ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

IFH
Department of Information Technology
and Electrical Engineering

NAVOLCHI WP6
Integration, Characterization & Testing

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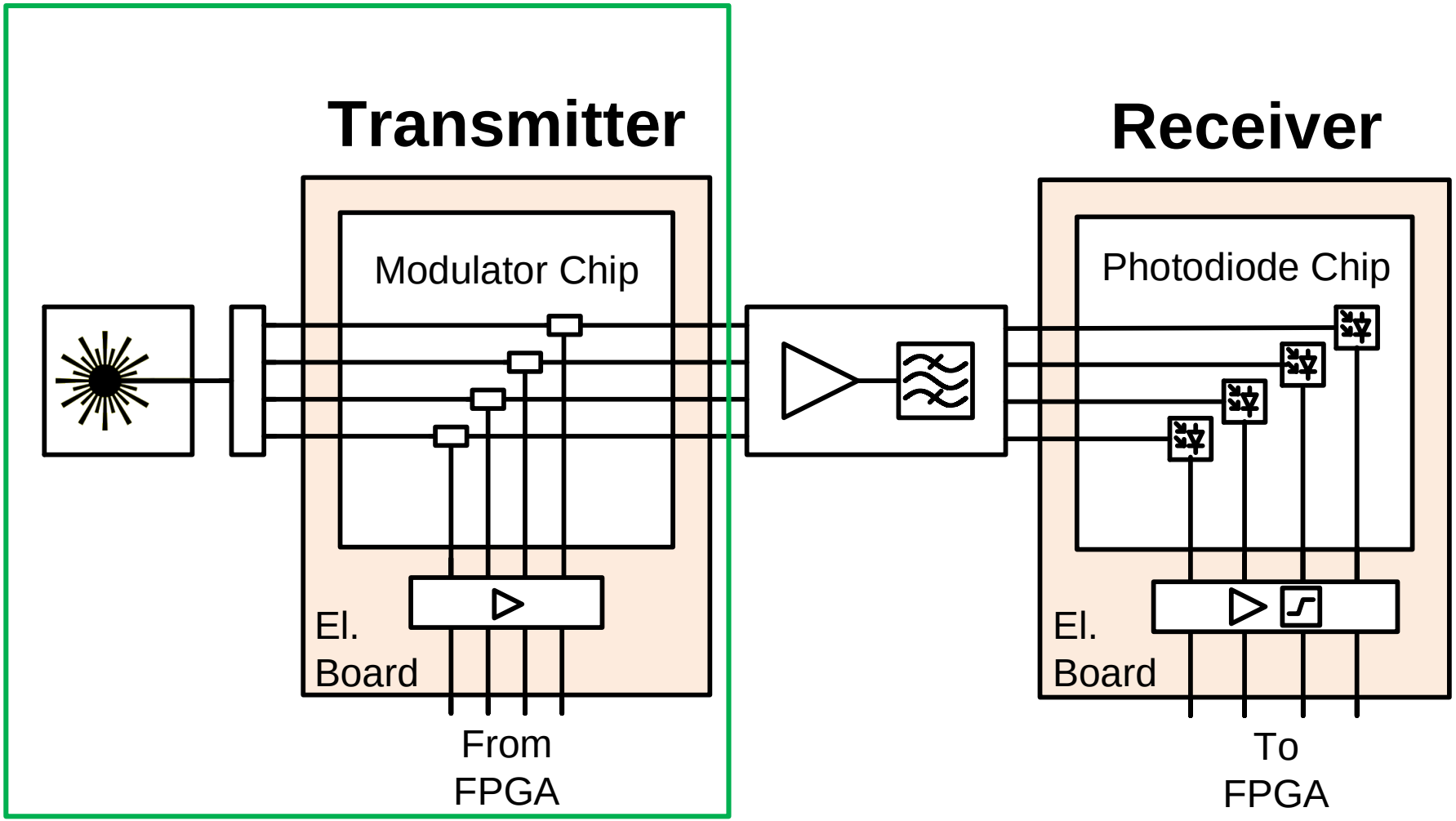
Demonstrator



Transmitter- PPM Chip (KIT)

Phase Modulator:

- Optical
  - Fed by external laser, split into four channels externally
  - Pitch between channels: 50 µm and 35 µm
  - Insertion loss (including GC): 30 dB
- Electrical
  - Pad pitch: 100 µm (85 µm x 85 µm, GSG)
  - Eletctrical probes or bonding for contacting
  - No 50 Ω termination on chip
- Electrooptic
  - VpiL: 1.1 Vmm (40 Gbit/s: 5 V_{pp}),
  - Bias or wavelength to determine operating point

Transmitter - FPGA

What ST does:

- Send the rtl for the FPGA
- Choose discrete components for implementing the analog parts
- Act as consultant for the partner(s) who will design and manufacture the board

What ETH does:

- Provide an FPGA (ST cannot move their FPGA somewhere else)
- Design and manufacture the electronic board (laser driver, modulator driver, etc.) with the discrete components
- Provide electrical wire bonding or pico-probes

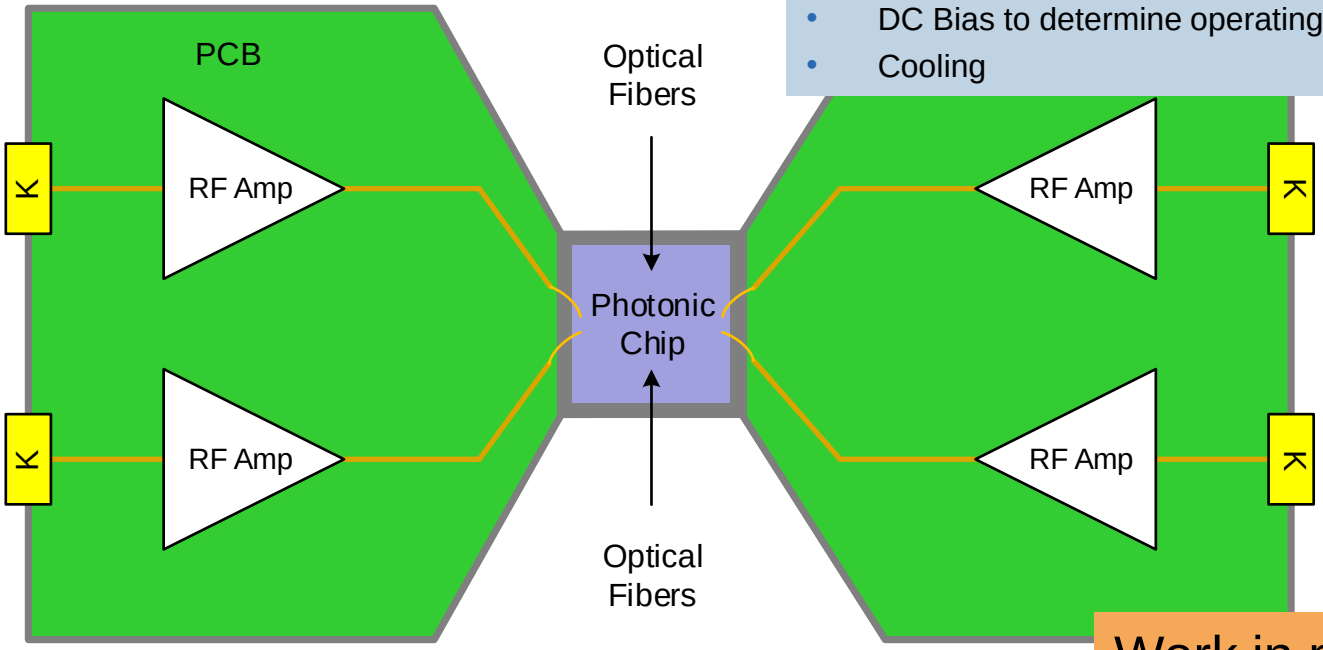
Transmitter – Packaging

Main challenges

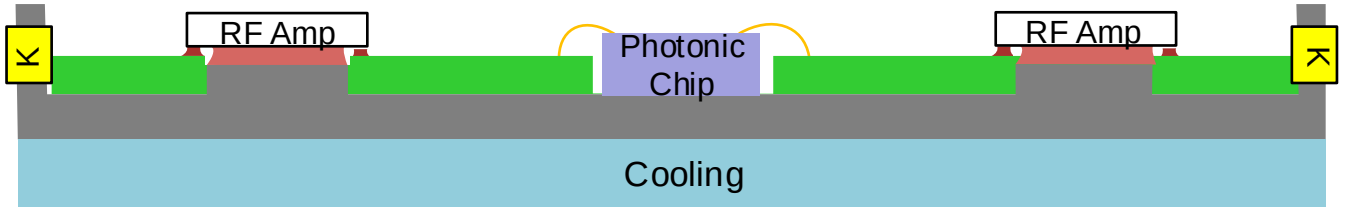
- Minimal light loss due to small pitch of 50 µm
- High frequencies require high precision alignment (K-connectors)
- High thermal density due to RF amplifiers

Transmitter –Electrical Board and Housing

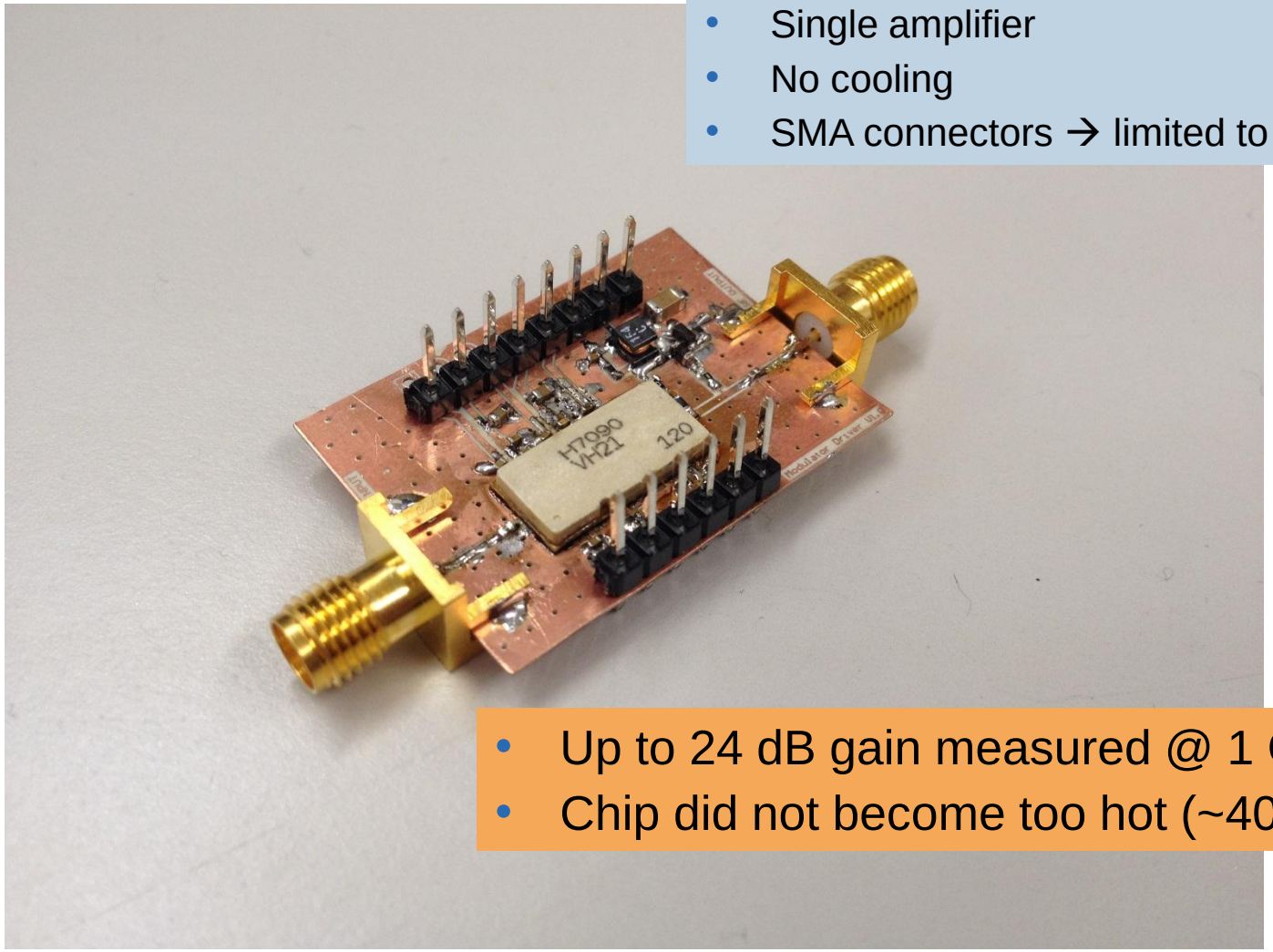
- K-connectors → 40 GHz
- Impedance matching
- DC Bias to determine operating point
- Cooling



Work in progress



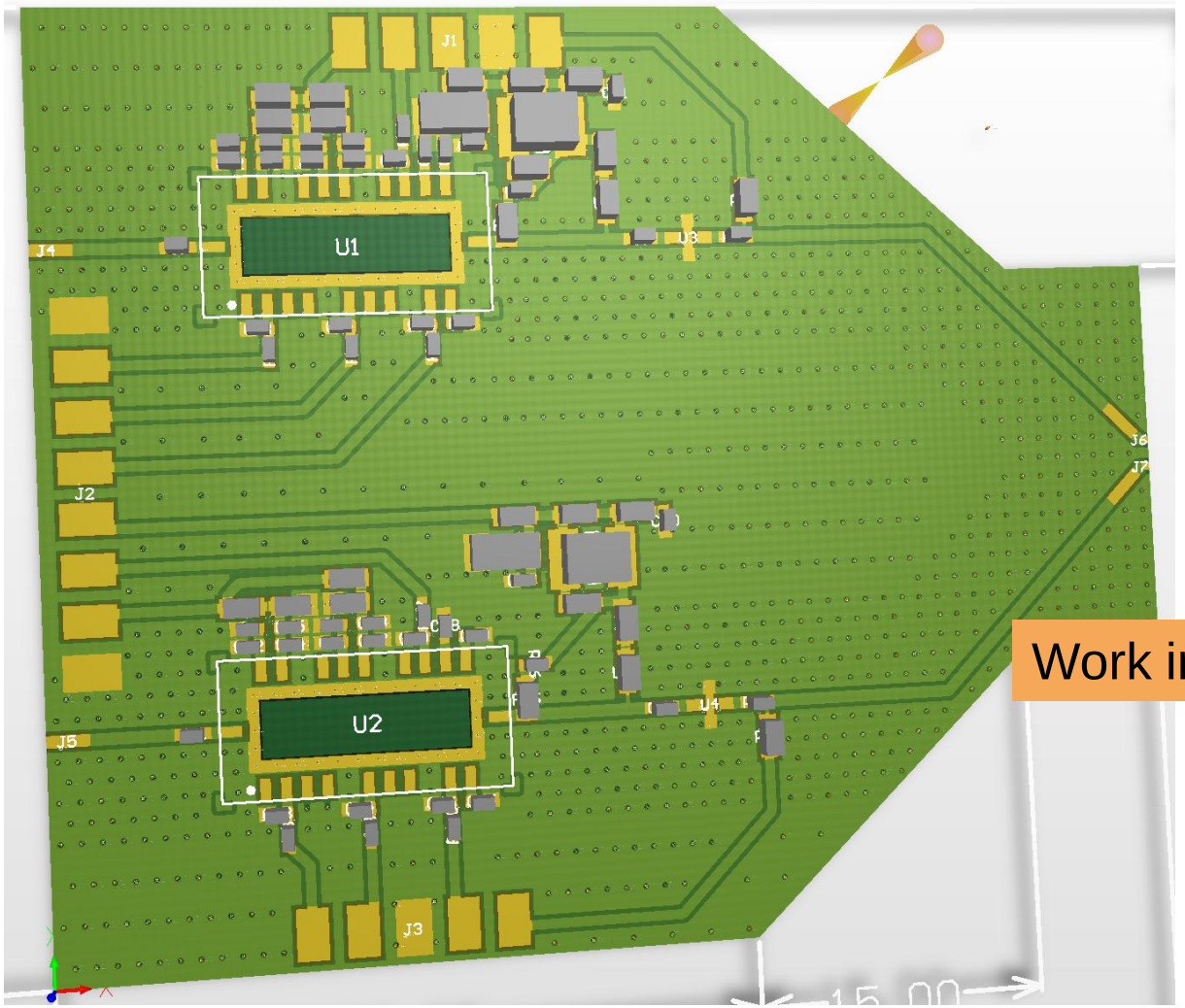
Transmitter – Prototype of Electrical Board



- Single amplifier
- No cooling
- SMA connectors → limited to 10 GHz

- Up to 24 dB gain measured @ 1 GHz
- Chip did not become too hot (~40 degC)

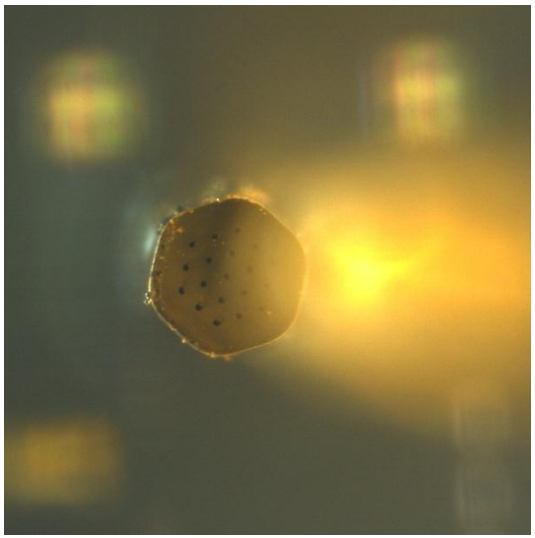
Transmitter – Final Electrical Board



Work in progress

Optical Link

Multicore Fiber (Chiral Photonics)



Main challenge: fiber array alignment accuracy

- 19 channels with 50 µm pitch
- Interchannel coupling <-35 dB (datasheet)
- Allows for optical amplifier between transmitter and receiver

Demonstrator

Timeline

Dec 2014

Testing of
- VHDL code (ST)
- Drivers (ETH)
- PD array (ETH)
- Fiber array (ETH)

March 2015

- VHDL hardware design (ETH)
- Modulator array fabrication (KIT, ETH)
- First prototype (all)

May 2015

- **Demo**

VHDL code ST→ETH: 16.12.2014 ✓

Modulator drivers arrived at ETH: 08.12.2014 ✓

First prototype of board finished: 07.01.2015 ✓