RF Test Report

U-NII 802.11a/n/ac/ax

Report No.	:	FCCBVCO-WAY-P21121009-1R1
Customer	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Use of Report	:	Certification
Model Name	:	NP950QED
FCC ID	:	A3LAX211D950QED
Date of Test	:	2021.11.25 to 2021.12.07
Test Method Used	:	FCC 47 CFR PART 15 Subpart E (Section §15.407)
Testing Environment	:	Refer to the Test Condition

Test Result : ☒ **Pass** ☐ **Fail**

ISSUED BY: BV CPS ADT Korea Ltd., EMC/RF Laboratory

ADDRESS: Innoplex No.2 106, Sinwon-ro 306, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea 16675

TEST LOCATION: HeungAn-daero 49, DongAn-gu, Anyang-si, Gyeonggi-do, Korea, 14119

Tested by

Name : Donghwa Shin (Signature)

Technical Manager

Name : Jongha Choi (Signature)

2021. 12. 24

BV CPS ADT Korea Ltd.

RELEASE CONTROL RECORD

REPORT NO.	REASON FOR CHANGE	DATE ISSUED
FCCBVCO-WAY-P21121009-1	Original release	2021.12.20
FCCBVCO-WAY-P21121009-1R1	Add modulation information, Add FCC ID information of AP, Update equipment information and Separate ISED report	2021.12.24

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1 Summary of Test Results

The EUT has been tested according to the following specifications

Applied Standard : FCC Part 15, Subpart E 15.407				
FCC Part Section(s)	**Test Description**	**Limit**	**Test Result**	**Reference**
15.407(b)(1), (2),(3),(4),(6)	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b)	PASS	Section 3.2
15.407(d)(6)	Contention Based Protocol	-62 dBm Threshold is referenced to a 0 dBi antenna gain	Pass	Section 3.3
15.205 15.407(b)(1), (4), (5), (6)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	PASS	Section 3.2

NOTES

1) The general test methods used to test on this devices are ANSI C63.10.

2) Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

3) 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.

1.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2

Measurement Items	Frequency Range	Expanded Uncertainty U = *k*Uc (*k* = 2)
Conducted Emissions at main ports	150 kHz – 30 MHz	2.99
Radiated Spurious Emissions	9 kHz – 30 MHz	1.92
	30 MHz – 1 GHz	4.00
	1 GHz – 18 GHz	5.68
	18 GHz – 40 GHz	5.24

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k = 2.

2 General Information

2.1 General Description of EUT

Product	Laptop
Brand	Samsung Electronics. Co., Ltd.
Model	NP950QED
Identification No. of EUT	1KJG912R900031L
Series Model	-
Model Difference	-
Power Supply	Battery: DC 15.44 V / Adaptor: DC 20 V(Output), AC 100 ~ 240 V(Input)
Modulation Type	OFDM, OFDMA
Transfer Rate	6, 9, 12, 18, 24, 36, 48, 54 Mbps (802.11a) MCS0 to MCS15 (802.11n) MCS0 to MCS9 (802.11ac) MCS0 to MCS11 (802.11ax)
Operating Frequency	5 150 to 5 250 MHz (U-NII-1) 5 250 to 5 350 MHz (U-NII-2A) 5 470 to 5 725 MHz (U-NII-2C) 5 725 to 5 850 MHz (U-NII-3) 5 925 to 6 425 MHz (U-NII-5) 6 425 to 6 525 MHz (U-NII-6) 6 525 to 6 875 MHz (U-NII-7) 6 875 to 7 125 MHz (U-NII-8)
Antenna Type	FPCB
Antenna Connector	U.FL Connector
H/W Version	PV1
S/W Version	N/A

NOTES

1) The above equipment has been tested by **Bureau Veritas Consumer Products Services ADT Korea**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Frequency Range	Test Mode	WLAN ANT1 (Main)	WLAN ANT2 (Aux)
5 GHz U-NII Band (5 150 to 5 850 MHz) **&** **6 GHz U-NII Band (5 925 to 7 125 MHz)**	802.11a_SISO	TX/RX	TX/RX
	802.11n(HT20)_SISO	TX/RX	TX/RX
	802.11n(HT40)_SISO	TX/RX	TX/RX
	802.11ac(VHT80)_SISO	TX/RX	TX/RX
	802.11ac(VHT160)_SISO	TX/RX	TX/RX
	802.11ax(HE20)_SISO	TX/RX	TX/RX
	802.11ax(HE40)_SISO	TX/RX	TX/RX
	802.11ax(HE80)_SISO	TX/RX	TX/RX
	802.11ax(HE160)_SISO	TX/RX	TX/RX
	802.11n(HT20)_MIMO	TX/RX	TX/RX
	802.11n(HT40)_MIMO	TX/RX	TX/RX
	802.11ac(VHT80)_MIMO	TX/RX	TX/RX
	802.11ac(VHT160)_MIMO	TX/RX	TX/RX
	802.11ax(HE20)_MIMO	TX/RX	TX/RX
	802.11ax(HE40)_MIMO	TX/RX	TX/RX
	802.11ax(HE80)_MIMO	TX/RX	TX/RX
	802.11ax(HE160)_MIMO	TX/RX	TX/RX

2) The following antennas were provided to the EUT

Antenna	Type	Manufacturer	Frequency	Peak Gain(dBi)
Ant B (Main)	PIFA	Galtronics	2400 - 2500 MHz	0.47
			5150 - 5250 MHz	2.52
			5250 - 5350 MHz	3.08
			5470 - 5725 MHz	3.94
			5725 - 5850 MHz	3.35
			5925 - 6425 MHz	4.81
			6425 - 6525 MHz	3.79
			6525 - 6875 MHz	4.98
			6875 - 7125 MHz	4.99
Ant A (Aux)	PIFA	Galtronics	2400 - 2500 MHz	-3.01
			5150 - 5250 MHz	-0.23
			5250 - 5350 MHz	0.57
			5470 - 5725 MHz	0.77
			5725 - 5850 MHz	-0.15
			5925 - 6425 MHz	1.52
			6425 - 6525 MHz	-1.24
			6525 - 6875 MHz	-1.23
			6875 - 7125 MHz	-0.99

3) **List of Accessories**

Accessories	Brand	Model	Manufacturer	Specification
Adapter	Samsung Electronics. Co., Ltd.	EP-TA865 R01	Samsung Electronics. Co., Ltd.	Input : AC 100 ~ 240 V 50 ~ 60 Hz Output : DC 5 ~ 20 V

2.2 Description of Test Mode

[Test Channel of EUT]

- 5 GHz U-NII 802.11a/n(HT20)/ac(VHT20)/ax(HE20)

Frequency [MHz]	Band Edge	Harmonic
5 180	Worst case from 802.11a/n(HT20)/ac(VHT20)/ax(HE20)	-
5 200	-	-
5 220	-	-
5 240	-	-
5 260	-	Applies to 802.11a only
5 280	-	-
5 300	-	-
5 320	Worst case from 802.11a/n(HT20)/ac(VHT20)/ax(HE20)	-
5 500	Worst case from 802.11a/n(HT20)/ac(VHT20)/ax(HE20)	-
5 520	-	-
5 540	-	-
5 560	-	-
5 580	-	Applies to 802.11a only
5 600	-	-
5 620	-	-
5 640	-	-
5 660	-	-
5 680	-	-
5 700	Worst case from 802.11a/n(HT20)/ac(VHT20)/ax(HE20)	-
5 720	-	-
5 745	Worst case from 802.11a/n(HT20)/ac(VHT20)/ax(HE20)	-
5 765	-	-
5 785	-	Applies to 802.11a only
5 805	-	-
5 825	Worst case from 802.11a/n(HT20)/ac(VHT20)/ax(HE20)	-

NOTES

1) The average result is not measured because the peak result of the frequency falling into the restricted band has a margin of 20 dB than the limit.

2) Band Edge/Harmonic has 2 dB margin of minimum.

3) For 802.11ax SU/RU highest output power was tested.

- 5 GHz U-NII 802.11n(HT40)/ac(VHT40)/ax(HE40)

Frequency [MHz]	Band Edge	Harmonic
5 190	Worst case from 802.11n(HT40)/ac(VHT40)/ax(HE40)	-
5 230	-	-
5 270	-	-
5 310	Worst case from 802.11n(HT40)/ac(VHT40)/ax(HE40)	-
5 510	Worst case from 802.11n(HT40)/ac(VHT40)/ax(HE40)	-
5 550	-	-
5 590	-	-
5 630	-	-
5 670	Worst case from 802.11n(HT40)/ac(VHT40)/ax(HE40)	-
5 710	-	-
5 755	Worst case from 802.11n(HT40)/ac(VHT40)/ax(HE40)	-
5 795	Worst case from 802.11n(HT40)/ac(VHT40)/ax(HE40)	-

- 5 GHz U-NII 802.11ac(VHT80)/ax(HE80)

Frequency [MHz]	Band Edge	Harmonic
5 210	Worst case from 802.11ac(VHT80)/ax(HE80)	-
5 290	Worst case from 802.11ac(VHT80)/ax(HE80)	-
5 530	Worst case from 802.11ac(VHT80)/ax(HE80)	-
5 610	Worst case from 802.11ac(VHT80)/ax(HE80)	-
5 690	-	-
5 775	Worst case from 802.11ac(VHT80)/ax(HE80)	-

- 5 GHz U-NII 802.11ac(VHT160)/ax(HE160)

Frequency [MHz]	Band Edge	Harmonic
5 250	Worst case from 802.11ac(VHT160)/ax(HE160)	-
5 570	Worst case from 802.11ac(VHT160)/ax(HE160)	-

NOTES

1) The average result is not measured because the peak result of the frequency falling into the restricted band has a margin of 20 dB than the limit.

2) Band Edge/Harmonic has 2 dB margin of minimum.

3) For 802.11ax SU/RU highest output power was tested.

- 6 GHz U-NII 802.11ax(HE20)

Band	Test Channel	Band Edge	Harmonic
U-NII-5	Lowest	802.11ax(HE20)	Worst margin of result in the original test report
	Middle	-	
	Highest	-	
U-NII-6	Lowest	-	Worst margin of result in the original test report
	Middle	-	
	Highest	-	
U-NII-7	Lowest	-	Worst margin of result in the original test report
	Middle	-	
	Highest	-	
U-NII-8	Lowest	-	Worst margin of result in the original test report
	Middle	-	
	Highest	802.11ax(HE20)	

- 6 GHz U-NII 802.11ax(HE40)

Band	Test Channel	Band Edge	Harmonic
U-NII-5	Lowest	802.11ax(HE20)	Worst margin of result in the original test report
	Middle	-	
	Highest	-	
U-NII-6	Lowest	-	Worst margin of result in the original test report
	Highest	-	
U-NII-7	Lowest	-	Worst margin of result in the original test report
	Middle	-	
	Highest	-	
U-NII-8	Lowest	-	Worst margin of result in the original test report
	Highest	802.11ax(HE20)	

NOTES

1) The average result is not measured because the peak result of the frequency falling into the restricted band has a margin of 20 dB than the limit.

2) Band Edge/Harmonic has 2 dB margin of minimum.

3) For 802.11ax SU/RU highest output power was tested.

- 6 GHz U-NII 802.11ax(HE80)

Band	Test Channel	Band Edge	Harmonic
U-NII-5	Lowest	802.11ax(HE80)	Worst margin of result in the original test report
	Middle	-	
	Highest	-	
U-NII-6	Lowest	-	Worst margin of result in the original test report
	Highest	-	
U-NII-7	Lowest	-	Worst margin of result in the original test report
	Highest	-	
U-NII-8	Lowest	-	Worst margin of result in the original test report
	Middle	-	
	Highest	802.11ax(HE80)	

- 6 GHz U-NII 802.11ax(HE160)

Band	Test Channel	Band Edge	Harmonic
U-NII-5	Lowest	802.11ax(HE80)	Worst margin of result in the original test report
	Highest	-	
U-NII-6	Middle	-	Worst margin of result in the original test report
U-NII-7	Middle	-	Worst margin of result in the original test report
U-NII-8	Middle	-	Worst margin of result in the original test report

NOTES

1) The average result is not measured because the peak result of the frequency falling into the restricted band has a margin of 20 dB than the limit.

2) Band Edge/Harmonic has 2 dB margin of minimum.

3) For 802.11ax SU/RU highest output power was tested.

Test Condition

Applicable to	Environmental Conditions	Test Voltage	Tested by
RE < 1G	(22 ± 2) °C, (50 ± 3 %) R.H.	AC 120 V, 60 Hz	Donghwa Shin
RE ≥ 1G	(22 ± 2) °C, (50 ± 3 %) R.H.	AC 120 V, 60 Hz	Donghwa Shin

2.2.1 Test Mode Applicability

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available XYZ axis, antenna port and EUT mode.
The worst case was found as listed below:

EUT Configure mode	Applicable to			Description
	Ant A	Ant B	MIMO	
Note book	-	Z axis	-	-
Tablet	X axis	-	X axis	-

2.3 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards.

FCC CFR 47 Part 15, Subpart E (§15.407)
KDB 789033 D02 General UNII Test Procedures New Rules v02r01
KDB 987594 D02 U-NII 6 GHz EMC Measurement v01r01
KDB 414788 D01 Radiated Test Site v01r01
KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2020

All test items in this test report have been performed and recorded as per the above standards.

2.4 Test Equipment

Test Equipment is traceable to the National Institute of Standards and Technology (NIST). Measurement antenna used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Equipment	Model	Serial Number	Manufacturer	Description	Cal Date	Cal Due
Loop Antenna	HFH2-Z2E	349806	R&S	Active Loop Antenna, 30 MHz	2021-02-18	2023-02-18
Bi-log Antenna	VULB 9163	1099	Schwarzbeck	Trilog Antenna, 3 GHz (with 6 dB ATT.)	2021-09-03	2023-09-03
Horn Antenna	HF907	102773	R&S	Horn Antenna, 18 GHz	2021-12-09	2022-12-09
Horn Antenna	BBHA9170	00955	Schwarzbeck	15 - 40 GHz, 10 W (cont.) 25 W (peak)	2021-12-13	2022-12-13
Amplifier	SCU08F2	8400016	R&S	Signal Conditioning Unit, 8 GHz	2021-11-23	2022-11-23
Amplifier	SCU08F2	8400017	R&S	Signal Conditioning Unit, 8 GHz	2021-11-23	2022-11-23
Amplifier	SCU-18F	180111	R&S	Signal Conditioning Unit, 18 GHz	2021-11-23	2022-11-23
Amplifier	JS44-18004000-33-8P	2142086	L3 Narda-MITEQ	Amplifier, 40 GHz	2021-11-29	2022-11-29
Signal analyzer	FSW50	101403	R&S	DC Coupled : 2 Hz to 50 GHz AC Coupled : 10 MHz to 50 GHz	2021-11-22	2022-11-22
Attenuator	PE7087-10	1712-2	Pasternack	10 dB Atten / 2 W / DC to 26 GHz	2021-06-04	2022-06-04
High Pass Filter	HPM17543	028	Micro-Tronics	3 GHz High Pass Filter	2021-06-04	2022-06-04
High Pass Filter	HPS17542	027	Micro-Tronics	6 GHz High Pass Filter	2021-06-04	2022-06-04
High Pass Filter	HPM50107-02	G010	Micro-Tronics	8 GHz High Pass Filter	2021-06-28	2022-06-28
2 Way Power Divider	0120A02208001S	DDT91LDW3S9	Woken Technology	2 GHz to 8 GHz (3 dB) Forward：35 W, Reverse：2 W	2021-11-29	2022-11-29
Directional Coupler	MC0512-10	1805	Fairview Microwave	500 MHz to 12.4 GHz / 30 W	2021-11-26	2022-11-26
EMI Receiver	ESR	102529	R&S	DC ~ 7 GHz	2021-11-23	2022-11-23
EMI Test Receiver	ESW8	101170	R&S	2 Hz - 8 GHz	2021-11-24	2022-11-24
EMI Test Receiver	ESW44	101812	R&S	2 Hz - 44 GHz	2021-11-25	2022-11-25
MXG Vecter Signal Generator	N5182B	MY59100574	Keysight	9 kHz ~ 6 GHz	2021-12-02	2022-12-02
Frequency Extender	N5182BX07	MY59360139	Keysight	9 kHz ~ 7.2 GHz	2021-12-02	2022-12-02
Signal Generator	SMB100A	MY41006053	R&S	100 kHz ~ 40 GHz	2021-06-04	2022-06-04

3 Test Results

3.1 Antenna Requirement

Except from §15.203 of the FCC Rules/Regulations:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 the section.

- The antenna(s) of the EUT are Permanently attached.
- There are no provisions for connection to an external antenna.

Result

The EUT complies with the requirement of §15.203

3.2 Spurious Emission, Band edge and Restricted Bands

3.2.1 Regulation

§15.407(b) : Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

(6) For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

§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 (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	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., §§15.231 and 15.241.

§15.205(a) : Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2]Above 38.6

§15.205 (b) : Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

3.2.2 Test Procedure

Primary method

The procedure for method AD is as follows:

a) RBW = 1 MHz.

b) VBW ≥ [3 × RBW].

c) Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.

d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)

e) Sweep time = auto.

f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then 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 the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.

   2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.

   3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Procedure for unwanted emissions measurements below 1 000 MHz

The procedure for unwanted emissions measurements below 1 000 MHz is as follows:

a) Follow the requirements in 12.7.4.

b) Compliance shall be determined using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

Procedure for unwanted emissions measurements above 1 000 MHz

The procedure for peak unwanted emissions measurements above 1000 MHz is as follows:

a) Follow the requirements in 12.7.4.

b) Peak emission levels are measured by setting the instrument as follows:

1) RBW = 1 MHz.

2) VBW ≥ [3 × RBW].

3) Detector = peak.

4) Sweep time = auto.

5) Trace mode = max hold.

6) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, then the time required for the trace to stabilize will increase by a factor of approximately 1 / D, where D is the duty cycle. For example, at 50% duty cycle, the measurement time will increase by a factor of two, relative to measurement time for continuous transmission.

Average Measurement Method above 1GHz (Method AD)

1) Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

2) RBW = 1 MHz

3) VBW = 3 MHz

4) Detector = power average (RMS)

5) Number of measurement points = Number of points must be ≥ 2 x span / RBW

6) Averaging type = power (RMS)

7) Sweep time = auto couple

8) Trace was averaged over 100 sweeps

Additionally, Average emission measurements for bandedge measurement.

1) RBW = 100 kHz
2) VBW ≥ [3 × RBW]
3) Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.

Peak Measurement Method above 1GHz

1) Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2) RBW = 1 MHz
3) VBW = 3 MHz
4) Detector = Peak
5) Sweep time = auto couple
6) Trace mode = max hold
7) Trace was allowed to stabilize

Peak Measurement Method below 1GHz

1) Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2) Span was set greater than 1 MHz
3) RBW = 120 kHz
4) Detector = CISPR Quasi-peak
5) Sweep time = auto couple

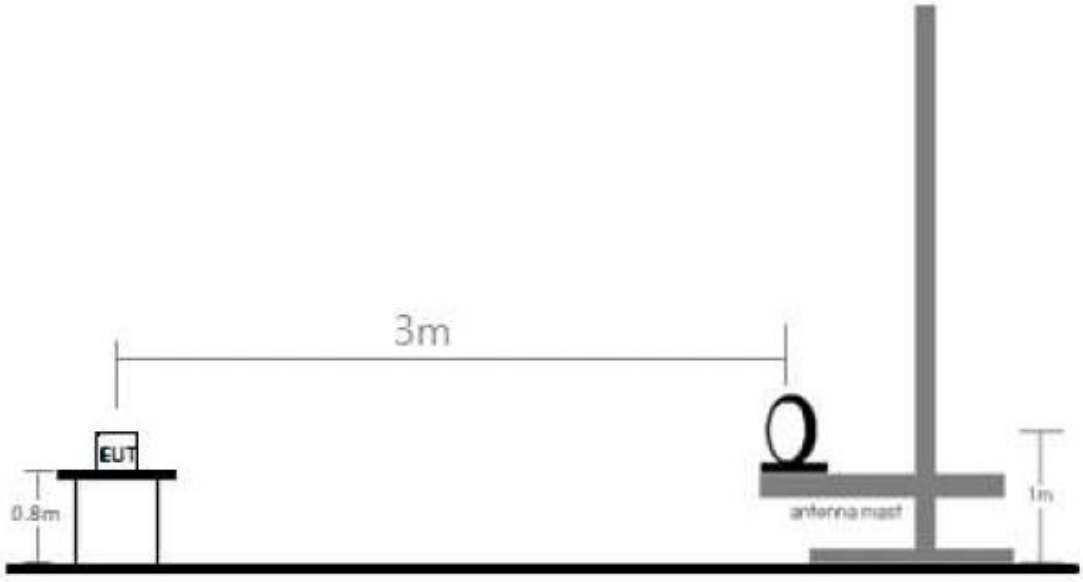
- Sample Calculation

- Field Strength Level [dBµV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m] + Duty Cycle Correction [dB]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable loss [dB]
- Margin [dB] = Field Strength Level [dBµV/m] – Limit [dBµV/m]

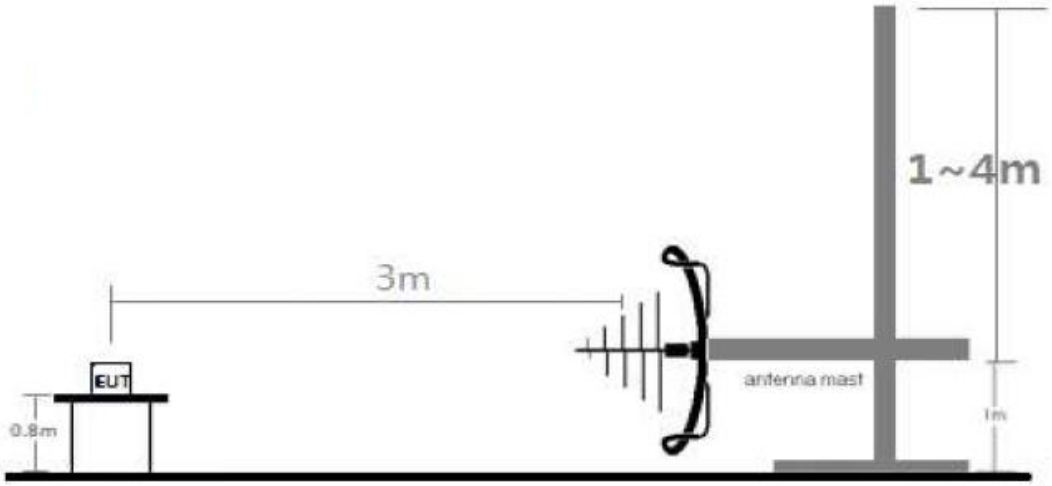
3.2.3 Deviation from Test Standard

No deviation.

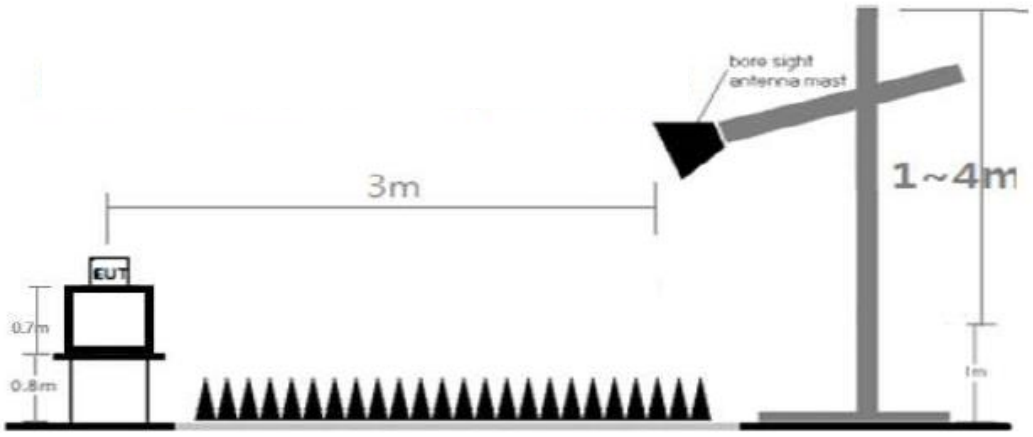
3.2.4 Test Setup

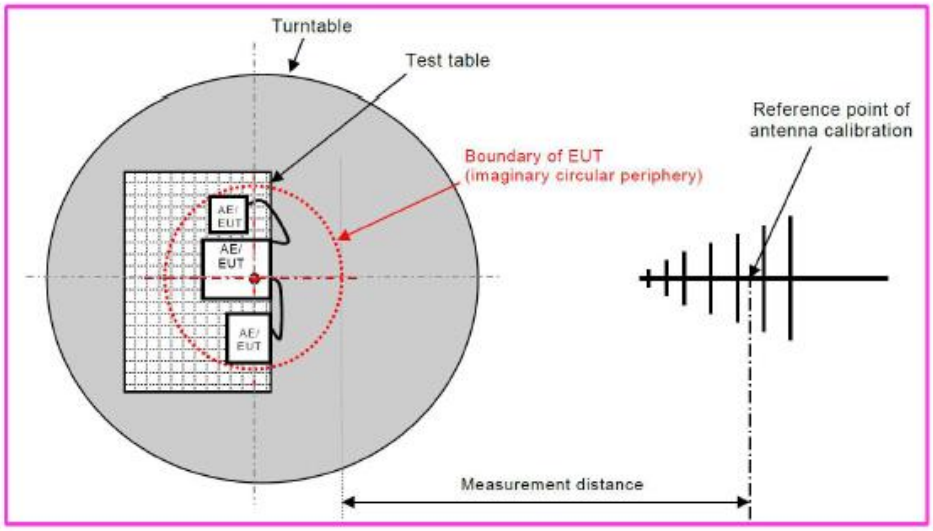


[Radiated Emission Test Setup Below 30 MHz]



[Radiated Emission Test Setup Below 1 GHz]





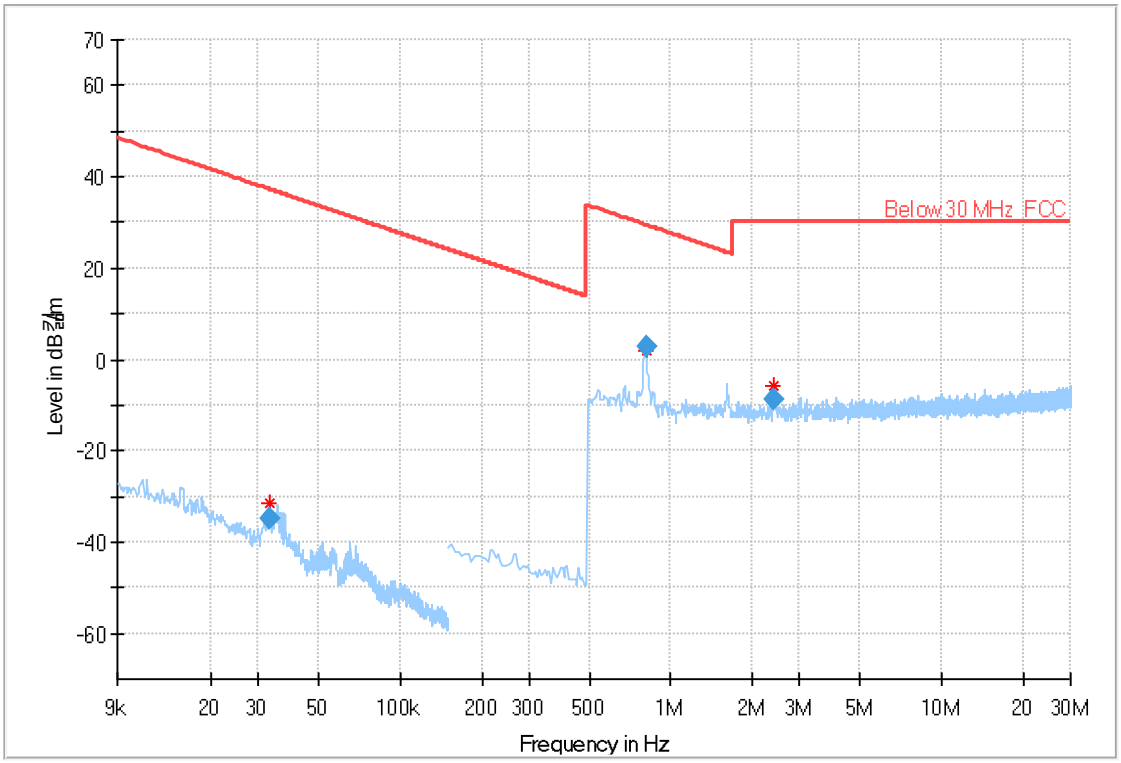
[Radiated Emission Test Setup Above 1 GHz]

3.2.5 Test Result

3.2.5.1 Radiated Spurious Emission (Below 30 MHz)

5 GHz UNII band

RSE_ANT B_802.11ax(20)_HE0(106/53)_5745_Ground parallel



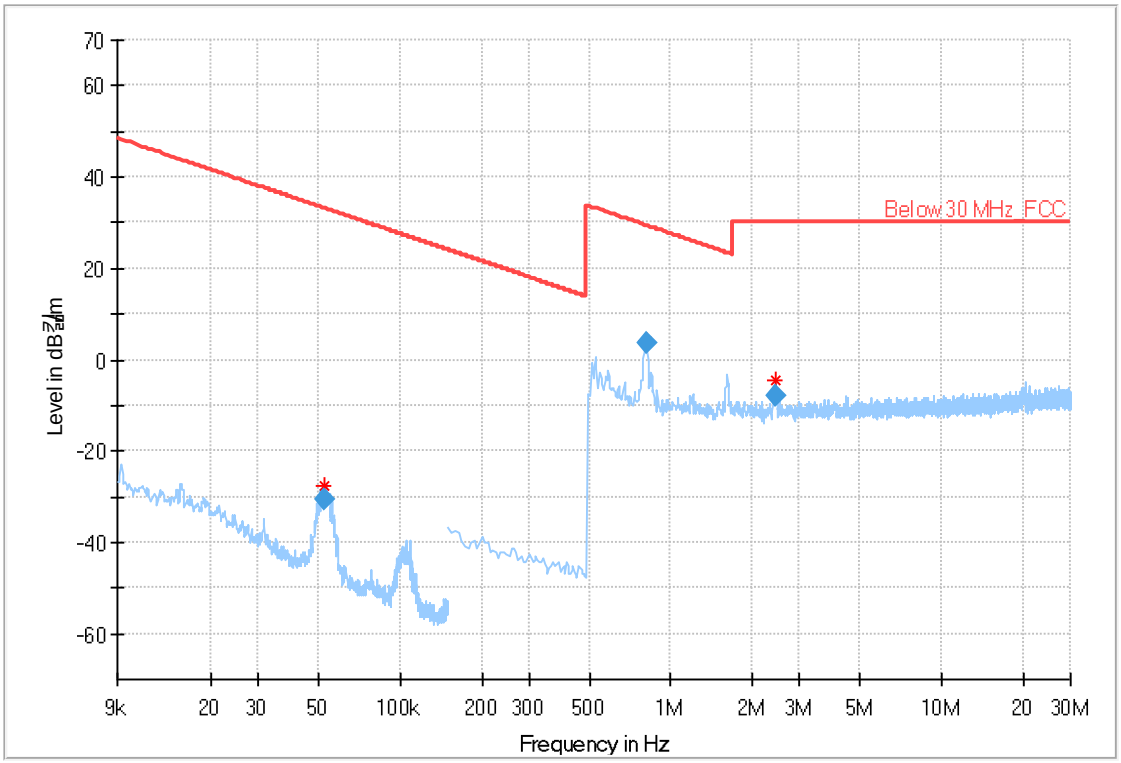
Frequency [MHz]	Peak Reading Value [dBuV]	Peak [dBuV/m]	Distance Correction Factor [dB]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB/m]
0.03	24.69	-34.71	-80.00	37.21	71.92	100.00	Ground parallel	65.00	-59.40
0.81	22.17	2.97	-40.00	29.46	26.49	100.00	Ground parallel	241.00	-19.20
2.41	9.98	-8.92	-40.00	30.00	38.92	100.00	Ground parallel	123.00	-18.90

Remarks

1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB) + Distance Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)
4. We tested three kind of Antenna Pol (Parallel, Perpendicular, Ground parallel) and reported worst case antenna Pol.

6 GHz UNII band

RSE_MIMO_802.11ax(160)_HE0(Full)_6025_Parallel



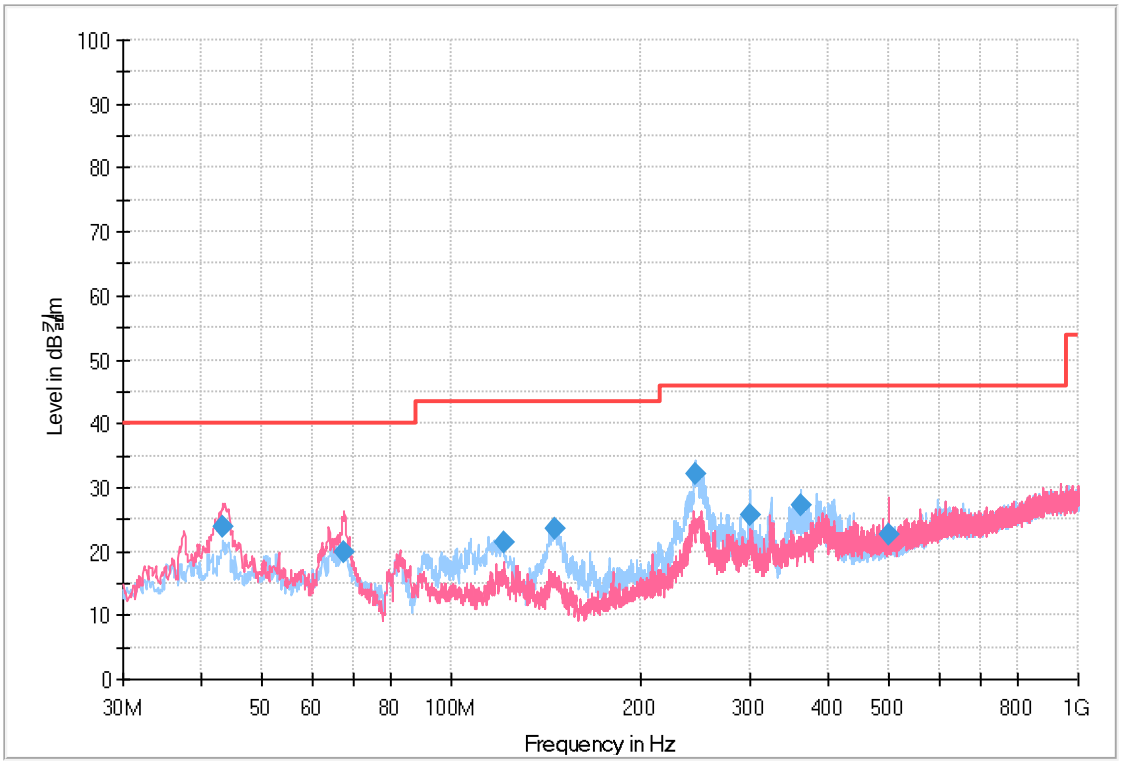
Frequency [MHz]	Peak Reading Value [dBuV]	Peak [dBuV/m]	Distance Correction Factor [dB]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB/m]
0.05	28.88	-30.52	-80.00	33.24	63.76	100.00	Parallel	50.00	-59.40
0.81	22.89	3.69	-40.00	29.46	25.77	100.00	Parallel	17.00	-19.20
2.44	11.02	-7.88	-40.00	30.00	37.88	100.00	Parallel	290.00	-18.90

Remarks
1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB) + Distance Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)
4. We tested three kind of Antenna Pol (Parallel, Perpendicular, Ground parallel) and reported worst case antenna Pol.

3.2.5.2 Radiated Spurious Emission (Below 1 GHz)

5 GHz UNII band

RSE_ANT B_802.11ax(20)_HE0(106/53)_5745

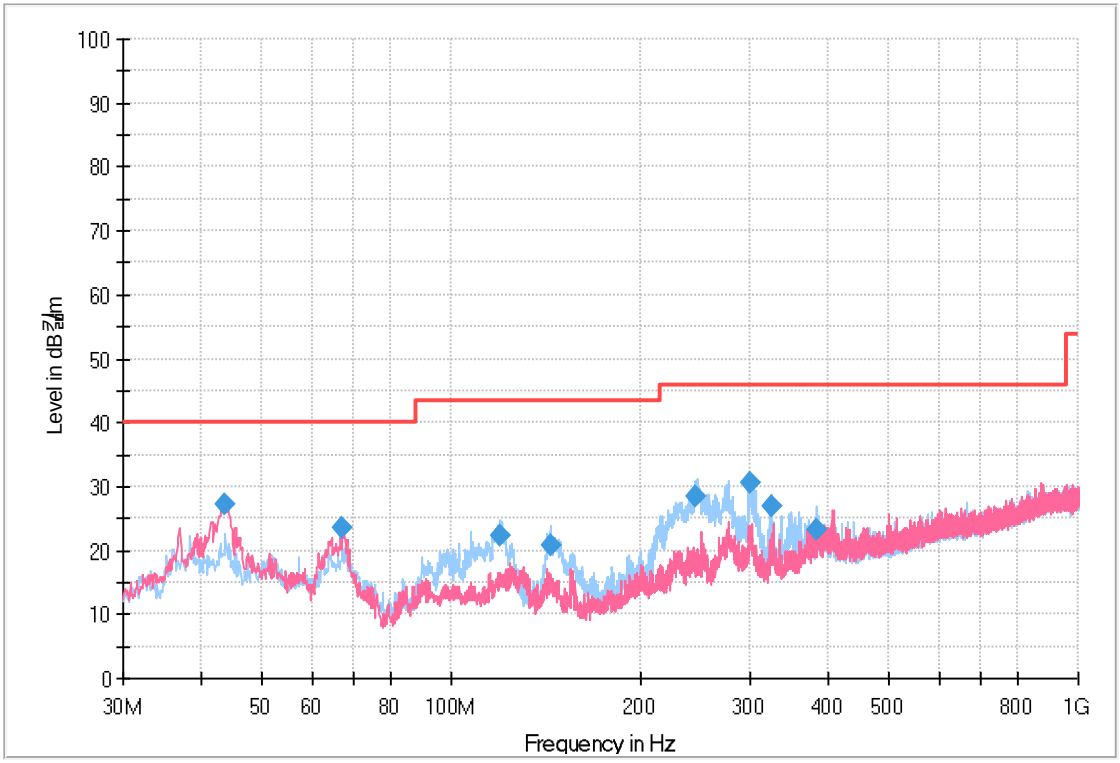


Frequency [MHz]	Quasi Reading Value [dBuV]	Quasi Peak [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB/m]
43.39	41.69	23.99	40.00	16.01	254	V	78	-17.70
67.44	41.91	20.01	40.00	19.99	120	V	89	-21.90
121.08	43.96	21.36	43.52	22.16	187	H	194	-22.60
146.40	47.67	23.67	43.52	19.85	140	H	78	-24.00
245.73	51.23	32.23	46.02	13.79	100	H	66	-19.00
299.56	43.76	25.66	46.02	20.36	100	H	64	-18.10
360.29	43.37	27.17	46.02	18.85	100	H	316	-16.20
499.97	35.67	22.67	46.02	23.35	173	V	144	-13.00

Remarks
1. Quasi Peak(dBµV/m) = Quasi Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Quasi Peak) Result (dBµV/m) – (Quasi Peak) Limit (dBµV/m)

6 GHz UNII band

RSE_MIMO_802.11ax(160)_HE0(Full)_6025



Frequency [MHz]	Quasi Reading Value [dBuV]	Quasi Peak [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB/m]
43.68	45.01	27.31	40.00	12.69	100	V	283	-17.70
67.05	45.34	23.54	40.00	16.46	100	V	103	-21.80
119.73	44.77	22.27	43.52	21.25	303	H	195	-22.50
143.88	44.83	20.83	43.52	22.69	136	H	212	-24.00
244.37	47.61	28.51	46.02	17.51	118	H	232	-19.10
299.27	48.71	30.61	46.02	15.41	100	H	65	-18.10
324.20	44.32	27.02	46.02	19.00	100	H	314	-17.30
382.83	38.79	23.29	46.02	22.73	154	H	88	-15.50

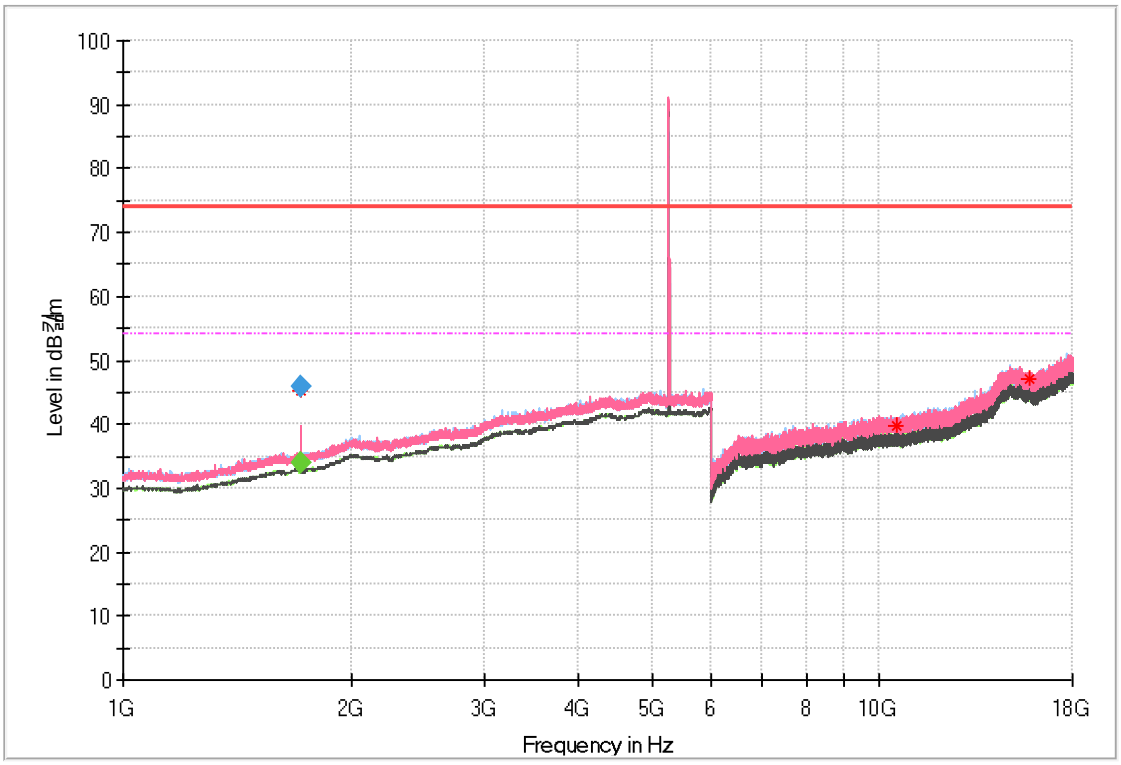
Remarks
1. Quasi Peak(dBµV/m) = Quasi Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Quasi Peak) Result (dBµV/m) – (Quasi Peak) Limit (dBµV/m)

3.2.5.3 Radiated Spurious Emission (Above 1 GHz)

5 GHz UNII band

RSE_ANT A_ 802.11a_6 Mbps_5260

1 GHz - 18 GHz



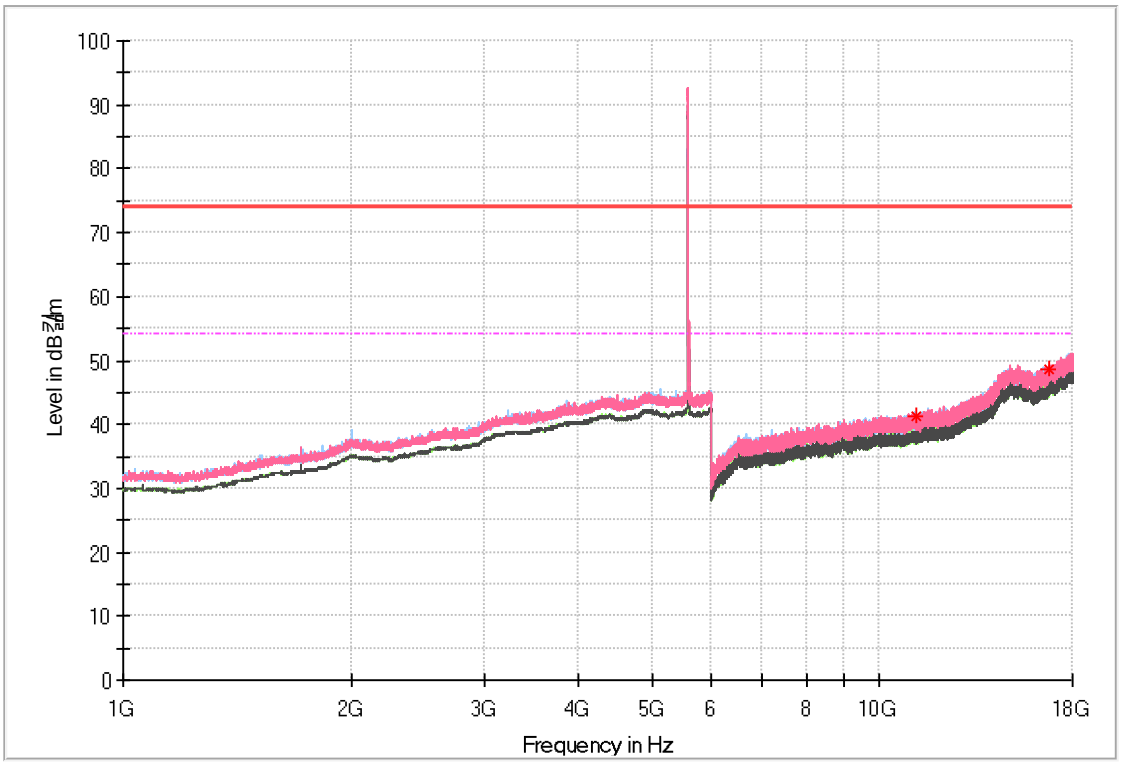
	Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
	1 717.03	-	-	33.60	34.00	-	242	V	10	0.40	-	-	20.00	54.00
	1 717.03	45.36	45.76	-	-	-	242	V	10	0.40	22.44	68.20	-	-
	10 520.25	27.49	39.69	-	-	-	200	H	137	12.20	28.51	68.20	-	-
*	15 780.00	26.84	46.94	-	-	-	300	H	3	20.10	27.06	74.00	-	-

Remarks

1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_ANT A_ 802.11a_6 Mbps_5580

1 GHz - 18 GHz



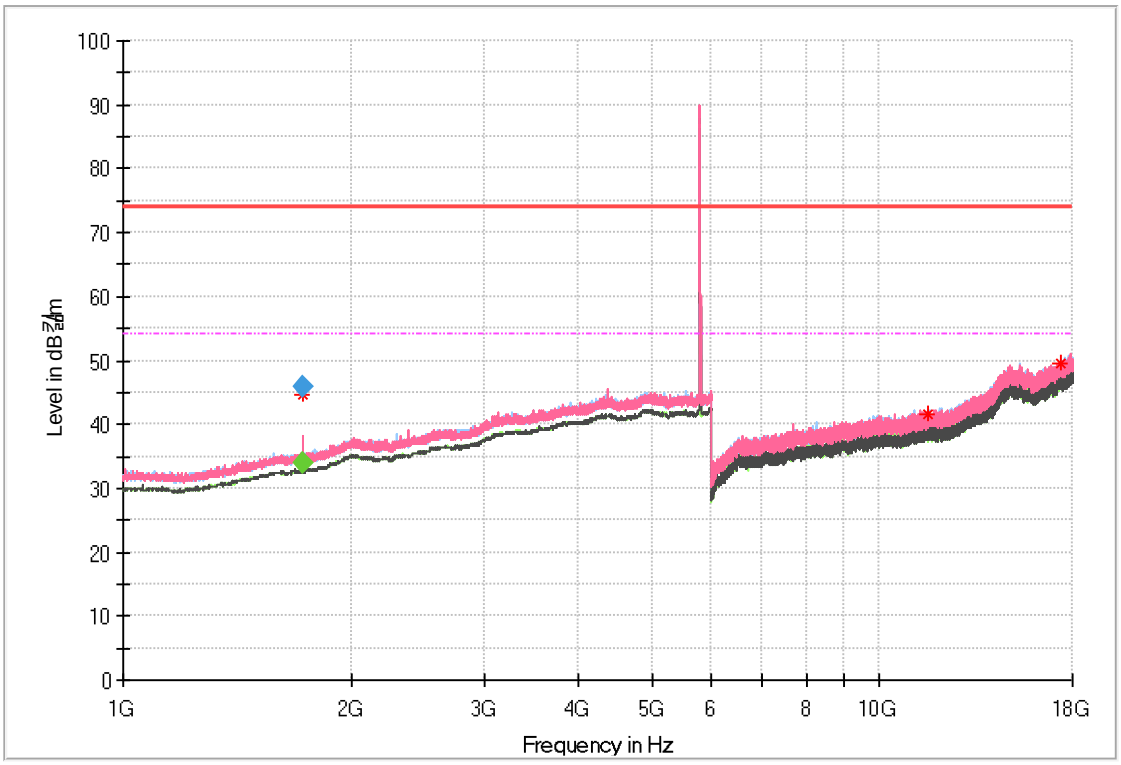
	Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
*	11 160.38	28.19	41.29	-	-	-	200	H	142	13.10	32.71	74.00	-	-
	16 740.38	27.26	48.56	-	-	-	300	V	199	21.30	19.64	68.20	-	-

Remarks

1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_ANT A_ 802.11a_6 Mbps_5785

1 GHz - 18 GHz



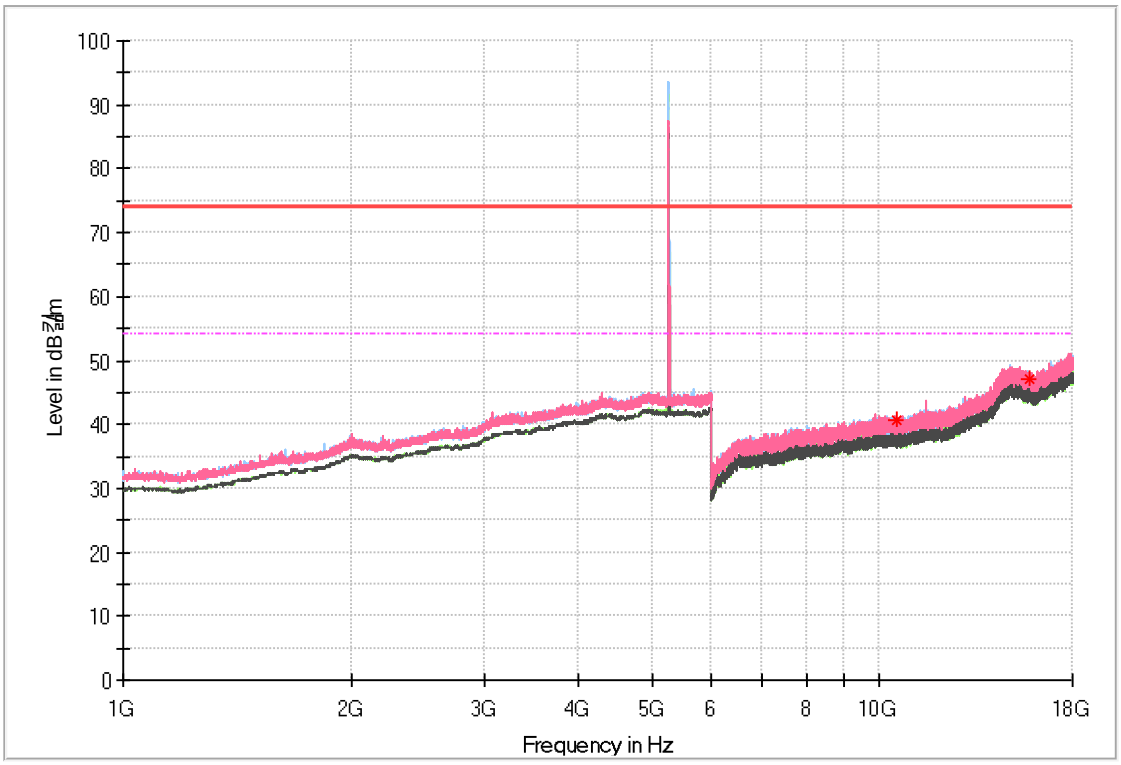
	Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
	1 724.06	-	-	33.49	33.99	-	251	V	352	0.50	-	-	20.01	54.00
	1 724.06	45.24	45.74	-	-	-	251	V	352	0.50	22.46	68.20	-	-
*	11 570.63	28.00	41.60	-	-	-	200	V	2	13.60	32.40	74.00	-	-
	17 355.75	27.55	49.45	-	-	-	200	H	40	21.90	18.75	68.20	-	-

Remarks

1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_ANT B_ 802.11a_6 Mbps_5260

1 GHz - 18 GHz



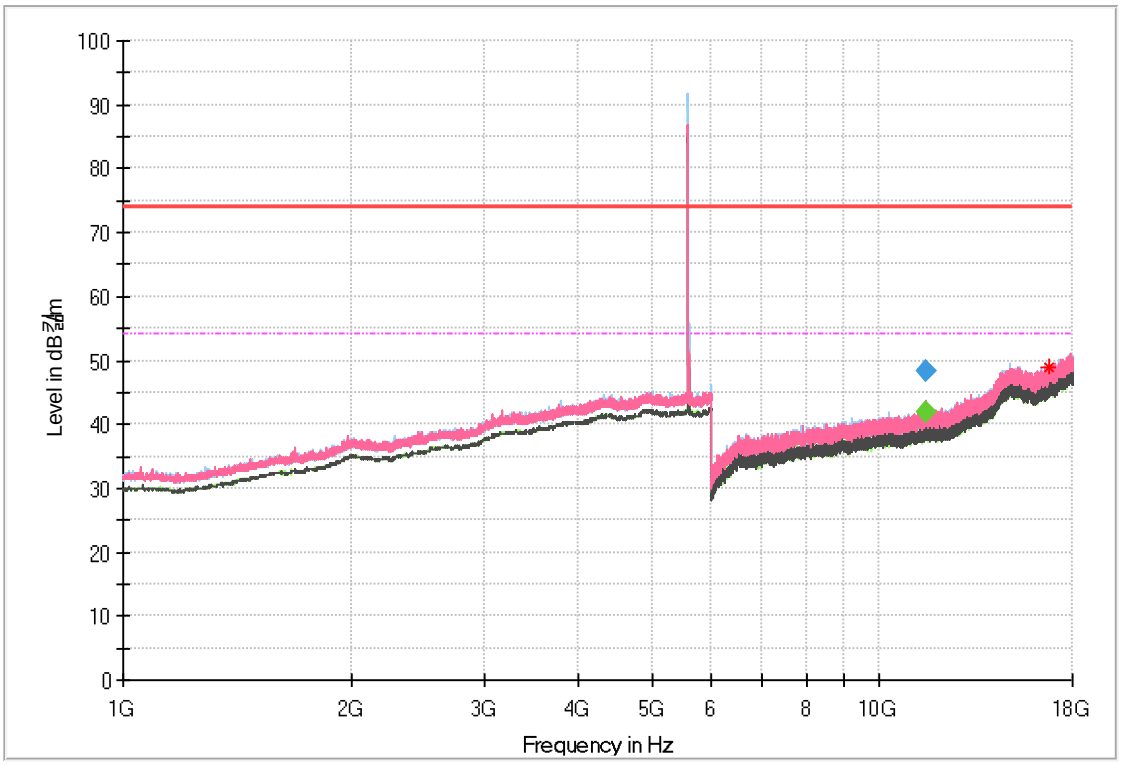
	Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
	10 522.50	28.59	40.79	-	-	-	200	H	82	12.20	27.41	68.20	-	-
*	15 780.38	27.01	47.11	-	-	-	200	V	238	20.10	26.89	74.00	-	-

Remarks

1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_ANT B_ 802.11a_6 Mbps_5580

1 GHz - 18 GHz

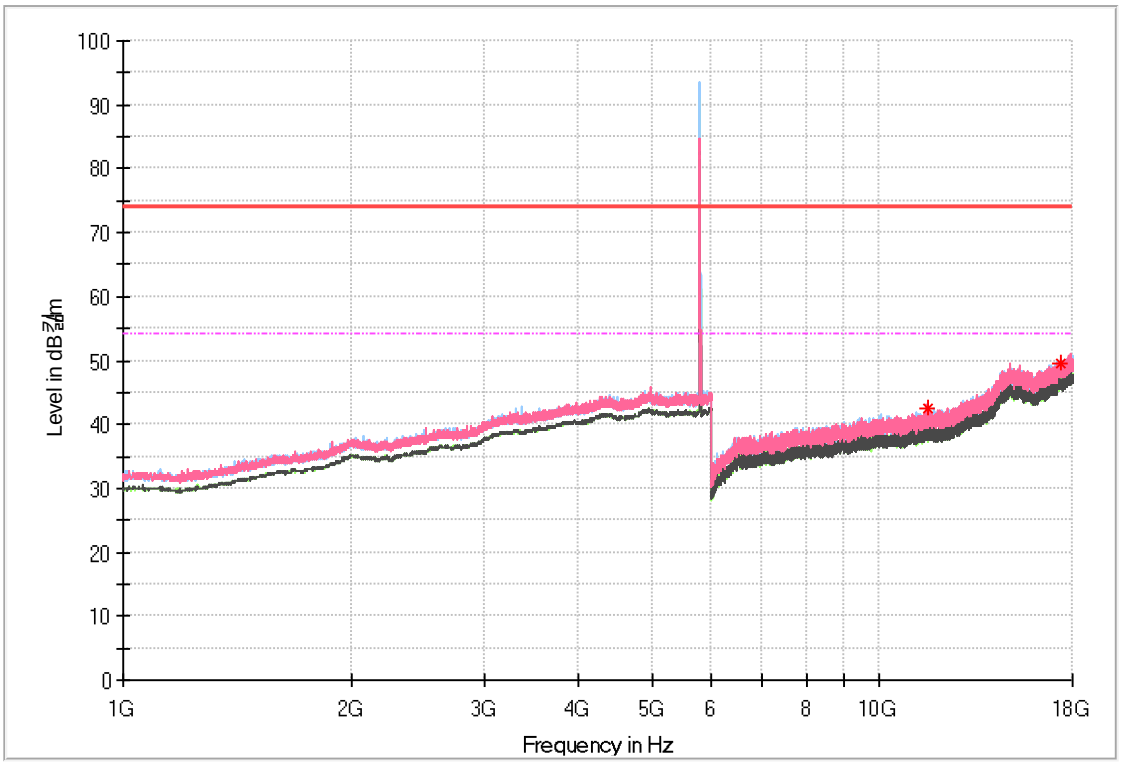


	Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
*	11 544.00	-	-	28.16	41.76	-	251	V	356	13.60	-	-	12.24	54.00
*	11 544.00	34.61	48.21	-	-	-	251	V	356	13.60	25.79	74.00	-	-
	16 740.75	27.69	48.99	-	-	-	200	V	70	21.30	19.21	68.20	-	-

Remarks

1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_ANT B_ 802.11a_6 Mbps_5785
1 GHz - 18 GHz



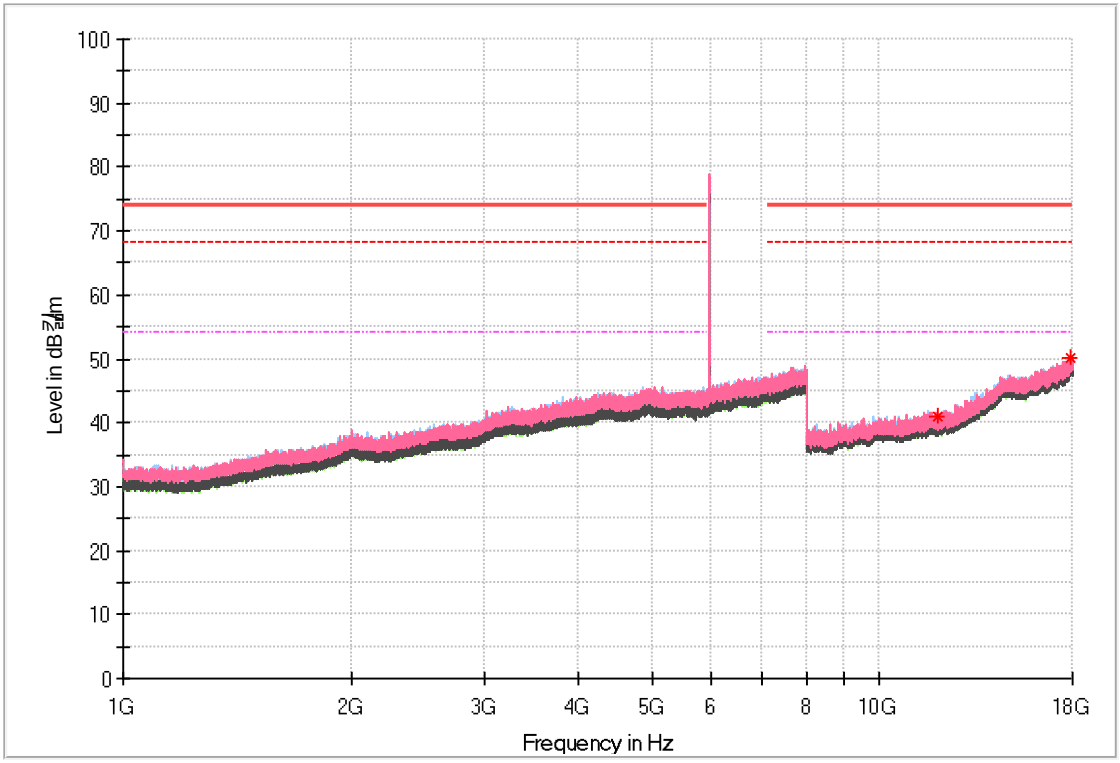
	Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
*	11 570.63	28.96	42.56	-	-	-	300	V	44	13.60	31.44	74.00	-	-
	17 354.63	27.76	49.66	-	-	-	200	H	259	21.90	18.54	68.20	-	-

Remarks
1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

6 GHz UNII band

RSE_ANT A_ 802.11ax(20)_HE0(Full)_5955

1 GHz - 18 GHz

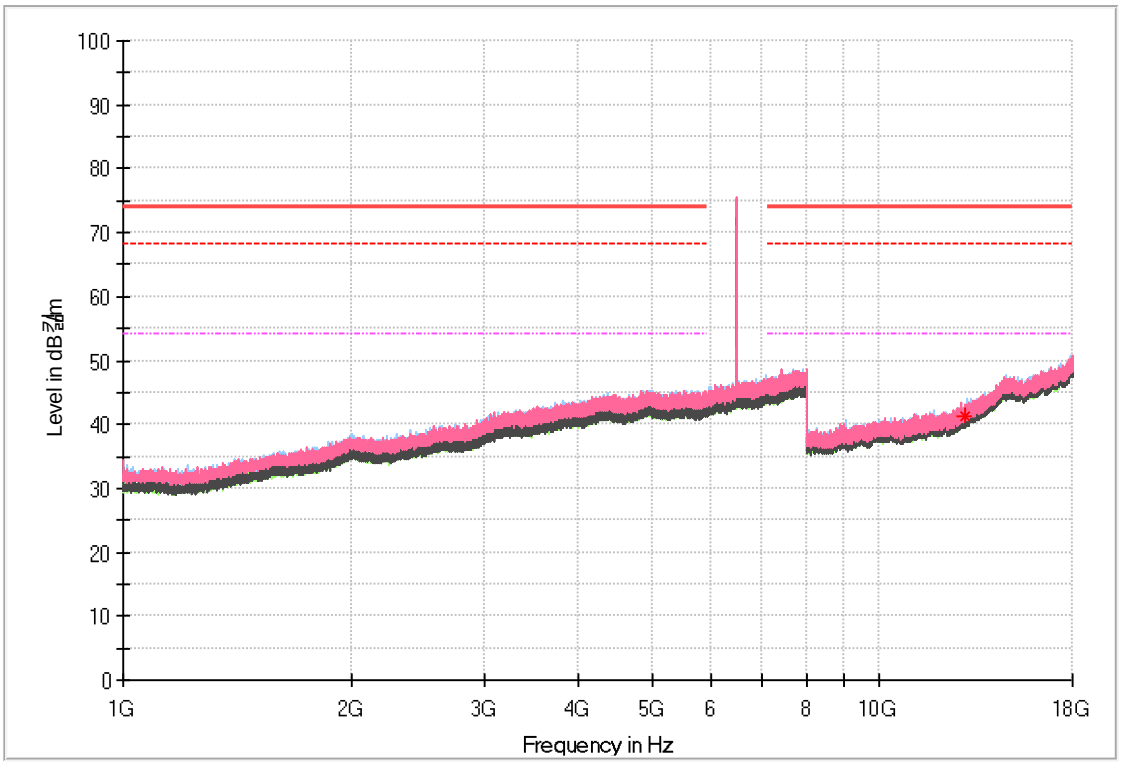


	Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
*	11 910.00	27.26	40.96	-	-	-	200	H	222	13.70	33.04	74.00	-	-
*	17 865.31	26.93	50.03	-	-	-	200	V	86	23.10	23.97	74.00	-	-

Remarks

1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_ANT A_ 802.11ax(20)_HE0(Full)_6475
1 GHz - 18 GHz

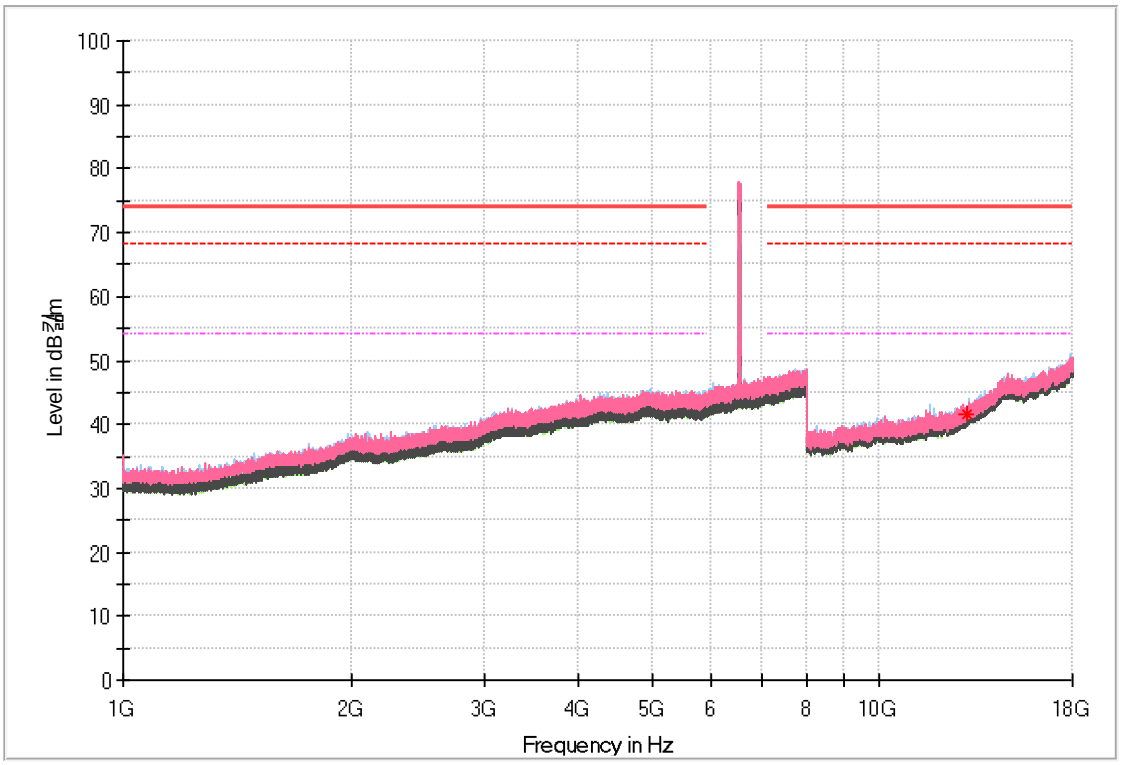


Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
12 950.00	26.66	41.36	-	-	-	200	H	161	14.70	26.84	68.20	-	-

Remarks

1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

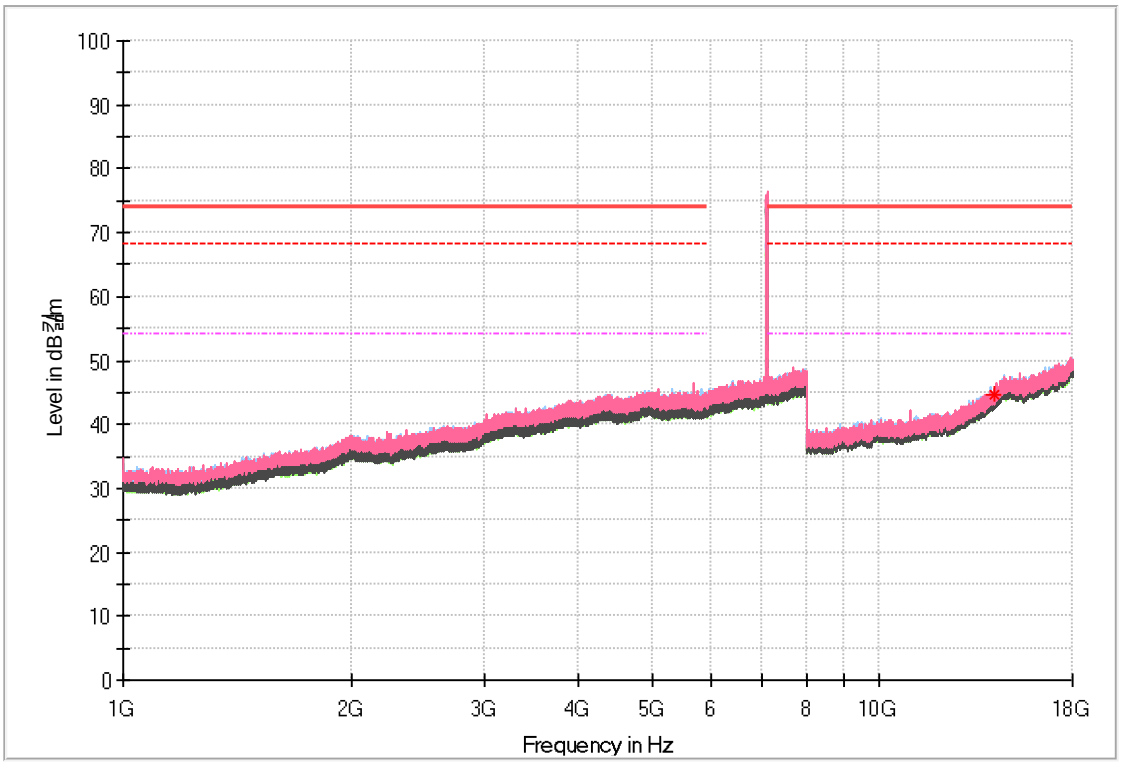
RSE_ANT A_ 802.11ax(20)_HE0(Full)_6535
1 GHz - 18 GHz



Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
13070.00	26.34	41.44	-	-	-	300	H	28	15.10	26.76	68.20	-	-

Remarks
1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

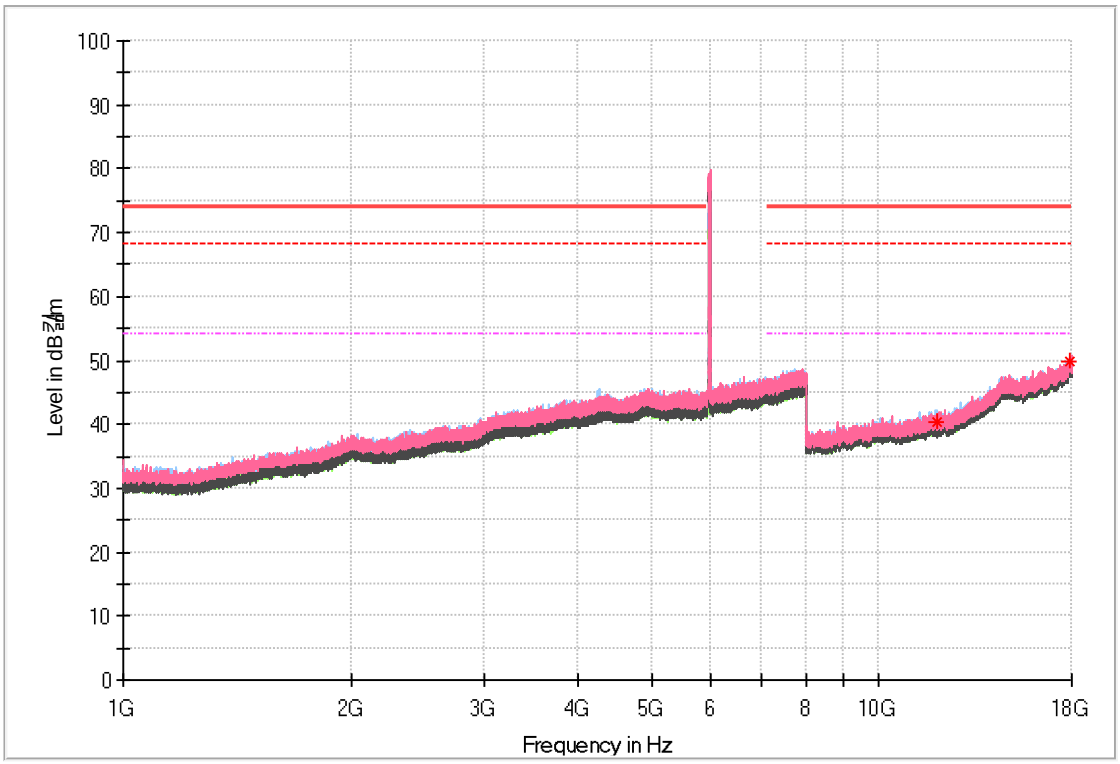
RSE_ANT A_ 802.11ax(20)_HE0(Full)_7095
1 GHz - 18 GHz



Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
14 190.94	26.66	44.76	-	-	-	300	V	20	18.10	23.44	68.20	-	-

Remarks
1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

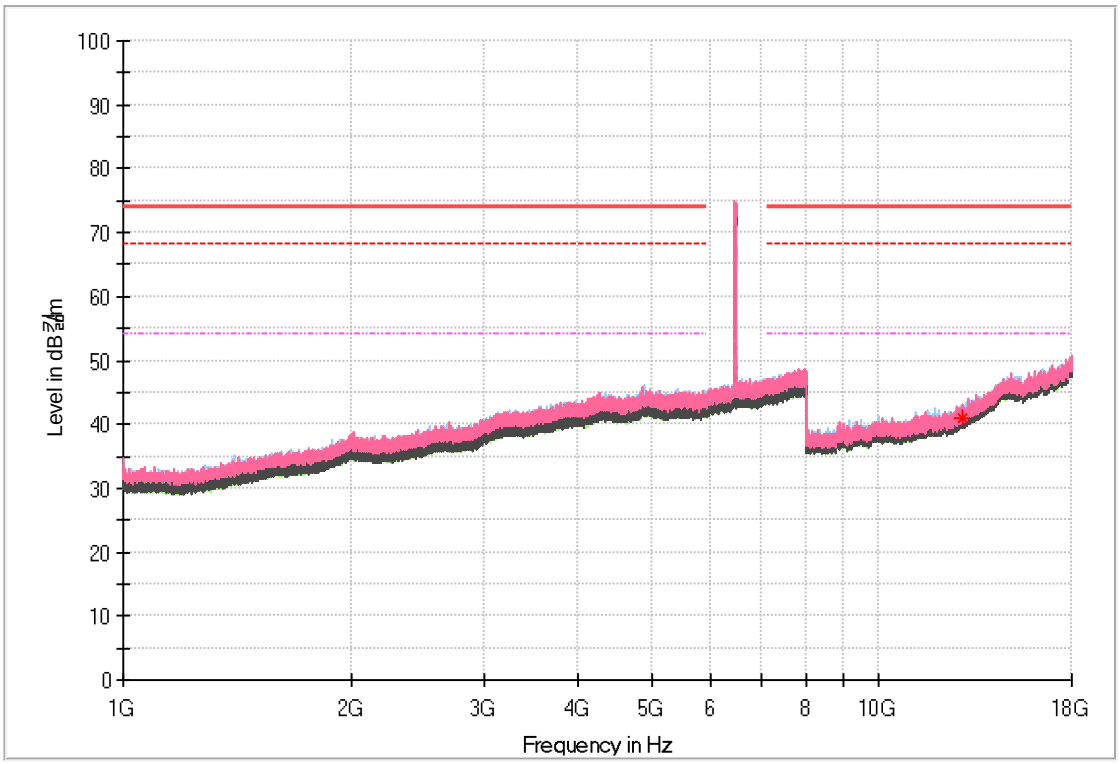
RSE_ANT A_ 802.11ax(40)_HE0(Full)_5965
1 GHz - 18 GHz



	Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
*	11 930.00	26.56	40.26	-	-	-	300	H	358	13.70	33.74	74.00	-	-
*	17 894.69	26.58	49.78	-	-	-	200	V	0	23.20	24.22	74.00	-	-

Remarks
1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_ANT A_ 802.11ax(40)_HE0(Full)_6445
1 GHz - 18 GHz



Frequency [MHz]	Peak Reading Value [dBuV]	Peak Result [dBuV/m]	AVG Reading Value [dBuV]	AVG Result [dBuV/m]	DCCF [dB]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Peak Margin [dB]	Peak Limit [dBuV/m]	AVG Margin [dB]	AVG Limit [dBuV/m]
12 890.00	26.22	40.92	-	-	-	200	H	297	14.70	27.28	68.20	-	-

Remarks

1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)