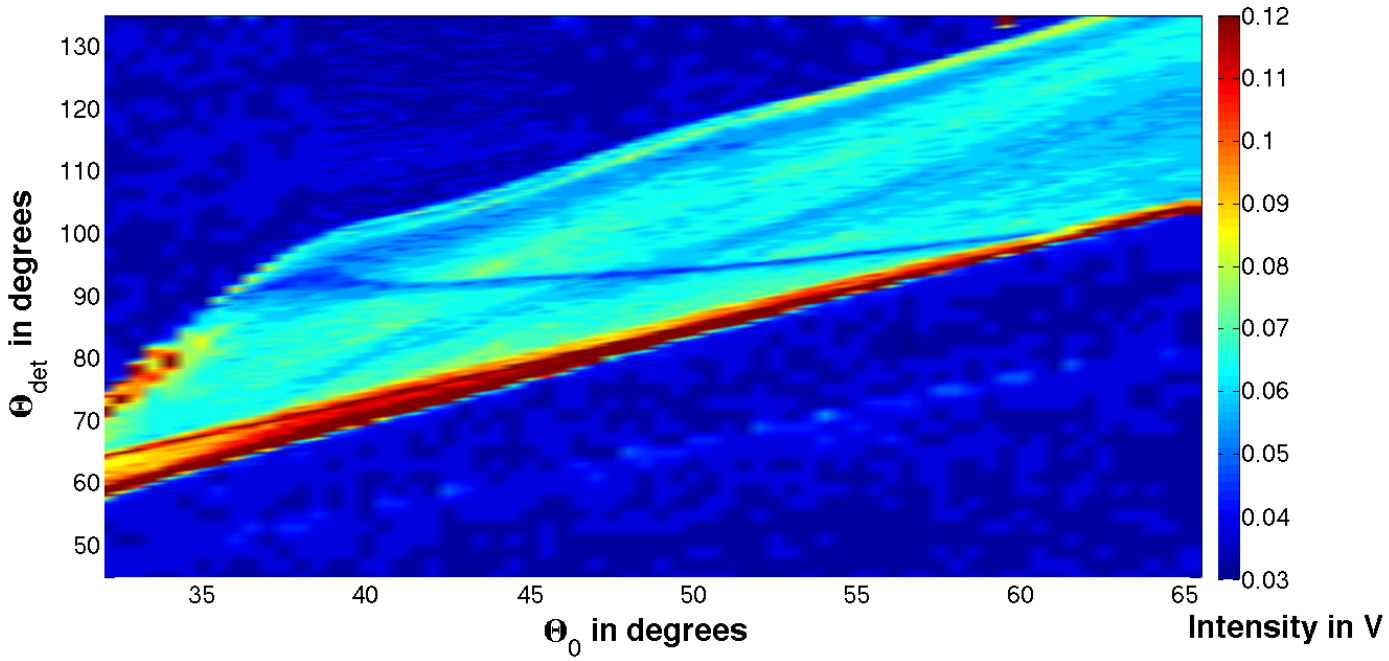
Theoretical and experimental demonstration of broad-angle coupling of Surface Plasmon Polaritons using shaped PDMS prisms

Abstract

Surface Plasmon Polaritons have been subject of vast research in the past years, and have applications within many fields including Biosensors, Waveguides, SERS, Solar Cells and Data Storage. In this letter, we have theoretically and experimentally demonstrated that broad-angle SPP coupling can be achieved using circular PDMS prisms in a Kretschmann-like configuration. In theory, we have predicted that such a coupler should be operational for angles of incidence between ~0°-80°, and we have demonstrated coupling between ~35°-60° experimentally. We also show that these systems could lay the foundation for a scalable configuration allowing broad-angle and broadband coupling on flexible substrates. This is particularly interesting, especially considering the fast growth of the field of flexible electronics.



Intensity of the light transmitted from the prism vs. the angle of incidence Θ_0 and the detector position Θ_{det}.