A Novel Free-standing Evanescent Waveguide for Sensing

X. Meng, Y. Xin, P. French
Department of Microelectronics, Delft University of Technology, Delft, Netherland

Introduction: The surface of the functionalized waveguide can capture E.coli, which is sensed by the evanescent waves on both sides of the waveguide surface. By comparing the power from the transmitted path and reference path, concentration of E.coli can be obtained. To reduce the coupling losses and misalignment effect, tapered couplers are designed to be added to the input and output of the waveguide.

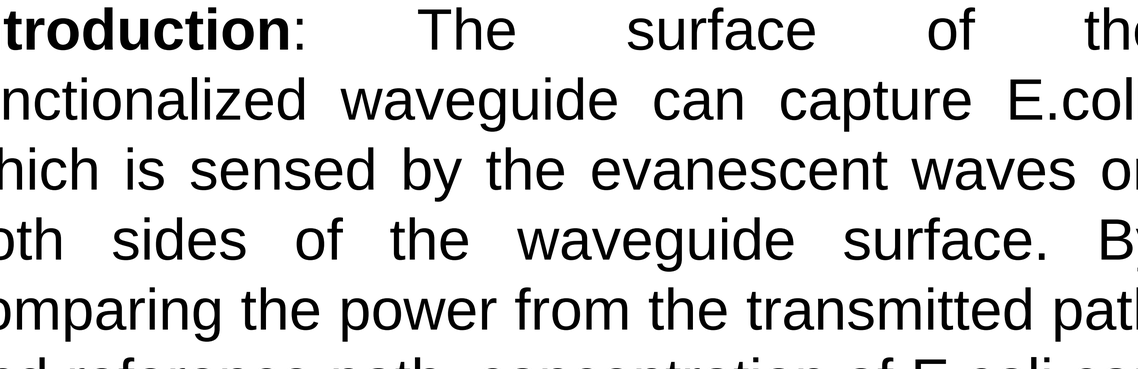

Figure 1. Schematic of evanescent waveguide

Computational Methods: A 2D simulation with effective refractive index method is set up. Two steps of Boundary Mode Analysis for both ports, and one step of Frequency Domain are brought in in Study.

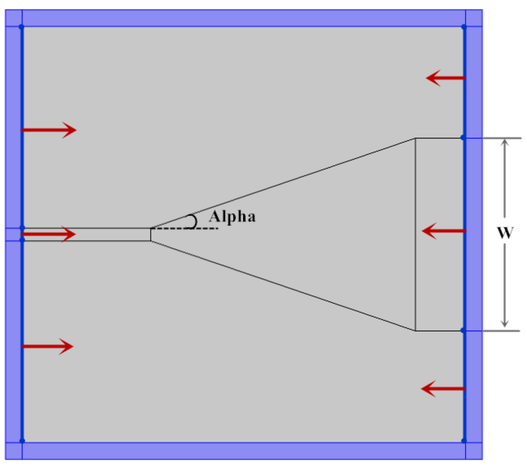

Figure 2. Port setting

Since higher order modes are not important for this simulation, the combination of Domain-backed type slit port and PMLs is used.

Results: The relationship between alpha and transmittance needs to be researched. 1D Plot Group is chosen for Parametric Solutions.

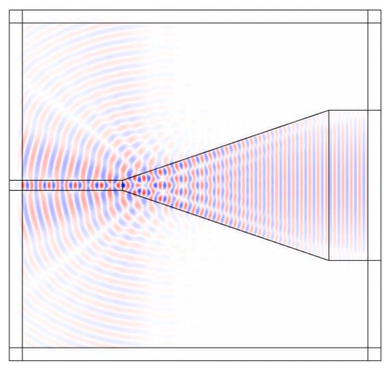

Figure 3. Electric field

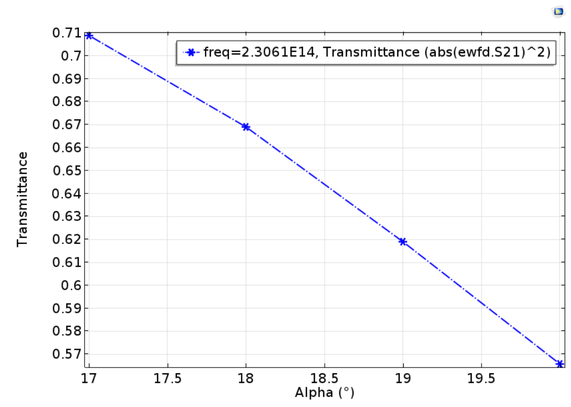

Figure 4. Transmittance vs Alpha

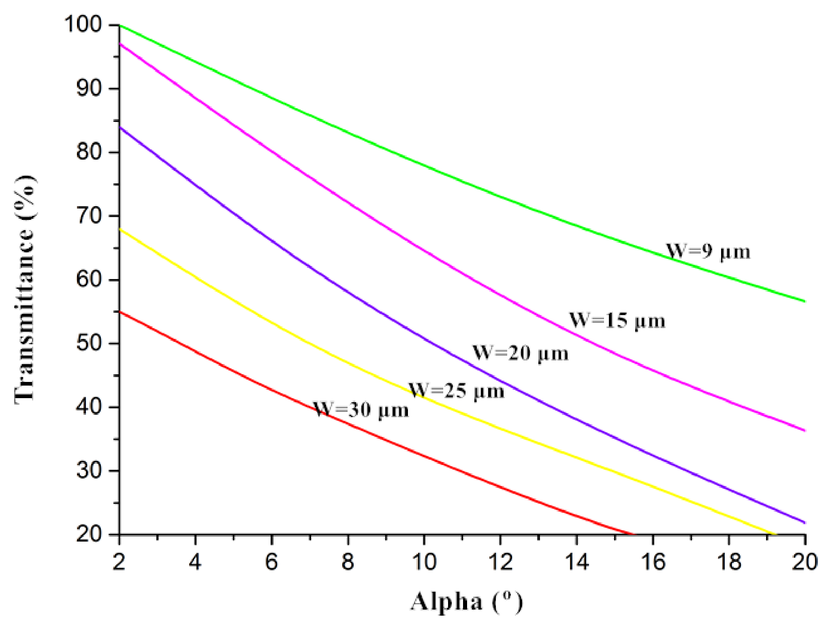

Figure 5. Transmittance varying on alpha&width

Conclusions: The simulation results indicated that when the width is less than 20 μm and the angle is less than 5 degrees, the transmittance is acceptable. In additional, considering the practical fabrication , the angle should not be too small both for size and energy transmission considerations.

References:

1. Yu Xin, Gregory Pandraud, Lukasz S. Pakula, Bruno Morana, Paddy J. French, Combination of LPCVD and PECVD SiC in fabricating evanescent waveguides, 2016 IEEE 11th Annual International Conference on NEMS , 549-552 (2016)