Produkte
Products

Prüfbericht - Nr.: **14044538 001**	**Seite 1 von 17**
Test Report No.:	*Page 1 of 17*

Auftraggeber:
Client:

CREATIVE CONCEPTS (USA)
50 Harrison Street, Suite 112
Hoboken, NJ 07030
USA

Gegenstand der Prüfung: Bluetooth Remote Shutter
Test Item:

Bezeichnung:	Clip a Phone	**Serien-Nr.:**	**Engineering sample**
Identification:		*Serial No.:*	
Wareneingangs-Nr.:	A000366341-001	**Eingangsdatum:**	**24.05.2016,**
Receipt No.:	A000410584-001	*Date of Receipt:*	**17.08.2016**

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: Test sample(s) is/are not damaged and
Condition of test item at delivery: suitable for testing.

Prüfgrundlage: FCC Part 15 Subpart C
Test Specification: ANSI C63.10-2013

Prüfergebnis: Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben
Test Results: genannter Prüfgrundlage.

The above mentioned product was tested and **passed**.

Prüflaboratorium: TÜV Rheinland Hong Kong Ltd.
Testing Laboratory: 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay
                         Kowloon, Hong Kong

geprüft/ *tested by:*		**kontrolliert/** *reviewed by:*	
	Mika Chan		Sharon Li
02.09.2016	Project Manager	02.09.2016	Department Manager
Datum	**Name/Stellung**	**Unterschrift**	**Datum**	**Name/Stellung**	**Unterschrift**
Date	*Name/Position*	*Signature*	*Date*	*Name/Position*	*Signature*

Sonstiges: FCC ID 2AJAQ-E5557
Other Aspects

Abkürzungen:	P(ass)	=	entspricht Prüfgrundlage	**Abbreviations:**	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

Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK
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	No
Nominal voltage	V_{nor}: 3.0 VDC CR2032
Independent Operation Modes	Transmit and receive

Product function and intended use

The Equipment Under Test (EUT) is a Bluetooth remote control camera shutter which can connect with Bluetooth enabled smartphone to trigger the smartphone camera shutter.

For details, please refer to the user manual.

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) Computer for fix channel transmission

   Brand: IBM
   Model: 8889-B49
   S/N: L3-X9333

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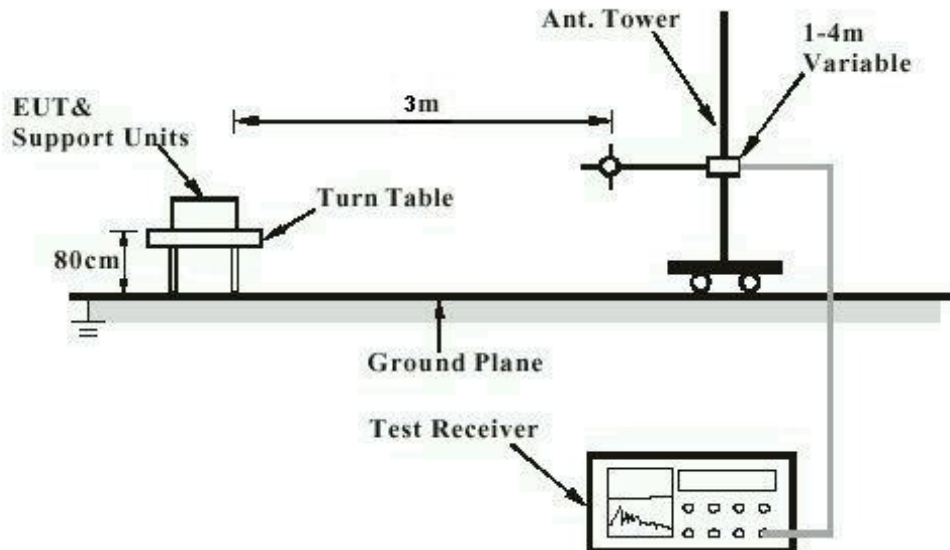
Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Configuration for Conducted RF Test
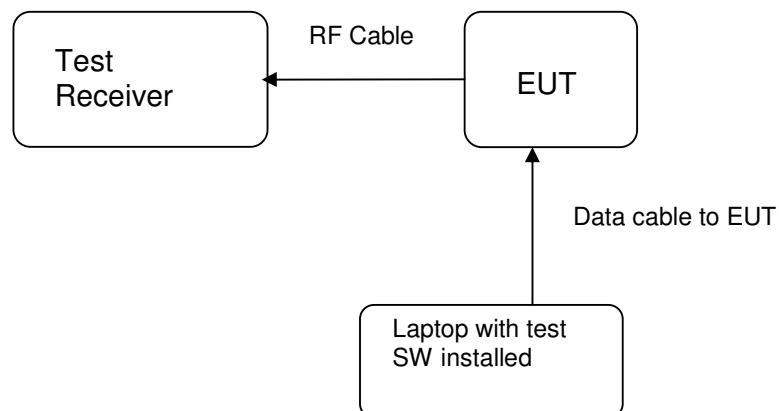
Diagram of Measurement Equipment Configuration for AC Mains Conducted Emission Test (if applicable)
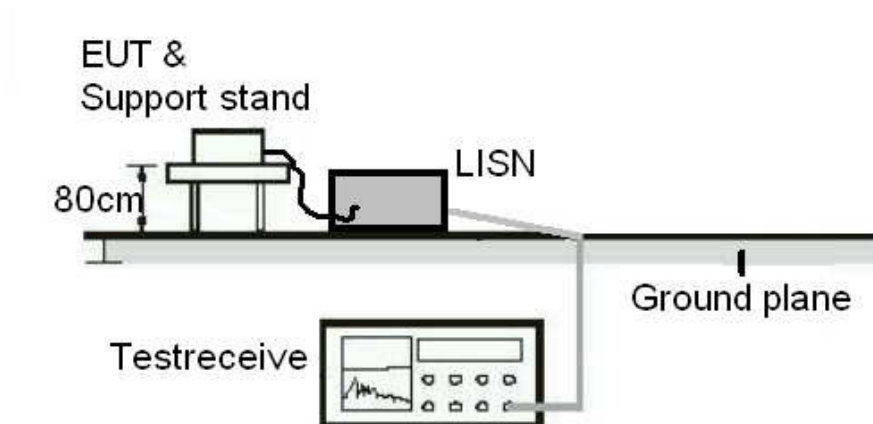
List of Test and Measurement Instruments

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	25 Apr 2016	25 Apr 2017
Cable	Hubersuhner	SUCOFLEX 104	72799 /6	31 Mar 2016	31 Mar 2018
Test Receiver	R & S	ESU26	100050	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 2016	10 Jun 2018
Microwave amplifer 0.5-26.5GHz, 25dB gain	HP	83017A	3950M00241	18 Jul 2016	18 Jul 2018
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.

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	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   : 3.0 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	2401.604	2402.660	1.056
2441	2440.604	2441.660	1.056
2480	2479.610	2480.660	1.050

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
Port of testing   : Temporary antenna port
Detector   : Peak
RBW/VBW   : 100 kHz / 300 kHz
Supply voltage   : 3.0VDC
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)	Channel separation (MHz)	Two-third of 20dB bandwidth (MHz)
2441	1.002	0.704

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   : 3.0 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   : 100 KHz / 300 KHz
Supply voltage   : 3.0 VDC
Temperature   : 23ºC
Humidity   : 50%

Results: Time period calculation = 0.4 x 79 = 31.6s
Dwell time = $63 \times 2.930 \times 10^{-3} = 184.59 \times 10^{-3}$ s
$\le 400 \times 10^{-3}$ 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.
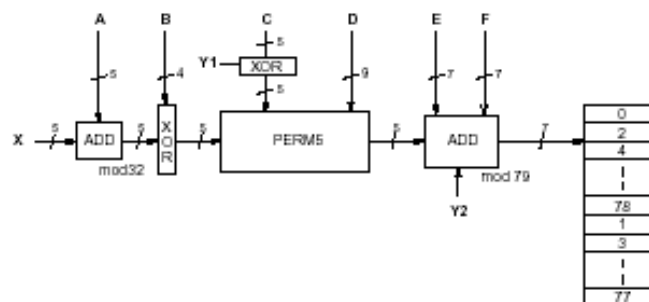
Example data:

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.

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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), GFSK
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 3 MHz / 10 MHz
Supply voltage : 3.0 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	-12.41	0	-12.41	1 / 30.0	Pass
2441	-13.14	0	-13.14	1 / 30.0	Pass
2480	-14.18	0	-14.18	1 / 30.0	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
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 100 kHz / 300 kHz
Supply voltage : 3.0 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	2704.000	-51.39	-12.62	-38.77	Pass
2441	1780.000	-47.77	-13.43	-34.34	Pass
2480	2168.000	-55.62	-14.51	-41.11	Pass

FCC 15.247 (d) – Spurious Radiated Emissions	Pass

Test Date	: 09 Jun 2016
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	: 3.0 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
298.996	34.9	46.0 / QP
4804.325	56.24	74.0 / PK
4804.368	47.23	54.0 / AV

Tx frequency 2402MHz	Horizontal Polarization	

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
96.000	33.1	43.5 / QP
597.995	36.7	46.0 / QP
4804.593	57.54	74.0 / PK
4804.449	49.02	54.0 / AV

Tx frequency 2441MHz	Vertical Polarization	

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
47.998	23.0	40.0 / QP
298.996	33.3	46.0 / QP
4882.708	55.23	74.0 / PK
4882.435	44.91	54.0 / AV

Tx frequency 2441MHz	Horizontal Polarization	

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
96.000	21.8	43.5 / QP
610.995	36.8	46.0 / QP
4882.528	57.49	74.0 / PK

| 4882.416 | 48.61 | 54.0 / AV |

| Tx frequency 2480MHz | | Vertical Polarization |

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
72.000	33.9	40.0 / QP
311.999	27.8	46.0 / QP
4960.721	56.73	74.0 / PK
4960.528	47.74	54.0 / AV

| Tx frequency 2480MHz | | Horizontal Polarization |

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
59.910	29.5	40.0 / QP
486.710	27.0	46.0 / QP
4960.368	57.20	74.0 / PK
4960.384	48.25	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 : 3.0 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	2400.000	-59.27	-12.62	-46.65	Pass
Upper band, hopping on	2485.740	-61.35	-12.62	-48.73	Pass
Lower band, hopping off	2399.980	-52.14	-12.62	-39.52	Pass
Upper band, hopping off	2484.640	-61.01	-12.62	-48.39	Pass