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Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**14042312 001**	**Seite 1 von 20** *Page 1 of 20*

Auftraggeber: *Client:*	**SANWA GLOBAL LIMITED** **Room 1001, 10/F, Phase 1,** **Prosperity Centre, 77-81 Container Port Road, Kwai Chung** **Hong Kong**
Gegenstand der Prüfung: *Test Item:*	**Bluetooth Headset**

Bezeichnung: *Identification:*	**Aria One**	**Serien-Nr.:** *Serial No.:*	**Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**A000320690-001,** **A000303164-001**	**Eingangsdatum:** *Date of Receipt:*	**24.02.2016,** **04.01.2016**

Prüfort: *Testing Location:*	**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: *Condition of test item at delivery:*	Test sample(s) is/are not damaged and suitable for testing.
Prüfgrundlage: *Test Specification:*	**FCC Part 15 Subpart C** **ANSI C63.10-2013**
Prüfergebnis: *Test Results:*	**Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.** The above mentioned product was tested and **passed**.
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland Hong Kong Ltd.** 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay Kowloon, Hong Kong

geprüft/ *tested by:*			**kontrolliert/** *reviewed by:*		
07.03.2016	Hugo Wan Senior Project Manager		07.03.2016	Benny Lau Senior Project Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges: **FCC ID 2AGYNBT1501**
Other Aspects

Abkürzungen:				*Abbreviations:*			
	P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*
	F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*
	N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*
	N/T	=	*nicht getestet*		*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.
This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.

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

Special accessories and auxiliary equipment 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 ..... N/A 10

FCC 15.247 (a)(1) – 20 dB Bandwidth ..... Pass 11

FCC 15.247 (a)(1) – Carrier Frequency Separation ..... Pass 12

FCC 15.247 (a)(1)(iii) – Number of hopping channels ..... Pass 12

FCC 15.247 (a)(1)(iii) – Time of Occupancy (Dwell Time) ..... Pass 13

FCC 15.247 (a) – Hopping Sequence ..... Pass 13

FCC 15.247 (a) – Equal Hopping Frequency Use ..... Pass 14

FCC 15.247 (a) – Receiver Input Bandwidth ..... Pass 15

FCC 15.247 (a) – Receiver Hopping Capability ..... Pass 15

FCC 15.247 (b)(1) – Peak Output Power ..... Pass 16

FCC 15.247 (d) – Spurious Conducted Emissions ..... Pass 17

FCC 15.247 (d) – Spurious Radiated Emissions ..... Pass 18

FCC 15.247 (d) – Band edge compliance of conducted emissions ..... Pass 20

Appendix 1 – Test protocols ..... 28 pages

Appendix 2 – Test setup ..... 2 pages

Appendix 3 – Photo documentation ..... 11 pages

Appendix 4 – Product documentation ..... 11 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_{nor}: 3.7 VDC internal battery
Independent Operation Modes	Transmit and receive Charging

Product function and intended use

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

There are 2 headsets in the system, a left and a right side headset. The left and the right wireless headset are electronically identical to each other including the schematics, PCB layouts and electronic components used. Due to the equivalence of the headset, only right side headset were performed testing.

For details, please refer to the datasheet.

Submitted documents

Circuit Diagram
Block Diagram
Bill of materials
User manual
Rating label

Special accessories and auxiliary equipment

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

1) Test control board for fix channel transmission

Independent Operation Modes

The basic operation modes are:

- Bluetooth communication link maintained 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 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:

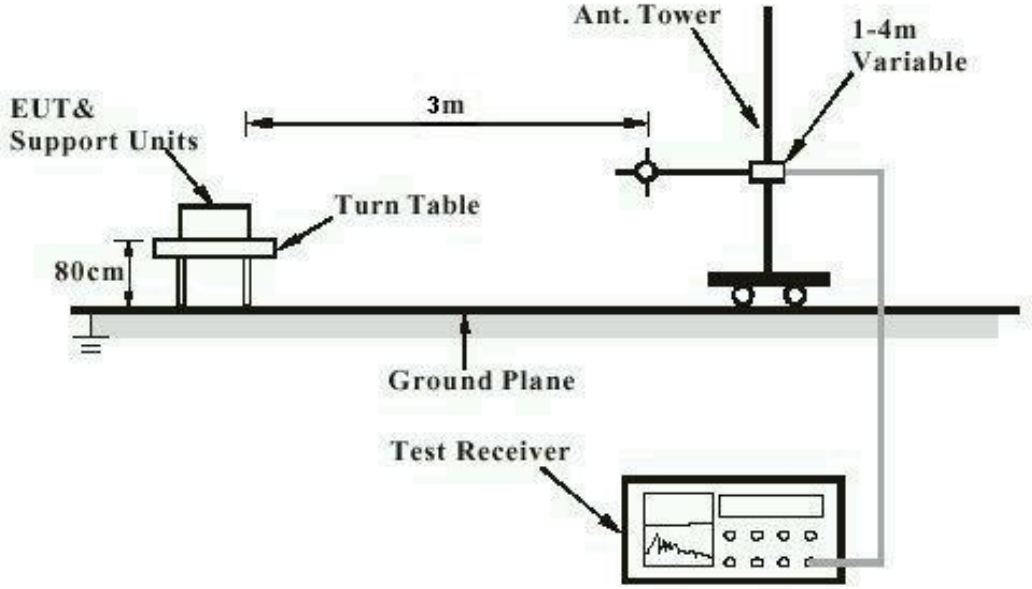
- none

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

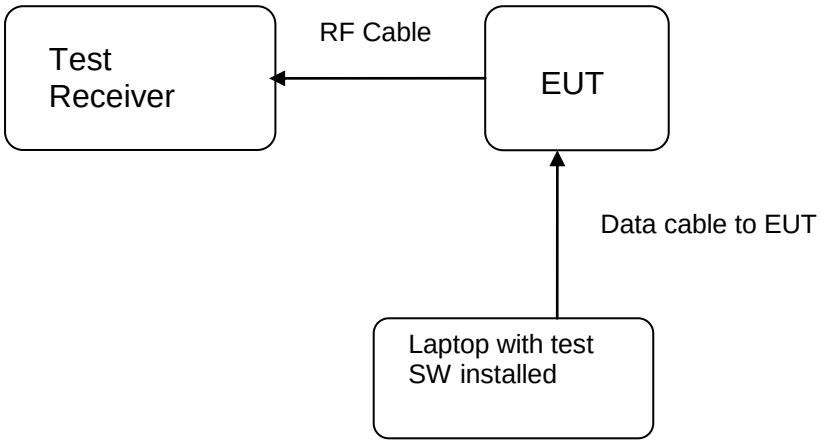
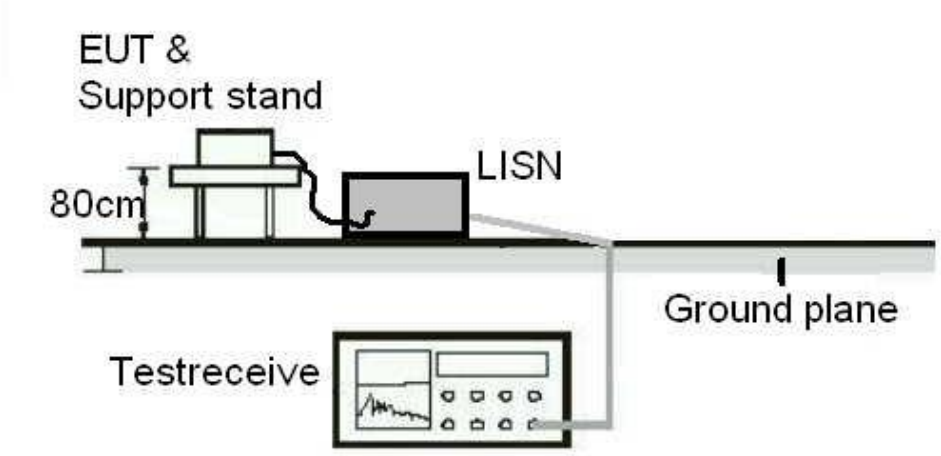


Diagram of Measurement Equipment Configuration for AC Mains Conducted Emission Test (if applicable)



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	14 Apr 2015	14 Apr 2016
Cable	Hubersuhner	SUCOFLEX 104	72799 /6	31 Mar 2014	31 Mar 2016
Test Receiver	R & S	ESU26	100050	12 Feb 2015	12 Feb 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 amplifer 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

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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:	Chip 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	**N/A**
This test is not applicable due to the EUT does not have AC mains input port.	

FCC 15.247 (a)(1) – 20 dB Bandwidth

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 : 3.7 VDC
Temperature : 23ºC
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.

GFSK Modulation

Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	2401.524	2402.466	0.942
2441	2440.520	2441.460	0.940
2480	2479.520	2480.464	0.944

8DPSK Modulation

Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	2401.336	2402.604	1.268
2441	2440.340	2441.600	1.260
2480	2479.334	2480.600	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 : 3.7VDC
Temperature : 23ºC
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.

Verdict: Pass

GFSK Modulation

Test Frequency (MHz)	Lower channel separation (MHz)	Upper channel separation (MHz)	Two-third of 20dB bandwidth (MHz)
2441	1.068	0.930	0.629

8DPSK Modulation

Test Frequency (MHz)	Lower channel separation (MHz)	Upper channel separation (MHz)	Two-third of 20dB bandwidth (MHz)
2441	1.008	0.930	0.845

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 : 3.7 VDC
Temperature : 23ºC
Humidity : 50%

Results: The total number of hopping frequencies is more than 15. For test Results plots refer to Appendix 1.

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	:	3.7 VDC
Temperature	:	23ºC
Humidity	:	50%

Results: Time period calculation = 0.4 x 79 = 31.6s

Dwell time = 107 x 2.920 x 10^{-3} = 312.44 x 10^{-3} s

<= 400 x 10^{-3} s

For test protocols please refer to Appendix 1.

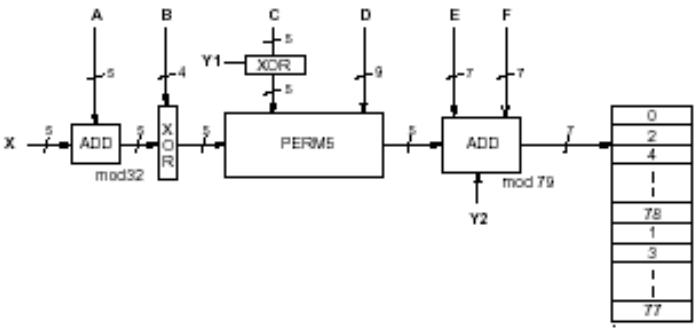
Verdict: Pass

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 and 8DPSK
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 3 MHz / 10 MHz
Supply voltage : 3.7 VDC
Temperature : 23ºC
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.

GFSK Modulation

Frequency (MHz)	Maximum peak output power (dBm)	Cable (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	4.43	0	4.43	1 / 30.0	Pass
2441	5.71	0	5.71	1 / 30.0	Pass
2480	5.83	0	5.83	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	1.92	0	1.92	0.125 / 21.0	Pass
2441	3.20	0	3.20	0.125 / 21.0	Pass
2480	3.42	0	3.42	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	2.38	0	2.38	0.125 / 21.0	Pass
2441	3.75	0	3.75	0.125 / 21.0	Pass
2480	4.00	0	4.00	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 : 3.7 VDC
Temperature : 23 ºC
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.

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 : 3.7 VDC
Temperature : 23ºC
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
636.000	32.80	46.0 / QP
2390.000	48.13	74.0 / PK
2390.000	34.24	54.0 / AV
4804.338	59.47	74.0 / PK
4803.988	51.10	54.0 / AV

Tx frequency 2402MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	48.20	74.0 / PK
2390.000	34.53	54.0 / AV
4803.950	58.90	74.0 / PK
4803.950	50.49	54.0 / AV

Tx frequency 2441MHz Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4881.952	54.93	74.0 / PK
4882.016	41.08	54.0 / AV

Tx frequency 2441MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
504.000	35.40	46.0 / QP
4882.337	57.70	74.0 / PK
4882.000	47.72	54.0 / AV

Tx frequency 2480MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
508.000	26.30	46.0 / QP
2483.500	66.26	74.0 / PK
2483.500	49.66	54.0 / AV
4959.519	59.05	74.0 / PK
4959.887	49.55	54.0 / AV
Tx frequency 2480MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2483.500	65.93	74.0 / PK
2483.500	49.26	54.0 / AV
4959.535	59.57	74.0 / PK
4959.968	50.24	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, hopping on), GFSK
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 100 kHz / 300 kHz
Supply voltage : 3.7 VDC
Temperature : 23ºC
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.

GFSK

Frequency	Emission frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
Lower band, hopping on	2399.980	-23.33	1.13	-24.46	Pass
Upper band, hopping on	2483.840	-38.23	2.45	-40.68	Pass
Lower band, hopping off	2399.200	-22.82	1.10	-23.92	Pass
Upper band, hopping off	2484.040	-38.31	2.42	-40.73	Pass