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Source: Thomas Kürner (Editor) Company: TU Braunschweig, Institut für Nachrichtentechnik
Address: Schleinitzstr. 22, D-38092 Braunschweig, Germany
Voice: +49313912416 FAX: +495313915192, E-Mail: t.kuerner@tu-bs.de
Re: n/a
Abstract: This document presents first results from a 300 GHz channel measurement campaign carried out in real data center within the EU Horizon 2020 project TERAPOD.
Purpose: Information of the Technical Advisory Group THz
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300 GHz Channel Measurements in a Real Data Center - First Results

Johannes Eckhardt, Tobias Doeker, Thomas Kürner

Technische Universität Braunschweig
Institut für Nachrichtentechnik
Germany
Outline

• Introduction to H2020 TERAPOD
• Data Center Application Scenarios for 300 GHz wireless links
• Measurement Set-Up
• First Measurement Results
• Conclusion and Outlook
Horizon 2020 TERAPOD - Terahertz based Ultra High Bandwidth Wireless Access Networks

- TERAPOD is one of the six funded projects from the Horizon 2020 ICT-Call-09-2017 on „Networking Research beyond 5G“

- Project duration 2017-2020

- 11 Partners from Ireland, Spain, Portugal, Germany and the United Kingdom

- Web Page: www.terapod-project.eu
Vision and Objective of TERAPOD

**VISION:** Push the boundaries of the THz communications, through the combination and integration of multiple THz technologies, paving the way towards future Tb/s wireless communications.

**Objective:** The overall TERAPOD objective to investigate and demonstrate the feasibility of ultra-high bandwidth wireless access networks operating in the Terahertz (THz) band. Demonstrated within the operational setting (Dell EMC Data Centre) and will significantly progress innovations across the full communications protocol stack.

- THz components and modules
- THz devices and links
- Characterization and modeling
- Communication protocols and networking
TERAPOD Concept
TERAPOD Target Scenario– Data Centre

• Short range (1-10 m)
• High data rates (1-over 40 Gbps)
• Dense Topology
• Protocols/integration
• Low mobility
• Limited sensitivity to cost
Why 300 GHz Channel Measurements in a real Data Center?

- In the literature no channel measurement campaign at 300 GHz in a real data center are reported up to now,
- The TG3d Channel Model (Channel Modeling Document – CMD, doc. 15-14-0310-17-003d) is based on ray tracing simulation in an ideal data center only
- Different link types have been defined in the CMD
- The measurements presented in this document are covering these and other configurations
Measurement Equipment

- TUBS's time domain channel sounder has been used for the measurements
- Allows Measurement of the time-variant impulse response with a PRBS signals (sequence M = 12)
- Carrier frequency: 304.2 GHz
- Bandwidth: approx. 8 GHz
- Use of rotational units to measure spatial channel characteristics

For more information on the measurement equipment see:
S. Rey, J. Eckhardt, Peng, K. Guan, T. Kürner, Channel Sounding Techniques for Applications in THz Communications, 2nd Workshop on THz Communications (THZCOM) at the 9th International Congress on Ultra Modern Telecommunications and Control Systems, 8 November 17, 5 pages
Initial Measurement Campaign within the Research Data Centre of Dell/EMC, Cork Ireland
Categorisation of THz communication scenarios

THz Data Centre Links

- Intra-rack communication
- Inter-rack communication

General Characterisation

Top-of-Rack Links

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Measurement campaign – Inter-rack scenarios
General characterisation

Rotational measurement  Point-to-point measurement
Measurement campaign – Inter-rack scenarios
Top-of-Rack

Rotational measurement
Point-to-point measurement
Measurement campaign – First Results

- Channel is time invariant
- Measurements agree with theoretical analysis
Measurement campaign – First Results

Power Angular Spectrum of General Characterisation Measurement;
left: long distance between Tx and Rx; 12,5 m
right: short distance between Tx and Rx: 3,6 m
Measurement campaign – First results

Reflection measurement agrees with the environment’s geometry
Conclusion and Outlook

• First results from a 300 GHz channel measurement campaign in the Research Data Center of Dell/EMC has been presented.

• Results indicate, that measured propagation effects can be traced back to the geometry of the scenario.

• Next steps:
  – Evaluation and assessment of the complete measurement campaign (including measurements in a second data center)
  – Calibration of ray tracing algorithm
• The TERAPOD project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 761579