

**RF EXPOSURE EVALUATION**
Maximal Permissible Exposure [MPE]**Applicant Name:**EUCAST Co., Ltd.
(13595) 4th FL Sungok Bldg, 262,
Hwangsaeul-ro Bundang-Gu, Seongnam-si,
Gyeonggi-do, Korea**Date of Testing:**

9/21 ~ 10/27/2020

Test Site/Location:PCTEST KOREA Lab. Yongin-si, Gyeonggi-do,
Korea**Test Report Serial No.:**

8K20091701-01.2AXTR

FCC ID:**2AXTR-ECL2248-2723****APPLICANT:****EUCAST Co., Ltd.****EUT Type:**

LTE enterprise small cell base station

Model:

ECL2248-2723

FCC Classification:

Part 30 Fixed Transmitter (5GB)

FCC Rule Part:

FCC Part 1 (§1.1310) and Part 2 (§2.1091)

Test Procedure(s):

KDB 447498 D01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC KDB 447498 D01. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Prepared by
KI SUNG KIMReviewed by
JAE CHUL SHIN

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1.0 RF EXPOSURE EVALUATION – MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Introduction

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC Rules and Regulations.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	...	...	f/300	6
1500-100,000	...	...	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

Table 1-1. Limits for Maximum Permissible Exposure (MPE)

1.2 EUT Description

The **EUCAST Co., Ltd. CBSD FCC ID: 2AXTR-ECL2248-2723** is a 2-port device which supports single carrier configurations (1CC). Each carrier operates using 10 or 20MHz bandwidth. It supports the following modulation schemes: QPSK, 16-QAM and 64-QAM.

Bandwidth	Antenna	Frequency (MHz)	Modulation	Max EIRP [dBm]
10 MHz	A + B	3555	16-QAM	27.34
20 MHz	A + B	3620	16-QAM	31.15

Table 1-2. Maximum EIRP Summary

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1.3 MPE Requirements Overview

Three different categories of transmitters are defined by the FCC KDB 447498 D01. These categories are fixed installation, mobile and portable and are defined as follows:

- **Fixed Installations:** fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.
- **Mobile Devices:** a mobile device is defined as a transmitting designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 46 CFR §2.1091.
- **Portable Devices:** a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR §2.1093).

The FCC also categorizes the use of the device as based upon the user's awareness and ability to exercise control over his or her exposure. The two categories defined are Occupational/ Controlled Exposure and General Population/Uncontrolled Exposure. These two categories are defined as follows:

- **Occupational/Controlled Exposure:** In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.
- **General Population/Uncontrolled Exposure:** The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

The **EUCAST Co., Ltd. CBSD FCC ID: 2AXTR-ECL2248-2723** is a fixed mounted base station and MPE is evaluated to the General Population/Uncontrolled Exposure limits per 1.1310.

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1.4 Procedure

The procedure used to determine the RF power density was based upon a calculation for determining compliance with the MPE requirements.

The power generated by the mmWave transmitter used in this product was measured in a radiated setup. The EIRP of the mmWave transmitter was calculated through use of the formula: $EIRP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8$; where D is the measurement distance in meters.

Through use of the Friis transmission formula, measurement of the maximum EIRP, and knowledge of the operational duty cycle, the minimum safe distance is calculated for MPE (power density) of 1 mW/cm².

Friis Transmission Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4\pi r^2)$

Where,

P_d = Power Density (mW/cm²)

π = 3.1416

P_{out} = output power to antenna (mW)

r = distance between observation point and center of the radiator (cm)

G = gain of antenna in linear scale

Calculated MPE

The power density limit for General Population/Uncontrolled Exposure at each frequency is determined based on the information in Table 1-1.

Frequency	3555 MHz	
Bandwidth	10 MHz	
Power Density (S) =	1.000 mW/cm ²	
Average EIRP, PGavg =	27.34 dBm	542.00 mW
Minimum Distance, R =	6.6 cm	

Table 1-2. Calculated MPE Data for 5G mmWave (10M Bandwidth, Ant A + Ant B)

Frequency	3620 MHz	
Bandwidth	20 MHz	
Power Density (S) =	1.000 mW/cm ²	
Average EIRP, PGavg =	31.15 dBm	1303.17 mW
Minimum Distance, R =	10.2 cm	

Table 1-3. Calculated MPE Data for 5G mmWave (20M Bandwidth, Ant A + Ant B)

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1.5 Summary of Results

Frequency Band [MHz]	Bandwidth [MHz]	Antenna	Maximum EIRP [dBm]	Minimum Safe Distance @ 1.0 mW/cm ² [cm]
3555-3695	10	A + B	27.34	6.6
3560-3690	20	A + B	31.15	10.2

Table 1-4. Maximum Permissible Exposure Summary Table

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2.0 CONCLUSION

The device meets the MPE Compliance requirements of the FCC Rules and Regulations with minimum safe distance of 10.2 m for operation. An appropriate RF exposure compliance statement will be placed in the user's manual.

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