TEST REPORT

Report Number	:	TZ0129241109FRF01
Product Name	:	Bluetooth headset
Model/Type reference	:	YYK-Q16
FCC ID	:	2AOZMYYK-Q16
Prepared for	:	Shenzhen KingAnDa Technology Development Co., Ltd. East Block NO. 2, Shangxue Industrial Zone, Bantian Street, Longgang District, Shenzhen, China

Prepared By	:	Shenzhen Tongzhou Testing Co., Ltd. 1st Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street, Longhua, Shenzhen, China
Standards	:	FCC CFR Title 47 Part 15C, ANSI C63.10: 2020
Date of Test	:	2024-11-09 to 2024-11-13
Date of Issue	:	2024-11-13

Prepared by	:	Lena Wen (File administrators)	Lena Wen
Reviewed by	:	Max Zhang (Technical Manager)	Max Zhang
Approved by	:	Andy Zhang (General Manager)	Andy Zhang

** Report Revise Record **

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2024-11-13	Valid	Initial release

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1. GENERAL INFORMATION

1.1. Client Information

Applicant	:	Shenzhen KingAnDa Technology Development Co., Ltd.
Address	:	East Block NO. 2, Shangxue Industrial Zone, Bantian Street, Longgang District, Shenzhen, China
Manufacturer	:	Shenzhen KingAnDa Technology Development Co., Ltd.
Address	:	East Block NO. 2, Shangxue Industrial Zone, Bantian Street, Longgang District, Shenzhen, China

1.2. Description of Device (EUT)

Product Name	:	Bluetooth headset
Trade Mark	:	YYK
Model Number	:	YYK-Q16
Model Declaration	:	N/A
Test Model	:	YYK-Q16
Power Supply	:	DC 5V from charging case or 3.7V from battery
Hardware version	:	N/A
Software version	:	N/A

1.3. Wireless Function Tested in this Report

Bluetooth BR/EDR		
Operation Frequency	:	2402 – 2480 MHz
Channel Number	:	79 Channels
Modulation Technology	:	GFSK, π/4-DQPSK, 8-DPSK
Data Rates	:	1/2/3Mbps
Antenna Type And Gain	:	internal antenna: 3.19dBi

Note 1: Antenna position refer to EUT Photos.
Note 2: the above information was supplied by the applicant.

1.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

○supplied by the manufacturer○

●supplied by the lab

●	Adapter	Model:	HW-095200CHQ
		Input:	5V
		Output:	1A

1.5. Description of Test Facility

FCC

Designation Number: CN1275

Test Firm Registration Number: 167722

Shenzhen Tongzhou Testing Co.,Ltd has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA

Certificate Number: 5463.01

Shenzhen Tongzhou Testing Co.,Ltd has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

IC

ISED#: 22033

CAB identifier: CN0099

Shenzhen Tongzhou Testing Co.,Ltd has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4 and CISPR 16-1-4:2010

1.6. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the Shenzhen Tongzhou Testing Co.,Ltd quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.7. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.26dB	(1)
		30MHz~1000MHz	±3.92dB	(1)
		1GHz~40GHz	±5.62dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±2.71dB	(1)

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

1.8. Description of Test Modes

The EUT works in the X-axis, Y-axis, Z-axis. The following operating modes were applied for the related test items. All test modes were tested, only the result of the worst case was recorded in the report.

Mode of Operations	Frequency Range (MHz)	Data Rate (Mbps)
Bluetooth	2402	1/2/3
	2441	1/2/3
	2480	1/2/3

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be GFSK-BT and recorded in this report.

Worst-case mode and channel used for 150 kHz-30 MHz power line conducted emissions was the mode and channel with the highest output power, which was determined to be GFSK-BT and recorded in this report.

1.9. Frequency of Channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
0	2402	40	2442
1	2403	---	---
2	2404	---	---
---	---	76	2480
---	---	77	2479
38	2440	78	2480
39	2441		

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2020, FCC CFR 47 PART 15C 15.207, 15.209, 15.247 and DA 00-705.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C.

2.3. Test Sample

Sample ID	Description
TZ0129241109FRF01–1#	Engineer sample – continuous transmit
TZ0129241109FRF01–2#	Normal sample – Intermittent transmit

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by engineer mode (#EngineerComand) provided by application.

3.3. Special Accessories

No.	Equipment	Manufacturer	Model No.	Serial No.	Length	shielded/ unshielded	Notes
/	/	/	/	/	/	/	/

3.4. Block Diagram/Schematics

Please refer to the related document.

3.5. Equipment Modifications

Shenzhen Tongzhou Testing Co.,Ltd has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Test Sample	Result
§15.247(b)(1)	Maximum Peak Conducted Output Power	TZ0129241109FRF01–1#	Compliant
§15.247(a)(1)	Frequency Separation And 20 dB Bandwidth	TZ0129241109FRF01–1#	Compliant
/	Occupied Bandwidth	TZ0129241109FRF01–1#	Note 1
§15.247(a)(1)(iii)	Number Of Hopping Frequency	TZ0129241109FRF01–1#	Compliant
§15.247(a)(1)(iii)	Time Of Occupancy (Dwell Time)	TZ0129241109FRF01–1#	Compliant
§15.209, §15.247(d)	Radiated and Conducted Spurious Emissions	TZ0129241109FRF01–1# TZ0129241109FRF01–2#	Compliant
§15.205	Emissions at Restricted Band	TZ0129241109FRF01–1#	Compliant
§15.207(a)	Conducted Emissions	TZ0129241109FRF01–2#	Compliant
§15.203	Antenna Requirements	TZ0129241109FRF01–1#	Compliant
Note 1: only for report purpose.			

Remark: The measurement uncertainty is not included in the test result.

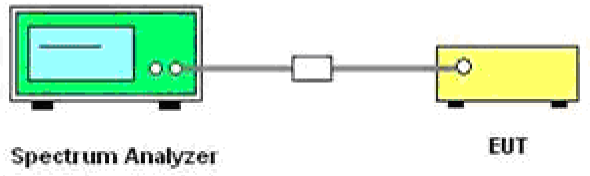
5. MEASUREMENT RESULTS

5.1. Maximum Peak Conducted Output Power

5.1.1. Limit

According to §15.247(b)(1), For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

5.1.2. Block Diagram of Test Setup



5.1.3. Test Procedure

a) Use the following spectrum analyzer settings:
  1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
  2) RBW > 20 dB bandwidth of the emission being measured.
  3) VBW ≥ RBW.
  4) Sweep: Auto.
  5) Detector function: Peak.
  6) Trace: Max hold.
b) Allow trace to stabilize.
c) Use the marker-to-peak function to set the marker to the peak of the emission.
d) The indicated level is the peak output power, after any corrections for external attenuators and cables.
e) A plot of the test results and setup description shall be included in the test report.

5.1.4. Test Results

Pass

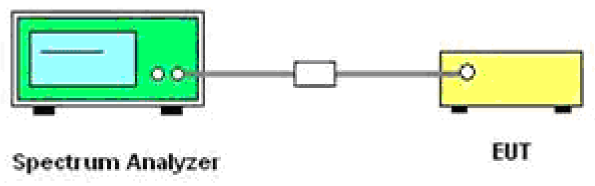
Remark:
1. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.
2. Plesase refer to Appendix Test Data for BT(BDR&EDR) for Maximum peak conducted output power test data

5.2. Frequency Separation and 20 dB Bandwidth

5.2.1. Limit

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

5.2.2. Block Diagram of Test Setup



5.2.3. Test Procedure

Frequency separation test procedure:
1). Place the EUT on the table and set it in transmitting mode.
2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
3). Set center frequency of Spectrum Analyzer = middle of hopping channel.
4). Set the Spectrum Analyzer as RBW = 300 kHz, VBW = 300 kHz, Span = wide enough to capture the peaks of two adjacent channels, Sweep = auto.
5). Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

20dB bandwidth test procedure:
1). Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel.
2). RBW ≥1% of the 20 dB bandwidth, VBW ≥RBW.
3). Detector function = peak.
4). Trace = max hold.

5.2.4. Test Results

Pass

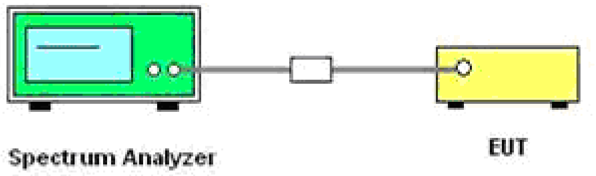
Remark:
1. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.
2. Plesase refer to Appendix Test Data for BT(BDR&EDR) for 20dB Bandwidth test data
3. Plesase refer to Appendix Test Data for BT(BDR&EDR) for Carrier Frequency Separation test data

5.3. Number of Hopping Frequency

5.3.1. Limit

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz- 2483.5 MHz bands shall use at least 15 channels. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.3.2. Block Diagram of Test Setup



5.3.3. Test Procedure

1). Place the EUT on the table and set it in transmitting mode.
2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
3) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
4) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
5) VBW ≥ RBW.
6) Sweep: Auto.
7) Detector function: Peak.
8) Trace: Max hold.
9) Allow the trace to stabilize.

5.3.4. Test Results

Pass

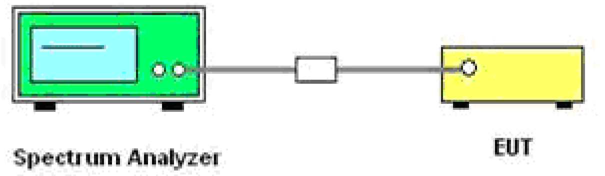
Remark:
1. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.
2. Plesase refer to Appendix Test Data for BT(BDR&EDR) for Hopping Channel Number test data.

5.4. Time of Occupancy (Dwell Time)

5.4.1. Limit

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz- 2483.5 MHz bands shall use at least 15 channels. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.4.2. Block Diagram of Test Setup



5.4.3. Test Procedure

1). Place the EUT on the table and set it in transmitting mode.
2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
3). Set center frequency of Spectrum Analyzer = operating frequency.
4). Set the Spectrum Analyzer as RBW=510kHz, VBW=3MHz,Span = 0Hz, Sweep = 3.16s.
5). Repeat above procedures until all frequency measured was complete.

The EUT must have its hopping function enabled.
Use the following spectrum analyzer settings:
Span = zero span, centered on a hopping channel
RBW = 1 MHz
VBW ⩾ RBW
Sweep = as necessary to capture the entire dwell time per hopping channel
Detector function = peak
Trace = max hold
If possible, use the marker-delta function to determine the dwell time.
If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.
The limit is specified in one of the subparagraphs of this Section.
Submit this plot(s). An oscilloscope may be used instead of a spectrum analyzer.

5.4.4. Test Results

Pass

☐**Option 1**
The Dwell Time=Burst Width*Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4[s]*hopping number=0.4[s]*79[ch]=31.6[s*ch].
The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop.
The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a hopping rate of 1600 [ch*hop/s] for all channels. So the final hopping rate for all channels is 1600/6=266.67 [ch*hop/s]
The hops per second on one channel: 266.67 [ch*hops/s]/79 [ch]=3.38 [hop/s].
The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]*31.6[s*ch]=106.67 [hop*ch].
The dwell time for all channels hopping: 106.67 [hop*ch]*Burst Width [ms/hop/ch].

☒**Option 2**
The Dwell Time=Burst Width*Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4[s]*hopping number=0.4[s]*79[ch]=31.6[s*ch].

The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop.
The dwell time for all channels hopping: [hops/3.16s]*10*Burst Width [ms/hop/ch].

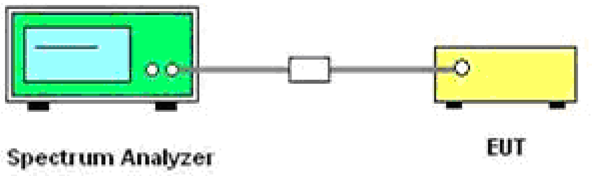
Remark:
1. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.
2. Plesase refer to Appendix Test Data for BT(BDR&EDR) for Dwell Time test data

5.5. Conducted Spurious Emissions and Band Edges Test

5.5.1. 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. Attenuation below the general limits specified in Section 15.209(a) is not required.

5.5.2. Block Diagram of Test Setup



5.5.3. Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 300 KHz.
Measurements are made over the 9 kHz to 26.5GHz range with the transmitter set to the lowest, middle, and highest channels

5.5.4. Test Results

Pass

Remark:
1. Test results including cable loss.
2. Measured at difference Packet Type for each mode and recorded worst case for each mode.
3. Plesase refer to Appendix Test Data for BT(BDR&EDR) for Band-edge Emissions test data.
4. Plesase refer to Appendix Test Data for BT(BDR&EDR) for Conducted Spurious Emissions test data.

5.6. Restricted Band Emission Limit

5.6.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

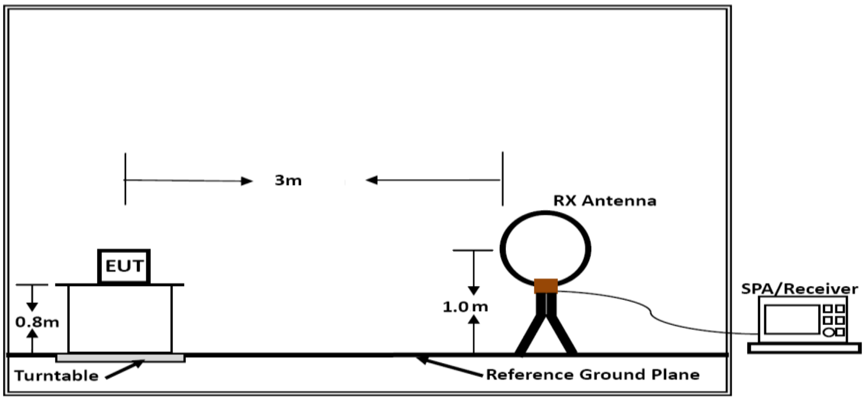
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	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			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
\2\ Above 38.6

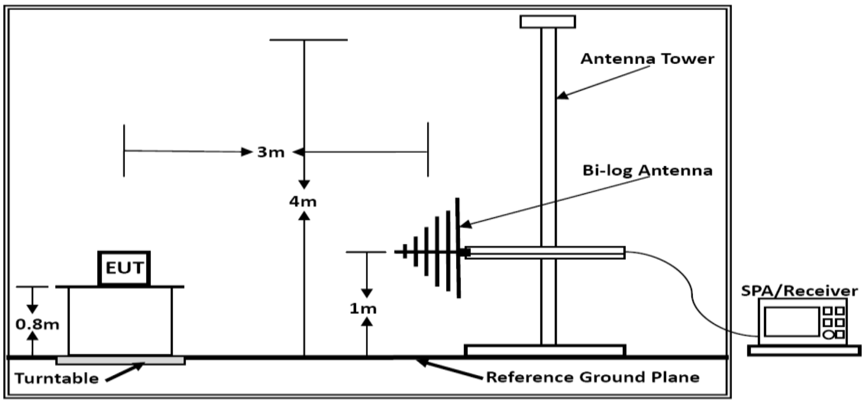
According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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

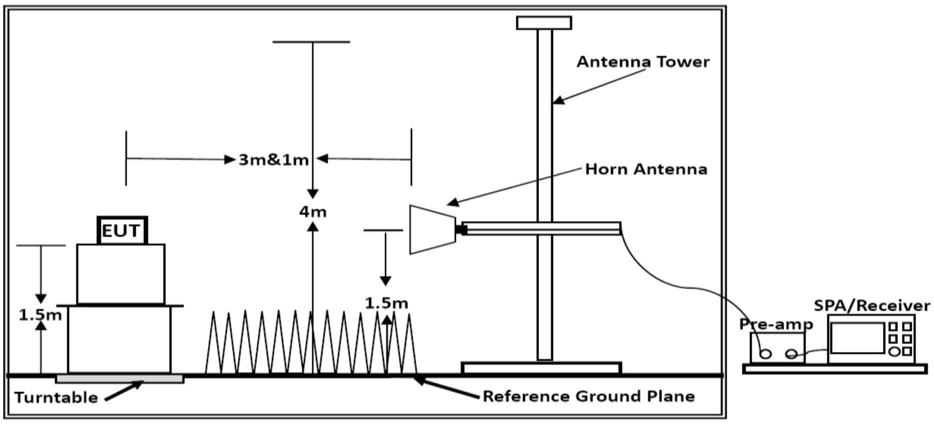
5.6.2. Block Diagram of Test Setup



Below 30MHz



Below 1GHz



Above 1GHz

Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1.5m]) (dB).

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.6.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.
Premeasurement:
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna height is 1.0 meter.
--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions
Final measurement:
--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.
Premeasurement:
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna is polarized vertical and horizontal.
--- The antenna height changes from 1 to 3 meter.
--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.
Final measurement:
--- The final measurement will be performed with minimum the six highest peaks.
--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.
--- The final measurement will be done with QP detector with an EMI receiver.
--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 40 GHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.
--- The EUT was set into operation.
Premeasurement:
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna is polarized vertical and horizontal.
--- The antenna height scan range is 1 meter to 2.5 meter.
--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.
Final measurement:
--- The final measurement will be performed with minimum the six highest peaks.
--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meters. This procedure is repeated for both antenna polarizations.
--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 1 meter.
--- The EUT was set into operation.
Premeasurement:
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.
Final measurement:
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

5.6.4. Measuring Instruments and Setting

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 3 MHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 3MHz for Peak, 1 MHz / 3 MHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.6.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.6.6. Test Results

Pass

Results of Radiated Emissions (9 KHz~30MHz)

Temperature	22.5℃	Humidity	56%
Test Engineer	Tony Luo	Configurations	Bluetooth TX

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

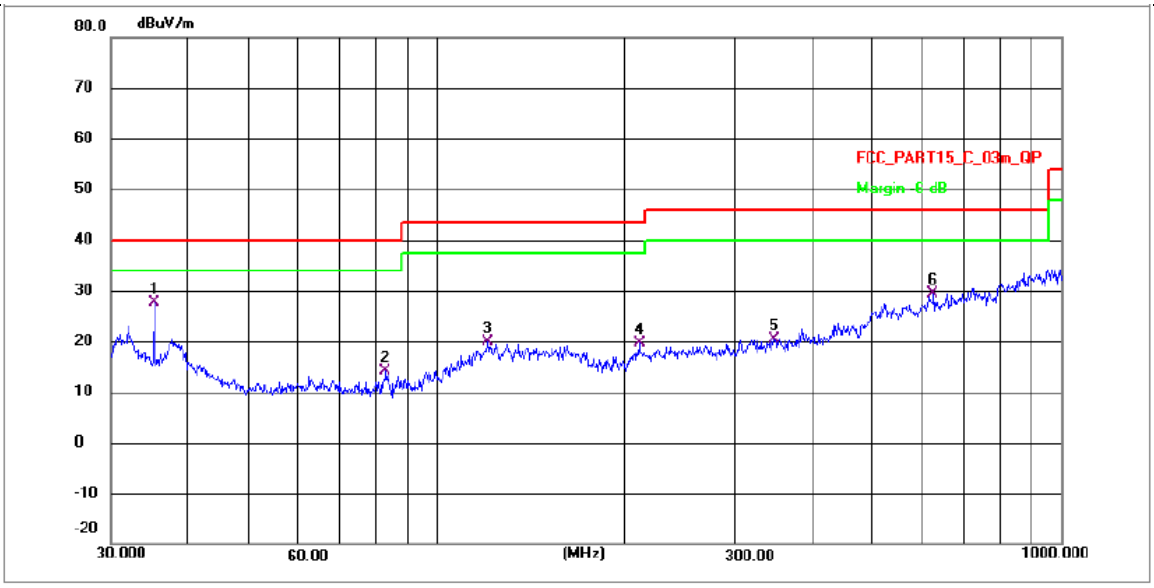
Note:
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
Limit line = specific limits (dBuV) + distance extrapolation factor.

Results of Radiated Emissions (30MHz ~1GHz)

Temperature	22.5℃	Humidity	56%
Test Engineer	Tony Luo	Configurations	Bluetooth TX

Left:

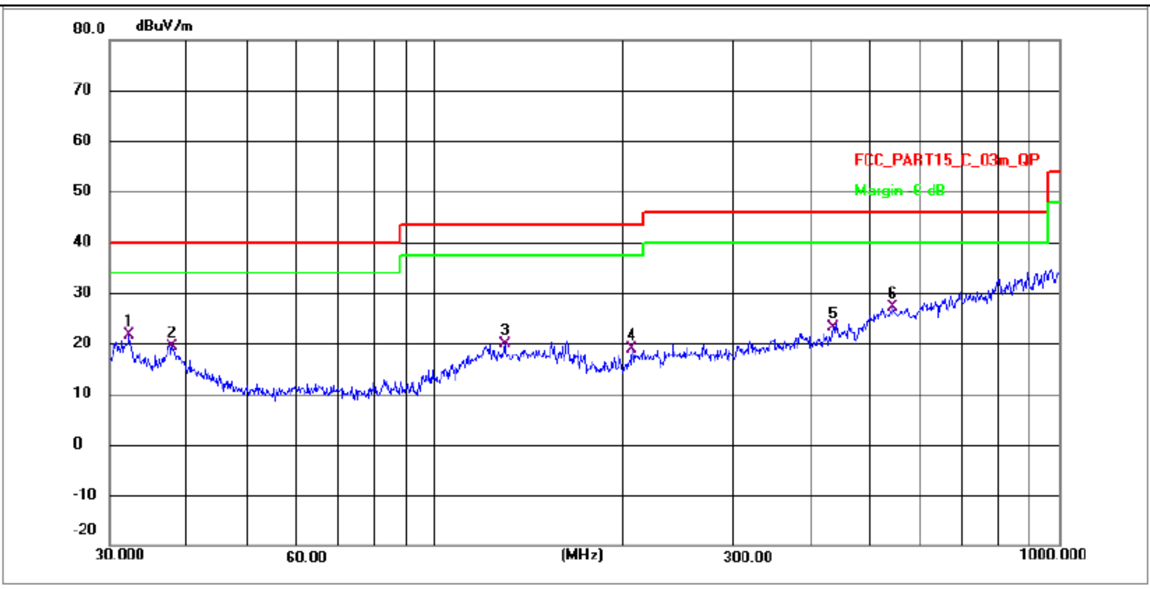
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1 *	35.2512	37.32	-9.68	27.64	40.00	-12.36	QP	P
2	82.7932	36.98	-22.73	14.25	40.00	-25.75	QP	P
3	120.6991	42.26	-22.28	19.98	43.50	-23.52	QP	P
4	210.7860	40.97	-21.42	19.55	43.50	-23.95	QP	P
5	347.4178	40.65	-20.24	20.41	46.00	-25.59	QP	P
6	623.9830	47.56	-18.17	29.39	46.00	-16.61	QP	P

***Note:
1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]
2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]
3.Pre-scan all modes and recorded the worst case results in this report.

Horizontal

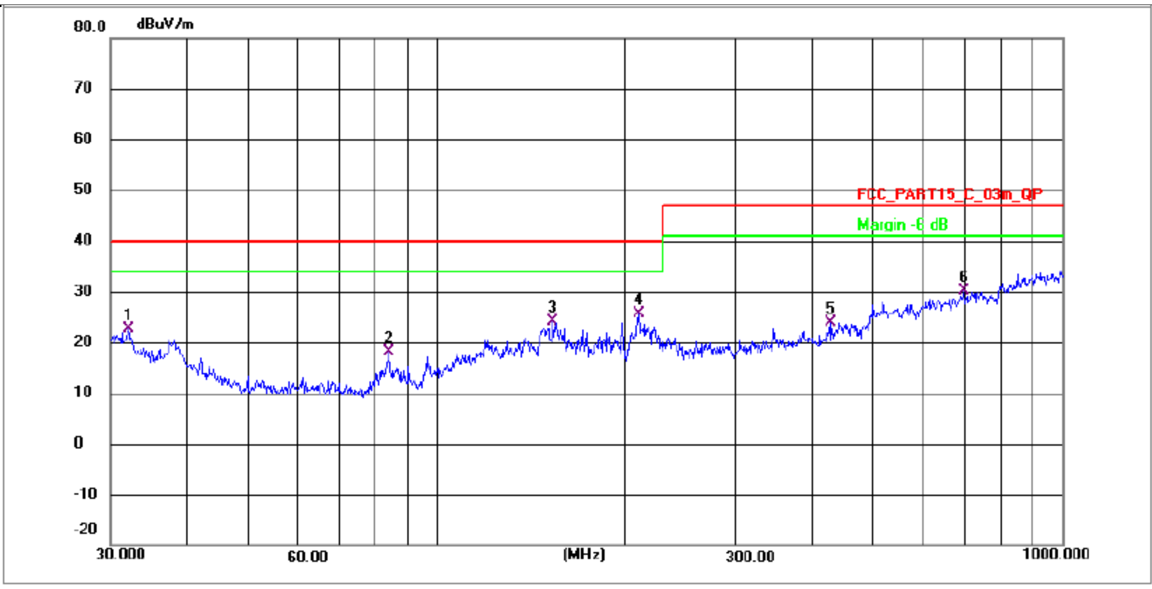


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1 *	32.4059	31.24	-9.70	21.54	40.00	-18.46	QP	P
2	37.8121	29.13	-9.65	19.48	40.00	-20.52	QP	P
3	129.2410	42.01	-22.20	19.81	43.50	-23.69	QP	P
4	207.1226	40.37	-21.47	18.90	43.50	-24.60	QP	P
5	435.5898	42.57	-19.52	23.05	46.00	-22.95	QP	P
6	542.3225	45.73	-18.72	27.01	46.00	-18.99	QP	P

***Note:
1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]
2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]
3.Pre-scan all modes and recorded the worst case results in this report.

Right

Vertical

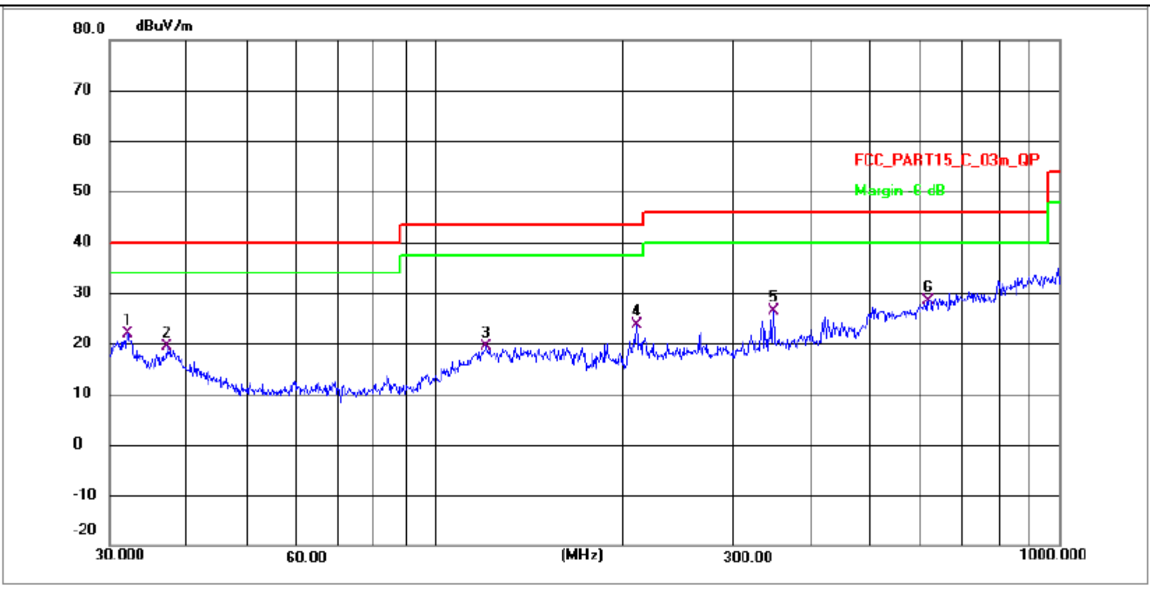


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	32.1231	32.40	-9.70	22.70	40.00	-17.30	QP	P
2	84.1100	40.72	-22.71	18.01	40.00	-21.99	QP	P
3	153.2004	46.16	-21.98	24.18	40.00	-15.82	QP	P
4 *	210.4168	46.95	-21.44	25.51	40.00	-14.49	QP	P
5	425.7739	43.60	-19.61	23.99	47.00	-23.01	QP	P
6	695.6360	47.74	-17.64	30.10	47.00	-16.90	QP	P

***Note:

1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]
2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]
3.Pre-scan all modes and recorded the worst case results in this report.

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	32.2359	31.54	-9.70	21.84	40.00	-18.16	QP	P
2	37.1550	29.02	-9.66	19.36	40.00	-20.64	QP	P
3	120.9109	41.67	-22.27	19.40	43.50	-24.10	QP	P
4	210.4168	45.16	-21.44	23.72	43.50	-19.78	QP	P
5	348.0274	46.62	-20.23	26.39	46.00	-19.61	QP	P
6 *	617.4534	46.63	-18.22	28.41	46.00	-17.59	QP	P

***Note:
1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]
2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]
3.Pre-scan all modes and recorded the worst case results in this report.

Results of Radiated Emissions (1GHz ~25GHz)

Temperature	22.5℃	Humidity	56%
Test Engineer	Tony Luo	Configurations	Bluetooth TX

Left:

The worst test result for GFSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4804	54.71	33.06	35.04	3.94	56.67	74	17.33	Peak	Horizontal
4804	35.30	33.06	35.04	3.94	37.26	54	16.74	Average	Horizontal
4804	53.11	33.06	35.04	3.94	55.07	74	18.93	Peak	Vertical
4804	38.75	33.06	35.04	3.94	40.71	54	13.29	Average	Vertical

The worst test result for GFSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4882	53.23	33.16	35.15	3.96	55.2	74	18.8	Peak	Horizontal
4882	36.11	33.16	35.15	3.96	38.08	54	15.92	Average	Horizontal
4882	54.13	33.16	35.15	3.96	56.1	74	17.9	Peak	Vertical
4882	37.75	33.16	35.15	3.96	39.72	54	14.28	Average	Vertical

The worst test result for GFSK, Channel 78 / 2480 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4960	48.56	33.26	35.14	3.98	50.66	74	23.34	Peak	Horizontal
4960	38.67	33.26	35.14	3.98	40.77	54	13.23	Average	Horizontal
4960	48.31	33.26	35.14	3.98	50.41	74	23.59	Peak	Vertical
4960	35.49	33.26	35.14	3.98	37.59	54	16.41	Average	Vertical

The worst test result for π/4-DQPSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4804	53.06	33.06	35.04	3.94	55.02	74	18.98	Peak	Horizontal
4804	34.53	33.06	35.04	3.94	36.49	54	17.51	Average	Horizontal
4804	54.06	33.06	35.04	3.94	56.02	74	17.98	Peak	Vertical
4804	34.19	33.06	35.04	3.94	36.15	54	17.85	Average	Vertical

The worst test result for π/4-DQPSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4882	50.11	33.16	35.15	3.96	52.08	74	21.92	Peak	Horizontal
4882	34.14	33.16	35.15	3.96	36.11	54	17.89	Average	Horizontal
4882	54.58	33.16	35.15	3.96	56.55	74	17.45	Peak	Vertical
4882	35.90	33.16	35.15	3.96	37.87	54	16.13	Average	Vertical

The worst test result for π/4-DQPSK, Channel 78 / 2480 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4960	53.16	33.26	35.14	3.98	55.26	74	18.74	Peak	Horizontal
4960	34.87	33.26	35.14	3.98	36.97	54	17.03	Average	Horizontal
4960	48.93	33.26	35.14	3.98	51.03	74	22.97	Peak	Vertical
4960	38.37	33.26	35.14	3.98	40.47	54	13.53	Average	Vertical

The worst test result for 8-DPSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4804	49.30	33.06	35.04	3.94	51.26	74	22.74	Peak	Horizontal
4804	35.79	33.06	35.04	3.94	37.75	54	16.25	Average	Horizontal
4804	53.25	33.06	35.04	3.94	55.21	74	18.79	Peak	Vertical
4804	34.70	33.06	35.04	3.94	36.66	54	17.34	Average	Vertical

The worst test result for 8-DPSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4882	50.04	33.16	35.15	3.96	52.01	74	21.99	Peak	Horizontal
4882	36.57	33.16	35.15	3.96	38.54	54	15.46	Average	Horizontal
4882	47.75	33.16	35.15	3.96	49.72	74	24.28	Peak	Vertical
4882	37.23	33.16	35.15	3.96	39.2	54	14.8	Average	Vertical

The worst test result for 8-DPSK, Channel 78 / 2480 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4960	51.78	33.26	35.14	3.98	53.88	74	20.12	Peak	Horizontal
4960	38.08	33.26	35.14	3.98	40.18	54	13.82	Average	Horizontal
4960	52.94	33.26	35.14	3.98	55.04	74	18.96	Peak	Vertical
4960	33.95	33.26	35.14	3.98	36.05	54	17.95	Average	Vertical

Right:

The worst test result for GFSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4804	54.71	33.06	35.04	3.94	56.67	74	17.33	Peak	Horizontal
4804	35.30	33.06	35.04	3.94	37.26	54	16.74	Average	Horizontal
4804	53.11	33.06	35.04	3.94	55.07	74	18.93	Peak	Vertical
4804	38.75	33.06	35.04	3.94	40.71	54	13.29	Average	Vertical

The worst test result for GFSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4882	53.23	33.16	35.15	3.96	55.2	74	18.8	Peak	Horizontal
4882	36.11	33.16	35.15	3.96	38.08	54	15.92	Average	Horizontal
4882	54.13	33.16	35.15	3.96	56.1	74	17.9	Peak	Vertical
4882	37.75	33.16	35.15	3.96	39.72	54	14.28	Average	Vertical

The worst test result for GFSK, Channel 78 / 2480 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4960	48.56	33.26	35.14	3.98	50.66	74	23.34	Peak	Horizontal
4960	38.67	33.26	35.14	3.98	40.77	54	13.23	Average	Horizontal
4960	48.31	33.26	35.14	3.98	50.41	74	23.59	Peak	Vertical
4960	35.49	33.26	35.14	3.98	37.59	54	16.41	Average	Vertical

The worst test result for π/4-DQPSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4804	53.06	33.06	35.04	3.94	55.02	74	18.98	Peak	Horizontal
4804	34.53	33.06	35.04	3.94	36.49	54	17.51	Average	Horizontal
4804	54.06	33.06	35.04	3.94	56.02	74	17.98	Peak	Vertical
4804	34.19	33.06	35.04	3.94	36.15	54	17.85	Average	Vertical

The worst test result for π/4-DQPSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4882	50.11	33.16	35.15	3.96	52.08	74	21.92	Peak	Horizontal
4882	34.14	33.16	35.15	3.96	36.11	54	17.89	Average	Horizontal
4882	54.58	33.16	35.15	3.96	56.55	74	17.45	Peak	Vertical
4882	35.90	33.16	35.15	3.96	37.87	54	16.13	Average	Vertical

The worst test result for π/4-DQPSK, Channel 78 / 2480 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4960	53.16	33.26	35.14	3.98	55.26	74	18.74	Peak	Horizontal
4960	34.87	33.26	35.14	3.98	36.97	54	17.03	Average	Horizontal
4960	48.93	33.26	35.14	3.98	51.03	74	22.97	Peak	Vertical
4960	38.37	33.26	35.14	3.98	40.47	54	13.53	Average	Vertical

The worst test result for 8-DPSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4804	49.30	33.06	35.04	3.94	51.26	74	22.74	Peak	Horizontal
4804	35.79	33.06	35.04	3.94	37.75	54	16.25	Average	Horizontal
4804	53.25	33.06	35.04	3.94	55.21	74	18.79	Peak	Vertical
4804	34.70	33.06	35.04	3.94	36.66	54	17.34	Average	Vertical

The worst test result for 8-DPSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4882	50.04	33.16	35.15	3.96	52.01	74	21.99	Peak	Horizontal
4882	36.57	33.16	35.15	3.96	38.54	54	15.46	Average	Horizontal
4882	47.75	33.16	35.15	3.96	49.72	74	24.28	Peak	Vertical
4882	37.23	33.16	35.15	3.96	39.2	54	14.8	Average	Vertical

The worst test result for 8-DPSK, Channel 78 / 2480 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab.Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
4960	51.78	33.26	35.14	3.98	53.88	74	20.12	Peak	Horizontal
4960	38.08	33.26	35.14	3.98	40.18	54	13.82	Average	Horizontal
4960	52.94	33.26	35.14	3.98	55.04	74	18.96	Peak	Vertical
4960	33.95	33.26	35.14	3.98	36.05	54	17.95	Average	Vertical

Notes:

1. Measuring frequencies from 9 KHz - 10th harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.
2. Radiated emissions measured in frequency range from 9 KHz ~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 30dB below the permissible limits or the field strength is too small to be measured.
4. Level = Reading + Ant. Fac - Pre. Fac. + Cab. Loss. Margin = Limit – Level.

5.7. AC Power line conducted emissions

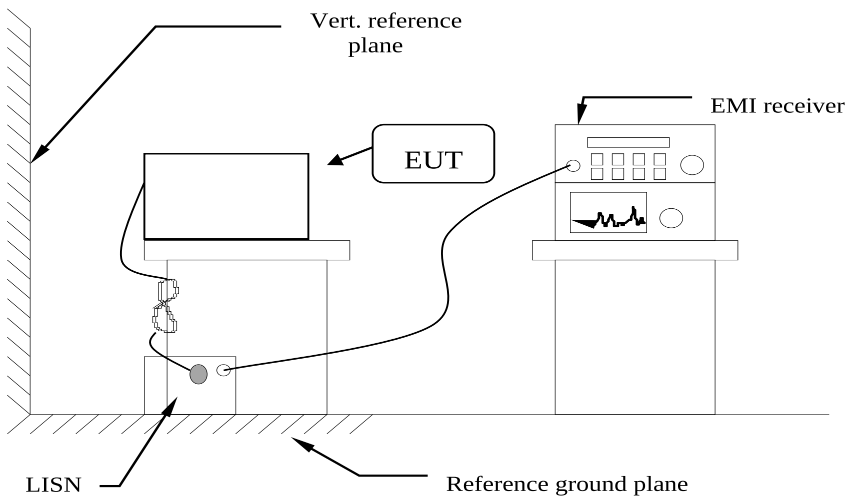
5.7.1. Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

5.7.2. Block Diagram of Test Setup



Note: the distance between LISN and Vertical reference plane is 40 cm and the distance between LISN and EUT is 80 cm.

5.7.3. Test Results

Not Applicable.

Note:When the EUT is charging, the Bluetooth can’t work.

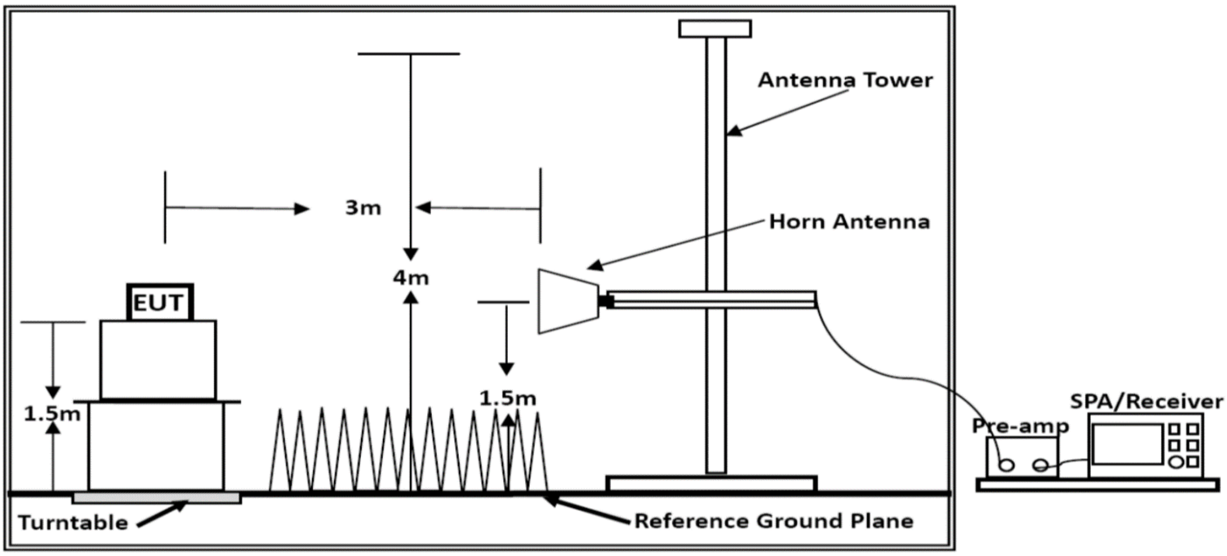
5.8. Band-edge measurements for radiated emissions

5.8.1. Standard Applicable

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. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

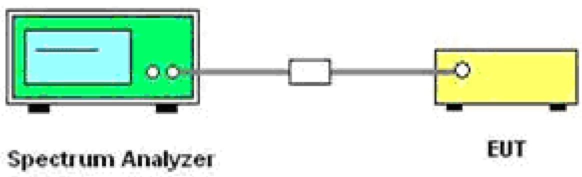
5.8.2. Block Diagram of Test Setup

☒**For Radiated**



Above 1GHz

☐**For Conducted**



5.8.3. Test Procedures

☒**Radiated Method:**

1. The EUT was placed on a turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed..
5. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak
	Average Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Average

☐**Conducted Method:**

According to KDB 558074 D01 for Antenna-port conducted measurement. Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to an EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=3MHz for AV detector.
4. 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.
5. Repeat above procedures until all measured frequencies were complete.
6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
7. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8. Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
9. For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10. Convert the result ant EIRP level to an equivalent electric field strength using the following relationship:

    $E = EIRP - 20\log D + 104.77 = EIRP + 95.23$

    Where:
    E = electric field strength in dBμV/m,
    EIRP = equivalent isotropic radiated power in dBm
    D = specified measurement distance in meters.
11. Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.
12. Per KDB662911 D01 section b) In cases where a combination of conducted measurements and cabinet radiated measurements are permitted to demonstrate compliance with absolute radiated out-of-band and spurious limits (e.g., KDB Publications 558074 for DTS and 789033 for U-NII), the conducted measurements must be combined with directional gain to compute the radiated levels of the out-of-band and spurious emissions as described in this section.
13. Compare the resultant electric field strength level to the applicable regulatory limit.
14. Perform radiated spurious emission test duress until all measured frequencies were complete.

5.8.4. Test Results

Pass

Temperature	24℃	Humidity	55.2%
Test Engineer	Tony Luo	Configurations	Bluetooth TX

Note: list the worst case mode in this item.

Left:

The worst test result for GFSK, Channel 0 / 2402 MHz										
Item (Mark)	Freq. MHz	Reading dBµV	Ant. Fac. dB/m	PRM Factor dB	Cable Loss dB	Level dBµV/m	Limit dBµV/m	Margin dB	Detector	Pol.
1	2390	46.8	29.99	30.21	8.35	54.93	74	19.07	Peak	Horizontal
1	2390	27.23	29.99	30.21	8.35	35.36	54	18.64	AV[1]	Horizontal
2	2390	47.07	29.99	30.21	8.35	55.2	74	18.8	Peak	Vertical
2	2390	28.47	29.99	30.21	8.35	36.6	54	17.4	AV[1]	Vertical
The worst test result for GFSK, Channel 79 / 2480 MHz										
Item (Mark)	Freq. MHz	Reading dBµV	Ant. Fac. dB/m	PRM Factor dB	Cable Loss dB	Level dBµV/m	Limit dBµV/m	Margin dB	Detector	Pol.
1	2483.50	47.5	30.25	30.25	8.5	56	74	18	Peak	Horizontal
1	2483.50	17.52	30.25	30.25	8.5	26.02	54	27.98	AV[1]	Horizontal
2	2483.50	43.24	30.25	30.25	8.5	51.74	74	22.26	Peak	Vertical
2	2483.50	17.03	30.25	30.25	8.5	25.53	54	28.47	AV[1]	Vertical
3	2486.67	45.59	30.25	30.25	8.5	54.09	74	19.91	Peak	Horizontal
3	2489.20	27.05	30.25	30.25	8.5	35.55	54	18.45	AV[1]	Horizontal
4	2496.23	38.07	30.25	30.25	8.5	46.57	74	27.43	Peak	Vertical
4	2495.01	28.53	30.25	30.25	8.5	37.03	54	16.97	AV[1]	Vertical

Right:

The worst test result for GFSK, Channel 0 / 2402 MHz										
Item	Freq.	Reading	Ant.	PRM	Cable	Level	Limit	Margin	Detector	Pol.
(Mark)	MHz	dBμV	Fac.	Factor	Loss	dBμV/m	dBμV/m	dB		
			dB/m	dB	dB					
1	2390	48.92	29.99	30.21	8.35	57.05	74	16.95	Peak	Horizontal
1	2390	29.35	29.99	30.21	8.35	37.48	54	16.52	AV[1]	Horizontal
2	2390	49.19	29.99	30.21	8.35	57.32	74	16.68	Peak	Vertical
2	2390	30.59	29.99	30.21	8.35	38.72	54	15.28	AV[1]	Vertical
The worst test result for GFSK, Channel 79 / 2480 MHz										
Item	Freq.	Reading	Ant.	PRM	Cable	Level	Limit	Margin	Detector	Pol.
(Mark)	MHz	dBμV	Fac.	Factor	Loss	dBμV/m	dBμV/m	dB		
			dB/m	dB	dB					
1	2483.50	49.62	30.25	30.25	8.5	58.12	74	15.88	Peak	Horizontal
1	2483.50	19.64	30.25	30.25	8.5	28.14	54	25.86	AV[1]	Horizontal
2	2483.50	45.36	30.25	30.25	8.5	53.86	74	20.14	Peak	Vertical
2	2483.50	19.15	30.25	30.25	8.5	27.65	54	26.35	AV[1]	Vertical
3	2486.67	47.71	30.25	30.25	8.5	56.21	74	17.79	Peak	Horizontal
3	2489.20	29.17	30.25	30.25	8.5	37.67	54	16.33	AV[1]	Horizontal
4	2496.23	40.19	30.25	30.25	8.5	48.69	74	25.31	Peak	Vertical
4	2495.01	30.65	30.25	30.25	8.5	39.15	54	14.85	AV[1]	Vertical

Note:
1. Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. The other emission levels were very low against the limit.
3. Margin = Limit - Level.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=3MHz/Sweep time=Auto/Detector=Average.

5.9. Pseudorandom frequency hopping sequence

5.9.1. Standard Applicable

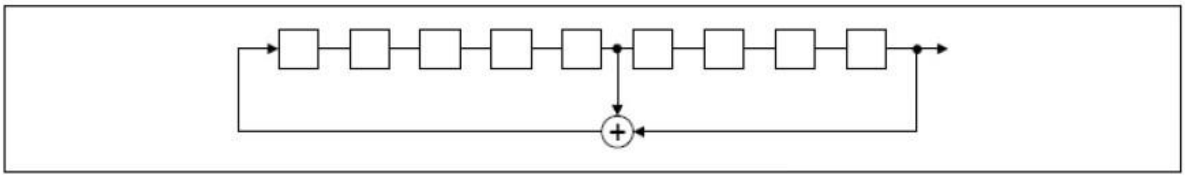
For 47 CFR Part 15C sections 15.247 (a) (1) requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

5.9.2. EUT Pseudorandom Frequency Hopping Sequence Requirement

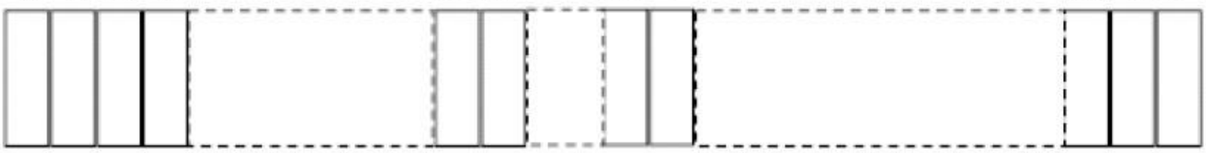
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

5.10. Antenna requirement

5.10.1. Standard Applicable

According to antenna requirement of §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

5.10.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is refer to section 1.1 of this report, and the antenna is an internal antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.10.3. Results

Compliance.

6. SUMMARY OF TEST EQUIPMENT

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2024/1/4	2025/1/3
2	Power Sensor	Agilent	U2021XA	MY5365004	2024/1/4	2025/1/3
3	Power Meter	Agilent	U2531A	TW53323507	2024/1/4	2025/1/3
4	Loop Antenna	schwarzbeck	FMZB1519 B	00023	2022/11/13	2025/11/12
5	Wideband Antenna	schwarzbeck	VULB 9163	958	2022/11/13	2025/11/12
6	Horn Antenna	schwarzbeck	BBHA 9120D	01989	2022/11/13	2025/11/12
7	EMI Test Receiver	R&S	ESCI	100849/003	2024/1/4	2025/1/3
8	Controller	MF	MF7802	N/A	N/A	N/A
9	Amplifier	schwarzbeck	BBV 9743	209	2024/1/4	2025/1/3
10	Amplifier	Tonscend	TSAMP-05 18SE	--	2024/1/4	2025/1/3
11	RF Cable(below 1GHz)	HUBER+SUHN ER	RG214	N/A	2024/1/4	2025/1/3
12	RF Cable(above 1GHz)	HUBER+SUHN ER	RG214	N/A	2024/1/4	2025/1/3
12	Artificial Mains	ROHDE & SCHWARZ	ENV 216	101333-IP	2024/1/4	2025/1/3
14	EMI Test Software	Frad	EZ_EMC	EMC-CON 3A1.1+	N/A	N/A
15	RE test software	Frad	EZ_EMC	FA-03A2 RE+	N/A	N/A
16	Test Software	TST Pass	--	V2.0	N/A	N/A
17	Horn Antenna	A-INFO	LB-180400-KF	J211020657	2023/10/12	2025/10/11
18	Amplifier	Chengyi	EMC18404 5SE	980508	2024/9/20	2025/9/19
19	Spectrum Analyzer	R&S	FSP40	100550	2024/6/7	2025/6/6

7. TEST SETUP PHOTOGRAPHS

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERNAL PHOTOS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------------THE END OF REPORT---------------