

TEST REPORT

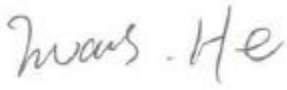
Applicant	VITEC IMAGING SOLUTIONS SPA
Address	CASSOLA(VI) VIA VALSUGANA 100 CAP 36022

Manufacturer or Supplier	Golden Trees technology Co.,Ltd.
Address	NO.3 Nan Tong Blvd,Bao Long Industrial Area Long Gang District,Shenzhen,China
Product	Beamo LED Light
Brand Name	JOBY
Model	JB01579-BWW
Additional Model & Model Difference	JB01635-BWW; JB01578-BWW
Date of tests	Jul. 18, 2019 ~ Aug. 22, 2019

the tests have been carried out according to the requirements of the following standard:

☒ **FCC Part 15, Subpart C, Section 15.247**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Evans He Project Engineer / EMC Department	Approved by David Huang Supervisor / EMC Department
	 Date: Aug 22, 2019

This report is governed by, and incorporates by reference, CPS Conditions of Service as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.



TABLE OF CONTENTS

RELEASE CONTROL RECORD	4
1 SUMMARY OF TEST RESULTS	5
1.1. TEST INSTRUMENTS.....	6
2 MEASUREMENT UNCERTAINTY	7
3 GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT	8
3.2 DESCRIPTION OF TEST MODES	9
3.2.1. CONFIGURATION OF SYSTEM UNDER TEST.....	10
3.2.2. Test Mode Applicability and tested channel detail.....	10
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS	13
3.4 DESCRIPTION OF SUPPORT UNITS	13
4 TEST TYPES AND RESULTS	14
4.1 CONDUCTED EMISSION MEASUREMENT	14
4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	14
4.1.2 TEST INSTRUMENTS.....	14
4.1.3 TEST PROCEDURES	15
4.1.4 DEVIATION FROM TEST STANDARD	15
4.1.5 TEST SETUP	16
4.1.6 EUT OPERATING CONDITIONS	16
4.1.7 TEST RESULTS.....	17
4.2 RADIATED EMISSION MEASUREMENT	19
4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT.....	19
4.1.2 TEST INSTRUMENTS.....	20
4.1.3 TEST PROCEDURES	21
4.1.4 DEVIATION FROM TEST STANDARD	22
4.1.5 TEST SETUP	22
4.1.6 EUT OPERATING CONDITIONS	23
4.1.7 TEST RESULTS.....	24
4.3 6dB BANDWIDTH MEASUREMENT.....	29
4.2.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT	29
4.2.4TEST SETUP	30
4.2.5EUT OPERATING CONDITIONS.....	30
4.2.6 TEST RESULTS	31
4.3 CONDUCTED OUTPUT POWER	32



4.3.1	LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT.....	32
4.3.2	TEST SETUP	32
4.3.6	TEST RESULTS	33
4.3.6.1	MAXIMUM PEAK OUTPUT POWER	33
4.3.6.2	AVERAGE OUTPUT POWER (FOR REFERENCE)	33
4.4	POWER SPECTRAL DENSITY MEASUREMENT	34
4.4.1	LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT.....	34
4.4.2	TEST SETUP	34
4.4.3	TEST PROCEDURE	34
4.4.4	DEVIATION FROM TEST STANDARD	34
4.4.5	EUT OPERATING CONDITION	34
4.4.6	TEST RESULTS.....	35
4.5	OUT OF BAND EMISSION MEASUREMENT	36
4.5.1	LIMITS OF OUT OF BAND EMISSION MEASUREMENT	36
4.5.2	TEST SETUP	36
4.5.3	TEST PROCEDURE	36
4.5.4	DEVIATION FROM TEST STANDARD	37
4.5.5	EUT OPERATING CONDITION	37
4.5.6	TEST RESULTS.....	38
5	PHOTOGRAPHS OF THE TEST CONFIGURATION	ERROR! BOOKMARK NOT DEFINED.
6	APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	41



BUREAU
VERITAS

Test Report No.: RF190822N030-V1

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF190822N030	Original release	Aug 22, 2019
RF190822N030-V1	Update KDB558074 version, Update RE test data below 1G,add Band Edge test data	Aug 22, 2019



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.205 15.209	Radiated Emission	PASS	Meet the requirement of limit.
15.247(d)	Out of band Emission Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted Output power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used

Note: Test Lab Information:

Lab: Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

Test Lab Address: Zone A, Floor 1, Building 2 Wan Ye Long Technology
Park South Side of Zhoushi Road, Bao'an District Shenzhen,
Guangdong, 518108, People's Republic of China



1.1. TEST INSTRUMENTS

Equipment	Model No.	Serial No.	Last Cal.	Next Cal.
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	Feb. 10, 19	Feb. 09, 20
EMI test receiver	ESL6	1300.5001K06-100262-eQ	Jan. 04, 19	Jan. 03, 20
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	Jan. 04, 19	Jan. 03, 20
Bilog Antenna (30MHz~6GHz)	JB6	A110712	Feb. 07, 19	Feb. 06, 20
Bilog Antenna (30MHz~2GHz)	JB1	A112017	Jan. 25, 19	Jan. 24, 20
A-INFOMW Horn Antenna (1~18GHz)	AH-118	71259	Jan. 25, 19	Jan. 24, 20
Pre-Amplifier (100MHz-26.5GHz)	EMC 012645	980077	May 17, 19	May 16, 20
Pre-Amplifier (18GHz-40GHz)	EMC 184045	980102	Nov. 07, 18	Nov. 06, 19
EMCO Horn Antenna (1~18GHz)	AH-118	71283	Feb. 01, 19	Jan. 31, 20
OPT 010 AMPLIFIER (0.1~1300MHz)	8447E	2727A02430	Dec. 08, 18	Dec. 07, 19
Horn Antenna	BBHA 9170	BBHA9170147	Mar. 14, 19	Mar. 13, 20
Microwave Preamplifier (0.5 ~ 18GHz)	PAM-118	443008	Dec. 08, 18	Dec. 07, 19
Large Loop Antenna	RF300	Rf300	Dec. 08, 18	Dec. 07, 19
Universal Radio Communication Tester	CMU200	121393	Feb. 10, 19	Feb. 09, 20
Positioning Controller	UC3000	MF780208282	Dec. 08, 18	Dec. 07, 19
Power Sensor	Dare RPR3006C/P/W	N/A	Jan. 04, 19	Jan. 03, 20
Power Sensor	Dare RPR3006C/P/W	N/A	Jan. 04, 19	Jan. 03, 20
GPS signal generator	6520	N/A	Dec. 08, 18	Dec. 07, 19
Test Software	EZ-EMC	ver.lcp-03A1	N/A	N/A

NOTE:

1. The test was performed in 966 Chamber and RF Oven room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.



2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted emission	0.15MHz ~ 30MHz	+/- 2.70 dB
Radiated emissions	30MHz~1GHz	+/- 3.74 dB
	Above 1GHz	+/- 4.66 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Beamo LED Light
MODEL NO.	JB01579-BWW
ADDITIONAL MODELS	JB01635-BWW; JB01578-BWW
FCC ID	2AQK5-BEAMO1
NOMINAL VOLTAGE	DC 3.7V from Li-ion or DC 5V from Adapter
MODULATION TECHNOLOGY	DTS
MODULATION TYPE	BT-LE(GFSK)
OPERATING FREQUENCY	2402-2480MHz
PEAK OUTPUT POWER	1.65dBm for BLE
ANTENNA TYPE	PCB Antenna, 0dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	Type C Line :Unshielded, Detachable 0.5m;

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 190822N030) for detailed product photo.
4. Additional models (see about table) are identical with the test model JB01635-BWW; JB01578-BWW except the color of the appearance and model name for trading purpose.



3.2 DESCRIPTION OF TEST MODES

40 channels are provided to BT-LE (GFSK)

CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480



3.2.1. CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photographs of the test configuration for reference.

3.2.2. TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports
The worst case was found when positioned on X axis for radiated emission. Following test modes were selected for the final test, and the final worst case is marked in boldface and recorded in the report:

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
A	√	√	√	√	Powered by Battery or USB with BT link

Where **RE<1G**: Radiated Emission below 1GHz **RE≥1G**: Radiated Emission above 1GHz
 PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

**RADIATED EMISSION TEST (BELOW 1GHz):**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
BT-LE	0 to 39	39	DTS	BT-LE	1

For the test results, only the worst case was shown in test report.

RADIATED EMISSION TEST (ABOVE 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
BT-LE	0 to 39	0,19, 39	DTS	BT-LE	1

ANTENNA PORT CONDUCTED MEASUREMENT:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
BT-LE	0 to 39	0, 19, 39	DTS	BT-LE	1



Test Report No.: RF190822N030-V1

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE	TESTED BY
RE<1G	25deg. C, 65%RH	DC 3.7V from Li-ion or DC 5V from USB	Caden Lu
RE≥1G	25deg. C, 65%RH	DC 3.7V from Li-ion or DC 5V from USB	Caden Lu
PLC	24deg. C, 71%RH	DC 3.7V from USB	Caden Lu
APCM	24deg. C, 71%RH	DC 3.7V from Li-ion or DC 5V from USB	Aaron Liang



3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C, Section 15.247

558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2013

Note: All test items have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as a dependent unit together without any other necessary accessories or support units.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Adapter	TECNO	A8-501000	N/A	N/A
2	Phone	Apple	A1530	N/A	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	Type C Line :Unshielded, Detachable 0.5m;



4 TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

- NOTE:** 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCS30	8471241027	Jan. 04,19	Jan. 03,20
Artificial Mains Network	SCHWARZBECK	8127	8127713	Jan. 04,19	Jan. 03,20
ISN	Com-Power	ISN T800	34373	Jan. 04,19	Jan. 03,20
Test software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

NOTE:

1. The test was performed in shielded room 843.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.



4.1.3 TEST PROCEDURES

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

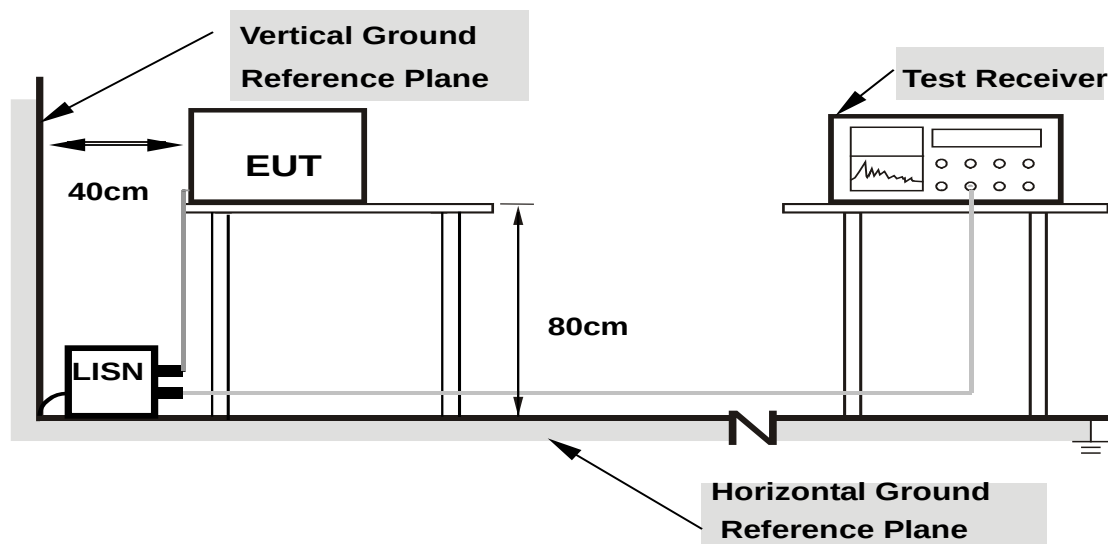
NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.



4.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT OPERATING CONDITIONS

- Turned on the power and connected of all equipment.
- EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.



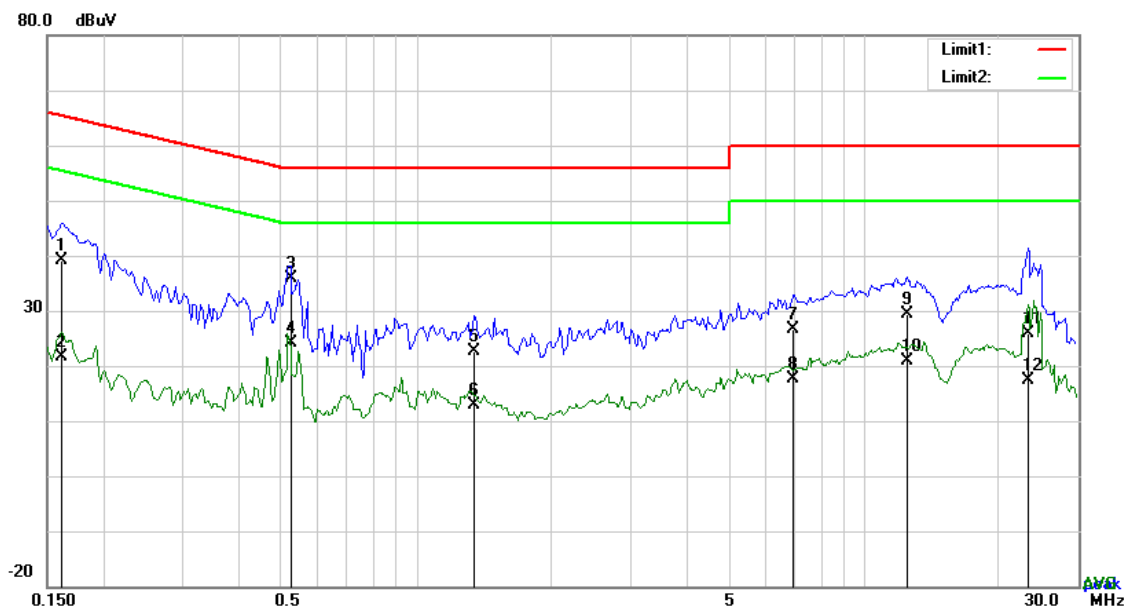
4.1.7 TEST RESULTS

CONDUCTED WORST-CASE DATA:

PHASE	Line	6dB BANDWIDTH	9kHz
-------	------	---------------	------

No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB}	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	L1	0.1617	29.08	QP	10.12	39.20	65.38	-26.18
2	L1	0.1617	11.52	AVG	10.12	21.64	55.38	-33.74
3	L1	0.5244	25.73	QP	10.10	35.83	56.00	-20.17
4	L1	0.5244	14.07	AVG	10.10	24.17	46.00	-21.83
5	L1	1.3512	12.56	QP	10.14	22.70	56.00	-33.30
6	L1	1.3512	2.67	AVG	10.14	12.81	46.00	-33.19
7	L1	6.9507	16.29	QP	10.22	26.51	60.00	-33.49
8	L1	6.9507	7.35	AVG	10.22	17.57	50.00	-32.43
9	L1	12.4887	19.14	QP	10.29	29.43	60.00	-30.57
10	L1	12.4887	10.68	AVG	10.29	20.97	50.00	-29.03
11	L1	23.2410	15.28	QP	10.48	25.76	60.00	-34.24
12	L1	23.2410	6.92	AVG	10.48	17.40	50.00	-32.60

REMARK: The emission levels of other frequencies were very low against the limit.





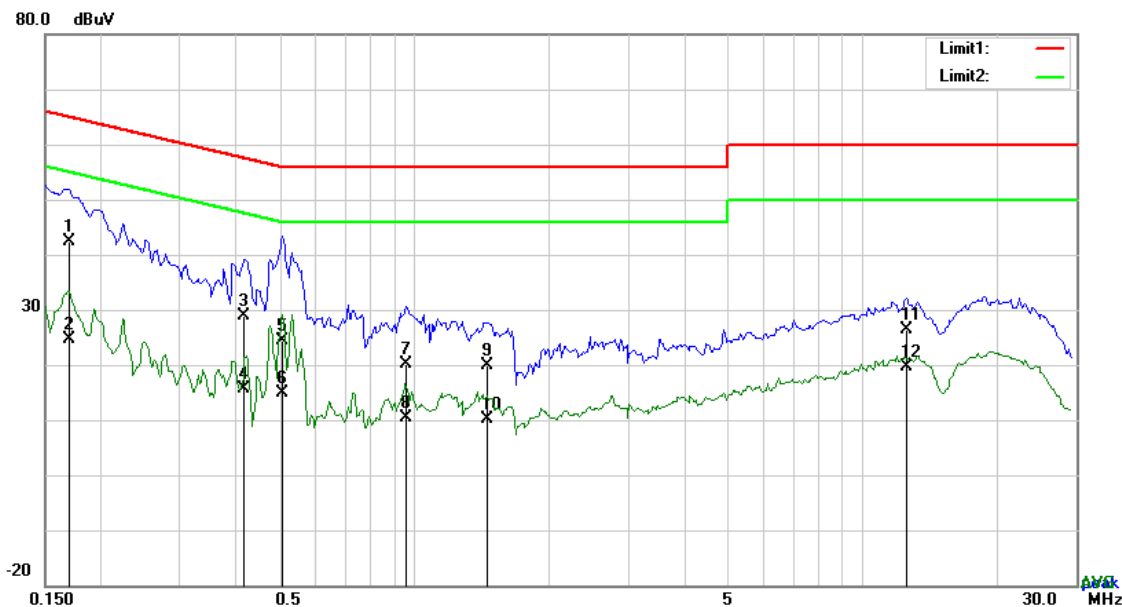
BUREAU
VERITAS

Test Report No.: RF190822N030-V1

PHASE	Neutral	6dB BANDWIDTH	9kHz
--------------	---------	----------------------	------

No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	N	0.1695	32.14	QP	10.14	42.28	64.98	-22.70
2	N	0.1695	14.61	AVG	10.14	24.75	54.98	-30.23
3	N	0.4191	18.84	QP	10.12	28.96	57.47	-28.51
4	N	0.4191	5.58	AVG	10.12	15.70	47.47	-31.77
5	N	0.5088	14.17	QP	10.12	24.29	56.00	-31.71
6	N	0.5088	4.83	AVG	10.12	14.95	46.00	-31.05
7	N	0.9612	9.92	QP	10.15	20.07	56.00	-35.93
8	N	0.9612	0.11	AVG	10.15	10.26	46.00	-35.74
9	N	1.4604	9.82	QP	10.16	19.98	56.00	-36.02
10	N	1.4604	-0.05	AVG	10.16	10.11	46.00	-35.89
11	N	12.5394	16.17	QP	10.29	26.46	60.00	-33.54
12	N	12.5394	9.33	AVG	10.29	19.62	50.00	-30.38

REMARK: The emission levels of other frequencies were very low against the limit.



Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie
Town, Dongguan City,
Guangdong 523942, China

Tel: +86 769 8998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com



4.2 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



4.1.2 TEST INSTRUMENTS

FREQUENCY RANGE BELOW 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESL6	1300.5001K06-100262-eQ	Jan. 04, 19	Jan. 03, 20
Bilog Antenna	Sunol Sciences	JB6	A110712	Feb. 07, 19	Feb. 06, 20
Active Antenna	CMO-POWER	AL-130	121031	Feb. 07, 19	Feb. 06, 20
Signal Amplifier	HP	8447E	443008	Jan. 24,19	Jan. 23,20
3m Semi-anechoic Chamber	SAEMC	9m*6m*6m	N/A	Oct. 18,18	Oct. 17,21
Test Software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

- NOTES:** 1. The test was performed in 3m Chamber.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA(Except 3m Semi-anechoic Chamber).

FREQUENCY RANGE ABOVE 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESL6	1300.5001K06-100262-eQ	Jan. 04, 19	Jan. 03, 20
MXA signal analyzer	Agilent	N9020A	MY49100060	Jan. 04, 19	Jan. 03, 20
Horn Antenna	COM-POWER	HAH-118	71259	Jan. 25,19	Jan. 24,20
Horn Antenna	COM-POWER	HAH-118	71283	Feb. 01, 19	Jan 31, 20
AMPLIFIER	EM Electornic Corporation	EM01G26G	60613	Jan. 24,19	Jan. 23,20
AMPLIFIER	Emc Instruments Corporation	Emc012645	980077	Jan. 04, 19	Jan. 03,20
3m Semi-anechoic Chamber	SAEMC	9m*6m*6m	N/A	Oct. 18,18	Oct. 17,21
Test Software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

- NOTES:** 1. The test was performed in 3m Chamber.
2. The calibration interval of the above test instruments is 12months. And the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA(Except 3m Semi-anechoic Chamber).



4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. For below 1GHz was used bilog antenna, and above 1GHz was used horn antenna, and its 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.
- d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
- g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz(Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
- 4.All modes of operation were investigated and the worst-case emissions are reported.
- 5.The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

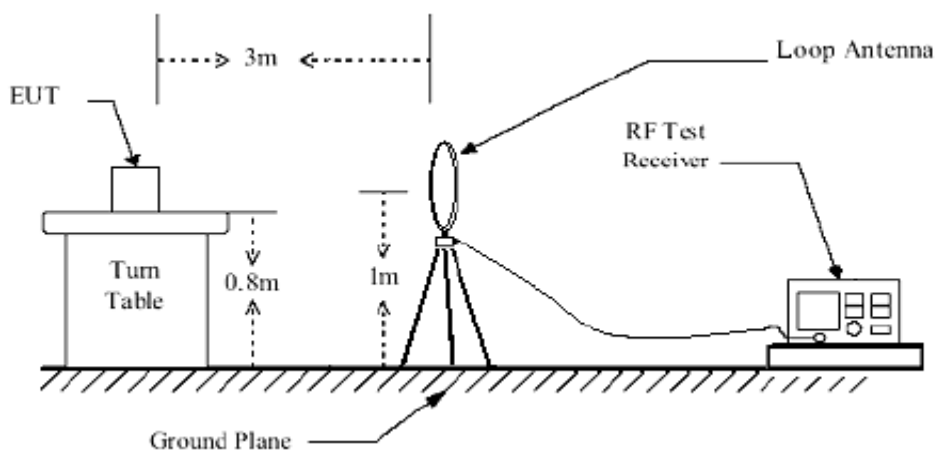


4.1.4 DEVIATION FROM TEST STANDARD

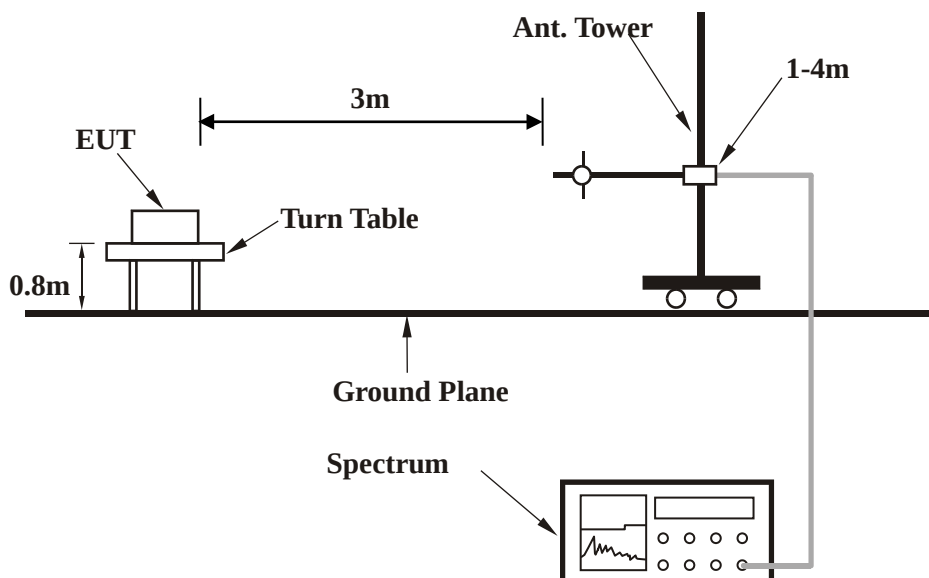
No deviation.

4.1.5 TEST SETUP

Below 30MHz test setup



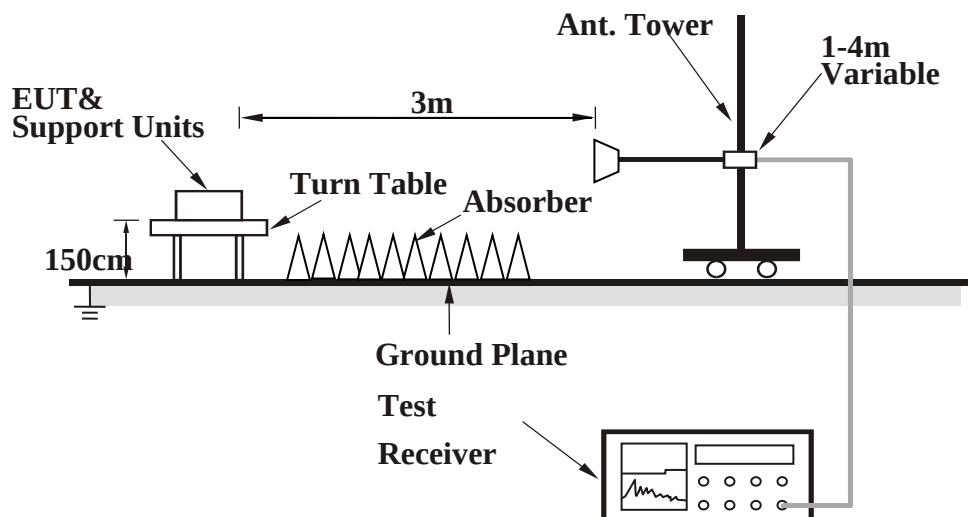
Below 1GHz test setup



Note: For the actual test configuration, please refer to the attached file (Test Setup Photo).



Above 1GHz test setup



Note: For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.



4.1.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

BT-LE (GFSK)

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & test distance: HORIZONTAL at 3m

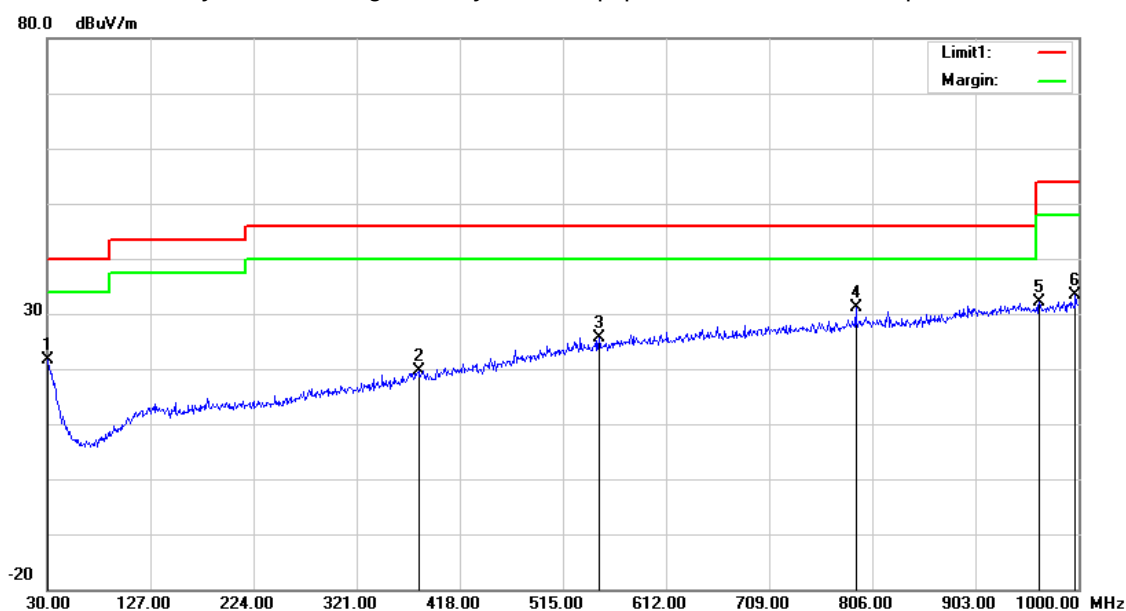
No.	Frequency (MHz)	Reading (dBuV/m)	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	30.9700	24.23	19.48	22.27	0.13	21.57	40.00	-18.43	100	293
2	379.2000	24.10	15.67	22.07	1.90	19.60	46.00	-26.40	100	109
3	548.9500	25.65	19.30	21.70	2.27	25.52	46.00	-20.48	100	198
4	790.4800	27.70	22.11	21.17	2.54	31.18	46.00	-14.82	100	313
5	963.1400	26.48	23.70	20.76	2.72	32.14	54.00	-21.86	100	265
6	997.0900	27.05	24.32	20.70	2.76	33.43	54.00	-20.57	100	201

REMARK: 1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.

2. Negative sign (-) in the margin column signify levels below the limit.

3. Frequency range scanned: 30MHz to 1000MHz.

4. Only emissions significantly above equipment noise floor are reported.





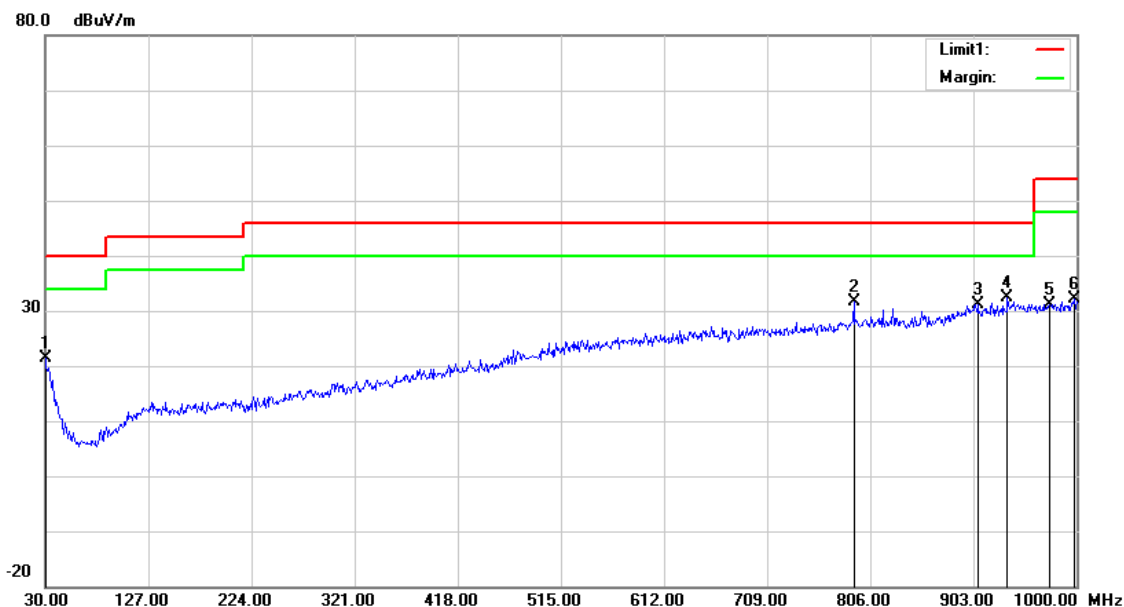
**BUREAU
VERITAS**

Test Report No.: RF190822N030-V1

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & test distance: VERTICAL at 3m										
No.	Frequency (MHz)	Reading (dBuV/m)	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	30.0000	23.55	20.10	22.28	0.13	21.50	40.00	-18.50	100	9
2	790.4800	28.03	22.11	21.17	2.54	31.51	46.00	-14.49	100	261
3	906.8800	25.56	23.76	20.87	2.66	31.11	46.00	-14.89	100	160
4	935.0100	26.91	23.52	20.81	2.69	32.31	46.00	-13.69	100	61
5	974.7800	25.53	23.70	20.74	2.73	31.22	54.00	-22.78	100	158
6	998.0600	25.61	24.35	20.69	2.76	32.03	54.00	-21.97	100	118

- REMARK:** 1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
2. Negative sign (-) in the margin column signify levels below the limit.
3. Frequency range scanned: 30MHz to 1000MHz.
4. Only emissions significantly above equipment noise floor are reported.



Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie
Town, Dongguan City,
Guangdong 523942, China

Tel: +86 769 8998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com



ABOVE 1GHz TEST DATA:

BT-LE (GFSK)

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2371	44.58PK	74	-27.44	100	300	60.21	-13.65
2	2371	34.12AV	54	-15.86	100	113	51.79	-13.65
3	2402	85.73PK			150	360	108.07	-13.97
4	2402	84.56AV			100	216	107.08	-13.97
5	4804	50.64PK	74	-22.18	100	24	55.57	-3.75
6	4804	40.15AV	54	-13.35	100	4	44.4	-3.75
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2371	44.58PK	74	-29.42	100	212	58.23	-13.65
2	2371	34.12AV	54	-19.88	100	17	47.77	-13.65
3	2402	85.73PK			100	275	99.7	-13.97
4	2402	84.56AV			100	249	98.53	-13.97
5	4804	50.64PK	74	-23.36	100	255	54.39	-3.75
6	4804	40.15AV	54	-13.85	100	304	43.9	-3.75

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.



CHANNEL	TX Channel 19	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2440	93.94PK				100	247	106.96
2	2440	93.15AV				100	64	106.17
3	4880	53.35PK	74	74	-20.65	100	271	57.31
4	4880	41.99AV	54	54	-12.01	200	56	45.95
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2440	85.32PK			100	61	98.34	-13.02
2	2440	84.76AV			100	224	97.78	-13.02
3	4880	53.03PK	74	-20.97	100	336	56.99	-3.96
4	4880	41.63AV	54	-12.37	100	356	45.59	-3.96

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.



CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2483.5	54.6PK	74	-19.4	100	229	68.25	-13.65
2	2483.5	43.12AV	54	-10.88	100	50	56.77	-13.65
3	2480	94.11PK			100	16	108.08	-13.97
4	2480	93.4AV			100	124	107.37	-13.97
5	4960	53.33PK	74	-20.67	100	33	57.08	-3.75
6	4960	43.4AV	54	-10.6	200	68	47.15	-3.75
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2483.5	48.95PK	74	74	-25.05	100	78	62.6
2	2483.5	40.25AV	54	54	-13.75	100	44	53.9
3	2480	85.66PK				100	209	99.63
4	2480	84.82AV				100	115	98.79
5	4960	51.95PK	74	74	-22.05	100	341	55.7
6	4960	43.55AV	54	54	-10.45	200	237	47.3

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.



4.3 6dB BANDWIDTH MEASUREMENT

4.2.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.2.2 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. 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 6 dB relative to the maximum level measured in the fundamental emission.

4.2.3 DEVIATION FROM TEST STANDARD

No deviation.



4.2.4 TEST SETUP



4.2.5 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



BUREAU
VERITAS

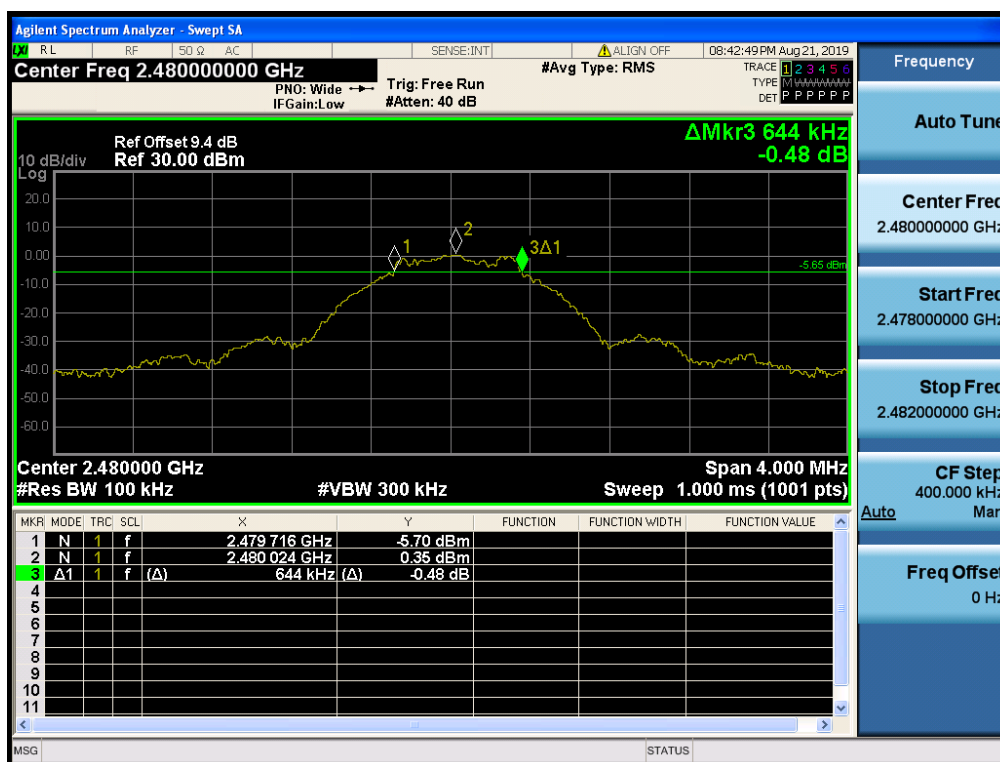
Test Report No.: RF190822N030-V1

4.2.6 TEST RESULTS

BT-LE (1Mbps)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	0.676	0.5	PASS
19	2440	0.660	0.5	PASS
39	2480	0.644	0.5	PASS

WORSE PLOT



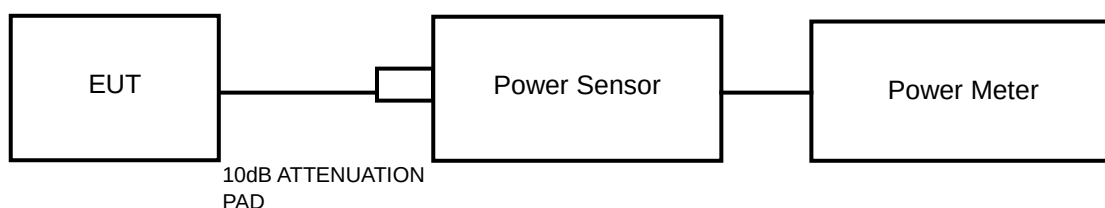


4.3 CONDUCTED OUTPUT POWER

4.3.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm)

4.3.2 TEST SETUP



4.3.3 TEST PROCEDURES

A peak sensor was used on the output port of the EUT. A peak power meter was used to read the response of the peak power sensor. Record the peak power level.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



4.3.6 TEST RESULTS

4.3.6.1 MAXIMUM PEAK OUTPUT POWER

BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT (W)	PASS/FAIL
0	2402	0.43	1.1041	1	PASS
19	2440	0.78	1.1967	1	PASS
39	2480	1.65	1.4622	1	PASS

4.3.6.2 AVERAGE OUTPUT POWER (FOR REFERENCE)

The average power sensor was used on the output port of the EUT. A power meter was used to read the response of the power sensor. Record the power level.

BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)
0	2402	-0.33
19	2440	0.41
39	2480	0.85

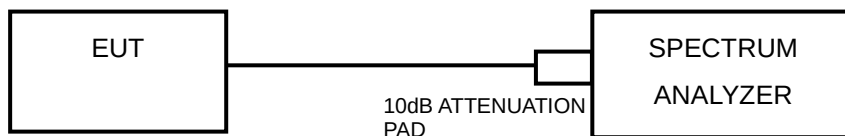


4.4 POWER SPECTRAL DENSITY MEASUREMENT

4.4.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm/3KHz.

4.4.2 TEST SETUP



4.4.3 TEST PROCEDURE

1. Set the span to 1.5 times the DTS bandwidth
2. Set the RBW = 3 kHz, VBW $\geq 3 \times$ RBW, Detector = peak.
3. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

4.4.5 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



BUREAU
VERITAS

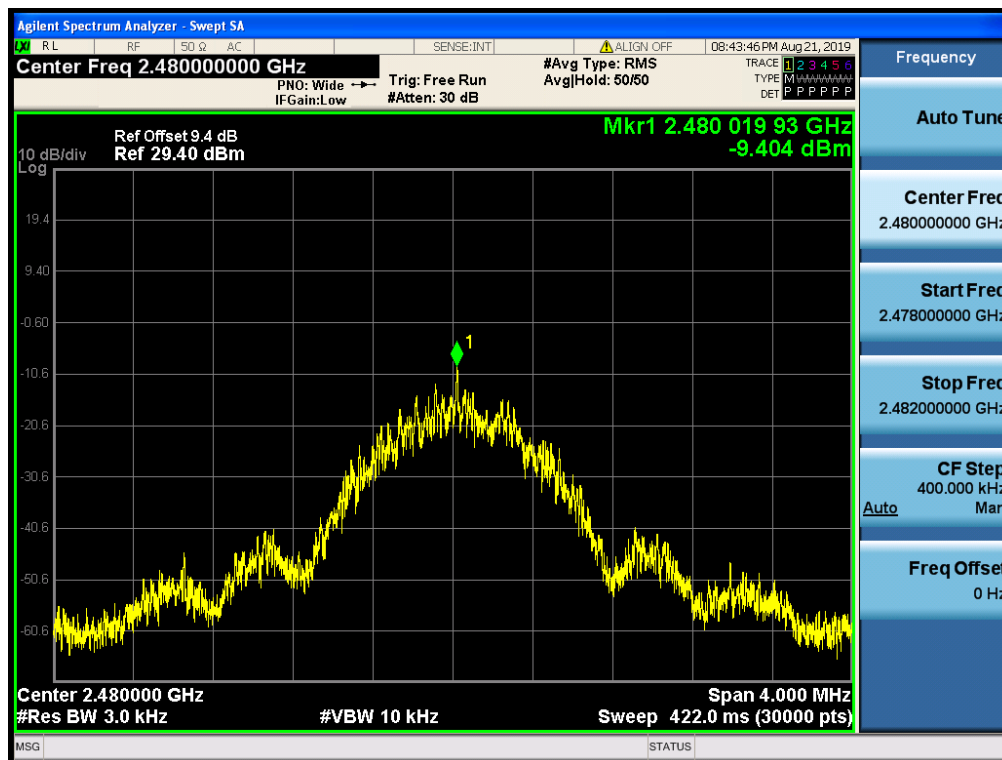
Test Report No.: RF190822N030-V1

4.4.6 TEST RESULTS

BT-LE (GFSK)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-9.95	8	PASS
19	2440	-10.03	8	PASS
39	2480	-9.4	8	PASS

WORSE PLOT



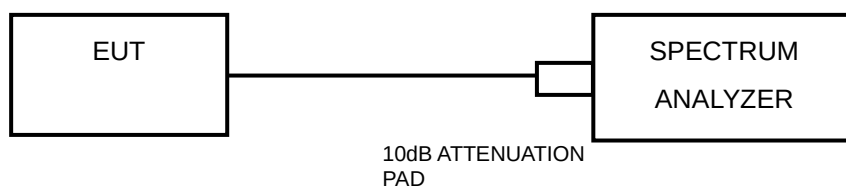


4.5 OUT OF BAND EMISSION MEASUREMENT

4.5.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.5.2 TEST SETUP



4.5.3 TEST PROCEDURE

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.



MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation.

4.5.5 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



BUREAU
VERITAS

Test Report No.: RF190822N030-V1

4.5.6 TEST RESULTS

BT-LE (GFSK)



Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

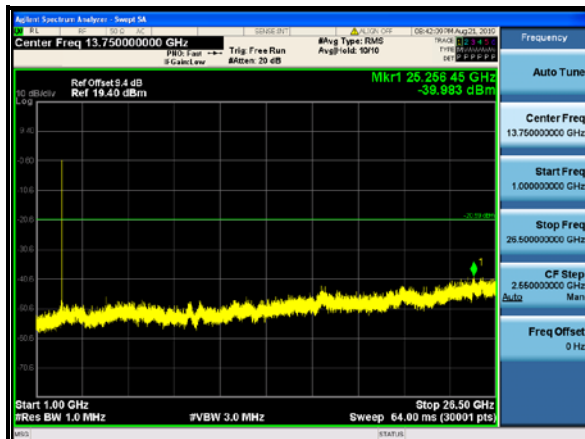
No. 34, Chenwulu Section, Guantai Rd., Houjie
Town, Dongguan City,
Guangdong 523942, China

Tel: +86 769 8998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com

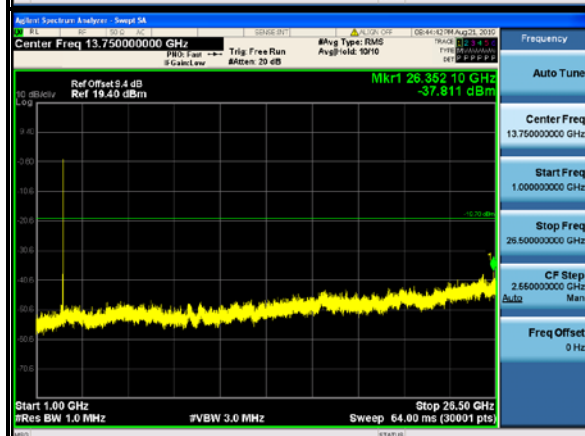
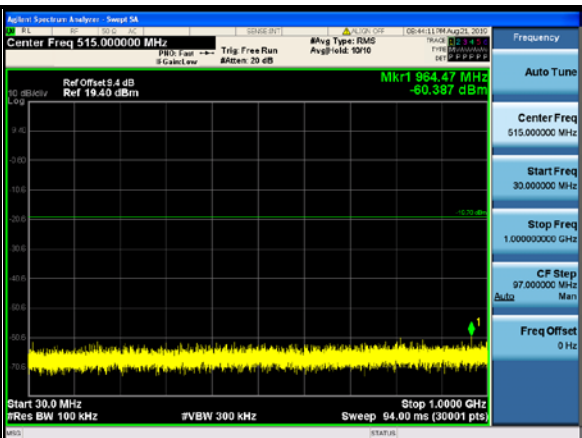
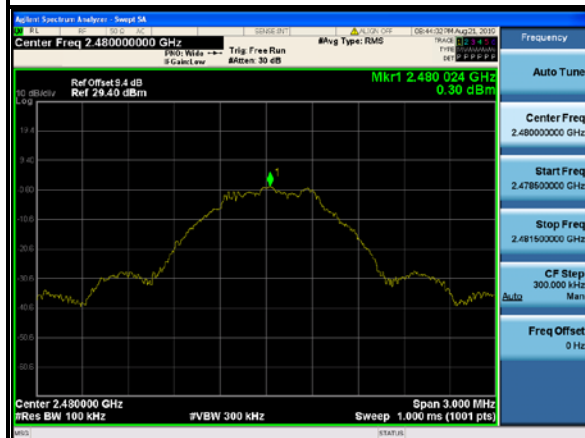


BUREAU
VERITAS

Test Report No.: RF190822N030-V1



CH 39



Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie
Town, Dongguan City,
Guangdong 523942, China

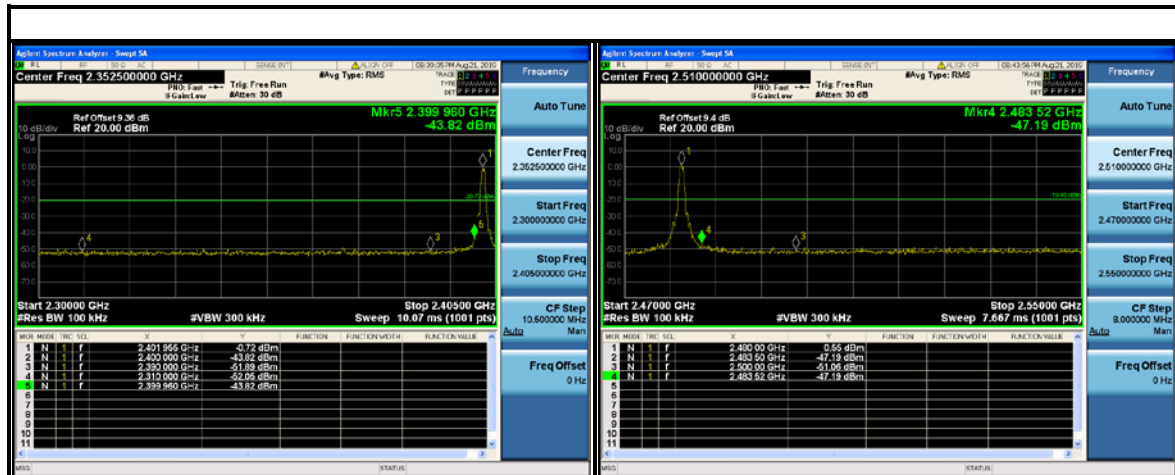
Tel: +86 769 8998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com



BUREAU
VERITAS

Test Report No.: RF190822N030-V1

Band Edge:



Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie
Town, Dongguan City,
Guangdong 523942, China

Tel: +86 769 8998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com



Test Report No.: RF190822N030-V1

5 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---