

CFR 47 FCC PART 15 SUBPART E ISED RSS-247 ISSUE 2

TEST REPORT

For

Square Terminal

MODEL NUMBER: SPD2-01-A

FCC ID: 2AF3K-SPD2

IC: 21827-SPD2

REPORT NUMBER: 4789331395-9

ISSUE DATE: June 2, 2020

Prepared for

Square, Inc. (FCC) 1455 Market St, Suite 600, San Francisco, California, United States 94103

Square Canada, Inc. (ISED) 5000 Yonge Street, Suite 1501; Toronto, ON, M2N7E9 Canada

Prepared by

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake Hi-Tech Development Zone Dongguan, People's Republic of China Tel: +86 769 22038881 Fax: +86 769 33244054 Website: www.ul.com

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			Revision History	
Rev.	Issue Date	Revisions		Revised By
V0	06/02/2020	Initial Issue		



Summary of Test Results				
Clause	Test Items	FCC/IC Rules	Test Results	
1	6dB/26dB Bandwidth	FCC 15.407 (a)&(e) RSS-247 Clause 6.2	PASS	
2	99% Occupied Bandwidth	RSS-Gen Clause 6.6	PASS	
3	Maximum Conducted Output Power	FCC 15.407 (a) RSS-247 Clause 6.2	PASS	
4	Power Spectral Density	FCC 15.407 (a) RSS-247 Clause 6.2	PASS	
5	Radiated Bandedge and Spurious Emission	FCC 15.407 (b) FCC 15.209 FCC 15.205 RSS-247 Clause 6.2 RSS-GEN Clause 8.9	PASS	
6	Conducted Emission Test For AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	PASS	
7	Frequency Stability	FCC 15.407 (g)	PASS	
8	Dynamic Frequency Selection	FCC 15.407 (h) RSS-247 Clause 6.3	PASS	
9	Antenna Requirement	FCC 15.203 RSS-GEN Clause 8.3	PASS	
Note:				

1. This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

2. The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART E >< ISED RSS-247 > when <Accuracy Method> decision rule is applied.



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1. ATTESTATION OF TEST RESULTS

FCC Applicant Information	
Company Name:	Square, Inc.
Address:	1455 Market St, Suite 600, San Francisco, California, United States 94103
ISED	
Applicant Information	
Company Name:	Square Canada, Inc.
Address:	5000 Yonge Street, Suite 1501; Toronto, ON, M2N7E9 Canada
FCC	
Manufacturer Information	

Manufacturer Informatio Company Name: Address:

Square, Inc. 1455 Market St, Suite 600, San Francisco, California, United States 94103

ISED Manufac

Manufacturer Information

Company Name:	Square Canada, Inc.
Address:	5000 Yonge Street, Suite 1501; Toronto, ON, M2N7E9 Canada

EUT Description

EUT Name	Square Terminal
Model for Canada	SPD2-01-A
Model for US	SPD2-01
Sample Status	Normal
Sample ID	2809002
Sample Received date	Jan 13, 2020
Date Tested	Jan 13~ May 21, 2020



APPLICABLE STANDARDS				
STANDARD TEST RESULTS				
CFR 47 FCC PART 15 SUBPART E	PASS			
ISED RSS-247 Issue 2	PASS			
ISED RSS-GEN Issue 5	PASS			

Prepared By:

Checked By:

Kebo. zhonz.

Sherry les

Kebo Zhang Project Engineer Shawn Wen Laboratory Leader

Approved By:

Aephenbuo

Stephen Guo Laboratory Manager



2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, CFR 47 FCC Part 2, CFR 47 FCC Part 15, KDB 789033 D02 v02r01, RSS-GEN Issue 5, RSS-247 Issue 2, KDB414788 D01 Radiated Test Site v01, KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 and KDB 905462 D03 UNII clients without radar detection New Rules v01r02. KDB 905462 D04 Operational Modes for DFS Testing New Rules v01

3. FACILITIES AND ACCREDITATION

	A2LA (Certificate No.: 4102.01)
	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
	has been assessed and proved to be in compliance with A2LA.
	FCC (FCC Designation No.: CN1187)
	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
	Has been recognized to perform compliance testing on equipment subject
	to the Commission's Delcaration of Conformity (DoC) and Certification
	rules
Accreditation	ISED(Company No.: 21320)
Certificate	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
Continouto	has been registered and fully described in a report filed with ISED.
	The Company Number is 21320.
	VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)
	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
	has been assessed and proved to be in compliance with VCCI, the
	Membership No. is 3793.
	Facility Name:
	Chamber D, the VCCI registration No. is G-20019 and R-20004
	Shielding Room B, the VCCI registration No. is C-20012 and T-20011

Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OFS.



4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty		
Uncertainty for Conduction emission test	3.62dB		
Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.2dB		
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.00dB		
Uncertainty for Radiation Emission test	5.78dB (1GHz-18GHz)		
(1GHz to 26GHz)(include Fundamental	5.23dB (18GHz-26GHz)		
emission)	5.64dB (26GHz-40GHz)		
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.			



5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	Square Terminal			
Model for Canada	SPD2-01-A			
Model for US	SPD2-01			
Radio Technology	IEEE802.11a 20 IEEE802.11n HT20/n HT40 IEEE802.11ac VHT20/VHT40/VHT80			
Operation frequency	UNII-1/UNII-2A/UNII-2C/UNII-3			
Modulation	OFDM(BPSK,QPSK,16QAM,64QAM, 256QAM only for 11 ac mode)			
Rating:	Power Adapter	Input Output	100~240V,50/60Hz,1.4A 5V dc,3.0A; 9V dc,3.0A; 15V dc,3.0A; 20V dc,3.0A	
Battery:	7.2Vdc, 3135mAh			



5.2. MAXIMUM EIRP

UNII-1 BAND						
IEE Std.	Frequency (MHz)	Max Power (dBm)	Max EIRP (dBm)			
802.11a 20	5150-5250	13.00	19.30			
802.11n HT20	5150-5250	11.49	19.32			
802.11n HT40	5150-5250	13.27	21.10			
802.11ac VHT20	5150-5250	11.71	19.55			
802.11ac VHT40	5150-5250	13.63	21.47			
802.11ac VHT80	5150-5250	13.23	21.07			

UNII-2A BAND

IEE Std.	Frequency (MHz)	Max Power (dBm)
802.11a 20	5250-5350	14.11
802.11n HT20	5250-5350	16.88
802.11n HT40	5250-5350	15.98
802.11ac VHT20	5250-5350	16.90
802.11ac VHT40	5250-5350	16.05
802.11ac VHT80	5250-5350	11.41

UNII-2C BAND

IEE Std.	Frequency (MHz)	Max Power (dBm)
802.11a 20	5470-5725	16.02
802.11n HT20	5470-5725	16.96
802.11n HT40	5470-5725	18.58
802.11ac VHT20	5470-5725	17.02
802.11ac VHT40	5470-5725	19.06
802.11ac VHT80	5470-5725	19.01

UNII-3 BAND

IEE Std. 802.11	Frequency (MHz)	Max Power (dBm)
802.11a 20	5725-5850	15.82
802.11n HT20	5725-5850	18.44
802.11n HT40	5725-5850	18.30
802.11ac VHT20	5725-5850	18.50
802.11ac VHT40	5725-5850	18.45
802.11ac VHT80	5725-5850	18.39



5.3. CHANNEL LIST

20 MHz Bandwidth Channel frequencies			
Band	Channel	Frequency (MHz)	
	36	5180	
LINIII-1	40	5200	
	44	5220	
	48	5240	
	52	5260	
	56	5280	
	60	5300	
	64	5320	
	100	5500	
	104	5520	
	108	5540	
LINII-2C	112	5560	
0111120	116	5580	
	132	5660	
	136	5680	
	140	5700	
	149	5745	
	153	5765	
UNII-3	157	5785	
	161	5805	
	165	5825	

40 MHz Bandwidth Channel frequencies			
Band	Channel	Frequency (MHz)	
	38	5190	
UNII-1	46	5230	
UNII-2	54	5270	
	62	5310	
UNII-2C	102	5510	
	110	5550	
	134	5670	
UNII-3	151	5755	
	159	5795	



80 MHz Bandwidth Channel frequencies			
Band	Channel	Frequency (MHz)	
UNII-1	42	5210	
UNII-2A	58	5290	
	106	5530	
UNII-2C	122	5610	
UNII-3	155	5775	



5.4. THE WORSE CASE POWER SETTING PARAMETER

	The Worse Case Power Setting Parameter
are	QRCT

Test Software	
---------------	--

1 INIII 4

UNII-1				
Mode	Rate	Channel	Software Setting Value	
			ANT1	ANT2
		36	13	13
11a	6M	40	13.5	13.5
		48	14	14
		36	8.5	8.5
11n HT20	MCS0	40	9	9
		48	9.5	9.5
	MCS0	38	10	10
11n H140		46	11	11
		36	8.5	8.5
11ac VHT20	MCS0	40	9	9
		48	9.5	9.5
11ac VHT40	MCSO	38	10	10
	NIC30	46	11	11
11ac VHT80	MCS0	42	11	11

UNII-2A

Mode	Rate	Channel	Software Setting Value	
			ANT1	ANT2
		52	15	15
11a	6M	60	15	15
		64	15	15
		52	15	15
11n HT20	MCS0	60	15.5	15.5
		64	15	15
11n UT40	M000	54	14	14
11111140	IVIC SU	62	12	12
	MCS0	52	15	15
11ac VHT20		60	15	15
		64	15	15
11ac VHT40	MCSO	54	14	14
	IVICSU	62	12	12
11ac VHT80	MCS0	58	10	10

UNII-2C					
Mode	Rate	Channel	Soft Setting	ware g Value	
			ANT1	ANT2	
		100	15	15	
11a	6M	120	15	15	
		140	15	15	
		100	14	14	
11n HT20	MCS0	120	13	13	
		140	140	13	13
		102	12	12	
11n HT40	MCS0	118	15	15	
		134	14.5	14.5	
		100	14	14	
11ac VHT20	MCS0	120	13.5	13.5	
		140	13.5	13.5	
		102	12	12	
11ac VHT40	MCS0	118	15	15	
		134	15	15	
	MCSO	106	11	11	
	NC30	122	15	15	

UNII-3

	0			UNII-5				
Mode	Rate	Channel	Software Setting Value					
			ANT1	ANT2				
		149	18	18				
11a	6M	157	18	18				
		165	18	18				
		149	17	17				
11n HT20	MCS0	157	17	17				
		165	17	17				
	MCS0	151	17	17				
11111140		159	17	17				
	MCS0	149	17	17				
11ac VHT20		157	17	17				
		165	17	17				
11ac VHT40	MCSO	151	17	17				
	IVIC30	159	17	17				
11ac VHT80	MCS0	155	17	17				

Note: For the test software setting values were provided by the customer, They are used to control power to meet the maximum declared power level.

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5.5. THE WORSE CASE CONFIGURATIONS

For SISO modes, there are two transmission antennas. The antenna used in any given time can be either ANTENNA 1 or ANTENNA 2. The output power measurement for SISO modes on both antennas are reported.

For 2TX MIMO modes, ANTENNA 1 and ANTENNA 2, used at the same time.

SISO mode and MIMO mode have the same power setting, so only the worst-case MIMO mode will be record in the report.

Worst-case data rates as provided by the client were:

802.11a mode: 6 Mbps 802.11n HT20 mode: MCS0 802.11n HT40 mode: MCS0 802.11ac VHT20 mode: MCS0 802.11ac VHT40 mode: MCS0 802.11ac VHT80 mode: MCS0

802.11ac VHT20 and VHT40 mode are different from 802.11nHT20 and HT40 only in control messages, so for these 4 modes, only 802.11ac VHT20 and 802.11ac VHT40 worst case power modes data are recorded in the report.

802.11ac VHT20/VHT40 SISO mode and MIMO mode have the same power setting, so only the worst case power mode(MIMO) will be record in the report.

802.11a support SISO mode, two antenna have the same power setting, so only the worst case power data for antenna 1 are recorded in the report.



5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna No.	Frequency Band	Antenna Type	Max Antenna Gain (dBi)	Directional Gain (dBi)
1	UNII1	PIFA	6.30	7 0/
2	UNII1	PIFA	3.05	7.04
1	UNII-2A	PIFA	6.04	7.00
2	UNII-2A	PIFA	3.57	7.90
1	UNII-2C	PIFA	5.68	7.40
2	UNII-2C	PIFA	3.09	7.49
1	UNII3	PIFA	5.28	7 20
2	UNII3	PIFA	3.36	1.30

Note: Directional gain= 10 log[$(10^{G1/20} + 10^{G2/20})^2/N_{ANT}$]dBi N_{ANT} : Antenna numbers

IEE Std. 802.11	Transmit and Receive Mode	Description	
802.11a	⊠2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.	
802.11n HT20	⊠2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.	
802.11n HT40	⊠2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.	
802.11ac VHT20	⊠2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.	
802.11ac VHT40	⊠2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.	
802.11ac VHT80	⊠2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.	
Note:			
3 BT&WI AN 2 4G & WI AN 5G can't transmit simultaneously (declared by client)			

Note: The value of the antenna gain was declared by customer.



5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	Laptop	Lenovo	TP00094A	/

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	TYPE C	/	1.0	/

ACCESSORIES

Item	Accessory	Brand Name	Model Name	Description
1	Power Adapter	/	SWD4-01	Input: 100-240V ~ 50/60Hz 1.4A Output: 5V dc,3.0A; 9V dc, 3.0A; 15V dc,3.0A; 20V dc,3.0A

TEST SETUP

The EUT can work in an engineer mode with software.

SETUP DIAGRAM FOR TESTS





6. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions							
	Instrument						
Used	Equipment	Manufactur er	Model N	No.	Serial No	Last Cal.	Next Cal.
\checkmark	EMI Test Receiver	R&S	ESR	3	101961	Dec.05,2019	Dec.05,2020
V	Two-Line V- Network	R&S	ENV2 ²	16	101983	Dec.05,2019	Dec.05,2020
V	Artificial Mains Networks	Schwarzbe ck	NSLK 8	126	8126465	Dec.05,2019	Dec.05,2020
			Softwa	are			
Used	Des	cription		Manu	ufacturer	Name	Version
\checkmark	Test Software for C	Conducted di	sturbance	F	arad	EZ-EMC	Ver. UL-3A1
		F	Radiated Er	nissio	ns		
			Instrum	nent			
Used	Equipment	Manufactur er	Model N	No.	Serial No	Last Cal.	Next Cal.
V	MXE EMI Receiver	KESIGHT	N9038	A	MY56400 036	Dec.06,2019	Dec.06,2020
V	Hybrid Log Periodic Antenna	TDK	HLP-300	03C	130960	Sep.17, 2018	Sep.17, 2021
\checkmark	Preamplifier	HP	8447[D	2944A090 99	Dec.05,2019	Dec.05,2020
V	EMI Measurement Receiver	R&S	ESR2	6	101377	Dec.05,2019	Dec.05,2020
\checkmark	Horn Antenna	TDK	HRN-01	18	130939	Sep.17, 2018	Sep.17, 2021
V	High Gain Horn Antenna	Schwarzbe ck	BBHA-9	170	691	Aug.11, 2018	Aug.11, 2021
V	Preamplifier	TDK	PA-02-0	118	TRS-305- 00066	Dec.05,2019	Dec.05,2020
V	Preamplifier	TDK	PA-02	-2	TRS-307- 00003	Dec.05,2019	Dec.05,2020
\checkmark	Preamplifier	TDK	PA-02	-3	TRS-308- 00002	Dec.05,2019	Dec.05,2020
V	Loop antenna	Schwarzbe ck	1519	1519B		Jan.07, 2019	Jan.07, 2022
V	Band Reject Filter	Wainwright	WRCJV12-5695- 5725-5850-5880- 40SS		4	Dec.05,2019	Dec.05,2020
	Band Reject Filter	Wainwright	WRCJV20 5150-5350 60SS	-5120- -5380- S	2	Dec.05,2019	Dec.05,2020
	Band Reject Filter	Wainwright	WRCJV20- 5470-5725 60SS	-5440- -5755- S	1	Dec.05,2019	Dec.05,2020



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V	High Pass Filter	Wainwright	WHKX 6500-18	10-58 800-40	50-)SS	4	Dec.05,2019	Dec.05,2020
	Software							
Used	Description			Manu	facturer		Name	Version
\checkmark	Test Software for Radiated disturbance			Fa	arad	EZ-EMC		Ver. UL-3A1
	Other instruments							
Used	Equipment	Manufactur er	Mode	l No.	Serial	No.	Last Cal.	Next Cal.
\checkmark	Spectrum Analyzer	Keysight	N9030A		MY554	10512	Dec.06,2019	Dec.06,2020
V	Power sensor, Power Meter	R&S	OSP120		1009	921	Dec.06,2019	Dec.06,2020



7. ANTENNA PORT TEST RESULTS 7.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only

TEST SETUP



TEST ENVIRONMENT

Temperature	25.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	DC7.2V

RESULTS

Mode	ON Time (ms)	Period (ms)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (KHz)	Final setting For VBW (KHz)
802.11a 20	2.05	2.15	0.95	95%	0.21	0.49	1
802.11n HT20	1.93	2.02	0.96	96%	0.20	0.52	1
802.11 ac VHT20	1.93	2.03	0.95	95%	0.22	0.52	1
802.11n HT40	0.95	1.045	0.91	91%	0.41	1.05	2
802.11 ac VHT40	0.95	1.035	0.92	92%	0.37	1.05	2
802.11 ac VHT80	0.462	0.558	0.83	83%	0.82	2.16	3

Note:

Duty Cycle Correction Factor= $10\log(1/x)$.

Where: x is Duty Cycle (Linear)

Where: T is On Time

If that calculated VBW is not available on the analyzer then the next higher value should be used. Antenna 1 and Antenna 2 has the same duty cycle, only Antenna 1 data show here.

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7.2. 6/26/99% dB BANDWIDTH

LIMITS

CFR 47 FCC Part15, Subpart E ISED RSS-247				
Test Item	Limit	Frequency Range (MHz)		
	26 dB Bandwidth	5150-5250		
	26 dB Bandwidth	5250-5350		
Bandwidth		For FCC:5470-5725		
Bandwidth	26 dB Bandwidth	For IC:5470-5600		
		5650-5725		
	Minimum 500kHz 6dB Bandwidth	5725-5850		

ISED RSS-247				
RSS-Gen Clause 6.6 99% Bandwidth		For reporting purposes only.		

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 6dB Bandwidth: RBW=100kHz For 26dB Bandwidth: approximately 1% of the emission bandwidth. For 99dB Bandwidth: approximately 1%~5% of the emission bandwidth.
VBW	For 6dB Bandwidth : VBW=300kHz For 26dB Bandwidth : >3RBW For 99%dB Bandwidth : >3RBW
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6dB/26dB&99% Occupied Bandwidth relative to the maximum level measured in the fundamental emission.



TEST SETUP



TEST ENVIRONMENT

Temperature	25.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	DC7.2V

RESULTS

7.2.1. 802.11a 20 MODE

ANT1 WORST CASE

UNII-1 BAND					
Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)		
Low	5180	22.54	16.513		
Mid	5200	22.83	16.550		
High	5240	20.32	16.513		



UNII-2A BAND					
Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)		
Low	5260	22.60	16.506		
Mid	5300	21.00	16.537		
High	5320	21.49	16.541		



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UNII-2C BAND					
Channel	Frequency (MHz)	26 dB BW	99% BW		
Channel		(MHz)	(MHz)		
Low	5500	21.96	16.529		
Mid	5580	22.63	16.624		
High	5700	22.78	16.576		

UNII-3 BAND						
Channel	Frequency (MHz)	6 dB BW (MHz)	99% BW (MHz)	Limit For 6dB BW (KHz)	Result	
Low	5745	16.63	16.993	500	PASS	
Mid	5785	16.38	17.274	500	PASS	
High	5825	16.41	17.160	500	PASS	

		99	9% BW
L	ow CHANNEL		Mid CHANNEL
Keyslight Spectrum Analyzer - Occupied BW IR RF 50 G DC Center Freq 5.745000000 GHz NFE #IFGaint.cov C	SENSE-INT ALIGN AUTO Center Freq: 5.745000000 GHz Trig: Free Run Avg Hold:>10/10 #Atten: 40 dB	12:40:15 PM Apr13, 2020 Radio Std: None Radio Device: BTS	Keysight Spectrum Analyzer - Occupied BW STINGEINT ALIGN AUTO 12-24435 MK Apr 13, 2020 R NL RF 50.0 DC Center Freq. 5.785000000 GHz 12-24435 MK Apr 13, 2020 Center Freq. 5.785000000 GHz Trig: Free Run Avg Hold:>1010 Radio Stt. Hoose N°E #IFGeincl.com #IFGeincl.com Radio Stt. Hoose Radio Device: BTS
Ref Offset 21.97 dB Ref 30.00 dBm reg reg reg reg reg reg reg reg	#VBW 620 kHz Total Power 22.9 dBm % of OBW Power 99.00 %	Span 40 MHz Sweep 1.067 ms	Center 5.785 GHz #Res BW 200 kHz Coccupied Bandwidth 17.274 MHz Transmit Freq Error 46.274 kHz % of OBW Power 99.00 %
^{so}	igh CHANNEL		mo srana
Krysight Spectrum Analyzer - Occupied BW RL RF 50 0 DC Center Freq 5.825000000 GHz NFE #IFGain:Low	SENSE:INT ALIGN AUTO Center Freq: 5.825000000 GHz Trig: Free Run Avg Hold: 10/10 #Atten: 40 dB	12:48:06 PM Apr 13, 2020 Radio Std: None Radio Device: BTS	
Before 22.06 dB Ref 03.00 dBm 0 Bidly 100 100 100 100 100 100 100 10		Span 40 MHz	
Res BW 200 kHz Occupied Bandwidth	#VBW 620 kHz Total Power 21.8 dBm	Sweep 1.067 ms	
17.160 MHz Transmit Freq Error 7.313 kHz x dB Bandwidth 16.40 MHz	% of OBW Power 99.00 % x dB -6.00 dB		
MSG	STATUS		

Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

7.2.2. 802.11ac VHT20 MODE

ANT1 WORST CASE

UNII-1 BAND					
Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)		
Low	5180	21.37	17.802		
Mid	5200	22.74	17.690		
High	5240	22.75	17.674		

UNII-2A BAND					
Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)		
Low	5260	23.42	17.755		
Mid	5300	22.76	17.675		
High	5320	22.62	17.721		

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UNII-2C BAND					
Channel	Frequency (MHz)	26 dB BW	99% BW		
Channer		(MHz)	(MHz)		
Low	5500	22.27	17.640		
Mid	5580	22.16	17.696		
High	5700	22.11	17.715		

UNII-3 BAND						
Channel	Frequency (MHz)	6 dB BW (MHz)	99% BW (MHz)	Limit For 6dB BW (KHz)	Result	
Low	5745	17.29	17.736	500	PASS	
Mid	5785	17.56	17.821	500	PASS	
High	5825	17.61	18.013	500	PASS	

Low CHANNEL Mid C	
High Characterize from the second se	
Reconnecting de Reconnecting de Reconn	39 AM Apr 14, 2020 None ice: BTS
Control 200 10	
Occupied Bandwidth Total Power 22.1 dBm 17.736 MHz Transmit Freq Error 74.585 kHz % of OBW Power 99.00 % x dB Bandwidth 16.72 MHz x dB -6.00 dB	pan 40 MHz
High CHANNEL	
NE WE generative Addres: 30 dB Regiment with the regiment withe regiment with the regiment wither the regiment withe r	
10 GB/dV Ref 20.00 dBm 10 GB/	
Center 5.825 GHz Span 40 MHz Bee SIW 200 kHz Sweep 1 067 ms	
Occupied Bandwidth Total Power 22.5 dBm 18.013 MHz Transmit Freq Error 56.409 kHz % of OBW Power 99.00 % x dB Bandwidth 17.31 MHz x dB -6.00 dB	
80a (37705)	

Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

7.2.3. 802.11ac VHT40 MODE

ANT1 WORST CASE

UNII-1 BAND					
Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)		
Low	5190	40.75	36.269		
High	5230	40.40	36.156		

UNII-2A BAND					
Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)		
Low	5270	41.00	36.249		
High	5310	40.91	36.158		

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UNII-2C BAND						
Channel	Frequency (MHz)	26 dB BW	99% BW			
Channer		(MHz)	(MHz)			
Low	5510	40.33	36.192			
Mid	5550	40.59	36.132			
High	5670	40.40	36.182			

UNII-3 BAND							
Channel	Frequency	6 dB BW	99% BW	Limit	Result		
Channel	(MHz)	(MHz)	(MHz)	(KHz)			
Low	5755	36.03	36.199	500	PASS		
High	5795	35.66	36.283	500	PASS		

	Lo		IEL			Hi	gh CHANN	IEL	
Keysight Spectrum Analyzer - Occupied BW RL RF SO Ω DC enter Freq 5.755000000 NF	GHz #FGain:Low	SENSE:INT AL Center Freq: 5.755000000 Trig: Free Run #Atten: 30 dB	IGN AUTO] 9 GHz Avg Hold:>10/10	12:16:14 PM Apr 14, 2020 Radio Std: None Radio Device: BTS	Keysight Spectrum Analyzer - Occupied Bi R RL RF 50 Ω DC Center Freq 5.795000000 N	GHz FE #IFGain:Low	SENSE:INT ALL Center Freq: 5.795000000 Trig: Free Run #Atten: 30 dB	SN AUTO GHz Avg Hold:>10/10	10:55:52 AM Apr14, 20 Radio Std: None Radio Device: BTS
Ref Offset 21.97 d dB/div Ref 20.00 dBm	3				10 dB/div Ref Offset 21.97 dB/div	iB 1			
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0	×**		- M	Manha Series and and	-20.0	West and a second s			bright and brighter in the state of the service
0				and the second	-40.0				
0					-50.0				
.0					-70.0				
enter 5.755 GHz tes BW 390 kHz		#VBW 1.2 MH	2	Span 80 MHz Sweep 1.067 ms	Center 5.795 GHz #Res BW 390 kHz		#VBW 1.2 MHz		Span 80 MH Sweep 1.067 n
Occupied Bandwidth 36	.199 MHz	Total Power	23.1 dBm		Occupied Bandwidt 36	^h 5.283 MHz	Total Power	23.1 dBm	
Transmit Freq Error	87.587 kHz	% of OBW Power	99.00 %		Transmit Freq Error	89.520 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	35.81 MHz	x dB	-6.00 dB		x dB Bandwidth	36.15 MHz	x dB	-6.00 dB	

Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

7.2.4. 802.11ac VHT80 MODE

ANT1 WORST CASE

UNII-1 BAND					
Channel	Frequency	26 dB BW	99% BW		
	(MHz)	(MHz)	(MHz)		
Mid	5210	83.83	75.834		

RL RF 50 Ω DC nter Freq 5.210000000 Ν	GHz FE #I	Gain:Low	SENSE:INT Center Fre Trig: Free #Atten: 30	q: 5.21000000 Run dB	JGN AUTO 0 GHz Avg Hold: 1	0/10		01:09:50 Radio Std: M Radio Devic	o PM Apr 14, 2020 Ione e: BTS
Ref Offset 21.58 dB/div Ref 20.00 dBn	dB n								
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		and the second	a dan sa ka	a service and the service of the ser	Chimical Market				
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es BW 820 kHz			#VE	W 2.4 MH	z			Spa Sweep	n 160 MHz 0 1.067 ms
Occupied Bandwidt	h		Total P	ower	13.5 dE	ßm			
75	5.834	MHz							
Fransmit Freg Error	207.	48 kHz	% of O	BW Power	99.00	%			
dB Bandwidth	83.8	3 MHz	x dB		-26.00	dB			

	UNII-2A BAND					
Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)			
Mid	5290	81.91	75.485			

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UNII-2C BAND					
Channel	Frequency (MHz)	26 dB BW	99% BW		
		(MHz)	(MHz)		
Low	5530	83.21	75.576		
High	5610	83.41	75.746		

UNII-3 BAND						
Channel	Frequency (MHz)	6 dB BW (MHz)	99% BW (MHz)	Limit For 6dB BW (KHz)	Result	
Mid	5775	75.13	75.711	500	PASS	

Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

7.3. MAXIMUM CONDUCTED OUTPUT POWER

LIMITS

CFR 47 FCC Part15, Subpart E				
Test Item	Limit	Frequency Range (MHz)		
	For FCC client devices:250mW (24dBm)	5150-5250		
Conducted Output	Not exceed the lesser of 250 mW or 11 dBm + 10 log B whichever is less where B is the 26 dB emission bandwidth in megahertz	5250-5350		
Power	Not exceed the lesser of 250 mW or 11 dBm + 10 log B whichever is less where B is the 26 dB emission bandwidth in megahertz	5470-5725		
	1 Watt (30dBm)	5725-5850		

	ISED RSS-247				
Test Item	Limit	Frequency Range (MHz)			
Conducted	Maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever is less where B is the 99% emission bandwidth in megahertz	5150-5250			
Output Power	Not exceed 250 mW or 11 + 10 log10 B, where B is the 99% emission bandwidth in megahertz	5250-5350			
	Not exceed 250 mW or 11 + 10 log10 B, where B is the 99% emission bandwidth in megahertz	5470-5600 5650-5725			
	1 Watt (30dBm)	5725-5850			

Note: If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

TEST PROCEDURE

Refer to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Connect the EUT to the a broadband average RF power meter, the power meter shall have a video bandwidth that is greater than or equal to the bandwidth and shall utilize a fastresponding diode detector.

Straddle channel power is measured using PXA spectrum analyzer.

TEST SETUP

TEST ENVIRONMENT

Temperature	25.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	DC7.2V

RESULTS

7.3.1. UNII-1 BAND

Mode	Frequency (MHz)	CONDUCTED POWER (dBm)		Total (dBm)	FCC Limit (dBm)	EIRP (dBm)		Total (dBm)	ISED EIRP Limit	Result
		ANT1	ANT2		(*)	ANT1	ANT2		(dBm)	
	5180	13.00	13.06	/	24	19.30	16.11	/	22.2	PASS
802.11a20	5200	12.86	12.86	/	24	19.16	15.91	/	22.2	PASS
	5240	12.86	12.84	/	24	19.16	15.89	/	22.2	PASS
	5180	8.68	8.22	11.47	22.2	/	/	19.30	22.5	PASS
802.11n HT20	5200	8.40	8.55	11.49	22.2	/	/	19.32	22.5	PASS
11120	5240	8.38	8.11	11.26	22.2	/	/	19.09	22.5	PASS
000.44	5180	8.28	8.29	11.30	22.2	/	/	19.13	22.5	PASS
802.11ac VHT20	5200	8.70	8.70	11.71	22.2	/	/	19.55	22.5	PASS
11120	5240	8.37	8.37	11.38	22.2	/	/	19.22	22.5	PASS
802.11n	5190	10.19	10.00	13.11	22.2	/	/	20.94	23	PASS
HT40	5230	10.31	10.20	13.27	22.2	/	/	21.10	23	PASS
802.11ac VHT40	5190	10.22	10.73	13.49	22.2	/	/	21.33	23	PASS
	5230	10.39	10.84	13.63	22.2	/	/	21.47	23	PASS
802.11ac VHT80	5210	10.02	10.41	13.23	22.2	/	/	21.07	23	PASS

Note: 1.Conducted Power=Meas. Level+ Correction Factor

2.For SISO Mode: EIRP=conducted Power + Antenna Gain,

For MIMO Mode: EIRP=conducted Power + Directional Gain.

7.3.2. UNII-2A BAND

Mode	Frequency (MHz)	equency (MHz) CONDUCTED POWER (MHz) (dBm)		Total (dBm)	CONDUCTED POWER (dBm)	ISED Limit (dBm)	Result
		ANT1	ANT2	,	. ,	× ,	
	5260	13.36	13.59	/	24	23.2	PASS
802.11a20	5300	14.04	13.82	/	24	23.2	PASS
	5320	13.85	14.11	/	24	23.2	PASS
802.11n HT20	5260	13.16	13.45	16.32	22.1	23.5	PASS
	5300	13.78	13.96	16.88	22.1	23.5	PASS
	5320	13.66	13.89	16.79	22.1	23.5	PASS
	5260	13.19	13.47	16.34	22.1	23.5	PASS
802.11ac VHT20	5300	13.85	13.83	16.85	22.1	23.5	PASS
	5320	13.73	14.05	16.90	22.1	23.5	PASS
802 11n HT40	5270	12.95	12.99	15.98	22.1	24	PASS
802.110 1140	5310	10.58	10.97	13.79	22.1	24	PASS
802.11ac VHT40	5270	12.98	13.10	16.05	22.1	24	PASS
	5310	10.96	10.59	13.79	22.1	24	PASS
802.11ac VHT80	5290	8.38	8.41	11.41	22.1	24	PASS

Note: 1.Conducted Power=Meas. Level+ Correction Factor

7.3.3. UNII-2C BAND

Mode	Frequency	CONDUCTED POWER (dBm)		Total	FCC Limit	ISED Limit	Result
		ANT1	ANT2	(автт)	(UDIII)	(dBm)	
	5500	15.35	15.48	/	24	23.2	PASS
802.11a20	5580	15.94	16.02	/	24	23.2	PASS
	5700	16.10	16.02	/	24	23.2	PASS
	5500	13.75	14.14	16.96	22.5	23.5	PASS
802.11n HT20	5580	13.77	13.16	16.49	22.5	23.5	PASS
	5700	13.41	13.97	16.71	22.5	23.5	PASS
	5500	14.11	13.90	17.02	22.5	23.5	PASS
802.11ac VHT20	5580	14.28	13.65	16.99	22.5	23.5	PASS
	5700	13.99	13.59	16.80	22.5	23.5	PASS
	5510	12.20	12.40	15.31	22.5	24	PASS
802.11n HT40	5590	15.88	15.22	18.57	22.5	24	PASS
	5670	15.62	15.51	18.58	22.5	24	PASS
	5510	12.48	12.33	15.42	22.5	24	PASS
802.11ac VHT40	5590	15.89	15.52	18.72	22.5	24	PASS
	5670	16.07	16.02	19.06	22.5	24	PASS
802 11ac \/HT80	5530	11.36	11.38	14.38	22.5	24	PASS
	5610	15.92	16.07	19.01	22.5	24	PASS

Note: 1.Conducted Power=Meas. Level+ Correction Factor

7.3.4. UNII-3 BAND

Mode	Frequency	CONDUCTI (dE	Total	Limit	Result	
		ANT1	ANT2	(UDIII)	(автт)	
	5745	15.21	15.14	/	30	PASS
802.11a20	5785	15.34	15.35	/	30	PASS
	5825	15.82	15.51	/	30	PASS
	5745	15.03	14.92	17.99	28.6	PASS
802.11n HT20	5785	15.21	15.20	18.22	28.6	PASS
	5825	15.49	15.37	18.44	28.6	PASS
	5745	15.14	15.02	18.09	28.6	PASS
802.11ac VHT20	5785	15.23	15.32	18.29	28.6	PASS
	5825	15.50	15.48	18.50	28.6	PASS
902 11p HT40	5755	14.83	14.83	17.84	28.6	PASS
802.11h H140	5795	15.23	15.35	18.30	28.6	PASS
802.11ac VHT40	5755	15.38	14.93	18.17	28.6	PASS
	5795	15.49	15.38	18.45	28.6	PASS
802.11ac VHT80	5775	15.48	15.28	18.39	28.6	PASS

Note: 1.Conducted Power=Meas. Level+ Correction Factor

7.4. POWER SPECTRAL DENSITY

<u>LIMITS</u>

CFR 47 FCC Part15, Subpart E ISED RSS-247							
Test Item	Limit	Frequency Range (MHz)					
Power Spectral Density	For FCC: Other than Mobile and portable:17dBm/MHz Mobile and portable:11dBm/MHz	5150-5250					
	For RSS: e.i.r.p. 10dBm/MHz						
	11dBm/MHz	5250-5350					
	11dBm/MHz	For FCC:5470-5725 For IC:5470-5600 5650-5725					
	30dBm/500kHz	5725-5850					
Note:	antennas of directional gain greater than 6 dBi are used, bo	th the maximum					

1. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	RMS
RBW	1MHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto
For U-NII-3:	
Center Frequency	The center frequency of the channel under test
Detector	RMS
RBW	500kHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

For U-NII-1, U-NII-2A and U-NII-2C band:

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

TEST SETUP

TEST ENVIRONMENT

Temperature	25.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	DC7.2V

RESULTS

7.4.1. 802.11a 20 MODE

UNII-1 BAND WORST CASE FOR ANT1

Test Channel	Frequency (MHz)	ANT	DCCF (dB)	PSD Result (dBm/MHz)	FCC Limit (dBm/MHz)	EIRP Result (dBm/MHz)	ISED EIRP Limit (dBm/MHz)
Low	5180	1	0.21	2.607		9.117	
Mid	5200	1	0.21	2.199	11	8.709	10
High	5240	1	0.21	2.162		8.672	

Note:

- 1. For test plots, it does not include the duty cycle correction factor.
- 2. PSD result=Test plots result+ Duty Cycle Correction Factor
- 3. The test results have already included the duty cycle correction factor. About correction Factor please refer to section 7.1.

