







# TEST REPORT

<b>Eurofins KCTL Co.,Ltd.</b> 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 <a href="http://www.kctl.co.kr">www.kctl.co.kr</a>	Report No.: KR23-SRF0193 Page (1) of (41)	   <b>KCTL</b>
<b>1. Client</b>		
<ul style="list-style-type: none"> <li>◦ Name : SUPREMA INC</li> <li>◦ Address : 17F-5, Parkview officetower,, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13554 Korea (Republic Of)</li> <li>◦ Date of Receipt : 2023-05-01</li> </ul>		
<b>2. Use of Report</b> : FCC Class II permissive change		
<b>3. Name of Product / Model</b> : BioStation3 / BS3-APWB		
<b>4. Manufacturer / Country of Origin</b> : SUPREMA INC / Korea		
<b>5. FCC ID</b> : TKWBS3-APWB		
<b>6. IC Certificate No.</b> : 23080-BS3APWB		
<b>7. Date of Test</b> : 2023-06-29 to 2023-07-17		
<b>8. Location of Test</b> : <input checked="" type="checkbox"/> Permanent Testing Lab <input type="checkbox"/> On Site Testing (Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)		
<b>9. Test method used</b> : FCC Part 15 Subpart C, 15.247 RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 February 2021		
<b>10. Test Result</b> : Refer to the test result in the test report		
Affirmation	Tested by   Name : Eunseong Lim (Signature)	Technical Manager   Name : Heesu Ahn (Signature)
2023-08-03		
<b>Eurofins KCTL Co.,Ltd.</b>		
As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Eurofins KCTL Co.,Ltd.		

<p><b>Eurofins KCTL Co.,Ltd.</b>  65, Sinwon-ro, Yeongtong-gu,  Suwon-si, Gyeonggi-do, 16677, Korea  TEL: 82-70-5008-1021 FAX: 82-505-299-8311  <a href="http://www.kctl.co.kr">www.kctl.co.kr</a></p>	<p>Report No.:  KR23-SRF0193  Page (2) of (41)</p>	
--	--	---

## REPORT REVISION HISTORY

Date	Revision	Page No
2023-08-03	Originally issued	-

*This report shall not be reproduced except in full, without the written approval of Eurofins KCTL Co.,Ltd. This document may be altered or revised by Eurofins KCTL Co.,Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by Eurofins KCTL Co.,Ltd. will constitute fraud and shall nullify the document. This test report is a general report that does not use the KOLAS accreditation mark and is not related to KS Q ISO/IEC 17025 and KOLAS accreditation.*

## General remarks for test reports

### Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

#### Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

Statement not required by the standard or client used for type testing

## CONTENTS

1.	General information .....	4
2.	Device information .....	4
2.1.	Accessory information .....	5
2.2.	Frequency/channel operations.....	5
2.3.	RF power setting in TEST SW .....	5
3.	Antenna requirement .....	6
4.	Summary of tests .....	7
5.	Measurement uncertainty .....	8
6.	Test results .....	9
6.1.	Spurious Emission, Band Edge and Restricted bands.....	9
6.2.	AC Conducted emission .....	39
7.	Measurement equipment .....	41

## 1. General information

Client : SUPREMA INC  
Address : 17F-5, Parkview officetower,, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13554 Korea (Republic Of)  
Manufacturer : SUPREMA INC  
Address : 17F-5, Parkview officetower,, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13554 Korea (Republic Of)  
Laboratory : Eurofins KCTL Co.,Ltd.  
Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea  
Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132  
VCCI Registration No. : R-20080, G-20078, C-20059, T-20056  
CAB Identifier: KR0040, ISED Number: 8035A  
KOLAS No.: KT231

## 2. Device information

Equipment under test : BioStation3  
Model : BS3-APWB  
Frequency range : 2 402 MHz ~ 2 480 MHz (Bluetooth Low Energy)  
2 412 MHz ~ 2 462 MHz (802.11b/g/n\_HT20)  
13.56 MHz (NFC)  
125 kHz (RFID)  
Modulation technique : GFSK (Bluetooth Low Energy)  
DSSS, OFDM(802.11b/g/n\_HT20), ASK (NFC, RFID)  
Number of channels : 40 ch (Bluetooth Low Energy), 11 ch (802.11b/g/n\_HT20)  
1 ch (NFC, RFID)  
Power source : DC 12 V, DC 24 V, PoE 48 V  
Antenna specification : PCB antenna (Bluetooth Low Energy)  
FPCB Antenna(802.11b/g/n\_HT20)  
PCB Loop antenna (NFC)  
Coil antenna (RFID)  
Antenna gain : -2.42 dBi (Bluetooth Low Energy)  
0.63 dBi (802.11b/g/n\_HT20)  
Software version : 1.0.0  
Hardware version : 1.0.0  
Operation temperature : -20 °C ~ 50 °C  
Test device serial No. : Conducted : 547841650  
Radiated : 538153331

## 2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
N/A	-	-	-	-

## 2.2. Frequency/channel operations

This device contains the following capabilities:


NFC, RFID(125 kHz), Bluetooth Low Energy, WIFI (802.11b/g/n HT20)

Ch.	Frequency (MHz)
00	2 402
.	.
19	2 440
.	.
39	2 480

Table 2.2.1. Bluetooth Low Energy

## 2.3. RF power setting in TEST SW

Test Condition	Frequency (MHz)	Test Program	Power Setting
Bluetooth Low Energy	2 402	nRF Connect v3.7.0	0
	2 440		
	2 480		

<p><b>Eurofins KCTL Co.,Ltd.</b>  65, Sinwon-ro, Yeongtong-gu,  Suwon-si, Gyeonggi-do, 16677, Korea  TEL: 82-70-5008-1021 FAX: 82-505-299-8311  <a href="http://www.kctl.co.kr">www.kctl.co.kr</a></p>	<p>Report No.:  KR23-SRF0193  Page (6) of (41)</p>	
--	--	---

### **3. Antenna requirement**

#### **Requirement of FCC part section 15.203:**

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.

#### **Requirement of RSS-Gen Section 6.8:**

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

- The transmitter has permanently attached PCB antenna (internal antenna) on board.
- The E.U.T Complies with the requirement of §15.203, §15.247.

#### 4. Summary of tests

FCC Part Section(s)	IC Rule Reference	Parameter	Test Mode	Test Results
15.247(b)(3)	RSS-247 (5.4)(d)	Maximum Peak Output Power	Conducted	N/T <sup>(1)</sup>
15.247(e)	RSS-247 (5.2)(b)	Peak Power Spectral Density		N/T <sup>(1)</sup>
15.247(a)(2)	RSS-247 (5.2)(a)	6 dB Channel Bandwidth		N/T <sup>(1)</sup>
-	RSS-Gen (6.7)	Occupied Bandwidth		N/T <sup>(1)</sup>
15.207(a)	RSS-Gen (8.8)	AC Conducted Emissions		Pass
15.247(d), 15.205(a), 15.209(a)	RSS-Gen (8.9), (8.10) RSS-247(5.5)	Spurious emission	Radiated	Pass
		Band-edge, restricted band		Pass

**Notes:** (N/T: Not Tested, N/A: Not Applicable)

- This is the FCC/IC Class II Permissive Change report.  
These test items were performed. (FCC ID: TKWBS3-APWB, IC: 23080-BS3APWB Test Report No. KR22-SRF0157 issued on 19, October, 2022 by Eurofins KCTL Co.,Ltd.)
- All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
- The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that Y orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Y orientation
- The worst-case data rate were: 1M Bits/s, 37 Packet
- The test procedure(s) in this report were performed in accordance as following.
  - ◆ ANSI C63.10-2013
  - ◆ KDB 558074 D01 v05r02

## 5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty ( $\pm$ )	
	Radiated Emissions	Below 30 MHz
30 MHz to 1 000 MHz		2.5 dB
1 000 MHz to 18 000 MHz		4.7 dB
Above 18 000 MHz		4.8 dB
Conducted Emissions	150 kHz to 30 MHz	2.7 dB



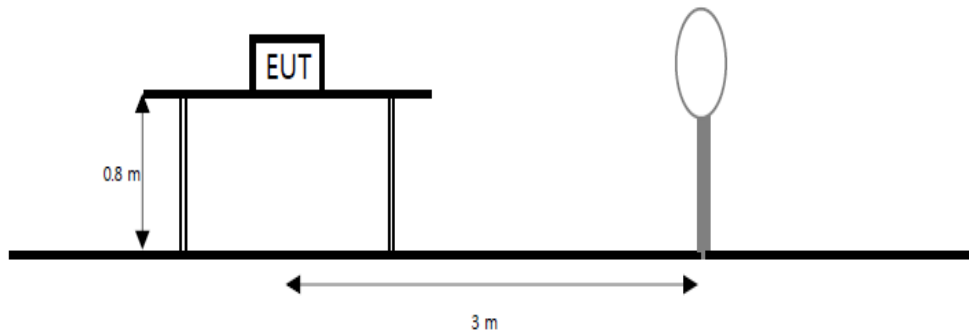


## 6. Test results

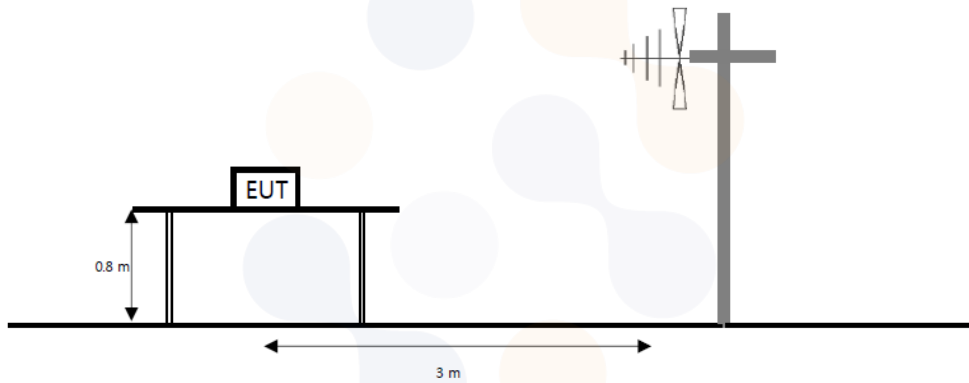
### 6.1. Spurious Emission, Band Edge and Restricted bands

#### Test setup

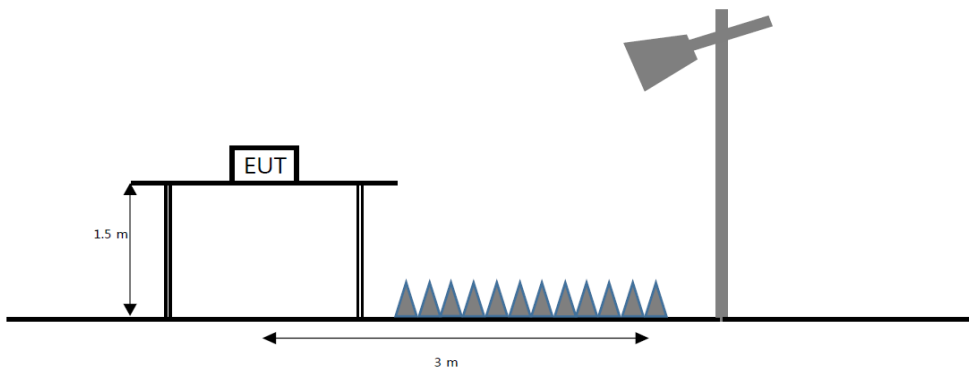
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz emissions, whichever is lower.



**Limit**

**FCC**

According to section 15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength ( $\mu\text{V}/\text{m}$ )	Measurement distance (m)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/F(kHz)	30
1.705 - 30	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section 15.231 and 15.241.

According to section 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.009 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 - 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 - 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 - 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 - 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 - 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 - 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 - 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 - 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525	2 483.5 - 2 500	17.7 - 21.4
8.376 25 - 8.386 75	25	2 690 - 2 900	22.01 - 23.12
8.414 25 - 8.414 75	156.7 - 156.9	3 260 - 3 267	23.6 - 24.0
12.29 - 12.293	162.012 5 - 167.17	3 332 - 3 339	31.2 - 31.8
12.519 75 - 12.520 25	167.72 - 173.2	3 345.8 - 3 358	36.43 - 36.5
12.576 75 - 12.577 25	240 - 285	3 600 - 4 400	Above 38.6
13.36 - 13.41	322 - 335.4		

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in section 15.209. At frequencies equal to or less than 1 000 MHz, compliance with the limits in section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 MHz, compliance with the emission limits in section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in section 15.35 apply to these measurements.

**IC**

According to RSS-247(5.5), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

According to RSS-Gen(8.9), Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

**Table 5- General field strength limits at frequencies above 30 MHz**

Frequency(MHz)	Field strength ( $\mu\text{V}/\text{m}$ at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

**Table 6- General field strength limits at frequencies below 30 MHz**

Frequency	Magnetic field strength (H-Field) ( $\mu\text{A}/\text{m}$ )	Measurement distance(m)
9 – 490 kHz <sup>1)</sup>	6.37/F (F in kHz)	300
490 – 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

**Note 1:** The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

According to RSS-Gen(8.10), Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

- (a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).
- (b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.
- (c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

**Table 7- Restricted frequency bands\***

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138	--	

\* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

## **Test procedure**

ANSI C63.10-2013

## **Test settings**

### **Peak field strength measurements**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW  $\geq$  (3 $\times$ RBW)
4. Detector = peak
5. Sweep time = auto
6. Trace mode = max hold
7. Allow sweeps to continue until the trace stabilizes

**Table. RBW as a function of frequency**

Frequency	RBW
9 kHz to 150 kHz	200 Hz to 300 Hz
0.15 MHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1 000 MHz	100 kHz to 120 kHz
> 1 000 MHz	1 MHz

### **Average field strength measurements**

#### **Trace averaging with continuous EUT transmission at full power**

If the EUT can be configured or modified to transmit continuously (D  $\geq$  98%), then the average emission levels shall be measured using the following method (with EUT transmitting continuously):

1. RBW = 1 MHz (unless otherwise specified).
2. VBW  $\geq$  (3 $\times$ RBW).
3. Detector = RMS (power averaging), if [span / (# of points in sweep)]  $\leq$  (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
4. Averaging type = power (i.e., rms):
  - 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
  - 2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.

#### **Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction**

If continuous transmission of the EUT (D  $\geq$  98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than  $\pm$ 2%), then the following procedure shall be used:

1. The EUT shall be configured to operate at the maximum achievable duty cycle.
2. Measure the duty cycle D of the transmitter output signal as described in 11.6.
3. RBW = 1 MHz (unless otherwise specified).
4. VBW  $\geq$  [3  $\times$  RBW].
5. Detector = RMS (power averaging), if [span / (# of points in sweep)]  $\leq$  (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
6. Averaging type = power (i.e., rms):

- 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
- 2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
7. Sweep time = auto.
8. Perform a trace average of at least 100 traces.
9. A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
  - 1) If power averaging (rms) mode was used in step f), then the applicable correction factor is  $[10 \log (1 / D)]$ , where D is the duty cycle.
  - 2) If linear voltage averaging mode was used in step f), then the applicable correction factor is  $[20 \log (1 / D)]$ , where D is the duty cycle.
  - 3) If a specific emission is demonstrated to be continuous ( $D \geq 98\%$ ) rather than turning ON and OFF with with the transmit cycle, then no duty cycle correction is required for that emission.

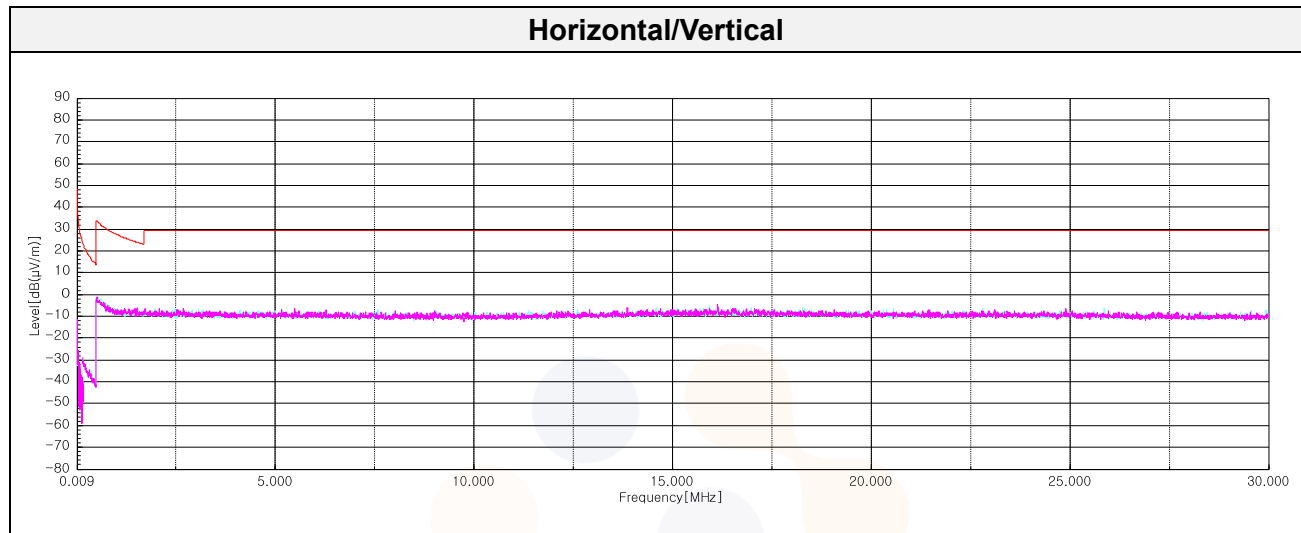
**Notes:**

1.  $f < 30$  MHz, extrapolation factor of 40 dB/decade of distance.  $F_d = 40 \log(D_m/D_s)$   
 $f \geq 30$  MHz, extrapolation factor of 20 dB/decade of distance.  $F_d = 20 \log(D_m/D_s)$   
Where:  
 $F_d$  = Distance factor in dB  
 $D_m$  = Measurement distance in meters  
 $D_s$  = Specification distance in meters
2. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or  $F_d$ (dB)
3. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
4. Average test would be performed if the peak result were greater than the average limit.
5. <sup>1)</sup> means restricted band.

**[DC 12 V]**

**Test results (Below 30 MHz) –Worst case: 1 Mbits/s(37 Bytes)\_2 402 MHz**

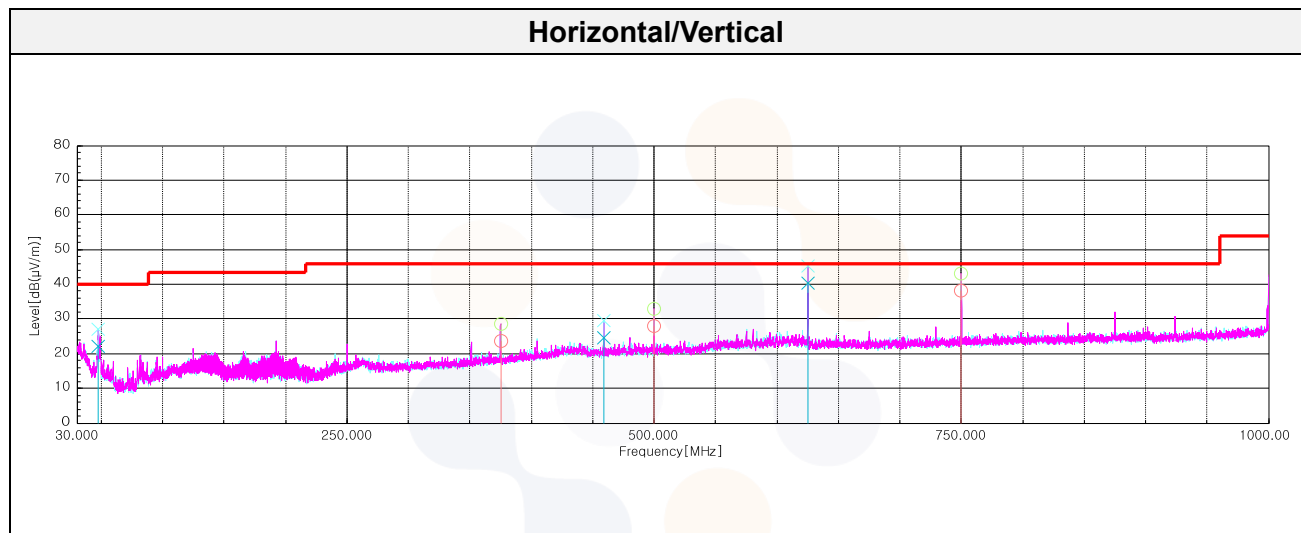
Frequency	Pol.	Reading	Cable Loss	Amp Gain	Antenna Factor	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
No spurious emissions were detected within 20 dB of the limit.									



Note. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X kHz resulted in a level of Y dBμV/m, which is equivalent to  $Y-51.5 = Z$  dBμA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to the 15.209(a) limit.

**Test results (Below 1 000 MHz) –Worst case: 1 Mbits/s(37 Bytes)\_2 402 MHz**

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB( $\mu V$ ))	(dB)	(dB)	(dB)	(dB( $\mu V/m$ ))	(dB( $\mu V/m$ ))	(dB)
<b>Quasi peak data</b>								
47.70	V	38.10	14.92	-31.93	-	21.09	40.00	18.91
375.08	H	32.90	20.70	-31.09	-	22.51	46.00	23.49
458.98	V	31.80	22.75	-30.79	-	23.76	46.00	22.24
500.09	H	34.60	23.20	-30.58	-	27.22	46.00	18.78
625.10	V	45.50	24.55	-30.53	-	39.52	46.00	6.48
750.10	H	41.90	25.50	-30.14	-	37.26	46.00	8.74



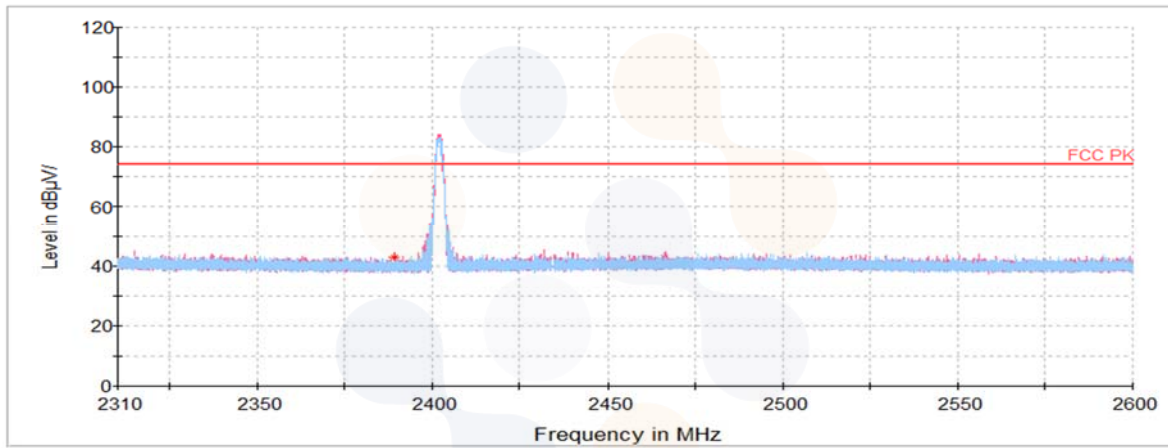


**Test results (Above 1 000 MHz)\_1 Mbits/s(37 Bytes)**

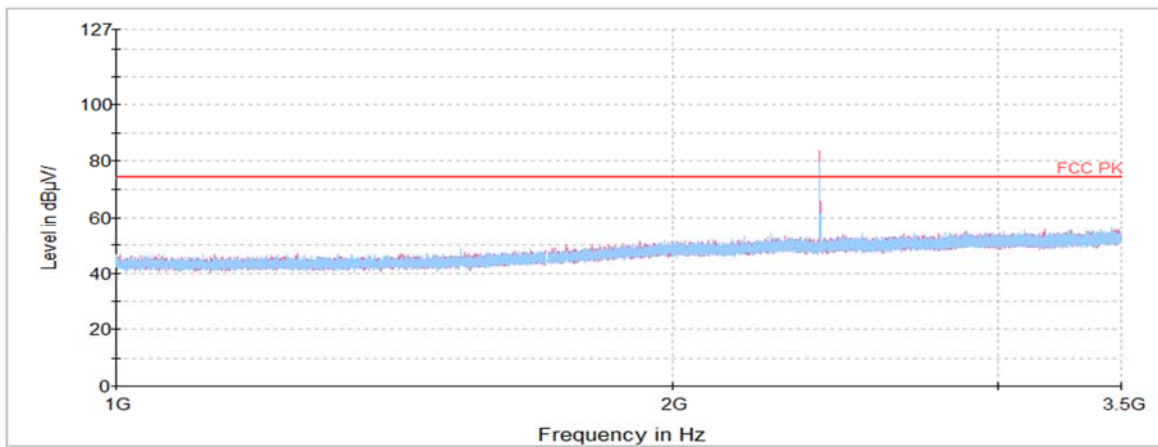
**2 402 MHz**

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
<b>Peak data</b>								
2 389.17 <sup>1)</sup>	H	39.34	32.08	-28.36	-	43.06	74.00	30.94
4 804.55 <sup>1)</sup>	V	71.00	33.40	-55.94	-	48.46	74.00	25.54
7 205.20	V	66.19	35.20	-51.96	-	49.43	74.00	24.57
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

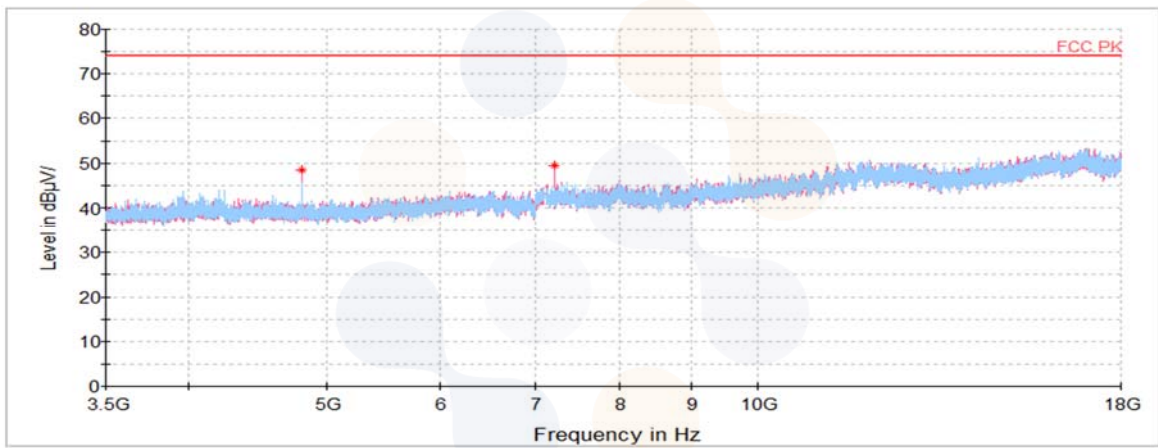
**Horizontal/Vertical for Band-edge**



**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**



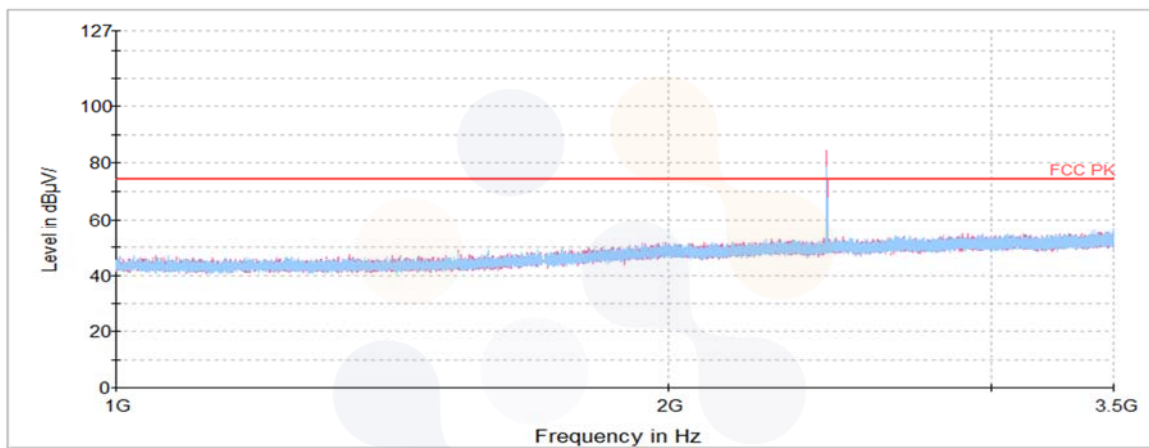
**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



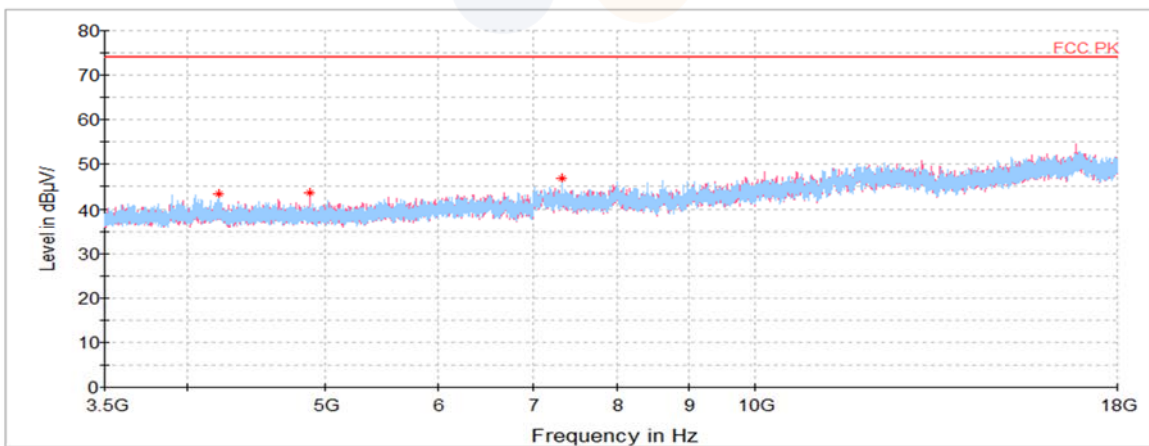
**2 440 MHz**

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
<b>Peak data</b>								
4 208.23 <sup>1)</sup>	H	66.86	33.17	-56.61	-	43.42	74.00	30.58
4 879.31 <sup>1)</sup>	V	65.92	33.40	-55.76	-	43.56	74.00	30.44
7 319.84 <sup>1)</sup>	H	63.68	35.20	-51.96	-	46.92	74.00	27.08
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**



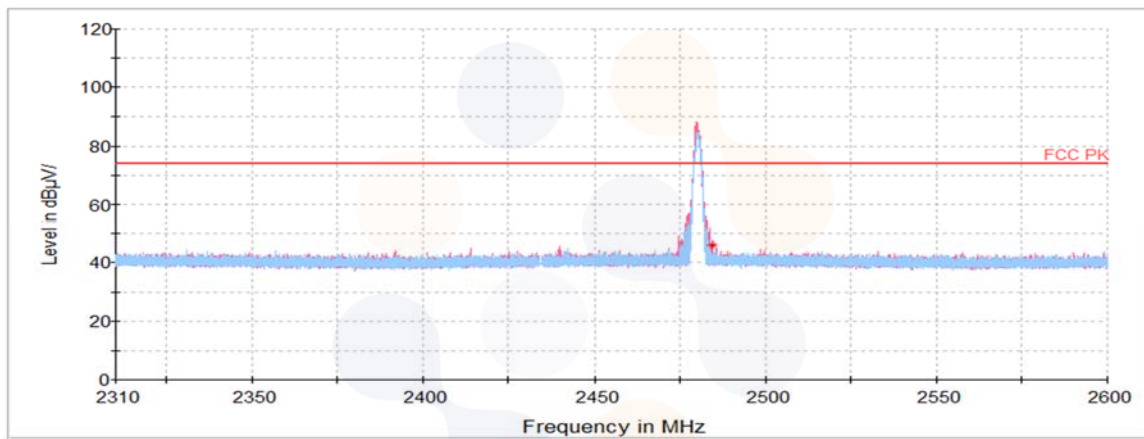
**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



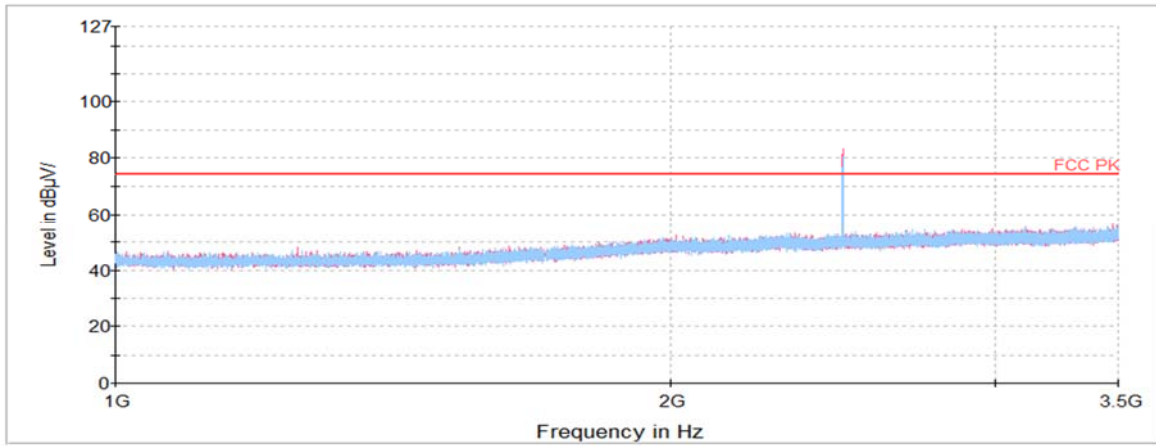
**2 480 MHz**

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
<b>Peak data</b>								
2 484.22 <sup>1)</sup>	V	41.71	32.27	-28.10	-	45.88	74.00	28.12
4 229.98 <sup>1)</sup>	V	66.88	33.18	-56.59	-	43.47	74.00	30.53
4 966.77 <sup>1)</sup>	V	63.44	33.40	-55.57	-	41.27	74.00	32.73
7 439.47 <sup>1)</sup>	V	64.13	35.20	-51.95	-	47.38	74.00	26.62
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

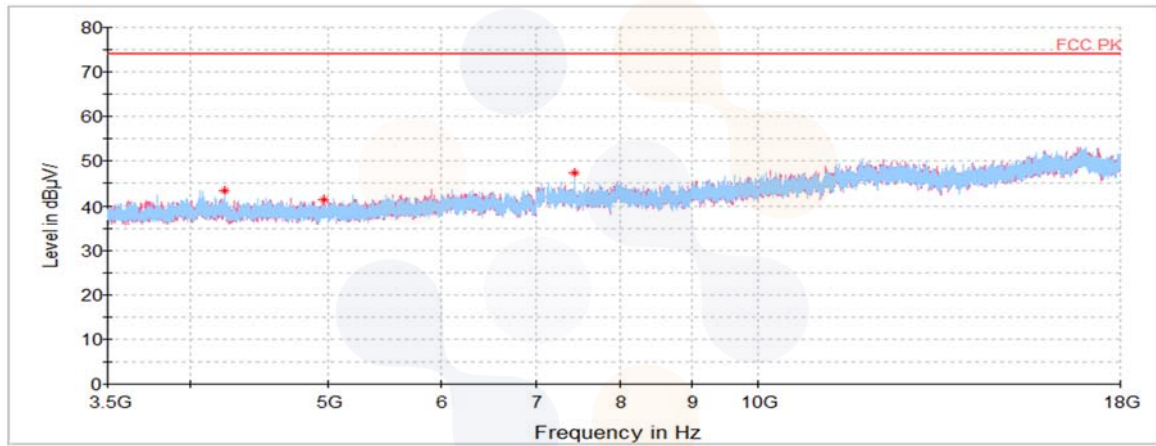
**Horizontal/Vertical for Band-edge**



**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**

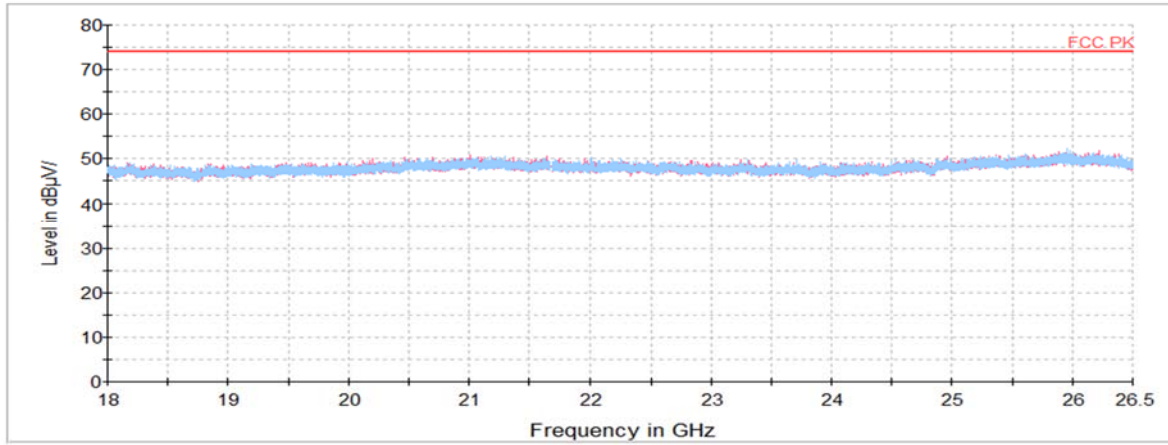


**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



**Test results (Above 18 GHz) – Worst case: 1 Mbits/s(37 Bytes) 2 402 MHz**

**Horizontal/Vertical for 18 GHz ~ 26.5 GHz**



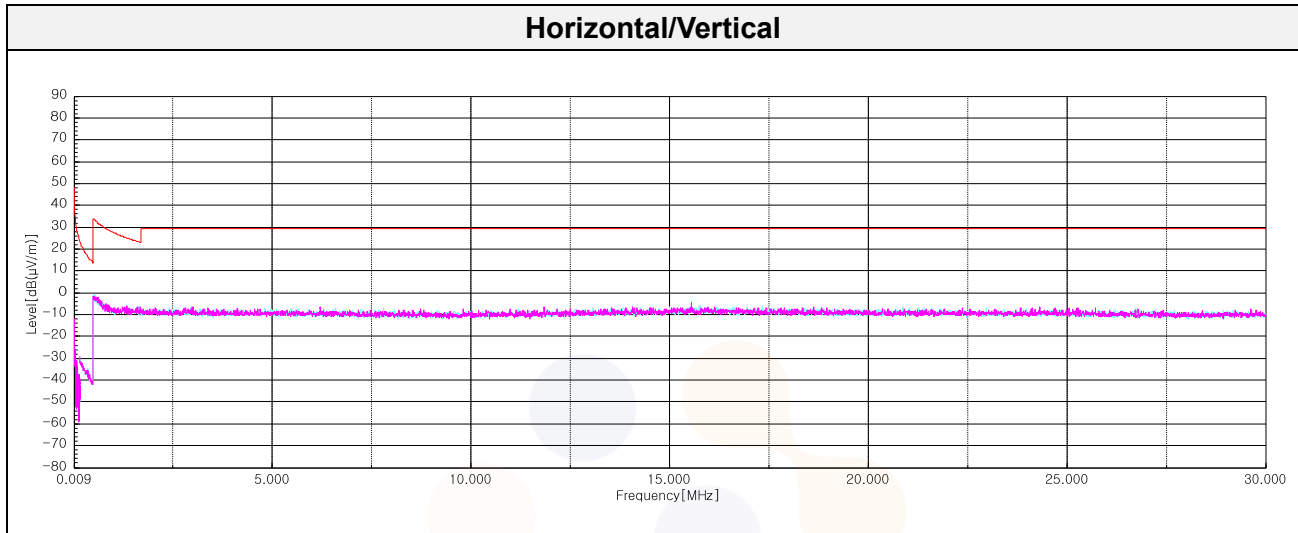
**Note:** The worst case was based on the lowest margin condition considering harmonic and spurious emission.



**[DC 24 V]**

**Test results (Below 30 MHz) –Worst case: 1 Mbits/s(37 Bytes)\_2 402 MHz**

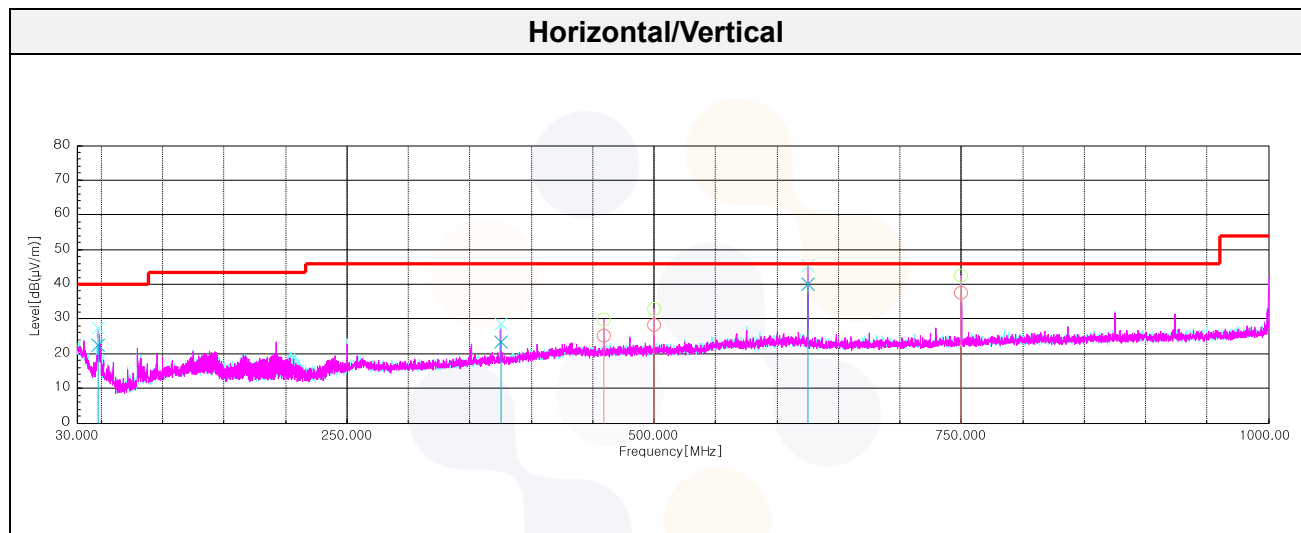
Frequency	Pol.	Reading	Cable Loss	Amp Gain	Antenna Factor	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
No spurious emissions were detected within 20 dB of the limit.									



Note. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X kHz resulted in a level of Y dBμV/m, which is equivalent to  $Y-51.5 = Z$  dBμA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to the 15.209(a) limit.

**Test results (Below 1 000 MHz) –Worst case: 1 Mbits/s(37 Bytes)\_2 402 MHz**

Frequency (MHz)	Pol. (V/H)	Reading (dB( $\mu$ V))	Antenna Factor (dB)	Amp. + Cable (dB)	DCF (dB)	Result (dB( $\mu$ V/m))	Limit (dB( $\mu$ V/m))	Margin (dB)
<b>Quasi peak data</b>								
47.70	V	38.40	14.92	-31.93	-	21.39	40.00	18.61
375.08	V	32.50	20.70	-31.09	-	22.11	46.00	23.89
458.98	H	32.40	22.75	-30.79	-	24.36	46.00	21.64
499.97	H	34.80	23.20	-30.58	-	27.42	46.00	18.58
625.10	V	45.30	24.55	-30.53	-	39.32	46.00	6.68
750.10	H	41.30	25.50	-30.14	-	36.66	46.00	9.34



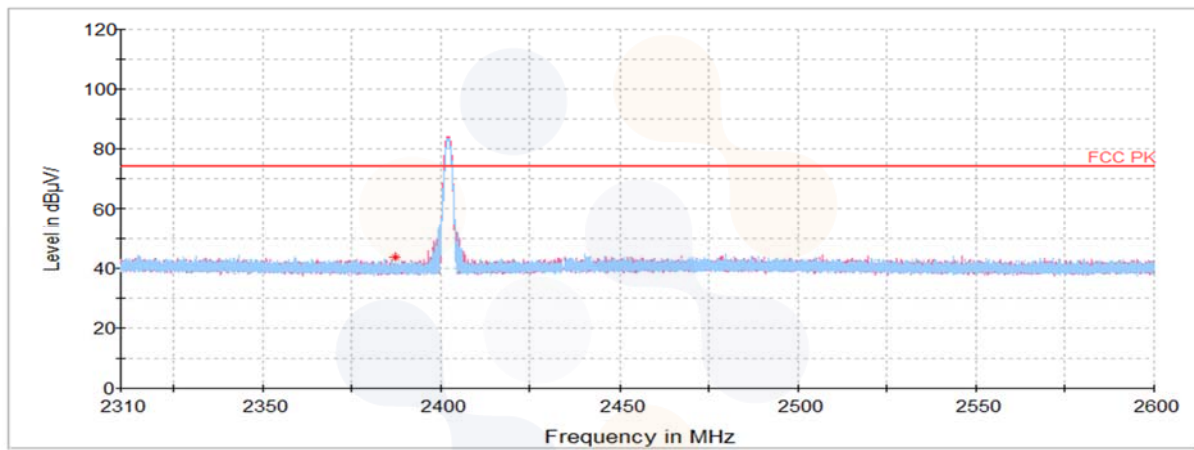


**Test results (Above 1 000 MHz)\_1 Mbits/s(37 Bytes)**

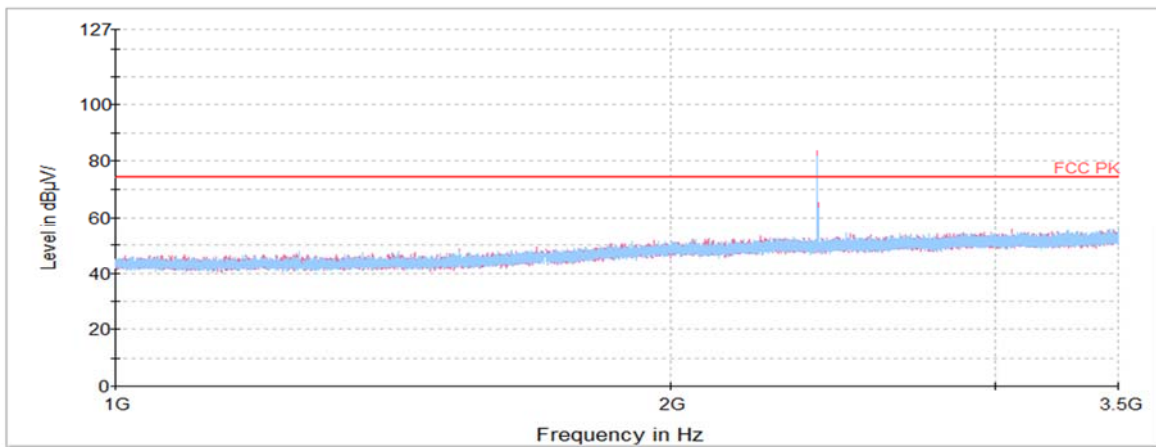
**2 402 MHz**

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
<b>Peak data</b>								
2 387.19 <sup>1)</sup>	H	39.86	32.07	-28.35	-	43.58	74.00	30.42
4 804.55 <sup>1)</sup>	V	70.34	33.40	-55.94	-	47.80	74.00	26.20
7 206.56 <sup>1)</sup>	V	65.89	35.20	-51.96	-	49.13	74.00	24.87
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

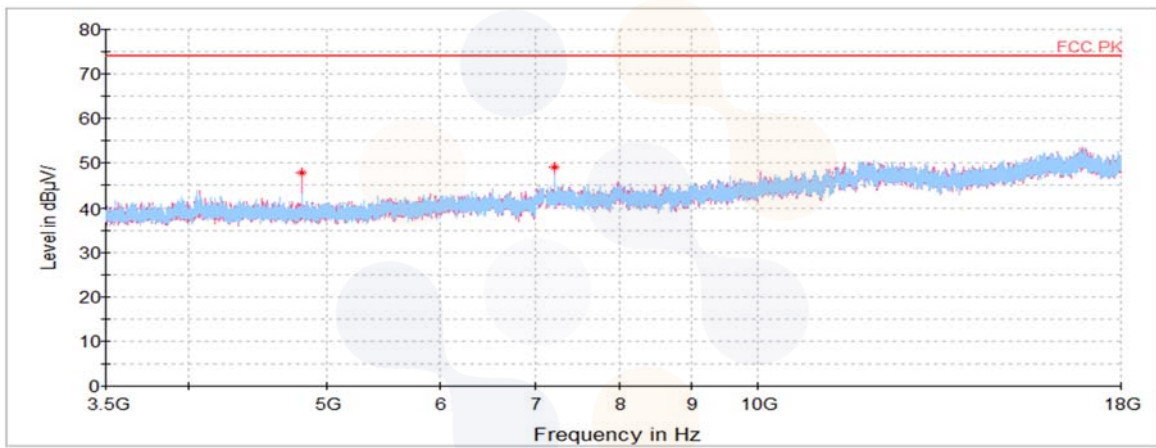
**Horizontal/Vertical for Band-edge**



**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**



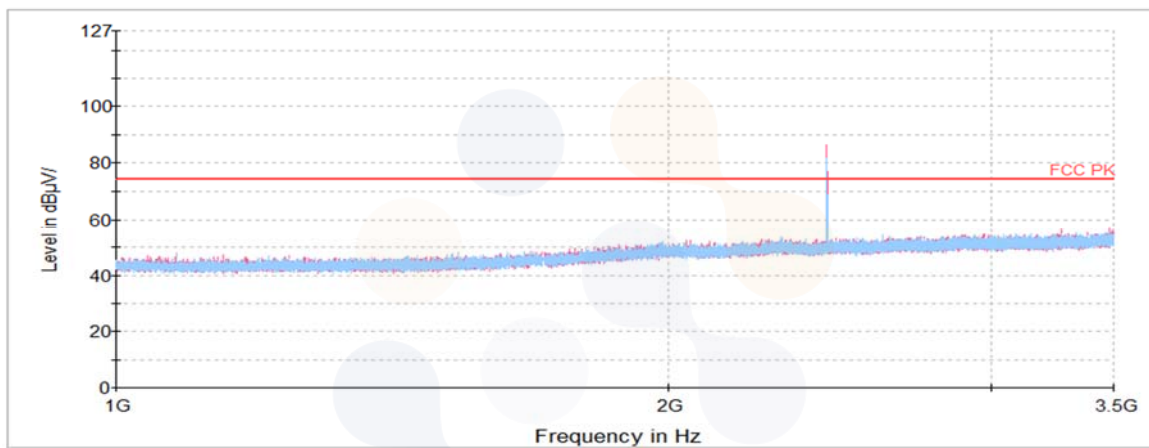
**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



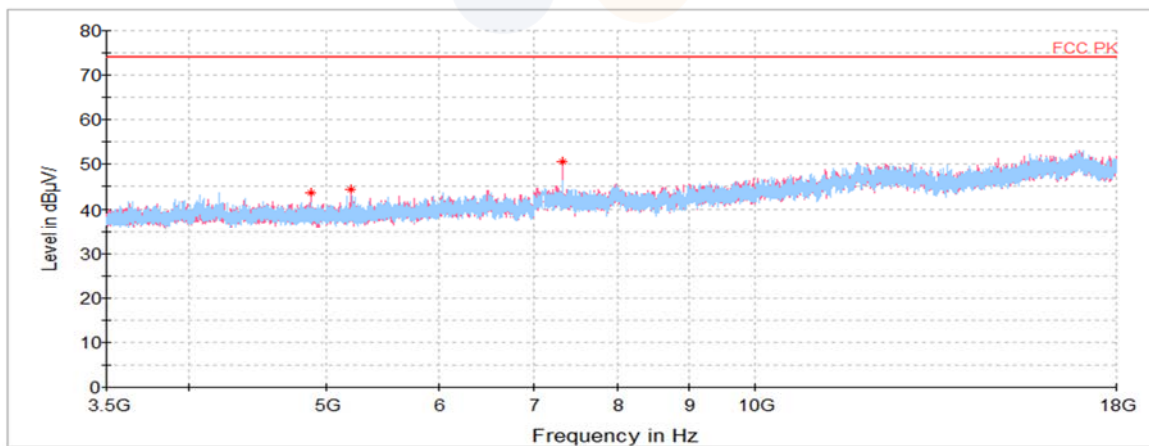
**2 440 MHz**

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
<b>Peak data</b>								
4 879.31 <sup>1)</sup>	V	65.85	33.40	-55.76	-	43.49	74.00	30.51
5 205.11	V	66.63	33.69	-55.92	-	44.40	74.00	29.60
7 319.39 <sup>1)</sup>	V	67.46	35.20	-51.96	-	50.70	74.00	23.30
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**



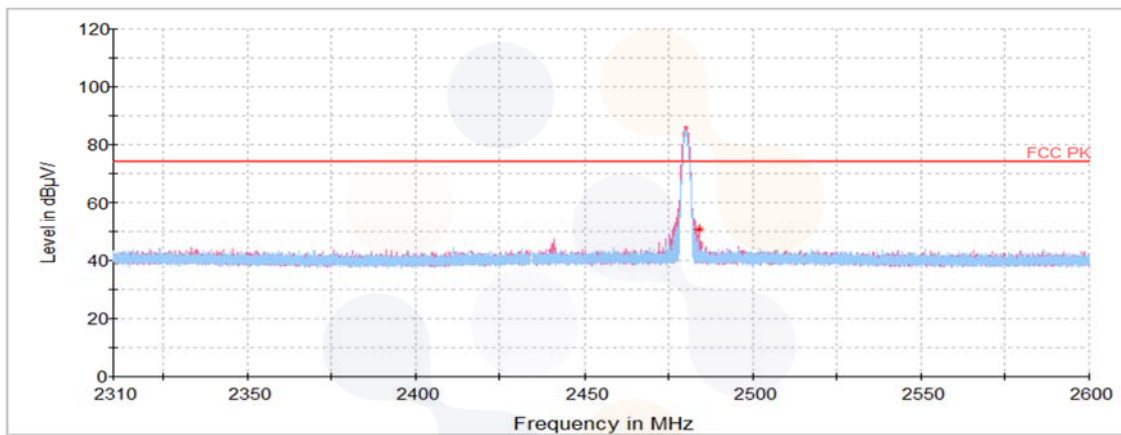
**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



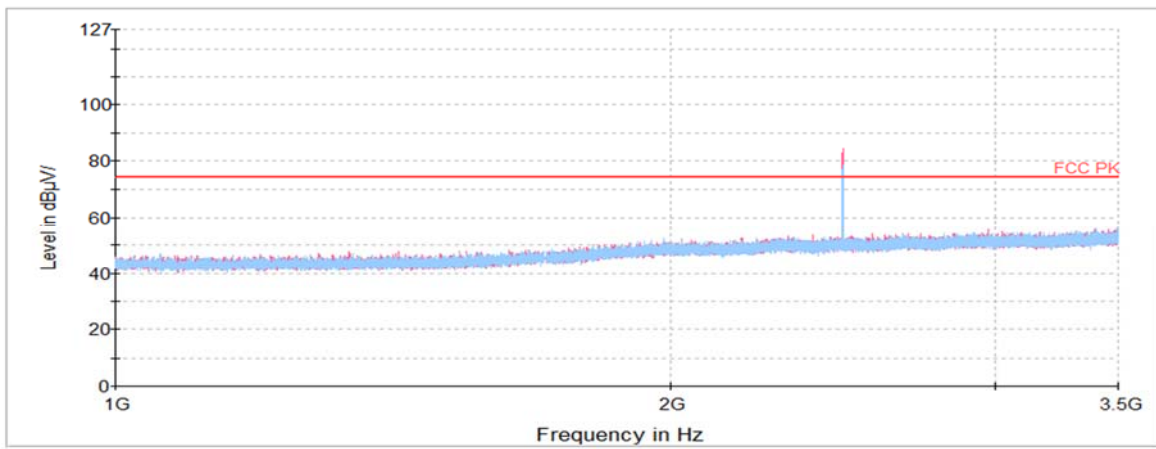
**2 480 MHz**

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
<b>Peak data</b>								
2 484.00 <sup>1)</sup>	V	46.46	32.27	-28.10	-	50.63	74.00	23.37
4 066.86 <sup>1)</sup>	H	68.32	33.05	-56.54	-	44.83	74.00	29.17
5 008.45 <sup>1)</sup>	H	64.09	33.41	-55.50	-	42.00	74.00	32.00
7 439.47 <sup>1)</sup>	V	65.92	35.20	-51.95	-	49.17	74.00	24.83
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

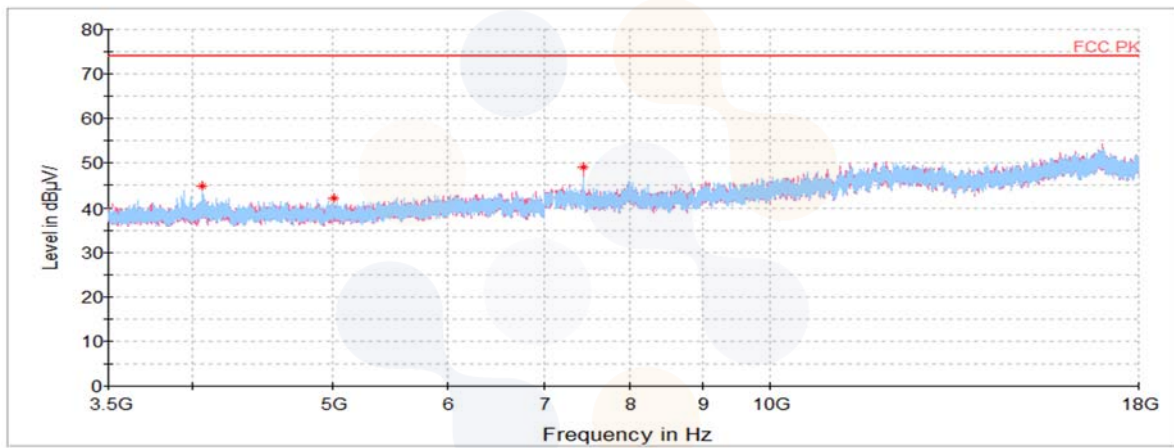
**Horizontal/Vertical for Band-edge**



**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**

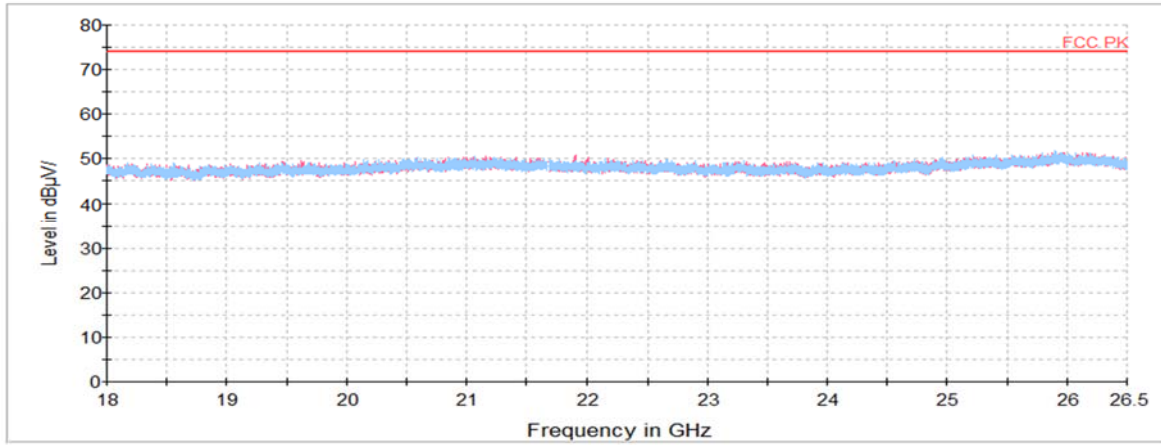


**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



**Test results (Above 18 GHz) – Worst case: 1 Mbits/s(37 Bytes) 2 402 MHz**

**Horizontal/Vertical for 18 GHz ~ 26.5 GHz**



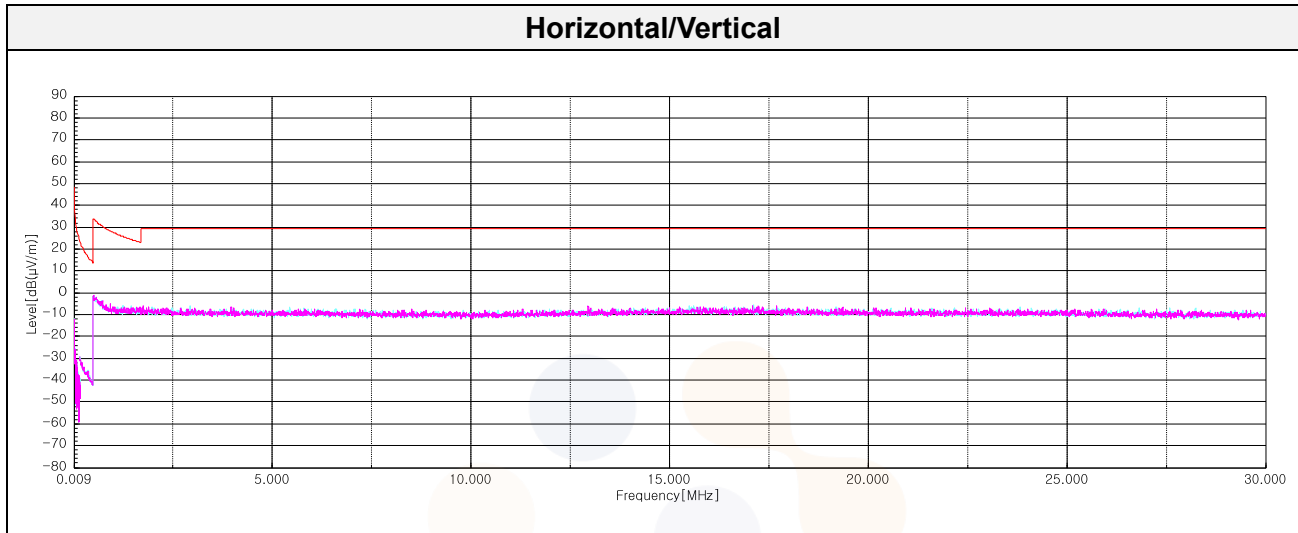
**Note:** The worst case was based on the lowest margin condition considering harmonic and spurious emission.



**[PoE 48 V]**

**Test results (Below 30 MHz) –Worst case: 1 Mbits/s(37 Bytes)\_2 402 MHz**

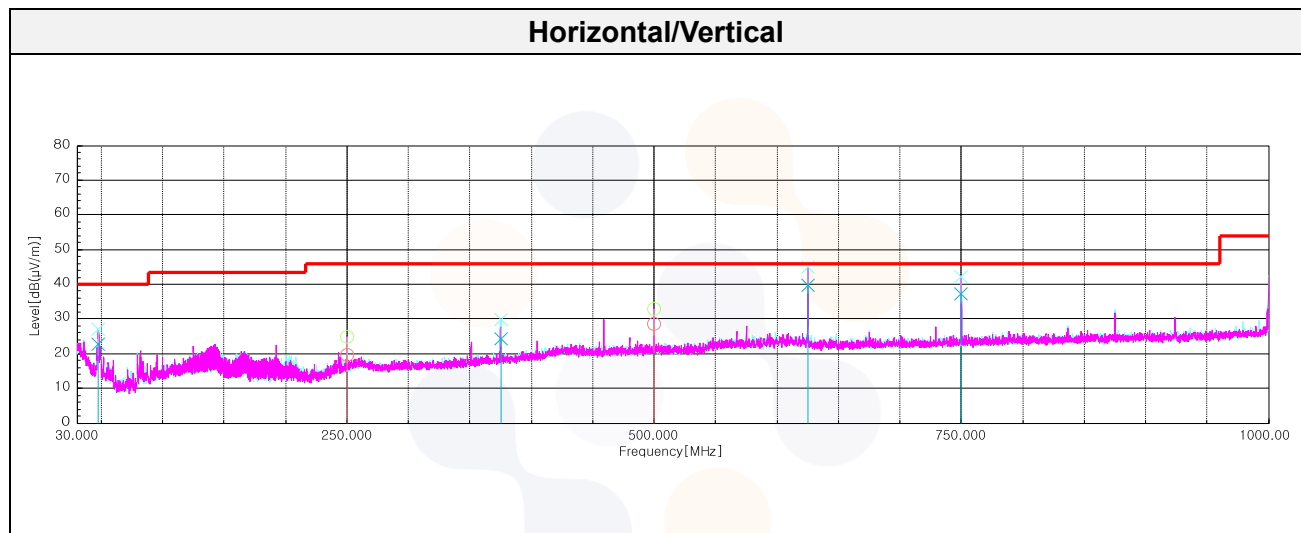
Frequency	Pol.	Reading	Cable Loss	Amp Gain	Antenna Factor	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
No spurious emissions were detected within 20 dB of the limit.									



Note. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X kHz resulted in a level of Y dBμV/m, which is equivalent to  $Y-51.5 = Z$  dBμA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to the 15.209(a) limit.

**Test results (Below 1 000 MHz) –Worst case: 1 Mbits/s(37 Bytes)\_2 402 MHz**

Frequency (MHz)	Pol. (V/H)	Reading (dB( $\mu$ V))	Antenna Factor (dB)	Amp. + Cable (dB)	DCF (dB)	Result (dB( $\mu$ V/m))	Limit (dB( $\mu$ V/m))	Margin (dB)
<b>Quasi peak data</b>								
47.70	V	38.60	14.92	-31.93	-	21.59	40.00	18.41
249.95 <sup>1)</sup>	H	31.40	18.49	-31.30	-	18.59	46.00	27.41
375.08	V	33.70	20.70	-31.09	-	23.31	46.00	22.69
499.97	H	35.10	23.20	-30.58	-	27.72	46.00	18.28
625.10	V	44.90	24.55	-30.53	-	38.92	46.00	7.08
750.10	V	41.00	25.50	-30.14	-	36.36	46.00	9.64



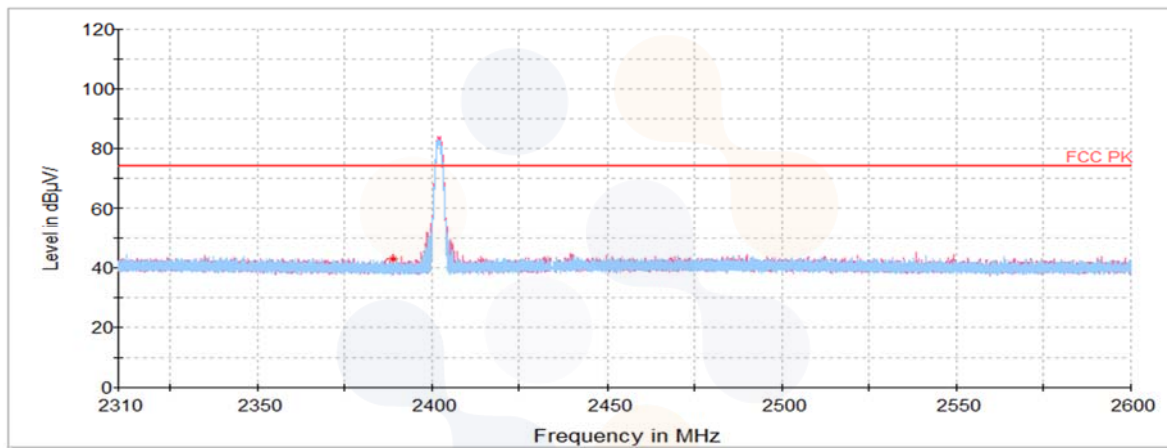


**Test results (Above 1 000 MHz)\_1 Mbits/s(37 Bytes)**

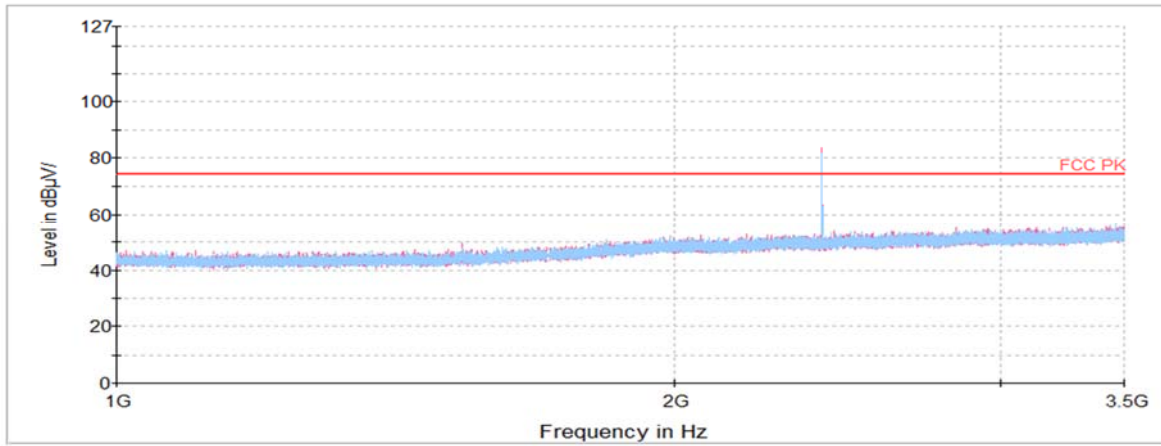
**2 402 MHz**

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
<b>Peak data</b>								
2 388.78	V	39.22	32.08	-28.36	-	42.94	74.00	31.06
4 804.09	V	69.78	33.40	-55.94	-	47.24	74.00	26.76
7 205.20	V	64.99	35.20	-51.96	-	48.23	74.00	25.77
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

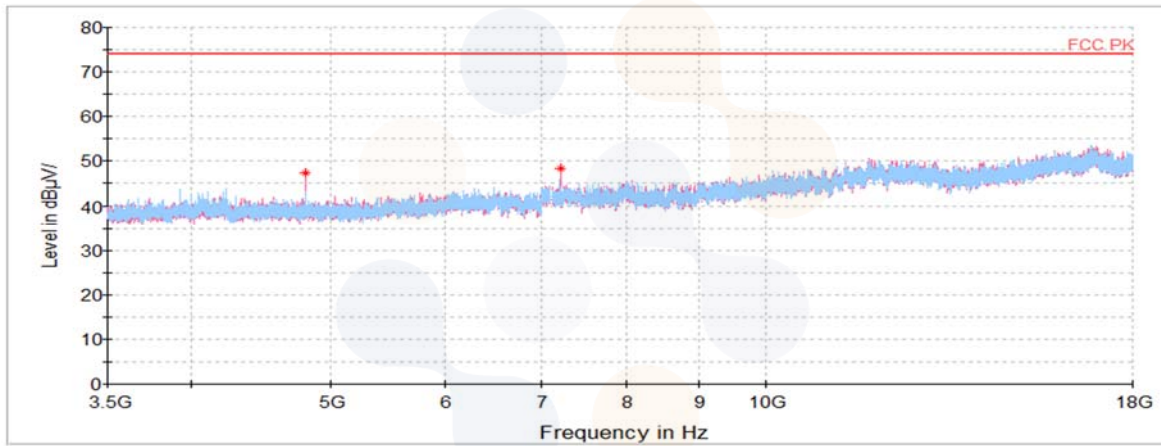
**Horizontal/Vertical for Band-edge**



**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**



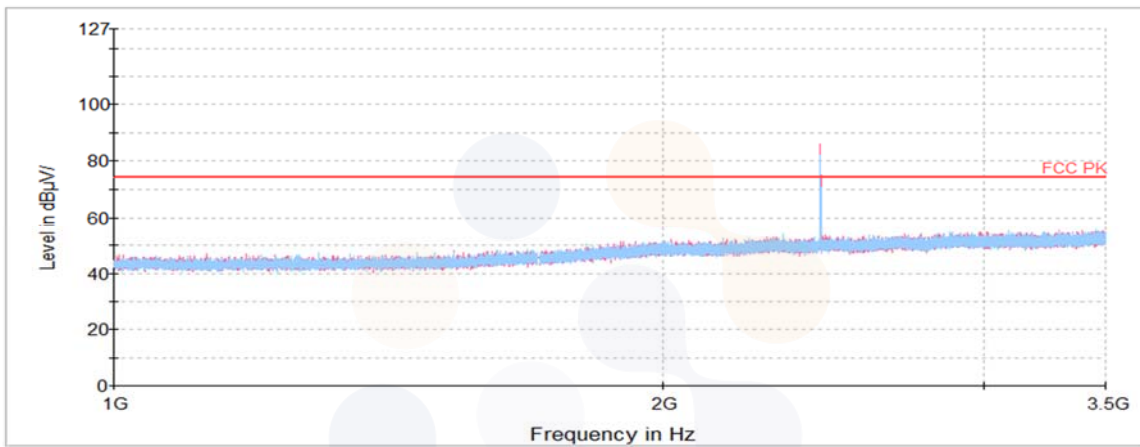
**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



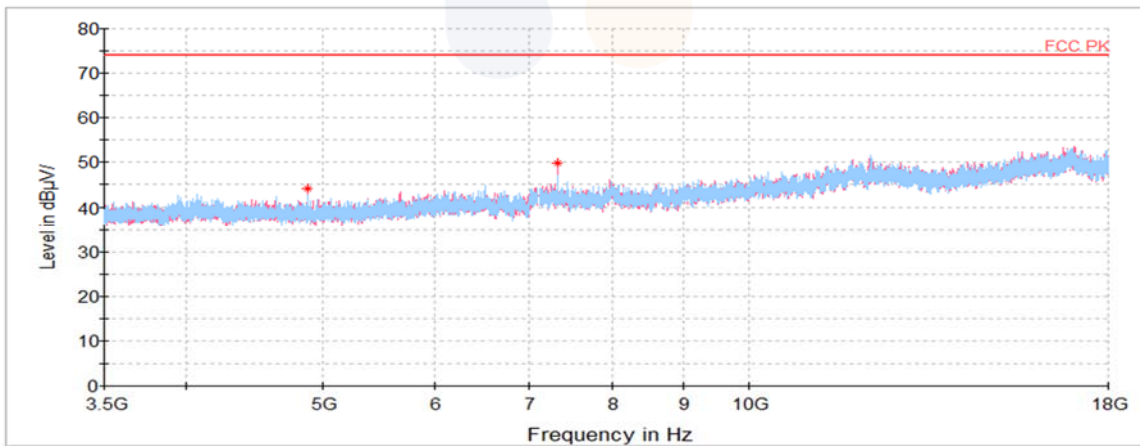
**2 440 MHz**

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
<b>Peak data</b>								
4 879.77 <sup>1)</sup>	V	66.58	33.40	-55.76	-	44.22	74.00	29.78
7 319.39 <sup>1)</sup>	V	66.72	35.20	-51.96	-	49.96	74.00	24.04
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**

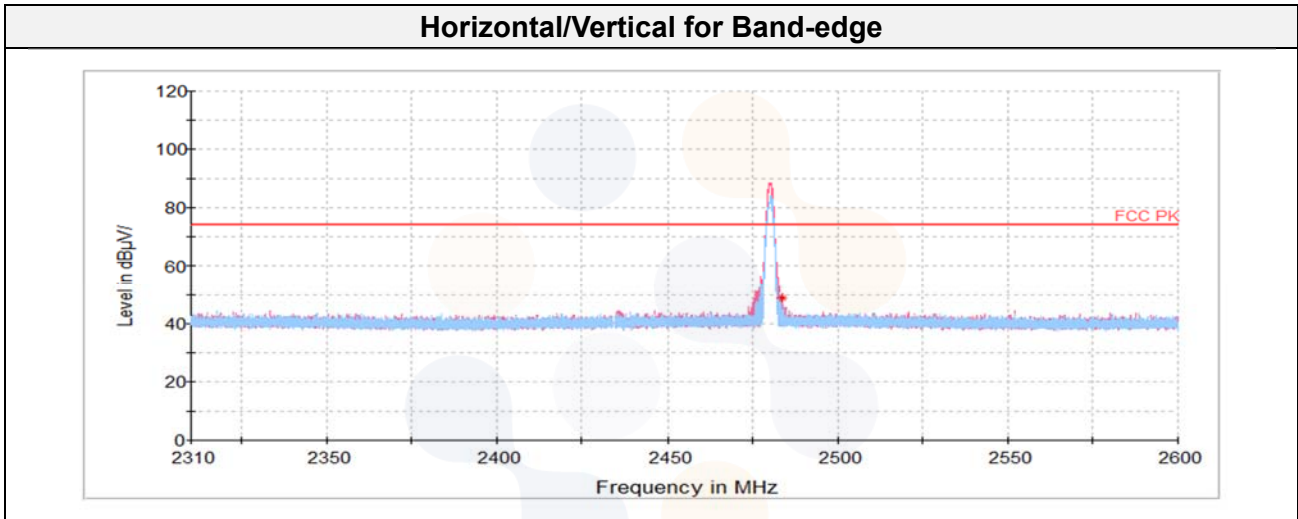


**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**

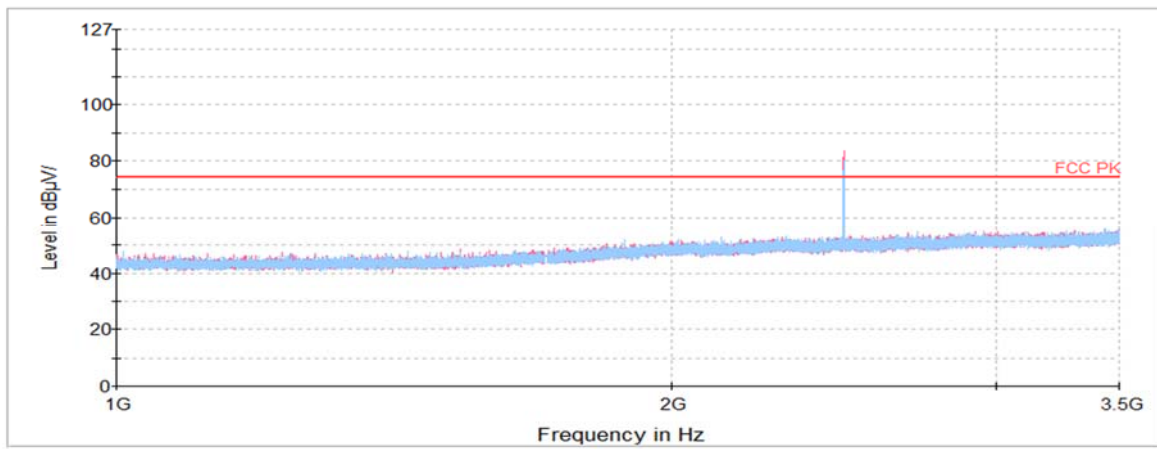


**2 480 MHz**

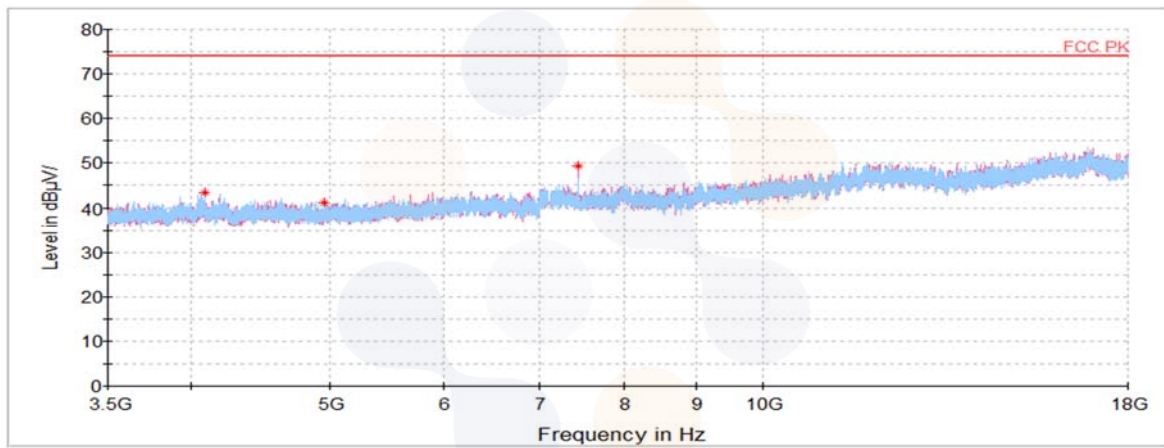
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
<b>Peak data</b>								
2 483.59 <sup>1)</sup>	V	44.56	32.27	-28.10	-	48.73	74.00	25.27
4 088.61 <sup>1)</sup>	H	66.62	33.07	-56.38	-	43.31	74.00	30.69
4 959.52 <sup>1)</sup>	V	63.27	33.40	-55.59	-	41.08	74.00	32.92
7 439.47 <sup>1)</sup>	V	65.98	35.20	-51.95	-	49.23	74.00	24.77
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								



**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**

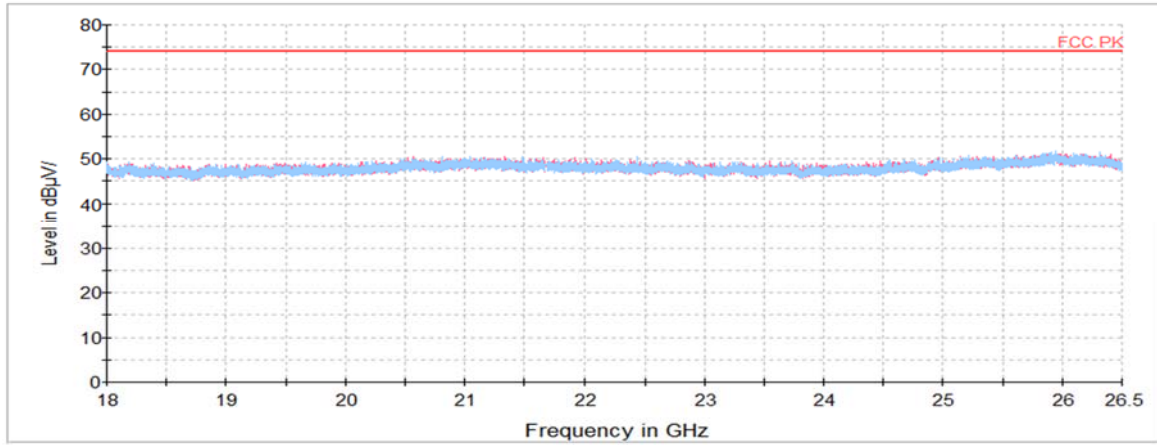


**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



**Test results (Above 18 GHz) – Worst case: 1 Mbits/s(37 Bytes) 2 402 MHz**

**Horizontal/Vertical for 18 GHz ~ 26.5 GHz**

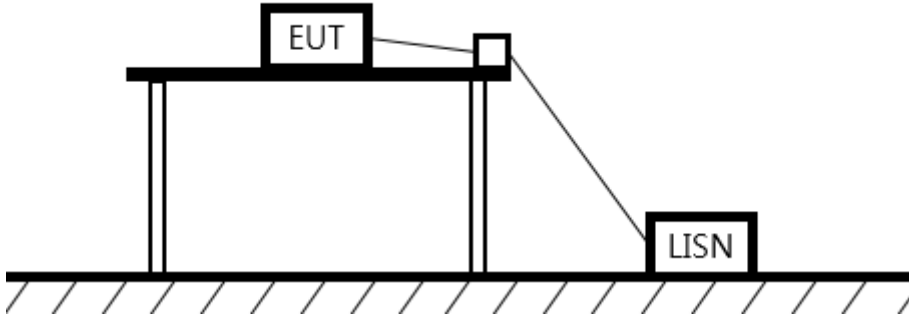


**Note:** The worst case was based on the lowest margin condition considering harmonic and spurious emission.



## 6.2. AC Conducted emission

### Test setup



### Limit

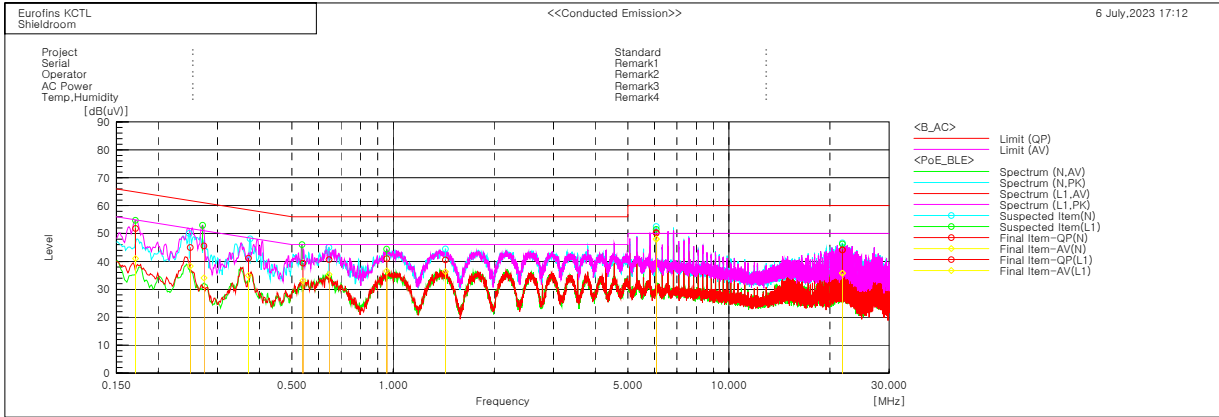
According to 15.207(a) and RSS-Gen(8.8), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall be on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted limit (dB $\mu$ V/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

### Measurement procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50 $\Omega$ /50 $\mu$ H LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 kHz or to quasi-peak and average within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

**Test results-Worst case: 1 MBits/s(37 Bytes) 2 402 MHz\_PoE 48 V**



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.2491	35.4	28.7	9.6	45.0	38.3	61.8	51.8	16.8	13.5
2	0.37107	31.4	25.1	9.8	41.2	34.9	58.5	49.5	17.3	13.6
3	0.64445	30.9	25.5	9.8	40.7	35.3	56.0	46.0	15.3	10.7
4	1.4312	30.9	26.7	9.7	40.6	36.4	56.0	46.0	15.4	9.6
5	6.07977	40.5	38.3	9.7	50.2	48.0	60.0	50.0	9.8	2.0
6	21.77388	34.2	26.0	9.9	44.1	35.9	60.0	50.0	15.9	14.1

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.17108	41.7	30.9	10.1	51.8	41.0	64.9	54.9	13.1	13.9
2	0.27329	36.0	24.5	9.6	45.6	34.1	61.0	51.0	15.4	16.9
3	0.53877	29.6	23.3	9.8	39.4	33.1	56.0	46.0	16.6	12.9
4	0.95745	31.3	26.9	9.7	41.0	36.6	56.0	46.0	15.0	9.4
5	6.07963	40.6	38.4	9.7	50.3	48.1	60.0	50.0	9.7	1.9
6	21.77452	34.2	25.7	10.0	44.2	35.7	60.0	50.0	15.8	14.3



## 7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Antenna Mast	Innco Systems	MA4640-XP-ET	-	N/A
Controller	Innco Systems	CO3000	1175/45850319/P	N/A
Spectrum Analyzer	R&S	FSV40	100989	23.10.14
Horn antenna	ETS.lindgren	3117	251528	24.02.02
Horn antenna	ETS.lindgren	3116	86632	24.01.25
AMPLIFIER	B&Z Technologies	BZRT-00504000-481055-382525	26299-27735	24.07.04
AMPLIFIER	B&Z Technologies	BZR-0050400-551028-252525	27736	24.07.04
Attenuator	API Inmet	40AH2W-10	12	24.05.03
High pass Filter	WT	WT-A1698-HS	WT160411001	24.04.25
High pass Filter	Qotana	DBHF058004000A	20070100016	24.07.04
Signal Generator	R&S	SMB100A	176206	24.01.19
TWO-LINE V - NETWORK	R&S	ENV216	101358	23.09.29
EMI TEST RECEIVER	R&S	ESCI3	100001	23.08.18
Power Sensor	R&S	NRP-Z81	1137.9009.02-106223-bB	24.04.25
Attenuator	R&S	DNF Dämpfungsglied 10 dB in N-50 Ohm	0003	24.02.09
DC Power Supply	AGILENT	E3632A	MY40006352	24.04.27
Spectrum Analyzer	R&S	FSVA40	101575	24.06.19
Spectrum Analyzer	AGILENT	E4440A	MY46186407	24.03.22
Amplifier	SONOMA INSTRUMENT	310N	421821	23.12.14
Bilog Antenna	Teseq GmbH	CBL 6112D	63756	24.11.17
Loop Antenna	R&S	HFH2-Z2	100355	24.08.10
Controller	innco systems GmbH	CO3000	CO3000/1442/5437 0322/P	N/A
Antenna Mast	innco systems GmbH	MA4640-XP-ET	N/A	N/A
Turn Device	innco systems GmbH	DS1200-S-1t	N/A	N/A
Spectrum Analyzer	R&S	FSV30	100914	24.07.03

**End of test report**