FCC PART 15C ANT+ TEST REPORT (RADIATED PART)

No. I15Z40514-SRD14

for

Sony Mobile Communications Inc.

GSM/WCDMA/LTE Device

FCC ID: PY7-PM0796

with

Hardware Version: A

Software Version: 1292-7201,s_atp_1_41_5_2

Issued Date: 2015-05-19

TESTING
CNAS L0570

Note: The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

Test Laboratory:

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CONTENTS

1. Test Laboratory

1.1. Testing Location

Company Name:	CTTL Beijing, Telecommunication Metrology Center of MIIT
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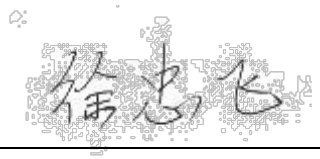
Postal Code:	100191
Telephone:	+86-10-62304633-2561
Fax:	+86-10-62304633-2504

1.2. Project data

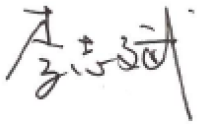
Testing Start Date:	2015-03-20
Testing End Date:	2015-04-30

1.3. Signature



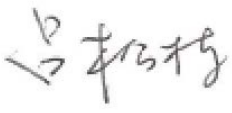
Xu Zhongfei

(Prepared this test report)



Li Zhibin

(Reviewed this test report)



Lv Songdong

(Approvedthis test report)

2. Client Information

2.1. Applicant Information

Company Name:	Sony Mobile Communications (China) Co. Ltd
Address /Post:	Sony Mobile R&D Center, No. 16, Guangshun South Street, Chaoyang District
City:	Beijing
Postal Code:	100102
Country:	China
Contact Person:	Ma, Gang
Telephone:	+86-10-58656312
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2.2. Manufacturer Information

Company Name:	Sony Mobile Communications Inc.
Address /Post:	1-8-15 Konan, Minato-ku, Tokyo, 108-0075, Japan
City:	Tokyo
Postal Code:	108-0075
Country:	Japan

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	GSM/WCDMA/LTE Device
FCC ID	PY7-PM0796
Frequency Range	ISM 2400MHz~2483.5MHz
Number of Channels	79
Antenna	Integrated Antenna
Power Supply	3.8VDC

Note: The EUT is a variant model. Only RSE/EIRP had been tested. The other result is coming from the initial model.

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT1	004402148061504	A	1292-7201,s_atp_1_41_5_2

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	SN
AE1	Travel Charger	/
AE3	USB Cable	1447A7PC000350C

*AE ID: is used to identify the test sample in the lab internally.

3.4. General Description

The Equipment Under Test (EUT) is a model of GSM/WCDMA/LTE Device with integrated antenna and embedded battery.
It has MP3, camera, USB memory, FM radio, GPS receiver, NFC, Bluetooth (EDR, BLE), ANT+, WLAN (802.11 a/ac/b/g/n) and Wi-Fi hotspot functions.
It consists of normal options: USB cable and travel charger.
Manual and specifications of the EUT were provided to fulfil the test.
Samples undergoing test were selected by the client.

4. Reference Documents

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz.	10–1–13 Edition
FCC Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations	10–1–13 Edition
ANSI C63.10	American National Standard for Testing Unlicensed Wireless Devices	2009

5. LABORATORY ENVIRONMENT

Semi-anechoic chamber (23 meters×17meters×10meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	< ±3.2 dB, 10 m distance, from 30 to 1000 MHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 2000 MHz

Control room/ conducted chamber did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. =20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber1 (6.8 meters×3.08 meters×3.53 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

Fully-anechoic chamber2 (8.6 meters×6.1 meters×3.85 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 1 Ω
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

Fully-anechoic chamber3 (10 meters×6.7 meters×6.15 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz

Additional Humidity Requirements for Electrostatic Discharge Test: Min. = 30%, Max. = 60%.

6. SUMMARY OF TEST RESULTS

6.1. Summary of Test Results

Abbreviations used in this clause:

P Pass, The EUT complies with the essential requirements in the standard.

F Fail, The EUT does not comply with the essential requirements in the standard

NA Not Applicable, The test was not applicable

NP Not Performed, The test was not performed by CTTL

SUMMARY OF MEASUREMENT RESULTS	Sub-clause	Verdict
Fundamental Field Strength Level	15.249	**P**
Radiated Emission	15.205, 15.209,15.249	**P**
AC Powerline Conducted Emission	15.207	**P**

Please refer to **ANNEX A** for detail.

6.2. Statements

CTTL has evaluated the test cases requested by the applicant /manufacturer as listed in section 6.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.2

The EUT met all requirements of the standards or reference documents.

This report only deals with the ANT+ functions among the features described in section 3.

6.3. Test Conditions

T nom	Normal Temperature
T min	Low Temperature
T max	High Temperature
V nom	Normal Voltage
V min	Low Voltage
V max	High Voltage
H nom	Norm Humidity
A nom	Norm Air Pressure

For this report, all the test case listed above are tested under Normal Temperature and Normal Voltage, and also under norm humidity, the specific conditions as following:

Temperature	T nom	25℃
Voltage	V nom	3.8V
Humidity	H nom	40%
Air Pressure	A nom	1010hPa

7. Test Equipments Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date
1	Vector Signal Analyzer	FSQ26	200136	Rohde & Schwarz	2015-01-06

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date
1	Test Receiver	ESU26	100376	Rohde & Schwarz	2014-11-05
2	EMI Antenna	VULB 9163	9163 175	Schwarzbeck	2015-07-13
3	EMI Antenna	3117	00119021	ETS-Lindgren	2017-04-19
4	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	2015-06-30
5	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	2015-06-30
6	LISN	ESH2-Z5	829991/012	Rohde & Schwarz	2017-04-14
7	Pre-amplifier(18GHz)	SCU18	1005277	Rohde & Schwarz	/
8	Pre-amplifier(26.5GHz)	SCU26	1006788	Rohde & Schwarz	/

Anechoic chamber

Fully anechoic chamber by Frankonia German.

Note : The pre amplifiers is calibrated with routes calibration every time before test, therefore no need for the calibration date.

ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

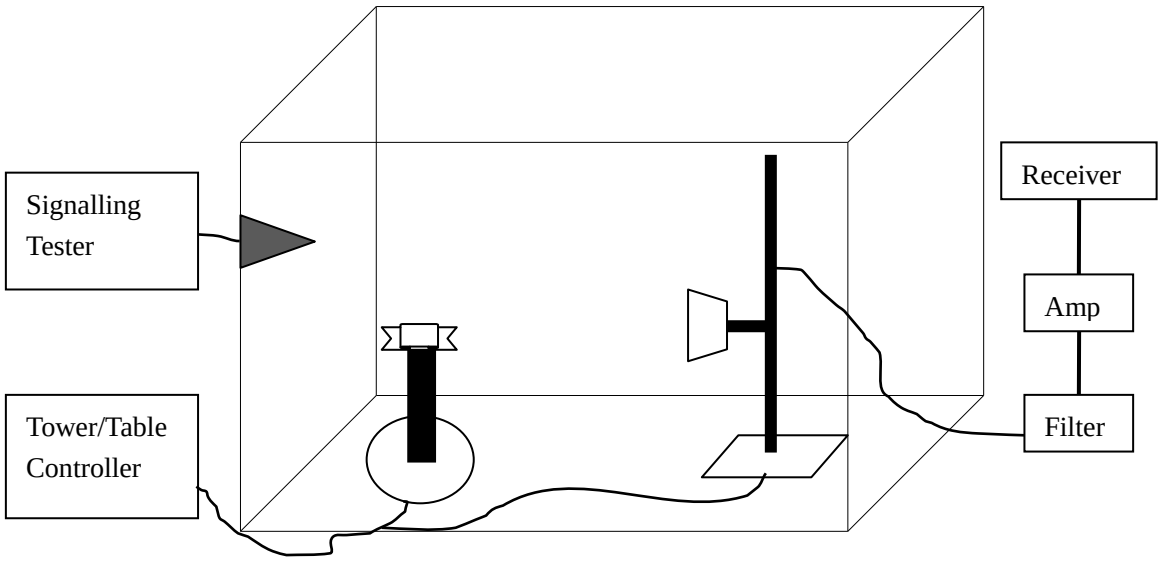
A.1.1. Radiated Emission Measurements

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 1MHz;



A.2. Radiated Emission

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.205, 15.209,15.249	Listed as follows

Frequency (MHz) Field strength	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/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

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Limit in restricted band:

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Condition

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
0.009-30	100KHz/300KHz	5
30-1000	100KHz/300KHz	5
1000-4000	1MHz/1MHz	15
4000-18000	1MHz/1MHz	40
18000-26500	1MHz/1MHz	20

Measurement Results:

A “reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable los.

The measurement results are obtained as described below:

$Result=P_{Mea}+A_{Rpl}$

Frequency	Frequency Range	Test Results	Conclusion
2402MHz	1 GHz ~ 3 GHz	Fig.1	P
	3 GHz ~ 18 GHz	Fig.2	P
2440 MHz	30 MHz ~ 1 GHz	Fig.3	P
	1 GHz ~ 3 GHz	Fig.4	P
	3 GHz ~ 18 GHz	Fig.5	P
	18 GHz ~ 26 GHz	Fig.6	P
2480 MHz	1 GHz ~ 3 GHz	Fig.7	P
	3 GHz ~ 18 GHz	Fig.8	P
Power	2.38GHz~2.4GHz---L	Fig.9	P
Power	2.45GHz~2.5GHz---H	Fig.10	P

Note: Only worst case result is given.

Conclusion: PASS

Test graphs as below:

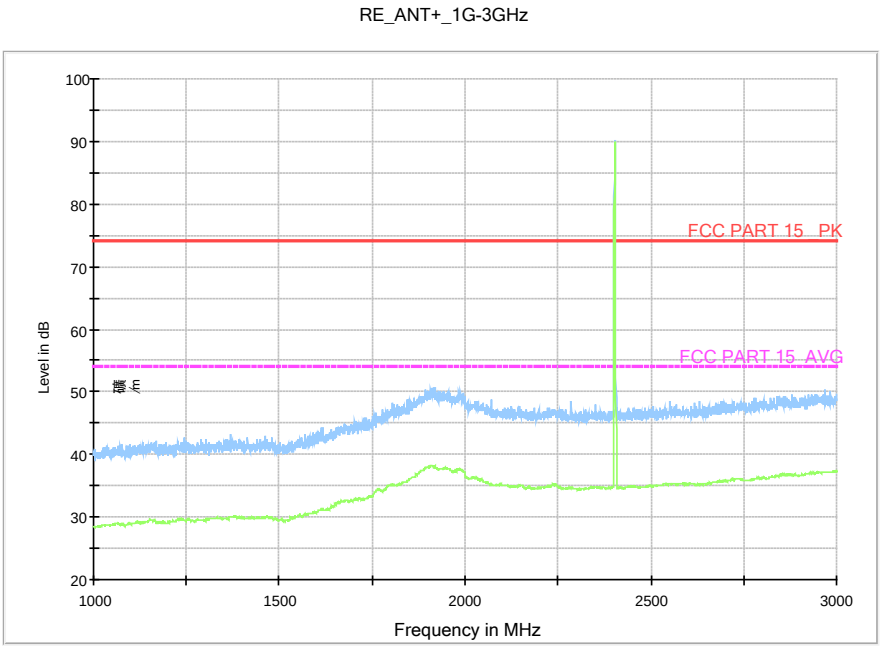


Fig.1 Radiated emission: Channel 0, 1 GHz - 3 GHz

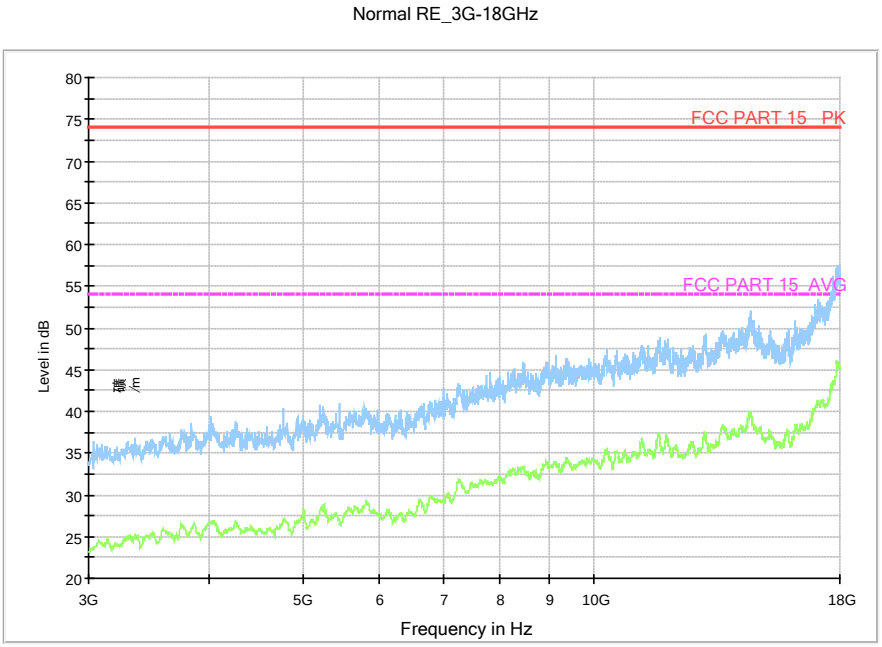


Fig.2 Radiated emission: Channel 0, 3 GHz - 18 GHz

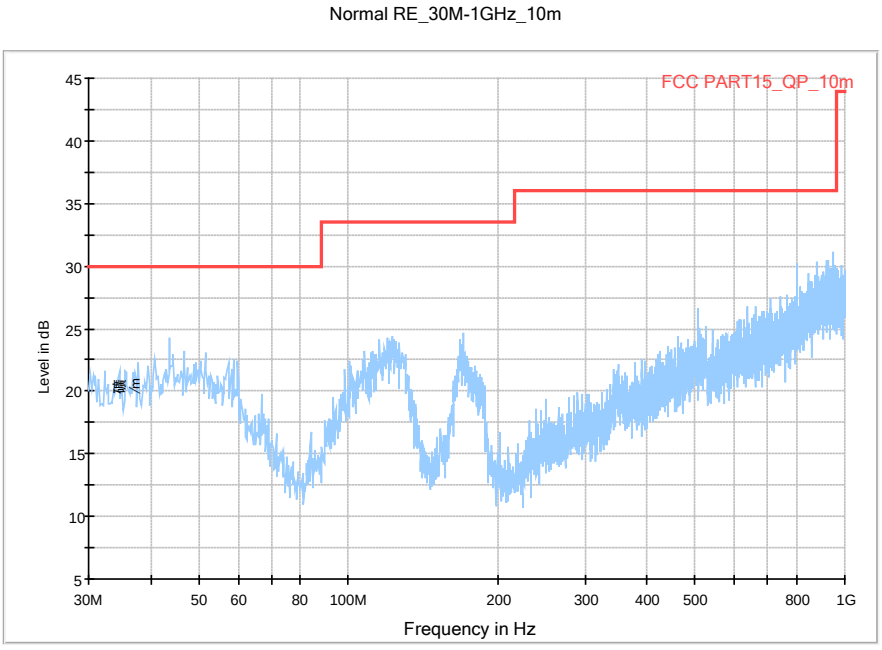


Fig.3 Radiated emission: Channel 39, 30 MHz - 1 GHz

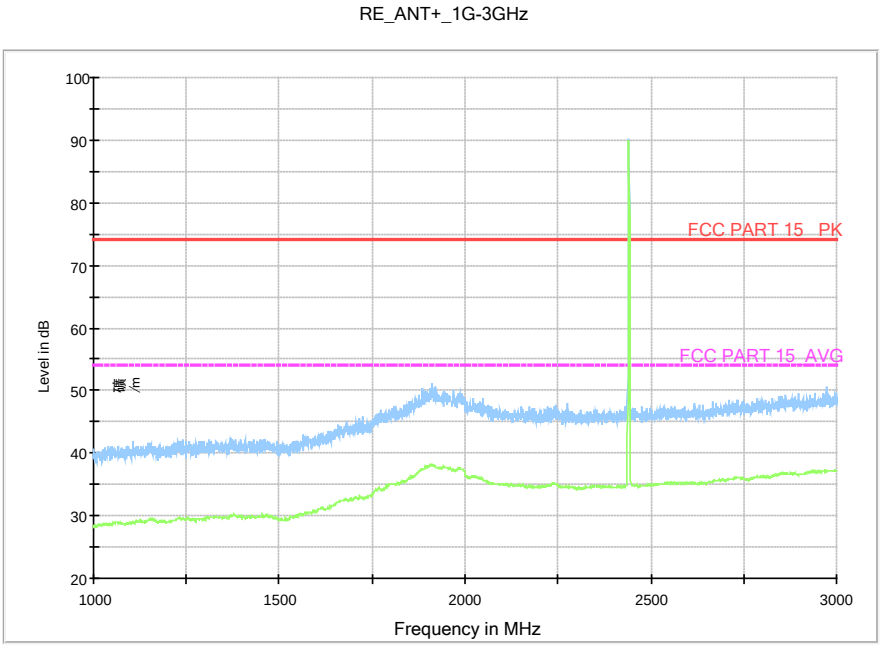


Fig.4 Radiated emission: Channel 39, 1 GHz - 3 GHz

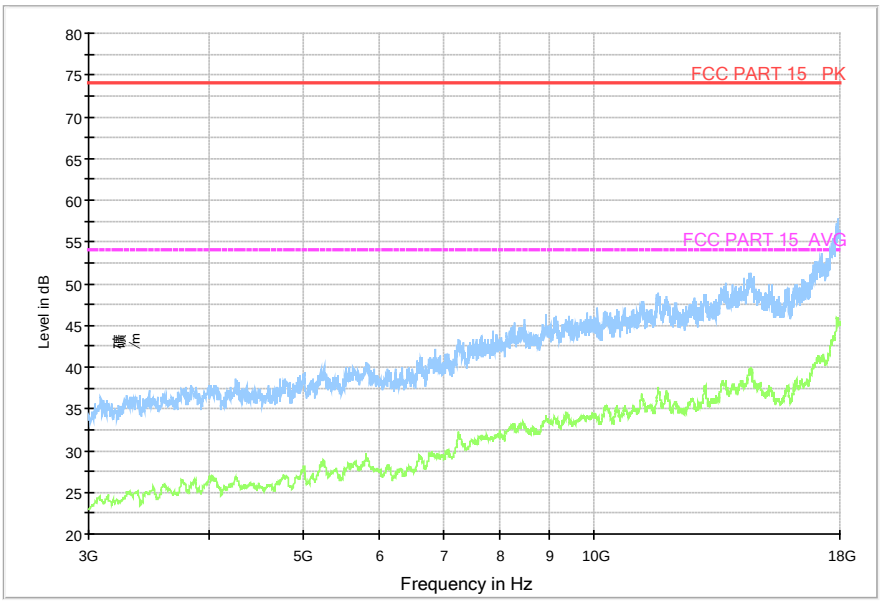


Fig.5 Radiated emission: Channel 39, 3 GHz - 18 GHz

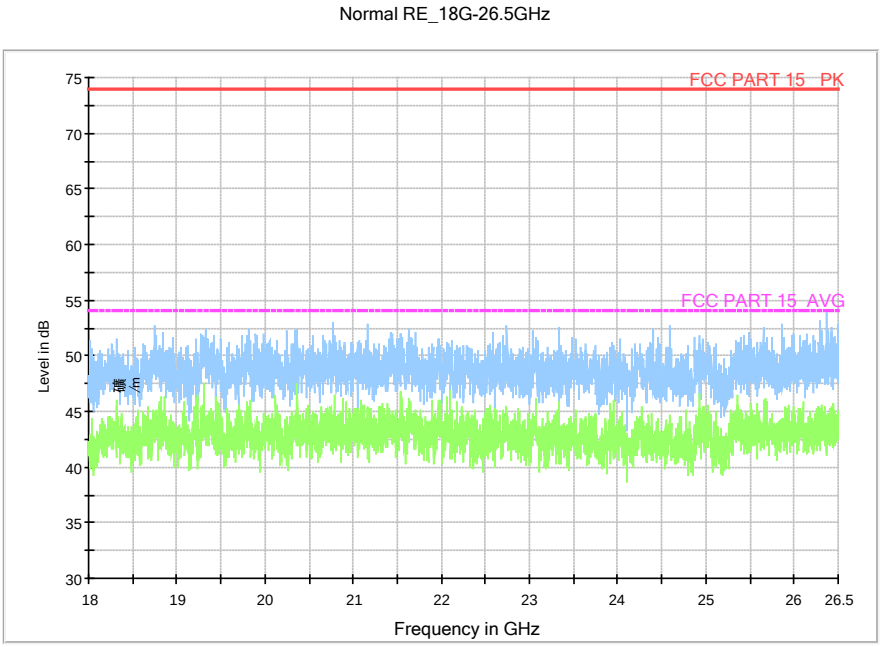


Fig.6 Radiated emission: Channel 39, 18 GHz ~ 26 GHz

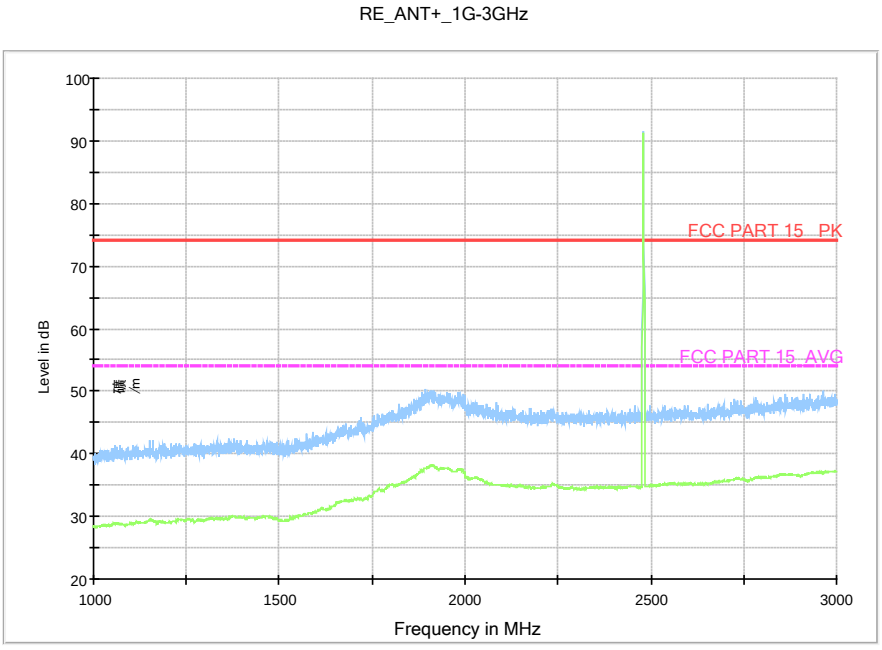


Fig.7 Radiated emission: Channel 78, 1 GHz - 3 GHz

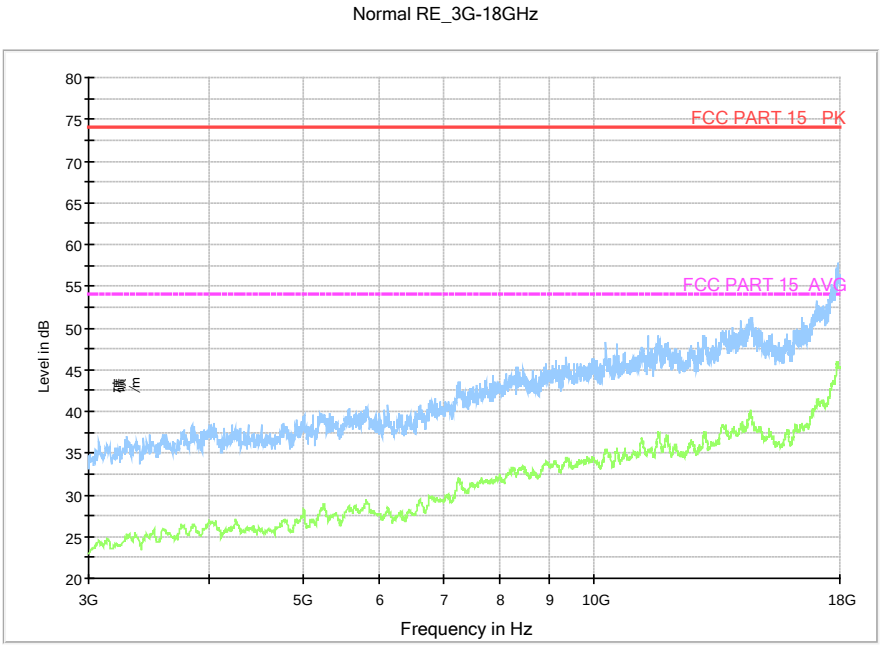


Fig.8 Radiated emission: Channel 78, 3 GHz - 18 GHz

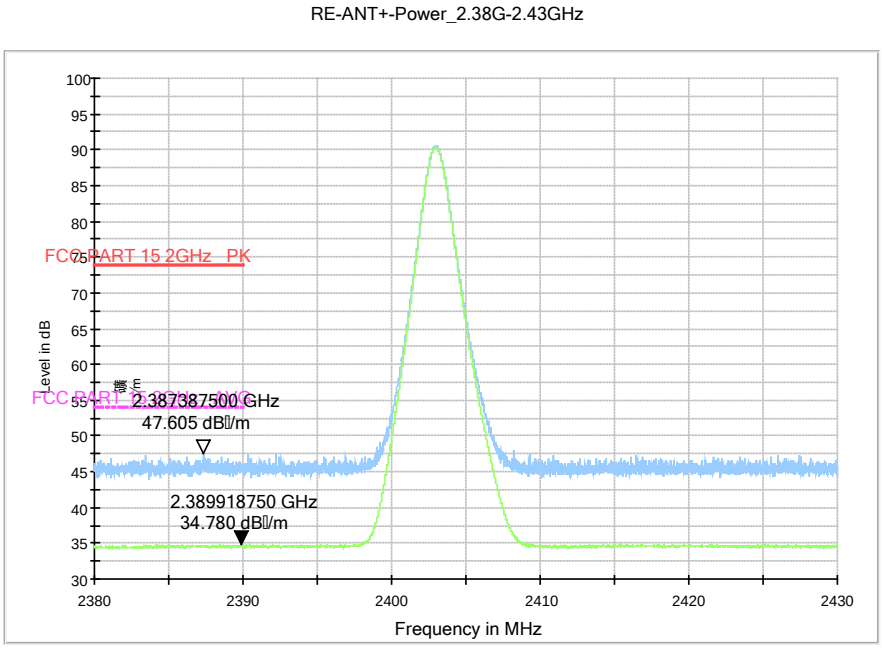


Fig.9 Radiated emission (Power): Low Channel

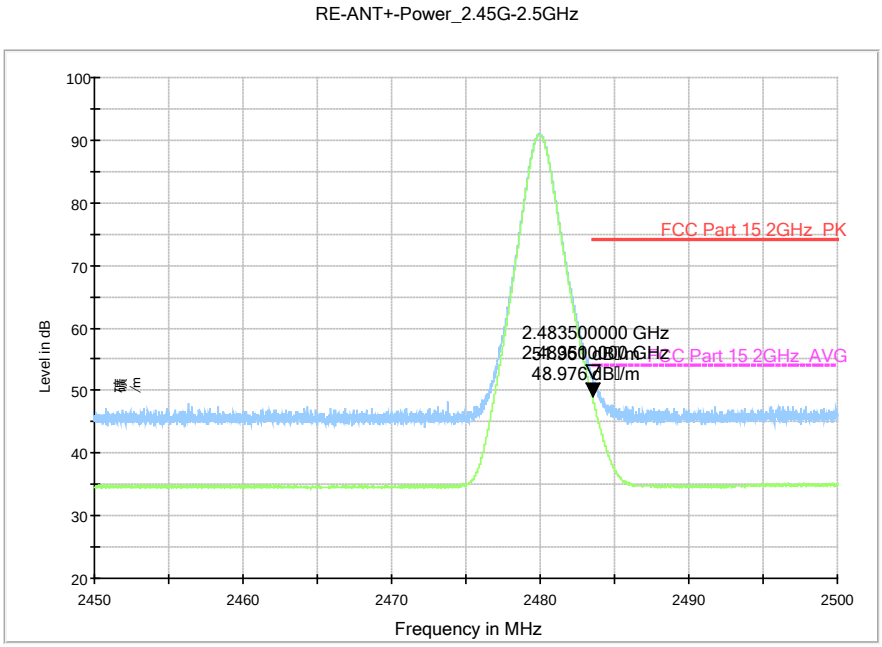


Fig.10 Radiated emission (Power): High Channel

A.3. AC Powerline Conducted Emission

Standard	Limit
FCC 47 CFR Part 15.207	See below

Test Condition

Voltage（V）	Frequency（Hz）
120	60

Measurement Result and limit:

Quasi-peak:

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV) With Charger	Conclusion
0.15 to 0.5	66 o 56	Fig.11. (TX Mode)	P
0.5 to 5	56		
5 to 30	60		
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.			

Average:

Frequency range (MHz)	Average Limit (dBμV)	Result (dBμV) With Charger	Conclusion
0.15 to 0.5	56 to 46	Fig.11. (TX Mode)	P
0.5 to 5	46		
5 to 30	50		
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.			

Note: the graphic result above is the maximum of the measurements for both phase line and neutral line.

Conclusion: PASS

Test graphs as below:

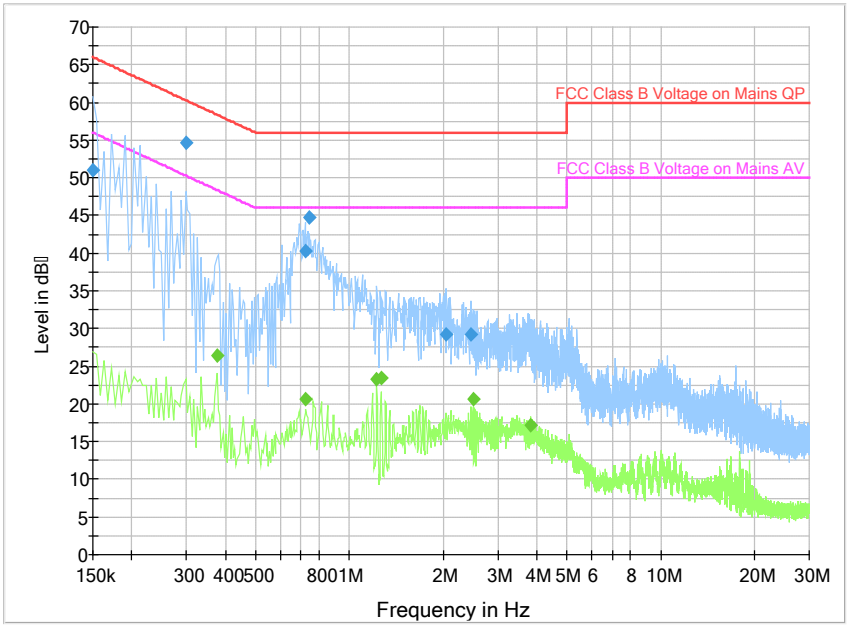


Fig.11 AC Powerline Conducted Emission with charger-TX Mode

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth	Filter	Line	Corr. (dB)
0.150000	51.1	2000.0	9.000	On	N	20.1
0.298500	54.7	2000.0	9.000	On	N	19.8
0.721500	40.3	2000.0	9.000	On	N	19.8
0.744000	44.7	2000.0	9.000	On	N	19.8
2.035500	29.2	2000.0	9.000	On	N	19.6
2.454000	29.3	2000.0	9.000	On	N	19.6

Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth	Filter	Line	Corr. (dB)
0.375000	26.5	2000.0	9.000	On	N	19.8
0.726000	20.6	2000.0	9.000	On	N	19.8
1.225500	23.2	2000.0	9.000	On	N	19.7
1.266000	23.4	2000.0	9.000	On	N	19.7
2.494500	20.6	2000.0	9.000	On	N	19.6
3.831000	17.1	2000.0	9.000	On	N	19.7

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