

RADIO TEST REPORT FCC ID: RBP-RD52

Product:Boha Handheld ScannerTrade Mark:BOHA!™Model No.:RD52Family Model:BOHA!™ Handheld 2Report No.:S19111503202002Issue Date:23 Dec. 2019

Prepared for

TransAct Technologies Incorporated 2319 Whitney Avenue, Suite 3B Hamden, Connecticut 06518-3509, United States.

Prepared by

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Version.1.3





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Certificate #4298.01

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1 TEST RESULT CERTIFICATION

Applicant's name: TransAct Technologies Incorporated	
Address:	2319 Whitney Avenue, Suite 3B Hamden, Connecticut 06518-3509, United States.
Manufacturer's Name:	TransAct Technologies Incorporated
Address:	2319 Whitney Avenue, Suite 3B Hamden, Connecticut 06518-3509, United States.
Product description	
Product name:	Boha Handheld Scanner
Model and/or type reference:	RD52
Family Model:	BOHA!™ Handheld 2

Measurement Procedure Used:

APPLICABLE STANDARDS

APPLICABLE STANDARD/ TEST PROCEDURE	TEST RESULT	
FCC 47 CFR Part 2, Subpart J		
FCC 47 CFR Part 15, Subpart C	Complied	
ANSI C63.10-2013	Complied	
KDB 558074 D01 15.247 Meas Guidance v05r02		

This device described above has been tested by Shenzhen NTEK 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.

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The test results of this report relate only to the tested sample identified in this report.

Date of Test	: 19 Nov. 2019 ~ 20 Dec, 2019	
Testing Engineer	: (Jerry Xie)	
Technical Manager	: Jusen chen (Jason Chen) Sam. Chew	
Authorized Signatory	:(Sam Chen)	

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FCC Part15 (15.247), Subpart C					
Standard Section	Test Item	Verdict	Remark		
15.207 Conducted Emission PASS					
15.247 (a)(2)	6dB Bandwidth	PASS			
15.247 (b) Peak Output Power PASS					
15.209 (a) 15.205 (a)					
15.247 (e)	Power Spectral Density	PASS			
15.247 (d)	Band Edge Emission	PASS			
15.247 (d) Spurious RF Conducted Emission PASS		PASS			
15.203	Antenna Requirement	PASS			

Remark:

 "N/A" denotes test is not applicable in this Test Report.
All test items were verified and recorded according to the standards and without any deviation during the test.



3 FACILITIES AND ACCREDITATIONS

3.1 FACILITIES

All measurement facilities used to collect the measurement data are located at 1/F, Building E, Fenda Science Park Sanwei, Xixiang, Bao'an District

Shenzhen, Guangdong, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

3.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description	
CNAS-Lab.	: The Laboratory has been assessed and proved to be in compliance with
	CNAS-CL01:2006 (identical to ISO/IEC 17025:2005)
	The Certificate Registration Number is L5516.
IC-Registration	The Certificate Registration Number is 9270A.
	CAB identifier:CN0074
FCC- Accredited	Test Firm Registration Number: 463705.
	Designation Number: CN1184
A2LA-Lab.	The Certificate Registration Number is 4298.01
	This laboratory is accredited in accordance with the recognized
	International Standard ISO/IEC 17025:2005 General requirements for
	the competence of testing and calibration laboratories.
	This accreditation demonstrates technical competence for a defined
	scope and the operation of a laboratory quality management system
	(refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).
	: Shenzhen NTEK Testing Technology Co., Ltd.
Site Location	: 1/F, Building E, Fenda Science Park Sanwei, Xixiang, Bao'an District
	Shenzhen, Guangdong, China

3.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y\pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	±2.80dB
2	RF power, conducted	±0.16dB
3	Spurious emissions, conducted	±0.21dB
4	All emissions, radiated(30MHz~1GHz)	±2.64dB
5	All emissions, radiated(1GHz~6GHz)	±2.40dB
6	All emissions, radiated(>6GHz)	±2.52dB
7	Temperature	±0.5°C
8	Humidity	±2%



4 GENERAL DESCRIPTION OF EUT

Product Feature and Specification				
Equipment Boha Handheld Scanner				
Trade Mark	BOHA!™			
FCC ID	RBP-RD52			
Model No.	RD52			
Family Model	BOHA!™ Handheld 2			
Model Difference	All models are the same circuit and RF module, except the different models sell to different customers.			
Operating Frequency	2402MHz~2480MHz			
Modulation	GFSK			
Number of Channels 40 Channels				
Bluetooth Version	BT V4.0			
Antenna Type	FPCB Antenna			
Antenna Gain	1dBi			
	DC supply: DC 3.8V/4000mAh from Battery or DC 5V from USB Port.			
Power supply	Adapter supply: Model: AW010WR-0500200UU Input: 100-240V~50/60Hz 0.4A Output: 5V2A			
HW Version	N/A			
SW Version	Android 8.1			
Firmware version	20181206.150521			

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Note: Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.



Revision History

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Certificate #4298.01

		vision History	
Report No.	Version	Description	Issued Date
S19111503202002	Rev.01	Initial issue of report	Dec 23, 2019



5 DESCRIPTION OF TEST MODES

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To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those data rates (1Mbps for GFSK modulation) were used for all test.

The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement -X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

Carrier Frequency and Channel list:

Channel	Frequency(MHz)
0	2402
1	2404
19	2440
20	2442
38	2478
39	2480

Note: fc=2402MHz+kx2MHz k=0 to 39

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Test Cases		
Test Item	Data Rate/ Modulation	
lest item	Bluetooth 4.0_LE / GFSK	
AC Conducted Emission	Mode 1: normal link mode	
	Mode 1: normal link mode	
Radiated Test	Mode 2: Bluetooth Tx Ch00_2402MHz_1Mbps	
Cases	Mode 3: Bluetooth Tx Ch19_2440MHz_1Mbps	
	Mode 4: Bluetooth Tx Ch39_2480MHz_1Mbps	
	Mode 2: Bluetooth Tx Ch00_2402MHz_1Mbps	
Conducted Test	Mode 3: Bluetooth Tx Ch19_2440MHz_1Mbps	
Cases	Mode 4: Bluetooth Tx Ch39_2480MHz_1Mbps	

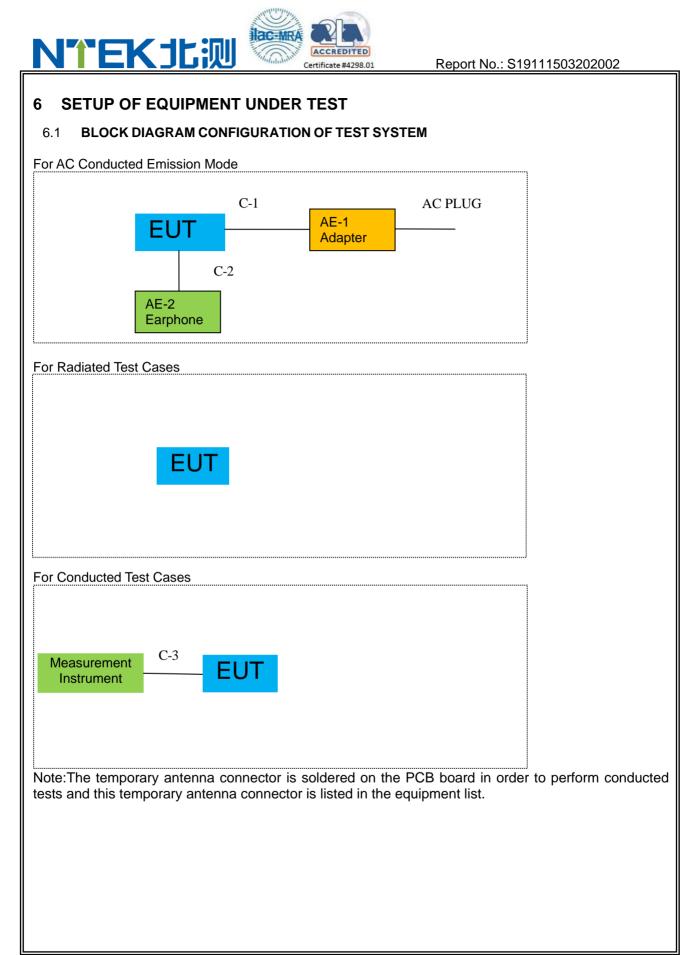
Note:

1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.

2. AC power line Conducted Emission was tested under maximum output power.

3. For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and no other significantly frequencies found in conducted spurious emission.

4. EUT built-in battery-powered, the battery is fully-charged.





6.2 SUPPORT EQUIPMENT

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
AE-1	Adapter	N/A	N/A	N/A	Peripherals
AE-2	Earphone	N/A	N/A	N/A	Peripherals

Item	Cable Type	Shielded Type	Ferrite Core	Length
C-1	USB Cable	NO	NO	1.2m
C-2	Earphone Cable	NO	NO	1.2m
C-3	RF Cable	YES	NO	0.1m

Notes:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in [Length] column.
- (3) "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".



6.3 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation& Conducted Test equipment

laula		estequipment					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibrati on period
1	Spectrum Analyzer	Aglient	E4407B	MY45108040	2019.05.13	2020.05.12	1 year
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	2019.08.28	2020.08.27	1 year
3	Spectrum Analyzer	R&S	FSV40	101417	2019.08.28	2020.08.27	1 year
4	Test Receiver	R&S	ESPI7	101318	2019.05.13	2020.05.12	1 year
5	Bilog Antenna	TESEQ	CBL6111D	31216	2019.04.15	2020.04.14	1 year
6	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2018.05.19	2020.05.18	2 year
7	Horn Antenna	EM	EM-AH-1018 0	2011071402	2019.04.15	2020.04.14	1 year
8	Broadband Horn Antenna	SCHWARZBE CK	BBHA 9170	803	2018.12.11	2019.12.10	1 year
9	Amplifier	EMC	EMC051835 SE	980246	2019.08.06	2020.08.05	1 year
10	Active Loop Antenna	SCHWARZBE CK	FMZB 1519 B	055	2018.12.11	2019.12.10	1 year
11	Power Meter	DARE	RPR3006W	15I00041SN 084	2019.08.06	2020.08.05	1 year
12	Test Cable (9KHz-30MHz)	N/A	R-01	N/A	2017.04.21	2020.04.20	3 year
13	Test Cable (30MHz-1GHz)	N/A	R-02	N/A	2017.04.21	2020.04.20	3 year
14	High Test Cable(1G-40G Hz)	N/A	R-03	N/A	2017.04.21	2020.04.20	3 year
15	High Test Cable(1G-40G Hz)	N/A	R-04	N/A	2017.04.21	2020.04.20	3 year
16	Filter	TRILTHIC	2400MHz	29	2017.04.19	2020.04.18	3 year
17	temporary antenna connector (Note)	NTS	R001	N/A	N/A	N/A	N/A

Note:

We will use the temporary antenna connector (soldered on the PCB board) When conducted test And this temporary antenna connector is listed within the instrument list



AC Co	AC Conduction Test equipment						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	· R&S	ESCI	101160	2019.05.13	2020.05.12	1 year
2	LISN	R&S	ENV216	101313	2019.04.15	2020.04.14	1 year
3	LISN	SCHWARZBE CK	NNLK 8129	8129245	2019.05.13	2020.05.12	1 year
4	50Ω Coaxial Switch	ANRITSU CORP	MP59B	6200983704	2019.05.13	2020.05.12	2 year
5	Test Cable (9KHz-30MH z)	N/A	C01	N/A	2017.04.21	2020.04.20	3 year
6	Test Cable (9KHz-30MH z)	N/A	C02	N/A	2017.04.21	2020.04.20	3 year
7	Test Cable (9KHz-30MH z)	N/A	C03	N/A	2017.04.21	2020.04.20	3 year

Note: Each piece of equipment is scheduled for calibration once a year except the Aux Equipment & Test Cable which is scheduled for calibration every 2 or 3 years.



7 TEST REQUIREMENTS

7.1 CONDUCTED EMISSIONS TEST

7.1.1 Applicable Standard

According to FCC Part 15.207(a) and KDB 174176 D01 Line Conducted FAQ v01r01

7.1.2 Conformance Limit

	Conducted Emission Limit		
Frequency(MHz)	Quasi-peak	Average	
0.15-0.5	66-56*	56-46*	
0.5-5.0	56	46	
5.0-30.0	60	50	

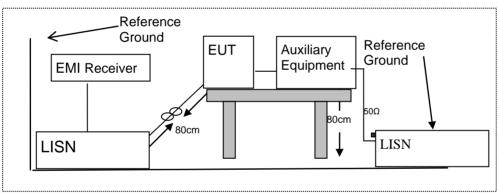
Note: 1. *Decreases with the logarithm of the frequency

- 2. The lower limit shall apply at the transition frequencies
 - 3. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

7.1.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.1.4 Test Configuration



7.1.5 Test Procedure

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.

- 1. The EUT was placed 0.4 meter from the conducting wall of the shielding room.
- 2. The EUT was placed on a table which is 0.8m above ground plane.
- 3. Connect EUT to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- 4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40cm long.
- 5. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- 6. LISN at least 80 cm from nearest part of EUT chassis.
- 7. The frequency range from 150KHz to 30MHz was searched.
- 8. Set the test-receiver system to Peak Detect Function and specified bandwidth(IF bandwidth=9KHz) with Maximum Hold Mode
- 9. For the actual test configuration, please refer to the related Item -EUT Test Photos.



7.1.6 Test Results

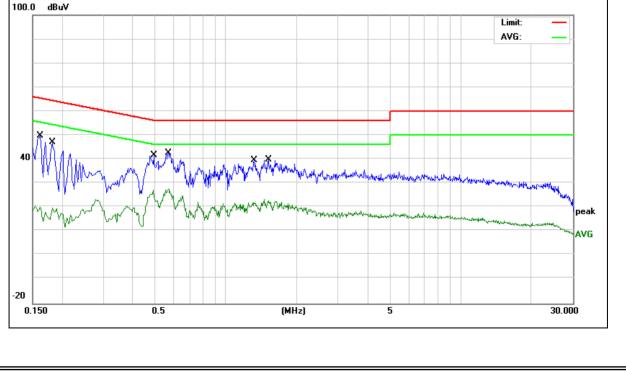
EUT:	Boha Handheld Scanner	Model Name :	RD52
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	L
	DC 5V from Adapter AC 120V/60Hz	Test Mode:	Mode 1

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Domork
(MHz)	(dBµV)	(dB)	(dBµV)	(dBµV)	(dB)	Remark
0.1620	39.96	9.76	49.72	65.36	-15.64	QP
0.1620	12.56	9.76	22.32	55.36	-33.04	AVG
0.1819	37.37	9.76	47.13	64.39	-17.26	QP
0.1819	12.35	9.76	22.11	54.39	-32.28	AVG
0.4940	31.92	9.74	41.66	56.10	-14.44	QP
0.4940	22.33	9.74	32.07	46.10	-14.03	AVG
0.5700	32.86	9.74	42.60	56.00	-13.40	QP
0.5700	21.68	9.74	31.42	46.00	-14.58	AVG
1.3220	29.89	9.75	39.64	56.00	-16.36	QP
1.3220	16.17	9.75	25.92	46.00	-20.08	AVG
1.5180	30.15	9.77	39.92	56.00	-16.08	QP
1.5180	15.39	9.77	25.16	46.00	-20.84	AVG

Remark:

All readings are Quasi-Peak and Average values.
Factor = Insertion Loss + Cable Loss.





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EUT:	Boha Handheld Scanner	Model Name :	RD52
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	N
Test Voltage :	DC 5V from Adapter AC 120V/60Hz	Test Mode:	Mode 1

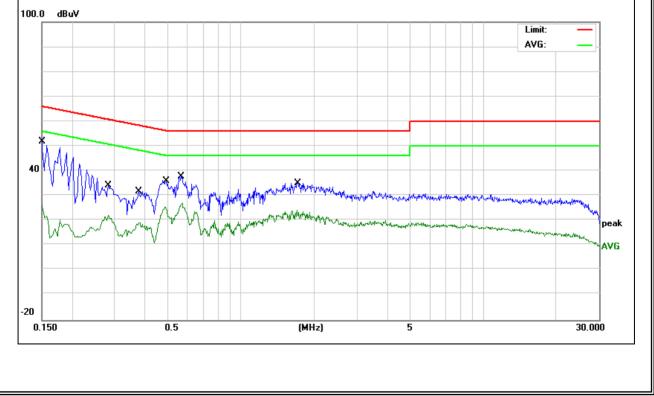
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Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Demark
(MHz)	(dBµV)	(dB)	(dBµV)	(dBµV)	(dB)	Remark
0.1500	42.10	9.74	51.84	66.00	-14.16	QP
0.1500	16.73	9.74	26.47	56.00	-29.53	AVG
0.2819	24.32	9.74	34.06	60.76	-26.70	QP
0.2819	12.33	9.74	22.07	50.76	-28.69	AVG
0.3820	19.97	9.75	29.72	58.23	-28.51	QP
0.3820	9.35	9.75	19.10	48.23	-29.13	AVG
0.4859	25.50	9.75	35.25	56.24	-20.99	QP
0.4859	15.67	9.75	25.42	46.24	-20.82	AVG
0.5699	27.90	9.75	37.65	56.00	-18.35	QP
0.5699	17.22	9.75	26.97	46.00	-19.03	AVG
1.7059	25.21	9.78	34.99	56.00	-21.01	QP
1.7059	14.33	9.78	24.11	46.00	-21.89	AVG

Remark:

All readings are Quasi-Peak and Average values.
Factor = Insertion Loss + Cable Loss.



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7.2 RADIATED SPURIOUS EMISSION

7.2.1 Applicable Standard

According to FCC Part 15.247(d) and 15.209 and ANSI C63.10-2013

7.2.2 Conformance Limit

According to FCC Part 15.247(d): radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)). According to FCC Part15.205, Restricted bands

According to FOC Fart 13.200, Restricted bands				
MHz	MHz	MHz	GHz	
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15	
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46	
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75	
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5	
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2	
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5	
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7	
6.26775-6.26825	123-138	2200-2300	14.47-14.5	
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2	
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4	
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12	
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0	
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8	
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5	
12.57675-12.57725	322-335.4	3600-4400	(2)	
13.36-13.41				

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Restricted Frequency(MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance
0.009~0.490	2400/F(KHz)	20 log (uV/m)	300
0.490~1.705	24000/F(KHz)	20 log (uV/m)	30
1.705~30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Limits of Radiated Emission Measurement(Above 1000MHz)

Frequency(MHz)	Class B (dBuV/m) (at 3M)		
	PEAK	AVERAGE	
Above 1000	74	54	

Remark :1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. For Frequency 9kHz~30MHz: Distance extrapolation factor =40log(Specific distance/ test distance)(dB); Limit line=Specific limits(dBuV) + distance extrapolation factor.

For Frequency above 30MHz: Distance extrapolation factor =20log(Specific distance/ test distance)(dB); Limit line=Specific limits(dBuV) + distance extrapolation factor.



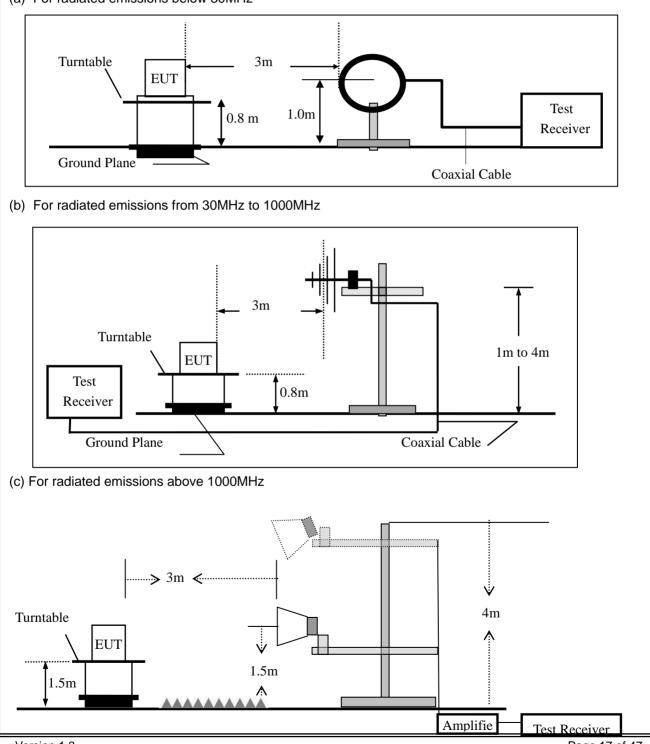
7.2.3 Measuring Instruments

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The Measuring equipment is listed in the section 6.3 of this test report.

7.2.4 Test Configuration

(a) For radiated emissions below 30MHz





7.2.5 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

Spectrum Parameter	Setting			
Attenuation	Auto			
Start Frequency	1000 MHz			
Stop Frequency	10th carrier harmonic			
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average			

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- e. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- f. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- g. For the actual test configuration, please refer to the related Item –EUT Test Photos. Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported



During the radiated emission t	During the radiated emission test, the Spectrum Analyzer was set with the following configurations:									
Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth							
30 to 1000	QP	120 kHz	300 kHz							
Above 1000	Peak Peak		1 MHz							
Above 1000	Average	1 MHz	10 Hz							

Note: for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10*lg(100 [kHz]/narrower RBW [kHz])., the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

7.2.6 Test Results

Spurious Emission below 30MHz (9KHz to 30MHz)								
Handheld her	Model No.:	RD52						
	Relative Humidity:	48%						
2/Mode3/Mode4	Test By:	Jerry Xie						
ן שו	Handheld er	Handheld Model No.: er Relative Humidity:						

Freq.	Ant.Pol.	Emission L	.evel(dBuV/m)	Limit 3	m(dBuV/m)	Over(dB)		
(MHz)	H/V	PK	AV	PK	AV	PK	AV	

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.



Spurious Emission below 1GHz (30MHz to 1GHz)

All the modulation modes have been tested, and the worst result was report as below:

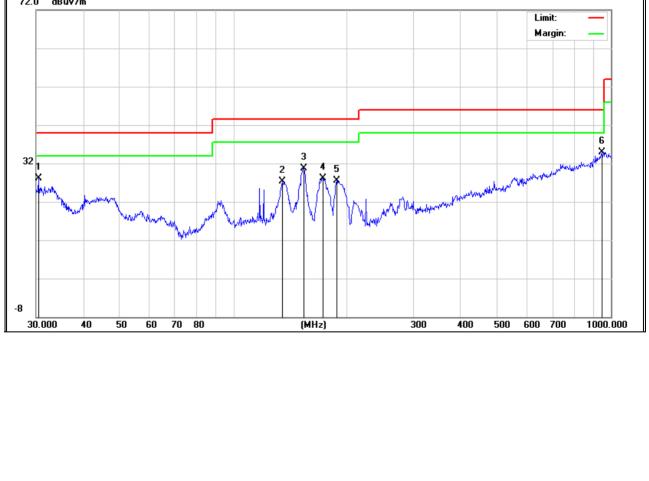
EUT:	Boha Handheld Scanner	Model Name :	RD52
Temperature:	20 ℃	Relative Humidity:	48%
Pressure:	1010hPa	Test Mode:	Mode 1
Test Voltage :	DC 3.8V		

Polar	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
(H/V)	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	30.4237	9.71	18.43	28.14	40.00	-11.86	QP
V	134.5592	14.83	12.47	27.30	43.50	-16.20	QP
V	153.7385	19.14	11.65	30.79	43.50	-12.71	QP
V	172.5988	18.09	10.08	28.17	43.50	-15.33	QP
V	187.7529	18.21	9.23	27.44	43.50	-16.06	QP
V	945.4398	6.87	28.05	34.92	46.00	-11.08	QP

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit







CHAN CMHz) CdBuV/ CdB CdBuV/m CdBuV/m CdBuV/m CdBvV/m CdBvV/m<
H 153.7384 14.13 11.65 25.78 43.50 -17.72 QP H 192.4185 15.86 8.79 24.65 43.50 -18.85 QP H 279.0436 10.06 15.59 25.65 46.00 -20.35 QP H 552.8832 7.46 22.45 29.91 46.00 -16.09 QP H 958.7943 6.49 28.17 34.66 46.00 -11.34 QP Remark: Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit 72.0 dBuV/m Margin: - 32 dBuV/m
H 153.7384 14.13 11.65 25.78 43.50 -17.72 QP H 192.4185 15.86 8.79 24.65 43.50 -18.85 QP H 279.0436 10.06 15.59 25.65 46.00 -20.35 QP H 552.8832 7.46 22.45 29.91 46.00 -16.09 QP H 958.7943 6.49 28.17 34.66 46.00 -11.34 QP Remark: Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit 72.0 dBuV/m dB
H 279.0436 10.06 15.59 25.65 46.00 -20.35 QP H 552.8832 7.46 22.45 29.91 46.00 -16.09 QP H 958.7943 6.49 28.17 34.66 46.00 -11.34 QP Remark: Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit 72.0 dBuV/m Limit:
H 552.8832 7.46 22.45 29.91 46.00 -16.09 QP H 958.7943 6.49 28.17 34.66 46.00 -11.34 QP Remark: Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit 72.0 dbw//m Imit:
H 958.7943 6.49 28.17 34.66 46.00 -11.34 QP Remark: Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit 72.0 dBuV/m Limit: Margin= Absolute Level - Limit 72.0 dBuV/m Junit:
Remark: Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit 72.0 dBuV/m
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit 72.0 dBuV/m

F



Spurious Emission Above 1GHz (1GHz to 25GHz)											
EUT:	Boha Handheld Scanner				Mode	Model No.: RD52					
Temperature	emperature: 20 °C				Relati	ve Humidit	ty:	48%			
Test Mode:		Mode2/N	/lode3/Mo	de4	Test E	By:		Jerry	/ Xie		
						•			, 		
Frequency	Read Level	Cable loss	Antenna Factor		amp ctor	Emission Level	Lim	its	Margin	Remark	Comment
(MHz)	(dBµV)	(dB)	dB/m	(0	dB)	(dBµV/m)	(dBµ\	V/m)	(dB)		
			Low	Chan	nel (24	102 MHz)-A	bove	1G			
4804.536	60.23	5.21	35.59	44	.30	56.73	74.	00	-17.27	Pk	Vertical
4804.536	42.84	5.21	35.59	44	.30	39.34	54.	00	-14.66	AV	Vertical
7206.665	62.28	6.48	36.27	44	.60	60.43	74.	00	-13.57	Pk	Vertical
7206.665	42.05	6.48	36.27	44	.60	40.20	54.	00	-13.80	AV	Vertical
4804.092	60.08	5.21	35.55	44	1.30	56.54	74.	00	-17.46	Pk	Horizontal
4804.092	42.83	5.21	35.55	44	.30	39.29	54.00		-14.71	AV	Horizontal
7206.499	61.69	6.48	36.27	44.52		59.92	74.00		-14.08	Pk	Horizontal
7206.499	39.54	6.48	36.27		1.52	37.77	54.		-16.23	AV	Horizontal
Mid Channel (2440 MHz)-Above 1G											
4879.020	60.87	5.21	35.66	44	1.20	57.54	74.	00	-16.46	Pk	Vertical
4879.020	39.58	5.21	35.66	44	.20	36.25	54.	00	-17.75	AV	Vertical
7319.545	62.00	7.10	36.50	44	4.43	61.17	74.	00	-12.83	Pk	Vertical
7319.545	42.83	7.10	36.50	44	4.43	42.00	54.	00	-12.00	AV	Vertical
4879.574	60.67	5.21	35.66	44	.20	57.34	74.	00	-16.66	Pk	Horizontal
4879.574	42.59	5.21	35.66	44	.20	39.26	54.	00	-14.74	AV	Horizontal
7319.927	62.15	7.10	36.50	44	4.43	61.32	74.	00	-12.68	Pk	Horizontal
7319.927	40.77	7.10	36.50		4.43	39.94	54.		-14.06	AV	Horizontal
			High	Chan	nel (24	180 MHz)- /	Above	1G			_
4960.222	59.78	5.21	35.52	44	1.21	56.30	74.	00	-17.70	Pk	Vertical
4960.222	42.62	5.21	35.52	44	.21	39.14	54.	00	-14.86	AV	Vertical
7439.731	60.68	7.10	36.53	44	.60	59.71	74.	00	-14.29	Pk	Vertical
7439.731	40.60	7.10	36.53	44	1.60	39.63	54.	00	-14.37	AV	Vertical
4960.670	60.45	5.21	35.52	44	.21	56.97	74.	00	-17.03	Pk	Horizontal
4960.670	40.65	5.21	35.52	44	l.21	37.17	54.	00	-16.83	AV	Horizontal
7440.238	60.23	7.10	36.53	44	1.60	59.26	74.	00	-14.74	Pk	Horizontal
7440.238	41.25	7.10	36.53	44	.60	40.28	54.	00	-13.72	AV	Horizontal

Note:

(1) Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor (2)All other emissions more than 20dB below the limit.



Spurious Emission	Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz								
EUT:	Boha Handheld Scanner	RD52							
Temperature:	20 ℃	Relative Humidity:	48%						
Test Mode:	Mode2/ Mode4	Test By:	Jerry Xie						

Frequenc	Meter	Cable	Antenna	Preamp	Emission	Limits	Margin	Detector			
У	Reading	Loss	Factor	Factor	Level	Linits	Margin	Detector	Comment		
(MHz)	(dBµV)	(dB)	dB/m	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре			
	GFSK										
2310.00	60.54	2.97	27.80	43.80	47.51	74	-26.49	Pk	Horizontal		
2310.00	41.66	2.97	27.80	43.80	28.63	54	-25.37	AV	Horizontal		
2310.00	60.81	2.97	27.80	43.80	47.78	74	-26.22	Pk	Vertical		
2310.00	42.43	2.97	27.80	43.80	29.40	54	-24.60	AV	Vertical		
2390.00	61.94	3.14	27.21	43.80	48.49	74	-25.51	Pk	Vertical		
2390.00	41.24	3.14	27.21	43.80	27.79	54	-26.21	AV	Vertical		
2390.00	59.96	3.14	27.21	43.80	46.51	74	-27.49	Pk	Horizontal		
2390.00	42.27	3.14	27.21	43.80	28.82	54	-25.18	AV	Horizontal		
2483.50	60.88	3.58	27.70	44.00	48.16	74	-25.84	Pk	Vertical		
2483.50	42.76	3.58	27.70	44.00	30.04	54	-23.96	AV	Vertical		
2483.50	61.34	3.58	27.70	44.00	48.62	74	-25.38	Pk	Horizontal		
2483.50	42.52	3.58	27.70	44.00	29.80	54	-24.20	AV	Horizontal		

Note: (1) All other emissions more than 20dB below the limit.



Spurious Emission in Restricted Band 3260MHz-18000MHz								
EUT:	Boha Handheld Scanner	Model No.:	RD52					
Temperature:	20 ℃	Relative Humidity:	48%					
Test Mode:	Mode2/ Mode4	Test By:	Jerry Xie					

Frequenc y	Readin g Level	Cable Loss	Antenn a	Preamp Factor	Emission Level	Limits	Margin	Detecto r	Commont
(MHz)	(dBµV)	(dB)	dB/m	(dB)	(dBµ V/m)	(dBµ V/m)	(dB)	Туре	Comment
3260	59.55	4.04	29.57	44.70	48.46	74	-25.54	Pk	Vertical
3260	51.47	4.04	29.57	44.70	40.38	54	-13.62	AV	Vertical
3260	59.53	4.04	29.57	44.70	48.44	74	-25.56	Pk	Horizontal
3260	50.36	4.04	29.57	44.70	39.27	54	-14.73	AV	Horizontal
3332	59.70	4.26	29.87	44.40	49.43	74	-24.57	Pk	Vertical
3332	48.66	4.26	29.87	44.40	38.39	54	-15.61	AV	Vertical
3332	60.04	4.26	29.87	44.40	49.77	74	-24.23	Pk	Horizontal
3332	49.16	4.26	29.87	44.40	38.89	54	-15.11	AV	Horizontal
17797	40.56	10.99	43.95	43.50	52.00	74	-22.00	Pk	Vertical
17797	30.10	10.99	43.95	43.50	41.54	54	-12.46	AV	Vertical
17788	40.58	11.81	43.69	44.60	51.48	74	-22.52	Pk	Horizontal
17788	30.23	11.81	43.69	44.60	41.13	54	-12.87	AV	Horizontal

Note: (1) All other emissions more than 20dB below the limit.



7.3 6DB BANDWIDTH

7.3.1 Applicable Standard

According to FCC Part 15.247(a)(2) and KDB 558074 D01 15.247 Meas Guidance v05r02 Section 8.2.

7.3.2 Conformance Limit

The minimum permissible 6dB bandwidth is 500 kHz.

7.3.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.3.4 Test Setup

Please refer to Section 6.1 of this test report.

7.3.5 Test Procedure

The testing follows Subclause 11.8 of ANSI C63.10

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously.

The EUT was operating in controlled its channel.

Use the following spectrum analyzer settings:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) \ge 3*RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.

g) 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.

7.3.6 Test Results

EUT:	Boha Handheld Scanner	Model No.:	RD52
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Jerry Xie



7.4 DUTY CYCLE

7.4.1 Applicable Standard

According to KDB 558074 D01 15.247 Meas Guidance v05r02s Section 6.

7.4.2 Conformance Limit

No limit requirement.

7.4.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.4.4 Test Setup

Please refer to Section 6.1 of this test report.

7.4.5 Test Procedure

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW \geq OBW if possible; otherwise, set RBW to the largest available value. Set VBW \geq RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T \leq 16.7 microseconds.)

The transmitter output is connected to the Spectrum Analyzer. We tested accroding to the zero-span measurement method, 6.0)b) in KDB 558074

The largest available value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if $T \le 6.25$ microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/T.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously. The EUT was operating in controlled its channel. Use the following spectrum analyzer settings: Span = Zero Span RBW = 8MHz(the largest available value) VBW = 8MHz (\geq RBW) Number of points in Sweep >100 Detector function = peak Trace = Clear write Measure T_{total} and T_{on} Calculate Duty Cycle = T_{on} / T_{total}



7.4.6 Test Results

EUT:	Boha Handheld Scanner	Model No.:	RD52
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Jerry Xie



7.5 **PEAK OUTPUT POWER**

7.5.1 Applicable Standard

According to FCC Part 15.247(b)(3) and KDB 558074 D01 15.247 Meas Guidance v05r02 Section 8.3.1.

7.5.2 Conformance Limit

The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 2400 - 2483.5 MHz bands shall not exceed: 1 Watt (30dBm). If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

7.5.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.5.4 Test Setup

Please refer to Section 6.1 of this test report.

7.5.5 Test Procedure

The testing follows Subclause 11.9.1.1 of ANSI C63.10 The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously. The EUT was operating in controlled its channel. Use the following spectrum analyzer settings: Set the RBW \geq DTS bandwidth. Set VBW =3*RBW. Set the span \geq 3*RBW Set Sweep time = auto couple. Set Detector = peak. Set Trace mode = max hold. Allow trace to fully stabilize. Use peak marker function to determine the peak amplitude level.

7.5.6 Test Results

EUT:	Boha Handheld Scanner	Model No.:	RD52
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Jerry Xie



7.6 **POWER SPECTRAL DENSITY**

7.6.1 Applicable Standard

According to FCC Part 15.247(e) and KDB 558074 D01 15.247 Meas Guidance v05r02 Section 8.4.

7.6.2 Conformance Limit

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.6.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.6.4 Test Setup

Please refer to Section 6.1 of this test report.

7.6.5 Test Procedure

The testing follows Measurement Procedure Subclause 11.10.2 of ANSI C63.10 This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously.

The EUT was operating in controlled its channel.

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5*DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW \geq 3 RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



7.6.6 Test Results

EUT:	Boha Handheld Scanner	Model No.:	RD52
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Jerry Xie



7.7 CONDUCTED BAND EDGE MEASUREMENT

7.7.1 Applicable Standard

According to FCC Part 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 Section 8.7.

7.7.2 Conformance 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 20 dB.

7.7.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.7.4 Test Setup

Please refer to Section 6.1 of this test report.

7.7.5 Test Procedure

The testing follows FCC KDB 558074 D01 15.247 Meas Guidance v05r02 Section 8.7.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously.

The EUT was operating in controlled its channel.

Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.

Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

Repeat above procedures until all measured frequencies were complete.

7.7.6 Test Results

EUT:	Boha Handheld Scanner	Model No.:	RD52
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode4	Test By:	Jerry Xie



7.8 SPURIOUS RF CONDUCTED EMISSIONS

7.8.1 Conformance 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.

7.8.2 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.8.3 Test Setup

Please refer to Section 6.1 of this test report.

7.8.4 Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 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=100kHz and VBW= 300KHz to measure the peak field strength , and measure frequeny range from 9KHz to 26.5GHz.

7.8.5 Test Results

Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.



7.9 ANTENNA APPLICATION

7.9.1 Antenna Requirement

15.203 requirement: For intentional device, according to 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.

7.9.2 Result

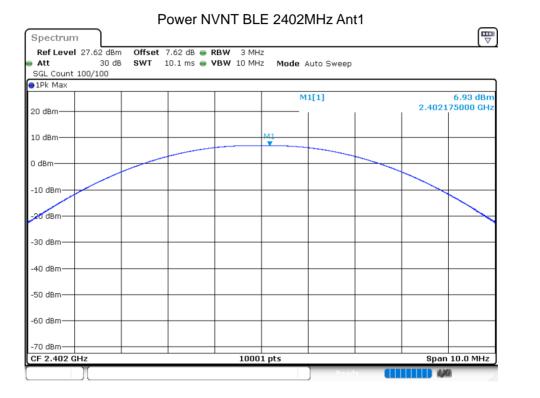
The EUT antenna is permanent attached FPCB antenna (Gain: 1dBi). It comply with the standard requirement.



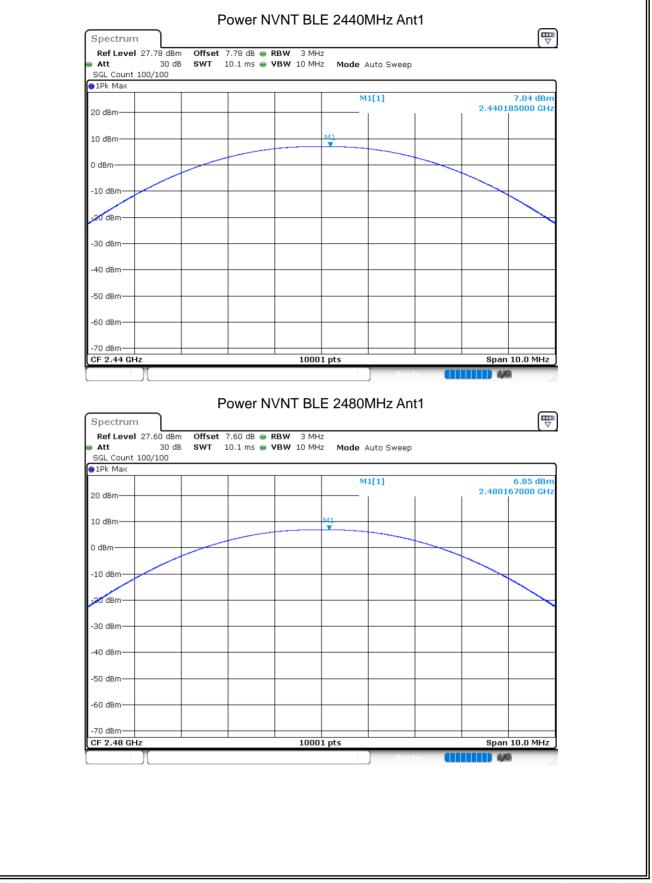
8 TEST RESULTS

8.1 MAXIMUM CONDUCTED OUTPUT POWER

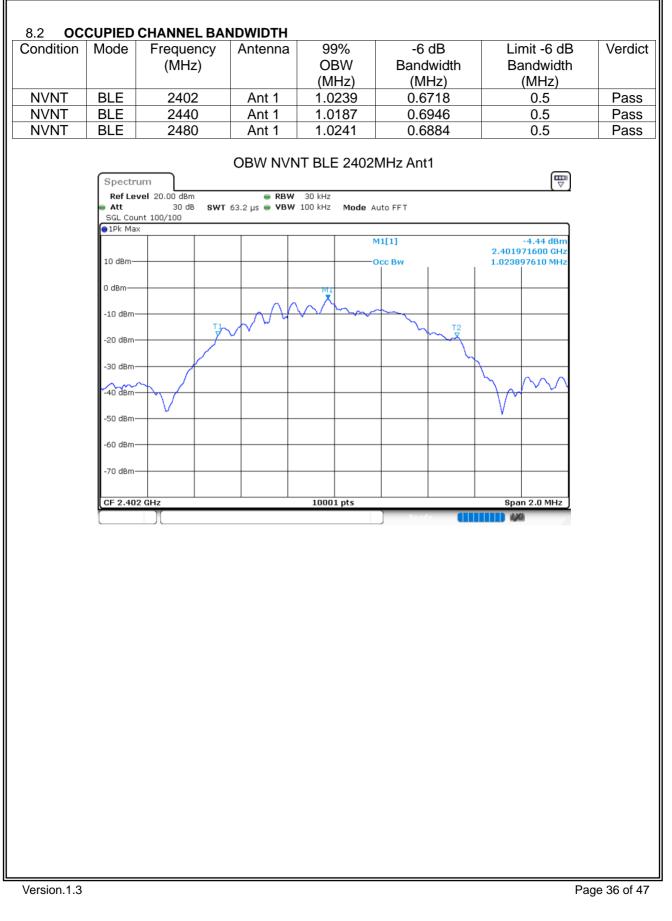
Condition	Mode	Frequency	Antenna	Conducted	Duty	Total	Limit	Verdict
		(MHz)		Power (dBm)	Factor	Power	(dBm)	
					(dB)	(dBm)		
NVNT	BLE	2402	Ant 1	6.926	0	6.926	30	Pass
NVNT	BLE	2440	Ant 1	7.042	0	7.042	30	Pass
NVNT	BLE	2480	Ant 1	6.853	0	6.853	30	Pass







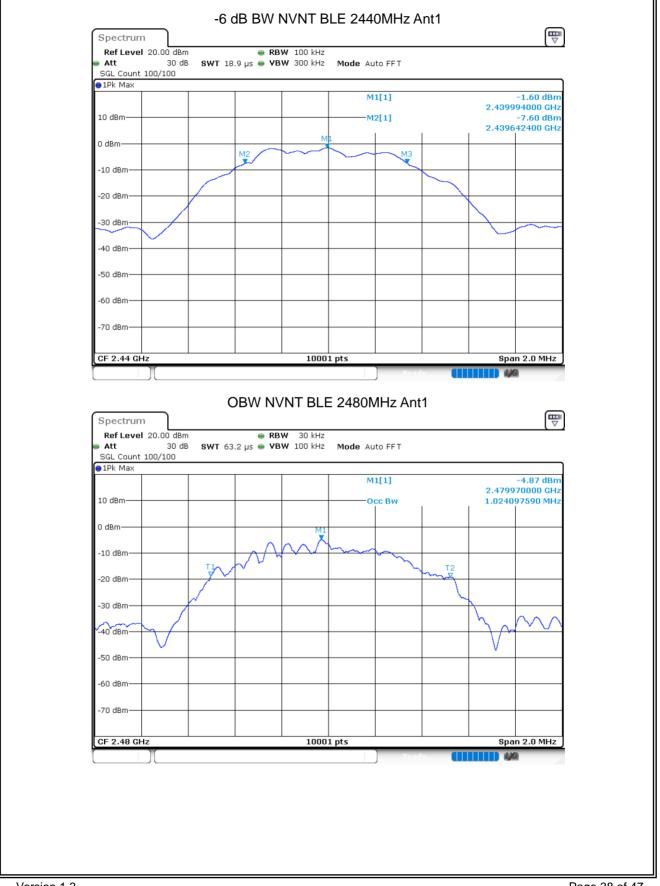




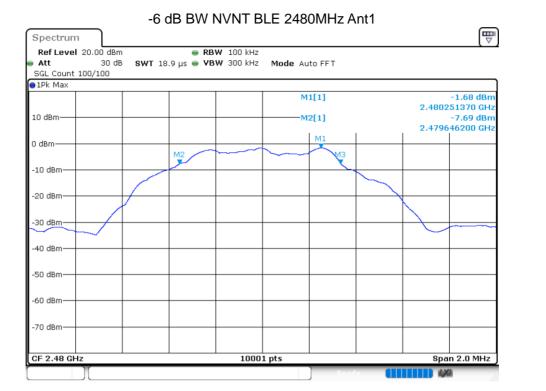








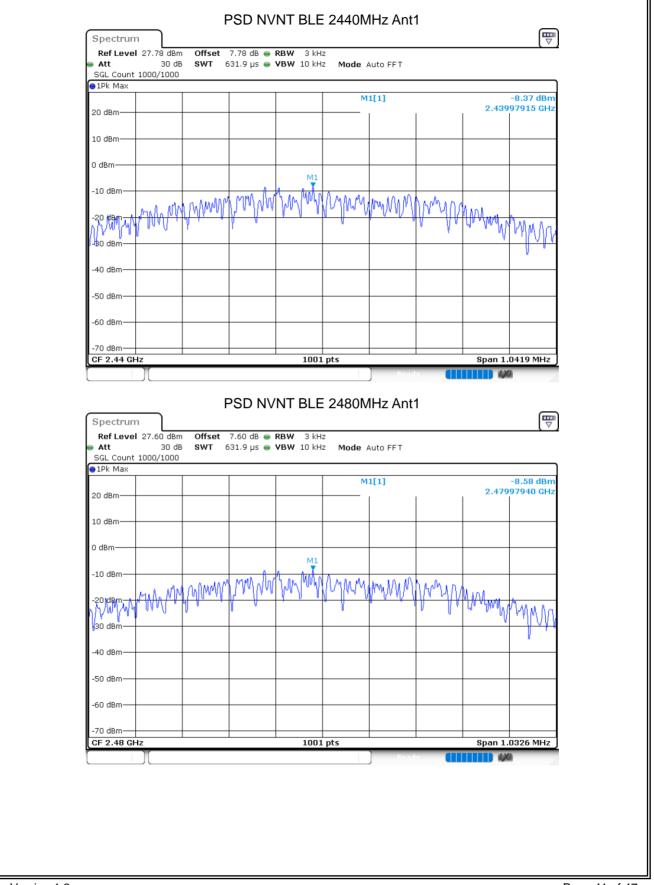




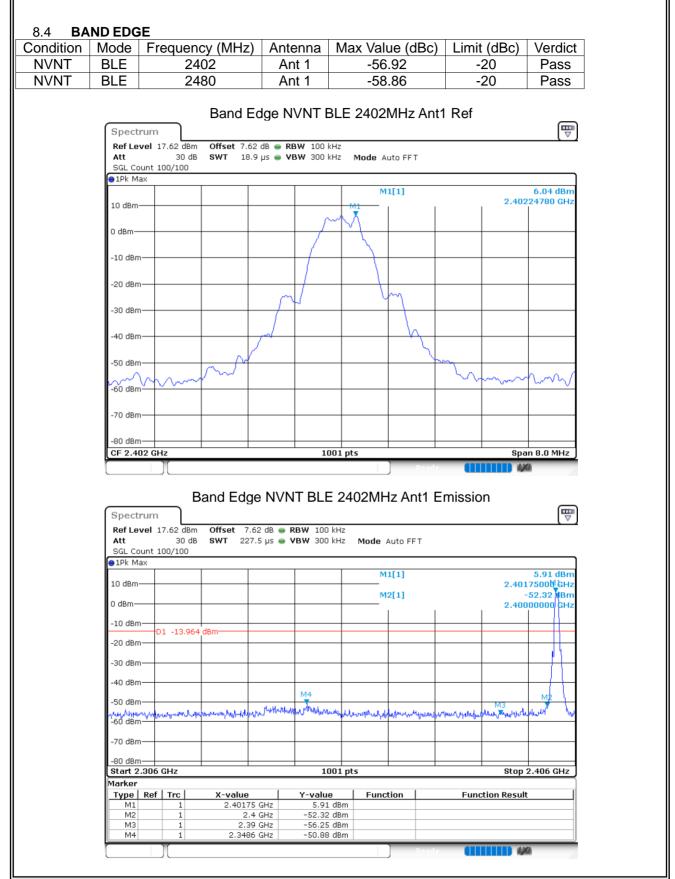


8.3 M ondition	Mode	POWER S				Max PSI	D (dBm/	/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	BLE	24	02	Ant			-8.49			8	Pass
NVNT	BLE	24		Ant			-8.37			8	Pass
NVNT	BLE	24	80	Ant	:1	-	-8.584			8	Pass
	👄 Att	rum evel 27.62 dBm 30 dB ount 1000/1000	Offset 7.	62 dB 👄 R	BW 3kH	E 2402N		1			
	●1Pk M	ax				M	1[1]			-8.49 dBm	
	20 dBm					IMI	1(1)			97885 GHz	
	10 dBm										
	0 dBm—										
	-10 dBm				M1						
	10 0.01	. A AMA	mmm	MAM	M	MMM	phym	ANMAN	ALION		
	-20 dBn /1 ///	᠕ᢔᢂᠰᡗ᠉᠋			<u> </u>			<u> </u>	- All Mary	MANAN	
	-30 dBm	י ע ר							U		
										U	
	-40 dBm	1									
	-50 dBm	ı—									
	-60 dBm	η									
	-70 dBm				100	L pts			Snan 1.	0077 MHz	
							Read	v di			



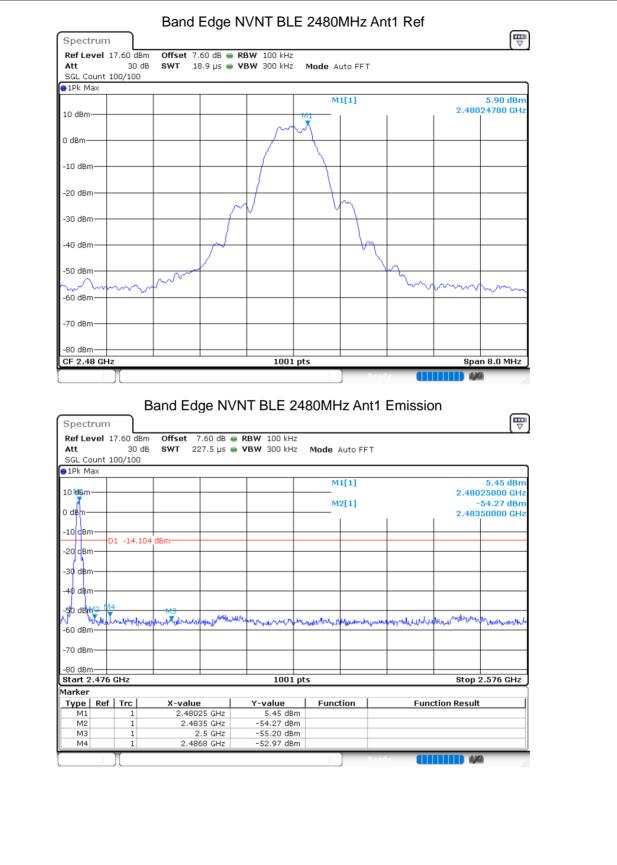






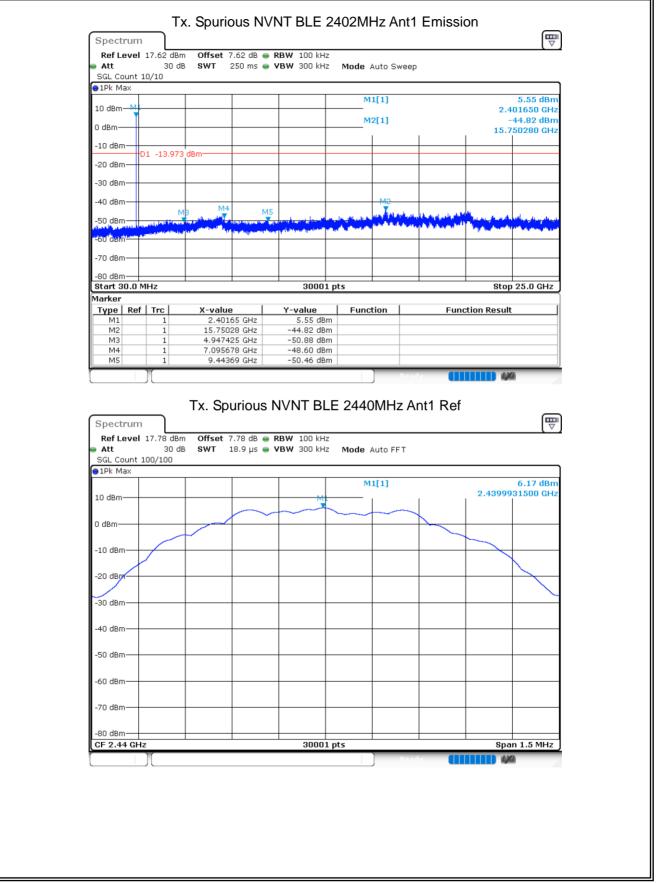
Version.1.3



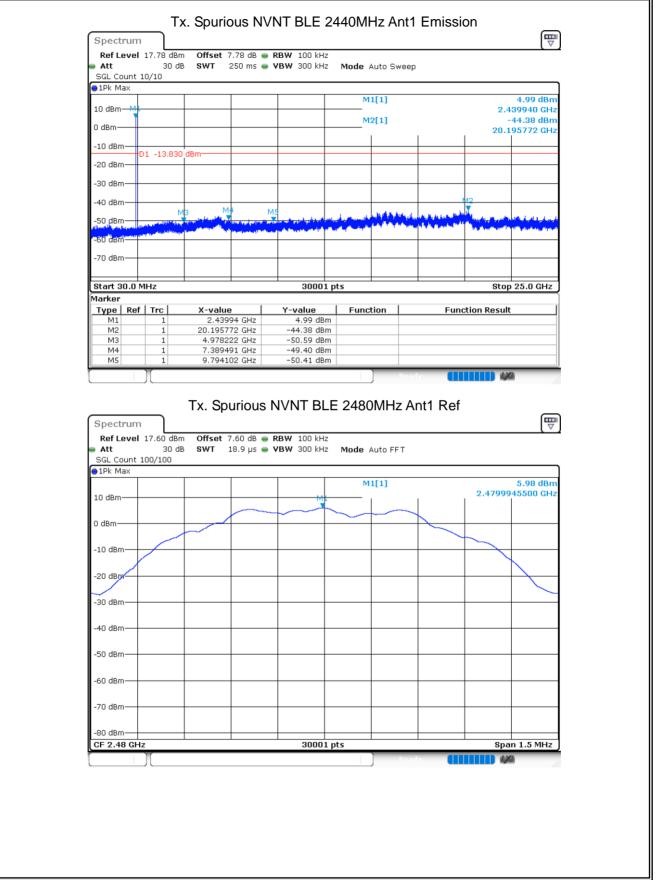














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	evel	17.60		-	• RBW 100 kHz						
Att		-	D dB SWT 25	D ms 🧉	• VBW 300 kHz	Mode A	uto S\	veep			
SGL C		0/10									
1Pk M	lax										
	м					M1	[1]				6.08 dBm
0 dBm											79890 GHz
dBm-						M2	2[1]				-44.18 dBm
ubiii-										19.7	57965 GHz
10 dBr	n										
		1 -14	019 dBm								├ ──
20 dBr	n—										
30 dBr	n –										
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to ubi	"		M3 M4		M5				. 🔻		
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arker					00001					0.01	2010 0112
Туре	Ref	Trc	X-value	1	Y-value	Funct	ion	1	Eune	tion Result	. 1
M1	Ker	1	2,47989	GH7	6.08 dBm		1011	<u> </u>	- Tune	cion Resul	· · · · · · · · · · · · · · · · · · ·
M2		1	19.757965		-44.18 dBm						
M3		1	5.019838		-49.85 dBm						
M4		1	7.401144		-49.95 dBm						
		1	10.115383		-50.22 dBm						

END OF REPORT

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