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Thesis Defense of Alejandro LORENZO RUIZ on next 5th february.
You can communicate this information to colleagues, who may be interested.

## Thesis Defense
## Institut Foton – OHM team
## Friday 5th february 2021, 9:15 am (visioconference)

# Nonlinear integrated photonic devices based on gallium phosphide

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## Abstract

The objective of this thesis is to investigate different aspects of nonlinear integrated devices based on GaP material, focusing on two processes: the use of GaP microdisks to perform second harmonic generation in the near infrared regime using whispering gallery modes and the use of IR waves to produce THz using difference frequency generation.

First, we study the vertical evanescent coupling process to a GaP microdisk to address its impact on the efficiency of the nonlinear device and demonstrate the importance of propagation constant mismatched couplers to properly design fully encapsulated devices.

We also demonstrate that the origin of the specific phase matching selection rules in circular microresonators is due to the Berry phase experienced by the transverse spin angular momentum components of the WGMs into azimuthal momentum.

To fabricate the designed schemes, we investigated the technological challenges of the process flow for the fabrication of these GaP-based photonic circuits, focusing on three processes: bonding, lithography, and encapsulation.

Finally, we propose a novel approach for integrated THz generation in the Reststrahlen band. Using surface phonon polariton modes to guide THz waves and showing how an unusual crystal alignment is suited for this configuration we estimate efficiencies about the state-of-the-art level.

***KEYWORDS** : Integrated photonics ; nonlinear photonics ; photonic circuits ; microresonators*