EMT **ELECTRO MAGNETIC TEST, INC.**
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

FCC Part 15.247
IC RSS-210, ISSUE 8, August 2010
TEST REPORT

for

the

CLASS 1 OEM Bluetooth Module

MODEL: BT31

FCC ID: X3ZBTMOD3
IC: 8828A-MOD3

Prepared for

Amp'ed RF Technology, Inc.
1879 Lundy Ave, Ste 138,
San Jose, CA 95131

Prepared by: _____
J.H BANG

Approved by: _____
KEVIN BOTHMANN

ELECTRO MAGNETIC TEST, INC.
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DATE: JULY 8, 2011

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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Electro Magnetic Test, Inc., which is an independent testing and consulting firm. The test report is based on testing performed Electro Magnetic Test, Inc. personnel according to the measurement procedure described in the test specification given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full.

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Federal Government.

Electro Magnetic Test, Inc. is recognized by the following agencies for performing EMI/EMC testing:

COUNTRY	AGENCY	IDENTIFYING #
USA	Federal Communications Commission (FCC) (EMT's test site is recognized by the FCC)	Registration Number: 90576
USA, Canada, Taiwan, Australia/New Zealand, European Community	National Voluntary Lab Accreditation Program (NVLAP) (EMT is accredited by NVLAP. A copy of the NVLAP Scope Of Accreditation is available upon request.)	Lab Code: 200147-0
Canada	Industry Canada	File No.: IC 2804
Japan	Voluntary Control Council For Interference (VCCI)	See Below
	Open Field Test Site "A"	R-589
	Mains Conducted Emissions Test Site "A"	C-604
	Telecom Conducted Emissions Test Site "A"	T-1655
	3 Meter Semi-Anechoic Chamber Site "E"	R-3227
	3 Meter Semi-Anechoic Chamber Site "E" (1GHz – 6GHz)	G-219
	Mains Conducted Emissions Test Site "E"	C-35793
	Telecom Conducted Emissions Test Site "E"	T-1715
Korea	Ministry of Information and Communication's Radio Research Laboratory (RRL) under the Asia Pacific Economic Cooperation (APEC) Mutual Recognition Arrangement (A copy of the Scope Of Accreditation is available upon request)	US0036
Taiwan	Bureau Of Standards, Metrology and Inspection (BSMI)	Reference Number: SL2-IN-E-1024
Australia / New Zealand	Australian Communications Authority (AUSTEL)	*

*These agencies do not issue an identifying number to test labs.

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GENERAL REPORT SUMMARY (CONTINUED)

Device Tested:	CLASS 1 OED Bluetooth Module Model: BT31 S/N: N/A
Product Description:	The EUT is a surface mount Bluetooth module supplied on a 24 pin, 6 layer PCB. The EUT measures approximately 27 mm (L) x 15 mm (W) x 2mm (H) and weighs approximately 0.5g.
Modifications:	The EUT was not modified during the testing other than the installation of test software to facilitate testing of the device. There were no hardware modifications.
Manufacturer:	1879 Lundy Ave, Ste 138, San Jose, CA 95131
Test Date(s):	June 29, 2011 ~ July 7, 2011
Test Specifications:	FCC Part 2, Subpart J, Part 15, Subparts A, B, and C IC RSS-210
Test Methodology:	ANSI C63.4-2003
Test Deviations:	The test procedure was not deviated from during the testing.

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SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	REMARKS	RESULTS
TRANSMITTER PARAMETERS			
FCC 15.203 IC RSS-GEN 7.1.4	Antenna Requirement	-	**Pass**
FCC 15.207 IC RSS-GEN 7.2.2	Power Line Conducted Emission	Conducted	**Pass**
FCC 15.209 IC RSS-210 2.2, 8.5	Radiated Emission	Radiated	**Pass**
FCC 15.247(a)(1) IC RSS-210 A8.1(D)	20dB Bandwidth	Conducted	**Pass**
FCC 15.247(a)(1) IC RSS-210 A8.1(B)	Carrier Frequency Separation	Conducted	**Pass**
FCC 15.247(a)(1)(iii) IC RSS-210 A8.1(D)	Number of Hopping Frequency	Conducted	**Pass**
FCC 15.247(a)(1)(iii) IC RSS-210 A8.1(D)	Dwell Time	Conducted	**Pass**
FCC 15.247(b)(1) IC RSS-210 A8.1(B)	Maximum Peak Output Power	Conducted	**Pass**
FCC 15.247(d) IC RSS-210 A8.5	Band Edge	Conducted	**Pass**
FCC 15.247(d) IC RSS-210 A8.5	Spurious Emission at Antenna Port	Conducted	**Pass**
IC RSS-GEN 4.10 IC RSS-210 2.6	Receiver Spurious Emission	Radiated	**Pass**
FCC 15.247(i) IC RSS-102	RF Exposure	-	**Pass**

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TECHNICAL DESCRIPTION OF THE EUT

Manufacturer:	Amp'ed RF Technology, Inc.
Manufacturer Address:	1879 Lundy Ave, Ste 138, San Jose, CA 95131
EUT Name:	CLASS 1 OEM Bluetooth module
Model No:	BT31
Operation frequency:	2402 MHz to 2480 MHz
Number of channels:	79
Modulation Technology:	AFH
Antenna Type:	Internal, 2.1dBi "Chip"
Brand Name:	Antenova
Serial No:	N/A
Power Supply Range:	N/A
Power Supply:	5 VDC 1.0A AC adapter
Power Cord:	N/A
Signal Cable:	N/A

Description of Channels:

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2402	40	2441	79	2480

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1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Equip. Under Test, Model: BT31. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 2003. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by FCC part 15 and IC RSS-210.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Electro Magnetic Test, Inc., 1547 Plymouth Street, Mountain View, California, 94043.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The measurement results in this report and the calibration of the test equipment are traceable to the National Institute of Standards and Technology (NIST).

2.3 Date Test Sample was Received

The test sample was received on June 27, 2011

2.4 Disposition of the Test Sample

The test sample has not been returned to Amp'ed RF Technology, Inc. at this time.

2.5 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
CISPR	International Special Committee On Radio Interference
FCC	Federal Communications Commission

3. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

3.1 EUT and Accessory List

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER	NOTE
BLUETOOTH MODULE (EUT)	Amp'ed RF Technology, Inc.	BT31	N/A	
Control Board	Amp'ed RF Technology, Inc.	BT120	N/A	
ITE POWER SUPPLY	GlobTek, Inc.	GT-A81051-0505UW2	WR9HA1000KCP-F	Less than 3m
THE FOLLOWING WERE ONLY USED TO CONFIGURE THE EUT THEN REMOVED:				
LAPTOP	DELL	INSPIRON	3R945 A00	
LAPTOP POWER SUPPLY	DELL	AA20031	9364U	
RS232 Serial Cable	Lantronix	500-107	N/A	3m

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3.2 EMI Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
EMI Receiver	Rohde & Schwarz	ESU40	100127	Jan 4, 2011	1 Year
BiConiLog Antenna	ETS-Lindgren	3142D	00102183	August 14, 2010	1 Year
Horn Antenna (1-18GHz)	ETS-Lindgren	3117	00109294	June16, 2011	1 Year
Horn Antenna (18-26.5GHz)	ETS-Lindgren	3160-09	102646	June 20, 2011	1 Year
Preamplifier (1-18GHz)	Rohde & Schwarz	TS-PR18	100056	October 22, 2010	1 Year
Preamplifier (18-26.5GHz)	Rohde & Schwarz	TS-PR26	100034	June 20, 2011	1 Year
LISN	Com Power	LI-200	12012	September 10, 2011	1 Year
LISN	Com Power	LI-200	12214	September 10, 2011	1 Year
LISN	Com Power	LI-200	1767	September 10, 2011	1 Year
LISN	Com Power	LI-200	1768	September 10, 2011	1 Year
Antenna Mast	ETS-Lindgren	2175	00095727	N/A	N/A
Turntable	ETS-Lindgren	2187-3.0	00118231	N/A	N/A
Computer	Acer	Aspire 8930	85100050123	N/A	N/A
Multi-Function Controller	ETS-Lindgren	2090	00102270	N/A	N/A
Spectrum Analyzer	Hewlett Packard	8566B	3013A07296	April 29, 2011	1 Year
RF Preselector	Hewlett Packard	85685A	3010A01157	April 29, 2011	1 Year
Quasi-Peak Adapter	Hewlett Packard	85650	2430A00451	April 29, 2011	1 Year
RF Attenuator	Mini-Circuits	CAT-10	Asset #1000	December 8, 2010	1 Year

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4. TEST SITE DESCRIPTION

4.1 Test Facility Description

All sites are located at 1547 Plymouth Street, Mountain View, California 94043.

The 5 meter semi-anechoic chamber of Electro Magnetic Test, Inc. was used for radiated emission testing. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength).

The presence of non EUT signals was verified by turning the EUT off. In case a non EUT signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the other signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance from 30 MHz to 25 GHz. to obtain final test data.

Calculation of Radiated Emission Test Data:

Amplitude - Gain + Antenna Factor + Cable Loss = Corrected Amplitude

Corrected Amplitude - Limit = Margin

Associated with the radiated emission test data in this report is a ±4.5dB measurement uncertainty.

4.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was grounded only through the safety ground in its power cable(s).

5. TEST REQUIREMENT AND RESULT

5.1 Antenna Requirement

5.1.1 Applicable Standard

For intentional device, according to FCC Part §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

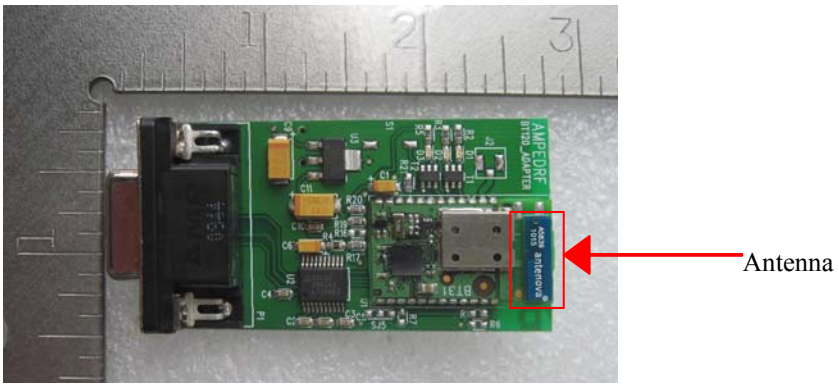
According to FCC §15.247(c)(1)(i) requirement, systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Per IC RSS-Gen §7.1.4, A transmitter can only be sold or operated with antennas with which it was certified. A transmitter maybe certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in IC RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to IC RSS-210 Annex 8 or RSS-210 Annex 9, the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to IC RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

5.1.2 EUT Antenna Construction

The antenna is integrated on PCB that the end user cannot access. It is fully enclosed by the EUT chassis and removal/modification would result in irreparable damage to the device. Maximum gain is 2.1dBi. Therefore, the antenna on EUT is compliant.



5.2 Conducted Emission

5.2.1 Applicable Standard

According to FCC §15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with logarithm of the frequency

5.2.2 Test Procedure

The HP 8566B spectrum analyzer was used as a measuring meter along with the HP 85650A quasi-peak adapter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak detector was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the spectrum analyzer offset was adjusted accordingly to read the actual data measured. The LISN output was read by the HP 8566B spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for the conducted emissions test was 9 kHz.

The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in CNS 13438: 2006. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The initial test data was taken in manual mode while scanning the frequency ranges of 0.150 MHz to 1.6 MHz, 1.6 MHz to 5 MHz and 5 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable and peripheral placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the spectrum analyzer span adjusted to 1 MHz.

The final data was collected under program control by the HP 85869PC software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave.

Associated with the conducted emission test data in this report is a ±2.6dB measurement uncertainty.

5.2.3 Test Environmental Conditions

Temperature:	24~27ºC
Relative Humidity:	48~49 %
ATM Pressure:	101.2~102.3kPa

**Testing was performed on 2011-07-6~2011-07-07*

5.2.4 Test Result

EUT has the worst margin of -10.0dB for quasi-peak at 0.3669MHz and -4.8dB for average at 0.365 MHz in the Line Conductor with Middle channel in basic mode.

Please see the datasheets in Appendix A for the measurement results.

5.3 Restricted Band and Unwanted Emissions

5.3.1 Applicable Standard

According to FCC §15.205 and IC RSS-210 §2.2, Restricted bands of operation

(a) Except as shown in §15.205 paragraphs (d), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz	GHz
0.090 – 0.110	8.291 – 8.294	16.69475 – 16.69525	156.7 – 156.9	1435 – 1626.5	3.332 – 3.339	10.6 – 12.7
0.495 – 0.505	8.362 – 8.366	25.5 – 25.67	162.0125 –167.17	1645.5 – 1646.5	3.3458 – 3.358	13.25 – 13.4
2.1735 – 2.1905	8.37625 – 8.38675	37.5 – 38.25	167.72 – 173.2	1660 – 1710	3.600 – 4.400	14.47 – 14.5
4.125 – 4.128	8.41425 – 8.41475	73 – 74.6	240 – 285	1718.8 – 1722.2	4.5 – 5.15	15.35 – 16.2
4.17725 – 4.17775	12.29 – 12.293	74.8 – 75.2	322 – 335.4	2200 – 2300	5.35 – 5.46	17.7 – 21.4
4.20725 – 4.20775	12.51975 – 12.52025	108 – 121.94	399.9 – 410	2310 – 2390	7.25 – 7.75	22.01 – 23.12
6.215 – 6.218	12.57675 – 12.57725	123 – 138	608 – 614	2483.5 – 2500	8.025 – 8.5	23.6 – 24.0
6.26775 – 6.26825	13.36 – 13.41	149.9 – 150.05	960 – 1240	2690 – 2900	9.0 – 9.2	31.2 – 31.8
6.31175 – 6.31225	16.42 – 16.423	156.52475 – 156.52525	1300 – 1427	3260 – 3267	9.3 – 9.5	36.43 – 36.5
						Above 38.6

(b) Except as provided in 15.205 paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e), regardless of the field strength limits specified elsewhere in this Subpart, the provisions of this Section apply to emissions from any intentional radiator.

As per FCC §15.209 Radiated emission limits, general requirements.

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

*** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.*

According to 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 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))

IC RSS-Gen §4.9 the measurement method shall be described in the test report. The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements. The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

5.3.2 Test Procedure

The Rohde & Schwarz ESU40 spectrum analyzer was used as a measuring meter. The built in preamplifier was used to increase the sensitivity of the instrument from 30 MHz to 1 GHz. Above 1GHz, the receiver's internal preamplifier was disabled and external preamplifiers were used as noted in the equipment list. The EMI receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the EMI receiver records the highest measured reading over all the sweeps. The built in quasi-peak and average detectors were used only for those readings which are marked accordingly on the data sheets. The effective measurement bandwidth used for the radiated emissions test was 120 kHz from 30 MHz to 1 GHz and 1 MHz from 1 GHz to 25 GHz.

Broadband BiConiLog and horn antennas were used as transducers during the measurement. The BiConiLog antenna was used from 30 MHz to 1000 MHz and the two horn antennas were used from 1 GHz to 18 GHz and 18GHz to 25GHz. The frequency spans were wide (30 MHz to 88 MHz, 88 MHz to 216 MHz, 216 MHz to 300 MHz, 300 MHz to 1 GHz, 1 GHz to 18 GHz, and 18GHz to 26 GHz) during preliminary investigations. The final data was taken with a frequency span of 1 MHz. Furthermore, the frequency span was reduced during the preliminary investigations as deemed necessary.

The 5 meter semi-anechoic chamber of Electro Magnetic Test, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 2003. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength).

The presence of non EUT signals was verified by turning the EUT off. In case a non EUT signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did

not exist. This ensures that the other signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance from 30 MHz to 25 GHz to obtain final test data.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz/VBW = 300 kHz/Sweep = Auto

Above 1000 MHz:

Peak: RBW = 1MHz/VBW = 1MHz/Sweep = Auto
Average: RBW = 1MHz/VBW = 10Hz/Sweep = Auto

Calculation ff Radiated Emission Test Data:

Amplitude - Gain + Antenna Factor + Cable Loss = Corrected Amplitude
Corrected Amplitude - Limit = Margin

Associated with the radiated emission test data in this report is a ±4.5dB measurement uncertainty.

5.3.3 Test Environmental Conditions

Temperature:	21.1 ~23.2℃
Relative Humidity:	48~49%
ATM Pressure:	101.2~102.3kPa

**Testing was performed on 2011-06-30~2011-07-01 and 2011-07-05*

5.3.4 Test Result

In pre-scan, the EUT has the worst margin in basic mode.

30-1000MHz

Frequency (MHz)	Corrected QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
938.100000	27.7	309.0	H	14.0	28.0	-18.30	46.00	LOW Channel
910.110000	27.1	159.0	H	115.0	27.6	-18.90	46.00	MIDDLE Channel
941.820000	27.3	180.0	V	51.0	27.7	-18.70	46.00	High Channel

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1-25GHz

Frequency (MHz)	Corrected Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
9608.5867	53	150	H	138	11.4	-1	54.00	LOW Channel
4882.4	48.5	200	H	17	5.8	-5.5	54.00	MIDDLE Channel
12400.827	53.4	150	H	6	15.8	-0.6	54.00	High Channel

Please see the datasheets in Appendix A for the measurement results.

5.4 20dB bandwidth Test

5.4.1 Applicable Standard

According to FCC§15.247(a)(l), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

According to IC RSS-210 §A8.1 (d), the frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

5.4.2 Test Procedure

(1) Connect the antenna port to the Spectrum Analyzer, and set the Spectrum Analyzer as RBW=30kHz,VBW≥RBW,Sweep time=Auto, Detector Function=Peak
(2) The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission.
(3) The above procedure shall be repeated at the low, the middle, and the high frequency of the stated frequency range with modulated mode, and also shall be performed at different modes of operation.

5.4.3 Test Environmental Conditions

Temperature:	21.1 ~23.0ºC
Relative Humidity:	48~49%
ATM Pressure:	101.2~102.3kPa

**Testing was performed on 2011-06-30~2011-06-31*

5.4.4 Test Result

Channel	Frequency(MHz)	20 dB Channel Bandwidth(kHz)
Low	2402	189.102
Mid	2441	185.897
High	2480	192.307

Please see the datasheets in Appendix A for the measurement results.

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5.5 Hopping Channel Separation

5.5.1 Applicable Standard

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

According to IC RSS-210 §A8.1 (b), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

5.5.2 Test Procedure

(1) Connect the antenna port to the Spectrum Analyzer, and set the Spectrum Analyzer as RBW=100kHz,VBW≥RBW,Sweep time=Auto, Detector Function=Peak
(2) The EUT should be transmitting at its maximum data rate. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.
(3) The above procedure shall be repeated at the low, the middle, and the high frequency of the stated frequency range with modulated mode, and also shall be performed at different modes of operation.

5.5.3 Test Environmental Conditions

Temperature:	21.1 ~23.0℃
Relative Humidity:	48~49%
ATM Pressure:	101.2~102.3kPa

**Testing was performed on 2011-06-30~2011-06-31*

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5.5.4 Test Result

Channel	Frequency (MHz)	Measured Channel Separation (kHz)	Limit > 2/3 20 dB BW (kHz)
Low	2402	1000	126.068
Mid	2441	1000	123.931
High	2480	1000	128.204

Please see the datasheets in Appendix A for the measurement results.

5.6 Number of Hopping Frequency Test

5.6.1 Applicable Standard

According to FCC§15.247(a)(1)(iii) and IC RSS-210 §A8.1(d), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.6.2 Test Procedure

(1) Connect the antenna port to the Spectrum Analyzer , set the Spectrum Analyzer as RBW=100kHz,VBW≥RBW,Sweep time=Auto, Detector Function=Peak Trace=Maxhold
(2) The EUT should have its hopping function enabled. Maxhold and record hopping channels. It may be necessary to break the span to sections, in order to clearly show all of the hopping frequencies.

5.6.3 Test Environmental Conditions

Temperature:	23.7℃
Relative Humidity:	44%
ATM Pressure:	102.7kPa

**Testing was performed on 2011-07-01*

5.6.4 Test Result

EUT has total 79 channels. Please see the datasheets in Appendix A for the measurement results.

5.7 Dwell Time

5.7.1 Applicable Standard

According to FCC §15.247(a)(1)(iii) and IC RSS-210 §A8.1 (d), Frequency hopping systems in the 2400-2483.5 MHz band shall have the average time of occupancy on any channel less than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

5.7.2 Test Procedure

(1) Connect the antenna port of the EUT to spectrum analyzer and set it in transmitting mode.
(2) Set the center frequency of spectrum analyzer as operating frequency.
(3) Set the spectrum analyzer as RBW=1MHz, VBW=1MHz, Span=0Hz, Sweep Time is more than once pulse time.
(4) Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
(5) The above procedure shall be repeated at the low, the middle, and the high frequency of the stated frequency range with modulated mode, and also shall be performed at different modes of operation.

5.7.3 Test Environmental Conditions

Temperature:	23.7ºC
Relative Humidity:	44%
ATM Pressure:	102.7kPa

**Testing was performed on 2011-07-01*

5.7.4 Test Result

Dwell time = Pulse time*(hop rate /6 / #of channels)*0.4 sec * # of channels

- Hop Rate = 800
- Number of Channels = 79
- Modulation type: DH5 package size 1021 bytes

Channel	Frequency (MHz)	Pulse Width (ms)	Dwell Time (Sec.)	Limit (Sec.)	Results
Low	2402	3.11	0.166	0.4	Compliant
Mid	2441	3.12	0.167	0.4	Compliant
High	2480	3.11	0.166	0.4	Compliant

Please see the datasheets in Appendix A for the measurement results.

5.8 Maximum Peak Output Power Test

5.8.1 Applicable Standard

According to FCC §15.247(b)(1), for frequency hopping systems in the 2400-2483.5MHz band employing at least 75 hopping channels, and all direct sequence systems, the maximum peak output power of the transmitter shall not exceed 1 Watt. For all other frequency hopping system in the 2400 – 2483.5 MHz band, the maximum peak output power of the transmitter shall not exceed 0.125 Watt.

According to IC RSS-210 §A8.1(b), for frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

According to IC RSS-210 §A8.4 (2), for frequency hopping systems operating in the band 2400-2483.5MHz employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125W.

5.8.2 Test Procedure

(1) Connected the antenna port to the Spectrum Analyzer, set the Spectrum Analyzer as RBW=1MHz,VBW≥RBW,Sweep time=Auto, Detector Function=Peak
(2) The EUT transmits at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.
(3) Calculate the output power according to the following formula:
Output Power = Reading + Cable loss + Atten loss + Antenna Gain
(4) The above procedure shall be repeated at the lowest, the middle, and the highest frequency of the stated frequency range with modulated mode, and also shall be performed at different modes of operation.

5.8.3 Test Environmental Conditions

Temperature:	24.0℃
Relative Humidity:	48%
ATM Pressure:	103.1~103.3kPa

**Testing was performed on 2011-07-07*

5.8.4 Test Result

Channel	Frequency (MHz)	Reading (dBm)	Cable loss (dB)	Antenna Gain (dBi)	Max Peak Output Power		Limit (mw)
					(dBm)	(mw)	
Low	2402	5.80	0.2	2.1	8.10	6.46	1000
Mid	2441	5.68	0.2	2.1	7.98	6.28	1000
High	2480	5.72	0.2	2.1	8.02	6.34	1000

Please see the datasheets in Appendix A for the measurement results.

5.9 Band Edge Compliance Test

5.9.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. 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 Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

According to IC RSS-210 §A8.5 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

5.9.2 Test Procedure

(1) Connect the antenna port to the Spectrum Analyzer, and set the Spectrum Analyzer as RBW=100kHz,VBW≥RBW,Sweep time=Auto, Detector Function=Peak
(2) The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. And then mark the band edge Level.
(3) The above procedure shall be repeated at the lowest, and the highest frequency of the stated frequency range with modulated mode.

5.9.3 Test Environmental Conditions

Temperature:	24.0℃
Relative Humidity:	48%
ATM Pressure:	103.1~103.3kPa

**Testing was performed on 2011-07-07*

5.9.4 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

5.10 Spurious Emission at Antenna Port

5.10.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. 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 Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

According to IC RSS-210 §A8.5 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

5.10.2 Test Procedure

(1) Connect the antenna port to the Spectrum Analyzer, and set the Spectrum Analyzer as RBW=100kHz,VBW≥RBW,Sweep time=Auto, Detector Function=Peak
(2) The EUT should be transmitting at its maximum data rate. Maxhold signal. Then, set receiver on View mode and record the data.
(3) The above procedure shall be repeated at the lowest, the middle, and the highest frequency of the stated frequency range with modulated mode, and also shall be performed at different modes of operation.

5.10.3 Test Environmental Conditions

Temperature:	21.1 ~23.0ºC
Relative Humidity:	48~49%
ATM Pressure:	101.2~102.3kPa

**Testing was performed on 2011-06-30~2011-06-31*

5.10.4 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

5.11 Receiver Spurious Emission

5.11.1 Applicable Standard

According to IC RSS-Gen §4.10 & RSS-210 §2.6,

General Field Strength Limits for Transmitters and Receivers at Frequencies above 30 MHz

Frequency (MHz)	Field Strength microvolts/m at 3 meters (watts, e.i.r.p.)	
	Transmitters	Receivers
30 - 88	100 (3 nW)	100 (3 nW)
88 - 216	150 (6.8 nW)	150 (6.8 nW)
216 - 960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

5.11.2 Test Procedure

The Rohde & Schwarz ESU40 spectrum analyzer was used as a measuring meter. The built in preamplifier was used to increase the sensitivity of the instrument from 30 MHz to 1 GHz. Above 1GHz, the receiver's internal preamplifier was disabled and external preamplifiers were used as noted in the equipment list. The EMI receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the EMI receiver records the highest measured reading over all the sweeps. The built in quasi-peak and average detectors were used only for those readings which are marked accordingly on the data sheets. The effective measurement bandwidth used for the radiated emissions test was 120 kHz from 30 MHz to 1 GHz and 1 MHz from 1 GHz to 25 GHz.

Broadband BiConiLog and horn antennas were used as transducers during the measurement. The BiConiLog antenna was used from 30 MHz to 1000 MHz and the two horn antennas were used from 1 GHz to 18 GHz and 18GHz to 25GHz. The frequency spans were wide (30 MHz to 88 MHz, 88 MHz to 216 MHz, 216 MHz to 300 MHz, 300 MHz to 1 GHz, 1 GHz to 18 GHz, and 18GHz to 26 GHz) during preliminary investigations. The final data was taken with a frequency span of 1 MHz. Furthermore, the frequency span was reduced during the preliminary investigations as deemed necessary.

The 5 meter semi-anechoic chamber of Electro Magnetic Test, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 2003. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength).

The presence of non EUT signals was verified by turning the EUT off. In case a non EUT signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the other signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance from 30 MHz to 25 GHz to obtain final test data.

5.11.3 Test Environmental Conditions

Temperature:	21.1 ~23.0ºC
Relative Humidity:	49%
ATM Pressure:	101.2~102.3kPa

**Testing was performed on 2011-06-30~2011-06-31*

5.114 Test Result

The EUT meets the requirements. Below 1GHz, the Low channel has the worst average margin of 18.7 at 908.88MHz in the Horizontal polarization of antenna with 120V/60Hz. Above 1 GHz, all emission levels are at the noise floor and/or more then 20 dB below the limit. Please see the datasheets in Appendix A for the measurement results.

5.12 RF Exposure

5.12.1 Applicable Standard

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Before equipment certification is granted, the procedure of RSS-102 must be followed concerning the exposure of humans to RF fields.

According to IC RSS-102 Issue 2 section 4.1, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Averaging Time (Minutes)
0.003 - 1	280	2.19	-	6
1 - 10	280 / f	2.19 / f	-	6
10 - 30	28	2.19 / f	-	6
30 – 300	28	0.073	2*	6
300 – 1 500	$1.585\ f^{0.5}$	$0.0042\ f^{0.5}$	f / 150	6
1 500 – 15 000	61.4	0.163	10	6
15 000 – 150 000	61.4	0.163	10	$616000 / f^{1.2}$
150 000- 300 000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000 / f^{1.2}$

Note: *f* is frequency in MHz
* Power density limit is applicable at frequencies greater than 100 MHz

5.12.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal (dBm):	5.80
Maximum peak output power at antenna input terminal (mW):	3.80
Prediction distance (cm):	20
Prediction frequency (MHz):	2402
Maximum Antenna Gain, typical (dBi):	2.1
Maximum Antenna Gain (numeric):	1.585
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.001198
Power density of prediction frequency at 20.0 cm (W/m^2):	0.01198
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	10

5.12.3 Test Result

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.001198 mW/cm^2 (0.01198 W/m^2).Limit is 1 mW/cm^2 (10 W/m^2).

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6. CONCLUSIONS / COMPLIANCE STATEMENT

Based upon the results contained in this report, Electro Magnetic Test, Inc. has determined that the Equipment under test identified in this report meets the specification limits defined by the FCC and IC RSS requirements. And it is applicable only to the tested sample identified in the report.

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APPENDIX A

RADIATED AND CONDUCTED DATA SHEETS

EMT ELECTRO MAGNETIC TEST, INC.
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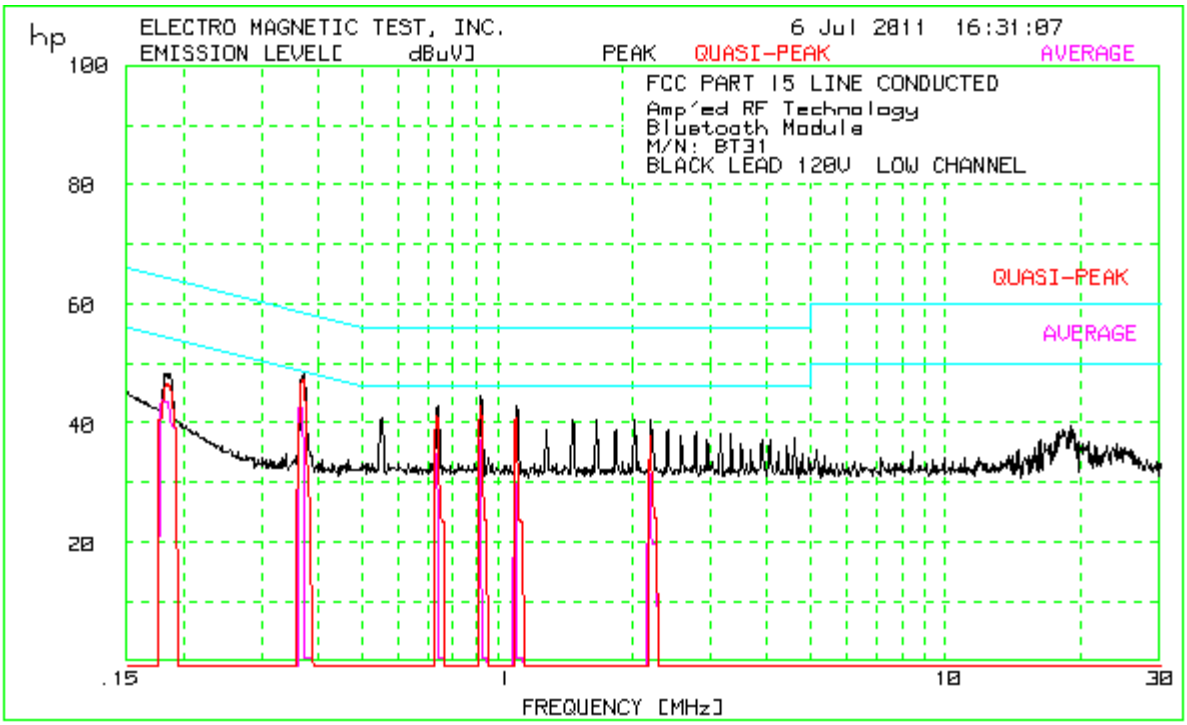
1) Power Line Conducted Emission

Low Channel 120 V/60 Hz, Line:



ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

==========
ELECTRO MAGNETIC TEST, INC. 6 Jul 2011 16:31:07
==========
1. CONDUCTED WITH PRESELECTOR
1.22 FCC PART 15 LINE CONDUCTED
==========
6 highest Quasi-Peaks above -30 dB of Limit Line #1
peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.3689	47.2	-11.3
2	0.9216	42.8	-13.2
3	0.734	41.1	-14.9
4	1.103	40.7	-15.3
5	0.1834	46.4	-17.9
6	2.196	37.7	-18.3

==========
ELECTRO MAGNETIC TEST, INC. 6 Jul 2011 16:31:07
==========
1. CONDUCTED WITH PRESELECTOR
1.22 FCC PART 15 LINE CONDUCTED
==========
6 highest Avg Peaks above -30 dB of Limit Line #2
peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.3669	42.6	-5.9
2	0.9119	38.1	-7.9
3	1.098	35.5	-10.5
4	0.1796	43.9	-10.6
5	0.7301	34.7	-11.3
6	2.184	31.6	-14.4

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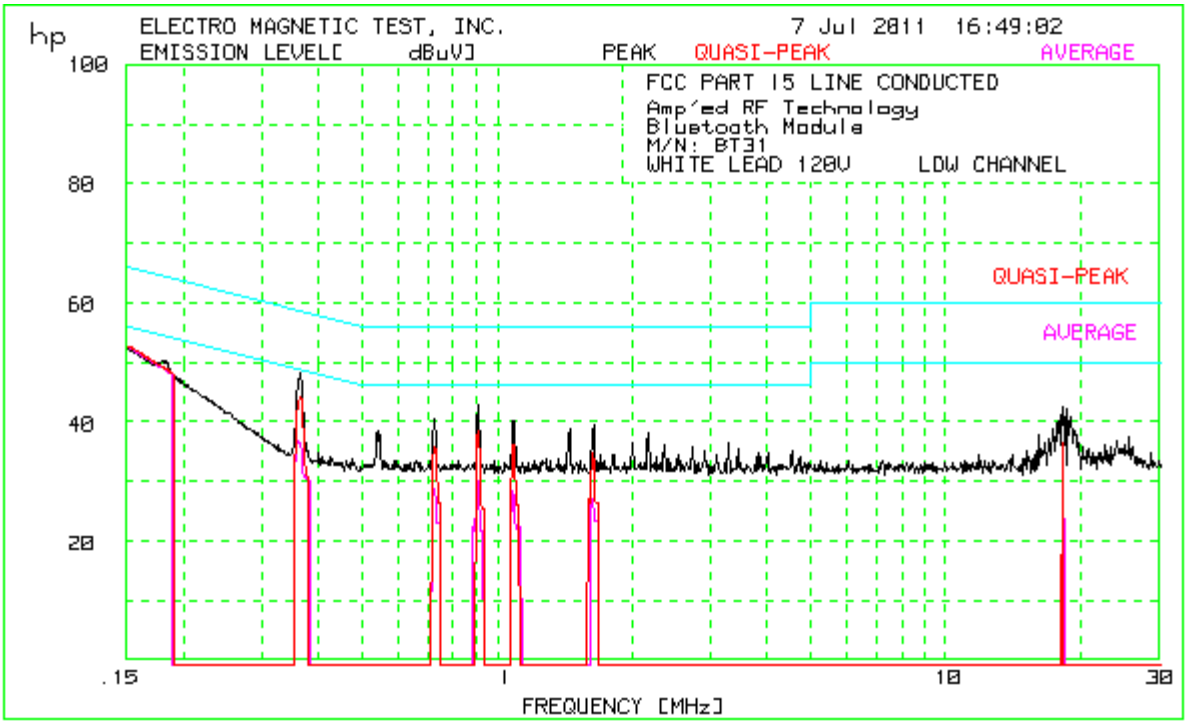
Low Channel 120 V/60 Hz, Neutral:



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1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

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ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 16:49:02

==========

1. CONDUCTED WITH PRESELECTOR

1.22 FCC PART 15 LINE CONDUCTED

==========

6 highest Quasi-Peaks above -40 dB of Limit Line #1

peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.365	44	-14.6
2	0.9071	38.5	-17.5
3	1.092	36.1	-19.9
4	0.7263	35.6	-20.4
5	1.632	34.8	-21.2
6	18.14	36.5	-23.5

==========

ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 16:49:02

==========

1. CONDUCTED WITH PRESELECTOR

1.22 FCC PART 15 LINE CONDUCTED

==========

6 highest Avg Peaks above -40 dB of Limit Line #2

peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.3592	36.7	-12
2	0.9071	30.1	-15.9
3	0.7225	28.6	-17.4
4	1.086	28.2	-17.8
5	1.632	27.1	-18.9
6	0.8834	22.2	-23.8

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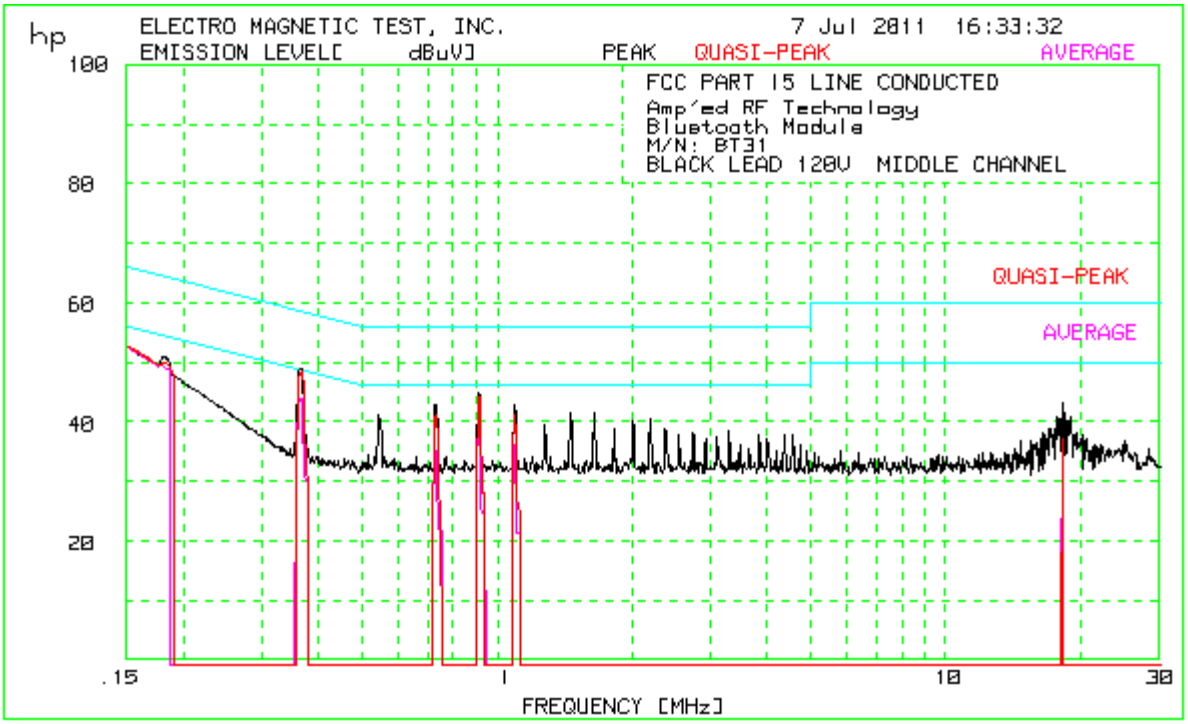
Middle Channel 120 V/60 Hz, Line:



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==========

ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 16:33:32

==========

1. CONDUCTED WITH PRESELECTOR

1.22 FCC PART 15 LINE CONDUCTED

==========

6 highest Quasi-Peaks above -30 dB of Limit Line #1

peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.3669	48.5	-10
2	0.9119	44.2	-11.8
3	0.1796	50	-14.5
4	1.098	41.2	-14.8
5	0.7301	41.1	-14.9
6	18.14	37.2	-22.8

==========

ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 16:33:32

==========

1. CONDUCTED WITH PRESELECTOR

1.22 FCC PART 15 LINE CONDUCTED

==========

6 highest Avg Peaks above -30 dB of Limit Line #2

peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.365	43.8	-4.8
2	0.1786	49.5	-5
3	0.3611	43.7	-5
4	0.9119	39.4	-6.6
5	1.092	36.2	-9.8
6	0.7301	35.2	-10.8

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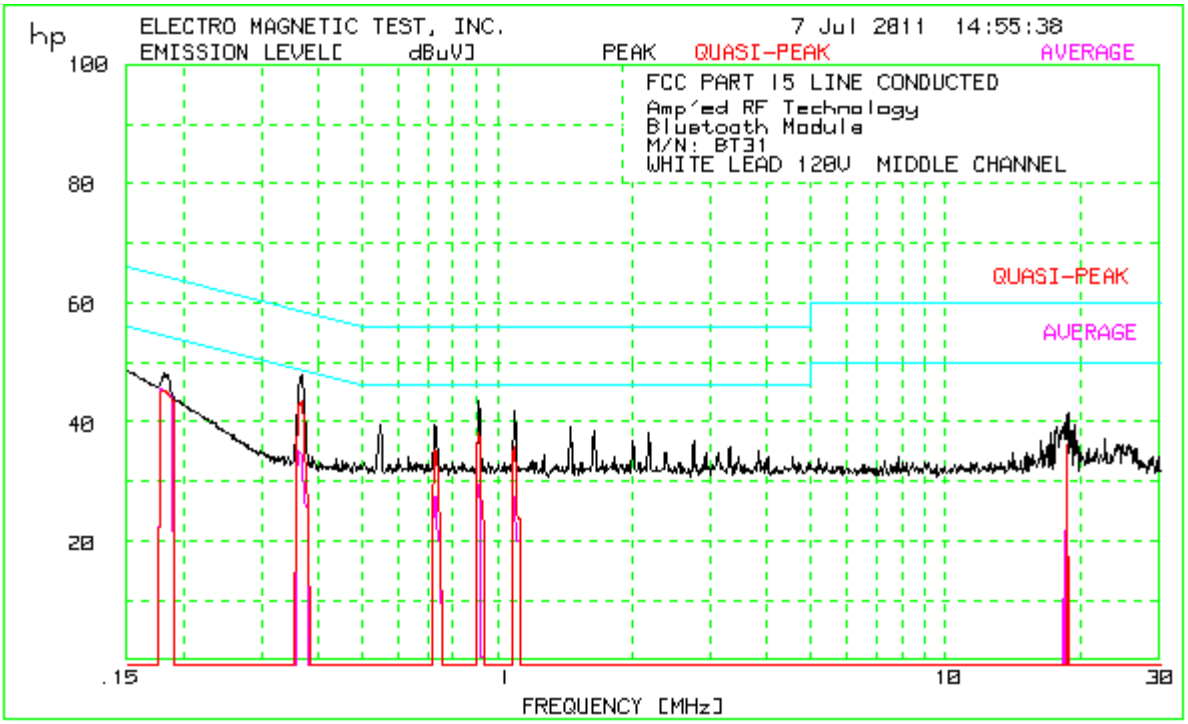
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Middle Channel 120 V/60 Hz, Neutral:



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1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

==========
ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 14:55:38
==========
1. CONDUCTED WITH PRESELECTOR
1.22 FCC PART 15 LINE CONDUCTED
==========
6 highest Quasi-Peaks above -40 dB of Limit Line #1
peak criteria = .1 dB

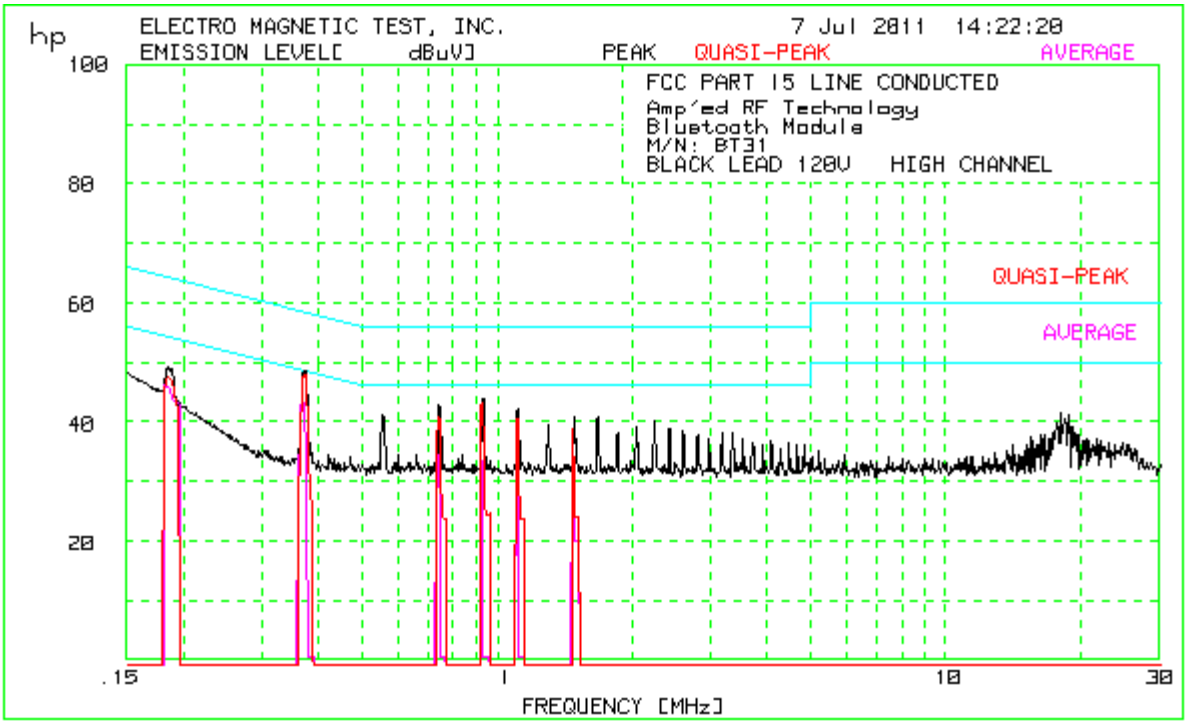
PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.3669	43.3	-15.2
2	0.9119	38.2	-17.8
3	0.1796	45.2	-19.3
4	1.092	35.7	-20.3
5	0.7301	35.2	-20.8
6	18.63	36.1	-23.9

==========
ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 14:55:38
==========
1. CONDUCTED WITH PRESELECTOR
1.22 FCC PART 15 LINE CONDUCTED
==========
6 highest Avg Peaks above -40 dB of Limit Line #2
peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.1777	45.6	-8.9
2	0.3611	34.9	-13.8
3	0.9119	29.2	-16.8
4	0.7263	27.3	-18.7
5	1.092	27.3	-18.7
6	0.7497	19.8	-26.2

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

High Channel 120 V/60 Hz, Line:



ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

==========

ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 14:22:20

==========

1. CONDUCTED WITH PRESELECTOR

1.22 FCC PART 15 LINE CONDUCTED

==========

6 highest Quasi-Peaks above -20 dB of Limit Line #1

peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.3728	47.8	-10.6
2	0.9265	43	-13
3	0.7418	40.7	-15.3
4	1.109	40.6	-15.4
5	0.1844	47.4	-16.8
6	1.476	38.6	-17.4

==========

ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 14:22:20

==========

1. CONDUCTED WITH PRESELECTOR

1.22 FCC PART 15 LINE CONDUCTED

==========

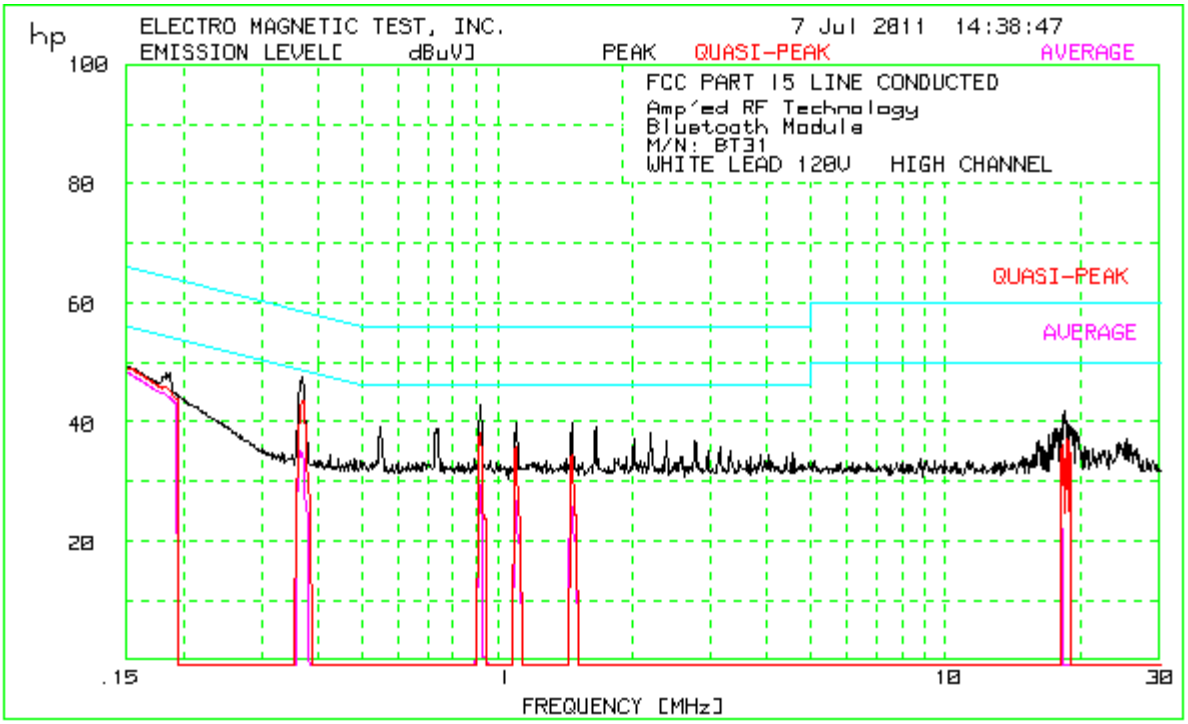
6 highest Avg Peaks above -20 dB of Limit Line #2

peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.3708	43	-5.4
2	0.9216	38.3	-7.7
3	0.1815	46.3	-8.1
4	1.109	35.6	-10.4
5	0.7379	34.5	-11.5
6	1.468	33.4	-12.6

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

High Channel 120 V/60 Hz, Neutral:



ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

==========
ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 14:38:47
==========
1. CONDUCTED WITH PRESELECTOR
1.22 FCC PART 15 LINE CONDUCTED
==========
6 highest Quasi-Peaks above -40 dB of Limit Line #1
peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.3689	43.4	-15.1
2	0.9168	38.2	-17.8
3	0.1805	45.8	-18.6
4	1.103	35.6	-20.4
5	1.468	34.5	-21.5
6	18.53	37.1	-22.9

==========
ELECTRO MAGNETIC TEST, INC. 7 Jul 2011 14:38:47
==========
1. CONDUCTED WITH PRESELECTOR
1.22 FCC PART 15 LINE CONDUCTED
==========
6 highest Avg Peaks above -40 dB of Limit Line #2
peak criteria = .1 dB

PEAK#	FREQ(MHz)	(dBuV)	DELTA
1	0.365	34.9	-13.7
2	0.9168	29.3	-16.7
3	1.098	27.3	-18.7
4	1.461	25.6	-20.4
5	1.133	19.6	-26.4
6	18.14	21.8	-28.2

EMT ELECTRO MAGNETIC TEST, INC.
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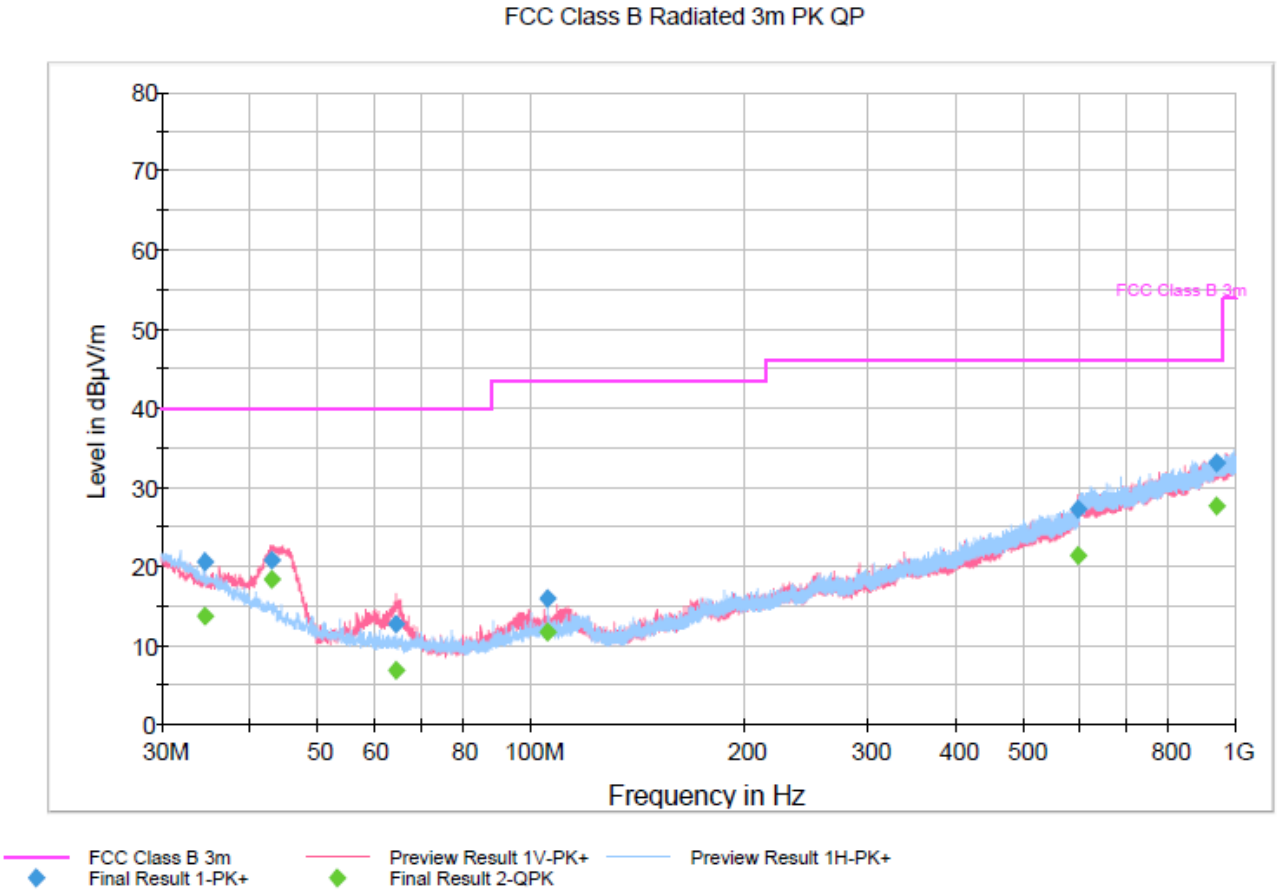
2) Restricted Band and Unwanted Emissions

*** Basic Mode is picked as the worst mode from pre-test.**

30 MHz – 1 GHz:

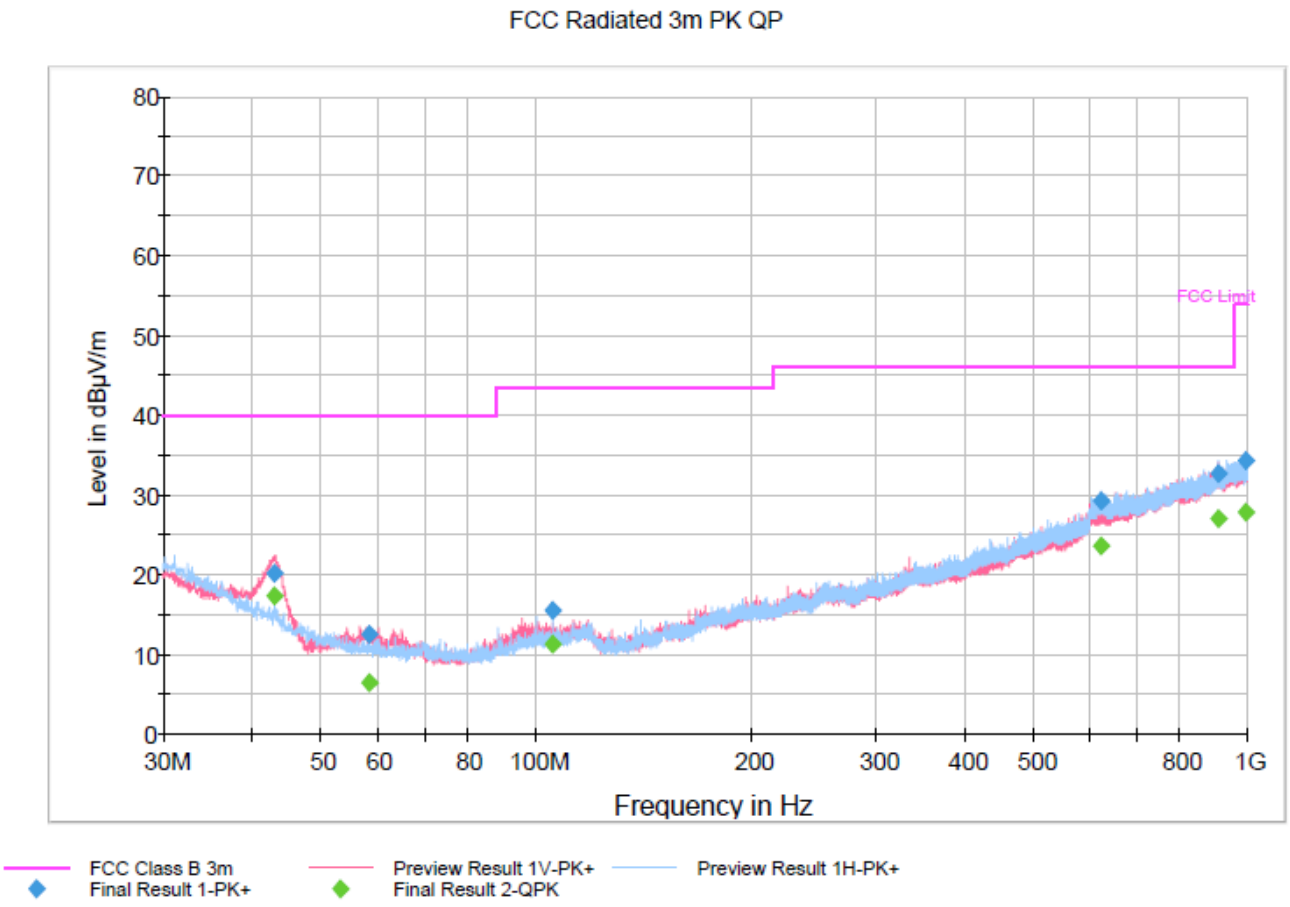
Low Channel (2402 MHz) @ Measured at 3 meter



Frequency (MHz)	Corrected QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
34.440000	13.8	192.0	H	105.0	16.2	-26.20	40.00	
42.930000	18.3	100.0	V	335.0	10.2	-21.70	40.00	
64.590000	6.8	146.0	V	210.0	7.3	-33.20	40.00	
105.720000	11.7	231.0	H	217.0	9.8	-31.80	43.50	
596.310000	21.4	291.0	V	214.0	22.6	-24.60	46.00	
938.100000	27.7	309.0	H	14.0	28.0	-18.30	46.00	

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

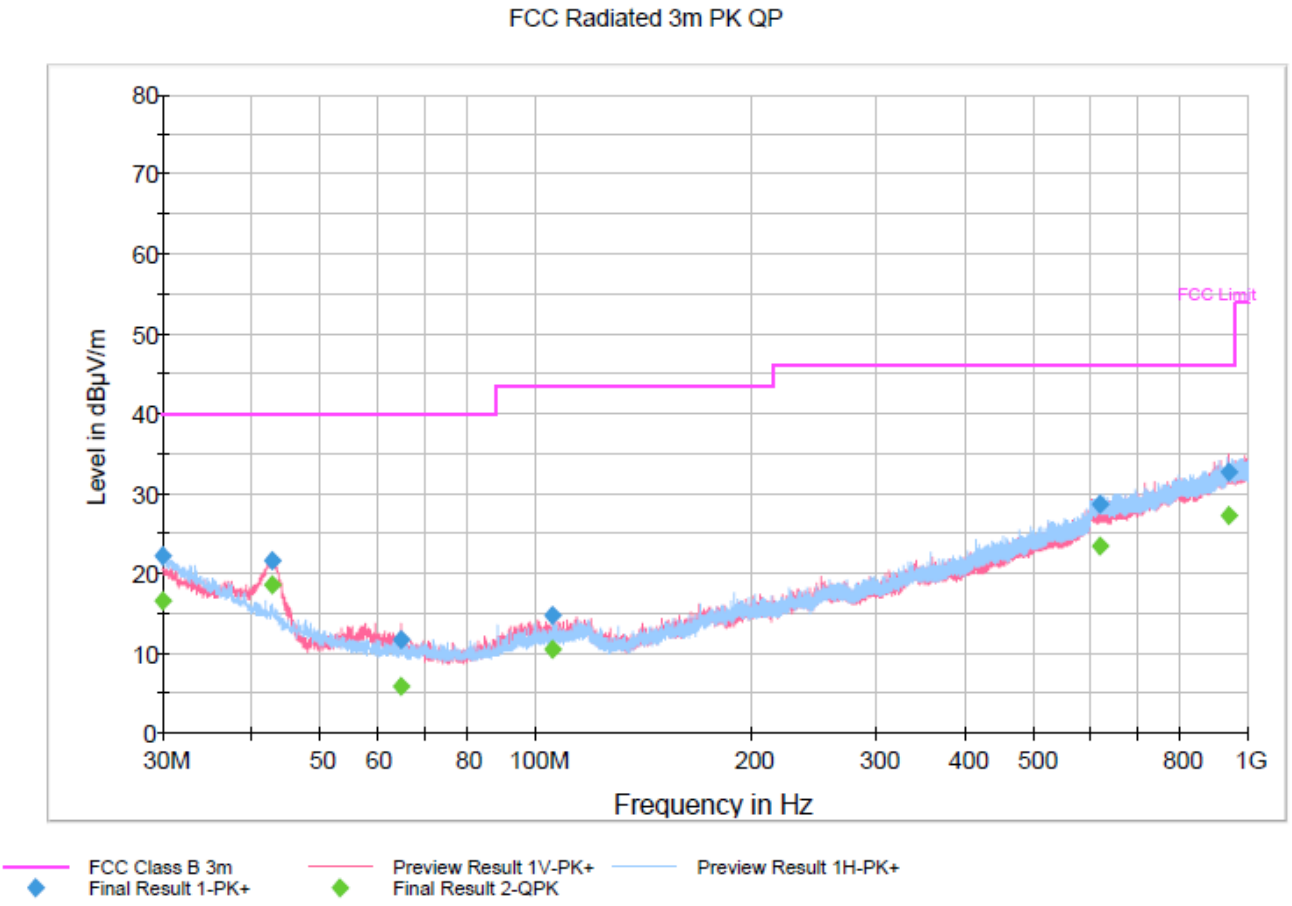
Middle Channel (2441 MHz) @ Measured at 3 meter



Frequency (MHz)	Corrected QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
42.930000	17.4	110.0	V	172.0	10.2	-22.60	40.00	
58.470000	6.5	371.0	V	341.0	8.0	-33.50	40.00	
105.660000	11.4	194.0	H	0.0	9.8	-32.10	43.50	
621.420000	23.6	234.0	H	283.0	23.7	-22.40	46.00	
910.110000	27.1	159.0	H	115.0	27.6	-18.90	46.00	
995.130000	27.9	100.0	V	23.0	28.1	-26.10	54.00	

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

High Channel (2480 MHz) @ Measured at 3 meter



Frequency (MHz)	Corrected QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.060000	16.7	185.0	H	43.0	18.6	-23.30	40.00	
42.720000	18.5	100.0	V	327.0	10.2	-21.50	40.00	
64.860000	5.9	306.0	V	157.0	7.3	-34.10	40.00	
105.690000	10.6	336.0	H	171.0	9.8	-32.90	43.50	
618.720000	23.5	173.0	H	127.0	23.6	-22.50	46.00	
941.820000	27.3	180.0	V	51.0	27.7	-18.70	46.00	

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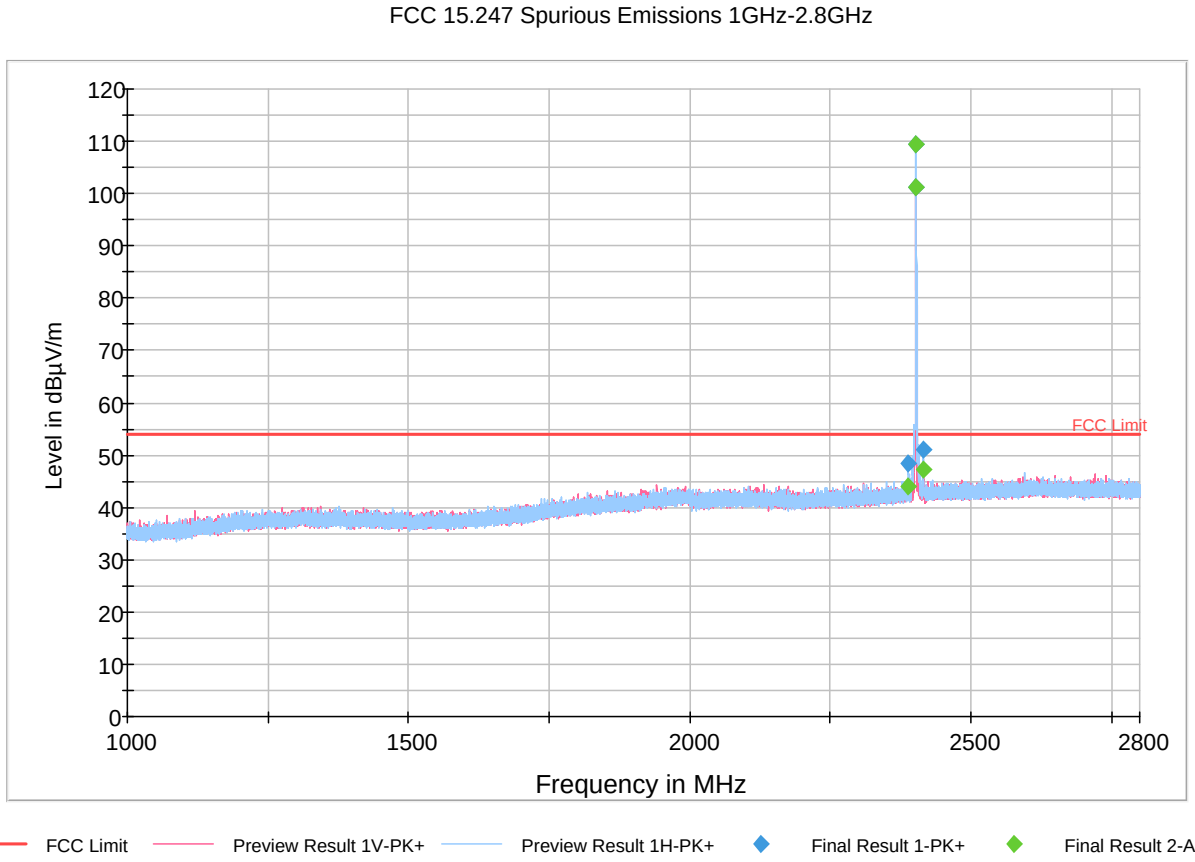
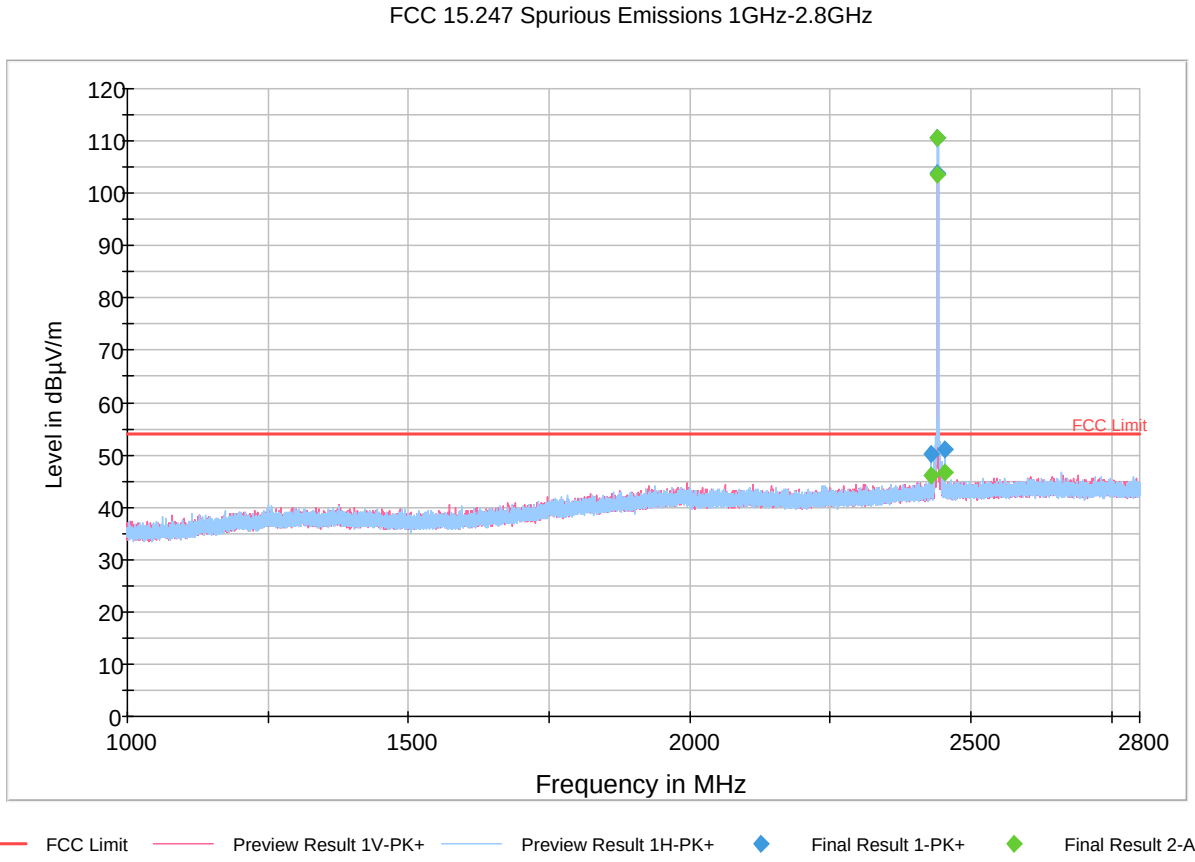
1-2.8GHz:
Low Channel 2402 MHz, measured at 3 meters



Frequency (MHz)	Corrected Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2389.24	44.1	100	H	302	2.3	-9.9	54	
2402.14	101.2	100	V	229	2.4	-	-	Fundamental Frequency
2402.2	109.4	100	H	329	2.4	-	-	Fundamental Frequency
2415.22	47.3	100	H	320	2.4	-6.7	54	

ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

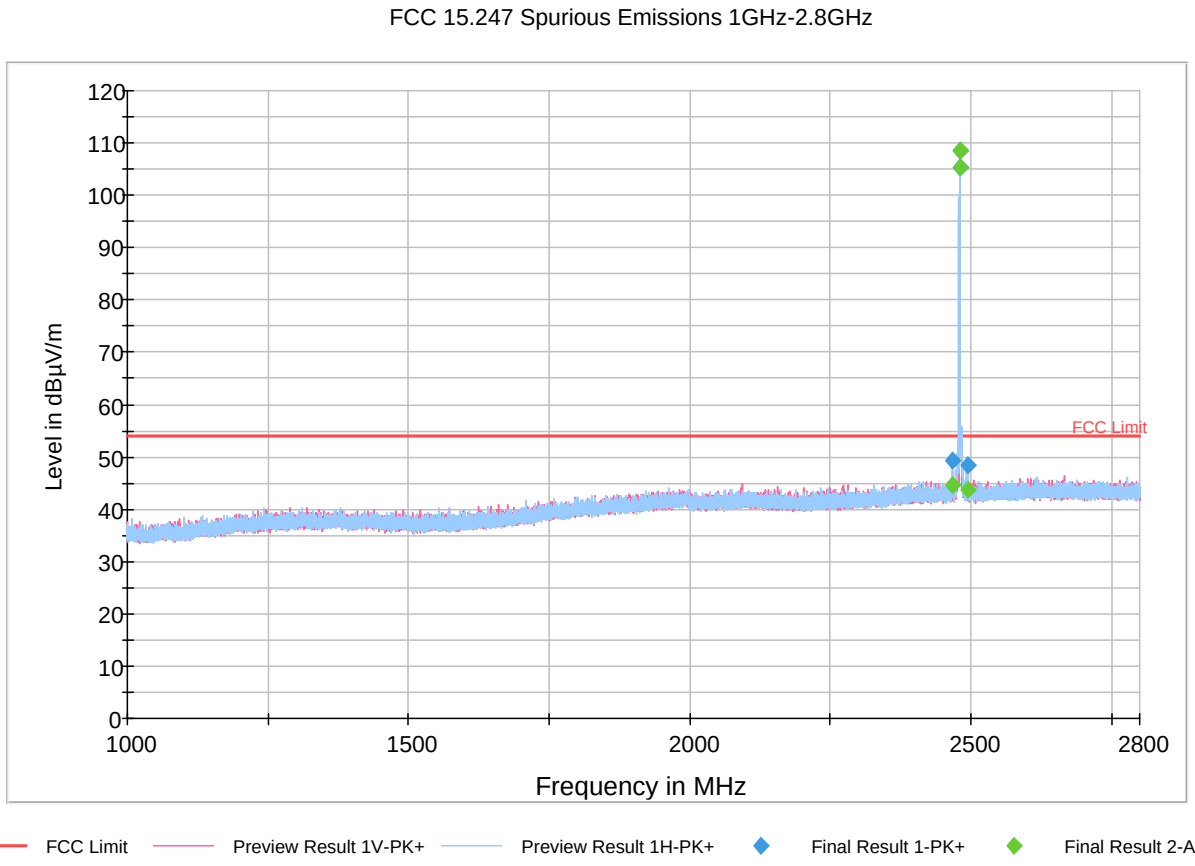
Middle Channel (2441 MHz) @ Measured at 3 meter



Frequency (MHz)	Corrected Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2428.36	46	100	H	317	2.4	-8	54	
2441.2	110.6	100	H	318	2.4	-	-	Fundamental Frequency
2441.32	103.7	111	V	290	2.4	-	-	Fundamental Frequency
2454.22	46.7	100	H	319	2.4	-7.3	54	

ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

High Channel (2480 MHz) @ Measured at 3 meter



Frequency (MHz)	Corrected Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2467.36	44.5	100	H	316	2.5	-9.5	54	
2480.2	108.6	100	H	317	2.5	-	-	Fundamental Frequency
2480.2	105.3	166	V	268	2.5	-	-	Fundamental Frequency
2493.28	43.8	100	H	317	2.6	-10.2	54	

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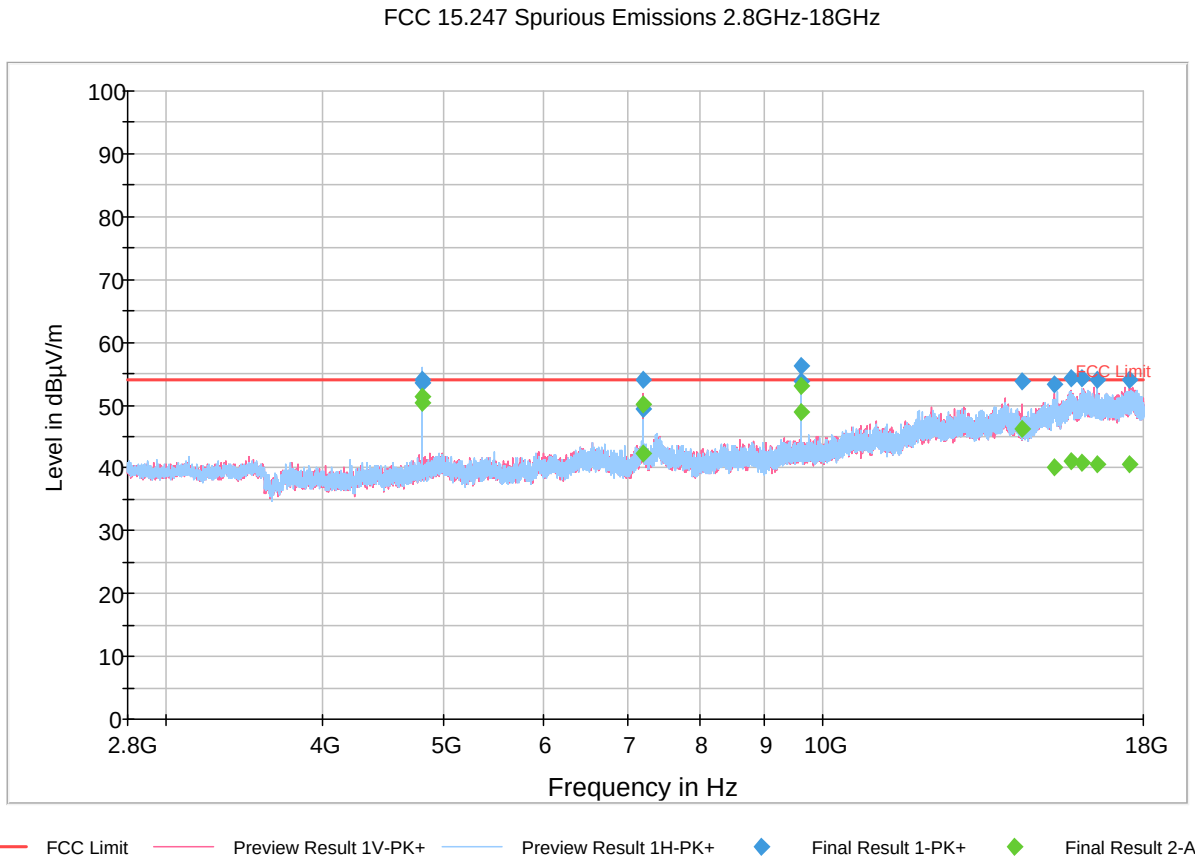
2.8 – 18 GHz:

Low Channel 2402 MHz, measured at 3 meters



Frequency (MHz)	Corrected Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4804.3733	50.4	100	H	112	5.4	-3.6	54	
4804.3733	51.2	150	V	235	5.4	-2.8	54	
7206.48	50.1	150	V	317	8.9	-3.9	54	
7206.48	42.4	200	H	331	8.9	-11.6	54	
9608.5867	53	150	H	138	11.4	-1	54	
9608.5867	49	100	V	193	11.4	-5	54	
14413.307	46.2	100	V	6	17.4	-7.8	54	
15295.92	40.2	250	V	184	19.6	-13.8	54	
15784.347	41.1	250	V	46	21.3	-12.9	54	
16103.04	40.9	250	H	-2	20.8	-13.1	54	
17563.76	40.7	100	V	186	21.1	-13.3	54	

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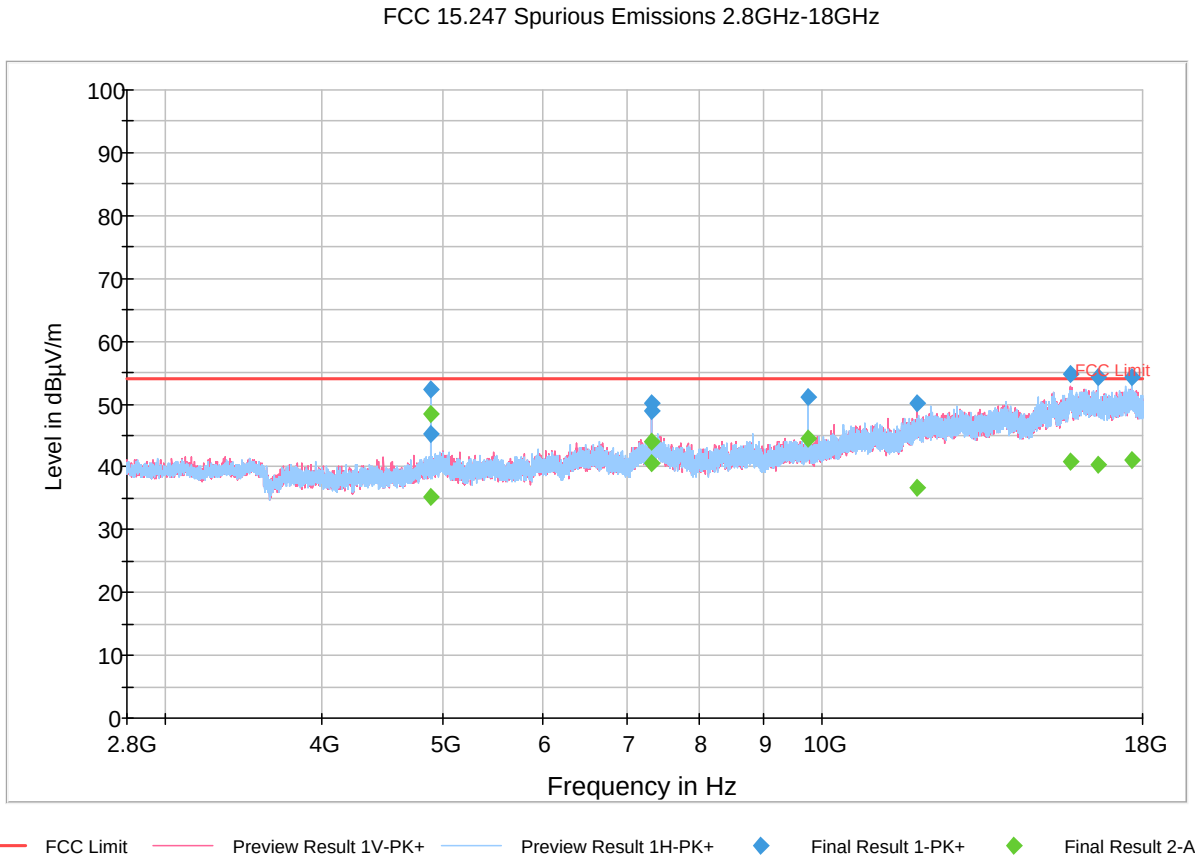
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Middle channel 2441 MHz measured at 3 meters



Frequency (MHz)	Corrected Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4881.8933	35.2	100	V	237	5.8	-18.8	54	
4882.4	48.5	200	H	17	5.8	-5.5	54	
7323.0133	40.6	200	H	192	9.1	-13.4	54	
7323.52	44	150	V	283	9.1	-10	54	
9764.64	44.6	100	H	88	11.7	-9.4	54	
11912.907	36.7	250	V	282	15.3	-17.3	54	
15751.92	40.8	150	V	66	21.4	-13.2	54	
16596.533	40.4	250	H	58	20.6	-13.6	54	
17641.787	41.2	200	V	196	21.4	-12.8	54	

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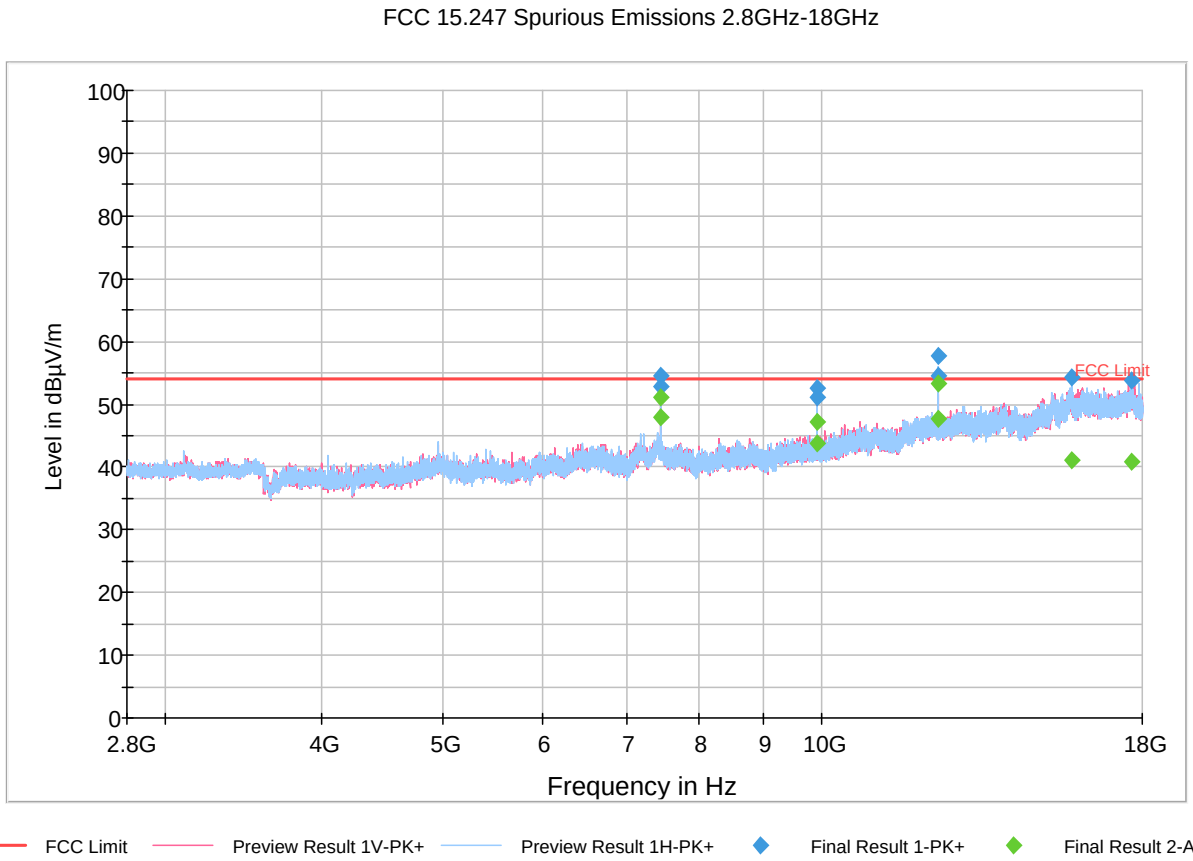
High channel 2480 MHz measured at 3 meters



Frequency (MHz)	Corrected Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
7440.56	47.9	150	H	168	9	-6.1	54	
7440.56	51.1	150	V	327	9	-2.9	54	
9920.6933	47.3	150	H	102	12.2	-6.7	54	
9920.6933	43.8	150	V	86	12.2	-10.2	54	
12400.827	53.4	150	H	6	15.8	-0.6	54	
12400.827	47.7	100	V	-7	15.8	-6.3	54	
15798.027	41	150	H	166	21.1	-13	54	
17624.56	40.8	200	V	227	21.3	-13.2	54	

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18 – 25 GHz:

All emission levels are at the noise floor and/or more then 20 dB below the limit.

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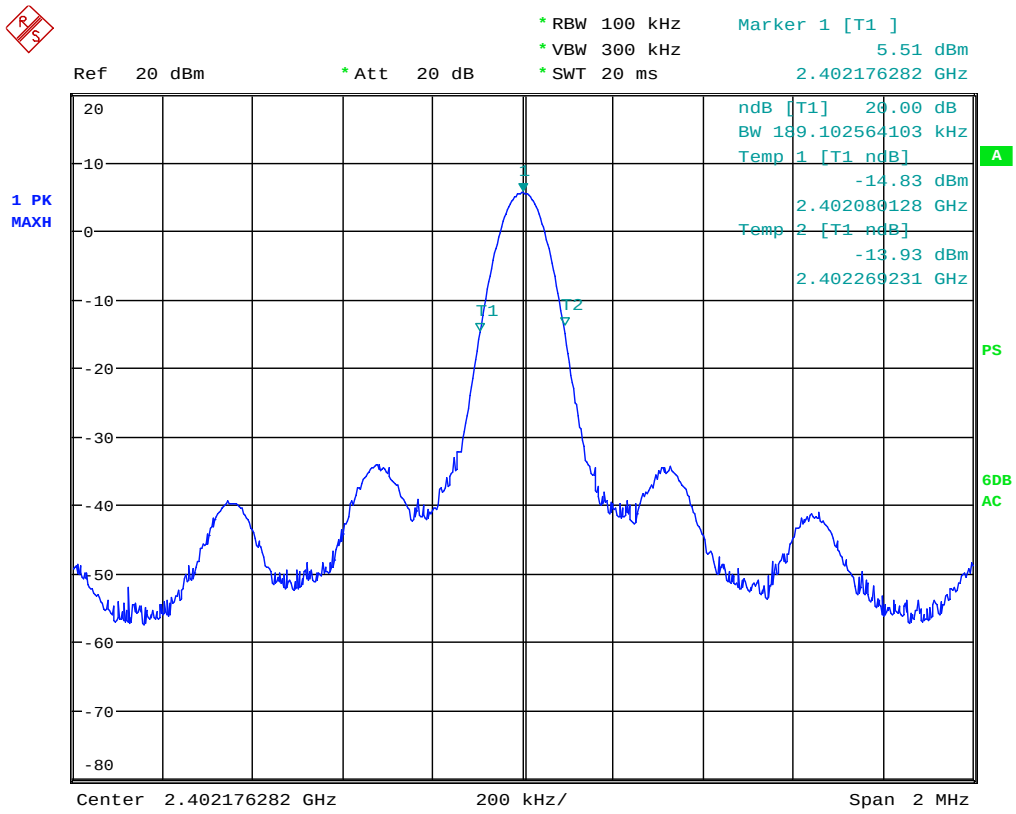
3) 20dB Bandwidth

*** Basic Mode is picked as the worst mode from pre-test.**

Low Channel



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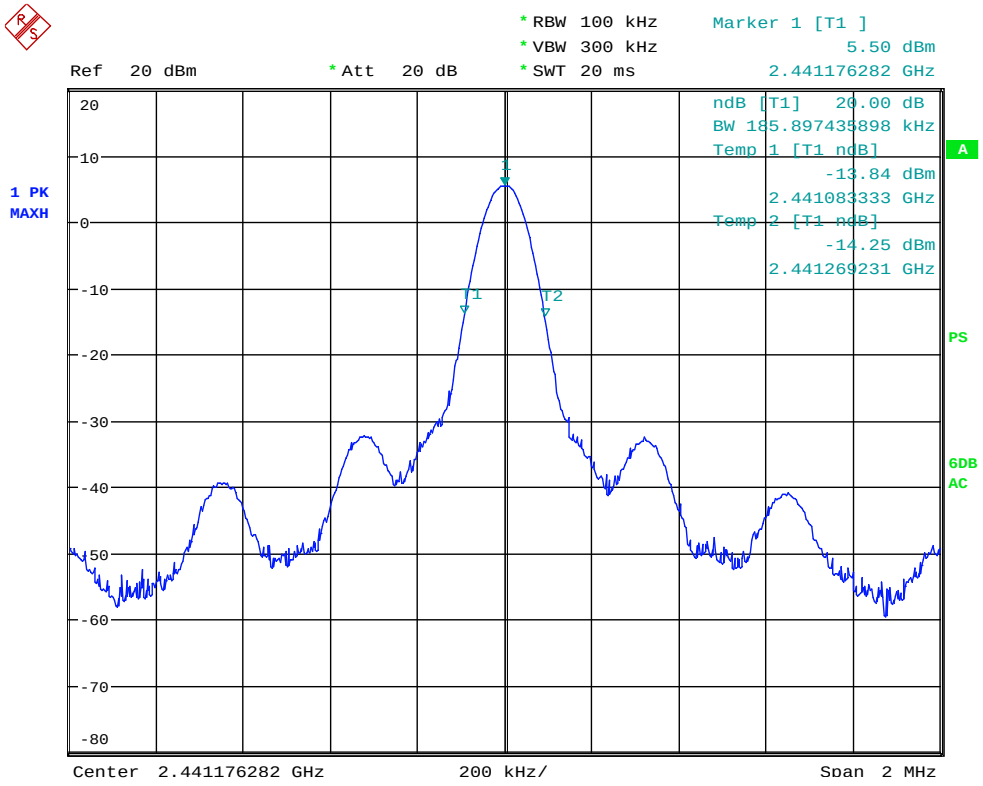
Middle Channel



EMT ELECTRO MAGNETIC TEST, INC.
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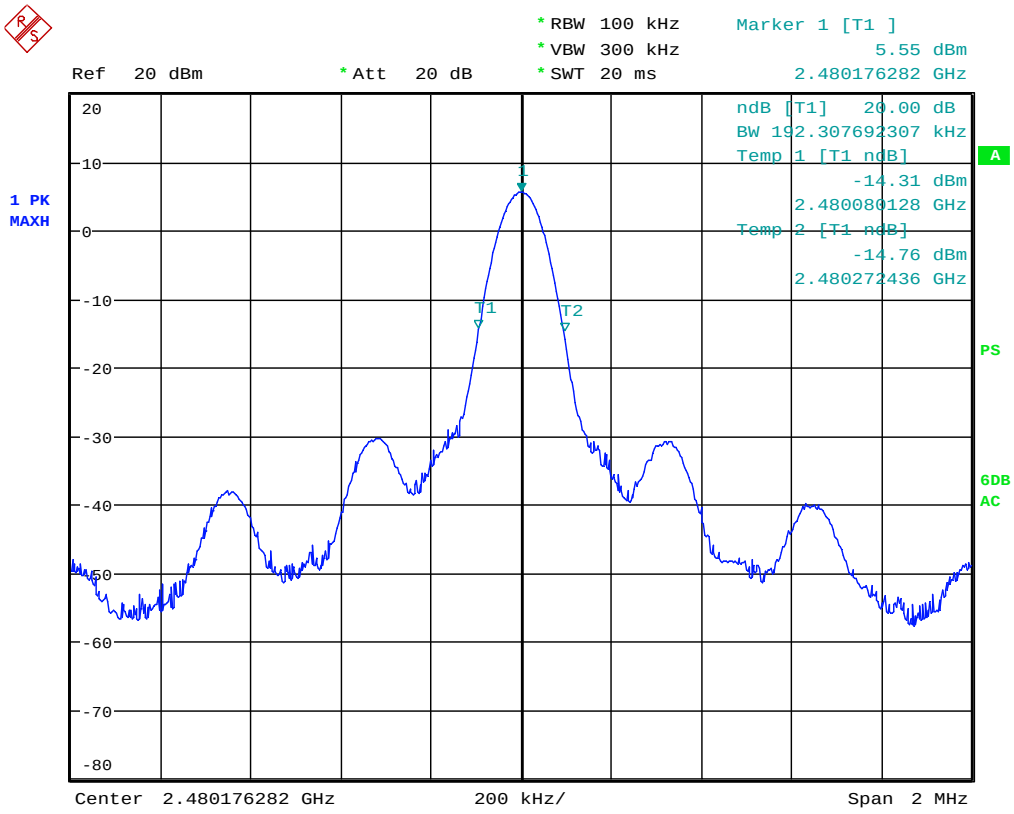
High Channel



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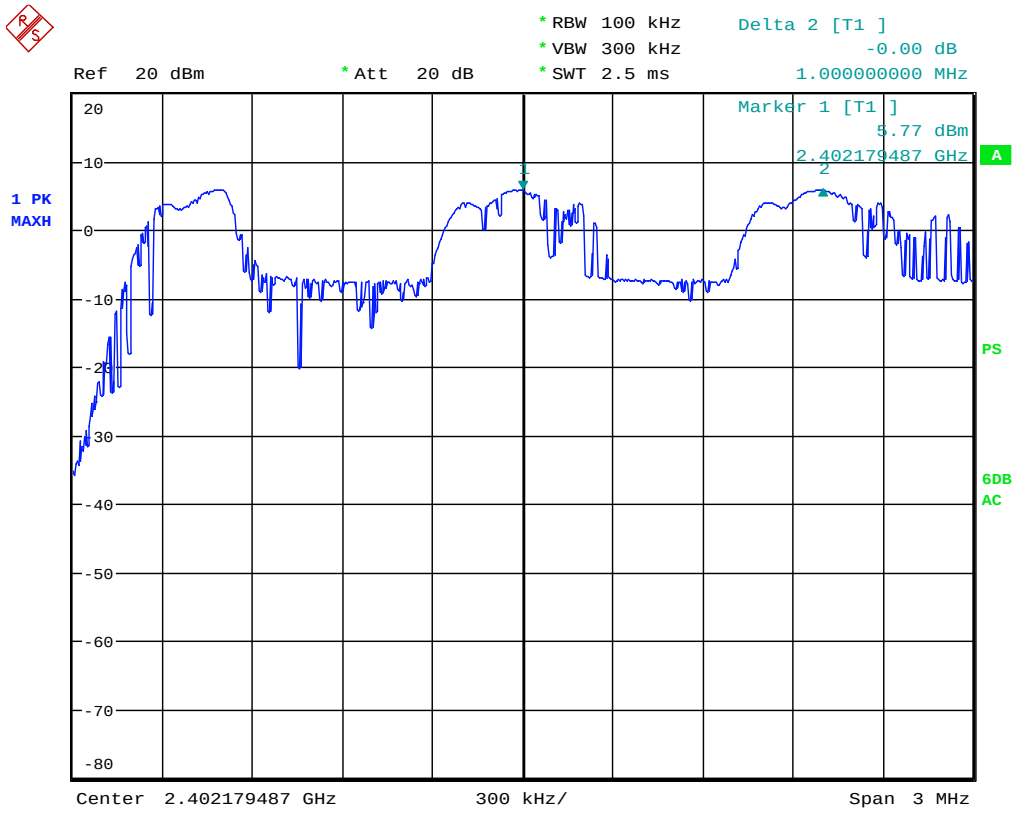
4) Carrier Frequency Separation

*** Basic Mode is picked as the worst mode from pre-test.**

Low Channel



ELECTRO MAGNETIC TEST, INC.
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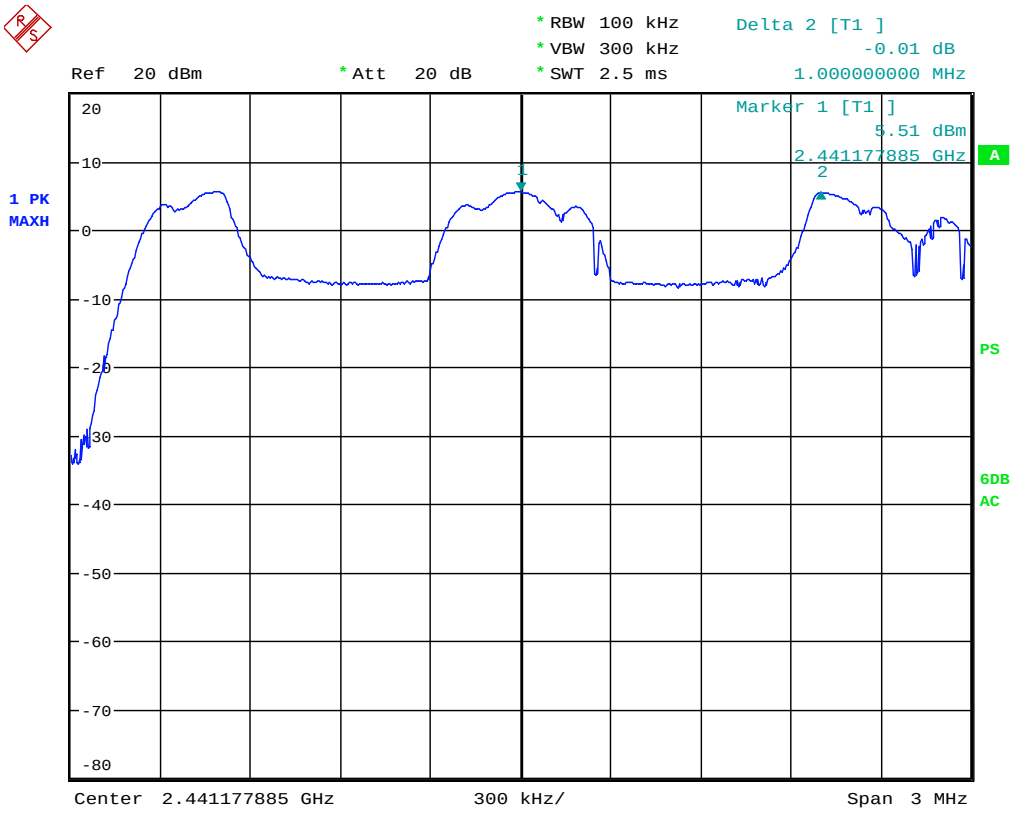
Middle Channel



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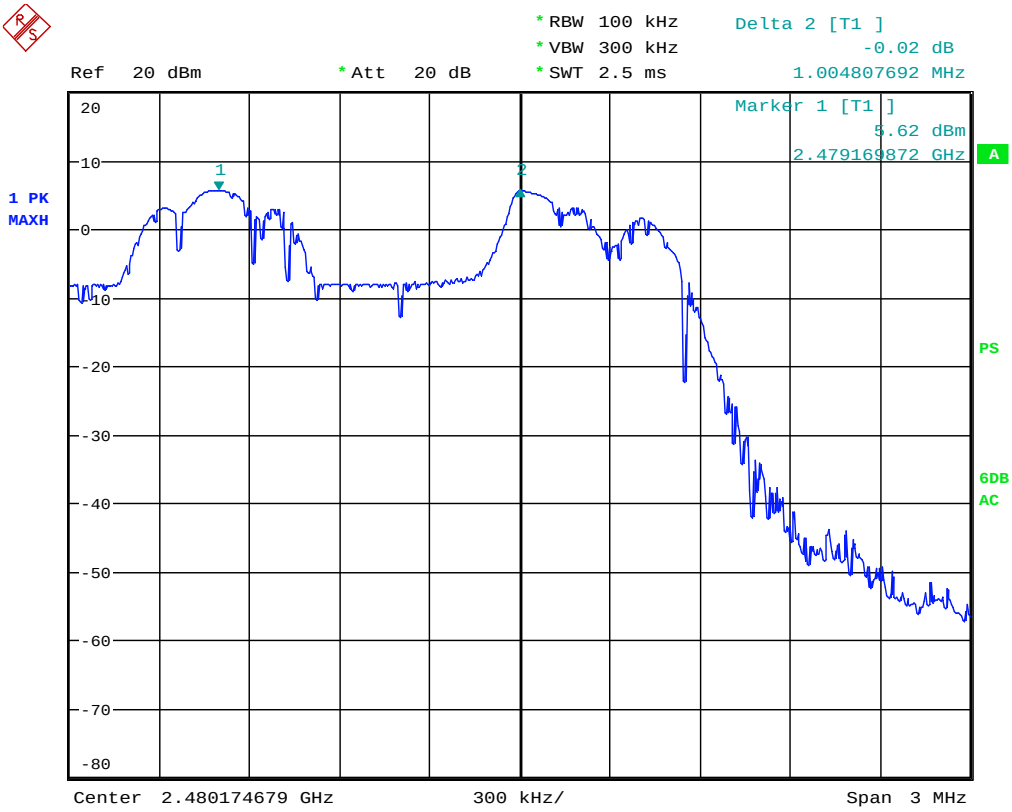
High Channel



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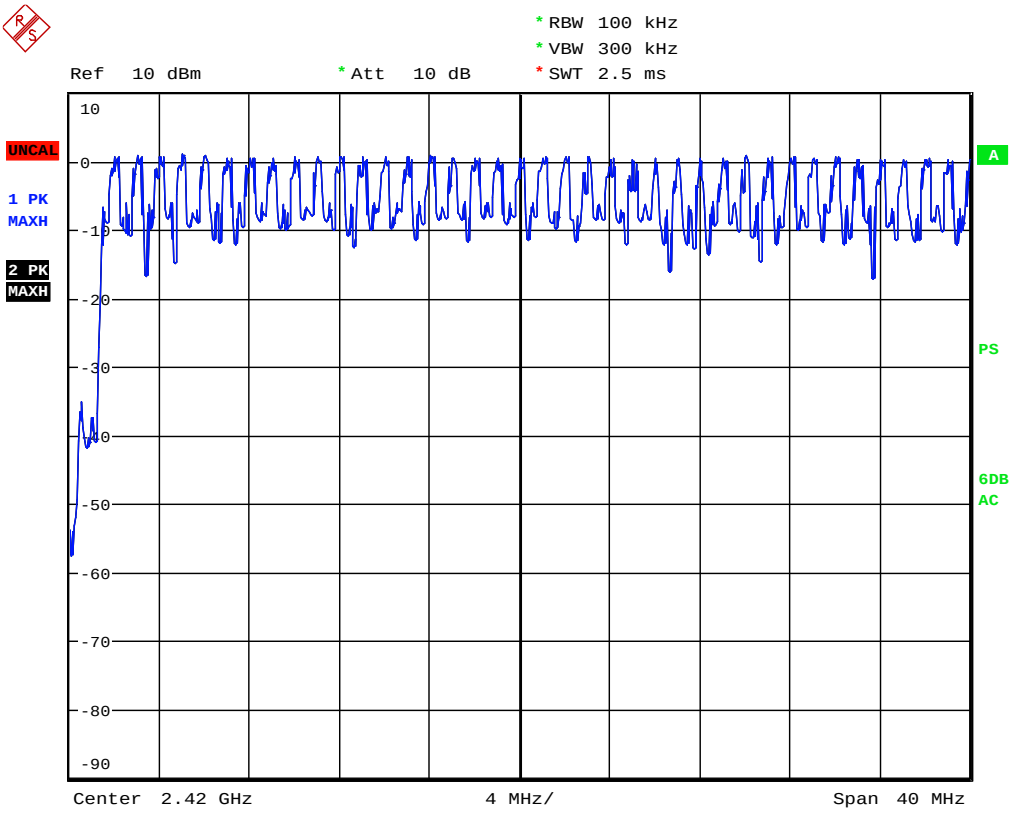
5) Number of Hopping Frequency

*** Basic Mode is picked as the worst mode from pre-test.**

39 channels between 2.42GHz to 2.44GHz



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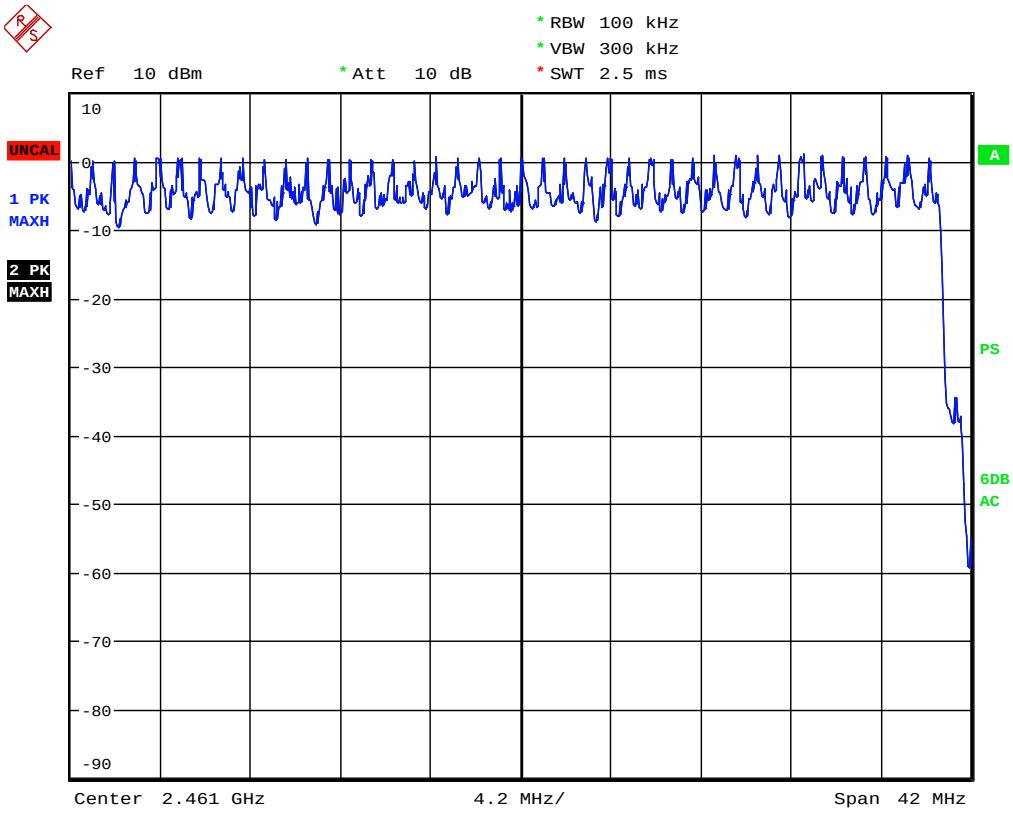
40 channels between 2.44GHz to 2.80GHz



ELECTRO MAGNETIC TEST, INC.
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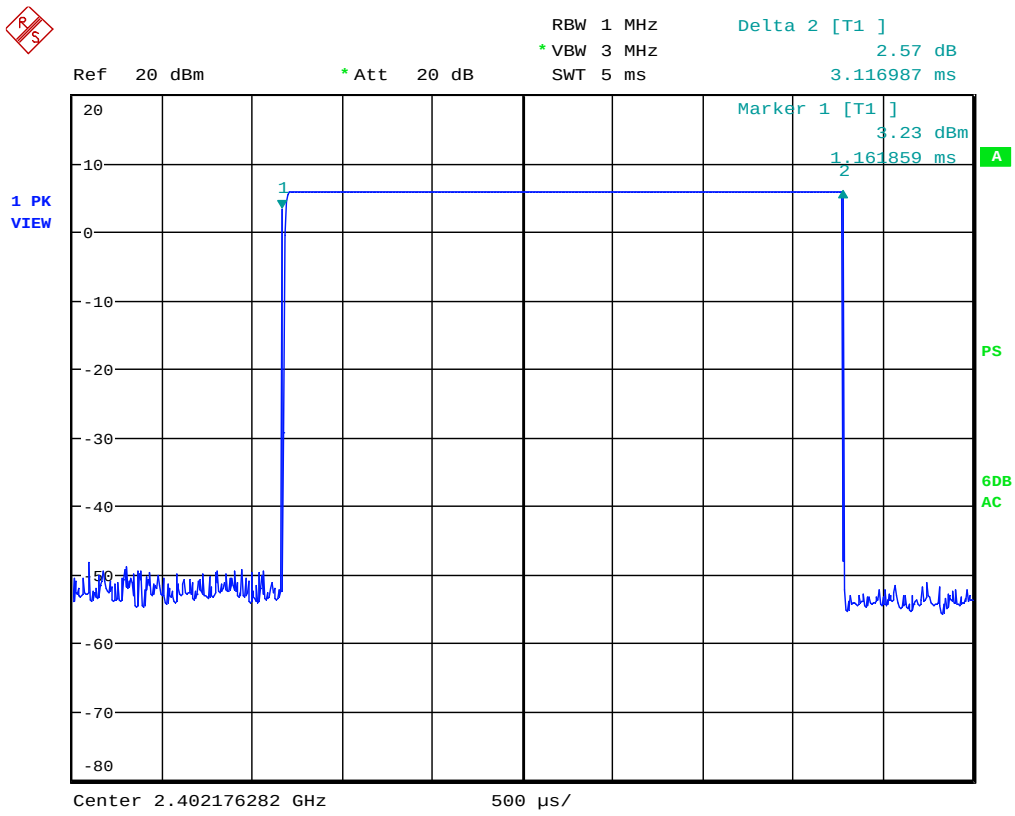
6) Dwell Time

*** Basic Mode is picked as the worst mode from pre-test.**

Low Channel



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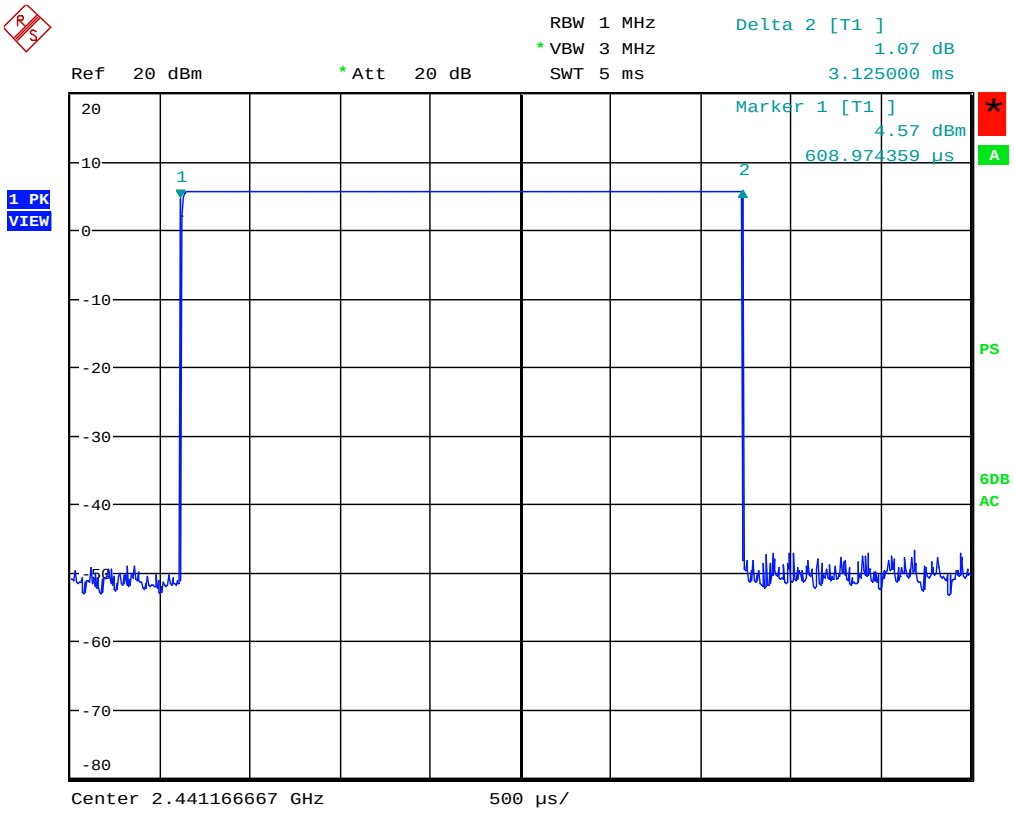
Middle Channel



ELECTRO MAGNETIC TEST, INC.
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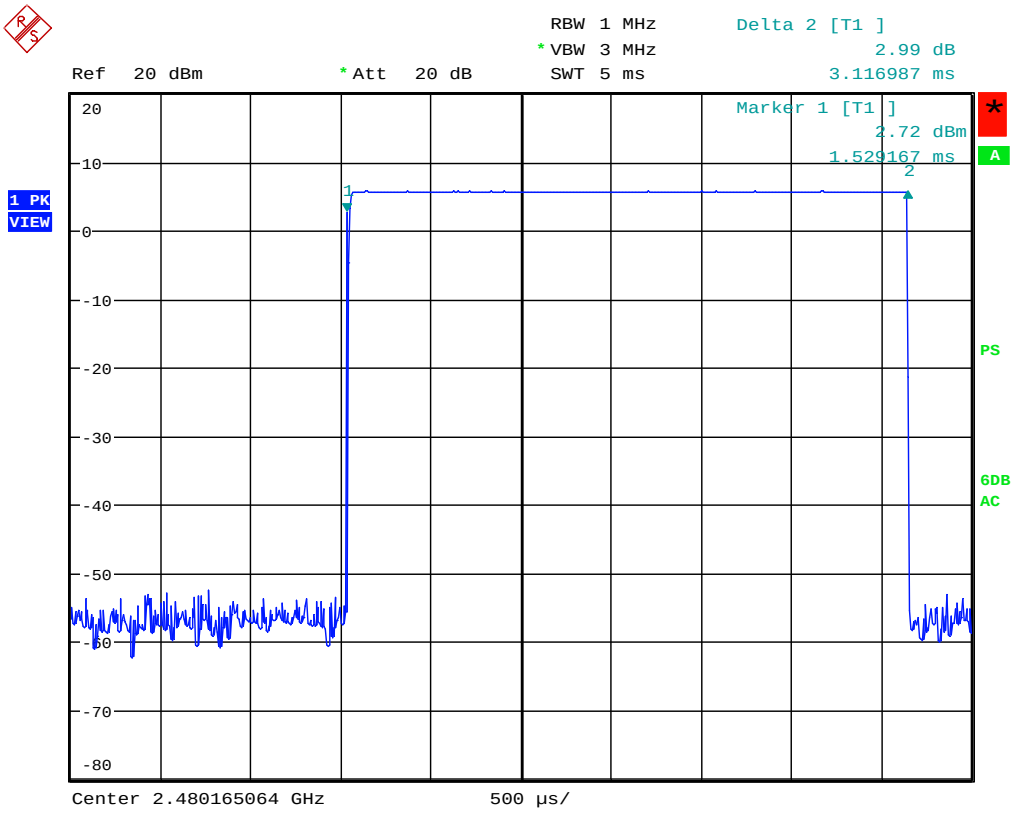
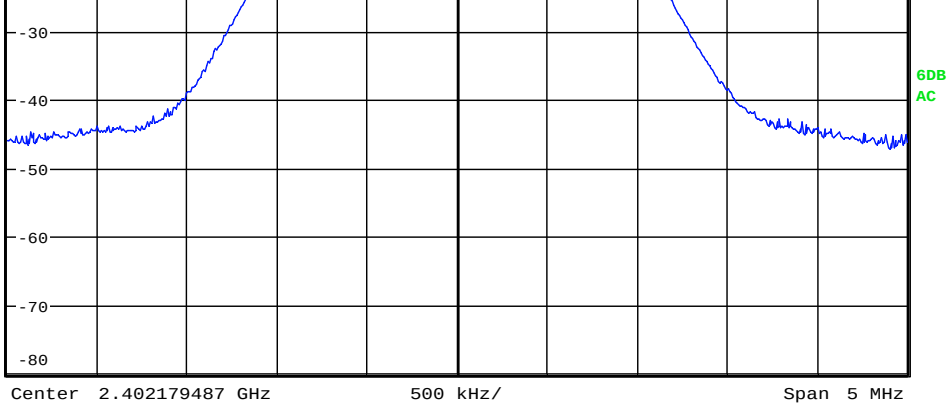
High Channel

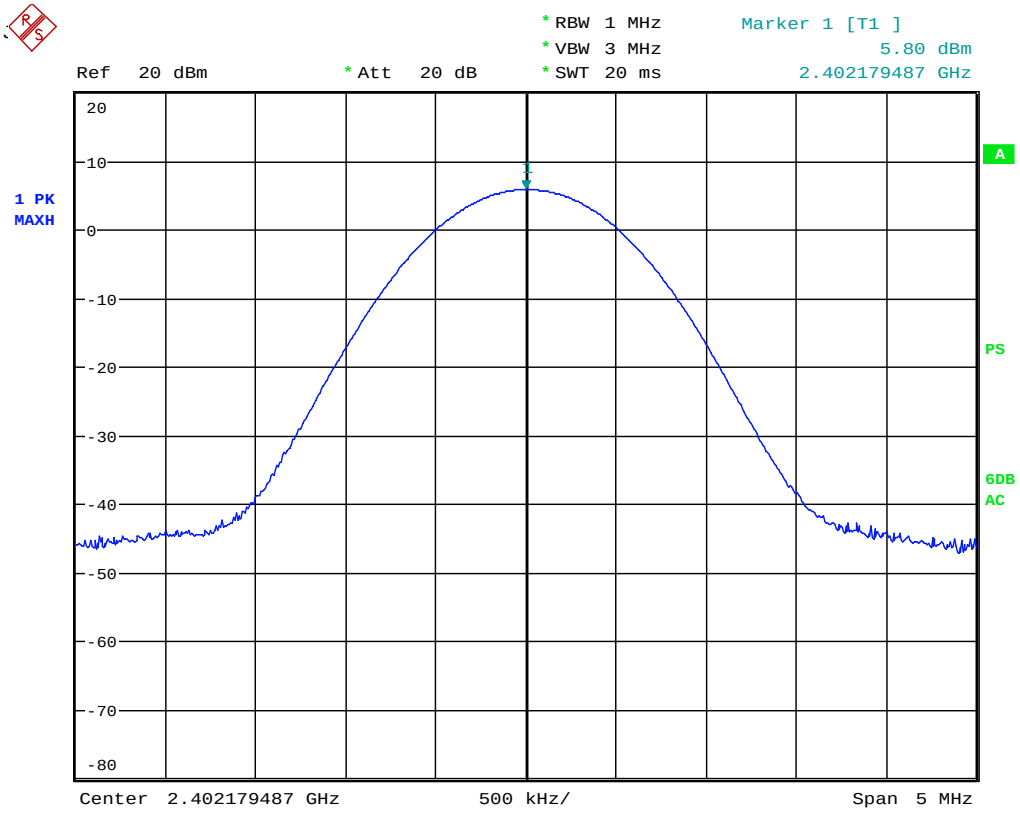


7)

* E


-30
-40
-50
-60
-70
-80
6DB
AC
Center 2.402179487 GHz
500 kHz/
Span 5 MHz

Date: 7..


*RBW 1 MHz
*VBW 3 MHz
*SWT 20 ms
Marker 1 [T1]
5.80 dBm
2.402179487 GHz
Ref 20 dBm
*Att 20 dB
1 PK
MAXH
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
A
PS
6DB
AC
Center 2.402179487 GHz
500 kHz/
Span 5 MHz

ELECTRO MAGNETIC TEST, INC.
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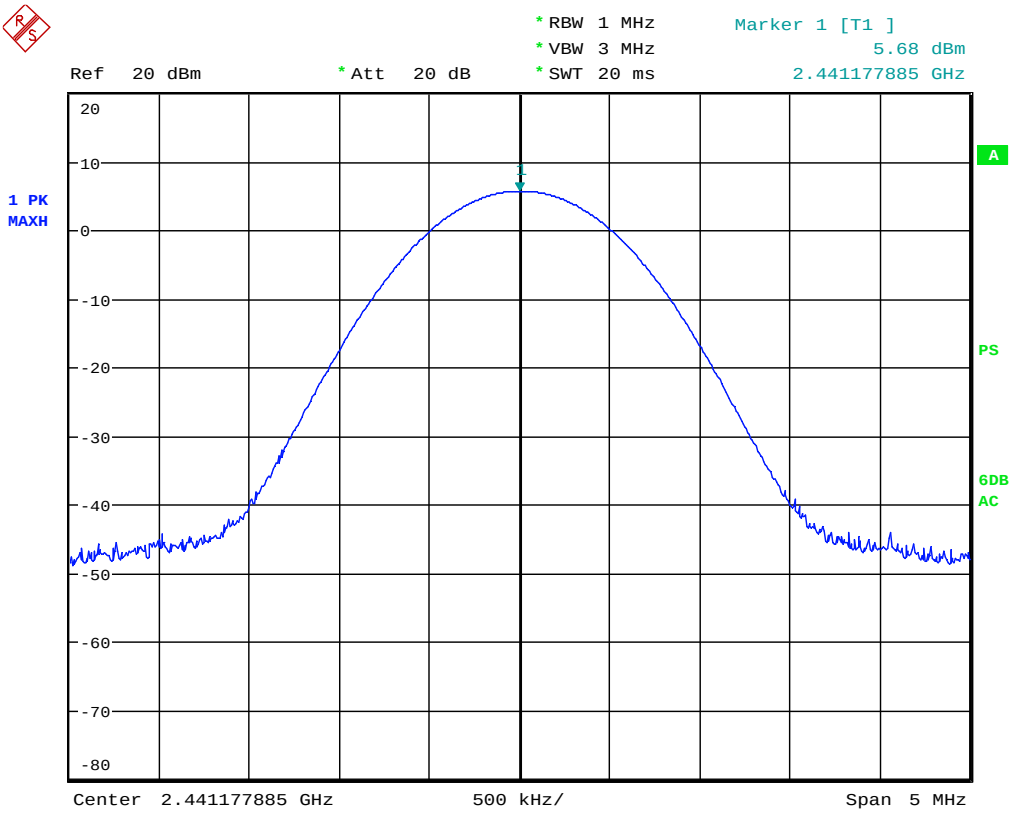
Middle Channel



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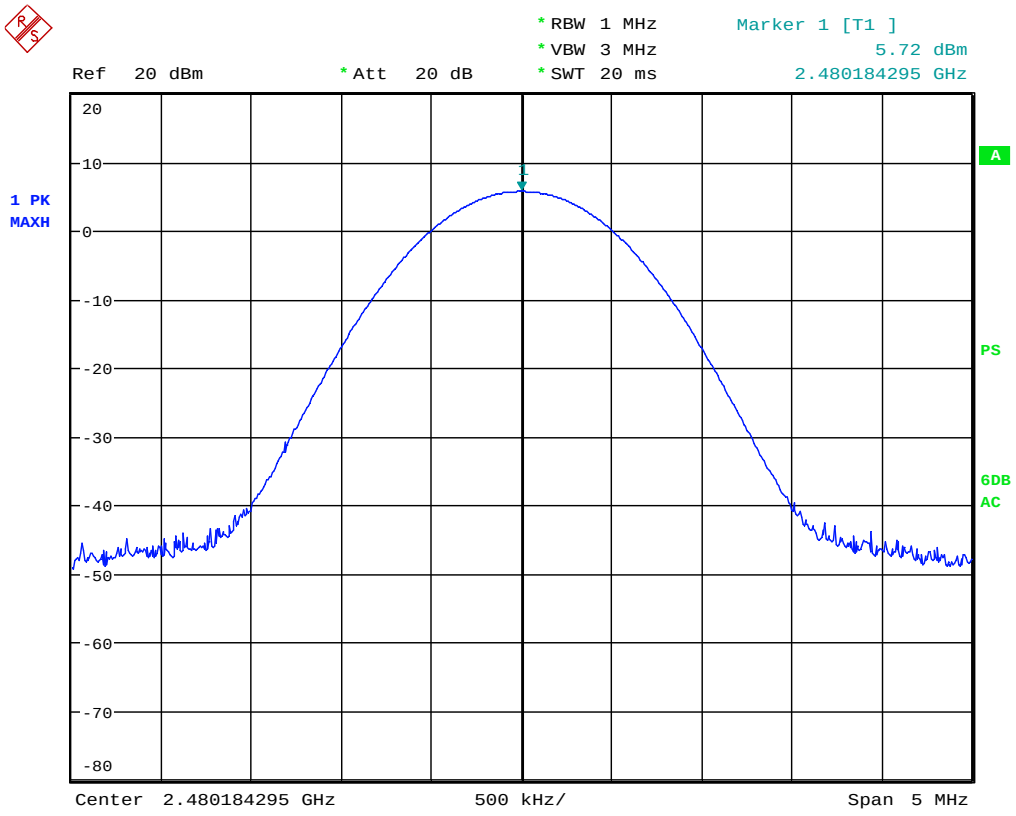
High Channel



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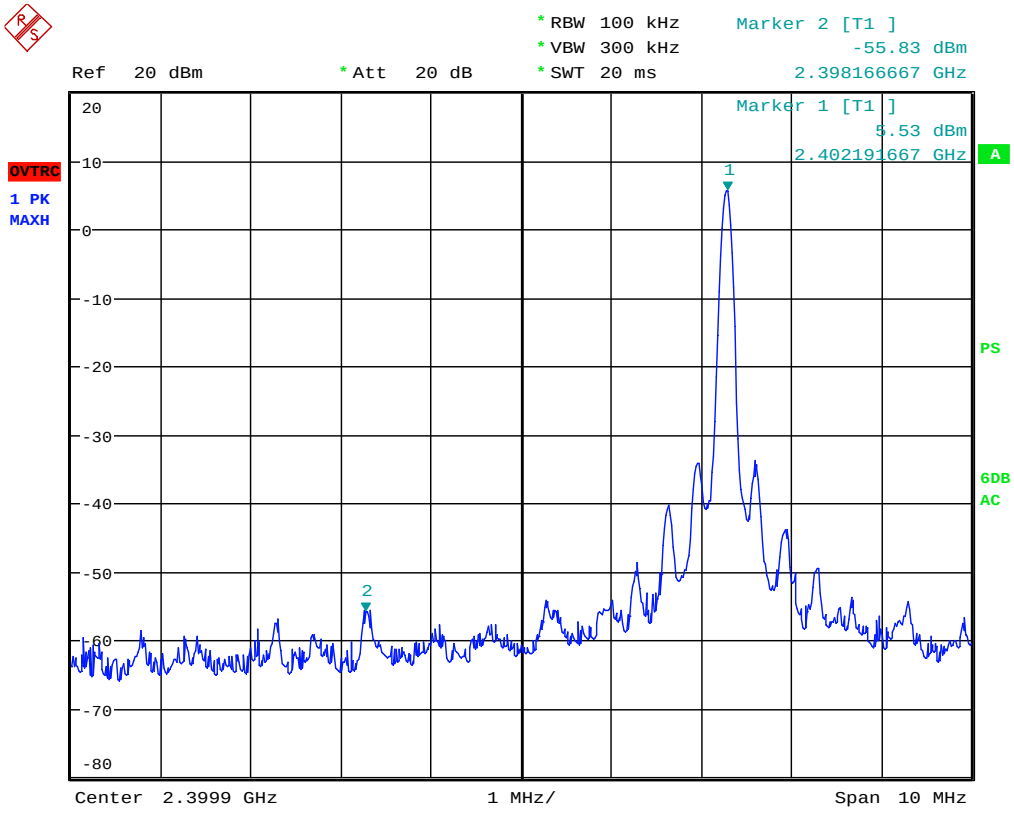
8) Band Edge

Conducted method

Lowest Channel



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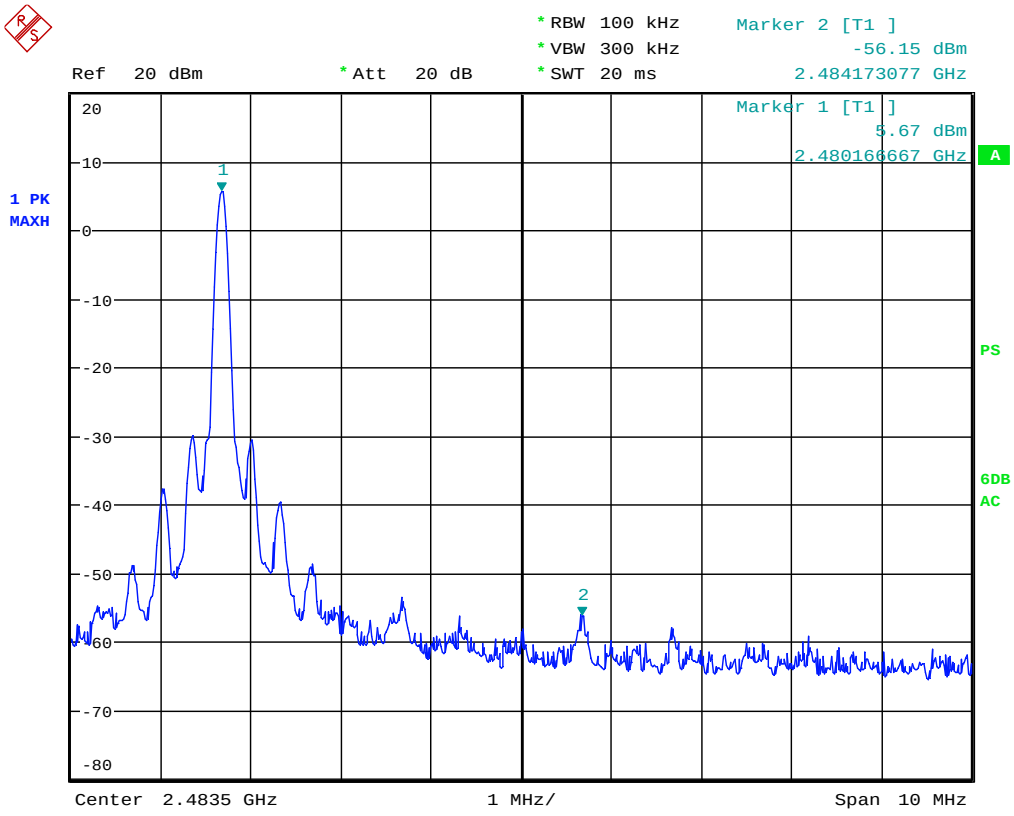
Highest Channel



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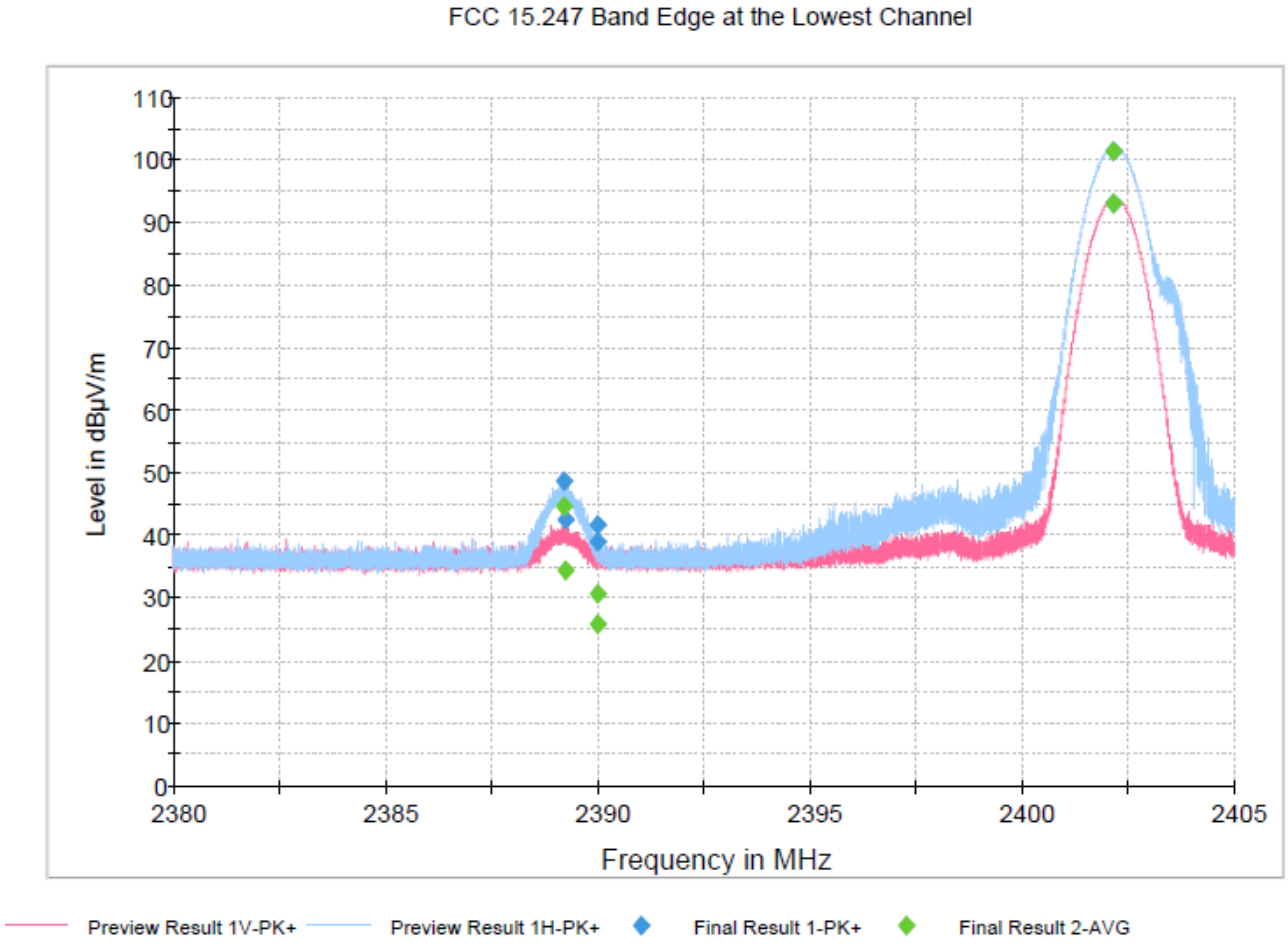
Radiated method

Lowest Channel



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Final Result 1

Frequency (MHz)	Corrected MaxPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2389.214167	48.6	100.0	H	292.0	0.9			
2389.244167	42.6	150.0	V	-6.0	0.9			
2390.000000	41.7	100.0	H	292.0	0.9			
2390.000000	39.0	150.0	V	-6.0	0.9			
2402.167500	101.5	100.0	H	290.0	1.0			
2402.170000	93.1	100.0	V	192.0	1.0			

Final Result 2

Frequency (MHz)	Corrected Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2389.214167	44.8	100.0	H	292.0	0.9			
2389.244167	34.4	150.0	V	-6.0	0.9			
2390.000000	30.6	100.0	H	292.0	0.9			
2390.000000	25.8	150.0	V	-6.0	0.9			
2402.167500	101.4	100.0	H	290.0	1.0			
2402.170000	93.0	100.0	V	192.0	1.0			

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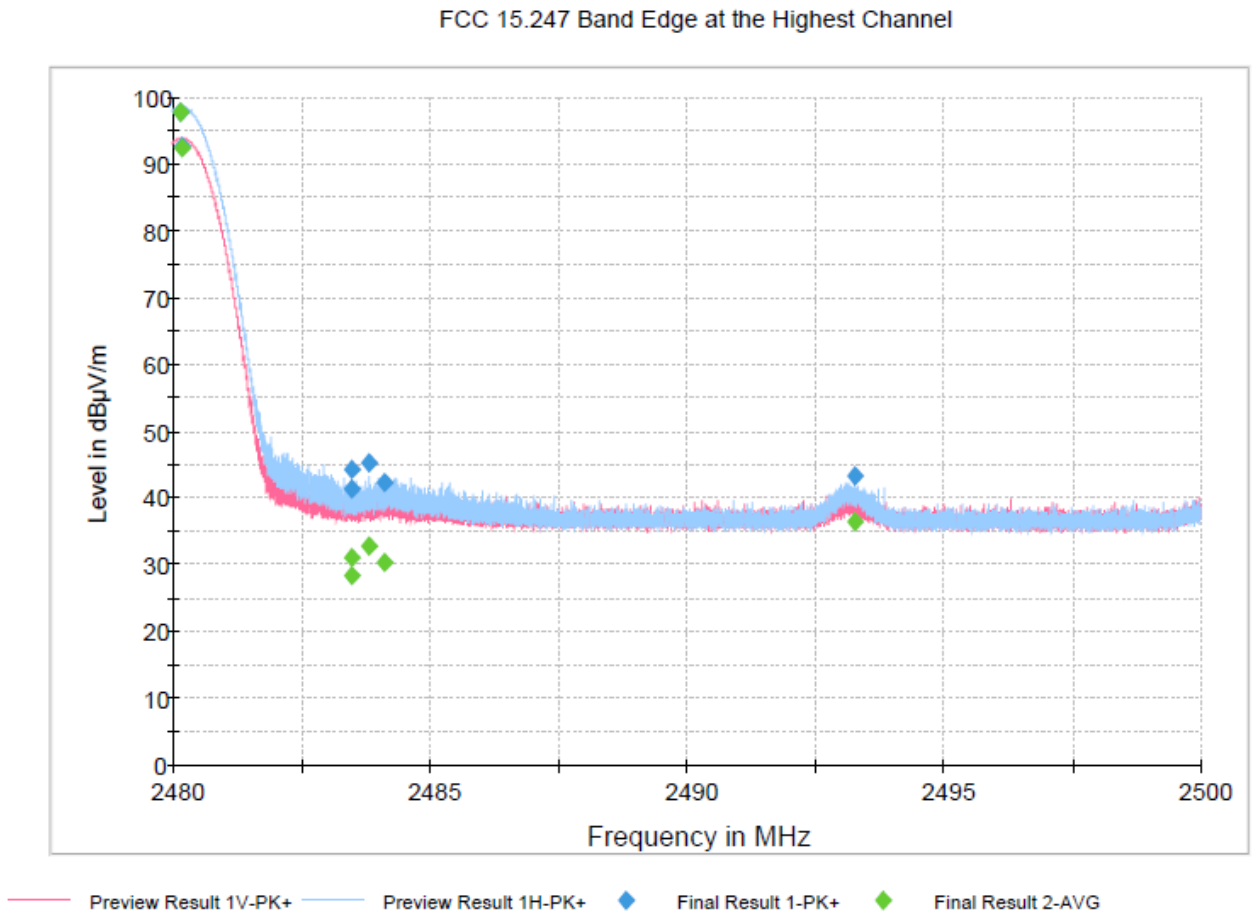
Highest Channel



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Final Result 1(Peak)

Frequency (MHz)	Corrected MaxPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2480.166000	97.9	150.0	H	294.0	1.1			
2480.172667	92.6	100.0	V	192.0	1.1			
2483.500000	44.3	150.0	H	313.0	1.1			
2483.500000	41.3	100.0	V	224.0	1.1			
2483.814000	45.2	150.0	H	294.0	1.1			
2484.114667	42.4	100.0	V	199.0	1.1			
2493.266000	43.4	150.0	H	293.0	1.1			

Final Result 2(Average)

Frequency (MHz)	Corrected Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2480.166000	97.8	150.0	H	294.0	1.1			
2480.172667	92.5	100.0	V	192.0	1.1			
2483.500000	31.1	150.0	H	313.0	1.1			
2483.500000	28.3	100.0	V	224.0	1.1			
2483.814000	32.7	150.0	H	294.0	1.1			
2484.114667	30.3	100.0	V	199.0	1.1			
2493.266000	36.3	150.0	H	293.0	1.1			

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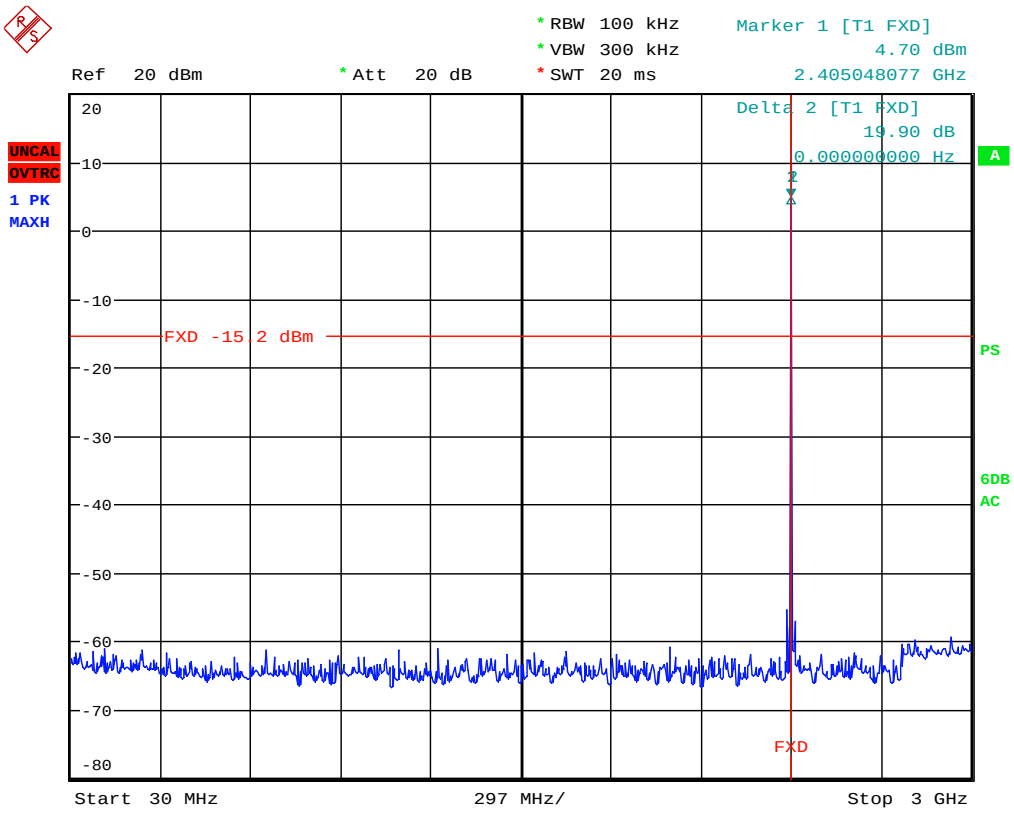
9) Spurious Emission At Antenna Port

Low Channel



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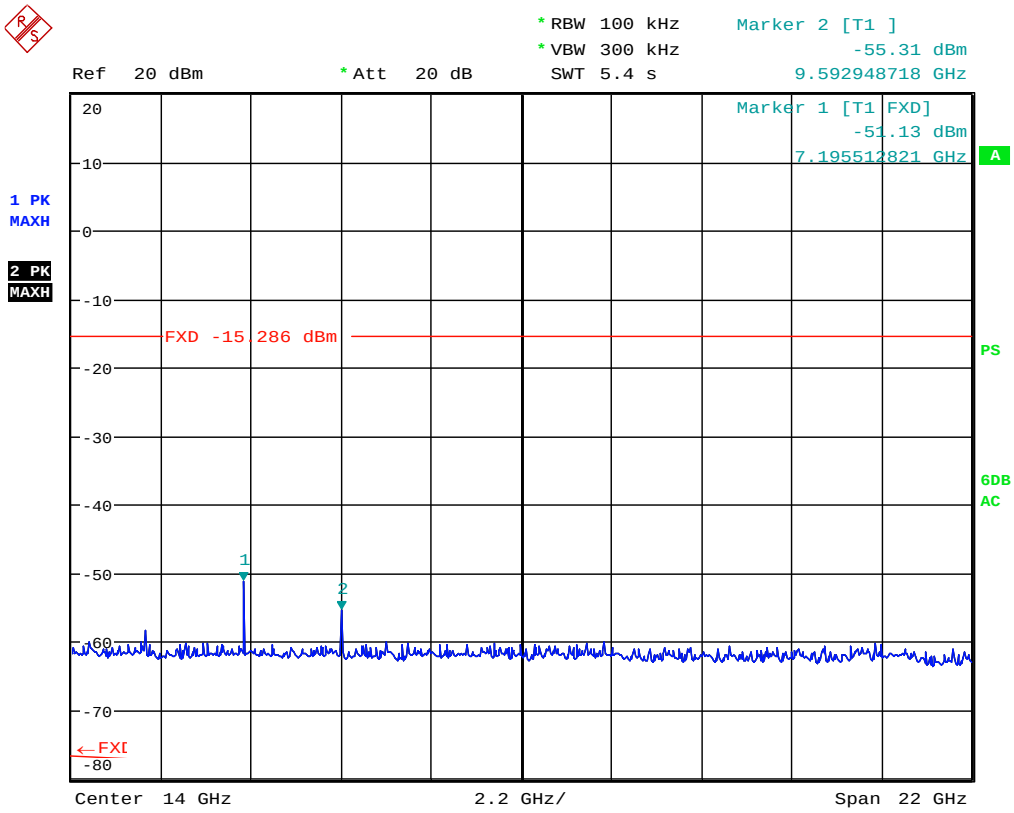

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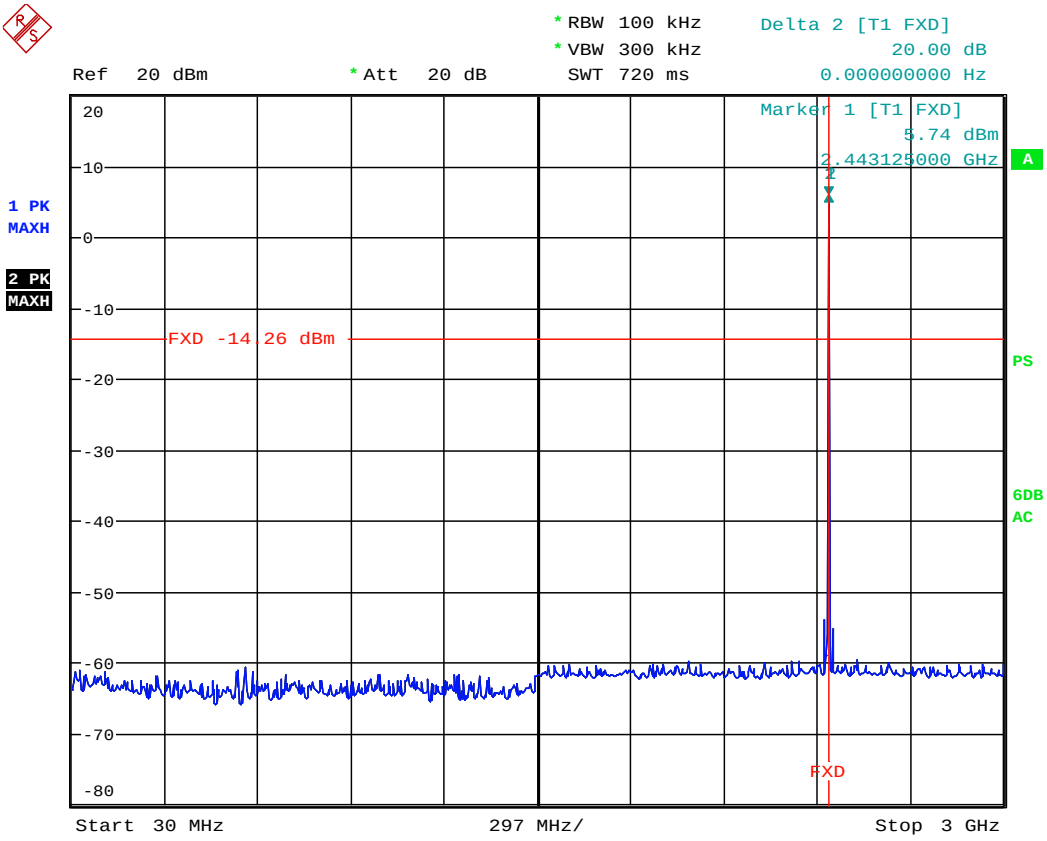
Middle Channel



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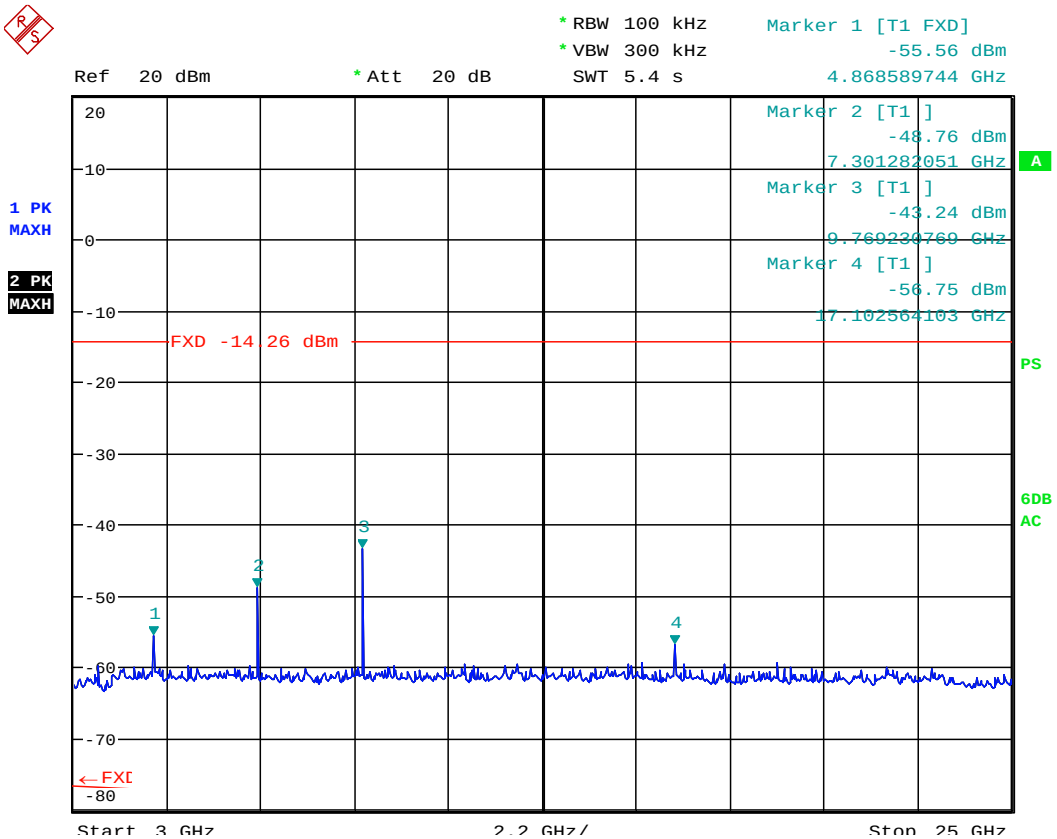

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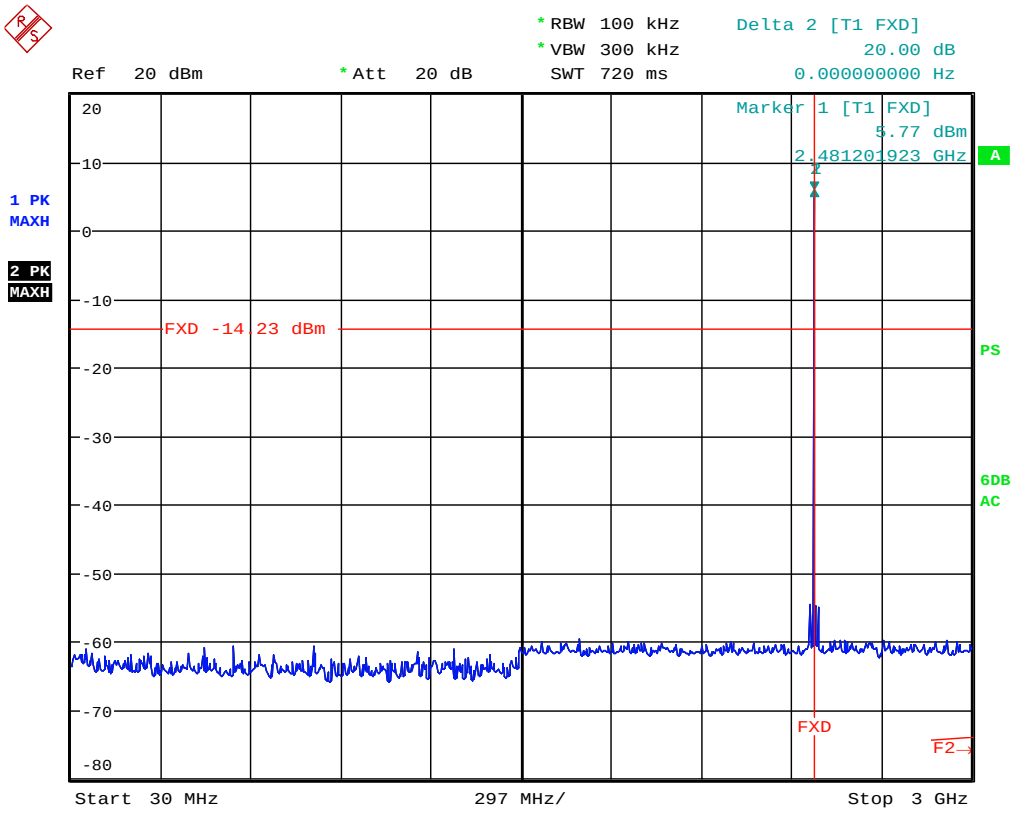
High Channel



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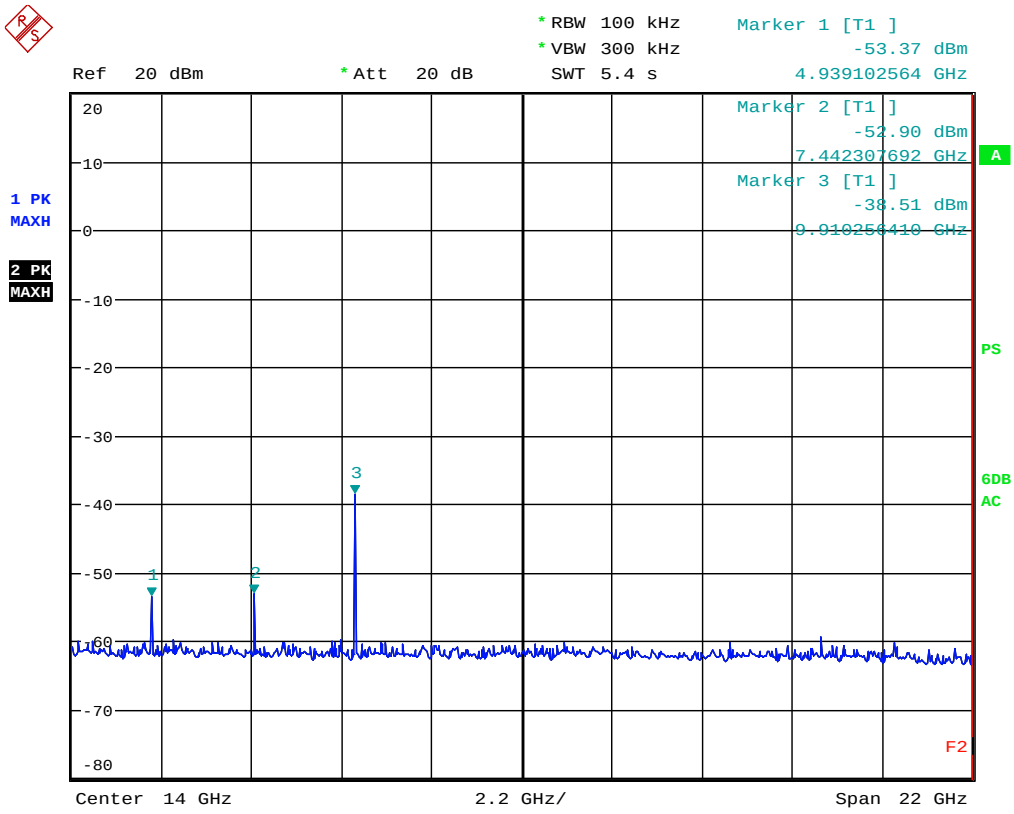

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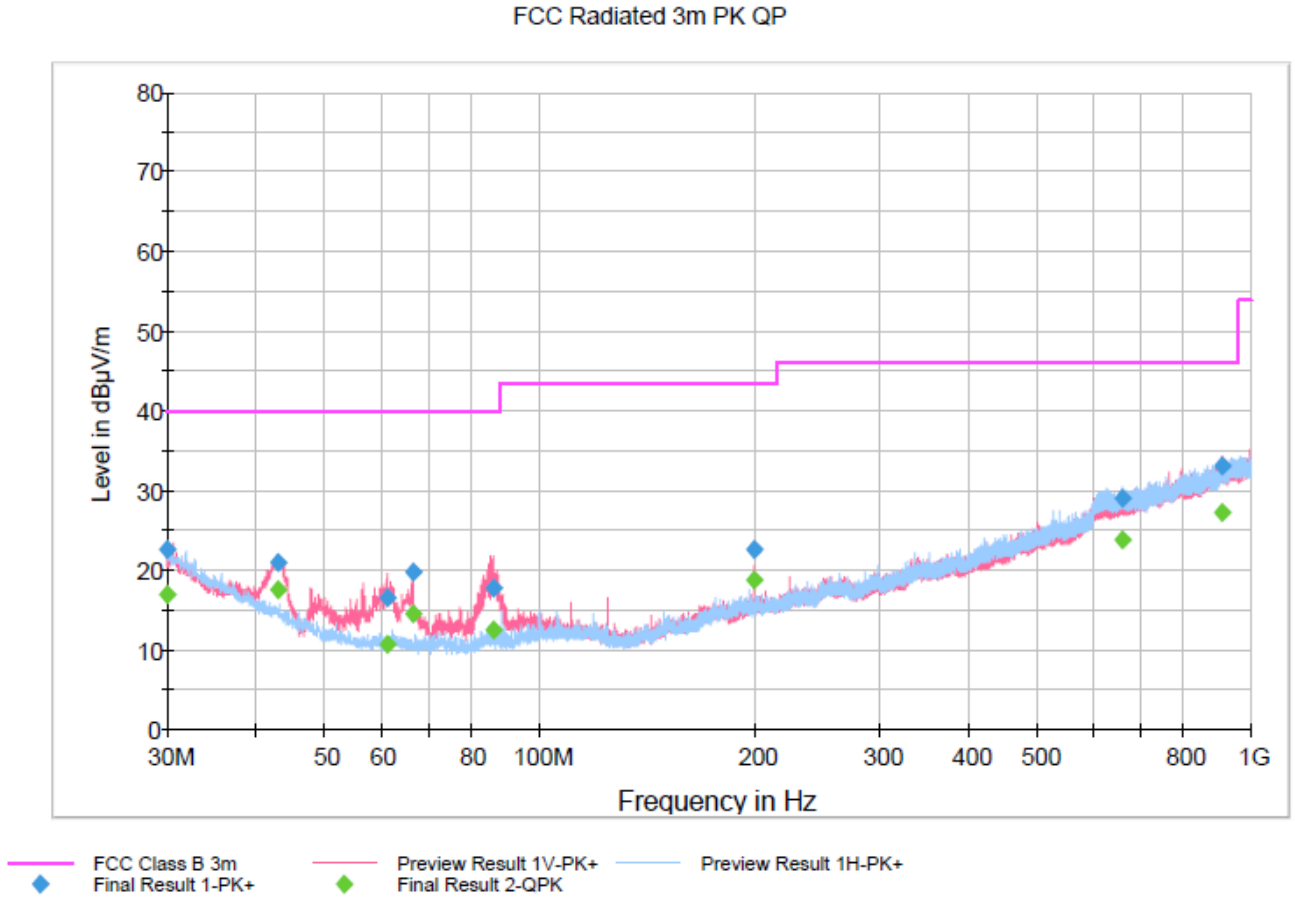
10) Receiver Spurious Emission

30-1000MHz:



Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.000000	17.0	200.0	H	162.0	18.6	23.00	40.00	
42.990000	17.5	100.0	V	42.0	10.2	22.50	40.00	
61.080000	10.7	100.0	V	335.0	7.5	29.30	40.00	
66.330000	14.5	198.0	V	22.0	7.1	25.50	40.00	
86.070000	12.5	193.0	V	161.0	8.4	27.50	40.00	
200.010000	18.8	114.0	V	256.0	12.2	24.70	43.50	
659.820000	23.8	119.0	H	191.0	23.9	22.20	46.00	
908.880000	27.3	172.0	H	250.0	27.6	18.70	46.00	

Above 1GHz:

All emission levels are at the noise floor and/or more then 20 dB below the limit.

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APPENDIX B

TEST SETUP DIAGRAMS

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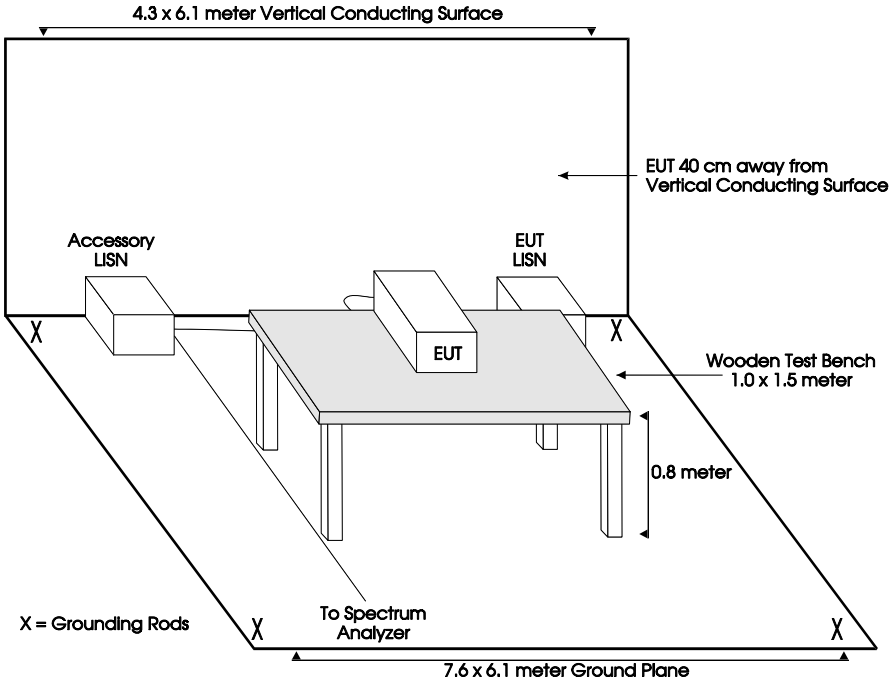

FIGURE 1 – TABLETOP CONDUCTED EMISSIONS TEST SETUP – SITE "A"

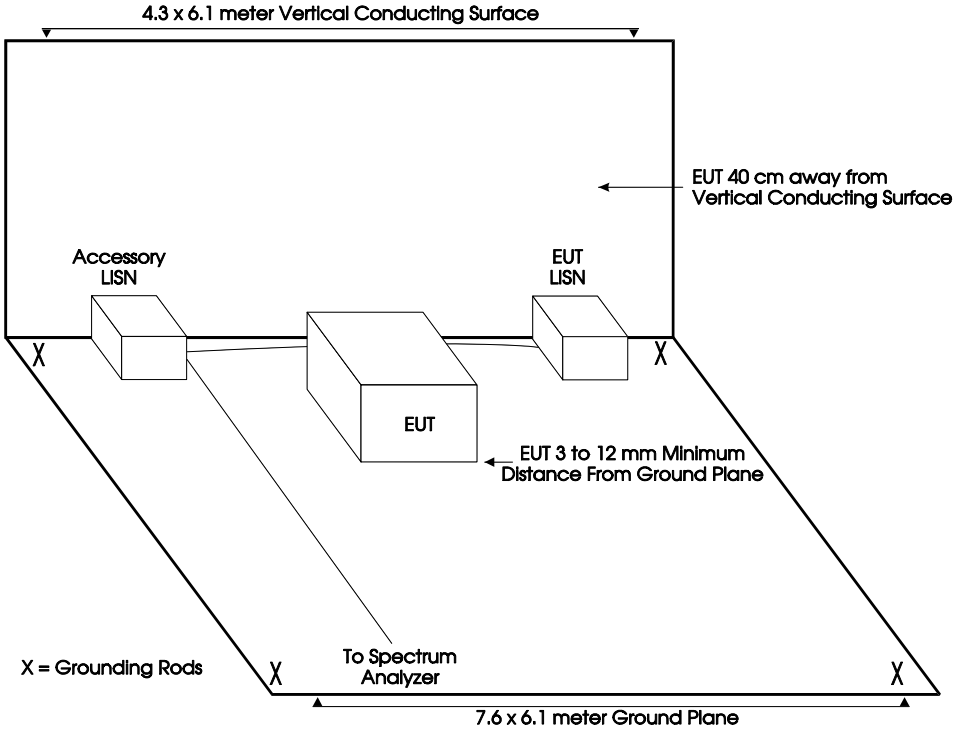

FIGURE 1a – FLOORSTANDING CONDUCTED EMISSIONS TEST SETUP – SITE "A"

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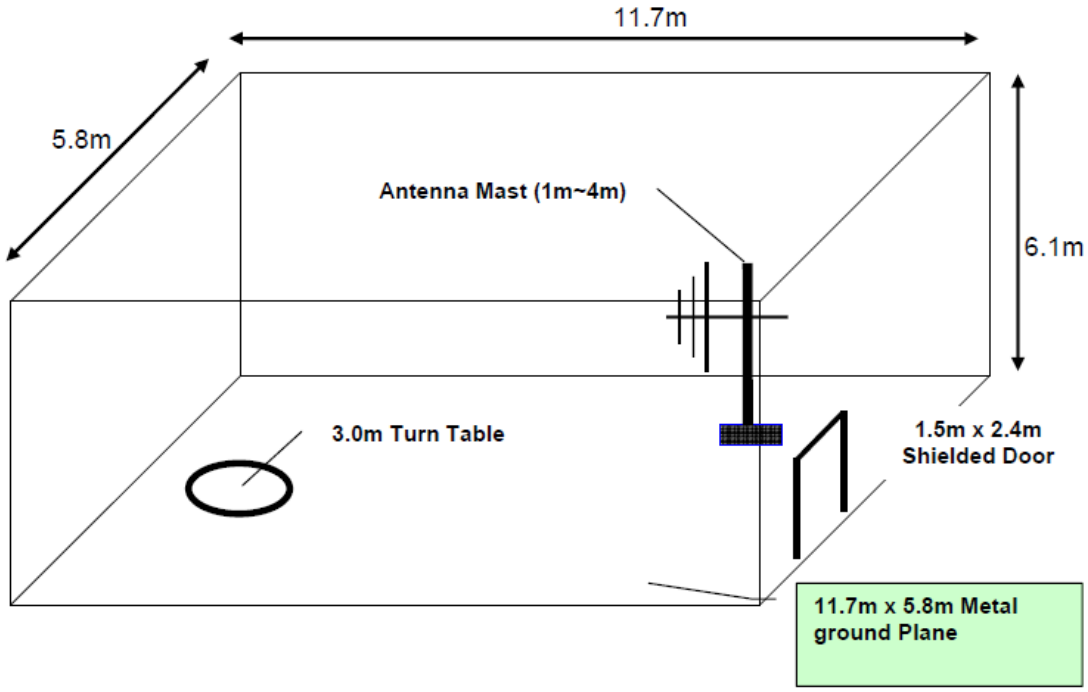

FIGURE 2 - LAYOUT OF 5 METER SEMI-ANECHOIC CHAMBER

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APPENDIX C

MODIFICATIONS TO THE EUT

EMT ELECTRO MAGNETIC TEST, INC.
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Modifications to the EUT

No modifications were made to the EUT by Electro Magnetic Test, Inc. personnel during the testing.

EMT ELECTRO MAGNETIC TEST, INC.
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APPENDIX D

ADDITIONAL MODELS COVERED UNDER THIS REPORT

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST MODEL:	BLUETOOTH module BT31

ALSO APPROVED UNDER THIS REPORT:

Same device model using internal 2.1dBi antenna