

Lab project / internship M1 PPN (1,5 months)

2022-2023

Title of the project:

Study and elaboration of an integrated dual-electrodes system for electrooptical light modulation

Supervisor(s): P. Mathey, C. Strutynski

Laboratory / Department / Team : ICB / SAFIR / Verres

Summary:

This internship involves two main areas of focus: theory and experimentation.

The objective is to study a system comprising two electrodes embedded within a dielectric material. This system is a fiber-based integrated-optics component, which can be used to make either an intensity modulator or a sensor.

In the sensor configuration, the electrodes are charged to a high enough potential to generate a plasma in a gas, which can be analyzed through spectroscopy to identify its characteristics.

In the modulator configuration, the potential difference between the electrodes generates a field that modulates the refractive index of the optical fiber.

The theoretical aspect of the internship involves using numerical methods to calculate the electric fields and potentials generated by the electrode system. The aim is to understand the impact of geometrical (shape and dimensions of the electrodes, spacing between the electrodes) as well as intrinsic (type of the metallic and dielectric materials used) parameters of the device on the overall system performance.

The experimental part of the internship focuses on developing and characterizing an optical fiber with two metallic electrodes. This involves making a preform using glass, polymers, or metals, and then drawing the preform to create a fiber. Key tasks include ensuring the electrodes are connected correctly and measuring the resistivity of the system. Additionally, optical characterizations may be performed to verify the results obtained through theoretical analysis.

Type of project (theory / experiment): theory and experiment May - June 2023

Required skills: numerical methods, electromagnetism