# Manufacture-compliant InP-based metal cavity nanolaser design

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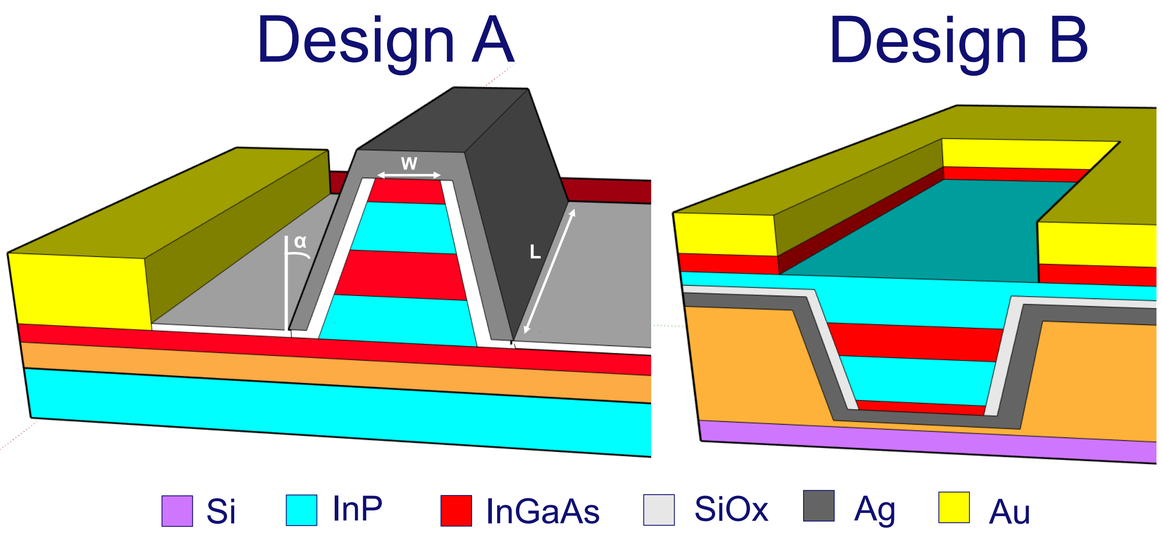
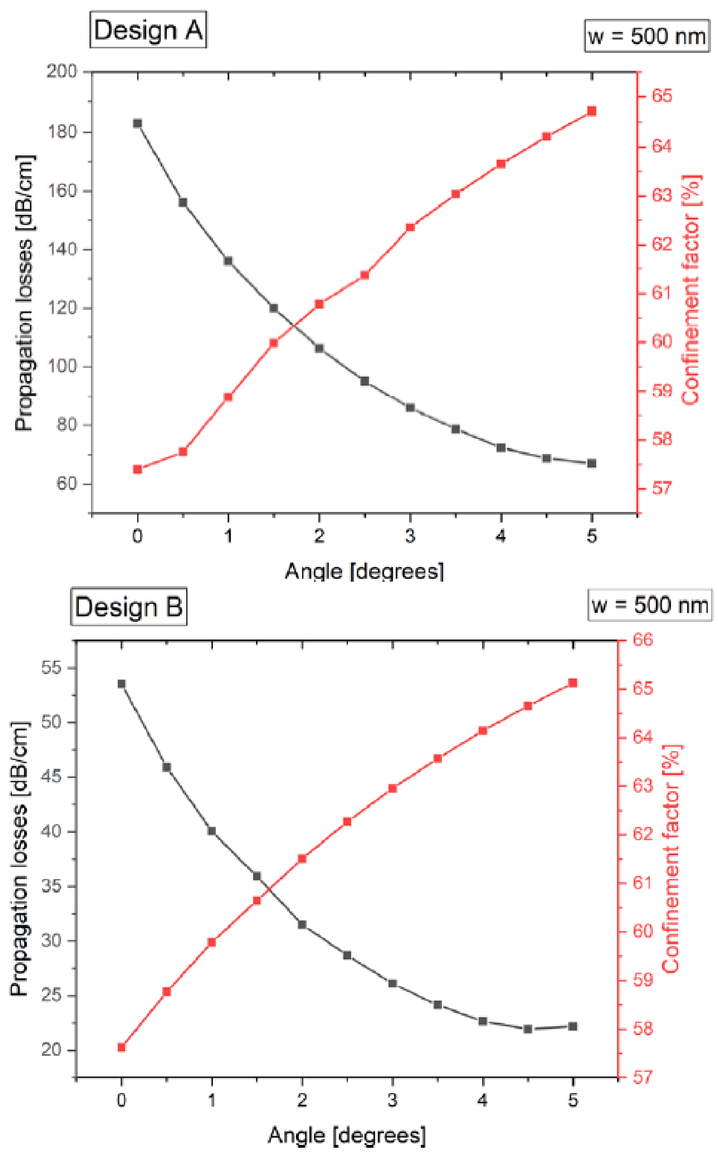
## INTRODUCTION

Nanolaser cavity structures are very sensitive to fabrication non-idealities, cavity sidewalls non-verticality in particular. In this work the influence of etching slopes on the lasing performance is studied, and novel nanolaser flipped cavity design on InP Membrane on Silicon platform with increased etching slopes tolerance is proposed.



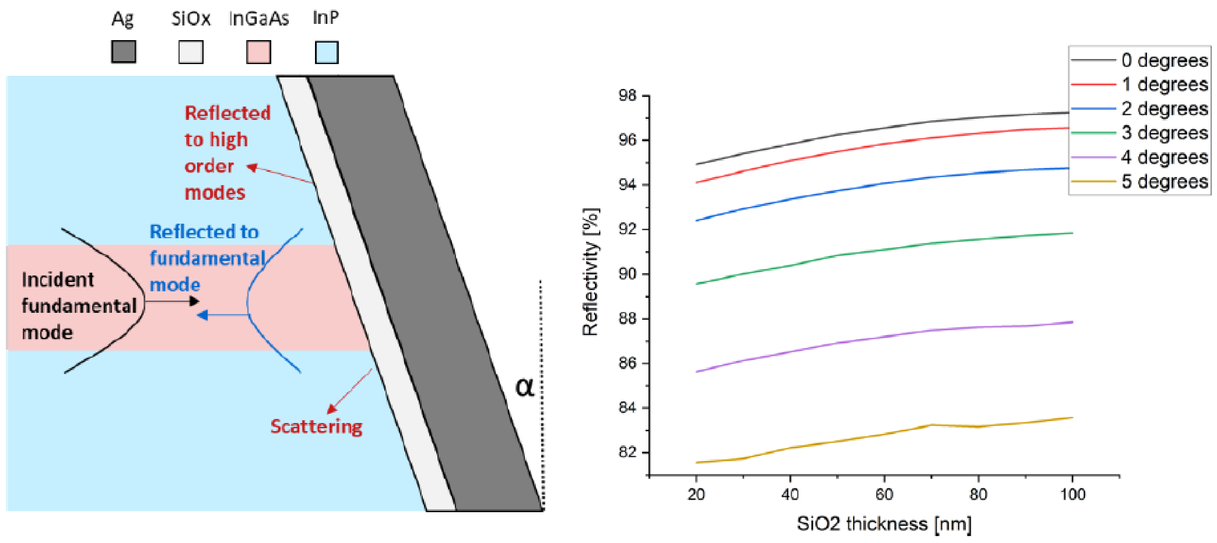

## MODE PROPAGATION

To investigate the effects of the etching slopes on the laser cavity for different designs, mode analysis was done for different inclination angles α and cavity widths w.



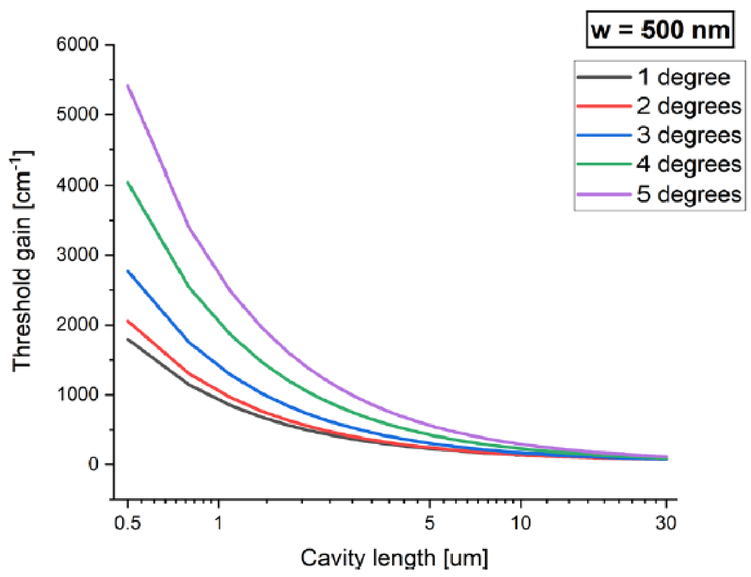

## FACETS REFLECTIVITY

Due to the tilted reflective surface, the mode is less efficiently coupled back to the fundamental mode upon reflection, and scattering losses are increasing. Effective reflectivity was calculated as a ratio of the optical power which is coupled back to the fundamental TE mode after the reflection to incident fundamental mode.




## THRESHOLD GAIN

Summing up all the losses contributions, the required gain to overcome the introduced losses was calculated.




## CONCLUSIONS

The effect of etching slopes in the laser cavity was numerically investigated, both in the transversal and longitudinal directions which affect the propagation loss and reflectivity, respectively. Despite the increase in mirror reflection loss, the reduction in propagation loss and improvement in confinement almost compensate it for small angles and large cavity lengths. The proposed flipped cavity design showed smaller propagation losses, and due to the fabrication on IMOS platform can be potentially compatible with nanophotonic waveguide.

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