
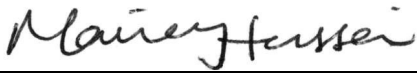




Test Report

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

Report No	EM2057-1
Client	Signal Fire Telemetry
Address	43 Broad Street, Unit A-403 Hudson, MA 01749
Phone	(978) 212-2868
Items tested	Sentinel Node Radio
FCC ID	W8V-SENTINEL
IC ID	8373A-SENTINEL
FRN	001814347
Equipment Type	DSS
Equipment Code	Part 15, Frequency Hopping Spread Spectrum Transmitter
FCC/IC Rule Parts	47 CFR 15.247, RSS 210 issue 8 and RSS GEN issue 3, 47 CFR 15 B
Test Dates	September 10-11, 2012
Results	As detailed within this report
Prepared by	 Edward Breen – Test Engineer
Authorized by	 Mairaj Hussain – EMC Supervisor
Issue Date	<u>9/27/12</u>
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 38 of this report.

Curtis-Straus LLC is accredited to ISO/IEC 17025 by A2LA for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation. See our scope of accreditation at the end of this test report. Any opinions or interpretations expressed in this report are outside the scope of our A2LA accreditation as A2LA only accredits testing.

Testing Cert. No. 1627-01



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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 the Sentinel Node Radio. It is a frequency hopping transmitter that operates in the range 905-925MHz.

We found that the product met the above requirements without modification. Josh Schadel from Signal Fire Telemetry 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), FCC public notice DA00-705 and RSS-GEN.

Radiated Emissions were maximized by rotating the device around three orthogonal axes as well as varying the test antenna's height and polarity. The device antenna is hard wired to the board and could not be maximized separately. Product can be powered through an on board custom 3.6V battery or an external DC source. Radiated emissions and antenna port conducted emission testing was performed while operating through a bench top power supply. AC mains conducted emissions were performed on the AC side of support power supply.

Conducted emission at the antenna port was performed, as required by rule section.

The product was configured for the transmission to either be in the range of 902-915Mhz, or 915-928MHz during testing.

This report also covers unintentional portion of the device.

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
1 Original Release

Date Issued
October 11, 2012



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Product Tested - Configuration Documentation

EUT Configuration										
Work Order: M2057 Company: Signal Fire Telemetry Company Address: 43 Broad Street, Suite A-403 Hudson, MA 01749 Contact: Josh Schadel Person Present: Josh Schadel										
MN					SN					
EUT: Sentinel Node					4861					
EUT Description: Sentinel Node Radio										
EUT Tx Frequency: 905-925MHz										
Support Equipment:										
	MN				PN		SN			
HP DC Power Supply	E3612A				--		--			
HP PC	MXD3480FQN				--		--			
Monitor	--				08G16		--			
Mouse	--				97599		--			
Keyboard	--				09C487		--			
EUT Ports:										
			No.						Max	In/Out
Port Label	Port Type	No. of ports	Populated	Cable Type	Shielded	Ferrites	Length	Length	NEBS Type	Unpopulated Reason
None										
Software / Operating Mode Description:										
EUT is transmitting from 905-925MHz										
Performance Criteria:										
EMI Only										



Statement of Conformity

The Sentinel Node Radio 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 varies 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.



Test Results

Bandwidth

LIMIT

The 20dB bandwidth of the hopping channel is less than 250kHz, the system shall use at least 50 hopping frequencies. [15.247(a) (1) (i)]

MEASUREMENTS / RESULTS

20dB Bandwidth			
Date: 10-Sep-12		Company: Signal Fire Telemetry	Work Order: M2057
Engineer: Chris Reynolds		EUT Desc: Signal Fire Telemetry Sentinel Node	EUT Operating Voltage/Frequency: 3.6VDC
Temp: 24.1 °C		Humidity: 31%	Pressure: 1007mBar
Frequency Range: 902-928MHz			
Notes: RBW = 30kHz VBW = 30kHz			
Antenna Polarization (H / V)	Frequency (MHz)	Reading (KHz)	
low channel	905.0	90.0	
mid channel	915.0	87.5	
high channel	925.0	87.5	
Test Site: 1DCC-OATS-3M-I			
Analyzer: Gold			

Rev. 9/8/2012

Spectrum Analyzers / Receivers /Preselectors

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	2/3/2013

Meteorological Meters

	MN	Mfr	SN	Asset	Cat	Calibration Due
Temp./Humidity/Atm. Pressure Gauge	7400 Perception II	Davis	N/A	965	I	4/4/2013
1DCC-OATS-3M-I Thermohygrometer	35519-044	Control Company	72457635	1334	II	8/19/2013

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



PLOT

Low Channel

* Agilent 09:21:51 Sep 10, 2012

R T

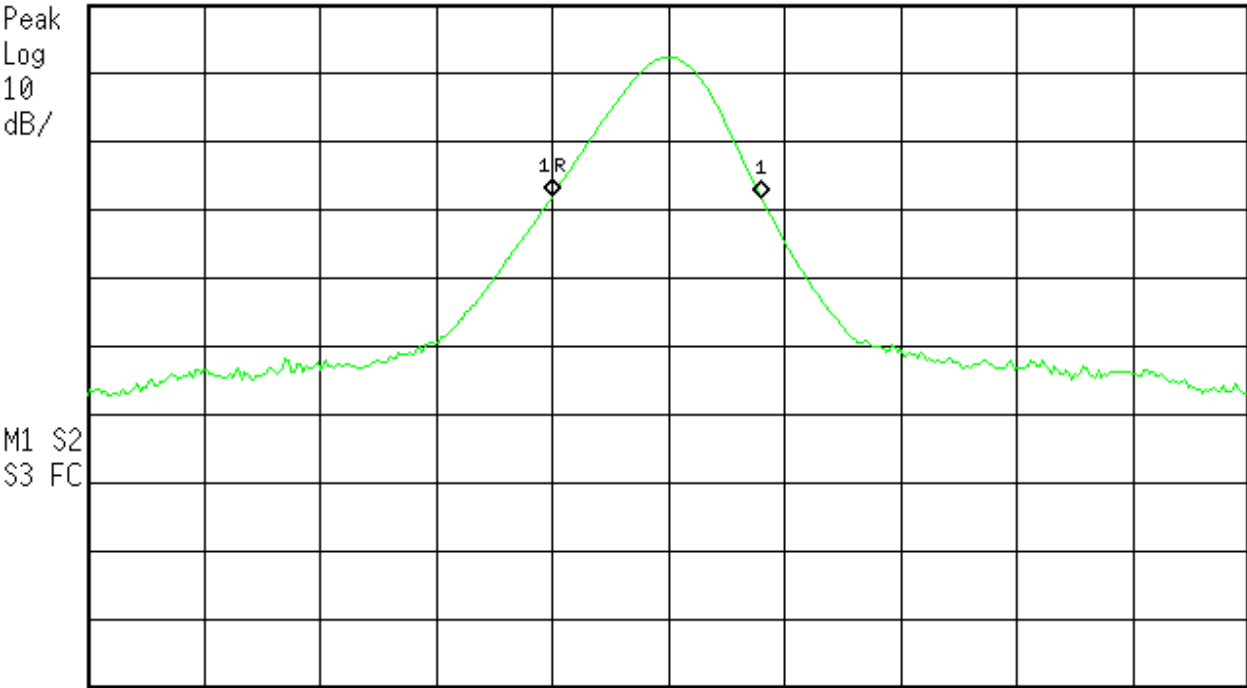
Mkr1 Δ 90.00 kHz
-0.124 dB

Ref 0 dBm

Atten 10 dB

Peak
Log
10
dB/M1 S2
S3 FCCenter 905 MHz
#Res BW 30 kHz

VBW 30 kHz

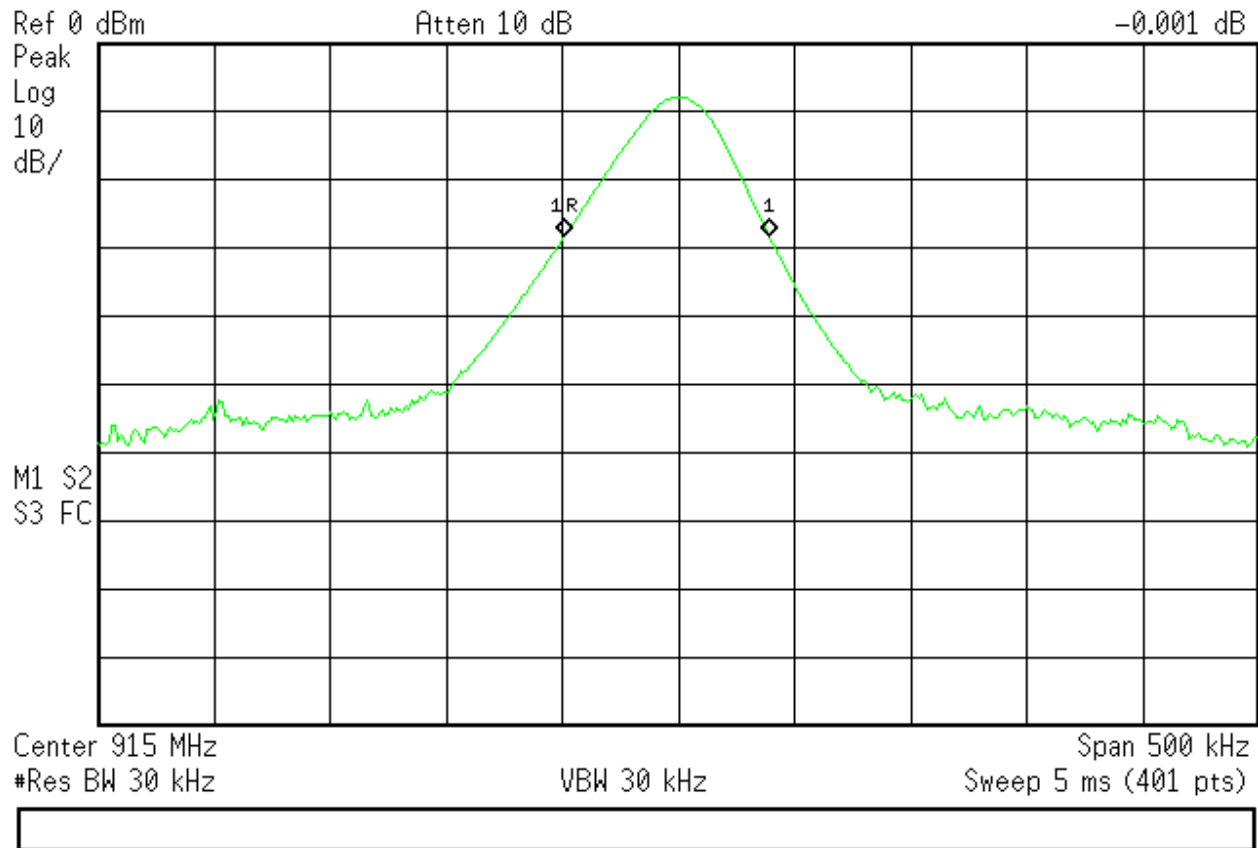
Span 500 kHz
Sweep 5 ms (401 pts)

Mid Channel

Agilent 09:25:02 Sep 10, 2012

R T

Mkr1 Δ 87.50 kHz
-0.001 dB

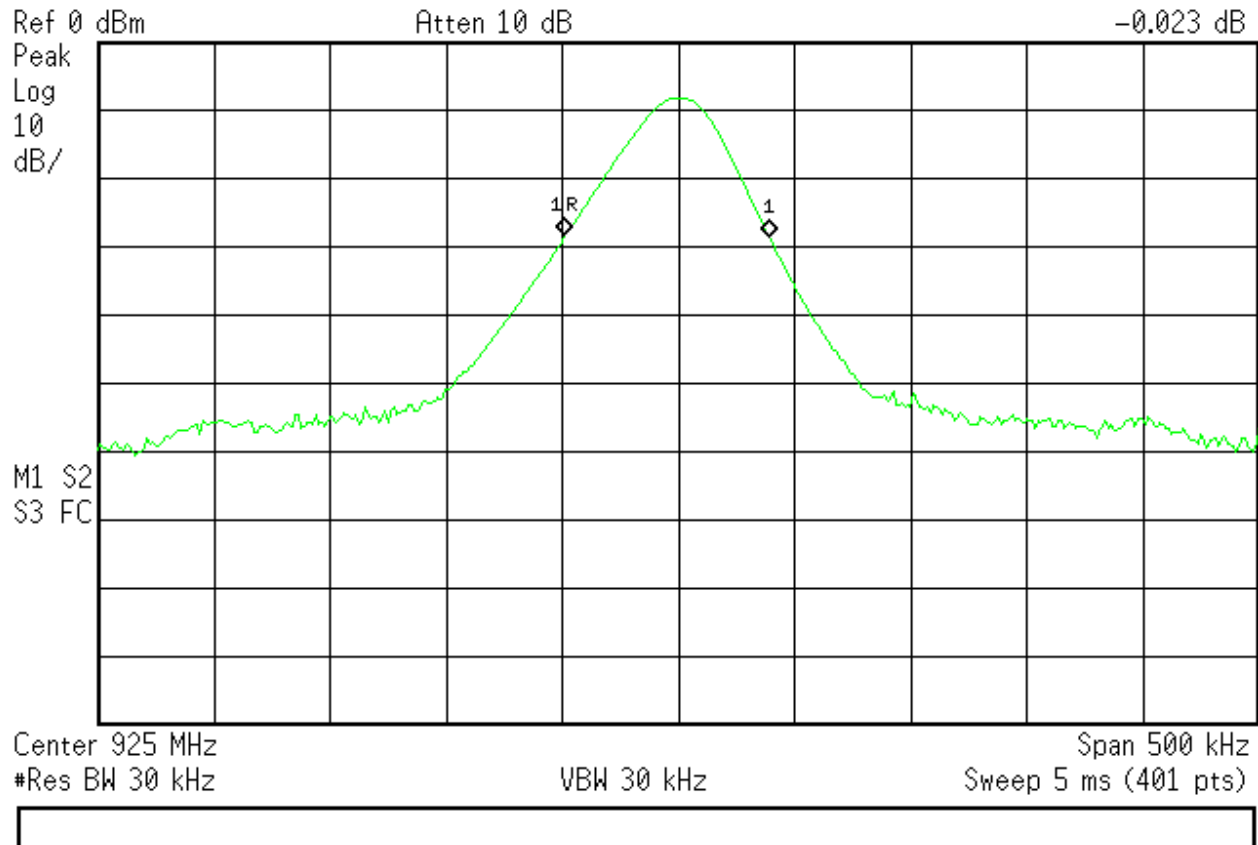


High Channel

Agilent 09:26:45 Sep 10, 2012

R T

Mkr1 Δ 87.50 kHz
-0.023 dB



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)]

Engineer	CR
Date	9-10-2012
Site	3Min

Test Equipment Used

Rev. 9/24/2012

Spectrum Analyzers / Receivers /Preselectors
Gold

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	2/3/2013

Radiated Emissions Sites
1DCC-OATS-3M-I

FCC Code	IC Code	VCCI Code	Cat	Calibration Due
719150	2762A-8	A-0015	II	10/7/2012

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

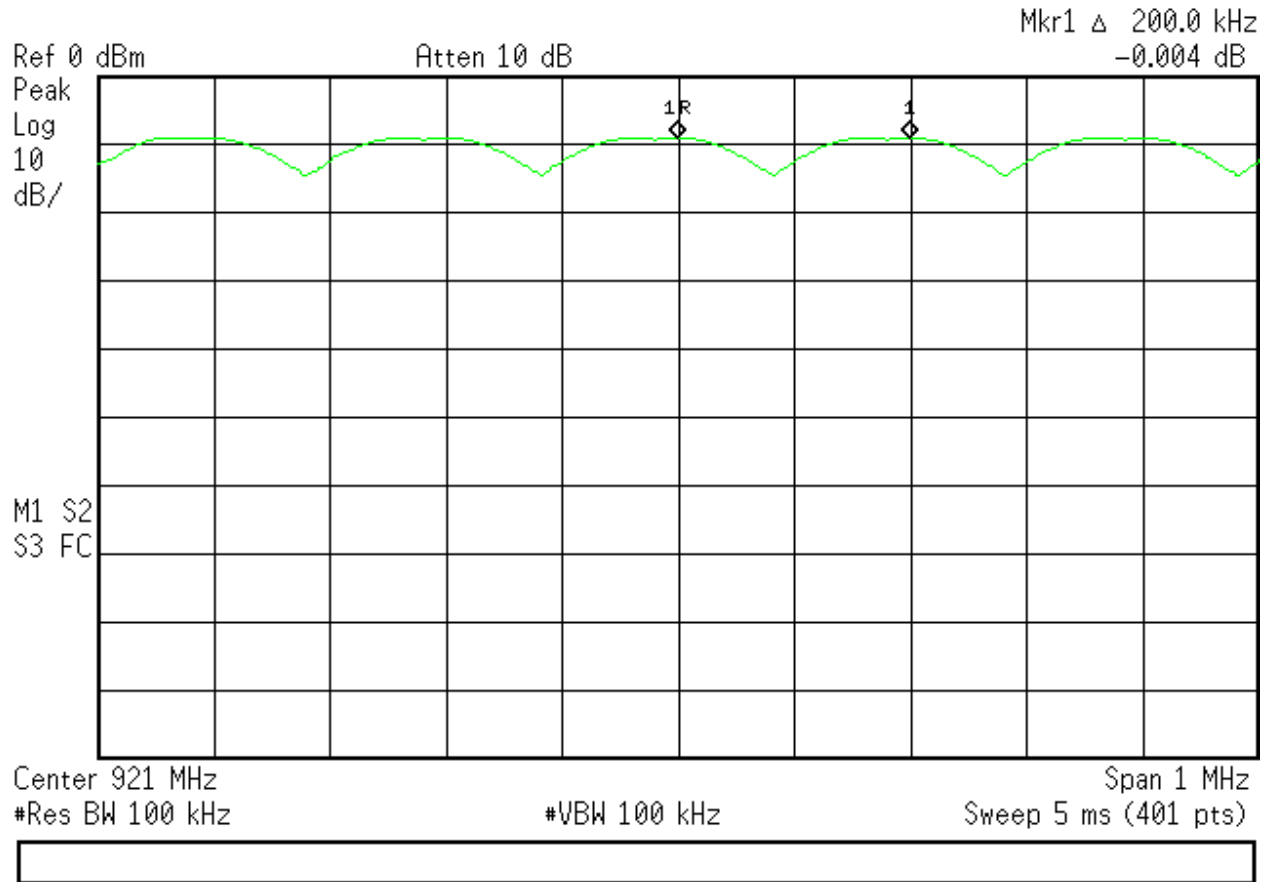


Plots

Channel spacing between carrier frequencies 200.0kHz > 20dB bandwidth

Agilent 09:37:33 Sep 10, 2012

R T



Number of Channels

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

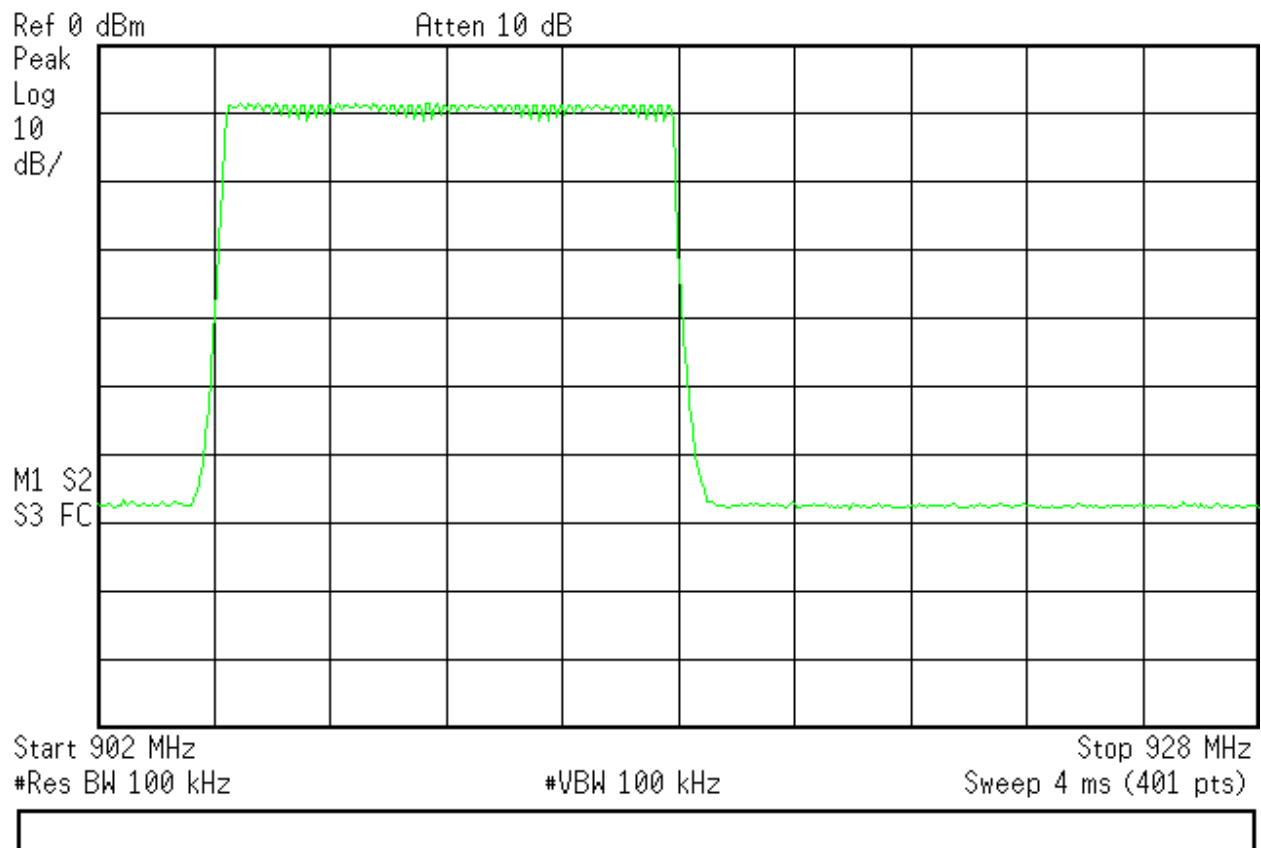
[15.247 (a) (1) (i)]

Plots

50 channels – low band

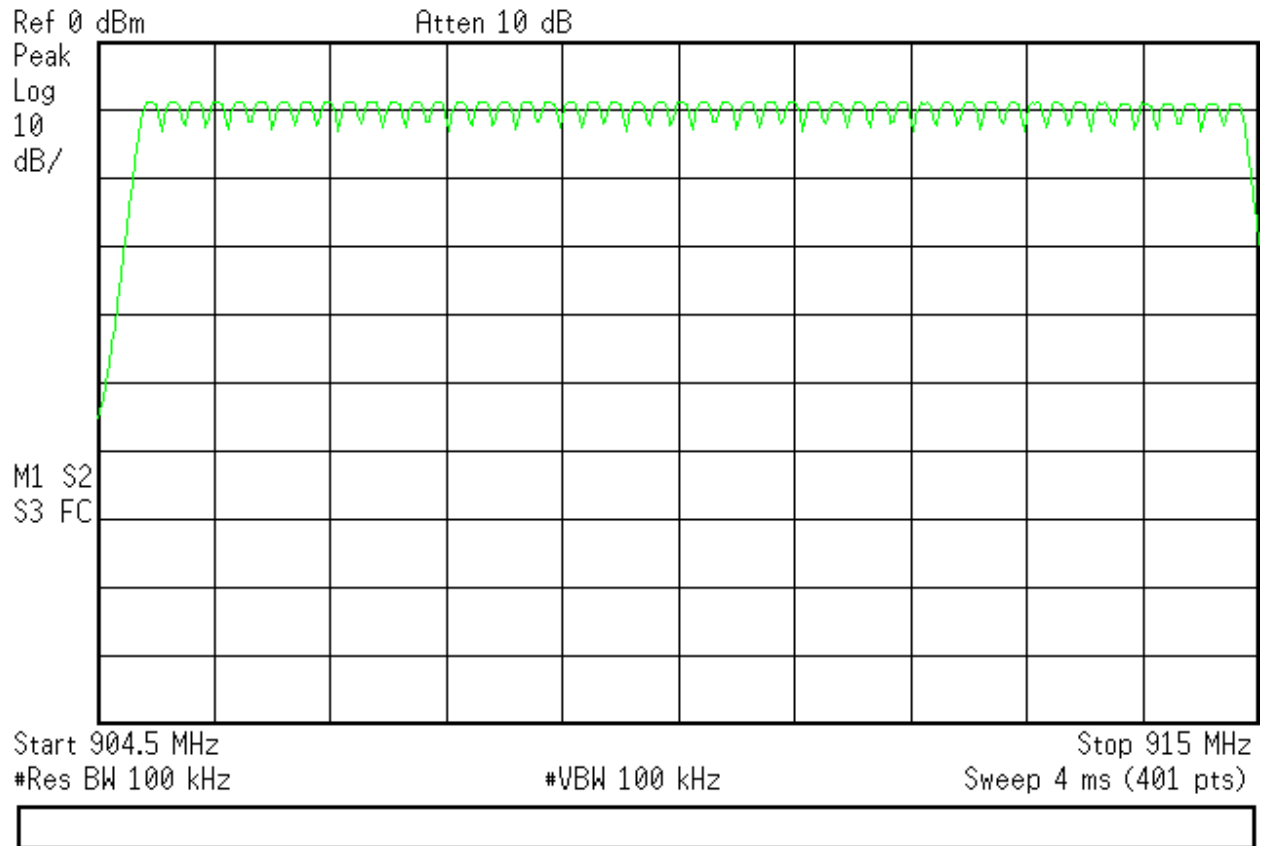
Agilent 09:43:36 Sep 10, 2012

R T



* Agilent 10:01:10 Sep 10, 2012

R T



50 channels – high band

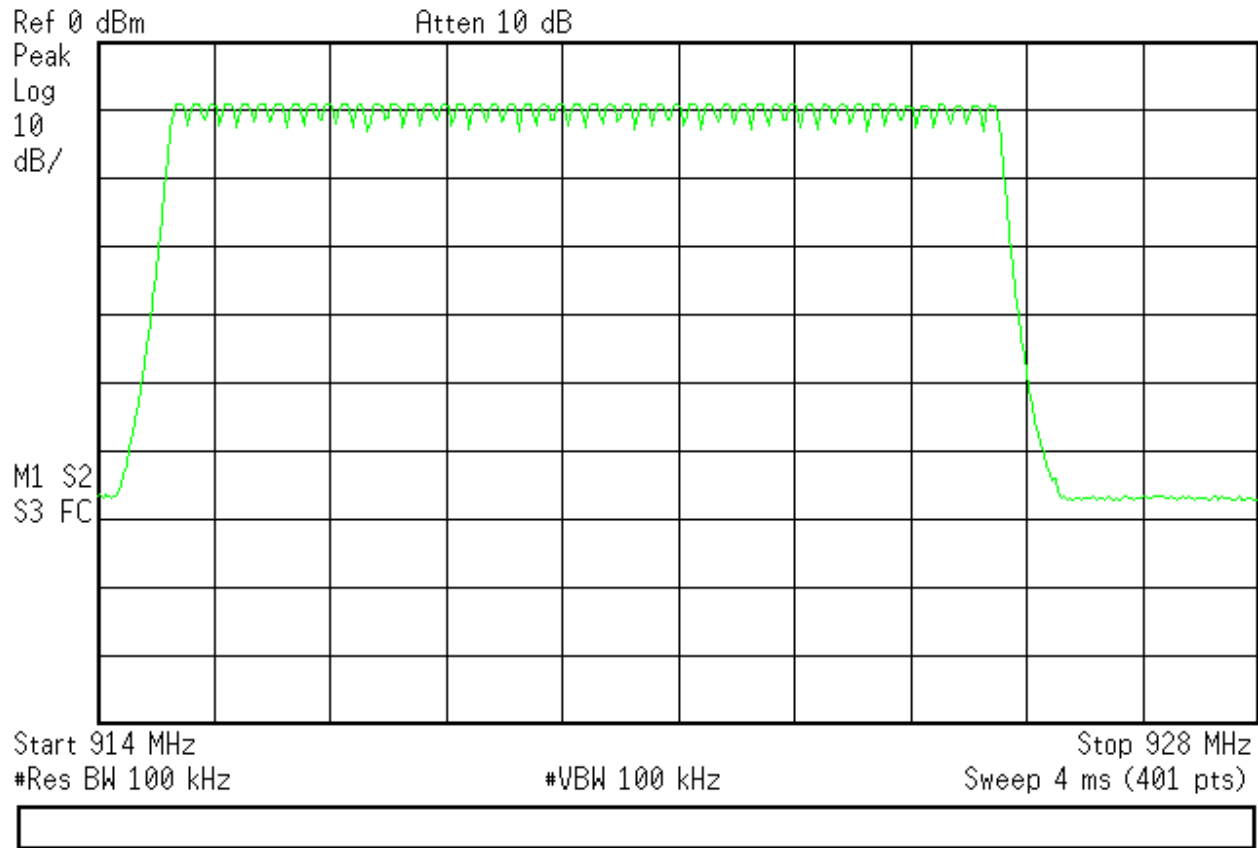
* Agilent 09:47:37 Sep 10, 2012

R T



Agilent 10:05:32 Sep 10, 2012

R T



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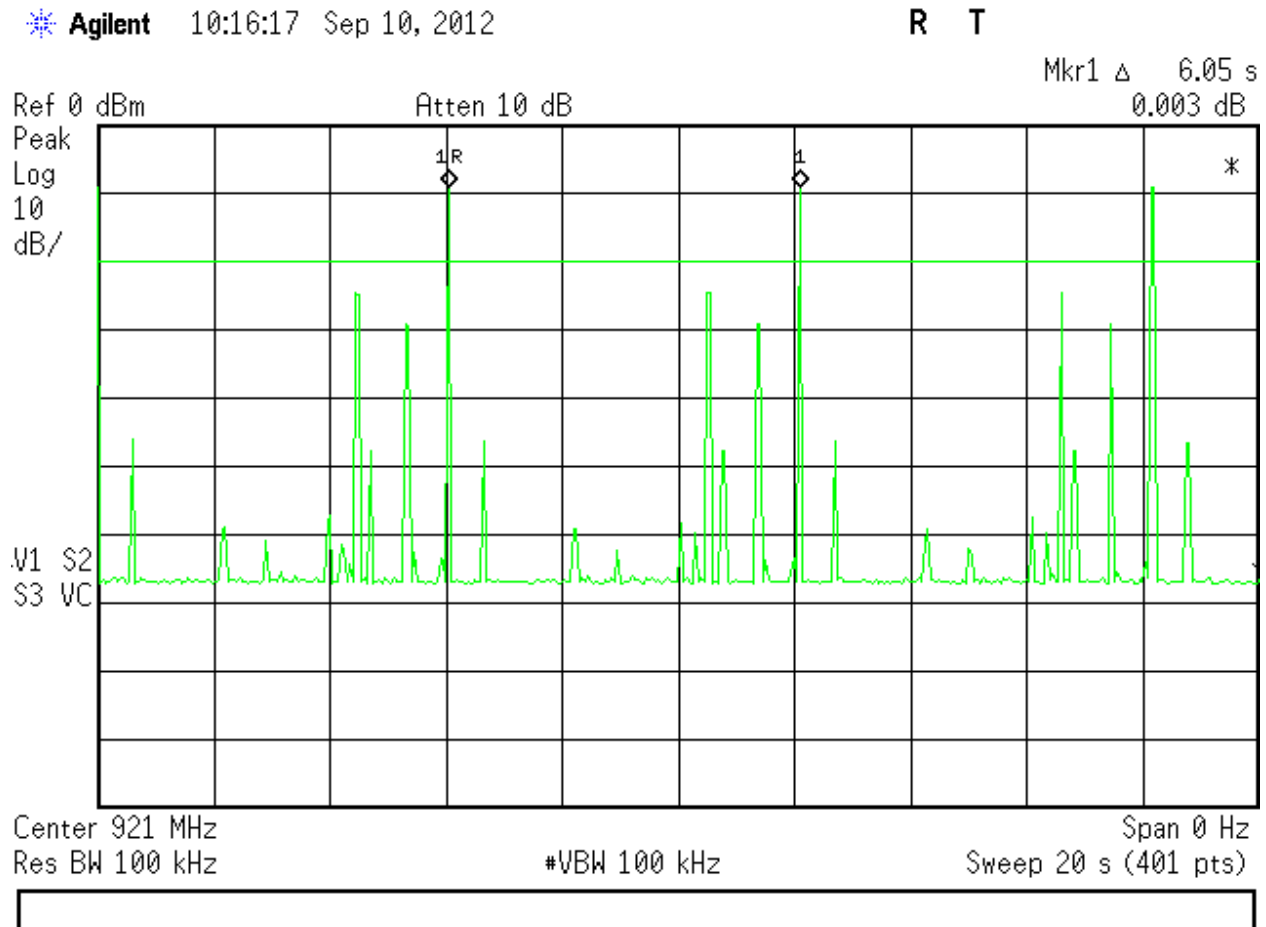


Occupancy Time

For frequency hopping systems operating in the 902-928MHz band:: if the 20dB bandwidth of the hopping channel is less than 250kHz ...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



The frequency is only transmitted once during a transmission burst

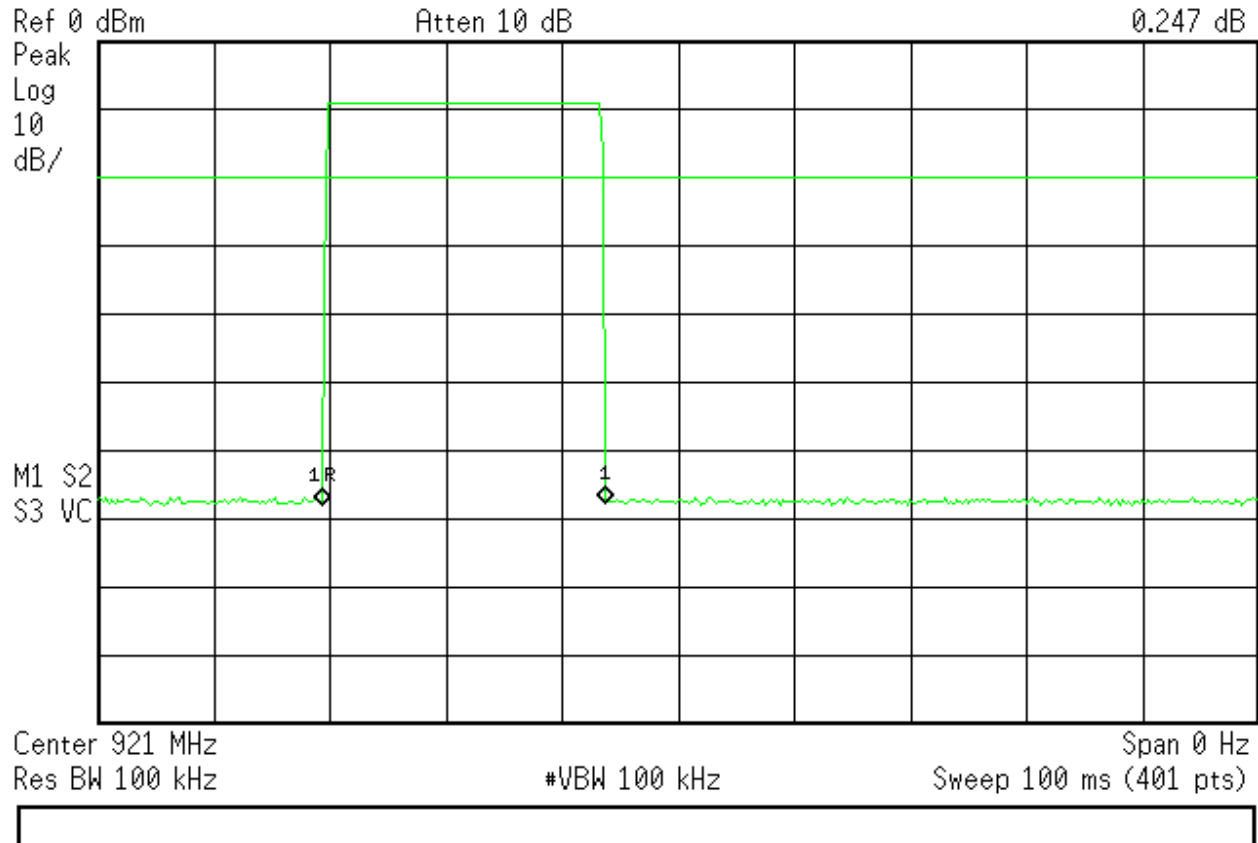
During 20 seconds, the transmission occurs 4 times



Agilent 10:23:10 Sep 10, 2012

R T

Mkr1 Δ 24.5 ms
0.247 dB



Time dwelled on a carrier frequency is 24.5 milliseconds.

Therefore $4 \times 0.0245 \text{ seconds} = 0.098 \text{ seconds} < 0.4 \text{ seconds}$

So within any 20 second window, either before or after the transmission, it shall be less than 0.4 seconds.



Peak Power**LIMIT**

Conducted Output Power

1 Watt

[15.247(b) (2)]

MEASUREMENTS / RESULTS

Peak Output Power												
Date: 10-Sep-12			Company: Signal Fire Telemetry						Work Order: M2057			
Engineer: Chris Reynolds			EUT Desc: Signal Fire Telemetry Sentinel Node						EUT Operating Voltage/Frequency: 3.6VDC			
Temp: 23.2°C			Humidity: 34%			Pressure: 1007mBar						
Frequency Range: 902-928MHz									Measurement Distance: Conductive			
Notes: RBW = 1MHz VBW = 3MHz												
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBm)	Attenuator Factor (dB)	Adjusted Reading (dBm)			---			FCC Section 15.247(b(2))		
										Limit (dBm)	Margin (dB)	Result (Pass/Fail)
low channel	905.0	-8.5	19.6	11.1	---	---	---	---	---	30.0	-18.9	Pass
mid channel	915.0	-8.5	19.6	11.1	---	---	---	---	---	30.0	-18.9	Pass
high channel	925.0	-8.4	19.6	11.2	---	---	---	---	---	30.0	-18.8	Pass
Test Site: 1DCC-OATS-3M-I			Attenuator: PE7019-20									
Analyzer: Gold												

Rev. 9/8/2012

Spectrum Analyzers / Receivers / Preselectors
Gold

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	2/3/2013

Preamplifiers / Couplers Attenuators / Filters
HF 20dB 50W Attenuator

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	6/1/2013

Meteorological MetersTemp./Humidity/Atm. Pressure Gauge
1DCC-OATS-3M-I Thermohygrometer

MN	Mfr	SN	Asset	Cat	Calibration Due
7400 Perception II	Davis	N/A	965	I	4/4/2013
35519-044	Control Company	72457635	1334	II	8/19/2013

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



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PLOTS

Low Channel

* Agilent 10:46:53 Sep 10, 2012

R T

Mkr1 905.008 MHz
-8.451 dBm

Ref 0 dBm

Atten 10 dB

Peak
Log
10
dB/M1 S2
S3 FC

Center 905 MHz

#Res BW 1 MHz

#VBW 3 MHz

Span 10 MHz

Sweep 4 ms (401 pts)



Mid Channel

Agilent 10:52:49 Sep 10, 2012

R T

Mkr1 915.050 MHz
-8.504 dBm

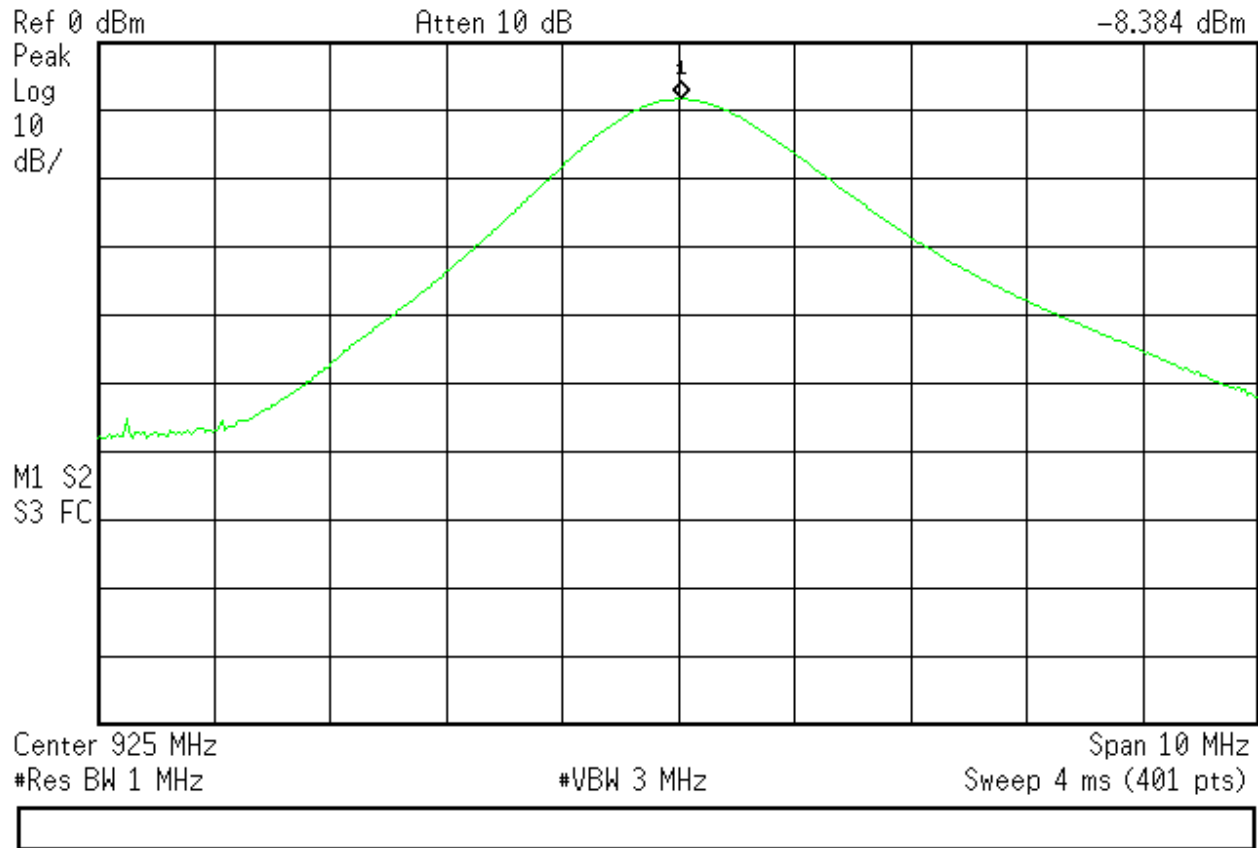


High Channel

Agilent 10:53:55 Sep 10, 2012

R T

Mkr1 925.025 MHz
-8.384 dBm



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)]

Engineer	CR
Date	9-10-2012
Site	3Min

Test Equipment Used

Rev. 9/24/2012

Spectrum Analyzers / Receivers /Preselectors

Gold

Range
100Hz-26.5 GHz

MN
E4407B

Mfr
Agilent

SN
MY45113816

Asset
1284

Cat
I

Calibration Due
2/3/2013

Radiated Emissions Sites

1DCC-OATS-3M-I

FCC Code
719150

IC Code
2762A-8

VCCI Code
A-0015

Cat
II

Calibration Due
10/7/2012

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



PLOTS

928MHz Edge

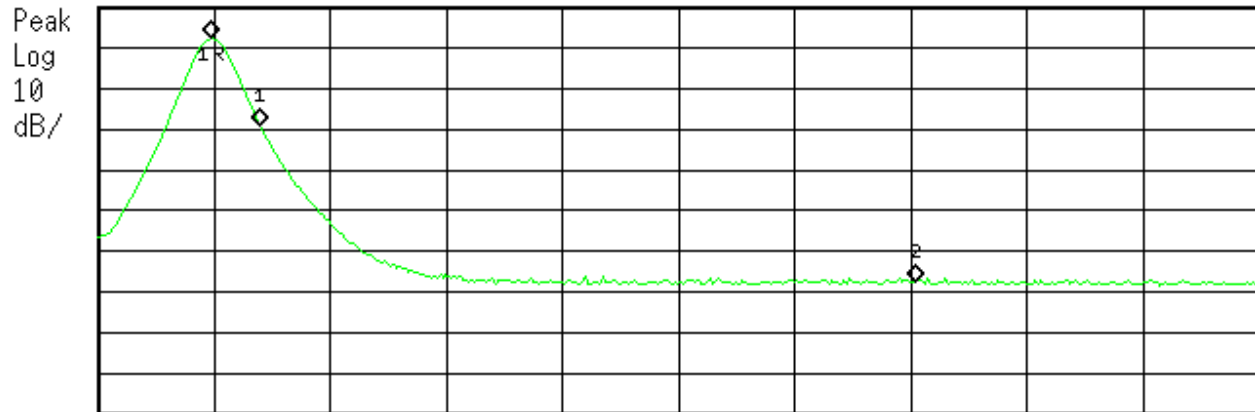
* Agilent 14:44:05 Sep 10, 2012

R T

Mkr2 928.0000 MHz
-47.63 dBm

Ref 20 dBm

Atten 30 dB



Center 927 MHz

Span 5 MHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 5 ms (401 pts)

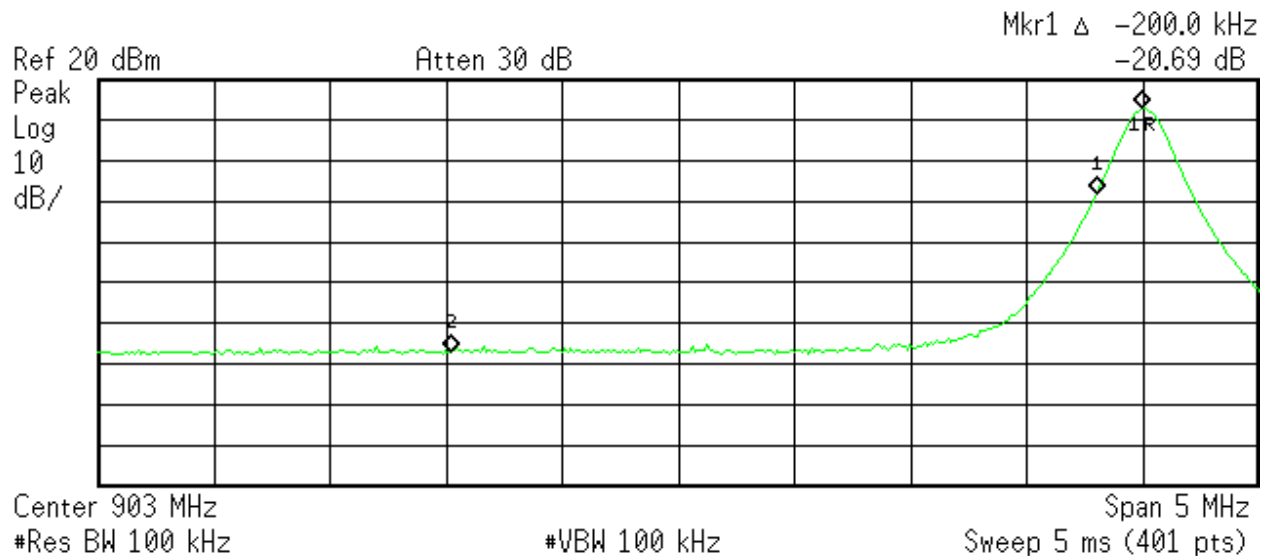
Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Freq	924.9625 MHz	12.2 dBm
1Δ	(1)	Freq	212.5 kHz	-21.28 dB
2	(1)	Freq	928.0000 MHz	-47.63 dBm

902MHz Band Edge



* Agilent 14:40:22 Sep 10, 2012

R T



Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Freq	904.9750 MHz	12.64 dBm
1 Δ	(1)	Freq	-200.0 kHz	-20.69 dB
2	(1)	Freq	902.0000 MHz	-47.03 dBm



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)]

Radiated emission measurements were also taken for the digital circuitry for compliance to FCC part 15 class A or class B products. These emissions were not present during the transmission function being active only.

MEASUREMENTS / RESULTS

Radiated Emissions Table												
Date: 11-Sep-12			Company: Signal Fire Telemetry						Work Order: M2057			
Engineer: Chris Bramley			EUT Desc: Signal Fire Telemetry Sentinel Node						EUT Operating Voltage/Frequency: 3.6Vdc			
Temp: 23.7°C			Humidity: 24%			Pressure: 1017mBar						
Frequency Range: 30-1000MHz							Measurement Distance: 3 m					
Notes: EUT is transmitting at 925MHz												
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)	---			FCC Class B		
							Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
Noise Floor Readings, Peak Values												
v	154.0	24.7	19.8	12.6	1.1	18.6	---	---	---	43.5	-24.9	Pass
v	175.0	21.1	19.8	11.6	1.2	14.1	---	---	---	43.5	-29.4	Pass
v	323.0	27.1	19.8	13.9	1.6	22.8	---	---	---	46.0	-23.2	Pass
v	348.0	23.0	19.5	14.1	1.7	19.3	---	---	---	46.0	-26.7	Pass
v	640.0	20.2	19.6	19.6	2.5	22.7	---	---	---	46.0	-23.3	Pass
v	828.0	22.3	19.2	21.5	2.8	27.4	---	---	---	46.0	-18.6	Pass
Table Result: Pass by -18.6 dB Worst Freq: 828.0 MHz												
Test Site: EMI Chamber 1			Cable 1: Asset #1505						Cable 2: Asset #1507			
Analyzer: Asset #1327			Preamp: Red						Antenna: Red-White			



Radiated Emissions Table															
Date: 11-Sep-12				Company: Signal Fire Telemetry						Work Order: M2057					
Engineer: Chris Bramley				EUT Desc: Signal Fire Telemetry Sentinel Node						EUT Operating Voltage/Frequency: 3.6Vdc					
Temp: 23.7°C				Humidity: 24%						Pressure: 1017mBar					
Frequency Range: 1-10GHz									Measurement Distance: 3 m						
Notes: EUT is transmitting at 925MHz Duty Cycle Correction Factor of -12.2dB applied															
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)	
Readings for Harmonics in Restricted Bands															
HPF Asset 1287															
h	2775.0	66.45	54.3	41.0	28.6	4.1	58.2	46.0	74.0	-15.8	Pass	54.0	-8.0	Pass	
v	2775.0	66.07	53.9	41.0	28.6	4.1	57.8	45.6	74.0	-16.2	Pass	54.0	-8.4	Pass	
HPF Asset 1311															
h	3700.0	68.29	56.1	40.2	32.2	5.3	65.6	53.4	74.0	-8.4	Pass	54.0	-0.6	Pass	
v	3700.0	64.61	52.4	40.2	32.2	5.3	61.9	49.7	74.0	-12.1	Pass	54.0	-4.3	Pass	
h	4625.0	53.17	41.0	39.5	32.6	5.9	52.2	40.0	74.0	-21.8	Pass	54.0	-14.0	Pass	
v	4625.0	53.31	41.1	39.5	32.6	5.9	52.3	40.1	74.0	-21.7	Pass	54.0	-13.9	Pass	
Table Result:				Pass		by		-0.6 dB		Worst Freq:				3700.0 MHz	
Test Site: EMI Chamber 1				Cable 1: Asset #1505						Cable 2: Asset #1507					
Analyzer: Asset #1327				Preamp: Red-Green						Antenna: Yellow Horn					

Rev. 9/8/2012

Spectrum Analyzers / Receivers / Preselectors
SA EMI Chamber (1327)

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
9kHz-13.2 GHz	E4405B	Agilent	MY45103416	1327	I	5/30/2013

Radiated Emissions Sites
EMI Chamber 1

FCC Code	IC Code	VCCI Code	Cat	Calibration Due
719150	2762A-6	A-0015	II	2/16/2014

Preamps / Couplers Attenuators / Filters
Red
Red-Green

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
0.009-2000MHz	ZFL-1000-LN	CS	N/A	798	II	4/13/2013
1-20GHz	PM2-38-218-4R5-17-15-SFF	CS	N/A	1256	II	6/18/2013

Antennas
Red-White Bilog
Yellow Horn

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
30-2000MHz	JB1	Sunol	A091604-1	1105	I	1/28/2013
1-18GHz	3115	EMCO	9608-4898	37	I	6/17/2013

Meteorological Meters
Temp/Humidity/Atm. Pressure Gauge
CHAMBER1 Thermohygrometer

MN	Mfr	SN	Asset	Cat	Calibration Due
7400 Perception II	Davis	N/A	965	I	4/4/2013
35519-044	Control Company	72457642	1345	II	8/19/2013

Cables
Asset #1505
Asset #1507

Range	Mfr	Cat	Calibration Due
9kHz - 18GHz	Florida RF	II	2/9/2013
9kHz - 26.5GHz	Florida RF	II	1/31/2013

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



Receive Mode

Radiated Emissions Table

Date: 20-Sep-12			Company: Signal Fire Telemetry				Work Order: M2057					
Engineer: MH			EUT Desc: Signal Fire Telemetry Sentinel Node				EUT Operating Voltage/Frequency: 3.6V DC					
Temp: 24.8°C			Humidity: 23%				Pressure: mBar					
Frequency Range: 30 - 1000MHz							Measurement Distance: 3 m					
Notes: Rx Mode peak readings							EUT Max Freq: 925MHz					
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	---			FCC Class B		
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
v	48.4	24.6	20.0	8.5	0.6	13.7	---	---	---	40.0	-26.3	Pass
v	61.5	25.2	20.0	7.6	0.6	13.4	---	---	---	40.0	-26.6	Pass
v	152.3	24.6	19.8	12.4	1.1	18.3	---	---	---	43.5	-25.2	Pass
v	177.0	28.0	19.9	11.3	1.2	20.6	---	---	---	43.5	-22.9	Pass
v	186.7	24.0	19.8	11.2	1.2	16.6	---	---	---	43.5	-26.9	Pass
v	422.0	23.1	19.8	16.3	1.9	21.5	---	---	---	46.0	-24.5	Pass
Table Result: Pass by -22.9 dB Worst Freq: 177.0 MHz												
Test Site: EMI Chamber 1			Cable 1: Asset #1505				Cable 2: Asset #1507			Cable 3: ---		
Analyzer: Asset #1328			Preamp: Red				Antenna: Red-Brown			Preselector: ---		

Radiated Emissions Table

Date: 20-Sep-12			Company: Signal Fire Telemetry				Work Order: M2057						
Engineer: MH			EUT Desc: Signal Fire Telemetry Sentinel Node				EUT Operating Voltage/Frequency: 3.6V DC						
Temp: 24.8°C			Humidity: 23%		Pressure: 1013mBar								
Frequency Range: 30 - 1000MHz						Measurement Distance: 3 m							
Notes: Rx Mode						EUT Max Freq: 925MHz							
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	---			FCC Class B			
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	
No emissions found													
Table Result: --- by --- dB Worst Freq: --- MHz													
Test Site: EMI Chamber 1			Cable 1: Asset #1505			Cable 2: Asset #1507			Cable 3: ---				
Analyzer: Asset #1328			Preamp: Red-Green			Antenna: Black Horn			Preselector: ---				



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)]

Engineer	CR
Date	9-10-2012
Site	3Min

Test Equipment Used

Rev. 9/24/2012

Spectrum Analyzers / Receivers /Preselectors

Gold

Range
100Hz-26.5 GHz

MN
E4407B

Mfr
Agilent

SN
MY45113816

Asset
1284

Cat
I

Calibration Due
2/3/2013

Radiated Emissions Sites

1DCC-OATS-3M-I

FCC Code
719150

IC Code
2762A-8

VCCI Code
A-0015

Cat
II

Calibration Due
10/7/2012

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



MEASUREMENTS / RESULTS

Agilent 14:27:10 Sep 10, 2012

R T

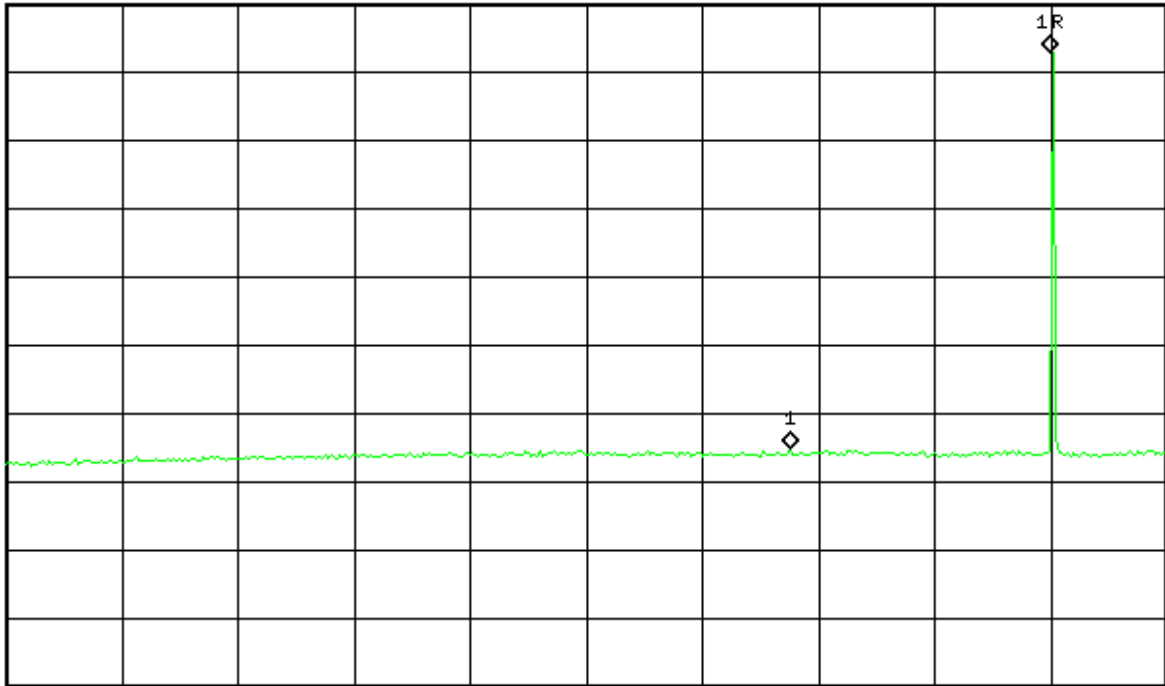
Mkr1 Δ -220.7 MHz
-58.03 dB

Ref 20 dBm

Atten 30 dB

Peak
Log
10
dB/

V1 S2
S3 FC



Start 30 MHz

#Res BW 100 kHz

#VBW 100 kHz

Stop 1 GHz

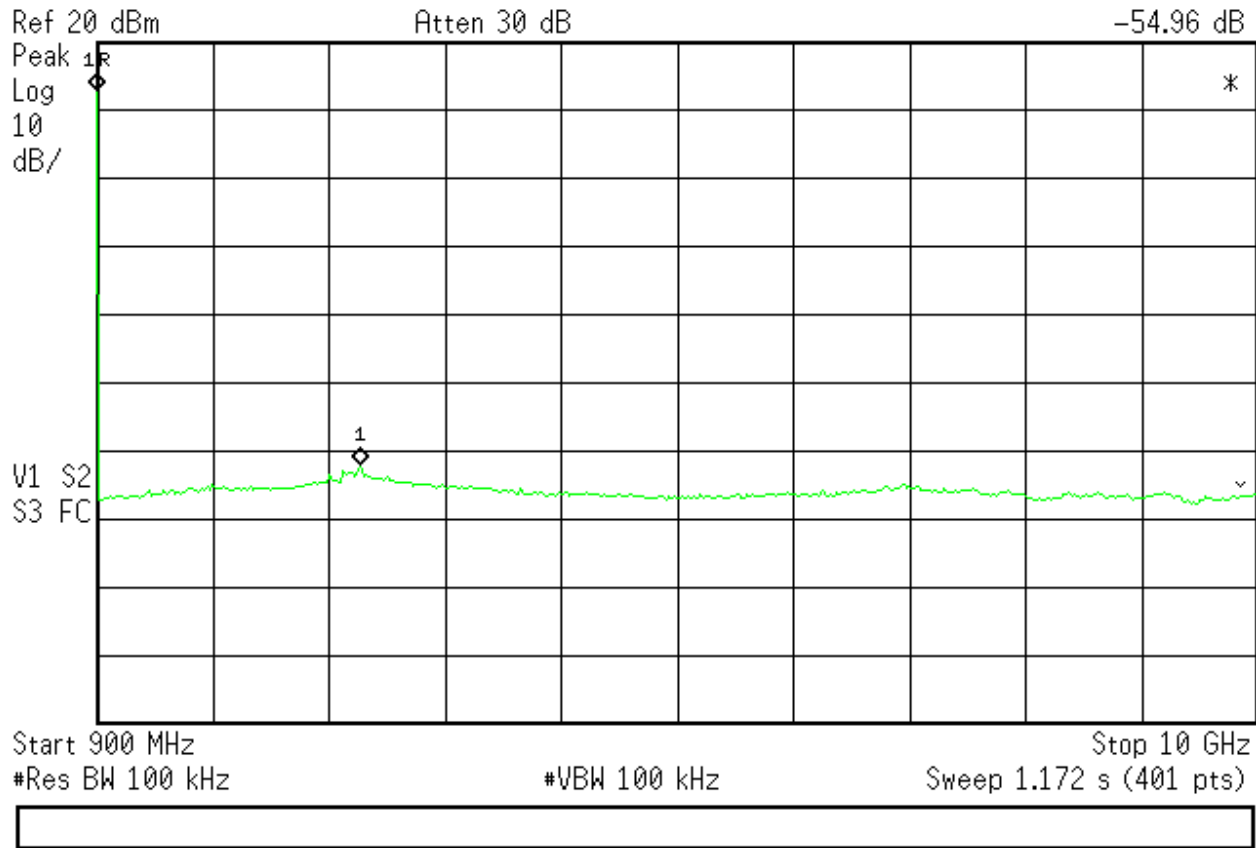
Sweep 125 ms (401 pts)



Agilent 14:30:32 Sep 10, 2012

R T

Mkr1 Δ 2.070 GHz
-54.96 dB



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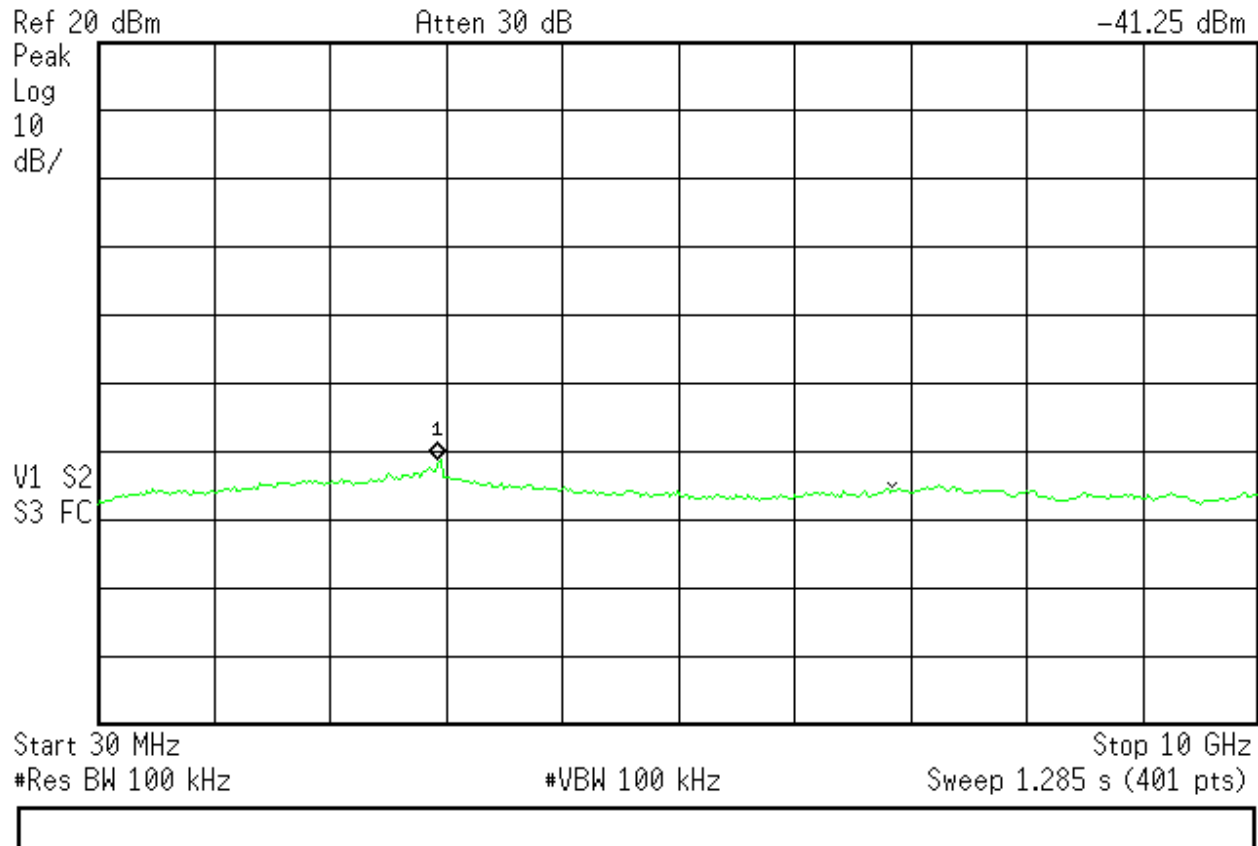


Receive Mode

Agilent 14:32:39 Sep 10, 2012

R T

Mkr1 2.971 GHz
-41.25 dBm



Occupied Bandwidth

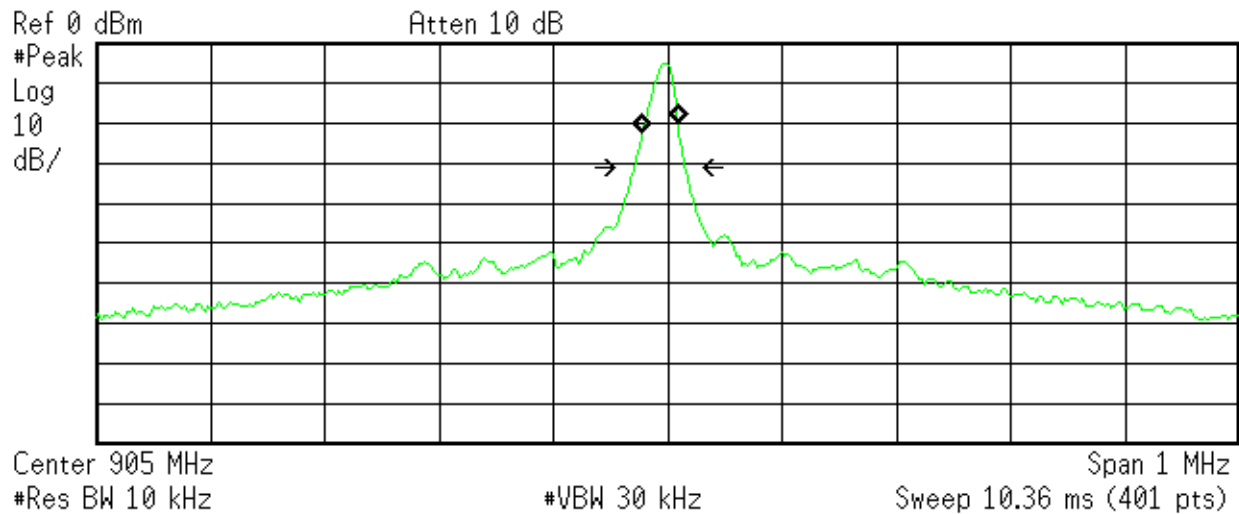
REQUIREMENT

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

Agilent 10:29:36 Oct 10, 2012

R L



Occupied Bandwidth
31.1740 kHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

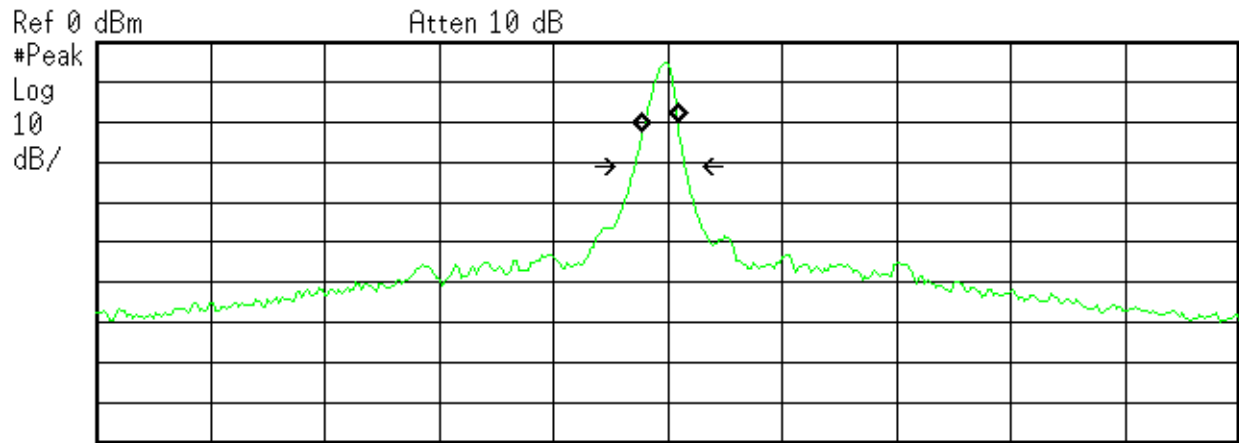
Transmit Freq Error -6.554 kHz
x dB Bandwidth 45.316 kHz



Mid Channel

Agilent 10:32:48 Oct 10, 2012

R L



Center 915 MHz

Span 1 MHz

#Res BW 10 kHz

#VBW 30 kHz

Sweep 10.36 ms (401 pts)

Occupied Bandwidth
31.0522 kHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

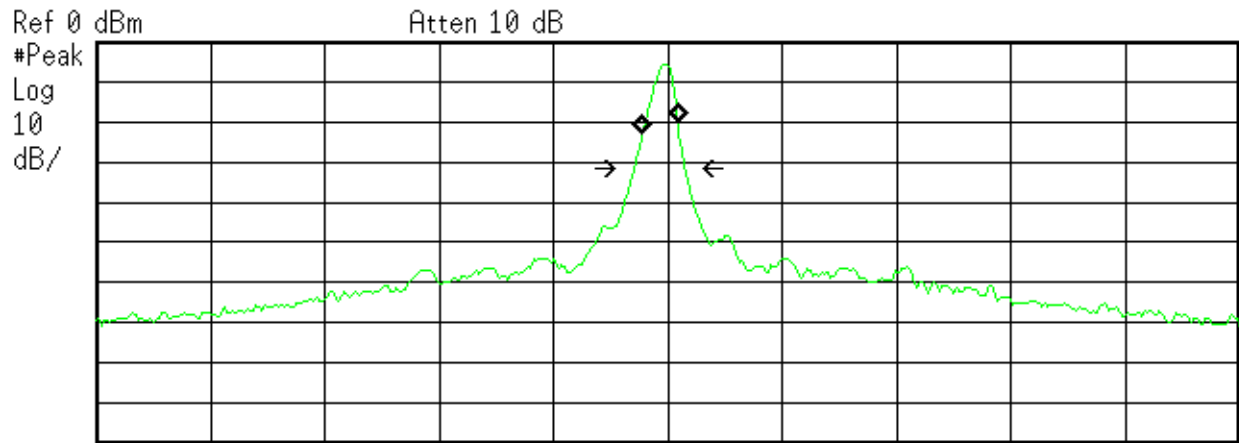
Transmit Freq Error -6.571 kHz
x dB Bandwidth 45.165 kHz



High Channel

Agilent 10:34:23 Oct 10, 2012

R L



Center 925 MHz

#Res BW 10 kHz

#VBW 30 kHz

Span 1 MHz
Sweep 10.36 ms (401 pts)

Occupied Bandwidth
30.9613 kHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -6.598 kHz
x dB Bandwidth 45.170 kHz



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 Side of a DC Supply Conducted Emissions														
Date: 10-Sep-12						Company: Signal Fire Telemetry				Work Order: M2057				
Engineer: Chris Reynolds						EUT Desc: Sentinel Node								
Temp: 23.8 °C						Humidity: 32%				Pressure: 1006 mBar				
Notes:														
Frequency Range: 0.15-30MHz														
EUT Input Voltage/Frequency: 120VAC, 60Hz, 3.6VDC														
Frequency (MHz)	Quasi-Peak Readings		Average Readings		LISN Factors		Cable Factor (dB)	ATTN Factor (dB)	FCC/CISPR Class B			FCC/CISPR Class B		
	QP1 (dBuV)	QP2 (dBuV)	AVG1 (dBuV)	AVG2 (dBuV)	L1 (dB)	L2 (dB)			QP Limit (dB)	Margin (dB)	Result (Pass/Fail)	AVG Limit (dB)	Margin (dB)	Result (Pass/Fail)
0.15	15.8	16.0	10.2	9.9	-0.1	-0.1	-0.1	-20.8	66.0	-29.0	Pass	56.0	-24.7	Pass
0.50	8.8	9.1	2.2	3.1	-0.1	-0.1	-0.1	-20.8	56.0	-26.0	Pass	46.0	-22.0	Pass
1.00	7.1	7.4	1.3	1.5	-0.1	0.0	-0.1	-20.8	56.0	-27.6	Pass	46.0	-23.5	Pass
5.00	5.6	5.7	-0.4	-0.4	-0.1	-0.1	-0.1	-20.8	60.0	-33.3	Pass	50.0	-29.4	Pass
10.00	4.5	4.3	-1.5	-1.5	-0.1	-0.1	-0.2	-20.8	60.0	-34.4	Pass	50.0	-30.3	Pass
15.00	4.2	4.2	-1.8	-1.9	-0.2	-0.2	-0.3	-20.8	60.0	-34.5	Pass	50.0	-30.5	Pass
20.00	4.0	4.1	-1.9	-1.9	-0.3	-0.4	-0.3	-20.8	60.0	-34.5	Pass	50.0	-30.4	Pass
Result: Pass						Worst Margin: -22.0 dB				Frequency: 0.50 MHz				
Measurement Device: 230VAC LISN Asset 1495						Cable: CEMI-07				Spectrum Analyzer: Red				
						Attenuator: 20dB Atten-4				Site: CEMI 1				
C-S CEMI Calculator Version 3.0.8														
Equipment Factor Sheet Rev: 9/8/2011														

C-S CEMI Calculator Version 3.0.8

Equipment Factor Sheet rev: 9/8/2012

Rev. 9/8/2012

Spectrum Analyzers / Receivers / Preselectors

Red 9kHz-1.8GHz MN 8591E Mfr Agilent SN 3441A03559 Asset 24 Cat I Calibration Due 5/23/2013

LISNs/Measurement Probes

230VAC LISN Asset 1495 10kHz-50MHz MN 9252-50-R-24-BNC Mfr Solar SN 84716 Asset 1495 Cat I Calibration Due 6/7/2013

Conducted Test Sites (Mains / Telco)

CEMI 1 FCC Code 719150 VCCI Code A-0015 Cat III Calibration Due NA

Meteorological Meters

Temp./Humidity/Atm. Pressure Gauge 7400 Perception II MN Mfr Davis SN N/A Asset 965 Cat I Calibration Due 4/4/2013
CEMI1 Thermohyrometer 35519-044 Control Company 72457738 1335 II Calibration Due 8/19/2013

Cables

CEMI-07 9kHz - 2GHz Mfr C-S Cat II Calibration Due 5/1/2013

Attenuators

20dB Atten-4 9kHz-2GHz MN Mfr SN N/A Asset Cat II Calibration Due 12/6/2013

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



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Product Documentation

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



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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 where 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.

Rev.160009121(2)_#684340 v13CS



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