Geometries for surface plasmon-polariton amplification in the context of the project NAVOLCHI

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Surface plasmon-polaritons (SPPs) and plasmonic devices have been attracting a lot of attention lately because they allow for propagation and manipulation of optical signals in subwavelength scales. However, SPPs suffer from significant losses due to the fact that part of the signal propagates inside the heavily lossy metal. To combat this effect, SPP amplifiers are built by utilizing amplification materials adjacent to the metal. In the context of EU-funded project NAVOLCHI, the amplification material is built by incorporating colloidal quantum dots in a polymer. In this work, we examine three plasmonic structures that can be utilized as SPP amplifiers. We examine the SPP propagation characteristics in each device under amplification by solving numerically the dispersion relations at hand. We then study their properties and limitations as amplifiers, and we compare their amplification and propagation length potential. Initial experimental results on amplification within the context of NAVOLCHI are also included.