the Su-Schrieffer-Heeger model, we find a nontrivial Zak phase in a certain dimerization regime, which predicts the manifestation of edge states in the system. These edges are found numerically by diagonalization of the Hamiltonian with pseudo-unitary matrices, as is required for bosonic particles. Furthermore, when two plasmonic chains living in different topological phases are connected, we find the appearance of the bosonic version of a Jackiw-Rebbi midgap state. We treat losses in the chain by way of both radiation and Landau damping and comment on the challenges for experimental realization of the Dirac and topological effects found theoretically.