Test Report

CURTIS-STRAUS Curtis-Straus LLC, *a wholly owned subsidiary of BV CPS*

Report No	EL1447-1
Client	Keurig Inc.
Address	55 Walkers Brook Drive Reading, MA 01876
Phone	1-781-205-7221
Items tested	Coffee Brewer
FCC ID	YMSKAEFUHRVI1G200
IC ID	9907A-KVE1U2R0I0G
FRN	0019667195
Equipment Type	DSS
Equipment Code	Part 15, Frequency Hopping Spread Spectrum Transmitter
Emission Designator	129KF1D
FCC/IC Rule Parts	47 CFR 15.247, RSS 210 issue 8 and RSS GEN issue 3
Test Dates	September 13-15th, 2011
Results	As detailed within this report
Prepared by	Matthew Burman – Test Engineer
Authorized by	Mairaj Hussain – EMC Supervisor
Issue Date	January 18, 2012
Conditions of Issue	This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 31 of this report.

Contents

Form Final Report REV 7-20-07 (DW)

Summary

This test report supports an application for certification of a transmitter operating pursuant to 47 CFR 15.247 and RSS-210. The product is a frequency hopping transmitter within a Coffee Brewer. It is a frequency hopping transmitter that operates in the range 902-928MHz.

We found that the product met the above requirements without modification. Ranga Narashimhan from Keurig Inc. was present during the testing. The test sample was received in good condition.

Test Methodology

Radiated emission and AC line conducted emission testing was performed according to the procedures specified in ANSI C63.4 (2003), and RSS-GEN. Radiated Emissions were maximized by rotating the device around the base as well as varying the test antenna's height and polarity. The device antenna could not be maximized separately.

Conducted emission at the antenna port was performed, as required by rule section. Testing was performed according to the procedure specified in FCC public notice DA00-705.

The following bandwidths were used during radiated spurious and line conducted emissions.

Frequency	RBW	VBW
0.15-30MHz	9kHz	30kHz
30-1000MHz	120kHz	1MHz
1-10GHz	1MHz	3MHz

Release Control Record

Issue No.	Reason for change	Date Issued
1	Original Release	January 31, 2012

Product Tested - Configuration Documentation

EUT Configuration

Work Order: L1447
Company: Keurig Inc.
Company Address: 55 Walkers Brook Drive
Reading, MA 01867
Contact: Ranganarayan Narasimhan
Person Present: Ranganarayan Narasimhan

	MN	PN	SN
EUT:	V1200	---	Sample 1

EUT Description: RFID Coffee Brewer
EUT Tx Frequency: 902-928MHz

Support Equipment:	MN	SN
none	---	---

EUT Ports:

Port Label	Port Type	No. of ports	No. Populated	Cable Type	Shielded	Ferrites	Length	Max Length	Unpopulated Reason
AC mains	AC	1	1	3-wire AC	no	none	1.5m	1.5m	

Software / Operating Mode Description:

EUT cotinues to transmit data at 902-928MHz.

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Statement of Conformity

The coffee brewer has been found to conform to the following parts of 47 CFR and RSS 210 as detailed below:

RSS-GEN	RSS 210	Part 15	Comments
5.4		15.15(b)	There are no controls accessible to the user that vary the output power.
5.2		15.19	The label is shown in the label exhibit.
7.1.3 7.1.2		15.21	Information to the user is shown in the instruction manual exhibit.
		15.27	No special accessories are required for compliance.
4.1		15.31	The EUT was tested in accordance with the measurement standards in this section.
		15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
		15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.
7.1.2		15.203	The antenna for this device is hardwired to the PCB.
	2.5	15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209.
7.2.4		15.207	EUT meets the AC Line conducted emissions requirements of 15.207.
	Annex 8	15.247	The unit complies with the requirements of 15.247
4.6.1			Occupied Bandwidth measurements were made.

Modifications Required for Compliance

No Modifications were required for compliance.

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Test Results

Bandwidth

LIMIT

The 20dB bandwidth of the hopping channel is 250kHz or greater, the system shall use at least 25 hopping frequencies…The maximum allow 20dB bandwidth of the hopping channel is 500kHz. [15.247(a) (1) (i)]

MEASUREMENTS / RESULTS

20dB Bandwidth

Date: 17-Jan-12	**Company:** Keurig	**Work Order:** L1447
Engineer: Matthew Burman	**EUT Desc:** RFID Brewer	**EUT Operating Voltage/Frequency:** 120Vac 60Hz
Temp: 22.1℃	**Humidity:** 22%	**Pressure:** 1000mBar
Frequency Range: 902-928MHz		**Measurement Distance:** Conductive

Notes: RBW = 10kHz

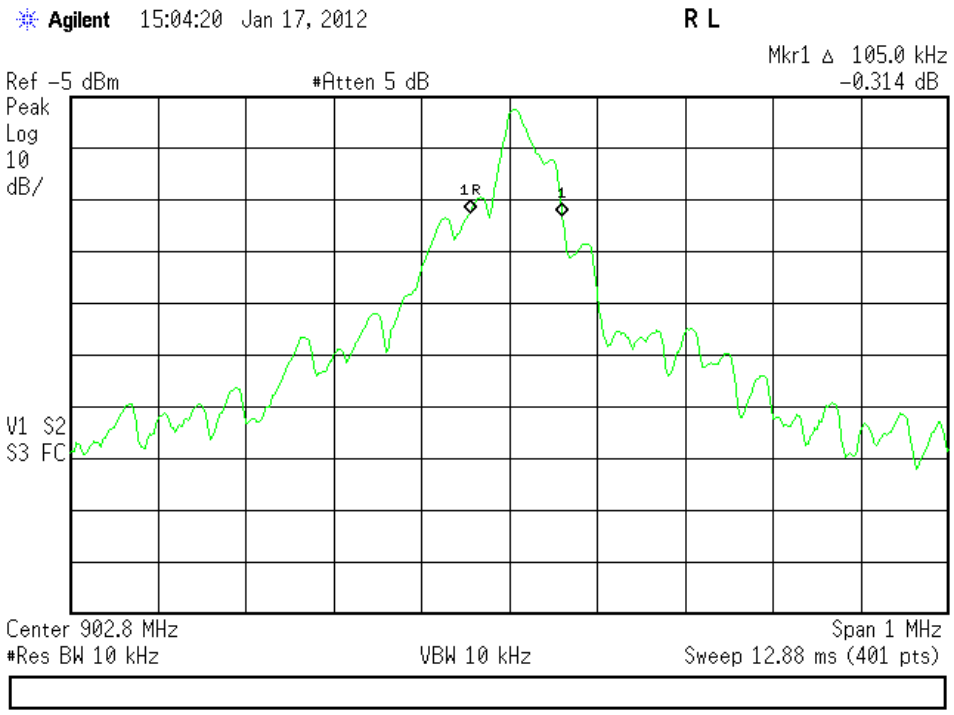
Antenna Polarization (H / V)	Frequency (MHz)	Bandwidth (kHz)						
low channel	902.75	105.0	---	---	---	---	---	---
mid channel	913.75	100.0	---	---	---	---	---	---
high channel	927.25	97.5	---	---	---	---	---	---

Test Site: EMC1

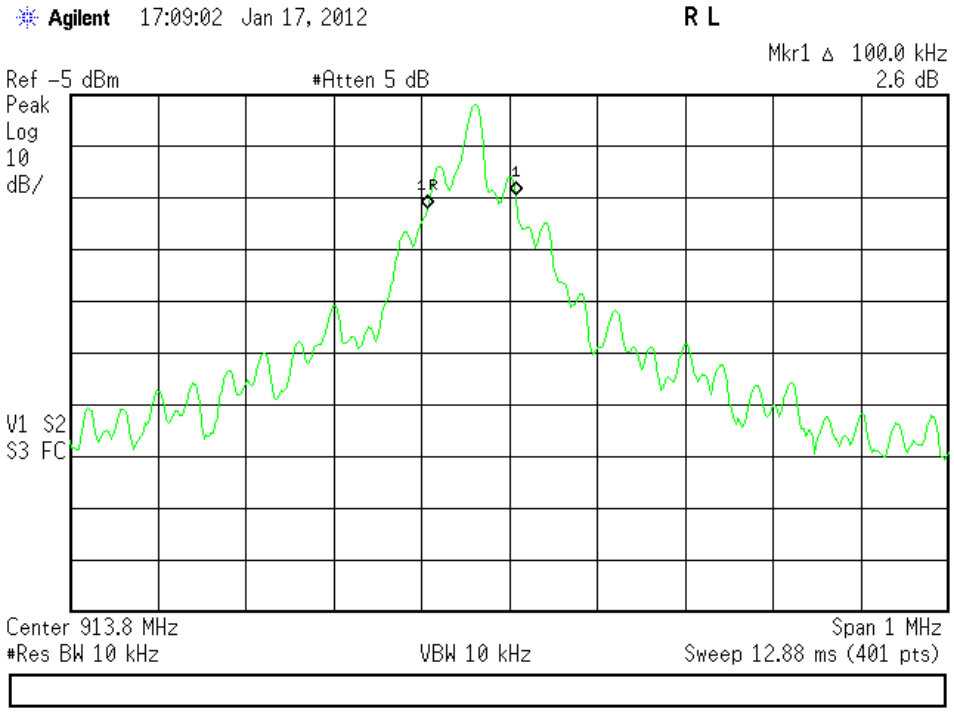
Analyzer: Rental #1 **Attenuator:** PE7019-20

PLOT

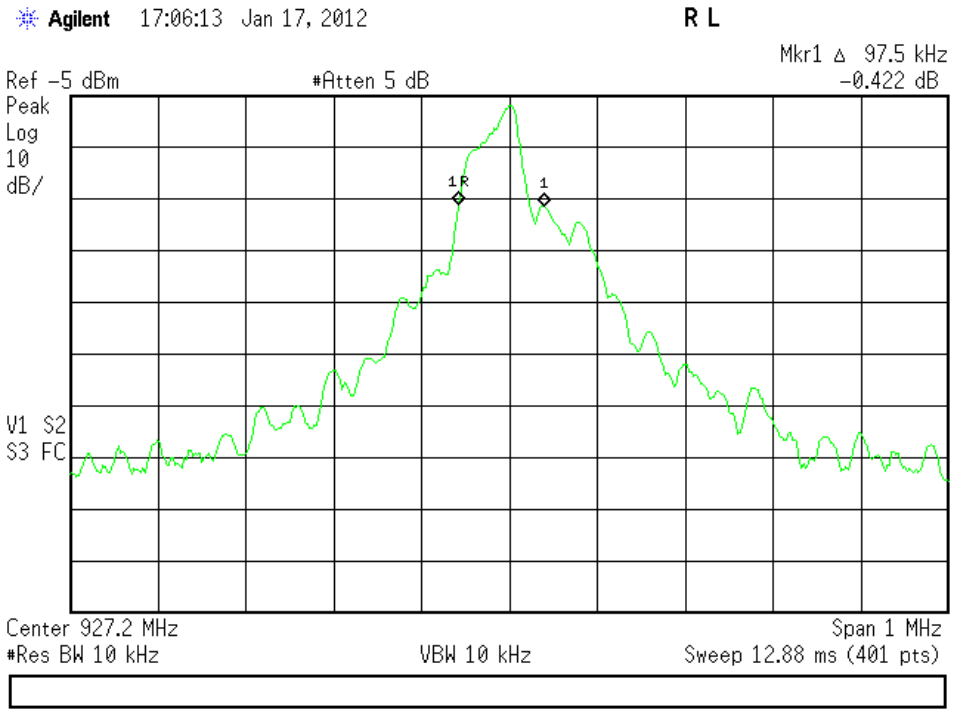
Low Channel



Mid Channel



High Channel



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Frequency Hopping Requirements

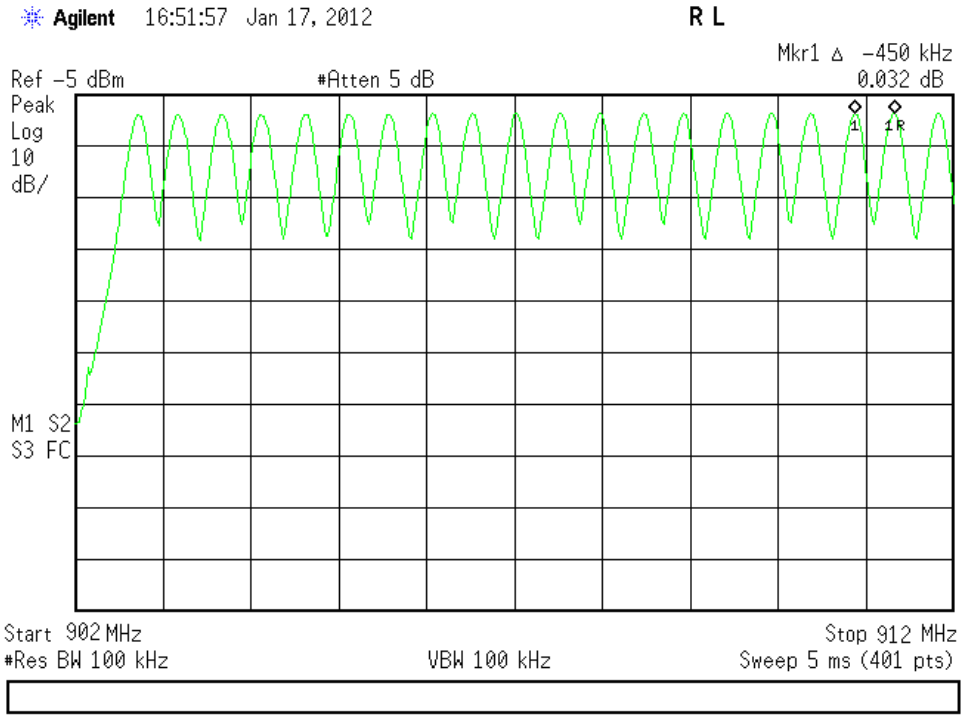
Channel Spacing

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

[15.247 (a) (1)]

Plots

Channel spacing between carrier frequencies of 420kHz > 20dB bandwidth



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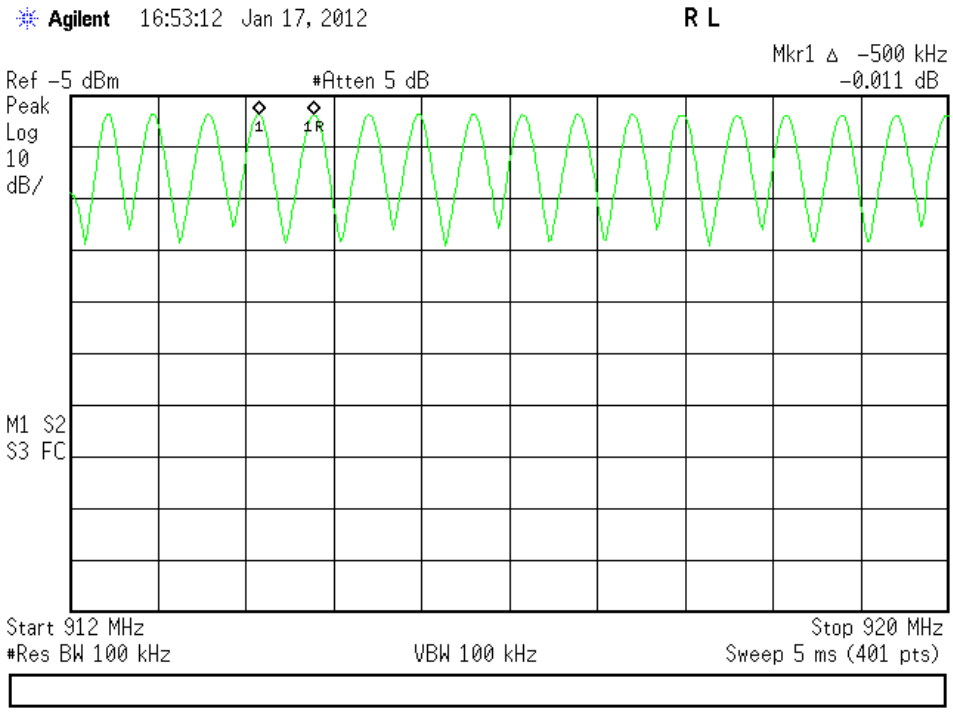
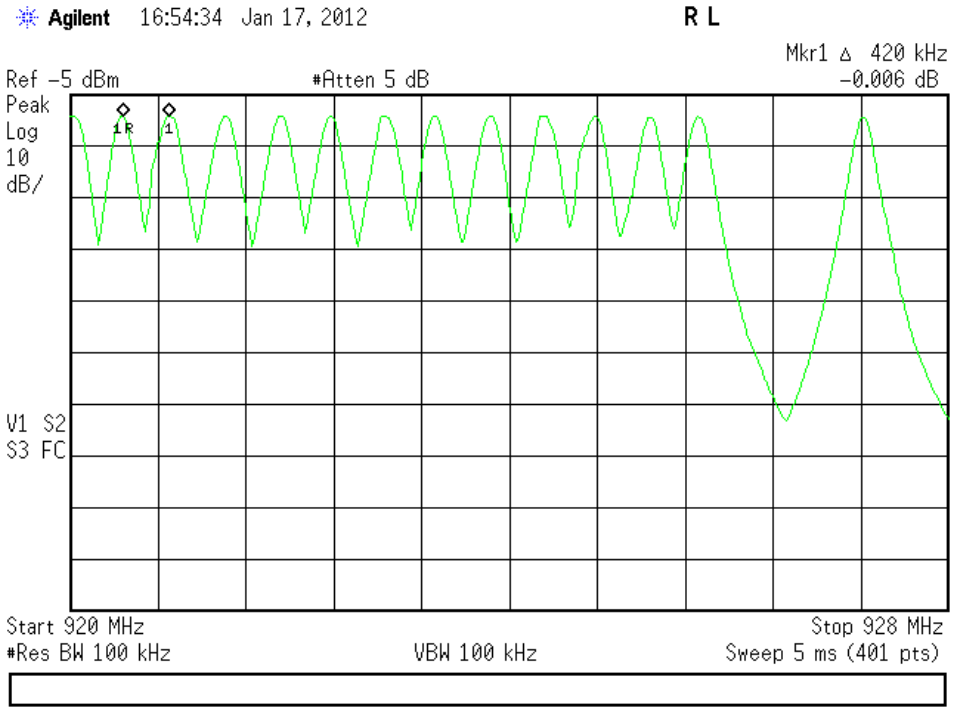

Agilent 16:53:12 Jan 17, 2012
R L
Mkr1 Δ -500 kHz
-0.011 dB
Ref -5 dBm
#Atten 5 dB
Peak
Log
10
dB/
1
1R
M1 S2
S3 FC
Start 912 MHz
#Res BW 100 kHz
VBW 100 kHz
Stop 920 MHz
Sweep 5 ms (401 pts)


Agilent 16:54:34 Jan 17, 2012
R L
Mkr1 Δ 420 kHz
-0.006 dB
Ref -5 dBm
#Atten 5 dB
Peak
Log
10
dB/
1R
1
V1 S2
S3 FC
Start 920 MHz
#Res BW 100 kHz
VBW 100 kHz
Stop 928 MHz
Sweep 5 ms (401 pts)

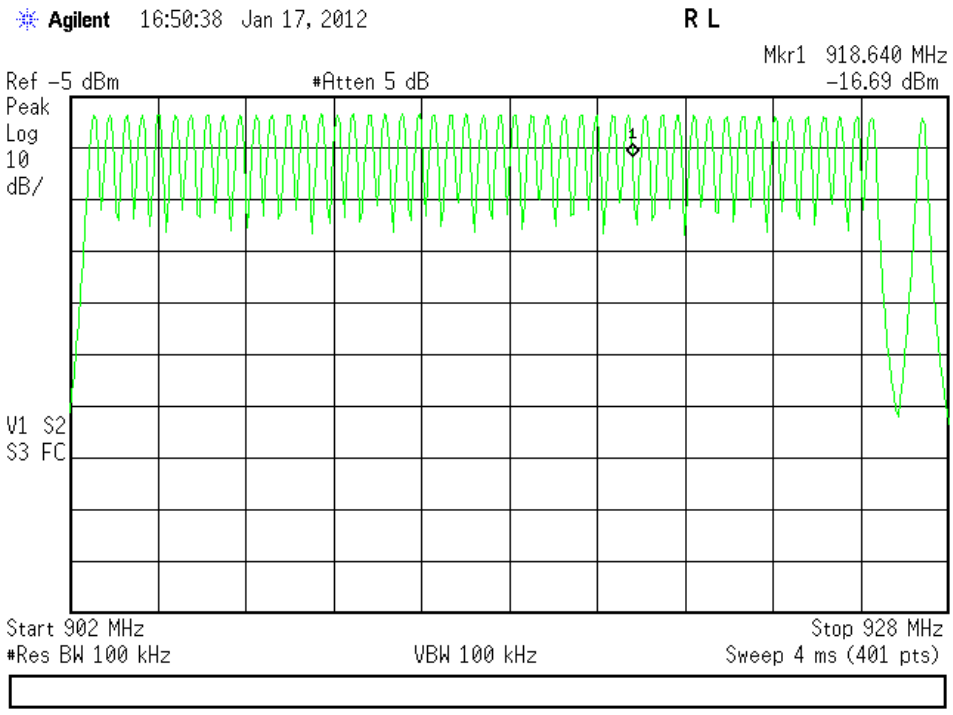
Number of Channels

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies

[15.247 (a) (1) (i)]

Plots

The system uses 50 hopping frequencies in the frequency range of 902-928MHz



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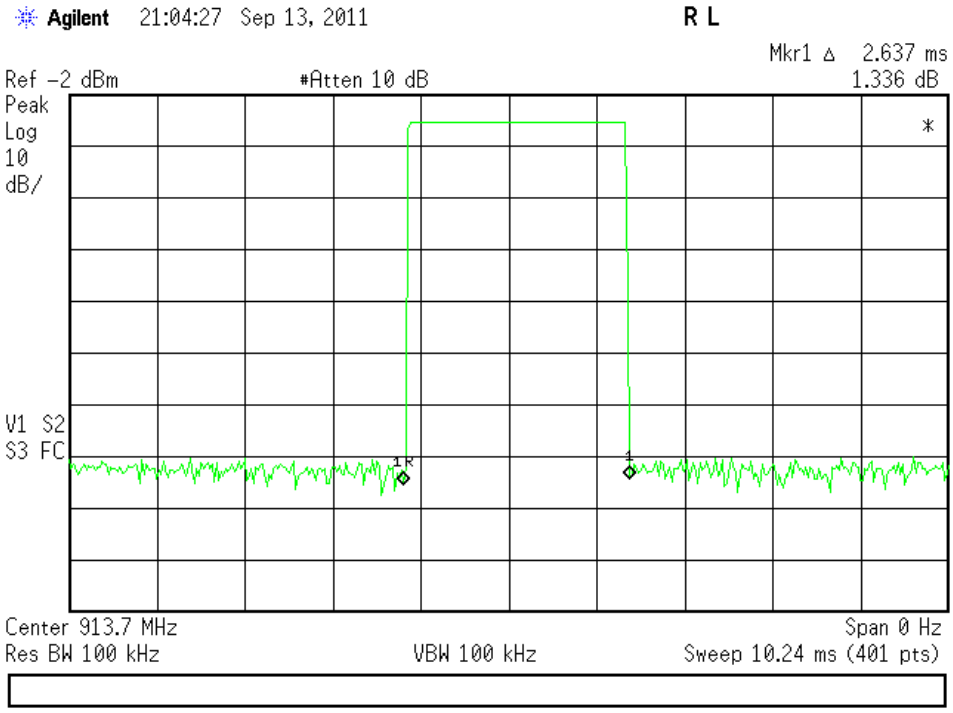
Occupancy Time

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period;

[15.247 (a) (1) (i)]

Plots

A single transmission has duration of 2.637ms



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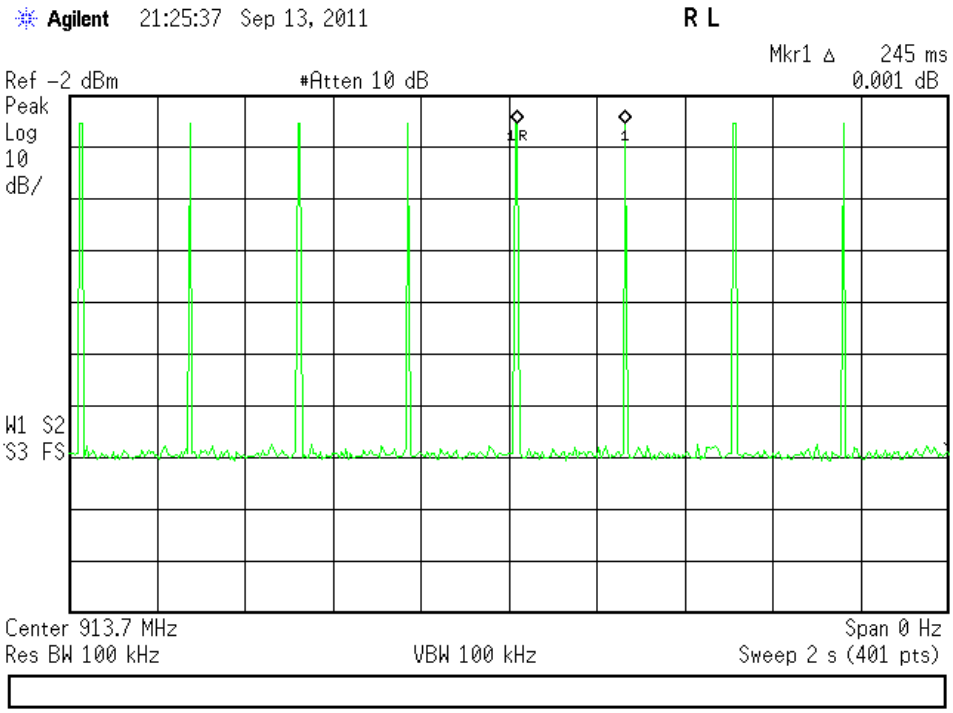
Transmissions can occur every 245ms



In 20 seconds 82 transmissions can occur

20seconds / .245seconds = 82

If each transmission is 2.637ms

2.637ms x 82 = 216.234ms

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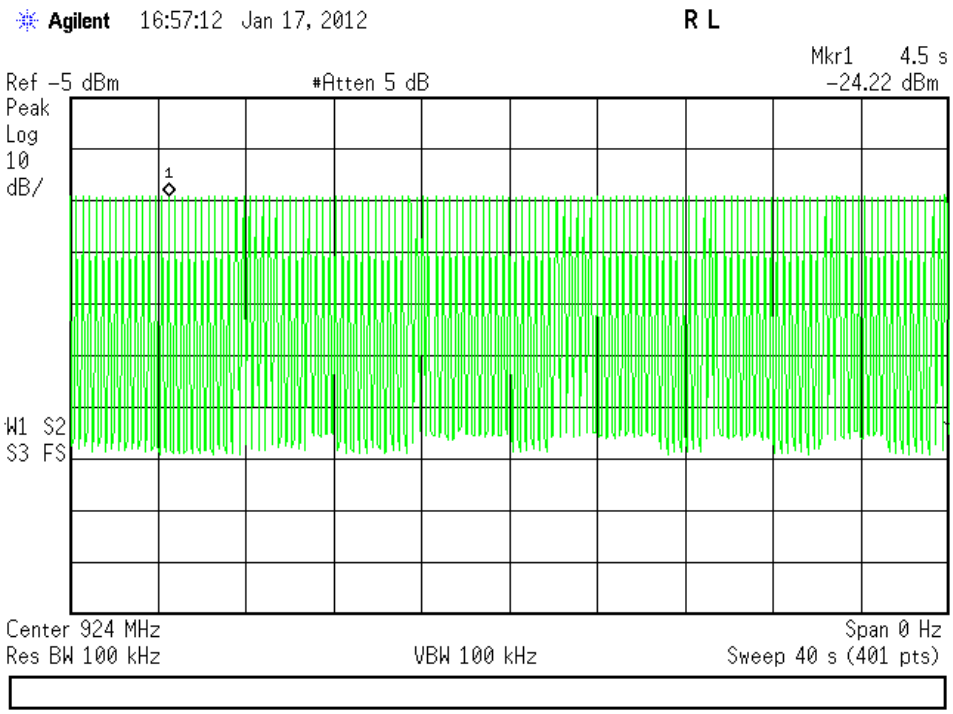

So within any 20 second window, the average time of occupancy on any frequency is 217ms, which is less than the limit of 400ms.

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Peak Power

LIMIT

Conducted Output Power
0.25 Watt
[15.247(b) (2)]

MEASUREMENTS / RESULTS

Peak Output Power

Date: 13-Sep-11 **Company:** Keurig **Work Order:** L1447
Engineer: Matthew Burman **EUT Desc:** RFID Brewer **EUT Operating Voltage/Frequency:** 120Vac 60Hz
Temp: 24.1°C **Humidity:** 41% **Pressure:** 1012mBar
Frequency Range: 902-928MHz **Measurement Distance:** Conductive
Notes:
0.25 Watt = 23.9794dBm

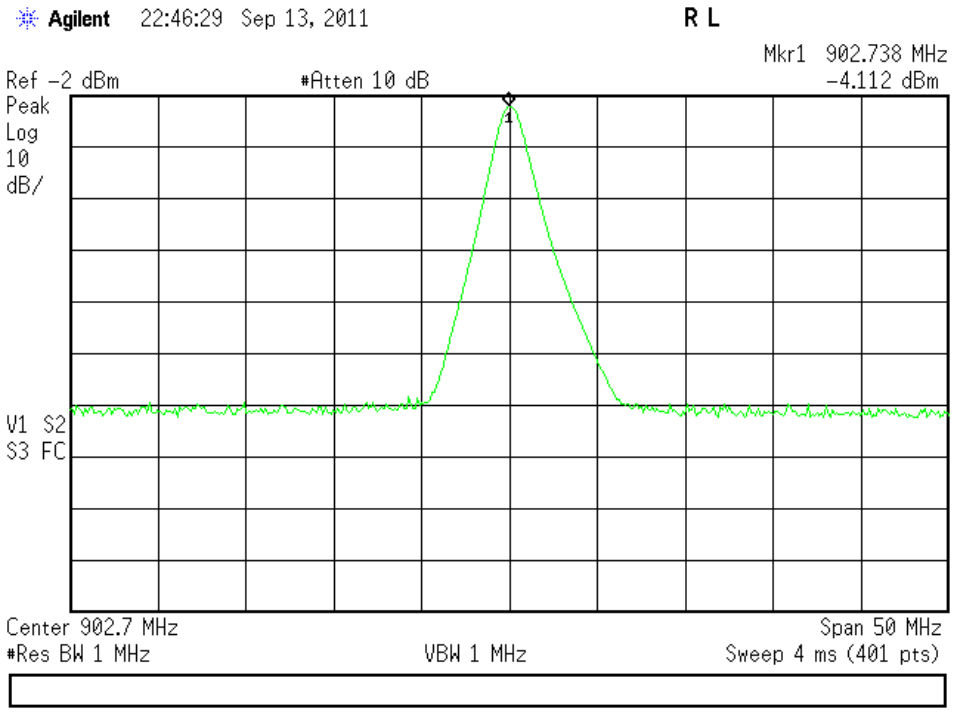
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBm)	Attenuator Factor (dB)			Adjusted Reading (dBm)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC 15.247 (b)(2) Limit (dBm)	FCC 15.247 (b)(2) Margin (dB)	FCC 15.247 (b)(2) Result (Pass/Fail)
low channel	902.75	-4.1	19.6	---	---	15.5	---	---	---	23.9794	-8.5	Pass
mid channel	913.75	-4.5	19.6	---	---	15.1	---	---	---	23.9794	-8.9	Pass
high channel	927.25	-4.5	19.6	---	---	15.1	---	---	---	23.9794	-8.9	Pass

Table Result: Pass by dB ***Worst Freq:*** 910.01 MHz

Test Site: 3m Indoor OATS I
Analyzer: Asset #1491 **Attenuator:** PE7019-20

PLOTS

Low Channel



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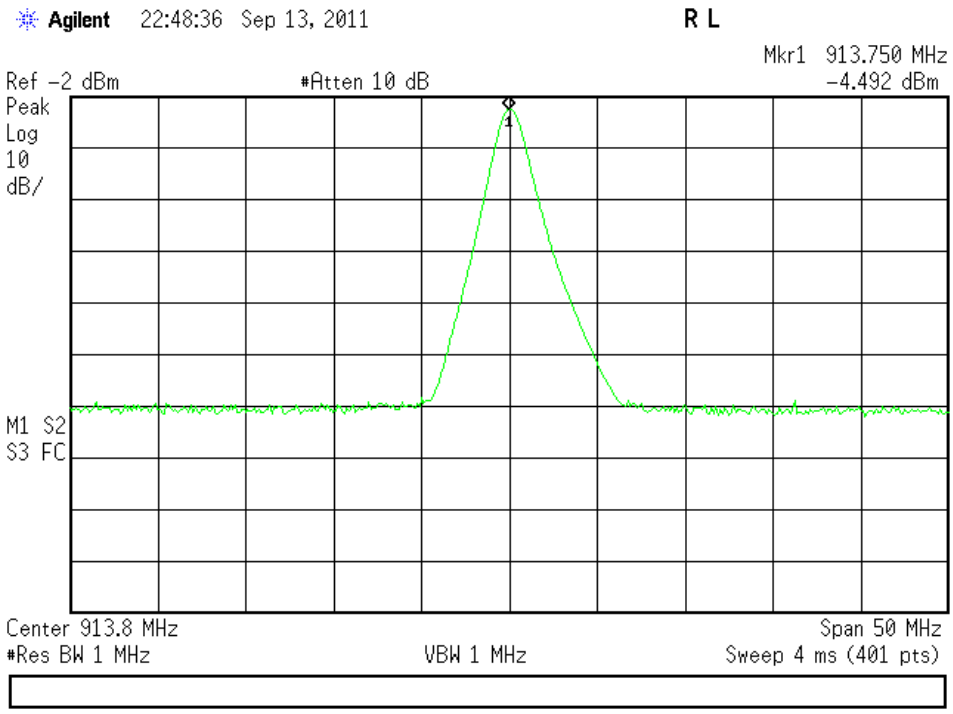
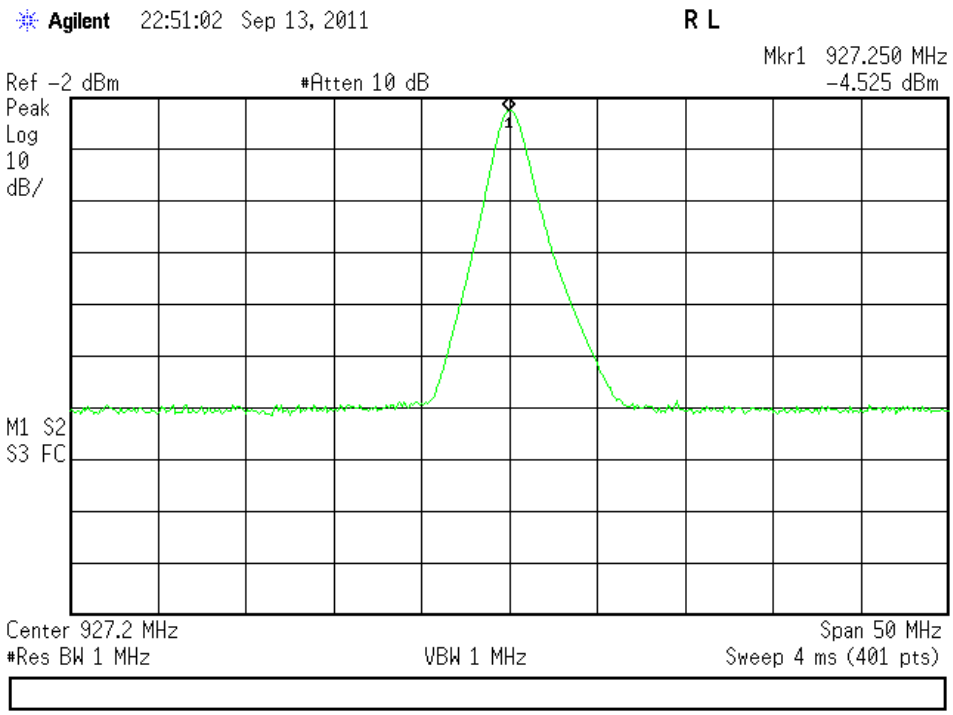
Mid Channel



High Channel



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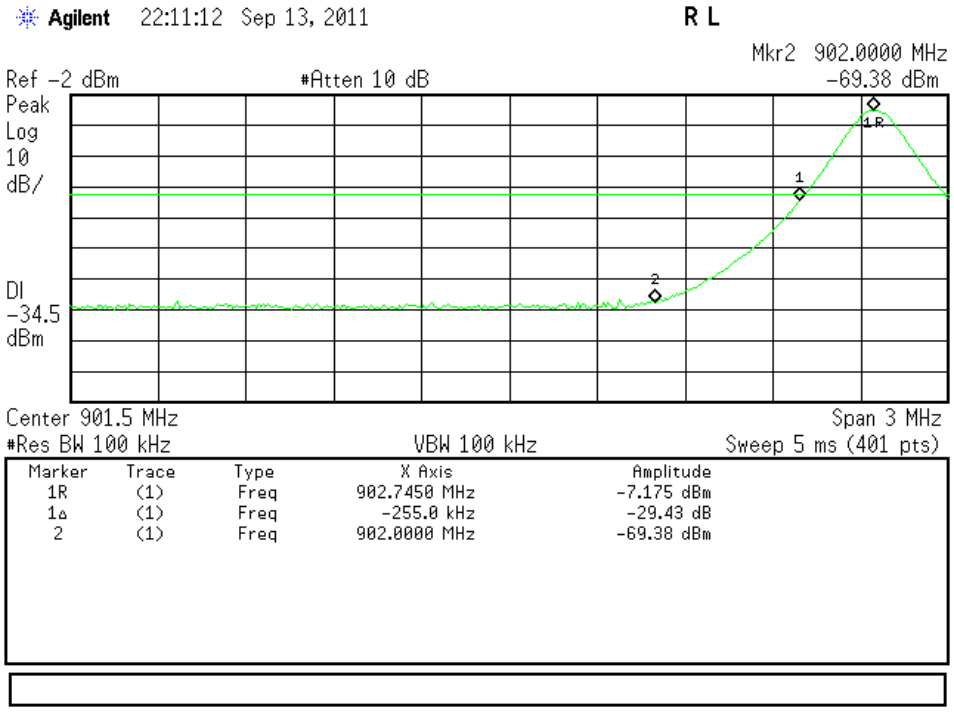
Band Edge Measurements

LIMITS

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either a RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.
[15.247(d)]

PLOTS

928MHz Edge



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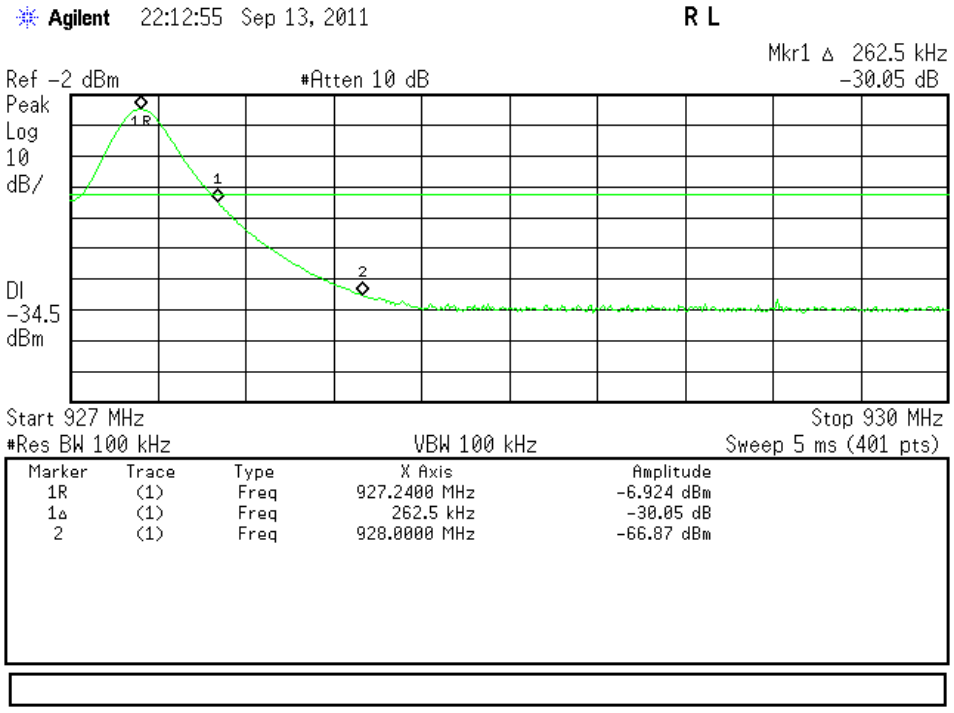
902MHz Band Edge



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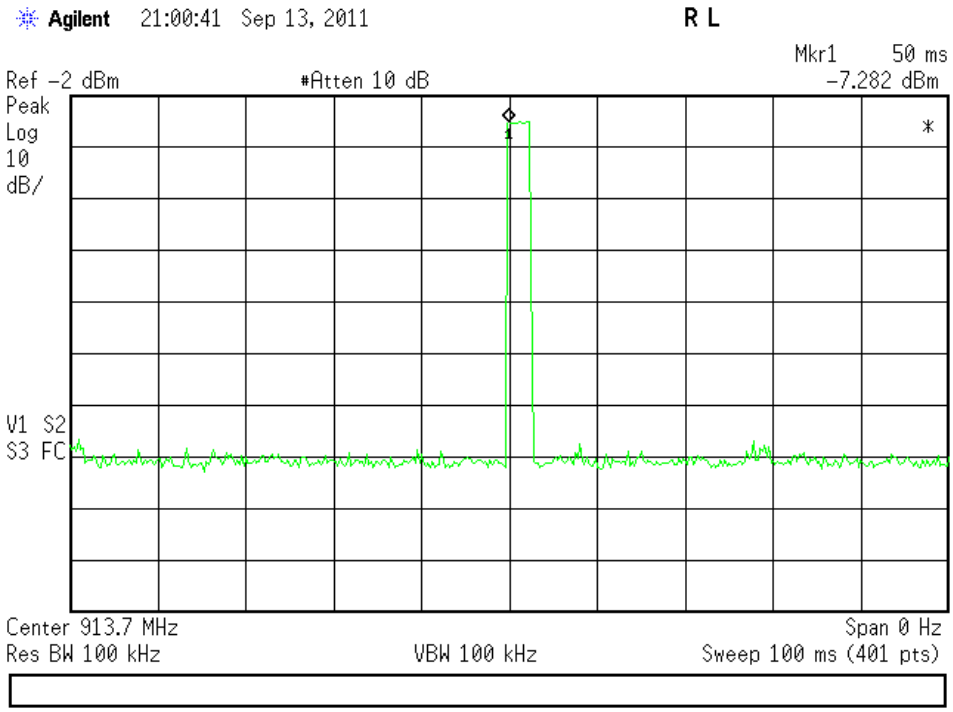
Duty Cycle Correction Factor

In 100ms one transmission occurs



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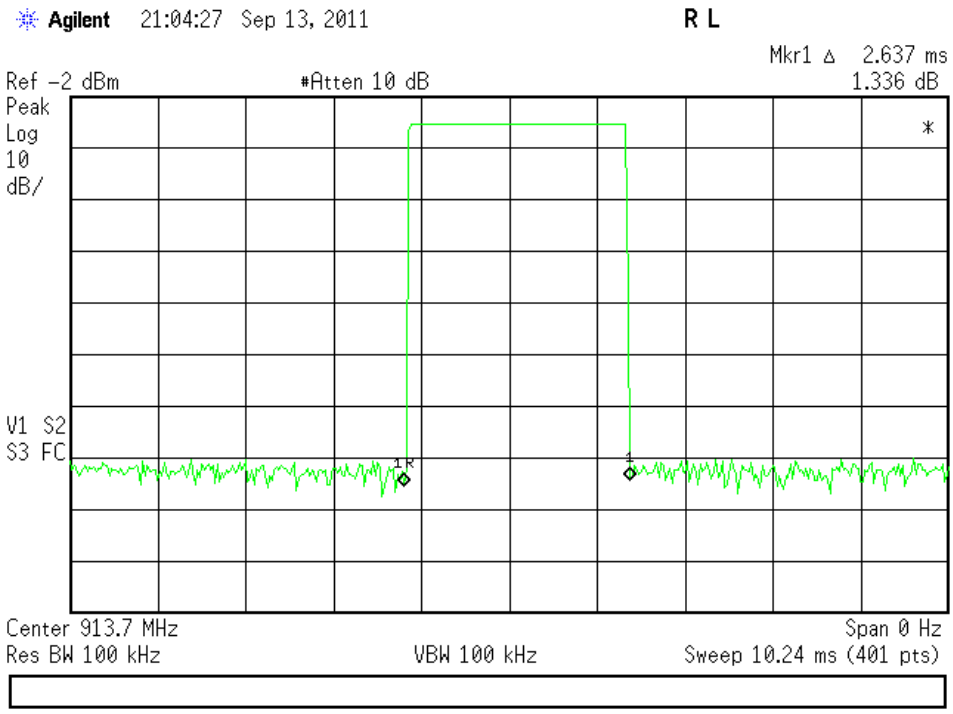
This transmission has duration of 2.637ms



DCCF = 20 x Log (X/100ms)
DCCF = 20 x Log (2.637/100)
Duty Cycle Correction Factor = -31.578dB

A duty cycle correction factor of 20dB was used

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Radiated Spurious Emissions

LIMITS

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).
[15.247(d)]

MEASUREMENTS / RESULTS

Radiated Emissions Table

Date: 13-Sep-11 **Company:** Keurig **Work Order:** L1447
Engineer: Matthew Burman **EUT Desc:** RFID coffee brewer **EUT Operating Voltage/Frequency:** 120Vac 60Hz
Temp: 25.0℃ **Humidity:** 41% **Pressure:** 1012mBar
Frequency Range: 30-1000MHz **Measurement Distance:** 3 m
Notes: Noise floor readings, no emissions found

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
v - nf	74.0	21.6	20.1	8.1	0.5	10.1	---	---	---	40.0	-29.9	Pass
v - nf	250.0	21.2	19.8	11.5	0.9	13.8	---	---	---	46.0	-32.2	Pass
v - nf	410.0	21.9	19.8	15.9	1.2	19.2	---	---	---	46.0	-26.8	Pass
v - nf	614.0	23.7	19.4	18.8	1.5	24.6	---	---	---	46.0	-21.4	Pass
v - nf	960.0	21.5	18.8	22.5	1.8	27.0	---	---	---	46.0	-19.0	Pass
v - nf	1000.0	21.2	18.4	23.0	2.0	27.8	---	---	---	54.0	-26.2	Pass

Table Result: Pass by -19.0 dB ***Worst Freq:*** 960.0 MHz

Test Site: EMI Chamber 2 **Cable 1:** Asset #1508 **Cable 2:** Asset #1506 **Cable 3:** ---
Analyzer: Asset #1328 **Preamp:** Red **Antenna:** Red-Black **Preselector:** ---

Radiated Emissions Table

Date: 13-Sep-11 **Company:** Keurig **Work Order:** L1447
Engineer: Matthew Burman **EUT Desc:** RFID coffee brewer **EUT Operating Voltage/Frequency:** 120Vac 60Hz
Temp: 24.1℃ **Humidity:** 41% **Pressure:** 1012mBar
Frequency Range: 1-6GHz **Measurement Distance:** 3 m
Notes: Duty cycle correction factor 20dB

Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Filter Factor (dB)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak Limit (dBµV/m)	FCC Class B High Frequency - Peak Margin (dB)	FCC Class B High Frequency - Peak Result (Pass/Fail)	FCC Class B High Frequency - Average Limit (dBµV/m)	FCC Class B High Frequency - Average Margin (dB)	FCC Class B High Frequency - Average Result (Pass/Fail)
v	1827.625	48.8	28.8	20.1	27.2	0.3	2.8	59.0	39.0	74.0	-15.0	Pass	54.0	-15.0	Pass
h	1827.625	47.0	27.0	20.1	27.2	0.3	2.8	57.2	37.2	74.0	-16.8	Pass	54.0	-16.8	Pass
v	2741.2875	42.4	22.4	21.9	28.9	0.4	3.5	53.3	33.3	74.0	-20.7	Pass	54.0	-20.7	Pass
h	2741.2875	38.34	18.3	21.9	28.9	0.4	3.5	49.2	29.2	74.0	-24.8	Pass	54.0	-24.8	Pass
v - nf	3655.05	28.84	8.8	21.1	31.9	0.4	3.9	43.9	23.9	74.0	-30.1	Pass	54.0	-30.1	Pass
h - nf	3655.05	30.0	10.0	21.1	31.9	0.4	3.9	45.1	25.1	74.0	-28.9	Pass	54.0	-28.9	Pass
v	4568.813	30.95	11.0	20.2	32.5	0.5	5.0	48.8	28.8	74.0	-25.3	Pass	54.0	-25.3	Pass
h - nf	4568.813	29.26	9.3	20.2	32.5	0.5	5.0	47.1	27.1	74.0	-26.9	Pass	54.0	-26.9	Pass
v - nf	5482.575	28.8	8.8	20.7	34.2	0.5	5.5	48.3	28.3	74.0	-25.7	Pass	54.0	-25.7	Pass
h - nf	5482.575	28.1	8.1	20.7	34.2	0.5	5.5	47.6	27.6	74.0	-26.4	Pass	54.0	-26.4	Pass

Table Result: Pass by -15.0 dB ***Worst Freq:*** 1827.625 MHz

Test Site: 1DCC-OATS-3M-I **Cable 1:** EMIR-HIGH-22 **High Pass Filter:** Asset #1310 **Cable 3:** ---
Analyzer: Rental SA#5 **Preamp:** Asset #1517 **Antenna:** Orange Horn **Preselector:** ---

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Radiated Emissions Table

Date: 13-Sep-11 **Company:** Keurig **Work Order:** L1447
Engineer: Matthew Burman **EUT Desc:** RFID coffee brewer **EUT Operating Voltage/Frequency:** 120Vac 60Hz
Temp: 24.1°C **Humidity:** 41% **Pressure:** 1012mBar
Frequency Range: 6-10GHz **Measurement Distance:** 1 m
Notes: Duty cycle correction factor 20dB

Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
v - nf	6396.338	31.22	11.2	20.5	35.4	6.1	52.2	32.2	83.5	-31.3	Pass	63.5	-31.3	Pass
h - nf	6396.338	29.8	9.8	20.5	35.4	6.1	50.8	30.8	83.5	-32.7	Pass	63.5	-32.7	Pass
v - nf	7310.1	31.12	11.1	20.3	37.2	6.1	54.1	34.1	83.5	-29.4	Pass	63.5	-29.4	Pass
h - nf	7310.1	31.14	11.1	20.3	37.2	6.1	54.1	34.1	83.5	-29.4	Pass	63.5	-29.4	Pass
v - nf	8223.863	29.66	9.7	20.3	37.7	6.9	54.0	34.0	83.5	-29.5	Pass	63.5	-29.5	Pass
h - nf	8223.863	30.88	10.9	20.3	37.7	6.9	55.2	35.2	83.5	-28.3	Pass	63.5	-28.3	Pass
v - nf	9137.625	31.22	11.2	20.0	38.0	7.1	56.3	36.3	83.5	-27.2	Pass	63.5	-27.2	Pass
h - nf	9137.625	31.22	11.2	20.0	38.0	7.1	56.3	36.3	83.5	-27.2	Pass	63.5	-27.2	Pass

Table Result: Pass by -27.2 dB ***Worst Freq:*** 9137.625 MHz

Test Site: 1DCC-OATS-3M-I **Cable 1:** EMIR-HIGH-22 **Cable 2:** --- **Cable 3:** ---
Analyzer: Rental SA#5 **Preamp:** Asset #1517 **Antenna:** Orange Horn **Preselector:** ---

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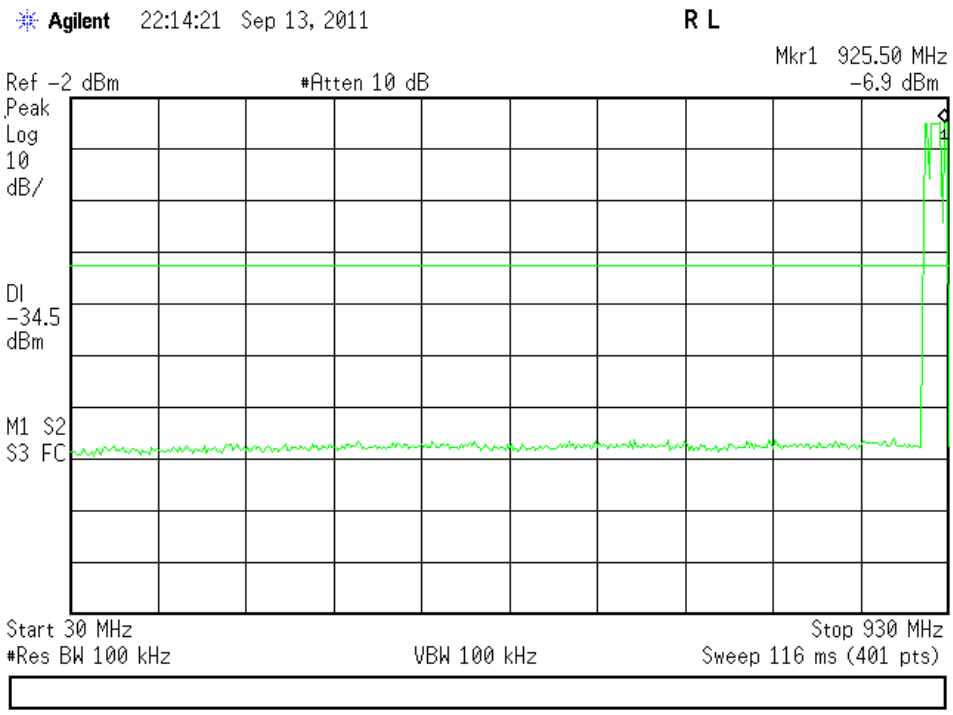
Conducted Spurious Emissions

LIMITS

In any 100kHz 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 20dB below that in the 100kHz bandwidth that contains the highest level of desired power…
[15.247(d)]

MEASUREMENTS / RESULTS



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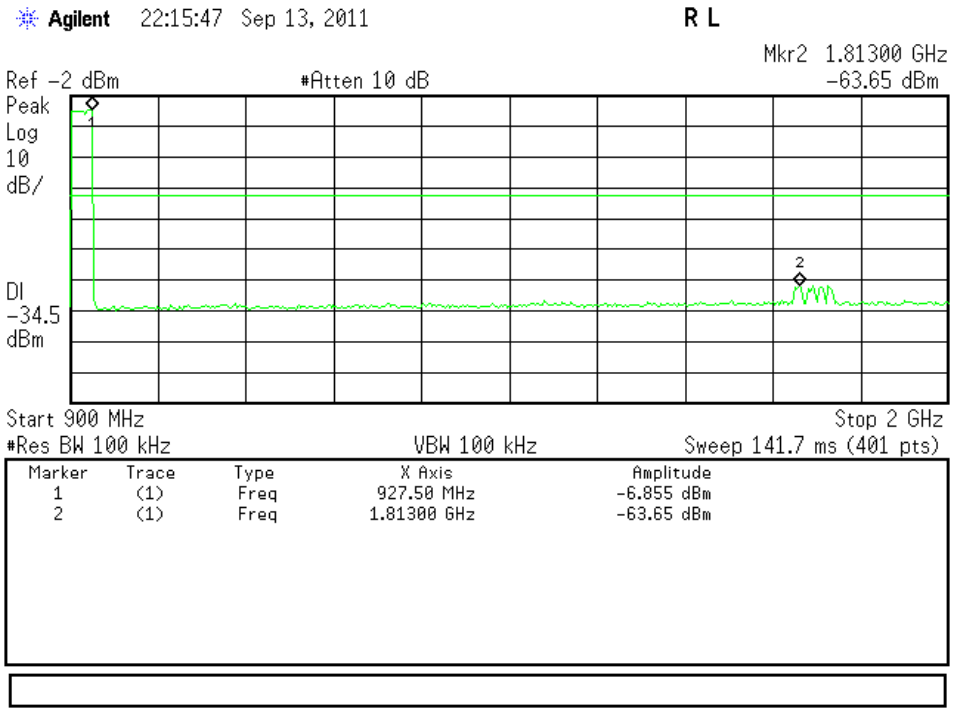
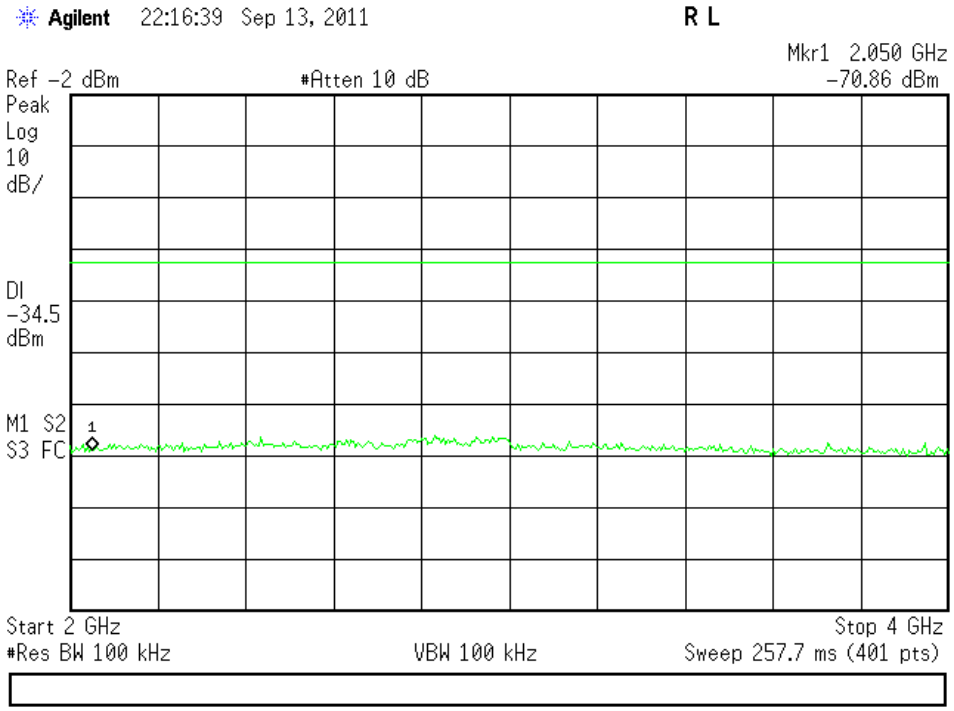
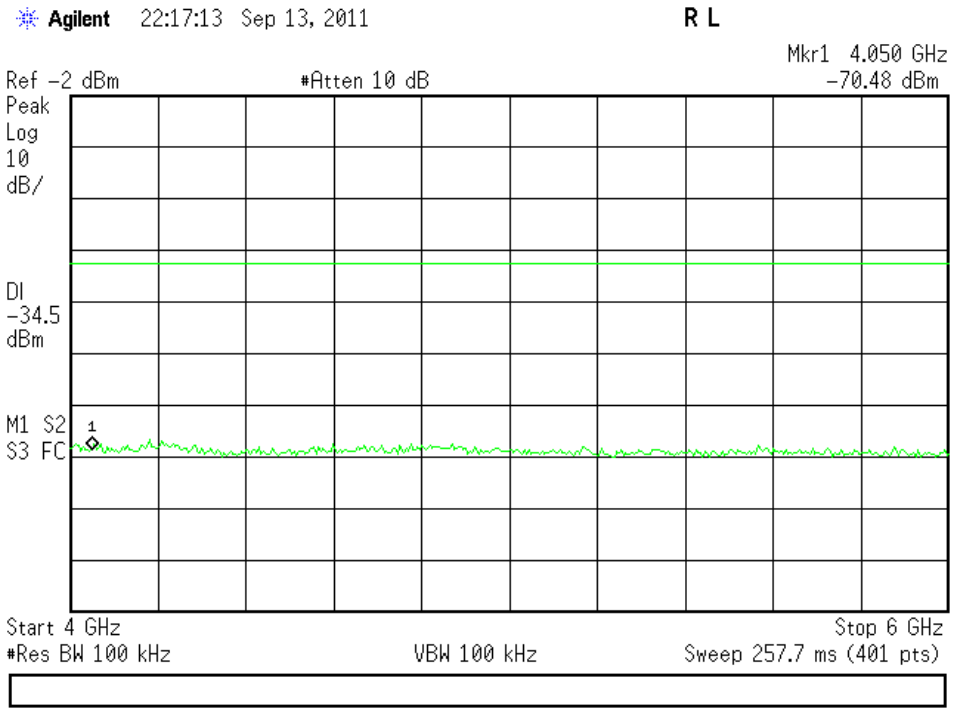
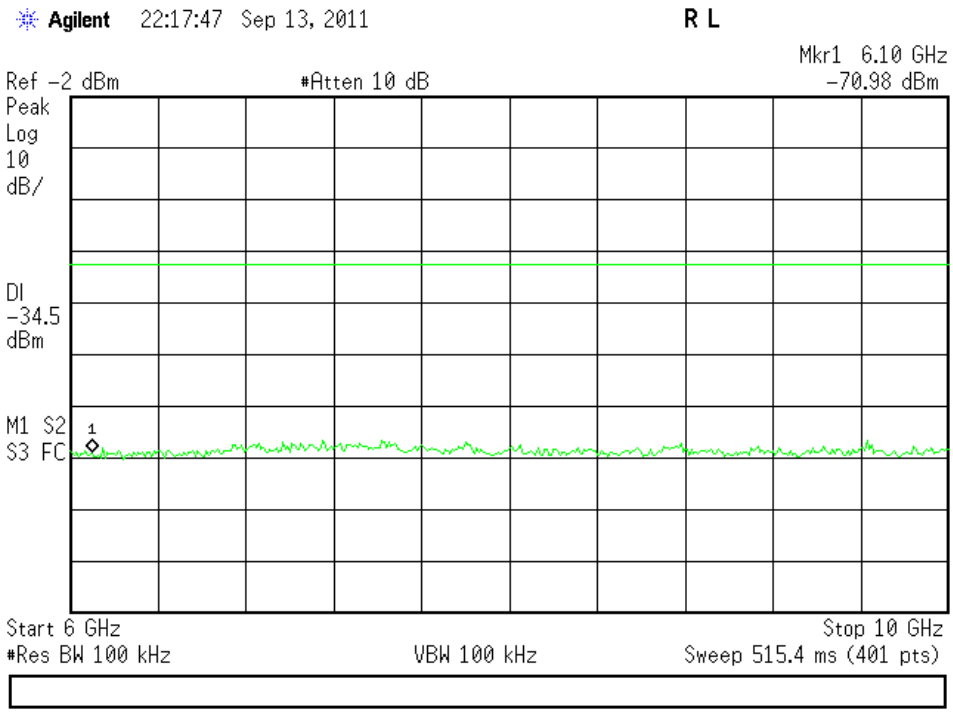

Agilent 22:15:47 Sep 13, 2011
R L
Mkr2 1.81300 GHz
-63.65 dBm
Ref -2 dBm
#Atten 10 dB
Peak
Log
10
dB/
DI
-34.5
dBm
Start 900 MHz
#Res BW 100 kHz
VBW 100 kHz
Stop 2 GHz
Sweep 141.7 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 927.50 MHz -6.855 dBm
2 (1) Freq 1.81300 GHz -63.65 dBm


Agilent 22:16:39 Sep 13, 2011
R L
Mkr1 2.050 GHz
-70.86 dBm
Ref -2 dBm
#Atten 10 dB
Peak
Log
10
dB/
DI
-34.5
dBm
M1 S2
S3 FC
Start 2 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 4 GHz
Sweep 257.7 ms (401 pts)


Agilent 22:17:13 Sep 13, 2011
R L
Mkr1 4.050 GHz
Ref -2 dBm
#Atten 10 dB
-70.48 dBm
Peak
Log
10
dB/
Dl
-34.5
dBm
M1 S2
S3 FC
1
Start 4 GHz
Stop 6 GHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 257.7 ms (401 pts)


Agilent 22:17:47 Sep 13, 2011
R L
Mkr1 6.10 GHz
Ref -2 dBm
#Atten 10 dB
-70.98 dBm
Peak
Log
10
dB/
Dl
-34.5
dBm
M1 S2
S3 FC
1
Start 6 GHz
Stop 10 GHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 515.4 ms (401 pts)

AC Line Conducted Emissions

LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dBµV)	Average limit (dBµV)
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.

[47 CFR 15.207(a)]

MEASUREMENTS / RESULTS

AC Mains Conducted Emissions

Date: 15-Sep-11 **Company:** Keurig Inc. **Work Order:** L1447
Engineer: Matthew Burman **EUT Desc:** RFID Coffee Brewer **Test Site:** CEMI1
Temp: 24.1°C **Humidity:** 53% **Pressure:** 998mBar
Notes: Noise Floor
Measurement Device: Brown LISN **EUT Operating Voltage/Frequency:** 120Vac 60Hz

Range: 0.15-30MHz **Spectrum Analyzer:** Black

	Q.P. Readings		Ave. Readings		Impedance Factor	FCC/CISPR B		FCC/CISPR B		Overall
Frequency	QP1	QP2	AV1	AV2		qp Limit	qp Margin	AVE Limit	AVE Margin	Result
(MHz)	(dBµV)	(dBµV)	(dBµV)	(dBµV)	(dB)	(dBµV)	dB	(dBµV)	dB	(Pass/Fail)
0.15	10.5	11.8	0.9	0.4	20.2	66.0	-34.0	56.0	-34.9	Pass
1.00	9.0	9.3	-5.6	-4.8	20.0	56.0	-26.7	46.0	-30.8	Pass
5.00	2.0	1.9	-7.4	-6.9	20.1	56.0	-33.9	46.0	-32.8	Pass
10.00	-1.5	-2.0	-12.6	-13.5	20.1	60.0	-41.4	50.0	-42.5	Pass
15.00	-2.2	-2.4	-14.6	-14.8	20.2	60.0	-42.0	50.0	-44.4	Pass
20.00	-2.2	-2.4	-14.8	-14.6	20.2	60.0	-42.0	50.0	-44.4	Pass

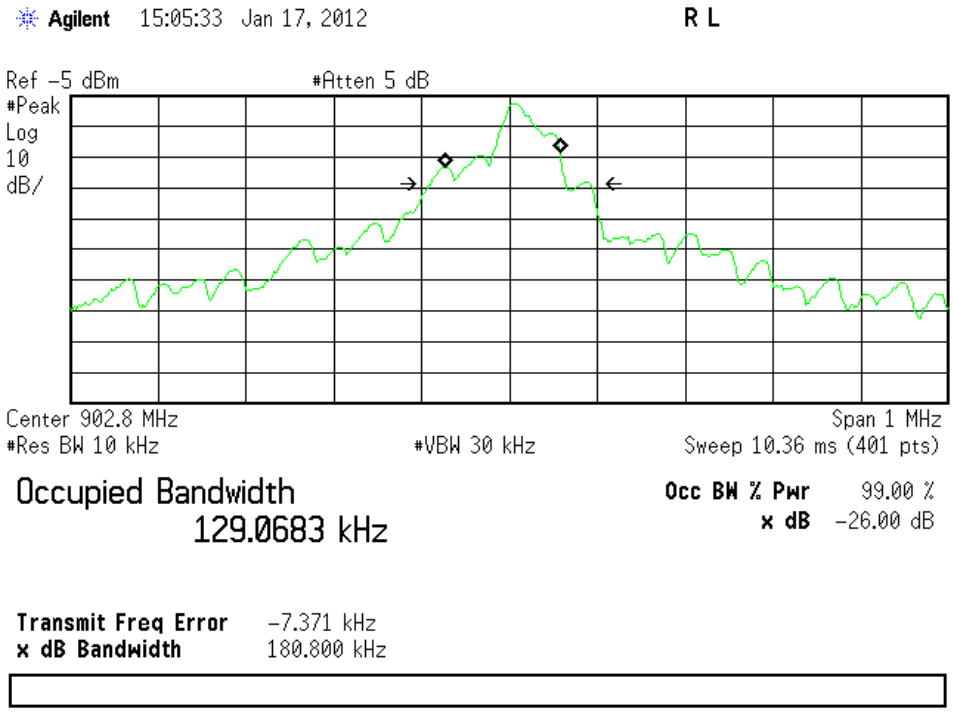
Table Result: Pass by -26.70 dB ***Worst Freq:*** 1.00 MHz

Occupied Bandwidth

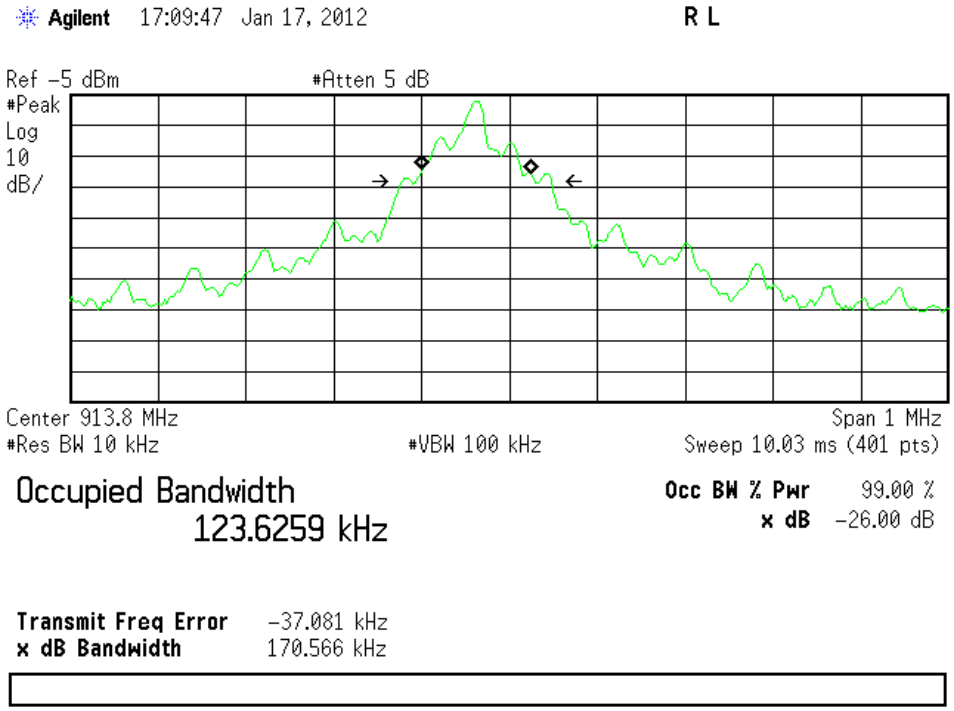
REQUIREMENT

When an occupied bandwidth is no specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured. [RSS-GEN 4.6.1]

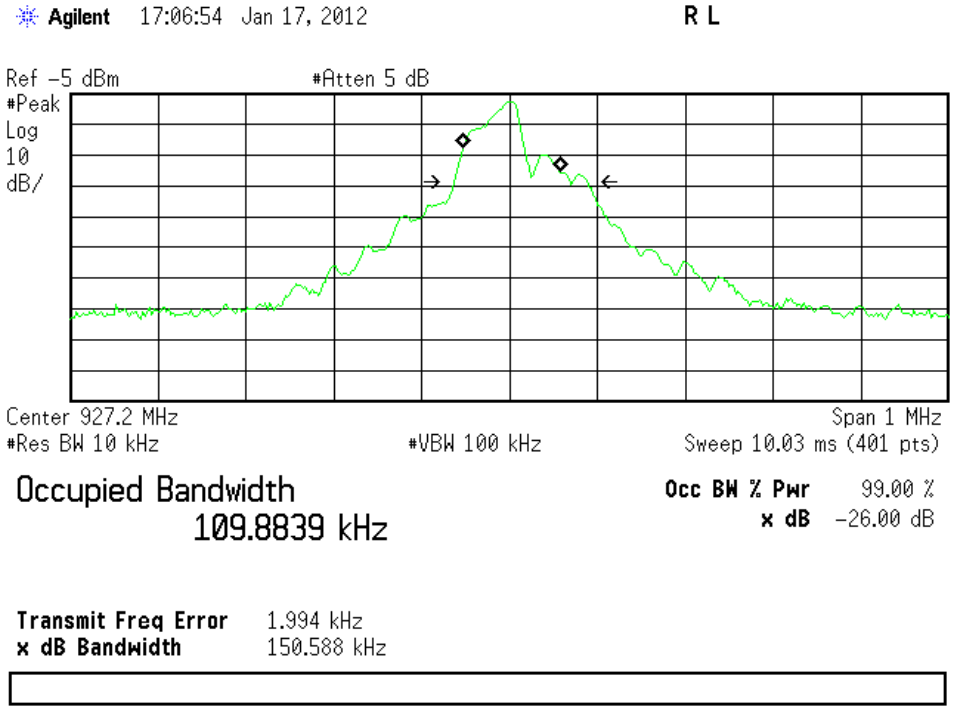
Low Channel



Mid Channel



High Channel



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Product Documentation

The following documentation has been provided by the client for inclusion in this report.

Test Equipment Used

Rev: 9-Sep-2011

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Black	9kHz-12.8GHz	8596E	Agilent	3710A00944	337	I	12-Oct-2011
SA EMI Chamber (1328)	9kHz-13.2 GHz	E4405B	Agilent	MY44210241	1328	I	4-Mar-2012
Rental SA #5	9kHz-26.5 GHz	E4407B	Agilent	MY44220066	1491	I	17-Mar-2012

Radiated Emissions Sites	FCC Code	IC Code	VCCI Code			Cat	Calibration Due
1DCC-OATS-3M-I	719150	2762A-8	R-3109			II	7-Oct-2011
EMI Chamber 2	719150	2762A-7	R-3033, G-107			I	12-Mar-2013

Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red	0.009-2000MHz	ZFL-1000-LN	CS	N/A	798	II	28-Mar-2012
1517 HF Preamp	1-20GHz	CS	CS	N/A	1517	II	29-Mar-2012
High Pass Filter	0.03-6.5 GHz	11SH10-1000/T3000-0/0	K&L	1	1310	II	22-Dec-2011
HF 20dB 50W Attenuator	0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	1-Jun-2013

Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red-Black Bilog	30-2000MHz	JB1	Sunol	A091604-2	1106	I	3-Dec-2012
Orange Horn	1-18GHz	3115	EMCO	0004-6123	390	I	27-Jul-2013

Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due
Temp./Humidity/Atm. Pressure Gauge		7400 Perception II	Davis	N/A	965	I	4-Apr-2013
1DCC-OATS-3M-I Thermohygrometer		35519-044	Control Company	72457635	1334	II	19-Aug-2013
CEMI1 Thermohygrometer		35519-044	Control Company	72457738	1335	II	19-Aug-2013
CHAMBER2 Thermohygrometer		35519-044	Control Company	72457639	1347	II	19-Aug-2013

Cables	Range		Mfr			Cat	Calibration Due
Asset #1506	9kHz - 18GHz		Florida RF			II	19-Aug-2012
Asset #1508	9kHz - 18GHz		Florida RF			II	9-Apr-2012
CEMI-04	9kHz - 2GHz		C-S			II	23-Sep-2011
REMI-High-22	9kHz - 15GHz		C-S			II	18-Jan-2012

LISNs/Measurement Probes	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Brown LISN	9kHz-50MHz	8012-50-R-24-BNC	Solar	411656	986	I	24-Aug-2012

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

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Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("**Client**"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "**Conditions**"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("**Test Report**") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "**BUREAU VERITAS**," "**BUREAU VERITAS CONSUMER PRODUCTS SERVICES**," "**BVCPS**", "**MTL**", "**ACTS**", "**MTL-ACTS**" and **CURTIS-STRAUS** (collectively, the "**Marks**") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only were such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims

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including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.
13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.
14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.
15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B)NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.$10,000, WHICHEVER IS THE LESSER AMOUNT.
16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.
17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

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