

Global United Technology Services Co., Ltd.

Report No.: GTS202010000064-01

TEST REPORT

FCC ID: Panoramic Power Itd. **Applicant:**

IC: Panoramic Power Ltd.

FCC ID: 15 Atir Yeda St., Kfar Saba, 4464312, Israel **Address of Applicant:**

IC: Atir Yeda St 15 Kfar Saba 4464312 Israel

Manufacturer: Panoramic Power Ltd.

Address of 15 Atir Yeda St., Kfar Saba, 4464312, Israel

Manufacturer:

Factory: USR Electronic Systems Ltd.

Address of Factory: 14 Hartom St.Jerusalem 9777514, Israel

Equipment Under Test (EUT)

Product Name: Wireless High Current Sensor with Power Measurement Ability

Model No.: PAN-14P-US

HVIN: F1.0

FCC ID: Z9M-PAN14P

IC: 23144-PAN14P

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249

> RSS-Gen Issue 5 **RSS-210 Issue 10**

Date of sample receipt: October 16, 2020

Date of Test: October 16, 2020-January 19, 2021

Date of report issued: January 19, 2021

Test Result: PASS *

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

Authorized Signature:

Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver. Page 1 of 19



2 Version

Version No.	Date	Description
00	January 19, 2021	Original

Prepared By:	Tiger. Chen	Date:	January 19, 2021
	Project Engineer		
Check By:	Johnson lust	Date:	January 19, 2021
	Reviewer		



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4 Test Summary

Test Item	Section	Result
Antenna requirement	15.203 RSS-Gen Section 6.8	Pass
AC Power Line Conducted Emission	15.207	Door
AC Power Line Conducted Emission	RSS-Gen Section 8.8	Pass
Field strength of the fundamental signal	15.249 (a)	Pass
Field strength of the fundamental signal	RSS-210 B10(a)	Pass
Spurious omissions	15.249 (a) (d)/15.209	Pass
Spurious emissions	RSS-Gen Clause 8.9&8.10	Pass
Band edge	15.249 (d)/15.205	Pass
Band edge	RSS-Gen Clause 8.9&8.10	Pass
20dB Occupied Bandwidth and 99%	15.215 (c)	Pass
Occupied Bandwidth	RSS-Gen 6.7	F455

Pass: The EUT complies with the essential requirements in the standard.

Remark: Test according to ANSI C63.10: 2013 and ANSI C63.4: 2014.

Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes			
Radiated Emission	30MHz-200MHz	3.8039dB	(1)			
Radiated Emission	200MHz-1GHz	3.9679dB	(1)			
Radiated Emission	1GHz-18GHz	4.29dB	(1)			
Radiated Emission	18GHz-40GHz	3.30dB	(1)			
AC Power Line Conducted Emission 0.15MHz ~ 30MHz 3.44dB (1)						
Note (1): The measurement unce	ertainty is for coverage factor of k	=2 and a level of confidence of 9	95%.			



5 General Information

5.1 General Description of EUT

Product Name:	Wireless High Current Sensor with Power Measurement Ability
Model No.:	PAN-14P-US
Serial No.:	290302539, 290302491
Hardware Version:	E5
Software Version:	1.27
Test sample(s) ID:	GTS202010000064-1
Sample(s) Status:	Engineer sample
Operation Frequency:	915MHz
Modulation type:	GFSK
Antenna Type:	Integral Antenna
Antenna gain:	-12dBi(declare by applicant)



5.2 Test mode

Transmitting mode

Keep the EUT in continuously transmitting mode.

Remark: During the test, the dutycycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	Х	Y	Z
Field Strength(dBuV/m)	101.62	100.84	98.71

5.3 Description of Support Units

N/A

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC —Registration No.: 381383

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383.

• IC —Registration No.: 9079A

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A

NVLAP (LAB CODE:600179-0)

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0.

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480 Fax: 0755-27798960

5.8 Additional Instructions

EUT Software Settings:

Mode	Special test firmware was pre built in by manufacturer, power set default
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6 Test Instruments list

Radiated Emission: Inventory								
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	(mm-dd-yy)		
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 02 2020	July. 01 2025		
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A		
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 25 2020	June. 24 2021		
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 25 2020	June. 24 2021		
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 25 2020	June. 24 2021		
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 25 2020	June. 24 2021		
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A		
8	Coaxial Cable	GTS	N/A	GTS213	June. 25 2020	June. 24 2021		
9	Coaxial Cable	GTS	N/A	GTS211	June. 25 2020	June. 24 2021		
10	Coaxial cable	GTS	N/A	GTS210	June. 25 2020	June. 24 2021		
11	Coaxial Cable	GTS	N/A	GTS212	June. 25 2020	June. 24 2021		
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 25 2020	June. 24 2021		
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 25 2020	June. 24 2021		
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 25 2020	June. 24 2021		
15	Band filter	Amindeon	82346	GTS219	June. 25 2020	June. 24 2021		
16	Power Meter	Anritsu	ML2495A	GTS540	June. 25 2020	June. 24 2021		
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 25 2020	June. 24 2021		
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 25 2020	June. 24 2021		
19	Splitter	Agilent	11636B	GTS237	June. 25 2020	June. 24 2021		
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 25 2020	June. 24 2021		
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 18 2020	Oct. 17 2021		
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 18 2020	Oct. 17 2021		
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 18 2020	Oct. 17 2021		
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 25 2020	June. 24 2021		



Cond	Conducted Emission							
Item Test Equipmen		Equipment Manufacturer Model No.		Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date		
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022		
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021		
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 25 2020	June. 24 2021		
4	ENV216 2-L-V- NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 25 2020	June. 24 2021		
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A		
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A		
7	Thermo meter	KTJ	TA328	GTS233	June. 25 2020	June. 24 2021		
8	Absorbing clamp	Elektronik- Feinmechanik	MDS21	GTS229	June. 25 2020	June. 24 2021		
9	ISN	SCHWARZBECK	NTFM 8158	GTD565	June. 25 2020	June. 24 2021		

RF C	RF Conducted Test:							
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)		
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 25 2020	June. 24 2021		
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021		
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 25 2020	June. 24 2021		
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 25 2020	June. 24 2021		
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 25 2020	June. 24 2021		
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 25 2020	June. 24 2021		
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 25 2020	June. 24 2021		
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 25 2020	June. 24 2021		

Gene	General used equipment:									
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)				
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 25 2020	June. 24 2021				
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021				



7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement: FCC Part15 C Section 15.203

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

RSS-Gen 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

EUT Antenna:

The antenna is Integral antenna, the best case gain of the antenna is -12dBi, reference to the appendix II for details.



7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207					
·	RSS-Gen Section 8.8					
Test Method:	ANSI C63.10:2013 and RSS-Gen					
Test Frequency Range:	150KHz to 30MHz					
Class / Severity:	Class B					
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto					
Limit:		(dBuV)				
	Frequency range (MHz)	Quasi-peak	Average			
	0.15-0.5	66 to 56*	56 to 46*			
	0.5-5	56	46			
	5-30	60	50			
	* Decreases with the logarith	m of the frequency.	_			
Test setup:	Reference Plan	e				
Test procedure:	Remark E.U.T Test table/Insulation plane Remark E.U.T. Equipment Under Test LISN: Line impedence Stabilization Network Test table height=0.8m	EMI Receiver	power			
Test procedure:	The E.U.T and simulators ar impedance stabilization net coupling impedance for the r	work (L.I.S.N.). This	provides a 50ohm/50uH			
	The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).					
	Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2014 on conducted measurement.					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.: 25 °C Hu	mid.: 52%	Press.: 1012mbar			
Test results:	Pass					



Measurement data

0.44

0.44

0.58 0.70 0.70 0.84 0.84

11.09

-1.74 11.14

-1.18

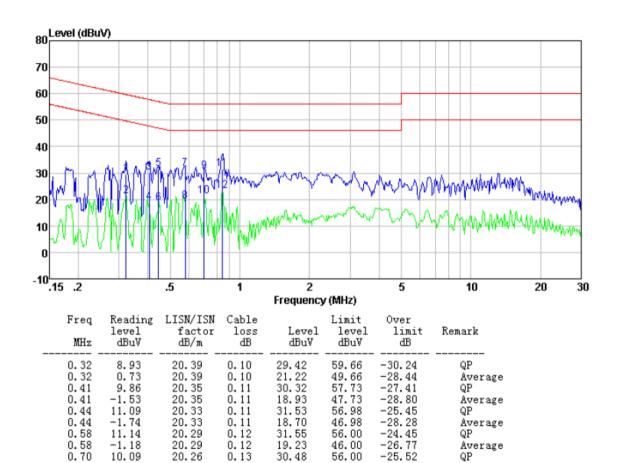
10.09

0.83

11.06

2.81

Line: AC120V 60Hz



31.53 18.70

31.55

19.23

30.48 21.22

31.43

23.18

56.98

46.98

56.00

46.00

56.00

46.00 56.00

46.00

-28.28

-24.45 -26.77 -25.52

-24.78

-24.57

-22.82

QΡ

QP

QP

QP

Äverage

Àverage

Äverage

Average

0.11

0.11

0.12 0.12

0.13

0.13 0.14

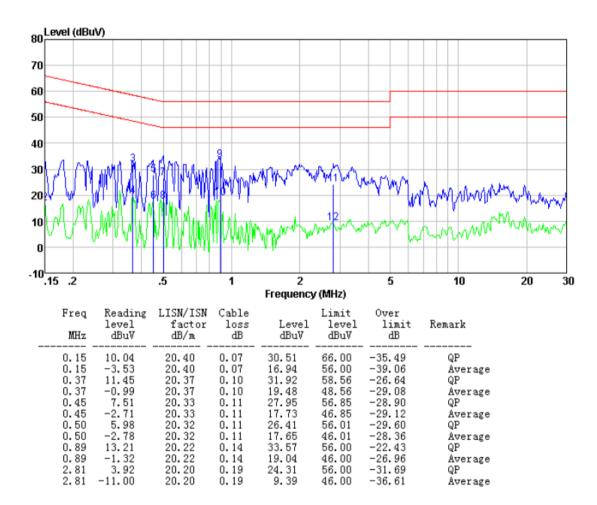
0.14

20. 26 20. 23

20.23



Neutral: AC120V 60Hz



Notes:

- 1. An initial pre-scan was performed on the line and neutral lines with peak detector.
- 2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
- 3. Final Level =Receiver Read level + LISN Factor + Cable Loss



7.3 Radiated Emission Method

Test Requirement:	FCC Part15 C Section	on 15.	.209				
'	RSS-210 B10(a)& RSS-210 B10(b)& RSS-Gen Clause 8.9&8.10					&8.10	
Test Method:	ANSI C63.10:2013 a		. ,				
Test Frequency Range:	9kHz to 10GHz Measurement Distance: 3m						
Test site:							
Receiver setup:	Frequency	Detector		RBW	VBW		Value
	9KHz-150KHz	Qua	asi-peak	200Hz	600l	Ηz	Quasi-peak
	150KHz-30MHz	Qua	asi-peak	eak 9KHz		Hz	Quasi-peak
	30MHz-1GHz	Qua	asi-peak	120KHz	300KHz		Quasi-peak
	Above 1GHz		Peak	1MHz	3MHz		Peak
	Above IGHZ		Peak	1MHz	10H	lz	Average
Limit:	Frequency		Limit ((dBuV/m @	93m)		Remark
(Field strength of the	902-928MHz	7		94.00			verage Value
fundamental signal)	002 02011111			114.00		1	Peak Value
Limit: (Spurious Emissions)	Frequency		Limit (uV	//m)	√alue	I	Measurement Distance
	0.009MHz-0.490M	-	2400/F(K		QP		300m
	0.490MHz-1.705M	-	24000/F(I	KHz)	QP		30m
	1.705MHz-30MH		30		QP		30m
	30MHz-88MHz		100		QP		
	88MHz-216MHz	-	150		QP		
	216MHz-960MH		200		QP		3m
	960MHz-1GHz		500		QP		
	Above 1GHz	-	500		verage		
12.26	Endanta and Patent	- 1-1-1	5000		Peak	<u> </u>	la
Limit: (band edge)	Emissions radiated of harmonics, shall be fundamental or to th whichever is the less	attenu e gen	uated by at eral radiate	least 50 c	B below	v the	level of the
Test setup:	Below 30MHz						
	Turn Table Turn Table Turn Table Turn Table Turn Table Receiver Receiver Turn Table Receiver Turn Table Turn Table						
	DOIOW TOTIZ						



Test Procedure:

Test environment:

Test Instruments:

Refer to section 5.2 for details

Pass

Test mode:

Test results:

Report No.: GTS202010000064-01 Test Antenna EUT-Turn Table < 80cm Turn Tables Receiver-Preamplifier Above 1GHz Test Antenna+ < 1m ... 4m > FUT. Tum Table <150cm> Receiver-Preamplifier+ 1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 25 °C Humid.: 52% Press.: 1 012mbar Temp.: Refer to section 6.0 for details



Measurement data:

7.3.1 Field Strength of The Fundamental Signal and spurious emissions

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
915	111.95	22.35	4.91	37.59	101.62	114	-12.38	Horizontal
915	111.01	22.35	4.91	37.59	100.68	114	-13.32	Vertical

QP value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
915	83.41	22.35	4.91	37.59	73.08	94	-20.92	Horizontal
915	82.87	22.35	4.91	37.59	72.54	94	-21.46	Vertical

7.3.2 Spurious emissions

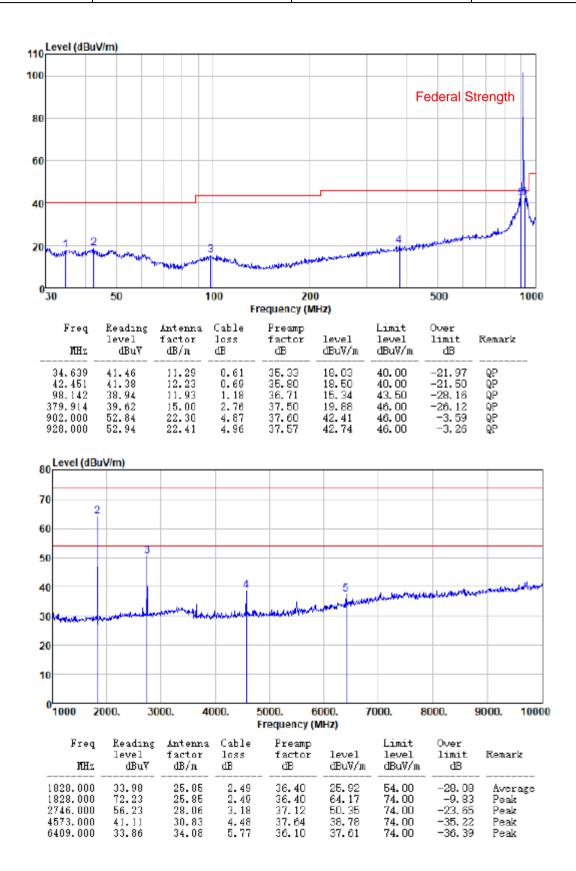
■ Below 30MHz

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o), the test result no need to reported.

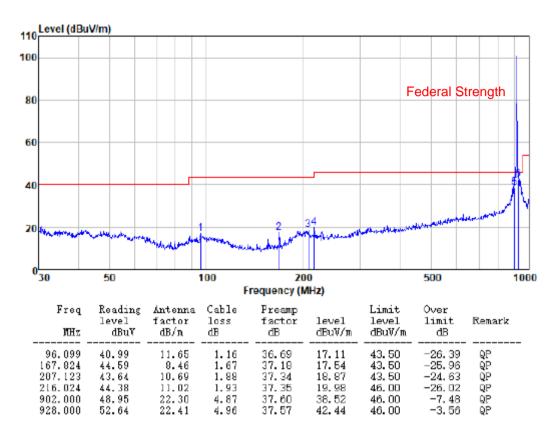


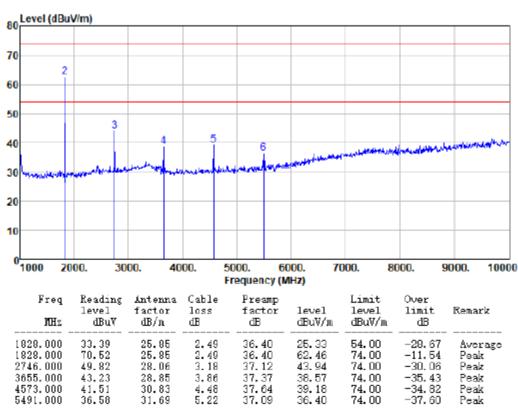
Above 30MHz

Test mode:	Transmitting mode	Antenna Polarity:	Horizontal
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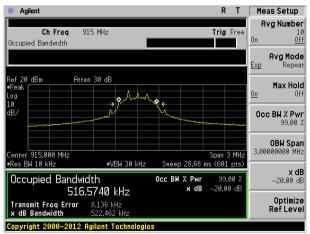
7.4 20dB Occupy Bandwidth and 99% Occupied Bandwidth

Test Requirement: Test Method:	FCC Part15 C Section 15.249/15.215 RSS-Gen Section 6.7 ANSI C63.10:2013 and RSS-Gen
Limit:	Operation Frequency range 902MHz~928MHz
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Operation Frequency	20dB bandwidth(kHz)	99% Occupied bandwidth(kHz)	Result
915MHz	522.462	516.5740	Pass

Test plot as follows:



915MHz



8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the appendix II for details

-----End-----