

Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: TERAPAN: Ultra-high Data Rate Transmission with steerable Antennas at 300 GHz

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Abstract: Recent results from ongoing research activities at TU Braunschweig in the TERAPAN project are presented. In the first part an overview over the project and the key technologies is given. The second part deals with the developed demonstrator.

Purpose: To inform the Interest Group THz about recent developments.

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TERAPAN: Ultra-high Data Rate Transmission with steerable Antennas at 300 GHz

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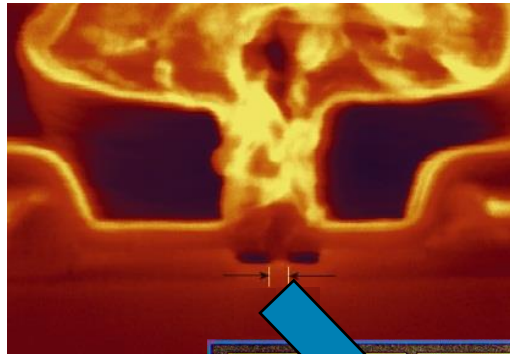
Outline

- Overview TERAPAN
- Enabling Technology
- Beamsteering
- Demonstrator Setup

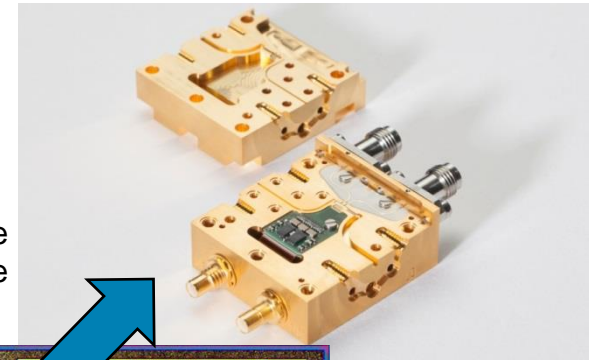
Project TERAPAN (Terahertz Communication for future Personal Area Networks)

- Project Goal: *Ultra High-Speed Wireless Communication Links Using Terahertz Frequencies*
- TERAPAN will demonstrate the feasibility of THz communication with data rates of up to *100 Gbps* over a distance of up to 10 m in indoor environments for *WLAN/WPAN types of applications* using monolithically integrated transceivers and beamsteering.
- Funded by the Federal Ministry of Education and Research (BMBF), Germany, with approx. 1.5 Mio Euro from the VIP (Validation Innovation Potential) Program.
- Collaboration project:
 - Institut für Robuste Leistungshalbleitersysteme, Universität Stuttgart
 - Fraunhofer-Institut für angewandte Festkörperphysik (Applied Solid State Physics)
 - Institut für Nachrichtentechnik, Technische Universität Braunschweig
- Runtime August 2013 to July 2016

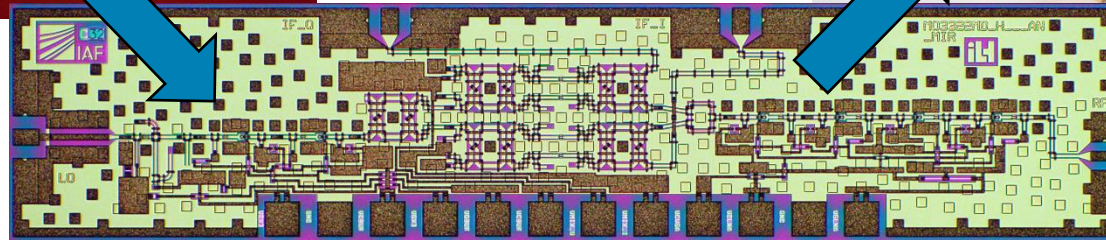
Enabling Technology



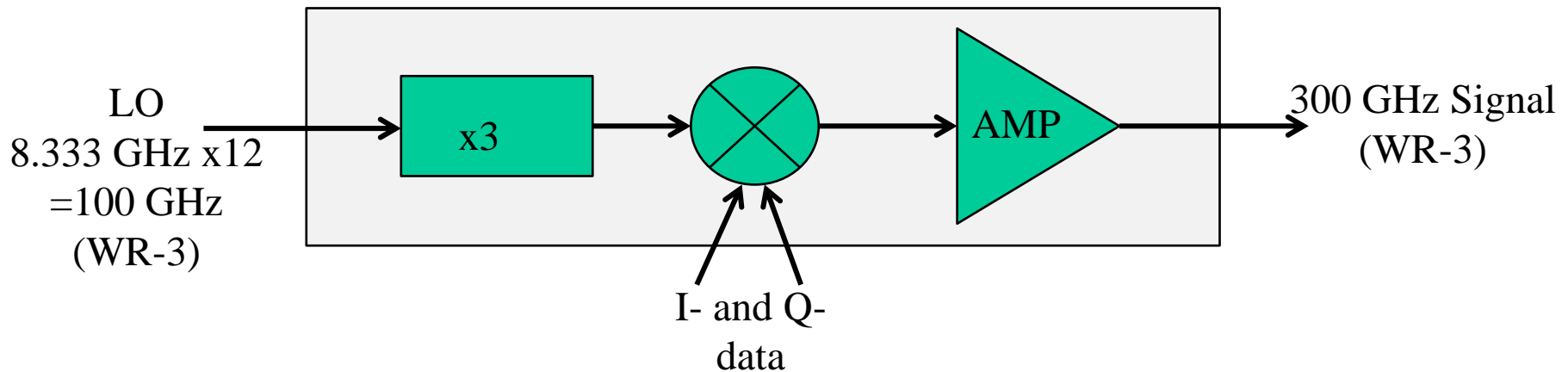
35 nm GaAs mHEMT technology with THz cutoff frequency



Compact high performance waveguide module



Fully integrated 300 GHz transmitter & receiver MMICs



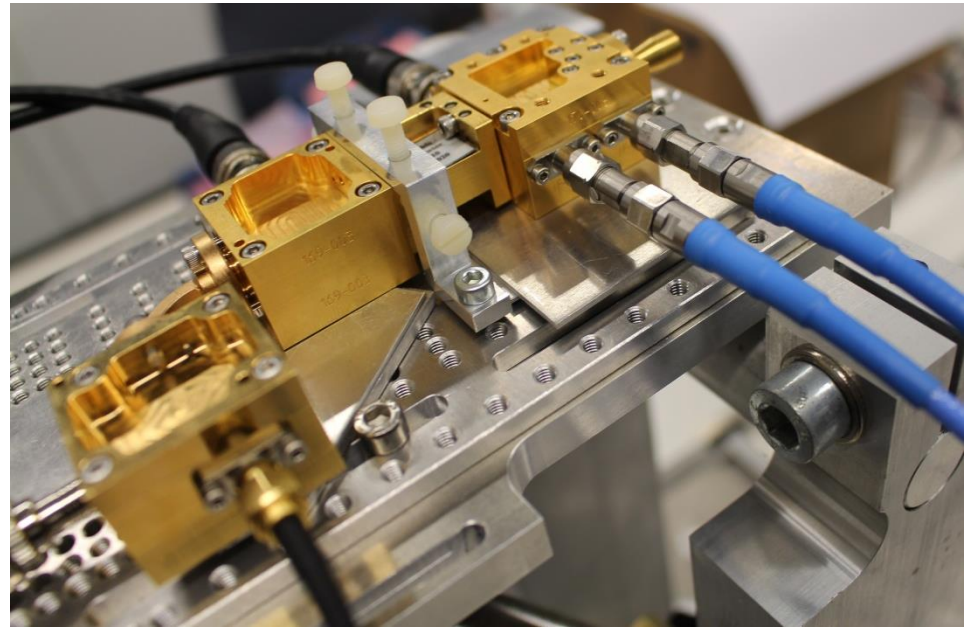
Outline

- Overview TERAPAN
- Enabling Technology
- **Beamsteering**
- Demonstrator Setup

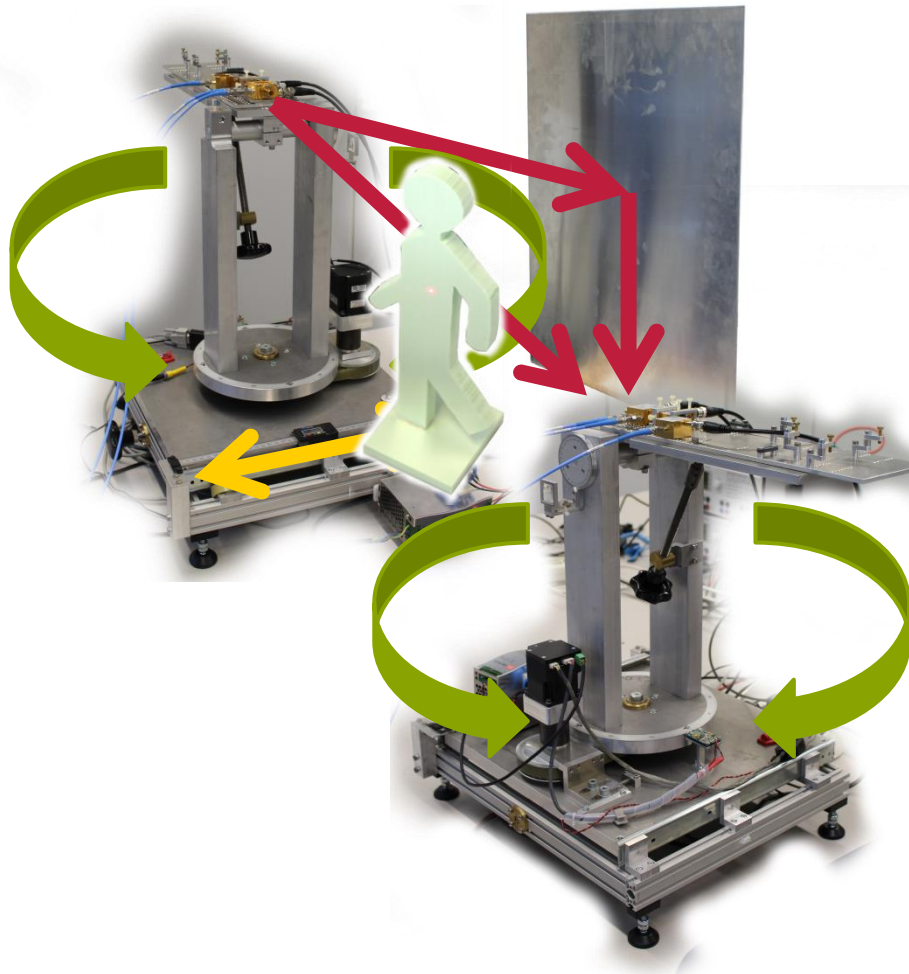
Why are high-gain antennas required at 300 GHz?

Current demonstrator:

- -10 dBm transmitted power @300GHz
- Free space loss @300GHz
 - ~82 dB @1m
 - ~102 dB @10m
- High directive antennas are required (as shown in IEEE802.15-13-0406-00-0thz)
 - Cylindrical horn antennas
 - 25 dBi gain with HPBW of 10°



Why are steerable Antennas required?



Why?

- To follow a moving Tx/Rx
- To maybe switch transmission paths

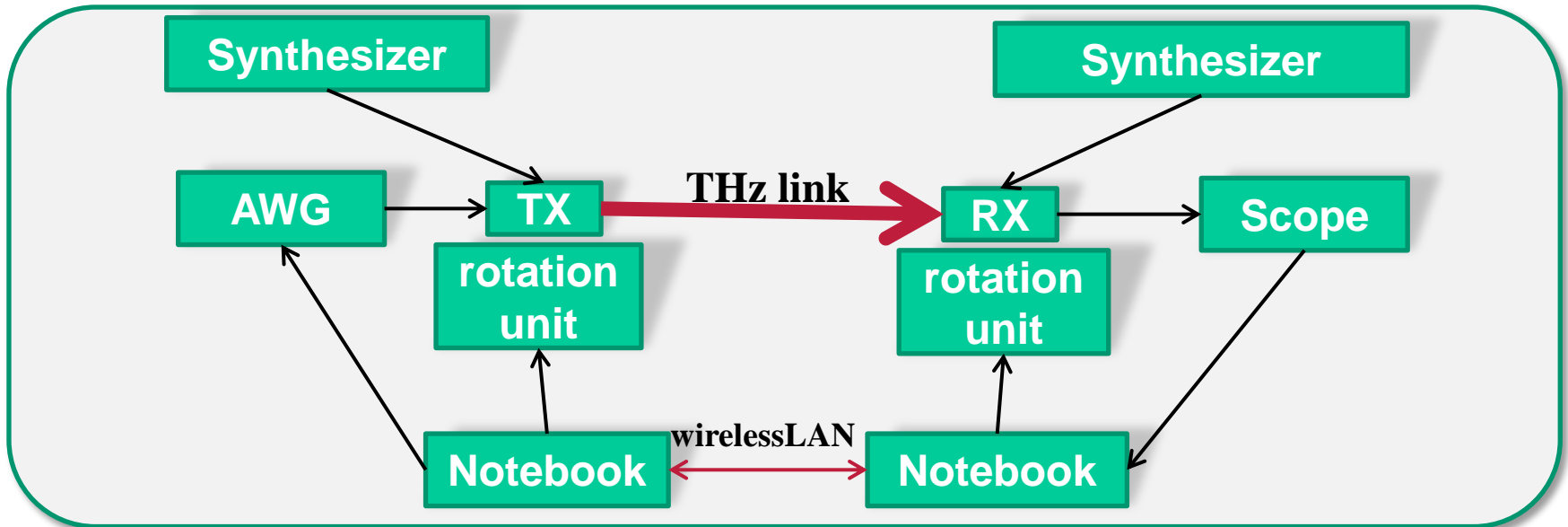
Why is electrical steering required?

- Mechanical approaches are to slow, bulky, ...

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- Overview TERAPAN
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- **Demonstrator Setup**

Demonstrator Set-up

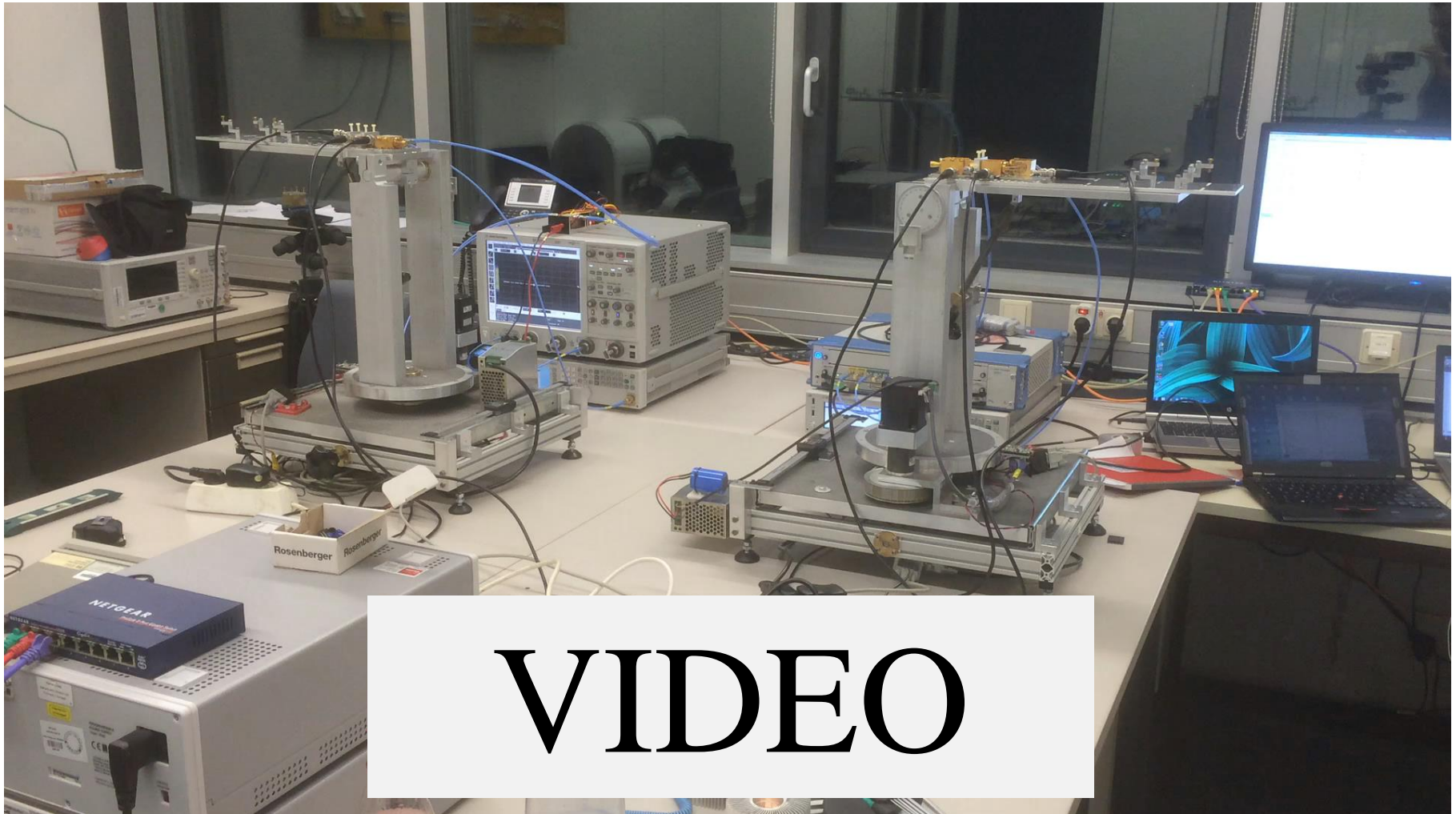


Current demonstrator

- 1st gen. of chip design
- Demonstrated data rate 10 Gbit/s
- Mechanical beam steering

Future demonstrator

- Optimised 2nd gen. of chip design
- Target data rate 100 Gbit/s
- Electronical beam steering



A nicer version of the video can be found at: <https://www.ifn.ing.tu-bs.de/en/news/ngmn/>
Live Presentation at the NGMN industry conference & exhibition 2015.

Danke für Ihre Aufmerksamkeit!
(Thank you for paying attention!)

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