

FCC AND IC RADIO TEST REPORT

FCC ID: 2AFWP-153100VA

IC: 21116-153100VA

Product: SONNET60, SONNET120



153100-VA,153100-Vx,153102-VA, 153102-Vx The "x" **Model Name :** in the model reference can be any letter A – Z denoting non-safety related changes, e.g leather covering

Report No.: UNIA19103018FR-02

Prepared for

Blackstar Amplification Ltd.

Beckett House, 14 Billing Road Northampton, NN1 5AW United Kingdom

Prepared by

Shenzhen United Testing Technology Co., Ltd.

2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

深圳市优耐检测技术有限公司 Shenzhen United Testing Technology Co.,Ltd. United Testing Technology(Hong Kong) Limited

TEST RESULT CERTIFICATION

Applicant's name:	Blackstar Amplification Ltd.
Address	Beckett House, 14 Billing Road Northampton, NN1 5AW
Address	United Kingdom
Manufacture's Name:	Blackstar Amplification Ltd.
Address	Beckett House, 14 Billing Road Northampton, NN1 5AW
Address	United Kingdom
Product description	
Product name:	SONNET60, SONNET120
Trade Mark	
Model and/or type reference .:	153100-VA,153100-Vx,153102-VA, 153102-Vx The "x" in the model reference can be any letter A – Z denoting non-safety related changes, e.g leather covering
Standards	FCC Rules and Regulations Part 15 Subpart C Section 15.247, ANSI C63.10: 2013; RSS-247 Issue 2: February 2017,

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

RSS-Gen Issue 5 April 2018;

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Date of Test	
Date (s) of performance of tests	Jul. 10 ~ 22, 2019
Date of Issue:	Jul. 23, 2019
Test Result:	Pass

Prepared by:

Reviewer:

Approved & Authorized Signer:

Kahn yang/Editor

Sherwin Qian/Supervisor

line

Liuze/Manager

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1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST CONDUCTED EMISSIONS TEST RADIATED EMISSION TEST BAND EDGE OCCUPIED BANDWIDTH MEASUREMENT PEAK OUTPUT POWER CONDUCTED BANDEGE MEASUREMENT SPURIOUS RF CONDUCTED EMISSION ANTENNA REQUIREMENT RESULT COMPLIANT COMPLIANT COMPLIANT COMPLIANT COMPLIANT COMPLIANT COMPLIANT

1.2 TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.

Address

Community, Xixiang Str, Bao'an District, Shenzhen, China

2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

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

CNAS-LAB Code: L6494

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

Designation Number: CN1227

Test Firm Registration Number: 674885

The 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 our files.

1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty		
Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	=	4.06dB, k=2

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	SONNET60, SONNET120
Trade Mark	Blackstar [®]
Test Model Name	153100-VA, 153102-VA
Model Difference	All models have same circuits diagram of Bluetooth module PCB, RF Chip construction; All models have the same enclosure and general appearance except the position of the I/O port. Also AC/DC Power board, control board and main board have minor difference which will not have influence on the RF features.
FCC ID	2AFWP-153100VA
IC	21116-153100VA
Antenna Type	PCB Antenna
Antenna Gain	0dBi
Frequency Range	2402-2480MHz
Number of Channels	40 channels for BLE
Modulation Type	GFSK for BLE
Power Source	AC 100-240V, 50/60Hz

Table for auxiliary equipment:

Equipment Description	Manufacturer	Model	Calibration Due Date
Notebook	Lenovo	Lenovo G475	GB14477457



2.2 Carrier Frequency of Channels

		2	Chanr	nel List			V
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	10	2422	20	2442	30	2462
01	2404	11	2424	21	2444	31	2464
02	2406	12	2426	22	2446	32	2466
03	2408	13	2428	23	2448	33	2468
04	2410	14	2430	24	2450	34	2470
05	2412	15	2432	25	2452	35	2472
06	2414	16	2434	26	2454	36	2474
07	2416	17	2436	27	2456	37	2476
08	2418	18	2438	28	2458	38	2478
09	2420	19	2440	29	2460	39	2480

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2.3 Operation of EUT during testing

Operating Mode The mode is used: Transmitting mode

Low Channel: 2402MHz

Middle Channel: 2440MHz

High Channel: 2480MHz

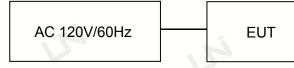
Test SW Version: Install BlueSuite_2_5_8_667

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:



Operation of EUT during Radiation testing:



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2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
		CONDUCTED	EMISSIONS TEST		
1	AMN	Schwarzbeck	NNLK8121	8121370	2020.09.06
2	AMN	ETS	3810/2	00020199	2020.09.06
3	EMI TEST RECEIVER	Rohde&Schwarz	ESCI	101210	2020.09.06
4	AAN	TESEQ	T8-Cat6	38888	2020.09.06
		RADIATED	EMISSION TEST		
1	Horn Antenna	Sunol	DRH-118	A101415	2020.09.06
2	BicoNILog Antenna	Sunol	JB1 Antenna	A090215	2020.09.06
3	PREAMP	HP	8449B	3008A00160	2020.09.06
4	PREAMP	HP	8447D	2944A07999	2020.09.06
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2020.09.06
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2020.09.06
7	Signal Generator	Agilent	E4421B	MY4335105	2020.09.06
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2020.09.06
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2020.09.06
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2020.09.06
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2020.09.06
12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2020.09.06
13	RF Power sensor	DARE	RPR3006W	15100041SNO88	2020.09.06
14	RF Power sensor	DARE	RPR3006W	15100041SNO89	2020.09.06
15	RF power divider	Anritsu	K241B	992289	2020.09.06
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2020.09.06
17	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2020.09.06
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2020.09.06
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2020.09.06
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2020.09.06
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2020.09.06
22	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2020.09.06
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2020.09.06
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2020.09.06
25	Power Meter	KEYSIGHT	N1911A	MY50520168	2020.09.06
26	Frequency Meter	VICTOR	VC2000	997406086	2020.09.06
27	DC Power Source	HYELEC	HY5020E	055161818	2020.09.06
		Test	software		A
1	E3	Audix	6.101223a	N/A	N/A

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3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

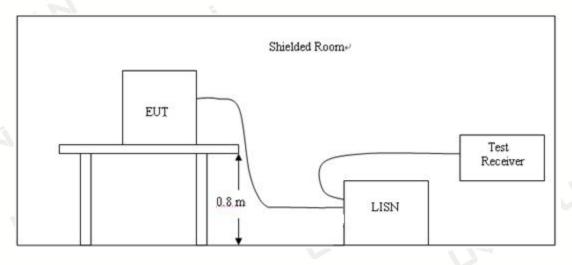
For unintentional device, according to § 15.107(a) & RSS-Gen [8.8] Line Conducted Emission Limits is as following

4	Maximum RF Line Voltage(dBµV)					
Frequency	CLASS A		CLASS B			
(MHz)	Q.P.	Ave.	Q.P.	Ave.		
0.15~0.50	79	66	66~56*	56~46*		
0.50~5.00	73	60	56	46		
5.00~30.0	73	60	60	50		

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

3.2 Test Setup



3.3 Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

3.4 Test Result

Pass

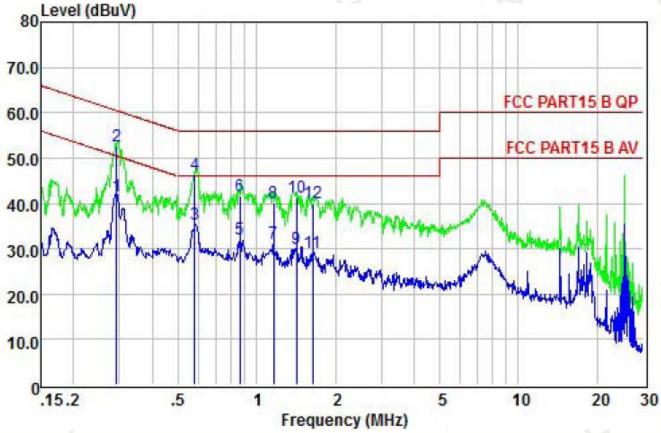
Remark:

All modes were tested at AC 120V and 240V, only the worst result of AC 120V was reported.
 All modes of Low, Middle, and High channel were tested, only the worst result of High Channel was reported as below:



Over

Temperature:	26°C	Relative Humidity:	48%	
Model:	153100-VA	Pressure:	1010hPa	
Test Voltage:	AC 120V, 60Hz	Phase:	Line	
Test Mode:	Fransmitting mode of GFSK 2480MHz			



Cable LISN Limit

Freq Level Loss Factor Line Limit Remark

	MHz	dBuV	dB	dB	dBuV	dB	(
1	0.29	41.72	0.25	9.62	50.46	-8.74	Average	
2	0.29	52.70	0.25	9.62	60.46	-7.76	QP	
3	0.58	35.52	0.25	9.59	46.00	-10.48	Average	
4	0.58	46.30	0.25	9.59	56.00	-9.70	QP	
5	0.86	32.03	0.26	9.60	46.00	-13.97	Average	
6	0.86	41.60	0.26	9.60	56.00	-14.40	QP	
7	1.17	31.11	0.27	9.59	46.00	-14.89	Average	
8	1.17	40.20	0.27	9.59	56.00	-15.80	QP	
9	1.42	29.99	0.27	9.60	46.00	-16.01	Average	
10	1.42	41.30	0.27	9.60	56.00	-14.70	QP	
11	1.64	29.27	0.27	9.60	46.00	-16.73	Average	
12	1.64	40.00	0.27	9.60	56.00	-16.00	QP	
	Remark: Factor = In	sertion Loss +	Cable Loss	Result = Read	ing + Factor	Margin = Reg	sult – Limit	

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.



Temperature:				,		48%	8%		
Model:	15	3100-VA		Pressure	Pressure:		H,		
Test Voltage:		C 120V, 60Hz		Phase: Neutral					
Test Mode:	Tr	ansmitting mo	de of GFSK	e of GFSK 2480MHz					
80 Level (dE	BuV)								
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			Fre	quency (MH	łz)				
			Cable	LISN	Limit	Over			
F	req	Level	Loss	Factor	Line	Limit	Remark		
]	MHz	dBuV	dB	dB	dBuV	dB			
	.29	43.03	0.25		50.50		Average		
	.29	51.60	0.25	9.58	60.50		Average		
0							and the second se		
	.59	37.01	0.25	9.59	46.00	-8.99	and the second se		
0						-8.99 -9.50	QP Average		
	.59	37.01	0.25	9.59	56.00	-9.50	QP Average		
0	.59 .59	37.01 46.50	0.25	9.59 9.60	56.00 46.00	-9.50	QP Average QP Average		
0	.59 .59 .88	37.01 46.50 30.05	0.25 0.25 0.26	9.59 9.60 9.60	56.00 46.00 56.00	-9.50 -15.95 -13.30	QP Average QP Average		
0 0 1	.59 .59 .88	37.01 46.50 30.05 42.70	0.25 0.25 0.26 0.26	9.59 9.60 9.60 9.59	56.00 46.00 56.00 46.00	-9.50 -15.95 -13.30	QP Average QP Average QP Average		
0 0 1 1	.59 .59 .88 .88	37.01 46.50 30.05 42.70 31.55	0.25 0.25 0.26 0.26 0.27	9.59 9.60 9.60 9.59 9.59	56.00 46.00 56.00 46.00 56.00	-9.50 -15.95 -13.30 -14.45 -14.50	QP Average QP Average QP Average		

1.40 41.30 0.27 9.59 56.00 -14.70 QP 1.62 30.07 0.27 9.58 46.00 -15.93 Average 1.62 40.10 0.27 9.58 56.00 -15.90 QP

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

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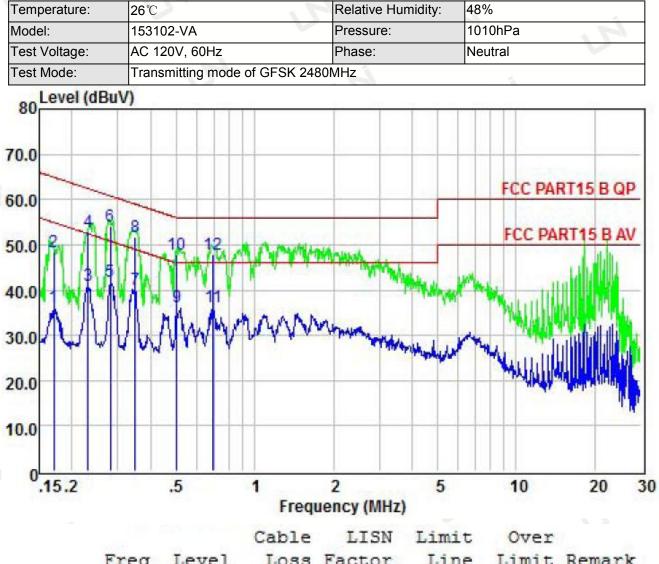
12



Femperature: 26°C			Relative Humidity:		nidity: 48	48%		
Model:	15310)2-VA		Pressure:		1010hPa		
Fest Voltage:	AC 12	20V, 60Hz		Phase:	Li	ne		
Fest Mode:	Trans	mitting mode	of GFSK 248	0MHz		i.		
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		.5		ency (MHz)	100		20	
	Fred		Cable	ency (MHz) LISN	Limit	Over		
	Freq	.5 Level		ency (MHz)	100	Over		
		Level	Cable Loss	ency (MHz) LISN Factor	Limit Line	Over Limit		
	Freq MHz		Cable	ency (MHz) LISN	Limit	Over Limit		
	MHz	Level dBuV	Cable Loss dB	ency (MHz) LISN Factor dB	Limit Line dBuV	Over Limit dB	Remark	
	MHz 0.17	Level dBuV 36.45	Cable Loss dB 0.24	ency (MHz) LISN Factor dB 9.67	Limit Line dBuV 54.99	Over Limit dB -18.54	Remark	
1 2	MHz 0.17 0.17	Level dBuV 36.45 48.91	Cable Loss dB 0.24 0.24	ency (MHz) LISN Factor dB 9.67 9.67	Limit Line dBuV 54.99 64.99	Over Limit dB -18.54 -16.08	Remark Averag QP	
1 2	MHz 0.17 0.17 0.23	Level dBuV 36.45 48.91 39.91	Cable Loss dB 0.24 0.25	ency (MHz) LISN Factor dB 9.67 9.67 9.63	Limit Line dBuV 54.99 64.99 52.39	Over Limit dB -18.54 -16.08 -12.48	Remark Averag QP Averag	
1 2	MHz 0.17 0.23 0.23	Level dBuV 36.45 48.91 39.91 51.91	Cable Loss dB 0.24 0.25 0.25 0.25	ency (MHz) LISN Factor dB 9.67 9.67 9.63 9.63 9.63	Limit Line dBuV 54.99 64.99 52.39 62.39	Over Limit dB -18.54 -16.08 -12.48 -10.48	Remark Averag QP Averag QP	
1 2 3 4 5	MHz 0.17 0.17 0.23 0.23 0.28	Level dBuV 36.45 48.91 39.91 51.91 42.42	Cable Loss dB 0.24 0.24 0.25 0.25 0.25 0.25	ency (MHz) LISN Factor dB 9.67 9.63 9.63 9.63 9.63 9.62	Limit Line dBuV 54.99 64.99 52.39 62.39 50.85	Over Limit dB -18.54 -16.08 -12.48 -10.48 -8.43	Remark Averag QP Averag QP Averag	
1 2 3 4 5 6	MHz 0.17 0.17 0.23 0.23 0.28 0.28	Level dBuV 36.45 48.91 39.91 51.91 42.42 53.00	Cable Loss dB 0.24 0.25 0.25 0.25 0.25 0.25	ency (MHz) LISN Factor dB 9.67 9.63 9.63 9.63 9.62 9.62	Limit Line dBuV 54.99 64.99 52.39 62.39 50.85 60.85	Over Limit dB -18.54 -16.08 -12.48 -10.48 -8.43 -7.85	Remark Averag QP Averag QP Averag QP	
1 2 3 4 5 6 7	MHz 0.17 0.23 0.23 0.28 0.28 0.28 0.34	Level dBuV 36.45 48.91 39.91 51.91 42.42 53.00 40.68	Cable Loss dB 0.24 0.25 0.25 0.25 0.25 0.25 0.25	ency (MHz) LISN Factor dB 9.67 9.63 9.63 9.63 9.62 9.62 9.62 9.60	Limit Line dBuV 54.99 64.99 52.39 62.39 50.85 60.85 49.13	Over Limit dB -18.54 -16.08 -12.48 -10.48 -8.43 -7.85 -8.45	Remark Averag QP Averag QP Averag QP Averag	
1 2 3 4 5 6 7 8	MHz 0.17 0.17 0.23 0.23 0.28 0.28 0.28 0.34 0.34	Level dBuV 36.45 48.91 39.91 51.91 42.42 53.00 40.68 52.08	Cable Loss dB 0.24 0.24 0.25 0.25 0.25 0.25 0.25 0.25 0.25	ency (MHz) LISN Factor dB 9.67 9.63 9.63 9.63 9.62 9.62 9.60 9.60 9.60	Limit Line dBuV 54.99 64.99 52.39 62.39 50.85 60.85 49.13 59.13	Over Limit dB -18.54 -16.08 -12.48 -10.48 -8.43 -7.85 -8.45 -7.05	Remark Averag QP Averag QP Averag QP Averag QP	
1 2 3 4 5 6 7 8 9	MHz 0.17 0.17 0.23 0.23 0.28 0.28 0.28 0.34 0.34 0.34 0.52	Level dBuV 36.45 48.91 39.91 51.91 42.42 53.00 40.68 52.08 35.86	Cable Loss dB 0.24 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	ency (MHz) LISN Factor dB 9.67 9.67 9.63 9.63 9.63 9.62 9.62 9.60 9.60 9.58	Limit Line dBuV 54.99 64.99 52.39 62.39 50.85 60.85 49.13 59.13 46.00	Over Limit dB -18.54 -16.08 -12.48 -10.48 -8.43 -7.85 -8.45 -7.05 -10.14	Remark Averag QP Averag QP Averag QP Averag QP Averag	
1 2 3 4 5 6 7 8 9 0	MHz 0.17 0.17 0.23 0.23 0.28 0.28 0.28 0.34 0.34 0.34 0.52 0.52	Level dBuV 36.45 48.91 39.91 51.91 42.42 53.00 40.68 52.08 35.86 46.70	Cable Loss dB 0.24 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	ency (MHz) LISN Factor dB 9.67 9.63 9.63 9.63 9.63 9.62 9.62 9.60 9.60 9.58 9.58	Limit Line dBuV 54.99 64.99 52.39 62.39 50.85 60.85 49.13 59.13 46.00 56.00	Over Limit dB -18.54 -16.08 -12.48 -10.48 -8.43 -7.85 -8.45 -7.05 -10.14 -9.30	Remark Averag QP Averag QP Averag QP Averag QP Averag QP	
1 2 3 4 5 6 7 8 9 0 1 2	MHz 0.17 0.17 0.23 0.23 0.28 0.28 0.28 0.34 0.34 0.34 0.52	Level dBuV 36.45 48.91 39.91 51.91 42.42 53.00 40.68 52.08 35.86 46.70	Cable Loss dB 0.24 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	ency (MHz) LISN Factor dB 9.67 9.63 9.63 9.63 9.63 9.62 9.62 9.60 9.60 9.58 9.58	Limit Line dBuV 54.99 64.99 52.39 62.39 50.85 60.85 49.13 59.13 46.00 56.00 46.00	Over Limit dB -18.54 -16.08 -12.48 -10.48 -8.43 -7.85 -8.45 -7.05 -10.14	Remark Averag QP Averag QP Averag QP Averag QP Averag QP Averag	

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.





	Freq	Level	Loss	Factor	Line	Limit	Remark	
	MHz	dBuV	dB	dB	dBuV	dB		
1	0.17	36.16	0.24	9.50	54.94	-18.78	Average	
2	0.17	48.49	0.24	9.50	64.94	-16.45	QP	
3	0.23	41.17	0.25	9.57	52.44	-11.27	Average	
4	0.23	52.93	0.25	9.57	62.44	-9.51	QP	
5	0.28	41.87	0.25	9.58	50.81	-8.94	Average	
6	0.28	54.00	0.25	9.58	60.81	-6.81	QP	
7	0.35	40.23	0.25	9.58	49.00	-8.77	Average	
8	0.35	51.85	0.25	9.58	59.00	-7.15	QP	
9	0.50	36.41	0.25	9.59	46.00	-9.59	Average	
10	0.50	47.74	0.25	9.59	56.00	-8.26	QP	
11	0.69	36.24	0.26	9.60	46.00	-9.76	Average	
12	0.69	48.00	0.26	9.60	56.00	-8.00	QP	

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

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4. RADIATED EMISSION TEST

4.1 Radiation Limit

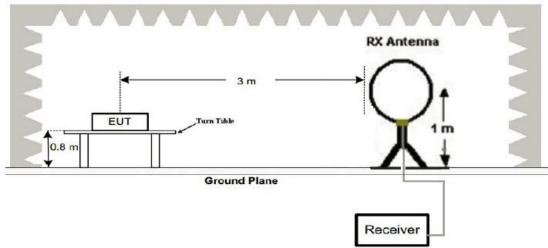
For unintentional device, according to § 15.109(a) & RSS-247 [5.5], except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency	Distance	Radiated	Radiated
(MHz)	(Meters)	(dBµV/m)	(µV/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960 👘 🐁	3	54	500

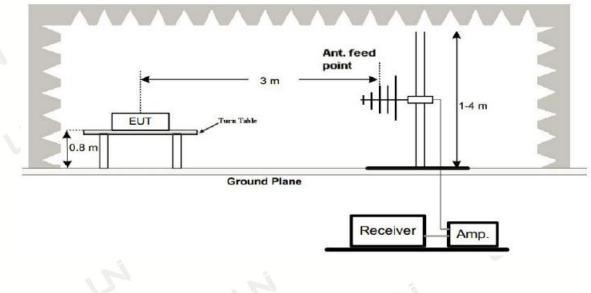
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

1. Radiated Emission Test-Up Frequency Below 30MHz



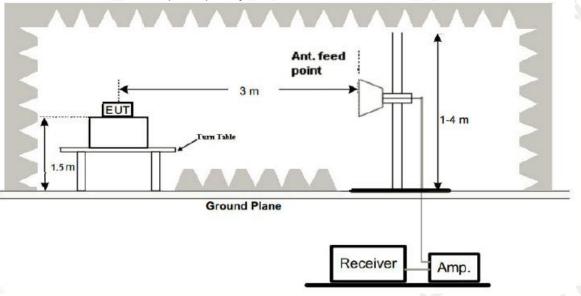
2. Radiated Emission Test-Up Frequency 30MHz~1GHz



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3. Radiated Emission Test-Up Frequency Above 1GHz



- 4.3 Test Procedure
 - 1. Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
 - 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
 - 3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
 - 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
 - 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
 - 6. Repeat above procedures until the measurements for all frequencies are complete.
 - 7. The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).
 - 8. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

Note:

For battery operated equipment, the equipment tests shall be performed using a new battery.

4.4 Test Result

PASS

Remark:

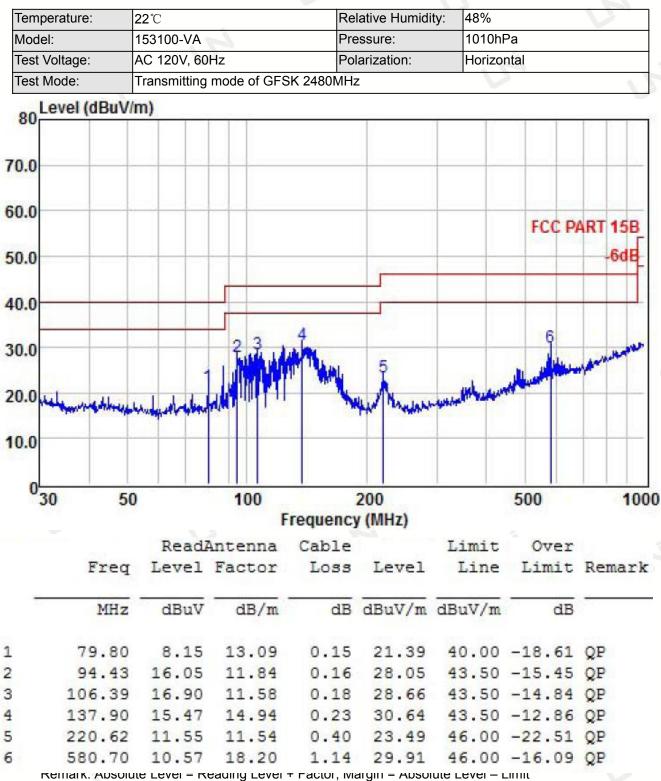
1. All the test modes completed for test. The worst case of Radiated Emission is High channel, the test data of this mode was reported.

2. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.

3. Radiated emission test from 9KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9KHz to 30MHz and not recorded in this report.



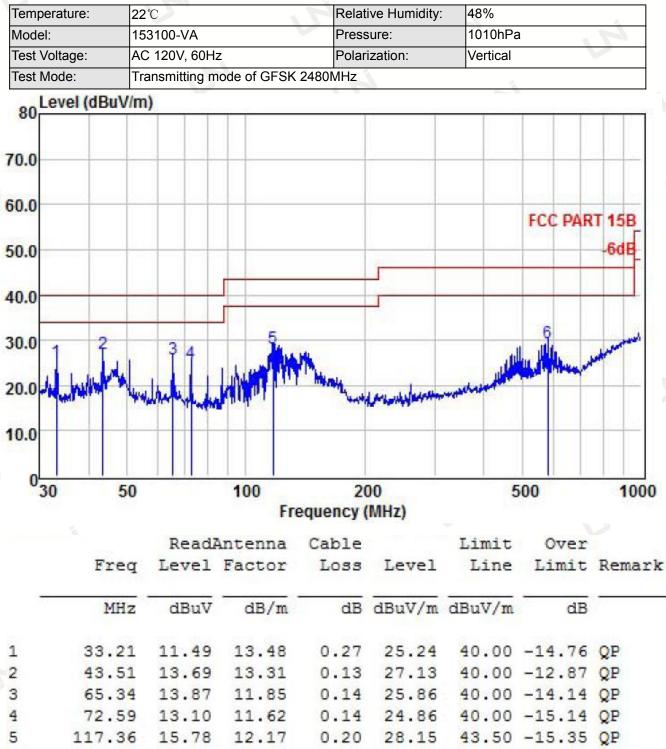
Below 1GHz Test Results:



Factor = Ant. Factor + Cable Loss

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Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit Factor = Ant. Factor + Cable Loss

17.38

Remark:

6

580.70

11.04

(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.

1.14

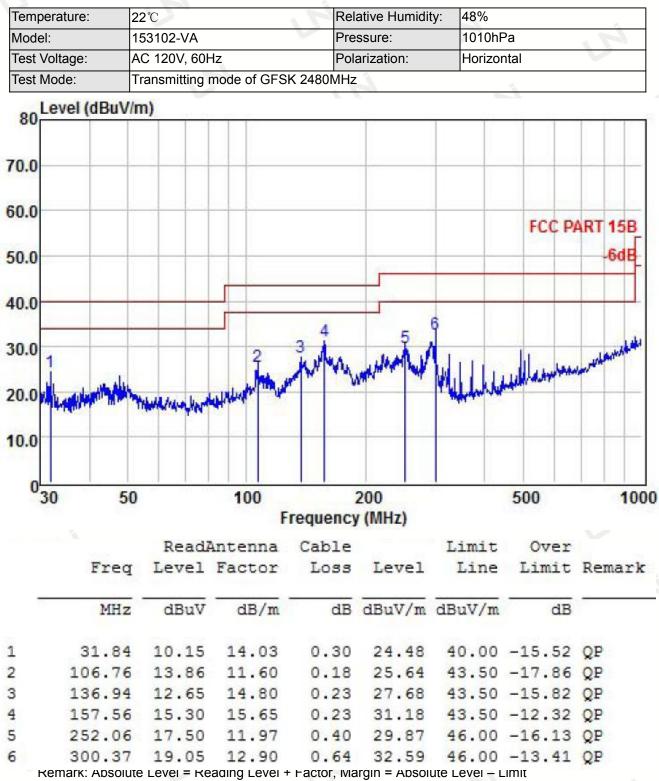
29.56

46.00 -16.44 QP

- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

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	http://www.uni-lab.bk

LNi



Factor = Ant. Factor + Cable Loss

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Temp	perature:	22℃		Re	lative Humid	ity: 48%		10 C
				Pre	Pressure: 101		1010hPa	
Test	Voltage:	AC 120V, 60)Hz	al				
Test Mode: Transmitting			mode of GFSK 2480MHz					
80	Level (dBuV/	m)						
0.0					_			
0.0					_		ECC D	ART 15B
0.0							TCCT	-6dB
0.0	3			6				
				AT INI.			11	1
	New Mark	he wat they	www.ww	AN MAN	way white	nd delanded	all martin	warden to be the
0.0	\ /\.	have a thirty	www.ww	An Mak	han MA	nd ad adams had	Mellinashan	www.u.kukk
0.0	30 50	hand the second	100 F	requenc	200 y (MHz)	nd and and and and and and and and and a	500	100
0.0 0.0 0.0				requenc	and the second second	Limit	500 Over	100
0.0		Read	F	Second Alexander	and the second second	Limit	Over	Remark
0.0	30 50 Freq	Read! Level	F Antenna	Cable Loss	y (MHz) Level	Line	Over Limit	
20.0 0.0 0;	30 50 Freq	Read Level dBuV	F Antenna Factor dB/m	Cable Loss dB	y (MHz) Level dBuV/m	Line dBuV/m	Over Limit dB	Remark
20.0 0.0 0	30 50 Freq MHz 30.11 30.75	Read Level dBuV 20.72 20.44	Factor dB/m 14.75 14.48	Cable Loss dB 0.34 0.32	y (MHz) Level dBuV/m 35.81 35.24	Line dBuV/m 40.00 40.00	Over Limit dB -4.19 -4.76	Remark QP QP
20.0 0.0 0	30 50 Freq MHz 30.11 30.75 31.40	Read/ Level dBuV 20.72 20.44 20.56	Factor dB/m 14.75 14.48 14.21	Cable Loss dB 0.34 0.32 0.31	y (MHz) Level dBuV/m 35.81 35.24 35.08	Line dBuV/m 40.00 40.00 40.00	Over Limit dB -4.19 -4.76 -4.92	Remark QP QP QP
20.0 0.0 0	30 50 Freq MHz 30.11 30.75 31.40 31.84	Read/ Level dBuV 20.72 20.44 20.56 18.74	Factor dB/m 14.75 14.48 14.21 14.03	Cable Loss dB 0.34 0.32 0.31 0.30	y (MHz) Level dBuV/m 35.81 35.24 35.08 33.07	Line dBuV/m 40.00 40.00 40.00 40.00	Over Limit dB -4.19 -4.76 -4.92 -6.93	Remark QP QP QP QP
20.0 0.0 0	30 50 Freq MHz 30.11 30.75 31.40 31.84 42.30	Read/ Level dBuV 20.72 20.44 20.56 18.74 18.50	Factor dB/m 14.75 14.48 14.21 14.03	Cable Loss dB 0.34 0.32 0.31 0.30 0.13	y (MHz) Level dBuV/m 35.81 35.24 35.08 33.07 32.01	Line dBuV/m 40.00 40.00 40.00 40.00 40.00	Over Limit dB -4.19 -4.76 -4.92 -6.93 -7.99	Remark QP QP QP QP QP QP

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit Factor = Ant. Factor + Cable Loss

Remark:

- (1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

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United Testing Technology(Hong Kong) Limited	深圳市宝安区西乡街道铁岗社区宝田一路365号嘉皇源科技园附楼2楼 邮编:518102 Tel:+86-755-86180996 Fax:+86-755-86180156
	http://www.upi-lab.bk

All model 153100-VA , 153102-VA were test, 153100-AV test results are the worst, the report only records the 153100-AV test results.

Above 1 GHz Test Results: CH Low (2402MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2402	104.05	-5.84	98.21	114.00	-15.79	PK
2402	83.18	-5.84	77.34	94.00	-16.66	AV
4804	60.32	-3.64	56.68	74.00	-17.32	РК
4804	51.27	-3.64	47.63	54.00	-6.37	AV
7206	61.25	-0.95	60.30	74.00	-13.70	РК
7206	49.81	-0.95	48.86	54.00	-5.14	AV
Remark: Fact	or = Antenna	Factor + Cabl	e Loss – Pre-ampli	ifier. Margin =	Absolute Le	evel – Limit

Vertical:

Reading Result	Factor	Emission Level	Limits	Margin	Detector
(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
105.25	-5.84	99.41	114.00	-14.59	PK
82.37	-5.84	76.53	94.00	-17.47	AV
61.26	-3.64	57.62	74.00	-16.38	РК
51.27	-3.64	47.63	54.00	-6.37	AV
60.15	-0.95	59.20	74.00	-14.80	РК
48.24	-0.95	47.29	54.00	-6.71	AV
	Result (dBμV) 105.25 82.37 61.26 51.27 60.15	Result Factor (dBµV) (dB) 105.25 -5.84 82.37 -5.84 61.26 -3.64 51.27 -3.64 60.15 -0.95	ResultFactorEmission Level(dBµV)(dB)(dBµV/m)105.25-5.8499.4182.37-5.8476.5361.26-3.6457.6251.27-3.6447.6360.15-0.9559.20	ResultPactorEmission LevelEmission Level(dBµV)(dB)(dBµV/m)(dBµV/m)105.25-5.8499.41114.0082.37-5.8476.5394.0061.26-3.6457.6274.0051.27-3.6447.6354.0060.15-0.9559.2074.00	ResultPactorEmission LevelLimitsMargin(dBµV)(dB)(dBµV/m)(dBµV/m)(dB)105.25-5.8499.41114.00-14.5982.37-5.8476.5394.00-17.4761.26-3.6457.6274.00-16.3851.27-3.6447.6354.00-6.3760.15-0.9559.2074.00-14.80

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit

CH Middle (2440MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2440	105.86	-5.71	100.15	114.00	-13.85	РК
2440	82.75	-5.71	77.04	94.00	-16.96	AV
4880	60.35	-3.51	56.84	74.00	-17.16	РК
4880	50.26	-3.51	46.75	54.00	-7.25	AV
7320	61.25	-0.82	60.43	74.00	-13.57	РК
7320	48.12	-0.82	47.30	54.00	-6.70	AV
Remark: Fact	or = Antenna	Factor + Cabl	e Loss – Pre-ampli	ifier. Margin =	Absolute Le	evel – Limit

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2440	106.47	-5.71	100.76	114.00	-13.24	PK
2440	81.385	-5.71	75.68	94.00	-18.33	AV
4880	61.28	-3.51	57.77	74.00	-16.23	РК
4880	51.34	-3.51	47.83	54.00	-6.17	AV
7320	61.25	-0.82	60.43	74.00	-13.57	РК
7320	49.54	-0.82	48.72	54.00	-5.28	AV
Remark: Fact	or = Antenna I	Factor + Cabl	e Loss – Pre-ampli	fier. Margin =	Absolute Le	evel – Limit

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CH High (2480MHz) Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2480	106.17	-5.65	100.52	114.00	-13.48	РК
2480	81.32	-5.65	75.67	94.00	-18.33	AV
4960	61.28	-3.43	57.85	74.00	-16.15	РК
4960	50.33	-3.43	46.90	54.00	-7.10	AV
7440	60.28	-0.75	59.53	74.00	-14.47	PK
7440	47.21	-0.75	46.46	54.00	-7.54	AV
Remark: Fact	or = Antenna	Factor + Cabl	e Loss – Pre-ampli	fier. Margin =	Absolute Le	evel – Limit

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2480	105.38	-5.65	99.73	114.00	-14.27	PK
2480	81.25	-5.65	75.60	94.00	-18.40	AV
4960	62.81	-3.43	59.38	74.00	-14.62	РК
4960	50.14	-3.43	46.71	54.00	-7.29	AV
7440	61.28	-0.75	60.53	74.00	-13.47	РК
7440	48.35	-0.75	47.60	54.00	-6.40	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit

Remark :

(1) Measuring frequencies from 1 GHz to the 25 GHz.

(2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.

(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(4) Data of measurement within this frequency range shown "----" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.

(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

(7)All modes of operation were investigated and the worst-case emissions are reported.



5. BAND EDGE

5.1 Limits

FCC PART 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.2 Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 100KHz and VBM to 300KHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength. The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW to 100 KHz and VBW to 300 KHz, to measure the conducted peak band edge.

5.3 Test Result

PASS

All model 153100-VA , 153102-VA were test, 153100-AV test results are the worst, the report only records the 153100-AV test results.

Radiated Band Edge Test:

Operation Mode: TX CH Low (2402MHz)

Horizontal:

Reading Result	Factor	Emission Level	Limits	Margin	Detector
(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	βμV/m) (dB)	
52.55	-5.81	46.74	74.00	-27.26	PK
1	-5.81	1	54.00	1	AV
51.38	-5.84	45.54	74.00	-28.46	РК
1	-5.84	1	54.00	Ń	AV
51.21	-5.84	45.37	74.00	-28.63	PK
1	-5.84	1	54.00	/	AV
	(dBµV) 52.55 / 51.38 /	(dBµV) (dB) 52.55 -5.81 / -5.81 51.38 -5.84 / -5.84 51.21 -5.84	(dBµV) (dB) (dBµV/m) 52.55 -5.81 46.74 / -5.81 / 51.38 -5.84 45.54 / -5.84 / 51.21 -5.84 45.37	(dBµV) (dB) (dBµV/m) (dBµV/m) 52.55 -5.81 46.74 74.00 / -5.81 / 54.00 51.38 -5.84 45.54 74.00 / -5.84 45.54 74.00 51.21 -5.84 45.37 74.00	(dBμV) (dB) (dBμV/m) (dBμV/m) (dBμV/m) 52.55 -5.81 46.74 74.00 -27.26 / -5.81 / 54.00 / 51.38 -5.84 45.54 74.00 -28.46 / -5.84 / 54.00 / 51.21 -5.84 45.37 74.00 -28.63

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

		1	2		
Reading Result	Factor	Emission Level	Limits	Margin	Detector
(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
51.33	-5.81	45.52	74.00	-28.48	PK
1	-5.81	1	54.00	1	AV
51.19	-5.84	45.35	74.00	-28.65	PK
1	-5.84	1	54.00		AV
51.48	-5.84	45.64	74.00	-28.36	PK
1	-5.84	/	54.00	1	AV
	(dBµV) 51.33 / 51.19 /	(dBµV) (dB) 51.33 -5.81 / -5.81 51.19 -5.84 / -5.84 51.48 -5.84	(dBµV) (dB) (dBµV/m) 51.33 -5.81 45.52 / -5.81 / 51.19 -5.84 45.35 / -5.84 / 51.48 -5.84 45.64	(dBµV) (dB) (dBµV/m) (dBµV/m) 51.33 -5.81 45.52 74.00 / -5.81 / 54.00 51.19 -5.84 45.35 74.00 / -5.84 45.35 54.00 / -5.84 45.35 74.00 51.48 -5.84 45.64 74.00	(dBµV) (dB) (dBµV/m) (dBµV/m) (dBµV/m) 51.33 -5.81 45.52 74.00 -28.48 / -5.81 / 54.00 / 51.19 -5.84 45.35 74.00 -28.65 / -5.84 / 54.00 / 51.19 -5.84 45.35 74.00 -28.65 / -5.84 / 54.00 / 51.48 -5.84 45.64 74.00 -28.36

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

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Operation Mode: TX CH High (2480MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2483.5	52.65	-5.65	47.00	74.00	-27.00	PK
2483.5	1	-5.65	1	54.00	1	AV
2500	51.48	-5.72	45.76	74.00	-28.24	PK
2500		-5.72		54.00	1	AV
Remark: Fac	tor = Antenna Facto	or + Cable Lo	oss – Pre-amplifier			1

Vertical:

ventical.						
Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2483.5	51.35	-5.65	45.70	74.00	-28.30	РК
2483.5	SI I	-5.65	1	54.00	1	AV
2500	52.52	-5.72	46.80	74.00	-27.20	РК
2500	1	-5.72	1	54.00	1	AV
Remark: Fact	tor = Antenna Facto	or + Cable Lo	oss – Pre-amplifier			

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6. OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Limit

	FCC Part15	6(15.247), Subpart C	& RSS-247 [5.2(1)	L)
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

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6.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.

- 2. Set EUT as normal operation.
- 3. Based on FCC Part15 C Section 15.247: RBW=100KHz, VBW=300KHz.
- 4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.
- 6.3 Measurement Equipment Used

Same as Radiated Emission Measurement

6.4 Test Result

PASS

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
2402	0.692	1.046	PASS
2440	0.694	1.045	PASS
2480	0.694	1.043	PASS

CH: 2402MHz

enter Freq 2.402000000	Trig: I	Free Run Avı n: 30 dB	g Hold:>10/10	Radio Device: BTS	
dB/div Ref 20.00 dBm					
					Center Fr 2.402000000 G
					2.402000000 G
0					
5					
enter 2.402 GHz				Span 3 MHz	
es BW 100 kHz	#	VBW 300 kHz		Sweep 1 ms	300.000 k Auto M
Occupied Bandwidth		Total Powe	er 10	.7 dBm	
1.0	456 MHz				Freq Offs
Transmit Freq Error	7.966 kHz	% of OBW	Power 9	9.00 %	0
x dB Bandwidth	692.0 kHz	x dB	-6	5.00 dB	

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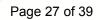
CH: 2440MHz

🔤 Keysight Spe	ctrum Analyzer - Occupied I	3W							
Center Fr	RF 50 Ω AC req 2.44000000	0 GHz #IFGain:Low	SENSE:INT Center Freq: 2.440 Trig: Free Run #Atten: 30 dB		LIGN AUTO >10/10	02:45:20 P Radio Std: Radio Dev		Fr	equency
15 dB/div Log	Ref 20.00 dB	m							
5.00 -10.0								1000	Center Freq
-25.0 -40.0					~~~~		man		
-70.0									
-100									
Center 2. #Res BW			#VBW 300	kHz			an 3 MHz ep 1 ms		CF Step 300.000 kHz
Occup	bied Bandwid			Power	12.9	dBm		<u>Auto</u>	Man
Transn	ا nit Freq Error	.0449 MH 3.603 k		DBW Powe	r 99	.00 %		F	Freq Offset 0 Hz
x dB B	andwidth	694.4 k	Hz x dB		-6.	00 dB			
MSG					STATUS				

CH: 2480MHz

Keysight Spectrum Analyzer - Occupied BV RF 50 Ω AC enter Freq 2.480000000	GHz Cente	SENSE:INT		02:43:48 PM Jul 11, 2019 Radio Std: None	Frequency
		Free Run Avg n: 30 dB	g Hold:>10/10	Radio Device: BTS	
5 dB/div Ref 20.00 dBr	n				
og					Center Free
0.0					2.48000000 GH
5.0					
0.0					
5.0					
5.0					
00					
15					
enter 2.48 GHz				Span 3 MHz	CF Ste
Res BW 100 kHz	#	¢VBW 300 kHz		Sweep 1 ms	300.000 kH
Occupied Bandwidt	h	Total Powe	r 13.	7 dBm	<u>Auto</u> Ma
1.	0425 MHz			4.77	FreqOffse
Transmit Freg Error	1.222 kHz	% of OBW I	Power 9	9.00 %	0 H
x dB Bandwidth	693.9 kHz	x dB		.00 dB	
	000.0 KH2	A GB		.00 dB	

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7. POWER SPECTRAL DENSITY TEST

7.1 Test Limit

	FCC Part15(15.247), Subpart C & RSS-247 [5.2(2)]									
Section	Section Test Item		Frequency Range (MHz)	Result						
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS						

7.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.

- 2. Set EUT as normal operation.
- 3. Based on FCC Part15 C Section 15.247: RBW=3KHz, VBW=10KHz.
- 4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.

7.3 Measurement Equipment Used

Same as Radiated Emission Measurement

7.4 Test Result

PASS

Туре	Channel	Power Spectral	Limit	Result	
.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Density	(dBm/3KHz)		
	0	-11.360			
GFSK	19	-9.026	8.00	Pass	
	39	-8.135			

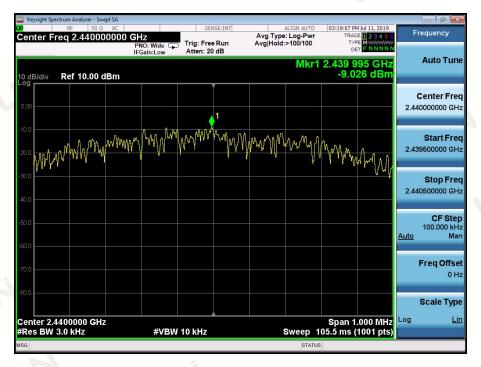
CH: 2402MHz



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CH: 2440MHz



CH: 2480MHz



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8. PEAK OUTPUT POWER TEST

8.1 Test Limit

For FCC

FCC Part15(15.247), Subpart C & RSS-247 [5.3(4)]								
Section	Test Item	Limit	Frequency Range (MHz)	Result				
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS				

For IC

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

- 8.2 Test Procedure
 - 1. The EUT was placed on a turn table which is 0.8m above ground plane.
 - 2. The EUT was directly connected to the Power meter.

8.3 Measurement Equipment Used

Same as Radiated Emission Measurement.

8.4 Test Result

PASS

Туре	Channel	Peak Output power (dBm)	Limit (dBm)	Result
	0	3.168		
GFSK	19	3.252	30	Pass
	39	3.354]	

LNi

9. CONDUCTED BANDEGE MEASUREMENT

9.1 Test Setup



9.2 Test Procedure

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. Set EUT as TX operation and connect directly to the spectrum analyzer.
- 3. Based on FCC Part15 C Section 15.247: RBW=100KHz, VBW=300KHz.
- 4. Set detected by the spectrum analyzer with peak detector.

9.3 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.

9.4 Test Result

PASS

Frequency Band	Delta Peak to band emission(dBc)	>Limit (dBc)	Result
Left-band	45.86	20	Pass
Right-band	57.98	20	Pass

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🦲 Keysight Sp	ectrum Analyzer - Sv						
X Start Fre	rF 50 G		SENSE:I	Avg	ALIGN AUTO	03:11:13 PM Jul 11, 2019 TRACE 1 2 3 4 5 6	Frequency
10 dB/div	Ref 20.00	PNO: Fa IFGain:Li	st Trig: Free Ru Atten: 30 dB	n Avg	Hold:>100/100	r2 2.400 0 GHz -41.646 dBm	Auto Tune
							Center Freq 2.360000000 GHz
-20.0 -30.0 -40.0						2 2	Start Free 2.310000000 GHz
-50.0 -60.0 -70.0	edaamaan taraana	ligangan yang dina daram		an while a single deferrance	Parline and Parlin		Stop Freq 2.410000000 GHz
Start 2.3 #Res BW		Х	VBW 300 kHz	FUNCTION		Stop 2.41000 GHz .600 ms (1001 pts)	CF Step 10.000000 MHz <u>Auto</u> Man
1 N 2 N 3 4 5 6	1 f 1 f	2.402 0 GH; 2.400 0 GH;	z 4.215 dBm z -41.646 dBm				Freq Offset 0 Hz
7 8 9							Scale Type
10 11							Log <u>Lin</u>
K MSG			m		STATUS	•	
					STATUS		



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10. SPURIOUS RF CONDUCTED EMISSION

10.1 Test Limit

1. Below -20dB of the highest emission level in operating band.

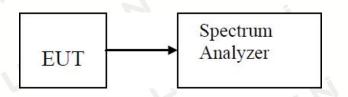
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

3.For below 30MHz,For 9KHz-150kHz,150K-10MHz,We use the RBW 1KHz,10KHz, So the limit need to calculated by "10lg(BW1/BW2)". for example For9KHz-150kHz,RBW 1KHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

10.2 Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013, For 9KHz-150kHz, Set RBW=1kHz and VBW= 3KHz; For 150KHz-10MHz, Set RBW=10kHz and VBW= 30KHz:For 10MHz-25GHz ,Set RBW=100kHz and VBW= 300KHz in order to measure the peak field strength, and mwasure frequeny range from 9KHz to 25GHz.

10.3 Test Setup



10.4 Test Result

PASS

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CH: 2402MHz



Keysight Sp	ectrum Analyzer - Swept S RF 50 Ω A		SENSE:INT	ALIGN AUTO	03:23:39 PM Jul 11, 2019	
tart Fre	q 30.000000 N		Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	Frequency
) dB/div	Ref 20.00 dBr	n		M	r1 2.557 5 GHz -43.692 dBm	Auto Tun
10.0						Center Fre 1.515000000 GF
00					DL1 -15.99 dBin	Start Fre 30.000000 Mi
						Stop Fr 3.000000000 G
						CF Ste 297.000000 M <u>Auto</u> M
	enninger (Ndythenemorphened	, water And the second second	And and a state of the state of	ogenbounderderder angendig he Derne	Willington would not	Freq Offs 0 I
						Scale Typ
tart 0.03 Res BW	10 GHZ 100 kHz	#VBW	300 kHz	Sween 2	Stop 3.000 GHz 83.9 ms (1001 pts)	

30MHz~3GHz

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3GHz~25GHz

CH: 2440MHz



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Keysight Spe	ectrum Analyzer - Swept SA RF 50 Ω AC		SENSE:INT	ALIGN AUTO	03:25:35 PM Jul 11, 2019	
art Free	q 30.000000 MHz	PNO: East	rig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 32/100	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	Frequency
dB/div	Ref 20.00 dBm			М	kr1 2.596 1 GHz -48.147 dBm	Auto Tur
.0						Center Fre 1.515000000 GH
					DL1 -13.83 dBm	Start Fre 30.000000 Mi
						Stop Fr 3.000000000 Gi
0					↓ ↓ ¹	CF Ste 297.000000 M Auto M
	to initely to any the second second	nuthation	ละแส่นเสเป็นเห็นเหล	nal have been some of the	n willing when when when	Freq Offs 0 I
.0						Scale Ty
art 0.03 es BW	0 GHz 100 kHz	#VBW 30	00 kHz	Sweep	Stop 3.000 GHz 283.9 ms (1001 pts)	Log <u>L</u>
1				STATL	IS	

30MHz~3GHz

	RF 50 Ω AC		SENSE:INT	ALIGN AUTO	03:25:57 PM Jul 11, 2019	
tart Fre	eq 3.000000000 (PNO: Fast	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 4/100	TYPE MWWWW DET P N N N N N	Frequency
) dB/div	Ref 20.00 dBm			М	kr1 24.010 GHz -46.964 dBm	Auto Tun
0.0						Center Fre 14.000000000 G⊦
00					DL1 -13.83 dBm	Start Fre 3.000000000 GH
D.O						Stop Fre 25.000000000 GF
0.0 				and the second	1- hg. hg. hg. hg. hg. hg. hg. hg. hg. hg.	CF Ste 2.200000000 GF <u>Auto</u> Ma
	Land and a fail of the second s	higher hand the second second	physical orbital articulty and	al-marked Palagels ^{ee} stal American Jerseway		Freq Offs 0 F
						Scale Typ
art 3.00 Res BW	0 GHz ' 100 kHz	#VBM	300 kHz	Sween	Stop 25.00 GHz 2.103 s (1001 pts)	

3GHz~25GHz

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CH: 2480MHz



	ectrum Analyzer - Swe RF 50 Ω			SEI	SE:INT		ALIGN AUTO	03-27-05 P	M Jul 11, 2019		- 6
tart Fre	q 30.00000) MHz	PNO: Fast G		Run		e: Log-Pwr	TRA	ET P N N N N N	Fred	quency
dB/div	Ref 20.00 c	IBm					Mk	r1 2.63 -47.7	4 7 GHz 13 dBm	A	Auto Tur
.0											enter Fre
.0									DL1 -13.11 dBm		Start Fre
.0											Stop Fr 100000 GI
.0		3				3		• • • • • • • • • • • • • • • • • • •		297.0 <u>Auto</u>	CF Ste 000000 MI M
	hverigeacentations in	Kqcqqarrows	hellowers	4 pildhadhardahayi	har-Hallond, Ma	toologiyya fodydaacy	and search and	morralla	genneligiented	Fi	r eq Offs 0 I
											cale Typ
art 0.03	0 GHz 100 kHz		41) (D))	V 300 kHz			Curren 3	Stop 3	.000 GHz (1001 pts)	Log	<u>L</u>

30MHz~3GHz

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Keysight Spectrum Analyzer - Swept SA RF 50 Ω AC	CONCE INT		04:17:27 PM Jul 11, 2019	
RF 50 Ω AC tart Freq 3.000000000 (GHZ PNO: Fast IFGain:Low Atten: 30 dB	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100	04:17:27 PM Jul 11, 2019 TRACE 1 2 3 4 5 6 TYPE M WWWW DET P N N N N N	Frequency
dB/div Ref 20.00 dBm		М	kr1 24.494 GHz -45.003 dBm	Auto Tun
0.0				Center Fre 14.000000000 GF
0.0			DL1 -13.11 dBm	Start Fre 3.000000000 GF
0.0				Stop Fr 25.000000000 GI
0.0			and and the	CF Ste 2.20000000 GI <u>Auto</u> M
0.0 workwalkensternet	walance and and and	when we we we have a start of the second		Freq Offs 0
				Scale Typ
tart 3.00 GHz Res BW 100 kHz	#VBW 300 kHz	Sweep	Stop 25.00 GHz 2.103 s (1001 pts)	Log <u>L</u>
G		STATUS		

3GHz~25GHz

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11. ANTENNA REQUIREMENT

Standard Applicable:

For intentional device, according to FCC 47 CFR Section 15.203, 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.

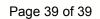
Antenna Connected Construction

The antenna used in this product is an PCB Antenna, The directional gains of antenna used for transmitting is 0dBi.

BT ANTENNA:

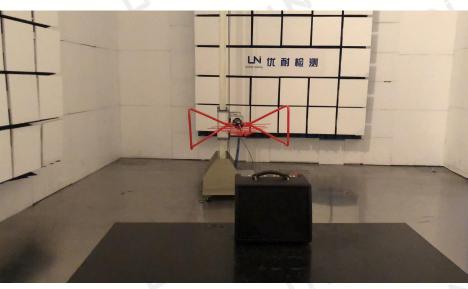


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Report No.: UNIA19103018FR-02

12. PHOTOGRAPH OF TEST



Radiated Emission (Below 1G)



Radiated Emission (Above 1G)



End of Report

Conducted Emission

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