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**TEST REPORT
PER FCC PT 15.247 FHSS
AND IC RSS-210**

APPLICANT	MOTOROLA SOLUTIONS, INC.
ADDRESS	1301 EAST ALGONQUIN RD. SCHAUMBURG IL 60196 USA
FCC ID	ABZ99FT4086
IC	109AB-99FT4086
MODEL	AAH56RDN9KA1AN
PRODUCT DESCRIPTION	UHF1 PORTABLE RADIO
DATE SAMPLE RECEIVED	7/28/2011
DATE TESTED	8/10/2011
TESTED BY	Nam Nguyen
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	1686BT11TestReport.doc
TEST RESULTS	☒ PASS ☐ FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01

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ATTESTATION

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.



Testing Certificate #0955-01

AUTHORIZED BY: Mario de Aranzeta



SIGNATURE:

FUNCTION: Lab Supervisor/ Test Engineer

DATE: 8/19/2011

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REPORT SUMMARY

Disclaimer:	The test results relate only to the items tested.
Purpose of Test:	To demonstrate that the DUT is compliant with FCC Pt 15.247 requirements for a FHSS radio.
Applicable Standards:	FCC Pt 15.247, ANSI C63.4: 2003, ANSI TIA-603: 2004, FCC Pt 15.109
Related Reports:	N/A

TEST ENVIRONMENT AND TEST SETUP

Test Facilities:	All measurements were made at one or more of the test sites of TIMCO ENGINEERING INC. located at 849 N.W. State Road 45, Newberry, FL 32669.
Laboratory Test Conditions:	Temperature: 26°C, Humidity: 55%
Test Exercise:	The DUT was set in continuous transmit mode of operation.
Deviation to the Standards:	There was no deviation from the standard.
Modification to the DUT:	No modification was made.
Supporting Accessories:	None

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DUT DESCRIPTION

DUT Description	UHF1 PORTABLE RADIO
FCC ID	ABZ99FT4086
IC	109AB-99FT4086
Model Number	AAH56RDN9KA1AN
Operating Frequency	(2402.00 – 2480.00) MHz
DUT Power Source	☐ 110–120Vac/50– 60Hz
	☐ DC Power
	☒ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☐ Mobile
	☒ Portable
Antenna	Integral antenna

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EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/10/10	5/10/12
AC Voltmeter	HP	400FL	2213A14499	CAL 6/12/11	6/12/13
Antenna: Dipole Kit	Electro-Metrics	TDA-30/1-4	153	CHAR 9/10/09	9/10/11
Antenna: Passive Loop	EMC Test Systems	EMCO 6512	9706-1211	CAL. 9/1/09	9/2/11
Frequency Counter	HP	5385A	2730A03025	CAL 8/17/11	8/17/13
Hygro-Thermometer	Extech	445703	0602	CAL 6/15/11	6/15/13
Modulation Analyzer	HP	8901A	3435A06868	CAL 7/18/11	7/18/13
Digital Multimeter	Fluke	FLUKE-77	35053830	CAL 11/18/09	11/18/11
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 11/21/09	11/21/11
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 11/22/09	11/22/11
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 11/21/09	11/21/11
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 11/24/09	11/24/11
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 4/25/10	4/25/12
Antenna	ETS	3117	41534	9/22/2010	9/22/2012
Antenna	Electro metrics	LPA-25	1122	5/04/2011	5/04/2013
Antenna	Electro metrics	BIA-25	1171	1/15/2010	1/15/2012

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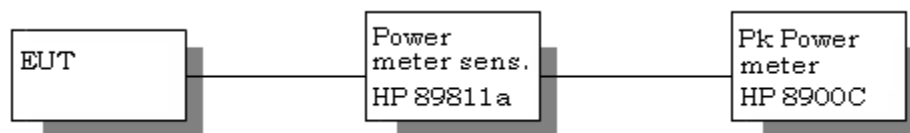
TEST PROCEDURES

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI C63.4-2003 using a 50uH LISN. Both lines were observed with the DUT transmitting. The resolution bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

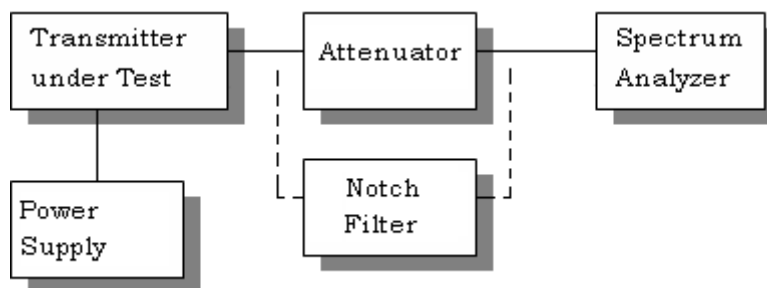
BANDWIDTH 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

RF Power Output: The RF power output was measured at the antenna feed point using a peak power meter.

Output Power Test Setup Diagram



ANTENNA CONDUCTED EMISSIONS: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz. Power was measured by disconnecting the antennas and measuring across a 50 ohm load as recommended by the manufacturer using a peak power meter. The antenna is non-directional and doesn't exceed 6 dBi gain. The power output was measured at three places in the band highest is reported below.



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RADIATION INTERFERENCE: The test procedure used was ANSI C63.4-2003 using an Agilent spectrum receiver with preselector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND: An in band field strength measurement of the fundamental emission using the RBW and detector function required by ANSI C63.4-2003 and the FCC rules.

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POWER LINE CONDUCTED INTERFERENCE

RULES PART NO.: 15.207

REQUIREMENTS:

Emission Frequency (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak (QP)	Average (AV)
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50
* Decreases with the logarithm of the frequency.		

TEST DATA: The following plots represent the emissions read for power line conducted. Both lines were observed

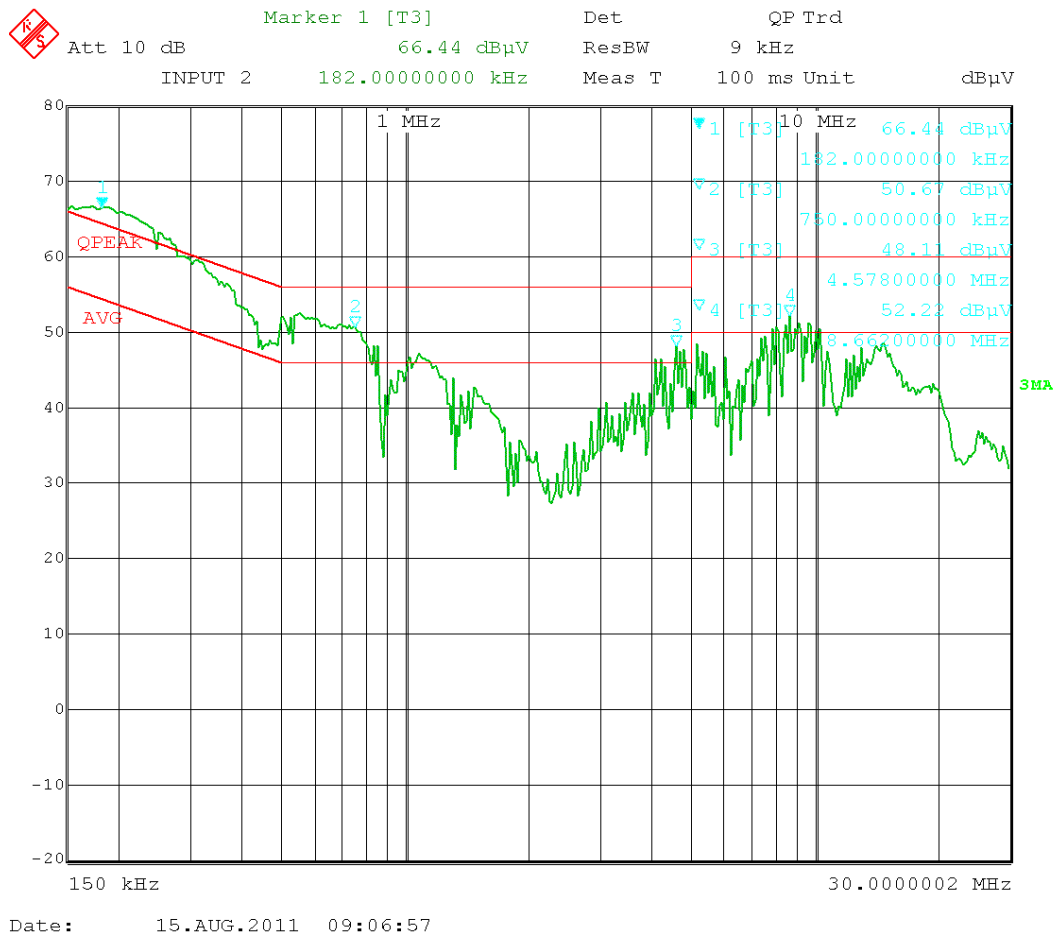
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POWERLINE CONDUCTED EMISSIONS – LINE 1 (Peak)



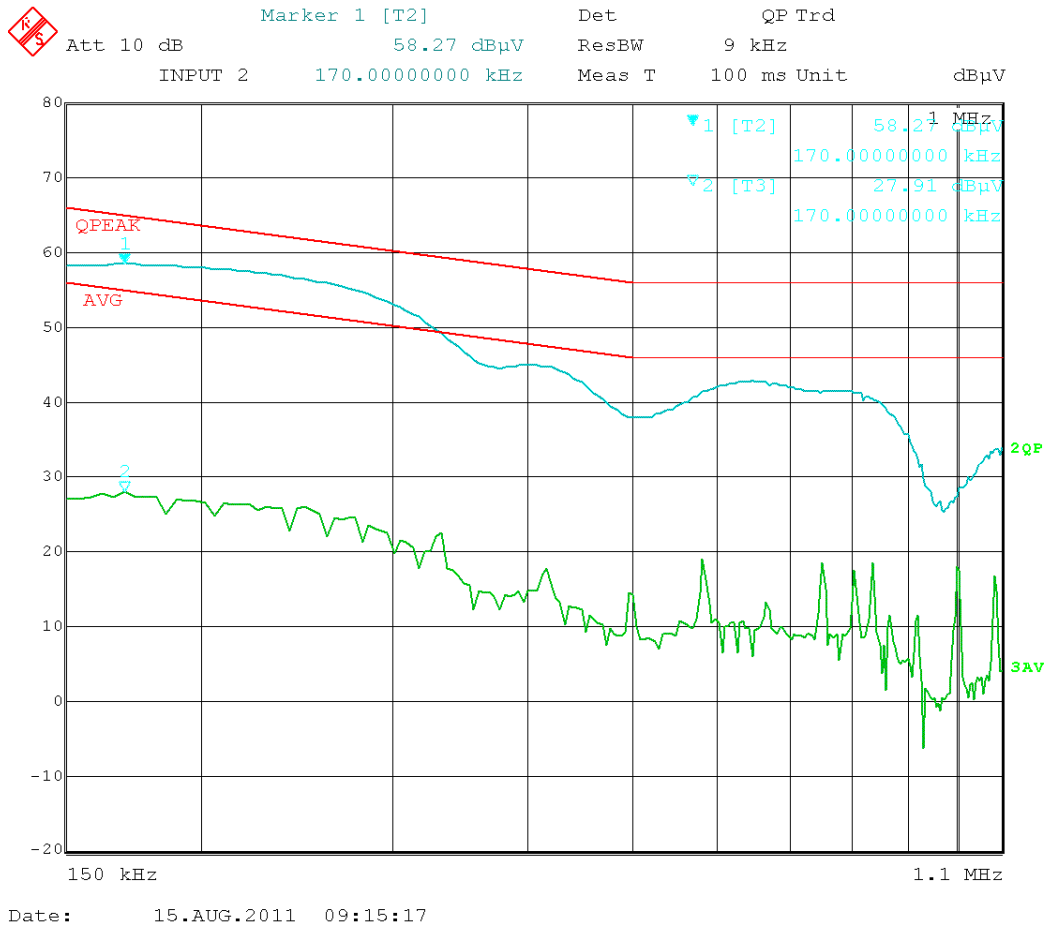
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POWERLINE CONDUCTED EMISSIONS – LINE 1(QUASI PEAK AND AVERAGING) A



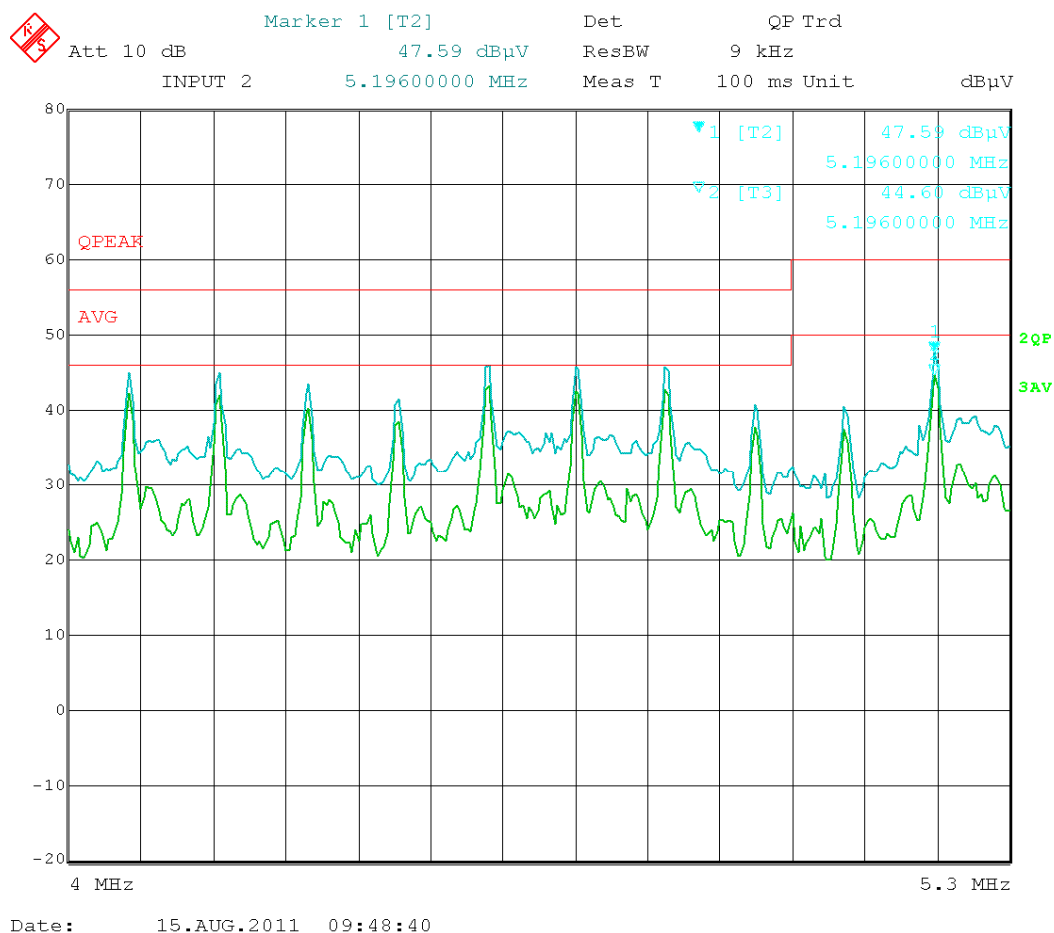
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POWERLINE CONDUCTED EMISSIONS – LINE 1(QUASI PEAK AND AVERAGING) B



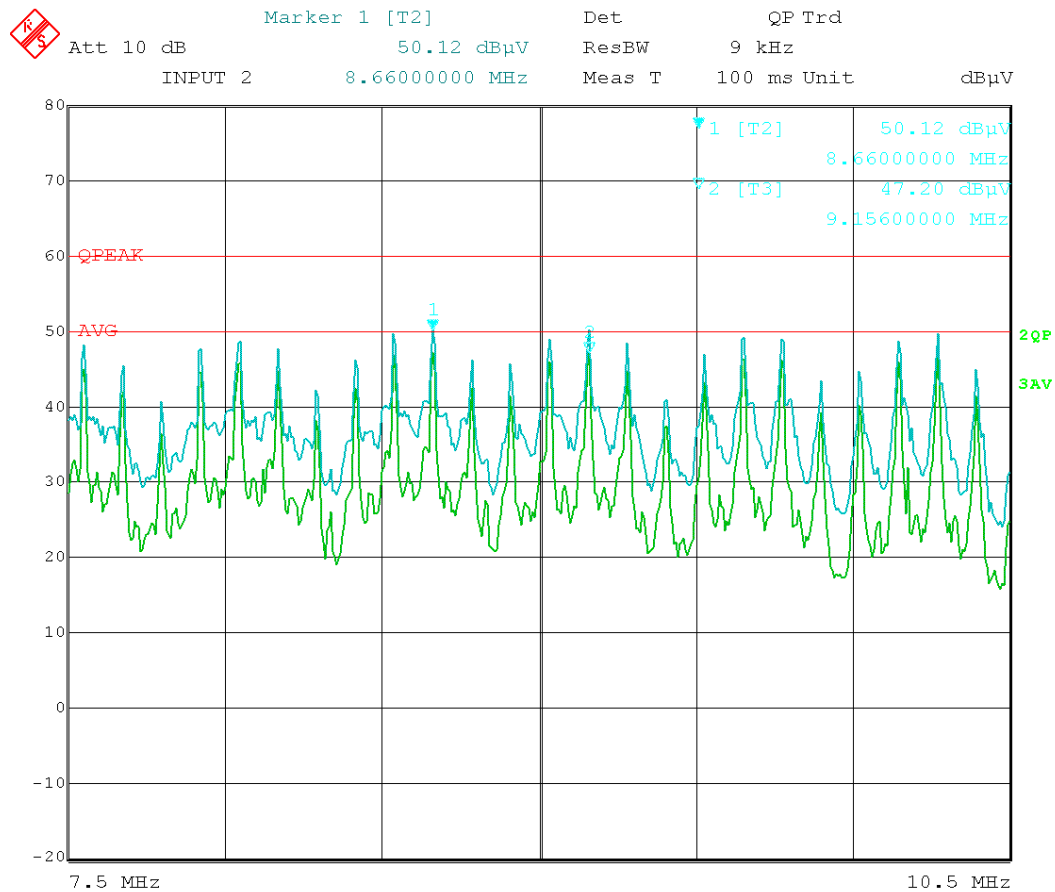
APPLICANT: MOTOROLA SOLUTIONS, INC

FCC ID: ABZ99FT4086

IC: 109AB-99FT4086

REPORT: M\MOTOROLA_SCHAUMBURG LARRY LARSEN\1686BT11\1686BT11TestReport.doc

POWERLINE CONDUCTED EMISSIONS – LINE 1(QUASI PEAK AND AVERAGING) C



Date: 15.AUG.2011 10:20:23

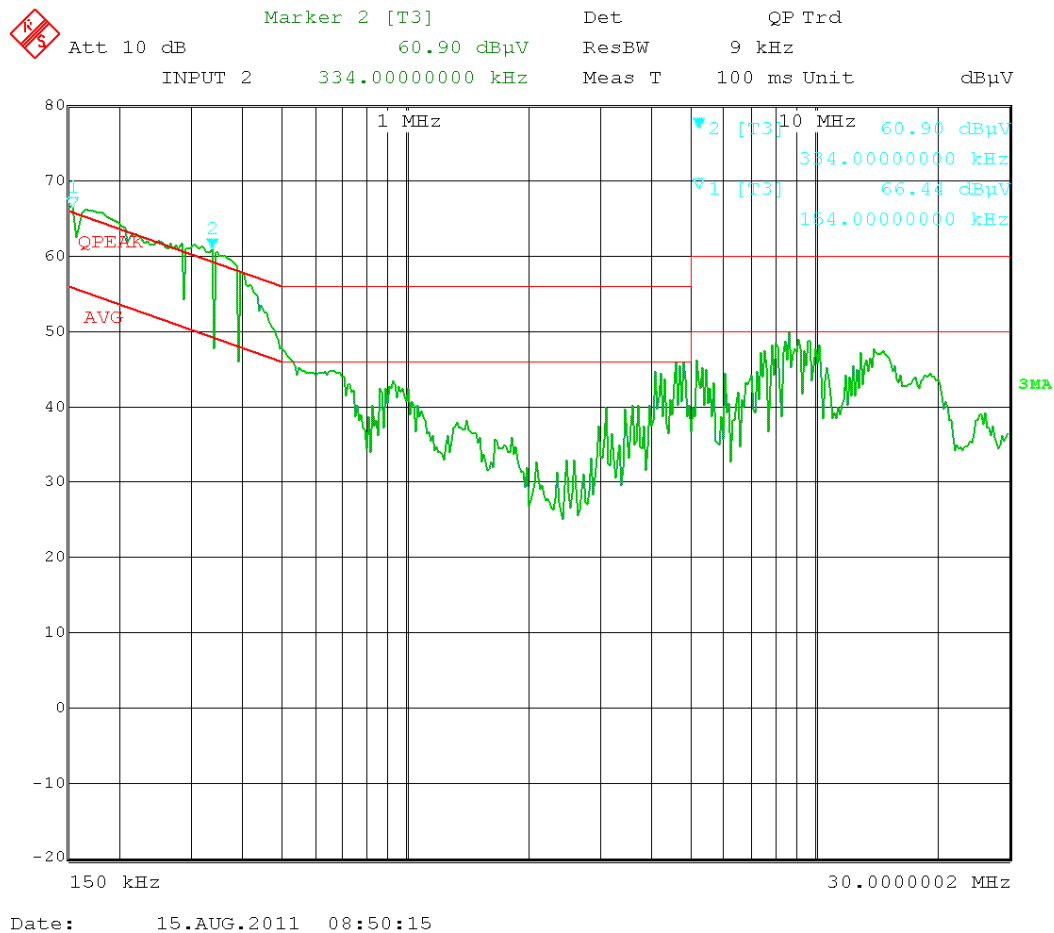
APPLICANT: MOTOROLA SOLUTIONS, INC

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IC: 109AB-99FT4086

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POWERLINE CONDUCTED EMISSIONS – LINE 2 (Peak)



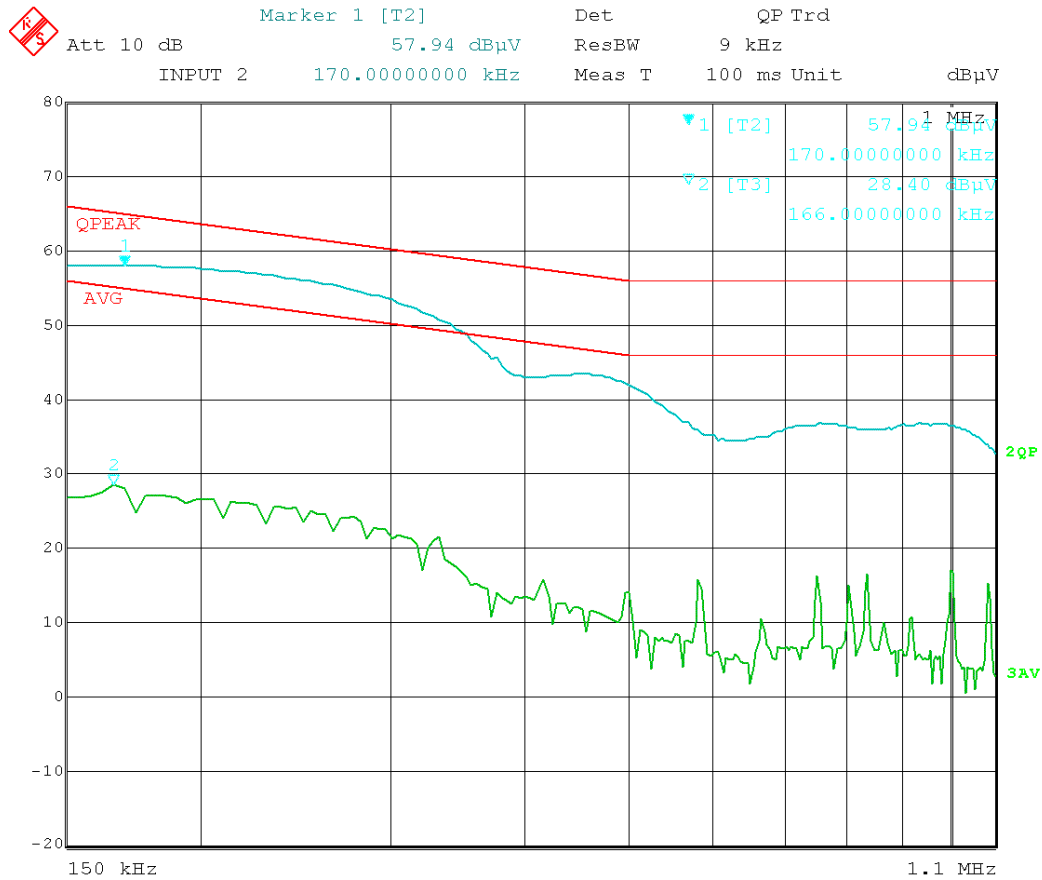
APPLICANT: MOTOROLA SOLUTIONS, INC

FCC ID: ABZ99FT4086

IC: 109AB-99FT4086

REPORT: M\MOTOROLA_SCHAUMBURG LARRY LARSEN\1686BT11\1686BT11TestReport.doc

POWERLINE CONDUCTED EMISSIONS – LINE 2(QUASI PEAK AND AVERAGING)



Date: 15.AUG.2011 09:18:22

APPLICANT: MOTOROLA SOLUTIONS, INC

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IC: 109AB-99FT4086

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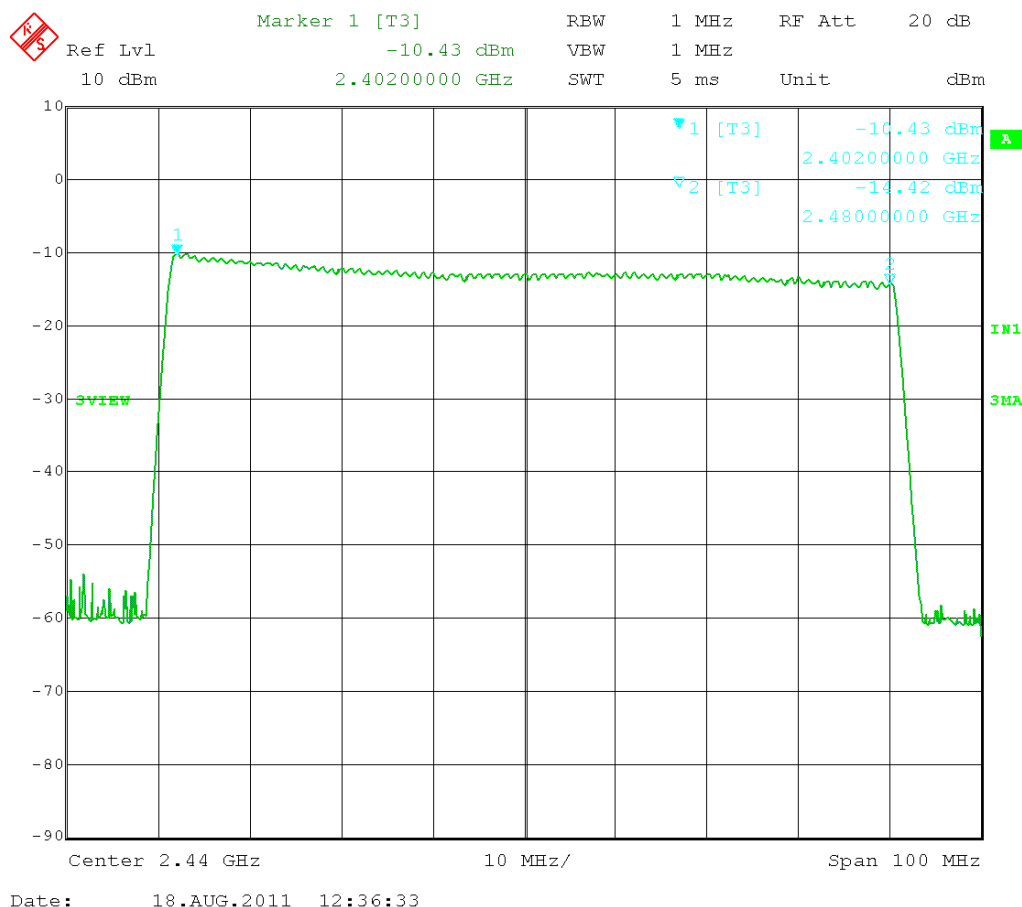
NUMBER OF HOPPING CHANNELS

Rules Part No.: 15.247(a)(1), RSS-210

Requirements:

902-928 MHz	If the 20 dB bandwidth is < 250 kHz, the system shall use at least 50 hopping frequencies.
	If the 20 dB bandwidth is 250 kHz or greater, the system shall use at least 25 hopping frequencies.
2400-2483.5 MHz	At least 15 channels
5725-5850 MHz	At least 75 channels

Test Data: There are 79 hopping channels



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DWELL TIME OF A HOPPING CHANNEL

RULES PART NO.: 15.247(a)(1)(i)

REQUIREMENTS:

902-928 MHz	If 20 dB bandwidth is < 250 kHz, average time of occupancy of any frequency shall not exceed 0.4 sec in 20 seconds.
	If 20 dB bandwidth is 250 kHz or greater, dwell time < = 0.4 seconds in a 10 second period.
2400-2483.5 MHz	< = 0.4 seconds in a 0.4 seconds multiplied the number of hopping channels employed.
5725-5850 MHz	< = 0.4 seconds in a 30 second period.

Set the EUT for DH5, DH3 and DH1 packet transmitting.
The Dwell Time can be calculated as follows:

Data Packet	Dwell Time(s)
DH5	$1600/79/6*31.6*(MkrDelta)/1000$
DH3	$1600/79/4*31.6*(MkrDelta)/1000$
DH1	$1600/79/2*31.6*(MkrDelta)/1000$

Note : Mkr Delta is once pulse time .

APPLICANT: MOTOROLA SOLUTIONS, INC

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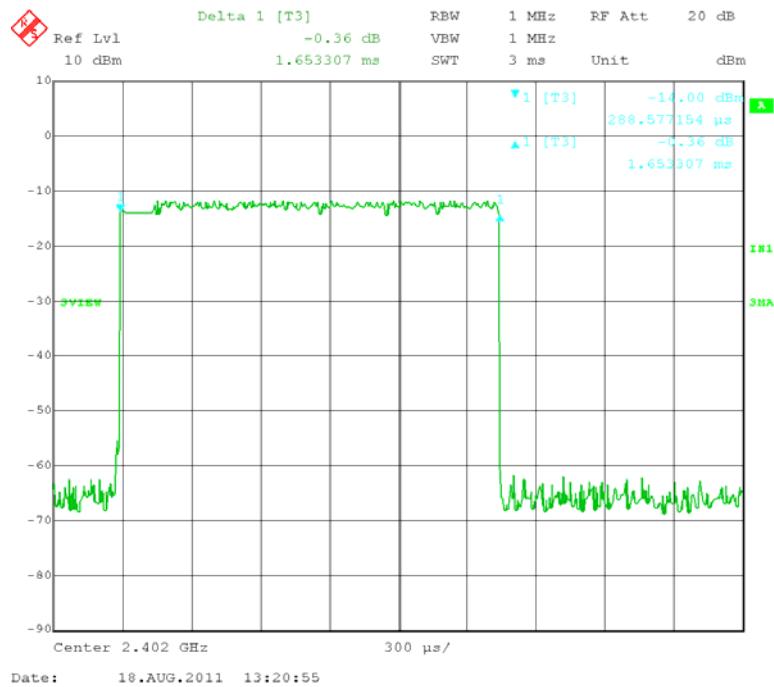
IC: 109AB-99FT4086

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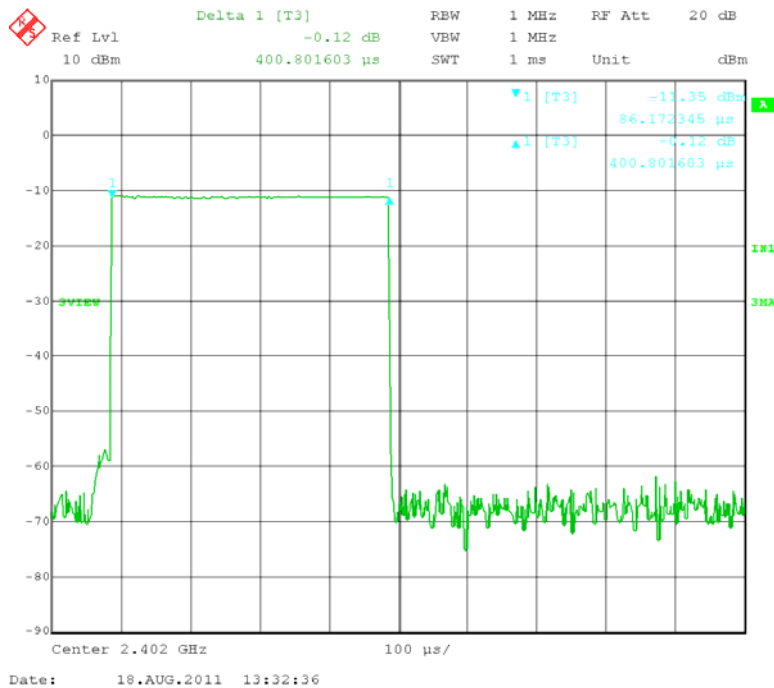
TEST DATA: The dwell time is 2.04 msec per hop.
Three places in the band were measured and the worst case presented.

Channel 00 2402 MHz DH5:

Channel 00 2402 MHz DH3:



Channel 00 2402 MHz DH1:



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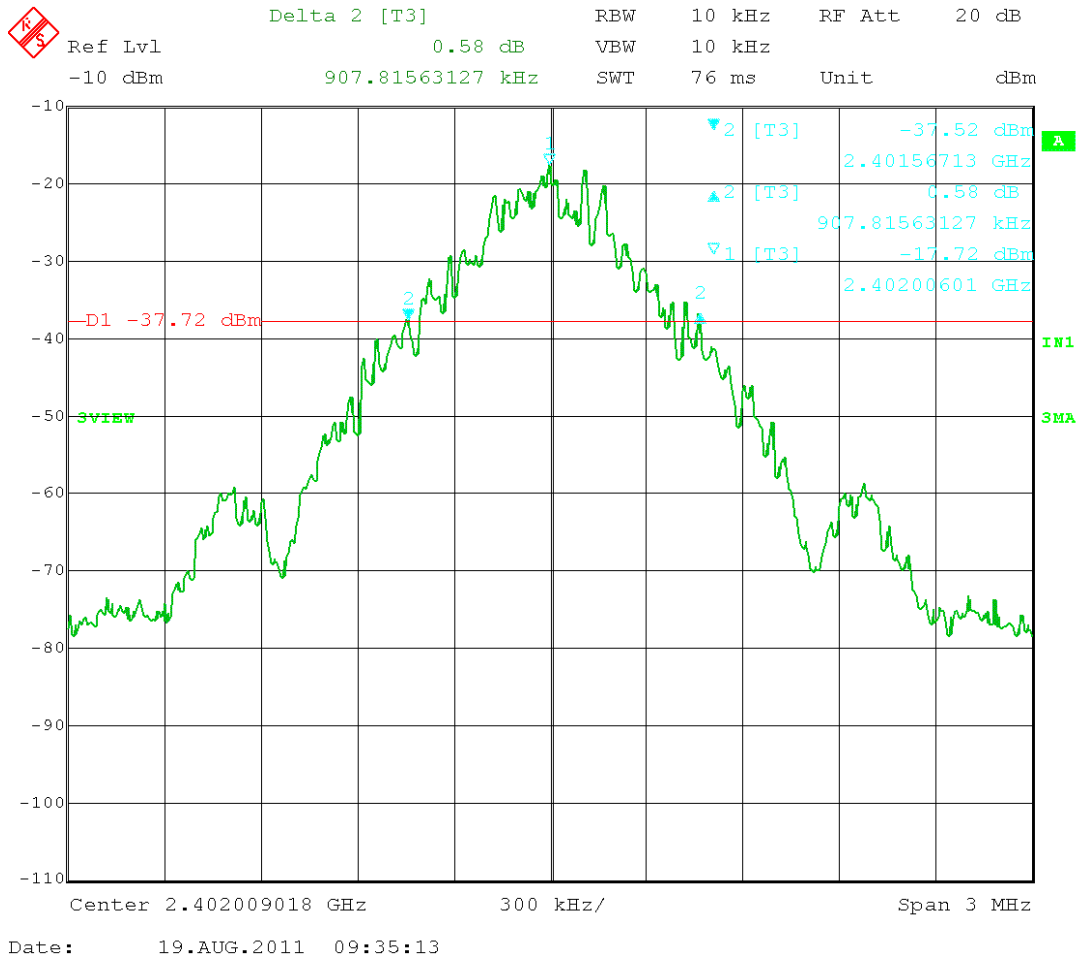
REPORT: M\MOTOROLA_SCHAUMBURG LARRY LARSEN\1686BT11\1686BT11TestReport.doc

20 dB BANDWIDTH

RULES PART NO.: 15.247(a)(2), RSS-210

REQUIREMENTS: The 20 dB bandwidth must be less than 1 MHz.

TEST DATA: See the following plot(s).
20 dB bandwidth plot: 907.8 kHz



Three places in the band were measured and the worst case presented above.

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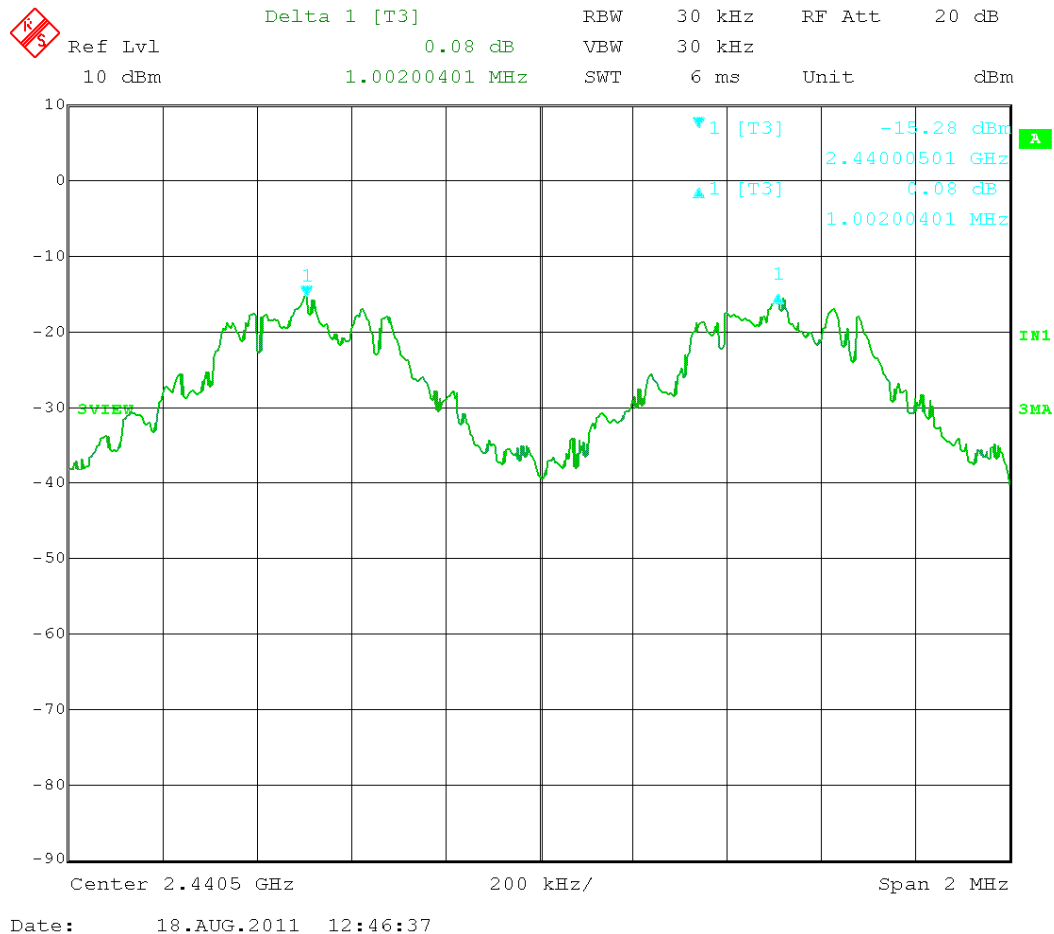
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CARRIER FREQUENCY SEPARATION

RULES PART NO.: 15.247(a)(2)

REQUIREMENTS: The hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

TEST DATA: The carrier frequency separation is 1.00 MHz



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POWER OUTPUT

Rules Part No.: 15.247(b)

Requirements: The maximum peak output power shall not exceed 1 watt (30 dBm). If directional transmitting antennas with a gain of more than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Data: The device under test has an integral antenna and the power was measured on a radiated basis.

Frequency MHz	Power (EIRP) mW
2,402.00	10.9
2,441.00	10.2
2,480.00	12.3

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SPURIOUS EMISSIONS AT ANTENNA TERMINALS

RULES PART NO.: 15.247(c)

REQUIREMENTS: Emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

Note: The spectrum was scanned to the tenth harmonic.

TEST DATA

N/A, Device has permanently attached antenna and no antenna connector.

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FIELD STRENGTH OF SPURIOUS EMISSIONS

RULES PART NO.: 15.247(c), 15.205 & 15.209(b)

REQUIREMENTS:

§15.247(c) & §15.205	
(Fundamental) Frequency	(Field Strength) Limits
902 – 928 MHz 2.4 – 2.4835 GHz	127.37 dB μ V/m @ 3m
§15.209	
30 - 88 MHz	40 dB μ V/m @ 3m
88 - 216 MHz	43.5 dB μ V/m @ 3m
216 - 960 MHz	46 dB μ V/m @ 3m
ABOVE 960 MHz	54 dB μ V/m @ 3m

Emissions that fall in the restricted bands (15.205) must be less than or equal to 500 μ V/m (54 dB μ V/m). Spurious not in a restricted band must be 20 dBc.

Test Data: All values are peak unless noted.
Items marked with an * designate a frequency in a restricted band.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μ V	Ant. Polarity		Coax Loss dB	Correction Factor dB/m	Field Strength dB μ V/m	Margin dB
2,402.00	2,402.00	71.6	H		3.18	32.33	107.11	20.27
2,402.00	2,402.00	72.3	V		3.18	32.33	107.81	19.57
2,402.00	4,804.00	6.1	V	*	4.9	34.34	45.34	8.66
2,402.00	4,804.00	6.4	H	*	4.9	34.34	45.64	8.36
2,402.00	7,206.00	6.5	V		5.72	36.15	48.37	39.44
2,402.00	7,206.00	7.9	H		5.72	36.15	49.77	38.04
2,402.00	9,608.00	8.6	V		6.78	37.53	52.91	34.9
2,402.00	9,608.00	11.1	H		6.78	37.53	55.41	32.4
2,402.00	12,010.00	4.9	V	*	7.81	38.9	51.61	2.39
2,402.00	12,010.00	5.4	H	*	7.81	38.9	52.11	1.89
2,441.00	2,441.00	71.5	H		3.21	32.43	107.14	20.24
2,441.00	2,441.00	71.9	V		3.21	32.43	107.54	19.84
2,441.00	4,882.00	6.5	H	*	4.94	34.41	45.85	8.15

Emissions were checked from the lowest frequency generated (without going below 9 kHz) to the 10th harmonic of the highest fundamental. Emissions not shown had margins > 20 dB below the limit.

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Test Data Continued:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Polarity		Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Margin dB
2,441.00	4,882.00	7.4	V	*	4.94	34.41	46.75	7.25
2,441.00	7,323.00	7	H	*	5.79	36.29	49.08	4.92
2,441.00	7,323.00	8.2	V	*	5.79	36.29	50.28	3.72
2,441.00	9,764.00	6.3	V		6.83	37.72	50.85	36.69
2,441.00	9,764.00	7.9	H		6.83	37.72	52.45	35.09
2,441.00	12,205.00	5.4	V	*	7.94	38.98	52.32	1.68
2,441.00	12,205.00	5.9	H	*	7.94	38.98	52.82	1.18
2,480.00	2,480.00	71.6	H		3.24	32.54	107.38	20
2,480.00	2,480.00	72.5	V		3.24	32.54	108.28	19.1
2,480.00	4,960.00	6.3	V	*	4.98	34.47	45.75	8.25
2,480.00	4,960.00	6.9	H	*	4.98	34.47	46.35	7.65
2,480.00	7,440.00	7.8	H	*	5.86	36.43	50.09	3.91
2,480.00	7,440.00	8.6	V	*	5.86	36.43	50.89	3.11
2,480.00	9,920.00	7.1	V		6.88	37.9	51.88	36.4
2,480.00	9,920.00	8.5	H		6.88	37.9	53.28	35
2,480.00	12,400.00	4.7	V	*	8.08	39.06	51.84	2.16
2,480.00	12,400.00	4.9	H	*	8.08	39.06	52.04	1.96

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RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND

REQUIREMENTS: Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 $\mu\text{V}/\text{m}$ (54dBuV/m). Emissions not in the restricted band must be 20 dBc.

TEST DATA:

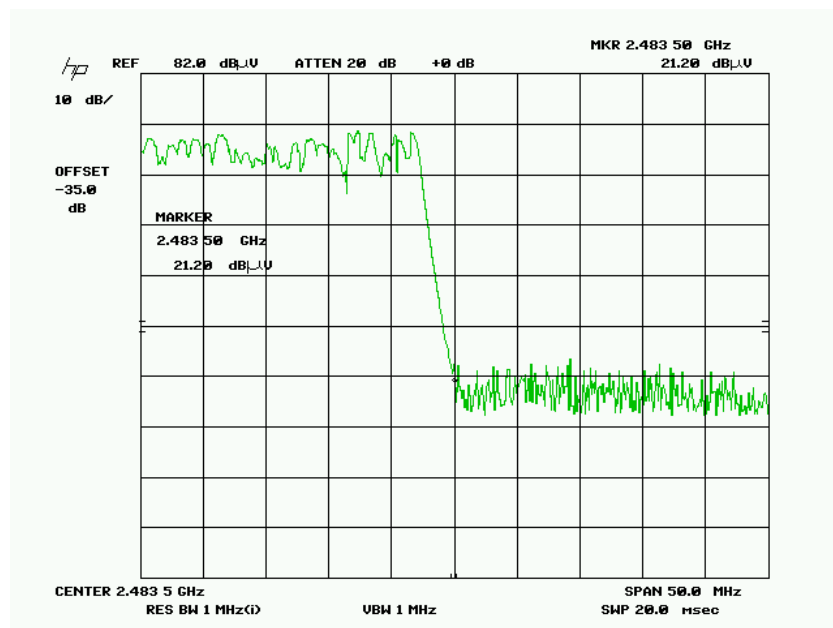
Lower restricted band: test channel 2402 MHz

Lower bandedge: test channel 2402 MHz

Upper bandedge: test channel 2480 MHz

The plots are presented below.

Upper band edge (peak)



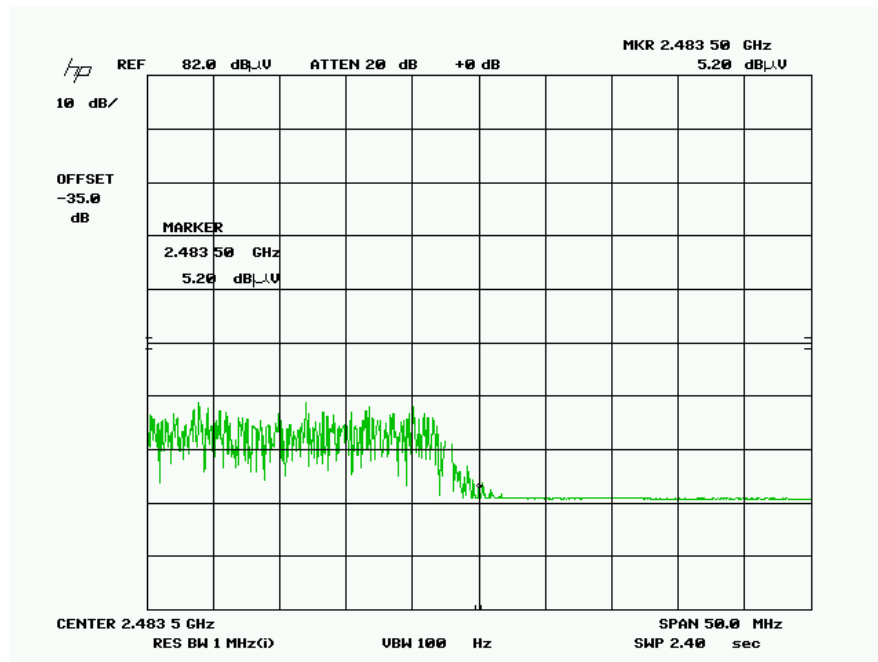
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Upper band edge (Average)



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Polarity		Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Margin dB
2,483.50	2,483.50	21.2	H		3.24	32.54	56.98	17.02
2,483.50	2,483.50	5.20	H		3.24	32.54	40.98	13.02

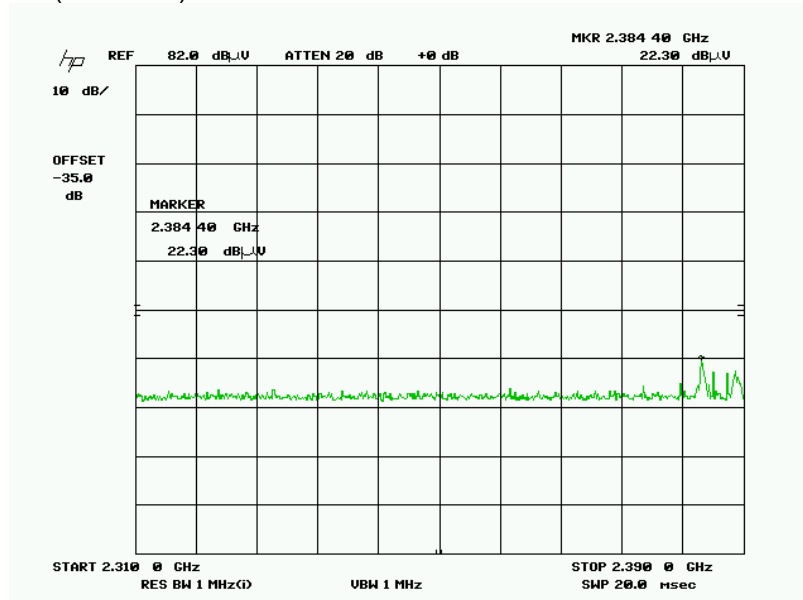
APPLICANT: MOTOROLA SOLUTIONS, INC

FCC ID: ABZ99FT4086

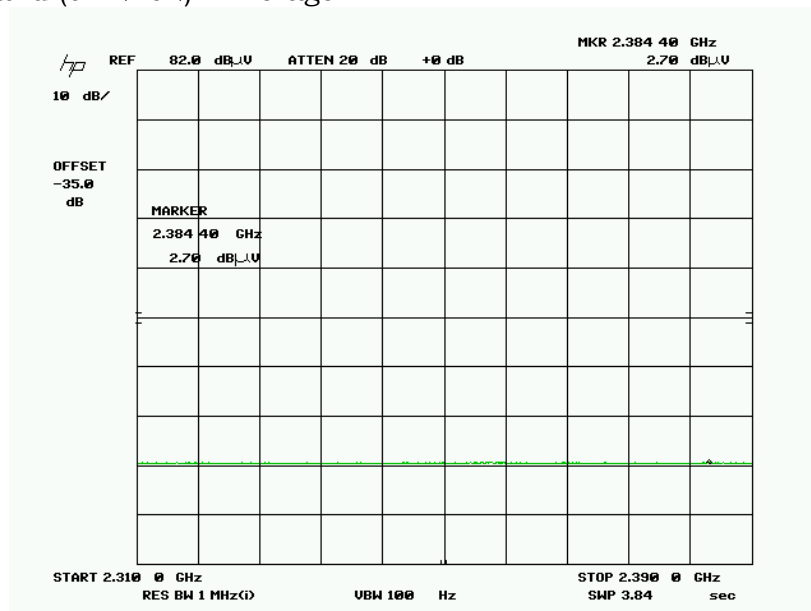
IC: 109AB-99FT4086

REPORT: M\MOTOROLA_SCHAUMBURG LARRY LARSEN\1686BT11\1686BT11TestReport.doc

Lower restricted band (ch 2402) - Peak



Lower restricted band (ch 2402) - Average



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Margin dB
2,402.00	2,384.40	22.3	V	3.17	32.46	57.93	16.07
2,402.00	2,384.40	2.7	V	3.17	32.46	38.33	15.67

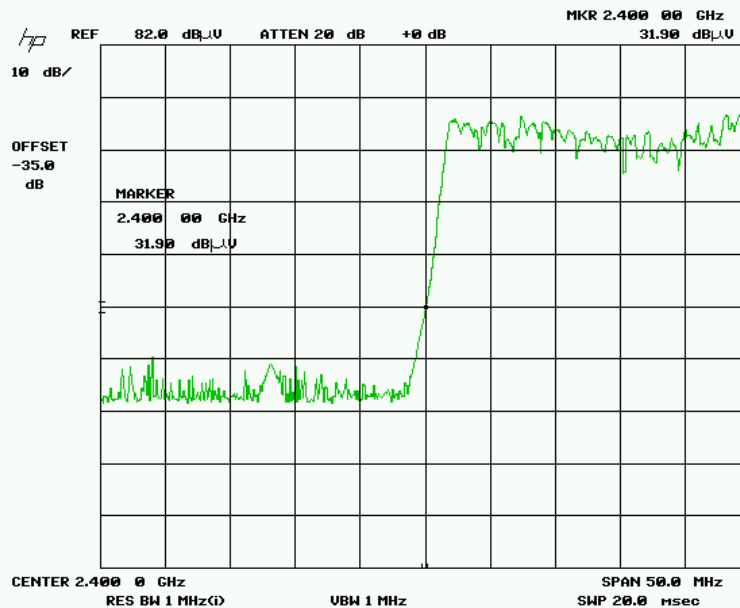
APPLICANT: MOTOROLA SOLUTIONS, INC

FCC ID: ABZ99FT4086

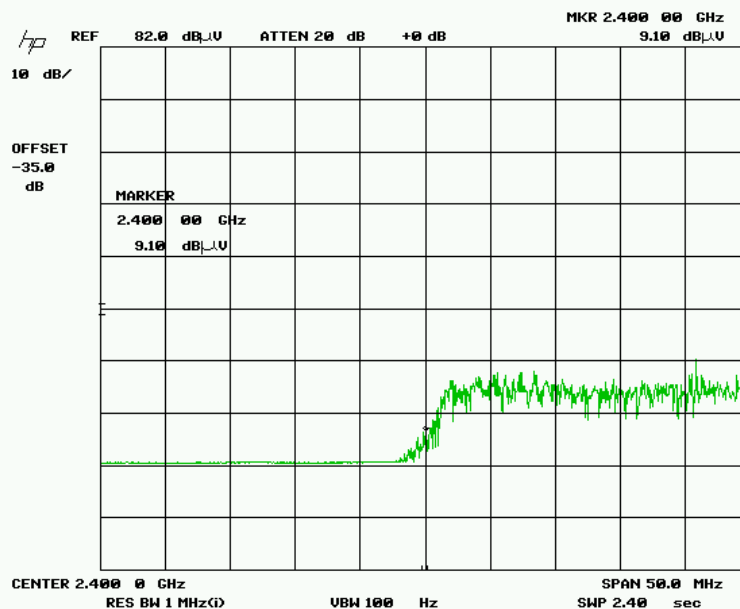
IC: 109AB-99FT4086

REPORT: M\MOTOROLA_SCHAUMBURG LARRY LARSEN\1686BT11\1686BT11TestReport.doc

Lower bandedge (ch 2402) - Peak



Lower bandedge (ch 2402) - Average



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Margin dB
2,402.00	2,400.00	31.9	V	3.18	32.48	67.56	6.44
2,402.00	2,400.00	9.1	V	3.18	32.48	44.76	9.24

APPLICANT: MOTOROLA SOLUTIONS, INC

FCC ID: ABZ99FT4086

IC: 109AB-99FT4086

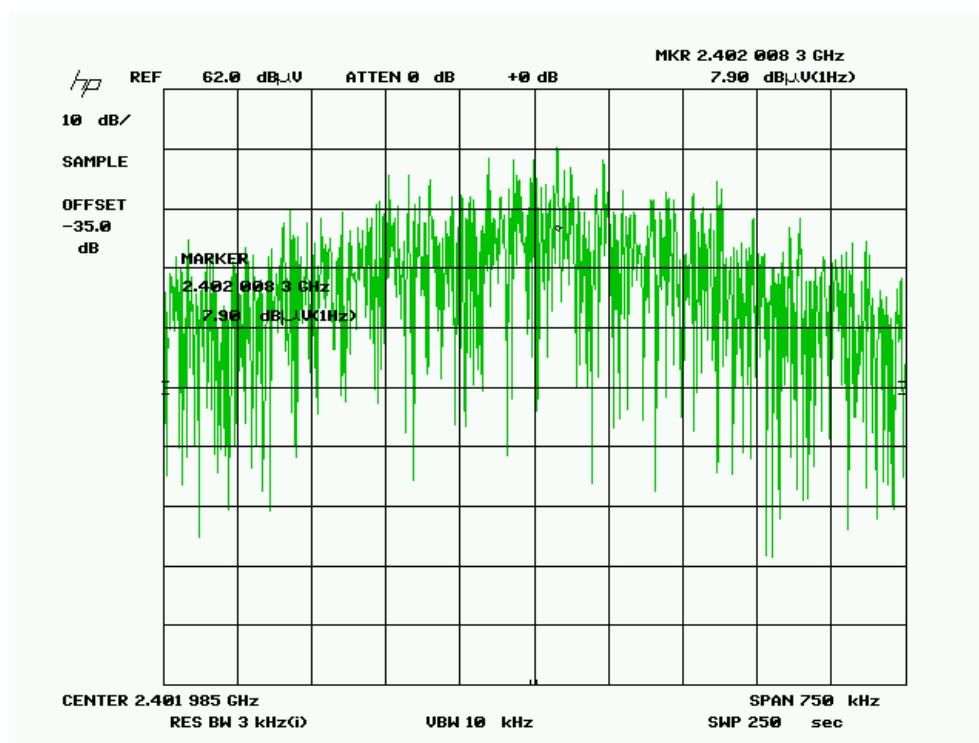
REPORT: M\MOTOROLA_SCHAUMBURG LARRY LARSEN\1686BT11\1686BT11TestReport.doc

POWER SPECTRAL DENSITY

Rules Part No.: 15.247(d)

Requirements: The peak level measured must be less than +8.0 dBm.

Test Data: SEE THE FOLLOWING PLOT(S)



Three places in the band were measured and the worst case reported.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m
2,402.00	2,402.01	7.9	V	3.18	32.48	43.56

43.56 dBμV / m
+35 dB CF for 1 Hz to 3 kHz RBW
 78.56 dBμV

-16.7 dBm converted from a EIRP value then to conducted in dBm.

APPLICANT: MOTOROLA SOLUTIONS, INC

FCC ID: ABZ99FT4086

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