RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_IC_RF_SL19021101-IDS-001 Rev 3.0
Supersede Report No.: FCC_IC_RF_SL19021101-IDS-001 Rev 2.0

Applicant	:	IDS GeoRadar s.r.l.
Product Name	:	Radar sensor in W band
Model No.	:	HYDRA
Test Standard	:	FCC 90 RSS-210 Issue 9: 2016
Test Method	:	FCC 15.209 ANSI C63.10 2013 TIA-603-E-2016 RSS Gen Issue 5 2018
FCC ID	:	UFW-HYDRA
Dates of test	:	03/11/2019-03/26/2019
Issue Date	:	04/26/2019
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification		**[X]**
Equipment did not comply with the specification		**[ ]**

This Test Report is Issued Under the Authority of:	
Gary Chou	
Gary Chou	**Chen Ge**
RF Test Engineer	Engineer Reviewer
This test report may be reproduced in full only **Test result presented in this test report is applicable to the tested sample only**	

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

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	EMC, RF/Wireless, Telecom, Safety
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, 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 & RED Directive
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_IC_RF_SL19021101-IDS-001	None	Original	03/27/2019
FCC_IC_RF_SL19021101-IDS-001 Rev 1.0	Rev 1.0	Updated per client	04/01/2019
FCC_IC_RF_SL19021101-IDS-001 Rev 2.0	Rev 2.0	Updated per client	04/09/2019
FCC_IC_RF_SL19021101-IDS-001 Rev 3.0	Rev 3.0	Updated per reviewer	04/26/2019

2 Executive Summary

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

Company: IDS GeoRadar s.r.l.
Product: Radar sensor in W band
Model: HYDRA

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	:	IDS GeoRadar s.r.l.
Applicant Address	:	Via A. Righi, 1-2, 56121 PISA (PI)- Italy
Manufacturer Name	:	IDS GeoRadar, s.r.l.
Manufacturer Address	:	Via A. Righi, 1-2, 56121 PISA (PI)- Italy

4 Test site information

Lab performing tests	:	SIEMIC Laboratories
Lab Address	:	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	:	540430
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	:	Radar sensor in W band
Model No.	:	HYDRA
Trade Name	:	IDS GEORADAR
Serial No.	:	010-19-000050
Input Power	:	120VAC, 60HZ, 12-24VDC
Product Hardware version	:	N/A
Product Software version		N/A
Date of EUT received	:	03/11/2019
Working Frequencies	:	76000-77000MHz

6.2 Radio Description

Specifications for Radio:

Radio Type	RFID
Operating Frequency	76000-7700MHz
Modulation	FMCW
Antenna Type	Horn Antenna
Antenna Gain	21dBi
Antenna Connector Type	Waveguide

6.3 EUT test modes/configuration Description

Mode	Note
RF test	EUT is set to continuously transmit at 76GHz
Note: None	

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Index	Supporting Equipment Description	Model	Serial No	Manu	Note
1	Laptop	Elitebook 8440 p	CZC04956YR	HP	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
-	-	-	-	-	-	-	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	N/A	Set the EUT to transmit continuously in test mode
-	-	-

8 Test Summary

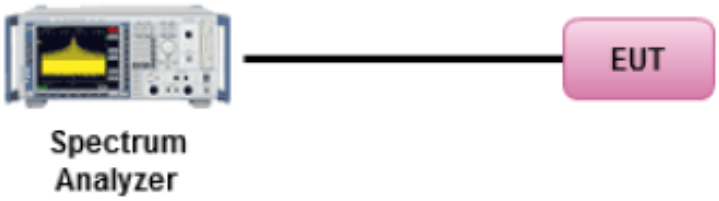
Test Item	Test standard		Test Method/Procedure		Pass / Fail
Spectrum Emission Mask	FCC	90.210	FCC	ANSI C63.10 2013	☒ Pass ☐ N/A
	IC	RSS 210	IC	RSS Gen	
RF Output Power	FCC	2.1046	FCC	ANSI C63.10 2013	☒ Pass ☐ N/A
	IC	RSS 210	IC	RSS Gen	
Frequency Stability	FCC	2.1055	FCC	ANSI C63.10 2013	☒ Pass ☐ N/A
	IC	RSS210	IC	RSS Gen	
Occupied Bandwidth	FCC	2.1049	FCC	ANSI C63.10 2013	☒ Pass ☐ N/A
	IC	RSS Gen	IC	RSS Gen	
Spurious Emission	FCC	2.1051	FCC	TIA-603-E: 2016	☒ Pass ☐ N/A
	IC	RSS Gen	IC	RSS Gen	
Remark	1. All measurement uncertainties are not taken into consideration for all presented test result. 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	Description	Uncertainty
AC Conducted Emissions Voltage	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2	±3.5dB
Radiated Spurious Emissions	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

10 Measurements, examination and derived results

10.1 Spectrum Emission Mask

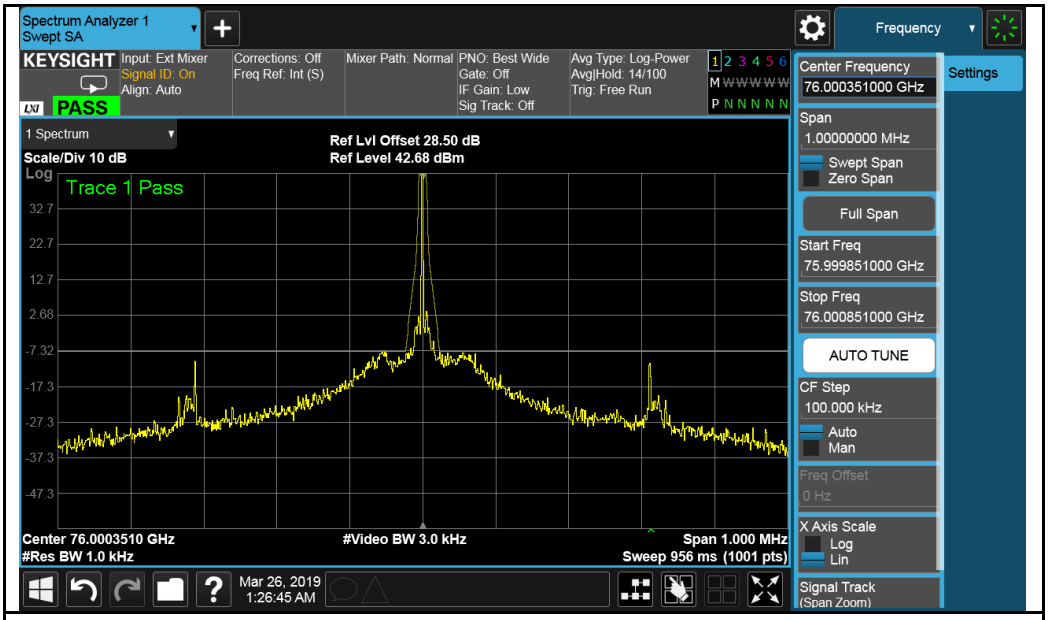
Spec	Requirement	Applicable
FCC 90.210 RSS 210	For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows: Antenna requirement must meet at least one of the following: (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (fd/5) dB; (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (fd2/11) dB or 50 dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.	☒
Test Setup		
Remark	N/A	
Result	☒ PASS ☐ FAIL	

Test Data ☐ Yes ☒ N/A

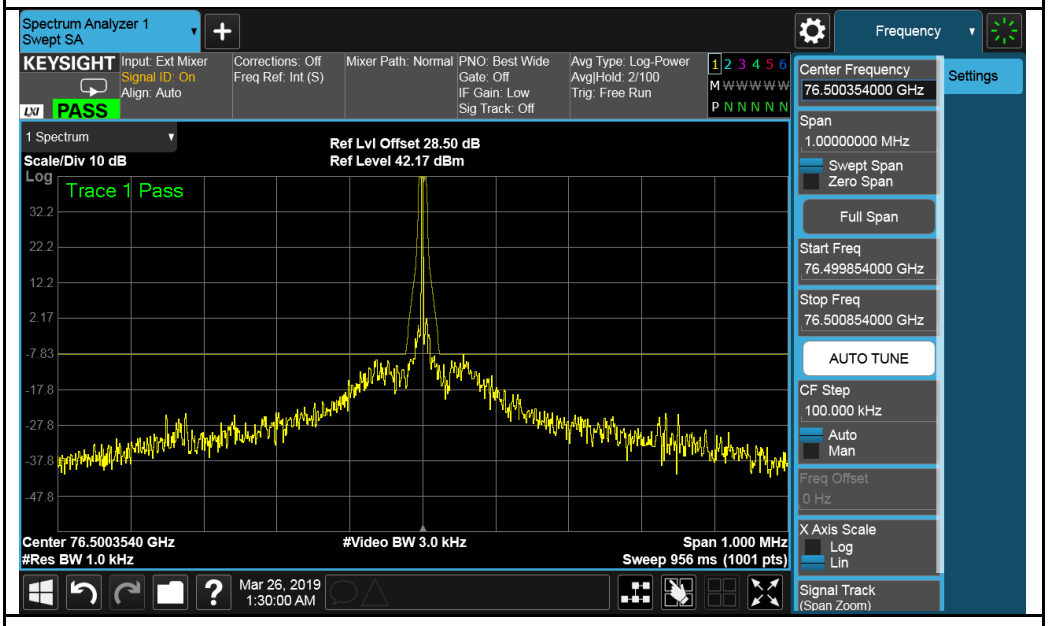
Test Plot ☒ Yes ☐ N/A

Test was done by Cipher at RF test site.

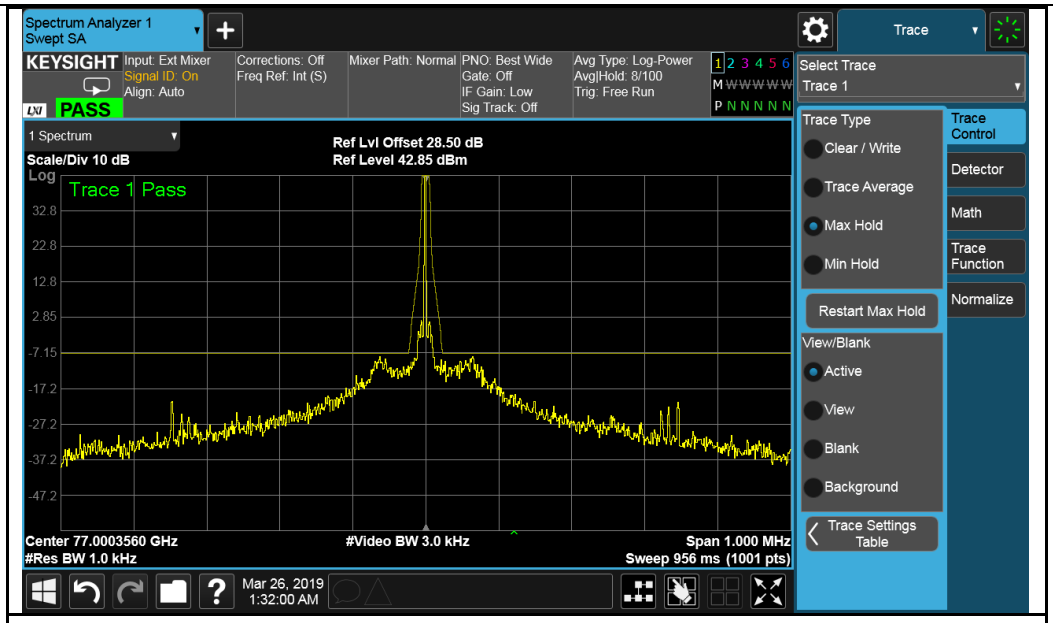
Emission Mask Test Plots



Low Channel

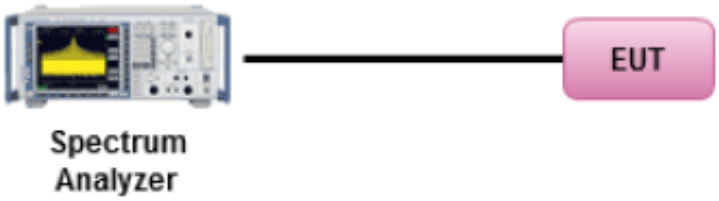


Middle Channel



High Channel

10.2 Power and E.I.R.P

Spec	Requirement	Applicable
FCC 90.205/2.1046 RSS 210	The maximum peak power (EIRP) shall not exceed 48 dBm.	☒
Test Setup		
Test Procedure	Power measurement procedure - Set RBW = 1 MHz. - Set the video bandwidth (VBW) ⩾ 3 x RBW. - Detector = Peak. - Span = 10MHz - Trace mode = max hold. - Sweep = auto couple. Allow the trace to stabilize.	
Remark	N/A	
Result	☒ PASS ☐ FAIL	

Test Data ☒Yes ☐N/A

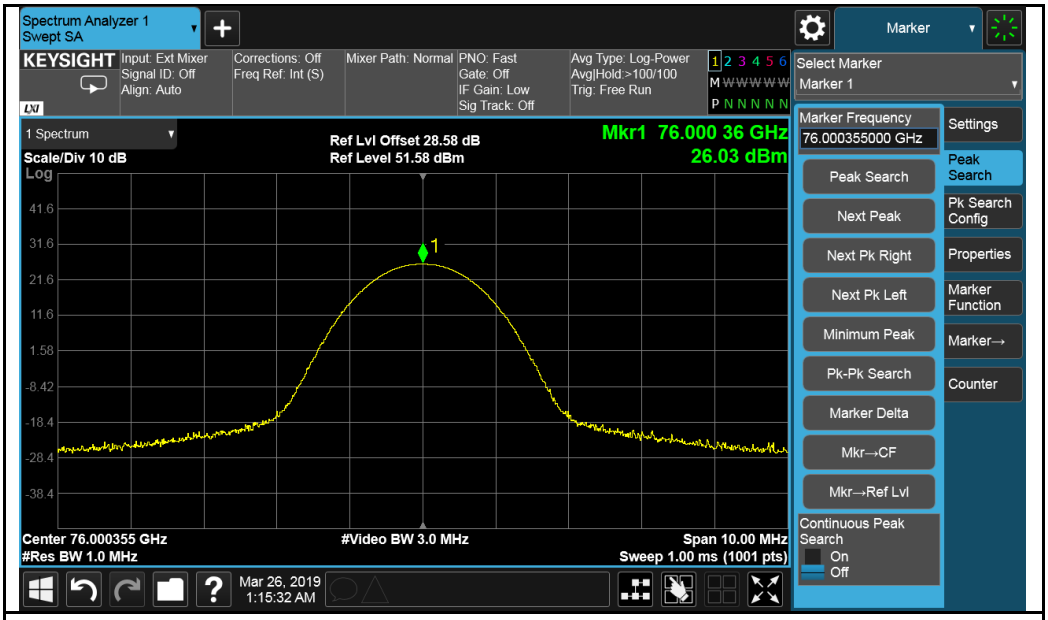
Test Plot ☒ Yes ☐ N/A

Test was done by Cipher at RF test site.

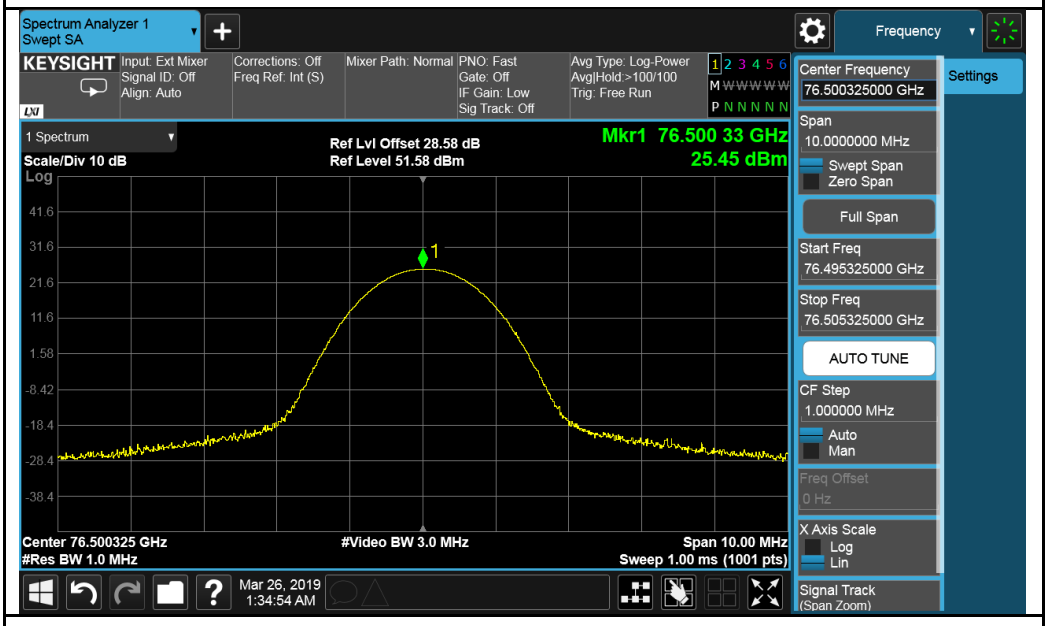
EIRP measurement result

Frequency Range (GHz)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
76	26.03	21	47.03	48	Pass
76.5	25.45	21	46.45	48	Pass
77	25.54	21	46.54	48	Pass

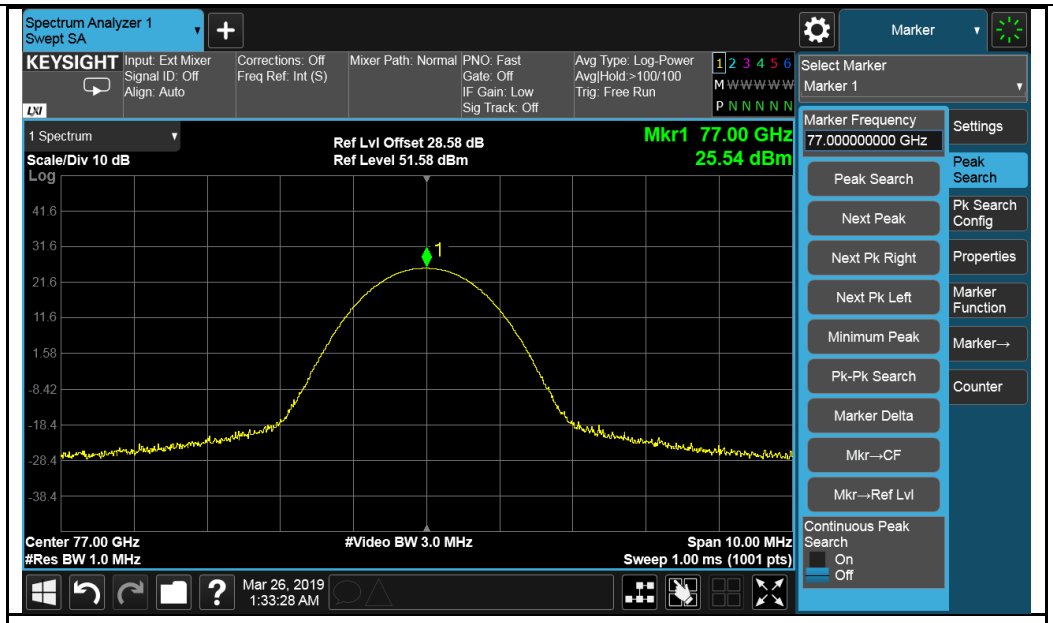
Output Power Test Plots



Low Channel



Middle Channel

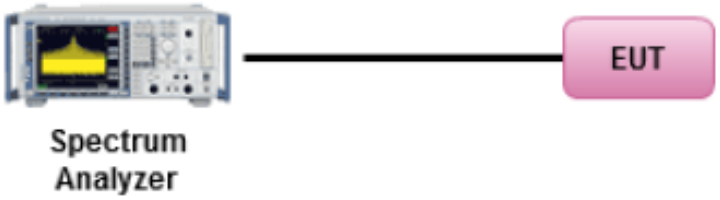


High Channel

10.3 99% Bandwidth

Requirement(s):

Spec	Requirement	Applicable
2.1049 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				
Test Procedure	99% bandwidth measurement procedure - Set RBW = 1 MHz. - Set the video bandwidth (VBW) ⩾ 3 x RBW. - Detector = Peak. - Span = 500MHz - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize.			
Test Date	03/11/2019	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 42% 1021mbar
Remark	N/A			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

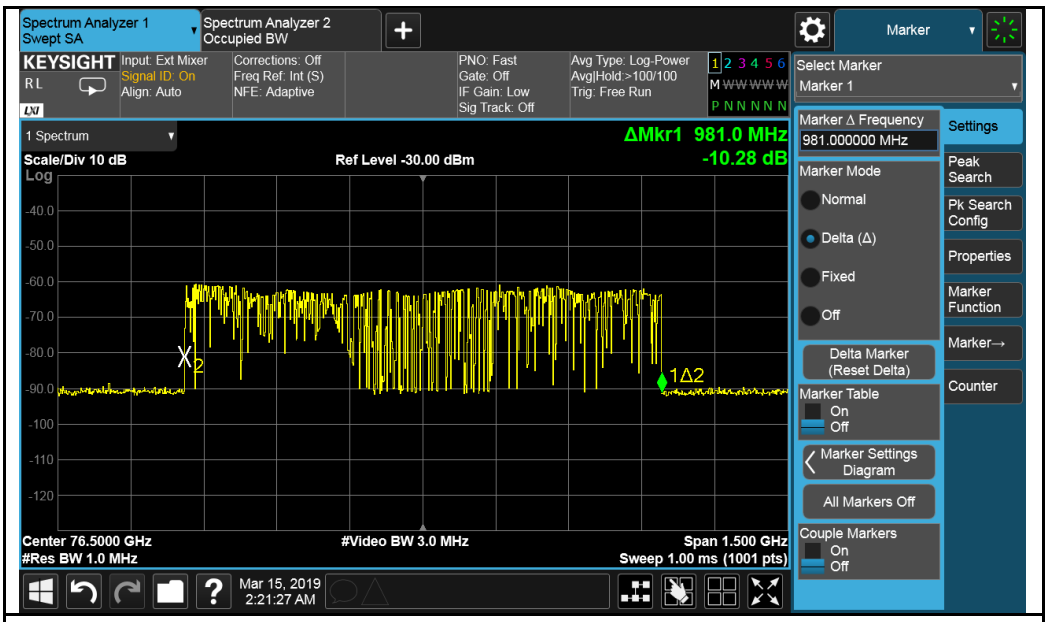
Test Plot ☒ Yes ☐ N/A

Test was done by Cipher at RF test site.

99% OBW measurement result

Type	Result (MHz)
99% OBW	981.0

99% Bandwidth Test Plots

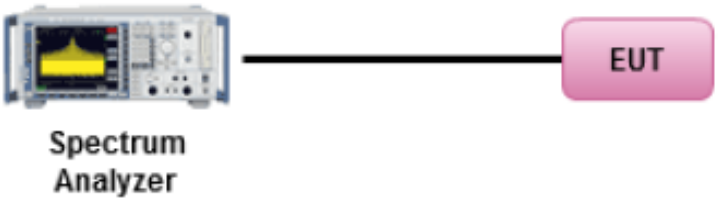


99% Bandwidth

10.4 Frequency Stability

Requirement(s):

Spec	Item	Requirement	Applicable
FCC 2.1055 RSS GEN	1	Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test. Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.	☒

Test Setup				
Test Procedure	Frequency measurement procedure - CW Tx - Allow the trace to stabilize. - Use the frequency counter to measure the Frequency. - Repeat above steps for different test channel			
Test Date	03/11/2019	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22 ℃ 45% 1018mbar
Remark	NONE			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A
Test Plot ☐ Yes ☒ N/A

Test was done by *Cipher* at *RF Test Site*.

Frequency Stability

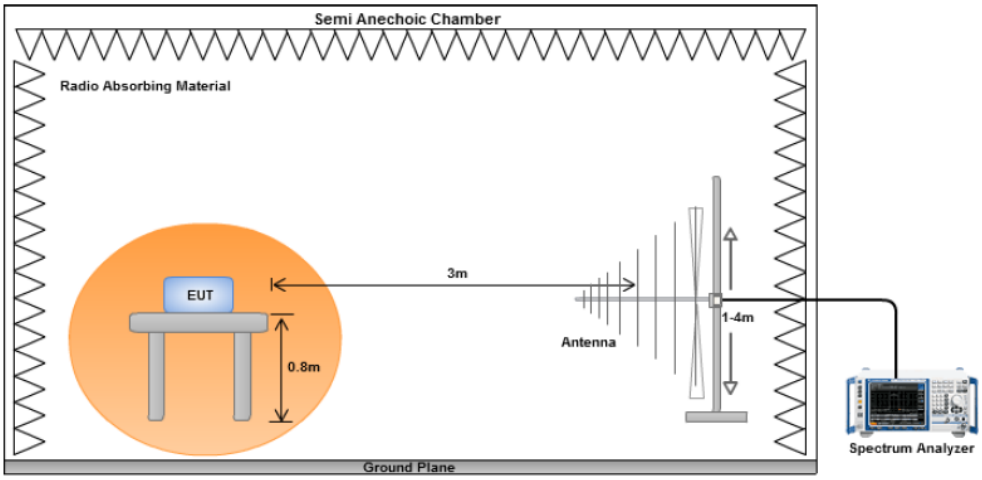
Temparature(C)	Voltage(V)	Center Freq (GHz)	Measured Freq (GHz)	Error (kHz)	ppm
-40	24	76.5	76.500321	321	4.20
-30	24	76.5	76.500315	315	4.12
-20	24	76.5	76.500303	303	3.96
-10	24	76.5	76.500300	300	3.92
0	24	76.5	76.500318	318	4.16
10	24	76.5	76.500327	327	4.27
20	24	76.5	76.500345	345	4.51
20	10.2	76.5	76.500336	336	4.39
20	27.6	76.5	76.500339	339	4.43
30	24	76.5	76.500345	345	4.51
40	24	76.5	76.500342	342	4.47
50	24	76.5	76.500342	342	4.47
55	24	76.5	76.500342	342	4.47

10.5 Radiated Spurious Emissions

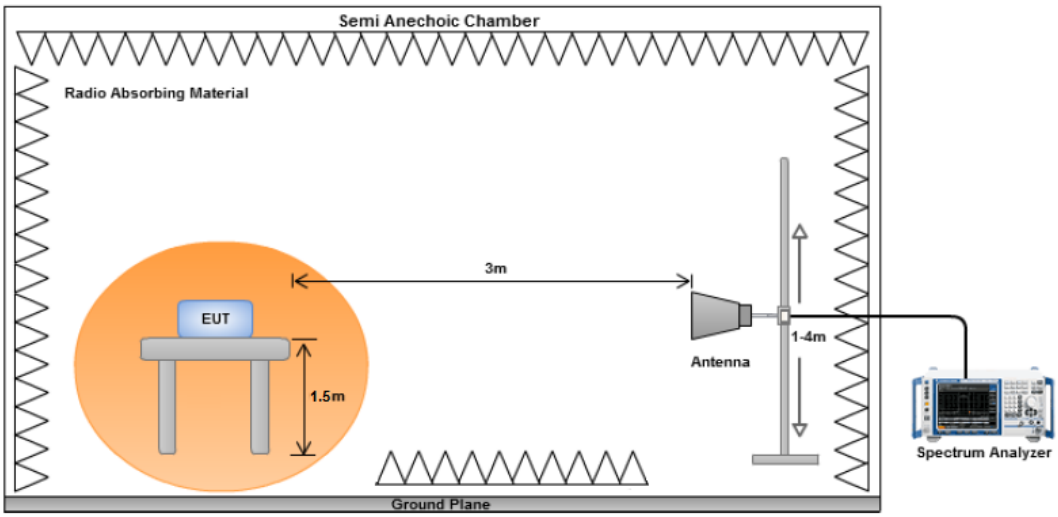
Requirement(s):

Spec	Requirement	Applicable
FCC 90.210 RSS 210	On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.	☒

Test Setup below 1GHz



Test Setup above 1GHz



Procedure	Refer to TIA-603-E: 2016

Test Date	03/11/2019 – 03/18/2019	Environmental conditions	Temperature 22°C Relative Humidity 40% Atmospheric Pressure 1026mbar
Remark	Emission test on low, middle and high channels, results show worst case only. 43 + 10 log (P) dB. = -13dBm		

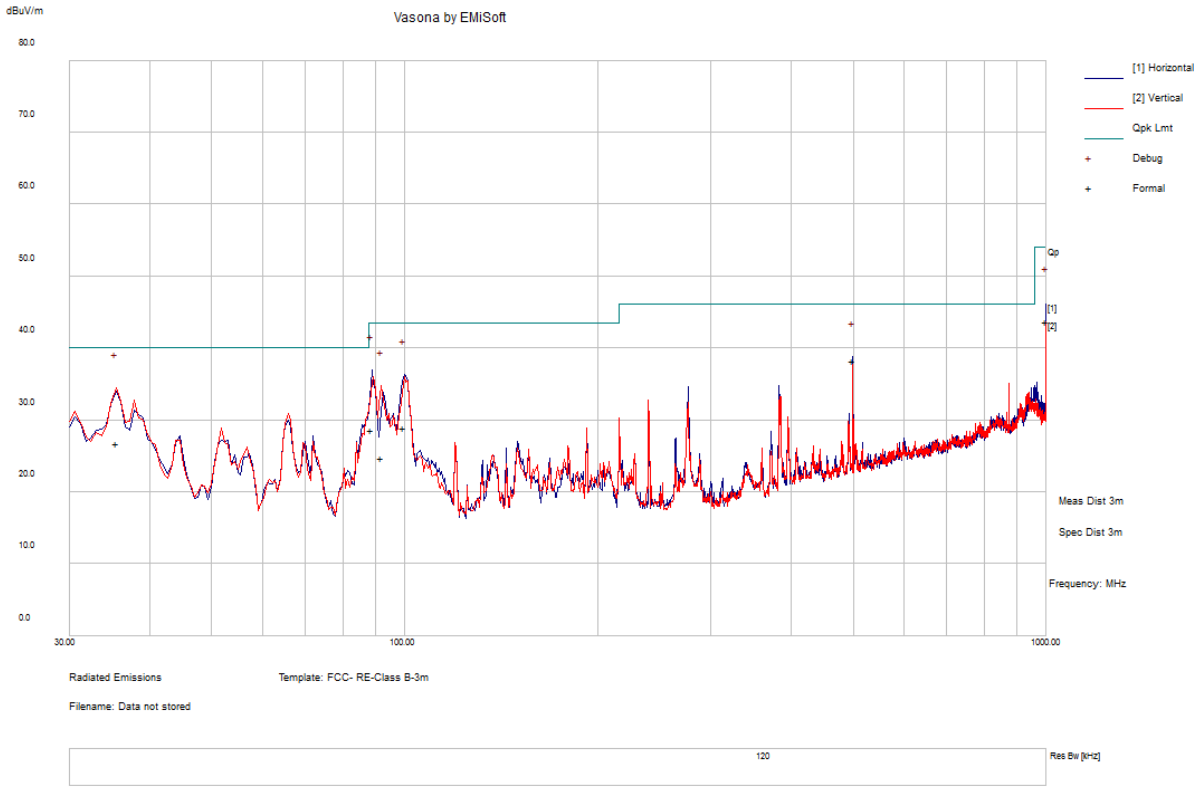
Result	☒ Pass ☐ Fail

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Cipher at 10m chamber.

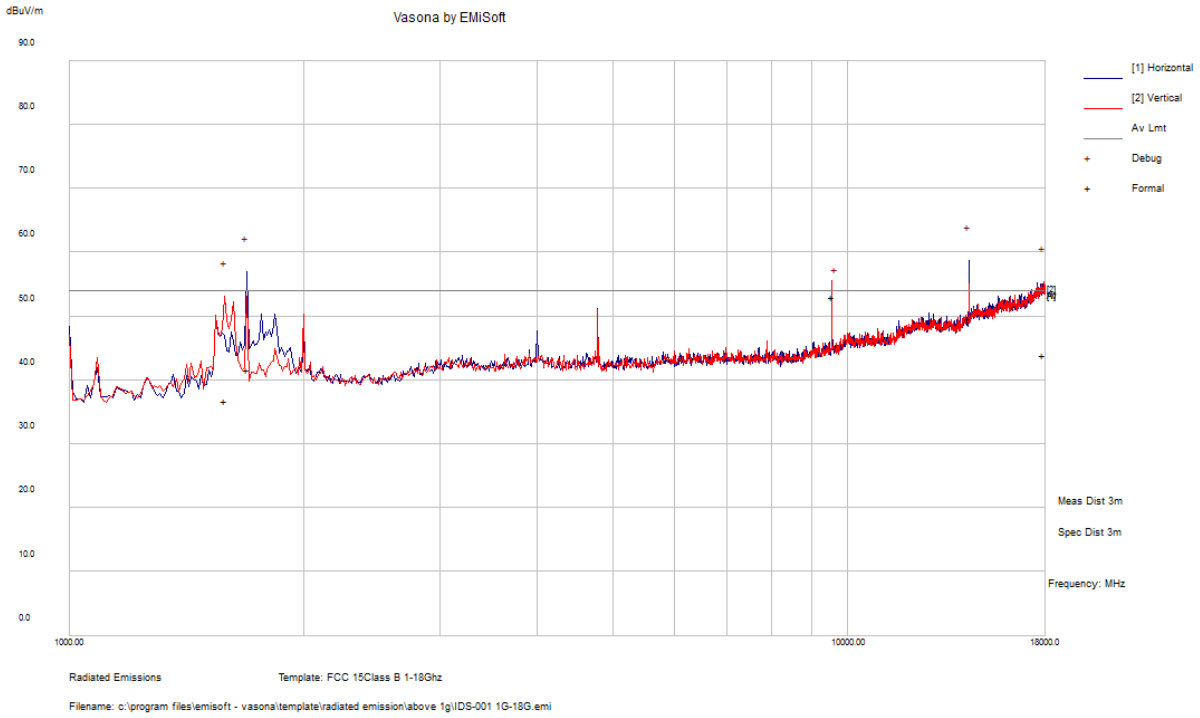
Test specification:	Radiated Spurious Emissions			
Mains Power:	120 VAC,60 Hz		Result:	☒ Pass ☐ Fail
Tested by:	Gary Chou			
Test Date:	03/13/2019			
Remarks:	Middle channel, 30MHz – 1GHz			



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
35.59	33.44	11.21	-17.87	26.79	Quasi Max	V	325	225	40	-13.21	Pass
88.86	44.7	11.78	-27.85	28.62	Quasi Max	H	247	127	43.5	-14.88	Pass
91.87	40.36	11.81	-27.34	24.83	Quasi Max	V	254	280	43.5	-18.67	Pass
99.54	42.64	11.88	-25.57	28.94	Quasi Max	H	146	248	43.5	-14.56	Pass
500.01	42.73	14.17	-18.55	38.35	Quasi Max	H	167	112	46	-7.65	Pass
1000.00	40.31	16.28	-12.92	43.67	Quasi Max	H	106	143	54	-10.33	Pass

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

Test specification:	Radiated Spurious Emissions			
Mains Power:	120 VAC,60 Hz		Result:	☒ Pass ☐ Fail
Tested by:	Gary Chou			
Test Date:	03/13/2019			
Remarks:	Middle channel, 1GHz – 18GHz			



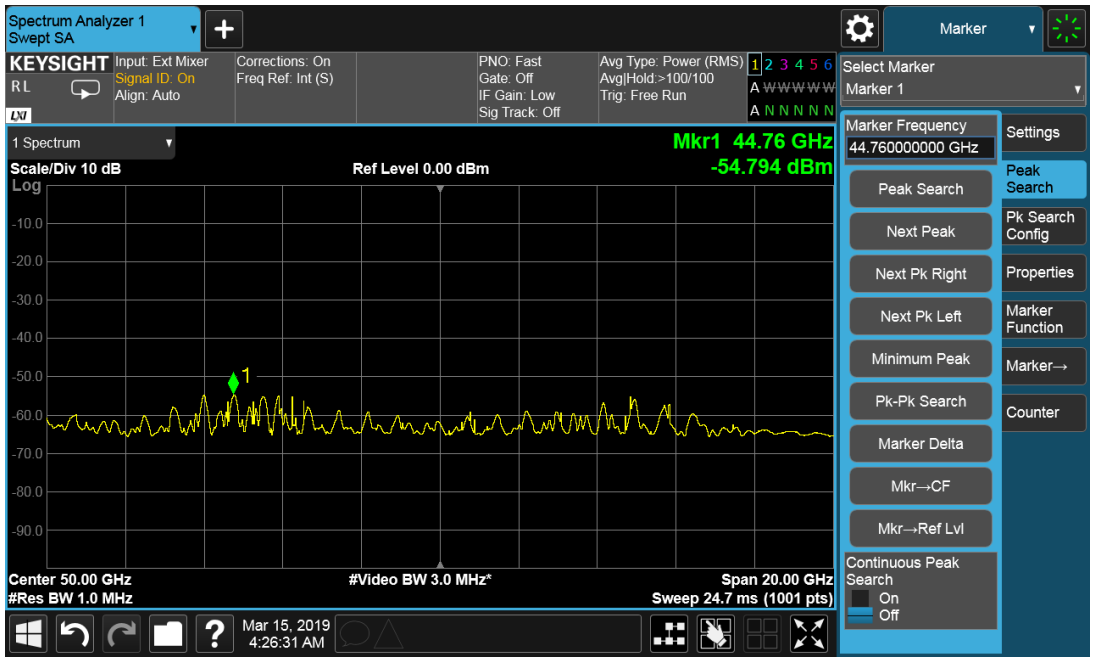
Frequency MHz	Raw dBuV/m	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1692.03	61.28	2.53	-4.95	58.86	Peak Max	H	157	253	74	-15.14	Pass
17892.96	43.45	7.98	8.62	60.05	Peak Max	H	108	245	74	-13.95	Pass
1586.08	57.22	2.43	-6.07	53.58	Peak Max	V	151	329	74	-20.42	Pass
1692.03	44.09	2.53	-4.95	41.66	Average Max	H	157	253	54	-12.34	Pass
17892.96	27.37	7.98	8.62	43.97	Average Max	H	108	245	54	-10.03	Pass
1586.08	40.43	2.43	-6.07	36.78	Average Max	V	151	329	54	-17.22	Pass

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

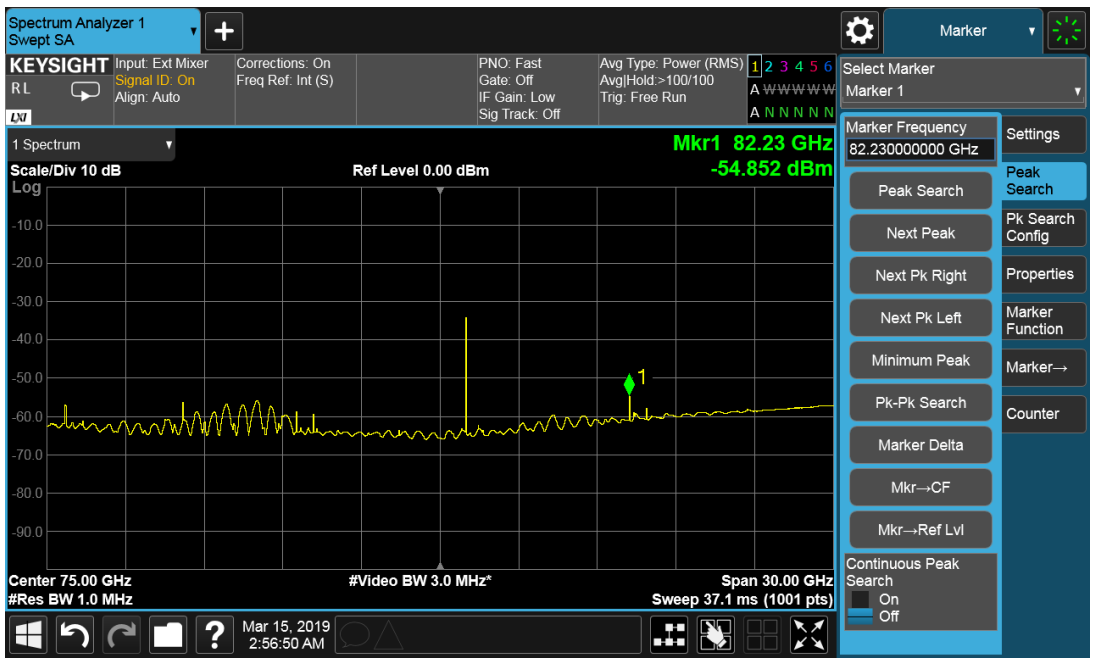
Test specification:	Radiated Spurious Emissions			
Mains Power:	120 VAC, 60Hz		Result:	☒ Pass ☐ Fail
Tested by:	Gary Chou			
Test Date:	03/13/2019			
Remarks:	Middle channel, 18GHz – 40GHz			

Frequency MHz	Raw dBuV/m	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
18094.875	42.65	8.11	6.78	57.54	Peak Max	V	145	5	74	-16.46	Pass
18924.825	40.04	7.94	8.67	56.66	Peak Max	V	190	5	74	-17.34	Pass
19000.248	39.17	8.45	0.83	48.45	Peak Max	V	160	205	74	-25.55	Pass
18094.875	29.82	8.11	6.78	44.71	Average Max	V	145	5	54	-9.29	Pass
18924.825	27.22	7.94	8.67	43.84	Average Max	V	190	5	54	-10.16	Pass
19000.248	28.6	8.45	0.83	37.88	Average Max	V	160	205	54	-16.12	Pass

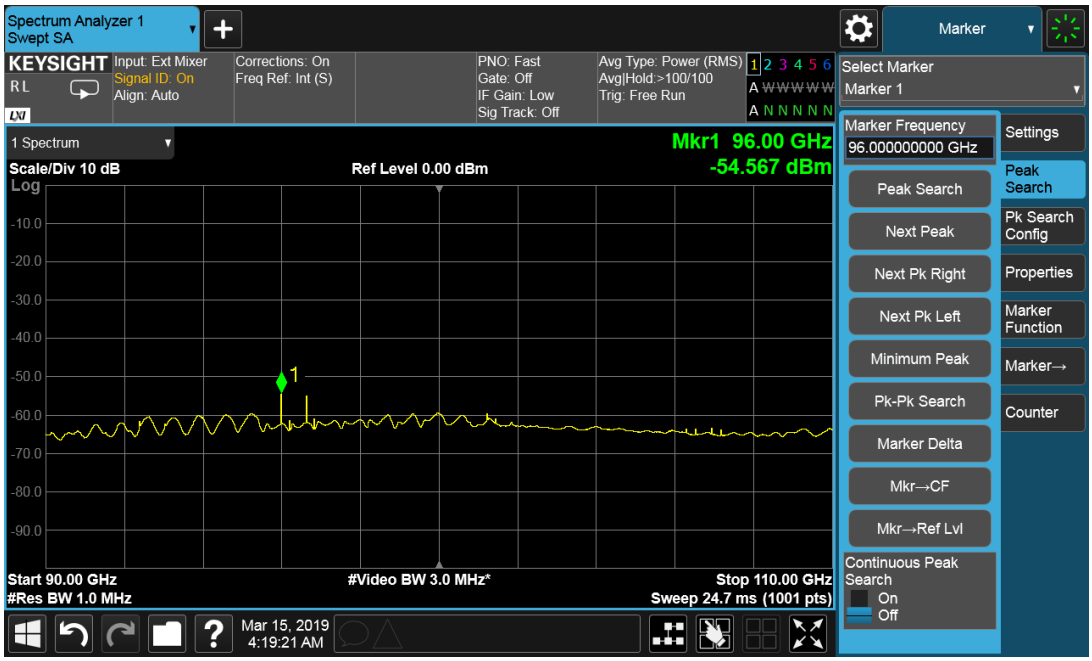
Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.



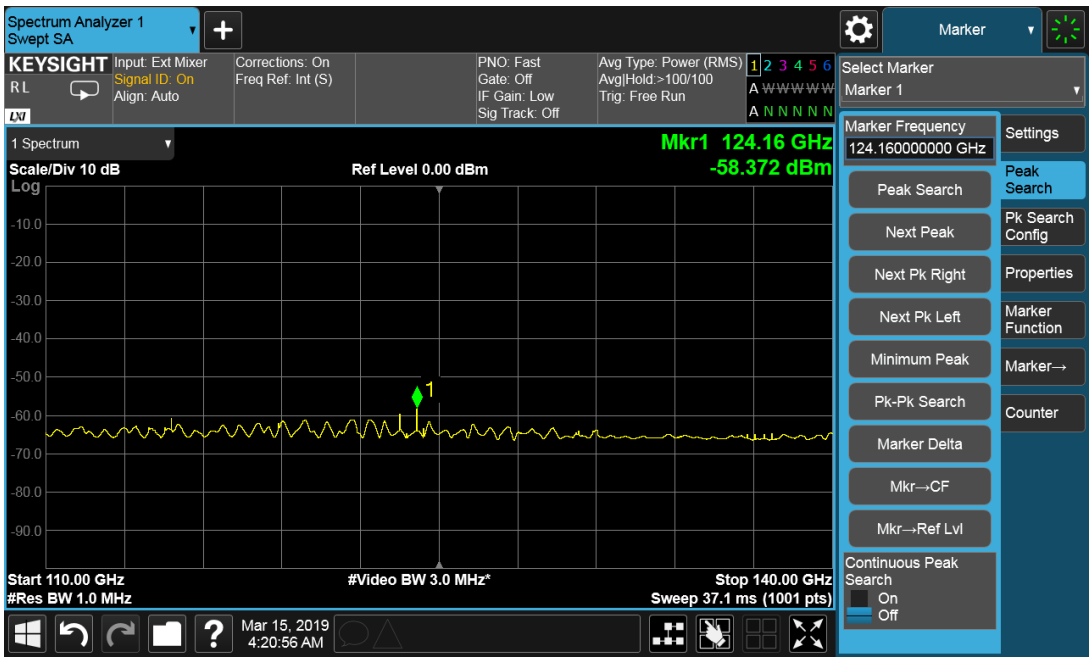
Spurious Emissions 40GHz - 60GHz



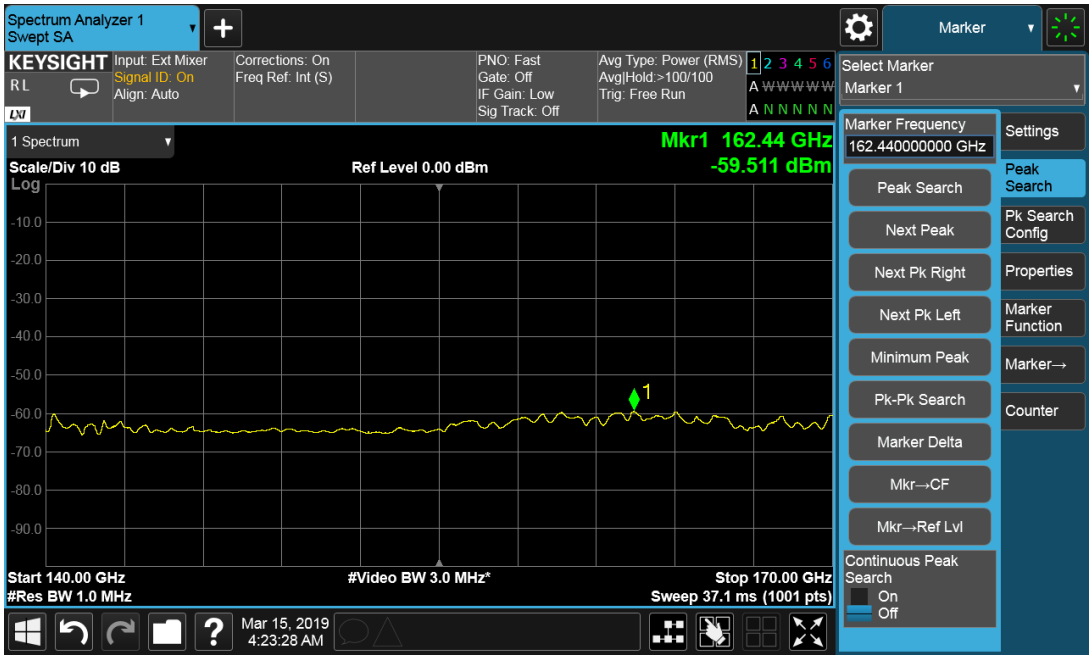
Spurious Emissions 60GHz - 90GHz



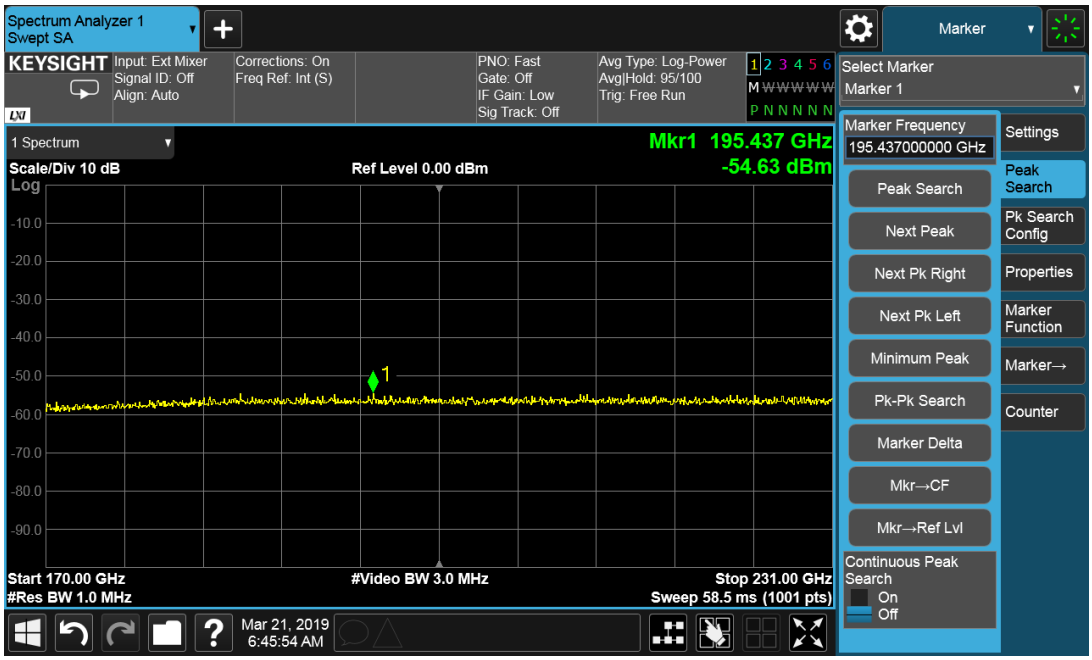
Spurious Emissions 90GHz - 110GHz



Spurious Emissions 110GHz - 140GHz



Spurious Emissions 140GHz - 170GHz



Spurious Emissions 170GHz - 231GHz

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Spectrum Analyzer	N9030B	10SL0289	09/06/2018	1 Year	09/06/2019	☑
ETS-Lingren Loop Antenna	6512	00049120	07/14/2018	1 Year	07/14/2019	☑
Bi-Log antenna (30MHz~2GHz)	JB6	A111717	10/05/2018	1 Year	10/05/2019	☑
Horn Antenna (1-26.5GHz)	3115	10SL0059	11/09/2018	1 Year	11/09/2019	☑
40GHz to 60GHz Harmonic Mixer	M19HWA	170811-1	05/09/2018	1 Year	05/09/2019	☑
60GHz to 90GHz Harmonic Mixer	M12HWA	170811-2	05/09/2018	1 Year	05/09/2019	☑
90GHz to 140GHz Harmonic Mixer	M08HWA	170811-3	05/09/2018	1 Year	05/09/2019	☑
140GHz to 220GHz Harmonic Mixer	M05HWA	170811-4	05/09/2018	1 Year	05/09/2019	☑
170GHz to 260GHz Harmonic Mixer	M04HWA	170911-1	05/09/2018	1 Year	05/09/2019	☑

Annex A. 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 Equipment: EN45011:** EN ISO/IEC 17065
		Electromagnetic Compatibility: EN45011 – EN ISO/IEC 17065
Singapore iDA CB(Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
Hong Kong 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 Measurement
Australia CAB Recognition		**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