

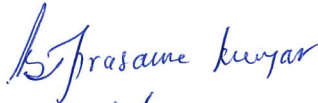
Wireless Relay Module

Model No.: FW-RM

Date: 06-Aug-2015

Report Prepared By:
Sasikala.S

EMC Test Report

Report Number	EMC-0379-1		
EUT Nomenclature	Wireless Relay Module		
Sample Identification	Model No.	:	FW-RM
	Sl. No.	:	11932
	Software Version	:	5.81
	Hardware Version	:	Rev 2
Number of Samples	01		
Date of receipt of Sample	08-05-2015		
Condition of Sample on receipt	Good		
Client name	Honeywell International Inc.		
Client Address	3825 Ohio Ave St.Charles , IL -60174		
Testing Laboratory	Honeywell Technology Solutions, Bangalore – EMC Lab		
Address	RMZ ECOWORLD INFRASTRUCTURE PVT. LTD., (Formerly Adarsh Prime Projects Pvt. Ltd., SEZ). Survey # 19/2, Devarabisanahalli Village, Varthur Hobli , Bangalore East Taluk, Bangalore – 560103		
Test Dates	11-05-2015 to 30-05-2015		
Applicable Standard	FCC Part 15: 2010, ANSI C63.10 : 2013		
Test Results	PASS		
Prepared By: Tech Lead Name : Sasikala Subramani		Reviewed By: Technical Manager Name : Rajesh N	
Signature:  Date : 06/08/2015		Signature:  Date : 07/08/2015	
Authorized By: Quality Manager Name : Prasanna Kumar BT			
Signature:  Date : 10/8/2015			
This Report relates to the above mentioned test sample only. Without the approval of Lab manager, this report shall not be reproduced except in full.			

TEST SUMMARY						
#	Name	Specification	Test Method	Pass	Fail	NA
FHSS						
1	20dB Bandwidth	FCC Part 15.247 : 2010	DA 00-705	☒	☐	☐
2	Maximum Peak Output Power	FCC Part 15.247 : 2010	DA 00-705	☒	☐	☐
3	Carrier Frequency Separation	FCC Part 15.247 : 2010	DA 00-705	☒	☐	☐
4	Number of Hopping Frequencies	FCC Part 15.247 : 2010	DA 00-705	☒	☐	☐
5	Band-edge Compliance	FCC Part 15.247 : 2010	DA 00-705	☒	☐	☐
6	Time of Occupancy (Dwell Time)	FCC Part 15.247 : 2010	DA 00-705	☒	☐	☐
7	Spurious RF Conducted Emissions	FCC Part 15.247 : 2010	DA 00-705	☒	☐	☐
8	Spurious Radiated Emissions	FCC Part 15.247 : 2010 and 15.209 : 2010	DA 00-705 ANSI C63.10 - 2013	☒	☐	☐
NA = Not Applicable						
DTS						
1	DTS 6dB Bandwidth	FCC Part 15.247 : 2010	KDB 558074	☒	☐	☐
2	Maximum Peak Output Power	FCC Part 15.247 : 2010	KDB 558074	☒	☐	☐
3	Maximum Power Spectral Density	FCC Part 15.247 : 2010	KDB 558074	☒	☐	☐
4	Band-edge Conducted Emissions	FCC Part 15.247 : 2010	KDB 558074	☒	☐	☐
5	Radiated Spurious Emissions	FCC Part 15.247 : 2010 and 15.209 : 2010	KDB 558074 ANSI C63.10 - 2013	☒	☐	☐
☒ = Test Performed						

MEASUREMENT UNCERTAINTY		
Where relevant, the following measurement uncertainty levels has been estimated for tests performed on the EUT as specified in CISPR 16-4		
The Expanded measurement uncertainty (K=2) is provided below		
#	Name	Value
1	20dB and 6dB bandwidth	1.08dB
2	Maximum Peak Output Power & Band Edge Emissions	1.37dB
3	Maximum Power Spectral Density	1.36dB
5	Spurious RF Conducted Emissions	1.36dB
6	Radiated Spurious Emissions (9KHz to 30MHz)	4.90dB
7	Radiated Spurious Emissions (30MHz to 1GHz)	4.90dB
7	Radiated Spurious Emissions (1GHz to 18GHz)	6.05dB

1 PRODUCT DETAILS

PRODUCT OPERATION AND INTENDED USE

The wireless relay module is powered by four CR123A batteries. It is intended to use with wireless gateway /Fire Alarm Panel. The module has LED indication, controlled by the panel to indicate the status.

RATINGS AND SYSTEM DETAILS

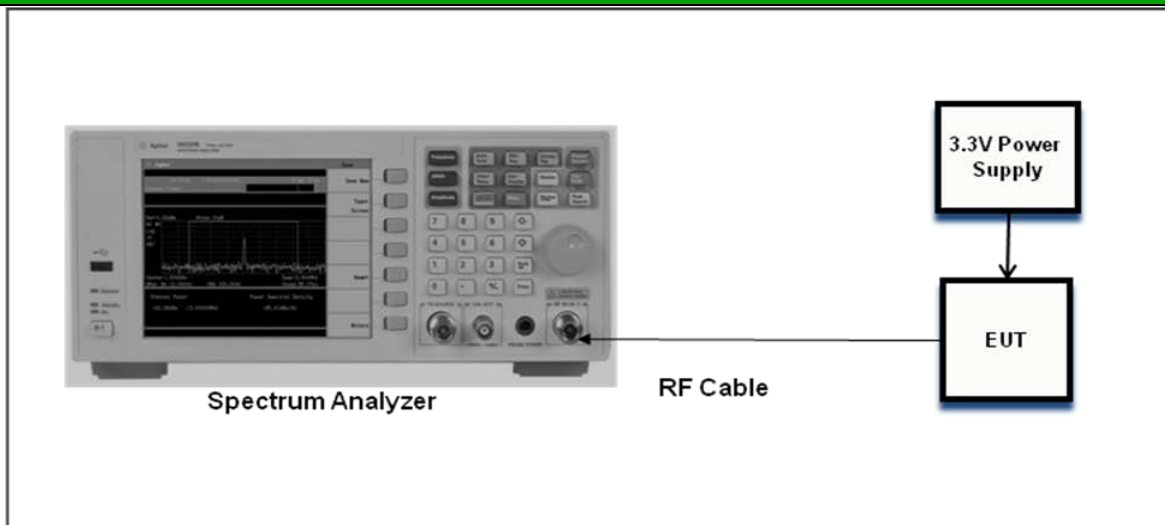
Operating Frequency	902MHz to 928MHz	
Number of Channels	DTS	: 6
	FHSS	: 52
Channel Bandwidth	DTS	: 1MHz
	FHSS	: 320 KHz
Transmitted Power	DTS	: 12dBm or 2dBm
	FHSS	: 17dBm
Modulation Type	FSK	
Data Rate	DTS	: 300Kbps
	FHSS	: 150Kbps
Antenna Type	Inverted F Patch Antenna	
No. of Antenna	3	
Antenna Gain	2dBi	
Supply Voltage and Current	3.3V , 21.5mA	
Dimensions (L x B x H)	4.263mm x 4.171mm x 1.465mm	
Environmental Conditions	Operating Temperature	: 0°C to 49°C
	Storage Temperature	: -20°C to 60°C
	Humidity	: 10% to 93% RH

TEST CONFIGURATION	
Config #	Description
Conducted Test	EUT is Powered by external 3.3V power supply. EUT Debug port (UART) is connected to Laptop through USB to UART converter cable. EUT is configured to the respective operating mode through HyperTerminal. Antenna 2 is selected for the test as this is the only transmitting antenna in the field. Post configuration, the USB to UART converter cable is removed for all Radiated Measurements
Radiated Test	EUT is Powered from Battery. EUT Debug port (UART) is connected to Laptop through USB to UART converter cable. EUT is configured to the respective operating mode through HyperTerminal. Antenna 2 is selected for the test as this is the only transmitting antenna in the field. Post configuration, the USB to UART converter cable is removed for all Radiated Measurements

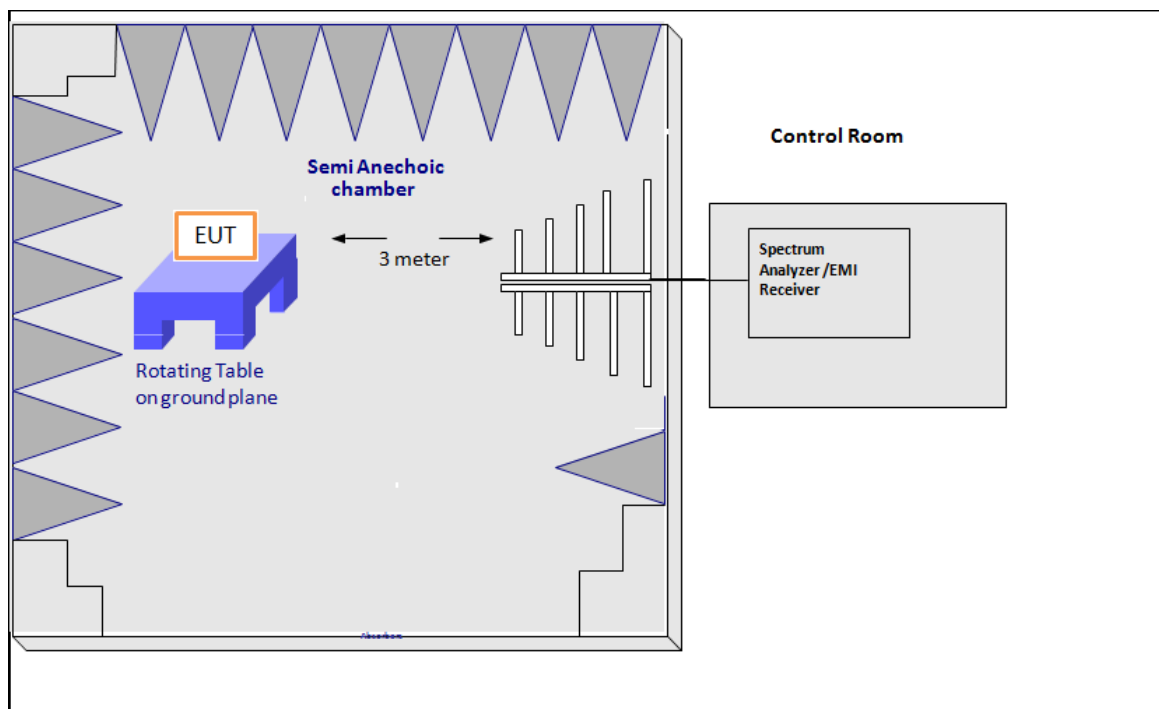
OPERATING MODES	
Mode #	Description
DTS	Following DTS channels have been used for Conducted (Continuous Transmission) and Radiated (Continuous Transmission) Tests Channel 1 : 902.875MHz (12dBm) Channel 2 : 908.425MHz (12dBm) Channel 3 : 914.325MHz (2dBm) Channel 4 : 915.325MHz (12dBm) Channel 5 : 921.575MHz (12dBm) Channel 6 : 927.125MHz (2dBm)
FHSS	Following FHSS channels have been used for Conducted (Continuous Transmission) and Radiated (Continuous Transmission) Tests Channel 1 : 903.55MHz (17dBm) Channel 27 : 916.35MHz (17dBm) Channel 52 : 926.45MHz (17dBm)

INPUT AND OUTPUT CABLES					
Port #	Name	Port Type	Cable Length	Cable type Shielded/ Unshielded	Comments
	Not Applicable				
*Note:	AC = AC Power Port			DC = DC Power Port	
	TP = Telecommunication Ports (eg. Ethernet)			DI/ DO = Digital Input/ Output	
	N/E = Non-Electrical			AI/ AO = Analog Input/ Output	

SUPPORT EQUIPMENTS AND ACCESSORIES USED					
#	Item Description	Make	Model	Part No. / Sl. No	Cal Due Date
1	Laptop	DELL	E6400	3351399400	NA
2	USB to UART Cable	FTDI	NA	TTL-232R-3V3	NA
3	Dual Channel Power Supply	GWINSTEK	GPS-2202	EH846116	31-Mar-2016

CONNECTION DIAGRAM AND SETUP DIAGRAM

Conducted RF Test Setup



Transmitter Spurious Radiated Emission Test Setup

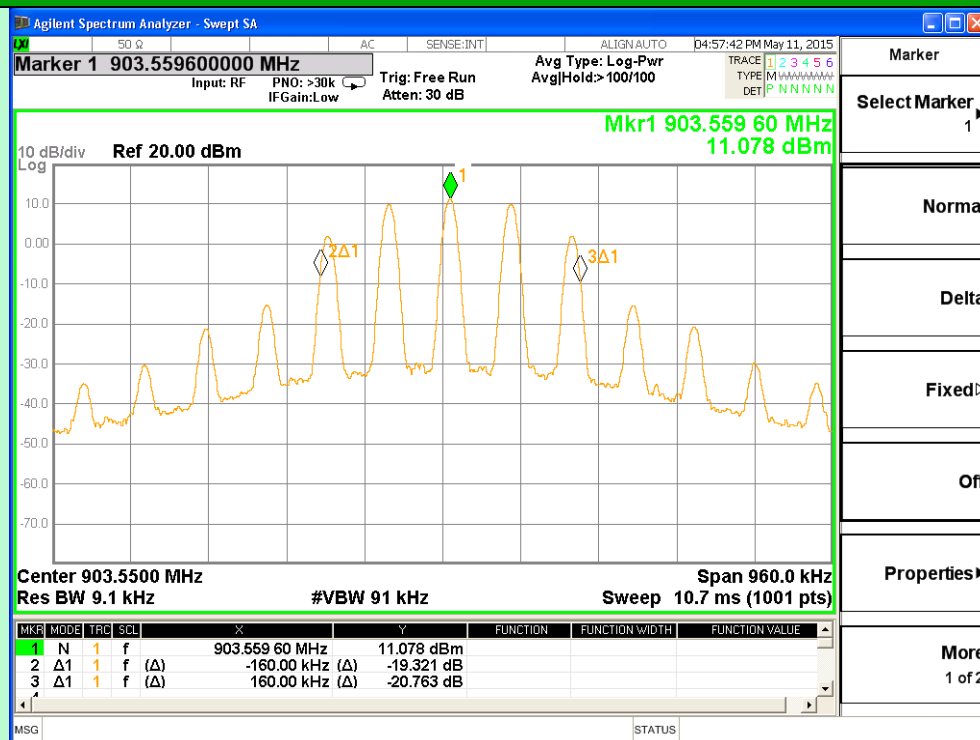
2 FHSS CHANNELS

2.1 20dB BANDWIDTH

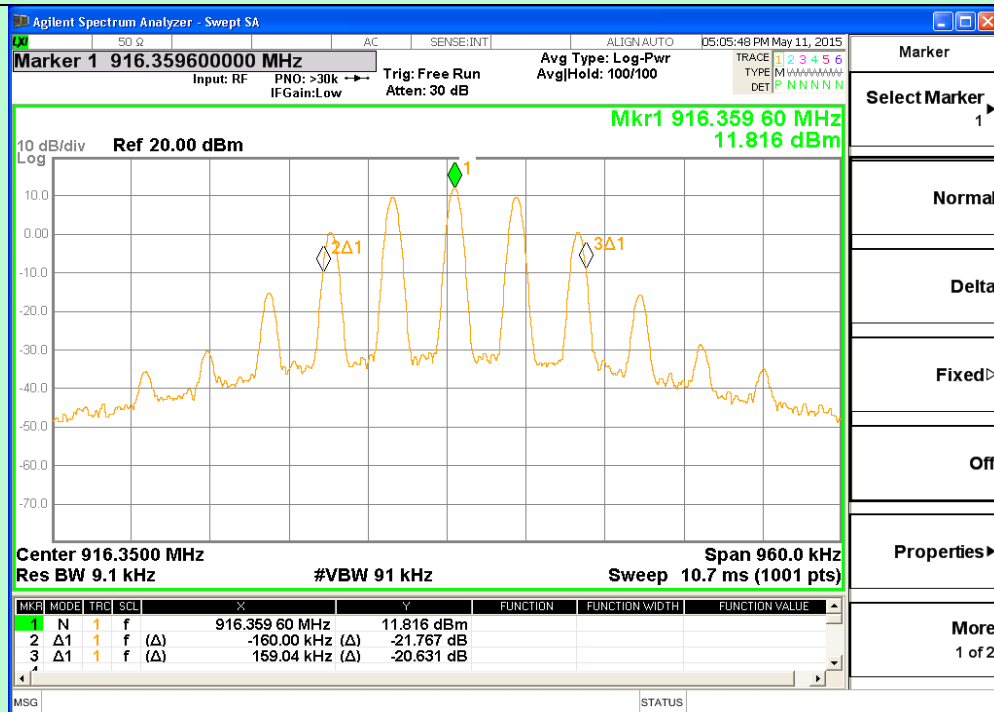
EUT Nomenclature	Wireless Relay Module	Test Report No.	EMC-0379-1
Model No.	FW-RM	Serial No.	11932
Test Start Date	11-May-2015	Temperature (°C)	23.2
Test End Date	11-May-2015	Humidity RH (%)	55.1
Tested By	Sasikala Subramani	Pressure (mbar)	NR
Input Voltage / Freq	3.3V dc		
Operating Mode	Refer Page 5 Operating Mode #2		
Test configuration	Refer Page 5 Test Configuration #1		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247 : 2010		
Test Method	DA 00-705		
Comment			
TEST DETAILS			
Method	☒ Conducted ☐ Radiated		
TEST PARAMETERS			
Antenna Height	NA	Turntable Rotation	NA
Equipment Class	NA	Measurement Distance	NA

TEST EQUIPMENT					
Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	29-Nov-2015
Y	RF Cable	Huber- Suhner	SUCOFLEX104	MY14404/04	04-Feb -2016

TEST GRAPHS



Channel 1 (903.55MHz)



Channel 27 (916.35MHz)

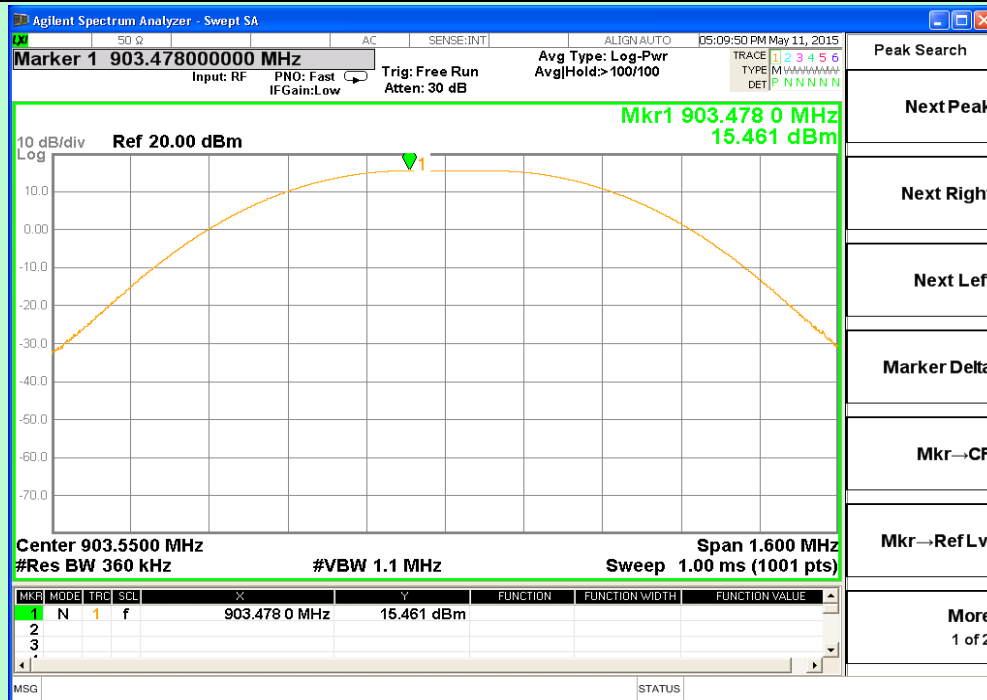
2.2 PEAK OUTPUT POWER

EUT Nomenclature	Wireless Relay Module	Test Report Number	EMC-0379-1
Model Number	FW-RM	Serial Number	11932
Test Start Date	11-May-2015	Temperature (°C)	23.2
Test End Date	11-May-2015	Humidity RH (%)	55.1
Tested By	Sasikala Subramani	Pressure (mbar)	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 Operating Mode #2		
Test configuration	Refer Page 5 Test Configuration #1		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247: 2010		
Test Method	DA 00-705		
Comment			
TEST DETAILS			
Method	☒ Conducted , ☐ Radiated		
TEST PARAMETERS			
Antenna Height	NA	Turntable Rotation	NA
Equipment Class	NA	Measurement Distance	NA

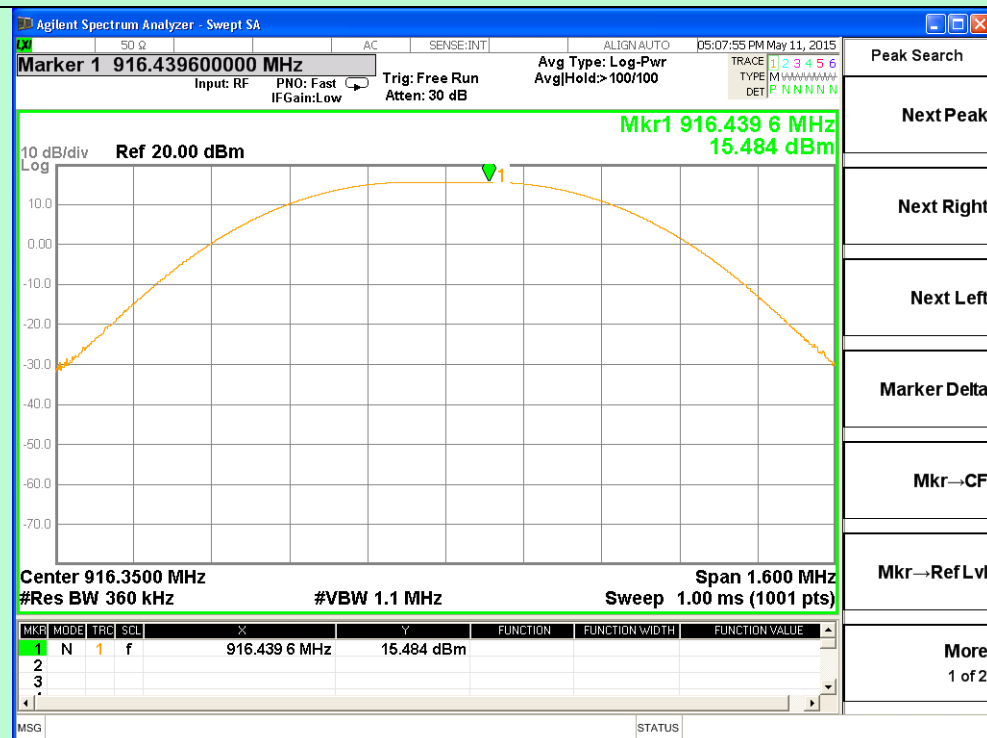
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	29-Nov-2015
Y	RF Cable	Huber- Suhner	SUCOFLEX104	MY14404/04	04-Feb -2016

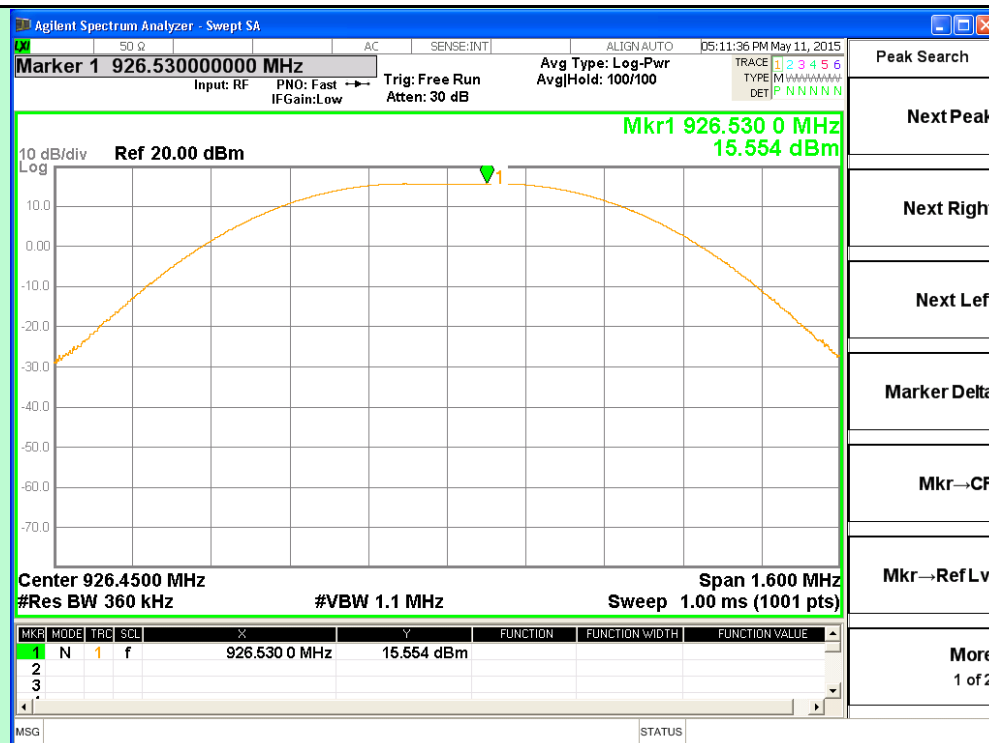
TEST GRAPHS



Channel 1 (903.55MHz)



Channel 27 (916.35MHz)



Channel 52 (926.45)

TEST RESULT

Channel	Frequency	Measured Power Level	Cable Loss	Transmitter Power Level	Limit	Result
#	MHz	dBm	dB	dBm	dBm	
1	903.55	15.461	0.5	15.961	<=23.979	PASS
27	916.35	15.484	0.5	15.984	<=23.979	PASS
52	926.45	15.554	0.5	16.054	<=23.979	PASS

Note: Transmitter Output Power = Measured Level (dBm) + Cable Loss (dB)

TEST SETUP PHOTOGRAPH

Refer Annexure -1

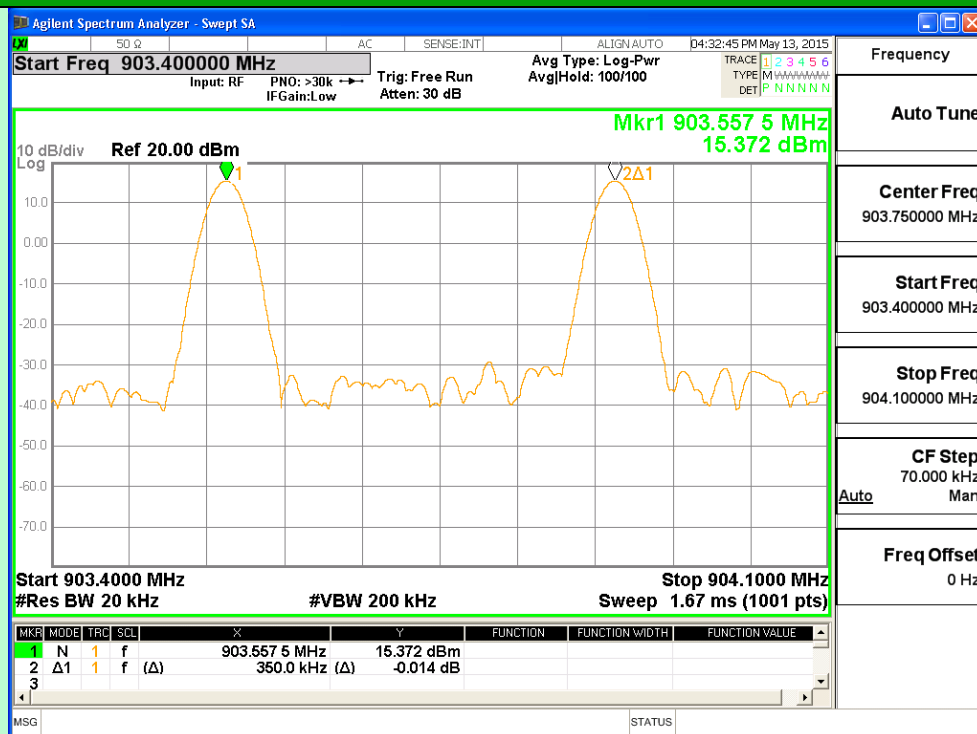
Conducted RF Test setup

2.3 CARRIER FREQUENCY SEPARATION

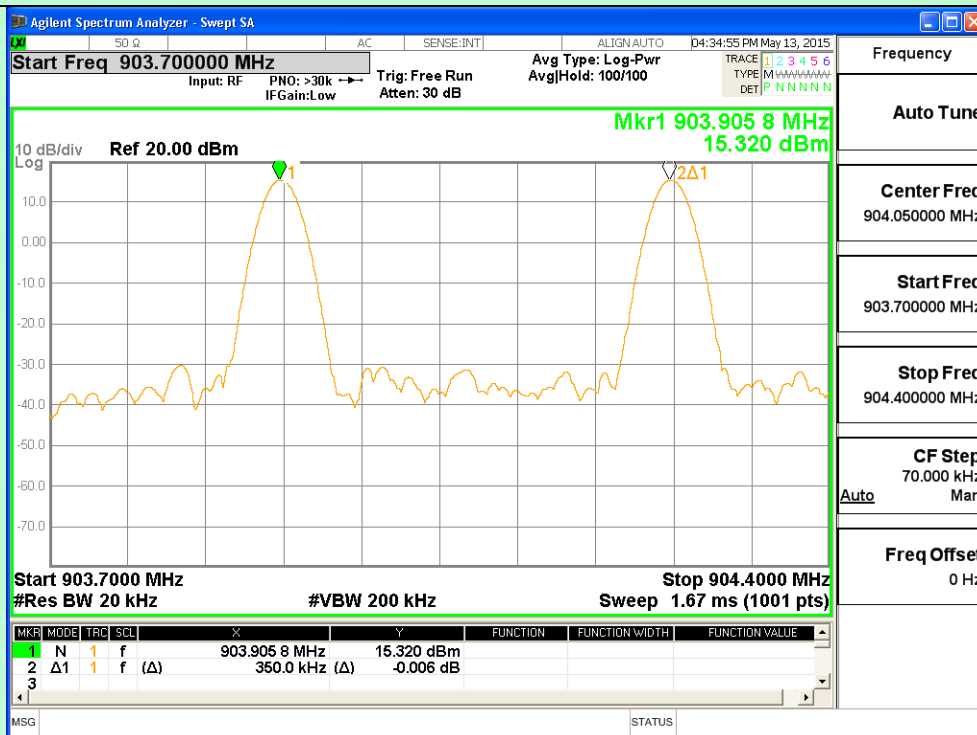
EUT Nomenclature	Wireless Relay Module	Test Report Number	EMC-0379-1			
Model Number	FW-RM	Serial Number	11932			
Test Start Date	13-May-2015	Temperature (°C)	24.2			
Test End Date	13-May-2015	Humidity RH (%)	54.1			
Tested By	Sasikala Subramani	Pressure (mbar)	NR			
Input Voltage / Freq	3.3 Vdc					
Operating Mode	Refer Page 5 Operating Mode #2					
Test configuration	Refer Page 5 Test Configuration #1					
Deviation from Std	NA					
Applicable standard	FCC Part 15.247 : 2010					
Test Method	DA 00-705					
Comment						
TEST DETAILS						
Method	☒ Conducted ☐ Radiated					
TEST PARAMETERS						
Antenna Height	NA	Turntable Rotation	NA			
Equipment Class	NA	Measurement Distance	NA			

TEST EQUIPMENT					
Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	29-Nov-2015
Y	RF Cable	Huber- Suhner	SUCOFLEX104	MY14404/04	04-Feb -2016

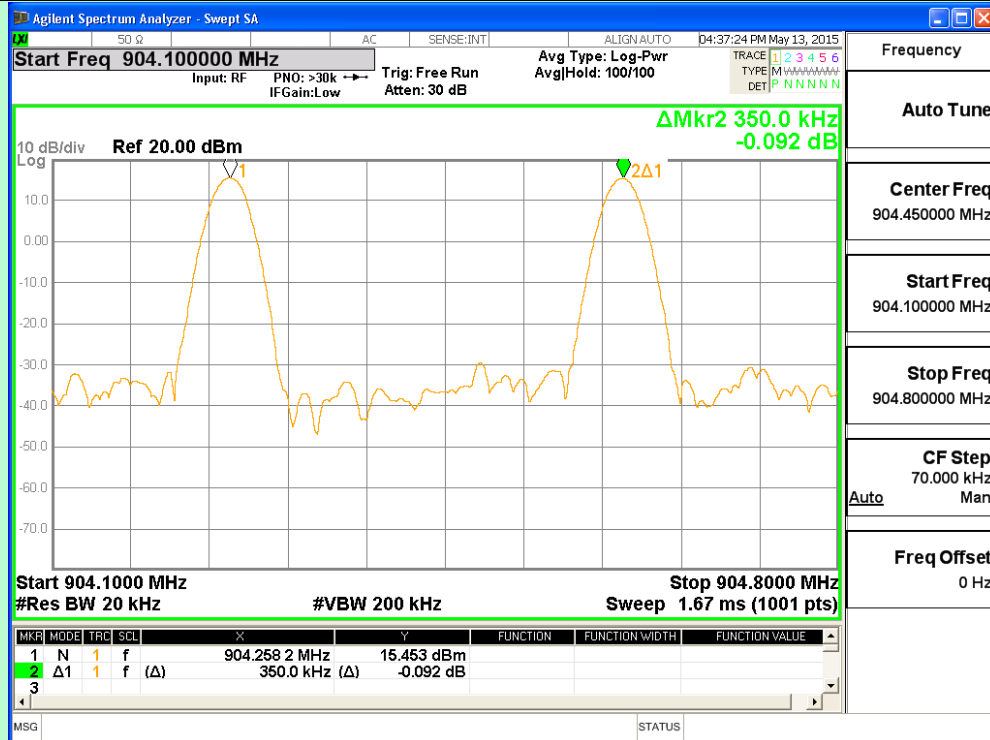
TEST GRAPHS



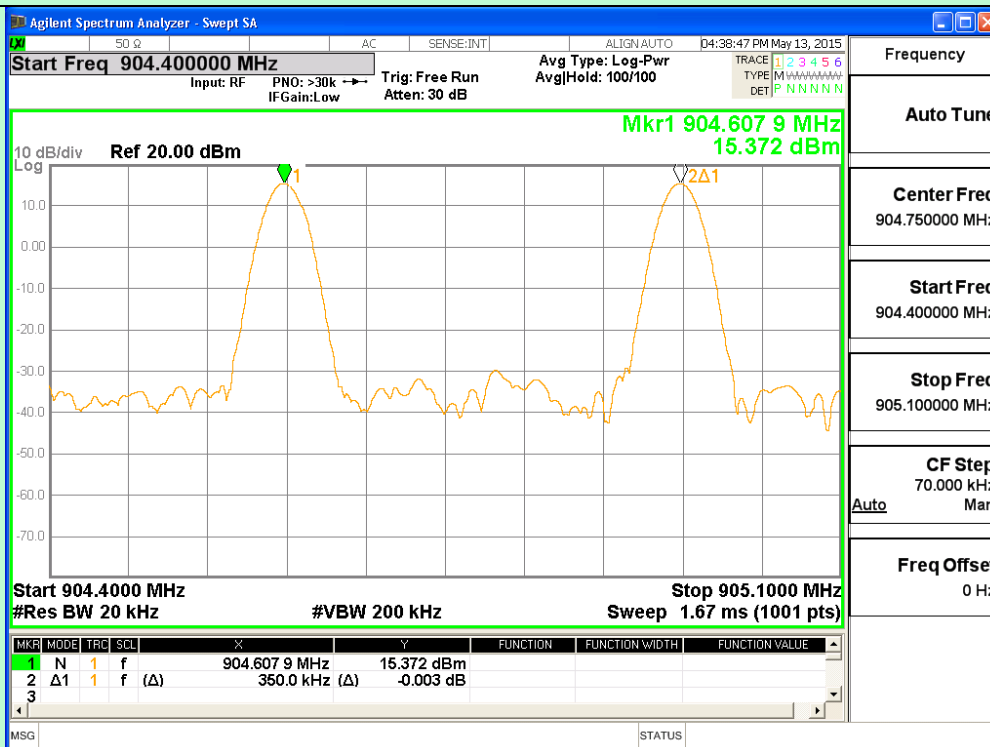
Channel 1 and 2



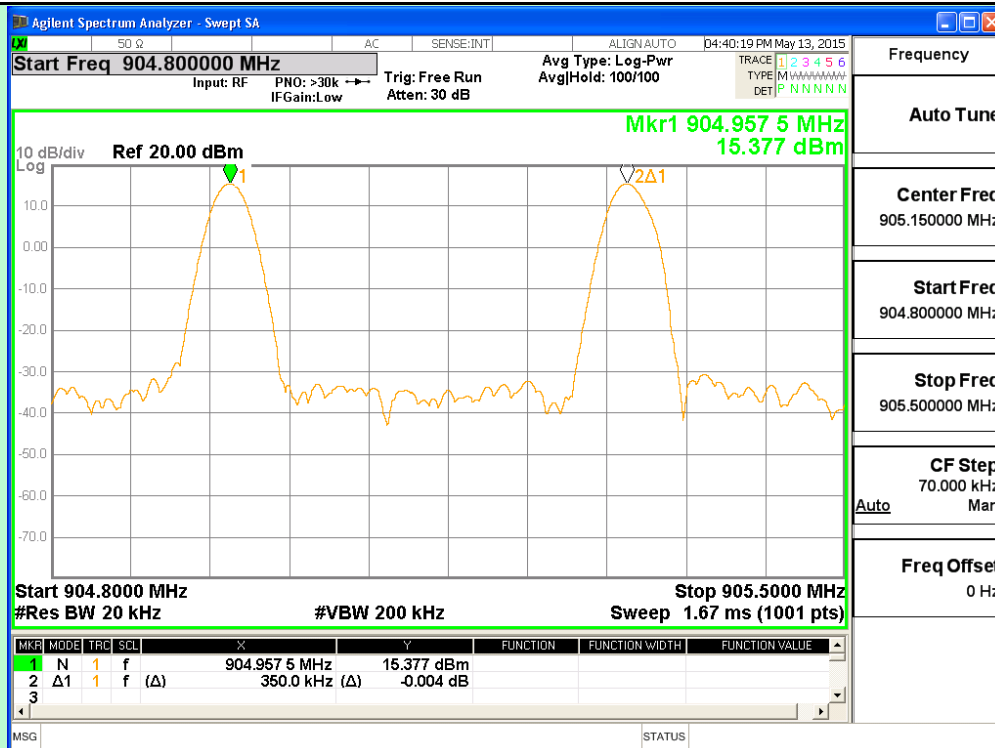
Channel 2 and 3



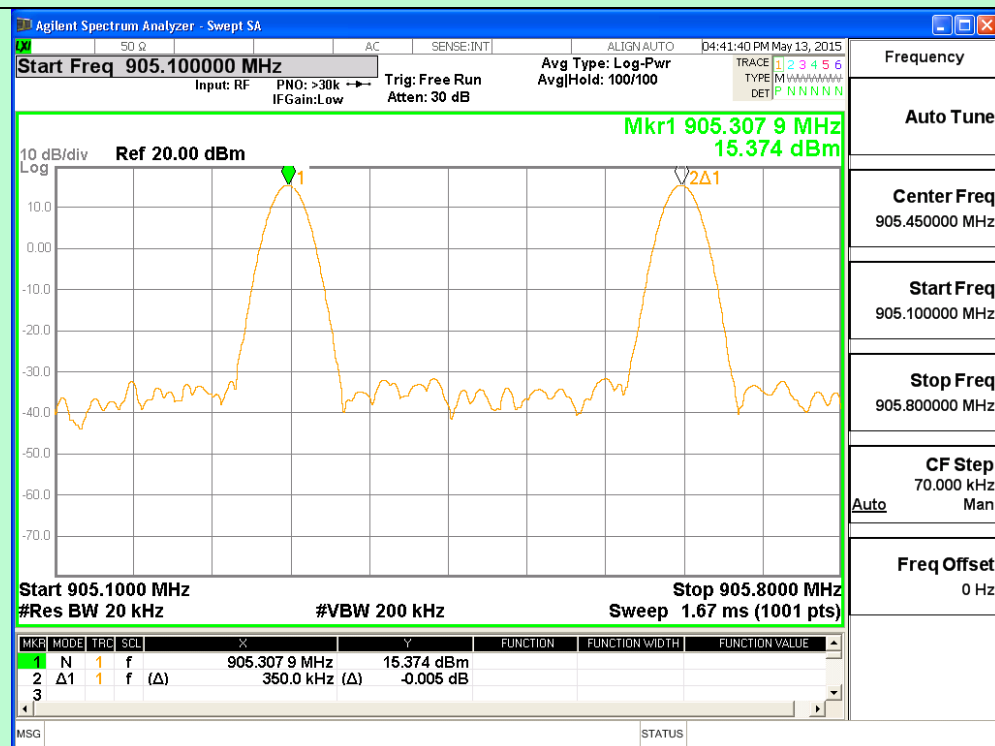
Channel 3 and 4



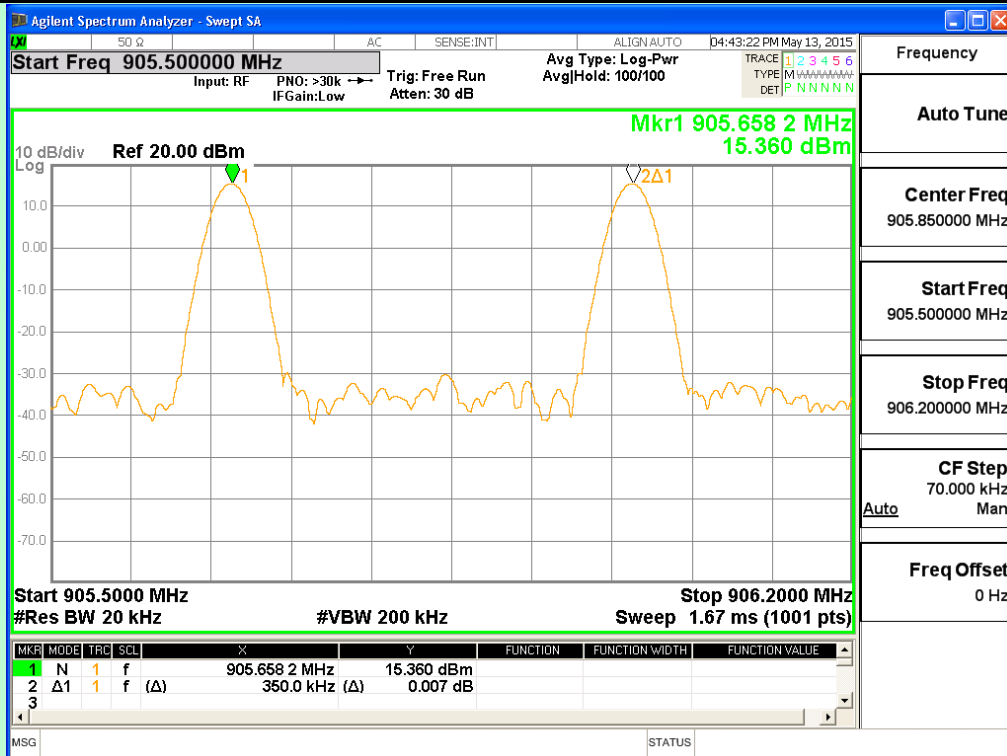
Channel 4 and 5



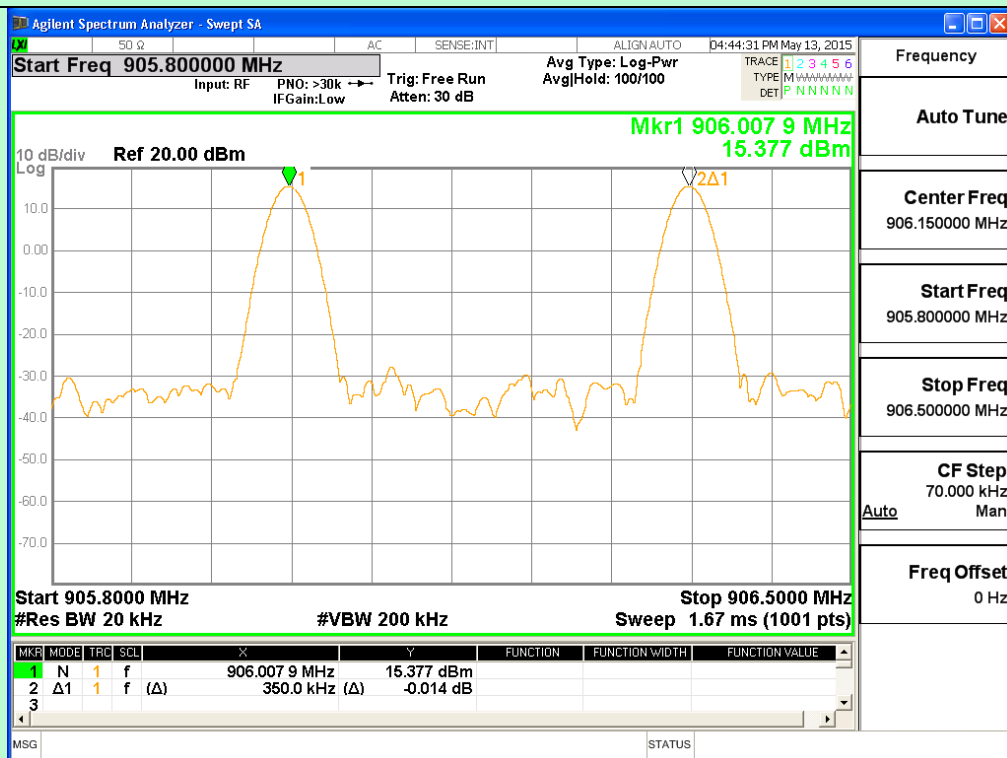
Channel 5 and 6



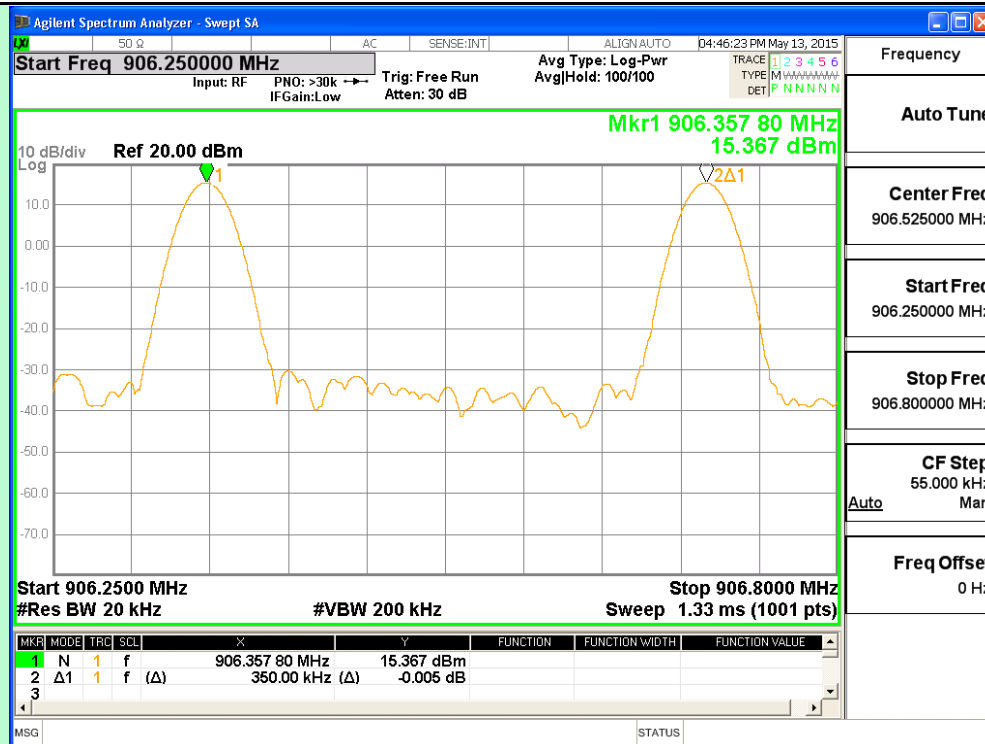
Channel 6 and 7



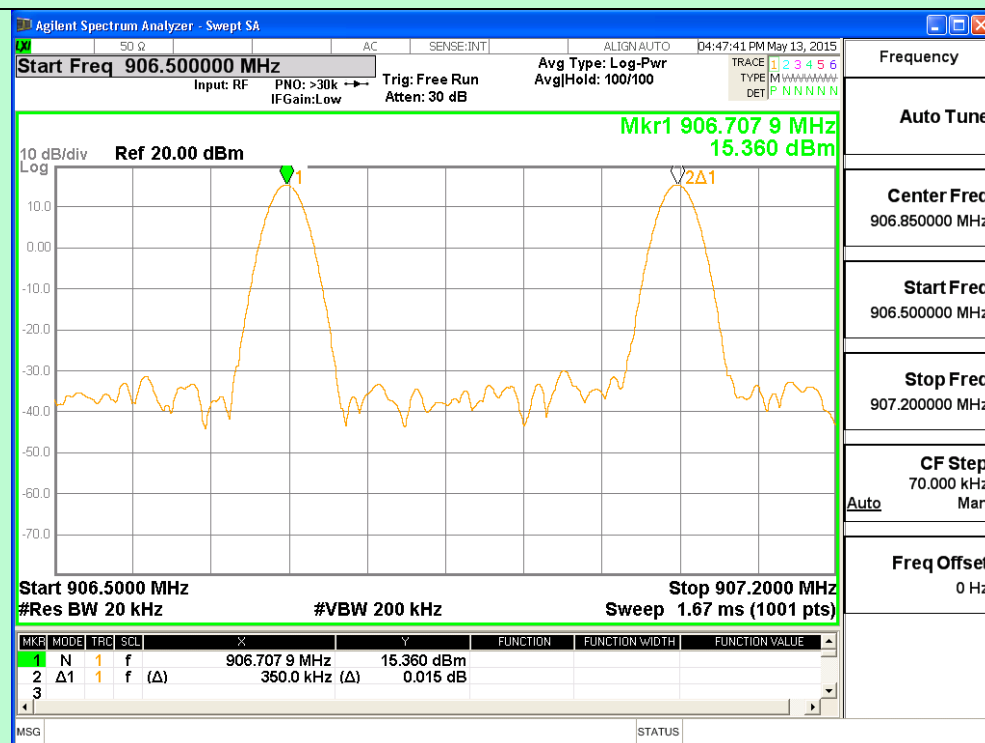
Channel 7 and 8



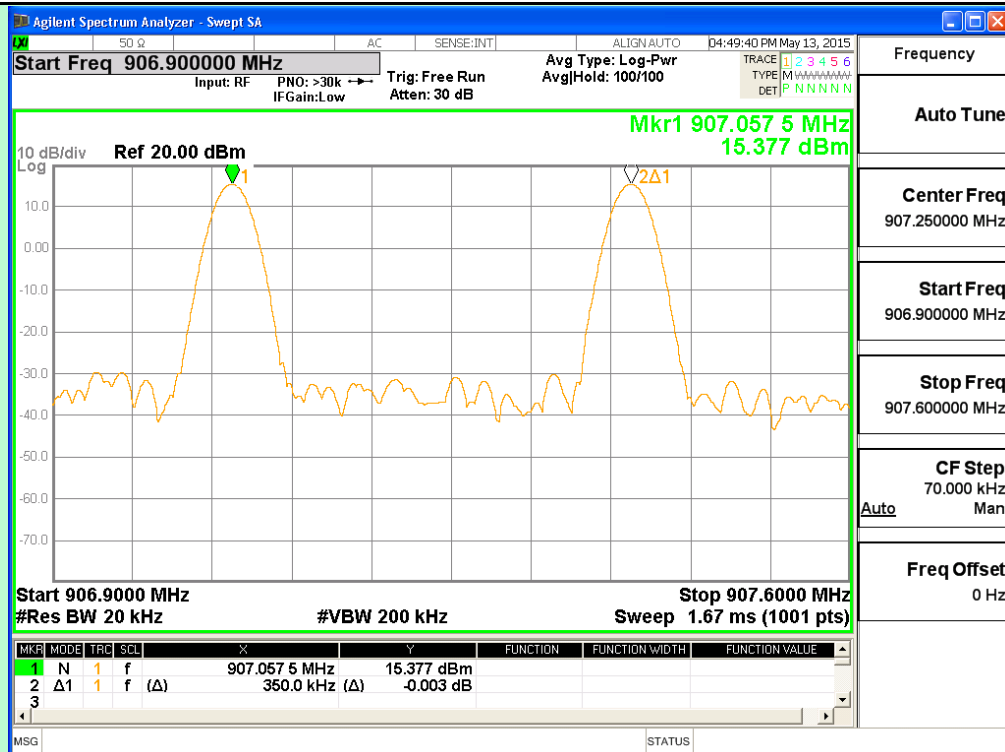
Channel 8 and 9



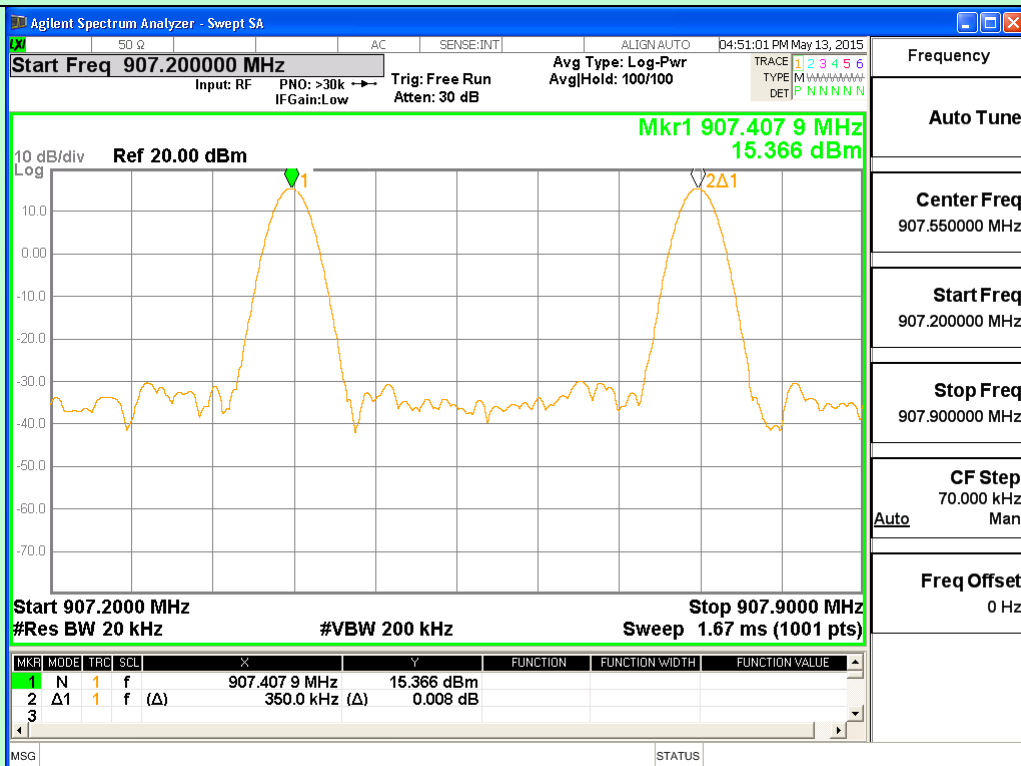
Channel 9 and 10



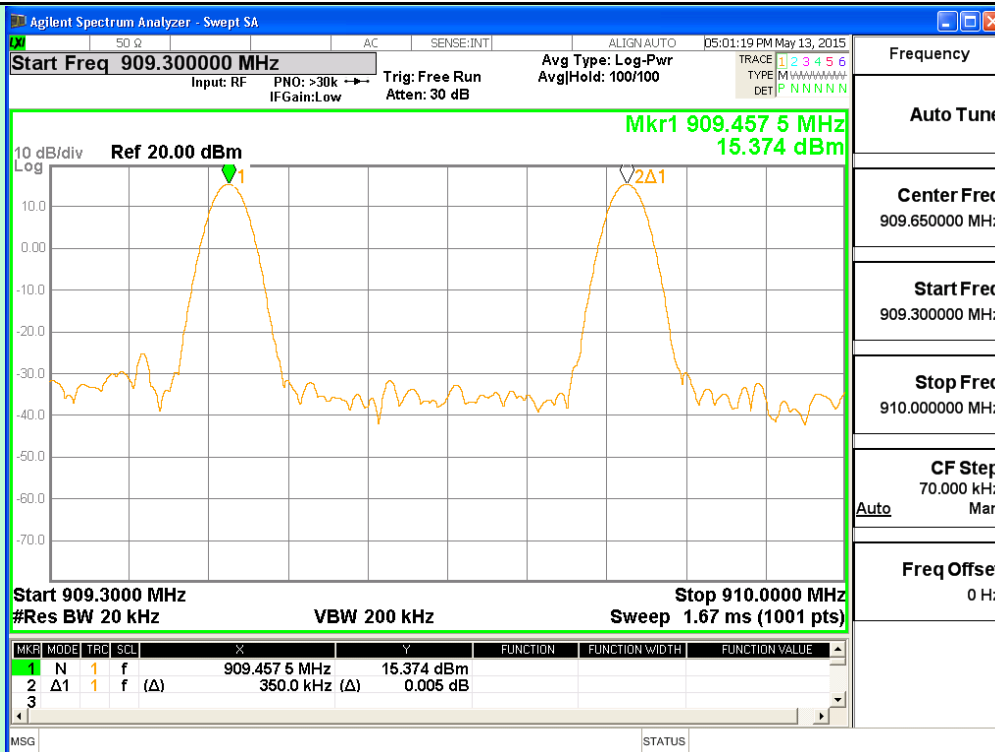
Channel 10 and 11



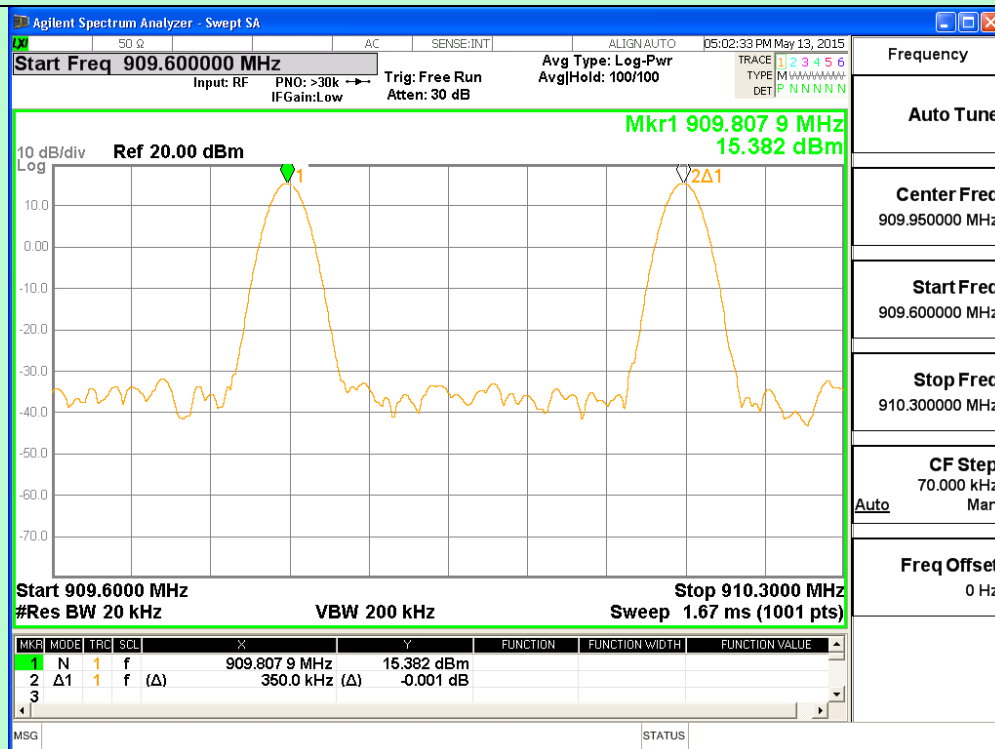
Channel 11 and 12



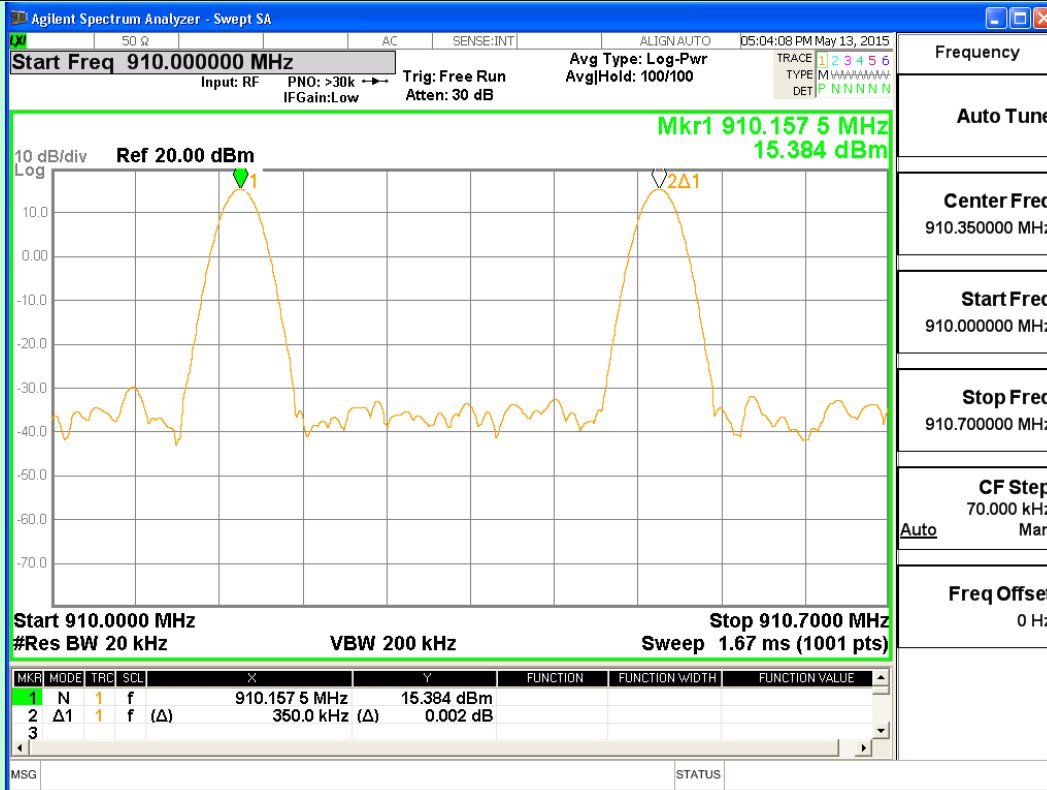
Channel 12 and 13



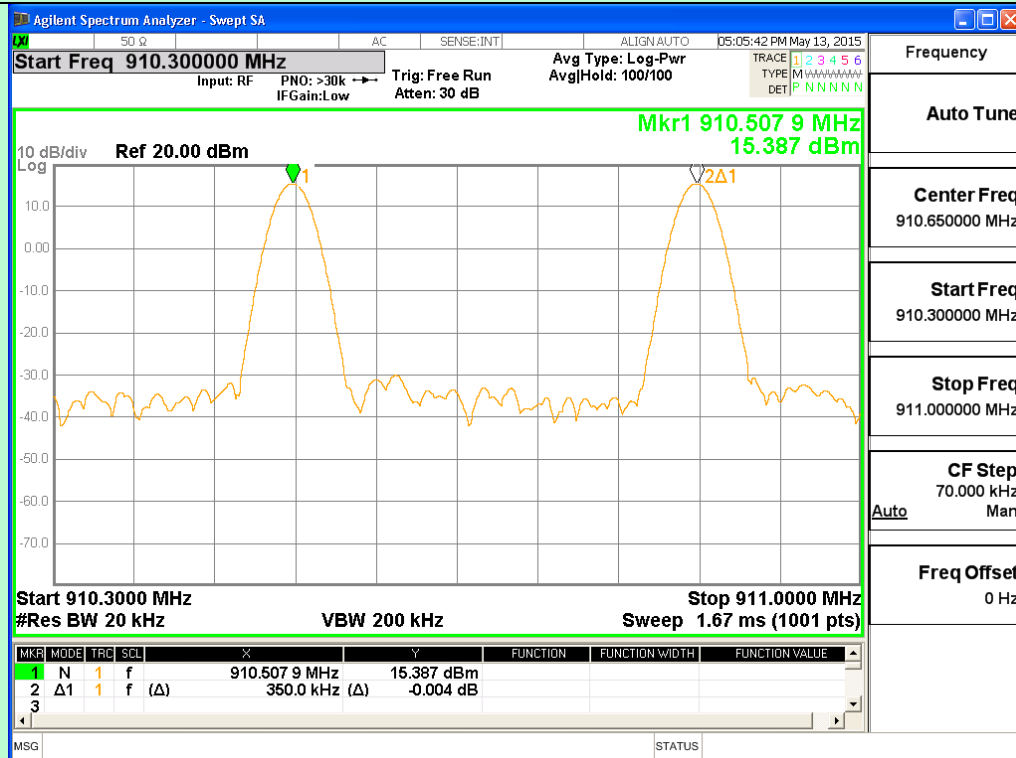
Channel 14 and 15



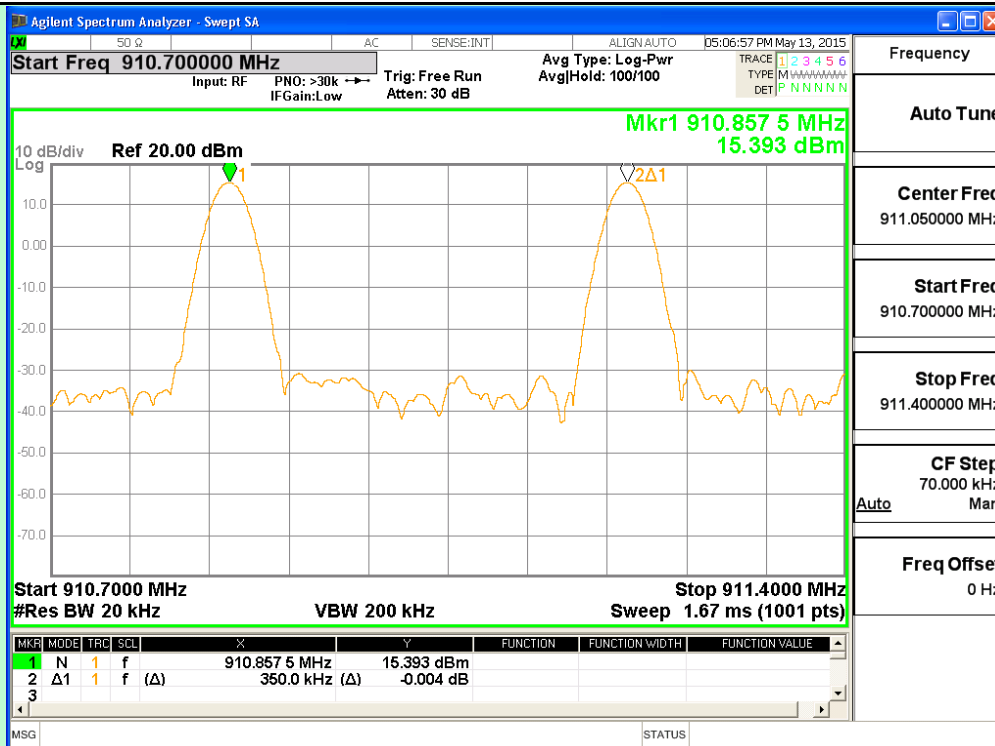
Channel 15 and 16



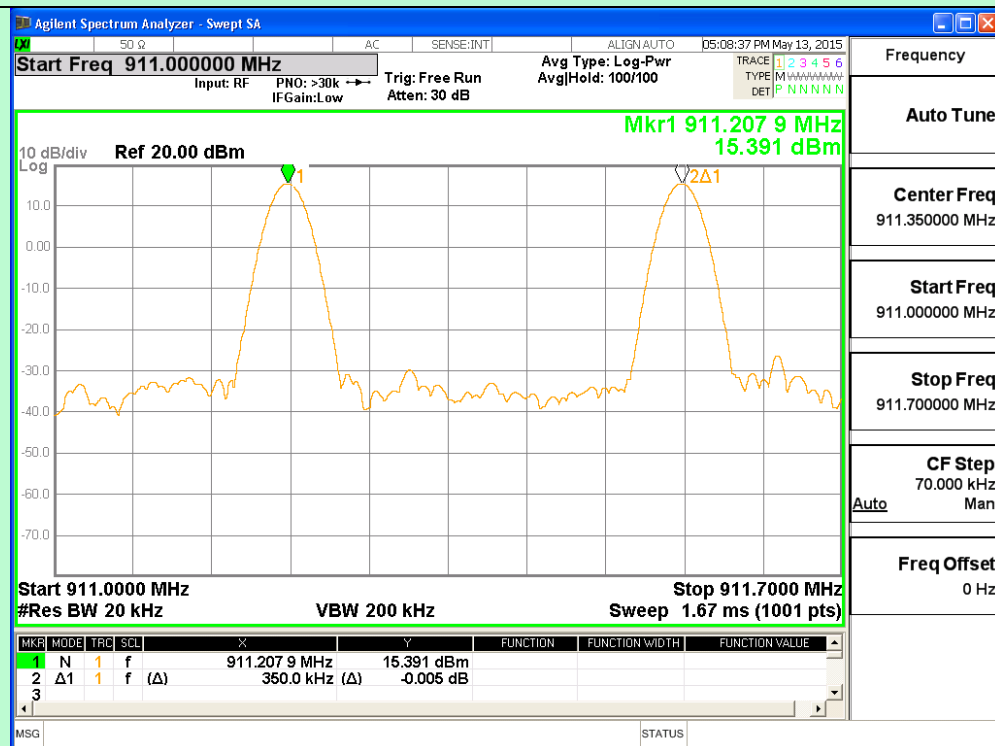
Channel 16 and 17



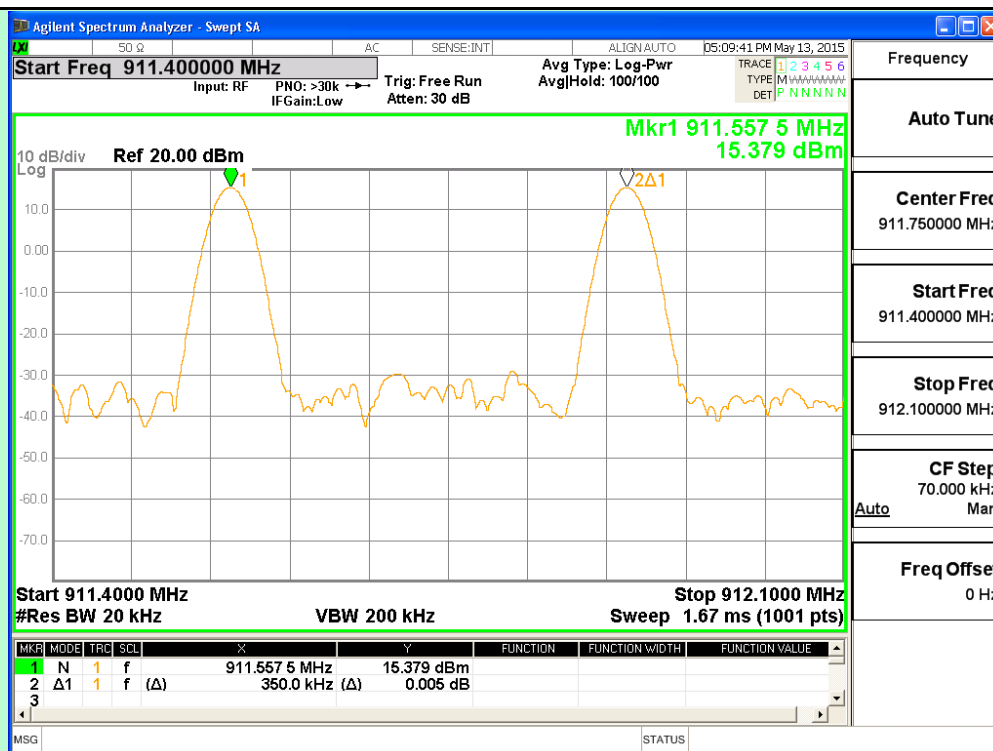
Channel 17 and 18



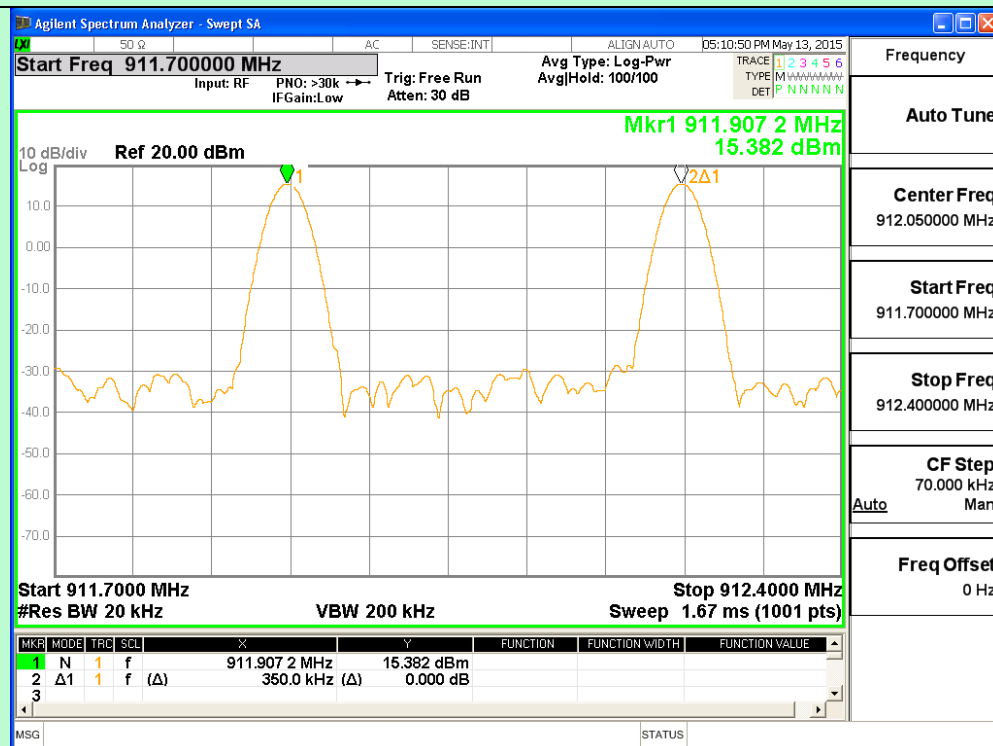
Channel 18 and 19



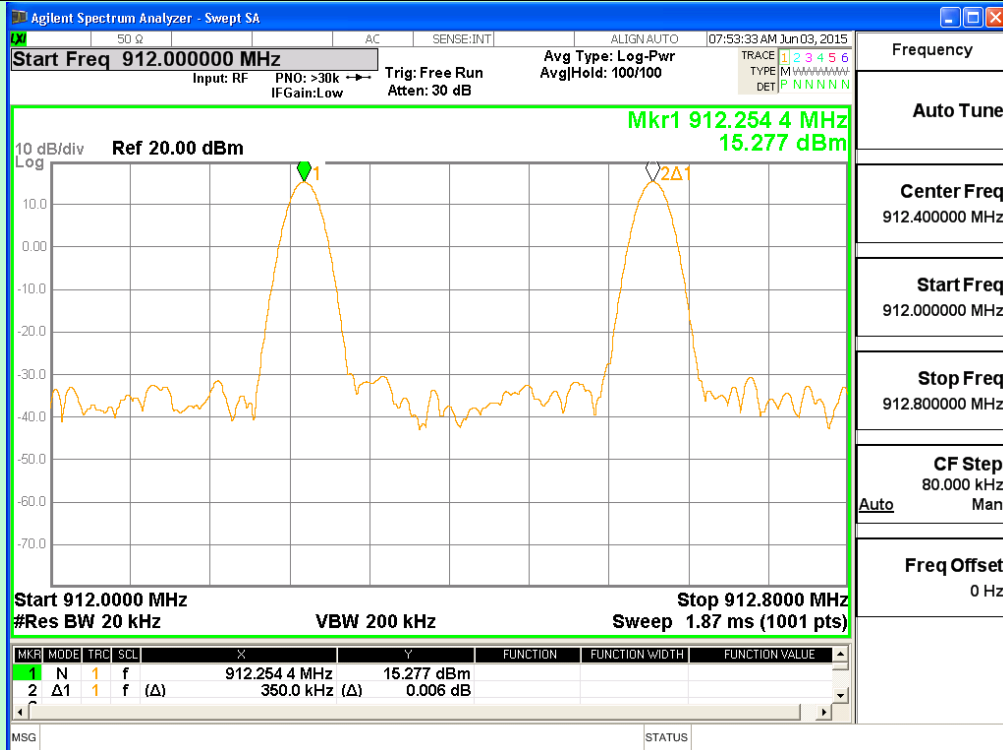
Channel 19 and 20



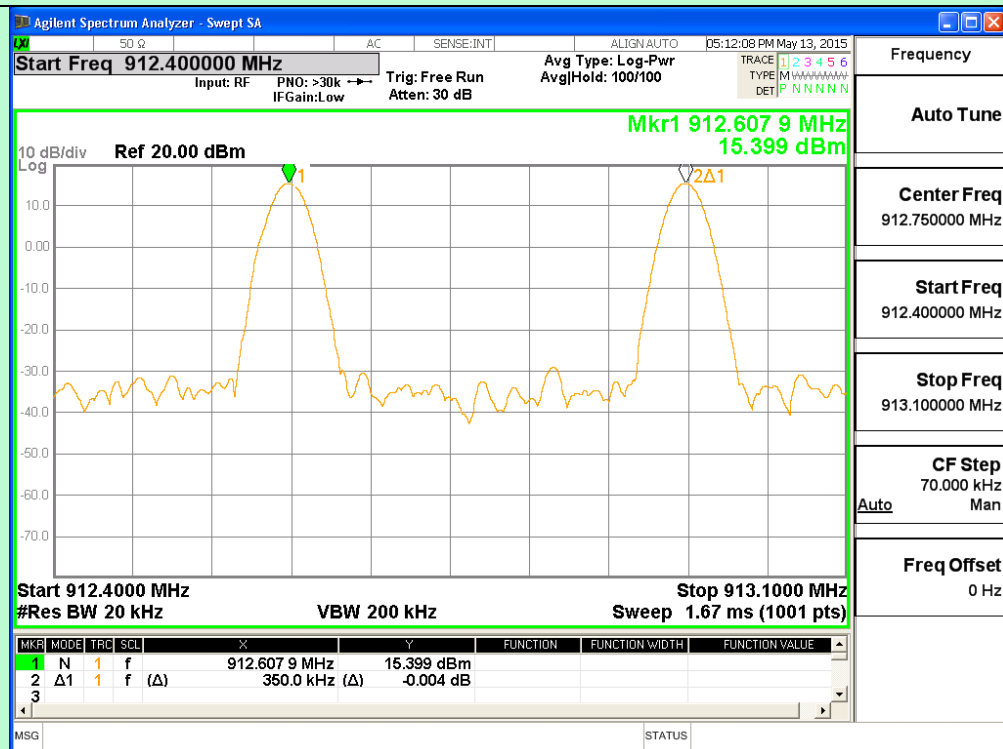
Channel 20 and 21



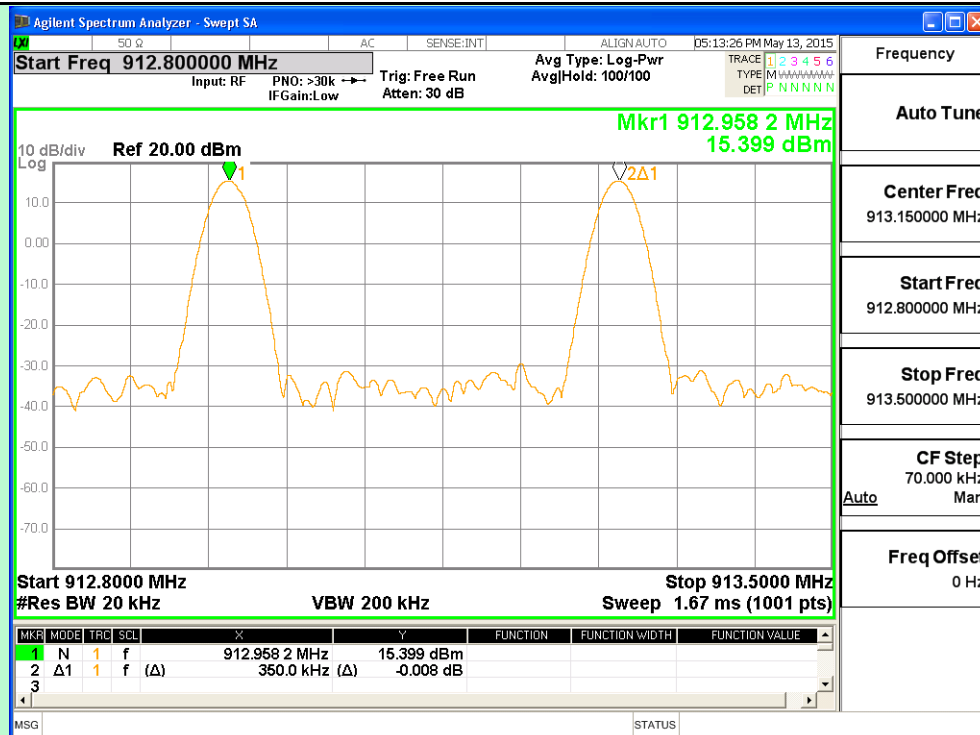
Channel 21 and 22



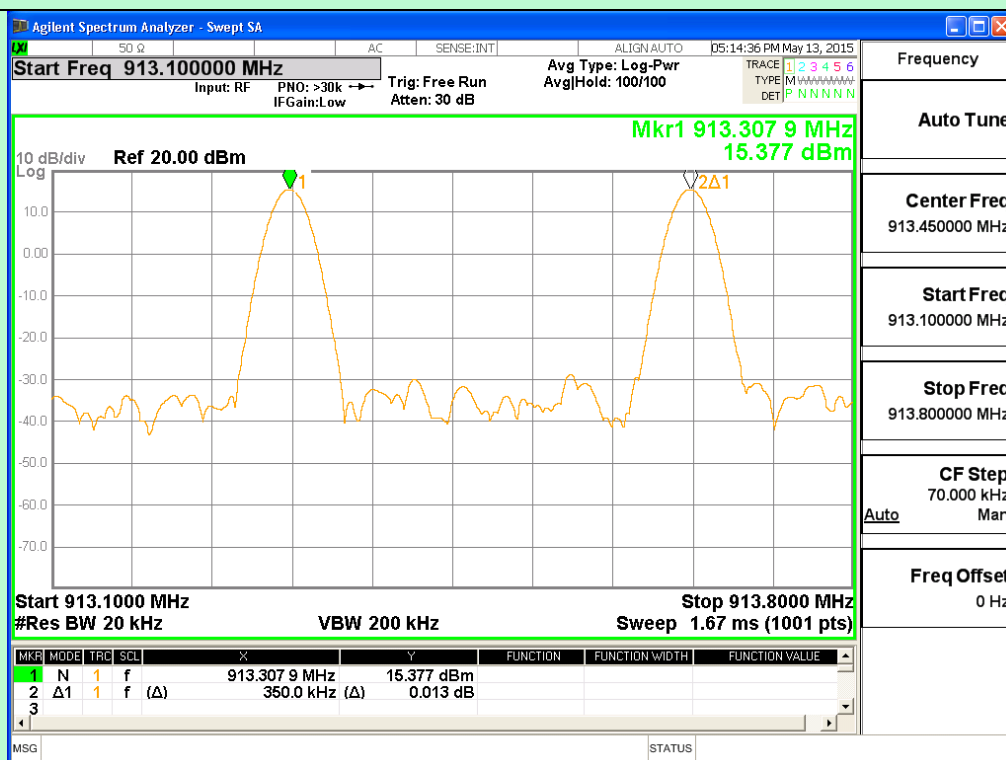
Channel 22 and 23



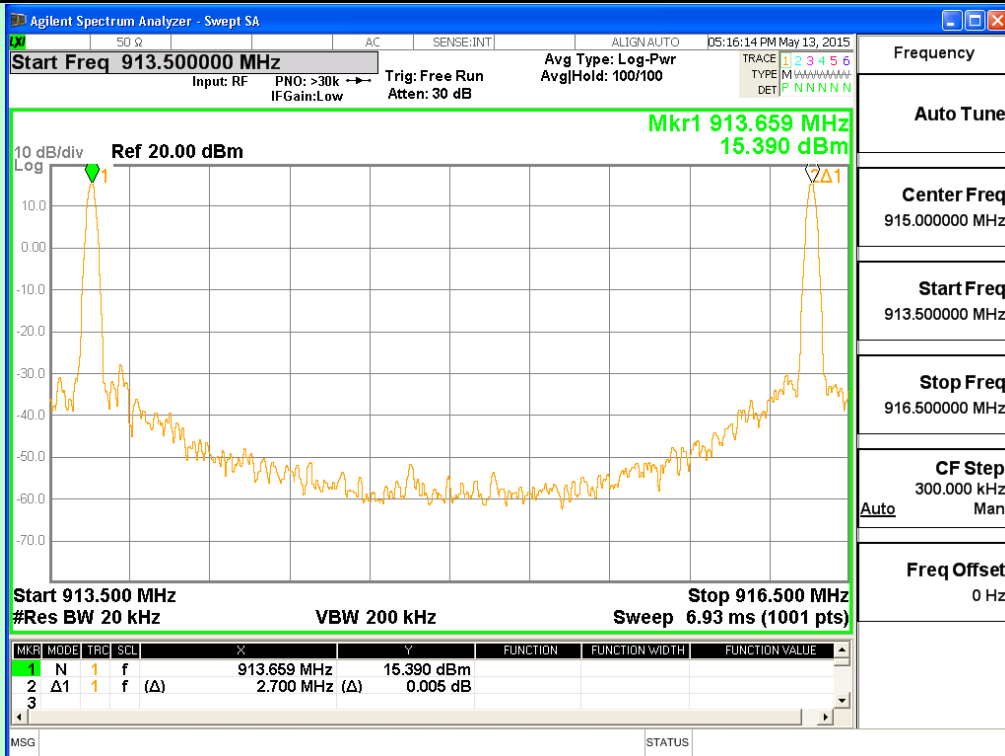
Channel 23 and 24



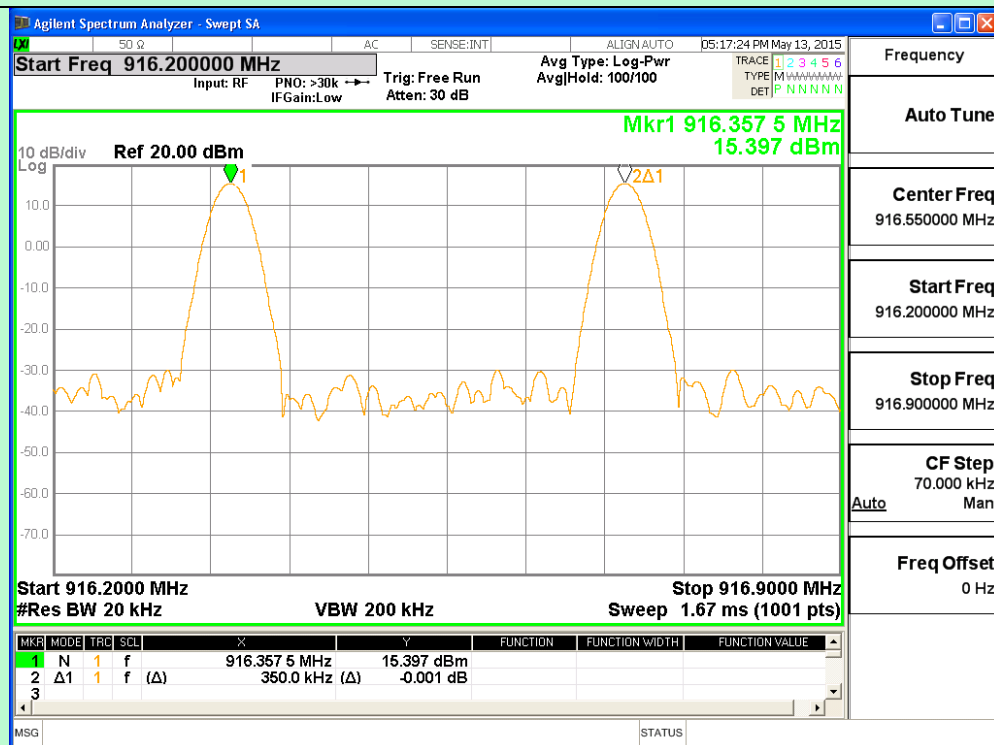
Channel 24 and 25



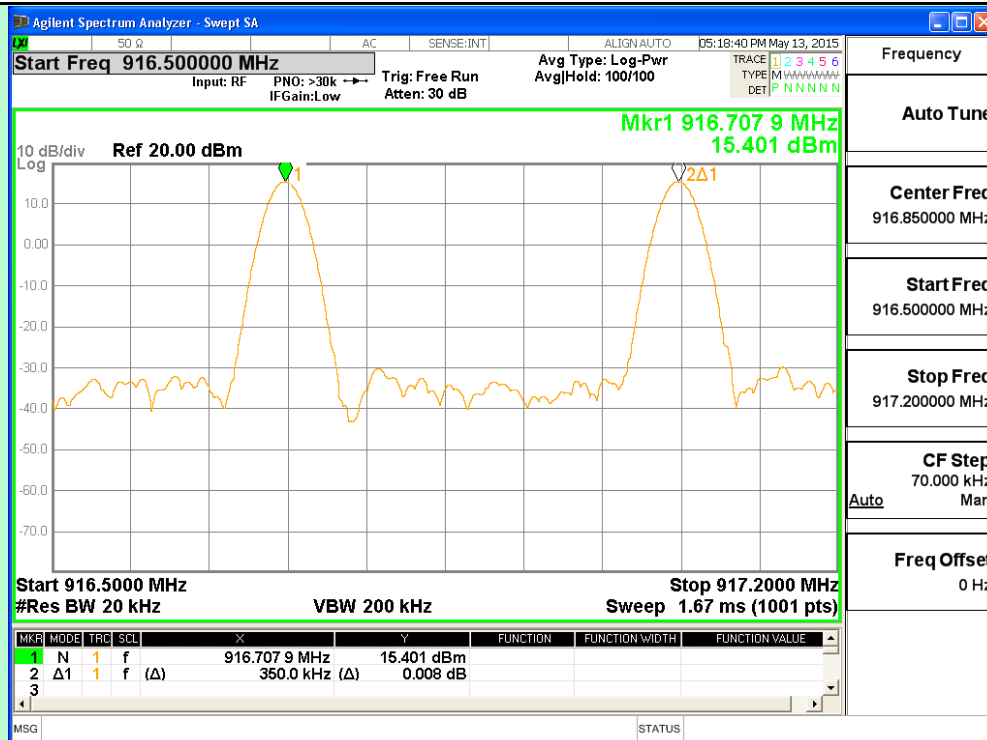
Channel 25 and 26



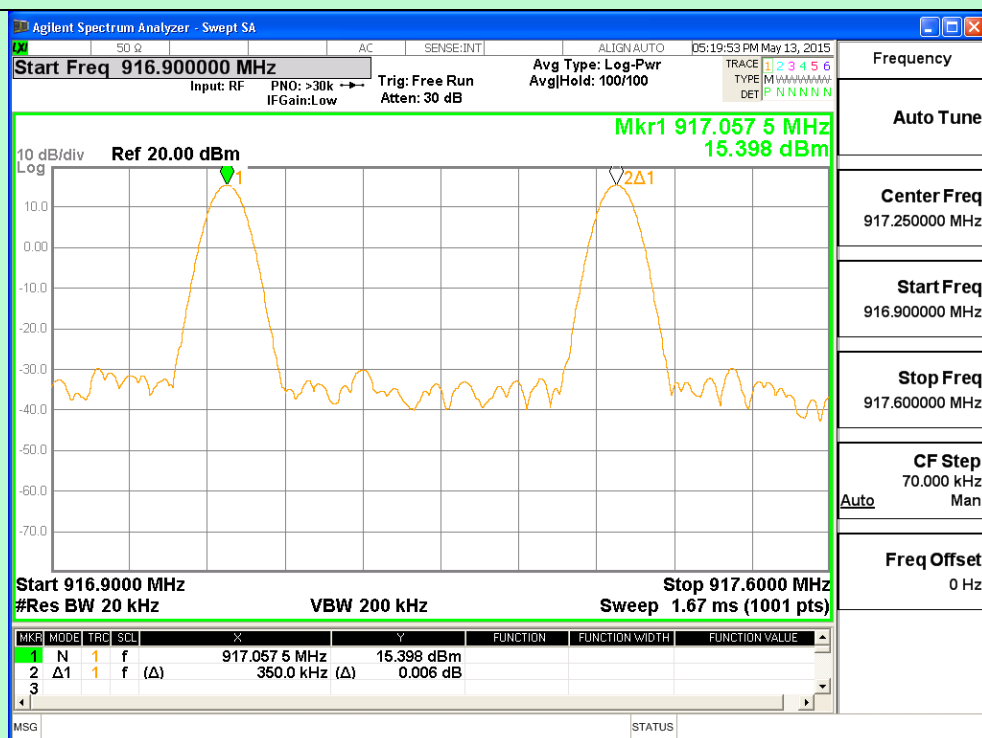
Channel 26 and 27



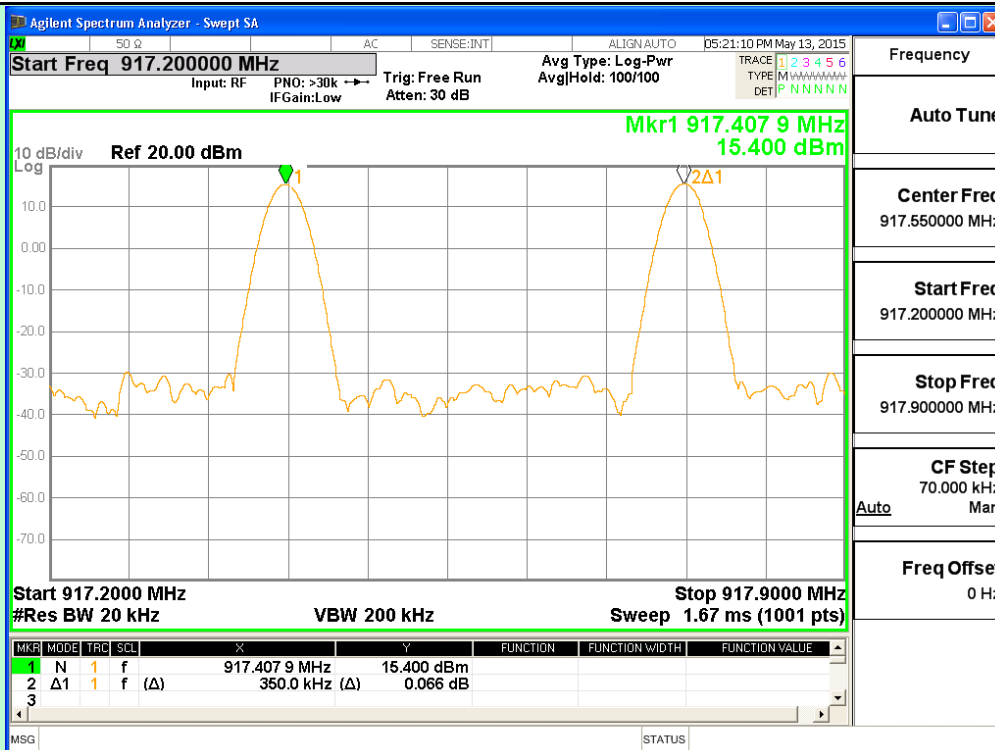
Channel 27 and 28



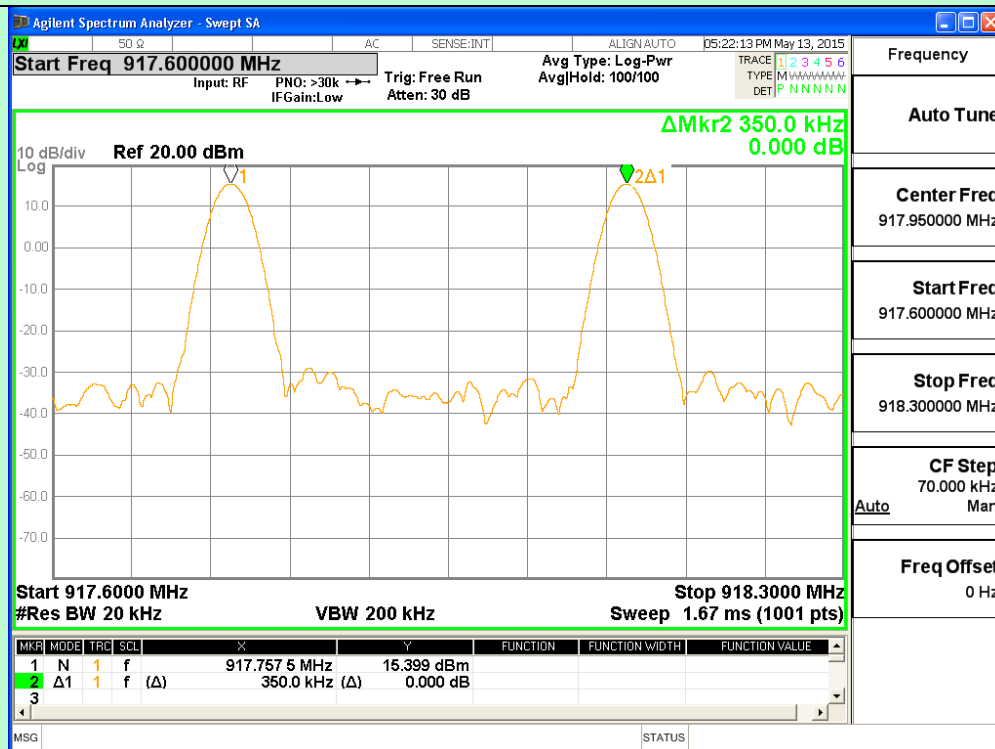
Channel 28 and 29



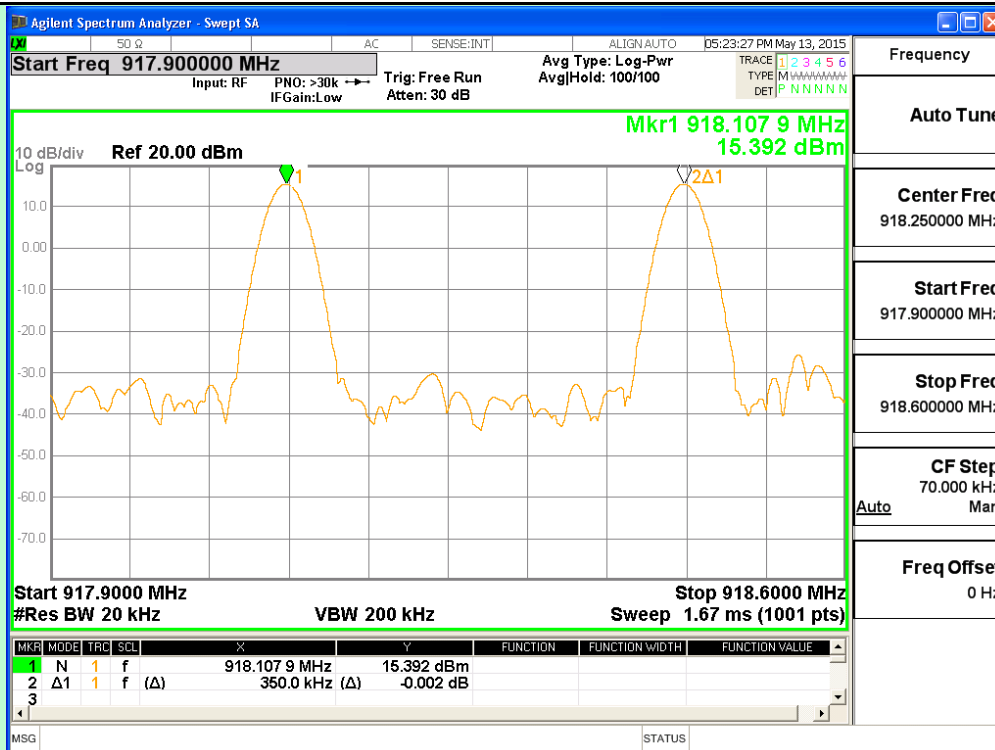
Channel 29 and 30



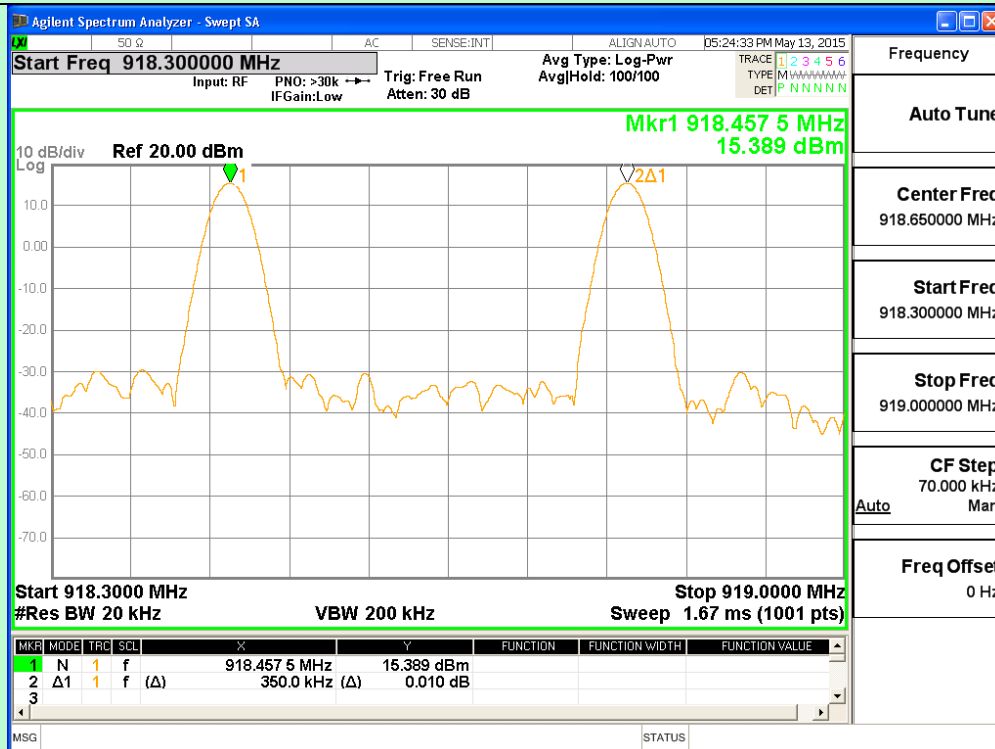
Channel 30 and 31



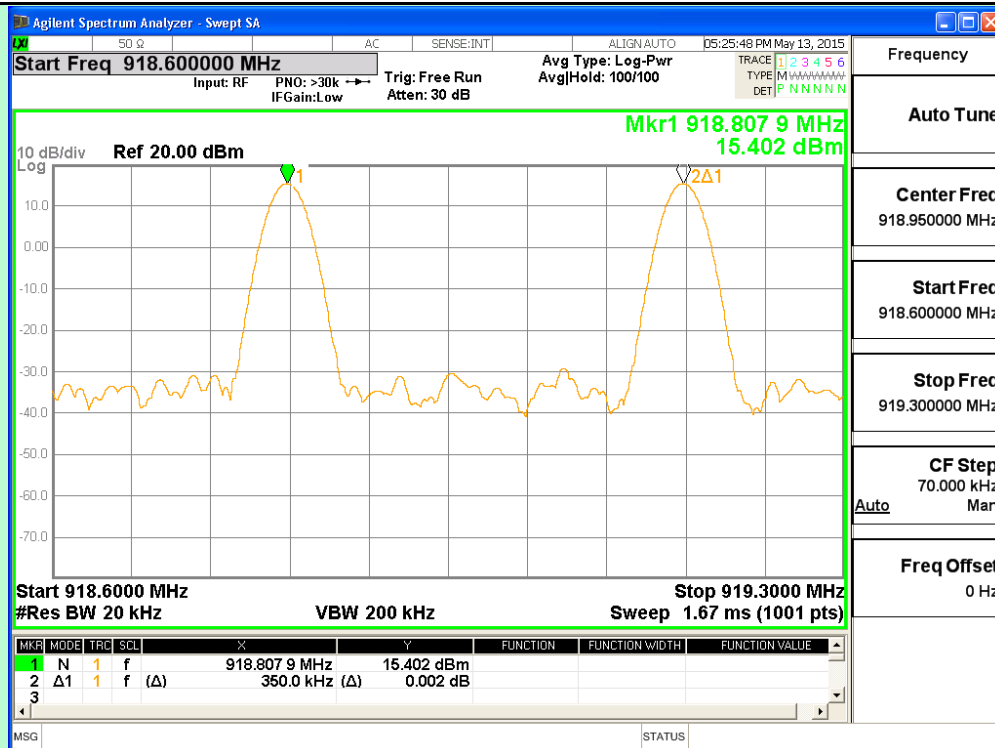
Channel 31 and 32



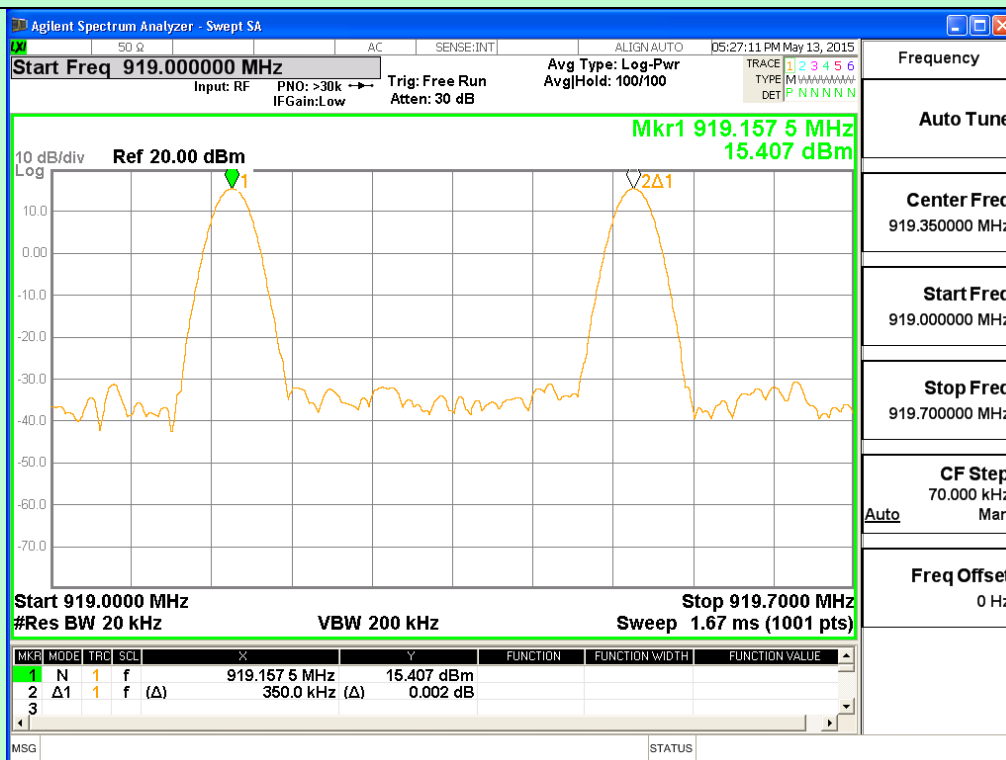
Channel 32 and 33



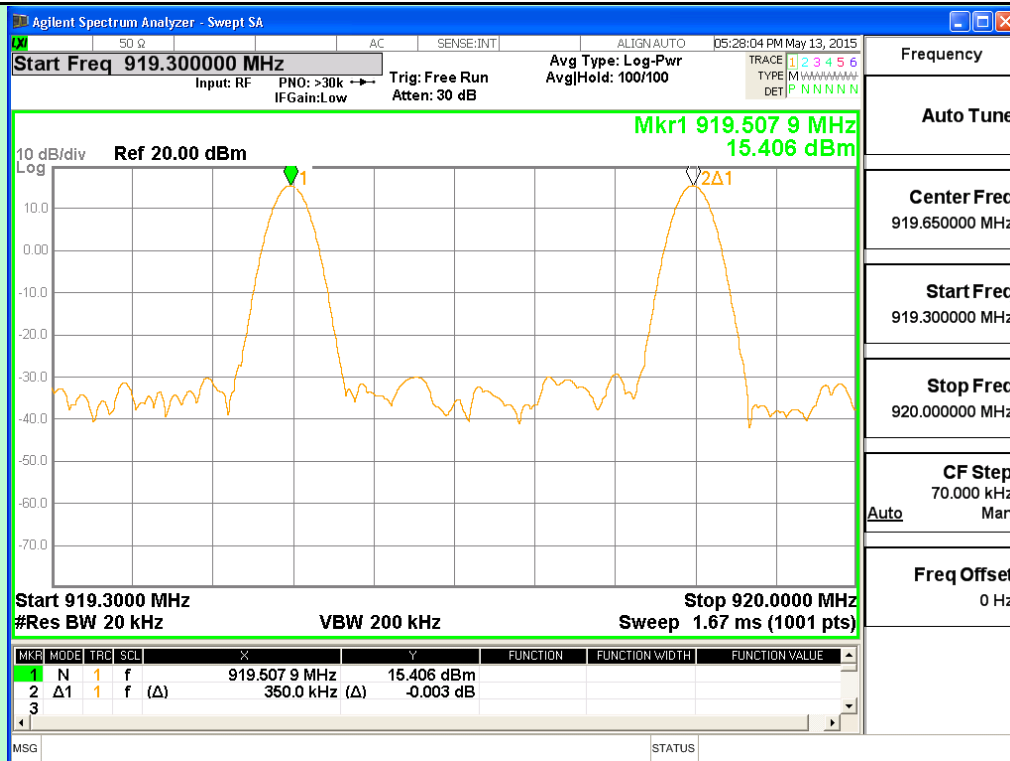
Channel 33 and 34



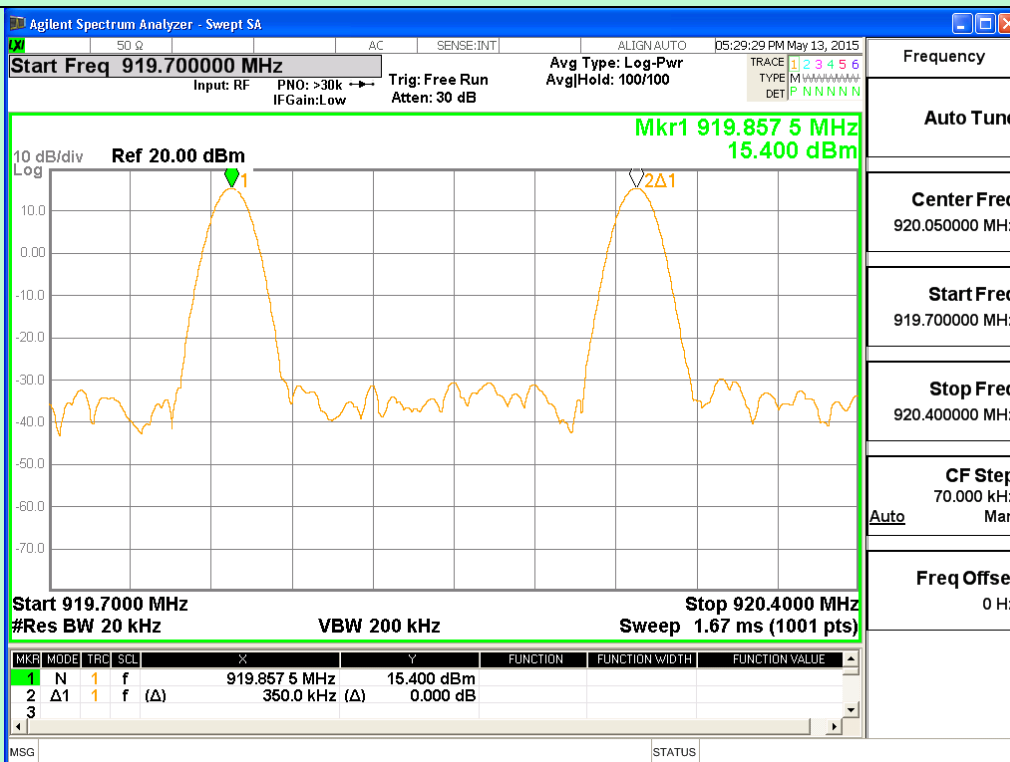
Channel 34 and 35



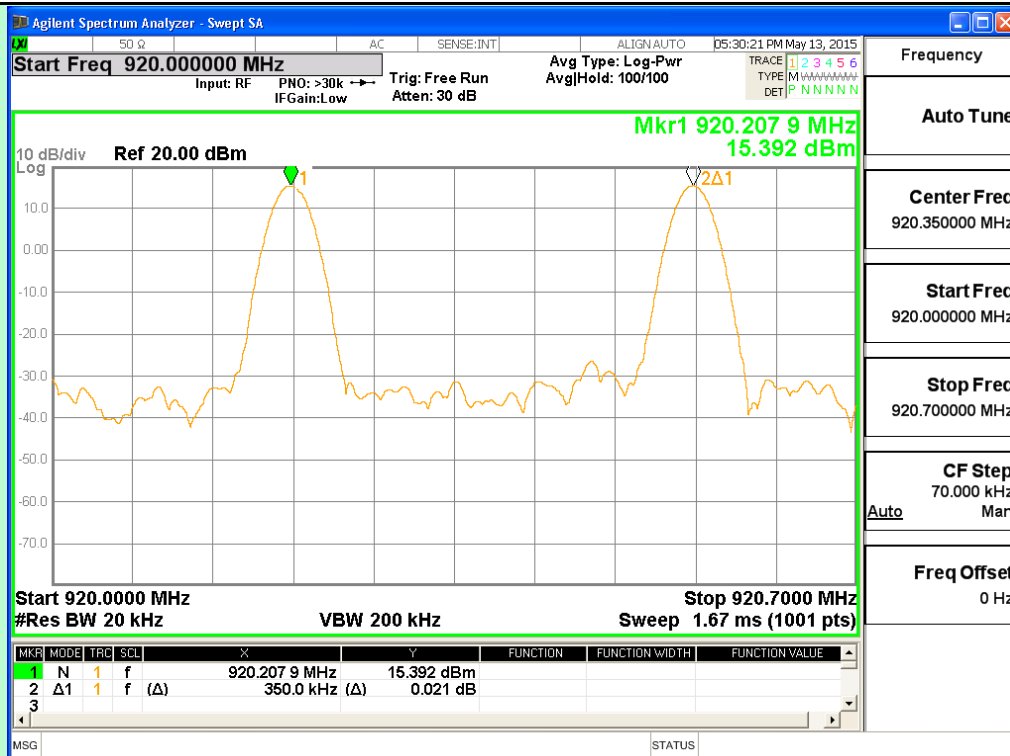
Channel 35 and 36



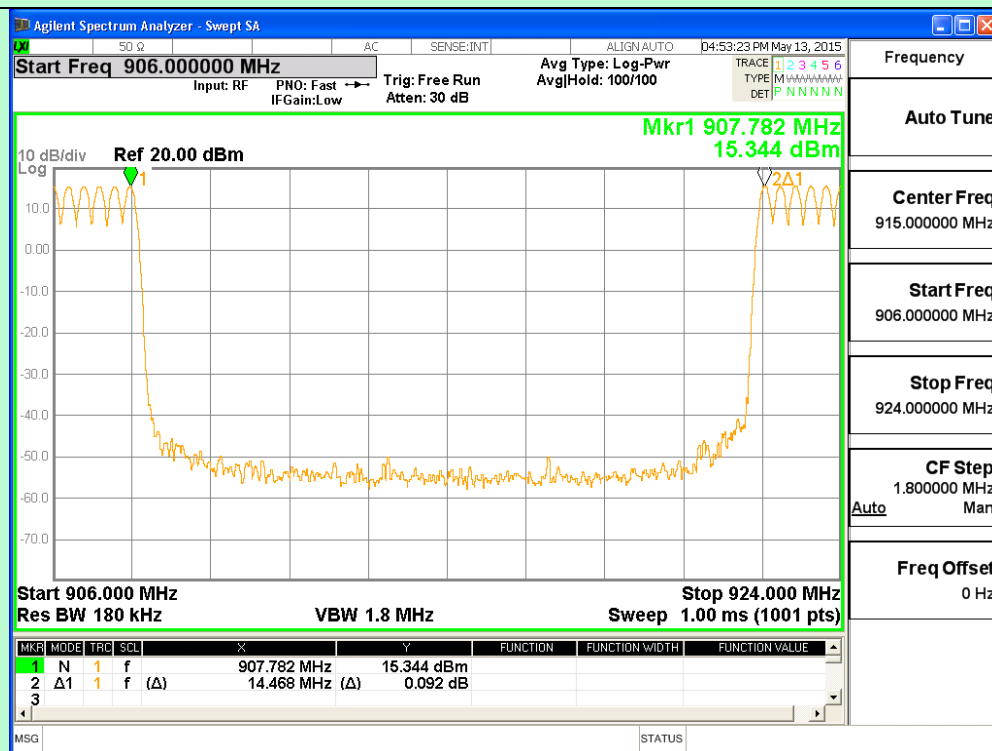
Channel 36 and 37



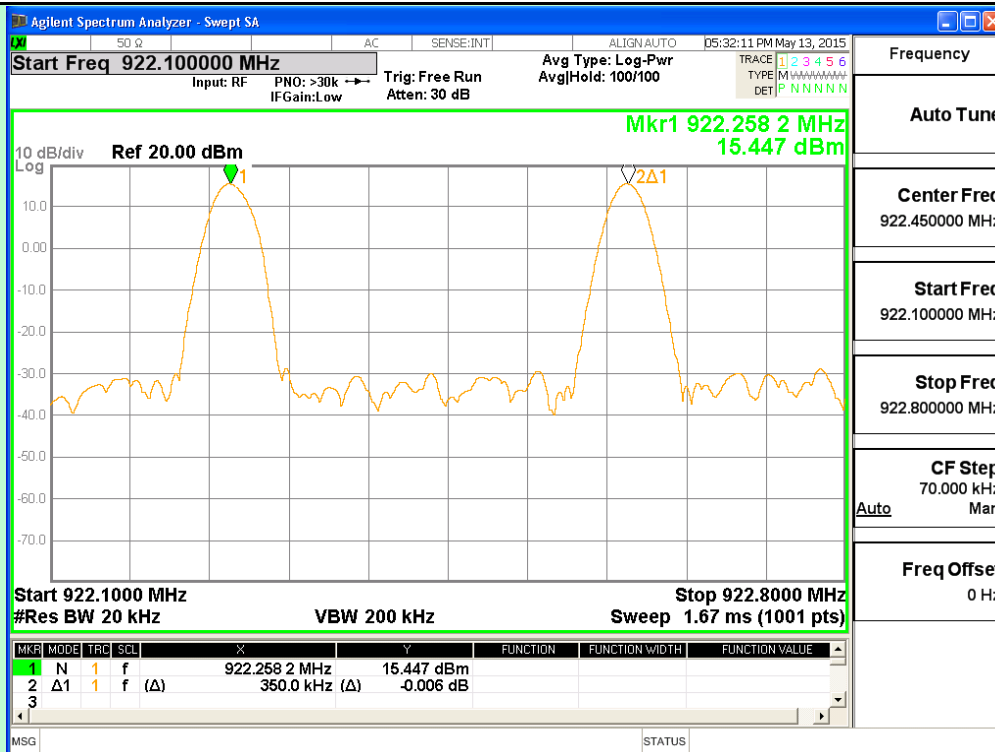
Channel 37 and 38



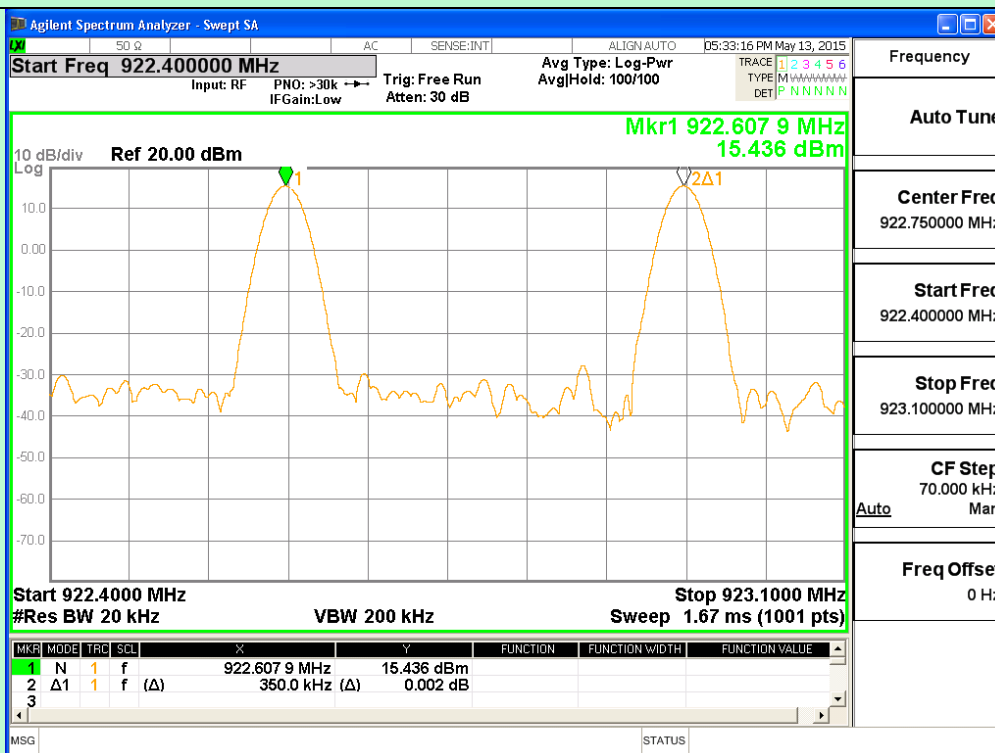
Channel 38 and 39



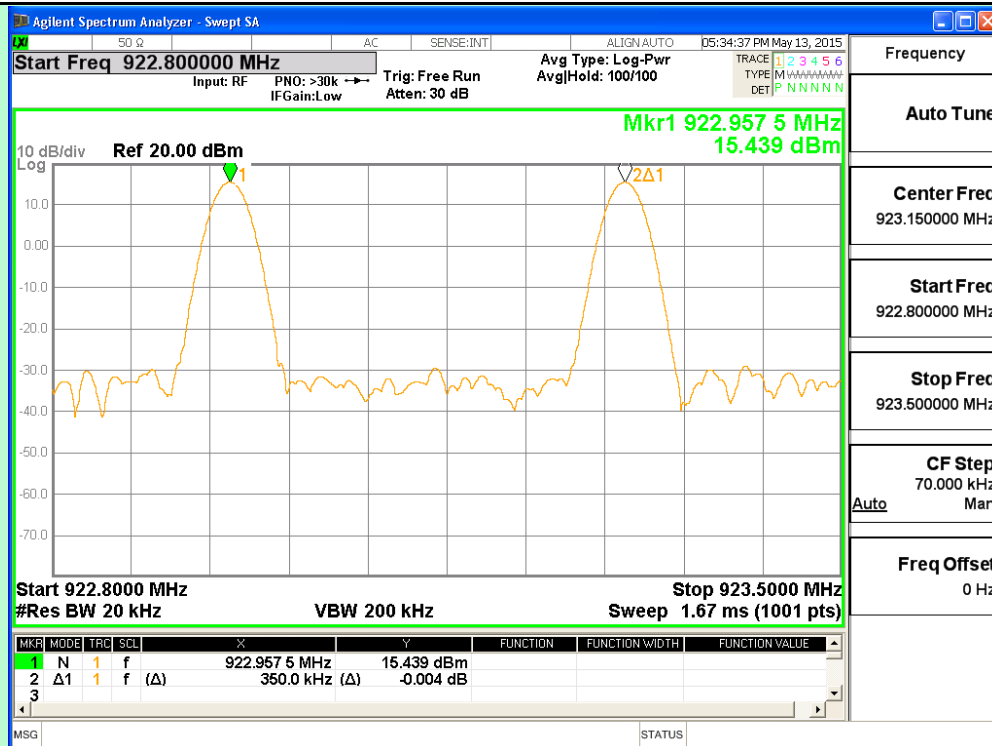
Channel 13 and 40



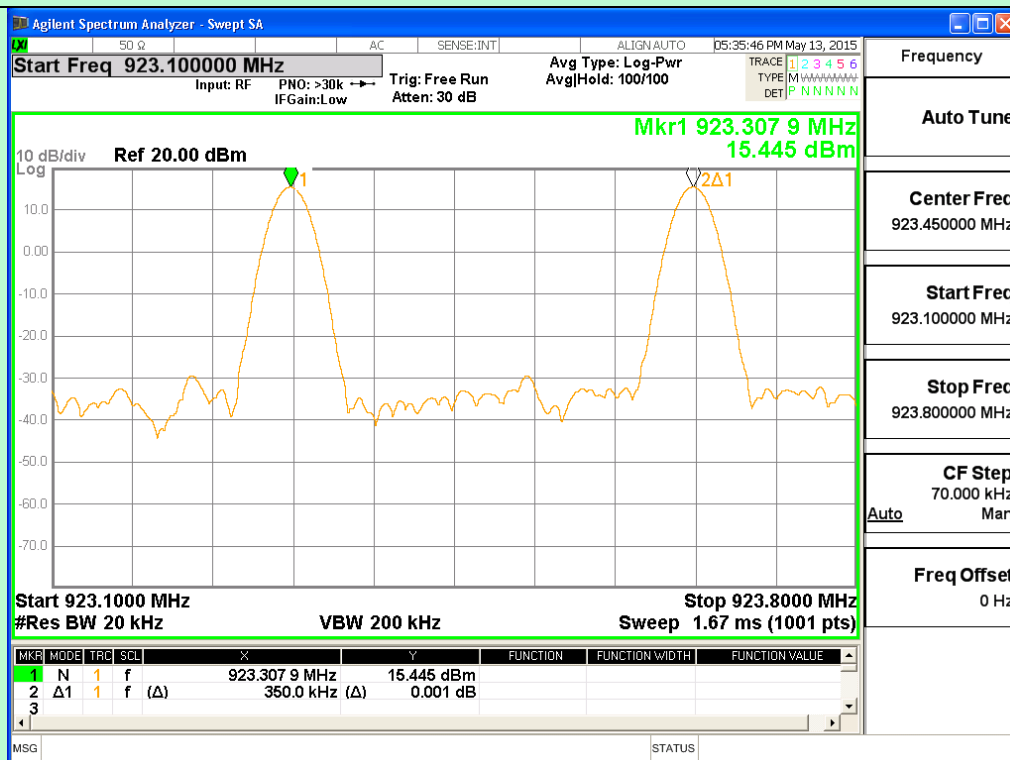
Channel 40 and 41



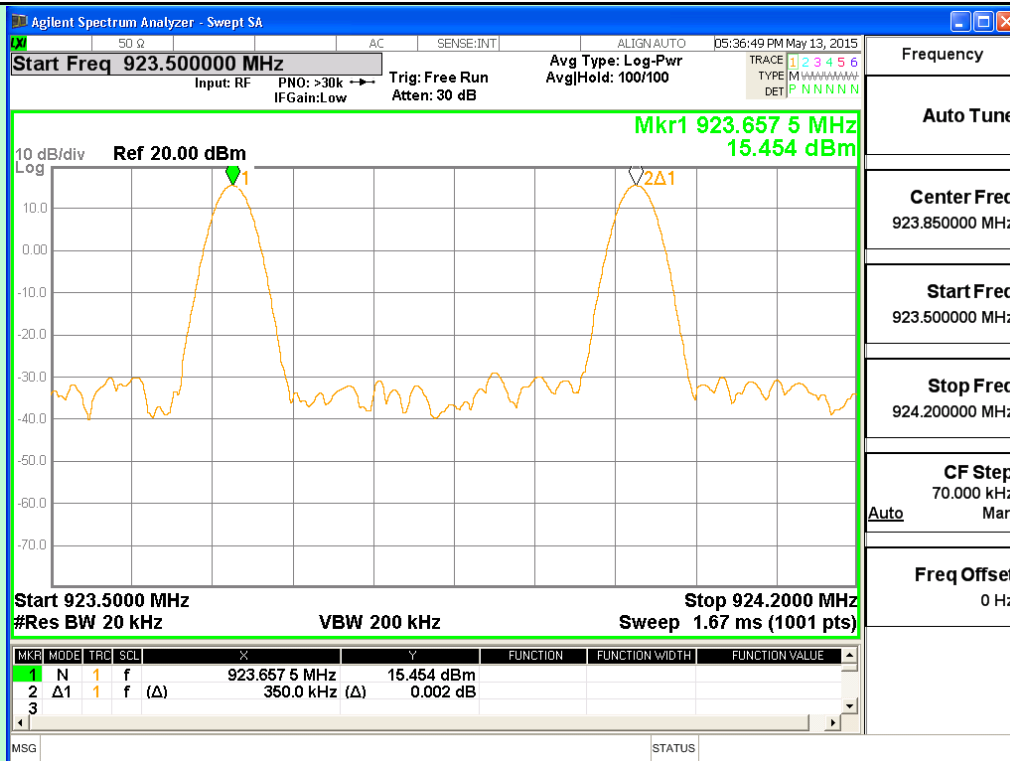
Channel 41 and 42



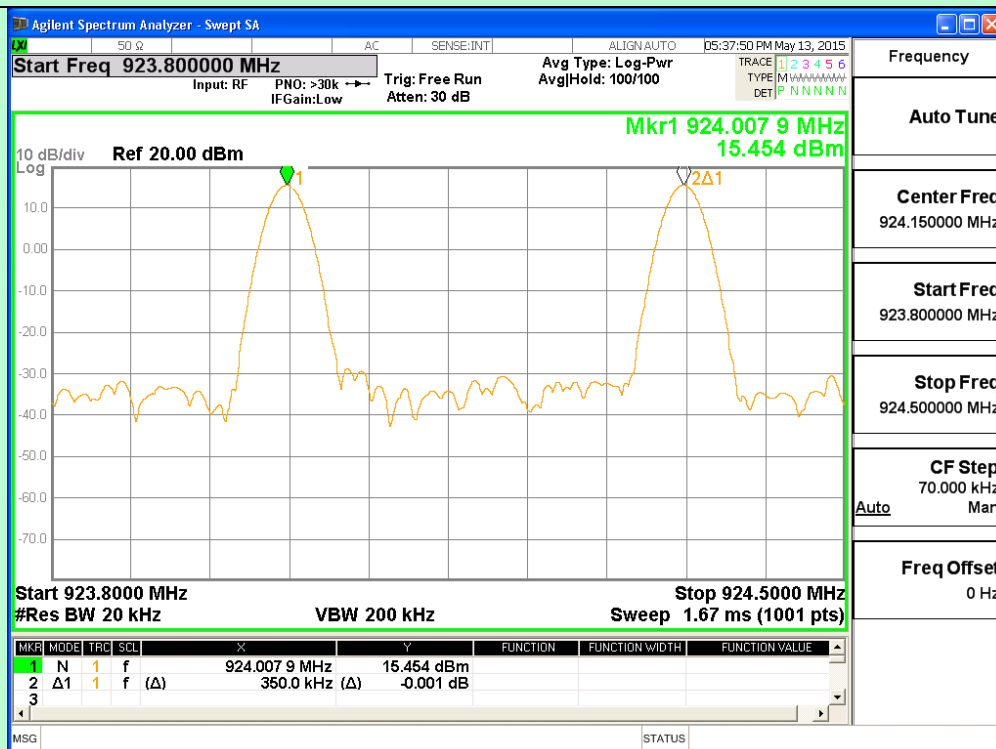
Channel 42 and 43



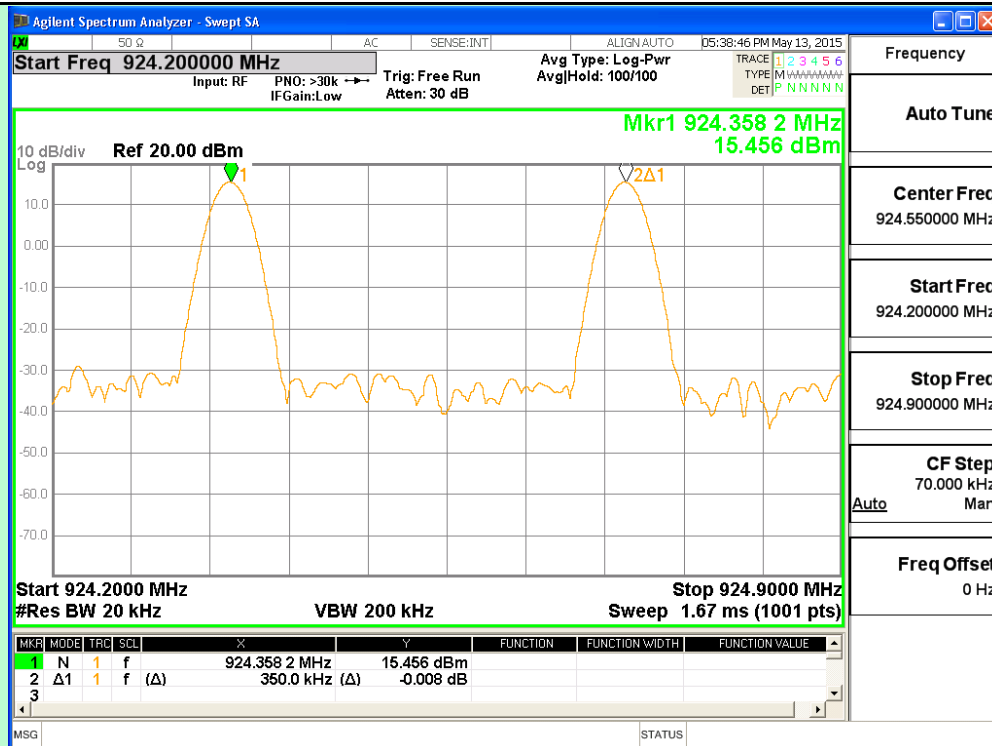
Channel 43 and 44



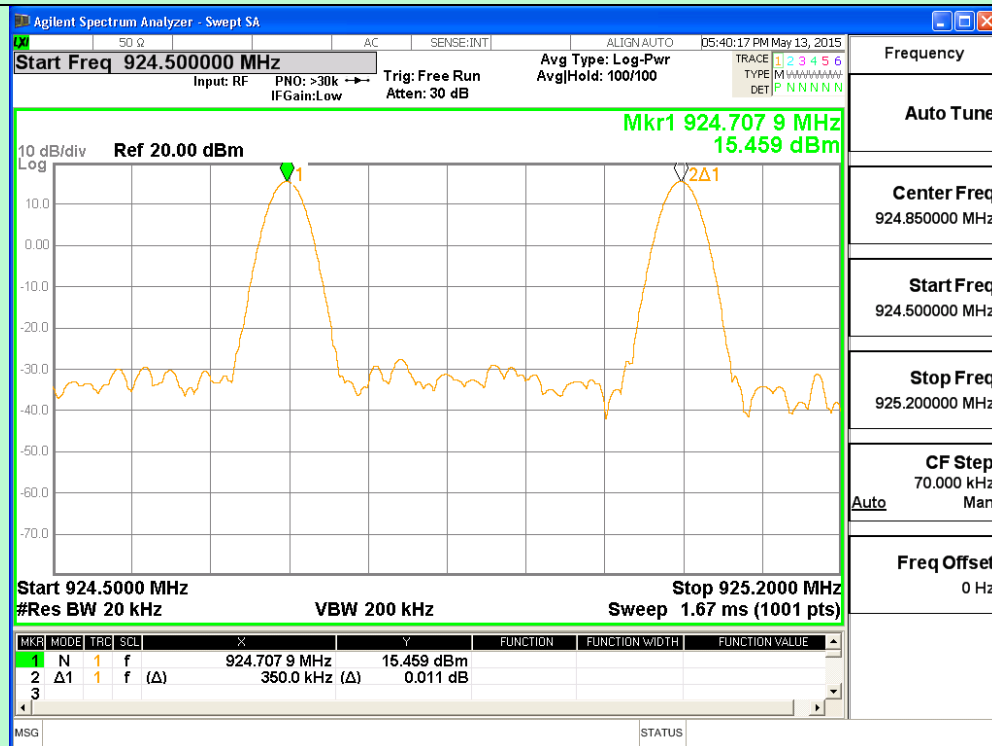
Channel 44 and 45



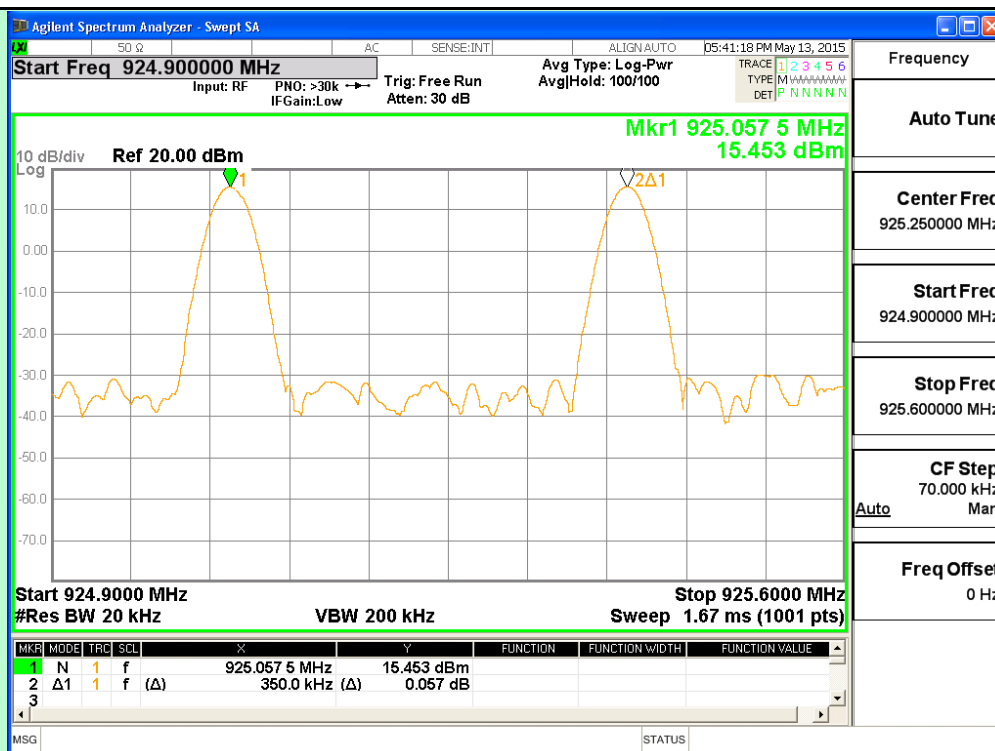
Channel 45 and 46



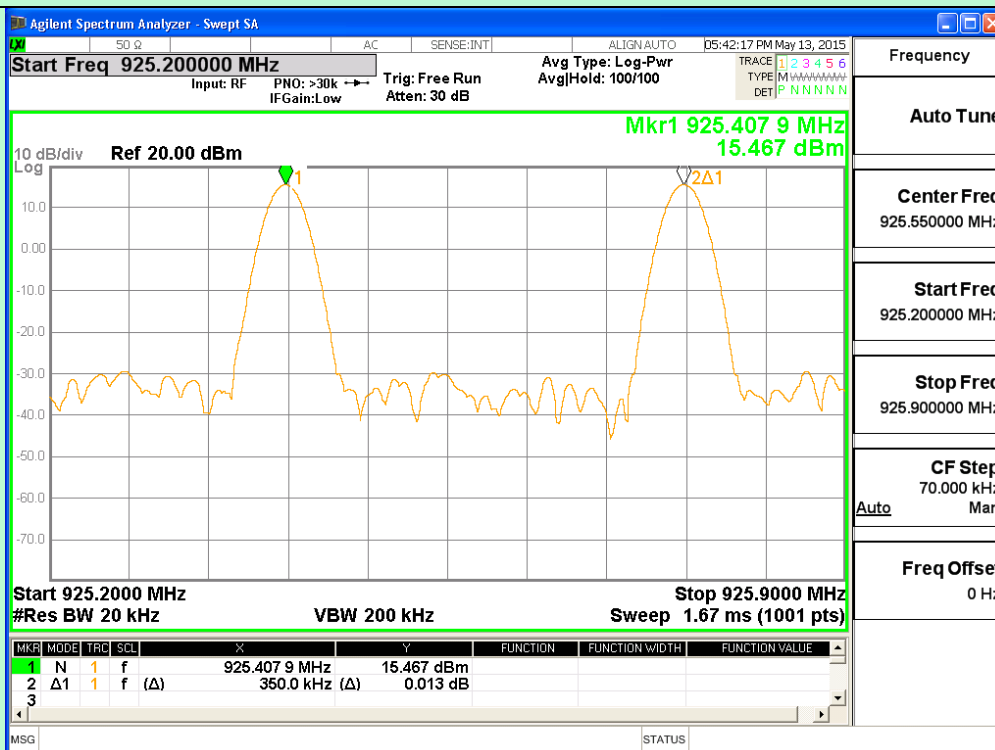
Channel 46 and 47



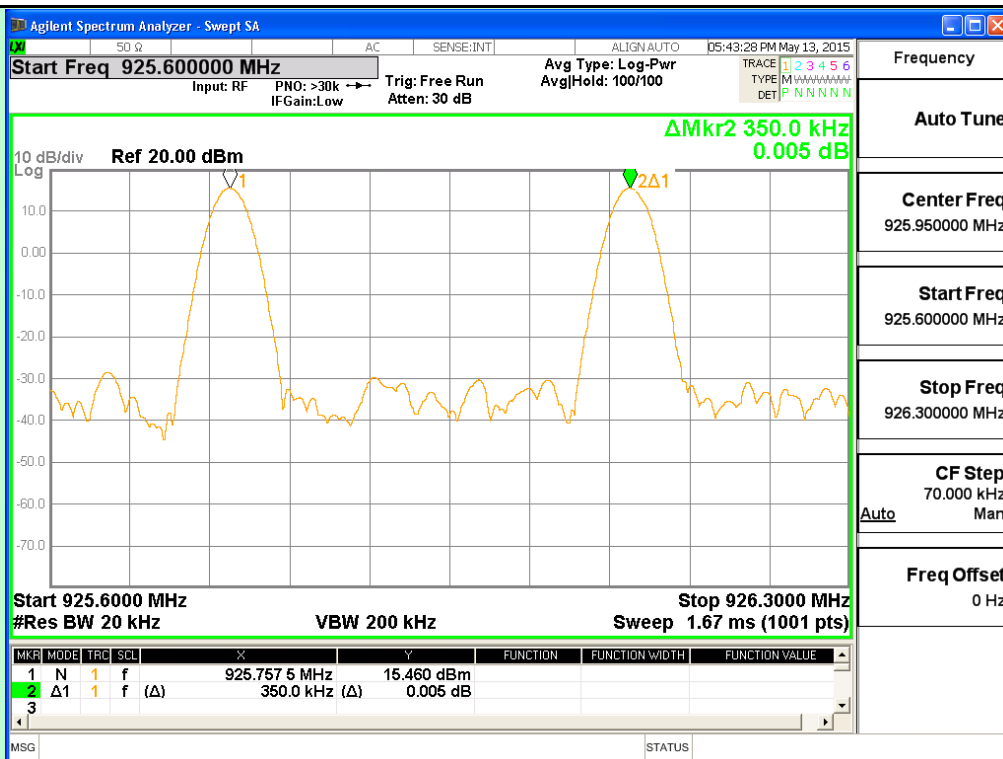
Channel 47 and 48



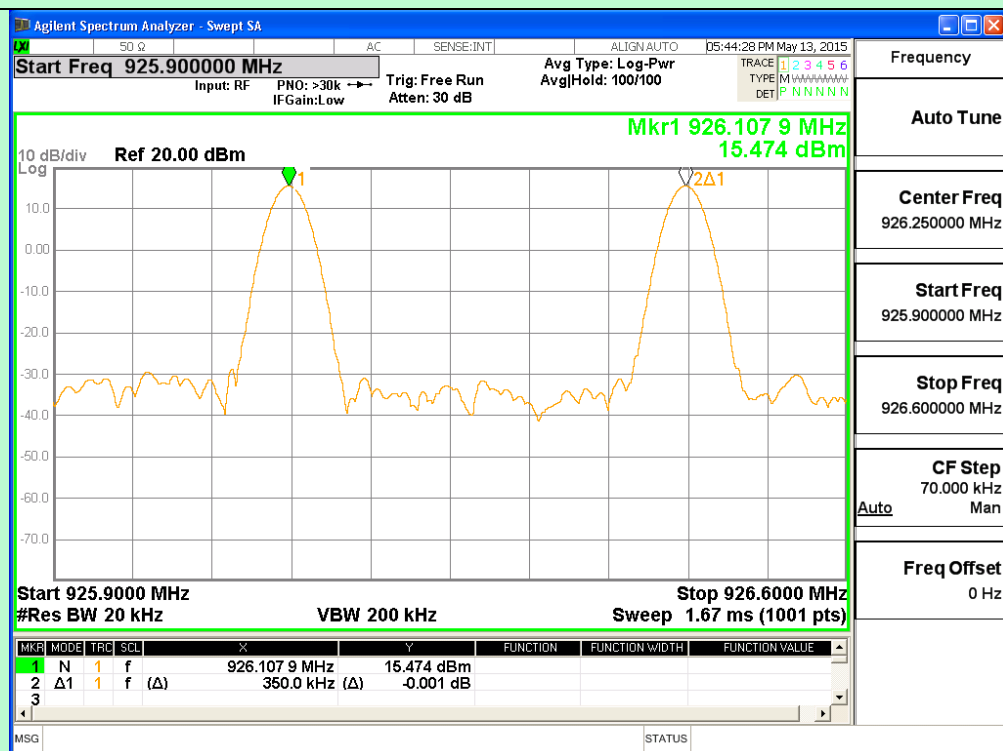
Channel 48 and 49



Channel 49 and 50



Channel 50 and 51



Channel 51 and 52

TEST RESULT			
Channel	Measured value	Limit	Result
#	KHz		
1 and 2	350	>20dB BW (320KHz)	PASS
2 and 3	350	>20dB BW (320KHz)	PASS
3 and 4	350	>20dB BW (320KHz)	PASS
4 and 5	350	>20dB BW (320KHz)	PASS
5 and 6	350	>20dB BW (320KHz)	PASS
6 and 7	350	>20dB BW (320KHz)	PASS
7 and 8	350	>20dB BW (320KHz)	PASS
8 and 9	350	>20dB BW (320KHz)	PASS
9 and 10	350	>20dB BW (320KHz)	PASS
10 and 11	350	>20dB BW (320KHz)	PASS
11 and 12	350	>20dB BW (320KHz)	PASS
12 and 13	350	>20dB BW (320KHz)	PASS
13 and 14	350	>20dB BW (320KHz)	PASS
14 and 15	350	>20dB BW (320KHz)	PASS
15 and 16	350	>20dB BW (320KHz)	PASS
16 and 17	350	>20dB BW (320KHz)	PASS
17 and 18	350	>20dB BW (320KHz)	PASS
18 and 19	350	>20dB BW (320KHz)	PASS
19 and 20	350	>20dB BW (320KHz)	PASS
20 and 21	350	>20dB BW (320KHz)	PASS
21 and 22	350	>20dB BW (320KHz)	PASS
22 and 23	350	>20dB BW (320KHz)	PASS
23 and 24	350	>20dB BW (320KHz)	PASS
24 and 25	350	>20dB BW (320KHz)	PASS
25 and 26	350	>20dB BW (320KHz)	PASS
26 and 27	2700	>20dB BW (320KHz)	PASS
27 and 29	350	>20dB BW (320KHz)	PASS
29 and 30	350	>20dB BW (320KHz)	PASS
30 and 31	350	>20dB BW (320KHz)	PASS
31 and 32	350	>20dB BW (320KHz)	PASS
32 and 33	350	>20dB BW (320KHz)	PASS
33 and 34	350	>20dB BW (320KHz)	PASS
34 and 35	350	>20dB BW (320KHz)	PASS
35 and 36	350	>20dB BW (320KHz)	PASS
36 and 37	350	>20dB BW (320KHz)	PASS
37 and 38	350	>20dB BW (320KHz)	PASS
38 and 39	350	>20dB BW (320KHz)	PASS
13 and 40	14468	>20dB BW (320KHz)	PASS
40 and 41	350	>20dB BW (320KHz)	PASS
41 and 42	350	>20dB BW (320KHz)	PASS
42 and 43	350	>20dB BW (320KHz)	PASS
43 and 44	350	>20dB BW (320KHz)	PASS
44 and 45	350	>20dB BW (320KHz)	PASS
45 and 46	350	>20dB BW (320KHz)	PASS
46 and 47	350	>20dB BW (320KHz)	PASS
47 and 48	350	>20dB BW (320KHz)	PASS
48 and 49	350	>20dB BW (320KHz)	PASS
49 and 50	350	>20dB BW (320KHz)	PASS
50 and 51	350	>20dB BW (320KHz)	PASS
51 and 52	350	>20dB BW (320KHz)	PASS
Note : Limit is derived from 20dB Bandwidth Test from Section 2.1			

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Conducted RF Test setup

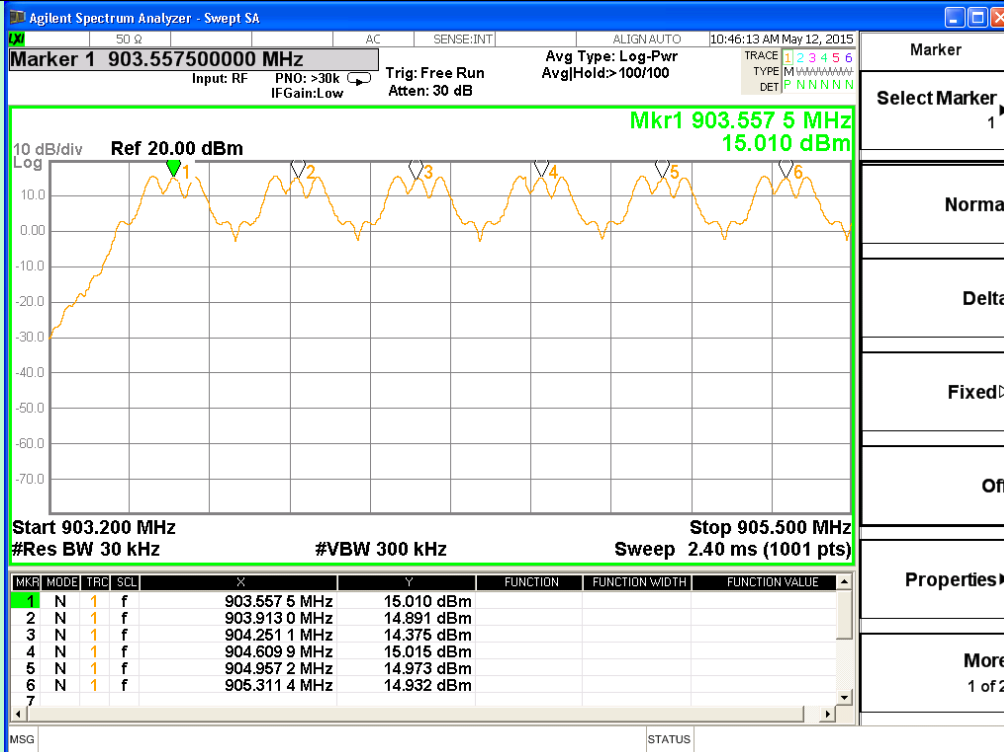
2.4 NUMBER OF HOPPING FREQUENCIES

EUT Nomenclature	Wireless Relay Module	Test Report Number	EMC-0379-1
Model Number	FW-RM	Serial Number	11932
Test Start Date	12-May-2015	Temperature (°C)	24.1
Test End Date	12-May-2015	Humidity RH (%)	57.2
Tested By	Sasikala Subramani	Pressure (mbar)	NR
Input Voltage / Freq	3.3V dc		
Operating Mode	Refer Page 5 Operating Mode #2		
Test configuration	Refer Page 5 Test Configuration #1		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247 : 2010		
Test Method	DA 00-705		
Comment			
TEST DETAILS			
Method	☒ Conducted ☐ Radiated		
TEST PARAMETERS			
Antenna Height	NA	Turntable Rotation	NA
Equipment Class	NA	Measurement Distance	NA

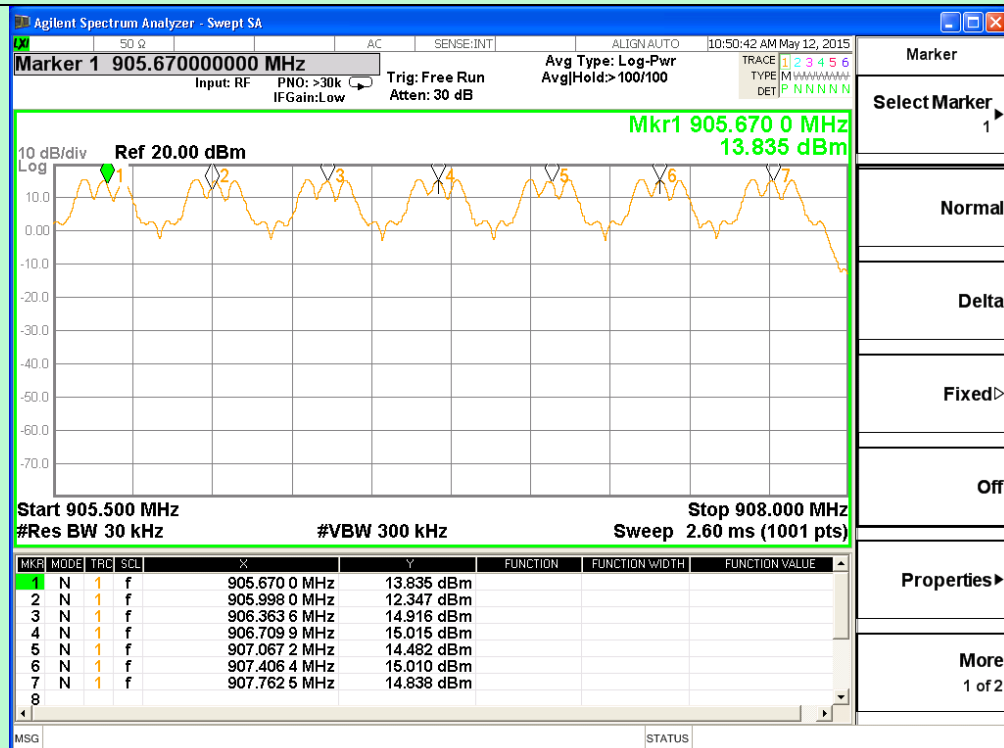
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	29-Nov-2015
Y	RF Cable	Huber- Suhner	SUCOFLEX104	MY14404/04	04-Feb -2016

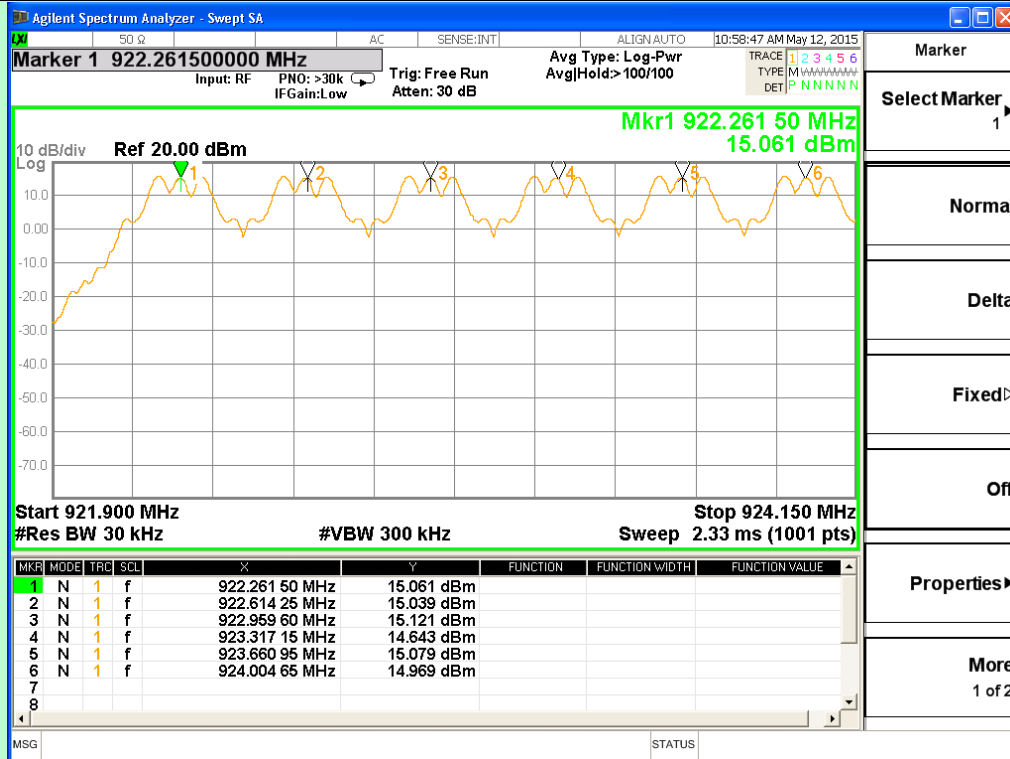
TEST GRAPHS



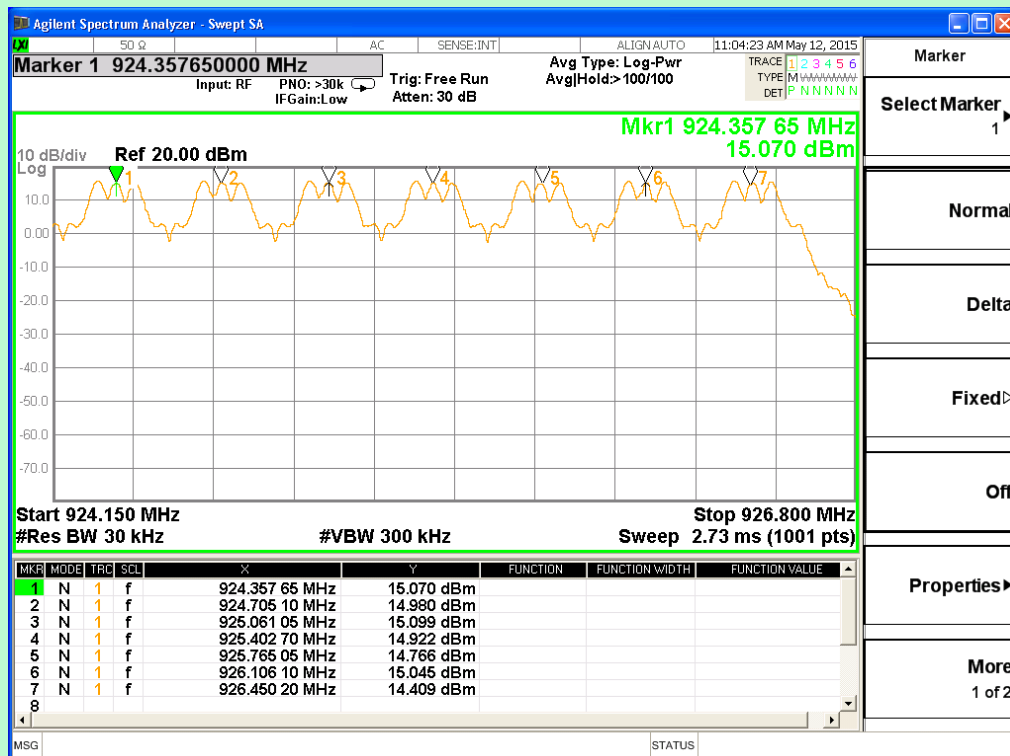
Channel 1 – 6 (Walkie-Talkie Mode)



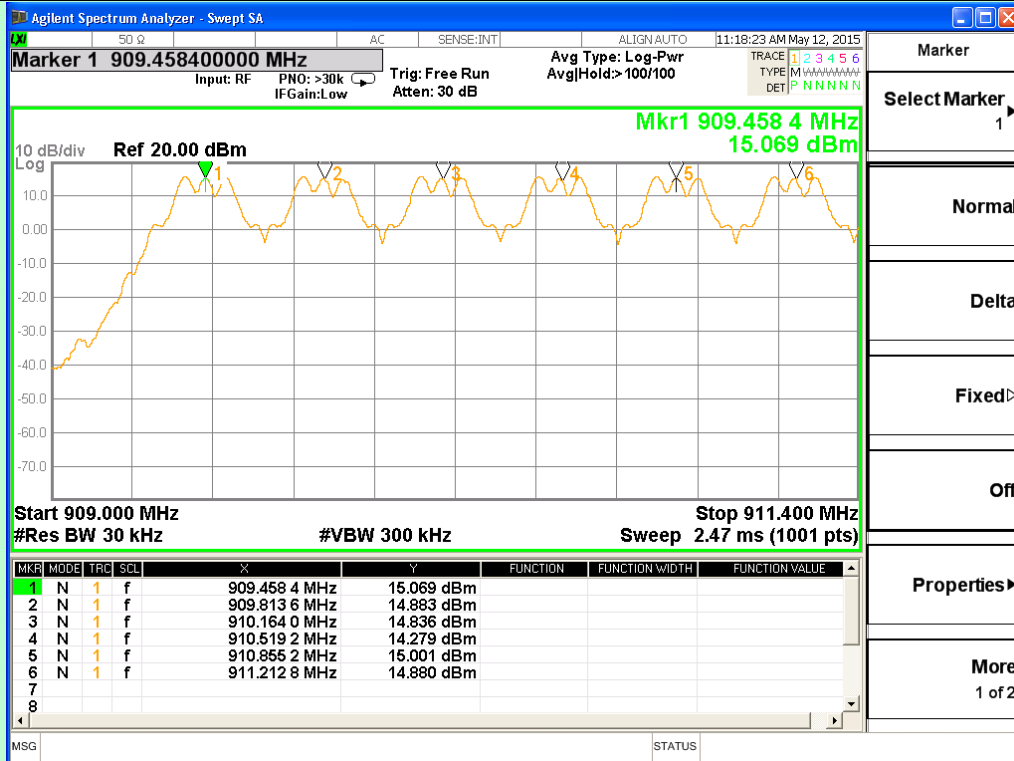
Channel 7 – 13 (Walkie-Talkie Mode)



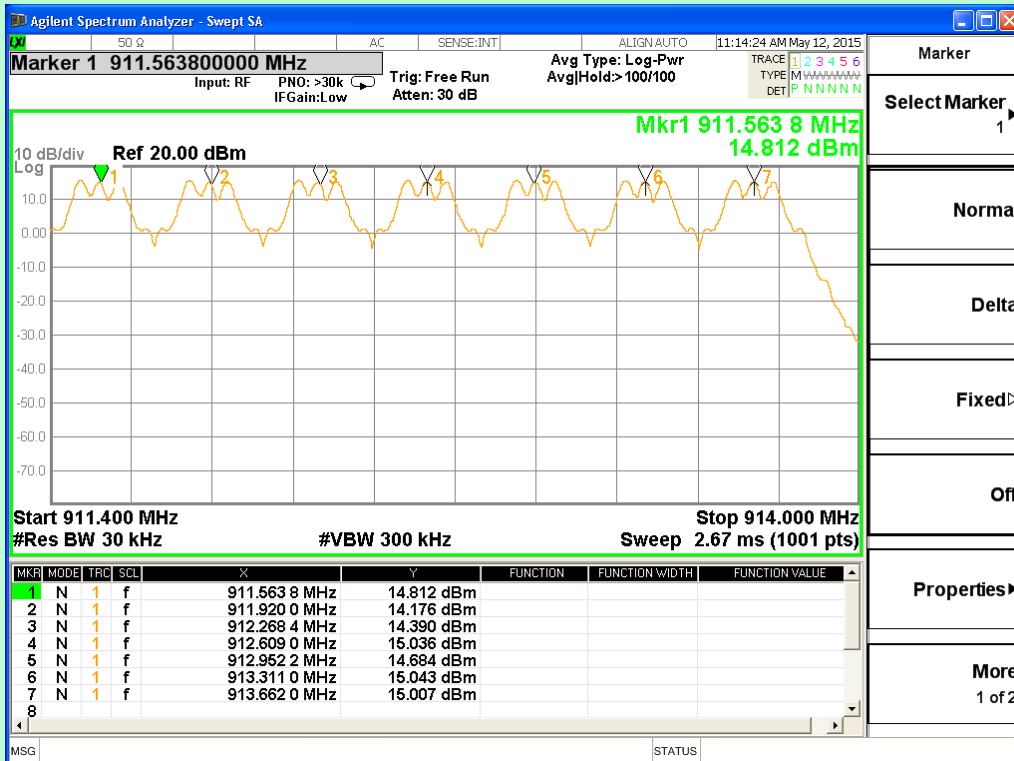
Channel 14 – 19 (Walkie-Talkie Mode)



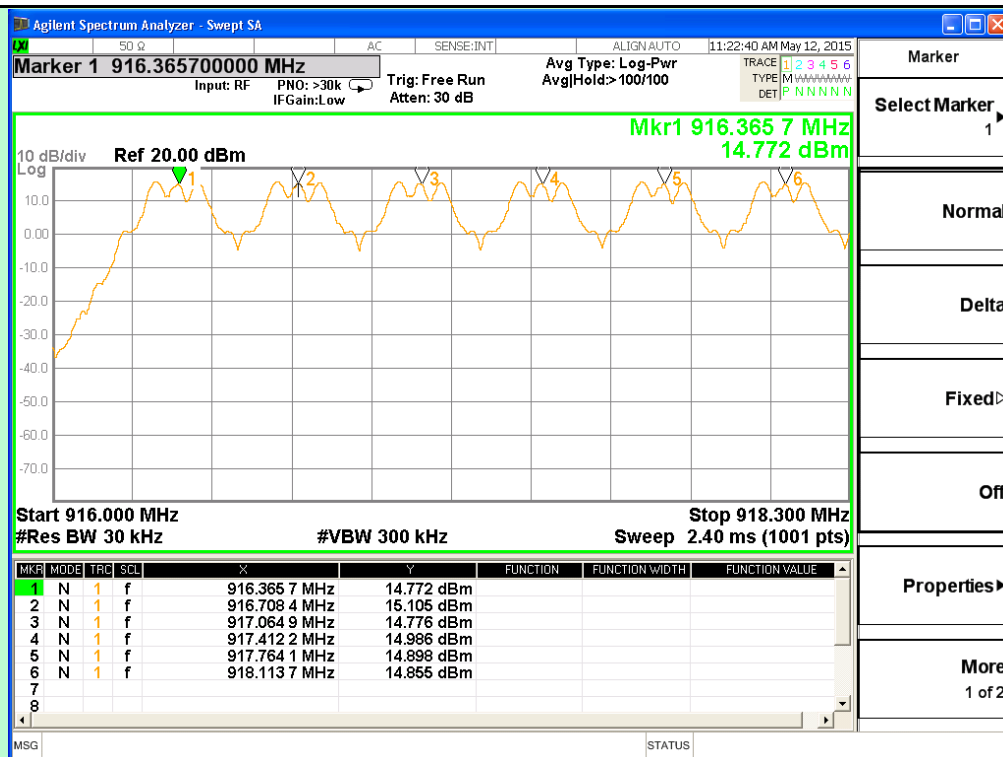
Channel 20 – 26 (Walkie-Talkie Mode)



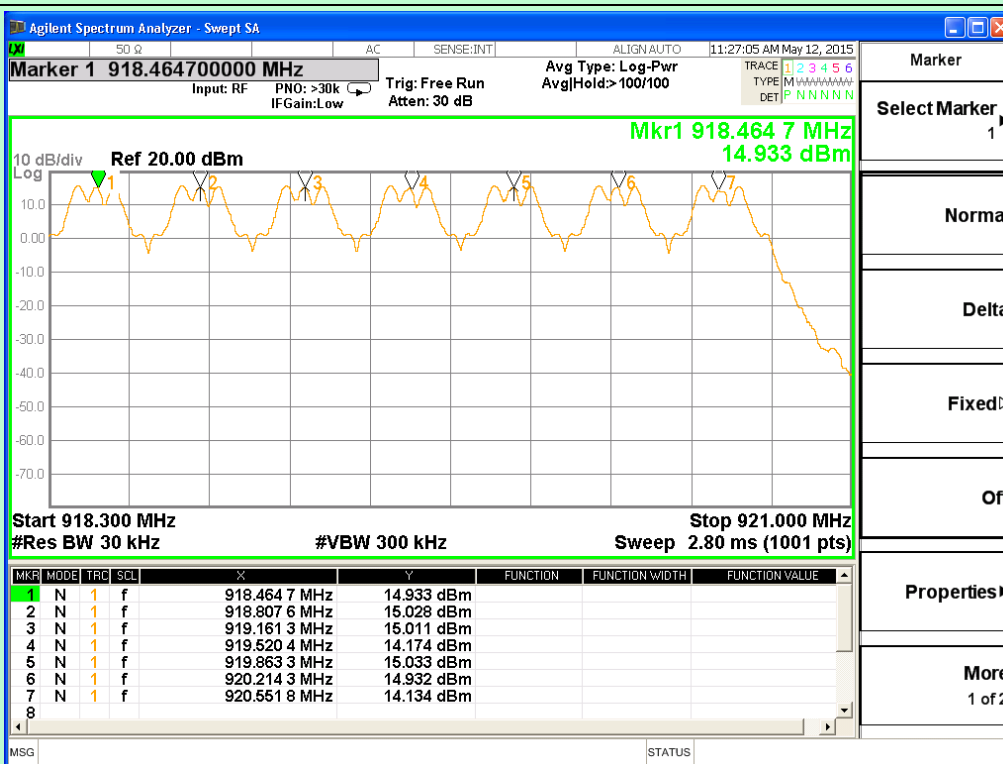
Channel 1 – 6 (Normal Mode)



Channel 7 – 13 (Normal Mode)



Channel 14 – 19 (Normal Mode)



Channel 20 – 26 (Normal Mode)

TEST RESULT

Mode of Operation	No. of Channels Measured	Limit (No. of Channels)	Test Results
Normal Mode	26	≥ 25	PASS
Walkie-Talkie Mode	26	≥ 25	PASS

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Conducted RF Test setup

2.5 BAND-EDGE COMPLIANCE

EUT Nomenclature	Wireless Relay Module	Test Report Number	EMC-0379-1
Model Number	FW-RM	Serial Number	11932
Test Start Date	12-May-2015	Temperature (°C)	23.7
Test End Date	12-May-2015	Humidity RH (%)	55.9
Tested By	Sasikala Subramani	Pressure (mbar)	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 Operating Mode #3		
Test configuration	Refer Page 5 Test Configuration #1		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247 : 2010		
Test Method	DA 00-705		
Comment			

TEST DETAILS

Method	☒ Conducted	☐ Radiated
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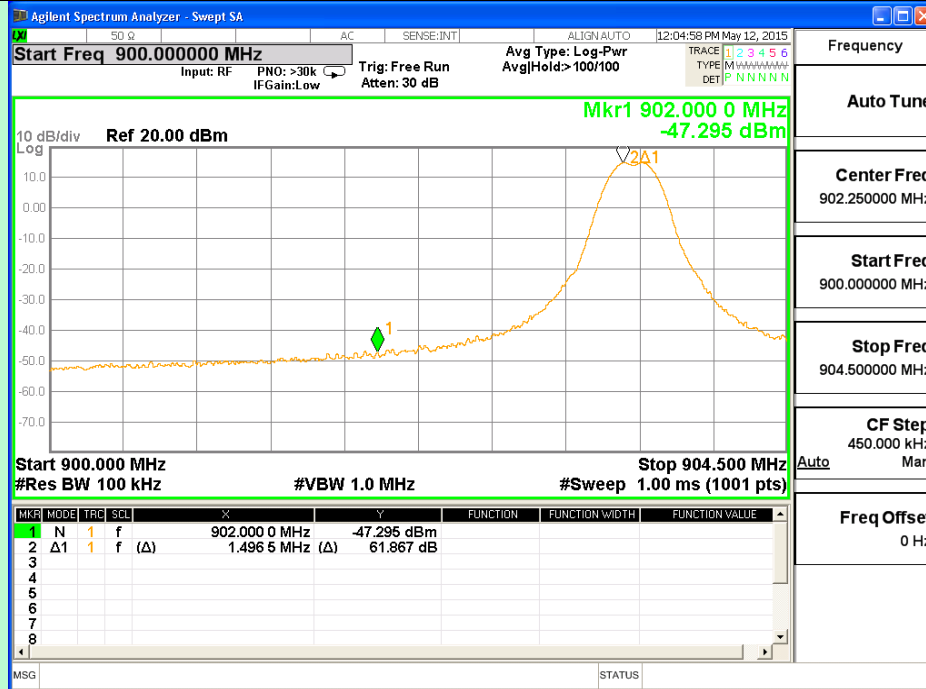
TEST PARAMETERS

Antenna Height	NA	Turntable Rotation	NA
Equipment Class	NA	Measurement Distance	NA

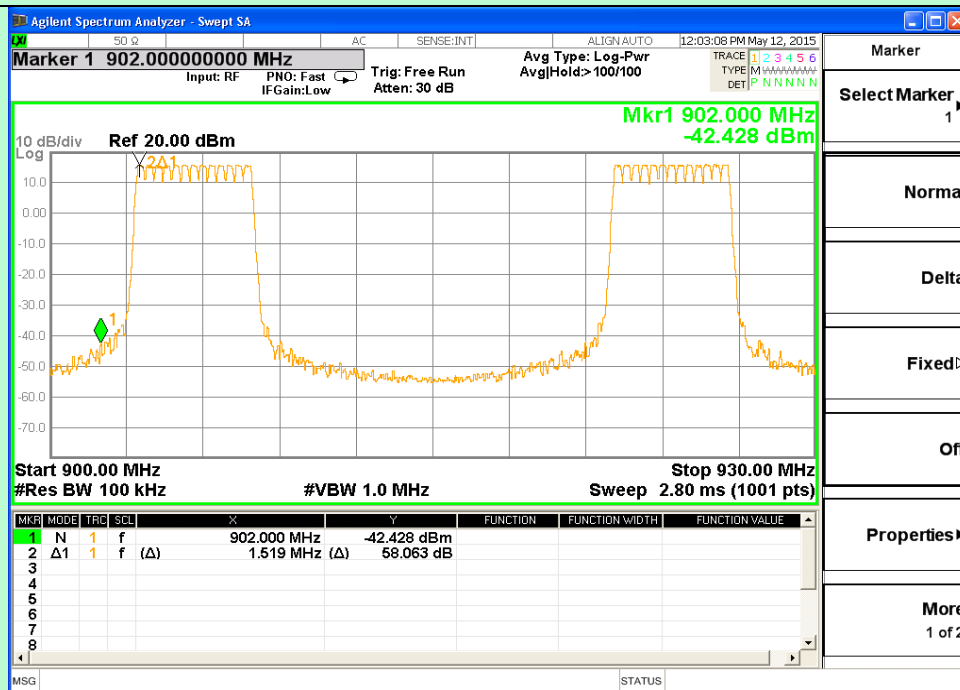
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	29-Nov-2015
Y	RF Cable	Huber- Suhner	SUCOFLEX104	MY14404/04	04-Feb -2016

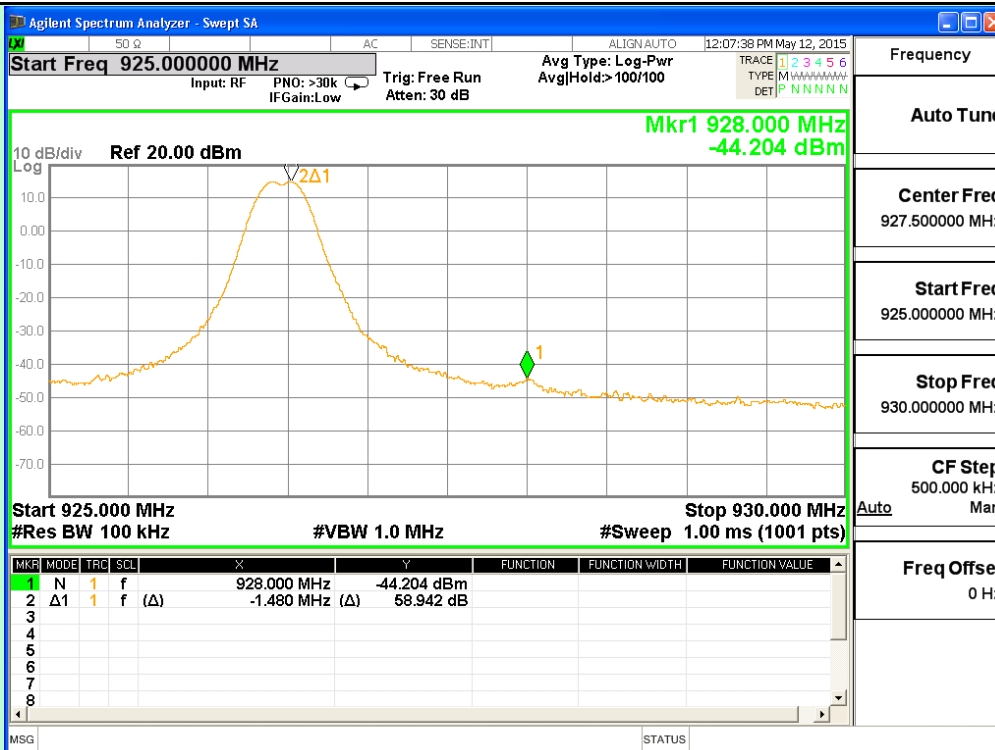
TEST GRAPHS



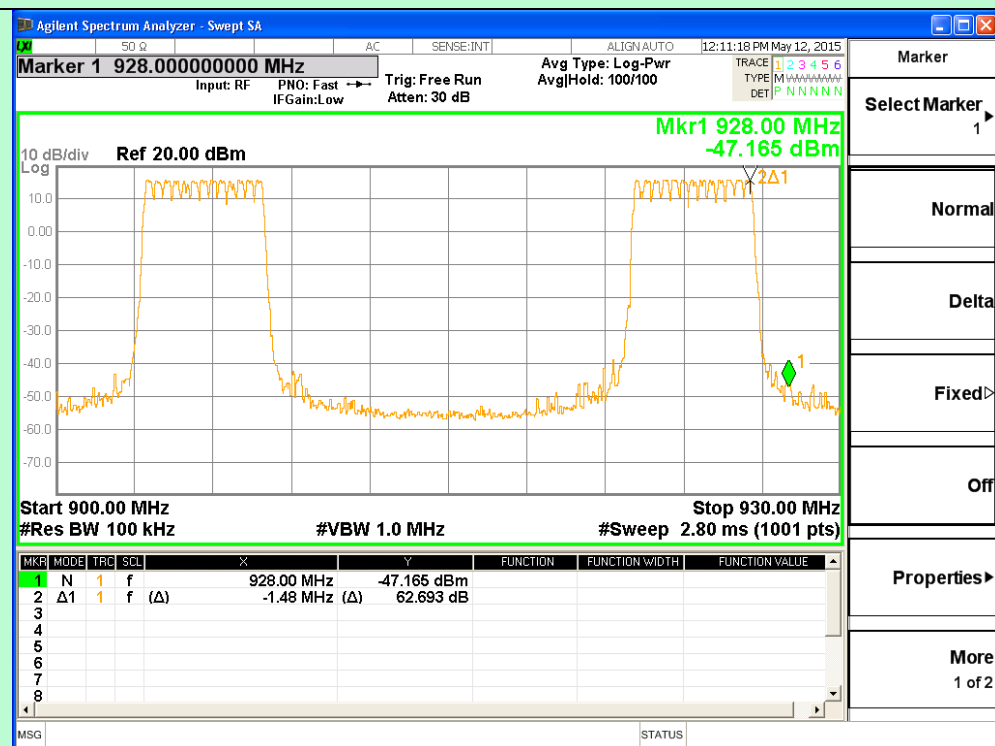
Band-edge at 902 MHz - Channel 1 (903.55MHz)



Band-edge at 902MHz – Hopping Enabled



Band-edge at 928 MHz - Channel 52 (926.45MHz)



Band-edge at 928MHz – Hopping Enabled

TEST RESULT					
Channel	Frequency	Measured Level – Single Channel	Measured Level- FHSS Enabled	Limit	Test Results
#	MHz	dBc	dBc	dBc	
1	903.355	61.867	58.063	>20	PASS
52	926.45	58.942	62.693	>20	PASS

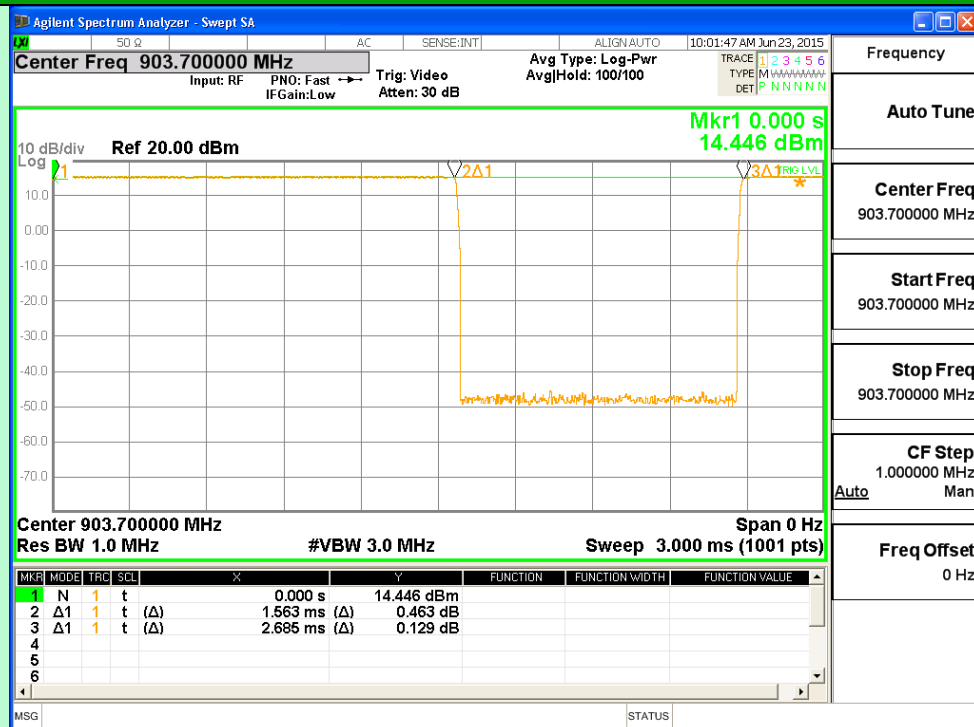
TEST SETUP PHOTOGRAPH	
Refer Annexure -1	
Conducted RF Test setup	

2.6 TIME OF OCCUPANCY (DWELL TIME)

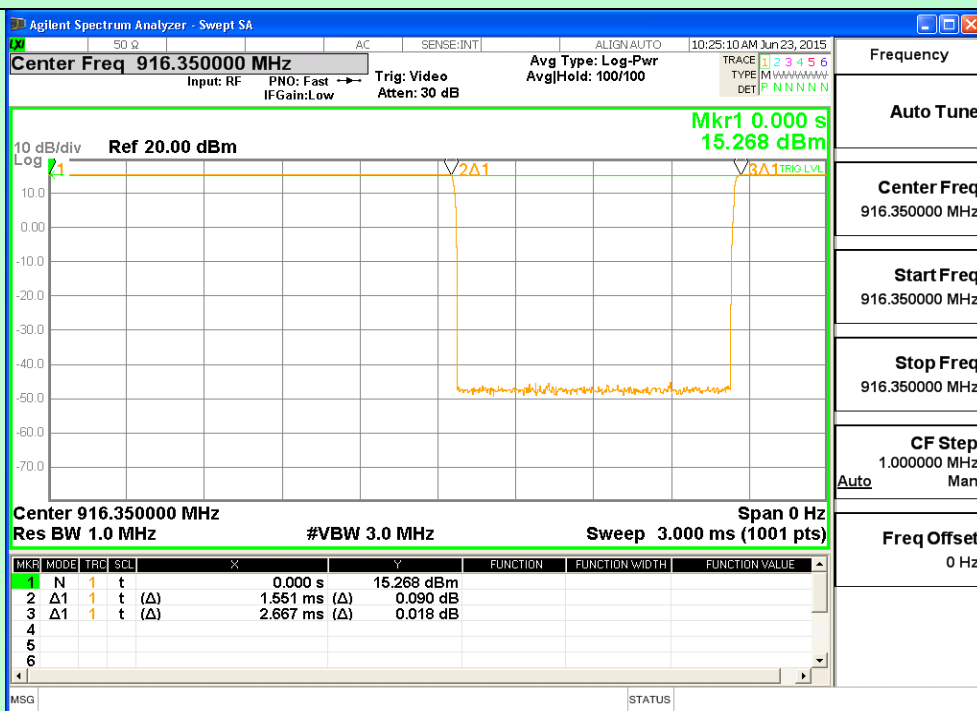
EUT Nomenclature	Wireless Relay Module	Test Report Number	EMC-0379-1			
Model Number	FW-RM	Serial Number	11932			
Test Start Date	12-May-2015	Temperature (°C)	23.2			
Test End Date	12-May-2015	Humidity RH (%)	55.2			
Tested By	Sasikala Subramani	Pressure (mbar)	NR			
Input Voltage / Freq	3.3 Vdc					
Operating Mode	Refer Page 5 Operating Mode #3					
Test configuration	Refer Page 5 Test Configuration #1					
Deviation from Std	NA					
Applicable standard	FCC Part 15.247 : 2010					
Test Method	DA 00-705					
Comment						
TEST DETAILS						
Method	☒ Conducted ☐ Radiated					
TEST PARAMETERS						
Antenna Height	NA	Turntable Rotation	NA			
Equipment Class	NA	Measurement Distance	NA			

TEST EQUIPMENT					
Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	29-Nov-2015
Y	RF Cable	Huber- Suhner	SUCOFLEX104	MY14404/04	04-Feb -2016

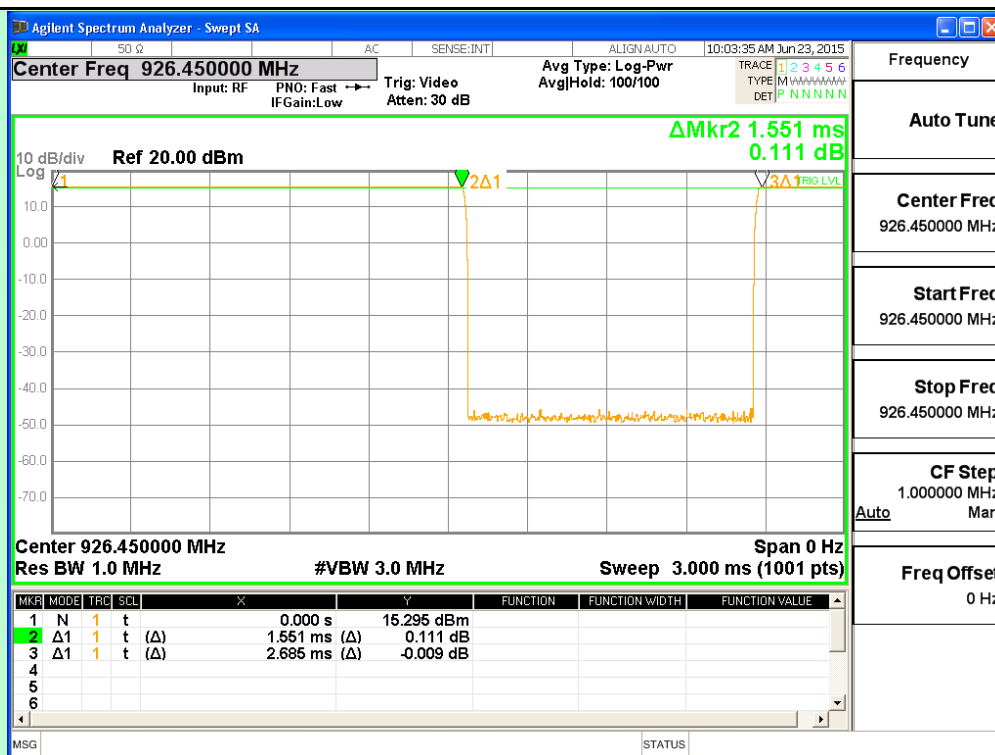
TEST GRAPHS



Channel 1 (903.55MHz)



Channel 27 (916.35MHz)



Channel 52 (926.45MHz)

TEST RESULT

Channel	Channel Frequency	Measured Dwell Time	No. of Bursts in 10sec	Total Dwell Time in 10sec	Limit in 10s period	Results
#	MHz	ms	#	ms	ms	
1	903.55	1.563	15	23.44	≤ 400	PASS
27	916.35	1.551	15	23.26	≤ 400	PASS
52	926.45	1.551	15	23.26	≤ 400	PASS

TEST SETUP PHOTOGRAPH

Refer Annexure -1

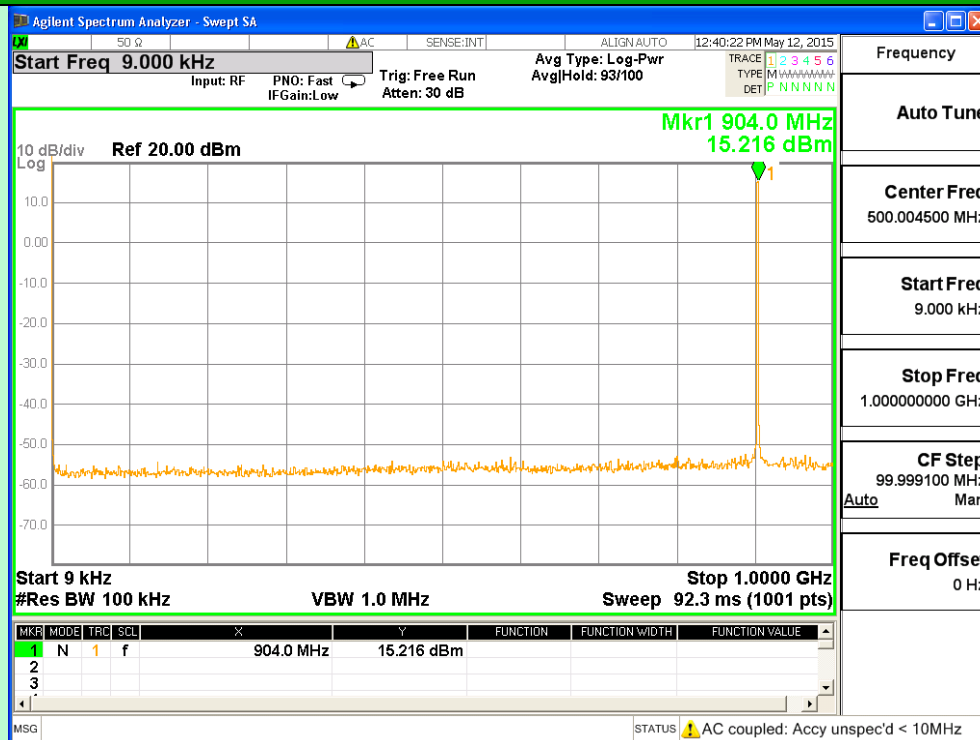
Conducted RF Test setup

2.7 SPURIOUS RF CONDUCTED EMISSIONS

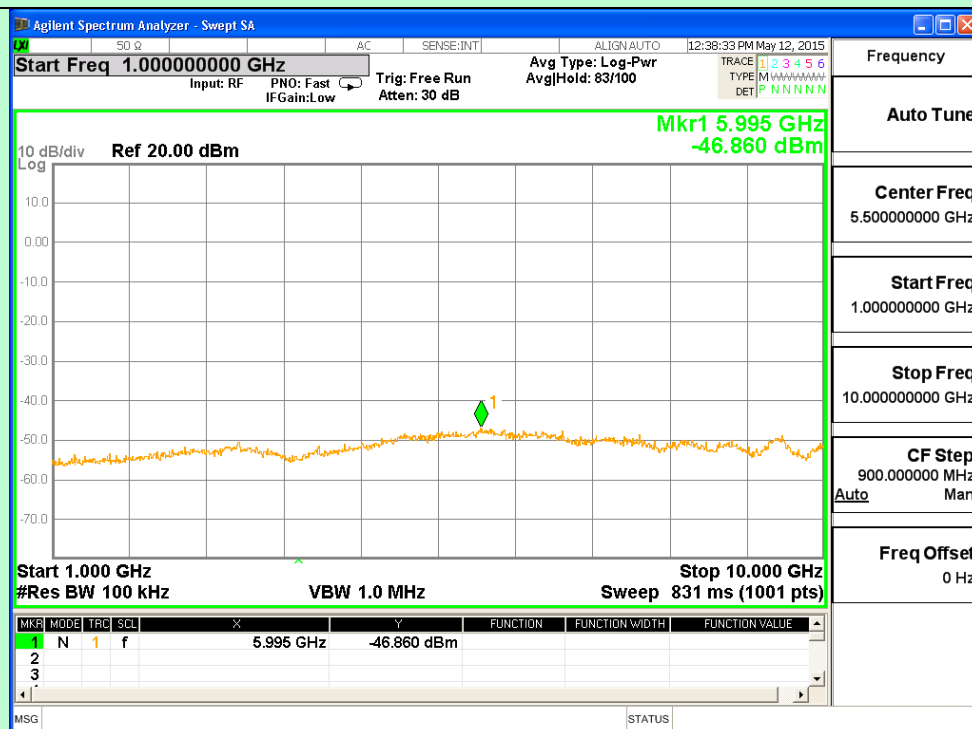
EUT Nomenclature	Wireless Relay Module	Test Request Number	EMC-0379-1
Model Number	FW-RM	Serial Number	11932
Test Start Date	12-May-2015	Temperature (°C)	23.3
Test End Date	12-May-2015	Humidity RH (%)	55.5
Tested By	Sasikala Subramani	Pressure (mbar)	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 Operating Mode #3		
Test configuration	Refer Page 5 Test Configuration #1		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247 : 2010		
Test Method	DA 00-705		
Comment			
TEST DETAILS			
Method	☒ Conducted	☐ Radiated	
TEST PARAMETERS			
Antenna Height	NA	Turntable Rotation	NA
Equipment Class	NA	Measurement Distance	NA

TEST EQUIPMENT					
Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	29-Nov-2015
Y	RF Cable	Huber- Suhner	SUCOFLEX104	MY14404/04	04-Feb -2016

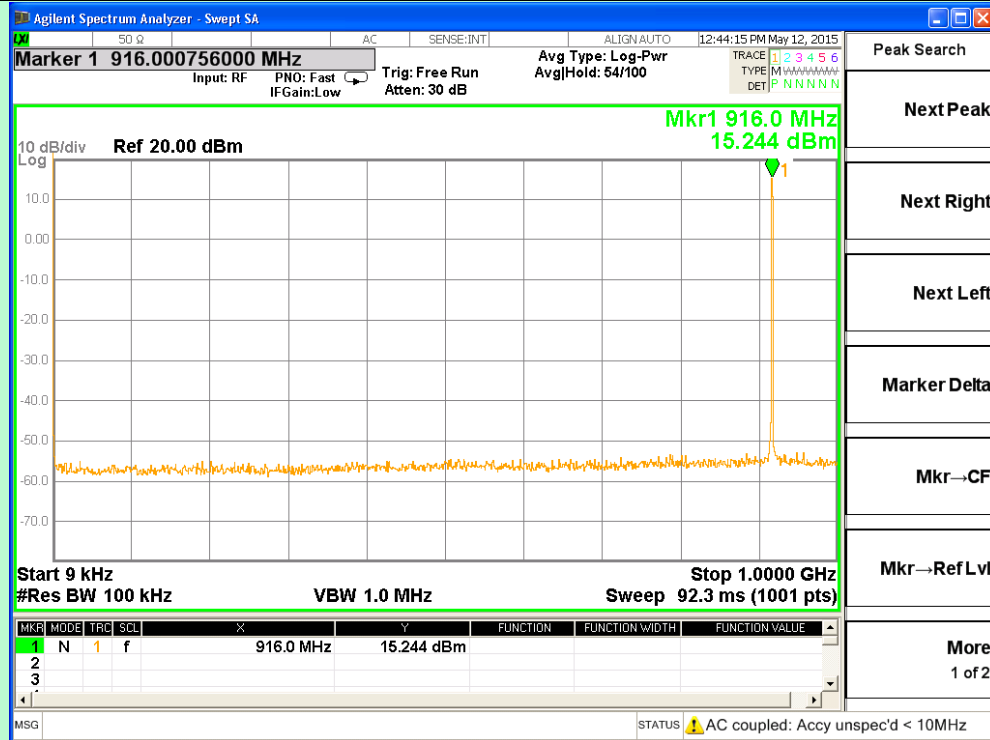
TEST GRAPHS



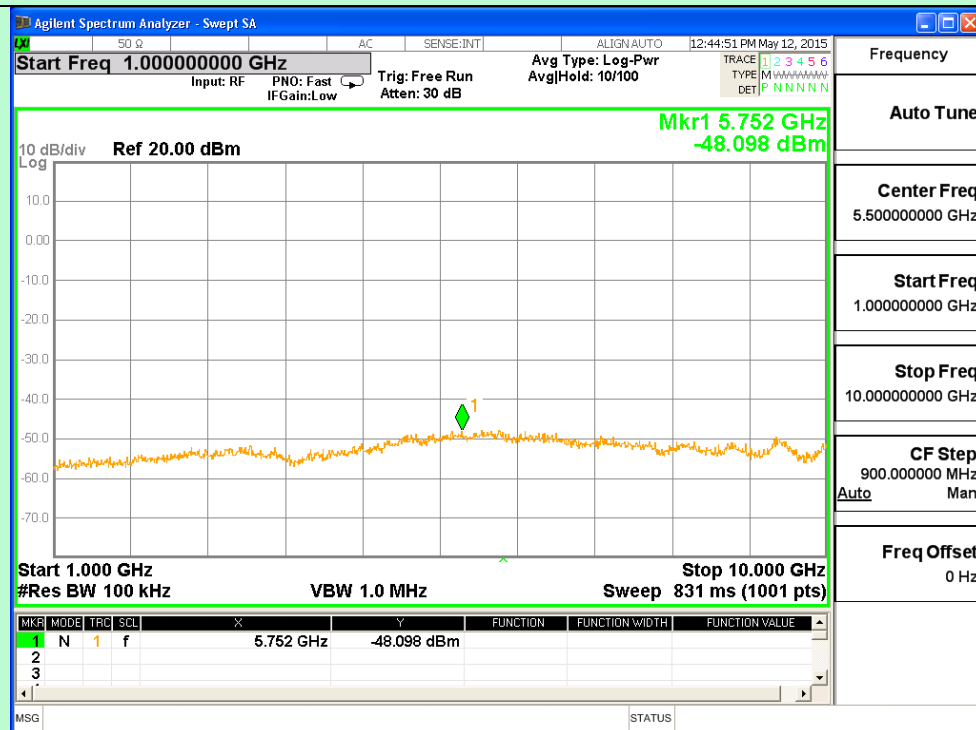
Channel 1 (903.55MHz) – 9KHz to 1GHz



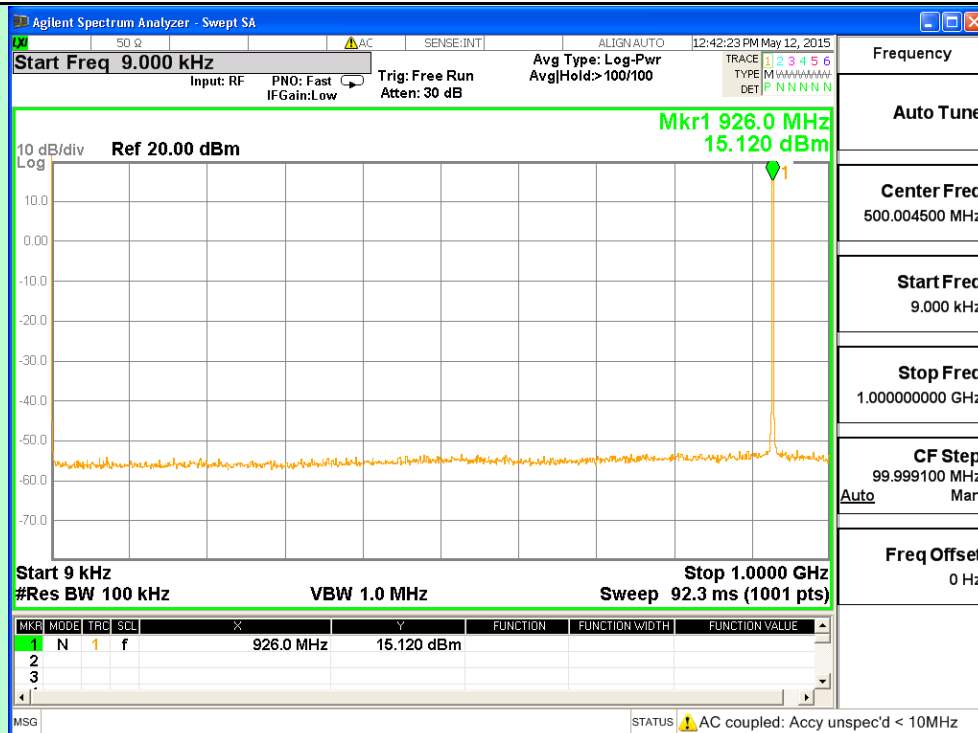
Channel 1 (903.55MHz) – 1GHz to 10GHz



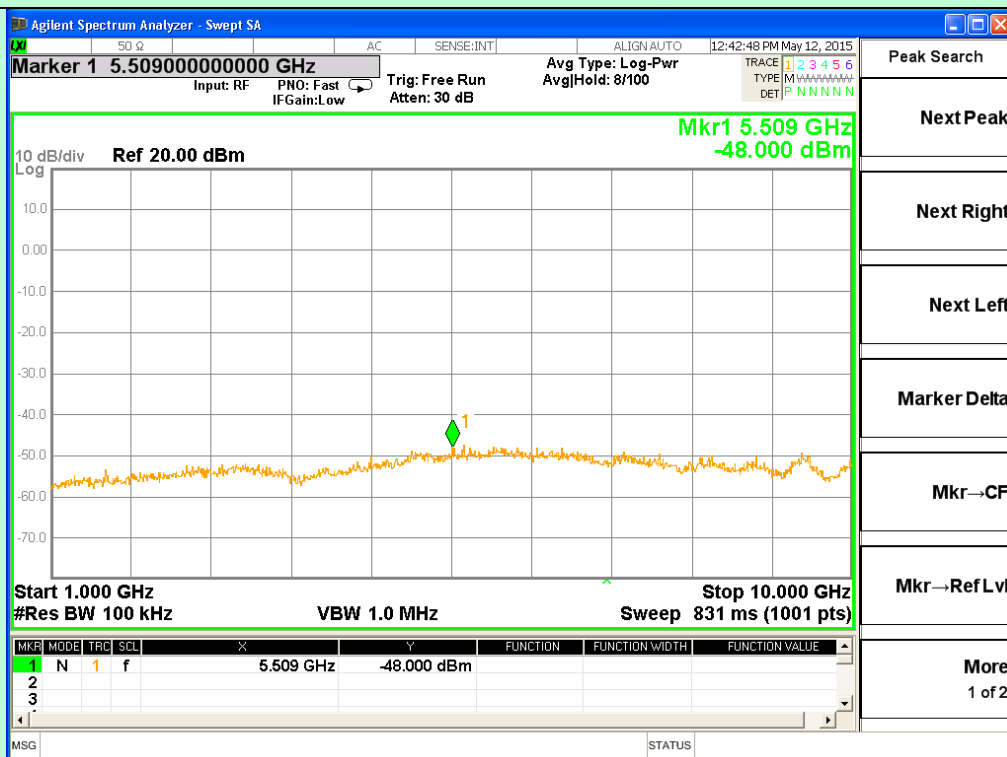
Channel 27 (916.35MHz) – 9KHz to 1GHz



Channel 27 (916.35MHz) – 1GHz to 10GHz



Channel 52 (926.45MHz) – 9KHz to 1GHz



Channel 52 (926.45MHz) – 1GHz to 10GHz

TEST RESULT							
Channel	Channel Frequency	Measured Parameters			Difference (B-A) dBc	Limit	Result
#	MHz	Spurious Frequency (GHz)	Spurious Level (dBm) (A)	Fundamental Level (dBm) (B)		dBc	
1	903.55	5.995	-46.680	15.21	61.89	>20	PASS
27	916.35	5.752	-48.098	15.24	63.33	>20	PASS
52	926.45	5.509	-48.00	15.12	63.12	>20	PASS

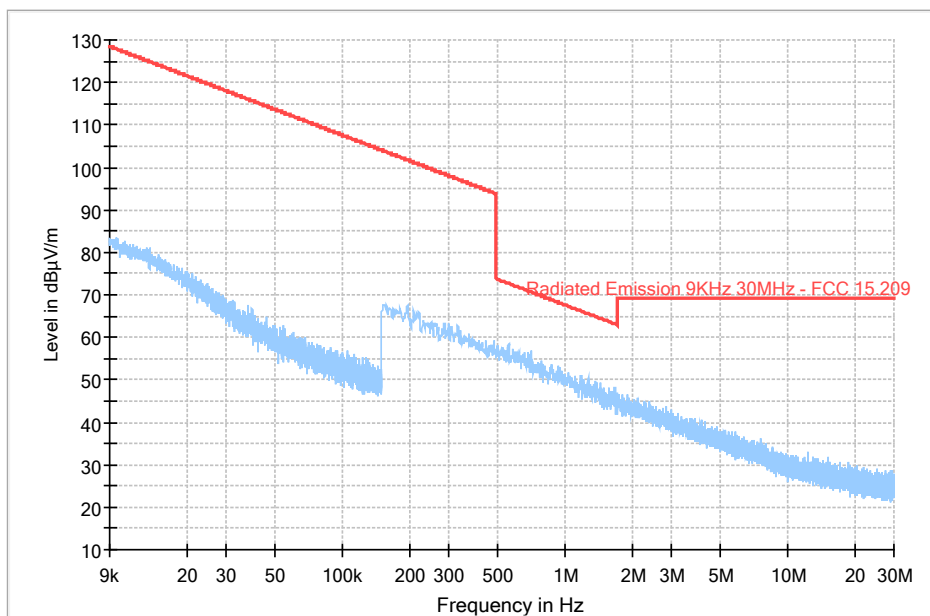
TEST SETUP PHOTOGRAPH	
Refer Annexure -1	
Conducted RF Test setup	

2.8 TRANSMITTER SPURIOUS RADIATED EMISSIONS

EUT Nomenclature	Wireless Relay Module	Test Report Number	EMC-0379-1
Model Number	FW-RM	Serial Number	11932
Test Start Date	22-May-2015	Temperature (°C)	23.3
Test End Date	26-May-2015	Humidity RH (%)	55.5
Tested By	Gulshan Kumar	Pressure (mbar)	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 Operating Mode #3		
Test configuration	Refer Page 5 Test Configuration #1		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247 : 2010 & 15.209 : 2010		
Test Method	ANSI C63.10-2013		
Comment			
TEST FREQUENCY RANGE			
Start Frequency	9KHz	Stop Frequency	18 GHz
MAXIMUM OPERATING FREQUENCY			
902MHz to 928MHz			
TEST PARAMETERS			
Antenna Height	1m to 4m	Turntable Rotation	0° to 360°
Applicable standard	FCC Part 15.247 : 2010 & 15.209 : 2010	Test Method	ANSI 63.10 - 2013
Equipment Class	Class B	Measurement Distance	3m
Pre Measurement in Sweep Mode	RBW =1MHz, VBW = 3MHz, Detector = Peak [Max –Hold] Sweep time = Auto coupled.	Final Scan Setting	IF = 1MHz, STEP SIZE – 400KHz Detector = Peak and Average Measurement Time = 2 sec

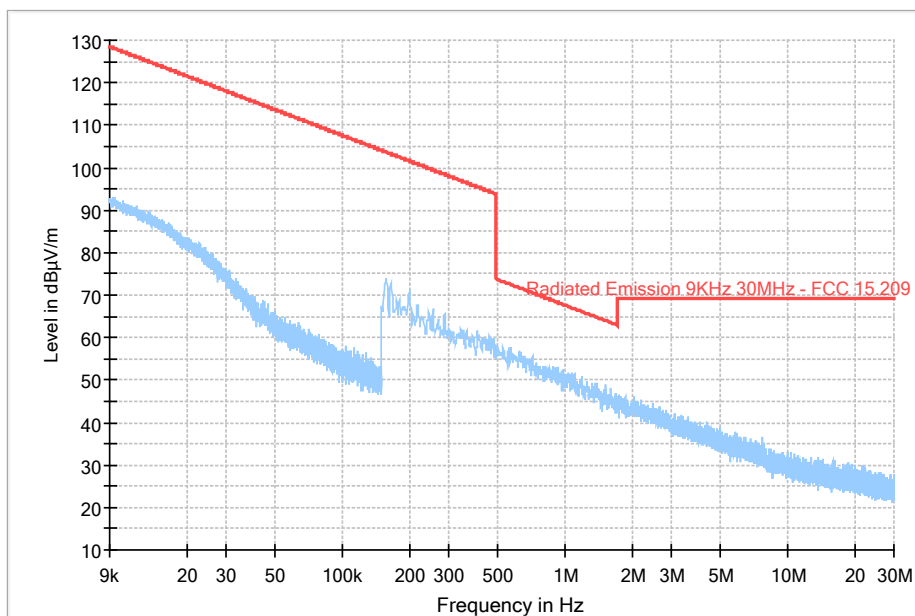
TEST EQUIPMENT					
Y/N	Equipment	Make	Model	Sl. No	Cal Due Date
Y	EMI Test Receiver	R&S	ESU26	100525	20-Jan-16
Y	3m Semi Anechoic Chamber	ETS Lindgren	DKE 6X7 DBL.DR	1625	26-Sep-15
Y	Double Ridge Guide Horn Antenna	ETS Lindgren	3117	00064055	07-Nov-15
Y	Bilog Antenna	ETS Lindgren	HLP3003C	130525	11-Nov-15
Y	Loop Antenna	ETS Lindgren	6507	00154265	29-Dec-15
Y	RF cable (9KHz to 1GHz)	COLEMAN	RG214	RE-1A	04-Feb-16
Y	RF cable (9KHz to 1GHz)	COLEMAN	RG214	RE-1B	04-Feb-16
Y	RF cable (1GHz to 18GHz)	AH Systems	SUCOFLEX 104	RE-2A	04-Feb-16
Y	High Pass Filter	Wainwright	WHKX1.5/15G-12ST	1	14-Jun-15
Y	Signal Conditioning Unit	R&S	SCU-18	10178	14-Jun-15
Y	EMC32 Software	R&S	8.30.0	820-OT101248	NA
Note: Switch ON /OFF the Internal Preamplifier based on carrier level and or noise floor without overloading the receiver					

Test Graphs – 9KHz to 30MHz



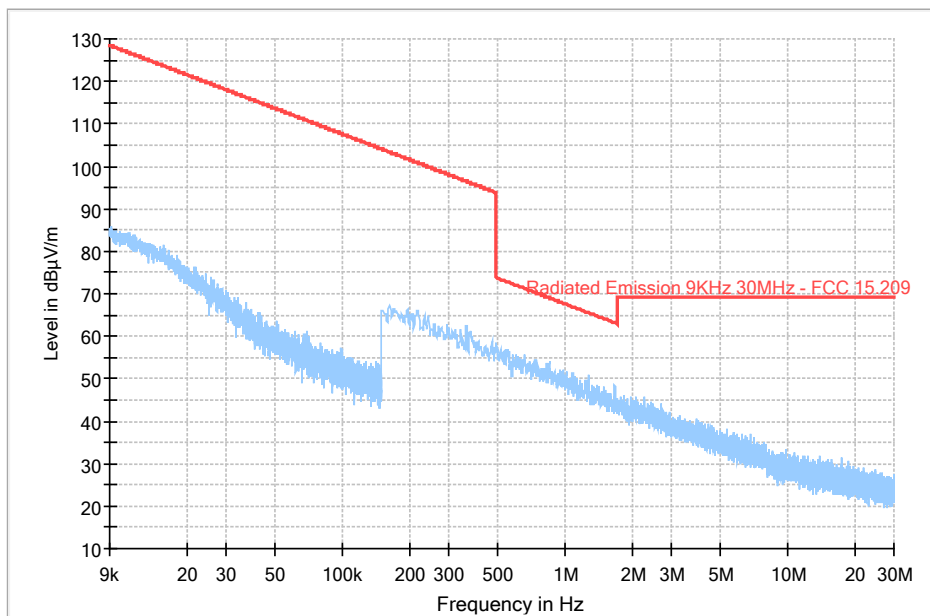
Channel 1 (903.55 MHz)

Note : Peak Graph - Parallel



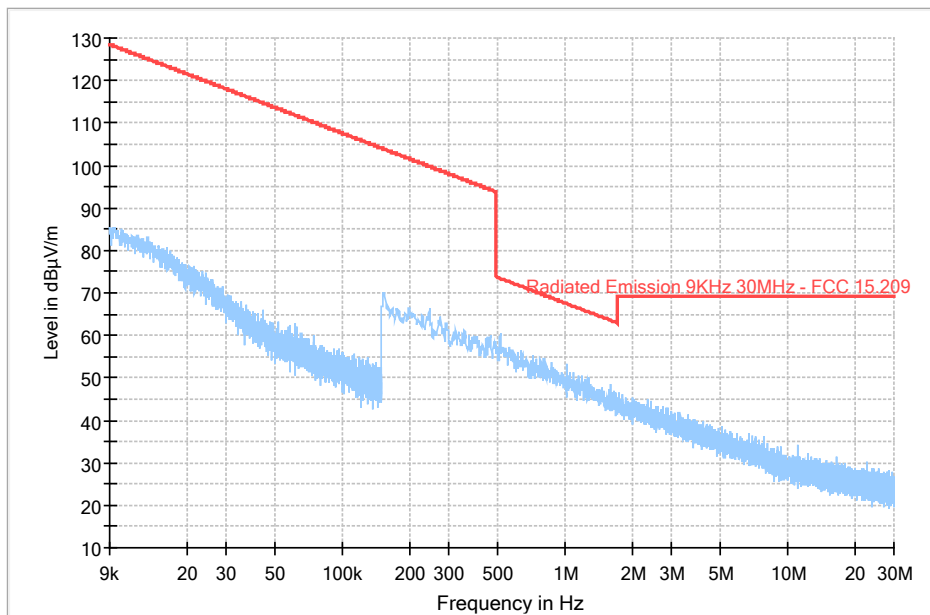
Channel 1 (903.55 MHz)

Note : Peak Graph - Perpendicular



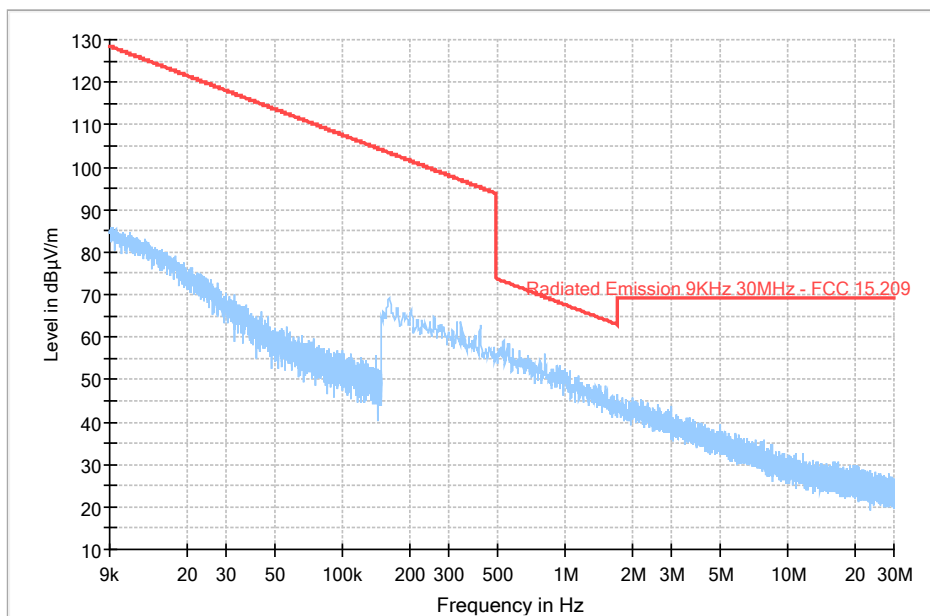
Channel 27 (916.35 MHz)

Note : Peak Graph - Parallel

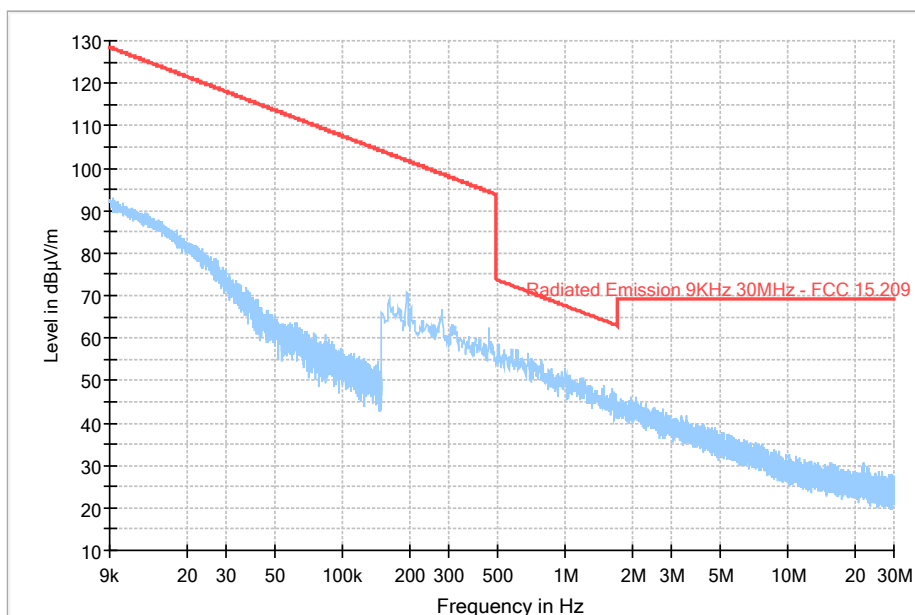


Channel 27 (916.35 MHz)

Note : Peak Graph - Perpendicular

**Channel 52 (926.45 MHz)**

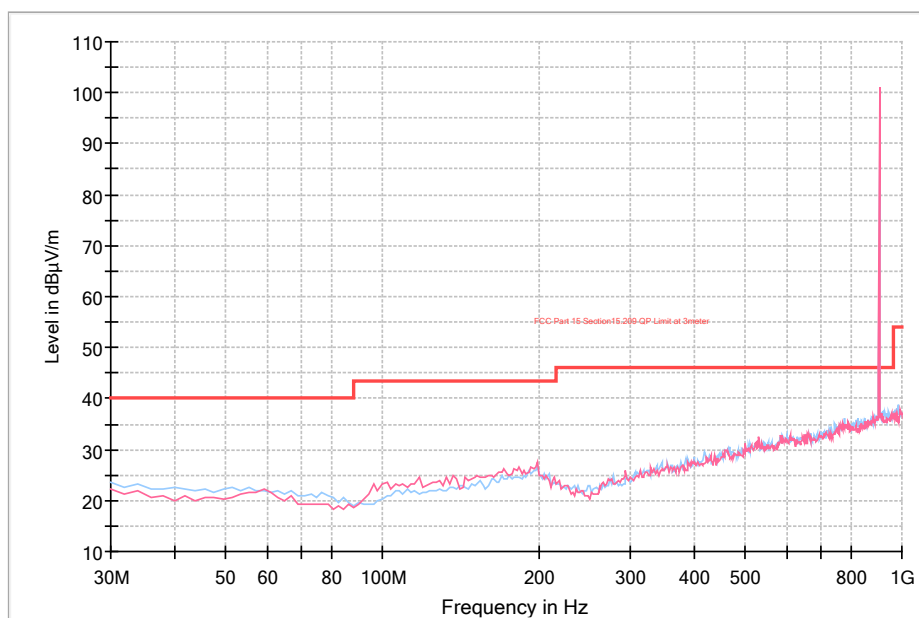
Note : Peak Graph - Parallel

**Channel 52 (926.45 MHz)**

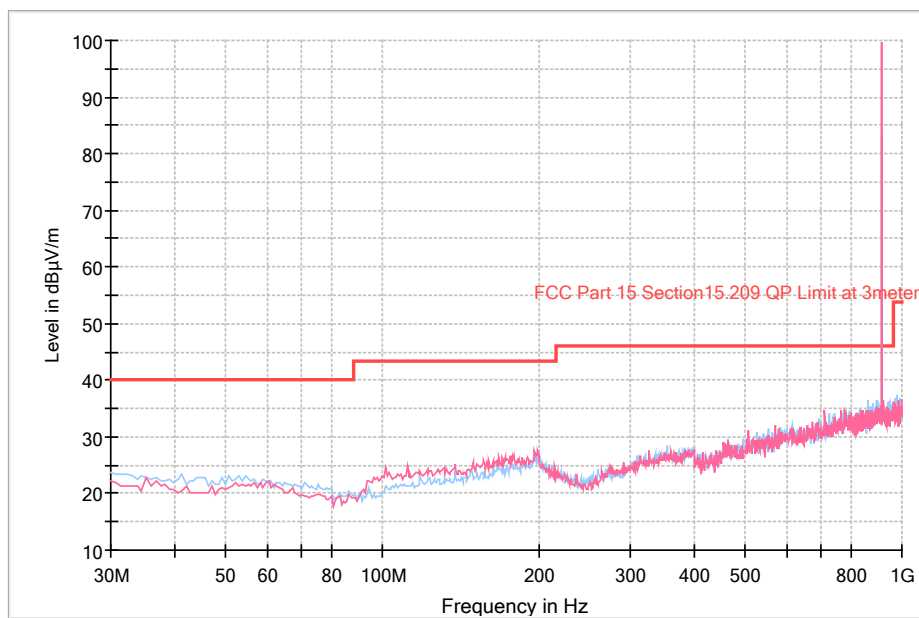
Note : Peak Graph - Perpendicular

TEST RESULT – 9KHz to 30MHz									
Channel	Channel Frequency	Spurious Frequency	Measured Quasi Peak	Height	Ant Pol	Azimuth	Margin	Quasi Peak Limit @ 3m Distance	Results
#	MHz	MHz	dBμV/m	cm	Parallel / Perpendicular	deg	dB	dBμV/m	
1	903.55	0.013	25.8	100.0	Parallel	153.0	99.0	124.9	PASS
1	903.55	0.024	20.6	100.0	Parallel	0.0	99.1	119.7	PASS
1	903.55	3.22	27.2	100.0	Parallel	169.0	42.1	69.3	PASS
1	903.55	7.58	24.4	200.0	Parallel	163.0	44.9	69.3	PASS
1	903.55	0.570	28.8	100.0	Perpendicular	0.0	43.6	72.5	PASS
1	903.55	0.713	28.9	100.0	Perpendicular	128.0	41.7	70.5	PASS
1	903.55	1.527	27.1	300.0	Perpendicular	288.0	36.9	64.0	PASS
1	903.55	3.097	25.1	200.0	Perpendicular	70.0	44.2	69.3	PASS
1	903.55	0.166	30.6	200.0	Perpendicular	274.0	72.6	103.2	PASS
1	903.55	0.200	31.3	300.0	Perpendicular	232.0	70.3	101.6	PASS
27	916.35	0.016	21.3	150.0	Parallel	153.0	102.4	123.7	PASS
27	916.35	0.024	15.4	200.0	Parallel	256.0	104.5	119.9	PASS
27	916.35	1.671	23.4	300.0	Parallel	126.0	39.8	63.2	PASS
27	916.35	1.975	23.1	300.0	Parallel	313.0	46.2	69.3	PASS
27	916.35	2.283	22.2	100.0	Parallel	274.0	47.1	69.3	PASS
27	916.35	2.448	22.1	100.0	Parallel	154.0	47.2	69.3	PASS
27	916.35	0.013	23.4	150.0	Perpendicular	48.0	101.7	125.1	PASS
27	916.35	0.021	16.8	150.0	Perpendicular	0.0	104.2	121.0	PASS
27	916.35	0.023	16.5	200.0	Perpendicular	0.0	103.7	120.2	PASS
27	916.35	1.018	24.6	150.0	Perpendicular	331.0	42.8	67.5	PASS
27	916.35	1.283	23.9	300.0	Perpendicular	128.0	41.5	65.5	PASS
27	916.35	1.606	23.4	150.0	Perpendicular	142.0	40.1	63.5	PASS
27	916.35	2.015	22.4	300.0	Perpendicular	101.0	46.9	69.3	PASS
27	916.35	2.343	22.0	150.0	Perpendicular	0.0	47.3	69.3	PASS
52	926.45	0.013	23.3	300.0	Parallel	204.0	102.0	125.4	PASS
52	926.45	0.021	16.9	150.0	Parallel	0.0	104.3	121.2	PASS
52	926.45	0.952	24.7	150.0	Parallel	57.0	43.4	68.0	PASS
52	926.45	1.051	24.4	100.0	Parallel	27.0	42.8	67.2	PASS
52	926.45	1.995	23.0	150.0	Parallel	183.0	46.3	69.3	PASS
52	926.45	0.009	29.9	200.0	Perpendicular	101.0	98.2	128.2	PASS
52	926.45	0.024	19.5	100.0	Perpendicular	0.0	100.7	120.2	PASS
52	926.45	0.031	14.6	200.0	Perpendicular	0.0	103.1	117.8	PASS
52	926.45	0.616	29.3	300.0	Perpendicular	72.0	42.5	71.8	PASS
52	926.45	0.684	28.0	200.0	Perpendicular	28.0	42.9	70.9	PASS
52	926.45	0.779	29.2	100.0	Perpendicular	357.0	40.6	69.8	PASS
52	926.45	1.492	27.6	300.0	Perpendicular	57.0	36.6	64.2	PASS
52	926.45	1.624	27.2	100.0	Perpendicular	331.0	36.2	63.4	PASS
Note : Measured Quasi Peak (dBuV/m) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)									

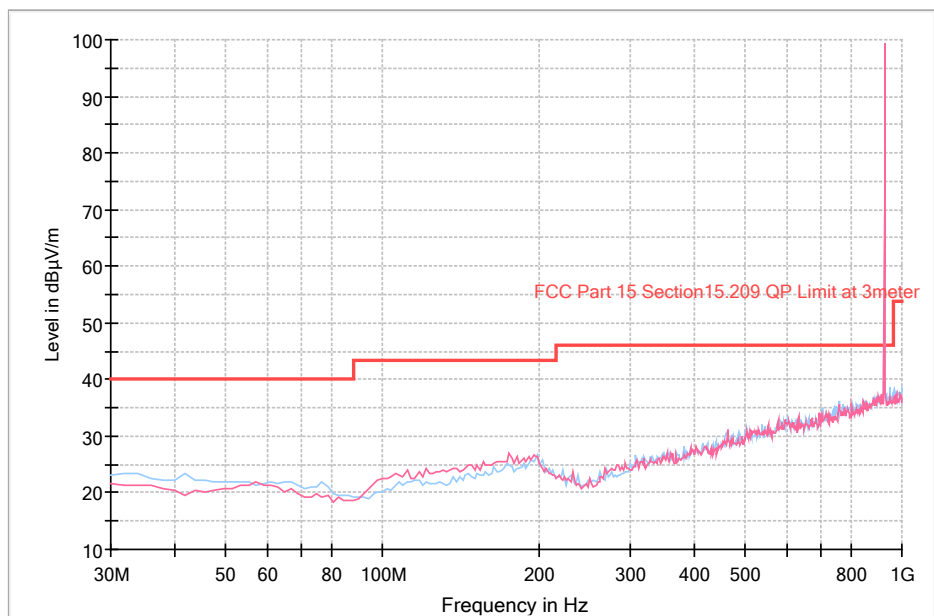
TEST GRAPHS – 30MHz to 1GHz

**Channel 1 (903.55 MHz)**

Note : Peak Graph Vertical (Red), Peak Graph Horizontal (Blue)

**Channel 27 (916.35 MHz)**

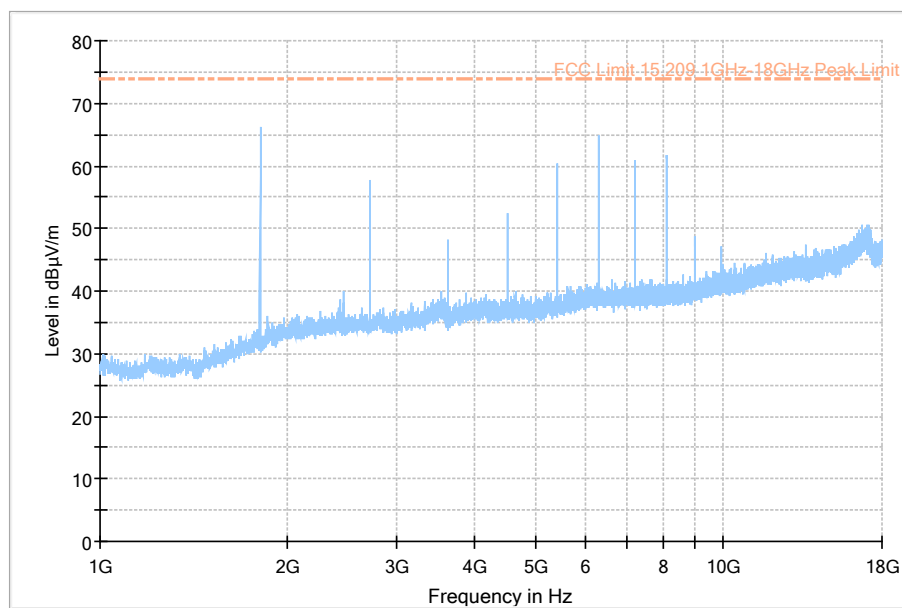
Note : Peak Graph Vertical (Red), Peak Graph Horizontal (Blue)

**Channel 52 (926.45 MHz)**

Note : Peak Graph Vertical (Red), Peak Graph Horizontal (Blue)

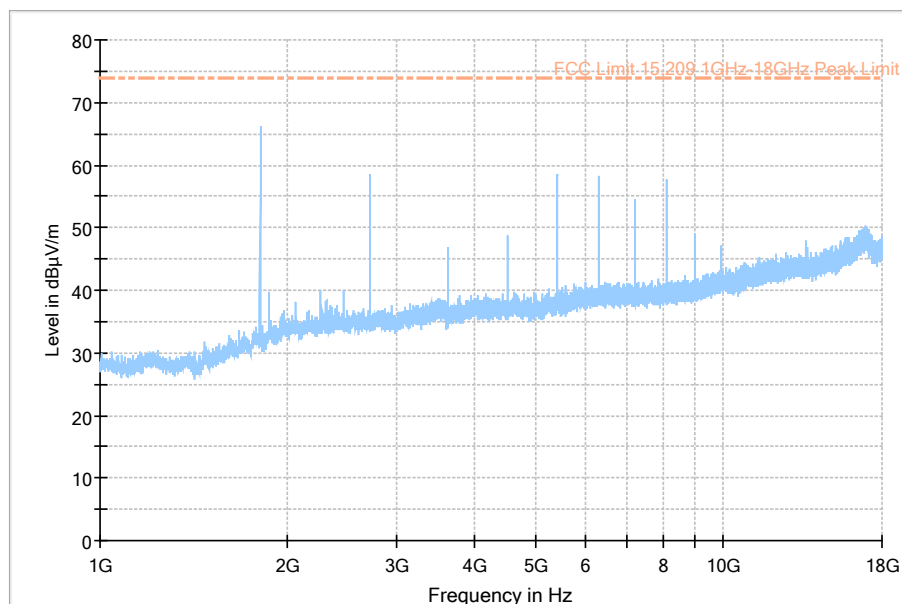
TEST RESULT – 30MHz to 1GHz								
Channel	Spurious Frequency	Measured Quasi Peak	Height	Ant Pol	Azimuth	Margin	Quasi Peak Limit @ 3m Distance	Results
#	MHz	dBμV/m	cm	H / V	deg	dB	dBμV/m	
1	659.82	26.9	200.0	V	244.0	19.1000	46.0000	PASS
1	687.03	27.4	299.0	H	34.0	18.6000	46.0000	PASS
1	698.70	27.9	200.0	H	317.0	18.1000	46.0000	PASS
1	776.45	29.9	299.0	V	34.0	16.1000	46.0000	PASS
1	817.27	29.9	299.0	H	202.0	16.1000	46.0000	PASS
1	823.11	29.9	200.0	H	131.0	16.1000	46.0000	PASS
1	828.94	30.0	200.0	V	149.0	16.0000	46.0000	PASS
1	832.83	30.0	100.0	H	70.0	16.0000	46.0000	PASS
1	867.82	30.5	200.0	H	357.0	15.5000	46.0000	PASS
1	904.75	100.2	100.0	V	202.0			Intended Frequency
27	30.00	17.4	200.0	H	0.0	22.6000	40.0000	PASS
27	32.22	16.9	300.0	H	218.0	23.1000	40.0000	PASS
27	50.76	16.4	200.0	H	0.0	23.6000	40.0000	PASS
27	54.47	16.2	300.0	H	0.0	23.8000	40.0000	PASS
27	196.09	20.9	300.0	V	0.0	22.6000	43.5000	PASS
27	199.06	21.4	100.0	V	327.0	22.1000	43.5000	PASS
27	462.53	24.5	300.0	H	0.0	21.5000	46.0000	PASS
27	494.59	24.6	100.0	H	0.0	21.4000	46.0000	PASS
27	689.38	27.6	100.0	V	0.0	18.4000	46.0000	PASS
27	690.98	27.8	200.0	H	0.0	18.2000	46.0000	PASS
27	866.13	30.6	200.0	H	0.0	15.4000	46.0000	PASS
27	916.63	98.9	100.0	V	0.0			Intended Frequency
52	34.01	16.5	200.0	H	0.0	23.5000	40.0000	PASS
52	41.68	16.2	300.0	H	304.0	23.8000	40.0000	PASS
52	175.41	20.1	300.0	V	252.0	23.4000	43.5000	PASS
52	181.39	20.1	100.0	V	0.0	23.4000	43.5000	PASS
52	195.20	20.6	100.0	V	300.0	22.9000	43.5000	PASS
52	199.62	20.9	200.0	H	246.0	22.6000	43.5000	PASS
52	461.35	24.0	200.0	V	159.0	22.0000	46.0000	PASS
52	504.62	25.5	200.0	H	317.0	20.5000	46.0000	PASS
52	693.14	27.6	100.0	V	252.0	18.4000	46.0000	PASS
52	702.34	28.1	100.0	H	331.0	17.9000	46.0000	PASS
52	868.01	30.5	100.0	H	34.0	15.5000	46.0000	PASS
52	926.53	99.2	100.0	V	246.0			Intended Frequency
NOTE: Measured Quasi Peak (dBuV/m) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)								

TEST GRAPHS – 1GHz to 18 GHz



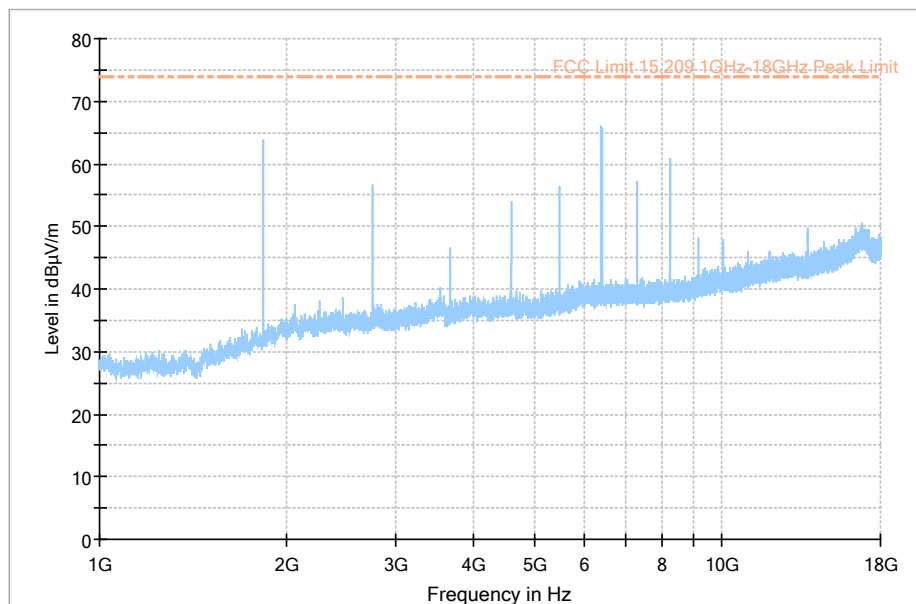
Channel 1 (903.55 MHz)

Note : Peak Graph - Horizontal

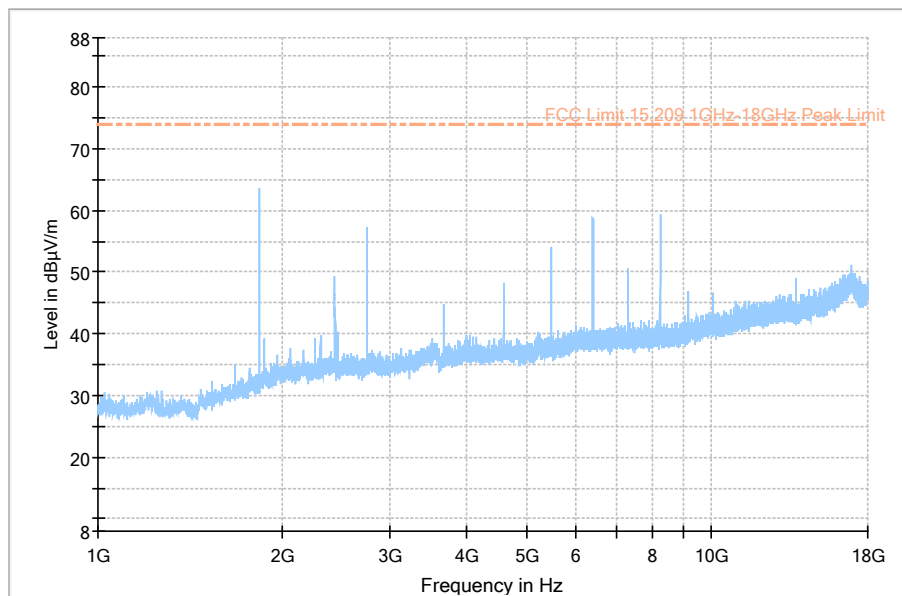


Channel 1 (903.55 MHz)

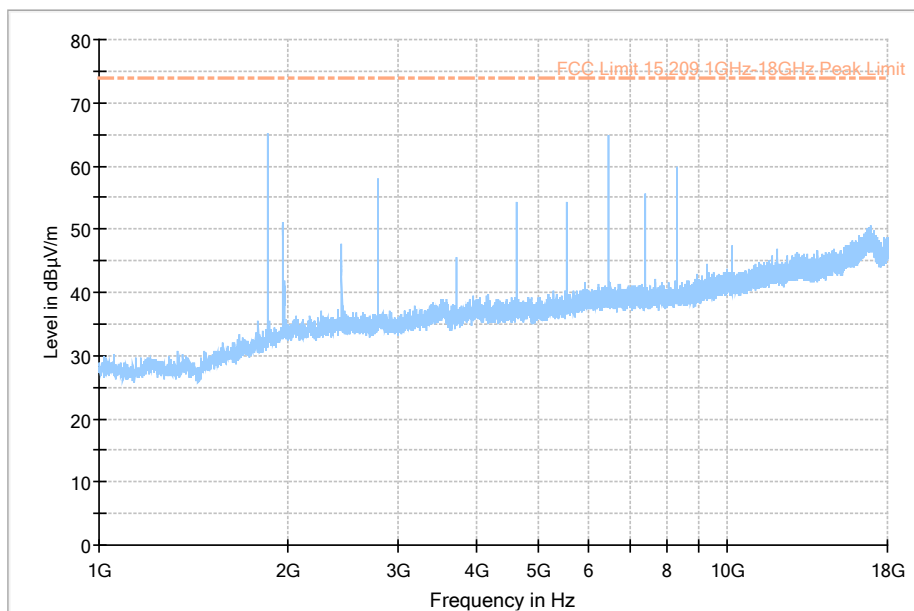
Note : Peak Graph - Vertical

**Channel 27 (916.35 MHz)**

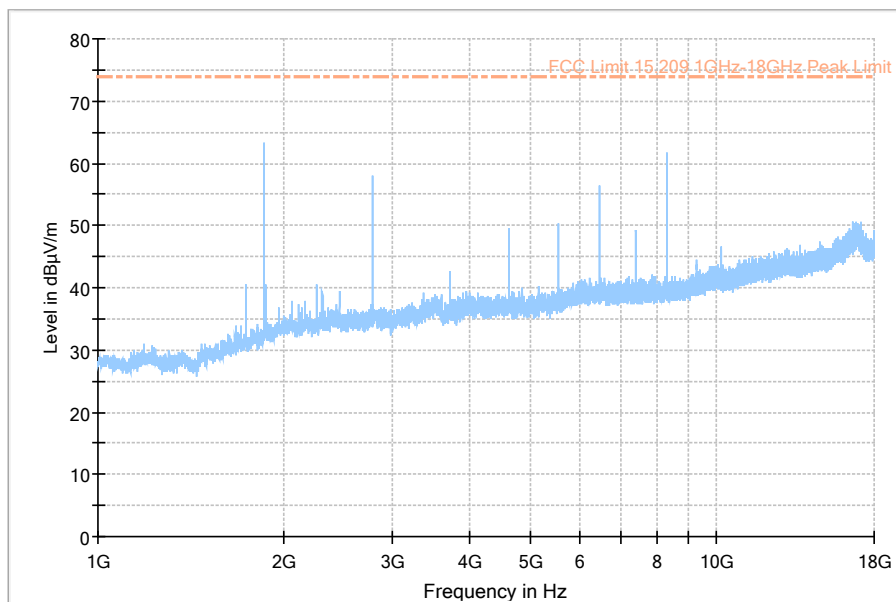
Note : Peak Graph - Horizontal

**Channel 27 (916.35 MHz)**

Note : Peak Graph - Vertical

**Channel 52 (926.45 MHz)**

Note : Peak Graph - Horizontal

**Channel 52 (926.45 MHz)**

Note : Peak Graph - Horizontal

TEST RESULT –1GHz to 18GHz						RESTRICTED BAND – PEAK & AVERAGE					
Channel	Spurious Frequency	Measured Field Strength - Peak	Height	Ant Pol	Azimuth	Peak Limit	Peak Margin	Calculated Average Reading [Peak – Duty cycle]	Average Limit	Average Margin	Results
#	GHz	dBμV/m	cm	H/V	deg	dBμV/m	dB	dBμV/m		dB	
1	2.7	57.9	250	H	340	74	16.1	39.85	54	14.15	PASS
1	4.5	52.6	200	H	260	74	21.4	34.55	54	19.45	PASS
1	5.4	60.4	200	H	151	74	13.6	42.35	54	11.65	PASS
1	8.1	61.6	200	H	80	74	12.4	43.55	54	10.45	PASS
1	9.0	48.9	200	H	174	74	25.1	30.85	54	23.15	PASS
1	2.7	58.7	200	V	175	74	15.3	40.65	54	13.35	PASS
1	4.5	48.7	250	V	41	74	25.3	30.65	54	23.35	PASS
1	5.4	58.5	250	V	22	74	15.5	40.45	54	13.55	PASS
1	8.1	57.7	200	V	345	74	16.3	39.65	54	14.35	PASS
1	9.0	49	200	V	101	74	25	30.95	54	23.05	PASS
27	2.7	56.8	100	H	317	74	17.2	38.75	54	15.25	PASS
27	4.5	53.9	200	H	257	74	20.1	35.85	54	18.15	PASS
27	7.3	57.1	200	H	323	74	16.9	39.05	54	14.95	PASS
27	8.2	61	200	H	80	74	13.0	42.95	54	11.05	PASS
27	2.7	57.2	250	V	0	74	16.8	39.15	54	14.85	PASS
27	7.3	50.7	250	V	323	74	23.3	39.15	54	14.85	PASS
27	8.2	59.3	200	V	342	74	14.7	32.65	54	21.35	PASS
									54		PASS
52	2.7	57.9	250	H	302	74	16.1	39.85	54	14.15	PASS
52	4.6	54.2	200	H	269	74	19.8	36.15	54	17.85	PASS
52	7.4	55.5	200	H	317	74	18.5	37.45	54	16.55	
52	8.3	59.9	200	H	91	74	14.1	41.85	54	12.15	PASS
52	2.7	58.1	250	V	0	74	15.9	40.05	54	13.95	PASS
52	4.6	49.4	100	V	58	74	24.6	31.35	54	22.65	PASS
52	7.4	49.4	250	V	218	74	24.6	31.35	54	22.65	PASS
52	8.3	61.7	200	V	355	74	12.3	43.65	54	10.35	PASS

Note :

Measured Field Strength - Peak (dBμV/m) = Receiver Readings (dBμV) + Antenna Factor (dB/m) + Cable loss (dB) + Filter Insertion loss (dB) – Ext. Pre amplifier Gain (dB)

Cal. Average Readings (dBμV/m) = Measured Peak (dBμV/m) – Duty Cycle Correction Factor (dB)

Duty Cycle Correction Factor is calculated using the guidelines provided in DA 00-705

Duty Cycle Factor = $20 \cdot \log(\text{Dwell time} / 100\text{msec})$, Number of Transmission for 100msec: 8, Dwell time per Transmission: 1.563msec
 Duty Cycle correction Factor = $20 \log(1.563 \cdot 8 / 100) = -18.05\text{dB}$

Test Result –1GHz to 18 GHz						NON RESTRICTED BAND – PEAK			
Channel	Measured Fundamental	Spurious Frequency	Measured Field Strength - Peak	Height	Azimuth	Ant Pol	Peak Limit [Fundamental – 20dBc]	Margin	Results
#	dBμV/m	GHz	dBuV	cm	deg	H / V	dBuV/m	dB	
1	100.2	1.80	66.3	250.0	17.0	H	80.2	13.9	PASS
1	100.2	6.32	64.9	200.0	354.0	H	80.2	15.3	PASS
1	100.2	7.23	60.9	200.0	326.0	H	80.2	19.3	PASS
1	100.2	1.80	66.2	101.0	162.0	V	80.2	14	PASS
1	100.2	6.32	58.4	200.0	299.0	V	80.2	21.8	PASS
1	100.2	7.23	54.6	200.0	34.0	V	80.2	25.6	PASS
27	98.9	1832	63.8	100.0	143.0	H	78.9	15.1	PASS
27	98.9	6414	66.1	200.0	0.0	H	78.9	12.8	PASS
27	98.9	5498	56.4	200.0	237.0	H	78.9	22.5	PASS
27	98.9	1832	63.7	100.0	203.0	V	78.9	15.2	PASS
27	98.9	2430	49.2	100.0	0.0	V	78.9	29.7	PASS
27	98.9	5498	54.0	250.0	327.0	V	78.9	24.9	PASS
27	98.9	6414	58.8	200.0	293.0	V	78.9	20.1	PASS
52	99.2	1853	65.1	150.0	31.0	H	79.2	14.1	PASS
52	99.2	1961	51.1	200.0	335.0	H	79.2	28.1	PASS
52	99.2	5558	54.2	200.0	58.0	H	79.2	25	PASS
52	99.2	6484	64.8	200.0	345.0	H	79.2	14.4	PASS
52	99.2	1852	63.4	200.0	280.0	V	79.2	15.8	PASS
52	99.2	5559	50.4	250.0	6.0	V	79.2	28.8	PASS
52	99.2	6485	56.5	200.0	345.0	V	79.2	22.7	PASS

Note :

Measured Field Strength - Peak (dBuV/m) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB) + Filter Insertion loss (dB) – Ext. Pre amplifier Gain (dB)

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Radiated Emission Test setup