

## AT A GLANCE

HHI's hybrid integration technology enables the fabrication of complex hybrid photonic integrated circuits (Hybrid PICs) based on the material systems polymer, SiN, TFLN, InP, GaAs and GaN.



### Applications

- Telecom / datacom
- Quantum technology
- Microwave photonics
- Sensing and analytics
- Medical and life science

### Features

- Rapid prototyping
- Short iteration cycles
- Low upfront development effort

### Services

- Design and simulation
- Process development
- Device fabrication
- Characterization
- Assembly
- Qualification

### Hybrid PICs

The Hybrid PICs team develops photonic components and hybrid integrated circuits based on PolyBoard, SiN and thin film lithium niobate (TFLN) single mode waveguides in combination with active elements made of InP, GaAs or GaN.

We are working to harness the unique properties of light for applications in fiber-based communications, quantum technologies, microwave photonics and 6G wireless networks and beyond, as well as life sciences, medicine, sensing and analytics.

Our technology enables rapid prototyping, short iteration cycles and low development effort and cost. Our expertise includes design and simulation, CAD, technology development and device fabrication as well as characterization, assembly and qualification.

## References

### International R&D projects

PHOENICS

POETICS

POLYNICES

QSNP

Qu-Test / Qu-Pilot

SPRINTER

TERA 6G

TERAMEASURE

TERAWAY

(funded by EU commission)

### National R&D projects

PolyChrome Berlin

PolSiQ

QuNET

Silhouette

VOMBAT

(funded by BMBF)

### Association

PolyPhotonics e.V.

[www.polyphotonics-berlin.de](http://www.polyphotonics-berlin.de)

### Assembly Partner

PHIX

[www.phix.com](http://www.phix.com)

ficonTEC

[www.ficontec.com](http://www.ficontec.com)



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## Hybrid Integration Technology

### PolyBoard platform based on polymer waveguides

- Passive WG structures: MMIs, AWGs, gratings
- Thermo-optic structures: TO-shifters, VOAs, tunable gratings
- $\mu$ Bench with slots, U grooves, vertical mirrors to integrate micro lenses, NLO crystals, isolators, and thin film elements (PBS,  $\lambda/2$  plates, filters);
- 3D photonic integrated elements: 3D MMIs, 3D optical phased arrays for beam steering;

### SiN platform based on silicon nitride waveguides:

- Passive WG structures: Ring resonators, MMIs, AWGs, gratings.
- Thermo-optic structures: TO-shifters, VOAs, tunable gratings;

### TFLN platform based on thin film lithium niobate waveguides.

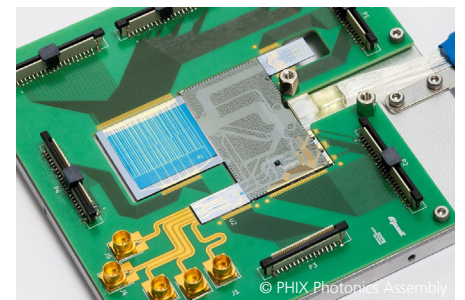
### Hybrid Integration for more complex functions:

Platforms can be combined and hybrid integrated with InP, GaAs or GaN active elements: lasers, detectors, gain chips and modulators to form complex hybrid photonic integrated circuits.

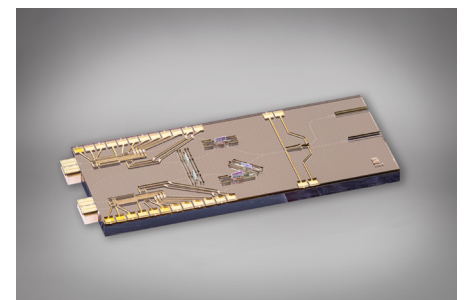
### RF Flexlines based on electrical co-planar waveguides:

Connecting optical and electrical components at very high speed (200 GHz and beyond)

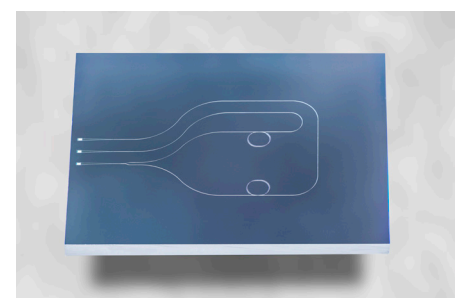
## Applications



*Photonic enabled THz transceiver for 5G networks and beyond (EU TERAWAY)*



*BB84 Transmitter for Quantum Communication (BMBF QuNET)*



*Micro Ring Resonator (MRR) with tolerant grating couplers for bio analytics*

