

<b>Prüfbericht-Nr.:</b> <i>Test Report No.:</i>	<b>50091281 001</b>	<b>Auftrags-Nr.:</b> <i>Order No.:</i>	<b>114066573</b>	<b>Seite 1 von 24</b> <i>Page 1 of 24</i>
<b>Kunden-Referenz-Nr.:</b> <i>Client Reference No.:</i>	<b>N/A</b>	<b>Auftragsdatum:</b> <i>Order date:</i>	<b>28-Jun-2017</b>	
<b>Auftraggeber:</b> <i>Client:</i>	<b>ARESON Technology Corp., 11F., No. 646, Sec.5, Chongxin Rd., SanChong Dist., New Taipei City 24158, Taiwan, R.O.C.</b>			
<b>Prüfgegenstand:</b> <i>Test item:</i>	<b>2.4GHz Wireless Mouse</b>			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type No.:</i>	<b>L087SR,MUS-TRLF132</b>			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	<b>FCC Test report</b>			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	<b>FCC 47CFR Part 15: Subpart C Section 15.249</b>			
<b>Wareneingangsdatum:</b> <i>Date of receipt:</i>	<b>5-Jul-2017</b>			
<b>Prüfmuster-Nr.:</b> <i>Test sample No.:</i>	<b>A000575419-001</b>			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	<b>12-Jul-2017 - 14-Jul-2017</b>			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	<b>EMC Laboratory Taipei</b>			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	<b>TUV Rheinland Taiwan Ltd.</b>			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	<b>Pass</b>			
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>		
<b>2017-07-20</b>	<b>Ryan W. T. Chen / Project Manager</b>	<b>2017-07-20</b>	<b>Rene Charton/Senior Project Manager</b>	
<b>Datum</b>	<b>Name / Stellung</b>	<b>Unterschrift</b>	<b>Datum</b>	<b>Name / Stellung</b>
<i>Date</i>	<i>Name / Position</i>	<i>Signature</i>	<i>Date</i>	<i>Name / Position</i>
<b>Sonstiges / Other:</b> FCC ID: P5A-CL0035				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>		<b>Prüfmuster vollständig und unbeschädigt</b> <i>Test item complete and undamaged</i>		
<b>* Legende:</b>	<b>1 = sehr gut</b>	<b>2 = gut</b>	<b>3 = befriedigend</b>	<b>4 = ausreichend</b>
	<b>5 = mangelhaft</b>	<b>P(ass) = entspricht o.g. Prüfgrundlage(n)</b>	<b>F(ail) = entspricht nicht o.g. Prüfgrundlage(n)</b>	<b>N/A = nicht anwendbar</b>
	<b>N/T = nicht getestet</b>			
<b>Legend:</b>	<b>1 = very good</b>	<b>2 = good</b>	<b>3 = satisfactory</b>	<b>4 = sufficient</b>
	<b>5 = poor</b>	<b>P(ass) = passed a.m. test specification(s)</b>	<b>F(ail) = failed a.m. test specification(s)</b>	<b>N/A = not applicable</b>
	<b>N/T = not tested</b>			
<b>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.</b> <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>				

## TEST SUMMARY

### **5.1.1 ANTENNA REQUIREMENT**

*RESULT: Passed*

### **5.1.2 FIELD STRENGTH OF FUNDAMENTAL**

*RESULT: Passed*

### **5.1.3 99% BANDWIDTH**

*RESULT: Passed*

### **5.1.4 SPURIOUS EMISSION**

*RESULT: Passed*

### **6.1.1 ELECTROMAGNETIC FIELDS**

*RESULT: Passed*

## Contents

<b>1.</b>	<b>GENERAL REMARKS .....</b>	<b>5</b>
<b>1.1</b>	<b>COMPLEMENTARY MATERIALS.....</b>	<b>5</b>
<b>2.</b>	<b>TEST SITES .....</b>	<b>6</b>
<b>2.1</b>	<b>TEST LABORATORY .....</b>	<b>6</b>
<b>2.2</b>	<b>TEST FACILITY.....</b>	<b>6</b>
<b>2.3</b>	<b>LIST OF TEST AND MEASUREMENT INSTRUMENTS.....</b>	<b>7</b>
<b>2.4</b>	<b>TRACEABILITY .....</b>	<b>8</b>
<b>2.5</b>	<b>CALIBRATION .....</b>	<b>8</b>
<b>2.6</b>	<b>MEASUREMENT UNCERTAINTY .....</b>	<b>8</b>
<b>3.</b>	<b>GENERAL PRODUCT INFORMATION.....</b>	<b>9</b>
<b>3.1</b>	<b>PRODUCT FUNCTION AND INTENDED USE .....</b>	<b>9</b>
<b>3.2</b>	<b>RATINGS AND SYSTEM DETAILS.....</b>	<b>9</b>
<b>3.3</b>	<b>INDEPENDENT OPERATION MODES.....</b>	<b>10</b>
<b>3.4</b>	<b>NOISE GENERATING AND NOISE SUPPRESSING PARTS .....</b>	<b>10</b>
<b>3.5</b>	<b>SUBMITTED DOCUMENTS.....</b>	<b>10</b>
<b>4.</b>	<b>TEST SET-UP AND OPERATION MODES.....</b>	<b>11</b>
<b>4.1</b>	<b>PRINCIPLE OF CONFIGURATION SELECTION .....</b>	<b>11</b>
<b>4.2</b>	<b>TEST OPERATION AND TEST SOFTWARE.....</b>	<b>11</b>
<b>4.3</b>	<b>SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT .....</b>	<b>11</b>
<b>4.4</b>	<b>COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....</b>	<b>12</b>
<b>4.5</b>	<b>TEST SETUP DIAGRAM .....</b>	<b>12</b>
<b>5.</b>	<b>TEST RESULTS .....</b>	<b>14</b>
<b>5.1</b>	<b>TRANSMITTER REQUIREMENT &amp; TEST SUITES .....</b>	<b>14</b>
5.1.1	<i>Antenna Requirement .....</i>	<i>14</i>
5.1.2	<i>Field strength of fundamental.....</i>	<i>15</i>
5.1.3	<i>99% Bandwidth .....</i>	<i>18</i>
5.1.4	<i>Spurious Emission .....</i>	<i>21</i>
<b>6.</b>	<b>SAFETY HUMAN EXPOSURE .....</b>	<b>22</b>
<b>6.1</b>	<b>RADIO FREQUENCY EXPOSURE COMPLIANCE .....</b>	<b>22</b>
6.1.1	<i>Electromagnetic Fields.....</i>	<i>22</i>
<b>7.</b>	<b>PHOTOGRAPHS OF THE TEST SET-UP.....</b>	<b>23</b>

<b>8.</b>	<b>LIST OF TABLES .....</b>	<b>25</b>
<b>9.</b>	<b>LIST OF PHOTOGRAPHS.....</b>	<b>25</b>

## 1. General Remarks

### 1.1 Complementary Materials

These attachments are integral parts of this test report.

**Appendix P: Photo Documentation**

(File Name: 50091281APPENDIX P)

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

(File Name: 50091281APPENDIX D)

Test Specifications

The following standards were applied.

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

<b>Radio</b>
FCC 47CFR Part 15: Subpart C Section 15.249 ANSI C63.10:2013

## 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 Facility

TUV Rheinland Taiwan Ltd.  
Taipei Office

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

FCC Registration No.: 340738  
IC Canada Registration No.: 9465A-1  
TAF Accredited NCC Test Lab. No.:0759  
TAF ISO17025 Certification effective periods: 2013-Jul-1st to 2016-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_EMG	Ver. TUV3A1	N/A	N/A
EMI Test Receiver	R&S	ESR7	101062	2016/09/12	2017/09/12
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	8447F	2805A03335	2016/07/29	2017/07/29
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2016/12/01	2017/12/01
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	060558	2016/11/17	2017/11/17
Bilog Antenna	TESEQ	CBL6111D	29802	2016/08/10	2017/08/10
Horn Antenna	ETS-Lindgren	3117	138160	2017/05/25	2018/05/25
Horn Antenna (18GHz~40GHz)	COM-POWER	AH-840	101031	2016/11/22	2017/11/22
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2017/06/14	2018/06/14
EMI Test Receiver	R&S	ESC17	100797	2016/12/30	2017/12/30
Spectrum Analyzer	R&S	FSL3	101943	2015/09/07	2017/09/07
Temp. & Humid. Chamber	Giant Force	GCT-099-40-S	MAF0103-007	2015/07/13	2017/07/12
LISN (1 phase)	R&S	ENV216	101243	6/18/2017	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  $\pm 3$ dB.

**Table 3: Emission Measurement Uncertainty**

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



### 3. General Product Information

#### 3.1 Product Function and Intended Use

The EUT is a 2.4GHz Wireless mouse. It contains a 2.4GHz 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 Ratings and System Details

**Table 4: Basic Information of EUT**

Item	EUT information
Kind of Equipment	2.4GHz Wireless Mouse
Type Designation	L087SR,MUS-TRLF132
FCC ID	P5A-CL0035

**Table 5: Technical Specification of EUT**

Technical Specification	Value
Operating Frequencies	2405 ~ 2477 MHz
Channel number	16
Operation Voltage	1.5 Vdc
Modulation	GFSK

### 3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting
  - 1. Low channel
  - 2. Middle channel
  - 3. High channel
- B. Receiving
  - 1. Low channel
  - 2. Middle channel
  - 3. High channel

### 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

## 4. Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum emission 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 provided with a modified software which makes it possible to control them through the button on the Mouse.

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.

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:

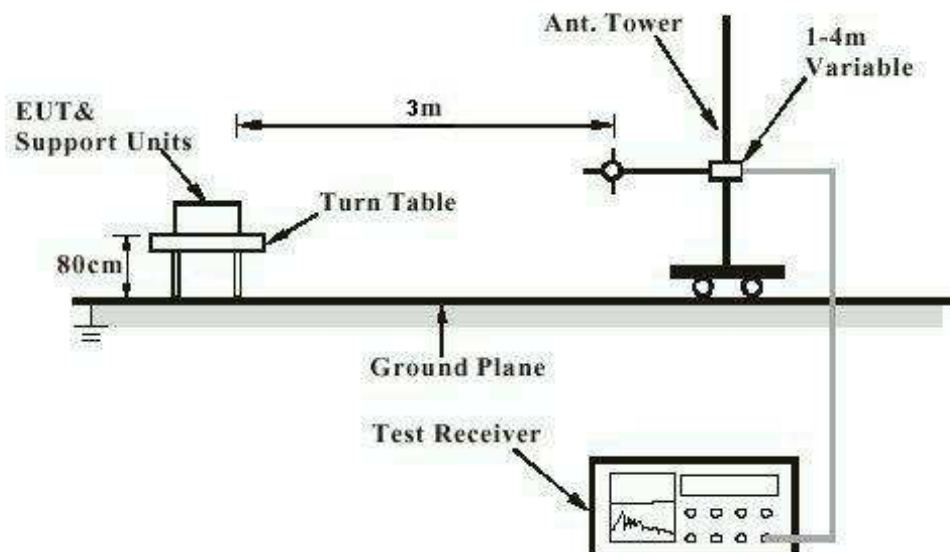
None.

## 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.

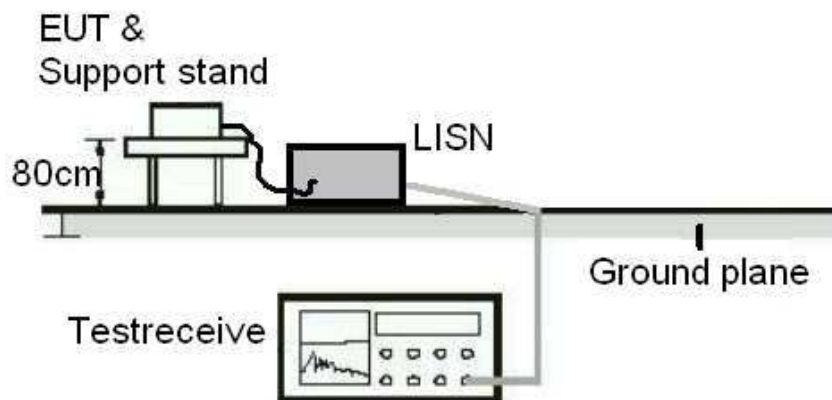
## 4.5 Test Setup Diagram

### 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)**



## 5. Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Antenna Requirement

**RESULT:** **Passed**

Standard	:	LP0002(2011): 2.2
Requirement	:	Part 15.203 and RSS-Gen 7.1.4 use of approved antennas only

The antenna is a Chip Antenna soldered to the PCB 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 Field strength of fundamental

**RESULT:****Passed**

Test standard : FCC Part 15.249(a), RSS-210 B.10  
LP0002: 3.10.2(2)  
Basic standard : ANSI C63.10:2013  
Kind of test site : Semi-Anechoic Chamber

**Test setup**

Test Channel : Low/ Middle/ High  
Operation Mode : A  
Atmospheric pressure : 100-103 kPa

In the table below the maximum results found are reported.

For detailed results of all frequencies tested, please refer to Appendix D.

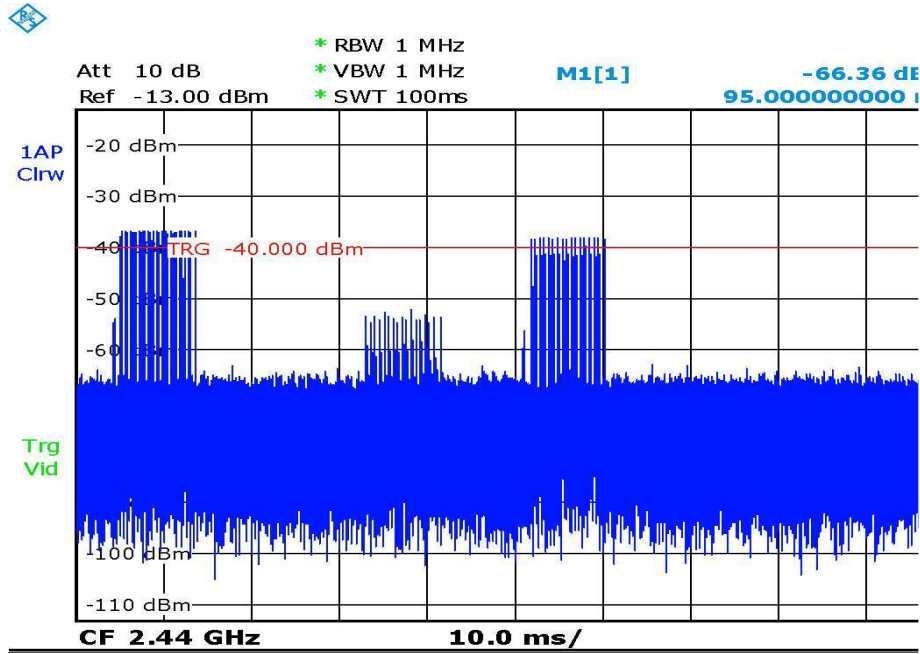
The EUT employs pulsed operation.  
The pulse width is: 8.69 msec.  
Pulse repetition interval:

The Tables below show calculated average values from the pulsed emissions measurement data, corrected with the worst case duty cycle factor over 100 msec.

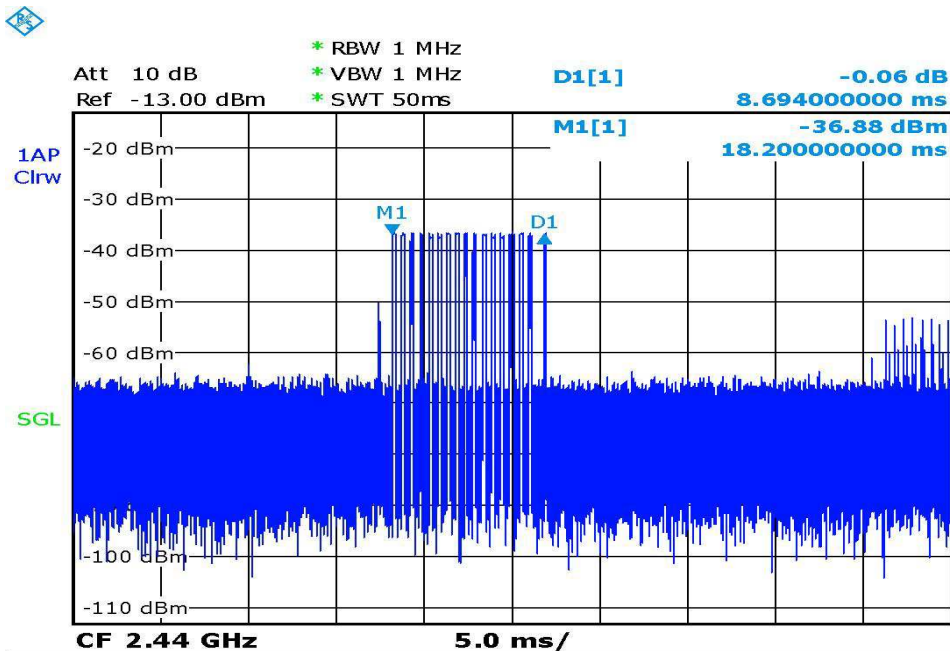
The average values noted are calculated through the application of a duty cycle correction, according to part 15.35c

Duty cycle calculation:  
Duty cycle correction (dB) =  $20 \log (8.69 \cdot 2 \text{ msec} / 100 \text{ msec}) = -15.2 \text{ dB}$  .

### Test Plot pulse width



Date: 20.JUL.2017 10:50:49



Date: 20.JUL.2017 10:54:07



**Table 6: Test result of Field strength of fundamental**

Channel Frequency (MHz)	Test result			
	Level (dBuV/m)	Limit (dBuV/m)	Antenna orientation	Detector
2405	97.34	114	Horizontal	Peak
2405	82.14	94		Average
2405	91.68	114	Vertical	Peak
2405	76.48	94		Average
2442	87.62	114	Horizontal	Peak
2442	72.42	94		Average
2442	90.4	114	Vertical	Peak
2442	75.2	94		Average
2477	84.36	114	Horizontal	Peak
2477	69.16	94		Average
2477	83.89	114	Vertical	Peak
2477	68.69	94		Average

Remark: For details refer to Appendix D.

**5.1.3 99% Bandwidth****RESULT:****Passed**

Test standard : RSS-Gen  
Basic standard : ANSI C63.10:2013  
Kind of test site : Semi-Anechoic Chamber

**Test setup**

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

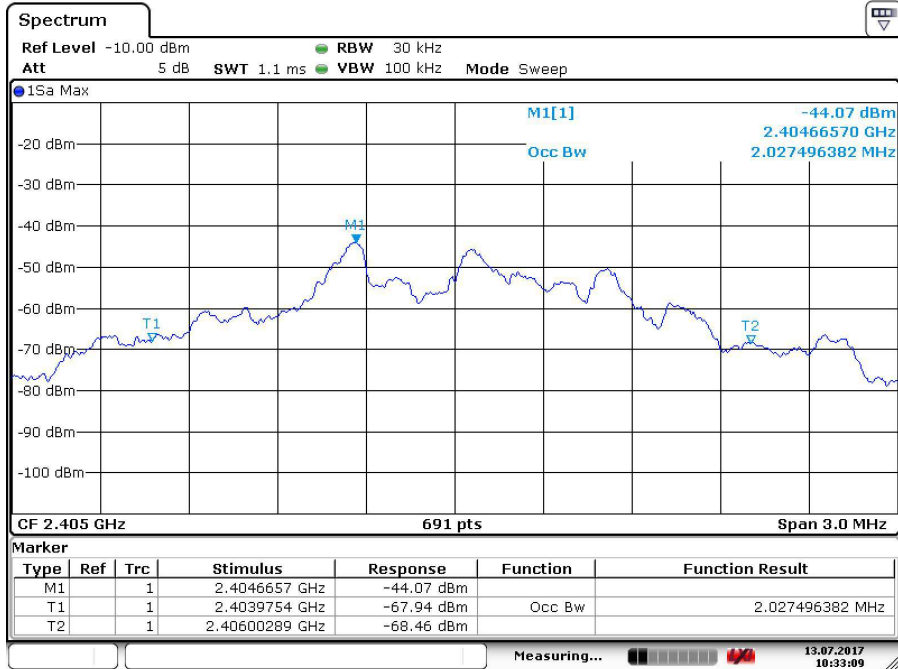
Ambient temperature : 22-26 °C  
Relative humidity : 50-65 %  
Atmospheric pressure : 100-103 kPa

**Table 7: Test result of 99% Bandwidth,**

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2405	2.027
Mid Channel	2442	2.483
High Channel	2477	2.066

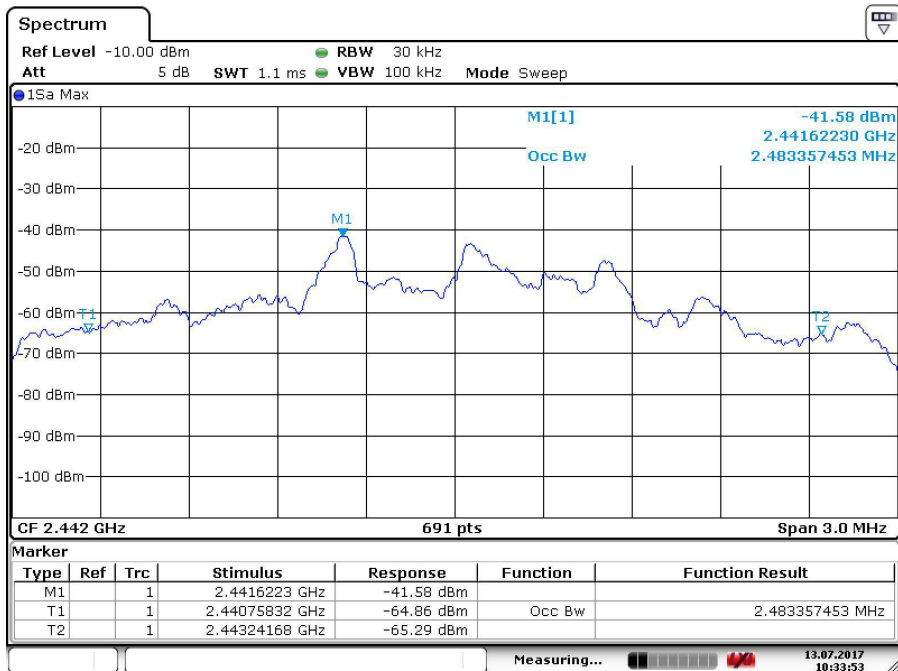
## Test Plot of 99% Bandwidth

### Low Channel

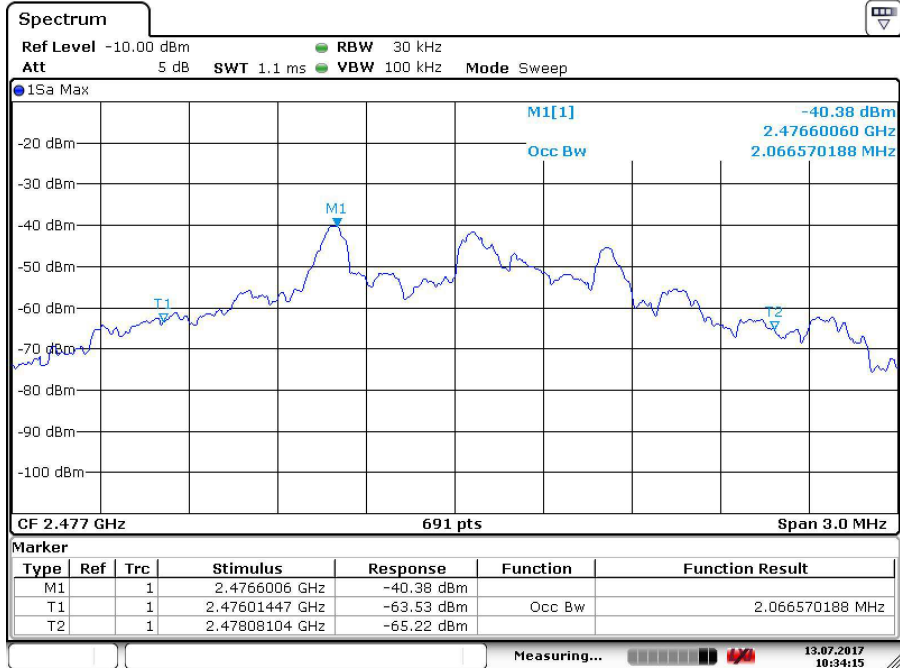


Date: 13.JUL.2017 10:33:09

### Middle Channel



Date: 13.JUL.2017 10:33:53

**High Channel**


Date: 13.JUL.2017 10:34:15

## 5.1.4 Spurious Emission

**RESULT:****Passed**

Test standard	:	FCC part 15.249(d), FCC 15.205, FCC 15.209, RSS-210 2.2, RSS-210 B.10(b), RSS-Gen 7.2.1
Basic standard	:	LP0002: 2.8
Limits	:	ANSI C63.10:2013
	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a). 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).
Kind of test site	:	3m Semi-Anechoic Chamber

**Test setup**

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

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 worst-case Axis orientation is 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 v06  
RSS-102 issue 5, Table 1

FCC:

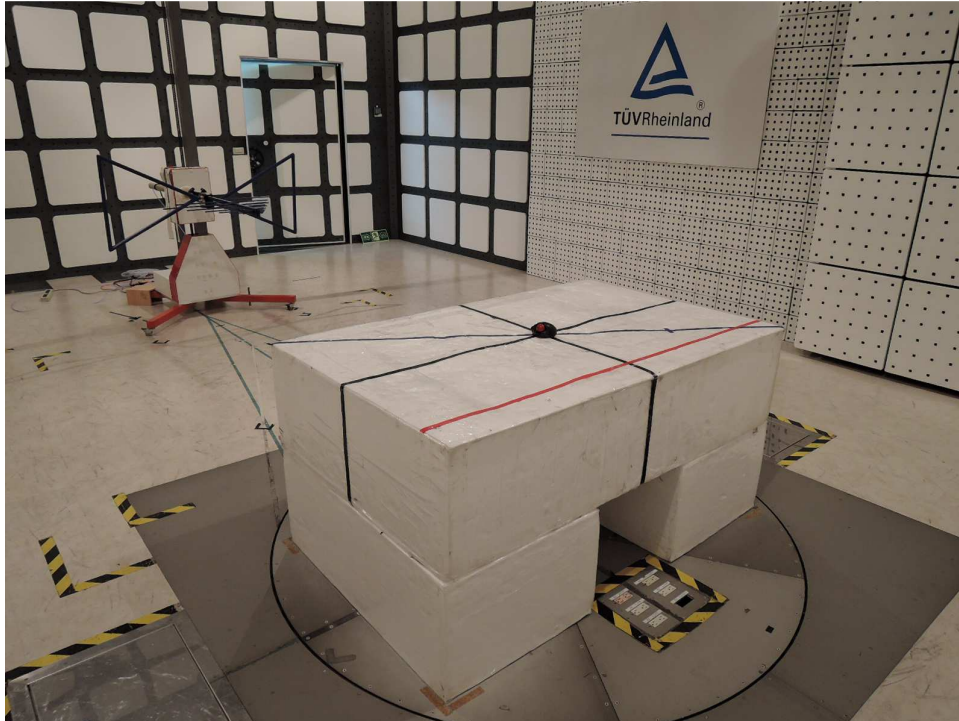
Since maximum peak output power of the transmitter is 0.108 mW < 10mW, hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498: Mobile Portable RF Exposure

## 7. Photographs of the Test Set-Up

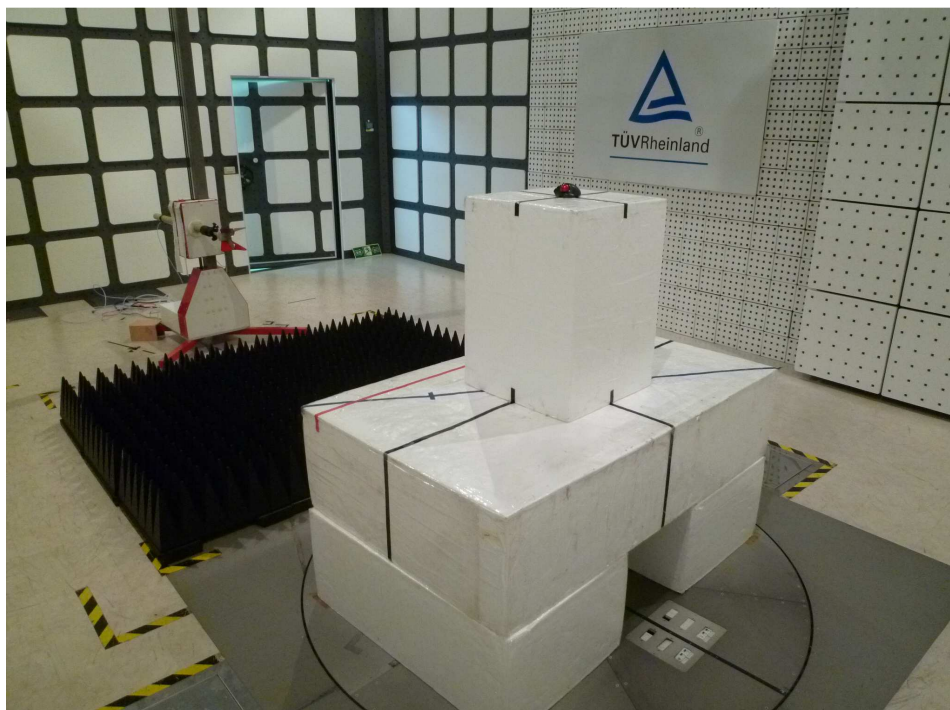
Photograph 1: Set-up for Spurious Emissions (Front View)



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



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





## 8. List of Tables

Table 1: Applied Standard and Test Levels .....	5
Table 2: List of Test and Measurement Equipment .....	7
Table 3: Emission Measurement Uncertainty.....	8
Table 4: Basic Information of EUT .....	9
Table 5: Technical Specification of EUT .....	9
Table 6: Test result of Field strength of fundamental.....	17
Table 7: Test result of 99% Bandwidth,.....	18

## 9. List of Photographs

Photograph 1: Set-up for Spurious Emissions (Front View).....	23
Photograph 2: Set-up for Spurious Emissions (Back View 1 TX) .....	24
Photograph 3: Set-up for Spurious Emissions (Back View 2 TX) .....	24