CORK INSTITUTE OF TECHNOLOGY
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Licence Opportunity

Slowlight Modulator

THE PROBLEM

Conventional rib waveguide modulators show high modulation speeds but are very long (mms in length) and therefor have a high capacitance and power consumption (5-10pJ/bit). They also require electronic driving circuits that also consume significant amounts of power (10s pJ/bit).

Slowlight modulators are much shorter, <0.5mm, and have much lower power consumption and use low-power driving circuits. Previous 2D PhC slowlight designs are not compatible with existing fabrication processes and show high loss due to the mode shape. Previous 1D PhC slowlight designs have markedly inferior performance to this invention.

SOLUTION

CIT and the UoP have combined an interleaved P-N junction with slowlight using a 1D PhC to create a new Mach-Zehnder (MZ) modulator

This combination yields a modulation efficiency that is considerably improved with respect to standard modulators or to the use of both effects alone, while retaining a wide bandwidth that is essential for optical communication.

The modulator has the following key benefits:

- *Compatible with current industry fabrication standards.*
- *Improved modulation efficiency.*
- *Reduced free-carrier induced insertion losses.*
- *Reduced energy dissipation per bit.*

At 1V reverse bias, modulator lengths <0.5 mm and energy consumption <0.5 pJ/bit can be obtained with bandwidths of several tens of nms.

APPLICATIONS

All applications are in the field of optical modulators.

The technique could be applied at different bitrates e.g. 10G, 25G, 50G and modulation formats e.g. NRZ, PAM4.

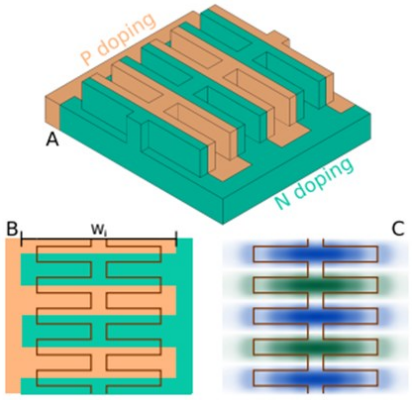
STAGE OF DEVELOPMENT

Detailed modelling of the device has been performed and a patent has been filed to protect the invention. Further improvements of the modulation efficiency are expected.

The present structures can support high speed modulation, and there is room for improving the cut-off frequency by tuning the doping levels and doping profiles both inside and outside the waveguide.

Trade-off between modulation rate, losses, and energy consumption will have to be determined for specific applications. The present concepts can find application to reduce the energy dissipation in MZ modulators on current-day technology platforms.

SCHEMATIC



Slow Light Modulator and Interleaved PN junction: 3D view (A) and top view (B). Field profile of the optical mode (C).

CIT is seeking to licence to and /or partner with an established modulator manufacturer with the necessary expertise, experience and fabrication capabilities to fully commercialise this technology.

For more information please contact:

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