

<b>Prüfbericht-Nr.:</b> <i>Test Report No.:</i>	50141823 001	<b>Auftrags-Nr.:</b> <i>Order No.:</i>	114074446	<b>Seite 1 von 72</b> <i>Page 1 of 72</i>
<b>Kunden-Referenz-Nr.:</b> N/A <i>Client Reference No.:</i>		<b>Auftragsdatum:</b> 12-Feb-2018 <i>Order date:</i>		
<b>Auftraggeber:</b> <i>Client:</i>		Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States.		
<b>Prüfgegenstand:</b> <i>Test item:</i>		IEEE 802.11 b/g/n Link Controller Module With Integrated Bluetooth		
<b>Bezeichnung / Typ-Nr.:</b> ATWILC3000-MR110UA <i>Identification / Type No.:</i>				
<b>Auftrags-Inhalt:</b> FCC Part 15C / IC RSS-247 Test report (Wi-Fi 2.4GHz) <i>Order content:</i>				
<b>Prüfgrundlage:</b> <i>Test specification:</i> FCC 47CFR Part 15: Subpart C Section 15.247 RSS-247 (02-2017)				
<b>Wareneingangsdatum:</b> 14-Feb-2018 <i>Date of receipt:</i>				
<b>Prüfmuster-Nr.:</b> A000698723-002 <i>Test sample No.:</i> A000698723-003				
<b>Prüfzeitraum:</b> 28-Mar-2018 – 21-Apr-2018 <i>Testing period:</i>				
<b>Ort der Prüfung:</b> EMC/RF Laboratory Taipei <i>Place of testing:</i>				
<b>Prüflaboratorium:</b> TUV Rheinland Taiwan Ltd. <i>Testing laboratory:</i>				
<b>Prüfergebnis*:</b> Pass <i>Test result*:</i>				
<b>Report Date / tested by:</b> 06-Jun-2018 Jack Chang/Project Manager		<b>kontrolliert von / reviewed by:</b> 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>
<b>Sonstiges / Other:</b>				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>	
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(pass) = entspricht o.g. Prüfgrundlage(n) F(fail) = 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(pass) = passed a.m. test specification(s) F(fail) = 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> <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>				

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## 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*

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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**  
(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

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## 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  $\pm 3\text{dB}$ .

**Table 3: Emission Measurement Uncertainty**

Parameter	Uncertainty
RF power, conducted	$\pm 1.5\text{ dB}$
Adjacent channel power	$\pm 3\text{ dB}$
Radiated emission of transmitter, valid up to 26 GHz	$\pm 6\text{ dB}$
Radiated emission of receiver, valid up to 26 GHz	$\pm 6\text{ dB}$
Temperature	$\pm 2\text{ }^{\circ}\text{C}$
Humidity	$\pm 10\text{ \%}$

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## 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	ATWIILC3000-MR110UA
FCC ID	2ADHKWILC3000U
Canada ID	20266-WILC3000UA
Canada HVIN	ATWIILC3000-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**

SNo.	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	RFMTA331215IMAB701	WALSIN	3.8 dBi	Metal Stamp	Cable length 150mm
5	RFMTA331240IMAB701	WALSIN	3.0 dBi	Metal Stamp	Antenna same as SNo.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 SNo.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	

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### 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:

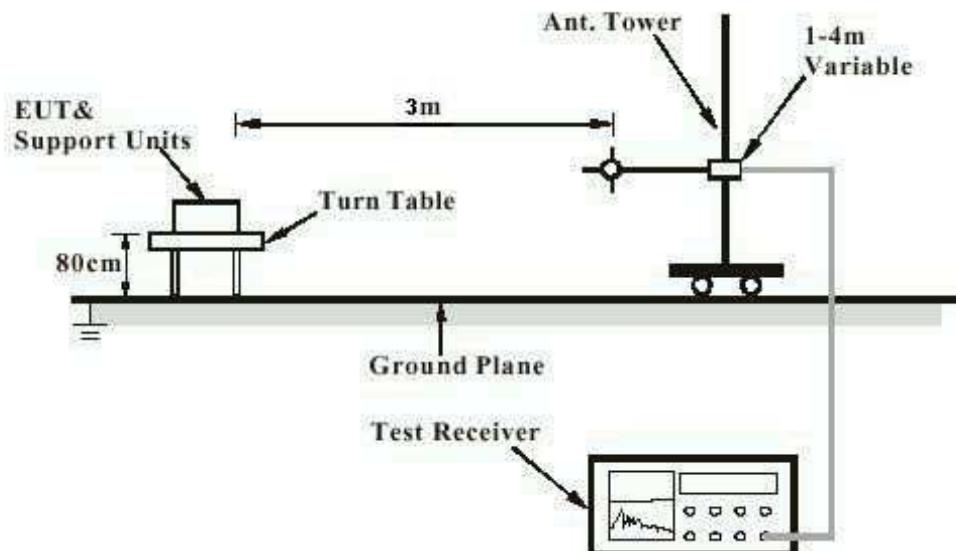
Description	Manufacturer	Model No.	Serial No.
Notebook(EMC-06)	Lenovo	TP00048A	PB-0F8B2
Test tool	Microchip	WILC3000/WINC3400 rev7189	N/A

### 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**

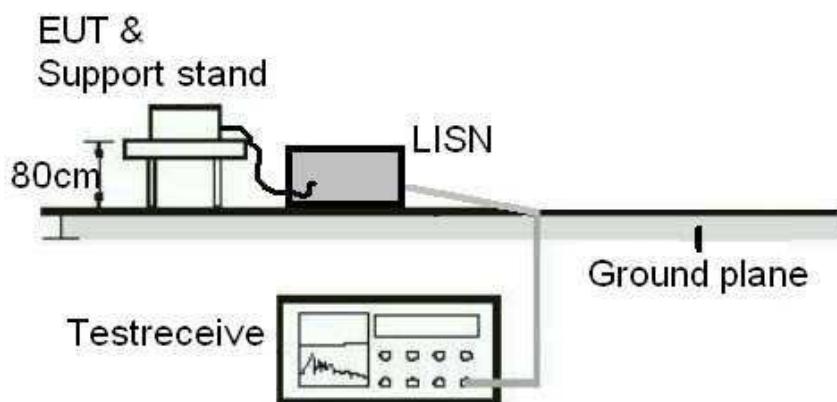


Note: Measurements above 1 GHz are done with a table height of 1.5m.

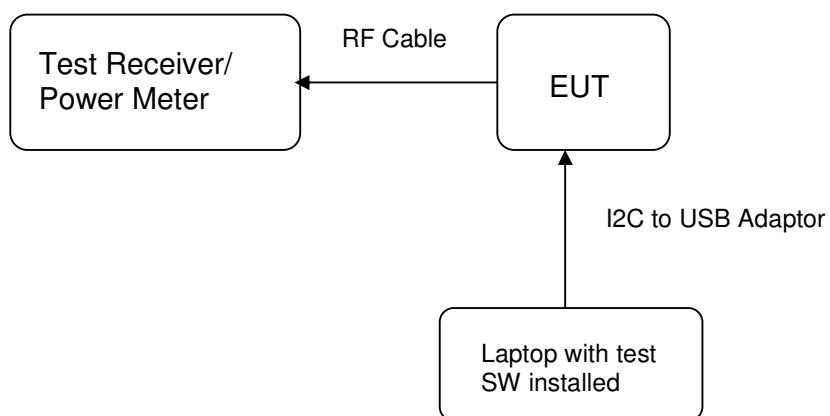
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**Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)**



**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.

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### 5.1.2 Peak Output Power

#### RESULT:

**Passed**

Test standard	:	LP0002(2018): 3.10.1.2
Basic standard	:	FCC Part 15.247(b)(3), RSS-247 5.4(4)
Limit	:	ANSI C63.10:2013, KDB558074
Kind of test site	:	1 Watt
	:	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

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

Channel	Channel Frequency (MHz)	Output Power		Limit	Power Setting
		(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	Power Setting
		(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	Power Setting
		(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

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### 5.1.3 6dB Bandwidth and 99% Bandwidth

**RESULT:****Passed**

Test standard : LP0002(2018): 3.10.1.5  
Basic standard : FCC Part 15.247(a)(2), RSS-247 5.2(1)  
Kind of test site : 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

**Prüfbericht - Nr.: 50141823 001**  
Test Report No.Seite 18 von 72  
Page 18 of 72**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

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**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)**

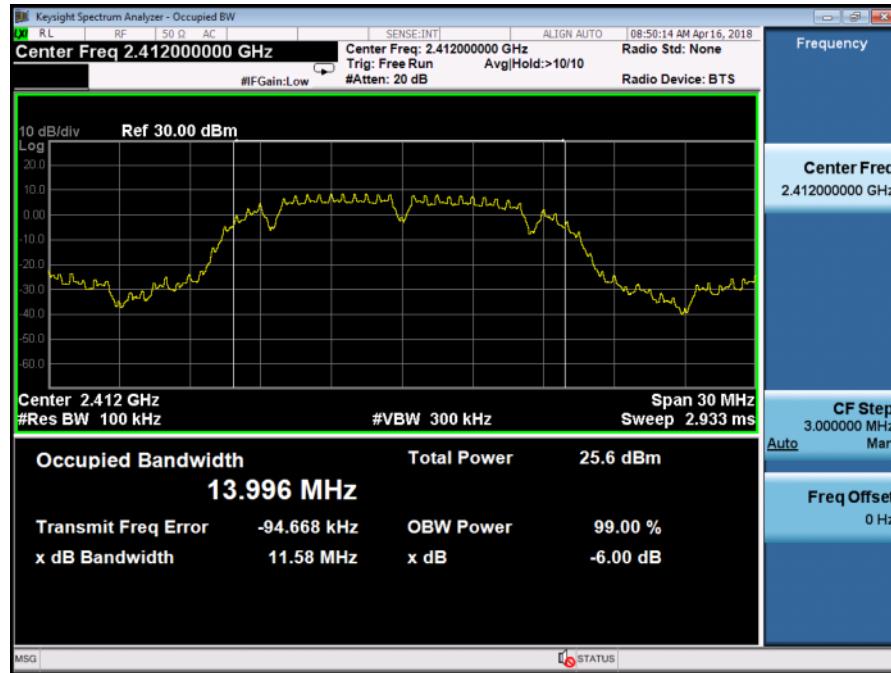
Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	17.886
Mid Channel	2437	18.536
High Channel	2462	17.901

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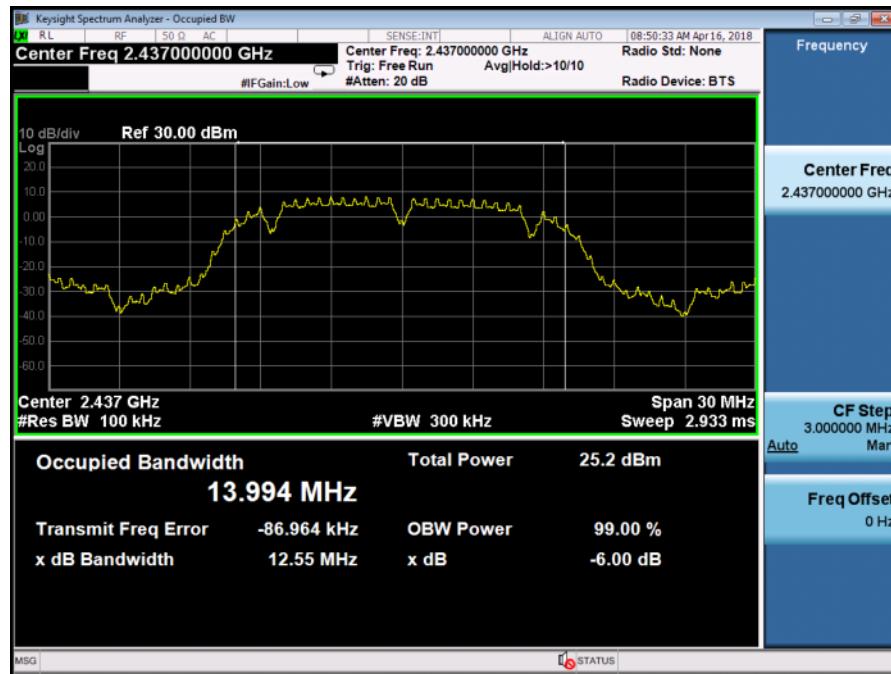
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### Test Plot of 6dB Bandwidth (802.11b)

#### Low Channel

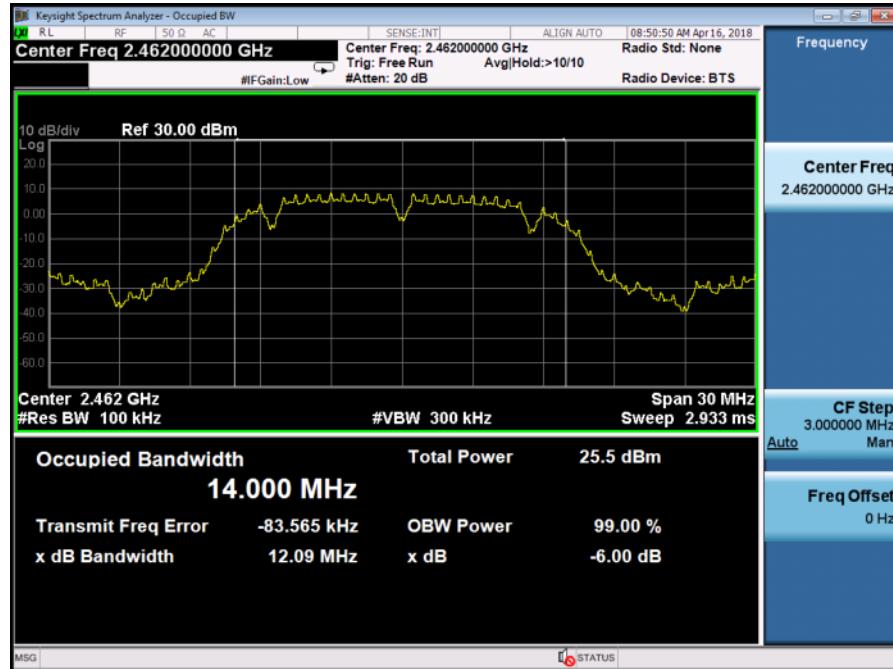


#### Middle Channel



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## High Channel

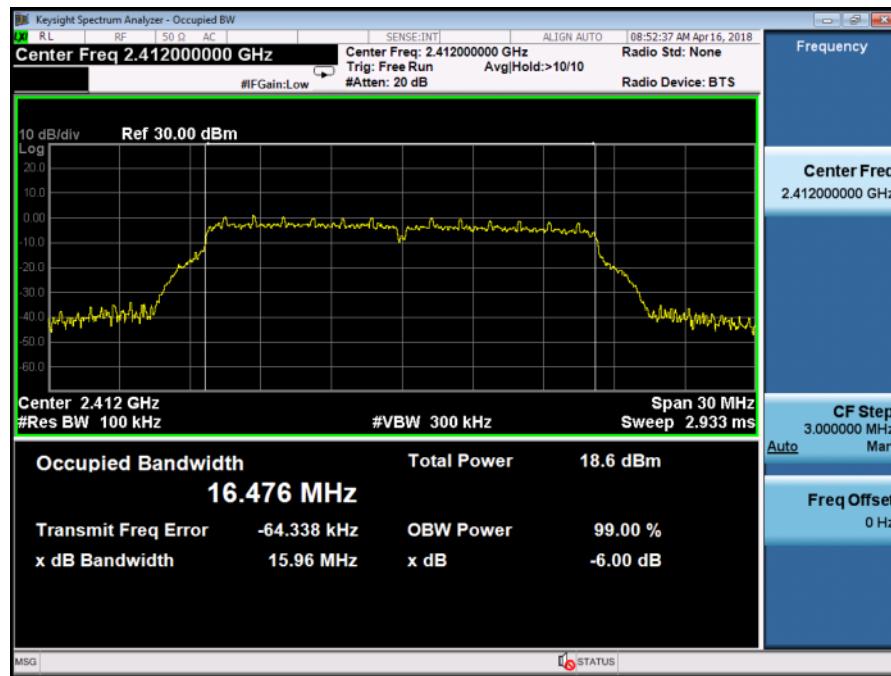


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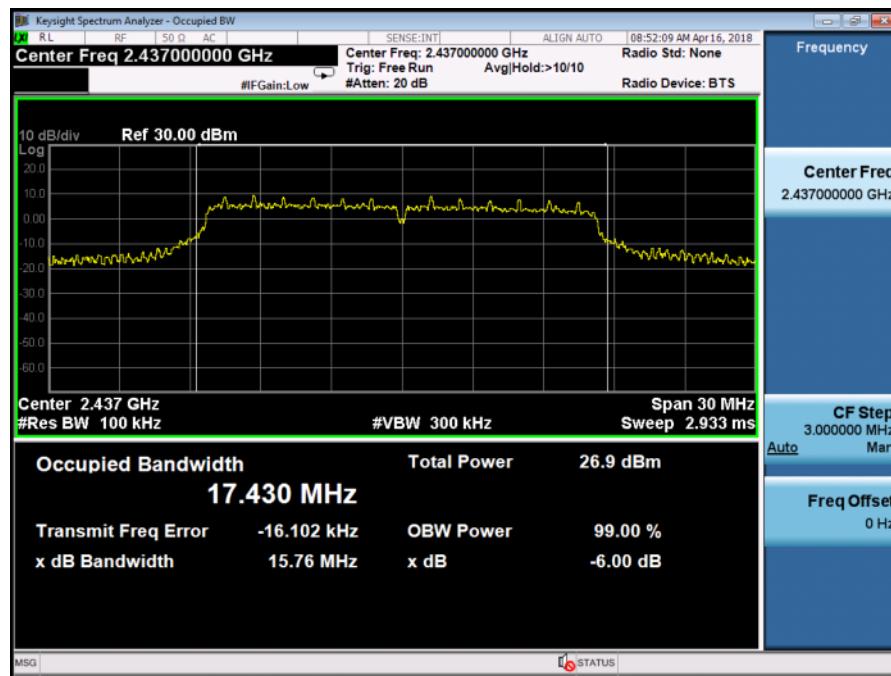
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### Test Plot of 6dB Bandwidth (802.11g)

#### Low Channel

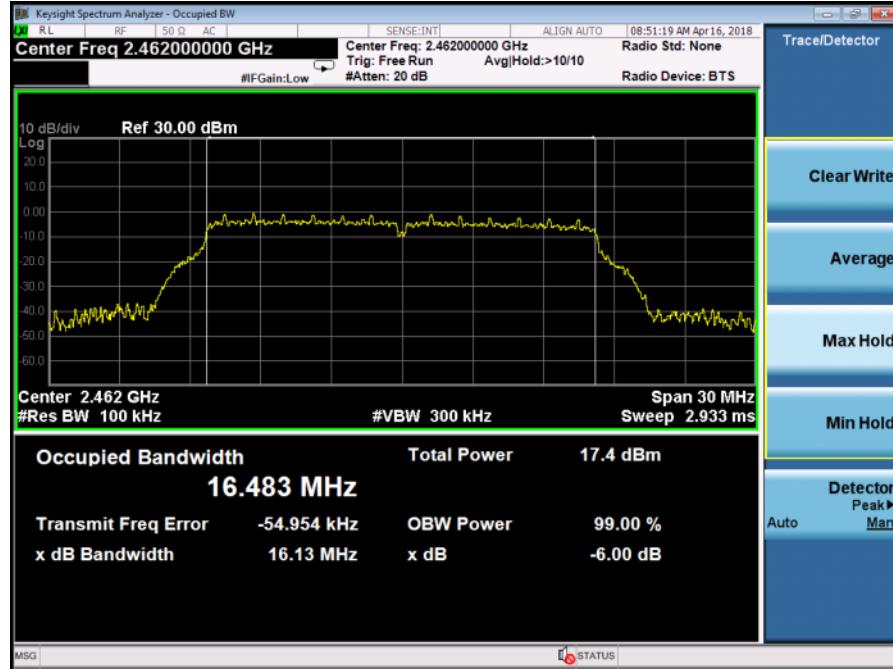


#### Middle Channel



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## High Channel

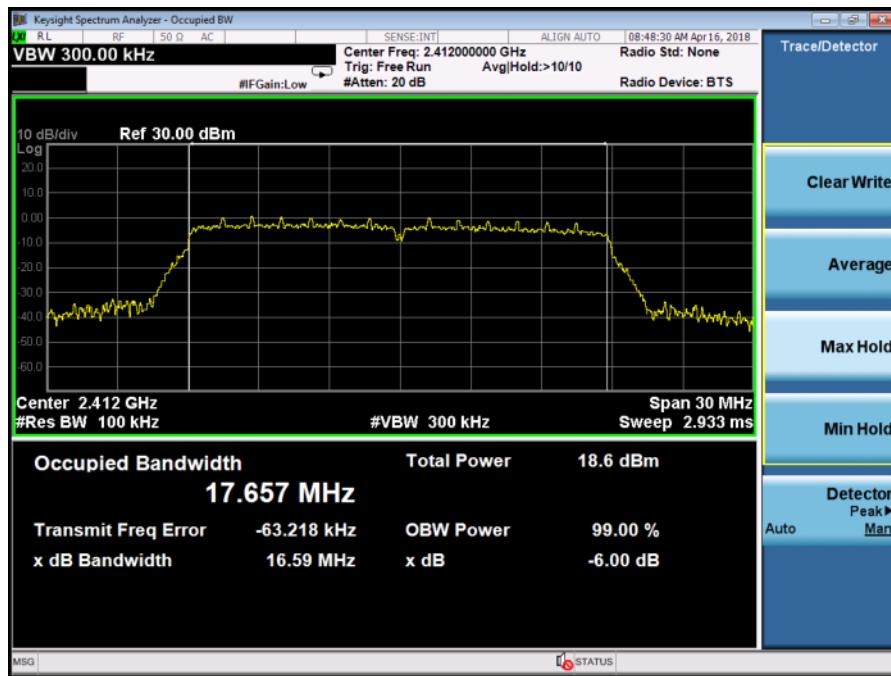


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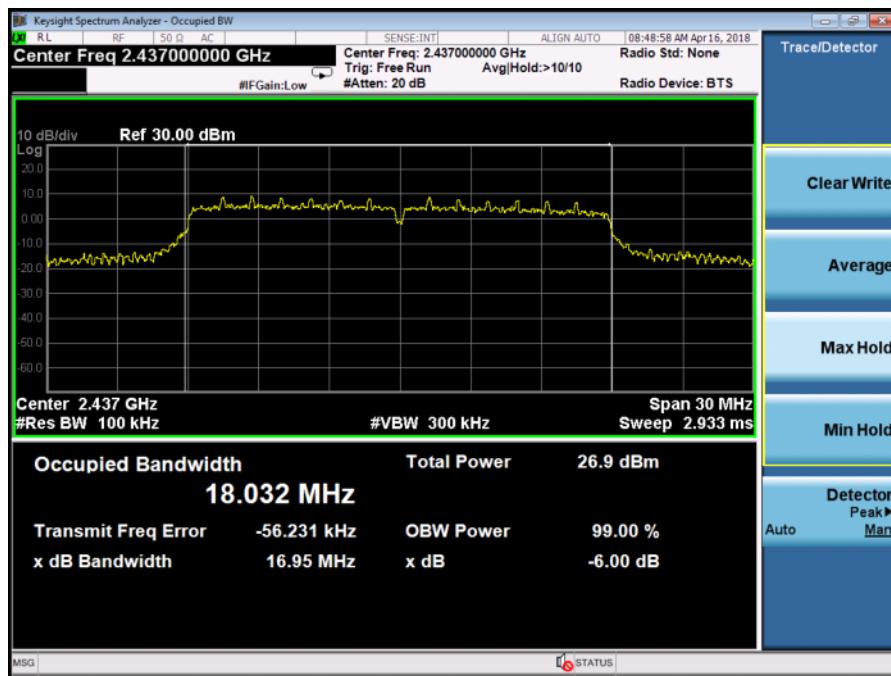
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## Test Plot of 6dB Bandwidth (802.11n HT20)

### Low Channel

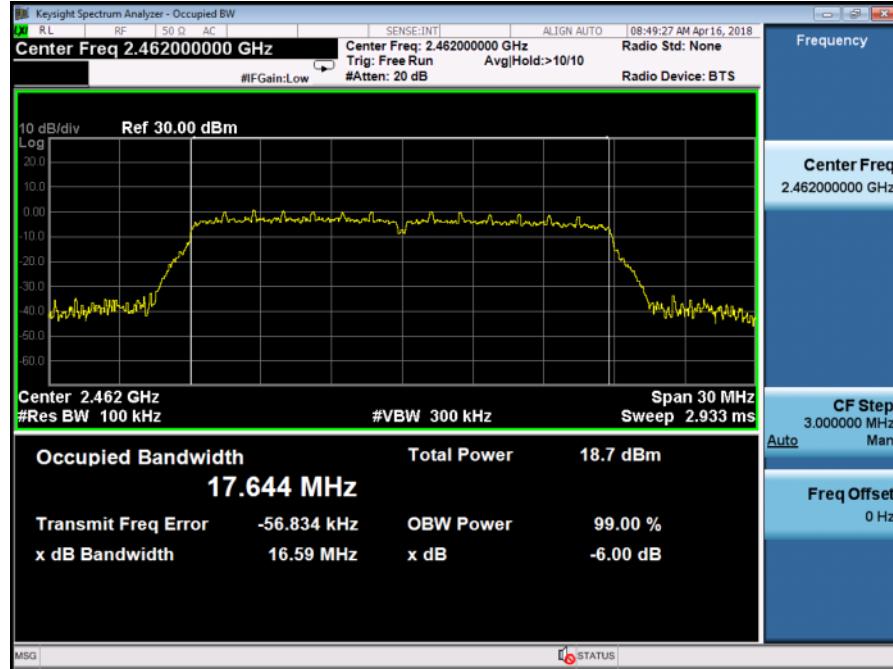


### Middle Channel



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## High Channel



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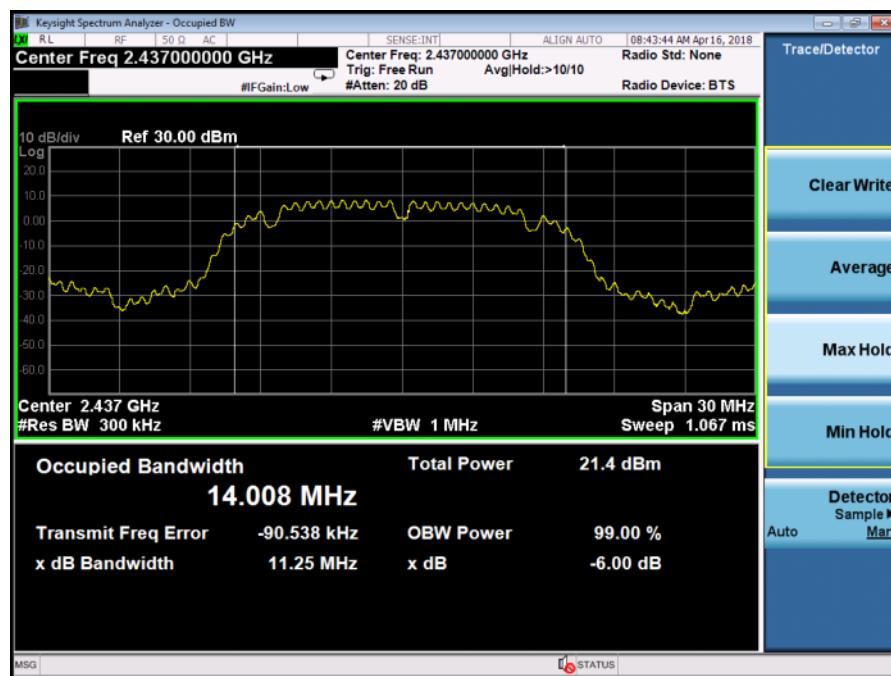
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### Test Plot of 99% Bandwidth (802.11b)

#### Low Channel

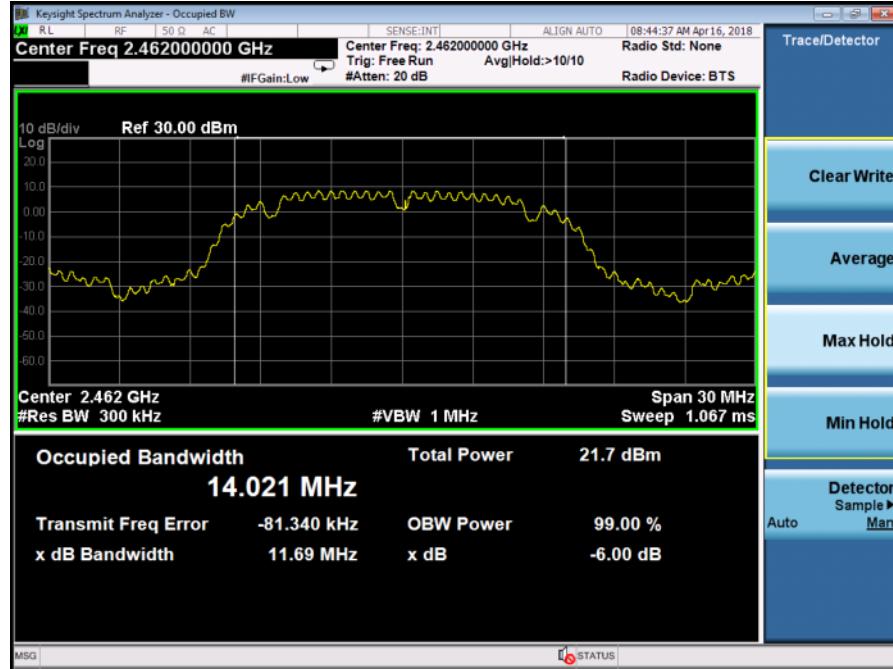


#### Middle Channel



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## High Channel

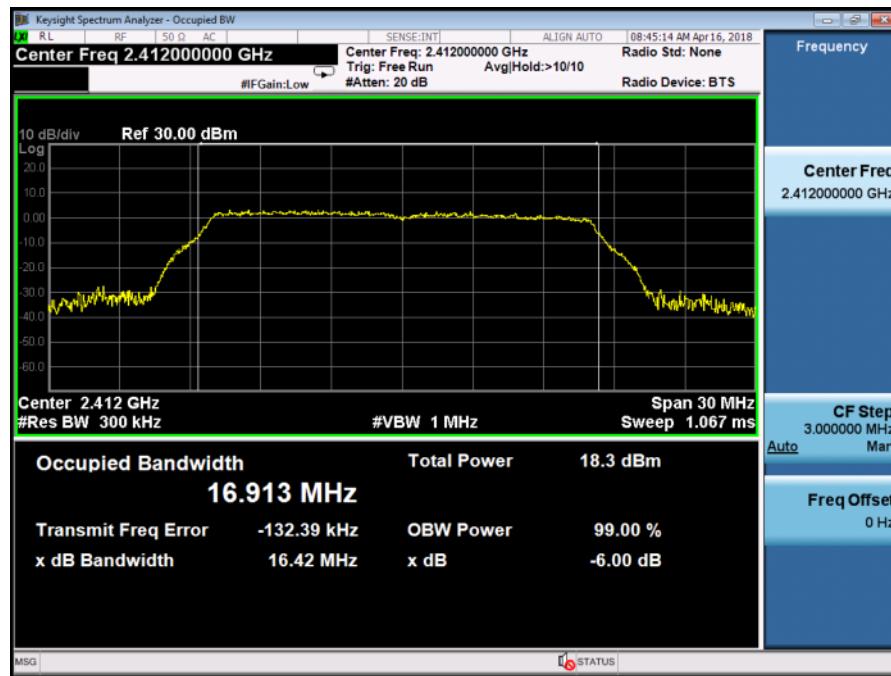


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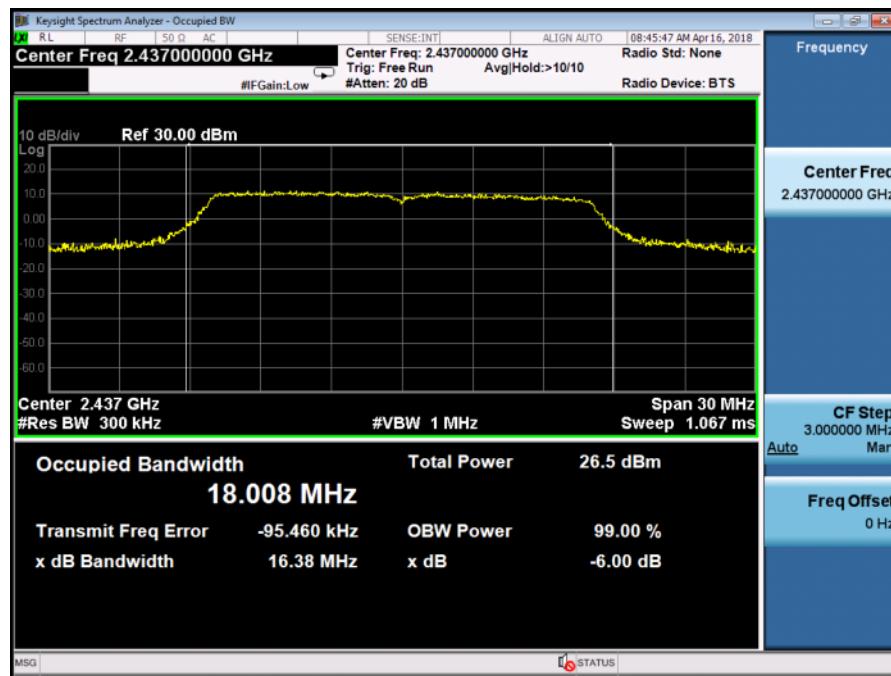
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### Test Plot of 99% Bandwidth (802.11g)

#### Low Channel

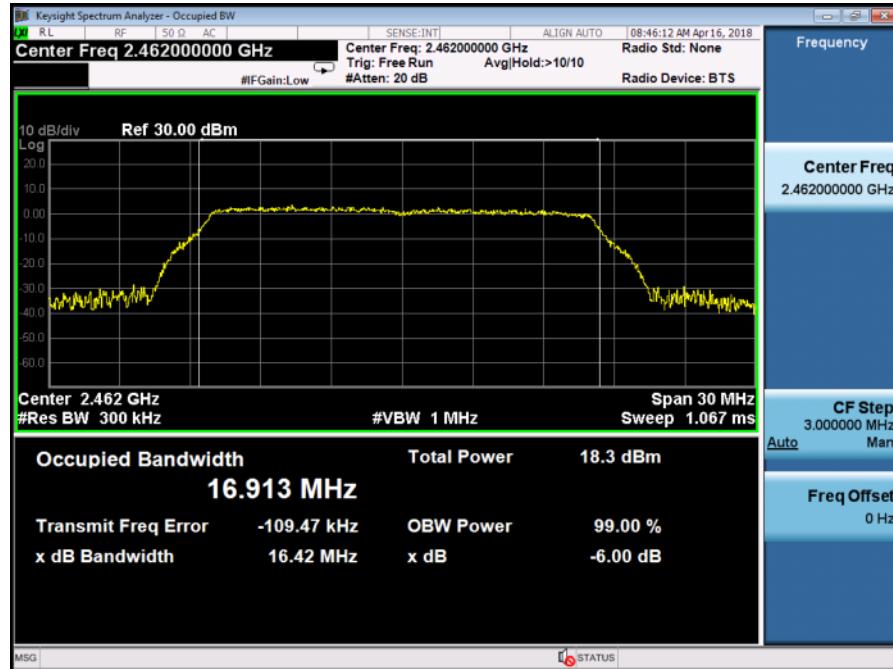


#### Middle Channel



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## High Channel

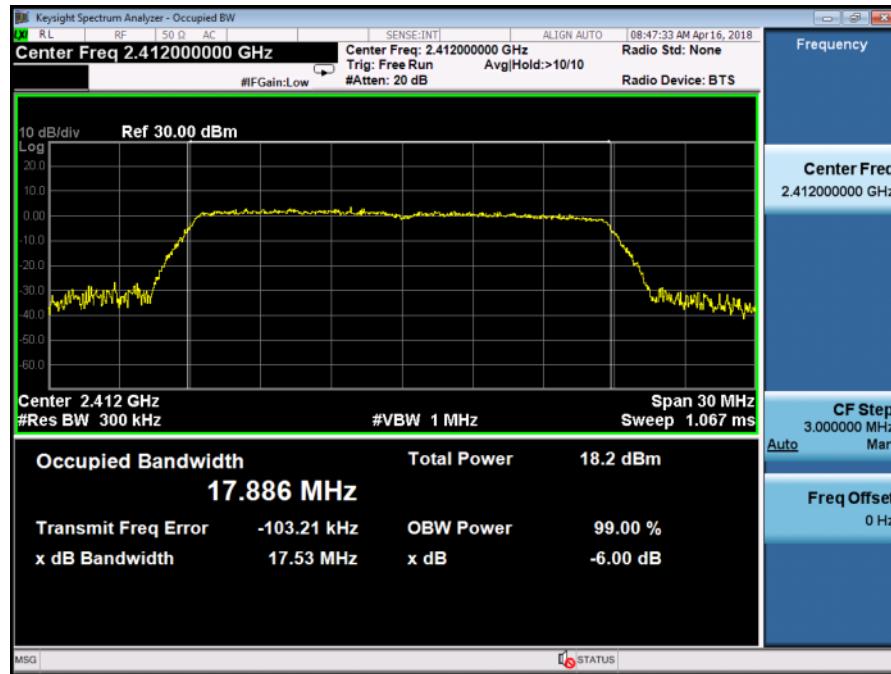


**Prüfbericht - Nr.: 50141823 001**  
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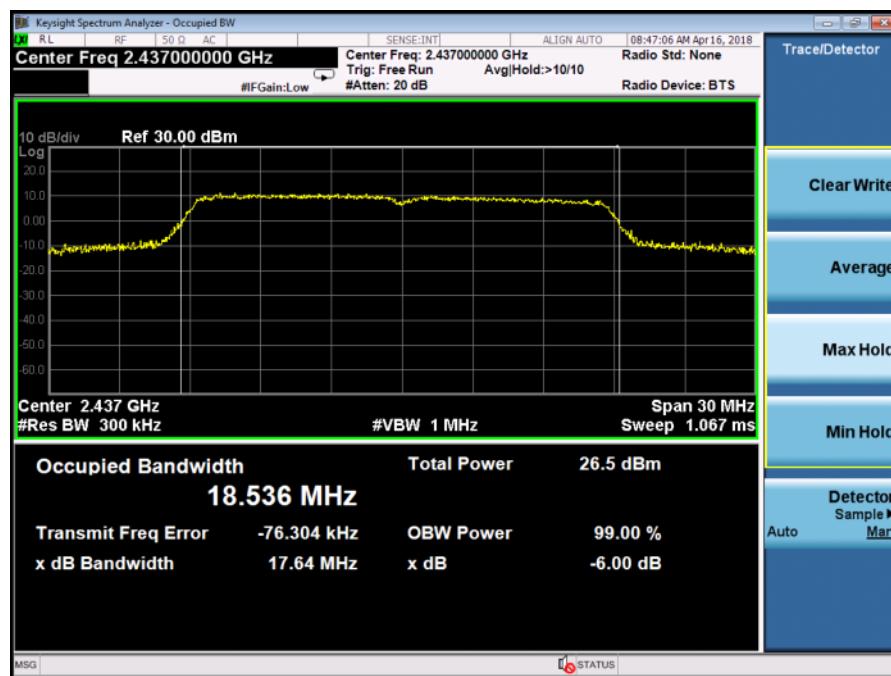
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## Test Plot of 99% Bandwidth (802.11n HT20)

### Low Channel

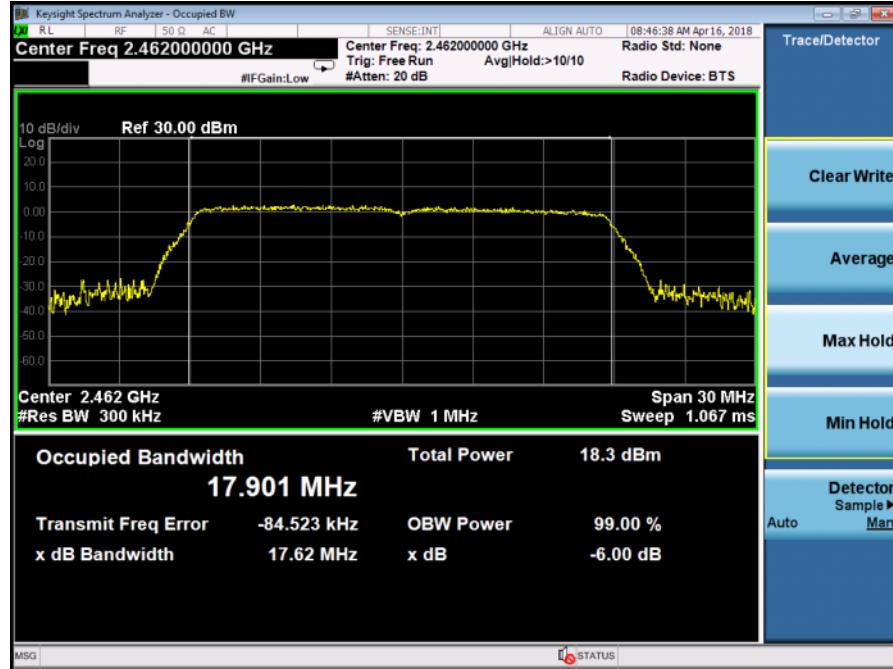


### Middle Channel



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## High Channel



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### 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)**

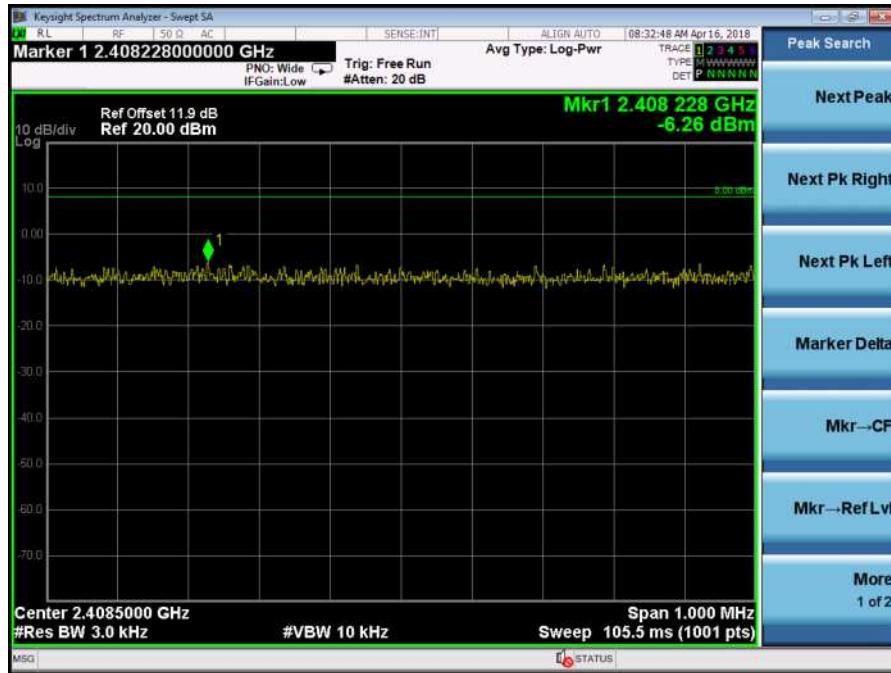
Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2412	-12.95	8
Middle Channel	2437	-4.89	8
High Channel	2462	-14.81	8

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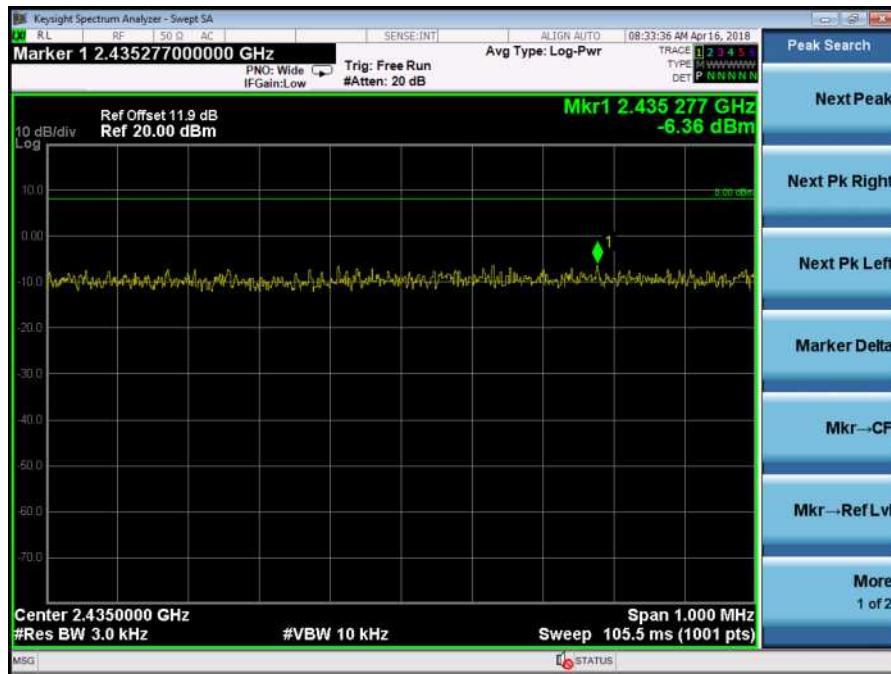
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## Test Plot of Power Density (802.11b)

### Low Channel

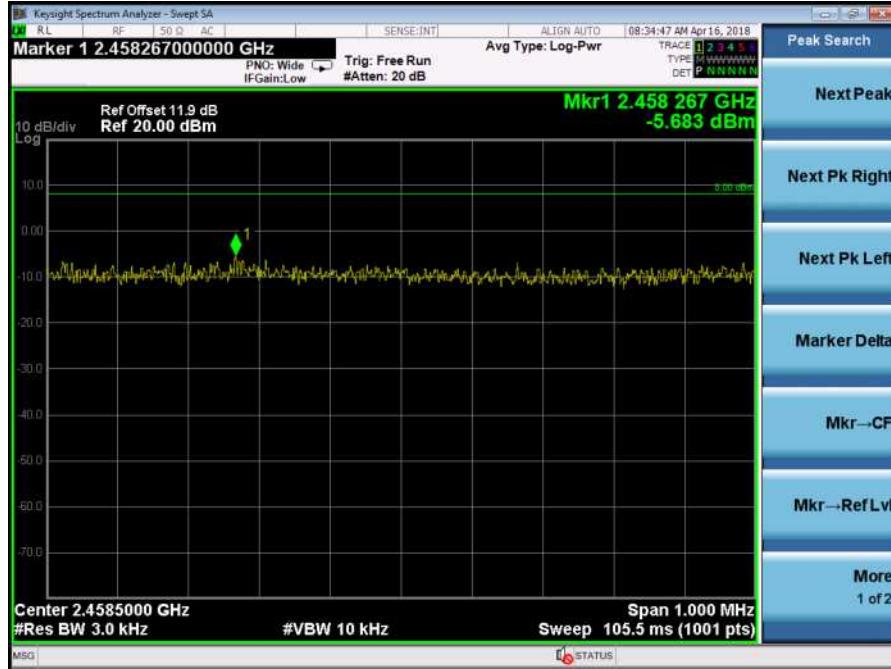


### Middle Channel



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## High Channel



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### Test Plot of Power Density (802.11g)

#### Low Channel



#### Middle Channel



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## High Channel



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## Test Plot of Power Density (802.11n HT20)

### Low Channel



### Middle Channel



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## High Channel



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### 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.

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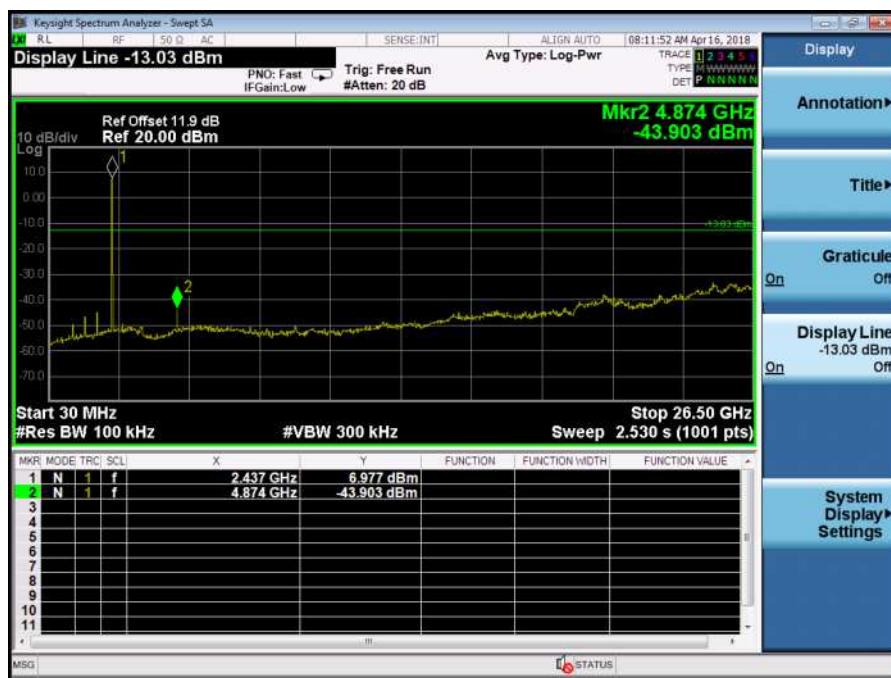
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## Test Plot 100kHz Conducted Emissions (802.11b)

### Low Channel



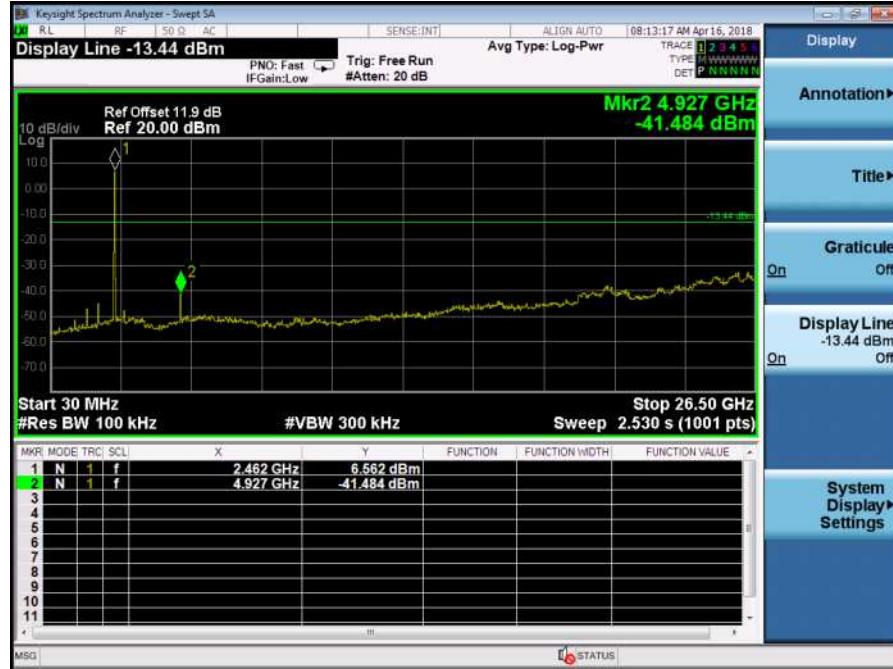
### Middle Channel



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## High Channel

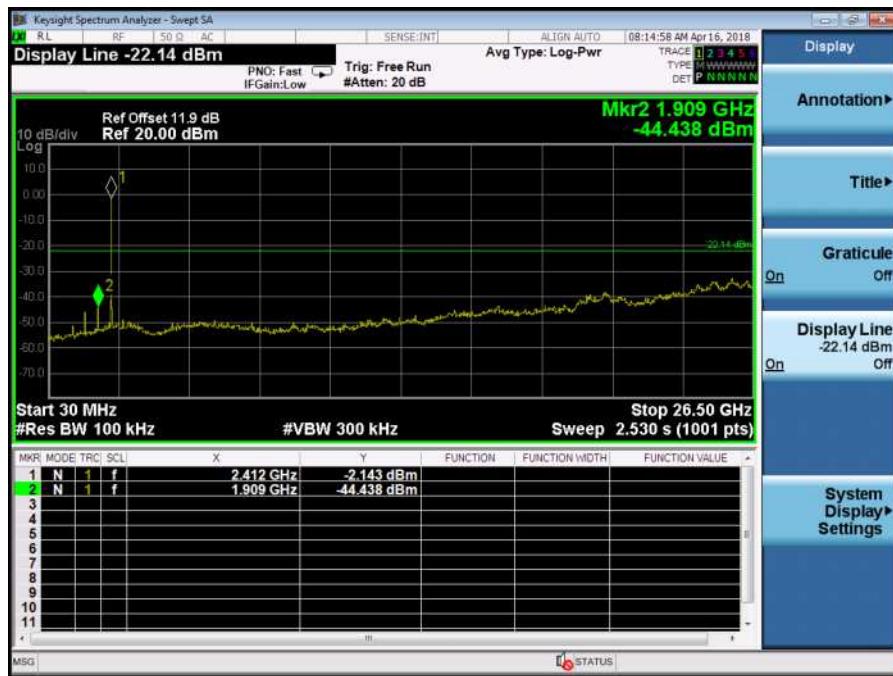


**Prüfbericht - Nr.: 50141823 001**  
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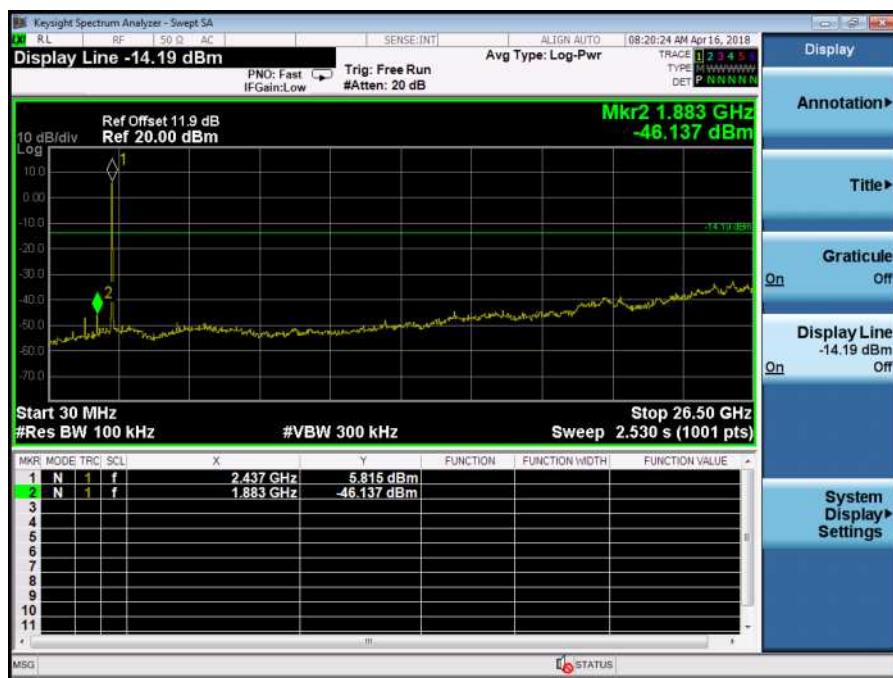
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## Test Plot 100kHz Conducted Emissions (802.11g)

## Low Channel



## Middle Channel

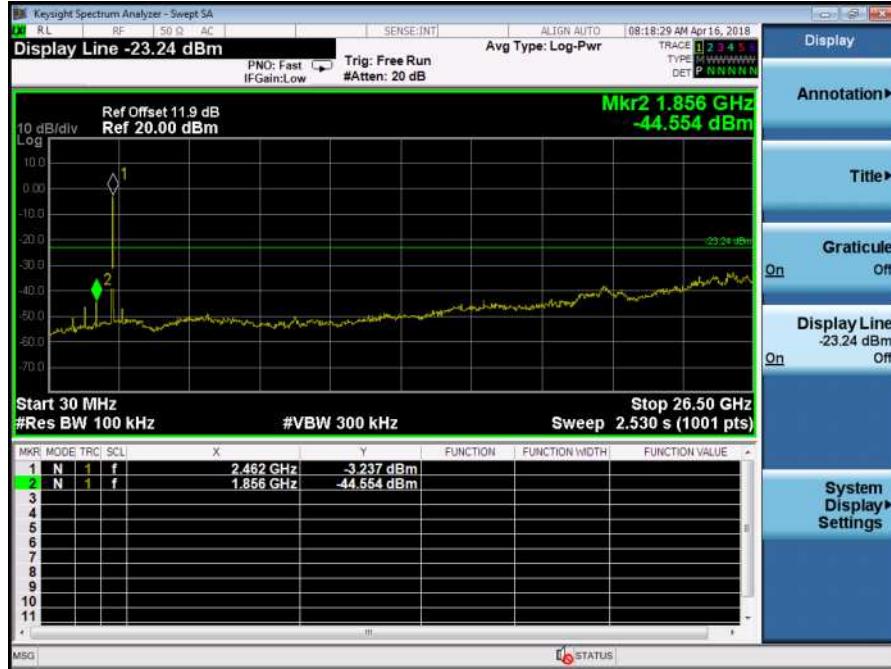


## Produkte *Products*

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## High Channel

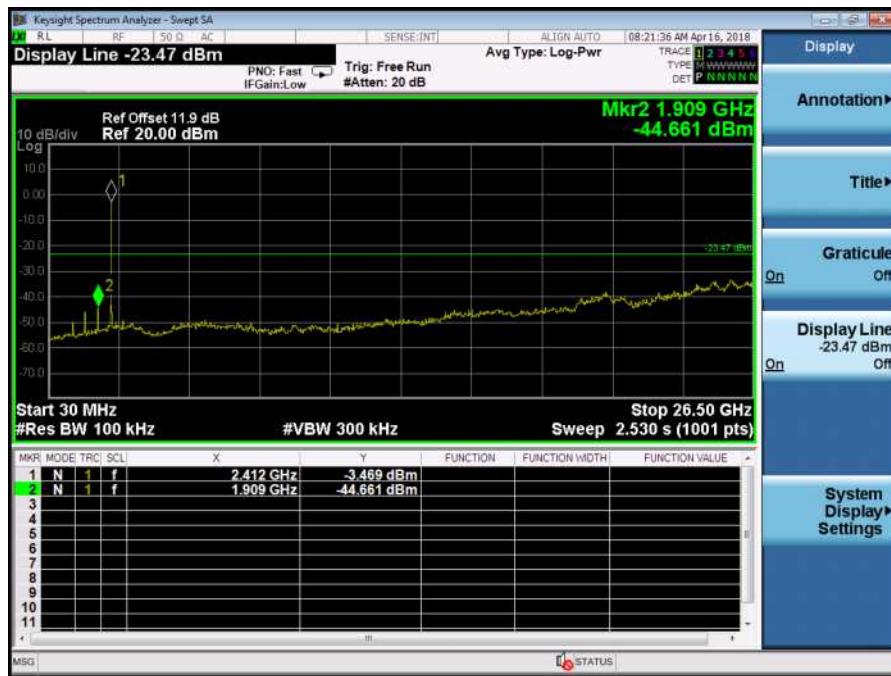


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## Test Plot 100kHz Conducted Emissions (802.11n HT20)

## Low Channel



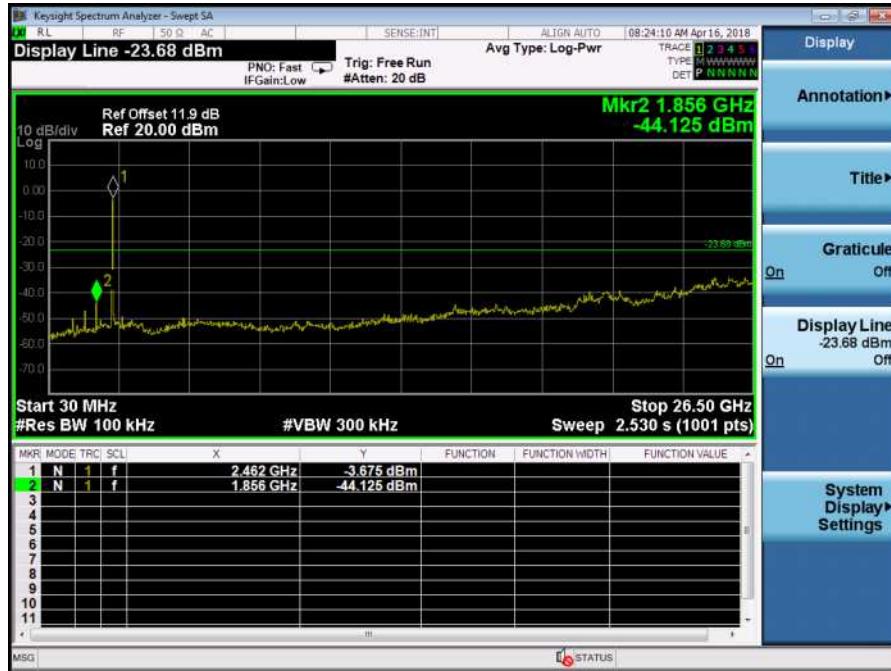
## Middle Channel



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## **High Channel**



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

## Low Channel



## **High Channel**



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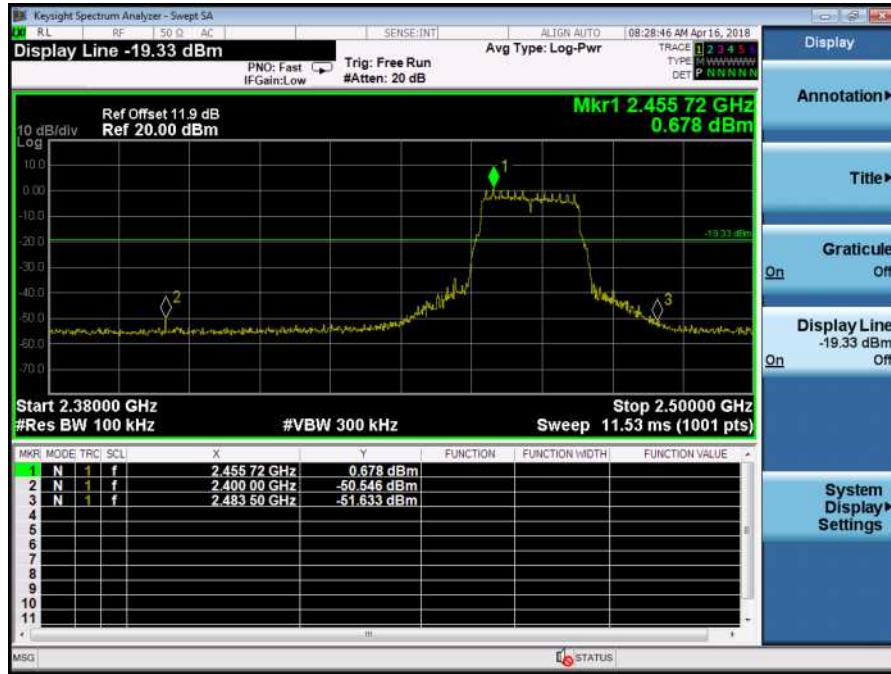
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## Test Plot 100kHz RBW of Band Edge (802.11g)

## Low Channel



## **High Channel**



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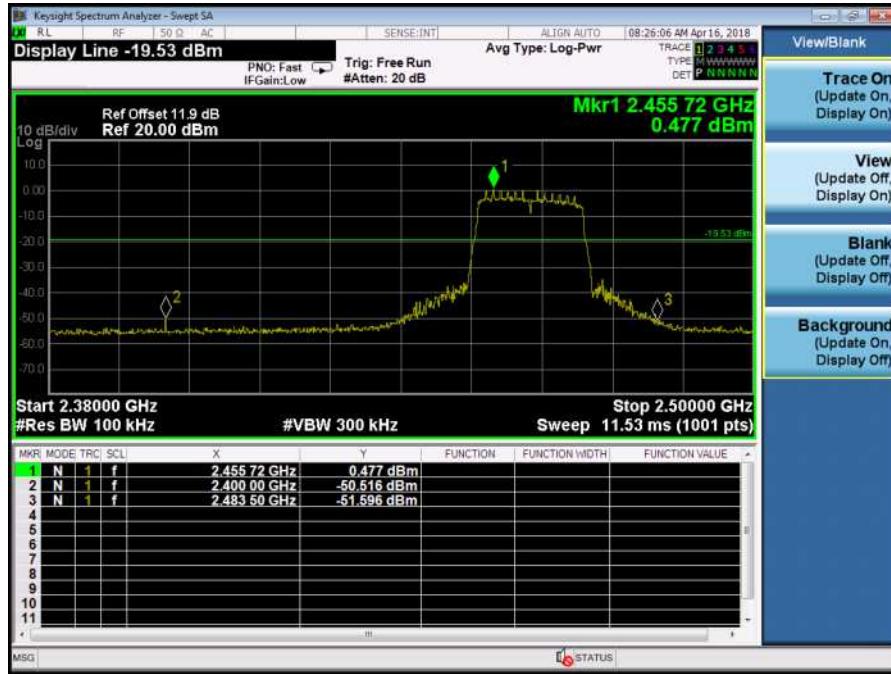
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## Test Plot 100kHz RBW of Band Edge (802.11n HT20)

## Low Channel



## **High Channel**



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### 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 Limits	:	ANSI C63.10:2013 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.

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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.

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## 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 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 <sup>2</sup>

Limit Canada: 0.542 mW/cm<sup>2</sup>

---End---

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## 7. Photographs of the Test Set-Up

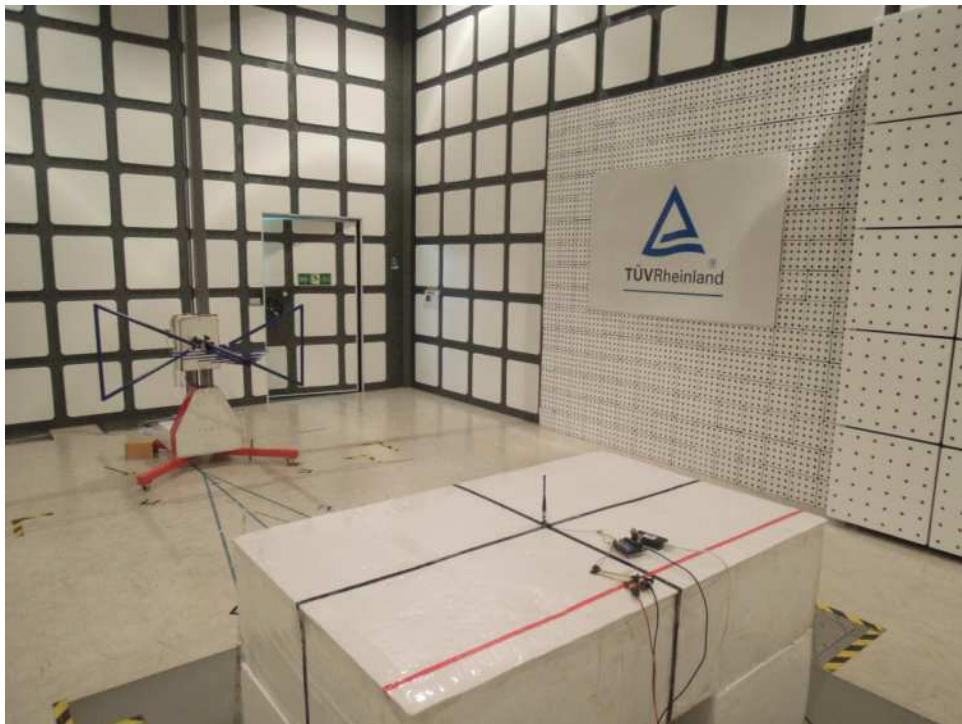
Photograph 1: Set-up for Spurious Emissions (Front View 1)- RFA-02-5-C7H1-ANT



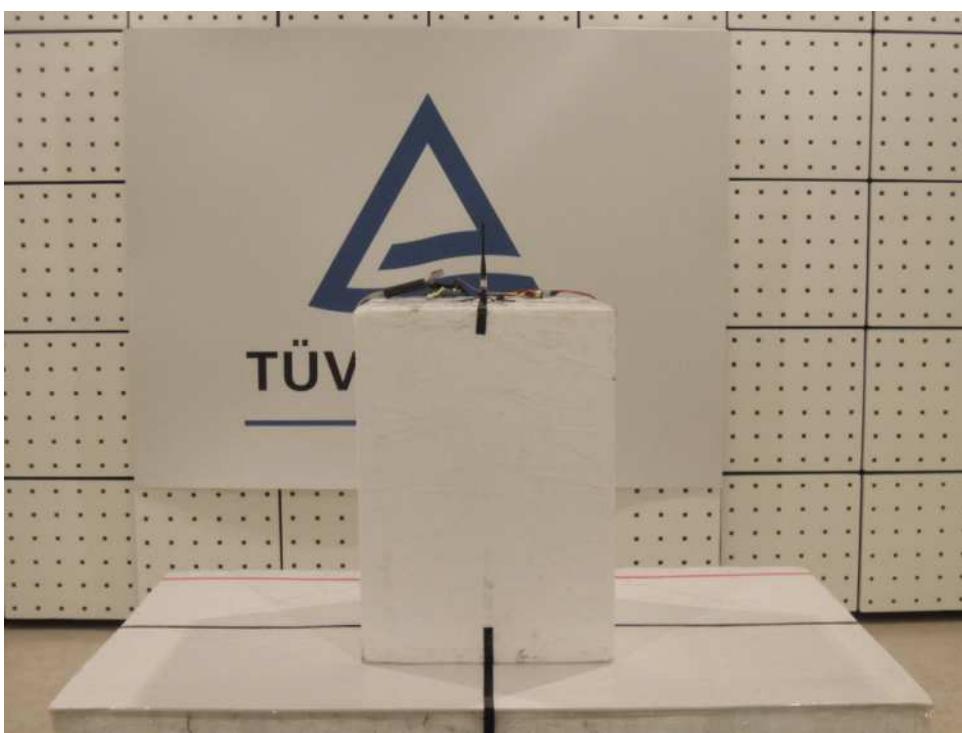
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**Photograph 2: Set-up for Spurious Emissions (Back View 1)- RFA-02-5-C7H1-ANT**



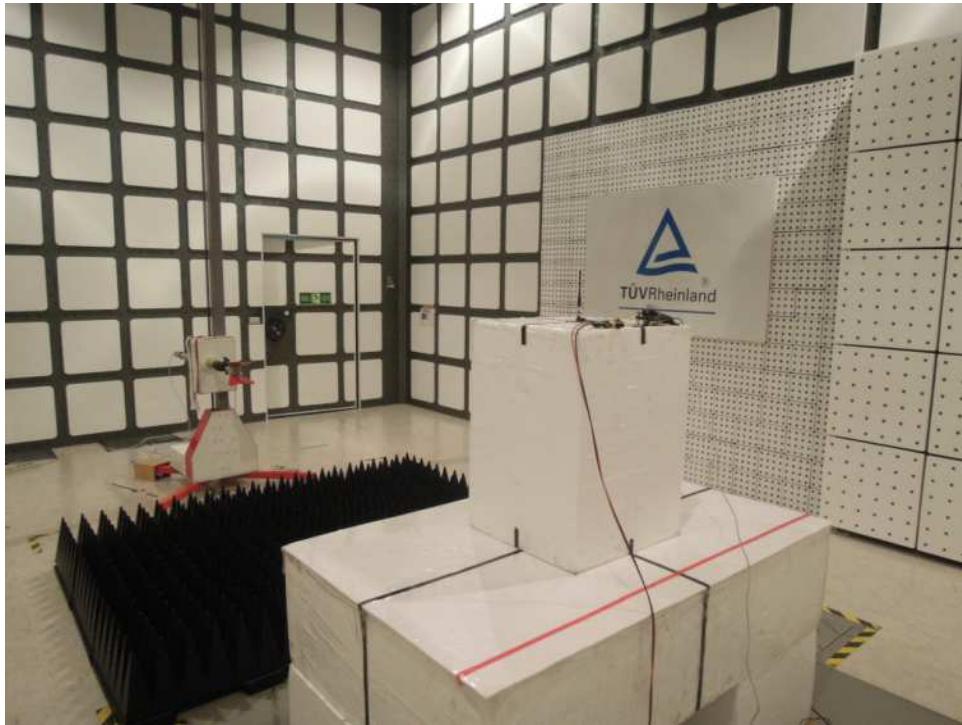
**Photograph 3: Set-up for Spurious Emissions (Front View 2)- RFA-02-5-C7H1-ANT**



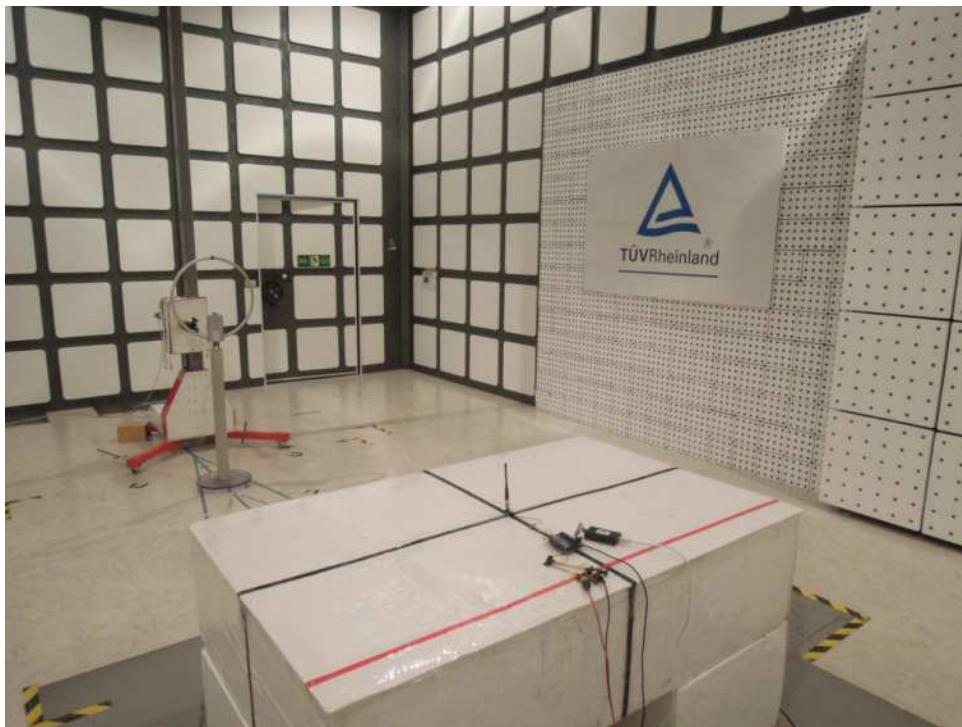
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**Photograph 4: Set-up for Spurious Emissions (Back View 2)- RFA-02-5-C7H1-ANT**



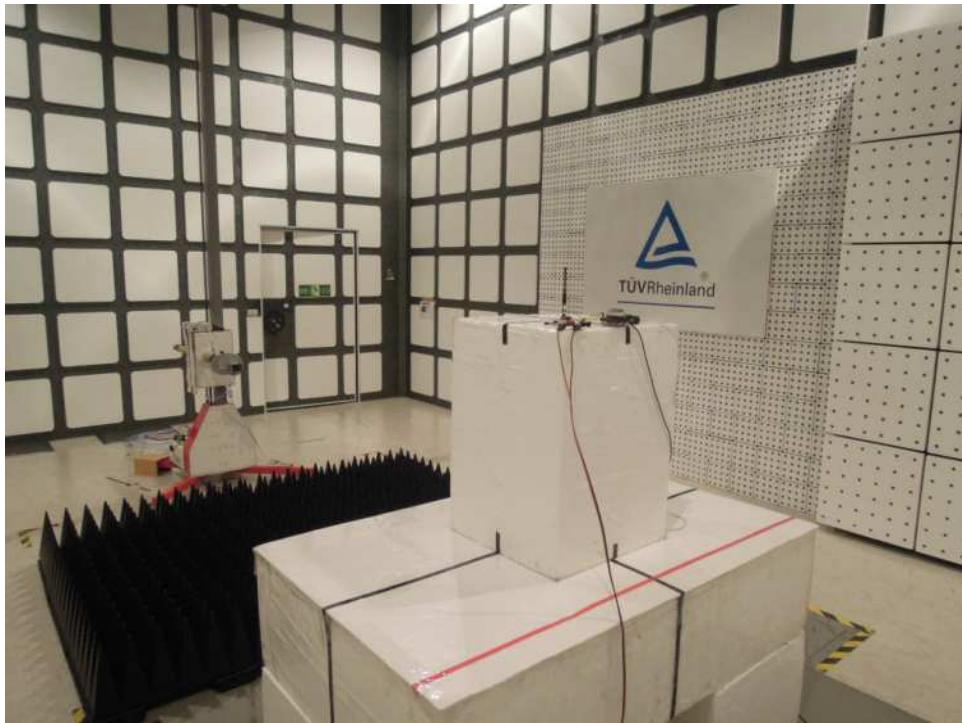
**Photograph 5: Set-up for Spurious Emissions (Back View 3)- RFA-02-5-C7H1-ANT**



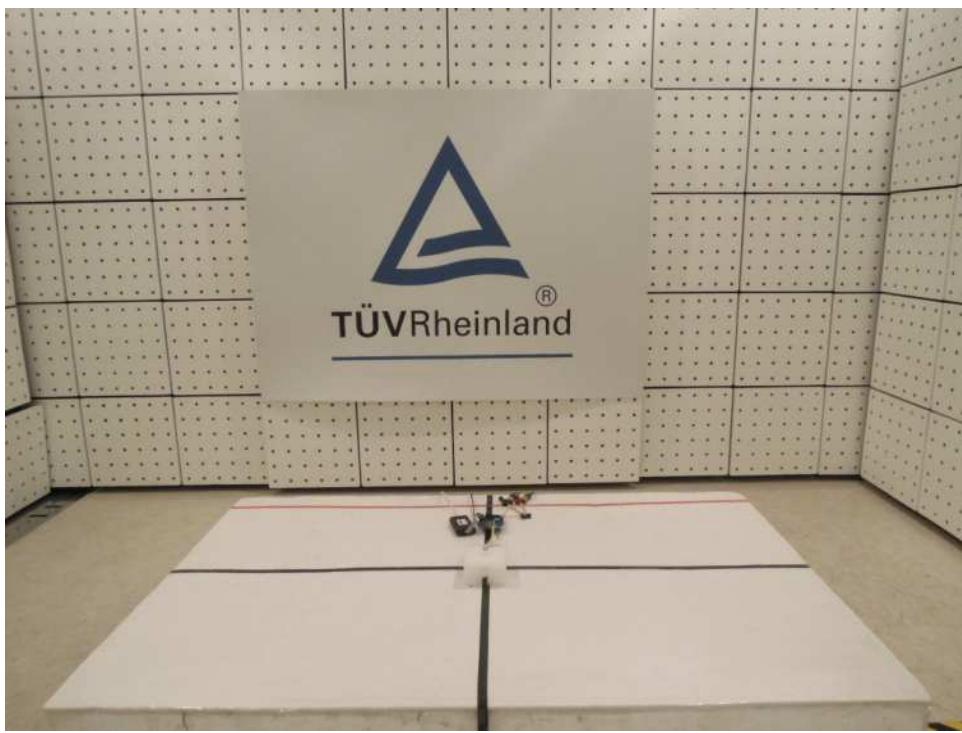
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**Photograph 6: Set-up for Spurious Emissions (Back View 4)- RFA-02-5-C7H1-ANT**



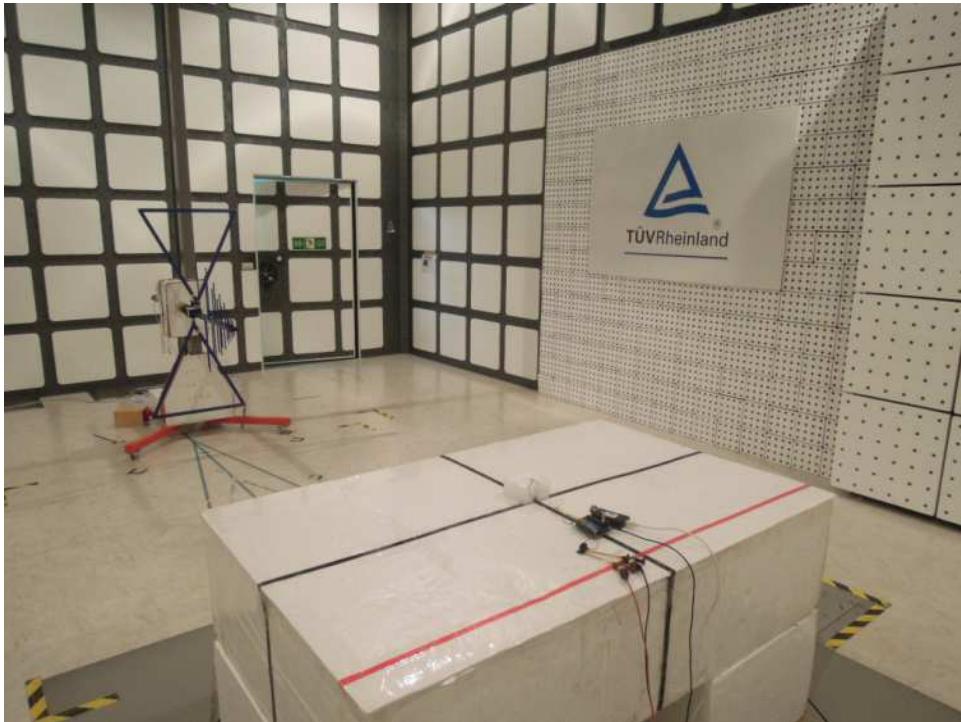
**Photograph 7: Set-up for Spurious Emissions (Front View 1)- RFMTA331215-ANT**



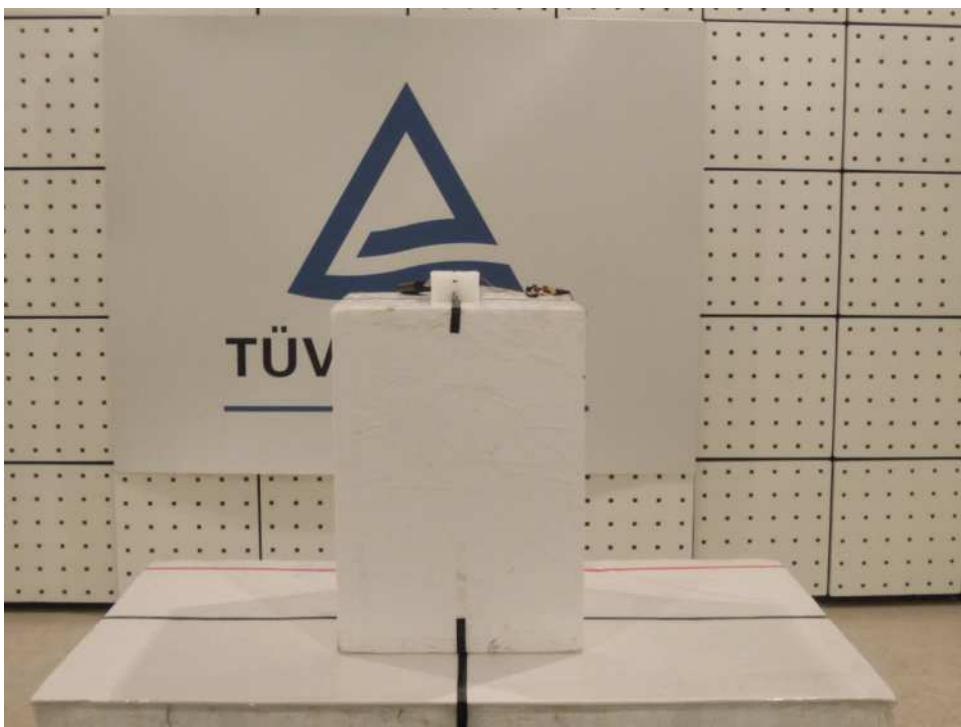
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**Photograph 8: Set-up for Spurious Emissions (Back View 1)- RFMTA331215-ANT**



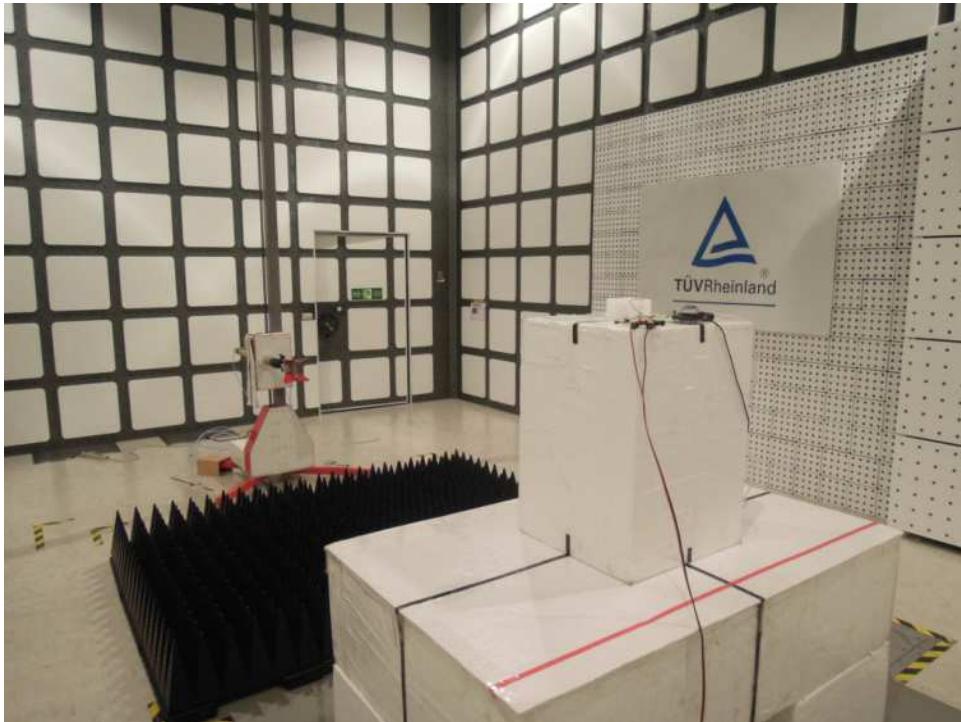
**Photograph 9: Set-up for Spurious Emissions (Front View 2)- RFMTA331215-ANT**



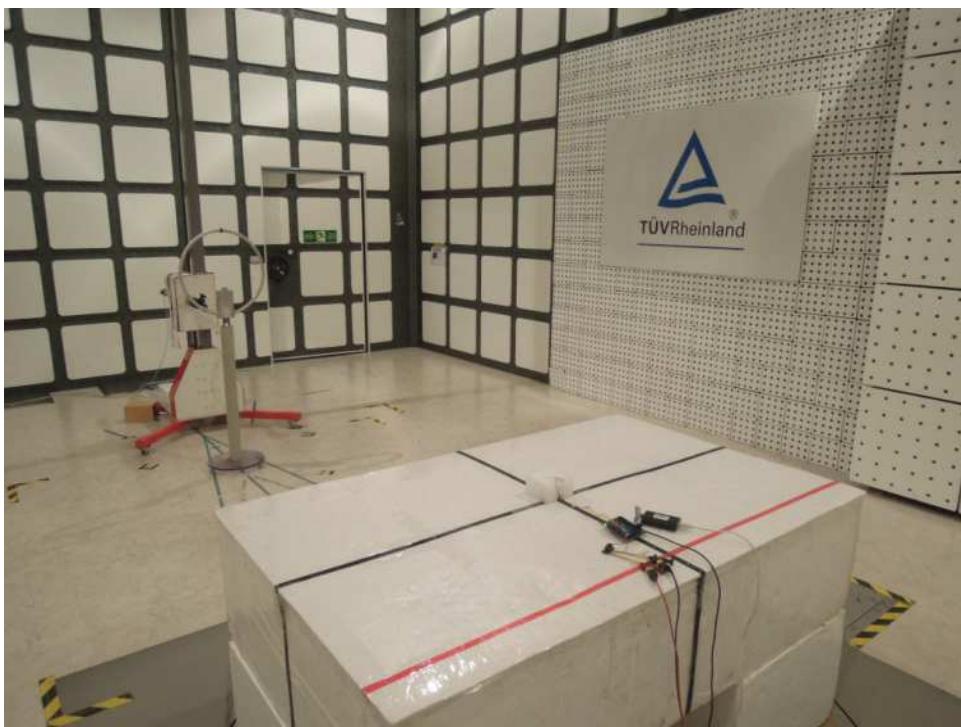
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**Photograph 10: Set-up for Spurious Emissions (Back View 2)- RFMTA331215-ANT**



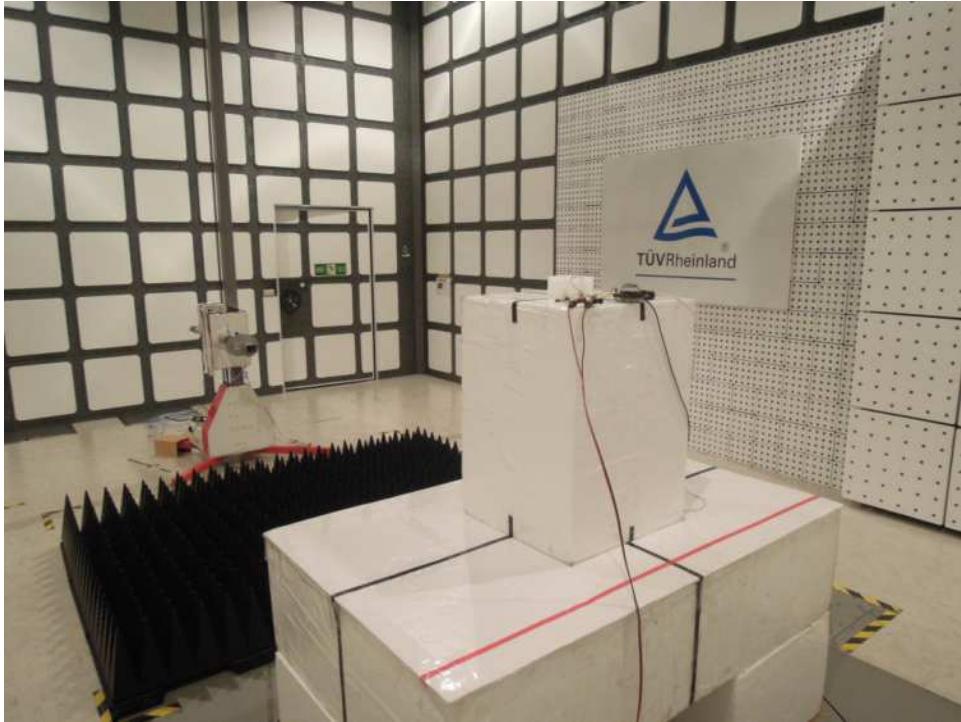
**Photograph 11: Set-up for Spurious Emissions (Back View 3)- RFMTA331215-ANT**



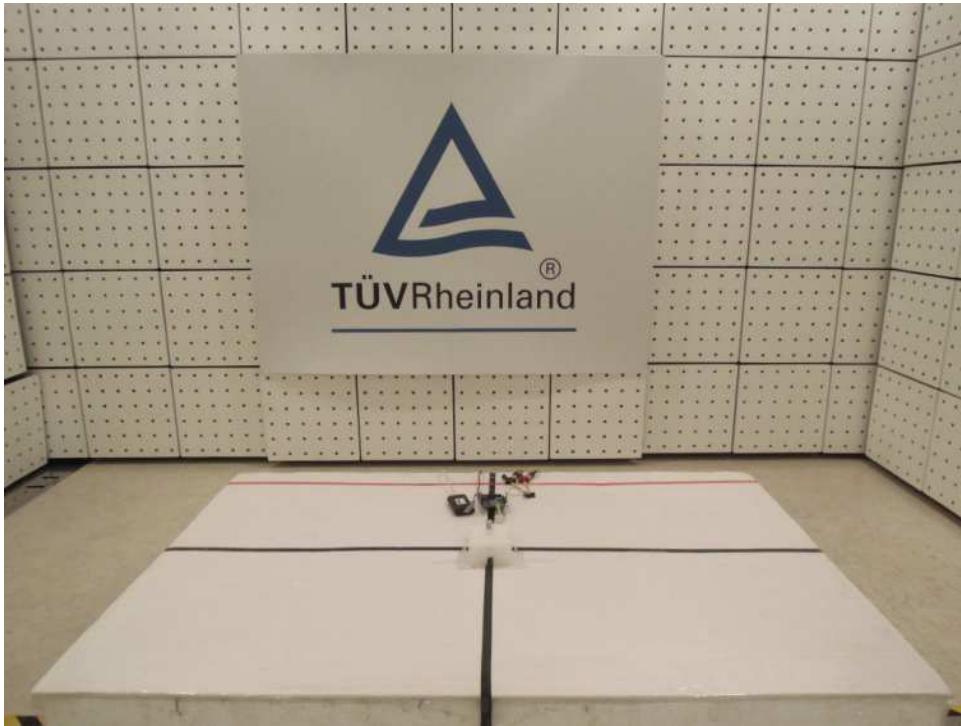
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**Photograph 12: Set-up for Spurious Emissions (Back View 4)- RFMTA331215-ANT**



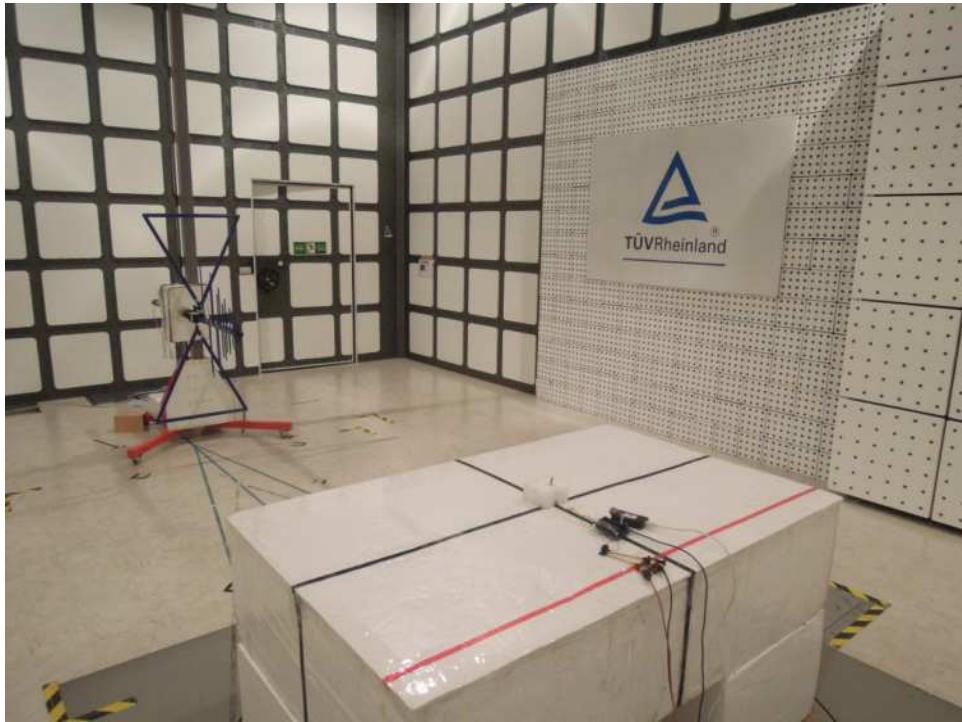
**Photograph 13: Set-up for Spurious Emissions (Front View 1)- RFPCA381013IMAB701-ANT**



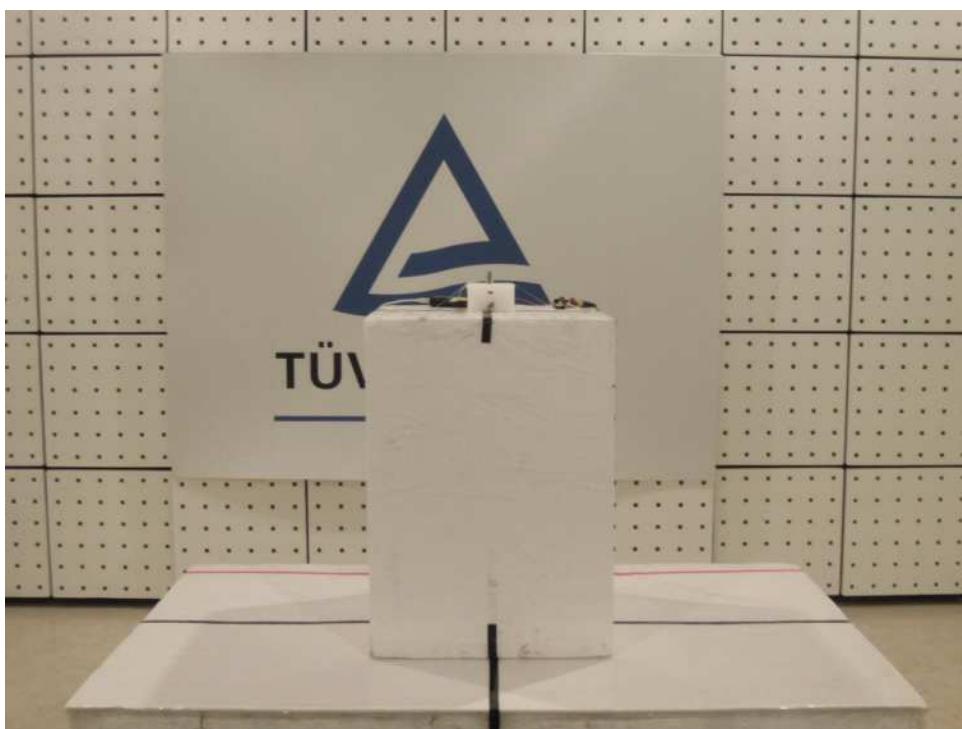
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**Photograph 14: Set-up for Spurious Emissions (Back View 1)- RFPCA381013IMAB701-ANT**



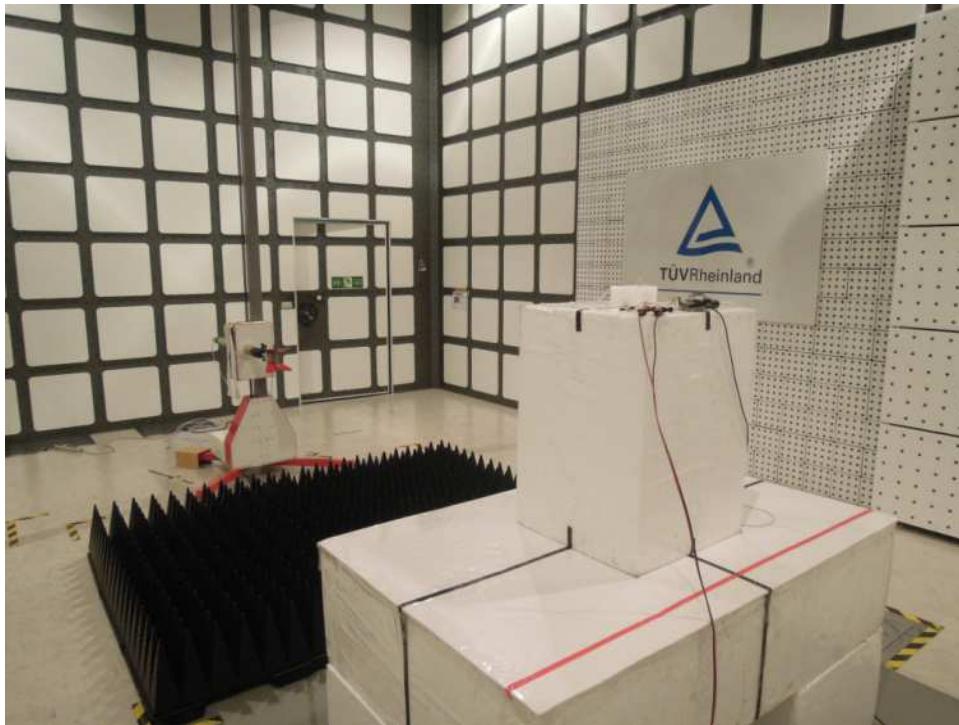
**Photograph 15: Set-up for Spurious Emissions (Front View 2)- RFPCA381013IMAB701-ANT**



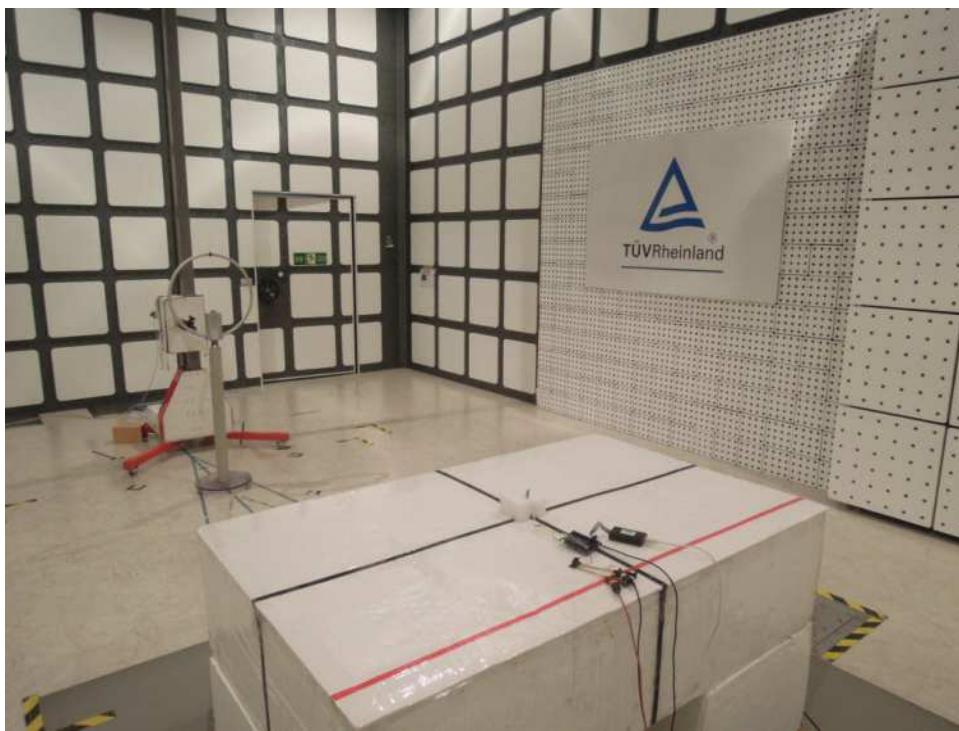
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**Photograph 16: Set-up for Spurious Emissions (Back View 2)- RFPCA381013IMAB701-ANT**



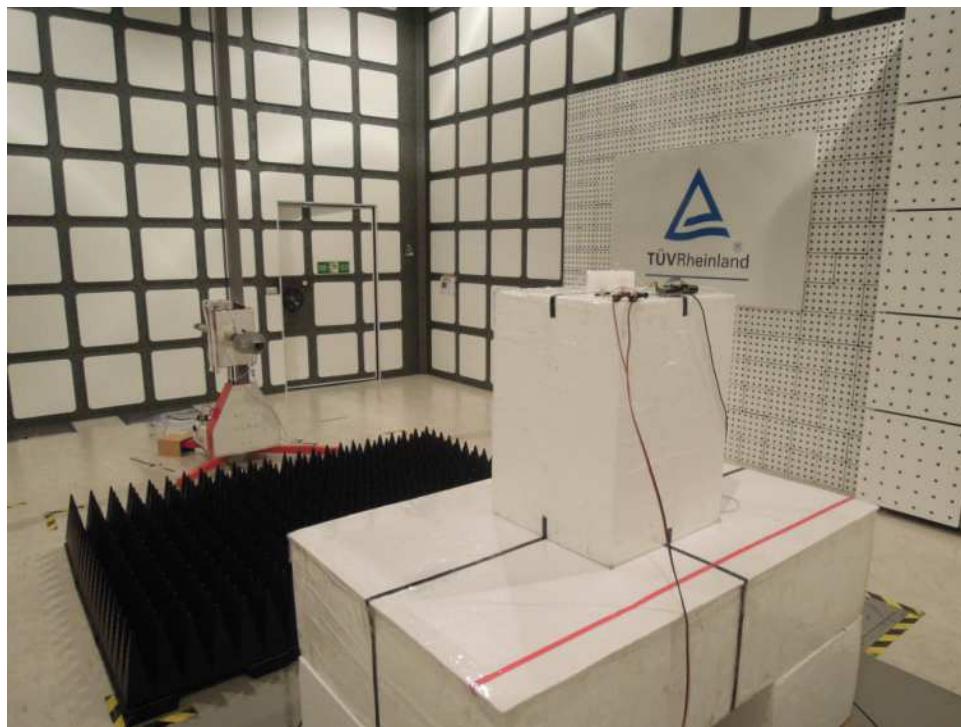
**Photograph 17: Set-up for Spurious Emissions (Back View 3)- RFPCA381013IMAB701-ANT**



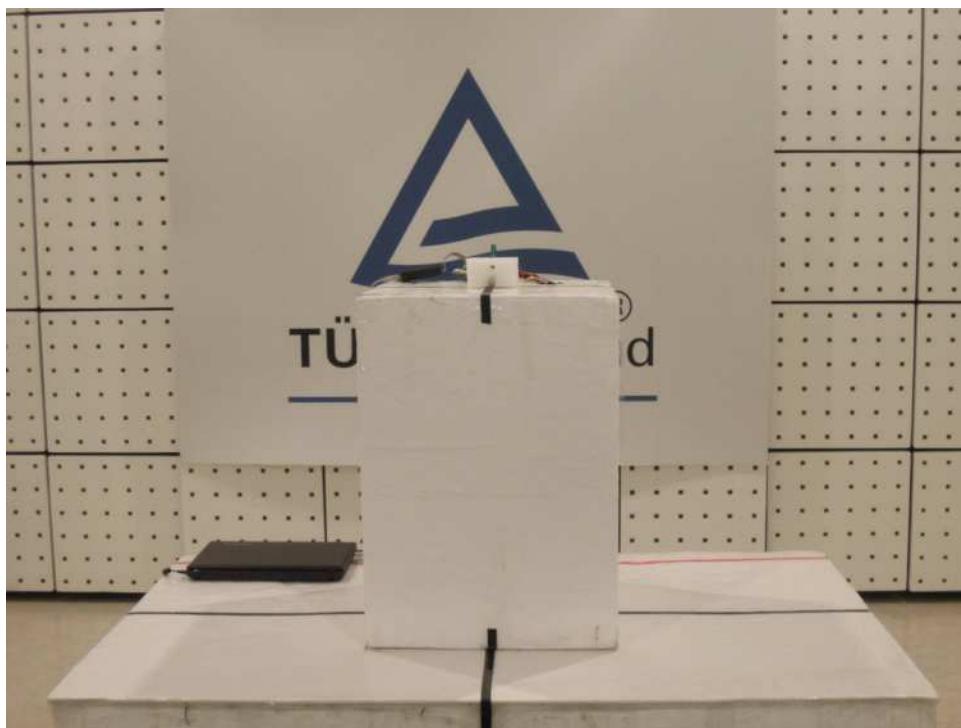
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**Photograph 18: Set-up for Spurious Emissions (Back View 4)- RFPCA381013IMAB701-ANT**



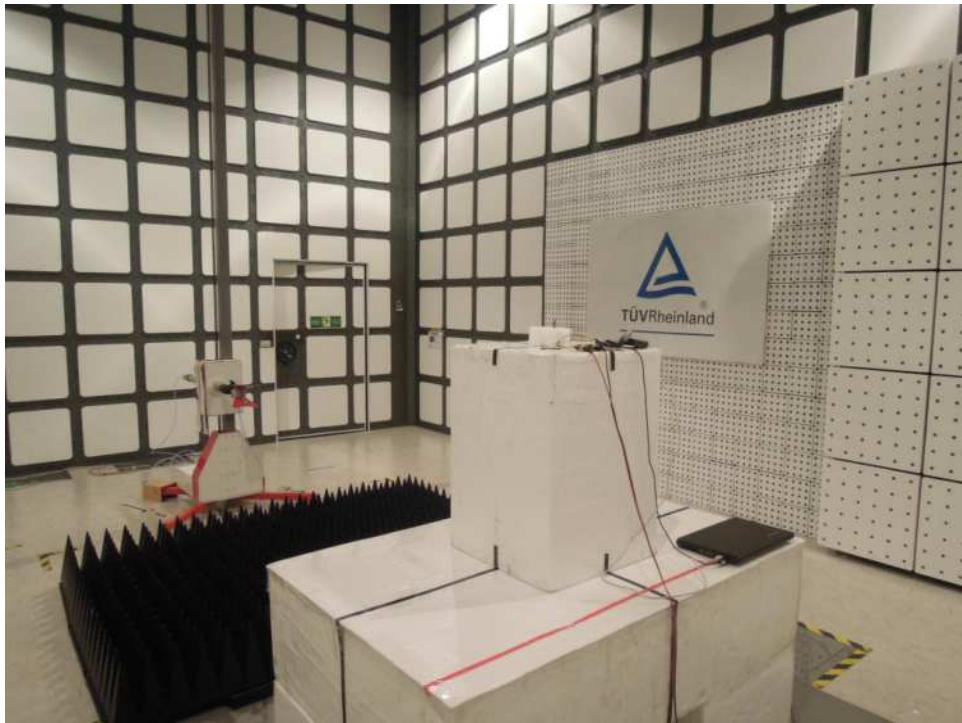
**Photograph 19: Set-up for Spurious Emissions (Front View)- W3525B039 -ANT**



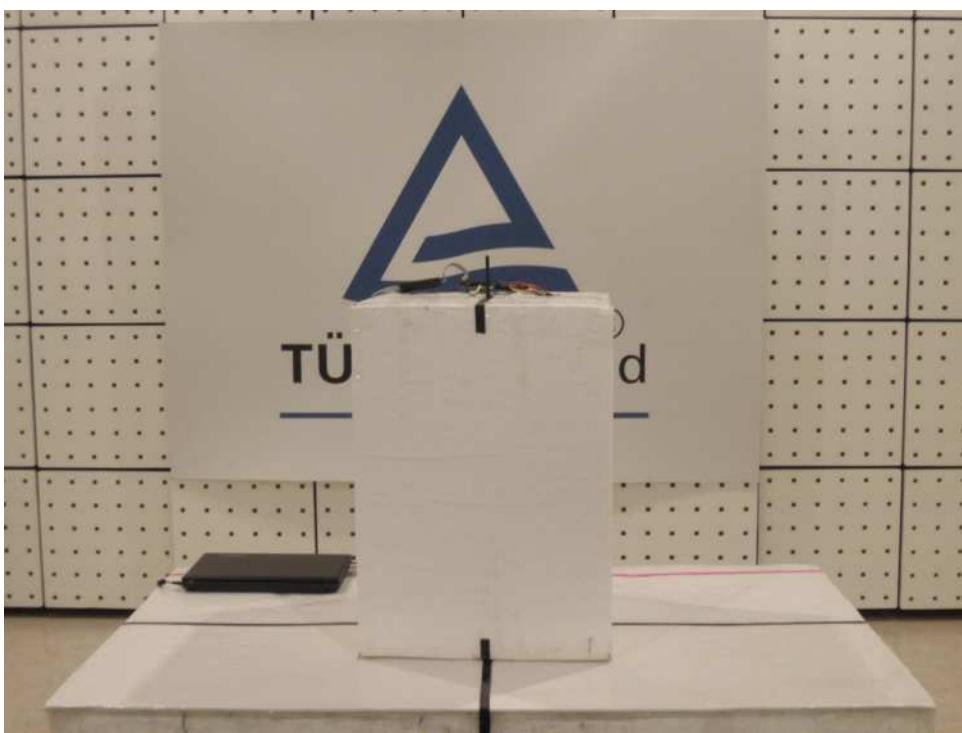
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**Photograph 20: Set-up for Spurious Emissions (Back View)- W3525B039 -ANT**



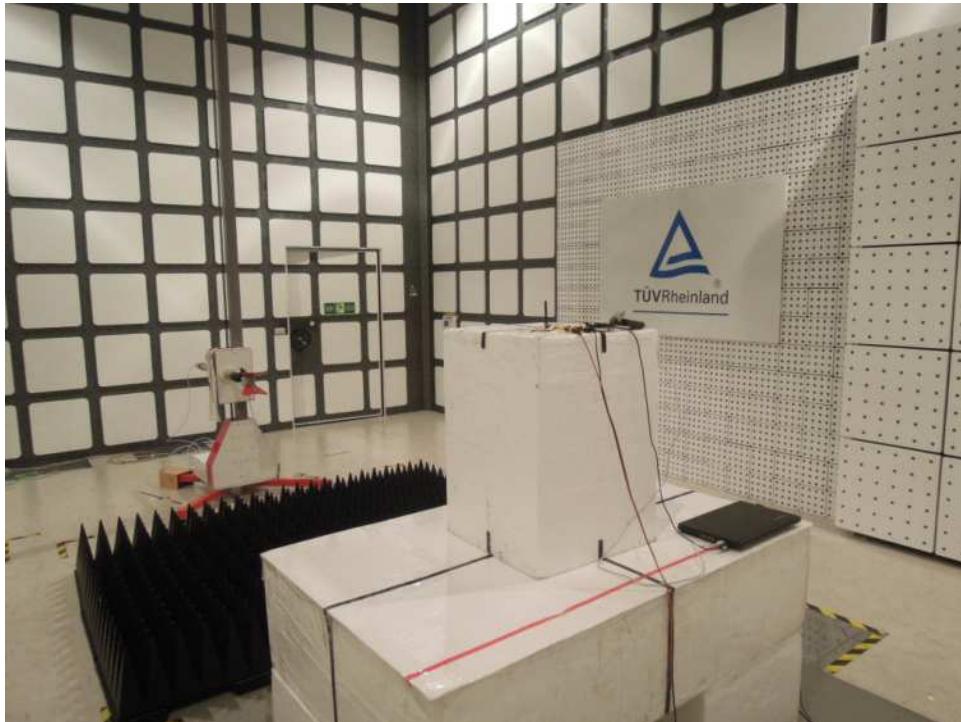
**Photograph 21: Set-up for Spurious Emissions (Front View)- RN-SMA-4 -ANT**



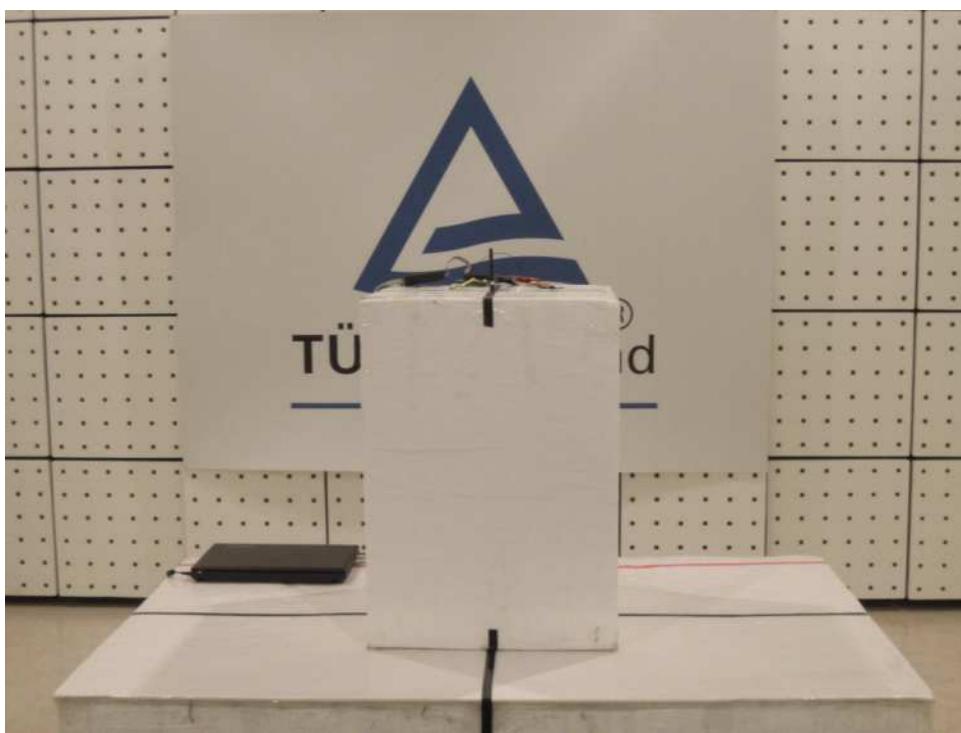
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**Photograph 22: Set-up for Spurious Emissions (Back View)- RN-SMA-4 -ANT**



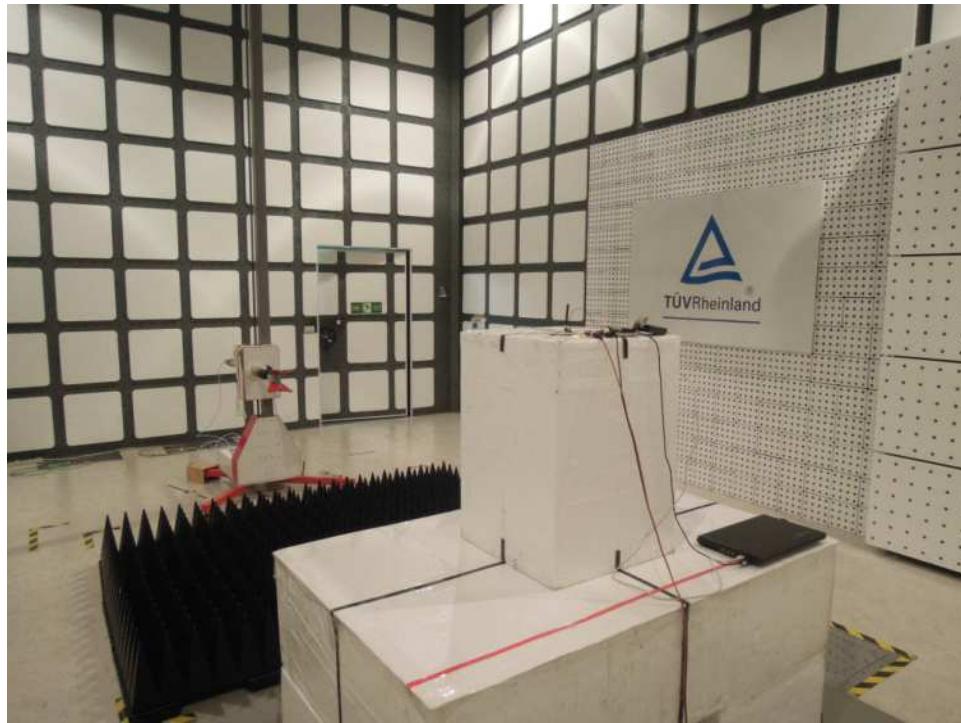
**Photograph 23: Set-up for Spurious Emissions (Front View)- RFDPA870920IMLB301 - ANT**



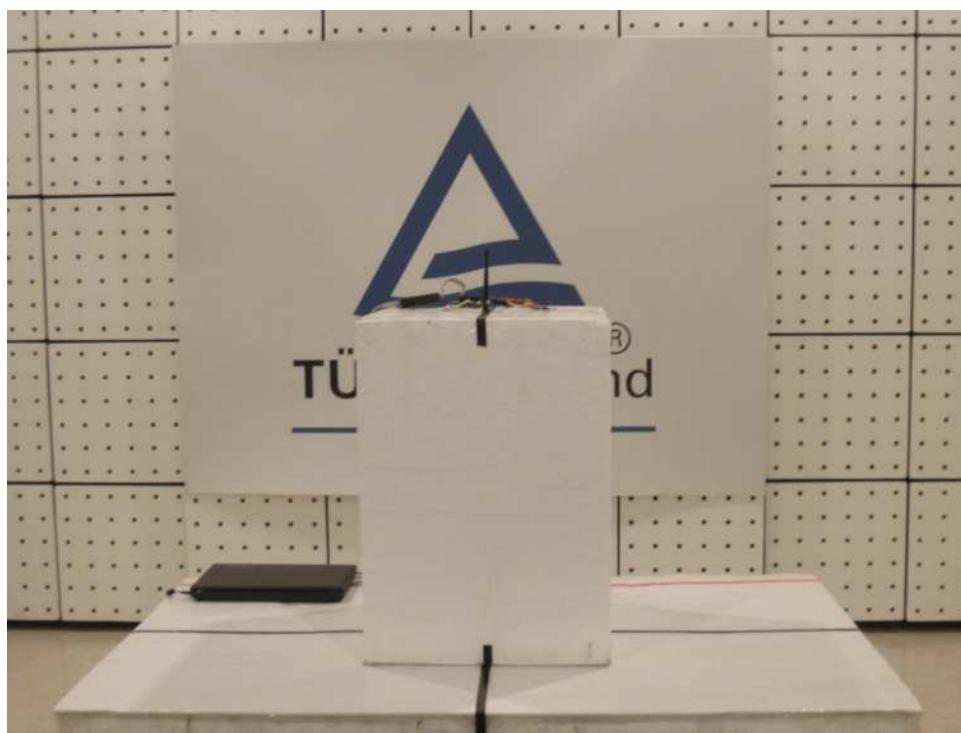
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**Photograph 24: Set-up for Spurious Emissions (Back View)- RFDPA870920IMLB301 -ANT**



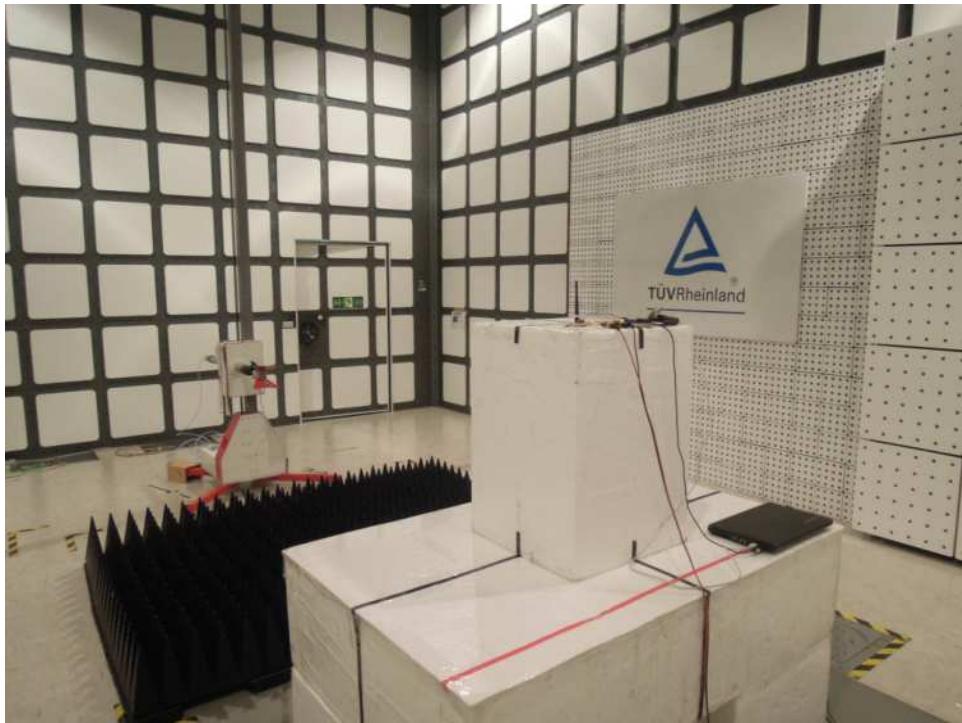
**Photograph 25: Set-up for Spurious Emissions (Front View)- RFA-02-3-C5H1 -ANT**



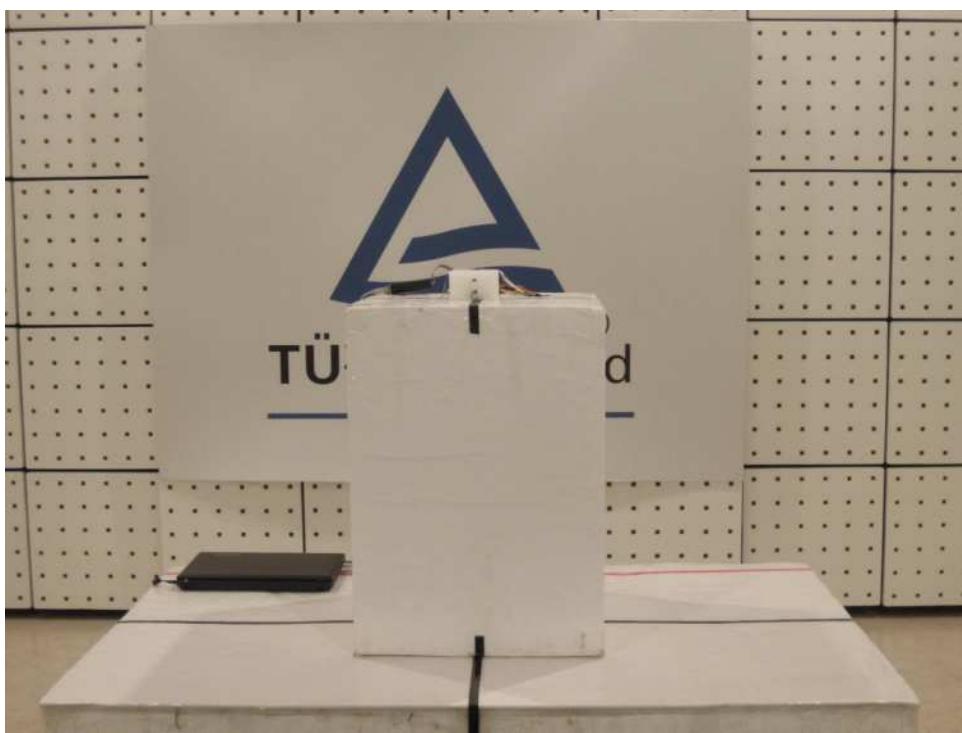
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**Photograph 26: Set-up for Spurious Emissions (Back View)- RFA-02-3-C5H1 -ANT**



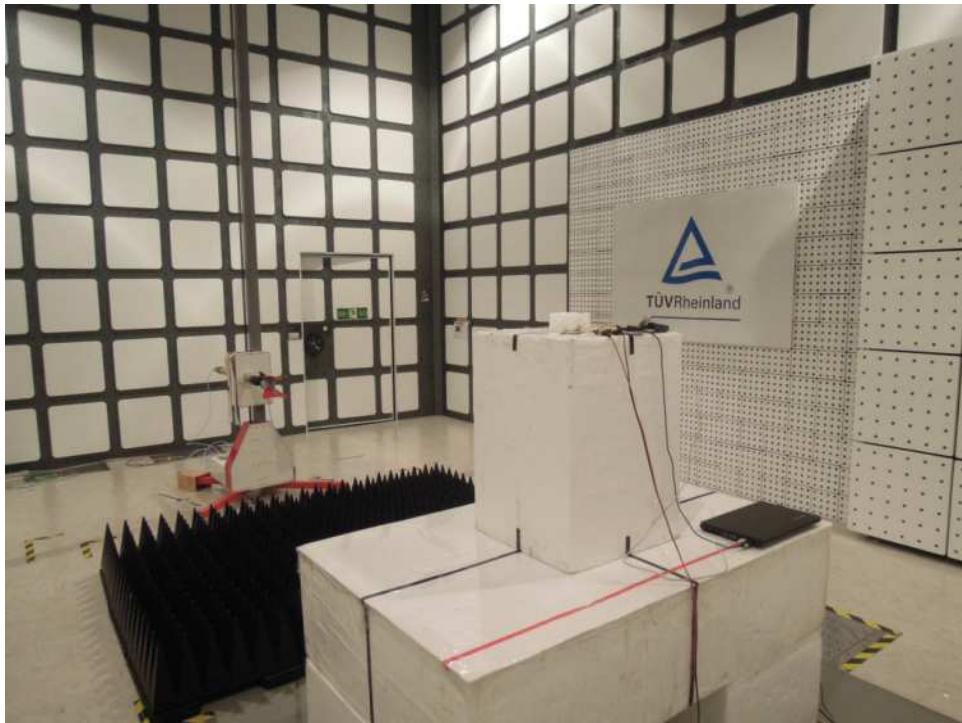
**Photograph 27: Set-up for Spurious Emissions (Front View)- 1461530100 -ANT**



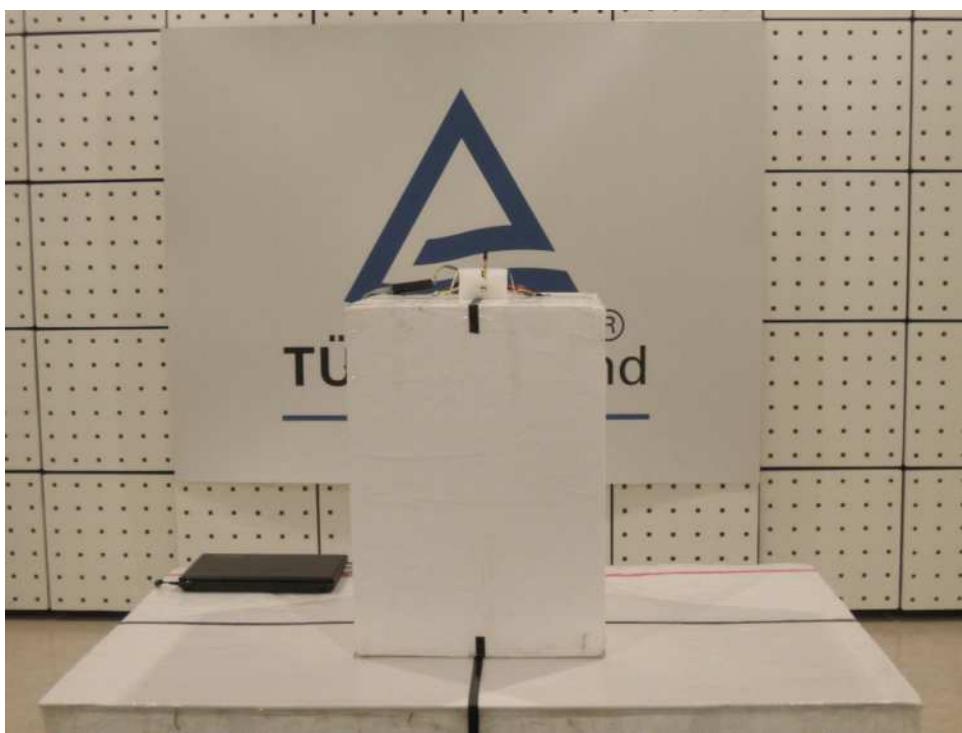
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**Photograph 28: Set-up for Spurious Emissions (Back View)- 1461530100 -ANT**



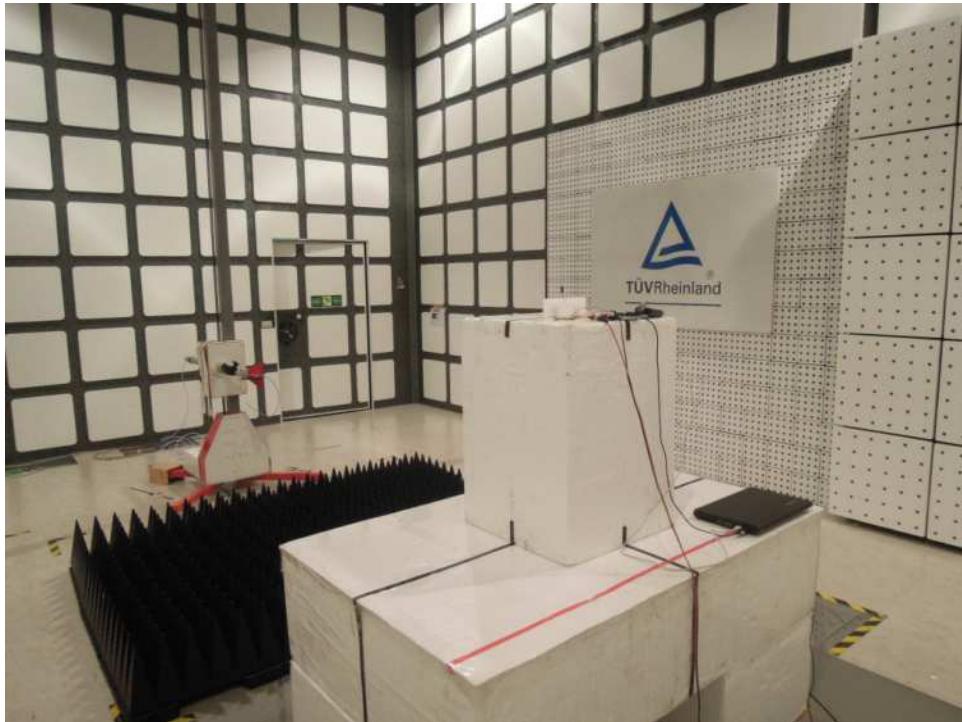
**Photograph 29: Set-up for Spurious Emissions (Front View)- RN-SMA-S -ANT**



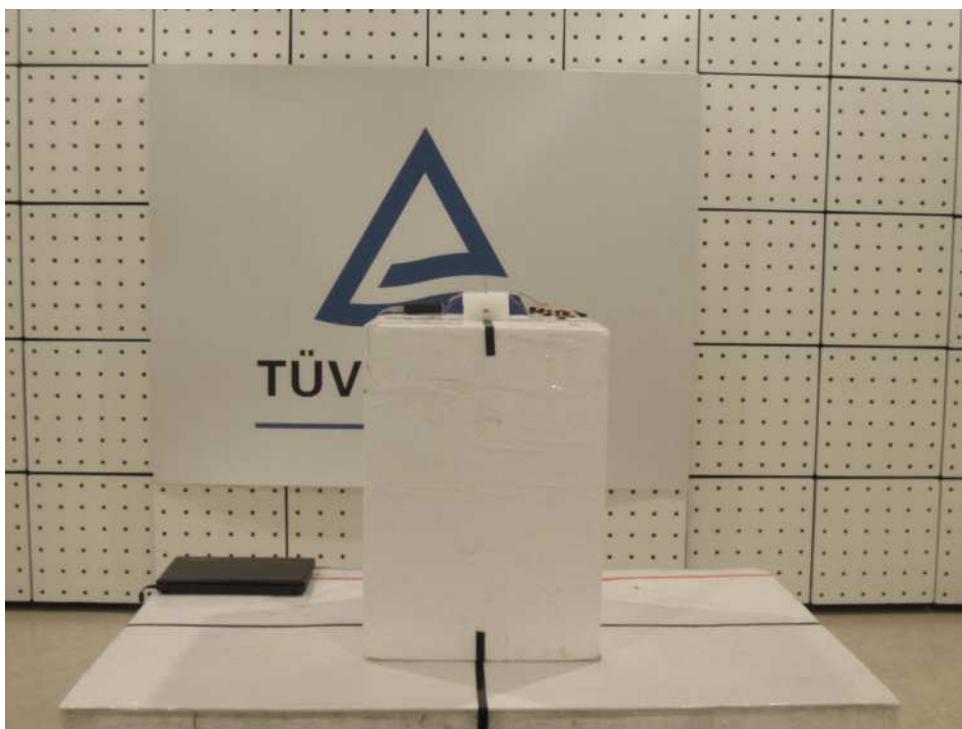
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**Photograph 30: Set-up for Spurious Emissions (Back View)- RN-SMA-S -ANT**

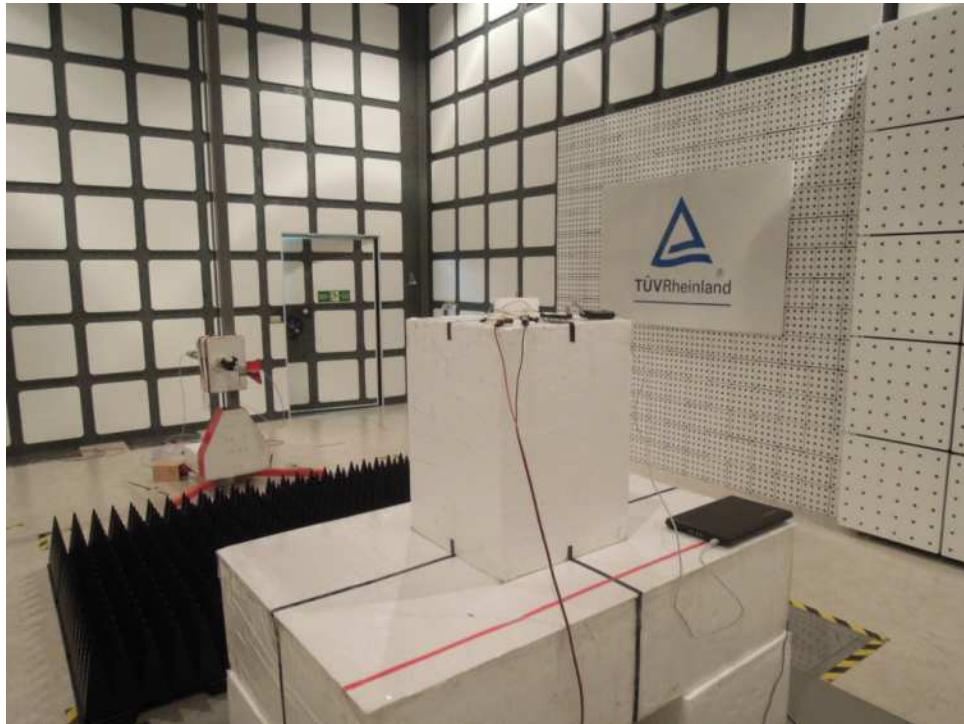


**Photograph 31: Set-up for Spurious Emissions (Front View)- RFA-02-G03-ANT**



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



Photograph 33: Set-up for Conducted testing



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**Photograph 34: Set-up for Conducted testing**



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



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