Testbed application

5G mmWave for Industrial Applications (T011)

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Speaker

Welcome to the 5G-ACIA Web Seminar

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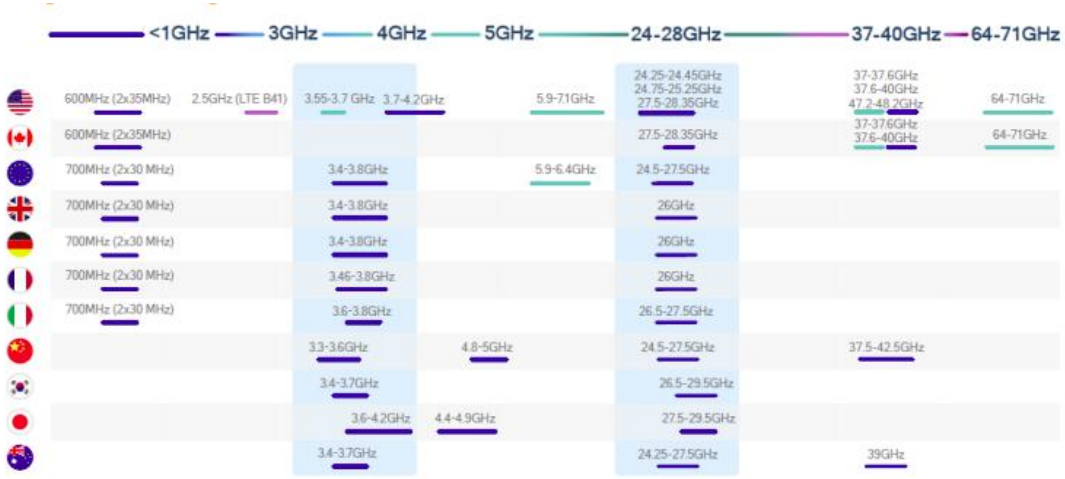
Motivation for 5G mmWave in Industry

Advantages of 5G mmWave spectrum

- **Higher Bandwidth:** Access to licensed spectrum with bandwidths up to 800 MHz in Germany
- **Enhanced Performance:** Potentially higher data rates and lower latencies
- **Interference Management:** Easier interference management due to spatial division



Drawbacks of 5G mmWave spectrum

- **Propagation Challenges:** Higher free space attenuation and very limited obstacle penetration
- **Device Availability:** Limited availability of industrial 5G mmWave devices

Aims of the testbed

- performance characteristics, propagation and network quality of 5G at mmWave spectrum in an industrial environment
- influence of radio configurations (e.g., channel modes, carrier aggregation) on performance
- influence of 5G UE configurations on performance
- use cases with high UL/DL demands
- evaluate the robustness of mmWave in an industrial context

Testbed Members and Equipment

- 4 testbed member (100% 5G-ACIA members)
- testbed lifetime until December 2025

Fraunhofer IPT *

- testbed main contact
- use cases
- measurements

ERICSSON *

- infrastructure
- measurements

Qualcomm *

- devices
- measurements

BASLER

- use cases

* = Testbed activities part of EU project TARGET-X

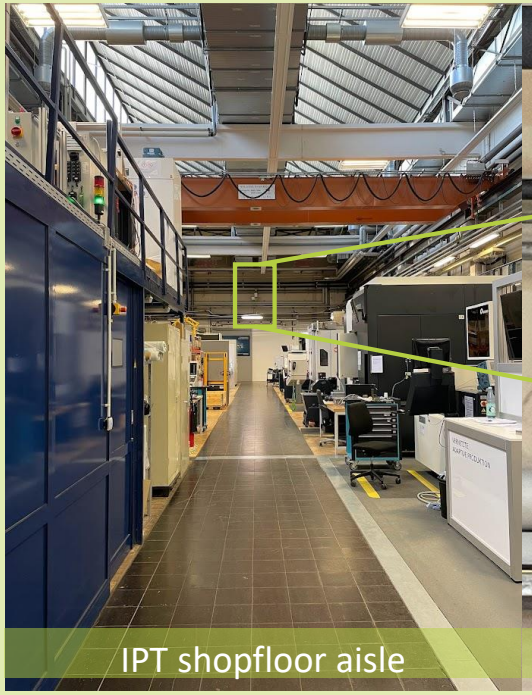
TARGET-X

Co-funded by the European Union

6GSNS

- Testbed located at the 5G-Industry Campus Europe (5G-ACIA testbed 2021-23)
- 5G-NSA/SA network
  - Radio and Core Network supporting LTE and NR
- Spectrum
  - FR2: 26.7-27.5 GHz (TDD / n258)
  - FR1: 3.7 – 3.8 GHz (TDD / n78)
  - LTE anchor bands: 2.51 GHz UL/ 2.63 DL (FDD / B7), 2.0-2.32 GHz (TDD / B40)
- Facility
  - 2.700 m² shopfloor
  - ~50 machine tools

5G INDUSTRY CAMPUS EUROPE



IPT shopfloor aisle

5G mmW & LTE

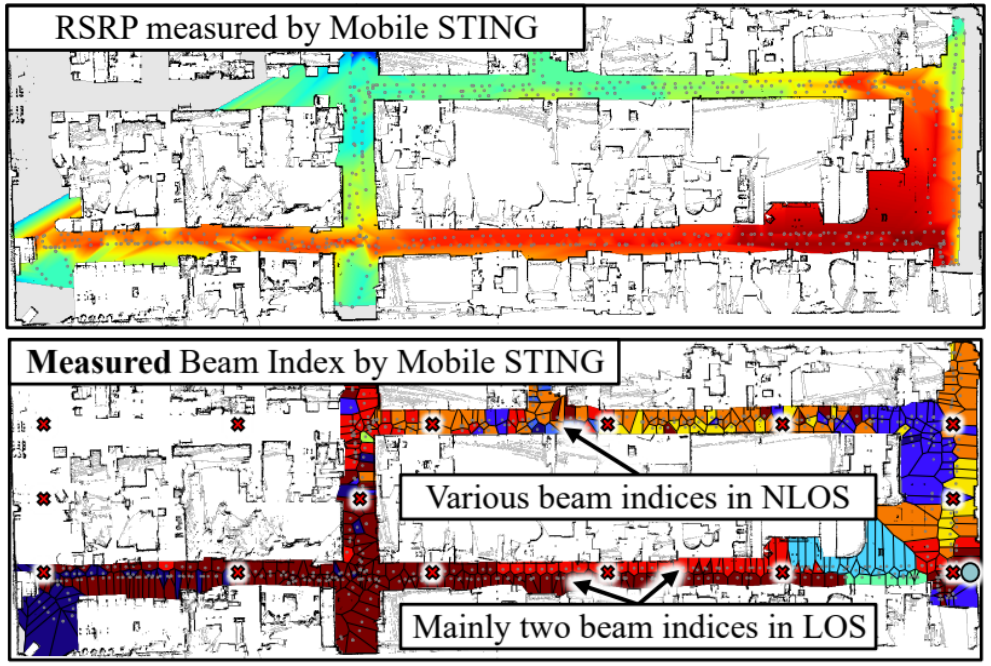
2021 TESTBED 5G-INDUSTRY CAMPUS EUROPE AACHEN | GERMANY

TESTBED Endorsed by 5GACIA

5G INDUSTRY CAMPUS EUROPE

Measurement Results

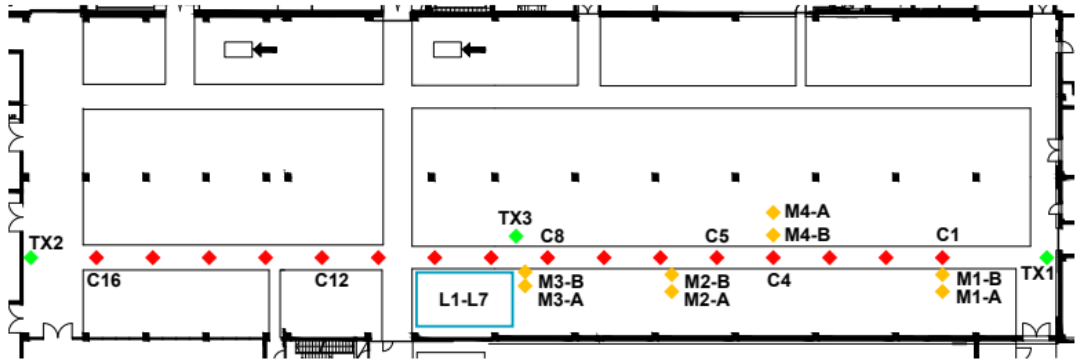
General Heatmap of the Shopfloor

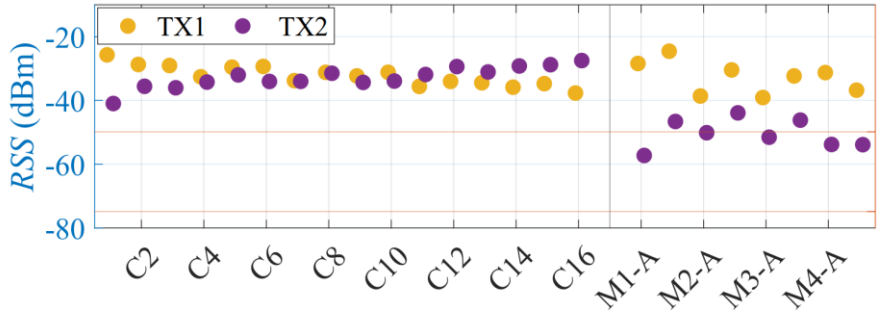


M. Danger et. al. "Performance Evaluation of IRS-Enhanced mmWave Connectivity for 6G Industrial Networks," 2024 IEEE International Symposium on Measurements & Networking (M&N), Rome, Italy, 2024, pp. 1-6, doi: 10.1109/MN60932.2024.10615534

Measurement Results

Measurement between Machinery





A. Schott, A. Ichkov, N. Beckmann, N. König and L. Simić, "Mm-Wave Connectivity in Industrial Environments: A Measurement Study at 28 and 60 GHz," GLOBECOM 2024 - 2024 IEEE Global Communications Conference, Cape Town, South Africa, 2024, pp. 4262-4267, doi: 10.1109/GLOBECOM52923.2024.10901259

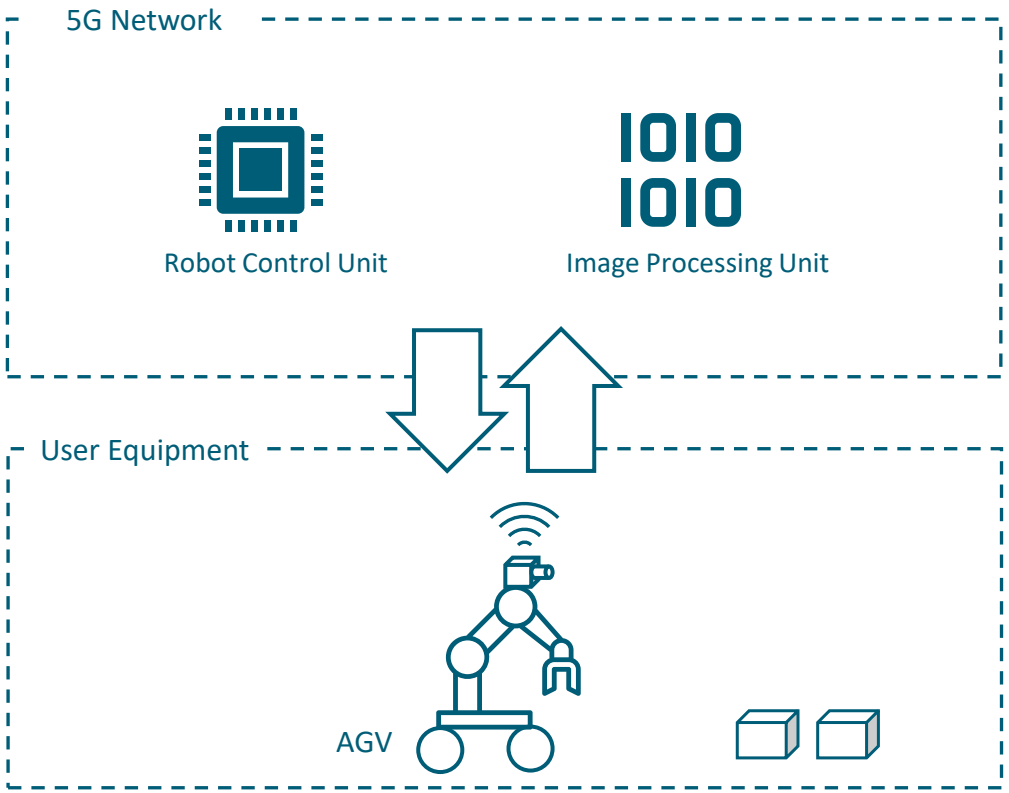
Scope: Future Measurements

Planned Measurement Campaigns

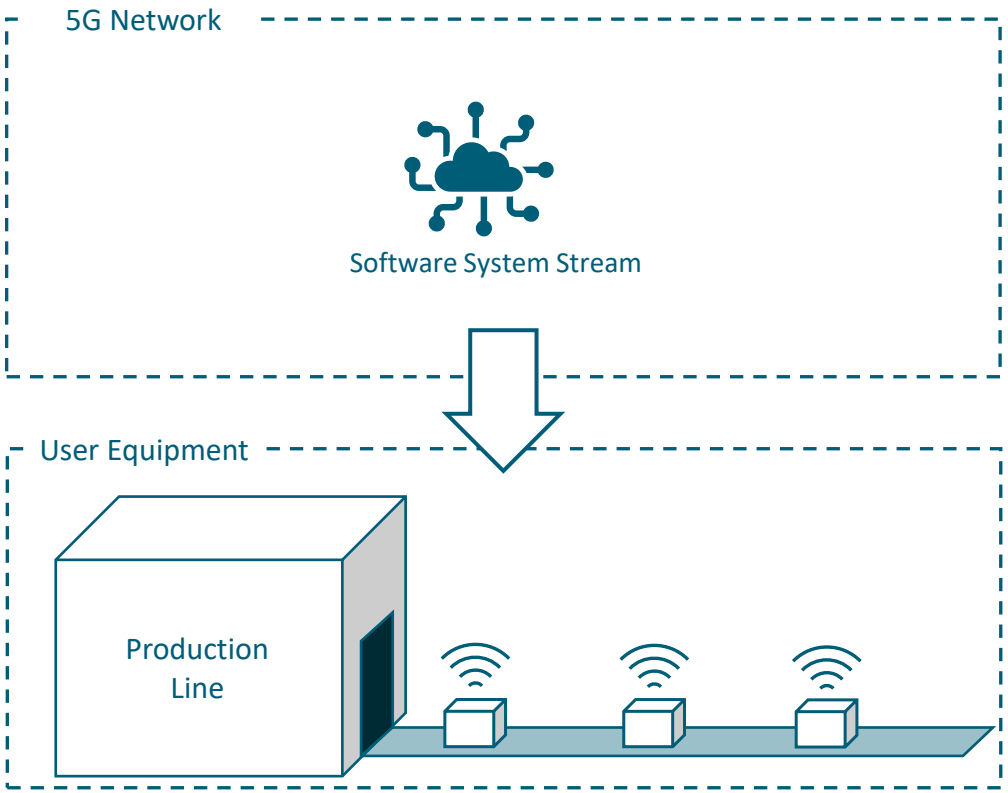
- Additional Coverage Measurements
- Mobility Measurements
- mmWave Multicell Handover Measurements
- 5G NR DC Measurements
- Reconfigurable Intelligent Surface (RIS) for Coverage Enhancement

Scope: Planned Usecase Implementations

Uplink Heavy Usecase: Mobile Robotics Machine Vision



Downlink Heavy Usecase: Date Shower for High Downlink Demands



Thank you!

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5G-ACIA WG5 Vice-Chair


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