Global EMC Inc. Labs

EMC & RF Test Report

As per

RSS 210 Issue 7:2007

&

FCC Part 15 Subpart C:2010

Unlicensed Intentional Radiators

on the

ARIZ02 - Smartphone Jukebox

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Testing produced for

See Appendix A for full customer & EUT details.

LAB REGISTRATION #6844A-1

FCC REGISTRATION #612361

Testing Laboratory Certificate #2555.01

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Report Scope

This report addresses the EMC verification testing and test results of the ARIZ02 - Smartphone Jukebox, herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:

RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.

Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

Client	**Unify4Life**
Product	ARIZ02 - Smartphone Jukebox
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010

Summary

The results contained in this report relate only to the item(s) tested.

EUT FCC Certification #, FCC ID:	WOQARIZ02
EUT Industry Canada Certification #, IC:	7987A-ARIZ02
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Scott Drysdale

Client	**Unify4Life**
Product	ARIZ02 - Smartphone Jukebox
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203 RSS 210 Section 5.5	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 Section 6.3 (Table 2)	Restricted Bands for intentional operation	None within chart	Pass See description
FCC 15.207 RSS 210 Section 6.6	Power line conducted emissions	QuasiPeak Average	Pass
FCC 15.209 RSS 210 Section 6.2.1 (Tables 3 & 7)	Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)(1) RSS 210 6.2.2(o)	Channel Separation	> 25 kHz	Pass
FCC 15.247(a)(1)(i) RSS 210 6.2.2(o)	Number of channels	> 50	Pass
FCC 15.247(a)(1)(i) RSS 210 6.2.2(o)	Time of occupancy	< 400 mSec in 20 sec period	Pass
FCC 15.247(b) RSS 210 6.2.2(o)	Max output power	< 1 Watt	Pass
FCC 15.247(b)(4) RSS 210 6.2.2(o)	Antenna Gain	< 6 dBi	Pass See Justification
FCC 15.247(d) RSS 210 6.2.2(d)	Antenna conducted spurious	> 20 dBc	Pass
FCC 15.247(h)	FHSS Intelligence	No coordination	Pass See Justification
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure	> 20 cm separation.	Pass See justification and calculations
Overall Result			**PASS**

All tests were performed by Scott Drysdale.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '*'.

Justifications, Descriptions, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 (RSS 210 section 5.5), this device uses a SMT chip antenna, and has no provisions for end-user replacement.

For the Restricted Bands of operation, the EUT is designed to only operate between 2.4 to 2.4835 GHz band.

For the Antenna gain, the stated gain according to the antenna manufacturer is less than 6 dBi.

For maximum permissible exposure, this device operates at up to 40 mW and is designated for use where the end user is 20 cm (or greater) from the transmit antenna during normal operation. No testing is required, however worst case calculated exposure compliance follows later in this report.

For FHSS intelligence, this device observes the Bluetooth™ protocol and has no channel hopping intelligence.

This device was tested at both 2401 and 2402 MHz, and no difference was observed other than a frequency shift of 1 MHz. The worst case results for 2401 MHz are presented in this report as representative. The device also passes at 2402 MHz.

Applicable Standards, Specifications and Methods

ANSI C63.4:2003	- Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2009	- American national standard for testing unlicensed wireless devices
CFR 47 FCC 15	- Code of Federal Regulations – Radio Frequency Devices
CISPR 22:1997	- Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
ICES-003:2004	- Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
ISO 17025:2005	- General Requirements for the competence of testing and calibration laboratories
RSS 210:2007	- Issue 6: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power Licence-Exempt Radiocommunication Devices

Sample calculation(s)

Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)
Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)
Margin = 8.5 dB

Document Revision Status

Revision 1 - Sept 3, 2010

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxiallary Equipment.

BW – Bandwidth. Unless otherwise stated, this is refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

ITE – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency

Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations

The measurement site used is registered with Federal Communications Commission (FCC) and Industry Canada (IC). This site is calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test. Global EMC is accredited by A2LA for testing as

Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (ºC)	Humidity (%)	Pressure (kPa)
July 15 – Aug 15 2010	All	SD	20-25ºC	30-45%	100 -103kPa

Detailed Test Results Section

Power Line Conducted Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard, as measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio operators, maritime radio, CB radio, and so on, from unwanted interference.

Limits & Method

The limits are as defined in 47 CFR FCC Part 15 Section 15.207
Method is as defined in ANSI C64:2003

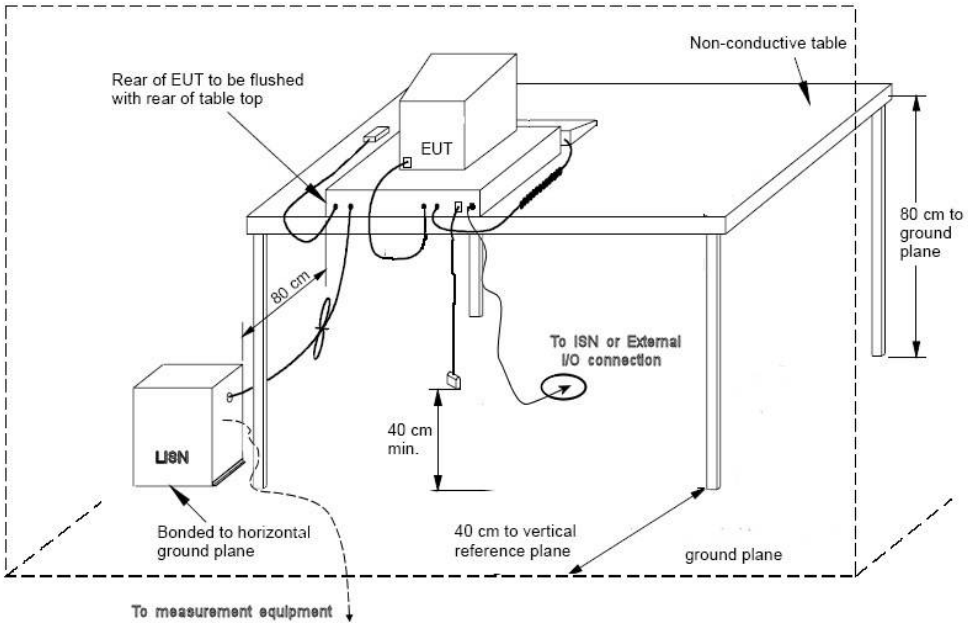
Average Limits		QuasiPeak Limits	
150 kHz – 500 kHz	56 to 46 dBuV	150 kHz – 500 kHz	66 to 56 dBuV
500 kHz – 5 MHz	46 dBuV	500 kHz – 5 MHz	56 dBuV
5 MHz – 30 MHz	50 dBuV	500 kHz – 30 MHz	60 dBuV

The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Note: If the Peak or Quasi Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Both limits are applicable, and each is specified as being measured with a 9 kHz measurement bandwidth .

Typical Setup Diagram



Note: The vertical reference plane is optional as per ANSI C63.4 section 5.2.2

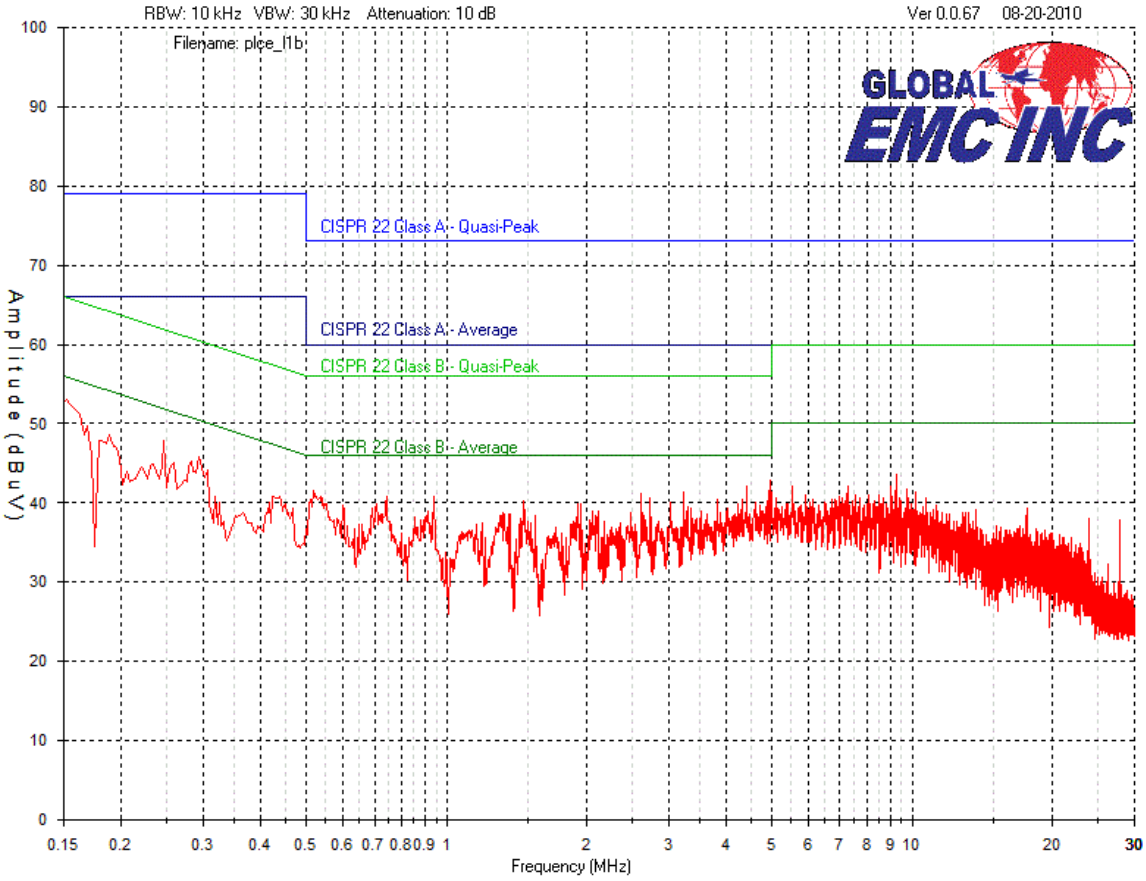
Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-3.6 dB with a 'k=2' coverage factor and a 95% confidence level.

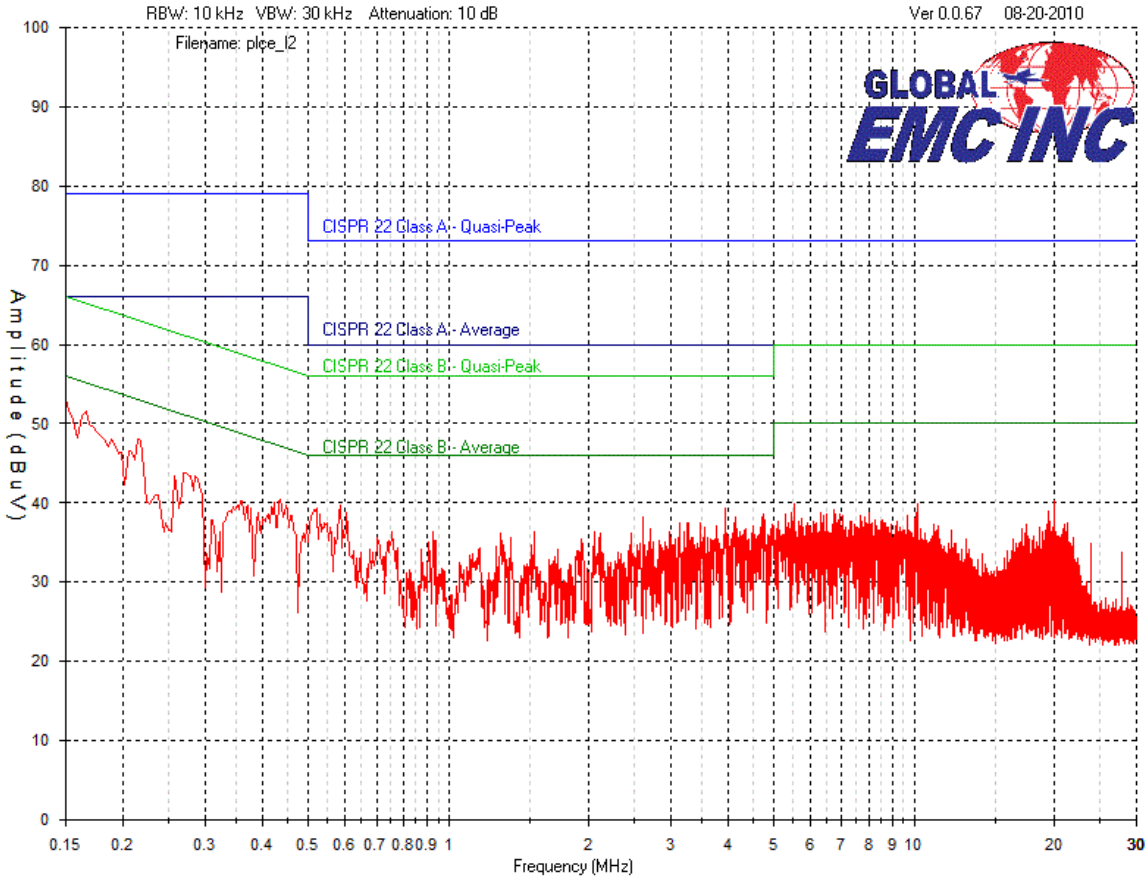
Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector where applicable, please refer to the table. The graph shown below is a peak measurement graph, measured with a resolution bandwidth greater then or equal to the final required detector. These graphs are performed as a worst case measurement to enable the detection of frequencies of concern and for considerable time savings.

Phase (Black/Brown)



Neutral (White/Blue)



Final Measurements

Line 1 – Phase (Black/Brown)

Frequency (MHz)	Raw (dBuV)	Atten Factor (dB)	LISN Factor (dB)	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
0.28303	34.1	10	0.6	44.7	50.7	6	Pass
0.51014	29.5	10	0.2	39.7	46	6.3	Pass
0.27654	32.9	10	0.6	43.5	50.9	7.4	Pass
0.44201	28.3	10	0.2	38.5	47	8.5	Pass
0.296	31	10	0.5	41.5	50.4	8.9	Pass
4.22509	26.4	10	0.2	36.6	46	9.4	Pass

Line 2 – Neutral (White/Blue)

Frequency (MHz)	Raw (dBuV)	Atten Factor (dB)	LISN Factor (dB)	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
0.29276	34.6	10	0.5	45.1	50.4	5.3	Pass
0.51338	28.6	10	0.2	38.8	46	7.2	Pass
0.24734	33	10	0.8	43.8	51.8	8	Pass
0.54259	26.9	10	0.2	37.1	46	8.9	Pass
0.15325	35.2	10	1.5	46.7	55.8	9.1	Pass
0.42903	27.4	10	0.2	37.6	47.3	9.7	Pass

No peak emissions exceeded the quasi-peak limits, therefore the unit was deemed to meet the quasi peak requirements based on the peak emissions. The tables above represent the peak emissions readings with respect to the average limit.

Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up for the highest line conducted emission

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
LISN	FCC-LISN-50/250-16-2-01	FCC	2009-02-11	2011-02-11	GEMC 65
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Spurious Radiated Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s) and Method

The method is as defined in ANSI C63.4:2003.

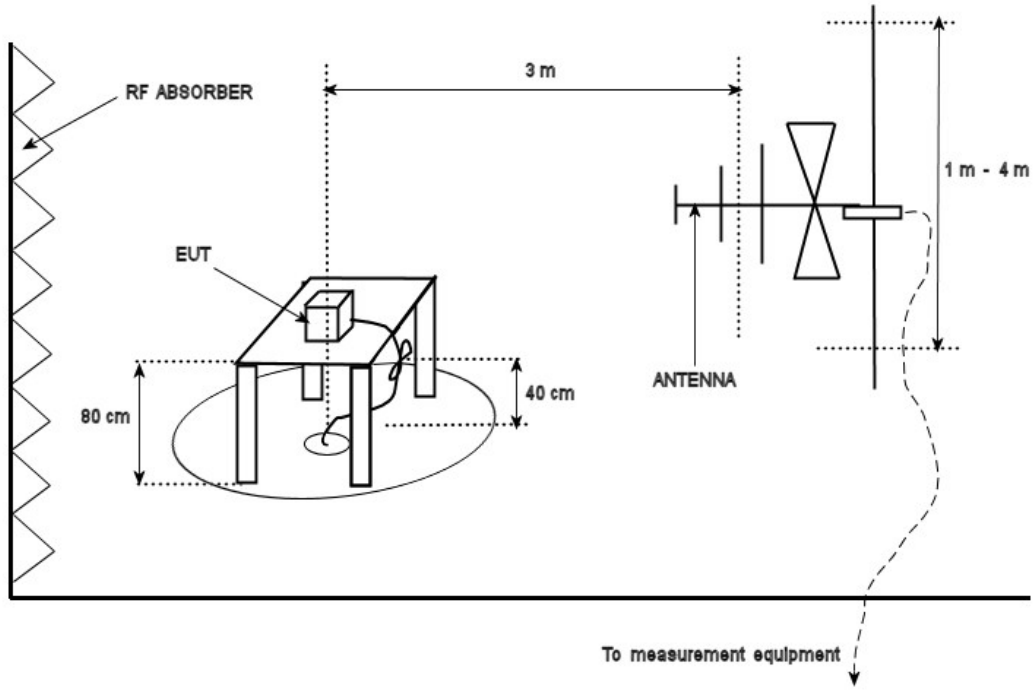
The limits, as defined in 15.247(d) for unintentional radiated emissions apply for those emissions that fall in the restricted bands, as defined in Section 15.205(a). These emissions must comply with the radiated emission limits specified in Section 15.209(a).

All unintentional emissions must also meet the 'Spurious Conducted Emissions' requirements of -20 dBc or greater. See also 'Spurious Conducted Emissions' for further details.

30 MHZ – 88 MHz, 100 uV/m (40.0 dBuV/m[1]) at 3 m
88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m[1]) at 3 m
216 MHz – 960 MHz, 200 uV/m (46.4 dBuV/m[1]) at 3 m
Above 960 MHz, 500 uV/m (54.0 dBuV/m[1]) at 3 m
Above 1000 MHz, 500 uV/m (54.0 dBuV/m[2]) at 3m

[1]Limit is with 120 kHz measurement bandwidth and a using a Quasi Peak detector.
[2]Limit is with 1 MHz measurement bandwidth and using an Average detector, scanned in accordance with 15.33 to above the 10th harmonic (26 GHz).

Typical Radiated Emissions Setup



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a 95% confidence level.

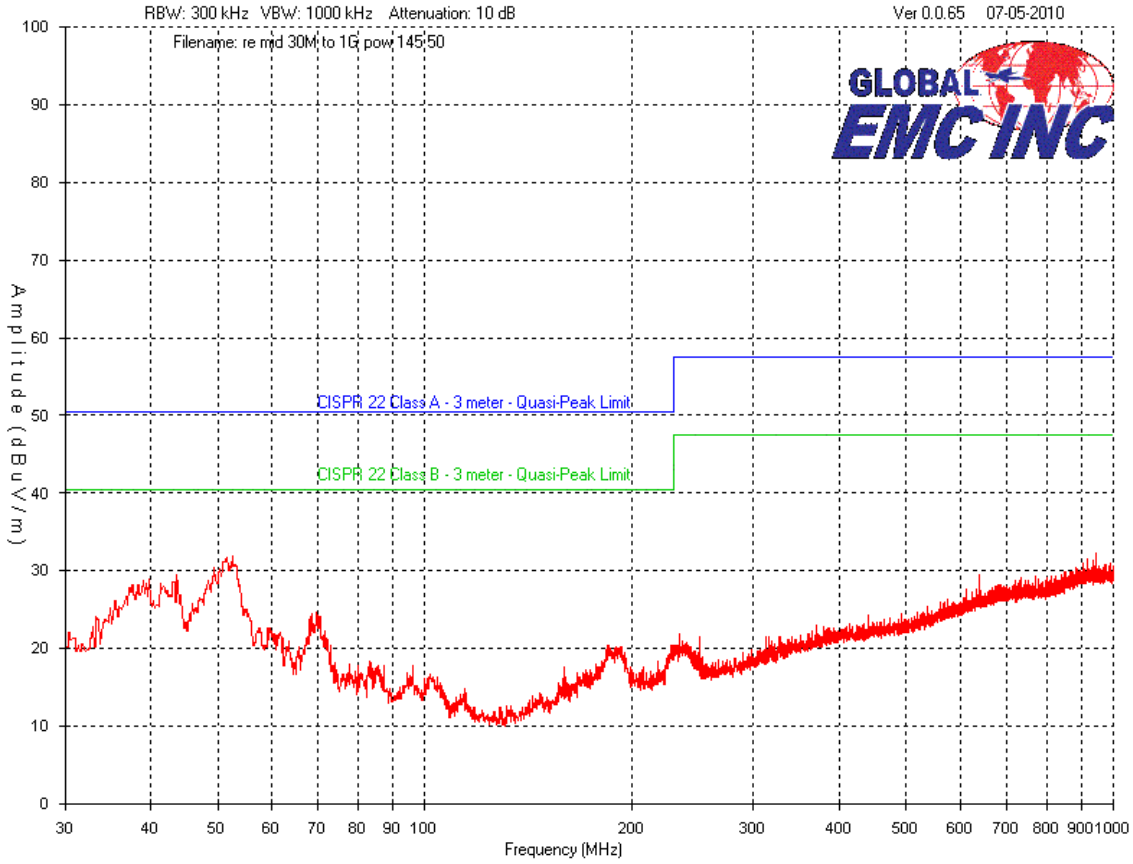
Preliminary Graphs

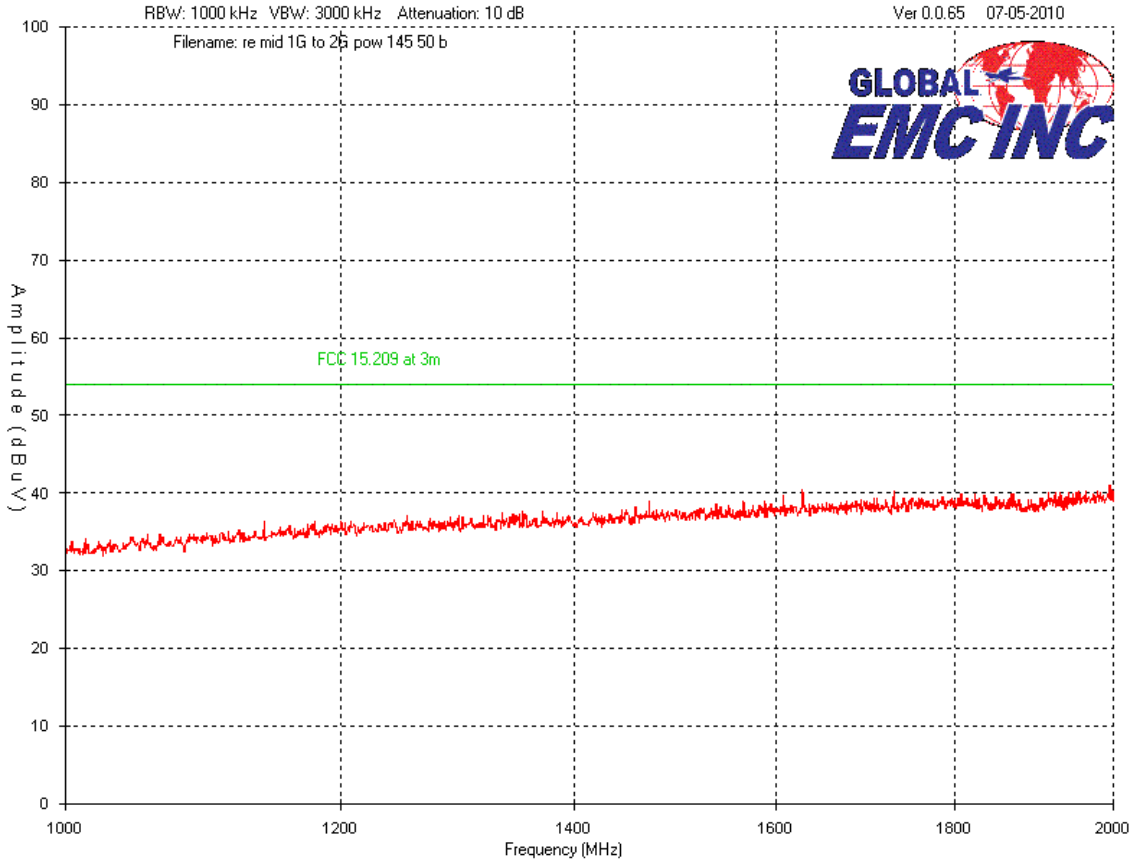
Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater then the final required detector and over a full 0-360 rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings.

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to a minimum of a 26 GHz, however no emissions were detected above 10 GHz.

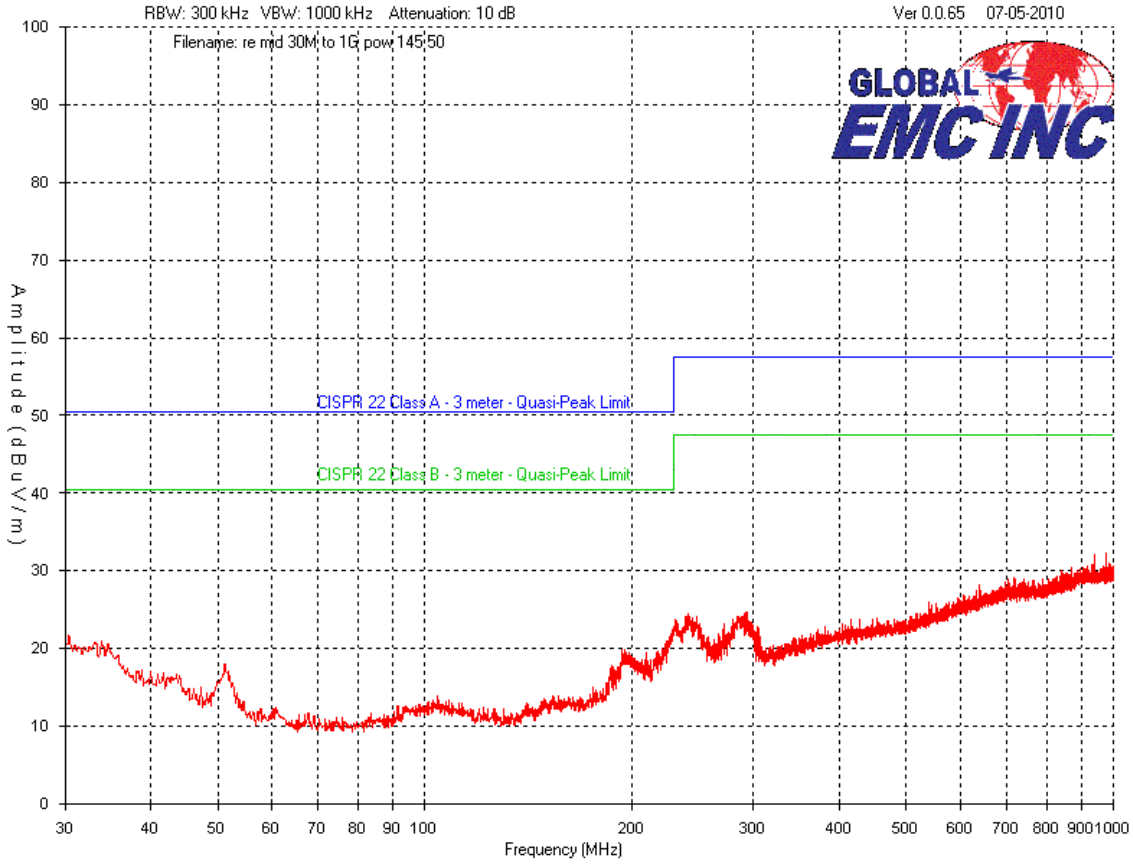
Low, middle and high channels with frequency hopping stopped were checked, however the worst case graphs are presented where representative of all modes.

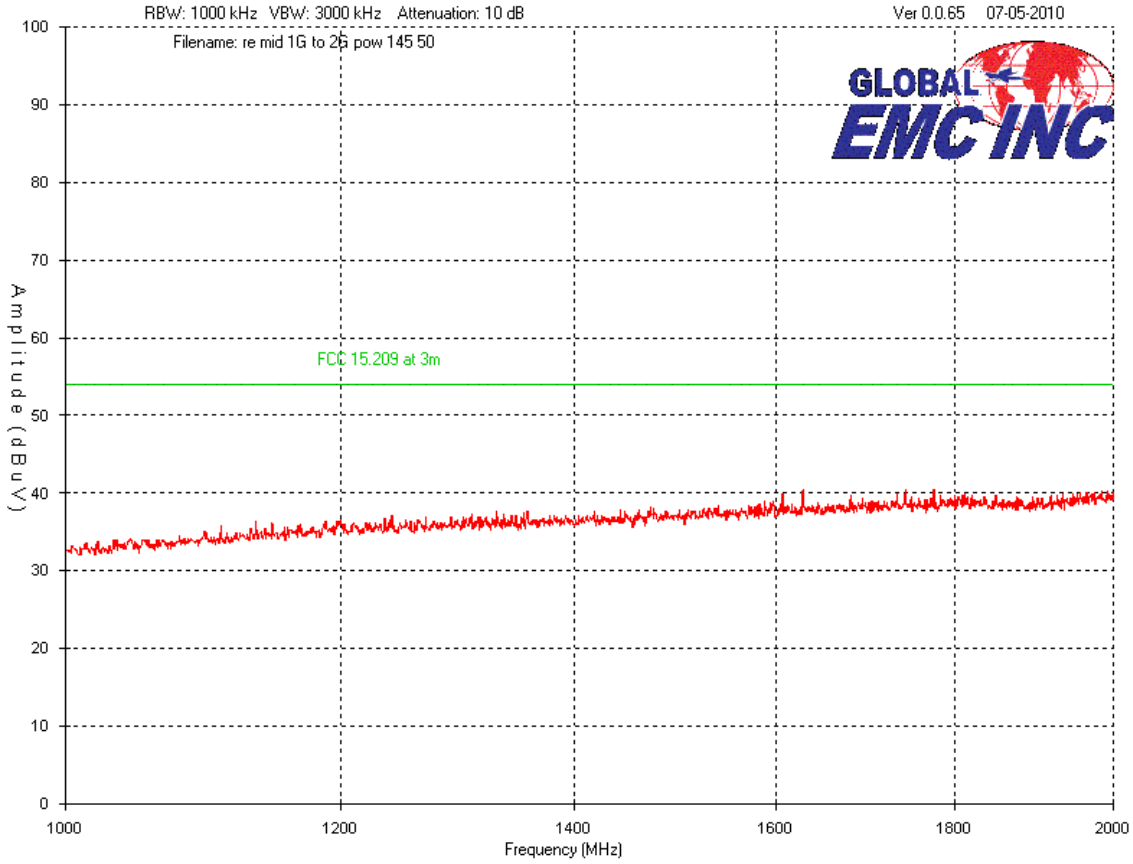
Vertical – Peak Emissions Graph – Worst Case (mid channel – hopping stopped)



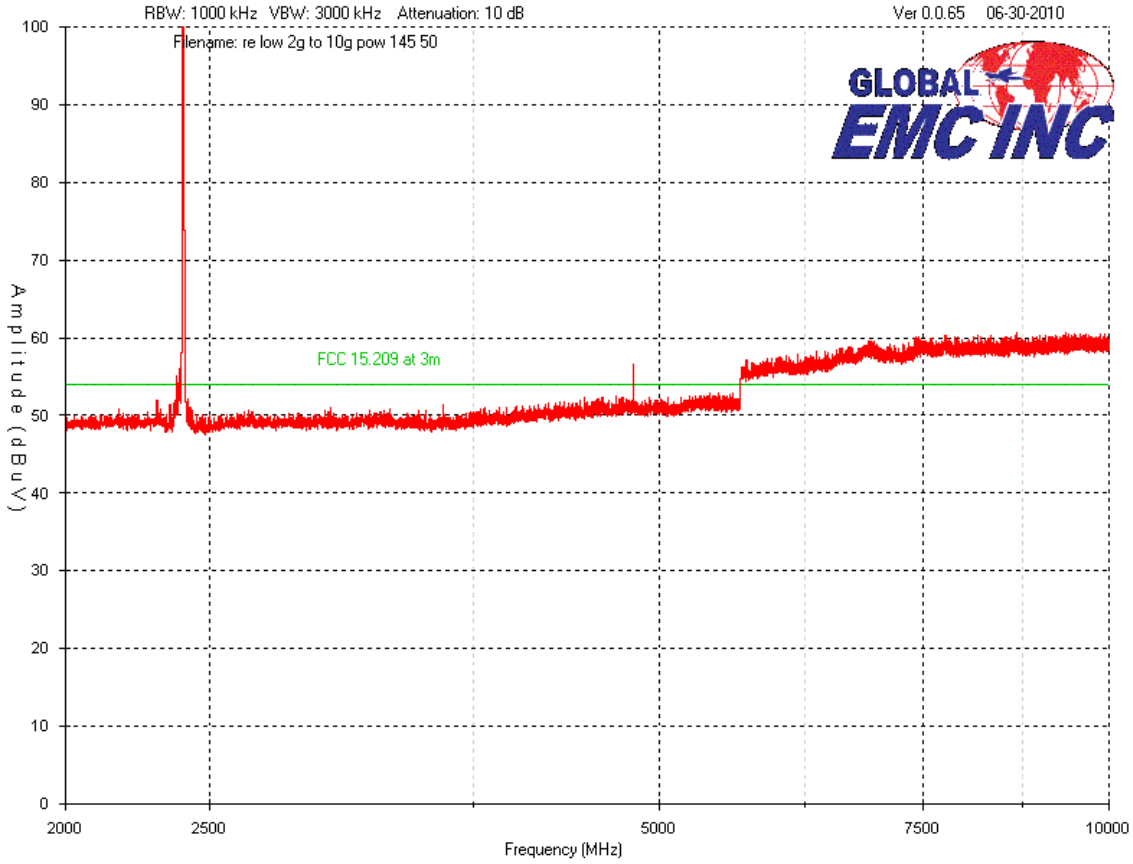


Horizontal – Peak Emissions Graph – Worst Case (mid channel – hopping stopped)

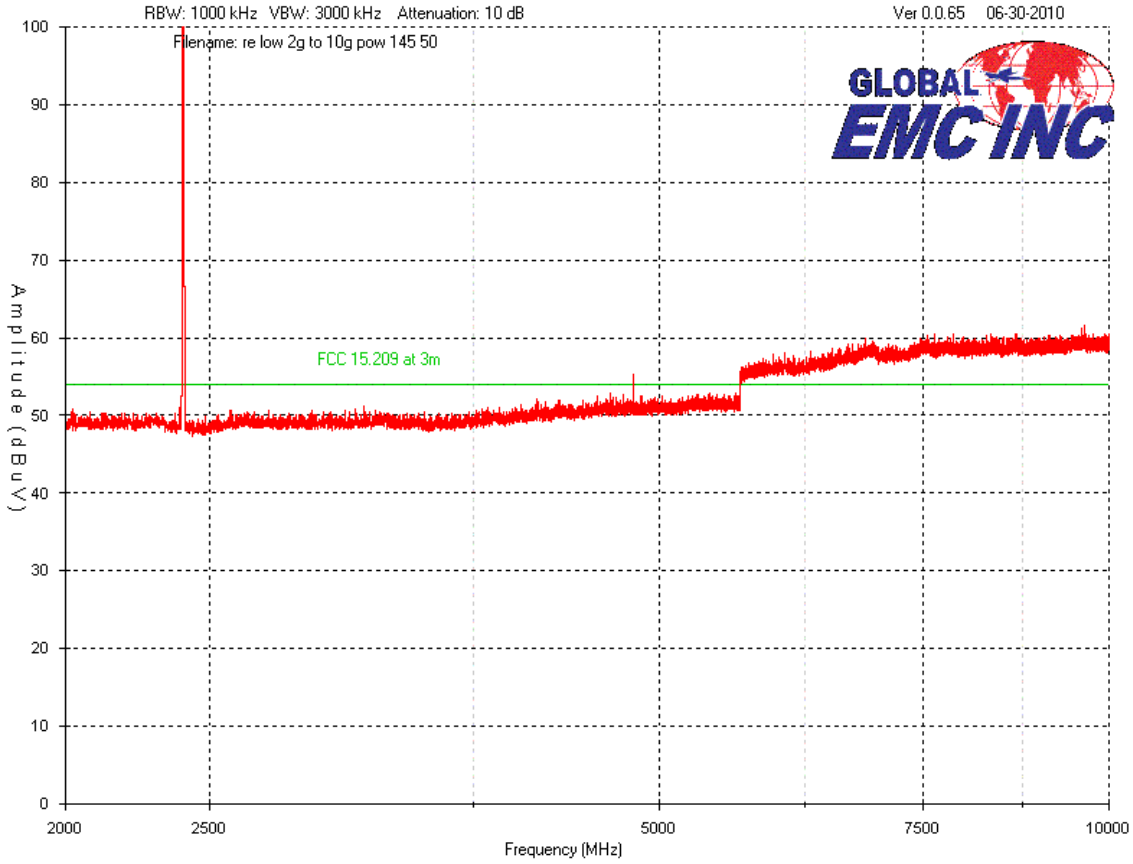




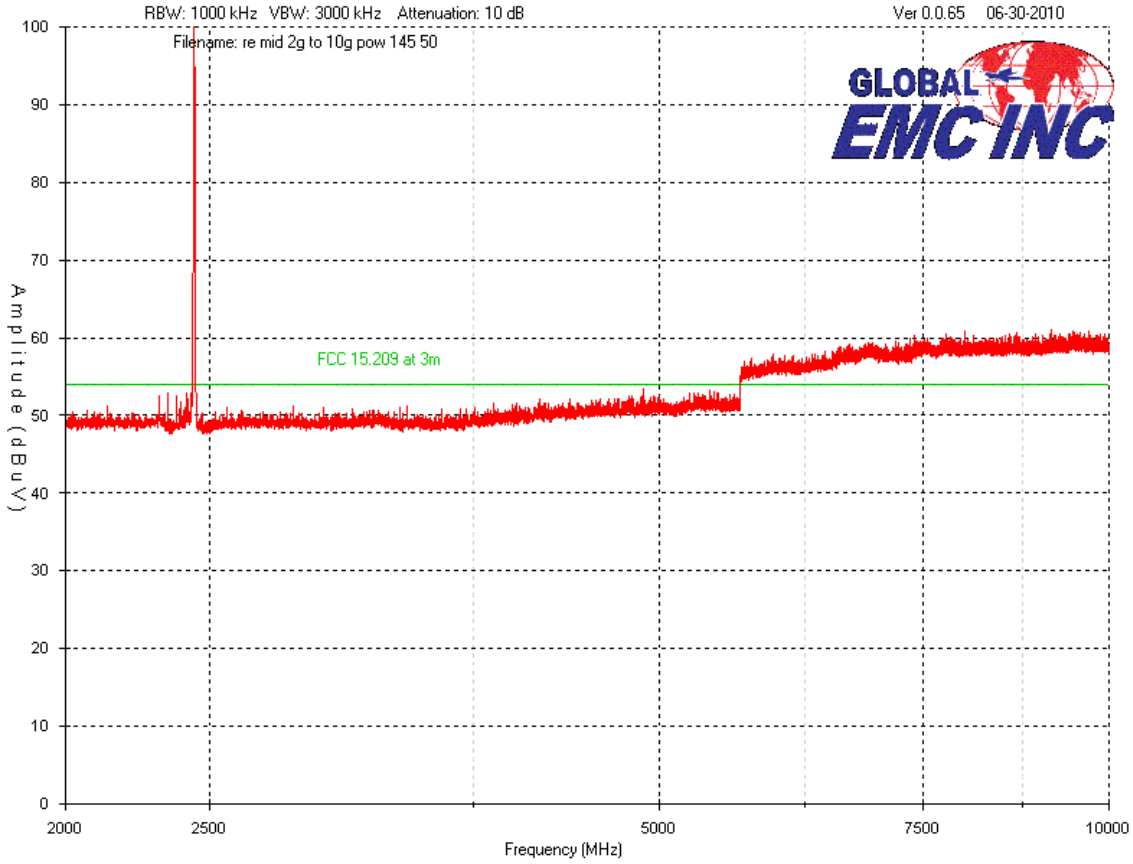
Vertical – Peak Emissions Graph – Low Channel (hopping stopped)



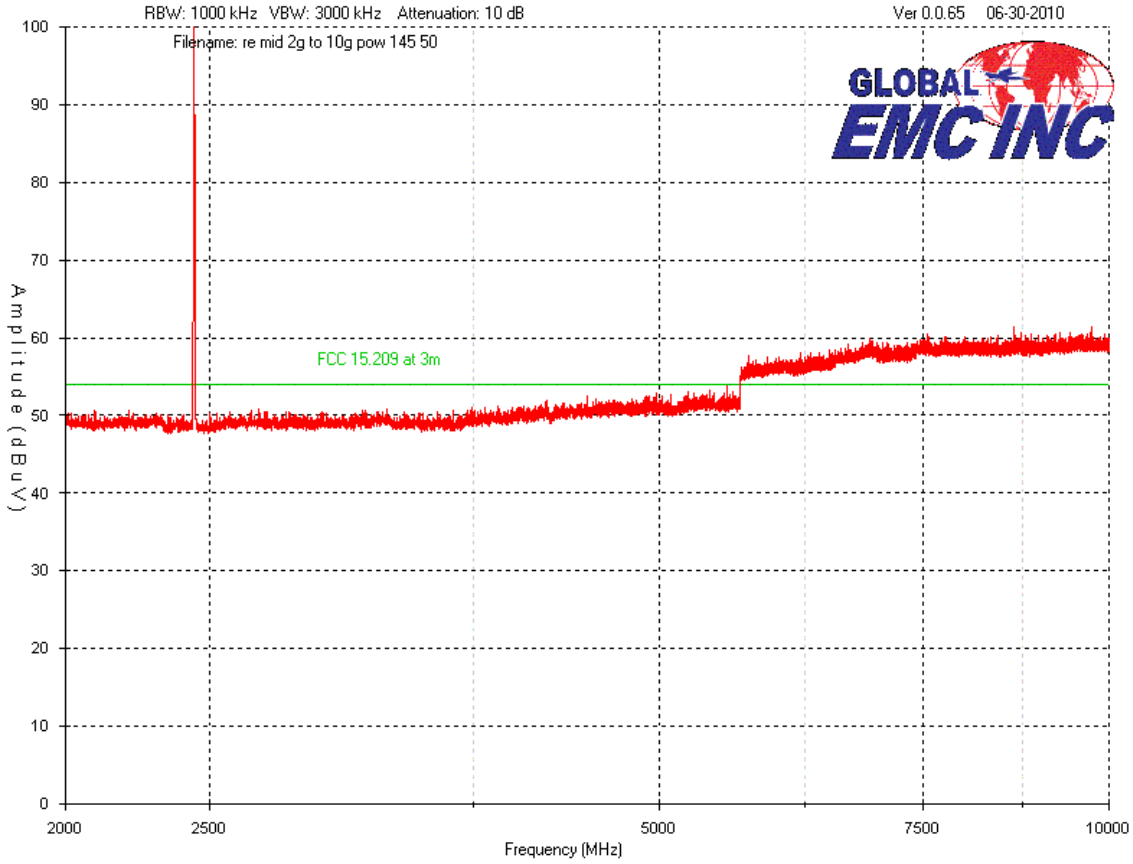
Horizontal – Peak Emissions Graph – Low Channel (hopping stopped)



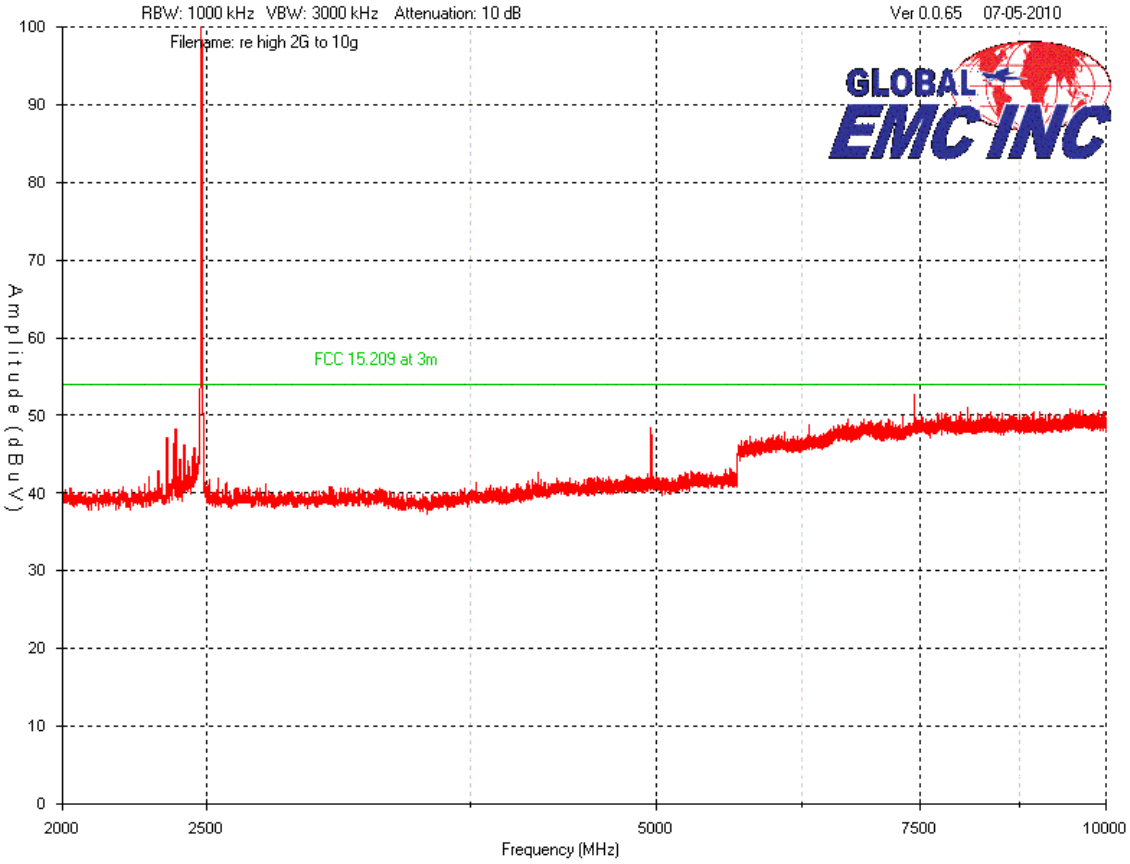
Vertical – Peak Emissions Graph – Mid Band (hopping stopped)



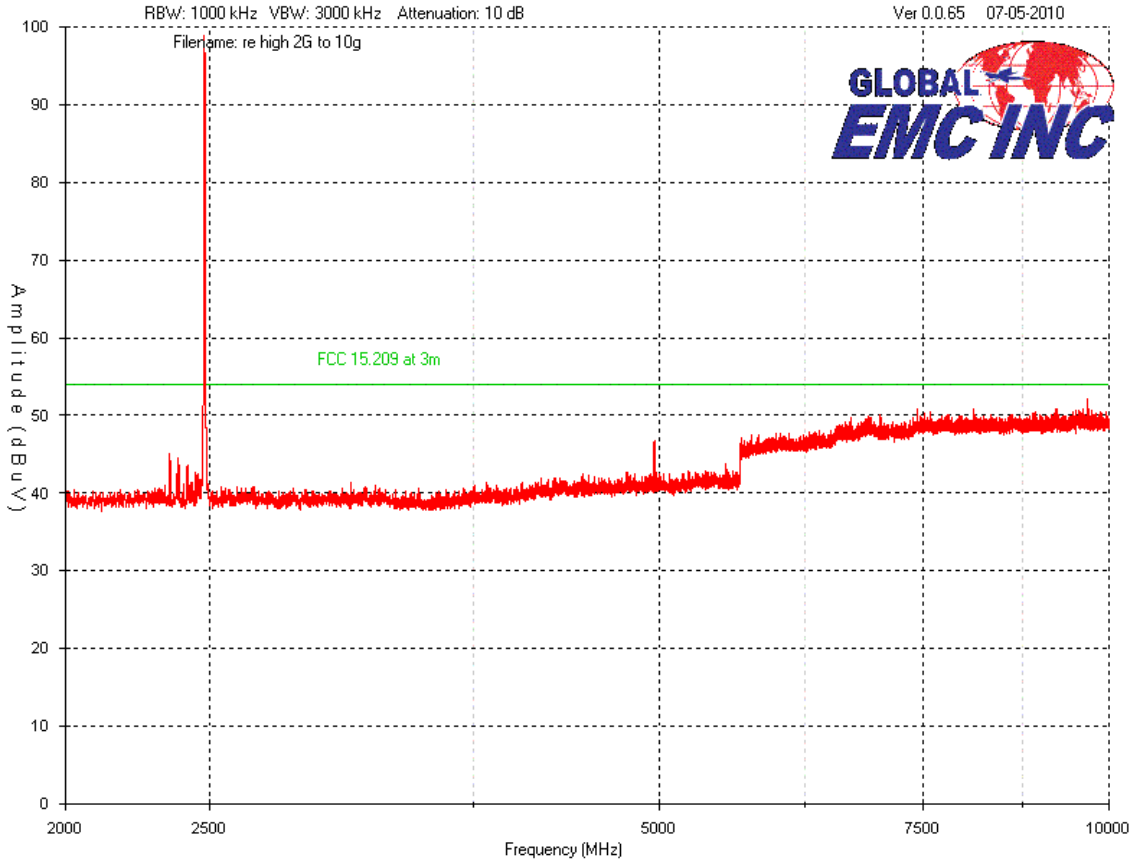
Horizontal – Peak Emissions Graph – Mid Channel (hopping stopped)



Vertical – Peak Emissions Graph – High Channel (hopping stopped)



Horizontal – Peak Emissions Graph – High Channel (hopping stopped)



Final Measurements

Note: In accordance with 15.247(d), only radiated emissions exceeding the 15.209 limit that occur within the bands listed in 15.205, need to be verified with a quasi-peak detector or an average detector.

The requirement of -20dBc is verified by the conducted method, please see 'Spurious Antenna Conducted Emissions' section of this report.

For information purposes, the fundamental was measured to be 110.1 dBuV/m at 3 meters, and none of the unintentional radiated emissions that fall outside of the restricted bands exceeded the -20dBc (or 90.1 dBuV/m) requirement.

The following measurements were made at the harmonics shown in the above graphs.

See 'Spurious Antenna Conducted Emissions' measurements for -20 dBc requirements.

Radiated Emissions Measurements

Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
Low Channel 145 - 50											
2401*	Peak	Horz	113.5	30.6	2.2	0.0	36.2	110.1			PASS
2401*	Avg	Horz	79.2	30.6	2.2	0.0	36.2	75.8			PASS
2401*	Peak	Vert	99.6	30.6	2.2	0.0	36.2	96.2			PASS
2401*	Avg	Vert	67.0	30.6	2.2	0.0	36.2	63.6			PASS
2390	Peak	Horz	54.0	30.6	2.2	0.0	36.2	50.6	74.0	23.4	PASS
2390	Avg	Horz	35.0	30.6	2.2	0.0	36.2	31.6	54.0	22.4	PASS
2390	Peak	Vert	50.5	30.6	2.2	0.0	36.2	47.1	74.0	26.9	PASS
2390	Avg	Vert	35.0	30.6	2.2	0.0	36.2	31.6	54.0	22.4	PASS
2400	Peak Marker Delta	Horz	76.5	30.6	2.2	0.0	36.2	73.1	74.0	0.9	PASS
2400	Avg	Horz	53.2	30.6	2.2	0.0	36.2	49.8	54.0	4.2	PASS
2400	Peak Marker Delta	Vert	62.6	30.6	2.2	0.0	36.2	59.2	74.0	14.8	PASS
2400	Avg	Vert	47.5	30.6	2.2	0.0	36.2	44.1	54.0	9.9	PASS
2398	Peak	Horz	75.5	30.6	2.2	0.0	36.2	72.1	74.0	1.9	PASS
2398	Avg	Horz	NA								
2398	Peak	Vert	61.6	30.6	2.2	0.0	36.2	58.2	74.0	15.8	PASS
2398	Avg	Vert	NA								
4802	Peak	Horz	65.8	33.7	2.9	0.0	35.7	66.7	74.0	7.3	PASS
4802	Avg	Horz	38.9	33.7	2.9	0.0	35.7	39.8	54.0	14.2	PASS
4802	Peak	Vert	62.1	33.7	2.9	0.0	35.7	63.0	74.0	11.0	PASS
4802	Avg	Vert	35.0	33.7	2.9	0.0	35.7	35.9	54.0	18.1	PASS
7203	Peak	Vert	54.2	37.9	4.3	0.0	35.9	60.5	74.0	13.5	PASS
7203	Avg	Vert	35.0	37.9	4.3	0.0	35.9	41.3	54.0	12.7	PASS
7203	Peak	Horz	53.1	37.9	4.3	0.0	35.9	59.4	74.0	14.6	PASS
7203	Avg	Horz	35.0	37.9	4.3	0.0	35.9	41.3	54.0	12.7	PASS
9604	Peak	Horz	NF								
9604	Avg	Horz	NF								
9604	Peak	Vert	NF								
9604	Avg	Vert	NF								
Mid channel											
2445	Peak	Horz	111.4	30.6	2.2	0.0	36.2	108.0			PASS
2445	Avg	Horz	82.3	30.6	2.2	0.0	36.2	78.9			PASS
2445	Peak	Vert	98.6	30.6	2.2	0.0	36.2	95.2			PASS
2445	Avg	Vert	70.5	30.6	2.2	0.0	36.2	67.1			PASS
4890	Peak	Horz	65.1	33.7	2.9	0.0	35.7	66.0	74.0	8.0	PASS

4890	Avg	Horz	38.8	33.7	2.9	0.0	35.7	39.7	54.0	14.3	PASS
4890	Peak	Vert	61.3	33.7	2.9	0.0	35.7	62.2	74.0	11.8	PASS
4890	Avg	Vert	34.2	33.7	2.9	0.0	35.7	35.1	54.0	18.9	PASS
7335	Peak	Vert	53.9	37.9	4.3	0.0	35.9	60.2	74.0	13.8	PASS
7335	Avg	Vert	34.2	37.9	4.3	0.0	35.9	40.5	54.0	13.5	PASS
7335	Peak	Horz	52.4	37.9	4.3	0.0	35.9	58.7	74.0	15.3	PASS
7335	Avg	Horz	34.8	37.9	4.3	0.0	35.9	41.1	54.0	12.9	PASS
High channel 25											
2480	Peak	Horz	109.5	30.6	2.2	0.0	36.2	106.1			PASS
2480	Avg	Horz	85.2	30.6	2.2	0.0	36.2	81.8			PASS
2480	Peak	Vert	98.2	30.6	2.2	0.0	36.2	94.8			PASS
2480	Avg	Vert	74.2	30.6	2.2	0.0	36.2	70.8			PASS
2483.5	Peak	Horz	75.6	30.6	2.2	0.0	36.2	72.2	74.0	1.8	PASS
2483.5	Avg	Horz	48.5	30.6	2.2	0.0	36.2	45.1	54.0	8.9	PASS
2483.5	Peak	Vert	65.6	30.6	2.2	0.0	36.2	62.2	74.0	11.8	PASS
2483.5	Avg	Vert	39.5	30.6	2.2	0.0	36.2	36.1	54.0	17.9	PASS
4960	Peak	Horz	64.8	33.7	2.9	0.0	35.7	65.7	74.0	8.3	PASS
4960	Avg	Horz	37.8	33.7	2.9	0.0	35.7	38.7	54.0	15.3	PASS
4960	Peak	Vert	61.0	33.7	2.9	0.0	35.7	61.9	74.0	12.1	PASS
4960	Avg	Vert	34.1	33.7	2.9	0.0	35.7	35.0	54.0	19.0	PASS
7440	Peak	Vert	53.3	37.9	4.3	0.0	35.9	59.6	74.0	14.4	PASS
7440	Avg	Vert	33.9	37.9	4.3	0.0	35.9	40.2	54.0	13.8	PASS
7440	Peak	Horz	52.0	37.9	4.3	0.0	35.9	58.3	74.0	15.7	PASS
7440	Avg	Horz	33.8	37.9	4.3	0.0	35.9	40.1	54.0	13.9	PASS

(*) Note: 2401 MHz is shown as the worst case frequency, however the data is representative of worst case between 2401 and 2402 MHz operation.

Note: Radiated emissions measurements above 10 GHz were performed at a 1 meter test distance, and in accordance with FCC 15.31(f)(1) an extrapolation factor of 9.5 dB was applied. No emissions above the 3rd harmonic were detected at 3 meters. The system noise floor at the 10th harmonic was approximately 12 dB at 1m.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
IFR Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
BiLog Antenna	3142-C	ETS	2009-02-12	2011-02-12	GEMC 8
Horn Antenna	6878/24	Q-Par	25/08/2008	25/08/2010	GEMC 6365
1-26G pre-amp	HP 8449B	HP	25/08/2008	25/08/2010	GEMC 6351
Schaffner Preamp 9kHz - 2 GHz	CPA9231A	Schaffner	8/26/2008	8/26/2010	GEMC 116
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template “FCC - 15.209 - Radiated Emissions_Rev2.doc”

Channel Carrier Bandwidth of Frequency Hopping Systems

Purpose

The purpose of this test is to allow for results that is used to help establish other limits. Although there is not specific limit for this requirement, the derived limits dependant on this information helps allow for other spread spectrum devices to co-exist in the same frequency spectrum.. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

Limits

There is no specified limit. However, an approximate calculated maximum limit can be obtained by dividing the maximum bandwidth of the frequency allocation by the minimum number of channels. Note that this is a maximum bandwidth, and the measurement is used to calculate other limits.

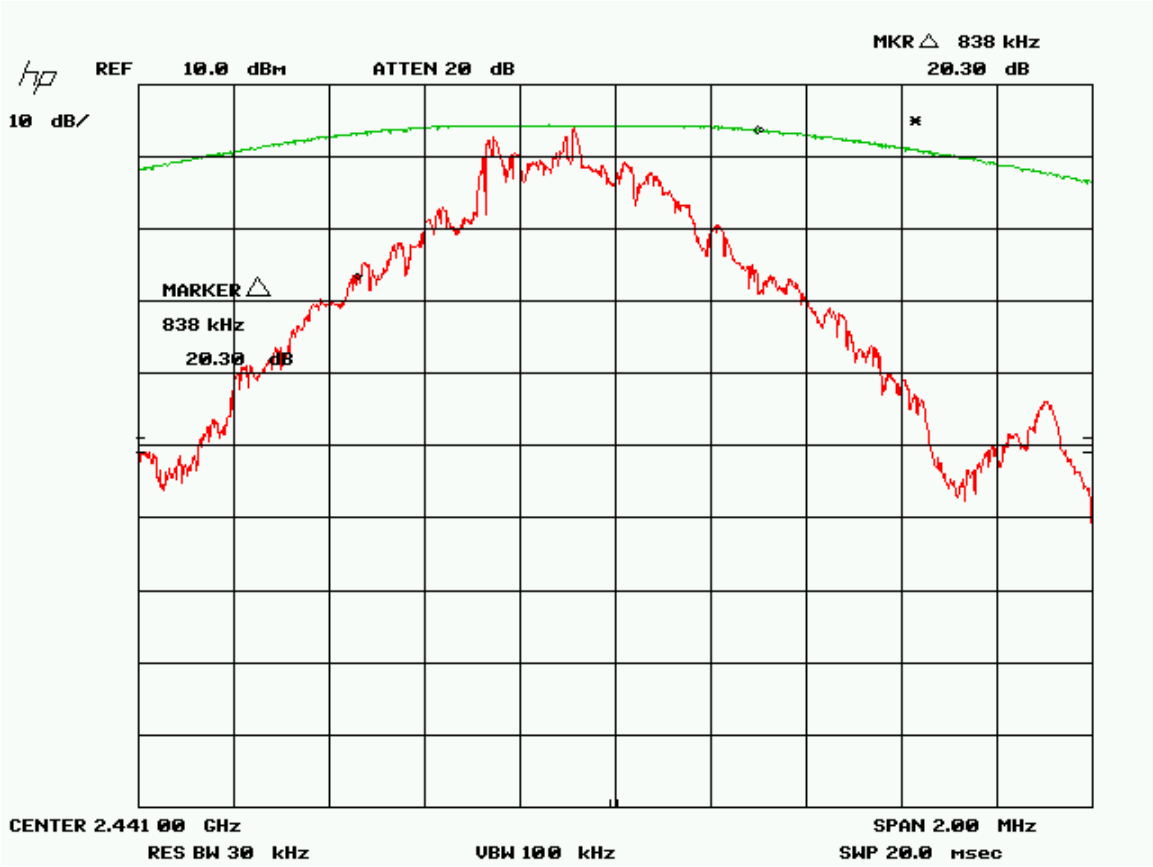
2.4 to 2.4835 GHz
83.5 MHz / 15
5.57 MHz

Results

The EUT passed. The 20 dB BW measured was 838 kHz.

Graph(s)

The graphs shown below shows the channel spacing during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 20 dB bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less then 1 minute.



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	AN940	IFR	Dec 29, 2009	Dec 29, 2011	GEMC 6350
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template “FCC – Power Line Conducted Emissions Class B_Rev1”

Channel Carrier Separation for Frequency Hopping Systems

Purpose

The purpose of this test is to ensure that the RF energy of frequency hopping systems is sufficiently spread over a spectrum and that the radio energy is not overly dense. This limit helps allow for other spread spectrum devices to co-exist in the same frequency spectrum. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

Limits

The limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)

	902 to 928 MHz	2.4 to 2.4835 GHz	5.275 to 5.85 GHz
No conditions	25 kHz or 20 dB BW[1]	25 kHz or 20 dB BW[1]	25 kHz or 20 dB BW[1]
< 125 mW	25 kHz or 20 dB BW[1]	25 kHz or 2/3 of 20 dB BW[1]	25 kHz or 20 dB BW[1]

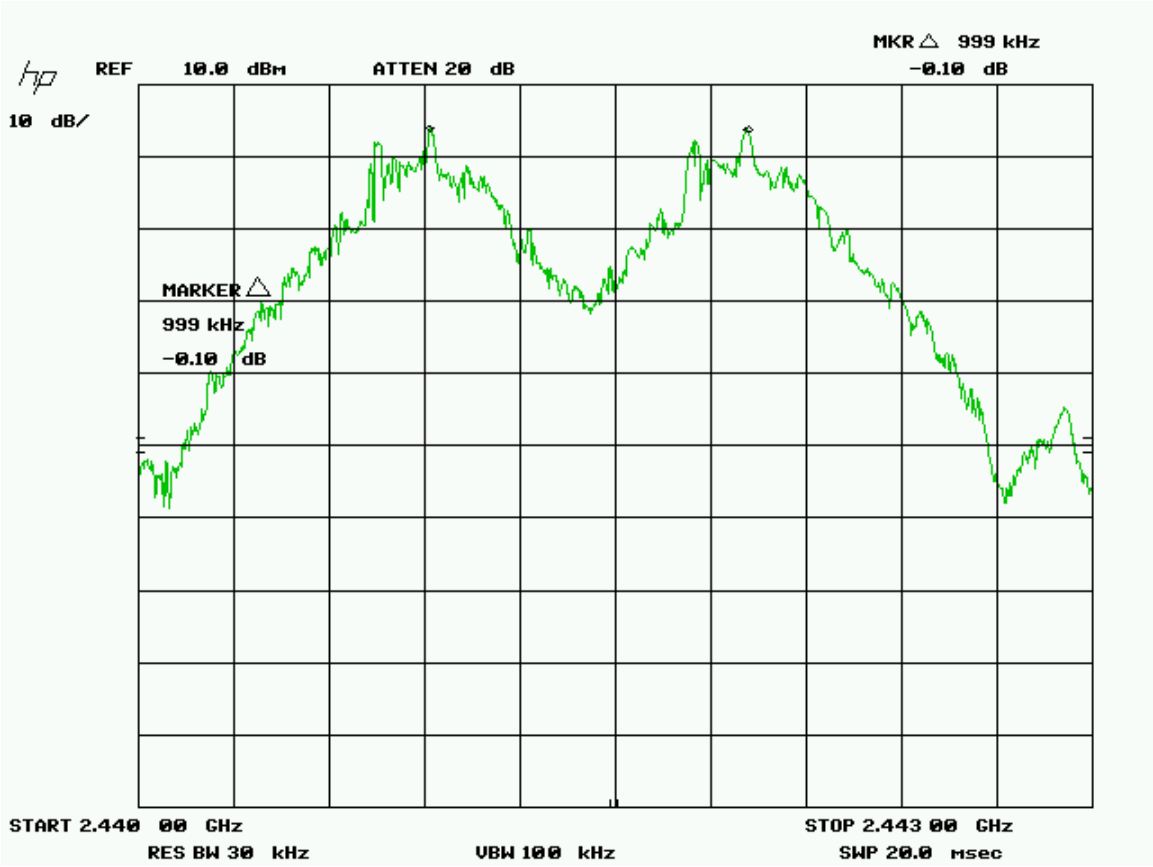
Note 1: Whichever is greater.

Results

The EUT passed the requirements of channel carrier spacing exceeding the measured 20 dB BW of the EUT. The 20 dB BW previously measured was 838 kHz, and the device had a channel spacing of 999 kHz.

Graph(s)

The graphs shown below shows the channel spacing during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the channel spacing of the signal being measured. This measurement is a peak measurement. Max hold is performed for a duration of not less then 1 minute.



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	AN940	IFR	Dec 29, 2009	Dec 29, 2011	GEMC 6350
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template “FCC – Power Line Conducted Emissions Class B_Rev1”

Number of Channels for Frequency Hopping Systems

Purpose

The purpose of this test is to ensure that the RF energy of frequency hopping systems is sufficiently spread over a spectrum and that the radio energy is not overly dense. This limit helps allow for other spread spectrum devices to co-exist in the same frequency spectrum. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

Limits

The limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)

	902 to 928 MHz	2.4 to 2.4835 GHz	5.275 to 5.85 GHz
No conditions	>= 50 channels	>= 15 channels	>= 75 channels
20 dB BW exceeds 250 kHz	>= 25 channels	>= 15 channels	>= 75 channels

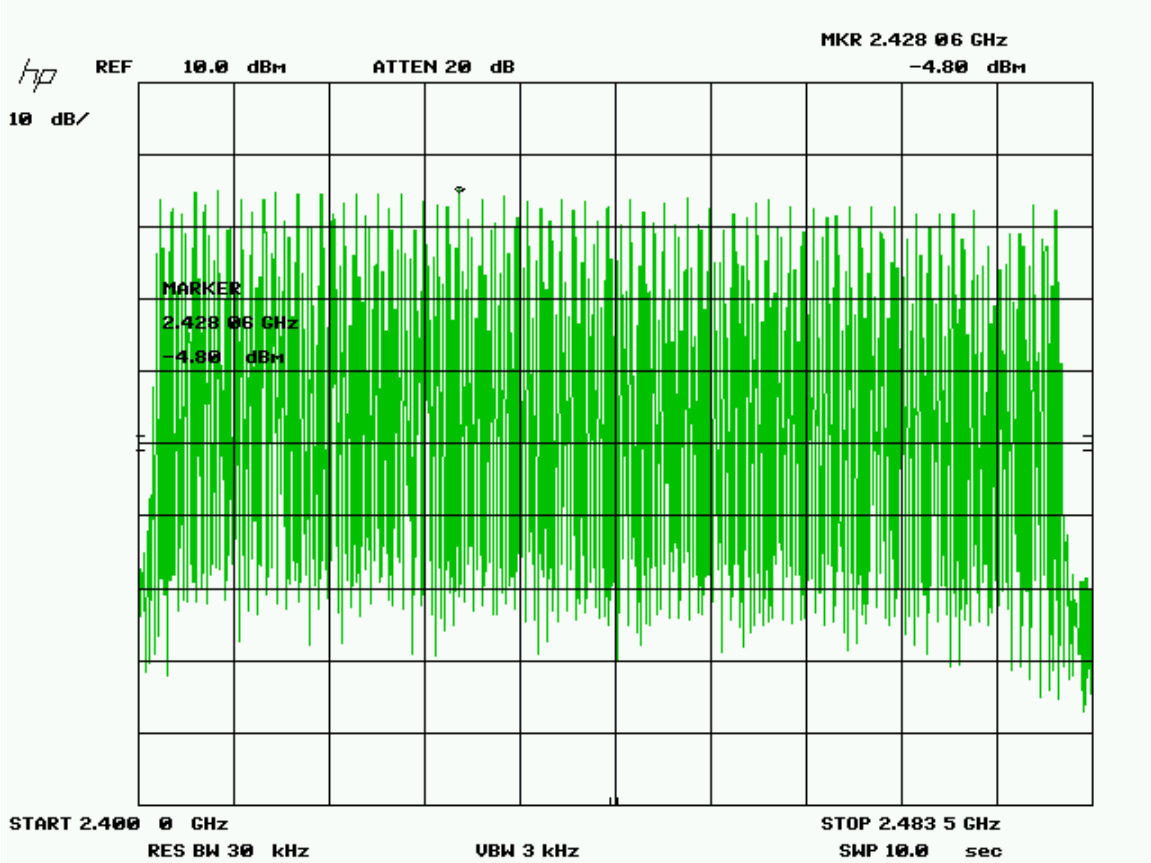
Results

The EUT passed the requirements of the number of channels. The number of channels the device occupies is 79 channels in the allocation band of 2.4 to 2.4835 GHz

Graph(s)

The graphs shown below shows the number of occupied channels during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the channel spacing of the signal being measured. This measurement is a peak measurement. Max hold is performed for a duration of not less then 10 minutes, or as sufficient to capture the channels occupied.

The number of



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	AN940	IFR	Dec 29, 2009	Dec 29, 2011	GEMC 6350
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template “FCC – Power Line Conducted Emissions Class B_Rev1”

Frequency Occupancy for Frequency Hopping Systems

Purpose

The purpose of this test is to ensure that the RF energy of frequency hopping systems is hopping at a minimum defined rate. This helps ensure sufficient time off to enable other frequency hopping devices to co-operate within this allocated band.

Limits

For 2400 – 2483.5 MHz systems, the limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)(iii).

For frequency hopping systems in 2400 – 2483.5 MHz, the unit shall use at least 15 channels. The average time of occupancy shall not be greater than 0.4s in a period of 0.4s X # of channels occupied.

Results

The EUT passed the requirements. The EUT cycles through its pseudo-random generated list of hopping frequencies. There are 79 channels occupied in total. The average occupancy time is 0.38 ms per channel and each channel is repeated every 98.6 ms.

The complete observation time is
= # of channels x 400 ms
= 79 x 400 ms
= 31,600 ms
= 31.6 s

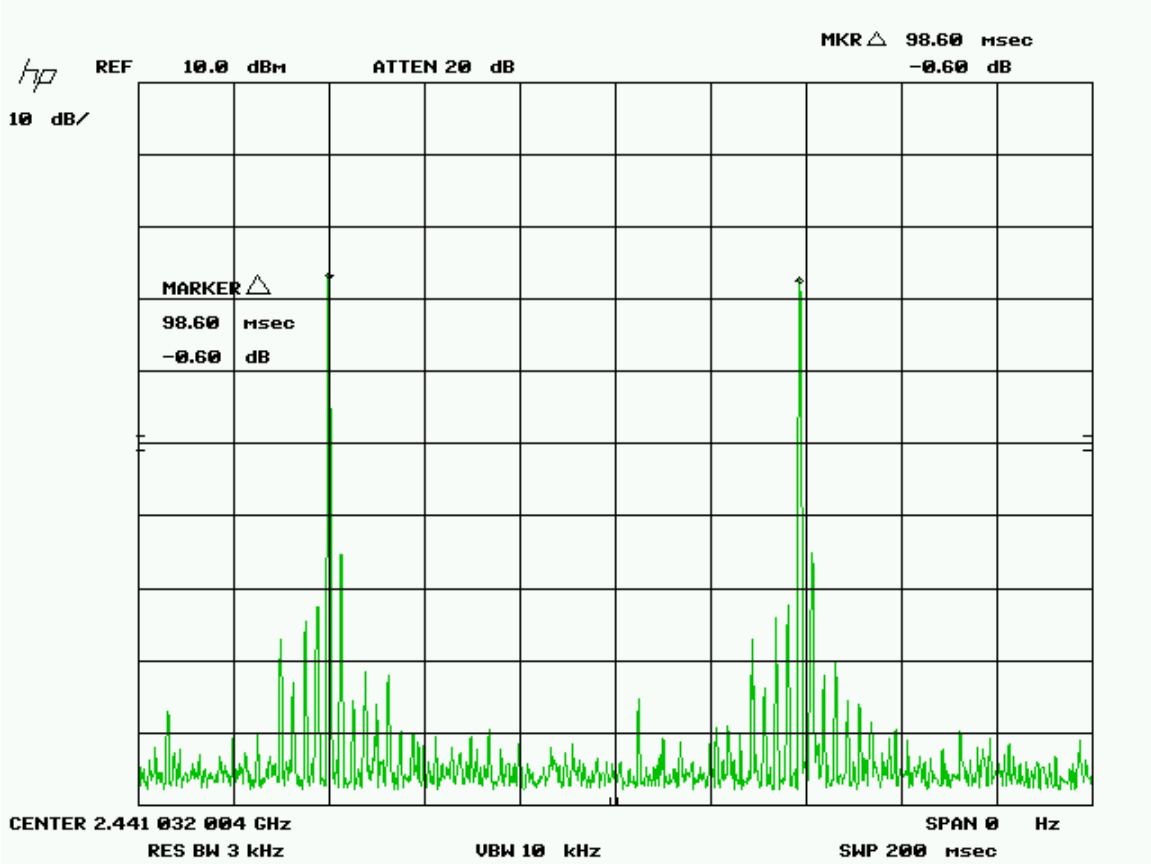
Number of time a channel is occupied in 31.6s = 31.6s / 98.18ms
= 31600 ms / 98.6ms
= 320.5 times.

Total occupancy time in 31.6 s is
= 320.5 x 0.38 ms
= 122.79 ms

The EUT has an average occupancy of 122.79 msec within a 31.6 second period. This is under the 400 msec limit as per 15.247 (a) 1 (iii)

Graph(s)

The graph shown below shows the repeat time of the pseudorandom generated hopping list.



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	AN940	HP	Dec 29, 2009	Dec 29, 2011	GEMC 6350
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Maximum Peak Envelope Conducted Power

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified.

Limits

The limits are defined in 15.247(b).

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels=: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Results

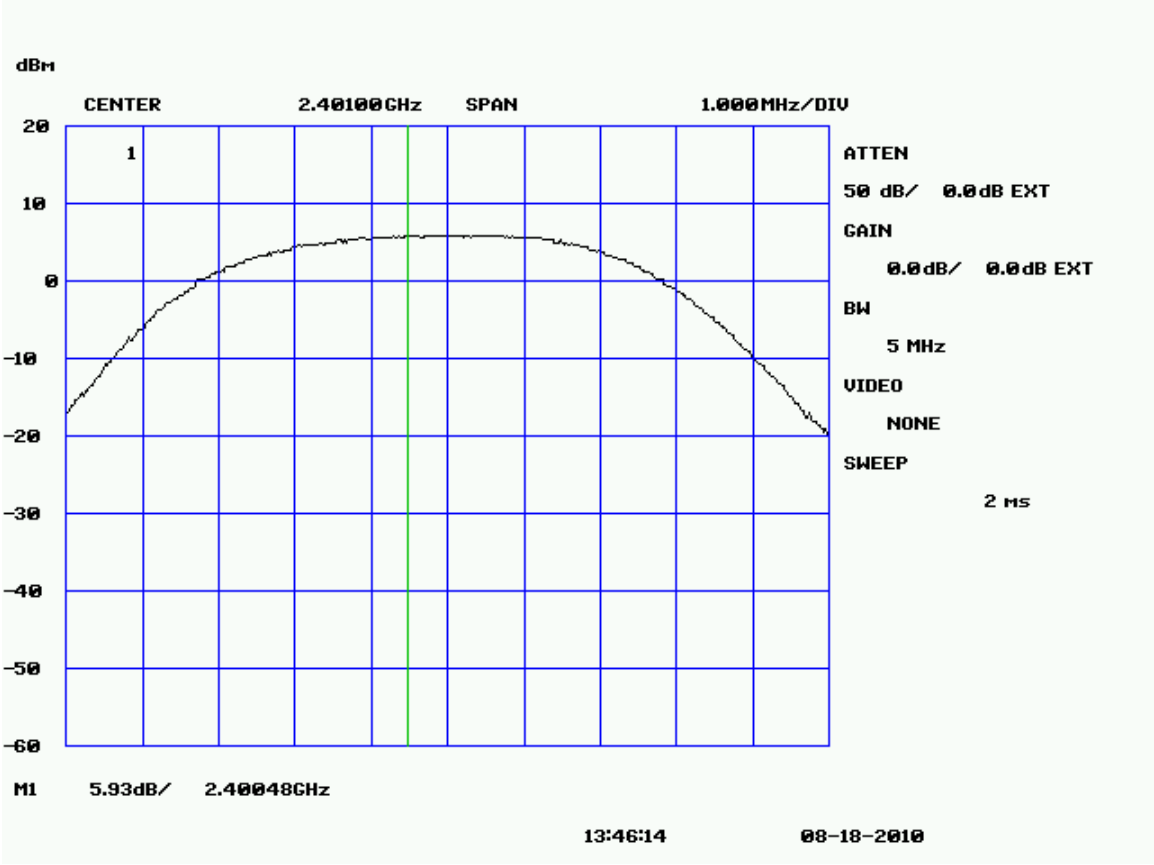
The EUT passed. The number of channels was 79, and the peak power measured was 16 dBm (39.8 mW).

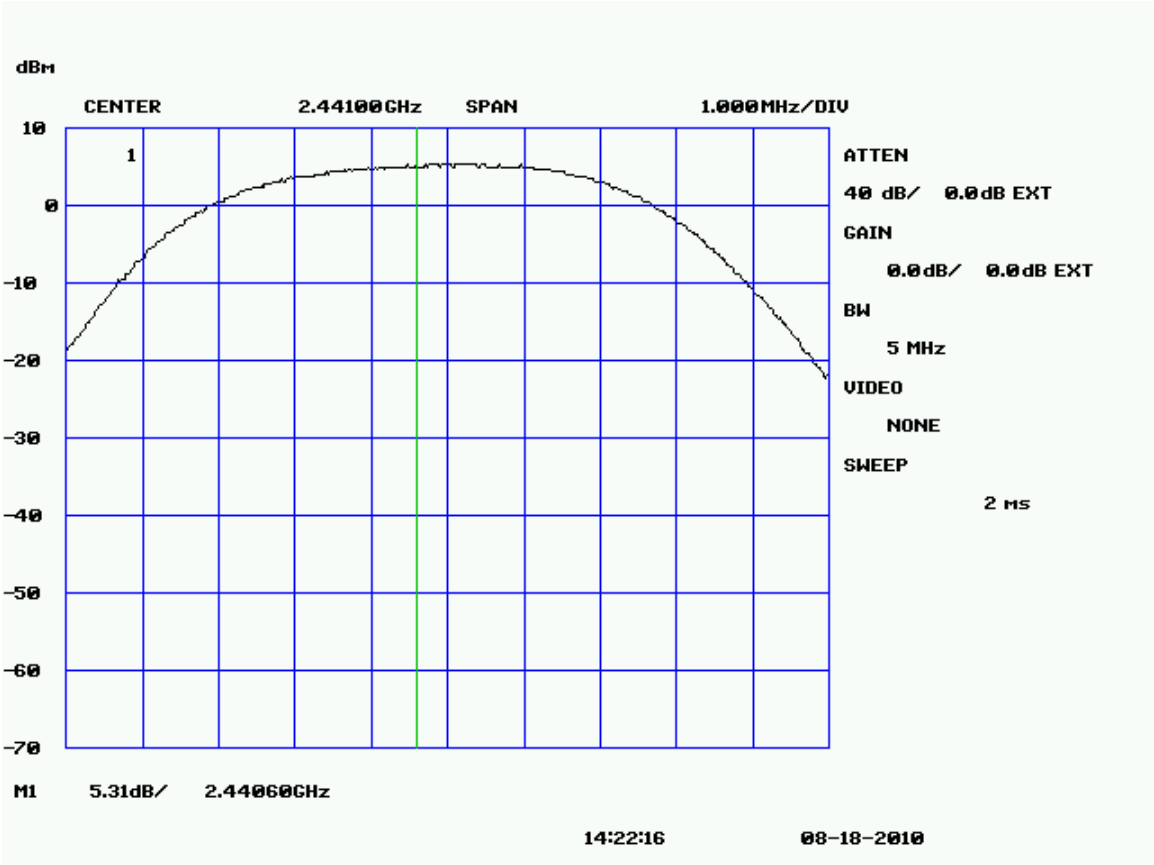
Frequency	Power	Atten	dBm	mW
2401*	6	10	16	39.81072
2441	5.4	10	15.4	34.67369
2480	3.1	10	13.1	20.41738

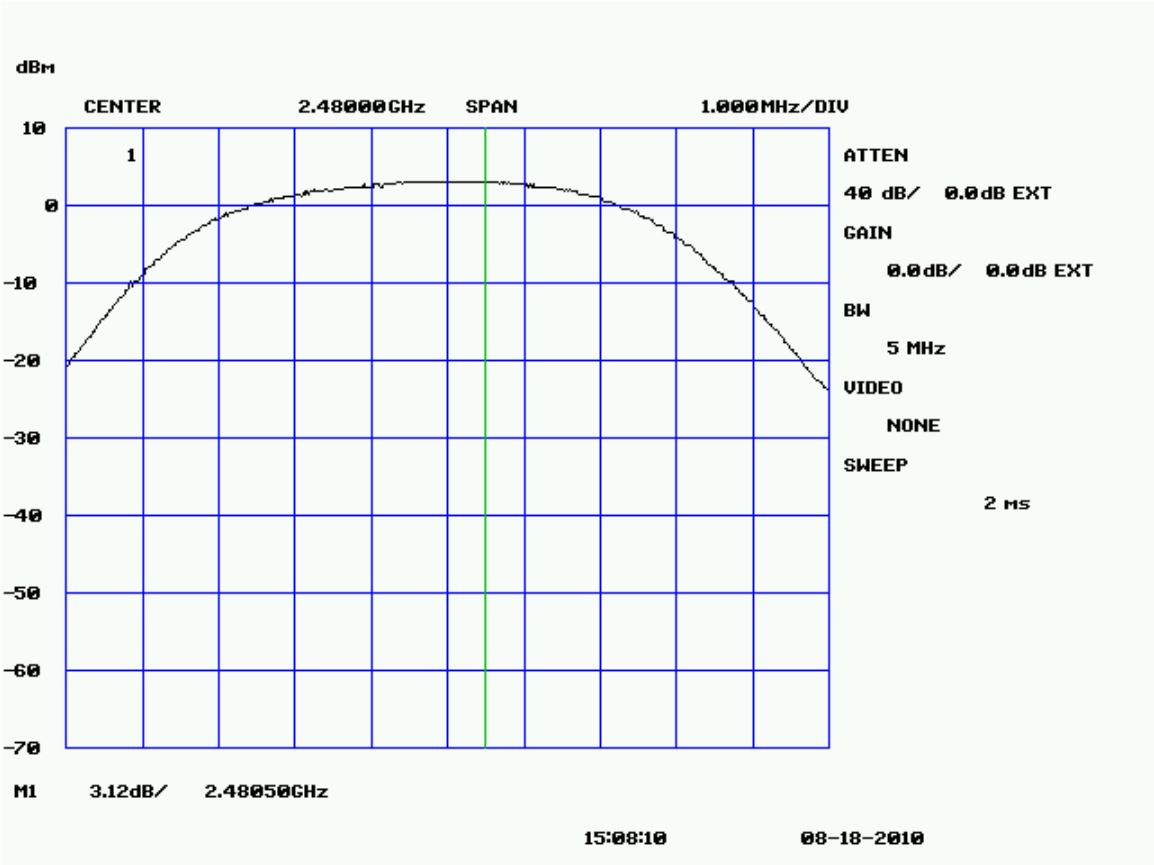
(*) Note: 2401 MHz is shown as the worst case frequency, however the data is representative of worst case between 2401 and 2402 MHz operation.

Graph(s)

The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 10 dB of external attenuation taken during this measurement.







Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	AN940	IFR	Dec 29, 2009	Dec 29, 2011	GEMC 6350
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Spurious Conducted Emissions

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified.

Limits

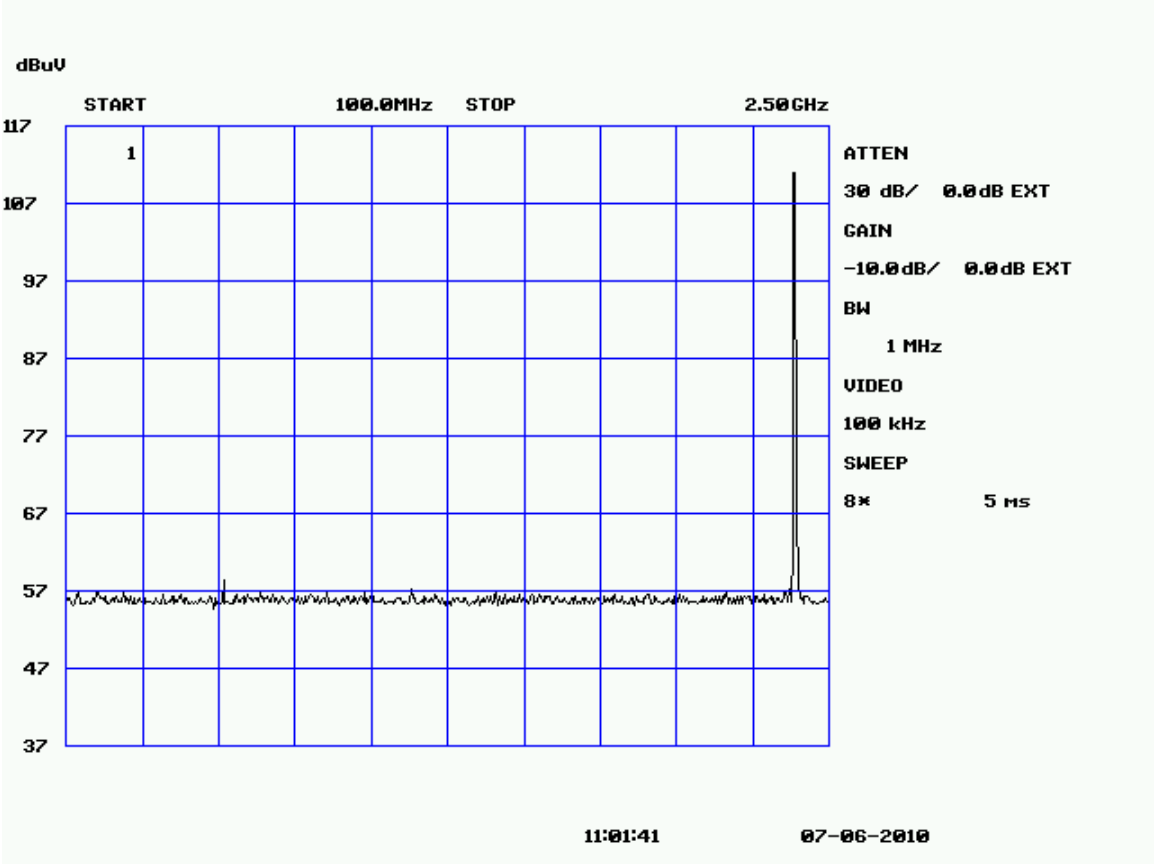
The limits are defined in 15.247(d).
In any 100 kHz band, the peak spurious harmonics emissions must be at least 20 dB below the fundamental.

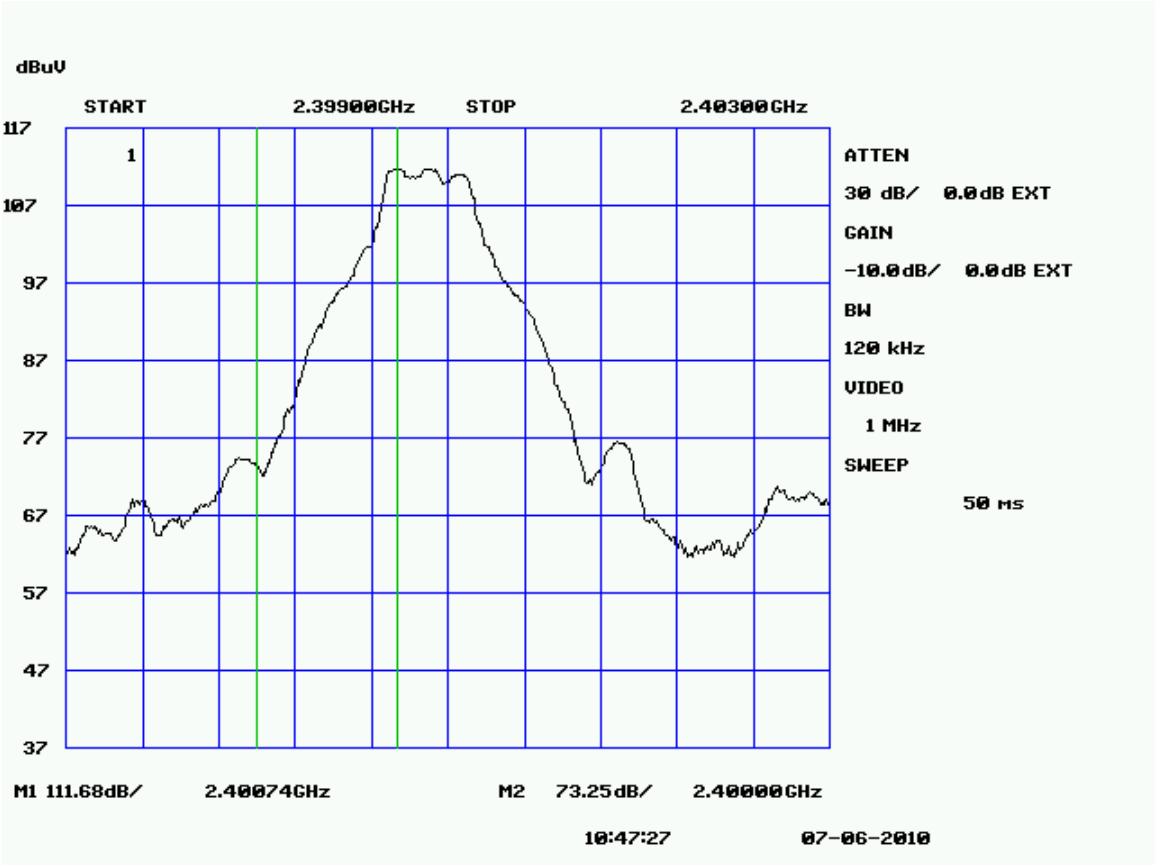
Results

The EUT passed. The peak power measured was 16.0 dBm (39.8 mW). The worst case (at band edge) was less than -4 dBm. Low, middle, and high channel with frequency hopping stopped was investigated.

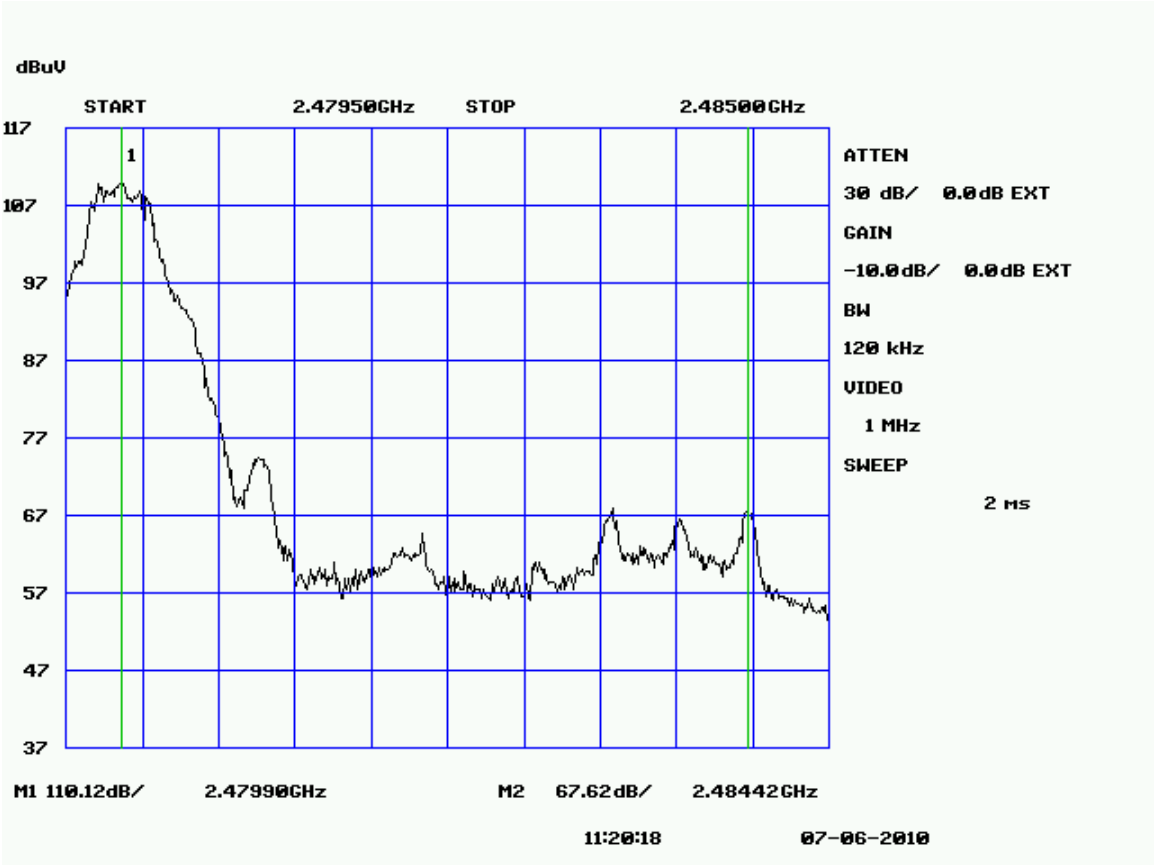
Graph(s)

The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 20 dB of external attenuation taken during this measurement.

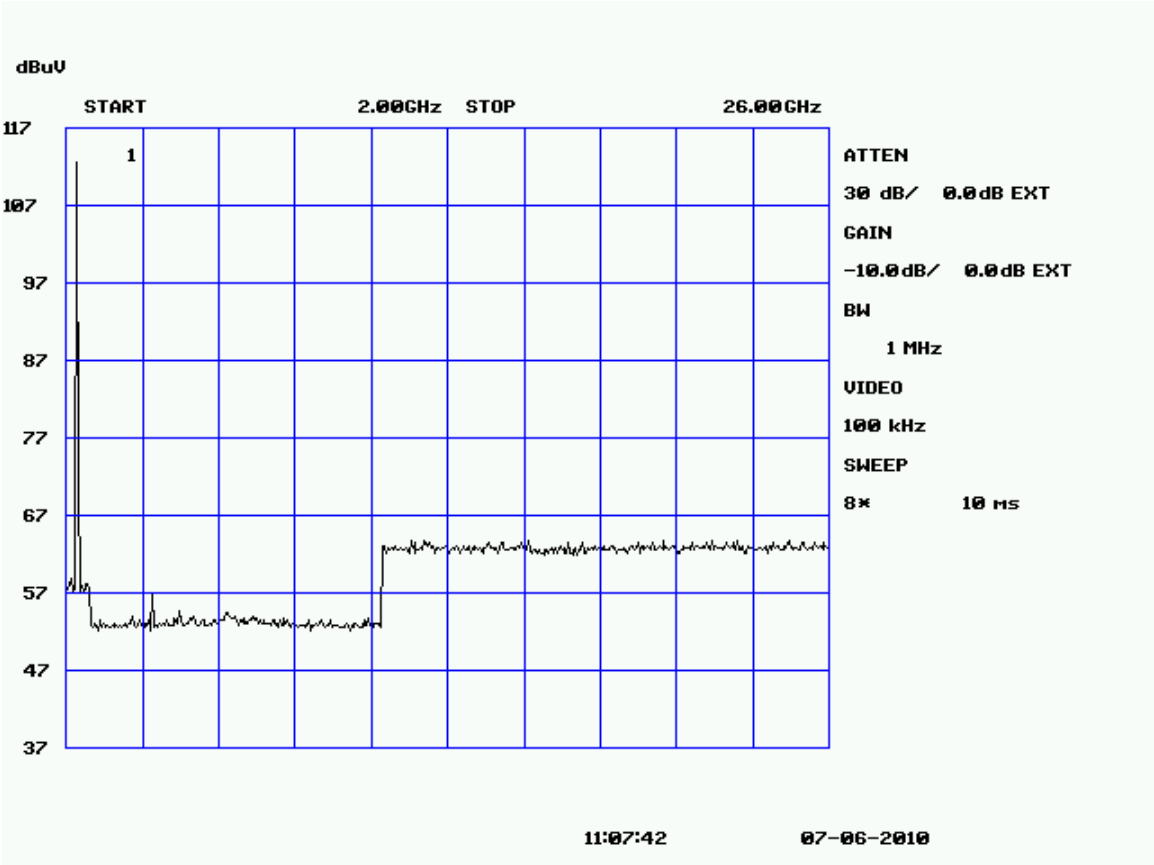




Low channel – Band edge



High Channel – Band Edge



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
IFR Spectrum Analyzer	AN940	IFR	Dec 29, 2009	Dec 29, 2011	GEMC 6350
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Maximum Permissible Exposure

Purpose

The purpose of this test is to ensure that the RF energy intentionally transmitted, in terms of power density emitted from the EUT at a stated operating distance does not exceed the limits listed below as defined in the applicable test standard, as calculated based upon readings obtained during testing. This helps protect human exposure to excessive RF fields.

Limit(s) and Method

The limits, as defined in FCC 15.247(i), and FCC 1.1310 Table 1 (B) limits for general public exposure was applied. The limit for the frequency range of 1.5 GHz to 100 GHz was applied. This is a limit of 1.0 mW/ cm^2 The distance used for calculations was 20cm, as this is the minimum distance an operator will be from the EUT during normal operation, as stated by the manufacturer.

Results

The EUT passed the requirements. The worst case calculated power density was 0.0079 mW/cm^2, this is significantly under the 1.0 mW/cm^2 requirement.

Calculations

Method 1 (conducted power)

$P_d = (P_t*G) / (4*pi*R^2)$
Where Pt = 16 or 39.8 mW as per Peak power conducted output
Where G = 0 dBi, or numerically 1
Where R = 20 cm

$P_d = (39.8\ mW * 1) / (4 * pi * 20cm^2)$
$P_d = 39.8\ mW / 5026\ cm^2$
$P_d = 0.0079\ mW/cm^2$

Appendix A – EUT Summary

For further details for filing purposes, refer to filing package.

General EUT Description

Client Details	
Organization / Address	Unify4Life Corporation 130 Esna Park Drive Markham, Ontario, L3R 1E3
Contact	Minh Doan
Phone	905.940.1117
Email	mdoan@unify4life.com
EUT Details	
EUT Model number	ARIZ02
Equipment Category	Residential
Basic EUT Functionality	The EUT allows the end user to stream audio via Bluetooth functionality.
Input Voltage and Frequency	120V 60Hz via DC adaptor
Connectors available on EUT	DC input
Peripherals Required for Test	None.
Release type	Final
Intentional Radiator Frequency	2402 – 2480.0 MHz for Bluetooth protocol.

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT & Test Setup Photographs'.

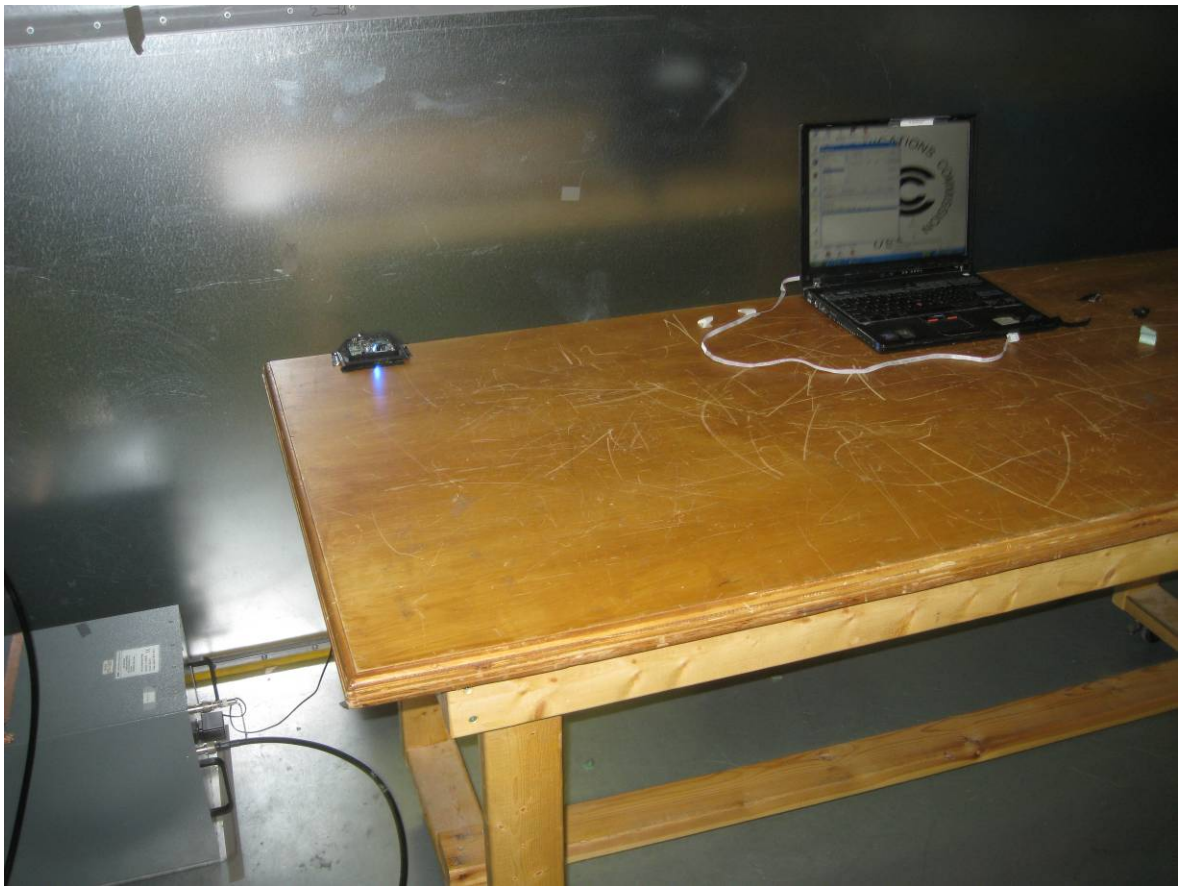
Appendix B – EUT and Test Setup Photographs

Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.

EUT

Radiated Emissions

Power Line Conducted Emissions



Antenna conducted measurements