

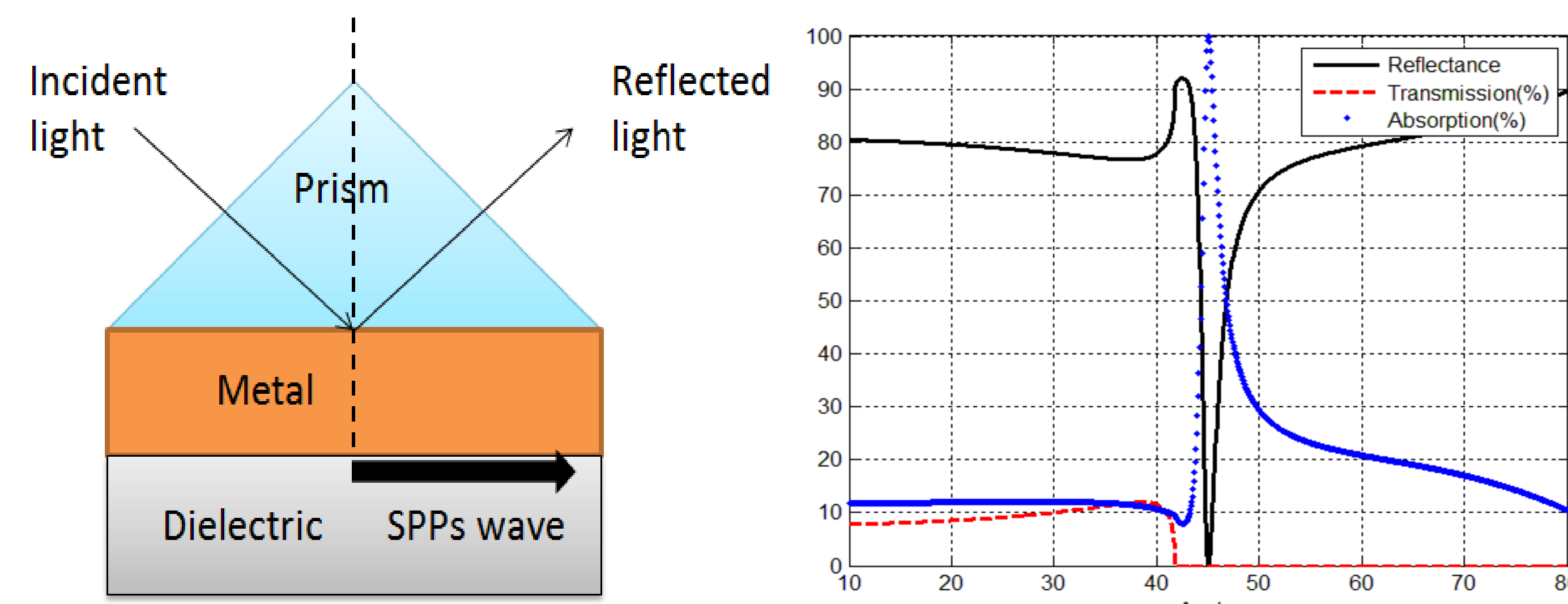
Numerical study on the characteristics of metal-insulator-metal diode integrated with spiral optical antenna

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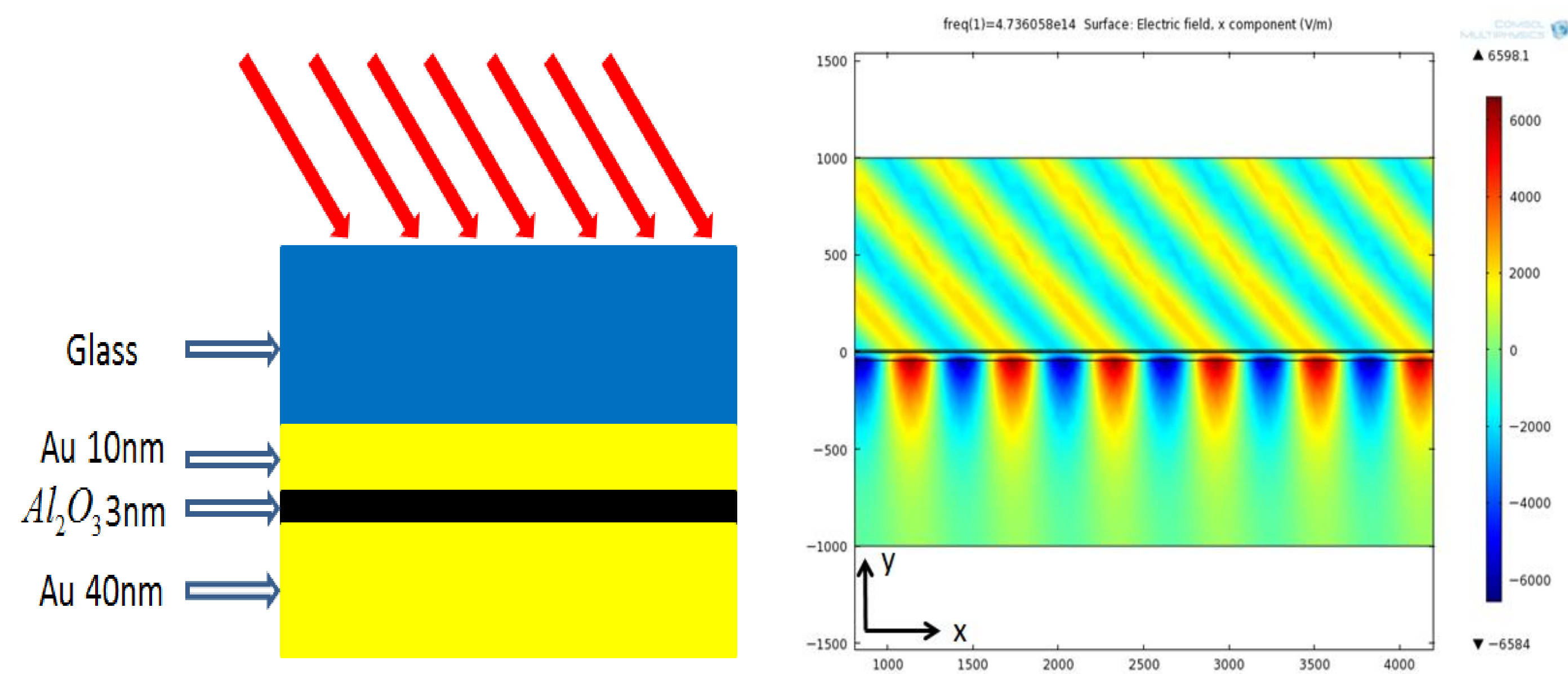
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Objective: Integrates MIM structure with a spiral slot optical antenna to achieve both extremely high field enhancement and circular polarization extinction ratio.

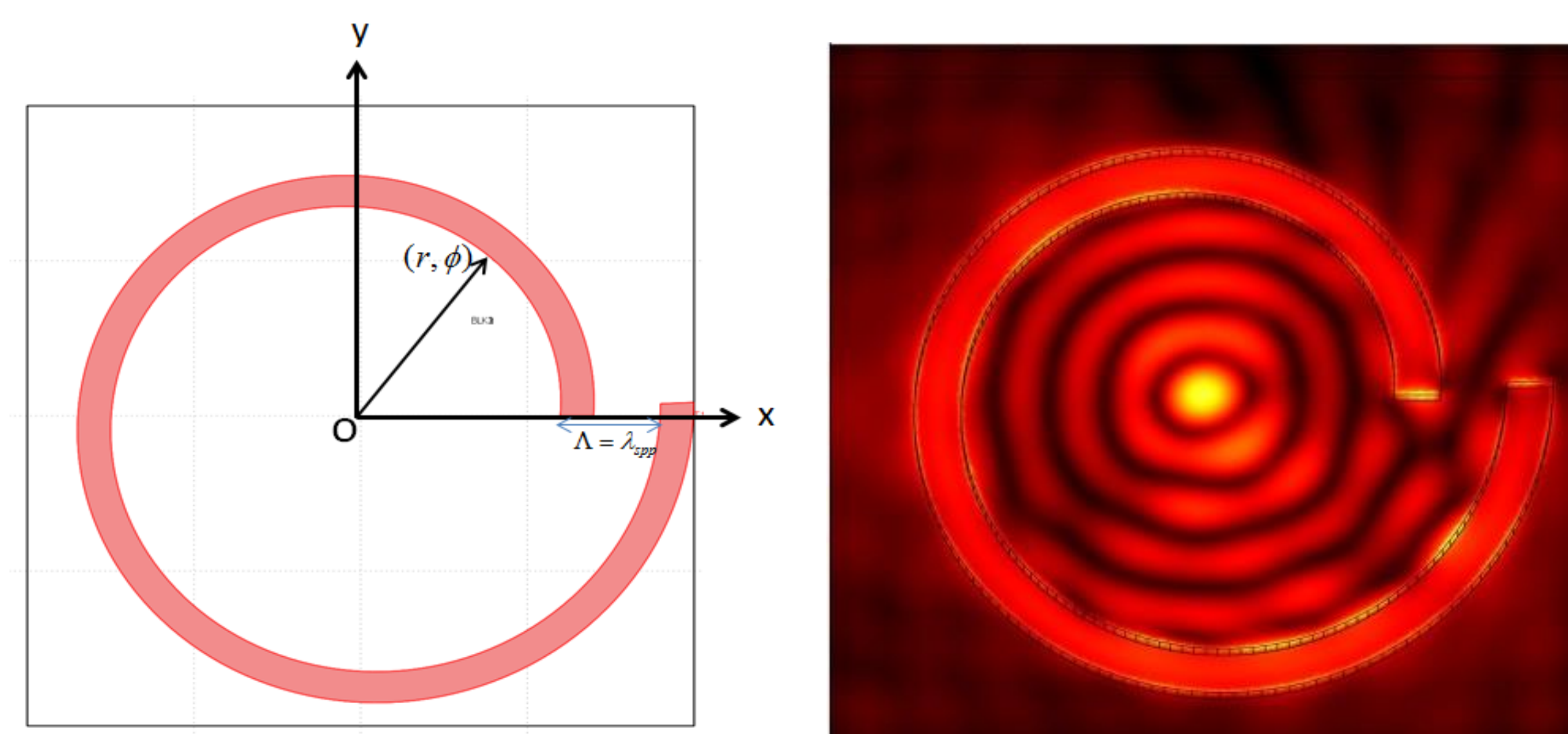
Surface plasma polaritons (SPPs) excitation



SPPs in planar MIM structure



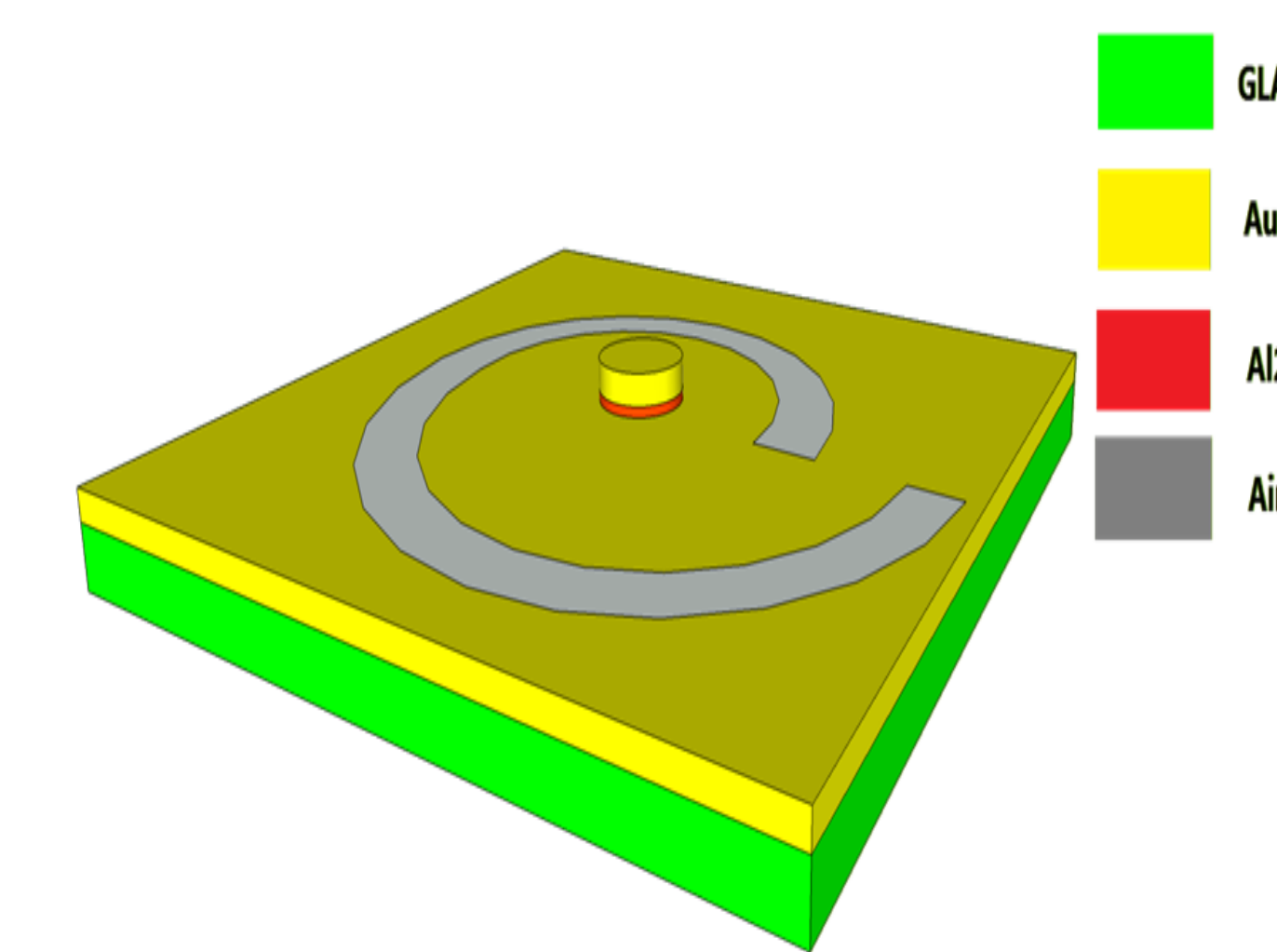
SPPs in spiral optical antenna



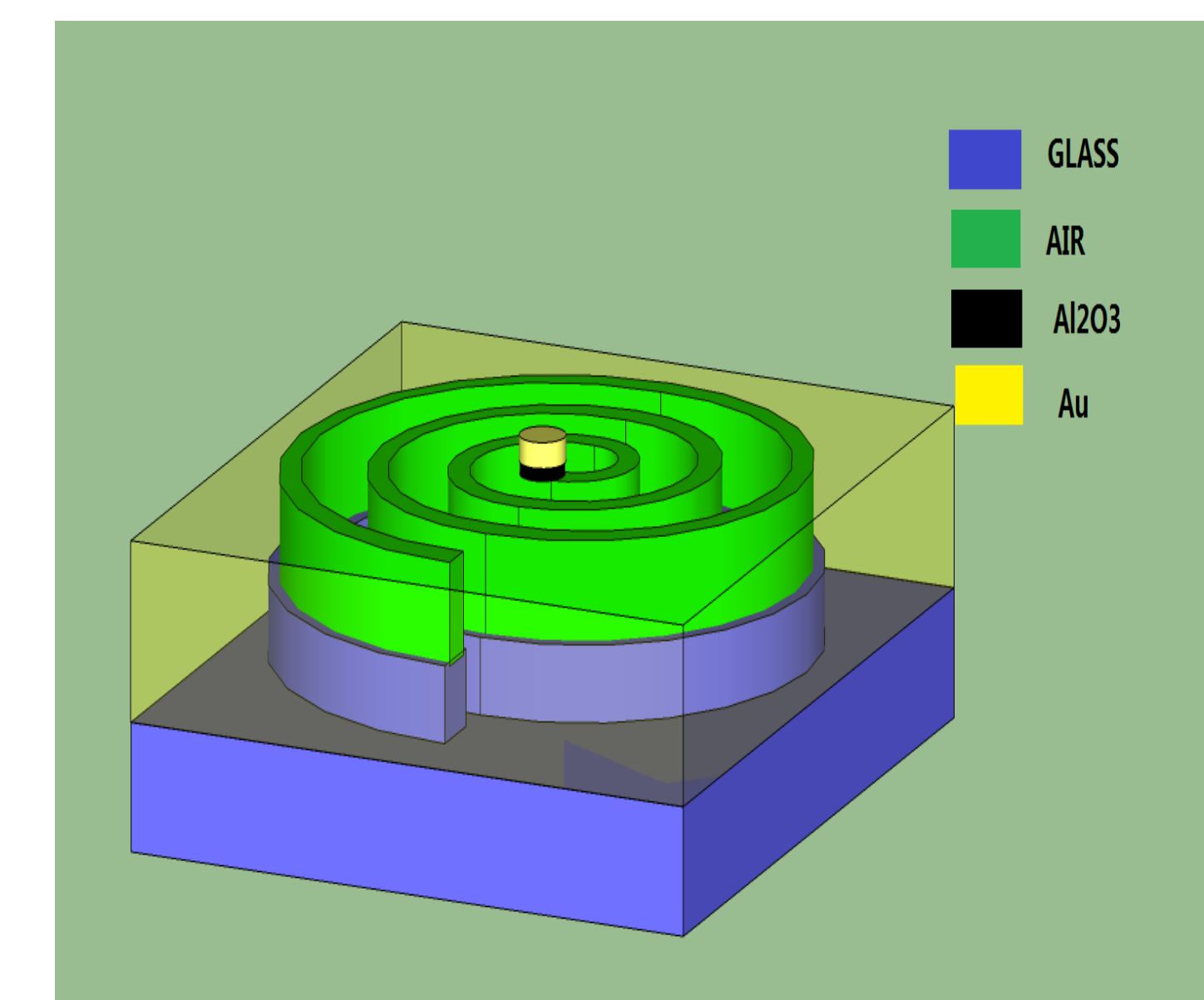
Method

Integrating MIM structure with spiral slot optical antenna structure. Specifically, small working area for the MIM structure is purposely designed to provide small mode volume for the SPPs wave and extremely high field enhancement is obtained with this design. Furthermore, a double-layer spiral slot optical antenna is adopted to get even higher field enhancement.

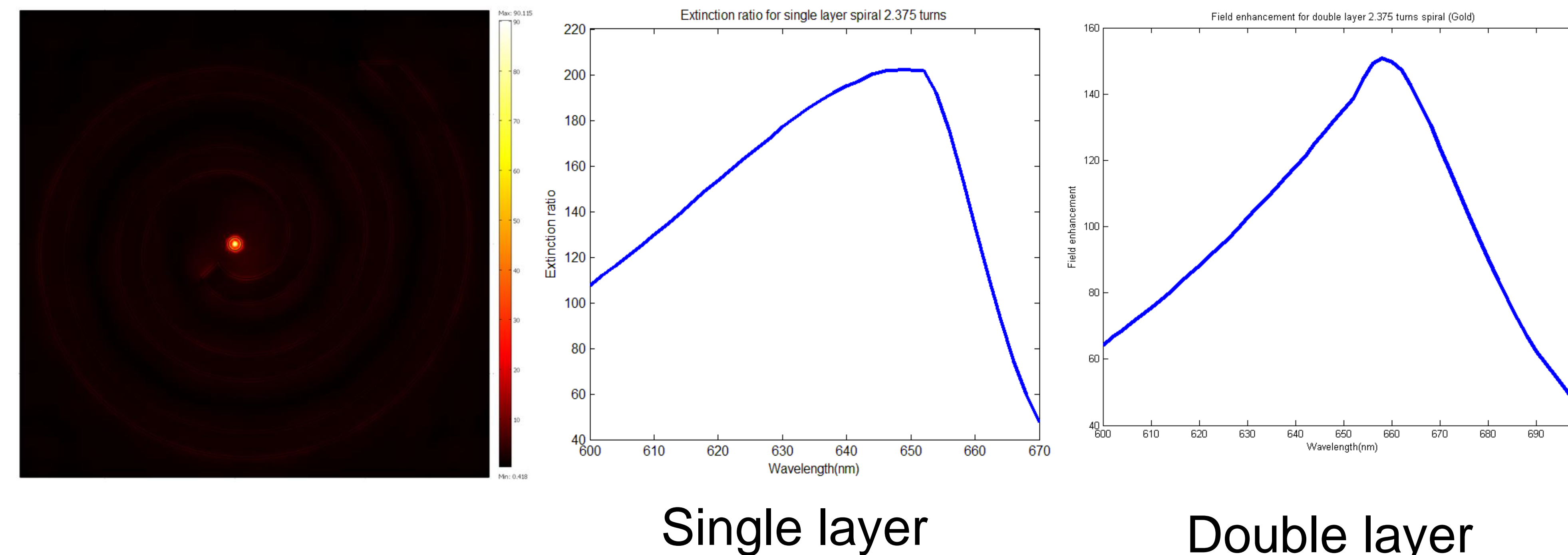
Single layer



Double layer



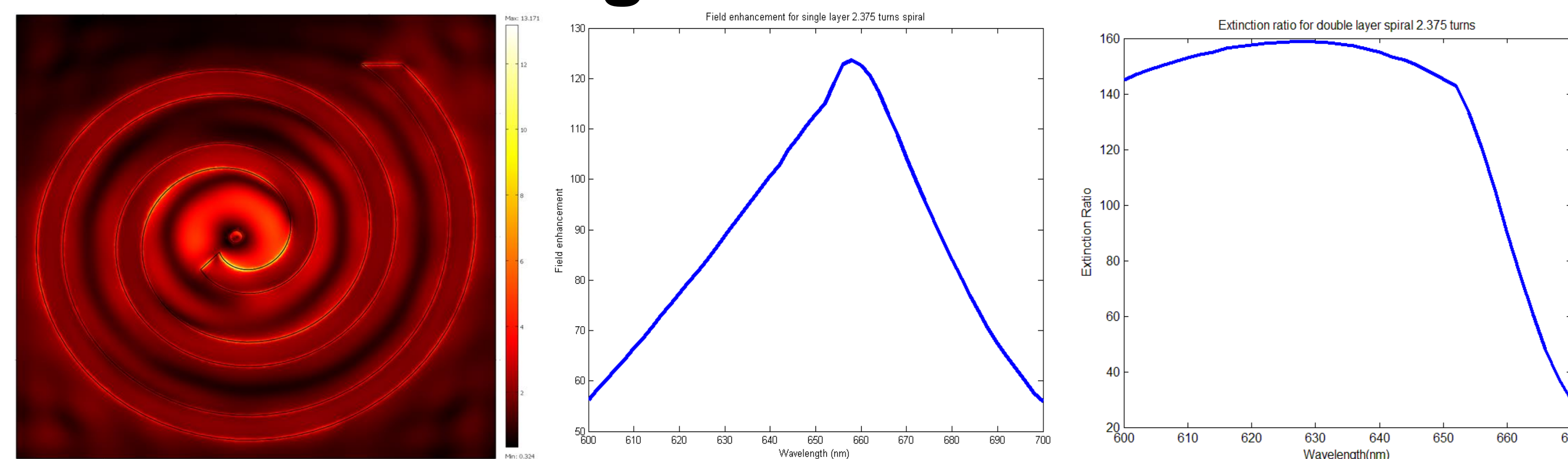
Results: High field enhancement



Single layer

Double layer

Results: High field enhancement



Single layer

Double layer

Conclusions

In conclusion, with numerical modeling it is demonstrated that extremely high field enhancement can be obtained for MIM devices through incorporating the latest development in optical antenna with the MIM diode. In addition, the device studied in this work can be optimized to offer distinction between the left-handed circular polarization state and the right-handed circular polarization state, making it an efficient miniature circular polarization analyzer.