Lithium niObate empowered siLIcon nitride Platform for fragmentation-free OPeration in the visible and the NIR

Project Launch

The implementation of the LOLIPOP project was officially inaugurated with the kick-off meeting that took place on the 6th and 7th of October 2022. The twelve (12) members of the consortium participated in a two-day productive hybrid meeting which was held at the premises of LioniX International in Enschede. During the hybrid event, LOLIPOP's workplan was analyzed in depth, the role of each partner in the project's deployment specified in detail, and the next actions towards the achievement of project's objectives defined.

Despite huge progress in photonics, extended spectral bands at the wavelengths below 1100 nm remain heavily underserved in terms of integration solutions. At the same time, silicon nitride is booming, and lithium niobate is making an impressive comeback in the form of lithium niobate on insulator (LNOI), with both materials being transparent both in the visible spectrum and near infrared (NIR) part of the spectrum.

With all these viewed as a unique opportunity, LOLIPOP steps in to develop a disruptive platform that will offer the highest integration, modulation, and second order nonlinear performance in the entire spectrum from 400 nm up to 1600 nm, based on the combination of LNOI and silicon-nitride (TriPleX®) technology. To this end, LOLIPOP will develop die-bonding and micro-transfer-printing methods for low-loss (<0.5 dB) integration of LNOI films on TriPleX® without compromising in functionality of the two platforms.

LOLIPOP will also develop a process for the growth of Ge photodiodes (PDs) inside pockets and a process for the flip-chip bonding of active elements inside recesses within TriPleX®. Given the possibility of the Ge-PDs to operate in the entire 400 -1600 nm spectral area, and the flexibility of the bonding process to adapt to different actives and wavelengths, the picture of this ultra-wideband technology is complete.

LOLIPOP will demonstrate its potential via the development of:

1) The first ever integrated laser Doppler vibrometer at 532 nm with ultra-narrow linewidth (<5 kHz) and ultra-high modulation (6 GHz),

2) the first ever integrated FMCW-LIDAR at 905 nm with ultra-high linear chirp (10 GHz) and optical phased array-based 2D beam scanning,

3) photonic convolutional neural networks with record scale, computation speed (24 TOPS), and power consumption reduction compared to electronic solutions, and

4) the first ever integrated squeezed-state source with 6 dB squeezing level for quantum applications at 1550 nm.

A roadmap for offering LOLIPOP technology as commercial services will be prepared.

Funded by the European Union

Project facts

Topic: HORIZON-CL4-2021-DIGITAL-EMERGING-01-07 Advanced photonic integrated circuits
Project no: 101070441
Start date: 1 September 2022
Duration: 42 Months
EU contribution: € 4.996.729,25
Beneficiaries: 12 Partners from 6 countries

LOLIPOP project comprises twelve (12) partners from six (6) European countries among which:

2 Large companies: Polytec (DE), and LioniX International BV (NL)

3 world renowned research and technology organizations: imec (BE), University College Cork – National University of Ireland (IE), and CSEM SA[1] (CH)

5 SMEs: PHIX Photonics Assembly (NL), Optagon Photonics (EL), Superlum Diodes Limited (IE), QuiX Quantum BV(NL), and Irida Labs (EL)

2 Academic organizations: University of Twente (NL), and the Institute of Communications & Computer Systems (EL) that coordinates the action.

For more info, visit LOLIPOP website
https://horizon-de-lolipop.eu/

[1] Funded by SERI

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