

# TEST REPORT

of

FCC Part 15 Subpart C §15.209

FCC ID: 2AUNAWSBIONA195

Equipment Under Test : WARPS BI:ON  
Model Name : WS-BIONA195  
Applicant : WARP Solution  
Manufacturer : WARP Solution  
Date of Receipt : 2019.09.17  
Date of Test(s) : 2019.11.08 ~ 2019.12.31  
Date of Issue : 2020.01.06

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Date:

2020.01.06

Nancy Park

Technical Manager:



Date:

2020.01.06

Jungmin Yang

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RTT5041-19(2019.04.24)(1)

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A4(210 mm x 297 mm)

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## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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Phone No. : +82 31 688 0901

Fax No. : +82 31 688 0921

### 1.2. Details of Applicant

Applicant : WARP Solution  
Address : 307, 291, Daehak-ro, Yuseong-gu, Daejeon, South Korea, 34141  
Contact Person : Jo, Min-hee  
Phone No. : +82 10 5007 4620

### 1.3. Details of Manufacturer

Company : Same as applicant  
Address : Same as applicant

### 1.4. Description of EUT

<b>Kind of Product</b>	WARPS BI:ON	
<b>Model Name</b>	WS-BIONA195	
<b>Power Supply</b>	DC 5 V	
<b>Frequency Range</b>	Ant. 1	110.01 kHz ~ 148 kHz
	Ant. 2	327 kHz
<b>Antenna Type</b>	Loop Coil Antenna	

### 1.5. Declaration by the Manufacturer

- The EUT has 2 loop coil antennas, and only one antenna can transmit at once.

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## 1.6. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Spectrum Analyzer	R&S	FSV30	100768	Mar. 08, 2019	Annual	Mar. 08, 2020
Signal Generator	R&S	SMBV100A	259067	Jun. 10, 2019	Annual	Jun. 10, 2020
Test Receiver	R&S	ESU26	100109	Jan. 31, 2019	Annual	Jan. 31, 2020
Amplifier	H.P.	8447F	2944A03909	Aug. 07, 2019	Annual	Aug. 07, 2020
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 22, 2019	Biennial	Aug. 22, 2021
Turn Table	Innco systems GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-963/3 8330516/L	CO3000-963/3 8330516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	SUCOFLEX	104 (3 m)	MY3258414	Jul. 20, 2019	Semi- annual	Jan. 20, 2020
Coaxial Cable	SUCOFLEX	104 (10 m)	MY3145814	Jul. 20, 2019	Semi- annual	Jan. 20, 2020
Test Receiver	R&S	ESCI 7	100911	Feb. 20, 2019	Annual	Feb. 20, 2020
Two-Line V-Network	R&S	ENV216	100190	May 14, 2019	Annual	May 14, 2020
Shield Room	SY Corporation	L × W × H (6.5 m × 3.5 m × 3.5 m)	N/A	N.C.R.	N/A	N.C.R.

## ► Support Equipment

Description	Manufacturer	Model	FCC ID
SMART WATCH	Samsung Electronics Co., Ltd.	SM-R805F	A3LSMR805F
SMART WATCH	Apple Inc.	A1553	BCG-E2870
USB Cable	WARP Solution	USB 3.0 AM TO CF	-
TRAVEL ADAPTER	Weihai Sunlin Electronics Co., Ltd.	MCS-04KR3	-

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## 1.7. Sample Calculation

Where relevant, the following sample calculation is provided:

### 1.7.1. Radiation Test

Field strength level (dB $\mu$ V/m) = Measured level (dB $\mu$ V) + Antenna factor (dB) + Cable loss (dB)

## 1.8. Worst Case of Test Configurations

Charging mode with client device	Antenna	Description
Model: SM-R805F FCC ID: A3LSMR805F	Ant. 1	1 % of battery 50 % of battery 99 % of battery
Model: A1553 FCC ID: BCG-E2870	Ant. 2	

**Note:**

- EUT was investigated with client device under normal charging condition as above then worst value was only reported.

## 1.9. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
20 dB Bandwidth	± 9.66 kHz
AC Conducted Emission	± 3.30 dB
Radiated Disturbance, 9 kHz to 30 MHz	± 3.59 dB
Radiated Disturbance, below 1 GHz	± 5.88 dB

Uncertainty figures are valid to a confidence level of 95 %.

## 1.10. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart C		
Section	Test Item	Result
15.209	Radiated Emission, Spurious Emission and Field Strength of Fundamental	Complied
2.1049	20 dB Bandwidth	Complied
15.207	AC Power Line Conducted Emission	Complied

**Note:**

- Due to the frequency range of the device is less than 1 MHz, so we perform Middle frequency according to 15.31 requirement.

## 1.11. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501/RF-RTL014651	2020.01.06	Initial

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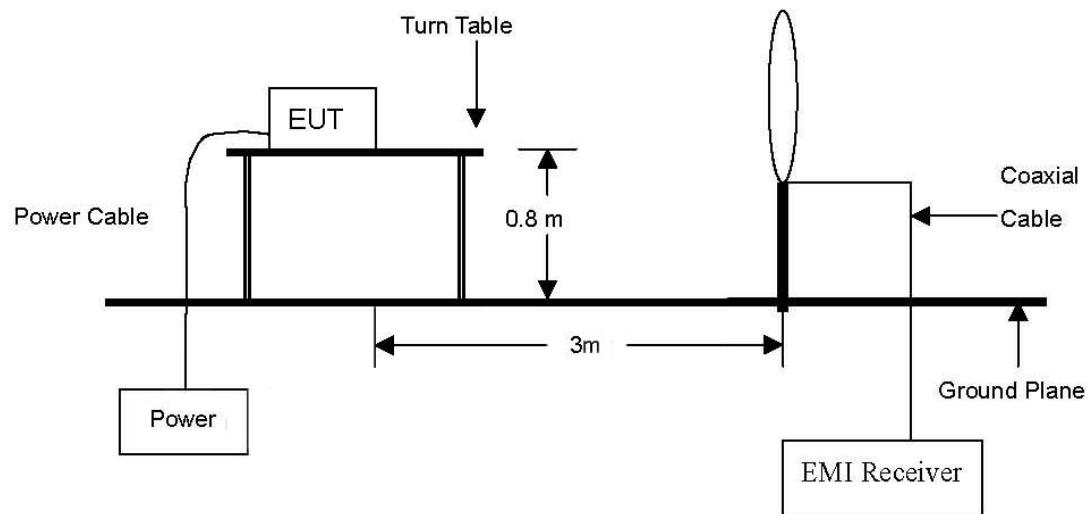
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## 2. Field Strength of Fundamental and Spurious Emission

### 2.1. Test Setup

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



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## 2.2. Limit

### 2.2.1. Radiated emission limits, general requirements

According to §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 (meter)
0.009-0.490	2 400/F(kHz)	300
0.490-1.705	24 000/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.

## 2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10:2013.

### 2.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- d. The test-receiver system was set to Quasi Peak and Average Detect Function and Specified Bandwidth with Maximum Hold Mode.

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## 2.4. Field Strength of Fundamental Test Result

Ambient temperature :  $(23 \pm 1)$  °C

Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

### Test Condition: Operating Mode with Client Device (1 % Battery Status of Client Device)

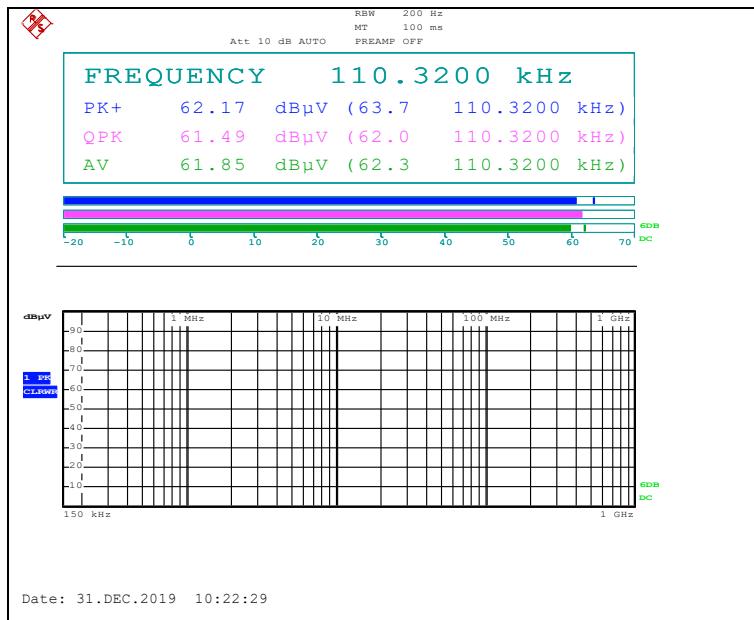
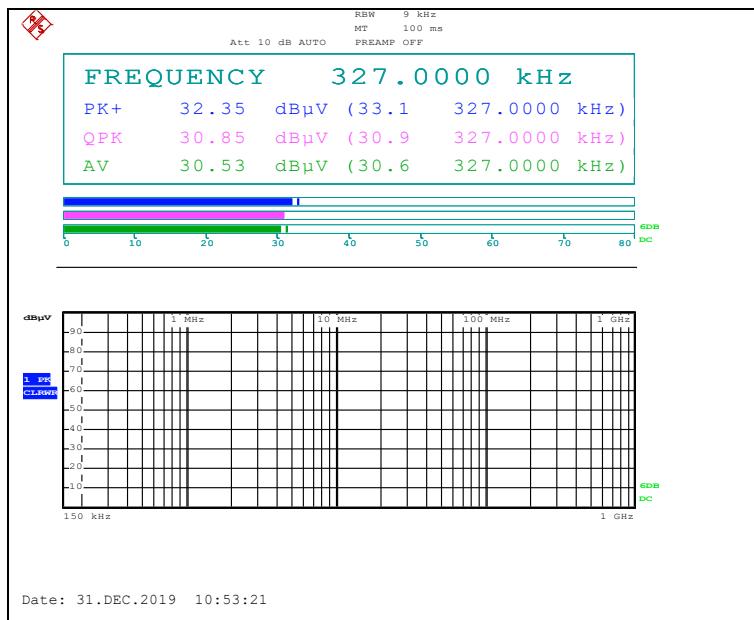
Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB $\mu$ V/m) at 3 m	Actual (dB $\mu$ V/m) at 300 m	Limit (dB $\mu$ V/m) at 300 m	Margin (dB)
Ant. 1 (110.01 kHz ~ 148 kHz)									
0.110	62.30	Average	H	17.80	0.05	80.15	0.15	26.78	26.63
Ant. 2 (327 kHz)									
0.327	30.60	Average	H	17.79	0.22	48.61	-31.39	17.31	48.70

#### Remark;

1. According to §15.31(f)(2),  
- 300 m Result (dB $\mu$ V/m) = 3 m Result (dB $\mu$ V/m) – 40 log (300/3) (dB $\mu$ V/m).
2. According to field strength table of general requirement in §15.209(a), field strength limits below 1.705 MHz were calculated as below.  
- 9 kHz to 490 kHz: 20 log (2 400 / F (kHz)) at 300 m (dB $\mu$ V/m)  
- 490 kHz to 1.705 MHz: 20 log (24 000/F (kHz)) at 30 m (dB $\mu$ V/m)
3. According to §15.209(d), the measurements were tested by using Quasi peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
4. The limit above was calculated based on table of §15.209(a).
5. Actual (dB $\mu$ V/m) at 3 m = Reading (dB $\mu$ V) + AF (dB/m) + CL (dB).

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**- Test plots****Ant. 1 (110.01 kHz ~ 148 kHz)****Ant. 2 (327 kHz)**

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## 2.5. Spurious Emission Test Result

Ambient temperature :  $(23 \pm 1)$  °C

Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

### Test Condition: Operating Mode with Client Device (1 % Battery Status of Client Device)

#### Ant. 1 (110.01 kHz ~ 148 kHz)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB $\mu$ N)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB $\mu$ N/m) at 3 m	Actual (dB $\mu$ N/m) at 300 m or 30 m	Limit (dB $\mu$ N/m) at 300 m or 30 m	Margin (dB)
0.020	34.60	Average	H	18.20	0.01	52.81	-27.19	41.58	68.77
0.047	22.20	Average	H	17.88	0.02	40.10	-39.90	34.16	74.06
0.330	31.70	Average	H	17.79	0.22	49.71	-30.29	17.23	47.52
0.552	22.00	Quasi Peak	H	17.74	0.34	40.08	0.08	32.77	32.69
0.771	18.70	Quasi Peak	H	17.92	0.46	37.08	-2.92	29.86	32.78
2.568	8.31	Quasi Peak	H	18.26	0.56	27.13	-12.87	30.00	42.87
Above 3.000	Not detected	-	-	-	-	-	-	-	-

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**Ant. 2 (327 kHz)**

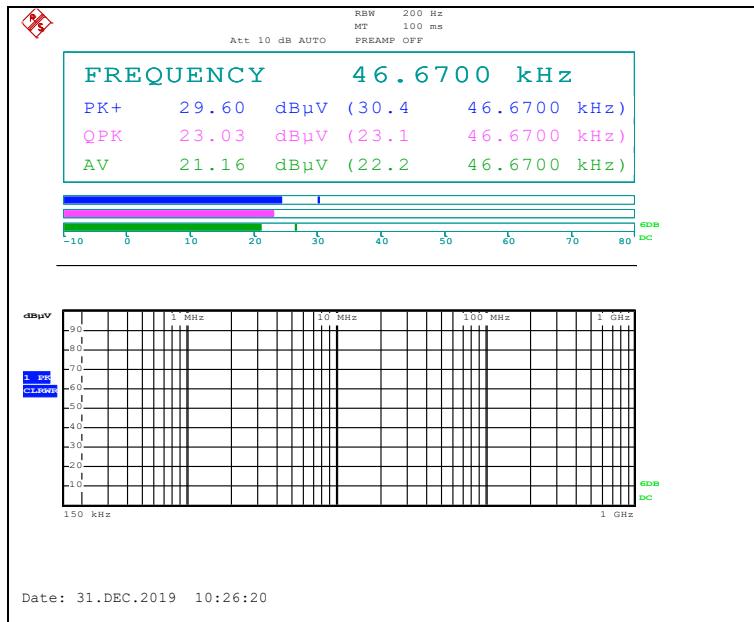
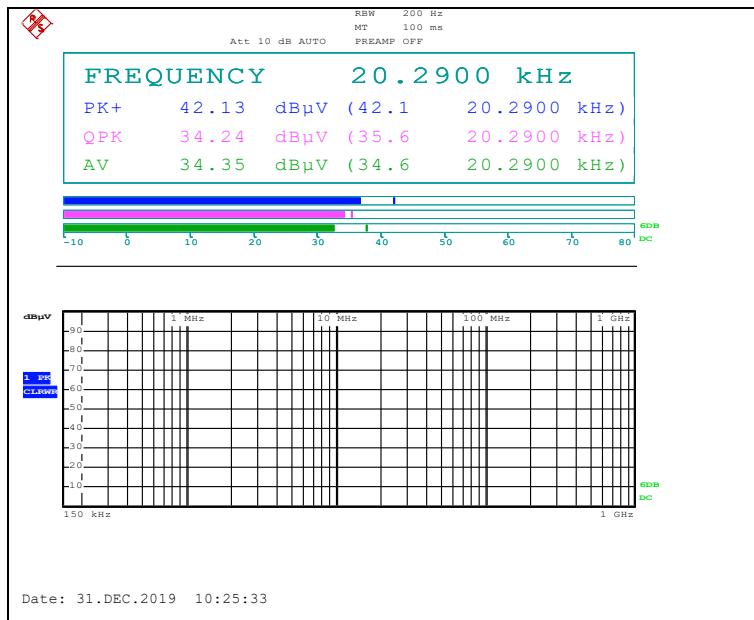
Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB $\mu$ N)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB $\mu$ N/m) at 3 m	Actual (dB $\mu$ N/m) at 300 m or 30 m	Limit (dB $\mu$ N/m) at 300 m or 30 m	Margin (dB)
0.023	29.30	Average	H	18.11	0.01	47.42	-32.58	40.37	72.95
0.068	20.70	Average	H	17.85	0.03	38.58	-41.42	30.95	72.37
0.090	19.00	Quasi Peak	H	17.81	0.04	36.85	-43.15	28.52	71.67
0.113	15.20	Average	H	17.80	0.05	33.05	-46.95	26.54	73.49
0.655	25.80	Quasi Peak	H	17.82	0.39	44.01	4.01	31.28	27.27
0.980	15.70	Quasi Peak	H	18.08	0.57	34.35	-5.65	27.78	33.43
Above 1.000	Not detected	-	-	-	-	-	-	-	-

**Remark:**

1. According to §15.31 (f)(2),
  - 300 m Result (dB $\mu$ N/m) = 3 m Result (dB $\mu$ N/m) – 40 log (300/3) (dB $\mu$ N/m)
  - 30 m Result (dB $\mu$ N/m) = 3 m Result (dB $\mu$ N/m) – 40 log (30/3) (dB $\mu$ N/m)
2. According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 MHz were calculated as below.
  - 9 kHz to 490 kHz: 20 log (2 400 / F (kHz)) at 300 m (dB $\mu$ N/m)
  - 490 kHz to 1.705 MHz: 20 log (24 000 / F (kHz)) at 30 m (dB $\mu$ N/m)
3. According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
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**- Test plots****Ant. 1 (110.01 kHz ~ 148 kHz)**

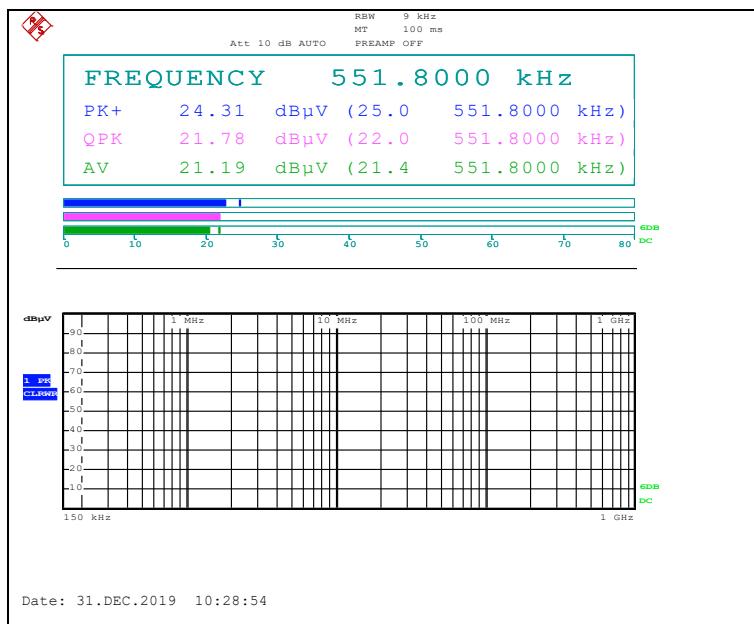
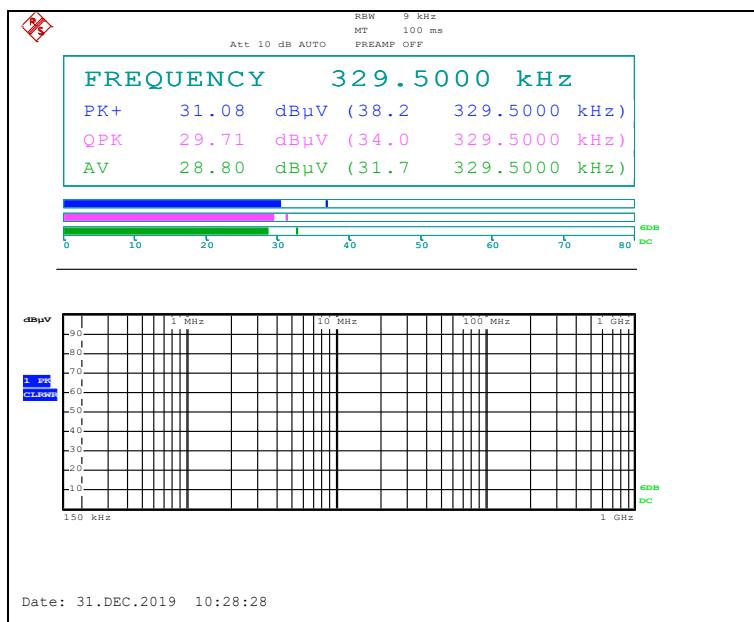
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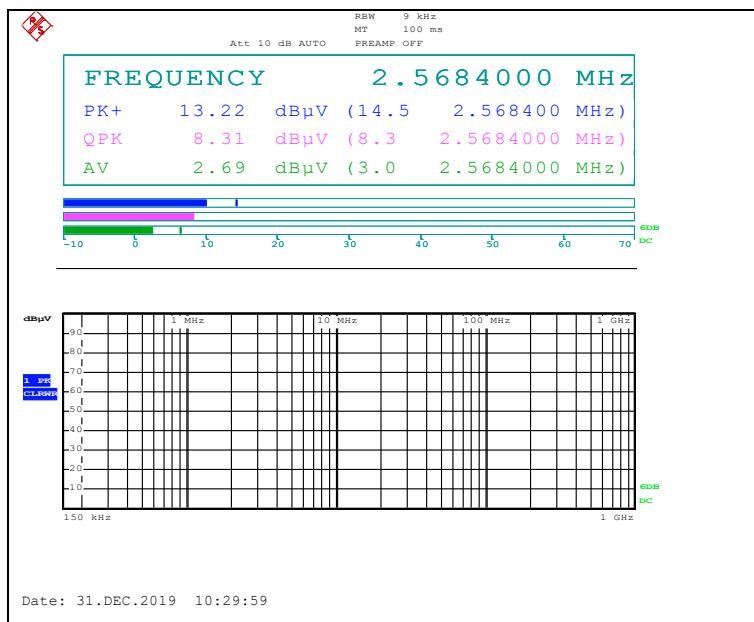
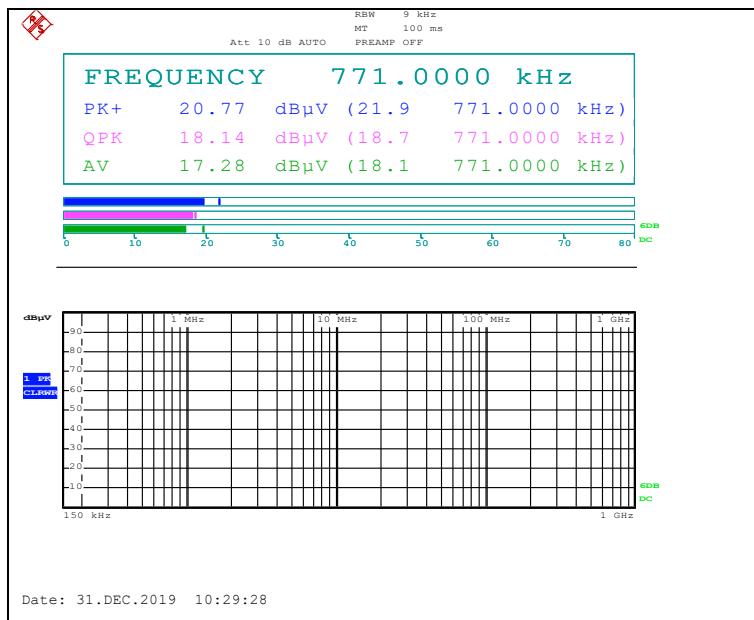
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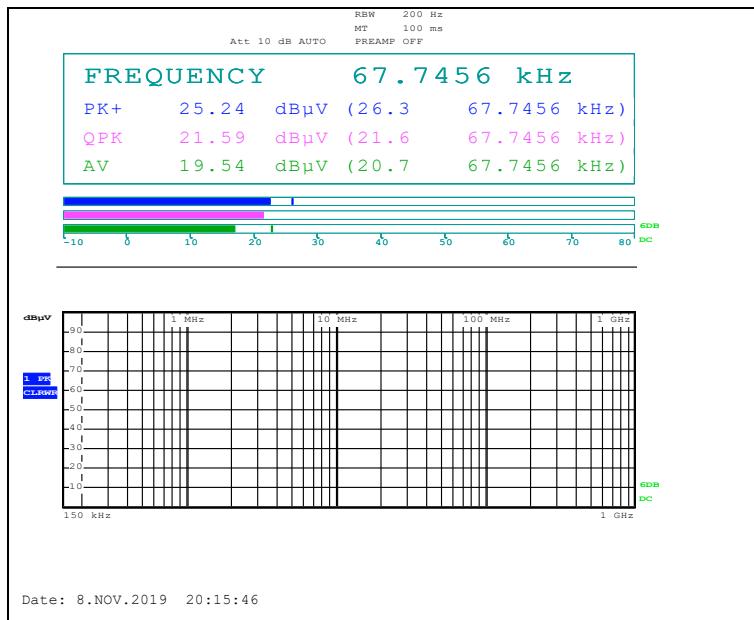
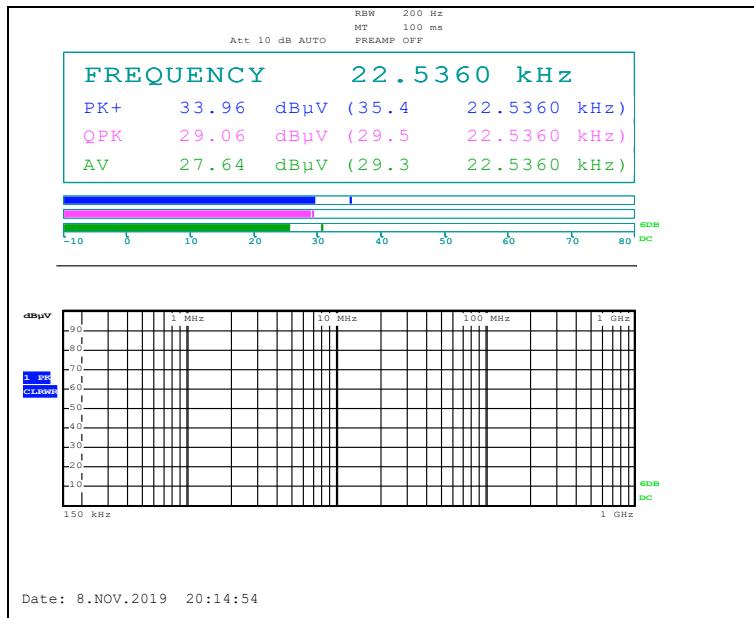
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**Ant. 2 (327 kHz)**

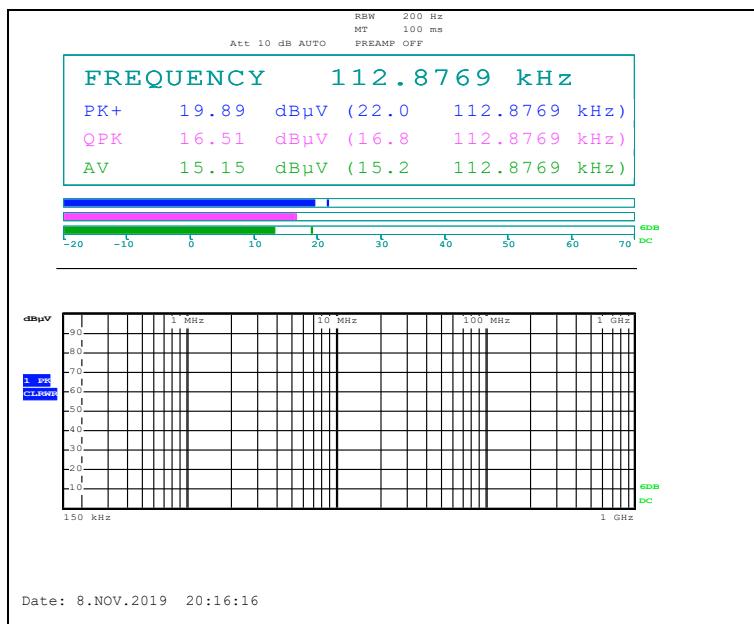
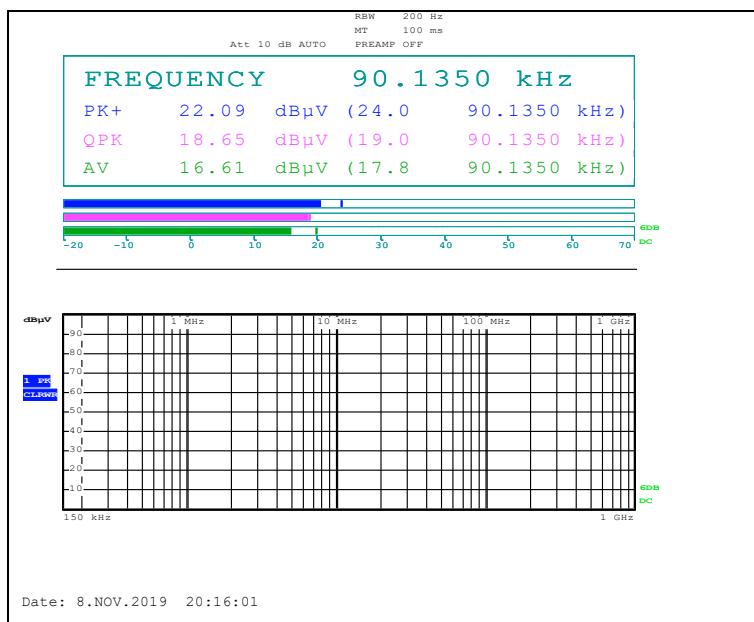
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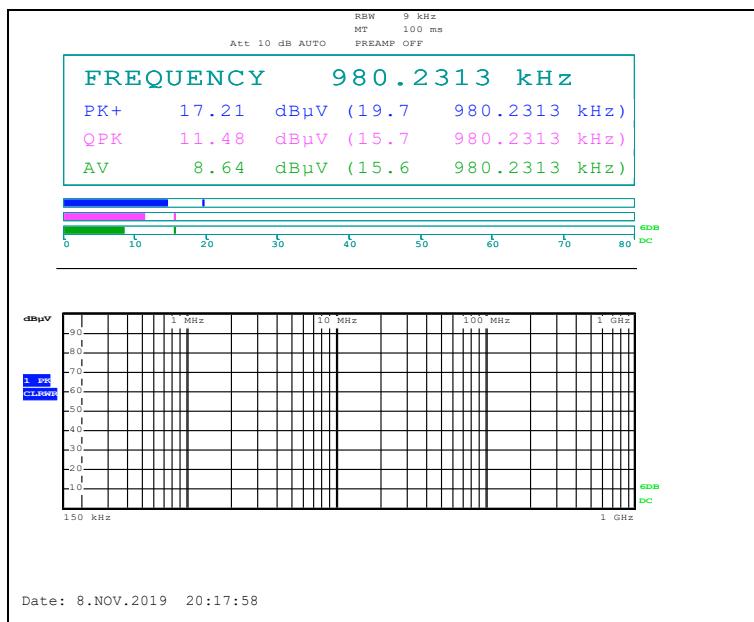
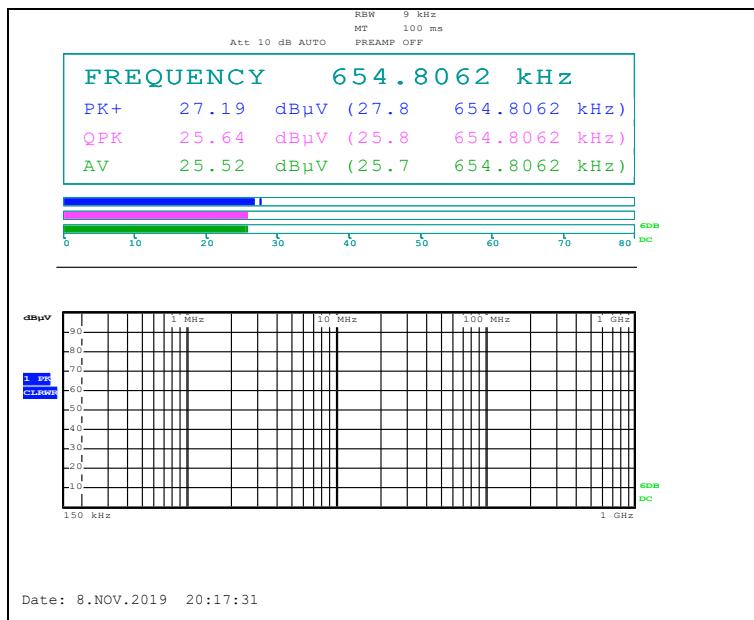
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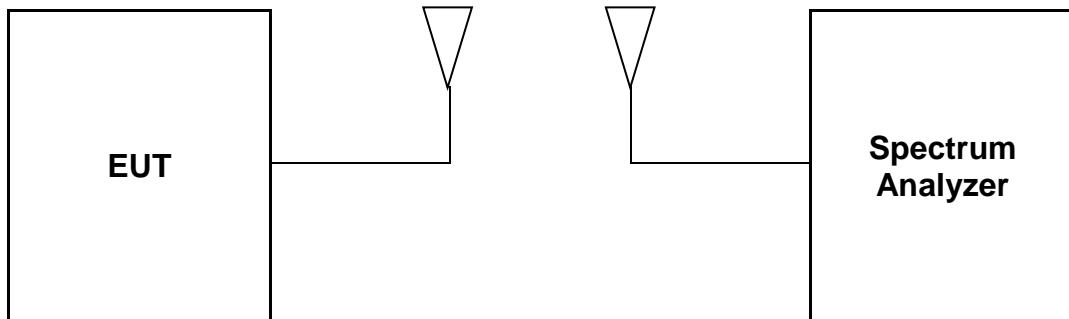
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A4(210 mm x 297 mm)

### 3. 20 dB Bandwidth

#### 3.1. Test Setup



#### 3.2. Limit

None; for reporting purposes only

#### 3.3. Test Procedure

- a. Span = set to capture all products of the modulation process, including the emission skirts.  
RBW = 200 Hz, VBW = 200 Hz, Sweep = auto, Detector = peak, Trace = max hold.
- b. The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is 20 dB bandwidth of the emission.

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### 3.4. Test Result

Ambient temperature :  $(23 \pm 1)$  °C

Relative humidity : 47 % R.H.

Frequency (kHz)	Antenna	EUT Status	20 dB Bandwidth (kHz)	Limit
110.01 ~ 148	Ant. 1	With client device (1 % battery status of client device)	0.622	Reporting proposed only
327	Ant. 2		0.593	

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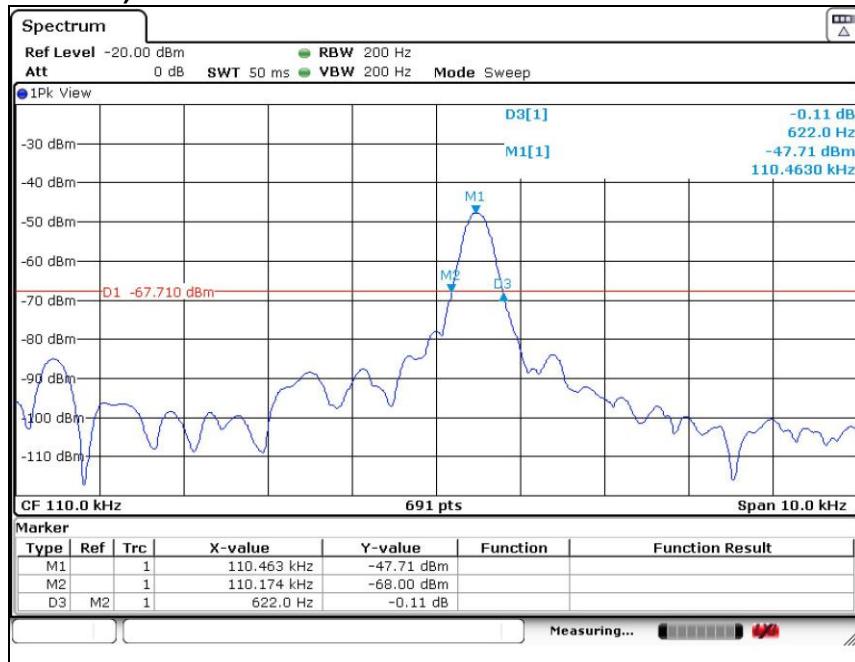
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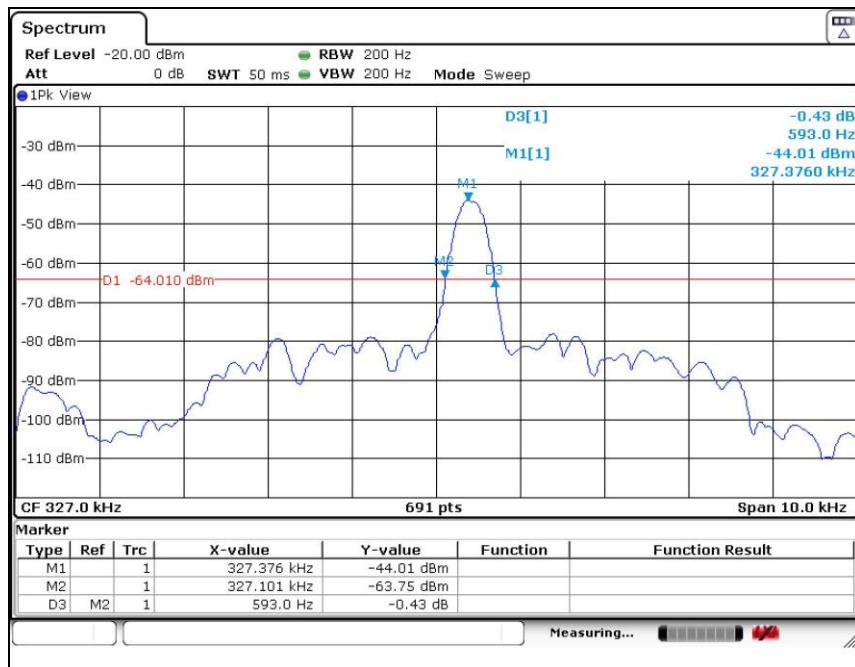
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### - Test plots

#### Ant. 1 (110.01 kHz ~ 148 kHz)



#### Ant. 2 (327 kHz)



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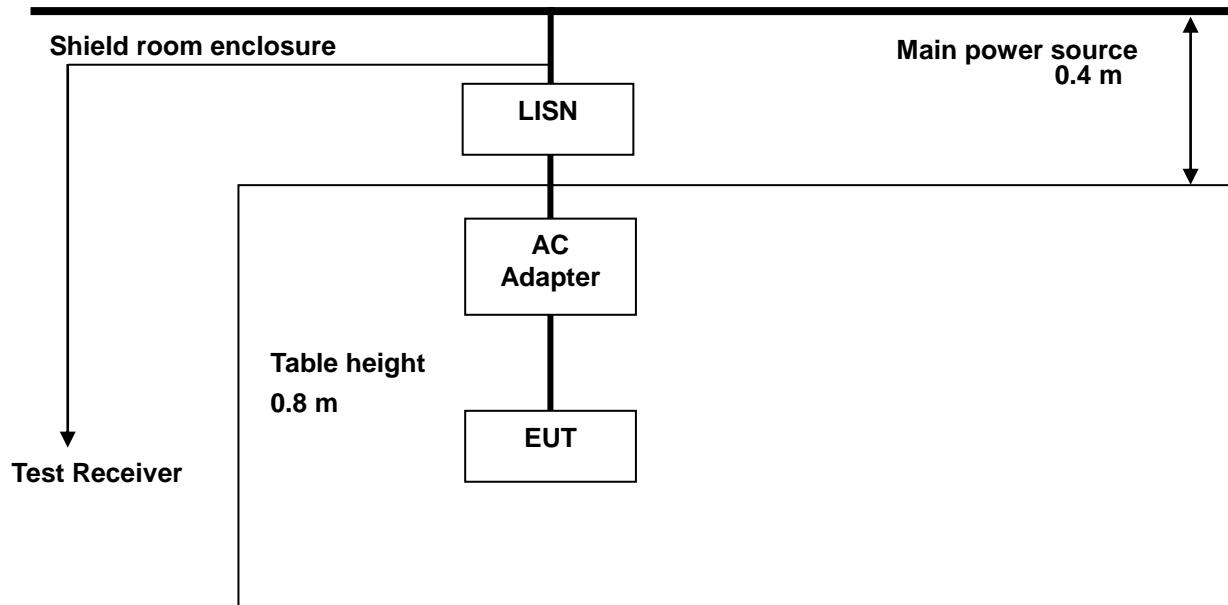
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## 4. Transmitter AC Power Line Conducted Emission

### 4.1. Test Setup



### 4.2. Limit

According to §15.207(a), 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 50  $\mu$ H /50 ohms line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

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### 4.3. Test Procedures

AC conducted emissions from the EUT were measured according to the dictates of ANSI C63.10:2013

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

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#### 4.4. Test Results

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Ambient temperature :  $(23 \pm 1)$  °C  
Relative humidity : 47 % R.H.  
Frequency range : 0.15 MHz – 30 MHz  
Measured Bandwidth : 9 kHz

##### Test Condition: Operating Mode with Client Device (1 % Battery Status of Client Device)

###### Ant. 1 (110.01 kHz ~ 148 kHz)

FREQ. (MHz)	LEVEL (dB $\mu$ V)		LINE	LIMIT (dB $\mu$ V)		MARGIN (dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.18	36.10	20.90	N	64.49	54.49	28.39	33.59
0.30	32.20	19.50	N	60.24	50.24	28.04	30.74
1.52	21.00	19.20	N	56.00	46.00	35.00	26.80
11.79	21.90	16.10	N	60.00	50.00	38.10	33.90
14.42	21.70	11.20	N	60.00	50.00	38.30	38.80
19.99	17.40	7.30	N	60.00	50.00	42.60	42.70
0.18	34.40	19.10	H	64.49	54.49	30.09	35.39
0.31	36.80	26.00	H	59.97	49.97	23.17	23.97
3.89	26.10	18.90	H	56.00	46.00	29.90	27.10
4.61	24.10	19.60	H	56.00	46.00	31.90	26.40
12.30	17.10	11.00	H	60.00	50.00	42.90	39.00
20.65	11.40	9.10	H	60.00	50.00	48.60	40.90

###### Remark;

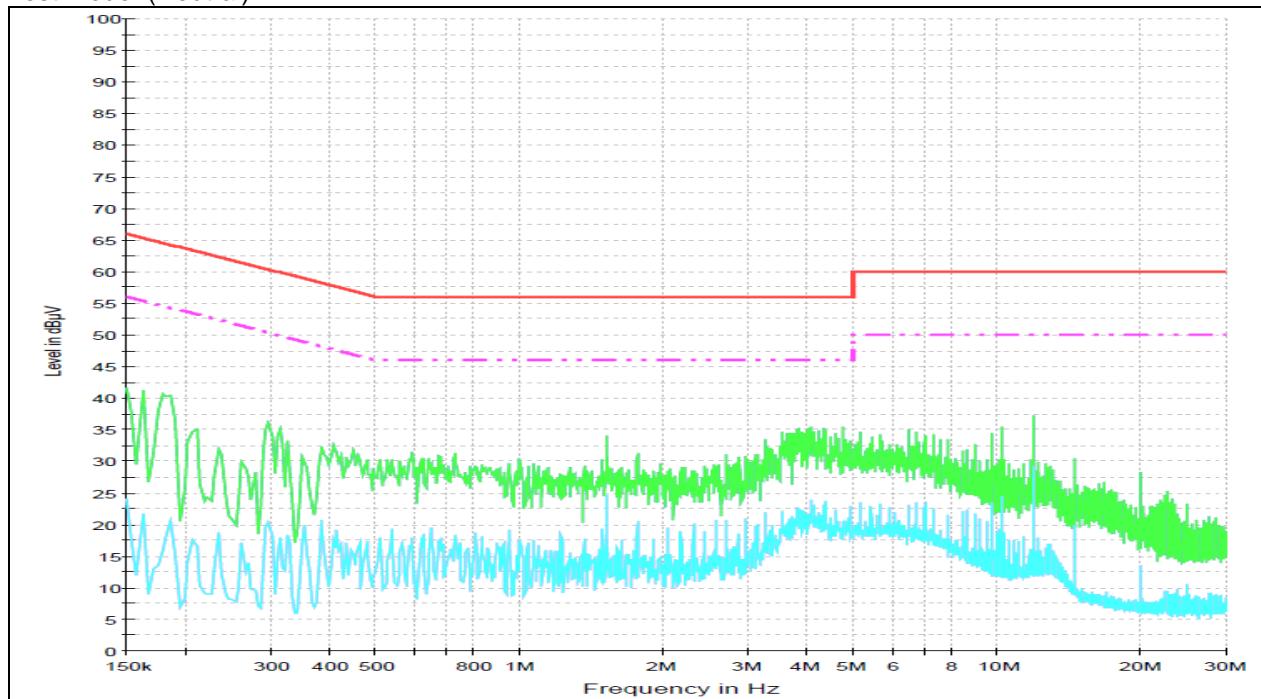
1. Line ( H ): Hot, Line ( N ): Neutral
2. Each charging mode with client device (1 %, 50 % and 99 % of battery) was tested.  
As worst condition, charging mode with client device (1 %) is reported.
3. The limit for Class B device(s) from 150 kHz to 30 MHz are specified in section of the Title 47 CFR.
4. Traces shown in plot were made by using a peak detector and average detector.
5. Deviations to the Specifications: None.

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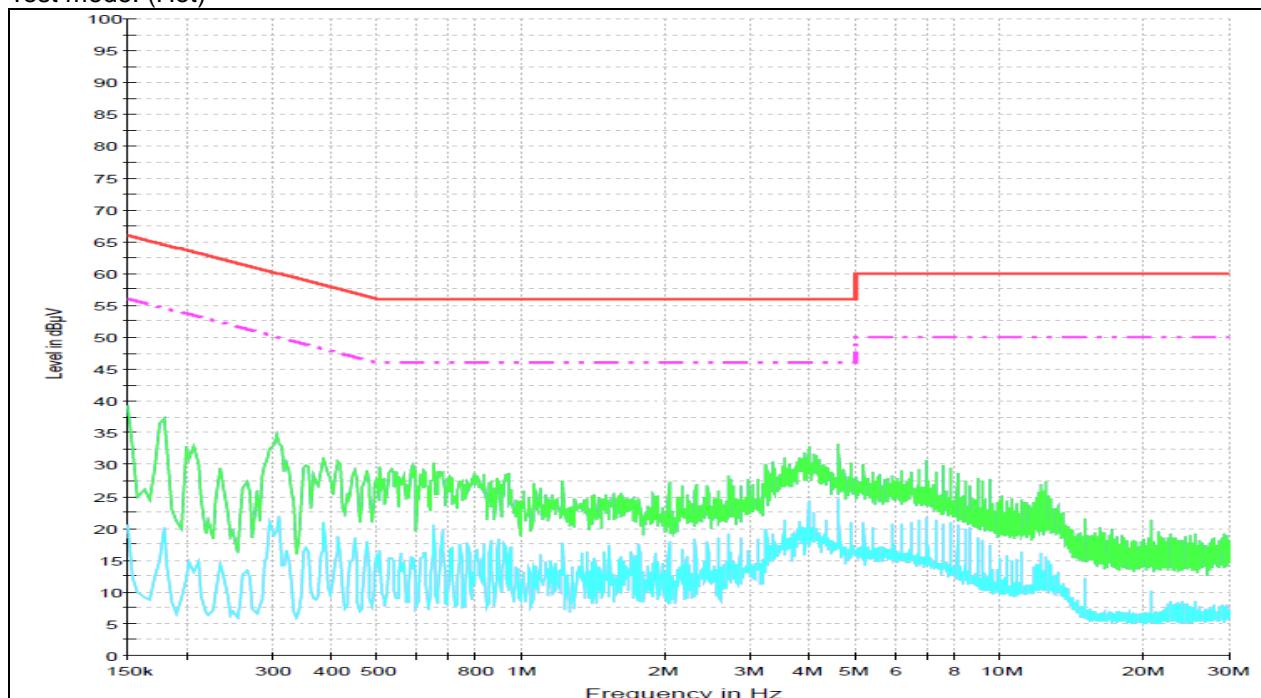
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**- Test plots**

Test mode: (Neutral)



Test mode: (Hot)



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**Ant. 2 (327 kHz)**

FREQ. (MHz)	LEVEL (dB $\mu$ V)		LINE	LIMIT (dB $\mu$ V)		MARGIN (dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.51	24.30	16.30	N	56.00	46.00	31.70	29.70
3.95	29.50	21.80	N	56.00	46.00	26.50	24.20
9.83	40.10	33.40	N	60.00	50.00	19.90	16.60
11.81	35.60	31.40	N	60.00	50.00	24.40	18.60
15.08	28.30	17.90	N	60.00	50.00	31.70	32.10
20.01	21.80	15.30	N	60.00	50.00	38.20	34.70
0.30	28.70	20.70	H	60.24	50.24	31.54	29.54
3.93	26.40	20.40	H	56.00	46.00	29.60	25.60
6.56	22.60	18.00	H	60.00	50.00	37.40	32.00
7.21	24.60	20.00	H	60.00	50.00	35.40	30.00
9.84	35.60	30.80	H	60.00	50.00	24.40	19.20
12.13	31.50	29.20	H	60.00	50.00	28.50	20.80

**Remark:**

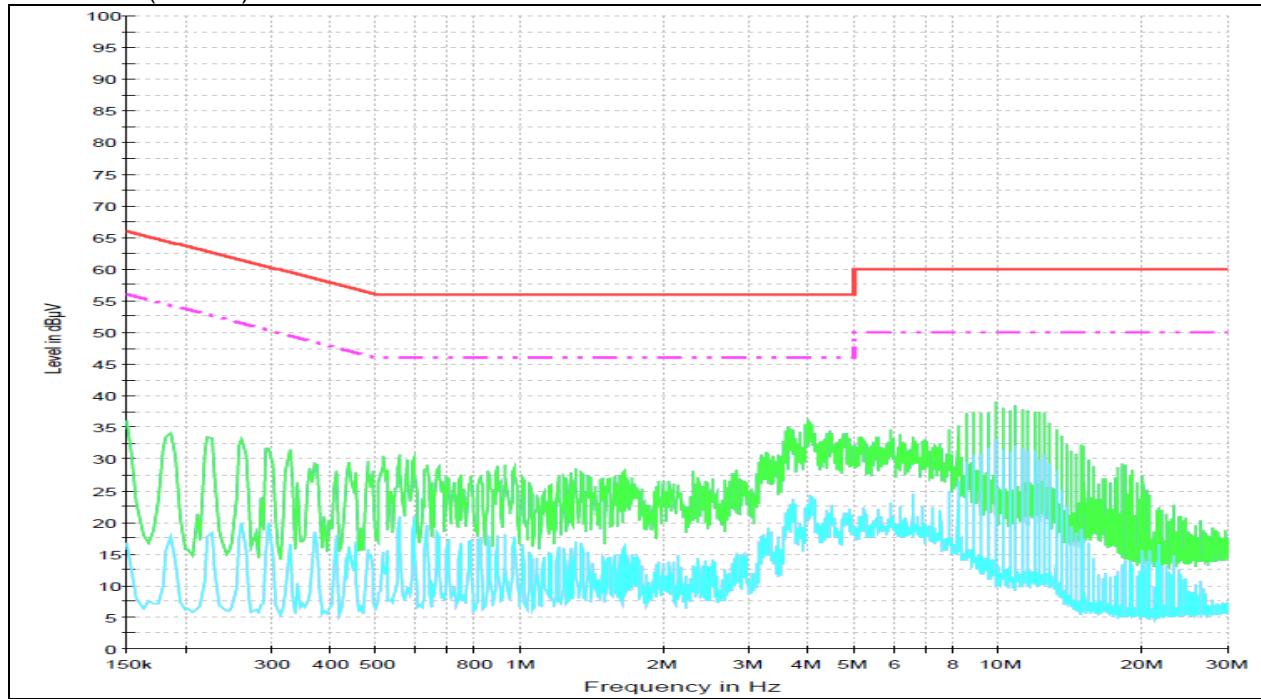
1. Line ( H ): Hot, Line ( N ): Neutral
2. Each charging mode with client device (1 %, 50 % and 99 % of battery) was tested. As worst condition, charging mode with client device (1 %) is reported.
3. The limit for Class B device(s) from 150 kHz to 30 MHz are specified in section of the Title 47 CFR.
4. Traces shown in plot were made by using a peak detector and average detector.
5. Deviations to the Specifications: None.

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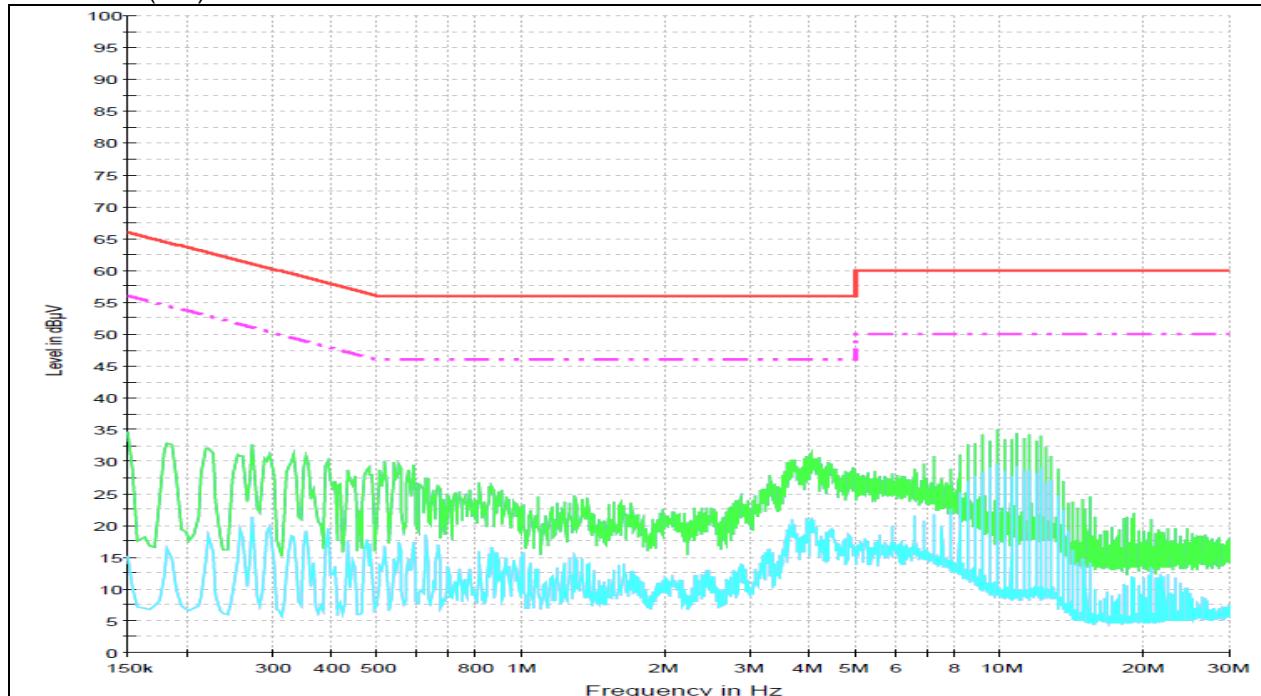
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**- Test plots**

Test mode: (Neutral)



Test mode: (Hot)

**- End of the Test Report -**

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