



Prüfbericht-Nr.: <i>Test Report No.:</i>	50141823 001	Auftrags-Nr.: <i>Order No.:</i>	114074446	Seite 1 von 72 <i>Page 1 of 72</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	12-Feb-2018		
Auftraggeber: <i>Client:</i>	Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States.				
Prüfgegenstand: <i>Test item:</i>	IEEE 802.11 b/g/n Link Controller Module With Integrated Bluetooth				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	ATWILC3000-MR110UA				
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 15C / IC RSS-247 Test report (Wi-Fi 2.4GHz)				
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.247 RSS-247 (02-2017)				
Wareneingangsdatum: <i>Date of receipt:</i>	14-Feb-2018				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000698723-002 A000698723-003				
Prüfzeitraum: <i>Testing period:</i>	28-Mar-2018 – 21-Apr-2018				
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Laboratory Taipei				
Prüflaboratorium: <i>Testing laboratory:</i>	TUV Rheinland Taiwan Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
Report Date / tested by:			kontrolliert von / reviewed by:		
06-Jun-2018 Jack Chang/Project Manager			06-Jun-2018 Arvin Ho/Vice General Manager		
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:					
Zustand des Prüfgegenstandes bei Anlieferung: <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					
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. <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 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	4
1.1	COMPLEMENTARY MATERIALS.....	4
2.	TEST SITES	5
2.1	TEST FACILITIES	5
2.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	6
2.3	TRACEABILITY	7
2.4	CALIBRATION	7
2.5	MEASUREMENT UNCERTAINTY	7
3.	GENERAL PRODUCT INFORMATION.....	8
3.1	PRODUCT FUNCTION AND INTENDED USE	8
3.2	SYSTEM DETAILS AND RATINGS.....	8
3.3	INDEPENDENT OPERATION MODES.....	10
3.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS	10
3.5	SUBMITTED DOCUMENTS.....	10
4.	TEST SET-UP AND OPERATION MODES.....	11
4.1	PRINCIPLE OF CONFIGURATION SELECTION	11
4.2	TEST OPERATION AND TEST SOFTWARE.....	11
4.3	AUXILIARY EQUIPMENT	12
4.4	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....	12
4.5	TEST SETUP DIAGRAM	12
5.	TEST RESULTS	14
5.1	TRANSMITTER REQUIREMENT & TEST SUITES	14
5.1.1	<i>Antenna Requirement</i>	<i>14</i>
5.1.2	<i>Peak Output Power.....</i>	<i>15</i>
5.1.3	<i>6dB Bandwidth and 99% Bandwidth.....</i>	<i>17</i>
5.1.4	<i>Power Density.....</i>	<i>32</i>
5.1.5	<i>Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth.....</i>	<i>39</i>
5.1.6	<i>Spurious Emission</i>	<i>49</i>
5.1.7	<i>Mains Conducted Emissions.....</i>	<i>50</i>
6.	SAFETY HUMAN EXPOSURE	51
6.1	RADIO FREQUENCY EXPOSURE COMPLIANCE	51
6.1.1	<i>Electromagnetic Fields.....</i>	<i>51</i>
7.	PHOTOGRAPHS OF THE TEST SET-UP.....	52

8.	LIST OF TABLES	71
9.	LIST OF PHOTOGRAPHS.....	72

1. General Remarks

1.1 Complementary Materials

The following attachments are integral parts of this test report:

Appendix P: Photo Documentation
(File Name: 50141823APPENDIXP)

Appendix D: Test Result of Radiated Emissions
(File Name: 50141823APPENDIXD)

Test Specifications

The following standards were applied (in bold: product standards, otherwise: basic standards).

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 Facilities

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 periods: 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	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	101029	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

2.3 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 by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements are ± 3 dB.

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
RF power, conducted	± 1.5 dB
Adjacent channel power	± 3 dB
Radiated emission of transmitter, valid up to 26 GHz	± 6 dB
Radiated emission of receiver, valid up to 26 GHz	± 6 dB
Temperature	± 2 °C
Humidity	± 10 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is an IEEE 802.11 b/g/n Link Controller Module With Integrated Bluetooth. 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	IEEE 802.11 b/g/n Link Controller Module With Integrated Bluetooth
Type Designation	ATWILC3000-MR110UA
FCC ID	2ADHKWILC3000U
Canada ID	20266-WILC3000UA
Canada HVIN	ATWILC3000-MR110UA

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	2412 MHz ~ 2462 MHz
Channel Spacing	5 MHz
Channel number	802.11b/g/n : 11 (2412 MHz ~ 2462 MHz)
Operation Voltage	2.5V to 4.2V (Typical = 3.3V)
Modulation	802.11b: DSSS ; 802.11g/n: OFDM
Antenna gain	Refer external antenna list

Table 6: External Antenna list
Antennas no.4, 6 and 9 selected for testing and no. 1, 2, 3, 8, 11, 12, 16 selected for spot check

S/no.	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	RFDP A870920IMLB301	WALSIN	1.84 dBi	Dipole-DB	Dual Band
4	RFMTA331215IMAB701	WALSIN	3.8 dBi	Metal Stamp	Cable length 150mm
5	RFMTA331240IMAB701	WALSIN	3.0 dBi	Metal Stamp	Antenna same as S/No.4, cable length 400 mm
6	RFPCA381013IMAB701	WALSIN	4.50 dBi	PCB	Cable length 130mm
7	RFPCA381035IMAB701	WALSIN	2.7 dBi	PCB	Antenna same as S/No.6, cable length 350mm
8	RFA-02-3-C5H1	Aristotle	3 dBi	Dipole	
9	RFA-02-5-C7H1	Aristotle	5 dBi	Dipole-Long	
10	RFA-02-P33	Aristotle	2 dBi	PCB	Cable length 150mm
11	1461530100	Molex	3 dBi	PCB/Flexi	Cable length 100mm Dual Band
12	RN-SMA-S	Microchip	0.56 dBi	Dipole-short	
13	RN-SMA-7	Microchip	5 dBi	Dipole-Long	
14	RFA-02-5-F7H1	Aristotle	5 dBi	Dipole-Long	
15	RFA-02-D3	Aristotle	2 dBi	Dipole-no encl.	
16	RFA-02-G03	Aristotle	2 dBi	Metal Stamp	Cable length 150mm
17	RFA-02-L2H1	Aristotle	2 dBi	Dipole	
18	RFA-02-P05	Aristotle	2 dBi	PCB	Cable length 150mm
19	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

- Photo Document
- Technical Description
- Rating Label
- Circuit Diagram
- Blocking Diagram

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 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: A000698723-002

Radiation: A000698723-003

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

IEEE 802.11b mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 1Mbps data rate were chosen for full testing.

IEEE 802.11g mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6.5Mbps data rate were chosen for full testing.

4.3 Auxiliary Equipment

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

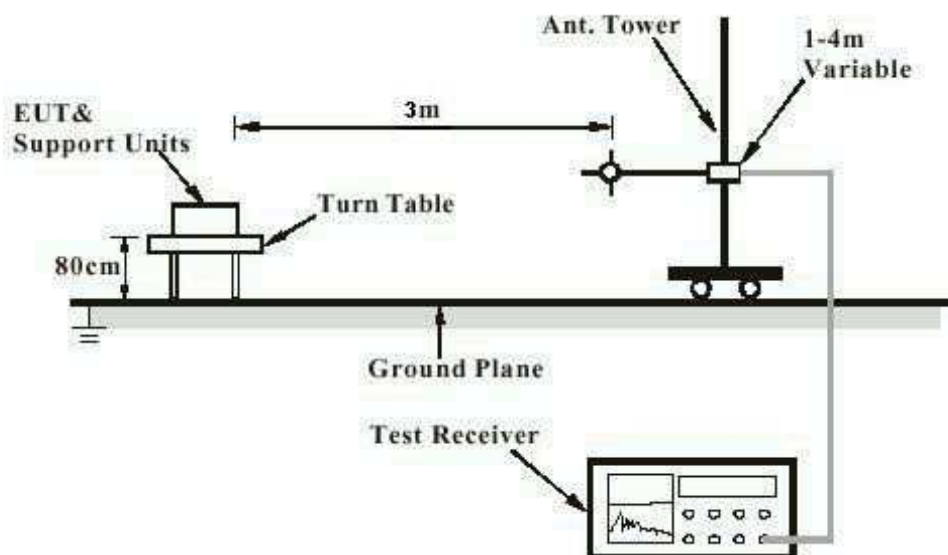
Description	Manufacturer	Model No.	Serial No.
Notebook(EMC-06)	Lenovo	TP00048A	PB-0F8B2
Test tool	Microchip	WILC3000/WINC3400 rev7189	N/A

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)

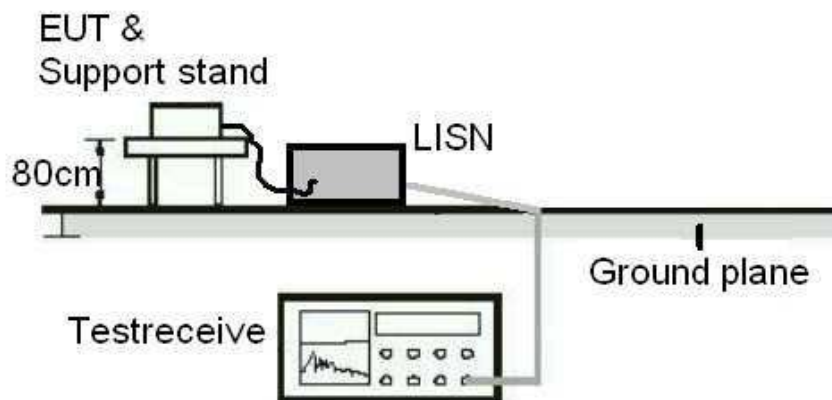
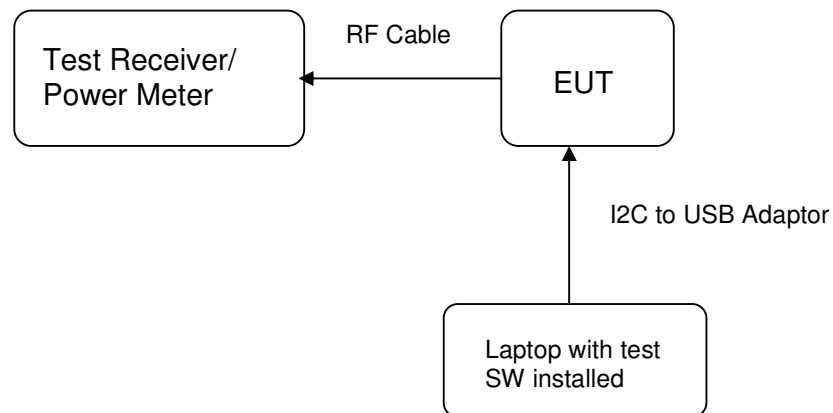


Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Passed**

Test standard	:	LP0002(2018): 3.10.1.3 FCC Part 15.247(b)(4), Part 15.203 and RSS- Gen 8.3
Limit	:	the use of antennas 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(2018): 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/Conducted room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	18-25 °C
Relative humidity	:	50-65 %
Atmospheric pressure	:	100-103kPa

Table 7: Test result of Peak Output Power (802.11b)

Channel	Channel Frequency (MHz)	Output Power		Limit (W)	Power Setting (PPA, PA, DG)
		(dBm)	(W)		
Low Channel	2412	20.88	0.12246	1	15, 18, -9
Middle Channel	2437	20.50	0.11220	1	15, 18, -9
High Channel	2462	20.71	0.11776	1	15, 18, -9

Table 8: Test result of Peak Output Power (802.11g)

Channel	Channel Frequency (MHz)	Output Power		Limit (W)	Power Setting (PPA, PA, DG)
		(dBm)	(W)		
Low Channel	2412	20.01	0.10023	1	15, 18, -13
Middle Channel	2437	24.35	0.27227	1	15, 18, -4
High Channel	2462	19.98	0.09954	1	15, 18, -13

Table 9: Test result of Peak Output Power (802.11n HT20)

Channel	Channel Frequency (MHz)	Output Power		Limit (W)	Power Setting (PPA, PA, DG)
		(dBm)	(W)		
Low Channel	2412	19.80	0.09550	1	15, 18, -13
Middle Channel	2437	24.17	0.26122	1	15, 18, -4
High Channel	2462	19.78	0.09506	1	15, 18, -13

5.1.3 6dB Bandwidth and 99% Bandwidth

RESULT:**Passed**

Test standard : LP0002(2018): 3.10.1.5
FCC Part 15.247(a)(2), RSS-247 5.2(1)
Basic standard : ANSI C63.10:2013, KDB558074
Kind of test site : Shielded room/Conducted room

Test setup

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

Ambient temperature : 18-25°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103kPa

Table 10: Test result of 6dB Bandwidth (802.11b)

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	11.58	0.5	Pass
Mid Channel	2437	12.55	0.5	Pass
High Channel	2462	12.09	0.5	Pass

Table 11: Test result of 6dB Bandwidth (802.11g)

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	15.96	0.5	Pass
Mid Channel	2437	15.76	0.5	Pass
High Channel	2462	16.13	0.5	Pass

Table 12: Test result of 6dB Bandwidth (802.11n HT20)

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	16.59	0.5	Pass
Mid Channel	2437	16.95	0.5	Pass
High Channel	2462	16.59	0.5	Pass

Table 13: Test result of 99% Bandwidth (802.11b)

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	13.990
Mid Channel	2437	14.008
High Channel	2462	14.021

Table 14: Test result of 99% Bandwidth (802.11g)

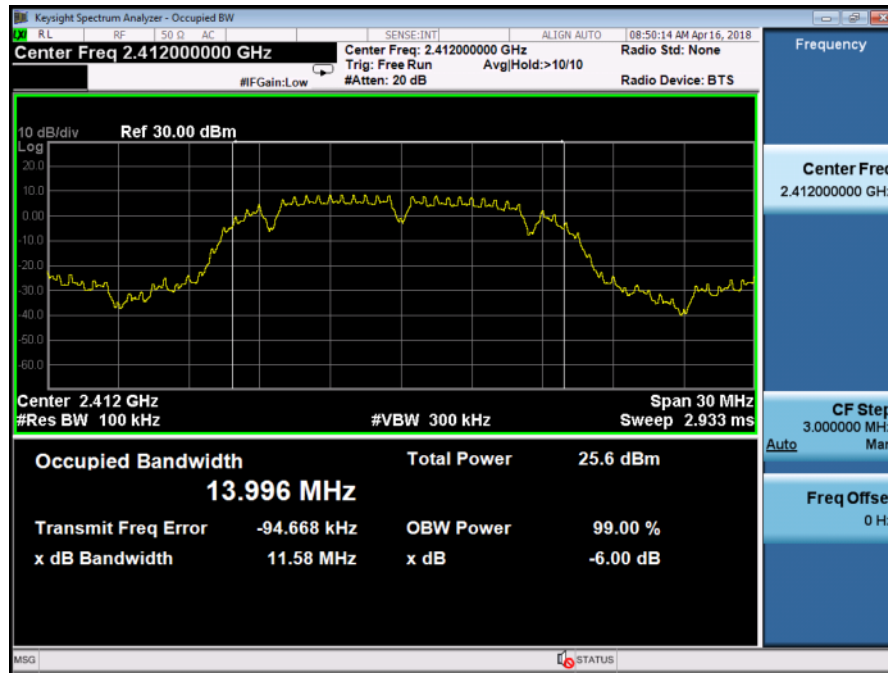
Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	16.913
Mid Channel	2437	18.008
High Channel	2462	16.913

Table 15: Test result of 99% Bandwidth (802.11n HT20)

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	17.886
Mid Channel	2437	18.536
High Channel	2462	17.901

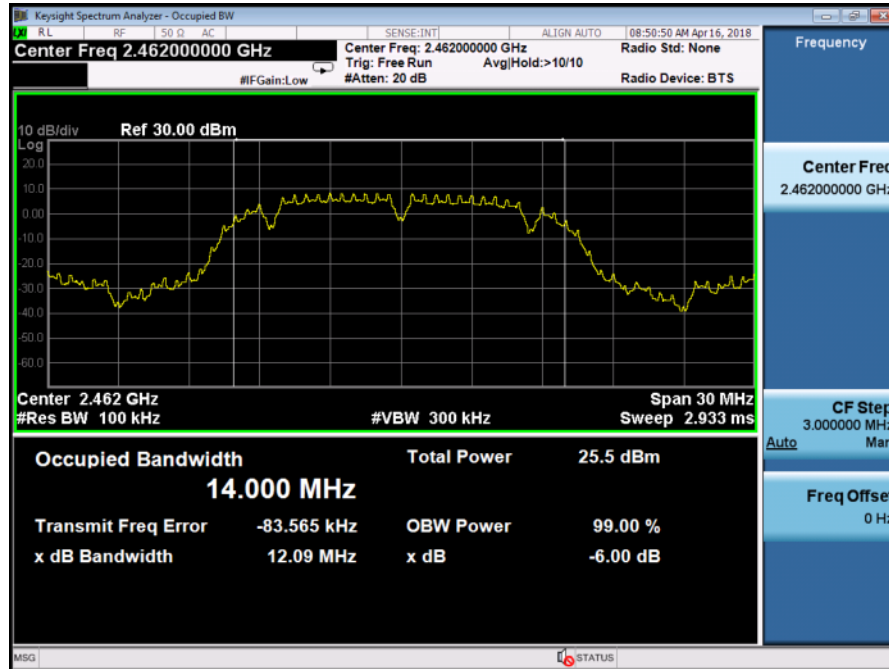
Test Plot of 6dB Bandwidth (802.11b)

Low Channel



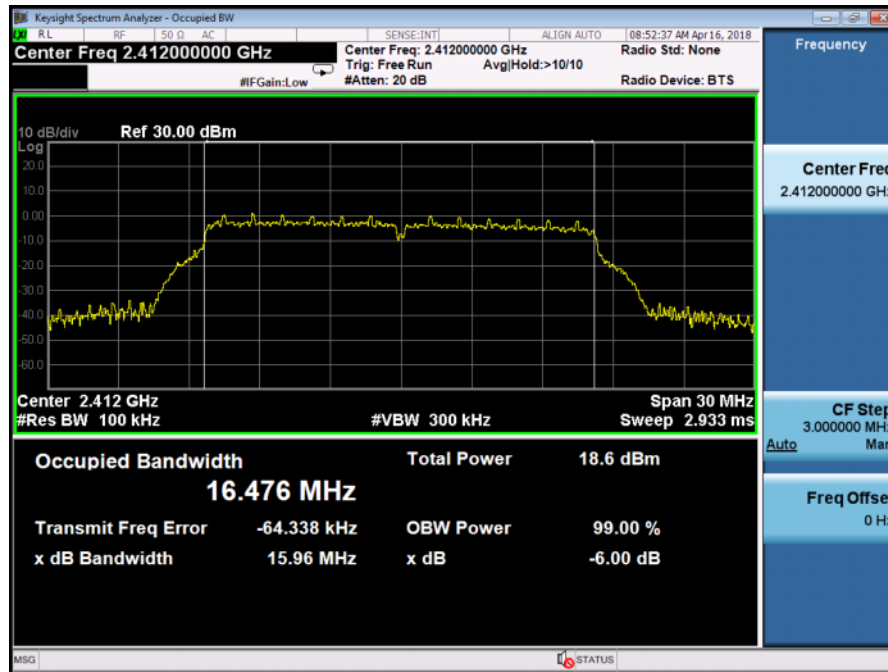
Middle Channel



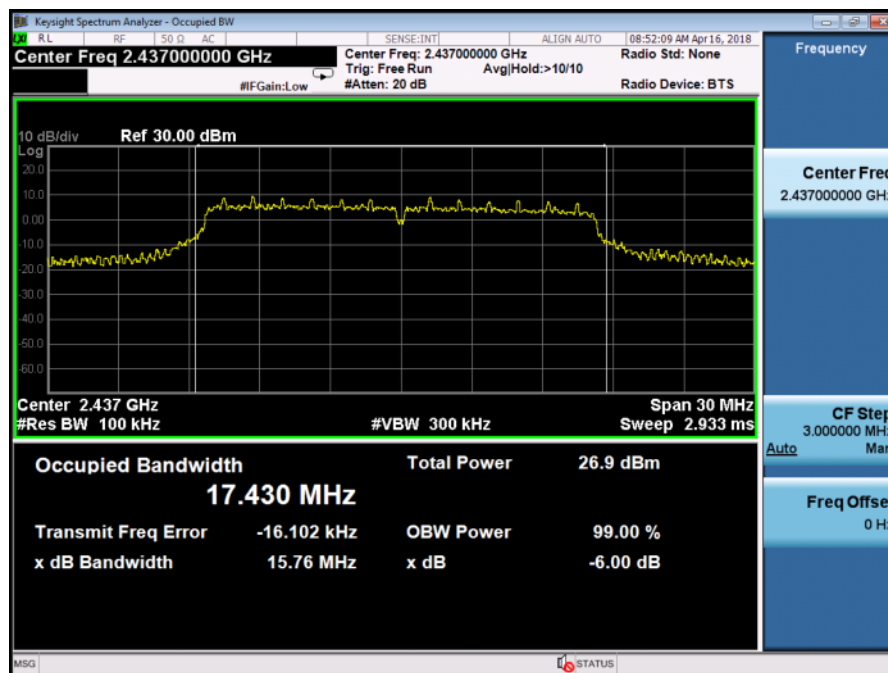
High Channel


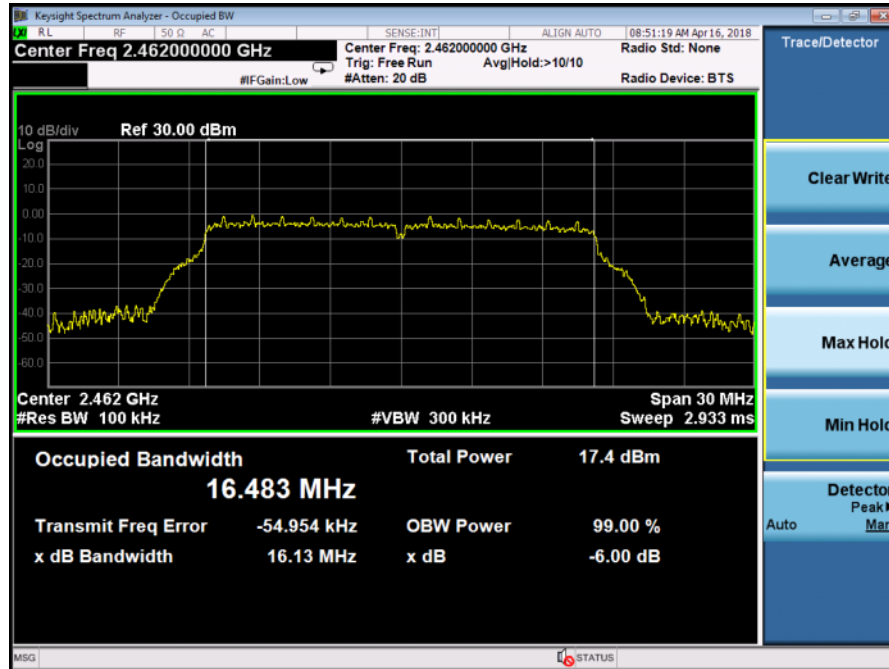
Test Plot of 6dB Bandwidth (802.11g)

Low Channel



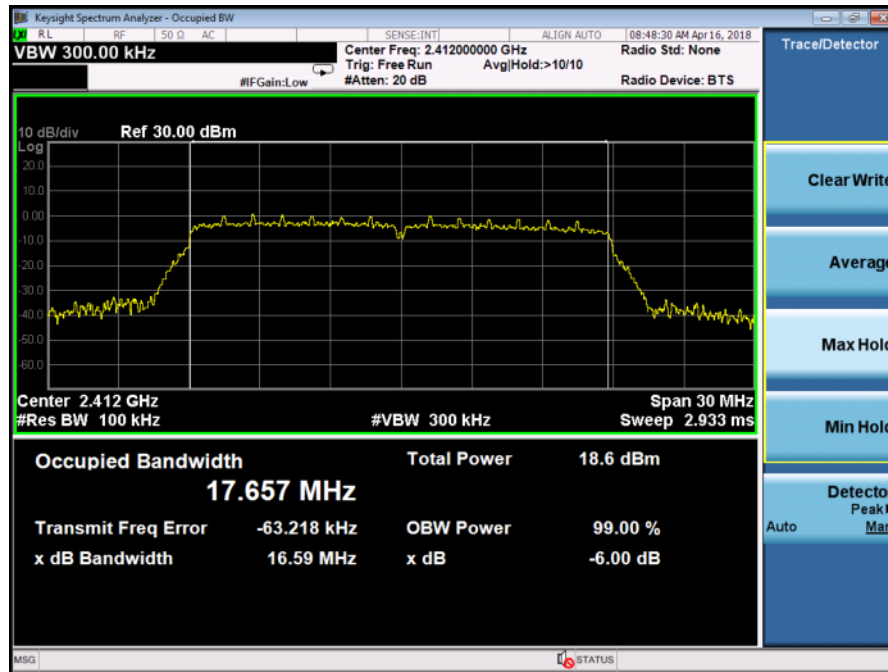
Middle Channel



High Channel


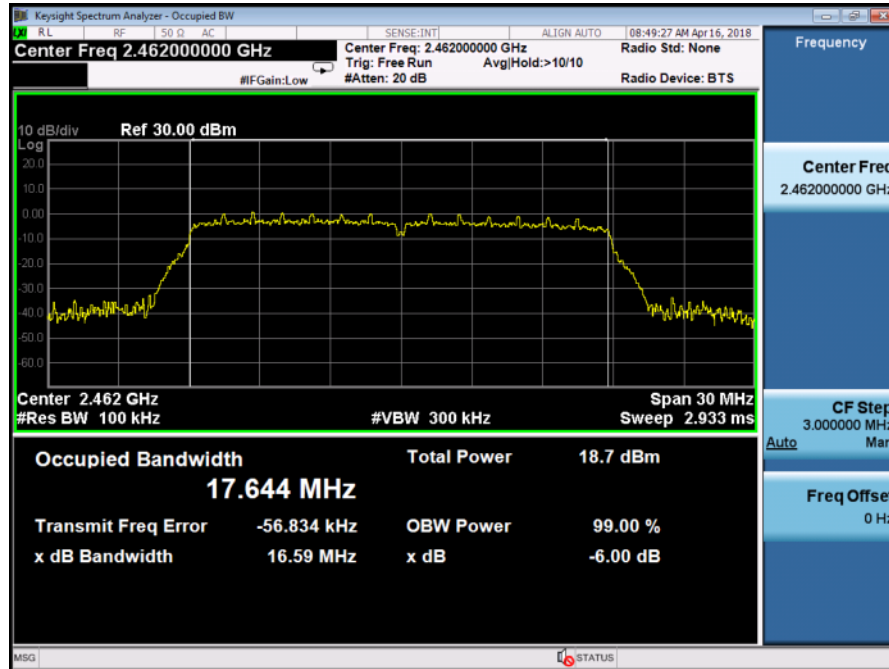
Test Plot of 6dB Bandwidth (802.11n HT20)

Low Channel



Middle Channel



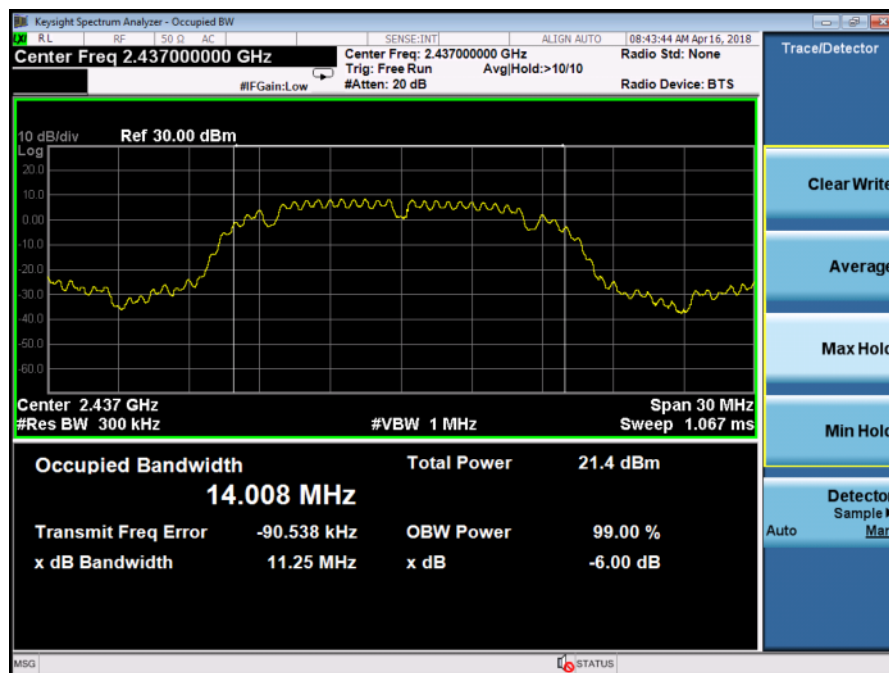
High Channel


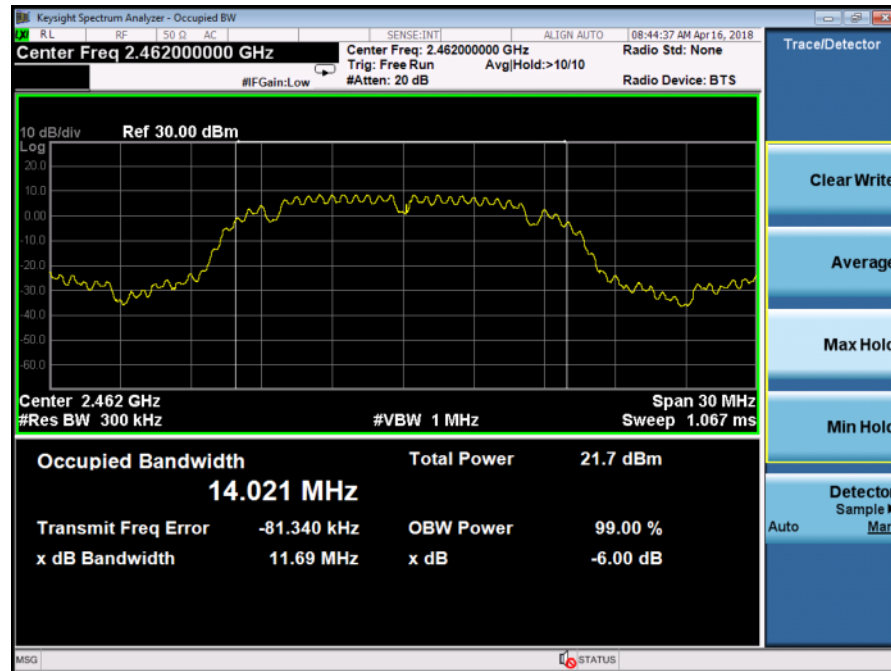
Test Plot of 99% Bandwidth (802.11b)

Low Channel



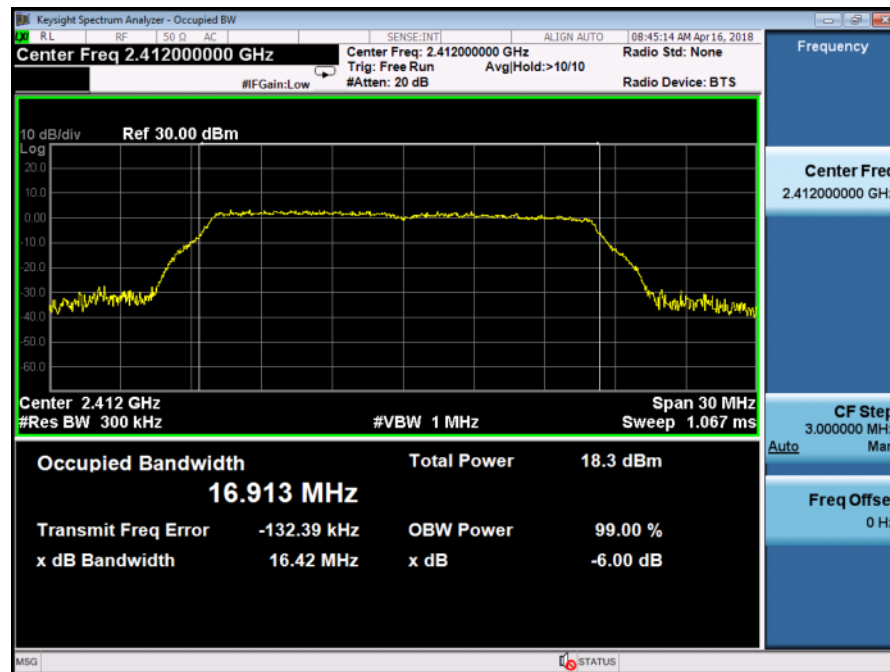
Middle Channel



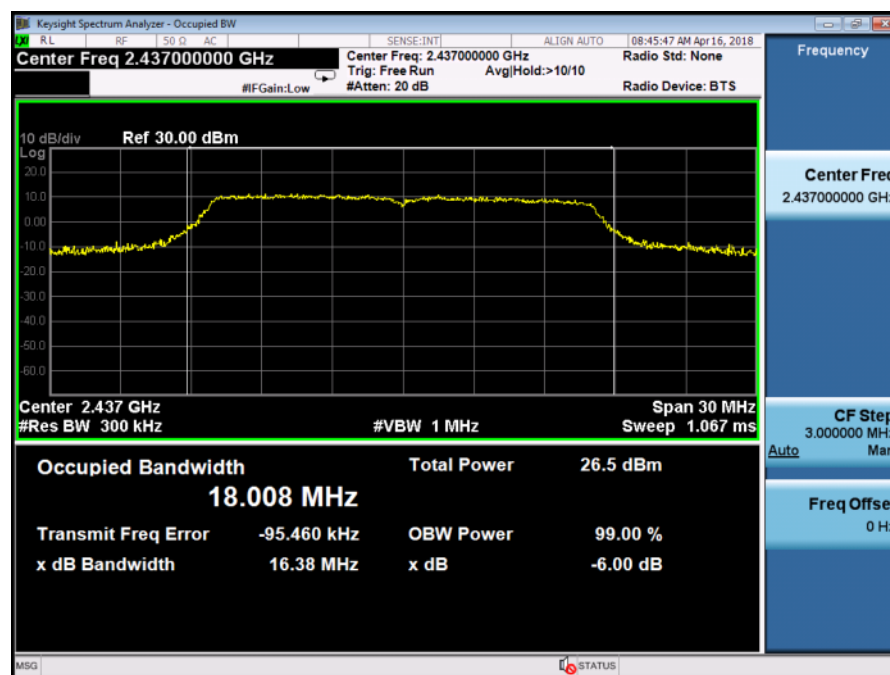
High Channel


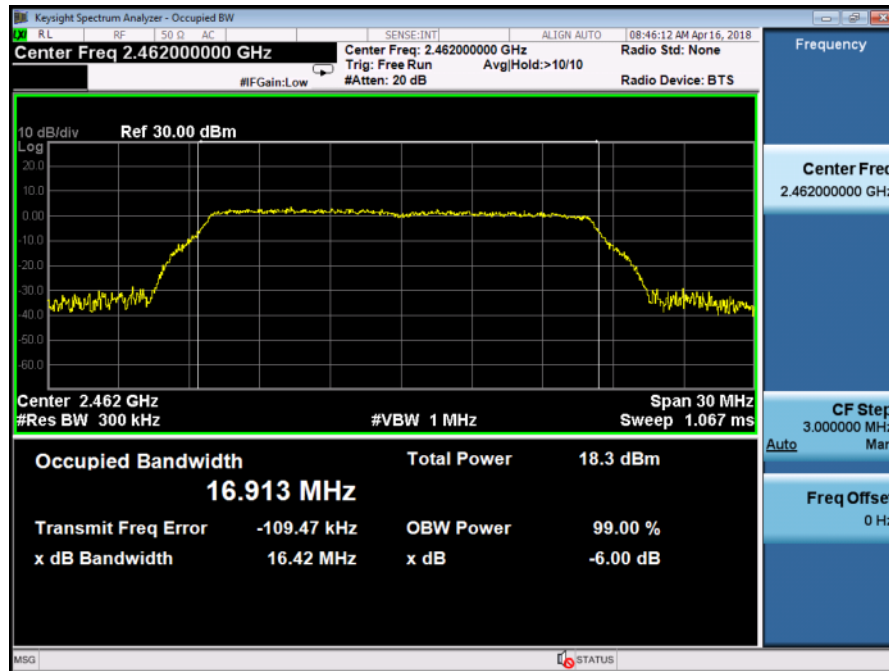
Test Plot of 99% Bandwidth (802.11g)

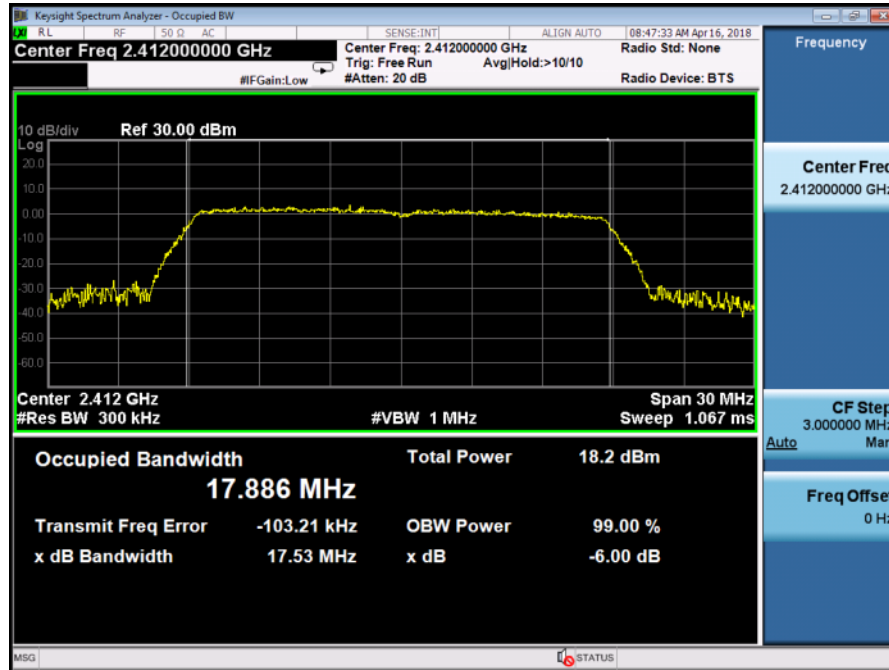
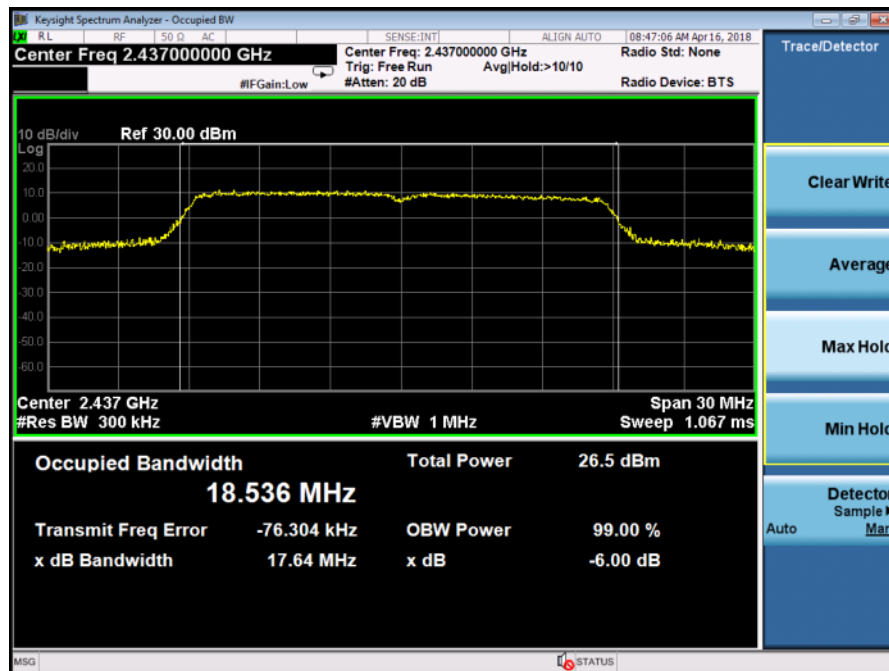
Low Channel



Middle Channel



High Channel


Test Plot of 99% Bandwidth (802.11n HT20)
Low Channel

Middle Channel


High Channel


5.1.4 Power Density

RESULT:
Passed

Test standard : LP0002(2018): 3.10.1.6 (2) (B)
 FCC Part 15.247(e) , RSS-247 5.2(2)
 Basic standard : ANSI C63.10:2013, KDB558074
 Kind of test site : Shielded room/Conducted room

Test setup

Test Channel : Low/ Middle/ High
 Operation Mode : A
 Ambient temperature : 18-25°C
 Relative humidity : 50-65%
 Atmospheric pressure : 100-103kPa

Table 16: Test result of Power Density (802.11b)

Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2412	-6.26	8
Middle Channel	2437	-6.36	8
High Channel	2462	-5.68	8

Table 17: Test result of Power Density (802.11g)

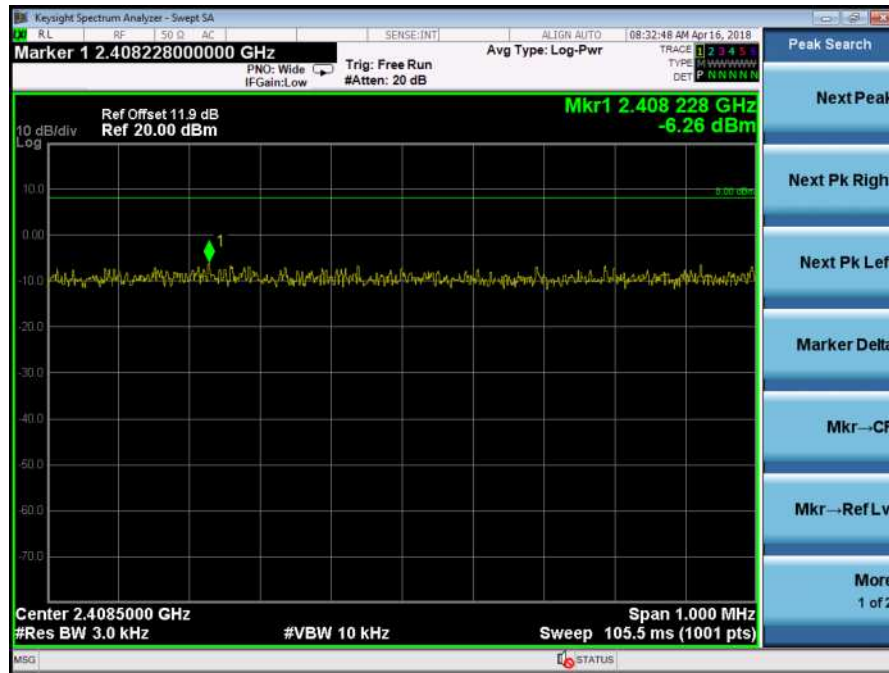
Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2412	-14.45	8
Middle Channel	2437	-5.84	8
High Channel	2462	-14.45	8

Table 18: Test result of Power Density (802.11n HT20)

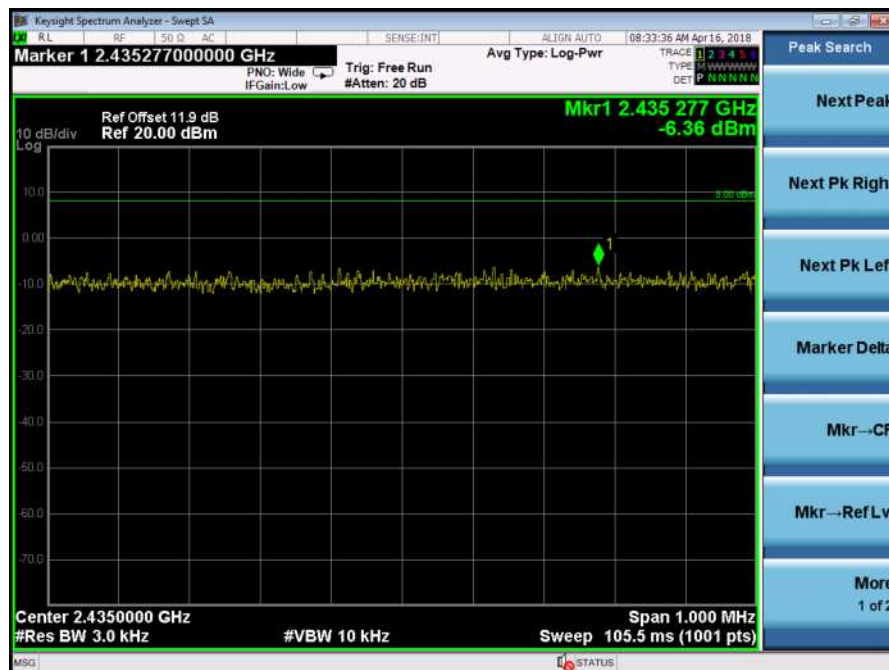
Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2412	-12.95	8
Middle Channel	2437	-4.89	8
High Channel	2462	-14.81	8

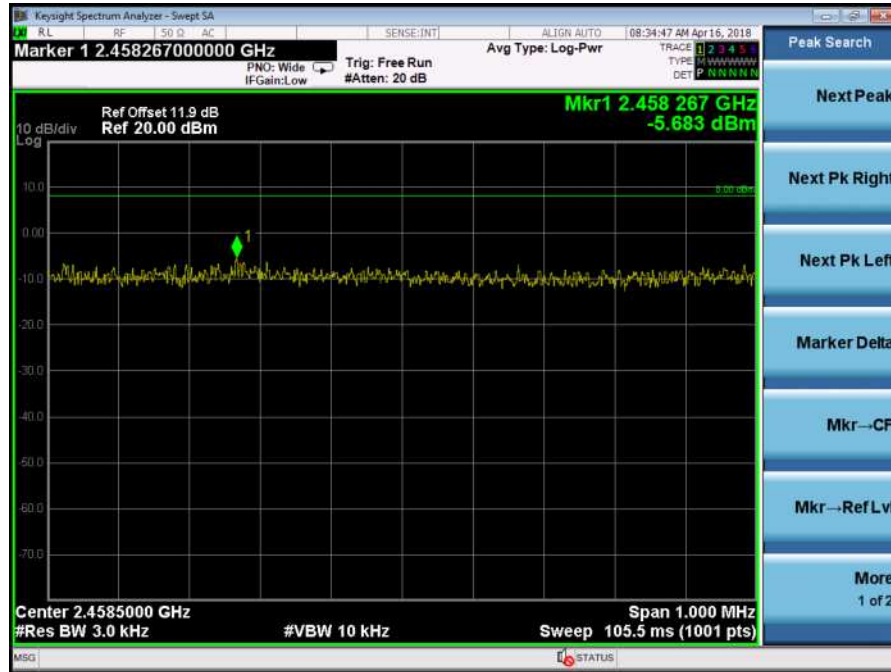
Test Plot of Power Density (802.11b)

Low Channel



Middle Channel



High Channel


Test Plot of Power Density (802.11g)

Low Channel



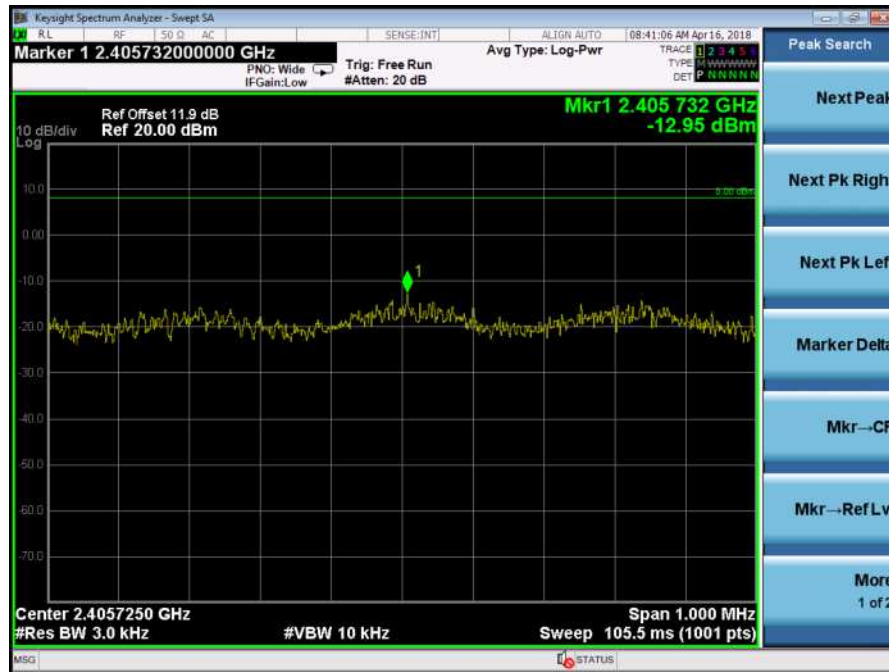
Middle Channel



High Channel


Test Plot of Power Density (802.11n HT20)

Low Channel



Middle Channel



High Channel


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

RESULT: **Passed**

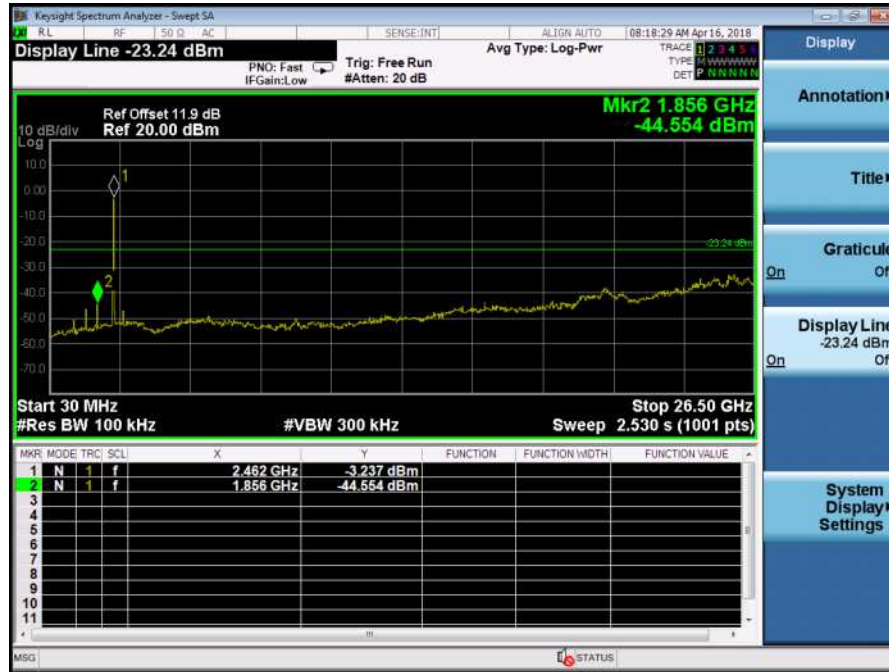
Test standard : LP0002(2018): 3.10.1.5
FCC part 15.247(d), RSS-247 5.5
Basic standard : ANSI C63.10:2013, KDB558074
Limit : 20dB (below that in the 100kHz bandwidth within the
band that contains the highest level of the desired power)
Kind of test site : Shielded room/Conducted room

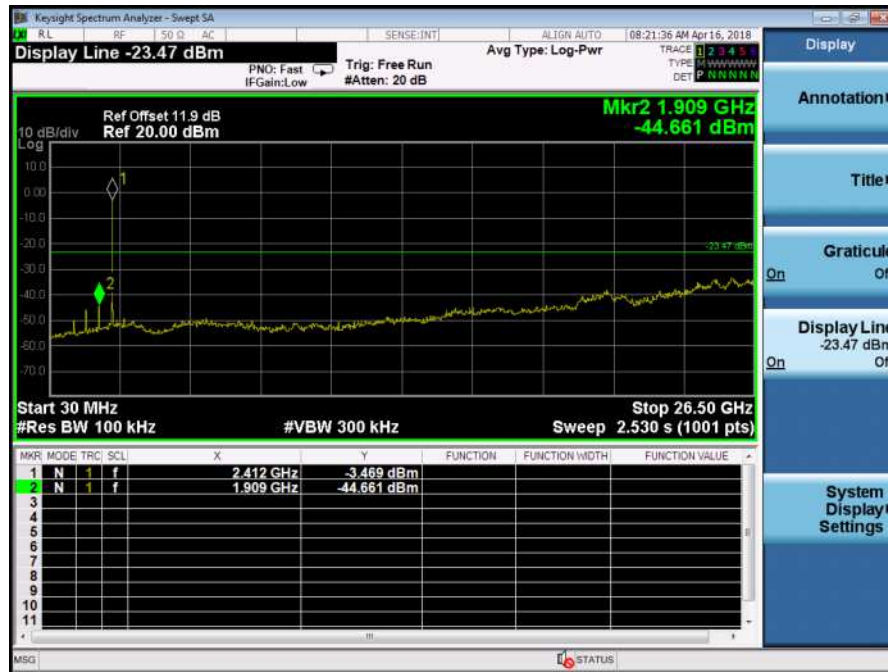
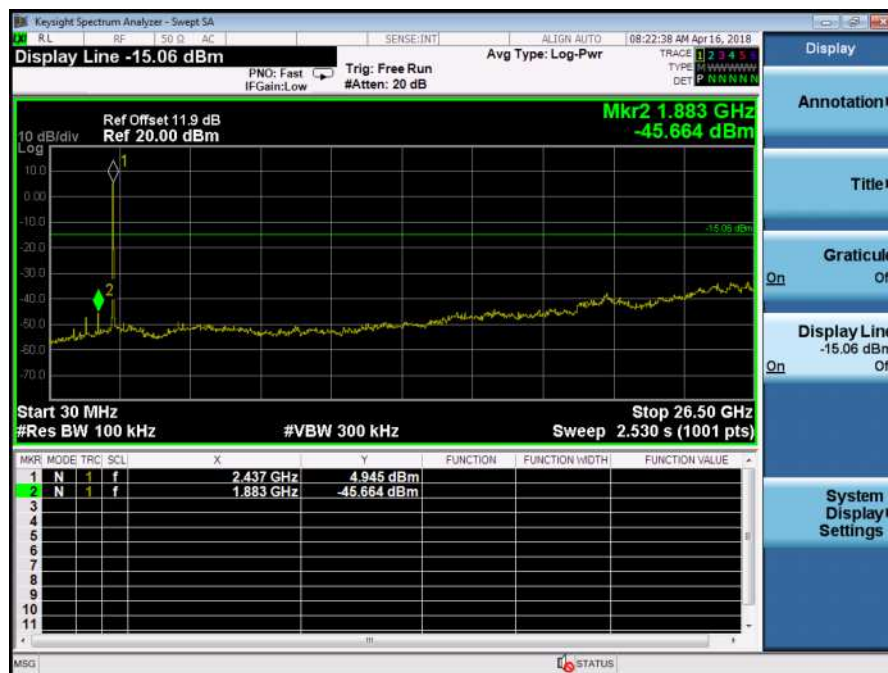
Test setup

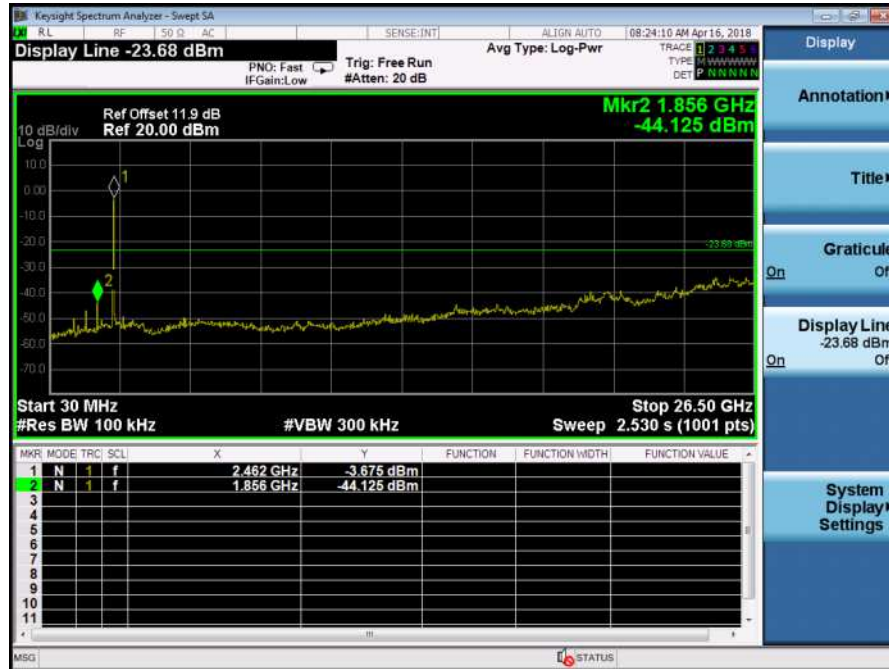
Test Channel : Low/ Mid/ High for spurious, Low/ High for
Band Edge
Operation mode : A
Ambient temperature : 18-25°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103kPa

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.

High Channel


Test Plot 100kHz Conducted Emissions (802.11n HT20)
Low Channel

Middle Channel


High Channel


Test Plot 100kHz RBW of Band Edge (802.11b)

Low Channel



High Channel

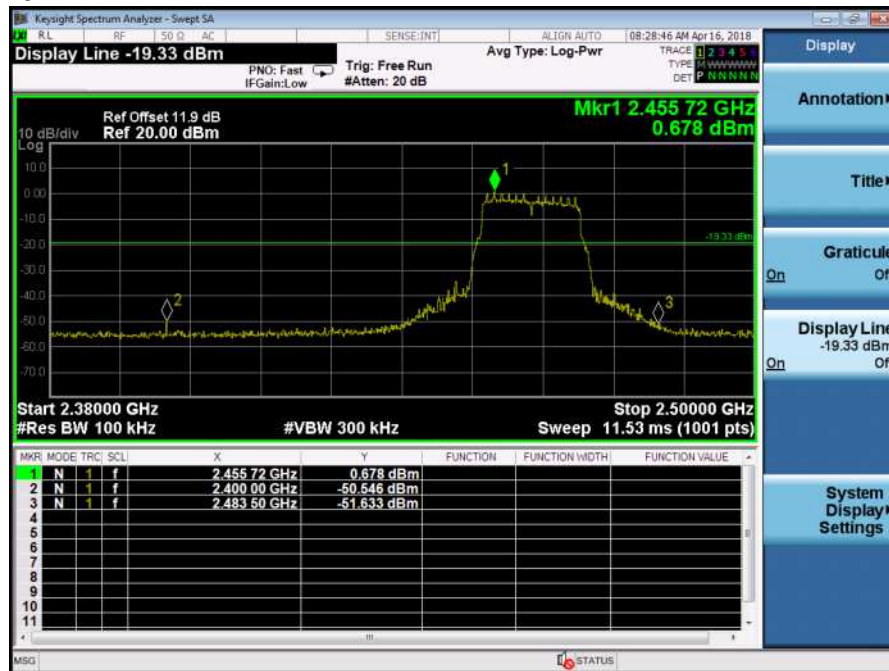


Test Plot 100kHz RBW of Band Edge (802.11g)

Low Channel



High Channel



Test Plot 100kHz RBW of Band Edge (802.11n HT20)
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(2018): 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(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. 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 1FCC:

Therefore the maximum output power of the transmitter is 272.27mW < 396mW(Distance: 80 mm), hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

Canada:

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

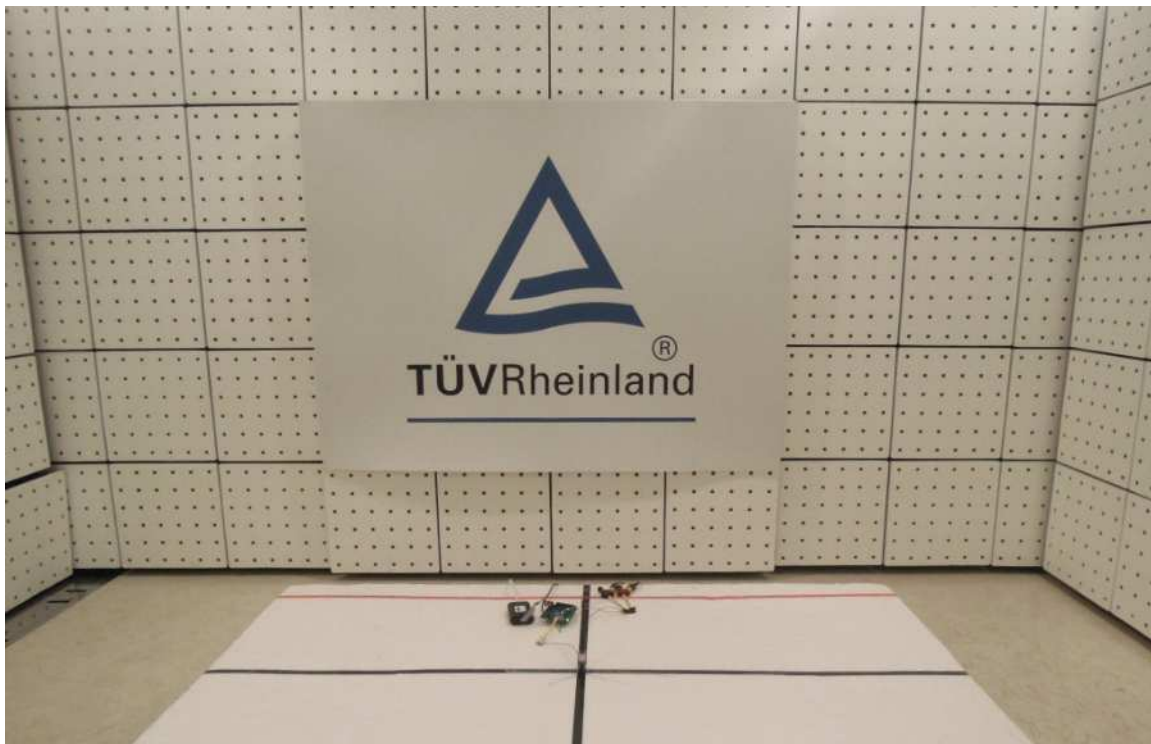
Maximum Exposure:

Power to Antenna (mW)	272.27 mW
Power to Antenna (dBm)	24.3 dBm
Antenna Gain	5 dBi
Power+Ant Gain	861.0 mW
Distance	20 cm
S=	0.171 mW/cm ²

Limit Canada: 0.542 mW/cm²**---End---**

7. Photographs of the Test Set-Up

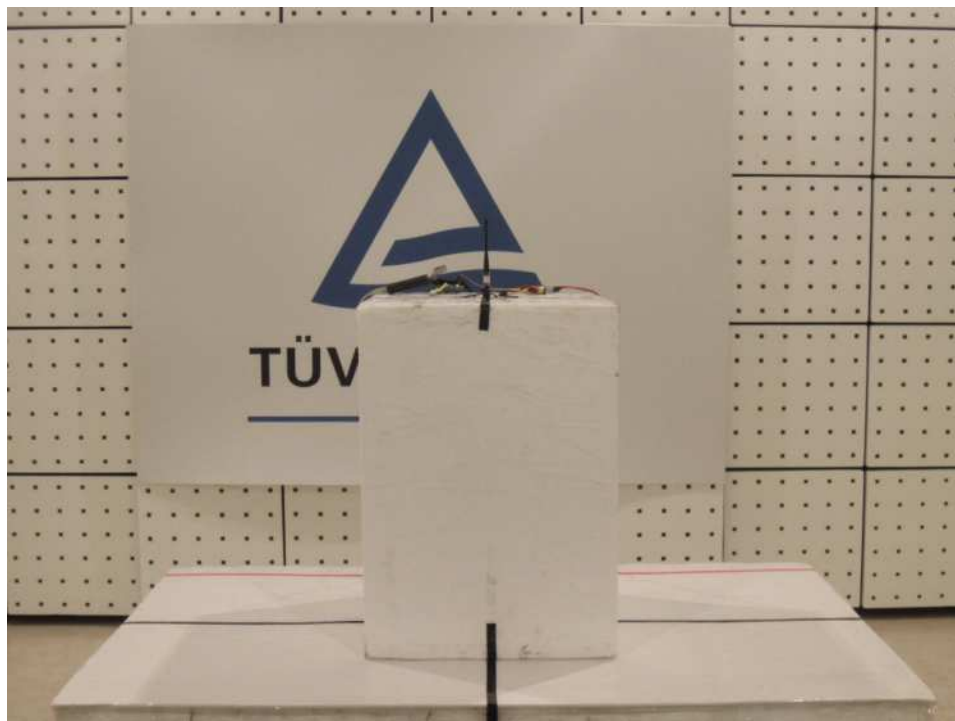
Photograph 1: Set-up for Spurious Emissions (Front View 1)- RFA-02-5-C7H1-ANT



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



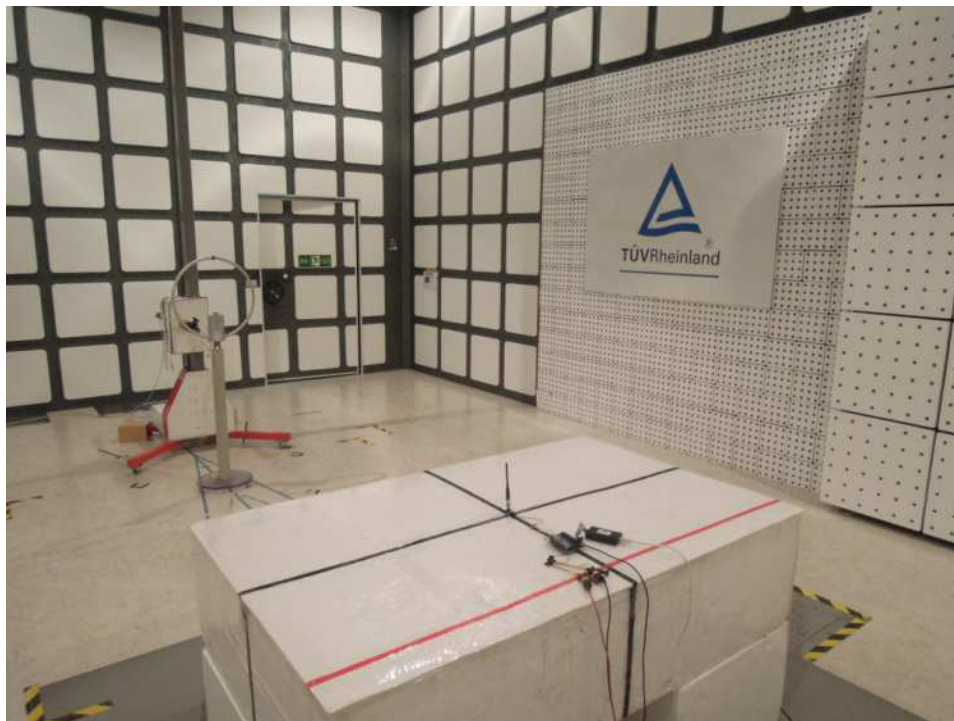
Photograph 3: Set-up for Spurious Emissions (Front View 2)- RFA-02-5-C7H1-ANT



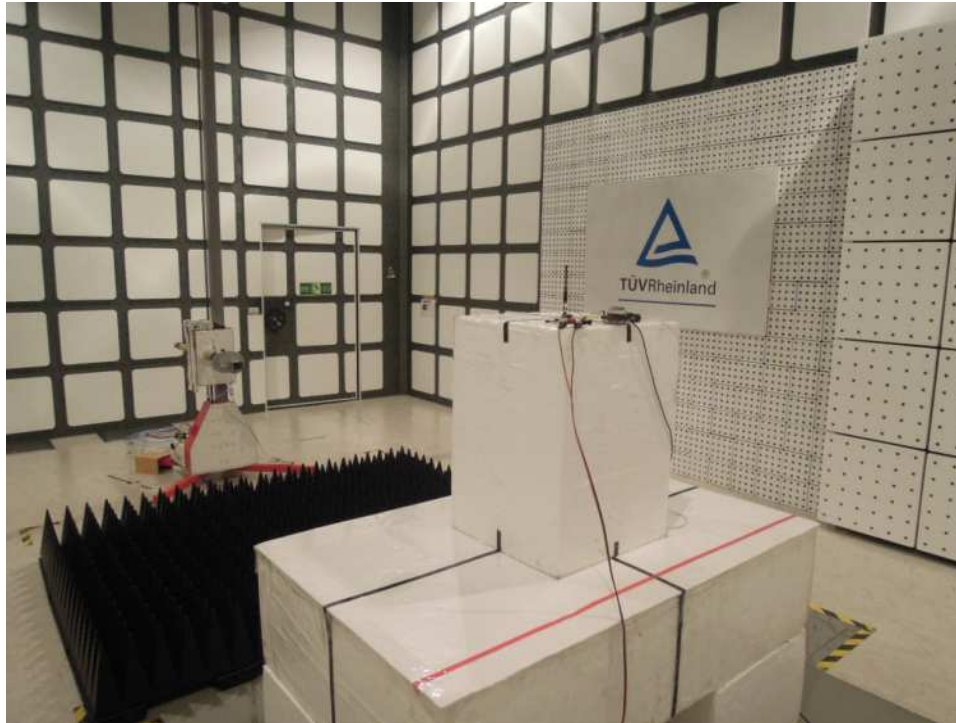
Photograph 4: Set-up for Spurious Emissions (Back View 2)- RFA-02-5-C7H1-ANT



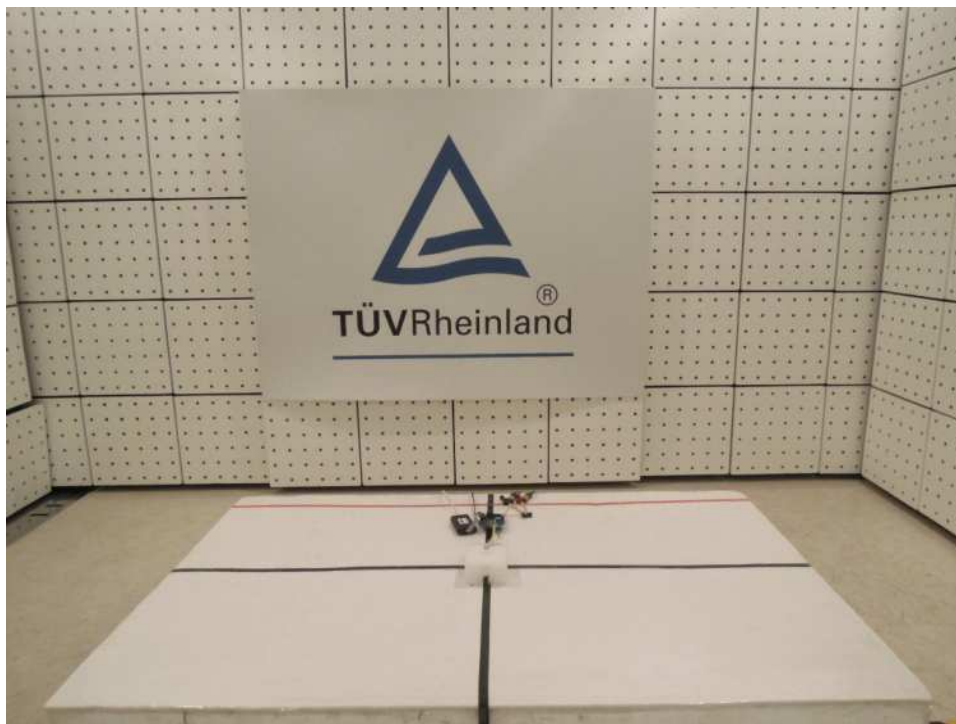
Photograph 5: Set-up for Spurious Emissions (Back View 3)- RFA-02-5-C7H1-ANT



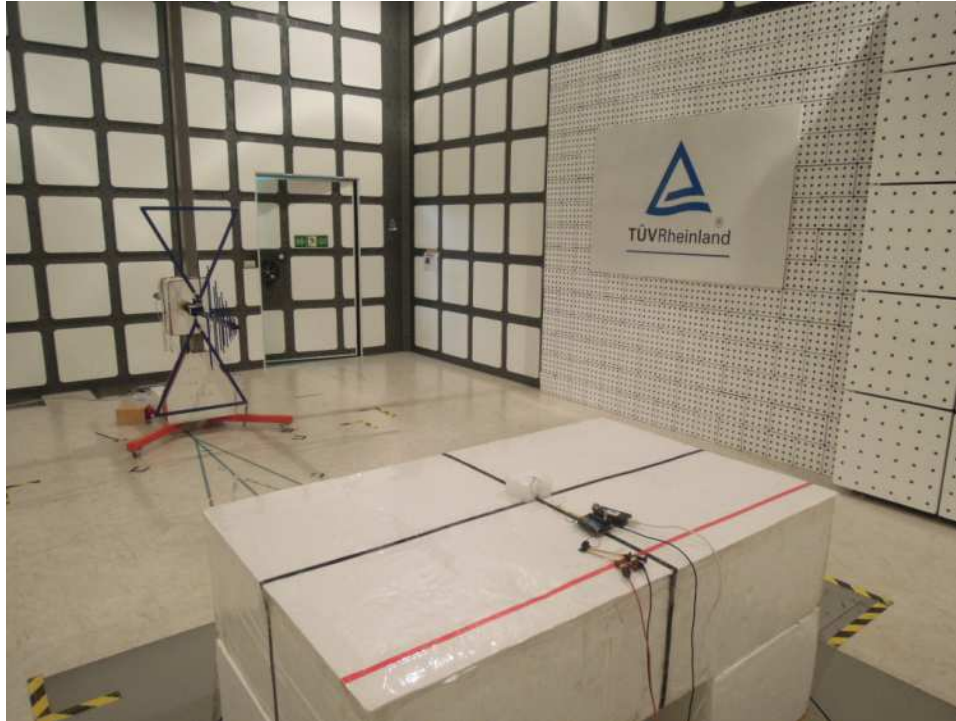
Photograph 6: Set-up for Spurious Emissions (Back View 4)- RFA-02-5-C7H1-ANT



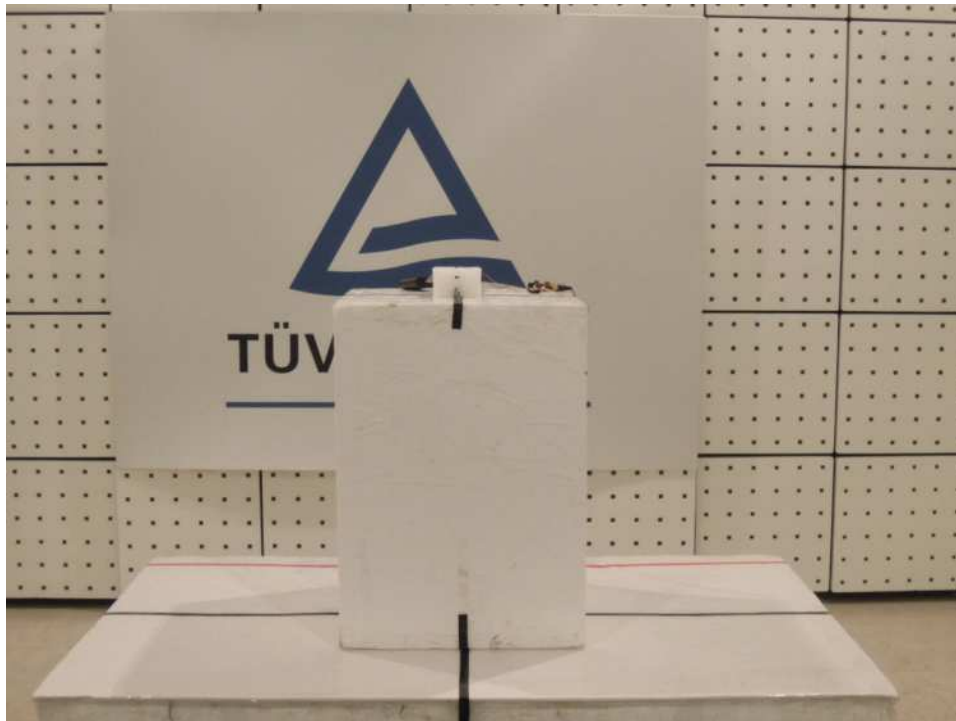
Photograph 7: Set-up for Spurious Emissions (Front View 1)- RFMTA331215-ANT



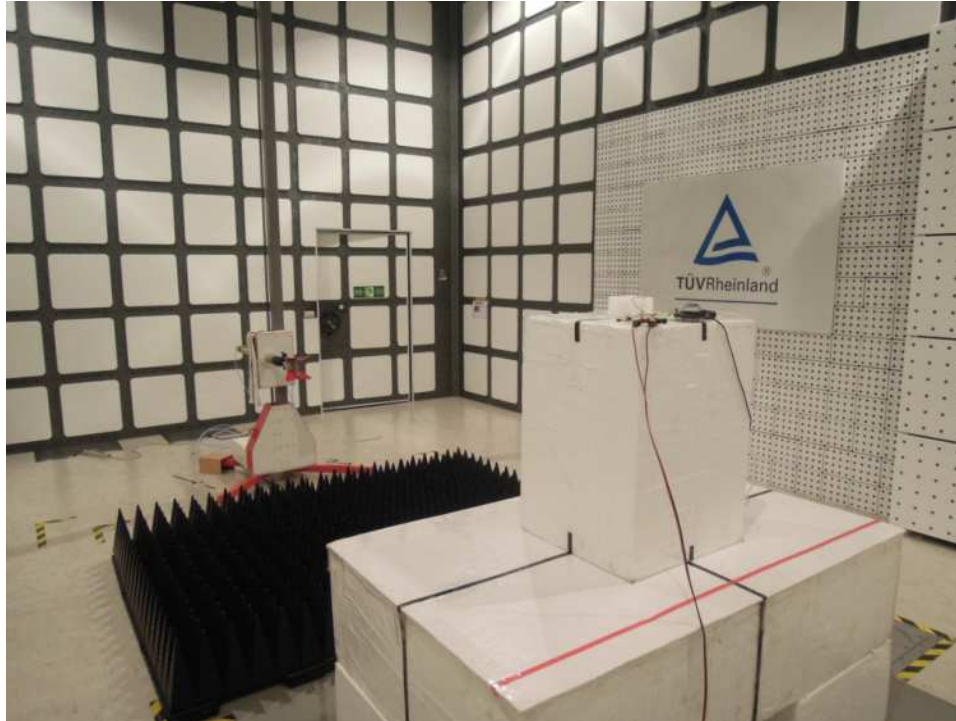
Photograph 8: Set-up for Spurious Emissions (Back View 1)- RFMTA331215-ANT



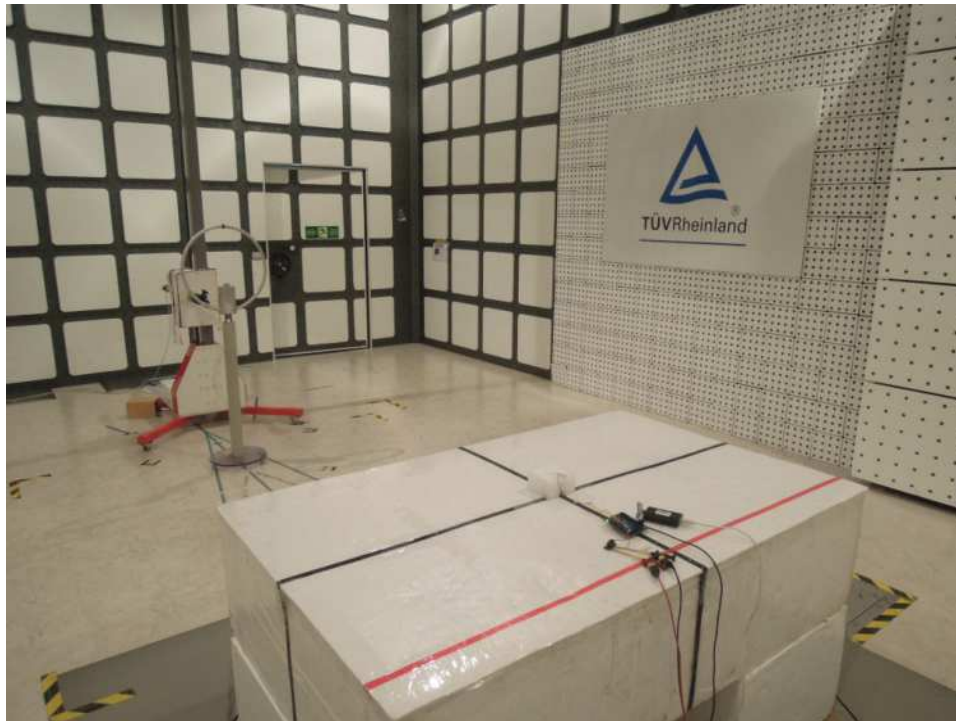
Photograph 9: Set-up for Spurious Emissions (Front View 2)- RFMTA331215-ANT



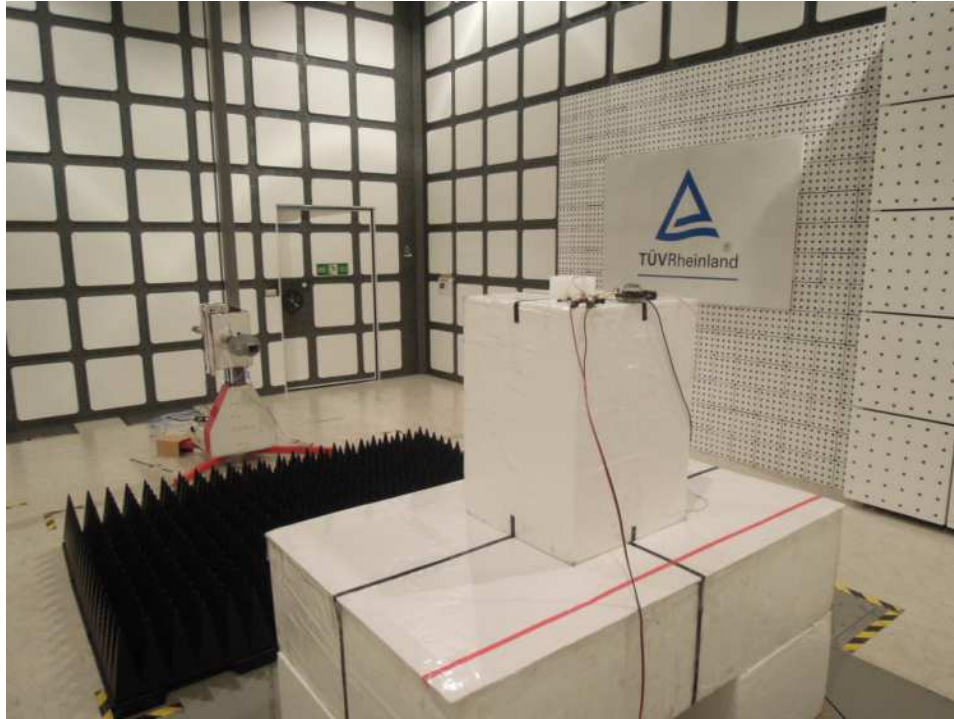
Photograph 10: Set-up for Spurious Emissions (Back View 2)- RFMTA331215-ANT



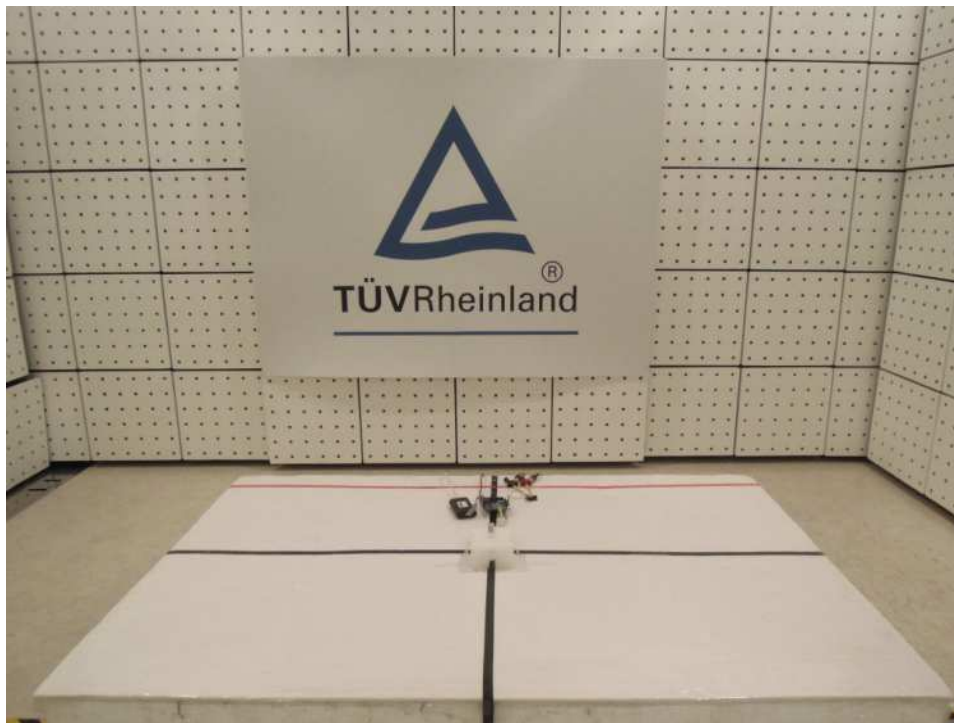
Photograph 11: Set-up for Spurious Emissions (Back View 3)- RFMTA331215-ANT



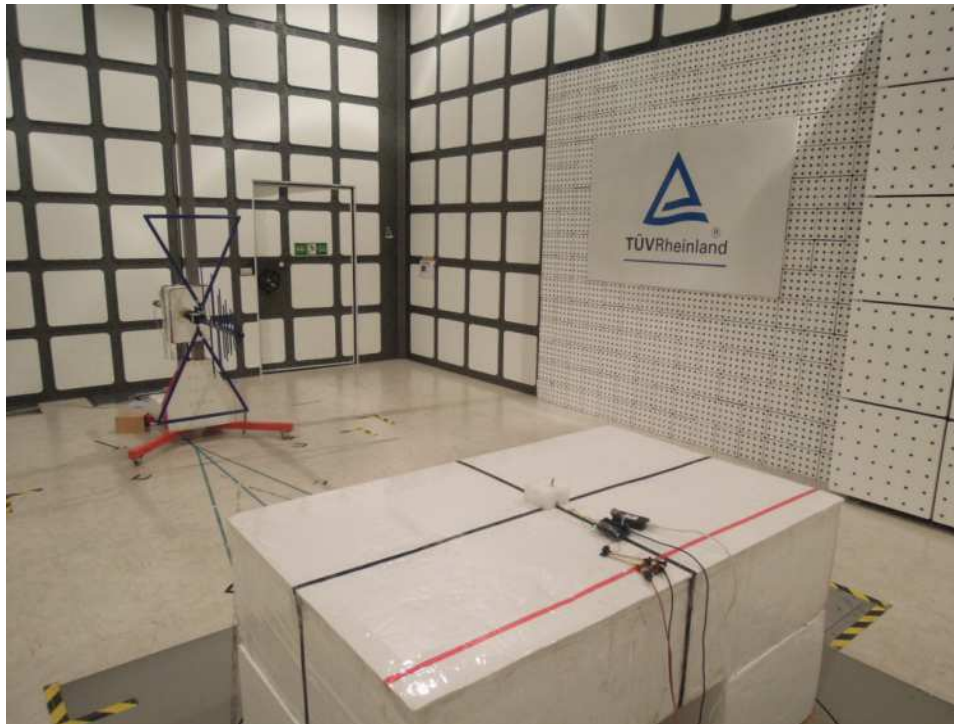
Photograph 12: Set-up for Spurious Emissions (Back View 4)- RFMTA331215-ANT



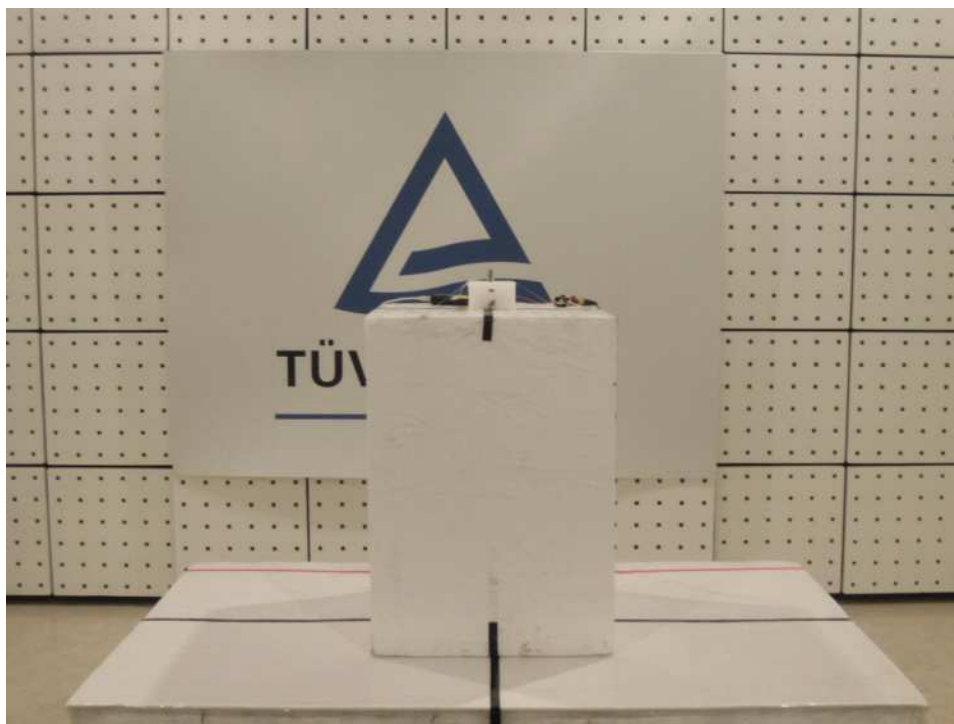
Photograph 13: Set-up for Spurious Emissions (Front View 1)- RFPCA381013IMAB701-ANT



Photograph 14: Set-up for Spurious Emissions (Back View 1)- RFPCA381013IMAB701-ANT



Photograph 15: Set-up for Spurious Emissions (Front View 2)- RFPCA381013IMAB701-ANT



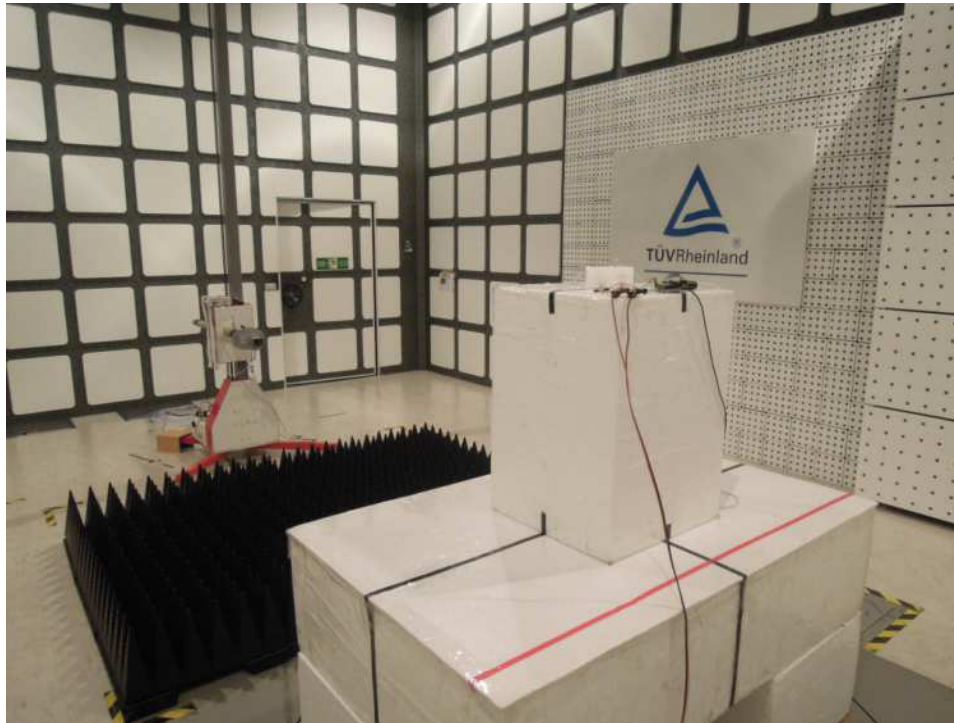
Photograph 16: Set-up for Spurious Emissions (Back View 2)- RFPCA381013IMAB701-ANT



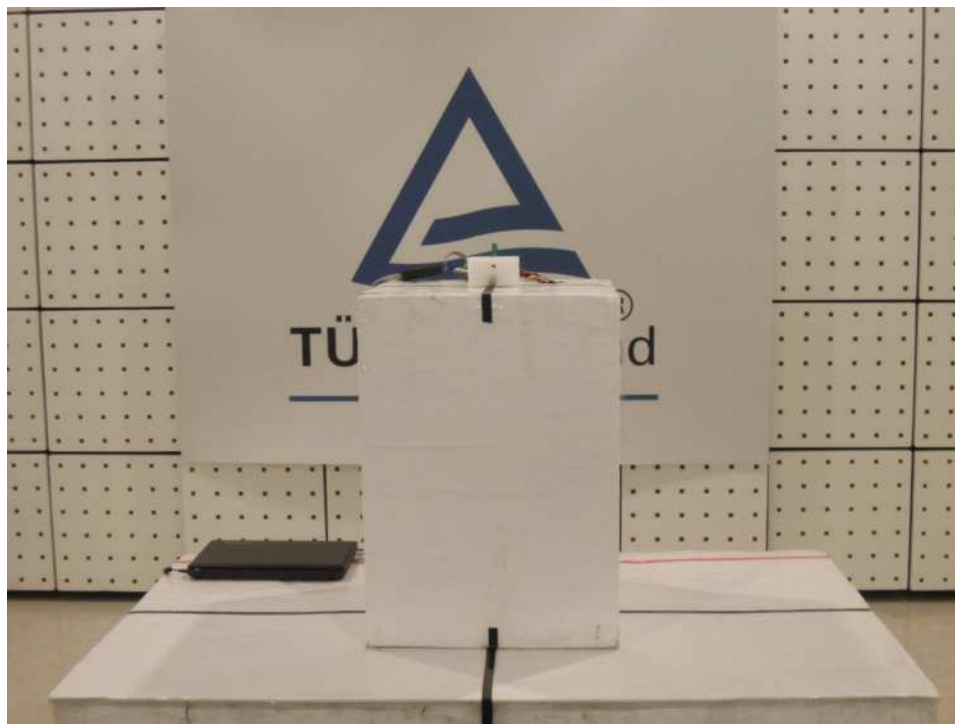
Photograph 17: Set-up for Spurious Emissions (Back View 3)- RFPCA381013IMAB701-ANT



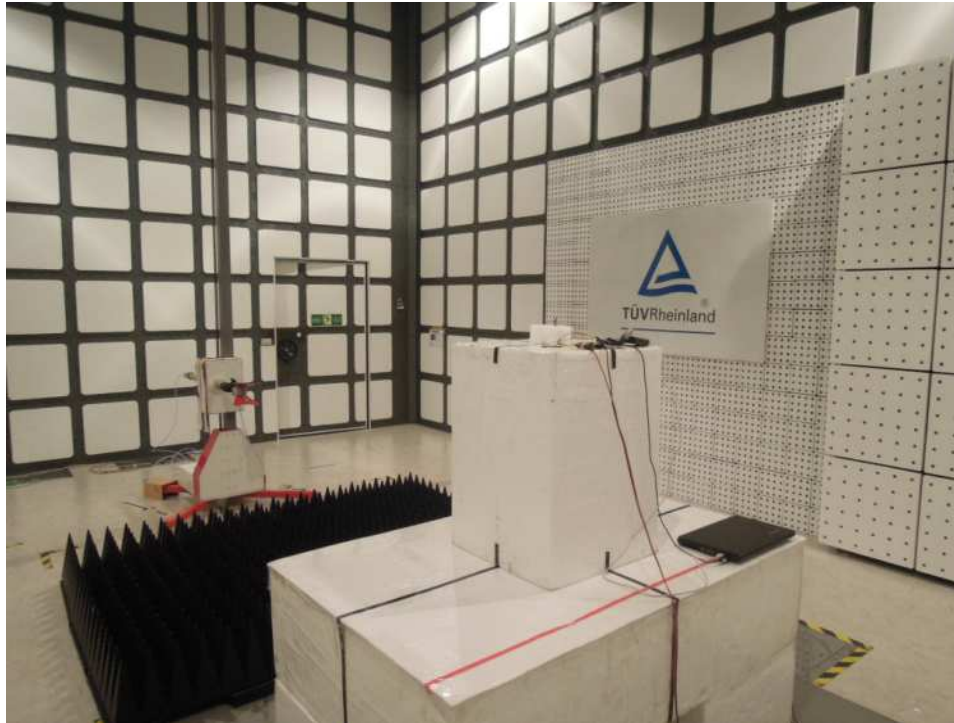
Photograph 18: Set-up for Spurious Emissions (Back View 4)- RFPCA381013IMAB701-ANT



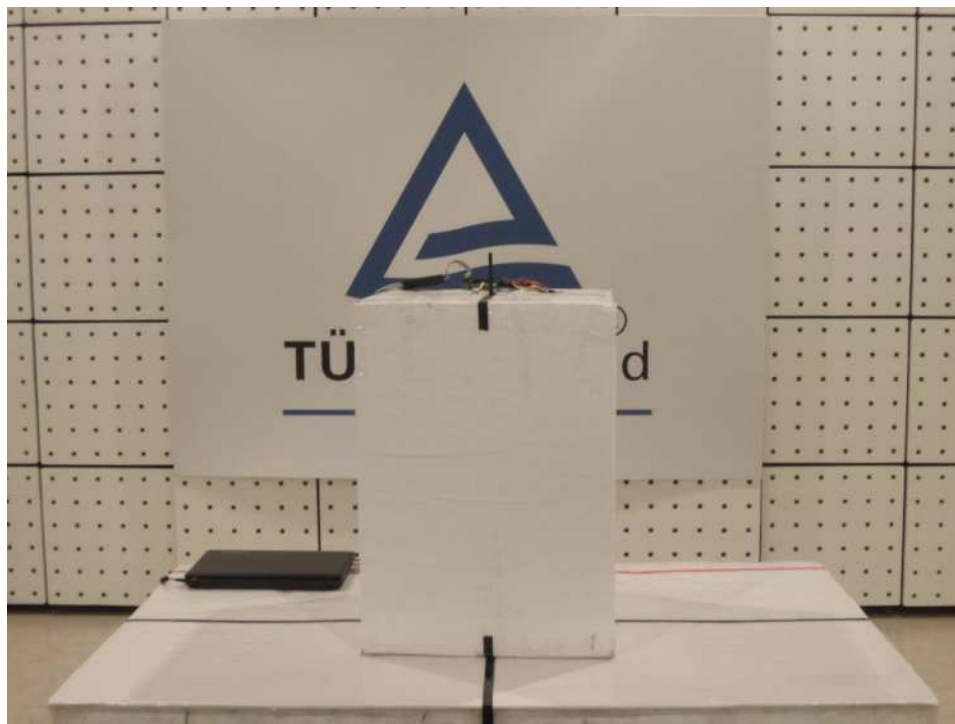
Photograph 19: Set-up for Spurious Emissions (Front View)- W3525B039 -ANT



Photograph 20: Set-up for Spurious Emissions (Back View)- W3525B039 -ANT



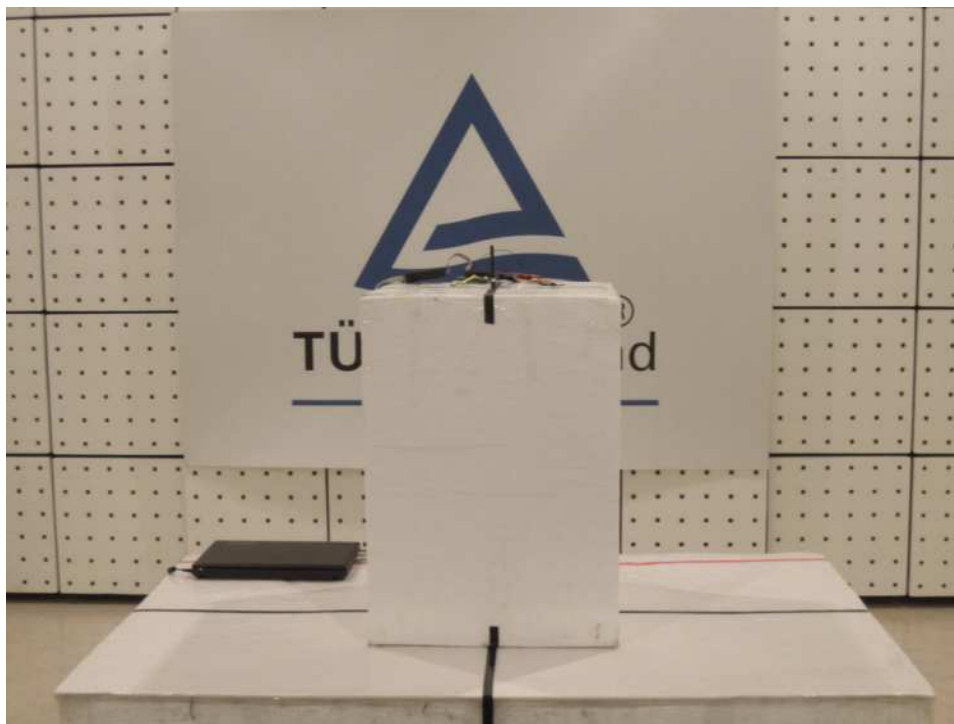
Photograph 21: Set-up for Spurious Emissions (Front View)- RN-SMA-4 -ANT



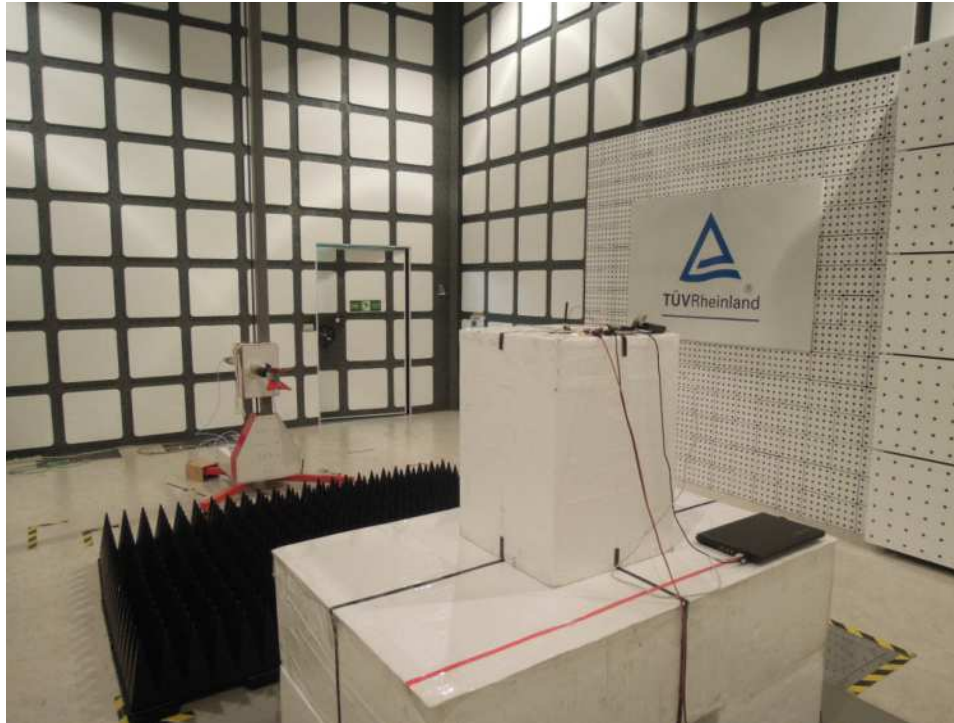
Photograph 22: Set-up for Spurious Emissions (Back View)- RN-SMA-4 -ANT



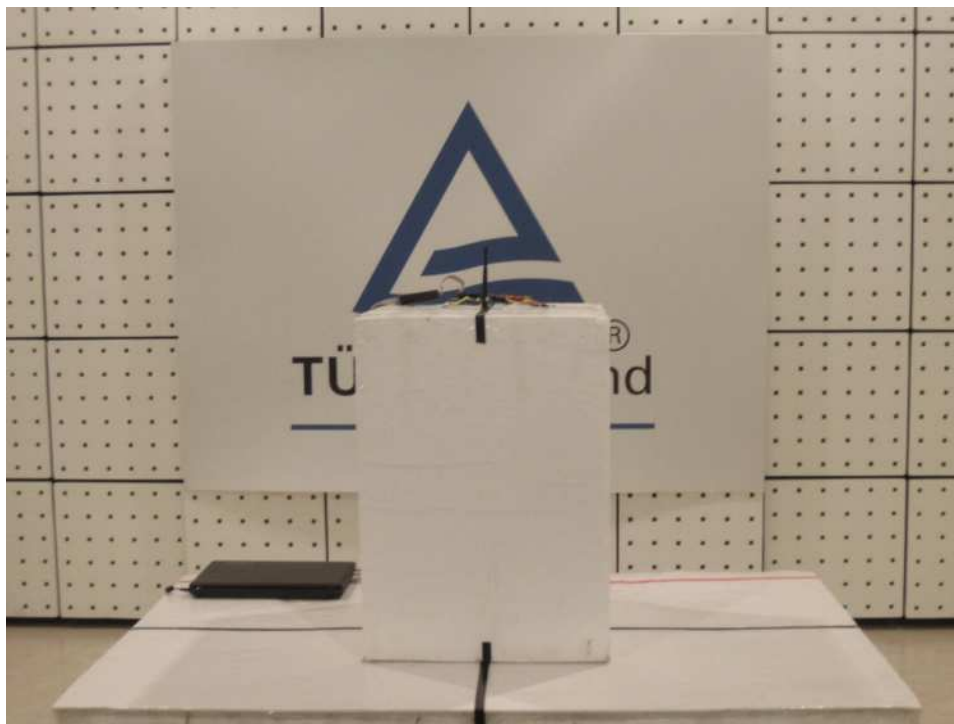
Photograph 23: Set-up for Spurious Emissions (Front View)- RFDPA870920IMLB301 - ANT



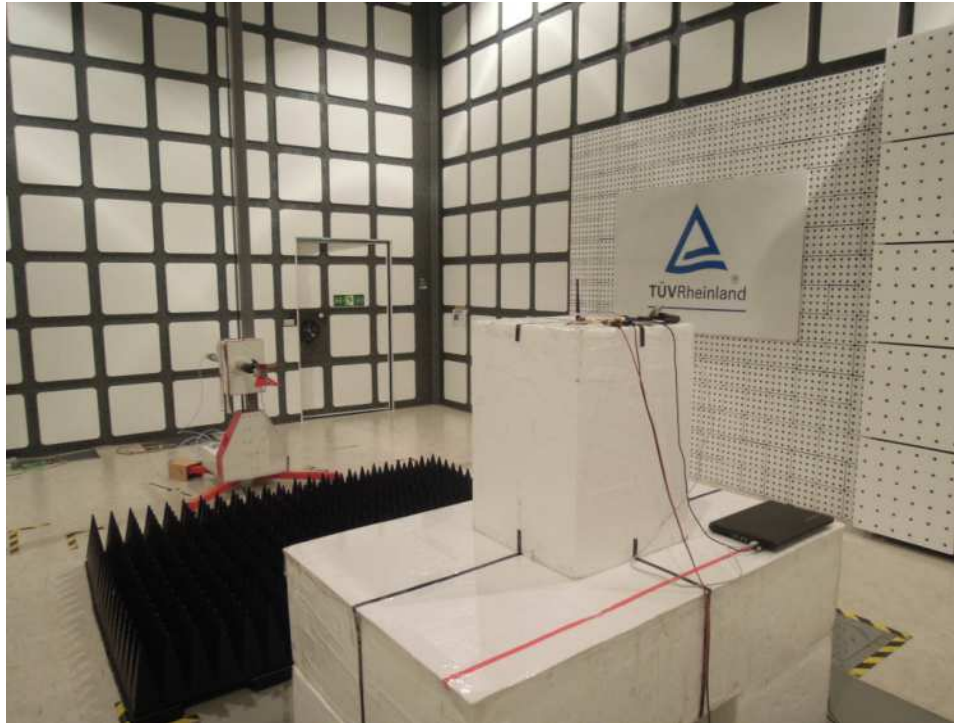
Photograph 24: Set-up for Spurious Emissions (Back View)- RFDPA870920IMLB301 -ANT



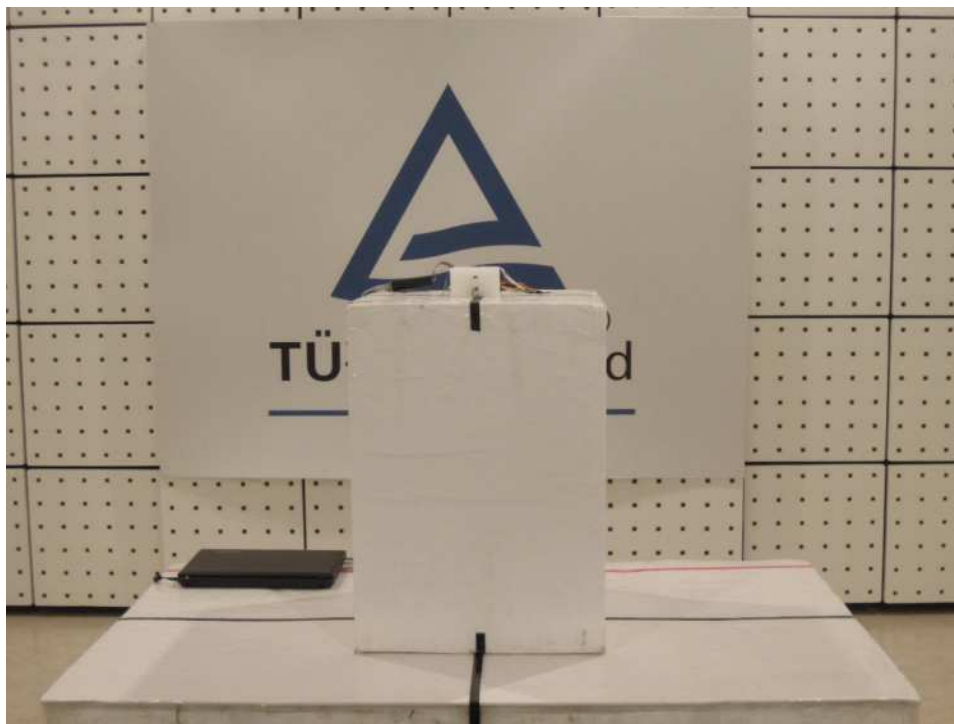
Photograph 25: Set-up for Spurious Emissions (Front View)- RFA-02-3-C5H1 -ANT



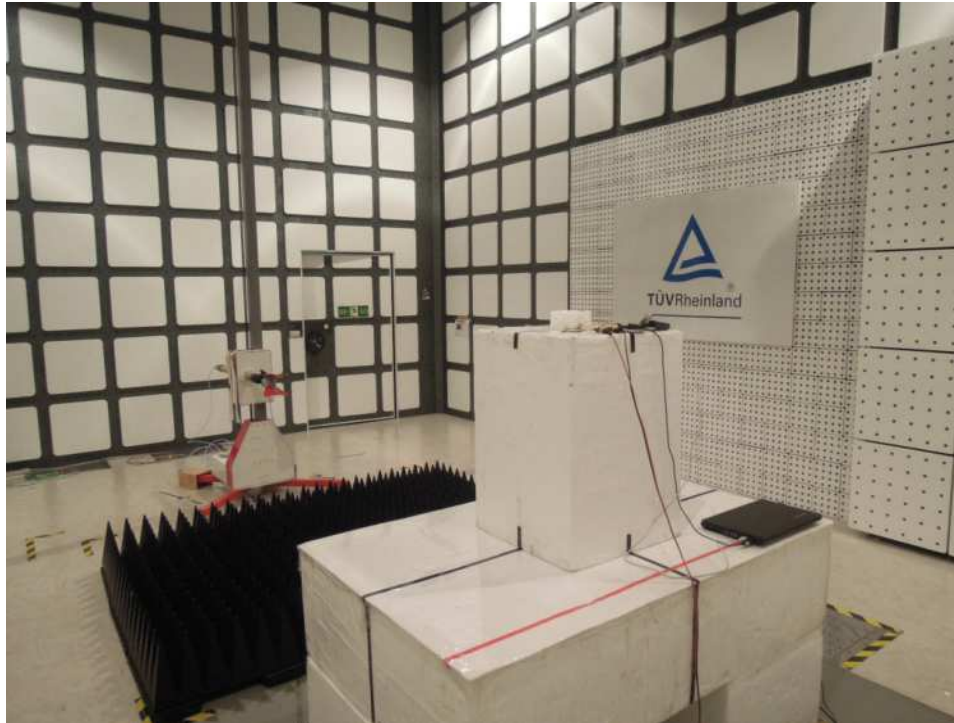
Photograph 26: Set-up for Spurious Emissions (Back View)- RFA-02-3-C5H1 -ANT



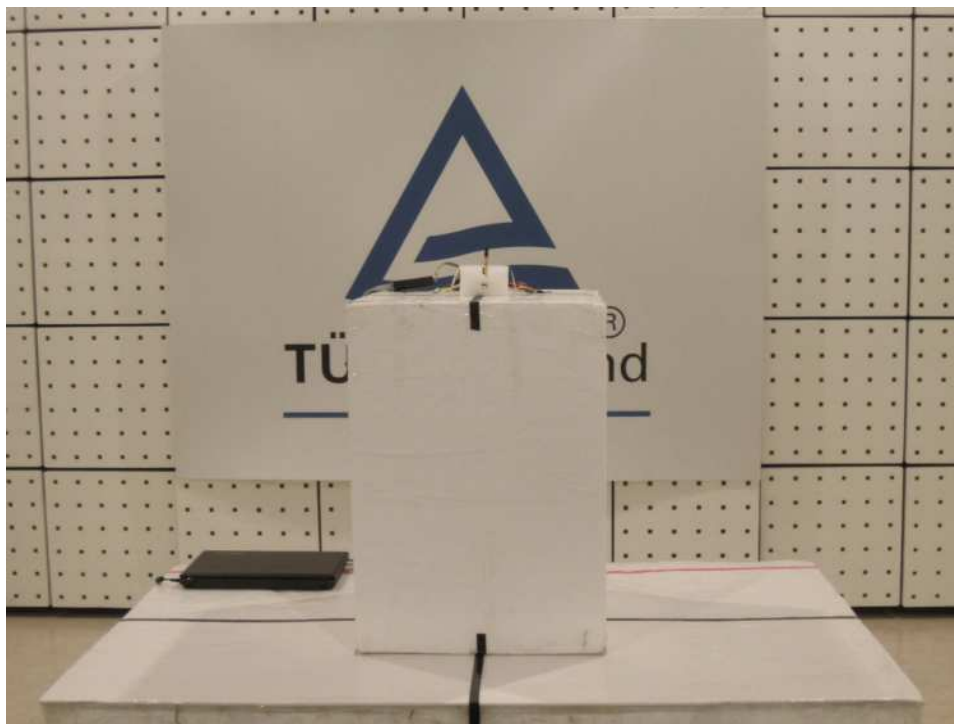
Photograph 27: Set-up for Spurious Emissions (Front View)- 1461530100 -ANT



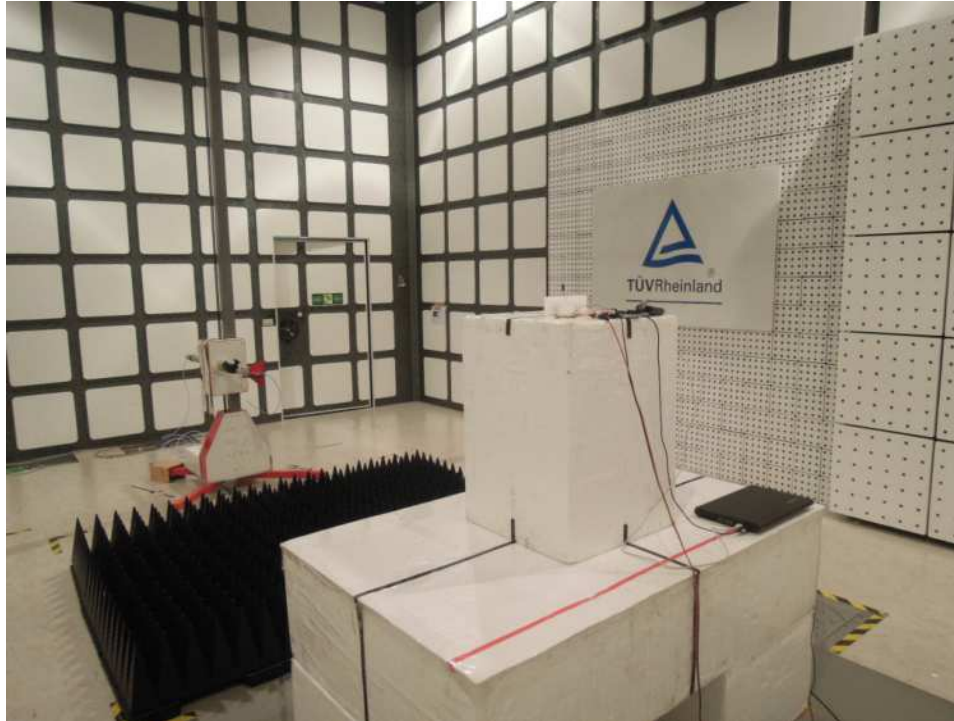
Photograph 28: Set-up for Spurious Emissions (Back View)- 1461530100 -ANT



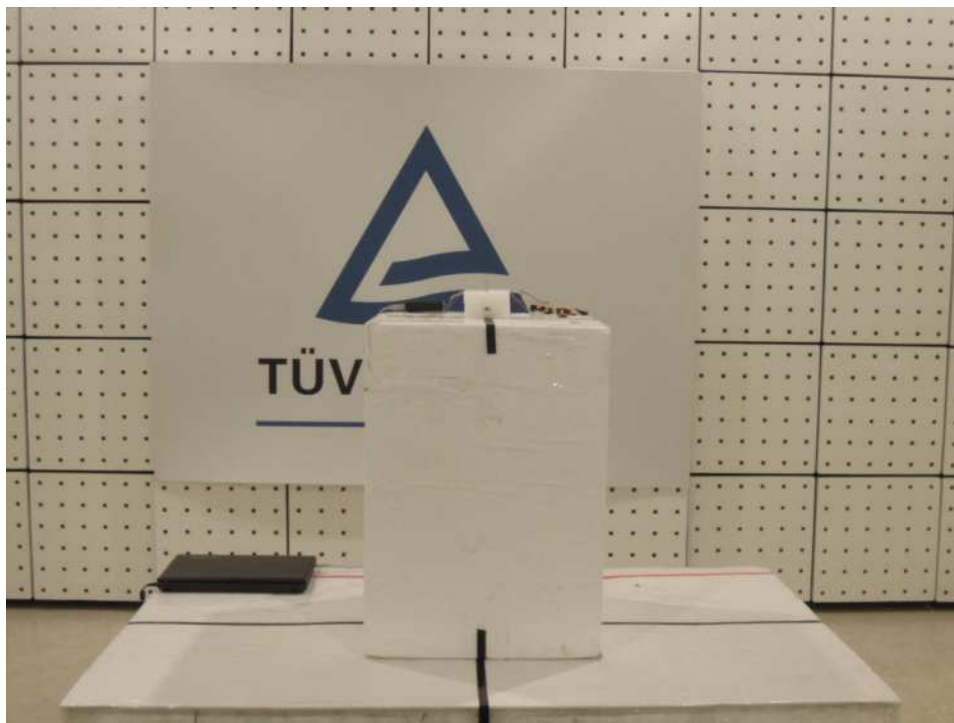
Photograph 29: Set-up for Spurious Emissions (Front View)- RN-SMA-S -ANT



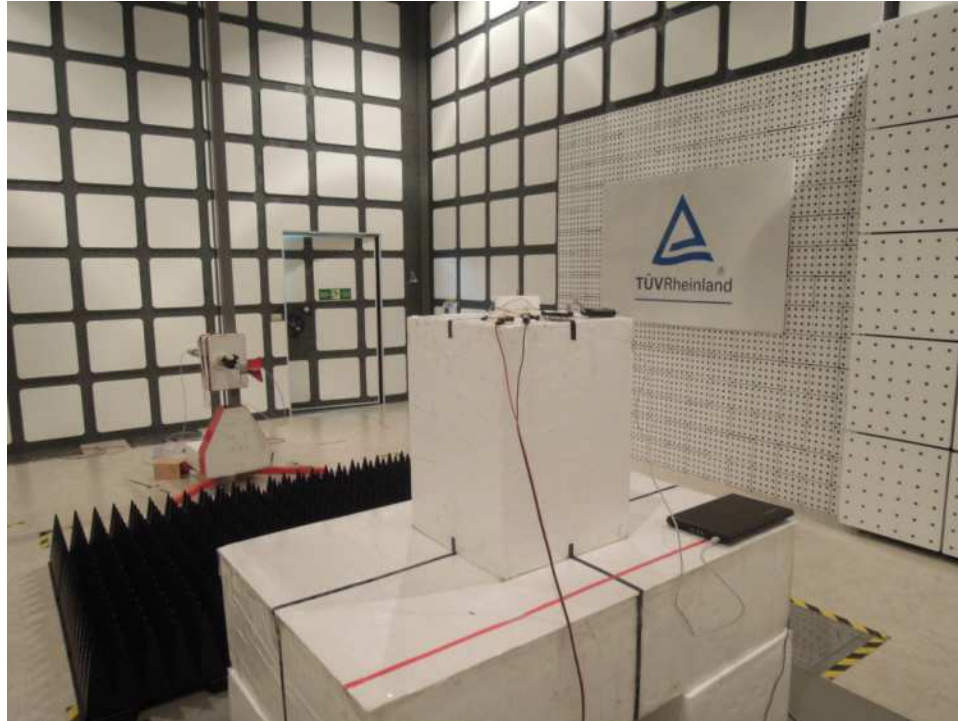
Photograph 30: Set-up for Spurious Emissions (Back View)- RN-SMA-S -ANT



Photograph 31: Set-up for Spurious Emissions (Front View)- RFA-02-G03-ANT



Photograph 32: Set-up for Spurious Emissions (Back View)- RFA-02-G03-ANT



Photograph 33: Set-up for Conducted testing



Photograph 34: Set-up for Conducted testing



Photograph 35: Set-up for Mains Conducted testing (Front View)



Photograph 36: Set-up for Mains Conducted testing (Back View)



8. List of Tables

Table 1: Applied Standard and Test Levels	4
Table 2: List of Test and Measurement Equipment	6
Table 3: Emission Measurement Uncertainty.....	7
Table 4: Basic Information of EUT	8
Table 5: Technical Specification of EUT	8
Table 6: Test result of Peak Output Power (802.11b)	16
Table 7: Test result of Peak Output Power (802.11g)	16
Table 8: Test result of Peak Output Power (802.11n HT20)	16
Table 9: Test result of 6dB Bandwidth (802.11b)	18
Table 10: Test result of 6dB Bandwidth (802.11g)	18
Table 11: Test result of 6dB Bandwidth (802.11n HT20)	18
Table 12: Test result of 99% Bandwidth (802.11b)	19
Table 13: Test result of 99% Bandwidth (802.11g)	19
Table 14: Test result of 99% Bandwidth (802.11n HT20)	19
Table 15: Test result of Power Density (802.11b)	32
Table 16: Test result of Power Density (802.11g)	32
Table 17: Test result of Power Density (802.11n HT20)	32

9. List of Photographs

Photograph 1: Set-up for Spurious Emissions (Front View 1)- RFA-02-5-C7H1-ANT	52
Photograph 2: Set-up for Spurious Emissions (Back View 1)- RFA-02-5-C7H1-ANT	53
Photograph 3: Set-up for Spurious Emissions (Front View 2)- RFA-02-5-C7H1-ANT	53
Photograph 4: Set-up for Spurious Emissions (Back View 2)- RFA-02-5-C7H1-ANT	54
Photograph 5: Set-up for Spurious Emissions (Back View 3)- RFA-02-5-C7H1-ANT	54
Photograph 6: Set-up for Spurious Emissions (Back View 4)- RFA-02-5-C7H1-ANT	55
Photograph 7: Set-up for Spurious Emissions (Front View 1)- RFMTA331215-ANT	55
Photograph 8: Set-up for Spurious Emissions (Back View 1)- RFMTA331215-ANT	56
Photograph 9: Set-up for Spurious Emissions (Front View 2)- RFMTA331215-ANT	56
Photograph 10: Set-up for Spurious Emissions (Back View 2)- RFMTA331215-ANT	57
Photograph 11: Set-up for Spurious Emissions (Back View 3)- RFMTA331215-ANT	57
Photograph 12: Set-up for Spurious Emissions (Back View 4)- RFMTA331215-ANT	58
Photograph 13: Set-up for Spurious Emissions (Front View 1)- RFPCA381013IMAB701-ANT	58
Photograph 14: Set-up for Spurious Emissions (Back View 1)- RFPCA381013IMAB701-ANT	59
Photograph 15: Set-up for Spurious Emissions (Front View 2)- RFPCA381013IMAB701-ANT	59
Photograph 16: Set-up for Spurious Emissions (Back View 2)- RFPCA381013IMAB701-ANT	60
Photograph 17: Set-up for Spurious Emissions (Back View 3)- RFPCA381013IMAB701-ANT	60
Photograph 18: Set-up for Spurious Emissions (Back View 4)- RFPCA381013IMAB701-ANT	61
Photograph 19: Set-up for Spurious Emissions (Front View)- W3525B039 -ANT	61
Photograph 20: Set-up for Spurious Emissions (Back View)- W3525B039 -ANT	62
Photograph 21: Set-up for Spurious Emissions (Front View)- RN-SMA-4 -ANT	62
Photograph 22: Set-up for Spurious Emissions (Back View)- RN-SMA-4 -ANT	63
Photograph 23: Set-up for Spurious Emissions (Front View)- RFDPA870920IMLB301 -ANT	63
Photograph 24: Set-up for Spurious Emissions (Back View)- RFDPA870920IMLB301 -ANT	64
Photograph 25: Set-up for Spurious Emissions (Front View)- RFA-02-3-C5H1 -ANT	64
Photograph 26: Set-up for Spurious Emissions (Back View)- RFA-02-3-C5H1 -ANT	65
Photograph 27: Set-up for Spurious Emissions (Front View)- 1461530100 -ANT	65
Photograph 28: Set-up for Spurious Emissions (Back View)- 1461530100 -ANT	66
Photograph 29: Set-up for Spurious Emissions (Front View)- RN-SMA-S -ANT	66
Photograph 30: Set-up for Spurious Emissions (Back View)- RN-SMA-S -ANT	67
Photograph 31: Set-up for Spurious Emissions (Front View)- RFA-02-G03-ANT	67
Photograph 32: Set-up for Spurious Emissions (Back View)- RFA-02-G03-ANT	68
Photograph 33: Set-up for Conducted testing	68
Photograph 34: Set-up for Conducted testing	69
Photograph 35: Set-up for Mains Conducted testing (Front View).....	69
Photograph 36: Set-up for Mains Conducted testing (Back View)	70