

TEST REPORT

OF

FCC Part 15 Subpart C §15.209

FCC ID : OSLOKA-202W

Equipment Under Test : UNIT ASSY – WIRELESS CHARGING
Model Name : OKA-202W
Applicant : Omron Automotive Electronics Korea Co., Ltd.
Manufacturer : Omron Automotive Electronics Korea Co., Ltd.
Date of Receipt : 2016.11.01
Date of Test(s) : 2016.12.07 ~ 2016.12.13
Date of Issue : 2016.12.15

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

Tested By:



Jinhyoung Cho

Date:

2016.12.15

Technical
Manager:

Hyunchae You

Date:

2016.12.15

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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>.

Phone No. : +82 31 688 0901

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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, 17507, Korea

Contact Person : Nam, Sang-Il

Phone No. : +82 2 850 5789

1.3. Description of EUT

Kind of Product	UNIT ASSY – WIRELESS CHARGING
Model Name	OKA-202W
Power Supply	DC 12 V
Frequency Range	111 kHz (WPC)
Antenna Type	Inductive loop coil antenna
H/W Version	1.00
S/W Version	1.00

1.4. Declarations by the manufacturer

- Operation temperature: -30 °C ~ 75 °C
- The EUT has 3 loop coil antennas with one amplifier, and only one antenna can transmit at once.

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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. 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	INN-CO GmbH	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.
Mobile Test Unit	R&S	CMW 500	144034	Feb. 29, 2016	Annual	Feb. 28, 2017

► Support equipment

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

1.6. Sample calculation

Where relevant, the following sample calculation is provided:

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

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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	Mode	Description
Charging Mode with client device (Model : SM-G900L, FCC ID : A3LSMG900S)	Ant. 1	Less than 1 % of battery
		Less than 50 % of battery
		100 % full charging of battery
	Ant. 2	Less than 1 % of battery
		Less than 50 % of battery
		100 % full charging of battery
	Ant. 3	Less than 1 % of battery
		Less than 50 % of battery
		100 % full charging of battery

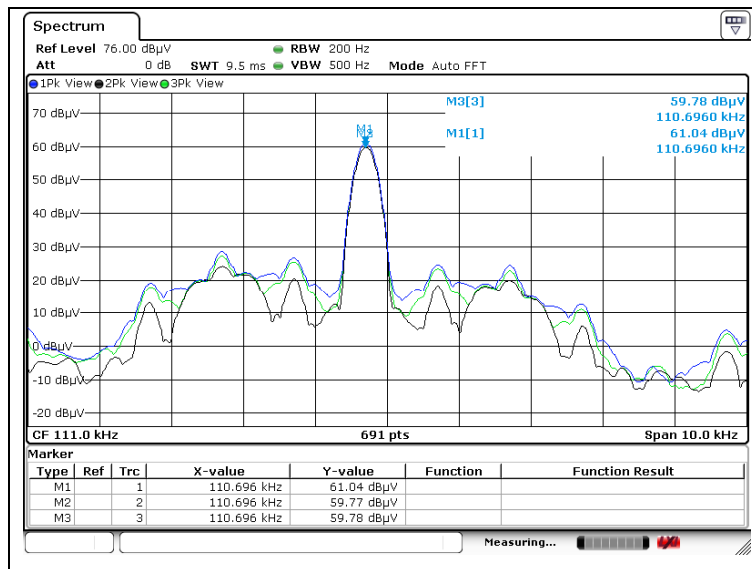
EUT setup configuration:

- The EUT has three power transfer zones.
- The EUT can be capable of charging one client at a time.
- The measurement is performed with a typical WPT client device on each power transfer zone.

Operating configurations :

Client device (SM- G900L)

- 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.

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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		
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

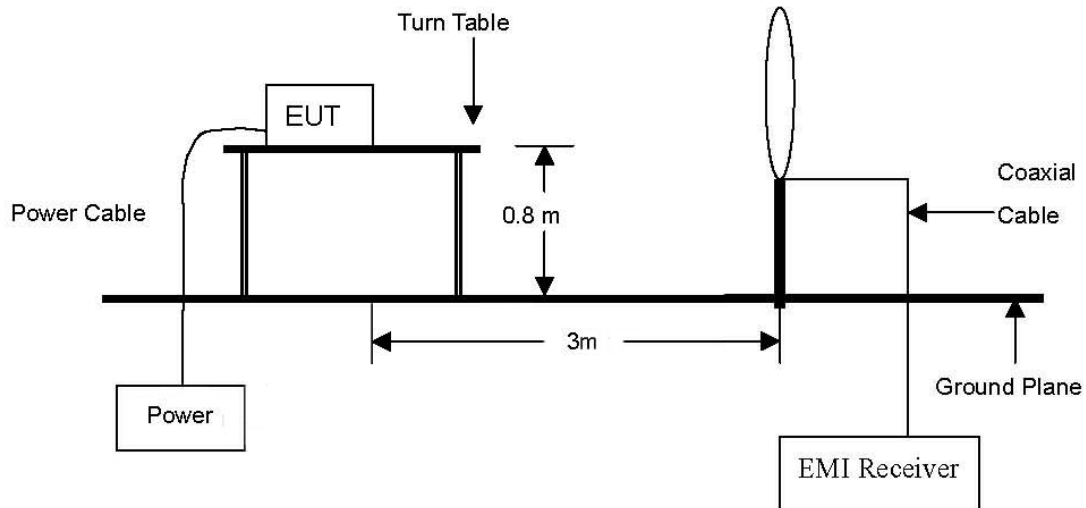
Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL010648	2016.12.15	Initial

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2. Field Strength of Fundamental and Spurious Emission

2.1. Test Setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz 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 (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meter)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., 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 C63.10-2013.

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

- 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.
- 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.
- 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.
- 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.

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2.4. Field Strength of Fundamental Test Result

Ambient temperature : (23 ± 1) °C
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: Ant. 1

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
Charging mode with client (less than 1 % battery status)									
0.111	64.50	Average	H	19.47	0.04	84.01	4.01	26.70	22.69
Charging mode with client (less than 50 % battery status)									
0.111	65.23	Average	H	19.47	0.04	84.74	4.74	26.70	21.96
Charging mode with client (100 % battery status)									
0.111	64.50	Average	H	19.47	0.04	84.01	4.01	26.70	22.69

Test condition: Ant. 2

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
Charging mode with client (less than 1 % battery status)									
0.111	64.80	Average	H	19.47	0.04	84.31	4.31	26.70	22.39
Charging mode with client (less than 50 % battery status)									
0.111	66.00	Average	H	19.47	0.04	85.51	5.51	26.70	21.19
Charging mode with client (100 % battery status)									
0.111	65.11	Average	H	19.47	0.04	84.62	4.62	26.70	22.08

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Test condition: Ant. 3

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
Charging mode with client (less than 1 % battery status)									
0.111	67.10	Average	H	19.47	0.04	86.61	6.61	26.70	20.09
Charging mode with client (less than 50 % battery status)									
0.111	67.90	Average	H	19.47	0.04	87.41	7.41	26.70	19.29
Charging mode with client (100 % battery status)									
0.111	67.20	Average	H	19.47	0.04	86.71	6.71	26.70	19.99

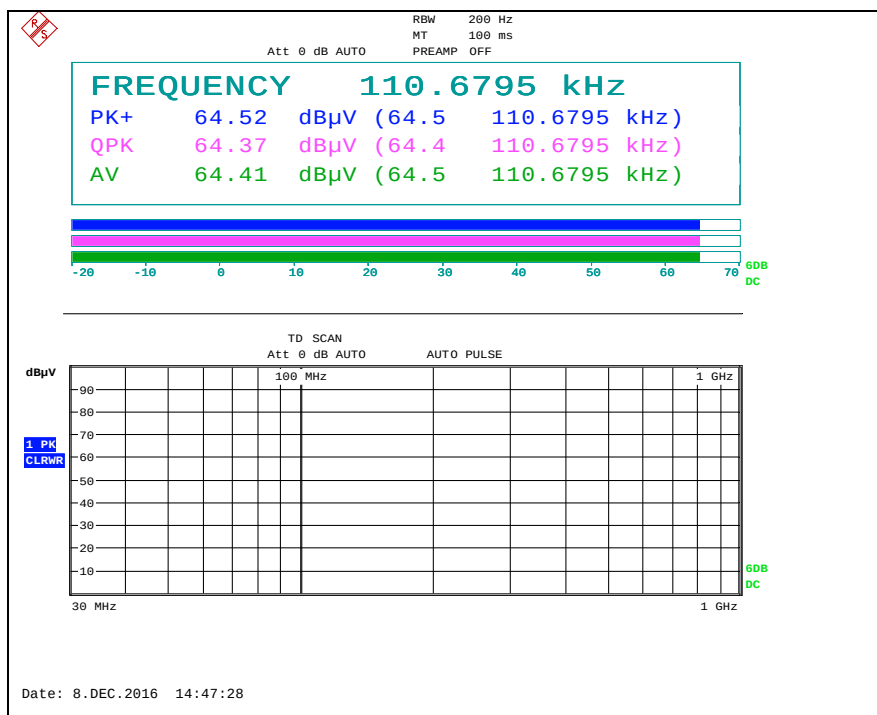
Note;

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

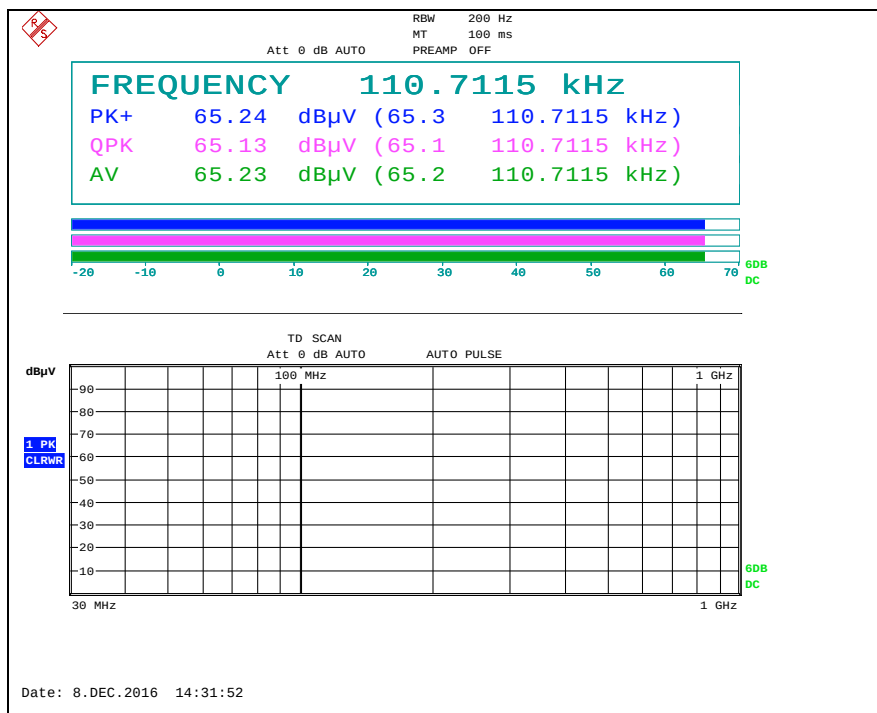
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Test condition: Ant. 1

Charging mode (less than 1 % battery status of client device)

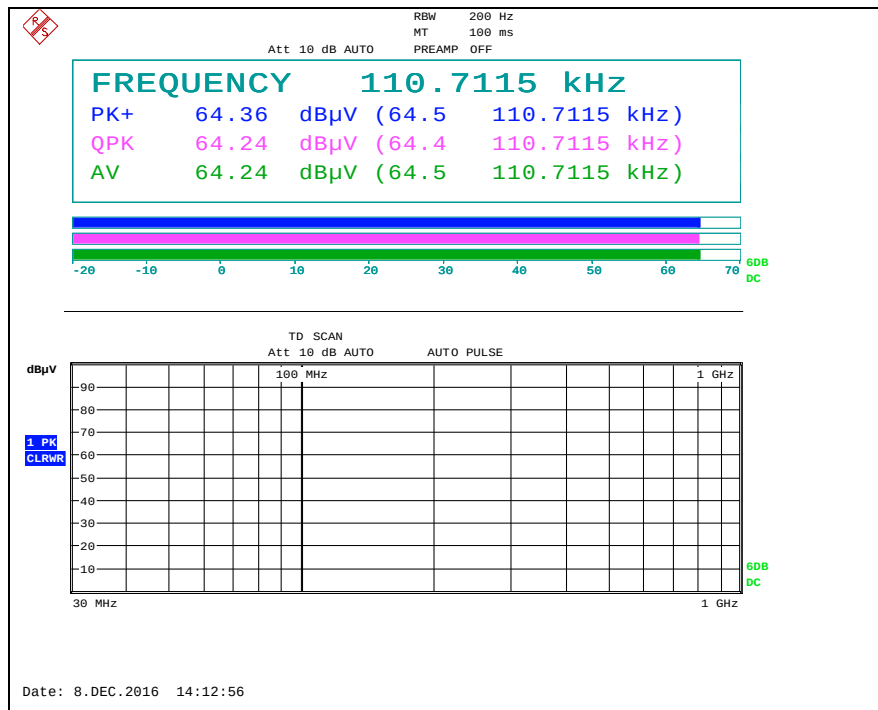


Charging mode (less than 50 % battery status of client device)



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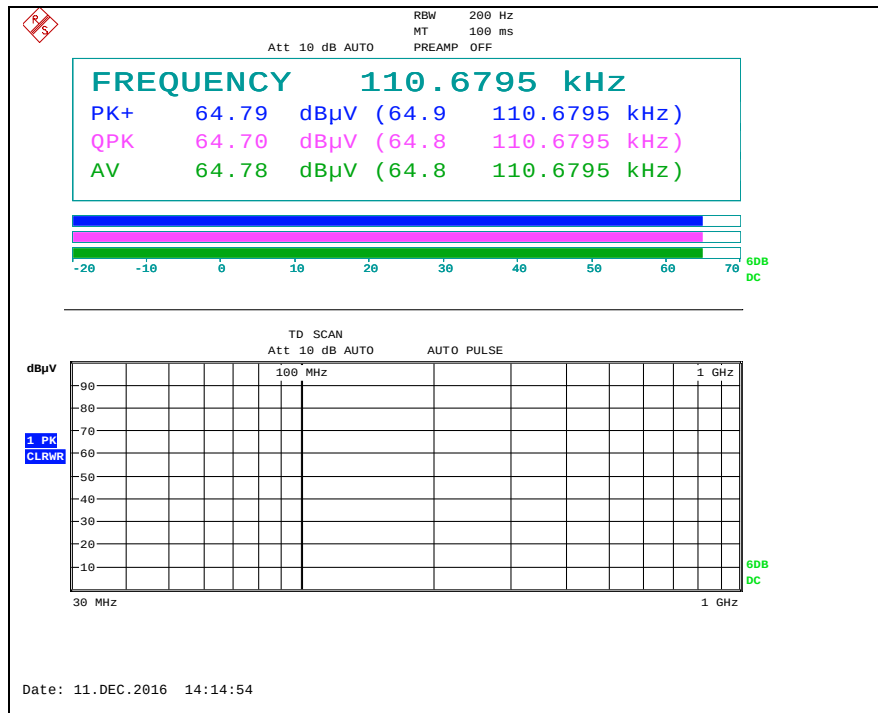
Charging mode (100 % battery status of client device)



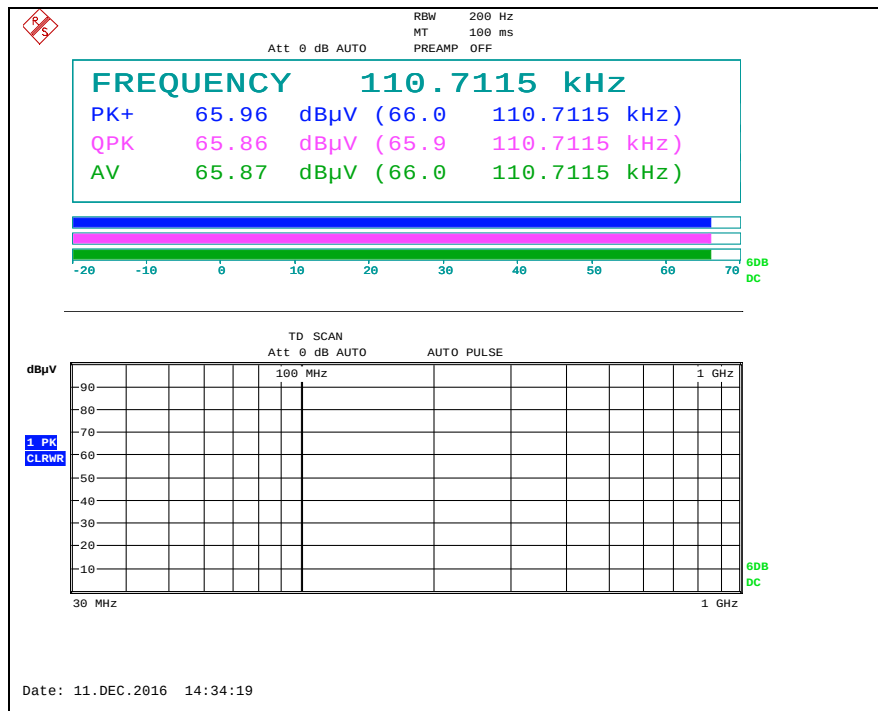
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Test condition: Ant. 2

Charging mode (less than 1 % battery status of client device)

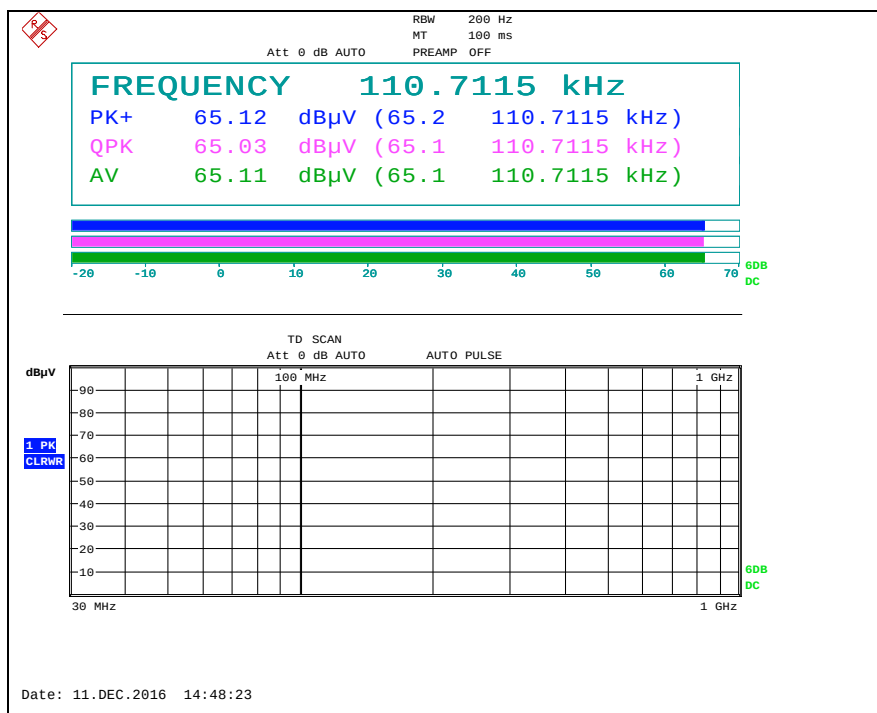


Charging mode (less than 50 % battery status of client device)



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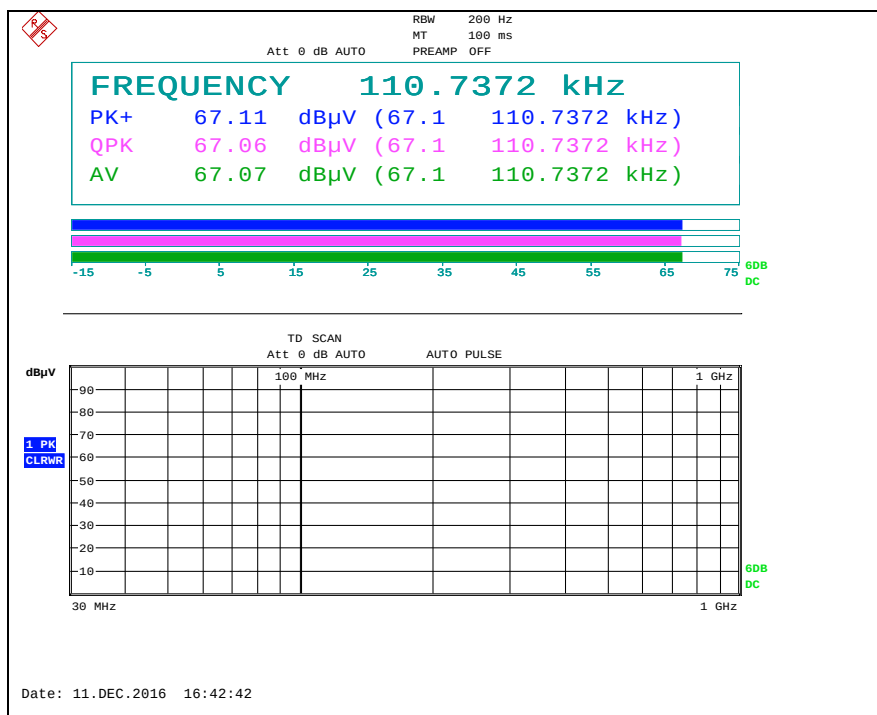
Charging mode (100 % battery status of client device)



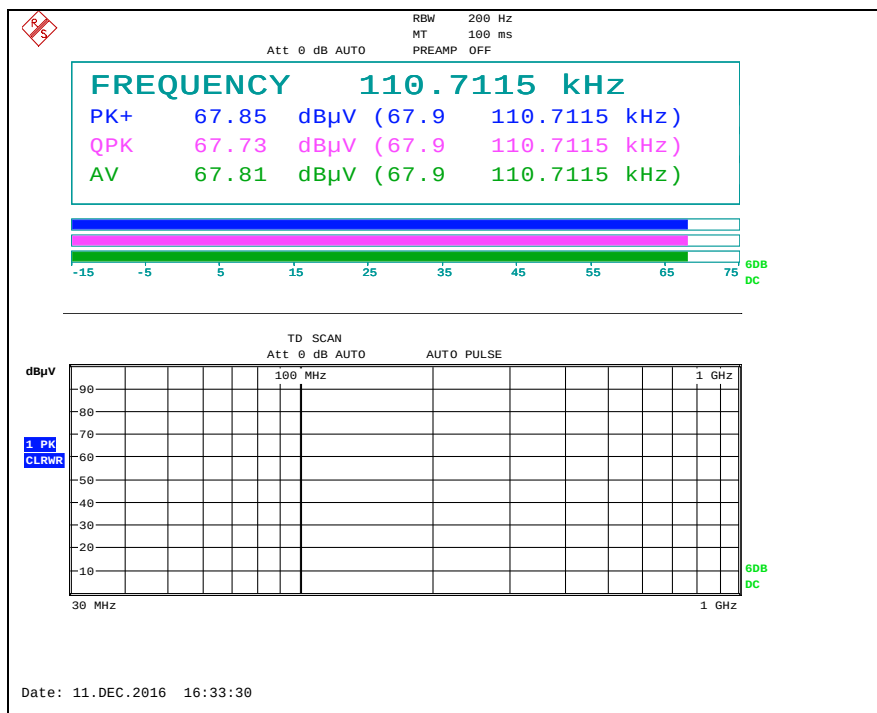
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Test condition: Ant. 3

Charging mode (less than 1 % battery status of client device)

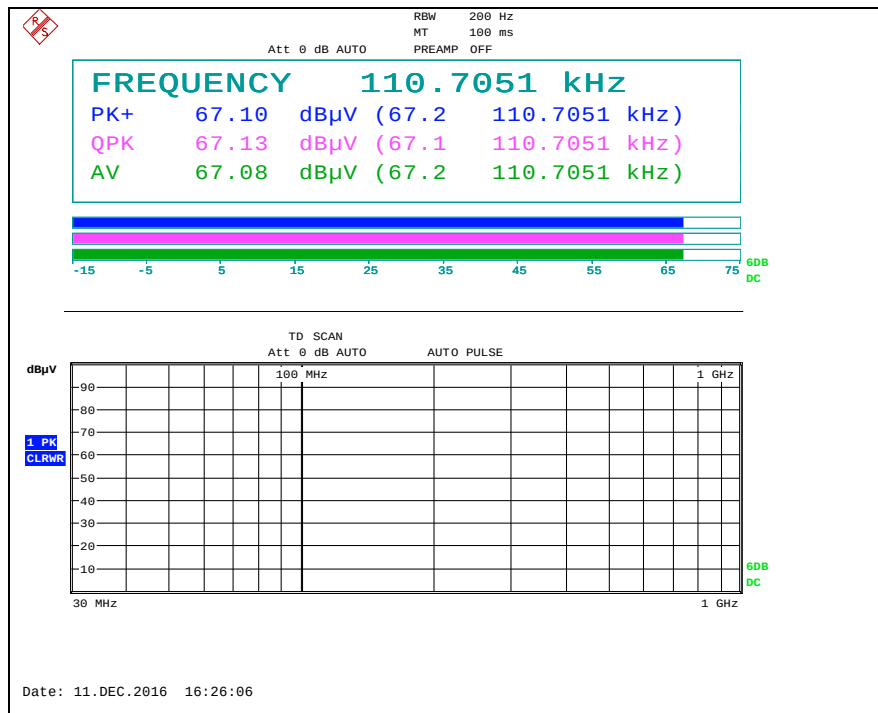


Charging mode (less than 50 % battery status of client device)



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Charging mode (100 % battery status of client device)



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2.5. Spurious Emission Test Result

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

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

Test condition: Ant. 1

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

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 30m or 300 m	Limit (dBμV/m) at 30m or 300 m	Margin (dB)
0.019	29.60	Average	H	19.52	0.02	49.14	-30.86	42.03	72.89
0.035	23.30	Average	H	19.30	0.02	42.62	-37.38	36.72	74.10
0.067	22.50	Average	H	19.37	0.02	41.89	-38.11	31.08	69.19
0.331	33.10	Average	H	19.02	0.04	52.16	-27.84	17.21	45.05
2.456	11.00	Quasi Peak	H	19.33	0.93	31.26	-8.74	29.54	38.28
Above 2.500	Not detected	-	-	-	-	-	-	-	-

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

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 30m or 300 m	Limit (dBμV/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	27.20	Average	H	19.30	0.02	46.52	-33.48	36.72	70.20
0.067	22.30	Average	H	19.37	0.02	41.69	-38.31	31.08	69.39
0.333	33.40	Average	H	19.02	0.04	52.46	-27.54	17.16	44.70
2.433	11.20	Quasi Peak	H	19.33	0.92	31.45	-8.55	29.54	38.09
Above 2.500	Not detected	-	-	-	-	-	-	-	-

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Charging mode with client device (100 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30m or 300 m	Limit (dB μ V/m) at 30m or 300 m	Margin (dB)
0.019	29.40	Average	H	19.52	0.02	48.94	-31.06	42.03	73.09
0.035	23.40	Average	H	19.30	0.02	42.72	-37.28	36.72	74.00
0.067	22.60	Average	H	19.37	0.02	41.99	-38.01	31.08	69.09
0.332	29.70	Average	H	19.02	0.04	48.76	-31.24	17.18	48.42
2.437	10.70	Quasi Peak	H	19.33	0.92	30.95	-9.05	29.54	38.59
Above 2.500	Not detected	-	-	-	-	-	-	-	-

Test condition: Ant. 2

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

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30m or 300 m	Limit (dB μ V/m) at 30m or 300 m	Margin (dB)
0.022	26.10	Average	H	19.46	0.02	45.58	-34.42	40.76	75.18
0.045	18.80	Average	H	19.30	0.02	38.12	-41.88	34.54	76.42
0.069	20.30	Average	H	19.38	0.02	39.70	-40.30	30.83	71.13
0.333	37.00	Average	H	19.02	0.04	56.06	-23.94	17.16	41.10
0.556	20.20	Quasi Peak	H	19.13	0.05	39.38	-0.62	32.70	33.32
Above 0.600	Not detected	-	-	-	-	-	-	-	-

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

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30m or 300 m	Limit (dB μ V/m) at 30m or 300 m	Margin (dB)
0.022	26.90	Average	H	19.46	0.02	46.38	-33.62	40.76	74.38
0.046	19.10	Average	H	19.30	0.02	38.42	-41.58	34.35	75.93
0.069	20.00	Average	H	19.38	0.02	39.40	-40.60	30.83	71.43
0.332	39.20	Average	H	19.02	0.04	58.26	-21.74	17.18	38.92
0.553	21.40	Quasi Peak	H	19.13	0.05	40.58	0.58	32.75	32.17
Above 0.600	Not detected	-	-	-	-	-	-	-	-

Charging mode with client device (100 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30m or 300 m	Limit (dB μ V/m) at 30m or 300 m	Margin (dB)
0.023	26.10	Average	H	19.44	0.02	45.56	-34.44	40.37	74.81
0.035	22.60	Average	H	19.30	0.02	41.92	-38.08	36.72	74.80
0.069	20.90	Average	H	19.38	0.02	40.30	-39.70	30.83	70.53
0.333	36.30	Average	H	19.02	0.04	55.36	-24.64	17.16	41.80
0.554	17.30	Quasi Peak	H	19.13	0.05	36.48	-3.52	32.73	36.25
Above 0.600	Not detected	-	-	-	-	-	-	-	-

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Test condition: Ant. 3
Charging mode with client device (less than 1 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30m or 300 m	Limit (dB μ V/m) at 30m or 300 m	Margin (dB)
0.023	27.10	Average	H	19.44	0.02	46.56	-33.44	40.37	73.81
0.045	17.50	Average	H	19.30	0.02	36.82	-43.18	34.54	77.72
0.069	20.10	Average	H	19.38	0.02	39.50	-40.50	30.83	71.33
0.331	29.00	Average	H	19.02	0.04	48.06	-31.94	17.21	49.15
Above 0.400	Not detected	-	-	-	-	-	-	-	-

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

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30m or 300 m	Limit (dB μ V/m) at 30m or 300 m	Margin (dB)
0.022	26.60	Average	H	19.46	0.02	46.08	-33.92	40.76	74.68
0.035	18.60	Average	H	19.30	0.02	37.92	-42.08	36.72	78.80
0.069	20.50	Average	H	19.38	0.02	39.90	-40.10	30.83	70.93
0.334	13.23	Average	H	19.02	0.04	32.29	-47.71	17.13	64.84
Above 0.400	Not detected	-	-	-	-	-	-	-	-

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Charging mode with client device (100 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30m or 300 m	Limit (dB μ V/m) at 30m or 300 m	Margin (dB)
0.023	26.90	Average	H	19.44	0.02	46.36	-33.64	40.37	74.01
0.035	18.70	Average	H	19.30	0.02	38.02	-41.98	36.72	78.70
0.069	20.30	Average	H	19.38	0.02	39.70	-40.30	30.83	71.13
0.333	20.60	Average	H	19.02	0.04	39.66	-40.34	17.16	57.50
Above 0.400	Not detected	-	-	-	-	-	-	-	-

Note;

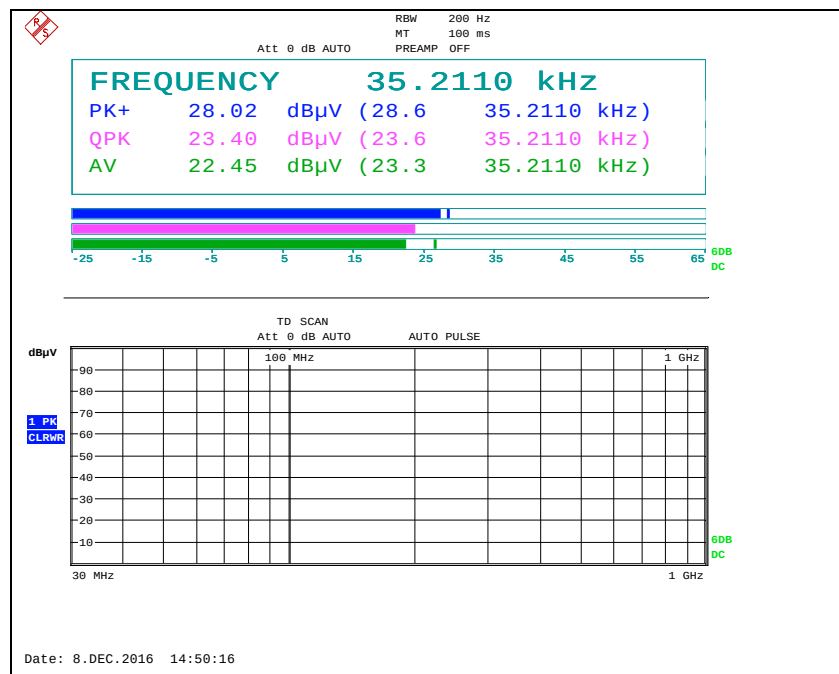
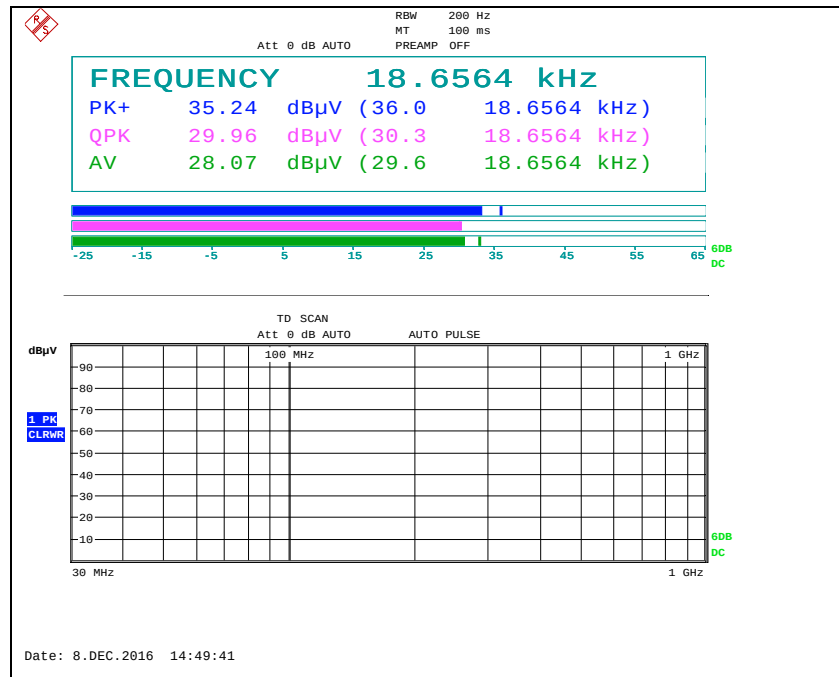
- According to §15.31 (f)(2)
 - 300 m Result(dB μ V/m) = 3 m Result(dB μ V/m) - 40log(300/3) (dB μ V/m)
 - 30 m Result(dB μ V/m) = 3 m Result(dB μ V/m) - 40log(30/3) (dB μ V/m)
- According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 MHz were calculated as below.
 - 9 kHz to 490 kHz : 20log(2 400 / F (kHz)) at 300 m (dB μ V/m)
 - 490 kHz to 1 705 kHz : 20log(24 000 / F (kHz)) at 30 m (dB μ V/m)
- According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9 – 90 kHz, 110 – 490 kHz and above 1 GHz in these three bands on measurements employing an average detector.

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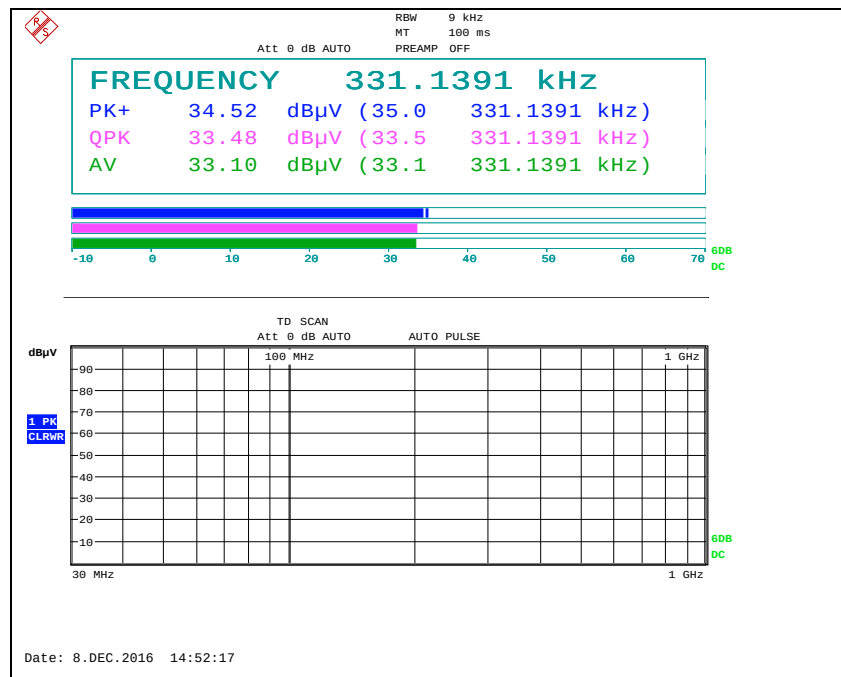
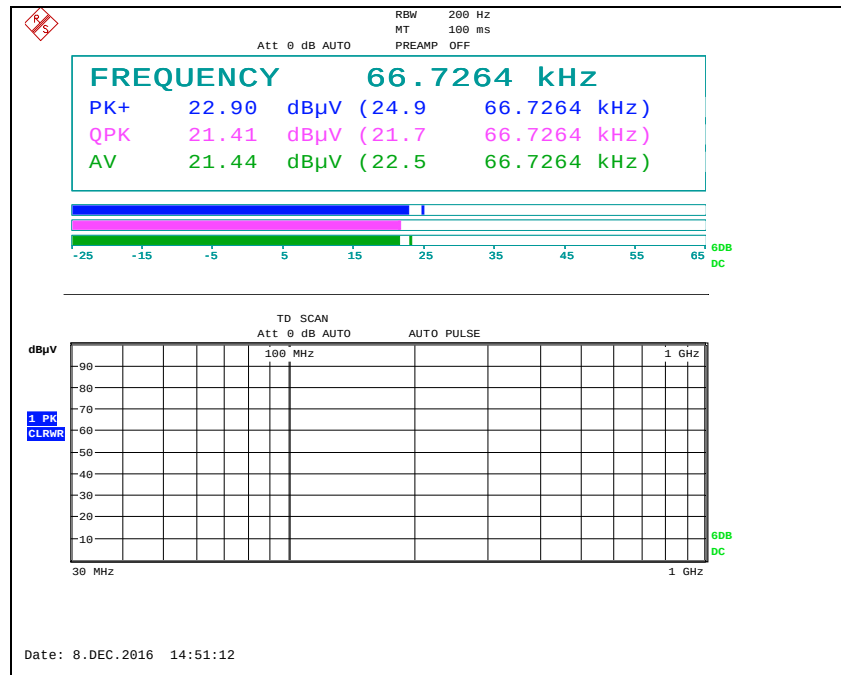
Test condition: Ant. 1

Below 30 MHz

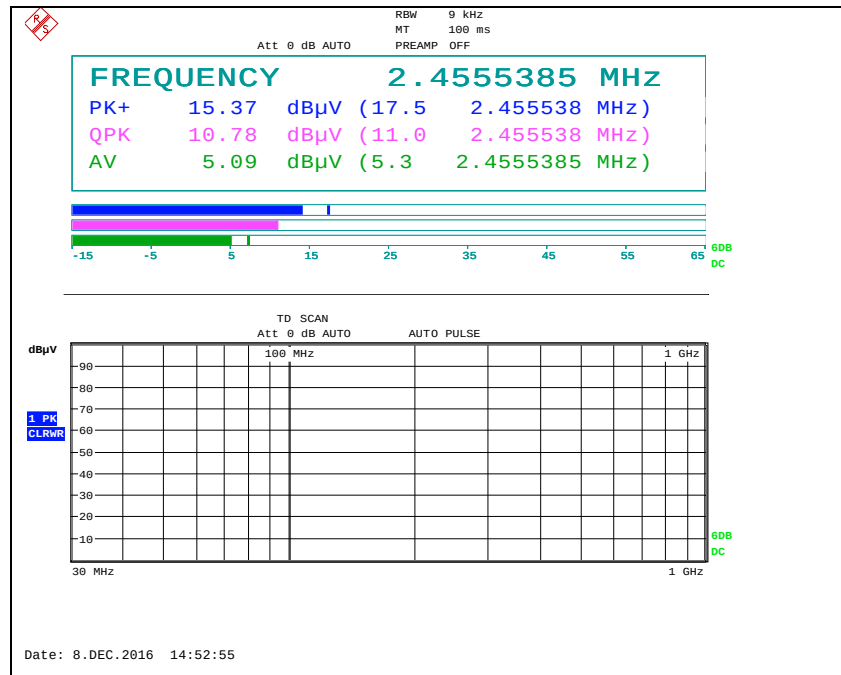
Charging mode (less than 1 % battery status of client device)



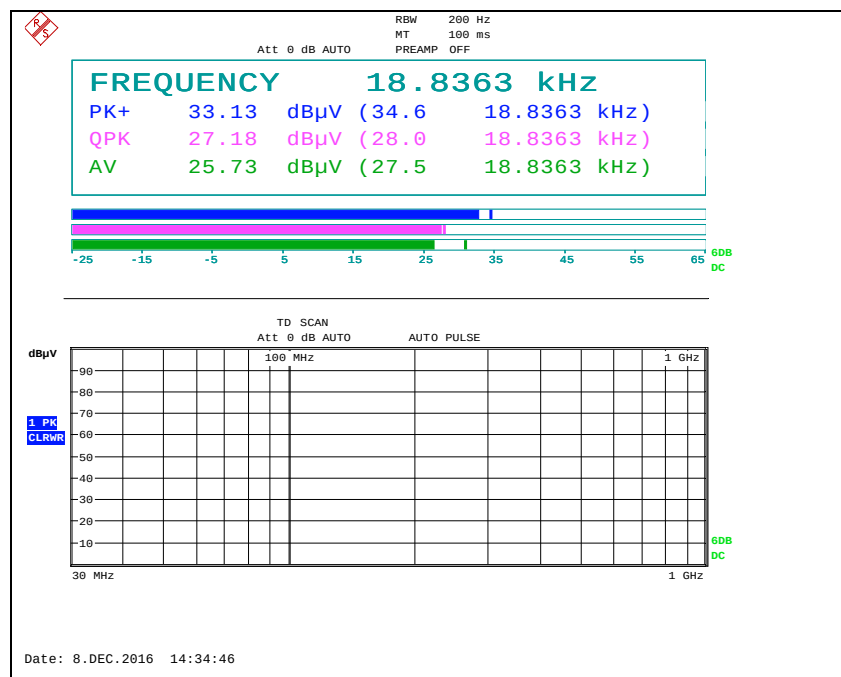
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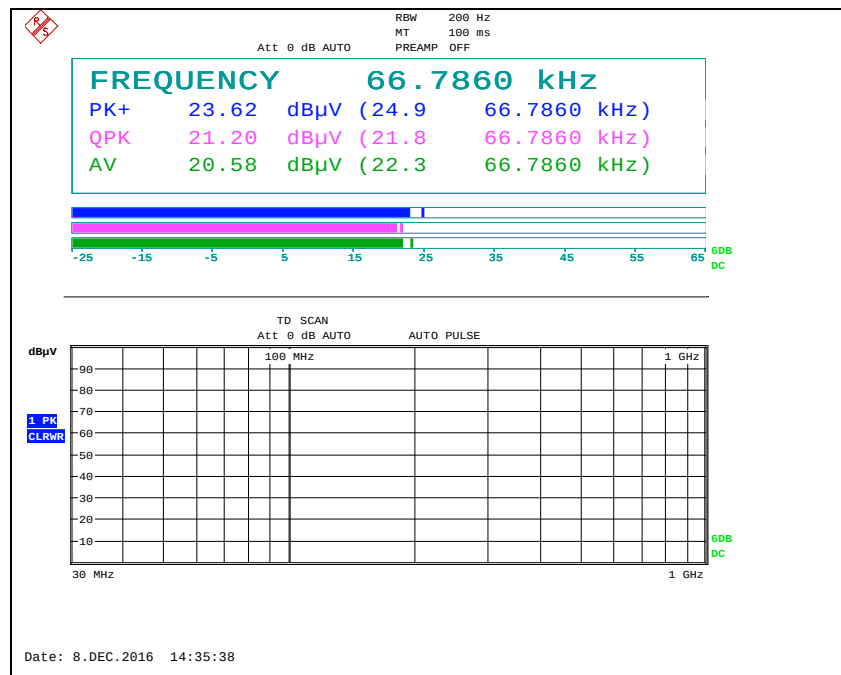
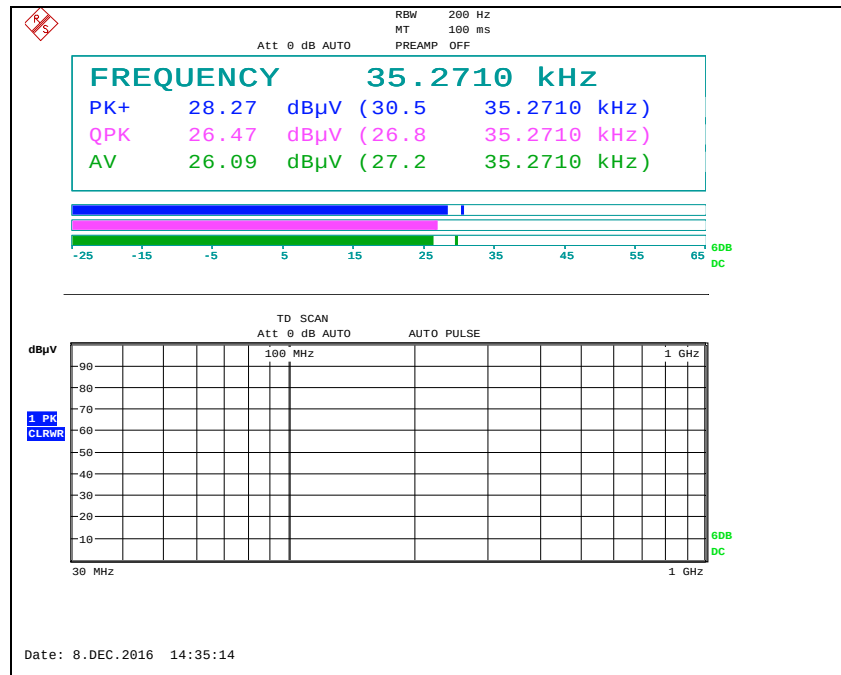
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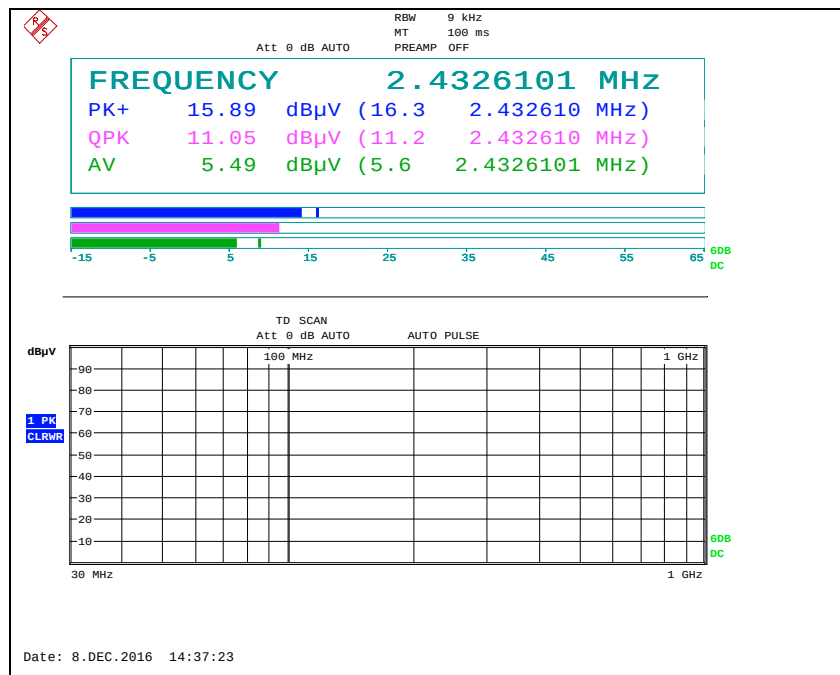
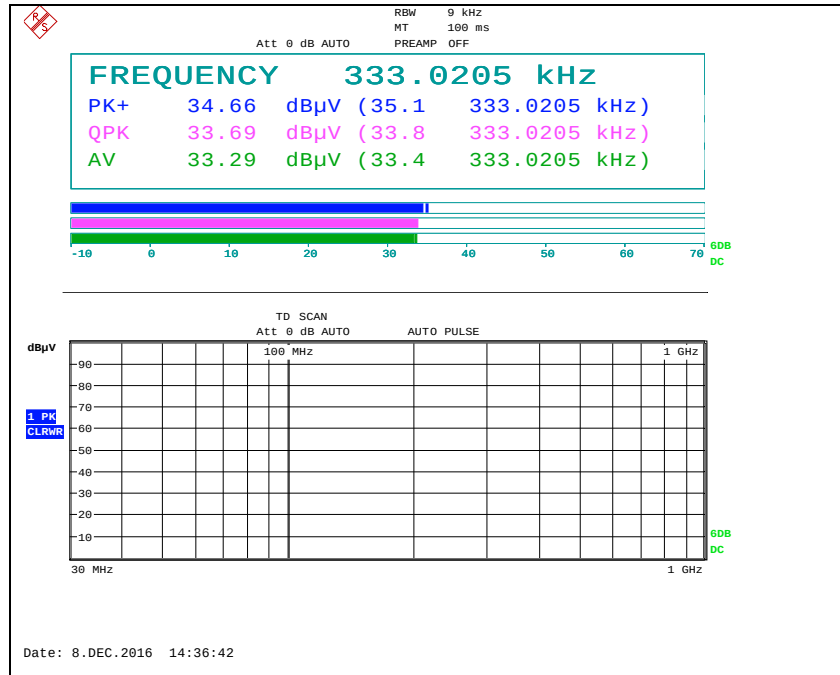
Charging mode (less than 50 % battery status of client device)



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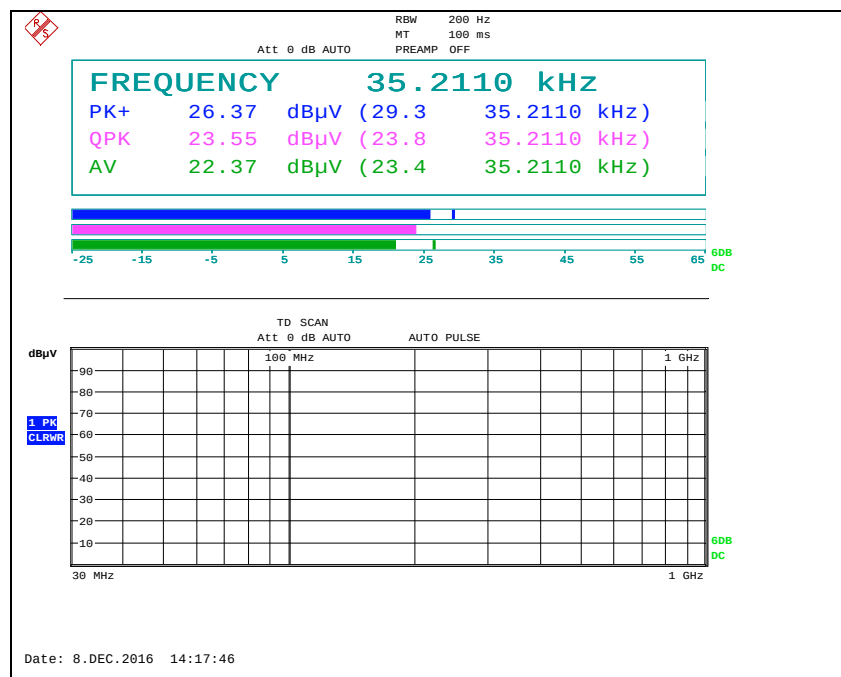
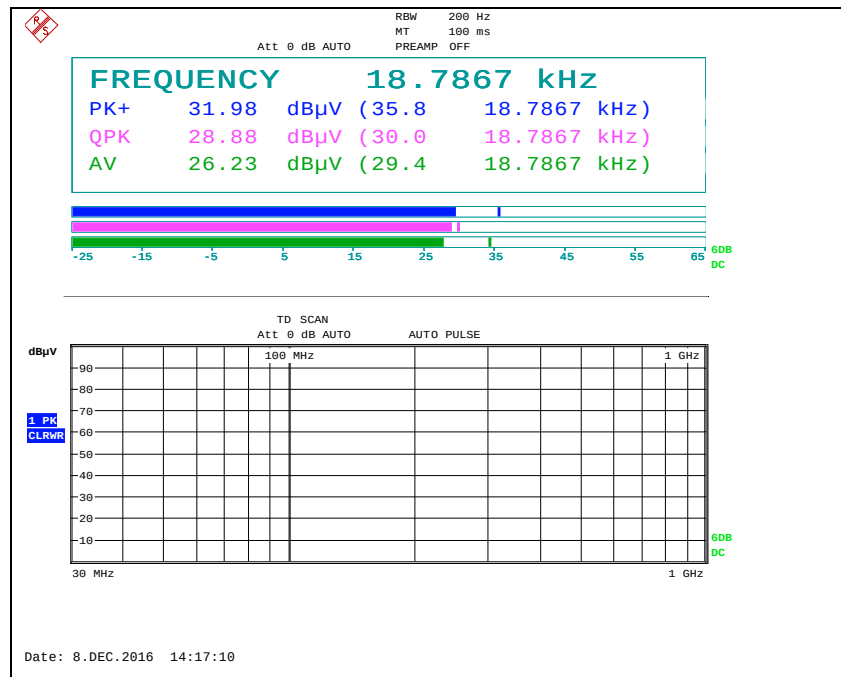


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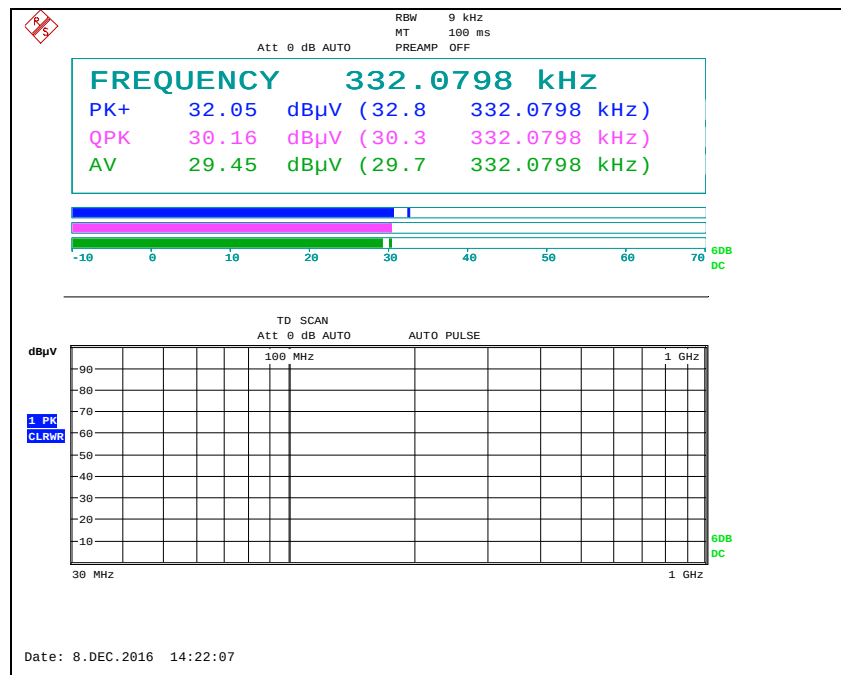
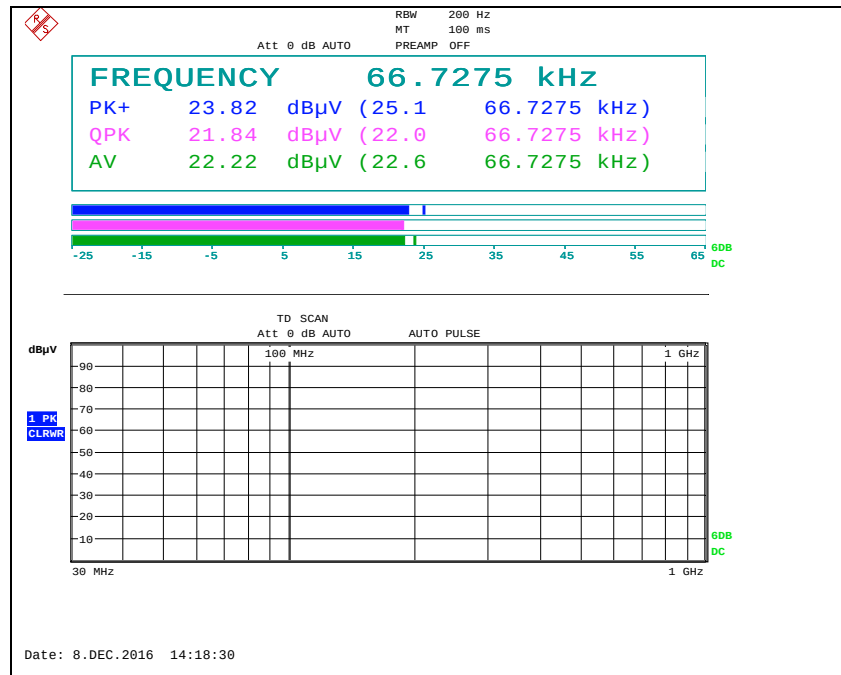


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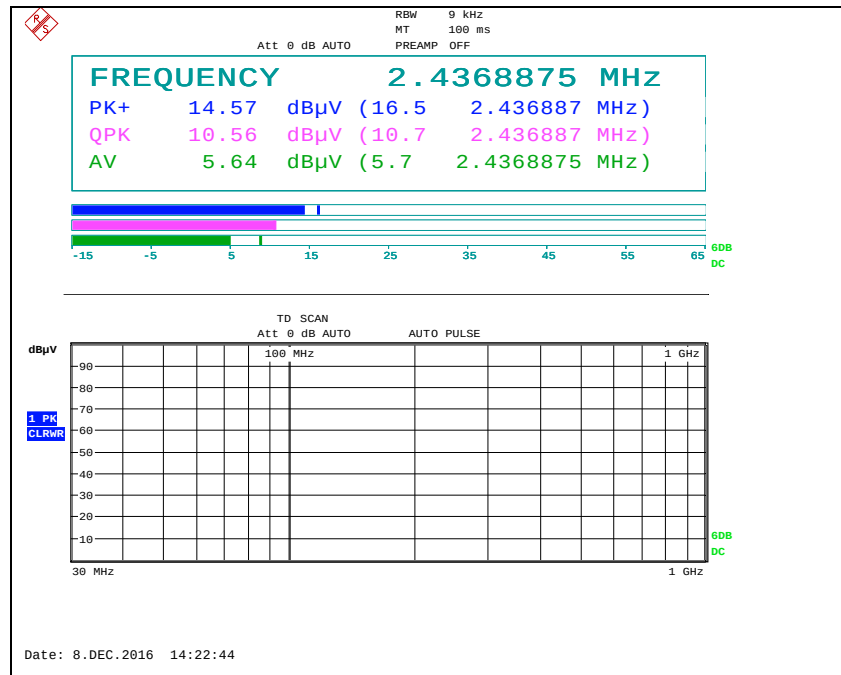
Charging mode (100% battery status of client device)



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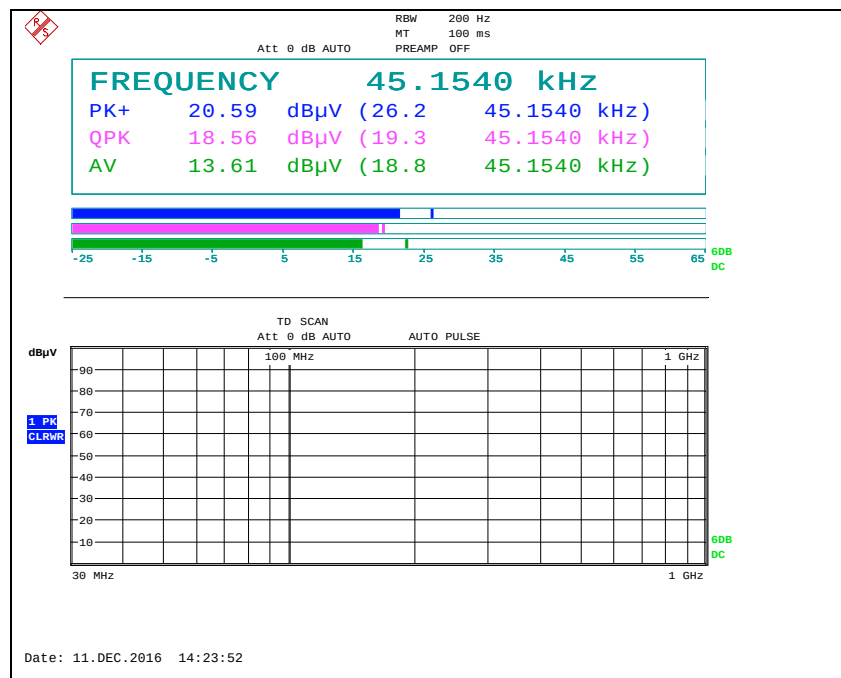
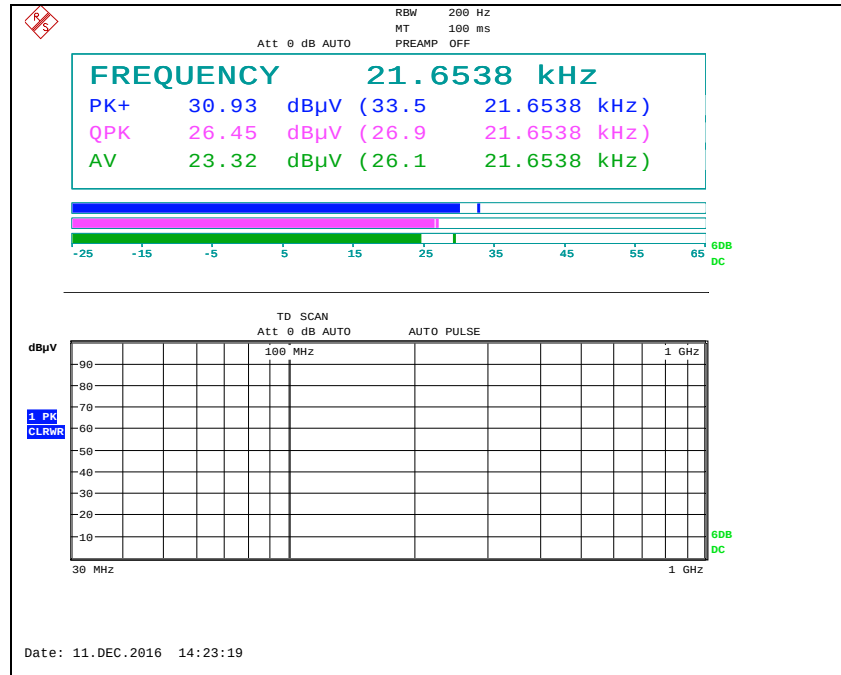


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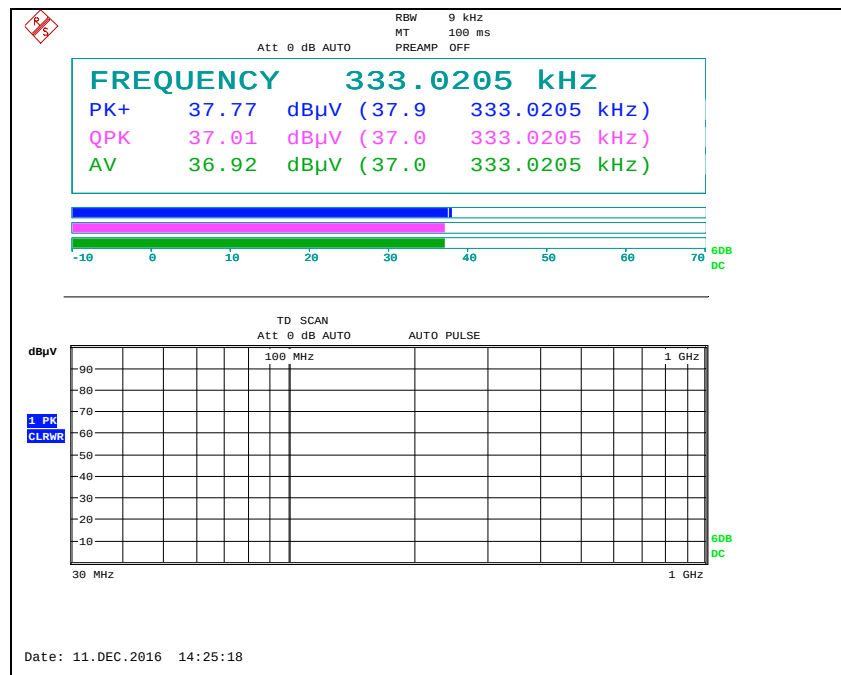
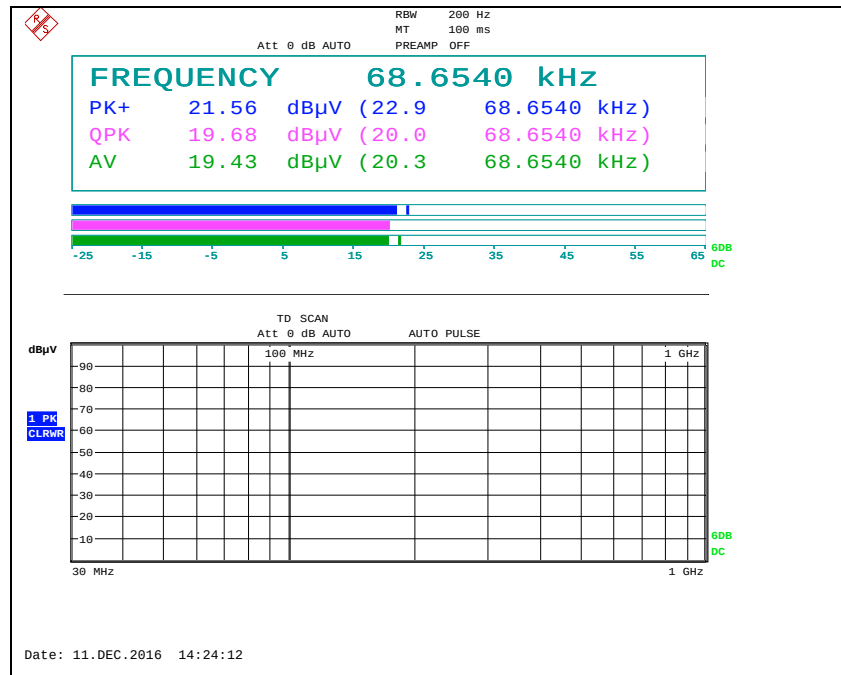
Test condition: Ant. 2

Below 30 MHz

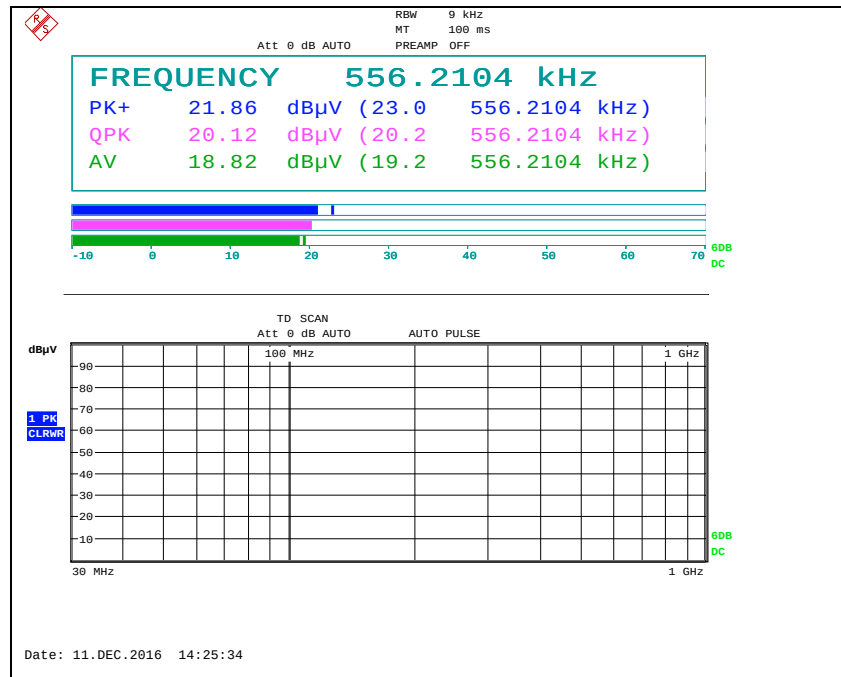
Charging mode (less than 1 % battery status of client device)



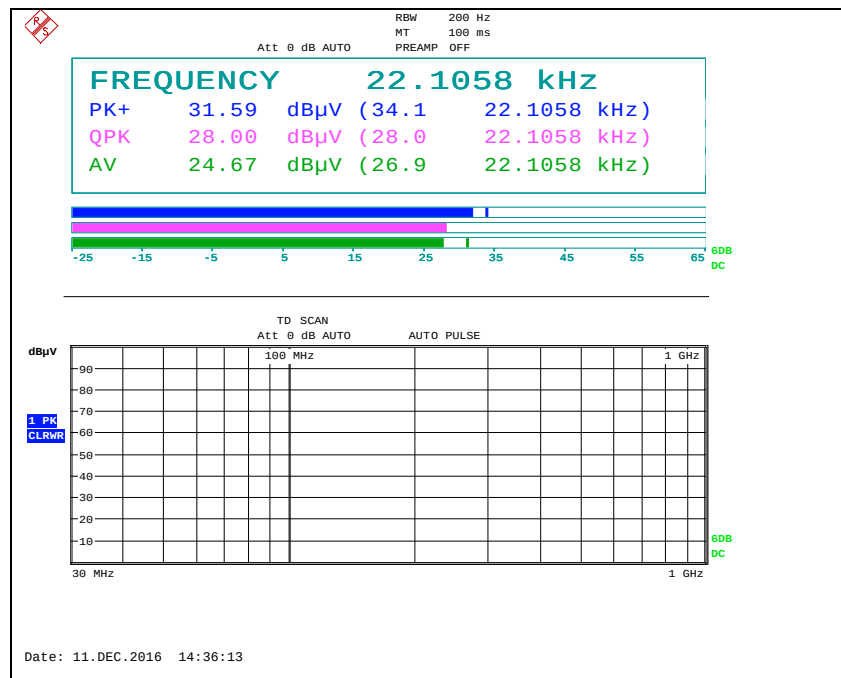
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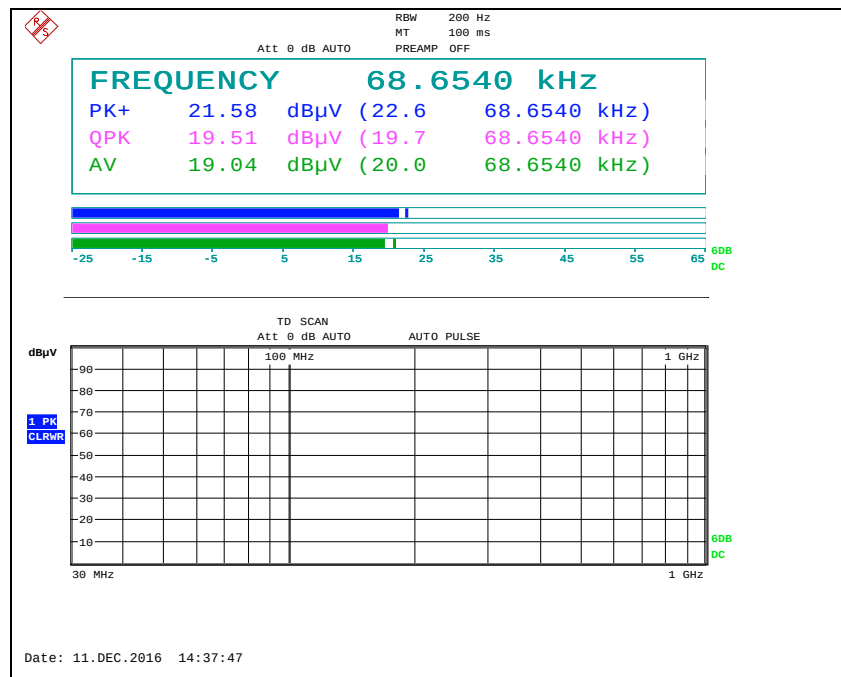
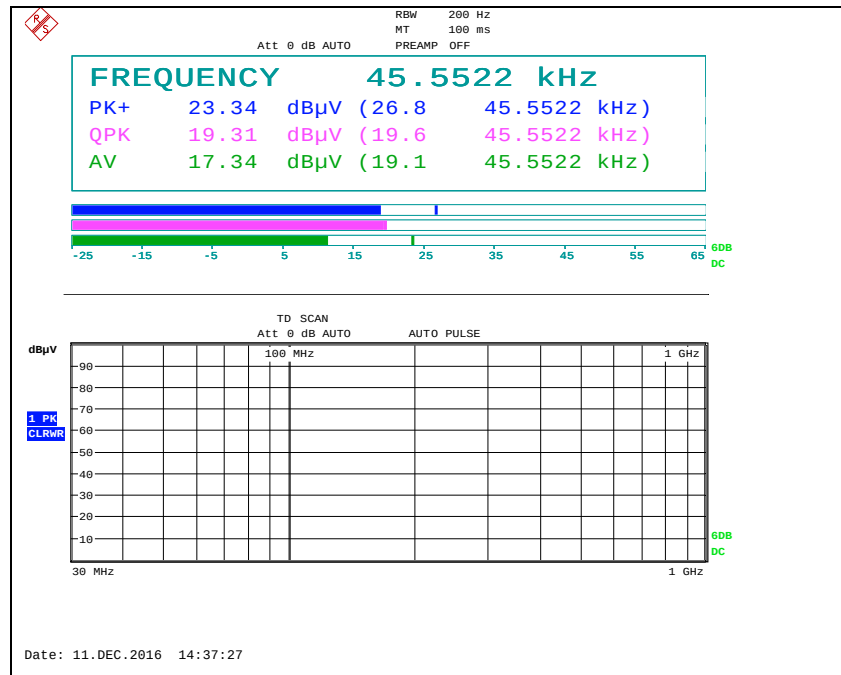
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.



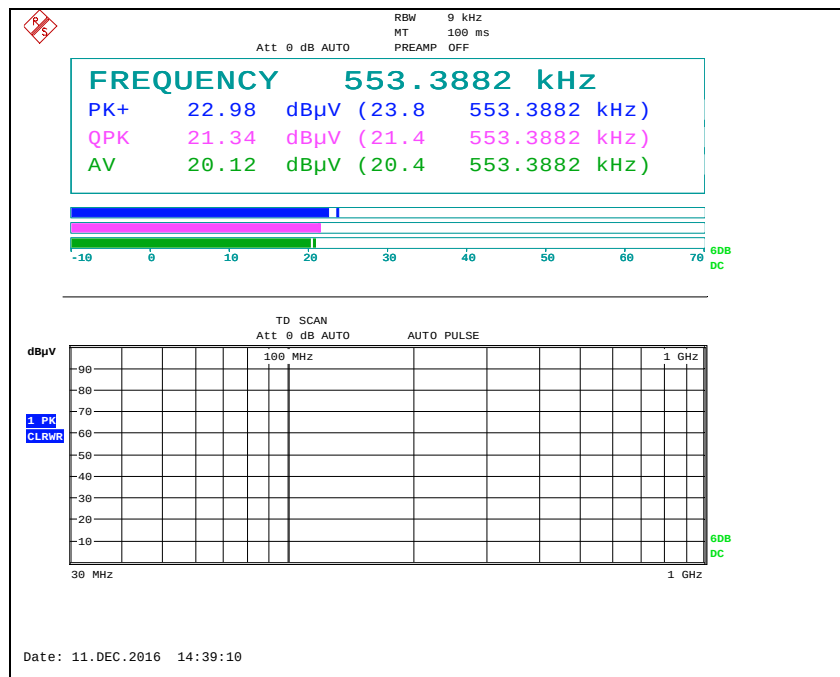
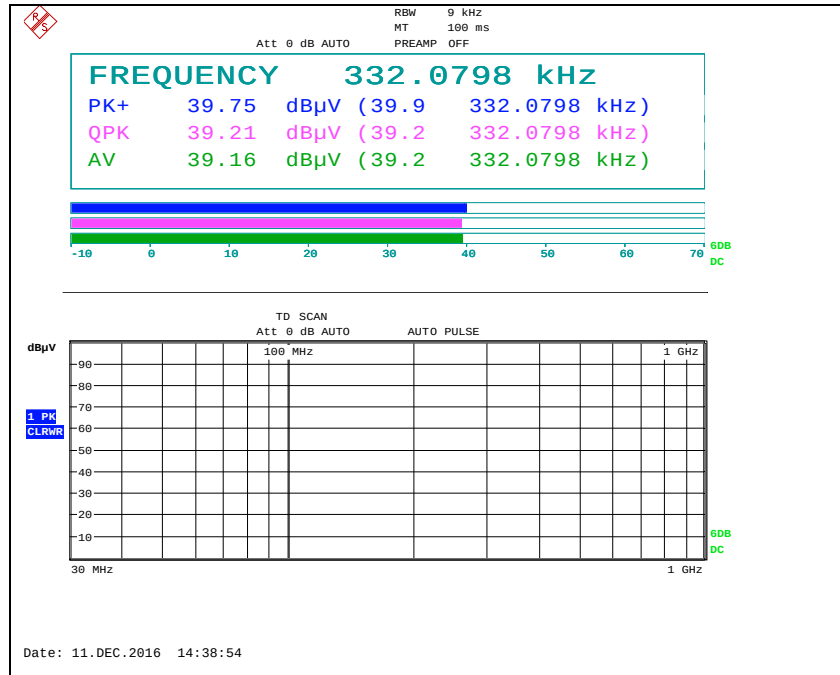
Charging mode (less than 50 % battery status of client device)



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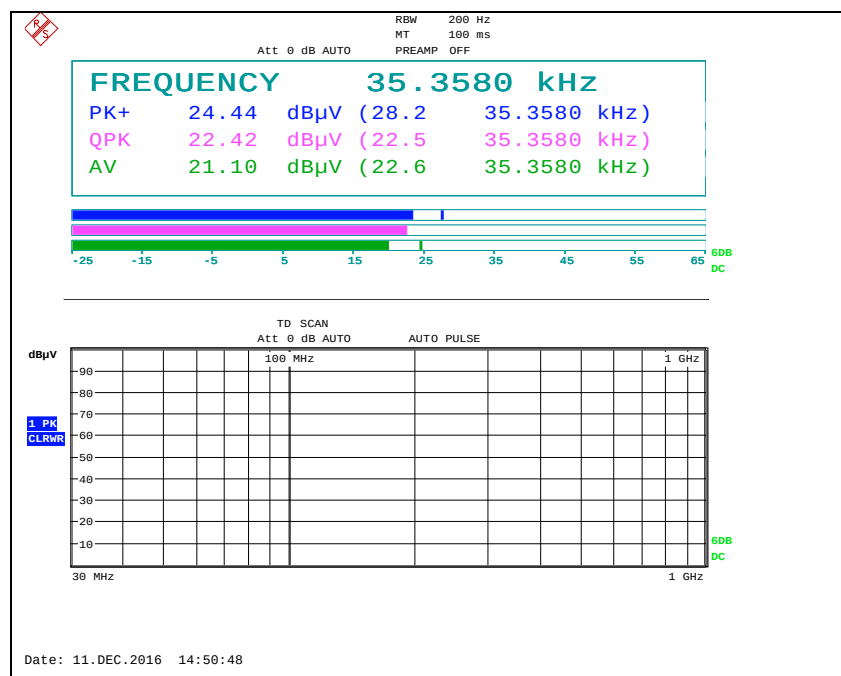
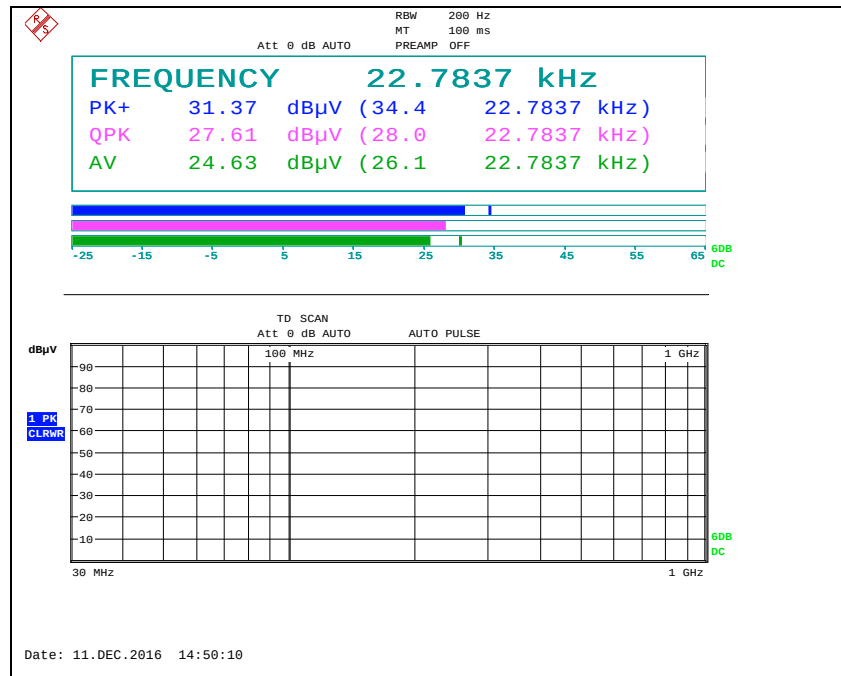


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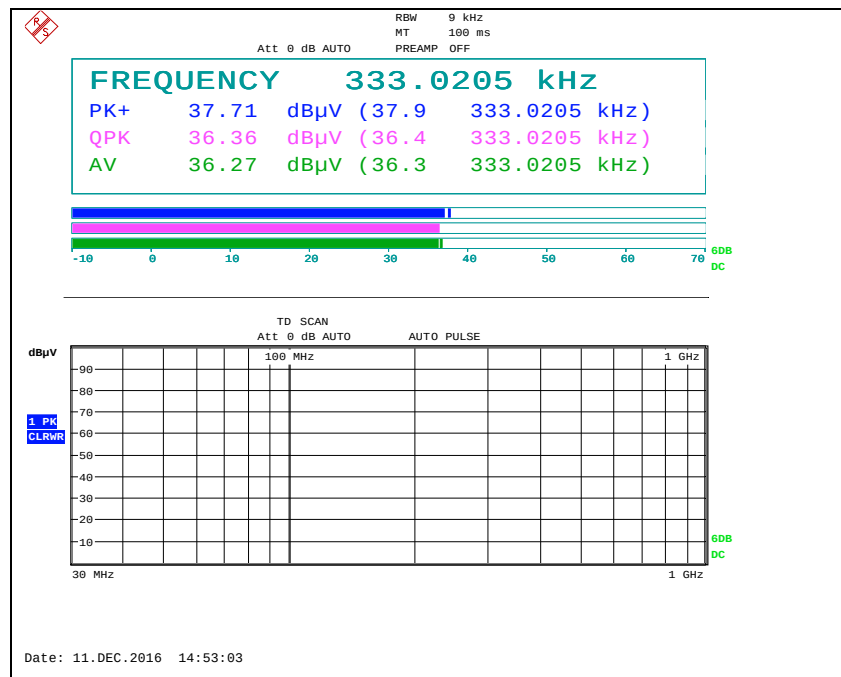
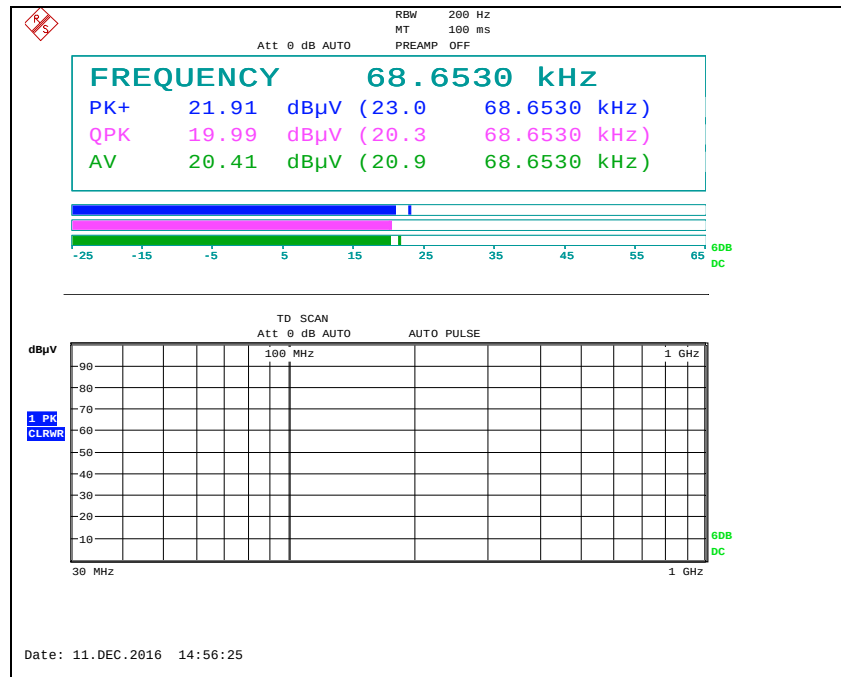


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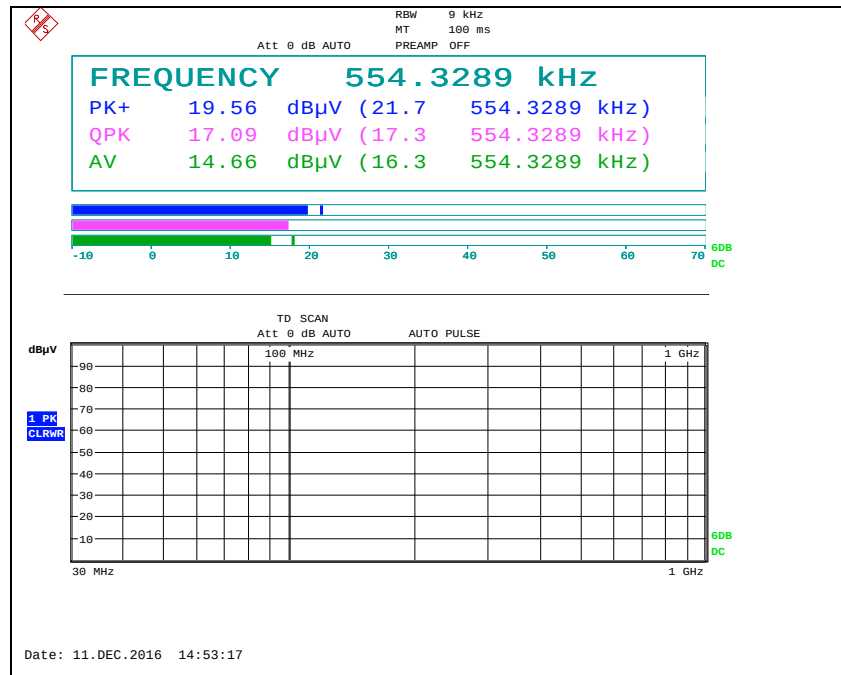
Charging mode (100% battery status of client device)



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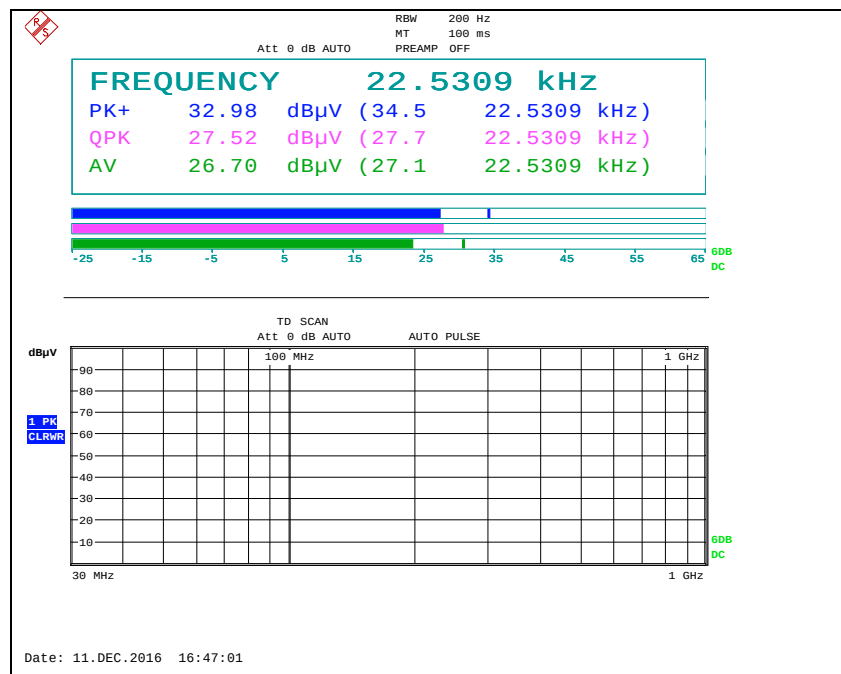
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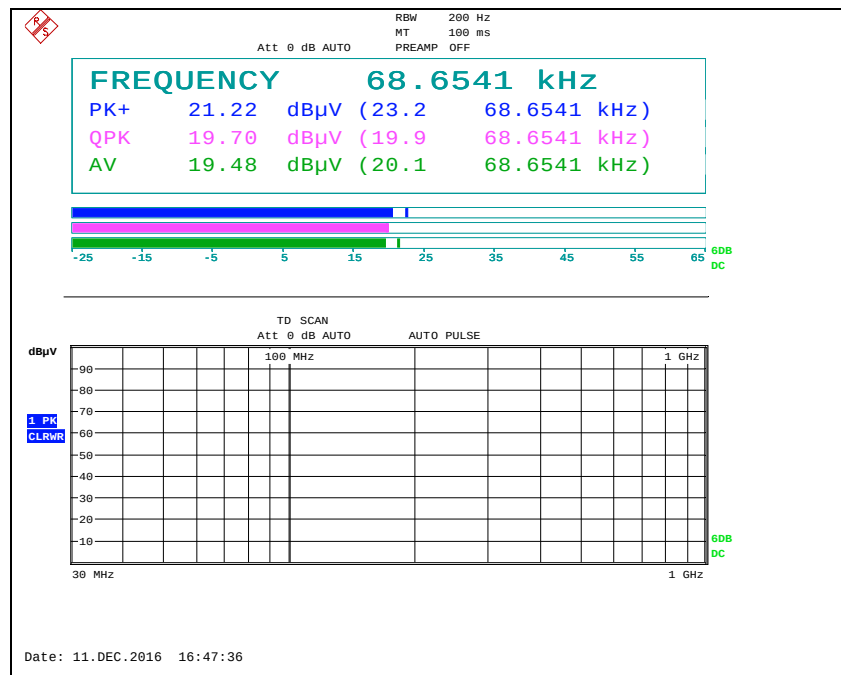
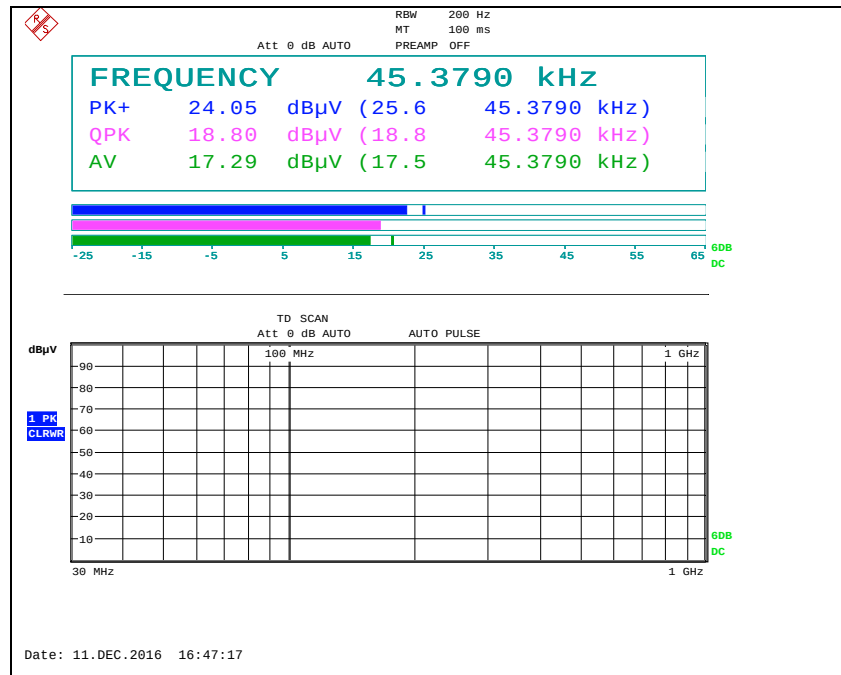
Test condition: Ant. 3

Below 30 MHz

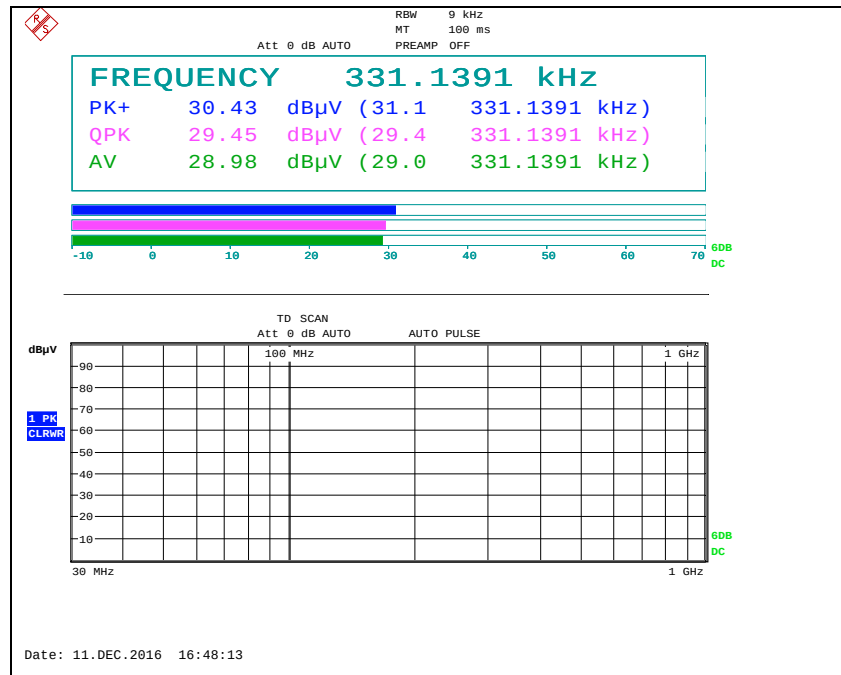
Charging mode (less than 1 % battery status of client device)



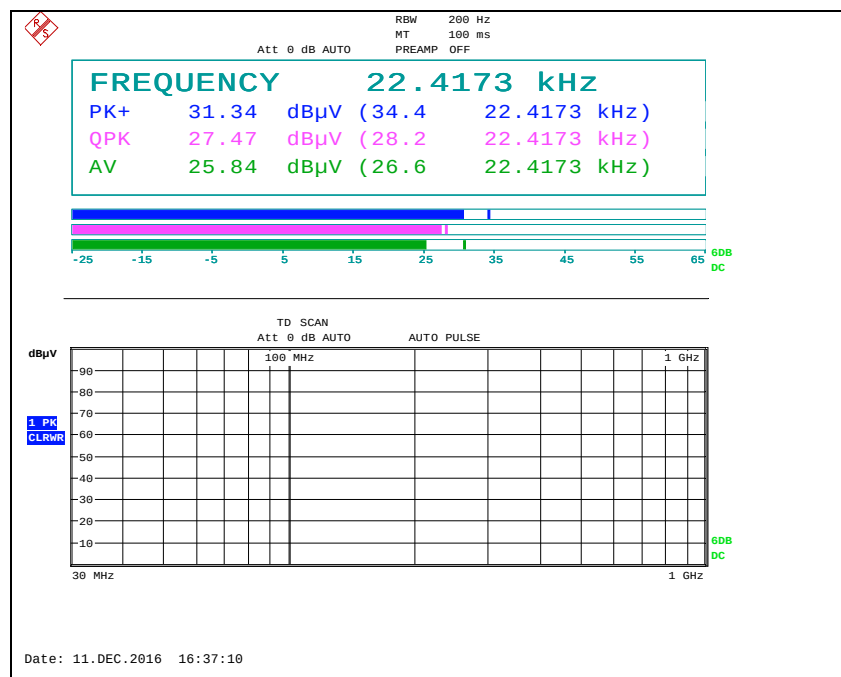
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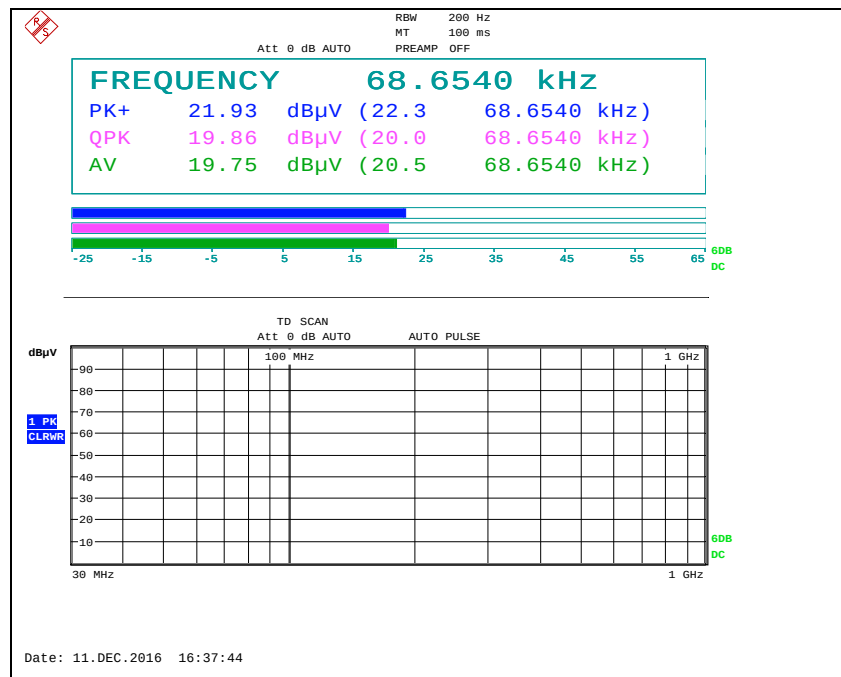
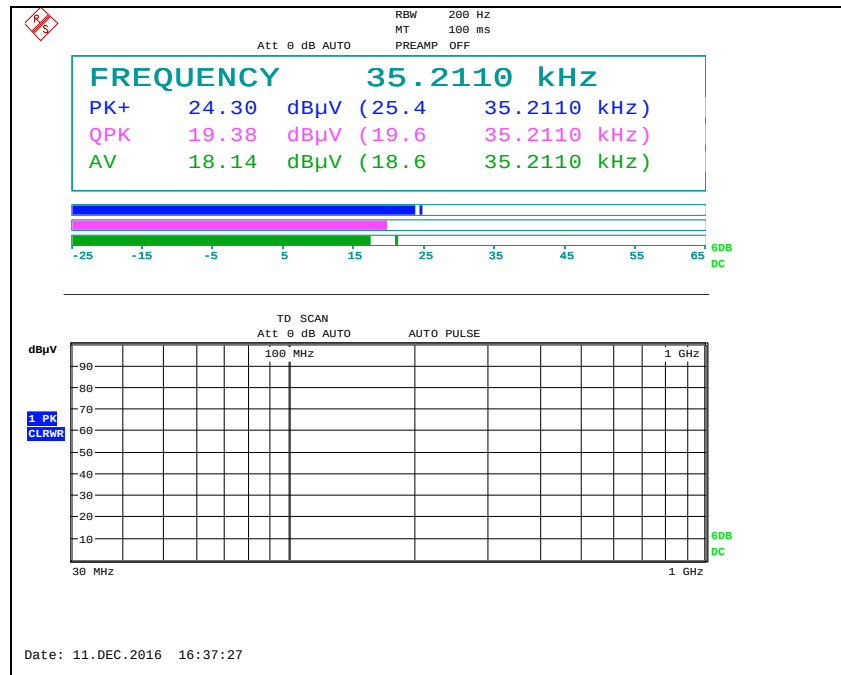
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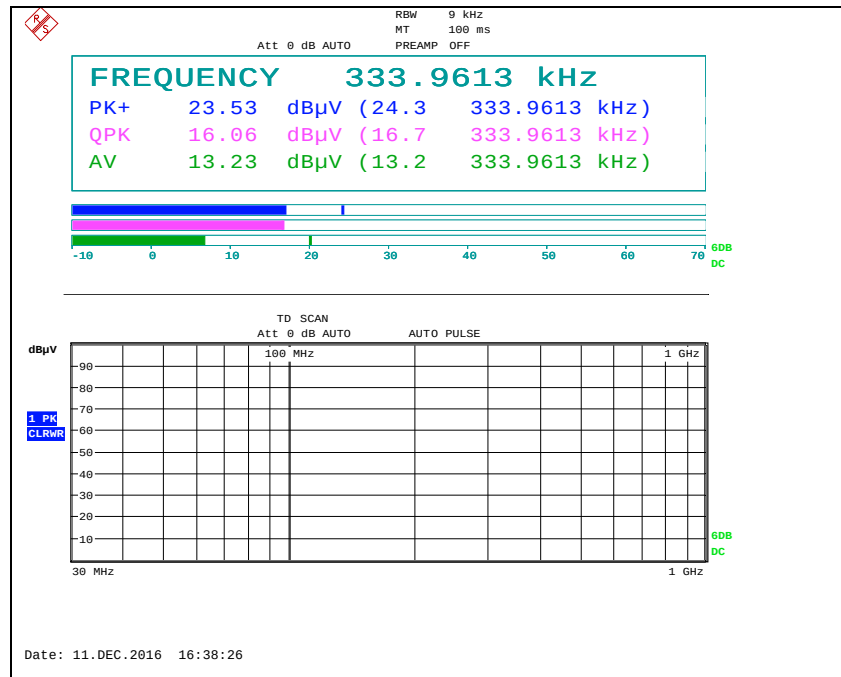
Charging mode (less than 50 % battery status of client device)



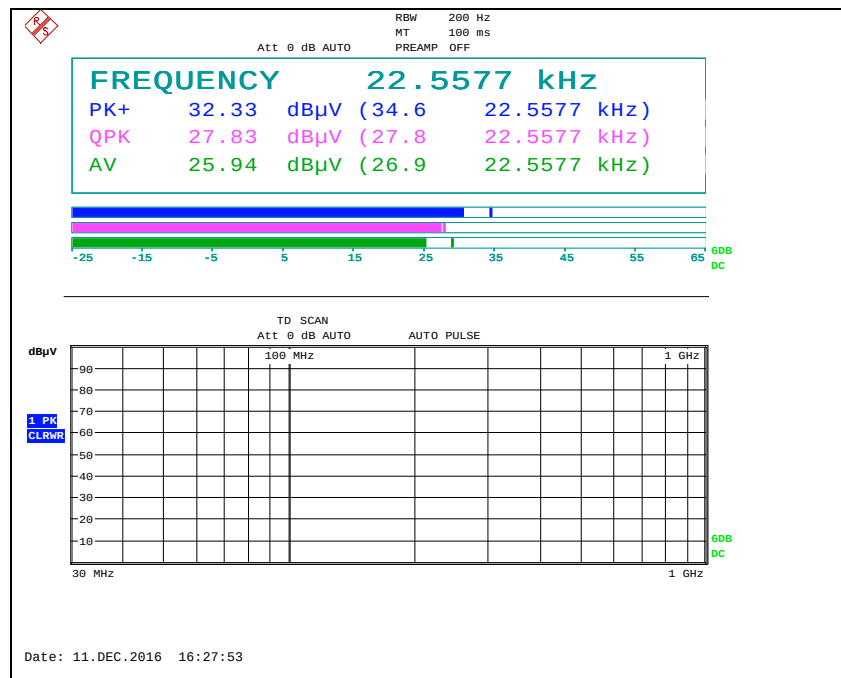
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.



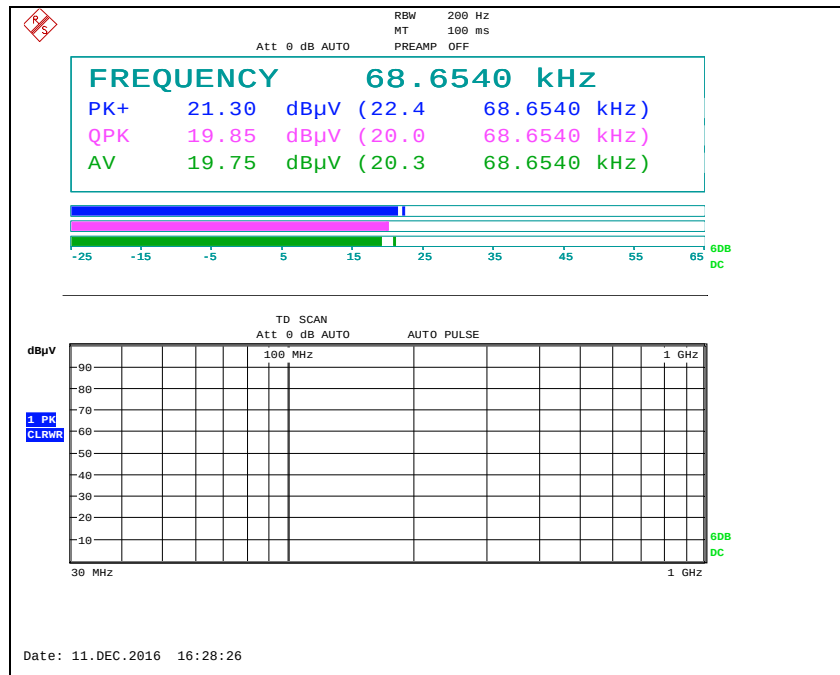
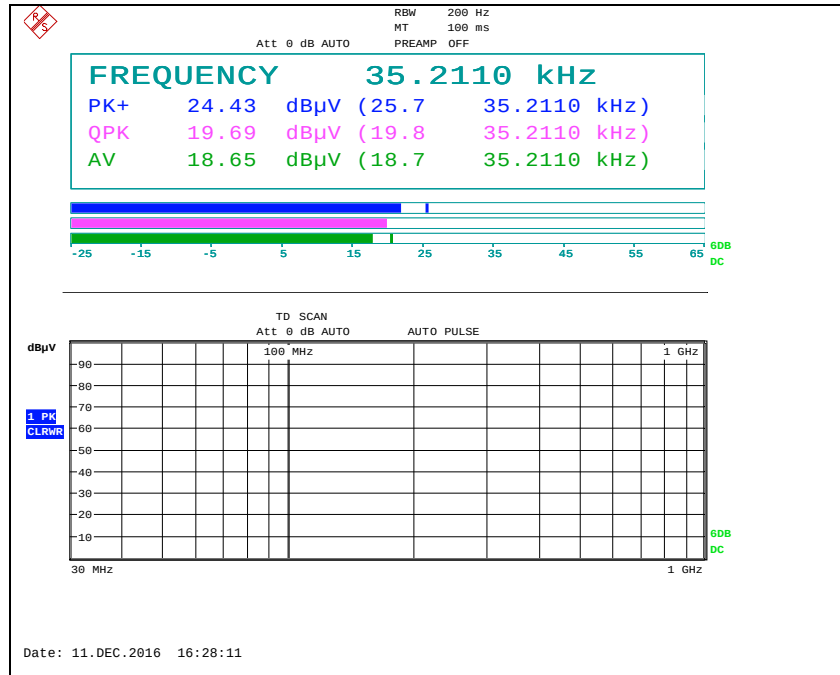
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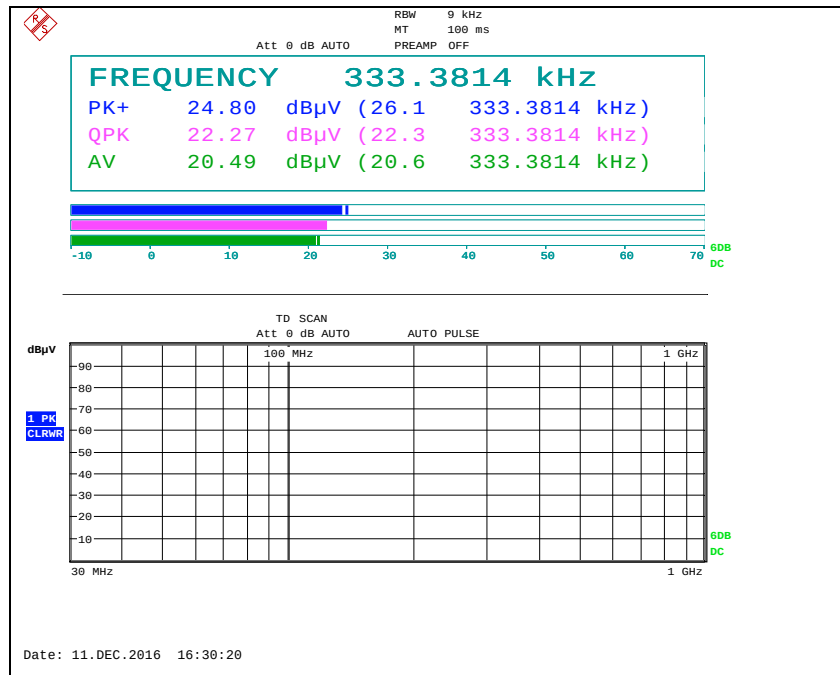
Charging mode (less than 100% battery status of client device)



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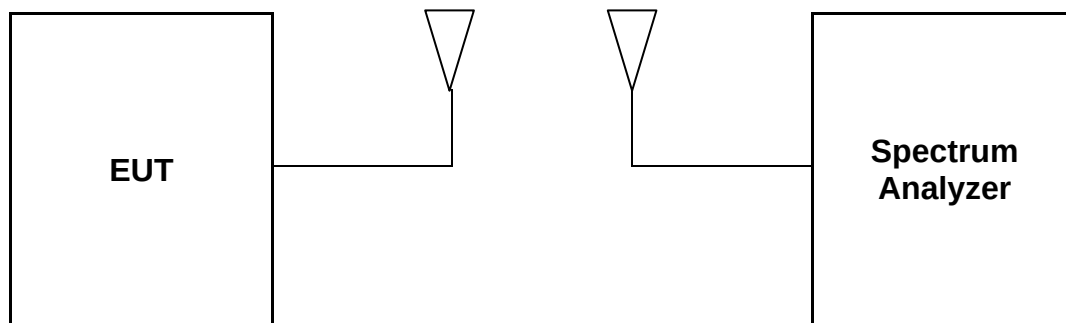
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3. 20 dB Bandwidth

3.1. Test Setup



3.2. Limit

None; for reporting purposed only

3.3. Test Procedure

20 dB Bandwidth

- 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.
- The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is 20 dB bandwidth of the emission.

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3.4. Test Result

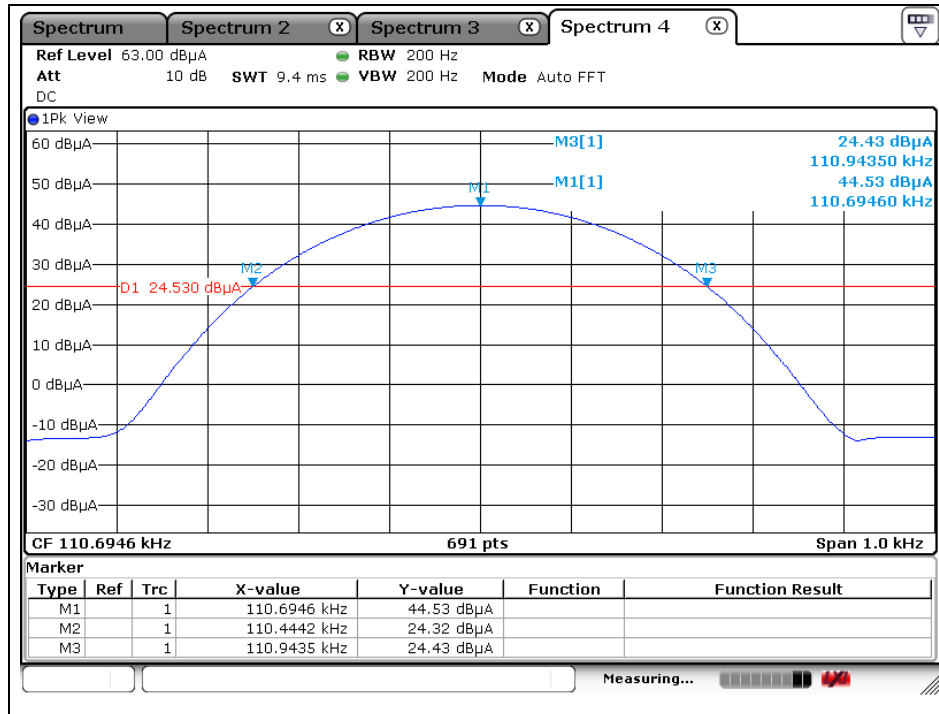
Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

Test condition	EUT status	20 dB Bandwidth (kHz)	Limit
Ant. 1	With client device (100 % battery status)	0.499	Reporting proposed only
Ant. 2	With client device (100 % battery status)	0.498	Reporting proposed only
Ant. 3	With client device (100 % battery status)	0.501	Reporting proposed only

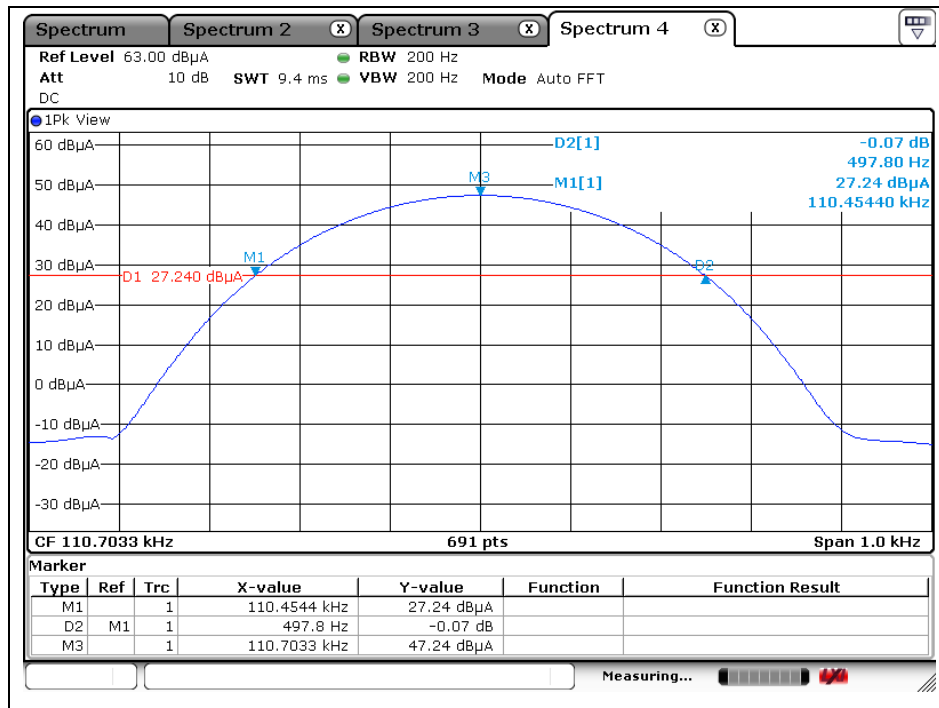
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20 dB Bandwidth

Ant. 1

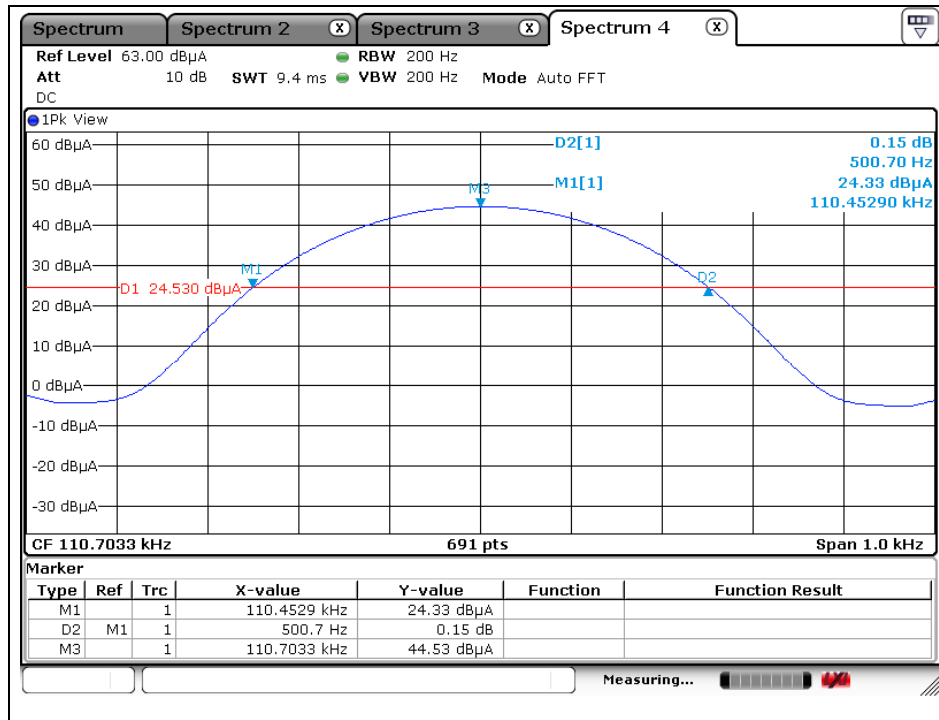


Ant. 2



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Ant. 3



- End of the Test Report -

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