TEST REPORT ADDENDUM - CONDUCTED

FROM

Test of: Silver Spring Networks Milli™ 5

To: FCC CFR 47 Part 15 Subpart C 15.247 & IC RSS 247 (DTS)

Test Report Serial No.: SSNT122-U2_Conducted Rev A

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Master Document Number	Addendum Reports
SSNT122-U2_Master	SSNT122-U2_Conducted
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1. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by MiTest. MiTest is an automated test system developed by MiCOM Labs. MiTest is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.

The MiCOM Labs "MiTest" Automated Test System" (Patent Pending)

2. TEST SUMMARY

List of Measurements

Test Header	Result	Data Link
15.247(a)(2) 20 dB & 99% Bandwidth	Complies	View Data
15.247(a)(2) Number of Channels	Complies	View Data
15.247(a)(2) Channel Spacing	Complies	View Data
15.247(a)(2) Dwell Time & Channel Occupancy	Complies	View Data
15.247(b), 15.31(e) Conducted Output Power	Complies	View Data
(1) Conducted Emissions	--	
(i) Conducted Spurious Emissions	Complies	View Data
(ii) Conducted Band-Edge Emissions	Complies	View Data

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3. TEST RESULTS

3.1. 20 dB & 99% Bandwidth

Conducted Test Conditions for 20 dB and 99% Bandwidth			
Standard:	FCC CFR 47:15.247 & RSS 247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	20 dB and 99 % Bandwidth	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2) & 5.1	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for 20 dB and 99% Bandwidth Measurement
The bandwidth at 20 dB and 99 % was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

Testing was performed under ambient conditions at nominal voltage

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limits for 20 dB and 99% Bandwidth

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(i) 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; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Equipment Configuration for 20 dB & 99% Bandwidth			
Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:	None		

Test Measurement Results

Test Frequency	Measured 20 dB Bandwidth (KHz)				20 dB Bandwidth (KHz)		Limit	Lowest Margin
	Port(s)							
MHz	a	b	c	d	Highest	Lowest	KHz	KHz
902.2	107	--	--	--	107	107	≤500.0	-393
915.2	108	--	--	--	108	108	≤500.0	-392
927.8	107	--	--	--	107	107	≤500.0	-393

Test Frequency	Measured 99% Bandwidth (KHz)				Maximum 99% Bandwidth (KHz)		
	Port(s)						
MHz	a	b	c	d			
902.2	107	--	--	--	107		
915.2	111	--	--	--	111		
927.8	110	--	--	--	110		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

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3.2. Number of Channels

Conducted Test Conditions for Number Of Channels			
Standard:	FCC CFR 47:15.247 & RSS 247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Number of Channels	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2) & 5.1	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure
The number of channels and channel occupancy is measured with a spectrum analyzer connected to the antenna terminal, while the EUT is operating in transmission mode at the appropriate center frequency and modulation.

Testing was performed under ambient conditions at nominal voltage..

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limit
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; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

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Equipment Configuration for Hopping Sequence			
Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Modulation	Frequency Range (MHz)	Number of Hopping Channels	Limit	Total Number of Hops	Results
			No of Hopping Channels		
2FSK	900.00 – 916.00	70.0	--	70.0	--
2FSK	916.00 – 928.00	58.0	--	58.0	--
2FSK	902.00 – 928.00	**Total No. of Hopping Channels:**	≥50	128.0	Pass

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

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3.3. Channel Spacing

Conducted Test Conditions for 6 dB and 99% Bandwidth			
Standard:	FCC CFR 47:15.247 & RSS 247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Channel Spacing	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2) & 5.1	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure
The number of channels and channel occupancy is measured with a spectrum analyzer connected to the antenna terminal, while the EUT is operating in transmission mode at the appropriate center frequency and modulation.

Testing was performed under ambient conditions at nominal voltage...

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

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

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Equipment Configuration for Channel Spacing			
Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Center Frequency	Packet Type	Chan Separation	Limit (20 dB Occ. BW)	Result
MHz		MHz	MHz	
915.4 & 925.6	2FSK	0.200	> 0.100	Pass
Traceability to Industry Recognized Test Methodologies				
Measurement Uncertainty:	±2.81 dB (Spectrum/Amplitude), ±0.86 ppm (Frequency)			

Note: click the links in the above matrix to view the graphical image (plot).

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3.4. Dwell Time & Channel Occupancy

Conducted Test Conditions for Channel Occupancy			
Standard:	FCC CFR 47:15.247 & RSS 247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Dwell Time & Channel Occupancy	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2) & 5.1	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure
The number of channels and channel occupancy is measured with a spectrum analyzer connected to the antenna terminal, while the EUT is operating in transmission mode at the appropriate center frequency and modulation.

Testing was performed under ambient conditions at nominal voltage...

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limit

(a)(1)(i) 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; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

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Equipment Configuration for Dwell Time & Channel Occupancy			
Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

		Test Measurement Results			
Center Frequency	**Variant Type**	**Dwell Time (Single Channel)**	**Channel Occupancy**	**Channel Occupancy Limit**	**Result**
MHz		**ms**	**ms**	**ms**	
915.6	2FSK	24.0	48.0	400.00	Pass

Traceability to Industry Recognized Test Methodologies	
Measurement Uncertainty:	±2.81 dB (Spectrum/Amplitude), ±0.86 ppm (Frequency)

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3.5. Conducted Output Power

Conducted Test Conditions for Fundamental Emission Output Power			
Standard:	FCC CFR 47:15.247 & RSS 247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Output Power	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (b) & (c) & 5.4 (1)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Fundamental Emission Output Power Measurement
In the case of average power measurements an average power sensor was utilized.

For peak power measurements the spectrum analyzer built-in power function was used to integrate peak power over the 20 dB bandwidth.

Testing was performed under ambient conditions at nominal voltage..

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.
Supporting Information
Calculated Power = A + G + Y+ 10 log (1/x) dBm

A = Total Power [10*Log10 ($10^{a/10}$ + $10^{b/10}$ + $10^{c/10}$ + $10^{d/10}$)]
G = Antenna Gain
Y = Beamforming Gain
x = Duty Cycle (average power measurements only)

Limits for Fundamental Emission Output Power
(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following for non-frequency hopping systems:

(3) For systems using digital modulation in the 902-928 MHz and 2400-2483.5 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.
(1) Fixed point-to-point operation:
(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(iii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) and (c)(1)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(2) In addition to the provisions in paragraphs (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

(i) Different information must be transmitted to each receiver.

(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:

(A) The directional gain shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

(B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.

(iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.

(iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.

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Equipment Configuration for Peak Output Power

Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB

Test Measurement Results

Test Frequency	Measured Output Power (dBm)				Calculated Total Power Σ Port(s)	Limit	Margin
	Port(s)						
MHz	**a**	**b**	**c**	**d**	**dBm**	**dBm**	**dBm**
902.2	23.73	--	--	--	23.73	30.00	-6.27
915.2	23.61	--	--	--	23.61	30.00	-6.39
927.8	23.77	--	--	--	23.77	30.00	-6.23

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

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3.6. Emissions

3.6.1. Conducted Emissions

3.6.1.1. Conducted Spurious Emissions

Conducted Test Conditions for Transmitter Conducted Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47:15.247 & RSS 247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Max Unwanted Emission Levels	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (d) & 5.5	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Transmitter Conducted Spurious and Band-Edge Emissions Measurement
Transmitter Conducted Spurious and Band-Edge emissions were measured at a limit of 30 dBc (average detector) or 20 dBc (peak detector) below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Measurements were made while EUT was operating in transmit mode of operation at the appropriate centre frequency closest to the band-edge. Emissions were maximized during the measurement and limits derived from the peak spectral power and drawn on each plot.

Testing was performed under ambient conditions at nominal voltage..

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limits Transmitter Conducted Spurious and Band-Edge Emissions
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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Equipment Configuration for Transmitter Conducted Spurious Emissions			
Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:	None		

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Conducted Spurious Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
902.2	30.0 - 26000.0	-40.53	3.24	--	--	--	--	--	--
915.2	30.0 - 26000.0	-36.52	3.39	--	--	--	--	--	--
927.8	30.0 - 26000.0	-35.56	3.46	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).

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3.6.1.2. Conducted Band-Edge Emissions

Conducted Low Band-Edge Emissions

Equipment Configuration for Conducted Low Band-Edge Emissions - Peak			
Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:	None		

Test Measurement Results

Channel Frequency:		902.2 MHz					
Band-Edge Frequency:		902 MHz					
Test Frequency Range:		880.0 – 904.0 MHz					
Temp C		**Band-Edge Markers and Limit**			**Revised Limit**		**Margin**
		M1 Amplitude (dBm)	**Plot Limit (dBm)**	**M2 Frequency (MHz)**	**Amplitude (dBm)**	**M2A Frequency (MHz)**	**(MHz)**
20	**3.3**	-5.93	3.4	902.02	--	--	-0.02

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).

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Conducted High Band-Edge Emissions

Equipment Configuration for Conducted High Band-Edge Emissions - Peak			
Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:	None		

Test Measurement Results

Channel Frequency:	927.8 MHz						
Band-Edge Frequency:	928.0 MHz						
Test Frequency Range:	927.0 – 935.0 MHz						
Temp C		**Band-Edge Markers and Limit**			**Revised Limit**		**Margin**
		M3 Amplitude (dBm)	**Plot Limit (dBm)**	**M2 Frequency (MHz)**		**M1 Amplitude (dBm)**	**Plot Limit (dBm)**
20	**3.3**	-1.033	1.310	927.97	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).

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Conducted Low Band-Edge Emissions Hopping

Equipment Configuration for Conducted Low Band-Edge Emissions - Peak			
Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:	None		

Test Measurement Results

Channel Frequency:	902.2 MHz						
Band-Edge Frequency:	902 MHz						
Test Frequency Range:	880.0 – 904.0 MHz						
Temp C		**Band-Edge Markers and Limit**			**Revised Limit**		**Margin**
		M1 Amplitude (dBm)	**Plot Limit (dBm)**	**M2 Frequency (MHz)**	**Amplitude (dBm)**	**M2A Frequency (MHz)**	**(MHz)**
20	**3.3**	-3.6	4.6	902.98	--	--	-0.98

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).

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Conducted High Band-Edge Emissions Hopping

Equipment Configuration for Conducted High Band-Edge Emissions - Peak			
Variant:	FHSS	**Duty Cycle (%):**	99
Data Rate:	50 kbps	**Antenna Gain (dBi):**	Not Applicable
Modulation:	2FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:	None		

Test Measurement Results

Channel Frequency:		927.8 MHz					
Band-Edge Frequency:		928.0 MHz					
Test Frequency Range:		927.0 – 935.0 MHz					
Temp C		**Band-Edge Markers and Limit**			**Revised Limit**		**Margin**
		M3 Amplitude (dBm)	**Plot Limit (dBm)**	**M2 Frequency (MHz)**		**M1 Amplitude (dBm)**	**Plot Limit (dBm)**
20	**3.3**	-2.3	5.00	927.0	--	--	-0.50

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).

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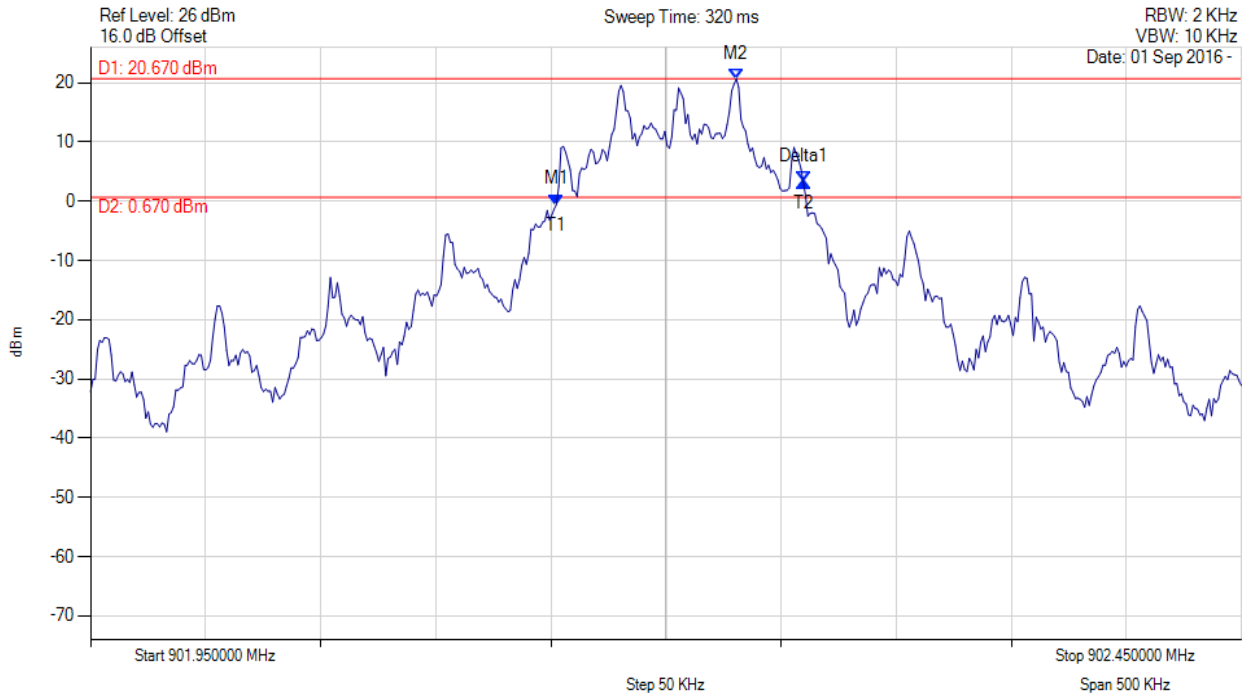
A. APPENDIX - GRAPHICAL IMAGES

A.1. 20 dB & 99% Bandwidth

20 dB & 99% BANDWIDTH

Variant: FHSS, Channel: 902.20 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 902.152 MHz : -0.549 dBm M2 : 902.231 MHz : 20.668 dBm Delta1 : 107 KHz : 3.817 dB T1 : 902.152 MHz : -0.549 dBm T2 : 902.260 MHz : 3.269 dBm OBW : 107 KHz	Channel Frequency: 902.20 MHz

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20 dB & 99% BANDWIDTH

Variant: FHSS, Channel: 915.20 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 915.153 MHz : 0.865 dBm M2 : 915.231 MHz : 20.334 dBm Delta1 : 108 KHz : -0.958 dB T1 : 915.149 MHz : -2.025 dBm T2 : 915.261 MHz : -0.093 dBm OBW : 111 KHz	Channel Frequency: 915.20 MHz

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20 dB & 99% BANDWIDTH

Variant: FHSS, Channel: 927.80 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 927.751 MHz : -0.298 dBm M2 : 927.831 MHz : 20.637 dBm Delta1 : 107 KHz : 5.939 dB T1 : 927.748 MHz : -1.816 dBm T2 : 927.859 MHz : 5.640 dBm OBW : 110 KHz	Channel Frequency: 927.80 MHz

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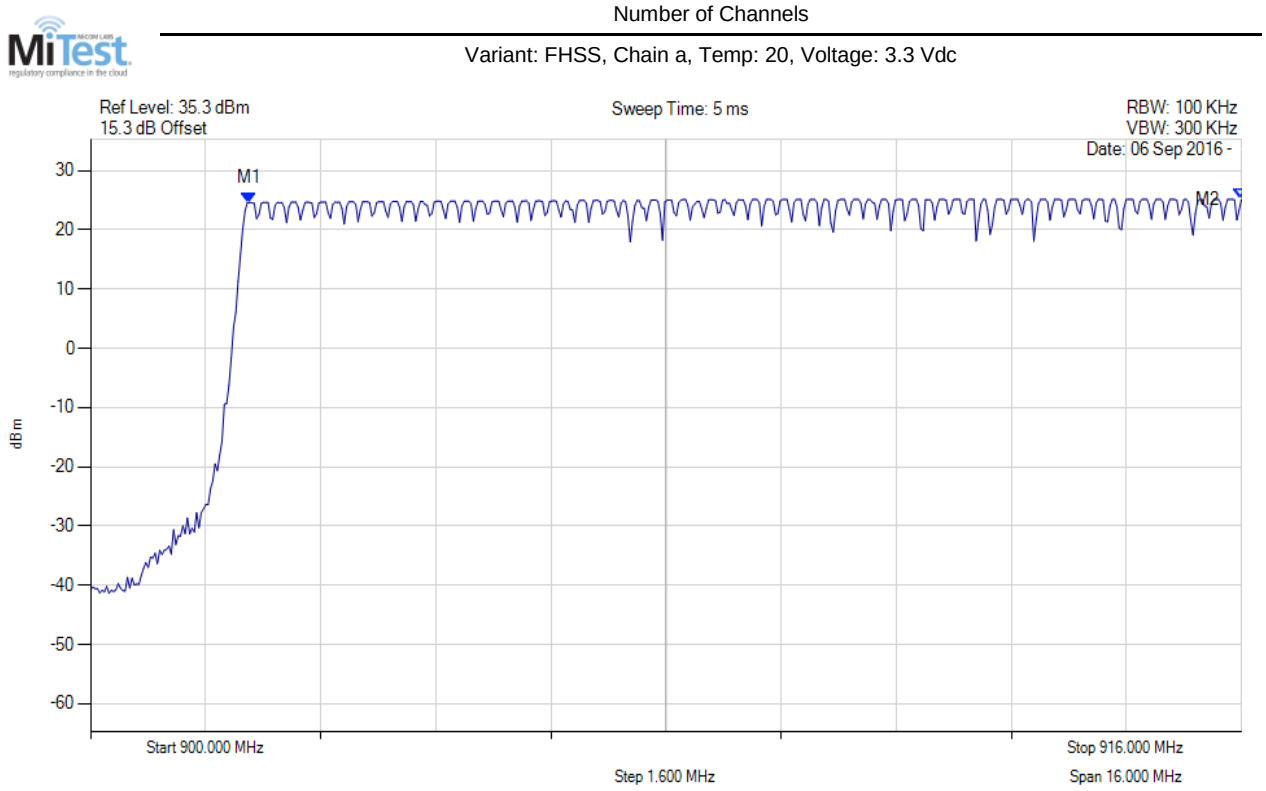
A.2. Number of Channels



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAX HOLD	M1 : 902.200 MHz : 24.615 dBm M2 : 916.000 MHz : 25.125 dBm	Channel Frequency: 0 Hz

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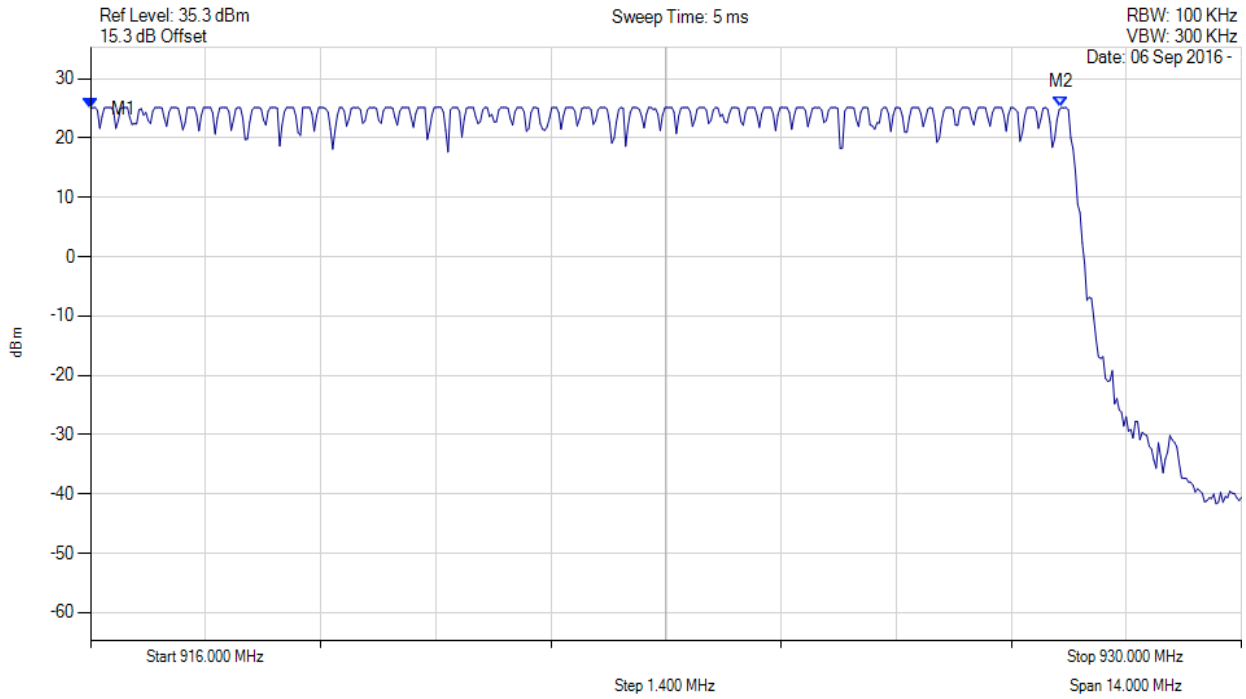
Number of Channels

Variant: FHSS, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAX HOLD	M1 : 916.000 MHz : 25.028 dBm M2 : 927.800 MHz : 25.146 dBm	Channel Frequency: FHSS 902-928 MHz

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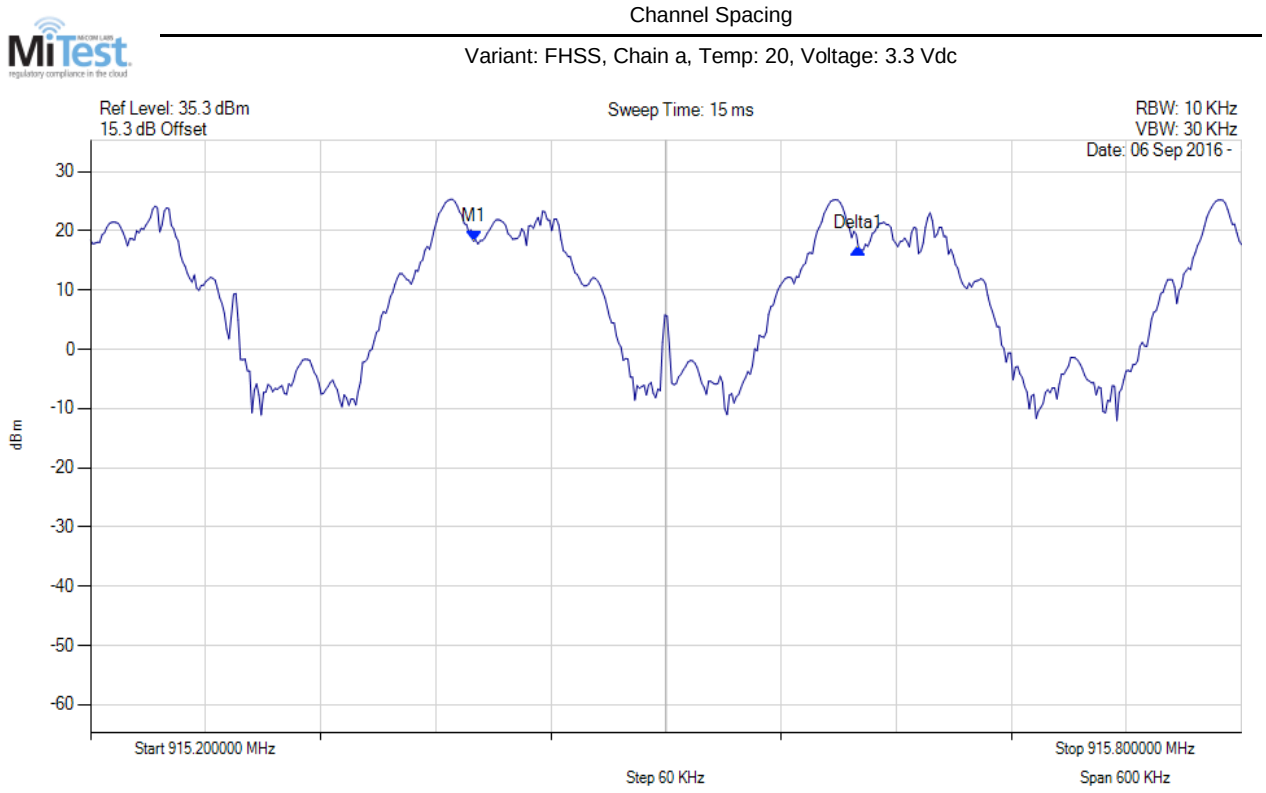
A.3. Channel Spacing



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAX HOLD	M1 : 915.400 MHz : 18.296 dBm Delta1 : 200 KHz : -1.269 dB	Channel Frequency: 915.4 MHz

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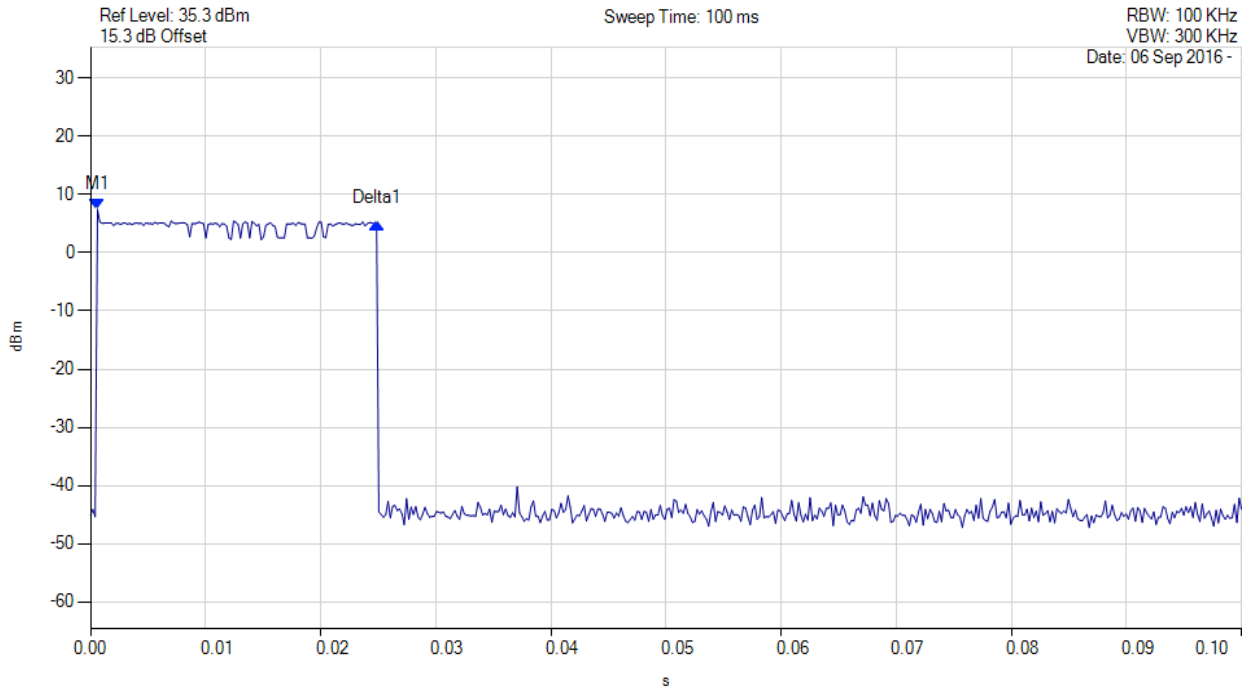
A.4. Dwell Time & Occupancy

Dwell Time

Variant: FHSS, Channel: 915.60 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Time:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = CLR/WRITE	M1(915.60 MHz) : 0.000 s : 7.415 dBm Delta1(915.60 MHz) : 0.024 s : -2.264 dB	Channel Frequency: 915.60 MHz

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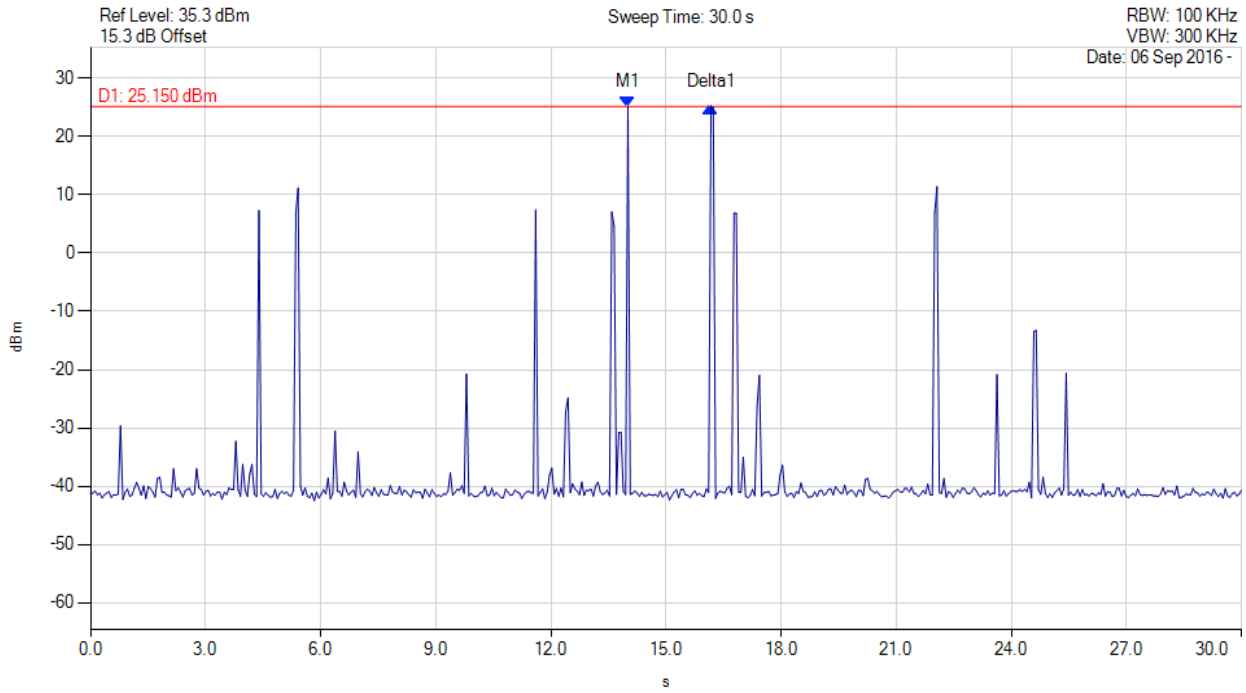
Channel Occupancy

Variant: FHSS, Channel: 915.60 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Time:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = CLR/WRITE	M1(915.60 MHz) : 14.008 s : 25.137 dBm Delta1(915.60 MHz) : 2.164 s : 0.012 dB	Channel Frequency: 915.60 MHz

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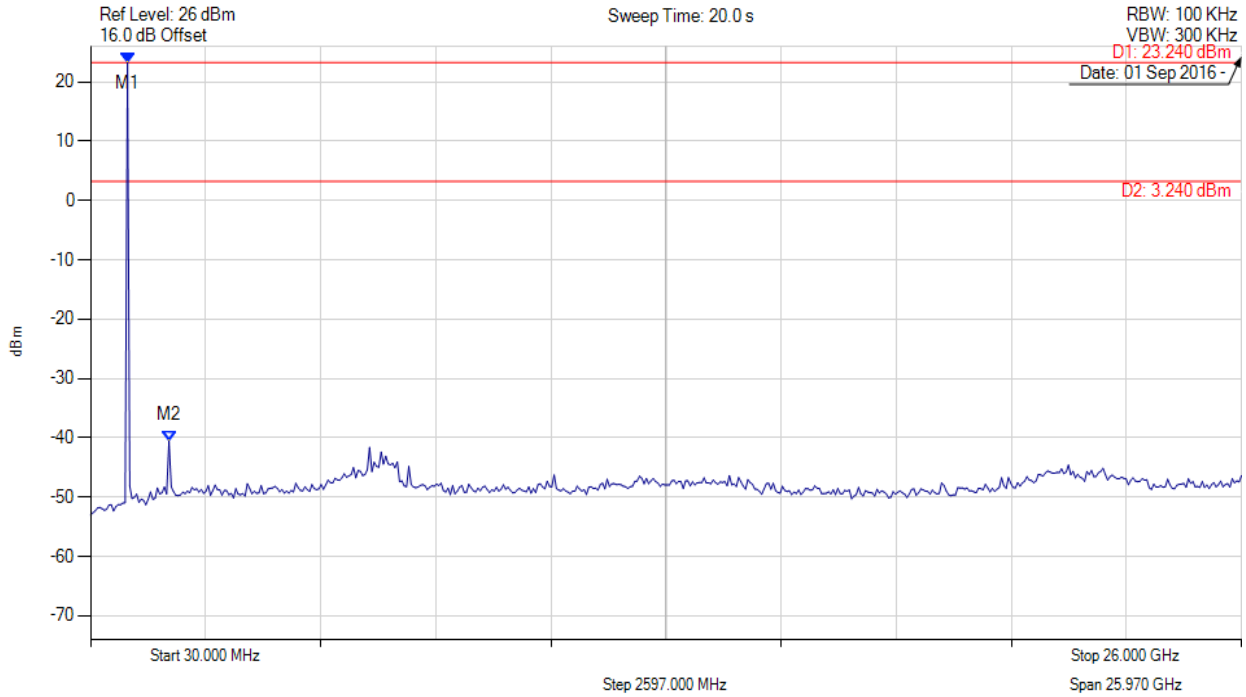
A.5. Emissions

A.5.1. Conducted Emissions

A.5.1.1. Conducted Spurious Emissions

CONDUCTED SPURIOUS EMISSIONS

Variant: FHSS, Channel: 902.20 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 862.705 MHz : 23.240 dBm M2 : 1799.499 MHz : -40.530 dBm	Channel Frequency: 902.20 MHz

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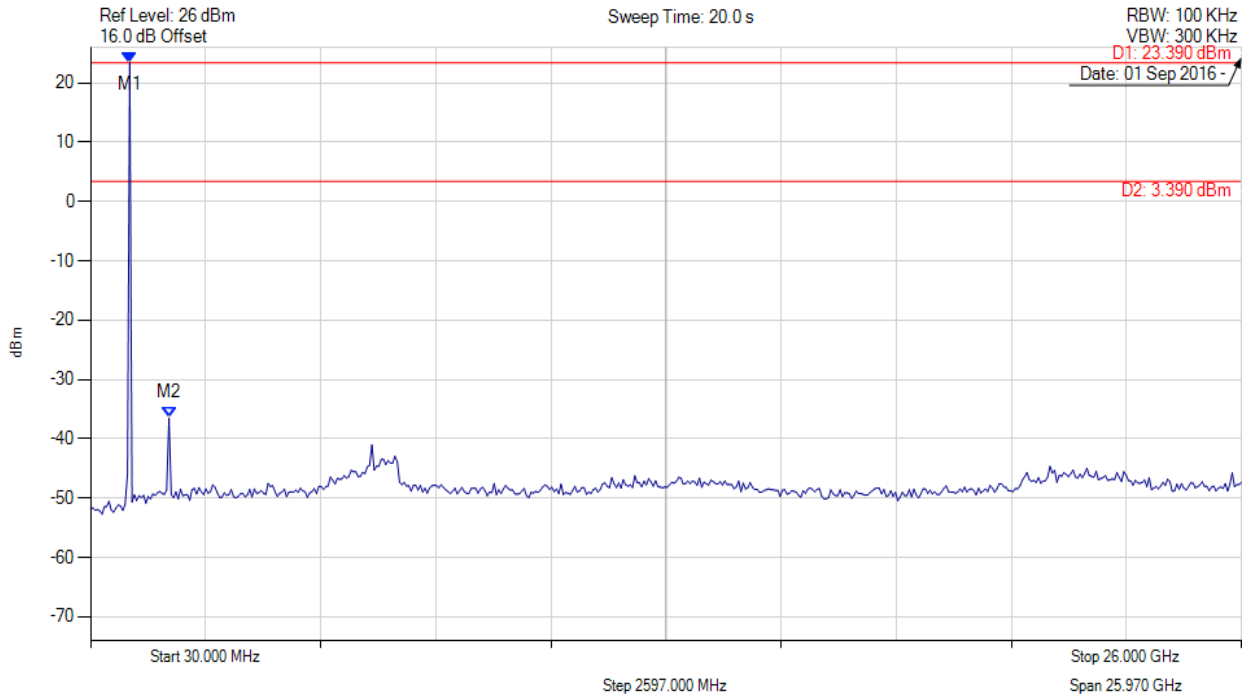
CONDUCTED SPURIOUS EMISSIONS

Variant: FHSS, Channel: 915.20 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 914.749 MHz : 23.389 dBm M2 : 1799.499 MHz : -36.515 dBm	Channel Frequency: 915.20 MHz

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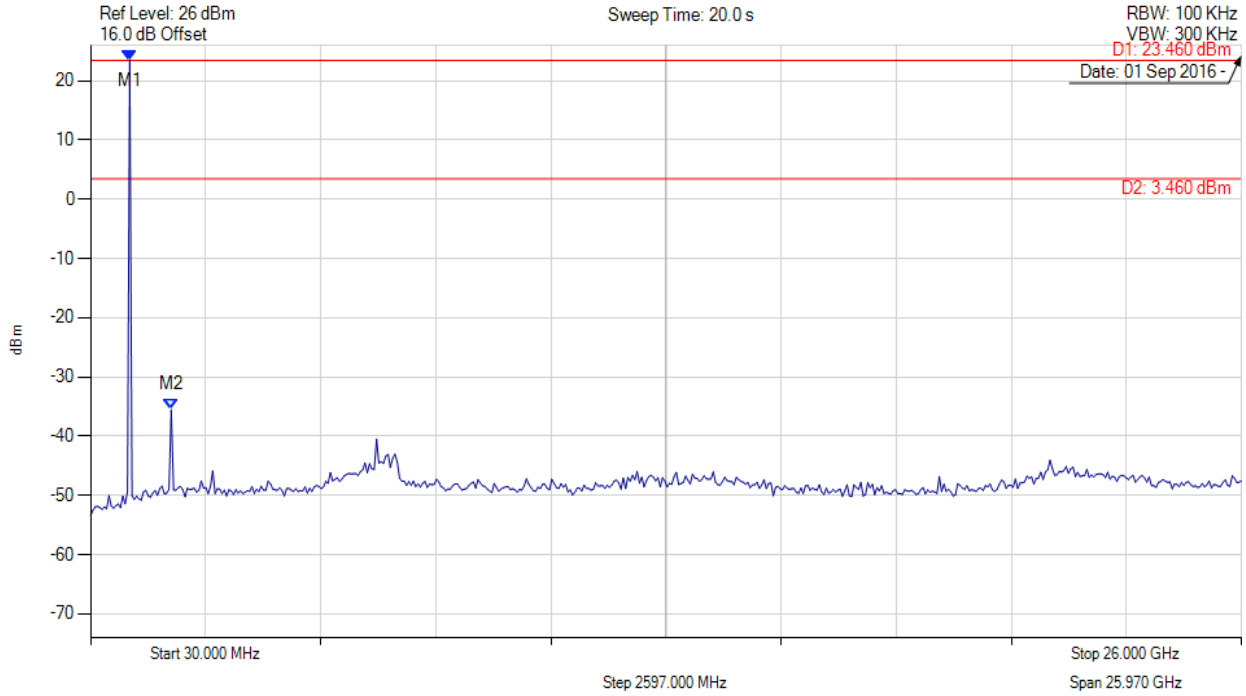
CONDUCTED SPURIOUS EMISSIONS

Variant: FHSS, Channel: 927.80 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = CLR/WRITE	M1 : 914.749 MHz : 23.462 dBm M2 : 1851.543 MHz : -35.564 dBm	Channel Frequency: 927.80 MHz

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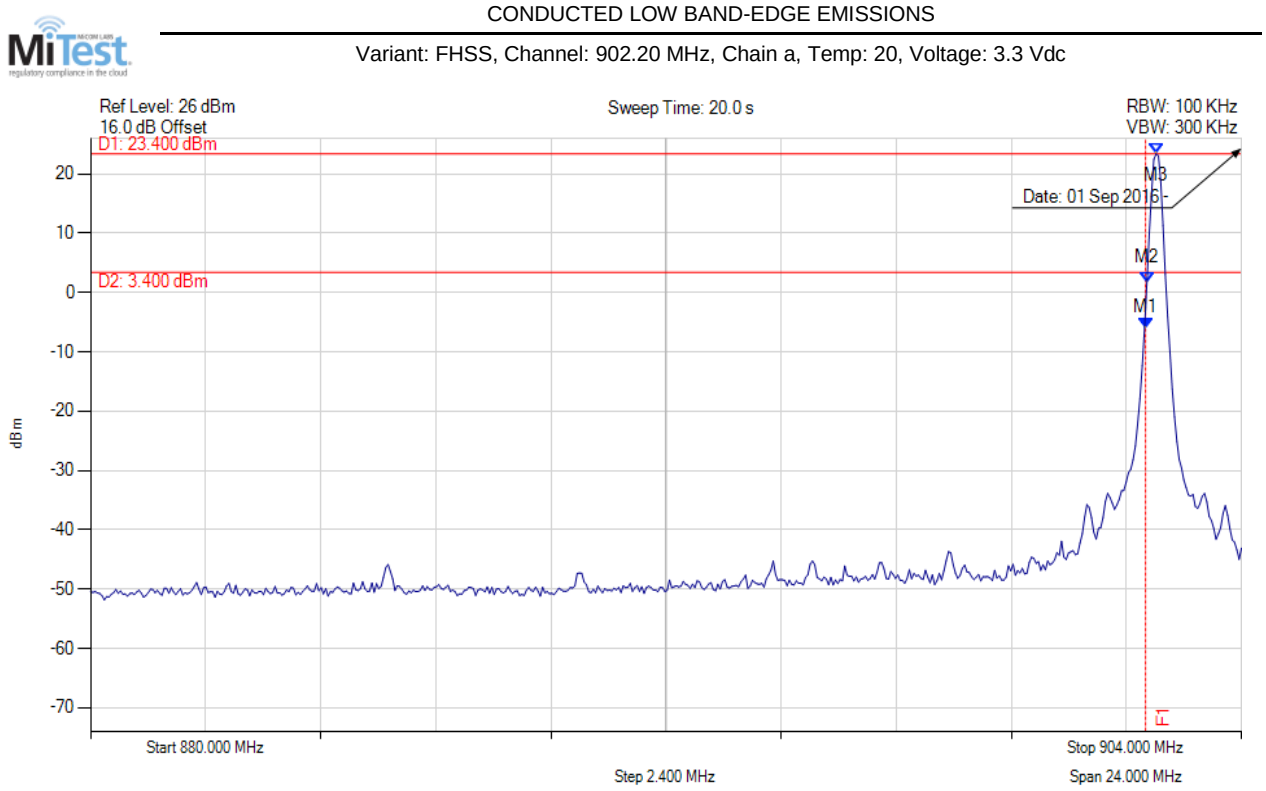
A.5.1.2. Conducted Band-Edge Emissions

Conducted Low Band-Edge Emissions



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 902.000 MHz : -5.934 dBm M2 : 902.028 MHz : 1.640 dBm M3 : 902.220 MHz : 23.397 dBm	Channel Frequency: 902.20 MHz

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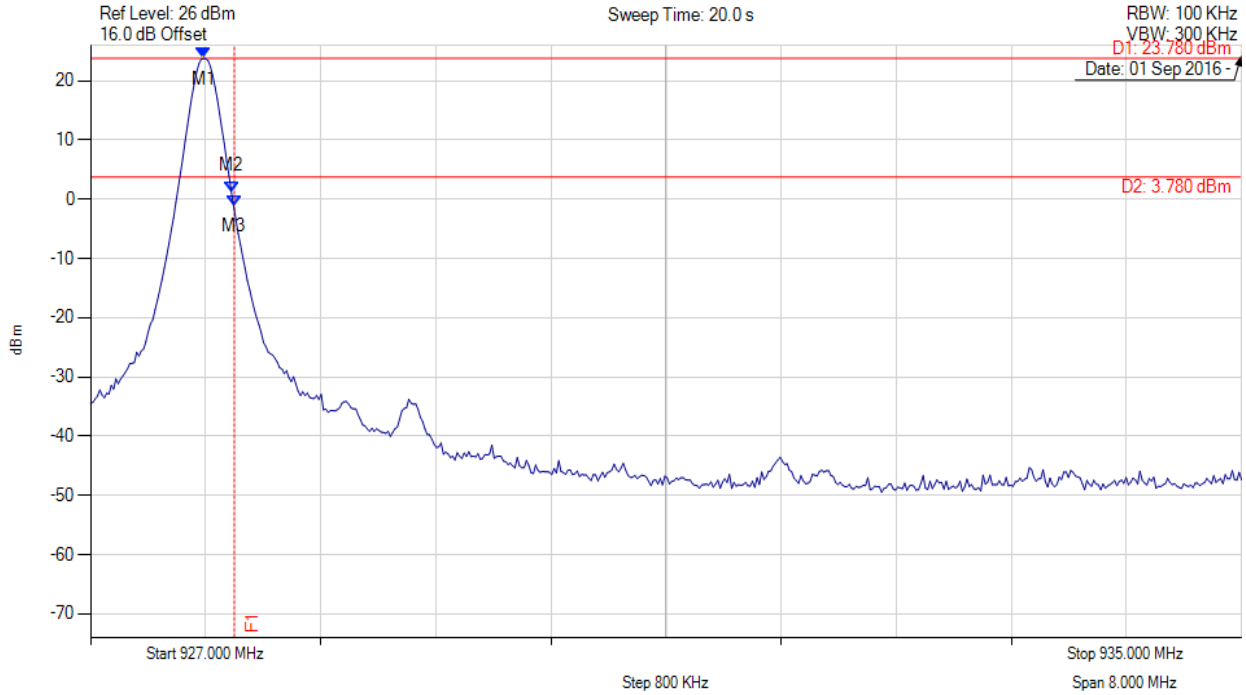
Conducted High Band-Edge Emissions

CONDUCTED HIGH BAND-EDGE EMISSIONS

Variant: FHSS, Channel: 927.80 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = CLR/WRITE	M1 : 927.786 MHz : 23.781 dBm M2 : 927.978 MHz : 1.310 dBm M3 : 928.000 MHz : -1.033 dBm	Channel Frequency: 927.80 MHz

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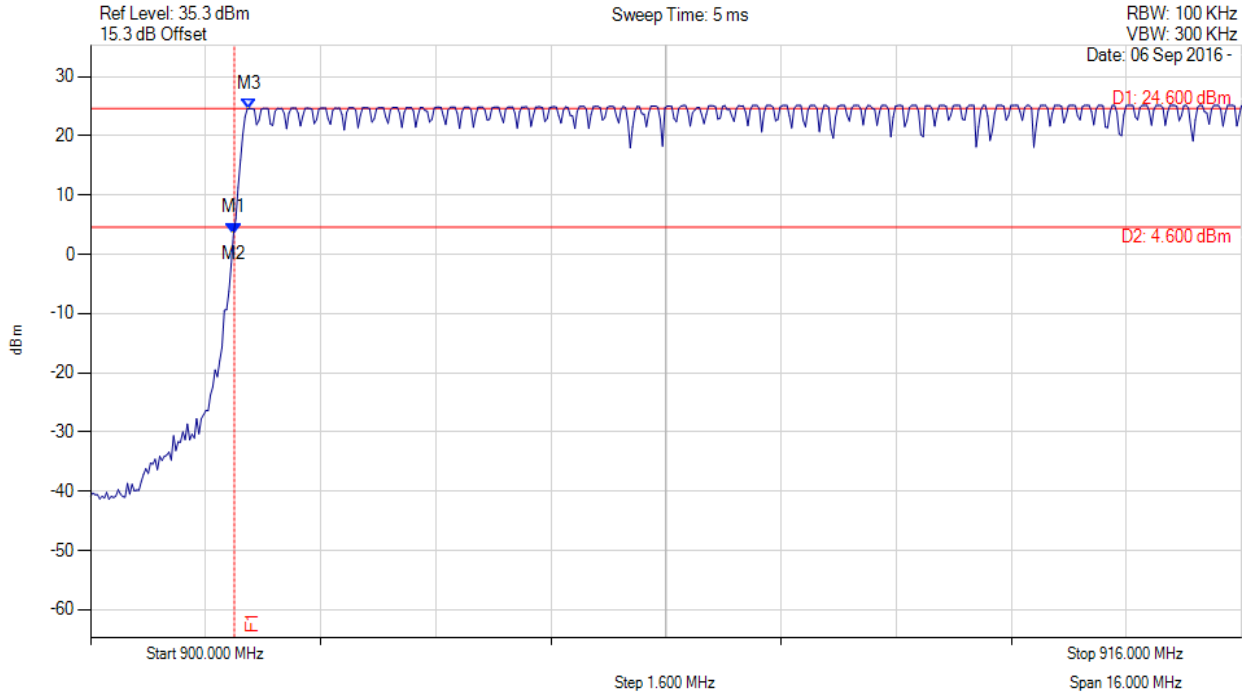
CONDUCTED LOW BAND-EDGE EMISSIONS HOPPING

Variant: FHSS, Channel: 902.2 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAX HOLD	M1 : 902.000 MHz : 3.600 dBm M2 : 902.988 MHz : 3.600 dBm M3 : 902.200 MHz : 24.615 dBm	Channel Frequency: 0 Hz

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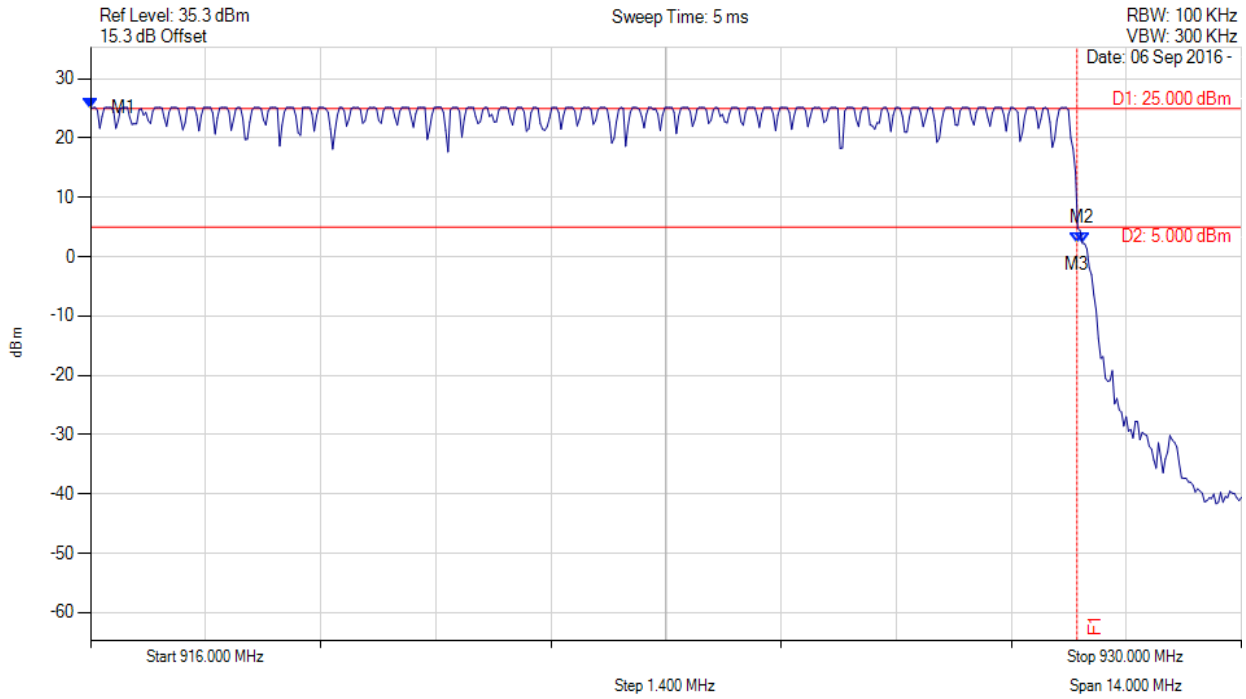
CONDUCTED HIGH BAND-EDGE EMISSIONS HOPPING

Variant: FHSS, Channel: 927.80 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAX HOLD	M1 : 916.000 MHz : 25.070 dBm M2 : 927.064 MHz : 2.300 dBm M3 : 928.000 MHz : 2.300 dBm	Channel Frequency: 0 Hz

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