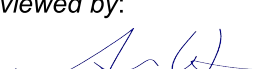


Prüfbericht-Nr.: Test Report No.:	50227971 001	Auftrags-Nr.: Order No.:	238101444	Seite 1 von 34 Page 1 of 34
Kunden-Referenz-Nr.: Client Reference No.:	N/A	Auftragsdatum: Order date:	21-Feb-2019	
Auftraggeber: Client:	孕龍科技股份有限公司 - 新北市中和區建八路 121 號 3 樓			
Prüfgegenstand: Test item:	Ras1ution racing wheel converter			
Bezeichnung / Typ-Nr.: Identification / Type No.:	ZPP0053			
Auftrags-Inhalt: Order content:	NCC LP0002 test report (BLE)			
Prüfgrundlage: Test specification:	NCC Low-power Radio-frequency Devices Technical Regulations LP0002(2018) Section 3.10.1			
Wareneingangsdatum: Date of receipt:	11-Mar-2019			
Prüfmuster-Nr.: Test sample No.:	A000890675-001(Conducted) A000890675-002(Radiated)			
Prüfzeitraum: Testing period:	15-Mar-2019 – 15-Mar-2019			
Ort der Prüfung: Place of testing:	EMC/RF Laboratory Taipei			
Prüflaboratorium: Testing laboratory:	TUV Rheinland Taiwan Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von / tested by:  10-Apr-2019 Jack Chang/Project Manager Datum Name / Stellung Unterschrift Date (Report Date) Name / Position Signature		kontrolliert von / reviewed by:  10-Apr-2019 Arvin Ho/Vice General Manager Datum Name / Stellung Unterschrift Date Name / Position Signature		
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* 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				
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. 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.				

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

5.2.1 MAINS CONDUCTED EMISSIONS

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: 50227971 001 APPENDIXP)

Appendix D: Test Result of Radiated Emissions
(File Name: 50227971 001 APPENDIXD)

Test Specifications

The following standards were applied.

Table 1: Applied Standard and Test Levels

Radio
NCC Low-power Radio-frequency Devices Technical Regulations LP0002(2018) (107 年 1 月 10 日)

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 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

2.2 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	2018/10/01	2019/10/01
Spectrum Analyzer	R&S	FSV 40	100921	2018/05/02	2019/05/02
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	2018/08/22	2019/08/22
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	060558	2018/11/30	2019/11/30
Bilog Antenna	TESEQ	CBL6111D	29802	2018/08/22	2019/08/22
Horn Antenna	ETS-Lindgren	3117	00138160	2018/06/01	2019/06/01
Horn Antenna (18GHz~40GHz)	COM-POWER	AH-840	101029	2018/12/22	2019/12/22
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2018/06/21	2019/06/21
LISN (1 phase)	R&S	ENV216	101243	2018/06/18	2019/06/18
LISN	R&S	ENV216	101262	2018/06/22	2019/06/22
Spectrum Analyzer	Agilent	N9010A	MY53470241	2018/06/04	2019/06/04

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

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.

2.5 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, 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 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a racing wheel converter intended to be used systems such as a control unit system that can be controlled by Bluetooth function. The module has RF shield and Printed Antenna.

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	Ras1ution racing wheel converter
Type Identification	ZPP0053
Brand Name	Brook

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	2402MHz to 2480MHz
Channel number	40
Operation Voltage	5Vdc
Modulation	GFSK
Antenna gain	-4.52dBi

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 equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: Test samples are provided special Firmware which can control the sample for change frequency and TX/RX modes through button switch.

It was used to enable the operation modes listed in section 3.3 as appropriate.

The samples were used as follows:

Conducted: A000890675-001

Radiation: A000890675-002

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:

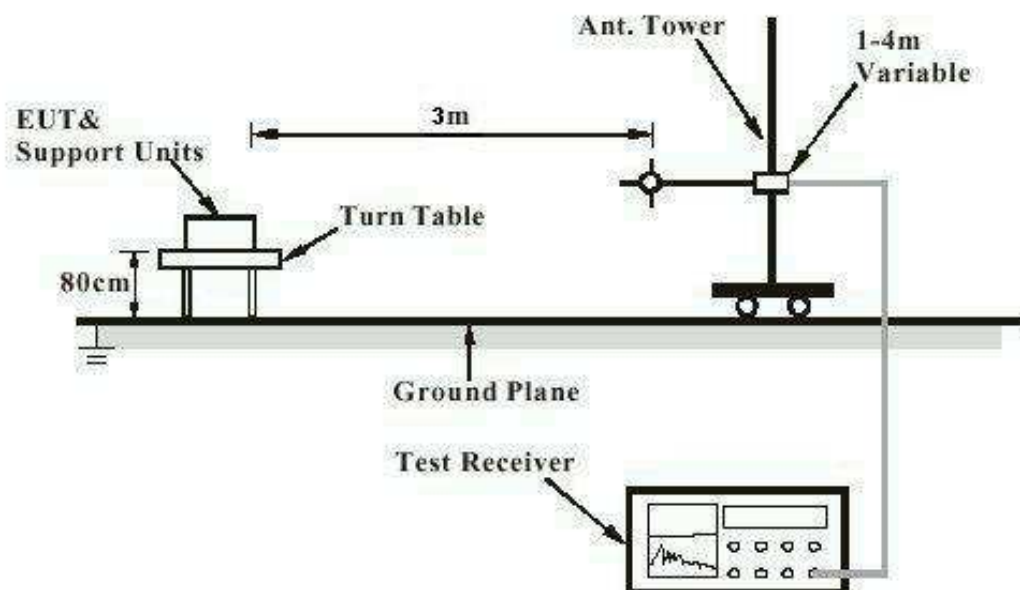
Description	Manufacturer	Model No.	Serial No.
Notebook	Lenovo	E480	009465
AC adapter	Apple	A1385	N/A

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)

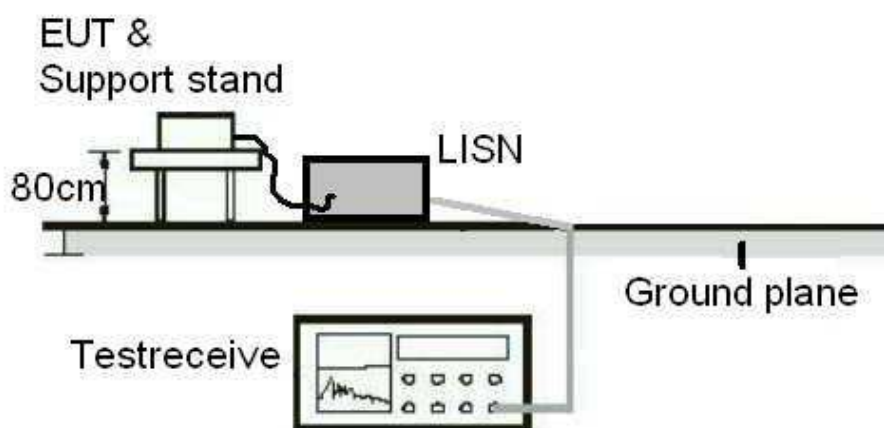
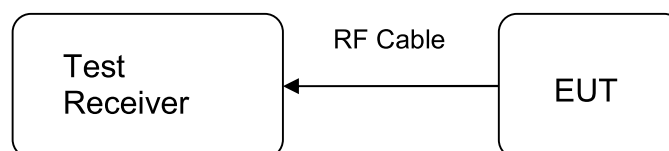


Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Passed**

Test standard : LP0002(2018): 2.2, 3.10.1.3, 3.10.1.4

Requirement : use of approved antennas only with directional gains that do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of -4.52dBi. The antenna is a printed PCB trace with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 Peak Output Power

RESULT:

Passed

Test standard : LP0002(2018): 3.10.1.2 (1)(C)
 Basic standard : ANSI C63.10:2013, KDB558074,
 LP0002(2008) Appendix II
 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 6: Test result of Peak Output Power

Channel	Channel Frequency (MHz)	Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2402	-10.23	0.00009	1
Middle Channel	2440	-11.32	0.00007	1
High Channel	2480	-12.26	0.00006	1

Pmax: -10.23dBm, 0.09mW

5.1.3 6dB Bandwidth

RESULT:**Passed**

Test standard : LP0002(2018): 3.10.1.6 (2)(A)
Basic standard : ANSI C63.10:2013, KDB558074,
LP0002(2008) Appendix II
Kind of test site : Shielded room

Test setup

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

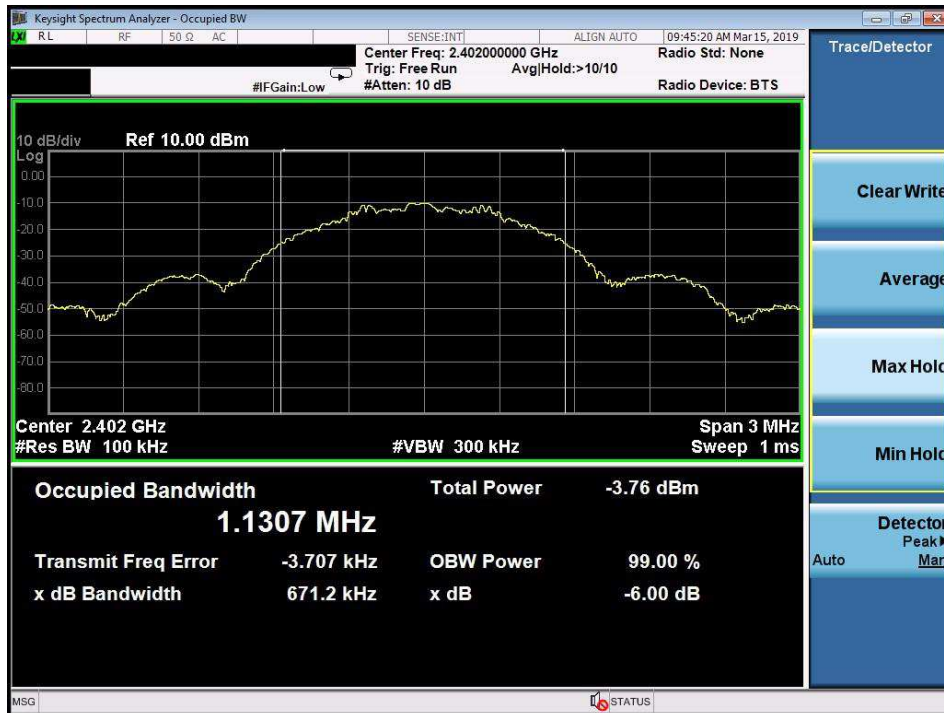
Ambient temperature : 20-24°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103 kPa

Table 7: Test result of 6dB Bandwidth

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
Low Channel	2402	671.2	>500	Pass
Mid Channel	2440	677.0	>500	Pass
High Channel	2480	682.8	>500	Pass

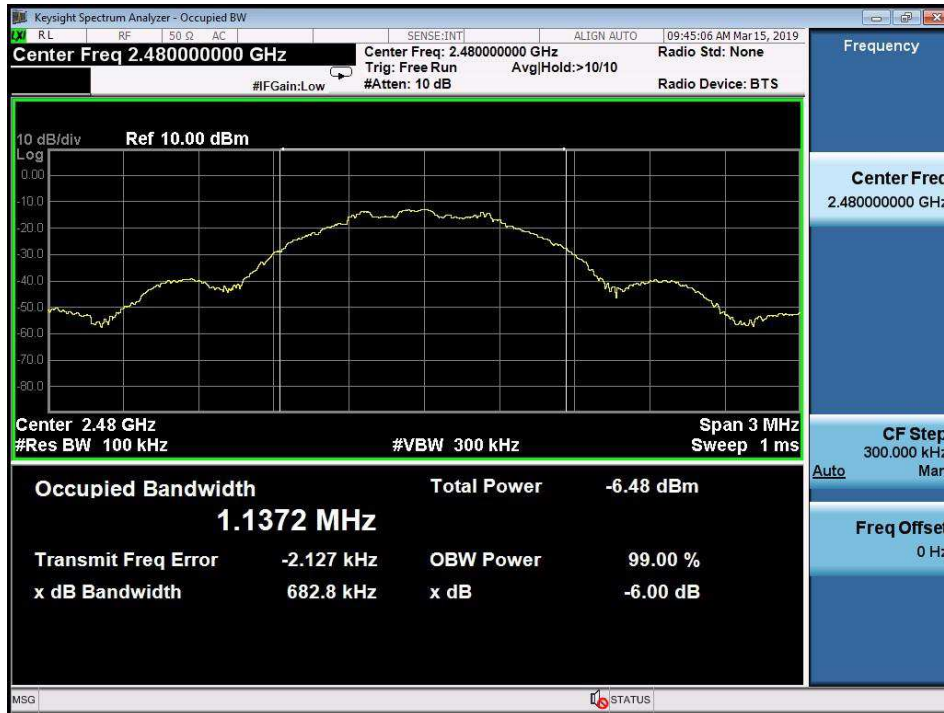
Test Plot of 6dB Bandwidth

Low Channel



Middle Channel



High Channel


5.1.4 Power Density

RESULT:

Passed

Test standard : LP0002(2018): 3.10.1.6 (2)(B)
Basic standard : ANSI C63.10:2013, KDB558074,
LP0002(2008) Appendix II
Kind of test site : Shielded room

Test setup

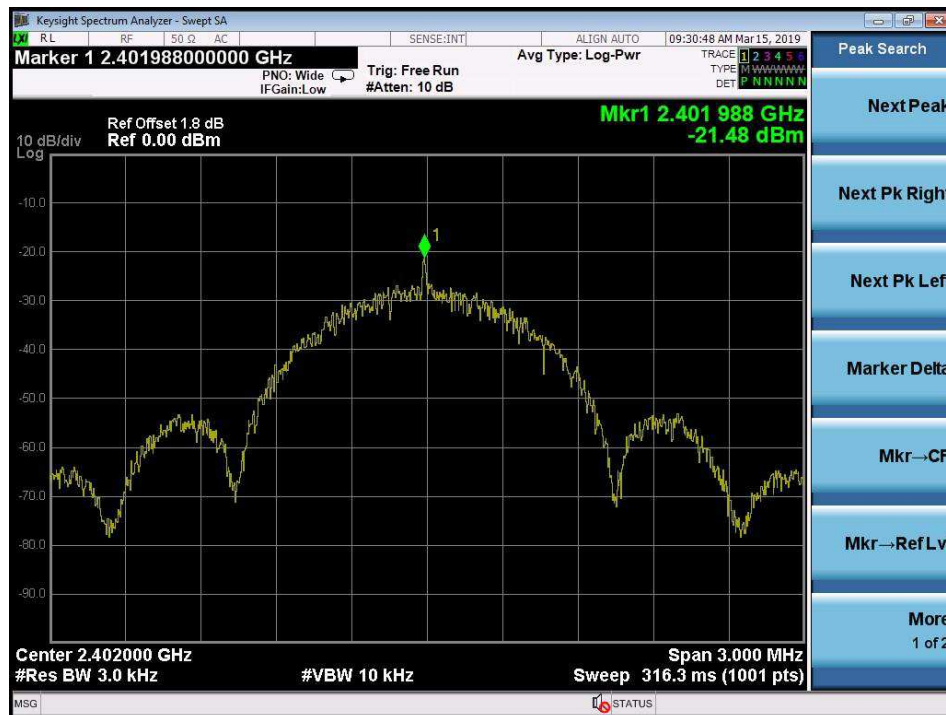
Test Channel : Low/ Middle/ High
Operation Mode : A
Ambient temperature : 20-24°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103 kPa

Table 8: Test result of Power Density

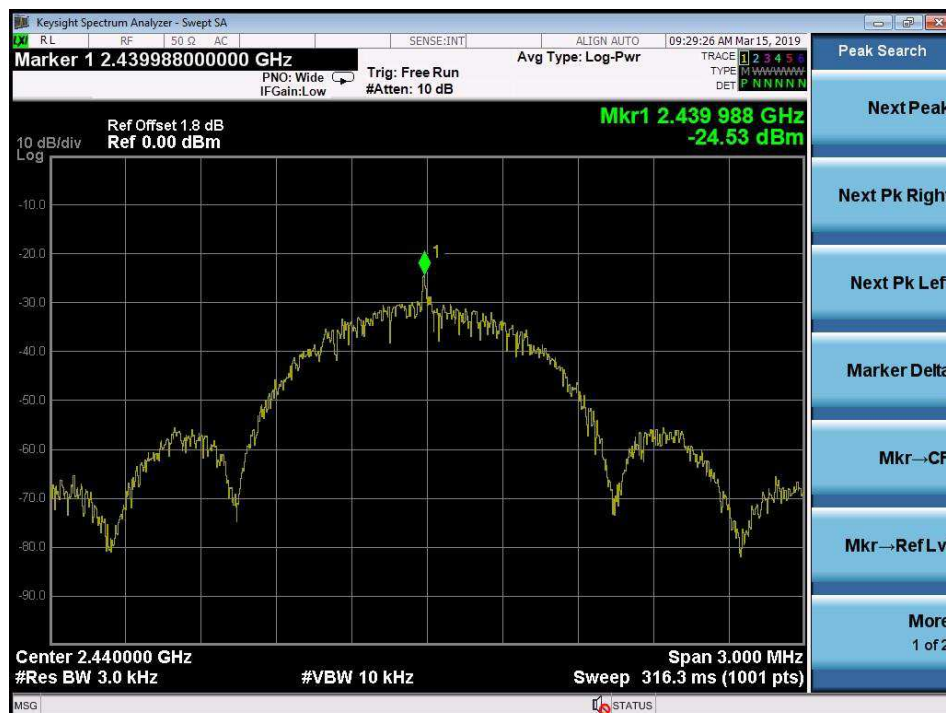
Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2402	-21.48	8
Middle Channel	2440	-24.53	8
High Channel	2480	-25.29	8

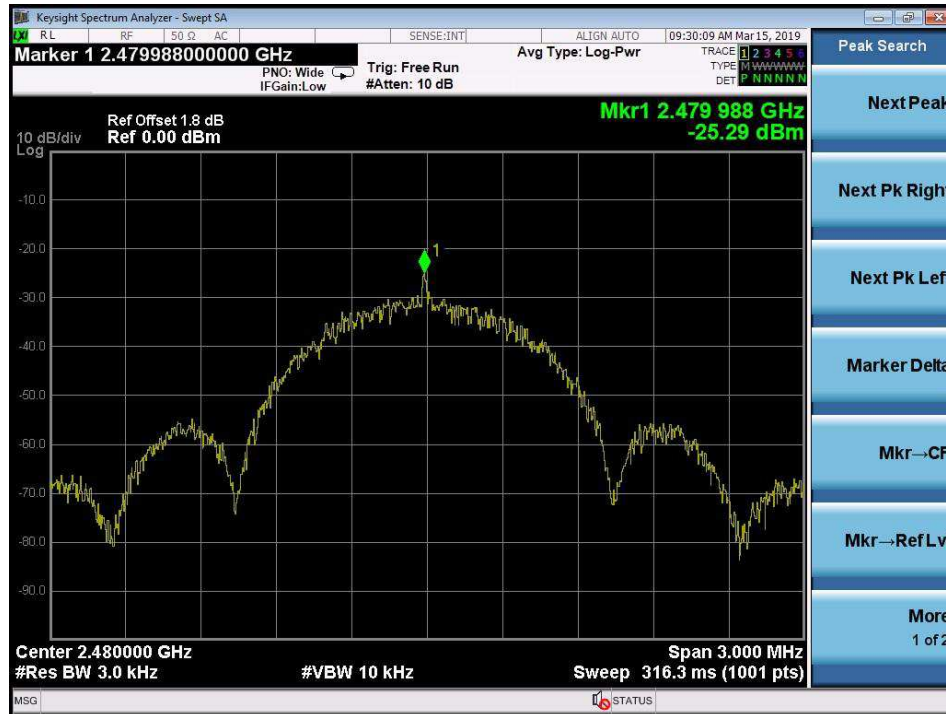
Test Plot of Power Density

Low Channel



Middle Channel



High Channel


**5.1.5 Conducted spurious emissions and Frequency Band Edge
measured in 100kHz Bandwidth****RESULT:****Passed**

Test standard	:	LP0002(2018): 3.10.1.5
Basic standard	:	ANSI C63.10:2013, KDB558074, LP0002(2008) Appendix II
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

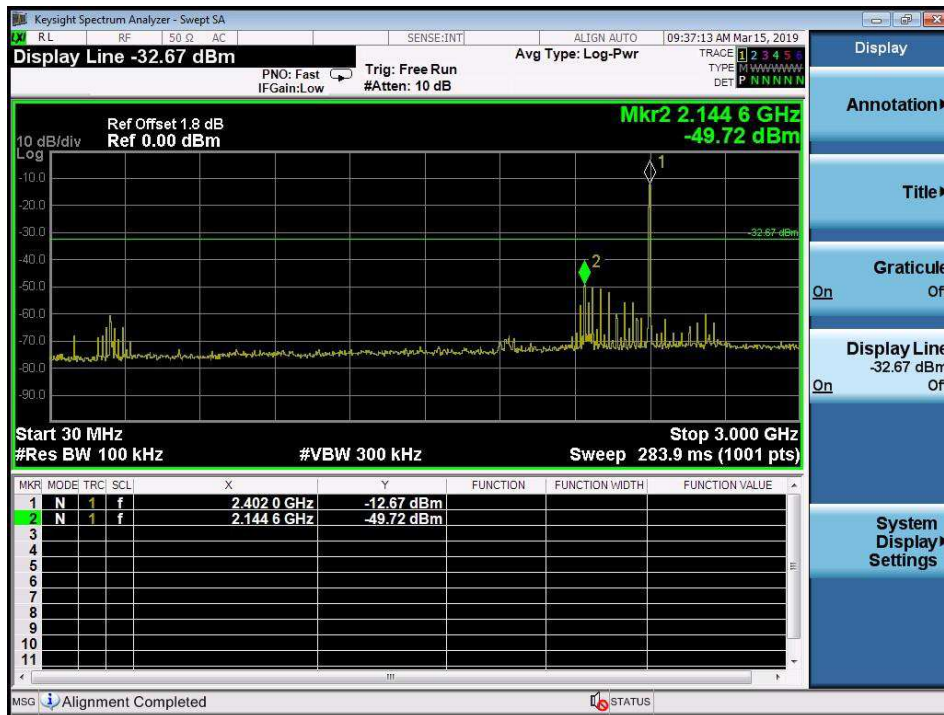
Test Channel	:	Low/ Mid/ High for spurious, Low/ High for Band Edge
Operation mode	:	A
Ambient temperature	:	20-24°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achieved as well.

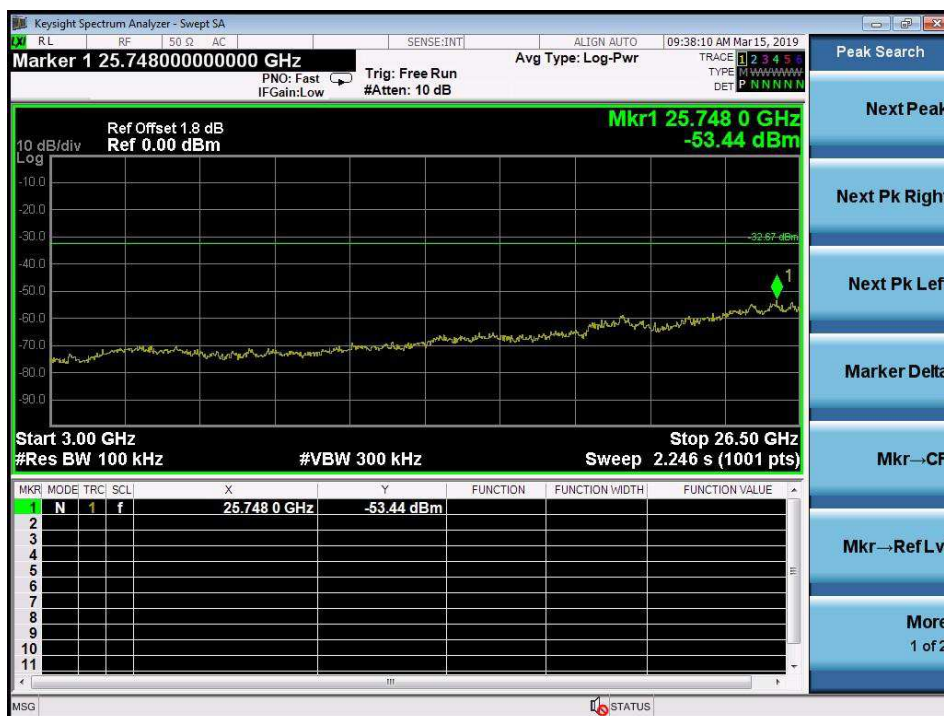
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

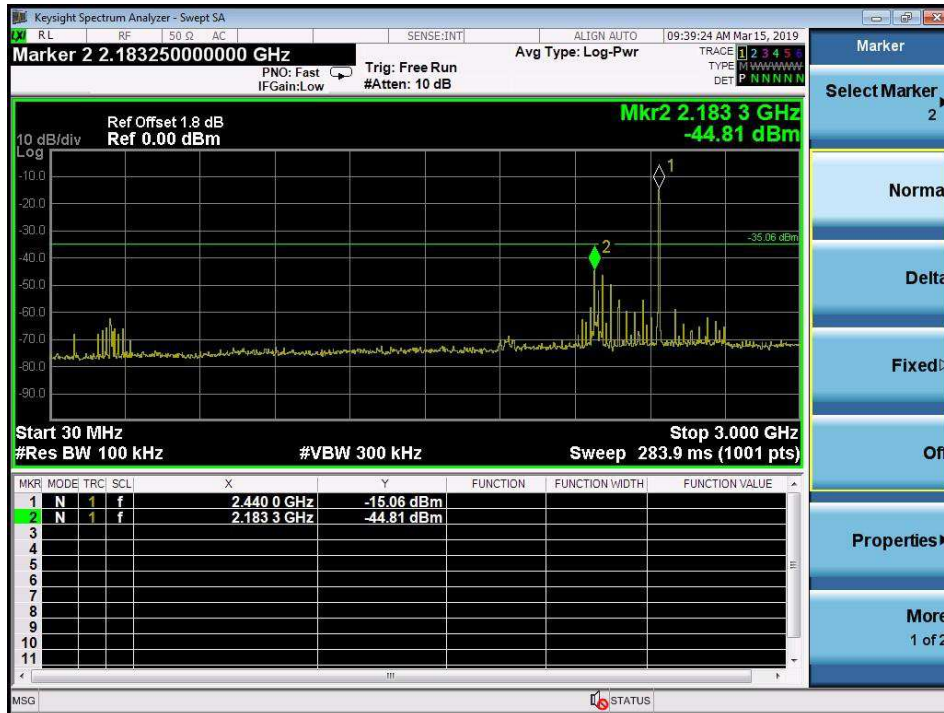
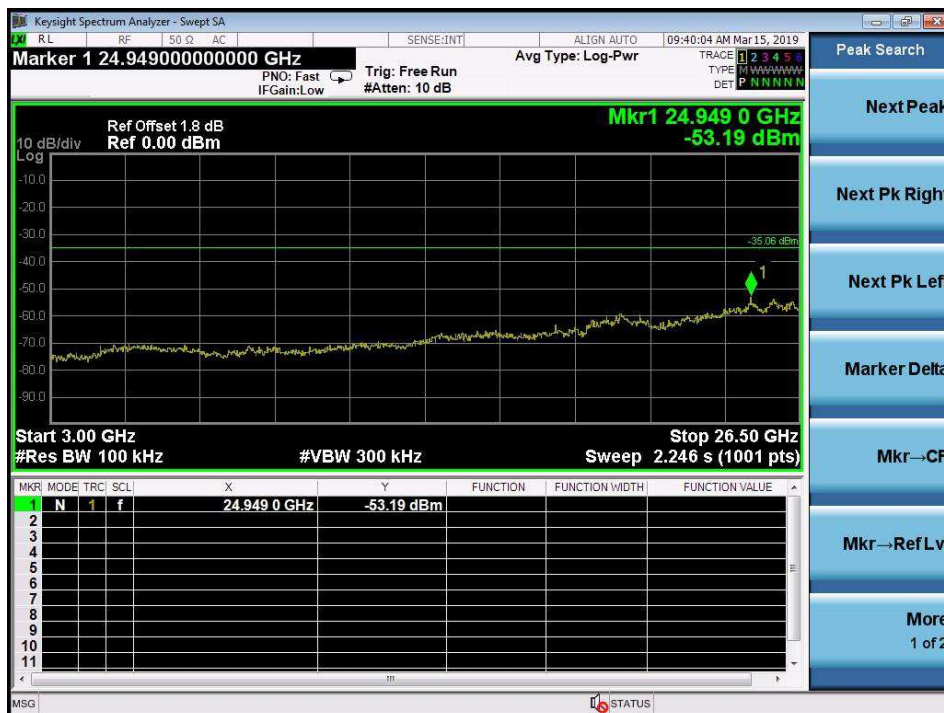
Test Plot 100kHz Conducted Emissions

Low Channel

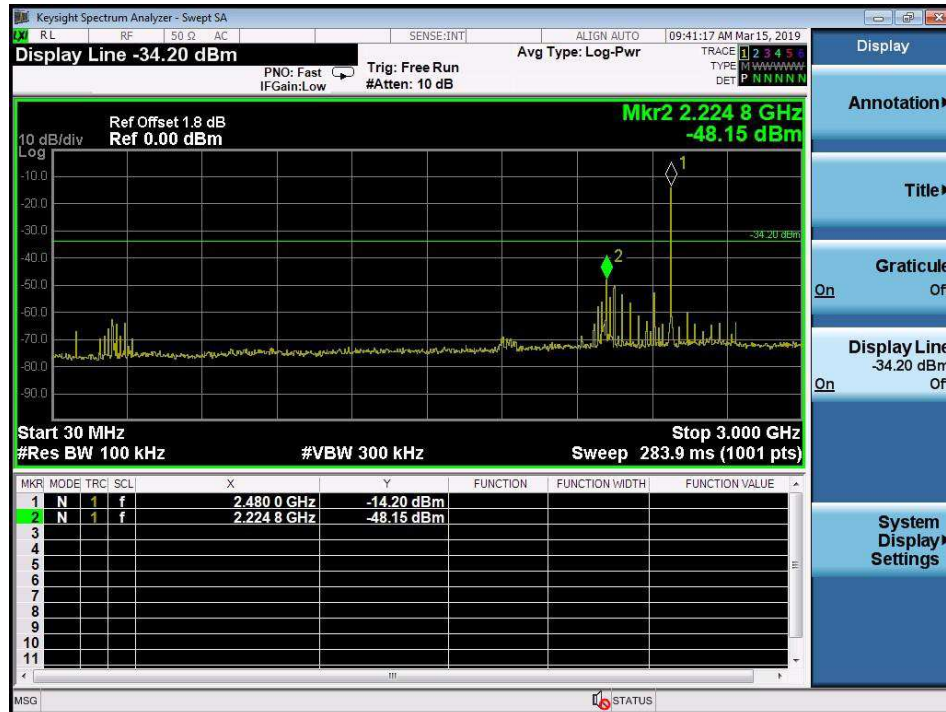


Low Channel

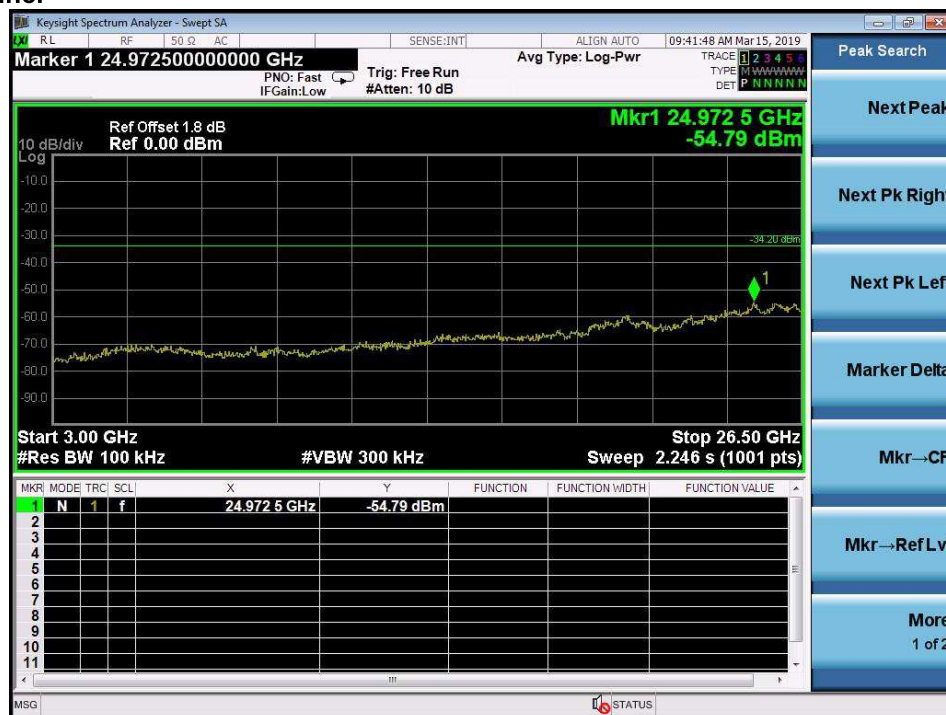


Middle Channel

Middle Channel


High Channel

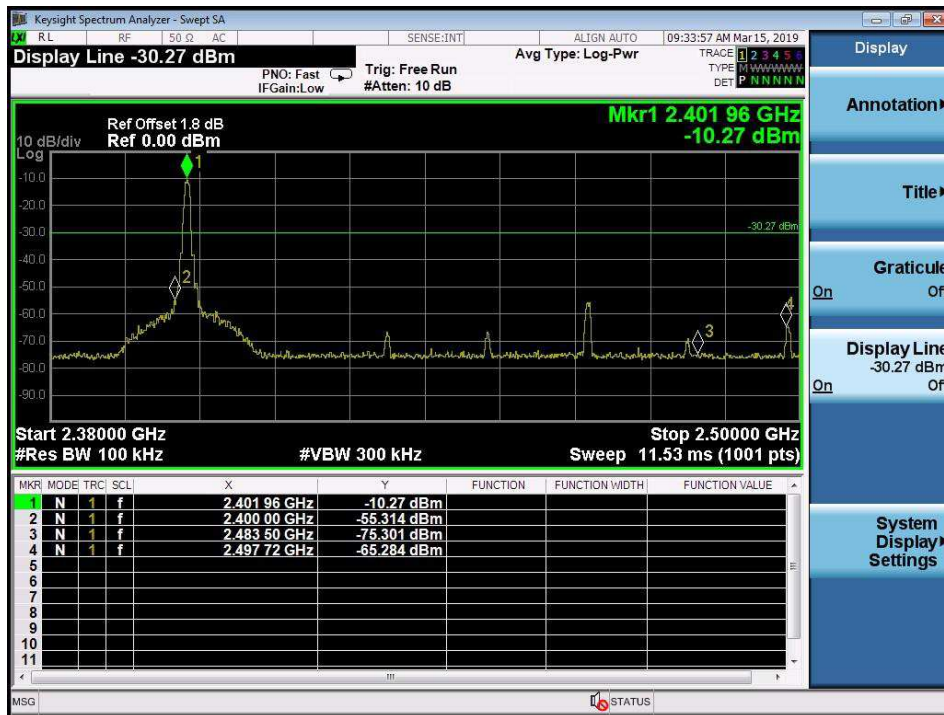


High Channel

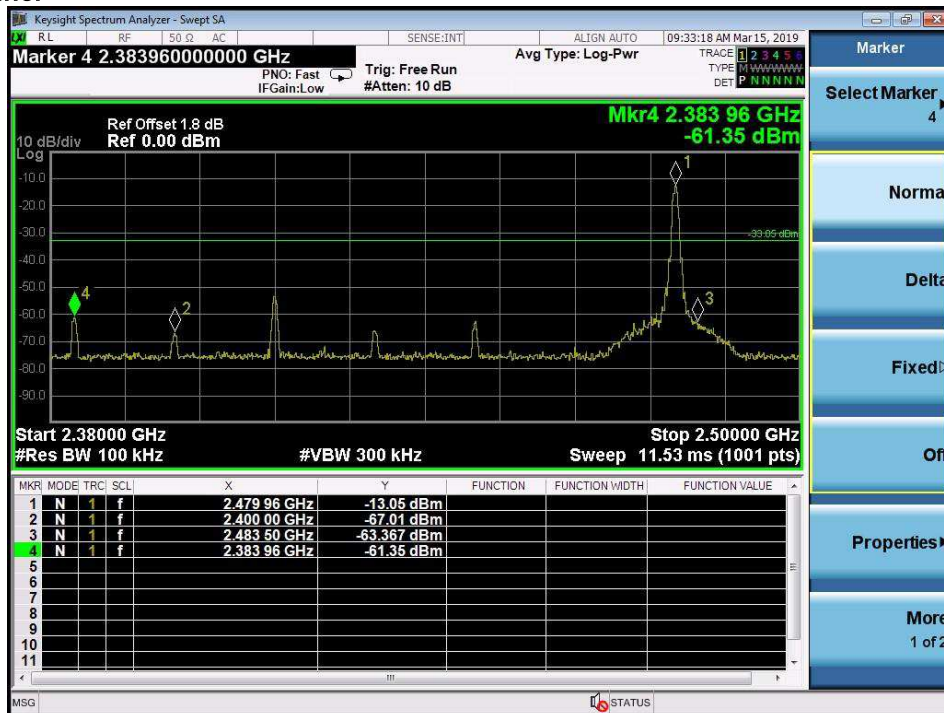


Test Plot 100kHz RBW of Band Edge

Low Channel



High Channel



5.1.6 Spurious Emission

RESULT:**Passed**

Test standard	:	LP0002(2018): 3.10.1.5
Basic standard	:	ANSI C63.10: 2013, LP0002(2008) Appendix II
Limits	:	Radiated emissions which fall in the restricted bands, as defined in LP0002(2018): 2.7 , must comply with the radiated emission limits specified in LP0002(2018): 2.8 Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in LP0002(2018): 2.8
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

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

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.

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

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

5.2 Mains Emissions

5.2.1 Mains Conducted Emissions

RESULT:**Passed**

Test standard	:	LP0002(2018): 2.3
Limits	:	Mains Conducted emissions as defined in above standards
Kind of test site	:	Shielded Room

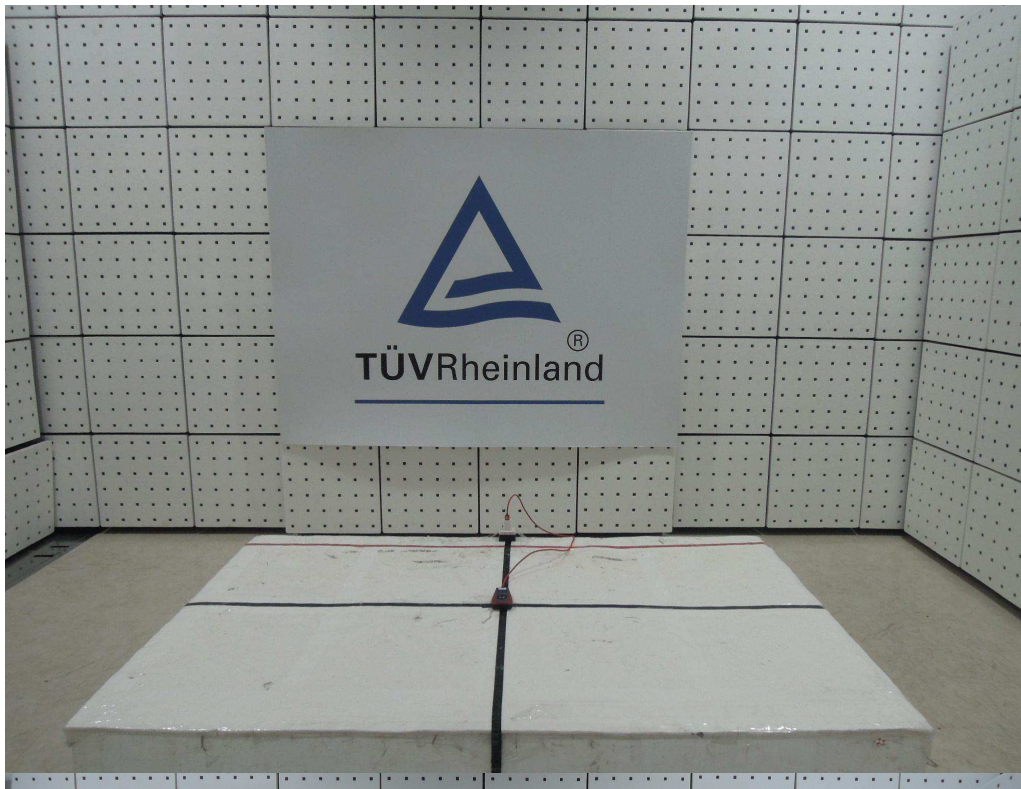
Test setup

Test Channel	:	Middle
Operation mode	:	A

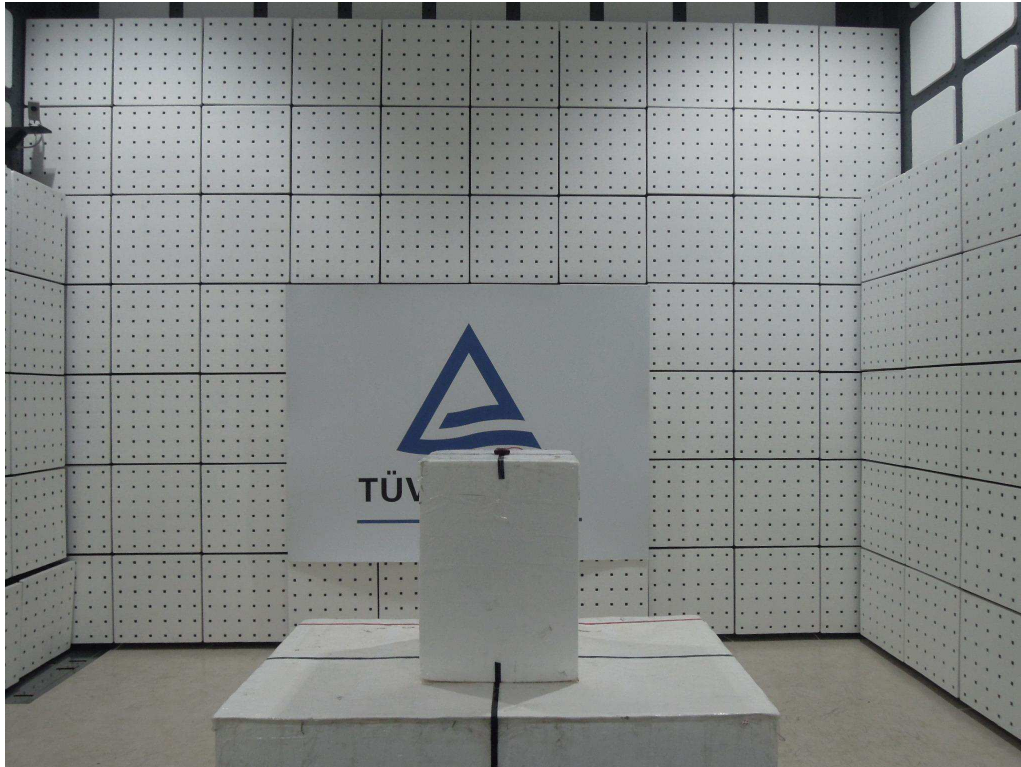
Remark: For details refer to Appendix D.

6. Photographs of the Test Set-Up

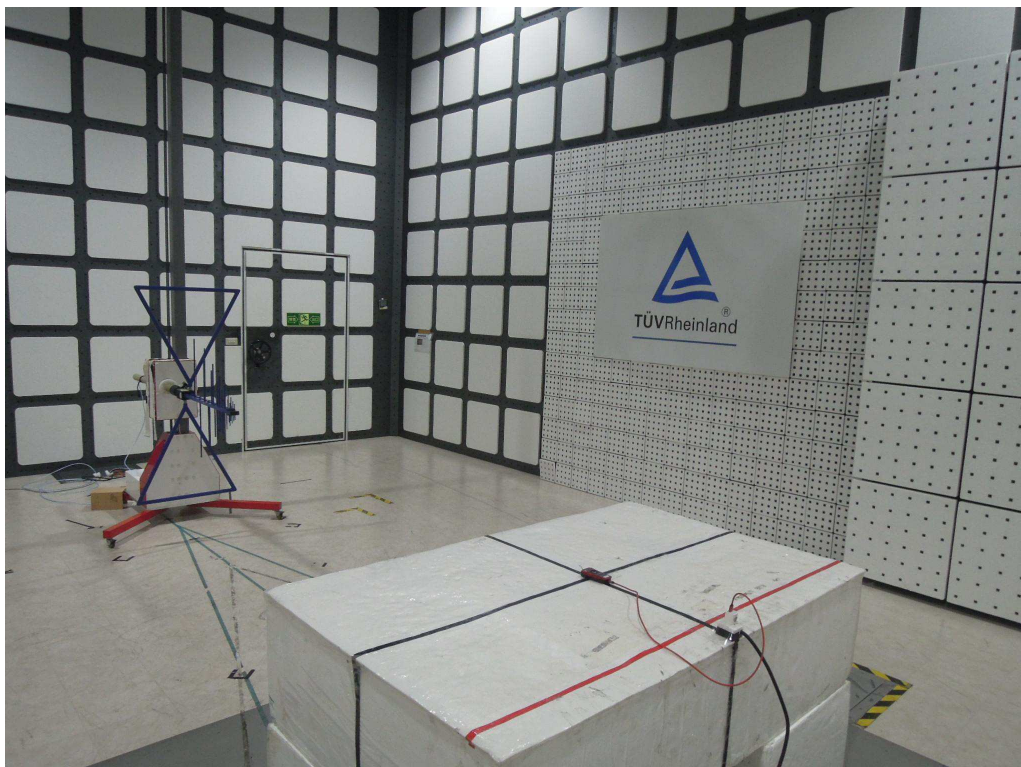
Photograph 1: Set-up for Spurious Emissions (Front View 1)



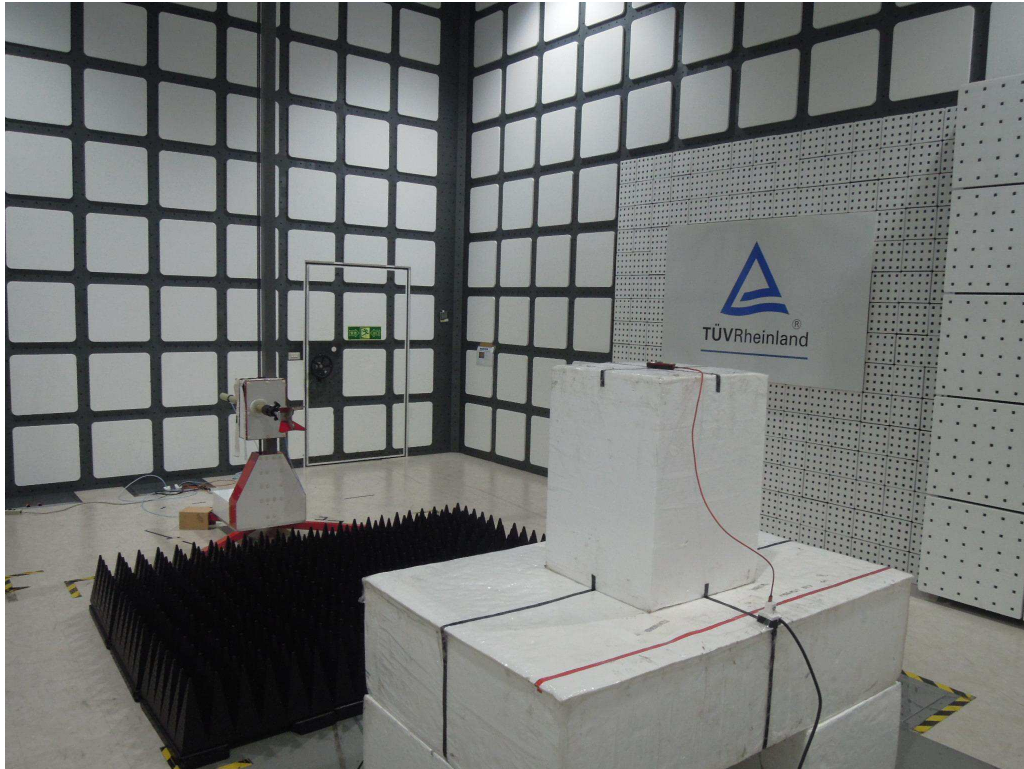
Photograph 2: Set-up for Spurious Emissions (Front View 2)



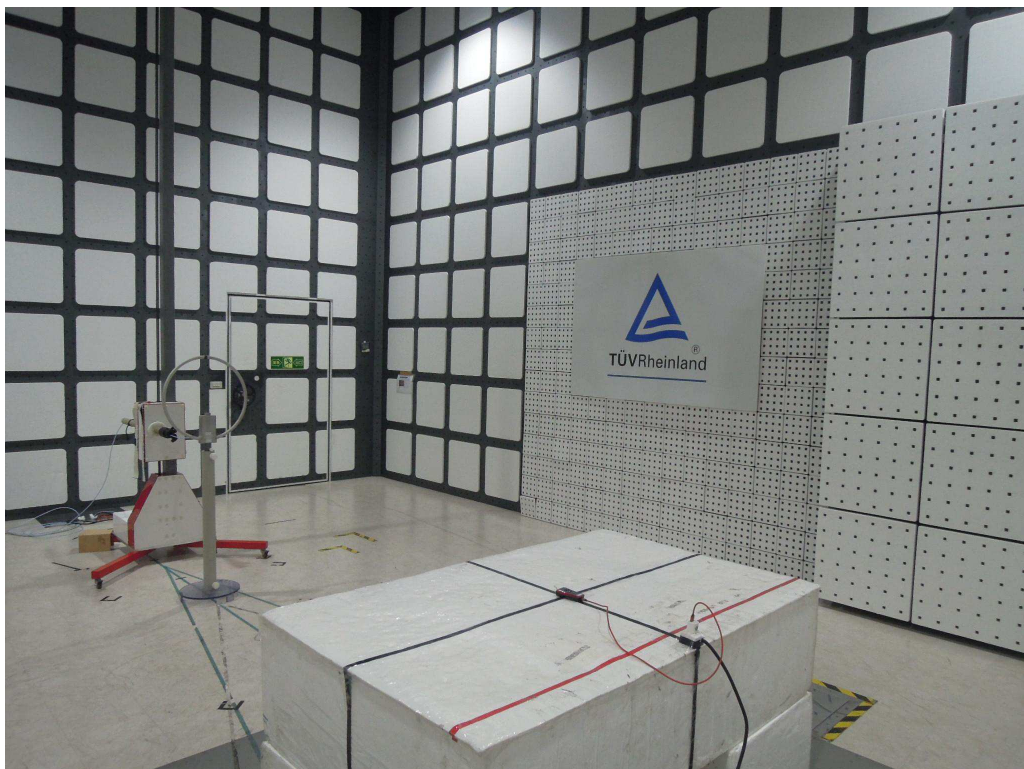
Photograph 3: Set-up for Spurious Emissions (Back View 1)



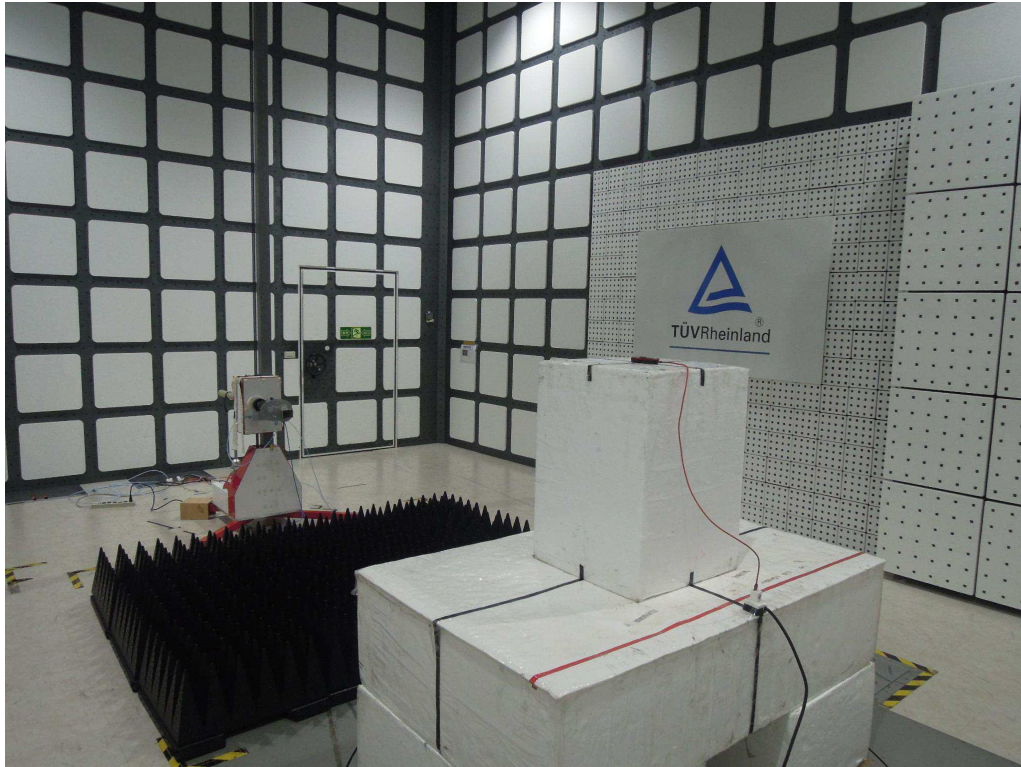
Photograph 4: Set-up for Spurious Emissions (Back View 2)



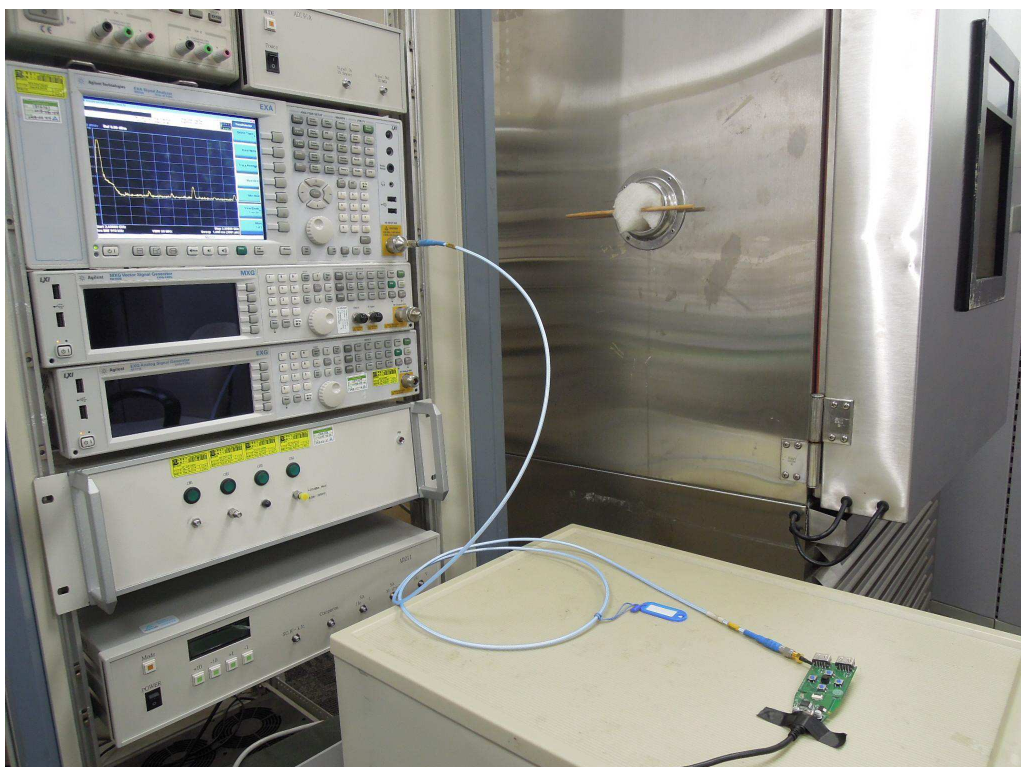
Photograph 5: Set-up for Spurious Emissions (Back View 3)



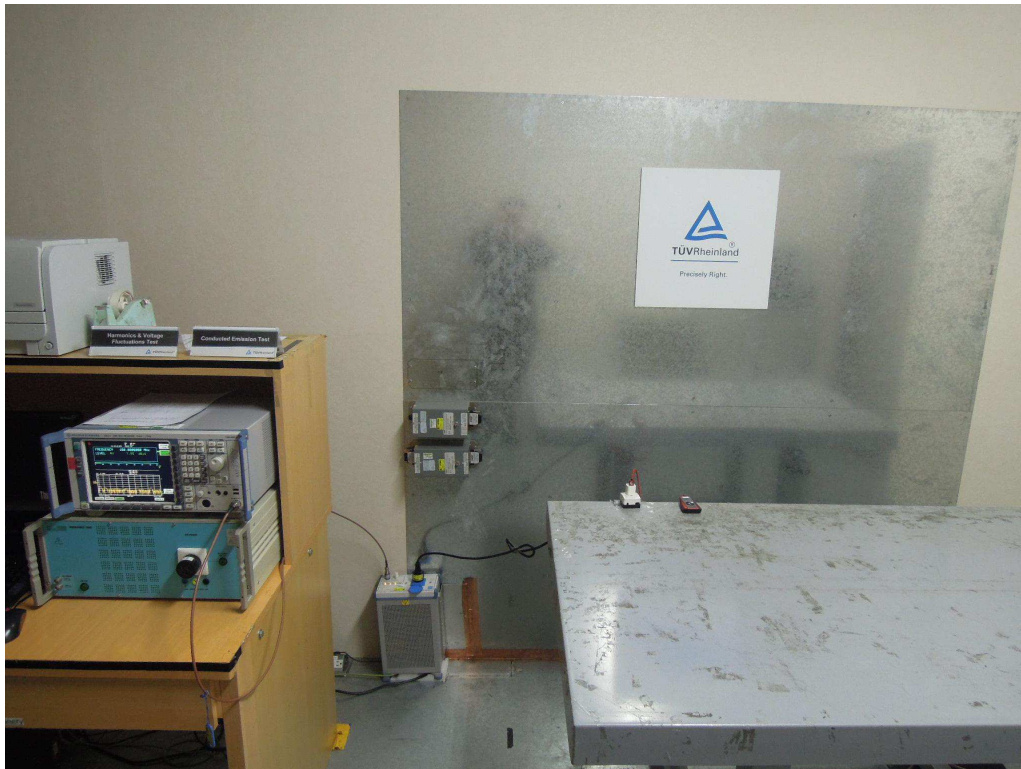
Photograph 6: Set-up for Spurious Emissions (Back View 4)



Photograph 7: Set-up for Conducted testing



Photograph 8: Set-up for Mains Conducted testing Front



Photograph 9: Set-up for Mains Conducted testing Back



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