

Nemko Korea Co., Ltd.

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FCC EVALUATION REPORT FOR C2PC

Project No. : NK-23-R-344**Dates of receipt :** October 20, 2023**Applicant :** i-SENS, Inc.**Dates of Issue :** September 15, 2023

43, Banpo-daero 28-gil, Seocho-gu, Seoul

Test Site :

06646, Korea, Republic of

Nemko Korea Co., Ltd.

FCC ID :

OELCGM-ST-101

Applicant :

i-SENS, Inc.

Brand Name

CareSens

Model:

CGM-ST-101

Additional Model(s):

CGM-ST-102, CGM-ST-103, CGM-ST-104

EUT Type:

Continuous Glucose Monitoring System

Classification:

FCC Part 15 Digital Transmission System (DTS)

Date of Test:

October 26, 2023 ~ October 27, 2023

Applied Standard:

FCC 47 CFR Part 15.247

The device bearing the brand name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. The client should not use it to claim product endorsement by TAF or any government agencies. The test results in the report only apply to the tested sample.

I attest to the accuracy of data and 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.



Tested By : Seojung Kim

Test Engineer



Reviewed By : Hoonpyo Lee

Technical Manager

Revision History

Rev.	Issue Date	Revisions	Revised By
00	November 15, 2023	Initial issue	Seojung Kim

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1. INTRODUCTION

1.1 Test facility

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2014), the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013) was used in determining radiated and conducted emissions emanating.

These measurement tests were conducted at **Nemko Korea Co., Ltd.**

The site address 165-51, Yurim-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, 17042, Rep. of Korea and 155, Osan-ro, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 16885 Rep. of Korea.

1.2 Accreditation and listing

Accreditation type		Accreditation number
	CAB Accreditation for DOC	Designation No. KR0026
	KOLAS Accredited Lab. (Korea Laboratory Accreditation Scheme)	Registration No. KT155
	Canada IC Registered site	Site No. 29506 Site No. 2040E
	VCCI registration site(RE/CE/Telecom CE)	Member No. 2118
	EMC CBTL	TL124
	KCC(RRL)Designated Lab.	Registration No. KR0026

2. EUT INFORMATION & TEST CONDITIONS

2.1 EUT Information

2.1.1 Specifications

EUT Type	Continuous Glucose Monitoring System
Model Name	CGM-ST-101
Frequency of Operation	2 402 MHz ~ 2 480 MHz
Peak Output Power (Conducted)	-4.18 dBm
Number of Channels	40 CH
Modulations	GFSK
Antenna Gain (peak)	1.31 dBi
Antenna Setup	1TX / 1RX
EUT Rated Voltage	1.55 Vdc
EUT Test Voltage	1.55 Vdc
Remarks	-

2.1.2 Additiional model covered by this report

- The purpose of the marketing and the color of the product are different.

2.2 Operation During Test

The EUT is the transceiver which is Bluetooth v5.2 supporting Bluetooth LE mode(Only 1 Mbps). The Laptop PC was used to control the EUT to transmit the wanted TX channel continuously (duty cycle < 98%) by the testing program (RF Tools) and testing command supported by manufacturer. The operating voltage of EUT was 3 Vdc supplied from jig board connected to USB port on Laptop PC.

The EUT was tested at the lowest, middle and the highest channels with the maximum output power in accordance with the manufacturer's specifications. The worst data were recorded in the report.

2.2.1 Table of Test power setting

Frequency	Mode	Modulation	Power setting Level
2 402 MHz ~ 2 480 MHz	BLE 1Mbps	GFSK	-5

2.2.2 Table of Test frequency

Frequency band	Modulation	Test Channel (CH)	Frequency (MHz)
2.4 GHz	GFSK	0	2 402
		19	2 440
		39	2 480

2.2.3 Peak Output Power

Mode	Frequency	Output Power (mW)	
		Original	Changed
Bluetooth LE 1Mbps	2 402	-4.32	-4.68
	2 440	-4.18	-4.41
	2 480	-4.32	-4.21

2.2.4 Antenna Information

Frequency band	Modulation	Antenna TX mode	Support CDD	Support MIMO
2.4 GHz	GFSK	☒ 1TX, ☐ 2TX	☐ Yes, ☒ No	☐ Yes, ☒ No

2.2.5 Additional Information Related to Testing

The cable and attenuator loss from 30 MHz to 26.5 GHz was reflected in spectrum analyzer with correction factor for all conducted testing.

2.2.6 Worst-case Configuration and Mode

Radiated emission below 1GHz was performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

The emissions (Band-edge & spurious emissions) were investigated in three orthogonal orientations X, Y and Z.

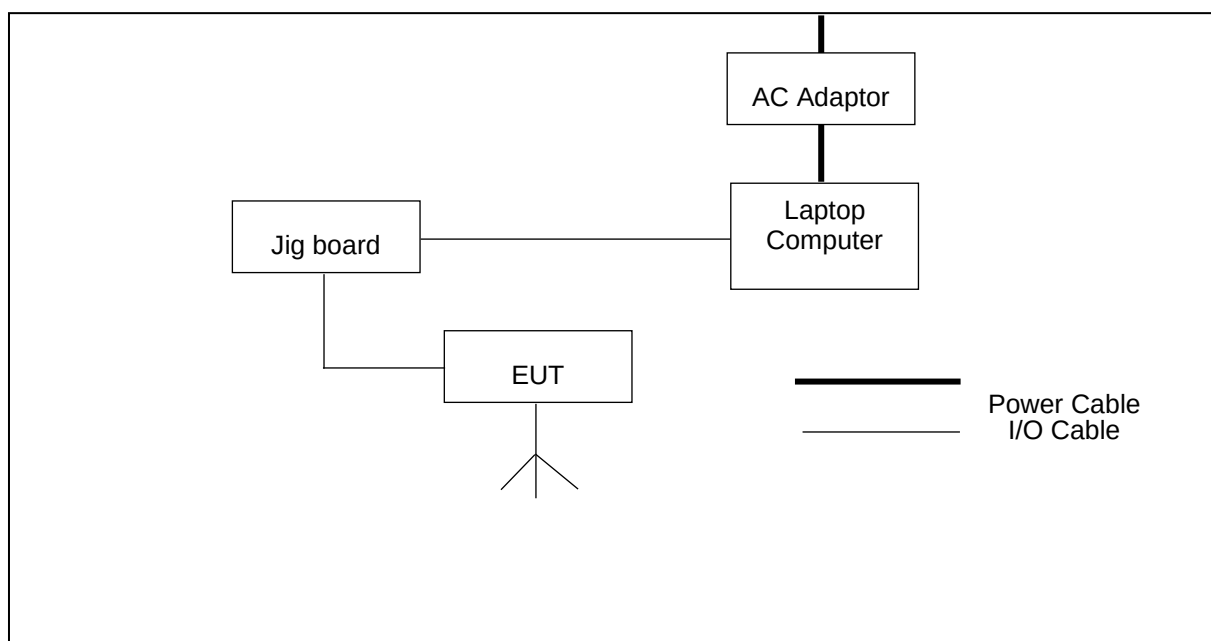
Accordingly, the orientation was determined and tested as shown in the table below:

Test Items	X	Y	Z
Band-edge	O	-	-
Spurious emissions	O	-	-

2.3 Support Equipment

EUT	i-SENS, Inc. Model : CGM-ST-101	S/N: N/A Identical Proto-type
Laptop Computer	LG Model : 15Z90N-VP50ML	FCC DOC S/N : 003NZET038884
AC/DC Adapter	LG Model : WA-48B19FS	FCC DOC S/N : AKDS7648893016463

2.4 Setup Drawing



3. ANTENNA REQUIREMENTS

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15.

§15.203 of the FCC Rules part 15 Subpart C

: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The transmitter has permanently attached Dielectric Chip antenna (Internal antenna) on board.

Used Antenna		
Model name		2 402 MHz ~ 2 480 MHz
		Max. peak gain (dBi)
Changed	IB20FE2_Neon	1.31
Original	IB20FP_Neon	1.02

4. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Name of Test	FCC Paragraph No.	Test Limit	Test Condition	Result	Remark
6dB Bandwidth	15.247(a)(2)	> 500 kHz	Conducted	N/P	-
Peak Output Power	15.247(b)(3)	< 1 Watt		Complies	Note 2
Power Spectral Density	15.247(e)	< 8 dBm/3 kHz		N/P	-
Band Edge / Conducted Spurious Emission	15.247(d)	$\geq$ 20 dBc		N/P	-
Radiated Spurious Emission	15.205, 15.209	< 74 dB μ V/m (PK) < 54 dB μ V/m (AV) Radiated limits detailed in 15.209	Radiated	Complies	Note 1
AC Line Conducted Emission	15.207	FCC 15.207 Limits	Line Conducted	N/P	-

N/P: Not performed.

Note 1 : C2PC Reason - Please see the FCC C2PC Request Letter description for details.

The integrated PCB antenna has been changed, and the antenna gain has been increased compared to the original. The rest of the circuit and RF specifications are the same.

So, we tested only radiated test.

Note 2 : The peak out power was tested to check whether the product output was valid.

5. TEST METHODOLOGY

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 15.247 Meas Guidance v05r02.
4. ANSI C63.10-2013.

7. TEST DATA

7.1 Radiated Spurious Emissions

FCC §15.205, §15.209, §15.247(d)

Test Mode : Set to Lowest channel, Middle channel and Highest channel

Result

LE 1Mbps_Lowest channel (2 402 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Mode*	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4 804.38	41.99	H	PK	-9.2	51.19	74.00	22.81

LE 1Mbps_Middle channel (2 440 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Mode*	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4 880.00	47.35	V	PK	-0.8	48.15	74.00	25.85

LE 1Mbps_Highest channel (2 480 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Mode*	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4 960.00	39.08	H	PK	-9.1	48.18	74.00	25.82

Notes:

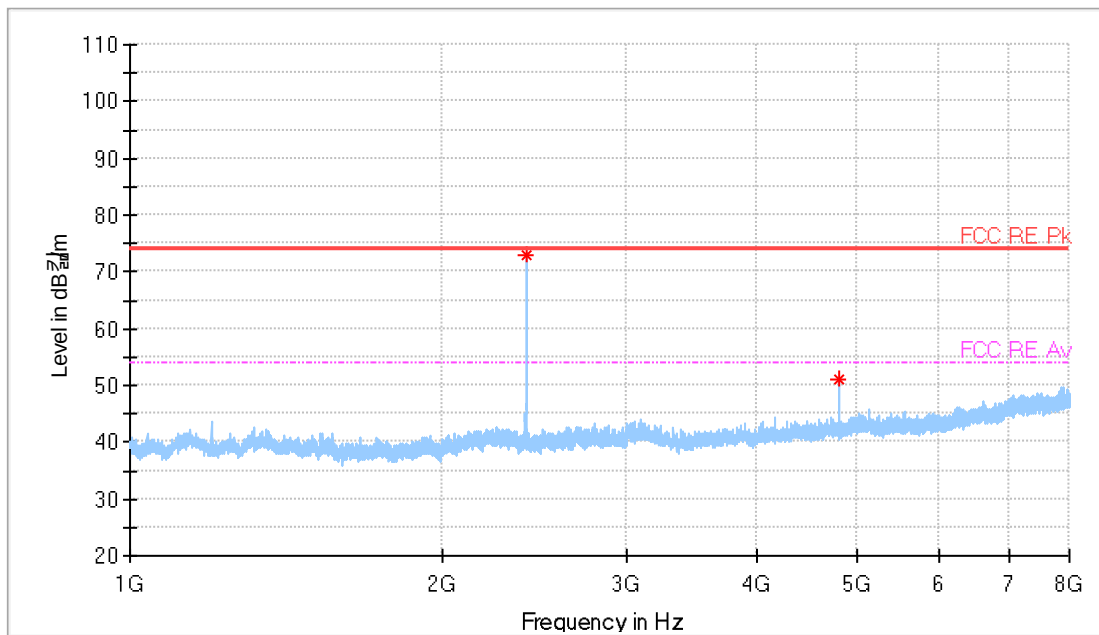
1. *Pol. : H = Horizontal, V = Vertical, Mode : PK = Peak, AV = Average
2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
3. Average measurement was not performed when peak-detected emission complies with the average limit.
4. Other spurious was under 20 dB below Fundamental.
5. Bluetooth 1Mbps, Lowest channel (2 402 MHz) was the worst condition.
6. The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization.
7. Peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
8. Average emissions were measured using RBW = 1 MHz, VBW = 10 kHz, Detector = Peak.
9. The spectrum was measured from 1 GHz to 10th harmonic and the worst-case emissions were reported.

PLOTS OF EMISSIONS

Worst Case

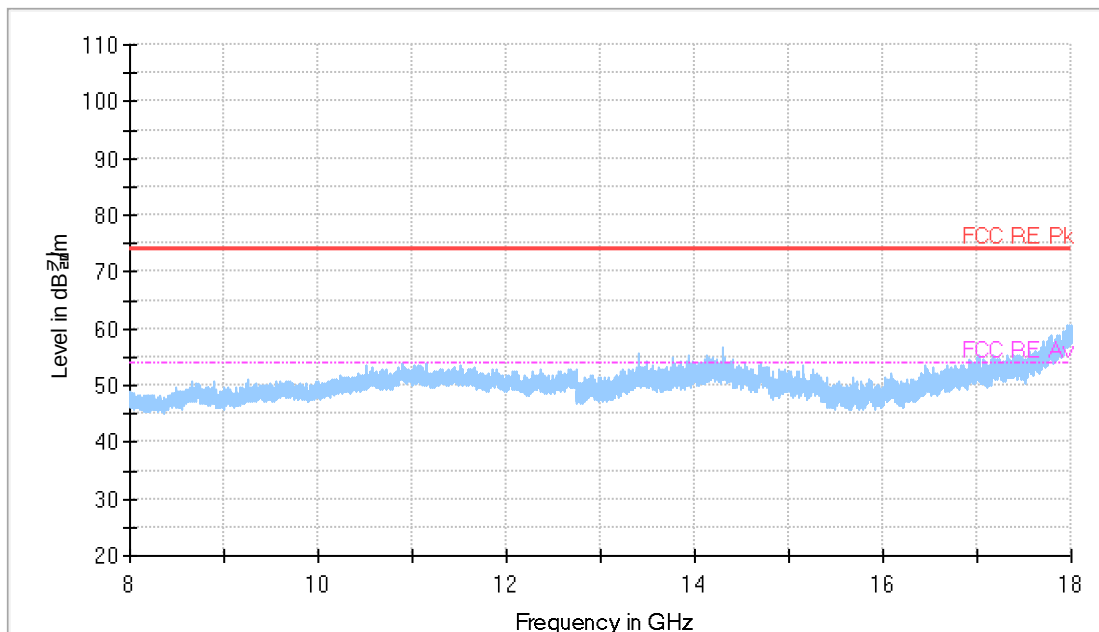
BLE 1Mbps, Lowest Channel (2 402 MHz) : 1 GHz to 8 GHz_Peak

Full Spectrum



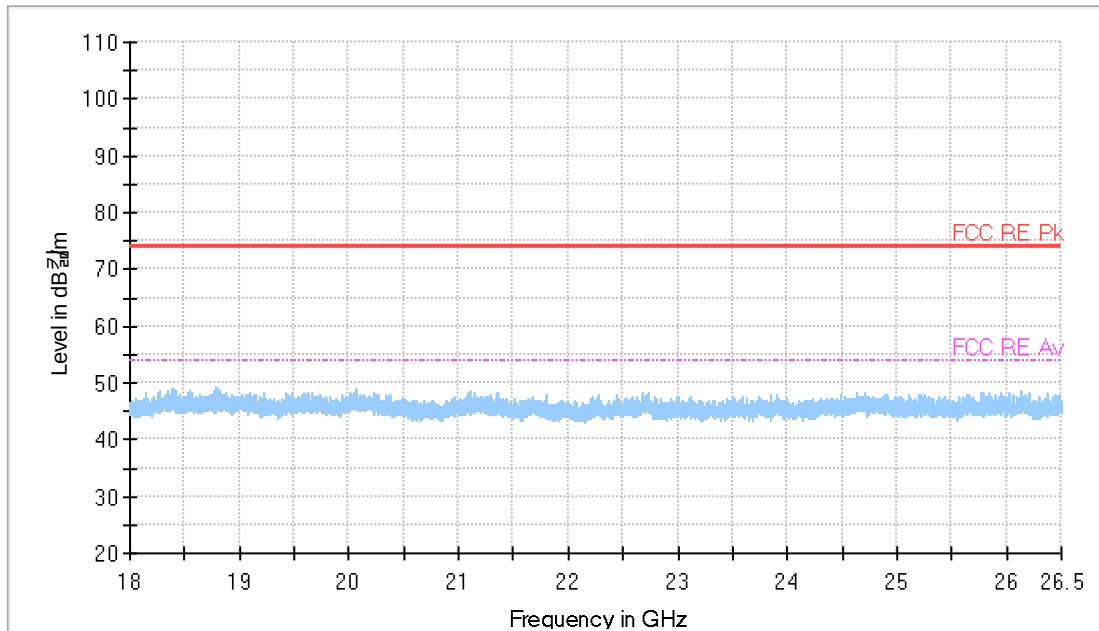
BLE 1Mbps Lowest Channel (2 402 MHz) : 8 GHz to 18 GHz_Peak

Full Spectrum



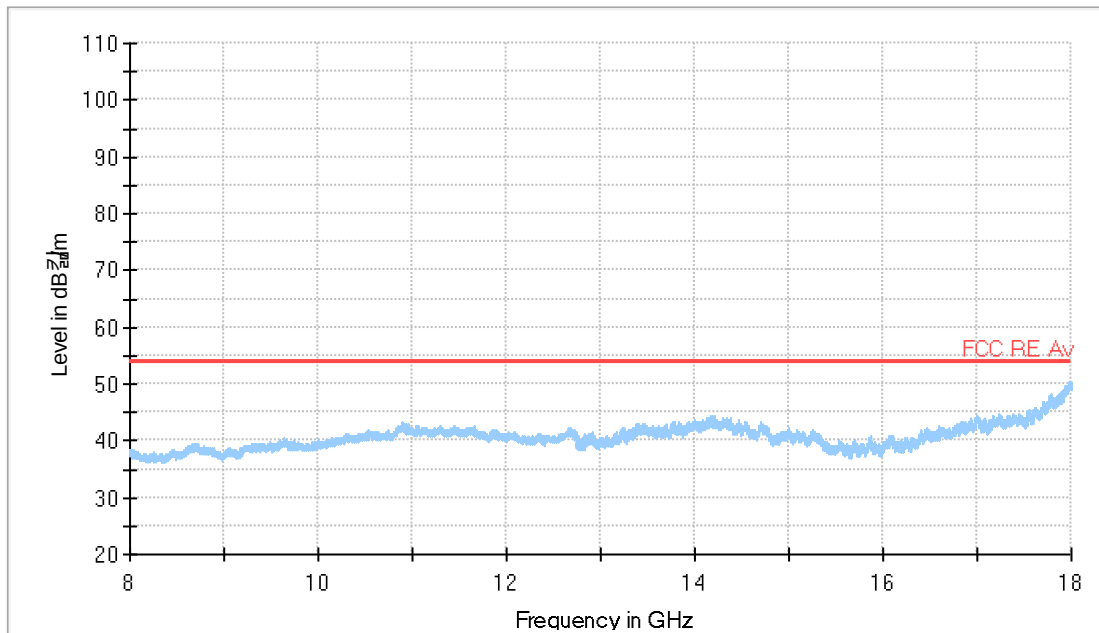
BLE 1Mbps Lowest Channel (2 402 MHz) : 18 GHz to 26.5 GHz_Peak

Full Spectrum



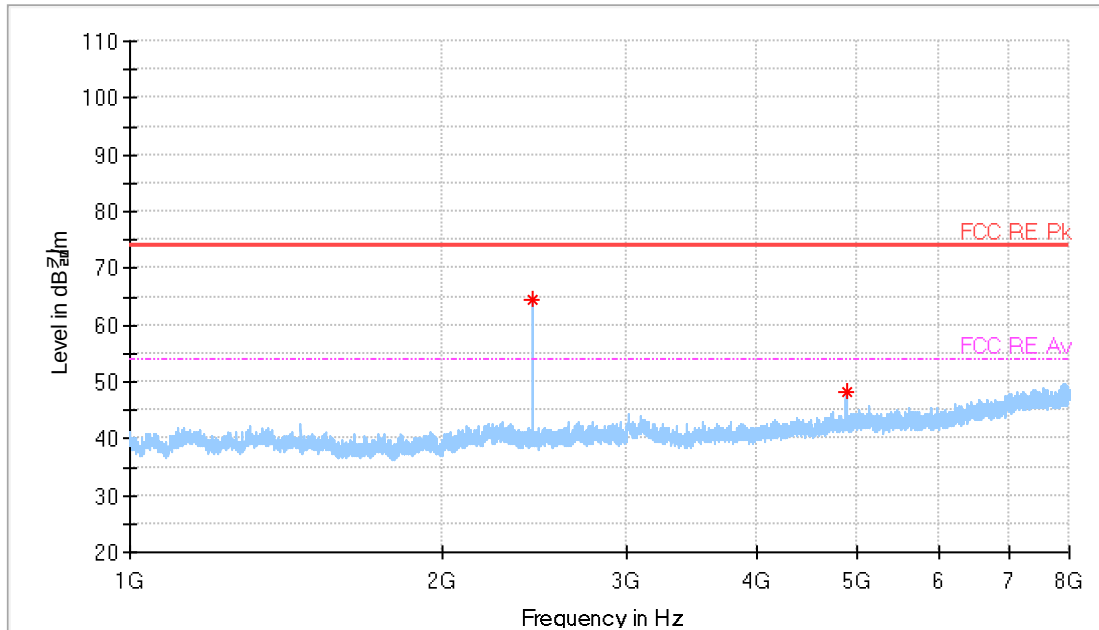
BLE 1Mbps, Lowest Channel (2 402 MHz) : 8 GHz to 18 GHz_Average

Full Spectrum



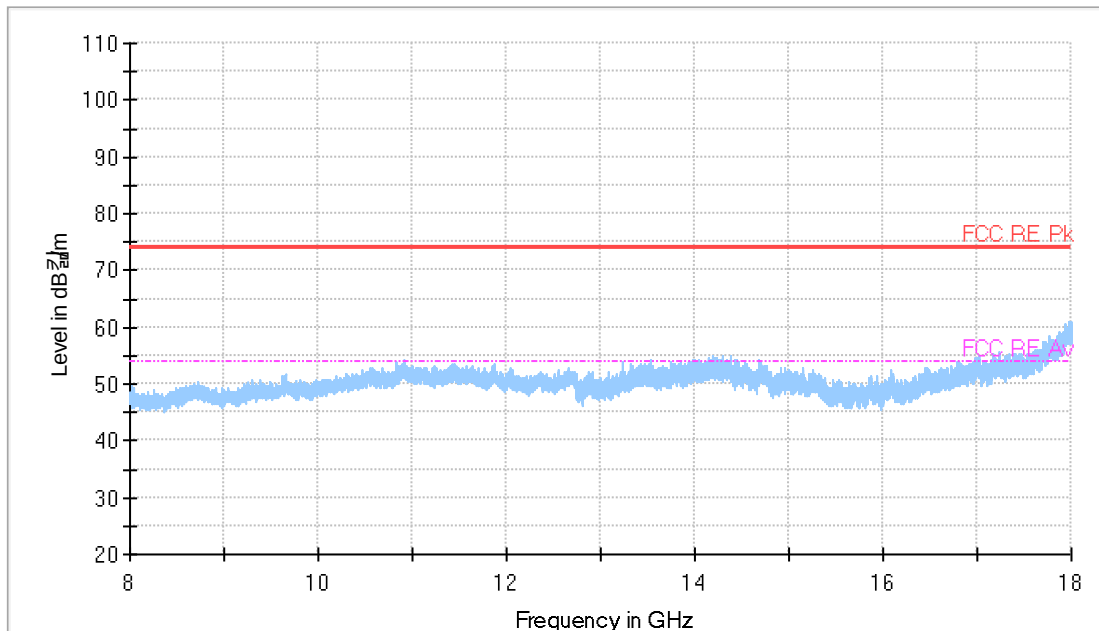
BLE 1Mbps, Middle Channel (2 440 MHz) : 1 GHz to 8 GHz_Peak

Full Spectrum



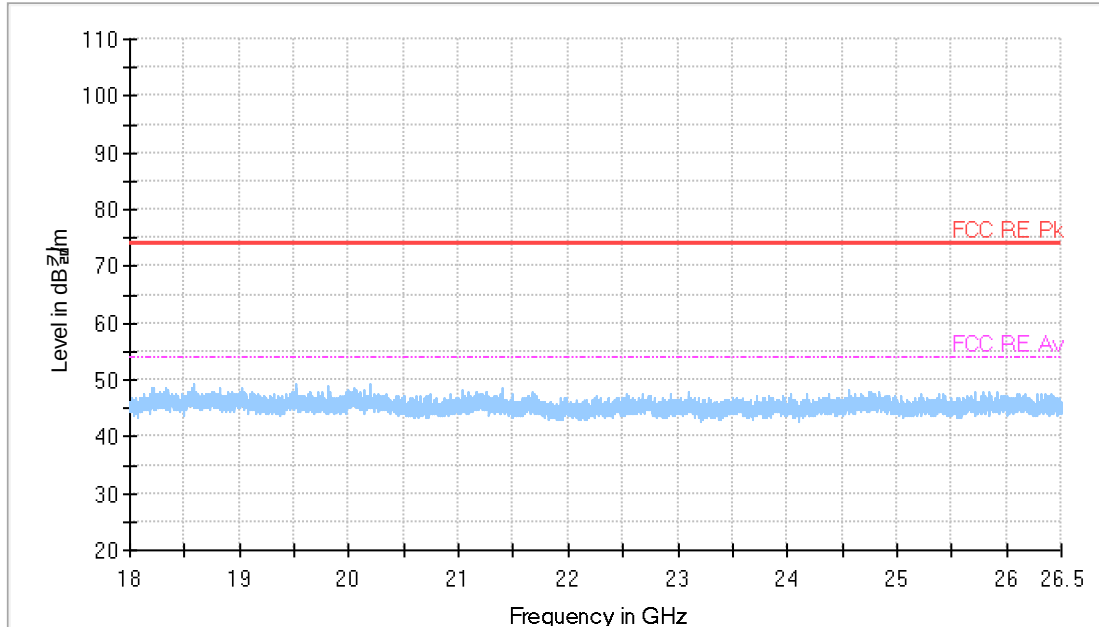
BLE 1Mbps Middle Channel (2 440 MHz) : 8 GHz to 18 GHz_Peak

Full Spectrum



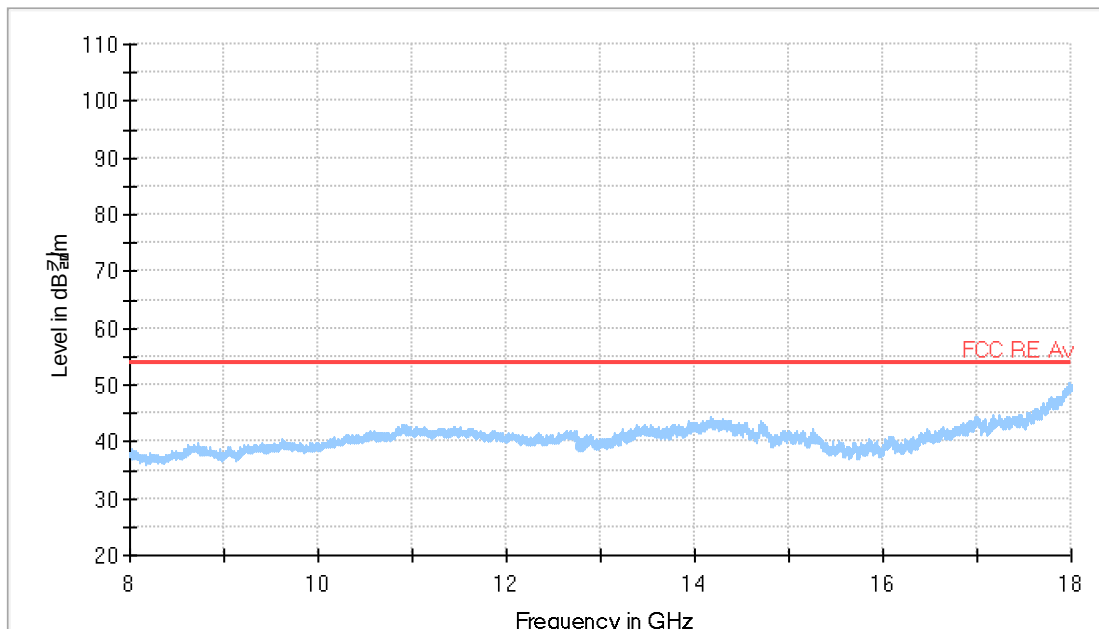
BLE 1Mbps Middle Channel (2 440 MHz) : 18 GHz to 26.5 GHz_Peak

Full Spectrum



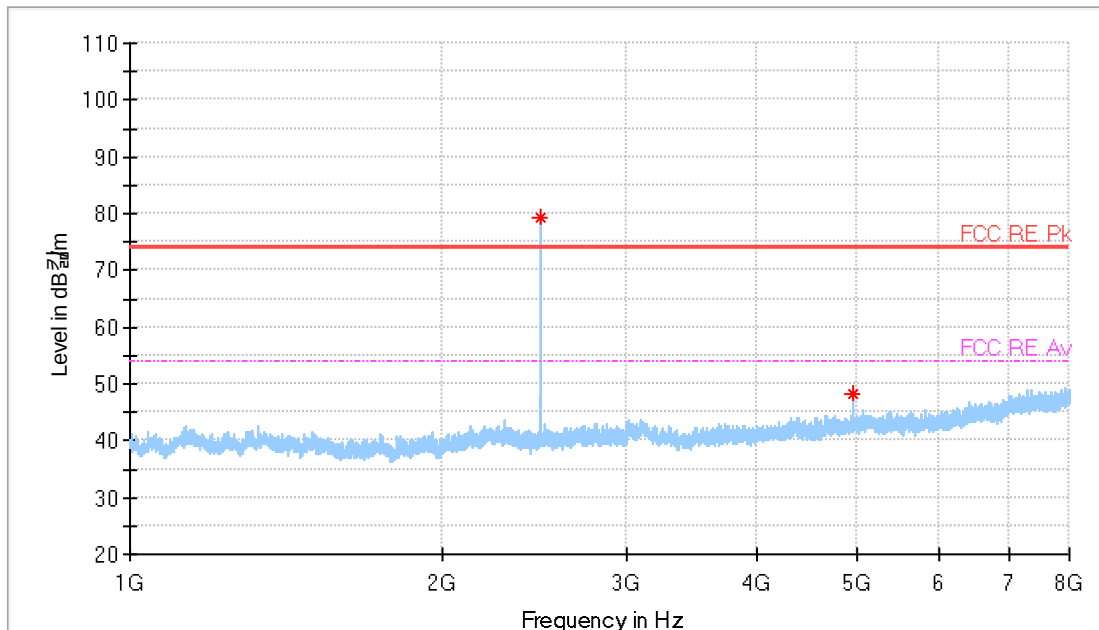
BLE 1Mbps, Middle Channel (2 440 MHz) : 8 GHz to 18 GHz_Average

Full Spectrum



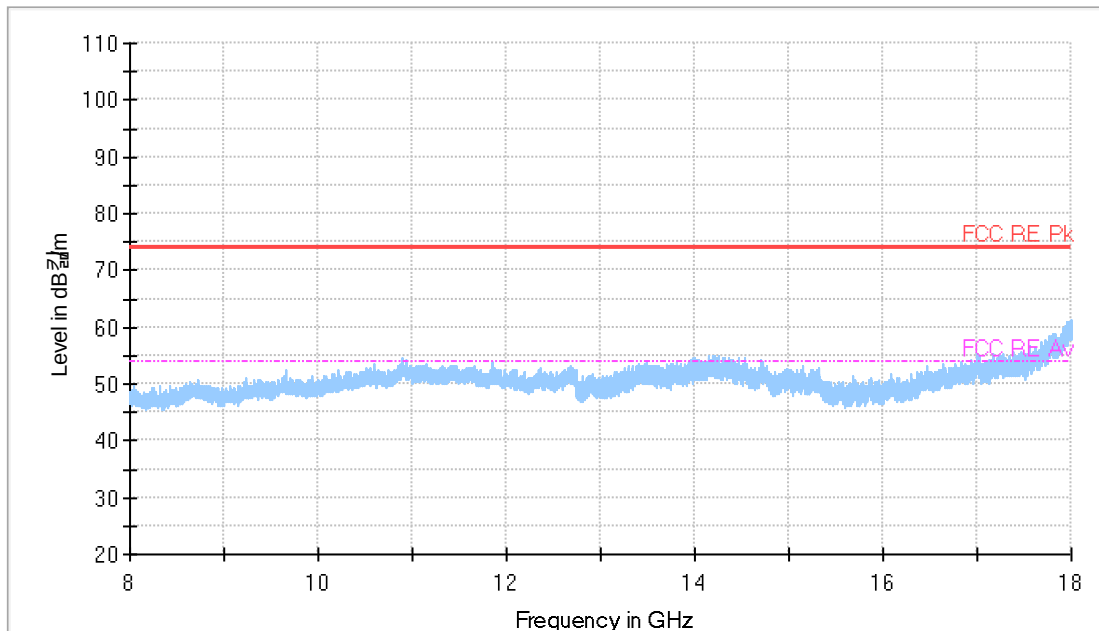
BLE 1Mbps, Highest Channel (2 480 MHz) : 1 GHz to 8 GHz_Peak

Full Spectrum



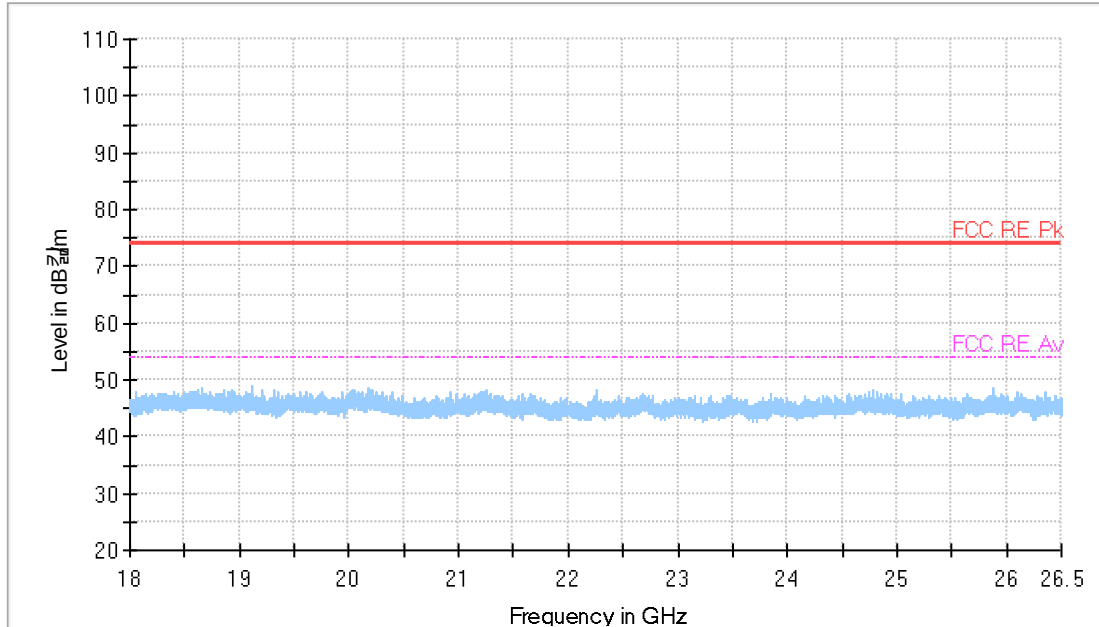
BLE 1Mbps Highest Channel (2 480 MHz) : 8 GHz to 18 GHz_Peak

Full Spectrum



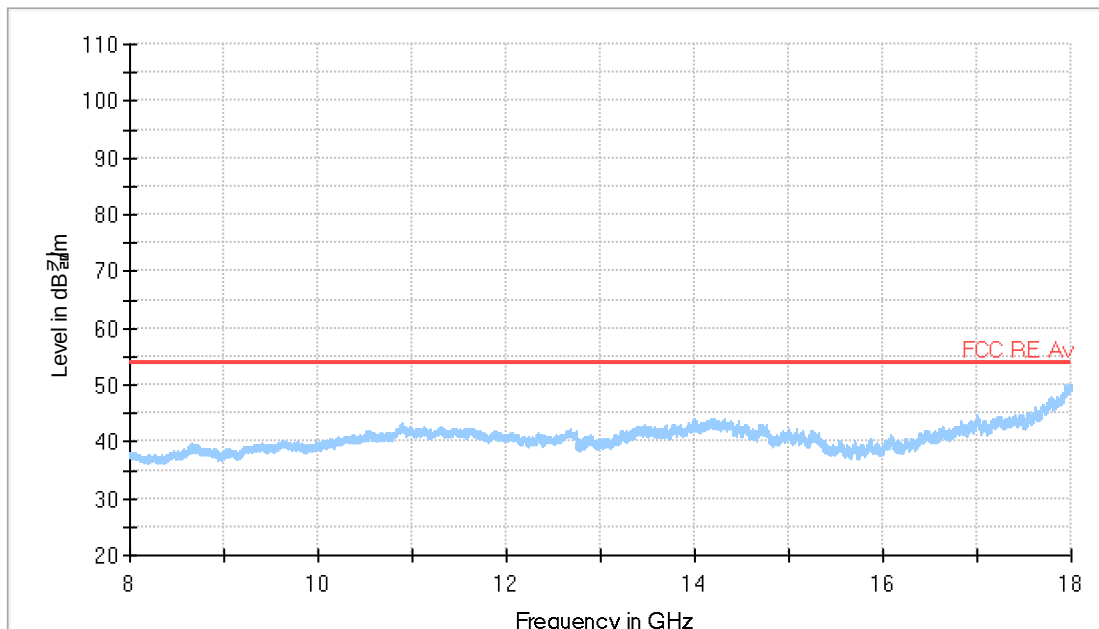
BLE 1Mbps Highest Channel (2 402 MHz) : 18 GHz to 26.5 GHz_Peak

Full Spectrum



BLE 1Mbps, Highest Channel (2 402 MHz) : 8 GHz to 18 GHz_Average

Full Spectrum



7.2 Radiated Band Edge

FCC §15.205, §15.209

Test Mode : Set to Lowest channel and Highest channel

Result

BLE 1Mbps, Lowest Channel (2 402 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Mode*	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2 312.94	53.21	H	PK	-8.8	44.41	74.00	29.59
2 380.11	51.89	H	PK	-9.0	42.89	74.00	31.11

BLE 1Mbps, Highest Channel (2 480 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Mode*	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2 483.50	49.71	H	PK	-9.0	40.71	74.00	33.29
2 487.83	50.68	H	PK	-9.0	39.84	74.00	34.16

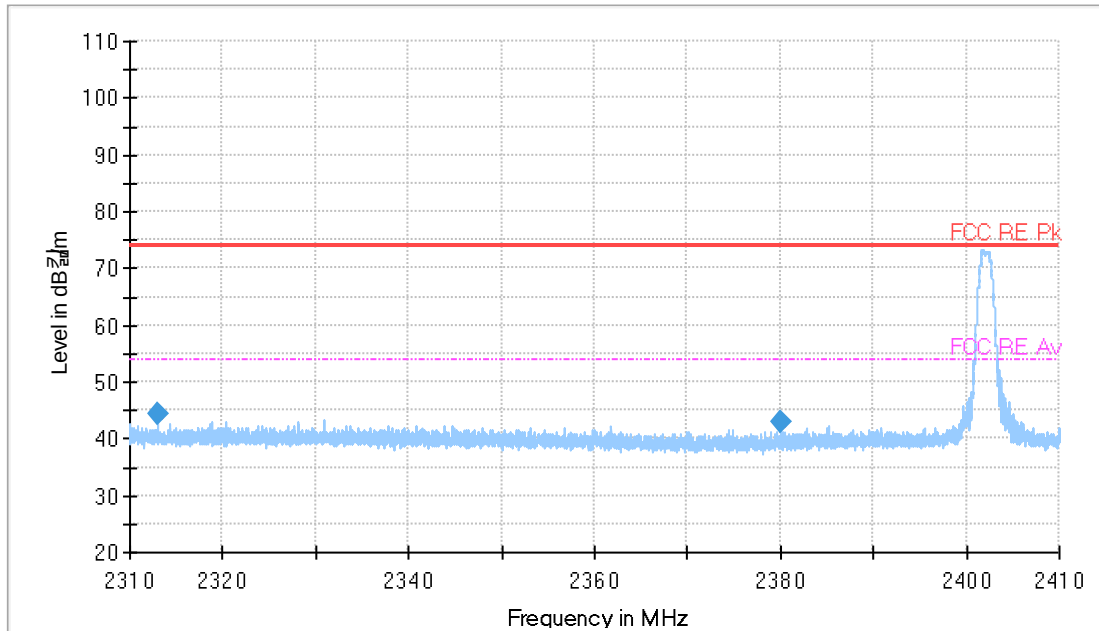
Notes:

- *Pol. : H = Horizontal, V = Vertical, Mode : PK = Peak, AV = Average
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- Average measurement was not performed when peak-detected emission complies with the average limit.
- Other spurious was under 20 dB below Fundamental.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization.
- Peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.

PLOTS OF EMISSIONS

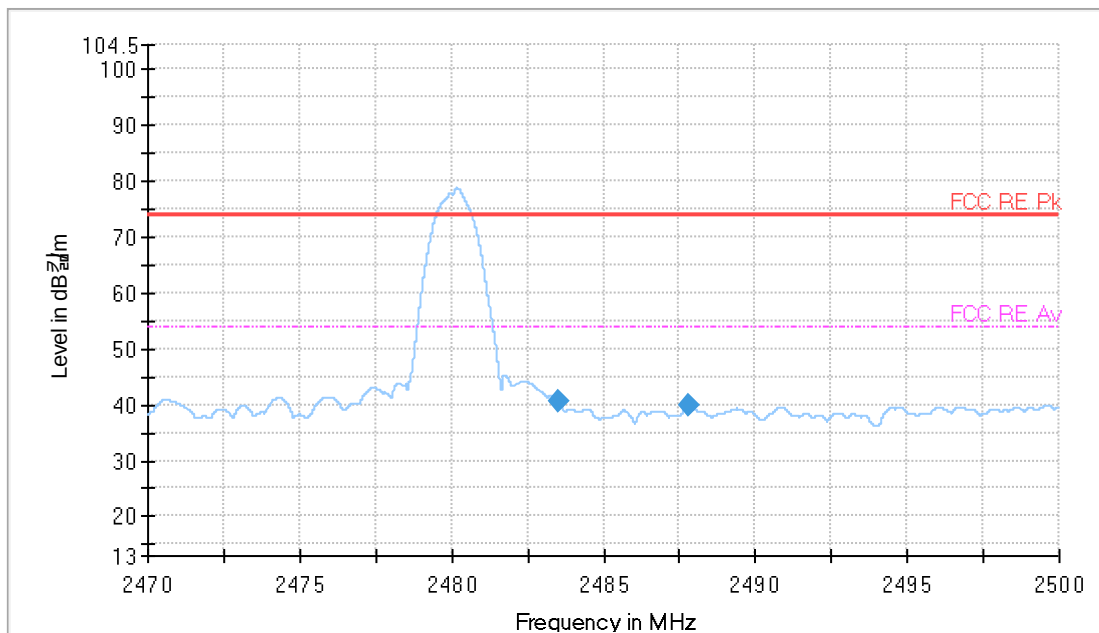
BLE 1Mbps, Lowest Channel (2 402 MHz)_Peak

Full Spectrum



BLE 1Mbps, Highest Channel (2 480 MHz)_Peak

Full Spectrum



7.3 Radiated Emissions_Below 1GHz

FCC §15.209

Result

BLE 1Mbps, Middle Channel (2 440 MHz) – Worst Case

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Mode*	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.00	67.59	V	QP	-34.4	33.19	40.00	6.81
41.32	61.78	V	QP	-32.0	29.78	40.00	10.22
51.07	62.32	V	QP	-31.0	31.32	40.00	8.68
249.97	54.74	V	QP	-29.8	24.94	46.00	21.06
425.54	56.54	H	QP	-24.9	31.64	46.00	14.36
888.61	47.11	V	QP	-17.4	29.71	46.00	16.29

Radiated Measurements at 3meters

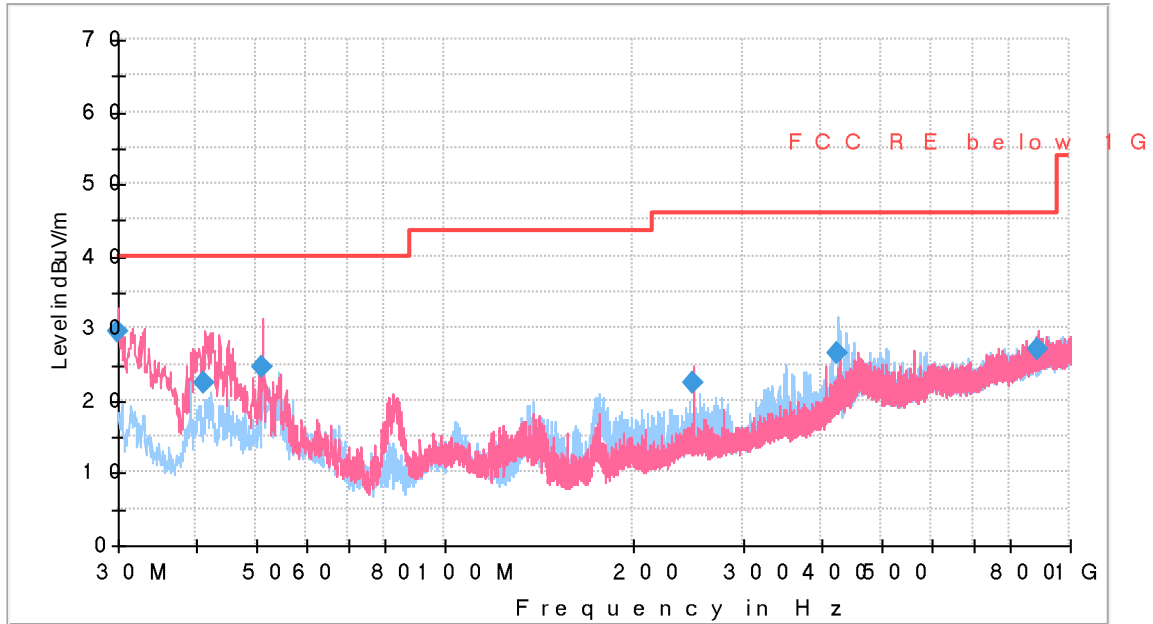
Notes:

1. The worst-case emission was reported.
2. *Pol. : H = Horizontal, V = Vertical, Mode : PK = Peak, QP = Qusi-Peak
3. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
4. Measurements using CISPR quasi-peak mode below 1 GHz.
5. The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
6. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
Per FCC part 15.31(o), test results were not reported.
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 414788.
7. The limit is on the FCC §15.209.

PLOTS OF EMISSIONS

Radiated emission below 1GHz, LE 1Mbps, Middle Channel (2 440 MHz)

F u l l S p e c t r u m



8. TEST EQUIPMENT

Instrument	Manufacture	Model	Serial No.	Calibration Date	Next Calibration Date
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW44	103091	2023-03-29	2024-03-29
Signal & Spectrum Analyzer	R&S	FSW43	104084	2023-03-30	2024-03-30
AMPLIFIER	Sonoma Instrument	315	420127	2023-07-03	2024-07-03
TRILOG Broadband Test Antenna	SCHWARZBECK	VULB 9163	01432	2023-06-16	2025-06-16
WiFi Filter Bank	R&S	U083	N/A	N/A	N/A
DIGITAL MULTIMETER	EZ DIGITAL	DM-334	2111395	2023-10-11	2024-10-11
Humidity Temperature	Lutron	MHB-382SD	AK.26553	2023-10-18	2024-10-18
Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	01615	2023-09-07	2024-09-07
SWITCH AND EXTENSION UNIT CAN-BUS	R&S	OSP150	100929	N/A	N/A
WiFi Filter Bank	R&S	U082	N/A	N/A	N/A
Signal Conditioning Unit	ROHDE & SCHWARZ	SCU 18	10065	2023-03-29	2024-03-29
Signal Conditioning Unit	R&S	SCU-26	10011	2023-07-05	2024-07-05
Horn Antenna	Q-par Angus	QMS-00225	17637	2023-09-07	2024-09-07

9. ACCURACY OF MEASUREMENT & DECISION RULE

9.1 Uncertainty Calculation

The Measurement Uncertainties stated were calculated in accordance with the requirements of measurement uncertainty contained in CISPR 16-4-2 with the confidence level of 95%

PARAMETER	UNCERTAINTY
Radiated Disturbance, 30 MHz to 1 GHz	5.68 dB
Radiated Disturbance, Above 1 GHz	5.06 dB

9.2 Decision rule

The choice of whether or not to include the measurement uncertainty of the measuring system used in the test in the conformance determination.:

- ☐ Application of internal procedures used in type testing where traceability of measurement uncertainty is established.
- ☒ Applying the decision that the standard used for type testing does not require it.

END REPORT