

TEST REPORT

OF

FCC Part 18 Subpart C § 18.305

FCC ID : A3LEPN5100

Equipment Under Test : WIRELESS CHARGER
Model Name : EP-N5100
Applicant : Samsung Electronics Co., Ltd.
Manufacturer : Samsung Electronics Co., Ltd.
Date of Receipt : 2017.10.18
Date of Test(s) : 2017.11.20 ~ 2017.12.04
Date of Issue : 2017.12.18

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

Tested By:



Date:

2017.12.18

Jinhyoung Cho

Technical
Manager:



Date:

2017.12.18

Hyunchae You

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RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

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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

Fax No. : + 82 31 688 0921

1.2. Details of applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 19 Chapin Rd., Building D Pine Brook New Jersey United States 07058

Contact Person : Youn, Chan-Ho

Phone No. : +1 973 808 6362

1.3. Details of manufacturer

Company : Samsung Electronics Co., Ltd.

Address : Yen Phong 1 Industrial park, Yen Phong District Bac Ninh Province VIETNAM

1.4. Description of EUT

Kind of Product	WIRELESS CHARGER	
Model Name	EP-N5100	
Power Supply	DC 5.0 V, DC 9.0 V	
Frequency Range	DC 5.0 V Wireless Charger (Ant. 1 : 105 kHz ~ 148 kHz) (Ant. 2 : 110 kHz ~ 148 kHz)	DC 9.0 V Wireless Charger (Ant. 1 : 110 kHz ~ 148 kHz) (Ant. 2 : 125 kHz ~ 148 kHz)
Operating Conditions	-20 °C ~ 70 °C	
Antenna Type	Inductive loop coil antenna	

1.5. Declarations by the manufacturer

- The EUT has 2 loop coil antennas and can't transmit simultaneously.

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1.6. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Spectrum Analyzer	R&S	FSV30	100768	Mar. 20, 2017	Annual	Mar. 20, 2018
Signal Generator	R&S	SMBV100A	255834	Jun. 15, 2017	Annual	Jun. 15, 2018
Signal Generator	R&S	E8257D	MY51501169	Jul. 07, 2017	Annual	Jul. 07, 2018
Test Receiver	R&S	ESU26	100109	Feb. 17, 2017	Annual	Feb. 17, 2018
Test Receiver	R&S	ESCI 7	100911	Feb. 22, 2017	Annual	Feb. 22, 2018
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 23, 2017	Biennial	Aug. 23, 2019
Two-Line V-Network	R&S	ENV216	100190	Dec. 21, 2016	Annual	Dec. 21, 2017
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	CO3000/963/3 8330516/L	N. C. R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
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.
Coaxial Cable	SUCOFLEX	104 (3 m)	MY3258414	Jul. 15, 2017	Semi-annual	Jan. 15, 2018
Coaxial Cable	SUCOFLEX	104 (10 m)	MY3145814	Jul. 15, 2017	Semi-annual	Jan. 15, 2018

► Support equipment

Description	Manufacturer	Model	FCC ID
Samsung Mobile Phone	Samsung Electronics Co., Ltd.	SM-G950U	A3LSMG950U
AC adaptor	SOLU M / DONG YANG E&P	EP-TA20JBE / EP-TA20JWE	-

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1.7. 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)

1.8. 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-G950U, FCC ID : A3LSMG950U)	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

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.

1.9. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 18 Subpart C		
Section in FCC Part 18	Test Item	Result
18.305	Radiated Emissions	Complied
18.307	AC Conducted Power Line Emissions	Complied

1.10. Test Report Revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL012107	2017.12.06	Initial
1	F690501/RF-RTL012107-1	2017.12.18	Added a AC adaptor information for Conducted Emission testing

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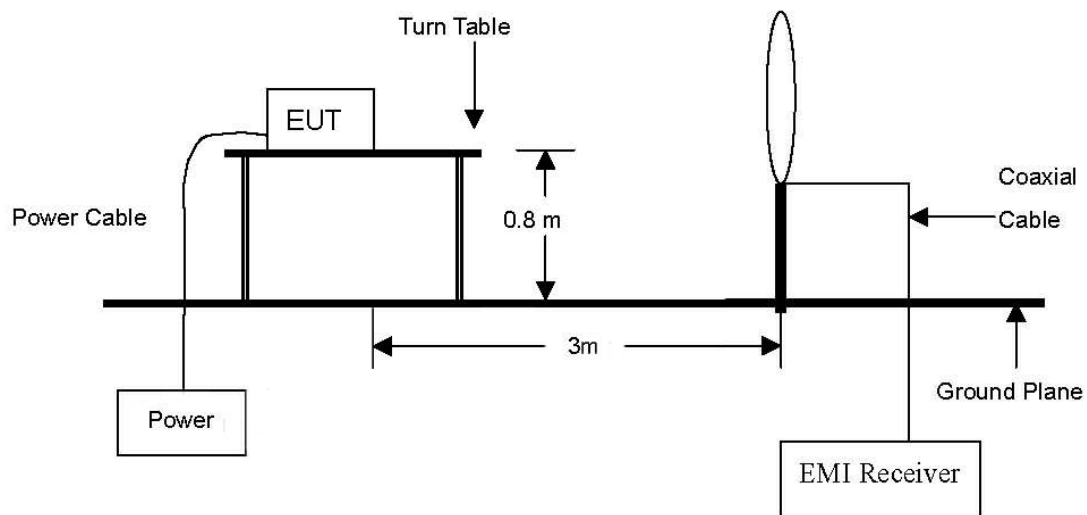
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A4(210 mm x 297 mm)

2. Field Strength of Fundamental and Spurious emissions

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.



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

Radiated emissions from the EUT were measured according to the dictates of MP-5 measurement.

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- Then antenna is a loop antenna is set from 1 meter to 2 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 average detect function and specified bandwidth with maximum hold mode.
- The test data of the worst-case condition was recorded.

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 v01.

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2.3. Radiated emission limit

According to §18.305 (b), The field strength levels of emissions which lie outside the bands specified in §18.301, unless otherwise indicated, shall not exceed the following :

Equipment	Operating frequency	RF power generated by equipment(watts)	Field strength limit($\mu\text{V/m}$)	Distance (meter)
Any type unless otherwise specified(miscellaneous)	Any ISM frequency	Below 500 500 or more	25 25 $\times$ SQRT (power/500)	300 ¹ 300
	<u>Any non-ISM frequency</u>	<u>Below 500</u> 500 or more	<u>15</u> 15 $\times$ SQRT (power/500)	<u>300</u> ¹ 300
Industrial heaters and RF stabilized arc welders	On or below 5,725 MHz Above 5,725 MHz	Any Any	10 (²)	1600 (²)
Medical diathermy	Any ISM frequency Any non-ISM Frequency	Any Any	25 15	300 300
Ultrasonic	Below 490 kHz	Below 500 500 or more	2,400/F(kHz) 2,400/F(kHz) $\times$ SQRT(power/500)	300 ³ 300
	490 to 1,600 kHz Above 1,600 kHz	Any Any	24,000/F(kHz) 15	30 30
Induction cooking ranges	Below 90 kHz On or above 90 kHz	Any Any	1,500 300	⁴ 30 ⁴ 30

¹Field strength may not exceed 10 $\mu\text{V/m}$ at 1 600 meters. Consumer equipment operating below 1 000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

²Reduced to the greatest extent possible.

³Field strength may not exceed 10 $\mu\text{V/m}$ at 1 600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.

⁴Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.

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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.

Test Mode : Ant. 1 in DC 5 V condition

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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 of client device)									
0.135	63.60	Average	H	19.68	0.05	83.33	3.33	23.52	20.19
Charging mode with client (less than 50 % battery status of client device)									
0.136	63.20	Average	H	19.68	0.06	82.94	2.94	23.52	20.58
Charging mode with client (100 % battery status of client device)									
0.120	63.50	Average	H	19.69	0.04	83.23	3.23	23.52	20.29

Test Mode : Ant. 2 in DC 5 V condition

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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 of client device)									
0.128	67.00	Average	H	19.69	0.05	86.74	6.74	23.52	16.78
Charging mode with client (less than 50 % battery status of client device)									
0.132	67.00	Average	H	19.68	0.05	86.73	6.73	23.52	16.79
Charging mode with client (100 % battery status of client device)									
0.121	69.10	Average	H	19.69	0.04	88.83	8.83	23.52	14.69

Note;

1. Result at 300 m [dB μ V/m] = Actual at 3 m [dB μ V/m] + 40 log(3/300)
2. According to clause 2.2.2. of MP-5(1986). The detector function selector shall be set to average.
3. The limit above was calculated based on table §18.305(b)

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Test Mode : Ant. 1 in DC 9 V condition

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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 of client device)									
0.132	63.60	Average	H	19.68	0.05	83.33	3.33	23.52	20.19
Charging mode with client (less than 50 % battery status of client device)									
0.137	54.30	Average	H	19.68	0.06	74.04	-5.96	23.52	29.48
Charging mode with client (100 % battery status of client device)									
0.137	60.60	Average	H	19.68	0.06	80.34	0.34	23.52	23.18

Test Mode : Ant. 2 in DC 9 V condition

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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 of client device)									
0.128	66.60	Average	H	19.69	0.05	86.34	6.34	23.52	17.18
Charging mode with client (less than 50 % battery status of client device)									
0.132	59.60	Average	H	19.68	0.05	79.33	-0.67	23.52	24.19
Charging mode with client (100 % battery status of client device)									
0.129	68.30	Average	H	19.69	0.05	88.04	8.04	23.52	15.48

Note;

1. Result at 300 m [dB μ V/m]= Actual at 3 m [dB μ V/m] + 40 log(3/300)
2. According to clause 2.2.2. of MP-5(1986). The detector function selector shall be set to average.
3. The limit above was calculated based on table §18.305(b)

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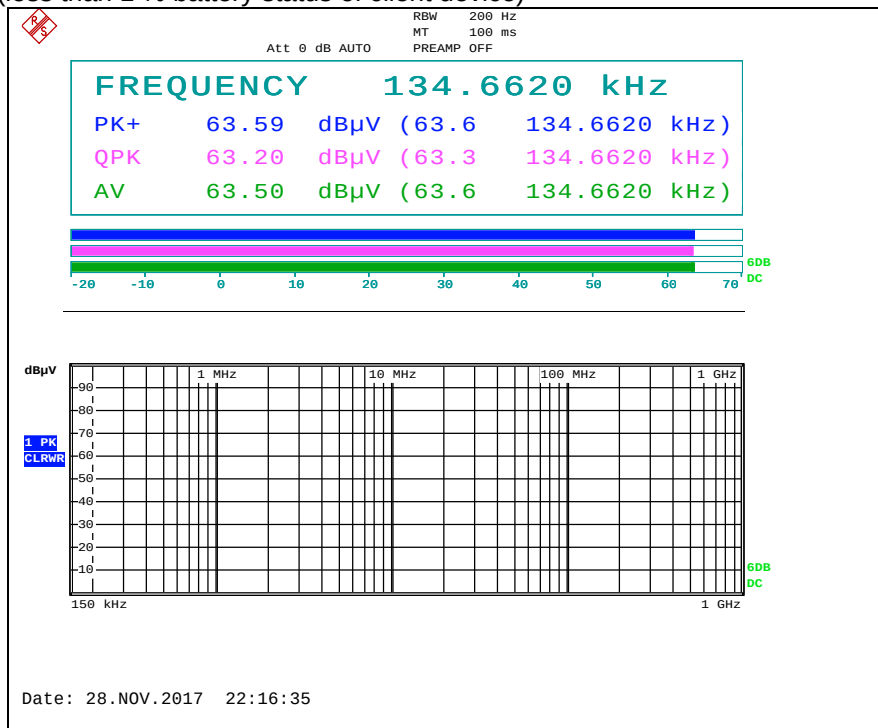
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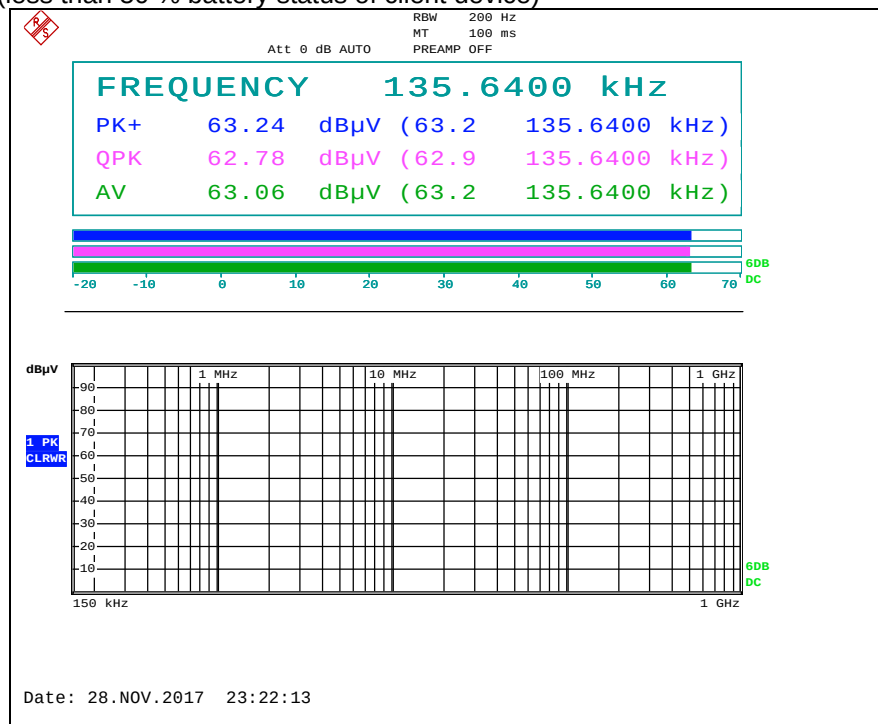
Test plots

Test Mode : Ant. 1 in DC 5 V condition

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

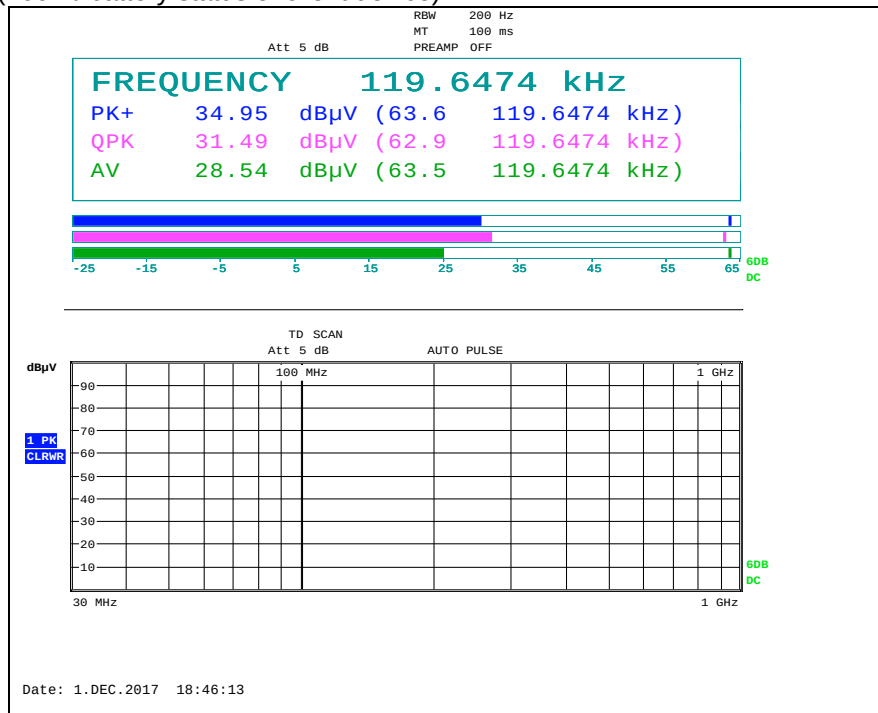


Charging mode (less than 50 % battery status of client device)



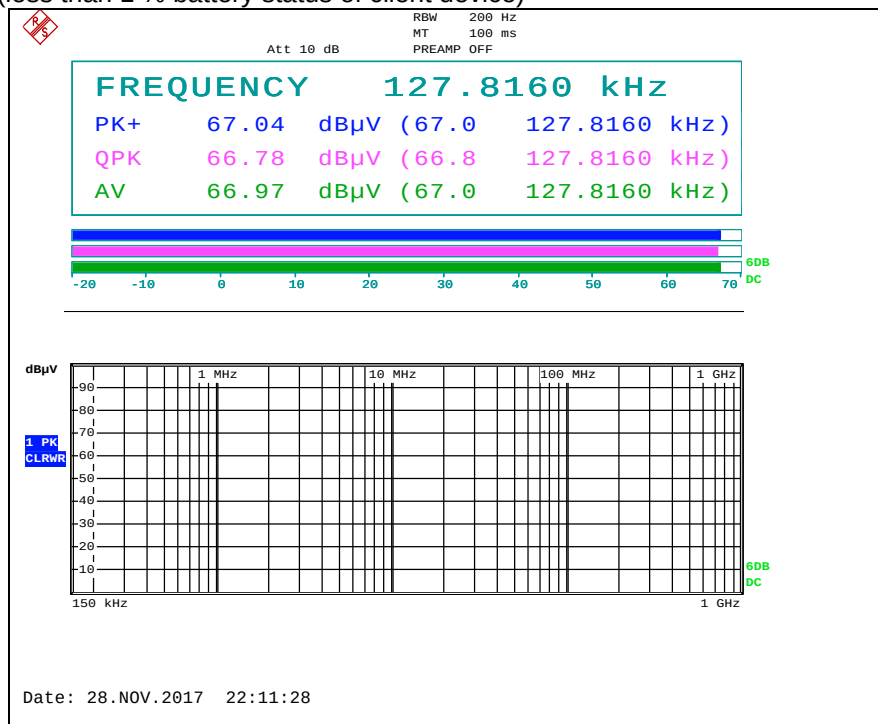
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Charging mode (100 % battery status of client device)



Test Mode : Ant. 2 in DC 5 V condition

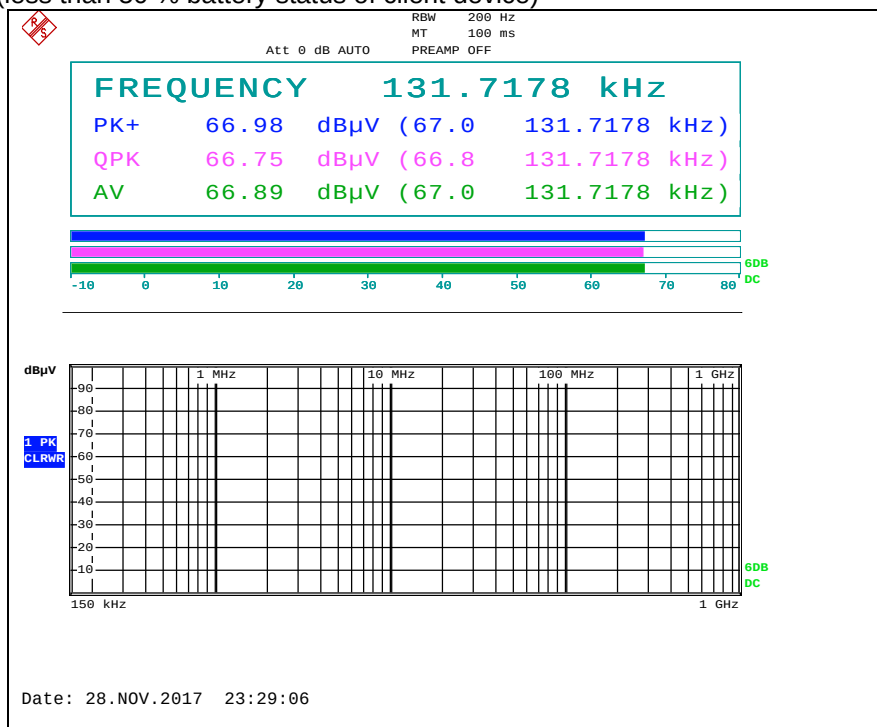
Charging mode (less than 1 % battery status of client device)



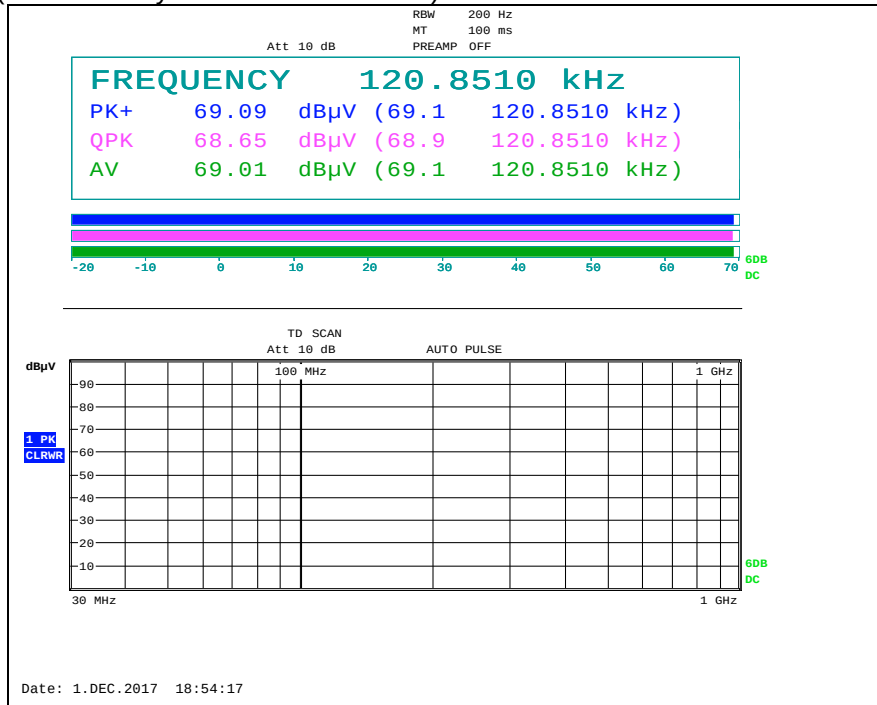
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Charging mode (less than 50 % battery status of client device)



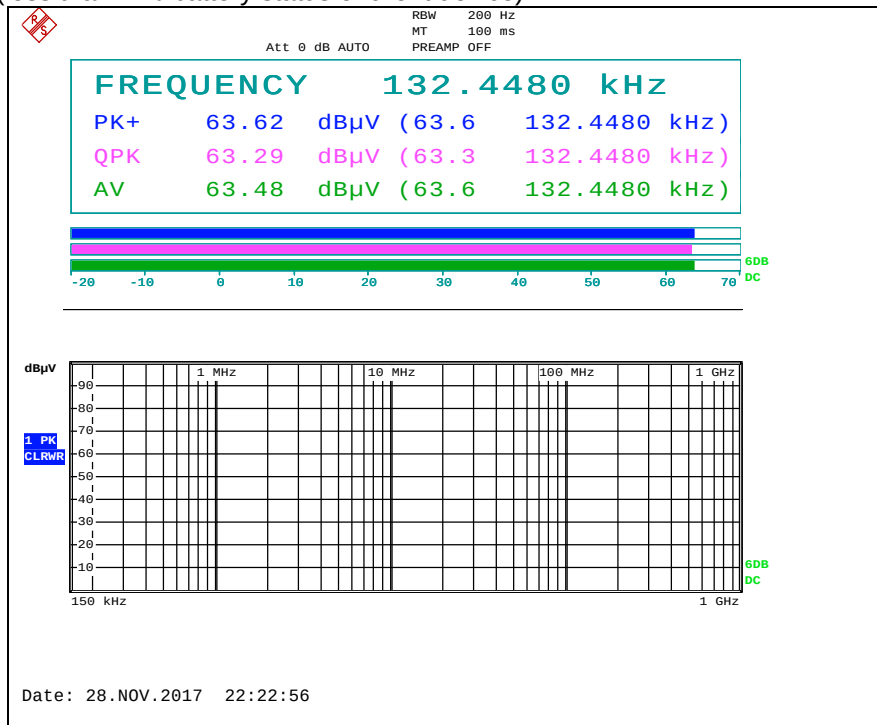
Charging mode (100 % battery status of client device)



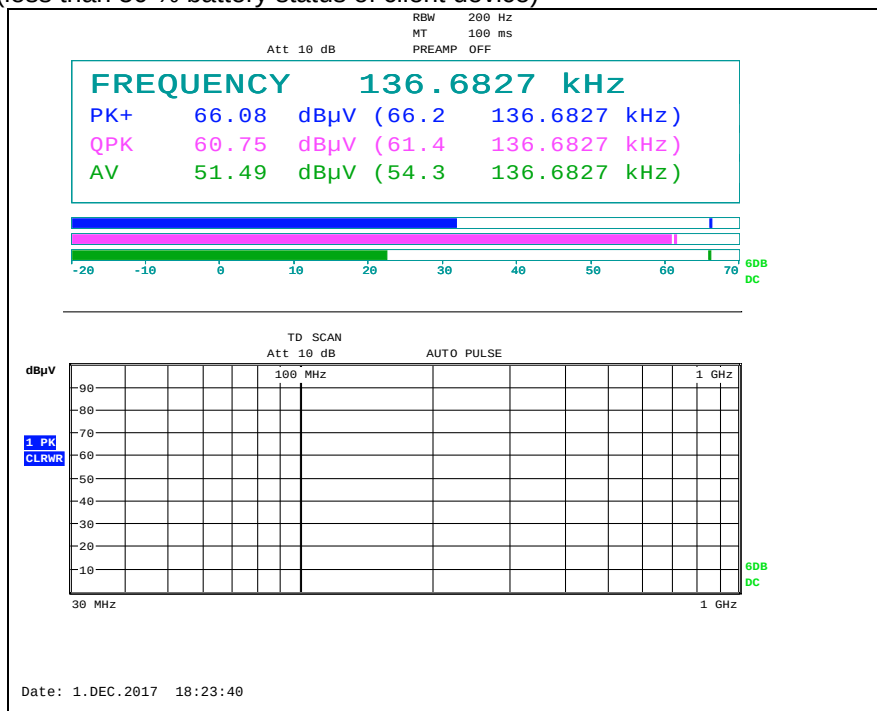
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Test Mode : Ant. 1 in DC 9 V condition

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

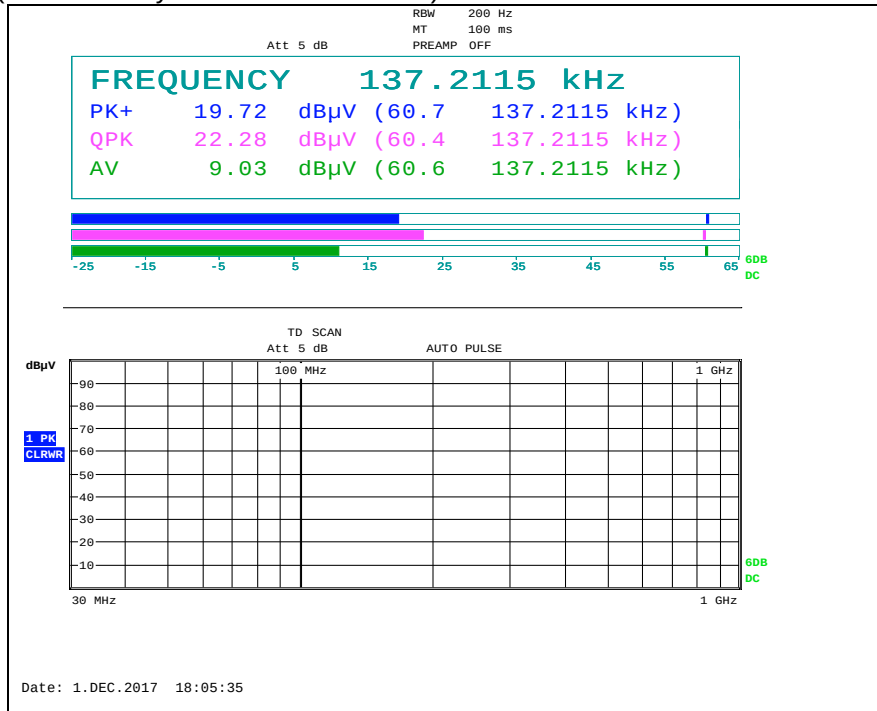


Charging mode (less than 50 % battery status of client device)



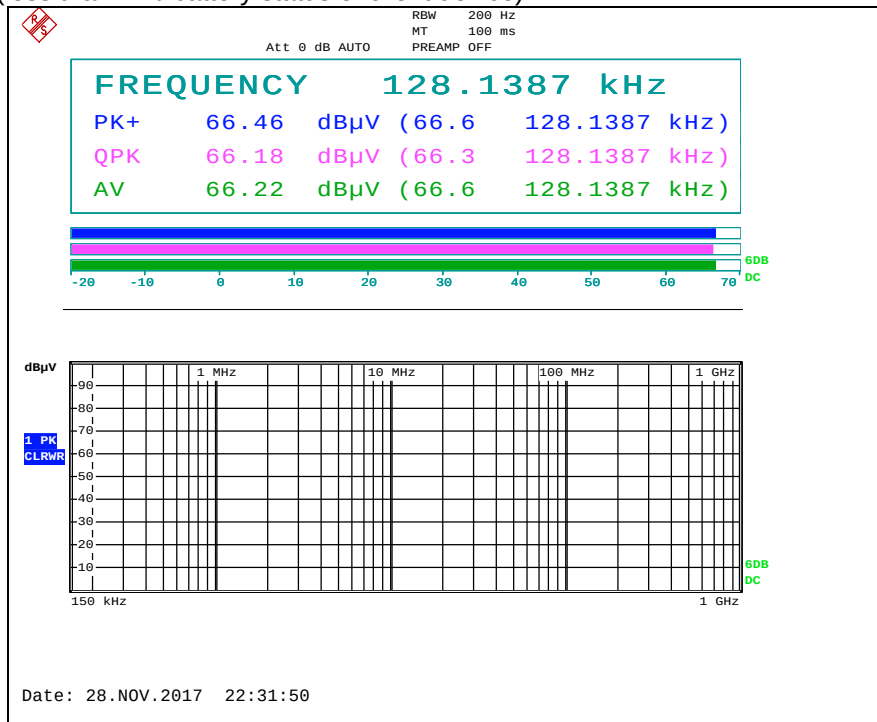
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Charging mode (100 % battery status of client device)



Test Mode : Ant. 2 in DC 9 V condition

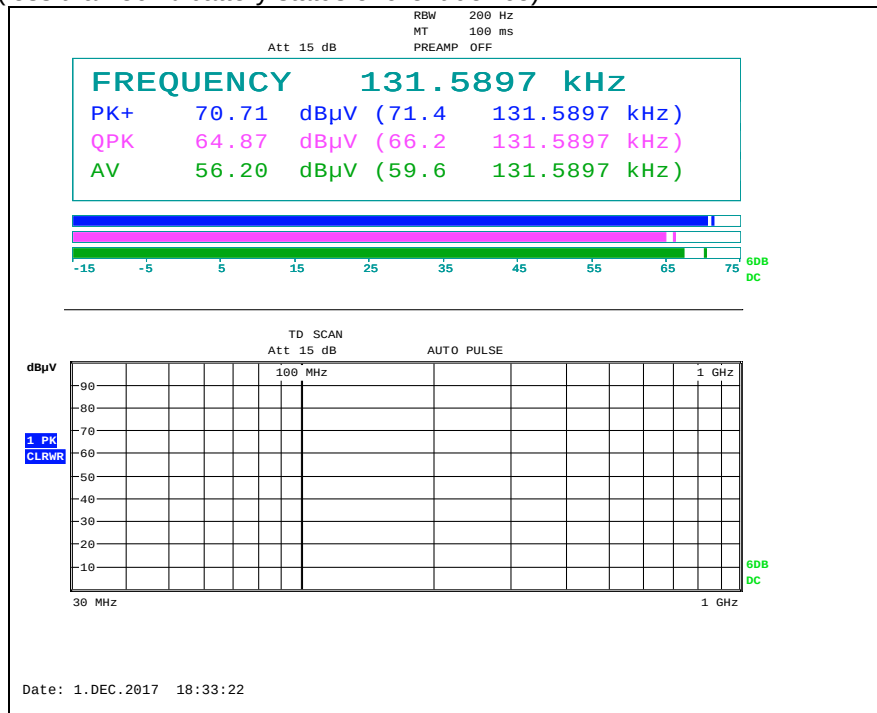
Charging mode (less than 1 % battery status of client device)



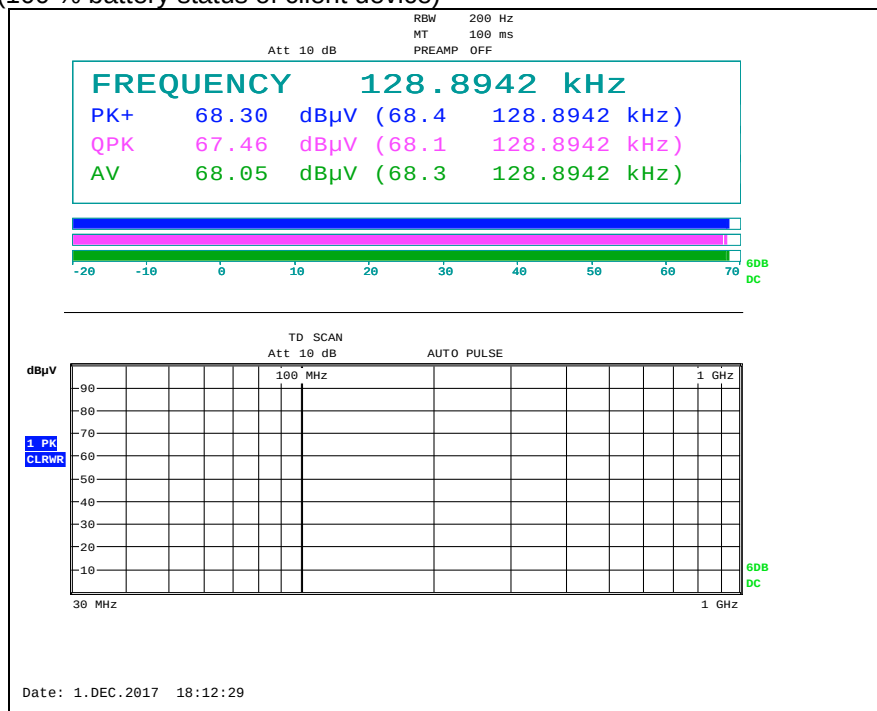
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Charging mode (less than 50 % battery status of client device)



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 from 9 kHz to 30 MHz

Test Mode : Ant. 1 in DC 5 V condition

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

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m	Limit (dBμV/m) at 300 m	Margin (dB)
0.019	32.30	Average	H	19.97	0.01	52.28	-27.72	23.52	51.24
0.067	23.00	Average	H	19.75	0.02	42.77	-37.23	23.52	60.75
0.404	39.10	Average	H	19.60	0.10	58.80	-21.20	23.52	44.72
0.673	29.80	Average	H	19.63	0.10	49.53	-30.47	23.52	53.99
0.943	23.70	Average	H	19.69	0.10	43.49	-36.51	23.52	60.03
1.213	19.30	Average	H	19.71	0.10	39.11	-40.89	23.52	64.41
Above 2.000	Not detected	-	-	-	-	-	-	-	-

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

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m	Limit (dBμV/m) at 300 m	Margin (dB)
0.019	24.60	Average	H	19.97	0.01	44.58	-35.42	23.52	58.94
0.067	20.70	Average	H	19.75	0.02	40.47	-39.53	23.52	63.05
0.407	39.00	Average	H	19.60	0.10	58.70	-21.30	23.52	44.82
0.675	27.60	Average	H	19.64	0.10	47.34	-32.66	23.52	56.18
0.949	23.60	Average	H	19.69	0.10	43.39	-36.61	23.52	60.13
1.218	19.30	Average	H	19.71	0.10	39.11	-40.89	23.52	64.41
Above 2.000	Not detected	-	-	-	-	-	-	-	-

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Charging mode with client device (100 % battery status of client device)

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.022	25.80	Average	H	19.92	0.01	45.73	-34.27	23.52	57.79
0.069	21.30	Average	H	19.74	0.02	41.06	-38.94	23.52	62.46
0.359	39.50	Average	H	19.60	0.10	59.20	-20.80	23.52	44.32
0.603	28.90	Average	H	19.62	0.10	48.62	-31.38	23.52	54.90
0.842	24.20	Average	H	19.67	0.10	43.97	-36.03	23.52	59.55
1.078	19.60	Average	H	19.70	0.10	39.40	-40.60	23.52	64.12
Above 2.000	Not detected	-	-	-	-	-	-	-	-

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RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Test Mode : Ant. 2 in DC 5 V condition
Charging mode with client device (less than 1 % battery status of client device)

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.019	31.90	Average	H	19.97	0.01	51.88	-28.12	23.52	51.64
0.067	23.30	Average	H	19.75	0.02	43.07	-36.93	23.52	60.45
0.384	34.90	Average	H	19.60	0.10	54.60	-25.40	23.52	48.92
0.639	29.00	Average	H	19.63	0.10	48.73	-31.27	23.52	54.79
0.898	23.70	Average	H	19.68	0.10	43.48	-36.52	23.52	60.04
Above 1.000	Not detected	-	-	-	-	-	-	-	-

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

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.018	27.30	Average	H	19.98	0.01	47.29	-32.71	23.52	56.23
0.067	23.60	Average	H	19.75	0.02	43.37	-36.63	23.52	60.15
0.086	13.30	Average	H	19.72	0.03	33.05	-46.95	23.52	70.47
0.384	34.00	Average	H	19.60	0.10	53.70	-26.30	23.52	49.82
0.640	28.80	Average	H	19.63	0.10	48.53	-31.47	23.52	54.99
0.896	24.40	Average	H	19.68	0.10	44.18	-35.82	23.52	59.34
1.153	19.20	Average	H	19.71	0.10	39.01	-40.99	23.52	64.51
Above 2.000	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

Charging mode with client device (100 % battery status of client device)

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.022	26.60	Average	H	19.92	0.01	46.53	-33.47	23.52	56.99
0.087	12.30	Average	H	19.72	0.03	32.05	-47.95	23.52	71.47
0.361	27.30	Average	H	19.60	0.10	47.00	-33.00	23.52	56.52
0.605	27.50	Average	H	19.62	0.10	47.22	-32.78	23.52	56.30
0.847	18.40	Average	H	19.67	0.10	38.17	-41.83	23.52	65.35
Above 1.000	Not detected	-	-	-	-	-	-	-	-

Note;

1. Result at 300 m [dB μ V/m]= Actual at 3 m [dB μ V/m] + 40 log(3/300)
2. According to clause 2.2.2. of MP-5(1986). The detector function selector shall be set to average.
3. The limit above was calculated based on table §18.305(b)

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A4(210 mm x 297 mm)

Test Mode : Ant. 1 in DC 9 V condition
Charging mode with client device (less than 1 % battery status of client device)

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.019	27.30	Average	H	19.97	0.01	47.28	-32.72	23.52	56.24
0.059	22.80	Average	H	19.76	0.02	42.58	-37.42	23.52	60.94
0.397	39.02	Average	H	19.60	0.10	58.72	-21.28	23.52	44.80
0.662	29.70	Average	H	19.63	0.10	49.43	-30.57	23.52	54.09
0.925	23.80	Average	H	19.69	0.10	43.59	-36.41	23.52	59.93
Above 1.000	Not detected	-	-	-	-	-	-	-	-

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

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.023	24.10	Average	H	19.91	0.01	44.02	-35.98	23.52	59.50
0.046	18.40	Average	H	19.78	0.02	38.20	-41.80	23.52	65.32
0.076	9.00	Average	H	19.73	0.02	28.75	-51.25	23.52	74.77
0.405	43.00	Average	H	19.60	0.10	62.70	-17.30	23.52	40.82
0.680	31.80	Average	H	19.64	0.10	51.54	-28.46	23.52	51.98
0.949	25.30	Average	H	19.69	0.10	45.09	-34.91	23.52	58.43
1.218	19.30	Average	H	19.71	0.10	39.11	-40.89	23.52	64.41
Above 2.000	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

Charging mode with client device (100 % battery status of client device)

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.022	25.90	Average	H	19.92	0.01	45.83	-34.17	23.52	57.69
0.069	21.60	Average	H	19.74	0.02	41.36	-38.64	23.52	62.16
0.086	18.70	Average	H	19.72	0.03	38.45	-41.55	23.52	65.07
0.411	37.70	Average	H	19.60	0.10	57.40	-22.60	23.52	46.12
0.685	28.30	Average	H	19.64	0.10	48.04	-31.96	23.52	55.48
0.957	22.30	Average	H	19.69	0.10	42.09	-37.91	23.52	61.43
Above 1.000	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

Test Mode : Ant. 2 in DC 9 V condition
Charging mode with client device (less than 1 % battery status of client device)

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.019	28.90	Average	H	19.97	0.01	48.88	-31.12	23.52	54.64
0.063	27.70	Average	H	19.75	0.02	47.47	-32.53	23.52	56.05
0.384	34.00	Average	H	19.60	0.10	53.70	-26.30	23.52	49.82
0.642	27.50	Average	H	19.63	0.10	47.23	-32.77	23.52	56.29
0.897	23.60	Average	H	19.68	0.10	43.38	-36.62	23.52	60.14
Above 1.000	Not detected	-	-	-	-	-	-	-	-

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

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.020	24.60	Average	H	19.95	0.01	44.56	-35.44	23.52	58.96
0.077	20.30	Average	H	19.73	0.02	40.05	-39.95	23.52	63.47
0.098	14.10	Average	H	19.70	0.03	33.83	-46.17	23.52	69.69
0.394	39.50	Average	H	19.60	0.10	59.20	-20.80	23.52	44.32
0.658	32.80	Average	H	19.63	0.10	52.53	-27.47	23.52	50.99
0.924	26.60	Average	H	19.68	0.10	46.38	-33.62	23.52	57.14
Above 1.000	Not detected	-	-	-	-	-	-	-	-

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Charging mode with client device (100 % battery status of client device)

Radiated Emissions			Ant.	Correction Factors		Total		FCC 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)
0.022	25.70	Average	H	19.92	0.01	45.63	-34.37	23.52	57.89
0.091	13.60	Average	H	19.71	0.03	33.34	-46.66	23.52	70.18
0.385	40.30	Average	H	19.60	0.10	60.00	-20.00	23.52	43.52
0.644	33.90	Average	H	19.63	0.10	53.63	-26.37	23.52	49.89
0.894	27.90	Average	H	19.68	0.10	47.68	-32.32	23.52	55.84
1.160	22.10	Average	H	19.71	0.10	41.91	-38.09	23.52	61.61
Above 2.000	Not detected	-	-	-	-	-	-	-	-

Note;

1. Result at 300 m [dB μ V/m]= Actual at 3 m [dB μ V/m] + 40 log(3/300)
2. According to clause 2.2.2. of MP-5(1986). The detector function selector shall be set to average.
3. The limit above was calculated based on table §18.305(b)

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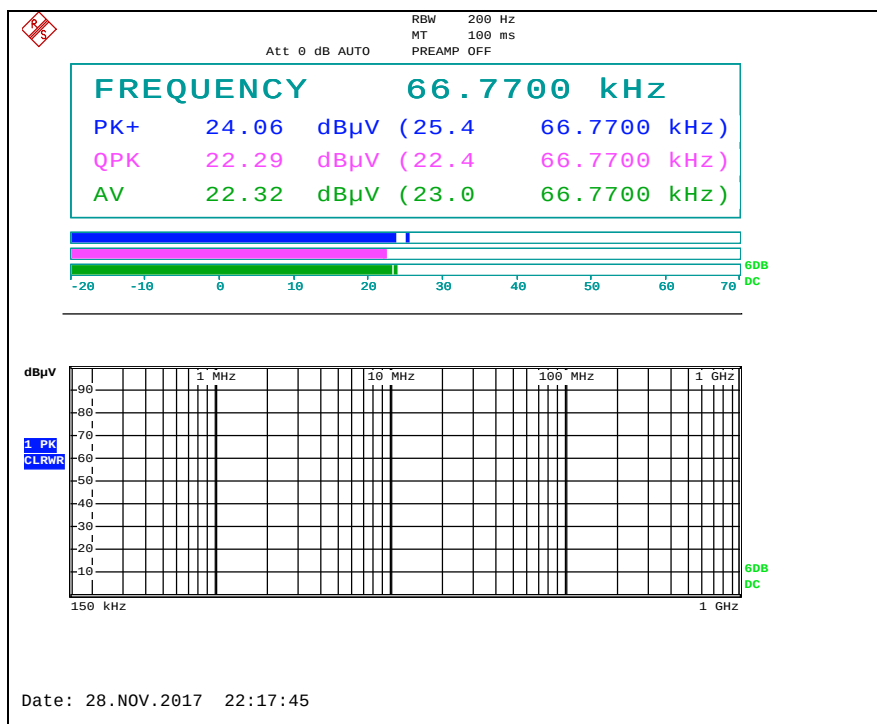
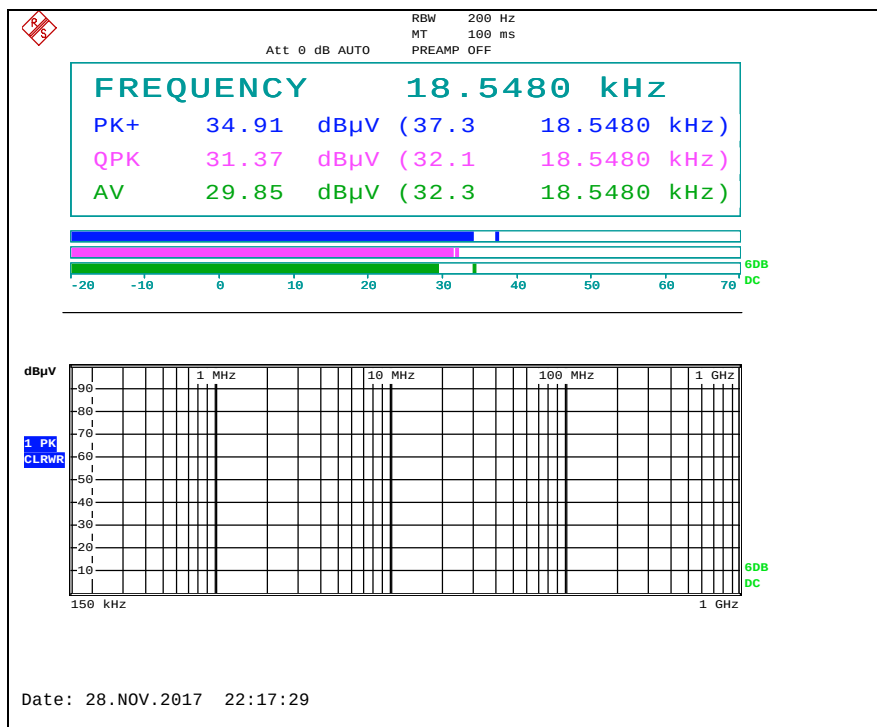
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A4(210 mm x 297 mm)

Test plots

Test Mode : Ant. 1 in DC 5 V condition

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



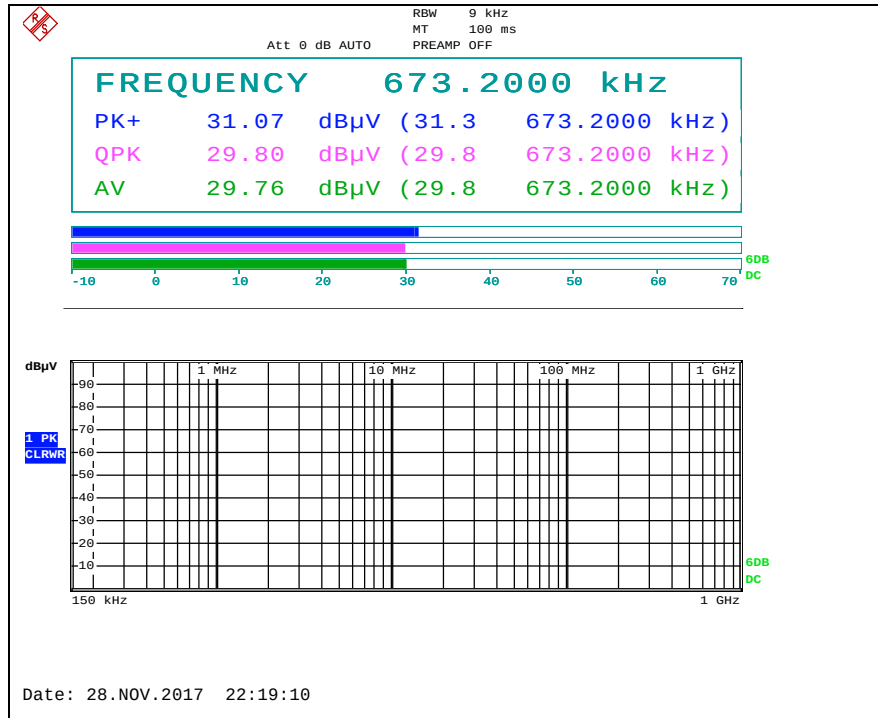
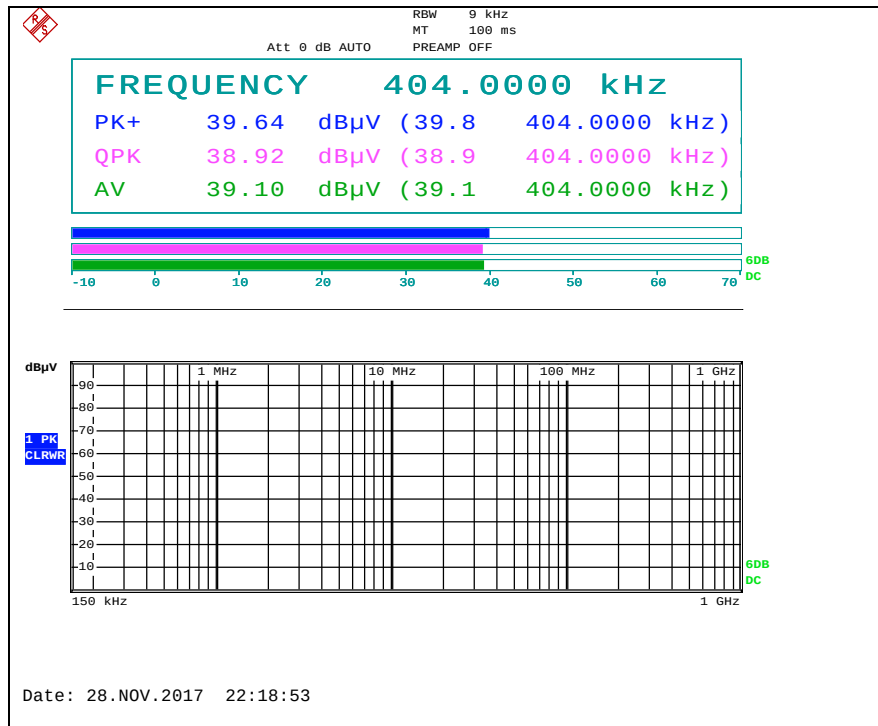
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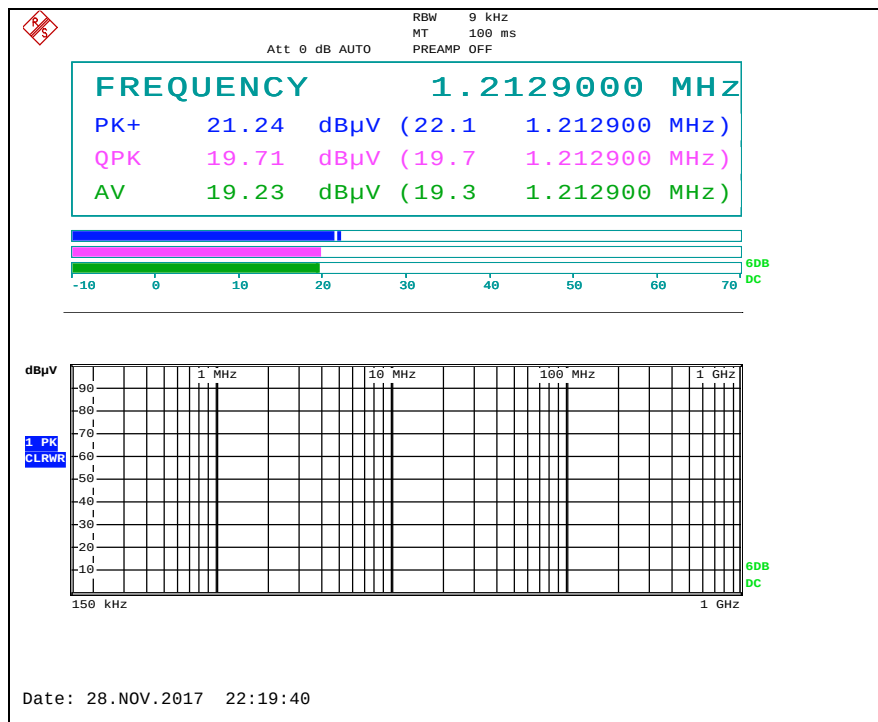
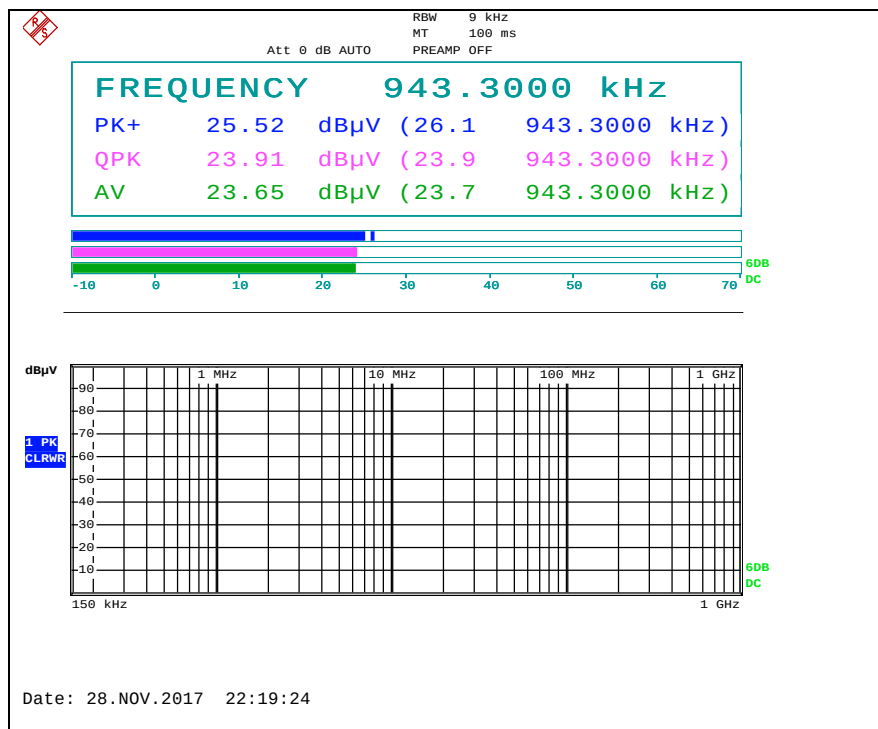
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A4(210 mm x 297 mm)

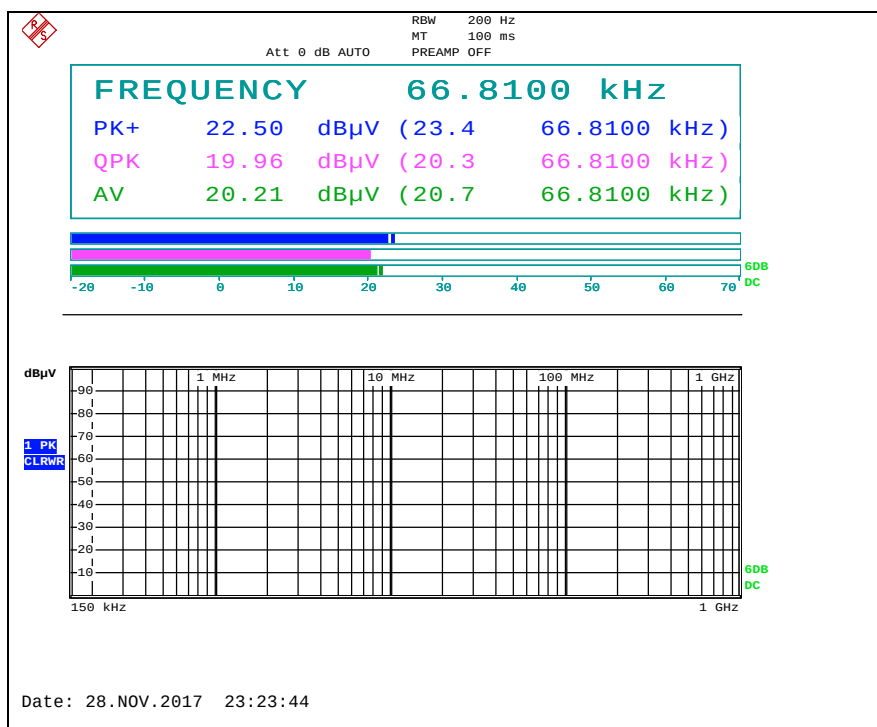
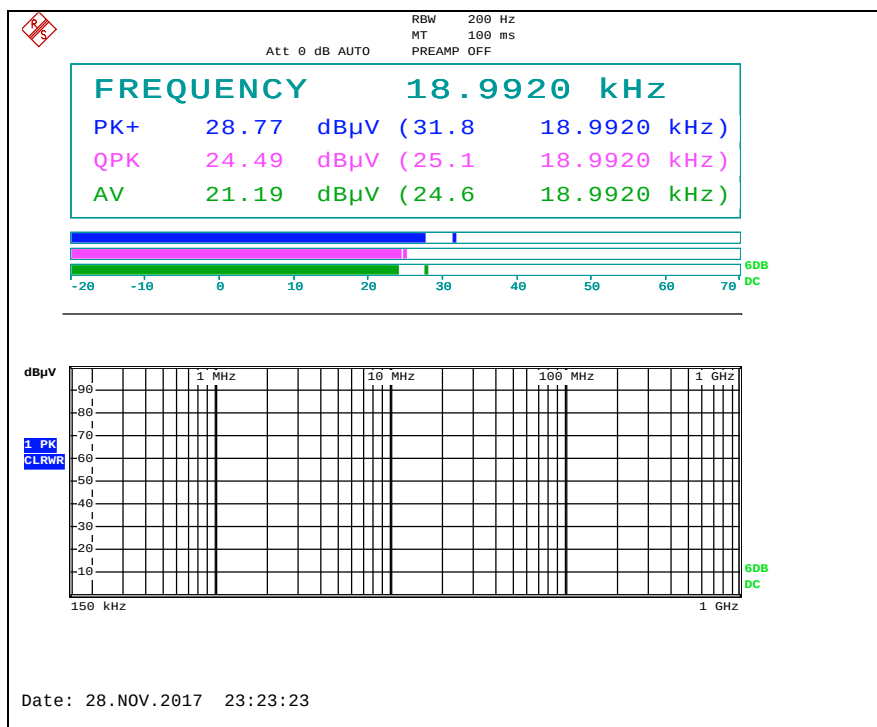


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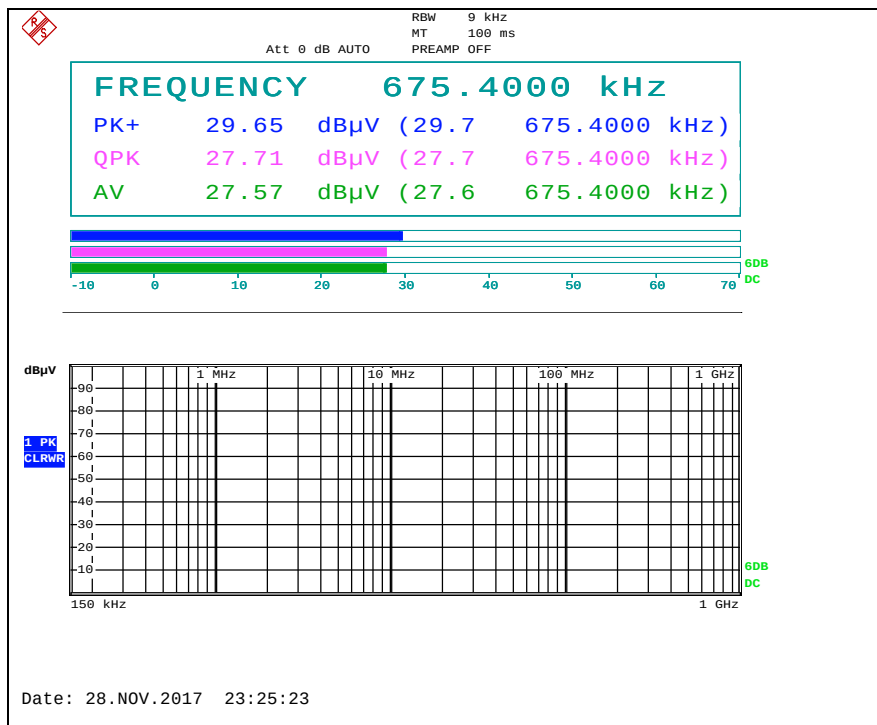
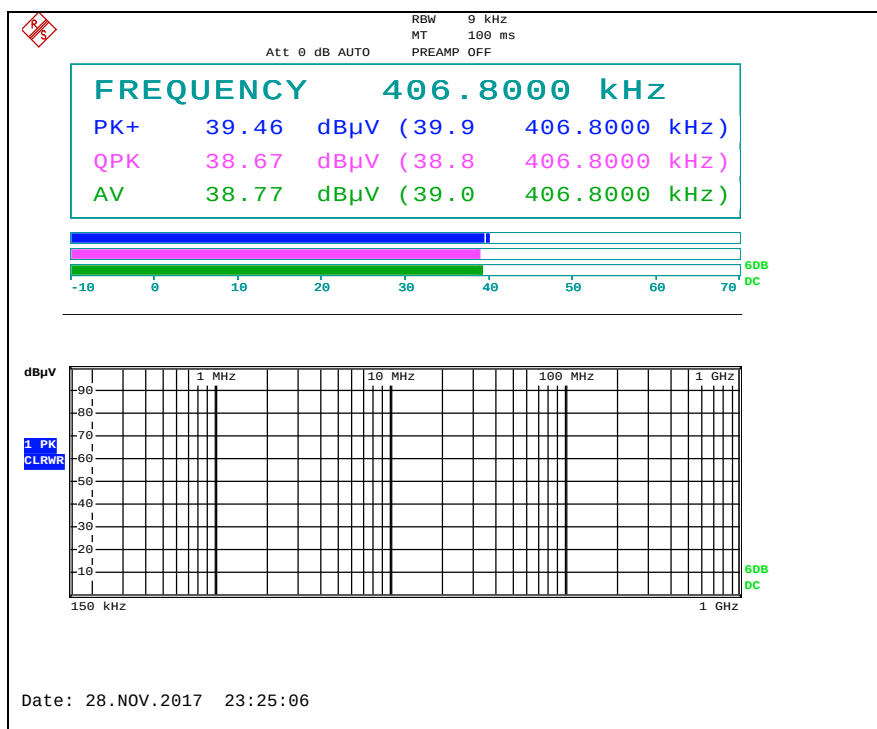


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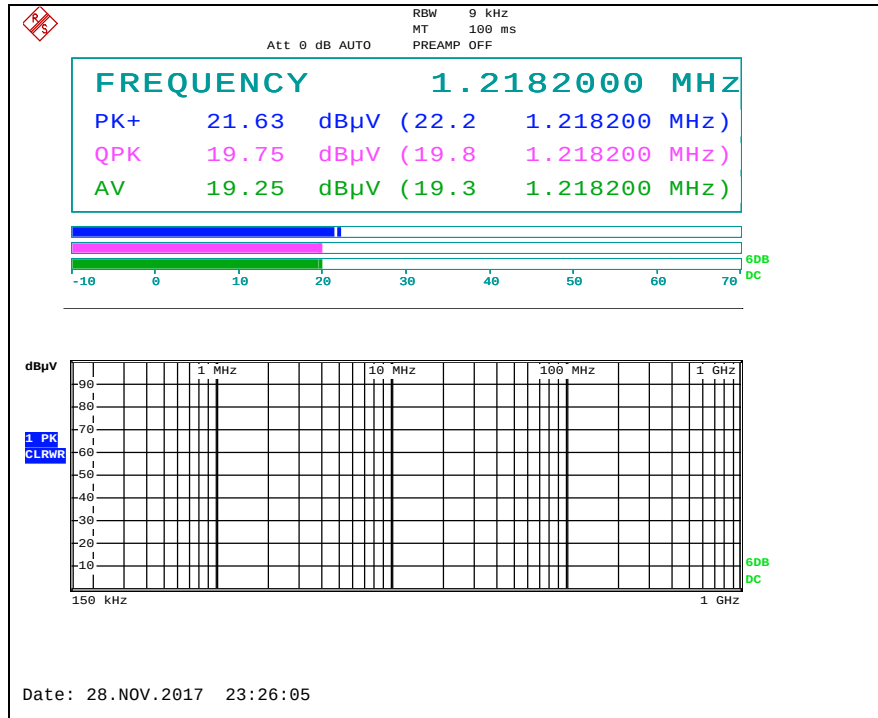
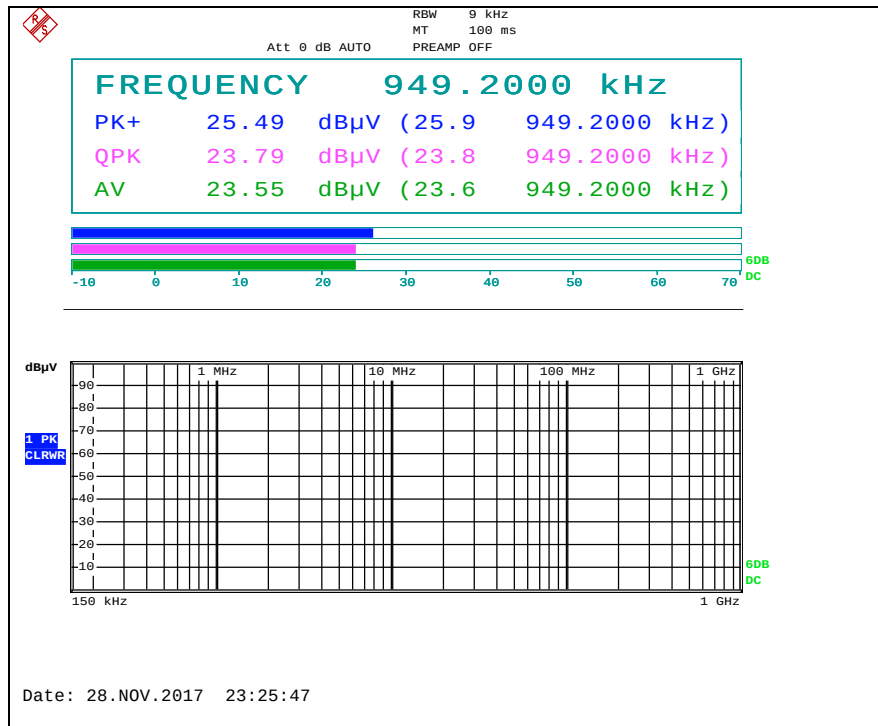
Charging mode (less than 50 % battery status of client device)



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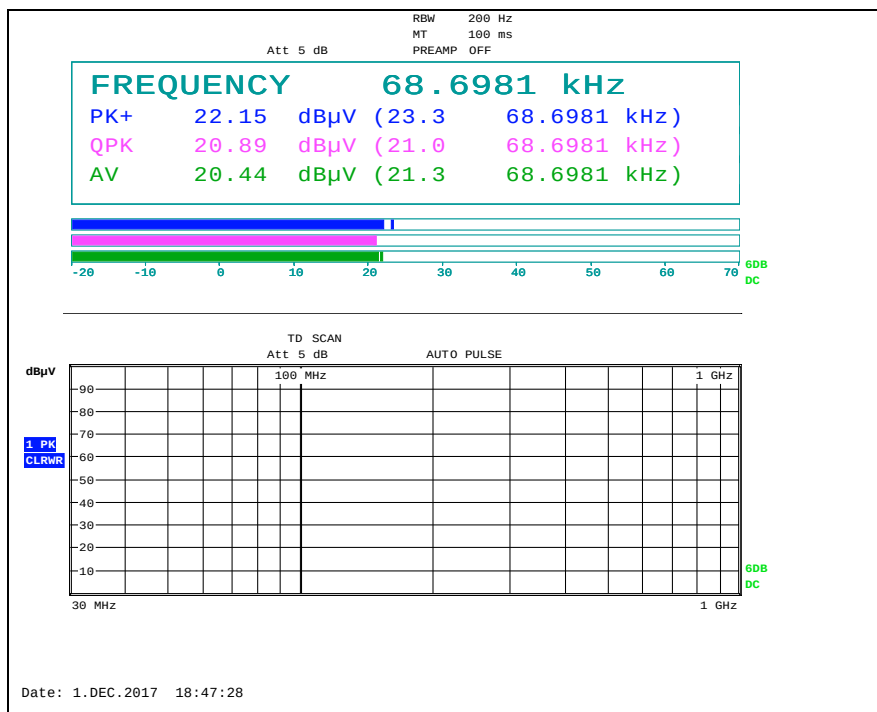
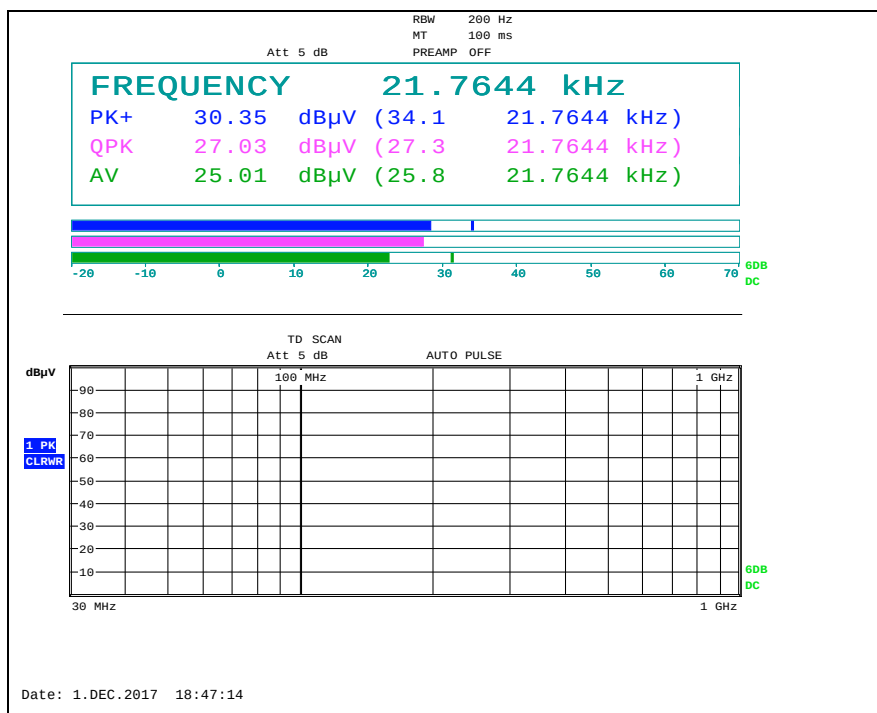


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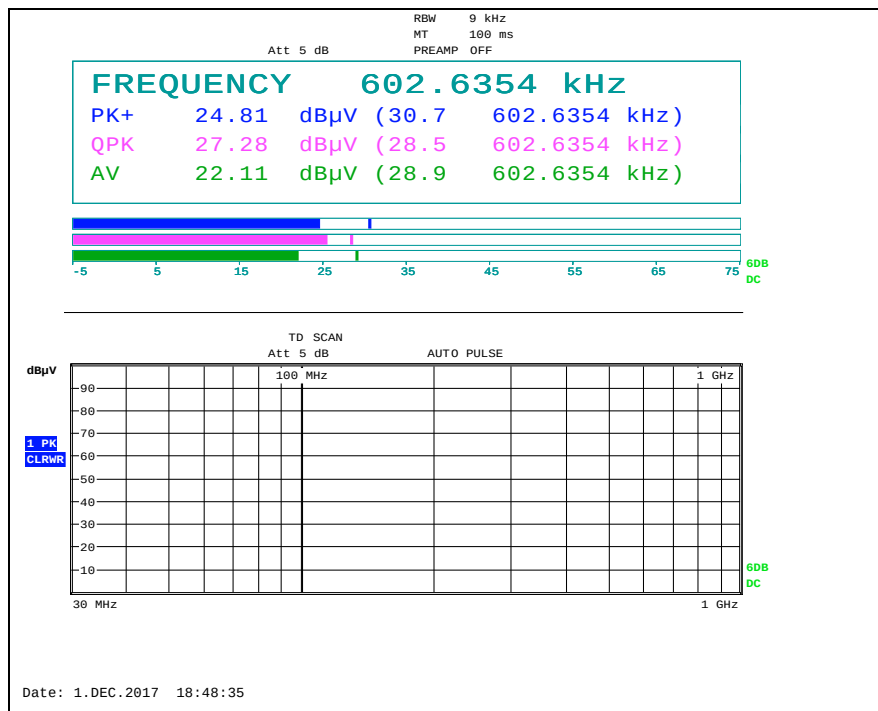
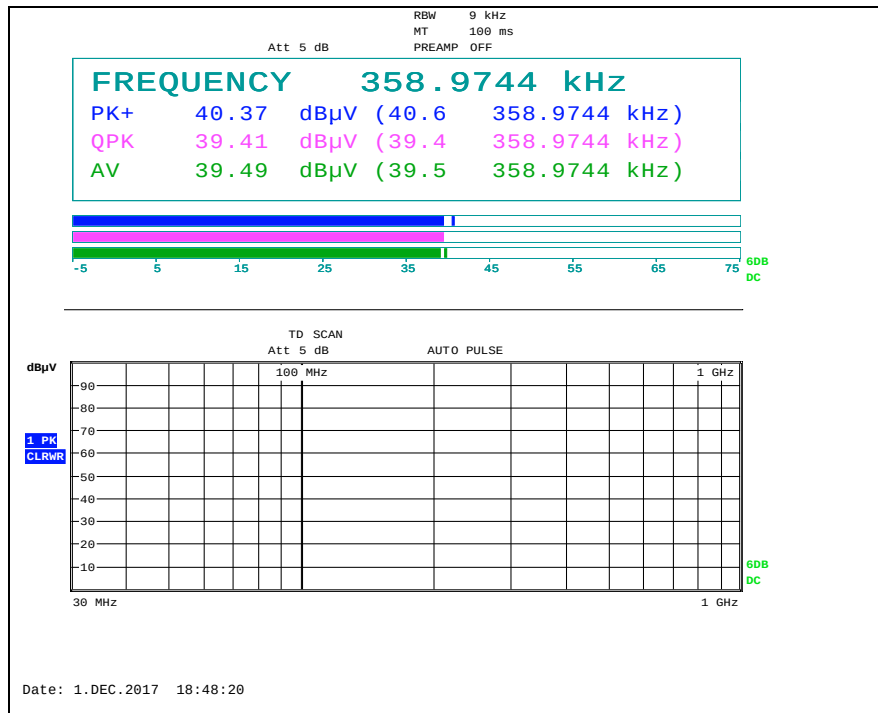


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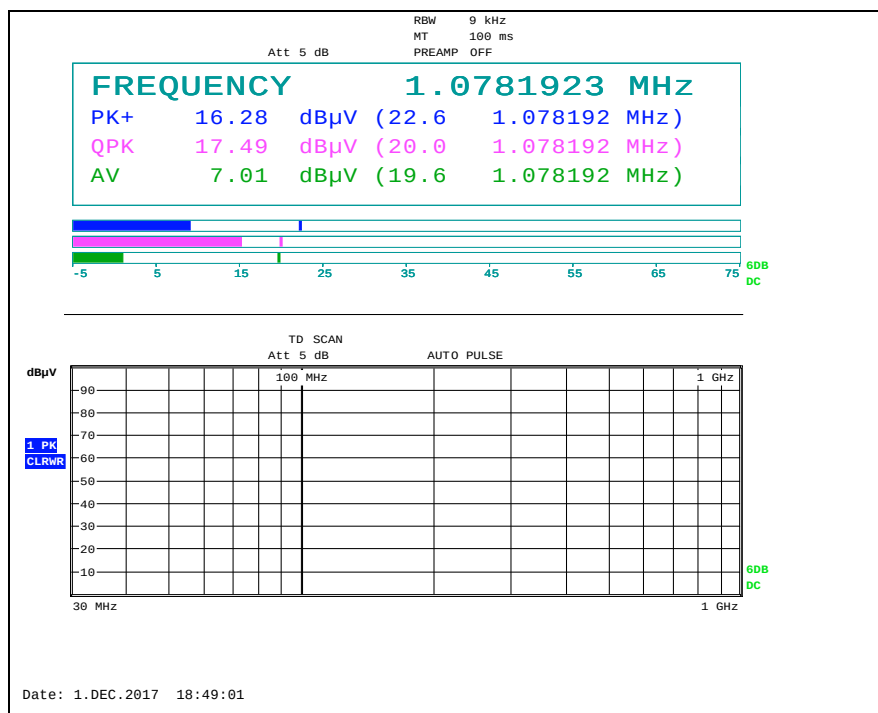
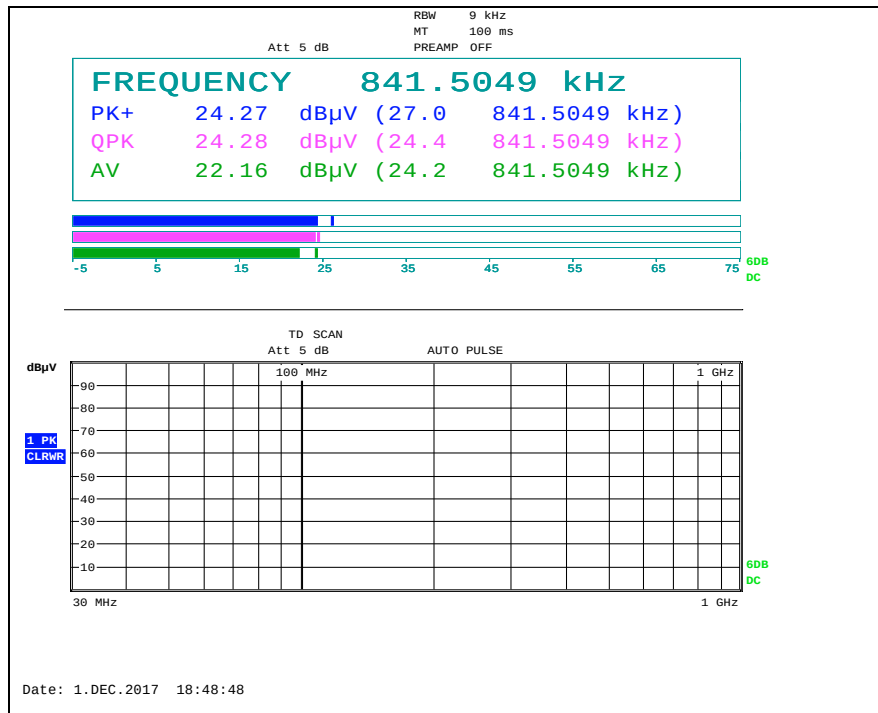
Charging mode (100 % battery status of client device)



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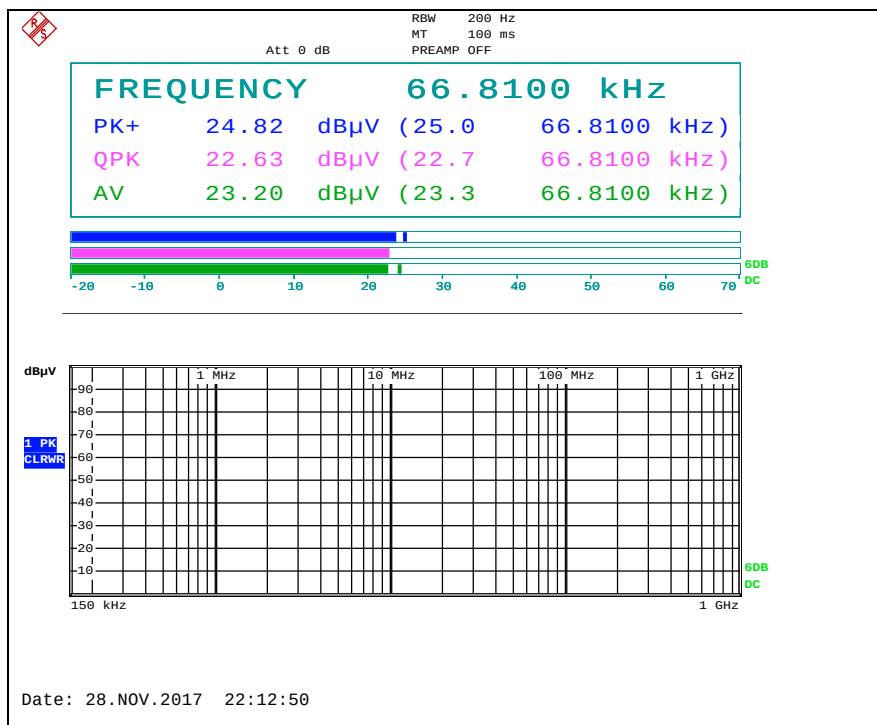
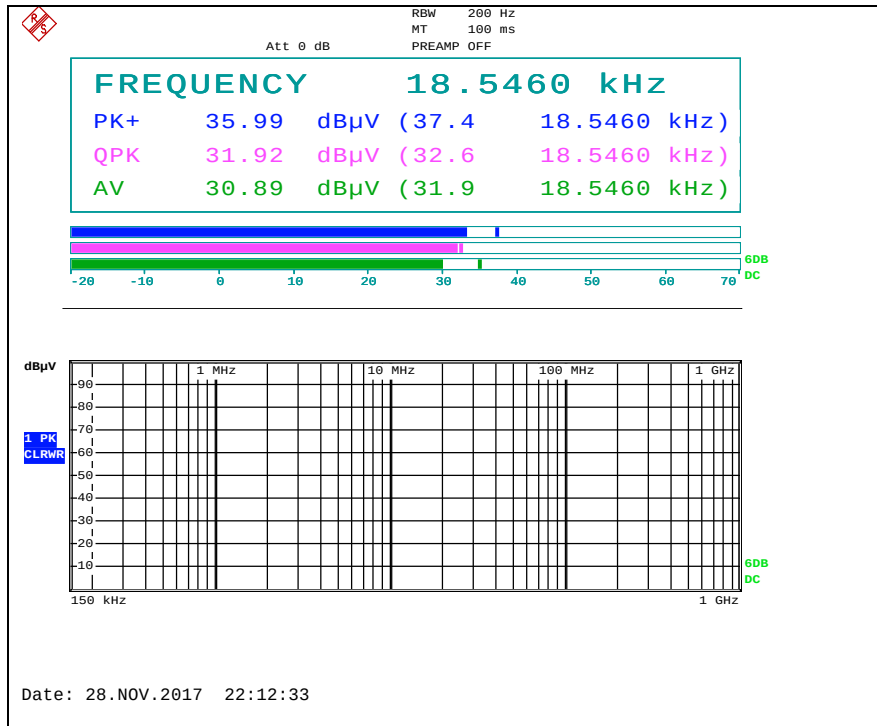
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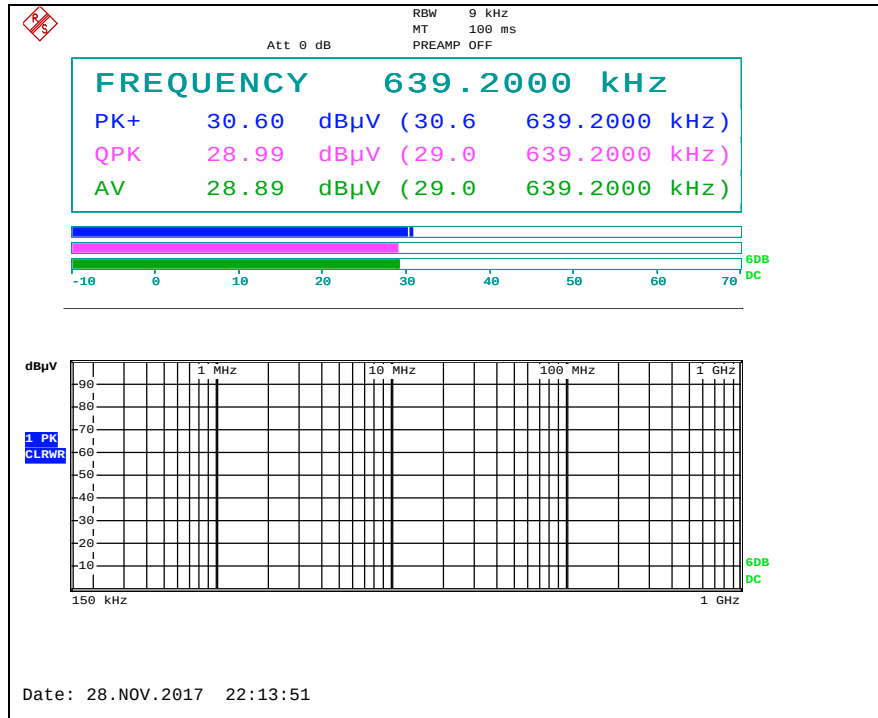
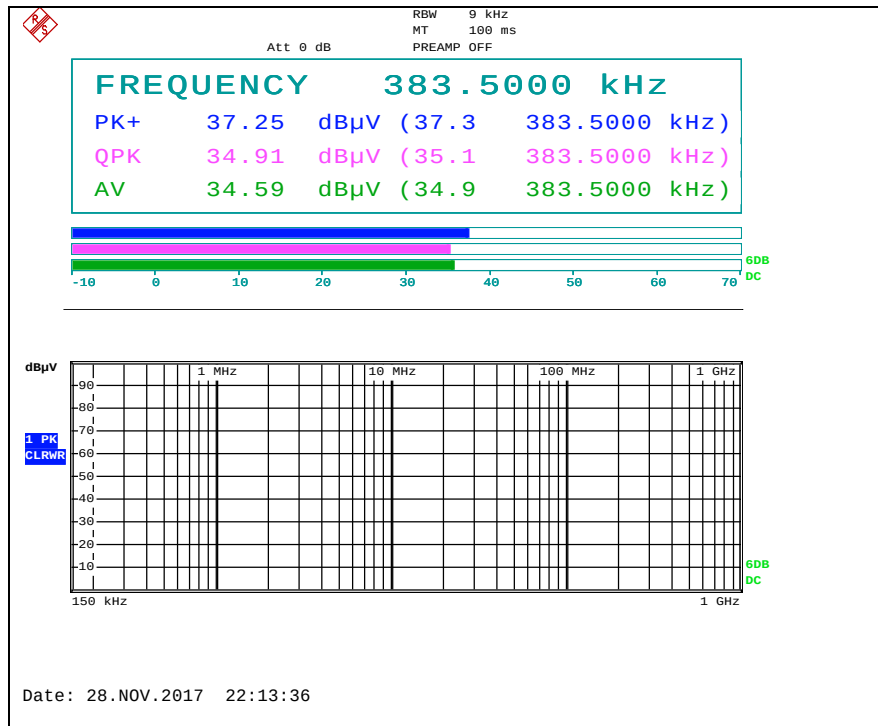
A4(210 mm x 297 mm)

Test Mode : Ant. 2 in DC 5 V condition

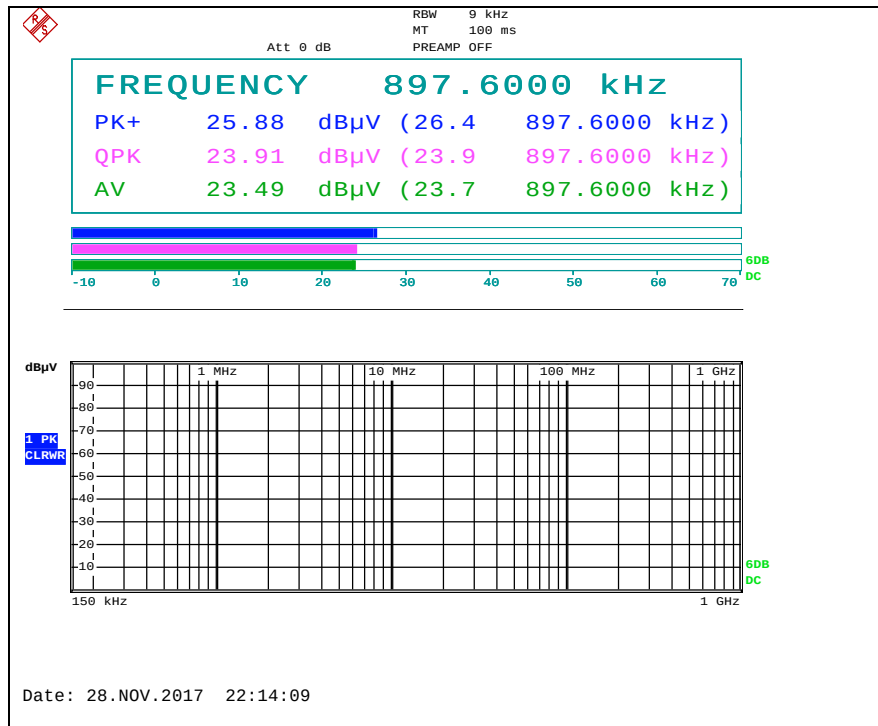
Charging mode (less than 1 % battery status of client device)



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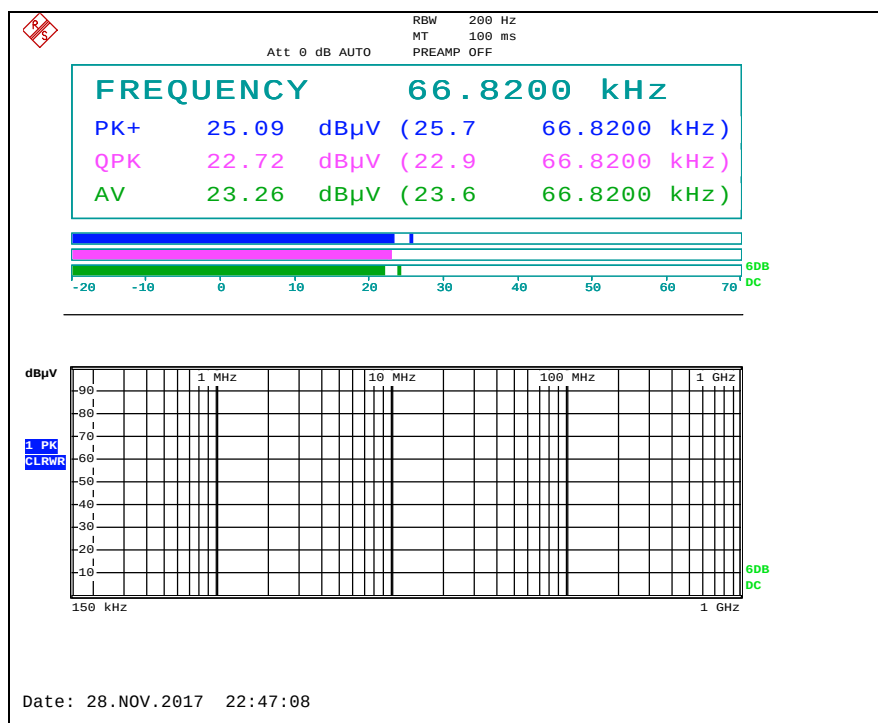
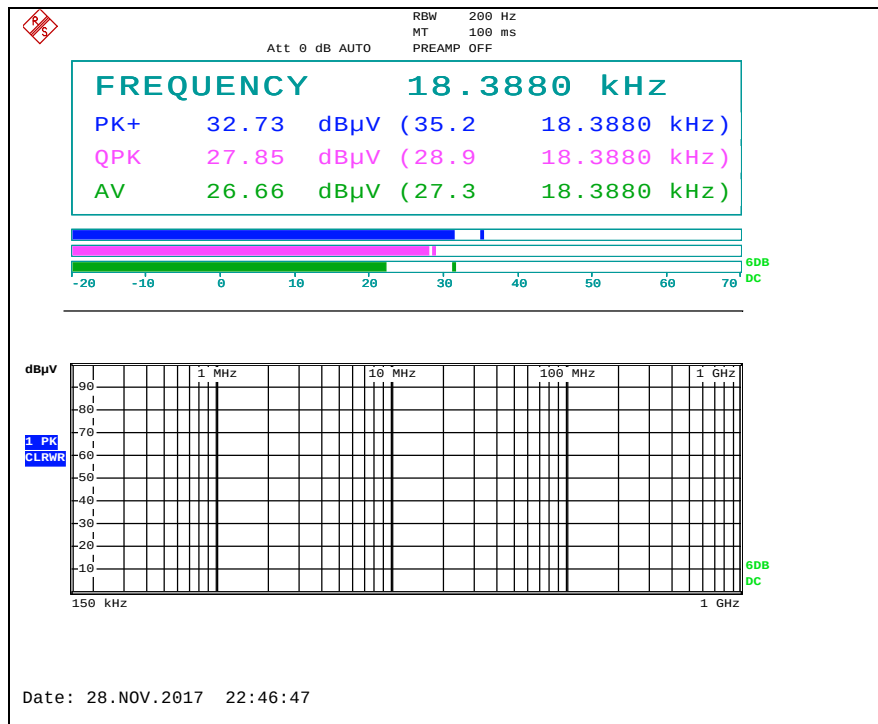
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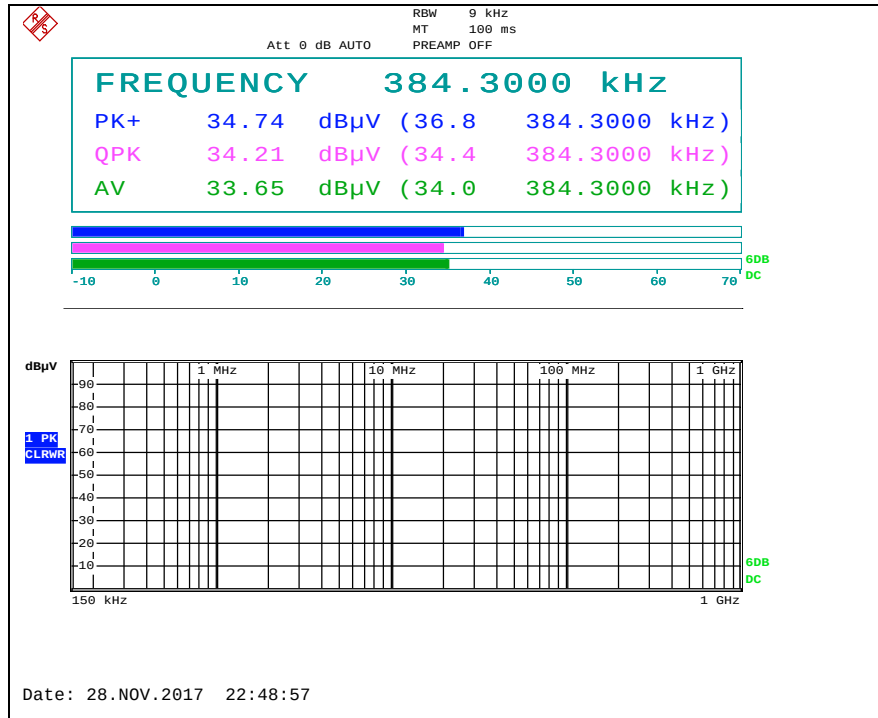
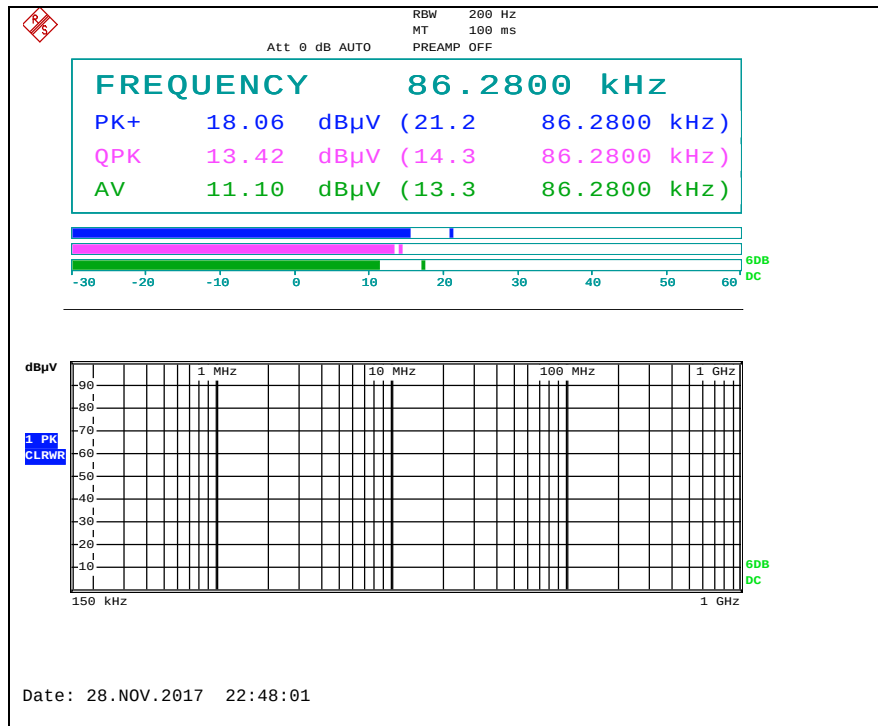
A4(210 mm x 297 mm)

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

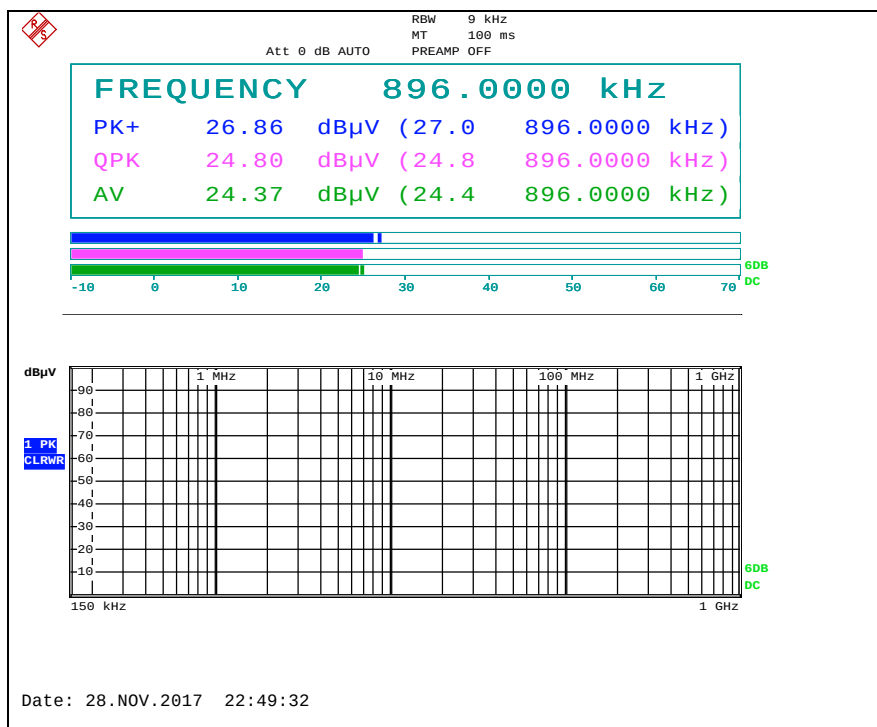
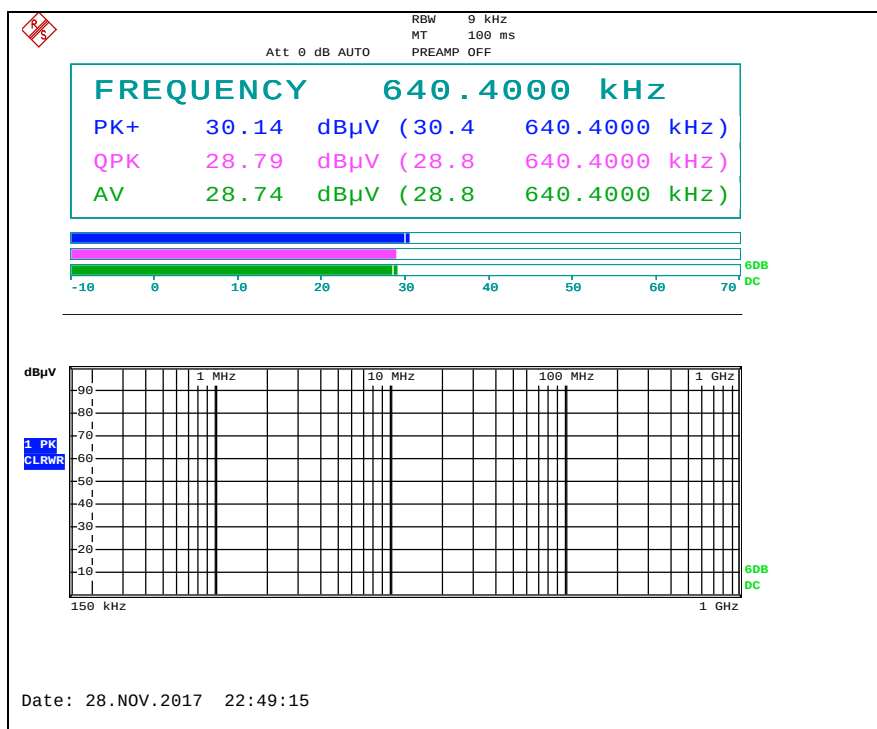


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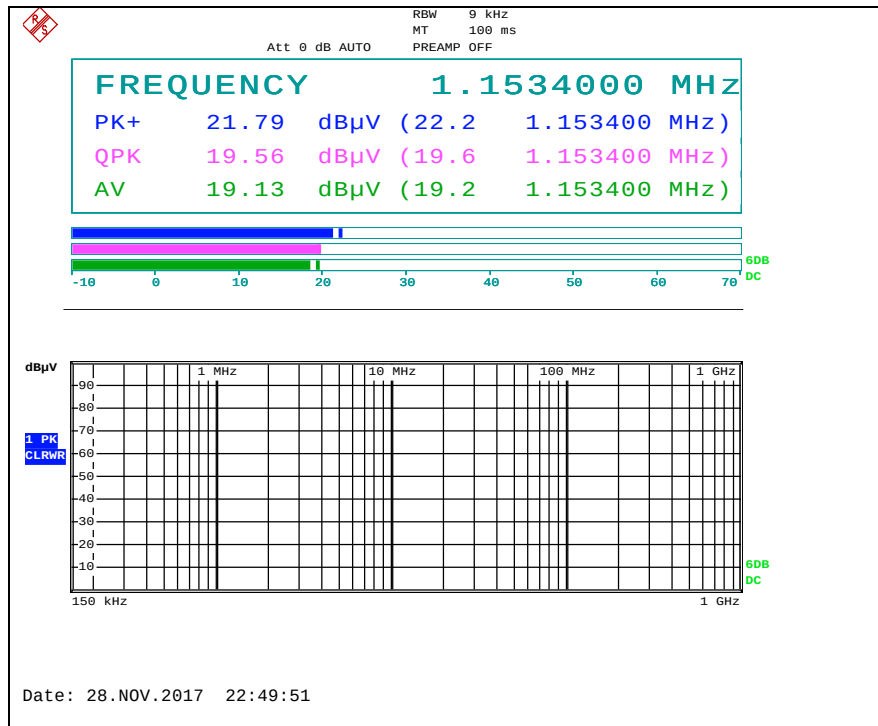
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>



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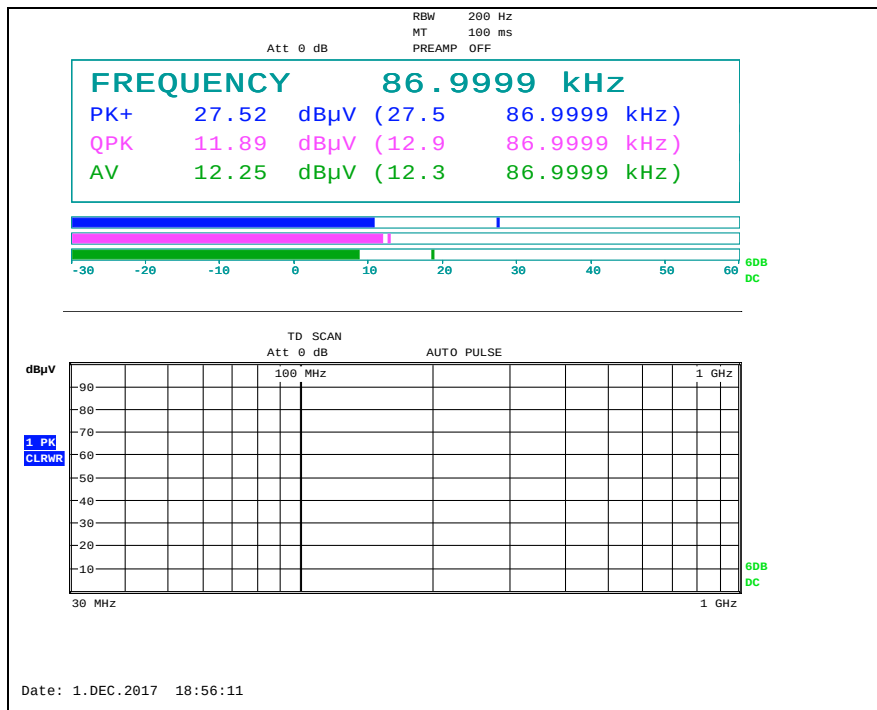
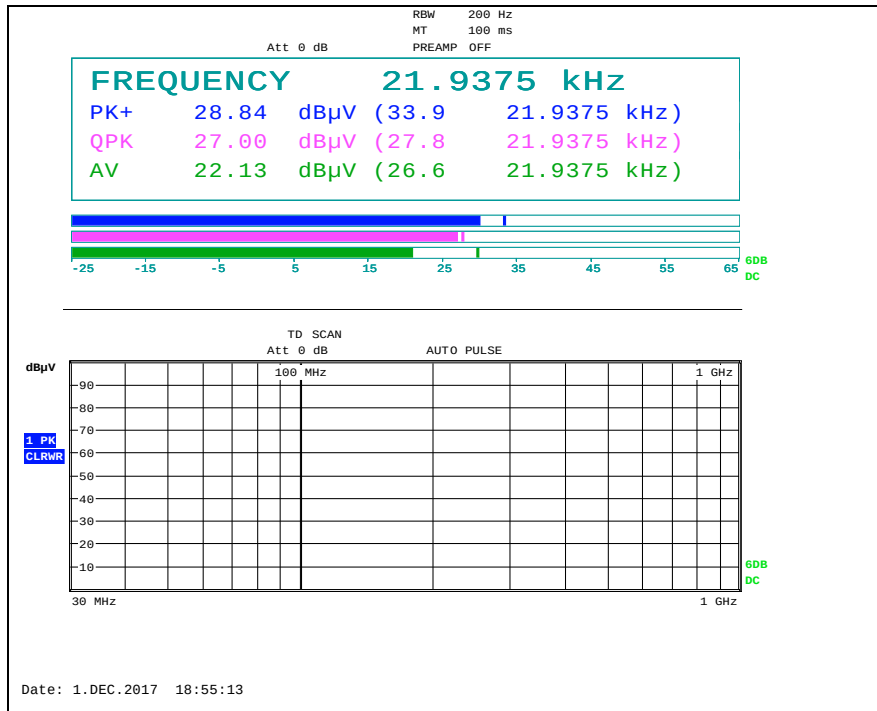
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

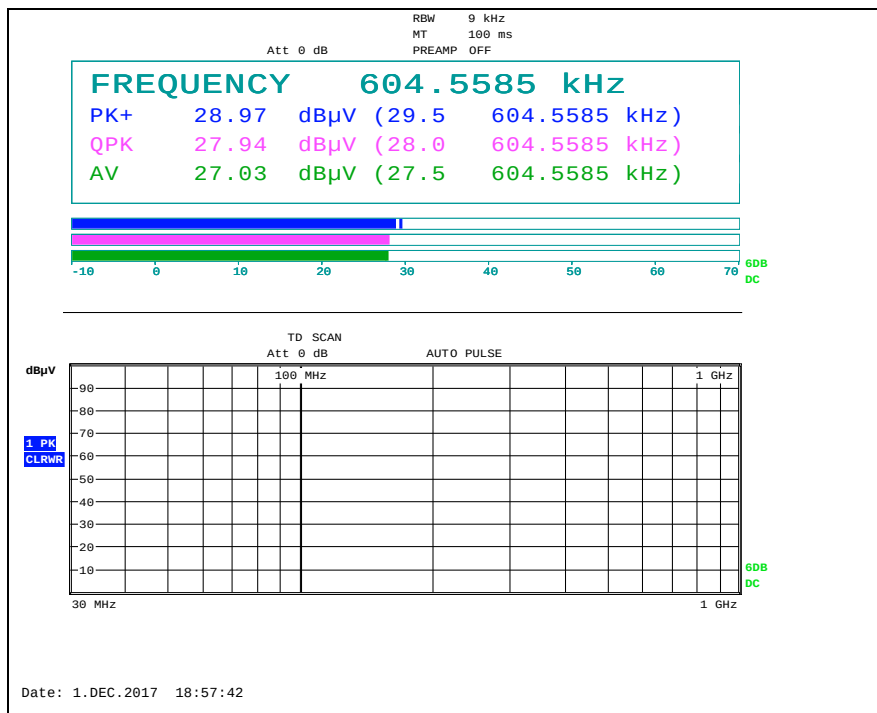
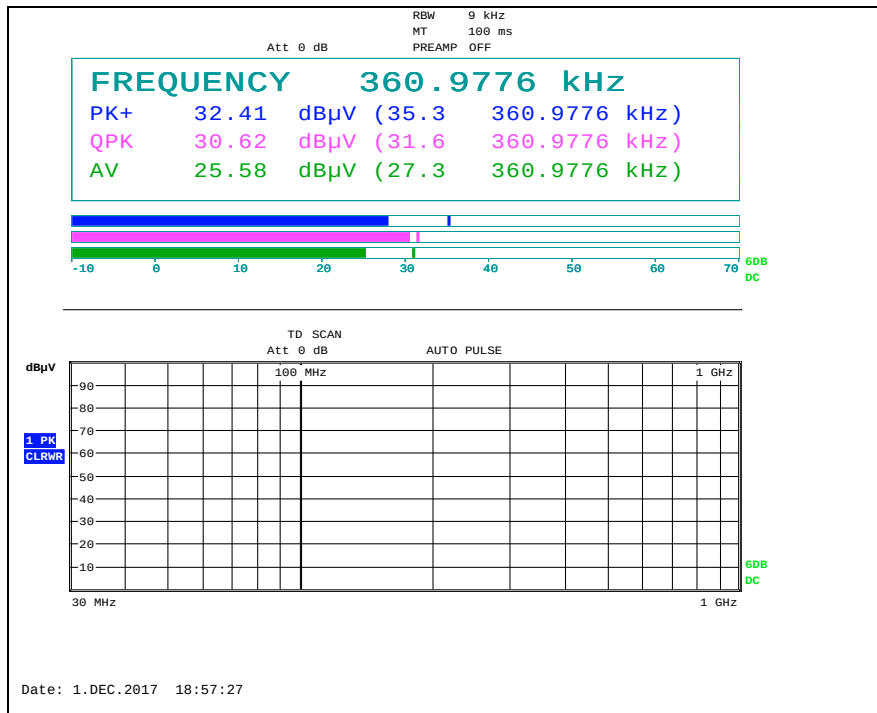
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

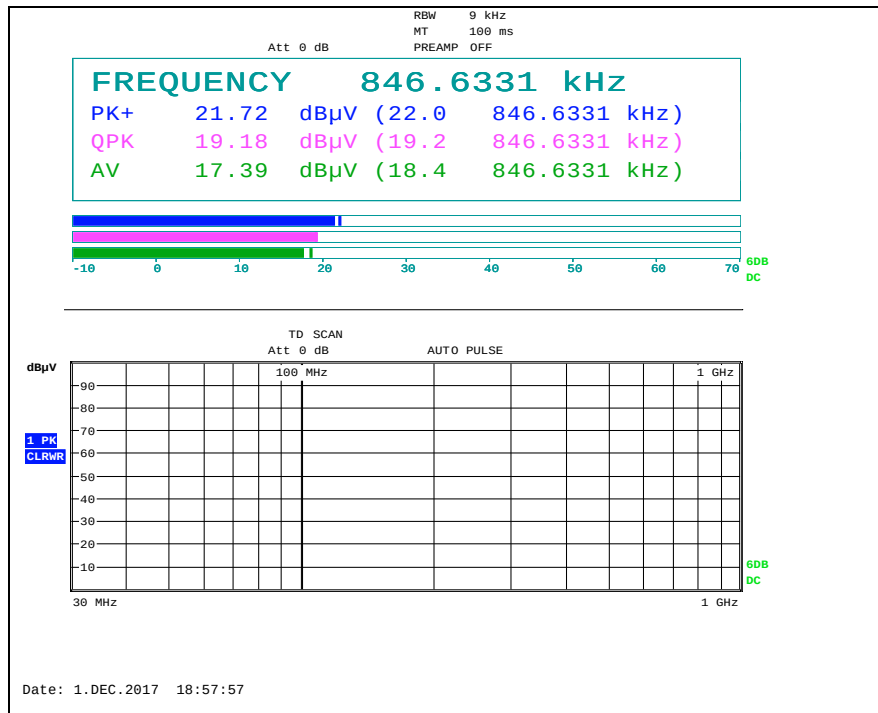
Charging mode (100 % battery status of client device)



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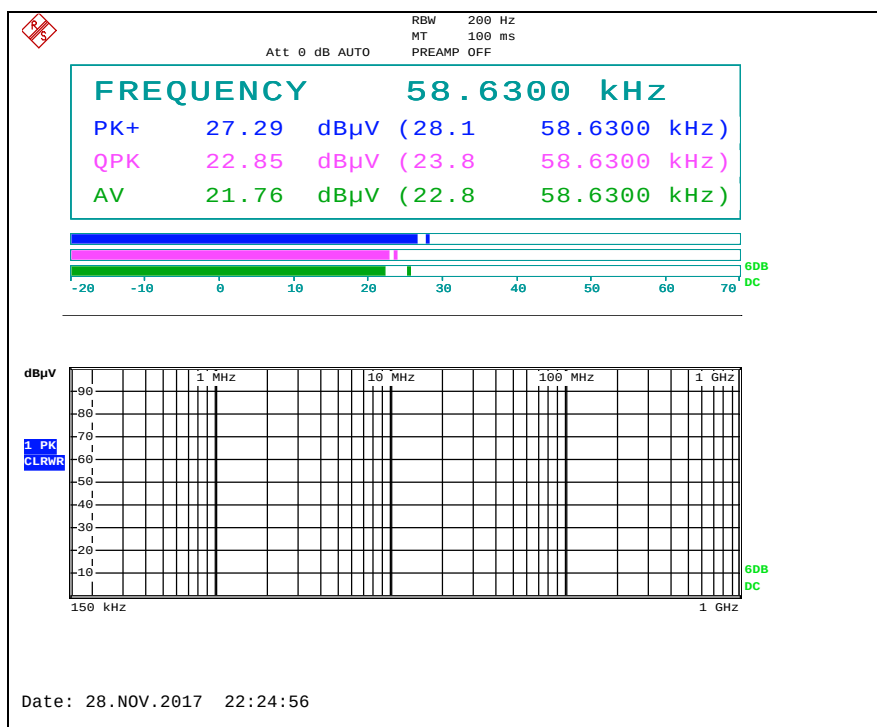
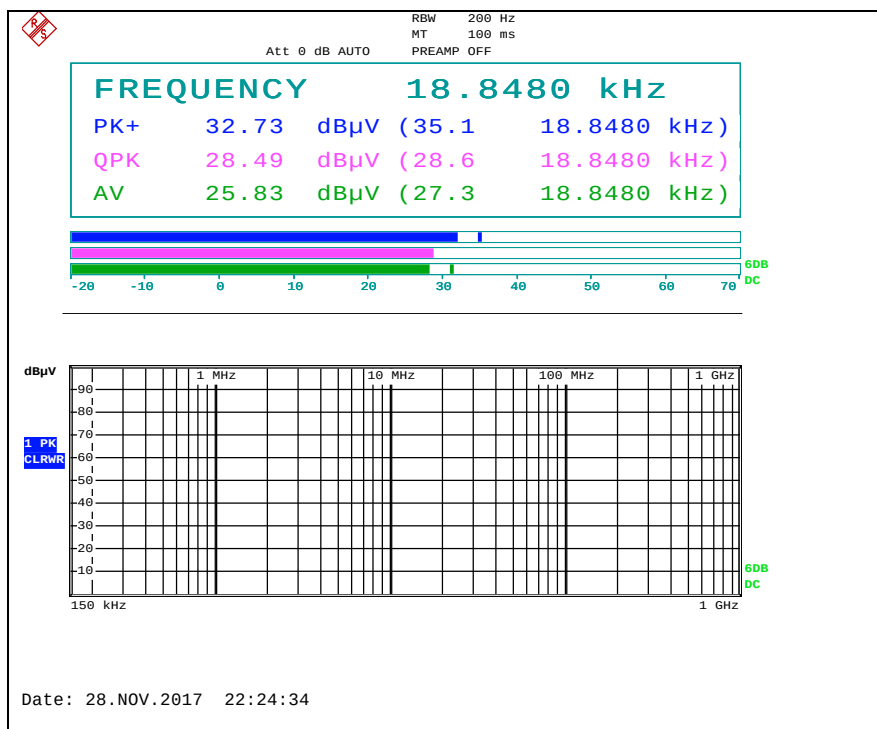
RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

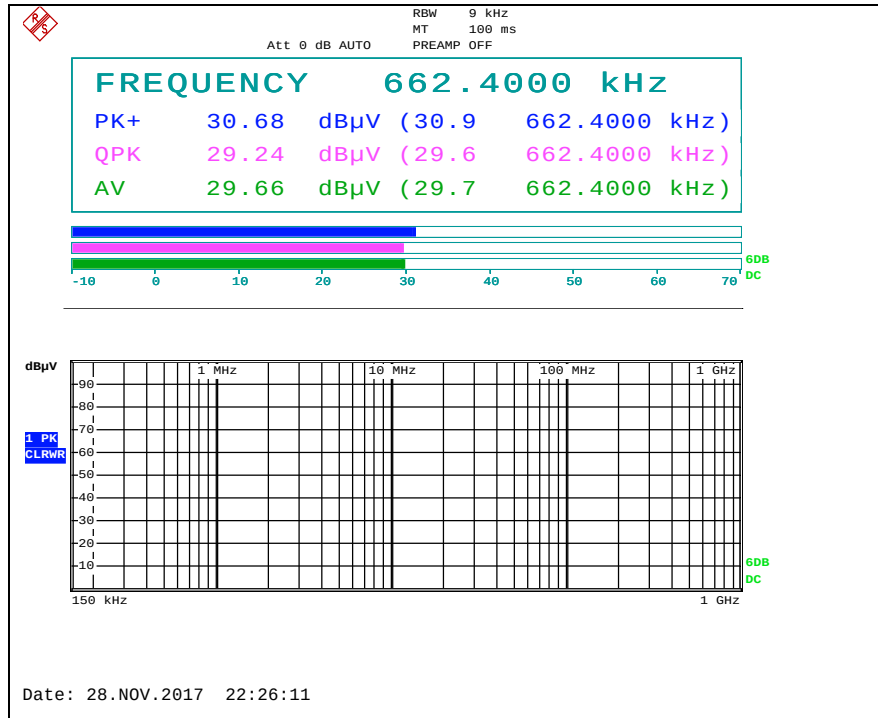
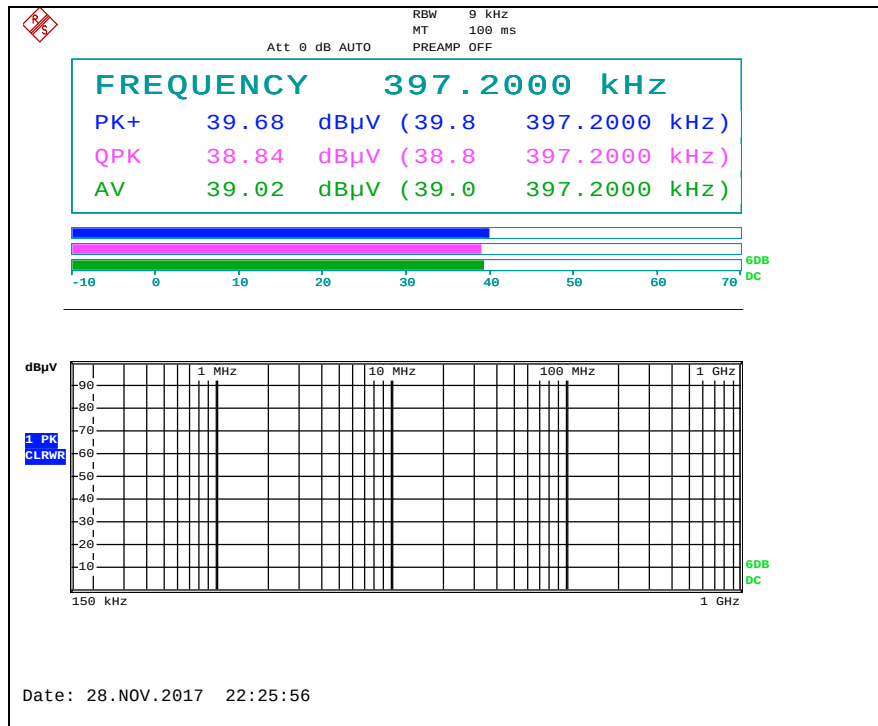
A4(210 mm x 297 mm)

Test Mode : Ant. 1 in DC 9 V condition

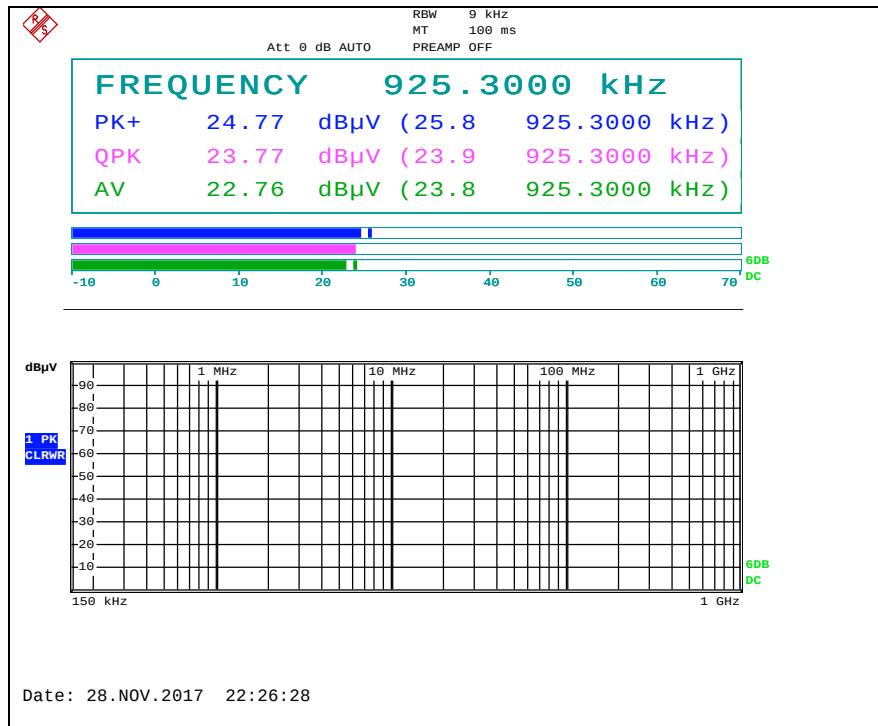
Charging mode (less than 1 % battery status of client device)



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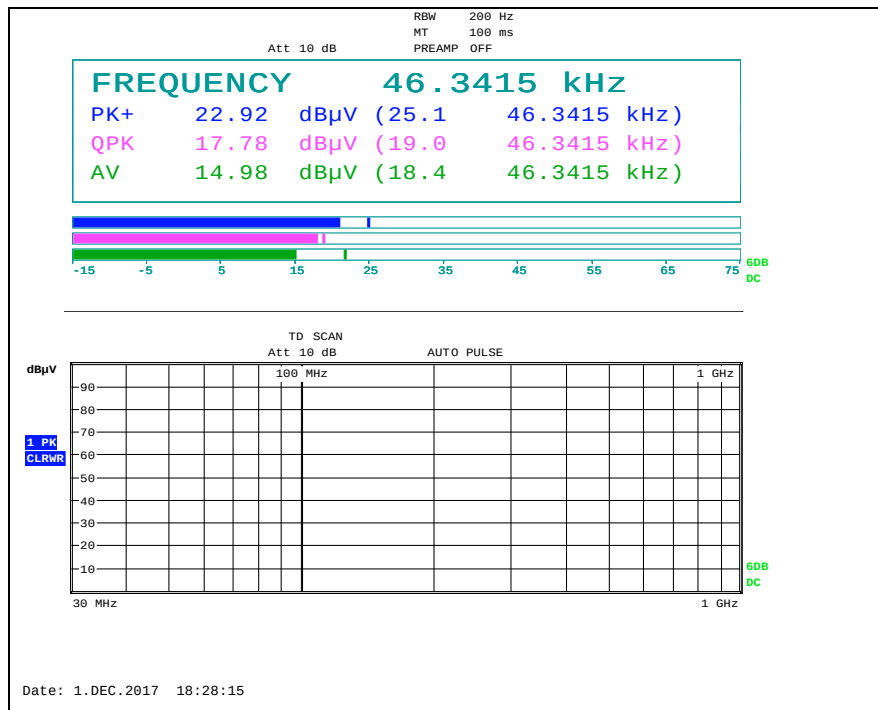
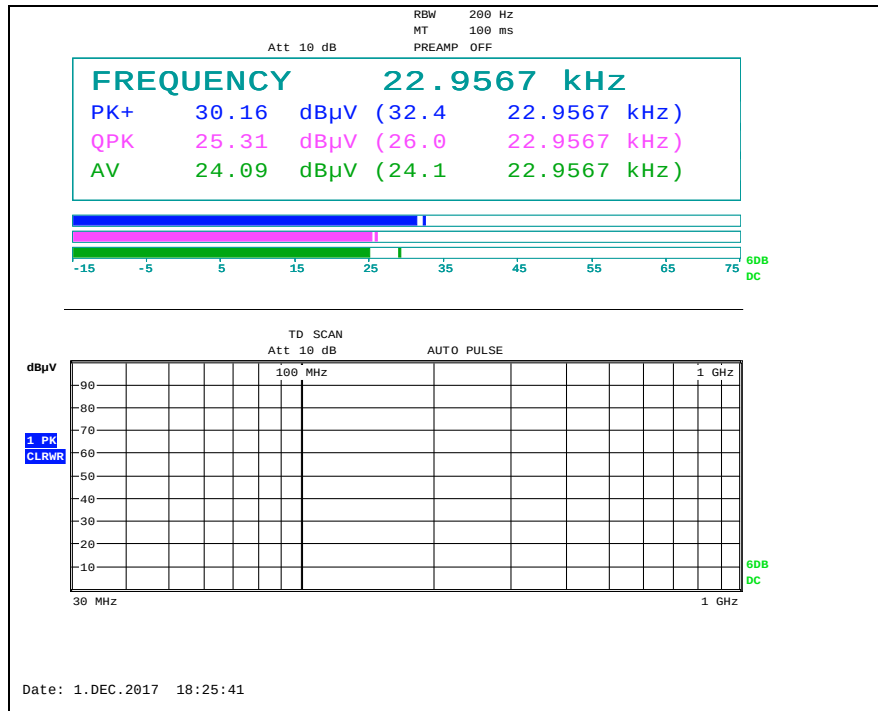
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.



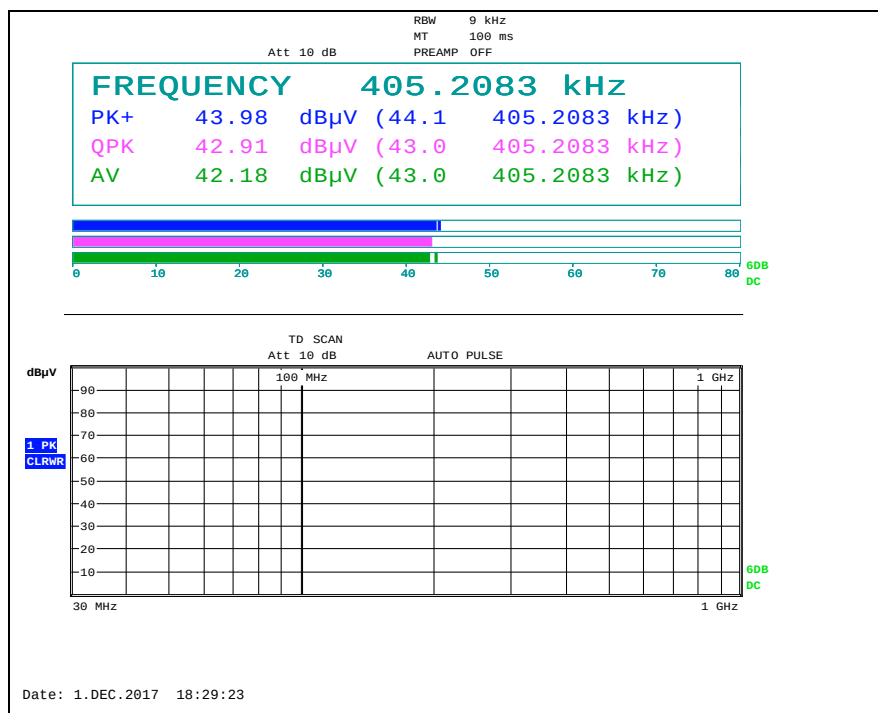
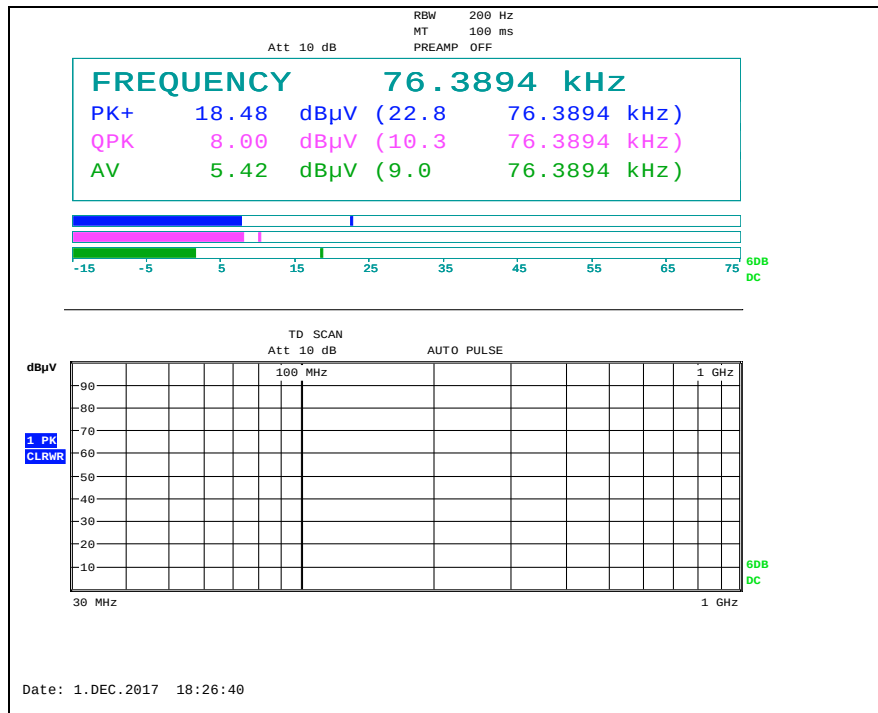
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Charging mode (less than 50 % battery status of client device)



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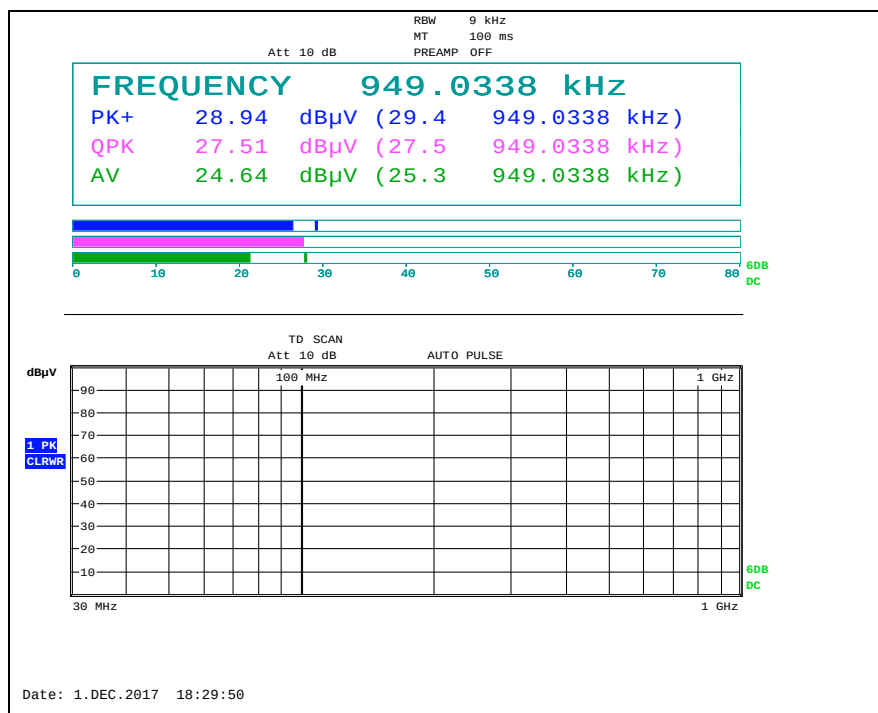
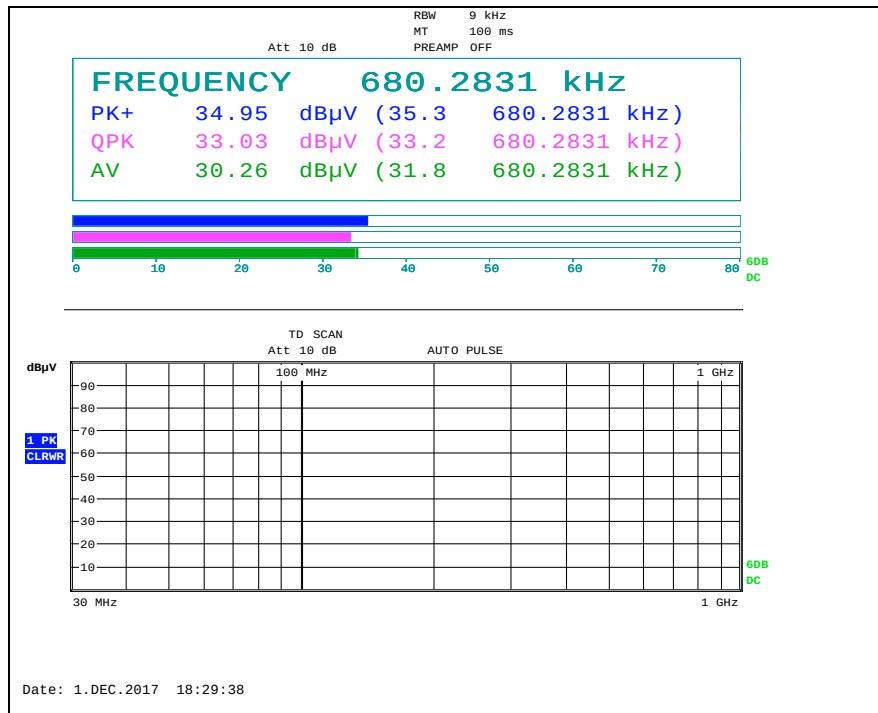
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A4(210 mm x 297 mm)



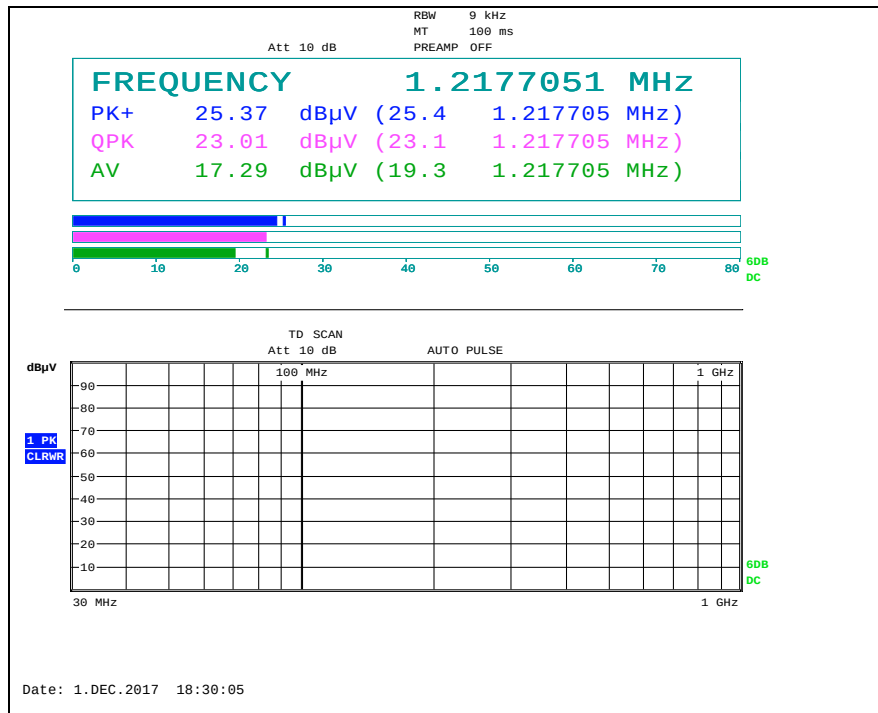
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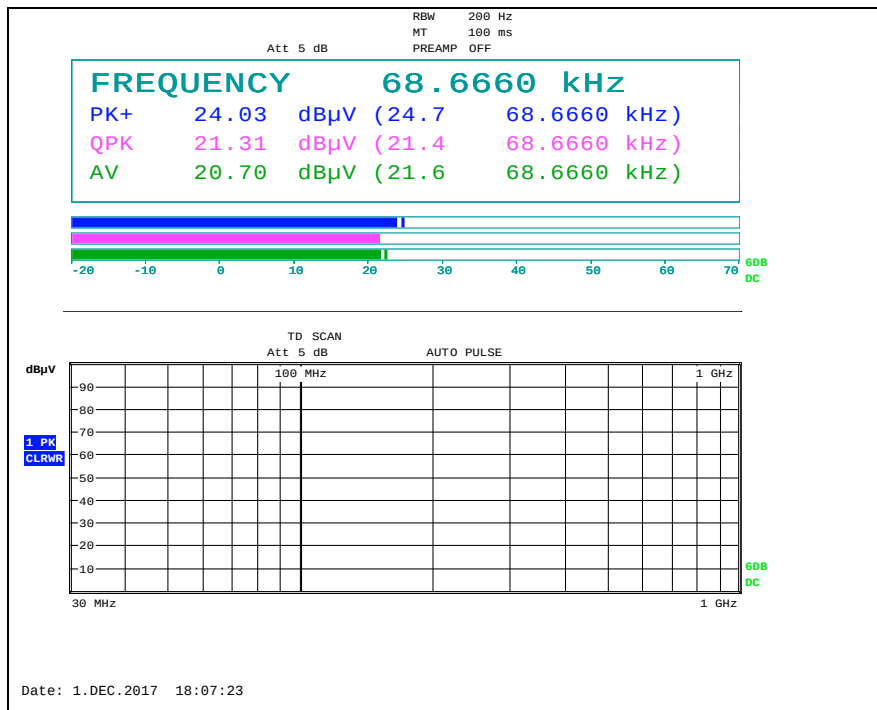
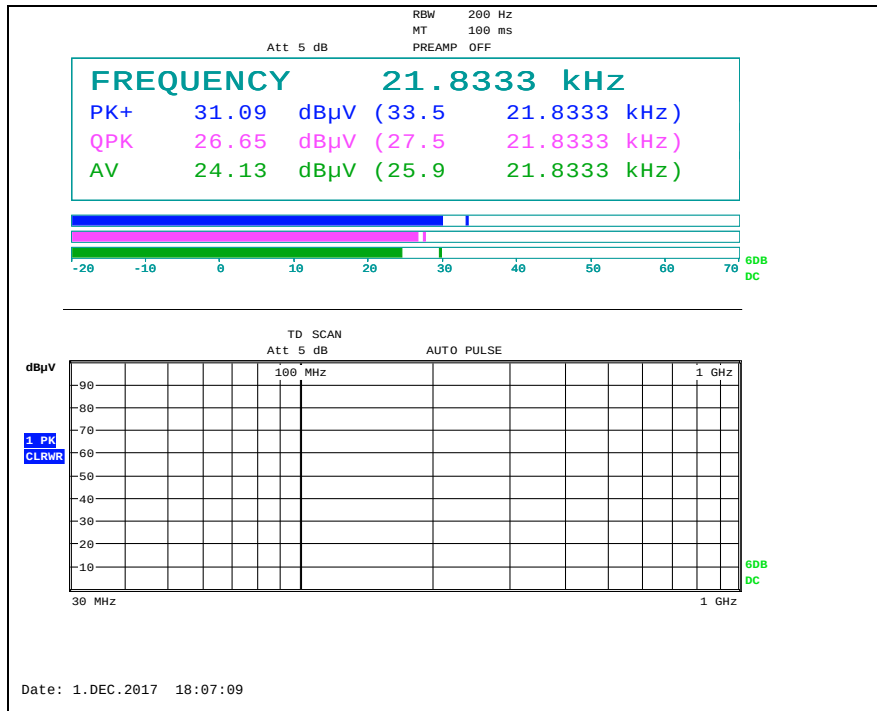
A4(210 mm x 297 mm)



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Charging mode (100 % battery status of client device)



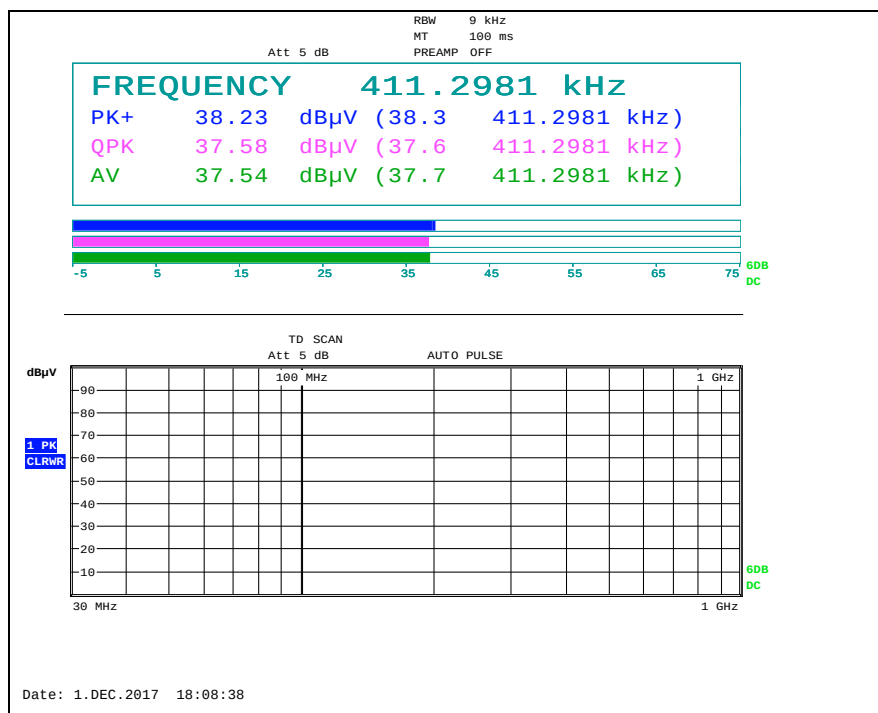
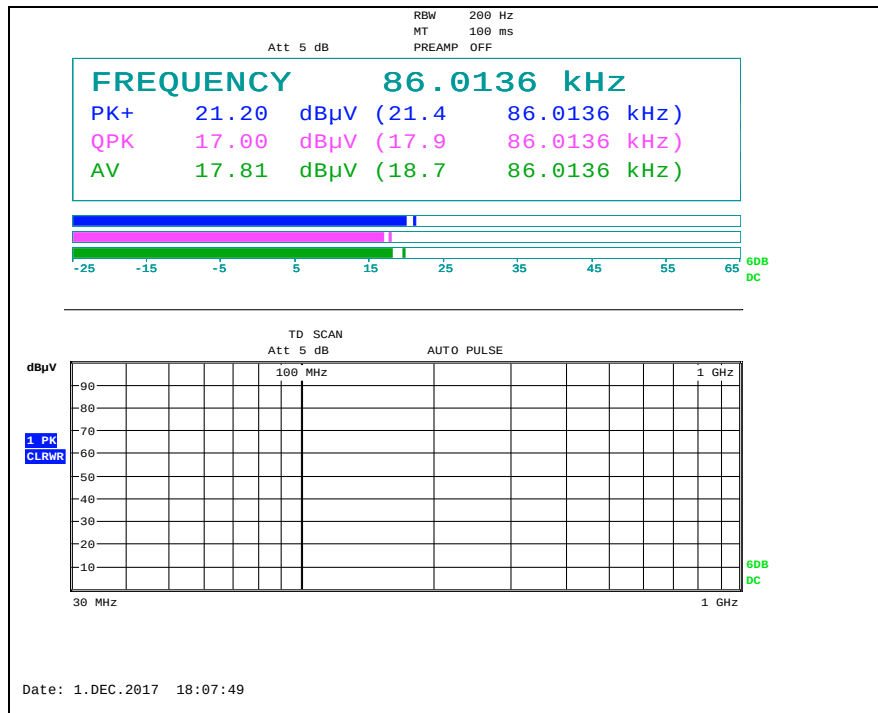
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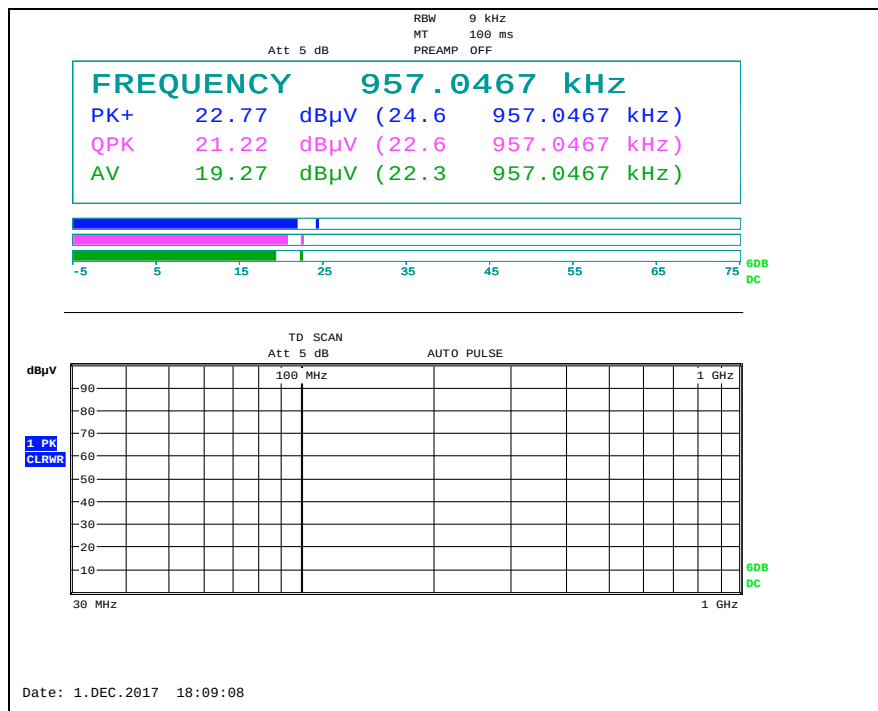
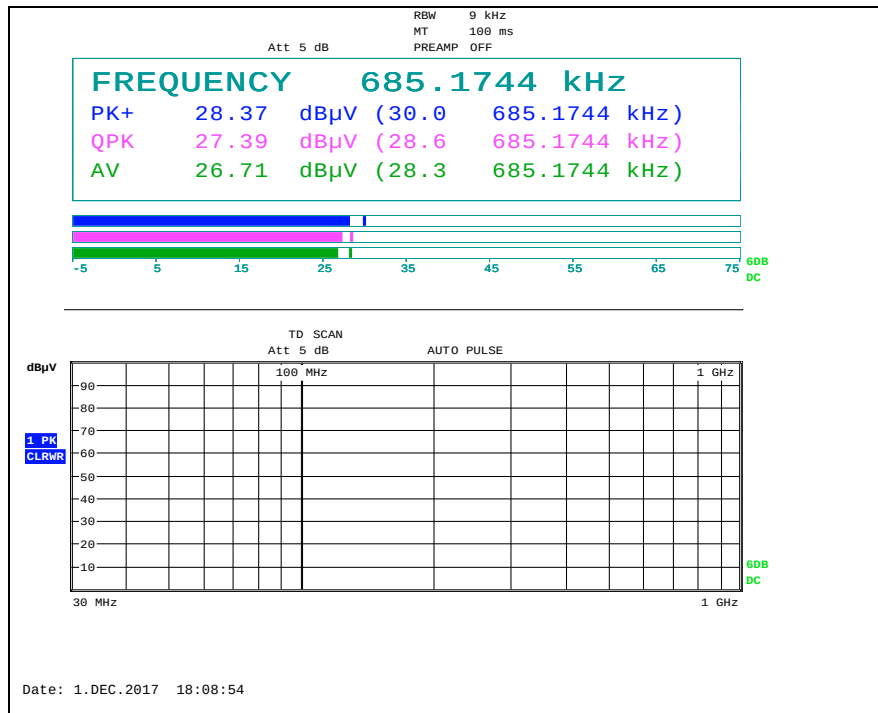
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A4(210 mm x 297 mm)



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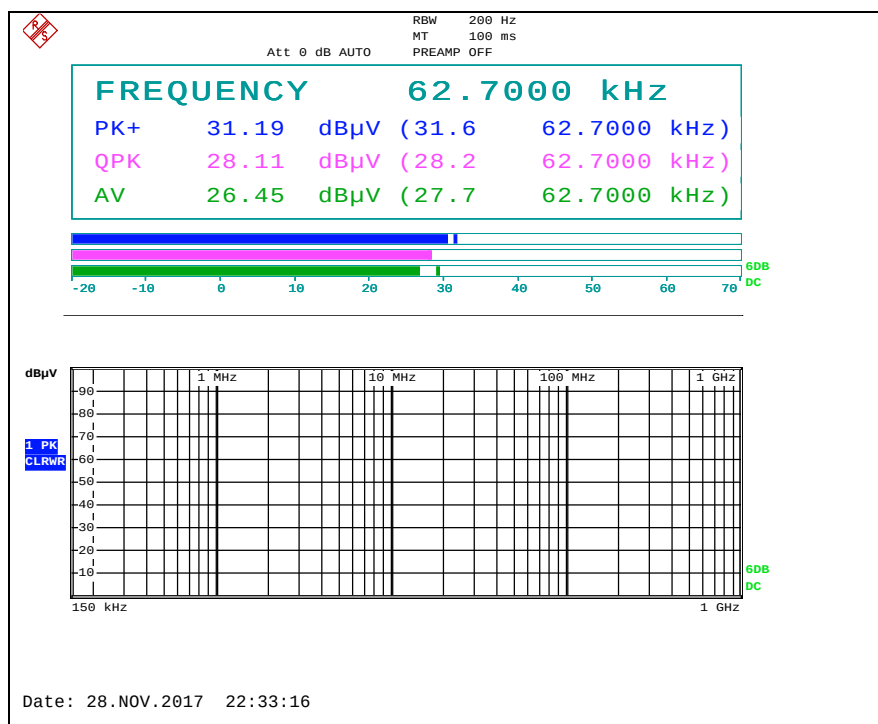
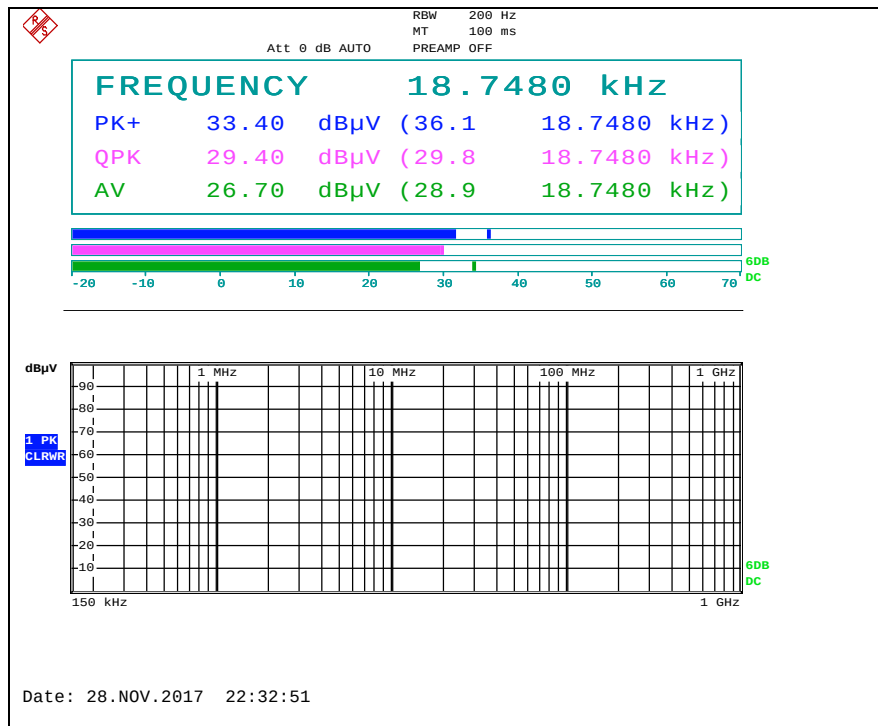
RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

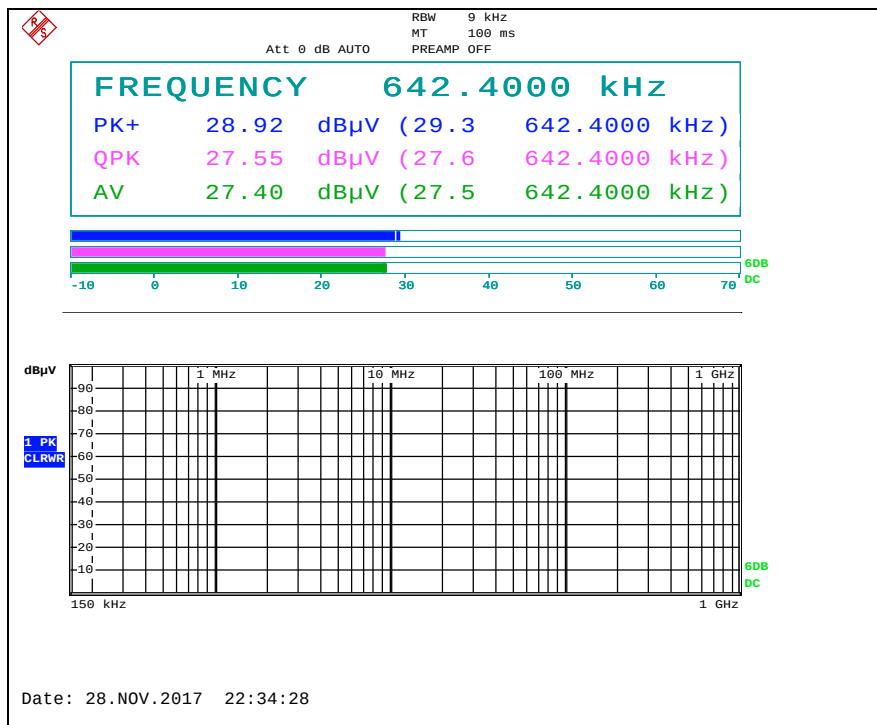
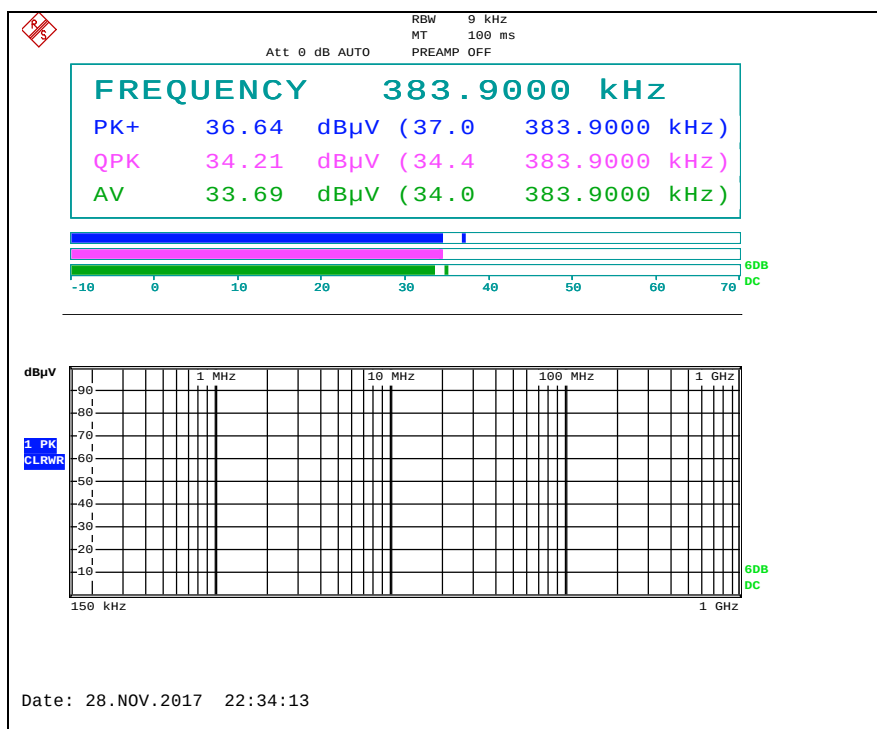
Test Mode : Ant. 2 in DC 9 V condition

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

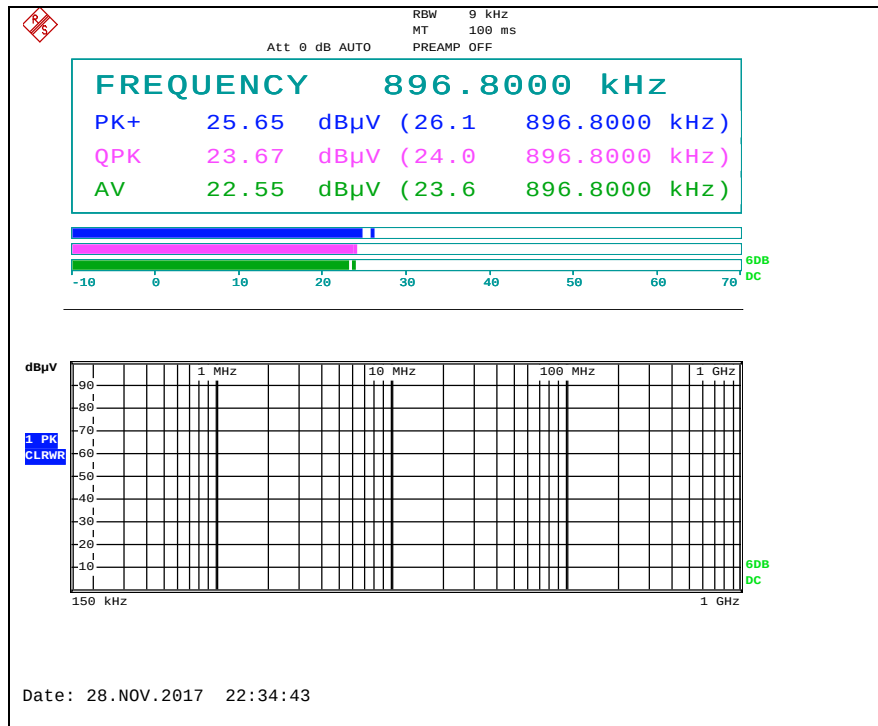


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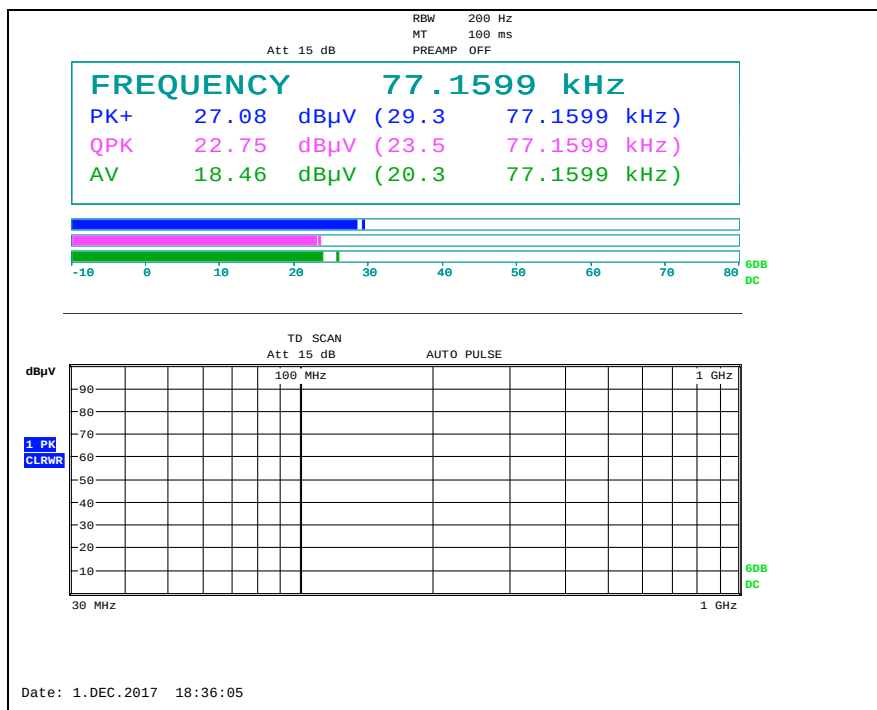
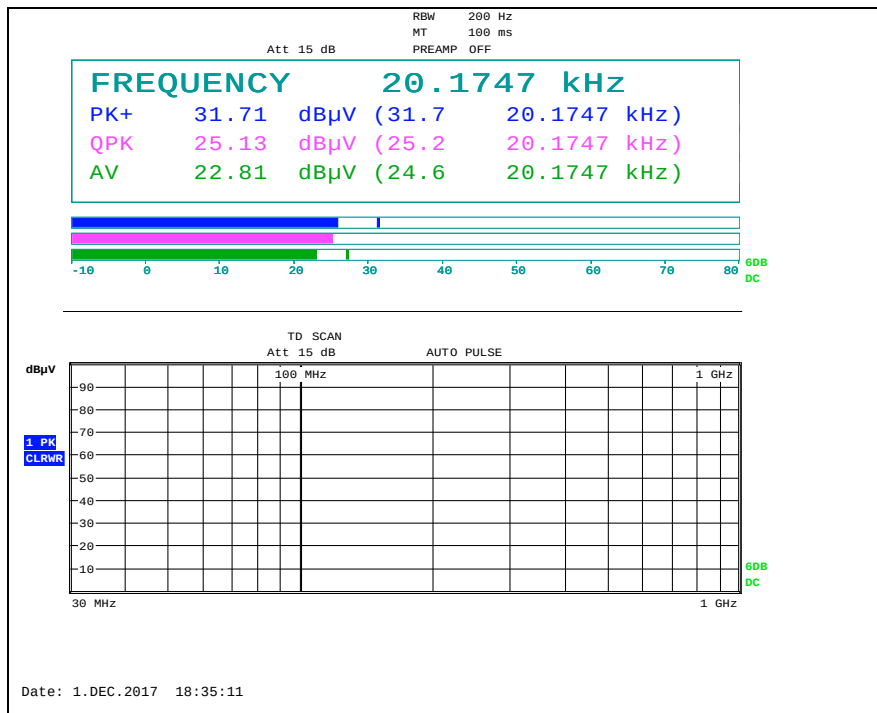
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Charging mode (less than 50 % battery status of client device)



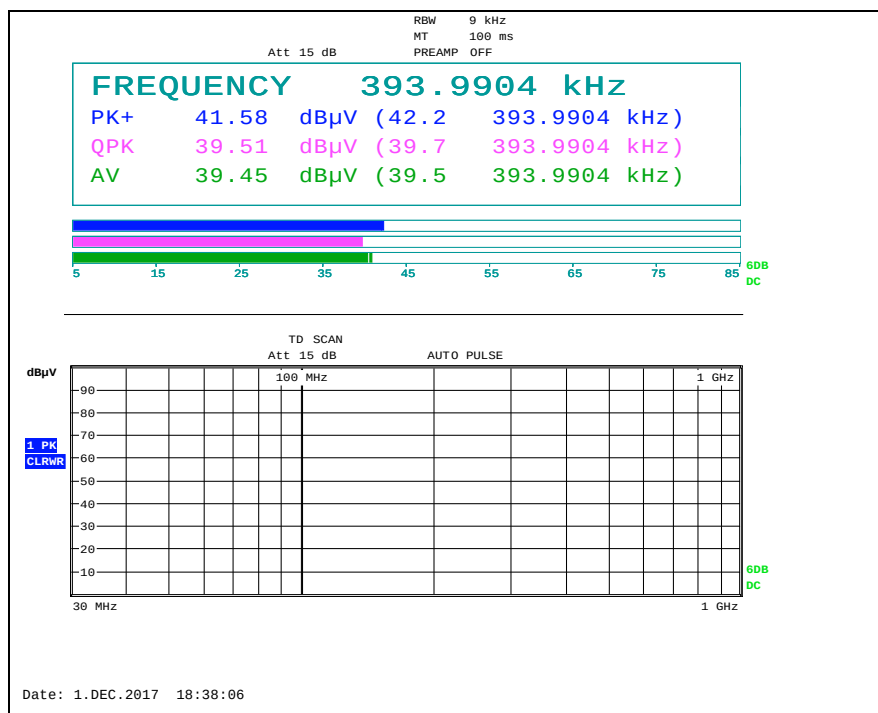
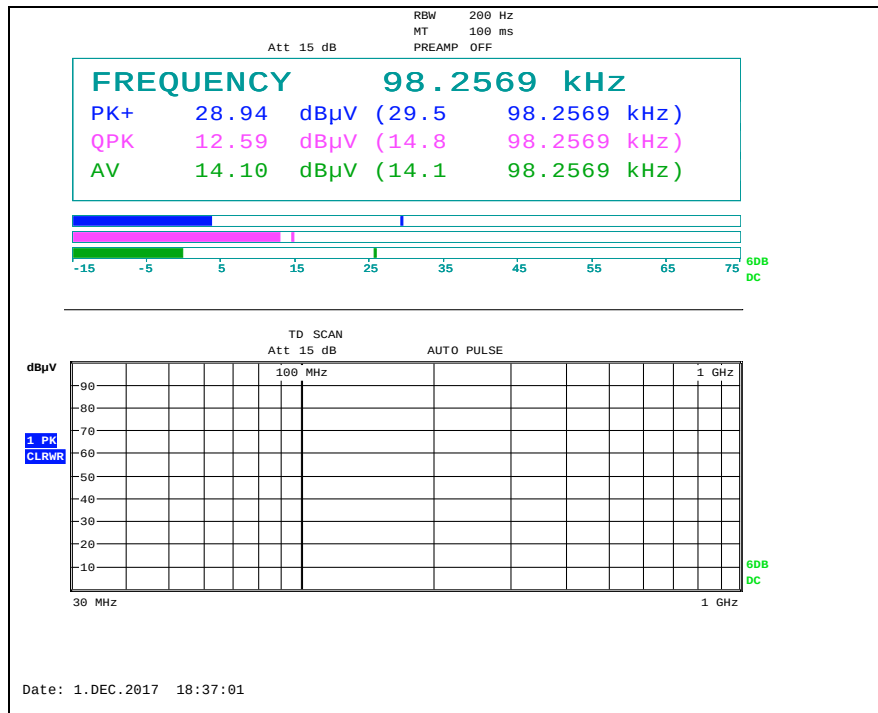
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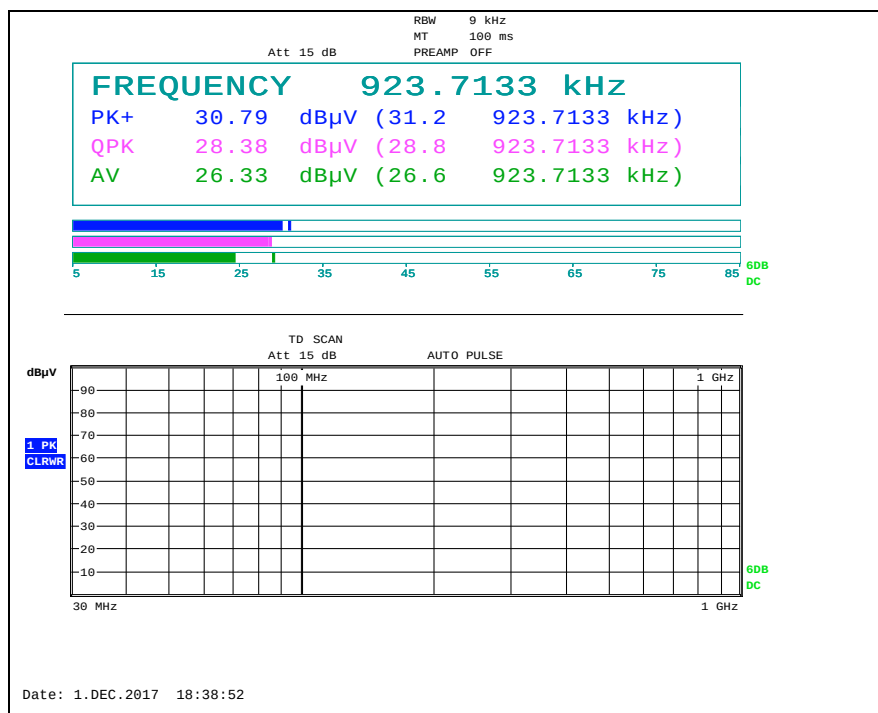
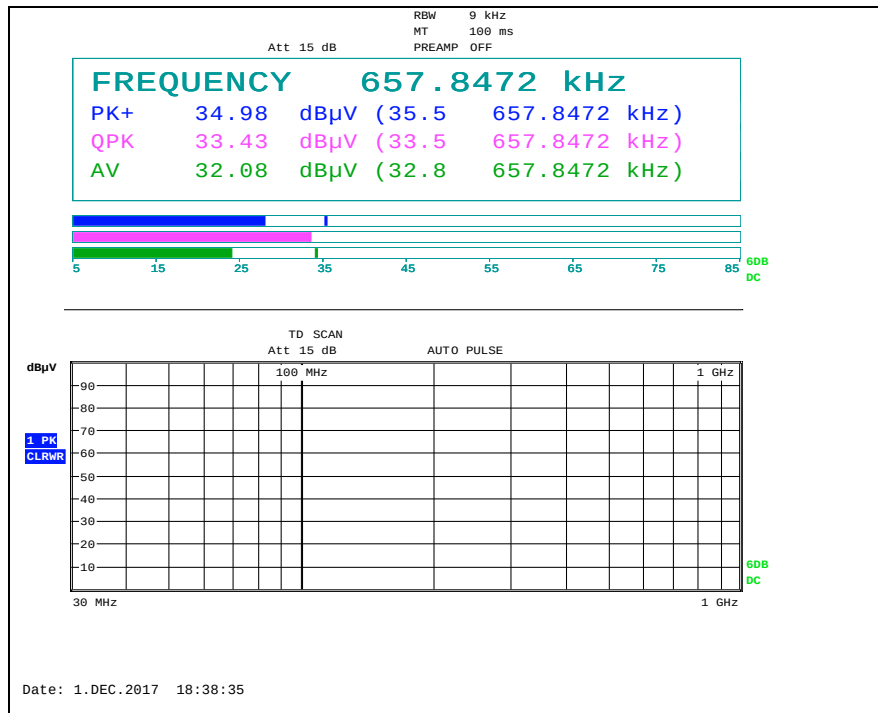
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A4(210 mm x 297 mm)



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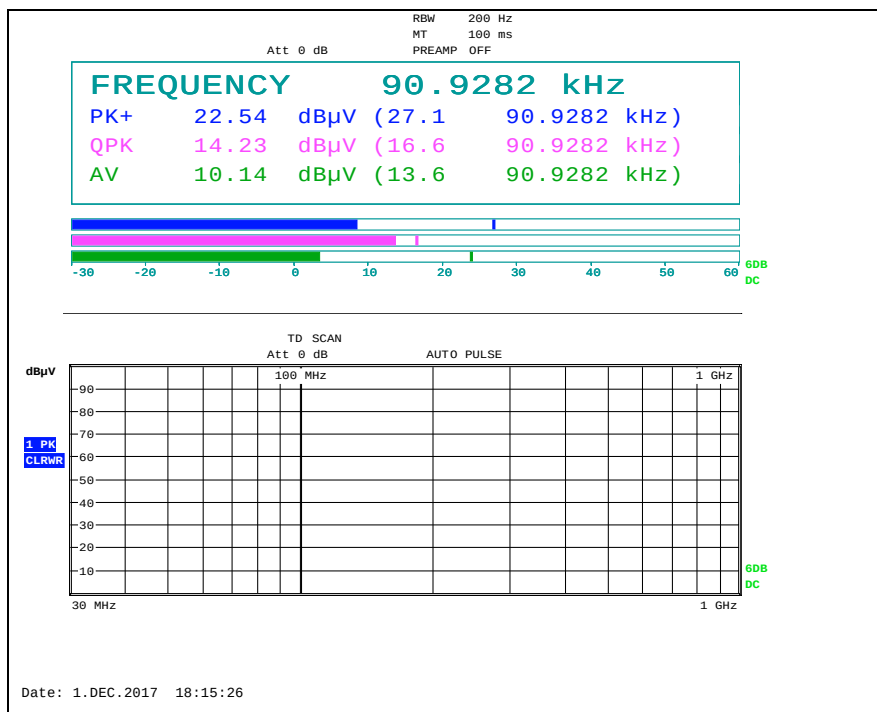
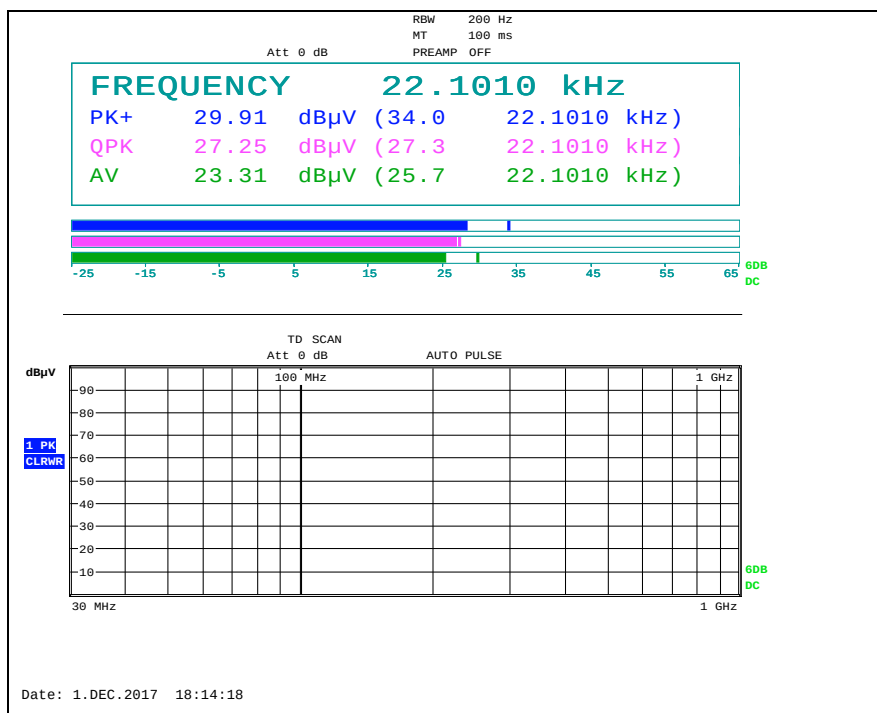
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RTT5041-19(2017.07.10)(0)

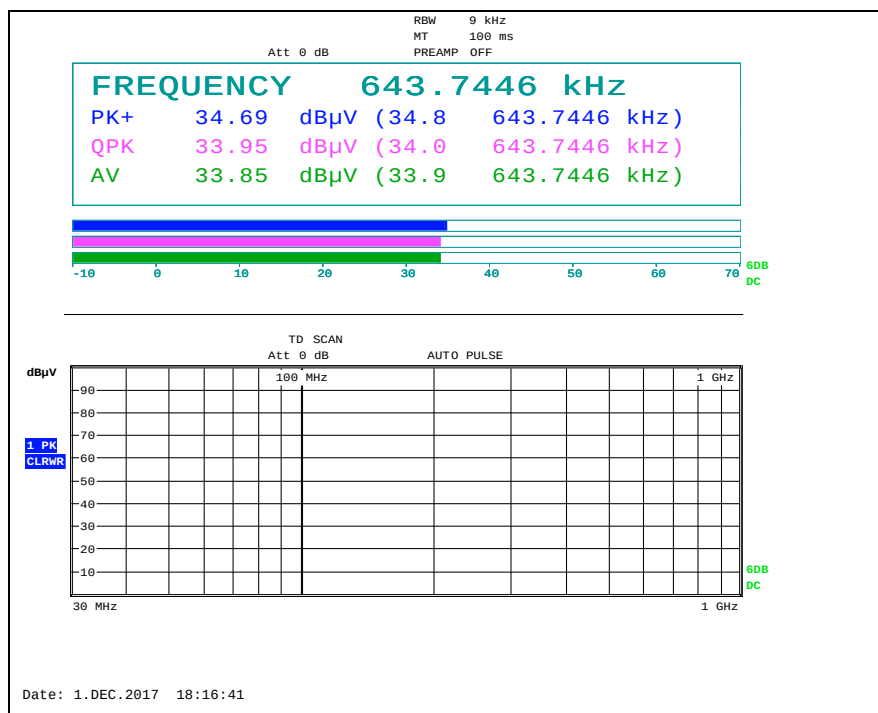
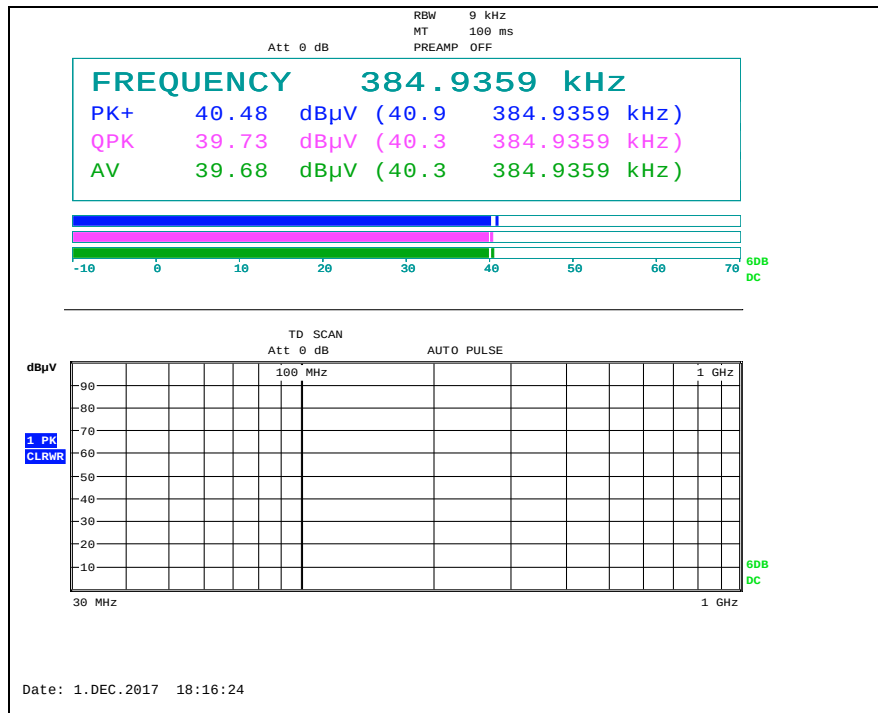
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A4(210 mm x 297 mm)

Charging mode (100 % battery status of client device)



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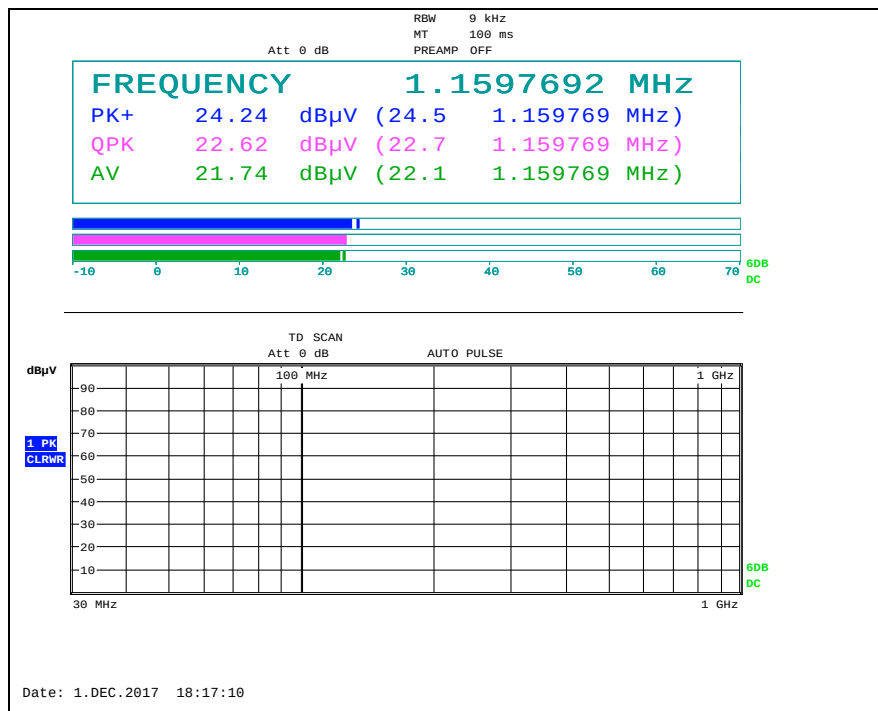
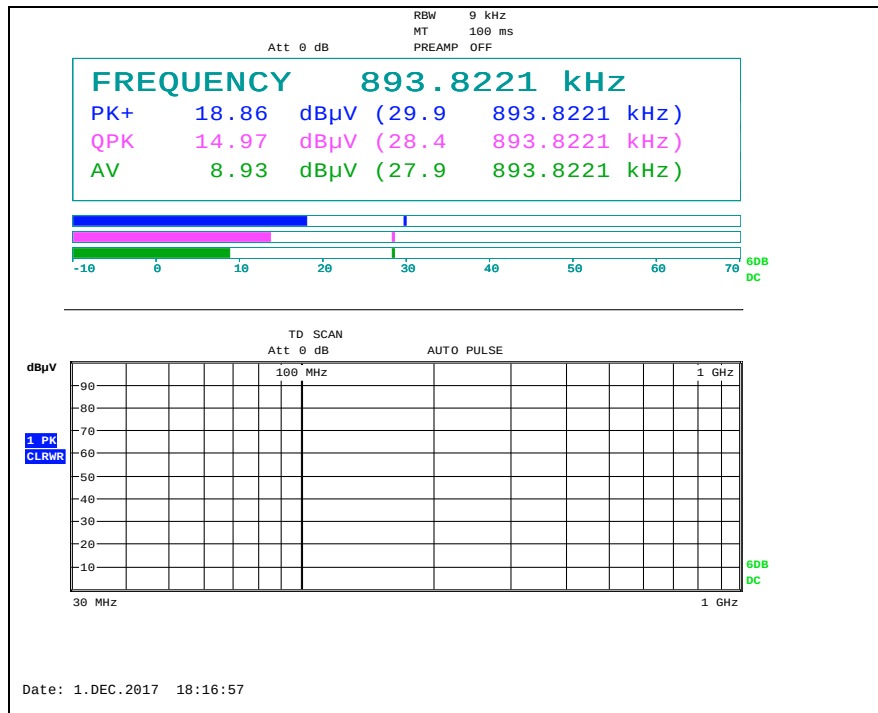
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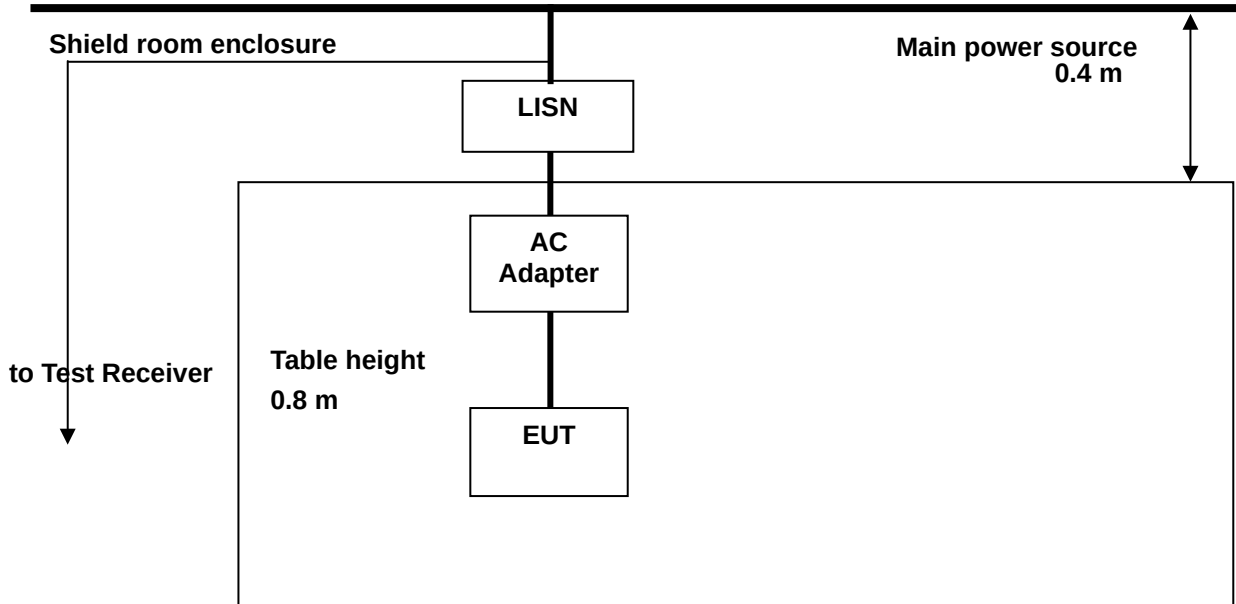
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A4(210 mm x 297 mm)

3. AC Conducted Power line Emissions

3.1. Test Setup



3.2. Limit

According to §18.307 for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/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.

(b) All other part 18 consumer devices :

Frequency of Emission (MHz)	Conducted limit (dBμV)	
	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.

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3.3. Test Procedures

AC conducted emissions from the EUT were measured according to the dictates of MP-5 measurement.

1. The test procedure is performed in a 6.5 m × 3.6 m × 3.6 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m(W) × 1.5 m(L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

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A4(210 mm × 297 mm)

3.4. Test Results

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

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

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

Test Mode: Ant. 1 in DC 5 V condition

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

FREQ. (MHz)	LEVEL(dB μ V)		LINE	LIMIT(dB μ V)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.17	40.90	25.10	N	64.96	54.96	24.06	29.86
0.26	38.10	23.50	N	61.43	51.43	23.33	27.93
0.69	33.80	19.50	N	56.00	46.00	22.20	26.50
3.48	39.60	32.70	N	56.00	46.00	16.40	13.30
7.87	27.70	19.40	N	60.00	50.00	32.30	30.60
21.51	35.40	26.10	N	60.00	50.00	24.60	23.90
0.17	41.30	27.80	H	64.96	54.96	23.66	27.16
0.25	38.10	25.60	H	61.76	51.76	23.66	26.16
0.75	37.40	20.40	H	56.00	46.00	18.60	25.60
2.71	45.10	36.50	H	56.00	46.00	10.90	9.50
7.67	31.50	23.10	H	60.00	50.00	28.50	26.90
20.98	35.60	28.00	H	60.00	50.00	24.40	22.00

Note ;

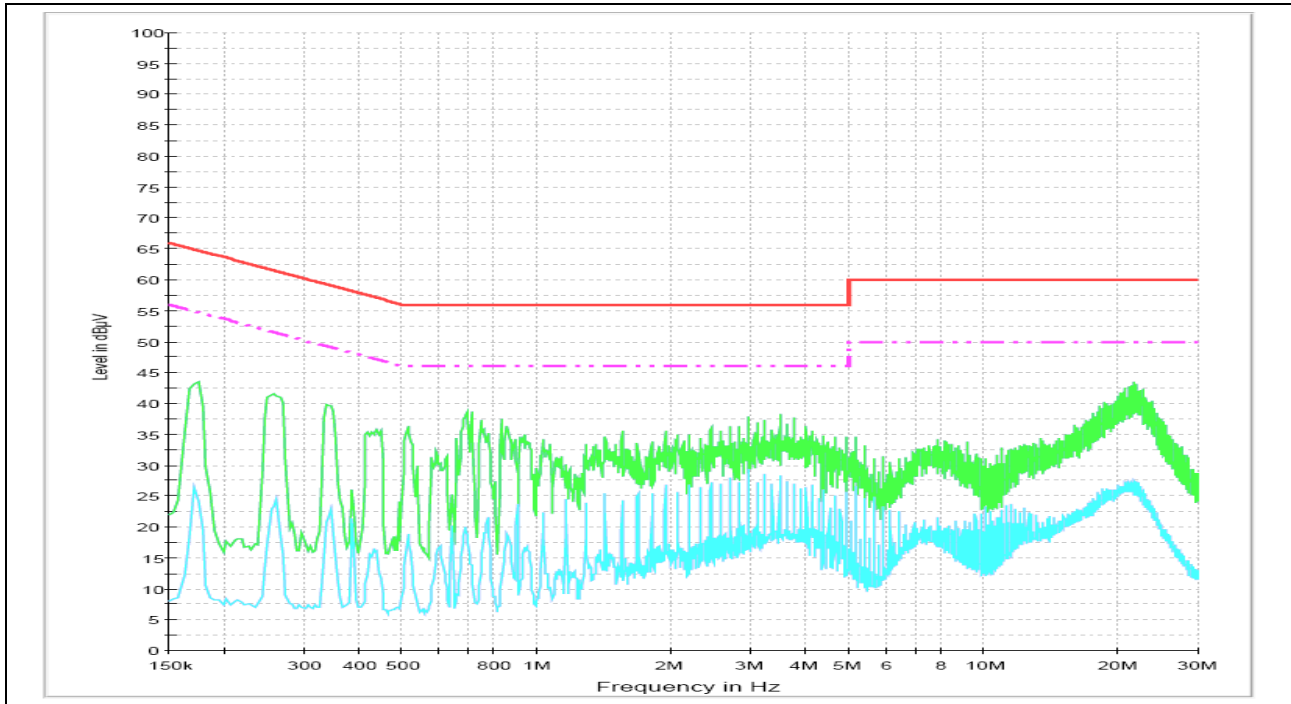
- Line (H): Hot, Line (N): Neutral
- All charging mode with client device (1 %, 50 %, and 100 % of battery) were tested.
As worst condition, charging mode with client device (1 %) is reported.
- The limit for Class B device(s) from 150 kHz to 30 MHz are specified in Section of the Title 47 CFR.
- The traces shown in plot were made by peak and average detector.
- Deviations to the Specifications: None.

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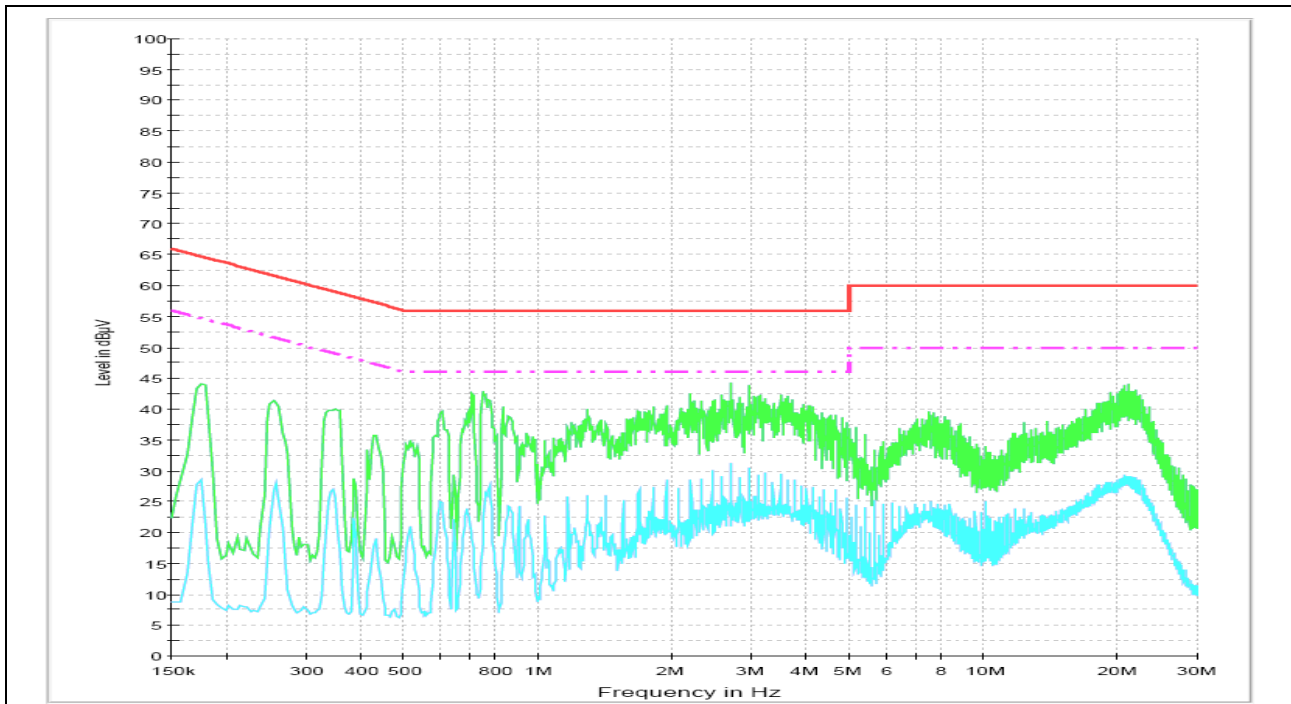
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Plots of Conducted Power line

Test mode: (Neutral)



Test mode: (Hot)



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A4(210 mm x 297 mm)

Test Mode: Ant. 2 in DC 5 V condition
Charging mode with Client device (less than 1 % battery status of client device)

FREQ. (MHz)	LEVEL(dB μ V)		LINE	LIMIT(dB μ V)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.17	41.30	26.00	N	64.96	54.96	23.66	28.96
0.26	38.90	24.40	N	61.43	51.43	22.53	27.03
0.70	40.70	31.50	N	56.00	46.00	15.30	14.50
2.41	33.10	28.30	N	56.00	46.00	22.90	17.70
3.88	33.50	29.50	N	56.00	46.00	22.50	16.50
21.41	34.50	25.10	N	60.00	50.00	25.50	24.90
0.17	41.10	28.00	H	64.96	54.96	23.86	26.96
0.26	38.10	27.80	H	61.43	51.43	23.33	23.63
0.70	38.10	25.50	H	56.00	46.00	17.90	20.50
1.60	33.90	24.50	H	56.00	46.00	22.10	21.50
3.35	45.70	37.70	H	56.00	46.00	10.30	8.30
20.69	35.40	27.20	H	60.00	50.00	24.60	22.80

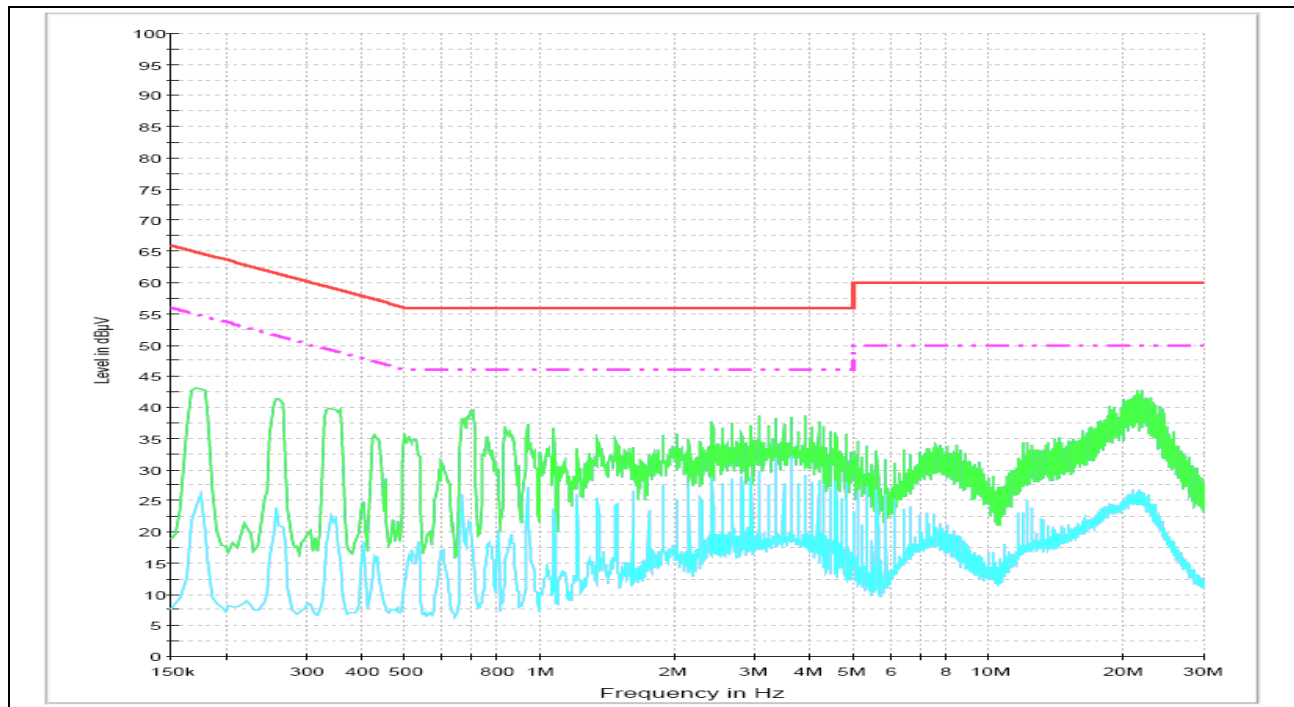
Note ;

- Line (H): Hot, Line (N): Neutral
- All charging mode with client device (1 %, 50 %, and 100 % of battery) were tested.
As worst condition, charging mode with client device (1 %) is reported.
- The limit for Class B device(s) from 150 kHz to 30 MHz are specified in Section of the Title 47 CFR.
- The traces shown in plot were made by peak and average detector.
- Deviations to the Specifications: None.

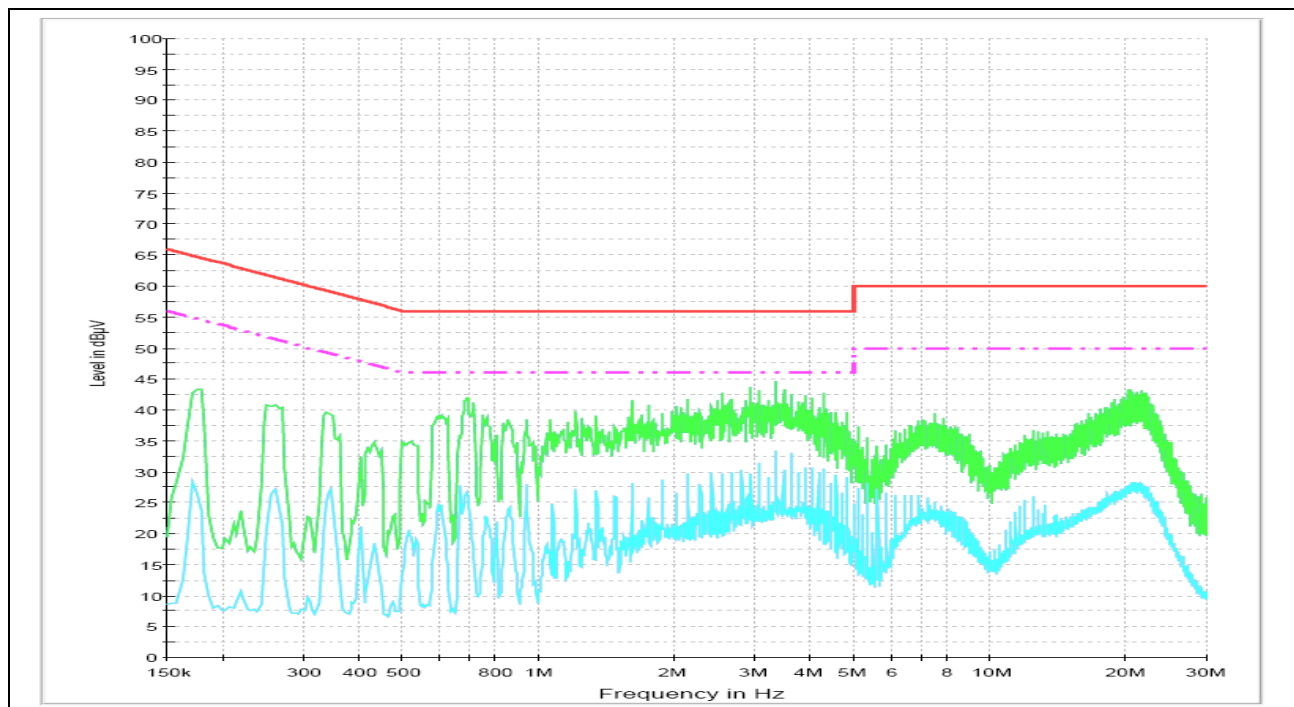
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Plots of Conducted Power line

Test mode: (Neutral)



Test mode: (Hot)



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RTT5041-19(2017.07.10)(0)

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A4(210 mm x 297 mm)

Test Mode: Ant. 1 in DC 9 V condition
Charging mode with Client device (less than 1 % battery status of client device)

FREQ. (MHz)	LEVEL(dB μ V)		LINE	LIMIT(dB μ V)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.16	42.20	26.10	N	65.46	55.46	23.26	29.36
0.23	37.50	22.00	N	62.45	52.45	24.95	30.45
0.33	29.30	13.70	N	59.45	49.45	30.15	35.75
0.70	32.10	20.10	N	56.00	46.00	23.90	25.90
1.95	30.60	22.80	N	56.00	46.00	25.40	23.20
4.17	30.80	18.70	N	56.00	46.00	25.20	27.30
0.16	41.90	28.00	H	65.46	55.46	23.56	27.46
0.23	37.40	22.80	H	62.45	52.45	25.05	29.65
0.39	31.50	24.80	H	58.06	48.06	26.56	23.26
0.65	40.90	32.10	H	56.00	46.00	15.10	13.90
1.43	34.60	22.40	H	56.00	46.00	21.40	23.60
3.67	35.50	22.60	H	56.00	46.00	20.50	23.40

Note ;

- Line (H): Hot, Line (N): Neutral
- All charging mode with client device (1 %, 50 %, and 100 % of battery) were tested.
As worst condition, charging mode with client device (1 %) is reported.
- The limit for Class B device(s) from 150 kHz to 30 MHz are specified in Section of the Title 47 CFR.
- The traces shown in plot were made by peak and average detector.
- Deviations to the Specifications: None.

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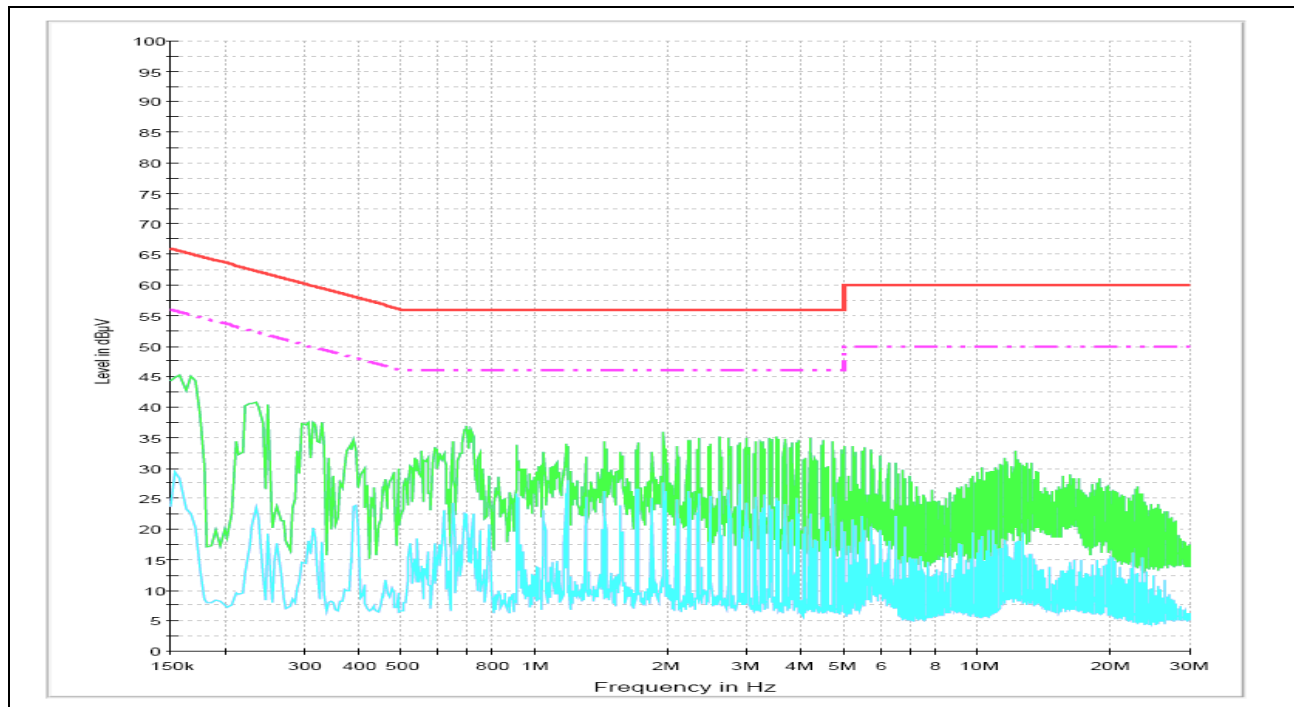
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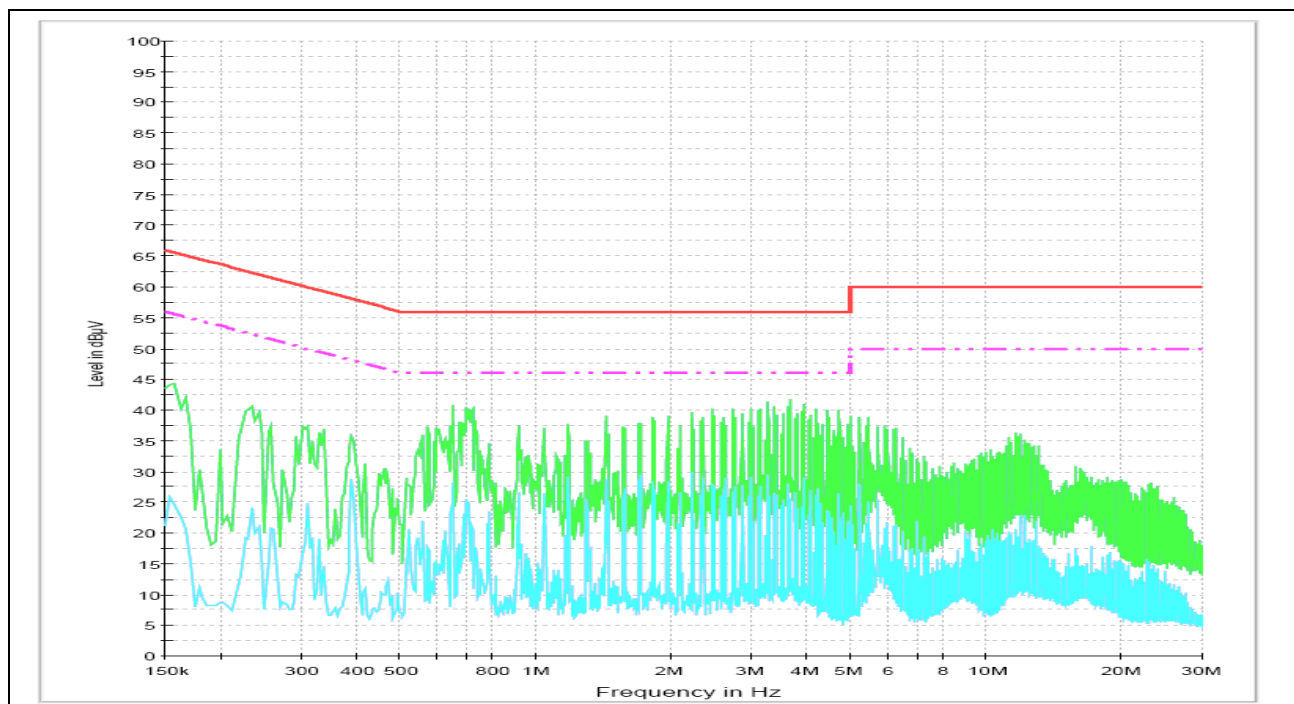
A4(210 mm x 297 mm)

Plots of Conducted Power line

Test mode: (Neutral)



Test mode: (Hot)



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RTT5041-19(2017.07.10)(0)

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A4(210 mm x 297 mm)

Test Mode: Ant. 2 in DC 9 V condition
Charging mode with Client device (less than 1 % battery status of client device)

FREQ. (MHz)	LEVEL(dB μ V)		LINE	LIMIT(dB μ V)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.16	43.00	27.10	N	65.46	55.46	22.46	28.36
0.25	41.90	29.60	N	61.76	51.76	19.86	22.16
0.34	33.50	17.30	N	59.20	49.20	25.70	31.90
0.58	30.80	21.40	N	56.00	46.00	25.20	24.60
1.61	31.30	27.60	N	56.00	46.00	24.70	18.40
3.98	33.80	26.00	N	56.00	46.00	22.20	20.00
0.16	42.90	28.70	H	65.46	55.46	22.56	26.76
0.25	38.10	25.50	H	61.76	51.76	23.66	26.26
0.59	31.60	19.80	H	56.00	46.00	24.40	26.20
1.36	36.50	29.60	H	56.00	46.00	19.50	16.40
3.61	35.60	21.60	H	56.00	46.00	20.40	24.40
5.69	37.30	30.00	H	60.00	50.00	22.70	20.00

Note ;

- Line (H): Hot, Line (N): Neutral
- All charging mode with client device (1 %, 50 %, and 100 % of battery) were tested.
As worst condition, charging mode with client device (1 %) is reported.
- The limit for Class B device(s) from 150 kHz to 30 MHz are specified in Section of the Title 47 CFR.
- The traces shown in plot were made by peak and average detector.
- Deviations to the Specifications: None.

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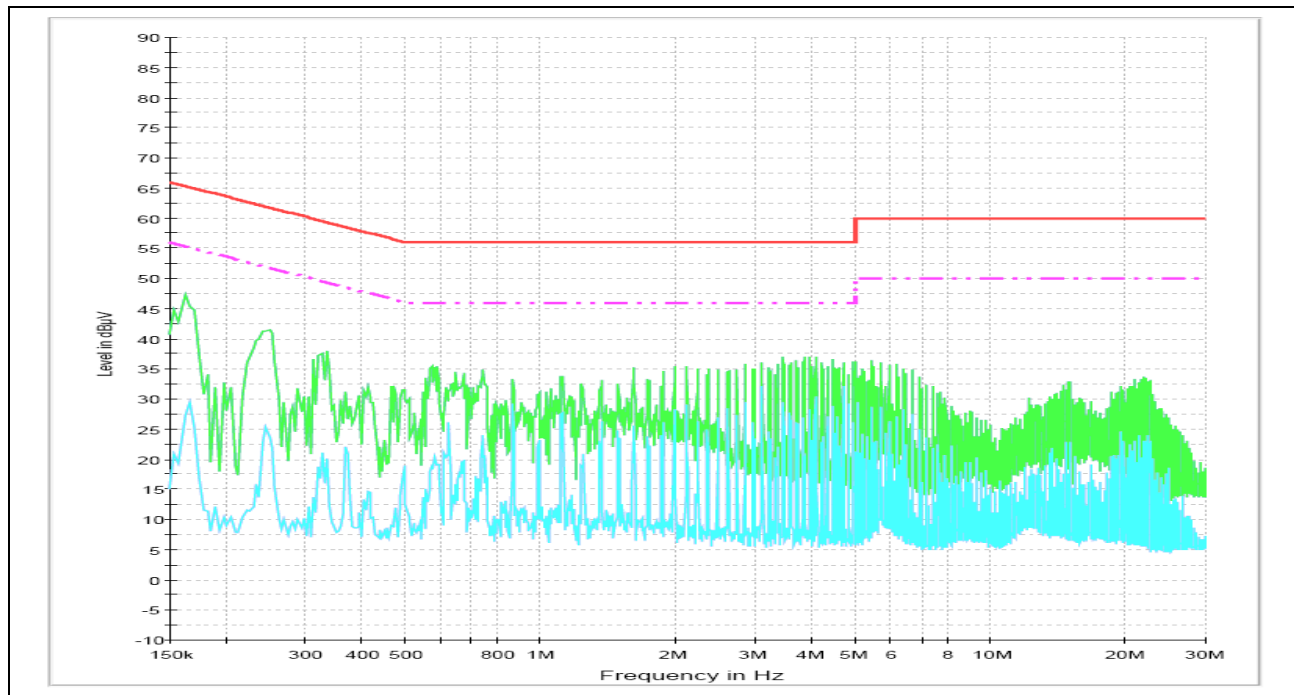
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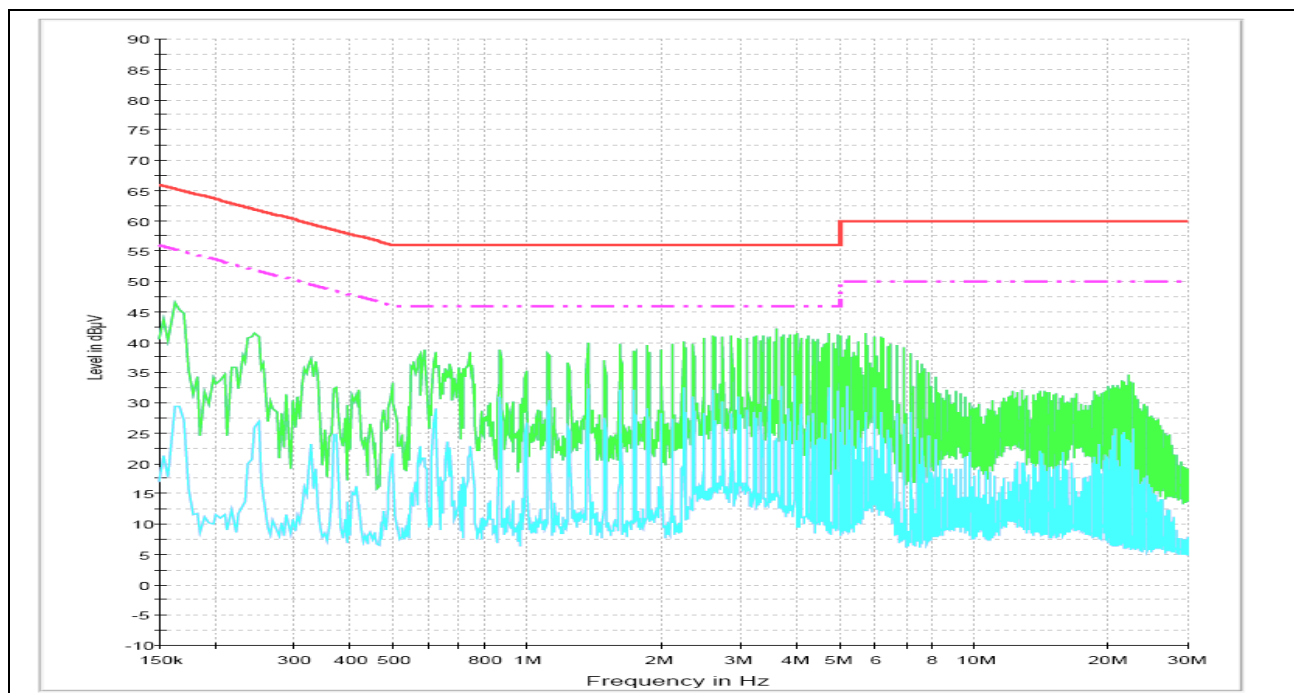
A4(210 mm x 297 mm)

Plots of Conducted Power line

Test mode: (Neutral)



Test mode: (Hot)



- End of the Test Report -

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A4(210 mm x 297 mm)