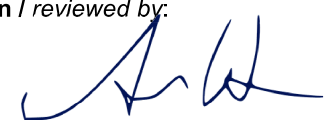


|                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                        |                                                                                           |                                        |                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------|
| <b>Prüfbericht-Nr.:</b><br><i>Test Report No.:</i>                                                                                                                                                                                                                                                                                                                                                                                                         | <b>50354460 001</b>                                                                                                    | <b>Auftrags-Nr.:</b><br><i>Order No.:</i>                                                 | <b>238111472</b>                       | Seite 1 von 32<br>Page 1 of 32 |
| <b>Kunden-Referenz-Nr.:</b><br><i>Client Reference No.:</i>                                                                                                                                                                                                                                                                                                                                                                                                | N/A                                                                                                                    | <b>Auftragsdatum:</b><br><i>Order date:</i>                                               | 28-Aug-2019                            |                                |
| <b>Auftraggeber:</b><br><i>Client:</i>                                                                                                                                                                                                                                                                                                                                                                                                                     | WINSCEM TECH LIMITED - Room 8, 5/F, Sunwise Industrial Building, 16-26 Wang Wo Tsai Street, Tsuen Wan, N.T. Hong Kong. |                                                                                           |                                        |                                |
| <b>Prüfgegenstand:</b><br><i>Test item:</i>                                                                                                                                                                                                                                                                                                                                                                                                                | Bluetooth Dartboard                                                                                                    |                                                                                           |                                        |                                |
| <b>Bezeichnung / Typ-Nr.:</b><br><i>Identification / Type No.:</i>                                                                                                                                                                                                                                                                                                                                                                                         | SDB A1                                                                                                                 |                                                                                           |                                        |                                |
| <b>Auftrags-Inhalt:</b><br><i>Order content:</i>                                                                                                                                                                                                                                                                                                                                                                                                           | FCC Part 15C Test report (BLE)                                                                                         |                                                                                           |                                        |                                |
| <b>Prüfgrundlage:</b><br><i>Test specification:</i>                                                                                                                                                                                                                                                                                                                                                                                                        | FCC 47CFR Part 15: Subpart C Section 15.247(DTS)                                                                       |                                                                                           |                                        |                                |
| <b>Wareneingangsdatum:</b><br><i>Date of receipt:</i>                                                                                                                                                                                                                                                                                                                                                                                                      | 26-Apr-2019                                                                                                            |                                                                                           |                                        |                                |
| <b>Prüfmuster-Nr.:</b><br><i>Test sample No.:</i>                                                                                                                                                                                                                                                                                                                                                                                                          | A001041698-001                                                                                                         |                                                                                           |                                        |                                |
| <b>Prüfzeitraum:</b><br><i>Testing period:</i>                                                                                                                                                                                                                                                                                                                                                                                                             | 24-Dec-2019~14-Jan-2020                                                                                                |                                                                                           |                                        |                                |
| <b>Ort der Prüfung:</b><br><i>Place of testing:</i>                                                                                                                                                                                                                                                                                                                                                                                                        | EMC/RF Laboratory Taipei                                                                                               |                                                                                           |                                        |                                |
| <b>Prüflaboratorium:</b><br><i>Testing laboratory:</i>                                                                                                                                                                                                                                                                                                                                                                                                     | TUV Rheinland Taiwan Ltd.                                                                                              |                                                                                           |                                        |                                |
| <b>Prüfergebnis*:</b><br><i>Test result*:</i>                                                                                                                                                                                                                                                                                                                                                                                                              | Pass                                                                                                                   |                                                                                           |                                        |                                |
| <b>geprüft von / tested by:</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                        | <b>kontrolliert von / reviewed by:</b>                                                    |                                        |                                |
|                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                        |      |                                        |                                |
| <b>16-Jan-2020</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Jack Chang/Project Manager</b>                                                                                      | <b>16-Jan-2020</b>                                                                        | <b>Arvin Ho / Vice General Manager</b> |                                |
| <b>Datum</b>                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Name / Stellung</b>                                                                                                 | <b>Datum</b>                                                                              | <b>Name / Stellung</b>                 |                                |
| <b>Date</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Name / Position</b>                                                                                                 | <b>Date</b>                                                                               | <b>Name / Position</b>                 |                                |
| <b>Sonstiges / Other:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                        |                                                                                           |                                        |                                |
| <b>Zustand des Prüfgegenstandes bei Anlieferung:</b><br><i>Condition of the test item at delivery:</i>                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                        | <b>Prüfmuster vollständig und unbeschädigt</b><br><i>Test item complete and undamaged</i> |                                        |                                |
| * Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft<br>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<br>P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested                                                                                                                                                                                                                                                     |                                                                                                                        |                                                                                           |                                        |                                |
| <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><br><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 PEAK OUTPUT POWER**

RESULT: *Passed*

### **5.1.3 6dB 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*

### **6.1.1 ELECTROMAGNETIC FIELDS**

RESULT: *Passed*

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Produkte  
Products

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*Test Report No.*

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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: 50274640 001 Appendix P)

**Appendix D: Test Result of Radiated Emissions**  
(File Name: 50274640 001 Appendix D)

#### Test Specifications

The following standards were applied.

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

| Radio                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC 47CFR Part 15: Subpart C Section 15.247<br>FCC 47CFR Part 2: Subpart J Section 2.1093<br>ANSI C63.10:2013<br>KDB558074 D01 DTS Meas Guidance v05r02<br>KDB447498 D01 General RF Exposure Guidance v06 |

### 1.2 Decision Rule of conformity

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.

## 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.

Radiated Test:  
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

Conducted Test:  
No. 458-18, Sec 2, Fenliao., Linkou Dist.  
New Taipei City 244  
Taiwan (R.O.C.)  
FCC Registration No.: 226631  
IC Canada Registration No.: 25563

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**

Radiated Test in Songshan:

| Equipment         | Manufacturer    | Model No.   | Serial No.     | Cal. Date  | Cal. Due Date |
|-------------------|-----------------|-------------|----------------|------------|---------------|
| EMI Test Receiver | Rohde & Schwarz | ESR 7       | 101062         | 2019/10/15 | 2020/10/15    |
| Spectrum Analyzer | Rohde & Schwarz | FSV-40      | 100921         | 2019/04/30 | 2020/04/30    |
| Pre-Amplifier     | Hewlett Packard | 8447F       | 2805A03335     | 2019/09/11 | 2020/09/11    |
| Pre-Amplifier     | EM Electronics  | EM01G18G    | 060558         | 2019/12/24 | 2020/12/24    |
| Pre-Amplifier     | EMC Instruments | EMC184045SE | 980609(980408) | 2019/06/14 | 2020/06/14    |
| Bilog Antenna     | TESEQ           | CBL 6111D   | 29802          | 2019/09/10 | 2020/09/10    |
| Horn Antenna      | ETS-Lindgren    | 3117        | 00138160       | 2019/06/24 | 2020/06/24    |
| Horn Antenna      | Schwarzbeck     | BBHA 9170   | 00907          | 2019/04/12 | 2020/04/12    |
| Loop Antenna      | Schwarzbeck     | FMZB 1513   | 1513-076       | 2019/07/11 | 2020/07/11    |
| Test Software     | Audix           | e3          | Ver. 9         | N/A        | N/A           |

Conducted Test in LinKou:

| Equipment         | Manufacturer | Model No.        | Serial No.  | Cal. Date | Cal. Due Date |
|-------------------|--------------|------------------|-------------|-----------|---------------|
| Spectrum Analyzer | R&S          | FSV40            | 101513      | 2019/2/8  | 2020/2/8      |
| Thermo Chamber    | Giant Force  | GHT-150-40-CP-SD | MAA1902-010 | 2019/2/1  | 2020/2/1      |
| Signal Generator  | R&S          | SMB100A03        | 181335      | 2019/1/23 | 2020/1/23     |
| Power Meter       | Anritsu      | ML2495A          | 1901008     | 2019/4/29 | 2020/4/28     |
| Power Sensor      | Anritsu      | MA2411B          | 1725269     | 2019/4/29 | 2020/4/28     |

## 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 a Bluetooth Dartboard . It contains a Bluetooth compatible 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 | Bluetooth Dartboard |
| Type Identification         | SDB A1              |
| FCC ID                      | 2ARFT-SDBA1         |

**Table 5: Technical Specification of EUT**

| Technical Specification | Value        |
|-------------------------|--------------|
| Operating Frequencies   | 2402~2480MHz |
| Channel number          | 40           |
| Operation Voltage       | 3Vdc         |
| Modulation              | GFSK         |
| Antenna gain            | -0.36dBi     |

### **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
- Blocking Diagram
- 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, Data Rate | Channel Frequency |          |          |
|-----------------|-------------------|----------|----------|
|                 | 2402 MHz          | 2440 MHz | 2480 MHz |
| BLE             | Default           | Default  | Default  |

### 4.2 Test Operation and Test Software

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

This software nRF\_DTM 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: A000913336-001

Radiation: A000913336-001

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

Channel Low (2402MHz), Channel Mid (2440MHz) and Channel High (2480MHz) were chosen for full testing.

| IOA5 | IOA4 | IOA3 | Test Firmware                                                                                |
|------|------|------|----------------------------------------------------------------------------------------------|
| 0    | 0    | 1    | A7107Config_RF[0X23] = 0x13;<br>A7107Config_RF[0X27] = 0x37;<br>A7107Config_RF[0X28] = 0x1D; |
| IOA2 | IOA1 | IOA0 | Test Frequency                                                                               |
| 0    | 0    | 0    | Tx 2402MHz Setting                                                                           |
| 0    | 1    | 1    | Tx 2440MHz Setting                                                                           |
| 1    | 0    | 0    | Tx 2480MHz Setting                                                                           |
| 1    | 0    | 1    | Rx 2402MHz Setting                                                                           |
| 1    | 1    | 0    | Rx 2440MHz Setting                                                                           |
| 1    | 1    | 1    | Rx 2480MHz Setting                                                                           |

### 4.3 Special Accessories and Auxiliary Equipment

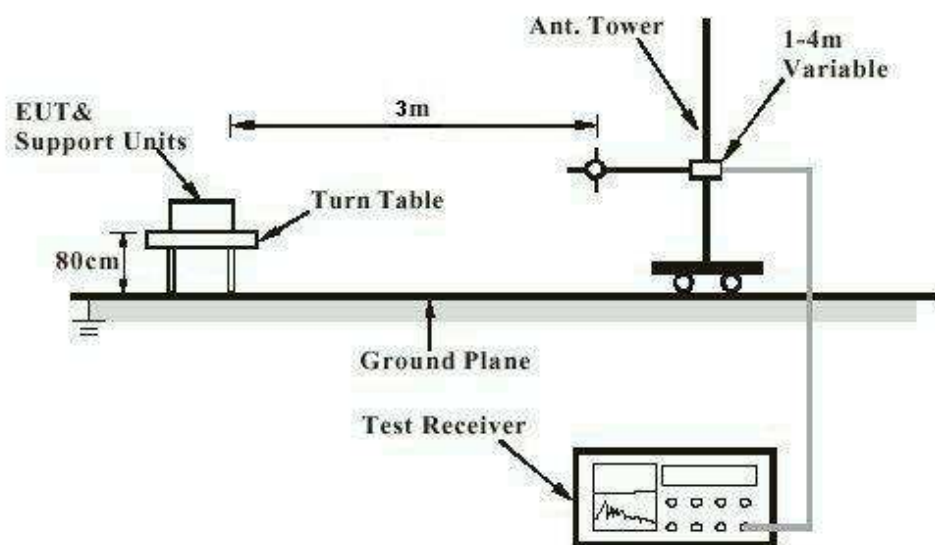
N/A

### 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.

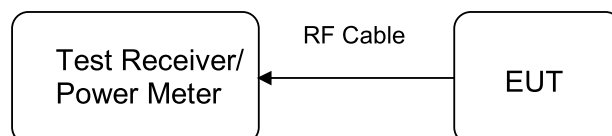
## 4.5 Test Setup Diagram

### 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 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 -0.36dBi. The antenna is a printed 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 : 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 |
|----------------|-------------------------|--------------|---------|-------|
|                |                         | (dBm)        | (W)     | (W)   |
| Low Channel    | 2402                    | -0.85        | 0.00082 | 1     |
| Middle Channel | 2440                    | -1.64        | 0.00069 | 1     |
| High Channel   | 2480                    | -2.37        | 0.00058 | 1     |

Pmax: 0.82mW

**5.1.3 6dB 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

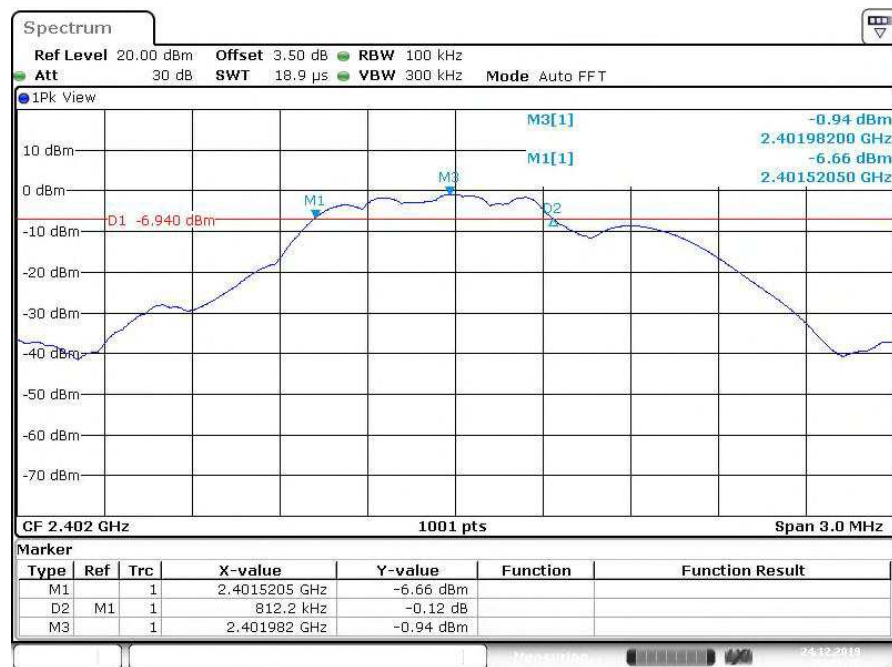
Ambient temperature : 20-24°C  
Relative humidity : 50-65%  
Atmospheric pressure : 100-103 kPa

**Table 8: Test result of 6dB Bandwidth**

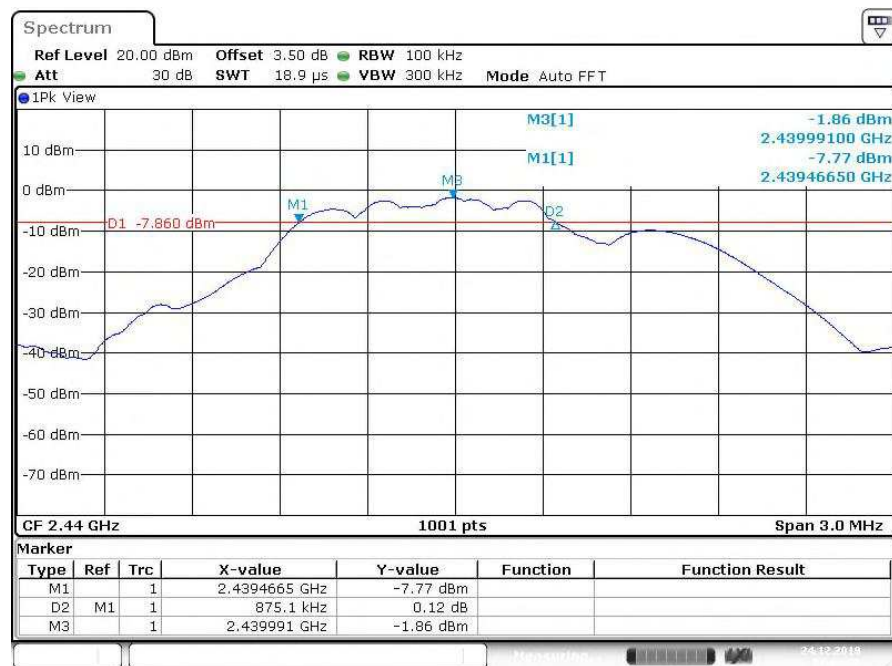
| Channel      | Channel Frequency (MHz) | 6dB Bandwidth (kHz) | Limit (kHz) | Result |
|--------------|-------------------------|---------------------|-------------|--------|
| Low Channel  | 2402                    | 812.2               | >500        | Pass   |
| Mid Channel  | 2440                    | 875.1               | >500        | Pass   |
| High Channel | 2480                    | 917.1               | >500        | Pass   |

## Test Plot of 6dB Bandwidth

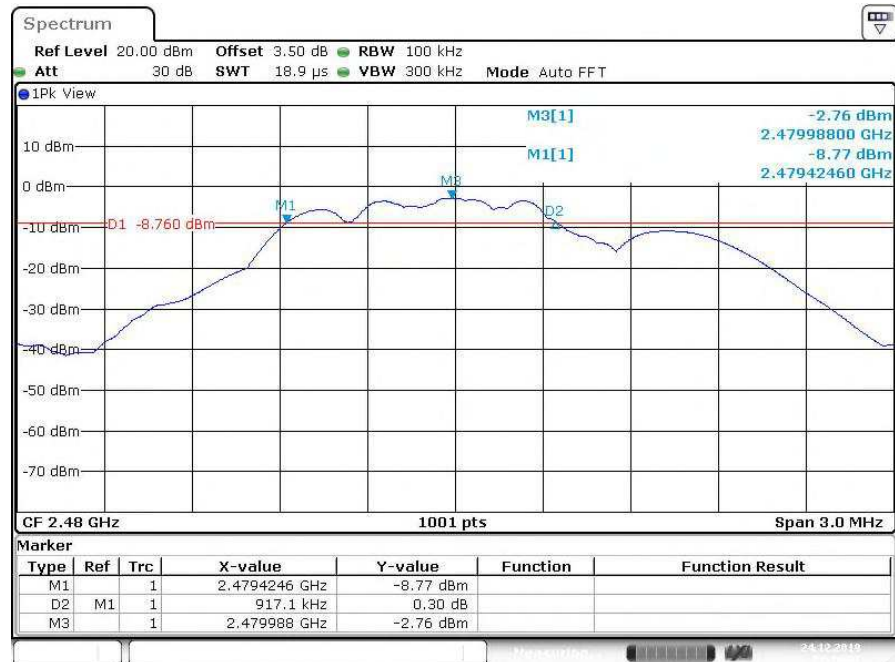
### Low Channel



### Middle Channel



### High Channel



Date: 24.DEC.2019 17:16:41

**5.1.4 Power Density****RESULT:****Passed**

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

**Test setup**

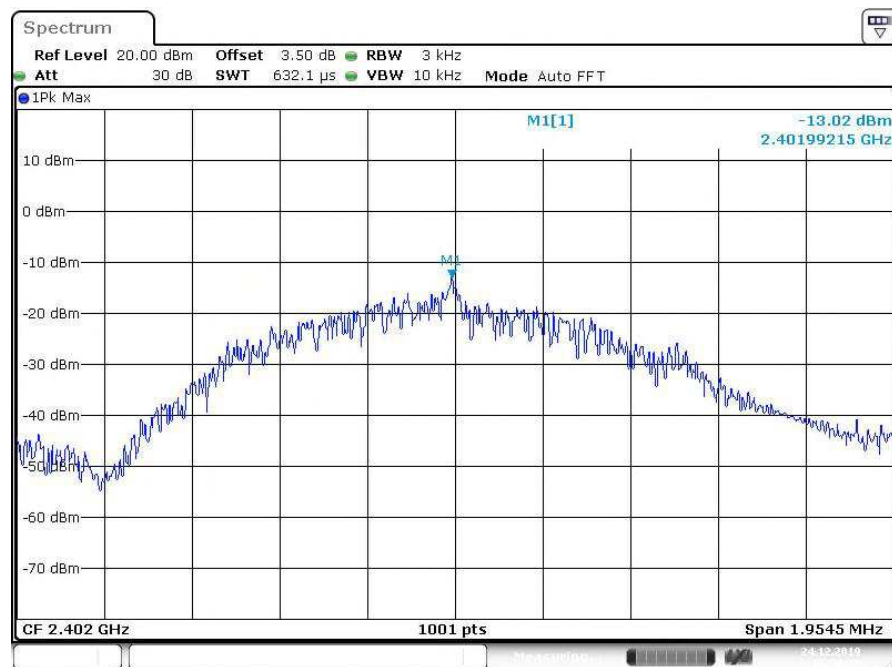
Test Channel : Low/ Middle/ High  
Operation Mode : A  
Ambient temperature : 20-24°C  
Relative humidity : 50-65%  
Atmospheric pressure : 100-103 kPa

**Table 9: Test result of Power Density**

| Channel        | Channel Frequency (MHz) | Power Density | Limit |
|----------------|-------------------------|---------------|-------|
|                |                         | (dBm)         | (dBm) |
| Low Channel    | 2402                    | -13.02        | 8     |
| Middle Channel | 2440                    | -14.48        | 8     |
| High Channel   | 2480                    | -15.6         | 8     |

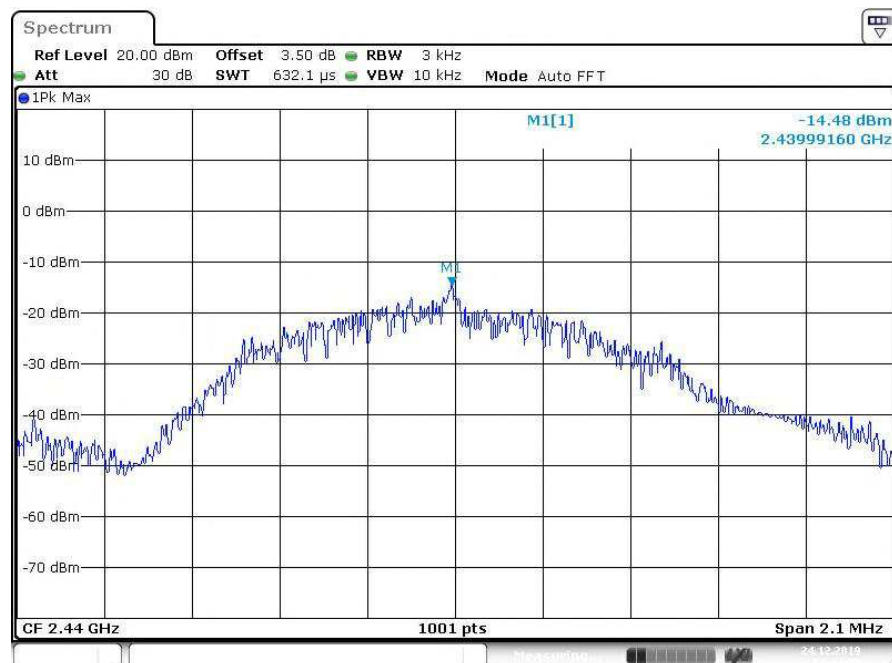
## Test Plot of Power Density

### Low Channel



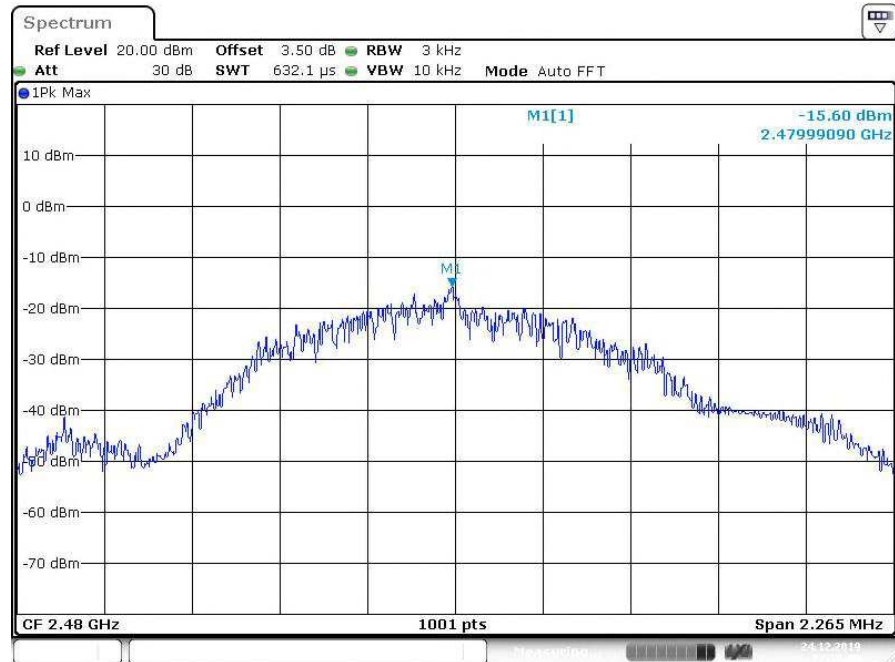
Date: 24.DEC.2019 16:59:34

### Middle Channel



Date: 24.DEC.2019 17:35:21

### High Channel



Date: 24.DEC.2019 17:18:28

**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<br>band that contains the highest level of the desired power) |
| Kind of test site | : | Shielded room                                                                                                     |

**Test setup**

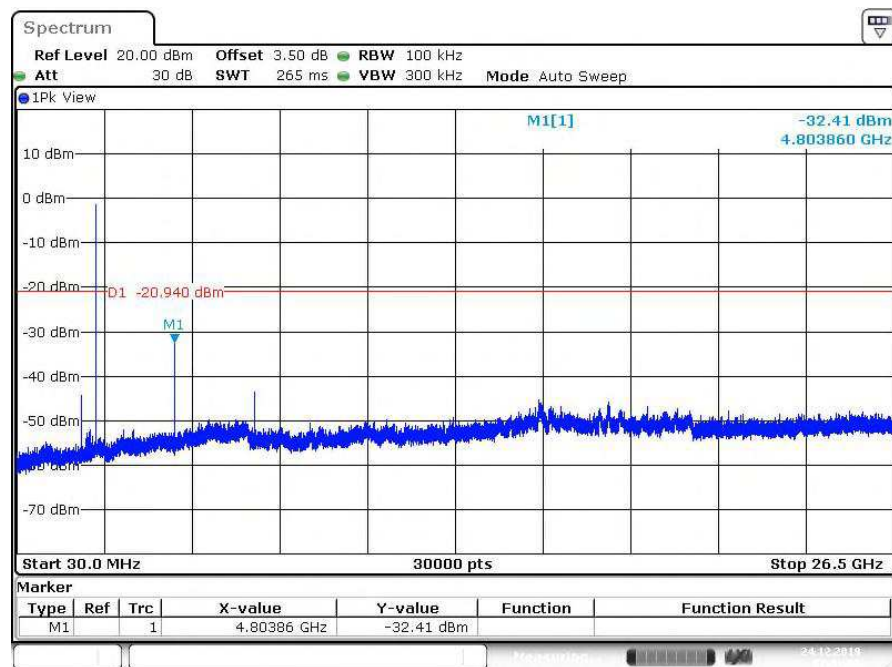
|                      |   |                                                                                         |
|----------------------|---|-----------------------------------------------------------------------------------------|
| Test Channel         | : | Low/ Middle/ High for Conducted Spurious Emissions<br>Low/ High for Frequency Band Edge |
| Operation Mode       | : | A                                                                                       |
| Ambient temperature  | : | °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.

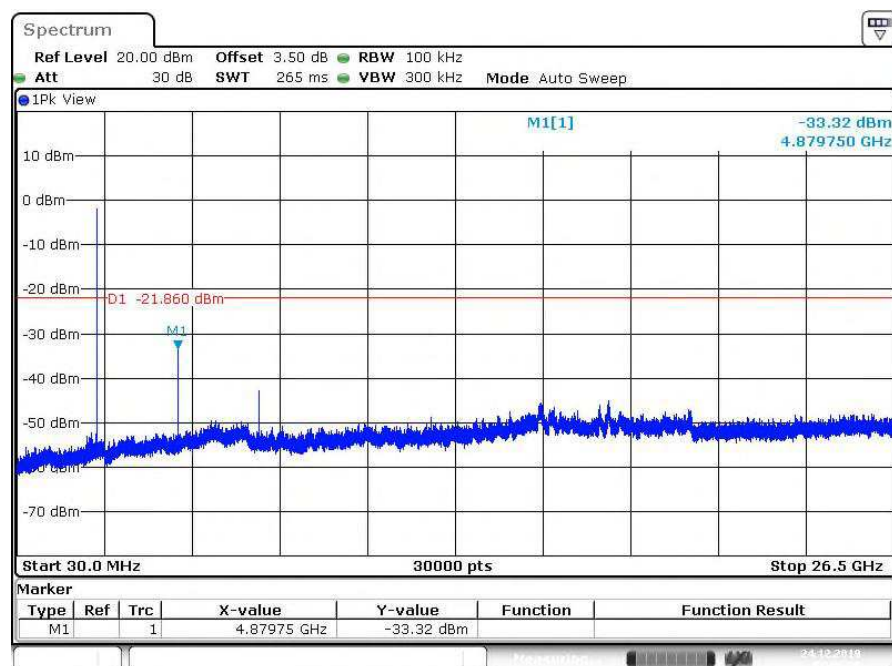
## Test Plot 100kHz Conducted Emissions

### Low Channel

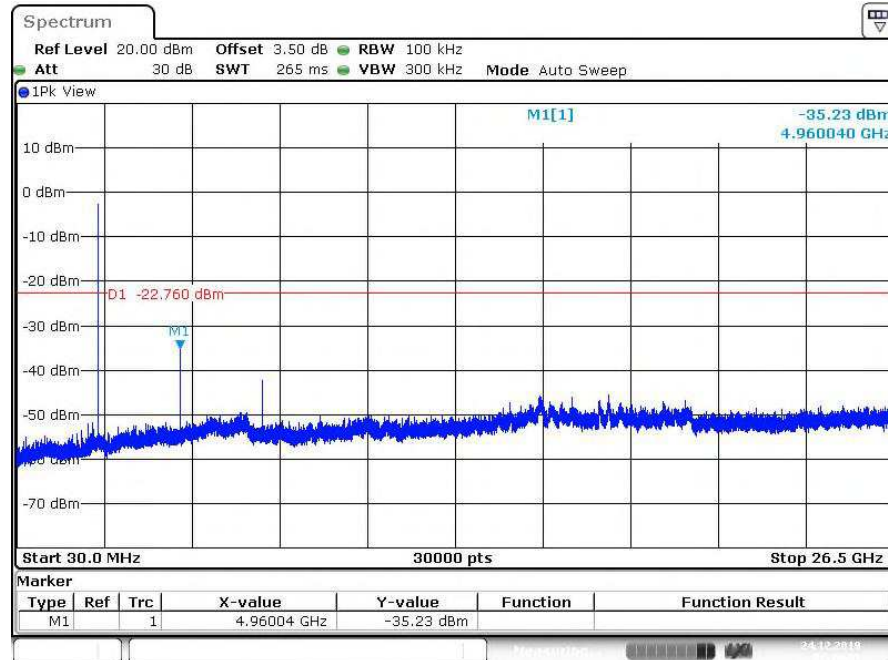
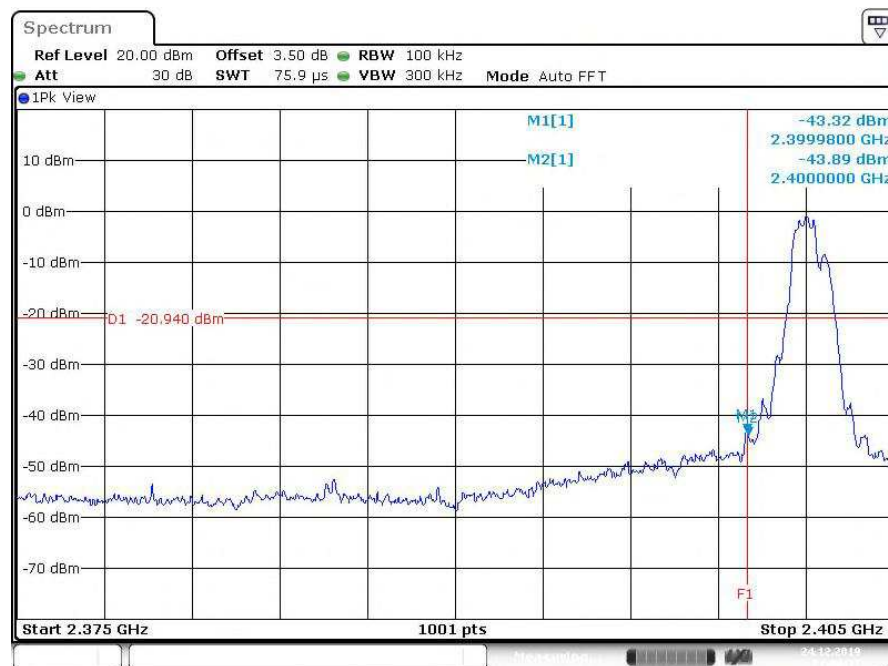


Date: 24.DEC.2019 17:01:06

### Middle Channel



Date: 24.DEC.2019 17:36:20

**High Channel**

**Test Plot 100kHz RBW of Band Edge**
**Low Channel**


Date: 24.DEC.2019 17:18:51

### 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 i5, 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 : Refer to Appendix D  
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)

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.

## 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

Therefore the maximum output power of the transmitter is  $0.82\text{mW} < 10\text{mW}$  (Distance: 5 mm), hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

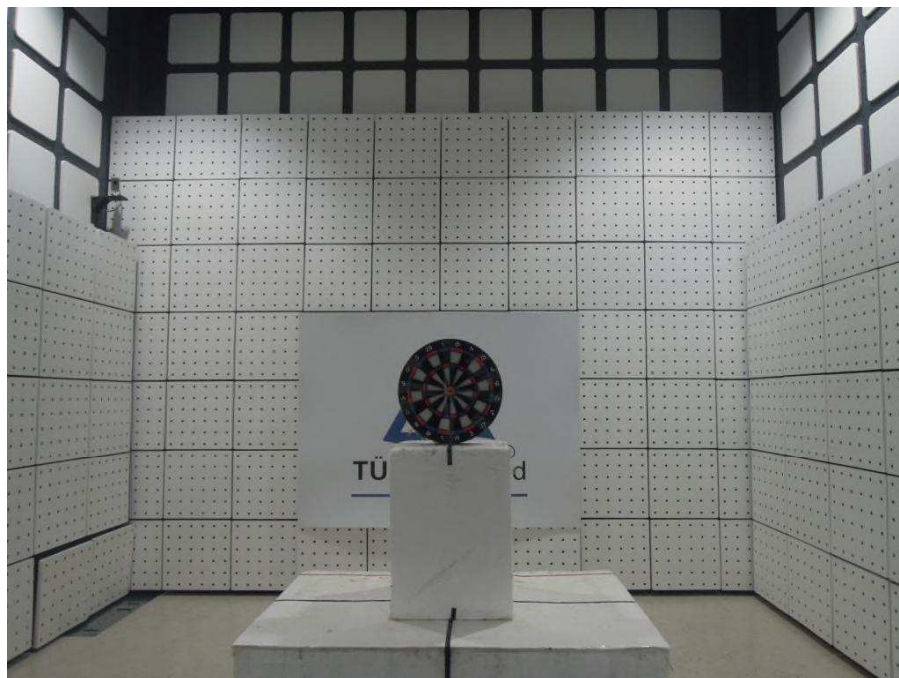
**---End---**

## 7. Photographs of the Test Set-Up

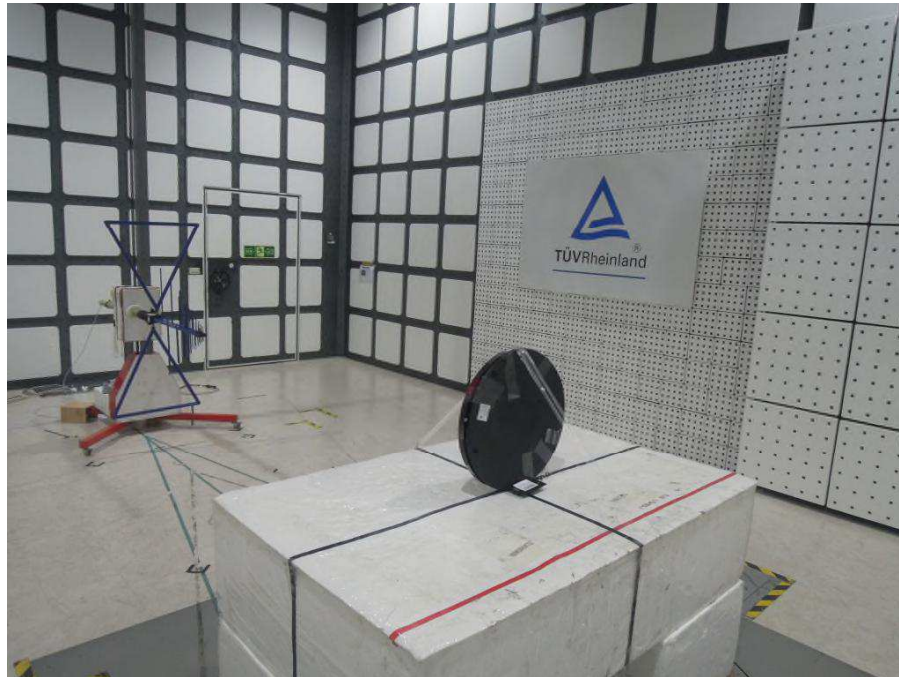
**Photograph 1: Set-up for Spurious Emissions (Front View 1)**



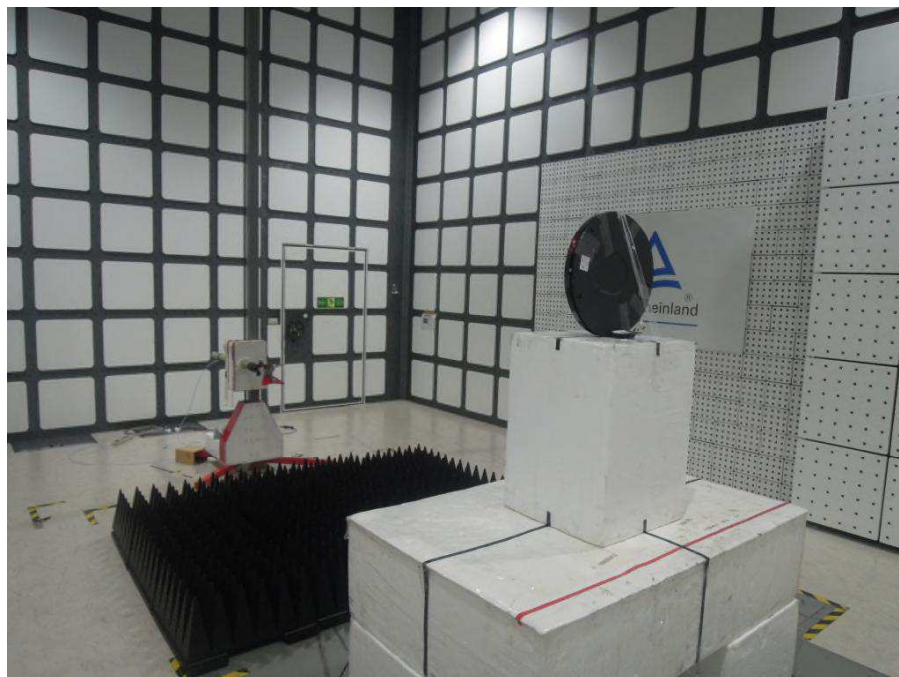
**Photograph 2: Set-up for Spurious Emissions (Front View 2)**



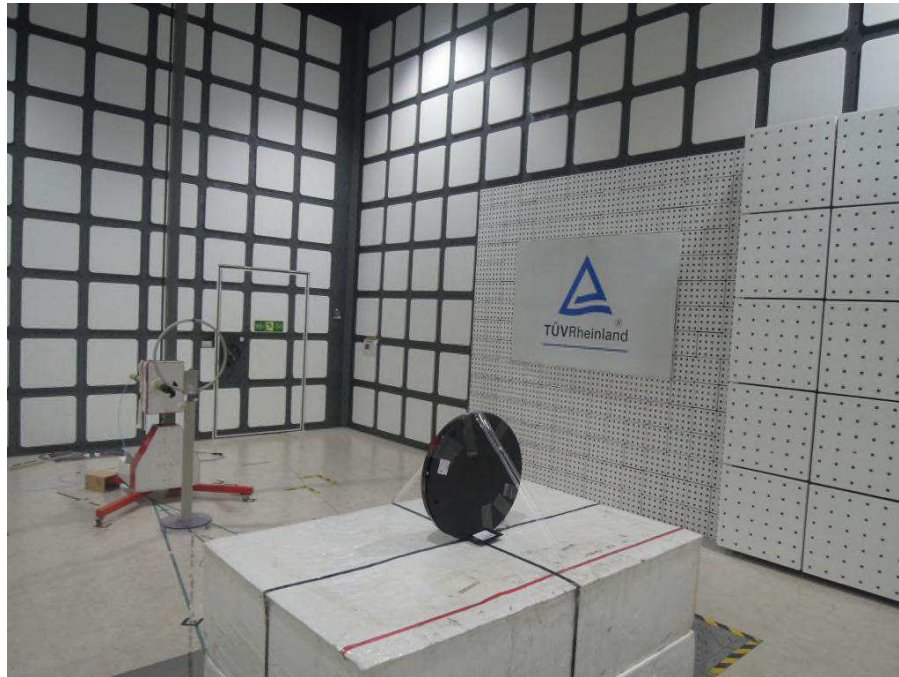
**Photograph 3: Set-up for Spurious Emissions (Back View 1)**



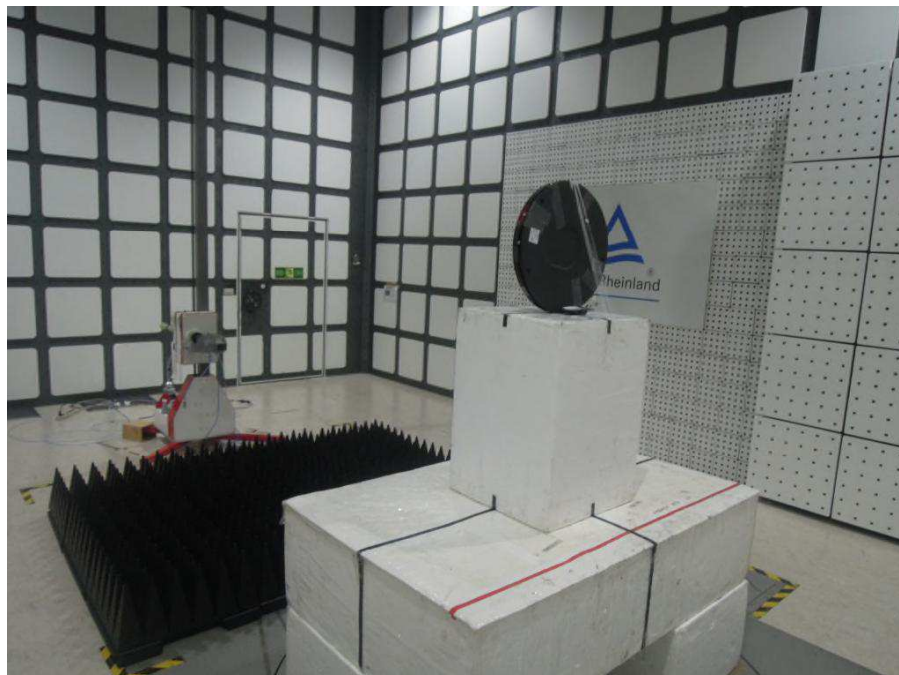
**Photograph 4: Set-up for Spurious Emissions (Back View 2)**



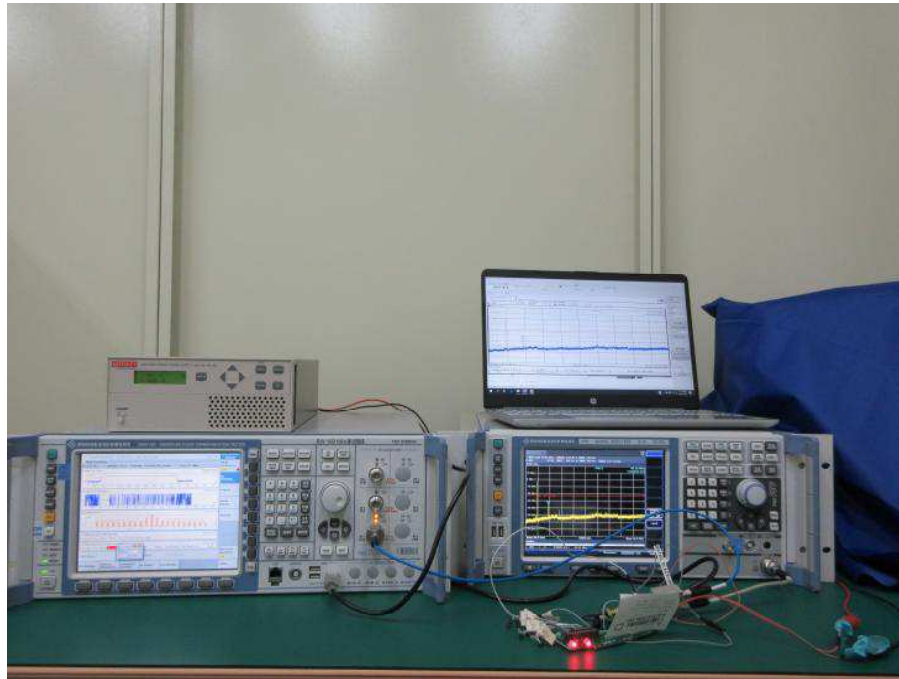
**Photograph 5: Set-up for Spurious Emissions (Back View 3)**



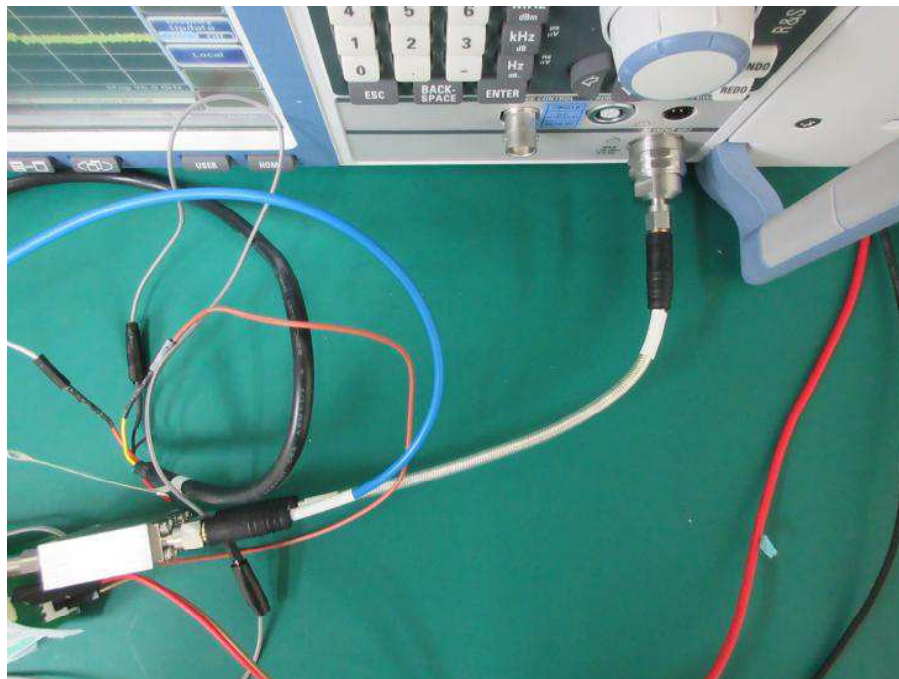
**Photograph 6: Set-up for Spurious Emissions (Back View 4)**



**Photograph 7: Set-up for Conducted testing**



**Photograph 8: Set-up for Conducted testing**



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