TEST REPORT

OF

FCC Part 15 Subpart C §15.209 / RSS-Gen Issue 3

FCC ID: A3LEP-HN910IBU
IC Certification: 649E-EPHN910IBU

Equipment Under Test	:	S CHARGER VEHICLE DOCK
Model Name	:	EP-HN910IBU
Applicant	:	Samsung Electronics Co., Ltd.
Manufacturer	:	Samsung Electronics Co., Ltd.
Date of Test(s)	:	2014.07.20 ~ 2014.07.28
Date of Issue	:	2014.08.20

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

Tested By: **Date:** **2014.08.20**

Logan Lee

Approved By: **Date:** **2014.08.20**

Feel Jeong

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INDEX

TABLE OF CONTENTS

Page

1. General Information ---------- 3

2. Field Strength of Fundamental ---------- 8

3. Spurious Emission---------- 12

4. Occupied Bandwidth & 20 dB Bandwidth---------- 19

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1. General Information

1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 435-837

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.

Phone No. : +82 31 688 0901
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1.2. Details of applicant

Applicant : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of Korea
Contact Person : Kim, Jae Man
Phone No. : +82 31 301 6864

1.3. Description of EUT

Kind of Product	S CHARGER VEHICLE DOCK
Model Name	EP-HN910IBU
Power Supply	DC 5 V (Used DC 12 V Cigar jack adaptor)
Frequency Range	115 ㎑ ~ 205 ㎑
Operating Conditions	-20 ℃ ~ 60 ℃
Maximum Field strength	88.20 dBμV/m at 3 m / 8.20 dBμV/m at 300 m
Antenna Type	Inductive loop coil antenna

1.4. Declarations by the manufacturer

- Operation temperature: -20 ℃ ~ 60 ℃
- EUT used only DC power source from vehicle battery. So, AC power line conducted emissions does not apply for EUT.

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1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal Date	Cal Interval	Cal Due.
Spectrum Analyzer	R&S	FSV30	100768	Mar. 27, 2014	Annual	Mar. 27, 2015
Signal Generator	R&S	SMBV100A	255834	Jun. 25, 2014	Annual	Jun. 25, 2015
DC Power Supply	Agilent	U8002A	MY48490027	Jan. 03, 2014	Annual	Jan. 03, 2015
Mobile Test Unit	R&S	CMW500	144035	Mar. 03, 2014	Annual	Mar. 03, 2015
Preamplifier	H.P.	8447D	2944A07087	Jan. 06, 2014	Annual	Jan. 06, 2015
Test Receiver	R&S	ESU26	100109	Mar. 04, 2014	Annual	Mar. 04, 2015
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Jul. 29, 2013	Biennial	Jul. 29, 2015
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	396	Jun. 07, 2013	Biennial	Jun. 07, 2015
Antenna Master	INN-CO	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	INN-CO	DS 1200 S	N/A	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.

1.6. Sample calculation

Where relevant, the following sample calculation is provided:

Field strength level (dBμV/m) = Measured level (dBμV) + Antenna factor (dB) + Cable loss (dB) – amplifier gain (dB)

1.7. Worst case of test configurations

In order to check all kinds of possible configurations, EUT was evaluated with appropriate client and under each charging condition as below table.

EUT configuration	Charging current (mA)	Mobile phone	Description
Charging Mode[1)] with resistive load	145		Maximum resistive load
	350		Medium resistive load
	645		Minimum resistive load
Charging Mode[2)] with client device (FCC ID : A3LSMG900V)		SM-G900V	Less than 1 % of battery
		SM-G900V	Less than 50 % of battery
		SM-G900V	100 % full charging of battery

1) Test Jig was used during the test to satisfy each current status by using resistive loads.
Output voltage = DC 5 V, Output current = 145 mA / 350 mA / 645 mA
- (Maximum load) 34.48 Ω = 5 V / 0.145 A

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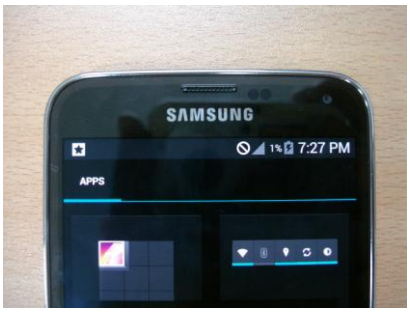
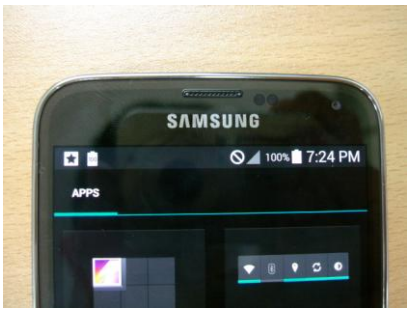
- (Medium load) 14.29 Ω = 5 V / 0.350 A
- (Minimum load) 7.75 Ω = 5 V / 0.645 A

2) PC device with client device was investigated each battery status and compared in two operating configurations.

Battery status during charging condition

- Less than 1 % of battery
- Less than 50 % of battery
- 100 % of battery

		
Plot#1 – less than 1 % of battery	Plot#2 – less than 50 % of battery	Plot#3 – 100 % of battery

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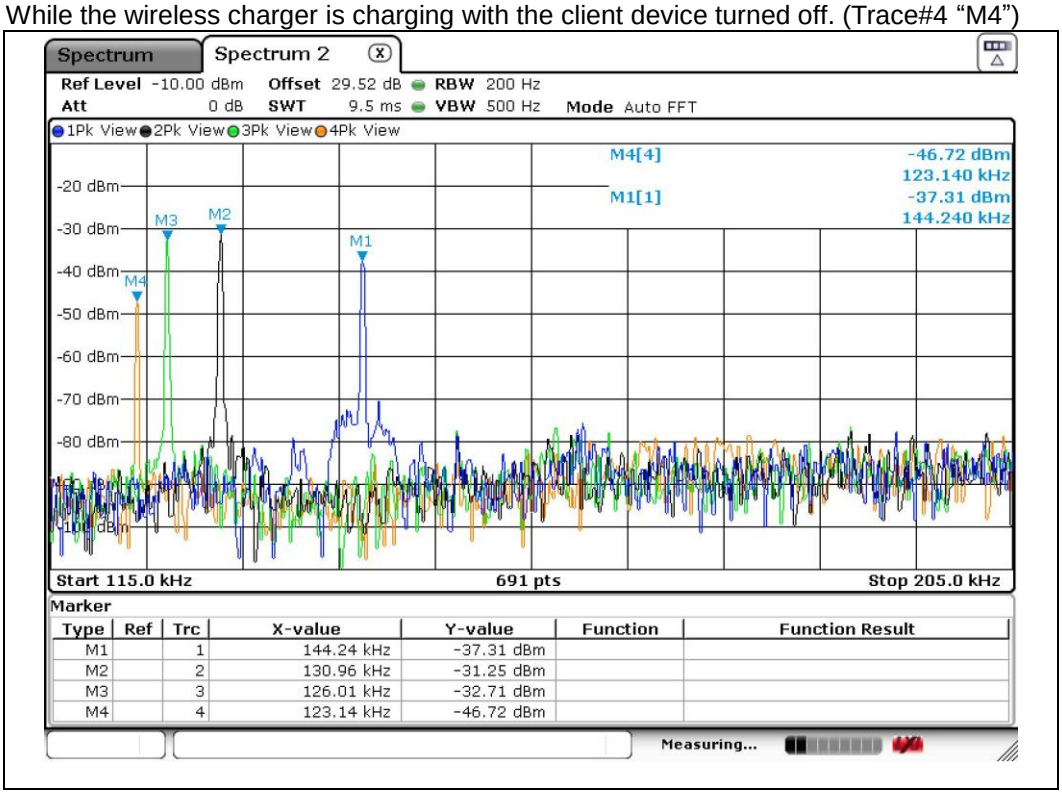
Operating configurations :

Galaxy S5 (SM-G900V)

- While the client device was in airplane mode (Trace#1 “M1”)
- While the client device was connected to an active data connection (Trace#2 “M2”)
  The device was tested under all modes and bands like 2G and 3G.
  In the result, **GSM1 900 / GPRS / 1 TX** was found in **Low channel**.
- While the wireless charger is charging without the client device. (Trace#3 “M3”)
- While the wireless charger is charging with the client device turned off. (Trace#4 “M4”)



Plot – fundamental emission comparison

- The level of Trace#2 was more than Trace#1, 3 and 4 so Trace#2 was selected.
- Trace#2 as **GSM1 900 / GPRS / 1 TX** which was found in **Low channel** should be tested with the client device as a worst case.

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1.8. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart C §15.209 / RSS-Gen Issue 3			
Section in FCC 15 Subpart C	**Section in RSS**	**Test Item**	**Result**
15.209 15.209(a)	RSS-Gen 7.2.5, Table 6	Radiated emission, Spurious Emission and Field Strength of Fundamental	Complied
2.1049	RSS-Gen 4.6.1	Occupied Bandwidth and 20 dB Bandwidth	Complied

1.9. Test Report Revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL007864	2014.07.29	Initial
1	F690501/RF-RTL007864-1	2014.08.20	Deleted alternative Model

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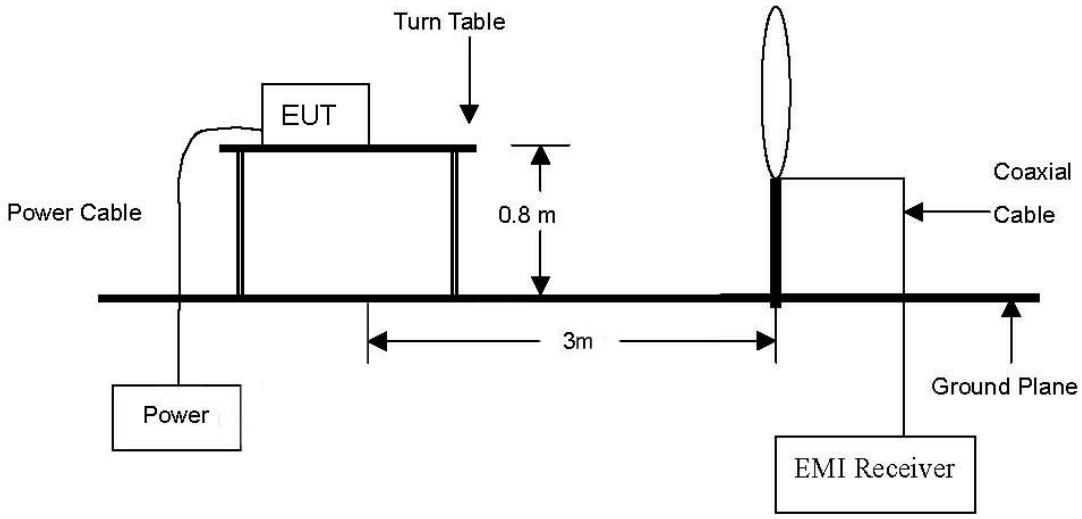
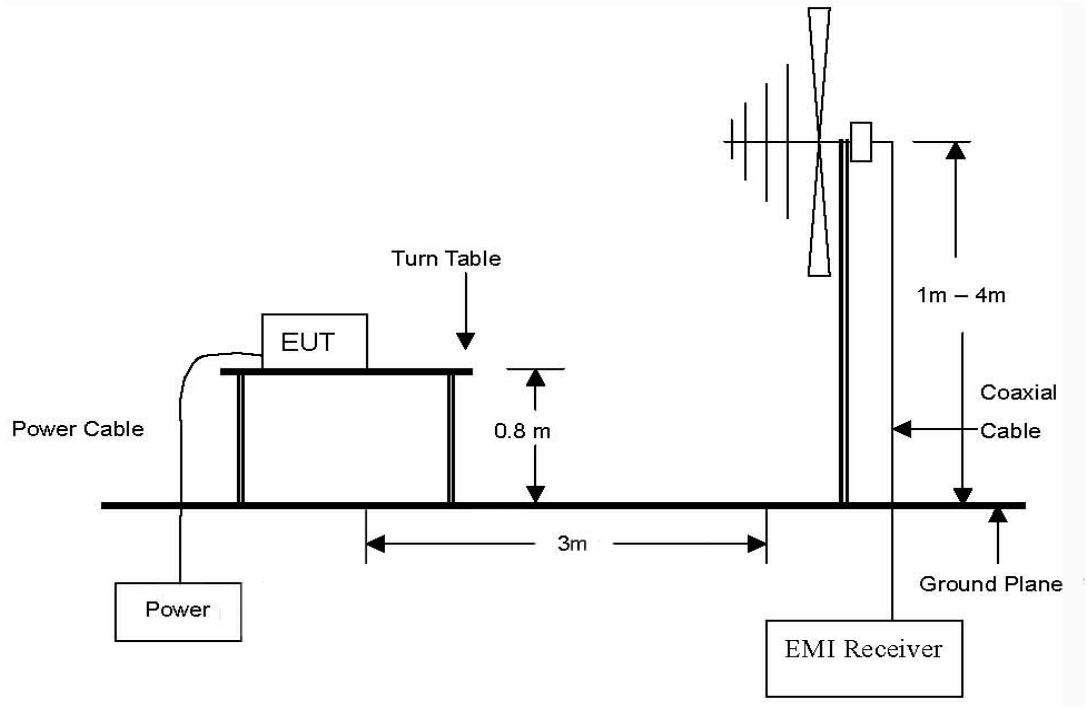
2. Field Strength of Fundamental

2.1. Test Setup

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



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



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 (㎒)	Field Strength (microvolts/meter)	Measurement Distance (meter)
0.009 – 0.490	2400/F(㎑)	300
0.490 – 1.705	24000/F(㎑)	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 ㎒, 76-88 ㎒, 174-216 ㎒ or 470-806 ㎒. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241

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2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

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

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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

2.3.2. Test Procedures for emission from 30 ㎒ to 1 000 ㎒

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. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈ margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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2.4. Test Result

Ambient temperature : (24 ± 1) ℃
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical. The field strength of spurious emission was measured in three orthogonal EUT position (x-axis, y-axis and z-axis). Worst case is y-axis.

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (㎑)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m	Limit (dBμV/m)	Margin (dB)
Charging mode with resistive load (145 ㎃ status)									
0.141	66.70	Average	H	20.03	0.07	86.80	6.80	24.62	17.82
Charging mode with resistive load (350 ㎃ status)									
0.137	68.10	Average	H	20.03	0.07	88.20	8.20	24.87	16.67
Charging mode with resistive load (645 ㎃ status)									
0.133	67.70	Average	H	20.03	0.07	87.80	7.80	25.13	17.33
Charging mode with client (less than 1 % battery status)									
0.134	53.60	Average	H	20.03	0.07	73.70	-6.30	25.06	31.36
Charging mode with client (less than 50 % battery status)									
0.136	51.70	Average	H	20.03	0.07	71.80	-8.20	24.93	33.13
Charging mode with client (100 % battery status)									
0.145	51.60	Average	H	20.03	0.07	71.70	-8.30	24.38	32.68

Note:
1. According to §15.31 (f)(2) 300 m Result(dBμV/m) = 3 m Result(dBμV/m) – 40log(300/3) (dBμV/m)
2. According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9 – 90 ㎑, 110 – 490 ㎑ and above 1 ㎓ in these three bands on measurements employing an average detector.
3. The limit above was calculated based on table of §15.209 (a).

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3. Spurious Emission

3.1. Test Setup

Same as section 2.1 of this report

3.2. Limit

Same as section 2.2 of this report

3.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

3.3.1. Test Procedures for emission from 9 ㎑ to 30 ㎒

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 Detect Function and Specified Bandwidth with Maximum Hold Mode.

3.3.2. Test Procedures for emission from 30 ㎒ to 1 000 ㎒

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. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈ margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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3.4. Test Result

Ambient temperature : (24 ± 1) ℃
Relative humidity : 47 % R.H.

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

A. Charging mode with resistive load (145 ㎃ status)

-Below 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m	Limit (dBμV/m)	Margin (dB)
0.094	34.30	Q.P.	H	20.04	0.07	54.41	-25.59	28.14	53.73
0.424	43.70	Average	H	20.08	0.10	63.88	-16.12	15.06	31.18

-Above 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m) at 3 m	Limit (dBμV/m)	Margin (dB)
45.360	41.03	Peak	H	14.75	-26.79	28.99	40.00	11.01
49.210	39.20	Peak	H	14.58	-26.73	27.05	40.00	12.95
Above 50.000	Not detected	-	-	-	-	-	-	-

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B. Charging mode with resistive load (350 ㎃ status)

-Below 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m	Limit (dBμV/m)	Margin (dB)
0.025	33.00	Average	H	20.31	0.05	53.36	-26.64	39.65	66.29
0.432	43.80	Average	H	20.09	0.10	63.99	-16.01	14.89	30.90

-Above 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m) at 3 m	Limit (dBμV/m)	Margin (dB)
39.650	35.33	Peak	H	14.06	-26.87	22.52	40.00	17.48
52.130	40.11	Peak	V	15.56	-26.70	28.97	40.00	11.03
Above 60.000	Not detected	-	-	-	-	-	-	-

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C. Charging mode with resistive load (645 ㎃ status)

-Below 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m	Limit (dBμV/m)	Margin (dB)
0.094	34.50	Q.P.	H	20.04	0.07	54.61	-25.39	28.14	53.53
0.398	44.00	Average	H	20.07	0.10	64.17	-15.83	15.61	31.44

-Above 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m) at 3 m	Limit (dBμV/m)	Margin (dB)
48.020	42.03	Peak	H	14.63	-26.75	29.91	40.00	10.09
46.310	38.15	Peak	H	14.71	-26.78	26.08	40.00	13.92
Above 50.000	Not detected	-	-	-	-	-	-	-

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D. Charging mode with client device (less than 1 % battery status)

-Below 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m	Limit (dBμV/m)	Margin (dB)
0.094	34.20	Q.P.	H	20.04	0.07	54.31	-25.69	28.14	53.83
0.410	28.80	Average	H	20.08	0.10	48.98	-31.02	15.35	46.37

-Above 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m) at 3 m	Limit (dBμV/m)	Margin (dB)
53.230	38.54	Peak	V	15.45	-26.68	27.31	40.00	12.69
62.350	36.56	Peak	V	13.67	-26.59	23.64	40.00	16.36
Above 70.000	Not detected	-	-	-	-	-	-	-

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E. Charging mode with client device (less than 50 % battery status)

-Below 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m	Limit (dBμV/m)	Margin (dB)
0.094	34.30	Q.P.	H	20.04	0.07	54.41	-25.59	28.14	53.73
0.407	29.90	Average	H	20.07	0.10	50.07	-29.93	15.41	45.34

-Above 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (㎒)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m) at 3 m	Limit (dBμV/m)	Margin (dB)
55.380	33.25	Peak	H	13.66	-26.67	20.24	40.00	19.76
59.200	40.74	Peak	V	14.81	-26.62	28.93	40.00	11.07
Above 60.00	Not detected	-	-	-	-	-	-	-

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F. Charging mode with client device (100 % battery status)

-Below 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m	Limit (dB㎶/m)	Margin (dB)
0.025	33.00	Average	H	20.31	0.05	53.36	-26.64	39.65	66.29
0.423	28.30	Average	H	20.08	0.10	48.48	-31.52	15.08	46.60

-Above 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m) at 3 m	Limit (dB㎶/m)	Margin (dB)
41.200	44.21	Peak	H	14.27	-26.80	31.68	40.00	8.32
46.520	39.25	Peak	H	14.70	-26.80	27.15	40.00	12.85
Above 50.000	Not detected	-	-	-	-	-	-	-

Note:

1. According to §15.31 (f)(2) 300 m Result(dB㎶/m) = 3 m Result(dB㎶/m) – 40log(300/3) (dB㎶/m)
2. 30 m Result(dB㎶/m) = 3 m Result(dB㎶/m) – 40log(30/3) (dB㎶/m)
3. According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 ㎒ were calculated as below.

- 9 ㎑ to 490 ㎑ = 2 400 / F (㎑) at 300 m
- 490 ㎑ to 1 705 ㎑ = 24 000 / F (㎑) at 30 m

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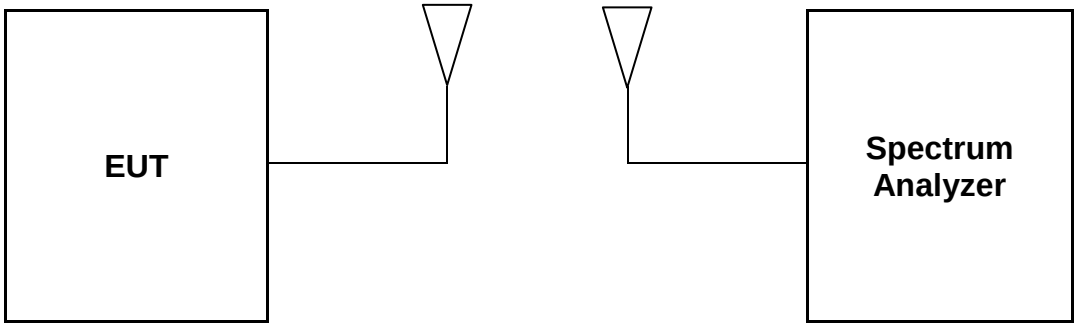
4. Occupied Bandwidth & 20 dB Bandwidth

4.1. Test Setup



4.2. Limit

None; for reporting purposed only

4.3. Test Procedure

20 dB Bandwidth

a. Span = approximately 2 to 3 times the 20 dB bandwidth, RBW = greater than 1 % of the 20 dB bandwidth, VBW = RBW, 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.

Occupied Bandwidth

a. Set the spectrum analyzer as SPAN = 2 or 3 times necessary bandwidth, RBW = approximately 1 % of the SPAN, VBW is set to 3 times RBW, Detector = sampling, Trace mode = max hold.
b. Measure lowest and highest frequencies are placed in a running sum until 0.5 % and 99.5 % of the total is reached.
c. Record the SPAN between the lowest and the highest frequencies for the 99 % occupied bandwidth.

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4.4. Test Result

Ambient temperature : (24 ± 1) ℃
Relative humidity : 47 % R.H.

EUT status	Occupied Bandwidth (㎑)	20 ㏈ Bandwidth (㎑)	Limit
With client device (100 % of battery)	0.280	0.295	Reporting proposed only
with resistive load (645 ㎃)	0.280	0.300	

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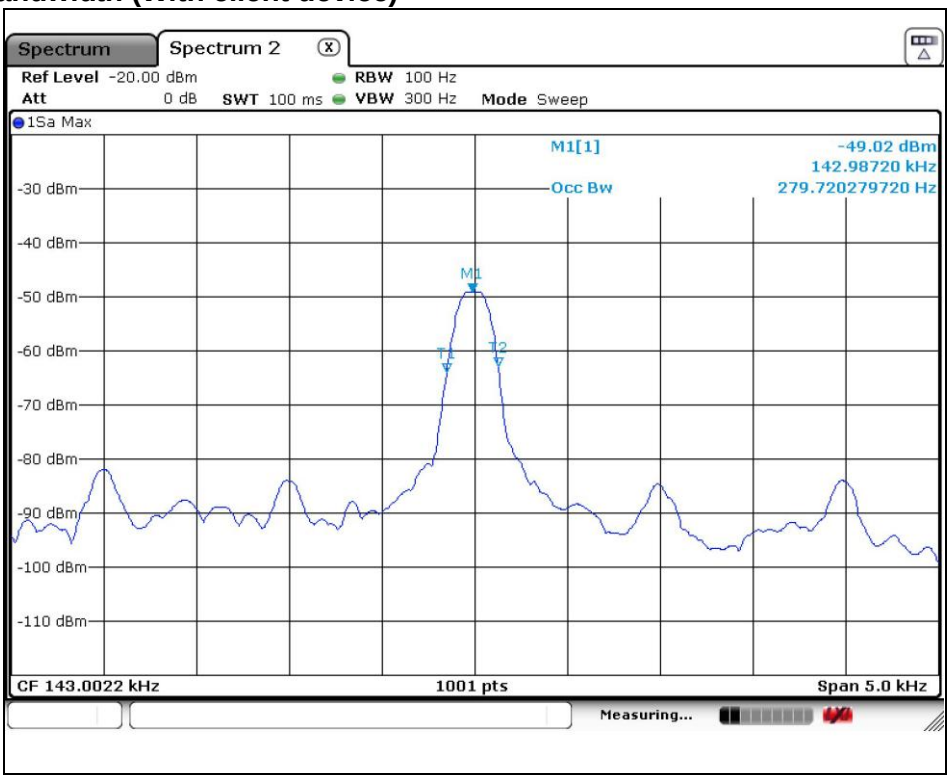
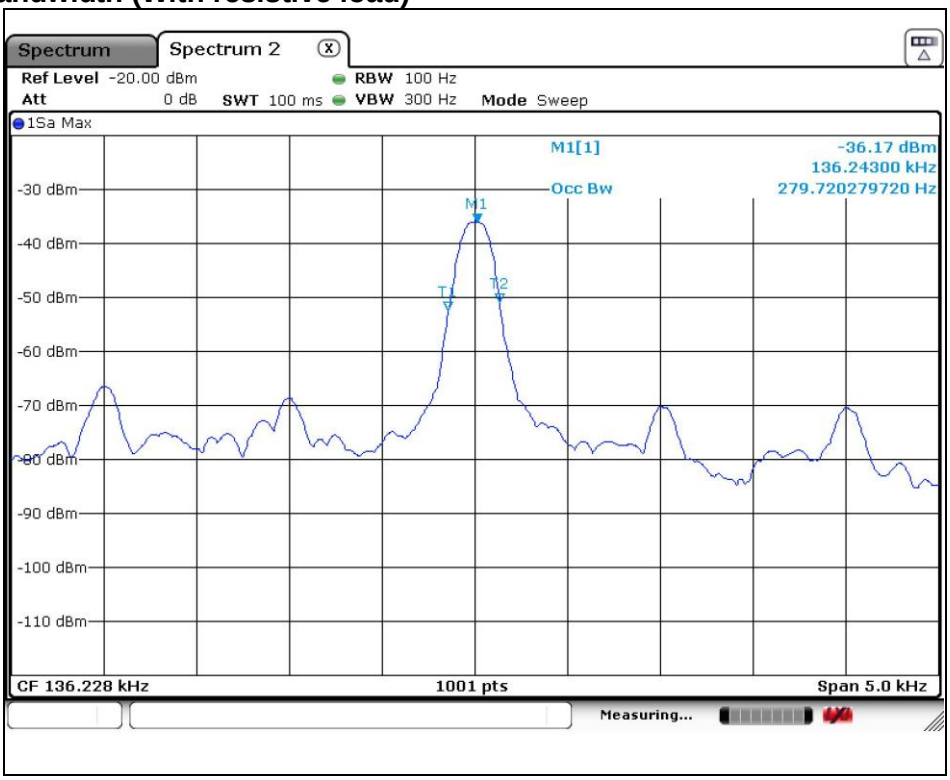
Occupied Bandwidth (With client device)



Occupied Bandwidth (With resistive load)



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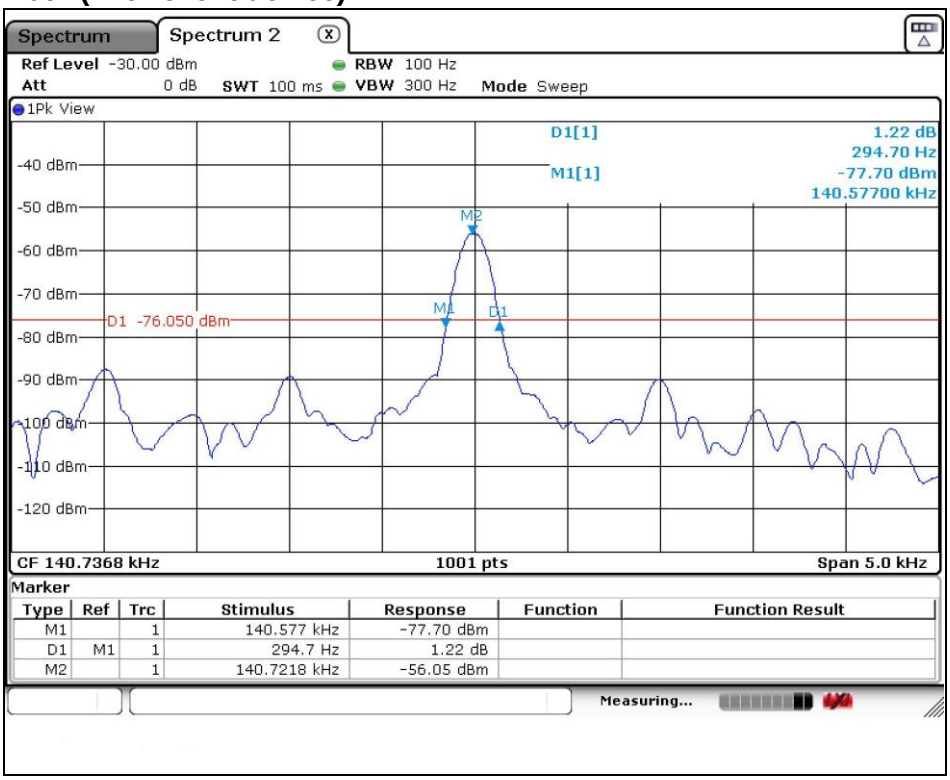
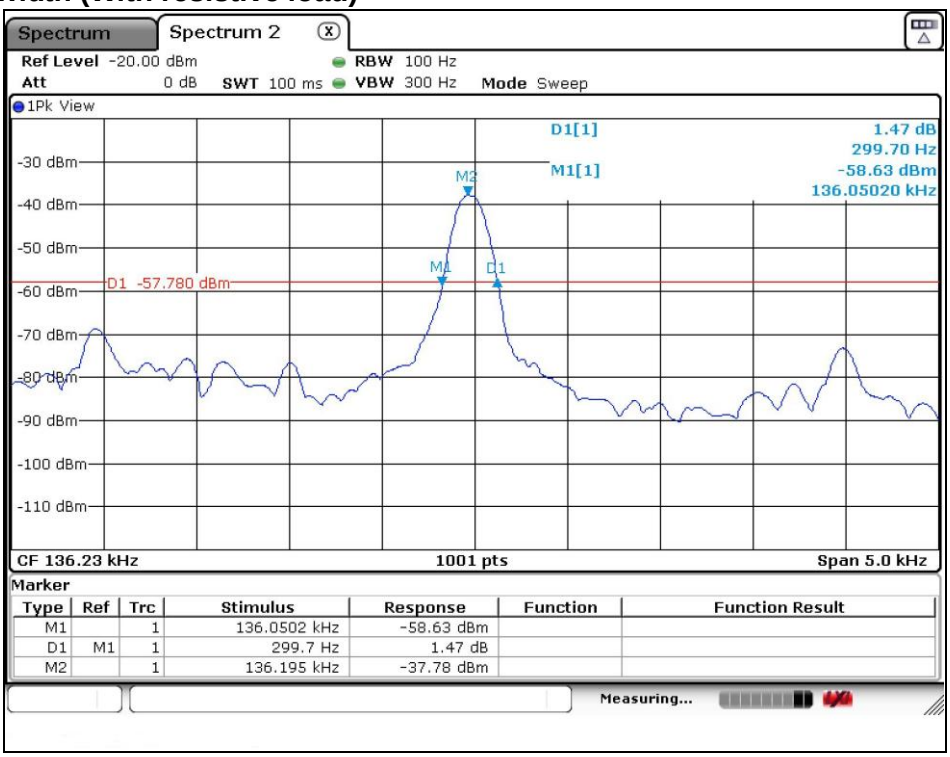
20 dB Bandwidth (With client device)



20 dB Bandwidth (With resistive load)



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