


<b>Prüfbericht-Nr.:</b> <i>Test Report No.:</i>	<b>50270936 001</b>	<b>Auftrags-Nr.:</b> <i>Order No.:</i>	238106318	Seite 1 von 32 <i>Page 1 of 32</i>
<b>Kunden-Referenz-Nr.:</b> <i>Client Reference No.:</i>	N/A	<b>Auftragsdatum:</b> <i>Order date:</i>	11-Jun-2019	
<b>Auftraggeber:</b> <i>Client:</i>	M2Communication Inc., 15F-1, No.32, Gaotie 2nd Rd., Zhubei City, Hsinchu Country, Taiwan 302			
<b>Prüfgegenstand:</b> <i>Test item:</i>	Aisle Light			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type No.:</i>	Aisle Light			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	FCC Part 15C / Part 2.1091 / Test report			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.247(DTS) FCC 47CFR Part 2: Subpart J Section 2.1091			
<b>Wareneingangsdatum:</b> <i>Date of receipt:</i>	11-Jun-2019			
<b>Prüfmuster-Nr.:</b> <i>Test sample No.:</i>	A000938083-001, 002			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	12-Jun-2019 - 29-Aug-2019			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	EMC/RF Laboratory Taipei			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	TUV Rheinland Taiwan Ltd.			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass			
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>		
				
30-Aug-2019 Mars Y. J. Lin / Project Engineer		30-Aug-2019 Arvin Ho/Vice General Manager		
<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>
				<b>Unterschrift</b> <i>Signature</i>
<b>Sonstiges / Other:</b>				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <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 N/T = nicht getestet		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><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></p>				

## TEST SUMMARY

### 5.1.1 ANTENNA REQUIREMENT

RESULT: *Passed*

### 5.1.2 PEAK OUTPUT POWER

RESULT: *Passed*

### 5.1.3 6dB BANDWIDTH 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 internal view**  
(File Name: 50270936 001 Appendix P)

**Appendix D: Test Result of Radiated Emissions**  
(File Name: 50270936 001 Appendix D)

Test Specifications

The following standards were applied.

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

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

<b>Radio</b>
FCC CFR47 Part 15: Subpart C Section 15.247
ANSI C63.10:2013
KDB558074 D01 DTS Meas Guidance v05
FCC 47CFR Part 2: Subpart J Section 2.1091

## 2. Test Sites

### 2.1 Test Laboratory

TUV Rheinland Taiwan Ltd.  
Taipei Testing Laboratories

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

### 2.2 Test Facility

TUV Rheinland Taiwan Ltd.

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

FCC Registration No.: 180491  
IC Canada Registration No.: 9465A  
TAF Accredited NCC Test Lab. No.:3567  
TAF ISO17025 Certification effective period: 6<sup>th</sup>-May-2019 to 05<sup>th</sup>-May-2022



**Testing Laboratory**  
**3567**

## 2.3 List of Test and Measurement Instruments

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

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal. Date</b>	<b>Cal. Due Date</b>
EMI Test Receiver	Rohde & Schwarz	ESR 7	101062	2018/10/01	2019/10/01
Spectrum Analyzer	Rohde & Schwarz	FSV-40	101514	2019/02/07	2020/02/07
Pre-Amplifier	Hewlett Packard	8447F	2805A03335	2019/08/22	2020/08/22
Pre-Amplifier	EM Electronics	EM01G18G	060558	2018/11/30	2019/11/30
Pre-Amplifier	EMC Instruments	EMC184045S E	980652	2019/02/25	2020/02/25
Bilog Antenna	TESEQ	CBL 6111D	29802	2019/08/22	2020/08/22
Horn Antenna	ETS-Lindgren	3117	00218931	2018/12/27	2019/12/27
Horn Antenna	Com-Power	AH-840	101029	2018/12/22	2019/12/22
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2019/07/11	2020/07/11
Test Software	Audix	e3	Ver. 9	N/A	N/A
Spectrum Analyzer	Agilent	N9010A	MY53470241	2019/06/17	2020/06/17
Power Meter	Anritu	ML2495A	1901008	2019/04/29	2020/04/29
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100797	2019/01/16	2020/01/16
Two-Line V-Network	Rohde & Schwarz	ENV216	101243	2019/06/23	2020/06/23
Telecom ISN 2 Line	Fischer Custom Communications	FCC-TLISN-T2-02-09	101169	2019/08/24	2020/08/24
Telecom ISN 4 Line	Fischer Custom Communications	FFCC-TLISN-T4-02-09	101168	2019/01/02	2020/01/02
Impedance Stabilization Network	TESEQ	ISN T800	51949	2019/02/20	2020/02/20

## 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 in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular schedule using in house standards or comparisons.

## 2.6 Measurement Uncertainty

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

**Table 3: Emission Measurement Uncertainty**

Parameter	Uncertainty
Radio Frequency	± 0.1 ppm
RF power/RF Exposure(MPE), conducted	± 1.5 dB
RF power density, conducted	± 3 dB
spurious emissions, conducted	± 3 dB
all emissions, radiated	± 6 dB
Temperature	± 1 °C
Humidity	± 5 %
DC and low frequency voltages	±3 %



### 3. General Product Information

#### 3.1 Product Function and Intended Use

The EUT is an Aisle Light. It contains a wireless chip 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/Test Item	Aisle Light
Type Identification	Aisle Light
FCC ID	2AFXU-EQALE-01

**Table 5: Technical Specification of EUT**

Technical Specification	Value
Operating Frequencies	903 - 927MHz
Channel Spacing	3MHz
Channel number	9
Operation Voltage	110 Vac
Modulation	GFSK
Antenna gain	4.01dBi

### **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**

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

## 4. Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

**Table 6: Table for Parameters of Test Software Setting**

Mode	Channel Frequency		
	903 MHz	915 MHz	927 MHz
GFSK	8	7	7

### 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: A000938083-002

Radiation: A000938083-001

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

Test Software	Tera Term
---------------	-----------

### 4.3 Special Accessories and Auxiliary Equipment

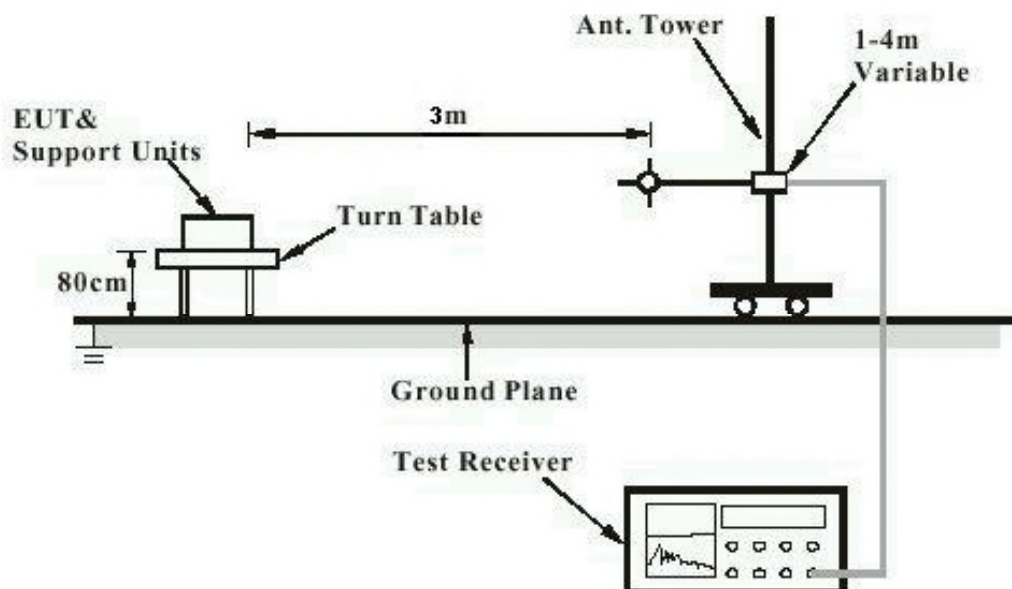
The product has been tested together with the following additional accessories:  
 N/A

### 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.

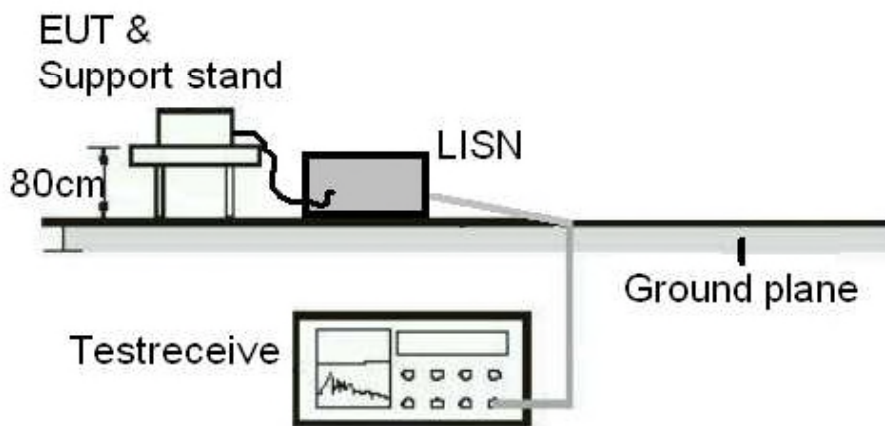
### 4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test

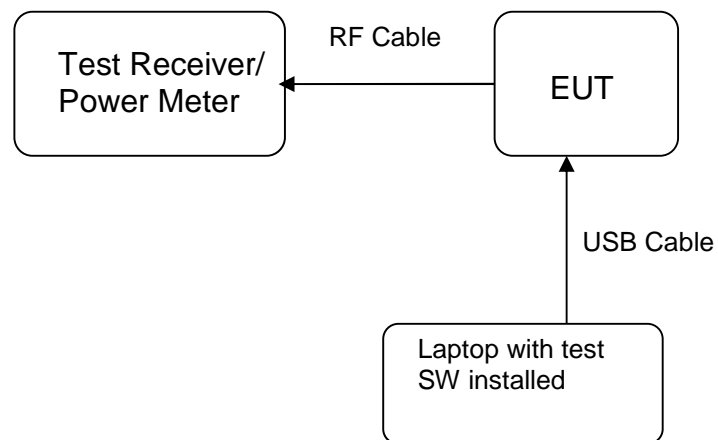


Note: Measurements above 1 GHz are done with a table height of 1.5m

**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 : FCC Part 15.247(b)(4), Part 15.203

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 4.01dBi. The antenna is a PIFA Antenna 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 : FCC Part 15.247(b)(3)  
 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 : 20-24 °C  
 Relative humidity : 50-65 %  
 Atmospheric pressure : 100-103 kPa

**Table 7: Test result of Peak Output Power**

Channel	Channel Frequency (MHz)	Output Power		Limit (W)
		(dBm)	(W)	
Low Channel	903	8.66	0.00735	1
Middle Channel	915	7.83	0.00607	1
High Channel	927	8.15	0.00653	1

**Table 8: Test result of Average Output Power (ANT1)**

Channel	Channel Frequency (MHz)	Output Power		Limit (W)
		(dBm)	(W)	
Low Channel	903	7.72	0.00592	1
Middle Channel	915	6.91	0.00491	1
High Channel	927	7.21	0.00526	1

### 5.1.3 6dB Bandwidth Bandwidth

**RESULT:****Passed**

Test standard : FCC Part 15.247(a)(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 : 20-24°C  
Relative humidity : 50-65%  
Atmospheric pressure : 100-103 kPa

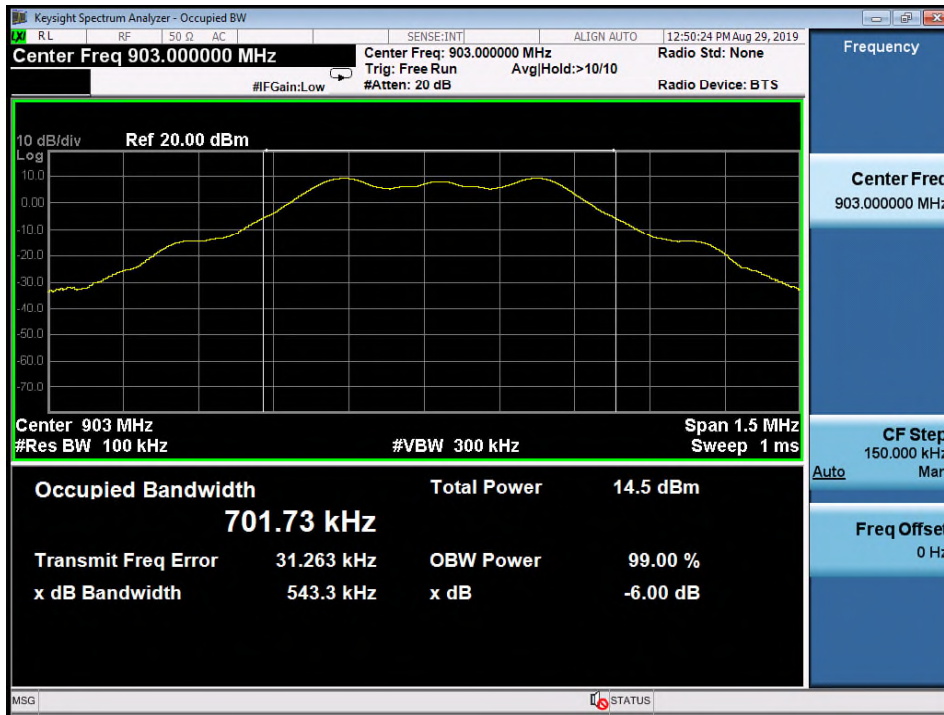
**Table 9: Test result of 6dB Bandwidth**

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
Low Channel	903	543.3	>500	Pass
Mid Channel	915	543.2	>500	Pass
High Channel	927	542.4	>500	Pass

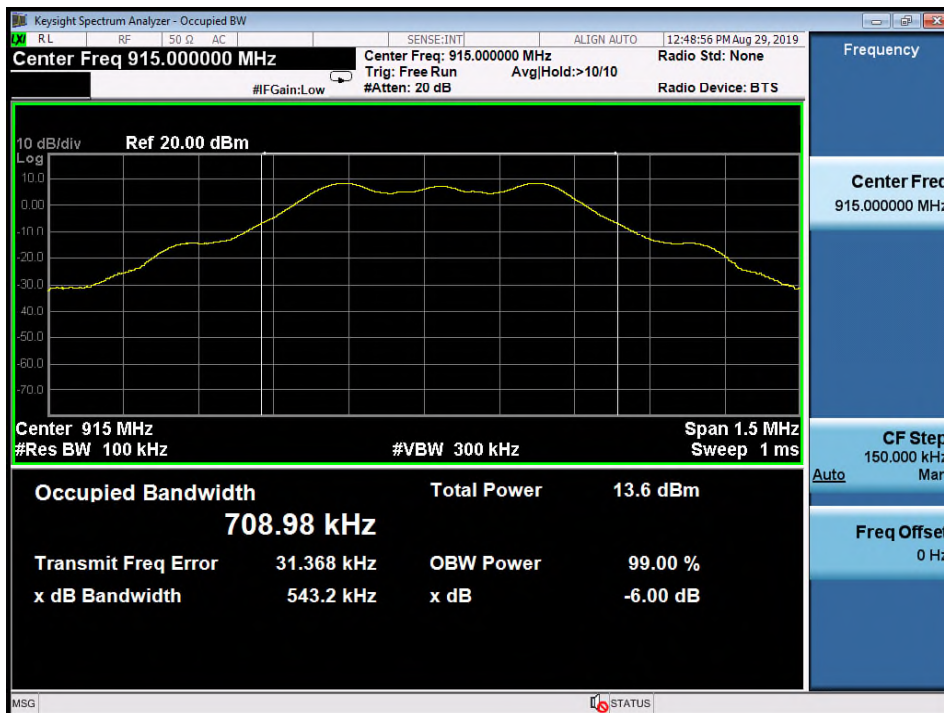


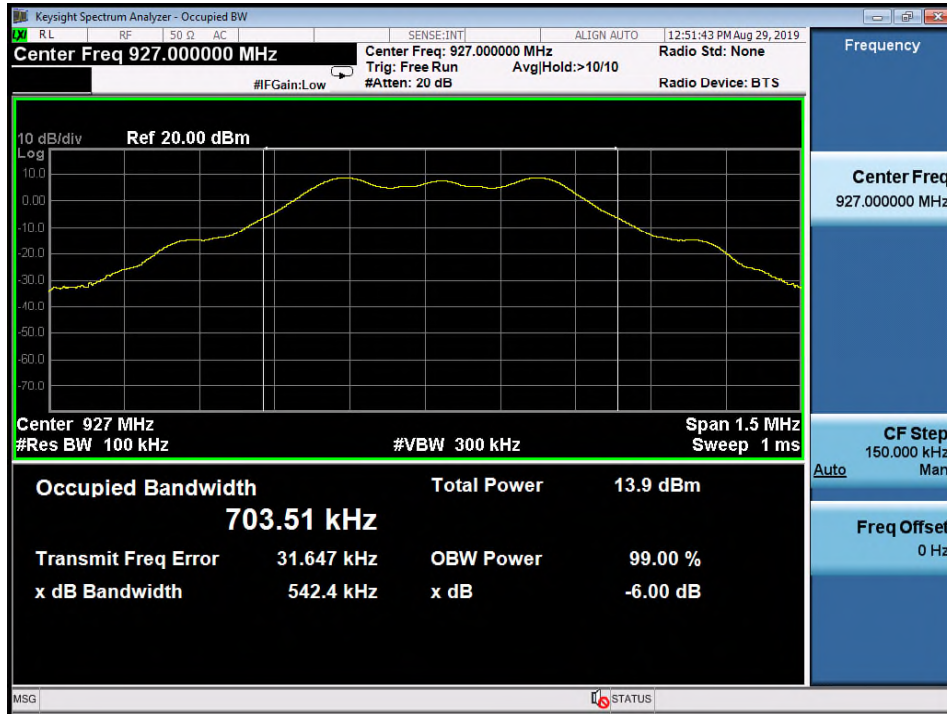
## Test Plot of 6dB Bandwidth

### Low Channel



### Middle Channel



**High Channel**


### 5.1.4 Power Density

**RESULT:****Passed**

Test standard : FCC Part 15.247(e)  
Basic standard : ANSI C63.10:2013, KDB558074  
Kind of test site : Shielded room

**Test setup**

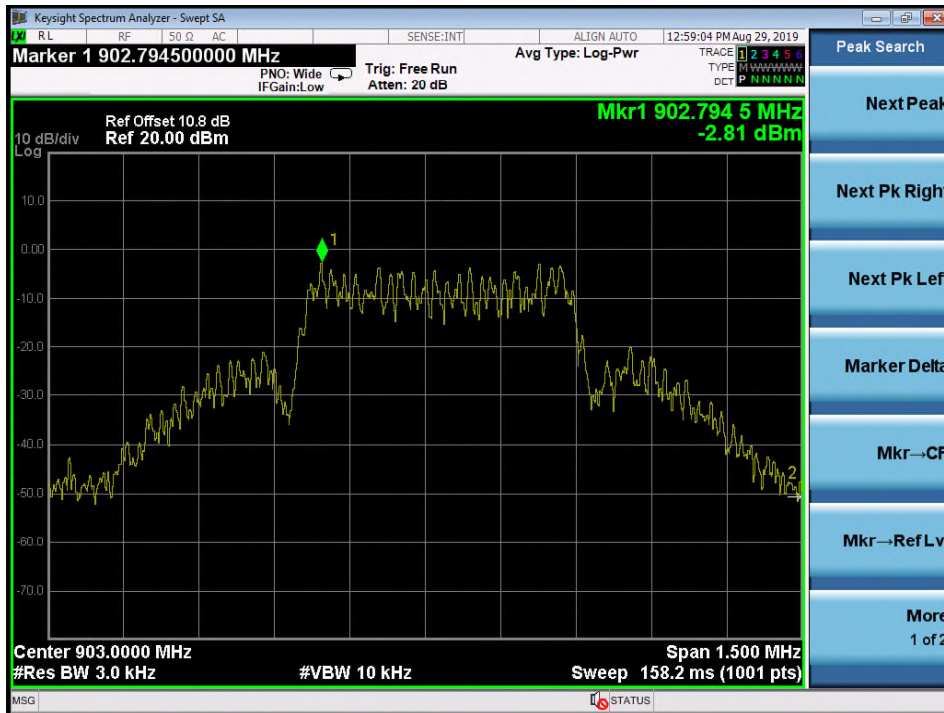
Test Channel : Low/ Middle/ High  
Operation Mode : A  
Ambient temperature : 20-24°C  
Relative humidity : 50-65%  
Atmospheric pressure : 100-103 kPa

**Table 10: Test result of Power Density**

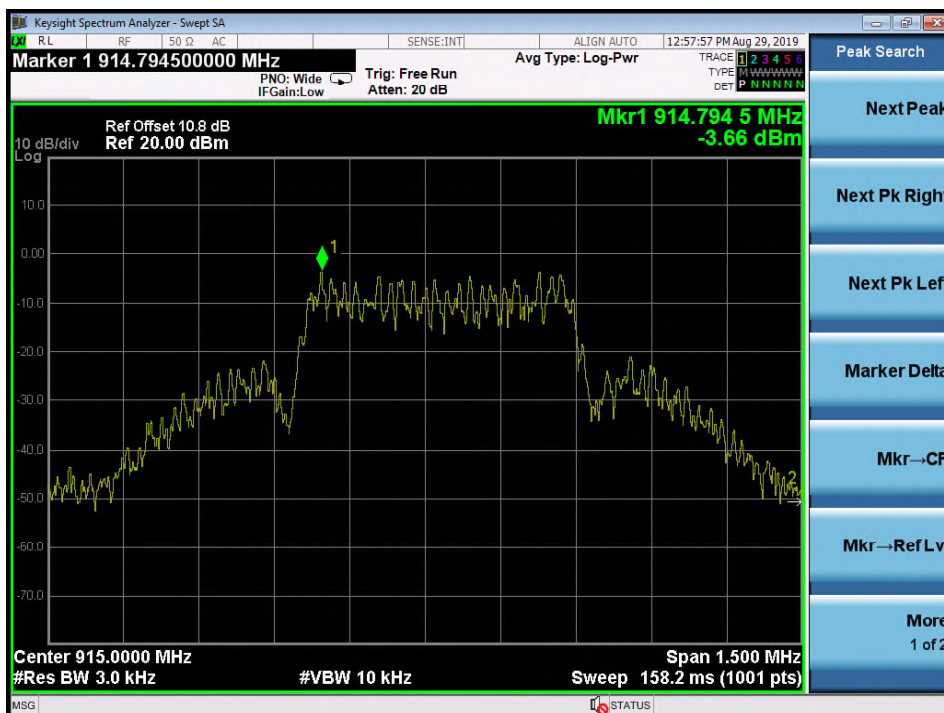
Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	903	-2.81	8
Middle Channel	915	-3.66	8
High Channel	927	-3.34	8

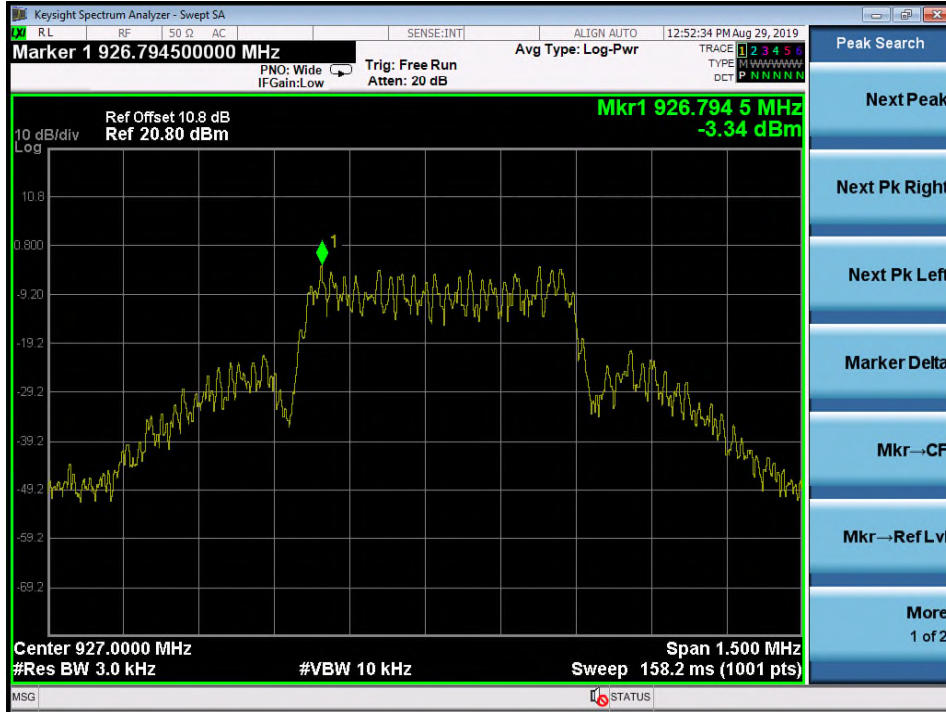
## Test Plot of Power Density

### Low Channel



### Middle Channel



**High Channel**


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

**RESULT:** **Passed**

Test standard : FCC part 15.247(d)  
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/ Middle/ High for Conducted Spurious Emissions  
Low/ High for Frequency Band Edge  
Operation Mode : A  
Ambient temperature : 20-24°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 RF circuit and that there are no inductive components of significant size connected to the antenna port, 9kHz to 30MHz frequency range is not tested based on technical judgment.

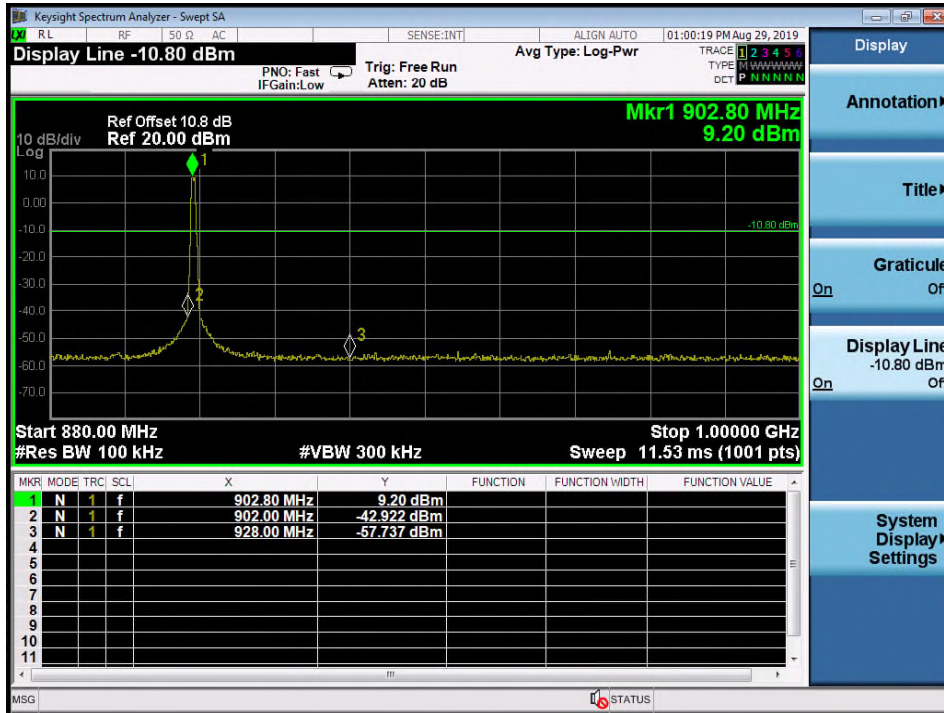




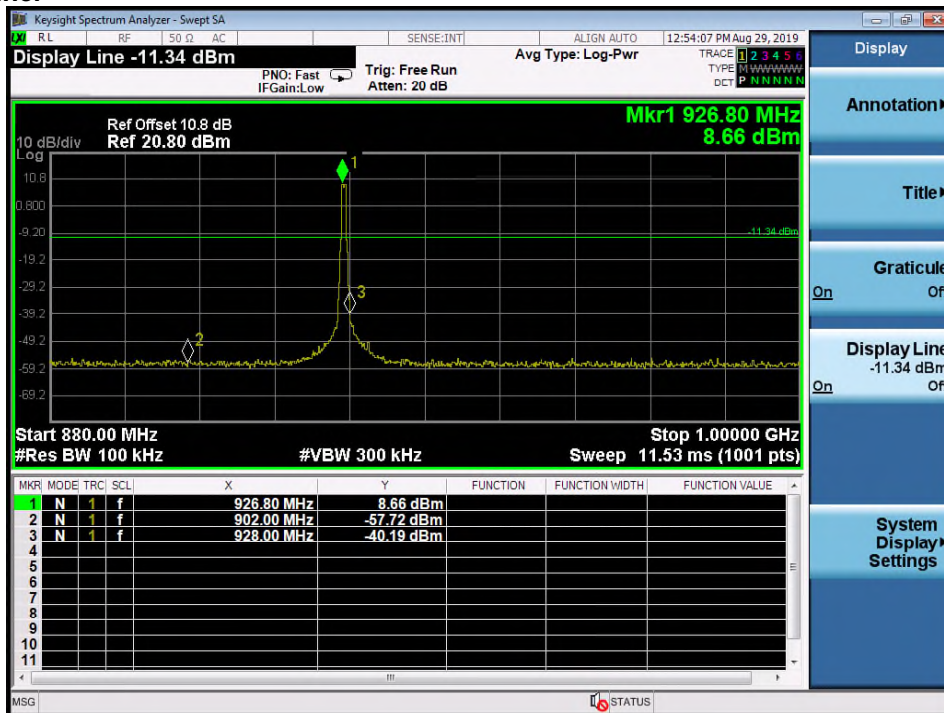


## Test Plot 100kHz RBW of Band Edge

### Low Channel



### High Channel



## 5.1.6 Spurious Emission

**RESULT:****Passed**

Test standard	:	FCC part 15.247(d), FCC 15.205, FCC 15.209
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 i5, 8.10 (Table 7), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen 5, 8.9 (Table 5 and 6).  Emission radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in FCC15.247(d) and RSS-247 i2, 5.5
Kind of test site	:	3m Semi-Anechoic Chamber

**Test setup**

Test Channel	:	Low/ Middle/ High
Operation mode	:	A
Ambient temperature	:	20-24 °C
Relative humidity	:	50-65 %
Atmospheric pressure	:	100-103 kPa

Factor (dB/m)=Antenna Factor(dB/m)+Cable loss (dB)

Level(dBuV/m)=Reading(dBuV)+ Factor(dB/m)

For details refer to Appendix D.

Testing was carried out within frequency range 9kHz 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.

## 5.2 Mains Emissions

### 5.2.1 Mains Conducted Emissions

**RESULT:****Passed**

Test standard : FCC Part 15.207  
FCC Part 15.107

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 : 903MHz  
Operation mode : A

Ambient temperature : 20-24 °C  
Relative humidity : 50-65 %  
Atmospheric pressure : 100-103 kPa

Remark: For details refer to Appendix D.

## 6. Safety Human exposure

### 6.1 Radio Frequency Exposure Compliance

#### 6.1.1 Electromagnetic Fields

**RESULT:** **Passed**

Test standard : FCC CFR 47 Part 2 Subpart J Section 2.1091

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

#### FCC Maximum Exposure:

Mode	Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Maximum Output Power (dBm)	Output Power (mW)	Power Density (S)(mW/cm <sup>2</sup> )	Test Result
GFSK	903	4.01	2.5177	7.72	5.92	0.002964	Pass

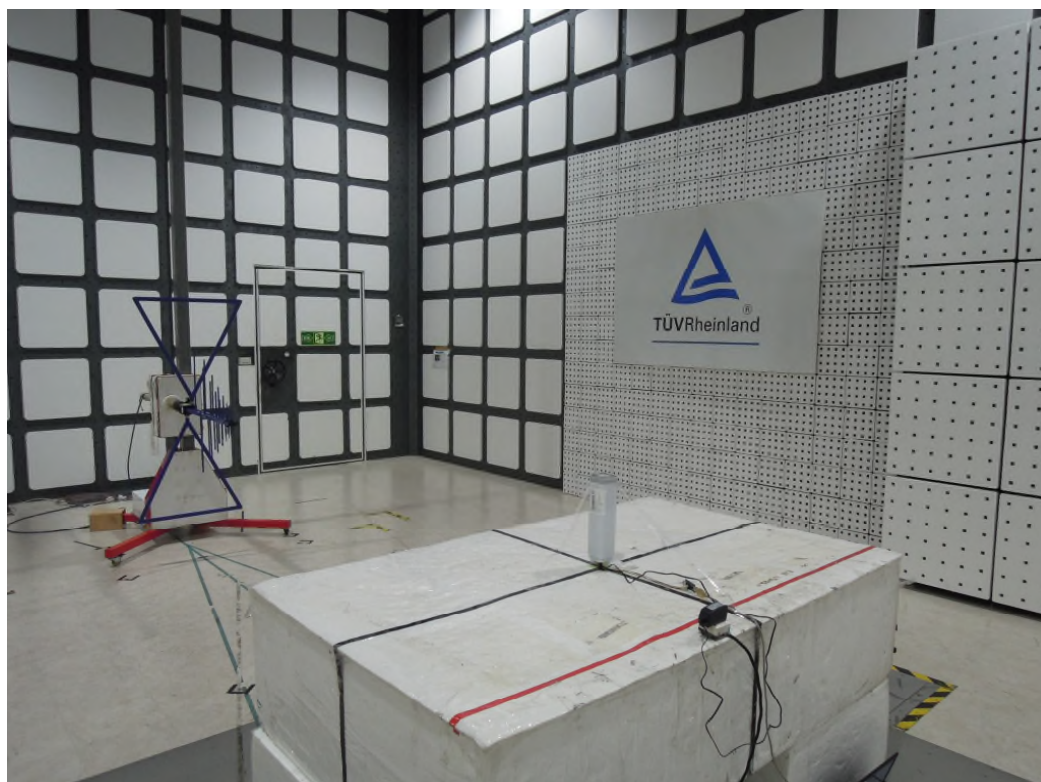
**Limit FCC: 1500-100,000 MHz 1.0 mW/cm<sup>2</sup>**

## 7. Photographs of the Test Set-Up

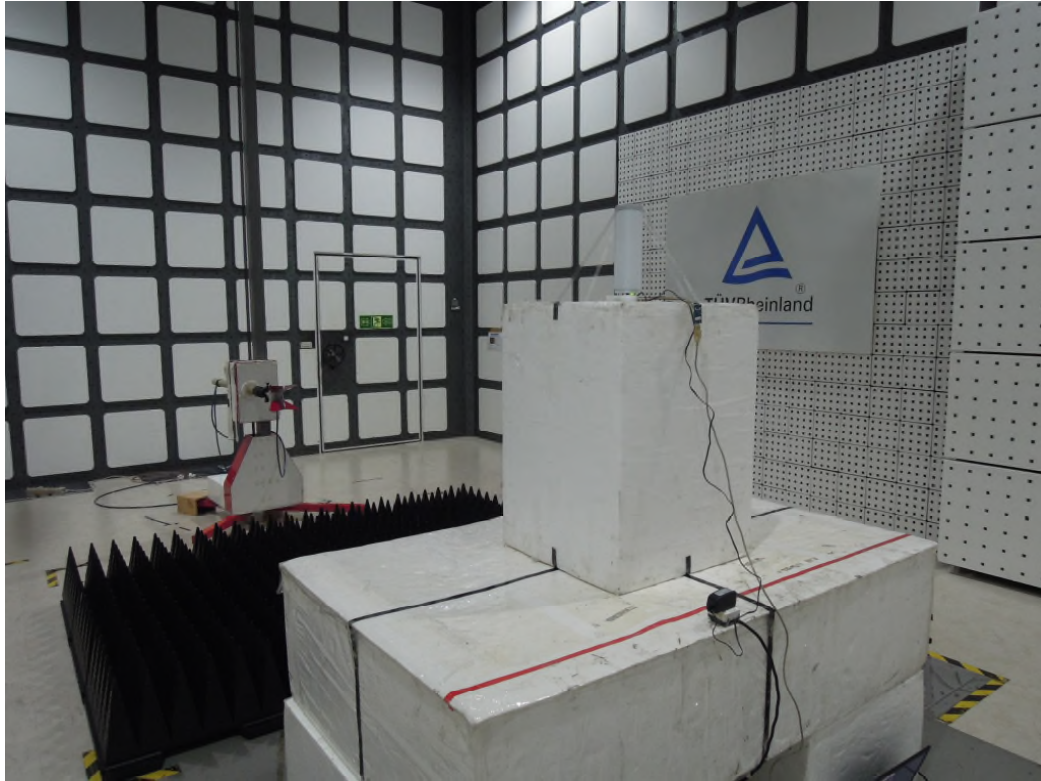
Photograph 1: Set-up for Spurious Emissions (Front View)



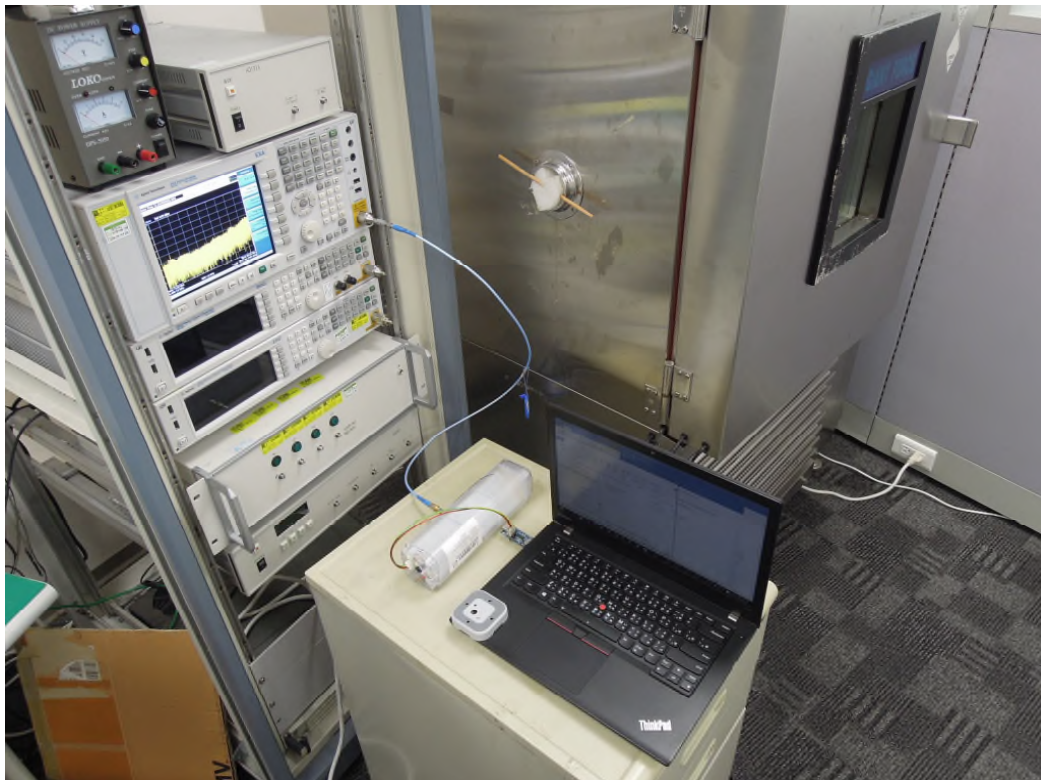
Photograph 2: Set-up for Spurious Emissions (Back View 1)



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



Photograph 4: Set-up for Conducted testing



**Photograph 5: Set-up for for AC Mains (Back)**



**Photograph 6: Set-up for for AC Mains (Front)**



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