

TEST REPORT

Reference No..... : WTS18S07117020-3W
FCC ID : XUJMAX3
Applicant..... : Launch Tech Co., Ltd.
Address..... : Launch Industrial Park, North of Wuhe Rd. Banxuegang, Longgang, Shenzhen, China
Manufacturer : The same as above
Address..... : The same as above
Product..... : Automotive intelligent diagnostic tools
Model(s). : MAXIMUS 3.0
Brand Name..... : 
Standards..... : FCC CFR47 Part 15.247:2017
Date of Receipt sample : 2018-07-03
Date of Test : 2018-07-04 to 2018-08-02
Date of Issue..... : 2018-08-03
Test Result..... : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

Waltek Services (Shenzhen) Co., Ltd.

Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China

Tel :+86-755-83551033

Fax:+86-755-83552400

Compiled by:



Ford Wang / Project Engineer

Approved by:



Philo Zhong / Manager

2 Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation) of USA, Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), IC(Industry Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. Electro Magnetic Compatibility (EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

Test Facility:**A. Accreditations for Conformity Assessment (International)**

Country/Region	Accreditation Body	Scope	Note
USA	A2LA (Certificate No.: 4243.01)	FCC ID \ DOC \ VOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		International Services	WPC
Thailand	NTC		-
Singapore	IDA		-
Note:			
1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.			
2. IC Canada Registration No.: 7760A			

B. TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of ...	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

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4 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS18S07117 020-3W	2018-07-03	2018-07-04 to 2018-08-02	2018-08-03	original	-	Valid

5 General Information

5.1 General Description of E.U.T.

Product:	Automotive intelligent diagnostic tools
Model(s):	MAXIMUS 3.0
Model Description:	N/A
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40 5G-802.11a/n/ac HT20/n HT40 HT80
Bluetooth Version:	Bluetooth v4.0 with BLE
GPS:	Support
NFC:	N/A
Hardware Version:	V1
Software Version:	V2
Highest frequency (Exclude Radio):	1.25GHz
Storage Location:	Internal Storage

5.2 Details of E.U.T.

Operation Frequency:	2.4G WiFi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz 5G WiFi: 802.11a/n/ac (HT20): U-NII-1: 5180-5240MHz, U-NII-2A: 5260-5320MHz(DFS), U-NII-2C: 5550-5700MHz(DFS), U-NII-3: 5745-5825MHz 802.11n/ac (HT40): U-NII-1: 5190-5230MHz, U-NII-2A: 5270-5310MHz(DFS), U-NII-2C: 5510-5670MHz(DFS), U-NII-3: 5755-5795MHz 802.11ac (HT80): U-NII-1: 5210MHz, U-NII-2A: 5290MHz(DFS), U-NII-2C: 5530MHz(DFS), U-NII-3: 5775MHz Bluetooth: 2402~2480MHz
Max. RF output power:	WiFi (2.4G): 13.26dBm WiFi (5G): 11.82dBm Bluetooth: 6.47dBm
Type of Modulation:	WiFi: CCK, OFDM Bluetooth: GFSK, Pi/4 DQPSK, 8DPSK
Antenna installation:	WiFi/Bluetooth: internal permanent antenna
Antenna Gain:	WiFi (2.4G): 5.56dBi WiFi (5G): 6.4dBi Bluetooth: 5.56dBi

Ratings:	Battery DC 3.8V, 9360mAh DC 5V, 3.0A/9V, 2.7A/12V, 2.0A charging from adapter (Adapter Input: AC100-240V, 50/60Hz 0.7A)
Adapter:	Manufacturer: Dongguan Guangshu Electrical Technology Co., Ltd Model No.: GS-QC24W

5.3 Channel List

WIFI

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462	12	-

BT BLE

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	1	2404	2	2406	3	2408
4	2410	5	2412	6	2414	7	2416
8	2418	9	2420	10	2422	11	2424
12	2426	13	2428	14	2430	15	2432
16	2434	17	2436	18	2438	19	2440
20	2442	21	2444	22	2446	23	2448
24	2450	25	2452	26	2454	27	2456
28	2458	29	2460	30	2462	31	2464
32	2466	33	2468	34	2470	35	2472
36	2474	37	2476	38	2478	39	2480

5.4 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Power Spectral Density	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
6dB Bandwidth	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Band Edge	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Transmitter Spurious Emissions	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX

Table 2 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	BT BLE	1 Mbps	0/19/39	TX
Power Spectral Density	BT BLE	1 Mbps	0/19/39	TX
6dB Bandwidth	BT BLE	1 Mbps	0/19/39	TX
Band Edge	BT BLE	1 Mbps	0/19/39	TX
Transmitter Spurious Emissions	BT BLE	1 Mbps	0/19/39	TX

Note :1, Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product .

2, The all test were tested on continue transmission and 100% duty cycle.

6 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.247(d) 15.205(a) 15.209(a)	PASS
Conducted Spurious Emissions	15.247(d)	PASS
Conducted Emissions	15.207(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3),(4)	PASS
Power Spectral Density	15.247(e)	PASS
Band Edge	15.247(d)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

7 Equipment Used during Test

7.1 Equipments List

Conducted Emissions Test Site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	100947	2017-09-12	2018-09-11
2.	LISN	R&S	ENV216	101215	2017-09-12	2018-09-11
3.	Cable	Top	TYPE16(3.5M)	-	2017-09-12	2018-09-11
Conducted Emissions Test Site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	2017-09-12	2018-09-11
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	2017-09-12	2018-09-11
3.	Limiter	York	MTS-IMP-136	261115-001-0024	2017-09-12	2018-09-11
4.	Cable	LARGE	RF300	-	2017-09-12	2018-09-11
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP	100091	2018-04-29	2019-04-28
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2018-04-09	2019-04-08
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2018-04-09	2019-04-08
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2017-09-12	2018-09-11
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2018-04-09	2019-04-08
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2018-04-09	2019-04-08
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2018-04-13	2019-04-12
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	2018-04-13	2019-04-12
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2018-04-13	2019-04-12
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2018-04-09	2019-04-08
3	Amplifier	Compliance direction systems inc	PAP-0203	22024	2018-04-13	2019-04-12
4	Cable	HUBER+SUHNER	CBL2	525178	2018-04-13	2019-04-12

RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2017-09-12	2018-09-11
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2017-09-12	2018-09-11
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2017-09-12	2018-09-11

7.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
/	/	/	/

7.3 Measurement Uncertainty

Parameter	Uncertainty
Conducted Emission	± 3.64 dB(AC mains 150KHz~30MHz)
Radiated Spurious Emissions	± 5.08 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)
Radio Frequency	± 1 x 10 ⁻⁷ Hz
RF Power	± 0.42 dB
RF Power Density	± 0.7dB
Conducted Spurious Emissions	± 2.76 dB (9kHz~26500MHz)
Confidence interval : 95%. Confidence factor:k=2	

7.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

8 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Class/Severity: Class B

Limit:

Frequency (MHz)	Limit (dB μ V)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

8.1 E.U.T. Operation

Operating Environment :

Temperature: 21.5 °C

Humidity: 51.9 % RH

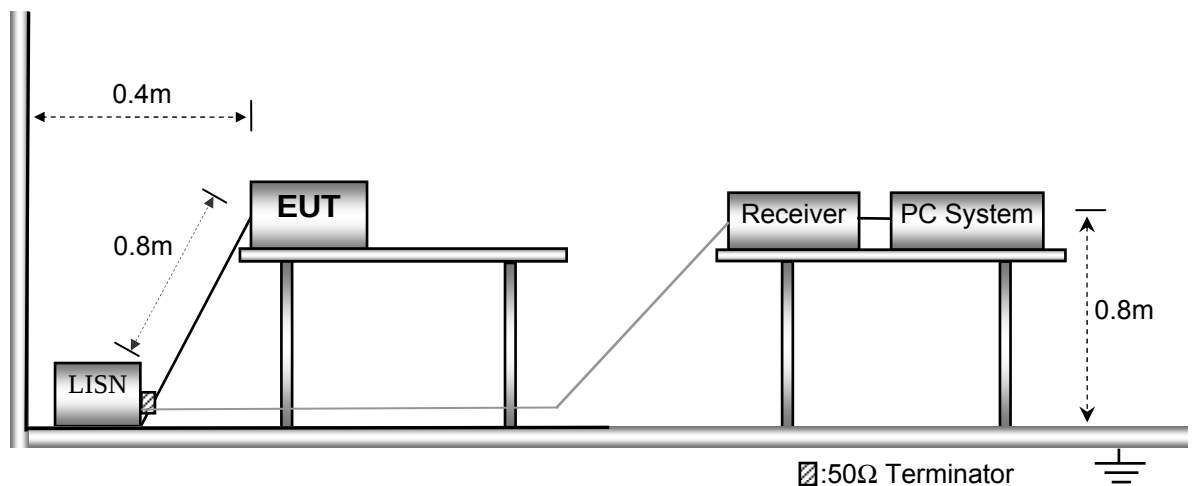
Atmospheric Pressure: 101.2kPa

EUT Operation :

The test was performed in TX transmitting mode, the worst data were shown in the report.

8.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10.



8.3 Measurement Description

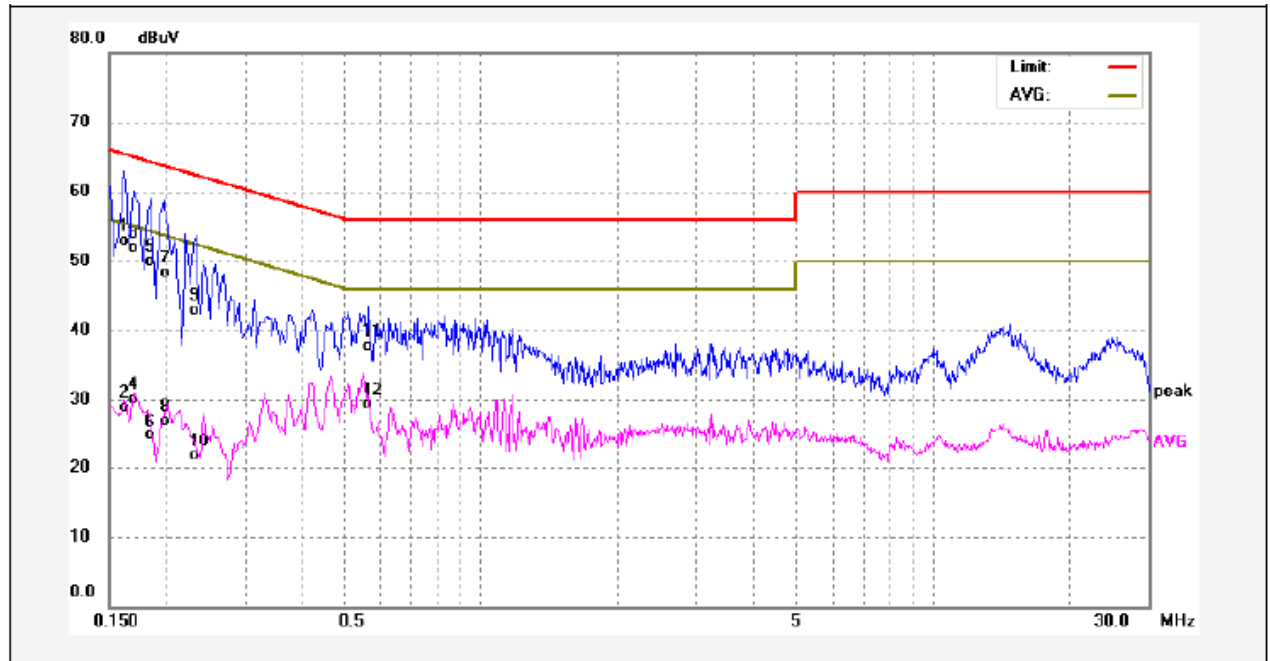
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

8.4 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

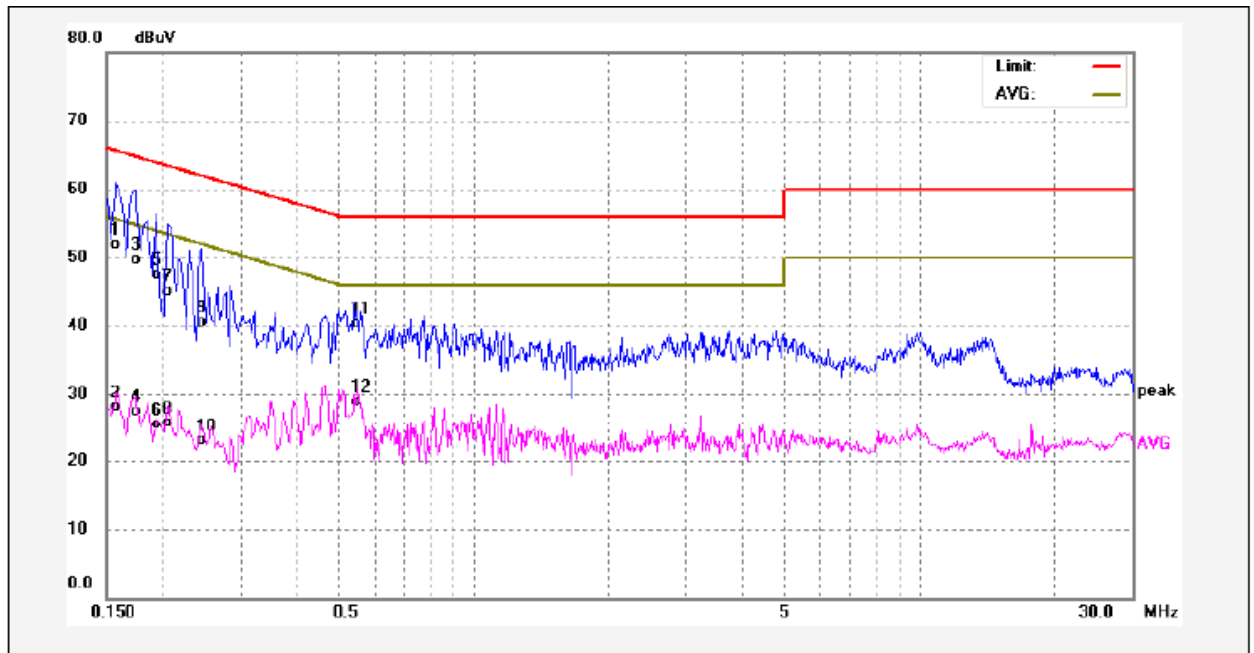
Worst Mode: WIFI mode (802.11b mode low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1620	42.62	10.28	52.90	65.36	-12.46	QP	
2	0.1620	18.55	10.28	28.83	55.36	-26.53	AVG	
3	0.1700	41.70	10.29	51.99	64.96	-12.97	QP	
4	0.1700	19.73	10.29	30.02	54.96	-24.94	AVG	
5	0.1860	39.69	10.31	50.00	64.21	-14.21	QP	
6	0.1860	14.46	10.31	24.77	54.21	-29.44	AVG	
7	0.1980	37.89	10.32	48.21	63.69	-15.48	QP	
8	0.1980	16.56	10.32	26.88	53.69	-26.81	AVG	
9	0.2340	32.56	10.37	42.93	62.30	-19.37	QP	
10	0.2340	11.40	10.37	21.77	52.30	-30.53	AVG	
11	0.5620	27.17	10.46	37.63	56.00	-18.37	QP	
12	0.5620	18.89	10.46	29.35	46.00	-16.65	AVG	

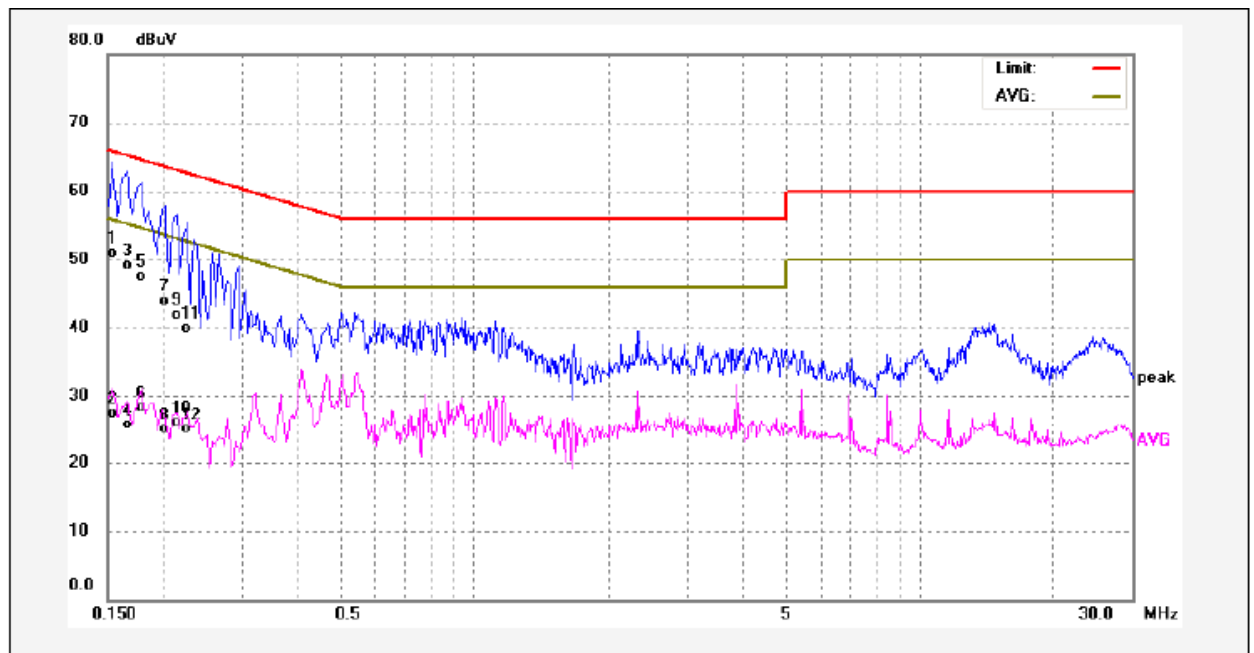
Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	41.72	10.27	51.99	65.56	-13.57	QP	
2	0.1580	17.79	10.27	28.06	55.56	-27.50	AVG	
3	0.1740	39.44	10.29	49.73	64.76	-15.03	QP	
4	0.1740	17.31	10.29	27.60	54.76	-27.16	AVG	
5	0.1940	37.12	10.32	47.44	63.86	-16.42	QP	
6	0.1940	15.15	10.32	25.47	53.86	-28.39	AVG	
7	0.2060	34.80	10.33	45.13	63.36	-18.23	QP	
8	0.2060	15.36	10.33	25.69	53.36	-27.67	AVG	
9	0.2460	30.04	10.38	40.42	61.89	-21.47	QP	
10	0.2460	12.65	10.38	23.03	51.89	-28.86	AVG	
11	0.5380	29.78	10.45	40.23	56.00	-15.77	QP	
12	0.5380	18.37	10.45	28.82	46.00	-17.18	AVG	

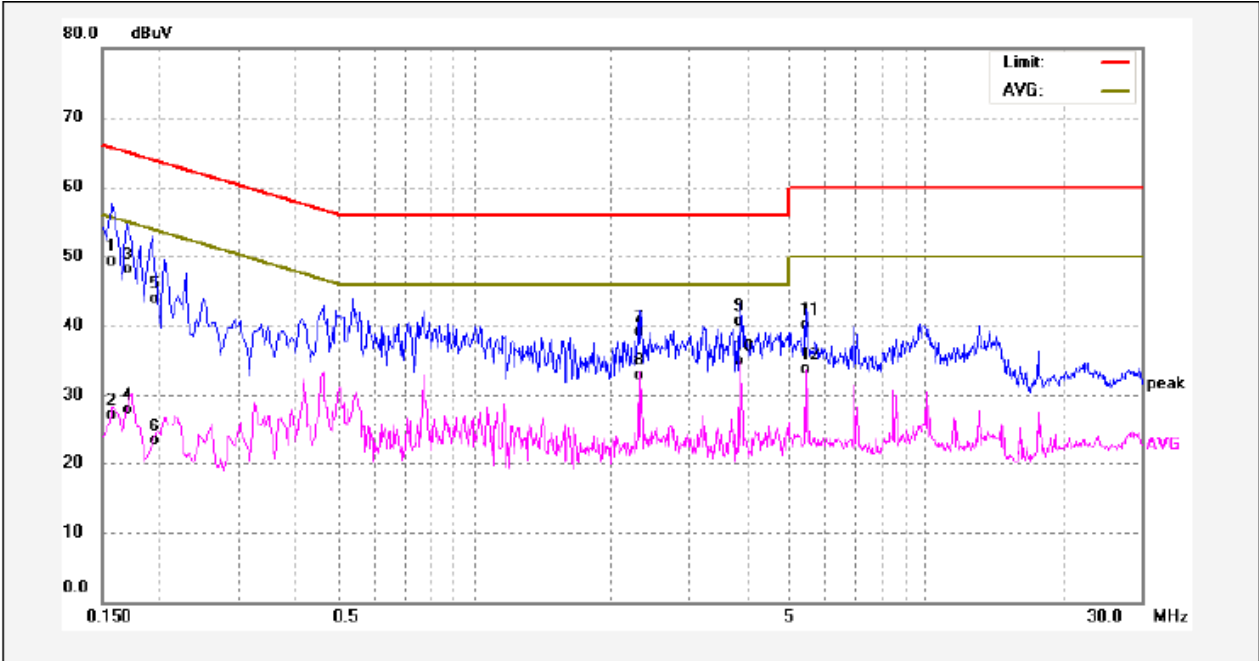
Worst Mode: BLE mode (low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	40.65	10.27	50.92	65.78	-14.86	QP	
2	0.1539	17.17	10.27	27.44	55.78	-28.34	AVG	
3	0.1660	38.91	10.28	49.19	65.15	-15.96	QP	
4	0.1660	15.40	10.28	25.68	55.15	-29.47	AVG	
5	0.1780	37.30	10.30	47.60	64.57	-16.97	QP	
6	0.1780	17.91	10.30	28.21	54.57	-26.36	AVG	
7	0.2020	33.55	10.33	43.88	63.52	-19.64	QP	
8	0.2020	14.73	10.33	25.06	53.52	-28.46	AVG	
9	0.2140	31.58	10.34	41.92	63.04	-21.12	QP	
10	0.2140	15.82	10.34	26.16	53.04	-26.88	AVG	
11	0.2260	29.55	10.36	39.91	62.59	-22.68	QP	
12	0.2260	14.82	10.36	25.18	52.59	-27.41	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	38.95	10.27	49.22	65.56	-16.34	QP	
2	0.1580	16.84	10.27	27.11	55.56	-28.45	AVG	
3	0.1700	37.79	10.29	48.08	64.96	-16.88	QP	
4	0.1700	17.63	10.29	27.92	54.96	-27.04	AVG	
5	0.1940	33.50	10.32	43.82	63.86	-20.04	QP	
6	0.1940	13.07	10.32	23.39	53.86	-30.47	AVG	
7	2.3100	28.47	10.62	39.09	56.00	-16.91	QP	
8	2.3100	22.26	10.62	32.88	46.00	-13.12	AVG	
9	3.8540	29.88	10.77	40.65	56.00	-15.35	QP	
10	3.8540	24.09	10.77	34.86	46.00	-11.14	AVG	
11	5.3940	29.18	10.85	40.03	60.00	-19.97	QP	
12	5.3940	22.93	10.85	33.78	50.00	-16.22	AVG	

9 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

9.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

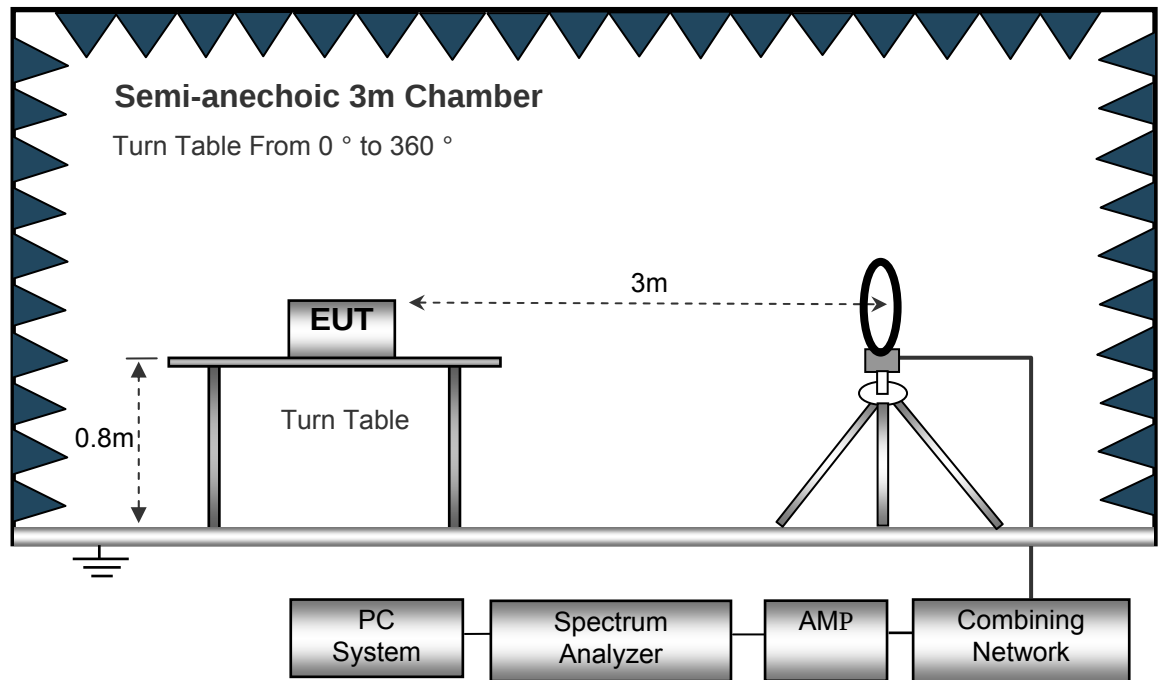
EUT Operation :

The test was performed in TX transmitting mode, the test data were shown in the report.

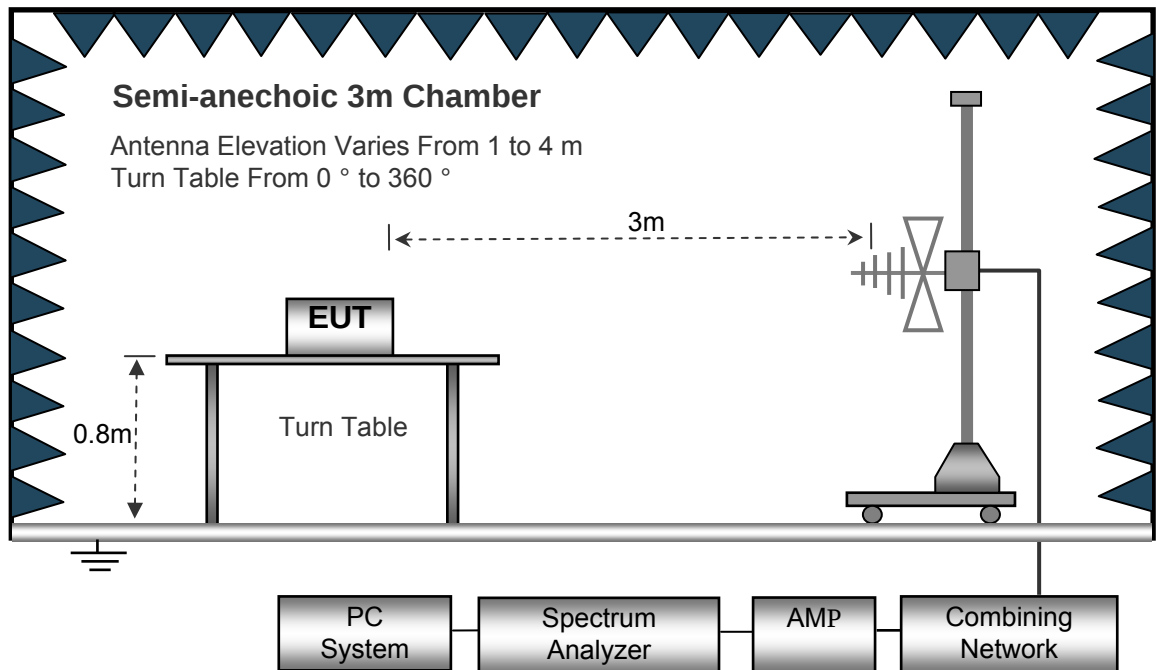
9.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.

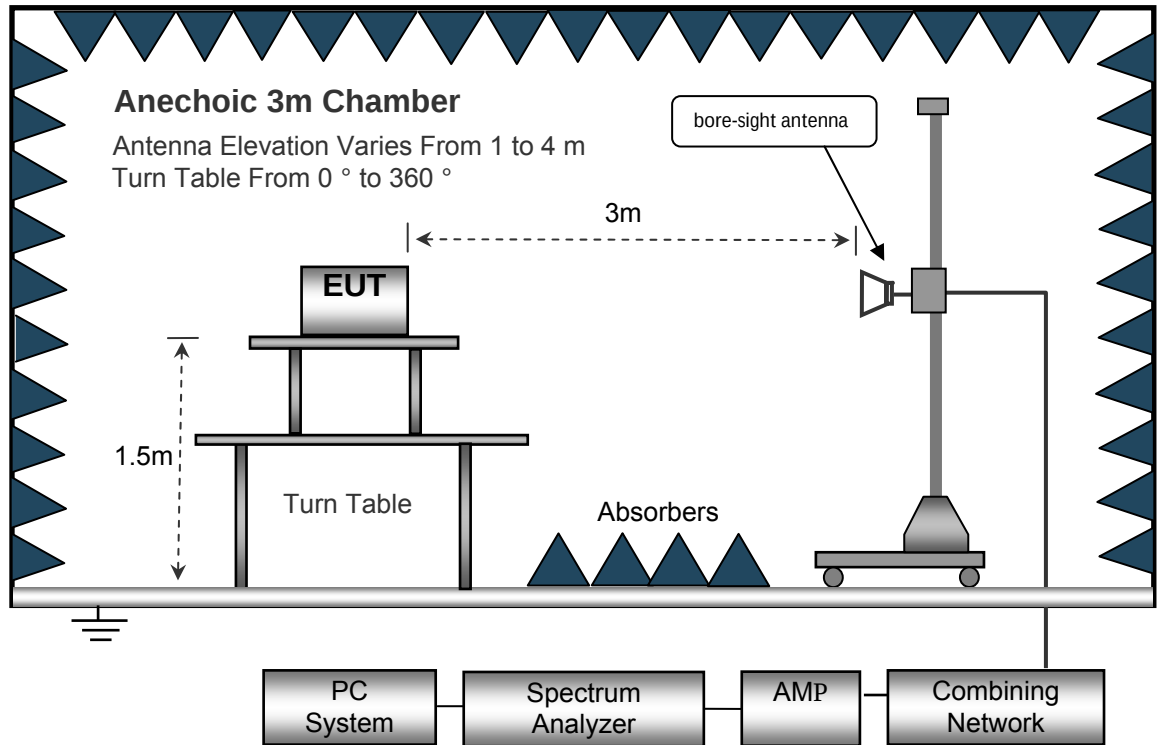
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



9.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed Auto
 IF Bandwidth.....10kHz
 Video Bandwidth.....10kHz
 Resolution Bandwidth.....10kHz

30MHz ~ 1GHz

Sweep Speed Auto
 DetectorPK
 Resolution Bandwidth.....100kHz
 Video Bandwidth.....300kHz

Above 1GHz

Sweep Speed Auto
 DetectorPK
 Resolution Bandwidth.....1MHz
 Video Bandwidth.....3MHz
 DetectorAve.
 Resolution Bandwidth.....1MHz
 Video Bandwidth.....10Hz

9.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in Z axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used during radiated emissions above 1GHz measurement.

9.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

9.6 Summary of Test Results

Wifi:

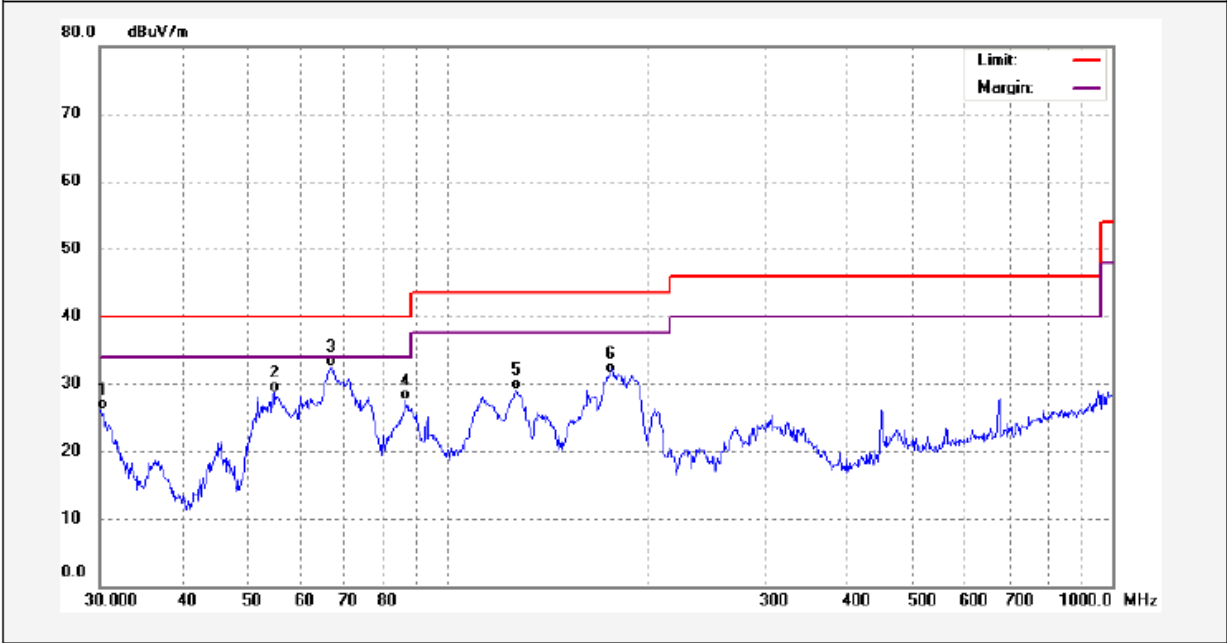
Test Frequency: 9KHz~30MHz

Remark: only the worst data (802.11b/g/n Low channel mode) were recorded.

Frequency	Measurement results dBμV @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dBμV/m @30m	Limits dBμV/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
802.11b							
6.021	25.12	QP	21.84	40.00	6.96	29.54	-22.58
15.730	25.36	QP	21.35	40.00	6.71	29.54	-22.83
25.680	25.14	QP	20.67	40.00	5.81	29.54	-23.73
802.11g							
6.021	25.17	QP	21.84	40.00	7.01	29.54	-22.53
15.730	25.39	QP	21.35	40.00	6.74	29.54	-22.80
25.680	25.44	QP	20.67	40.00	6.11	29.54	-23.43
802.11n(HT20)							
6.021	25.33	QP	21.84	40.00	7.17	29.54	-22.37
15.730	25.52	QP	21.35	40.00	6.87	29.54	-22.67
25.680	25.81	QP	20.67	40.00	6.48	29.54	-23.06
802.11n(HT40)							
6.021	25.11	QP	21.84	40.00	6.95	29.54	-22.59
15.730	25.35	QP	21.35	40.00	6.70	29.54	-22.84
25.680	25.66	QP	20.67	40.00	6.33	29.54	-23.21

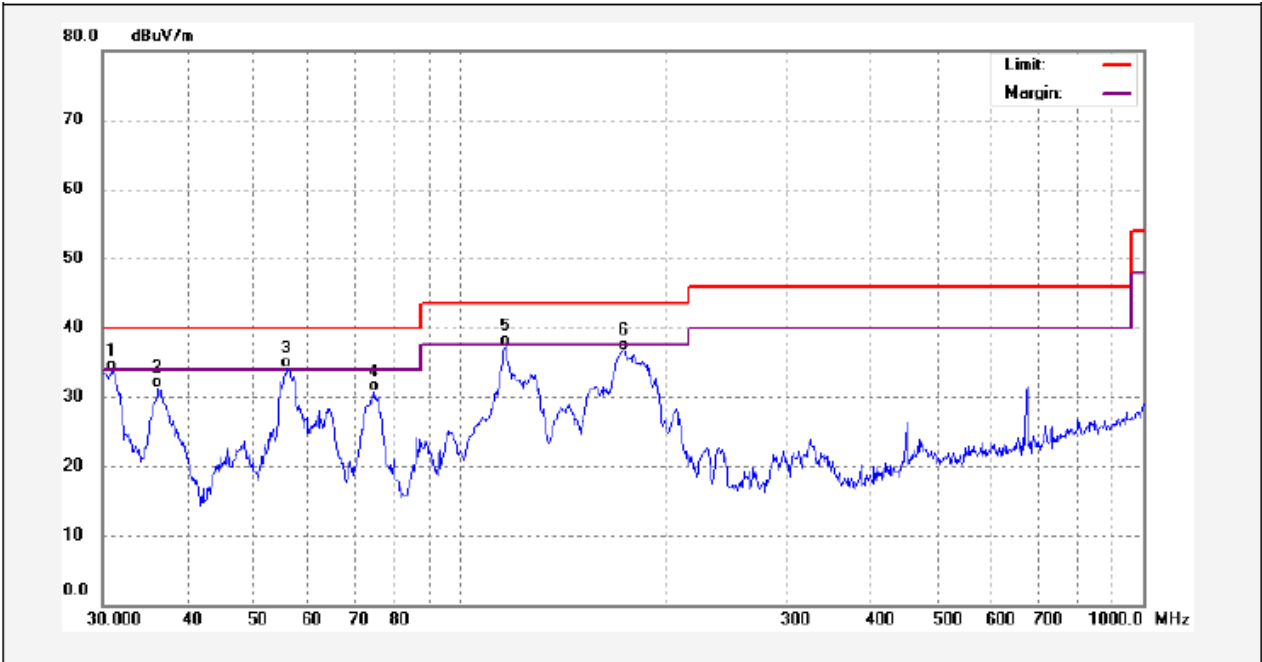
Test Frequency : 30MHz ~ 1GHz Remark: only the worst data (802.11n HT20 Low CH mode) were reported

Low Channel – Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.1054	43.98	-17.83	26.15	40.00	-13.85	QP	
2	54.8348	45.07	-16.44	28.63	40.00	-11.37	QP	
3	66.7325	49.99	-17.52	32.47	40.00	-7.53	QP	
4	86.5029	48.76	-21.17	27.59	40.00	-12.41	QP	
5	126.7723	46.10	-17.09	29.01	43.50	-14.49	QP	
6	175.6516	48.00	-16.45	31.55	43.50	-11.95	QP	

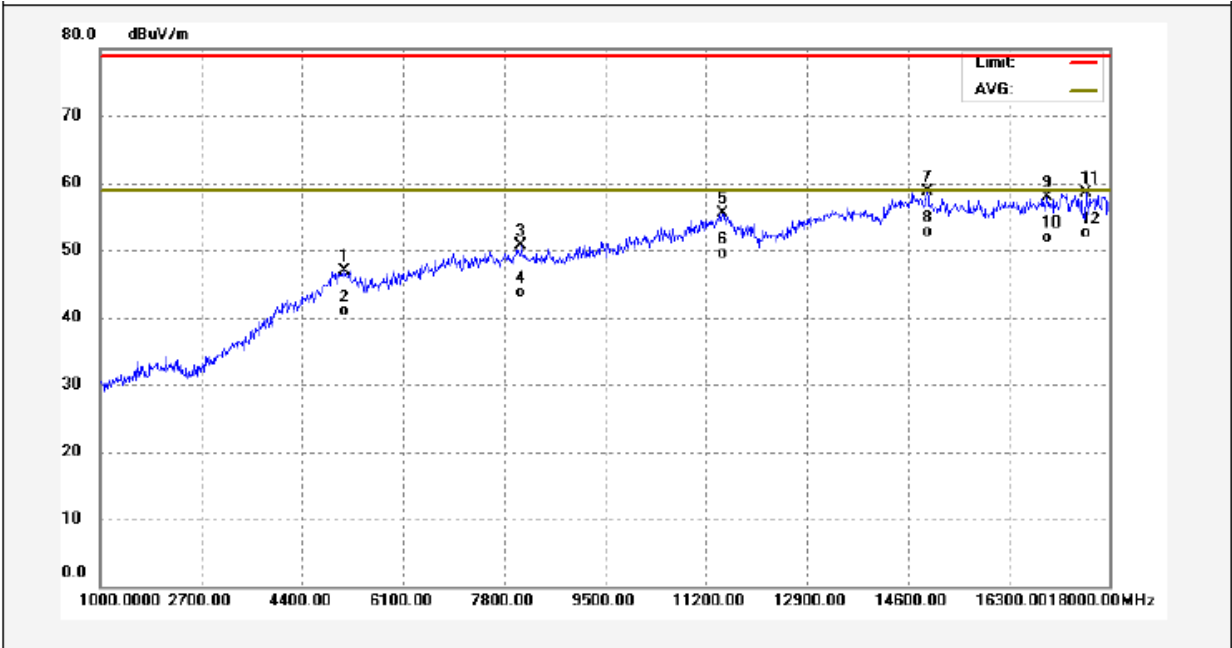
Low Channel – Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.9619	51.51	-17.78	33.73	40.00	-6.27	QP	
2	36.1272	48.85	-17.53	31.32	40.00	-8.68	QP	
3	55.8047	50.59	-16.48	34.11	40.00	-5.89	QP	
4	74.9191	50.28	-19.55	30.73	40.00	-9.27	QP	
5	116.5401	54.80	-17.50	37.30	43.50	-6.20	QP	
6	173.2051	53.00	-16.27	36.73	43.50	-6.77	QP	

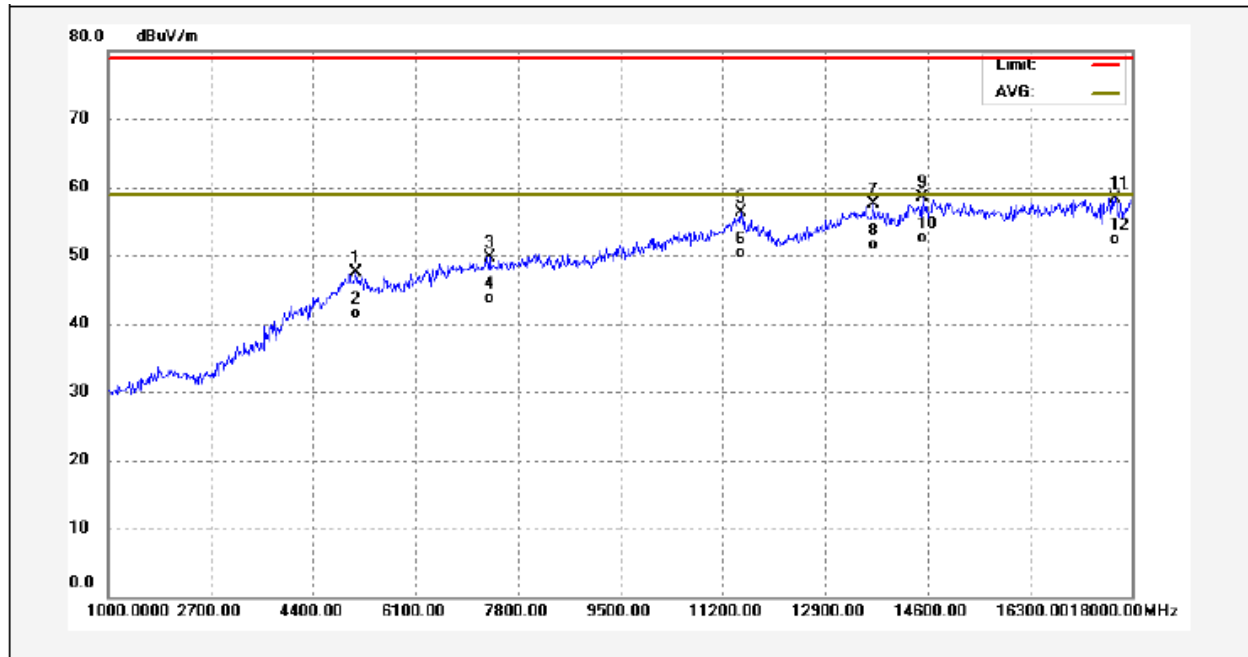
Test Frequency : Above 1GHzRemark: only the worst data (802.11n HT20 Low CH mode) were reported

Low Channel – Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	5114.000	48.21	-1.26	46.95	79.00	-32.05	peak	
2	5114.000	42.21	-1.26	40.95	59.00	-18.05	AVG	
3	8089.000	49.36	1.40	50.76	79.00	-28.24	peak	
4	8089.000	42.36	1.40	43.76	59.00	-15.24	AVG	
5	11472.000	48.59	6.96	55.55	79.00	-23.45	peak	
6	11472.000	42.59	6.96	49.55	59.00	-9.45	AVG	
7	14923.000	48.42	10.29	58.71	79.00	-20.29	peak	
8	14923.000	42.42	10.29	52.71	59.00	-6.29	AVG	
9	16946.000	46.59	11.27	57.86	79.00	-21.14	peak	
10	16946.000	40.59	11.27	51.86	59.00	-7.14	AVG	
11	17592.000	44.70	13.75	58.45	79.00	-20.55	peak	
12	17592.000	38.70	13.75	52.45	59.00	-6.55	AVG	

Low Channel – Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	5114.000	48.70	-1.26	47.44	79.00	-31.56	peak	
2	5114.000	42.70	-1.26	41.44	59.00	-17.56	AVG	
3	7324.000	48.40	1.23	49.63	79.00	-29.37	peak	
4	7324.000	42.40	1.23	43.63	59.00	-15.37	AVG	
5	11506.000	49.22	7.06	56.28	79.00	-22.72	peak	
6	11506.000	43.22	7.06	50.28	59.00	-8.72	AVG	
7	13699.000	49.26	8.24	57.50	79.00	-21.50	peak	
8	13699.000	43.26	8.24	51.50	59.00	-7.50	AVG	
9	14515.000	48.20	10.37	58.57	79.00	-20.43	peak	
10	14515.000	42.20	10.37	52.57	59.00	-6.43	AVG	
11	17711.000	44.24	14.16	58.40	79.00	-20.60	peak	
12	17711.000	38.24	14.16	52.40	59.00	-6.60	AVG	

Test Frequency: 18GHz~25GHz

The measurements were more than 20 dB below the limit and not reported.

BT BLE:**Test Frequency: 9KHz~26MHz**

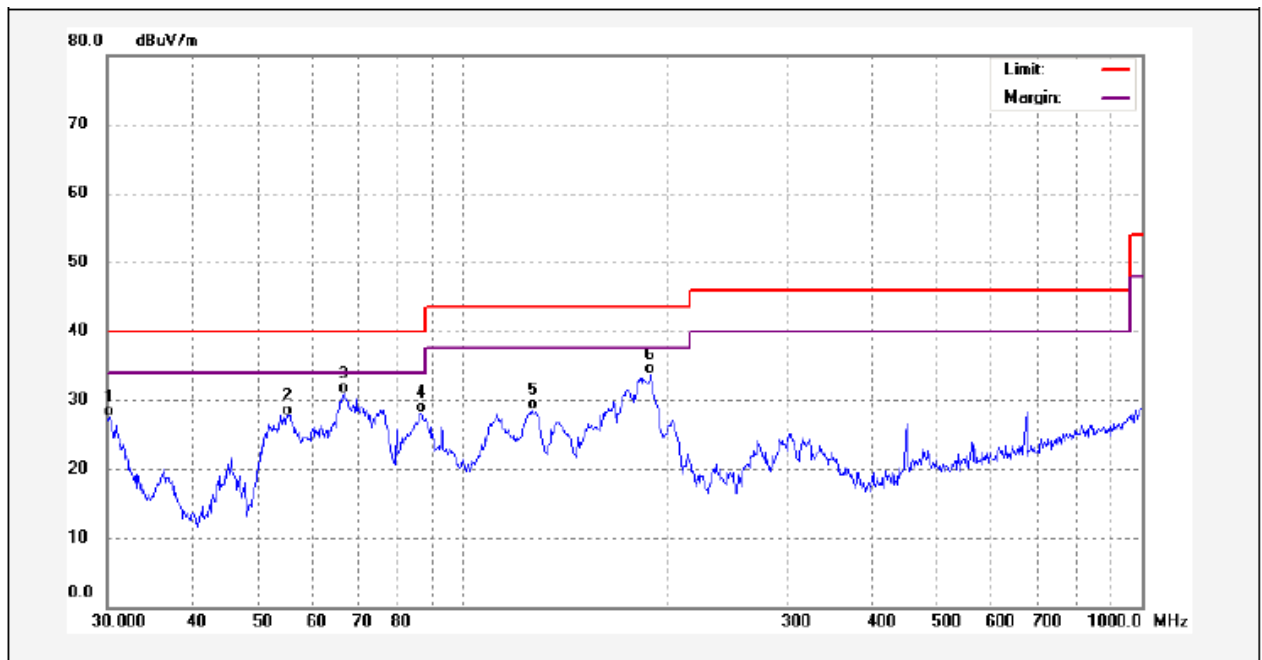
Remark: only the worst data (GFSK modulation Low channel mode) were recorded.

Frequency	Measurement results dB μ V @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dB μ V/m @30m	Limits dB μ V/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
25.95	QP	21.84	40.00	7.79	29.54	-21.75	25.95
24.71	QP	21.35	40.00	6.06	29.54	-23.48	24.71
24.06	QP	20.67	40.00	4.73	29.54	-24.81	24.06

Test Frequency : 30MHz ~ 1GHz

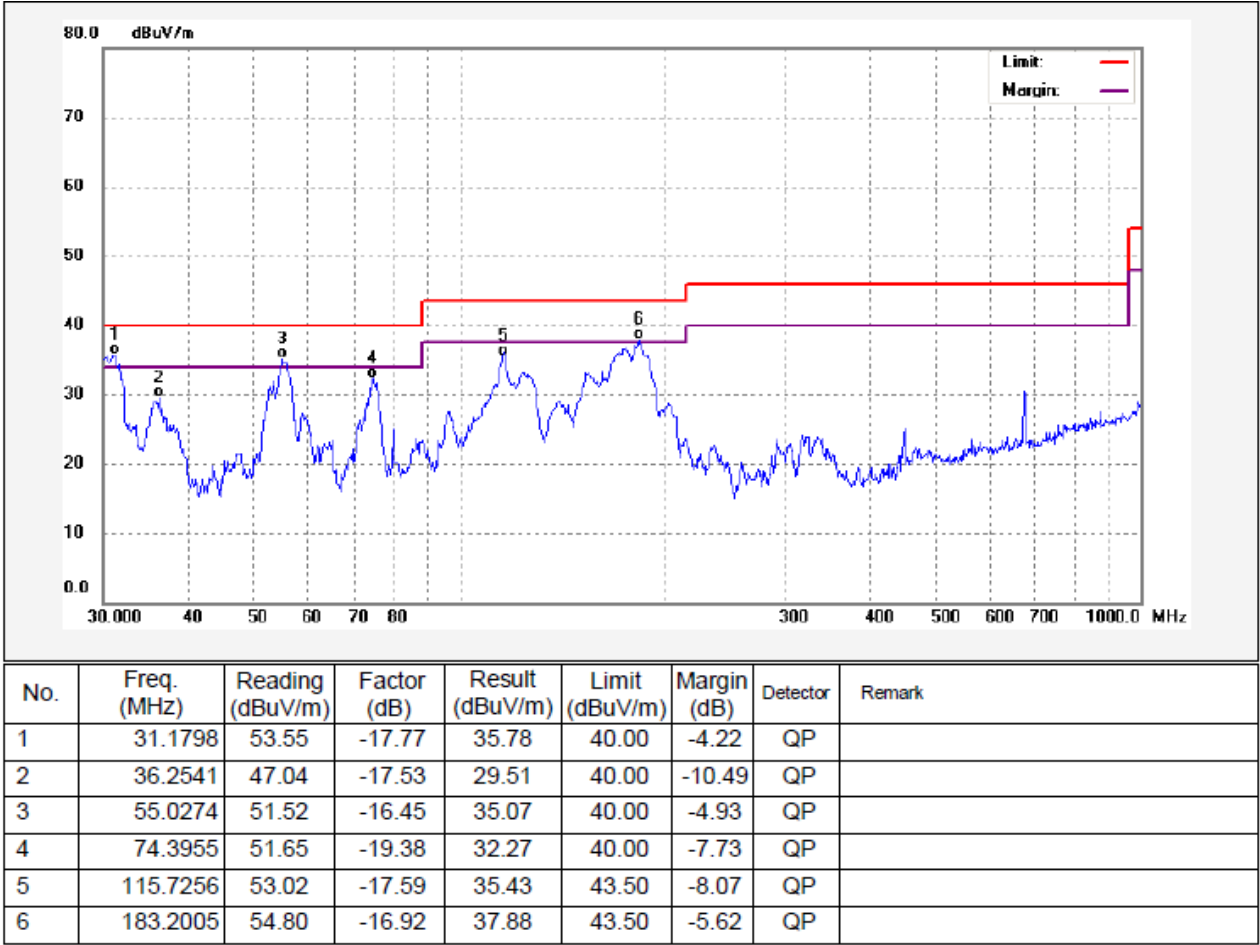
only the worst data (high Channel) were reported

High Channel – Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.0000	45.43	-17.83	27.60	40.00	-12.40	QP	
2	55.2207	44.20	-16.46	27.74	40.00	-12.26	QP	
3	66.7325	48.41	-17.52	30.89	40.00	-9.11	QP	
4	86.8068	49.25	-21.17	28.08	40.00	-11.92	QP	
5	126.7723	45.64	-17.09	28.55	43.50	-14.95	QP	
6	189.0743	50.81	-17.20	33.61	43.50	-9.89	QP	

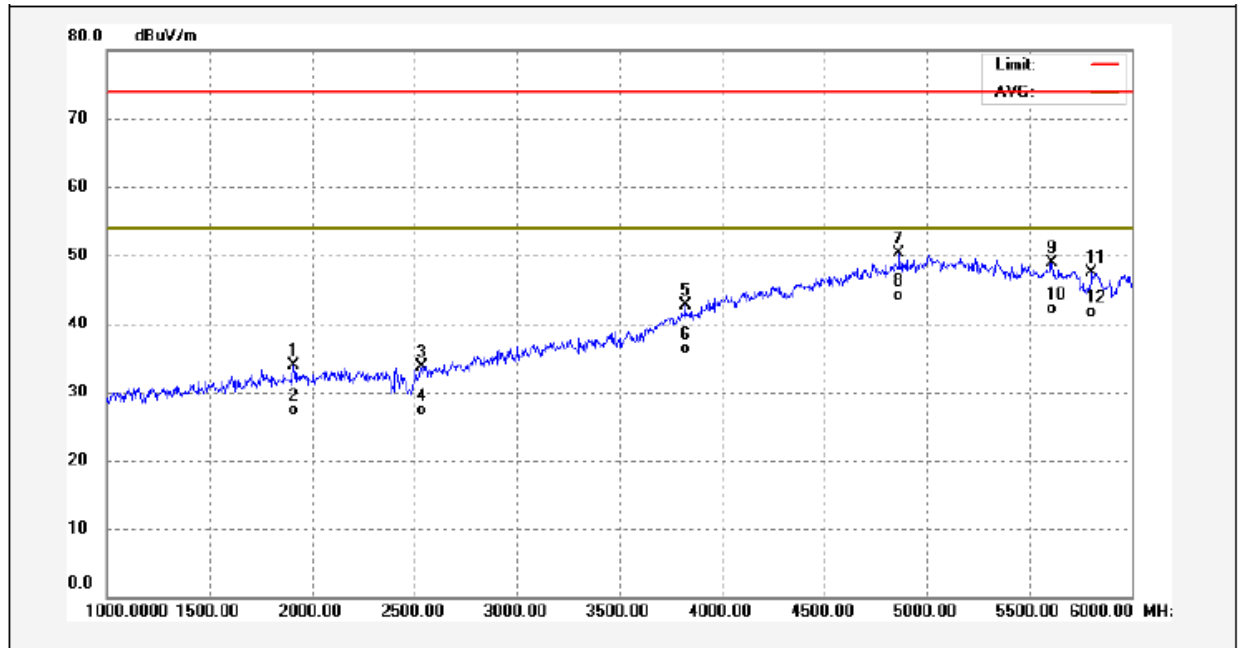
High Channel – Vertical



Test Frequency : Above 1GHz

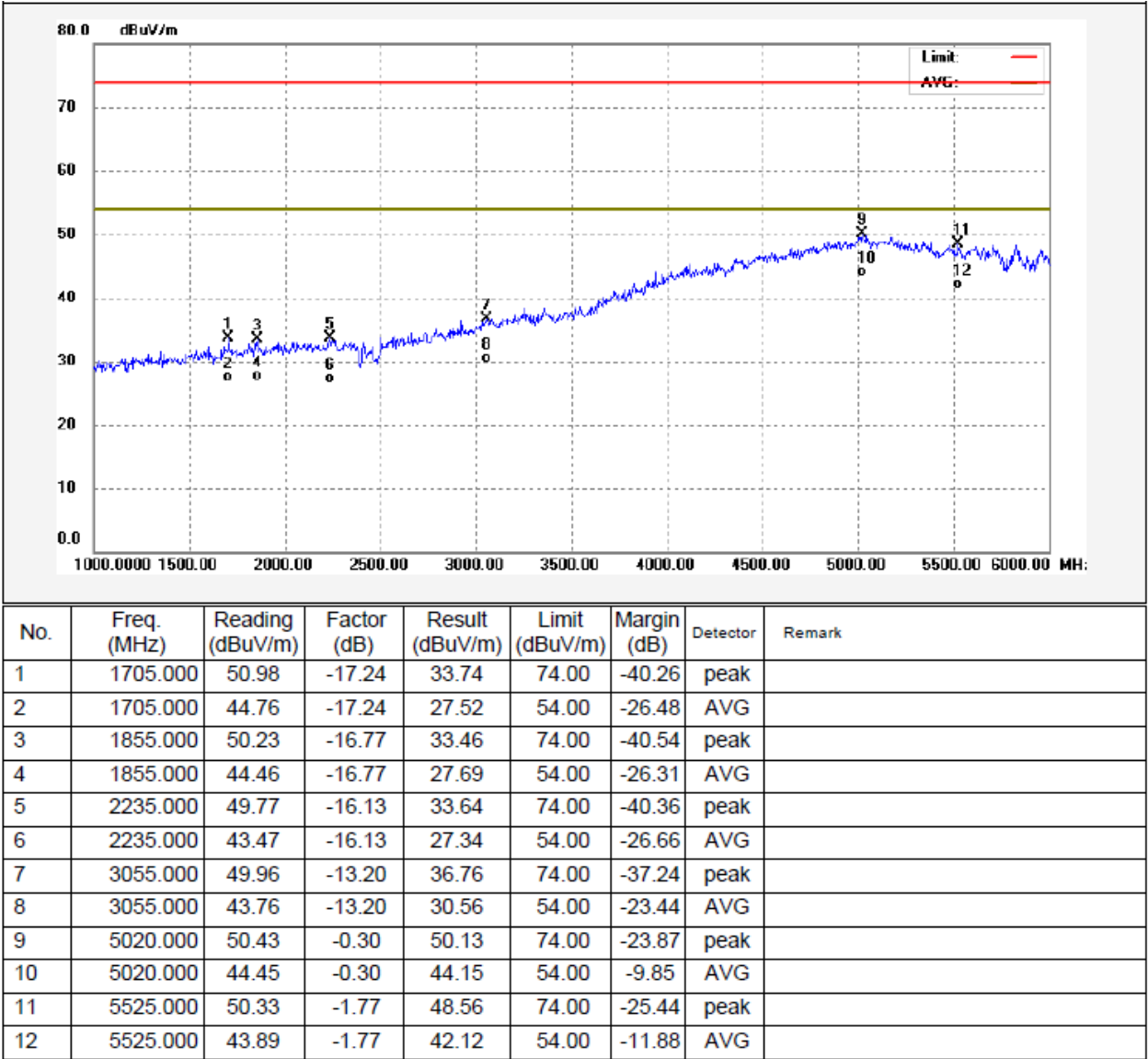
only the worst data (low Channel) were reported

low Channel - Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1910.000	50.50	-16.60	33.90	74.00	-40.10	peak	
2	1910.000	43.85	-16.60	27.25	54.00	-26.75	AVG	
3	2535.000	49.45	-15.75	33.70	74.00	-40.30	peak	
4	2535.000	43.09	-15.75	27.34	54.00	-26.66	AVG	
5	3820.000	50.70	-8.07	42.63	74.00	-31.37	peak	
6	3820.000	44.42	-8.07	36.35	54.00	-17.65	AVG	
7	4865.000	51.26	-1.03	50.23	74.00	-23.77	peak	
8	4865.000	45.05	-1.03	44.02	54.00	-9.98	AVG	
9	5610.000	50.79	-1.86	48.93	74.00	-25.07	peak	
10	5610.000	43.99	-1.86	42.13	54.00	-11.87	AVG	
11	5805.000	49.51	-2.05	47.46	74.00	-26.54	peak	
12	5805.000	43.77	-2.05	41.72	54.00	-12.28	AVG	

low Channel - Vertical



Test Frequency: 18GHz~25GHz

The measurements were more than 20 dB below the limit and not reported.

10 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247
Test Method: KDB 558074 D01 DTS Meas Guidance v04
Test Result: PASS
Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

10.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:

Below 30MHz:

RBW = 100kHz, VBW = 300kHz, Sweep = auto

Detector function = peak, Trace = max hold

Above 30MHz:

For WIFI mode

RBW = 100kHz, VBW = 300kHz, Sweep = auto

Detector function = peak, Trace = max hold

For BLE mode

RBW = 100kHz, VBW = 300kHz, Sweep = auto

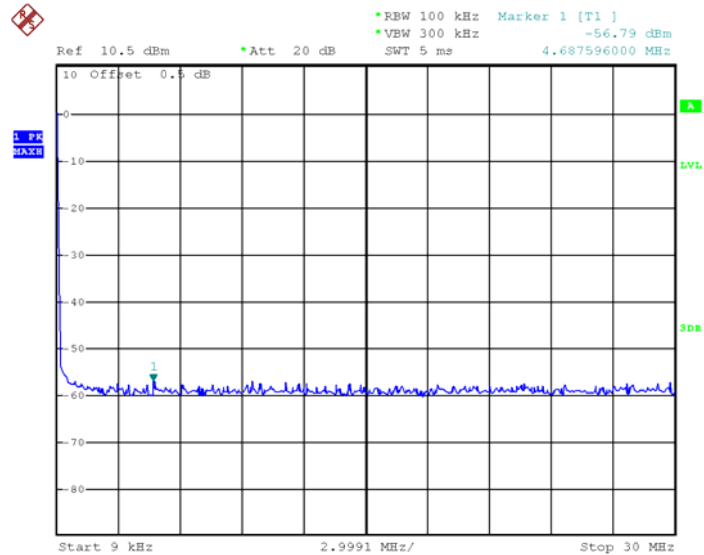
Detector function = peak, Trace = max hold

10.2 Test Result

9KHz – 30MHz

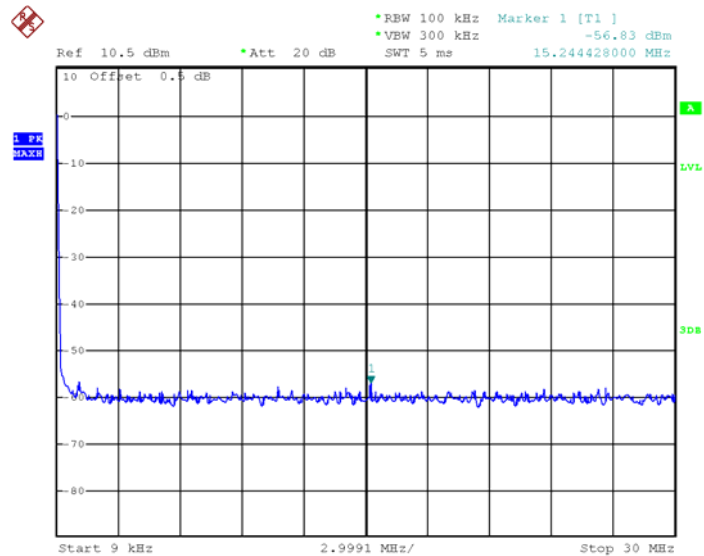
802.11b

Low Channel

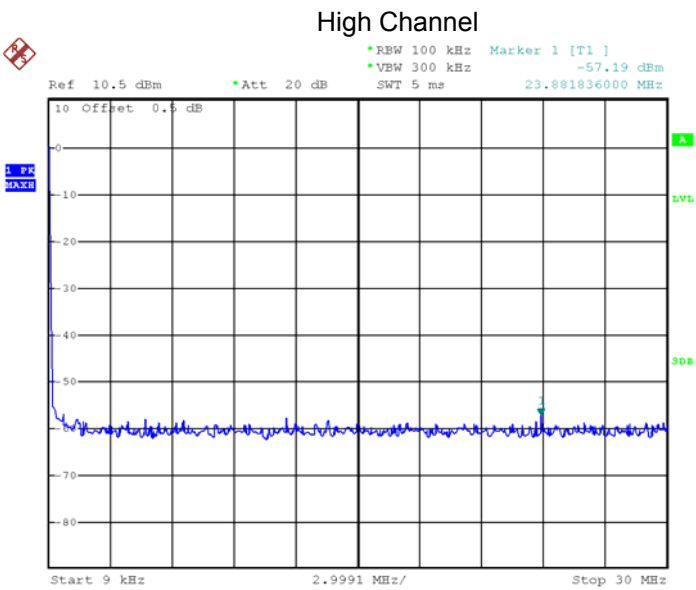


Date: 31.JUL.2018 23:02:08

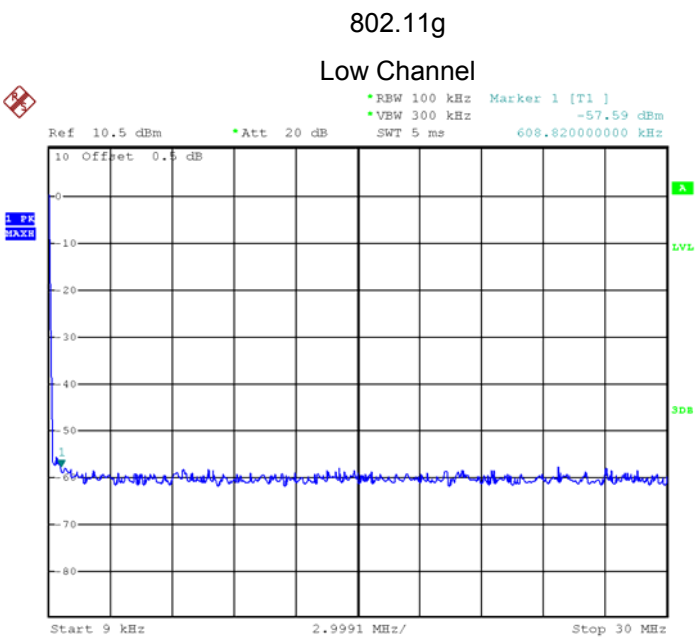
Middle Channel



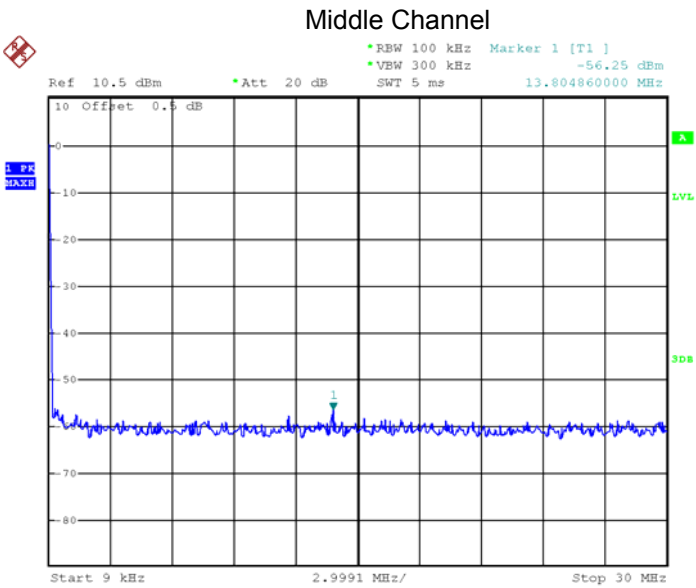
Date: 31.JUL.2018 23:02:18



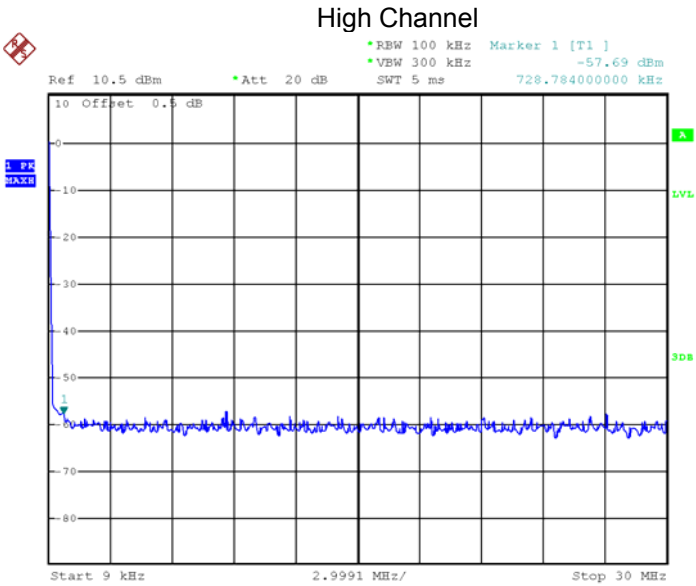
Date: 31.JUL.2018 23:02:27



Date: 31.JUL.2018 23:02:38



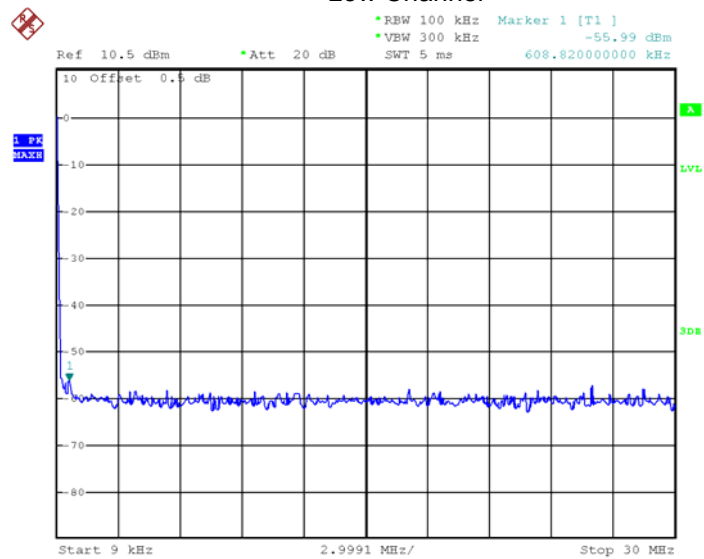
Date: 31.JUL.2018 23:02:45



Date: 31.JUL.2018 23:02:53

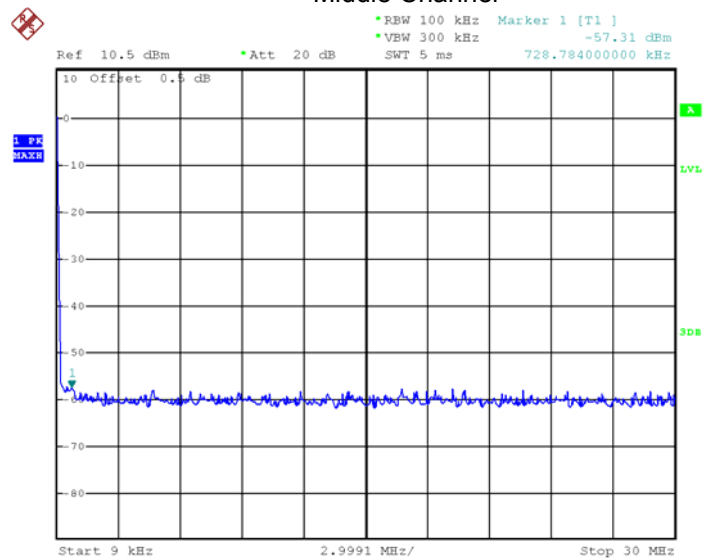
802.11n HT20

Low Channel

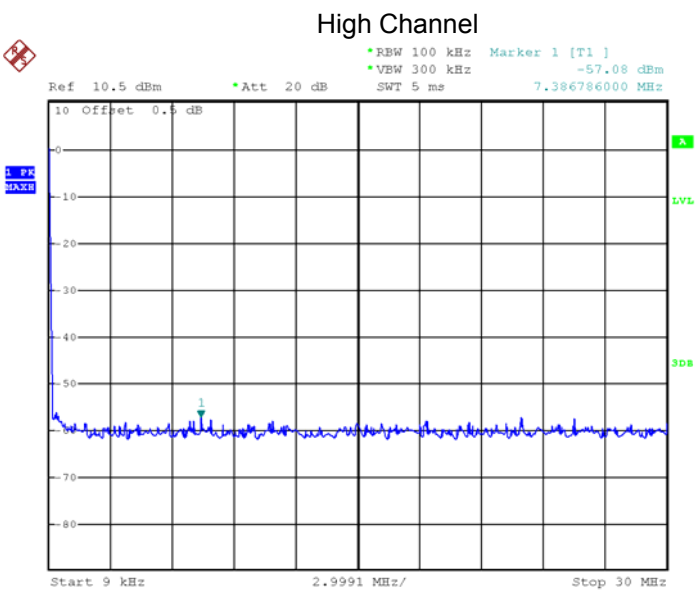


Date: 31.JUL.2018 23:03:01

Middle Channel

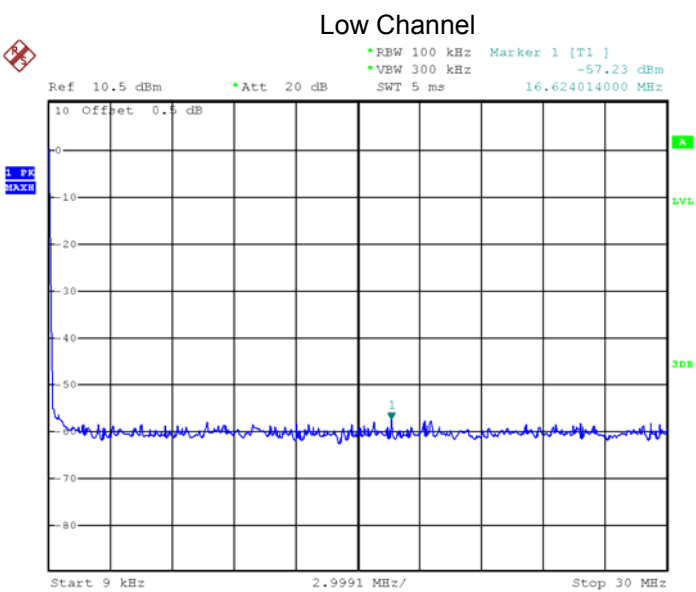


Date: 31.JUL.2018 23:03:11



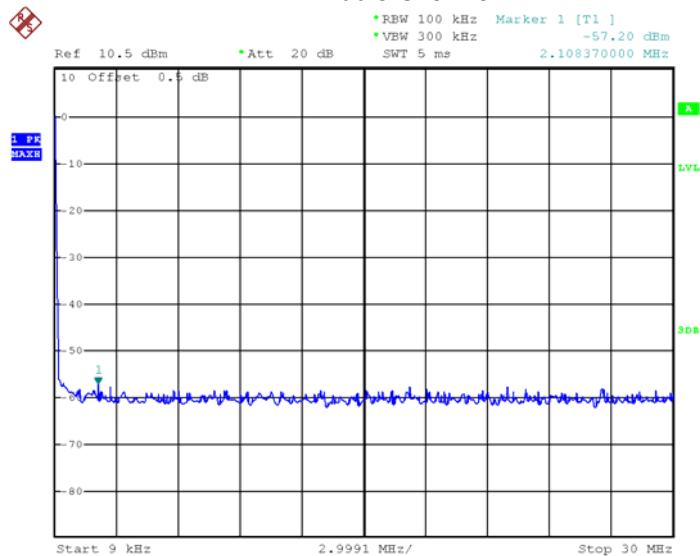
Date: 31.JUL.2018 23:03:22

802.11n HT40



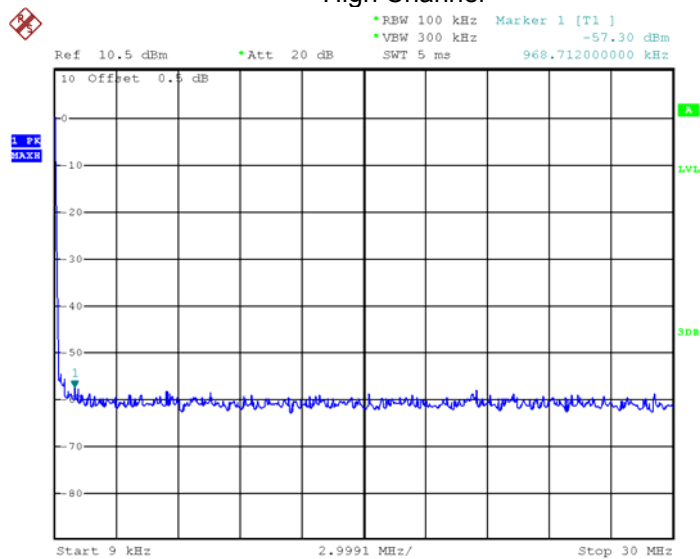
Date: 31.JUL.2018 23:03:31

Middle Channel



Date: 31.JUL.2018 23:03:40

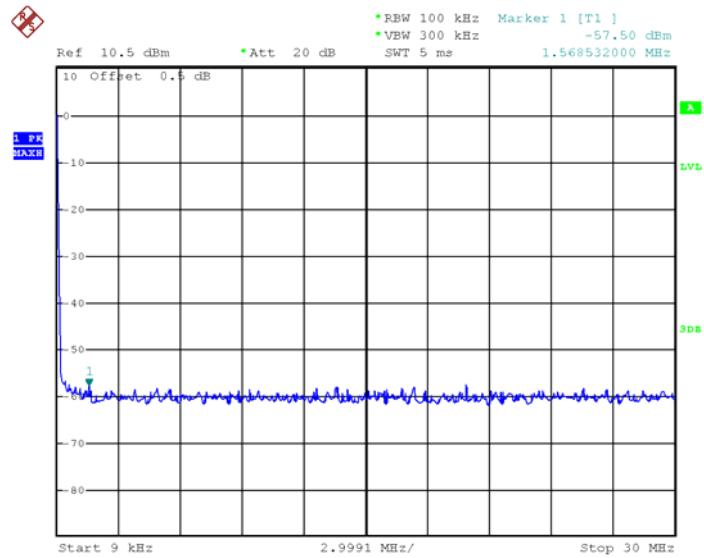
High Channel



Date: 31.JUL.2018 23:03:47

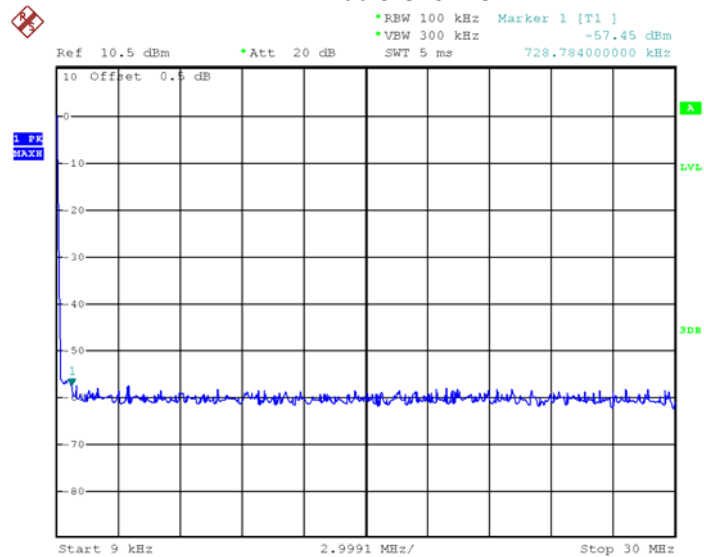
BLE

Low Channel

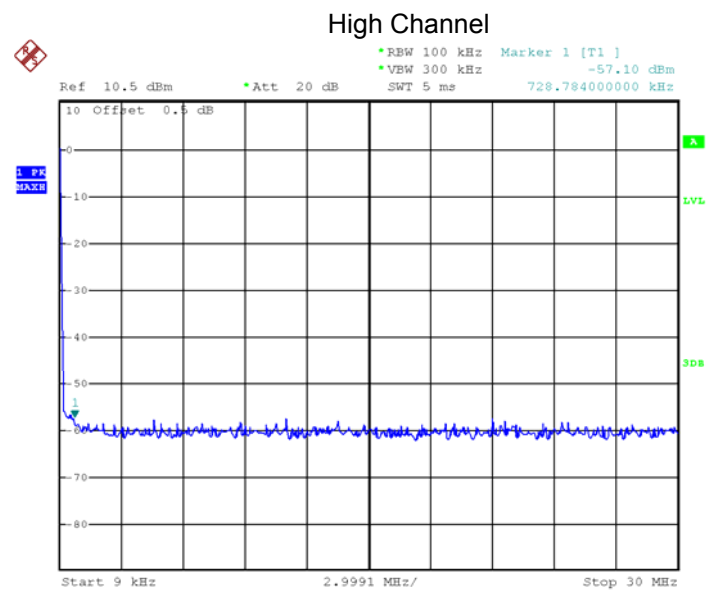


Date: 31.JUL.2018 23:05:54

Middle Channel



Date: 31.JUL.2018 23:06:03



Date: 31.JUL.2018 23:06:13

Above 30MHz

802.11b

Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



802.11g

Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



802.11n HT20

Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



802.11n HT40

Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



BLE

Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



11 Band Edge Measurement

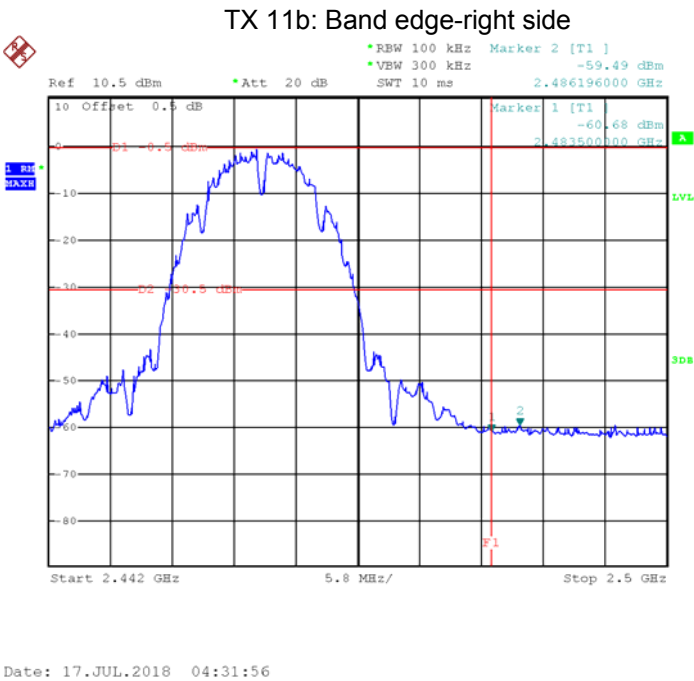
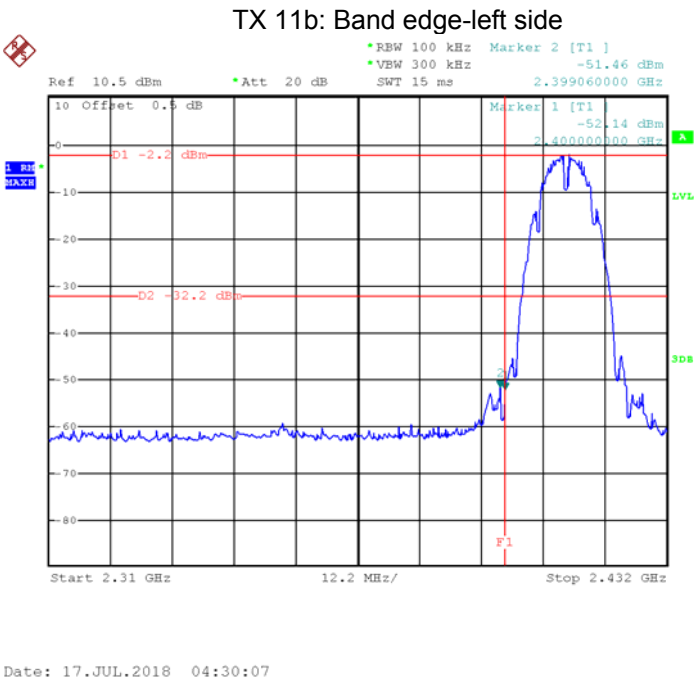
Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	KDB 558074 D01 DTS Meas Guidance v04
Test Limit:	Regulation 15.247 (d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
Test Mode:	Transmitting

11.1 Test Produce

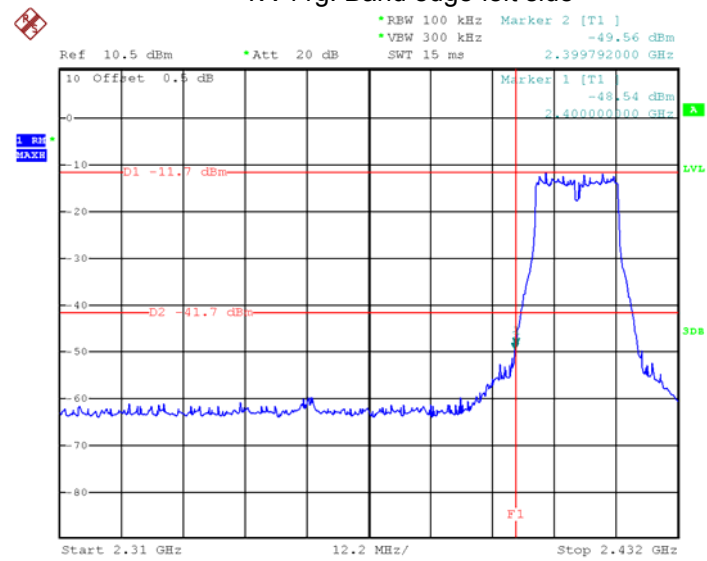
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

11.2 Test Result

Test result plots shown as follows:

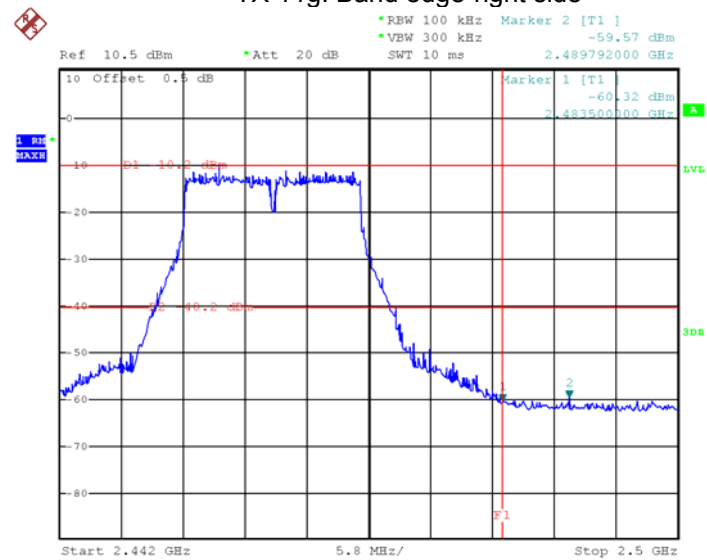


TX 11g: Band edge-left side



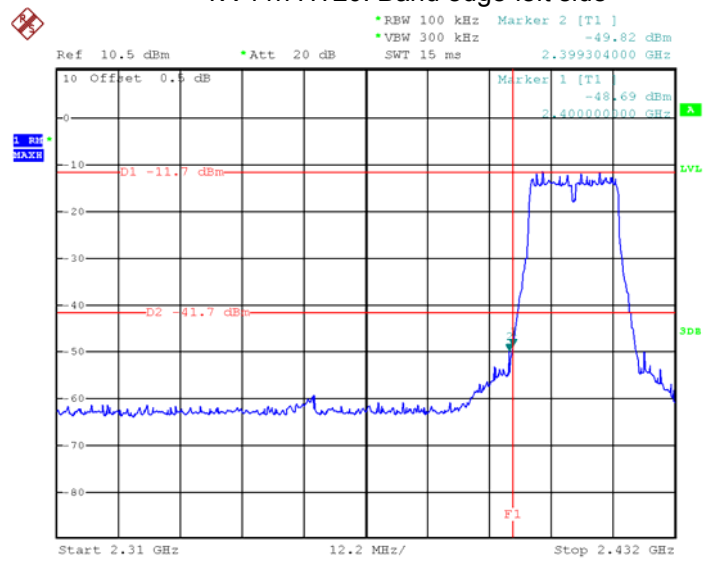
Date: 17.JUL.2018 05:05:37

TX 11g: Band edge-right side



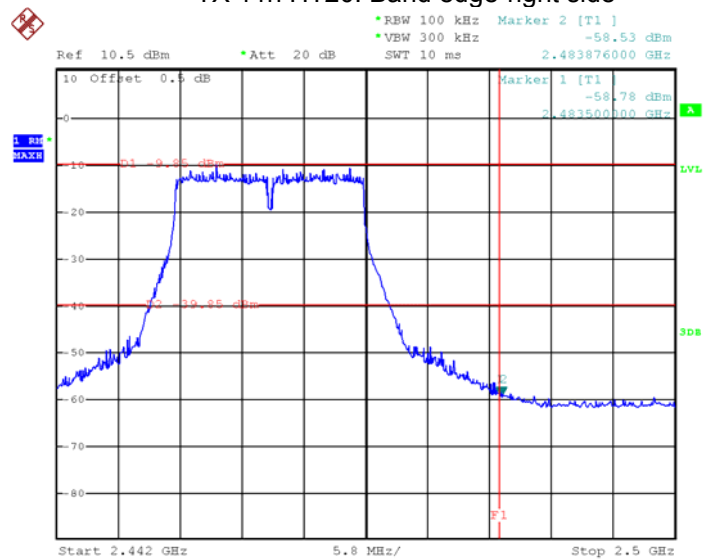
Date: 17.JUL.2018 05:03:53

TX 11n HT20: Band edge-left side



Date: 19.JUL.2018 01:22:45

TX 11n HT20: Band edge-right side

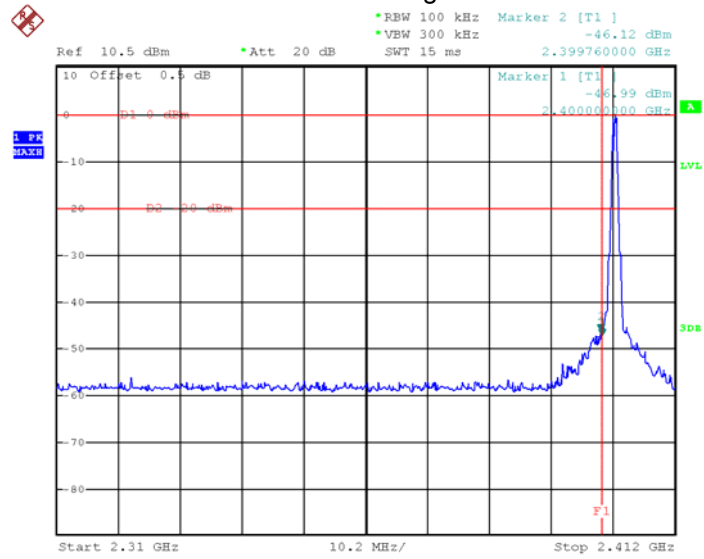


Date: 19.JUL.2018 01:21:05

Date: 19.JUL.2018 02:07:53

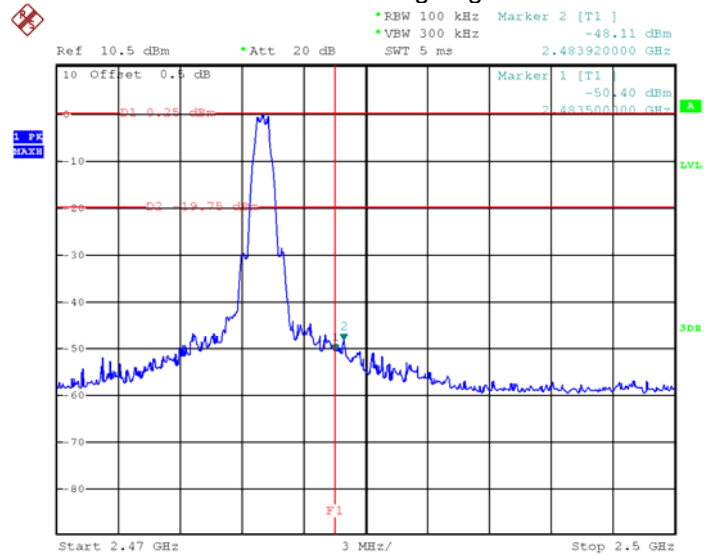
Date: 19.JUL.2018 02:00:16

BLE: Band edge-left side



Date: 16.JUL.2018 05:41:40

BLE: Band edge-right side



Date: 16.JUL.2018 05:42:58

12 6 dB Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

KDB 558074 D01 DTS Meas Guidance v04

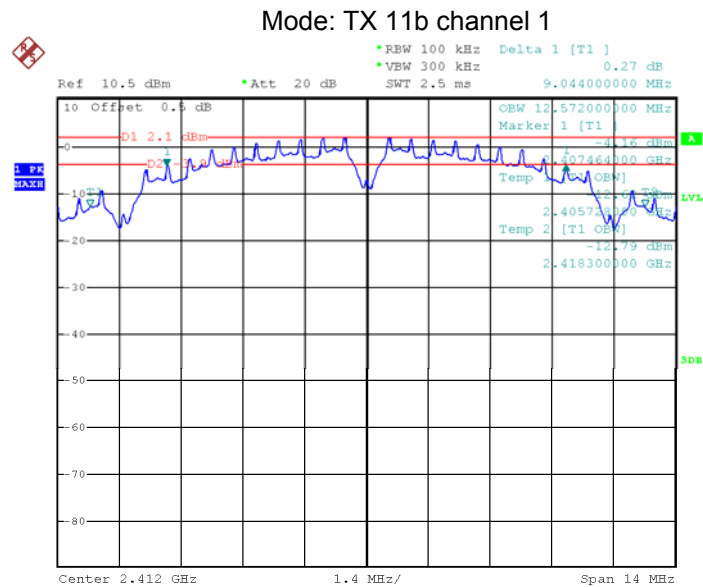
12.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

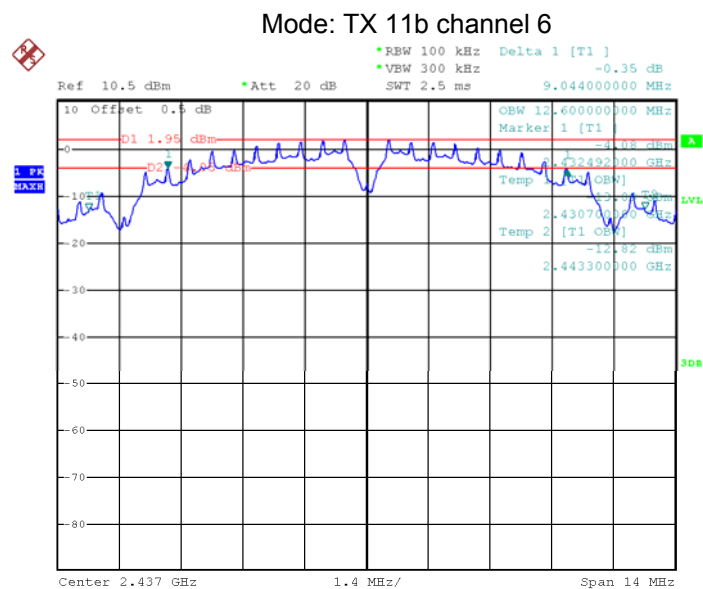
12.2 Test Result:

Operation mode	Test Channel	Bandwidth (MHz)	Limit (kHz)
TX 11b	Channel 1	0.904	500
	Channel 6	0.904	500
	Channel 11	0.904	500
TX 11g	Channel 1	17.712	500
	Channel 6	16.550	500
	Channel 11	16.550	500
TX 11n HT20	Channel 1	17.712	500
	Channel 6	17.712	500
	Channel 11	17.712	500
TX 11n HT40	Channel 3	35.750	500
	Channel 6	35.748	500
	Channel 9	35.748	500
BLE	Channel 0	0.702	500
	Channel 19	0.690	500
	Channel 39	0.690	500

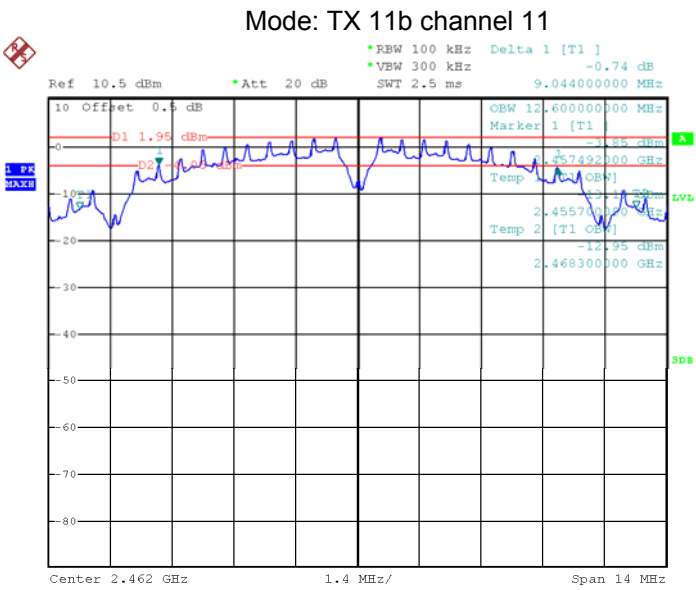
Test result plot:



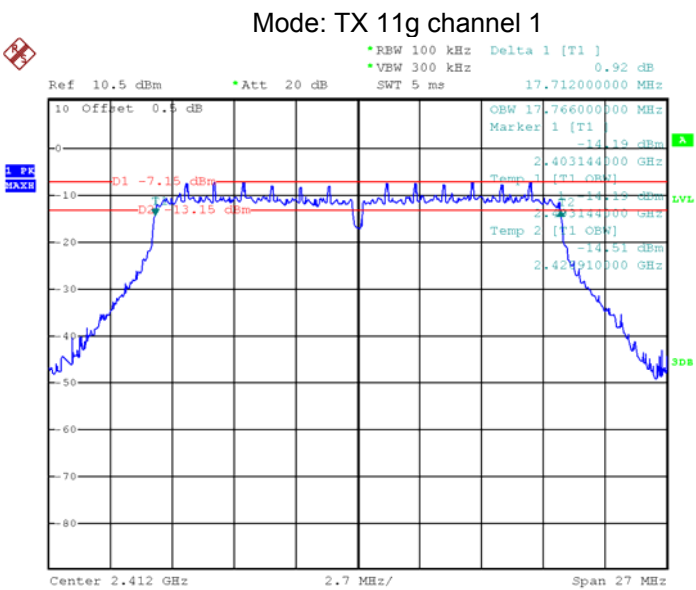
Date: 17.JUL.2018 04:05:46



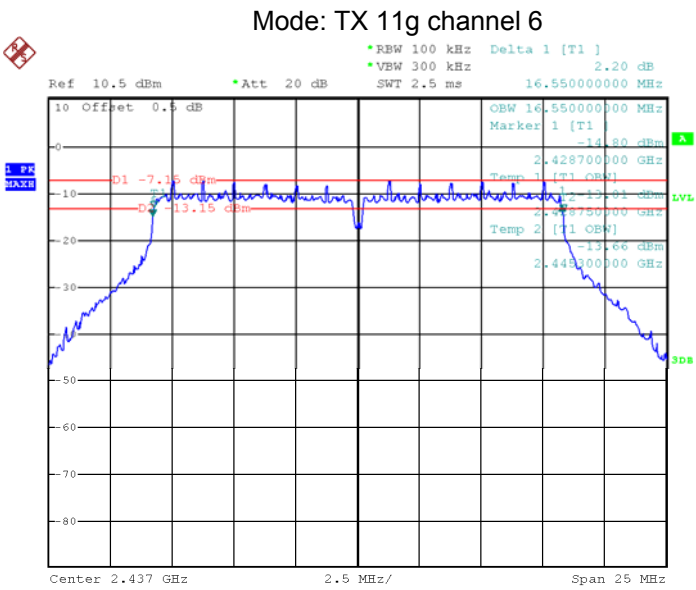
Date: 17.JUL.2018 04:10:43



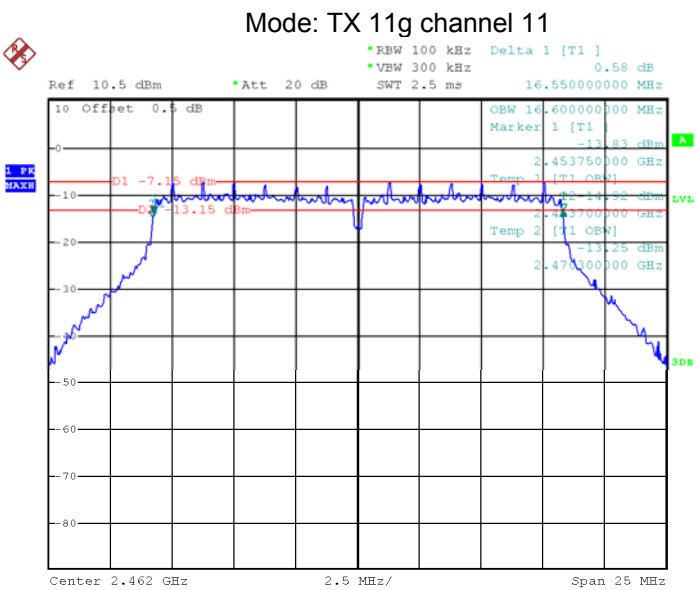
Date: 17.JUL.2018 04:13:36



Date: 17.JUL.2018 05:13:10

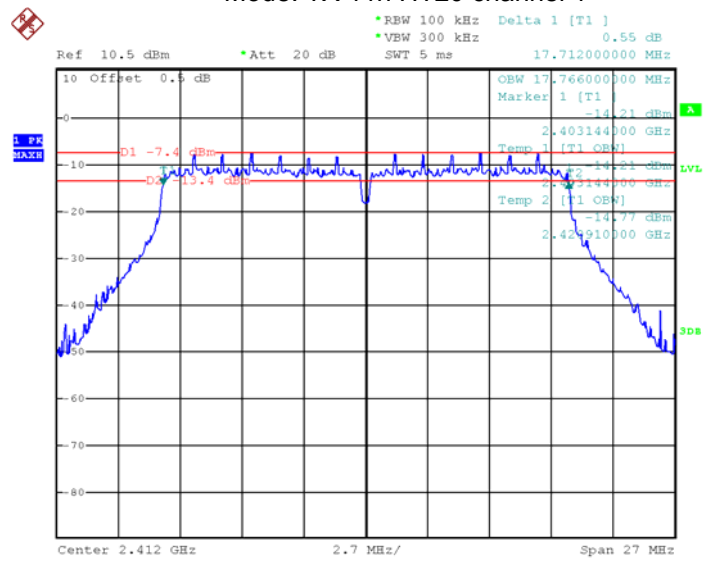


Date: 17.JUL.2018 04:56:55



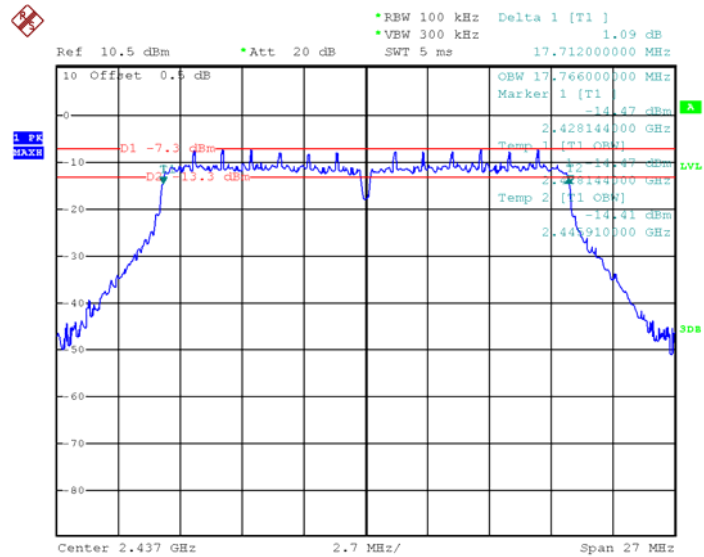
Date: 17.JUL.2018 04:59:49

Mode: TX 11n HT20 channel 1



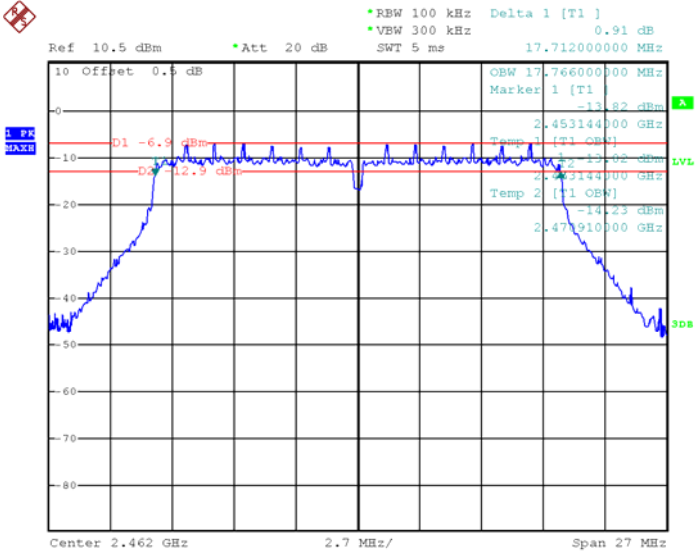
Date: 18.JUL.2018 06:42:56

Mode: TX 11n HT20 channel 6



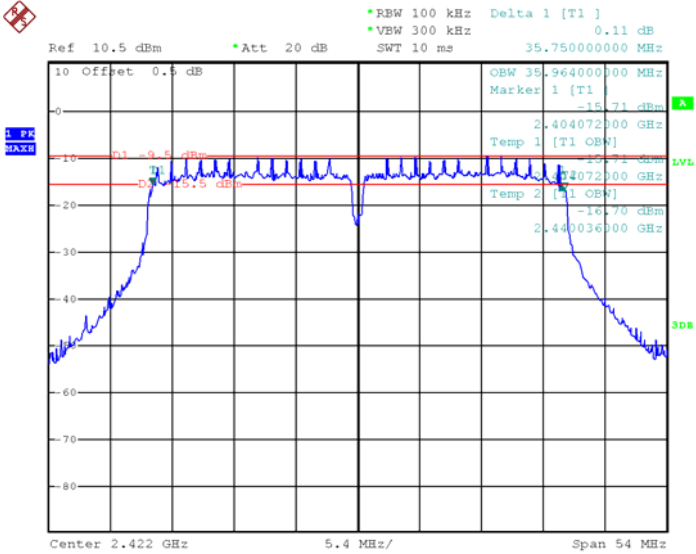
Date: 18.JUL.2018 06:46:24

Mode: TX 11n HT20 channel 11

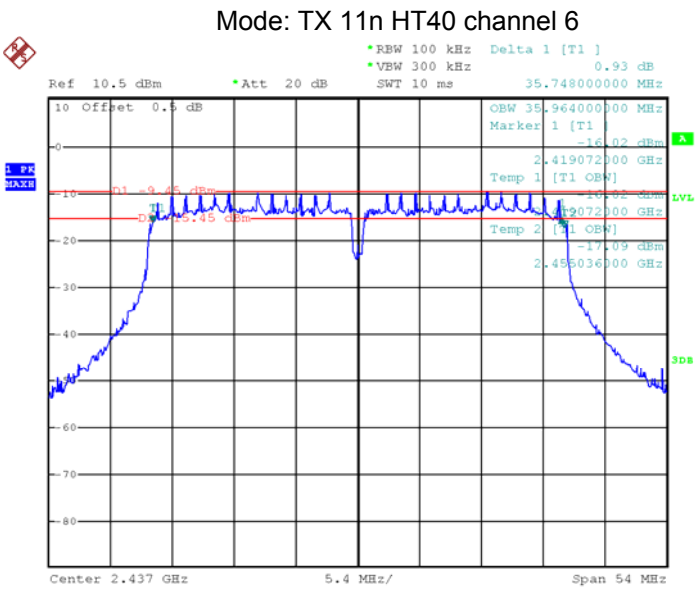


Date: 19.JUL.2018 01:12:15

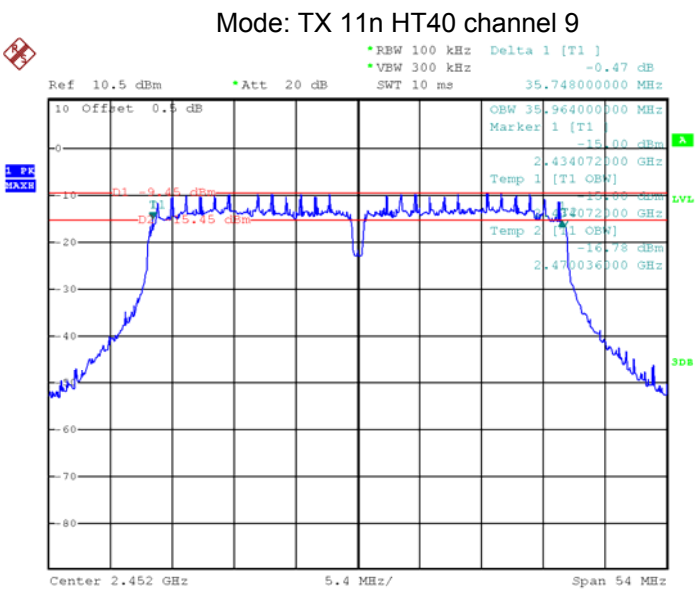
Mode: TX 11n HT40 channel 3



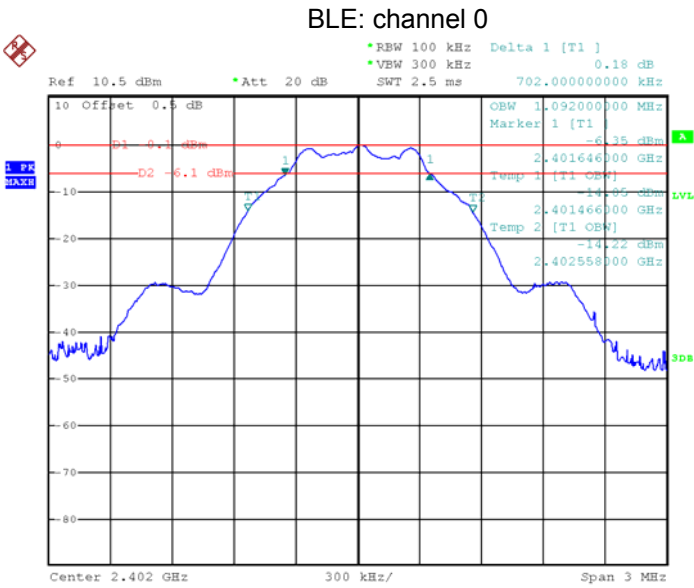
Date: 19.JUL.2018 01:43:05



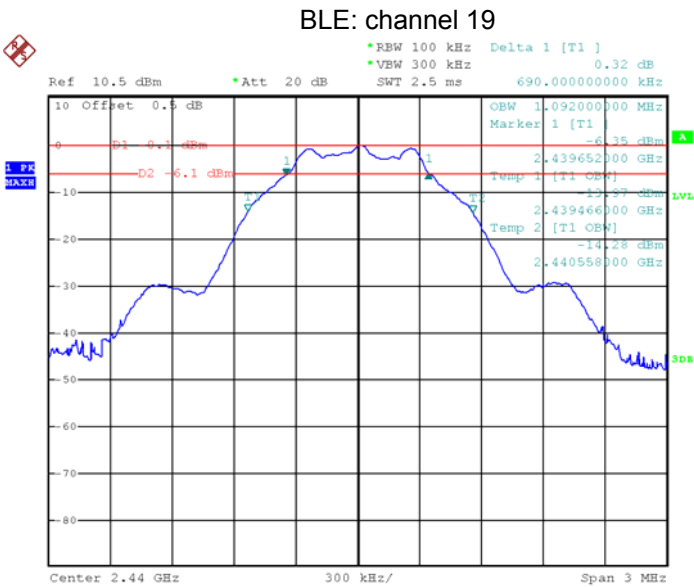
Date: 19.JUL.2018 01:49:38



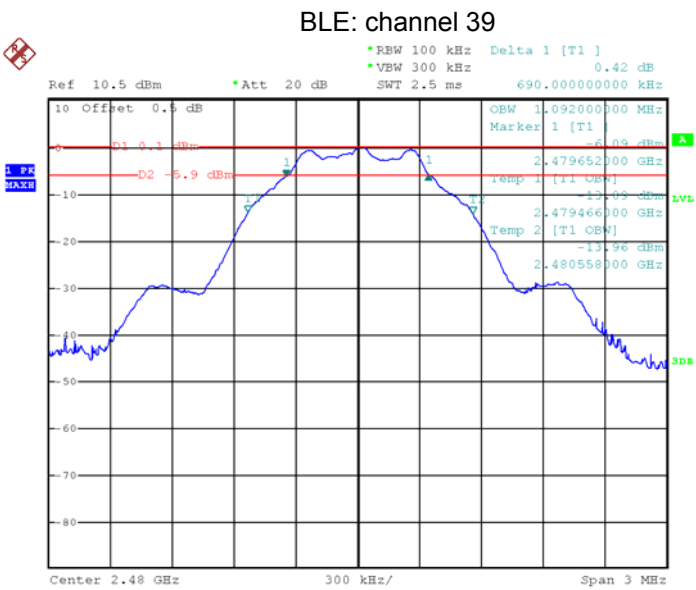
Date: 19.JUL.2018 01:52:13



Date: 16.JUL.2018 05:39:41



Date: 16.JUL.2018 05:38:50



Date: 16.JUL.2018 05:38:03

13 Maximum Peak Output Power

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

KDB 558074 D01 DTS Meas Guidance v04

13.1 Test Procedure:

KDB 558074 D01 DTS Meas Guidance v04

section 9.1.1 (For BLE)

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the $RBW \geq DTS \text{ bandwidth}$.
- b) Set $VBW \geq 3 \times RBW$.
- c) Set $span \geq 3 \times RBW$.
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

section 9.1.2 (For WIFI)

This procedure may be used when the maximum available RBW of the measurement instrument is less than the DTS bandwidth.

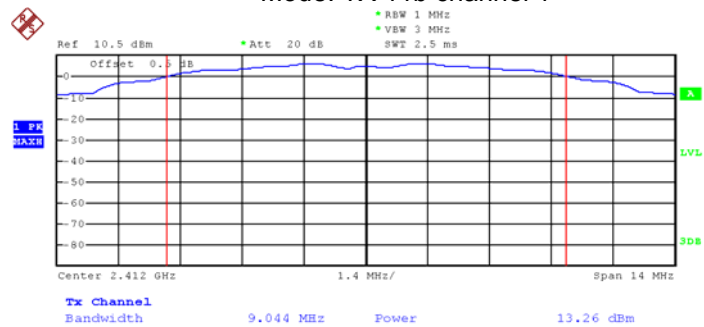
- a) Set the $RBW = 1 \text{ MHz}$.
- b) Set the $VBW \geq 3 \times RBW$.
- c) Set the $span \geq 1.5 \times DTS \text{ bandwidth}$.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select peak detector). If the instrument does not have a band power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS bandwidth.

13.2 Test Result:

Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	13.26	1W/30dBm
	Middle-2437	13.24	1W/30dBm
	High-2462	13.18	1W/30dBm
TX 11g	Low-2412	12.71	1W/30dBm
	Middle-2437	12.48	1W/30dBm
	High-2462	12.58	1W/30dBm
TX 11n HT20	Low-2412	12.41	1W/30dBm
	Middle-2437	12.50	1W/30dBm
	High-2462	13.01	1W/30dBm
TX 11n HT40	Low-2422	12.80	1W/30dBm
	Middle-2437	12.87	1W/30dBm
	High-2452	12.89	1W/30dBm
BLE	Low-2402	0.22	1W/30dBm
	Middle-2440	0.24	1W/30dBm
	High-2480	0.48	1W/30dBm

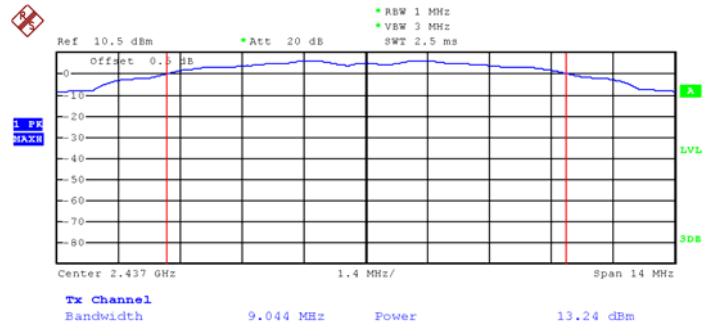
Test Plot

Mode: TX 11b channel 1

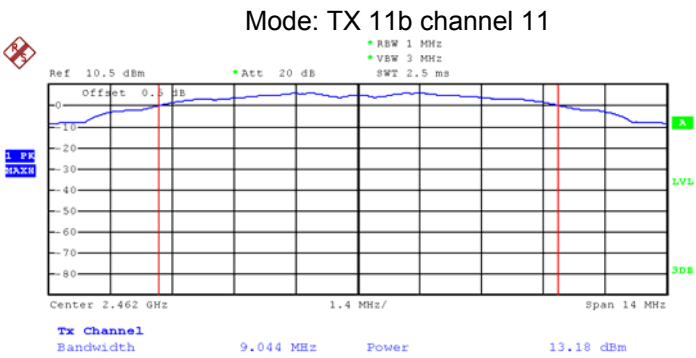


Date: 17.JUL.2018 04:06:36

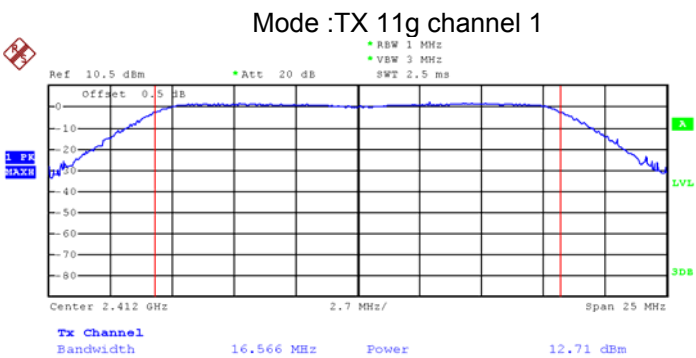
Mode: TX 11b channel 6



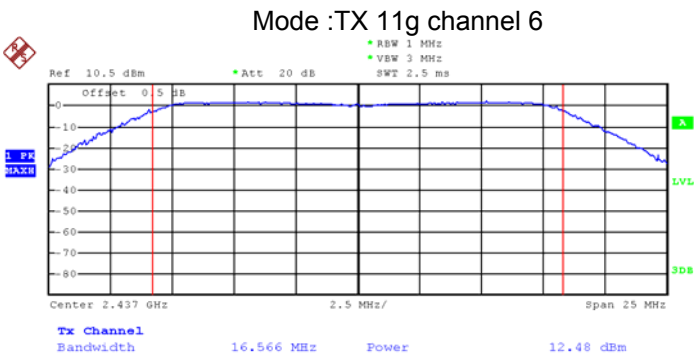
Date: 17.JUL.2018 04:09:05



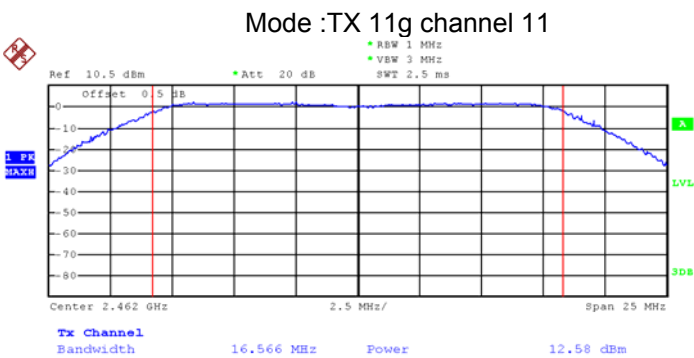
Date: 17.JUL.2018 04:12:27



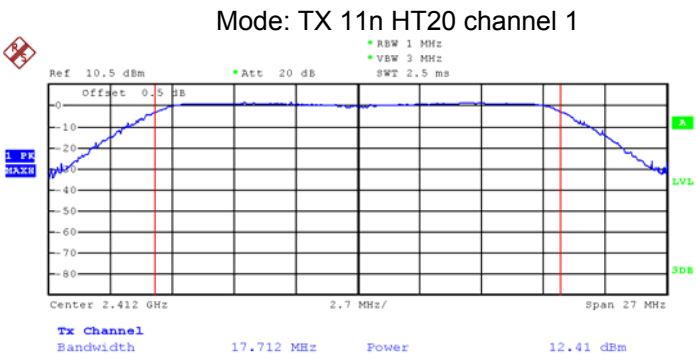
Date: 17.JUL.2018 05:14:15



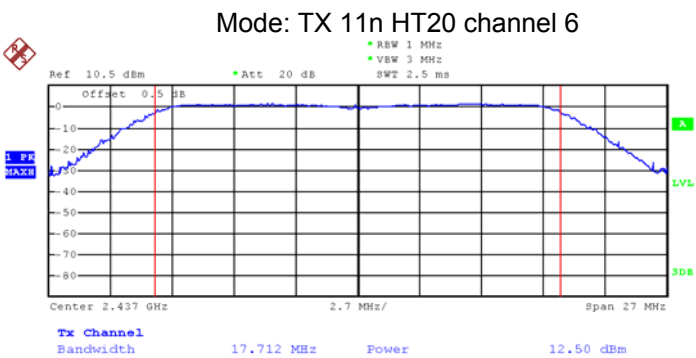
Date: 17.JUL.2018 04:54:54



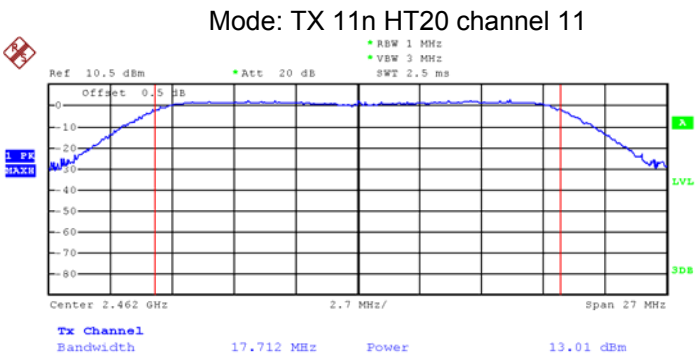
Date: 17.JUL.2018 05:00:37



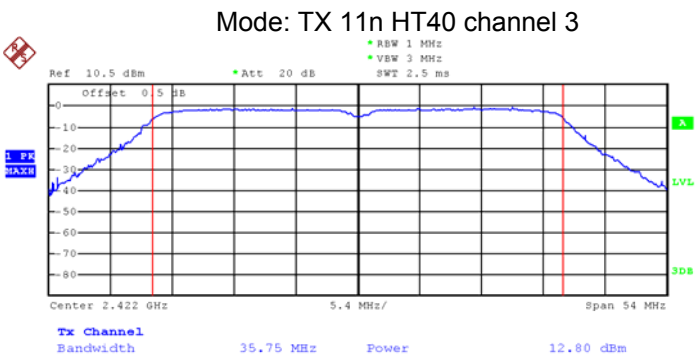
Date: 18.JUL.2018 06:41:52



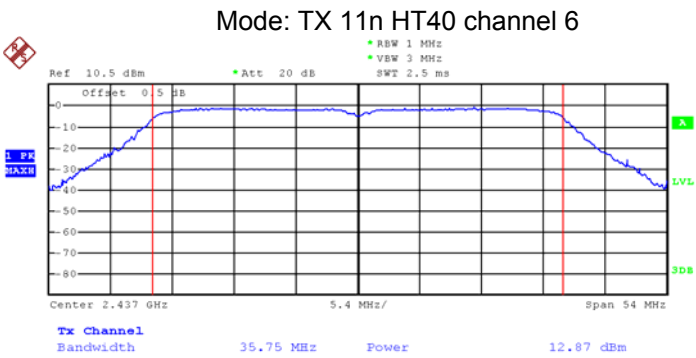
Date: 18.JUL.2018 06:47:00



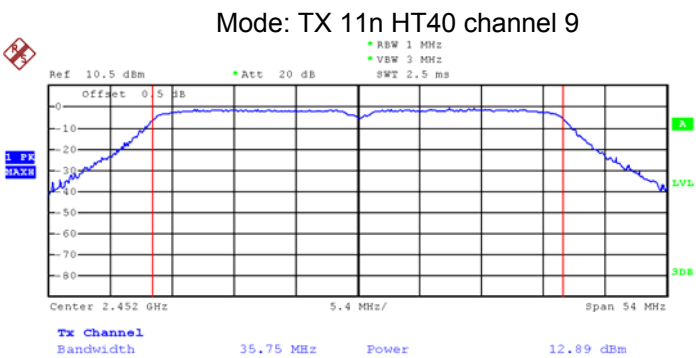
Date: 19.JUL.2018 01:10:24



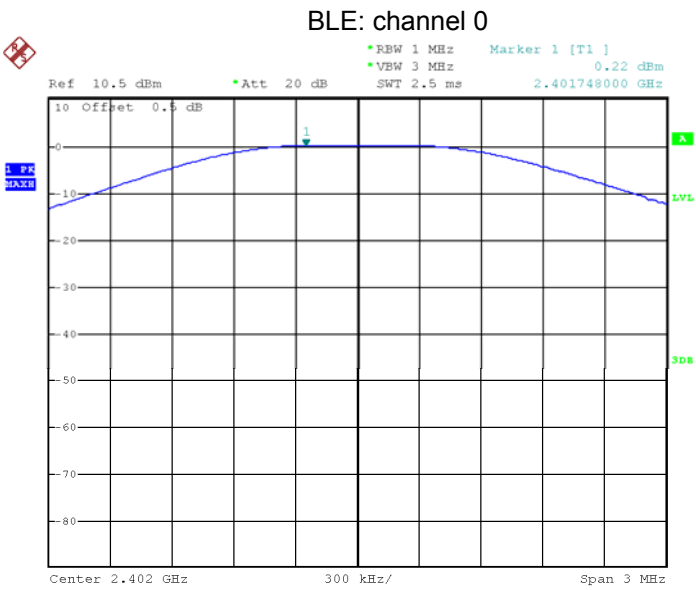
Date: 19.JUL.2018 01:44:57



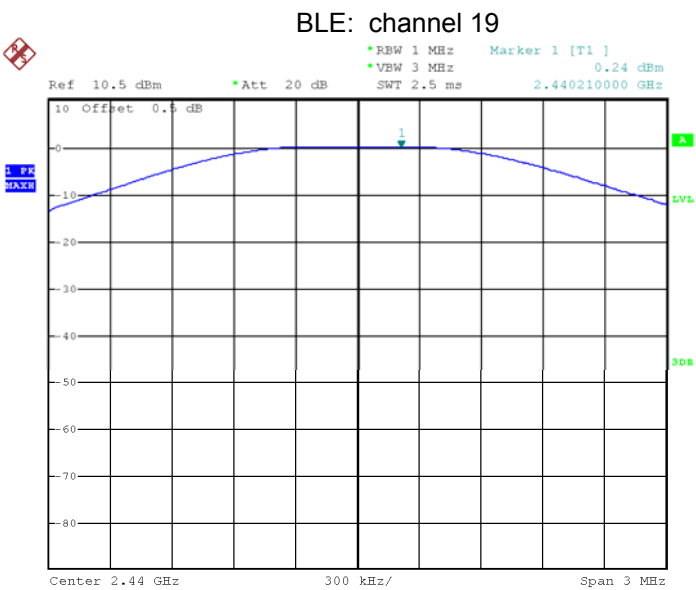
Date: 19.JUL.2018 01:50:33



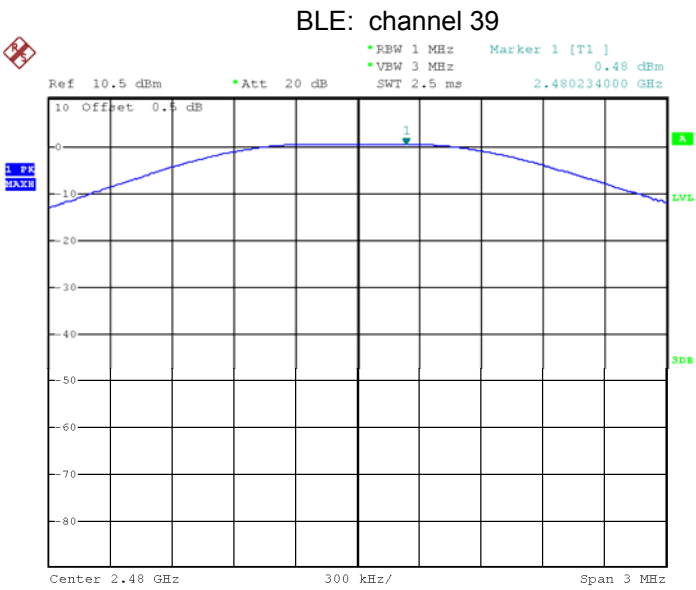
Date: 19.JUL.2018 01:51:12



Date: 16.JUL.2018 04:19:22



Date: 16.JUL.2018 04:20:53



Date: 16.JUL.2018 04:21:26

14 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 DTS Meas Guidance v04

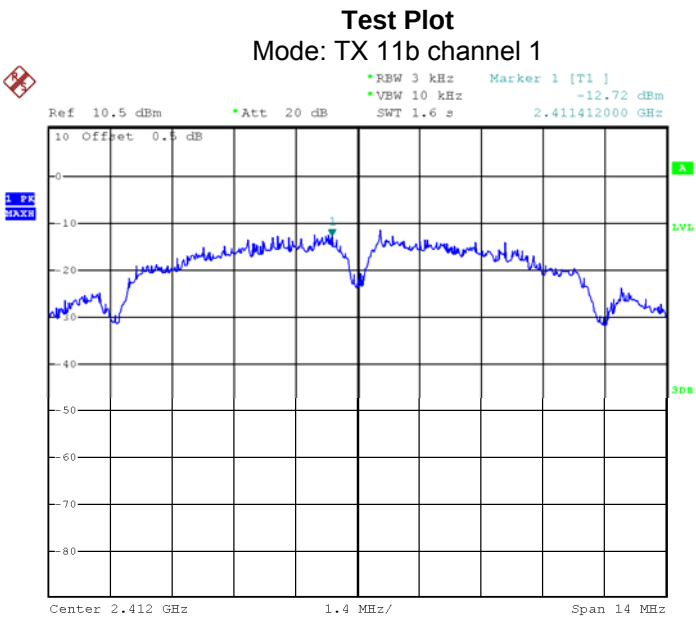
14.1 Test Procedure:

KDB 558074 D01 DTS Meas Guidance v04 section 10.2

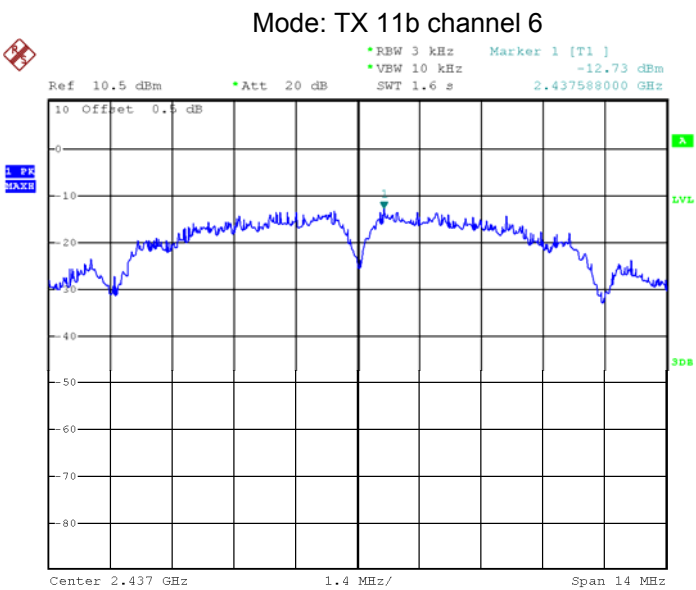
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

14.2 Test Result:

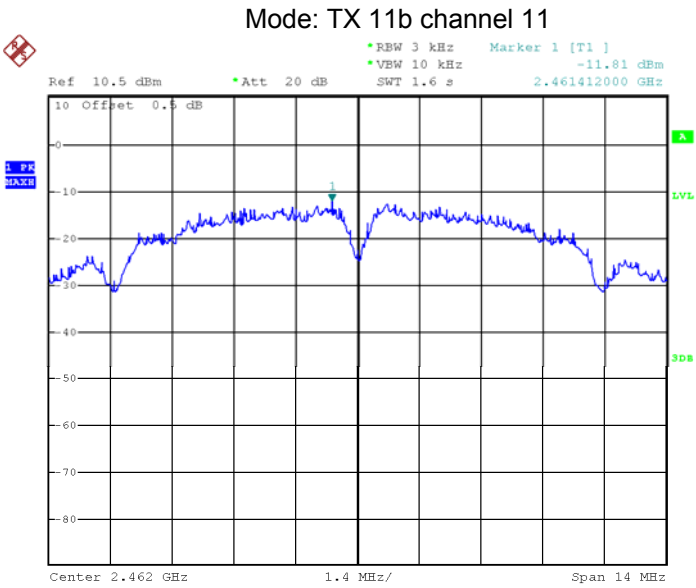
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
TX 11b	Low-2412	-12.72	8dBm per 3kHz
	Middle-2437	-12.73	8dBm per 3kHz
	High-2462	-11.81	8dBm per 3kHz
TX 11g	Low-2412	-21.49	8dBm per 3kHz
	Middle-2437	-21.06	8dBm per 3kHz
	High-2462	-20.76	8dBm per 3kHz
TX 11n HT20	Low-2412	-21.03	8dBm per 3kHz
	Middle-2437	-21.65	8dBm per 3kHz
	High-2462	-20.62	8dBm per 3kHz
TX 11n HT40	Low-2422	-24.27	8dBm per 3kHz
	Middle-2437	-25.02	8dBm per 3kHz
	High-2452	-22.79	8dBm per 3kHz
BLE	Low-2402	-15.39	8dBm per 3kHz
	Middle-2440	-15.41	8dBm per 3kHz
	High-2480	-15.16	8dBm per 3kHz



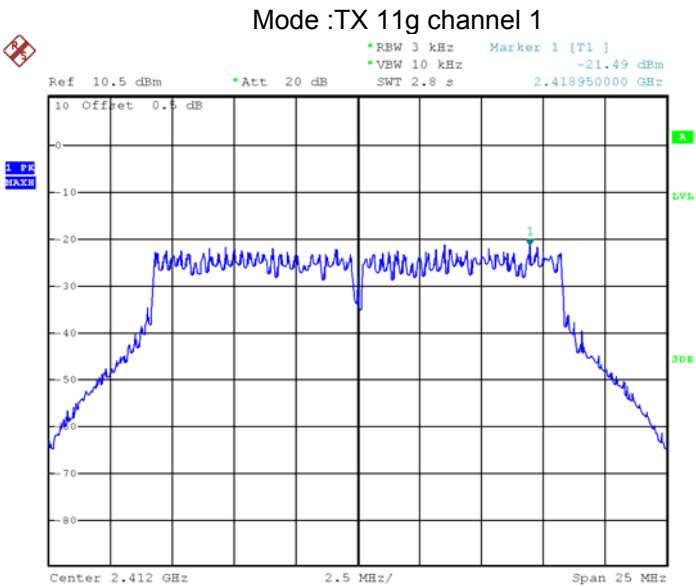
Date: 17.JUL.2018 05:07:07



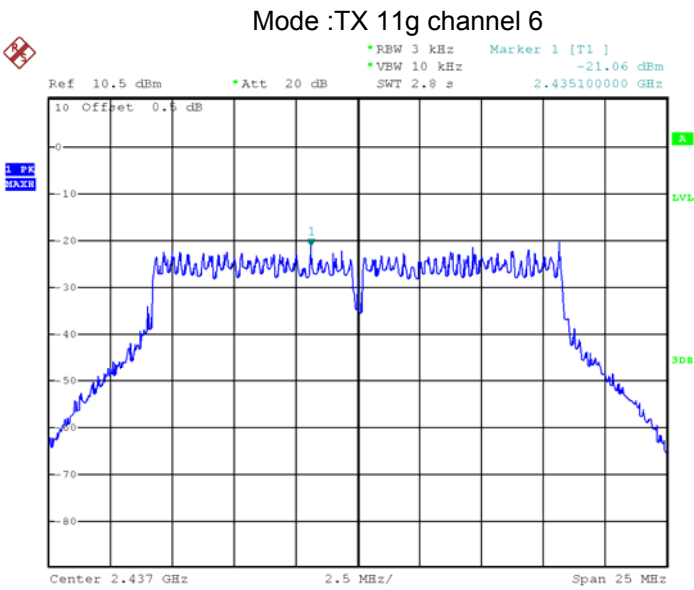
Date: 17.JUL.2018 04:11:16



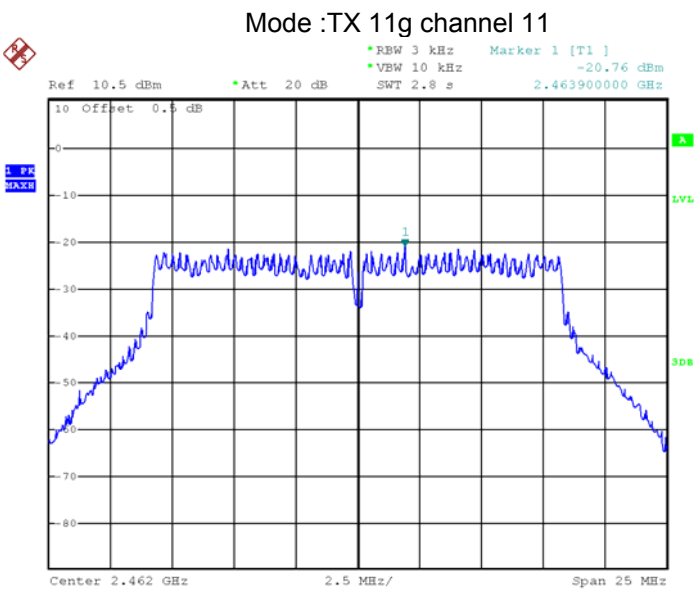
Date: 17.JUL.2018 04:14:35



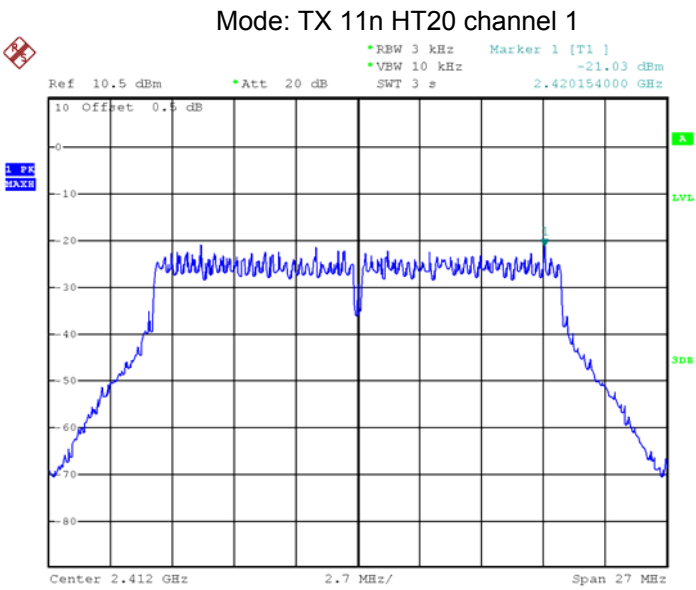
Date: 17.JUL.2018 04:52:58



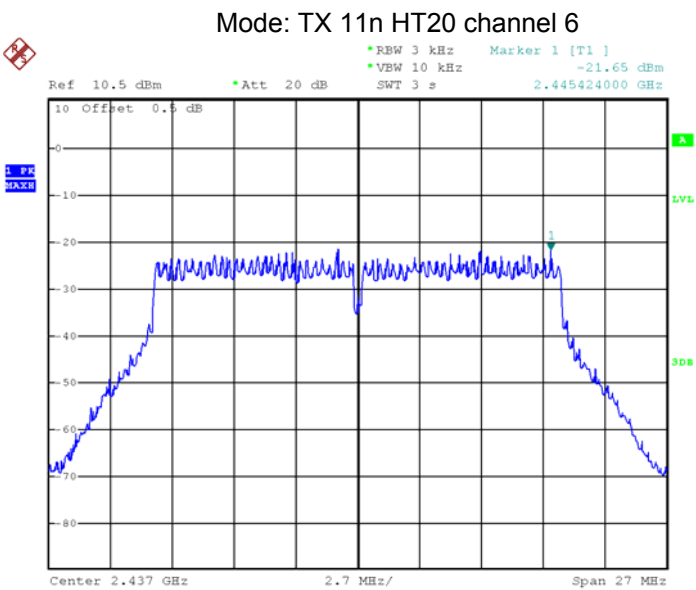
Date: 17.JUL.2018 04:55:24



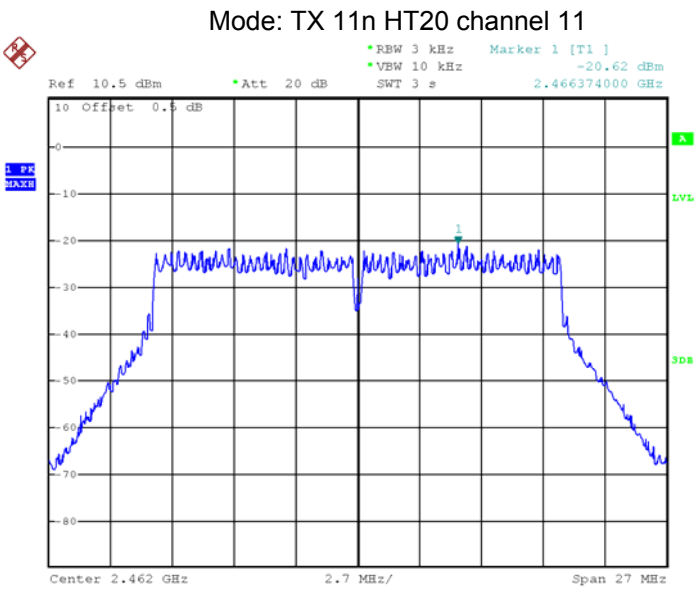
Date: 17.JUL.2018 05:01:37



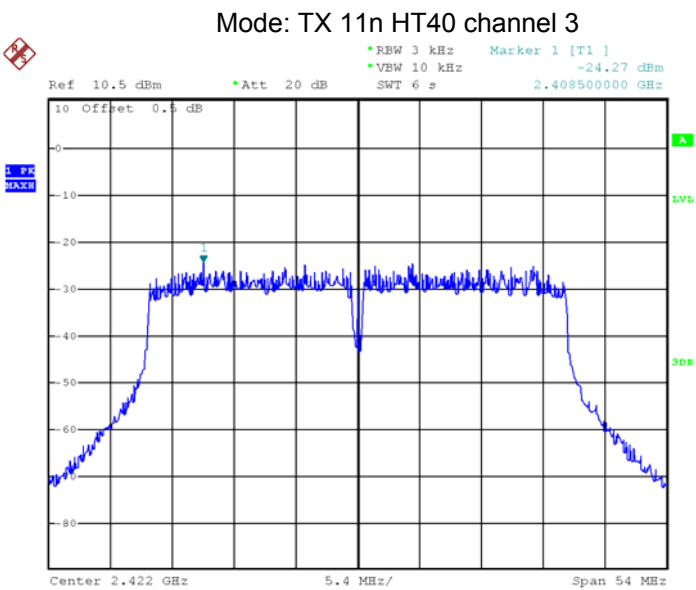
Date: 18.JUL.2018 06:43:42



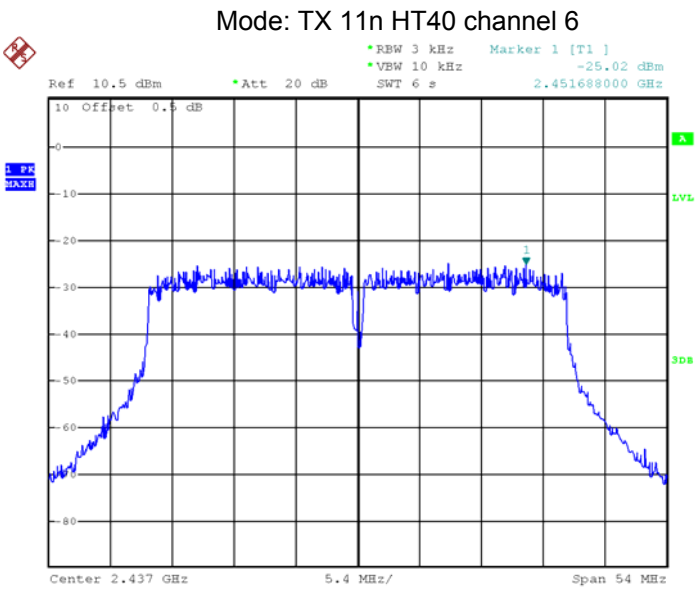
Date: 18.JUL.2018 06:45:28



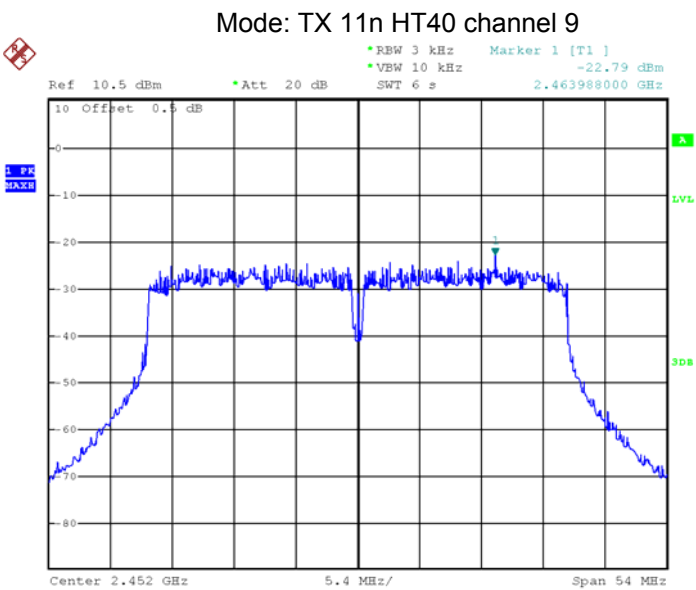
Date: 19.JUL.2018 01:13:08



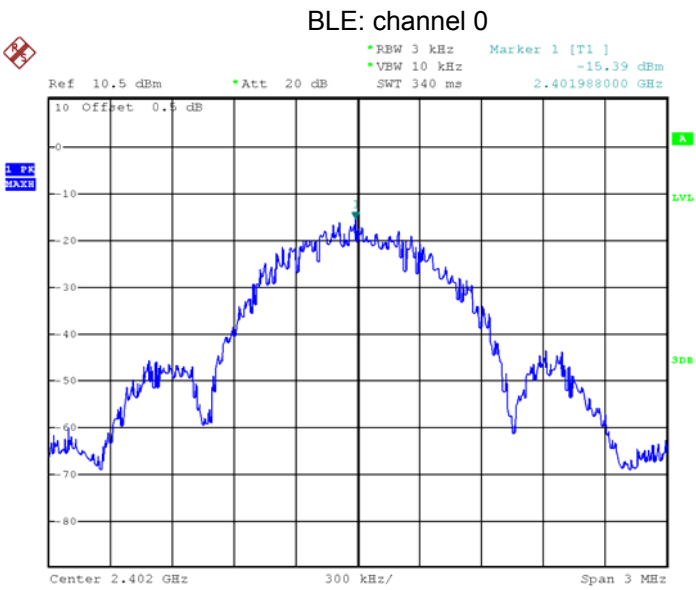
Date: 19.JUL.2018 01:45:47



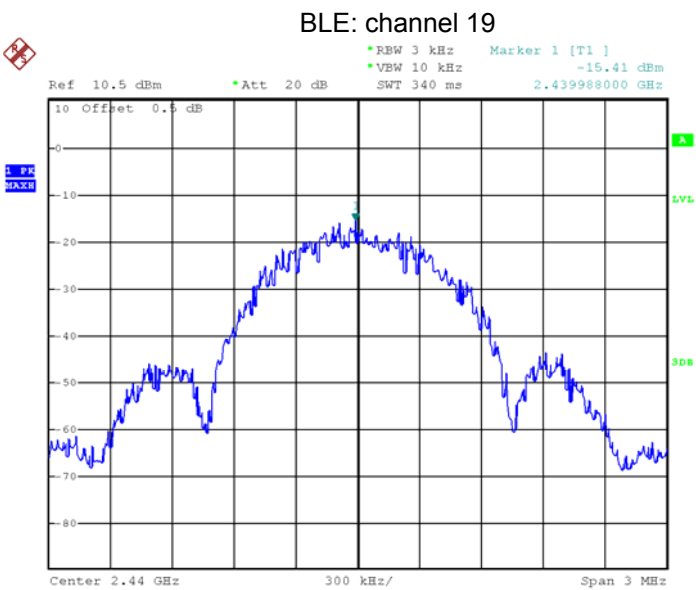
Date: 19.JUL.2018 01:47:25



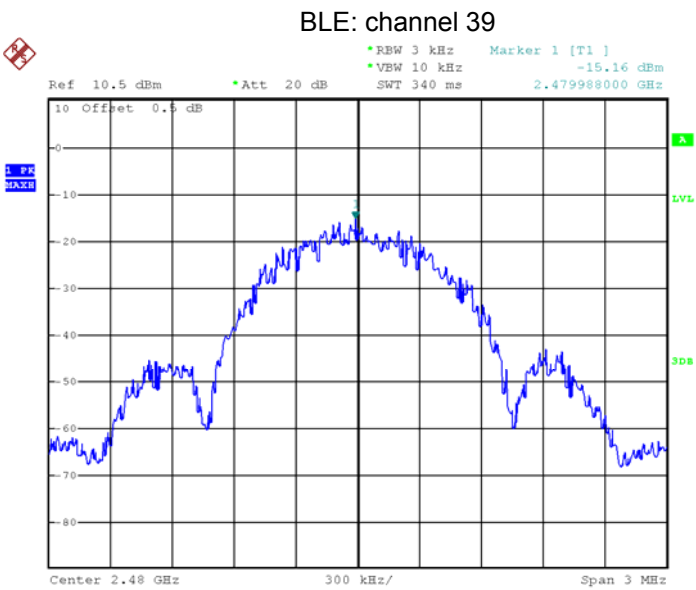
Date: 19.JUL.2018 01:53:22



Date: 16.JUL.2018 04:30:39



Date: 16.JUL.2018 04:30:19



Date: 16.JUL.2018 04:27:10

15 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. This product has an integrated antenna fulfill the requirement of this section.

16 RF Exposure

Remark: refer to SAR test report: WTS18S07117020-1W.

17 Photographs of test setup and EUT.

Note: Please refer to appendix: WTS18S07117020W_Photo.

=====End of Report=====