TEST REPORT

OF

FCC Part 15 Subpart C §15.209

FCC ID : A3LEPPN920

Equipment Under Test	:	WIRELESS CHARGER
Model Name	:	EP-PN920
Applicant	:	Samsung Electronics Co., Ltd.
Manufacturer	:	Samsung Electronics Co., Ltd.
Date of Receipt	:	2016.09.28
Date of Test(s)	:	2016.09.30 ~ 2016.10.14
Date of Issue	:	2016.10.17

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

Tested By: **Date:** **2016.10.17**

Jinhyoung Cho

Technical Manager: **Date:** **2016.10.17**

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

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 : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Contact Person : Kim, Kyung-Won
Phone No. : +82 31 301 0274

1.3. Description of EUT

Kind of Product	WIRELESS CHARGER
Model Name	EP-PN920
Power Supply	DC 5.0 V, DC 9.0 V
Frequency Range	110 ㎑ ~ 148 ㎑
Antenna Type	Inductive loop coil antenna
Operating Temperature	-20 ℃ ~ 60 ℃
H/W Version	REV0.6
S/W Version	0923

1.4. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Spectrum Analyzer	R&S	FSV30	100768	Mar. 30, 2016	Annual	Mar. 30, 2017
Signal Generator	R&S	SMBV100A	255834	Jun. 20, 2016	Annual	Jun. 20, 2017
DC Power Supply	Agilent	U8002A	MY50060028	Mar. 21, 2016	Annual	Mar. 21, 2017
Test Receiver	R&S	ESU26	100109	Mar. 07, 2016	Annual	Mar. 07, 2017
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 19, 2015	Biennial	Aug. 19, 2017
Turn Table	INNCO systems	CONTROLLER CO3000	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.
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.
Mobile Test Unit	R&S	CMW 500	144034	Feb. 29, 2016	Annual	Feb. 28, 2017
Test Receiver	R&S	ESCI 7	100911	Dec. 22, 2015	Annual	Dec. 22, 2016
Two-Line V-Network	R&S	ENV216	100190	Dec. 21, 2015	Annual	Dec. 21, 2016

▶ Support equipment

Description	Manufacturer	Model	FCC ID
Smart Wearable Device	Samsung Electronics Co., Ltd.	SM-G935F	A3LSMG935F

1.5. Sample calculation

Where relevant, the following sample calculation is provided:

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

1.6. 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.

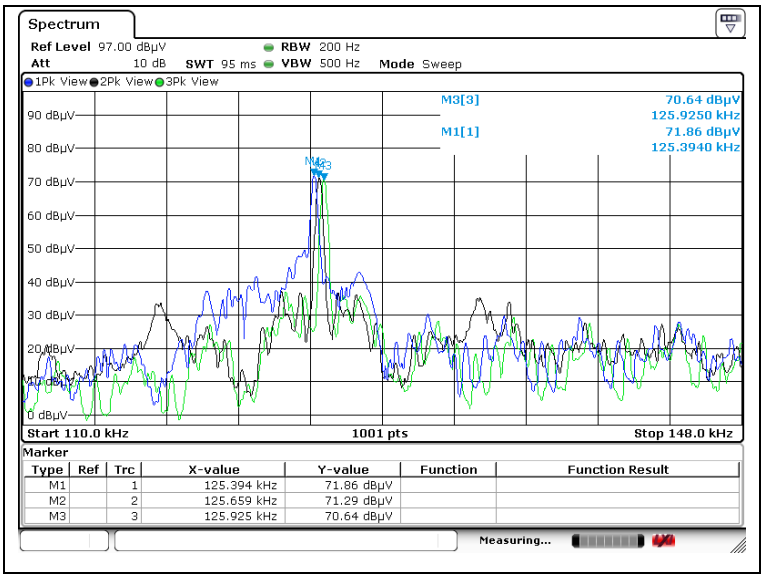
EUT configuration	Description
Charging Mode with client device (Model : SM-G935F, FCC ID : A3LSMG935F)	Less than 1 % of battery
	Less than 50 % of battery
	100 % full charging of battery

EUT setup configuration:
- The EUT can be capable of charging one client at a time.
- The measurement is performed with a typical WPT client device on the power transfer zone.

Operating configurations :

Client device (SM- G935F)

- While the client device was connected to an active data connection (Trace#1 “M1”)
  The device was tested under all modes and bands like 2G and 3G.
  In the result, **PCS GSM / GPRS1900 / 1 TX** was found in **Middle channel**.
- While the client device was in airplane mode (Trace#2 “M2”)
- While the wireless charger is charging with the client device turned off. (Trace#3 “M3”)



Plot – fundamental emission comparison

- The level of Trace#1 was higher than Trace#2 and 3 so Trace#1 was selected.
- Trace#1 as **PCS GSM / GPRS1900 / 1 TX** which was found in **Middle channel** should be tested with the client device as a worst case.

1.7. 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 ㏈ Bandwidth	Complied
15.207	Transmitter AC Power Line Conducted Emission	Complied

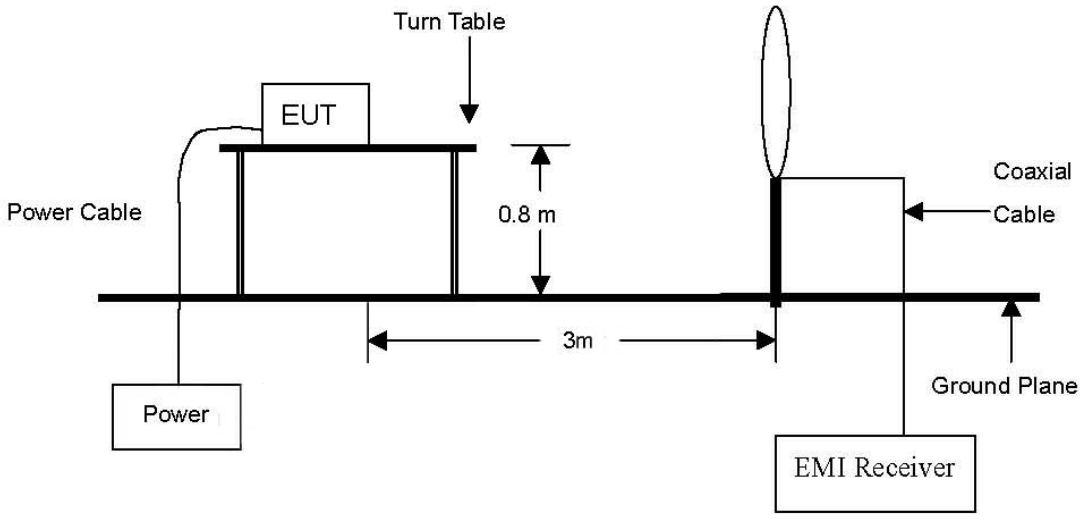
1.8. Test Report Revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL010413	2016.10.17	Initial

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 ㎒ 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	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 Peak 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 937606.

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). Definition of DUT for a orthogonal plane was described in the test setup photo.

Test Condition : DC 5 V Charging mode

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 (less than 1 % battery status)									
0.126	63.00	Average	H	19.44	0.06	82.50	2.50	25.60	23.10
Charging mode with client (less than 50 % battery status)									
0.126	65.30	Average	H	19.44	0.06	84.80	4.80	25.60	20.80
Charging mode with client (100 % battery status)									
0.126	63.50	Average	H	19.44	0.06	83.00	3.00	25.60	22.60

Test Condition : DC 9 V Charging mode

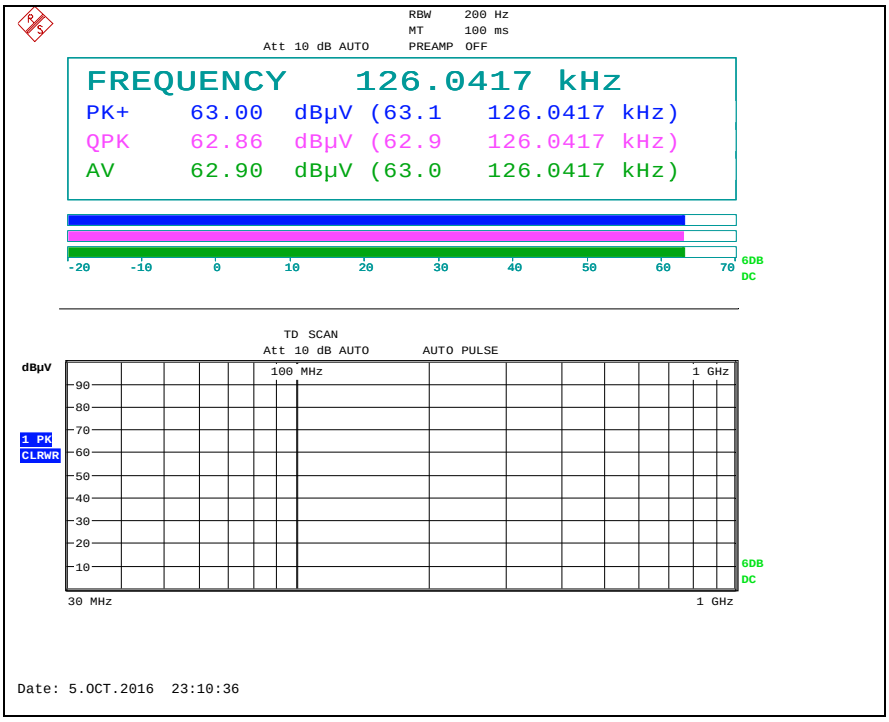
Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m	Limit (dB㎶/m) at 300 m	Margin (dB)
Charging mode with client (less than 1 % battery status)									
0.126	60.60	Average	H	19.44	0.06	80.10	0.10	25.60	25.50
Charging mode with client (less than 50 % battery status)									
0.126	63.40	Average	H	19.44	0.06	82.90	2.90	25.60	22.70
Charging mode with client (100 % battery status)									
0.126	71.00	Average	H	19.44	0.06	90.50	10.50	25.60	15.10

Note;
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).

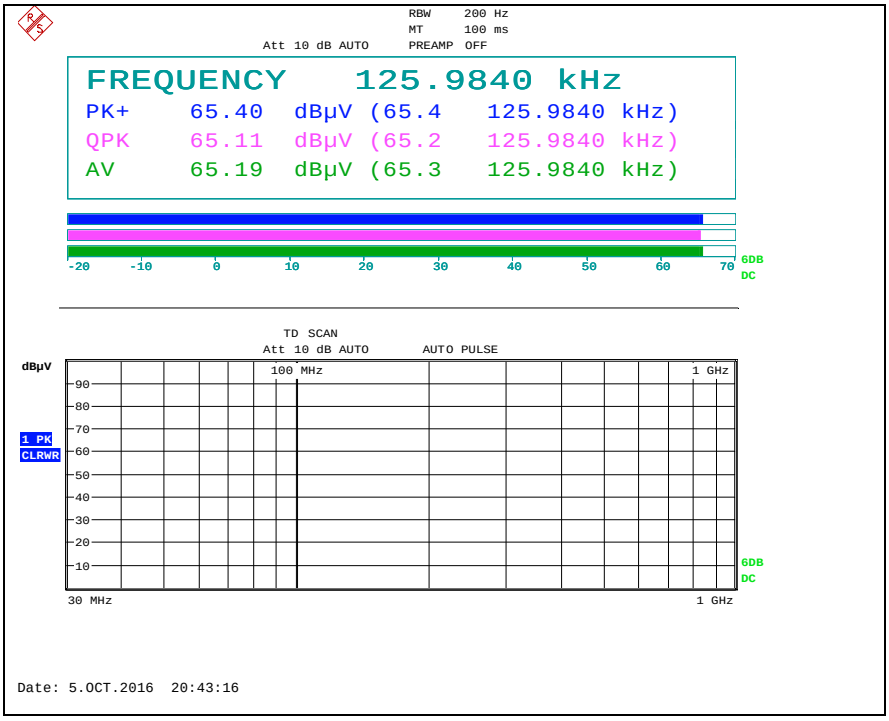
Test plots

Test Condition : DC 5 V Charging mode

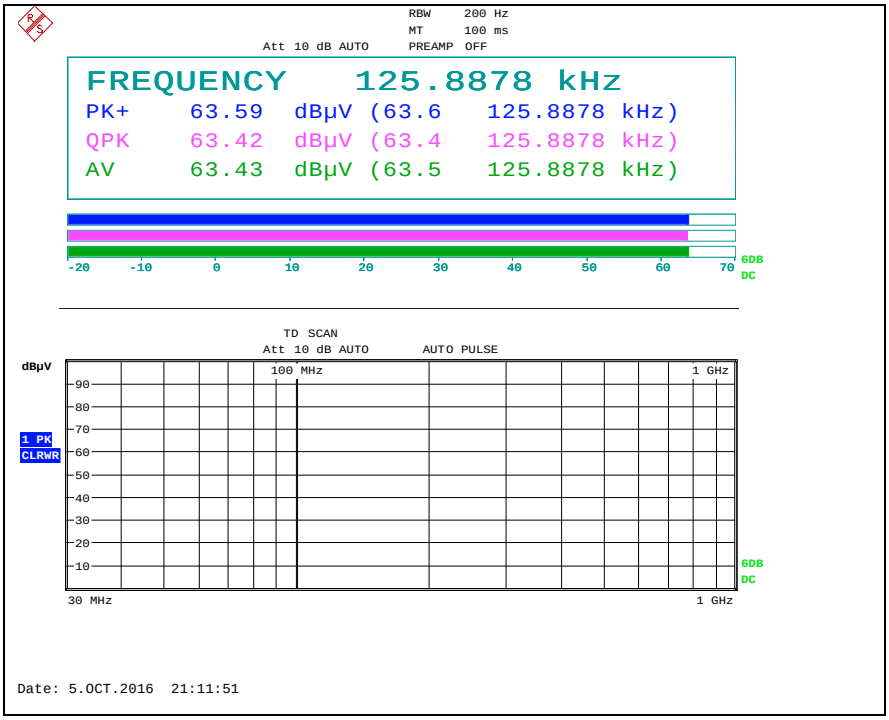
Less than 1 % battery status of client device



Less than 50 % battery status of client device

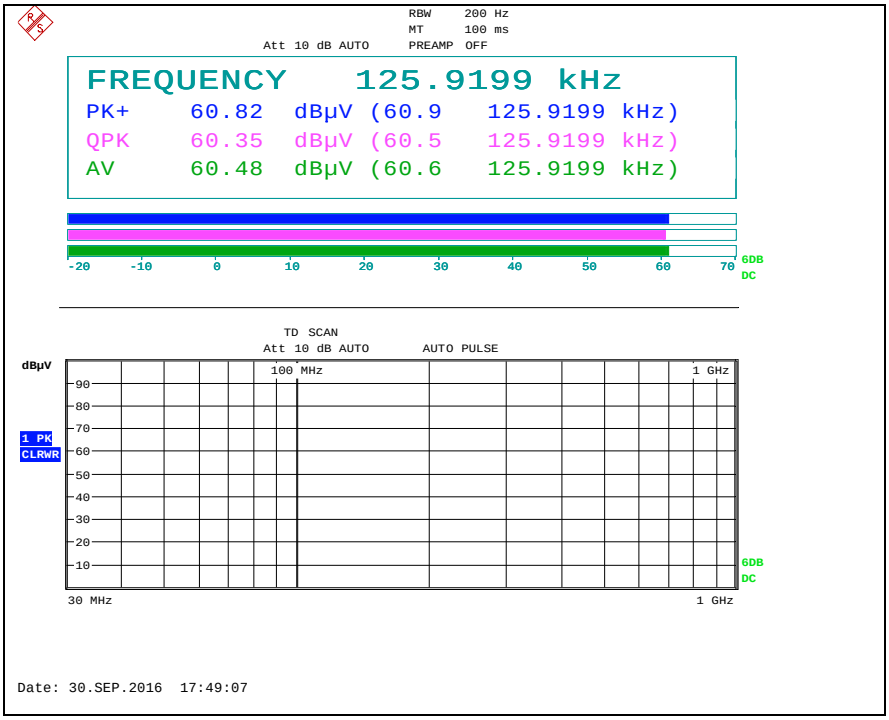


100 % battery status of client device

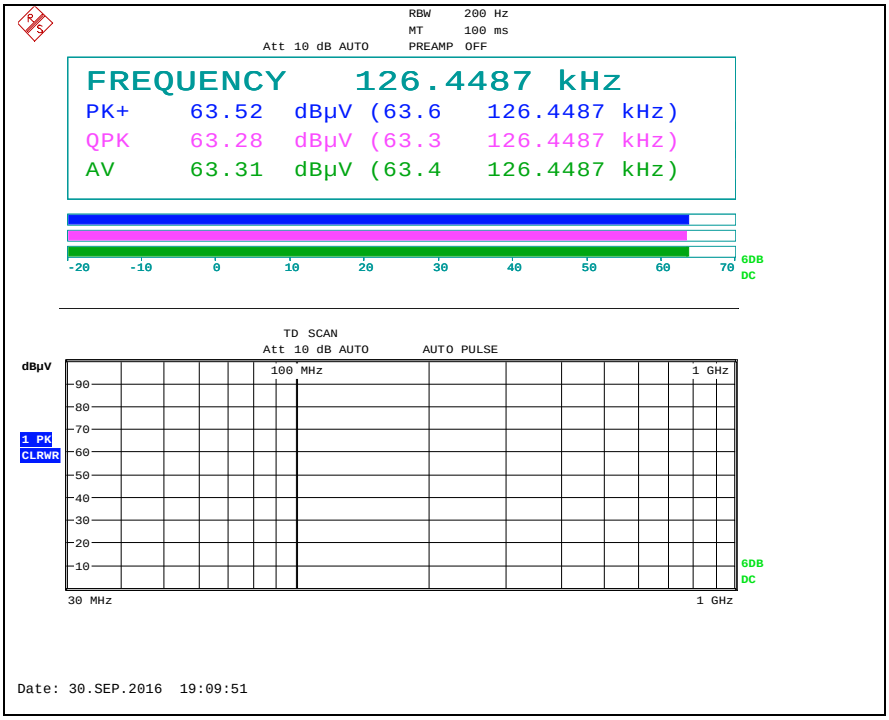


Test Condition : DC 9 V Charging mode

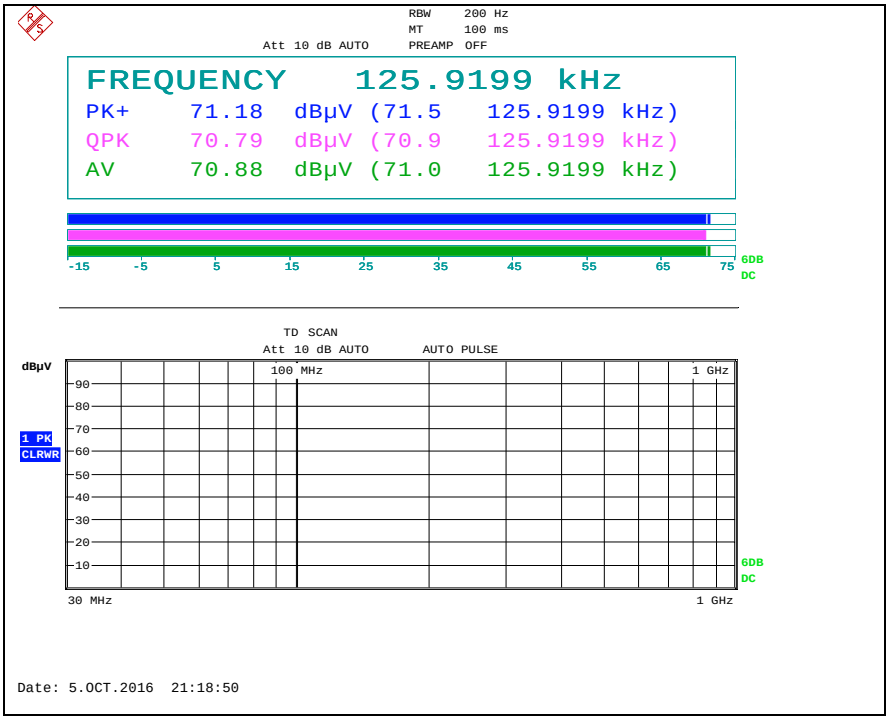
Less than 1 % battery status of client device



Less than 50 % battery status of client device



100 % 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 : DC 5 V Charging mode

Less than 1 % battery status of client device

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 30m or 300 m	Limit (dB㎶/m) at 30m or 300 m	Margin (dB)
0.022	18.30	Average	H	19.46	0.02	37.78	-42.22	40.76	82.98
0.041	26.60	Average	H	19.30	0.03	45.93	-34.07	35.35	69.42
0.082	22.10	Average	H	19.43	0.04	41.57	-38.43	29.33	67.76
0.133	10.80	Average	H	19.42	0.07	30.29	-49.71	25.13	74.84
0.379	41.10	Average	H	19.04	0.28	60.42	-19.58	16.03	35.61
0.633	32.72	Quasi Peak	H	19.18	0.50	52.40	12.40	31.58	19.18
0.886	27.43	Quasi Peak	H	19.33	0.72	47.48	7.48	28.66	21.18
Above 1.000	Not detected	-	-	-	-	-	-	-	-

Less than 50 % battery status of client device

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 30m or 300 m	Limit (dB㎶/m) at 30m or 300 m	Margin (dB)
0.020	26.50	Average	H	19.50	0.02	46.02	-33.98	41.58	75.56
0.037	30.50	Average	H	19.30	0.03	49.83	-30.17	36.24	66.41
0.074	27.20	Average	H	19.40	0.03	46.63	-33.37	30.22	63.59
0.135	23.30	Average	H	19.41	0.07	42.78	-37.22	25.00	62.22
0.380	43.30	Average	H	19.04	0.28	62.62	-17.38	16.01	33.39
0.632	34.81	Quasi Peak	H	19.18	0.50	54.49	14.49	31.59	17.10
0.882	29.04	Quasi Peak	H	19.33	0.72	49.09	9.09	28.69	19.60
Above 1.000	Not detected	-	-	-	-	-	-	-	-

100 % battery status of client device

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 30m or 300 m	Limit (dB㎶/m) at 30m or 300 m	Margin (dB)
0.023	25.70	Average	H	19.44	0.02	45.16	-34.84	40.37	75.21
0.043	31.60	Average	H	19.30	0.03	50.93	-29.07	34.93	64.00
0.064	25.80	Average	H	19.36	0.03	45.19	-34.81	31.48	66.29
0.132	9.00	Average	H	19.42	0.07	28.49	-51.51	25.19	76.70
0.377	42.11	Average	H	19.04	0.28	61.43	-18.57	16.08	34.65
0.628	33.50	Quasi Peak	H	19.18	0.50	53.18	13.18	31.65	18.47
0.886	25.90	Quasi Peak	H	19.33	0.72	45.95	5.95	28.66	22.71
Above 1.000	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)
   - 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 : DC 9 V Charging mode

Less than 1 % battery status of client device

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 30m or 300 m	Limit (dB㎶/m) at 30m or 300 m	Margin (dB)
0.019	27.50	Average	H	19.52	0.02	47.04	-32.96	42.03	74.99
0.035	19.90	Average	H	19.30	0.03	39.23	-40.77	36.72	77.49
0.060	19.10	Average	H	19.34	0.03	38.47	-41.53	32.04	73.57
0.134	11.00	Average	H	19.42	0.07	30.49	-49.51	25.06	74.57
0.378	39.70	Average	H	19.04	0.28	59.02	-20.98	16.05	37.03
0.630	31.24	Quasi Peak	H	19.18	0.50	50.92	10.92	31.62	20.70
0.880	25.63	Quasi Peak	H	19.33	0.72	45.68	5.68	28.71	23.03
2.469	12.40	Quasi Peak	H	19.33	0.54	32.27	-7.73	29.54	37.27
Above 3.000	Not detected	-	-	-	-	-	-	-	-

Less than 50 % battery status of client device

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 30m or 300 m	Limit (dB㎶/m) at 30m or 300 m	Margin (dB)
0.019	27.30	Average	H	19.52	0.02	46.84	-33.16	42.03	75.19
0.025	18.50	Average	H	19.40	0.02	37.92	-42.08	39.65	81.73
0.067	21.10	Average	H	19.37	0.03	40.50	-39.50	31.08	70.58
0.083	8.50	Average	H	19.43	0.04	27.97	-52.03	29.22	81.25
0.380	42.20	Average	H	19.04	0.28	61.52	-18.48	16.01	34.49
0.632	33.42	Quasi Peak	H	19.18	0.50	53.10	13.10	31.59	18.49
0.885	28.40	Quasi Peak	H	19.33	0.72	48.45	8.45	28.67	20.22
2.433	14.90	Quasi Peak	H	19.33	0.54	34.77	-5.23	29.54	34.77
Above 3.000	Not detected	-	-	-	-	-	-	-	-

100 % battery status of client device

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 30m or 300 m	Limit (dB㎶/m) at 30m or 300 m	Margin (dB)
0.022	25.30	Average	H	19.46	0.02	44.78	-35.22	40.76	75.98
0.036	27.70	Average	H	19.30	0.03	47.03	-32.97	36.48	69.45
0.087	11.70	Average	H	19.45	0.04	31.19	-48.81	28.81	77.62
0.132	14.90	Average	H	19.42	0.07	34.39	-45.61	25.19	70.80
0.379	48.00	Average	H	19.04	0.28	67.32	-12.68	16.03	28.71
0.631	38.42	Quasi Peak	H	19.18	0.50	58.10	18.10	31.60	13.50
0.884	31.70	Quasi Peak	H	19.33	0.72	51.75	11.75	28.68	16.93
Above 1.000	Not detected	-	H	-	-	-	-	-	-

Note;

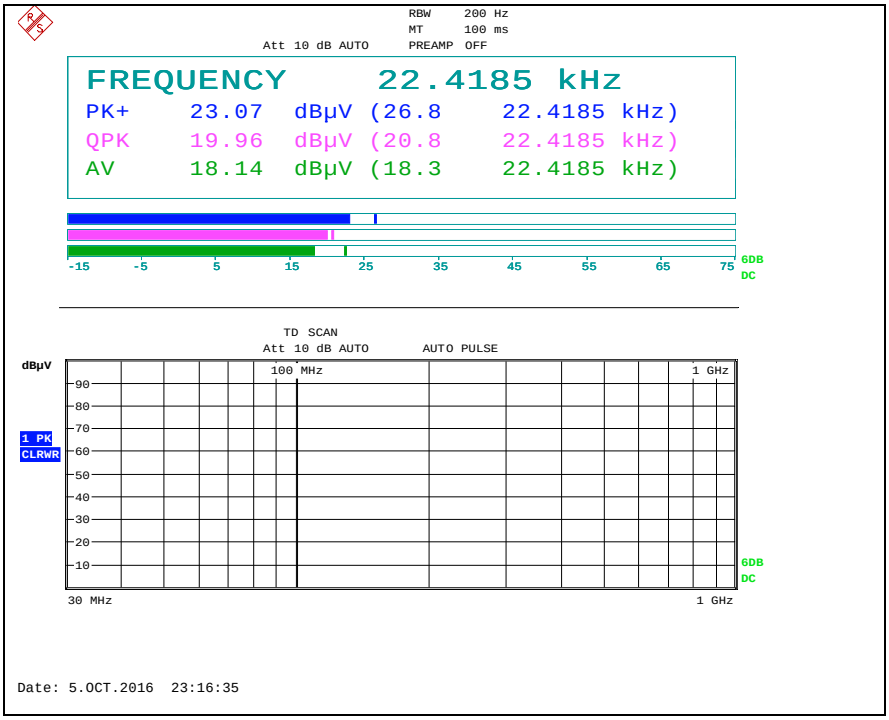
1. According to §15.31 (f)(2)
   - 300 m Result(dB㎶/m) = 3 m Result(dB㎶/m) - 40log(300/3) (dB㎶/m)
   - 30 m Result(dB㎶/m) = 3 m Result(dB㎶/m) - 40log(30/3) (dB㎶/m)
2. According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 ㎒ were calculated as below.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

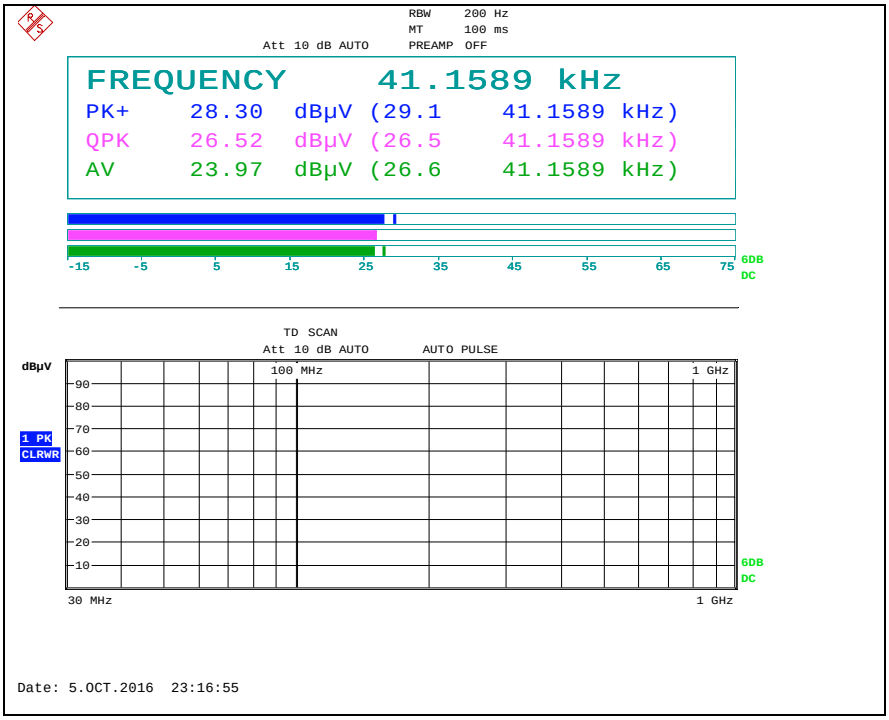
Test plots

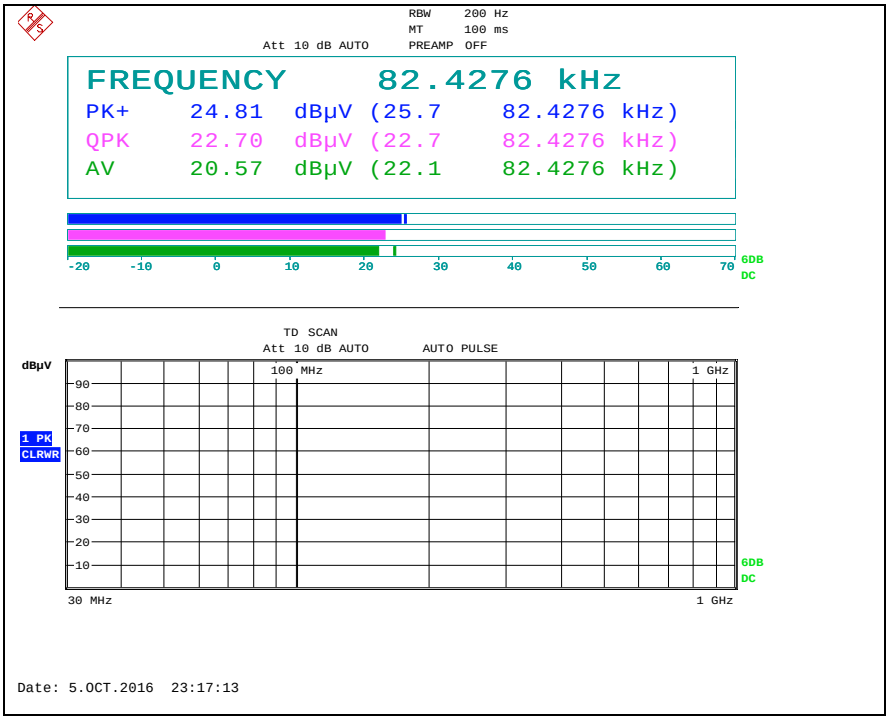
Test Condition : DC 5 V Charging mode

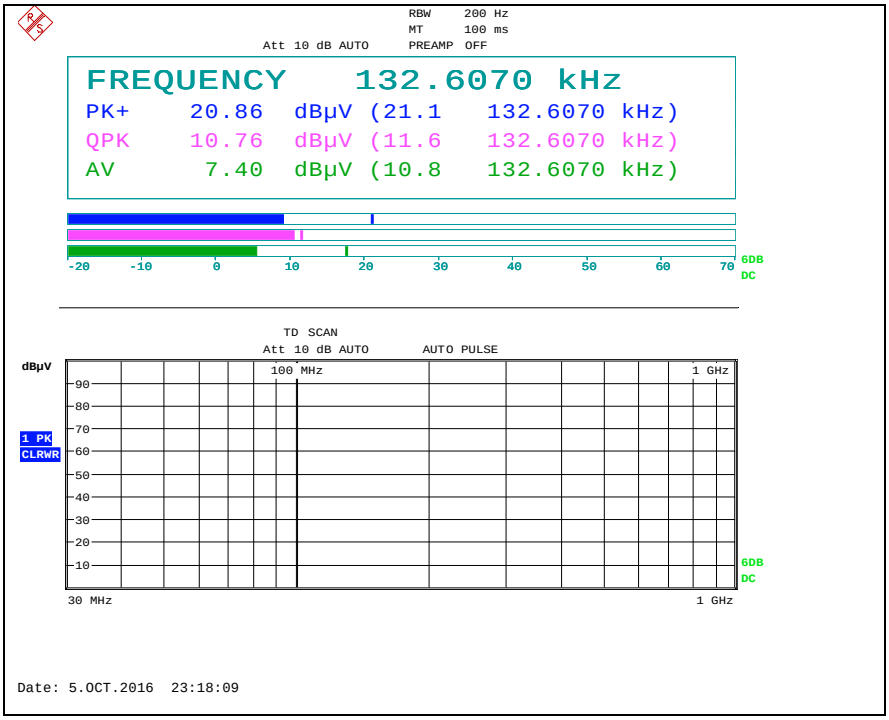
Below 30 ㎒

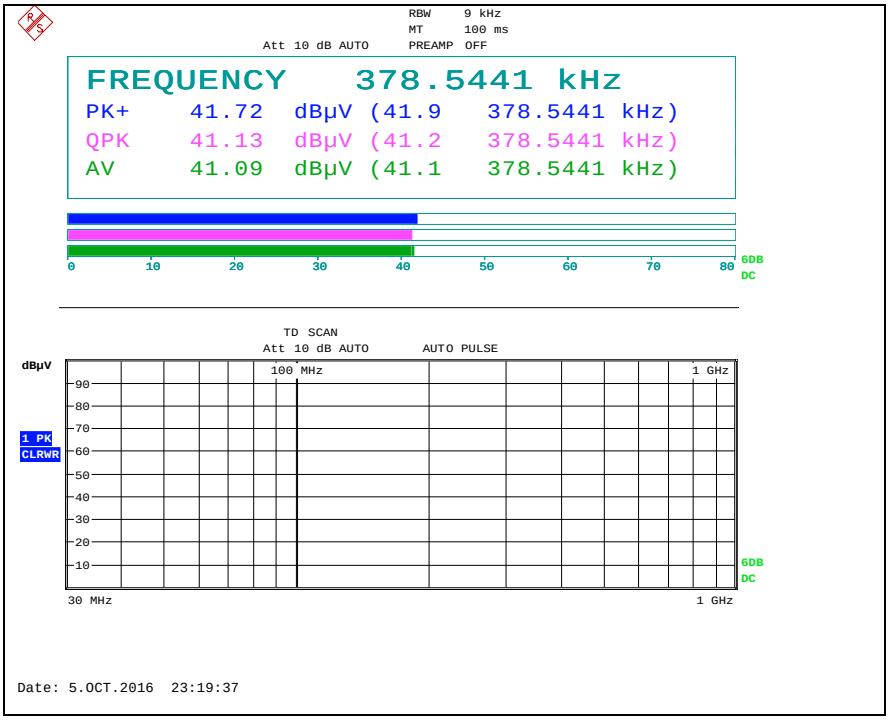
Less than 1 % battery status of client device

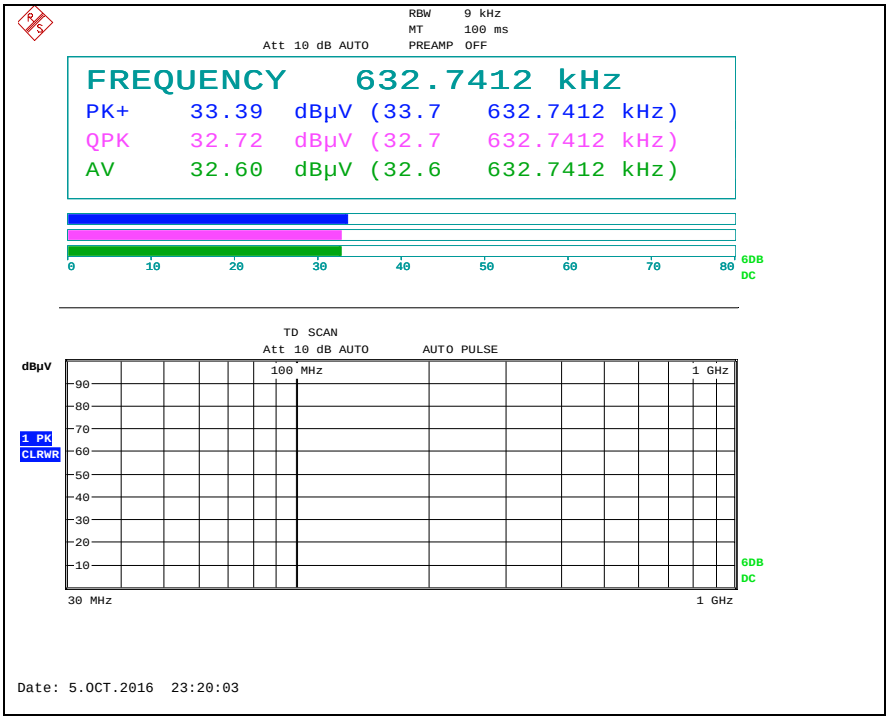


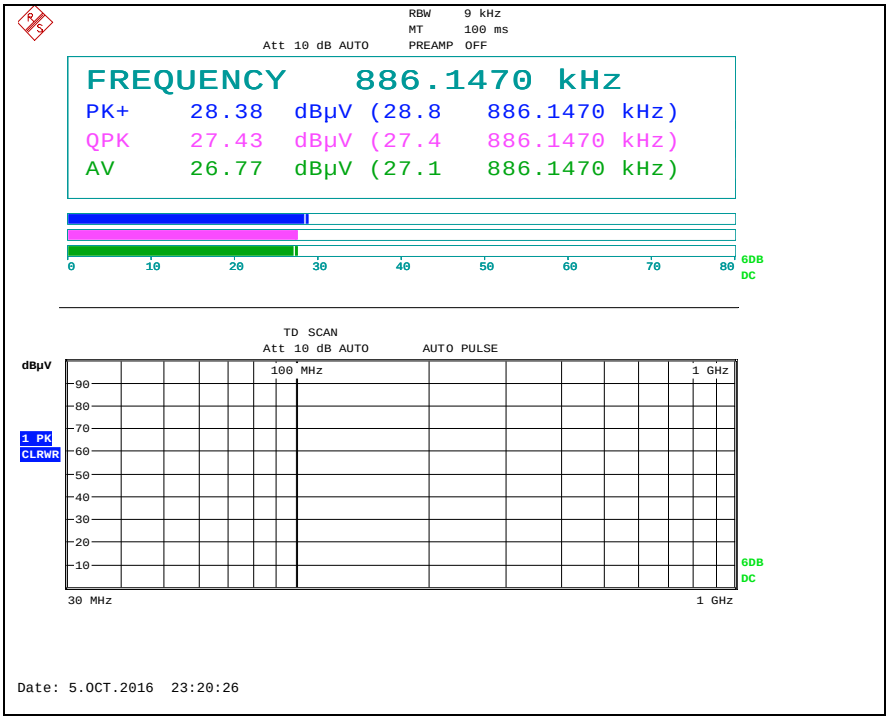




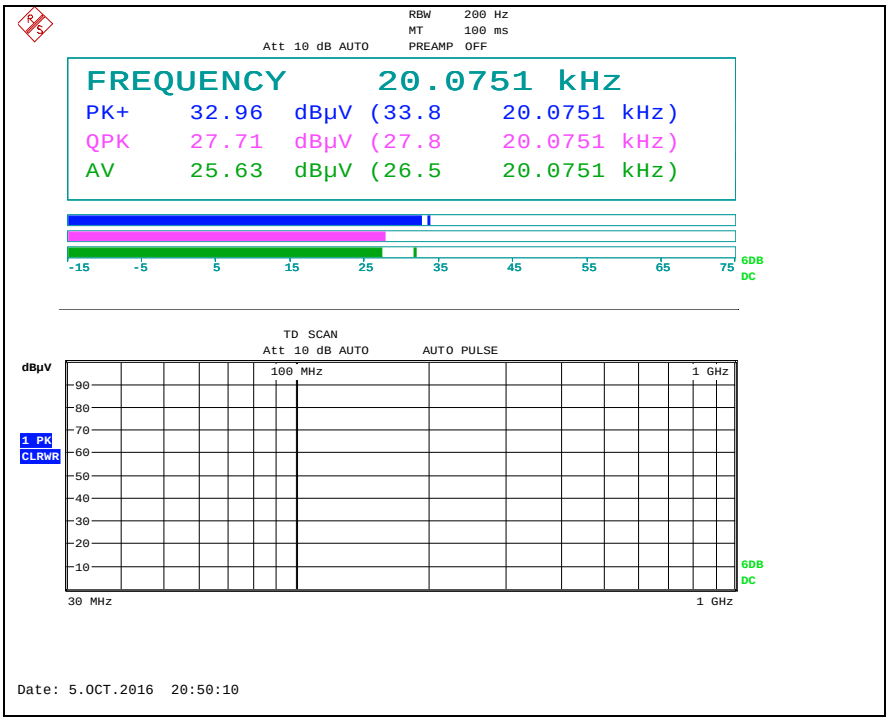


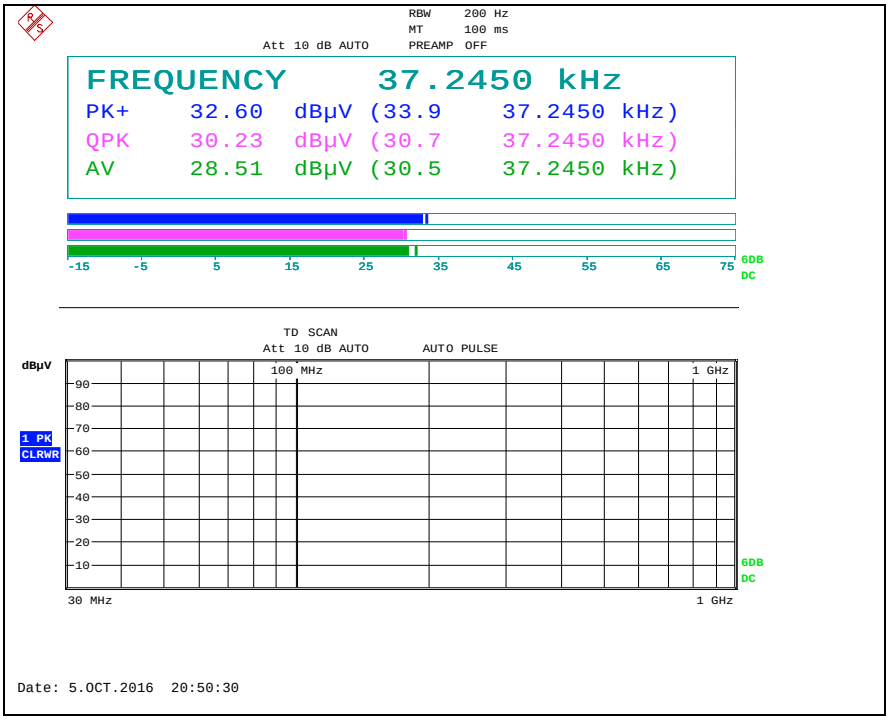

RBW 9 kHz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 378.5441 kHz
PK+ 41.72 dBµV (41.9 378.5441 kHz)
QPK 41.13 dBµV (41.2 378.5441 kHz)
AV 41.09 dBµV (41.1 378.5441 kHz)
0 10 20 30 40 50 60 70 80
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
6DB
DC
30 MHz
1 GHz
Date: 5.OCT.2016 23:19:37

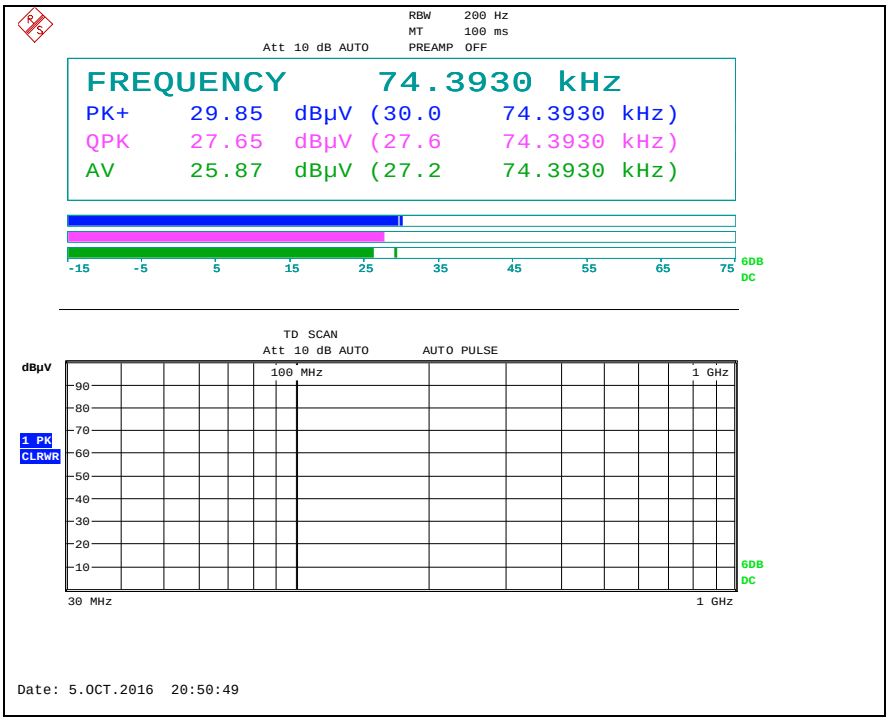

RBW 9 kHz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 632.7412 kHz
PK+ 33.39 dBµV (33.7 632.7412 kHz)
QPK 32.72 dBµV (32.7 632.7412 kHz)
AV 32.60 dBµV (32.6 632.7412 kHz)
0 10 20 30 40 50 60 70 80
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
6DB
DC
30 MHz
1 GHz
Date: 5.OCT.2016 23:20:03

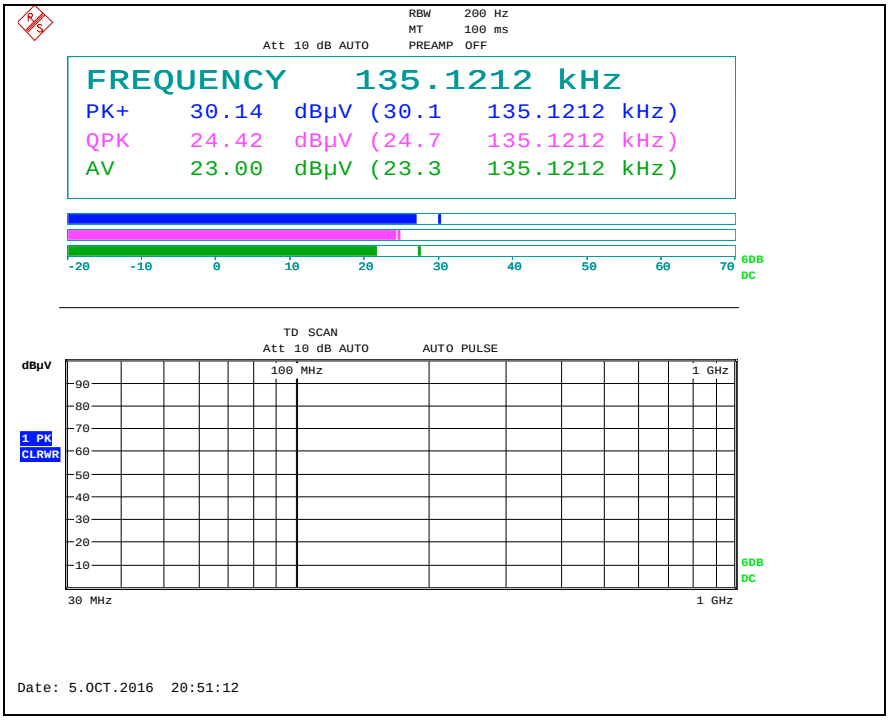


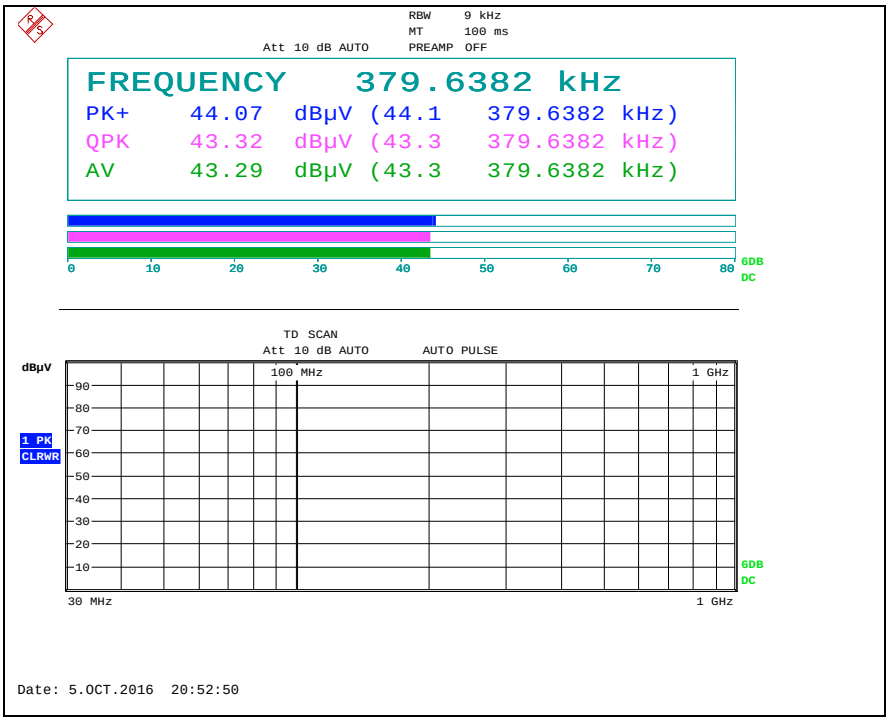
Less than 50 % battery status of client device

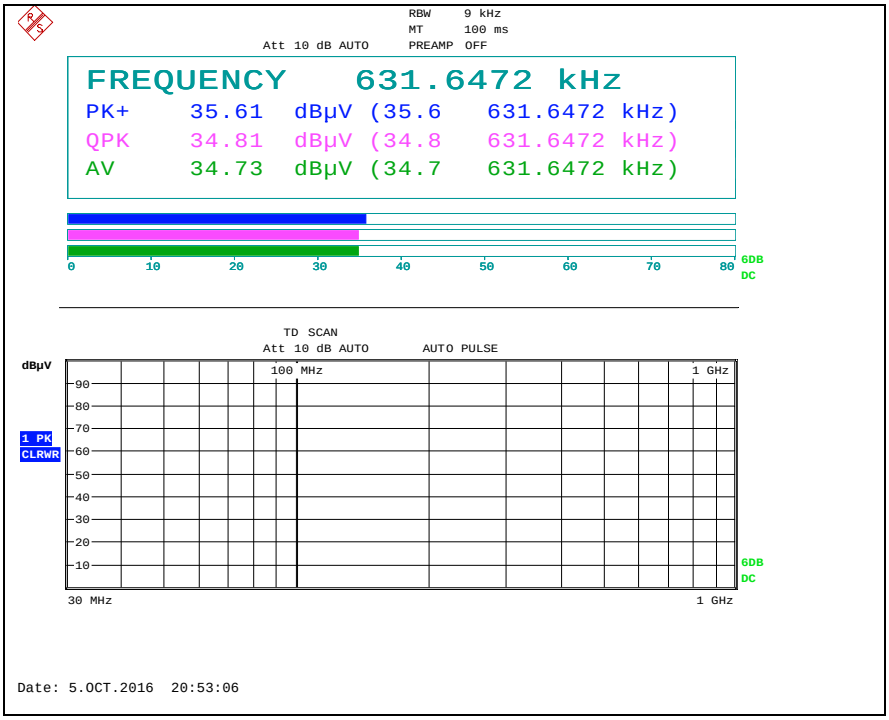


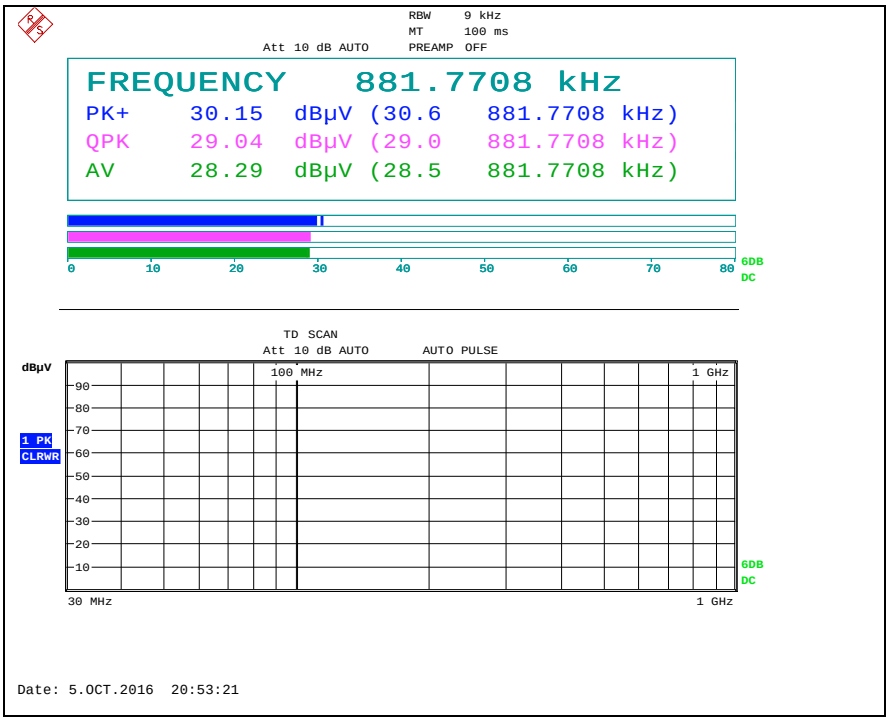




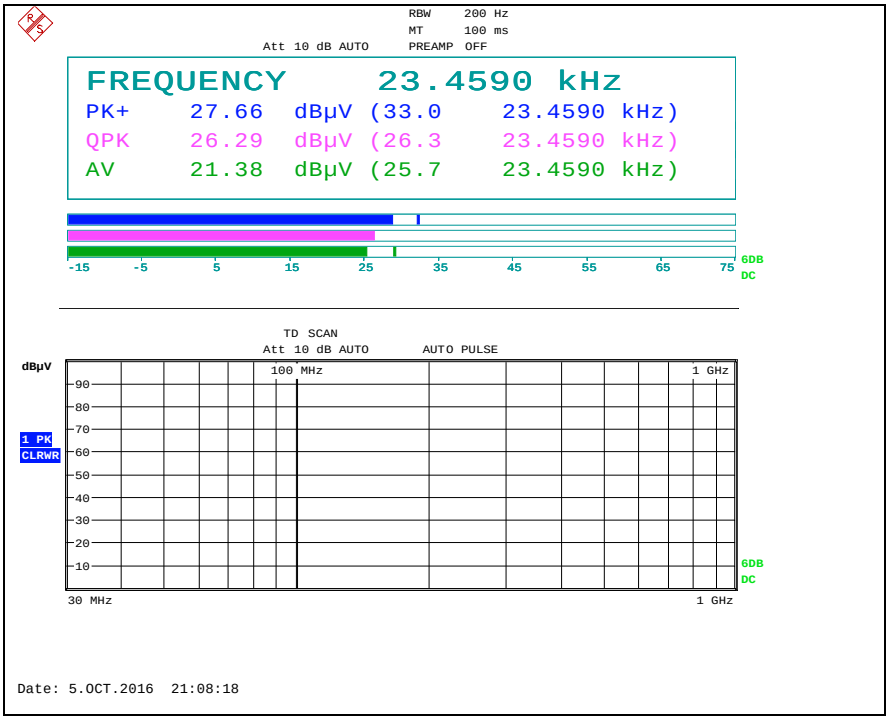

RBW 200 Hz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 135.1212 kHz
PK+ 30.14 dBµV (30.1 135.1212 kHz)
QPK 24.42 dBµV (24.7 135.1212 kHz)
AV 23.00 dBµV (23.3 135.1212 kHz)
-20 -10 0 10 20 30 40 50 60 70
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
30 MHz
1 GHz
Date: 5.OCT.2016 20:51:12

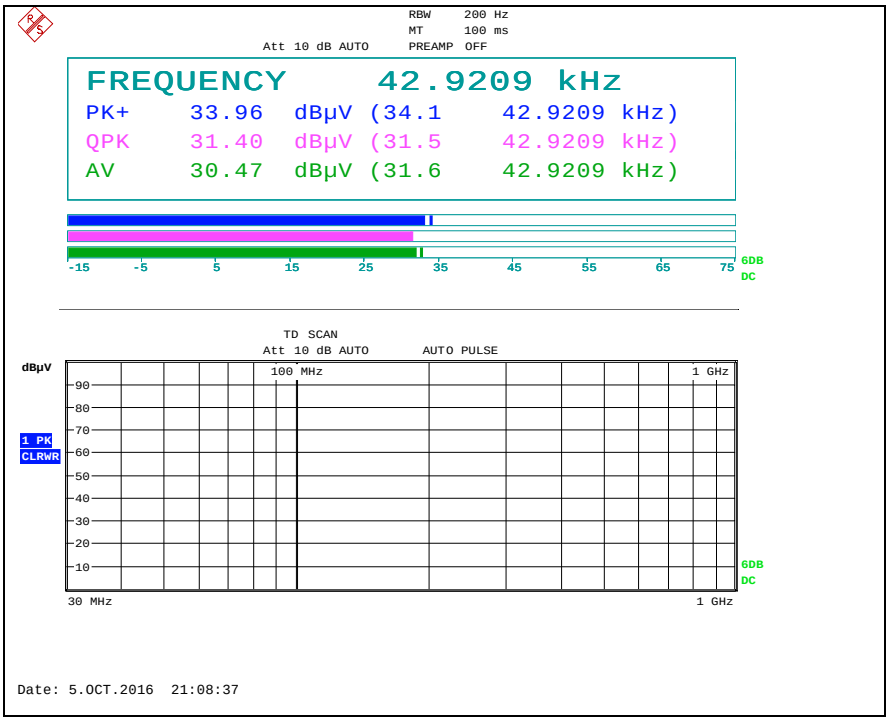

RBW 9 kHz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 379.6382 kHz
PK+ 44.07 dBµV (44.1 379.6382 kHz)
QPK 43.32 dBµV (43.3 379.6382 kHz)
AV 43.29 dBµV (43.3 379.6382 kHz)
0 10 20 30 40 50 60 70 80
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
30 MHz
1 GHz
Date: 5.OCT.2016 20:52:50

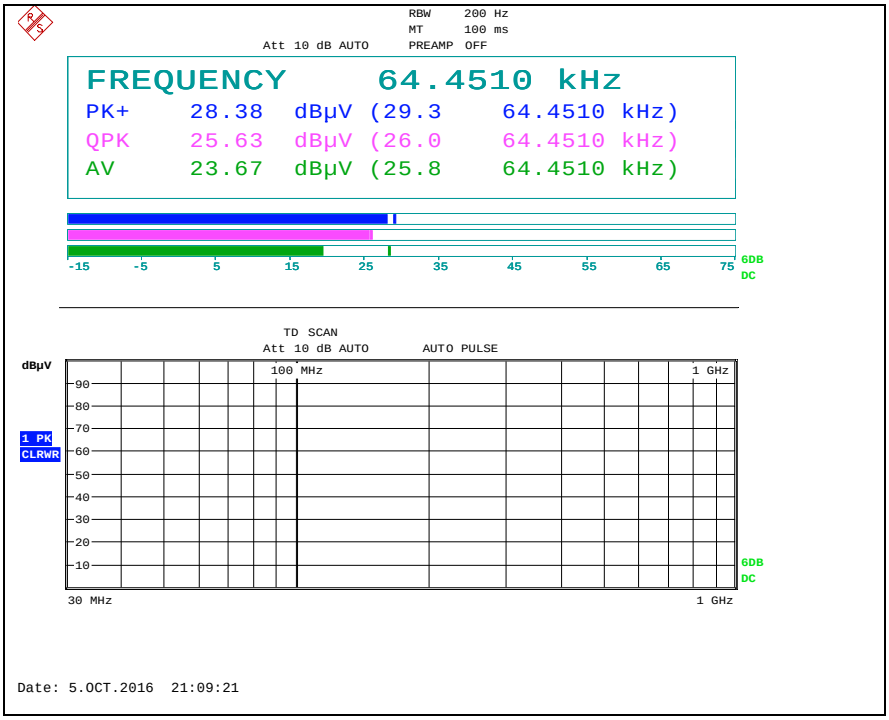


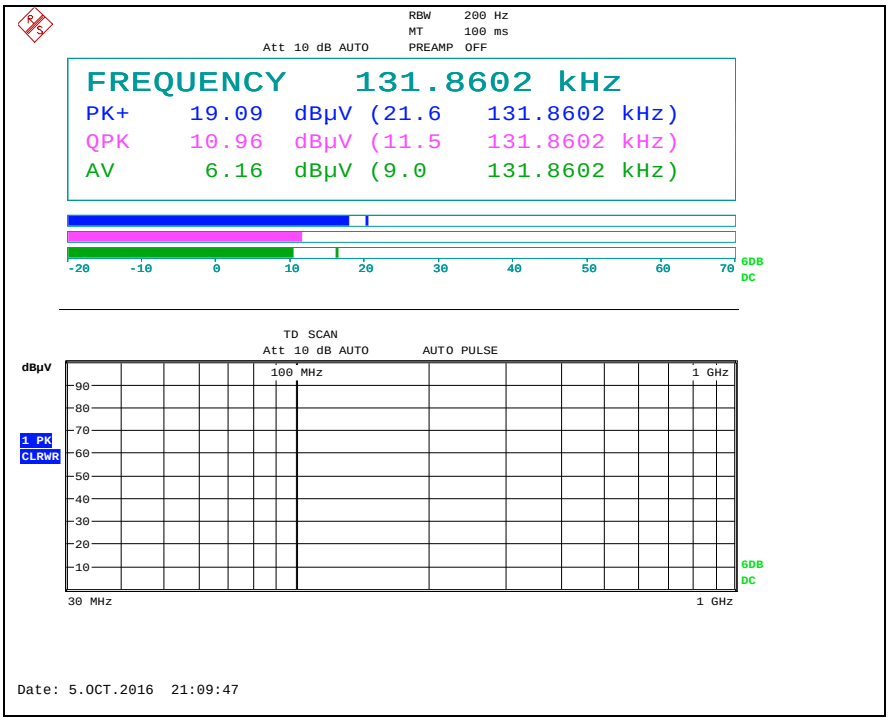


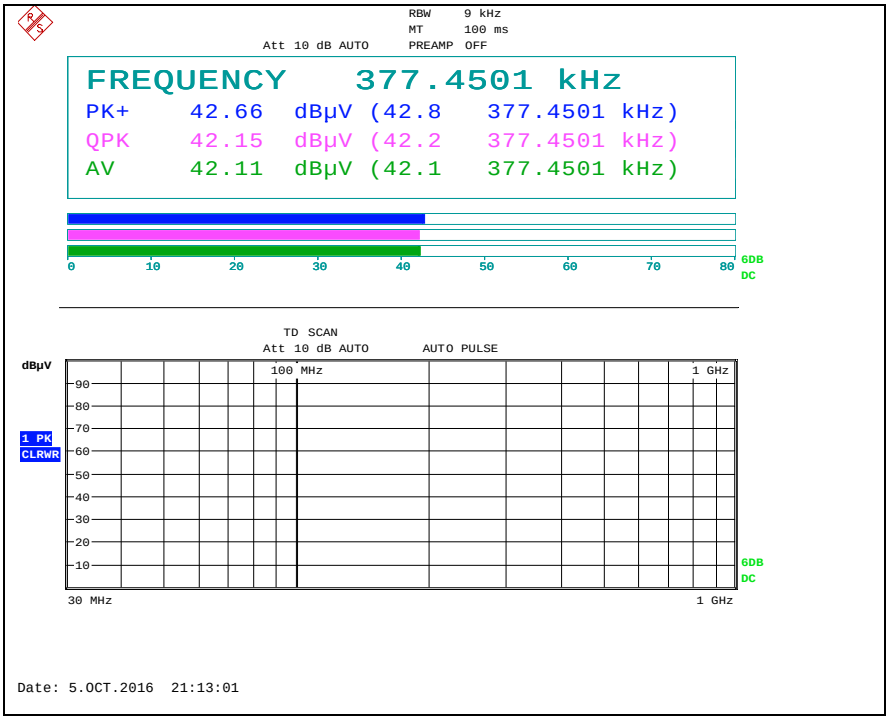
100% battery status of client device

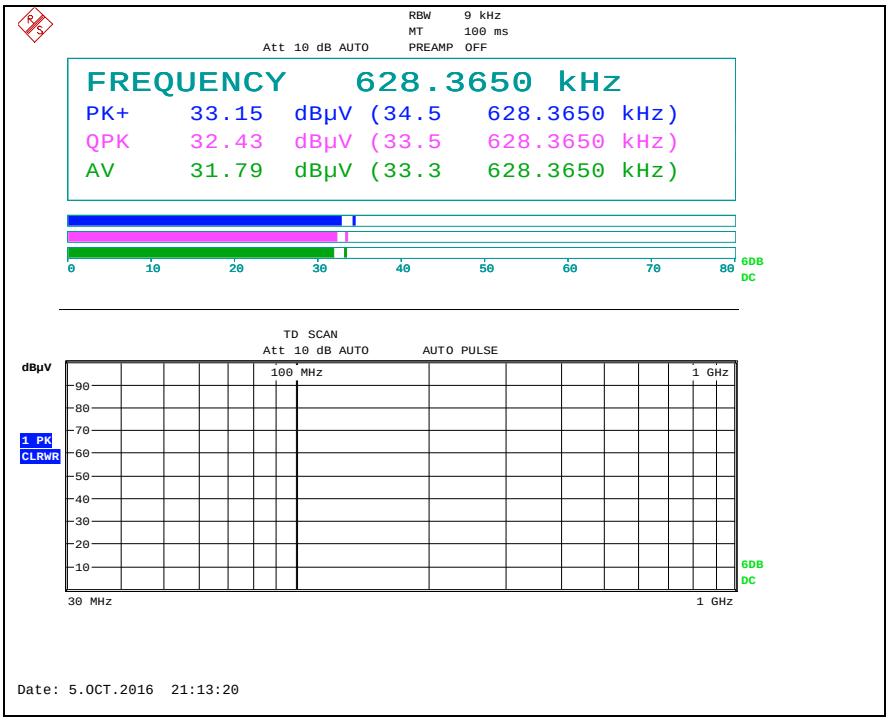


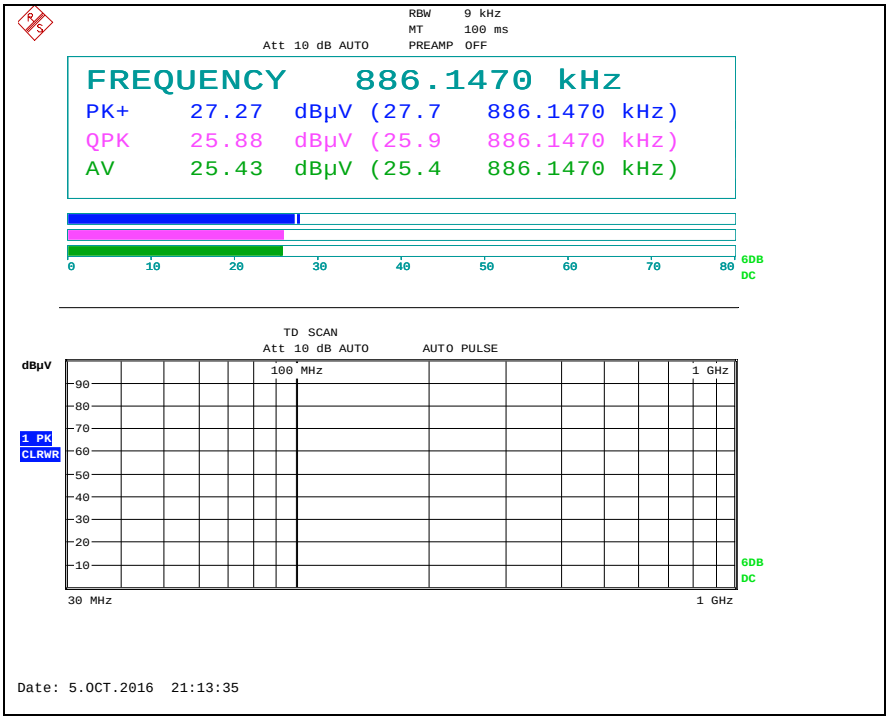








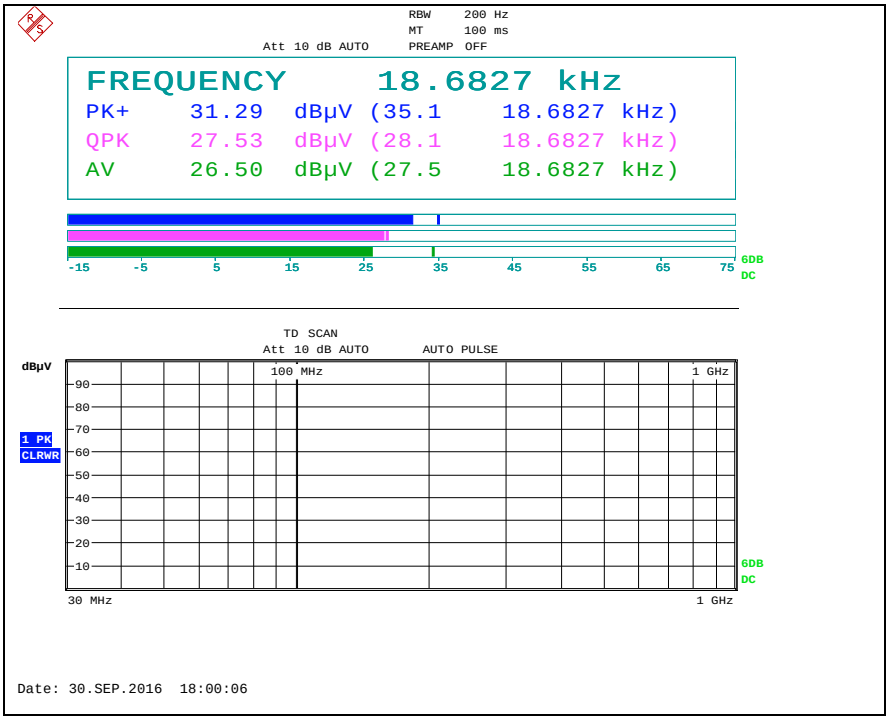


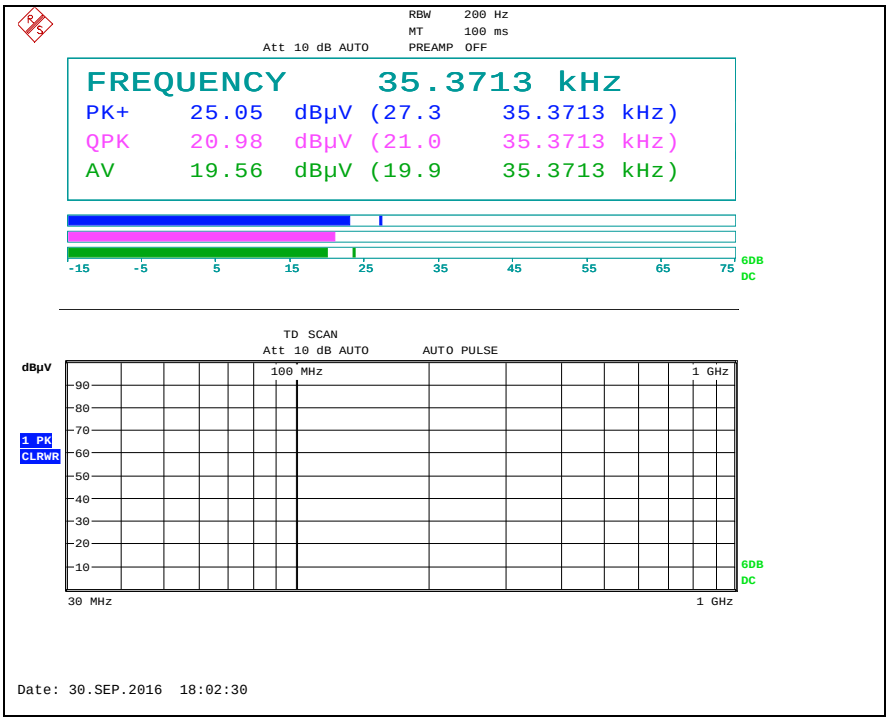

RBW 9 kHz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 886.1470 kHz
PK+ 27.27 dBµV (27.7 886.1470 kHz)
QPK 25.88 dBµV (25.9 886.1470 kHz)
AV 25.43 dBµV (25.4 886.1470 kHz)
0 10 20 30 40 50 60 70 80
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
90 80 70 60 50 40 30 20 10
1 PK
CLRWR
6DB
DC
30 MHz
1 GHz
Date: 5.OCT.2016 21:13:35

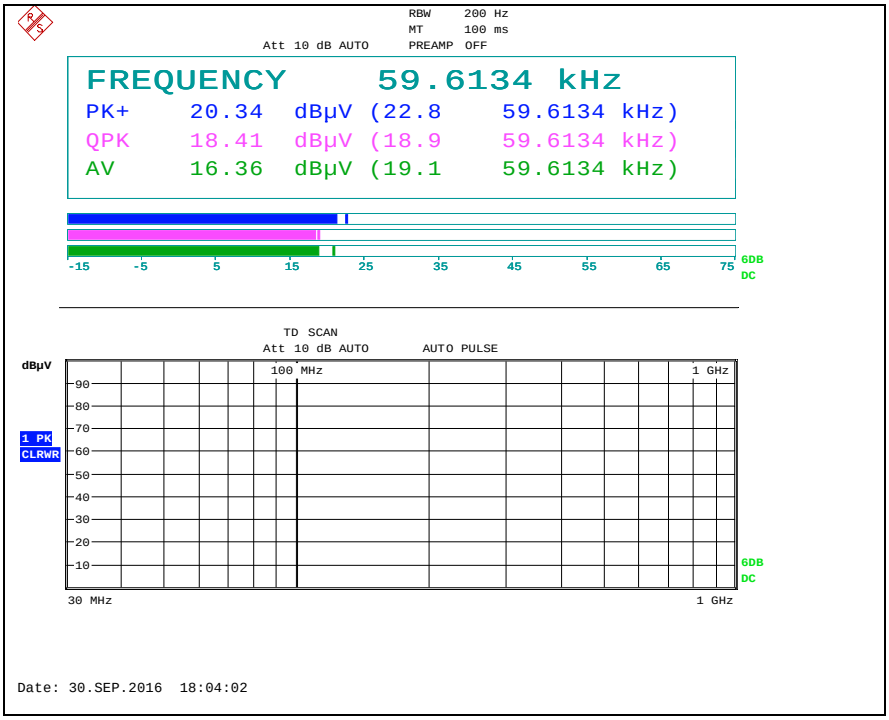
Test Condition : DC 9 V Charging mode

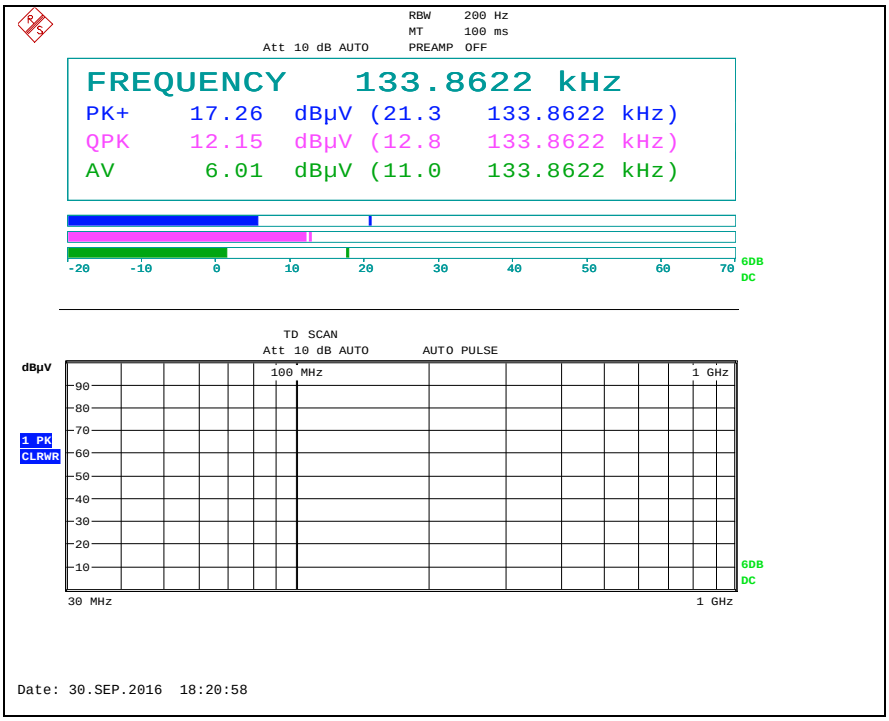
Below 30 ㎒

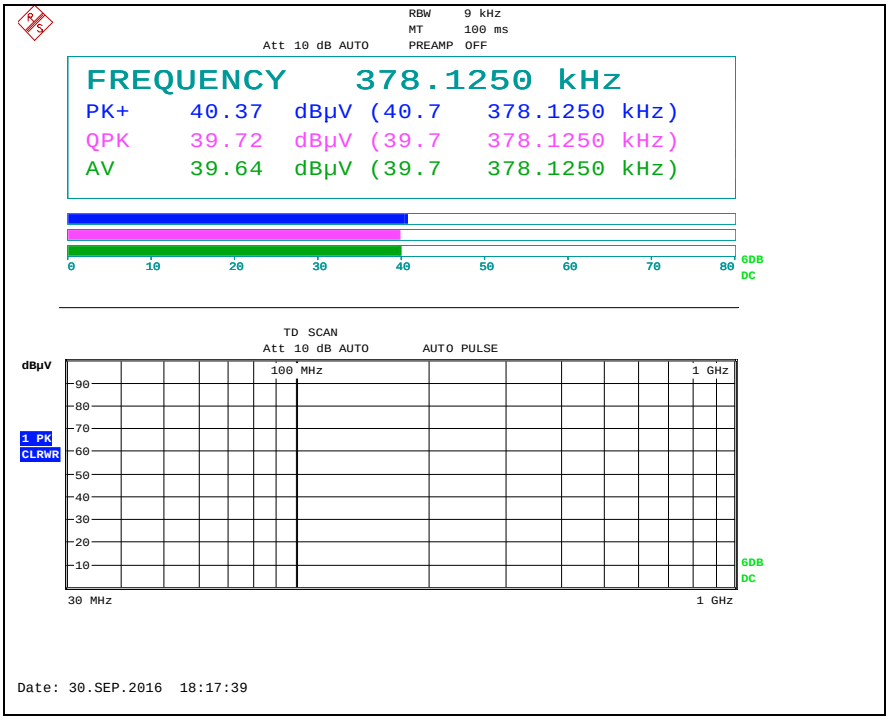
Less than 1 % battery status of client device

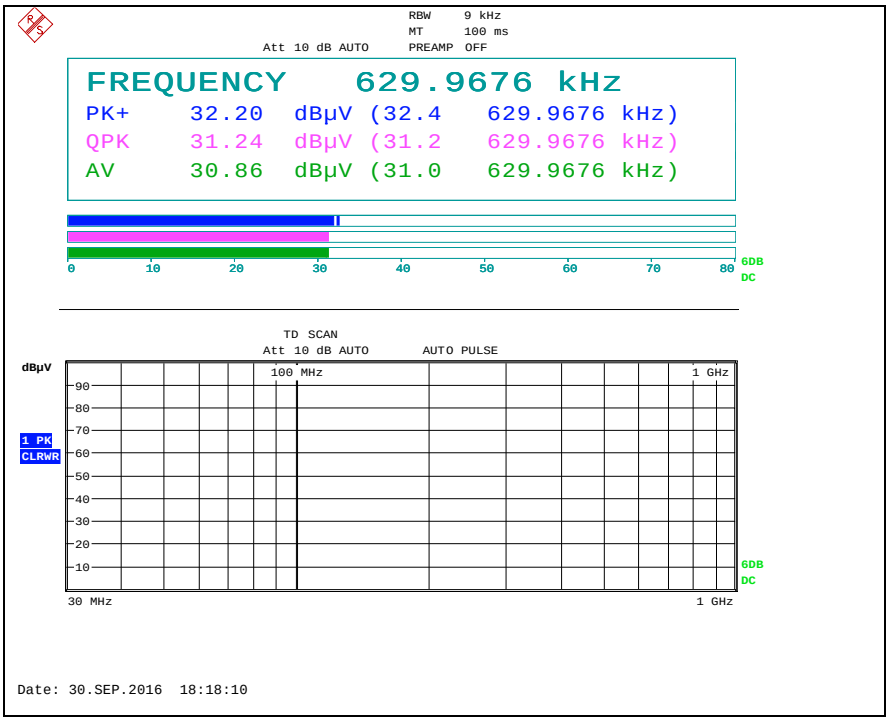


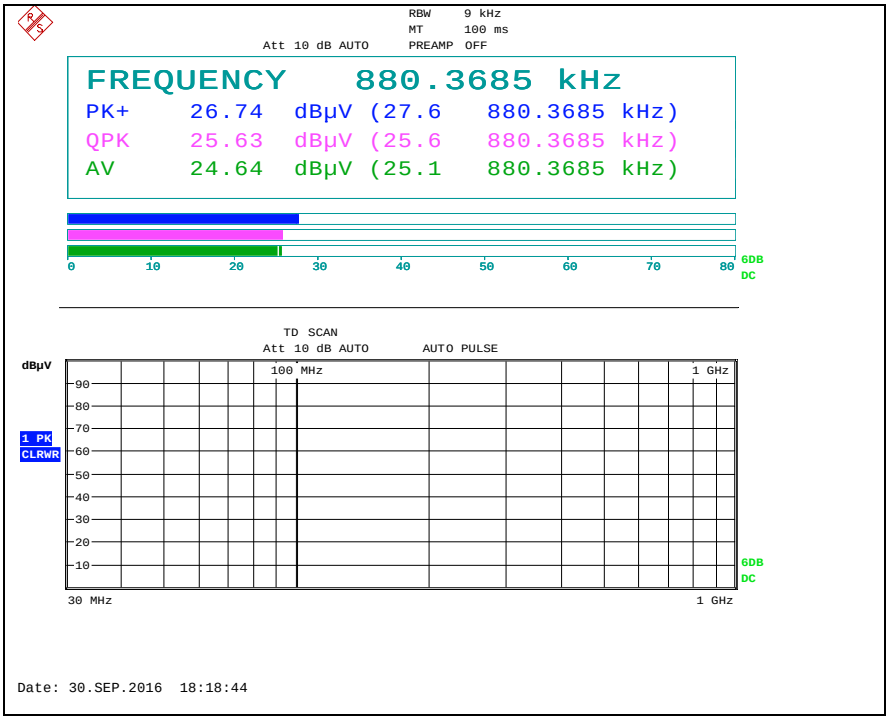


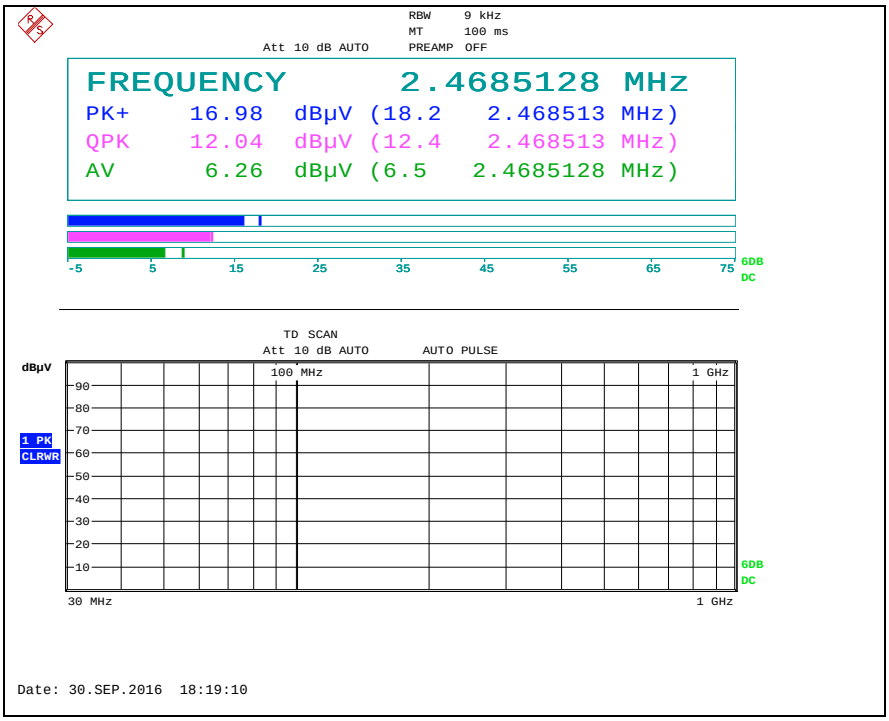

RBW 200 Hz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 59.6134 kHz
PK+ 20.34 dBµV (22.8 59.6134 kHz)
QPK 18.41 dBµV (18.9 59.6134 kHz)
AV 16.36 dBµV (19.1 59.6134 kHz)
-15 -5 5 15 25 35 45 55 65 75
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
90 80 70 60 50 40 30 20 10
1 PK
CLRWR
6DB
DC
30 MHz
1 GHz
Date: 30.SEP.2016 18:04:02


RBW 200 Hz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 133.8622 kHz
PK+ 17.26 dBµV (21.3 133.8622 kHz)
QPK 12.15 dBµV (12.8 133.8622 kHz)
AV 6.01 dBµV (11.0 133.8622 kHz)
-20 -10 0 10 20 30 40 50 60 70
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
90 80 70 60 50 40 30 20 10
1 PK
CLRWR
6DB
DC
30 MHz
1 GHz
Date: 30.SEP.2016 18:20:58

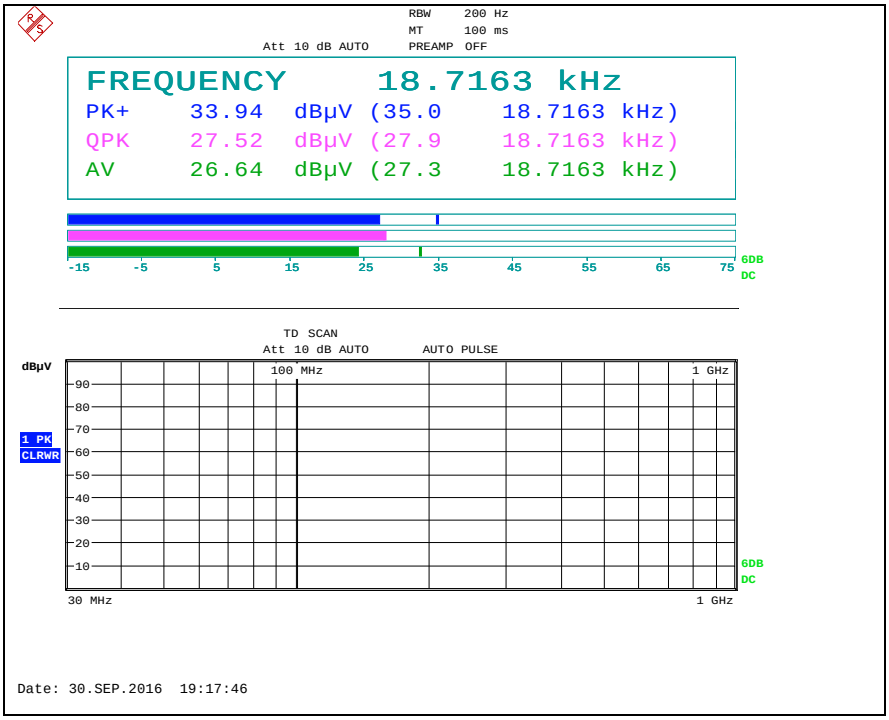

RBW 9 kHz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 378.1250 kHz
PK+ 40.37 dBµV (40.7 378.1250 kHz)
QPK 39.72 dBµV (39.7 378.1250 kHz)
AV 39.64 dBµV (39.7 378.1250 kHz)
0 10 20 30 40 50 60 70 80
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
6DB
DC
30 MHz
1 GHz
Date: 30.SEP.2016 18:17:39

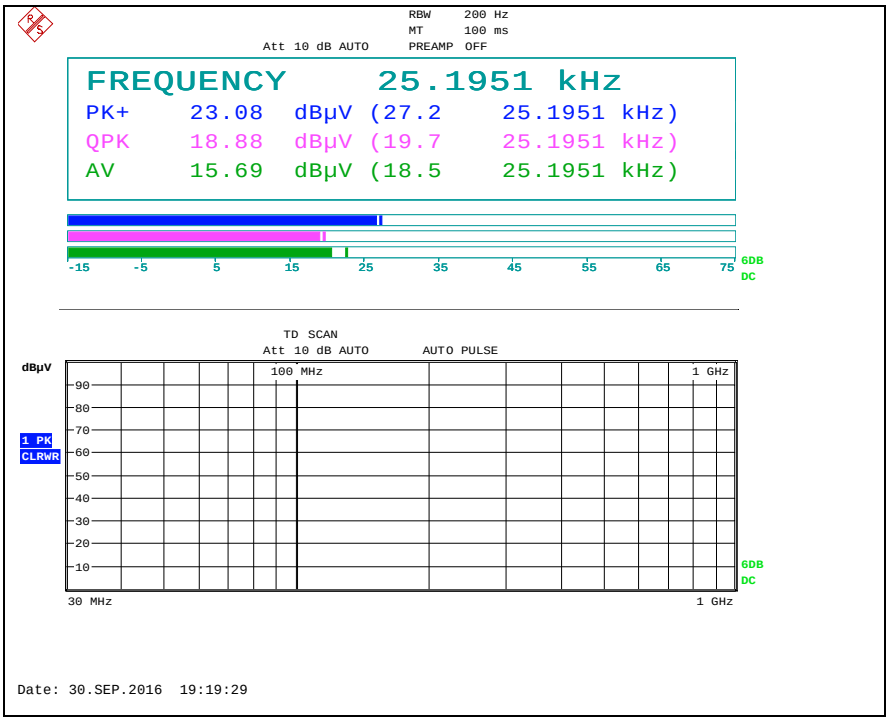

RBW 9 kHz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 629.9676 kHz
PK+ 32.20 dBµV (32.4 629.9676 kHz)
QPK 31.24 dBµV (31.2 629.9676 kHz)
AV 30.86 dBµV (31.0 629.9676 kHz)
0 10 20 30 40 50 60 70 80
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
6DB
DC
30 MHz
1 GHz
Date: 30.SEP.2016 18:18:10

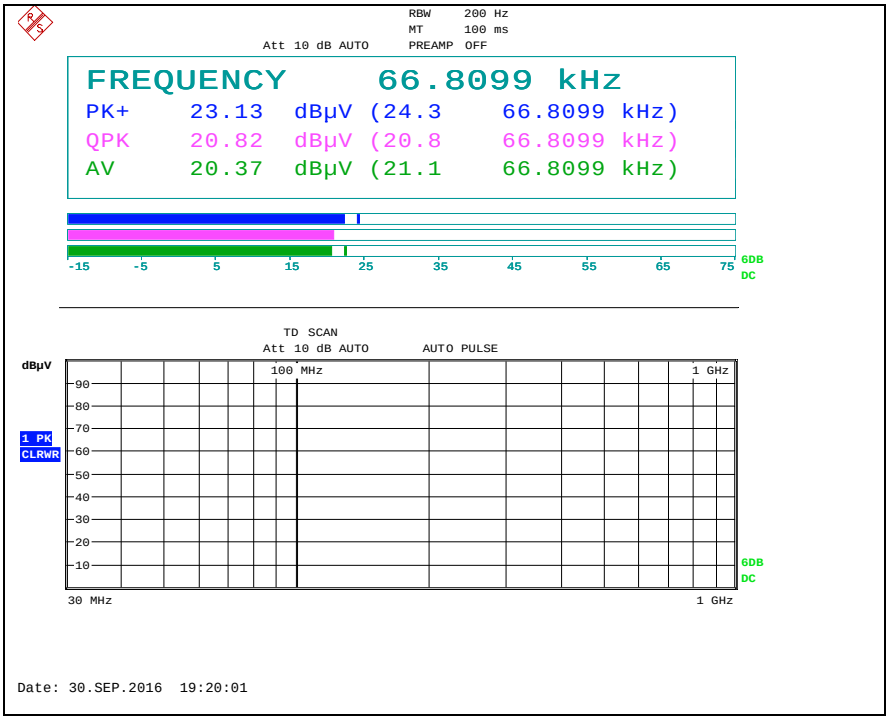


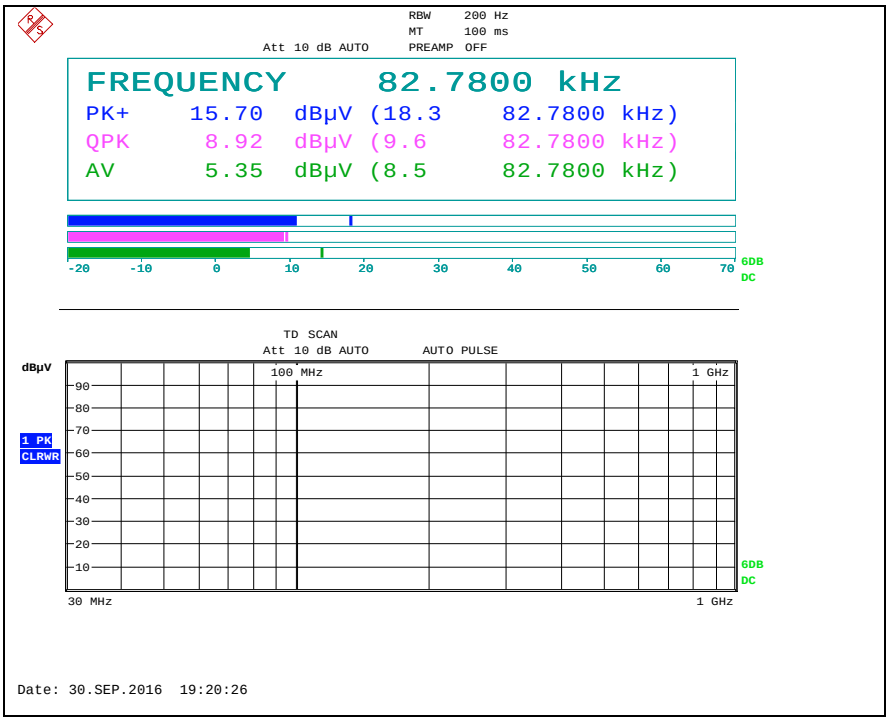


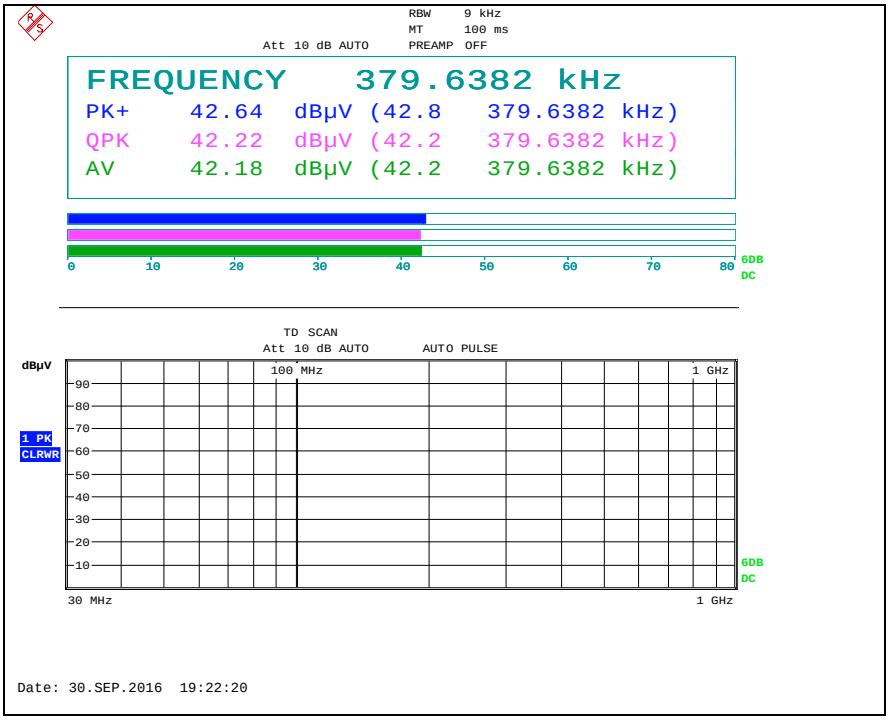
Less than 50 % battery status of client device

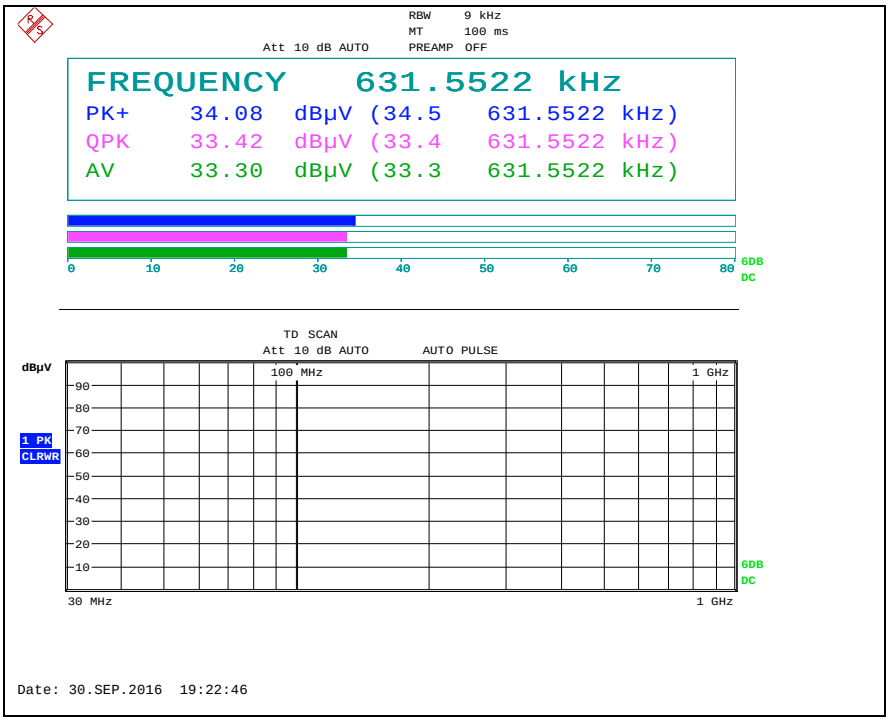


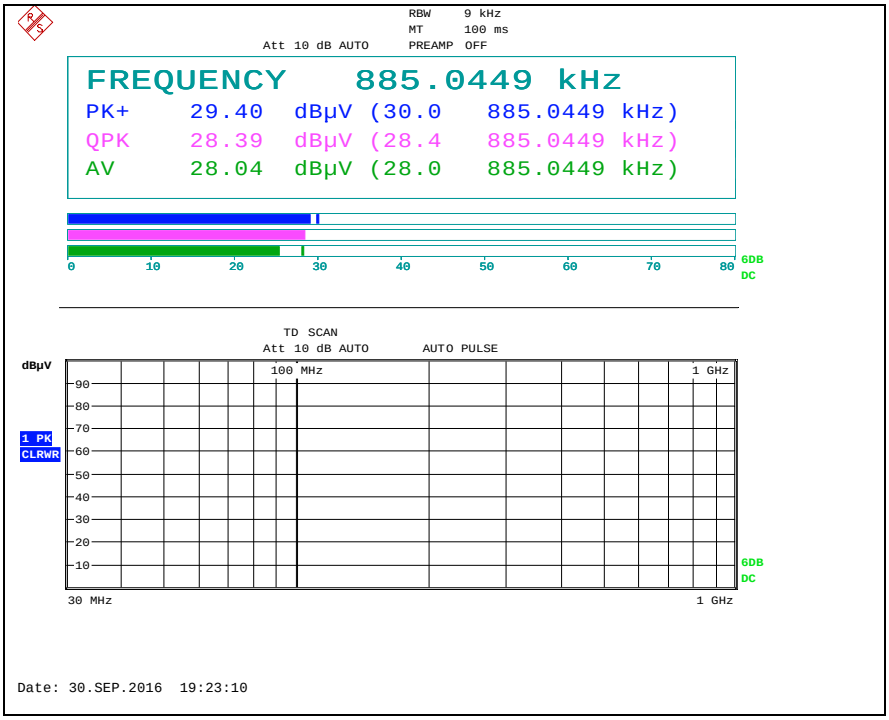


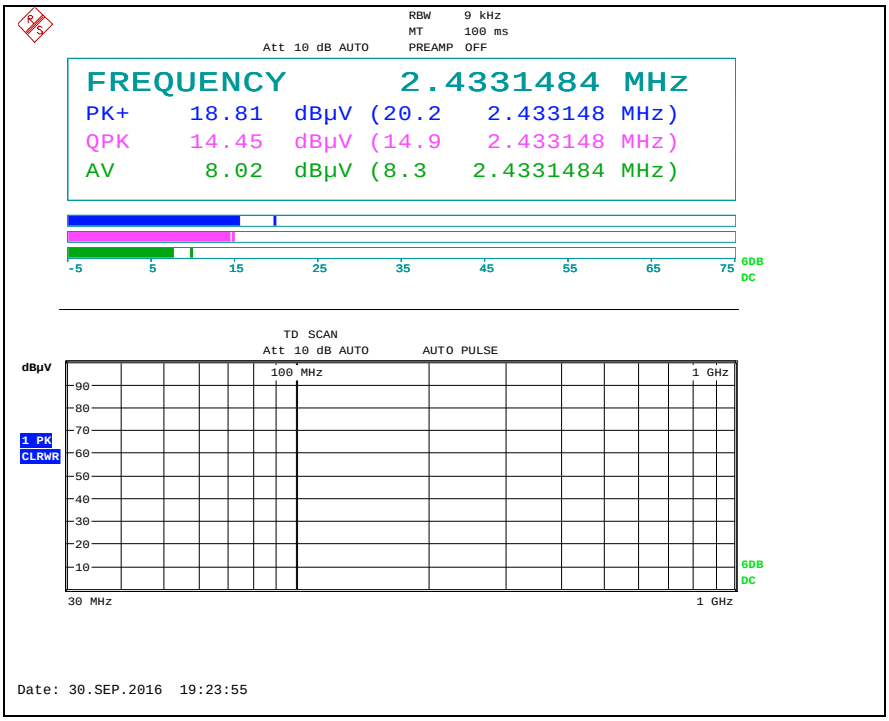

RBW 200 Hz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 66.8099 kHz
PK+ 23.13 dBµV (24.3 66.8099 kHz)
QPK 20.82 dBµV (20.8 66.8099 kHz)
AV 20.37 dBµV (21.1 66.8099 kHz)
-15 -5 5 15 25 35 45 55 65 75
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
30 MHz
1 GHz
Date: 30.SEP.2016 19:20:01


RBW 200 Hz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 82.7800 kHz
PK+ 15.70 dBµV (18.3 82.7800 kHz)
QPK 8.92 dBµV (9.6 82.7800 kHz)
AV 5.35 dBµV (8.5 82.7800 kHz)
-20 -10 0 10 20 30 40 50 60 70
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
30 MHz
1 GHz
Date: 30.SEP.2016 19:20:26

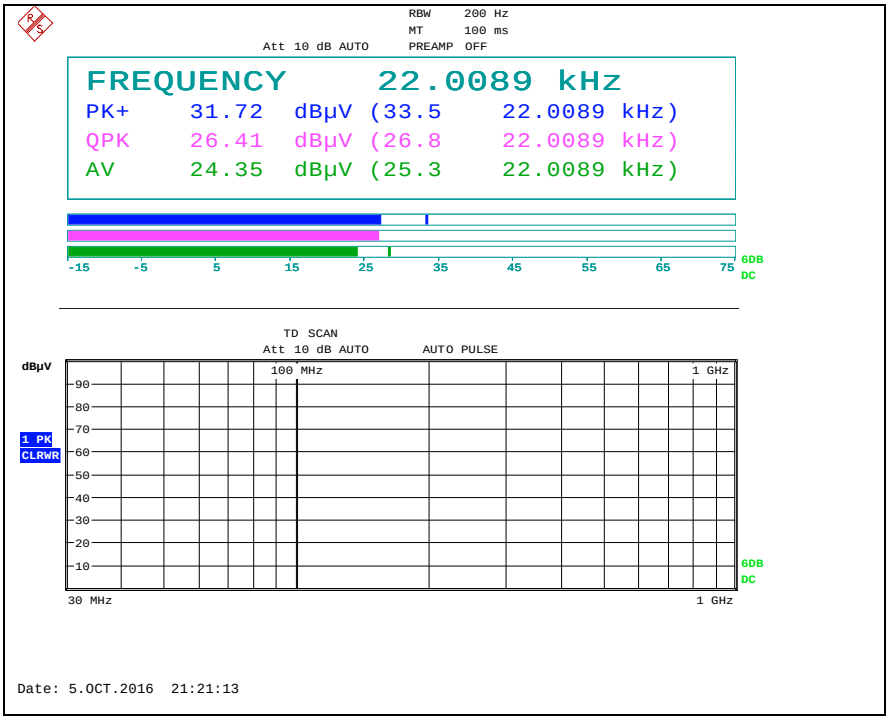


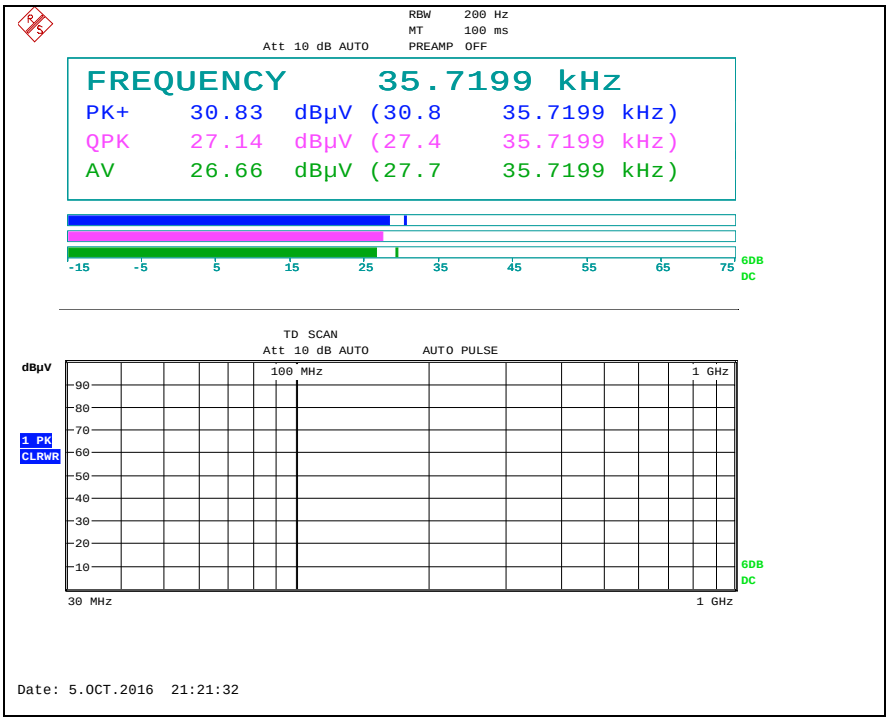


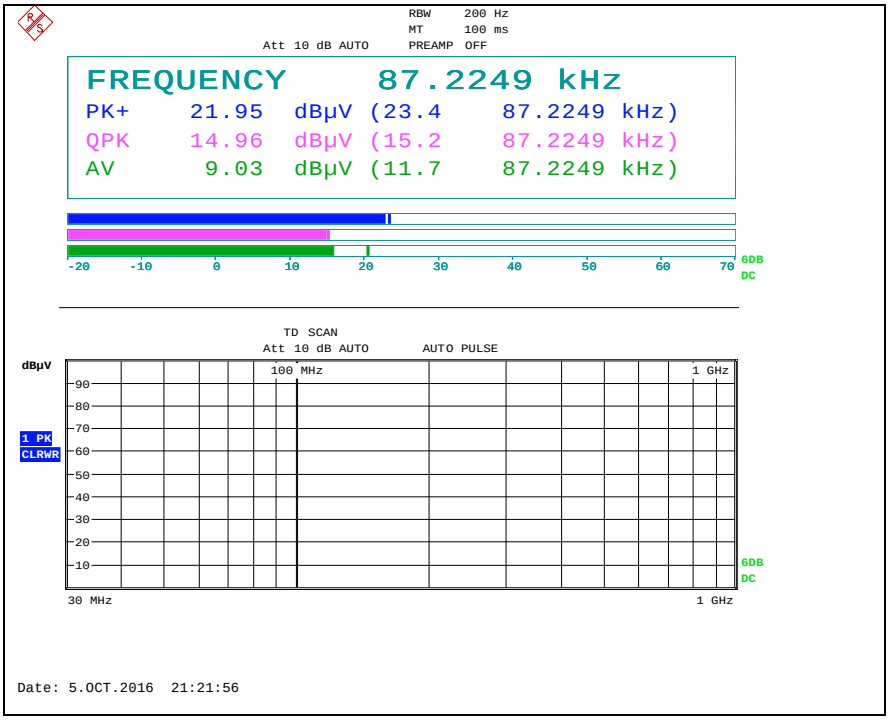


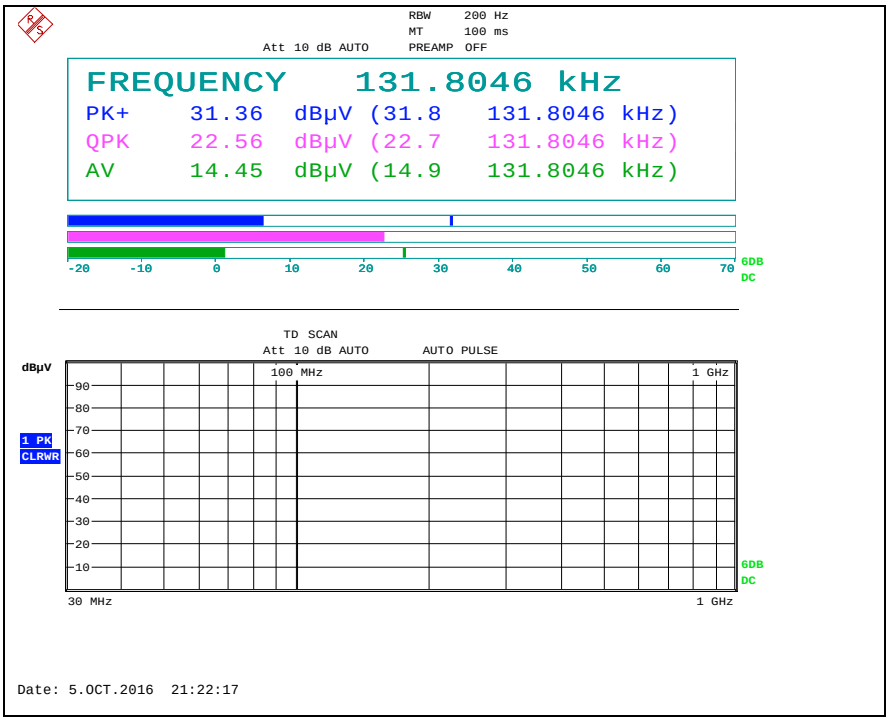


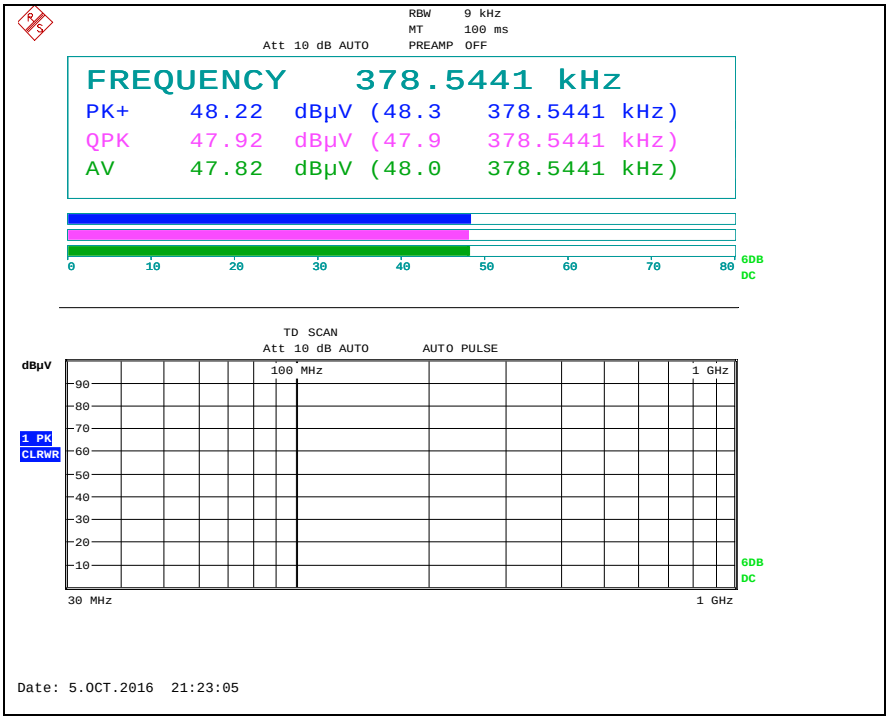
100% battery status of client device

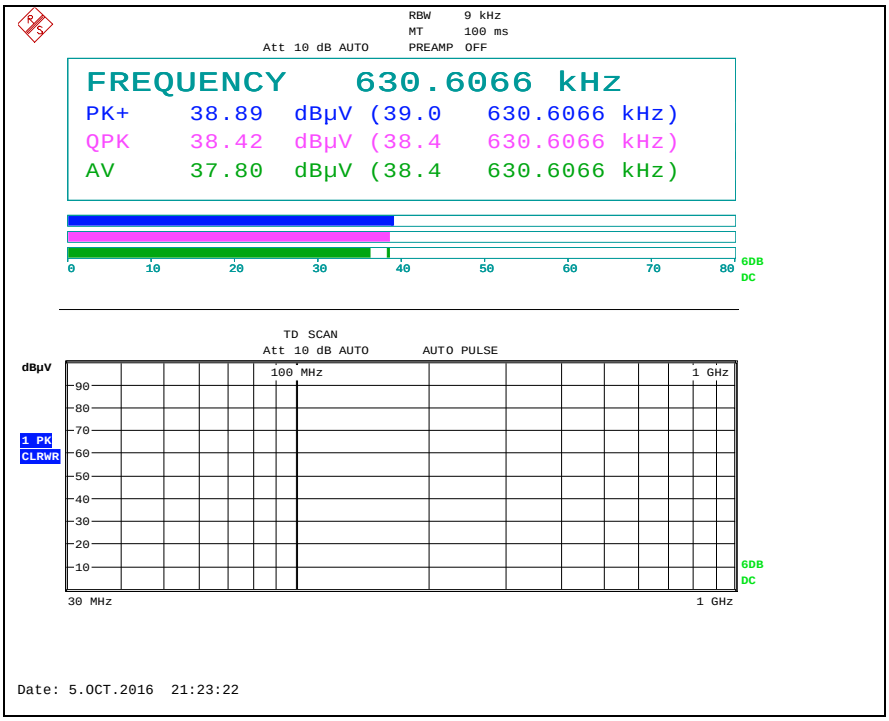


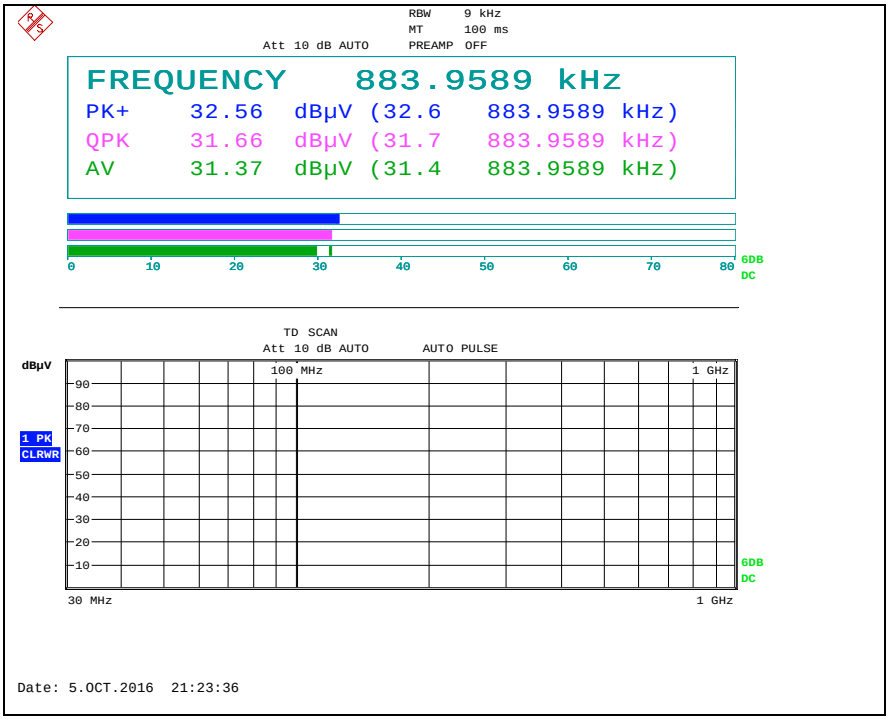



RBW 200 Hz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 87.2249 kHz
PK+ 21.95 dBµV (23.4 87.2249 kHz)
QPK 14.96 dBµV (15.2 87.2249 kHz)
AV 9.03 dBµV (11.7 87.2249 kHz)
-20 -10 0 10 20 30 40 50 60 70
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
30 MHz
1 GHz
Date: 5.OCT.2016 21:21:56


RBW 200 Hz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 131.8046 kHz
PK+ 31.36 dBµV (31.8 131.8046 kHz)
QPK 22.56 dBµV (22.7 131.8046 kHz)
AV 14.45 dBµV (14.9 131.8046 kHz)
-20 -10 0 10 20 30 40 50 60 70
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
1 PK
CLRWR
90 80 70 60 50 40 30 20 10
30 MHz
1 GHz
Date: 5.OCT.2016 21:22:17

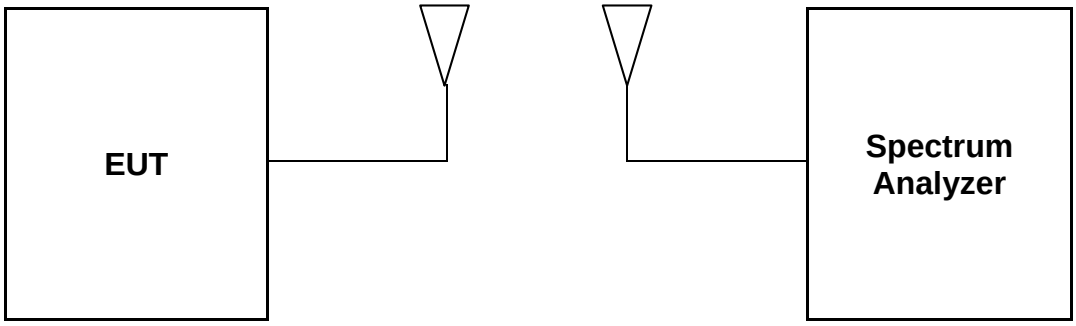

RBW 9 kHz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 378.5441 kHz
PK+ 48.22 dBµV (48.3 378.5441 kHz)
QPK 47.92 dBµV (47.9 378.5441 kHz)
AV 47.82 dBµV (48.0 378.5441 kHz)
0 10 20 30 40 50 60 70 80
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
90 80 70 60 50 40 30 20 10
1 PK
CLRWR
6DB
DC
30 MHz
1 GHz
Date: 5.OCT.2016 21:23:05


RBW 9 kHz
MT 100 ms
Att 10 dB AUTO PREAMP OFF
FREQUENCY 630.6066 kHz
PK+ 38.89 dBµV (39.0 630.6066 kHz)
QPK 38.42 dBµV (38.4 630.6066 kHz)
AV 37.80 dBµV (38.4 630.6066 kHz)
0 10 20 30 40 50 60 70 80
6DB
DC
TD SCAN
Att 10 dB AUTO AUTO PULSE
dBµV
100 MHz
1 GHz
90 80 70 60 50 40 30 20 10
1 PK
CLRWR
6DB
DC
30 MHz
1 GHz
Date: 5.OCT.2016 21:23:22



3. 20 dB Bandwidth

3.1. Test Setup



3.2. Limit

None; for reporting purposed only

3.3. 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 functions 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 : DC 5 V Charging mode

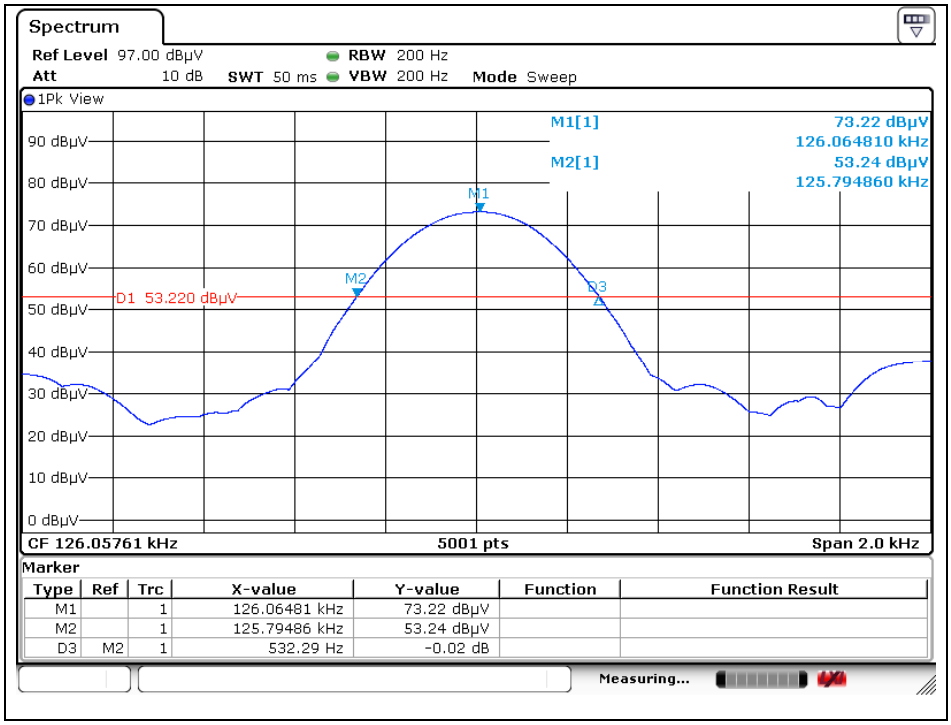
EUT status	20 dB Bandwidth (㎑)	Limit
With client device (less than 1 % battery status)	0.532	Reporting proposed only

Test Condition : DC 9 V Charging mode

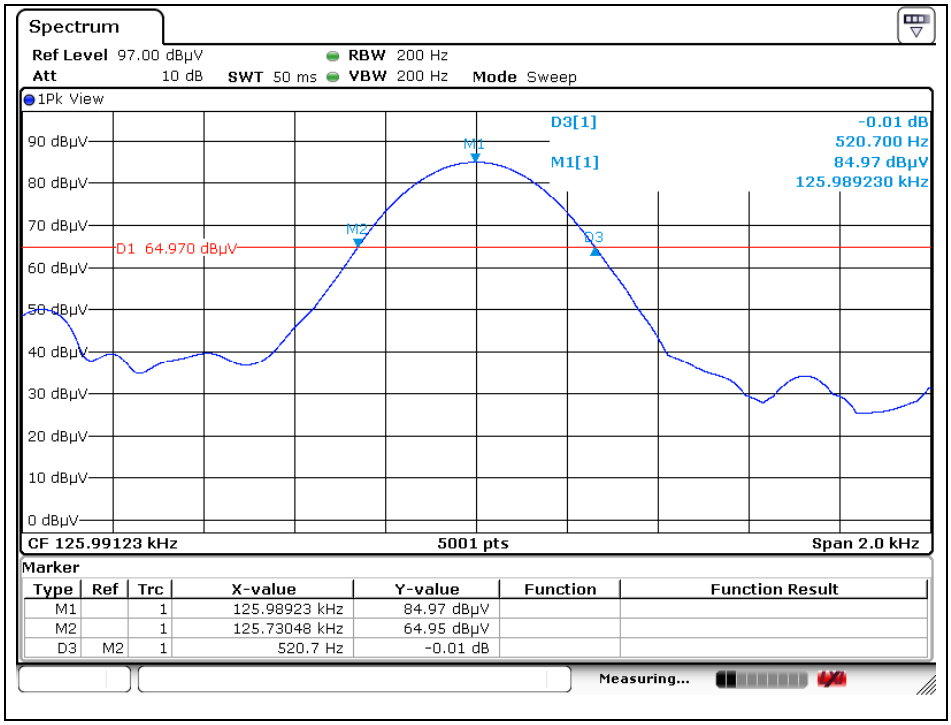
EUT status	20 dB Bandwidth (㎑)	Limit
With client device (less than 1 % battery status)	0.521	Reporting proposed only

Occupied Bandwidth

Test Condition : DC 5 V Charging mode

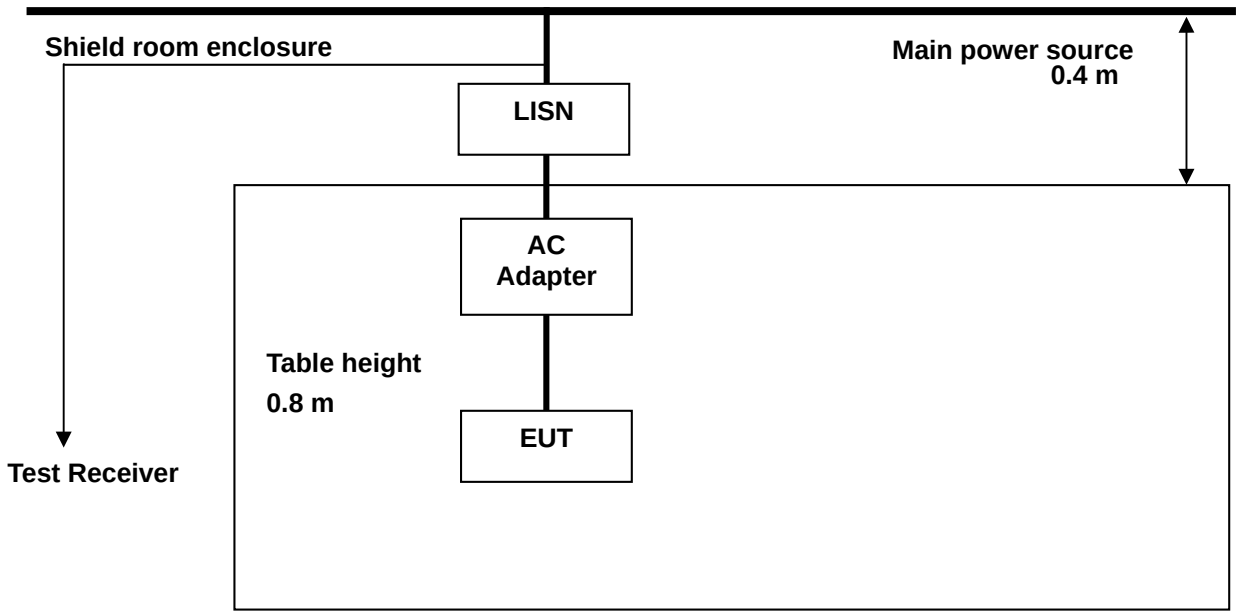


Test Condition : DC 9 V Charging mode



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 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50 ㎌ /50 ohm line impedance stabilization network(LISN).
Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency of Emission (㎒)	Conducted limit (dB㎶)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

* Decreases with the logarithm of the frequency.

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.

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 ± 1) ℃
Relative humidity : 47 % R.H.

Frequency range : 0.15 ㎒ – 30 ㎒
Measured Bandwidth : 9 ㎑

Test Condition : DC 5 V Charging mode

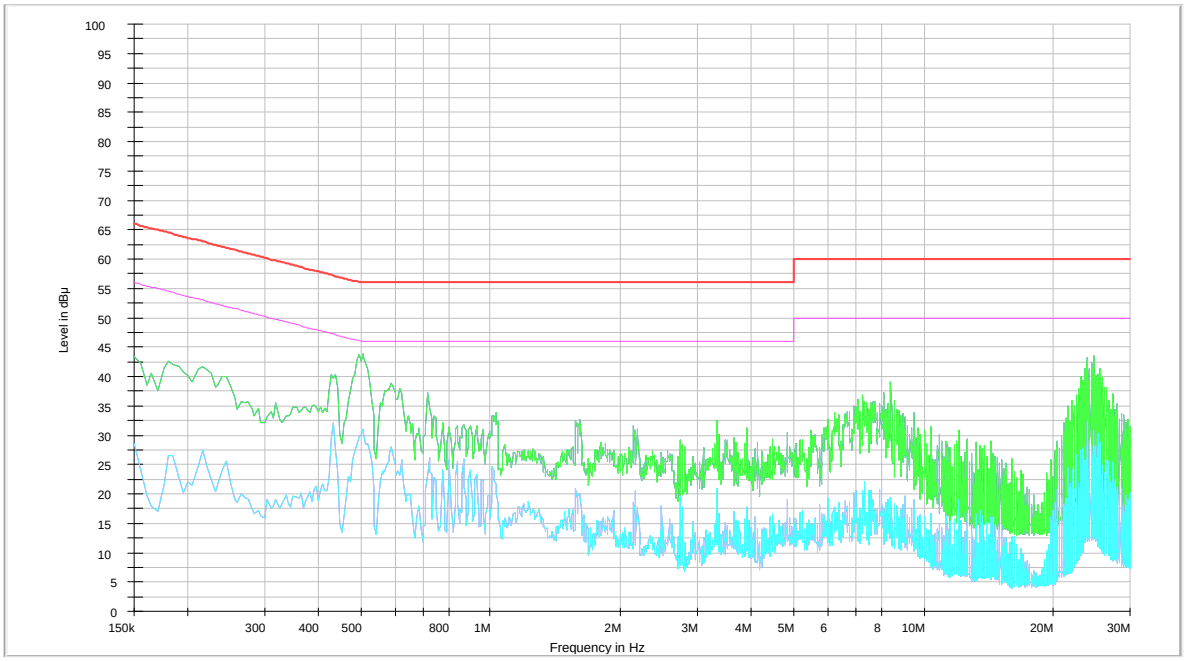
Less than 1 % battery status of client device

FREQ.	LEVEL(dBμV)		LINE	LIMIT(dBμV)		MARGIN(dB)	
(㎒)	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.51	38.90	29.20	Neutral	56.00	46.00	17.10	16.80
1.03	39.00	29.40	Neutral	56.00	46.00	17.00	16.60
1.60	30.10	19.00	Neutral	56.00	46.00	25.90	27.00
3.36	23.40	14.40	Neutral	56.00	46.00	32.60	31.60
8.07	23.00	14.20	Neutral	60.00	50.00	37.00	35.80
23.86	33.20	18.50	Neutral	60.00	50.00	26.80	31.50
0.20	30.00	21.10	Hot	63.61	53.61	33.61	32.51
0.26	42.50	33.70	Hot	61.43	51.43	18.93	17.73
0.50	42.30	33.80	Hot	56.00	46.00	13.70	12.20
1.59	32.60	23.70	Hot	56.00	46.00	23.40	22.30
6.92	32.50	23.30	Hot	60.00	50.00	27.50	26.70
24.39	35.80	22.70	Hot	60.00	50.00	24.20	27.30

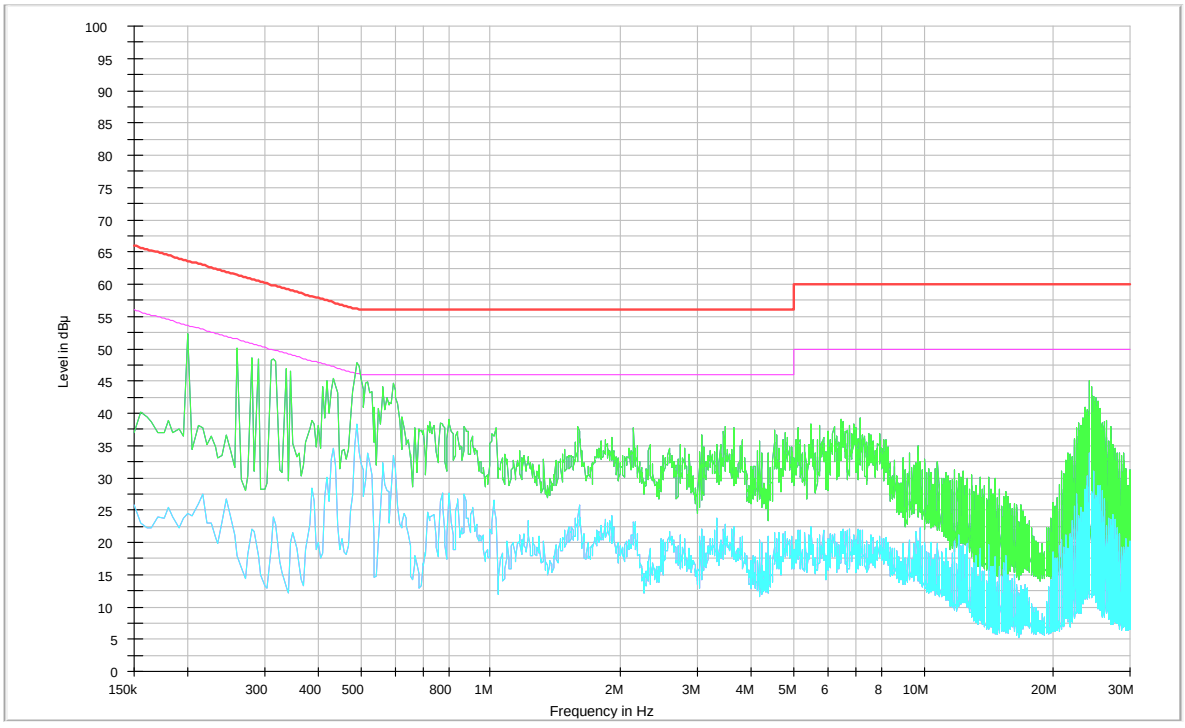
Note ;

1. Line (H): Hot, Line (N): Neutral
2. All antennas of operation and charging mode with client device (1 %, 50 %, and 100 % of battery) were tested.
   As worst condition, charging mode with client device (1 %) is reported.
3. The limit for Class B device(s) from 150 ㎑ to 30 ㎒ 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.

Test mode: (Neutral)



Test mode: (Hot)



Test Condition : DC 9 V Charging mode

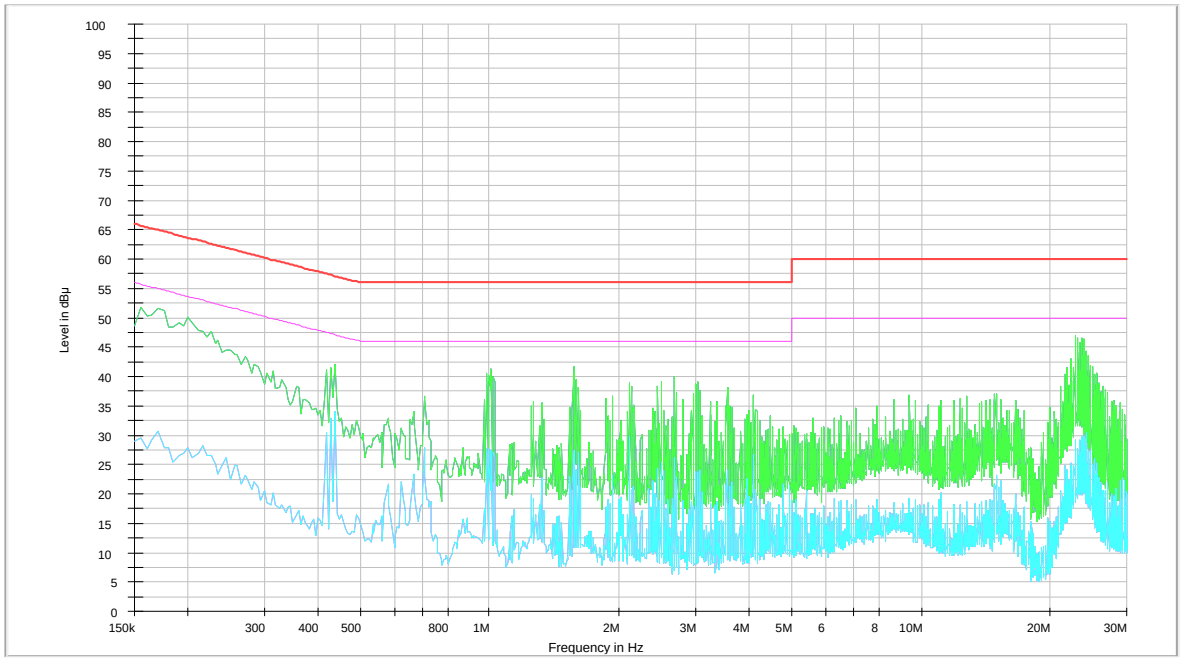
Less than 1 % battery status of client device

FREQ.	LEVEL(dBμV)		LINE	LIMIT(dBμV)		MARGIN(dB)	
(MHz)	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.17	45.40	28.80	Neutral	64.96	54.96	19.56	26.16
0.43	45.60	28.70	Neutral	57.25	47.25	11.65	18.55
1.00	37.00	24.30	Neutral	56.00	46.00	19.00	21.70
1.59	36.90	22.90	Neutral	56.00	46.00	19.10	23.10
2.51	37.00	23.70	Neutral	56.00	46.00	19.00	22.30
23.41	34.90	21.40	Neutral	60.00	50.00	25.10	28.60
0.43	18.10	12.10	Hot	57.25	47.25	39.15	35.15
1.02	40.80	26.20	Hot	56.00	46.00	15.20	19.80
1.56	43.10	25.60	Hot	56.00	46.00	12.90	20.40
2.51	38.90	21.90	Hot	56.00	46.00	17.10	24.10
3.62	37.40	21.90	Hot	56.00	46.00	18.60	24.10
22.83	35.80	23.40	Hot	60.00	50.00	24.20	26.60

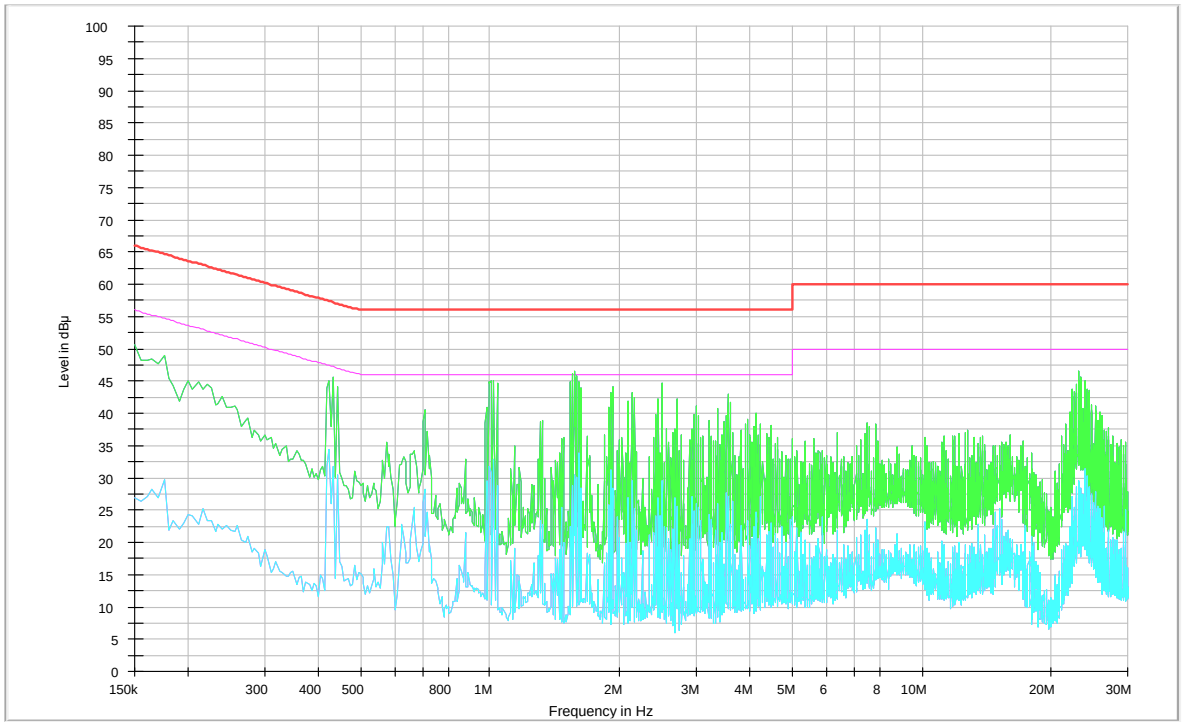
Note ;

1. Line (H): Hot, Line (N): Neutral
2. All antennas of operation and charging mode with client device (1 %, 50 %, and 100 % of battery) were tested.
   As worst condition, charging mode with client device (1 %) is reported.
3. The limit for Class B device(s) from 150 ㎑ to 30 ㎒ 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.

Test mode: (Neutral)



Test mode: (Hot)



- End of the Test Report -