FCC CFR47 Part 15 Subpart C
ISED RSS-210
Certification Test Report

For the

Product	**: SMART DIGITAL DOOR LOCK**
Model	**: PDS-100**
FCC ID	**: 2AQMR-PDS100**
ISED	**: 24126-PDS100**
Applicant	**: PHILIA TECHNOLOGY Co., Ltd.**
FCC Rule	**: CFR 47 Part 15 Subpart C**
ISED Rule	**: ISED RSS-210 Issue 9**

We hereby certify that the above product has been tested by us with the listed rules and found in compliance with the regulation. The test data and results are issued on the test report no. **TR-W1808-005**

Signature

Choi, Yeong-min / Technical Manager
Date: 2018-08-06

Test Laboratory: ENG Co., Ltd.

FCC/ISED CERTIFICATION TEST REPORT

Project Number	**: EA1806C-107**
Test Report Number	**: TR-W1808-005**
Type of Equipment	**: SMART DIGITAL DOOR LOCK**
Model Name	**: PDS-100**
FCC ID	**: 2AQMR-PDS100**
ISED Cert. Number	**: 24126-PDS100**
Multiple Model Name	**: N/A**
Applicant	**: PHILIA TECHNOLOGY Co., Ltd.**
Address	**: A-904 Digital Empire, #387, Simin-daero, Dongan-gu, Anyang-si, Gyeonggi-do, KOREA**
Manufacturer	**: PHILIA TECHNOLOGY Co., Ltd.**
Address	**: A-904 Digital Empire, #387, Simin-daero, Dongan-gu, Anyang-si, Gyeonggi-do, KOREA**
Regulation	**: FCC Part 15 Subpart C Section 15.249, ISED RSS-210 Issue9**
Total page of Report	**: 24 Pages**
Date of Receipt	**: 2018-06-19**
Date of Issue	**: 2018-08-06**
Test Result	**: PASS**

This test report only contains the result of a single test of the sample supplied for the examination.
It is not a generally valid assessment of the features of the respective products of the mass-production.

Prepared by Song, In-young / Senior Engineer _____ (Signature) 2018-08-06 (Date)

Reviewed by Choi, Yeong-min / Technical Manager _____ (Signature) 2018-08-06 (Date)

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Release Control Record

Issue Report No.	Issued Date	Details/Revisions
TR-W1808-005	2018-08-06	Initial Release
-	-	-

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1. TEST SUMMARY

1.1 Regulations and results

The sample submitted for evaluation (Referred to below as the EUT) has been tested in accordance with the following regulations or standards.

FCC Reference Section	ISED Reference Section	Description	P	F	N.T.	Note
15.205, 15.209 & 15.249(a), (d)	RSS-210 B.10	Radiated Emissions&Restricted band around Fundamental Frequency	**P**			
15.215	RSS GEN 6.6	20 dB Bandwidth, 99 % Bandwidth	**P**			
15.207	RSS GEN 8.8	AC Power-line Conducted Emissions			**N.T.**	**Note 1**
Remark: P means Passed F means Failed N.T. means Not Tested						

Note1. The EUT shall be operated by battery only. (used manganese dry cell as type AA)

1.2 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC Part 15 Subpart C Section 15.249, RGG-Gen and RSS-210

1.3 Test Methodology

The tests mentioned in clause 1.1 in this test report were performed according to FCC CFR 47 Part 2, CFR 47 Part 15, ANSI C63.10-2013, and RSS-Gen.

1.4 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

1.5 Test Facility

The measurement facilities are located at 135-60 Gyeongchung-daero, Gonjiam-eup, Gwangju-si, Gyeonggi-do 12813, Korea. Description details of test facilities were submitted to the FCC and IC, designated by the RRA (Radio Research Agency), and accredited by Korea and accredited by KOLAS (Korea Laboratory Accreditation Scheme) in Korea according to the requirement of ISO 17025.

Agency Name	Registration No.	Mark
FCC	KR0160	
ISED(Canada)	IC 12721A	
RRA	KR0160	
Korean Agency for Technology and Standards	KT733	

2. EUT (Equipment Under Test) INFORMATION

2.1 General Description

The PHILIA TECHNOLOGY Co., Ltd., Model PDS-100 (referred to as the EUT in this report) is a SMART DIGITAL DOOR LOCK. The EUT is a device for transferring Z-wave signal to an Z-wave Device through wireless communication. The product specification described herein was obtained from product data sheet or user's manual.

Operating Frequency	908.4 MHz, 916 MHz
KIND OF CLASS	DXX - Part 15 Low Power Communication Device Transmitter
Modulation Types	FSK (908.4 MHz), GFSK (916 MHz)
Generated or used Freq. in EUT	32.768 kHz, 13.56 MHz, 16 MHz, 32 MHz
Type of Antenna	■ Integrated Type (Chip Antenna) □ Dedicated Type
Operating Temperature	-25 °C ~ + 50 °C
Normal Test Voltage	DC 6.0 V
Electrical Rating	DC 6.0 V
External Port(s)	N/A
Test SW Version	Tera Term ver.4.91
RF power setting in TEST SW	20
Software Version	1.0
Hardware Version	1.0

2.2 Available channel number and frequency

Operating Mode: Z-Wave			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	908.4	2	916

2.3 Additional Model

None

3. TEST CONDITION

3.1 Equipment Used During Test

The following peripheral devices and/or interface cables were connected during the measurement:

Description	Model No.	Serial No.	Manufacturer.
SMART DIGITAL DOOR LOCK (EUT)	PDS-100	N/A	PHILIA TECHNOLOGY Co., Ltd.
Test Jig	FT232	N/A	N/A
Notebook PC	E5470	ZU10190-15008	DELL
Adapter for Notebook PC	LA65NM130	N/A	DELL

3.2 Mode of operation during the test

Software used to control the EUT for staying in continuous transmitting mode is programmed.

The used modulation type for the testing is FSK (908.4 MHz), GFSK (916 MHz)

3.3 Preliminary Testing for Worst case configuration

For finding worst case configuration and operating mode, preliminary testing was performed and radiated emission and conducted emission tests were performed with the EUT set to transmit at the channel with the highest output power as worst case scenario. Since the EUT is a fixed type device, all spurious emission tests were performed in one axis direction.

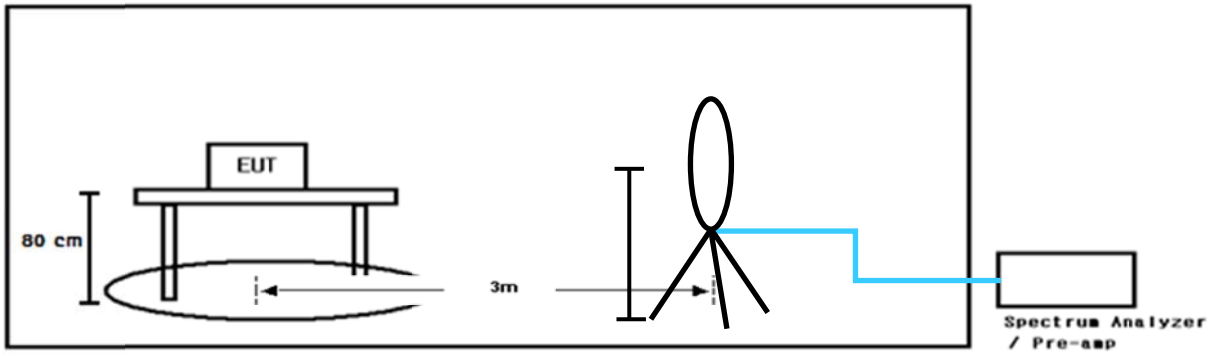
Based on preliminary testing following operating modes were selected for the final test as listed below.

3.3.1 Test Channel and Frequency

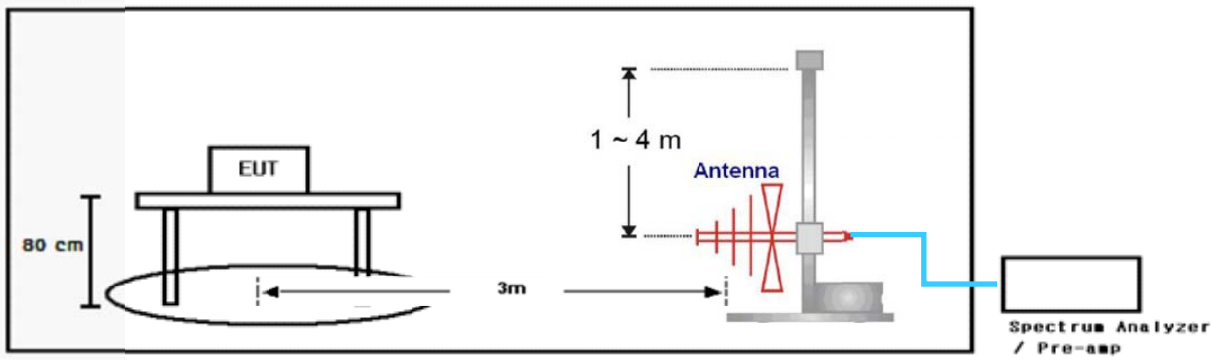
Test Channel	Frequency
1	908.400 MHz
2	916.000 MHz

3.3 Test Setup Drawing

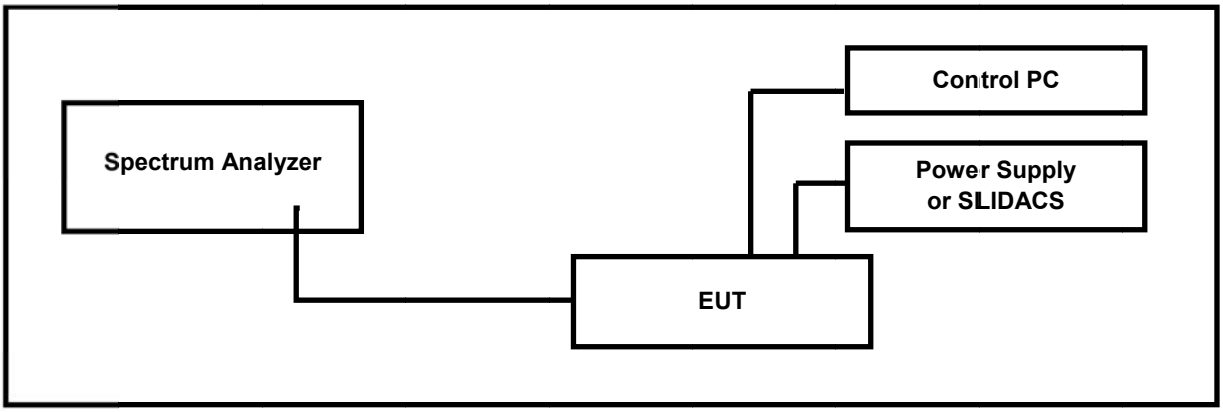
(Radiated Test below 30 MHz)



(Radiated Test below 1 GHz)



(20 dB & 99 % Bandwidth Test)



3.4 EUT Modifications

- No EMC Relevant Modifications were performed by this test laboratory.

4. ANTENNA REQUIREMENT

According to FCC CFR 47 Part 15 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 provision of this section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31 (d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

4.1 Conclusion

The EUT has an integral Chip antenna, so there is no consideration of replacement by the user.

5. TEST RESULT

5.1 Radiated emissions and Restricted band around fundamental frequency

5.1.1 Regulation

Acc. To section 15.249 and RSS-210 Annex B.10, following table shall be applied.

Fundamental Frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (millivolts/meter)
902 – 928 MHz	50	500
2 400 -2 483.5 MHz	50	500
5 725 -5 875 MHz	50	500
24.0 – 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation.

Frequency (MHz)	Field strength limit (μV/m)	Field strength limit (dBμV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F (kHz) = 266.7 – 4.9	48.5 – 13.8	300
0.490 – 1.705	24000/F (kHz) = 49.0 – 14.1	33.8 - 23.0	30
1.705 – 30.0	30	29.5	30
30 – 88	100	40.0	3
88 - 216	150	43.5	3
216 - 960	200	46.0	3
Above 960	500	54.0	3

Note: The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector. For the frequency bands 9 – 90 kHz, 110 – 490 kHz and above 1000 MHz, the radiated emission limits are based on measurements employing an average detector.

5.1.2 Method of Measurement

The preliminary radiated emission test was performed using the procedure in ANSI C63.10 2013 to determine the worse operating conditions. The radiated emissions measurements were performed on the 10 m Semi Anechoic Chamber

Radiated Emissions Test, 9 kHz to 30 MHz (Magnetic Field Test)

For frequencies from 9 kHz to 30 MHz measurements were made of the magnetic H field. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. The measuring antenna is an electrically screened loop antenna. Emissions from the EUT are maximized by adjusting the orientation of the Loop antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions if applicable. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

Radiated Emissions Test, from 30 MHz to 1 GHz

The frequency spectrum from 30 MHz to 1 GHz was scanned and maximum emission levels maximized at each frequency recorded. The EUT was placed on the top of a rotating table of 0.8-meter height, 1 × 1.5 meter non-metallic table. The measuring antenna was broadband Tri-log antenna. The system rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna. The test receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode. The EUT is situated in three orthogonal planes (if appropriate).

Radiated Emissions Test, above 1 GHz

The frequency spectrum of above 1 GHz was scanned and maximum emission levels maximized at each frequency recorded. The EUT was placed on the top of a rotating table of 1.5-meter height. The measuring antenna was broadband horn antenna. The system rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna. The test receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode. If the peak measured value also meets average limit, measurement with the average detector is unnecessary. The EUT is situated in three orthogonal planes (if appropriate).

5.1.3 Test Site Requirement for KDB 937606

Acc. to KDB 937606, Semi Anechoic Chamber (SAC) shall be verified test results below 30 MHz with Open Area Test Site (OATS), so we compared test results between the measurements from our SAC and an OATS and found test results almost same, so we **declare test result for below 30 MHz from our SAC is valid and met the requirement acc. to KDB 937606**.

5.1.4 Measurement Uncertainty

Measurement uncertainties were not taken into account and following uncertainty levels have been estimated for tests performed on the apparatus. The measurement uncertainties are given with at least 95 % confidence.

Frequency Range	Uncertainty	Frequency Range	Uncertainty
9 kHz ~ 30 MHz	±2.1 dB	30 MHz ~ 1 GHz	±4.7 dB
1 GHz ~ 10 GHz	±5.0 dB		

5.1.5 Sample Calculated Example

At 80 MHz Limit = 40.0 dBuV/m

Result =Receiver reading value + Antenna Factor + Cable Loss – Pre-amplifier gain = 30 dBuV/m

Margin = Limit – Result = 40 – 30 = 10 so the EUT has 10.0 dB margin at 80 MHz

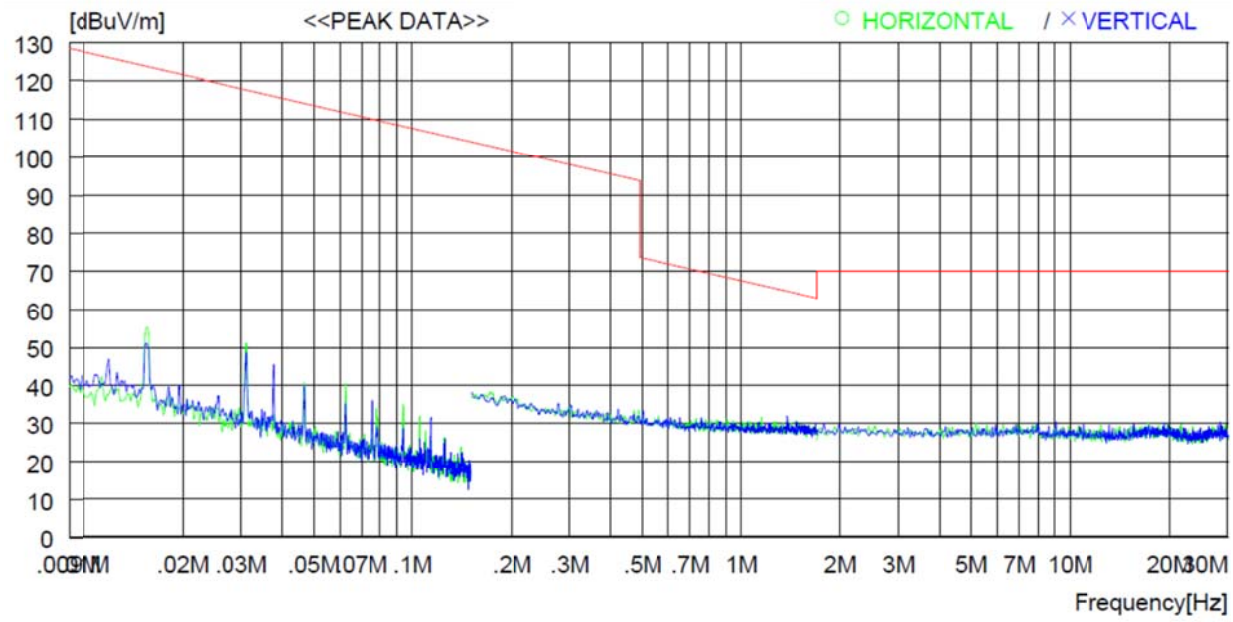
5.1.6 Test Data

Date of Test	2018-07-20	Temperature	(22.6 ± 2.7) °C
		Relative humidity	(50.4 ± 5.9) % R.H.
Measurement Frequency Range		9 kHz ~ 1 GHz	
Test Result	***PASS***	Tested By	Do-heon Kim

Frequency range	Detector Mode	Resolution BW	Video BW	Video Filtering	Measurement distance
Below 30 MHz	Peak or Q.P.	9 kHz	30 kHz	-	3 m
30 MHz ~ 1 000 MHz	Peak or Q.P.	100 kHz	300 kHz	-	3 m
Above 1 GHz	Peak or Average	1 MHz	3 MHz	-	3 m

5.1.6.1 Test Data below 30 MHz

Graphical Test Data – Below 30 MHz, Channel 1,2



Tabulated Test Data - Below 30 MHz, Channel 1,2

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
* Spurious emissions that 20 dB below the limits didn't be recorded										

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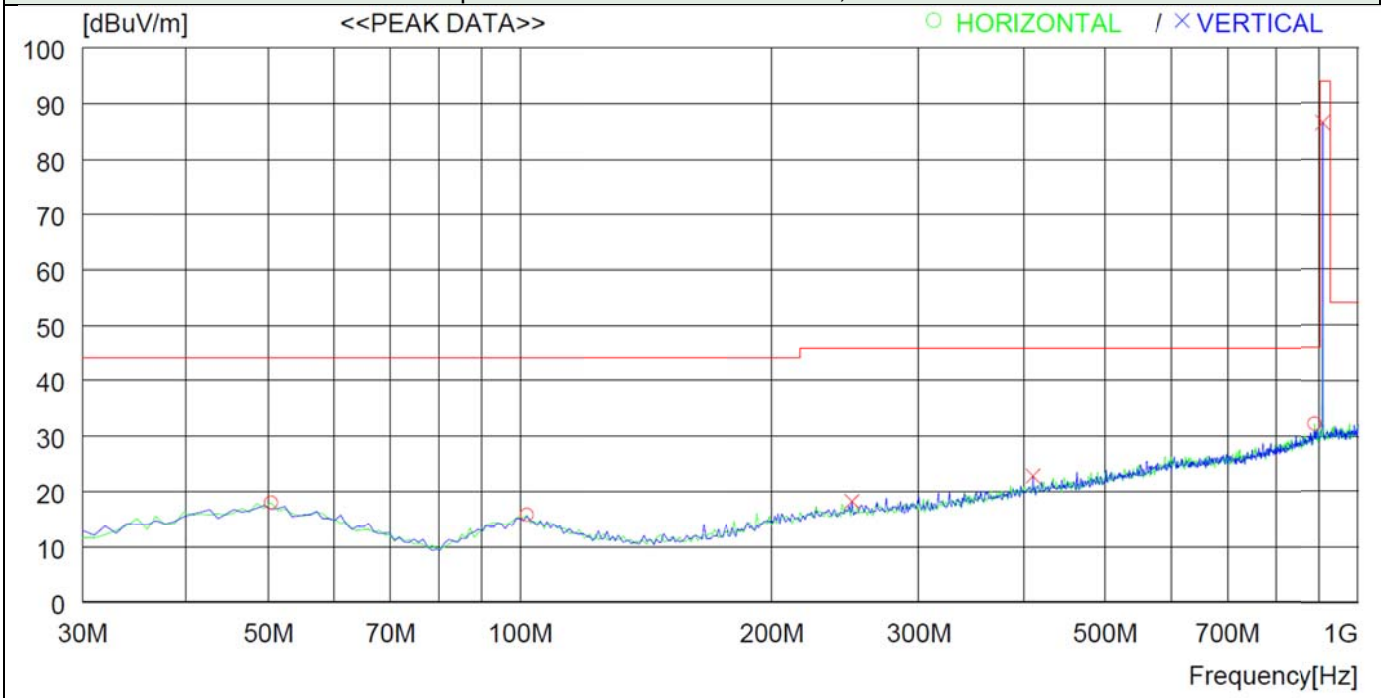
5.1.6.2 Test Data from 30 MHz to 1 GHz

Graphical Test Data – Below 1 GHz, Channel1



Tabulated Test Data – Below 1 GHz, Channel1

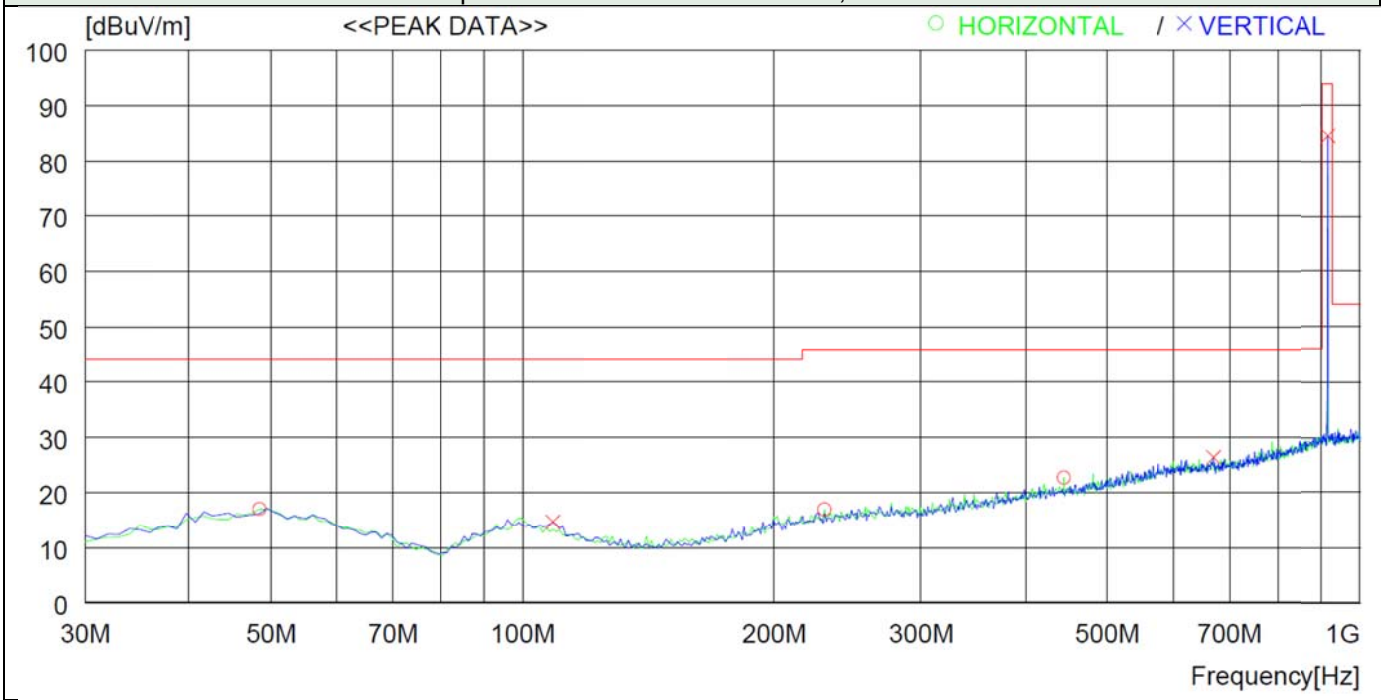
Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
50.370	29.2	Peak	H	14.2	25.4	18.0	44.0	26.0	100	359
101.780	28.9	Peak	H	11.6	24.7	15.8	44.0	28.2	100	359
249.220	28.8	Peak	V	12.8	23.4	18.2	46.0	27.8	300	0
410.240	29.2	Peak	V	16.1	22.5	22.8	46.0	23.2	200	290
889.409	29.4	Peak	H	22.7	19.8	32.3	46.0	13.7	100	359
908.809	83.3	Peak	V	22.9	19.7	86.5	94.0	7.5	100	359

Note: Result(dBuV/m)= Receiver Reading(dBuV) + Antenna Factor(dB/m) - Corr. Factor(dB)

Corr. Factor(dB)= Pre-amplifier(dB) – Cable loss(dB)

Margin(dB)= Limit(dBuV/m) – Result(dBuV/m)

Graphical Test Data – Below 1 GHz, Channel2



Tabulated Test Data – Below 1 GHz, Channel2

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
48.430	28.4	Peak	H	14.0	25.4	17.0	44.0	27.0	100	170
108.570	28.7	Peak	V	28.7	24.7	14.6	44.0	29.4	200	0
229.820	28.2	Peak	H	28.2	23.5	16.9	46.0	29.1	200	1
444.191	28.4	Peak	H	28.4	22.4	22.7	46.0	23.3	100	312
670.196	27.9	Peak	V	27.9	21.4	26.4	46.0	19.6	200	358
916.568	81.2	Peak	V	81.2	19.6	84.6	94.0	9.4	100	3

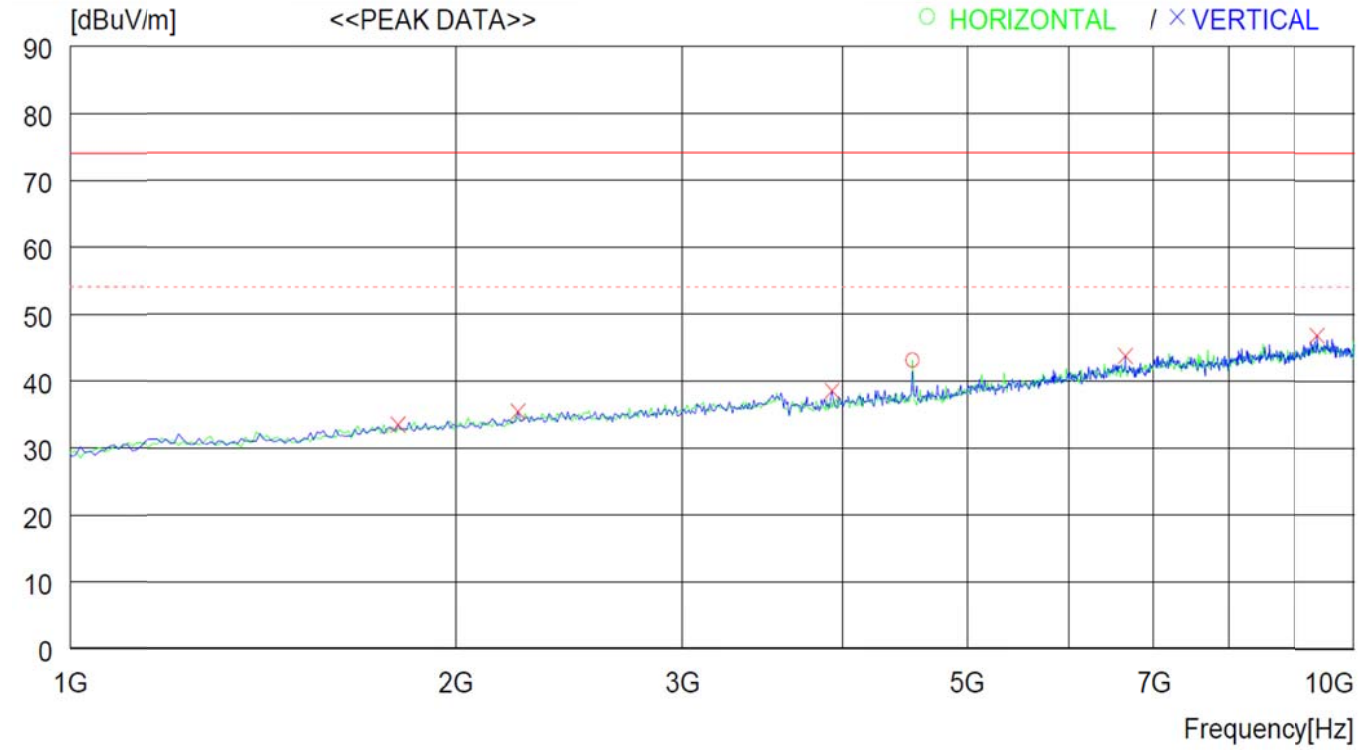
Note: Result(dBuV/m)= Receiver Reading(dBuV) + Antenna Factor(dB/m) - Corr. Factor(dB)

Corr. Factor(dB)= Pre-amplifier(dB) – Cable loss(dB)

Margin(dB)= Limit(dBuV/m) – Result(dBuV/m)

5.1.6.3 Test Data - above 1 GHz (Peak Data)

Graphical Test Data – Above 1 GHz, Channel1 (Peak)



Tabulated Test Data – Above 1 GHz, Channel1 (Peak)

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)

* Spurious emissions that 20 dB below the limits didn't be recorded

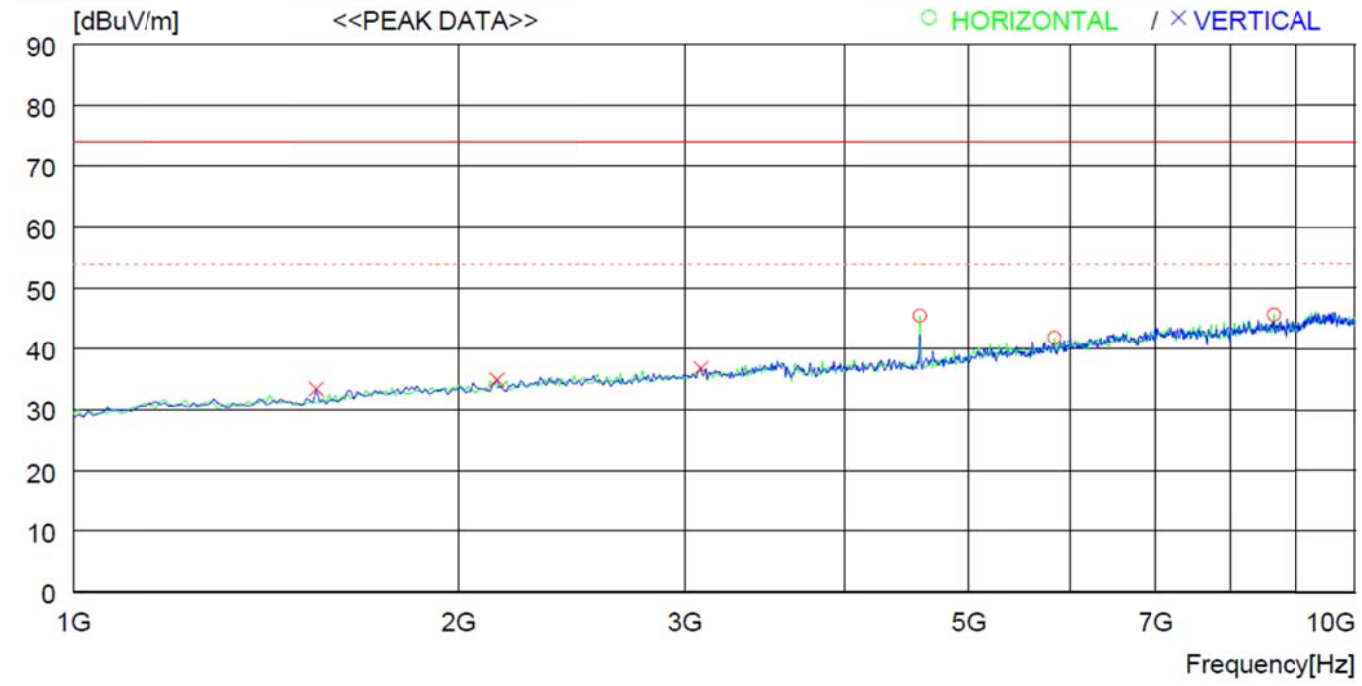
Note: "H" means Horizontal polarity, "V" means Vertical polarity

Result(dBuV/m)= Receiver Reading(dBuV) + Antenna Factor(dB/m) - Corr. Factor(dB)

Corr. Factor(dB)= Pre-amplifier(dB) – Cable loss(dB)

Margin(dB)= Limit(dBuV/m) – Result(dBuV/m)

Graphical Test Data – Above 1 GHz, Channel2 (Peak)



Tabulated Test Data – Above 1 GHz, Channel2 (Peak)

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)

* Spurious emissions that 20 dB below the limits didn't be recorded

Note: "H" means Horizontal polarity, "V" means Vertical polarity

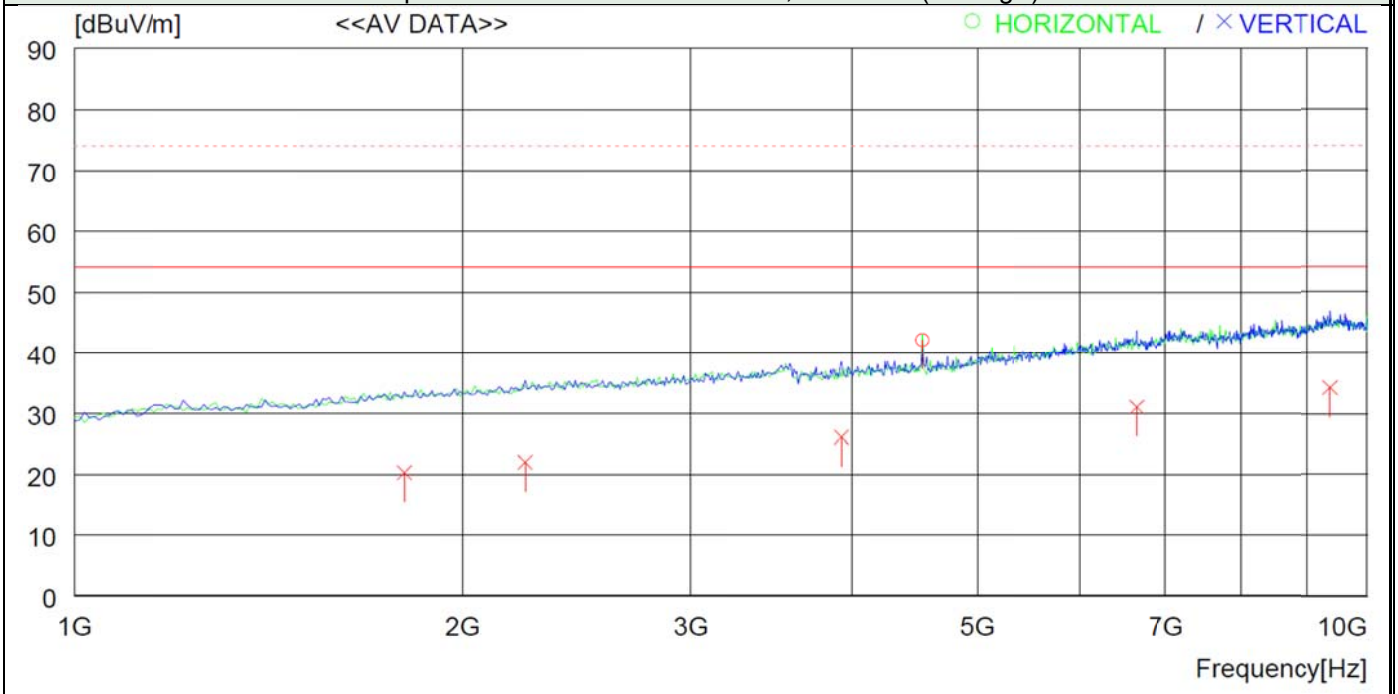
Result(dBuV/m)= Receiver Reading(dBuV) + Antenna Factor(dB/m) - Corr. Factor(dB)

Corr. Factor(dB)= Pre-amplifier(dB) – Cable loss(dB)

Margin(dB)= Limit(dBuV/m) – Result(dBuV/m)

5.1.6.4 Test Data - above 1 GHz (Average Data)

Graphical Test Data – Above 1 GHz, Channel1 (Average)



Tabulated Test Data – Above 1 GHz, Channel1 (Average)

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
1 801.000	27.6	Average	V	26.9	34.2	20.3	54.0	33.7	200	359
2 233.000	27.1	Average	V	28.4	33.5	22.0	54.0	32.0	100	359
3 925.000	25.8	Average	V	31.8	31.5	26.1	54.0	27.9	200	184
4 537.000	41.2	Average	H	31.8	30.9	42.1	54.0	11.9	100	0
6 643.000	23.9	Average	V	35.4	28.3	31.0	54.0	23.0	200	33
9 370.000	22.3	Average	V	37.4	25.4	34.3	54.0	19.7	150	0

Note: "H" means Horizontal polarity, "V" means Vertical polarity

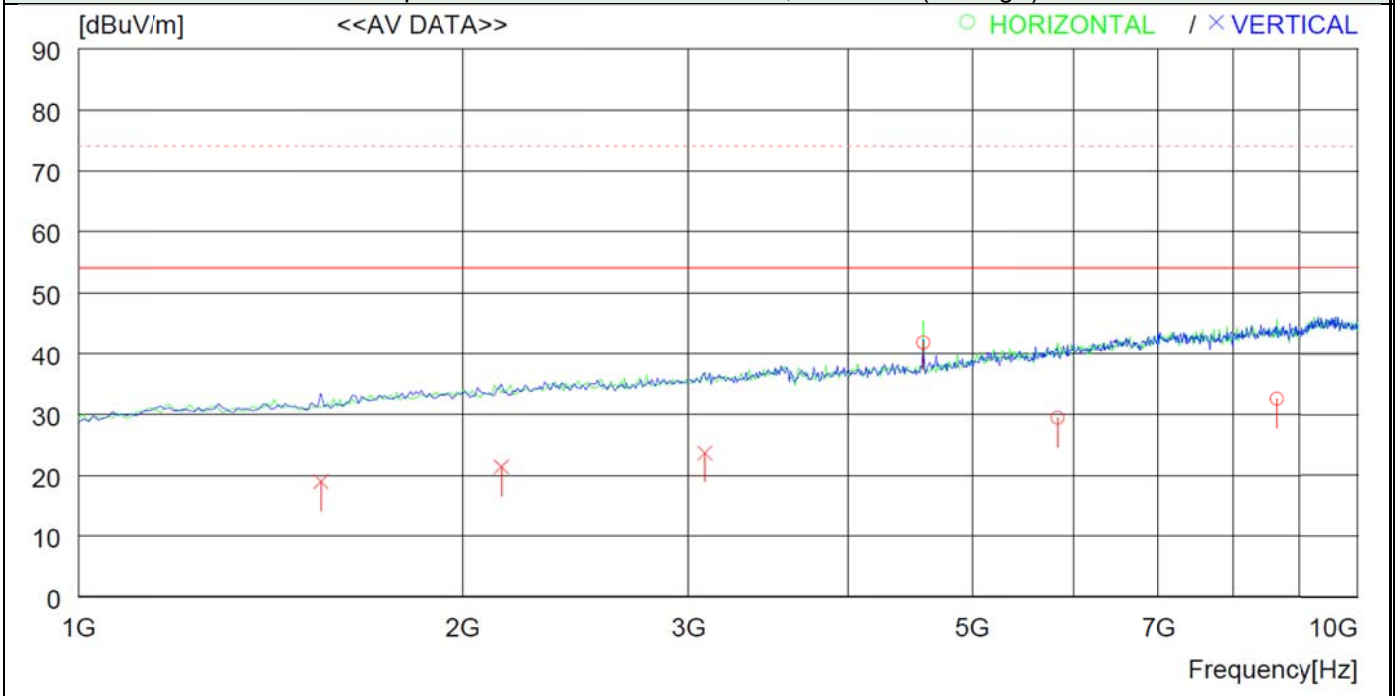
Corr. Factor(dB)= Pre-amplifier(dB) – Cable loss(dB)

Result(dBuV/m)= Receiver Reading(dBuV) + Antenna Factor(dB/m) - Corr. Factor(dB) + Duty factor(dB)

* Duty Cycle = 100 %

Margin(dB)= Limit(dBuV/m) – Result(dBuV/m)

Graphical Test Data – Above 1 GHz, Channel2 (Average)



Tabulated Test Data – Above 1 GHz, Channel2 (Average)

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
1 549.000	27.9	Average	V	26.0	34.9	19.0	54.0	35.0	200	211
2 143.000	26.9	Average	V	28.1	33.6	21.4	54.0	32.6	200	359
3 088.000	26.2	Average	V	30.0	32.5	23.7	54.0	30.3	150	335
4 582.000	40.7	Average	H	31.9	30.7	41.9	54.0	12.1	100	0
5 833.000	24.2	Average	H	34.4	29.2	29.4	54.0	24.6	100	0
8 650.000	22.0	Average	H	36.6	26.1	32.5	54.0	21.5	100	0

Note: "H" means Horizontal polarity, "V" means Vertical polarity

Corr. Factor(dB)= Pre-amplifier(dB) – Cable loss(dB)

Result(dBuV/m)= Receiver Reading(dBuV) + Antenna Factor(dB/m) - Corr. Factor(dB) + Duty factor(dB)

* Duty Cycle = 100 %

Margin(dB)= Limit(dBuV/m) – Result(dBuV/m)

5.2 20 dB bandwidth

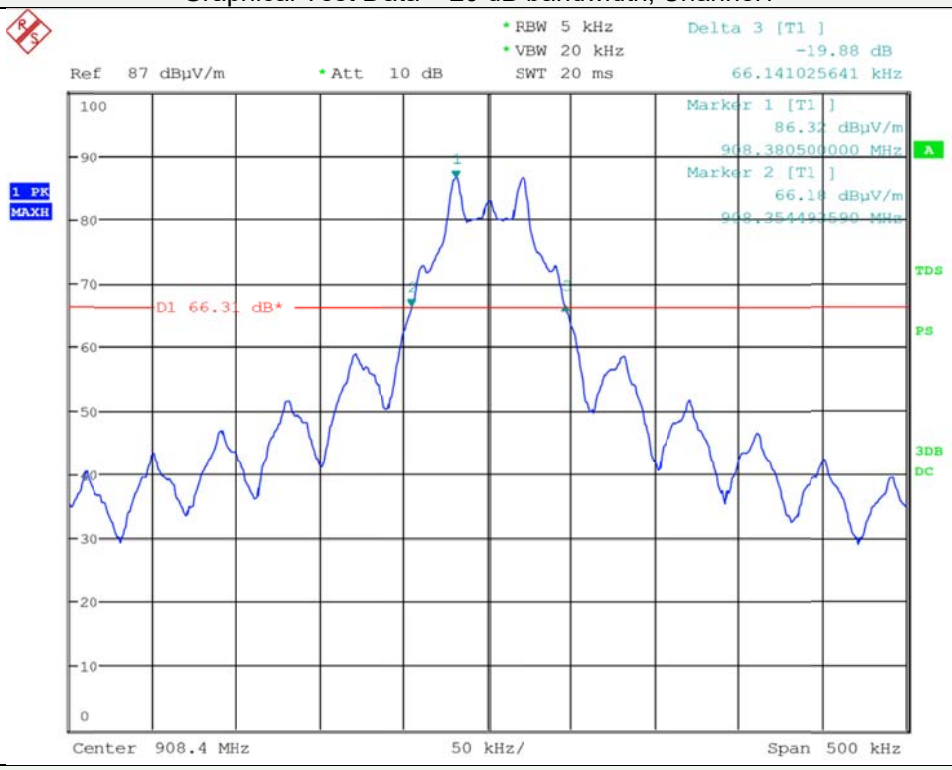
5.2.1 Method of Measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution is set to 5 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.

5.2.2 Test Data

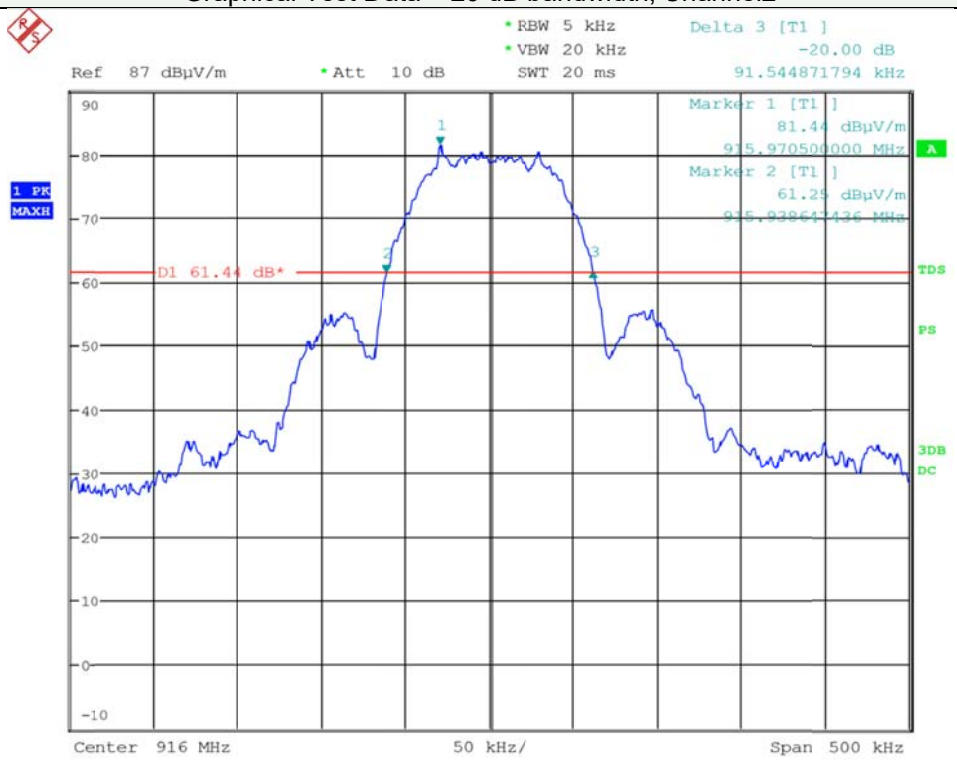
Date of Test	2018-07-20	Temperature	(22.6 ± 2.7) °C
		Relative humidity	(50.4 ± 5.9) % R.H.
Test Result	***PASS***	Tested by	Do-heon Kim

Graphical Test Data – 20 dB bandwidth, Channel1



Tabulated Test Data – 20 dB bandwidth, Channel1

Operating Frequency (MHz)	Measured Value (kHz)	Limit
908.4	66.141	902 MHz ~ 928 MHz

Graphical Test Data – 20 dB bandwidth, Channel2


Tabulated Test Data – 20 dB bandwidth, Channel2		
Operating Frequency (MHz)	Measured Value (kHz)	Limit
916.0	91.545	902 MHz ~ 928 MHz

5.3 99% bandwidth

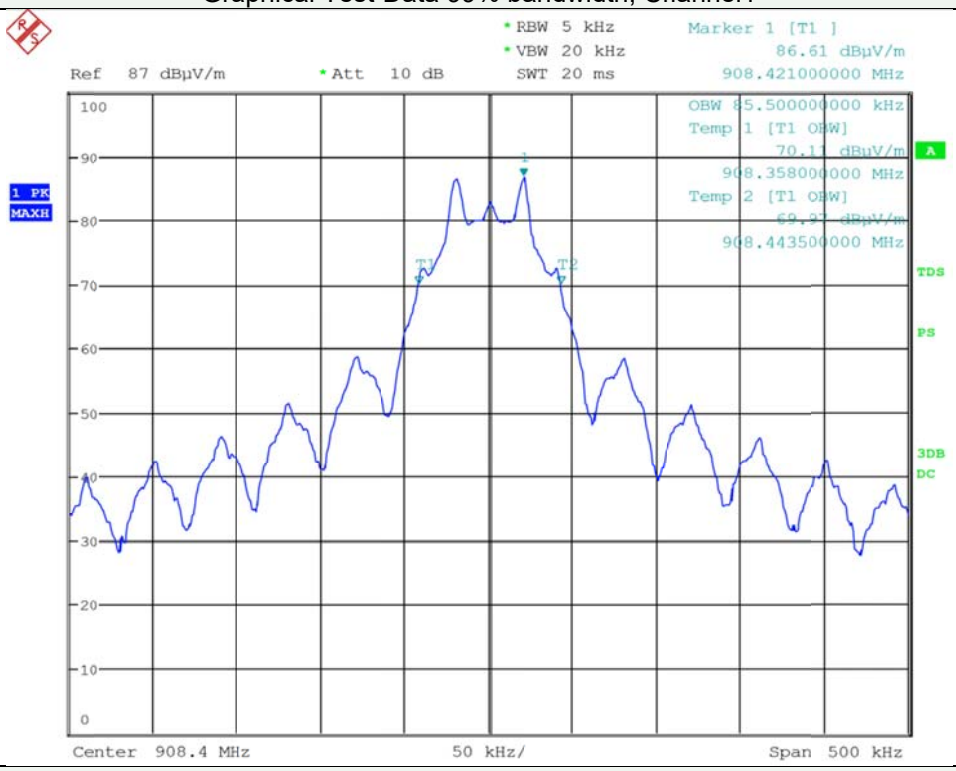
5.3.1 Method of Measurement

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolutuon bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

5.3.2 Test Data

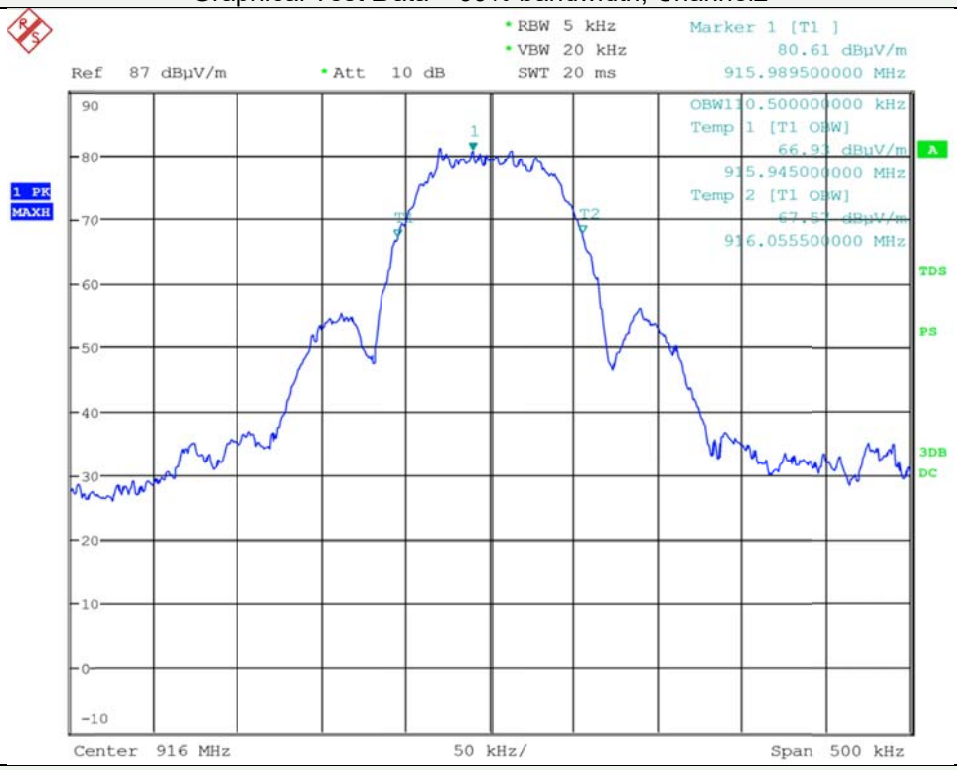
Date of Test	2018-07-20	Temperature	(22.6 ± 2.7) °C
		Relative humidity	(50.4 ± 5.9) % R.H.
Test Result	***PASS***	Tested by	Do-heon Kim

Graphical Test Data 99% bandwidth, Channel1



Tabulated Test Data 99% bandwidth, Channel1

Operating Frequency (MHz)	Measured Value (kHz)	Limit
908.4	85.500	902 MHz ~ 928 MHz

Graphical Test Data – 99% bandwidth, Channel2


Tabulated Test Data – 99% bandwidth, Channel2		
Operating Frequency (MHz)	Measured Value (kHz)	Limit
916.0	110.500	902 MHz ~ 928 MHz

Appendix I – Test Instrumentation

Description	Model No.	Serial No.	Manufacturer.	Due for Cal Date
Test Receiver	ESU 26	100303	Rohde & Schwarz	2019-01-18
Loop Antenna	HFH2-Z2	100341	Rohde & Schwarz	2019-04-21
TRILOG Broadband Antenna	VULB9163	9163.799	Schwarzbeck	2019-09-14
Horn Antenna	HF 907	102426	Rohde & Schwarz	2018-11-25
Attenuator	6dB	272.4110.50	Rohde & Schwarz	2019-01-18
Pre-Amplifier	310N	344015	Sonoma Instrument	2019-01-18
Pre-Amplifier	SCU 18D	19006450	Rohde & Schwarz	2019-04-24
Turn Table	DT3000-3t	1310814	INNCO SYSTEM	N/A
Antenna Master	MA4000-EP	4600814	INNCO SYSTEM	N/A
Antenna Master	MA4000-XP-ET	-	INNCO SYSTEM	N/A
Camera Controller	HDCon4102	6531445048	PONTIS	N/A
CO3000 Controller	Co3000-4Port	CO3000/806/ 34130814/L	INNCO SYSTEM	N/A
CO3000 Controller	Co3000-4Port	CO3000/807/ 34130814/L	INNCO SYSTEM	N/A

The measuring equipment utilized to perform the tests documented in this test report has been calibrated in accordance with manufacturer's recommendations, and is traceable to recognized national standards.