



Test Lab
Cert 2764.01

FCC LISTED, REGISTRATION
NUMBER: 2764.01

ISED LISTED REGISTRATION
NUMBER: 23595-1

Test report No:

2271ERM.004

Partial Test report

USA FCC Part 15.407 (U-NII), 15.209

CANADA RSS-247, RSS-Gen

Unlicensed National Information Infrastructure Devices. General technical
requirements.

Licence-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
General Requirements and Information for the Certification of Radio
Apparatus.

Identification of item tested	Head unit with radio and Bluetooth
Trademark	Panasonic
Model and /or type reference	MIB3E_MQB_BTWIFI
Other identification of the product	FCC ID: WUQ-MIB3HBTWIFI IC: 216R-MIB3HBTWIFI PN: 654.035.869.A HW Version: X31 SW Version: X450
Features	Bluetooth, WLAN, FM, AM, DAB, USB.
Manufacturer	PANASONIC AUTOMOTIVE SYSTEMS EUROPE GMBH Robert Bosch Str. 27-29-63225 Langen- Germany
Test method requested, standard	USA FCC Part 15.407 10-1-18 Edition: Unlicensed National Information Infrastructure Devices. General technical requirements. USA FCC Part 15.209 10-1-18 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (April 2018). Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General UNII Test Procedures New Rules v02r01 dated 12/14/2018. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager  Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, ou=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US Date: 2019.02.12 05:32:58 -0500
Date of issue	1-25-2019
Report template No	FDT08_21

Index

Competences and guarantees 3

General conditions 3

Uncertainty 3

Data provided by the client 4

Usage of samples 4

Test sample description 5

Identification of the client 6

Testing period and place 6

Document history 6

Environmental conditions 7

Remarks and comments 7

Testing verdicts 7

Summary 8

List of equipment used during the test 9

Appendix A: Test results for 5.15 GHz – 5.25 GHz Band 10

Appendix B: Test results for 5.725 GHz – 5.85 GHz Band 45

Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Certification internal document PODT000.

Frequency (MHz)	U(k=2)	Units
0,009 - 30	2.69	dB
30-180	3.82	dB
180-1000	2.61	dB
1000-18000	2.92	dB
18000-40000	2.15	dB

Data provided by the client

Automotive head unit to be installed in cars with the following features: Bluetooth, WLAN, FM, AM, DAB, USB

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
2271.044	Car Radio	MIB3E_MQB_BTWIFI	04S PM6- 00124.07.18413E007	12/21/2018
2271.019	Antenna	-	380	10/2/2018
2271.038	Power Cable	-	-	12/21/2018
2271.052	BNC to FAKRA RF Cable	-	-	12/21/2018
2271.053	SMA to FAKRA RF Cable	-	-	12/21/2018
2271.054	BNC to FAKRA RF Cable	-	-	12/21/2018
2271.055	BNC 1 to 2-way splitter			12/28/2018

1. Sample S/01 has undergone following test(s):
All radiated tests indicated in appendix A & B..

Test sample description

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	Not Provided Data			☐	☐	☐	
			☐	☐	☐		
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☐	DC:					
☒	DC: 12 Vdc						
Rated Power	No Data provided						
Clock frequencies	No Data provided						
Other parameters..... :	No Data provided						
Software version	X450						
Hardware version..... :	X31						
Dimensions in cm (W x H x D).... :	Data not provided						
Mounting position..... :	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Car Equipment					
Modules/parts	Module/parts of test item			Type		Manufacturer	
	Not Provided Data						

Accessories (not part of the test item)	Description	Type	Manufacturer
	Not Provided Data		
Documents as provided by the applicant.....	Description	File name	Issue date
	FDT30_14 Data Declaration Equipment Data		

Copy of marking plate:



Identification of the client

PANASONIC AUTOMOTIVE SYSTEMS GMBH
Robert Bosch Str. 27-29-63225 Langen, Germany.

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	12-26-2018
Date (finish)	01-23-2018

Document history

Report number	Date	Description
2271ERM.004	01-25-2018	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semi-anechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Koji Nishimoto and Poojita Bhattu.

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

FCC PART 15 PARAGRAPH / RSS-247 (WIFI 5GHz) 5.15 GHz -5.25 GHz Band					
Report Section	15.407 Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
-	§ 15.403 (i) KDB 789033 D02	RSS 247 6.2.1	26dB Emission Bandwidth & Occupied Bandwidth	N/A	Refer 1
-	§ 15.407 (a) (1) (4)	RSS 247 6.2.1.1	Power Limits. Maximum Output Power	N/A	Refer 1
-	§ 15.407 (a) (1) (5)	RSS-247 6.2.1.1	Maximum Power Spectral Density	N/A	Refer 1
-	§ 15.407 (b) (1)	RSS-247 6.2.1.2	Band-edge conducted emissions compliance (Transmitter)	N/A	Refer 1
-	§ 15.407 (b)(6) § 15.207	RSS-Gen 8.8	AC Power Line Conducted Emissions	N/A	Refer 1
A.1	§ 15.407 (b)(1)(6)(7) § 15.209 § 15.205	RSS-247 6.2.1.2 RSS-Gen 8.9 & 8.10	Undesirable radiated emissions (Transmitter)	P	N/A
-	§ 15.407 (g)	RSS-Gen 6.11 & 8.11	Frequency Stability	N/A	Refer 1
Supplementary information and remarks: The test set-up was made in accordance to the general provisions of ANSI C63.10: 2013 and FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 dated 12/14/2017 1) Testing not requested.					

FCC PART 15 PARAGRAPH / RSS-247 (WIFI 5GHz) 5.725 GHz -5.85 GHz Band					
Report Section	15.407 Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
-	§ 15.403 (i) KDB 789033 D02	RSS 247 6.2.4	26dB Emission Bandwidth & Occupied Bandwidth	N/A	Refer 1
-	§ 15.407 (e)	RSS 247 6.2.4.1	6dB Bandwidth	N/A	Refer 1
-	§ 15.407 (a)(3)(4)	RSS 247 6.2.4.1	Power Limits. Maximum Output Power	N/A	Refer 1
-	§ 15.407 (a)(3)(5)	RSS-247 6.2.4.1	Maximum Power Spectral Density	N/A	Refer 1
-	§ 15.407 (b)(4)	RSS-247 6.2.4.2	Band-edge conducted emissions compliance (Transmitter)	N/A	Refer 1
-	§ 15.407 (b)(6) § 15.207	RSS-Gen 8.8	AC Power Line Conducted Emissions	N/A	Refer 1
B.1	§ 15.407 (b)(4)(6)(7) § 15.209 § 15.205	RSS-247 6.2.4.2 RSS-Gen 8.9 & 8.10	Undesirable radiated emissions (Transmitter)	P	N/A
-	§ 15.407 (g)	RSS-Gen 6.11 & 8.11	Frequency Stability	N/A	Refer 1
Supplementary information and remarks: The test set-up was made in accordance to the general provisions of ANSI C63.10: 2013 and FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 dated 12/14/2017 1) Testing not requested.					

FCC PART 15 PARAGRAPH / RSS-247 (WIFI 5GHz) Common Requirements for all bands					
Report Section	15.407 Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
-	§ 15.407 (c)	--	Transmission in case of absence of information to transmit, or operational failure.	N/M	Refer 1
Supplementary information and remarks:					
1) The compliance is checked through a description of how this requirement is met that is provided by the applicant.					

List of equipment used during the test

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
1014	Signal Analyzer	ROHDE & SCHWARZ	FSV40	2017/03	2019/03
1012	EMI Test Receiver	ROHDE & SCHWARZ	ESR26	2018/09	2020/09
1058	Double Ridged Waveguide Horn Antenna	ETS LINDGREN	3115	2017/03	2020/03
1055	Double Ridged Waveguide Horn Antenna	ETS LINDGREN	3116C	2016/12	2019/12
1065	Biconilog Antenna	ETS LINDGREN	3142E	2017/03	2020/03
0981	Preamplifier	BONN ELEKTRONIK	BLMA 0118-2A	2017/05	2019/05
0980	Preamplifier	BONN ELEKTRONIK	BLNA 0360-01N	2017/05	2019/05
0982	Preamplifier	BONN ELEKTRONIK	BLMA1840-1M	2017/05	2019/05
1017	EMC measurement software	ROHDE & SCHWARZ	EMC32 V9.01	---	---

Appendix A: Test results

5.15 GHz – 5.25 GHz Band

Appendix A Content

PRODUCT INFORMATION 12

DESCRIPTION OF TEST CONDITIONS..... 13

TEST A.1: UNDESIRABLE RADIATED EMISSIONS (TRANSMITTER) 14

PRODUCT INFORMATION

The following information is provided by the client

Information	Description
Modulation	FHSS
Adaptive	Adaptive Equipment without the possibility to switch to a non-adaptive equipment.
Maximum RF Output Power	14 dBm
Operation mode 1: Single Antenna Equipment	Equipment with only one antenna
- Operating Frequency Range	5150 - 5250 MHz
- Nominal Channel Bandwidth	20/ 40/ 80 MHz
Extreme operating conditions	
- Temperature range	-38 °C to +70 °C
Antenna type	Integral antenna
Antenna gain	0.7 dBi
Nominal Voltage	
- Supply Voltage	12 Vdc
- Type of power source	DC voltage from battery
Equipment type	WIFI 5GHz
Geo-location capability	No

Test modes available:

- Sub-Band 5.15 -5.25 GHz

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01 ⁽¹⁾ (a mode)	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Test Frequencies for Conducted/Radiated tests: (20 MHz)</u> Lowest range: 5180 MHz Middle channel: 5220 MHz Highest range: 5240 MHz
TC#02 ⁽¹⁾ (n mode)	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Test Frequencies for Radiated tests: (20 MHz)</u> Lowest channel: 5180 MHz Middle channel: 5220 MHz Highest channel: 5240 MHz <u>Test Frequencies for Radiated tests: (40 MHz)</u> Lowest channel: 5180 MHz Highest channel: 5240 MHz
TC#03 ⁽¹⁾ (ac mode)	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Test Frequencies for Radiated tests: (20 MHz)</u> Lowest channel: 5180 MHz Middle channel: 5220 MHz Highest channel: 5240 MHz <u>Test Frequencies for Radiated tests: (40 MHz)</u> Lowest channel: 5180 MHz Highest channel: 5240 MHz <u>Test Frequencies for Radiated tests: (80 MHz)</u> Middle channel: 5180 MHz

Note (1): For spurious emissions for OFDM modes 802.11a, 802.11n20/40 and 802.11ac20/40/80 a preliminary scan was performed to determine the worst case.

The data rates of 6Mb/s for 802.11a, HT0 (SISO) for 802.11n20/ac20 and n40/ac40, and VHT0 (SISO) for 802.11 ac80 were selected based on preliminary testing that identified those rates corresponding to the worst cases.

TEST A.1: UNDESIRABLE RADIATED EMISSIONS (TRANSMITTER)

LIMITS:	Product standard:	Part 15 Subpart C §15.407 and RSS-247
	Test standard:	Part 15 Subpart C §15.407(b) (1)(6)(7) and RSS-247 6.2.1.2

LIMITS

For transmitters operating in the 5.15 – 5.25 GHz band: all emissions outside of the 5.15 – 5.25 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.23 dBμ V/m at 3m distance).

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) / RSS-Gen):

Frequency Range (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function

TEST SETUP

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at 3 m for the frequency range 30-1000 MHz (Bilog antenna) and at 1m for the frequency range 1-40 GHz (1 GHz-18 GHz and 18 GHz-40 GHz Double ridge horn antennas).

For radiated emissions in the range 1-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

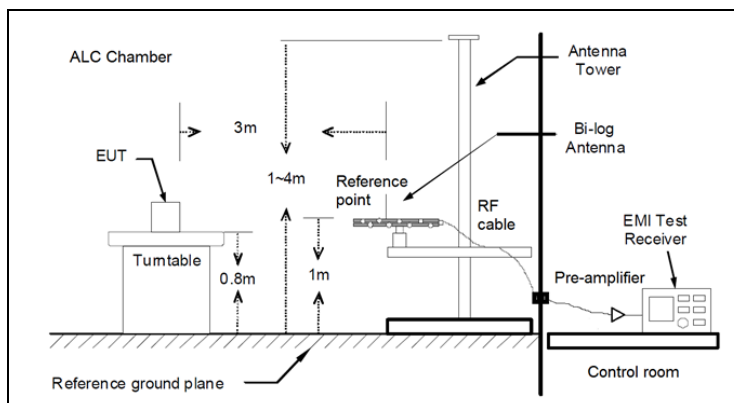
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

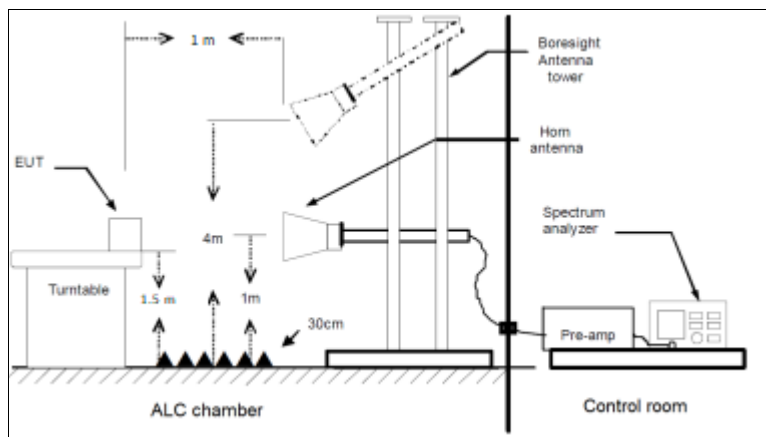
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

TEST SETUP (CONT.)

Radiated measurements Setup $f < 1$ GHz



Radiated measurements setup $f > 1$ GHz



TESTED SAMPLES:

S/01

TESTED CONDITIONS MODES:

TC#01 (a mode)

TEST RESULTS:

PASS

Co-Location

The test was performed with the equipment transmitting first with only the WiFi 5 GHz (WLAN0 CORE0) radio and repeated with the 2.4 GHz BT-EDR (WLAN 0), WiFi 2.4GHz (WLAN0 CORE1) radios transmitting simultaneously to check the impact of the co-location of the other radio interfaces. The results and plots below show the worst results obtained.

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT. See worst operation mode selected for this range (n mode 20 MHz and Mid channel) as a worst case.

Frequency range 1 GHz – 40 GHz

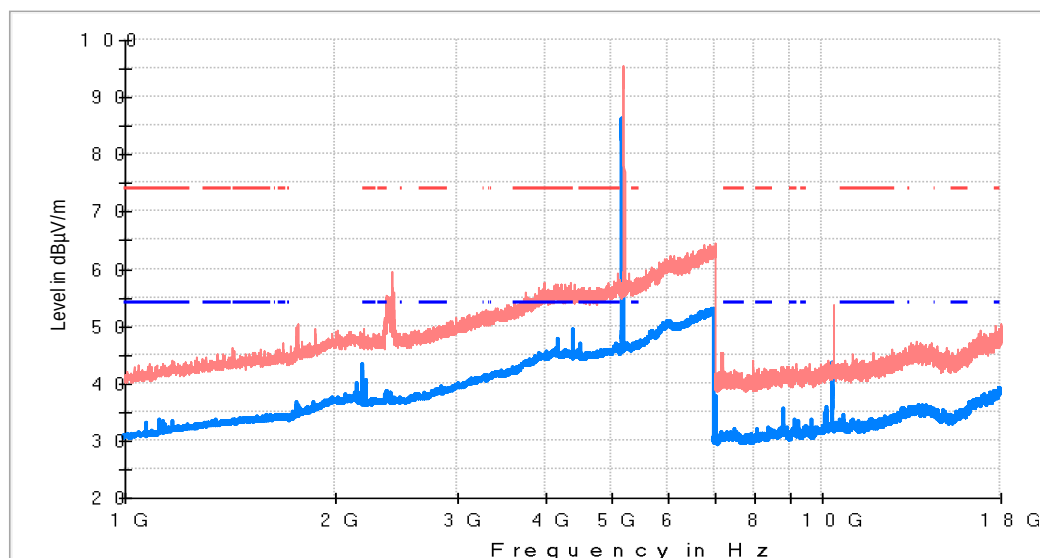
The results and plots below show the maximum measured levels in the 1- 40 GHz range and the restricted band 4.5 – 5.15 GHz.

FREQUENCY RANGE

1 GHz – 18 GHz

Low Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — P K + _ M A X H
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

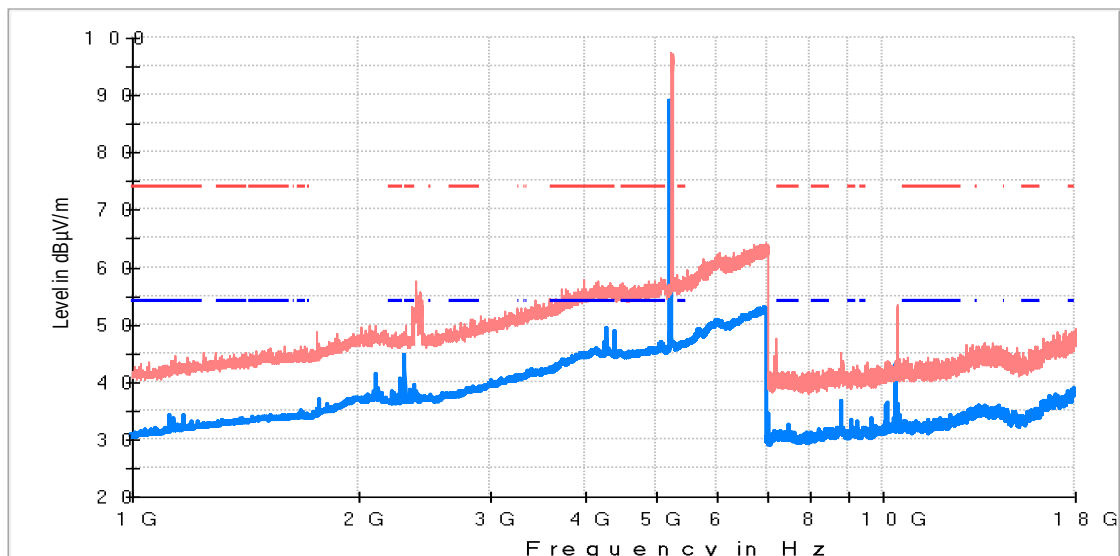
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2225.500000	47.65	40.58	V	
4191.000000	56.31	47.70	V	
5179.500000	94.71	86.24	H	Fundamental
10361.500000	53.42	43.62	H	

TEST RESULTS (Cont.)

Middle Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — PK + _ M A X H
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G

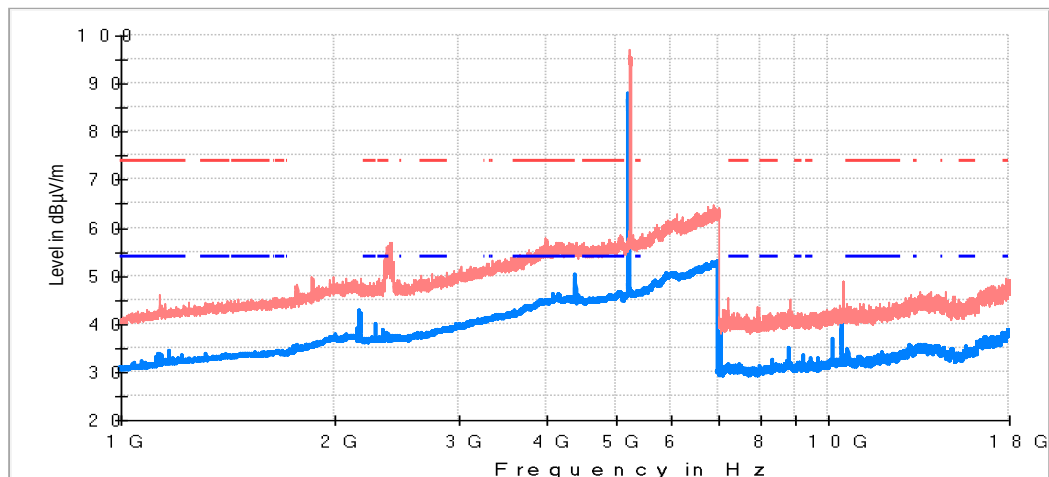
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2316.500000	49.92	44.75	V	
4303.000000	56.02	49.45	V	
4409.500000	55.94	48.79	V	
5216.500000	96.49	88.79	H	Fundamental
8819.000000	42.56	36.49	V	
10441.000000	53.24	42.90	H	

TEST RESULTS (Cont.)

High Channel

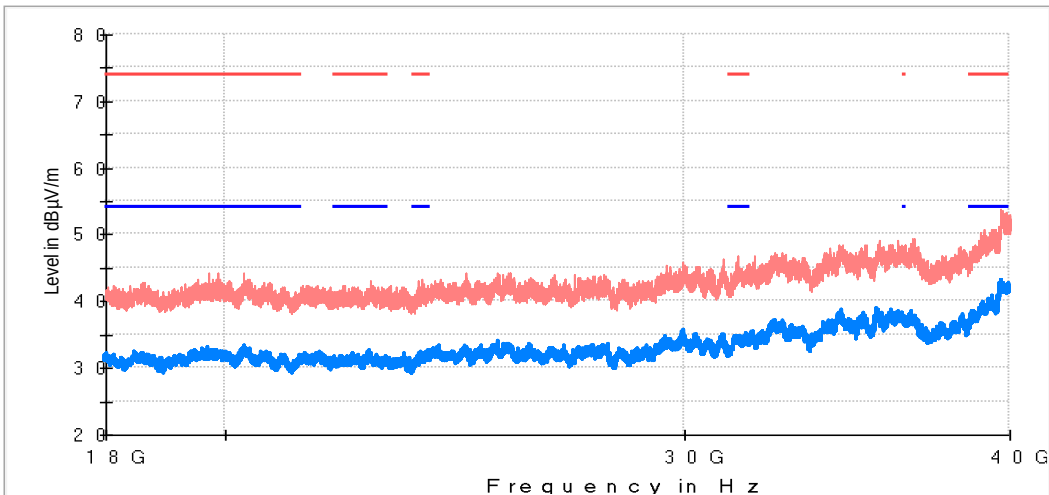
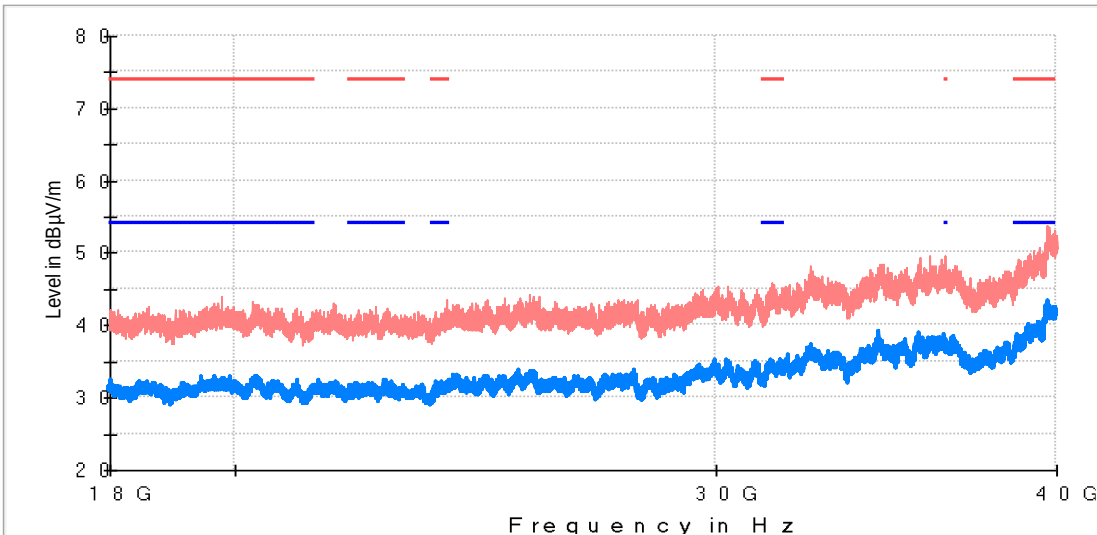
R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — PK + _ M A X H
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

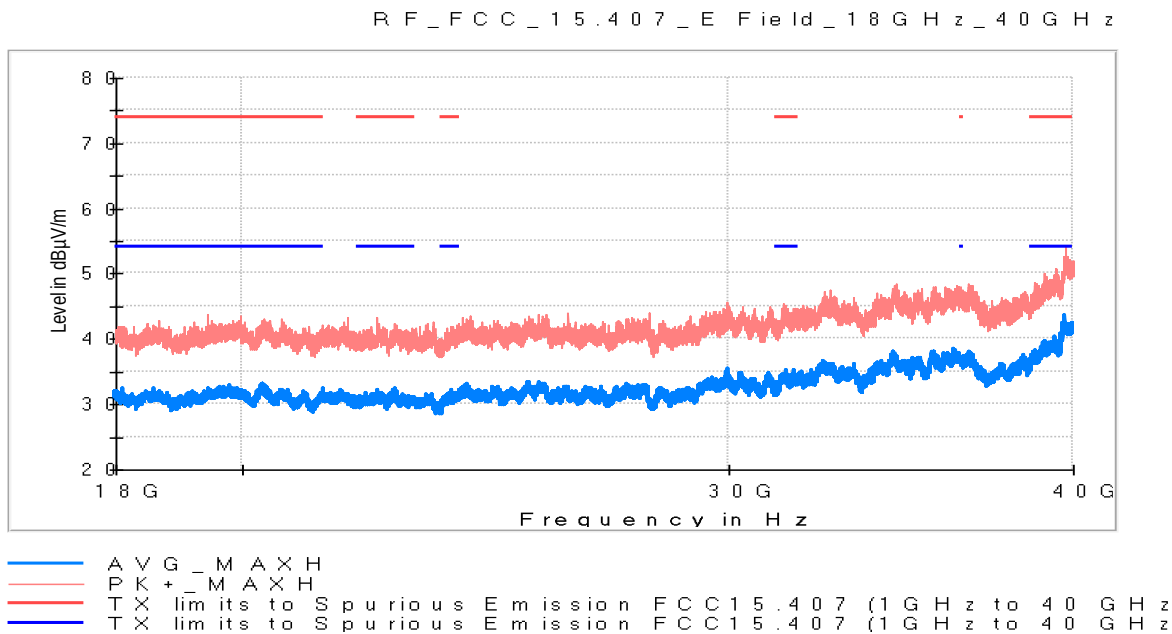
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2184.500000	49.47	42.67	V	
4386.000000	56.94	50.35	V	
5238.500000	95.97	87.81	H	Fundamental
7072.000000	42.97	38.47	V	
10142.000000	42.87	36.83	H	
10477.000000	46.85	39.98	H	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Low Channel R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  Level in dBµV/m Frequency in Hz — A V G _ M A X H — P K + _ M A X H — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z) — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z) Middle Channel R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  Level in dBµV/m Frequency in Hz — A V G _ M A X H — P K + _ M A X H — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z) — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)	

TEST RESULTS (Cont.)

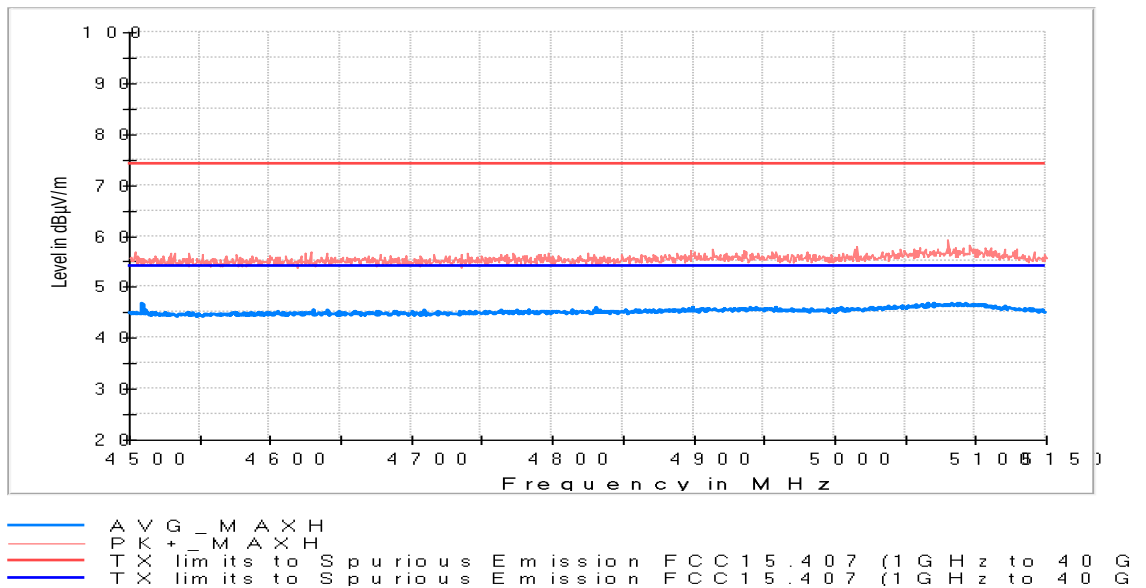
High Channel



RESTRICTED BANDS

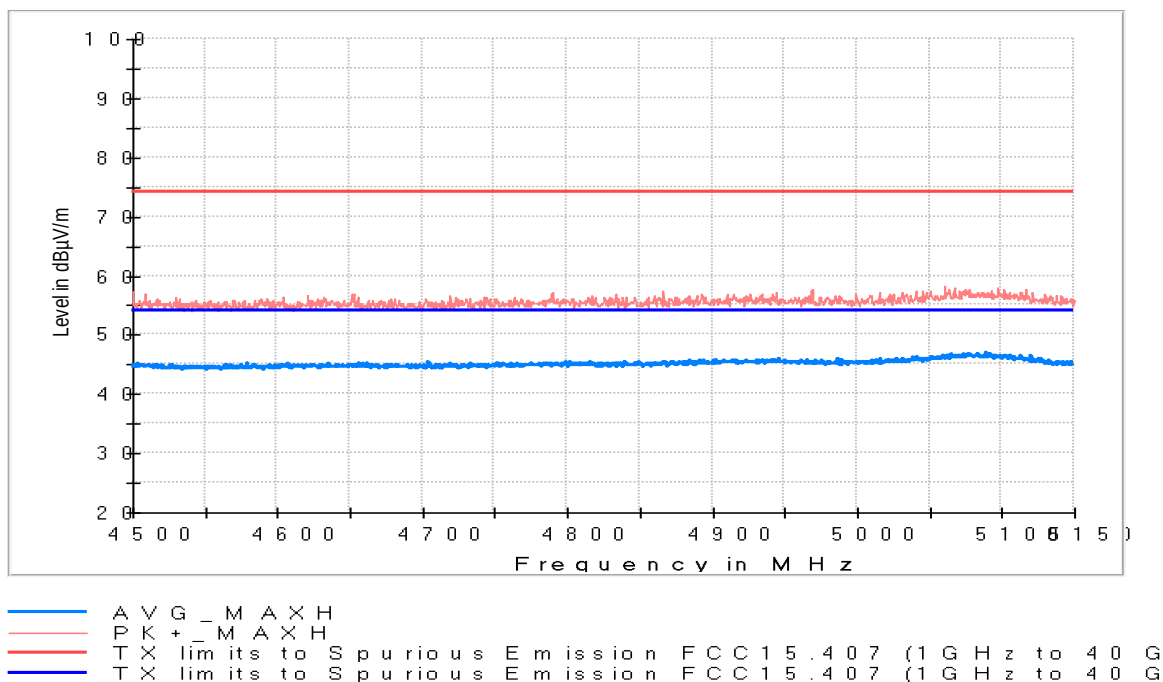
4.5 GHz – 5.15 GHz

Low Channel



TEST RESULTS (Cont.)

Mid Channel



TESTED SAMPLES:

S/01

TESTED CONDITIONS MODES:

TC#02 (n mode)

TEST RESULTS:

PASS

Co-Location

The test was performed with the equipment transmitting first with only the WiFi 5 GHz (WLAN0 CORE0) radio and repeated with the 2.4 GHz BT-EDR (WLAN 0), WiFi 2.4GHz (WLAN0 CORE1) radios transmitting simultaneously to check the impact of the co-location of the other radio interfaces. The results and plots below show the worst results obtained.

Frequency range 30 MHz – 1000 MHz

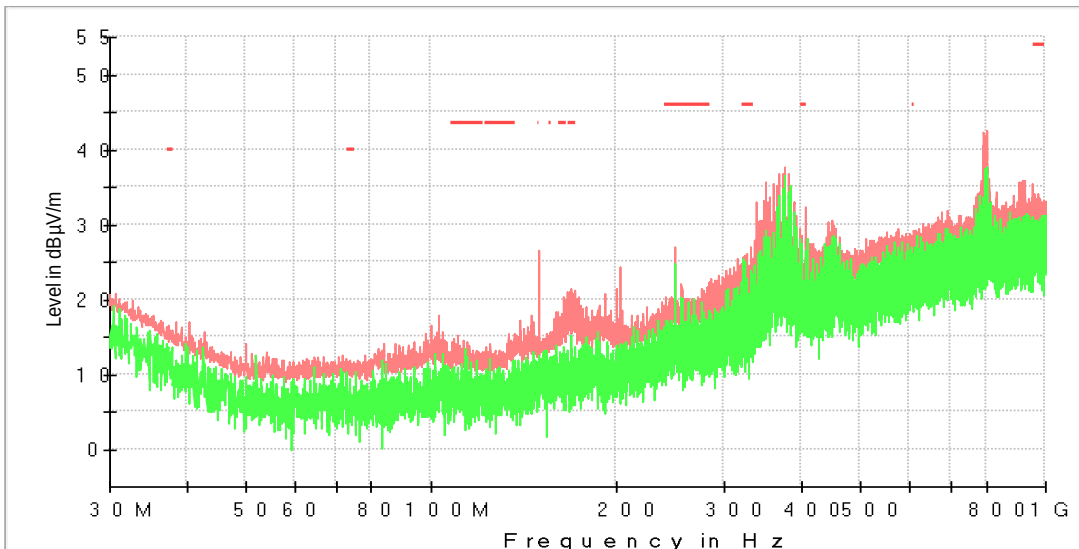
The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.

Frequency range 1 GHz – 40 GHz

The results and plots below show the maximum measured levels in the 1- 40 GHz range and the restricted band 4.5 – 5.15 GHz.

TEST RESULTS	n mode (20 MHz)
FREQUENCY RANGE	30 MHz – 1000 MHz

RF_FCC_15.247_E Field_30MHz_1GHz



Level in dBµV/m

Frequency in Hz

PK+_MAX
PK+_CLRWR
TX limits to Spurious Emission FCC15.247 (30MHz to 1GHz)

Result Table_Single				
Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol	Comments
350.003000	37.0	34.0	H	
249.996000	29.8	25.6	H	
377.114500	38.1	35.0	H	
800.083000	42.6	32.4	H	
925.067500	38.1	28.9	V	
149.989000	27.6	24.3	V	

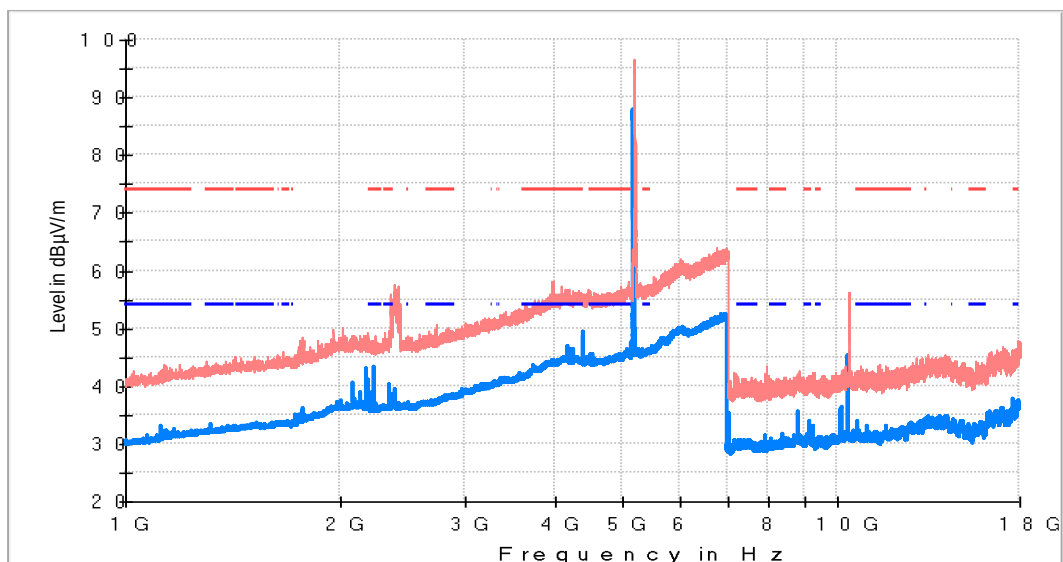
TEST RESULTS (Cont.)

FREQUENCY RANGE

1 GHz – 18 GHz

Low Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — PK + _ M A X H
 — TX lim its to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 — TX lim its to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

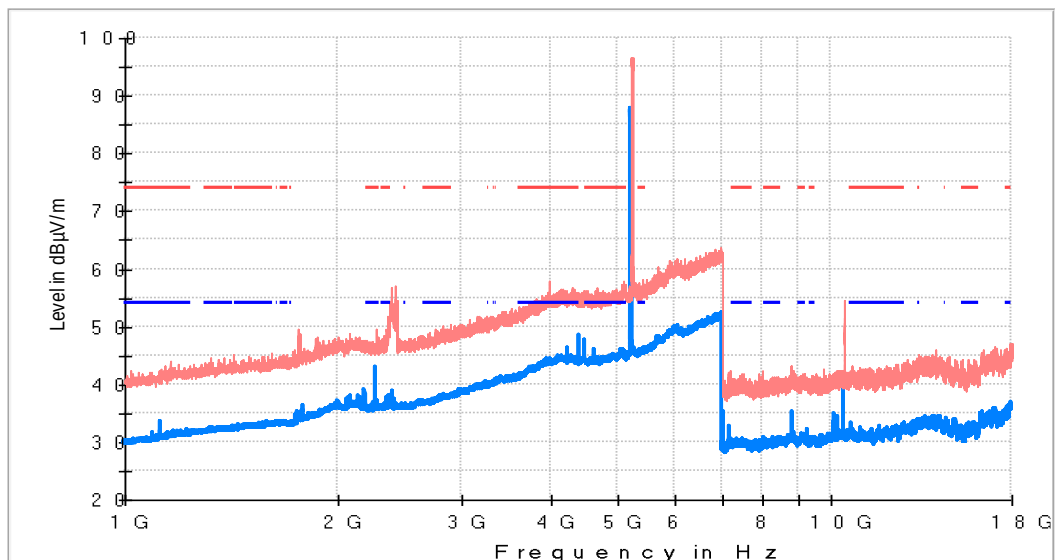
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
3757.000000	53.07	43.44	H	
5175.000000	95.87	87.83	V	Fundamental
10360.000000	53.24	45.08	H	
14264.500000	44.63	34.79	V	
17638.500000	45.69	37.83	V	

TEST RESULTS (Cont.)

Middle Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — PK + _ M A X H
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G

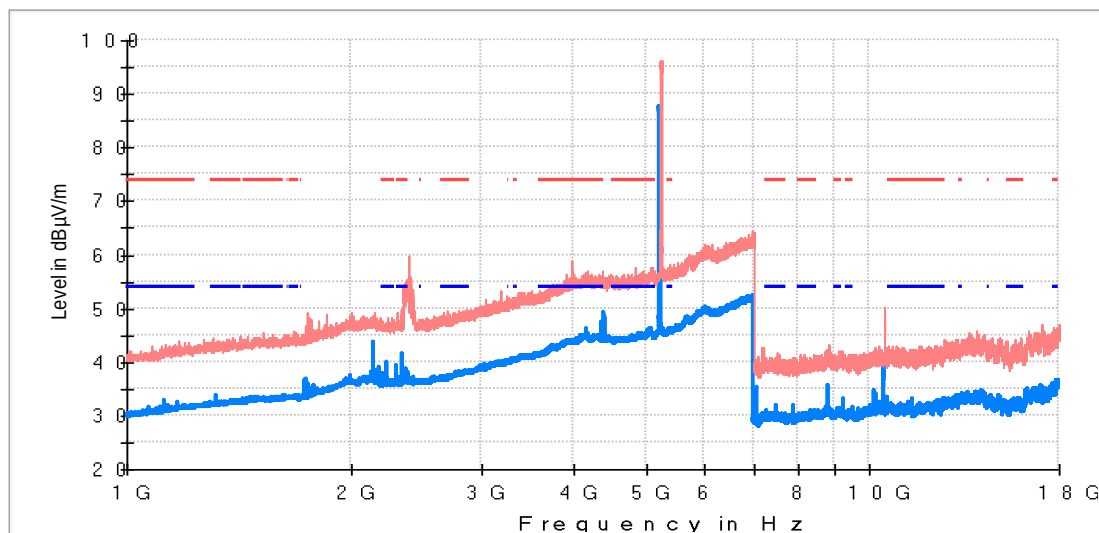
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
3771.500000	52.66	43.11	V	
5226.000000	94.48	87.92	H	Fundamental
10441.500000	51.17	40.90	H	
13984.000000	42.61	34.53	H	
17983.000000	45.23	36.85	V	

TEST RESULTS (Cont.)

High Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — PK + _ M A X H
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

Maximizations

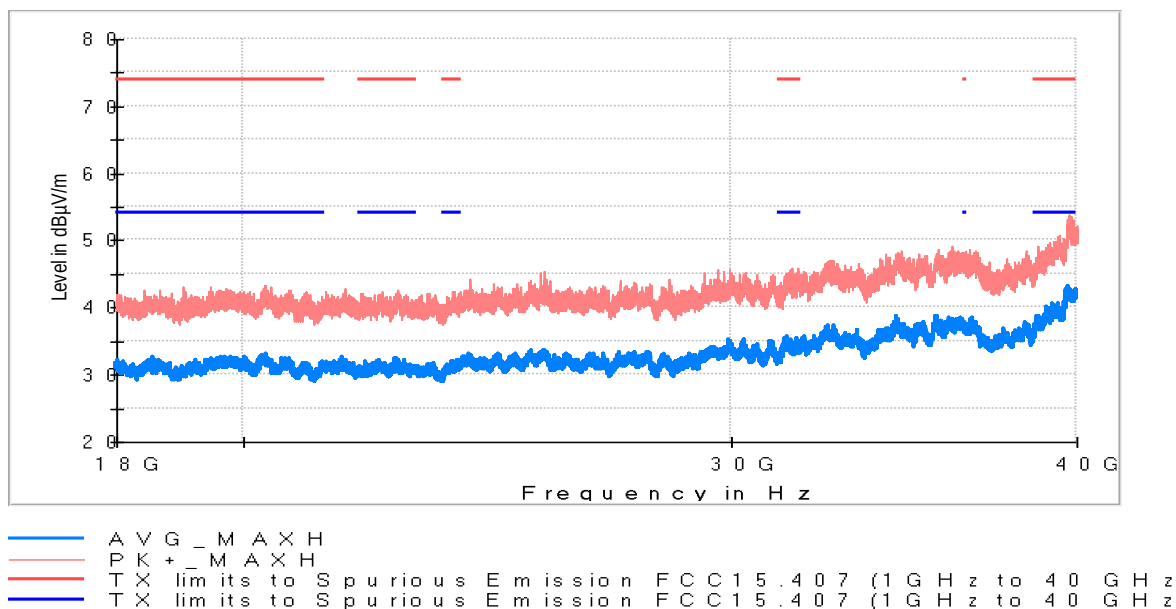
Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2155.500000	49.24	43.63	V	
5236.000000	96.21	87.68	H	Fundamental
6996.000000	62.46	52.25	H	
10480.000000	49.24	40.68	H	
14206.000000	42.83	34.61	V	
17941.000000	45.88	36.65	V	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Low Channel RF_FCC_15.407_E Field_18GHz_40GHz Level in dBµV/m Frequency in Hz AVG_MAXH PK+_MAXH TX limits to Spurious Emission FCC15.407 (1GHz to 40GHz) TX limits to Spurious Emission FCC15.407 (1GHz to 40GHz)	
Middle Channel RF_FCC_15.407_E Field_18GHz_40GHz Level in dBµV/m Frequency in Hz AVG_MAXH PK+_MAXH TX limits to Spurious Emission FCC15.407 (1GHz to 40GHz) TX limits to Spurious Emission FCC15.407 (1GHz to 40GHz)	

TEST RESULTS (Cont.)

High Channel

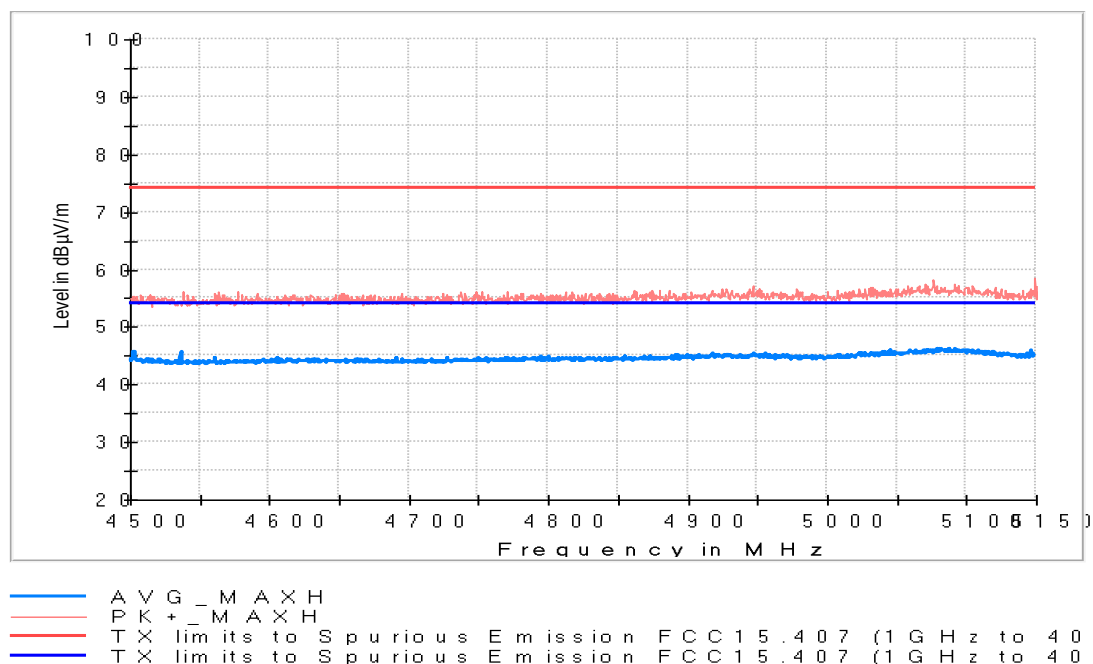
R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z



RESTRICTED BANDS

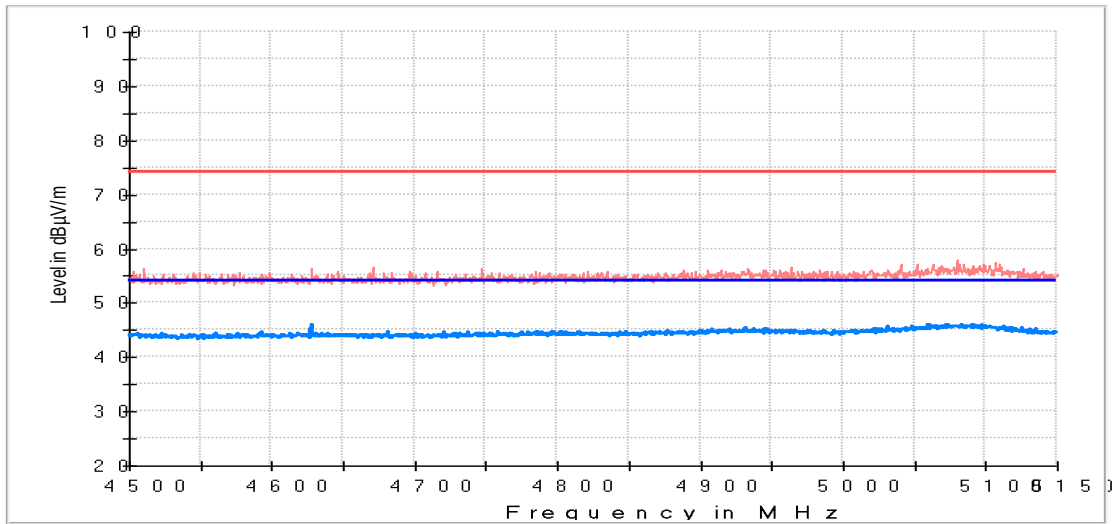
4.5 GHz – 5.15 GHz

Low Channel



TEST RESULTS (Cont.)

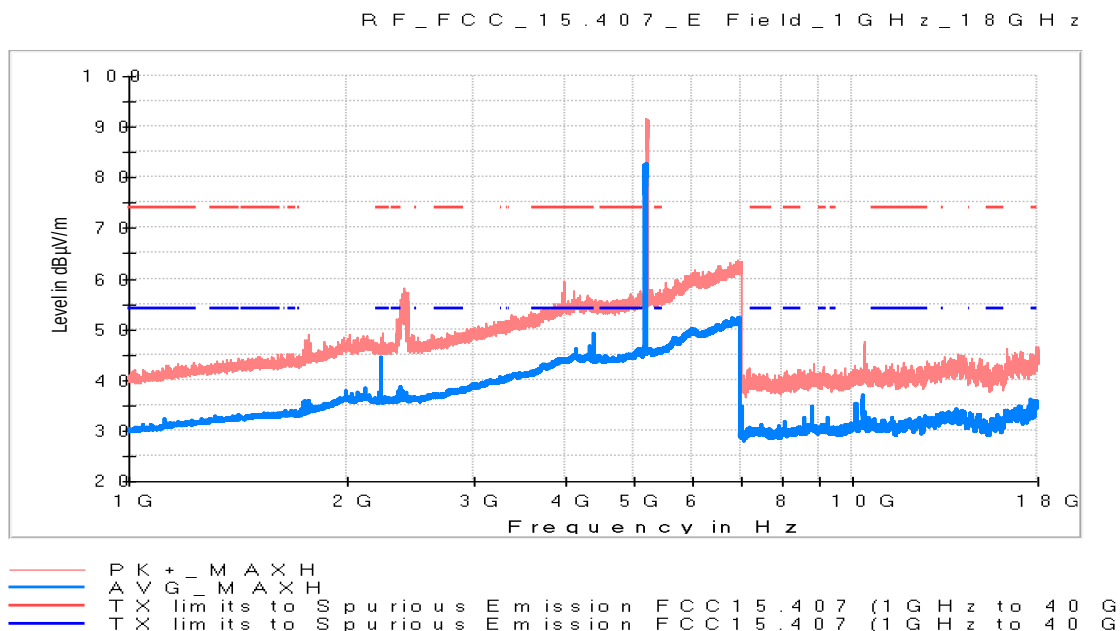
Middle Channel



— A V G _ M A X H
— P K _ M A X H
— T X lim its to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G
— T X lim its to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G

TEST RESULTS (Cont.)	n mode (40 MHz)
FREQUENCY RANGE	1 GHz – 18 GHz

Low Channel

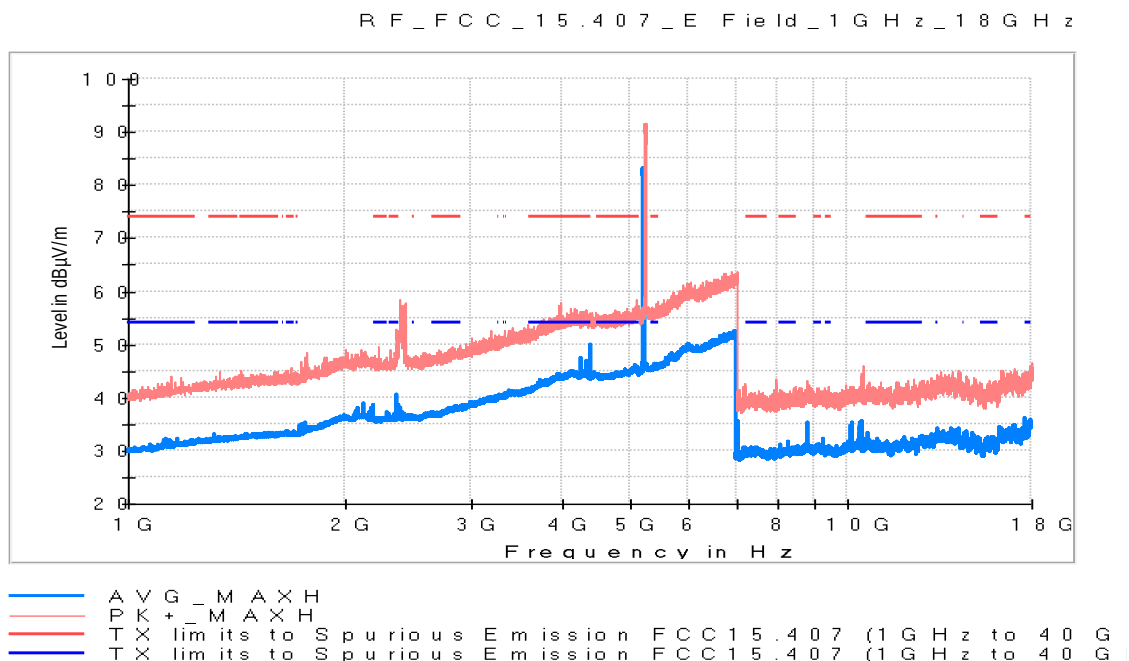


Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comments
2235.000000	49.42	44.24	V	
5196.500000	90.62	82.63	H	Fundamental
8819.000000	41.70	34.79	V	
10380.000000	47.77	36.88	H	
13930.000000	42.88	34.23	V	
17638.500000	45.16	36.19	V	

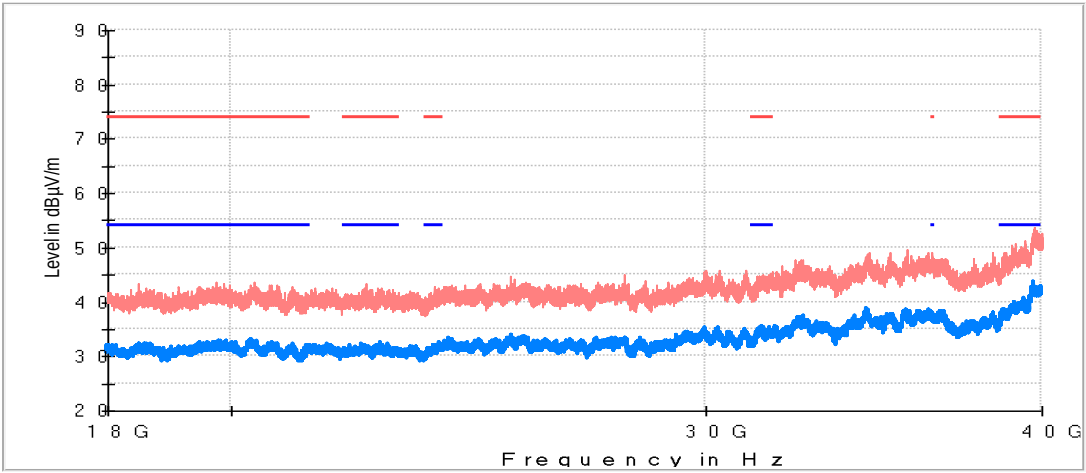
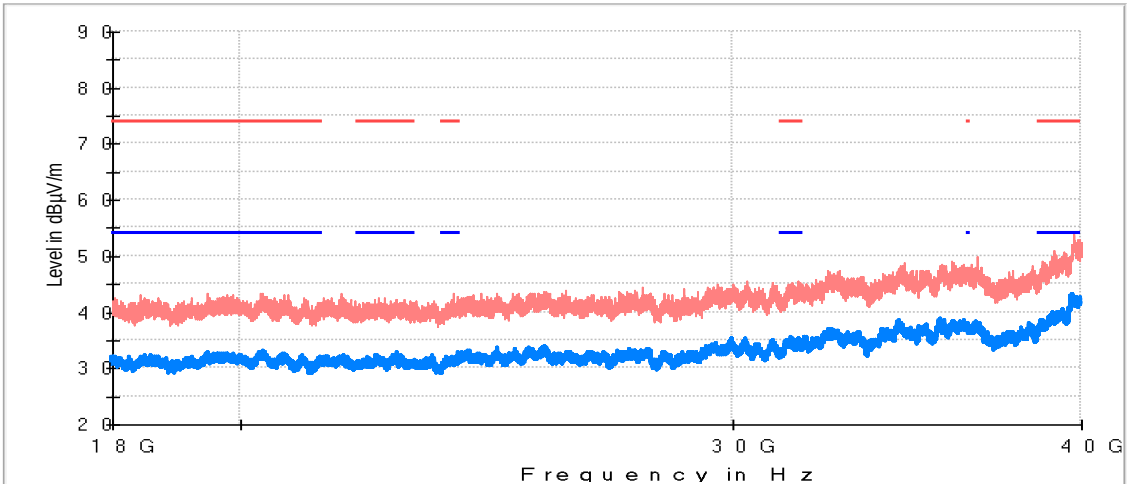
TEST RESULTS (Cont.)

High Channel



Maximizations

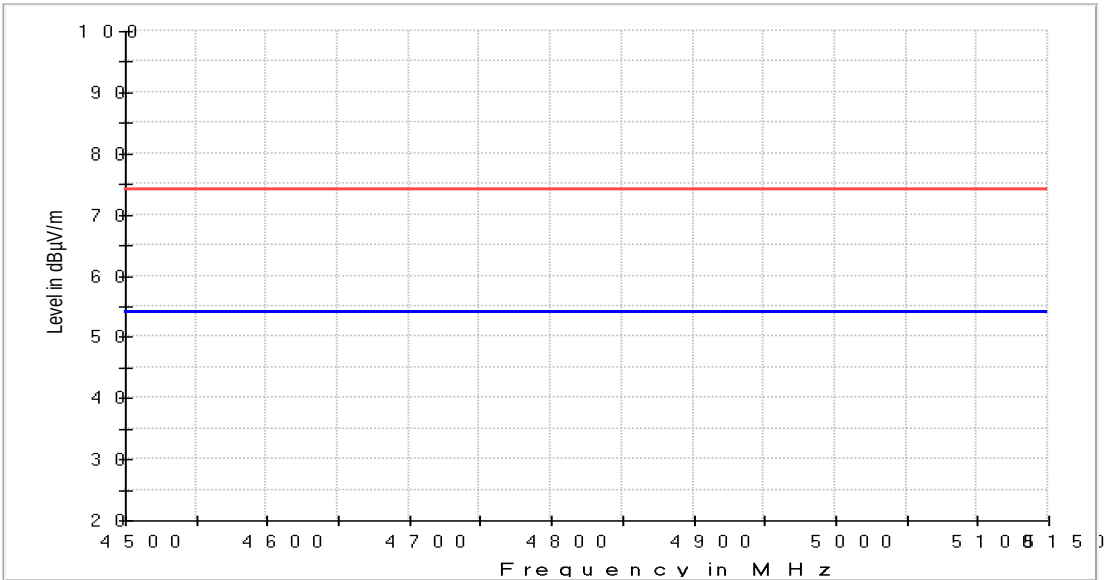
Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
3758.500000	53.46	43.19	H	Fundamental
5218.000000	90.03	83.06	H	
6992.000000	61.70	52.29	V	
10464.500000	43.51	35.52	V	
13982.000000	43.53	34.16	V	
17638.000000	43.89	36.19	V	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Low Channel R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  Level in dBµV/m Frequency in Hz AVG_MAX H PK+_MAX H TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz) TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)	
High Channel R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  Level in dBµV/m Frequency in Hz AVG_MAX H PK+_MAX H TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz) TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)	

RESTRICTED BANDS

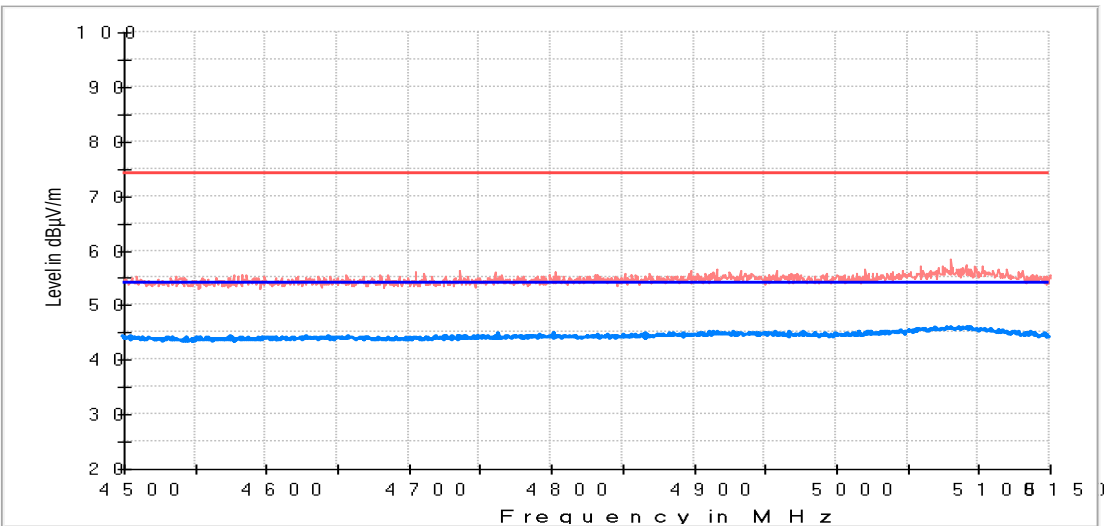
4.5 GHz – 5.15 GHz

Low Channel



— T X lim its to S purious E mission FCC 15.407 (1 G Hz to 4 0 G
— T X lim its to S purious E mission FCC 15.407 (1 G Hz to 4 0 G

High Channel



— A V G _ M A X H
— P K + _ M A X H
— T X lim its to S purious E mission FCC 15.407 (1 G Hz to 4 0 G
— T X lim its to S purious E mission FCC 15.407 (1 G Hz to 4 0 G

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (ac mode)
TEST RESULTS:	PASS

Co-Location

The test was performed with the equipment transmitting first with only the WiFi 5 GHz (WLAN0 CORE0) radio and repeated with the 2.4 GHz BT-EDR (WLAN 0), WiFi 2.4GHz (WLAN0 CORE1) radios transmitting simultaneously to check the impact of the co-location of the other radio interfaces. The results and plots below show the worst results obtained.

Frequency range 30 MHz – 1000 MHz

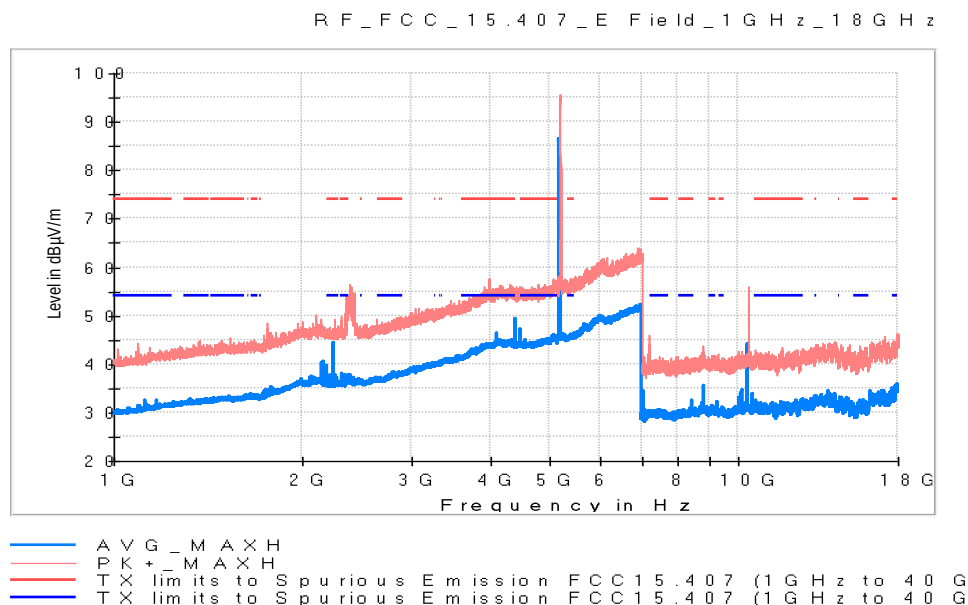
The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT. See worst operation mode selected for this range (N mode 20 MHz and Mid channel) as a worst case.

Frequency range 1 GHz – 40 GHz

The results and plots below show the maximum measured levels in the 1- 40 GHz range and the restricted band 4.5 – 5.15 GHz.

TEST RESULTS	ac mode (20 MHz)
FREQUENCY RANGE	1 GHz – 18 GHz

Low Channel



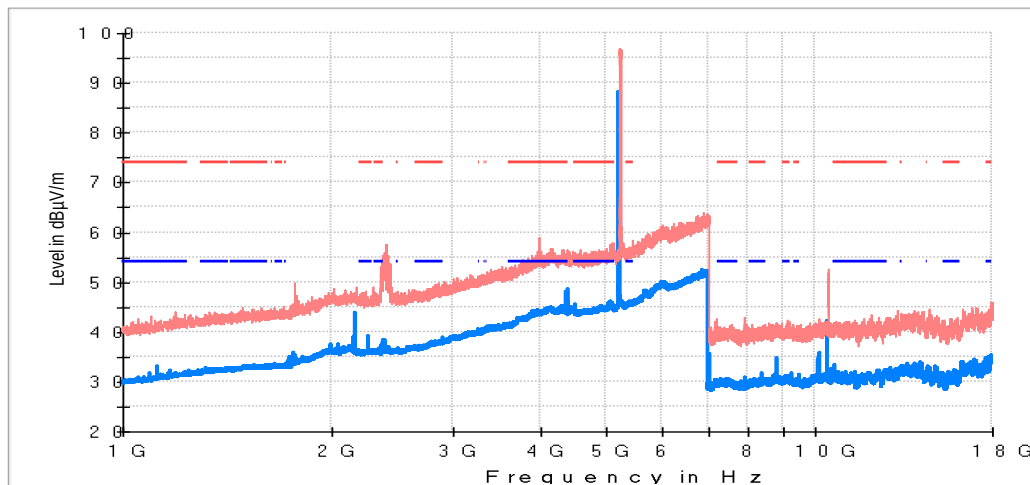
Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comments
2249.500000	49.28	44.35	V	
5186.000000	94.50	86.52	H	Fundamental
8819.000000	41.96	35.55	H	
10360.000000	53.16	44.08	V	
17982.000000	44.15	35.88	V	

TEST RESULTS (Cont.)

Mid Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



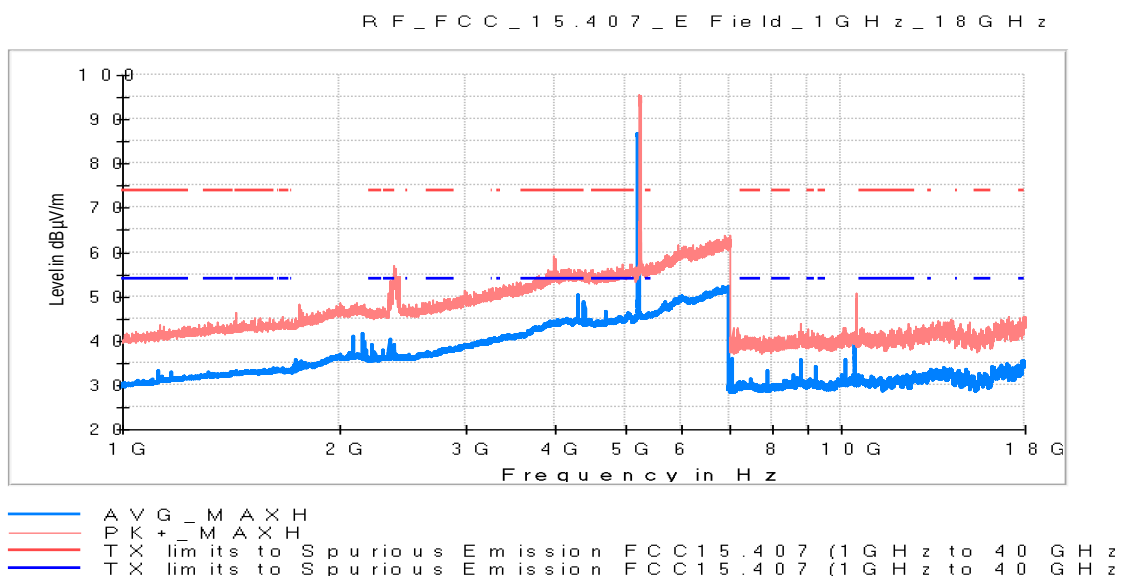
———— A V G _ M A X H
 ———— P K + _ M A X H
 ———— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G)
 ———— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G)

Maximizations

Frequency (MHz)	PK+_MAXH (dBuV/m)	AVG_MAXH (dBuV/m)	Pol	Comments
2167.500000	49.13	43.91	V	
4386.000000	56.41	47.95	V	
5213.500000	95.98	88.18	H	Fundamental
10440.000000	52.66	42.17	H	

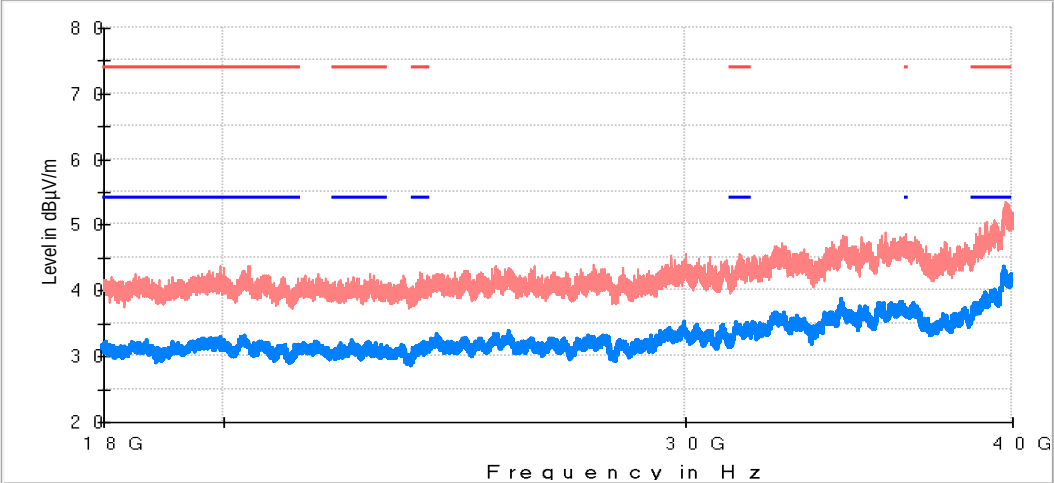
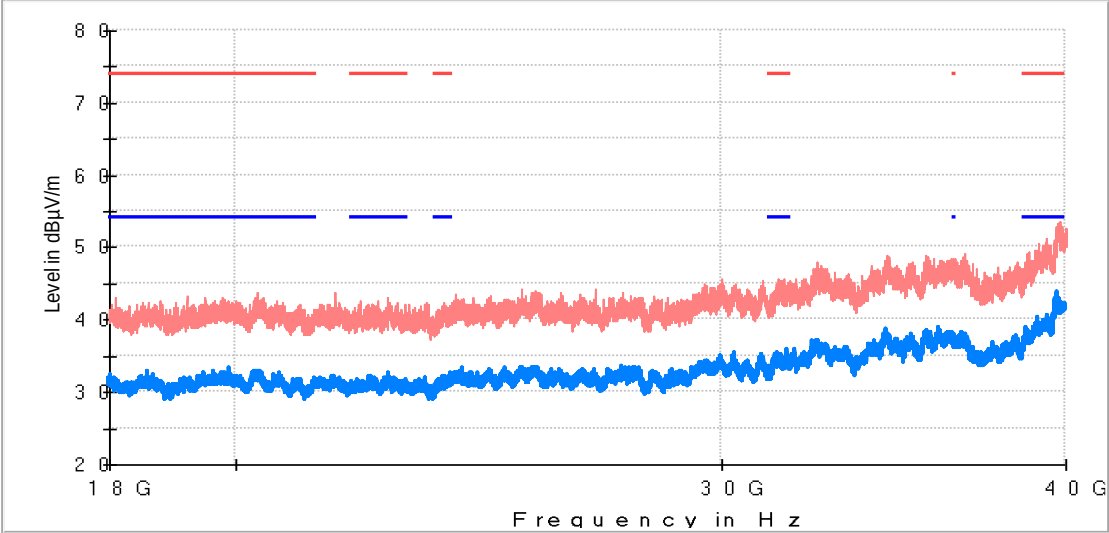
TEST RESULTS (Cont.)

High Channel



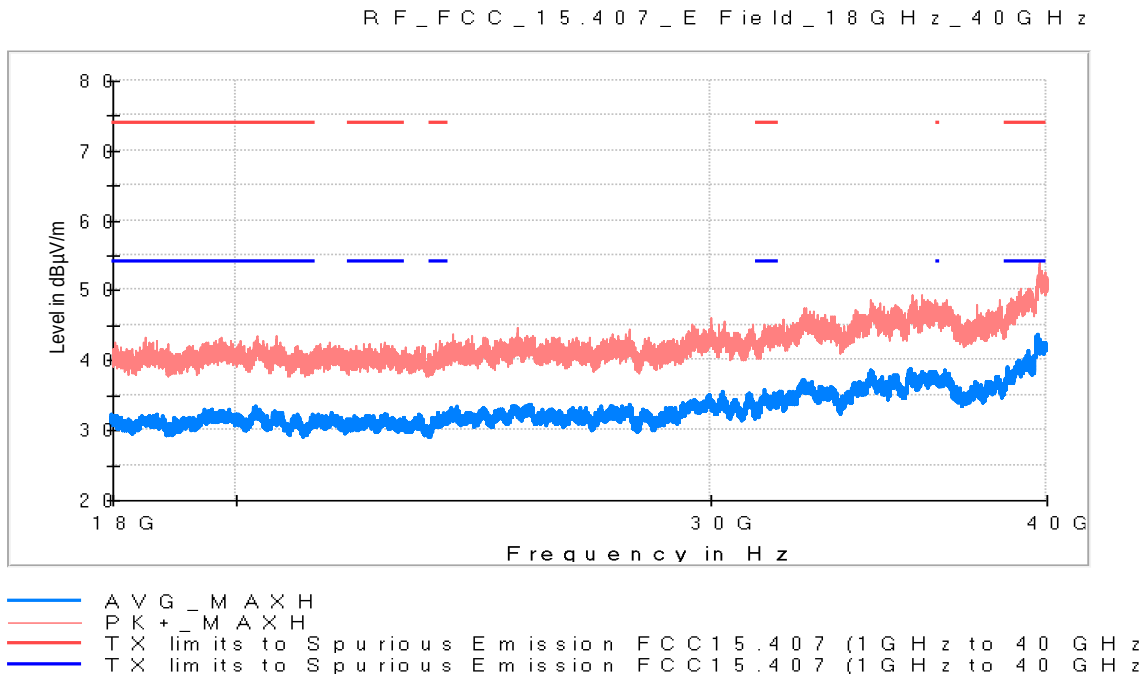
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
3761.500000	52.81	42.93	V	
5234.500000	94.35	86.67	H	Fundamental
6978.500000	61.80	52.12	V	
10478.000000	48.65	40.29	H	
13923.000000	42.02	33.77	V	
17941.000000	43.23	35.20	V	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Low Channel RF_FCC_15.407_E Field_18 GHz_40 GHz z  — AVG_MAXH — PK+_MAXH — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz) — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)	
Middle Channel RF_FCC_15.407_E Field_18 GHz_40 GHz z  — AVG_MAXH — PK+_MAXH — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz) — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)	

TEST RESULTS (Cont.)

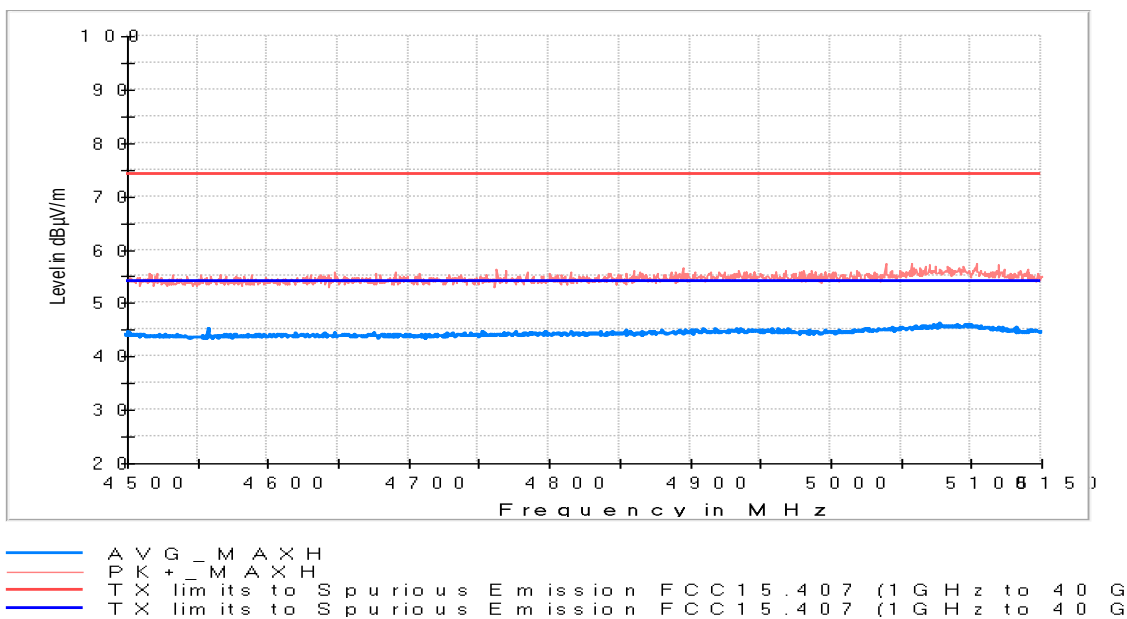
High Channel



RESTRICTED BANDS

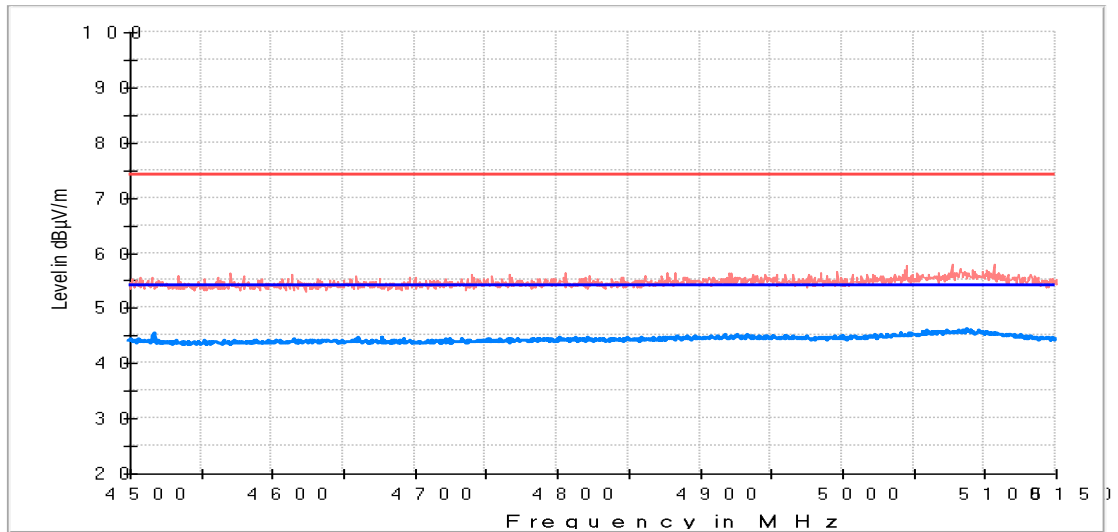
4.5 GHz – 5.15 GHz

Low Channel

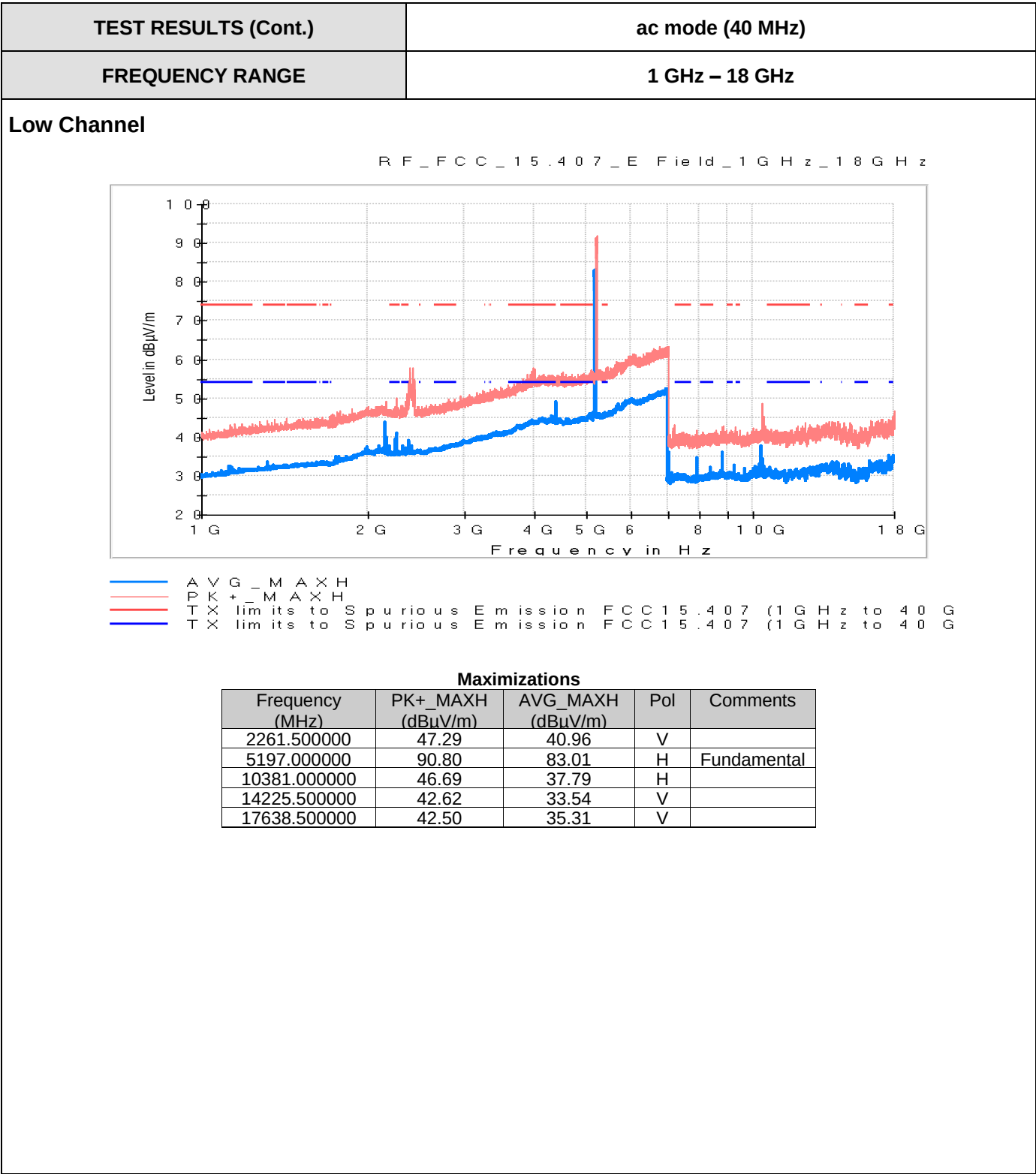


TEST RESULTS (Cont.)

Middle Channel

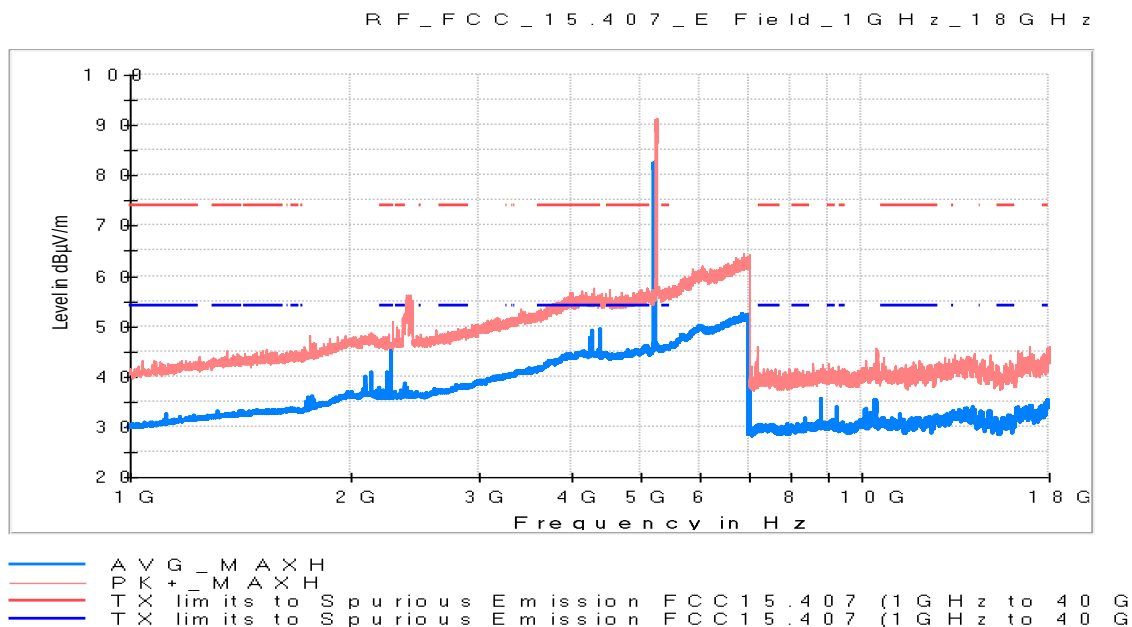


— AVG_MAX
— PK_MAX
— TX limits to Spurious Emission FCC 15.407 (1 GHz to 40 GHz)
— TX limits to Spurious Emission FCC 15.407 (1 GHz to 40 GHz)



TEST RESULTS (Cont.)

High Channel



Maximizations

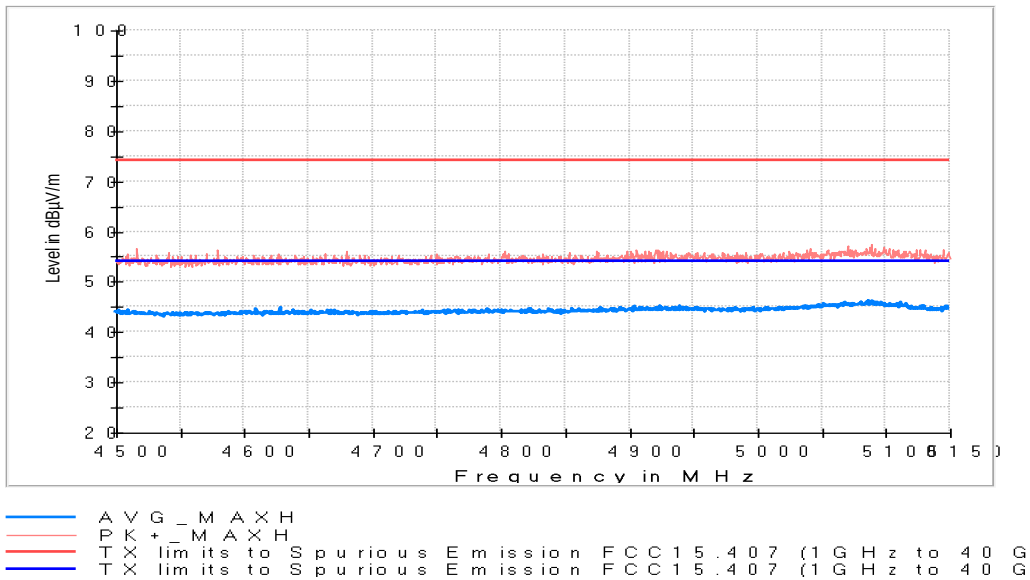
Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2277.000000	50.53	45.73	V	
5225.000000	89.77	82.56	V	Fundamental
10456.500000	43.82	35.28	H	
14264.500000	43.44	33.80	V	
17952.000000	44.68	35.22	V	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Low Channel RF_FCC_15.407_E Field_18GHz_40GHz Level in dBµV/m Frequency in Hz AVG_MAXH PK+_MAXH TX limits to Spurious Emission FCC15.407 (1GHz to 40GHz) TX limits to Spurious Emission FCC15.407 (1GHz to 40GHz)	
High Channel RF_FCC_15.407_E Field_18GHz_40GHz Level in dBµV/m Frequency in Hz AVG_MAXH PK+_MAXH TX limits to Spurious Emission FCC15.407 (1GHz to 40GHz) TX limits to Spurious Emission FCC15.407 (1GHz to 40GHz)	

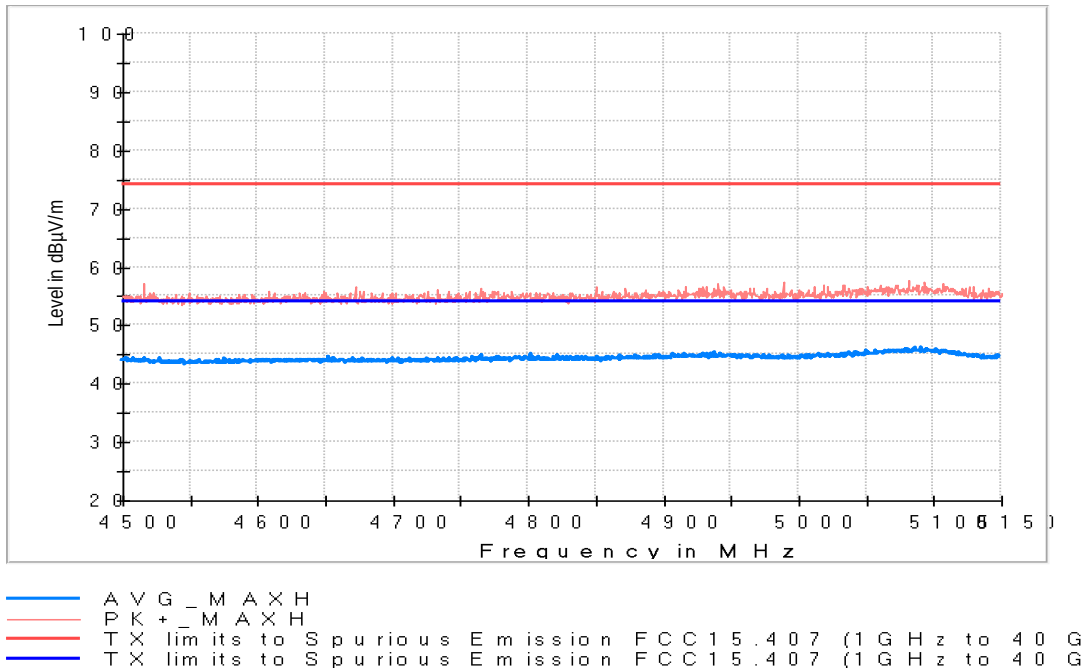
RESTRICTED BANDS

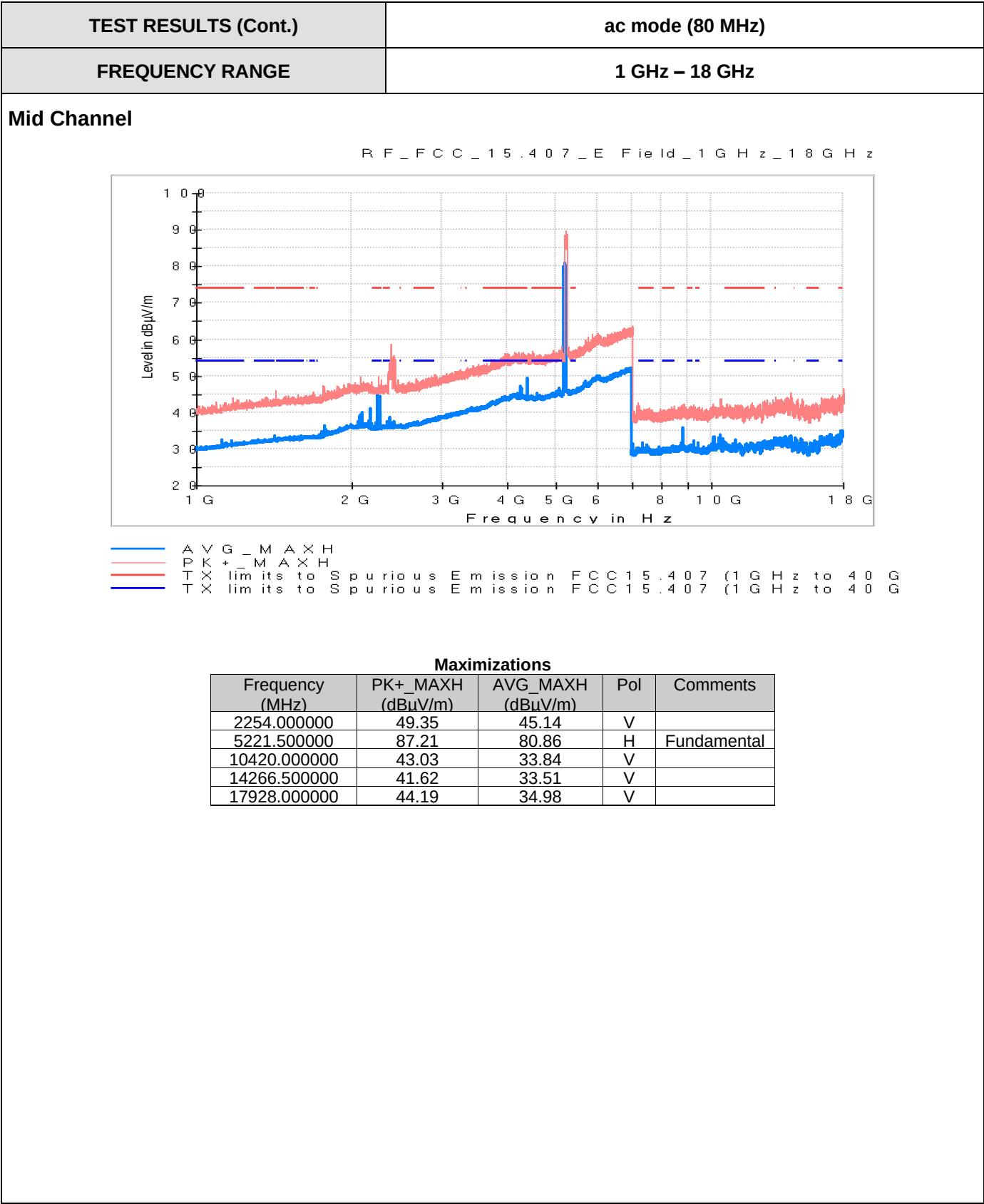
4.5 GHz – 5.15 GHz

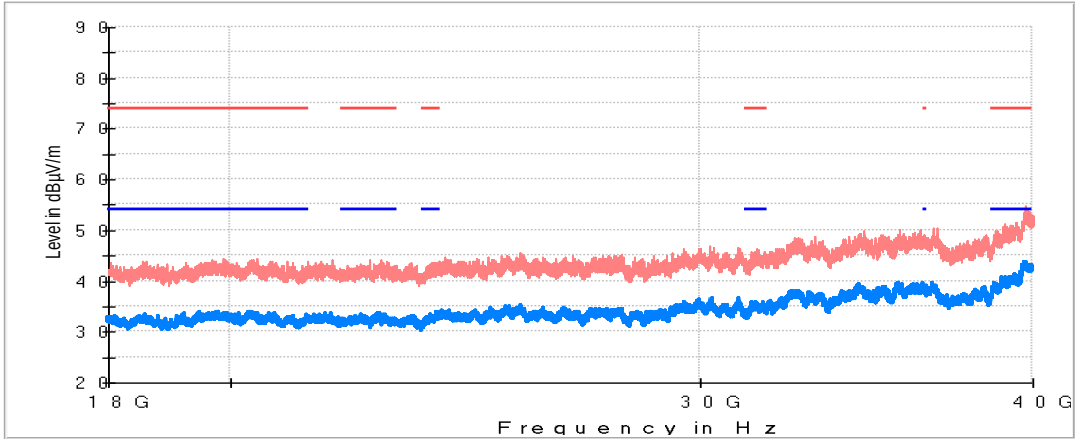
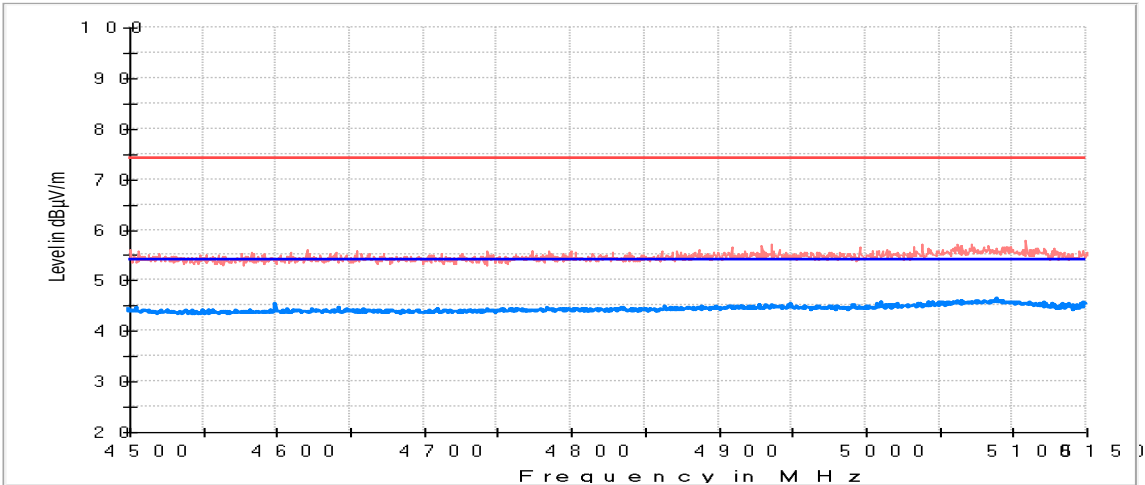
Low Channel



High Channel





TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Mid Channel	R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  — A V G _ M A X H — P K + _ M A X H — T X lim its to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z — T X lim its to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z
RESTRICTED BANDS	4.5 GHz – 5.15 GHz
Mid Channel	 — A V G _ M A X H — P K + _ M A X H — T X lim its to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z — T X lim its to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z

Appendix B: Test results

5.725 GHz – 5.85 GHz Band

Appendix B Content

PRODUCT INFORMATION 47

DESCRIPTION OF TEST CONDITIONS..... 48

TEST B.1: UNDESIRABLE RADIATED EMISSIONS (TRANSMITTER) 49

PRODUCT INFORMATION

The following information is provided by the client

Information	Description
Modulation	FHSS
Adaptive	Adaptive Equipment without the possibility to switch to a non-adaptive equipment.
Maximum RF Output Power	14 dBm
Operation mode 1: Single Antenna Equipment	Equipment with only one antenna
- Operating Frequency Range	5150 - 5250 MHz 5735 – 5835 MHz
- Nominal Channel Bandwidth	20/ 40/ 80 MHz
Extreme operating conditions	
- Temperature range	-38 °C to +70 °C
Antenna type	Integral antenna
Antenna gain	0.7 dBi
Nominal Voltage	
- Supply Voltage	12 Vdc
- Type of power source	DC voltage from battery
Equipment type	WIFI 5GHz
Geo-location capability	No

Test modes available:

- Sub-Band 5.725 -5.85 GHz

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01 ⁽¹⁾ (a mode)	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Test Frequencies for Radiated tests (20 MHz):</u> Lowest channel: 5745 MHz Middle channel: 5785 MHz Highest channel: 5825 MHz
TC#02 ⁽¹⁾ (n mode)	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Test Frequencies for Radiated tests: (20 MHz)</u> Lowest channel: 5745 MHz Middle channel: 5785 MHz Highest channel: 5825 MHz <u>Test Frequencies for Radiated tests: (40 MHz)</u> Lowest channel: 5745 MHz Highest channel: 5785 MHz
TC#03 ⁽¹⁾ (ac mode)	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Test Frequencies for Radiated tests: (20 MHz)</u> Lowest channel: 5745 MHz Middle channel: 5785 MHz Highest channel: 5825 MHz <u>Test Frequencies for Radiated tests: (40 MHz)</u> Lowest channel: 5745 MHz Highest channel: 5785 MHz <u>Test Frequencies for Radiated tests: (80 MHz)</u> Middle channel: 5745 MHz

Note (1): For spurious emissions for OFDM modes 802.11a, 802.11n20/40 and 802.11ac20/40/80 a preliminary scan was performed to determine the worst case.
The data rates of 6Mb/s for 802.11a, HT0 (SISO) for 802.11n20/ac20 and n40/ac40, and VHT0 (SISO) for 802.11 ac80 were selected based on preliminary testing that identified those rates corresponding to the worst cases.

TEST B.1: UNDESIRABLE RADIATED EMISSIONS (TRANSMITTER)

LIMITS:	Product standard:	Part 15 Subpart C §15.407 and RSS-247
	Test standard:	Part 15 Subpart C §15.407(b) (4)(6)(7) and RSS-247 6.2.4.2

LIMITS

For transmitters operating in the 5.725 – 5.85 GHz band: all emissions shall be limited to a level of -27 dBm /MHz at 75 MHz or more above or below the band-edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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) / RSS-Gen):

Frequency Range (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function

TEST SETUP

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at 3 m for the frequency range 30-1000 MHz (Bilog antenna) and at 1m for the frequency range 1-40 GHz (1 GHz-18 GHz and 18 GHz-40 GHz Double ridge horn antennas).

For radiated emissions in the range 1-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

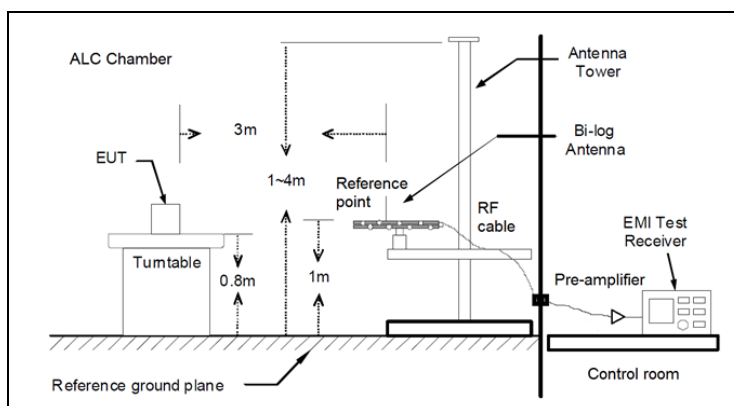
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

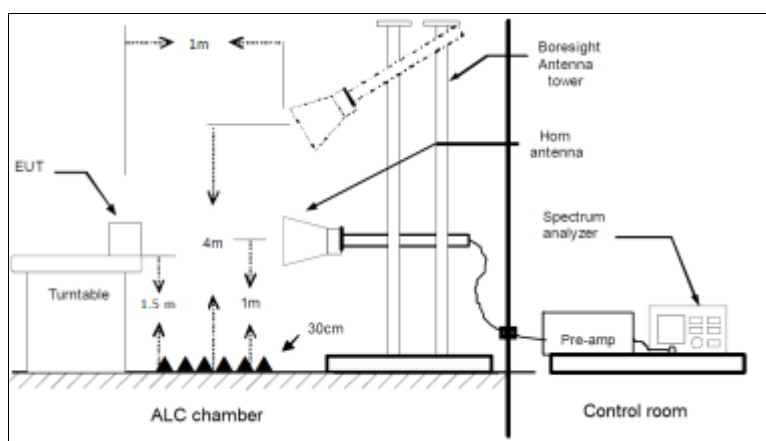
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

TEST SETUP (CONT.)

Radiated measurements Setup $f < 1$ GHz



Radiated measurements setup $f > 1$ GHz



TESTED SAMPLES:

S/01

TESTED CONDITIONS MODES:

TC#01 (a mode)

TEST RESULTS:

PASS

Co-Location

The test was performed with the equipment transmitting first with only the WiFi 5 GHz (WLAN0 CORE0) radio and repeated with the 2.4 GHz BT-EDR (WLAN 0), WiFi 2.4GHz (WLAN0 CORE1) radios transmitting simultaneously to check the impact of the co-location of the other radio interfaces. The results and plots below show the worst results obtained.

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.

Frequency range 1 GHz – 40 GHz

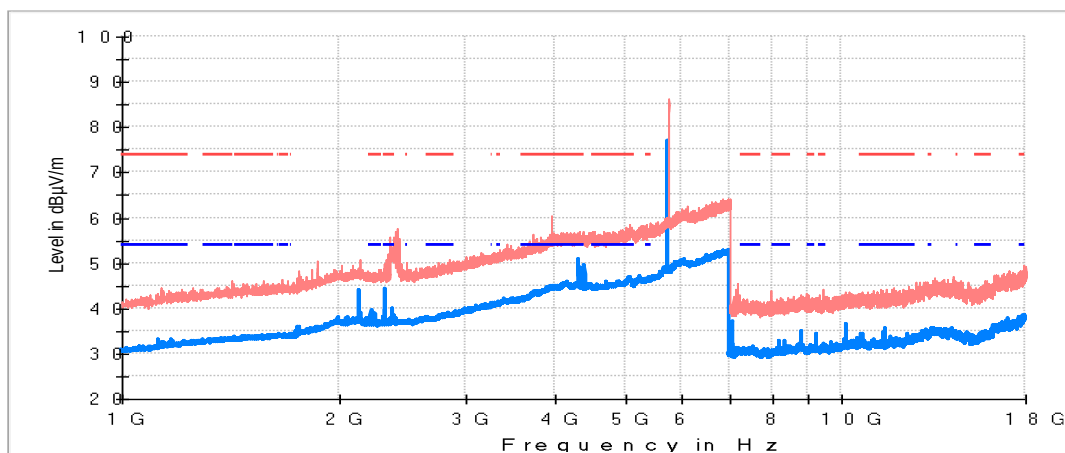
The results and plots below show the maximum measured levels in the 1- 40 GHz range.

FREQUENCY RANGE

1 GHz – 18 GHz

Low Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



———— A V G _ M A X H
 ———— P K + _ M A X H
 ———— T X lim its to S purious E m ission F C C 1 5 . 4 0 7 (1 G H z to 4 0 G H z)
 ———— T X lim its to S purious E m ission F C C 1 5 . 4 0 7 (1 G H z to 4 0 G H z)

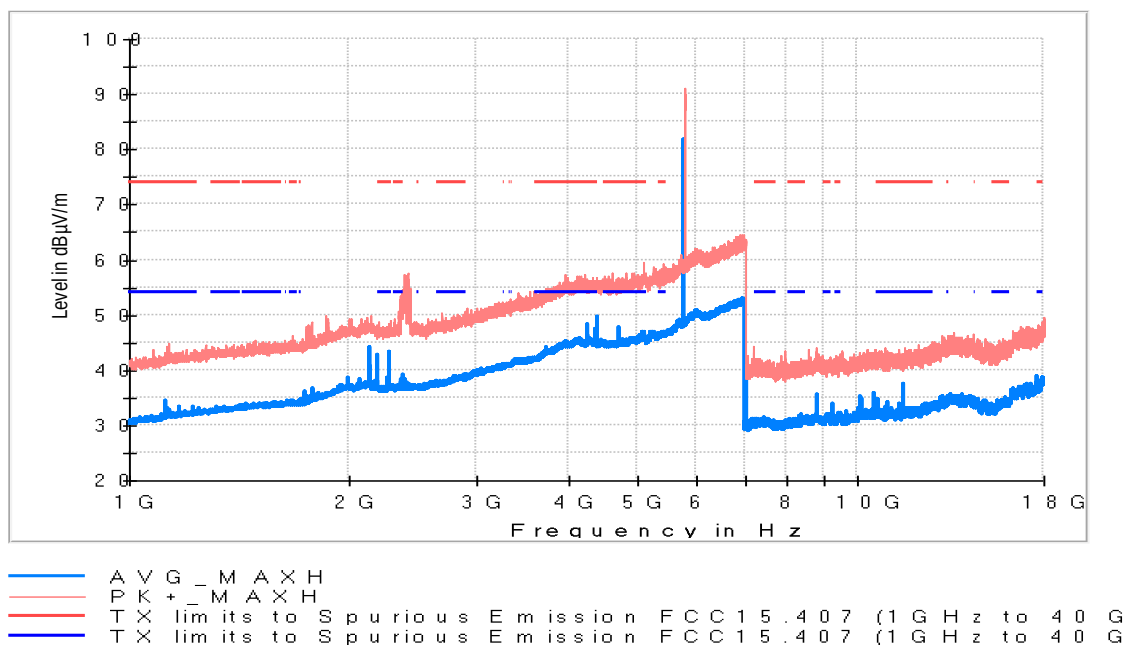
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2326.000000	49.29	44.24	V	
2377.500000	52.91	39.89	V	
3961.000000	60.45	44.34	V	
4331.000000	56.94	50.71	V	
5751.500000	85.07	76.82	V	Fundamental
10141.500000	42.88	36.60	H	

TEST RESULTS (Cont.)

Middle Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



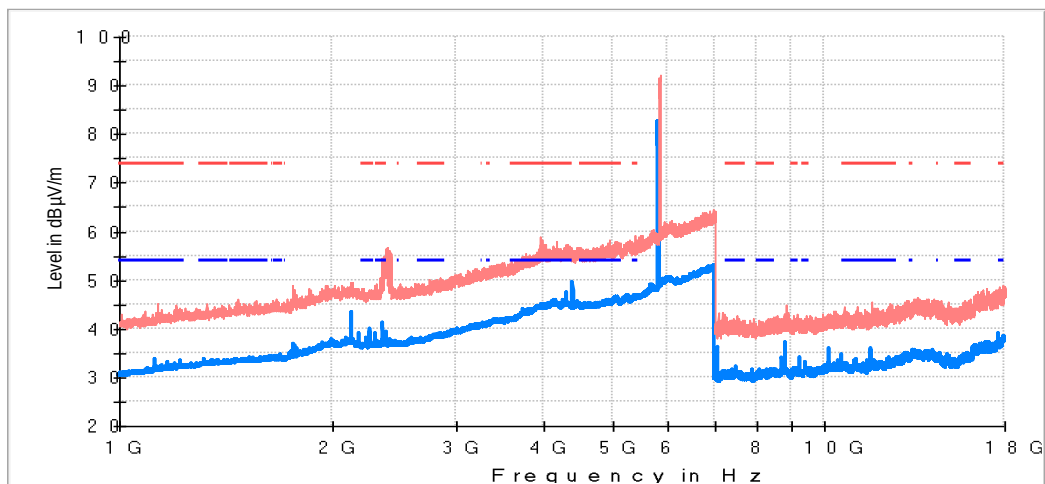
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2277.000000	49.20	43.38	V	
4409.500000	55.73	49.65	V	
5783.500000	89.24	81.63	H	Fundamental
11570.000000	42.79	37.43	V	
17638.500000	45.91	38.86	H	

TEST RESULTS (Cont.)

High Channel

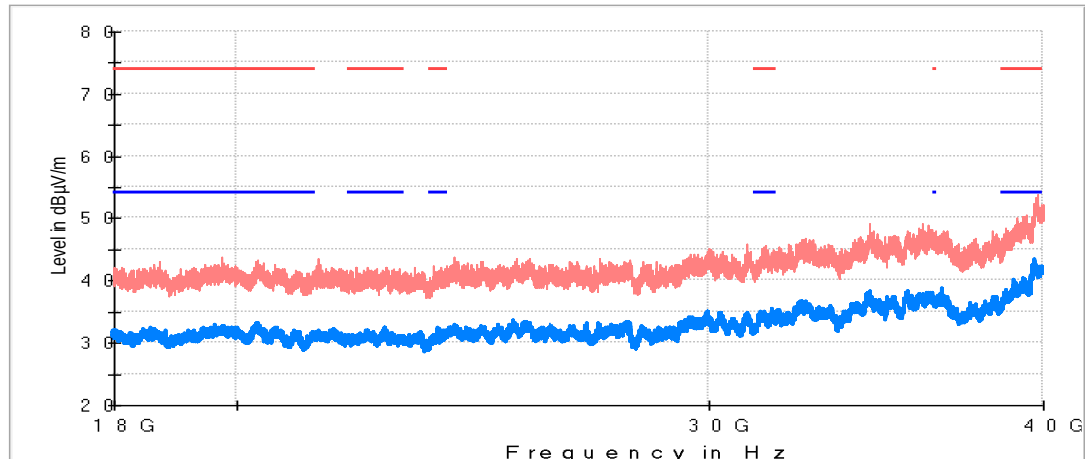
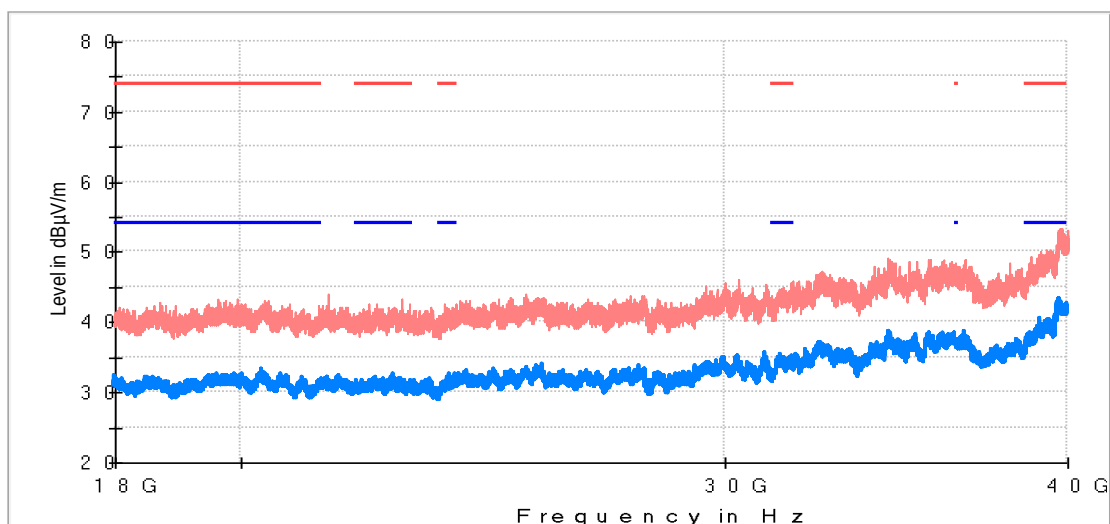
R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — PK + _ M A X H
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

Maximizations

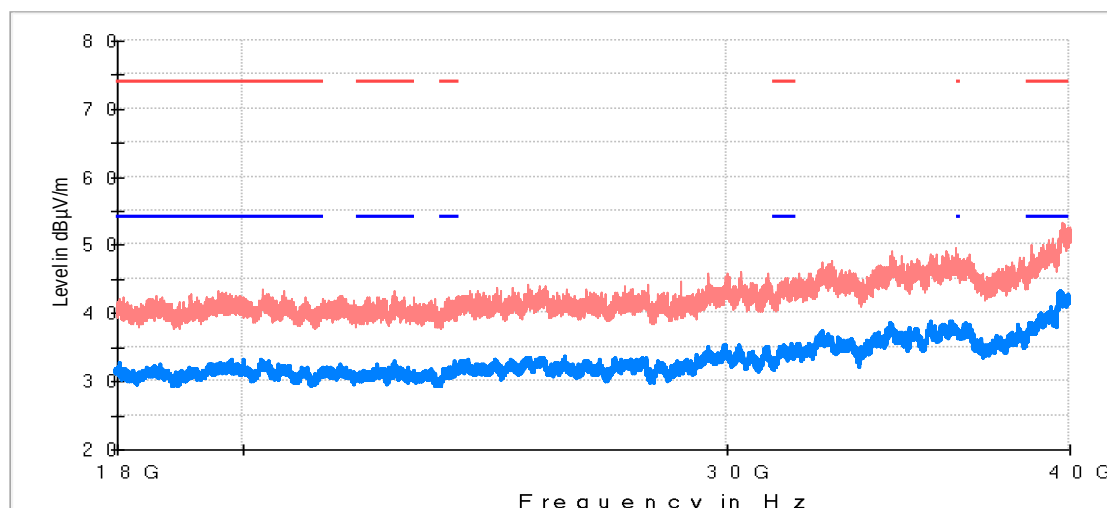
Frequency (MHz)	PK+_MAXH (dBuV/m)	AVG_MAXH (dBuV/m)	Pol	Comments
2375.000000	51.87	41.24	V	
4331.000000	57.09	47.44	V	
5832.500000	92.12	82.68	H	Fundamental
8819.000000	42.61	37.03	H	
11650.000000	43.43	35.77	H	
17638.000000	47.62	39.10	V	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Low Channel R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  Level in dBµV/m Frequency in Hz AVG_MAXH PK+_MAXH TX limits to Spurious Emission FCC 15.407 (1 GHz to 40 GHz) TX limits to Spurious Emission FCC 15.407 (1 GHz to 40 GHz) Middle Channel R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  Level in dBµV/m Frequency in Hz AVG_MAXH PK+_MAXH TX limits to Spurious Emission FCC 15.407 (1 GHz to 40 GHz) TX limits to Spurious Emission FCC 15.407 (1 GHz to 40 GHz)	

TEST RESULTS (Cont.)

High Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z



— AVG _ M A X H
— PK + _ M A X H
— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

TESTED SAMPLES:

S/01

TESTED CONDITIONS MODES:

TC#02 (n mode)

TEST RESULTS:

PASS

Co-Location

The test was performed with the equipment transmitting first with only the WiFi 5 GHz (WLAN0 CORE0) radio and repeated with the 2.4 GHz BT-EDR (WLAN 0), WiFi 2.4GHz (WLAN0 CORE1) radios transmitting simultaneously to check the impact of the co-location of the other radio interfaces. The results and plots below show the worst results obtained.

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.

Frequency range 1 GHz – 40 GHz

The results and plots below show the maximum measured levels in the 1- 40 GHz range.

TEST RESULTS (Cont.)	
FREQUENCY RANGE	1 GHz – 18 GHz

Low Channel

RF_FCC_15.407_E Field_1 GHz_18 GHz

Level in dBµV/m

Frequency in Hz

AVG_MAXH

PK+_MAXH

TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)

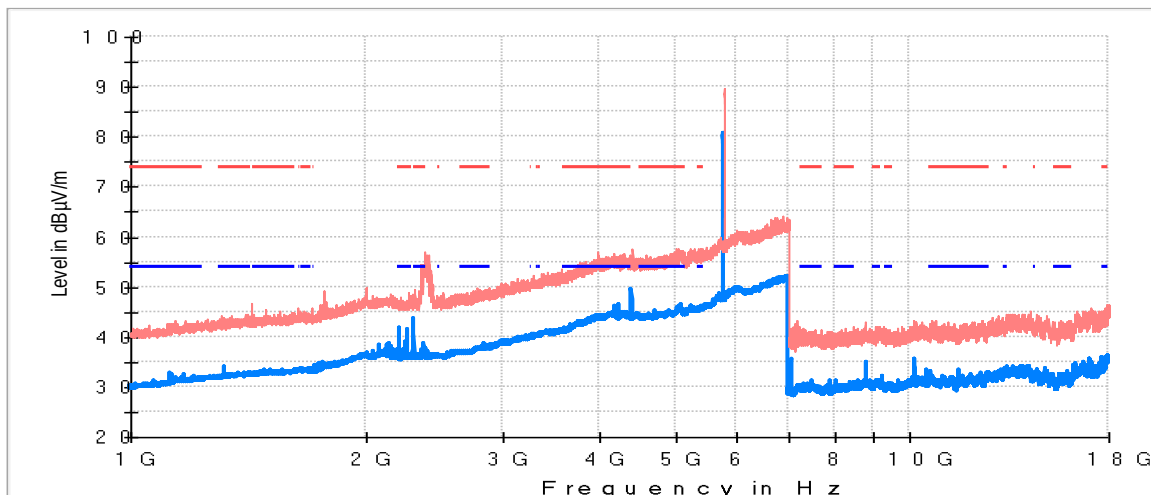
TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)

Maximizations				
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comments
3817.500000	52.16	42.96	V	Fundamental
5738.000000	86.56	78.73	V	
6997.500000	61.84	52.15	V	
11490.000000	42.27	35.32	V	
13953.500000	43.17	34.38	V	
17980.500000	46.36	36.69	V	

TEST RESULTS (Cont.)

Middle Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



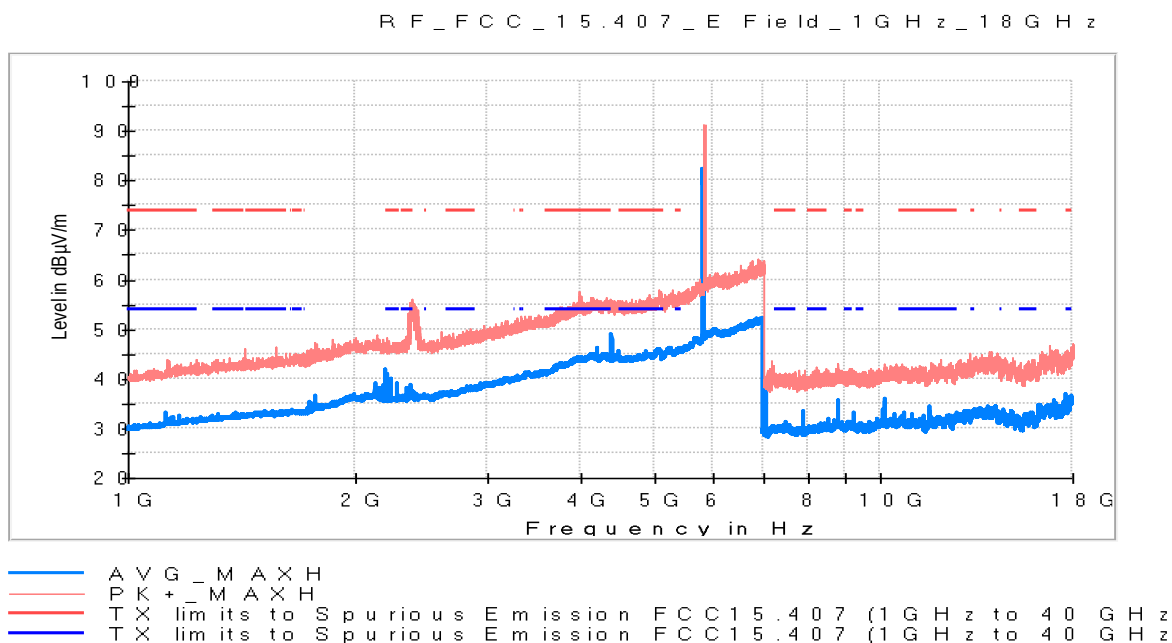
— AVG _ M A X H
— P K + _ M A X H
— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comments
2319.000000	49.64	43.73	V	
5780.500000	87.76	80.74	H	Fundamental
6935.500000	61.71	52.12	V	
10142.000000	43.11	35.43	V	
13607.000000	43.43	34.16	H	
17954.000000	46.41	36.21	V	

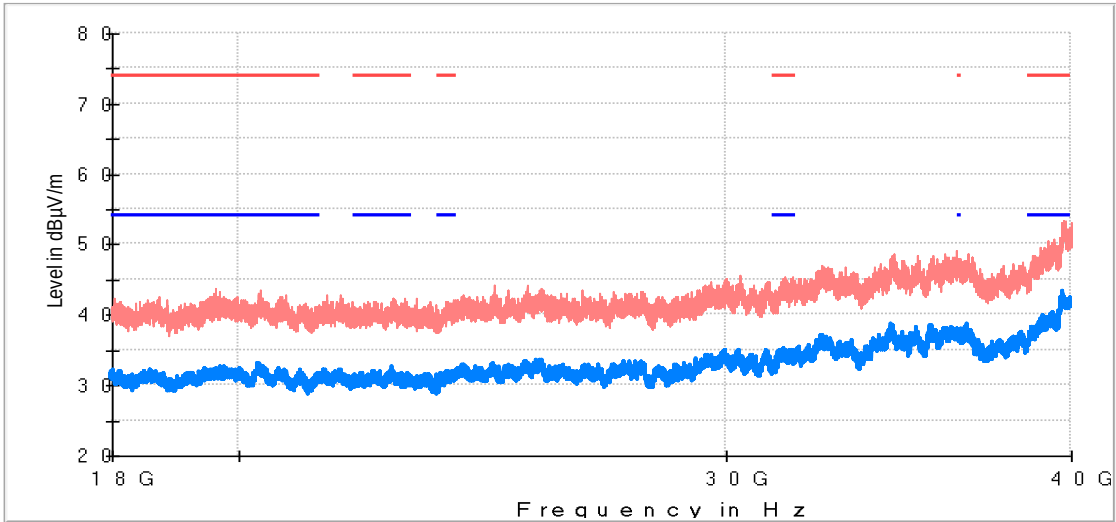
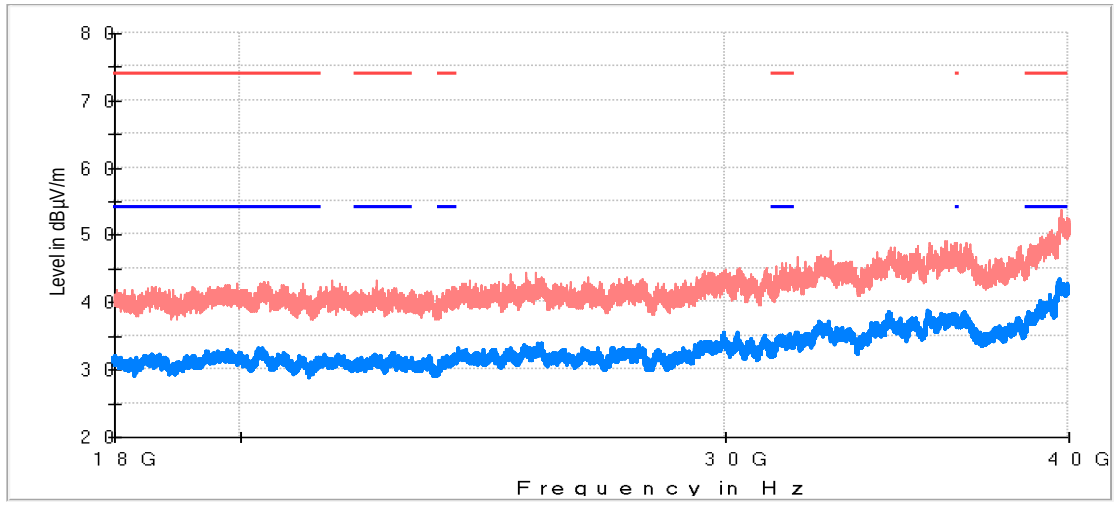
TEST RESULTS (Cont.)

High Channel



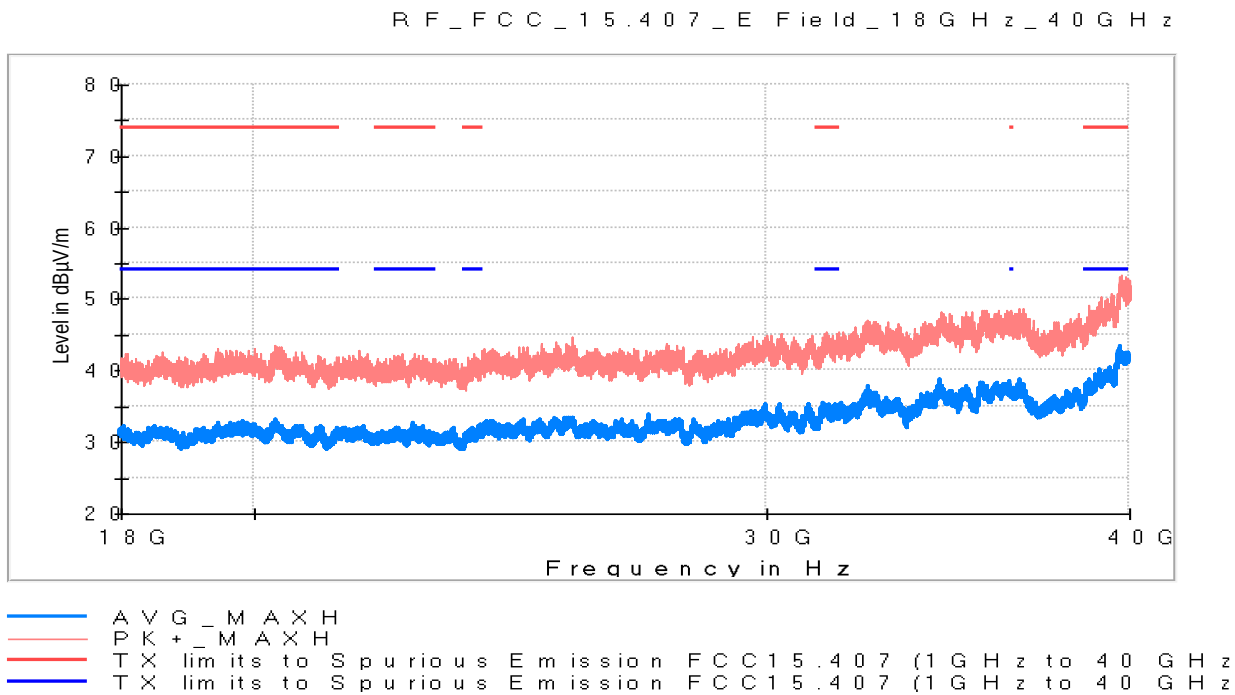
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
3829.000000	52.87	42.94	V	
5827.500000	88.90	82.26	H	Fundamental
6882.000000	62.49	52.18	H	
10147.000000	42.22	35.98	V	
13937.500000	43.88	34.31	V	
17638.500000	44.68	36.82	V	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Low Channel RF_FCC_15.407_E Field_18 GHz_40 GHz z  — AVG_MAX — PK_MAX — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz z) — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz z)	
Middle Channel RF_FCC_15.407_E Field_18 GHz_40 GHz z  — AVG_MAX — PK_MAX — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz z) — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz z)	

TEST RESULTS (Cont.)

High Channel



TEST RESULTS (Cont.)

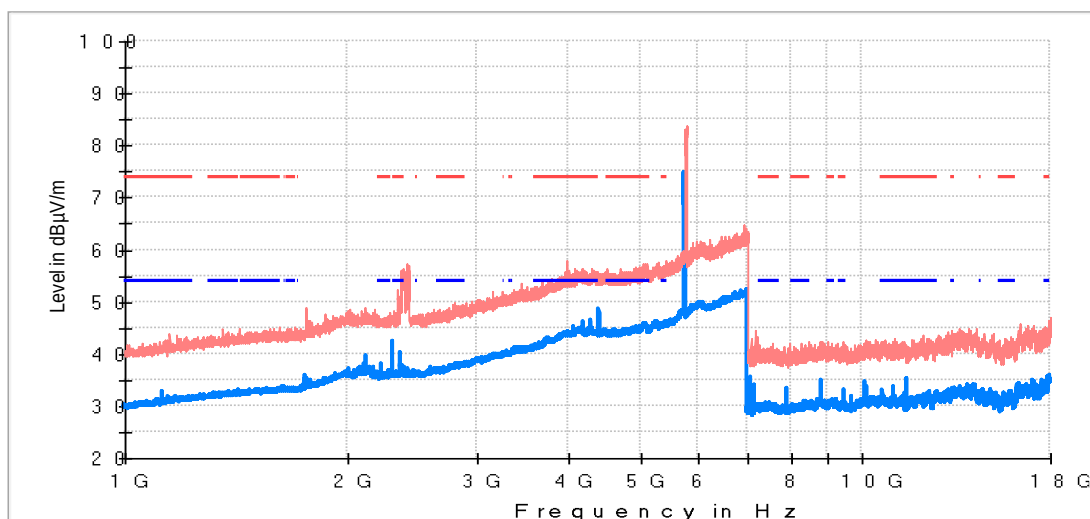
n mode (40 MHz)

FREQUENCY RANGE

1 GHz – 18 GHz

Low Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



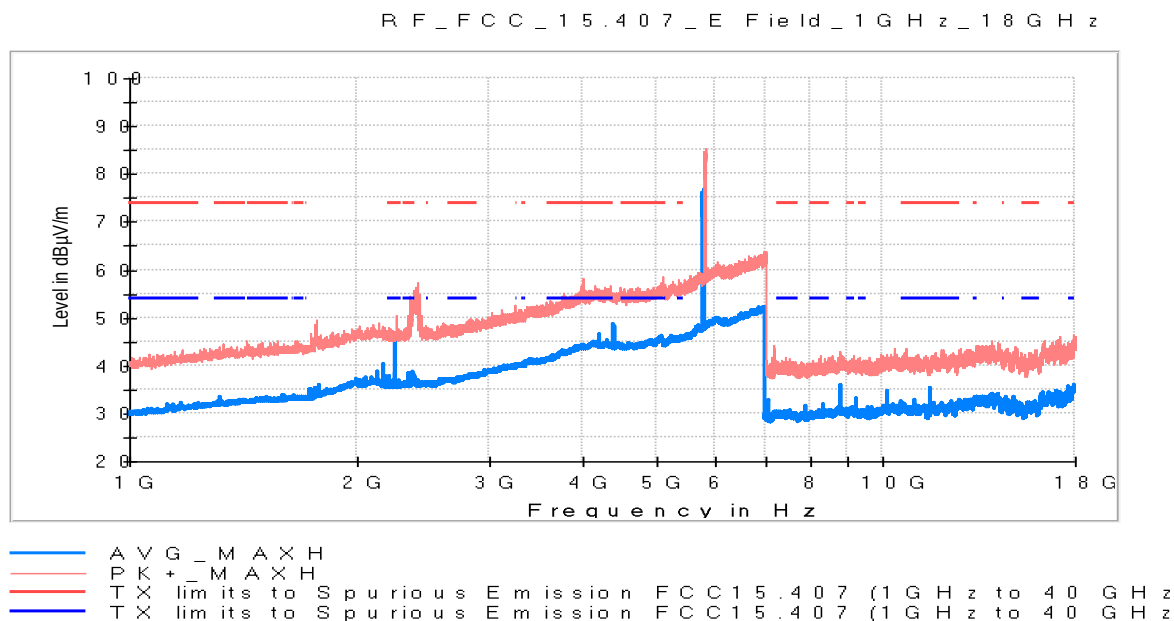
— AVG _ M A X H
 — PK + _ M A X H
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
3743.000000	52.55	43.00	H	
5770.000000	82.68	74.89	H	Fundamental
6999.500000	61.63	52.30	V	
11510.000000	41.42	35.32	V	
14225.500000	42.52	34.08	V	
17968.500000	45.72	35.74	V	

TEST RESULTS (Cont.)

High Channel



Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2259.000000	49.15	45.43	V	
5812.000000	83.66	76.58	H	Fundamental
6991.500000	62.24	52.18	V	
11590.000000	41.89	35.34	V	
13993.000000	43.39	33.88	V	
17960.000000	44.82	35.76	V	

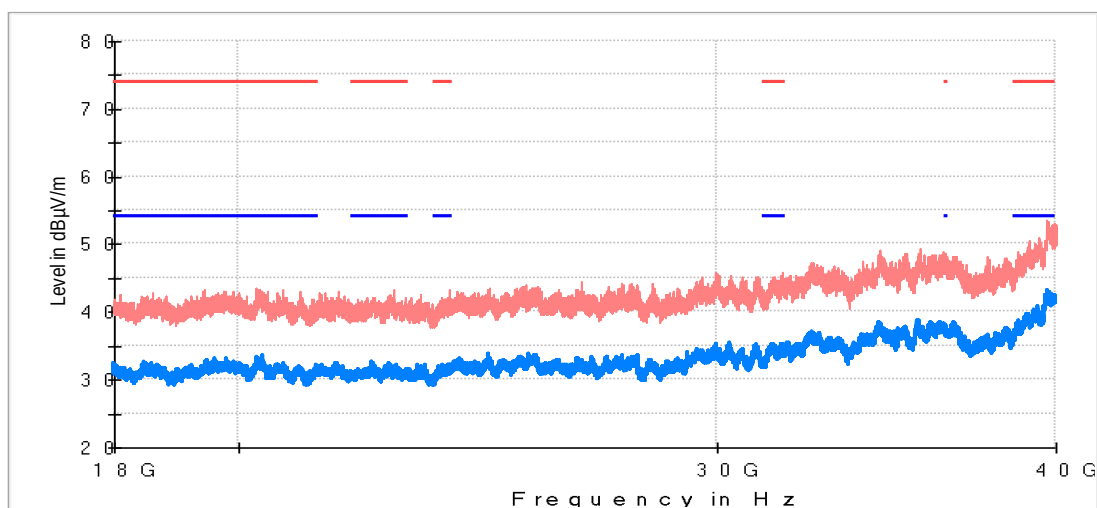
TEST RESULTS (Cont.)

FREQUENCY RANGE

18 GHz – 40 GHz

Low Channel

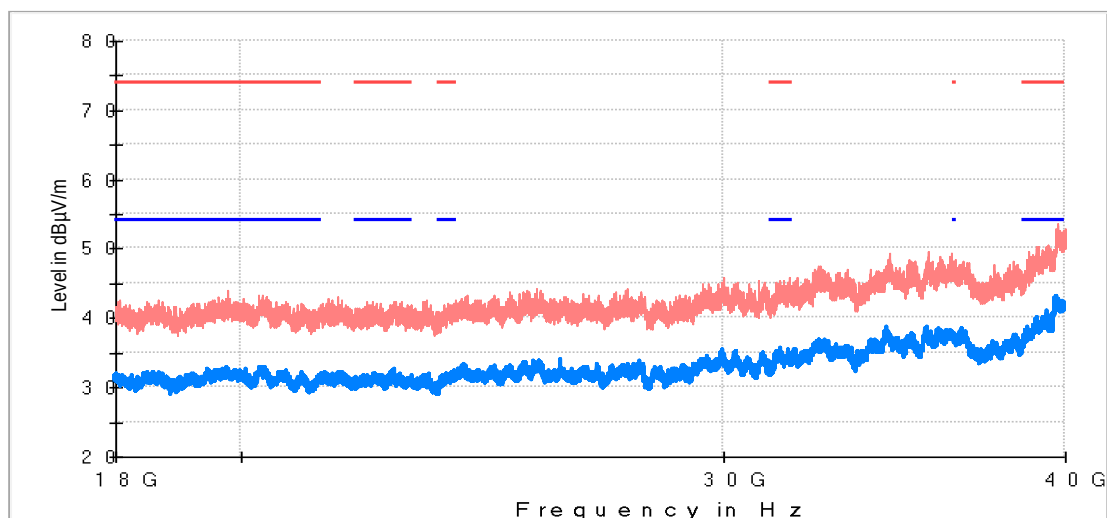
R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z



— AVG _ M A X H
— PK + _ M A X H
— TX lim its to S purious E m ission FCC 15 . 4 0 7 (1 G H z to 4 0 G H z)
— TX lim its to S purious E m ission FCC 15 . 4 0 7 (1 G H z to 4 0 G H z)

High Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z



— AVG _ M A X H
— PK + _ M A X H
— TX lim its to S purious E m ission FCC 15 . 4 0 7 (1 G H z to 4 0 G H z)
— TX lim its to S purious E m ission FCC 15 . 4 0 7 (1 G H z to 4 0 G H z)

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (ac mode)
TEST RESULTS:	PASS

Co-Location

The test was performed with the equipment transmitting first with only the WiFi 5 GHz (WLAN0 CORE0) radio and repeated with the 2.4 GHz BT-EDR (WLAN 0), WiFi 2.4GHz (WLAN0 CORE1) radios transmitting simultaneously to check the impact of the co-location of the other radio interfaces. The results and plots below show the worst results obtained.

Frequency range 30 MHz – 1000 MHz

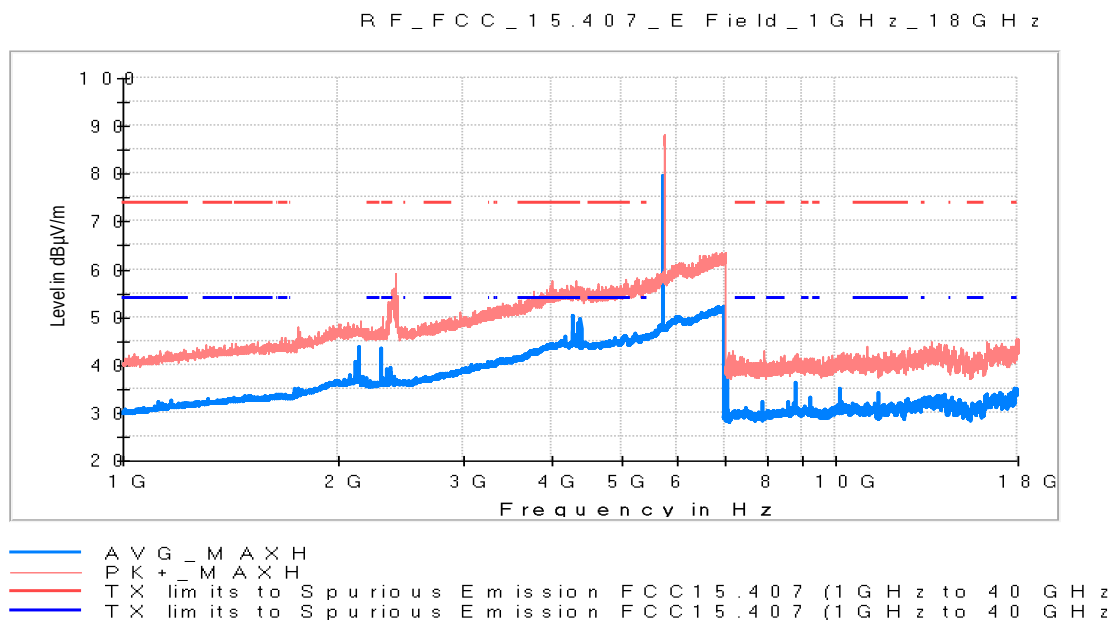
The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.

Frequency range 1 GHz – 40 GHz

The results and plots below show the maximum measured levels in the 1- 40 GHz range.

TEST RESULTS (Cont.)	ac mode (20 MHz)
FREQUENCY RANGE	1 GHz – 18 GHz

Low Channel



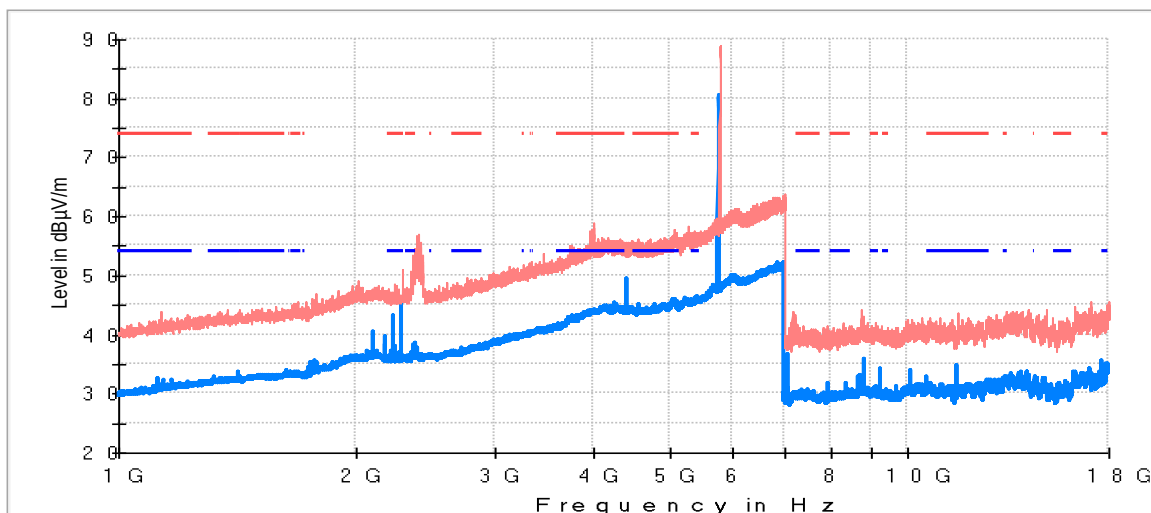
Maximizations

Frequency (MHz)	PK+_MAXH (dBuV/m)	AVG_MAXH (dBuV/m)	Pol	Comments
2158.000000	48.83	43.70	V	
5751.000000	86.66	79.31	H	Fundamental
6999.500000	62.26	52.13	V	
10142.000000	42.39	34.96	V	
14265.500000	43.47	33.71	V	
17915.000000	44.77	34.95	V	

TEST RESULTS (Cont.)

Mid Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — PK + _ M A X H
 — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)
 — TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)

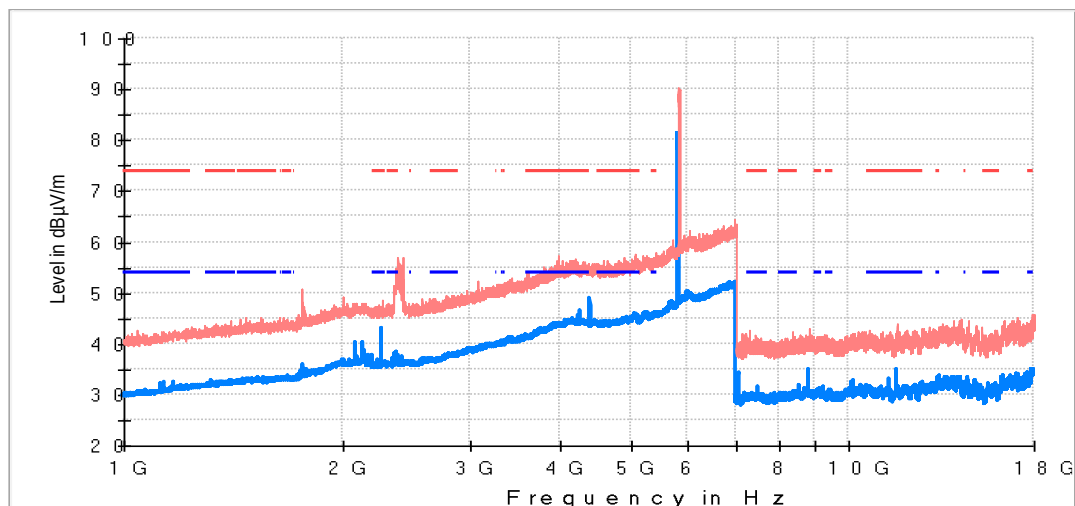
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2287.500000	51.11	45.53	V	
5786.500000	88.62	80.36	H	Fundamental
6985.500000	61.56	52.15	V	
11570.000000	43.79	34.75	V	
13975.500000	42.37	33.73	V	
17638.500000	42.59	35.51	V	

TEST RESULTS (Cont.)

High Channel

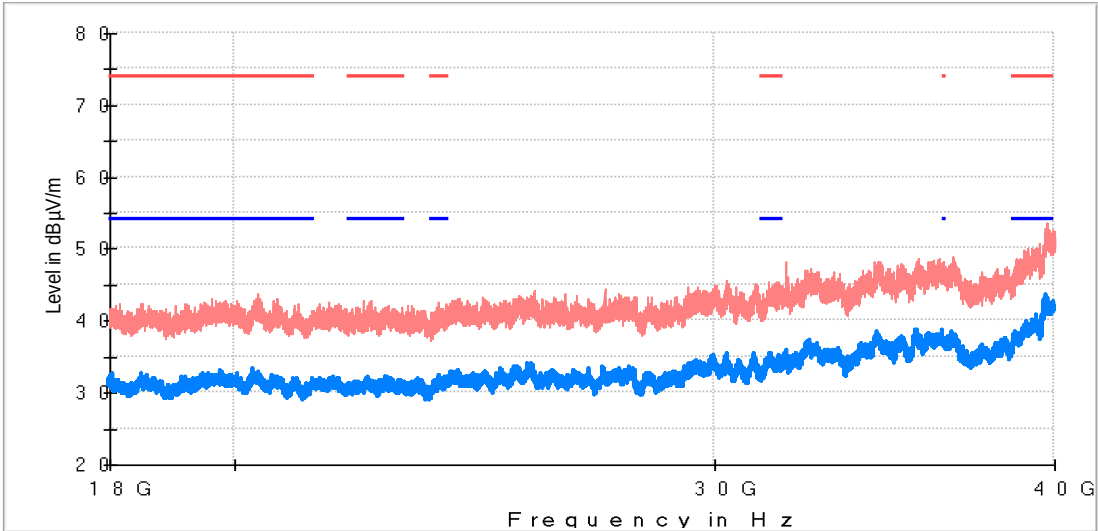
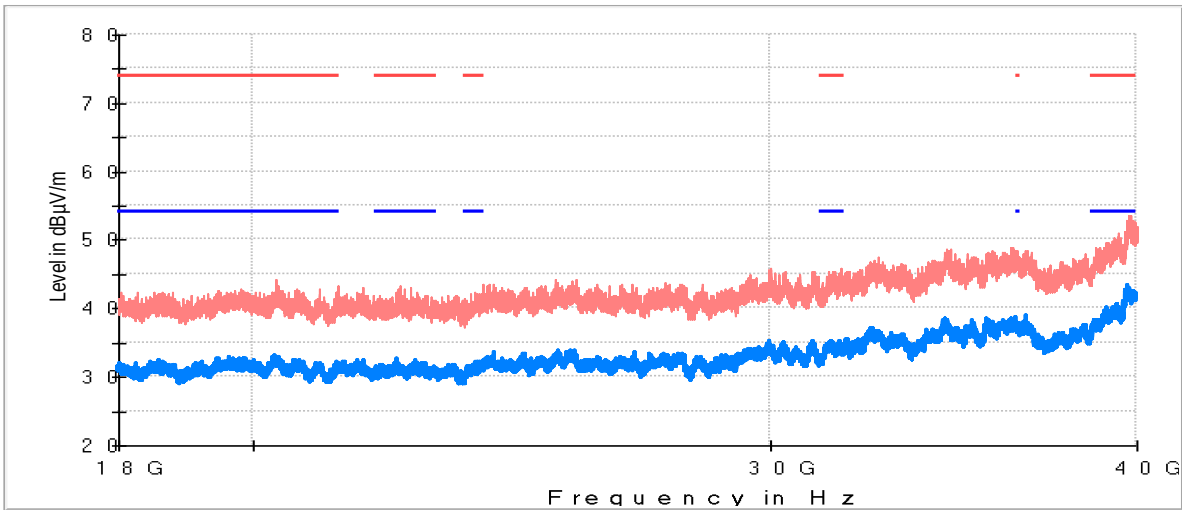
R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



———— A V G _ M A X H
 ———— P K + _ M A X H
 ———— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 ———— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

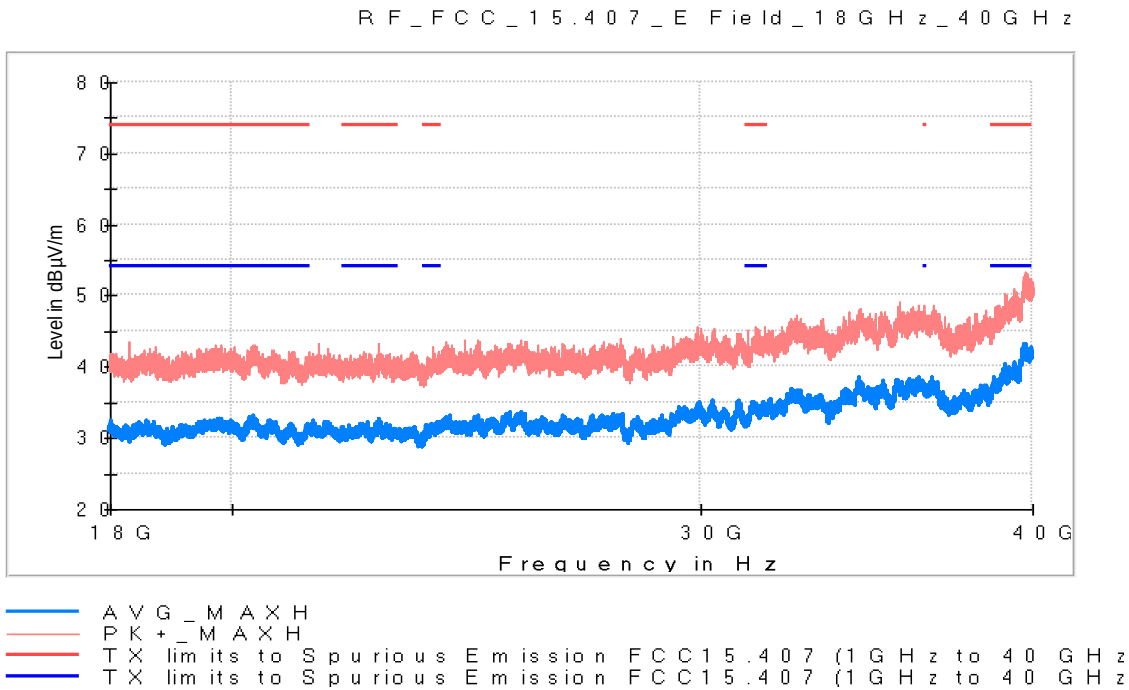
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
2274.500000	48.67	43.19	V	
5832.500000	90.08	81.26	H	Fundamental
6999.500000	62.37	52.05	V	
11651.000000	44.02	34.95	H	
13357.500000	41.44	33.62	V	
17978.500000	44.94	35.00	V	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Low Channel R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  — A V G _ M A X H — P K + _ M A X H — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z) — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)	
Middle Channel R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  — A V G _ M A X H — P K + _ M A X H — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z) — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)	

TEST RESULTS (Cont.)

High Channel



TEST RESULTS (Cont.)

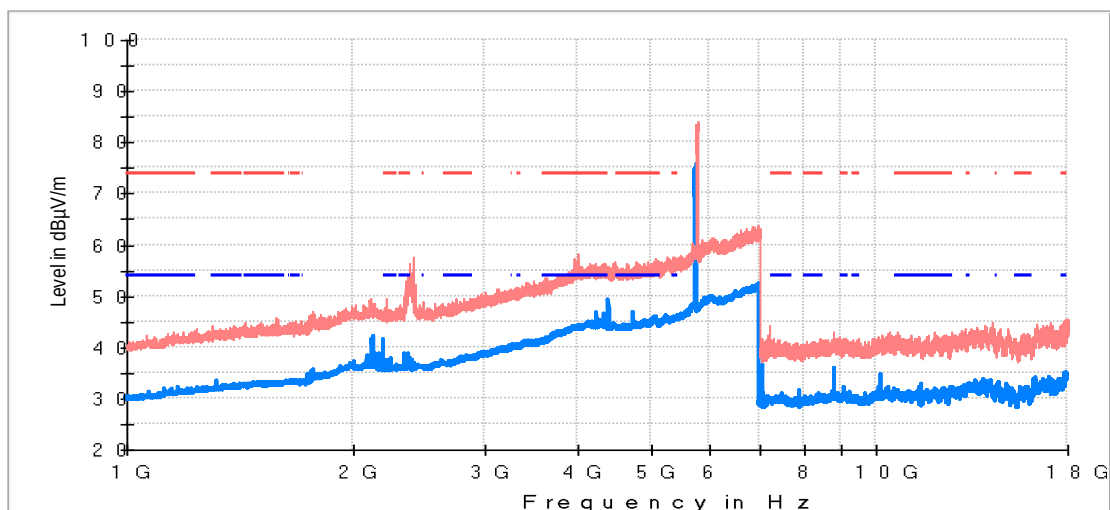
ac mode (40 MHz)

FREQUENCY RANGE

1 GHz – 18 GHz

Low Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



———— A V G _ M A X H
 ———— P K + _ M A X H
 ———— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 ———— T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

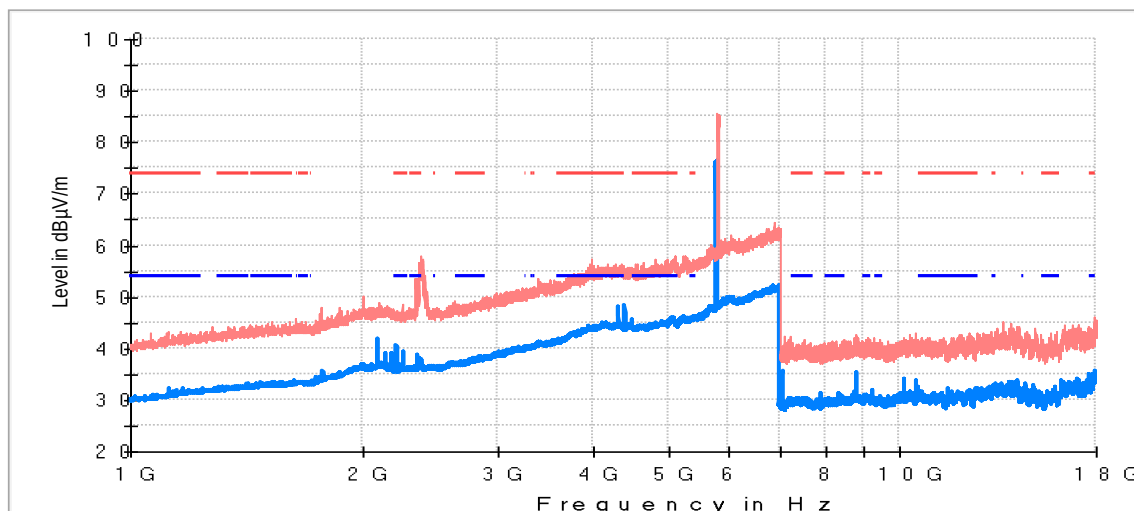
Maximizations

Frequency (MHz)	PK+_MAXH (dBuV/m)	AVG_MAXH (dBuV/m)	Pol	Comments
2379.500000	56.33	37.24	V	
4409.500000	55.05	49.36	V	
5771.500000	83.73	75.58	H	Fundamental
7049.500000	37.25	29.03	V	
8819.000000	41.51	35.91	V	
10141.500000	42.25	34.68	V	

TEST RESULTS (Cont.)

High Channel

R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — PK + _ M A X H
 — T X limits to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 — T X limits to S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

Maximizations

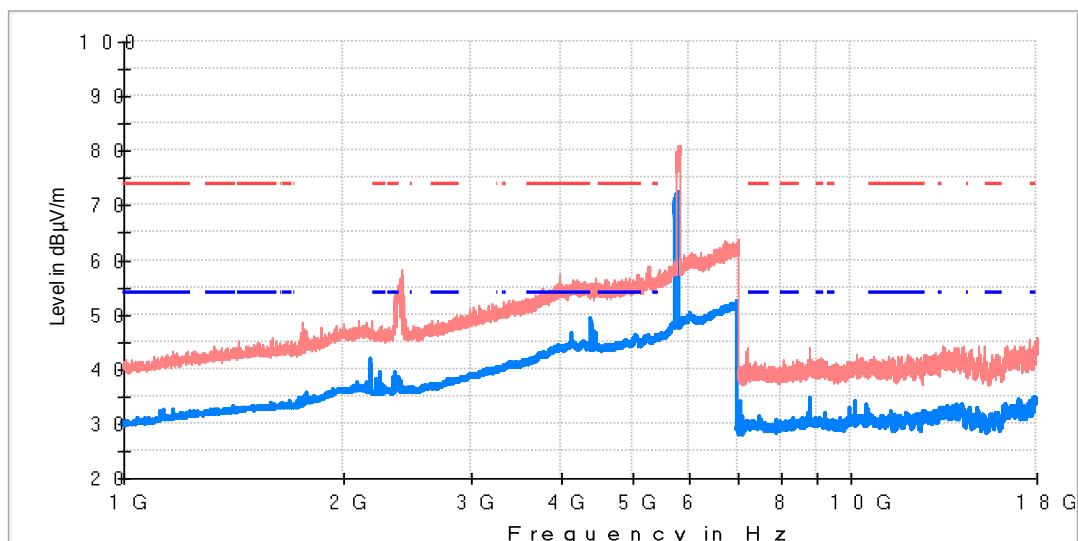
Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comments
3804.000000	52.90	43.02	V	
5803.000000	84.83	76.47	H	Fundamental
6857.500000	61.90	52.12	V	
10142.000000	40.52	33.86	H	
14264.500000	42.68	33.60	V	
17962.500000	44.16	35.56	V	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Low Channel RF_FCC_15.407_E Field_18 GHz_40 GHz Level in dBµV/m Frequency in Hz AVG_MAXH PK+_MAXH TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz) TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)	
High Channel RF_FCC_15.407_E Field_18 GHz_40 GHz Level in dBµV/m Frequency in Hz AVG_MAXH PK+_MAXH TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz) TX limits to Spurious Emission FCC15.407 (1 GHz to 40 GHz)	

TEST RESULTS (Cont.)	ac mode (80 MHz)
FREQUENCY RANGE	1 GHz – 18 GHz

Mid Channel

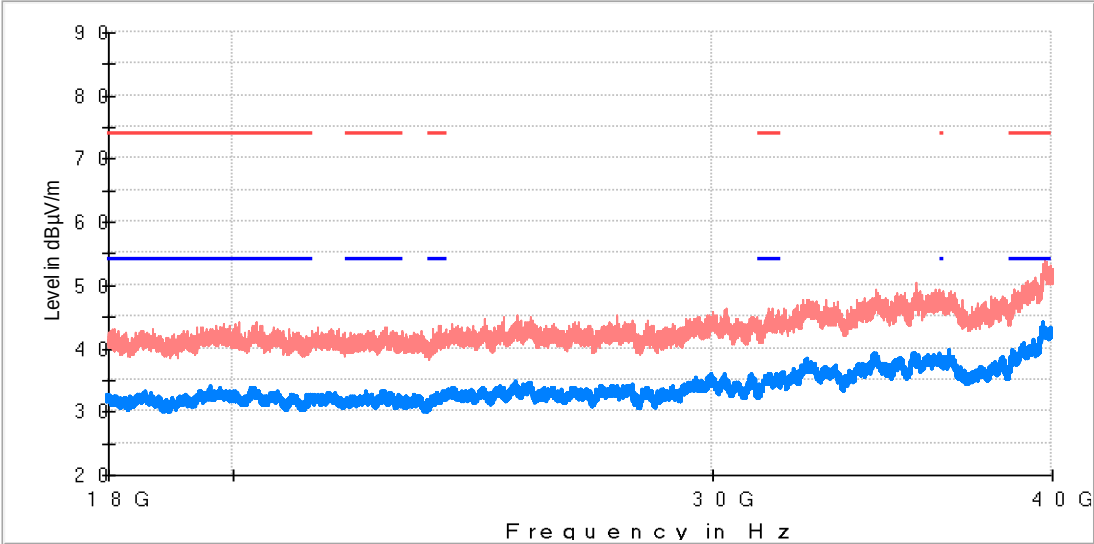
R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 G H z _ 1 8 G H z



— AVG _ M A X H
 — PK + _ M A X H
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)
 — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)

Maximizations

Frequency (MHz)	PK+ MAXH (dBμV/m)	AVG MAXH (dBμV/m)	Pol	Comments
3789.500000	53.30	43.16	V	
5812.500000	81.07	72.30	H	Fundamental
6989.500000	61.95	52.23	V	
10142.000000	42.65	34.14	V	
13982.000000	41.71	33.53	V	
17953.500000	43.20	34.78	V	

TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 40 GHz
Mid Channel R F _ F C C _ 1 5 . 4 0 7 _ E F i e l d _ 1 8 G H z _ 4 0 G H z  — A V G _ M A X H — P K + _ M A X H — T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z) - - - T X l i m i t s t o S p u r i o u s E m i s s i o n F C C 1 5 . 4 0 7 (1 G H z t o 4 0 G H z)	