

Auftrags-Nr.: 114024887 Seite 1 von 41 Prüfbericht-Nr.: 10047908 001 Order No.: Page 1 of 41 Test Report No .: Auftragsdatum: July 24, 2014 Kunden-Referenz-Nr.: N/A Order date: Client Reference No .: Auftraggeber: Parex Electronics & Computer Co., Ltd., 2F., No.9, Aly. 24, Ln. 68, Sec. 1, Guangfu Client: Rd., Sanchong Dist., New Taipei City 241, Taiwan Prüfgegenstand: Bluetooth Keyboard Test item: Bezeichnung / Typ-Nr.: BT1311 Identification / Type No .: Auftrags-Inhalt: FCC Part 15C Test report Order content: Prüfgrundlage: Test specification: FCC 47CFR Part 15: Subpart C Section 15.247 RSS-210 (12-2010) A8 Wareneingangsdatum: 08/12/2014 Date of receipt: Prüfmuster-Nr.: A000099663-001 Test sample No .: A000099663-001 Prüfzeitraum: 13-Aug-2014 - 19-Aug-2014 Testing period: EMC Laboratory Taipei Ort der Prüfung: Place of testing: TUV Rheinland Taiwan Ltd. Prüflaboratorium: Testing laboratory: Prüfergebnis\*: Pass Test result\* kontrolliert von I reviewed by: geprüft von I tested by: Ryan Chen/Project Engineer Rene Charton/Senior Project Manager 2014-09-02 2014-09-02 Name / Stellung Unterschrift Datum Unterschrift Name / Stellung Datum Name / Position Signature Date Name I Position Signature Date Sonstiges I Other. Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt Test item complete and undamaged Condition of the test item at delivery: \* Legende: 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft 1 = sehr aut N/A = nicht anwendbar N/T = nicht getestet P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) Legend: 1 = very good 2 = good3 = 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 testedDieser 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 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.



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### **TEST SUMMARY**

5.1.1 ANTENNA REQUIREMENT

RESULT: Passed

**5.1.2 PEAK OUTPUT POWER** 

RESULT: Passed

5.1.3 20DB BANDWIDTH

RESULT: Passed

5.1.4 99% BANDWIDTH

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

5.1.7 FREQUENCY SEPARATION

RESULT: Passed

5.1.8 Number of hopping frequency

RESULT: Passed

5.1.9 TIME OF OCCUPANCY

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

All attachments are integral parts of this test report. This applies especially to the following appendix:

**Appendix P: Photo Documentation** 

(File Name: 10047908APPENDIX P)

**Appendix D: Test Result of Radiated Emissions** 

(File Name: 10047908APPENDIX D)

**Test Specifications** 

The following standards were applied

#### **Table 1: Applied Standard and Test Levels**

#### Radio

FCC CFR47 Part 15: Subpart C Section 15.247 ANSI C63.4:2009, Public Notice DA 00-705



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### 2. Test Sites

### 2.1 Test Facilities

TUV Rheinland Taiwan Ltd.

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.

Taipei City 105 Taiwan

FCC Registration No.: 365730

TAF Accredited NCC Test Lab. No.:0759

TAF Accredition effective period: 2013-Jul-1<sup>st</sup> to 2016-Jun-30<sup>th</sup>



Testing Laboratory 0759

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### 2.2 List of Test and Measurement Instruments

### **Table 2: List of Test and Measurement Equipment**

Kind of Equipment	Manufacturer	Туре	S/N	Calibrated until
EMI Test Receiver	R&S	ESCI 7	101062	1-Sep-14
Bilog Antenna	TESEQ	CBL6111D	29802	4-Jul-15
Spectrum Analyzer	R&S	FSV 40	100921	10-Dec-14
Horn Antenna	ETS-Lindgren	3117	138160	10-Jan-15
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101031	29-Oct-15
Preamplifier (30MHz - 1GHz)	HP	8447F	2805A03335	2-Sep-14
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2-Sep-14
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM30180	60558	23-Oct-14
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	28-Sep-14
EMI Test Receiver	R&S	ESCI	101094	29-Aug-14
LISN (1 phase)	R&S	ENV216	101243	30-May-15
LISN	Rolf Heine	NNB-2/16Z	99080	30-Aug-14

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### 2.3 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.

### 2.4 Calibration

requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

### 2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements:.

**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 ºC
Humidity	± 10 %



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### 3. General Product Information

### 3.1 Product Function and Intended Use

The EUT is a Wireless Keyboard. It contains a Bluetooth 3.0 compatible module enabling the user to keyboard function 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	Bluetooth Keyboard		
Type Designation	BT1311		
FCC ID	2ACW4-BT1311	IC Can ID: 12250A-BT1311	

#### **Table 5: Technical Specification of EUT**

Technical Specification	Value
Operating Frequency	2402 MHz ~ 2480 MHz
Channel Spacing	1 MHz
Channel number	79
Operation Voltage	3.7 V from Li-lon Battery
Modulation	GFSK
Antenna gain	1.87 dBi

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**Table 6: Frequency hopping information** 

Technical Specification	Description
Hopping Range	Hereby we declare that the maximum frequency of this device is: 2402-2480MHz. This is according the Bluetooth Core Specification V2.1+EDR for devices which will be operated in the USA. This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04).
Hopping Sequence	Example of a 79 hopping sequence in data mode:  33,04,21,44,23,42,53,46,55,48,40,59,72,29,76,31,08,73, 07,75,09,45,60,39,58,13,47,11,77,52,35,50,65,54,67,56, 69,62,71,64, 7,25,27,66,57,70,74,61,78,63,10,41,05,43, 15,44,64,68,02,70,06,01,51,03,55,05,03,66,53,49,36,47,
Receiver input bandwidth	The input bandwidth of the receiver is 1MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.  Additionally the type of connection is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.  Repeating of a packer has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case.
	That means a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

# 3.3 Independent Operation Modes

The basic operation modes are:

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



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## 3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

### 3.5 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description



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### 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

Test operation refers to test setup in chapter 4. All testing were performed according to the procedures in ANSI C63.10: 2009 and DA 00-705 of March 30, 2000.

The samples were used as follows: Conducted: **A000099663-001**Radiation: **A000099663-001** 

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

### 4.3 Special Accessories and Auxiliary Equipment

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

Kind of Equipment	Manufacturer	Model Name	S/N
Laptop	HP	HSTNN-Q78C-3	CNF0339QBM



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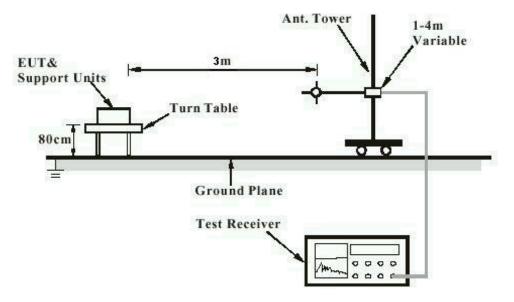
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### 4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested containing the noise suppression parts as in the Photo Appendix and the Test Setup Photos. No additional measures were employed to achieve compliance.

### 4.5 Test Setup Diagram

**Diagram of Measurement Configuration for Radiation Test** 



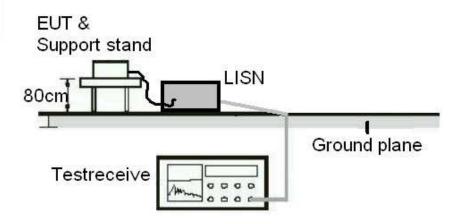


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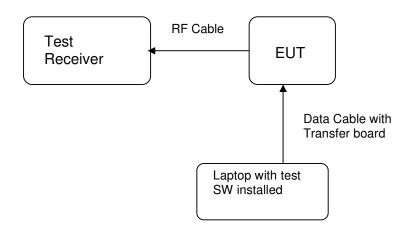
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# Diagram of Measurement Equipment Configuration for Mains Conduction Measurement



# Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement





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### 5. Test Results

### 5.1 Transmitter Requirement & Test Suites

### 5.1.1 Antenna Requirement

RESULT: Passed

Test standard : LP0002(2011): 2.2, 3.10.1, (3)

FCC Part 15.247(b)(4), Part 15.203 and RSS-

Gen 7.1.4

Requirement : use of approved antennas only with directional gains that

do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 1.87 dBi dBi. 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.



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### 5.1.2 Peak Output Power

**RESULT: Passed** 

Test standard FCC Part 15.247(b)(1),

RSS-210 A8.4(2)

LP0002(2011): 3.10.1, (2)

DA 00-705 of March 30, 2000 Basic standard

LP0002(2011) Appendix II

Kind of test site Shielded room

**Test setup** 

Test Channel Low/ Middle/ High

Operation Mode

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

Table 7: Test result of Peak Output Power, GFSK modulation

Channel	Channel Frequency	Peak Output Power		Limit
	(MHz)	(dBm)	(W)	(W)
Low Channel	2402	-5.32	0.0003	0.125
Middle Channel	2441	-5.18	0.0003	0.125
High Channel	2480	-5.46	0.0003	0.125

Pmax: 0.3033 mW



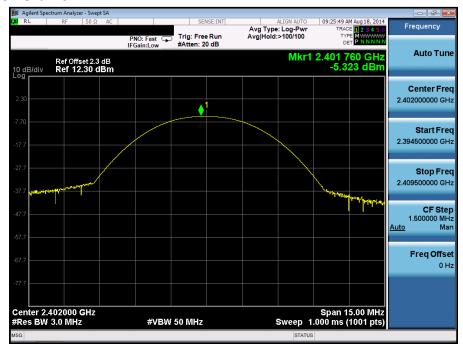
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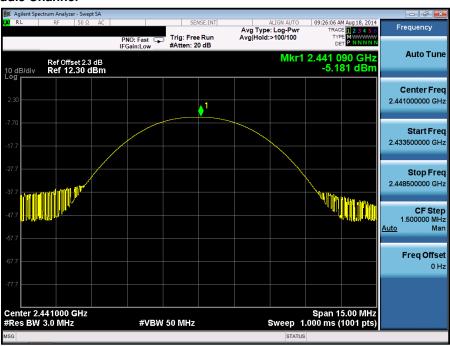
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### Test Plot of Peak Output Power, GFSK modulation

#### **Low Channel**



#### **Middle Channel**



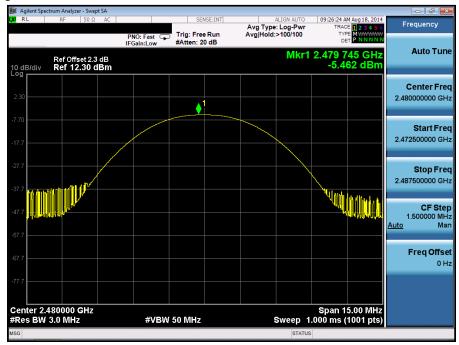


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#### **High Channel**





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#### 5.1.3 20dB Bandwidth

RESULT: Passed

Test standard : FCC Part 15.247(a)(1),

RSS-210 A8.1(a)

LP0002(2011): 3.10.1, (6.1.1)

Basic standard : DA 00-705 of March 30, 2000

LP0002(2011) Appendix II

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 : 100-103kPa

Table 8: Test result of 20dB Bandwidth, GFSK modulation

Channel	Channel Frequency (MHz)	20dB Bandwidth (kHz)	Limit (MHz)	Result
Low Channel	2402	1024	1.5	Pass
Mid Channel	2441	1020	1.5	Pass
High Channel	2480	1015	1.5	Pass

Note: Limit is for Channel Separation of 1 MHz and a power limit of 125 mW.

If the carrier separation frequency of a Bluetooth Device is set at 1 MHz due to the firmware setting and the Bluetooth Standard, then the limit for the 20 dB Bandwidth, becomes 1 MHz / 0.66666 = 1.5 MHz.

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### Test Plot of 20dB Bandwidth, GFSK modulation

#### **Low Channel**



#### **Middle Channel**





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#### 5.1.4 99% Bandwidth

**RESULT: Passed** 

Test standard RSS-Gen (Issue 3) Dec. 2010 Basic standard RSS-Gen (Issue 3) Dec. 2010

Kind of test site Shielded room

**Test setup** 

Test Channel : Operation Mode : Low/ Middle/ High

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

#### Table 9: Test result of 99% Bandwidth, GFSK modulation

Channel	Channel Frequency (MHz)	99% Bandwidth (kHz)	Result
Low Channel	2402	939.79	Pass
Mid Channel	2441	940.4	Pass
High Channel	2480	935.9	Pass

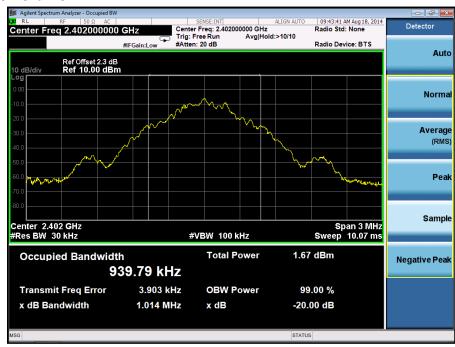
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### Test Plot of 99% Bandwidth, GFSK modulation

#### **Low Channel**

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#### **Middle Channel**





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#### **High Channel**

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

RESULT: Passed

Test standard : FCC part 15.247(d),

RSS-210 A8.5

LP0002(2011): 3.10.1, (5)

Basic standard : DA 00-705 of March 30, 2000

LP0002(2011) Appendix II 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** 

Limit

Test Channel : Low/ Middle/ 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 achived 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.



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### Test Plot of 100kHz Conducted Emissions, GFSK modulation

#### **Low Channel**



#### **Middle Channel**





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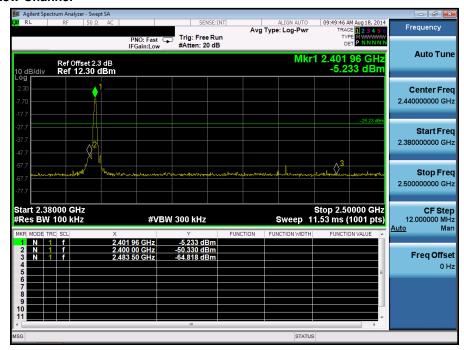


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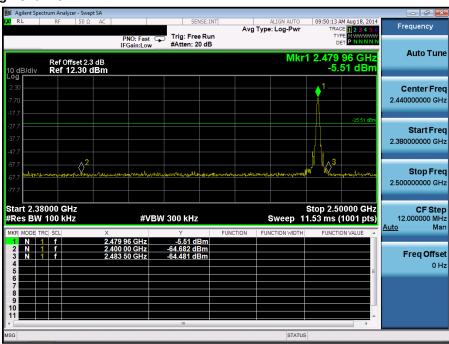
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### Test Plot of 100kHz Bandwidth of Frequency Band Edge, GFSK modulation

#### **Low Channel**



#### **High Channel**





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### 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-210 A8.5 and RSS-Gen 7.2.1

LP0002(2011): 3.10.1, (5)

Basic standard ANSI C63.10: 2009

Radiated emissions which fall in the restricted bands, Limits

> as defined in FCC 15.205(a) and RSS-210 2.7 (Table 1), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-210 2.7 (Table

2 and 3).

Radiated emissions which fall in the restricted bands, as defined in LP0002(2011): 2.7, must comply with

the radiated emission limits specified in

LP0002(2011): 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-210 2.7 (Table 2 and 3) and RSS-210 A2.9(a). Emission radiated outside the specified frequency bands must comply with the radiated emission limits

specified in LP0002(2011): 2.8

Kind of test site 3m Semi-Anechoic Chamber

**Test setup** 

Test Channel Low/ Middle/ High

Operation Mode

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.



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### 5.1.7 Frequency Separation

**RESULT: Passed** 

Test standard FCC part 15.247(a)(1)

RSS-210 A8.1(b)

LP0002(2011): 3.10.1, (6.1.1)

Basic standard DA 00-705 of March 30, 2000

LP0002(2011) Appendix II

≥ 25kHz or 2/3 of 20dB bandwidth, whichever is greater Limit

**Test setup** 

Test Channel Low/ Middle/ High

Operation Mode Ambient temperature **24**℃ Relative humidity 53%

#### **Table 10: Test result of Frequency Separation**

Channel	Channel Frequency (MHz)	Measured Channel Separation (MHz)	Limit (kHz)	Result
Record Channel	2441		> 05111 0/0 (	
Record Channel adj 1	2440	1	≥ 25kHz or 2/3 of 20dB bandwidth	Pass
Record Channel adj 2	2442		200B bandwidth	



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### **Test Plot of Frequency Separation**

**GFSK** 





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### 5.1.8 Number of hopping frequency

**RESULT: Passed** 

Test standard FCC part 15.247(a)(1)(iii)

RSS-210 A8.1(d)

LP0002(2011): 3.10.1, (6.1.2)

Basic standard DA 00-705 of March 30, 2000

LP0002(2011) Appendix II

Limits ≥ 15 non-overlapping channels

Kind of test site Shield room

**Test setup** 

Test Channel Low/ Middle/ High

Operation Mode Α

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

#### Table 11: Test result of Number of hopping frequency

Frequency Range	Measured Quantity of Hopping Channel	Limit	Result
2400 to 2483.5 MHz	79	≥15	Pass

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### 5.1.9 Time of Occupancy

**RESULT: Passed** 

Test standard FCC part 15.247(a)(1)(iii)

RSS-210 A8.1(d)

LP0002(2011): 3.10.1, (6.1.2)

Basic standard DA 00-705 of March 30, 2000 :

LP0002(2011) Appendix II

Limits 0.4s

Shield room Kind of test site

**Test setup** 

Test Channel Low/ Middle/ High

Operation Mode Α

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

#### Table 12: Test result of Time of Occupancy

Data Mode	Captured Burst (s)	Dwell time (s)	On+Off time (s)	Limit (s)	Result
DH5	0.0030	0.3160	0.00376	0.4	Pass

Dwell time = Pulse width x (Hopping rate / Number of channels) x Period

Period = 0.4 (seconds/ channel) x 79 (channel) = 31.6 seconds.

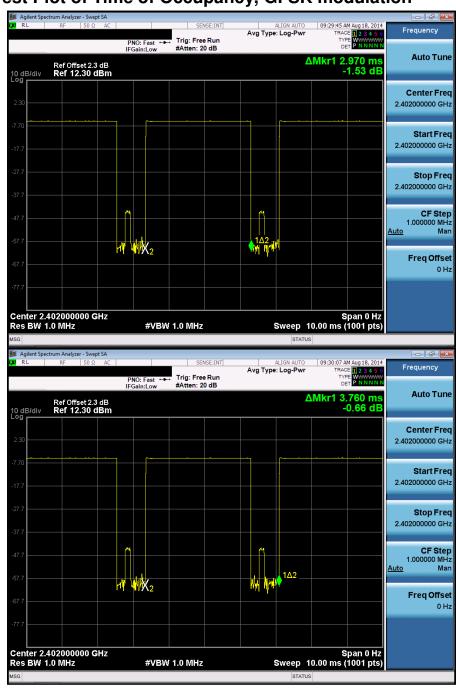
Hopping rate = 1 / (On+Off time) = 266 Hz

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## Test Plot of Time of Occupancy, GFSK modulation





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# 5.2 Mains Emissions

### 5.2.1 Mains Conducted Emissions

RESULT: Passed

Test standard : FCC Part 15.207

FCC Part 15.107 RSS-Gen 7.2.4 LP0002: 2.3

Limits : Mains Conducted emissions as defined in

above test standards must comply with the mains conducted emission limits specified

Kind of test site : Shielded Room

Test setup

Test Channel : Middle Operation mode : A

Remark: For details refer to Appendix D.



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# 6. Safety Human exposure

## **6.1 Radio Frequency Exposure Compliance**

### **6.1.1 Electromagnetic Fields**

RESULT: Passed

Test standard : FCC KDB Publication 447498

Since maximum peak output power of the transmitter is <1mW, hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure..

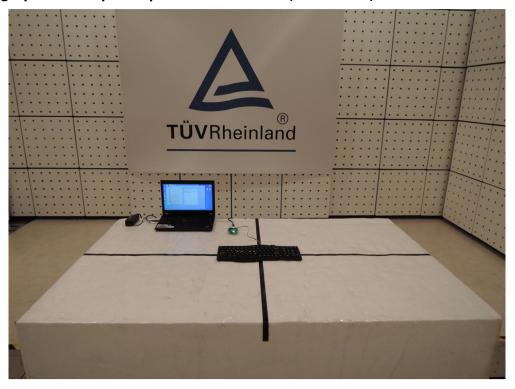


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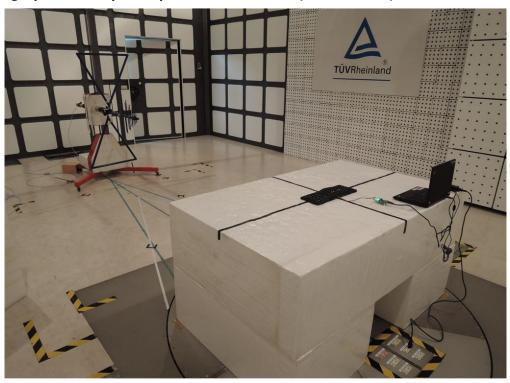
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# 7. Photographs of the Test Set-Up

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



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

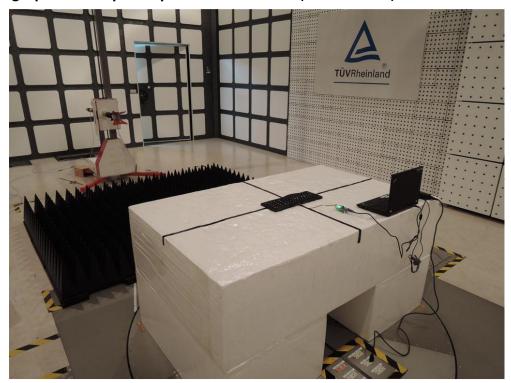




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### Photograph 3: Set-up for Spurious Emissions (Back View 2)



Photograph 4: Set-up for Conducted testing

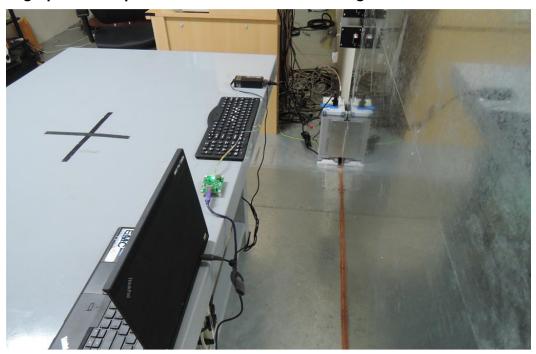




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**Photograph 5: Set-up for Mains Conducted testing Back** 



Photograph 6: Set-up for for Mains Conducted testing Front





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