RF TEST REPORT

SIEMIC
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Report No.: FCC_RF_SL13092401-AVE-031_RFID Rev2.1
Supersede Report No.: FCC_RF_SL13092401-AVE-031_RFID Rev2.0

Applicant	Avery Dennison
Product Name	RFID module
Model No.	RS500GX
Test Standard	47CFR15.247, RSS-210 Issue8: 2010
Test Method	ANCI C63.4:2009 47CFR15.247, RSS-210 Issue8: 2010
FCC ID	GU6-RS500GX
IC ID	1502A-RS500GX
Date of test	11/26/2013 - 12/31/2013
Issue Date	8/11/2014
Test Resut	Pass Fail
Equipment complied with the specification	[x]
Equipment did not comply with the specification	[ ]

David Zhang	Nima Molaei
Test Engineer	Engineer Reviewer

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Test result presented in this test report is applicable to the tested sample only

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA

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A2LA ACCREDITED
TESTING CERT # 2742-01

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC , RF/Wireless , Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless , Telecom
Taiwan	BSMI , NCC , NIST	EMC, RF, Telecom , Safety
Hong Kong	OFTA , NIST	RF/Wireless ,Telecom
Australia	NATA, NIST	EMC, RF, Telecom , Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF , Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC , RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom , Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC , RF , Telecom
Canada	IC FCB , NIST	EMC , RF , Telecom
Singapore	iDA, NIST	EMC , RF , Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC (RCB 208)	RF , Telecom
HongKong	OFTA (US002)	RF , Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL13092401-AVE-031_RFID	None	Original	1/6/2014
FCC_RF_SL13092401-AVE-031_RFID Rev1.0	Rev1.0	Update EUT model	2/9/2014
FCC_RF_SL13092401-AVE-031_RFID Rev2.0	Rev2.0	Update EUT model	7/18/2014
FCC_RF_SL13092401-AVE-031_RFID Rev2.1	Rev2.1	Update test data and description	8/11/2014

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Avery Dennison
Product: RFID module
Model: RS500GX

to be installed into a printer host (Printer Model: ADTP1, ADTP1CT, ADTP1CR) and simultaneously transmission with FCC certified WLAN radio module (FCC ID: GU6-SDMAN, IC ID: 1502A-SDMAN) , against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	Avery Dennison
Applicant Address	170 Monarch Lane,Miamisburg, OH, 45342
Manufacturer Name	Avery Dennison
Manufacturer Address	170 Monarch Lane,Miamisburg, OH, 45342

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	RFID module
Model No.	IPJ-RS500-GX
Trade Name	Monarch / Avery Dennison
Serial No.	N/A
Host Input Power	100-120/200-240VAC
Power Adapter Manu/Model	N/A
Power Adapter SN	-
Hardware version	N/A
Software version	N/A
Date of EUT received	11/18/2013
Equipment Class/ Category	DSS
Clock Frequencies	902 - 928 MHz
Port/Connectors	N/A
Remark	ADTP1 - Basic model with 140W power supply ADTP1CT - Extended model with 300W power supply that allows cutter to be added. ADTP1CR - DC version (Cart Ready) The testing was performed on ADTP1 as the worst case representative.

6.2 Radio Description

Spec for Radio -

Radio Type	UHF RFID
Operating Frequency	902.75-927.25 MHz
Modulation	ASK
Antenna Type	PCB antenna
Antenna Gain	-12dBi
Channel Separation	500 KHz
Number of Channels	50

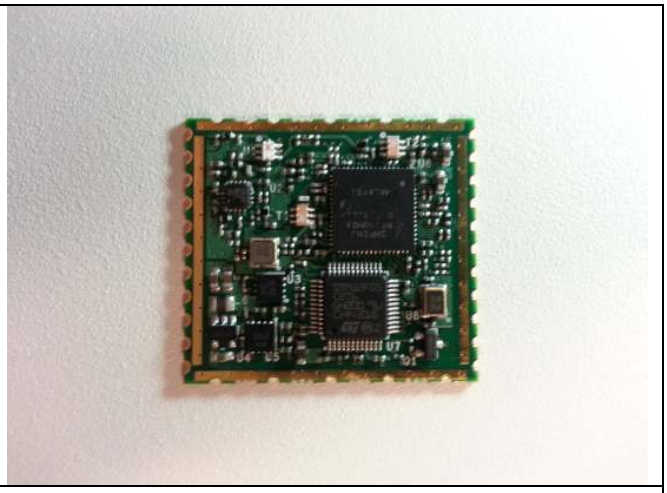
6.3 EUT test modes/configuration Description

Test mode

Final Test Mode		Note
Final_test_mode_1	Below 1GHz-Mode1:UHF RFID hopping + WLAN @ 802.11b-2437MHz	-
Final_test_mode_2	Above 1GHz-Mode1: above 1GHz - RFID-low	-
Final_test_mode_3	Above 1GHz-Mode2:above 1GHz - RFID-Mid	-
Final_test_mode_4	Above 1GHz-Mode3: above 1GHz - RFID-High	-
Final_test_mode_5	Above 1GHz-Mode4: UHF RFID hopping + WLAN @ 802.11b-2437MHz	-
Final_test_mode_6	-	-
Final_test_mode_7	-	-
Final_test_mode_8	-	-
Final_test_mode_9	-	-
Remark:		

6.4 EUT Photos - External

Top Side View

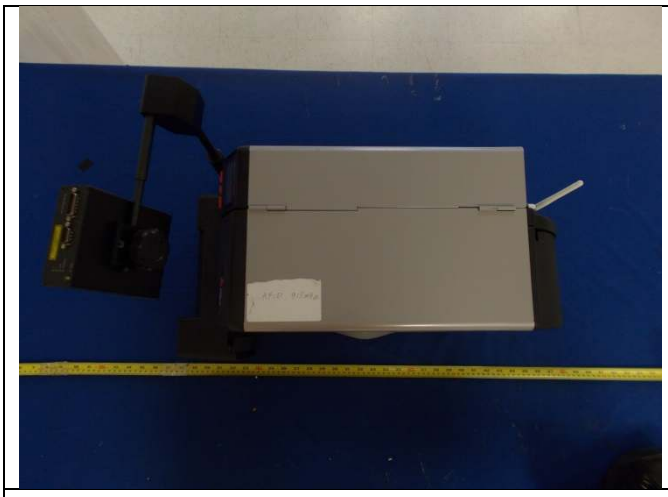


Radio module with shielding

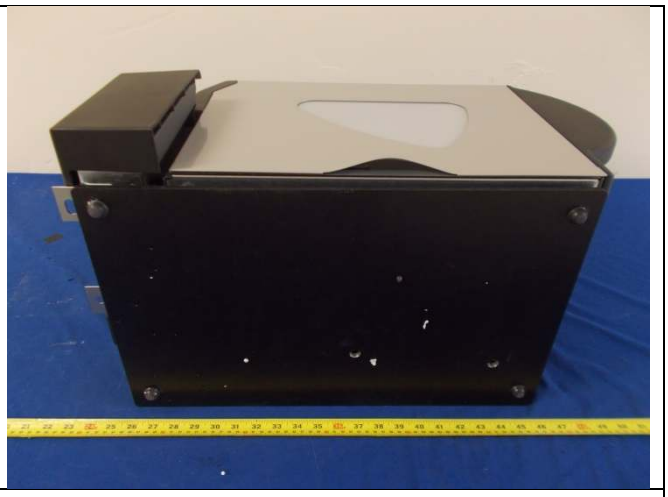
Antenna top View

Antenna Bottom View

6.5 Host Photos - External

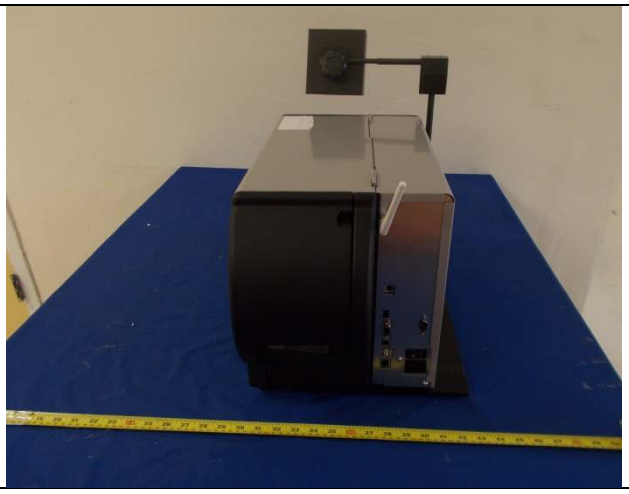


Top Side View

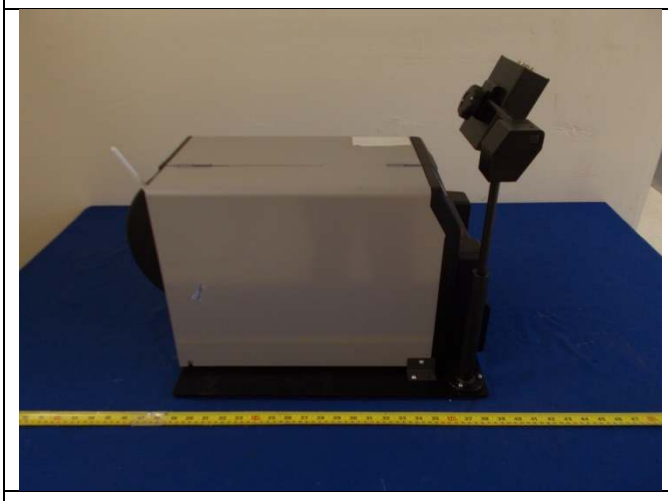


Bottom Side View

Front Side View Side



Rear View Side



Left Side View

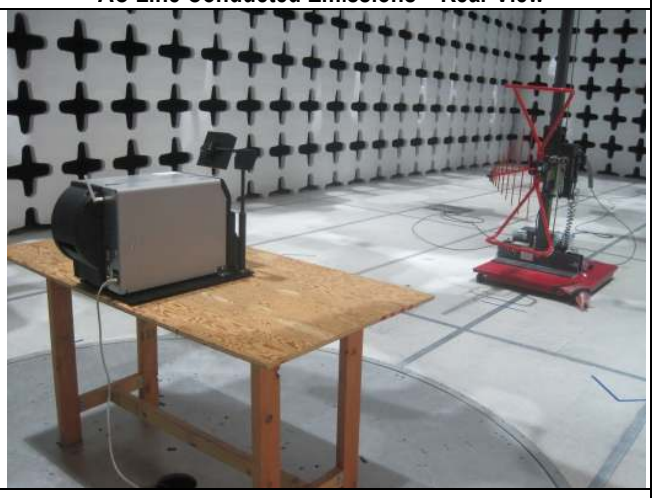
Right Side View

6.6 EUT Test Setup Photos

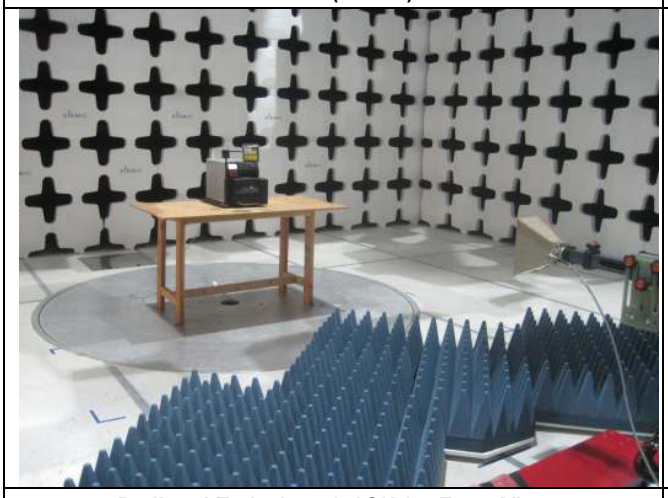
AC Line Conducted Emissions – Front View

AC Line Conducted Emissions – Rear View

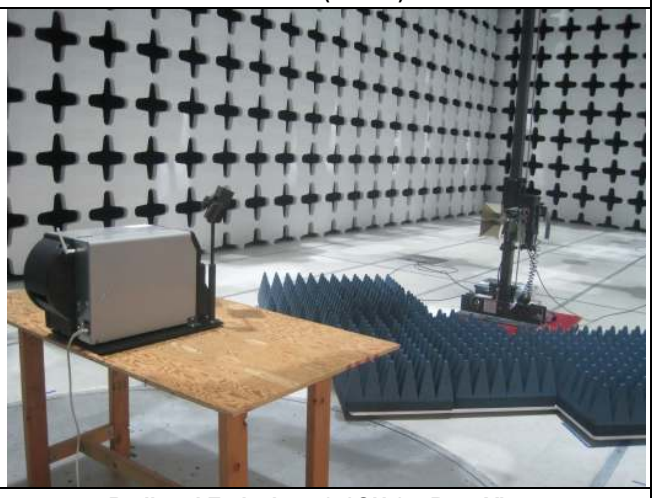
Radiated Emissions (<1GHz) – Front View



Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (>1GHz) – Front View



Radiated Emissions (>1GHz) – Rear View

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	D600	Laptop PC	9444352681	Dell	-
2	PA-1650-05D2	AC Power Adapter	F7970	Dell	-

7.2 Test Software Description

Test Item	Software	Description
Spurious Emission	ADTP1 RFID Regulatory Test	Enable RF Test mode for RFID

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Restricted Band of Operation	FCC	15.205	FCC	ANSI C63.4 – 2009 FCC Public Notice DA 00-705	☐ Pass ☒ N/A
	IC	RSS 210 (2.2)	IC	-	
AC Conducted Emissions Voltage	FCC	15.207(a)	FCC	ANSI C63.4 – 2009	☒ Pass ☐ N/A
	IC	RSS Gen (7.2.2)	IC	-	

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Channel Separation	FCC	15.247 (a)(1)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS210 (A8.1)	IC	-	
Occupied Bandwidth	FCC	15.247(a)(1)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS210(A8.1)	IC	-	
Bandwidth	FCC	15.247(a)(2)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS210 (A8.2)	IC	-	
Number of Hopping Channels	FCC	15.247(a)(1)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS210(A8.1)	IC	-	
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS210(A8.5)	IC	-	
Time of Occupancy	FCC	15.247(a)(1)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS210(A8.1)	IC	-	
Output Power	FCC	15.247(b)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS210 (A8.4)	IC	-	
Receiver Spurious Emissions	FCC	15.247(d)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS Gen (4.8)	IC	-	
Antenna Gain > 6 dBi	FCC	15.247(e)	FCC	-	☐ Pass ☒ N/A
	IC	RSS210(A8.4)	IC	-	
Power Spectral Density	FCC	15.247(e)	FCC	-	☐ Pass ☒ N/A
	IC	RSS210(A8.3)	IC	-	
Hybrid System Requirement	FCC	15.247(f)	FCC	-	☐ Pass ☒ N/A
	IC	RSS210(A8.3)	IC	-	
Hopping Capability	FCC	15.247(g)	FCC	-	☐ Pass ☒ N/A
	IC	RSS210(A8.1)	IC	-	
Hopping Coordination Requirement	FCC	15.247(h)	FCC	-	☐ Pass ☒ N/A
	IC	RSS210(A8.1)	IC	-	
RF Exposure requirement	FCC	15.247(i)	FCC	-	☐ Pass ☒ N/A
	IC	RSS Gen(5.5)	IC	-	
Remark	1. All measurement uncertainties do not take into consideration for all presented test results. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.				

9 Measurement Uncertainty

Test Item	Frequency Range	Description	Uncertainty
Conducted Emissions	150KHz – 30MHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2	±3.5dB
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious Emissions	1GHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+4.3dB/-4.1dB

10 Measurements, Examination and Derived Results

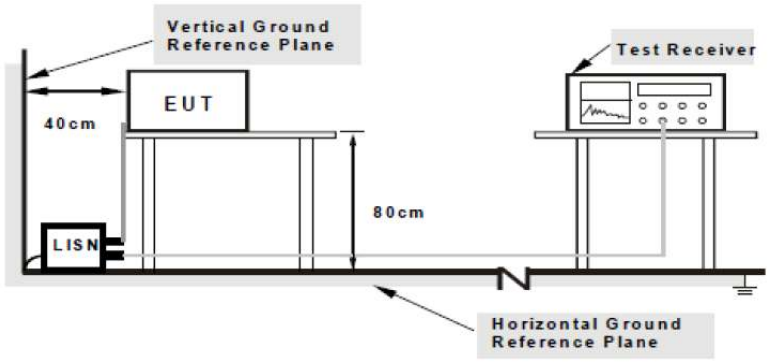
10.1 Antenna Requirement

Spec	Requirement	Applicable
§15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. Antenna requirement must meet at least one of the following: a) Antenna must be permanently attached to the device. b) Antenna must use a unique type of connector to attach to the device. c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.	☒
Remark	The RFID antenna is integral to the PCB board permanently to the device which meets the requirement (See Internal Photographs submitted as another Exhibit).	
Result	☒ PASS ☐ FAIL	

10.2 Conducted Emissions

Conducted Emission Limit

Frequency ranges (MHz)	Limit (dBuV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

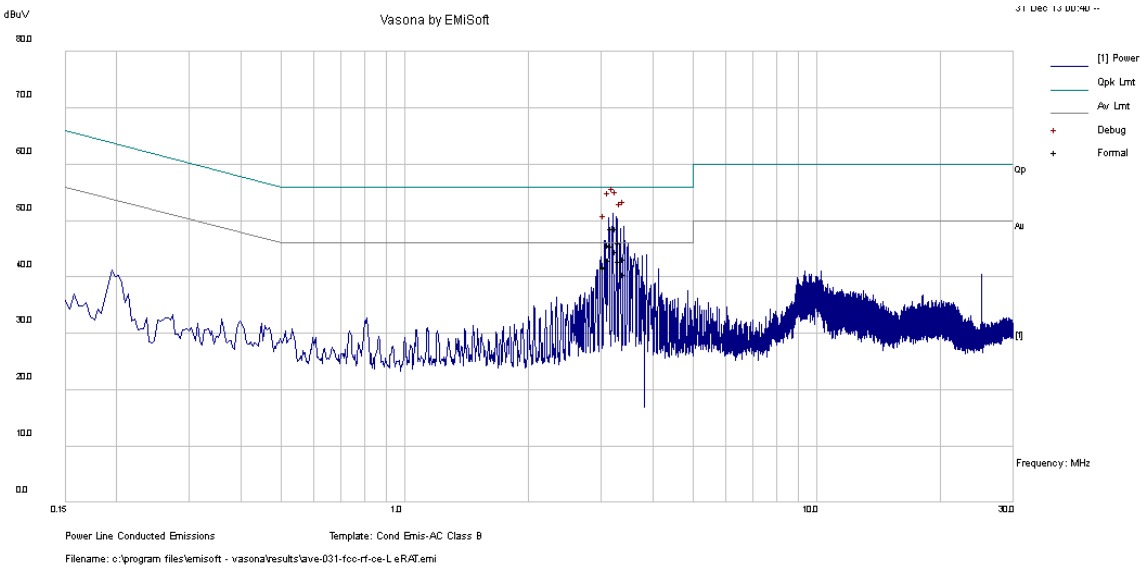
Spec	Item	Requirement	Applicable
47CFR§15.207, RSS210(A8.1)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	☒
Test Setup	 Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.		
Procedure	- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B. - The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains. - The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. - All other supporting equipment were powered separately from another main supply.		
Remark	Different RF configuration has been evaluated but not much difference was found. The data presented here is the worst case data with EUT under 802.11n –HT20-2437MHz mode.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

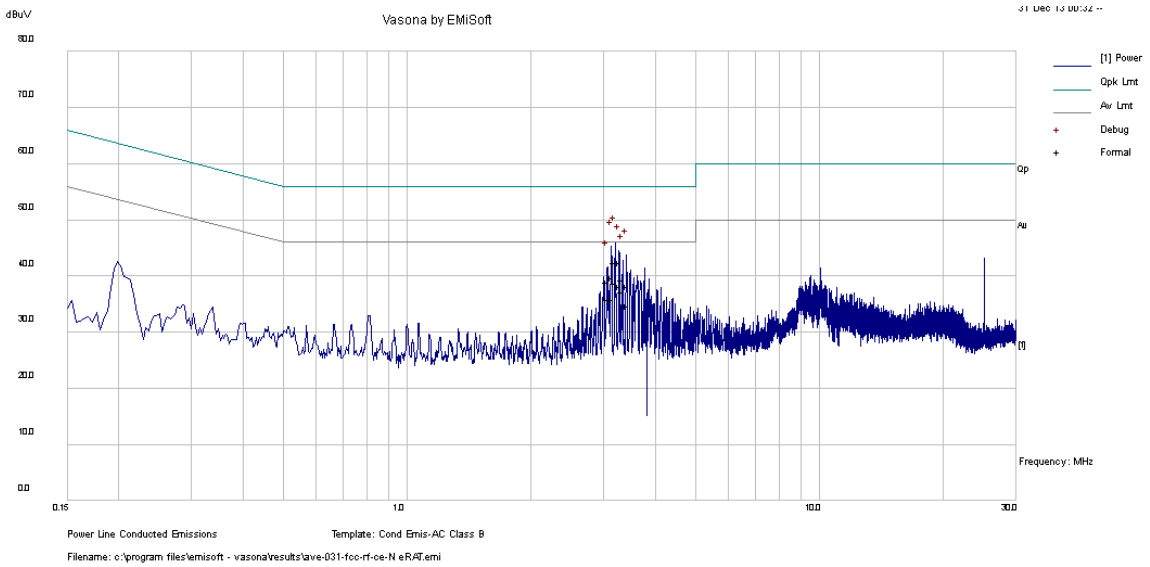
Conducted Emission Test Results (AC Line Test Result)

Environmental Conditions:	Temp (°C):	21	Result
	Humidity (%)	44	
	Atmospheric (mPa):		
Mains Power:	120 VAC/ 60Hz/ Live Line		
Tested by:	David Zhang		
Test Date:	31-Dec-13		
Remarks:	With host ADTP1		



Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail
3.190	37.64	10.03	1	48.67	Quasi Peak	Live	56	-7.33	Pass
3.259	37.57	10.03	1.01	48.61	Quasi Peak	Live	56	-7.39	Pass
3.122	34.81	10.03	0.99	45.83	Quasi Peak	Live	56	-10.17	Pass
3.398	32.23	10.03	1.02	43.28	Quasi Peak	Live	56	-12.72	Pass
3.329	35.09	10.03	1.01	46.13	Quasi Peak	Live	56	-9.87	Pass
3.051	30.83	10.03	0.98	41.84	Quasi Peak	Live	56	-14.16	Pass
3.190	34.54	10.03	1	45.57	Average	Live	46	-0.43	Pass
3.259	33.56	10.03	1.01	44.59	Average	Live	46	-1.41	Pass
3.122	32.12	10.03	0.99	43.14	Average	Live	46	-2.86	Pass
3.398	29.47	10.03	1.02	40.52	Average	Live	46	-5.48	Pass
3.329	31.84	10.03	1.01	42.88	Average	Live	46	-3.12	Pass
3.051	30.61	10.03	0.98	41.62	Average	Live	46	-4.38	Pass

Environmental Conditions:	Temp (°C):	21	Result
	Humidity (%)	44	
	Atmospheric (mPa):		
Mains Power:	120 VAC/ 60Hz/ Neutral Line		
Tested by:	David Zhang		
Test Date:	31-Dec-13		
Remarks:	With host ADTP1		



Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail
3.192	31.39	10.03	1	42.41	Quasi Peak	Neutral	56	-13.59	Pass
3.122	28.79	10.03	0.99	39.81	Quasi Peak	Neutral	56	-16.19	Pass
3.259	31.39	10.03	1.01	42.42	Quasi Peak	Neutral	56	-13.58	Pass
3.398	27.14	10.03	1.02	38.19	Quasi Peak	Neutral	56	-17.81	Pass
3.331	28.43	10.03	1.01	39.47	Quasi Peak	Neutral	56	-16.53	Pass
3.061	27.95	10.03	0.99	38.96	Quasi Peak	Neutral	56	-17.04	Pass
3.192	27.77	10.03	1	38.8	Average	Neutral	46	-7.2	Pass
3.122	24.91	10.03	0.99	35.93	Average	Neutral	46	-10.07	Pass
3.259	27.2	10.03	1.01	38.23	Average	Neutral	46	-7.77	Pass
3.398	23.75	10.03	1.02	34.8	Average	Neutral	46	-11.2	Pass
3.331	26.16	10.03	1.01	37.2	Average	Neutral	46	-8.8	Pass
3.061	24.91	10.03	0.99	35.92	Average	Neutral	46	-10.08	Pass

10.3 20dB Bandwidth

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(a), RSS210(A8.1)(b)	a)	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. However, frequency hopping systems operated in 2400-2483.5MHz with output power not greater than 125mW, the intervals of hopping channel carrier frequencies shall not be less than 25kHz or two thirds of the 20dB bandwidth of the hopping channel, whichever is greater.	☒
47CFR§15.247(a), RSS210(A8.1)(e)	b)	Frequency hopping systems operating in the 5725-5850MHz band shall use at least 75 hopping frequencies. The maximum 20dB bandwidth of the hopping channel is 1MHz.	☐

Test Setup			
Test Procedure	20dB Emission bandwidth measurement procedure - Set RBW ⩾ 1% 20dB Bandwidth - Set the video bandwidth (VBW) ⩾ RBW. - Detector = Peak. - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize. - Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.		
Test Date	12/31/2013	Environmental condition	Temperature 22°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	The 20 dB test result and the 2/3 of 20 dB data calculation are for channel separation measurement reference only. There isn't limit for 20 dB bandwidth for this product.		
Result	☒ Pass ☐ Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
20dB Bandwidth	≥1% 20dB bandwidth	≥ RBW	~2 – 3 times 20dBbandwidth	PK	Auto	Maxhold	-

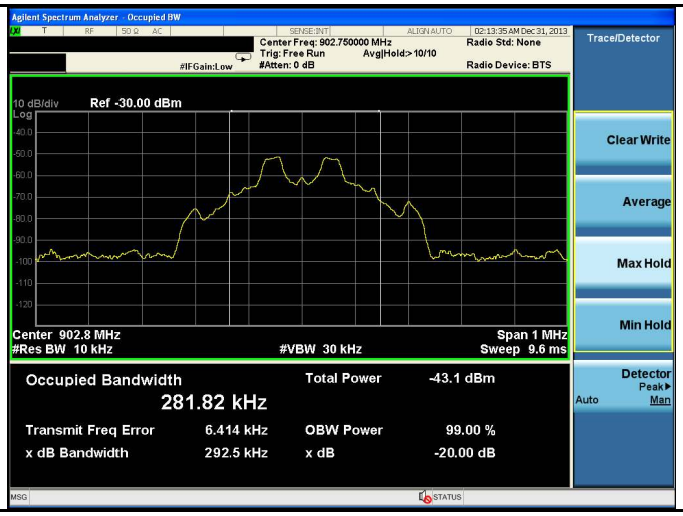
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

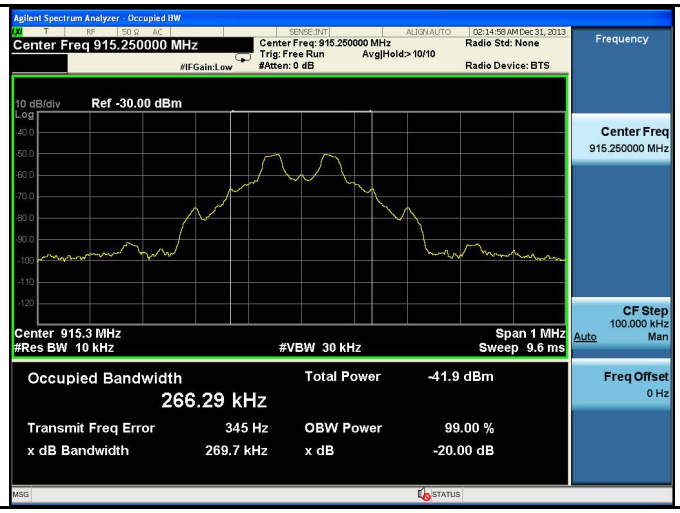
20dB Bandwidth measurement result

Type	Freq (MHz)	Test mode	CH	20dB Bandwidth (MHz)	2/3 20dB Bandwidth (MHz)	Pass/Fail
20dB OBW	902.750	Cont-TX	Low	0.2925	0.1950	N/A
20dB OBW	915.250	Cont-TX	Mid	0.2697	0.1798	N/A
20dB OBW	927.250	Cont-TX	High	0.2672	0.1781	N/A

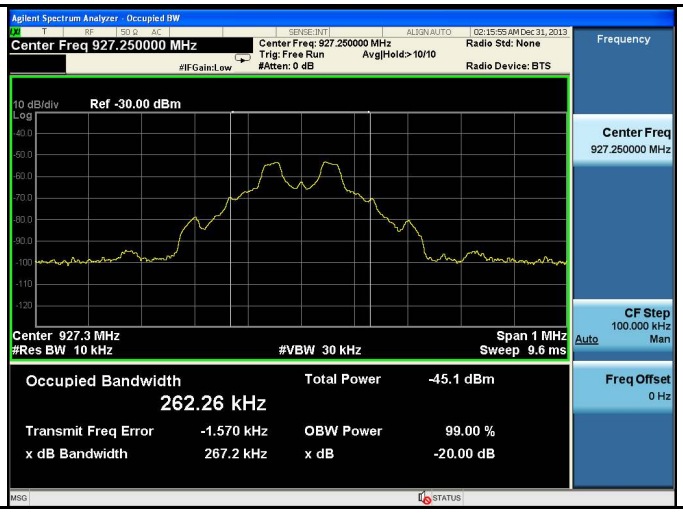
Test Plots



20dB Low CH



20dB Mid CH



20dB High CH

10.4 99% Occupied Bandwidth

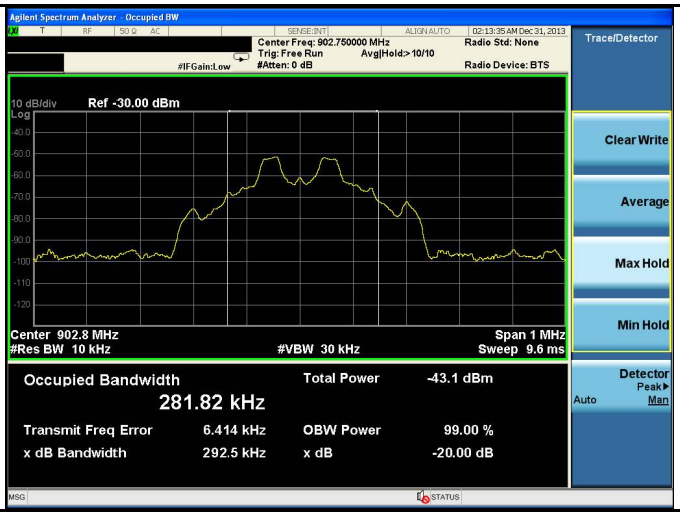
Requirement(s):

Spec	Requirement	Applicable
RSS Gen 4.6.1	The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual. The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth	☒
Test Setup		
Procedure	1. EUT was set for low , mid, high channel with modulated mode and highest RF output power. 2. The spectrum analyzer was connected to the antenna terminal.	
Test Date	12/31/2013	Environmental condition: Temperature 22°C; Relative Humidity 47%; Atmospheric Pressure 1019mbar
Remark	-	
Result	☒ Pass ☐ Fail	

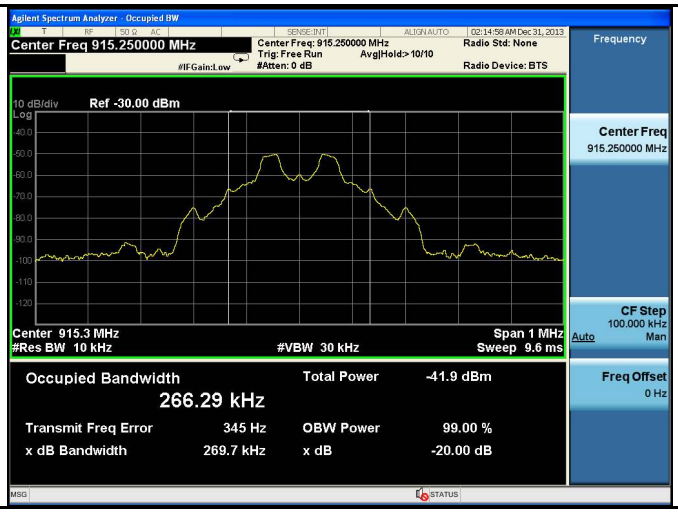
Test Data ☒ Yes (See below) ☐ N/A

Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (KHz)
Low	902.750	281.82
Mid	915.250	266.29
High	927.250	262.26

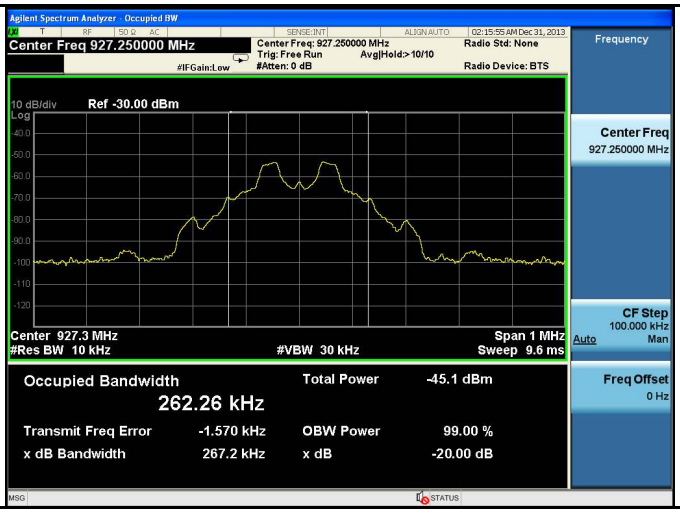
Test Plot ☒ Yes (See below) ☐ N/A



99% BW Low CH



99% BW Mid CH



99% BW High CH

10.5 Number of Hopping Channel

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(a), RSS210(A8.1)	a)	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	☒

Test Setup				
Test Procedure	Number of hopping frequencies procedure - The EUT must have its hopping function enabled - Span = the frequency band of operation. - Resolution (or IF) Bandwidth (RBW) >= 1% of the span. - Video (or Average) Bandwidth (VBW) >= RBW. - Detector = peak. - Sweep time = auto couple. - Trace mode = max hold. - Allow trace to fully stabilize. - Save the plot			
Test Date	11/26/2013	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22°C 47% 1019mbar
Remark	NONE			
Result	☒ Pass ☐ Fail			

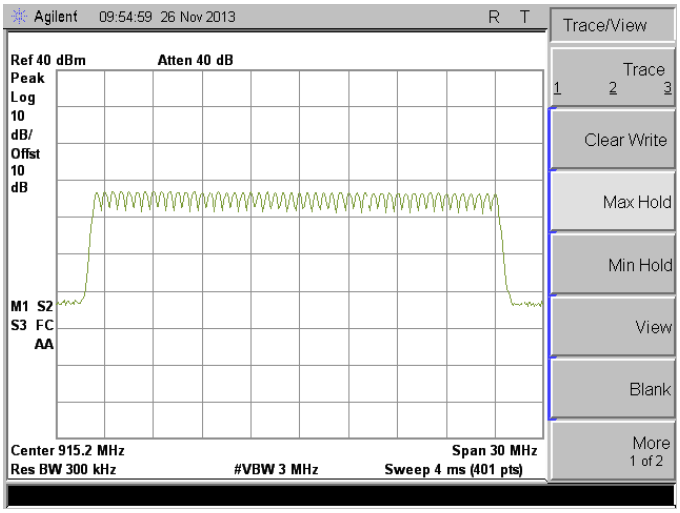
Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
Hopping Channel Number	≥1% Span	≥ RBW	-	PK	Auto	Maxhold	-

Test Data ☐ Yes ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Plots



Hopping Channel Number

10.6 Peak Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247, RSS210(A8.1)	a)	For frequency hopping systems in the 2400-2483.5MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: below 1 Watt (inclusive).	☐
	b)	For all other frequency hopping systems in the 902-928 MHz band: 1 Watt. The power is converted from watt to dBm, therefore, 1 watt = 30 dBm.	☒
47CFR§15.247, RSS210(A8.1)		frequency hopping systems operated in 2400-2483.5MHz with output power not greater than 125mW, the intervals of hopping channel carrier frequencies shall not be less than 25kHz or two thirds of the 20dB bandwidth of the hopping channel, whichever is greater.	☐
Test Setup			
Test Procedure	Maximum output power measurement procedure - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel. - RBW > 1% of the 20 dB bandwidth of the emission being measured; - VBW >= RBW. - Detector = peak. - Sweep time = auto couple. - Trace mode = max hold. - Allow trace to fully stabilize. - Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.		
Test Date	11/26/2013	Environmental condition	Temperature 22°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	NONE		
Result	☒ Pass ☐ Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
PK output power	≥1% 20dB bandwidth	≥ RBW	~ 5 times 20dB bandwidth	Peak	Auto	Maxhold	Including Cable loss and Attenuation

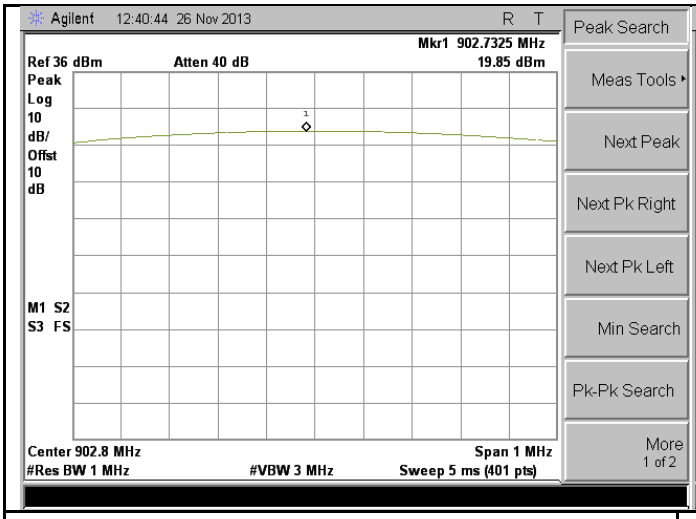
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

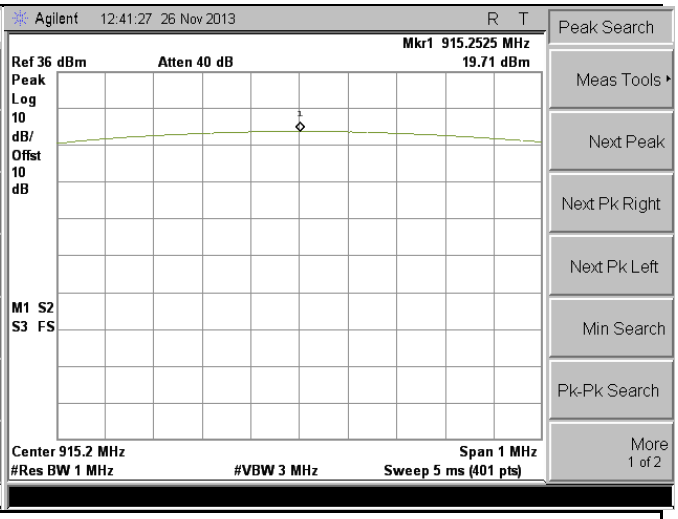
Output Power measurement result

Type	Freq (MHz)	Test mode	CH	Conducted Power (dBm)	Limit (dBm)	Result
Output power	902.75	Cont-TX	Low	19.85	30	Pass
Output power	915.25	Cont-TX	Mid	19.71	30	Pass
Output power	927.25	Cont-TX	High	19.12	30	Pass

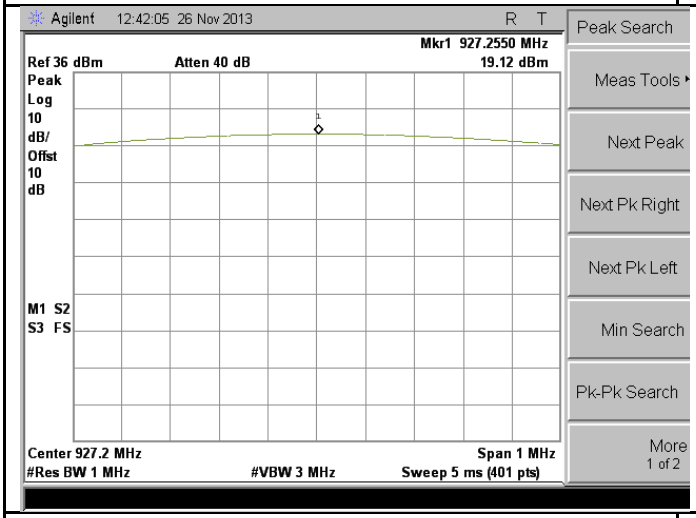
Test Plots



FCC-15.247-PWR-902.75M



FCC-15.247-PWR-915.25M



FCC-15.247-PWR-927.25M

10.7 Channel Separation

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247, RSS210(A8.1)	a)	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.	☒

Test Setup				
Test Procedure	DA 00-705 Measurement Guidelines for Frequency Hopping Spread Spectrum Systems Channel Separation procedure - The EUT must have its hopping function enabled. - Span = wide enough to capture the peaks of two adjacent channels - Resolution (or IF) Bandwidth (RBW) >= 1% of the span - Video (or Average) Bandwidth (VBW) >= RBW. - Detector = Peak. - Trace mode = max hold. - Use the marker-delta function to determine the separation between the peaks of the adjacent channels.			
Test Date	11/26/2013	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22°C 47% 1019mbar
Remark	NONE			
Result	☒ Pass ☐ Fail			

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
Channel Separation	≥1% Span	≥ RBW	-	PK	Auto	Maxhold	-

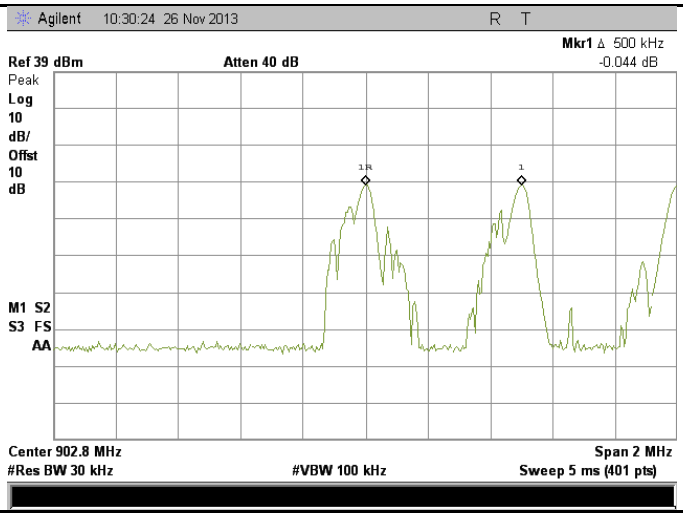
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

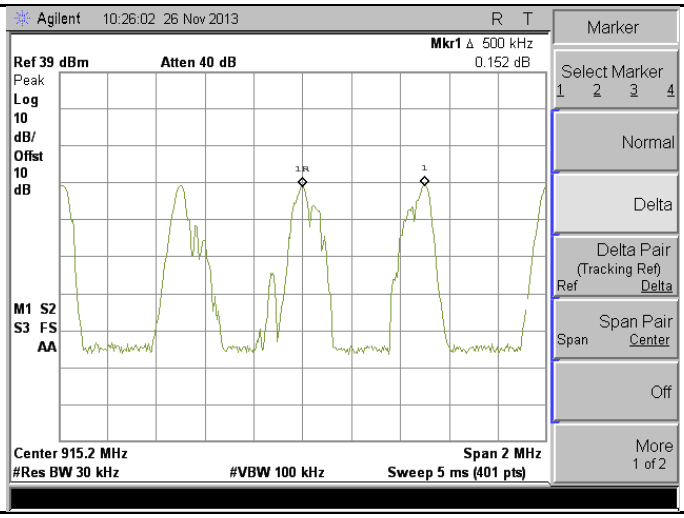
Measurement result

Type	Freq (MHz)	Test mode	CH	Result (MHz)	20dB Bandwidth (MHz)	Result
Channel Sep	902.750	Con-TX	Low	0.500	0.2925	Pass
Channel Sep	915.250	Con-TX	Mid	0.500	0.2697	Pass
Channel Sep	927.250	Con-TX	High	0.500	0.2672	Pass

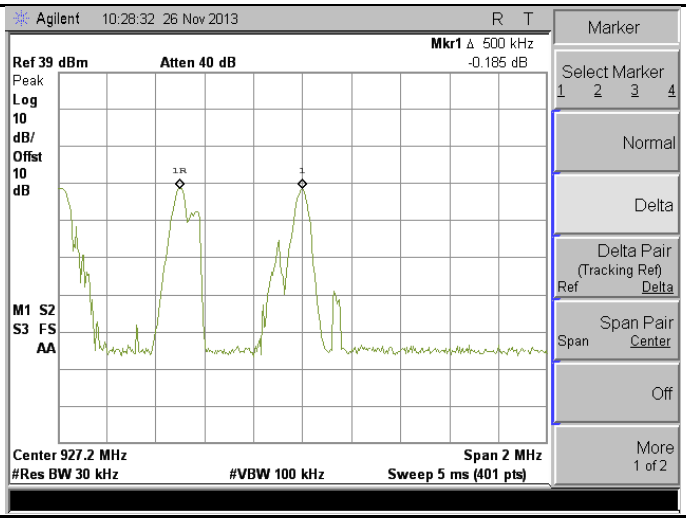
Test Plots



FCC-15.247- Ch Sep-902.75M



FCC-15.247-Ch Sep-915.25M



FCC-15.247- Ch Sep-927.25M

10.8 Time of Occupancy

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247, RSS210(A8.1)		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	☒

Test Setup			
Test Procedure	DA 00-705 Measurement Guidelines for Frequency Hopping Spread Spectrum Systems Channel Separation procedure - The EUT must have its hopping function enabled. - Span = zero span - centered on a hopping channel - RBW = 1 MHz; VBW >= RBW - Sweep = as necessary to capture the entire dwell time per hopping channel. - Detector = Peak. - Trace mode = max hold. - If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.		
Test Date	11/26/2013	Environmental condition	Temperature 22°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	Dwell time = 10 Sec / Repetition cycle time * Pulse on time		
Result	☒ Pass ☐ Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
Occupied Time	1MHz	≥ RBW	0Hz	PK	-	Maxhold	-

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

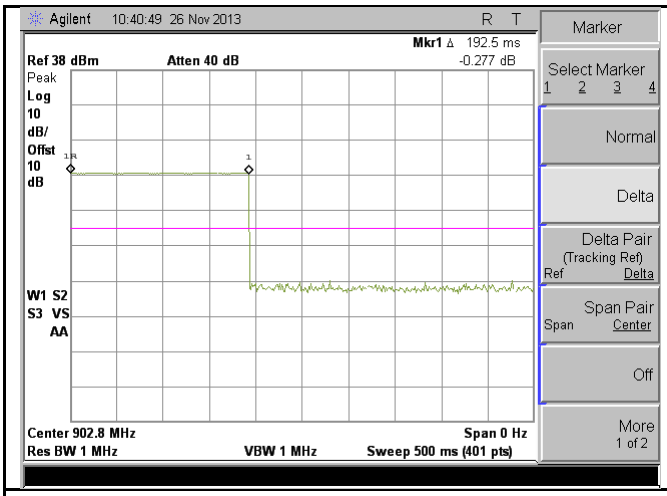
Dwell time measurement result

Type	Freq (MHz)	Test mode	CH	Pulse on time (sec)	Repetition Cycle time (sec)	Dwell Time (sec)	Limit (Sec)
Dwell time	902.750	Cont-TX	Low	0.193	16.31	0.118	0.4
Dwell time	915.250	Cont-TX	Mid	0.193	16.31	0.118	0.4
Dwell time	927.250	Cont-TX	High	0.193	16.38	0.118	0.4

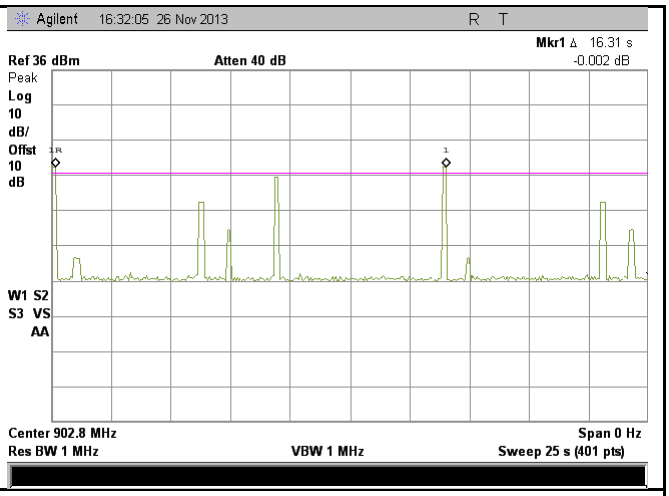
Note:

Dwell time = 10 Sec / Repetition cycle time * Pulse on time

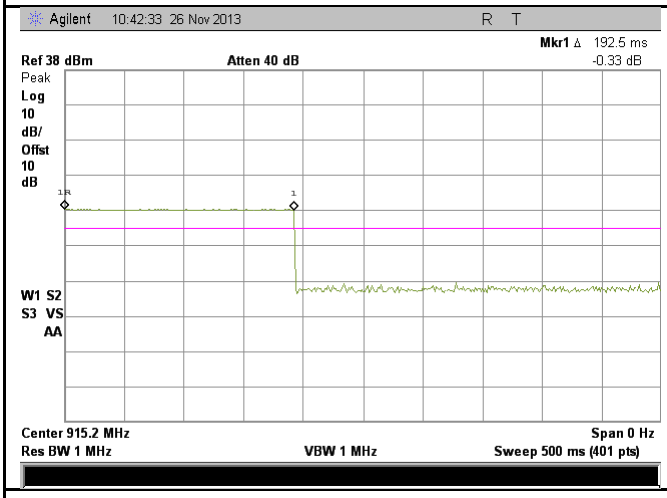
Test Plots



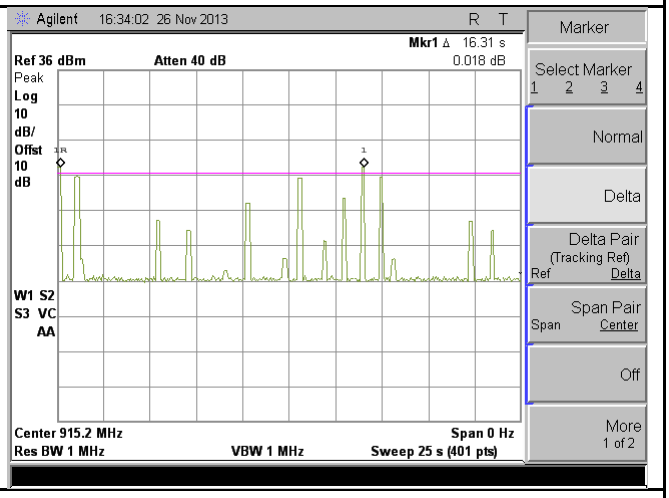
FCC-15.247-DwT-902.75M



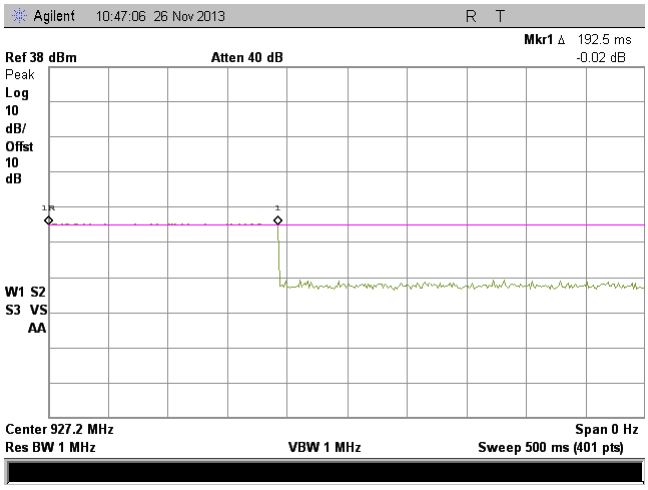
FCC-15.247-DwT-Cycle-902.75M



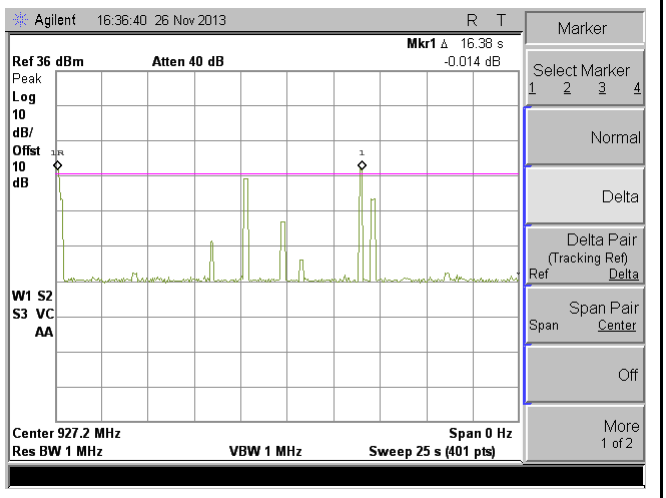
FCC-15.247-DwT-915.25M



FCC-15.247-DwT-Cycle-915.25M



FCC-15.247-DwT-927.25M



FCC-15.247-DwT-Cycle-927.25M

10.9 100 KHz Bandwidth of Frequency Band Edge

Requirement(s):

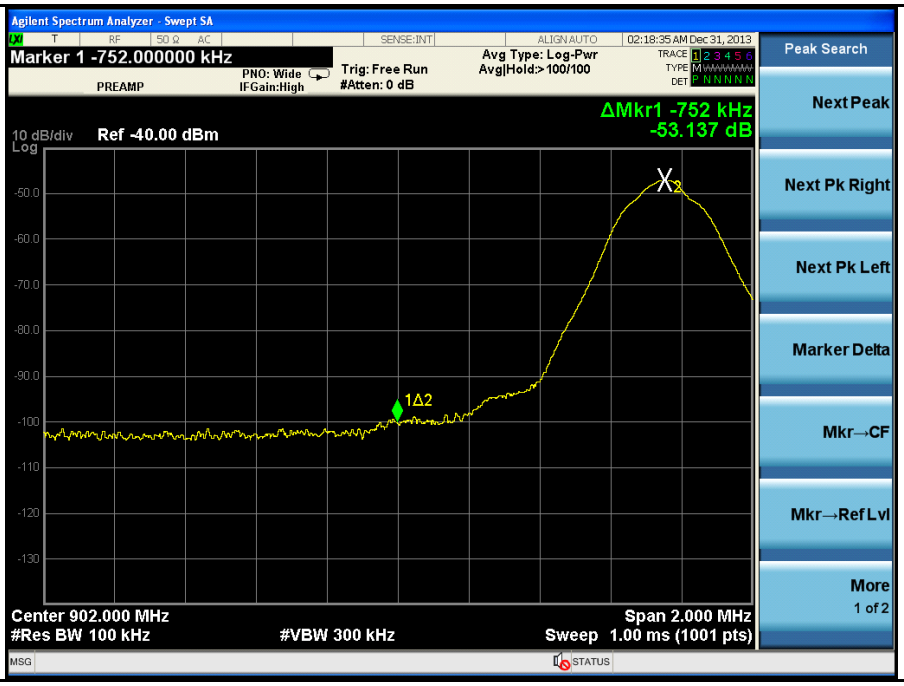
Spec	Requirement	Applicable
47 CFR §15.247 (b) RSS-210 (A2.6)	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required	☒

Test Setup			
Procedure	1. EUT was set for low , mid, high channel with modulated mode and highest RF output power. 2. The spectrum analyzer was connected to the antenna terminal. 3. RBW=3 KHz, VBW > RBW, Sweep time: auto		
Test Date	12/31/2013	Environmental condition	Temperature 24°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	-		
Result	☒ Pass ☐ Fail		

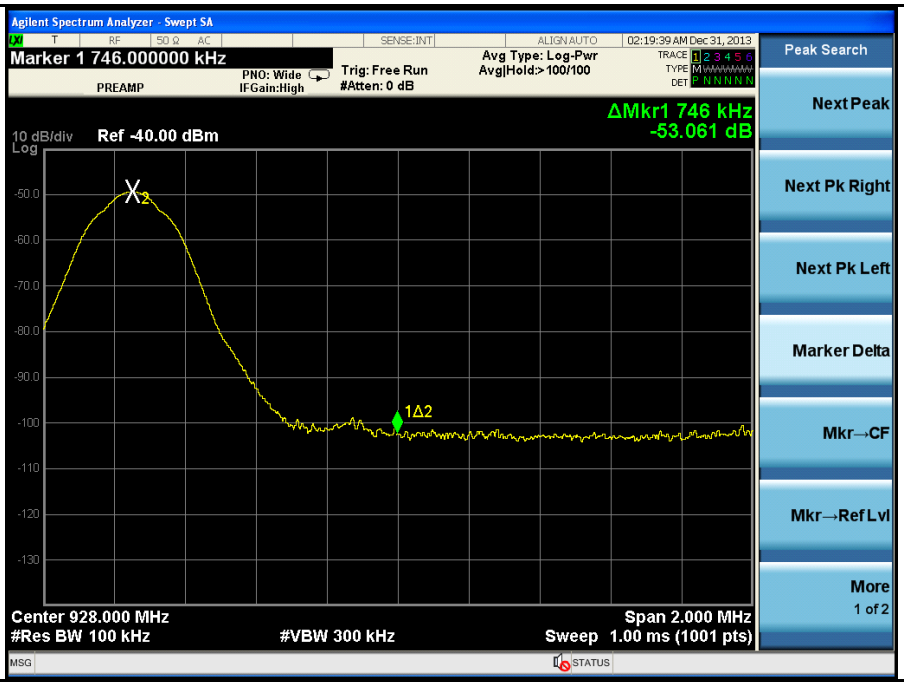
Test Data ☒ Yes (See below) ☐ N/A

Channel	Channel Frequency (MHz)	Measured (dB)	Limit (dB)	Pass/Fail
Low	902.750	53.137	More than 20	Pass
High	927.250	53.061	More than 20	Pass

Test Plot ☒ Yes (See below) ☐ N/A



100 KHz Bandwidth of Frequency Band Edge-Low Channel



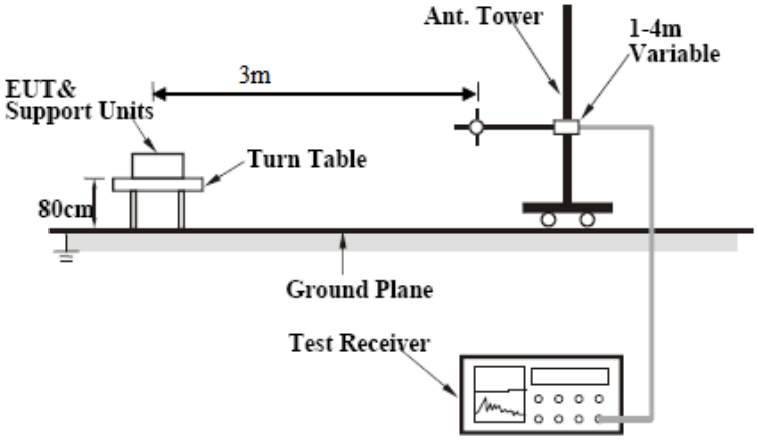
100 KHz Bandwidth of Frequency Band Edge -High Channel

10.10 Radiated Emissions below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS210(A8.5)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges	☒

Frequency range (MHz)	Field Strength (uV/m)
30 – 88	100
88 – 216	150
216 960	200
Above 960	500

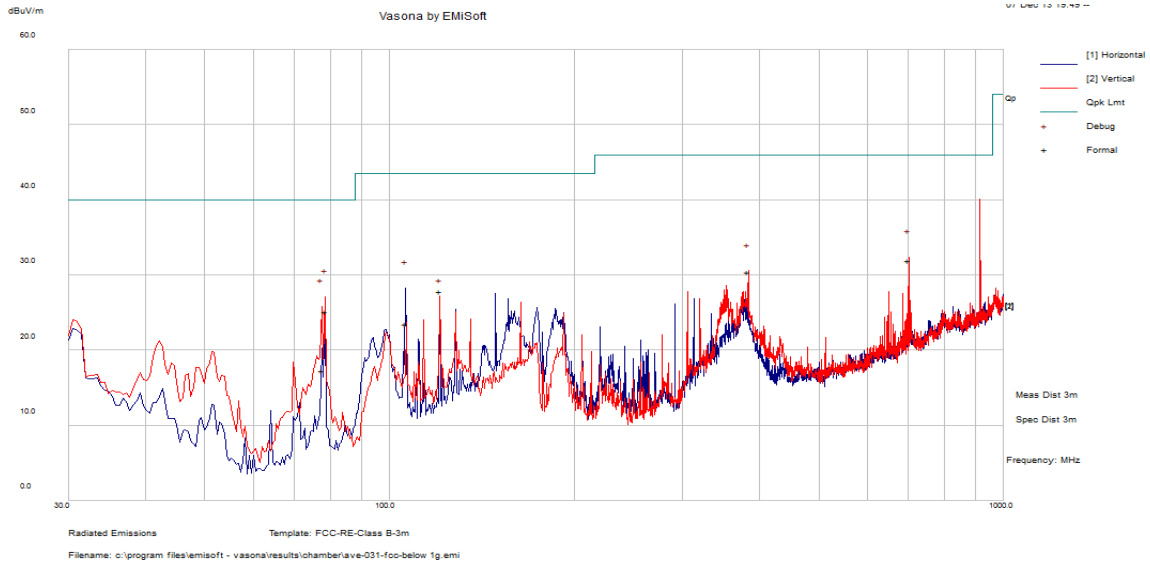
Test Setup	
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. A Quasi-peak measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	Different RF configuration has been evaluated but not much difference was found. The data presented here is the worst case data with EUT under 802.11n –HT20-2437MHz mode.
Result	☒ Pass ☐ Fail

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Radiated Emission Test Results (Below 1GHz)

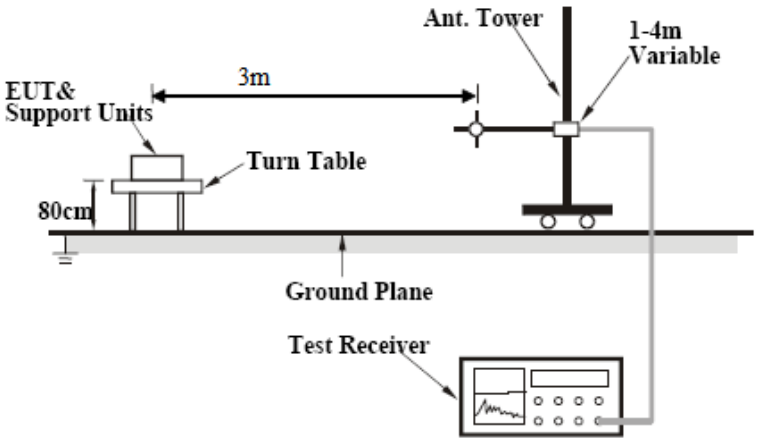
Test specification	below 1GHz			
Environmental Conditions:	Temp (°C):	18.9	Result	PASS
	Humidity (%)	22		
	Atmospheric (mPa):			
Mains Power:	110VAC, 60Hz			
Tested by:	Teody Manansala			
Test Date:	9-Dec-13			
Remarks:	Avery ADTP1, RFID + WLAN TX simultaneously			



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
78.541	42.23	1.36	-18.43	25.17	Quasi Max	V	113	189	40	-14.83	Pass
700.01	34.05	4.67	-6.77	31.95	Quasi Max	V	100	3	46	-14.05	Pass
77.813	34.23	1.35	-18.35	17.23	Quasi Max	H	196	189	40	-22.77	Pass
106.18	36.33	1.73	-14.62	23.44	Quasi Max	V	197	213	43.5	-20.06	Pass
384.05	39.31	3.36	-12.27	30.41	Quasi Max	V	100	231	46	-15.59	Pass
120.75	38.47	1.88	-12.53	27.82	Quasi Max	H	184	105	43.5	-15.68	Pass

10.11 Radiated Spurious Emissions above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS210(A8.5)	a)	For non-restricted band, 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 or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required ☒ 20 dB down ☐ 30 dB down	☒
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 2.8	☒
Test Setup			
Procedure		1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. An average measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.	
Test Date	12/31/2013	Environmental condition	Temperature 24°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	None		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Radiated Emission Test Results (Above 1GHz)

Above 1GHz-10GHz- Mode1: RFID Low (902.75MHz)

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4577.912	43.75	2.48	-0.19	46.05	Peak Max	H	142	231	74	-27.95	Pass
1676.309	44.4	1.29	-5.61	40.08	Peak Max	V	179	218	74	-33.92	Pass
1535.731	62.56	1.17	-6.14	57.6	Peak Max	V	126	331	74	-16.4	Pass
1437.311	43.72	1.1	-6.38	38.45	Peak Max	V	107	9	74	-35.55	Pass
4577.912	31.03	2.48	-0.19	33.32	Average Max	H	142	231	54	-20.68	Pass
1676.309	31.39	1.29	-5.61	27.07	Average Max	V	179	218	54	-26.93	Pass
1535.7315	57.16	1.17	-6.14	52.19	Average Max	V	126	331	54	-1.81	Pass
1437.311	30.97	1.1	-6.38	25.69	Average Max	V	107	9	54	-28.31	Pass

Above 1GHz-10GHz- Mode2: RFID Mid (915.25MHz)

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4636.269	59.88	2.5	-0.11	62.27	Peak Max	H	100	181	74	-11.73	Pass
1535.619	62.1	1.17	-6.14	57.13	Peak Max	V	128	325	74	-16.87	Pass
1327.226	48.46	1.02	-6.55	42.92	Peak Max	H	99	234	74	-31.08	Pass
4636.269	51.12	2.5	-0.11	53.51	Average Max	H	100	181	54	-0.49	Pass
1535.619	57.85	1.17	-6.14	52.88	Average Max	V	128	325	54	-1.12	Pass
1327.226	32.87	1.02	-6.55	27.34	Average Max	H	99	234	54	-26.66	Pass

Above 1GHz-10GHz- Mode3: RFID High (927.25MHz)

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1535.443	61.11	1.17	-6.14	56.14	Peak Max	V	128	321	74	-17.86	Pass
8413.169	45.37	3.23	5.25	53.84	Peak Max	H	109	214	74	-20.16	Pass
1334.345	44.5	1.02	-6.54	38.98	Peak Max	V	182	269	74	-35.02	Pass
1140.791	47.93	0.87	-6.89	41.91	Peak Max	V	119	236	74	-32.09	Pass
1535.443	55.72	1.17	-6.14	50.75	Average Max	V	128	321	54	-3.25	Pass
8413.169	31.9	3.23	5.25	40.37	Average Max	H	109	214	54	-13.63	Pass
1334.3447	31.88	1.02	-6.54	26.36	Average Max	V	182	269	54	-27.64	Pass
1140.791	34.02	0.87	-6.89	28	Average Max	V	119	236	54	-26	Pass

Above 1GHz-10GHz- Mode4: RFI UHF RFID hopping + Silex WLAN module @ 802.11b-2437MHz simultaneously

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4513.711	64.25	2.46	-0.27	66.44	Peak Max	V	122	156	74	-7.56	Pass
9300.653	45.33	3.39	6.23	54.95	Peak Max	H	182	202	74	-19.05	Pass
1535.595	62.68	1.17	-6.14	57.71	Peak Max	V	129	325	74	-16.29	Pass
1327.026	48.48	1.02	-6.55	42.95	Peak Max	H	188	77	74	-31.05	Pass
4513.711	50.24	2.46	-0.27	52.43	Average Max	V	122	156	54	-1.57	Pass
9300.653	32.99	3.39	6.23	42.61	Average Max	H	182	202	54	-11.39	Pass
1535.5952	58.43	1.17	-6.14	53.46	Average Max	V	129	325	54	-0.54	Pass
1327.026	31.75	1.02	-6.55	26.21	Average Max	H	188	77	54	-27.79	Pass

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESIB 40	100179	04/20/2013	1 Year	04/20/2014	☑
R&S LISN	ESH2-Z5	861741/013	05/18/2013	1 Year	05/18/2014	☑
CHASE LISN	MN2050B	1018	07/24/2013	1 Year	07/24/2014	☑
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2013	1 Year	05/25/2014	☑
Radiated Emissions						
R & S Receiver	ESL6	100178	03/01/2013	1 Year	03/01/2014	☑
R & S Receiver	ESIB 40	100179	04/20/2013	1 Year	04/20/2014	☑
ETS-Lingren Loop Antenna	6512	00049120	05/13/2013	1 Year	05/13/2014	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	02/09/2013	1 Year	02/09/2014	☑
Horn Antenna (1-26.5GHz)	3115	10SL0059	04/26/2013	1 Year	04/26/2014	☑
Horn Antenna (18-40 GHz)	AH-840	101013	04/23/2013	1 Year	04/23/2014	☑
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	05/30/2013	1 Year	05/30/2014	☑
Microwave Preamplifier (18-40 GHz)	PA-840	181251	05/30/2013	1 Year	05/30/2014	☑
3 Meters SAC	3M	N/A	10/13/2013	1 Year	10/13/2014	☐
10 Meters SAC	10M	N/A	06/05/2013	1 Year	06/05/2014	☑
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2013	1 Year	05/25/2014	☑
RF Conducted Measurement						
Spectrum Analyzer	N9010A	MY50210206	05/30/2013	1 Year	05/30/2014	☑
Spectrum Analyzer	E4407B	US88441016	05/31/2013	1 Year	05/31/2014	☑
R & S Receiver	ESIB 40	100179	04/20/2013	1 Year	04/20/2014	☑

Annex B. USER MANUAL, BLOCK & CIRCUIT DIAGRAM

Please see attachment

Annex C. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		**Radio & Telecommunications Terminal Equipment:** EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
HongKong OFCA		**(Phase II)** OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		**Radio:** Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		**Radio** : A1. Terminal equipment for purpose of calling **Telecom** : B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		**EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI**EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measuremet
Australia CAB Regocnition		**EMC:** AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radiocommunications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016,AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2