Advanced laser sources and detectors for SWIR LIDAR systems

Frederic van Dijk
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A private research lab set-up between Thales, Nokia and CEA/Leti
- 120 research staff including 20 PhD students
- Specific legal entity (Group of Economic Interest)
- 1 site in Paris region: Palaiseau

Focus on III-V semiconductors technologies development (GaAs, InP, GaN ...) and their integration with Si circuits and micro-systems.

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Who we are …

Defence, Security, space, aerospace and transportation

Optical and wireless networks and communication technologies

Exploitation for high volume applications

Design → Fabrication → Test

40% → 40% → 20%

THALES

NOKIA

cea

III-V Lab

Palaiseau

Coherent Receiver

Hybrid RF GaN Circuit

1-Tb/s optical transmitter with 64 QAM modulation

laser diode for atomic clock
LIDAR activities at III-V Lab

- Taking benefit of developments for telecom applications:
  - 1.5µm Single mode lasers, high speed modulators and detectors

- Using synergies with defence and space applications:
  - Laser range finder, satellite free-space optical transmissions

- Two type of LIDAR systems:

  ![LIDAR diagram]

  - Coherent LIDAR
    - Data processing
    - Driver electronics
    - CW laser
    - Coherent detection
  - Pulsed LIDAR
    - Data processing
    - Driver electronics
    - Pulsed laser
    - High sens. detector

Advanced eye-safe emitters and detectors
Expertise on advanced sensing systems
Multiquantum well DFB laser:

- $P_{out} > 300$ mW (chip)
- Linewidth <200 kHz (lorentzian fit)
- Tunability: 1.5 pm/mA
- $\text{RIN}< -160\text{dB/Hz}$ from 0.1 to 20 GHz

Hybrid SiN/III-V laser cavity:
- Bragg grating reflector on low loss SiN platform (<2 dB/m)
- InP reflective optical amplifier

Performances:
- Linewidth < 10 kHz
- Fast continuous tuning range > 5 GHz
- Tuning speed >70 MHz/µs
- Output power > 10 mW

High sensitivity APD detectors

► 200µm diameter Avalanche Photodiodes (APD)

- Low avalanche voltage (<35V)
- Dark current <40 nA
- Multiplication gain > 10
- Bandwidth > 100 MHz
Photodiodes from 2 to 3 mm of diameter

- Capacitance below 400pF
- Dark current below 13μA at 98°C and 5 V of reverse bias
- High bandwidth capability
Snake SW detector

- VGA (650 x 512)
- Quantum efficiency > 70% from 1 to 1.6 µm
- 15 µm x 15 µm pixels
- 30 fA dark current at -0.2 V
- Scientific applications

SWIR InGaAs imagers (Lynred)
Vision, Identification, with Z-sensing Technologies and key Applications
See more at: www.vizta-ecsel.eu/

OBJECTIVE
Develop innovative technologies for optical sensors and laser sources, for short to long-range 3D-imaging, and demonstrate their value in several key applications

MAIN TARGETS
• Develop innovative technologies for 3D-imaging depth map high resolution sensors and associated IR light sources
• Exercise new 3D sensors and light sources in key applications with various ranges: Secured access, driver monitoring, object recognition, few cm to several meters, up to LiDARs systems with hundreds meters range
• Build partnership ecosystems foreseeing future competitive European products for Automotive, Security, Smart Cities and Industry 4.0 and anticipate normative requirements

DURATION 3,5 years - May 2019 until Oct 2022  
FUNDING 21 M€

COORDINATION STMicroelectronics Crolles (France)

VIZTA has been accepted for funding within the Electronic Components and Systems For European Leadership Joint Undertaking in collaboration with the European Union’s H2020 Framework Program and National Authorities, under grant agreement n°826600
More integration of LIDAR optical elements?

- Photonic Integrated Circuits
- Supported by European platforms

www.inpulse.jeppix.eu
coordinator@jeppix.eu
What can we do for you? / What could you do for us?

We can provide:

- R&D capabilities on design, process and test of III-V devices
- High performance lasers emitters and detectors

We are looking for:

- Collaboration in the frame of research projects
- Partners for back-end, packaging
- Partners for further system tests