Prüfbericht-Nr.: *Test Report No.*:	**501938570 001**	**Auftrags-Nr.:** *Order No.*:	114082189	**Seite 1 von 61** *Page 1 of 61*
Kunden-Referenz-Nr.: *Client Reference No.*:	N/A	**Auftragsdatum:** *Order date*:	26-Sep-2018	
Auftraggeber: *Client*:	InnoComm Mobile Technology Corporation 3F, No. 6, Hsin Ann Rd., Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.			
Prüfgegenstand: *Test item*:	Wireless audio module			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	WB10			
Auftrags-Inhalt: *Order content*:	FCC Part 15C (WiFi 2.4GHz)			
Prüfgrundlage: *Test specification*:	FCC 47CFR Part 15: Subpart C Section 15.247(DTS)			

Wareneingangsdatum: *Date of receipt*:	08-Oct-2018
Prüfmuster-Nr.: *Test sample No.*:	A000817010-002
Prüfzeitraum: *Testing period*:	8-Oct-2018 - 30-Oct-2018
Ort der Prüfung: *Place of testing*:	EMC/RF Laboratory Taipei
Prüflaboratorium: *Testing laboratory*:	TUV Rheinland Taiwan Ltd.
Prüfergebnis*: *Test result**:	Pass

geprüft von / *tested by*:

2018-11-1	Mars Y. J. Lin / Project Engineer	
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

kontrolliert von / *reviewed by*:

2018-11-1	Ryan W. T. Chen / Project Manager	
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*:
The module has both modes with heat sink and without heat sink.
Both models of this report are evaluated, taking the Worst case test.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT
RESULT: Passed

5.1.2 PEAK OUTPUT POWER
RESULT: Passed

5.1.3 6DB BANDWIDTH
RESULT: Passed

5.1.4 POWER DENSITY
RESULT: Passed

5.1.5 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE MEASURED IN 100KHZ BANDWIDTH
RESULT: Passed

5.1.6 SPURIOUS EMISSION
RESULT: Passed

5.2.1 MAINS CONDUCTED EMISSIONS
RESULT: Passed

6.1.1 ELECTROMAGNETIC FIELDS
RESULT: Passed

Contents

1. General Remarks

1.1 Complementary Materials

The following attachments are integral parts of this test report:

Appendix P: Photo Documentation
(File Name: 501938570 001 Appendix P)
Appendix D: Test Result of Radiated Emissions
(File Name: 501938570 001 Appendix D)

Test Specifications

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

Table 1: Applied Standard and Test Levels

Radio
FCC CFR47 Part 15: Subpart C Section 15.247 ANSI C63.10:2013 KDB558074 D01 DTS Meas Guidance v04

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	ESR7	101062	2018/09/12	2019/09/12
Spectrum Analyzer	R&S	FSV 40	100921	2018/04/21	2019/04/21
Spectrum Analyzer	Agilent	N9010A	MY53470241	2018/04/25	2019/04/24
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	2018/07/29	2019/07/29
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2017/11/19	2018/11/19
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	060558	2017/11/19	2018/11/19
Bilog Antenna	TESEQ	CBL6111D	29804	2018/06/23	2019/06/23
Horn Antenna	ETS-Lindgren	3117	138160	2018/05/03	2019/05/03
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101031	2018/11/02	2019/11/02
EMI Test Receiver	R&S	ESCI7	100797	2017/12/28	2018/12/27
Temp. & Humid. Chamber	Giant Force	GCT-099-40-S	MAF0103-007	2018/07/13	2019/07/12
LISN (1 phase)	R&S	ENV216	101243	2018/06/02	2019/06/02
LISN	R&S	ENV216	101262	2018/06/16	2019/06/16
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	MY53480013	2018/03/11	2019/03/10

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 basics using in house standards or comparisons.

2.6 Measurement Uncertainty

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

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 ºC
Humidity	± 10 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Wireless audio module. It contains both Bluetooth and WiFi 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	Wireless audio module
Type Designation	WB10
FCC ID	YAIWB10

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	2412~2462 MHz
Channel Spacing	5 MHz
Channel number	11
Operation Voltage	DC 5V
Modulation	802.11b: DSSS 802.11g/n: OFDM with BPSK, QPSK, QAM
Antenna gain	3.69dBi

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

- Block Diagram
- Photo Document
- Technical Description
- Circuit Diagram
- Instruction Manual
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Table 6: Table for Parameters of Test Software Setting

Mode	Channel Frequency					
	NCB: 20MHz			NCB: 40MHz		
	2412 MHz	2437 MHz	2462 MHz	2422 MHz	2437 MHz	2452 MHz
802.11b	17	15.5	17.5	x	x	x
802.11g	13	13.5	13.5	x	x	x
802.11n MCS0 HT20	12	11.5	12.5	x	x	x
802.11n MCS0 HT40	x	x	x	12	12	12.5

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 a 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:
A000817010-002

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.

IEEE 802.11n HT 40 mode:
Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 13Mbps data rate were chosen for full testing.

4.3 cial Accessories and Auxiliary Equipment

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

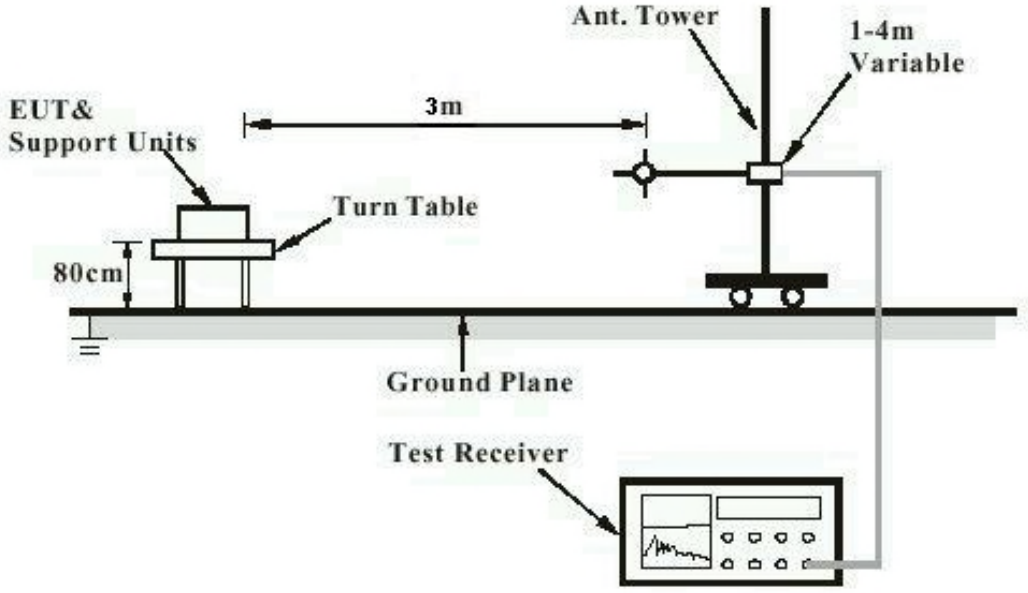
Description	Manufacturer	Model No.	Serial No.
Notebook(EMC-06)	Lenovo	TP00048A	PB-0F8B2

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)

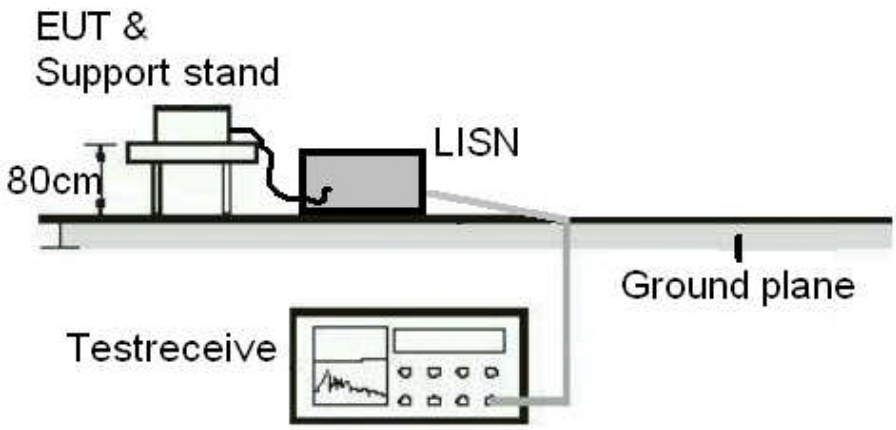
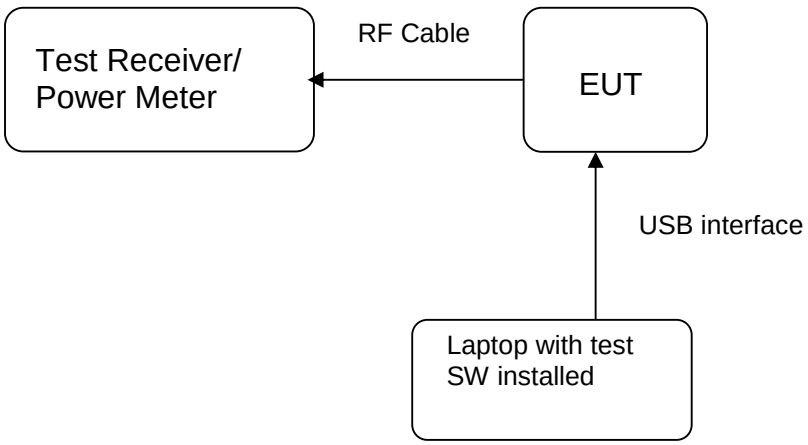


Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Passed**

Test standard	:	FCC Part 15.247(b)(4), Part 15.203
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 3.69 dBi. The antenna is a PCB Antenna 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 : FCC Part 15.247(b)(3)

Basic standard : ANSI C63.10:2013, KDB558074
Limit : 1 Watt
Kind of test site : Shielded room

Test setup

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

Ambient temperature : 22-26 °C
Relative humidity : 50-65 %
Atmospheric pressure : 100-103 kPa

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

Channel	Channel Frequency (MHz)	Output Power			Limit	Result
		Ant1 (dBm)	Ant2 (dBm)	Total (W)	(W)	
Low Channel	2412	13.16	16.13	0.0617	1	Pass
Middle Channel	2437	10.42	14.02	0.0363	1	Pass
High Channel	2462	13.08	15.38	0.0549	1	Pass

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

Channel	Channel Frequency (MHz)	Output Power			Limit	Result
		Ant1 (dBm)	Ant2 (dBm)	Total (W)	(W)	
Low Channel	2412	12.64	15.72	0.0557	1	Pass
Middle Channel	2437	12.61	15.69	0.0553	1	Pass
High Channel	2462	12.63	15.07	0.0505	1	Pass

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

Channel	Channel Frequency (MHz)	Output Power			Limit	Result
		Ant1 (dBm)	Ant2 (dBm)	Total (W)	(W)	
Low Channel	2412	10.76	14.65	0.0411	1	Pass
Middle Channel	2437	10.34	14.7	0.0404	1	Pass
High Channel	2462	11.74	13.88	0.0394	1	Pass

Table 10: Test result of Peak Output Power (802.11 HT40)

Channel	Channel Frequency (MHz)	Output Power			Limit	Result
		Ant1 (dBm)	Ant2 (dBm)	Total (W)	(W)	
Low Channel	2422	11.06	14.62	0.0418	1	Pass
Middle Channel	2437	10.54	14.46	0.0393	1	Pass
High Channel	2452	11.39	14.27	0.0405	1	Pass

Table 11: Test result of Maximum Average Output Power (802.11 b)

Channel	Channel Frequency (MHz)	Output Power			Limit	Result
		Ant1 (dBm)	Ant2 (dBm)	Total (W)	(W)	
High Channel	2462	6.54	9.18	0.0128	1	Pass

5.1.3 6dB Bandwidth

RESULT: **Passed**

Test standard	:	FCC Part 15.247(a)(2)
Basic standard	:	ANSI C63.10:2013, KDB558074
Kind of test site	:	Shielded room

Test setup

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

Ambient temperature	:	22-26°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

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

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	8.129	0.5	Pass
Mid Channel	2437	8.132	0.5	Pass
High Channel	2462	8.126	0.5	Pass

Table 13: Test result of 6dB Bandwidth (802.11g)

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	16.29	0.5	Pass
Mid Channel	2437	16.32	0.5	Pass
High Channel	2462	16.30	0.5	Pass

Table 14: Test result of 6dB Bandwidth (802.11n HT20)

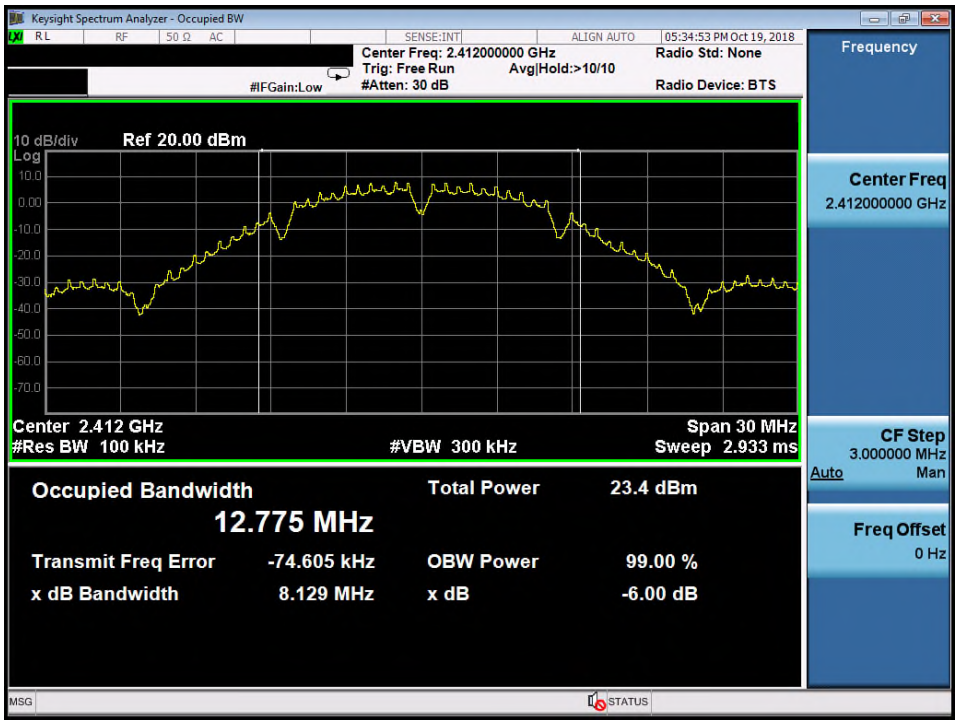
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	16.32	0.5	Pass
Mid Channel	2437	16.29	0.5	Pass
High Channel	2462	16.28	0.5	Pass

Table 15: Test result of 6dB Bandwidth (802.11n HT40)

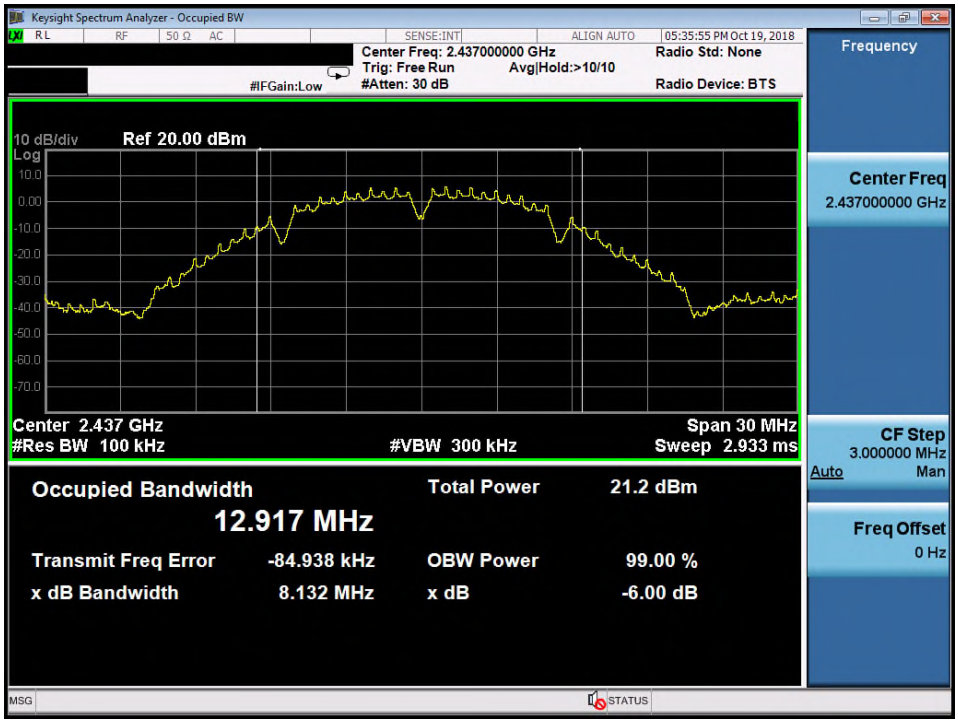
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2422	35.16	0.5	Pass
Mid Channel	2437	35.16	0.5	Pass
High Channel	2452	35.15	0.5	Pass

Test Plot of 6dB Bandwidth (802.11b)

Low Channel



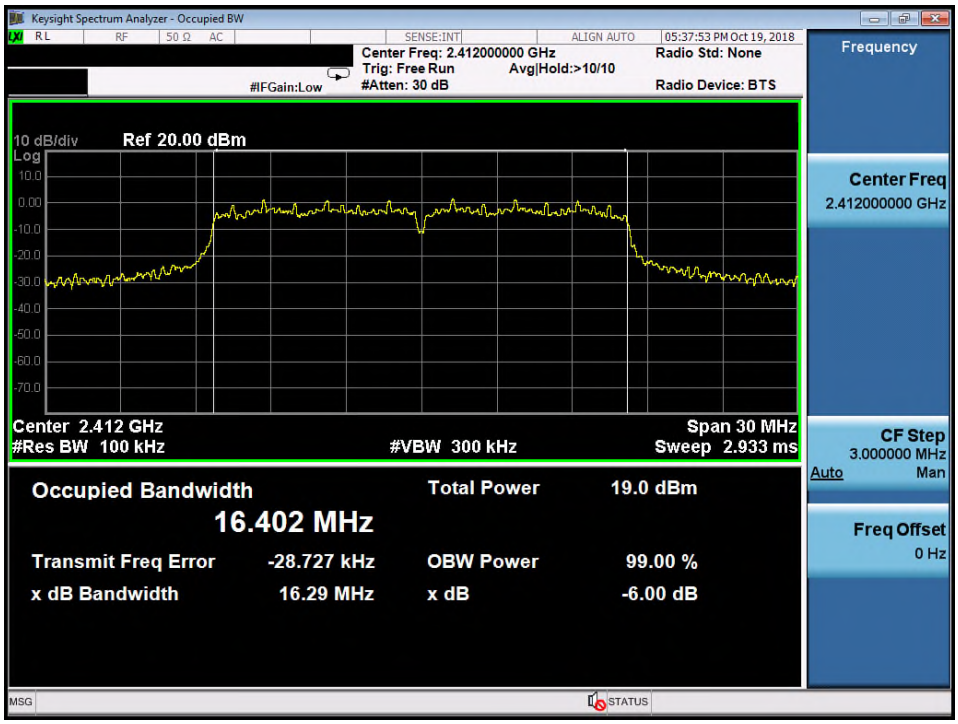
Middle Channel



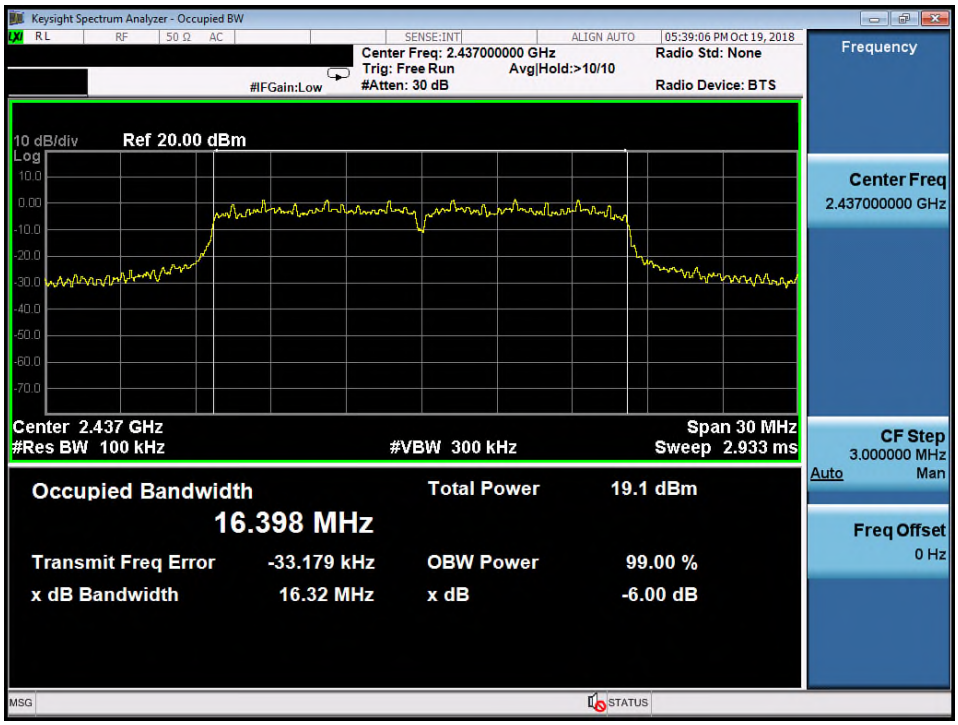
High Channel

Test Plot of 6dB Bandwidth (802.11g)

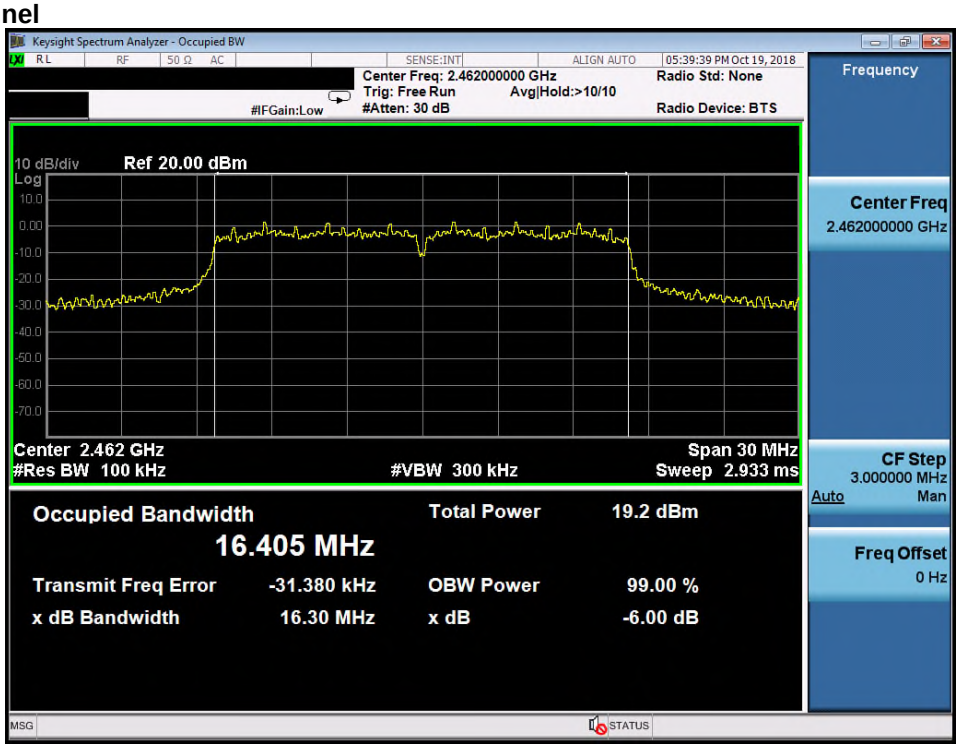
Low Channel



Middle Channel

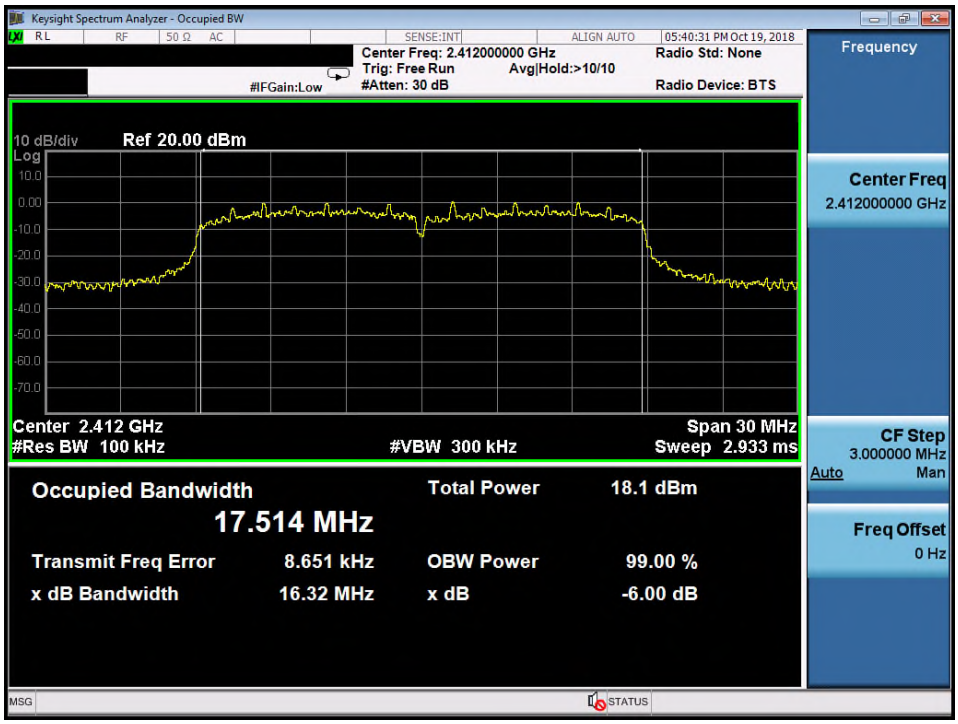


High Channel



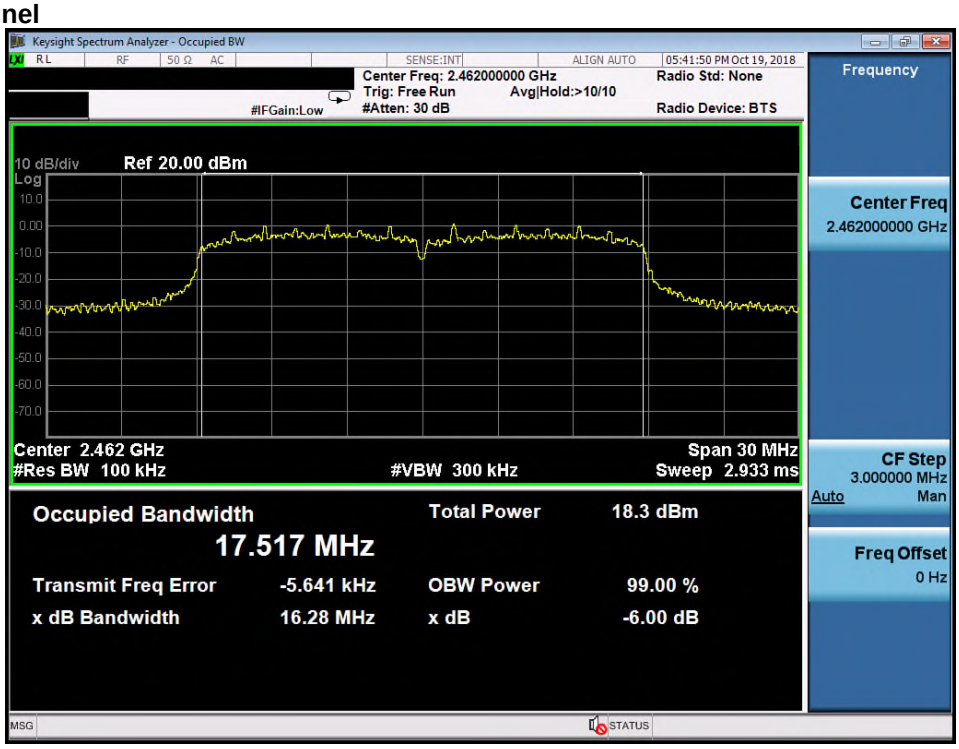
Test Plot of 6dB Bandwidth (802.11n HT20)

Low Channel



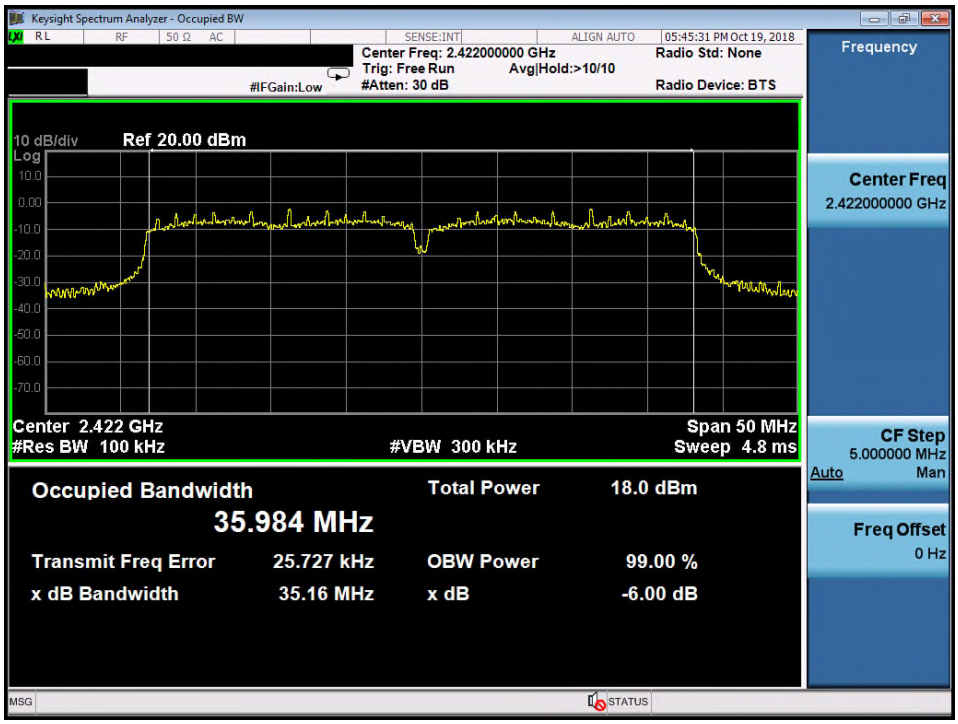
Middle Channel

High Channel



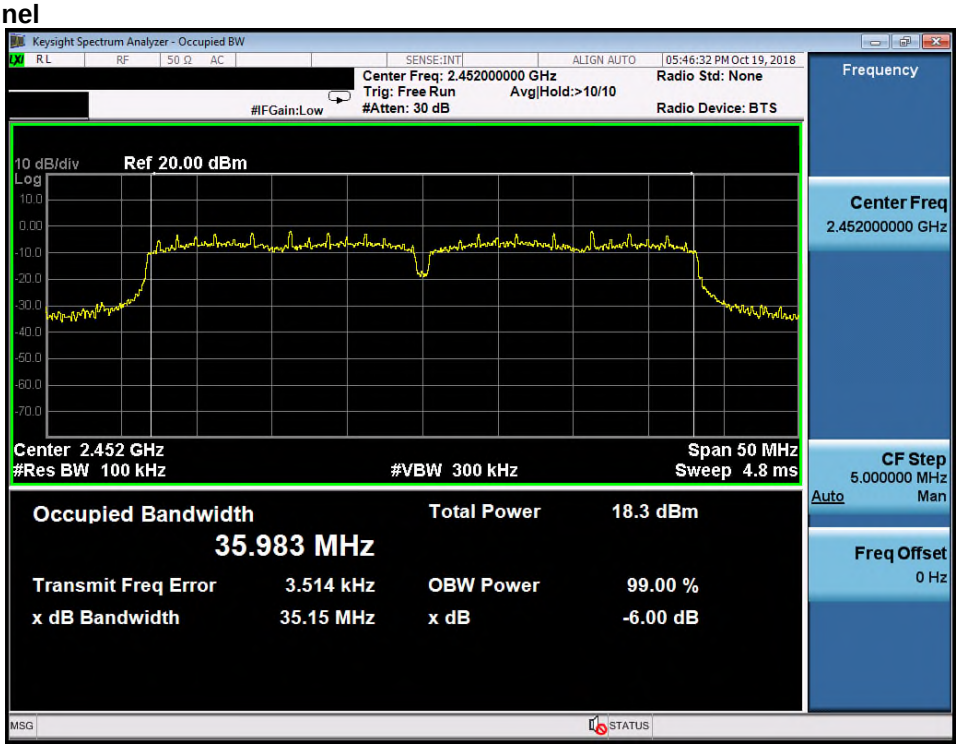
Test Plot of 6dB Bandwidth (802.11n HT40)

Low Channel



Middle Channel

High Channel



5.1.4 Power Density

RESULT: **Passed**

Test standard	:	FCC Part 15.247(e)
Basic standard	:	ANSI C63.10:2013, KDB558074
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	22-26°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

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

Channel	Channel Frequency (MHz)	ANT1 (dBm)	ANT2 (dBm)	Total (dBm)	Limit (dBm/MHz)	Result
1	2412	-15.05	-10.84	-9.44	7.3	Pass
6	2437	-17.54	-13.75	-12.23	7.3	Pass
11	2462	-13.17	-10.61	-8.69	7.3	Pass

Note: Directional gain = G_{ANT} + 10 log (N_{ANT}) dBi = 3.69dBi+3.01dBi = 6.7dBi, so limit = 7.3dBm

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

Channel	Channel Frequency (MHz)	ANT1 (dBm)	ANT2 (dBm)	Total (dBm)	Limit (dBm/MHz)	Result
1	2412	-23.96	-18.60	-17.49	7.3	Pass
6	2437	-22.63	-17.64	-16.44	7.3	Pass
11	2462	-20.00	-16.51	-14.90	7.3	Pass

Note: Directional gain = G_{ANT} + 10 log (N_{ANT}) dBi = 3.69dBi+3.01dBi = 6.7dBi, so limit = 7.3dBm

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

Channel	Channel Frequency (MHz)	ANT1 (dBm)	ANT2 (dBm)	Total (dBm)	Limit (dBm/MHz)	Result
1	2412	-25.20	-19.22	-18.24	7.3	Pass
6	2437	-25.14	-20.73	-19.39	7.3	Pass
11	2462	-23.69	-18.67	-17.48	7.3	Pass

Note: Directional gain = G_{ANT} + 10 log (N_{ANT}) dBi = 3.69dBi+3.01dBi = 6.7dBi, so limit = 7.3dBm

Table 19: Test result of Power Density (802.11n HT40)

Channel	Channel Frequency (MHz)	ANT1 (dBm)	ANT2 (dBm)	Total (dBm)	Limit (dBm/MHz)	Result
3	2422	-28.12	-22.46	-21.42	7.3	Pass
6	2437	-28.26	-23.62	-22.34	7.3	Pass
9	2452	-25.88	-21.47	-20.13	7.3	Pass

Note: Directional gain = G_{ANT} + 10 log (N_{ANT}) dBi = 3.69dBi+3.01dBi = 6.7dBi, so limit = 7.3dBm

Test Plot of Power Density (802.11b)

Ant 1 Low Channel

Ant 1 Middle Channel

Ant 1 High Channel

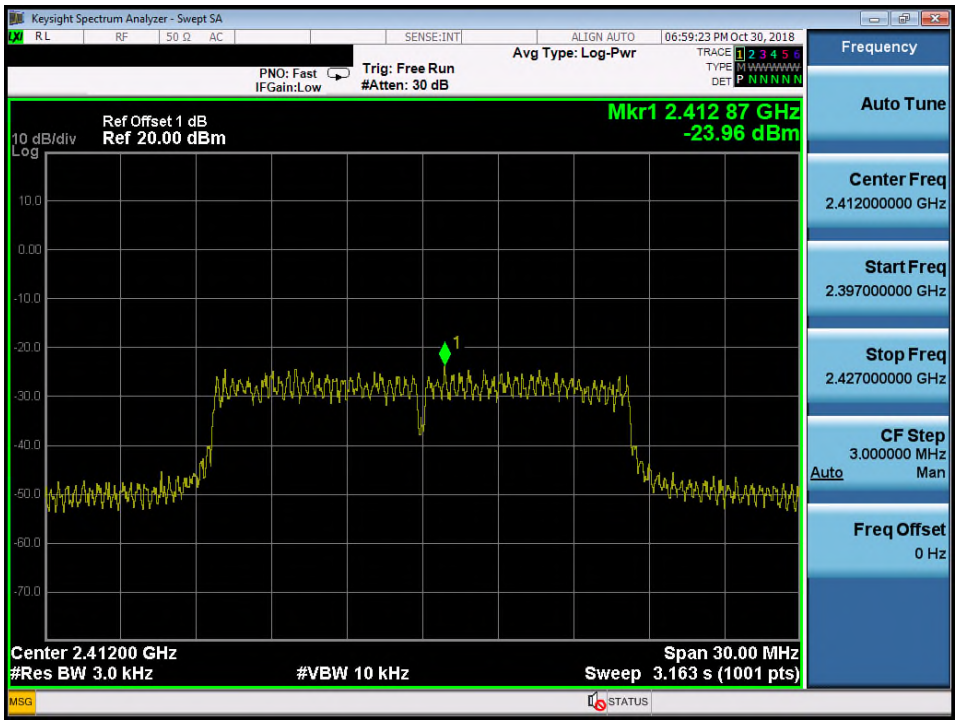
Ant 2 Low Channel

Ant 2 Middle Channel

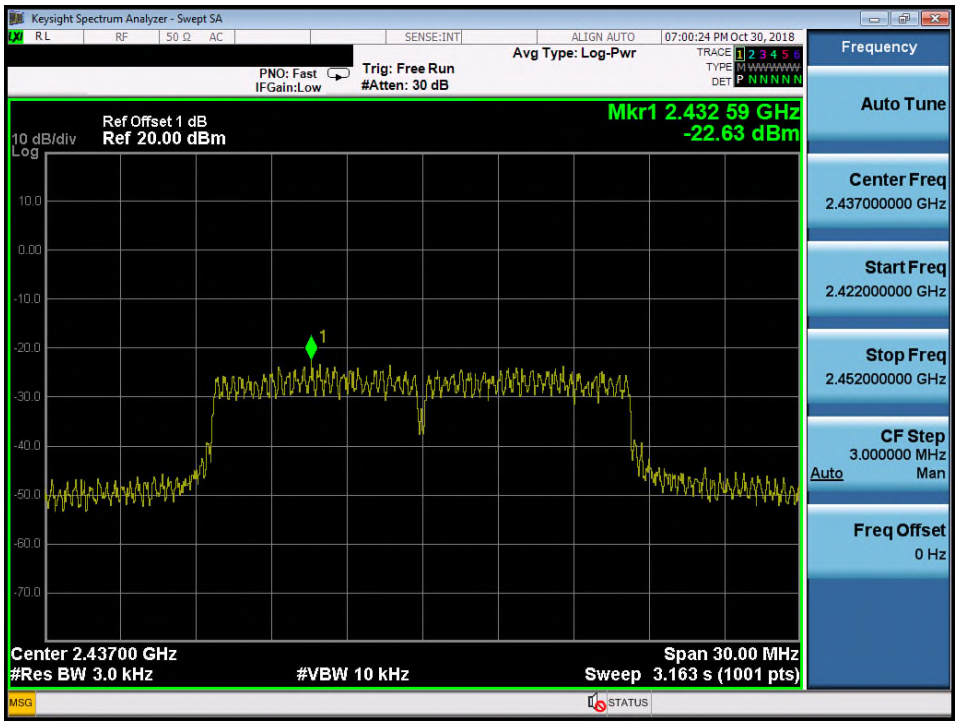
Ant 2 High Channel

Test Plot of Power Density (802.11g)

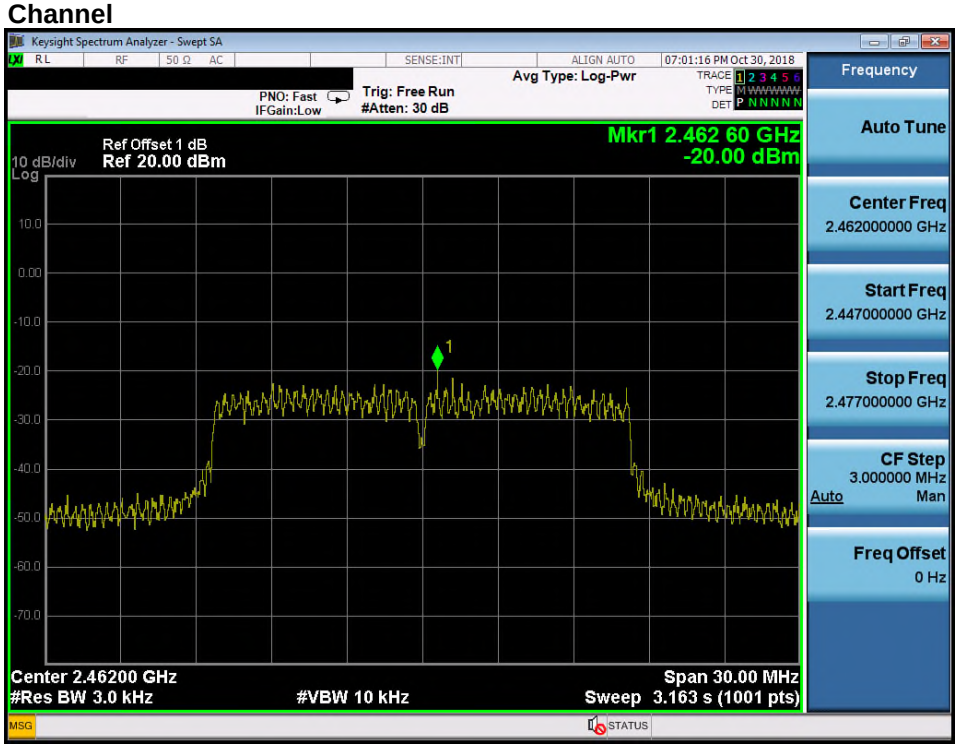
Ant 1 Low Channel



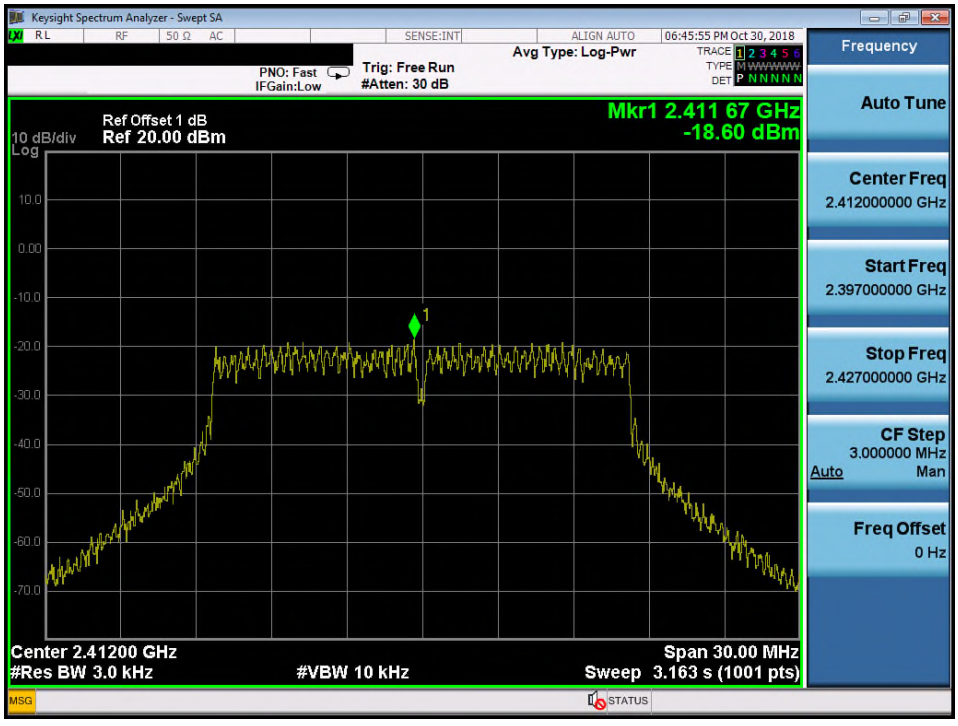
Ant 1 Middle Channel



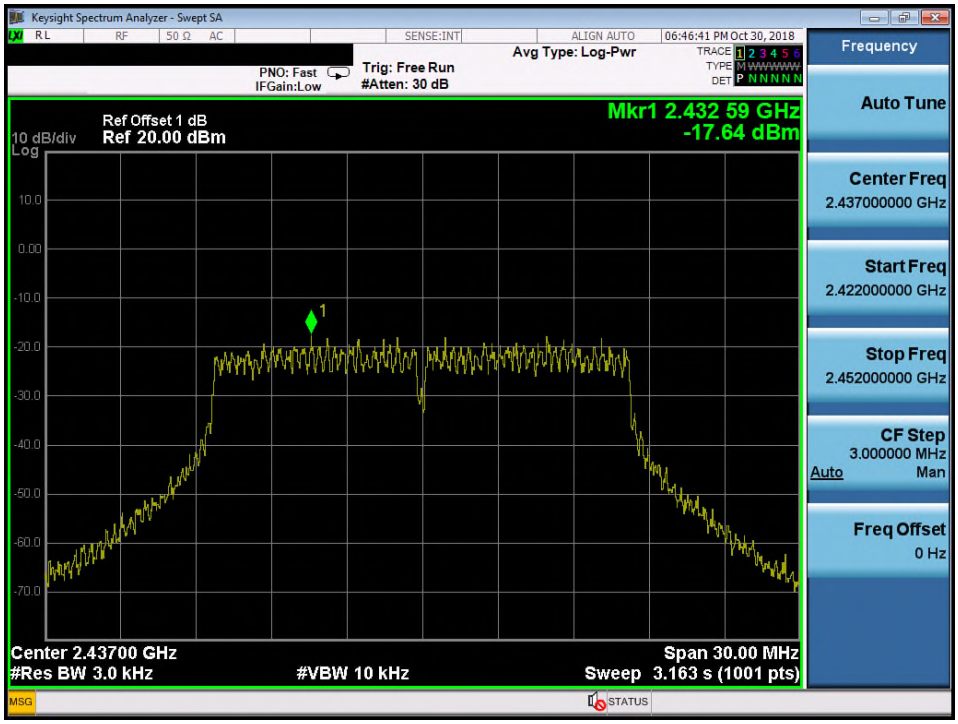
Ant 1 High Channel



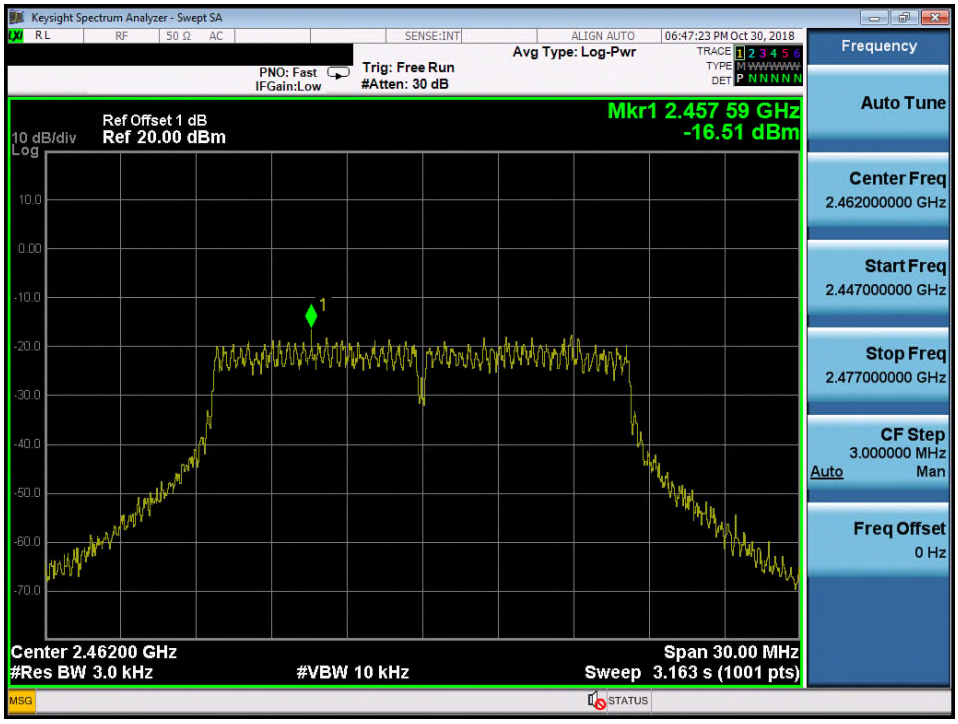
Ant 2 Low Channel



Ant 2 Middle Channel

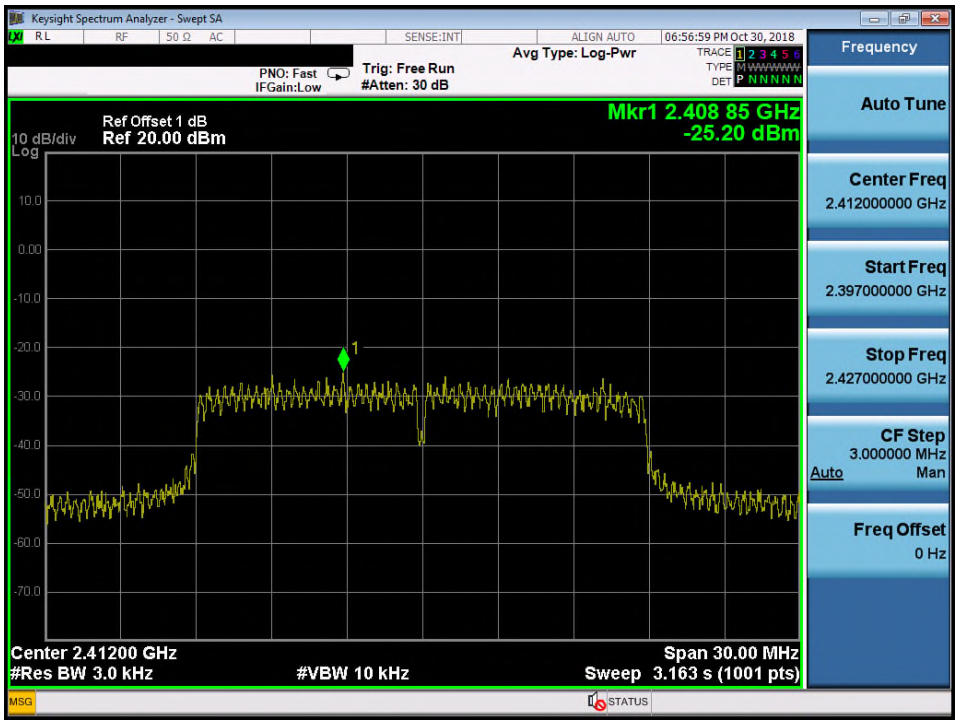


Ant 2 High Channel

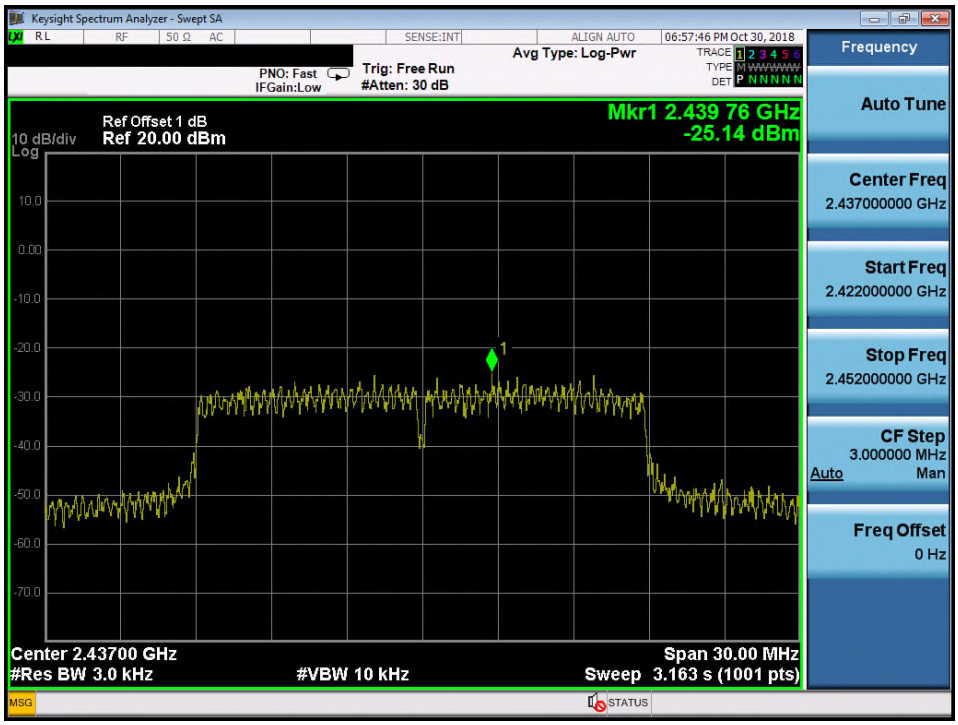


Test Plot of Power Density (802.11n HT20)

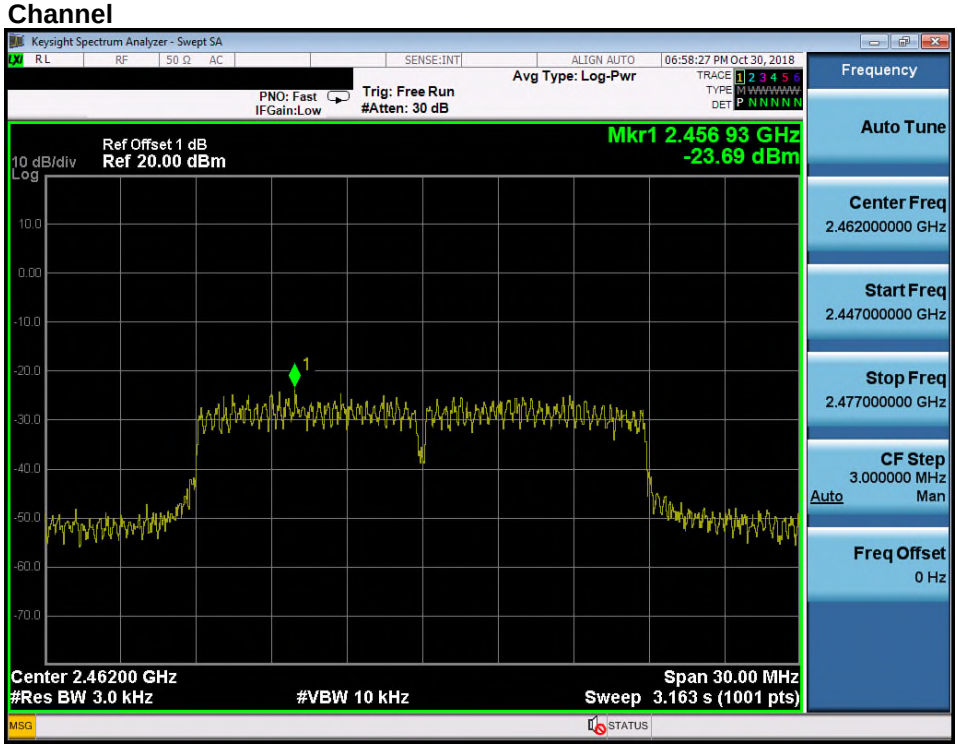
Ant 1 Low Channel



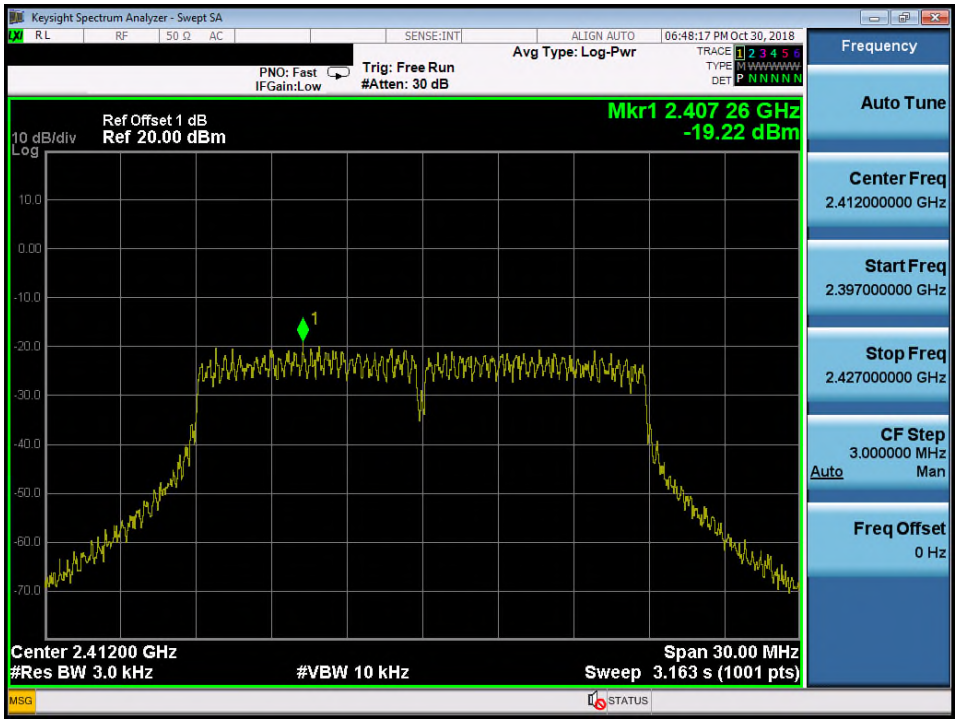
Ant 1 Middle Channel



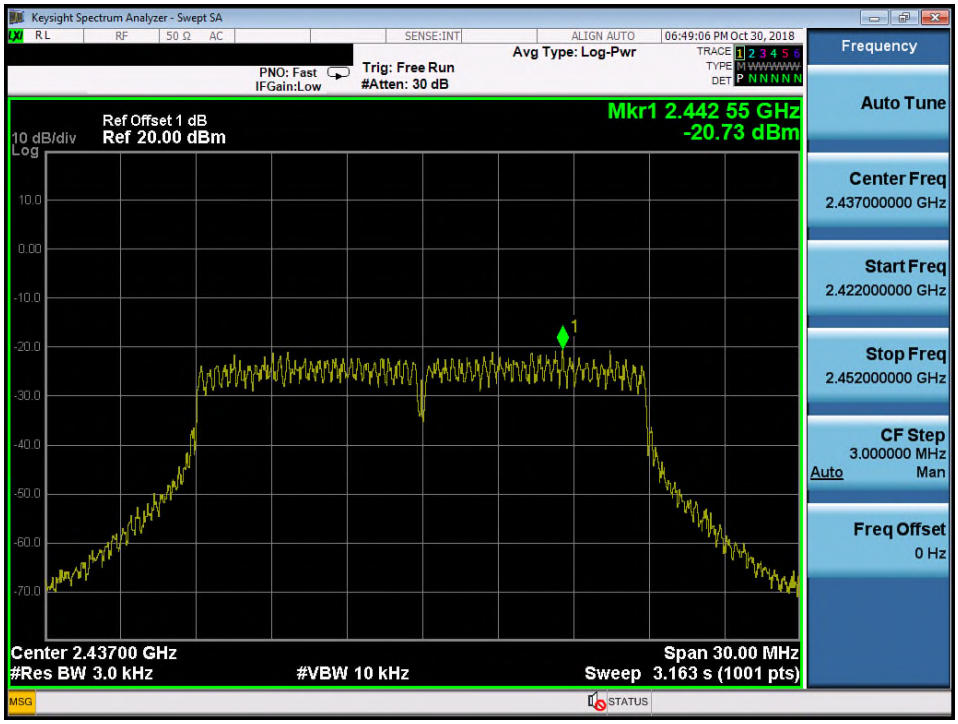
Ant 1 High Channel



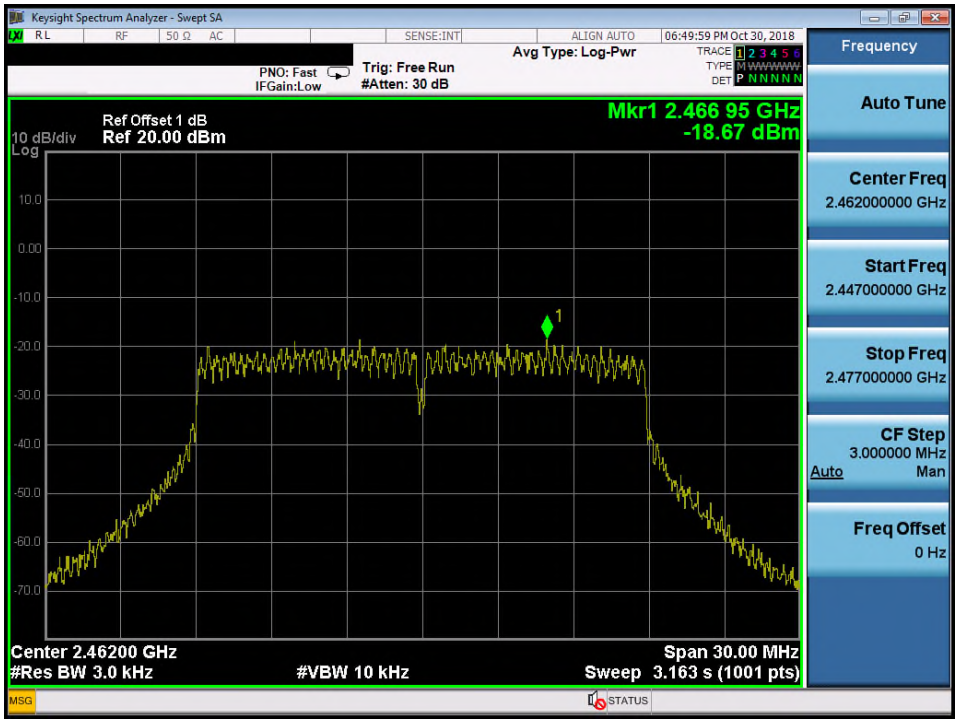
Ant 2 Low Channel



Ant 2 Middle Channel

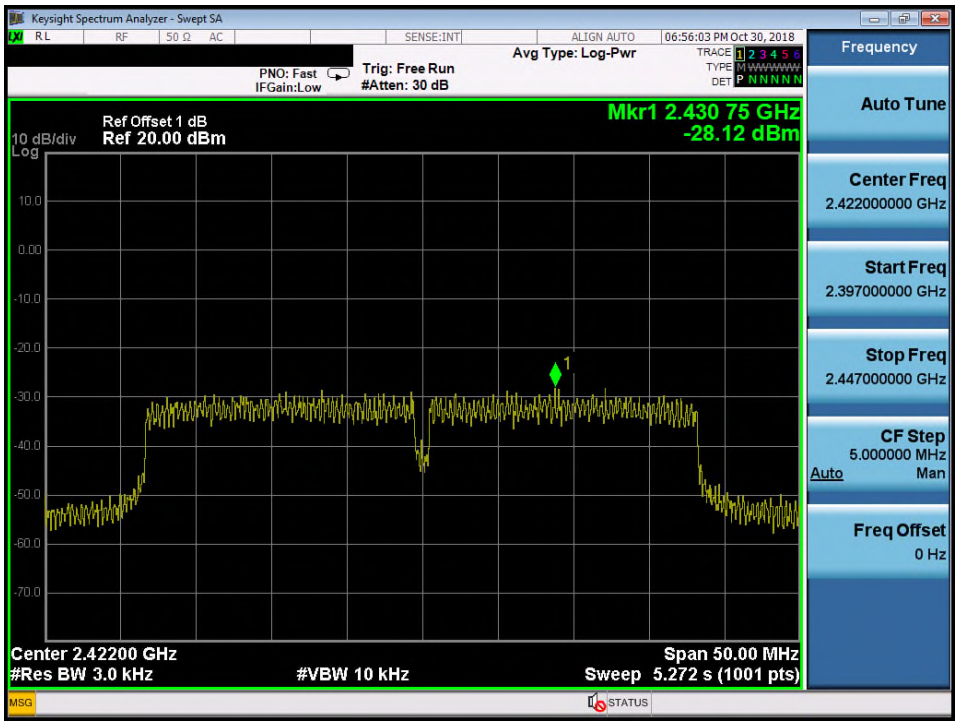


Ant 2 High Channel

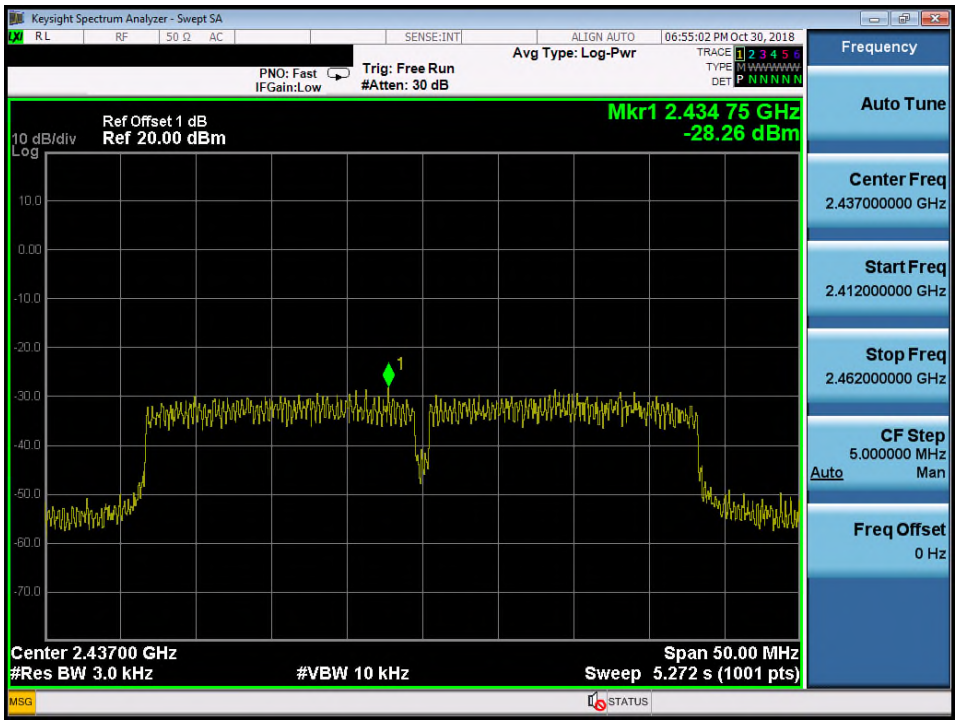


Test Plot of Power Density (802.11n HT40)

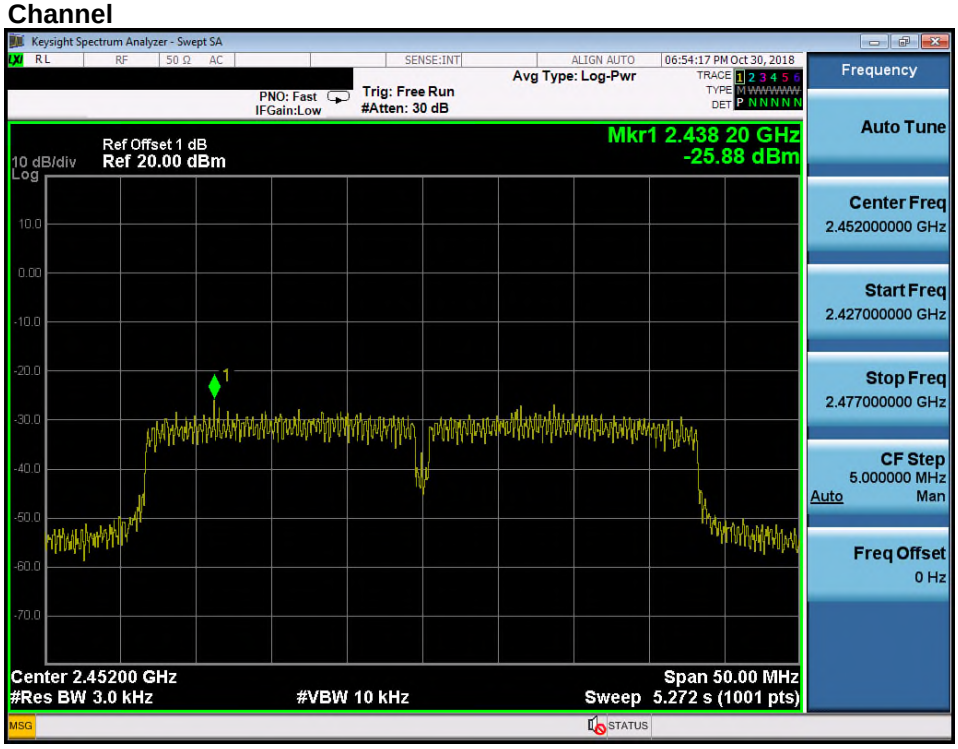
Ant 1 Low Channel



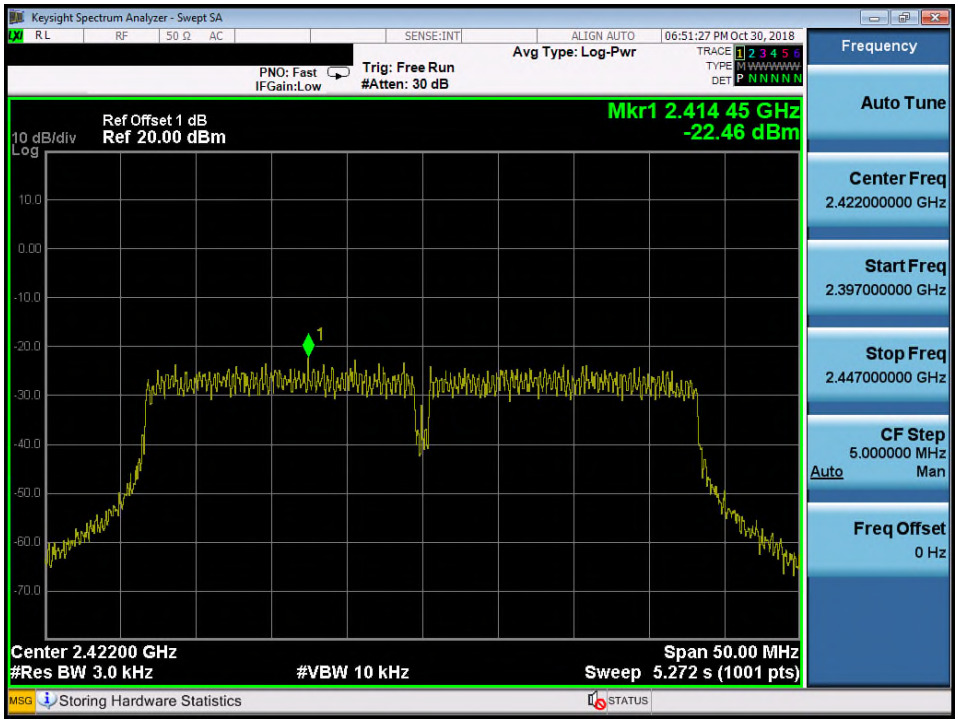
Ant 1 Middle Channel



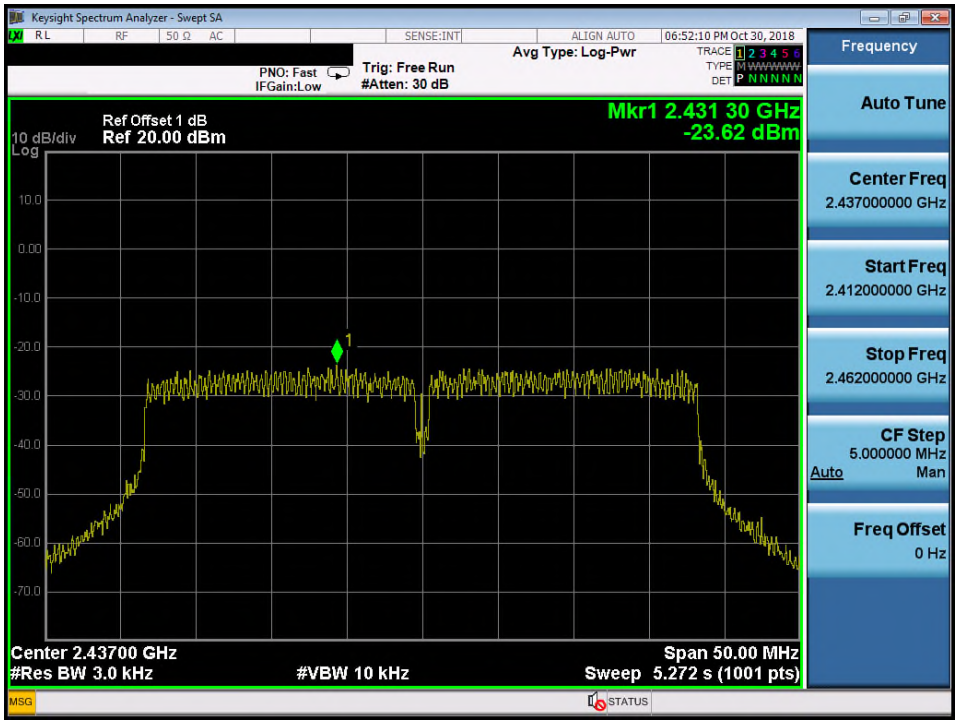
Ant 1 High Channel



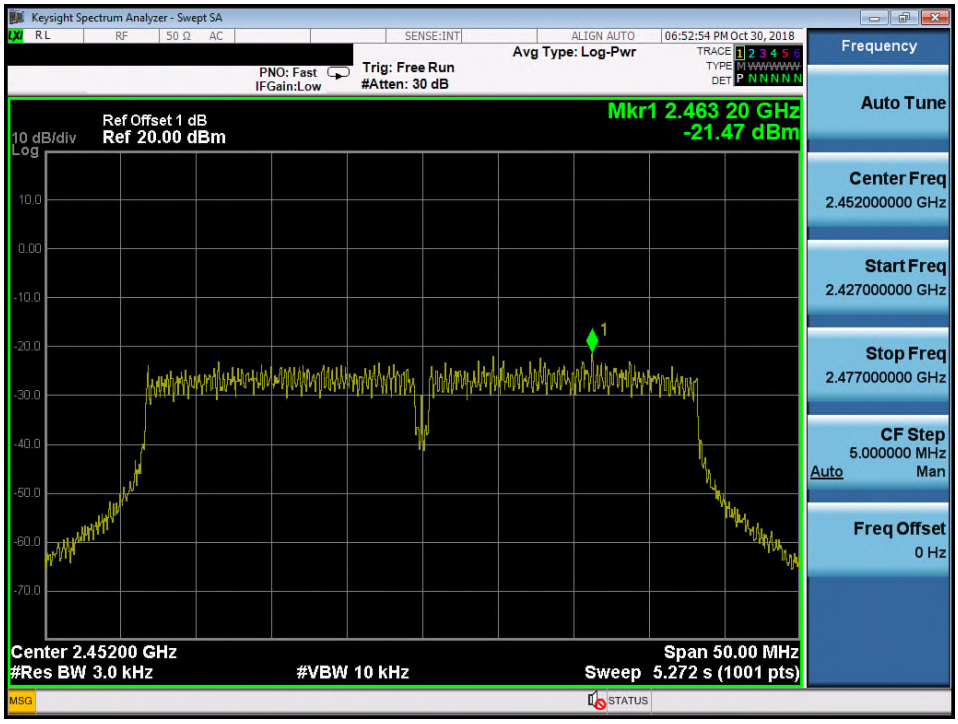
Ant 2 Low Channel



Ant 2 Middle Channel



Ant 2 High Channel



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

RESULT: **Passed**

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

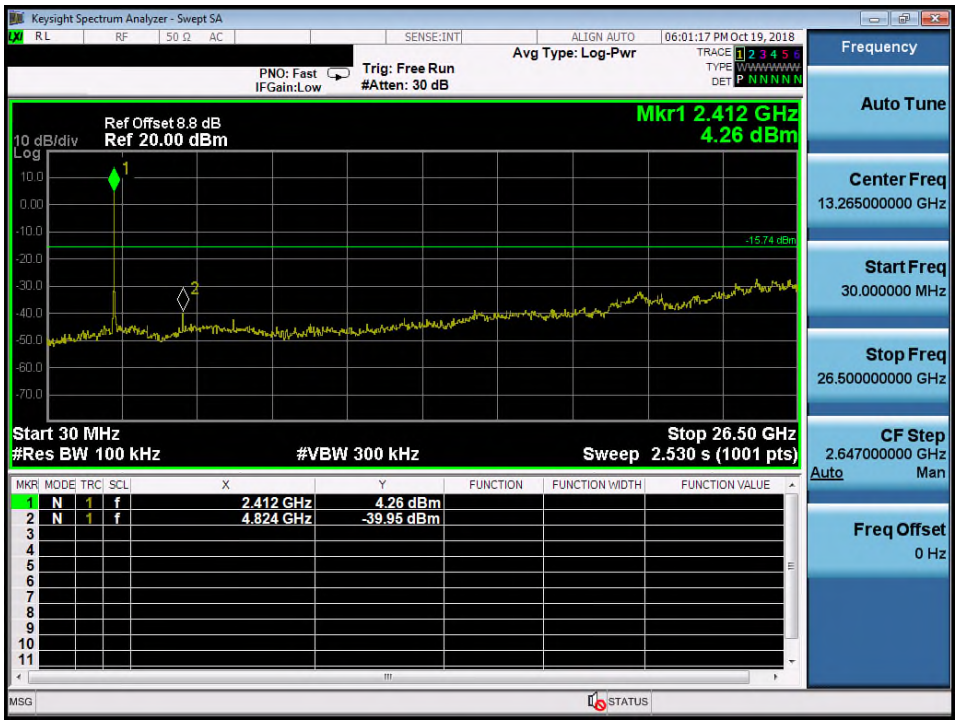
Test setup

Test Channel	:	Low/ Middle/ High for Conducted Spurious Emissions Low/ High for Frequency Band Edge
peration mode	:	A
Ambient temperature	:	22-26°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

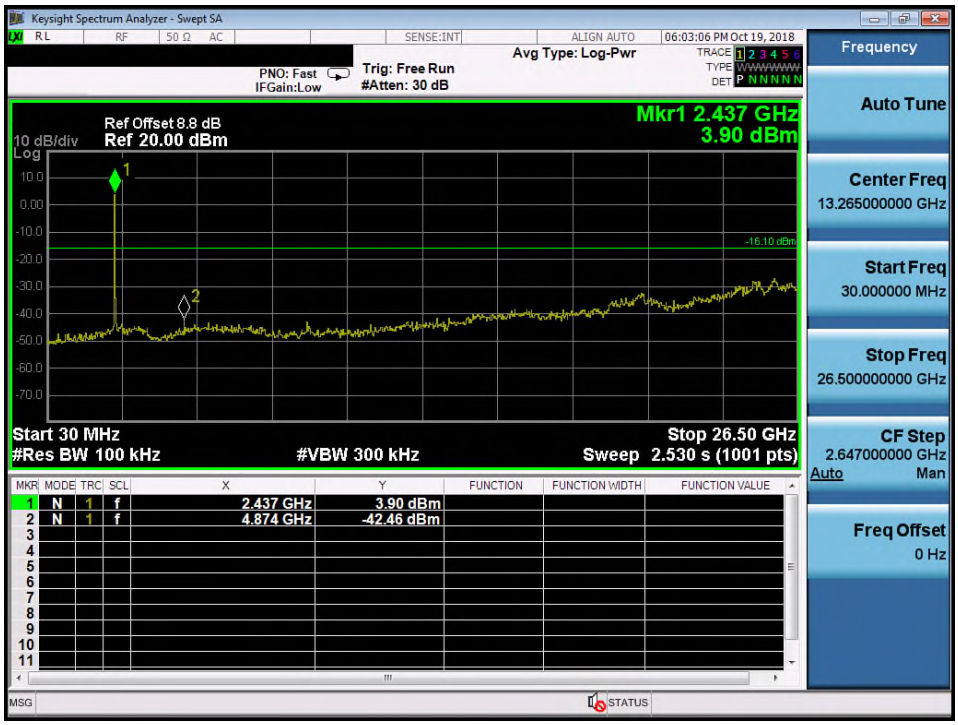
All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achived as well.
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

Test Plot 100kHz Conducted Emissions (802.11b)

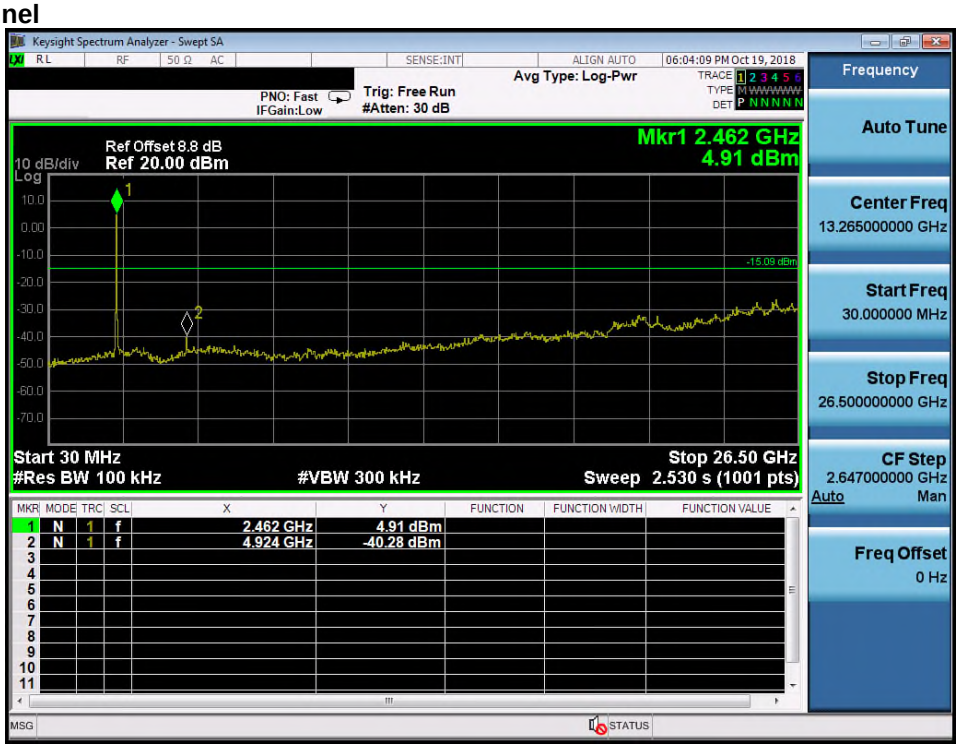
Low Channel



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 Conducted Emissions (802.11n HT40)

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

Test Plot 100kHz RBW of Band Edge (802.11n HT40)

Low Channel

High Channel

5.1.6 Spurious Emission

RESULT: **Passed**

Test standard	:	FCC part 15.247(d), FCC 15.205, FCC 15.209
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). Emission radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in FCC15.247(d) .
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

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

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 Z 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
Limits	:	Mains Conducted emissions as defined in above test standards must comply with the mains conducted emission limits specified
Kind of test site	:	Shielded Room

Test setup

Test Channel	:	Normal link
Operation mode	:	C
Ambient temperature	:	20-24 °C
Relative humidity	:	50-65 %
Atmospheric pressure	:	100-103 kPa

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 : LP0002(2018): 5.20.2.2

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

Maximum Exposure:

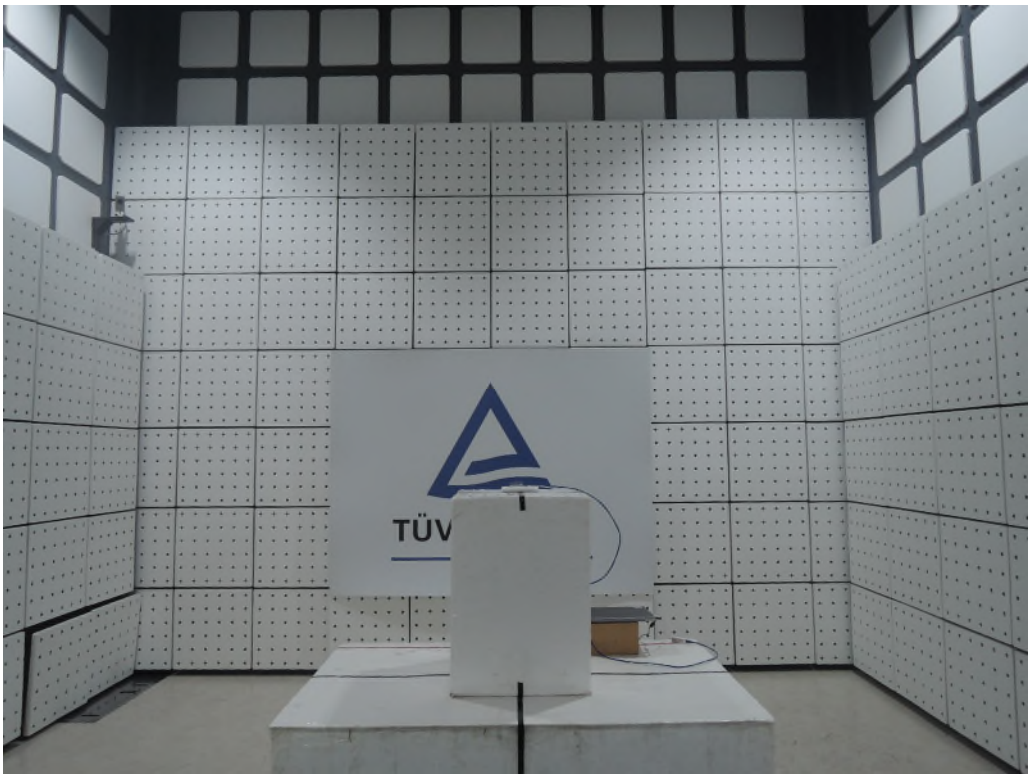
Power to Antenna (mW)	12.8 mW
Power to Antenna (dBm)	11.1 dBm
Antenna Gain	3.69 dBi
Power+Ant Gain	29.9 mW
Distance	20 cm
S=	0.006 mW/cm^2

Limit NCC:
1500-100,000 MHz 1.0 mW/cm^2

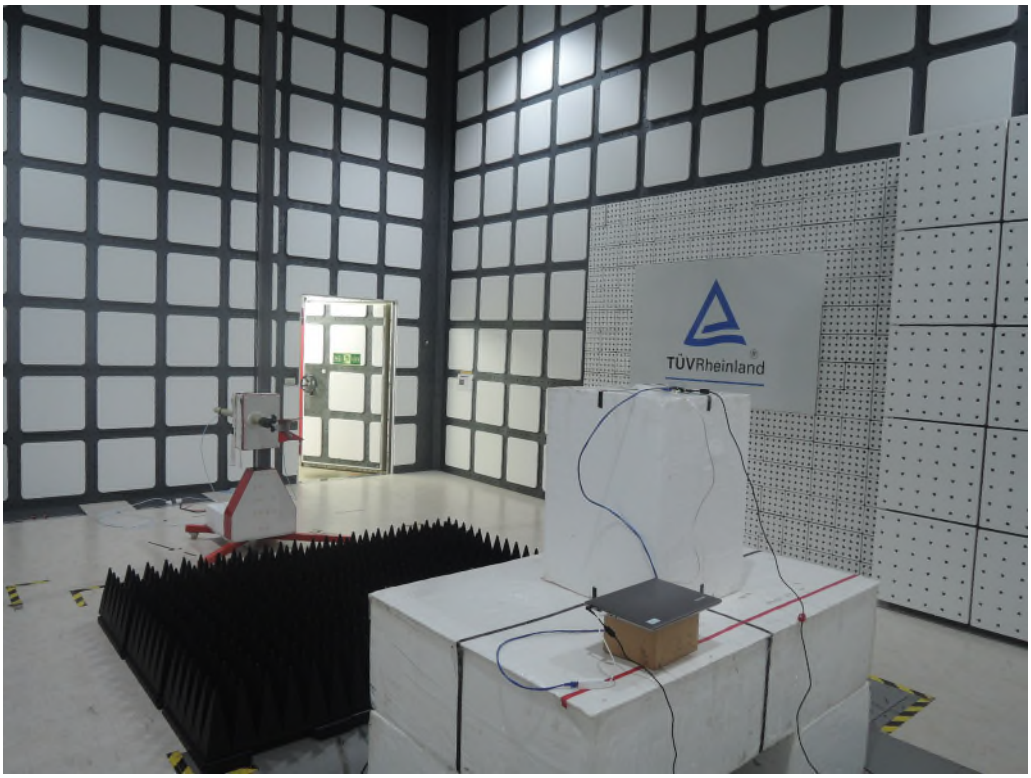
---End---

7. Photographs of the Test Set-Up

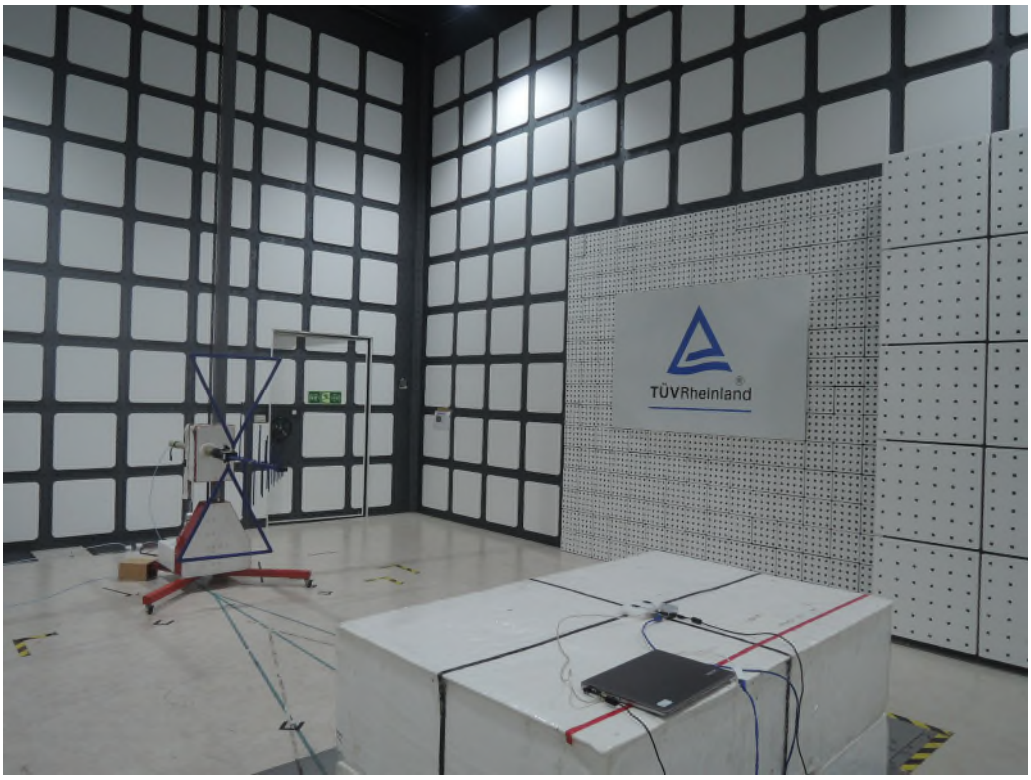
Photograph 1: Set-up for Spurious Emissions (Front View)



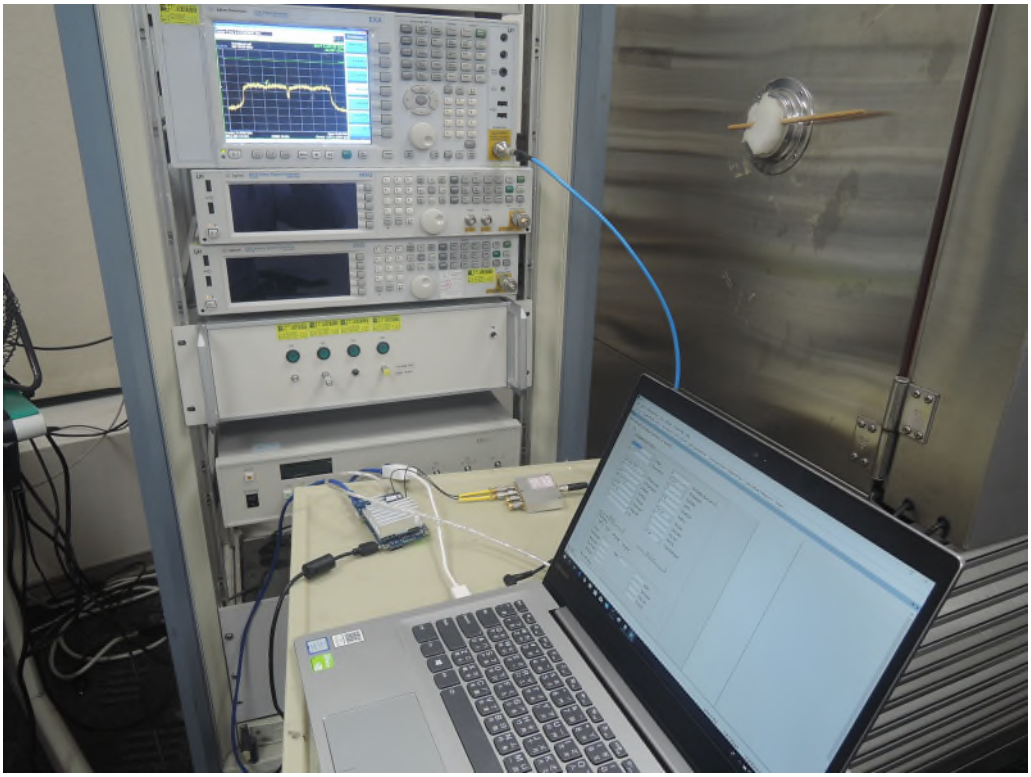
Photograph 2: Set-up for Spurious Emissions (Back View 1)



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

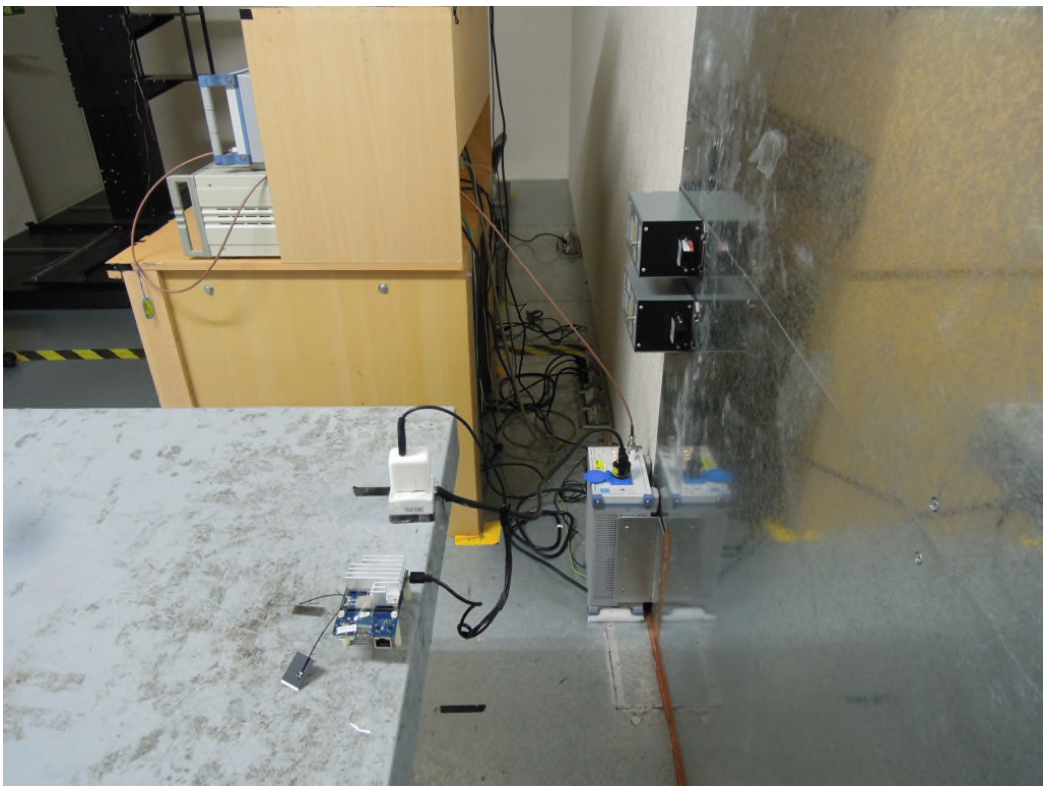


Photograph 4: Set-up for Conducted testing



Photograph 5: Set-up for AC Mains Emissions (Front View)

Photograph 6: Set-up for AC Mains Emissions (Back View)



8. List of Tables

9. List of Photographs