

Prüfbericht-Nr.: <i>Test Report No.:</i>	50125219 001	Auftrags-Nr.: <i>Order No.:</i>	114072858	Seite 1 von 58 <i>Page 1 of 58</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	28-Nov-2017	
Auftraggeber: <i>Client:</i>	Elgato Systems LLC 900 Kearny St., Suite 750, CA 94133, USA			
Prüfgegenstand: <i>Test item:</i>	Eve Light Strip			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	20EAS9901			
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 FCC 47CFR Part 2: Subpart J Section 2.1091 RSS-247 (02-2017) RSS-102 Issue 5			
Wareneingangsdatum: <i>Date of receipt:</i>	3-Jan-2018			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000677355-004 A000677355-005			
Prüfzeitraum: <i>Testing period:</i>	5-Jan-2018 – 18-Jan-2018			
Ort der Prüfung: <i>Place of testing:</i>	EMC 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:		
2018-06-04	Sam C.J. Kuo / Project Engineer	2018-06-04	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>
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

5.2.1 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: 50125219 50125220 50125224APPENDIXP)

Appendix D: Test Result of Radiated Emissions

(File Name: 50125219APPENDIXD)

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 4, November 2014 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 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

2.3 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	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
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	2018/03/07

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 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.

2.6 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	$\pm 10 \text{ \%}$

3. General Product Information

3.1 Product Function and Intended Use

The EUT is an Eve Light Strip. It contains a Wi-Fi 2.4GHz compatible module enabling the user to communicate data through a Wireless interface.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment	Eve Light Strip
Type Designation	20EAS9901
FCC ID	SNE-LST-001
Canada ID	11192A-LST001
Canada HVIN	20EAS9901

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	Power Adapter: Input:100-240v 1.5A ; Output: 20V 3.25A
Modulation	802.11b: DSSS ; 802.11g/n: OFDM
Antenna gain	2.01dBi

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

- | | |
|-------------------------|----------------------|
| - Bill of Material | - Circuit Diagram |
| - PCB Layout | - Instruction Manual |
| - Photo Document | - Rating Label |
| - Technical Description | |

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

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

4.2 Test Operation and Test Software

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

This software, Realtek MPtool 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: A000677355-004

Radiation: A000677355-005

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 13Mbps data rate were chosen for full testing.

4.3 Auxiliary Equipment

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

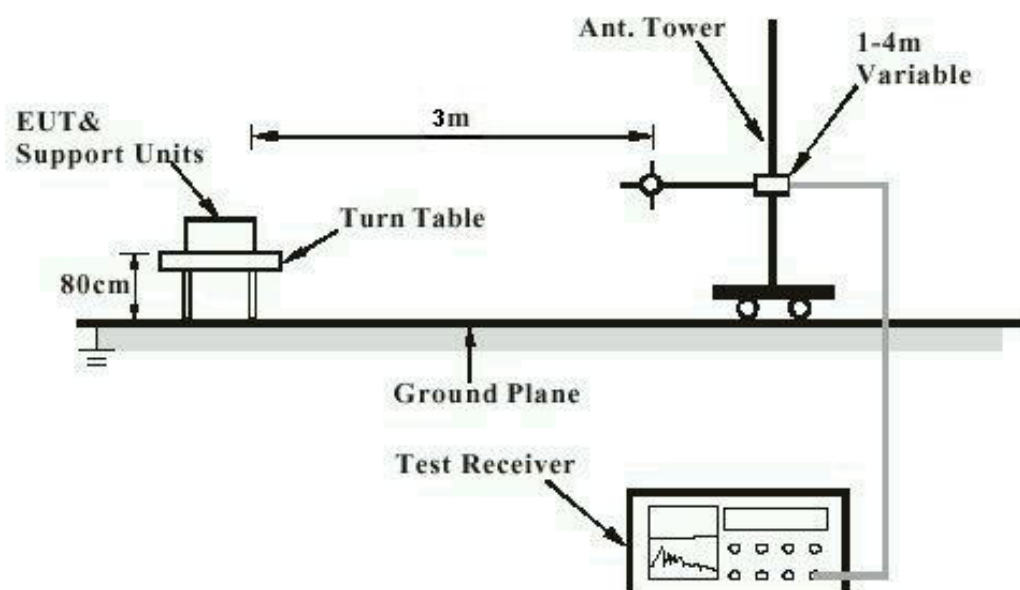
Description	Manufacturer	Model No.	Serial No.
Notebook(EMC-06)	Lenovo	TP00048A	PB-0F8B2

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)

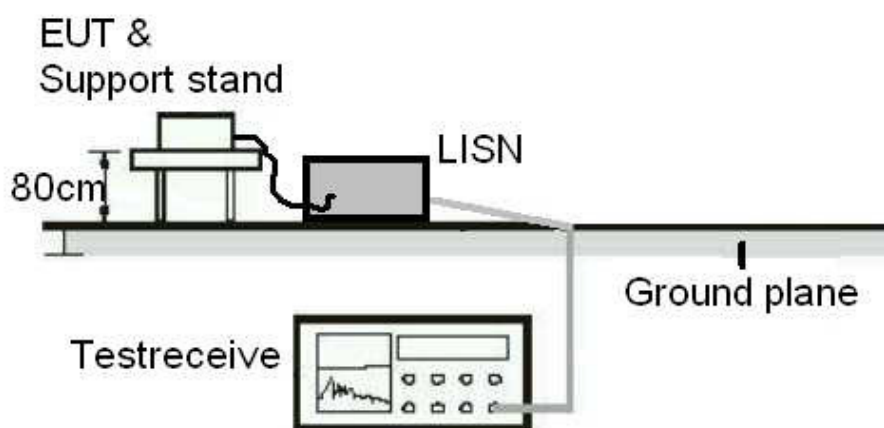
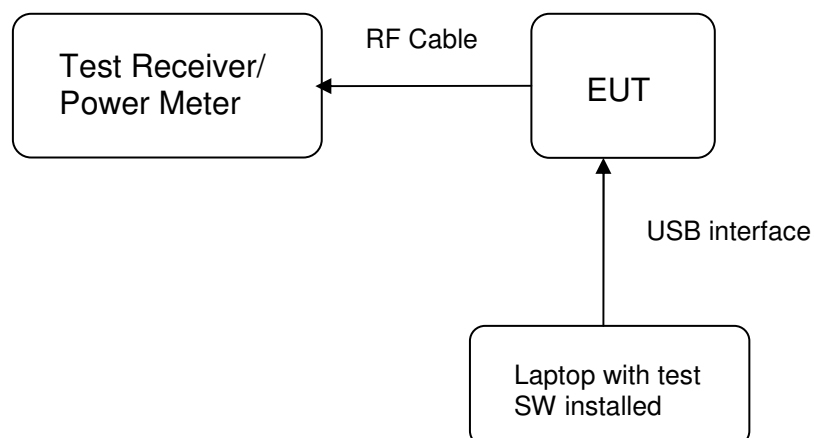


Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



4.6 Test Environment

Ambient temperature : 18-25 °C
Relative humidity : 45-65 %

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 a directional gain of 2.01dBi. The antenna is a Chip Antenna soldered to the PCB 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

Table 6: Test result of Peak Output Power (802.11b)

Channel	Channel Frequency (MHz)	Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2412	17.44	0.05546	1
Middle Channel	2437	17.35	0.05433	1
High Channel	2462	17.32	0.05395	1

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

Channel	Channel Frequency (MHz)	Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2412	21.78	0.15066	1
Middle Channel	2437	21.68	0.14723	1
High Channel	2462	21.32	0.13552	1

Table 8: Test result of Peak Output Power (802.11n HT20)

Channel	Channel Frequency (MHz)	Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2412	20.54	0.11324	1
Middle Channel	2437	20.66	0.11641	1
High Channel	2462	20.49	0.11194	1

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

Table 9: Test result of 6dB Bandwidth (802.11b)

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	9.085	0.5	Pass
Mid Channel	2437	9.085	0.5	Pass
High Channel	2462	9.09	0.5	Pass

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

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	16.59	0.5	Pass
Mid Channel	2437	16.58	0.5	Pass
High Channel	2462	16.58	0.5	Pass

Table 11: Test result of 6dB Bandwidth (802.11n HT20)

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	17.77	0.5	Pass
Mid Channel	2437	17.75	0.5	Pass
High Channel	2462	17.74	0.5	Pass

Table 12: Test result of 99% Bandwidth (802.11b)

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	13.338
Mid Channel	2437	13.368
High Channel	2462	13.332

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

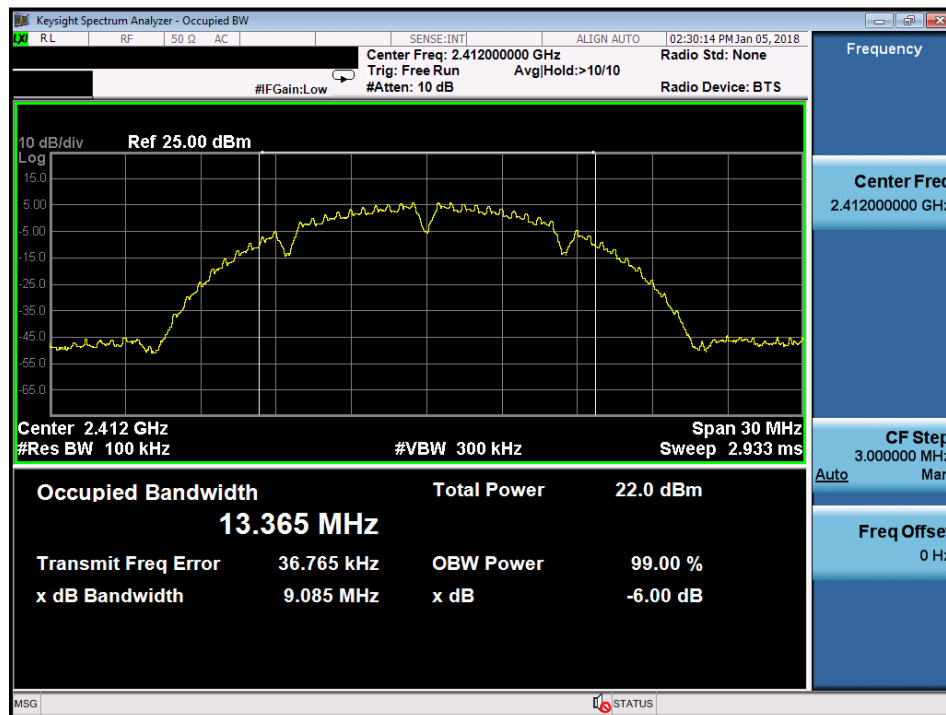
Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	16.753
Mid Channel	2437	16.782
High Channel	2462	16.763

Table 14: Test result of 99% Bandwidth (802.11n HT20)

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	17.775
Mid Channel	2437	17.796
High Channel	2462	17.774

Test Plot of 6dB Bandwidth (802.11b)

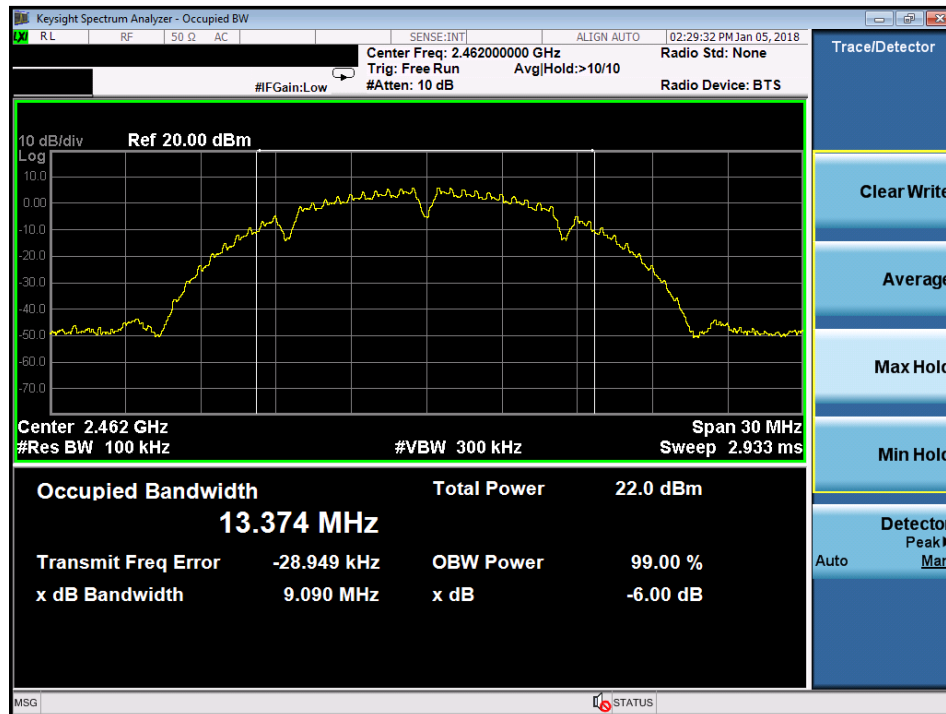
Low Channel



Middle Channel

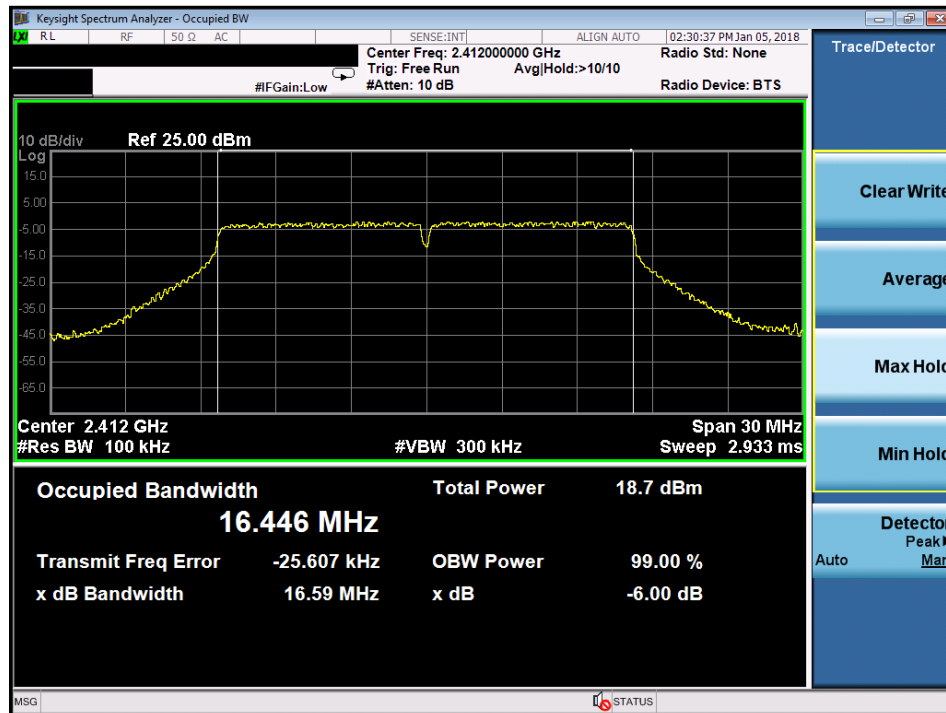


High Channel

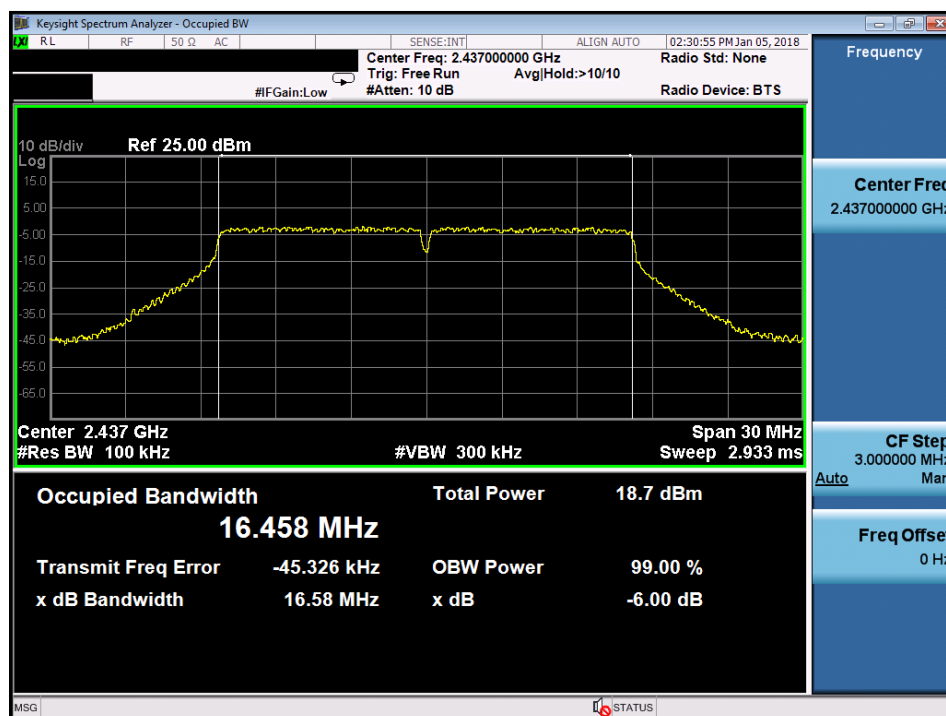


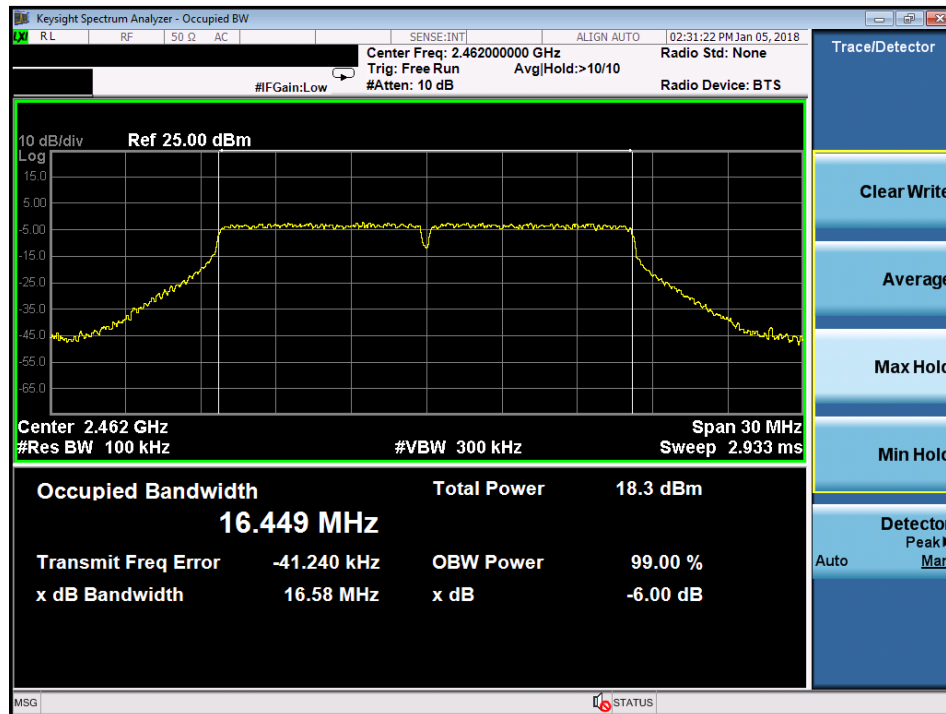
Test Plot of 6dB Bandwidth (802.11g)

Low Channel



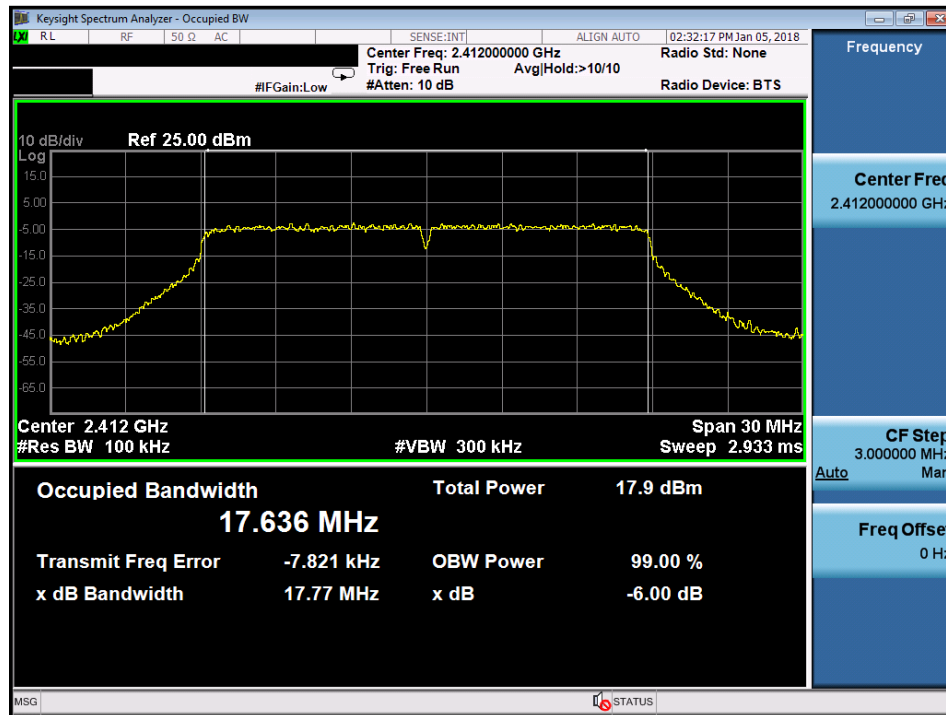
Middle Channel



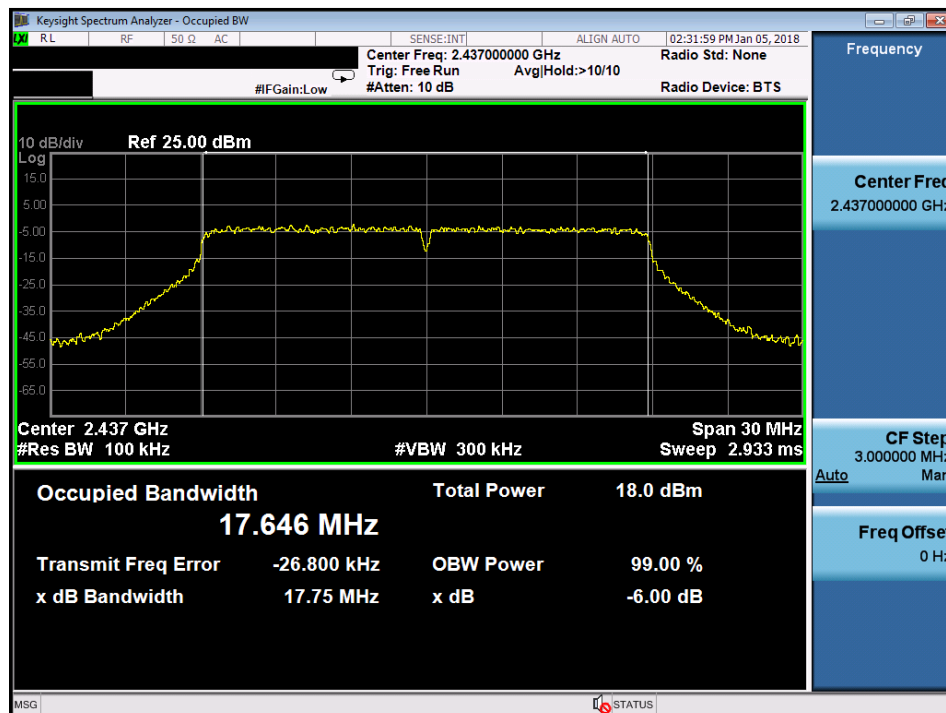
High Channel


Test Plot of 6dB Bandwidth (802.11n HT20)

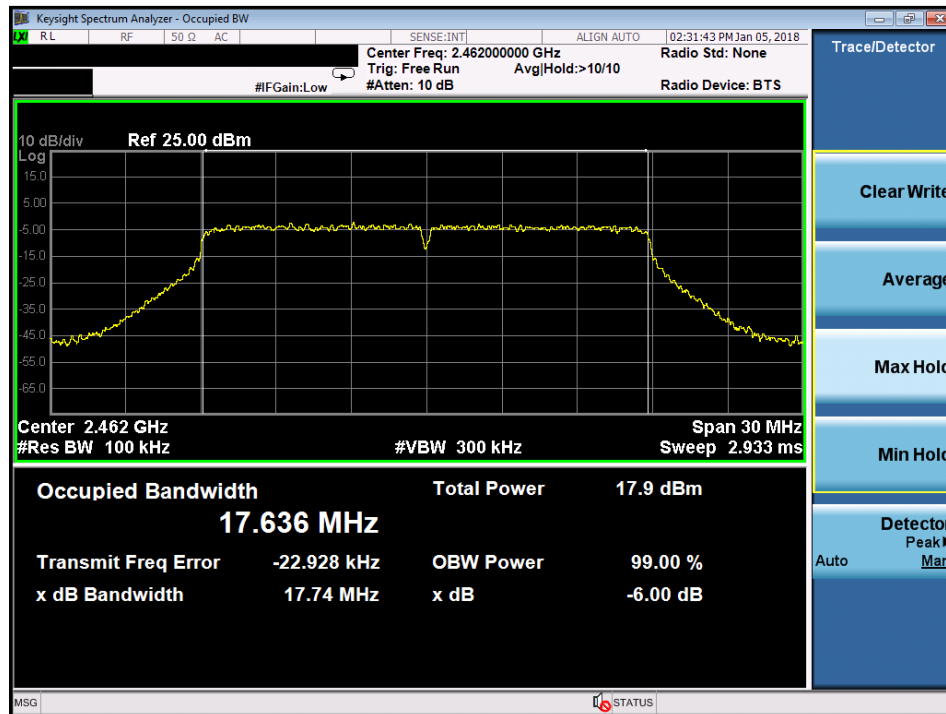
Low Channel



Middle Channel

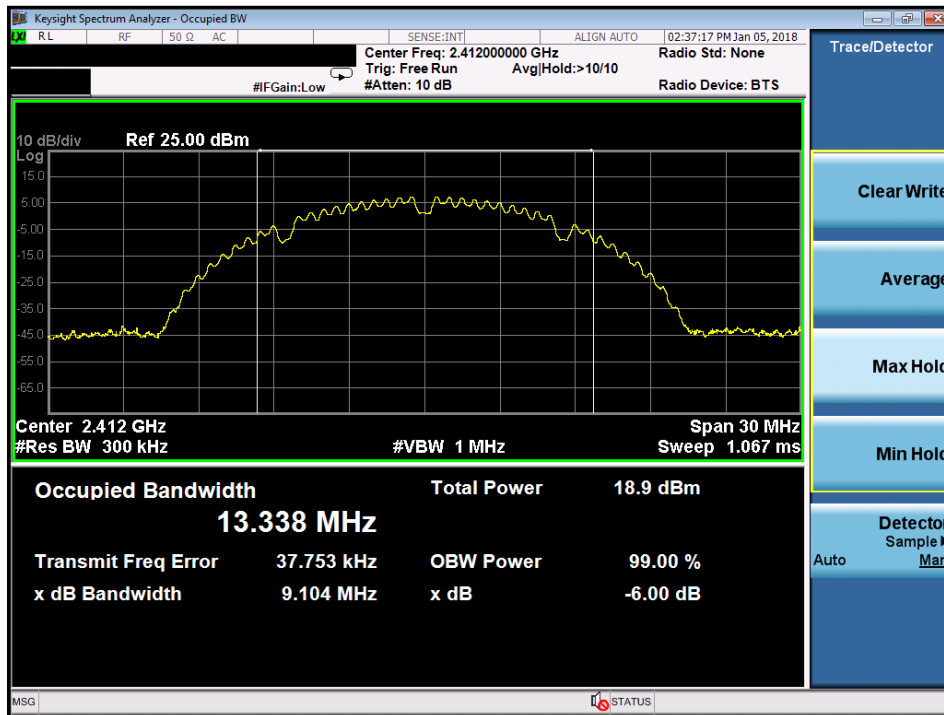


High Channel

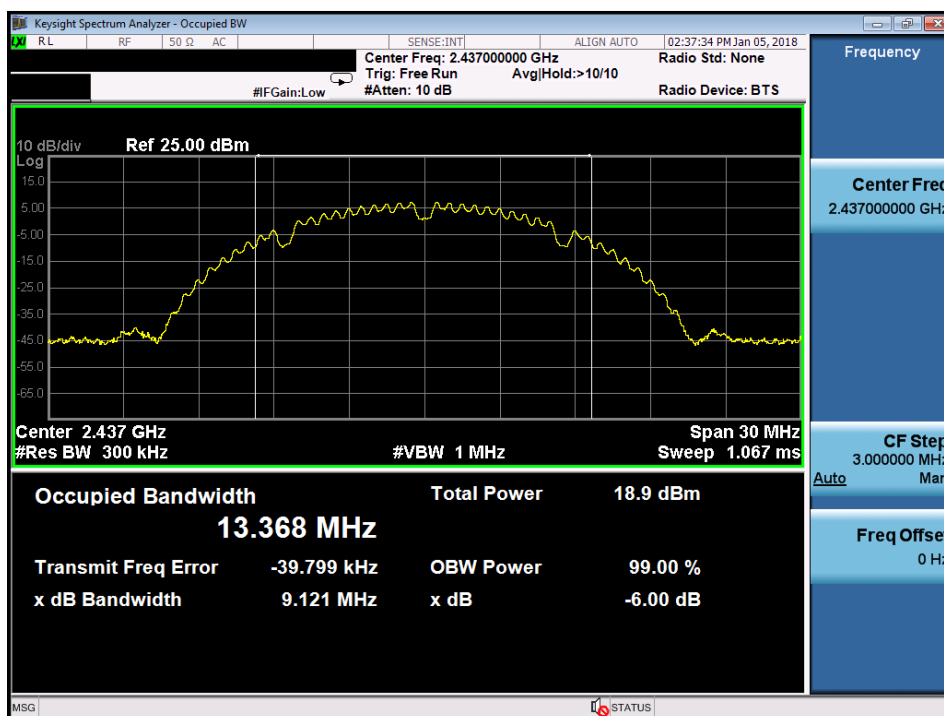


Test Plot of 99% Bandwidth (802.11b)

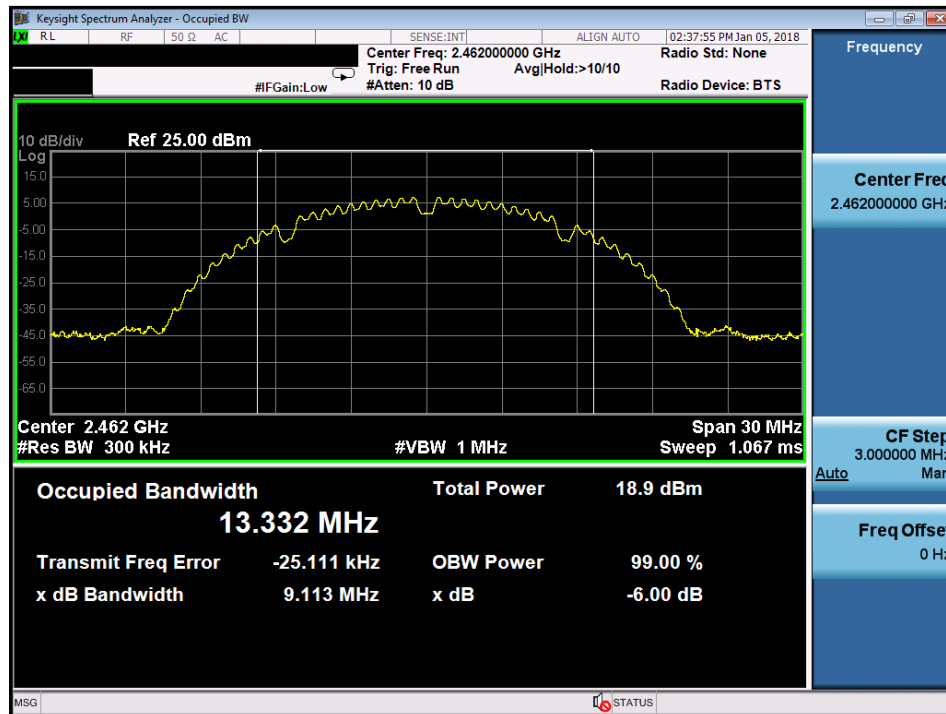
Low Channel



Middle Channel

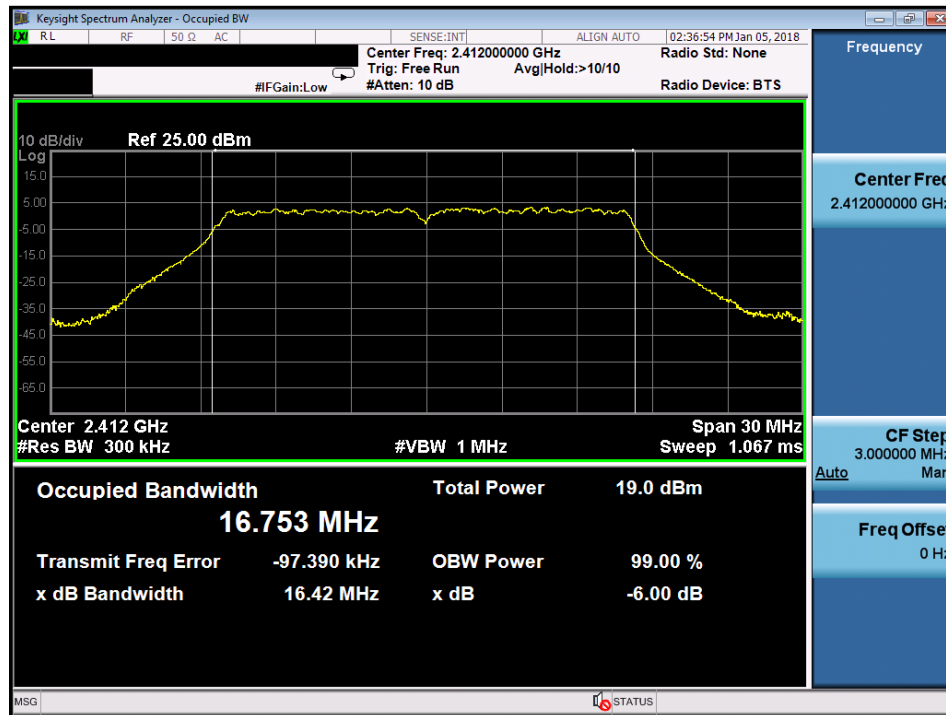


High Channel

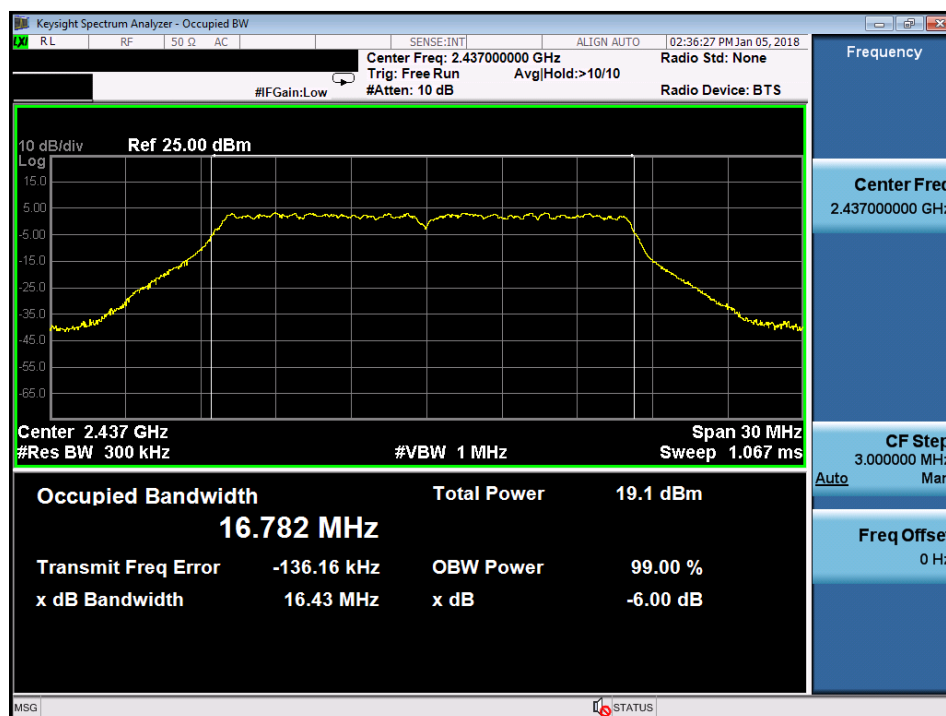


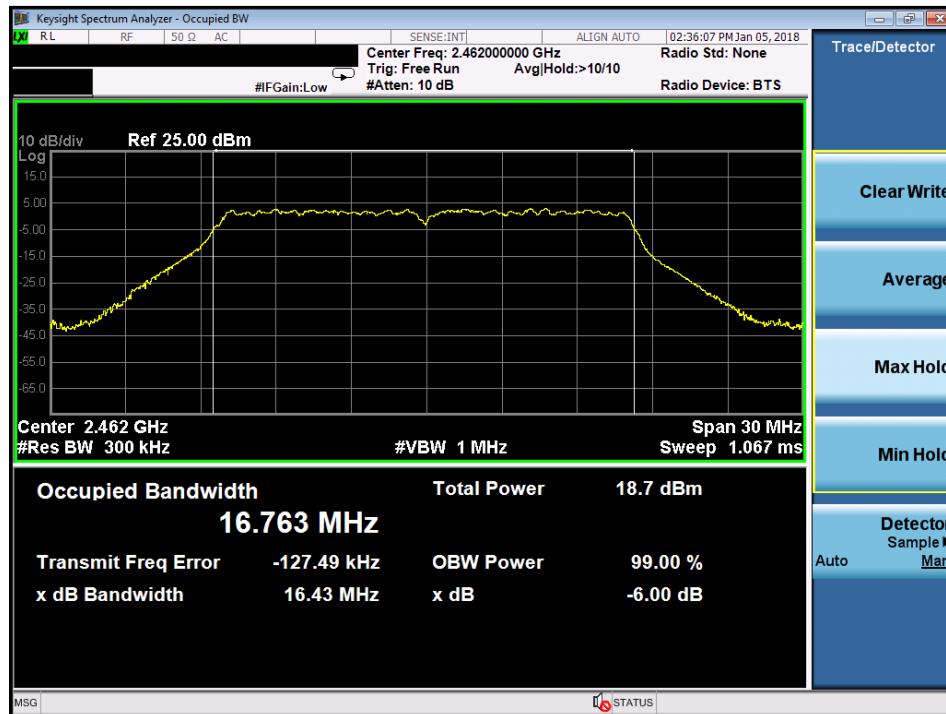
Test Plot of 99% Bandwidth (802.11g)

Low Channel



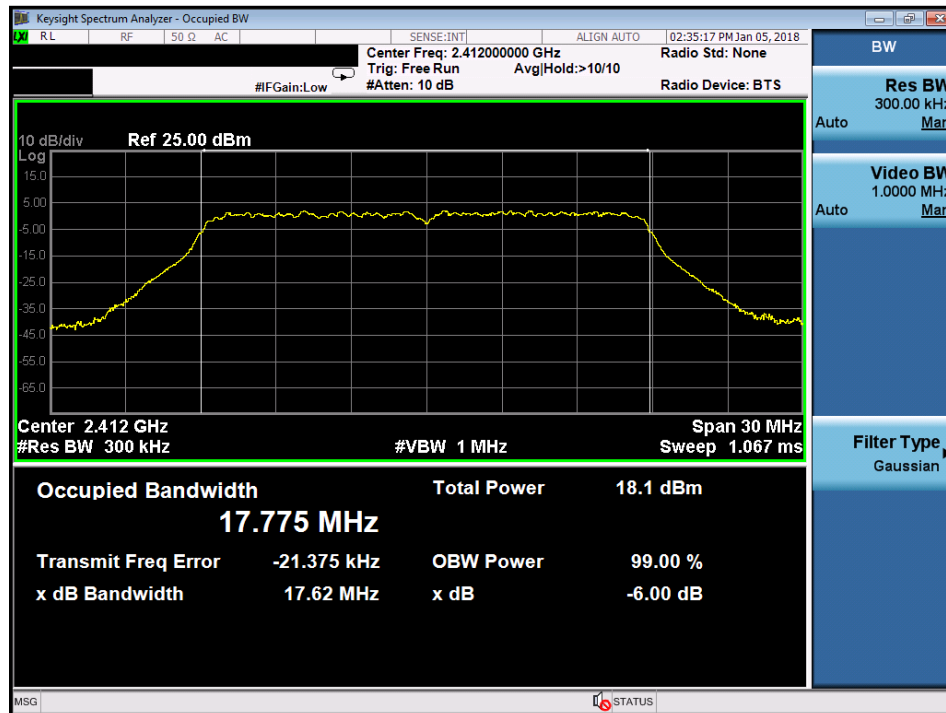
Middle Channel



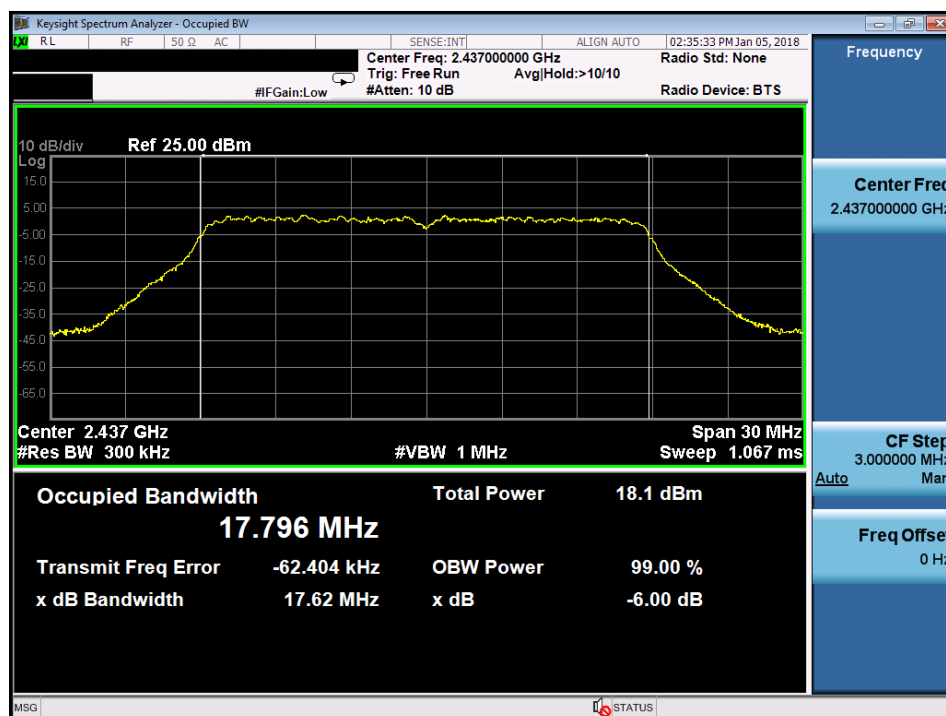
High Channel


Test Plot of 99% Bandwidth (802.11n HT20)

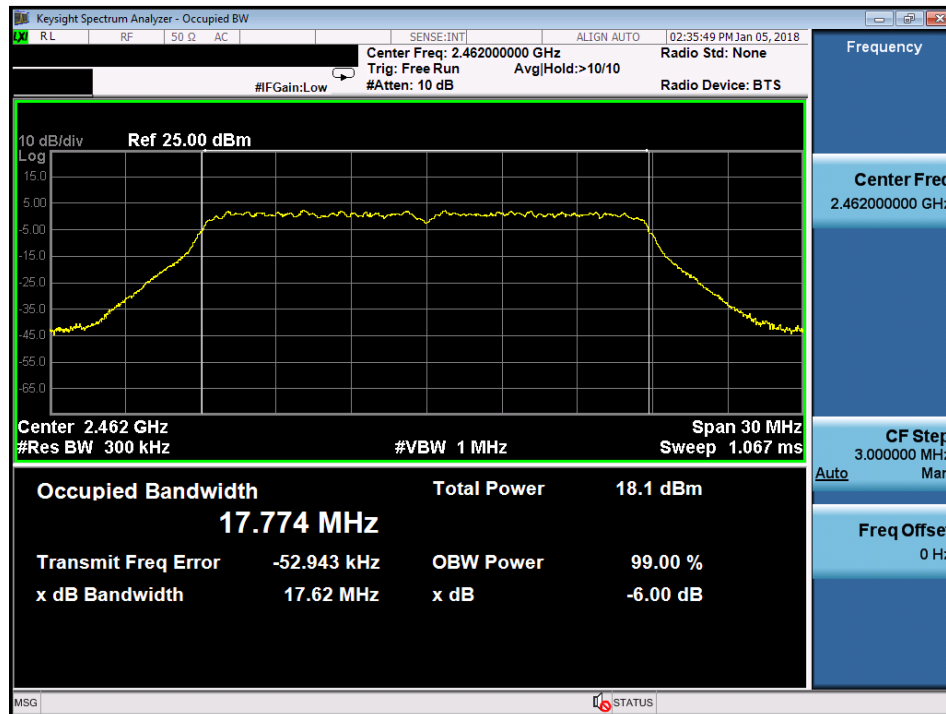
Low Channel



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

Table 15: Test result of Power Density (802.11b)

Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2412	6.02	8
Middle Channel	2437	5.53	8
High Channel	2462	5.77	8

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

Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2412	-2.07	8
Middle Channel	2437	-1.98	8
High Channel	2462	-2.12	8

Table 17: Test result of Power Density (802.11n HT20)

Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2412	-2.67	8
Middle Channel	2437	-2.45	8
High Channel	2462	-2.3	8

Test Plot of Power Density (802.11b)

Low Channel



Middle Channel

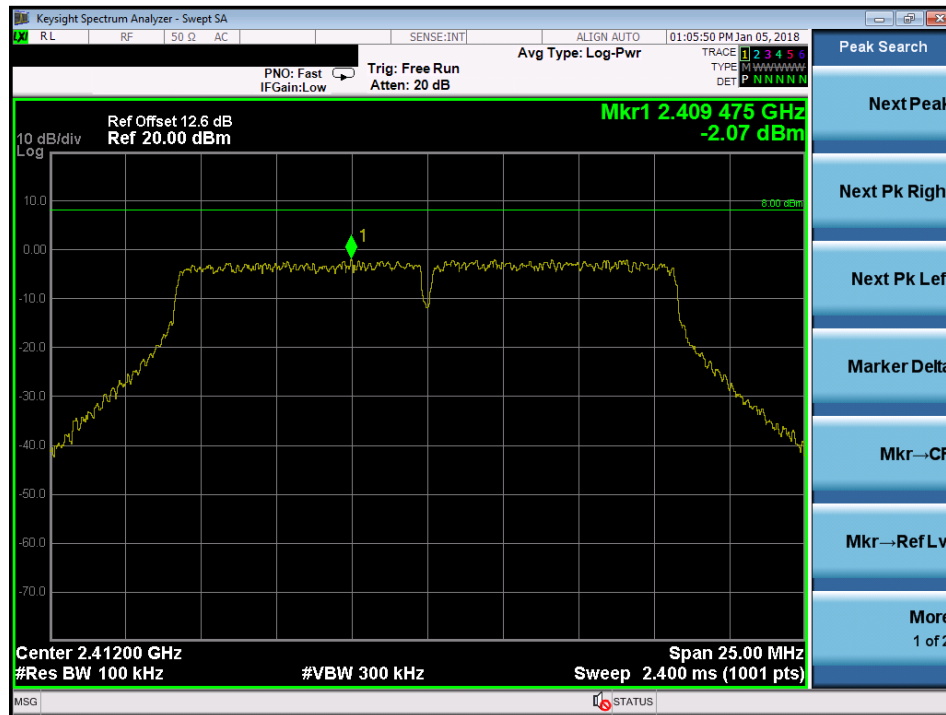


High Channel

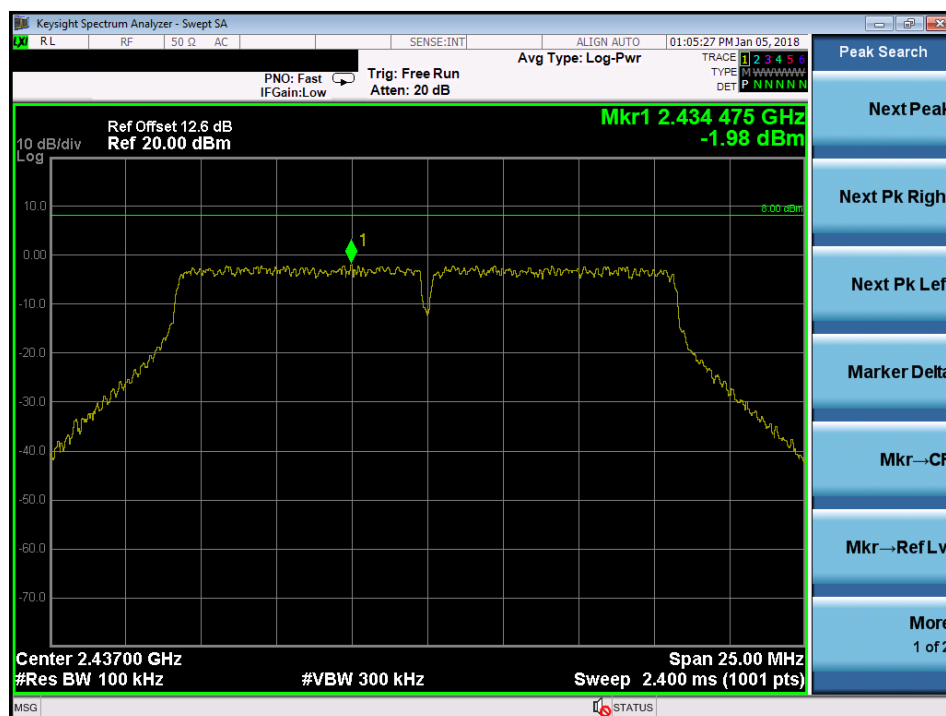


Test Plot of Power Density (802.11g)

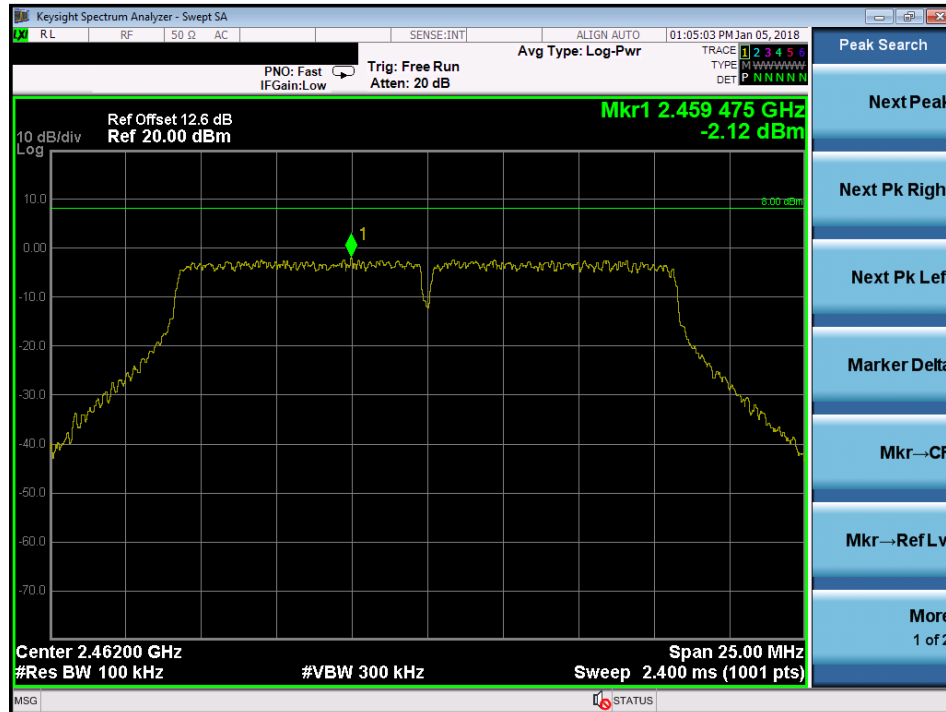
Low Channel



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

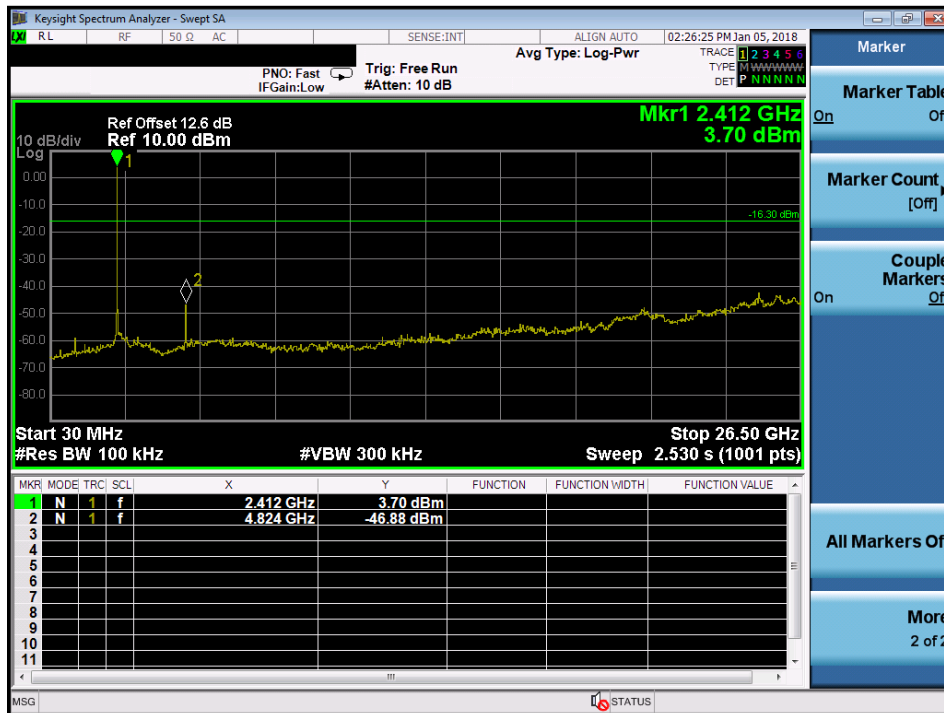
Test Channel	:	Low/ High
Operation mode	:	A

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

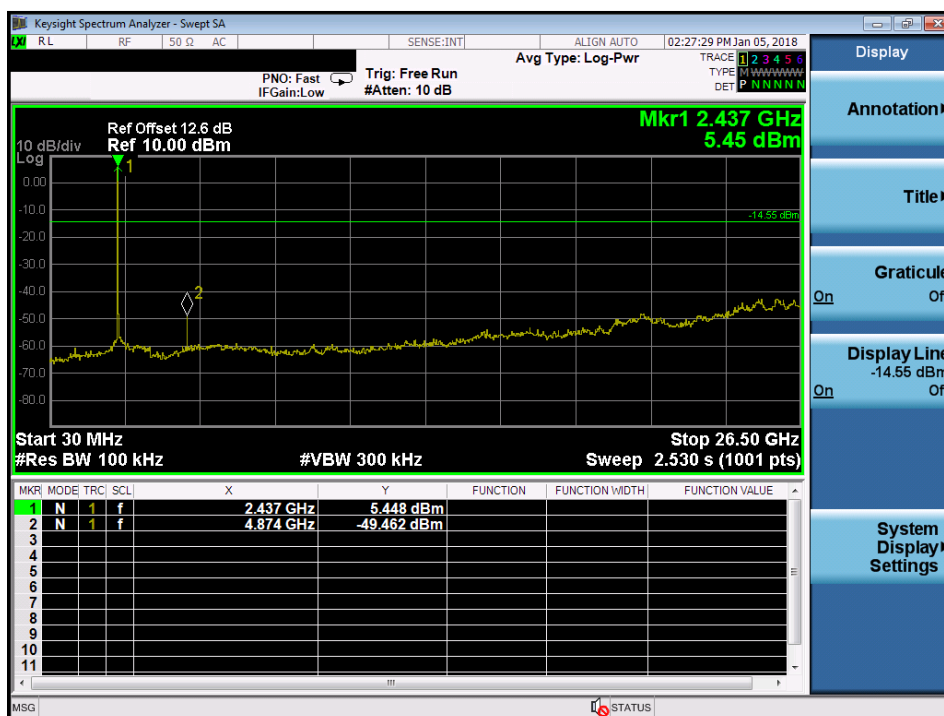
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

Test Plot 100kHz Conducted Emissions (802.11b)

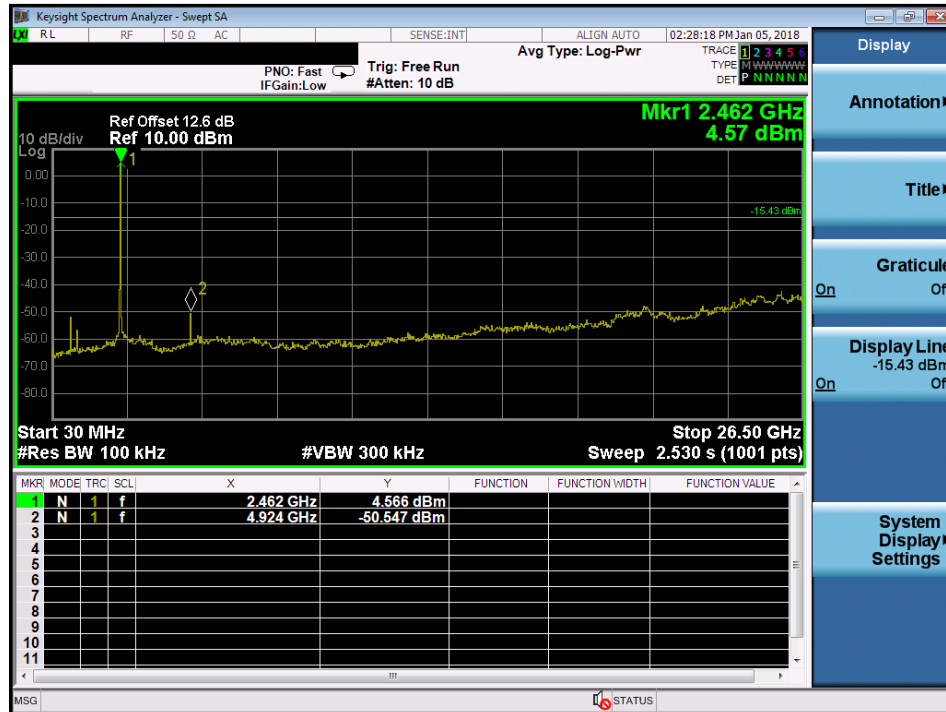
Low Channel



Middle Channel



High Channel



Test Plot 100kHz Conducted Emissions (802.11g)

Low Channel



Middle Channel



High Channel



Test Plot 100kHz Conducted Emissions (802.11n HT20)

Low Channel



Middle Channel

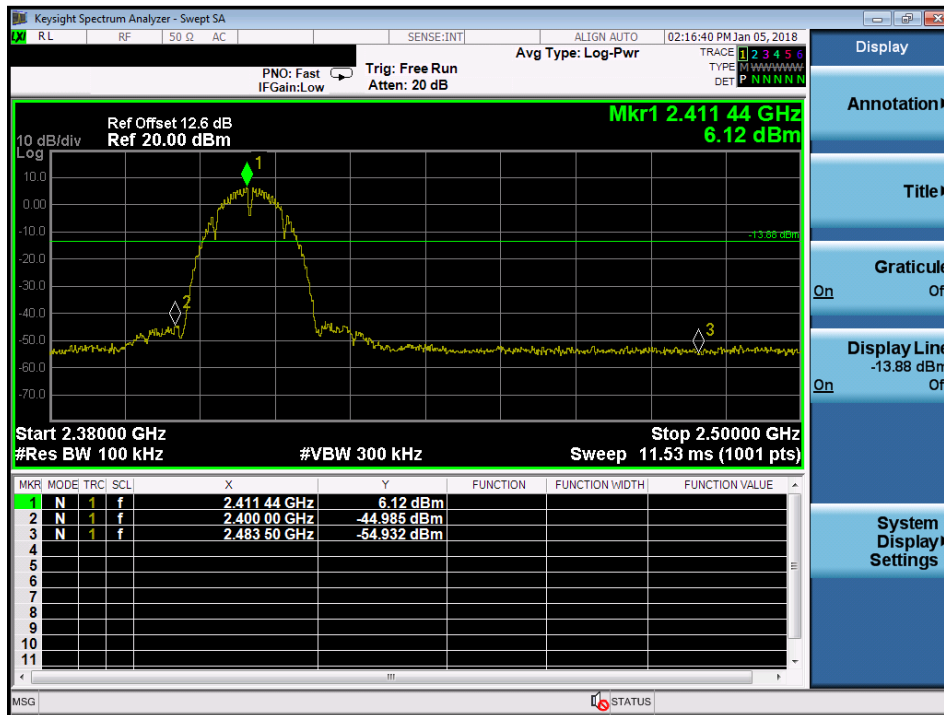


High Channel

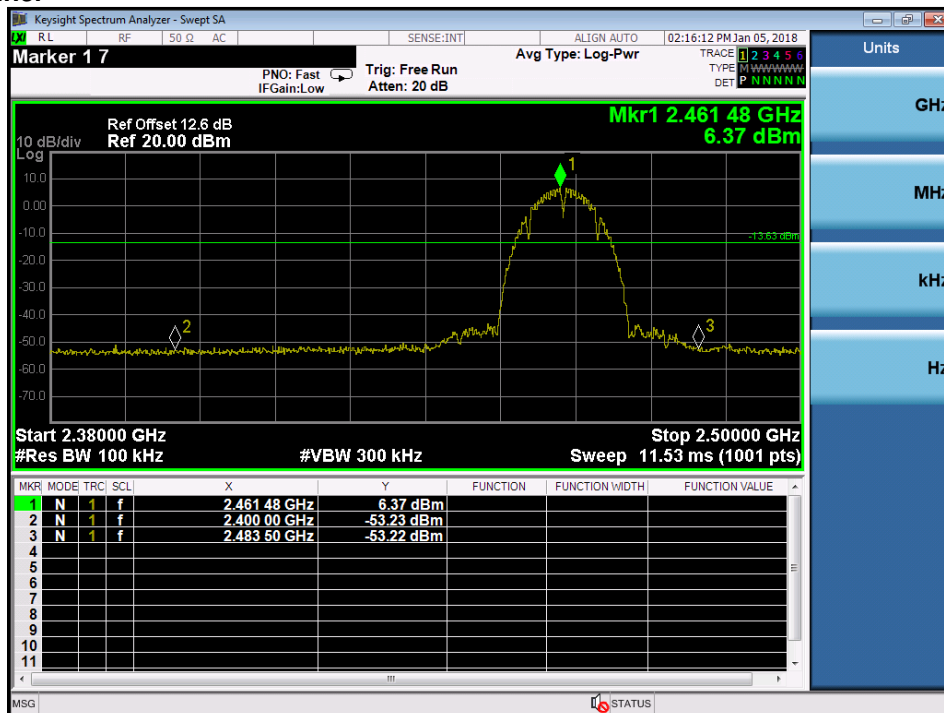


Test Plot 100kHz RBW of Band Edge (802.11b)

Low Channel

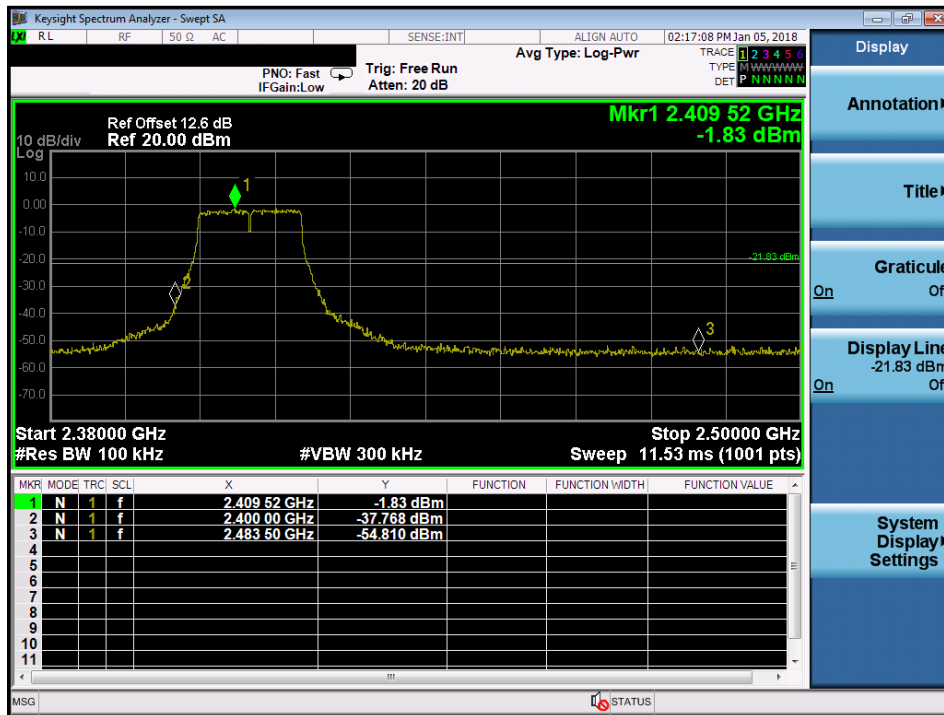


High Channel

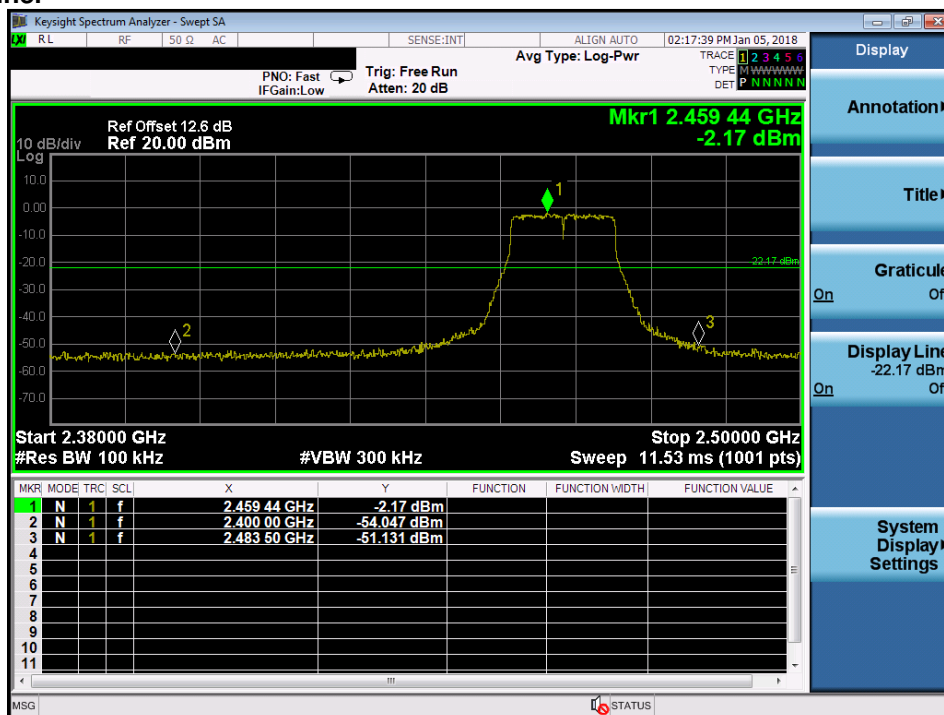


Test Plot 100kHz RBW of Band Edge (802.11g)

Low Channel

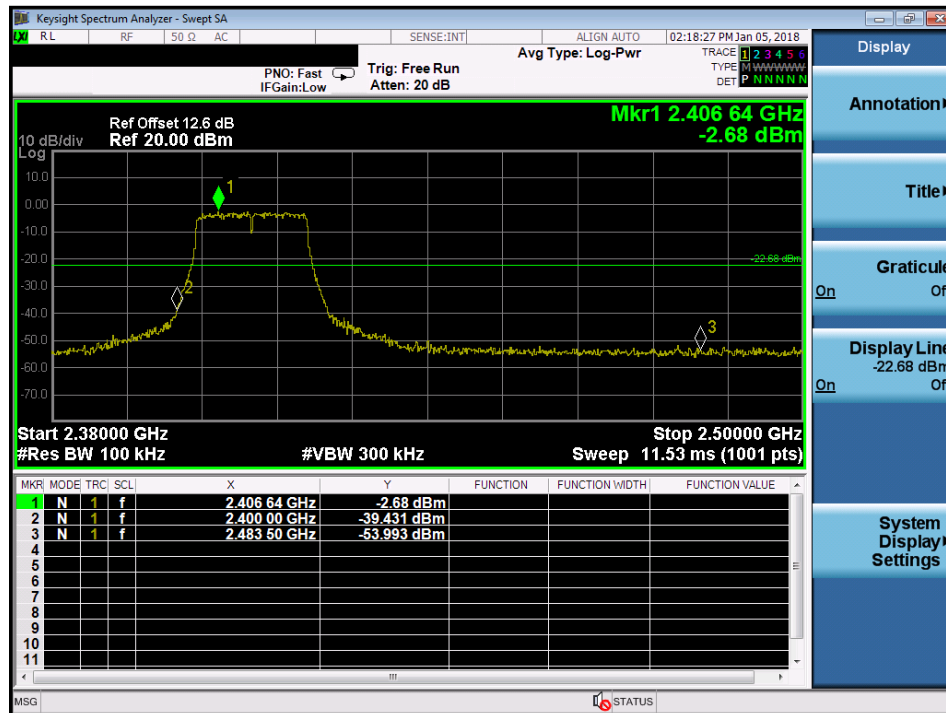


High Channel

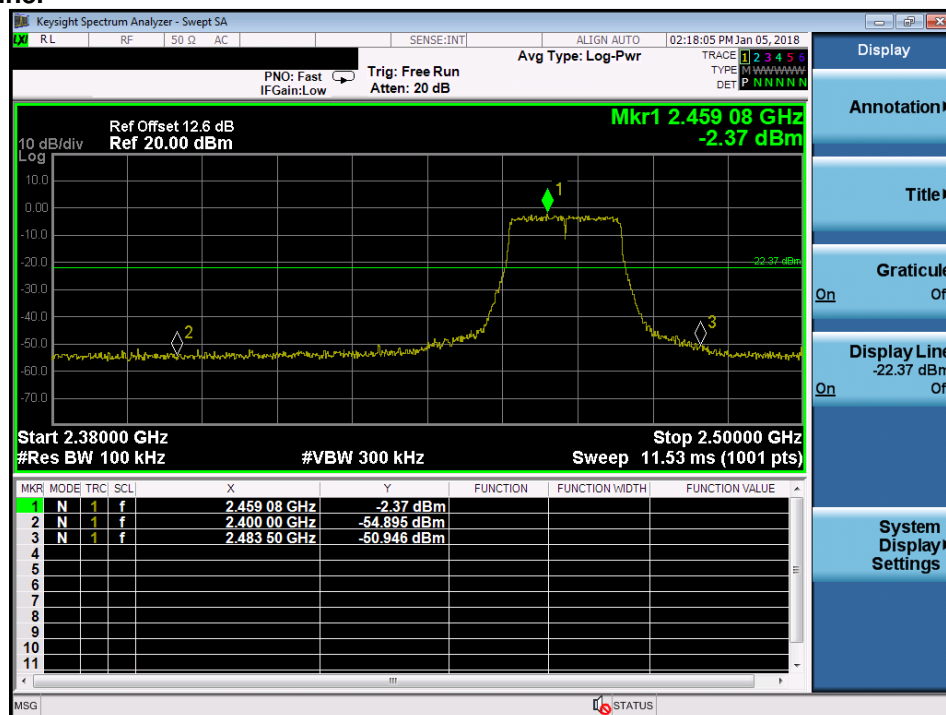


Test Plot 100kHz RBW of Band Edge (802.11n HT20)

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-210 2.2, 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 i4, 8.9 (Table 6), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen i4, 8.9 (Table 4 and 5). Radiated emissions which fall in the restricted bands, as defined in LP0002(2018): 2.7 , must comply with the radiated emission limits specified in LP0002(2018): 2.8 Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) and FCC 15.249(a), RSS-Gen i4, 8.9 (Table 4 and 5) and RSS-210 A2.9(a). Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in LP0002(2018): 2.8
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

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

Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic.

For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The X Axis orientation is the worst-case and recorded in this test report. 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.

5.2 Mains Emissions

5.2.1 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 47 CFR Part 2:Subpart J Section 2.1091
 FCC KDB Publication 447498 D01 v06
 RSS-102 Issue 5

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

Maximum Exposure:

Power to Antenna (mW)	150 mW
Power to Antenna (dBm)	21.8 dBm
Antenna Gain	2.01 dBi
Power+Ant Gain	238.3 mW
Distance	20 cm
S=	0.047 mW/cm ²

Limit FCC:

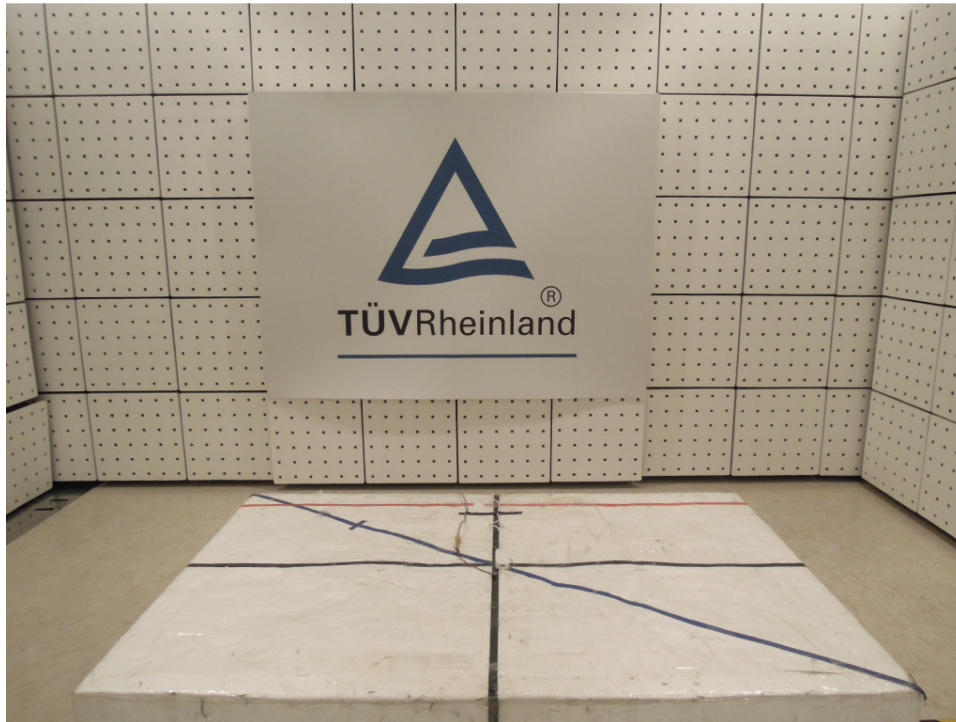
0.3-1.34 MHz (100) mW/cm²
 1.34-30 MHz (180/f²) mW/cm²
 30-300 MHz 0.2 mW/cm²
 300-1500 MHz f/1500 mW/cm²
1500-100,000 MHz 1.0 mW/cm²

Limit Canada: 0.543 mW/cm²

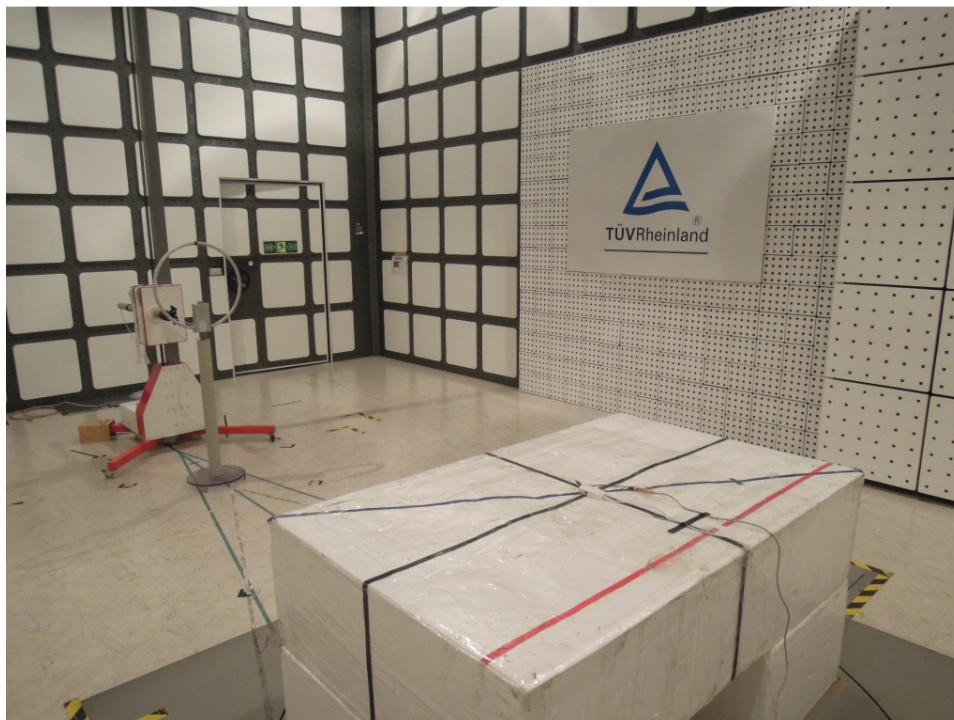
---End---

Photographs of the Test Set-Up

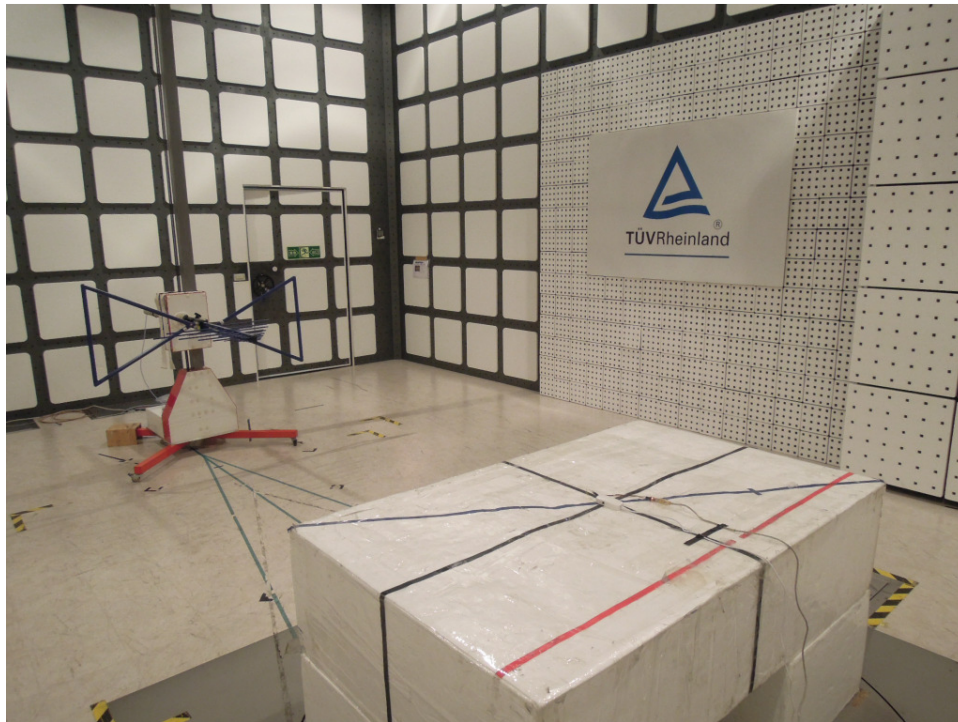
Photograph 1: Set-up for Spurious Emissions (Front View)



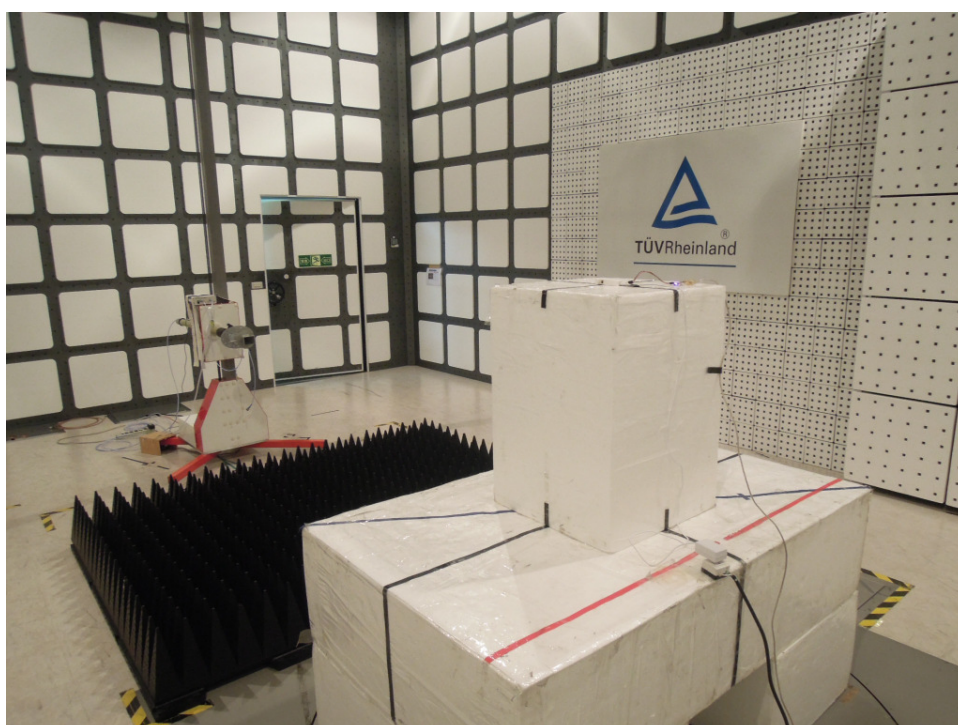
Photograph 2: Set-up for Spurious Emissions (Back View 1)



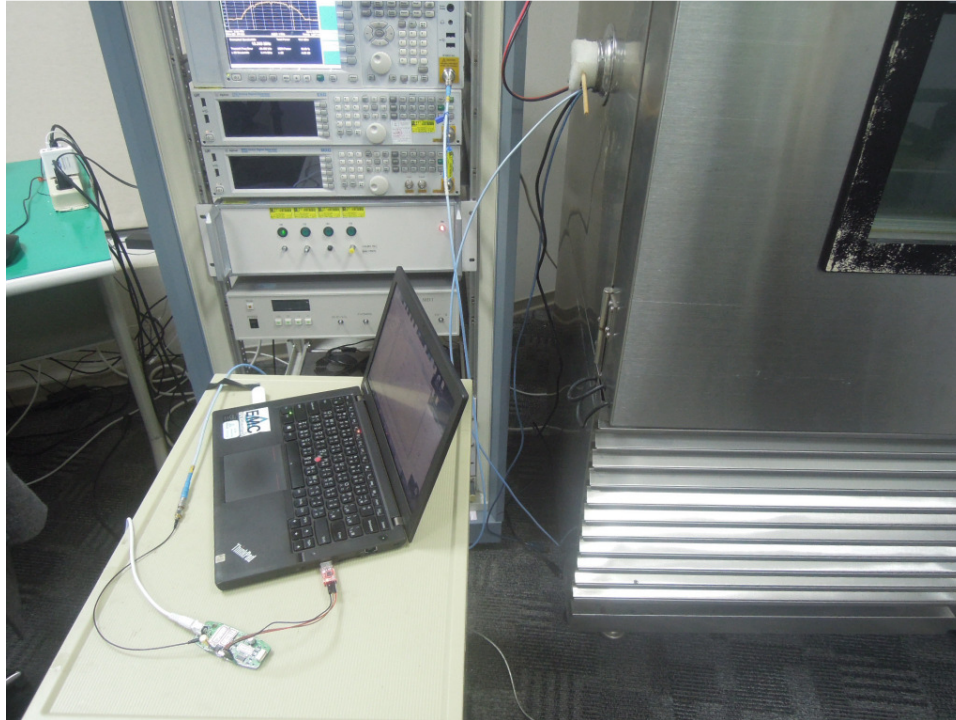
Photograph 3: Set-up for Spurious Emissions (Back View 2)



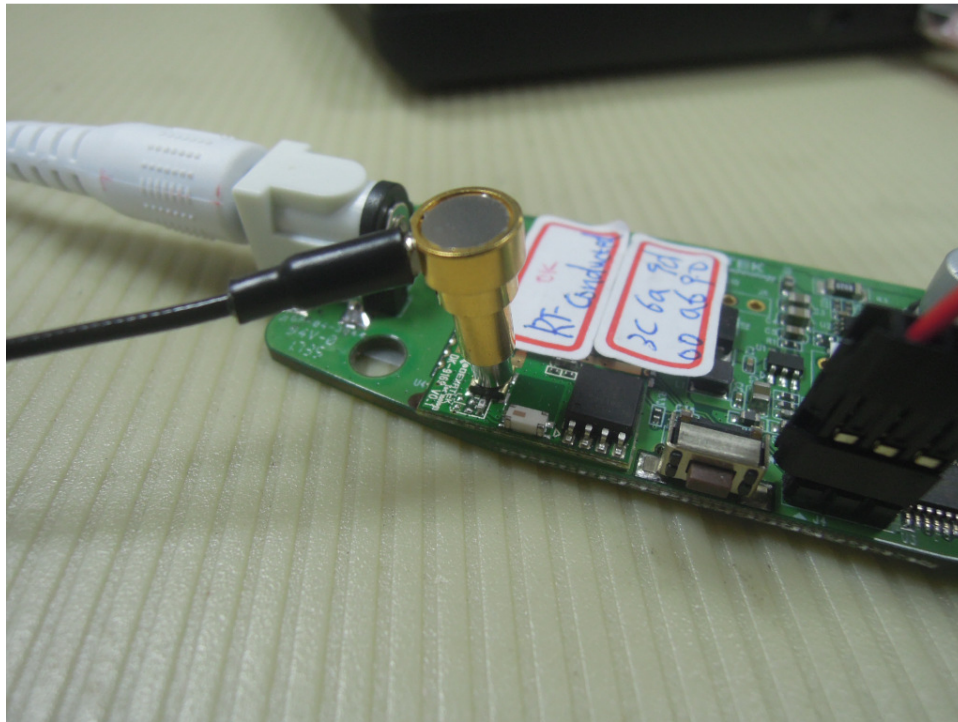
Photograph 4: Set-up for Spurious Emissions (Back View 3)



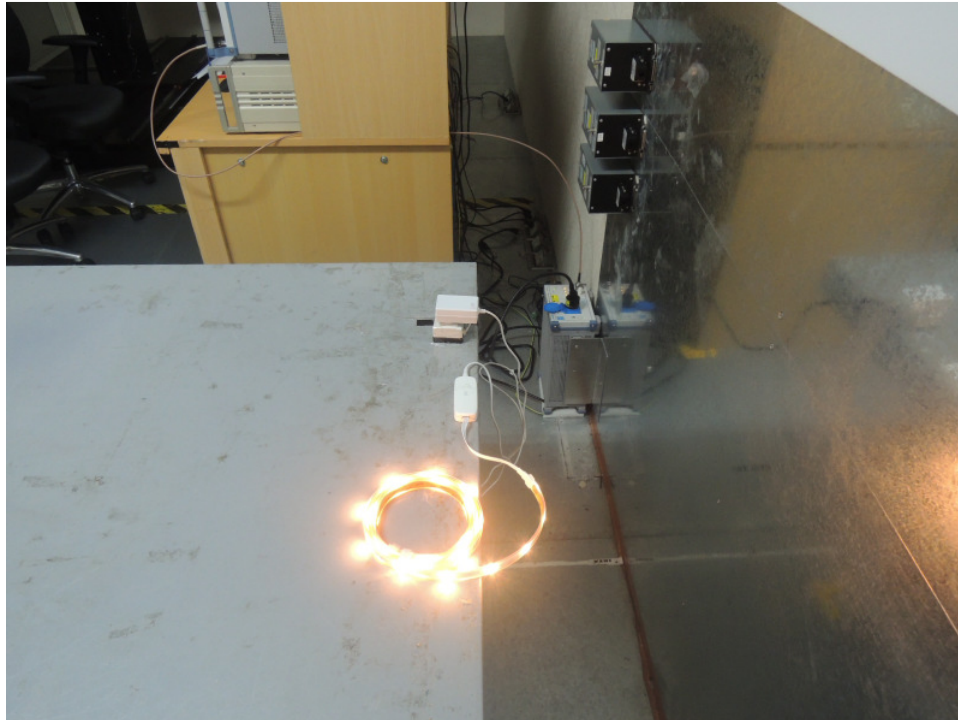
Photograph 5: Set-up for Conducted testing



Photograph 6: Set-up for Conducted testing



Photograph 7: Set-up for Mains Conducted testing (Back View)



Photograph 8: Set-up for Mains Conducted testing (Front View)



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