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Integrated optical cross-strip interferometers — modeling the lateral dimension

Candidate: — requested —
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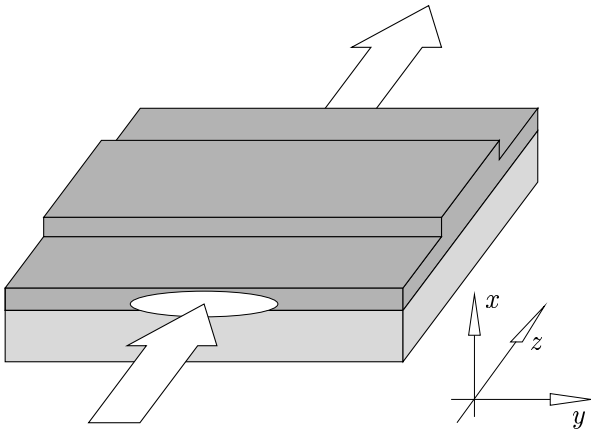
? ∈ IOMS, UT, Department of Electrical Engineering
Time: To be started as soon as possible.

Consider the following structure:



A wide, deeply etched rib is prepared using an air covered guiding dielectric film layer, the region indicated by the darker shading. Provided that the material and geometrical parameters are properly adjusted, this structure shows the characteristic properties of an interferometer, if a — vertically guided, laterally unguided — beam of light passes the structure in a direction *perpendicularly* to the rib.

In a two-dimensional setting, we have simulated structures of this kind, and found them to be quite promising for the realization of explicitely simple integrated optical devices (see the paper [1] on the polarizer proposal).

But what about the third, the lateral dimension (y) ?

Issues investigated in the course of the project could include

- Propagation of laterally unguided beams:
  - What are the relevant beam widths in the homogeneous slab regions?
  - What happens, if the beam enters/exits the thick segment (bimodal)
    - for perpendicular incidence, and
    - for angled incidence?
    - What about the polarization dependence?

  Does the nonuniformity in the lateral dimension affect significantly the interferometer properties, i.e. the performance of the proposed polarizer devices?
- For this concept to become a real integrated optical device, the light should be confined in the y-direction as well. Hence we would like to consider
  - a slightly etched, wide rib, or
  - a wide, weakly guiding lateral graded index profile

  along the light path, and determine the influence of these modifications on the interferometer performance.

Therefore, if you have some background in the concepts of optical waveguides (or think that you could find them interesting), if you know how to operate a C/C++ compiler or a simulation environment like MATLAB, and if you are interested in a modeling task that is located somewhere between Applied Mathematics, Applied Physics, and Electrical Engineering, you are invited to contact

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http://www.math.utwente.nl/∼hammerm/ for further information.

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[1]: M. Lohmeyer, R. Stoffer, *Integrated optical cross strip polarizer concept*, Optical and Quantum Electronics **33** (4/5), 413-431 (2001), http://www.math.utwente.nl/∼hammerm/Papers/Jrnl/cspol.pdf