

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

Submission Title: [Prospect of next ten years R&D on terahertz communication]

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Abstract: [This document discusses the R&Ds on terahertz communication in the next ten years.]

Purpose: [Information]

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R&D on THz Comm. in NEXT 10 years

Aiming for ultra-high bit-rate (e.g. 1Tbit/s)

→ **Use higher frequency bands (e.g. THz)**

→ **Smaller coverage (e.g. 10 m)**

Basic Questions:

Coverage vs. Economical Efficiency

Private 5G(/B5G/6G) vs. Wi-Fi X

(Natural) Extension of 3d

[R&D in Last 10 Years]

(IEEE802.15.3d)

Beam Switchable Point to Point Link with 100Gbit/s

Technologies to be developed

Beam Steerable Point to Multi-Point Link over 1Tbit/s

[R&D in Next 10 Years for IEEE802.XX.XX]

(Natural) Extension of 3d

[R&D in Last 10 Years]

(IEEE802.15.3d)

Beam Switchable Point to Point Link with 100Gbit/s

Array Antenna

Technologies to be developed

Beam Steerable Point to Multi-Point Link over 1Tbit/s

[R&D in Next 10 Years for IEEE802.XX.XX]

(Natural) Extension of 3d

[R&D in Last 10 Years]

(IEEE802.15.3d)

Beam Switchable **Point to Point Link** with 100Gbit/s

Array Antenna

or/and

100 mW class-PA for 10 m

Technologies to be developed

Beam Steerable **Point to Multi-Point Link** over 1Tbit/s

[R&D in Next 10 Years for IEEE802.XX.XX]

(Natural) Extension of 3d

(IEEE802.15.3d)

[R&D in Last 10 Years]

Beam Switchable Point to Point Link with 100Gbit/s

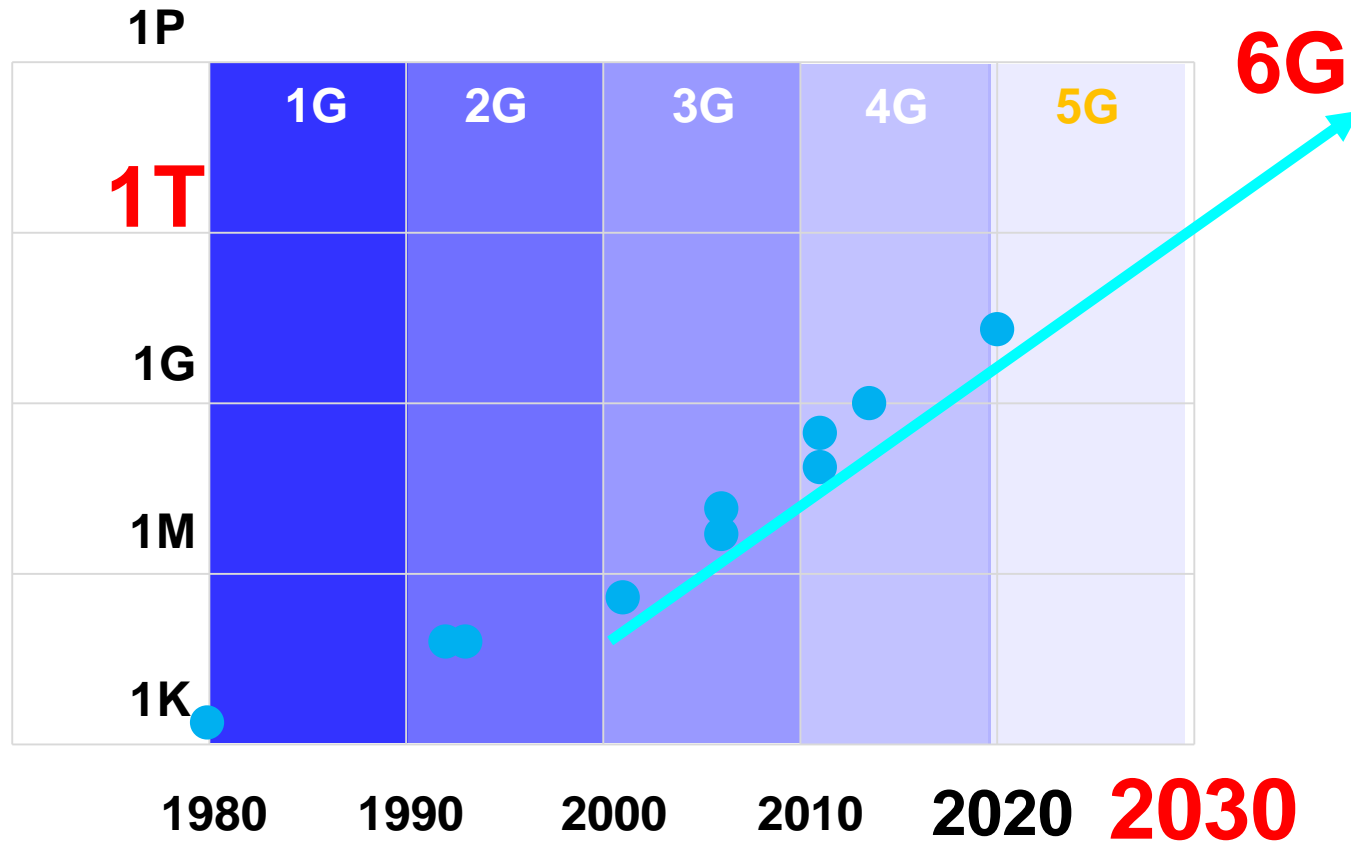
Technologies to be developed

**Massive MIMO
with
Array Antenna**

Beam Steerable Point to Multi-Point Link over 1Tbit/s

[R&D in Next 10 Years for IEEE802.XX.XX]

Trend of mobile system



Challenges-1

[R&D in Last 10 Years]

(IEEE802.15.3d)

Beam Switchable Point to Point Link with 100Gbit/s

Array Antenna

Technologies to be developed

Beam Steerable Point to Multi-Point Link over 1Tbit/s

[R&D in Next 10 Years for IEEE802.XX.XX]

Challenges-2

[R&D in Last 10 Years]

(IEEE802.15.3d)

Beam Switchable Point to Point Link with 100Gbit/s

How to find Tx/Rx pair

Technologies to be developed

Beam Steerable Point to Multi-Point Link over 1Tbit/s

[R&D in Next 10 Years for IEEE802.XX.XX]

Challenges-3

[R&D in Last 10 Years]

(IEEE802.15.3d)

Beam Switchable Point to Point Link with 100Gbit/s

Interference among THz systems with very narrow beam

Beam Steerable Point to Multi-Point Link over 1Tbit/s

[R&D in Next 10 Years for IEEE802.XX.XX]

Challenges-4

[R&D in Last 10 Years]

(IEEE802.15.3d)

Beam Switchable Point to Point Link with 100Gbit/s

Signal processing for 1 Tbit/s
(Massive MIMO, FEC, BB, etc)

Beam Steerable Point to Multi-Point Link over 1Tbit/s

[R&D in Next 10 Years for IEEE802.XX.XX]

(Challenges-5)

[R&D in Last 10 Years]

(IEEE802.15.3d)

Beam Switchable Point to Point Link with 100Gbit/s

Security

(in common for radio communication)

(e.g. Physical layer cryptography with Information theoretical safety)

Beam Steerable Point to Multi-Point Link over 1Tbit/s

[R&D in Next 10 Years for IEEE802.XX.XX]

R&D in NEXT 10 years (Summary)

Aiming for ultra-high bit-rate (e.g. 1Tbit/s)

→ **Use higher frequency bands (e.g. THz)**

→ **Smaller coverage (e.g. 10 m)**

Technologies to be developed:

- 1. Array antenna**
- 2. Algorithm to find Tx/Rx pair**
- 3. Avoiding interference among THz systems**
- 4. Advanced signal processing**
- 5. (Assured security)**