

Produkte
Products







Prüfbericht - Nr.: 14041156 001 <i>Test Report No.:</i>			Seite 1 von 21 <i>Page 1 of 21</i>								
Auftraggeber: <i>Client:</i>		Sound N Light Animatronics Co. Ltd. 13/F., Part A, Peninsula Centre 67 Mody Road, Tsim Sha Tsui East, Kowloon Hong Kong									
Gegenstand der Prüfung: Bluetooth Plush Speaker <i>Test Item:</i>											
Bezeichnung: <i>Identification:</i>		PA64639AR		Serien-Nr.: <i>Serial No.:</i>							
Wareneingangs-Nr.: <i>Receipt No.:</i>		A000237370-001, A000185534-001		Eingangsdatum: 05.08.2015, <i>Date of Receipt:</i> 14.04.2015							
Prüfart: <i>Testing Location:</i>		TÜV Rheinland Hong Kong Ltd. 8/F., First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong									
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of test item at delivery:</i>			Test sample(s) is/are not damaged and suitable for testing.								
Prüfgrundlage: <i>Test Specification:</i>		FCC Part 15 Subpart C ANSI C63.10-2013									
Prüfergebnis: <i>Test Results:</i>		Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed .									
Prüflaboratorium: <i>Testing Laboratory:</i>		TÜV Rheinland Hong Kong Ltd. 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay Kowloon, Hong Kong									
<table style="width: 100%; border: none;"> <tr> <td colspan="3" style="vertical-align: top;"> geprüft/ tested by: <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> 27.05.2016 Hugo Wan Senior Project Manager _____ <i>Datum</i> <i>Name/Stellung</i> <i>Unterschrift</i> <i>Date</i> <i>Name/Position</i> <i>Signature</i> </div> <div style="text-align: center;">  </div> </div> </td> <td colspan="3" style="vertical-align: top;"> kontrolliert/ reviewed by: <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> 30.05.2016 Sharon Li Department Manager _____ <i>Datum</i> <i>Name/Stellung</i> <i>Unterschrift</i> <i>Date</i> <i>Name/Position</i> <i>Signature</i> </div> <div style="text-align: center;">  </div> </div> </td> </tr> </table>						geprüft/ tested by: <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> 27.05.2016 Hugo Wan Senior Project Manager _____ <i>Datum</i> <i>Name/Stellung</i> <i>Unterschrift</i> <i>Date</i> <i>Name/Position</i> <i>Signature</i> </div> <div style="text-align: center;">  </div> </div>			kontrolliert/ reviewed by: <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> 30.05.2016 Sharon Li Department Manager _____ <i>Datum</i> <i>Name/Stellung</i> <i>Unterschrift</i> <i>Date</i> <i>Name/Position</i> <i>Signature</i> </div> <div style="text-align: center;">  </div> </div>		
geprüft/ tested by: <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> 27.05.2016 Hugo Wan Senior Project Manager _____ <i>Datum</i> <i>Name/Stellung</i> <i>Unterschrift</i> <i>Date</i> <i>Name/Position</i> <i>Signature</i> </div> <div style="text-align: center;">  </div> </div>			kontrolliert/ reviewed by: <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> 30.05.2016 Sharon Li Department Manager _____ <i>Datum</i> <i>Name/Stellung</i> <i>Unterschrift</i> <i>Date</i> <i>Name/Position</i> <i>Signature</i> </div> <div style="text-align: center;">  </div> </div>								
Sonstiges: FCC ID 2AFSK1564639AR <i>Other Aspects</i>											
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> Abkürzungen: P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet </td> <td style="width: 50%; vertical-align: top;"> Abbreviations: P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested </td> </tr> </table>						Abkürzungen: P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations: P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested				
Abkürzungen: P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations: P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested										
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be</i> <i> duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>											

Table of Content

	Page
Cover Page	1
Table of Content	2
Product information.....	4
Manufacturers declarations	4
Product function and intended use	4
Submitted documents.....	4
Independent Operation Modes	5
Related Submittal(s) Grants	5
Test Set-up and Operation Mode.....	6
Principle of Configuration Selection	6
Test Operation and Test Software	6
Special Accessories and Auxiliary Equipment.....	6
Countermeasures to achieve EMC Compliance.....	6
Test Setup Diagram	7
List of Test and Measurement Instruments.....	9
Results FCC Part 15 – Subpart C	10
FCC 15.203 – Antenna Requirement 1.....	Pass..... 10
FCC 15.204 – Antenna Requirement 2.....	Pass..... 10
FCC 15.207 – Disturbance Voltage on AC Mains	Pass..... 11
FCC 15.247 (a)(1) – 20 dB Bandwidth.....	Pass..... 12
FCC 15.247 (a)(1) – Carrier Frequency Separation.....	Pass..... 13
FCC 15.247 (a)(1)(iii) – Number of hopping channels.....	Pass..... 13
FCC 15.247 (a)(1)(iii) – Time of Occupancy (Dwell Time)	Pass..... 14
FCC 15.247 (a) – Hopping Sequence	Pass..... 14
FCC 15.247 (a) – Equal Hopping Frequency Use	Pass..... 15
FCC 15.247 (a) – Receiver Input Bandwidth	Pass..... 16
FCC 15.247 (a) – Receiver Hopping Capability.....	Pass..... 16
FCC 15.247 (b)(1) – Peak Output Power	Pass..... 17
FCC 15.247 (d) – Spurious Conducted Emissions.....	Pass..... 18

FCC 15.247 (d) – Spurious Radiated Emissions	Pass.....	19
FCC 15.247 (d) – Band edge compliance of conducted emissions.....	Pass.....	21
Appendix 1 – Test protocols		30 pages
Appendix 2 – Test setup		2 pages
Appendix 3 – Photo documentation		11 pages
Appendix 4 – Product documentation		10 pages
Appendix 5 – RF Exposure		2 pages

Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK; Pi/4 DQPSK; 8 DPSK
Number of channels	79
Channel separation	1 MHz
Type of antenna	PCB Antenna
Antenna gain (dBi)	0
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	Yes
Nominal voltage	V _{nom} : 5.0VDC from USB or 4.5 VDC from battery compartment,
Independent Operation Modes	Transmit and receive

Product function and intended use

The Equipment Under Test (EUT) is a Bluetooth wireless speaker which can connect with Bluetooth enabled audio source to receive audio signal for music playing.

For details, please refer to the datasheet.

Submitted documents

Circuit Diagram
Block Diagram
Bill of materials
User manual
Rating label

Independent Operation Modes

The basic operation modes are:

- Bluetooth communication link with data transfer.

For further information refer to User Manual

Related Submittal(s) Grants

This is a single application for certification of the transmitter.

Test Set-up and Operation Mode

Principle of Configuration Selection

Emission: The EUT was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Test Operation and Test Software

Test operation should refer to test methodology.

- 1) The EUT was connected with a test control board with a computer
- 2) A control software "RF Control Kit v1.0.exe" provided by client to set the EUT into transmission mode with longest supported packet, highest RF output power at the lowest, middle and highest frequency channels.

Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

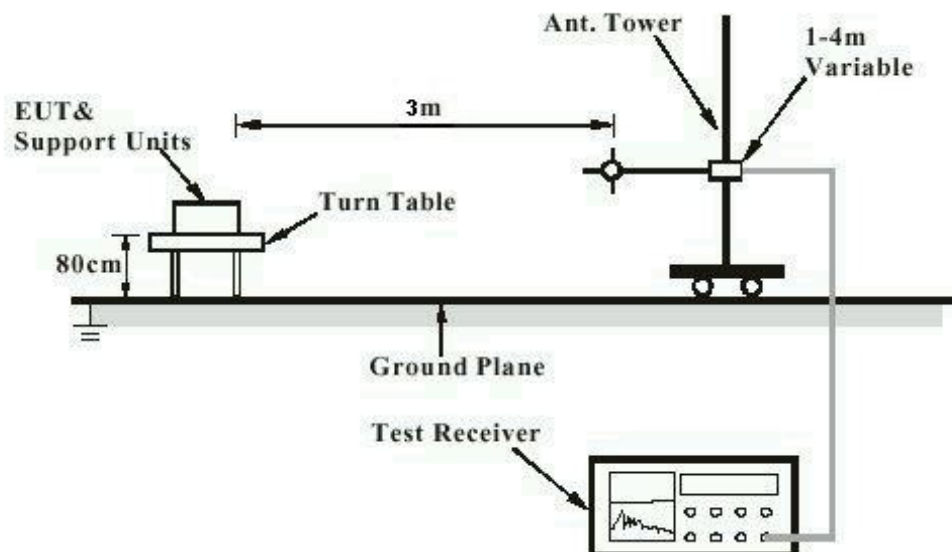
- 1) Test control board for fix channel transmission
- 2) AC/DC power adaptor (laboratory reference use)
Brand: Apple
Model: A1401
Input rating: 100-240VAC, 50/60Hz
Output rating: 5.2VDC, 2.4A

Countermeasures to achieve EMC Compliance

- none

Test Setup Diagram

Diagram of Measurement Configuration for Radiated Emission Test



Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Configuration for Conducted RF Test

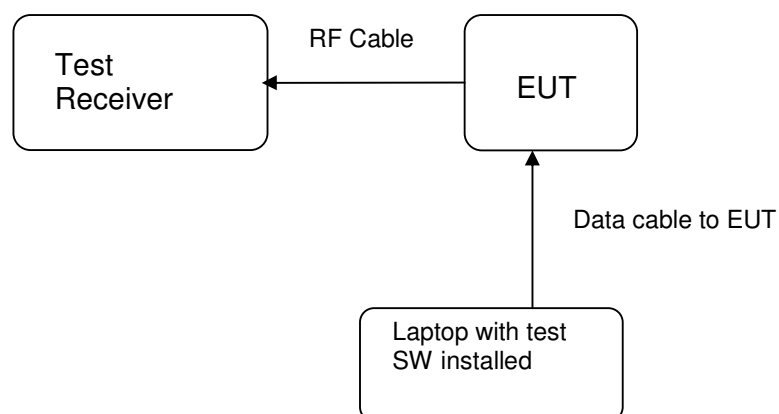
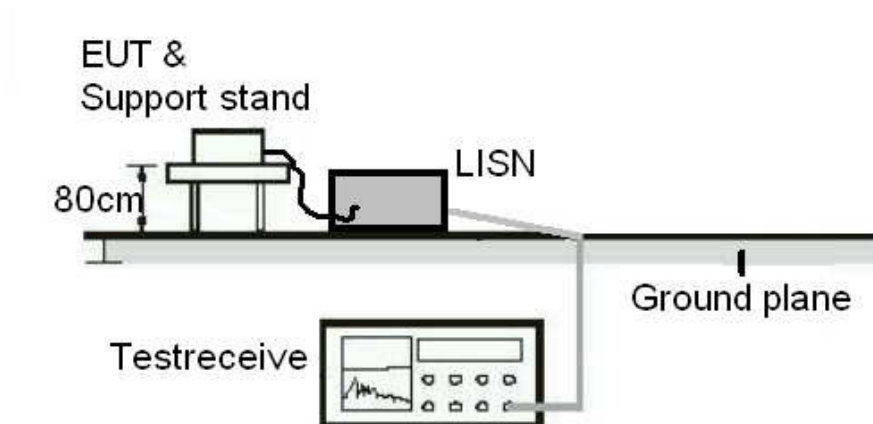


Diagram of Measurement Equipment Configuration for AC Mains Conducted Emission Test (if applicable)



List of Test and Measurement Instruments

Hong Kong Productivity Council (FCC Registration number: 90656)

Radiated Emission

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
Semi-anechoic Chamber	Frankonia	Nil	Nil	25 Apr 2016	25 Apr 2017
Cable	Hubersuhner	SUCOFLEX 104	72799 /6	31 Mar 2016	31 Mar 2018
Test Receiver	R & S	ESU40	100190	07 Dec 2015	07 Dec 2016
Bi-conical Antenna	R & S	HK116	100241	01 Sep 2015	01 Sep 2017
Log Periodic Antenna	R & S	HL223	841516/017	01 Sep 2015	01 Sep 2017
Coaxial cable	Harbour	LL335	N/A	10 Jun 2014	10 Jun 2016
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	3950M00241	17 Jul 2014	17 Jul 2016
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	28 Oct 2015	28 Oct 2017
Horn Antenna	EMCO	3115	9002-3347	26 Aug 2015	26 Aug 2017
Active Loop Antenna	EMCO	6502	9107-2651	15 Aug 2015	15 Aug 2016

TÜV Rheinland Hong Kong Ltd.

Conducted Emission on AC Mains Terminals

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
Test Receiver	Rohde & Schwarz	ESR3	101833	22 Oct 2015	22 Oct 2016
LISN	Rohde & Schwarz	ENV216	100273	19 Jan 2016	19 Jan 2017
EMC32	Rohde & Schwarz	v8.53	N/A	N/A	N/A

Radio Frequency Test

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSP30	100007	13 Jan 2015	13 Jan 2017

Results FCC Part 15 – Subpart C

FCC 15.203 – Antenna Requirement 1		Pass
FCC Requirement: No antenna other than that furnished by the responsible party shall be used with the device		
Results:	Permanent attached antenna	
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		Pass
FCC Requirement: Provide information for every antenna proposed for the use with the EUT		
Results:	a) Antenna type: PCB Antenna	
	b) Manufacturer and model no: N/A	
	c) Gain with reference to an isotropic radiator: 0 dBi	
Verdict:	Pass	

FCC 15.207 – Disturbance Voltage on AC Mains						Pass
Test Port: AC mains input port of the AC/DC adaptor Applied Voltage: 120VAC, 60Hz Adaptor Model: Please refer to page 4 Mode of operation: Bluetooth music playing						
Live measurement						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	--	--	--	66 - 56	56 - 46	Pass
> 0,5 - 5	0.8385	34.1	29.0	56	46	Pass
> 5 - 30	--	--	--	60	50	Pass
Neutral measurement						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	--	--	--	66 - 56	56 - 46	Pass
> 0,5 - 5	0.8385	34.6	29.4	56	46	Pass
> 5 - 30	--	--	--	60	50	Pass
Results: The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz does not exceed the limits. For test Results plots refer to Appendix 1, page 2-3.						

FCC 15.247 (a)(1) – 20 dB Bandwidth		Pass	
FCC Requirement: Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.			
Test Specification : FCC KDB DA 00-705 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 30 kHz / 100 kHz Supply voltage : 5.0VDC from USB Temperature : 23°C Humidity : 50%			
Results:		Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. For test protocols refer to Appendix 1, page 4-7.	
GFSK Modulation			
Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	2401.526	2402.480	0.954
2441	2440.526	2441.480	0.954
2480	2479.526	2480.480	0.954
8DPSK Modulation			
Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	2401.346	2402.612	1.266
2441	2440.346	2441.612	1.266
2480	2479.346	2480.612	1.266

FCC 15.247 (a)(1) – Carrier Frequency Separation		Pass	
FCC Requirement: Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.			
Test Specification : FCC KDB DA 00-705 Mode of operation : Tx mode (hopping on), GFSK and 8DPSK Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 5.0VDC from USB Temperature : 23°C Humidity : 50%			
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. The centre frequencies of the hopping channels are separated by more than the 2/3*20dB bandwidth. For test Results plots refer to Appendix 1, page 8.			
Verdict: Pass			
GFSK Modulation			
Test Frequency (MHz)	Lower channel separation (MHz)	Upper channel separation (MHz)	Two-third of 20dB bandwidth (MHz)
2441	0.996	1.152	0.636
8DPSK Modulation			
Test Frequency (MHz)	Lower channel separation (MHz)	Upper channel separation (MHz)	Two-third of 20dB bandwidth (MHz)
2441	1.014	1.002	0.844

FCC 15.247 (a)(1)(iii) – Number of hopping channels		Pass
FCC Requirement: Frequency hopping systems operating in the 2400MHz-2483.5MHz bands shall use at least 15 hopping frequencies.		
Test Specification : FCC KDB DA 00-705 Mode of operation : Tx mode (hopping on), GFSK Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 1 MHz / 3 MHz Supply voltage : 5.0VDC from USB Temperature : 23°C Humidity : 50%		
Results: The total number of hopping frequencies is more than 15. For test Results plots refer to Appendix 1, page 9.		
Verdict: Pass		

FCC 15.247 (a)(1)(iii) – Time of Occupancy (Dwell Time)**Pass**

FCC Requirement: Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Specification : FCC KDB DA 00-705
 Mode of operation : Tx mode (hopping on), DH5 packet
 Port of testing : Temporary antenna port
 Detector : Peak
 RBW/VBW : 1 MHz / 3 MHz
 Supply voltage : 5.0VDC from USB
 Temperature : 23°C
 Humidity : 50%

Results: Time period calculation = $0.4 \times 79 = 31.6\text{s}$
 Dwell time = $89 \times 2.910 \times 10^{-3} = 258.99 \times 10^{-3} \text{ s}$
 $\leq 400 \times 10^{-3} \text{ s}$

For test protocols please refer to Appendix 1, page 10.

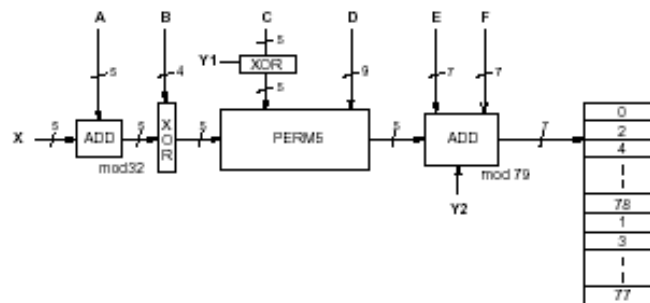
Verdict: Pass

FCC 15.247 (a) – Hopping Sequence**Pass**

FCC Requirement: The hopping sequence is generated and provided with an example.

Hopping sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master. The X input determines the phase in the 32-hop segment, whereas Y1 and Y2 selects between master-to-slave and slave-to-master transmission. The inputs A to D determine the ordering within the segment, the inputs E and F determine the mapping onto the hop frequencies.



Example data:

Hop sequence {k} for CONNECTION STATE:

CLK start: 0x0000010

ULAP: 0x00000000

#ticks: 00 02 | 04 06 | 08 0a | 0c 0e | 10 12 | 14 16 | 18 1a | 1c 1e |

```

0x0000010: 08 66 | 10 70 | 12 19 | 14 23 | 16 01 | 18 05 | 20 33 | 22 37 |
0x0000030: 24 03 | 26 07 | 28 35 | 30 39 | 32 72 | 34 76 | 36 25 | 38 29 |
0x0000050: 40 74 | 42 78 | 44 27 | 46 31 | 48 09 | 50 13 | 52 41 | 54 45 |
0x0000070: 56 11 | 58 15 | 60 43 | 62 47 | 32 17 | 36 19 | 34 49 | 38 51 |
0x0000090: 40 21 | 44 23 | 42 53 | 46 55 | 48 33 | 52 35 | 50 65 | 54 67 |
0x00000b0: 56 37 | 60 39 | 58 69 | 62 71 | 64 25 | 68 27 | 66 57 | 70 59 |
0x00000d0: 72 29 | 76 31 | 74 61 | 78 63 | 01 41 | 05 43 | 03 73 | 07 75 |
0x00000f0: 09 45 | 13 47 | 11 77 | 15 00 | 64 49 | 66 53 | 68 02 | 70 06 |
0x0000110: 01 51 | 03 55 | 05 04 | 07 08 | 72 57 | 74 61 | 76 10 | 78 14 |
0x0000130: 09 59 | 11 63 | 13 12 | 15 16 | 17 65 | 19 69 | 21 18 | 23 22 |
0x0000150: 33 67 | 35 71 | 37 20 | 39 24 | 25 73 | 27 77 | 29 26 | 31 30 |
0x0000170: 41 75 | 43 00 | 45 28 | 47 32 | 17 02 | 21 04 | 19 34 | 23 36 |
0x0000190: 33 06 | 37 08 | 35 38 | 39 40 | 25 10 | 29 12 | 27 42 | 31 44 |
0x00001b0: 41 14 | 45 16 | 43 46 | 47 48 | 49 18 | 53 20 | 51 50 | 55 52 |
0x00001d0: 65 22 | 69 24 | 67 54 | 71 56 | 57 26 | 61 28 | 59 58 | 63 60 |
0x00001f0: 73 30 | 77 32 | 75 62 | 00 64 | 49 34 | 51 42 | 57 66 | 59 74 |
0x0000210: 53 36 | 55 44 | 61 68 | 63 76 | 65 50 | 67 58 | 73 03 | 75 11 |
0x0000230: 69 52 | 71 60 | 77 05 | 00 13 | 02 38 | 04 46 | 10 70 | 12 78 |
0x0000250: 06 40 | 08 48 | 14 72 | 16 01 | 18 54 | 20 62 | 26 07 | 28 15 |
0x0000270: 22 56 | 24 64 | 30 09 | 32 17 | 02 66 | 06 74 | 10 19 | 14 27 |
0x0000290: 04 70 | 08 78 | 12 23 | 16 31 | 18 03 | 22 11 | 26 35 | 30 43 |
0x00002b0: 20 07 | 24 15 | 28 39 | 32 47 | 34 68 | 38 76 | 42 21 | 46 29 |
0x00002d0: 36 72 | 40 01 | 44 25 | 48 33 | 50 05 | 54 13 | 58 37 | 62 45 |
0x00002f0: 52 09 | 56 17 | 60 41 | 64 49 | 34 19 | 36 35 | 50 51 | 52 67 |
0x0000310: 38 21 | 40 37 | 54 53 | 56 69 | 42 27 | 44 43 | 58 59 | 60 75 |
0x0000330: 46 29 | 48 45 | 62 61 | 64 77 | 66 23 | 68 39 | 03 55 | 05 71 |
0x0000350: 70 25 | 72 41 | 07 57 | 09 73 | 74 31 | 76 47 | 11 63 | 13 00 |
0x0000370: 78 33 | 01 49 | 15 65 | 17 02 | 66 51 | 70 67 | 03 04 | 07 20 |
0x0000390: 68 55 | 72 71 | 05 08 | 09 24 | 74 59 | 78 75 | 11 12 | 15 28 |
0x00003b0: 76 63 | 01 00 | 13 16 | 17 32 | 19 53 | 23 69 | 35 06 | 39 22 |
0x00003d0: 21 57 | 25 73 | 37 10 | 41 26 | 27 61 | 31 77 | 43 14 | 47 30 |
0x00003f0: 29 65 | 33 02 | 45 18 | 49 34 | 19 04 | 21 08 | 23 20 | 25 24 |

```

FCC 15.247 (a) – Equal Hopping Frequency Use**Pass****FCC Requirement:** Each of the transmitter's hopping channels is used equally on average.

Equal hopping frequency use

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

FCC 15.247 (a) – Receiver Input Bandwidth		Pass
FCC Requirement:	The associated receiver(s) complies with the requirement that its input bandwidth matches the bandwidth of the transmitted signal.	
Receiver input bandwidth The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1 MHz. The receiver bandwidth was verified during Bluetooth RF conformance testing.		

FCC 15.247 (a) – Receiver Hopping Capability		Pass
FCC Requirement:	The associated receiver has the ability to shift frequencies in synchronisation with the transmitted signals.	
Receiver hopping Capability The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.		

FCC 15.247 (b)(1) – Peak Output Power					Pass
Test Specification : FCC KDB DA 00-705 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), GFSP, Pi/4 DQPSK and 8DPSK Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 3 MHz / 10 MHz Supply voltage : 5.0VDC from USB Temperature : 23°C Humidity : 50%					
FCC Requirement: 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.					
Results: For test protocols please refer to Appendix 1, page 11-16.					
GFSK Modulation					
Frequency (MHz)	Maximum peak output power (dBm)	Cable loss + attenuator (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	2.71	0	2.71	1 / 30.0	Pass
2441	2.68	0	2.68	1 / 30.0	Pass
2480	2.50	0	2.50	1 / 30.0	Pass
Pi/4 DQPSK Modulation					
Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	1.03	0	1.03	0.125 / 21.0	Pass
2441	1.03	0	1.03	0.125 / 21.0	Pass
2480	0.85	0	0.85	0.125 / 21.0	Pass
8DPSK Modulation					
Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	1.34	0	1.34	0.125 / 21.0	Pass
2441	1.25	0	1.25	0.125 / 21.0	Pass
2480	1.06	0	1.06	0.125 / 21.0	Pass

FCC 15.247 (d) – Spurious Conducted Emissions					Pass
Test Specification : FCC KDB DA 00-705 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), GFSK, 8DPSK Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 5.0VDC from USB Temperature : 23 °C Humidity : 50 %					
FCC Requirement: 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.					
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. All three transmit frequency modes comply with the limit stated in subclause 15.247(d). For test protocols refer to Appendix 1, page 17-28.					
GFSK					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	No peak found	--	--	--	Pass
2441	No peak found	--	--	--	Pass
2480	No peak found	--	--	--	Pass
8DPSK					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	No peak found	--	--	--	Pass
2441	No peak found	--	--	--	Pass
2480	No peak found	--	--	--	Pass

FCC 15.247 (d) – Spurious Radiated Emissions		Pass
Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), GFSK Port of testing : Enclosure Detector : Peak RBW/VBW : 100 kHz / 300 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz Supply voltage : 5.0VDC from USB Temperature : 23°C Humidity : 50%		
FCC Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).		
Results:	Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.	
Tx frequency 2402MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
195.999	29.00	43.5 / QP
439.998	29.70	46.0 / QP
2390.000	46.12	74.0 / PK
4803.824	55.80	74.0 / PK
4803.968	43.55	54.0 / AV
Tx frequency 2402MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
111.999	30.00	43.5 / QP
447.999	31.50	46.0 / QP
2390.000	46.55	74.0 / PK
4803.904	53.79	74.0 / PK
4803.952	40.24	54.0 / AV
Tx frequency 2441MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
195.999	28.80	43.5 / QP
439.999	30.30	46.0 / QP
4882.321	52.54	74.0 / PK
4882.000	40.05	54.0 / AV
Tx frequency 2441MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
111.999	29.90	43.5 / QP

447.998	31.80	46.0 / QP
4881.663	53.23	74.0 / PK
4881.968	40.67	54.0 / AV
Tx frequency 2480MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
195.999	29.10	43.5 / QP
439.999	30.10	46.0 / QP
2483.500	53.61	74.0 / PK
4960.304	55.04	74.0 / PK
4959.984	42.35	54.0 / AV
Tx frequency 2480MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
111.999	29.70	43.5 / QP
447.998	31.70	46.0 / QP
2483.500	49.80	74.0 / PK
4959.744	53.70	74.0 / PK
4959.888	39.97	54.0 / AV

FCC 15.247 (d) – Band edge compliance of conducted emissions		Pass
Test Specification : FCC KDB DA 00-705 Mode of operation : Tx mode (2402MHz, 2480MHz), GFSK Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 5.0VDC from USB Temperature : 23°C Humidity : 50%		
FCC Requirement: 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.		
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. There is no peak found outside any 100 kHz bandwidth of the operating frequency band. For test protocols refer to Appendix 1, page 29-30.		