# PRESS-RELEASE

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## THE PHOENIX RESEARCH AND INNOVATION PROJECT CONTINUES ITS JORNEY TOWARDS THE CREATION OF PHOTONIC INTEGRATED CIRCUITS FOR THE NEXT GENERATION OF ENCRYPTION AND COMPUTING HARDWARE

**PHOENIX project´s main ambition is to create the next generation of compact PICs leveraging on Lumiphase´s barium titanate (BTO) on silicon nitride (SiN) platform that will be optimized to enable novel functionalities and produce enhanced PICs.**

**As the project PHOENIX progresses through its lifecycle, the current results are as follows:**

The design of circuits and building blocks (waveguides, splitters, bends, phase shifters, etc.) has been completed for each hardware platform.

A setup was created to validate the presence of the photorefractive effect in BTO thin films.

Successful integration of $VO_2$ onto integrated photonic structures has been accomplished using silicon waveguides. These hybrid structures consist of a $VO_2$ layer deposited on a silicon waveguide, where the optical response depends on the optical loss of the insulator and the metal state of the VO2.

Switching speeds ranging from a few microseconds to hundreds of nanoseconds have been attained.

Results indicate a notable decrease in insertion loss with a high extinction ratio in micrometer-size active lengths.

A hybrid $VO_2$/BTO device: the growth conditions for depositing $VO_2$ on BTO surfaces have been investigated, leading to the development of a process that allows the growth of a material stack where $VO_2$ undergoes the metal-to-insulator transition while maintaining the integrity of the BTO material.

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**Two hardware platforms:**

1. Fully Homomorphic Encryption (FHE) and 5G infrastructure. PHOENIX optical technology is designed to enhance the computations of FHE and reduce its latency.

2. Inference and training of Deep Neural Networks (DNN). A highly compact tunable attenuation element can be created using VOx absorbers.

- A tunable coupler can be achieved through reflection on a diffraction grating formed in the BTO waveguides, utilizing the photorefractive effect.
- A new MBE system has been installed for growing metal oxide thin films on substrates up to 300 mm in diameter, with initial tests and growth trials currently underway.

The current tasks for the ongoing work at PHOENIX are the optimization of hybrid device performance, create PDKs, fabricate devices, develop demonstrators with electronics, firmware, and testing, validate deposition process and monitoring techniques.

## PHOENIX Consortium

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