



**System Reference document (SRdoc);
Technical characteristics of
Multiple Gigabit Wireless Systems (MGWS)
in radio spectrum between 57 GHz and 71 GHz**

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

Modal verbs terminology

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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Introduction

The present document includes necessary information to support the co-operation under the MoU between ETSI and the Electronic Communications Committee (ECC) of the European Conference of Post and Telecommunications Administrations (CEPT).

The present document covers applications that require wireless systems delivering multiple gigabits of data throughput operating on license-exempt radio frequencies in the extended 60 GHz range including intelligent transport system and outdoor applications. These applications provide economic benefits to a variety of markets including communications, computing, consumer electronics and transport.

The purpose of producing the present document is, in particular, to support the co-operation between ETSI and the Electronic Communications Committee (ECC) of the European Conference of Post and Telecommunications Administrations (CEPT), and the international harmonization of a class of innovative and useful products.

1 Scope

The present document describes the requirements for radio frequency usage for the following:

- 1) Multiple Gigabit Wireless Systems (MGWS) in radio spectrum between 57 GHz and 71 GHz including outdoor applications.
- 2) Millimetre Wave communication for Intelligent Transport Systems (mmW-ITS) and a proposal to move the existing mmW-ITS allocation to a single MGWS channel.

The present document is intended to update and replace ETSI TR 102 555 [i.1] and ETSI TR 102 400 [i.12].

The present document intended to provide necessary information to support the co-operation between ETSI and the Electronic Communications Committee (ECC) of the European Conference of Post and Telecommunications Administrations (CEPT).

2 References

2.1 Normative references

Normative references are not applicable in the present document.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TR 102 555 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Technical characteristics of multiple gigabit wireless systems in the 60 GHz range System Reference Document".
- [i.2] ITU-R Report M.2227-2 (2017): "Multiple Gigabit Wireless Systems in frequencies around 60 GHz".
- [i.3] Recommendation ITU-R M.2003-2 (2018): "Multiple Gigabit Wireless Systems in frequencies around 60 GHz".
- [i.4] RP-182007: "New SID: Study on NR beyond 52.6 GHz".
- [i.5] 3GPP TR 38.807: "Study on requirements for NR beyond 52.6 GHz".
- [i.6] IEEE 802.11-2016 TM (December 2016): "IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".
- [i.7] IEEE 802.15.3-2016TM: "IEEE Standard for High Data Rate Wireless Multi-Media Networks".
- [i.8] IEEE 802.15.3e-2017TM: "IEEE Standard for High Data Rate Wireless Multi-Media Networks Amendment: High-Rate Close Proximity Point-to-Point Communications".
- [i.9] ETSI EN 302 567 (V2.1.1): "Multiple-Gigabit/s radio equipment operating in the 60 GHz band; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".

- [i.10] Wi-Fi Alliance ® Protocol Adaptation Layer (PAL) specifications:
- WiGig® Display Extension Technical Specification Version 2.0, March 2015.
 - WiGig® Bus Extension Specification v1.2, October 2014.
 - WiGig® SD (WSD) Extension Specification v1.1, January 2015.
- [i.11] P802.11ay™/D2.0: "Draft Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Amendment 7: Enhanced throughput for operation in license-exempt bands above 45 GHz".
- [i.12] ETSI TR 102 400: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Intelligent Transport Systems (ITS); Road Traffic and Transport Telematics (RTTT); Technical characteristics for communications equipment in the frequency band from 63 GHz to 64 GHz; System Reference Document".
- [i.13] ETSI EN 303 883: "Short Range Devices (SRD) using Ultra Wide Band (UWB); Measurement Techniques".
- [i.14] ECC Report 113: "Compatibility studies around 63 GHz between Intelligent Transport Systems (ITS) and other systems".
- [i.15] ETSI EN 302 686: "Intelligent Transport Systems (ITS); Radiocommunications equipment operating in the 63 GHz to 64 GHz frequency band; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".
- [i.16] ETSI EN 302 217-3: "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 3: Equipment operating in frequency bands where both frequency coordinated or uncoordinated deployment might be applied; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".
- [i.17] ERC Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".
- [i.18] ECC Decision 09/01: "Harmonised use of the 63.72-65.88 GHz frequency band for Intelligent Transport Systems (ITS)".
- [i.19] ECC/REC/(05)02: "Use of the 64-66 GHz frequency band for fixed service".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 303 883 [i.13] and the following apply:

EIRP: product of the power supplied to the antenna and the maximum antenna gain relative to an isotropic radiator (absolute or isotropic gain)

roadside-to-vehicle communications: also includes vehicle-to roadside communications

roadside unit: roadside unit includes localized transmitters or receivers or both functions integrated into one unit

NOTE: roadside includes:

- single RSUs operating in a stand-alone fashion; or
- a group of RSUs connected together by an appropriate infrastructure, which may include an information network; or
- a single RSU connected to an information network.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

dB	decibel
GHz	GigaHertz
m	meter
s	second

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AES	Advanced Encryption Standard
AP	Access Point
AR	Augmented Reality
ATPC	Automatic Transmit Power Control
BBU	Base Band Unit
BPSK	Binary Phase Shift Keying
CE	Consumer Electronics
CEPT	European Conference of Post and Telecommunications Administrations
DEC	Decision of Electronics Communications Committee
DP	DisplayPort
ECC	Electronic Communications Committee
EIRP	Equivalent Isotropically Radiated Power
ERC	European Radiocommunication Committee
ERM	Electromagnetic compatibility and Radio spectrum Matters
FDD	Frequency Division Duplex
GCM	Galois/Counter Mode
HD	High Definition
HDMI	High Definition Multimedia Interface
IEEE	Institution of Electrical and Electronic Engineers
IMT	International Mobile Telecommunications
ISM	Industrial Scientific Medical
ITS	Intelligent Transport Systems
LAN	Local Area Network
LOS	Line Of Sight
MAC	Media Access Control
MGWS	MultiGigabit Wireless Systems
MoU	Memorandum of Understanding
NLOS	Non Line Of Sight
NR	New Radio
OFDM	Orthogonal Frequency Division Multiplex
PAN	Personal Area Network
PHY	PHYsical layer
PSD	Power Spectral Density
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RLAN	Radio Local Area Network
RRH	Remote Radio Head
RSU	Road-Side Unit
RTTT	Road Transport and Traffic Telematics
SC	Single Carrier
SISO	Single Input Single Output
SRD	Short Range Device
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TTT	Transport and Traffic Telematics
USB	Universal Serial Bus
VR	Virtual Reality

WAS	Wireless Access System
WLAN	Wireless Local Area Network
WPAN	Wireless Personal Area Network
WTTB	Wireless-to-the-Block
WTTH	Wireless-to-the-Home

4 Comments on the System Reference Document

Ericsson AB and Qualcomm UK Ltd. would like to make the following comments, which have been proposed to be included in the SRdoc, but could not be resolved.

- Wi-Fi offloading shall be replaced by WAS/RLAN offloading (or "Wi-Fi" shall be removed completely). This ensures a neutral approach without mentioning any specific technology.
- It shall be remarked in the SRdoc that 66 GHz to 71 GHz is a candidate band for IMT identification with associated services (many common with the applications listed in clauses 5.1.1 to 5.1.4).
- A harmonization of the channel plan between ITS and other users without restricting choice of technology/standard in the extended range 66 GHz to 71 GHz has to be ensured.

Ericsson AB, Qualcomm UK Ltd	9.1, 10	Bullet point 2	General	Add the text: without restricting choice of technology/standard in the extended range 66-71 GHz.	Harmonization of the channel plan between ITS and other users without restricting choice of technology/standard in the extended range 66-71 GHz.	Not resolved
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5 Presentation of the proposed 60 GHz systems

5.1 MultiGigabit Wireless Systems (MGWS)

5.1.1 MGWS Overview

Multiple Gigabit Wireless System (MGWS) radiocommunication networks can be used in short-range, line-of-sight and non-line-of-sight circumstances with traditional WLAN topologies. MGWS systems can also be used in very short range high rate proximity communications where the radio range is a few centimetres with devices pairing point-to-point in close proximity of each other.

For WLAN, total communication range and performance will vary depending on system design (e.g. number of antenna elements) as well as the environment, but multiple gigabit performance is typically expected at ranges around 10 m for in-room use when devices typically possess a few (≤ 3) dozen antenna elements, to a few hundred meters for outdoor use when devices can be equipped with several (≥ 6) dozen antenna elements. These networks can be deployed with an access point as in existing WLAN deployments or without such an infrastructure such as in both WLAN in ad hoc mode and Wireless Personal Area Network (WPAN).

For close proximity communication topology is a pair of devices with performance up to 100 gigabit is expected with range of 10 cm or less (devices nearly touching) with transient connections (rapid setup and teardown); Close proximity device typically will use a single antenna element and very low transmit power.

When access points are used, they are mounted indoor with service covering home or an office space with a nomadic user terminal typically also used indoor, i.e. the entire WLAN system would be used in indoor environment. To provide longer ranges and better capacity, the access point is typically equipped with a larger number of antenna elements than the user terminals.

When access points are not used, MGWS devices are allowed to communicate by setting up direct links for data exchange between the devices/equipment. Typical applications include equipment to equipment (e.g. laptop to projector) and a Consumer Electronics (CE) device to a kiosk (providing distribution of, and providing access to, electronic content such as movies, music, video, e-books, etc.) and it may be assumed that usage would predominantly be indoors. In some application, nomadic devices connect with stationary devices (i.e. kiosk, doorway, turnstile, vending machine) for very short duration to transfer large amounts of data, e.g. download 2 hours of HD video content in 250 ms while passing through an entry turnstile at a train station or airport. For the close proximity applications, a high density of devices and users may be concentrated in a small space, for example when passing through the entry ticket gates at train station or airport.

5.1.2 MGWS Applications

The following distinct applications are examples of services that can be delivered with Multiple Gigabit Wireless Systems (MGWS):

- Wireless video delivery; e.g. connectivity to monitors and head-mounted displays.
- Video streaming from source; e.g. machine vision, robotics, augmented reality.
- Low latency applications; e.g. inter-rack datacentre connectivity, augmented reality.
- Radio Local Area Network (RLAN).
- Kiosk to device; e.g. ticket turnstile to phone.
- Peer-to-peer; e.g. camera to computer.
- device to peripheral; e.g. set top box to monitor, laptop docking.
- Mesh networking.
- Augmented Reality (AR).
- Virtual Reality (VR).
- Location/Navigation.

It should be noted that these applications could be indoor or outdoor. Additional outdoor applications include:

- Backhaul/fronthaul in cellular and wireless systems.
- Point-to-point and point-to-multipoint connectivity.

5.1.3 Possible Outdoor Usage Scenarios

As existing technology gains traction in the marketplace, new applications are being envisioned using the same mass market technology. These new applications encompass usages in commercial and enterprise environments such as Point-to-Point and Point-to-Multipoint backhaul, front haul, outdoor access usage, mesh networks, etc. Backhaul and access examples are shown below in Figure 1 and Figure 2.

Such application are already common and used in this band within the regulatory frame of the Fixed service primary allocation; however, they can also be adapted in the WAS/RLAN technology.

Wireless backhaul could be used for small cell backhauling in lieu of expensive fibre networks to access networks, inter buildings, others. Single hop < 1 000 m, throughput multiple Gbps.