


<b>Prüfbericht-Nr.:</b> 50175102 001 <i>Test Report No.:</i>	<b>Auftrags-Nr.:</b> 114077828 <i>Order No.:</i>	<b>Seite 1 von 34</b> <i>Page 1 of 34</i>																								
<b>Kunden-Referenz-Nr.:</b> N/A <i>Client Reference No.:</i>	<b>Auftragsdatum:</b> 22-May-2018 <i>Order date:</i>																									
<b>Auftraggeber:</b> Microchip Technology Inc. <i>Client:</i> 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States.																										
<b>Prüfgegenstand:</b> SAM R34 Xplained Pro Evaluation Kit <i>Test item:</i>																										
<b>Bezeichnung / Typ-Nr.:</b> A09-3167 <i>Identification / Type No.:</i>																										
<b>Auftrags-Inhalt:</b> EN 300 220 Test Report <i>Order content:</i>																										
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<b>Wareneingangsdatum:</b> 05-Jun-2018 <i>Date of receipt:</i>																										
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<b>Prüfzeitraum:</b> 10-Aug-2018 - 20-Aug-2018 <i>Testing period:</i>																										
<b>Ort der Prüfung:</b> EMC/RF Laboratory Taipei <i>Place of testing:</i>																										
<b>Prüflaboratorium:</b> TÜV Rheinland Taiwan Ltd. <i>Testing laboratory:</i>																										
<b>Prüfergebnis*:</b> Pass <i>Test result*:</i>																										
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <b>geprüft von / tested by:</b>             21-Sep-2018 Jack Chang / Project Manager  <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Datum</th> <th>Name / Stellung</th> <th>Unterschrift</th> </tr> <tr> <th>Date</th> <th>Name / Position</th> <th>Signature</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> </div> <div style="width: 48%;"> <b>kontrolliert von / reviewed by:</b>             21-Sep-2018 Ryan W. T. Chen / Project Manager  <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Datum</th> <th>Name / Stellung</th> <th>Unterschrift</th> </tr> <tr> <th>Date</th> <th>Name / Position</th> <th>Signature</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> </div> </div>			Datum	Name / Stellung	Unterschrift	Date	Name / Position	Signature				Datum	Name / Stellung	Unterschrift	Date	Name / Position	Signature									
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<b>Sonstiges / Other:</b>																										
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> Prüfmuster vollständig und unbeschädigt <i>Condition of the test item at delivery:</i> <i>Test item complete and undamaged</i>																										
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<p><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></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 FREQUENCY ERROR

RESULT: *Pass*

### 5.1.2 EFFECTIVE RADIATED POWER (CONDUCTED)

RESULT: *Passed*

### 5.1.3 OCCUPIED BANDWIDTH

RESULT: *Passed*

### 5.1.4 OUT OF BAND EMISSIONS

RESULT: *Passed*

### 5.1.5 UNWANTED EMISSIONS IN THE TX SPURIOUS DOMAIN

RESULT: *Passed*

### 5.1.6 TRANSIENT POWER

RESULT: *Passed*

### 5.1.7 DUTY CYCLE

RESULT: *Passed*

### 5.1.8 ADJACENT CHANNEL POWER

RESULT: *N/A*

### 5.1.9 ADAPTIVE POWER CONTROL

RESULT: *N/A*

### 5.1.10 SHORT TERM BEHAVIOR

RESULT: *N/A*

*Non-applicable. The EUT operation band is out of specified in annex C, table C.1 and NRI.*

### 5.2.1 RX SPURIOUS EMISSIONS

RESULT: *Passed*

### 5.2.2 RX SENSITIVITY LEVEL

RESULT: *N/A*

### 5.2.3 CLEAR CHANNEL ASSESSMENT THRESHOLD

RESULT: *N/A*

### 5.2.4 POLITE SPECTRUM ACCESS TIMING PARAMETERS

RESULT: *N/A*

### 5.2.5 ADAPTIVE FREQUENCY AGILITY

RESULT: *N/A*

### 5.2.6 BLOCKING

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 FACILITIES .....</b>	<b>6</b>
<b>2.2</b>	<b>LIST OF TEST AND MEASUREMENT INSTRUMENTS.....</b>	<b>7</b>
<b>2.3</b>	<b>UNCERTAINTY OF MEASUREMENT .....</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>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 COMPLIANCE.....</b>	<b>11</b>
<b>5.</b>	<b>TEST RESULTS RADIO.....</b>	<b>12</b>
<b>5.1</b>	<b>TRANSMITTER REQUIREMENT &amp; TEST SUITES .....</b>	<b>12</b>
5.1.1	<i>Frequency error.....</i>	<i>12</i>
5.1.2	<i>Effective radiated power (Conducted).....</i>	<i>13</i>
5.1.3	<i>Occupied Bandwidth .....</i>	<i>14</i>
5.1.4	<i>Out Of Band Emissions.....</i>	<i>16</i>
5.1.5	<i>Unwanted emissions in the TX spurious domain .....</i>	<i>19</i>
5.1.6	<i>Transient power .....</i>	<i>20</i>
5.1.7	<i>Duty cycle.....</i>	<i>21</i>
5.1.8	<i>Adjacent channel power.....</i>	<i>23</i>
5.1.9	<i>Adaptive Power Control .....</i>	<i>24</i>
5.1.10	<i>Short term behavior.....</i>	<i>24</i>
<b>5.2</b>	<b>RECEIVER REQUIREMENT &amp; TEST SUITES.....</b>	<b>25</b>
5.2.1	<i>RX Spurious emissions .....</i>	<i>25</i>
5.2.2	<i>RX sensitivity level .....</i>	<i>25</i>
5.2.3	<i>Clear channel assessment threshold.....</i>	<i>25</i>
5.2.4	<i>Polite spectrum access timing parameters .....</i>	<i>26</i>
5.2.5	<i>Adaptive Frequency Agility.....</i>	<i>26</i>
5.2.6	<i>Blocking.....</i>	<i>27</i>
<b>6.</b>	<b>SAFETY HUMAN EXPOSURE .....</b>	<b>29</b>

<b>6.1</b>	<b>RADIO FREQUENCY EXPOSURE COMPLIANCE .....</b>	<b>29</b>
6.1.1	Electromagnetic Fields.....	29
<b>7.</b>	<b>PHOTOGRAPHS OF THE TEST SET-UP.....</b>	<b>30</b>
<b>8.</b>	<b>LIST OF TABLES .....</b>	<b>34</b>
<b>9.</b>	<b>LIST OF PHOTOGRAPHS.....</b>	<b>34</b>

## 1. General Remarks

### 1.1 Complementary Materials

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

**Appendix 1: IUT Photos**

(File Name: 50175102 001 AppendixP)

**Appendix 2: Test Result of Radiated Emissions**

(File Name: 50175102 001 AppendixD)

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

Radio
EN 300 220-1 V 3.1.1
EN 300 220-2 V 3.1.1
EN 62479:2010

## 2. Test Sites

### 2.1 Test Facilities

TUV Rheinland Taiwan Ltd.

11F, No.758, Sec. 4, Bade Rd.,  
Songshan Dist.  
Taipei City 105  
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 RegistrationNo.: 340738  
IC Canada Registration No.: 9465A-1  
TAF Accredited NCC Test Lab. No.:0759  
TAF ISO17025 Certification effective period: 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_EMC	Ver. TUV3A1	N/A	N/A
EMI Test Receiver	R&S	ESR 7	101062	2017/09/25	2018/09/25
Spectrum Analyzer	Agilent	N9010A	MY52221334	2018/02/05	2019/02/05
Preamplifier (30MHz -1GHz)	HP	8447D	2944A06641	2017/12/26	2018/12/26
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2018/01/18	2019/01/18
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	60558	2017/11/21	2018/11/21
Bilog Antenna	TESEQ	CBL6111D	29804	2018/07/02	2019/07/02
Horn Antenna	ETS-Lindgren	3117	00138160	2018/06/01	2019/06/01
Horn Antenna (18GHz~40GHz)	COM-POWER	AH-840	2176/08/10	2017/11/28	2018/11/28
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2018/06/21	2019/06/21
Bluetooth Tester	R&S	CBT	100866	2017/03/09	2020/03/08
Temp. & Humid. Chamber	Giant Force	GCT-099-40-S	MAF0103-007	2017/03/09	2019/03/09
Test Software	Audix	e3	Ver. 9	N/A	N/A
Test Software	Agilent	300328 testsystem	V2.1.1	N/A	N/A
Power sensor	Agilent	U2021XA	MY54020001	2017/03/08	2019/03/31
EXG-B RF Analog Signal Generator	Agilent	N5171B	MY53050377	2017/03/08	2020/04/10
MXG-B RF Vector Signal Generator	Agilent	N5182B	MY53050524	2017/03/08	2020/04/10
Embedded Attenuator	Keysight	AD211	TW5451121	N/A	N/A

## 2.4 Uncertainty of Measurement

According to the requirement of clause 4.4 of EN 300 220-1 V3.1.1, the value of the measurement uncertainty of each parameter is listed as below:

**Table 3: Measurement Uncertainty**

Parameter	Uncertainty
Radio frequency	±0,5 ppm
RF power, conducted	±1,5 dB
Conducted spurious emission of transmitter, valid up to 6 GHz	±3 dB
Conducted emission of receivers	±3 dB
Radiated emission of transmitter, valid up to 6 GHz	±6 dB
Radiated emission of receiver, valid up to 6 GHz	±6 dB
RF level uncertainty for a given BER	±1,5 dB
Radiated emission of receiver, valid up to 26 GHz	± 6 dB
Occupied BandWidth	±5 %
Temperature	±2,5 °C
Humidity	±2,5 °C



### 3. General Product Information

#### 3.1 Product Function and Intended Use

The EUT is a Low Power transceiver LoRa Technology Evaluation Kit. It contains a 868MHz compatible ATSAMR34 Low Power LoRa® Sub-GHz SiP 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: Technical Specification of EUT**

Technical Specification	Value
Kind of Equipment	SAM R34 Xplained Pro Evaluation Kit
Operating Frequency	868.1MHz – 868.5MHz
Channel number	3
Extreme Temperature Range	-40~85 °C
Operation Voltage	5Vdc through USB
Modulation	FSK, GFSK, LoRa. (Tests done with LoRa Modulation)
Bandwidth	125KHz
Spreading Factor (SF)	7 to 12
Antenna Gain	2 dBi

### **3.3 Independent Operation Modes**

Testing basic operation modes are:

- A. Transmitting
- B. Receiving
- C. Standby
- D. Normal
- E. Off

### **3.4 Noise Generating and Noise Suppressing Parts**

Refer to the Circuit Diagram.

## **4. Test Set-up and Operation Modes**

### **4.1 Principle of Configuration Selection**

The equipment under test (EUT) were 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 provided with a USB interface 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: A000769530-002  
Radiation: A000769530-002

### **4.3 Special Accessories and Auxiliary Equipment**

None.

### **4.4 Countermeasures to Achieve Compliance**

The test sample which has been tested contained the noise suppression parts as can be seen in the Photo documentation. No additional measures were employed to achieve compliance.

## 5. Test Results RADIO

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Frequency error

**RESULT:**
**Pass**

Test procedure: EN 300 220-1 V3.1.1 clause 5.7

**Test Setup**

Date of testing : 14-Aug-2018  
 Input Voltage : DC 5V  
 Operation mode : A  
 Ambient temperature : 20-24 °C  
 Relative humidity : 40-50 %  
 Atmospheric pressure : 100-103 kPa

**Table 5: Test result of Frequency error**
**Low CH**

TEST CONDITION	Channel	Measurement	Freq. Error	Limit
Temp.	MHz	MHz	ppm	ppm
-40 °C	868.1	868.10010	0.12	±100
25 °C	868.1	868.10023	0.26	±100
85 °C	868.1	868.10019	0.22	±100

**High CH**

TEST CONDITION	Channel	Measurement	Freq. Error	Limit
Temp.	MHz	MHz	ppm	ppm
-40 °C	868.5	868.50011	0.13	±100
25 °C	868.5	868.50019	0.22	±100
85 °C	868.5	868.50021	0.24	±100

## 5.1.2 Effective radiated power (Conducted)

**RESULT:**
**Passed**

Test procedure: EN 300 220-1 V3.1.1 clause 5.2.2.1

**Test Setup**

Date of testing : 10-Aug-2018  
 Input Voltage : DC 5V  
 Operation mode : A  
 Ambient temperature : 20-24 °C  
 Relative humidity : 40-50 %  
 Atmospheric pressure : 100-103 kPa

**Table 6: Test result of Effective radiated power**

Antenna Assembly Gain (dBi):				2
Cable Loss=				1.4
Power setting				13
TEST CONDITIONS		TRANSMITTER POWER (dBm)		
		-40 deg C	25	85 deg C
Frequency		5V		
868.1	Read Power	12.010	12.318	12.232
	e.r.p	13.260	13.568	13.482
868.5	Read Power	12.014	12.378	12.228
	e.r.p	13.264	13.628	13.478

### 5.1.3 Occupied Bandwidth

**RESULT:****Passed**

Test procedure: EN 300 220-1 V3.1.1 clause 5.6.3.4

**Test Setup**

Input Voltage : DC 5V  
Operation mode : A  
Ambient temperature : 20-24 °C  
Relative humidity : 40-50 %  
Atmospheric pressure : 100-103 kPa

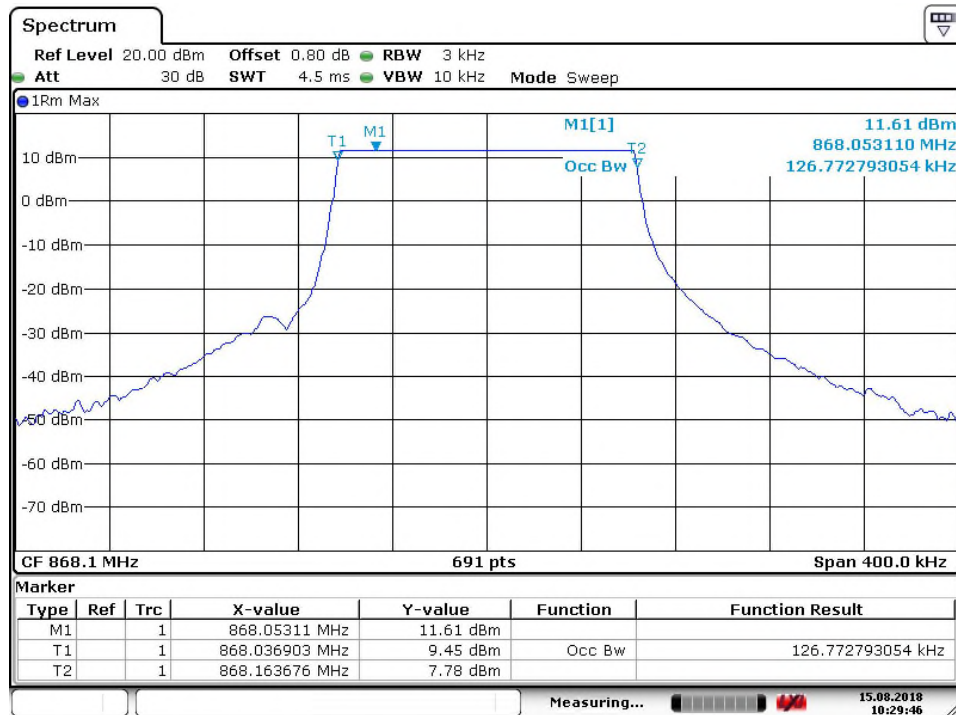
**Table 7: Test result of Occupied Bandwidth (SF 12, BW 125KHz)**

Channel	Channel Frequency (MHz)	99% Bandwidth (KHz)
Low Channel	868.1	126.77
High Channel	868.5	126.77

**Note: SF=12, BW=125KHz**

## Test Plot of Occupied Bandwidth, (Normal Temp)

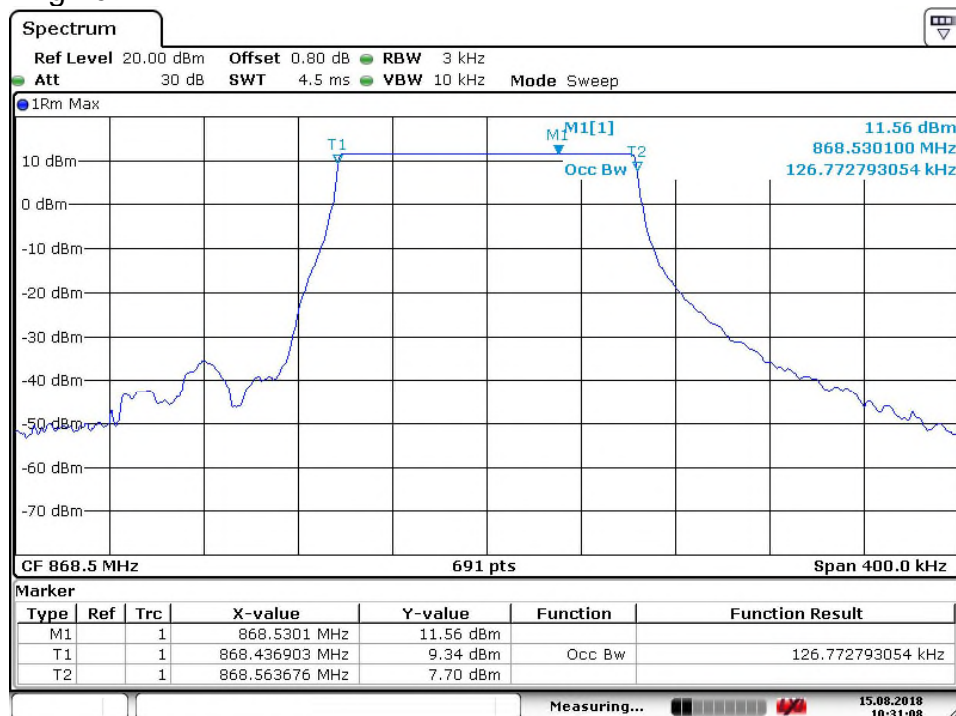
Low ch



Date: 15.AUG.2018 10:29:46

## Test Plot of Occupied Bandwidth, (Normal Temp)

High ch



Date: 15.AUG.2018 10:31:09

## 5.1.4 Out Of Band Emissions

### RESULT:

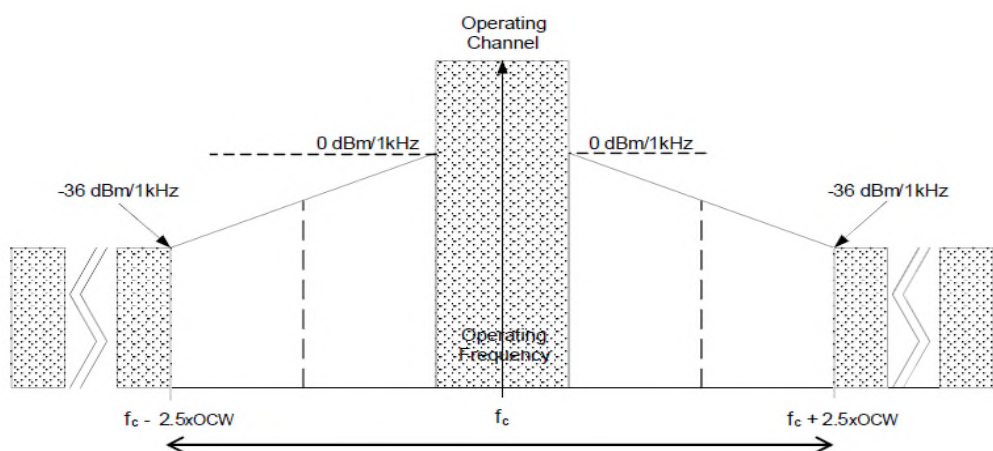
**Passed**

Test procedure: EN 300 220-1 V3.1.1 clause 5.8.3.4

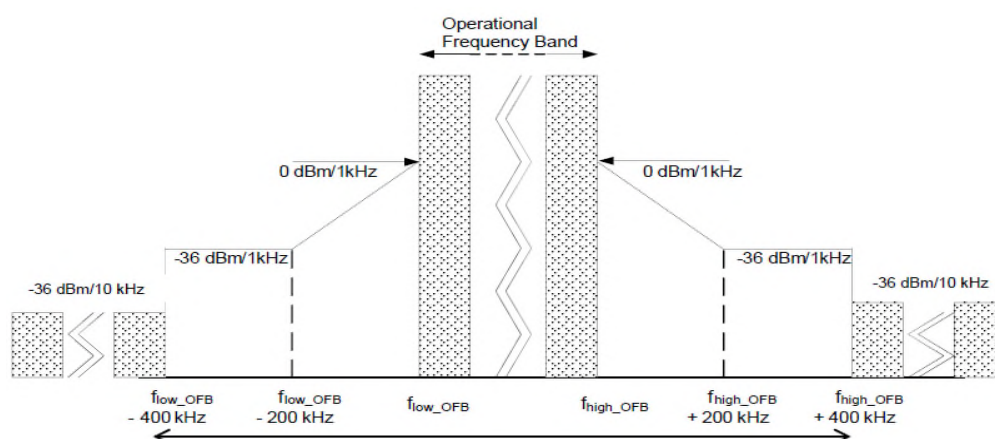
### Test Setup

Input Voltage : DC 5V  
Operation mode : A  
Ambient temperature : 20-24 °C  
Relative humidity : 40-50 %  
Atmospheric pressure : 100-103 kPa

The test was done in the conducted setup and the defined IUT antenna gain is not included in the test result, due to the result is far from the limit so the technical judgment of the ERP value will still be under the limits.



**Figure 5: Out Of Band Domain for Operating Channel with reference BW**

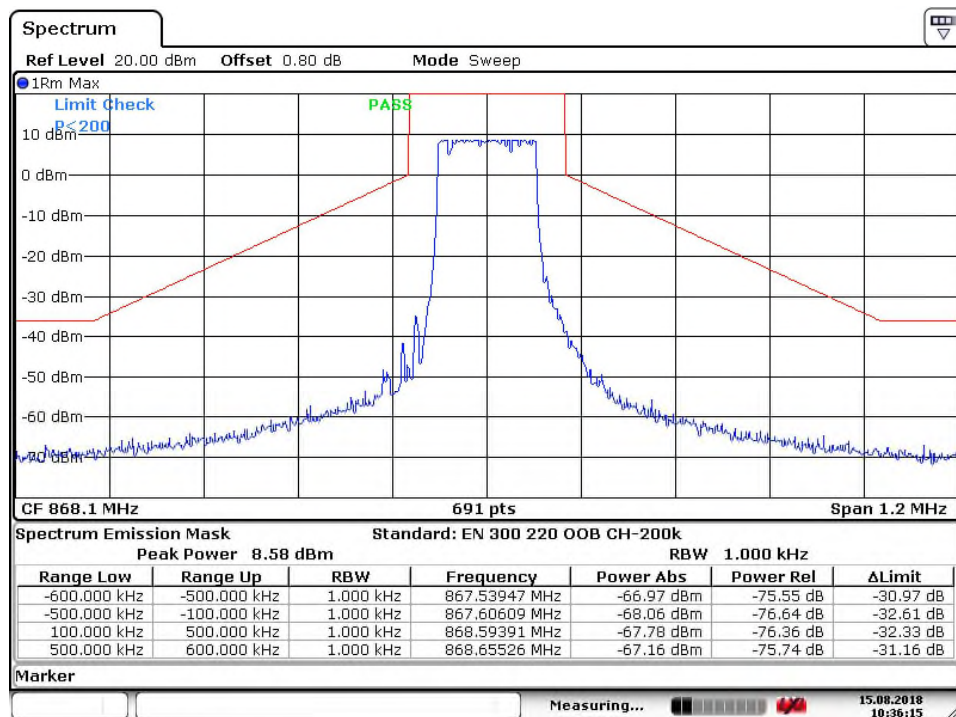


**Figure 6: Out Of Band Domain for Operational Frequency Band with reference BW**



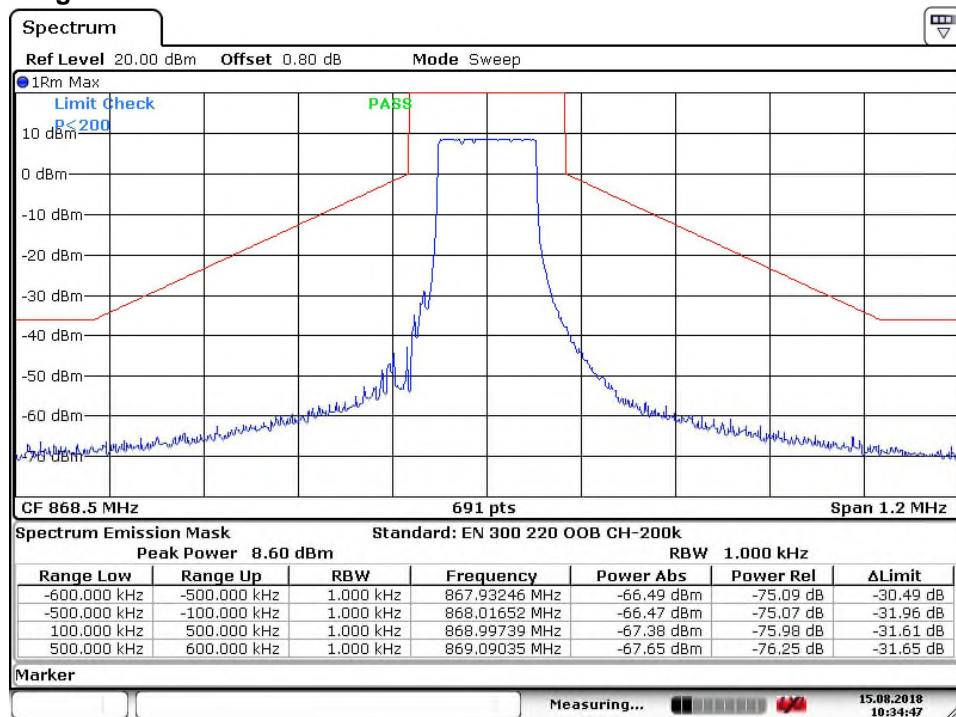
## Test Plot of Operating Channel

### Low ch



Date: 15.AUG.2018 10:36:16

### High ch

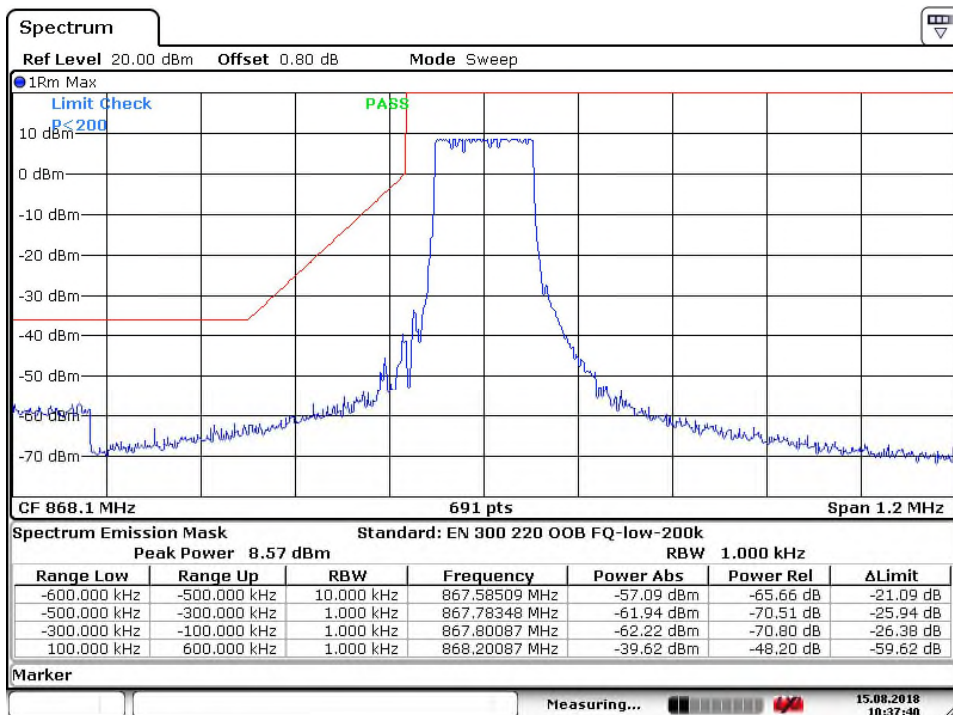


Date: 15.AUG.2018 10:34:47

Note: SF=12, BW=125KHz

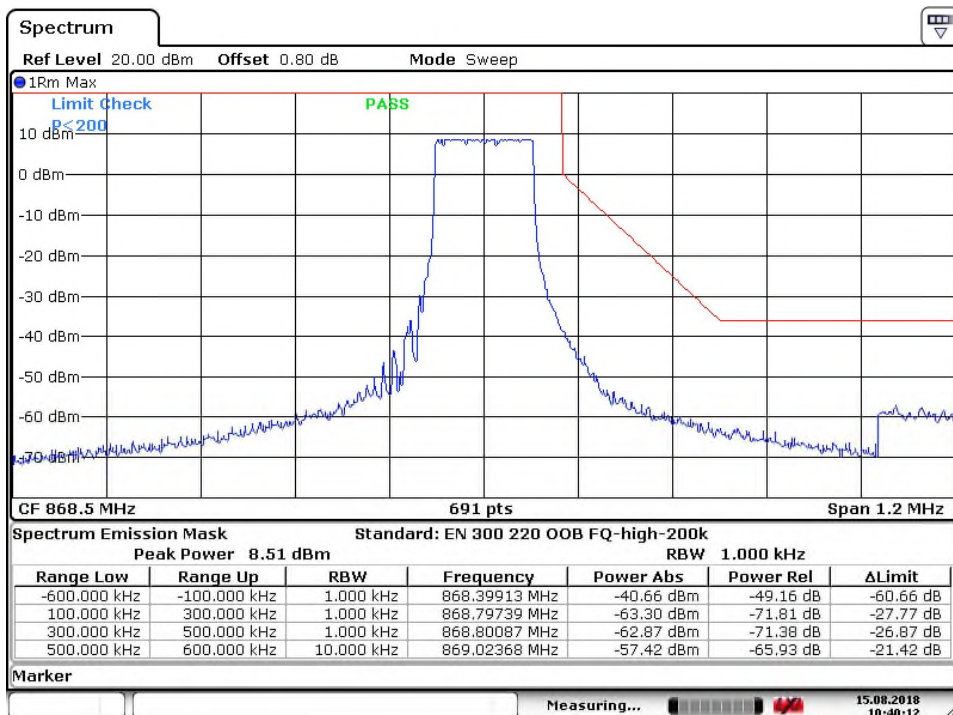
## Test Plot of operational frequency band

Low ch



Date: 15.AUG.2018 10:37:41

High ch



Date: 15.AUG.2018 10:40:12

Note: SF=12, BW=125KHz

### 5.1.5 Unwanted emissions in the TX spurious domain

**RESULT:****Passed**

Test procedure: EN 300 220-1 V3.1.1 clause 5.9.1.1

**Test Setup**

Input Voltage	:	DC 5V
Operation mode	:	A
Ambient temperature	:	20-24 °C
Relative humidity	:	40-50 %
Atmospheric pressure	:	100-103 kPa

Please refer to Appendix D: Test result of Radiated Emissions

## 5.1.6 Transient power

### RESULT:

**Passed**

Test procedure: EN 300 220-1 V3.1.1 clause 5.10.3.2

Date of testing : 14-Aug-2018  
 Input Voltage : DC 5V  
 Operation mode : A  
 Ambient temperature : 20-24 °C  
 Relative humidity : 40-50 %  
 Atmospheric pressure : 100-103 kPa

**Table 8: Test result of Transient power**

Low ch

Test Freq. (MHz)	Reading dBm	Result dBm/kHz	Limit
867.9997	-37.739	-37.739	0 dBm
868.2003	-37.742	-37.742	0 dBm
868.3	-58.121	-73.3498	0 dBm
867.9	-58.144	-73.3728	0 dBm
867.6	-77.146	-97.146	0 dBm
868.6	-77.392	-97.392	0 dBm
866.8	-77.435	-102.206	-27 dBm
869.4	-77.892	-102.663	-27 dBm

High ch

Test Freq. (MHz)	Reading dBm	Result dBm/kHz	Limit
868.3997	-37.73	-37.73	0 dBm
868.6003	-37.81	-37.81	0 dBm
868.7	-58.266	-73.4948	0 dBm
868.3	-58.823	-74.0518	0 dBm
868	-77.458	-97.458	0 dBm
869	-77.465	-97.465	0 dBm
867.2	-77.564	-102.335	-27 dBm
869.8	-77.756	-102.527	-27 dBm

### 5.1.7 Duty cycle

**RESULT:****Passed**

Test procedure: EN 300 220-1 V3.1.1 clause 5.5.2.2

**Test Setup**

Date of testing : 20-Aug-2018

Input Voltage : DC 5V

Operation mode : A

Ambient temperature : 20-24 °C

Relative humidity : 40-50 %

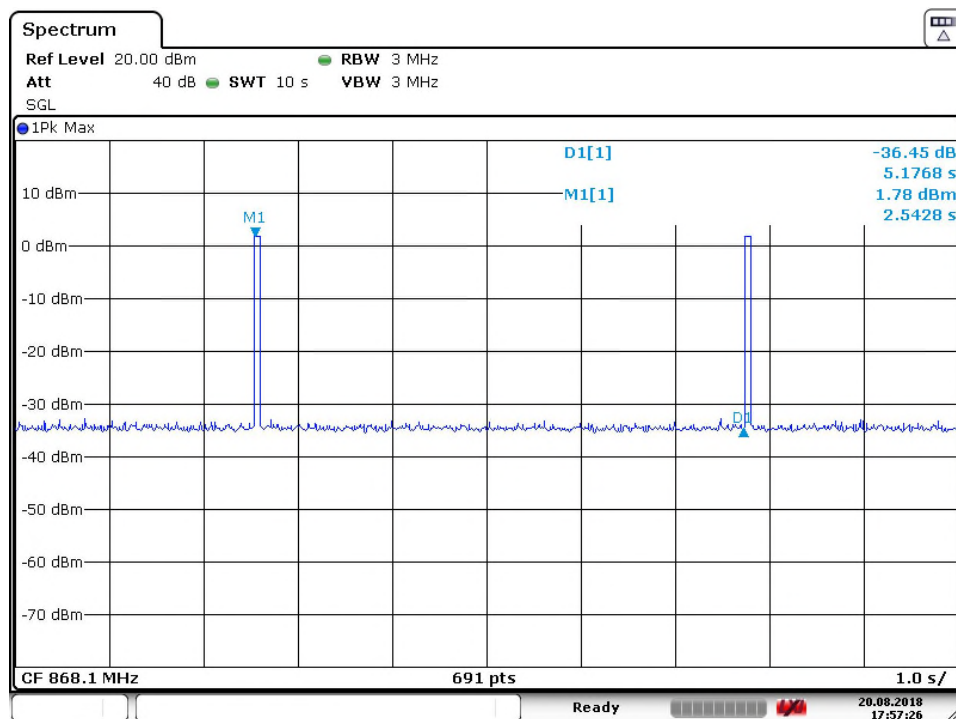
Atmospheric pressure : 100-103 kPa

**Table 9: Test result of Duty cycle**

Frequency (MHz)	Duty cycle	Limit
868.1	0.90%	$\leq 1\%$

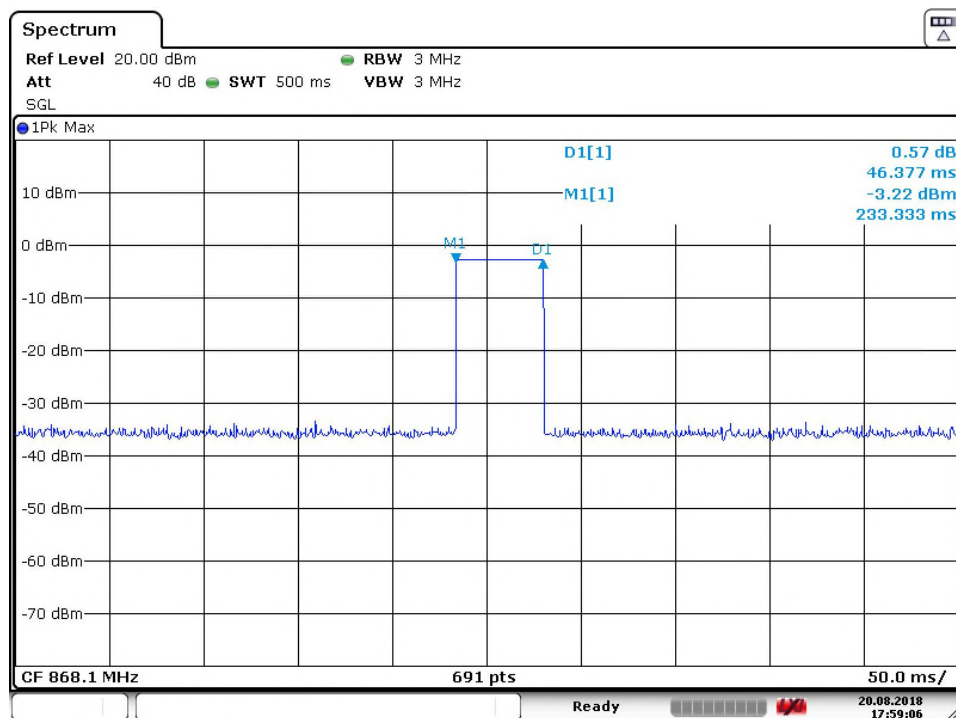
## Test Plot of Duty cycle

### On+Off



Date: 20.AUG.2018 17:57:26

### On



Date: 20.AUG.2018 17:59:06

### 5.1.8 Adjacent channel power

**RESULT:****N/A**

Test procedure: EN 300 220-1 V3.1.1 clause 4.3.7

This requirement is not applicable because this device OCW &gt; 25 kHz.

### 5.1.9 Adaptive Power Control

**RESULT:****N/A**

Non-applicable. The EUT does not support Adaptive Power Control function.

### 5.1.10 Short term behavior

**RESULT:****N/A**

Non-applicable. The EUT operation band is out of specified in annex C, table C.1 and NRI.



## 5.2 Receiver Requirement & Test Suites

### 5.2.1 RX Spurious emissions

**RESULT:** **Passed**

Please refer to Appendix D: Test result of Radiated Emissions

### 5.2.2 RX sensitivity level

**RESULT:** **N/A**

Non-applicable. The EUT does not support polite spectrum access function

### 5.2.3 Clear channel assessment threshold

**RESULT:** **N/A**

Non-applicable. The EUT does not support polite spectrum access function

#### **5.2.4 Polite spectrum access timing parameters**

**RESULT:****N/A**

Non-applicable. The EUT does not support polite spectrum access function

#### **5.2.5 Adaptive Frequency Agility**

**RESULT:****N/A**

Non-applicable. The EUT does not support adaptive frequency agility function.

## 5.2.6 Blocking

### RESULT:

**Passed**

Test procedure: EN 300 220-1 V3.1.1 clause 5.18.6.4

### Test Setup

Date of testing : 14-Aug-2018  
 Input Voltage : DC 5V  
 Operation mode : D  
 Ambient temperature : 20-24 °C  
 Relative humidity : 40-50 %  
 Atmospheric pressure : 100-103 kPa

This device is Category 2 equipment which is standard performance level of receiver.

Receiver category 2				
Operating Frequency:		868.1 MHz		
Blocking frequency	Blocking Level at EUT	level from Signal source A	Status	Limit
Lower OC frequency (MHz):	(dBm)	(dBm)		
866	-23.443	-90.99	Pass	≥ -69 dBm
858	-21.633		Pass	≥ -44 dBm
824.595	-10.284		Pass	
Upper OC frequency (MHz):	(dBm)	(dBm)		
870.2	-24.201	-90.99	Pass	≥ -69 dBm
878.2	-22.111		Pass	≥ -44 dBm
911.605	-11.265		Pass	

Receiver category 2				
Operating Frequency:		868.3	MHz	
Blocking frequency	Blocking Level at EUT	level from Signal source A	Status	Limit
Lower OC frequency (MHz):	(dBm)	(dBm)		
866.2	-22.868	-90.99	Pass	≥ -69 dBm
858.2	-21.486		Pass	≥ -44 dBm
824.785	-11.112		Pass	
Upper OC frequency (MHz):	(dBm)	(dBm)		
870.4	-23.058	-90.99	Pass	≥ -69 dBm
878.4	-21.985		Pass	≥ -44 dBm
911.815	-11.565		Pass	

Receiver category 2				
Operating Frequency:		868.5	MHz	
Blocking frequency	Blocking Level at EUT	level from Signal source A	Status	Limit
Lower OC frequency (MHz):	(dBm)	(dBm)		
866.4	-22.546	-90.99	Pass	≥ -69 dBm
858.4	-21.432		Pass	≥ -44 dBm
824.975	-11.356		Pass	
Upper OC frequency (MHz):	(dBm)	(dBm)		
870.6	-23.01	-90.99	Pass	≥ -69 dBm
878.6	-21.868		Pass	≥ -44 dBm
912.025	-11.735		Pass	

## 6. Safety Human exposure

### 6.1 Radio Frequency Exposure Compliance

#### 6.1.1 Electromagnetic Fields

**RESULT:****Passed**

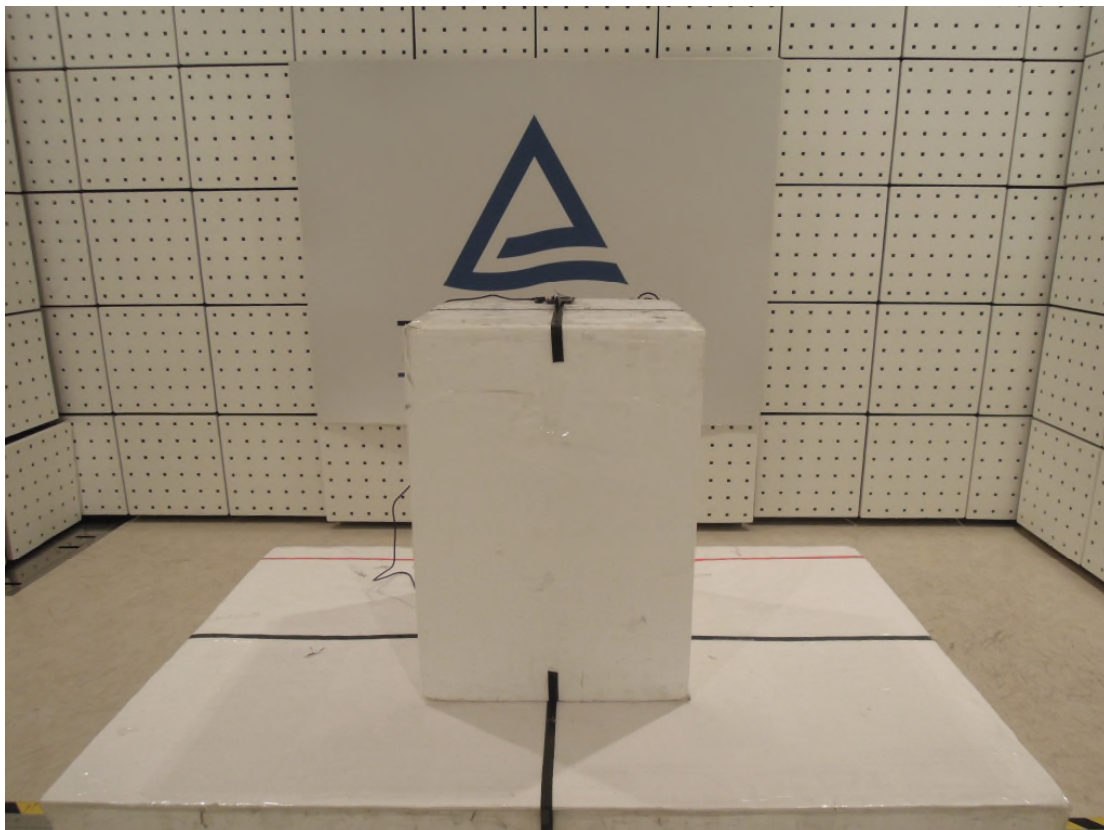
Test standard : EN 62479:2010, A.3

Maximum available Power:

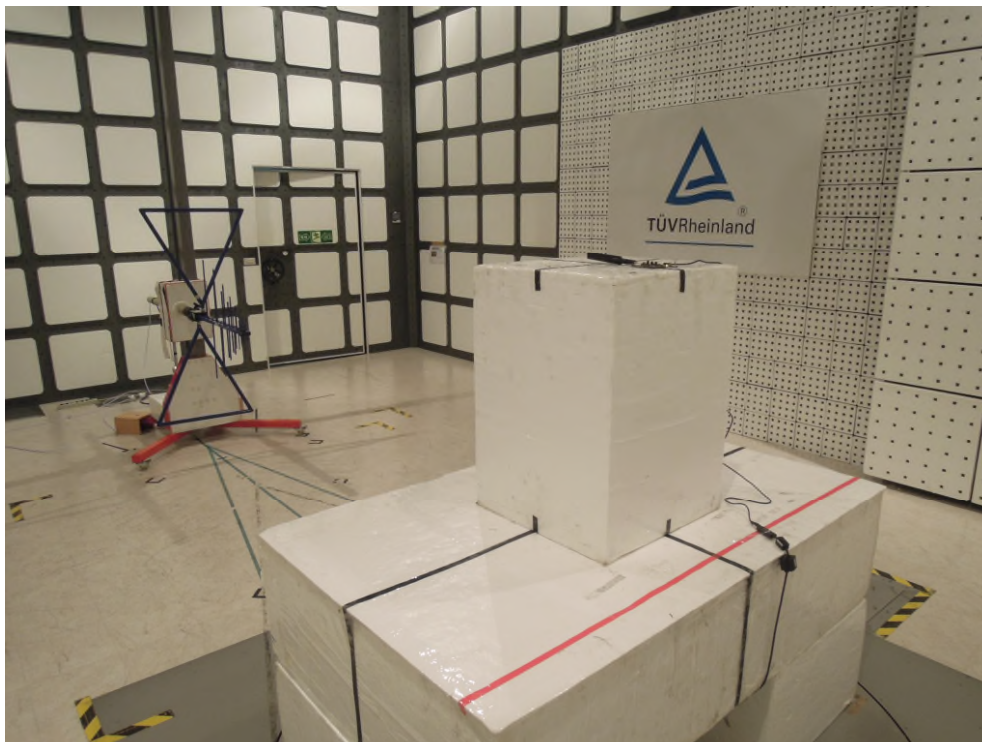
Max Power (dBm)	Power (mW)	Head and Body Power Limit in (mW)	Pass/Fail
12.378	17.29	20	PASS

## 7. Photographs of the Test Set-Up

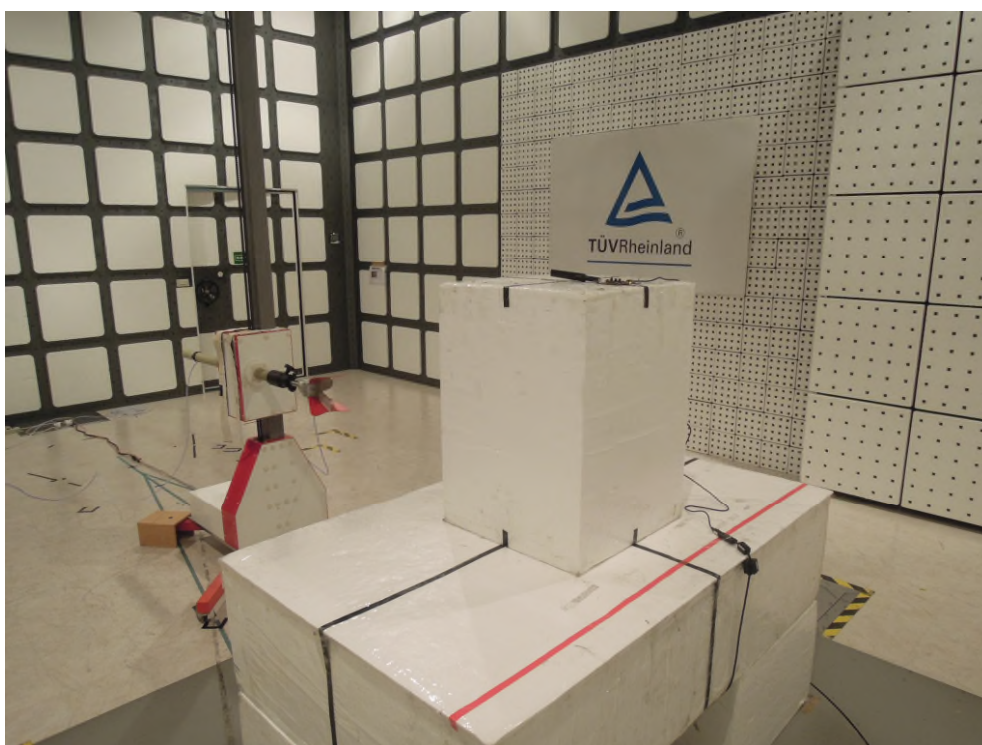
**Photograph 1: Setup for Radiated Emission (front)**



**Photograph 2: Set-up for Radiated Emission (Rear View 1)**

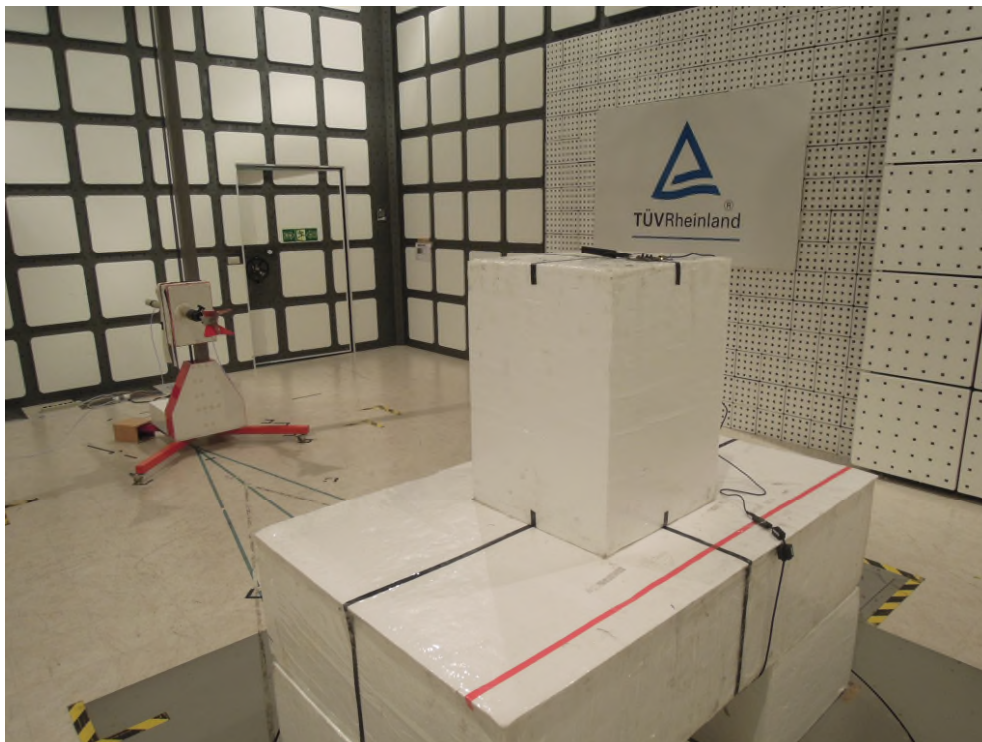


**Photograph 3: Set-up for Radiated Emission (Rear View 2)**

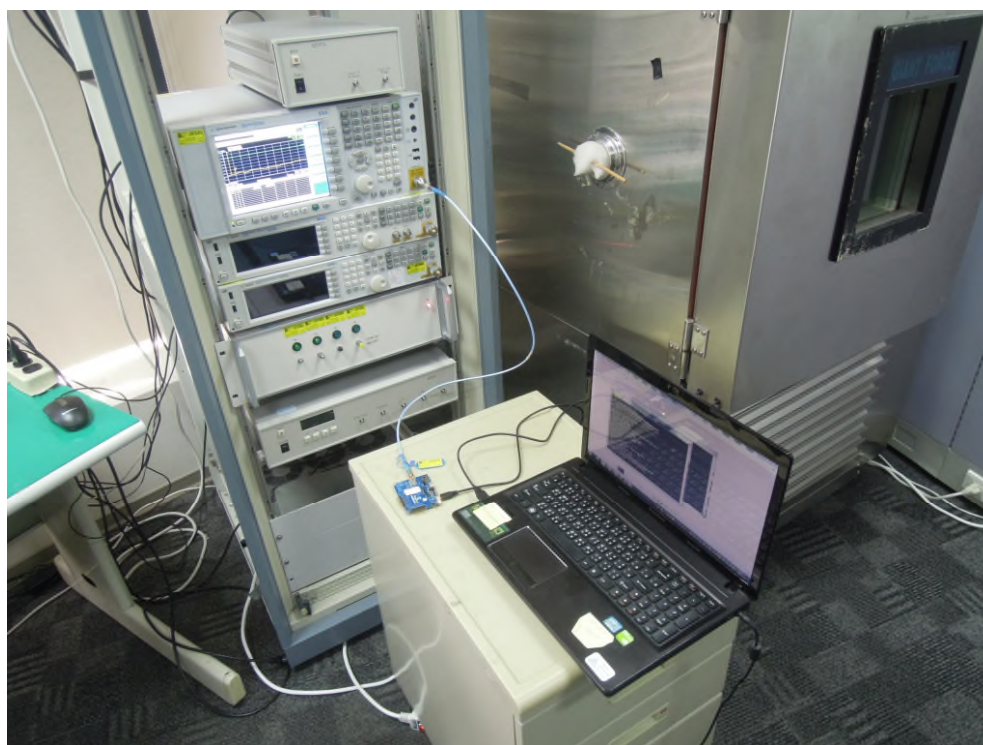




**Photograph 4: Set-up for Radiated Emission (Rear View 3)**



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





**Photograph 6: Set-up for Conducted testing**



## 8. List of Tables

Table 1: Applied Standard and Test Levels .....	5
Table 2: List of Test and Measurement Equipment .....	7
Table 3: Measurement Uncertainty .....	8
Table 4: Technical Specification of EUT .....	9
Table 5: Test result of Frequency error .....	12
Table 6: Test result of Effective radiated power .....	13
Table 7: Test result of Occupied Bandwidth (SF 12, BW 125KHz).....	14
Table 8: Test result of Transient power .....	20
Table 9: Test result of Duty cycle .....	21

## 9. List of Photographs

Photograph 1: Setup for Radiated Emission (front) .....	30
Photograph 2: Set-up for Radiated Emission (Rear View 1).....	31
Photograph 3: Set-up for Radiated Emission (Rear View 2).....	31
Photograph 4: Set-up for Radiated Emission (Rear View 3).....	32
Photograph 5: Set-up for Conducted testing .....	32
Photograph 6: Set-up for Conducted testing .....	33