


Prüfbericht-Nr.: <i>Test Report No.:</i>	50114959 001	Auftrags-Nr.: <i>Order No.:</i>	114071612	Seite 1 von 31 <i>Page 1 of 31</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	23-Nov-2017	
Auftraggeber: <i>Client:</i>	Philips Lighting (China) Investment Co., Ltd. Building 9, Lane 888, Tianlin Road, Minhang District, Shanghai 200233 China			
Prüfgegenstand: <i>Test item:</i>	Philips Occupancy and Multi Sensor			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	9290018190, 9290018191			
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 15C Test report (Zigbee IEEE 802.15.4)			
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.247			
Wareneingangsdatum: <i>Date of receipt:</i>	27-Nov-2017			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000657651-001			
Prüfzeitraum: <i>Testing period:</i>	01-Dec-2017 - 12-Dec-2017			
Ort der Prüfung: <i>Place of testing:</i>	EMC Laboratory Taipei			
Prüflaboratorium: <i>Testing laboratory:</i>	TUV Rheinland Taiwan Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
Report date / tested by:			kontrolliert von / reviewed by:	
12-Dec-2017	Jack Chang/Project Manager		12-Dec-2017	Arvin Ho/Vice General Manager
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend
	5 = mangelhaft	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar
Legend:	1 = very good	2 = good	3 = satisfactory	4 = sufficient
	5 = poor	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable
				N/T = not tested
<p>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.</p> <p><i>This test report only 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 test mark.</i></p>				

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT*RESULT: Passed***5.1.2 PEAK OUTPUT POWER***RESULT: Passed***5.1.3 6dB BANDWIDTH AND 99% BANDWIDTH***RESULT: Passed***5.1.4 POWER DENSITY***RESULT: Passed***5.1.5 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE MEASURED IN 100KHz BANDWIDTH***RESULT: Passed***5.1.6 SPURIOUS EMISSION***RESULT: Passed***5.2.1 MAINS CONDUCTED EMISSIONS***RESULT: Passed***6.1.1 ELECTROMAGNETIC FIELDS***RESULT: Passed*

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1. General Remarks

1.1 Complementary Materials

The following attachments are integral parts of this test report:

Appendix P: Photo Documentation
(File Name: 50114959APPENDIX P)

Appendix D: Test Result of Radiated Emissions
(File Name: 50114959APPENDIX D)

Test Specifications

The following standards were applied (in bold: product standards, otherwise: basic standards).

Table 1: Applied Standard and Test Levels

Radio
FCC CFR47 Part 15: Subpart C Section 15.247
ANSI C63.10:2013, KDB558074 D01 DTS Meas Guidance v02

2. Test Sites

2.1 Test Laboratory

TUV Rheinland Taiwan Ltd.
Taichung Branch Office

No.9, Lane 36, Minsheng Rd., Sec. 3, Daya District,
Taichung City 428
Taiwan (R.O.C.)

2.2 Test Facilities

TUV Rheinland Taiwan Ltd.
Taipei Office

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

FCC RegistrationNo.: 340738
IC Canada Registration No.: 9465A-1
TAF Accredited NCC Test Lab. No.:0759
TAF ISO17025 Certification effective periods: 2016-Jul-1st to 2019-Jun-30th



Testing Laboratory
0759

2.3 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Kind of Equipment	Manu-facturer	Type	S/N	Last Calibration	Next Calibration
Test Software	Farad	EZ_EM C	Ver. TUV3A1	N/A	N/A
EMI Test Receiver	R&S	ESCI 7	100797	2016/12/30	2017/12/30
Spectrum Analyzer	R&S	FSV 40	100921	2017/05/02	2018/05/01
Spectrum Analyzer	Agilent	N9010A	MY53470241	2017/05/23	2018/05/22
Preamplifier (30MHz -1GHz)	HP	8447D	2944A06641	2016/12/28	2017/12/28
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2016/12/01	2017/12/31
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	60649	2017/07/28	2018/07/28
Bilog Antenna	TESEQ	CBL6111D	29804	2017/08/18	2018/08/18
Horn Antenna	ETS-Lindgren	3117	201918	2017/08/18	2018/08/18
Horn Antenna (18GHz~40GHz)	COM-POWER	AH-840	101031	2017/11/28	2018/11/28
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2017/06/14	2018/06/14
EMI Test Receiver	R&S	ESCI7	100797	2016/12/30	2017/12/30
LISN (1 phase)	R&S	ENV216	101243	2017/06/18	2018/06/18
LISN	R&S	ENV216	101262	2017/06/22	2018/06/21

2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.5 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements are ± 3 dB.

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
RF power, conducted	± 1.5 dB
Adjacent channel power	± 3 dB
Radiated emission of transmitter, valid up to 26 GHz	± 6 dB
Radiated emission of receiver, valid up to 26 GHz	± 6 dB
Temperature	± 2 °C
Humidity	± 10 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a ZigBee Green Power multi-sensors. It contains a Zigbee compatible module enabling the user to communicate data through a Wireless interface. For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment	Philips Occupancy and Multi Sensor
Type Designation	9290018190, 9290018191
FCC ID	2AGBW9290018190X
ISED ID	20812-8190X
HVIN	Philips Occupancy and Multi Sensor

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	2405~2480 MHz
Channel Spacing	5 MHz
Channel number	16
Operation Voltage	3.6 Vdc
Modulation	DSSS
Antenna gain	1.71 dBi

3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting
 - 1. Low channel
 - 2. Middle channel
 - 3. High channel
- B. Receiving
- C. Standby
- D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Block Diagram
- PCB Layout
- Photo Document
- Technical Description
- Circuit Diagram
- Instruction Manual
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: Test samples are connected with a conversion board which makes it possible to control them through a test software installed on a notebook computer.

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate.

The samples were used as follows:

Conducted: A000657651-001

Radiation: A000657651-001

Full test was applied on all test modes, but only worst case was shown

Zigbee IEEE 802.15.4 mode:

Channel Low (2405MHz), Channel Mid (2440MHz) and Channel High (2480MHz) with 250Kbps data rate were chosen for full testing.

4.3 Additional Accessories and Auxiliary Equipment

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

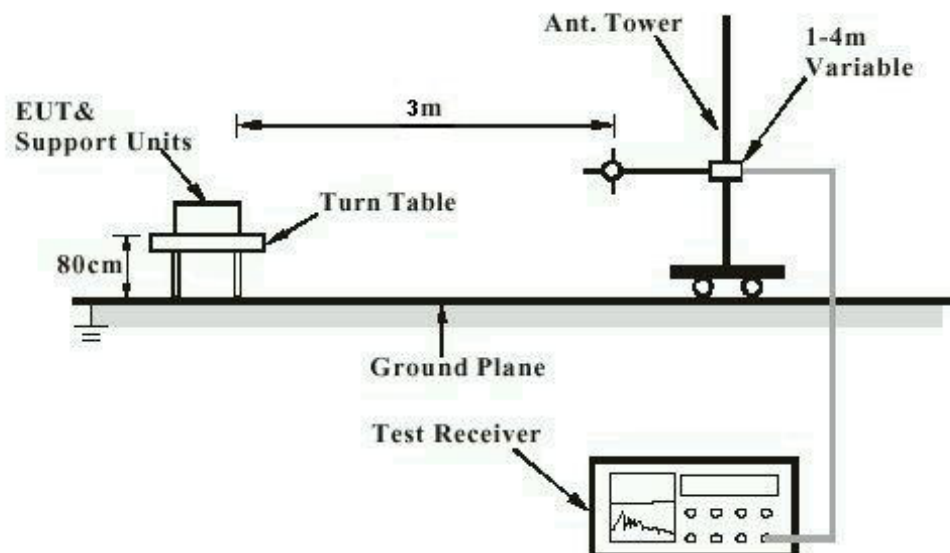
Description	Manufacturer	Model No.	Serial No.
Notebook(EMC-06)	Lenovo	TP00048A	PB-0F8B2

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m.

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)

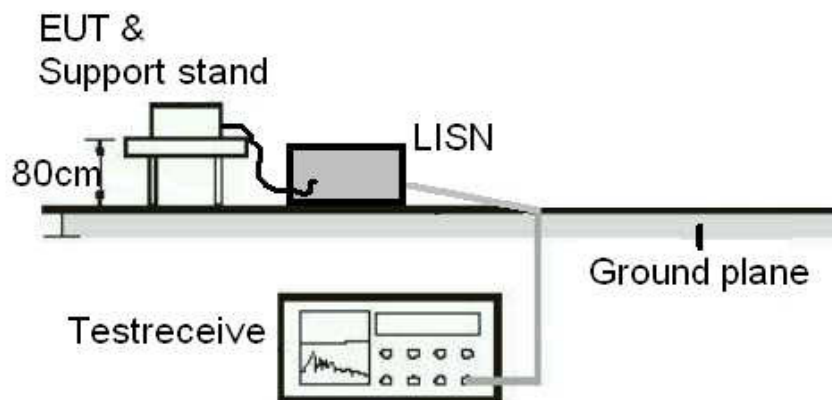
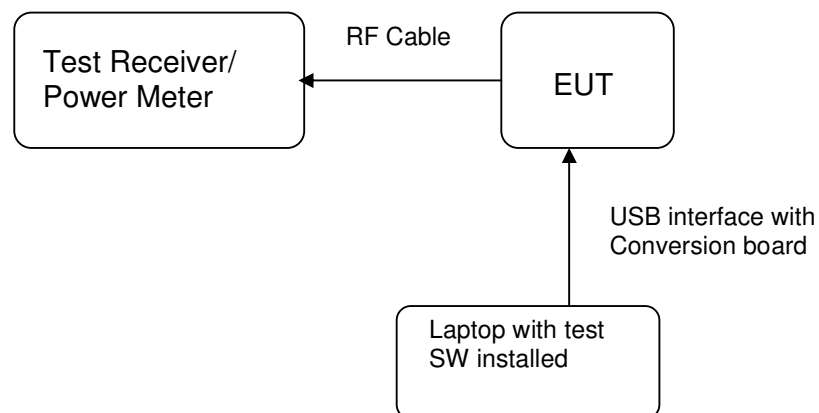


Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Passed**

Test standard : LP0002(2016): 3.10.1, (3)
FCC Part 15.247(b)(4), Part 15.203 and RSS-
Gen 8.3

Limit : the use of antennas with directional gains that do not
exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 1.71dBi .The antenna is a printed PCB trace with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 Peak Output Power

RESULT:
Passed

Test standard : LP0002(2016): 3.10.1, (2)
 FCC Part 15.247(b)(3), RSS-247 5.4(4)
 Basic standard : ANSI C63.10:2013, KDB558074
 Limit : 1 Watt
 Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
 Operation Mode : A

 Ambient temperature : 22-26 °C
 Relative humidity : 50-65 %
 Atmospheric pressure : 100-103 kPa

Table 6: Test result of Peak Output Power (Zigbee IEEE 802.15.4)

Channel	Channel Frequency (MHz)	Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2405	1.18	0.00131	1
Middle Channel	2440	0.50	0.00112	1
High Channel	2480	-0.14	0.00097	1

Max Value 1.31 mW

5.1.3 6dB Bandwidth and 99% Bandwidth

RESULT:
Passed

Test standard : LP0002(2016): 3.10.1, (5)
 FCC Part 15.247(a)(2), RSS-247 5.2(1)
 Basic standard : ANSI C63.10:2013, KDB558074
 Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
 Operation Mode : A

Ambient temperature : 22-26°C
 Relative humidity : 50-65%
 Atmospheric pressure : 100-103 kPa

Table 7: Test result of 6dB Bandwidth (Zigbee IEEE 802.15.4)

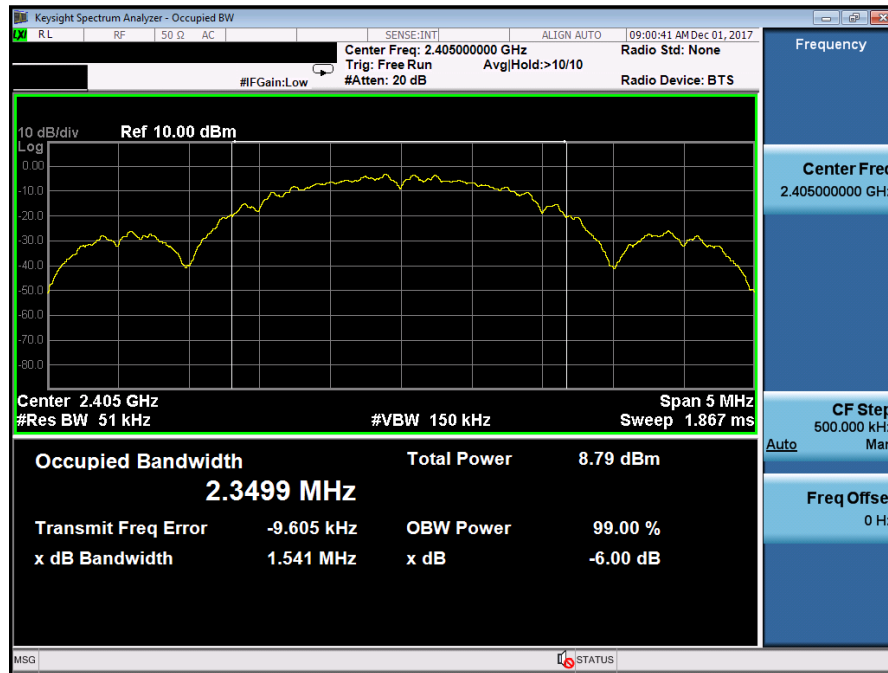
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2405	1.541	0.5	Pass
Mid Channel	2440	1.532	0.5	Pass
High Channel	2480	1.540	0.5	Pass

Table 8: Test result of 99% Bandwidth (Zigbee IEEE 802.15.4)

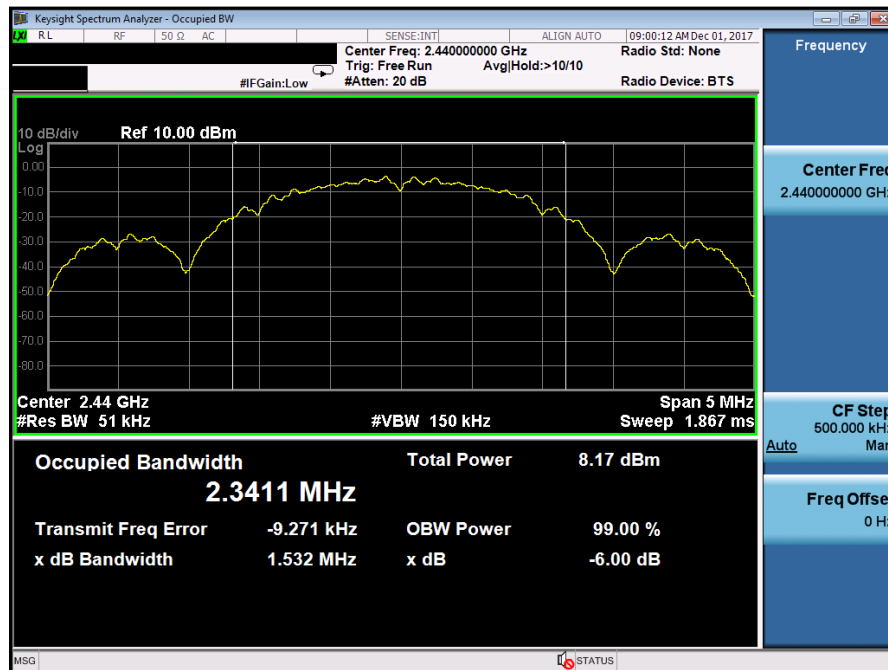
Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2405	2.3499
Mid Channel	2440	2.3411
High Channel	2480	2.3510

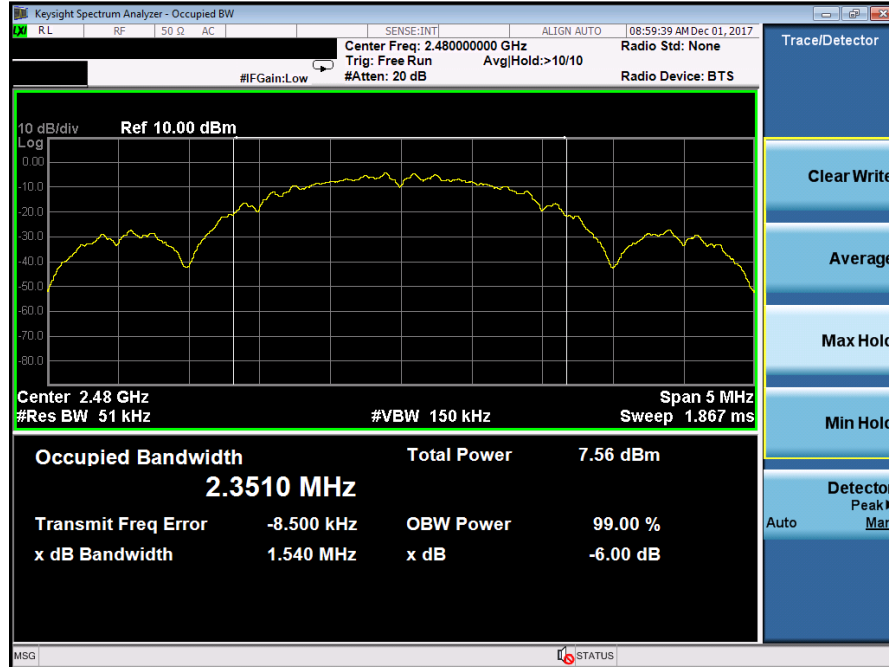
Test Plot of 6dB Bandwidth (Zigbee IEEE 802.15.4)

Low Channel



Middle Channel



High Channel


5.1.4 Power Density

RESULT:
Passed

Test standard : LP0002(2016): 3.10.1, (6.2.2)
 FCC Part 15.247(e) , RSS-247 5.2(2)
 Basic standard : ANSI C63.10:2013, KDB558074
 Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
 Operation Mode : A
 Ambient temperature : 22-26°C
 Relative humidity : 50-65%
 Atmospheric pressure : 100-103 kPa

Table 9: Test result of Power Density (Zigbee IEEE 802.15.4)

Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2405	-1.87	8
Middle Channel	2440	-2.64	8
High Channel	2480	-3.24	8

Test Plot of Power Density (Zigbee IEEE 802.15.4)

Low Channel



Middle Channel



High Channel



5.1.5 Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth

RESULT: **Passed**

Test standard : LP0002(2016): 3.10.1, (5)
FCC part 15.247(d), RSS-247 5.5
Basic standard : ANSI C63.10:2013, KDB558074
Limit : 20dB (below that in the 100kHz bandwidth within the
band that contains the highest level of the desired power)
Kind of test site : Shielded room

Test setup

Test Channel : Low/ High
Operation mode : A
Ambient temperature : 22-26°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103 kPa

All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achieved as well.
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

Test Plot 100kHz Conducted Emissions (Zigbee IEEE 802.15.4)

Low Channel



Middle Channel

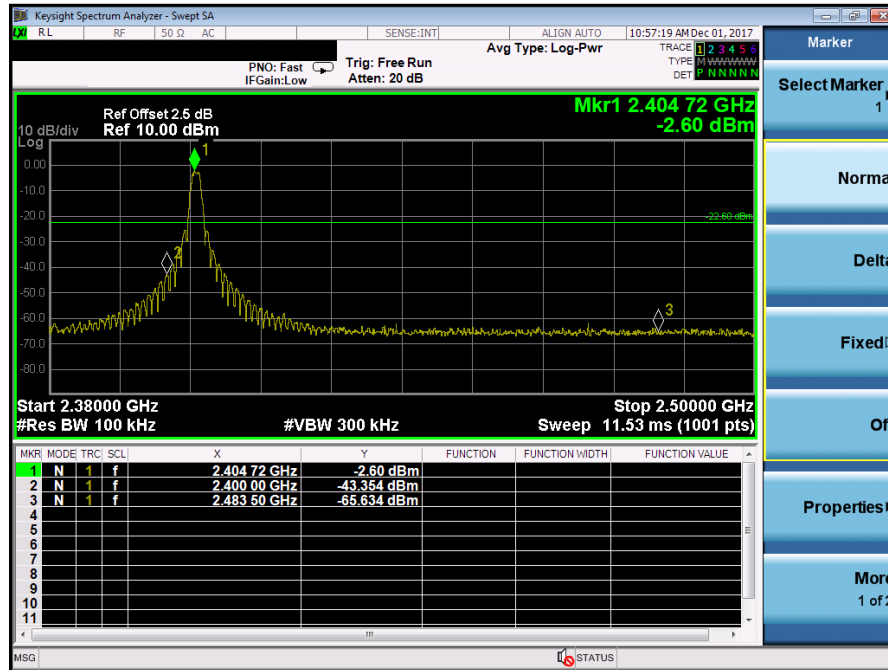


High Channel

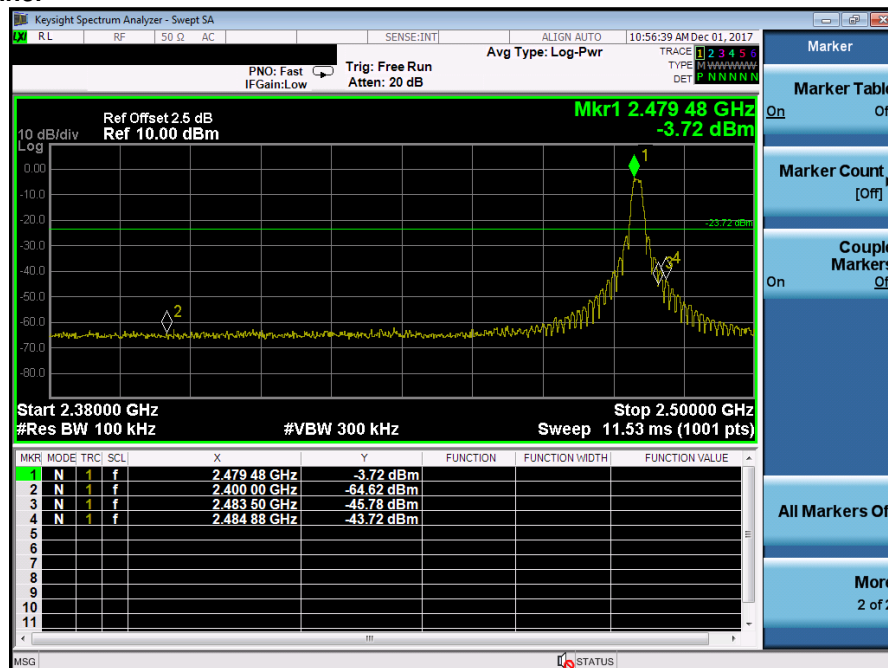


Test Plot 100kHz RBW of Band Edge (Zigbee IEEE 802.15.4)

Low Channel



High Channel



5.1.6 Spurious Emission

RESULT:**Passed**

Test standard	:	FCC part 15.247(d), FCC 15.205, FCC 15.209, RSS-210 2.2, RSS-247 5.5 and RSS-Gen 8.9 LP0002(2016): 3.10.1, (5)
Basic standard	:	ANSI C63.10:2013
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-Gen i4, 8.9 (Table 6), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen i4, 8.9 (Table 4 and 5). Radiated emissions which fall in the restricted bands, as defined in LP0002(2016): 2.7 , must comply with the radiated emission limits specified in LP0002(2016): 2.8 Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) and FCC 15.249(a), RSS-Gen i4, 8.9 (Table 4 and 5) and RSS-210 A2.9(a). Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in LP0002(2016): 2.8
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A, B

Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic.

For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The X Axis orientation is the worst-case and recorded in this test report. Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

6. Safety Human exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:**Passed**

Test standard : FCC KDB Publication 447498 D01
47CFR 2.1091
RSS--102 issue 5, Table 4

Separation distance is more than 20 cm, thus mobile device exposure limits can be applied

Maximum Exposure:

Power to Antenna (mW)	1.31 mW
Power to Antenna (dBm)	1.2 dBm
Antenna Gain	1.71 dBi
Power+Ant Gain	1.9 mW
Distance	20 cm
S=	0.000 mW/cm ²

Limit FCC: 0.61 mW/cm²

Limit Canada: 0.274 mW/cm²

FCC:

0.3-1.34 MHz	(100) mW/cm ²
1.34-30 MHz	(180/f ²) mW/cm ²
30-300 MHz	0.2 mW/cm ²
300-1500 MHz	f/1500 mW/cm ²
1500-100,000 MHz	1.0 mW/cm ²

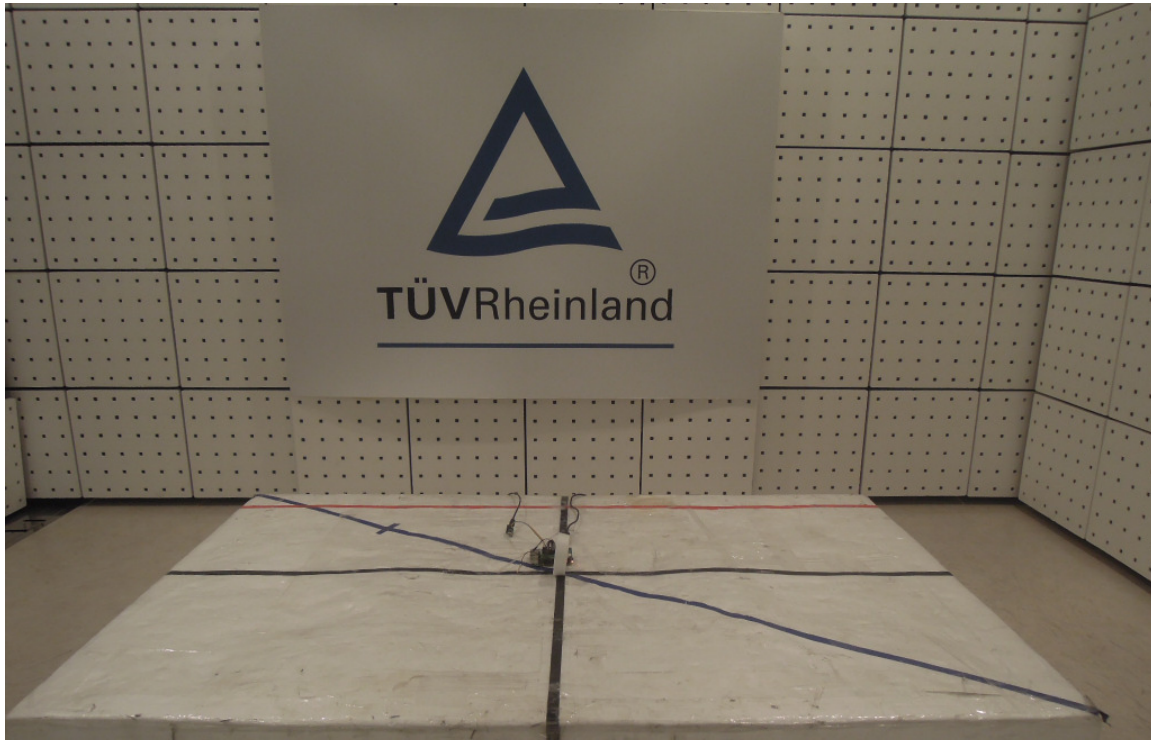
Canada:

10-20 MHz	0.2 mW/cm ²
20-48 MHz	(0.8944/f ^{0.5}) mW/cm ²
48-300 MHz	0.129 mW/cm ²
300-6000 MHz	(0.002619*f ^{0.6834}) mW/cm ²
6000-15000MHz	1.0 mW/cm ²

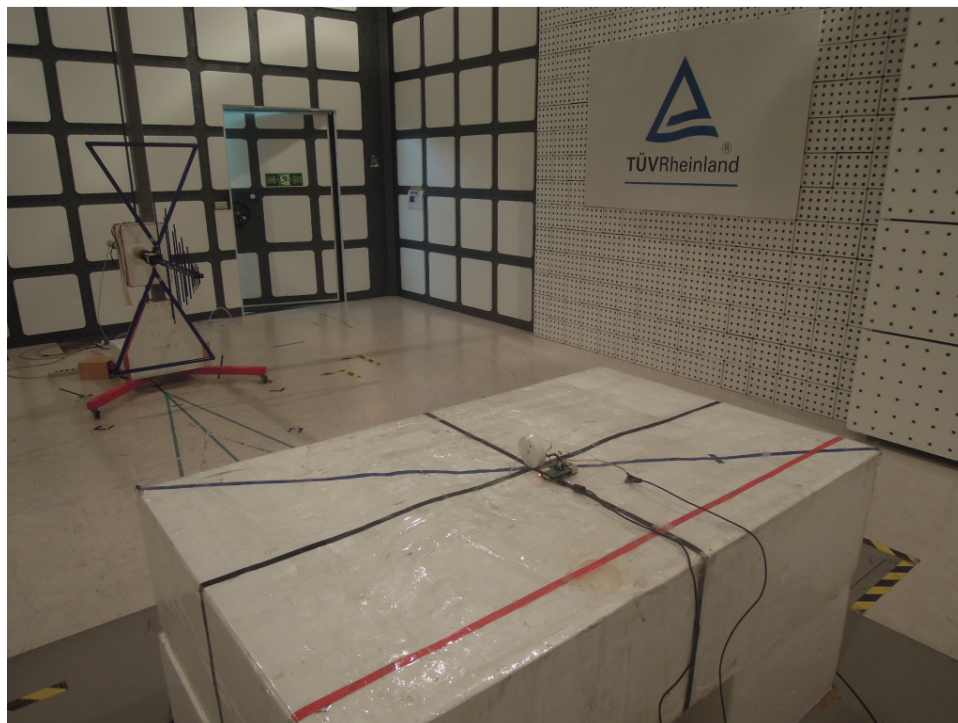
---End---

Photographs of the Test Set-Up

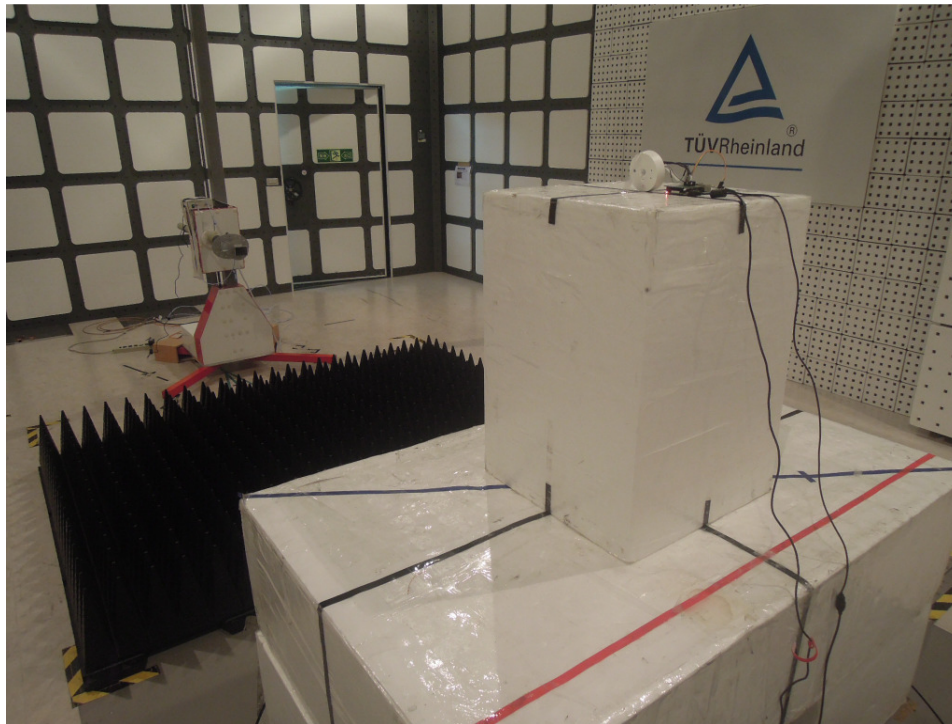
Photograph 1: Set-up for Spurious Emissions (Front View)



Photograph 2: Set-up for Spurious Emissions (Back View 1)



Photograph 3: Set-up for Spurious Emissions (Back View 2)



Photograph 4: Set-up for Conducted testing



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