Prüfbericht-Nr.: *Test Report No.*:	**50142288 001**	**Auftrags-Nr.:** *Order No.*:	114074445	Seite 1 von 45 *Page 1 of 45*
Kunden-Referenz-Nr.: *Client Reference No.*:	N/A	**Auftragsdatum:** *Order date*:	12-Feb-2018	
Auftraggeber: *Client*:	Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States.			
Prüfgegenstand: *Test item*:	IEEE 802.11 b/g/n Network Controller Module with Integrated Bluetooth Low Energy			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	ATWINC3400-MR210UA			
Auftrags-Inhalt: *Order content*:	FCC Part 15C / IC RSS-247 Test report (BLE)			
Prüfgrundlage: *Test specification*:	FCC 47CFR Part 15: Subpart C Section 15.247 RSS-247 (02-2017)			

Wareneingangsdatum: *Date of receipt*:	08-Mar-2018
Prüfmuster-Nr.: *Test sample No.*:	A000704986-005 A000704986-006
Prüfzeitraum: *Testing period*:	20-Mar-2018 - 10-Apr-2018
Ort der Prüfung: *Place of testing*:	EMC/RF Laboratory Taipei
Prüflaboratorium: *Testing laboratory*:	TUV Rheinland Taiwan Ltd.
Prüfergebnis*: *Test result**:	Pass

Report date / *tested by*:			**kontrolliert von** / *reviewed by*:		
30-May-2018	Jack Chang/Project Manager		30-May-2018	Arvin Ho/Vice General Manager	
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *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*

v04

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT
RESULT: Passed

5.1.2 PEAK OUTPUT POWER
RESULT: Passed

5.1.3 6DB BANDWIDTH AND 99% 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

5.1.7 MAINS CONDUCTED EMISSIONS
RESULT: Passed

6.1.1 ELECTROMAGNETIC FIELDS
RESULT: Passed

Contents

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: 50142288APPENDIXP)

Appendix D: Test Result of Radiated Emissions
(File Name: 50142288APPENDIXD)

Test Specifications

The following standards were applied.

Table 1: Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart C Section 15.247
FCC 47CFR Part 2: Subpart J Section 2.1091
RSS-247 Issue 2 (Feb 2017)
RSS-102 Issue 5
RSS-Gen, Issue 5, April 2018
ANSI C63.10:2013
KDB558074 D01 DTS Meas Guidance v03r05
KDB447498 D01 General RF Exposure Guidance v06

2. Test Sites

2.1 Test Laboratory

TUV Rheinland Taiwan Ltd.
Taichung Branch Office

No.9, Lane 36, Minsheng Rd., Sec. 3, Daya District,
Taichung City 428
Taiwan (R.O.C.)

2.2 Test Facility

TUV Rheinland Taiwan Ltd.
Taipei Office

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

FCC 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

TAF
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	ESCI 7	101549	2017/11/10	2018/11/10
Spectrum Analyzer	R&S	FSV 40	100921	2017/05/02	2018/05/01
Spectrum Analyzer	Agilent	N9010A	MY53470241	2017/05/23	2018/05/22
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	2017/08/14	2018/08/14
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	2017/08/18	2018/08/18
Horn Antenna	ETS-Lindgren	3117	201918	2017/08/18	2018/08/18
Horn Antenna (18GHz~40GHz)	COM-POWER	AH-840	101031	2017/11/28	2018/11/28
Temp. & Humid. Chamber	Giant Force	GCT-099-40-S	MAF0103-007	2017/03/09	2019/03/09
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2017/06/14	2018/06/14
LISN (1 phase)	R&S	ENV216	101243	2017/06/18	2018/06/18
LISN	R&S	ENV216	101262	2017/06/22	2018/06/21
Test Software	Audix	e3	Ver. 9	N/A	N/A
Test Software	Agilent	300328 testsystem	V1.9.1	N/A	N/A
Power sensor	Agilent	U2021XA	MY54020001	2017/03/08	2018/05/30

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	± 1 x 10^{-7}
RF power, conducted	± 1.5 dB
RF power density, conducted	± 3 dB
spurious emissions, conducted	± 3 dB
all emissions, radiated	± 6 dB
Temperature	± 1 ºC
Humidity	± 5 %
DC and low frequency voltages	±3 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is an IEEE 802.11 b/g/n Network Controller Module with Integrated Bluetooth Low Energy . The Module has RF Shield and u.FL connector for External Antenna(s).

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	IEEE 802.11 b/g/n Network Controller Module with Integrated Bluetooth Low Energy
Type Designation	ATWINC3400-MR210UA
FCC ID	2ADHKWINC3400U
IC ID	20266-WINC3400UA
HVIN	ATWINC3400-MR210UA

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	2402~2480MHz
Channel number	40
Operation Voltage	3.0V to 4.2V (Typical = 3.3V)
Modulation	GFSK
Antenna gain	Refer external antenna list

Table 6: External Antenna list

Based on worst case, Antennas no.4 and 7 selected for testing

Slno.	P/N	Vendor	Antenna Gain @ 2.4GHz Band	Antenna type	Remarks
1	W3525B039	Pulse Electronics Corporation	2 dBi	PCB	Cable length 100mm
2	RN-SMA-4	Microchip	2.2 dBi	Dipole	
3	RFDPA870920IMLB301	WALSIN	1.84 dBi	Dipole-DB	Dual Band
4	RFPCA381013IMAB701	WALSIN	4.50 dBi	PCB	Cable length 130mm
5	RFPCA381035IMAB701	WALSIN	2.7 dBi	PCB	Antenna same as SlNo.4, cable length 350mm
6	RFA-02-3-C5H1	Aristotle	3 dBi	Dipole	
7	RFA-02-5-C7H1	Aristotle	5 dBi	Dipole-Long	
8	RFA-02-P33	Aristotle	2 dBi	PCB	Cable length 150mm
9	1461530100	Molex	3 dBi	PCB/Flexi	Cable length 100mm Dual Band
10	RN-SMA-S	Microchip	0.56 dBi	Dipole-short	
11	RN-SMA-7	Microchip	5 dBi	Dipole-Long	
12	RFA-02-5-F7H1	Aristotle	5 dBi	Dipole-Long	
13	RFA-02-D3	Aristotle	2 dBi	Dipole-no encl.	
14	RFA-02-L2H1	Aristotle	2 dBi	Dipole	
15	RFA-02-P05	Aristotle	2 dBi	PCB	Cable length 150mm
16	RFA-02-C2M2	Aristotle	2 dBi	Dipole	

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
- Photo Document

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 with an I2C to USB Adaptor and UART Interface which makes it possible to control them through the 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: A000704986-005
Radiation: A000704986-006

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.

4.3 Special Accessories and Auxiliary Equipment

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

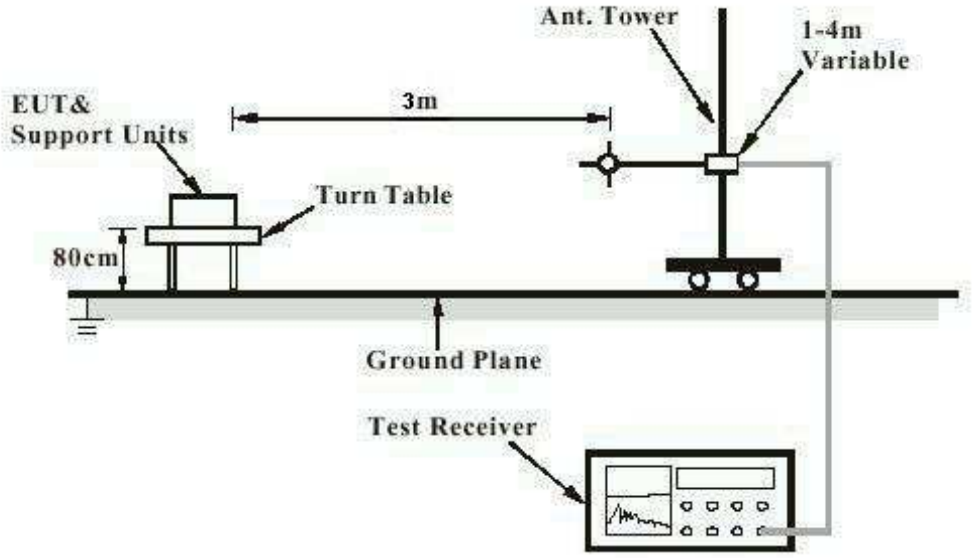
Description	Manufacturer	Model No.	Serial No.
Notebook(EMC-06)	Lenovo	TP00048A	PB-0F8B2
Test tool	Microchip	WILC3000/WINC3400 rev7189	N/A

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)

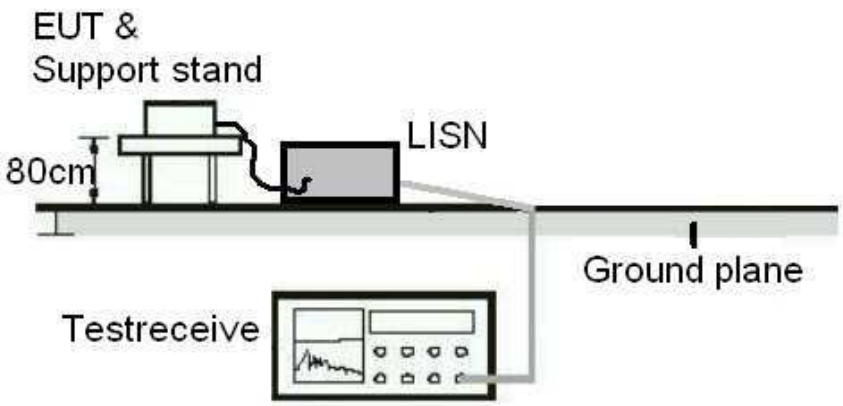
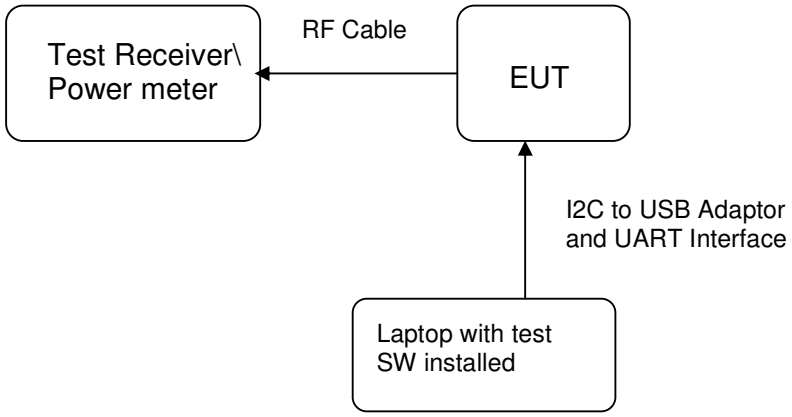


Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Passed**

Test standard	:	LP0002(2016): 2.2, 3.10.1, (3) FCC Part 15.247(b)(4), Part 15.203 and RSS-Gen 8.3
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 Max directional gain of 5dBi (refer External Antenna List). The antenna is connected through a proprietary connector 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(2016): 3.10.1, (2) FCC Part 15.247(b)(3), RSS-247 5.4(4)
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	Power Setting
		(dBm)	(W)	(W)	PPA, PA, DG
Low Channel	2402	6.62	0.00459	1	6, 6, -5
Middle Channel	2440	5.77	0.00378	1	6, 6, -6
High Channel	2480	6.94	0.00494	1	6, 6, -5

Pmax: 4.9431 mW

5.1.3 6dB Bandwidth and 99% Bandwidth

RESULT: **Passed**

Test standard	:	LP0002(2016): 3.10.1, (5) FCC Part 15.247(a)(2), RSS-247 5.2(1) RSS-Gen (Issue 5)
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	644.0	>500	Pass
Mid Channel	2440	643.9	>500	Pass
High Channel	2480	643.8	>500	Pass

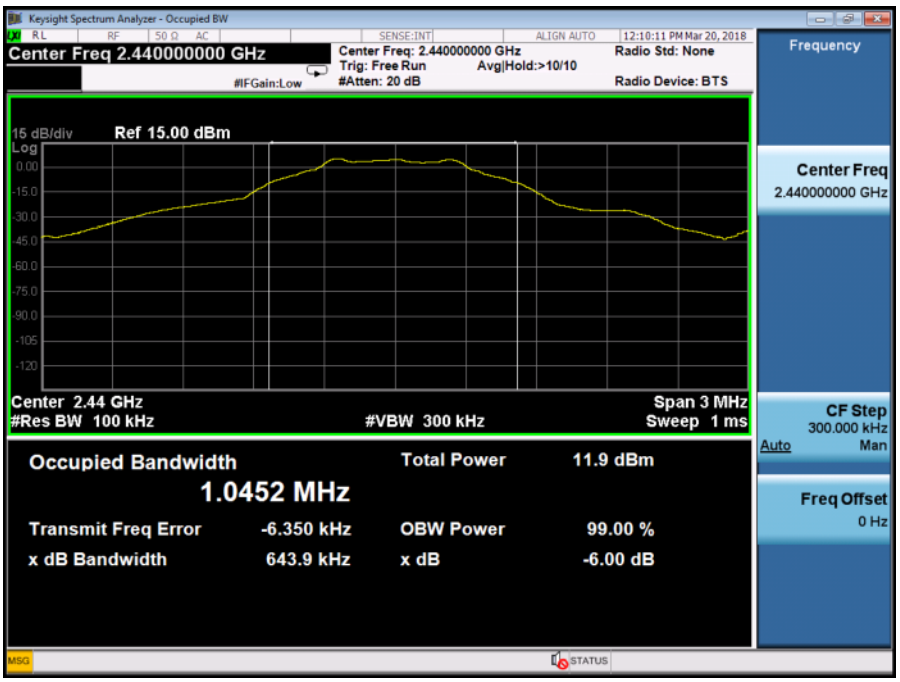
Table 9: Test result of 99% Bandwidth,

Channel	Channel Frequency (MHz)	99% Bandwidth (kHz)
Low Channel	2402	1.0463
Mid Channel	2440	1.0452
High Channel	2480	1.0424

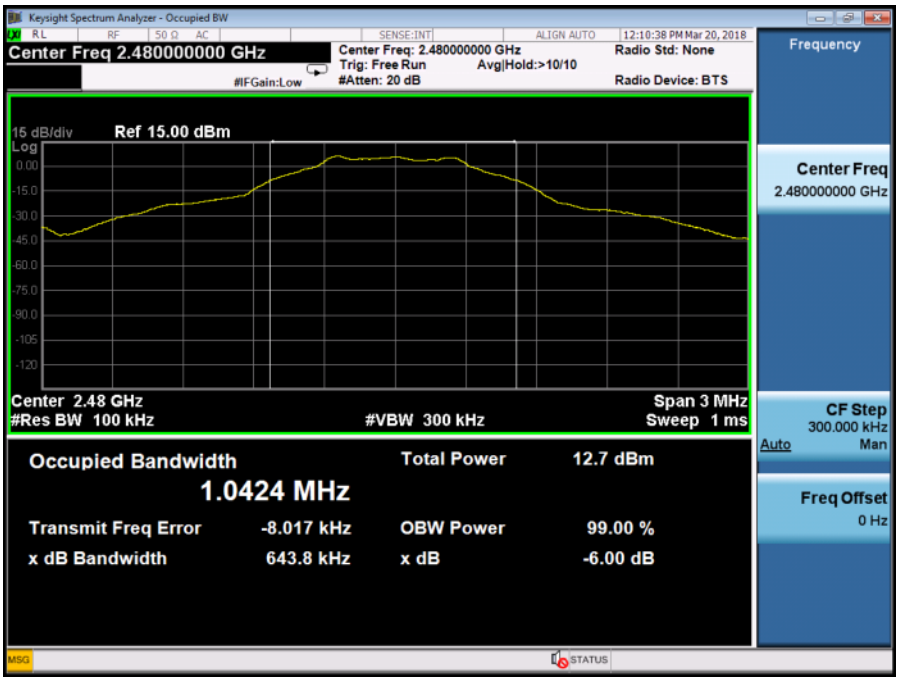
Test Plot of 6dB Bandwidth

Low Channel

Middle Channel



High Channel



5.1.4 Power Density

RESULT: **Passed**

Test standard	:	LP0002(2016): 3.10.1, (6.2.2) FCC Part 15.247(e) , RSS-247 5.2(2)
Basic standard	:	ANSI C63.10:2013, KDB558074
Kind of test site	:	Shielded room

Test setup

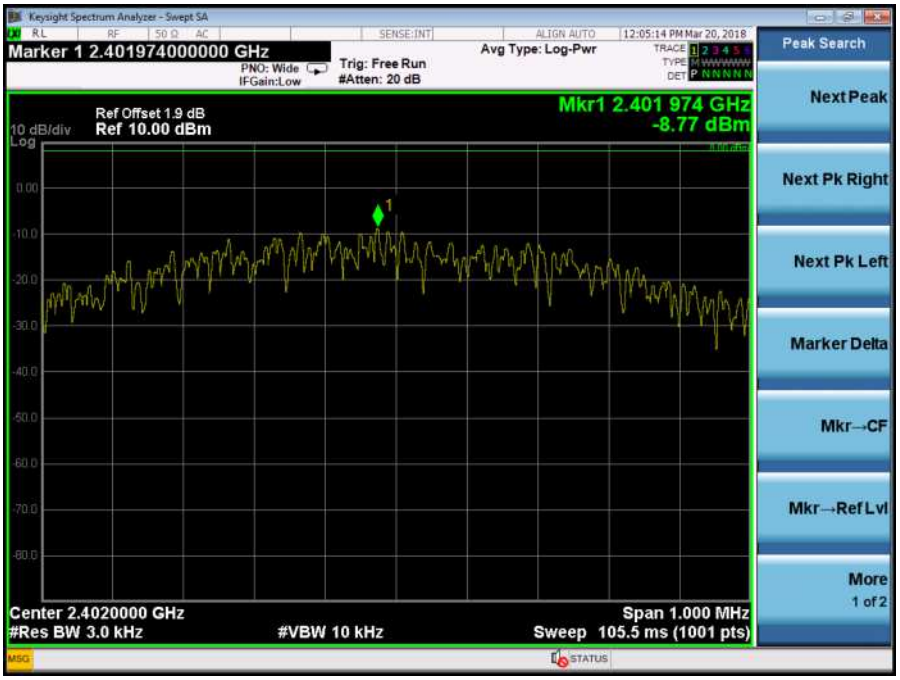
Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	20-24°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

Table 10: Test result of Power Density

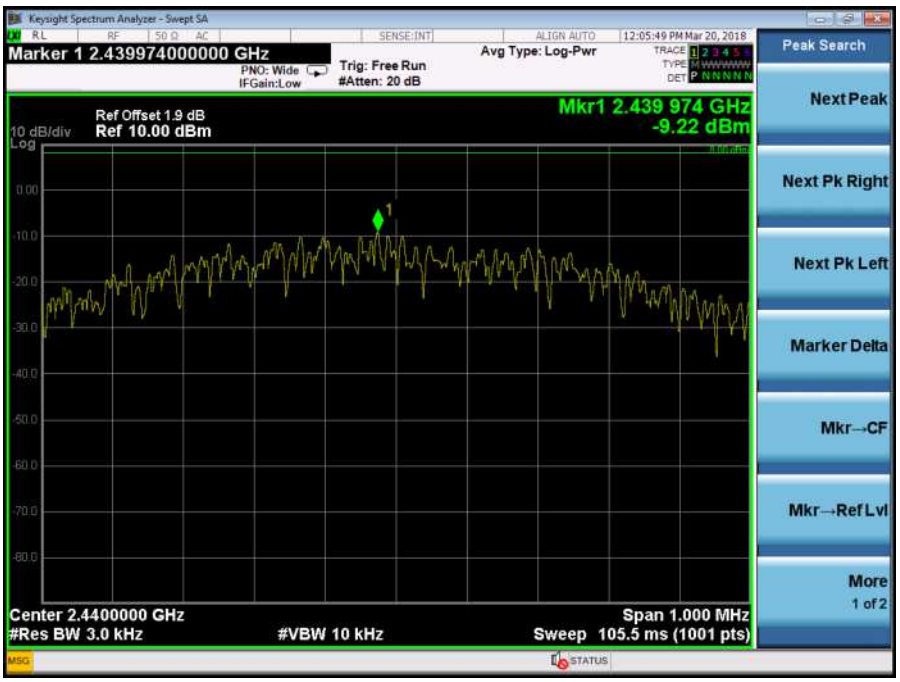
Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2402	-8.77	8
Middle Channel	2440	-9.22	8
High Channel	2480	-8.48	8

Test Plot of Power Density

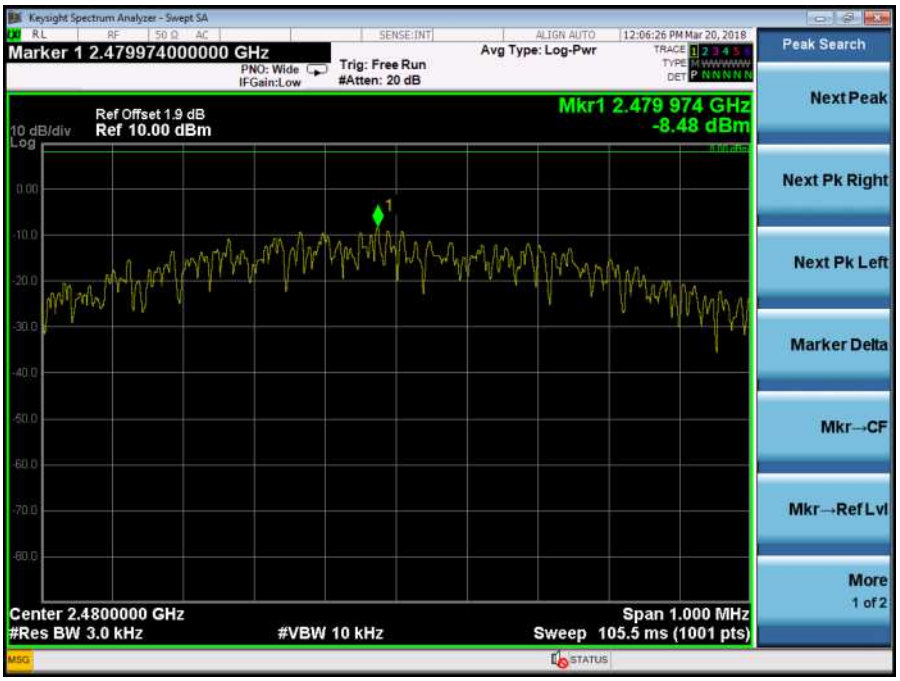
Low Channel



Middle Channel



High Channel



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

RESULT: **Passed**

Test standard	:	LP0002(2016): 3.10.1, (5) FCC part 15.247(d), RSS-247 5.5
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

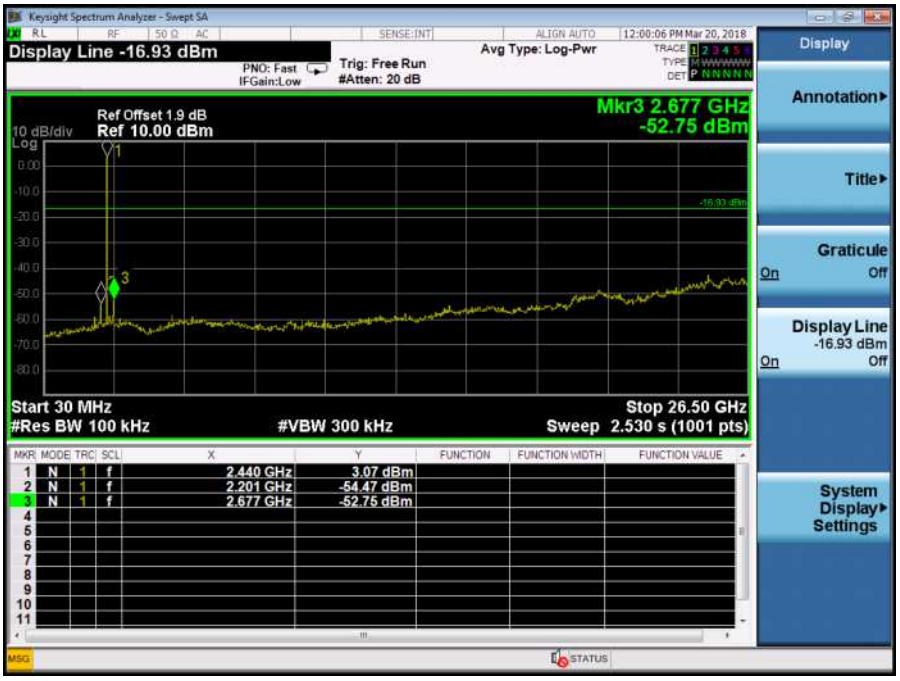
Test Channel	:	Low/ Mid/ High for spurious, Low/ High for Band Edge
Operation mode	:	A
Ambient temperature	:	20-24°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

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.

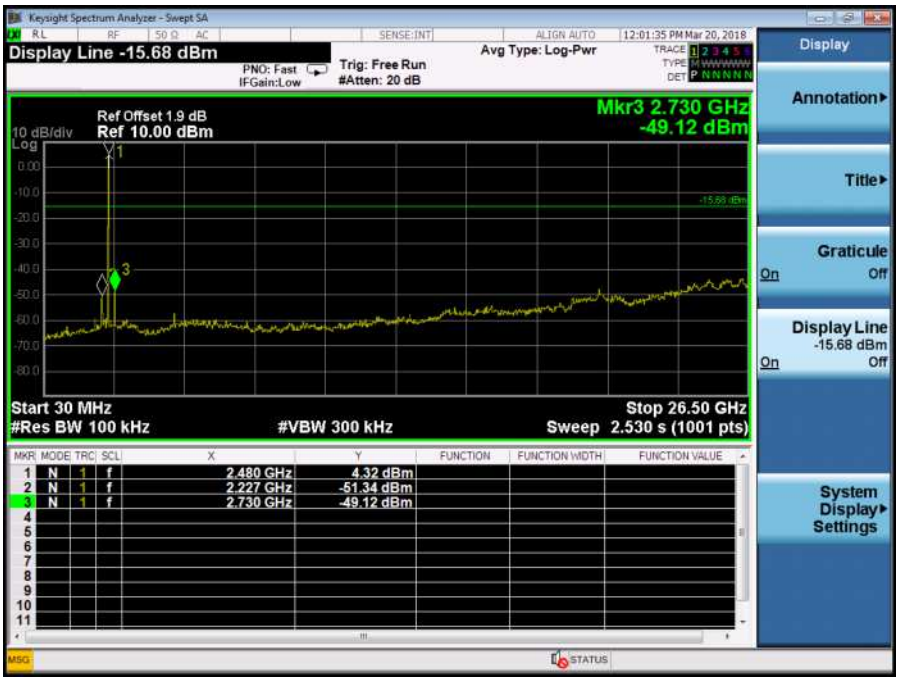
Test Plot 100kHz Conducted Emissions

Low Channel

Middle Channel



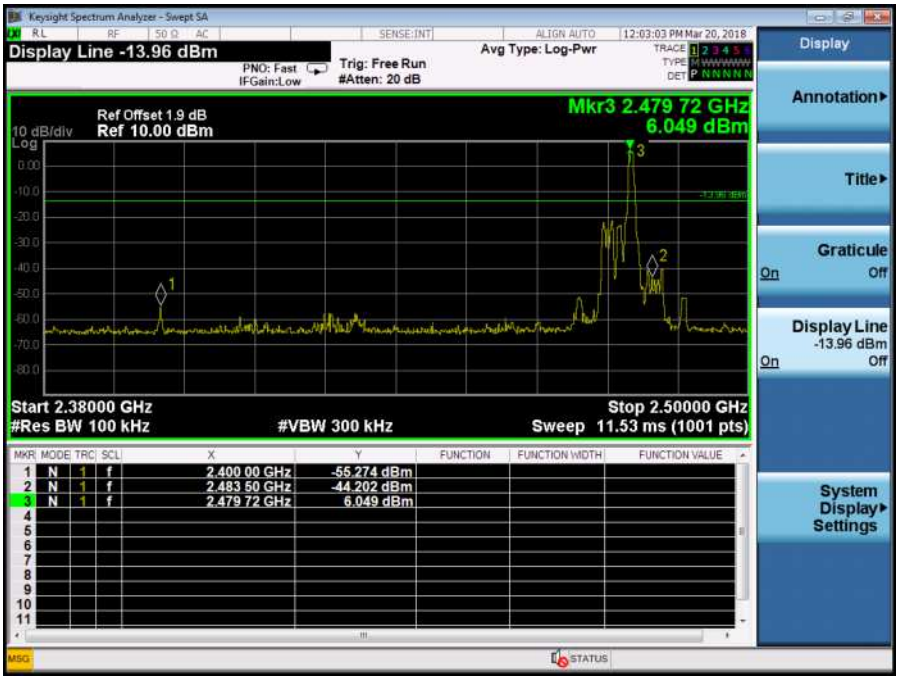
High Channel



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, RSS-247 5.5 and RSS-Gen 8.9 LP0002(2016): 3.10.1, (5)
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). Radiated emissions which fall in the restricted bands, as defined in LP0002(2016): 2.7 , must comply with the radiated emission limits specified in LP0002(2016): 2.8 Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) and FCC 15.249(a), RSS-Gen i5, 8.9 (Table 5 and 6). Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in LP0002(2016): 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.

Mains Emissions

5.1.7 Mains Conducted Emissions

RESULT: **Passed**

Test standard	:	FCC Part 15.207 FCC Part 15.107 RSS-Gen 8.8 LP0002: 2.3
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	:	Middle
Operation mode	:	A

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 KDB Publication 447498 D01
RSS-102 issue 5, Table 1

FCC:

Therefore the maximum output power of the transmitter is 4.9431mW < 196mW(Distance: 60 mm), hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

Canada:

Maximum conducted peak power: 4.9431 mW
Antenna Gain: 5 dbi
Maximum EIRP available 15.6 mW

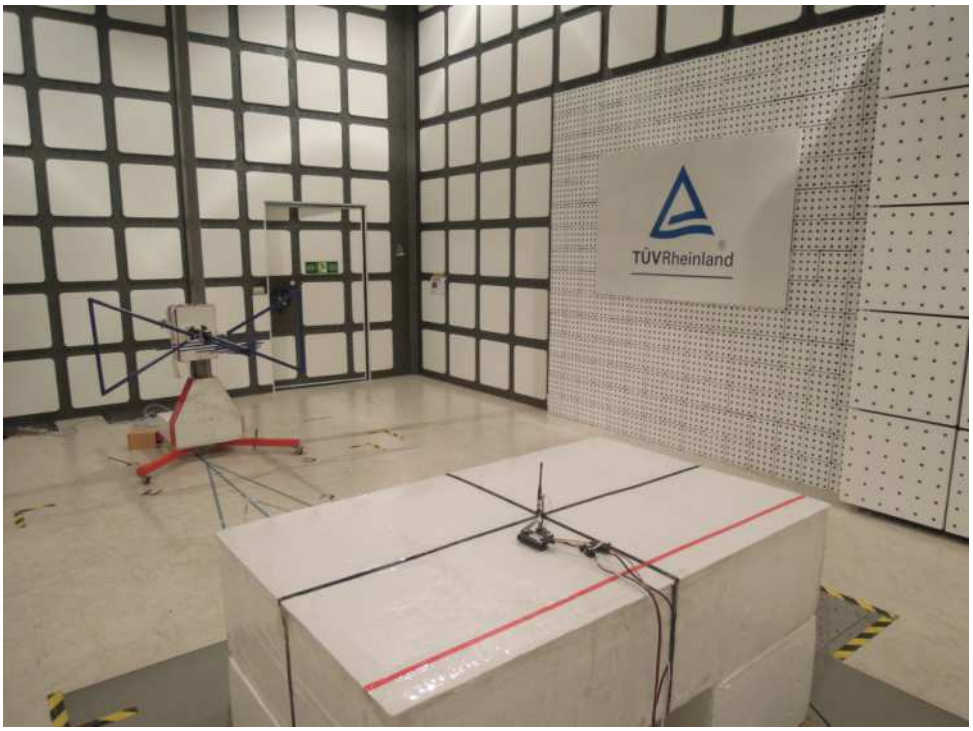
Since maximum output power of the transmitter is 15.6mW < 309mW (distance ≥50 mm), hence the EUT is excluded from SAR evaluation according to Table 1 in RSS-102

---End---

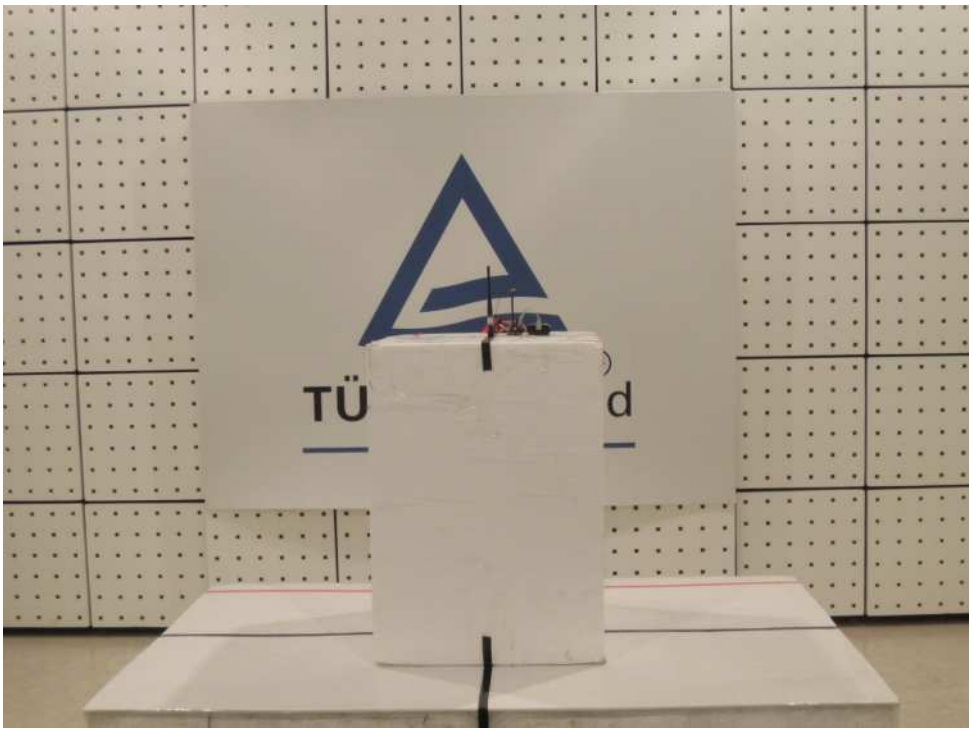
7. Photographs of the Test Set-Up

Photograph 1: Set-up for Spurious Emissions (Front View 1)- RFA-02-5-C7H1-ANT

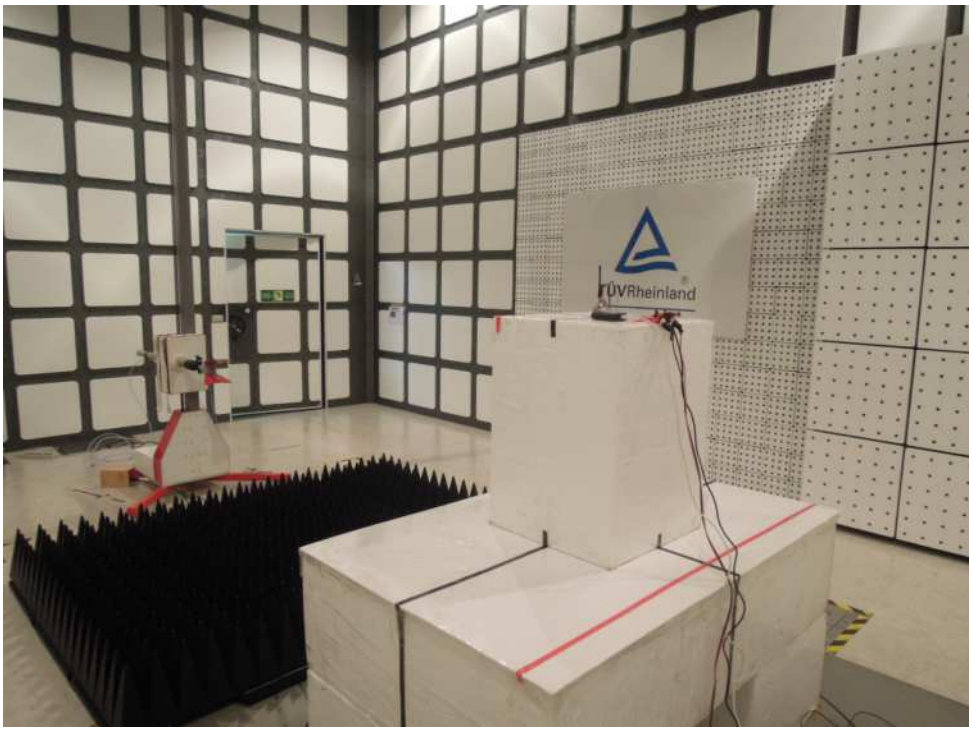
Photograph 2: Set-up for Spurious Emissions (Back View 1)- RFA-02-5-C7H1-ANT



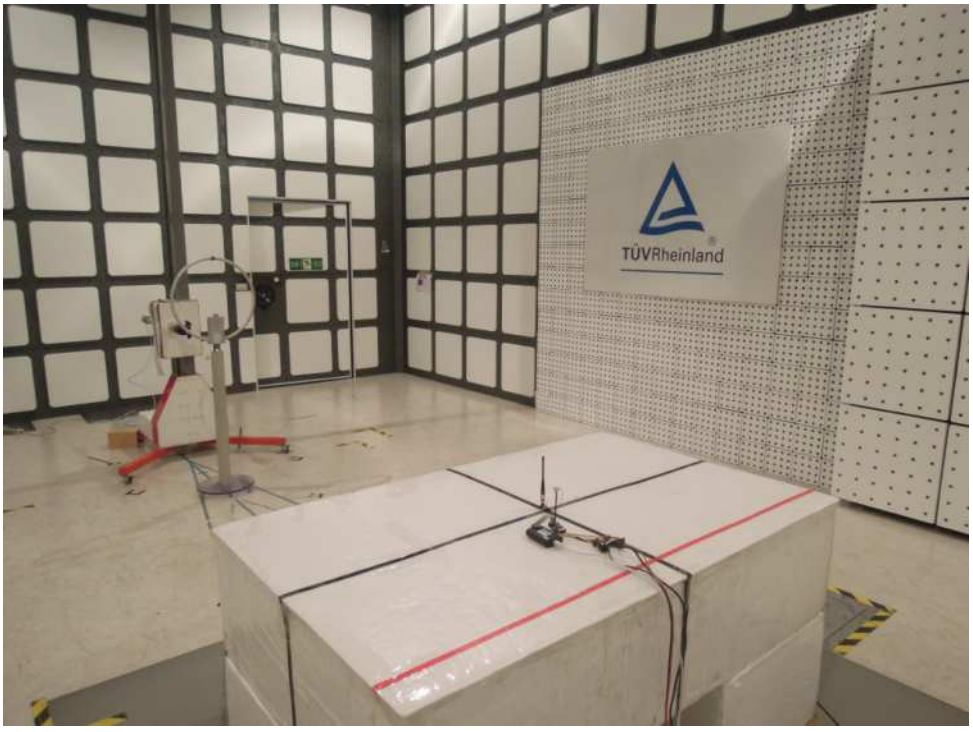
Photograph 3: Set-up for Spurious Emissions (Front View 2)- RFA-02-5-C7H1-ANT



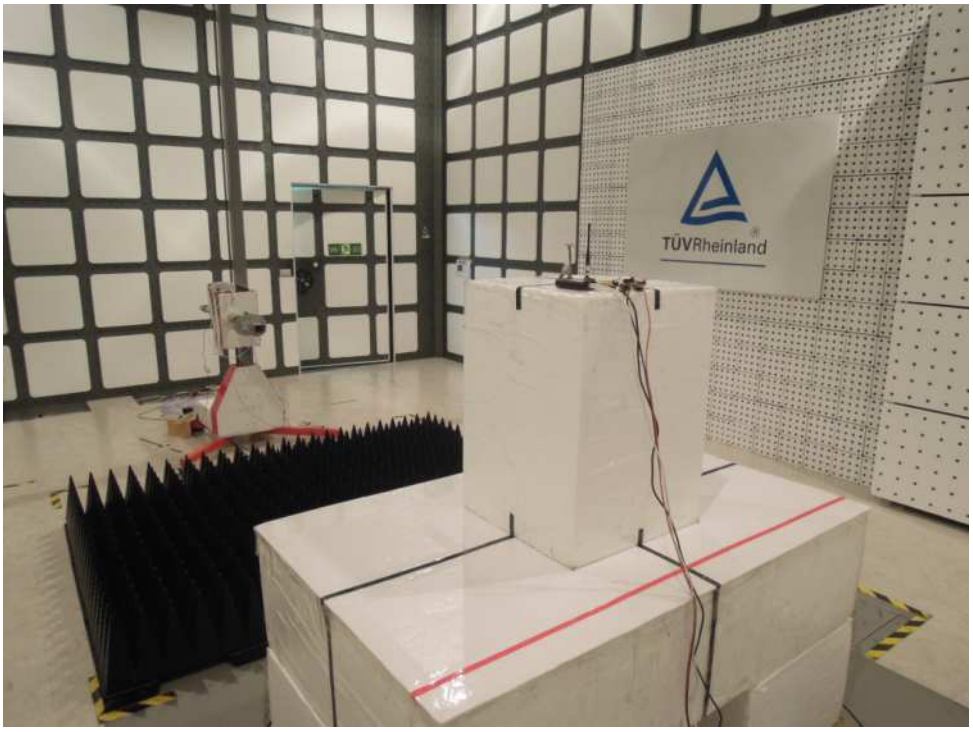
Photograph 4: Set-up for Spurious Emissions (Back View 2)- RFA-02-5-C7H1-ANT



Photograph 5: Set-up for Spurious Emissions (Back View 3)- RFA-02-5-C7H1-ANT

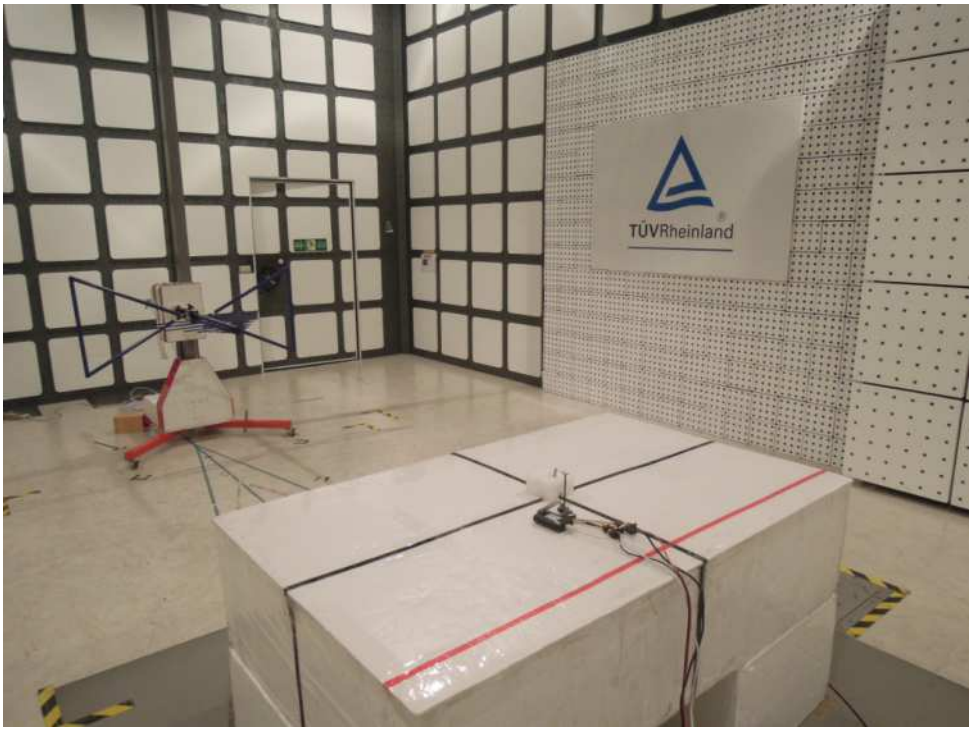


Photograph 6: Set-up for Spurious Emissions (Back View 4)- RFA-02-5-C7H1-ANT

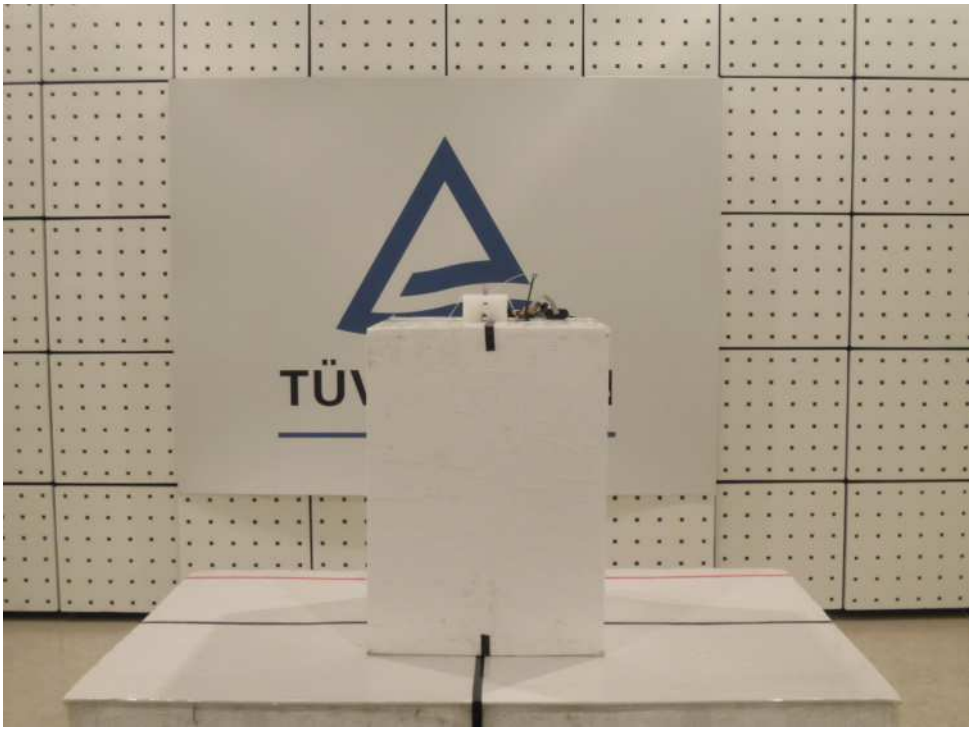


Photograph 7: Set-up for Spurious Emissions (Front View 1)- RFPCA381013IMAB701-ANT

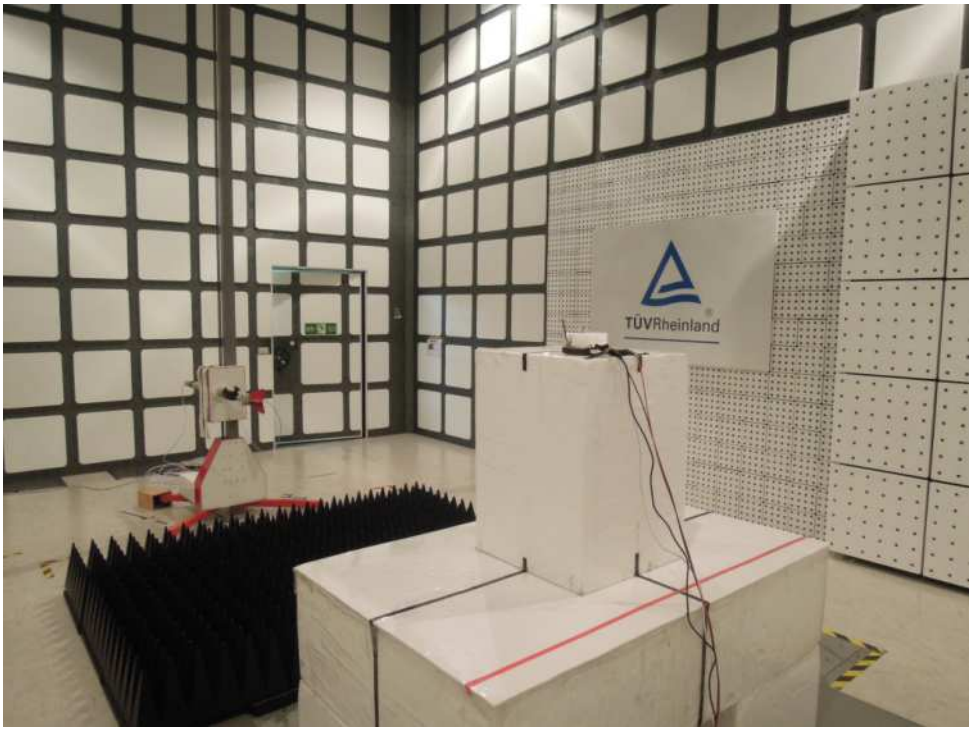
Photograph 8: Set-up for Spurious Emissions (Back View 1)- RFPCA381013IMAB701-ANT



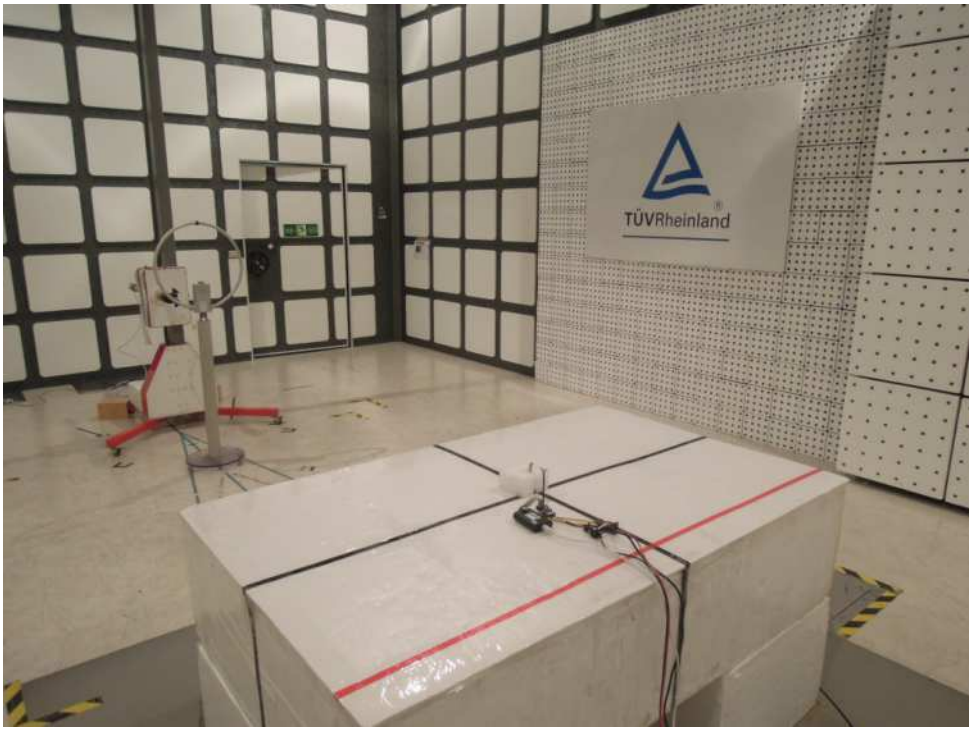
Photograph 9: Set-up for Spurious Emissions (Front View 2)- RFPCA381013IMAB701-ANT



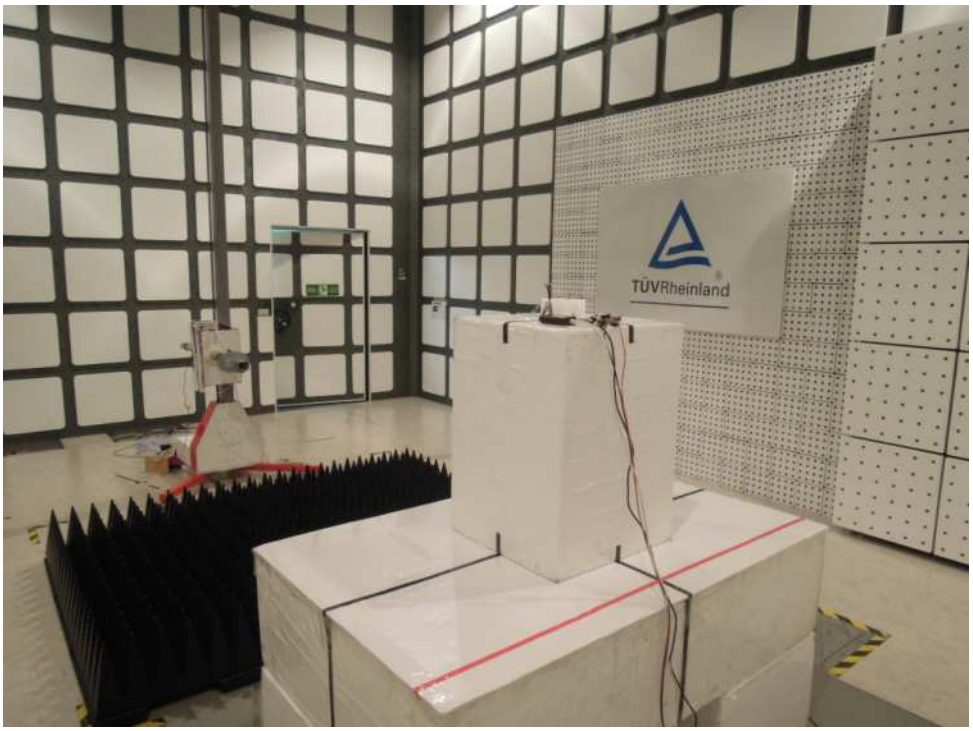
Photograph 10: Set-up for Spurious Emissions (Back View 2)- RFPCA381013IMAB701-ANT



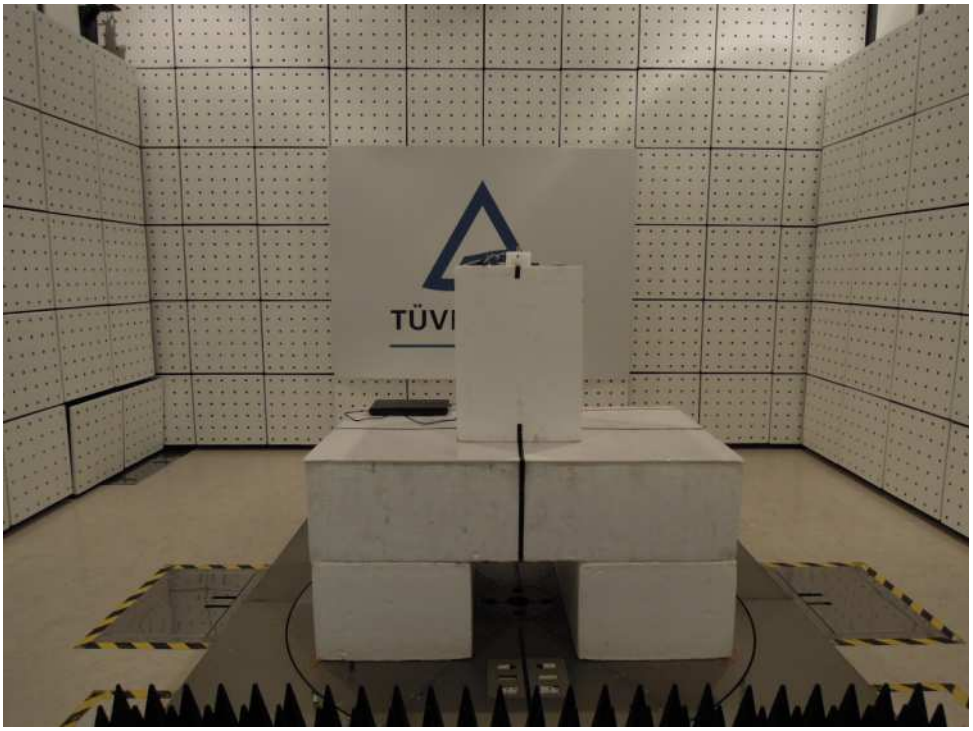
Photograph 11: Set-up for Spurious Emissions (Back View 3)- RFPCA381013IMAB701-ANT



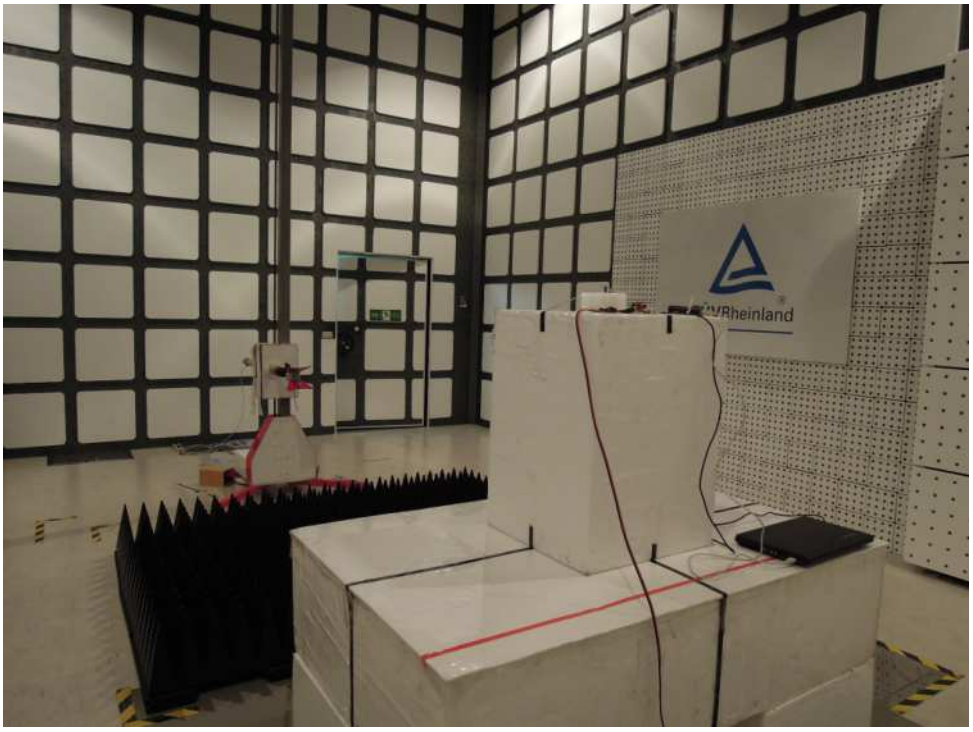
Photograph 12: Set-up for Spurious Emissions (Back View 4)- RFPCA381013IMAB701-ANT



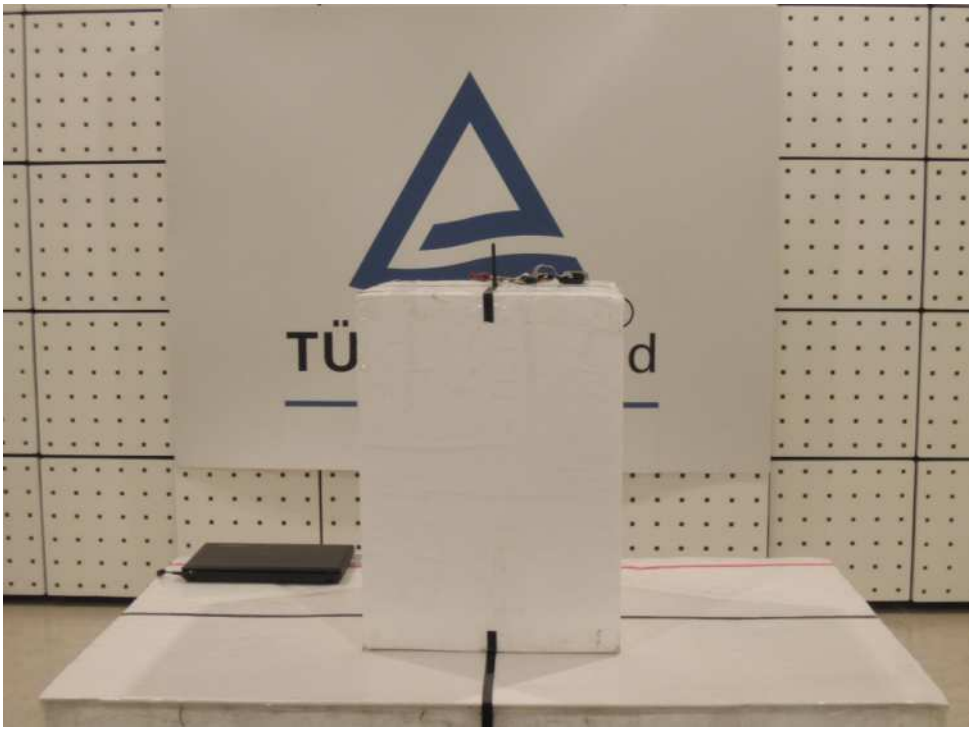
Photograph 13: Set-up for Spurious Emissions (Front View)- W3525B039 -ANT



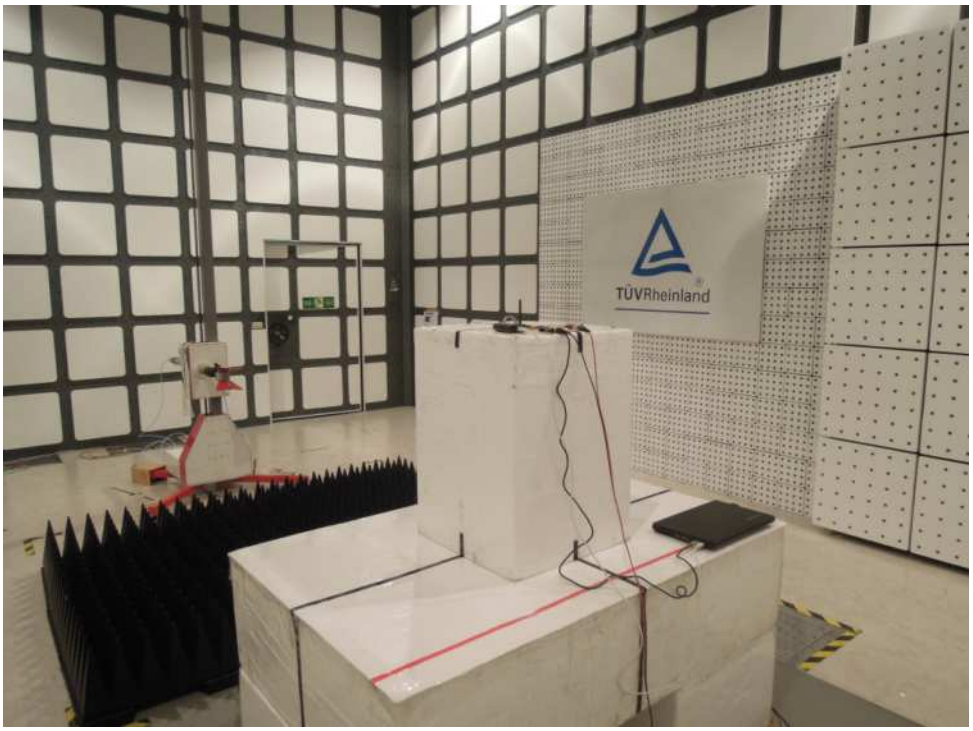
Photograph 14: Set-up for Spurious Emissions (Back View)- W3525B039 -ANT



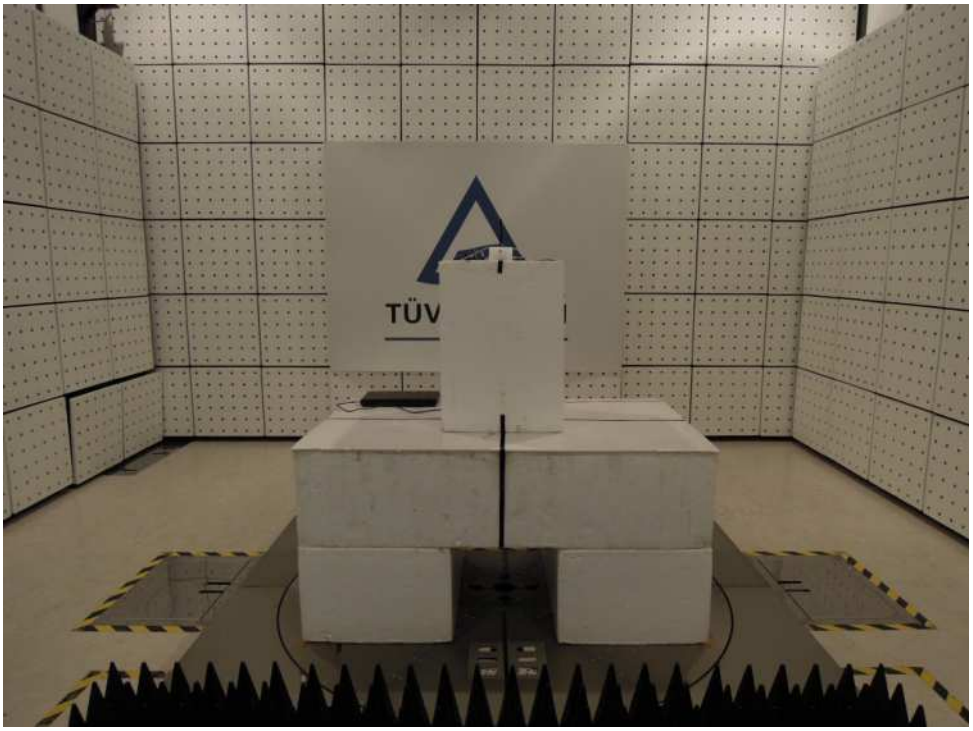
Photograph 15: Set-up for Spurious Emissions (Front View)- RN-SMA-4 -ANT



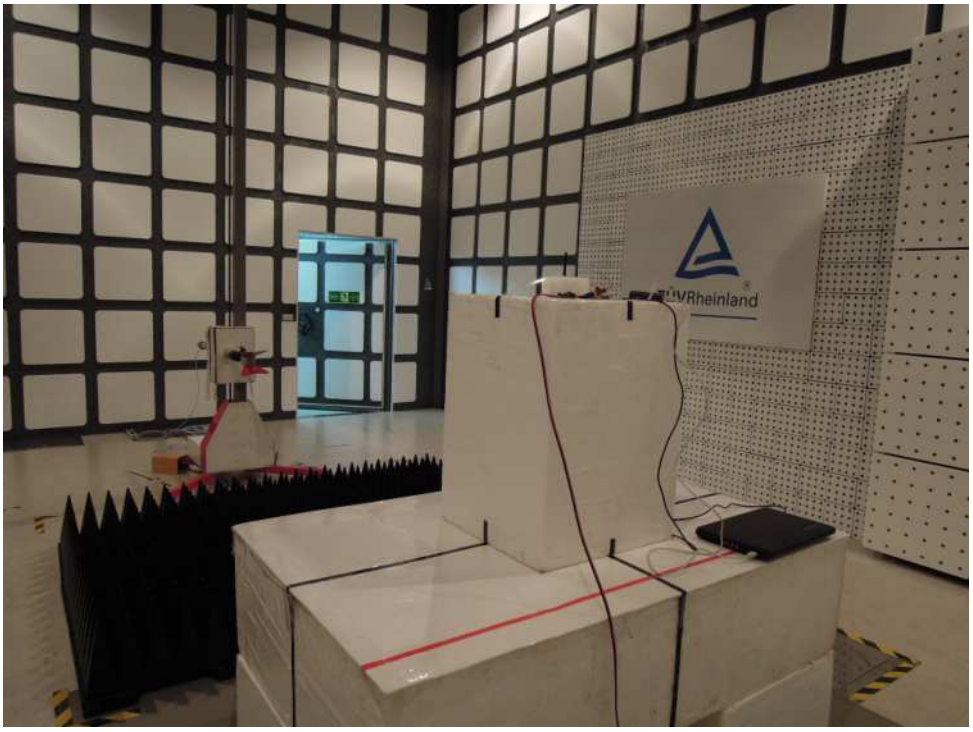
Photograph 16: Set-up for Spurious Emissions (Back View)- RN-SMA-4 -ANT



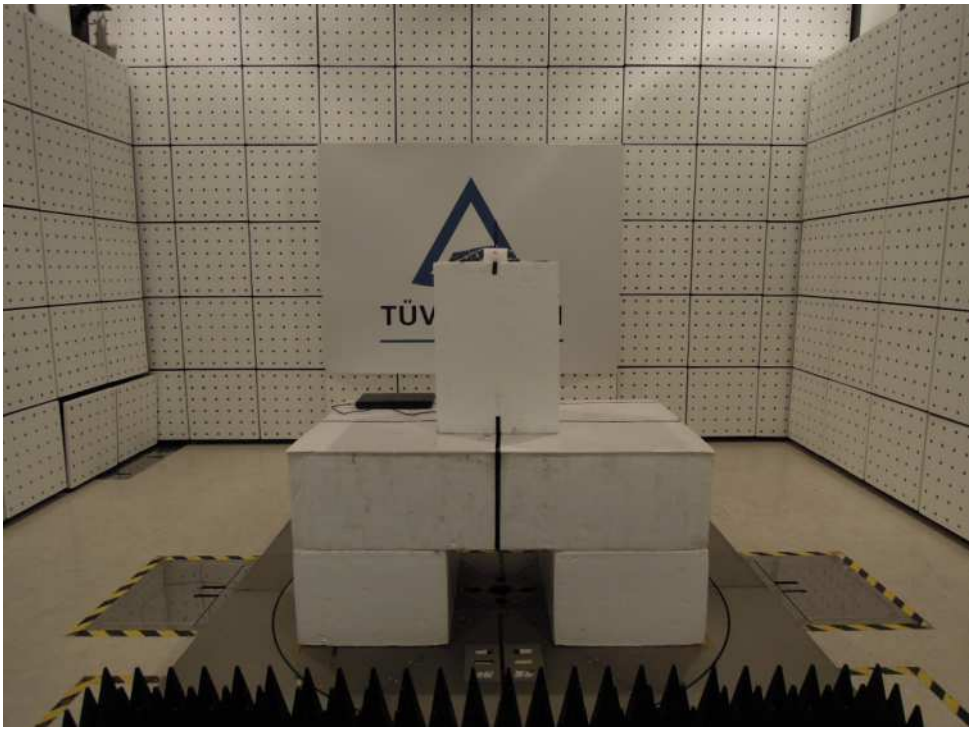
Photograph 17: Set-up for Spurious Emissions (Front View)- RFDPA870920IMLB301 -ANT



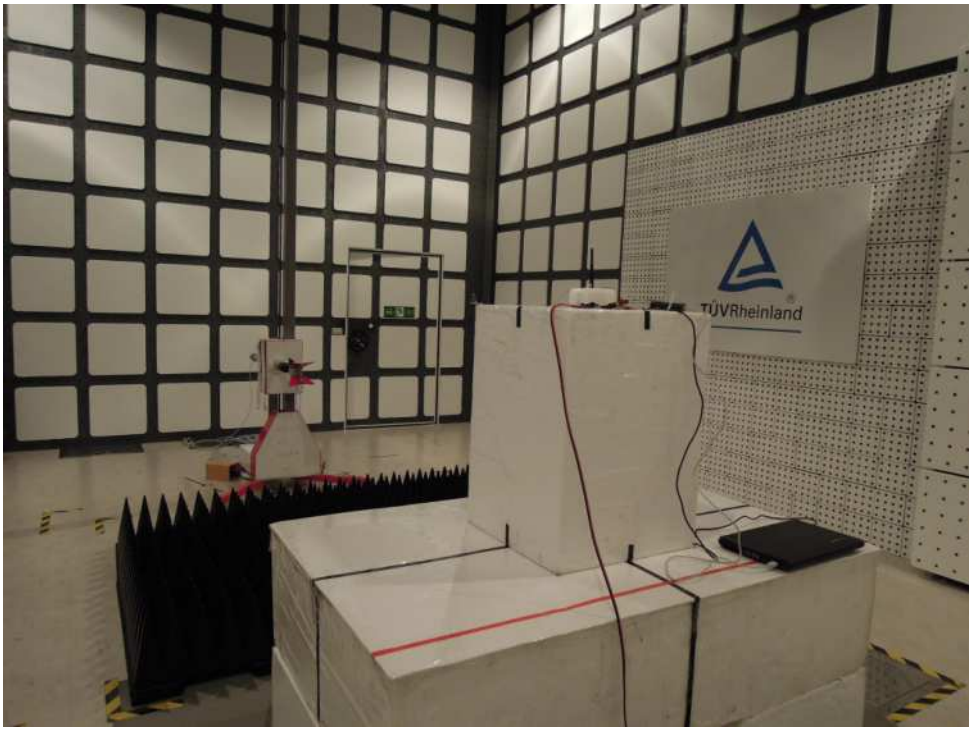
Photograph 18: Set-up for Spurious Emissions (Back View)- RFDPA870920IMLB301 -ANT



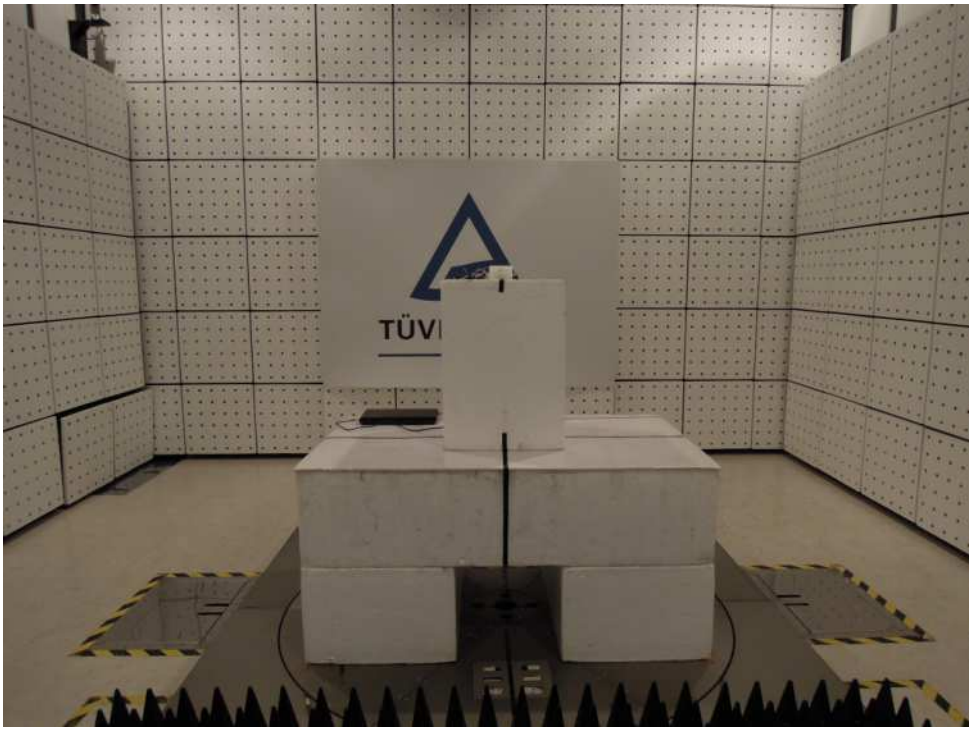
Photograph 19: Set-up for Spurious Emissions (Front View)- RFA-02-3-C5H1 -ANT



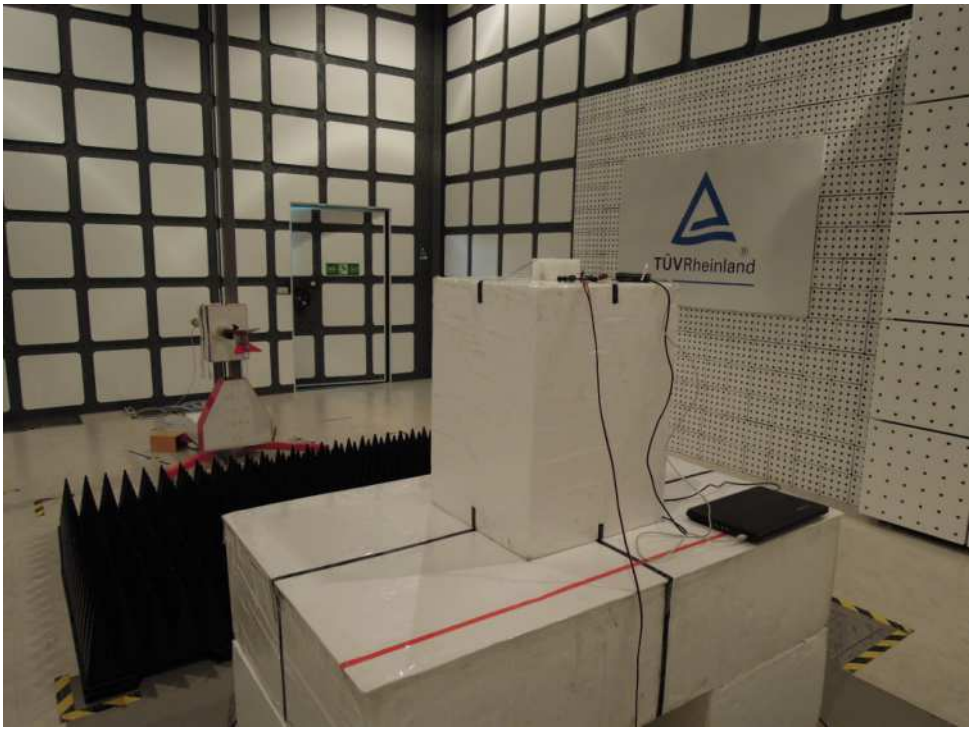
Photograph 20: Set-up for Spurious Emissions (Back View)- RFA-02-3-C5H1 -ANT



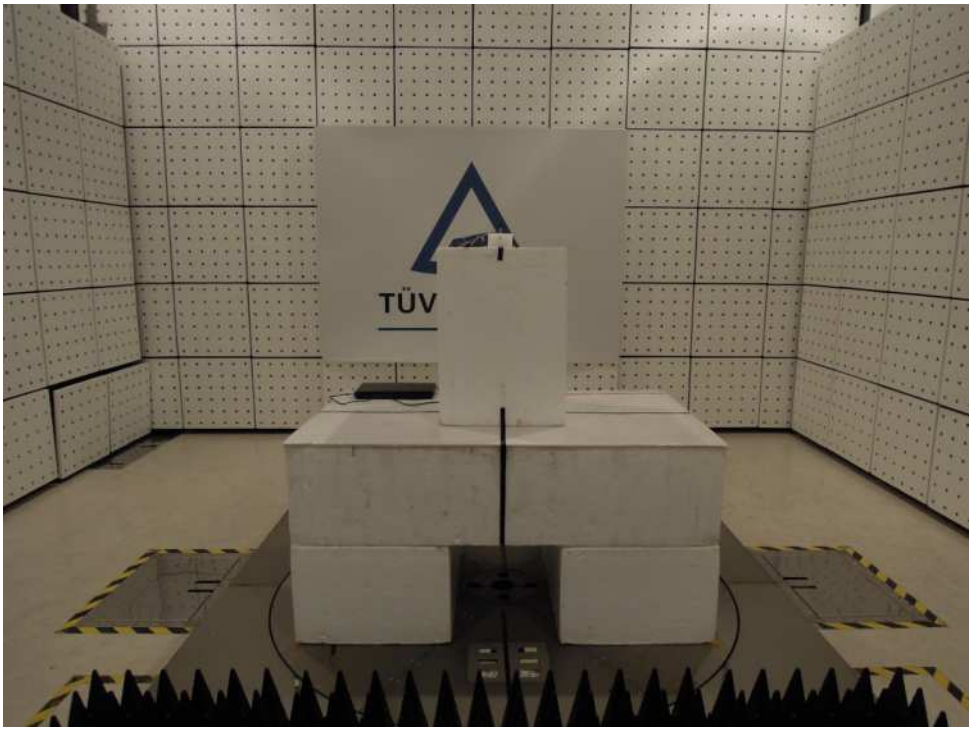
Photograph 21: Set-up for Spurious Emissions (Front View)- 1461530100 -ANT



Photograph 22: Set-up for Spurious Emissions (Back View)- 1461530100 -ANT



Photograph 23: Set-up for Spurious Emissions (Front View)- RN-SMA-S -ANT

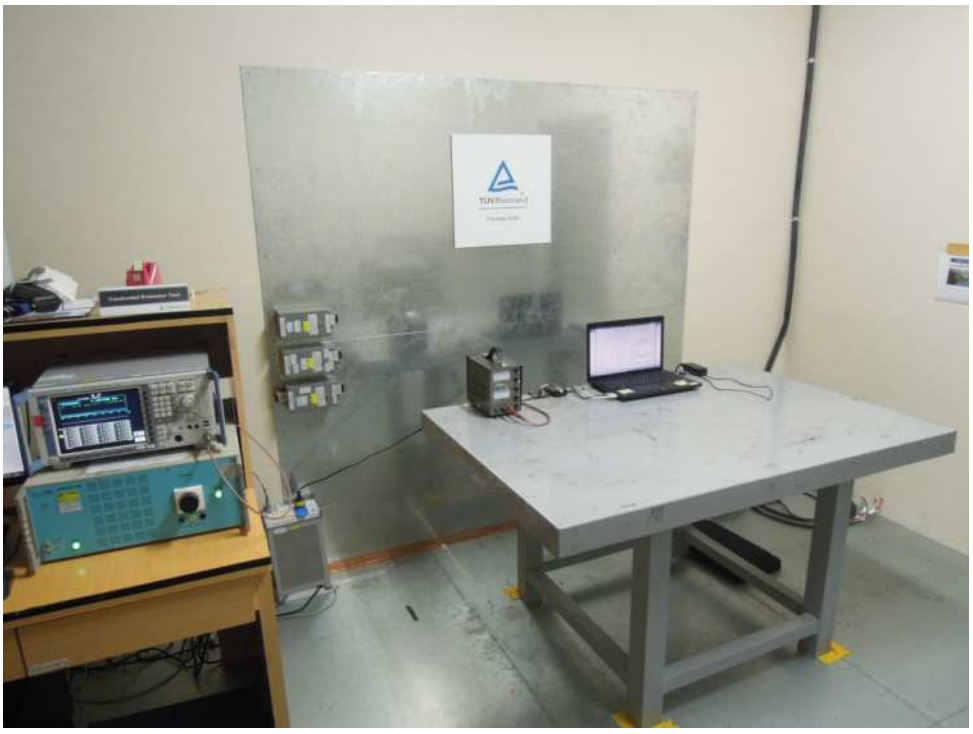


Photograph 24: Set-up for Spurious Emissions (Front View)- RN-SMA-S -ANT

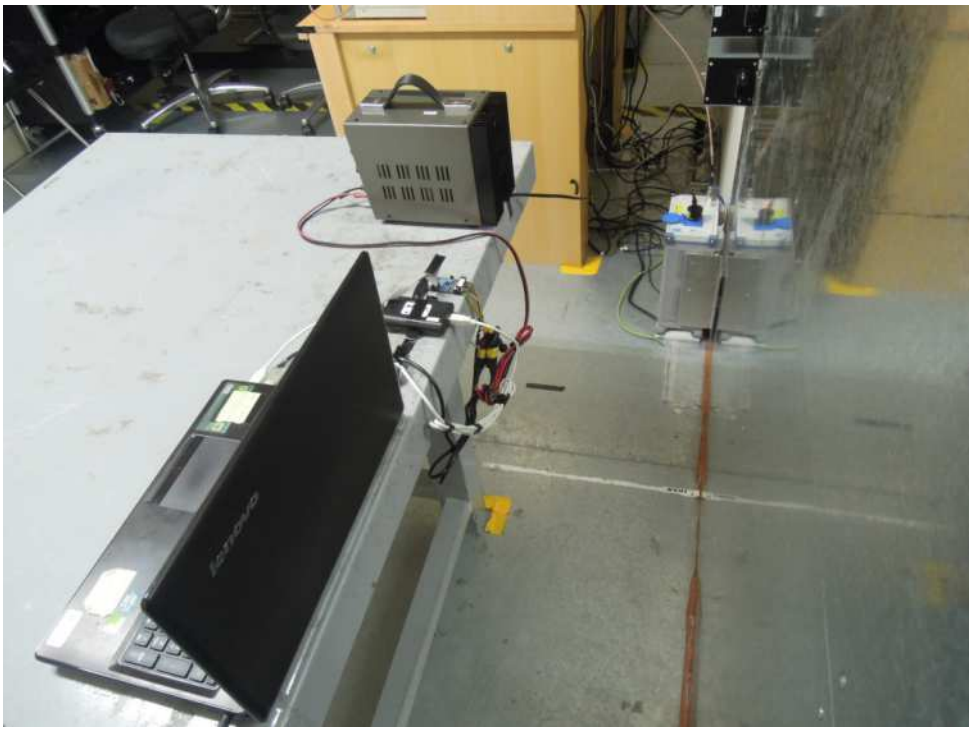
Photograph 25: Set-up for Conducted testing

Photograph 26: Set-up for Conducted testing

Photograph 27: Set-up for Mains Conducted testing (Front View)



Photograph 28: Set-up for Mains Conducted testing (Back View)



8. List of Tables

9. List of Photographs