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

Submission Title: [Prospect of next ten years R&D on terahertz communication]
Date Submitted: [16 July 2019]
Source: [Iwao Hosako]
Company: [National Institute of Information and Communications Technology (NICT)]
Address [4-2-1, Nukuikita, Koganei, 184-8795, Tokyo, Japan]
Voice:[+ 81 42 327 6508], FAX: [+81 42 327 6941], E-Mail:[hosako@nict.go.jp]

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

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]

Beam Switchable Point to Point Link with 100Gbit/s

Array Antenna

Technologies to be developed

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

Beam Steerable Point to Multi-Point Link over 1Tbit/s
(Natural) Extension of 3d

[R&D in Last 10 Years]

Beam Switchable Point to Point Link with 100Gbit/s

Array Antenna or/and

100 mW class-PA for 10 m

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

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

(IEEE802.15.3d)
(Natural) Extension of 3d

[R&D in Last 10 Years]
Beam Switchable Point to Point Link with 100Gbit/s

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

1P  1T  1G  1G

1M  1M  1M  1M

1K  1K  1K  1K


1G  2G  3G  4G  5G  6G
Challenges-1

[R&D in Last 10 Years]

Beam Switchable Point to Point Link with 100Gbit/s

Array Antenna

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

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

(IEEE802.15.3d)
Challenges-2

[R&D in Last 10 Years]
Beam Switchable Point to Point Link with 100Gbit/s

How to find Tx/Rx pair

[R&D in Next 10 Years for IEEE802.XX.XX]
Beam Steerable Point to Multi-Point Link over 1Tbit/s
Challenges-3

[Technologies to be developed]

Beam Switchable Point to Point Link with 100Gbit/s

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

[R&D in Last 10 Years]

(IEEE802.15.3d)

Interference among THz systems with very narrow beam

[R&D in Next 10 Years for IEEE802.XX.XX]
Challenges-4

[R&D in Last 10 Years] Beam Switchable Point to Point Link with 100Gbit/s

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

[R&D in Next 10 Years for IEEE802.XX.XX] Beam Steerable Point to Multi-Point Link over 1Tbit/s

(IEEE802.15.3d)
(Challenges-5)

[R&D in Last 10 Years]

Beam Switchable Point to Point Link with 100Gbit/s

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

Security (in common for radio communication)
(e.g. Physical layer cryptography with Information theoretical safety)

[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)