UPISC UNIVERSITY OF PITTSBURGH INFRASTRUCTURE SENSING COLLABORATION WORKSHOP

NATIONAL ENERGY TECHNOLOGY LABORATORY

Simulation of fiber optic Multimode Interferometer with COMSOL Multiphysics and its Application

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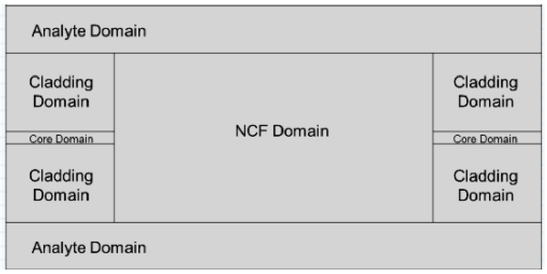
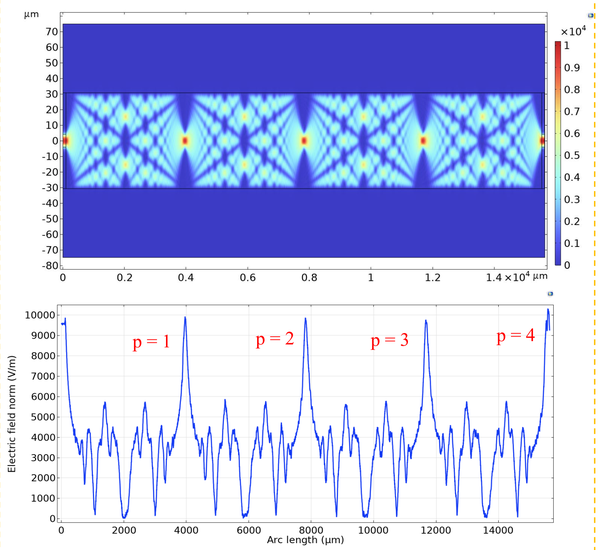
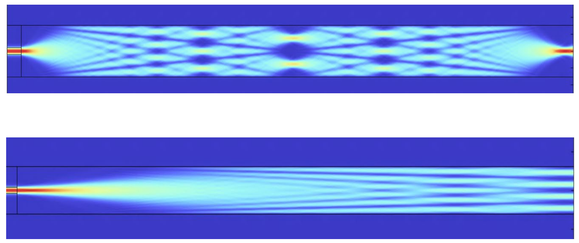




COMSOL version 6.1
Module : Wave optics
Domain : Electromagnetic Waves, Beam Envelopes (ewbe)

$$L_{MMF} = P\frac{n_1 D_{MMF}^2}{\lambda}$$

n_1 is the RI of core,
D_{MMF} is the diameter of MMF,
L_{MMF} is the MMF length,
P = 1,2,3….is an integer, representing the self-image order.



- When light is coupled from a SMF to a MMF/NCF, the modes that are supported by the MMF/NCF are excited and interferes with each other giving rise to an interference pattern along the MMF/NCF.
- At a certain length, light interferes constructively along the MMF/NCF central axis forming replicas of the input light field (self-image).
- If another SMF is connected to the MMF/NCF at the self-image point, multimode interference (MMI) information can be obtained.
- The self-imaging peaks are dependent on refractive index, wavelength, length and diameter of the MMF/NCF.

Acknowledgement
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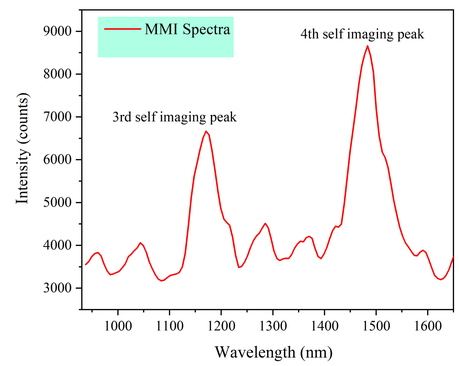
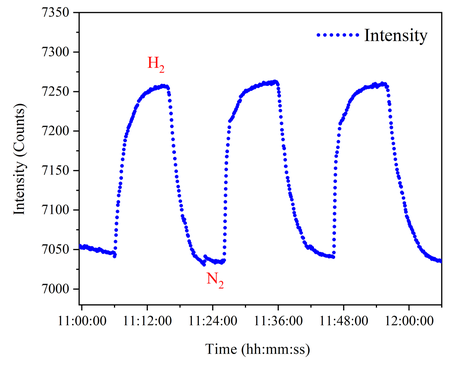
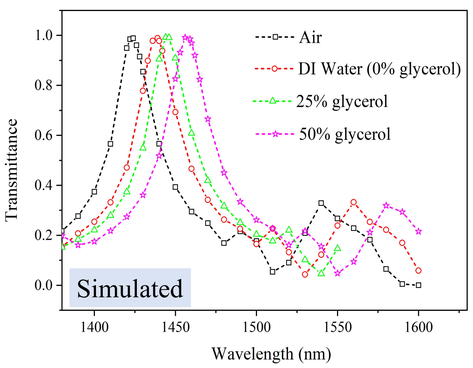
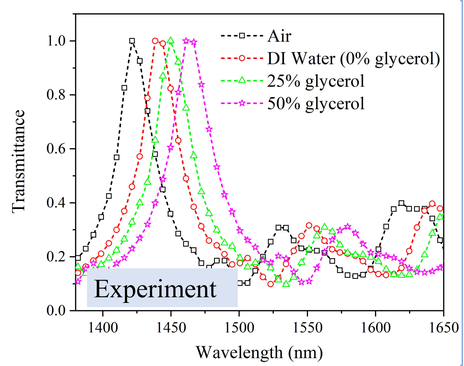
H_2 Sensing (80 μm NCF + Pd Thin Film)





RI Sensing (61.5 μm NCF)





Axial strain Sensing (105 μm MMF)