|  |  |  |  |
| --- | --- | --- | --- |
|  | **Radiocommunication Study Groups** | |  |
| **INTERNATIONAL TELECOMMUNICATION UNION** | |  | |
|  | |  | |
| Source: Document 5A/TEMP/2(Rev.1) | | **Annex 28 to Document 5A/114-E** | |
| **24 May 2016** | |
| **English only** | |
| Annex 28 to Working Party 5A Chairman’s Report | | | |
| working document towards a preliminary draft  new report itu-r M.[300GHz\_MS\_CHAR] | | | |
| Technical and operational characteristics and applications of the land mobile service operating in the frequency band 275-450 GHz | | | |

WRC-19 agenda item 1.15

# 1 Introduction

# 2 Scope

# 3 Related Recommendation and Report

|  |  |
| --- | --- |
| Report ITU-R SM.2352-0: | Technology trends of active services in the frequency range 275‑3 000 GHz |

# 4 List of acronyms and abbreviations

|  |  |
| --- | --- |
| BBU | Base band unit |
| RRH | Remote radio head |

# 5 Definition of terahertz (THz) and others

*[Editor’s note: This section will review section 2.1 to Report ITU-R SM.2352-0 from the points of view of the land mobile service applications and technologies.]*

# 6 Regulatory information above 275 GHz

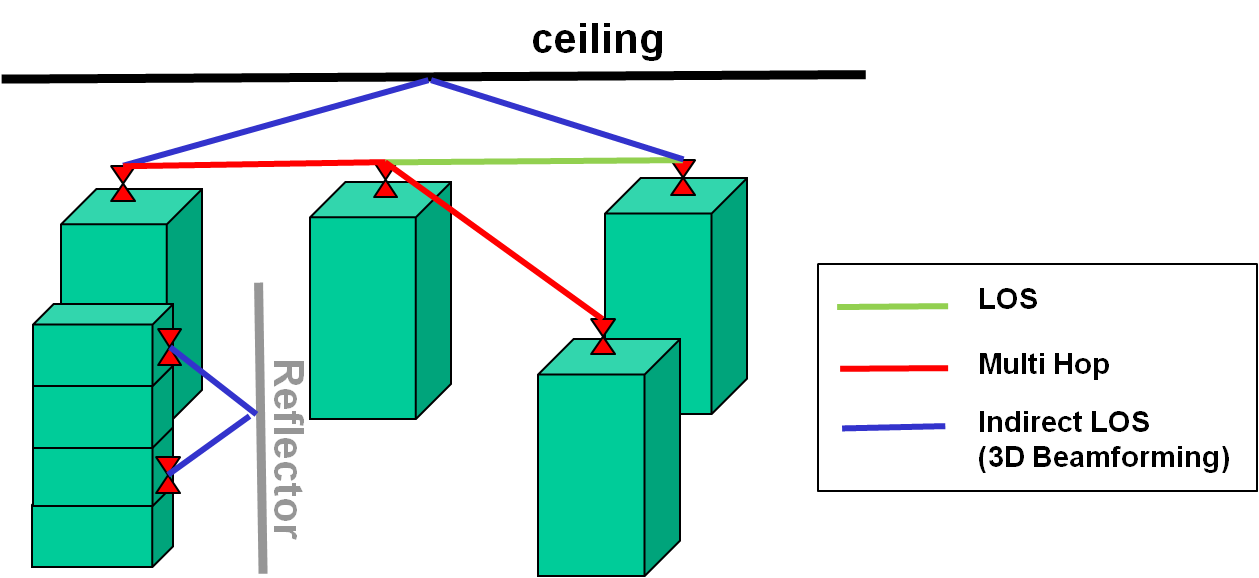
# 7 System Overview

## 7.1 300 GHz close proximity radiocommunication system

*[Editor’s note: This section will identify the specific frequency bands and land mobile service applications which will be used for sharing and compatibility studies with passive services by WP 1A.]*

## 7.2 Wireless links for data centers

*The goal of wireless data links in addition to the existing fibres is to provide flexibility by introducing reconfigurable routes within a data center. In the figure some examples are illustrated between or inside the server racks (green) for line-of-sight (LOS) or Multi Hop links.*



## 7.3 intra-device communications

In intra-device communications, one or more communication links are operated within a device. High speed terahertz wireless links could connect two or more PCBs or even chips on the same PCB. The terahertz band is huge hence several channels could be used in a small area (within one device). The following figure illustrates point-to-point communications between boards, where the color of the beams indicate different frequencies.



# 8 System characteristics

*[Editor’s note: Technical and operational characteristics of the land mobile radiocommunication system operating in the frequency band 275-450 GHz are invited to be addressed in this section.]*

## 8.1 A close proximity radiocommunication system

A close proximity land mobile radiocommunication system operating in the band 275-320 GHz is shown in Table 1.

TABLE 1

Technical and operational characteristics of a land mobile CPRS applications operating   
in the frequency band 275-321.84 GHz

| Frequency band (GHz) | 275-321.84 |
| --- | --- |
| Deployment density | Depending on outdoor usage |
| Duplex Method | TDD |
| Modulation | OOK/BPSK/QPSK/16QAM/64QAM  8PSK/8APSK |
| Average distance between CPRS[[1]](#footnote-1) fixed and mobile devices (m) | 0.1 |
| Maximum between CPRS fixed and mobile devices (m) | 1 |
| Antenna height (m) | TBD |
| Antenna beamwidth (degree) | 3-10 15? |
| Frequency reuse | 1 |
| Antenna pattern | TBD |
| Antenna polarization | Linear |
| Indoor CPRS fixed device deployment (%) | 90 |
| Indoor CPRS fixed device penetration loss (dB) | >100 |
| Feeder loss (dB) | 2 |
| Maximum CPRS fixed device output power (dBm) | 10 |
| Channel bandwidth (GHz) | 2.16/4.32/8.64/12.96/17.28/25.92/51.84/69.12[[2]](#footnote-2) |
| Transmitter spectrum mask | TBD |
| Maximum CPRS fixed device antenna gain (dBi) | 30 |
| Maximum CPRS mobile device antenna gain (dBi) | 30 |
| Maximum CRPS fixed device output power (e.i.r.p.) (dBm) | 40 |
| Maximum CRPS mobile device output power (e.i.r.p.) (dBm) | 40 |
| Average CPRS fixed device activity (%) | 20 |
| Average CPRS fixed device power (dBm (e.i.r.p)) | 20 |
| Receiver noise figure typical (dB) | 15 |

## 8.2 Wireless links for data centers

The characteristics of wireless links for data centers in the band 275-321.84 GHz is shown in Table 2.

TABLE 2

Technical and operational characteristics of a land mobile wireless links for data centers operating   
in the frequency band 275-321.84 GHz

| Frequency band (GHz) | 275-321.84 |
| --- | --- |
| Duplex Method | TDD, FDD, SDD |
| Modulation | OOK/BPSK/QPSK/16QAM/64QAM  8PSK/8APSK |
| Maximum distance between devices | 100 m |
| Antenna height (m) | TBD |
| Antenna beamwidth (degree) | <25 (expected) |
| Frequency reuse | 1 |
| Antenna pattern | TBD |
| Antenna polarization | Linear |
| Indoor deployment (%) | 100 |
| Indoor penetration loss (dB) | TBD (>100) |
| Maximum device output power (dBm) | 10 |
| Channel bandwidth (GHz) | 2.16/4.32/8.64/12.96/17.28/ 25.92/51.84/69.12[[3]](#footnote-3) |
| Transmitter spectrum mask | TBD |
| Maximum device antenna gain (dBi) | 30 |
| Maximum device output power (e.i.r.p.) (dBm) | 40 |
| Maximum device activity (%) | 100 |
| Receiver noise figure typical (dB) | 10 |

## 8.3 intra-device communications

The characteristics of wireless intra-device links in the band 275-321.84 GHz is shown in Table 3.

TABLE 3

Technical and operational characteristics of a land mobile wireless intra-device links operating   
in the frequency band 275-321.84 GHz

| Frequency band (GHz) | 275-321.84 |
| --- | --- |
| Duplex Method | TDD, FDD, SDD |
| Modulation | OOK/BPSK/QPSK/16QAM/64QAM  8PSK/8APSK |
| Maximum distance between devices | <1 m |
| Antenna height (m) | TBD |
| Antenna beamwidth (degree) | 180 (expected) |
| Frequency reuse | 1 |
| Antenna pattern | TBD |
| Antenna polarization | Linear |
| Maximum device output power (dBm) | 10 |
| Channel bandwidth (GHz) | 2.16/4.32/8.64/12.96/17.28//25.92/51.84/69.12[[4]](#footnote-4) |
| Transmitter spectrum mask | TBD |
| Maximum device antenna gain (dBi) | 20 |
| Maximum device output power (e.i.r.p.) (dBm) | 30 |
| Maximum device activity (%) | 100 |
| Receiver noise figure typical (dB) | 10 |

# 9 Summary

# 10 References

# 11 Annex(s) [if necessary]

1. CPRS stands for Close Proximity Radiocommunication System. [↑](#footnote-ref-1)
2. The planned applications will operate in the frequency range from 252.72 to 321.84 GHz. Therefore, mentioned bandwidths may exceed the available bandwidth between 275 GHz to 321.84 GHz. [↑](#footnote-ref-2)
3. The planned applications will operate in the frequency range from 252.72 to 321.84 GHz. Therefore, mentioned bandwidths may exceed the available bandwidth between 275 GHz to 321.84 GHz. [↑](#footnote-ref-3)
4. The planned applications will operate in the frequency range from 252.72 to 321.84 GHz. Therefore, mentioned bandwidths may exceed the available bandwidth between 275 GHz to 321.84 GHz. [↑](#footnote-ref-4)