TEST REPORT

of

FCC Part 15 Subpart C §15.209

FCC ID : OSLOKA-210W

Equipment Under Test	:	UNIT ASSY - WIRELESS CHARGING
Model Name	:	OKA-210W
Applicant	:	Omron Automotive Electronics Korea Co., Ltd.
Manufacturer	:	Omron Automotive Electronics Korea Co., Ltd.
Date of Receipt	:	2017.11.27
Date of Test(s)	:	2018.01.24 ~ 2018.02.05
Date of Issue	:	2018.02.27

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

Tested By: **Date:** **2018.02.27**

Nancy Park

Technical Manager: **Date:** **2018.02.27**

Hyunchae You

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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, 15807
- Designation number: KR0150

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.

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1.2. Details of applicant

Applicant : Omron Automotive Electronics Korea Co., Ltd.
Address : 790-12, Bogaewonsam-ro, Bogae-myeon, Anseong-si, Gyeonggi-do, Korea
Contact Person : Nam, Sang-Il
Phone No. : +82 2 850 5789

1.3. Details of manufacturer

Company : Same as applicant
Address : Same as applicant

1.4. Description of EUT

Kind of Product	UNIT ASSY - WIRELESS CHARGING
Model Name	OKA-210W
Power Supply	DC 12.0 V
Frequency Range	111 ㎑
Antenna Type	Inductive loop coil antenna

1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Spectrum Analyzer	R&S	FSV30	100768	Mar. 20, 2017	Annual	Mar. 20, 2018
Signal Generator	R&S	SMBV100A	255834	Jun. 15, 2017	Annual	Jun. 15, 2018
DC Power Supply	R&S	HMP2020	019922876	Apr. 26, 2017	Annual	Apr. 26, 2018
Test Receiver	R&S	ESU26	100109	Feb. 17, 2017	Annual	Feb. 17, 2018
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 23, 2017	Biennial	Aug. 23, 2019
Turn Table	Innco systems GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/38330516/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	Jan. 12, 2018	Semi-annual	Jul. 12, 2018
Coaxial Cable	SUCOFLEX	104 (10 m)	MY3145814	Jan. 12, 2018	Semi-annual	Jul. 12, 2018

▶ Support equipment

Description	Manufacturer	Model	FCC ID
Samsung Mobile Phone	Samsung Electronics Co., Ltd.	SM-G900L	A3LSMG900S

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)

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	Description
Charging Mode with client device (Model: SM-G900L, FCC ID: A3LSMG900S)	1 % of battery
	50 % of battery
	99 % of battery

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		
Section in FCC Part 15 Subpart C	**Test Item**	**Result**
15.209	Radiated emission, Spurious Emission and Field Strength of Fundamental	Complied
2.1049	20 dB Bandwidth	Complied

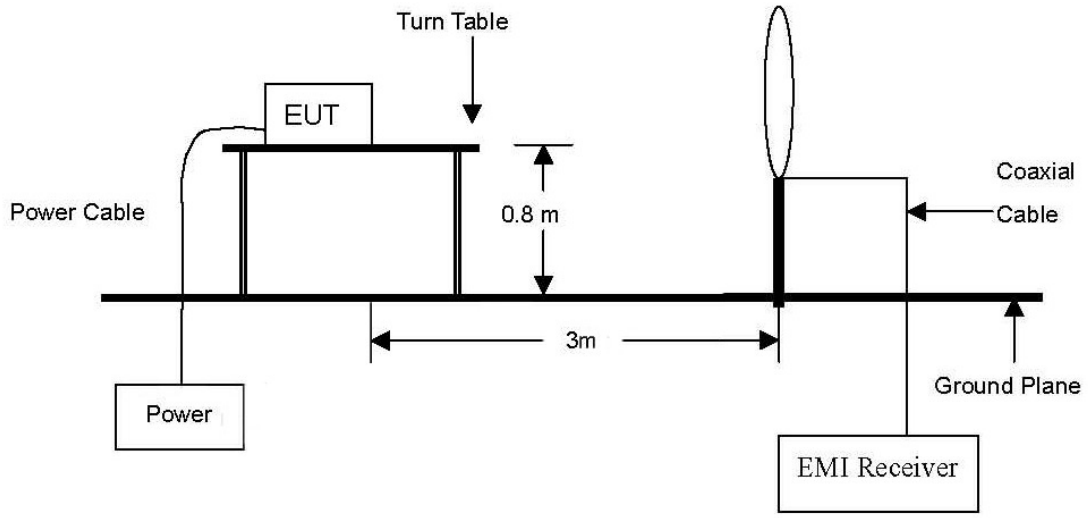
1.9. Test Report Revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL012363	2018.02.12	Initial
1	F690501/RF-RTL012363-1	2018.02.27	Modified calibrate date of coaxial cable

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 ㎑ to 30 ㎒.



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	2 400/F(㎑)	300
0.490-1.705	24 000/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

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 ㎑ 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 and Average Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note;

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 meter open field test 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 D01 Radiated Test Site v01.

2.4. Field Strength of Fundamental Test Result

Ambient temperature : (23 ± 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 one orthogonal EUT position (X-axis).

Test Condition: Ant. 1

Radiated Emissions			Ant.	Correction Factors		Total		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) at 300 m	Margin (dB)
Charging mode with client (1 % battery status)									
0.111	60.50	Average	H	19.69	0.05	80.24	0.24	26.70	26.46
Charging mode with client (50 % battery status)									
0.111	61.00	Average	H	19.69	0.05	80.74	0.74	26.70	25.96
Charging mode with client (99 % battery status)									
0.111	60.80	Average	H	19.69	0.05	80.54	0.54	26.70	26.16

Test Condition: Ant. 2

Radiated Emissions			Ant.	Correction Factors		Total		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) at 300 m	Margin (dB)
Charging mode with client (1 % battery status)									
0.111	61.30	Average	H	19.69	0.05	81.04	1.04	26.70	25.66
Charging mode with client (50 % battery status)									
0.111	61.15	Average	H	19.69	0.05	80.89	0.89	26.70	25.81
Charging mode with client (99 % battery status)									
0.111	60.50	Average	H	19.69	0.05	80.24	0.24	26.70	26.46

Test Condition: Ant. 3

Radiated Emissions			Ant.	Correction Factors		Total		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) at 300 m	Margin (dB)
Charging mode with client (1 % battery status)									
0.111	63.60	Average	H	19.69	0.05	83.34	3.34	26.70	23.36
Charging mode with client (50 % battery status)									
0.111	63.50	Average	H	19.69	0.05	83.24	3.24	26.70	23.46
Charging mode with client (99 % battery status)									
0.111	63.10	Average	H	19.69	0.05	82.84	2.84	26.70	23.86

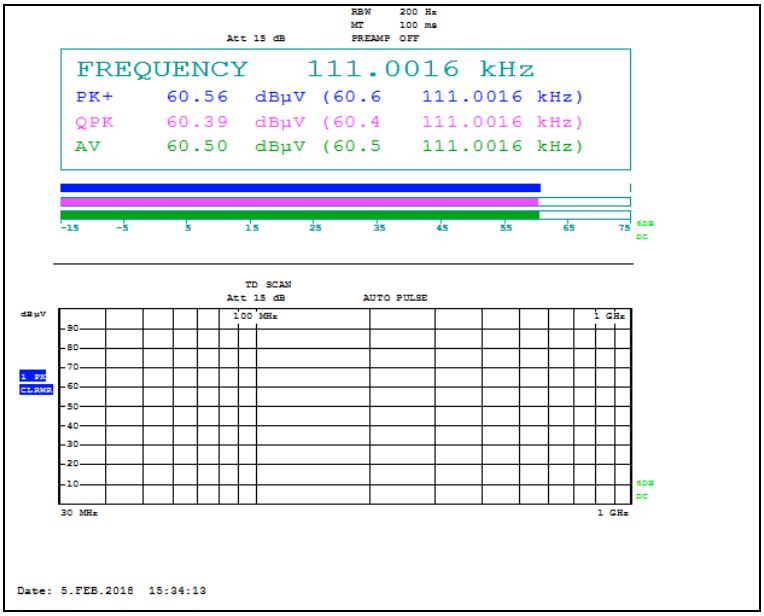
Remark;

1. According to §15.31 (f)(2) 300 m Result (dB㎶/m) = 3 m Result (dB㎶/m) - 40log(300/3) (dB㎶/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).

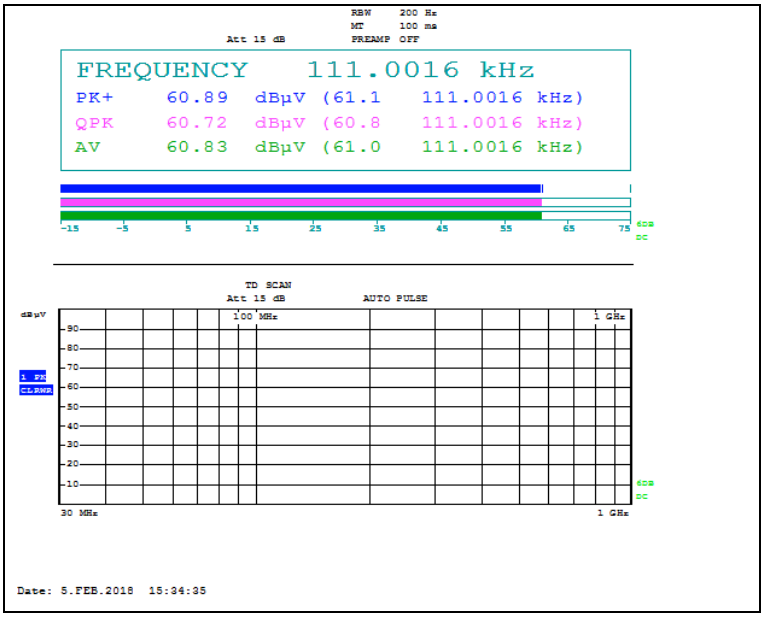
Test plots

Test Condition: Ant. 1

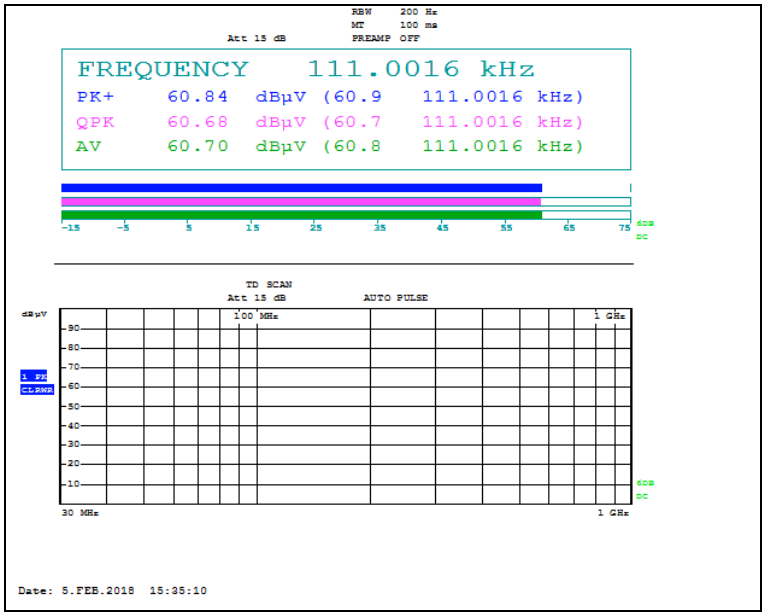
Charging mode (1 % battery status of client device)



Charging mode (50 % battery status of client device)

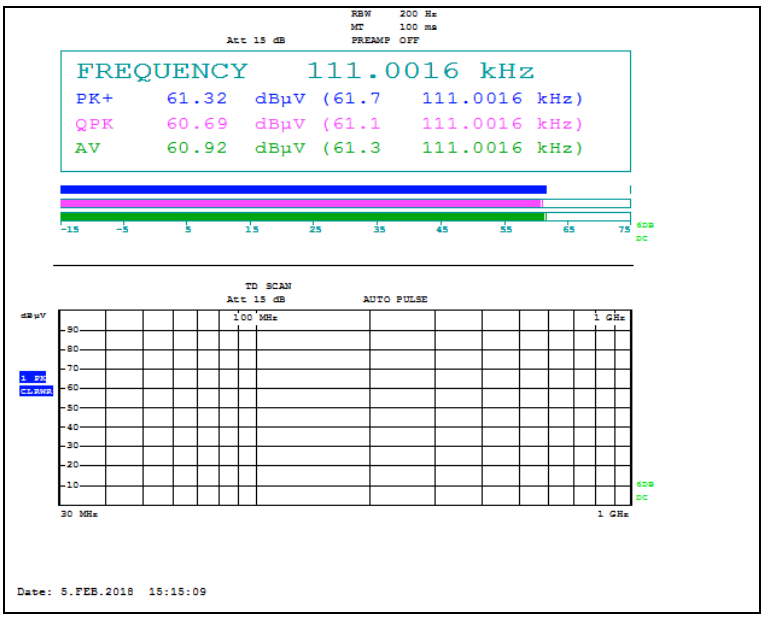


Charging mode (99 % battery status of client device)

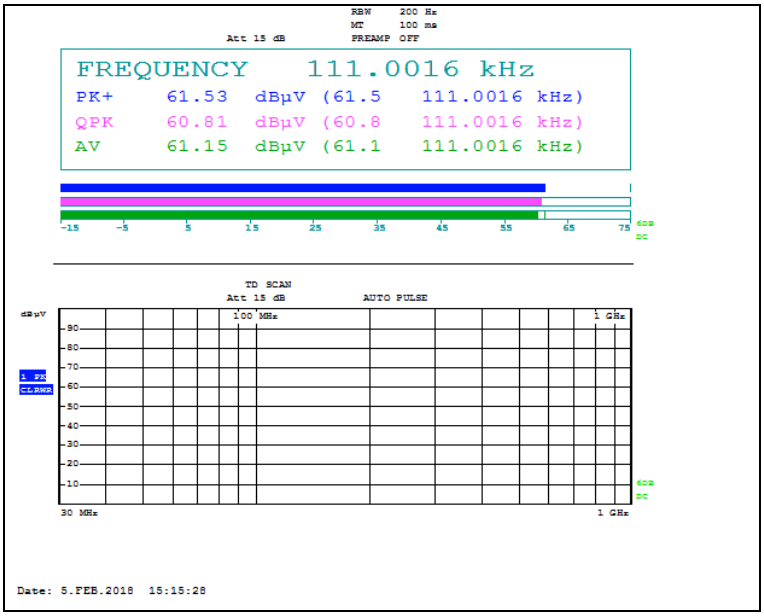


Test Condition: Ant. 2

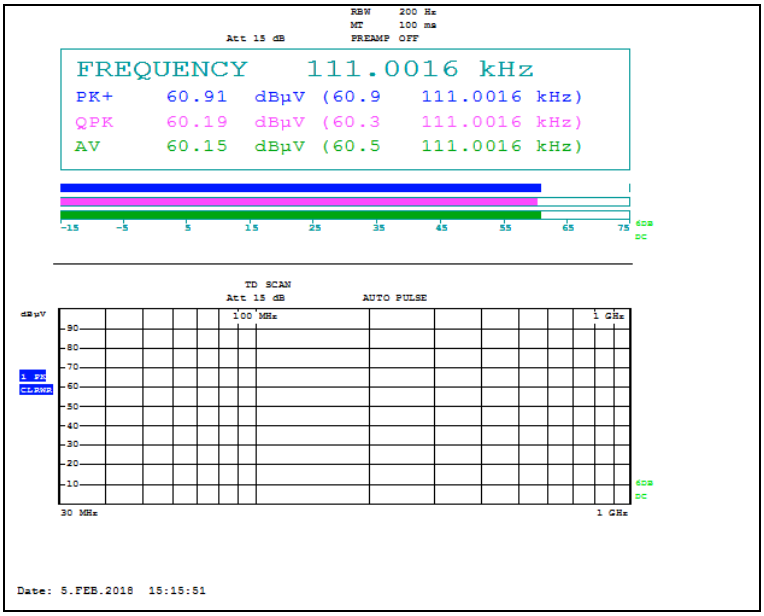
Charging mode (1 % battery status of client device)



Charging mode (50 % battery status of client device)

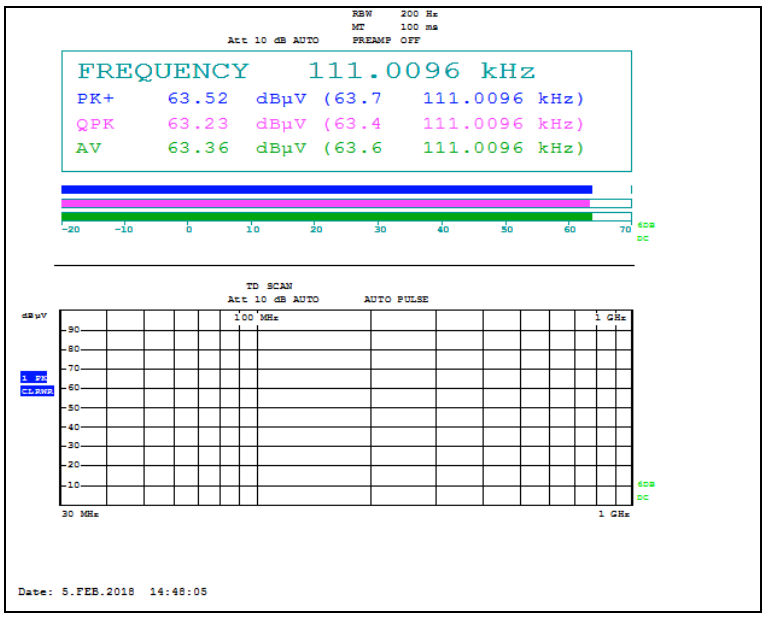


Charging mode (99 % battery status of client device)

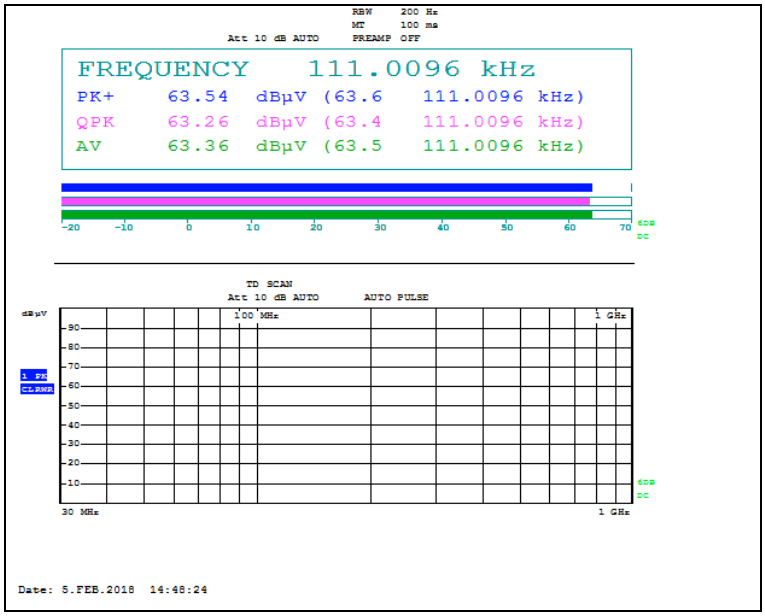


Test Condition: Ant. 3

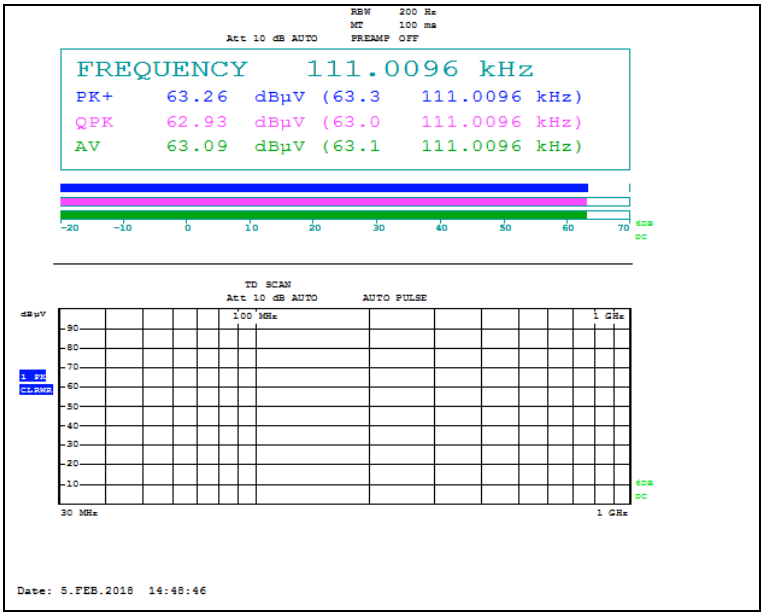
Charging mode (1 % battery status of client device)



Charging mode (50 % battery status of client device)



Charging mode (99 % battery status of client device)



2.5. Spurious Emission Test Result

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

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

Test Condition: Ant. 1

Charging mode with client device (1 % battery status of client device)

-Spurious

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Limit (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.068	30.50	Average	H	19.75	0.02	50.27	-29.73	30.95	60.68
0.138	21.60	Average	H	19.68	0.06	41.34	-38.66	24.81	63.47
0.331	32.00	Average	H	19.60	0.10	51.70	-28.30	17.21	45.51
2.493	10.20	Quasi Peak	H	19.77	0.13	30.10	-9.90	19.67	29.57
Above 2.500	Not detected	-	-	-	-	-	-	-	-

Charging mode with client device (50 % battery status of client device)

-Spurious

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Limit (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.069	33.40	Average	H	19.74	0.02	53.16	-26.84	30.83	57.67
0.104	17.30	Quasi Peak	H	19.70	0.03	37.03	-2.97	47.26	50.23
0.136	21.50	Average	H	19.68	0.06	41.24	-38.76	24.93	63.69
0.331	32.40	Average	H	19.60	0.10	52.10	-27.90	17.21	45.11
2.413	9.80	Quasi Peak	H	19.77	0.12	29.69	-10.31	19.95	30.26
Above 2.500	Not detected	-	-	-	-	-	-	-	-

Charging mode with client device (99 % battery status of client device)

-Spurious

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Actual (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.068	33.50	Average	H	19.75	0.02	53.27	-26.73	30.95	57.68
0.089	19.40	Average	H	19.72	0.03	39.15	-40.85	28.62	69.47
0.138	21.90	Average	H	19.68	0.06	41.64	-38.36	24.81	63.17
0.331	32.40	Average	H	19.60	0.10	52.10	-27.90	17.21	45.11
2.463	10.10	Quasi Peak	H	19.77	0.13	30.00	-10.00	19.77	29.77
Above 2.500	Not detected	-	-	-	-	-	-	-	-

Test Condition: Ant. 2

Charging mode with client device (1 % battery status of client device)

-Spurious

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Limit (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.069	32.60	Average	H	19.74	0.02	52.36	-27.64	30.83	58.47
0.136	21.10	Average	H	19.68	0.06	40.84	-39.16	24.93	64.09
0.329	35.00	Average	H	19.60	0.10	54.70	-25.30	17.26	42.56
1.230	8.20	Quasi Peak	H	19.71	0.10	28.01	-11.99	25.81	37.80
Above 1.300	Not detected	-	-	-	-	-	-	-	-

Charging mode with client device (50 % battery status of client device)

-Spurious

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Limit (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.069	32.20	Average	H	19.74	0.02	51.96	-28.04	30.83	58.87
0.136	21.10	Average	H	19.68	0.06	40.84	-39.16	24.93	64.09
0.330	36.60	Average	H	19.60	0.10	56.30	-23.70	17.23	40.93
2.493	10.00	Quasi Peak	H	19.77	0.13	29.90	-10.10	19.67	29.77
Above 2.500	Not detected	-	-	-	-	-	-	-	-

Charging mode with client device (99 % battery status of client device)

-Spurious

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Actual (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.069	32.80	Average	H	19.74	0.02	52.56	-27.44	30.83	58.27
0.084	16.60	Average	H	19.72	0.03	36.35	-43.65	29.12	72.77
0.136	22.40	Average	H	19.68	0.06	42.14	-37.86	24.93	62.79
0.330	36.92	Average	H	19.60	0.10	56.62	-23.38	17.23	40.61
2.431	9.60	Quasi Peak	H	19.77	0.13	29.50	-10.50	19.89	30.39
Above 2.500	Not detected	-	-	-	-	-	-	-	-

Test Condition: Ant. 3

Charging mode with client device (1 % battery status of client device)

-Spurious

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Limit (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.069	33.40	Average	H	19.74	0.02	53.16	-26.84	30.83	57.67
0.090	20.60	Average	H	19.71	0.03	40.34	-39.66	28.52	68.18
0.136	22.00	Average	H	19.68	0.06	41.74	-38.26	24.93	63.19
0.328	33.50	Average	H	19.60	0.10	53.20	-26.80	17.29	44.09
2.389	10.20	Quasi Peak	H	19.77	0.12	30.09	-9.91	20.04	29.95
Above 2.400	Not detected	-	-	-	-	-	-	-	-

Charging mode with client device (50 % battery status of client device)

-Spurious

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Limit (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.069	33.10	Average	H	19.74	0.02	52.86	-27.14	30.83	57.97
0.090	21.10	Average	H	19.71	0.03	40.84	-39.16	28.52	67.68
0.136	22.00	Average	H	19.68	0.06	41.74	-38.26	24.93	63.19
0.329	34.70	Average	H	19.60	0.10	54.40	-25.60	17.26	42.86
2.484	10.10	Quasi Peak	H	19.77	0.13	30.00	-10.00	19.70	29.70
Above 2.500	Not detected	-	-	-	-	-	-	-	-

Charging mode with client device (99 % battery status of client device)

-Spurious

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Actual (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.069	33.20	Average	H	19.74	0.02	52.96	-27.04	30.83	57.87
0.076	10.40	Average	H	19.73	0.02	30.15	-49.85	29.99	79.84
0.136	21.80	Average	H	19.68	0.06	41.54	-38.46	24.93	63.39
0.330	33.80	Average	H	19.60	0.10	53.50	-26.50	17.23	43.73
1.258	8.30	Quasi Peak	H	19.71	0.10	28.11	-11.89	25.61	37.50
2.424	9.80	Quasi Peak	H	19.77	0.12	29.69	-10.31	19.91	30.22
Above 2.500	Not detected	-	-	-	-	-	-	-	-

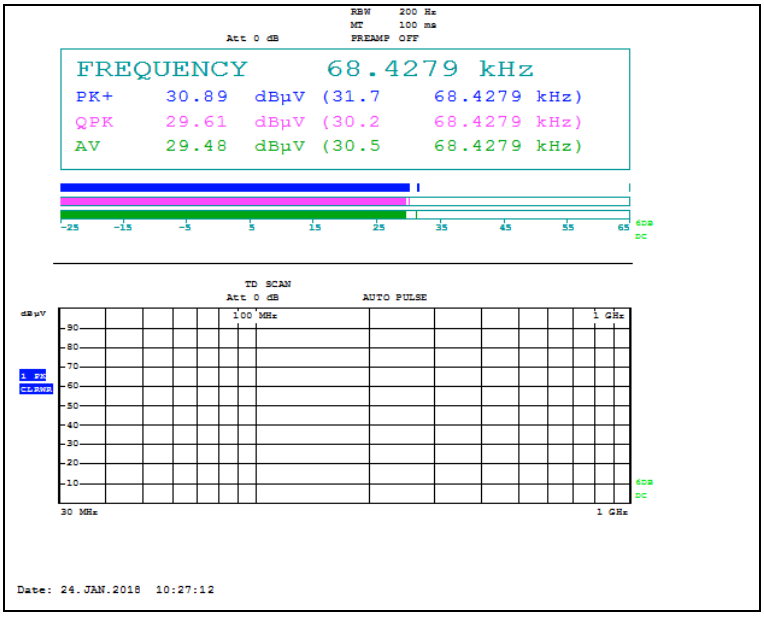
Remark;

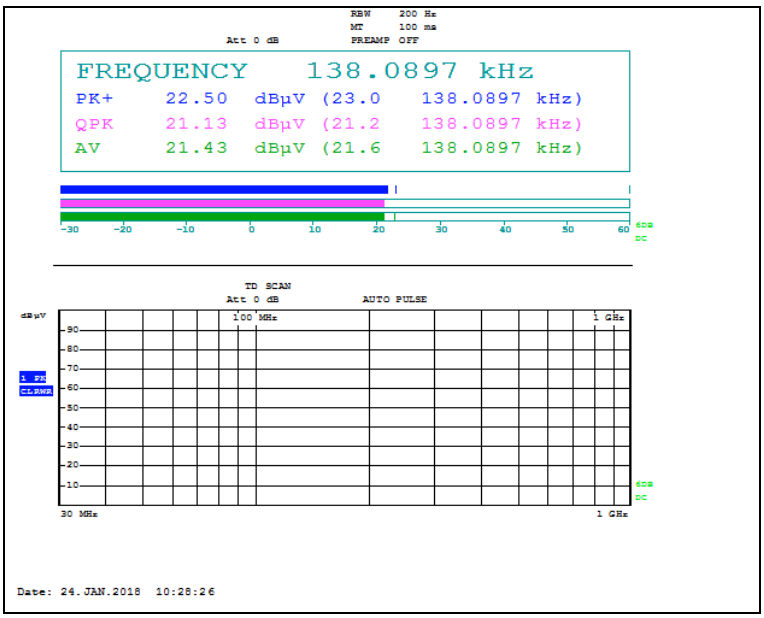
1. According to §15.31 (f)(2)
   - 300 m Result (dB㎶/m) = 3 m Result (dB㎶/m) - 40log(300/3) (dB㎶/m)
   - 30 m Result (dB㎶/m) = 3 m Result (dB㎶/m) - 40log(30/3) (dB㎶/m)
2. According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 ㎒ were calculated as below.
   - 9 ㎑ to 490 ㎑: 20log(2 400 / F (㎑)) at 300 m (dB㎶/m)
   - 490 ㎑ to 1.705 ㎒: 20log (24 000 / F (㎑)) at 30 m (dB㎶/m)
3. 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.

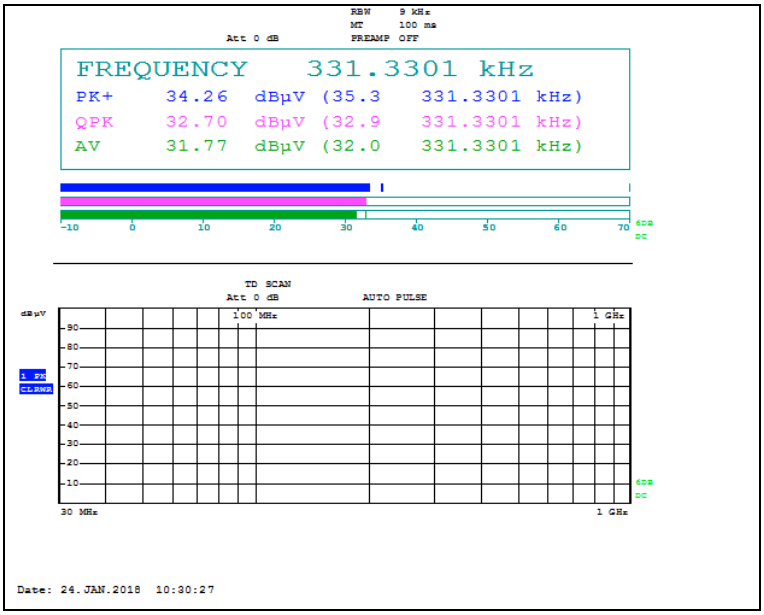
Test Condition: Ant. 1

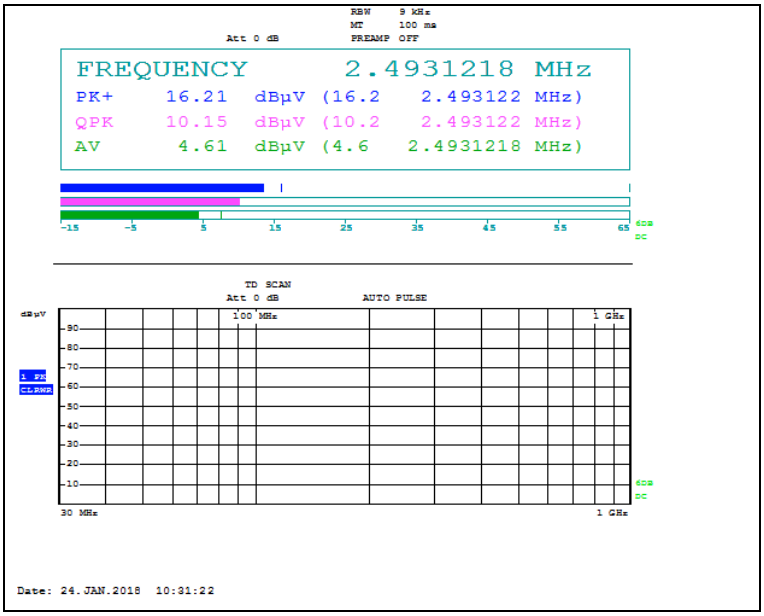
Test plots

Charging mode (1 % battery status of client device)

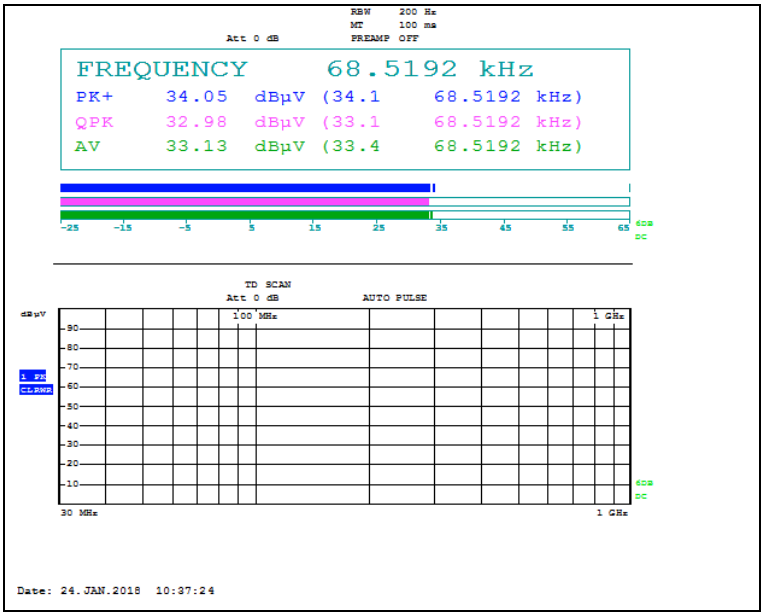


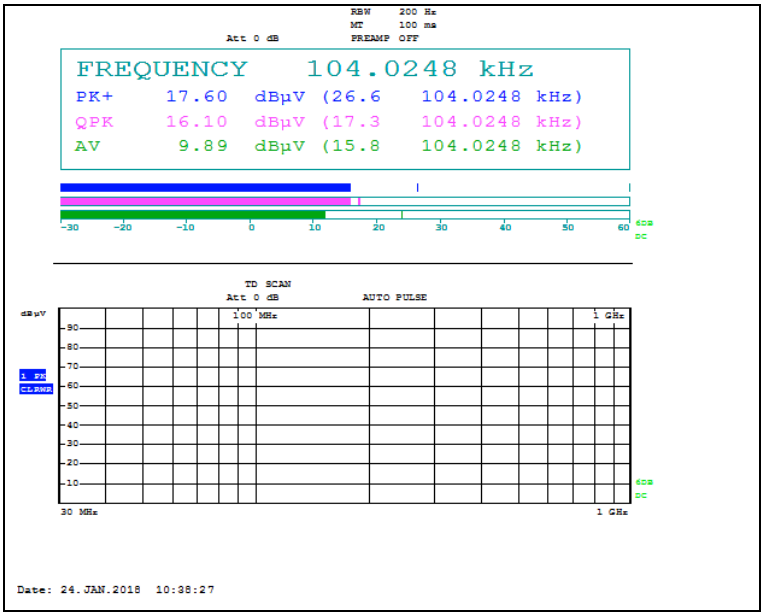


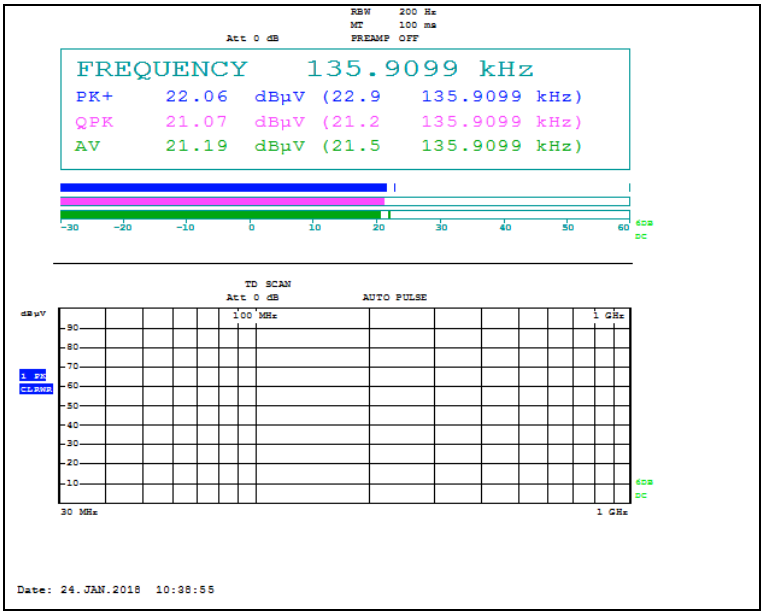


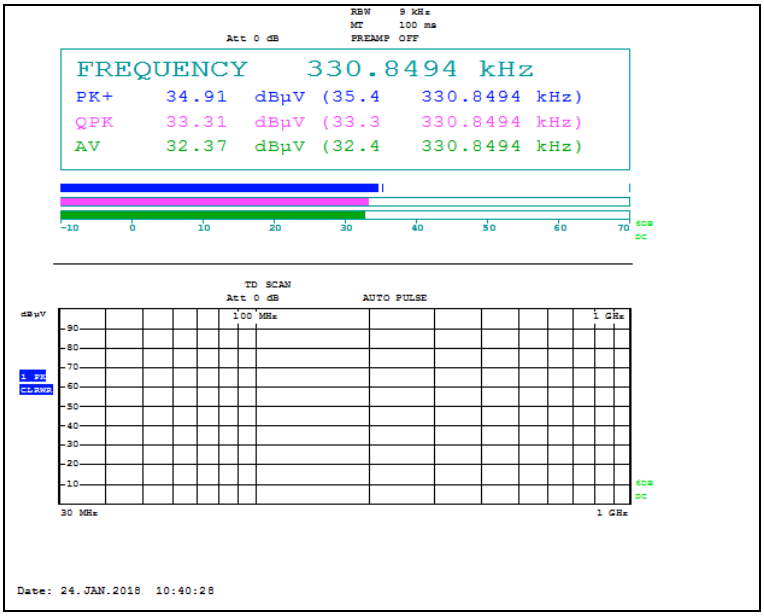


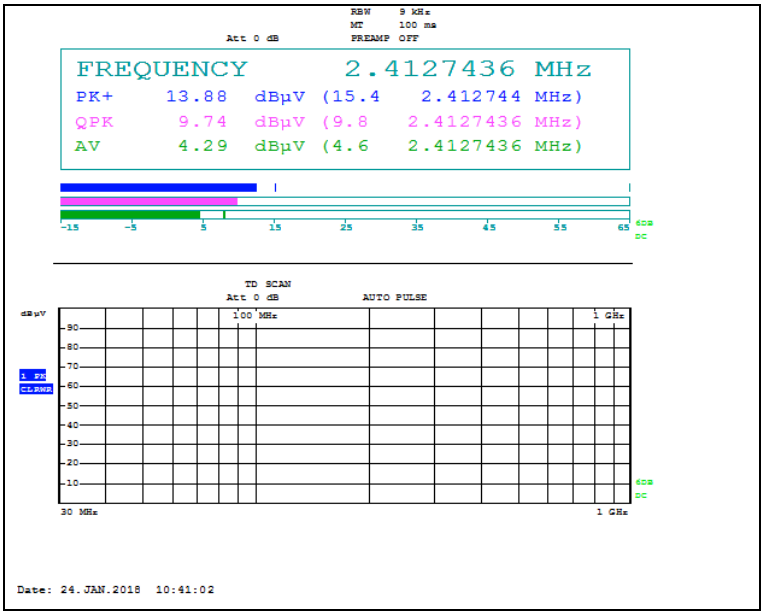
Charging mode (50 % battery status of client device)



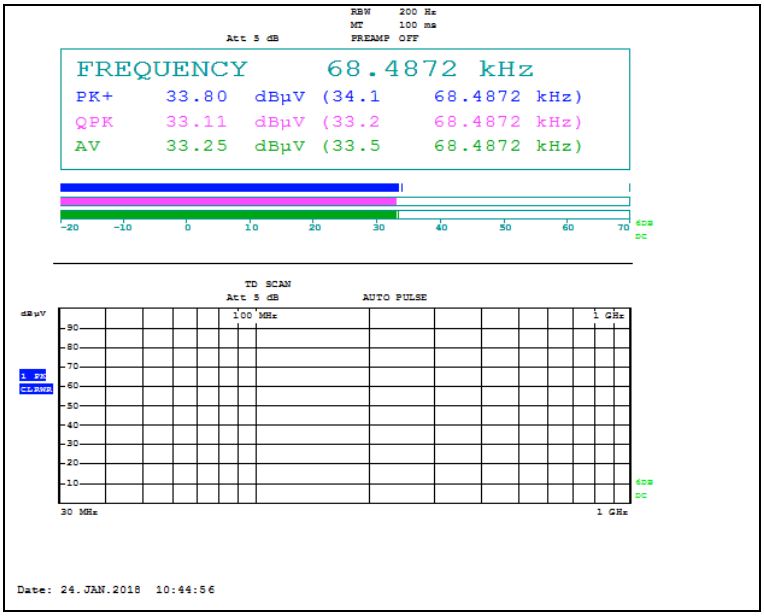


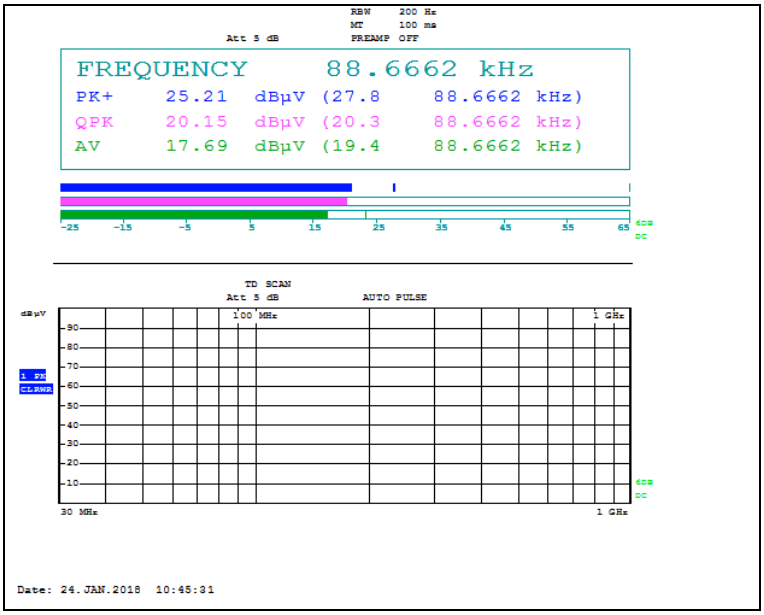


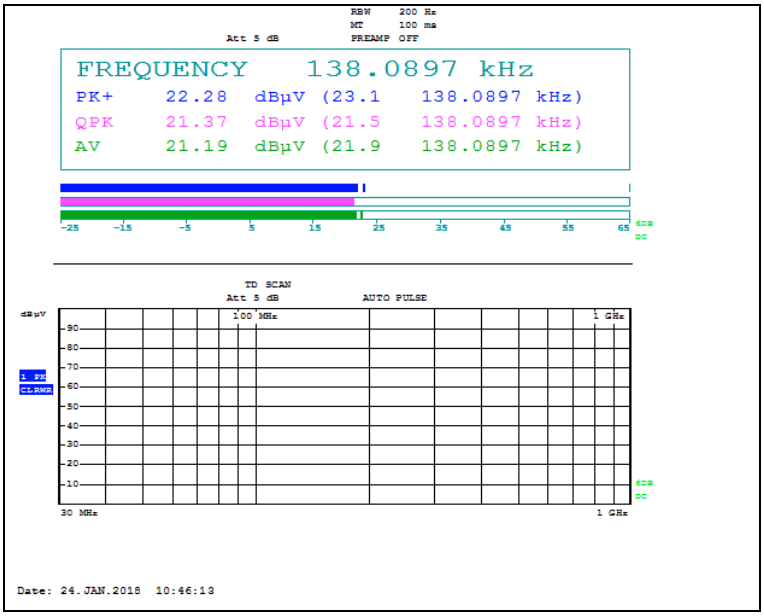


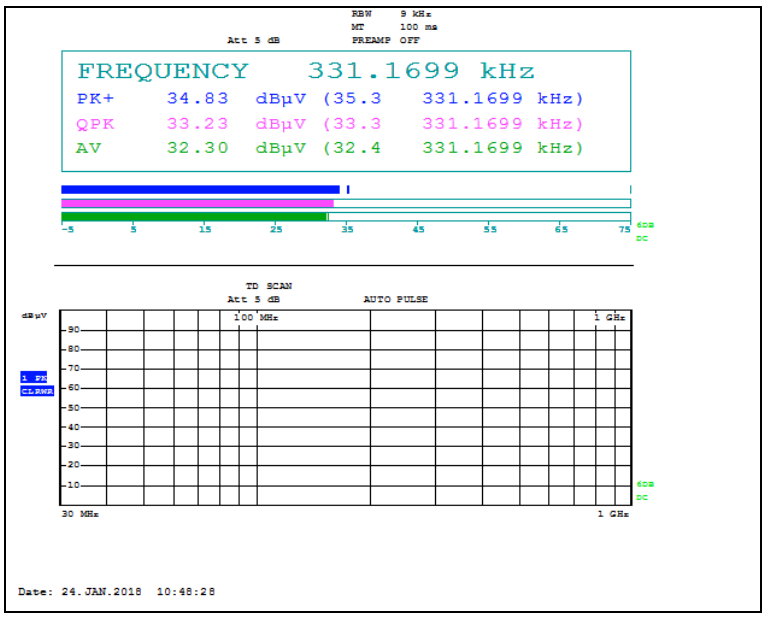


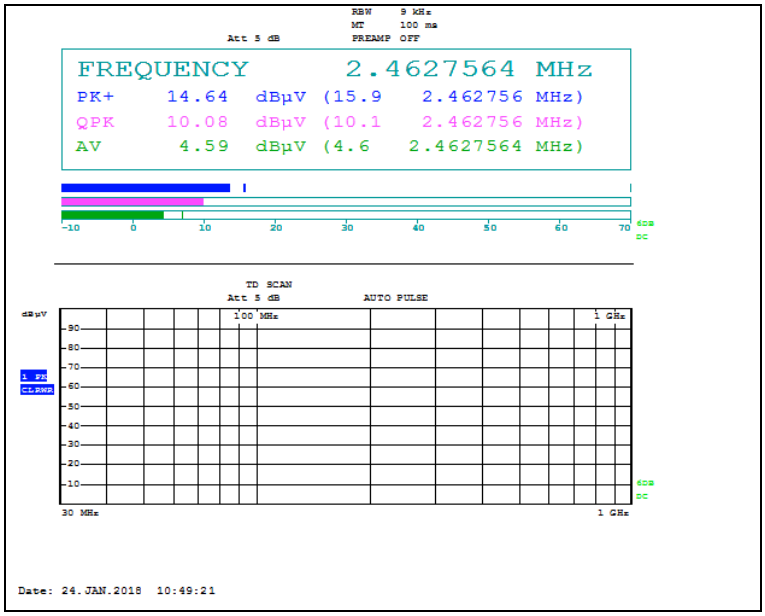
Charging mode (99 % battery status of client device)







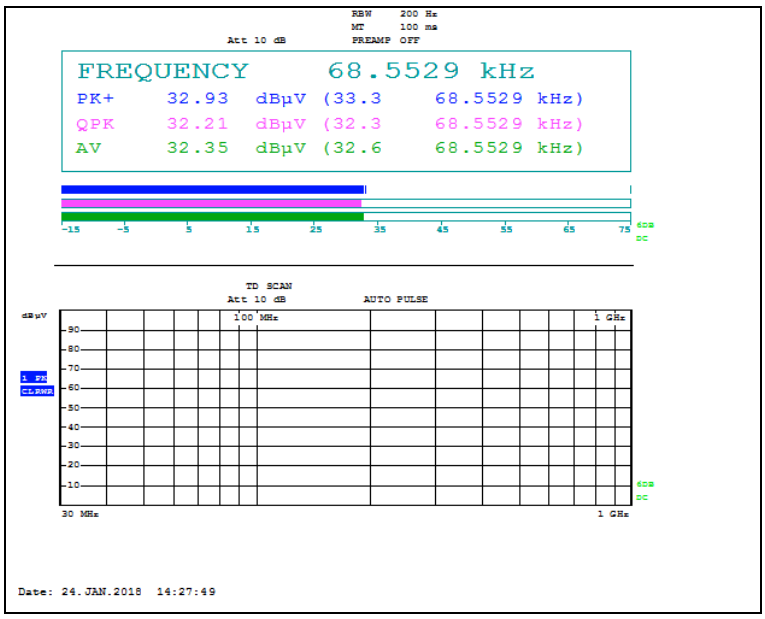


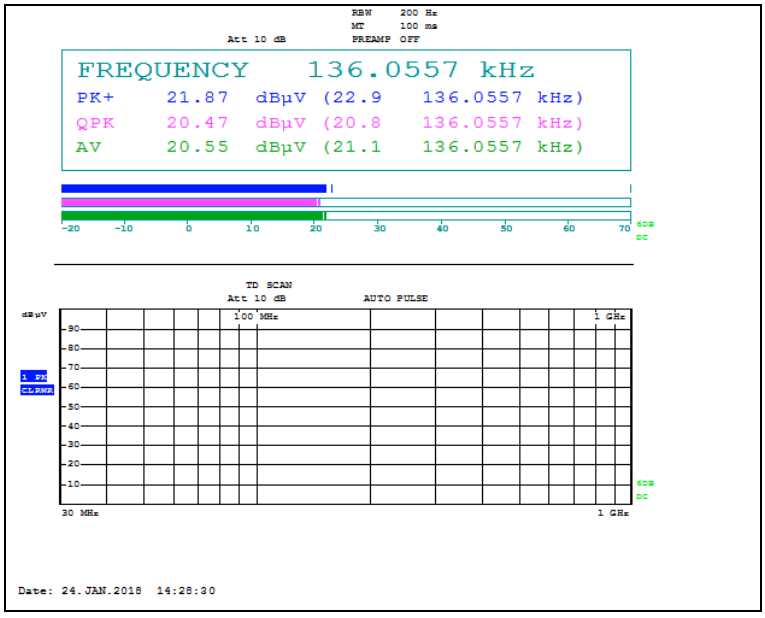


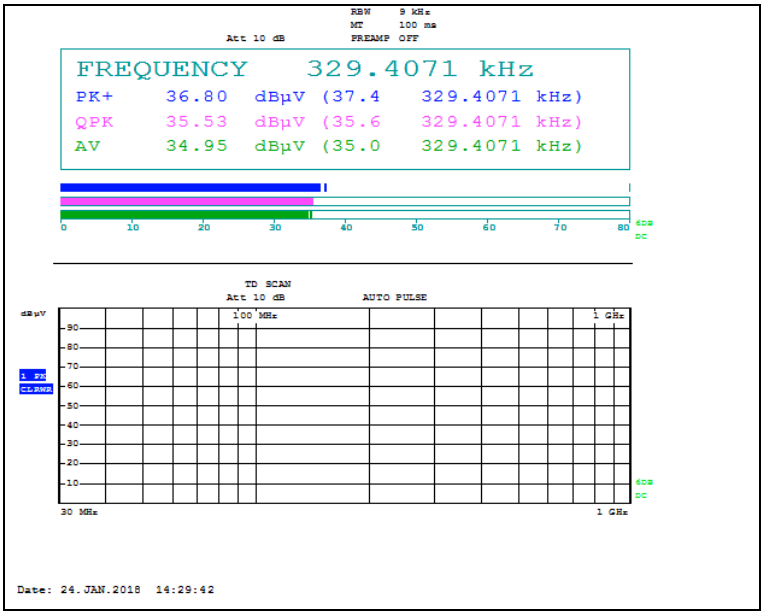
Test Condition: Ant. 2

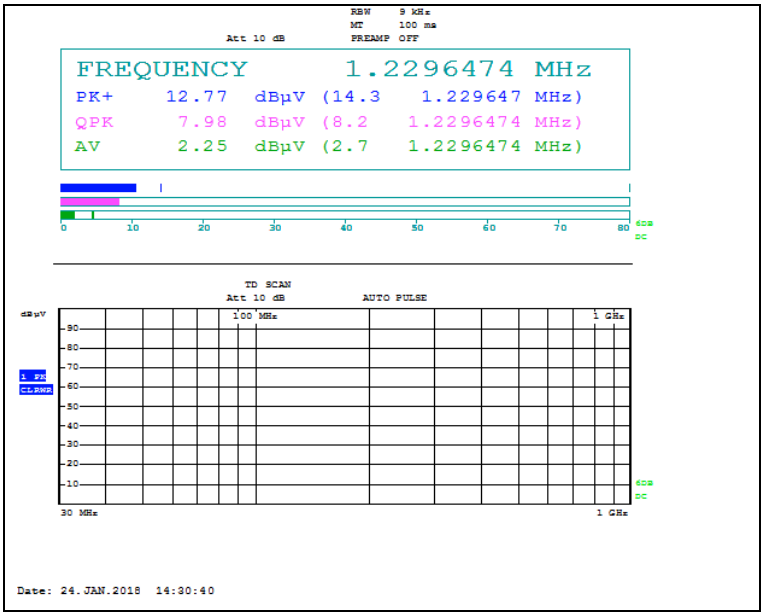
Test plots

Charging mode (1 % battery status of client device)

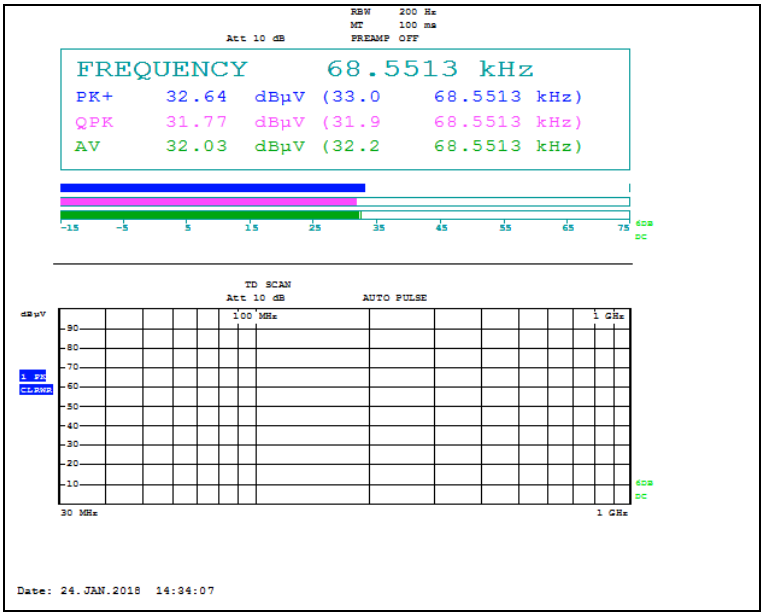


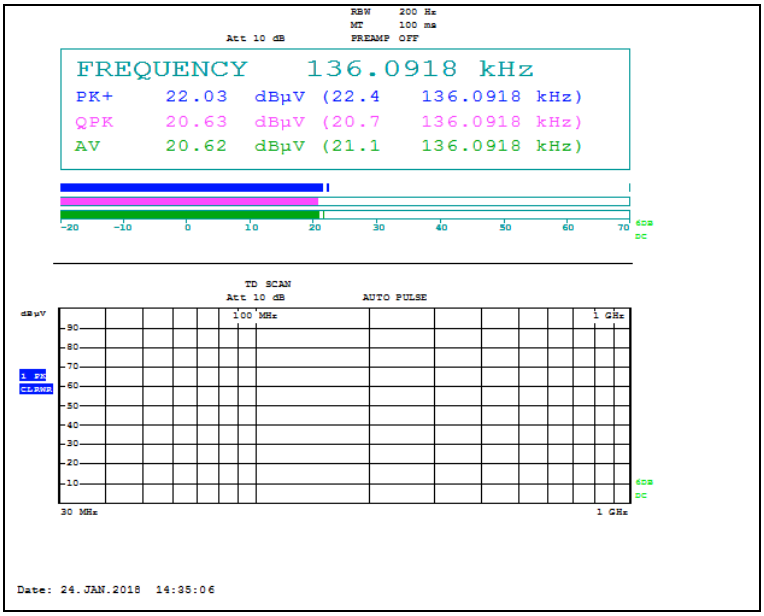


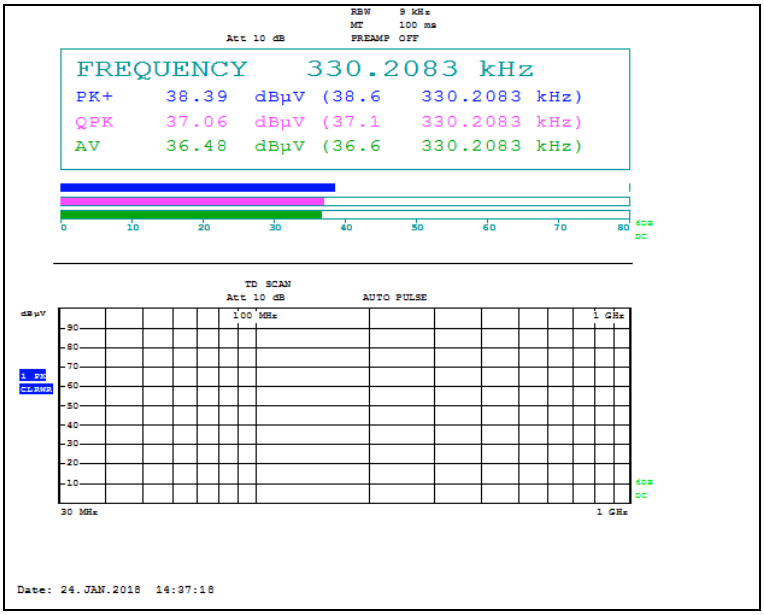


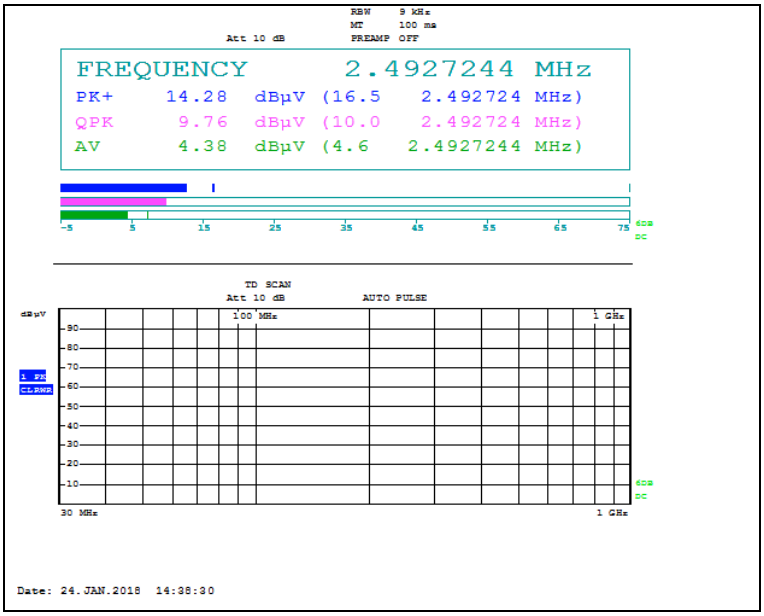


Charging mode (50 % battery status of client device)

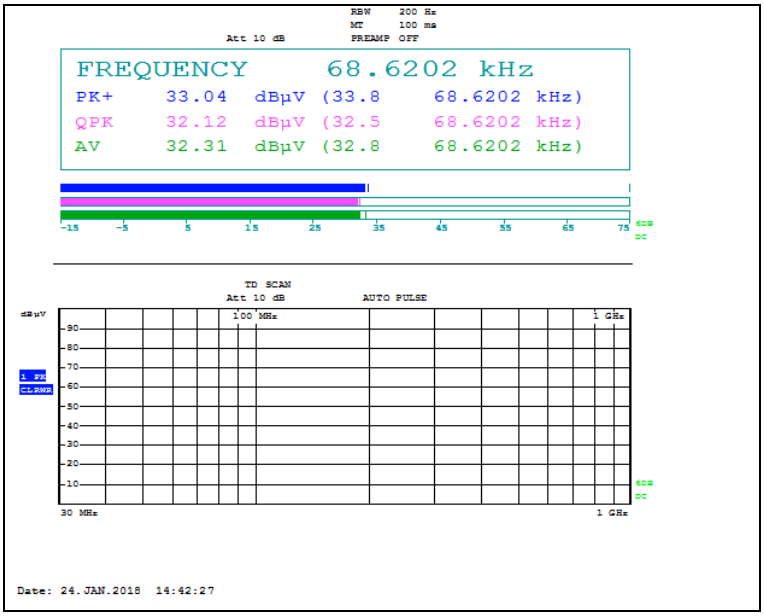


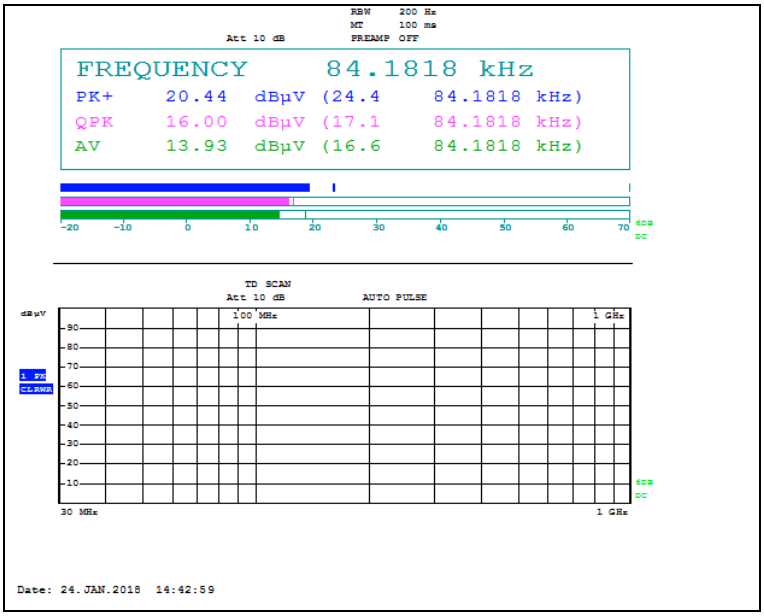


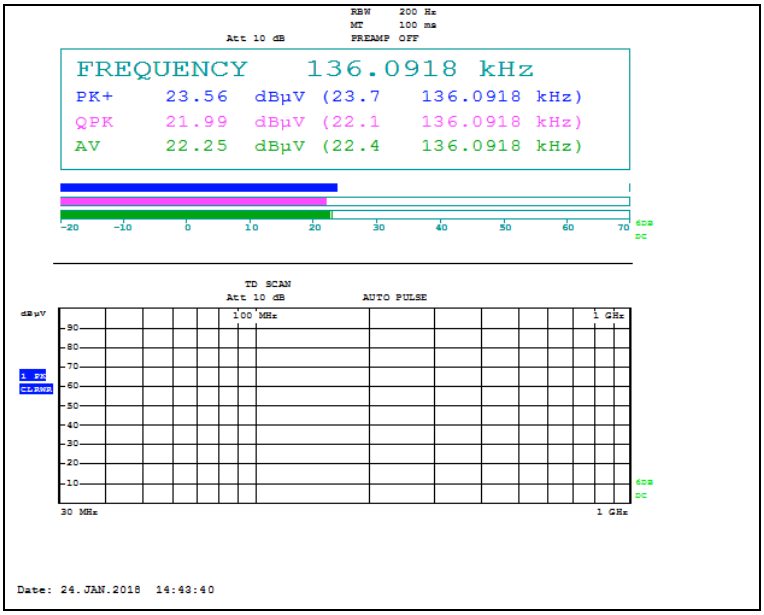


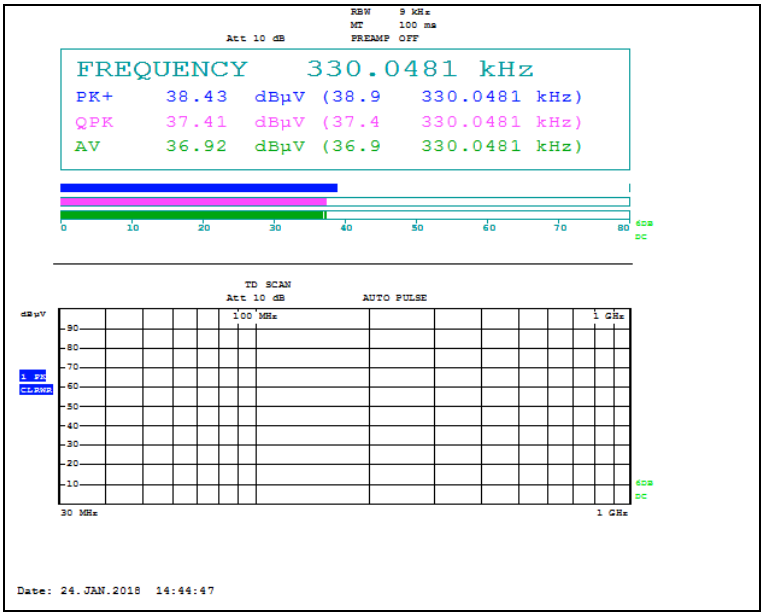


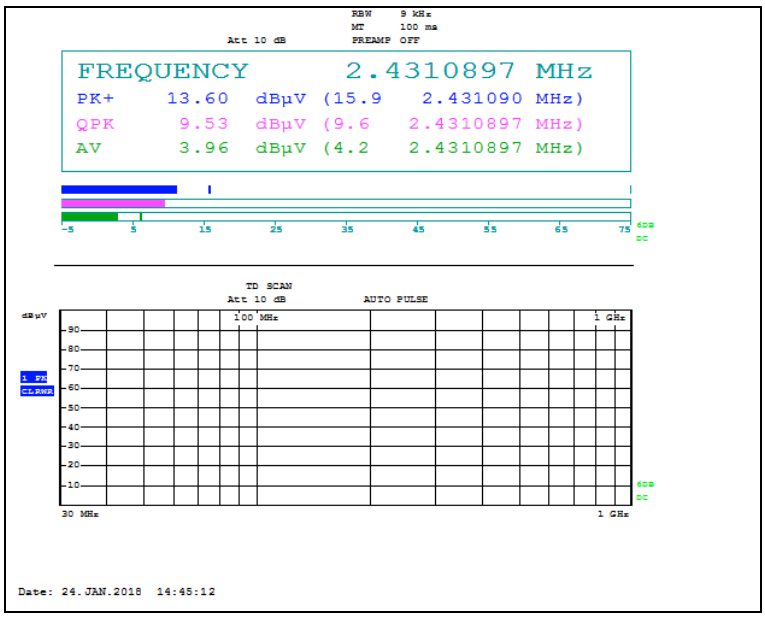
Charging mode (99 % battery status of client device)







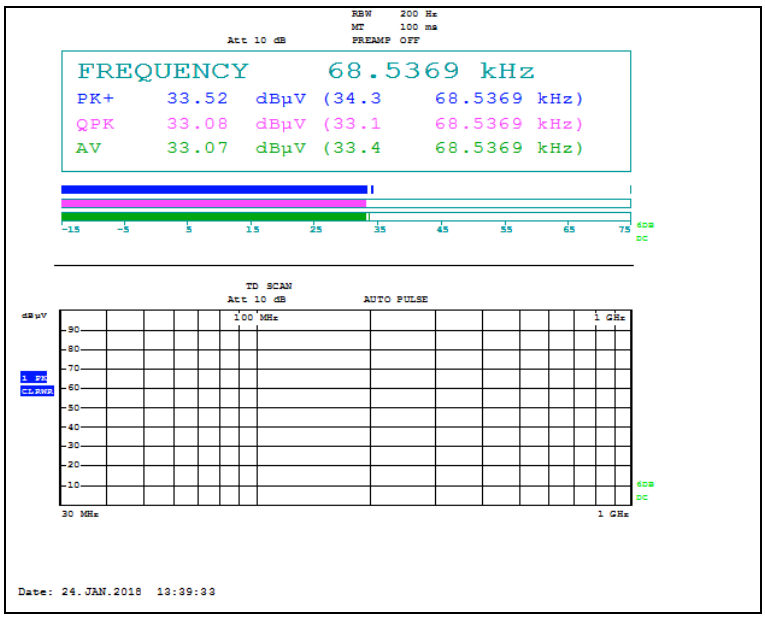


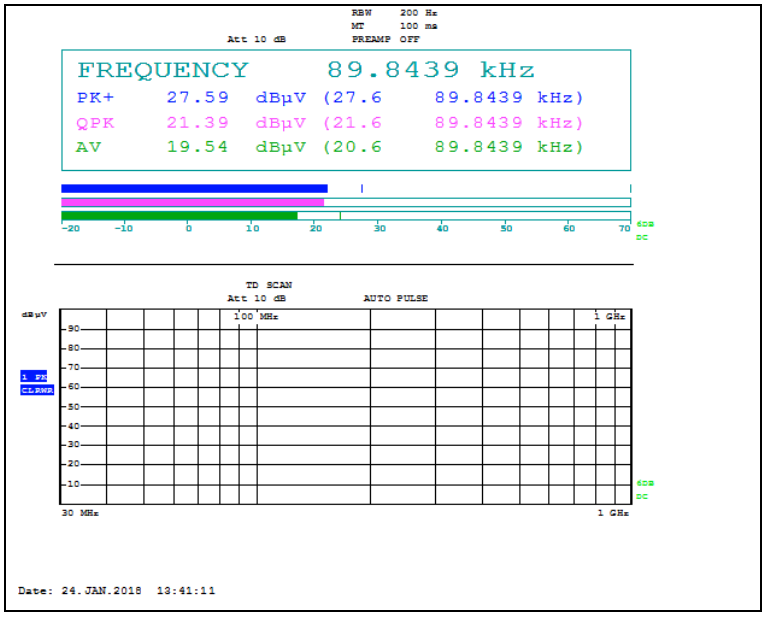


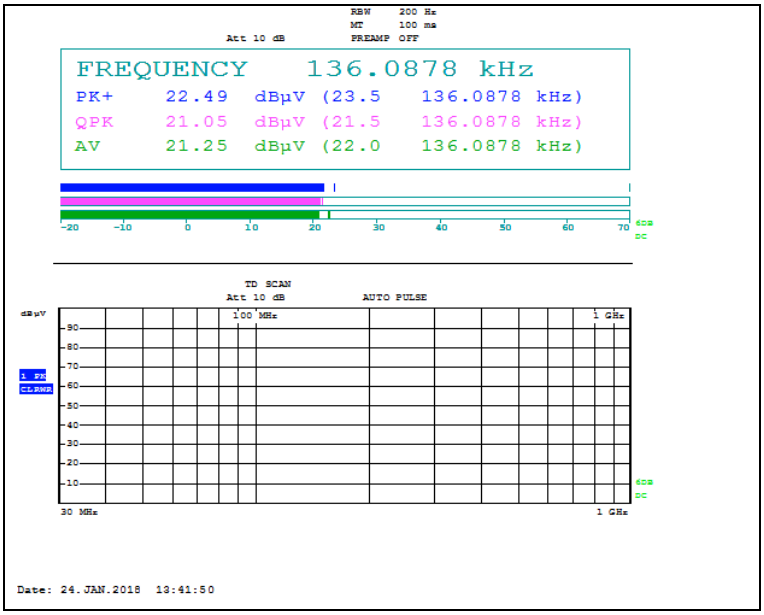
Test Condition: Ant. 3

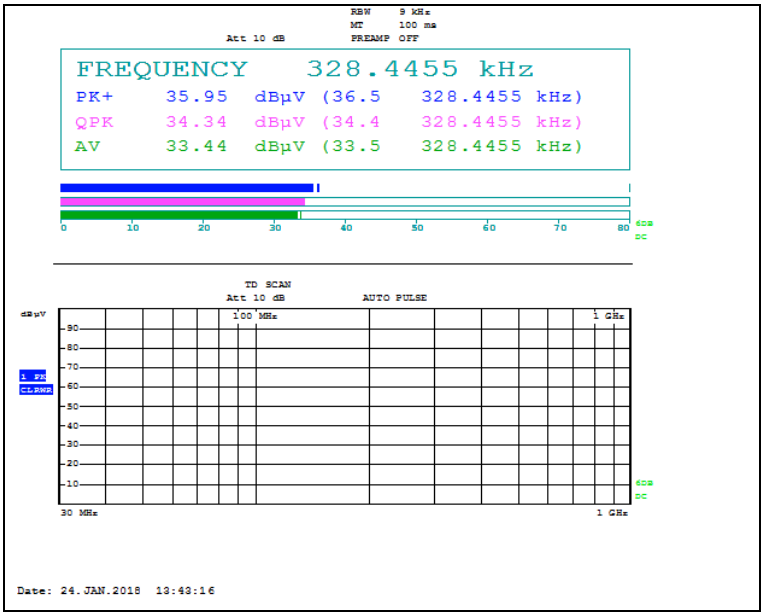
Test plots

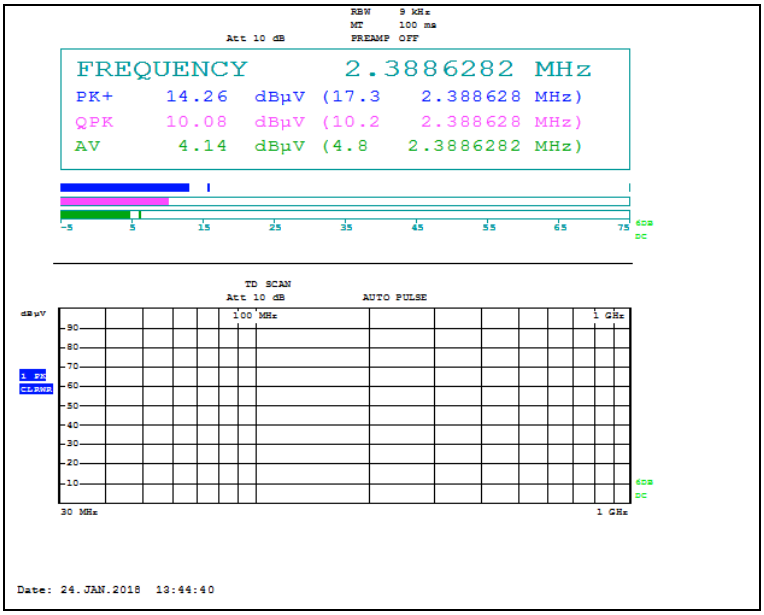
Charging mode (1 % battery status of client device)



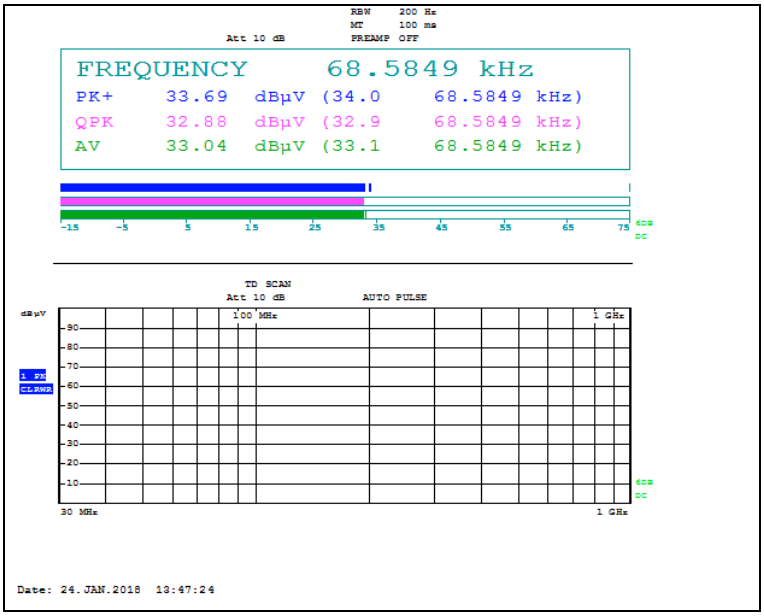


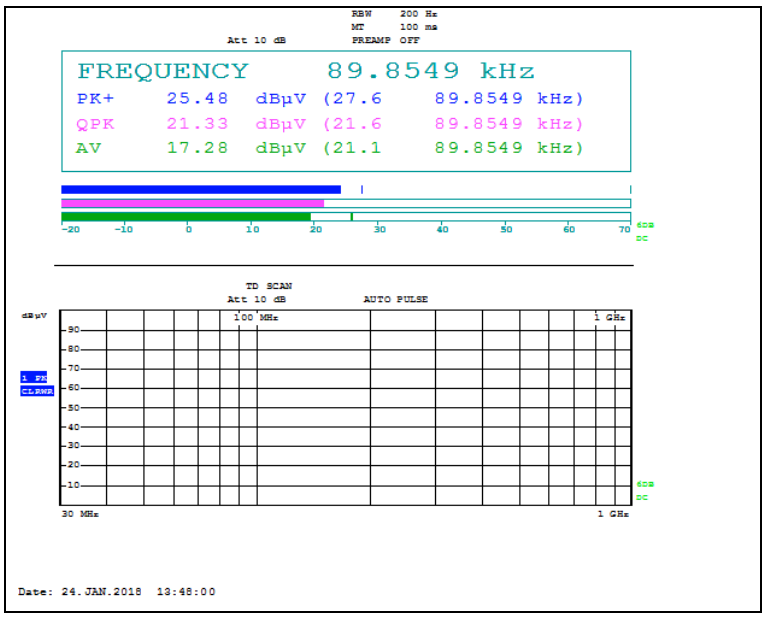


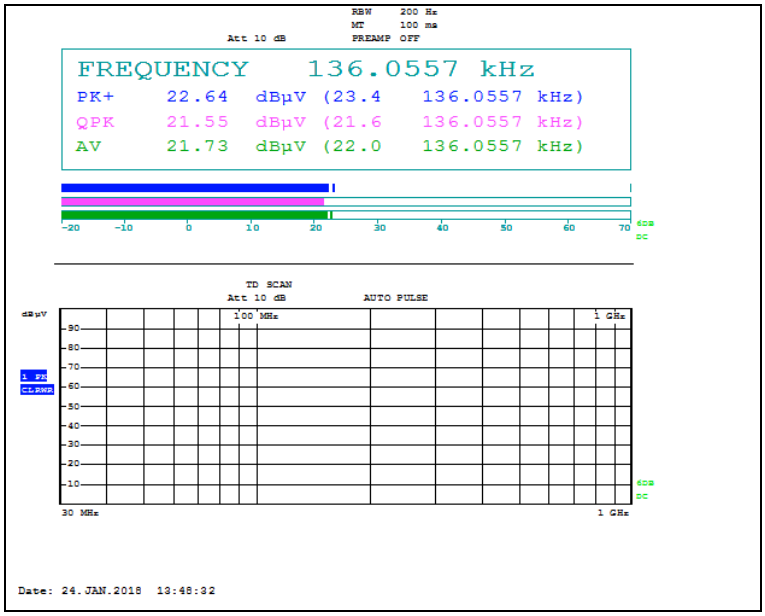


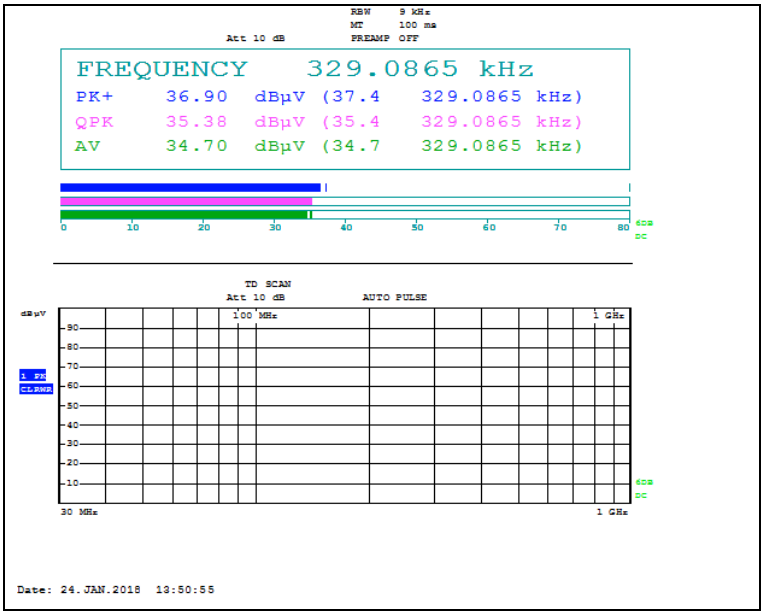


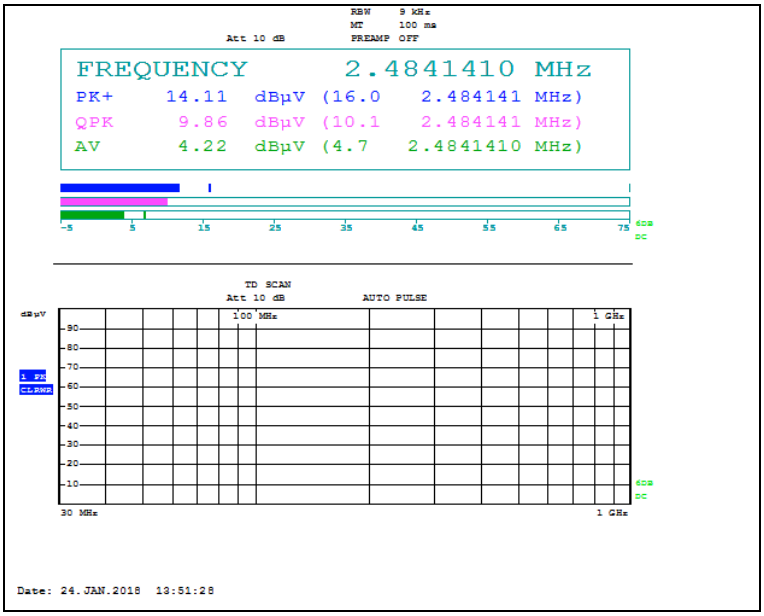
Charging mode (50 % battery status of client device)



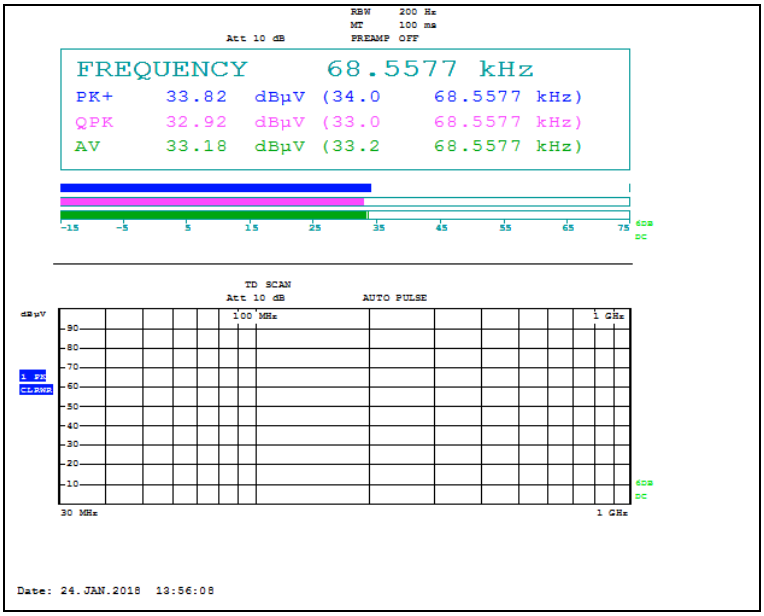


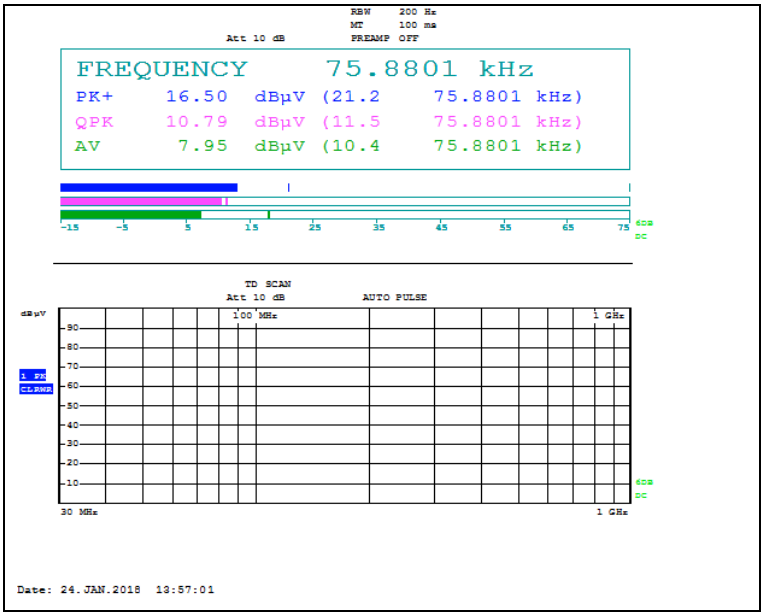


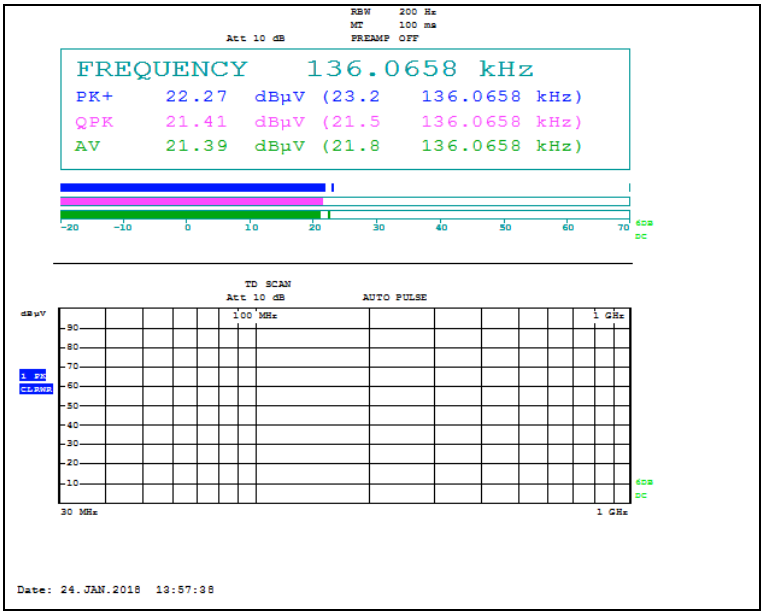


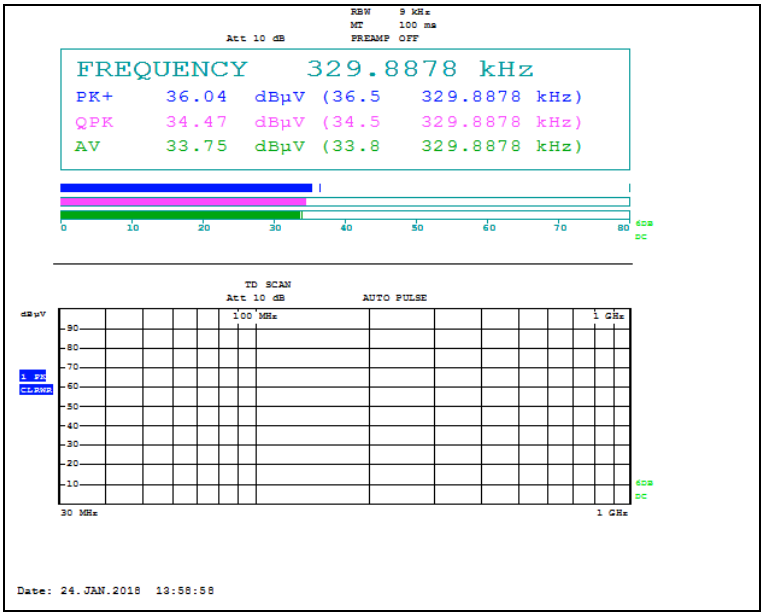


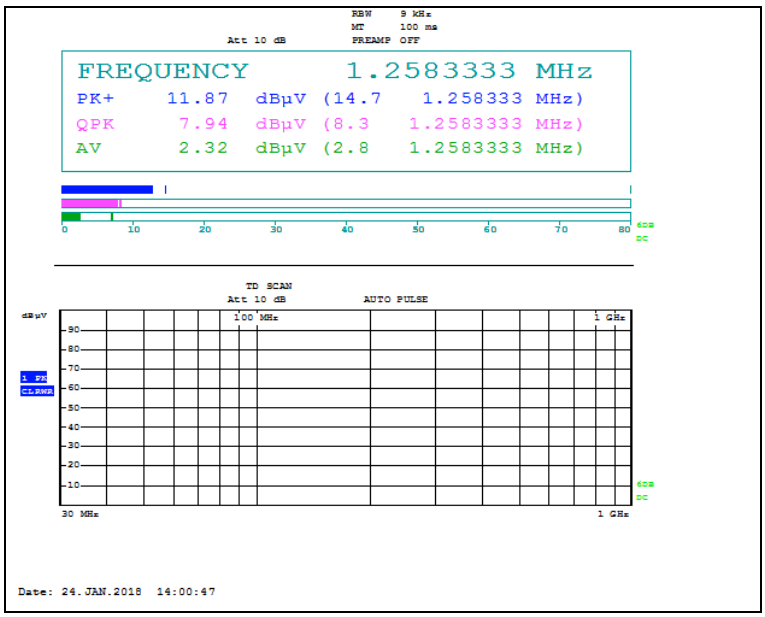
Charging mode (99 % battery status of client device)

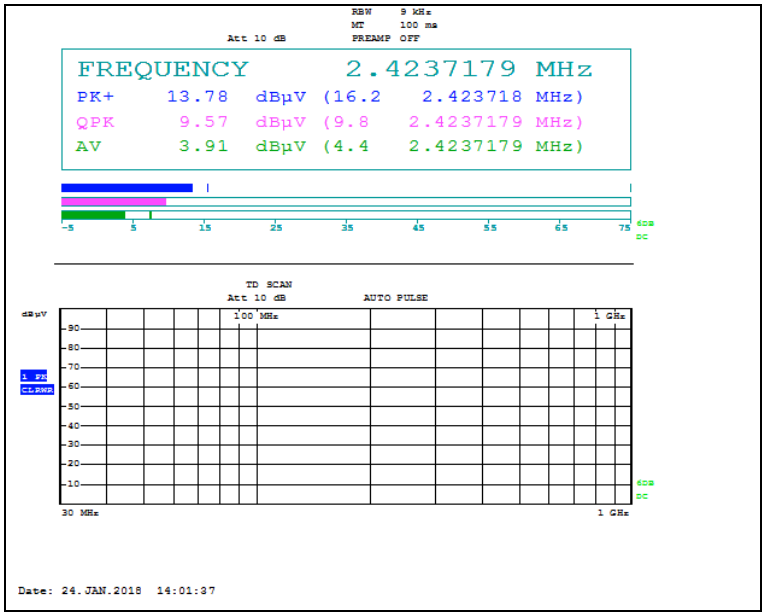






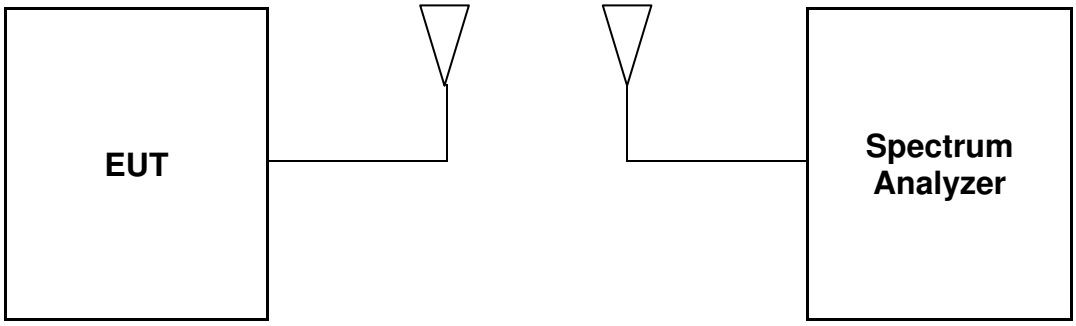






3. 20 dB Bandwidth

3.1. Test Setup



3.2. Limit

None; for reporting purposed 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.

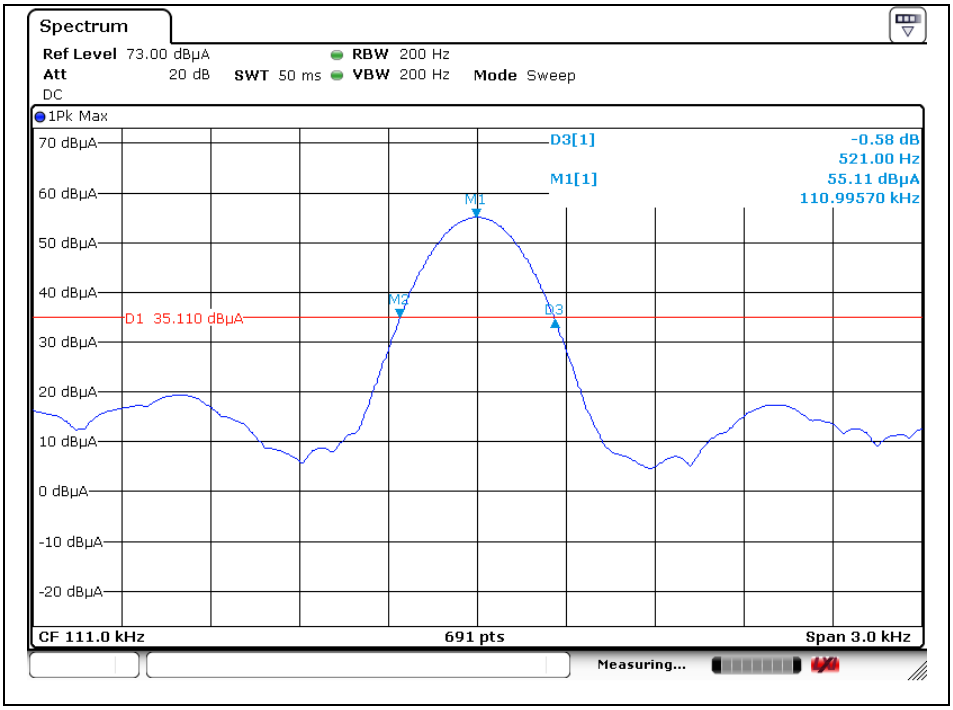
3.4. Test Result

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

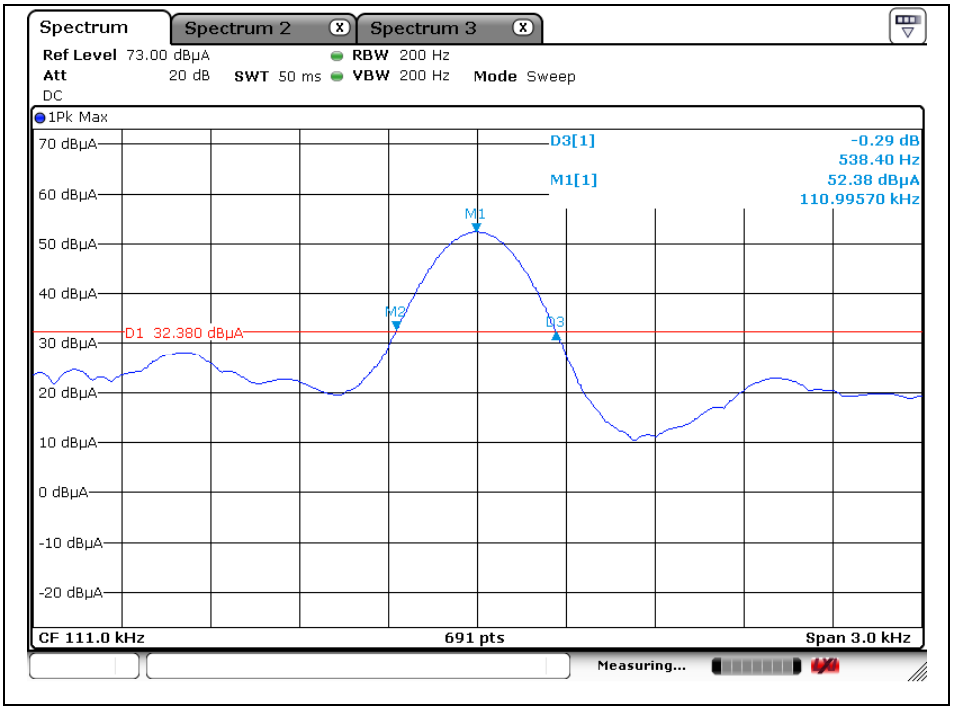
Test condition	EUT status	20 dB Bandwidth (Hz)	Limit
Ant. 1	With client device (99 % battery status of client device)	521.00	Reporting proposed only
Ant. 2		538.40	
Ant. 3		516.60	

20 dB Bandwidth

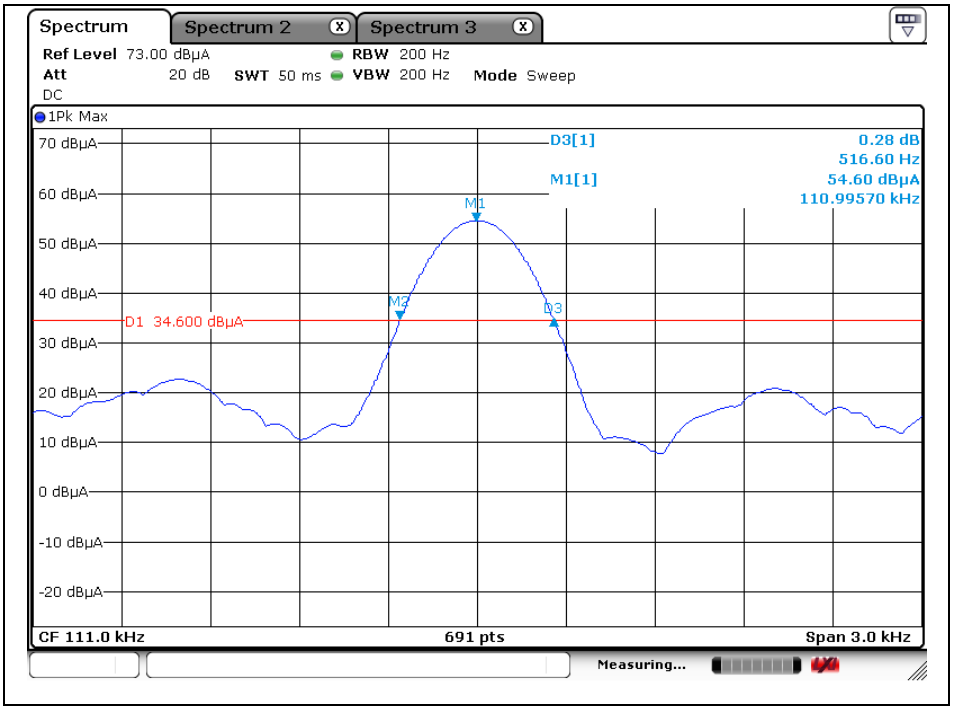
Ant. 1



Ant. 2



Ant. 3



- End of the Test Report -