Wireless Monitor Module

Model No.: FW-MM

Date: 22-Dec-2013

Report Prepared By:

Sasikala Subramani

EMC Test Report

Report Number	EMC-0004-2
EUT Nomenclature	Wireless Monitor Module
Sample Identification	Model No. : FW-MM Sl. No. : 05879 Software Version : 5.82 Hardware Version : Rev 2
Number of Samples	01
Date of receipt of Sample	16-09-2013
Condition of Sample on receipt	Good
Client name	Honeywell International Inc.
Client Address	System Sensor, 3825, Ohio Ave, St. Charles , IL, USA - 60174
Testing Laboratory	Honeywell Technology Solutions Lab Pvt. Ltd.
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	16-09-2013 to 06-12-2013
Applicable Standard	FCC Part 15 Subpart C
Test Results	PASS

Prepared By: Technical Lead Name : Sasikala Subramani Signature: Date : 23-Dec-2013	Reviewed By: Project Lead Name : Loganathan Joghee Signature: Date : 23-Dec-2013
Authorized By: Quality Manager Name : Prasanna Kumar BT Signature: Date : 23-Dec-2013	Authorized By: Lab Manager Name : Ananth Krishna Signature: Date : 23-Dec-2013

TEST SUMMARY						
#	Name	Specification	Test Method	Pass	Fail	NA
		FHSS				
1	20dB Bandwidth	FCC Part 15.247	DA 00-705	☒	☐	
2	Maximum Peak Output Power	FCC Part 15.247	DA 00-705	☒	☐	
3	Carrier Frequency Separation	FCC Part 15.247	DA 00-705	☒	☐	
4	Number of Hopping Frequencies	FCC Part 15.247	DA 00-705	☒	☐	
5	Band-edge Compliance	FCC Part 15.247	DA 00-705	☒	☐	
6	Time of Occupancy (Dwell Time)	FCC Part 15.247	DA 00-705	☒	☐	
7	Spurious RF Conducted Emissions	FCC Part 15.247	DA 00-705	☒	☐	
8	Spurious Radiated Emissions	FCC Part 15.247 and 15.209	DA 00-705	☒	☐	
		DTS				
1	DTS 6dB Bandwidth	FCC Part 15.247	KDB 558074	☒	☐	
2	Maximum Peak Output Power	FCC Part 15.247	KDB 558074	☒	☐	
3	Maximum Power Spectral Density	FCC Part 15.247	KDB 558074	☒	☐	
4	Band-edge Conducted Emissions	FCC Part 15.247	KDB 558074	☒	☐	
5	Radiated Spurious Emissions	FCC Part 15.247 and 15.209	KDB 558074	☒	☐	

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	1.4dB
2	Maximum Peak Output Power	1.4dB
3	Maximum Power Spectral Density	1.4dB
4	Band-edge Emissions	1.4dB
5	Spurious RF Conducted Emissions	1.4dB
6	Radiated Spurious Emissions <1GHz	4.9dB
7	Radiated Spurious Emissions >1GHz	6.3dB

1 PRODUCT DETAILS

PRODUCT OPERATION AND INTENDED USE

The wireless monitor module is powered by four CR123A batteries. It can be connected to a switch within three feet of it location or wired directly to the pull station. 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 (20 dB)	DTS	:1MHz
	FHSS	:320 KHz
Transmitted Power	DTS	:12dBm & 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 , 27mA	
Dimensions (L x B x H)	4.263mm x 4.171mm x 1.465mm	
Environmental Conditions	Operating Temperature	:20°C to 70°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.
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.

OPERATING MODES

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

INPUT AND OUTPUT CABLES

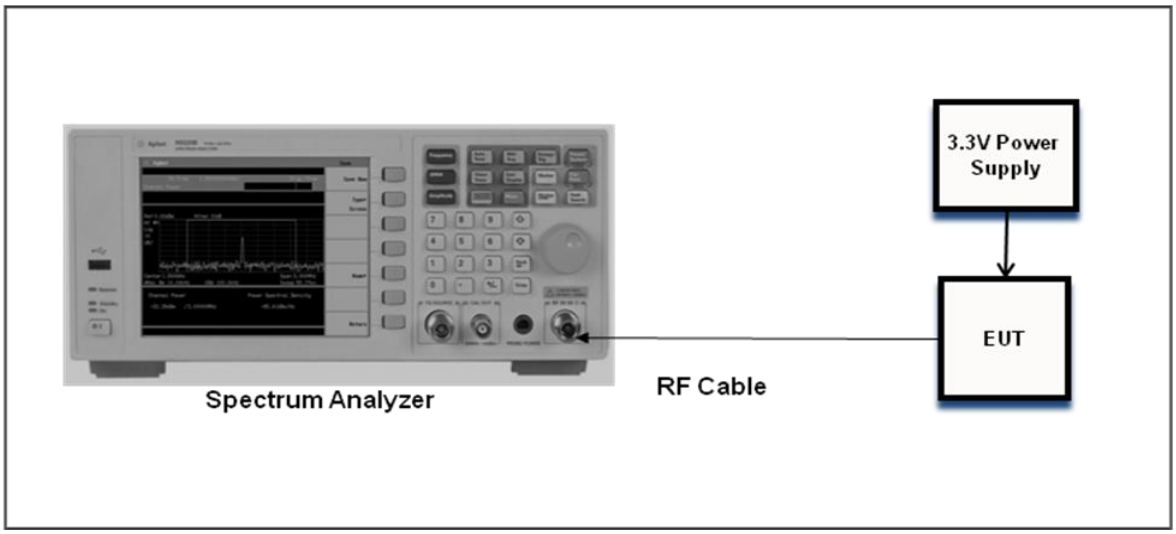
Port #	Name	Port Type	Cable Length	Cable type Shielded/ Unshielded	Comments
	Not Applicable				

*Note: AC = AC Power Port; TP = Telecommunication Ports (eg. Ethernet); N/E = Non-Electrical; DC = DC Power Port; DI/ DO = Digital Input/ Output; AI/ AO = Analog Input/ Output

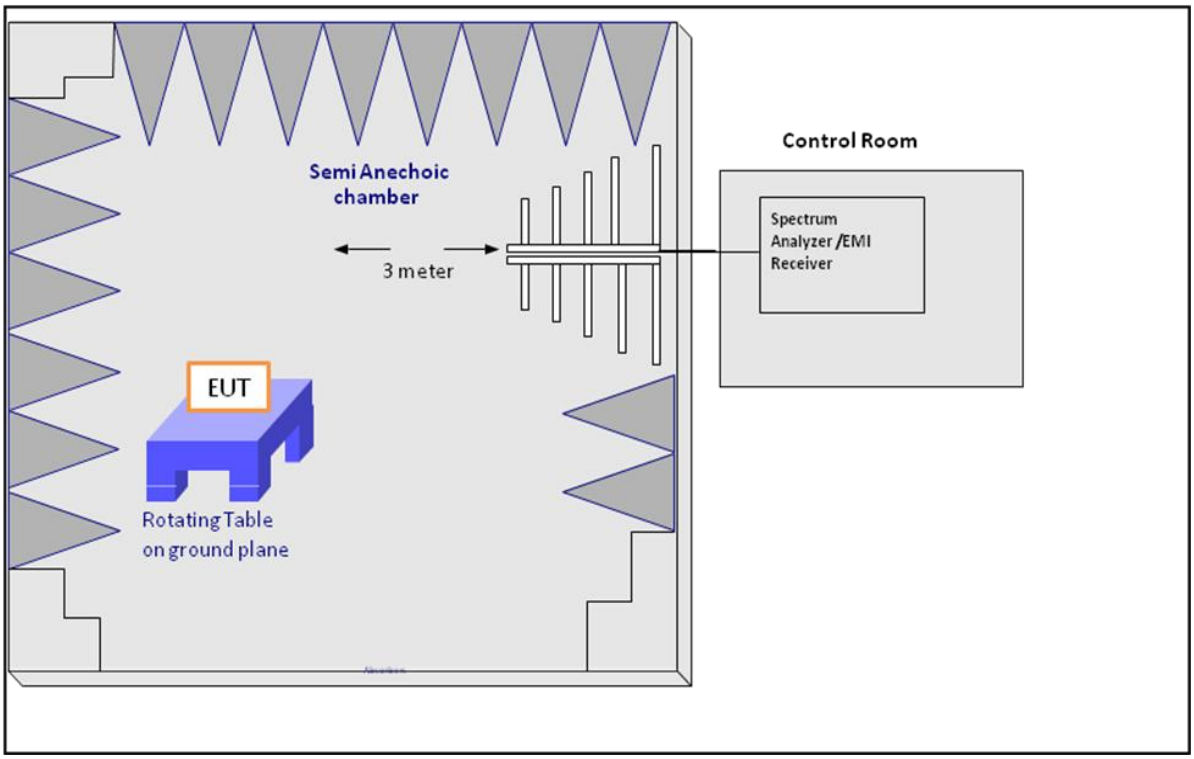
SUPPORT EQUIPMENTS AND ACCESSORIES USED

#	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	ZH846116	18-Feb-2014

CONNECTION DIAGRAM AND SETUP DIAGRAM



Conducted RF Test Setup



Radiated Emission Test Setup

2 FHSS CHANNELS

2.1 20dB BANDWIDTH

EUT Nomenclature	Wireless Monitor Module	**Test Report No.**	EMC-0004-2
Model No.	FW-MM	**Serial No.**	05879
Test Start Date	21-Nov-2013	**Temperature (˚C)**	23.2
Test End Date	21-Nov-2013	**Humidity RH (%)**	55.1
Tested By	Loganathan Joghee	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3V dc		
Operating Mode	Refer Page 5 for Operating Mode Table		
Test configuration	Refer Page 5 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247		
Test Method	DA 00-705		
Comment			

TEST DETAILS

Method	☒ Conducted ☐ Radiated

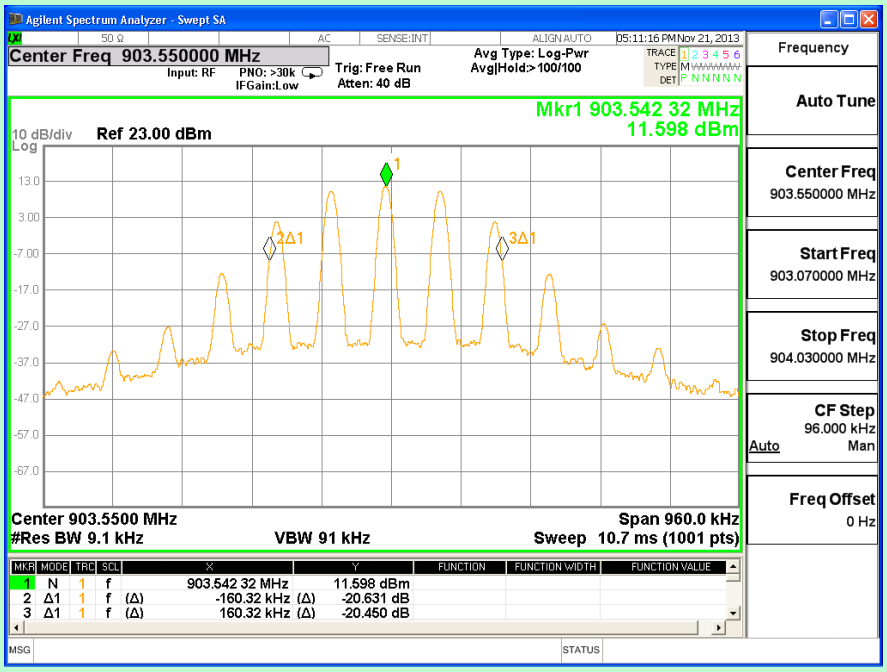
TEST PARAMETERS

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

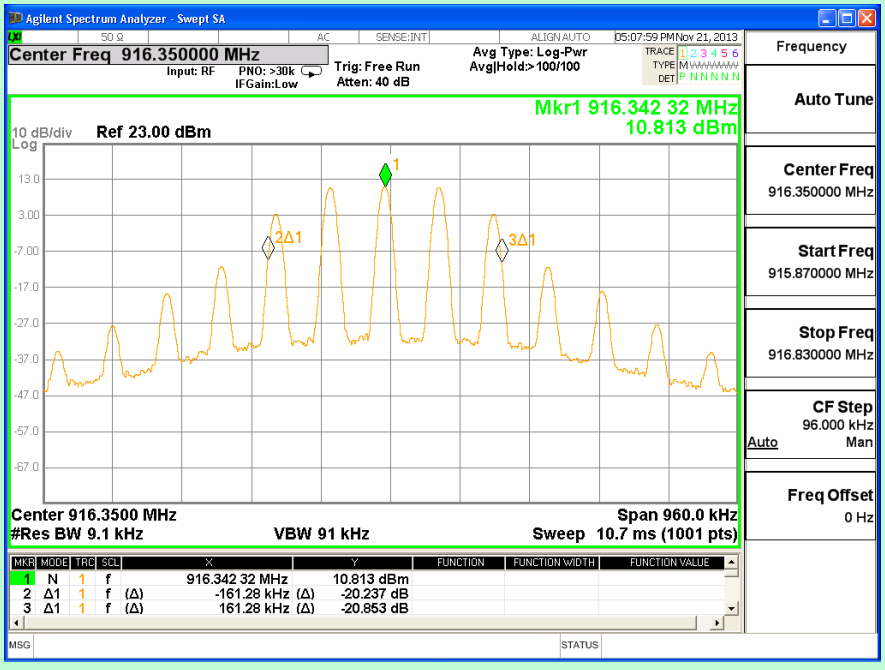
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	28-Nov-2014
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

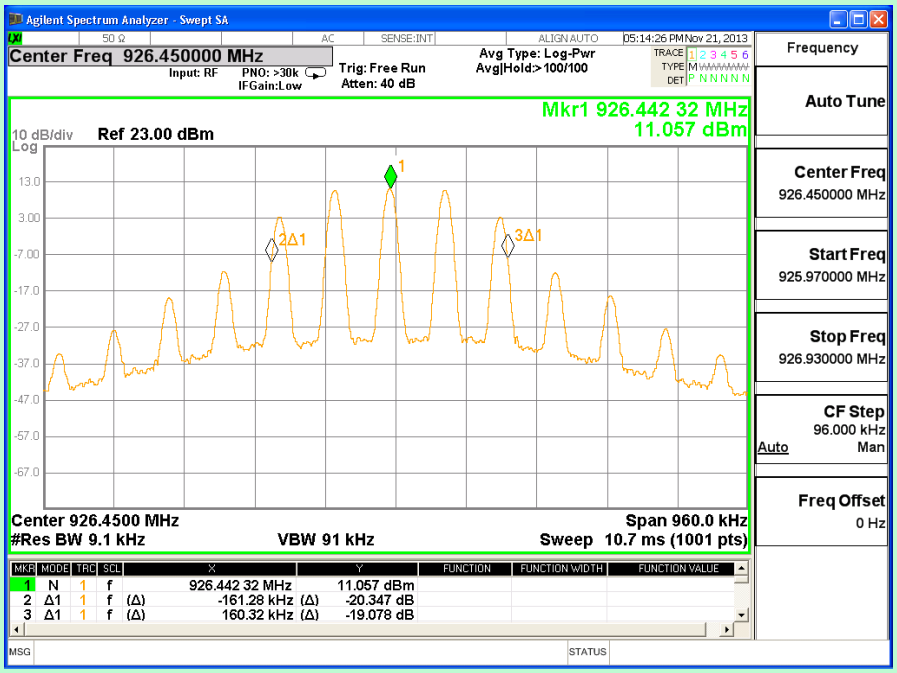
TEST GRAPHS



Channel 1 (903.55 MHz)



Channel 27 (916.35 MHz)



Channel 52 (926.45 MHz)

TEST RESULT

Channel	Frequency	Measured Bandwidth	Limit	Result
#	MHz	KHz	KHz	
1	903.55	320.64	≥250 & ≤500	PASS
27	916.35	322.56	≥250 & ≤500	PASS
52	926.45	321.6	≥250 & ≤500	PASS

TEST SETUP PHOTOGRAPH

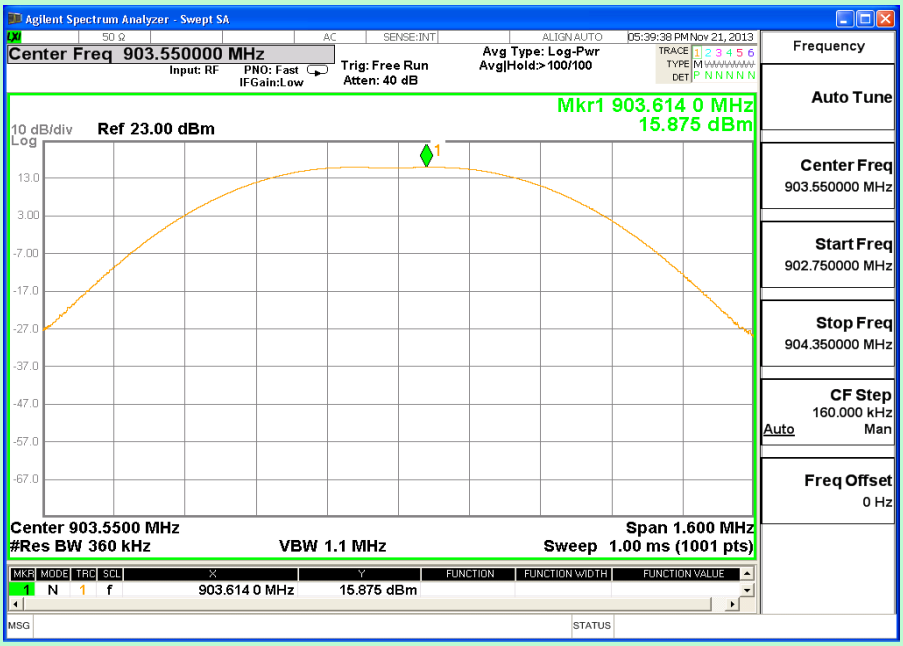
Refer Annexure -1

Conducted RF Test setup

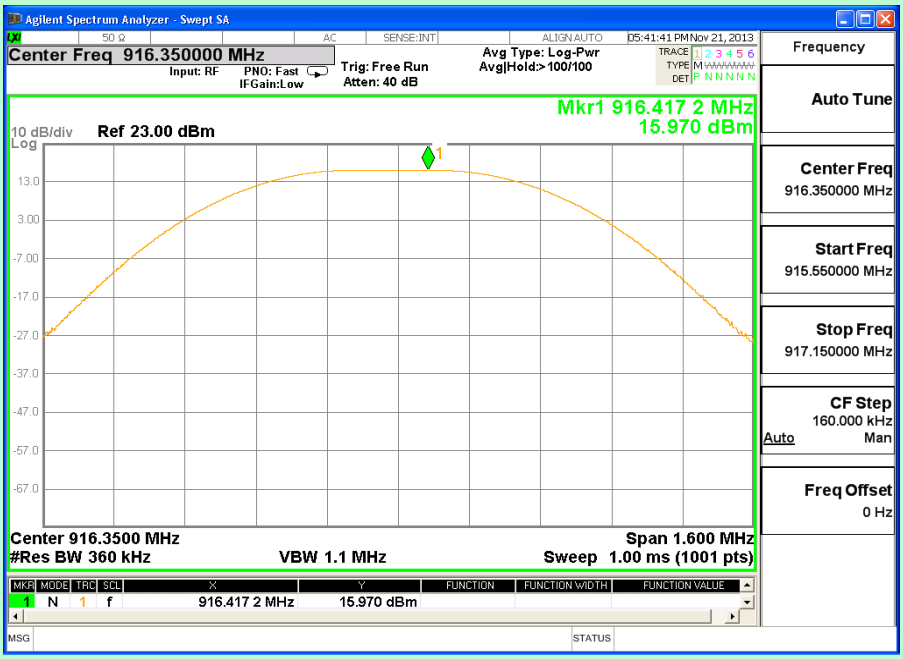
2.2 PEAK OUTPUT POWER			
EUT Nomenclature	Wireless Monitor Module	**Test Request No.**	EMC-0004-2
Model No.	FW-MM	**Serial No.**	01
Test Start Date	21-Nov-2013	**Temperature (°C)**	23.2
Test End Date	21-Nov-2013	**Humidity RH (%)**	55.1
Tested By	Loganathan Joghee	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 for Operating Mode Table		
Test configuration	Refer Page 5 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247		
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	28-Nov-2014
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

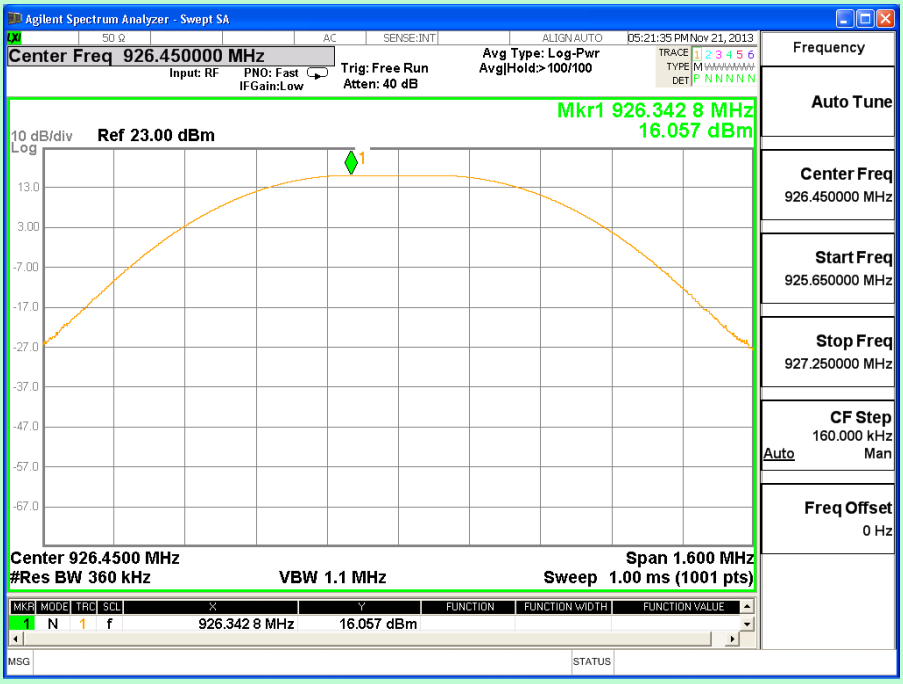
TEST GRAPHS



Channel 1 (903.55 MHz)



Channel 27 (916.35 MHz)



Channel 52 (926.45 MHz)

TEST RESULT

Channel #	Frequency MHz	Measured Power Level dBm	Cable Loss dB	Transmitter Power Level dBm	Limit dBm	Result
1	903.55	15.875	0.5	16.375	≤23.979	PASS
27	916.35	15.970	0.5	16.470	≤23.979	PASS
52	926.45	16.057	0.5	16.557	≤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 Monitor Module	**Test Request No.**	EMC-0004-2
Model No.	FW-MM	**Serial No.**	05879
Test Start Date	18-Oct-2013	**Temperature (°C)**	23.2
Test End Date	18-Oct-2013	**Humidity RH (%)**	55.1
Tested By	Loganathan Joghee	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 for Operating Mode Table		
Test configuration	Refer Page 5 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247		
Test Method	DA 00-705		
Comment			

TEST DETAILS

Method	☒ Conducted ☐ Radiated

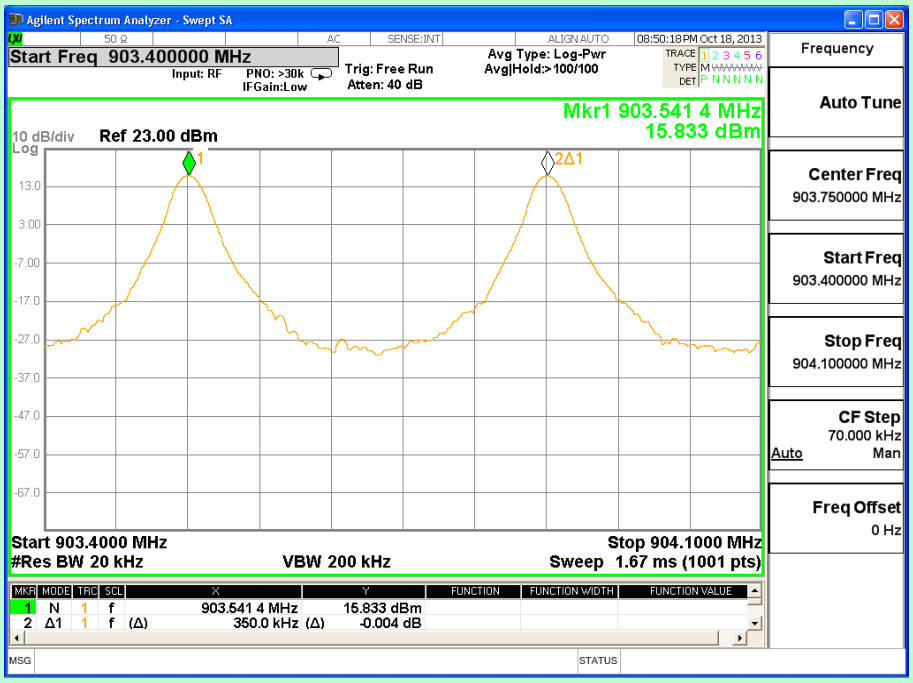
TEST PARAMETERS

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

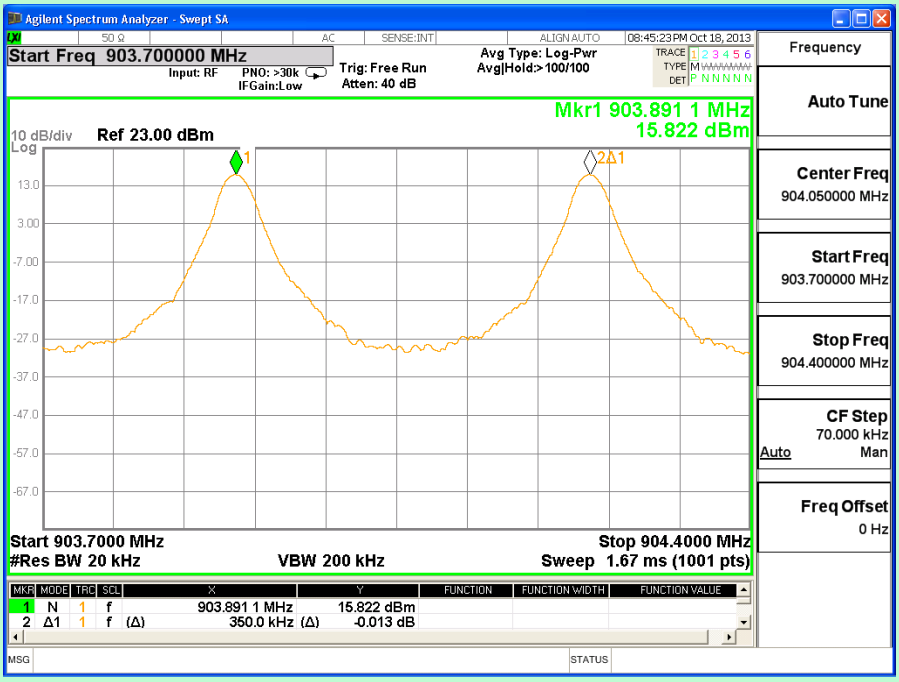
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	28-Nov-2014
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

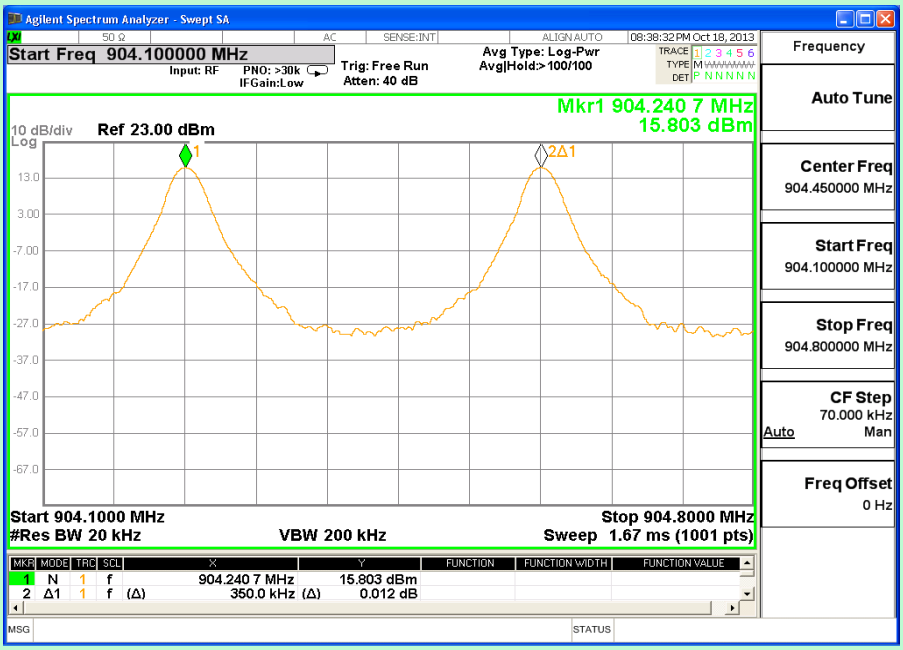
TEST GRAPHS



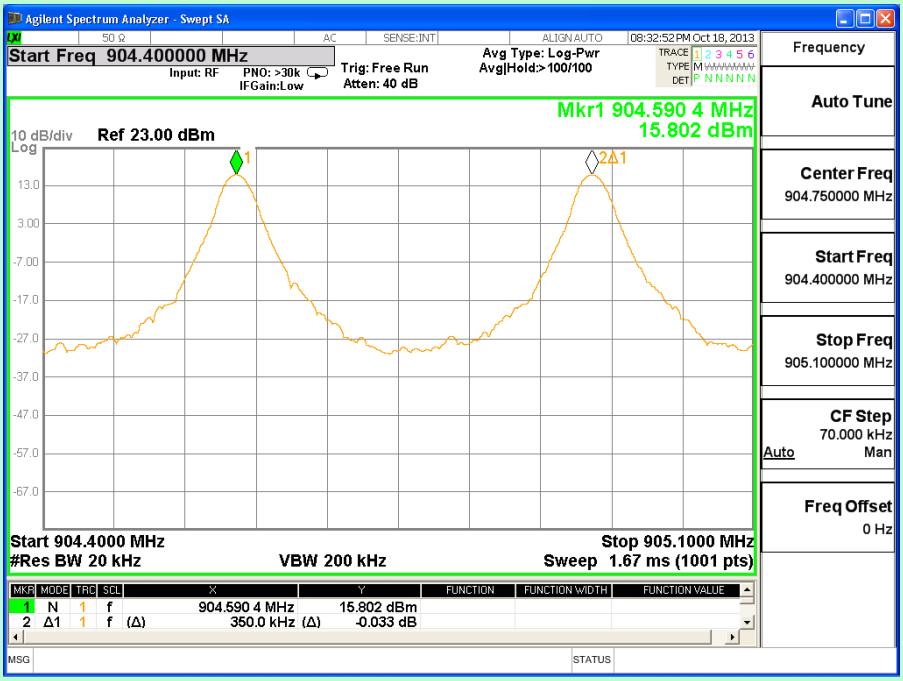
Channel 1 and 2



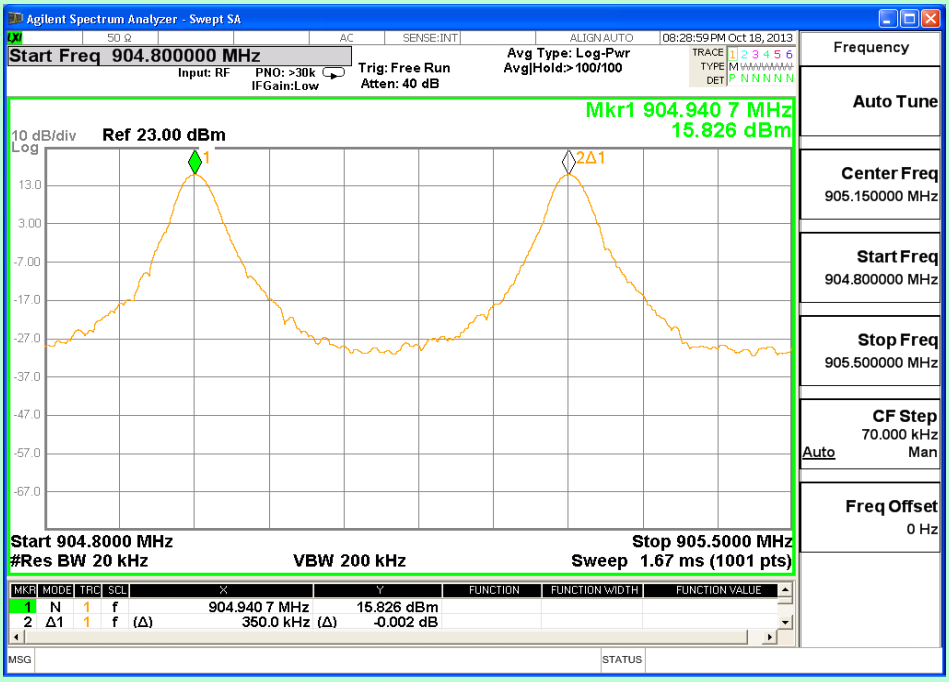
Channel 2 and 3



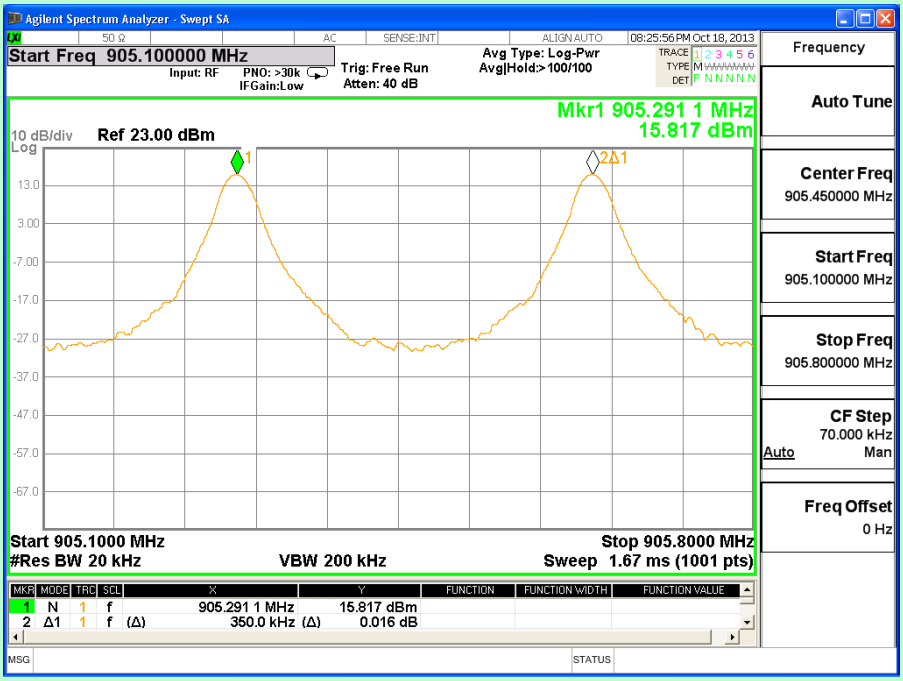
Channel 3 and 4



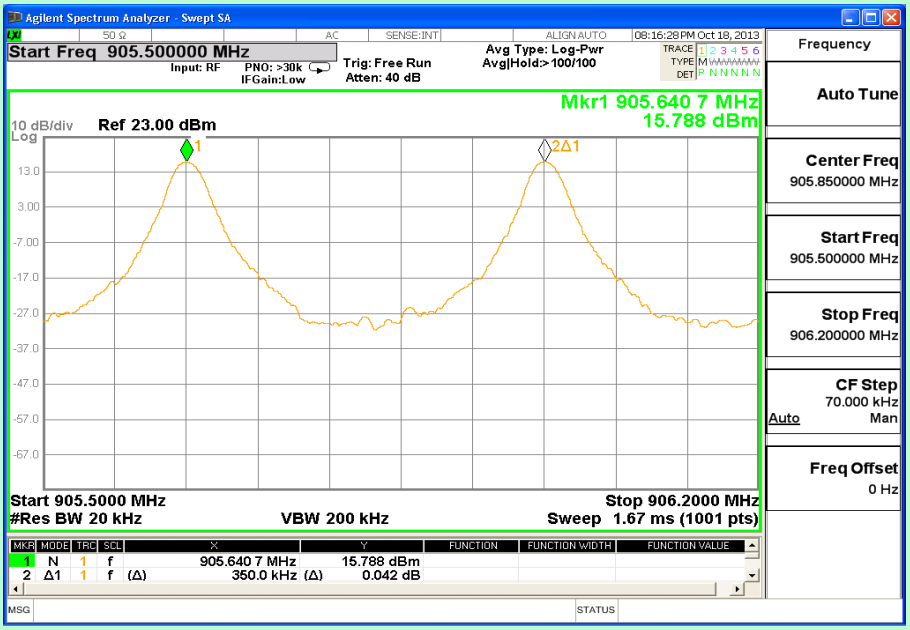
Channel 4 and 5



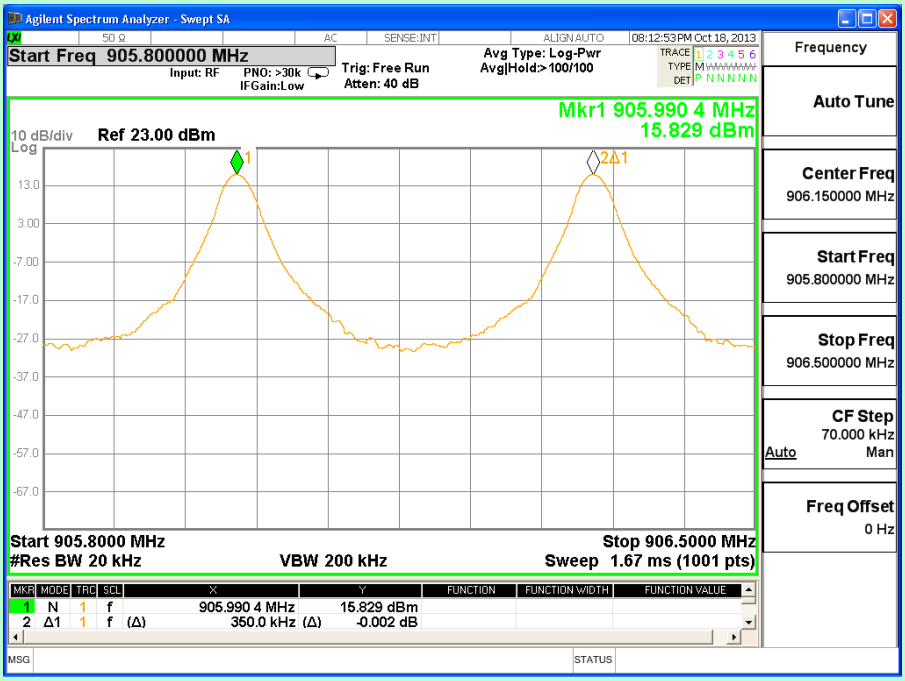
Channel 5 and 6



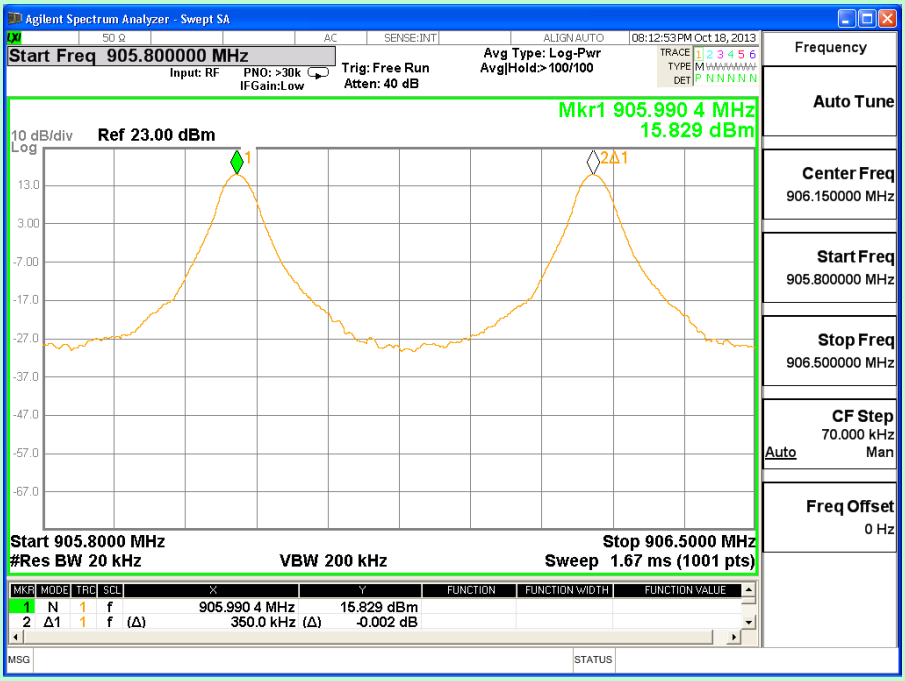
Channel 6 and 7



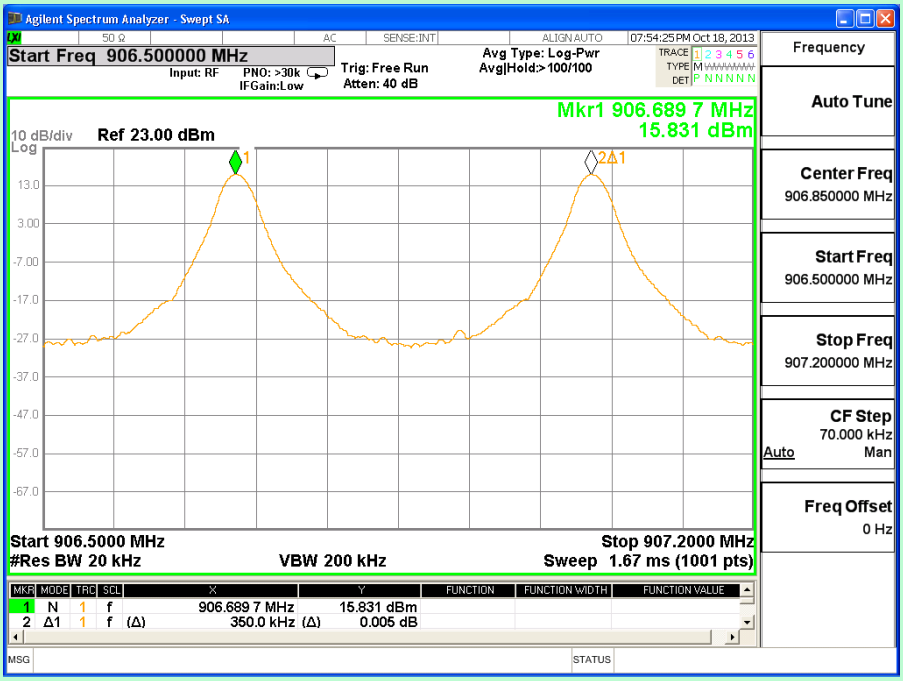
Channel 7 and 8



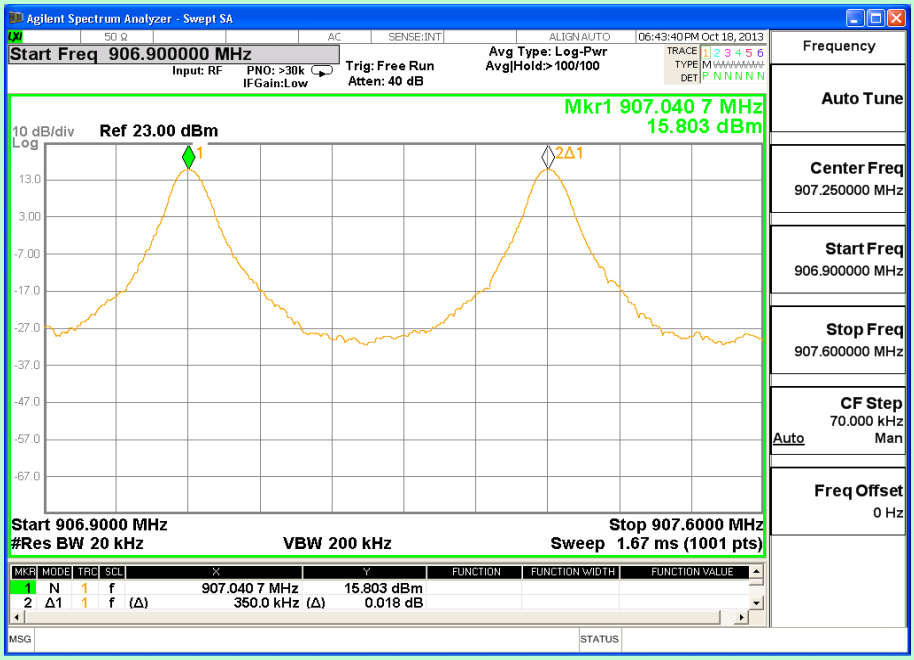
Channel 8 and 9



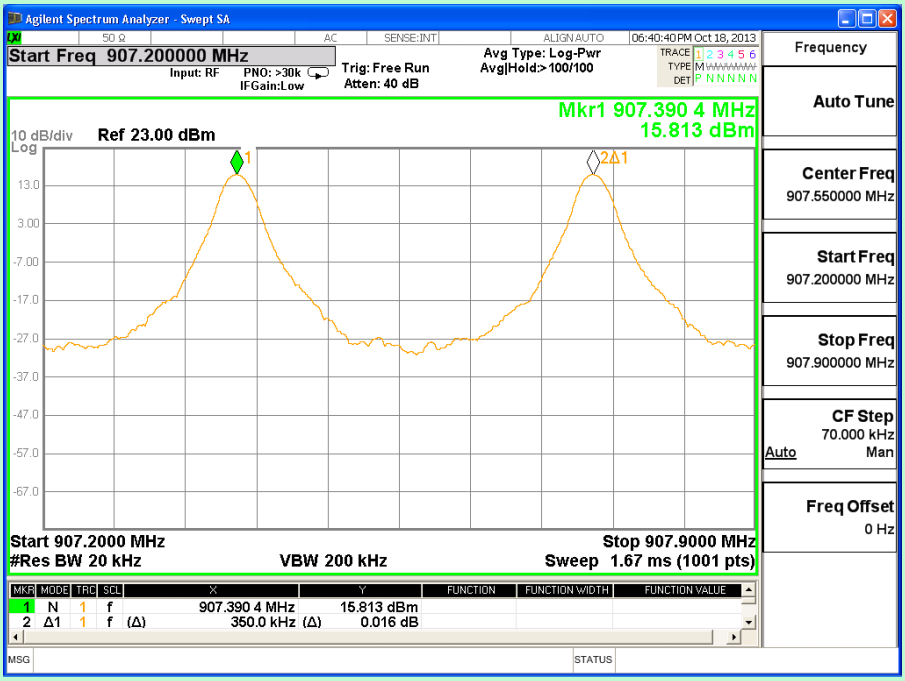
Channel 9 and 10



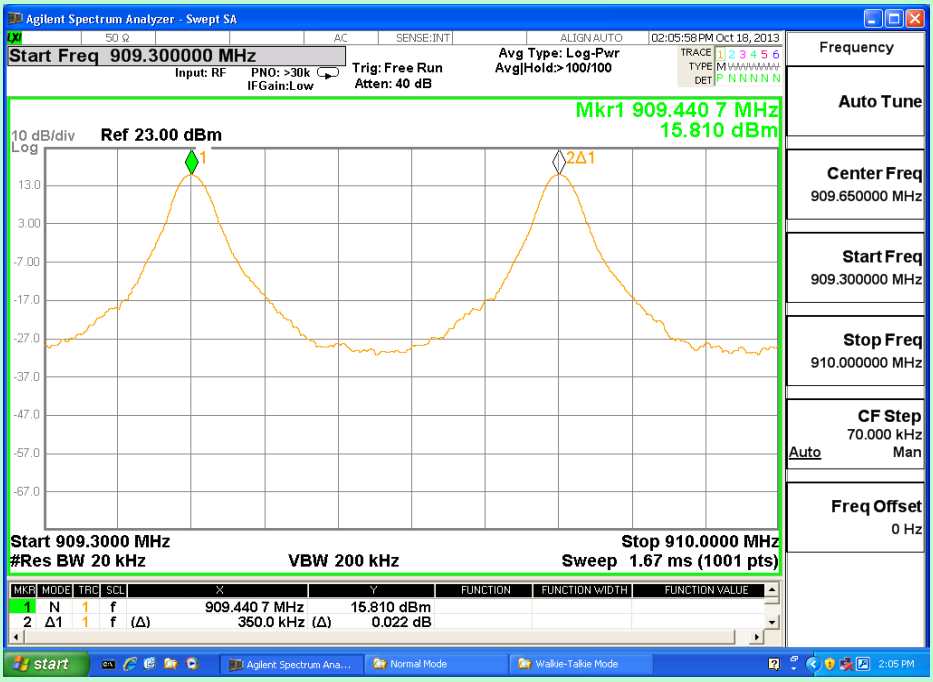
Channel 10 and 11



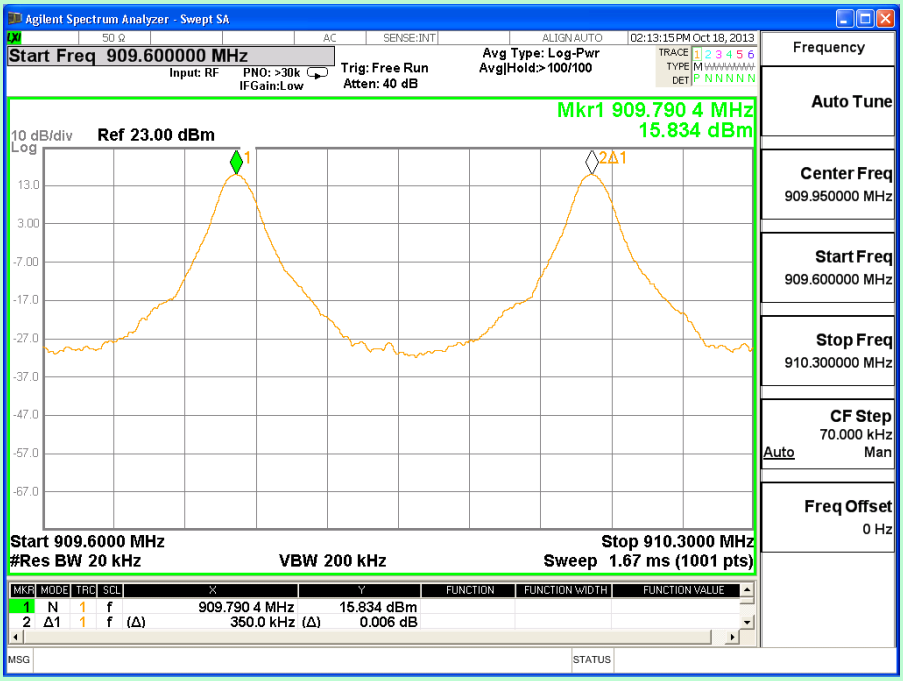
Channel 11 and 12



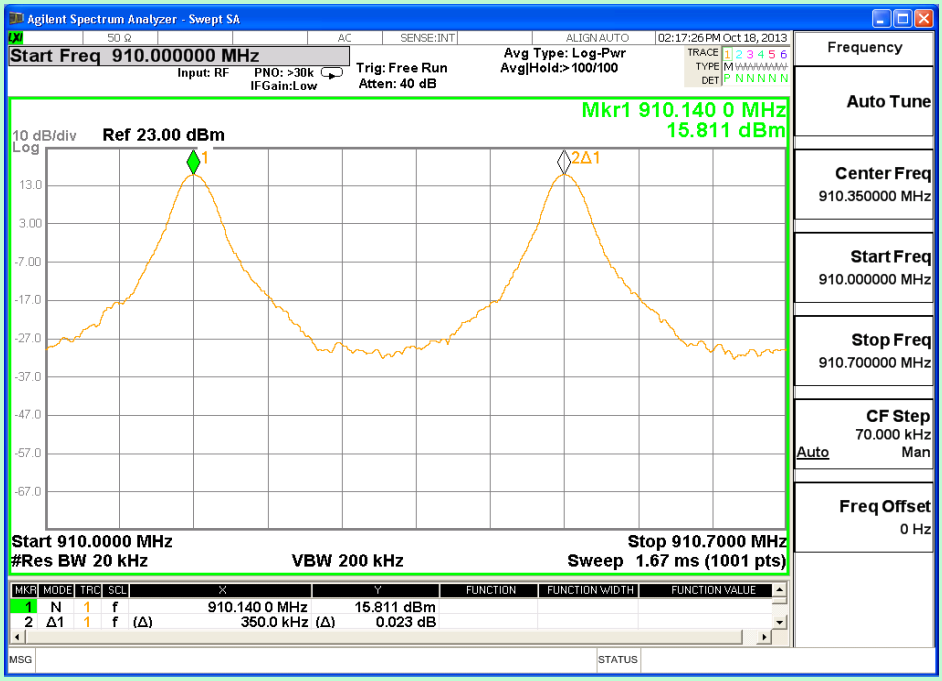
Channel 12 and 13



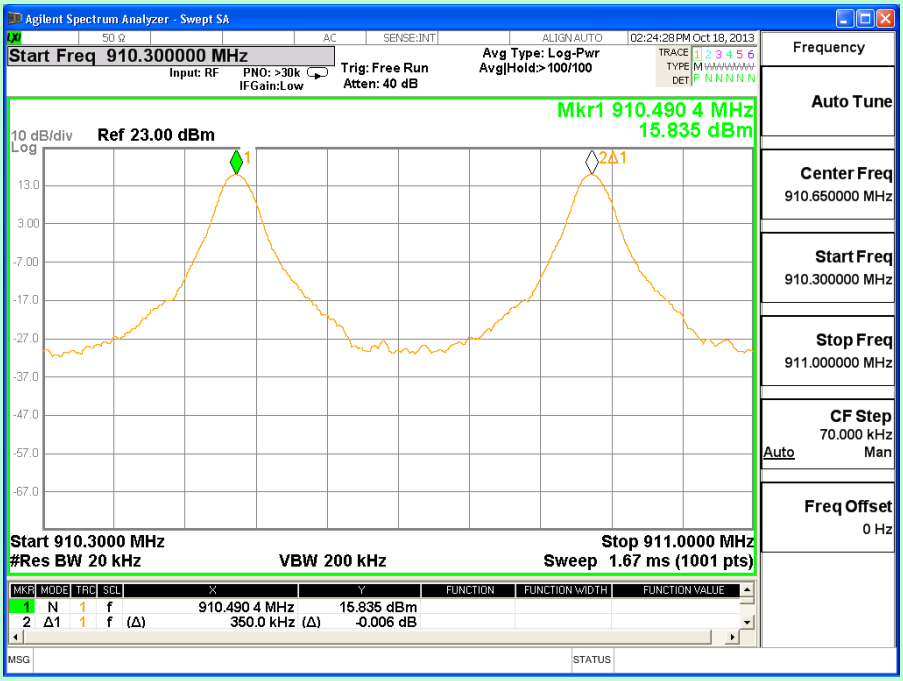
Channel 14 and 15



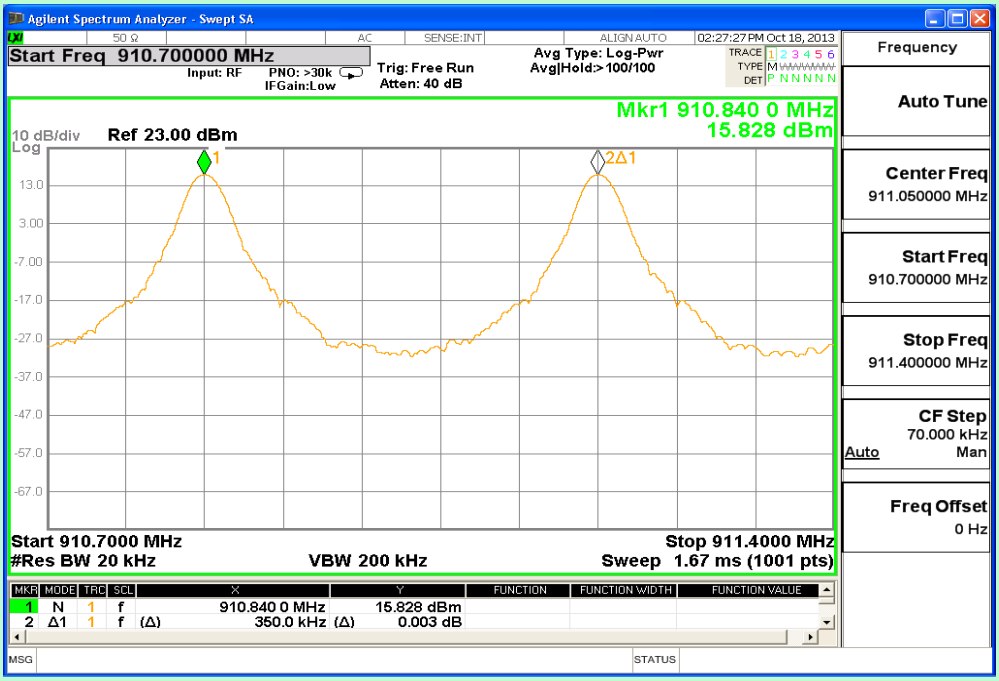
Channel 15 and 16



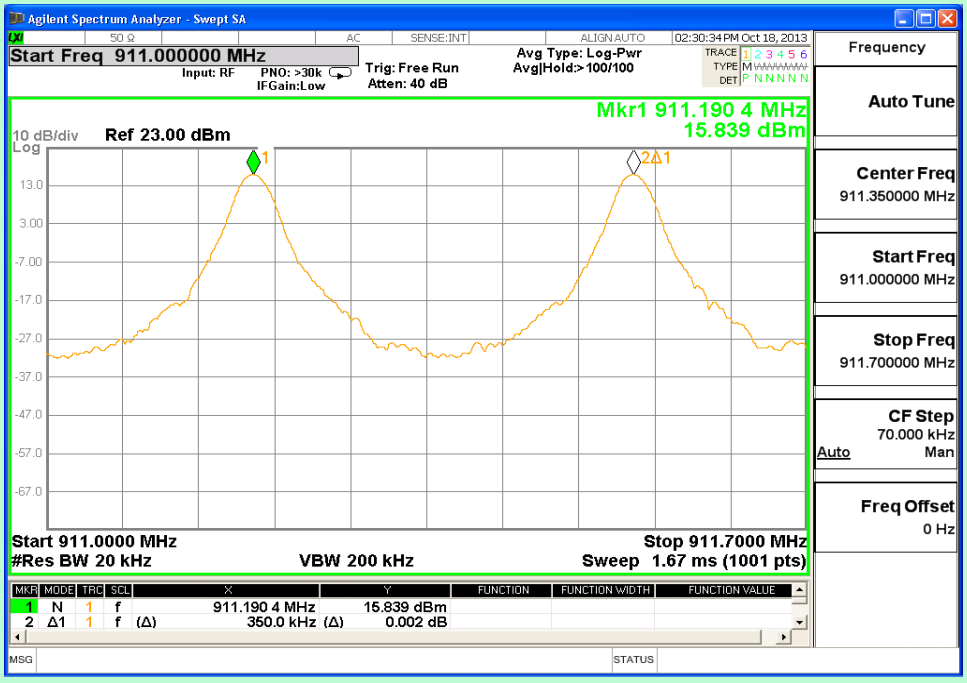
Channel 16 and 17



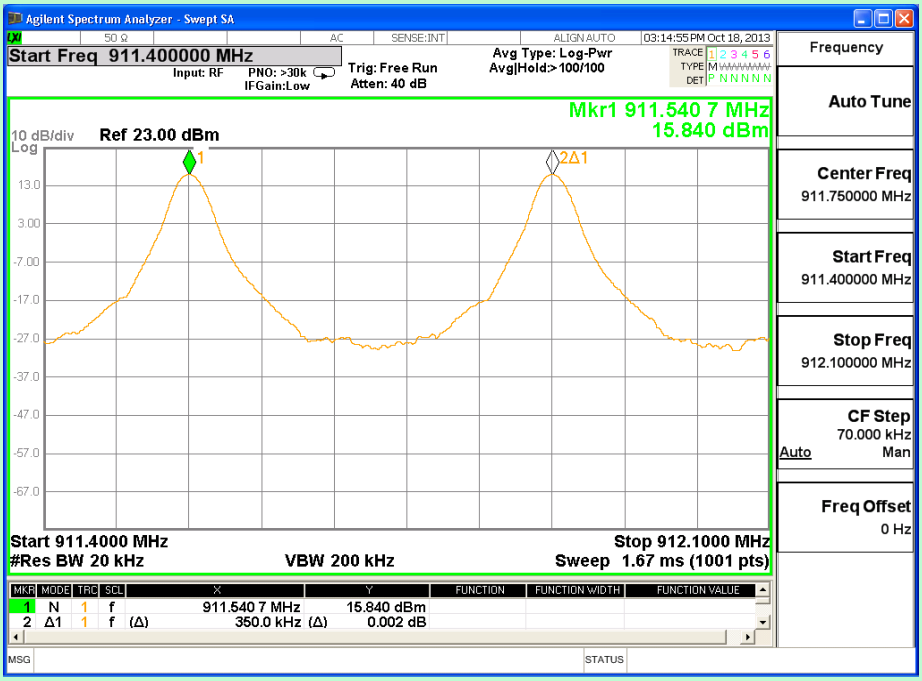
Channel 17 and 18



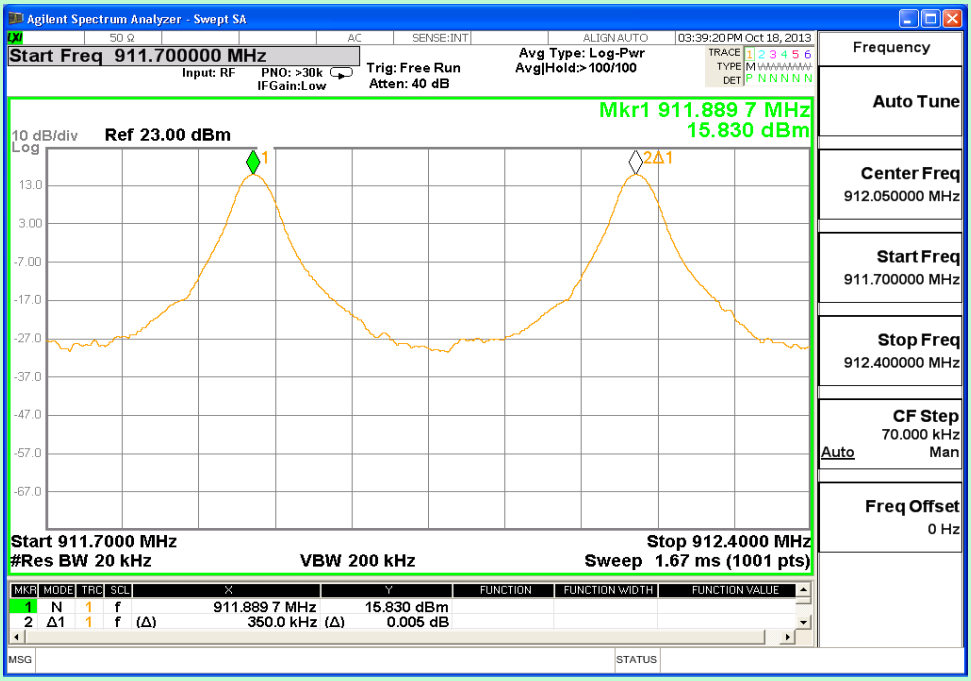
Channel 18 and 19



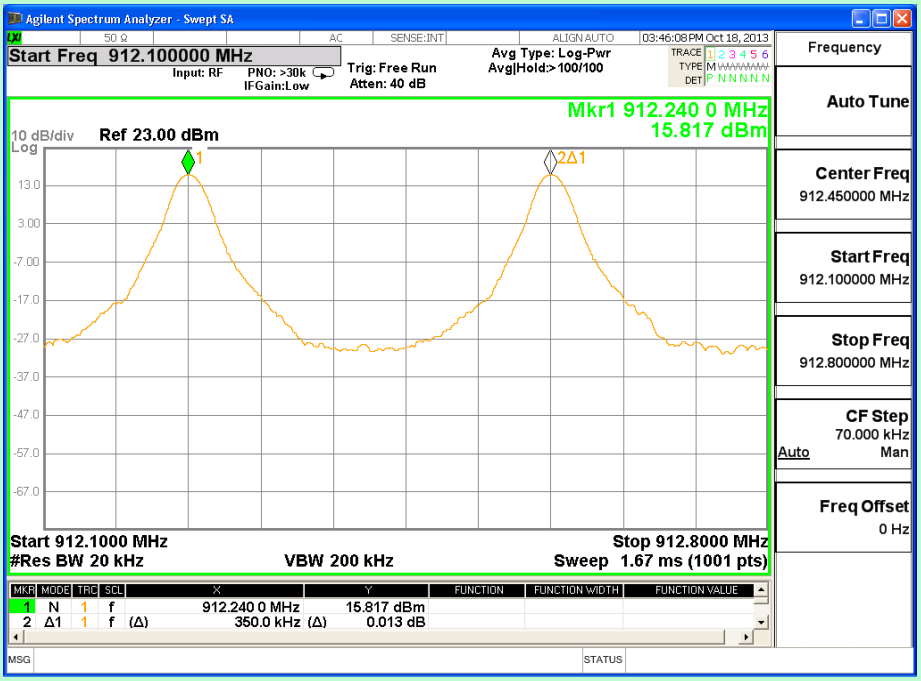
Channel 19 and 20



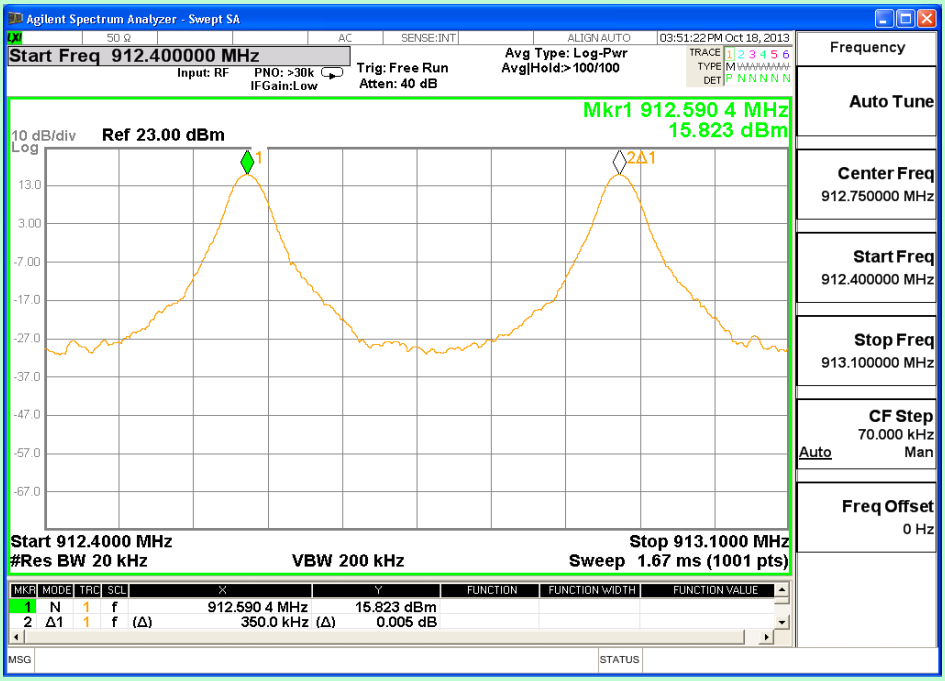
Channel 20 and 21



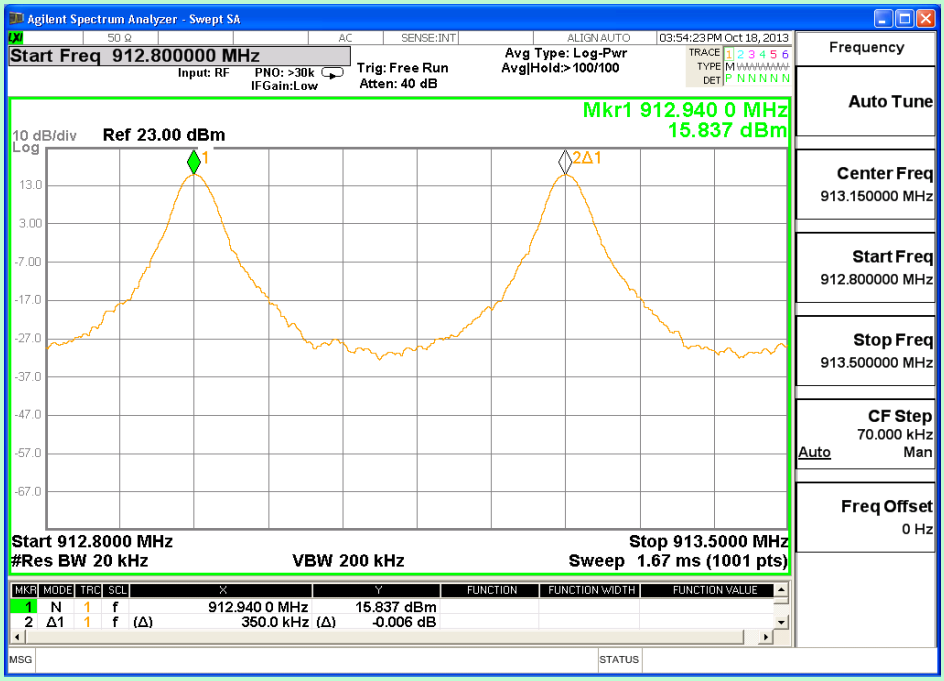
Channel 21 and 22



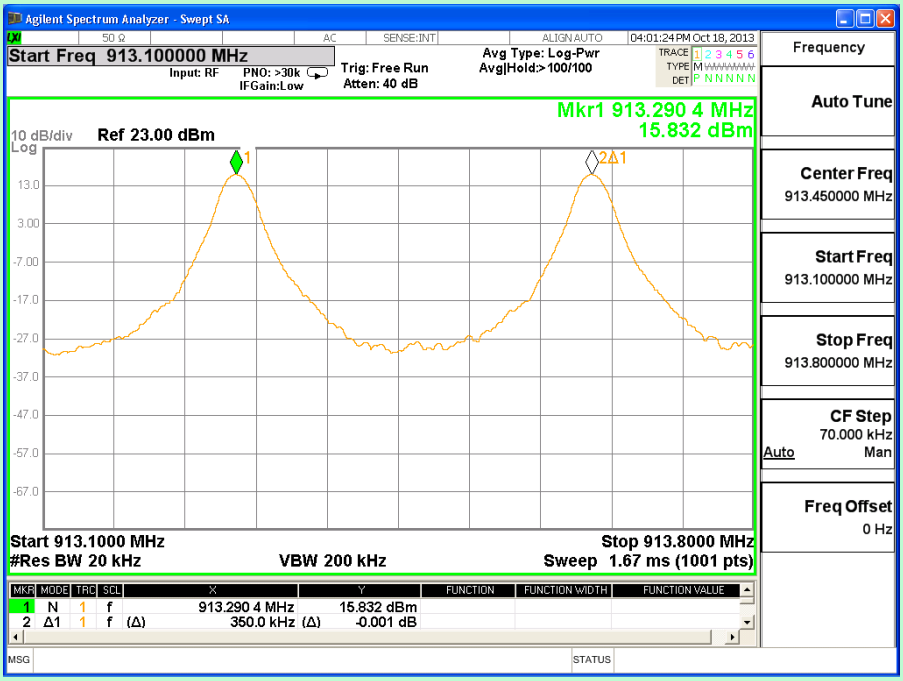
Channel 22 and 23



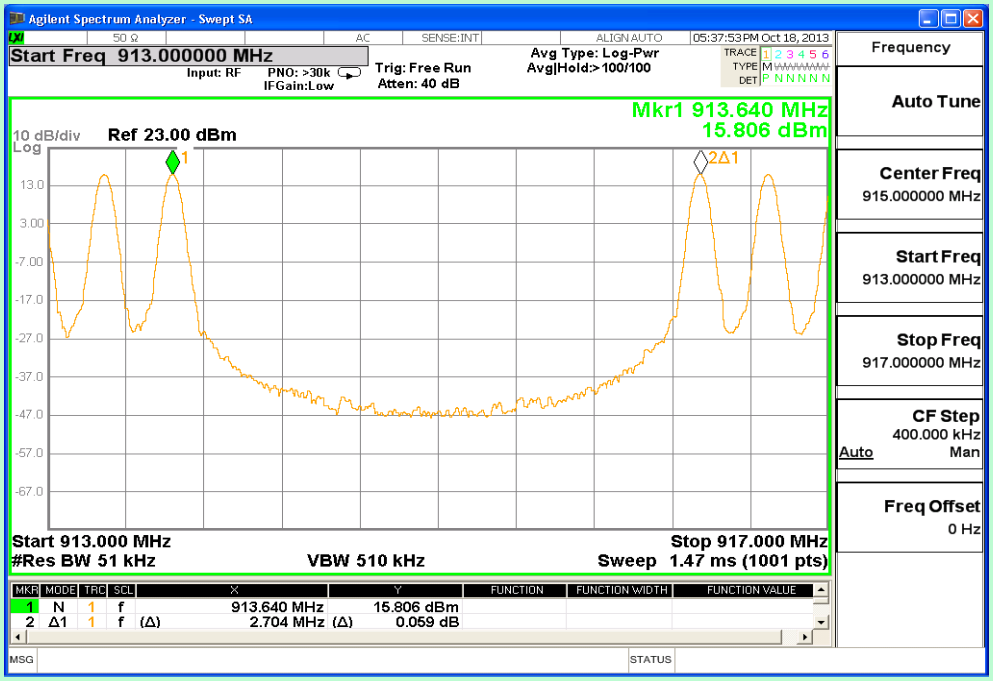
Channel 23 and 24



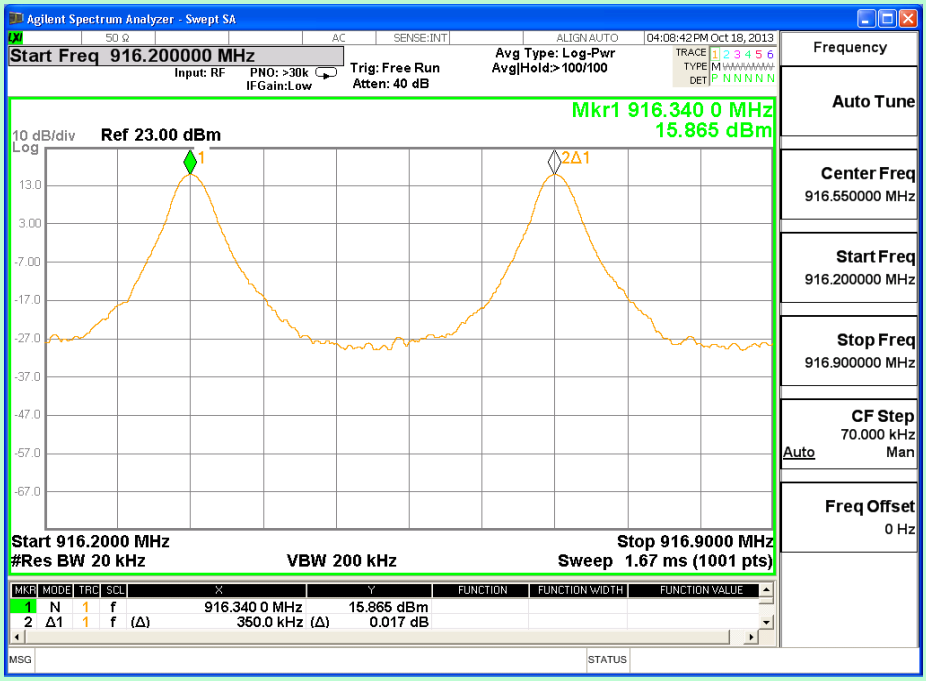
Channel 24 and 25



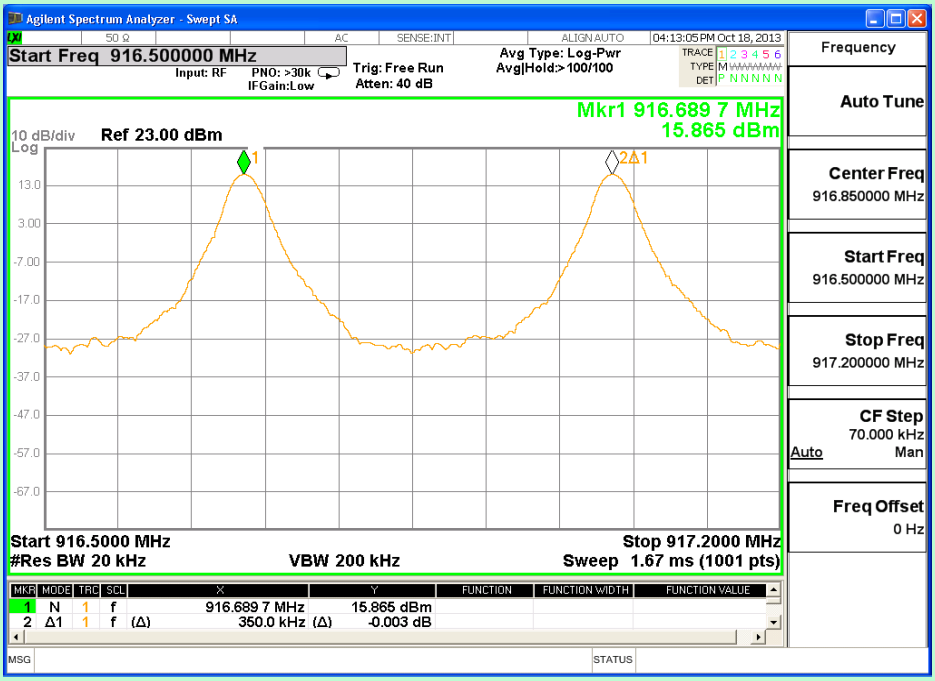
Channel 25 and 26



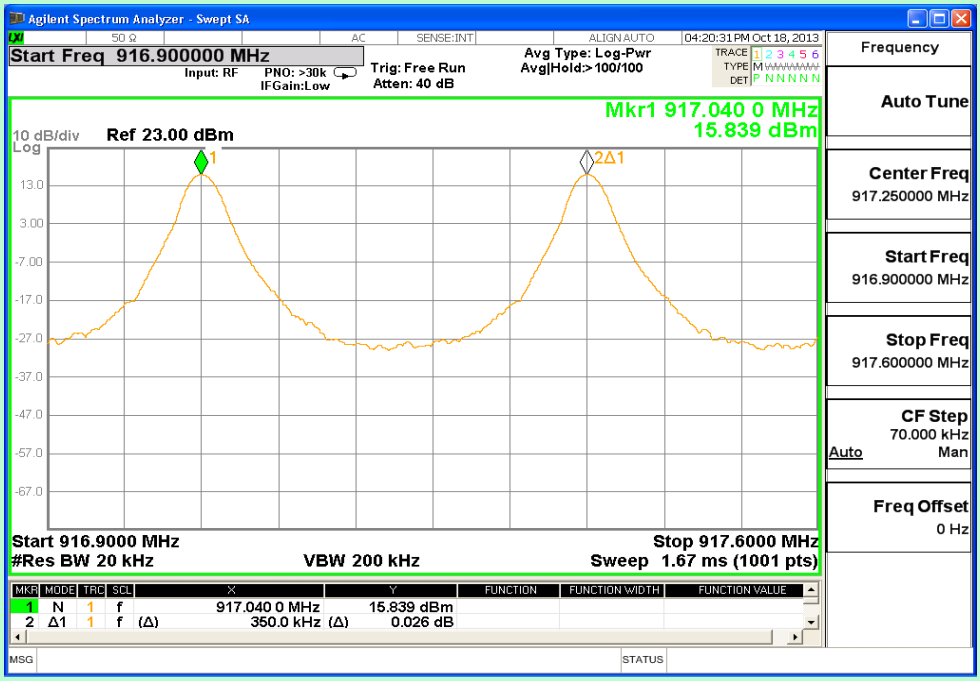
Channel 26 and 27



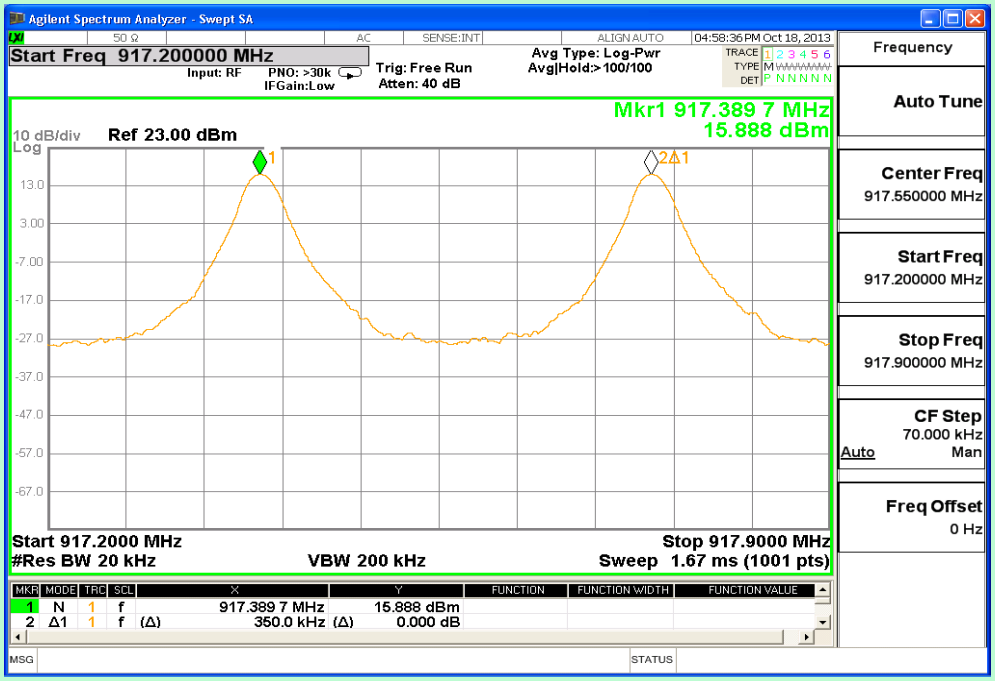
Channel 27 and 28



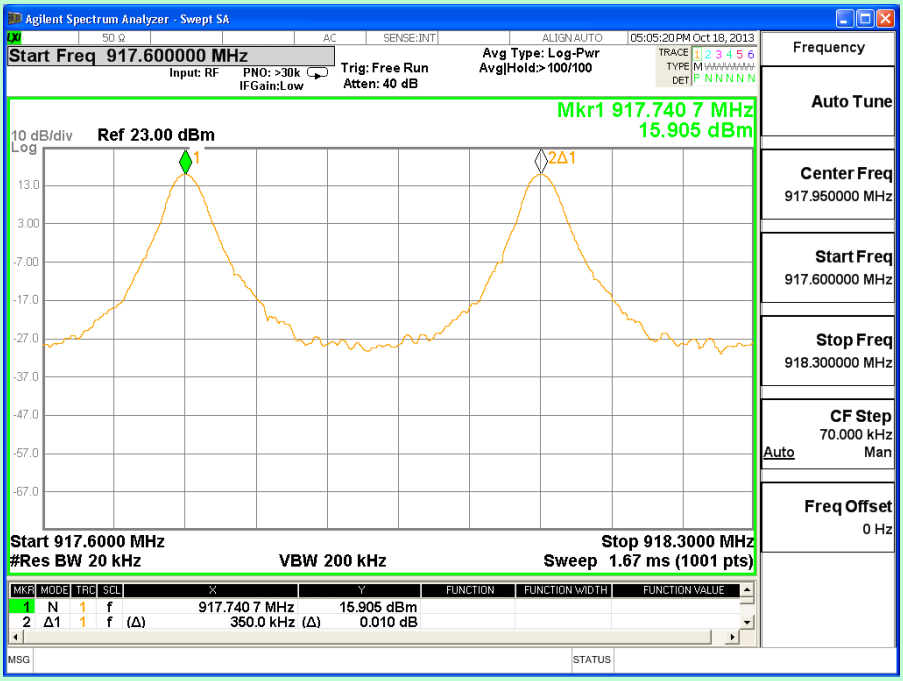
Channel 28 and 29



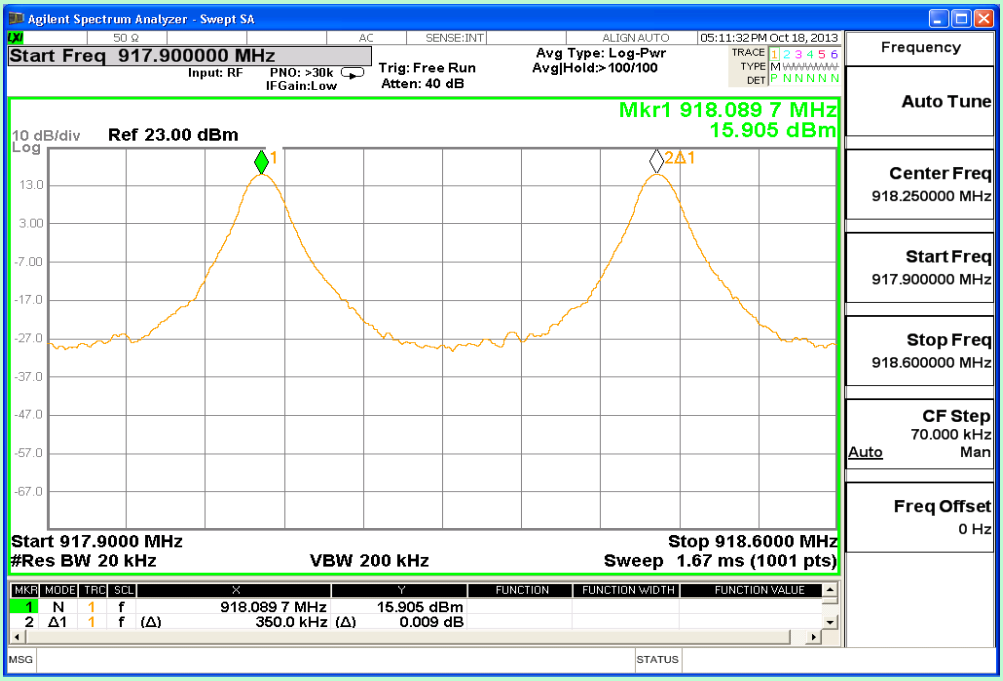
Channel 29 and 30



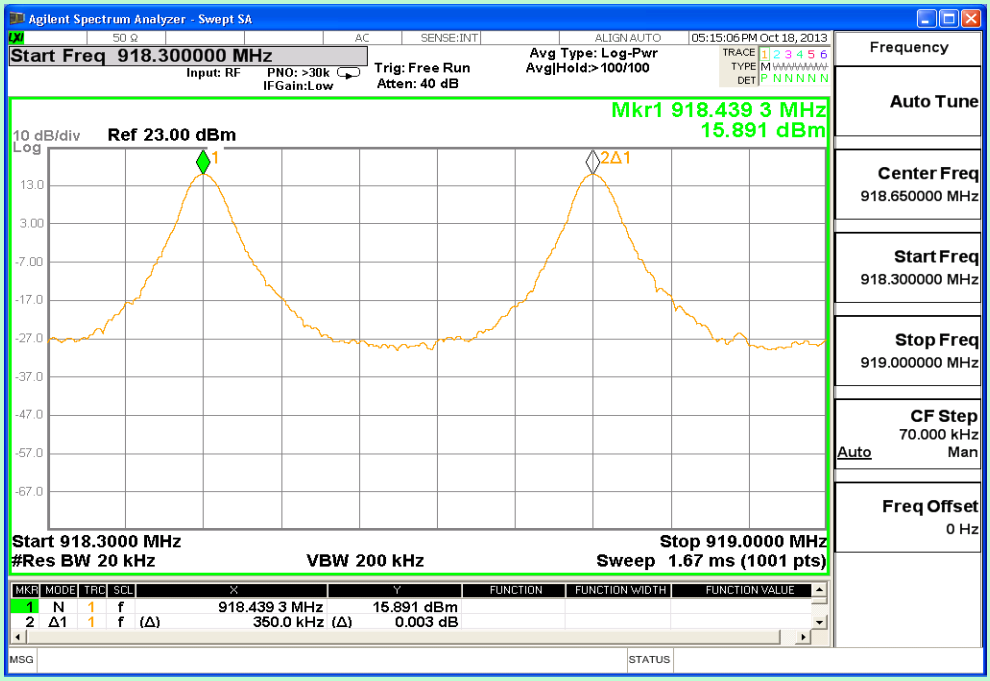
Channel 30 and 31



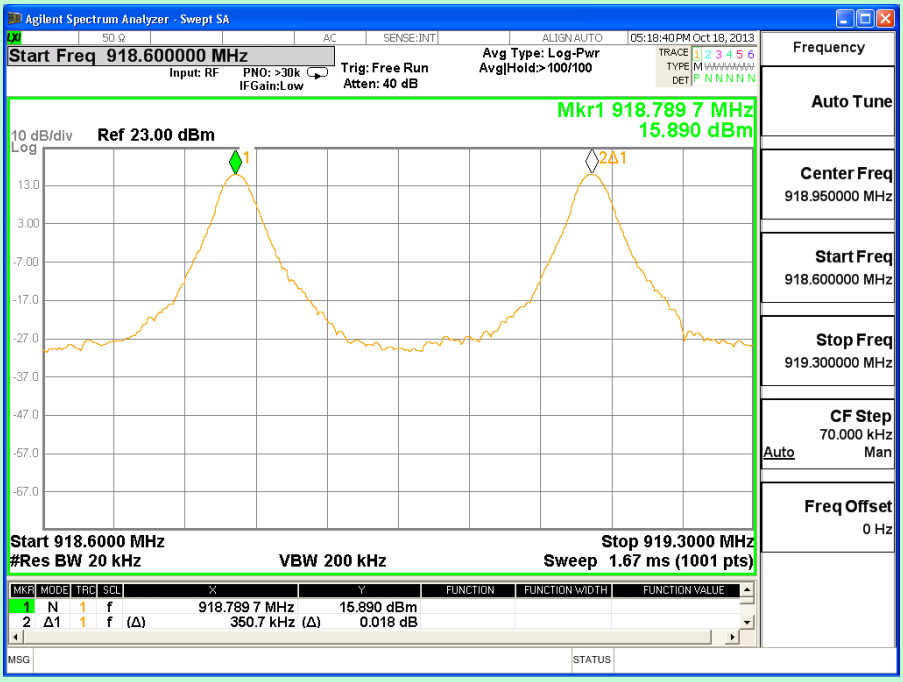
Channel 31 and 32



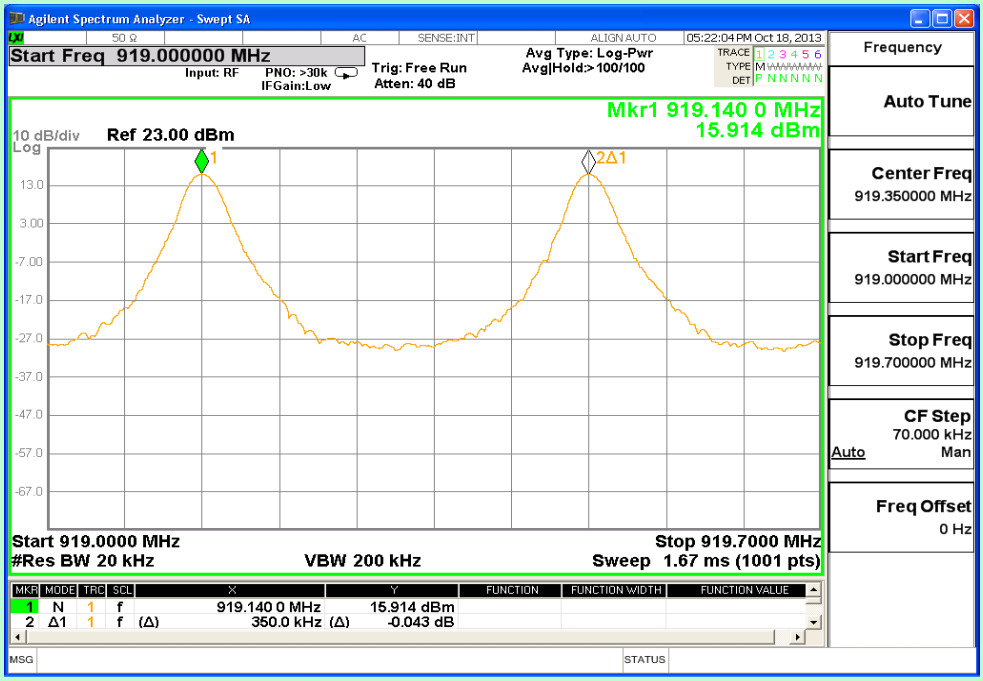
Channel 32 and 33



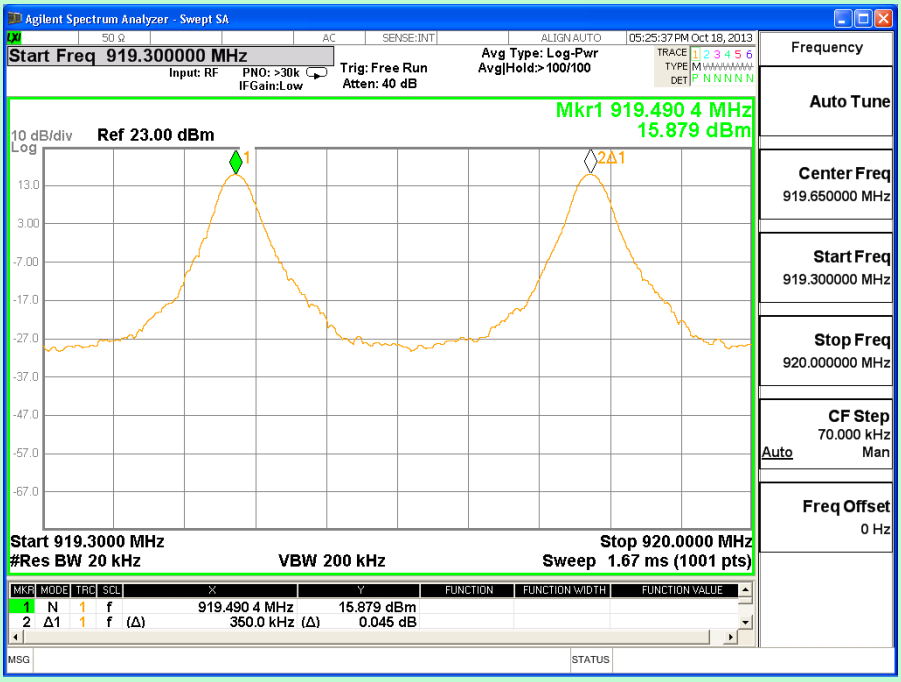
Channel 33 and 34



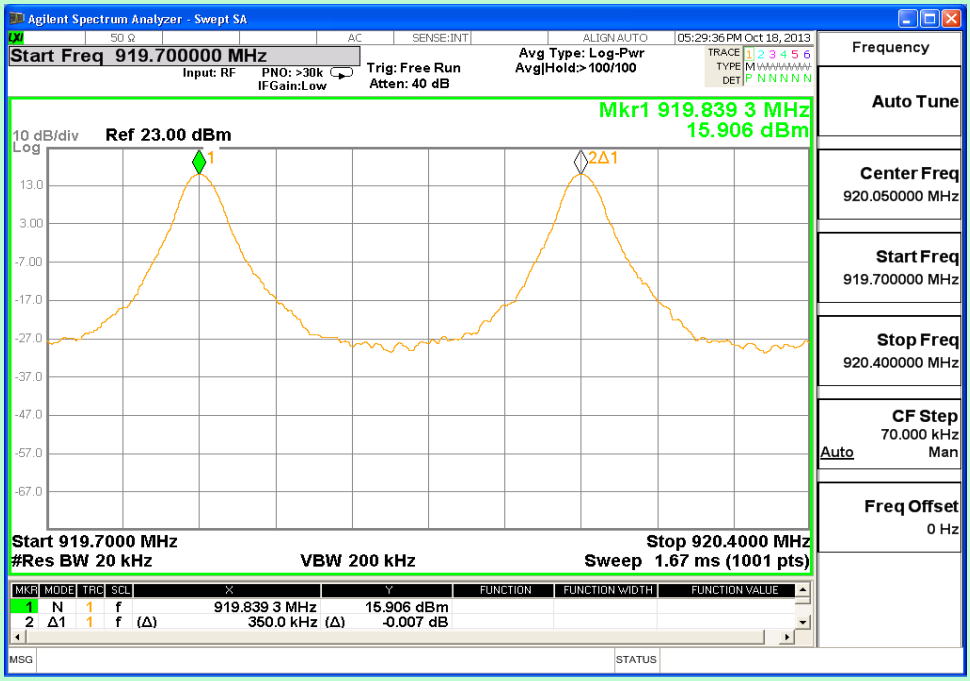
Channel 34 and 35



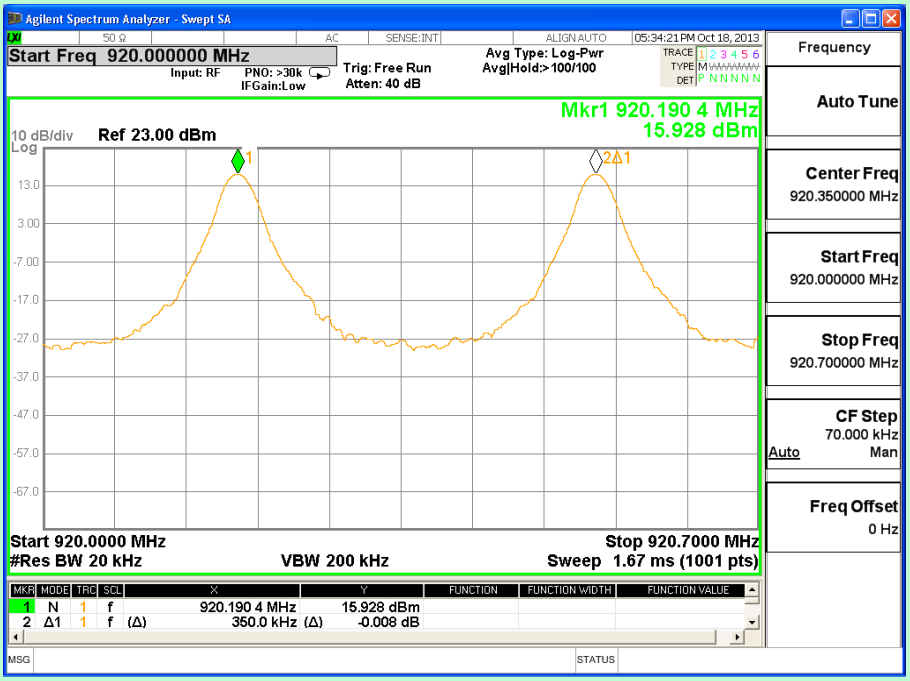
Channel 35 and 36



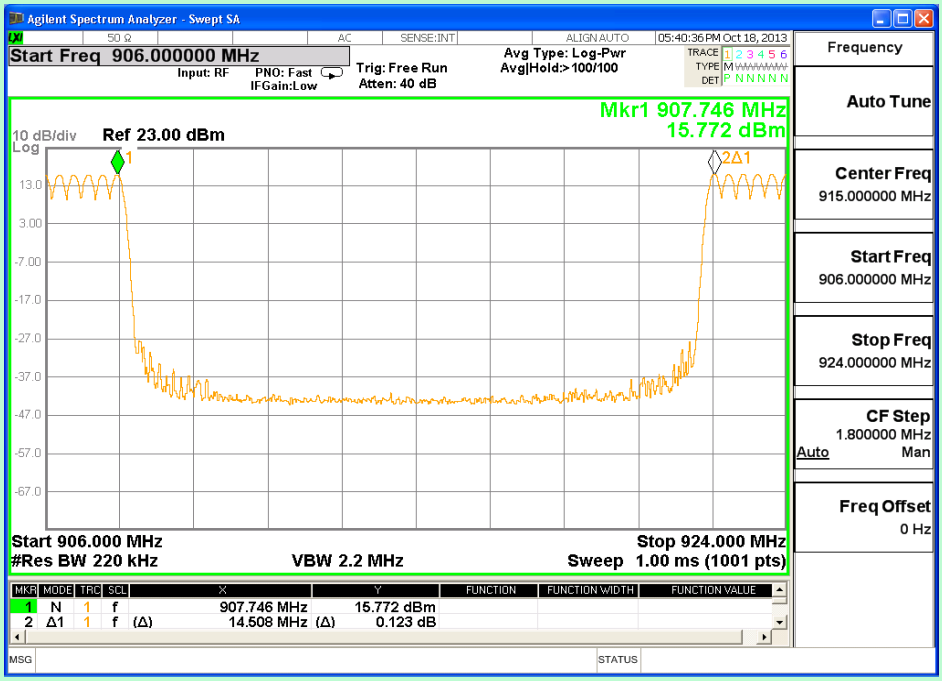
Channel 36 and 37



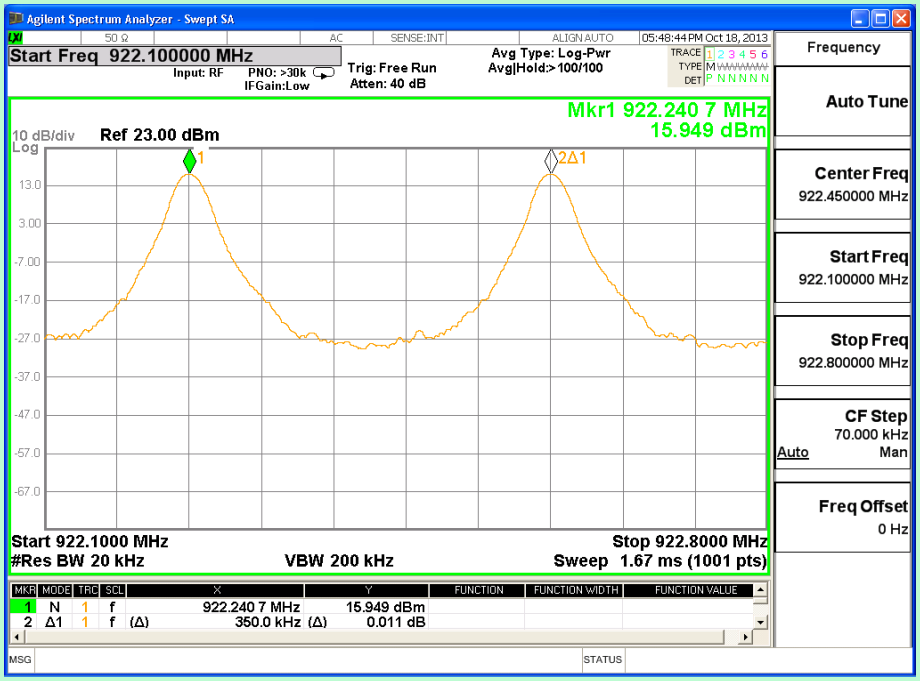
Channel 37 and 38



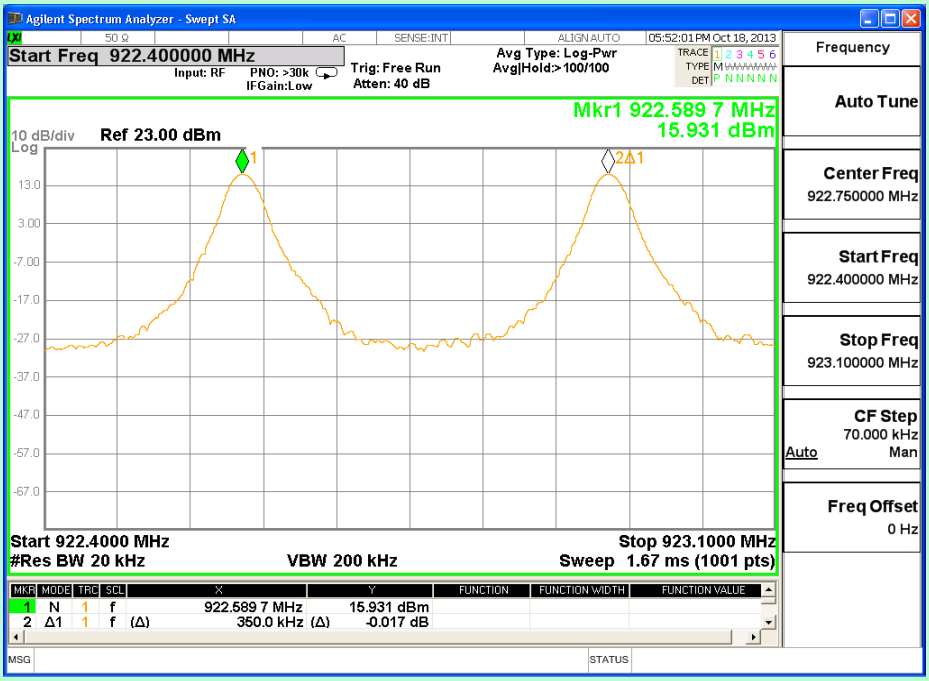
Channel 38 and 39



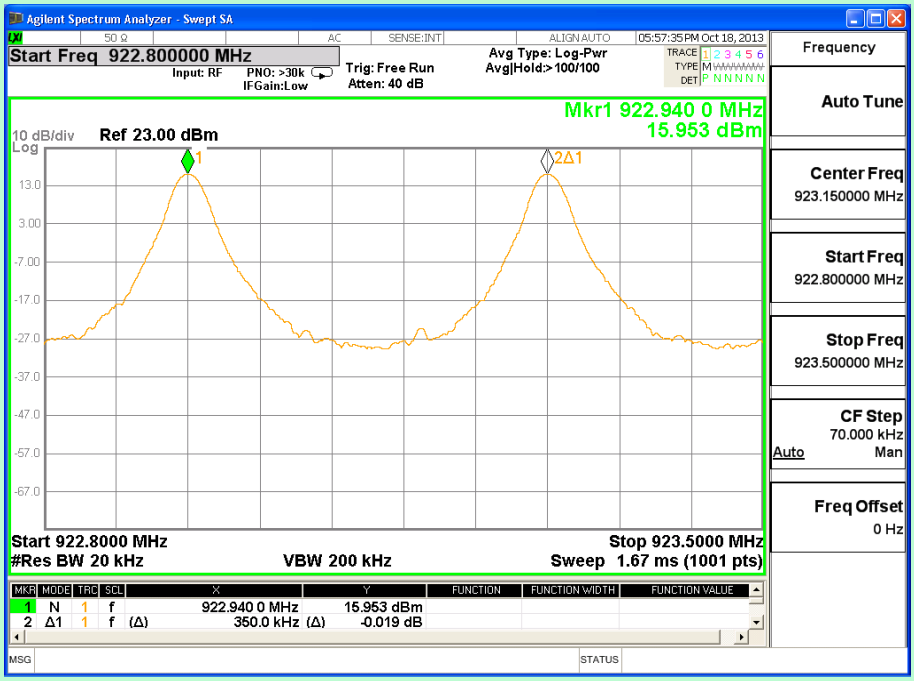
Channel 13 and 40



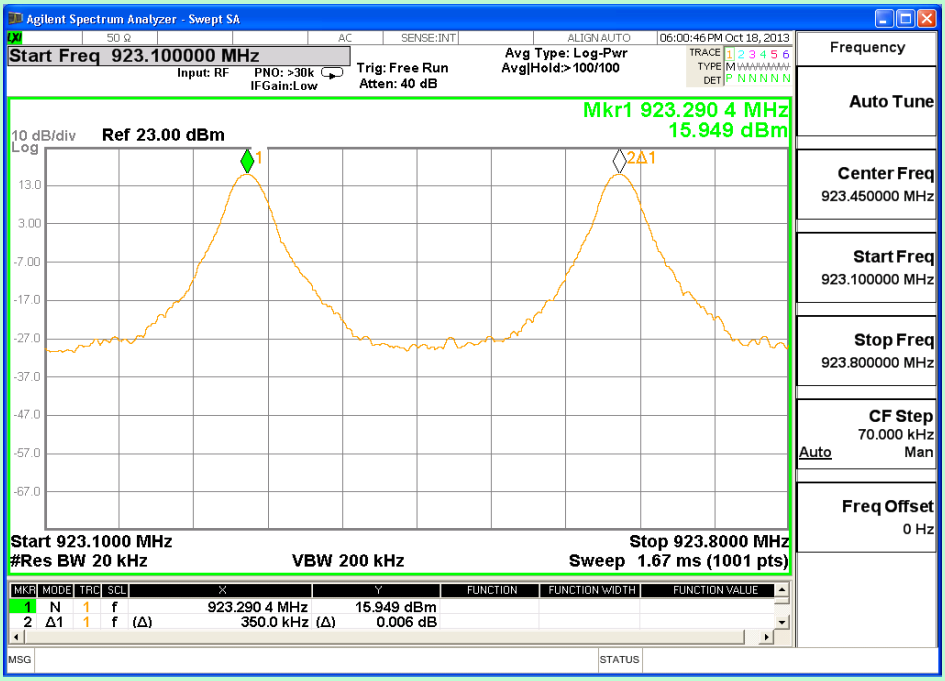
Channel 40 and 41



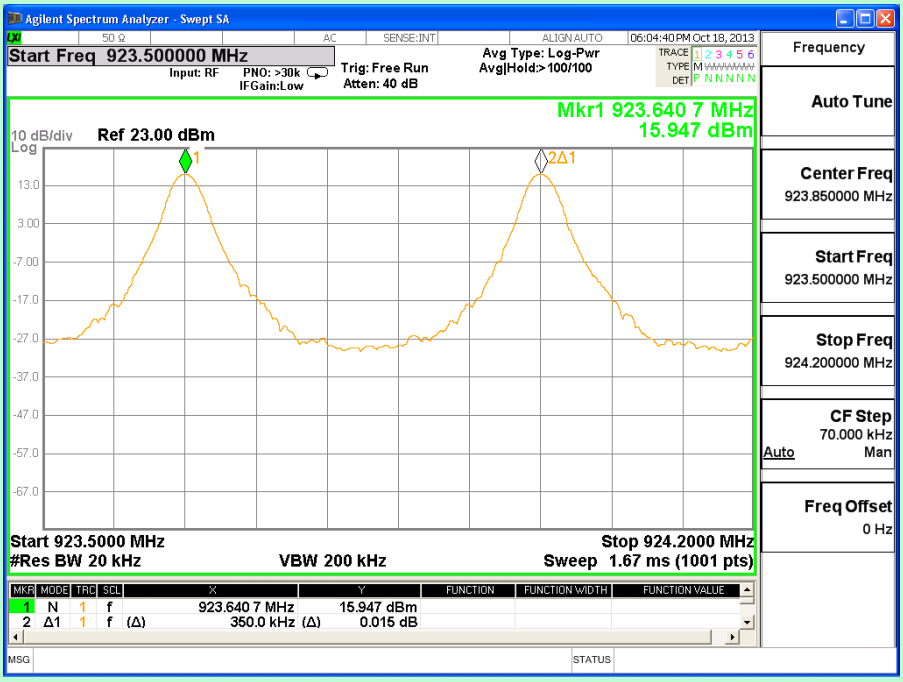
Channel 41 and 42



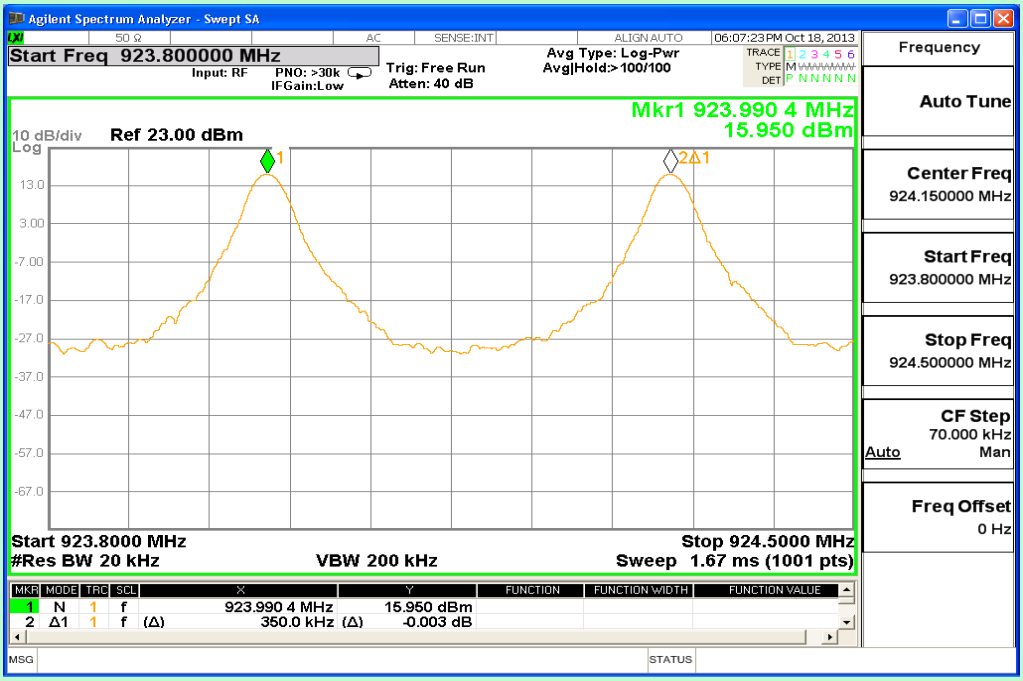
Channel 42 and 43



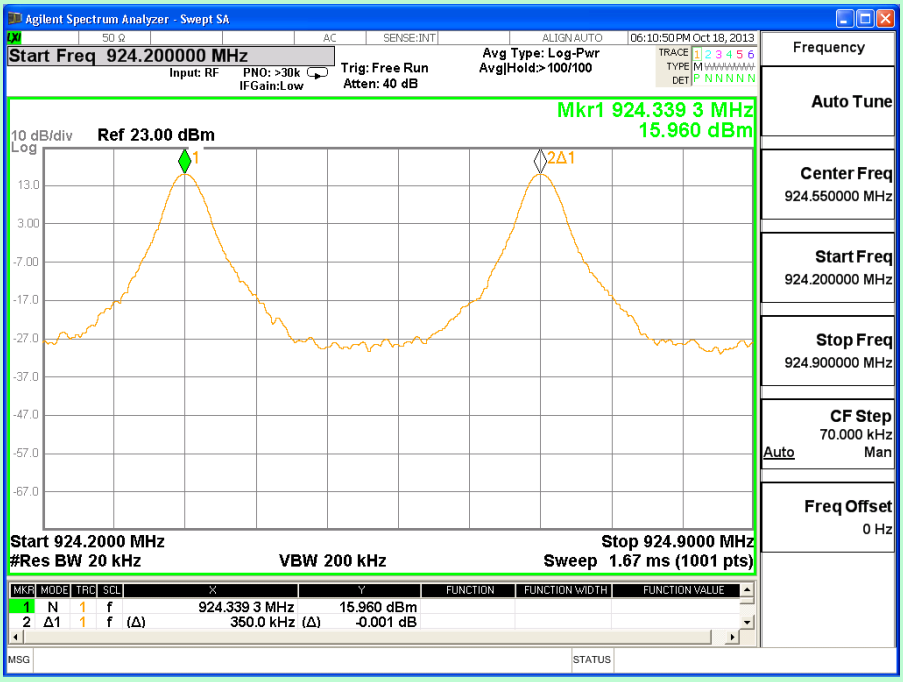
Channel 43 and 44



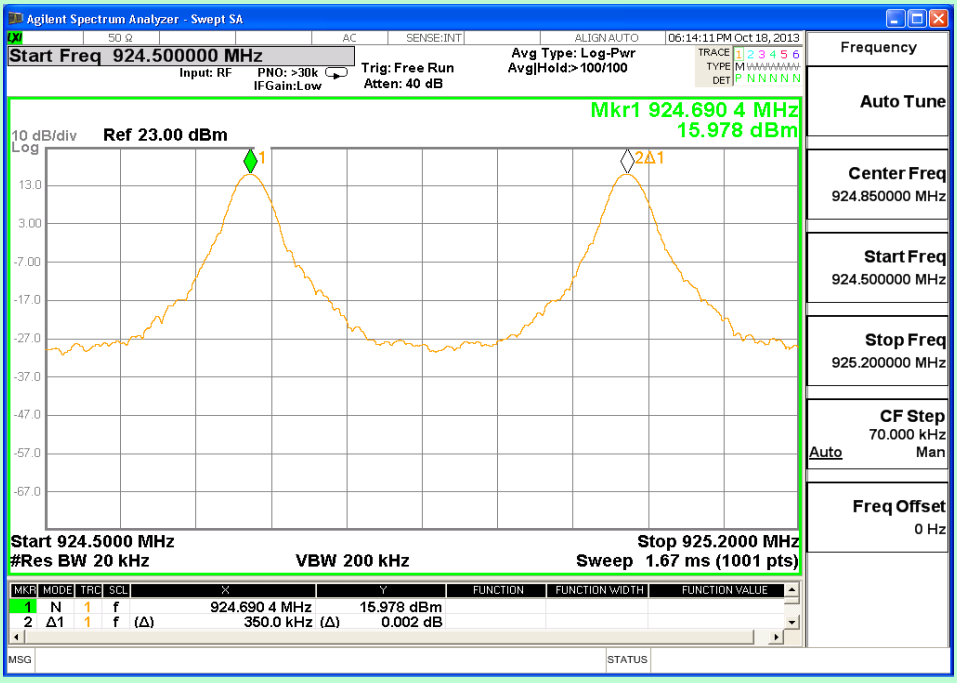
Channel 44 and 45



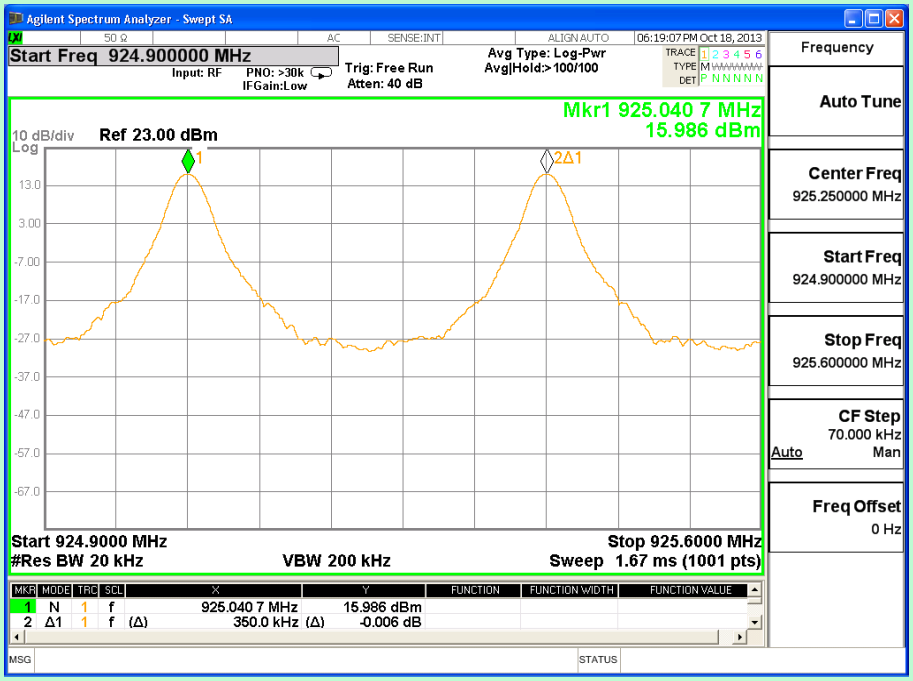
Channel 45 and 46



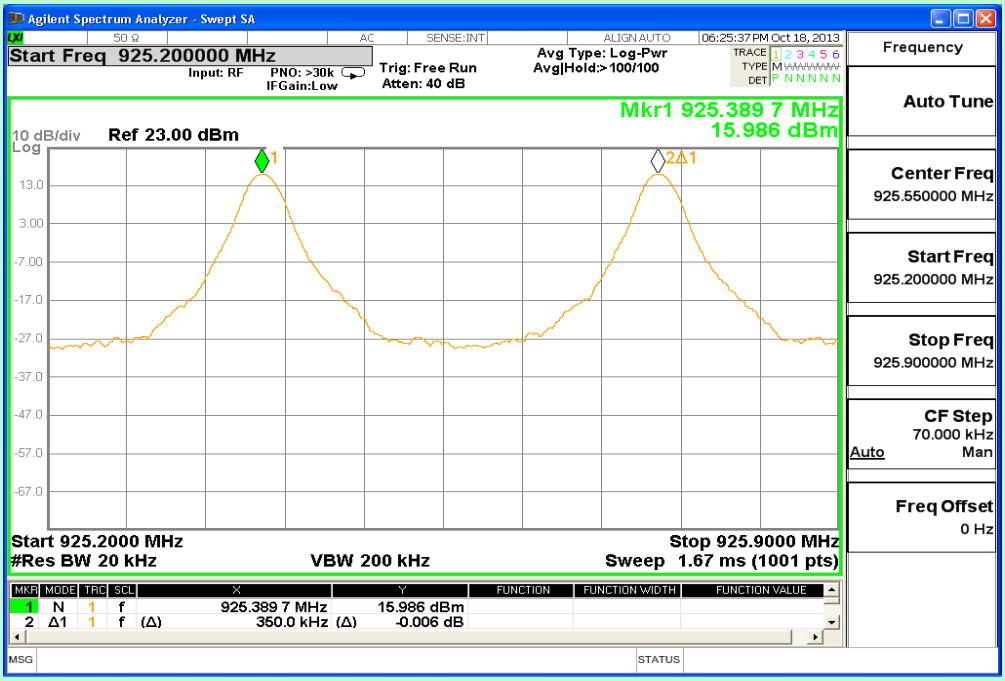
Channel 46 and 47



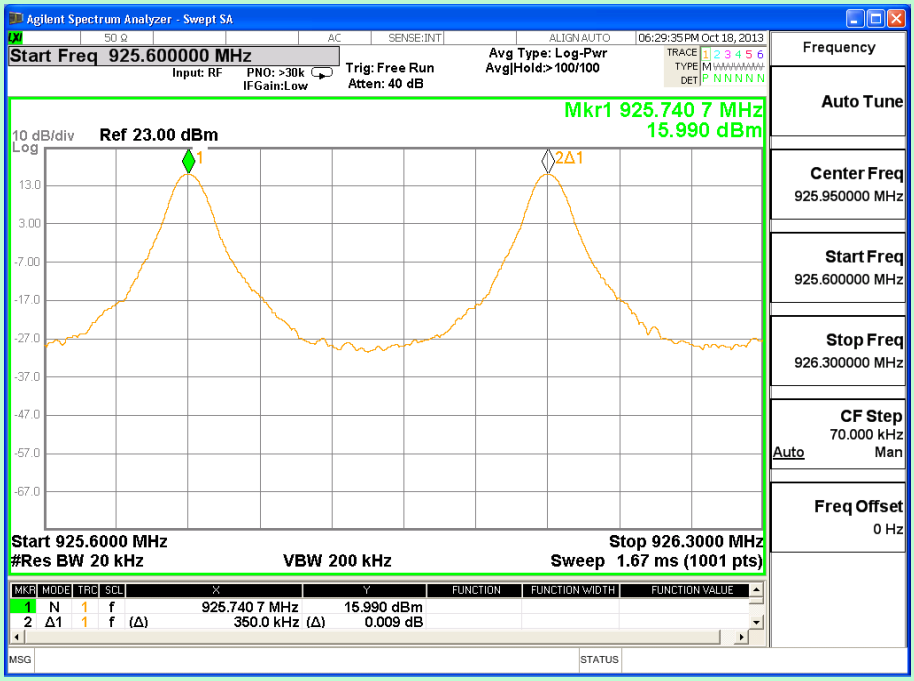
Channel 47 and 48



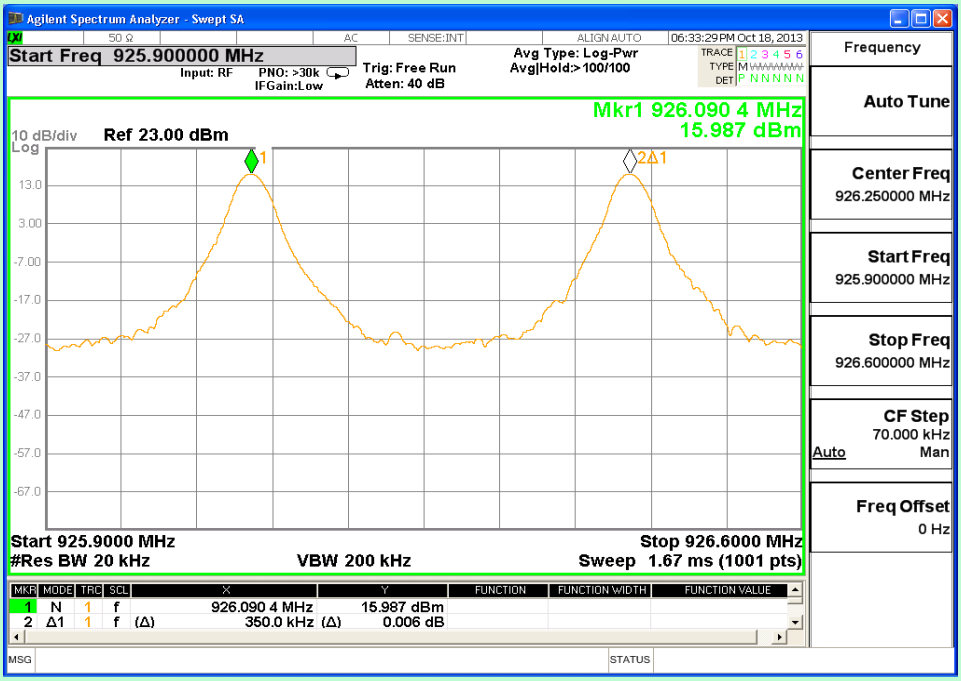
Channel 48 and 49



Channel 49 and 50



Channel 50 and 51



Channel 51 and 52

TEST RESULT			
Channel #	Measured value KHz	Limit	Result
1 and 2	350	>20dB BW	PASS
2 and 3	350	>20dB BW	PASS
3 and 4	350	>20dB BW	PASS
4 and 5	350	>20dB BW	PASS
5 and 6	350	>20dB BW	PASS
6 and 7	350	>20dB BW	PASS
7 and 8	350	>20dB BW	PASS
8 and 9	350	>20dB BW	PASS
9 and 10	350	>20dB BW	PASS
10 and 11	350	>20dB BW	PASS
11 and 12	350	>20dB BW	PASS
12 and 13	350	>20dB BW	PASS
13 and 14	350	>20dB BW	PASS
14 and 15	350	>20dB BW	PASS
15 and 16	350	>20dB BW	PASS
16 and 17	350	>20dB BW	PASS
17 and 18	350	>20dB BW	PASS
18 and 19	350	>20dB BW	PASS
19 and 20	350	>20dB BW	PASS
20 and 21	350	>20dB BW	PASS
21 and 22	350	>20dB BW	PASS
22 and 23	350	>20dB BW	PASS
23 and 24	350	>20dB BW	PASS
24 and 25	350	>20dB BW	PASS
25 and 26	350	>20dB BW	PASS
26 and 27	2700	>20dB BW	PASS
27 and 29	350	>20dB BW	PASS
29 and 30	350	>20dB BW	PASS
30 and 31	350	>20dB BW	PASS
31 and 32	350	>20dB BW	PASS
32 and 33	350	>20dB BW	PASS
33 and 34	350	>20dB BW	PASS
34 and 35	350	>20dB BW	PASS
35 and 36	350	>20dB BW	PASS
36 and 37	350	>20dB BW	PASS
37 and 38	350	>20dB BW	PASS
38 and 39	350	>20dB BW	PASS
13 and 40	14508	>20dB BW	PASS
40 and 41	350	>20dB BW	PASS
41 and 42	350	>20dB BW	PASS
42 and 43	350	>20dB BW	PASS
43 and 44	350	>20dB BW	PASS
44 and 45	350	>20dB BW	PASS
45 and 46	350	>20dB BW	PASS
46 and 47	350	>20dB BW	PASS
47 and 48	350	>20dB BW	PASS
48 and 49	350	>20dB BW	PASS
49 and 50	350	>20dB BW	PASS

50 and 51	350	>20dB BW	PASS
51 and 52	350	>20dB BW	PASS

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Conducted RF Test setup

2.4 NUMBER OF HOPPING FREQUENCIES

EUT Nomenclature	Wireless Monitor Module	**Test Request No.**	EMC-0004-2
Model No.	FW-MM	**Serial No.**	05879
Test Start Date	16-Oct-2013	**Temperature (°C)**	23.1
Test End Date	16-Oct-2013	**Humidity RH (%)**	55.2
Tested By	Loganathan Joghee	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3V dc		
Operating Mode	Refer Page 5 for Operating Mode Table		
Test configuration	Refer Page 5 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247		
Test Method	DA 00-705		
Comment			

TEST DETAILS

Method	☒ Conducted ☐ Radiated

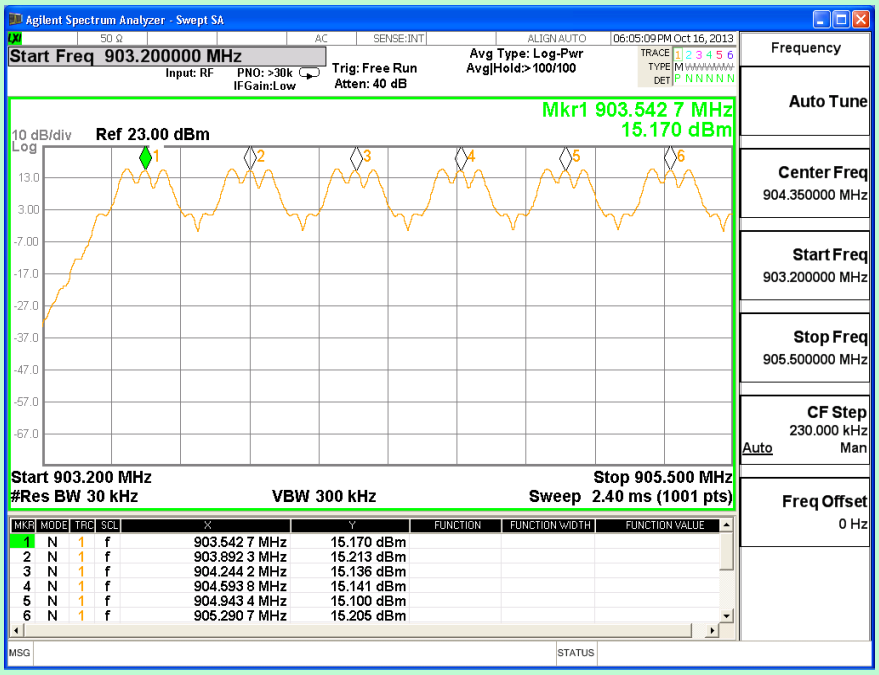
TEST PARAMETERS

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

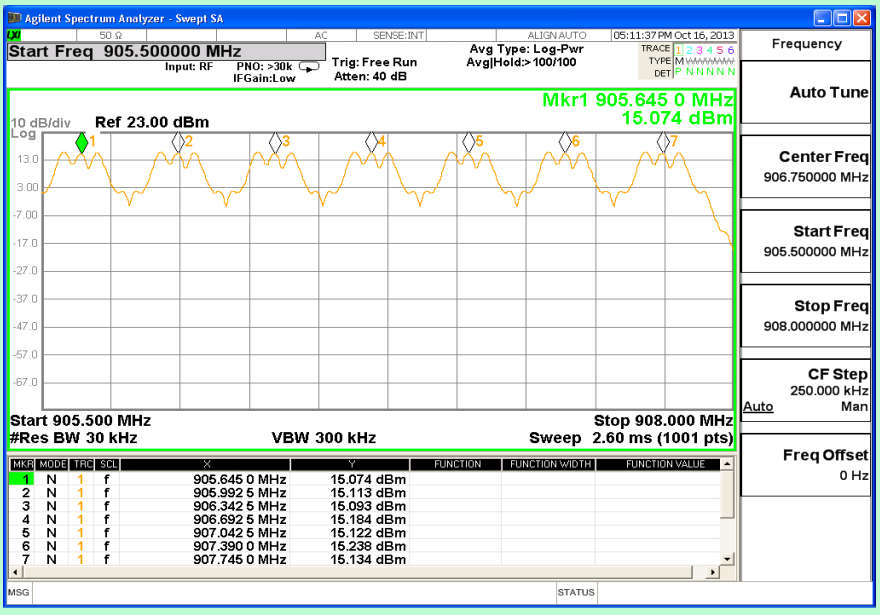
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	28-Nov-2014
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

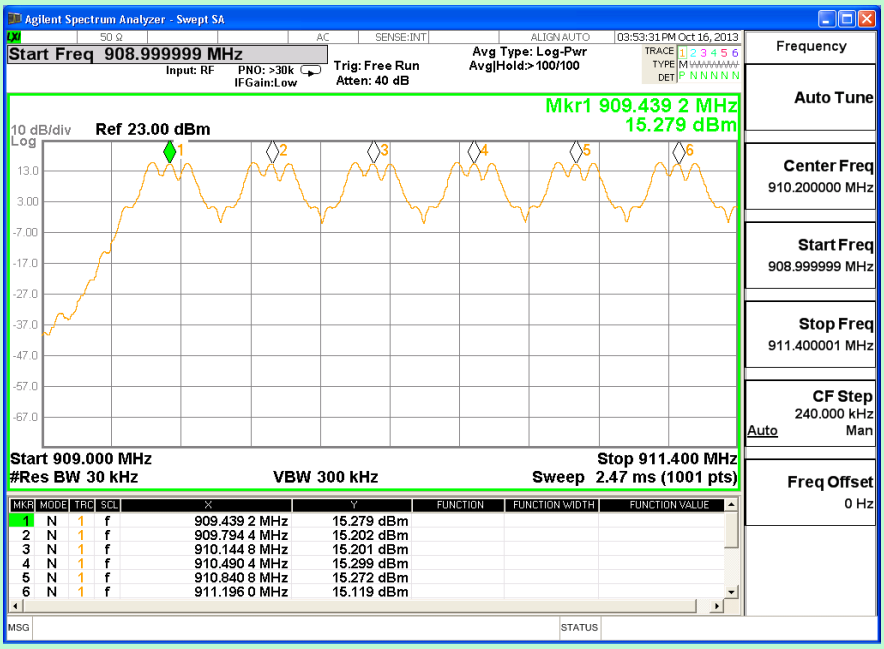
TEST GRAPHS



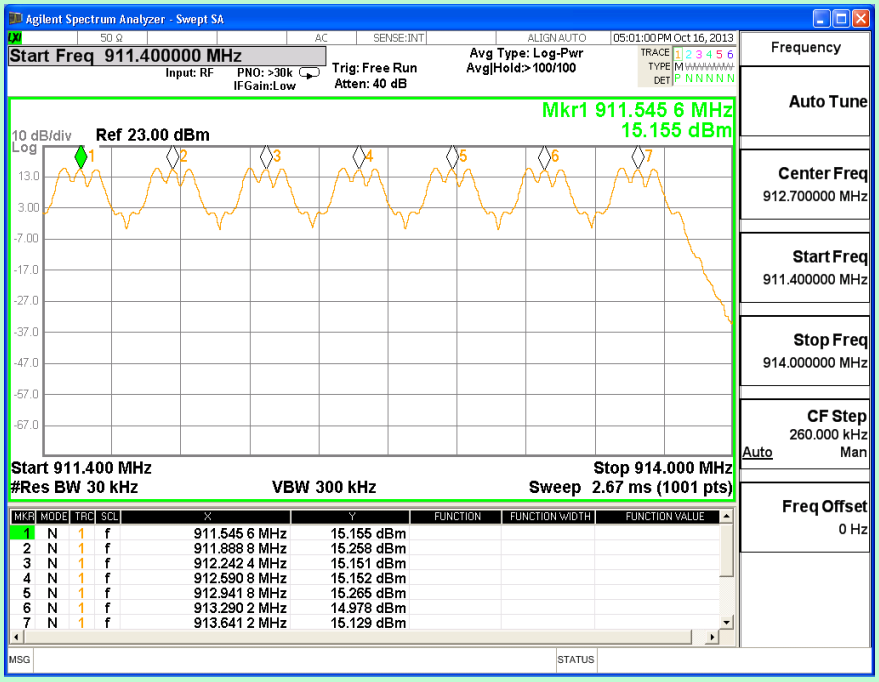
Channel 1 – 6 (Walkie-Talkie Mode)



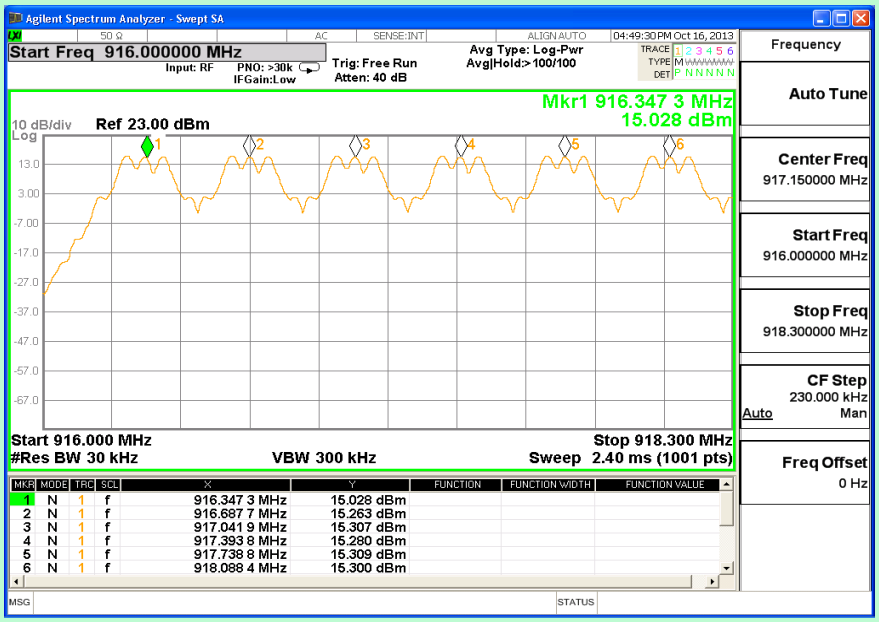
Channel 7 – 13 (Walkie-Talkie Mode)



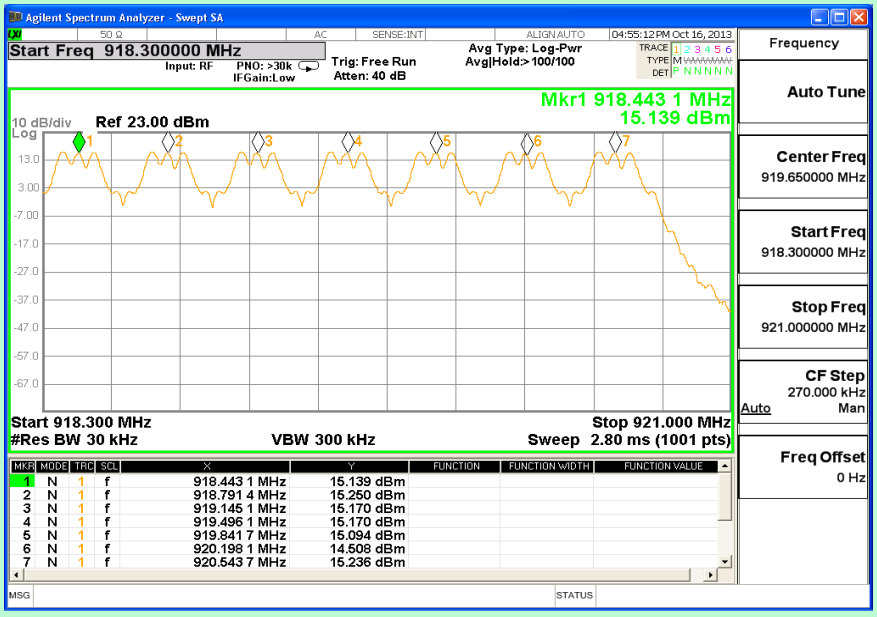
Channel 14 – 19 (Normal Mode)



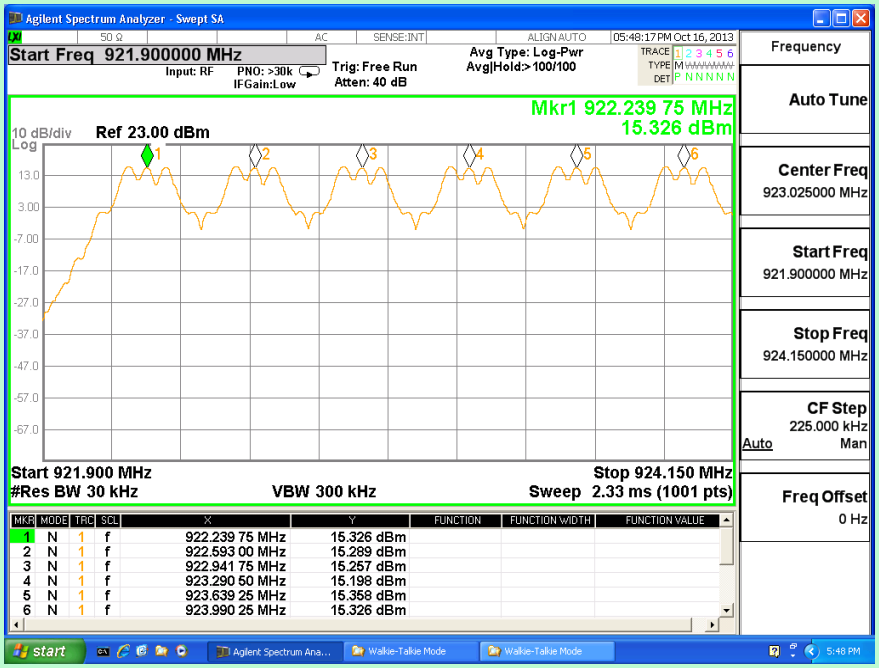
Channel 20 – 26 (Normal Mode)



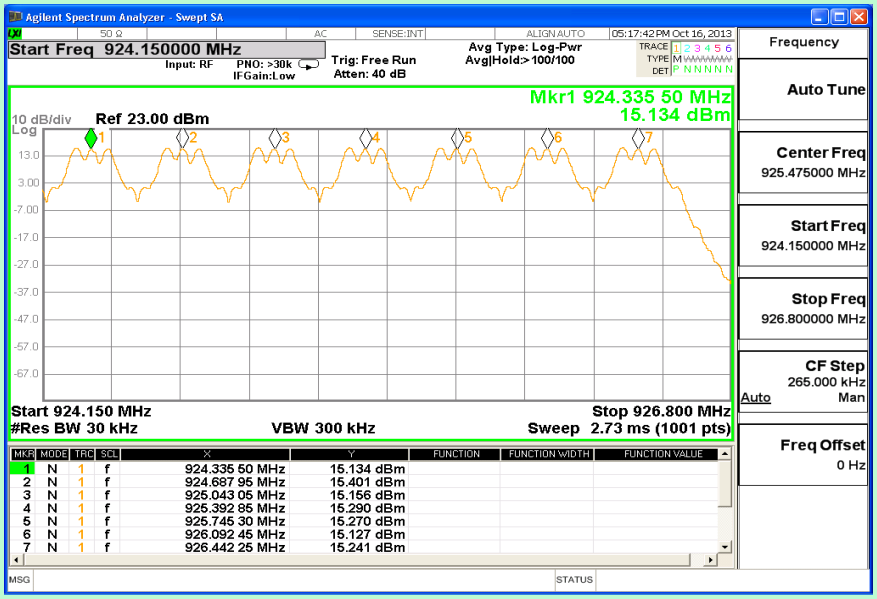
Channel 27 – 32 (Normal Mode)



Channel 33 – 39 (Normal Mode)



Channel 40 – 45 (Walkie-Talkie Mode)



Channel 46 – 52 (Walkie-Talkie 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 Monitor Module	**Test Request No.**	EMC-0004-2
Model No.	FW-MM	**Serial No.**	05879
Test Start Date	15-Oct-2013	**Temperature (˚C)**	23.2
Test End Date	15-Oct-2013	**Humidity RH (%)**	55.1
Tested By	Loganathan Joghee	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 for Operating Mode Table		
Test configuration	Refer Page 5 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247		
Test Method	DA 00-705		
Comment			

TEST DETAILS

Method	☒ Conducted ☐ Radiated

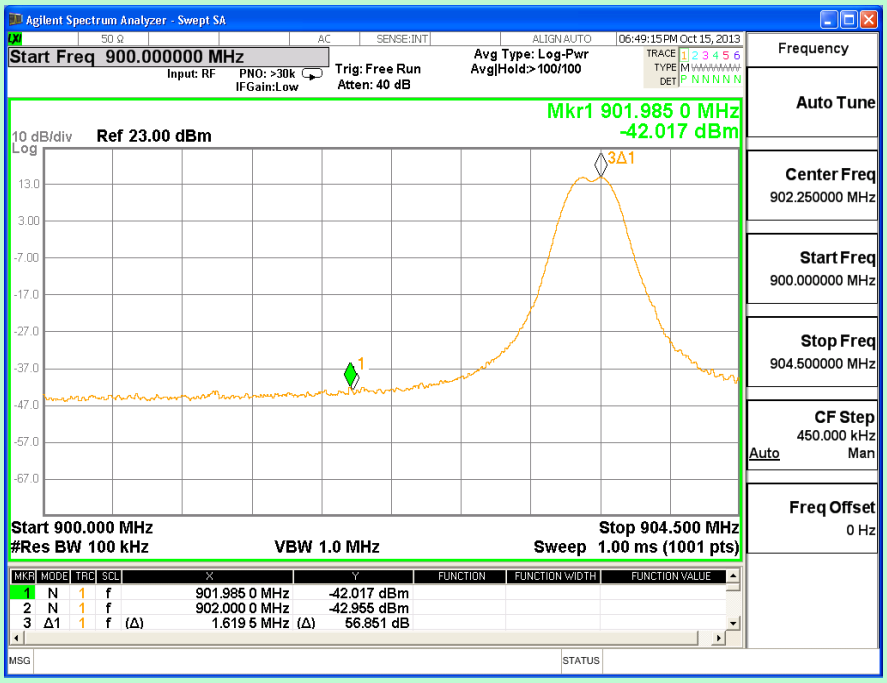
TEST PARAMETERS

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

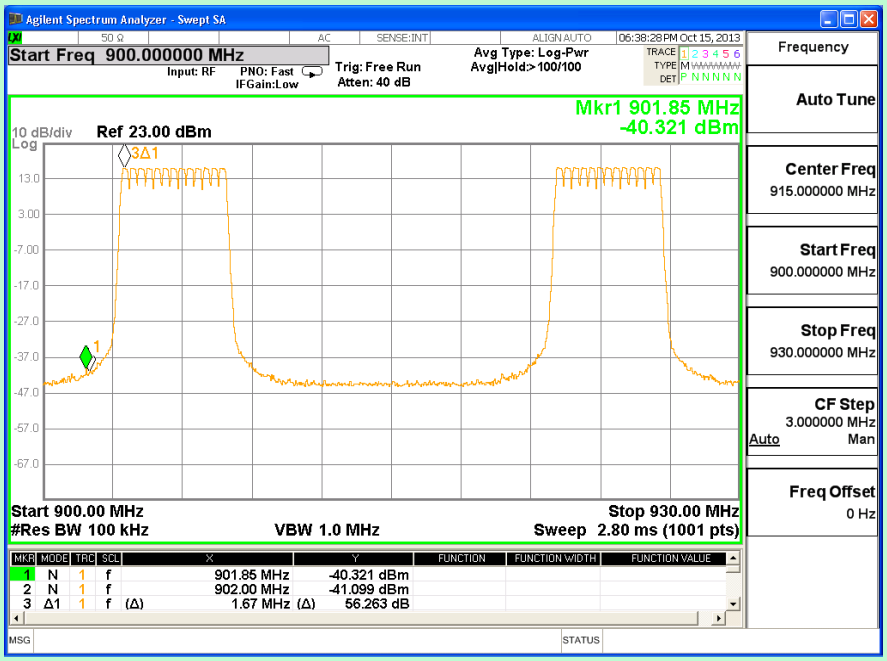
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	28-Nov-2014
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

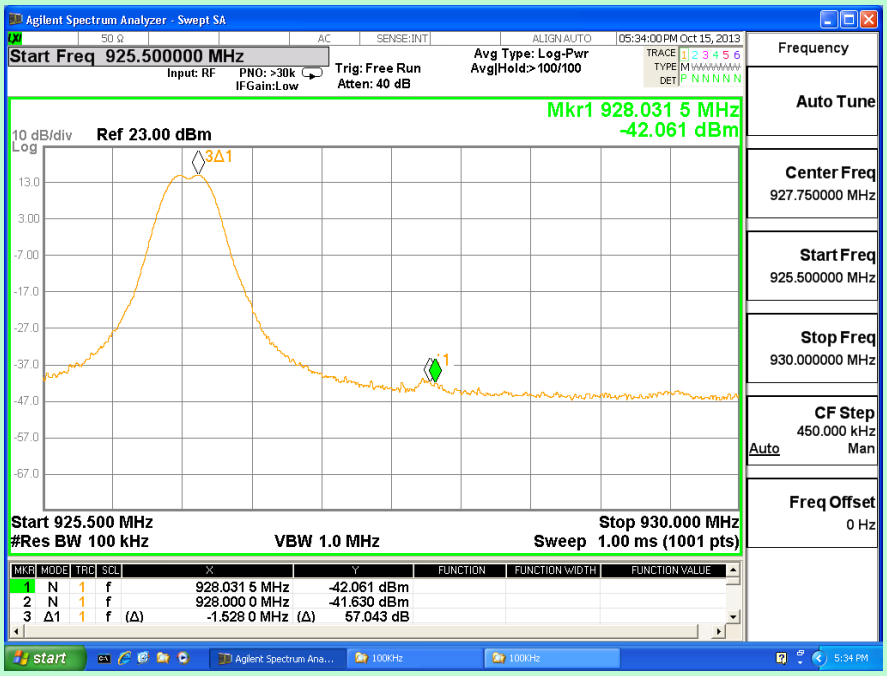
TEST GRAPHS



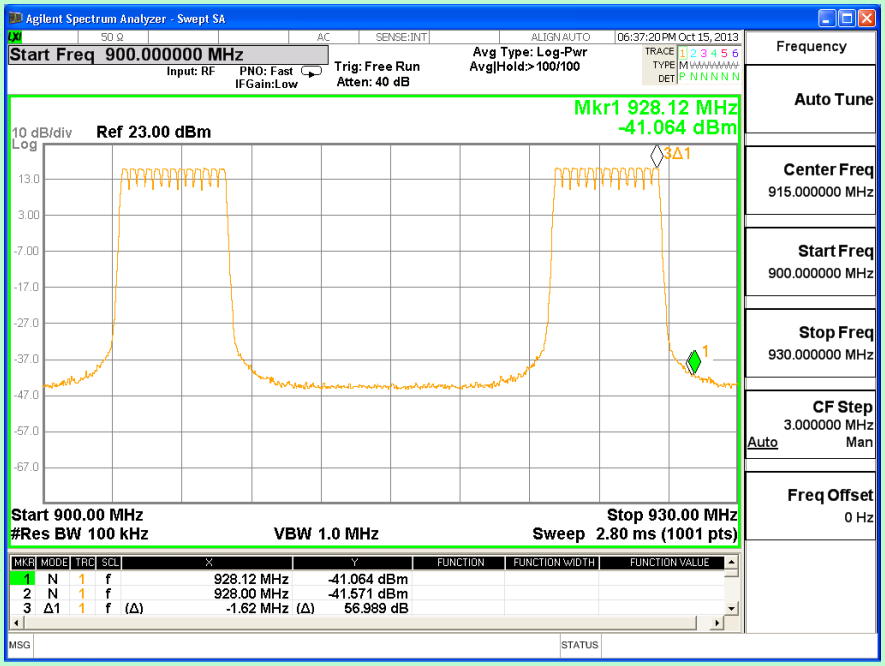
Band-edge at 902 MHz - Channel 1 (903.55 MHz)



Band-edge at 902 MHz – Hopping Enabled



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



Band-edge at 928 MHz – Hopping Enabled

TEST RESULT

Channel	Frequency	Measured difference		Limit	Test Results
#	MHz	SINGLE CHANNEL	FHSS ENABLED	dBc	
1	903.355	56.852	56.263	>20	PASS
52	926.45	57.043	56.989	>20	PASS

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Conducted RF Test setup

2.6 TIME OF OCCUPANCY (DWELL TIME)

EUT Nomenclature	Wireless Monitor Module	**Test Request No.**	EMC-0004-2
Model No.	FW-MM	**Serial No.**	05879
Test Start Date	04-Nov-2013	**Temperature (˚C)**	23.2
Test End Date	04-Nov-2013	**Humidity RH (%)**	55.2
Tested By	Loganathan Joghee	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 for Operating Mode Table		
Test configuration	Refer Page 5 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247		
Test Method	DA 00-705		
Comment			

TEST DETAILS

Method	☒ Conducted ☐ Radiated

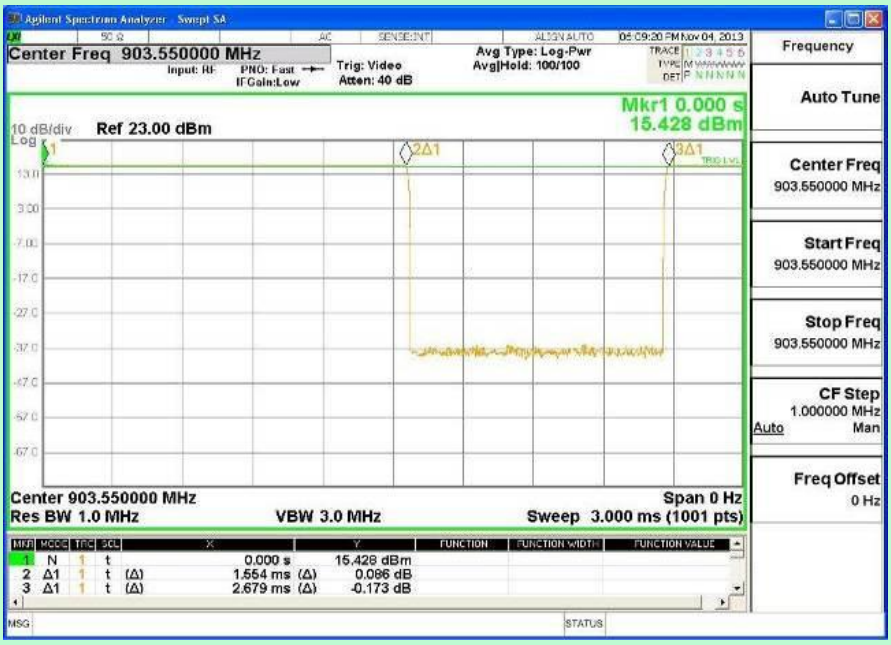
TEST PARAMETERS

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

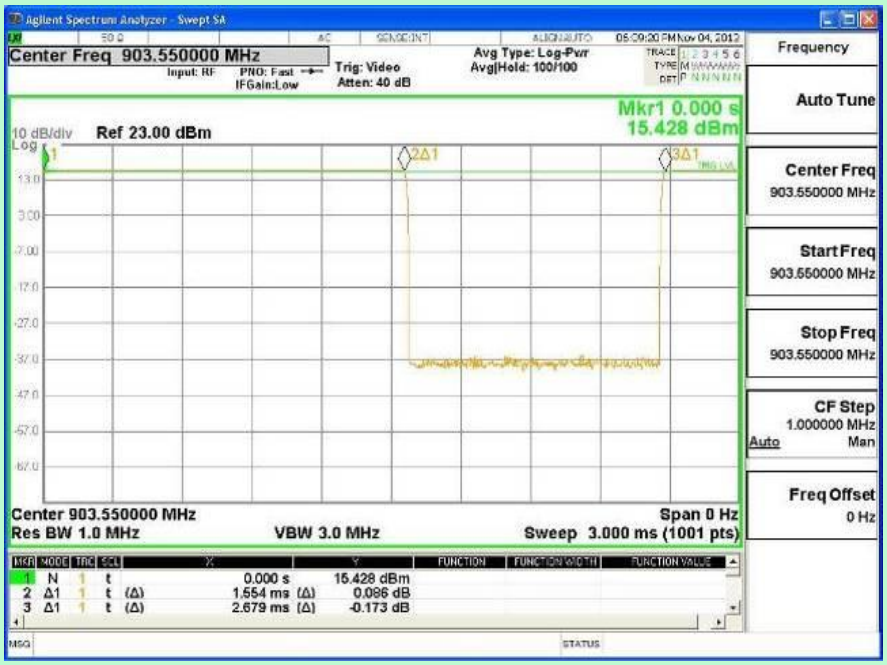
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	28-Nov-2014
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

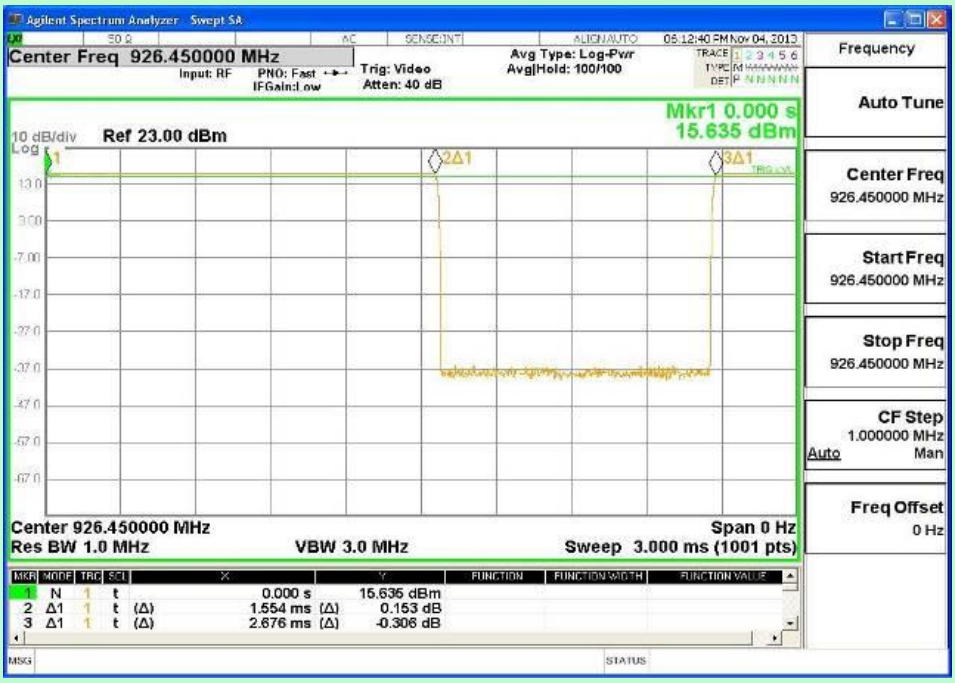
TEST GRAPHS



Channel 1 (903.55 MHz)



Channel 27 (916.35 MHz)



Channel 52 (926.45 MHz)

TEST RESULT

Channel	Channel Frequency	Measured Dwell Time	No. of Bursts	Total Dwell Time in 10sec	Limit in 10s period	Results
#	MHz	ms	#	ms	ms	
1	903.55	1.554	8	12.48	≤ 400	PASS
27	916.35	1.554	8	12.48	≤ 400	PASS
52	926.45	1.554	8	12.48	≤ 400	PASS

TEST SETUP PHOTOGRAPHS

Refer Annexure -1

Conducted RF Test setup

2.7 SPURIOUS RF CONDUCTED EMISSIONS

EUT Nomenclature	Wireless Monitor Module	**Test Request No.**	EMC-0004-2
Model No.	FW-MM	**Serial No.**	05879
Test Start Date	15-Oct-2013	**Temperature (˚C)**	23.3
Test End Date	15-Oct-2013	**Humidity RH (%)**	55.5
Tested By	Loganathan Joghee	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 for Operating Mode Table		
Test configuration	Refer Page 5 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247		
Test Method	DA 00-705		
Comment			

TEST DETAILS

Method	☒ Conducted ☐ Radiated

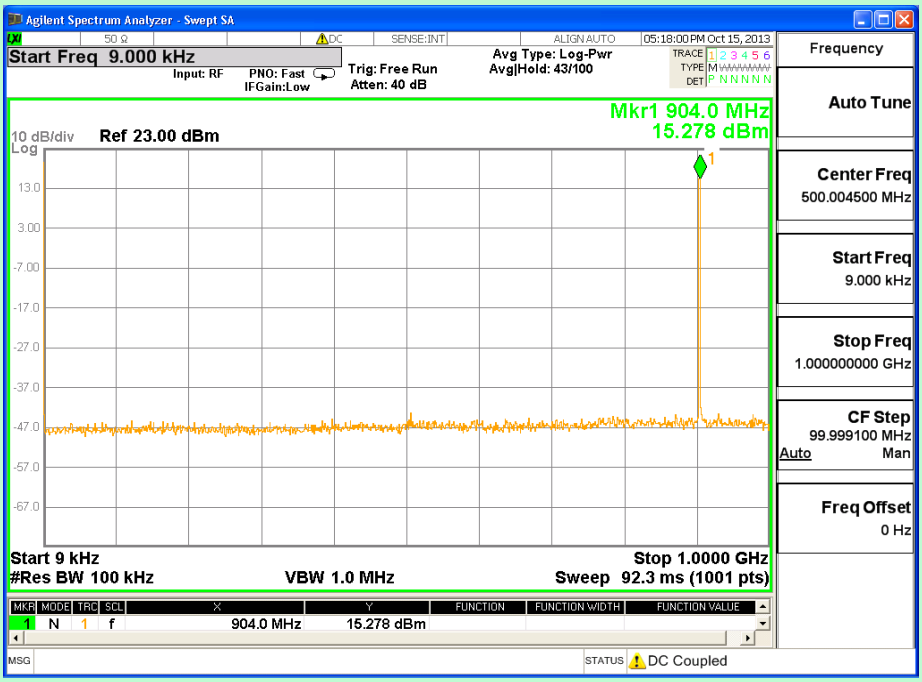
TEST PARAMETERS

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

TEST EQUIPMENT

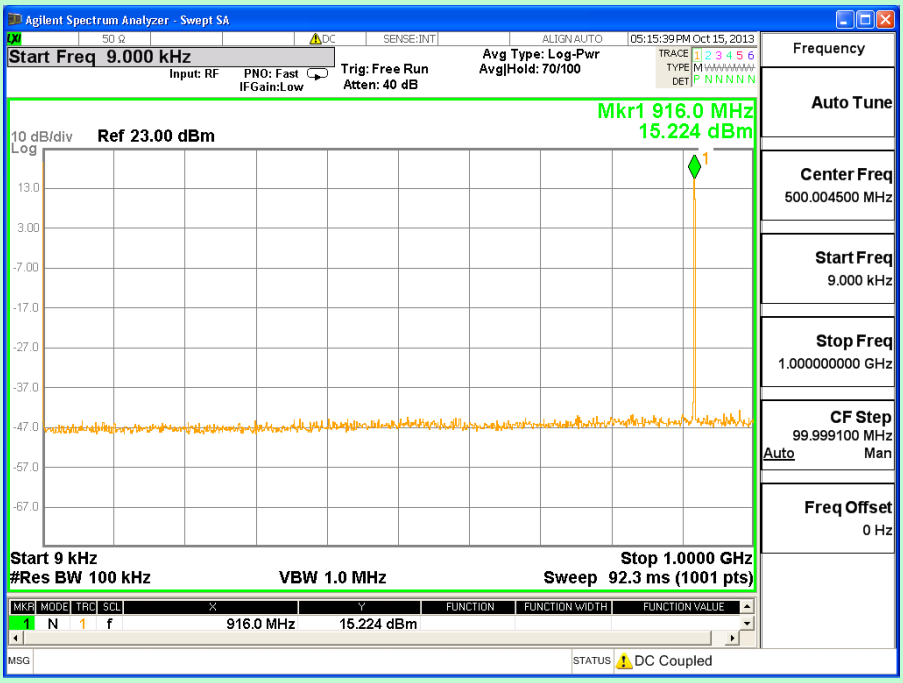
Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	28-Nov-2014
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

TEST GRAPHS

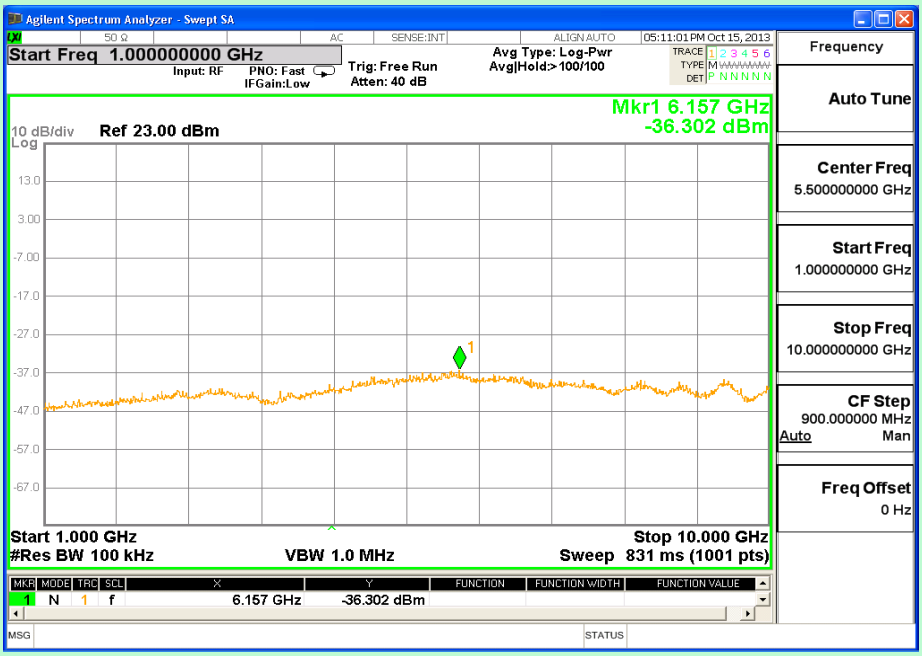


Channel 1 (903.55 MHz) – 9 KHz to 1 GHz

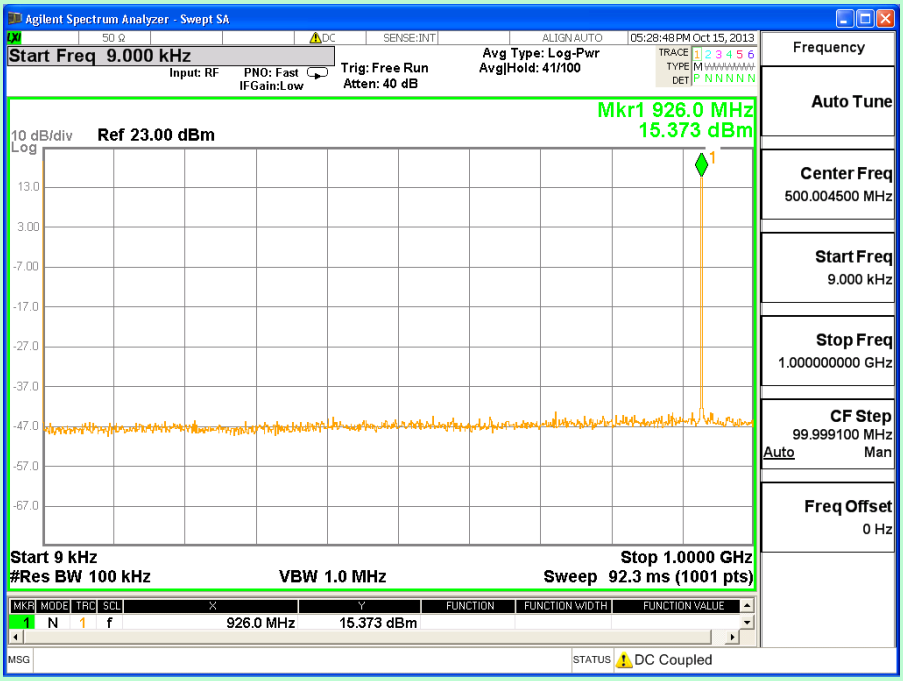
Channel 1 (903.55 MHz) – 1 GHz to 10 GHz



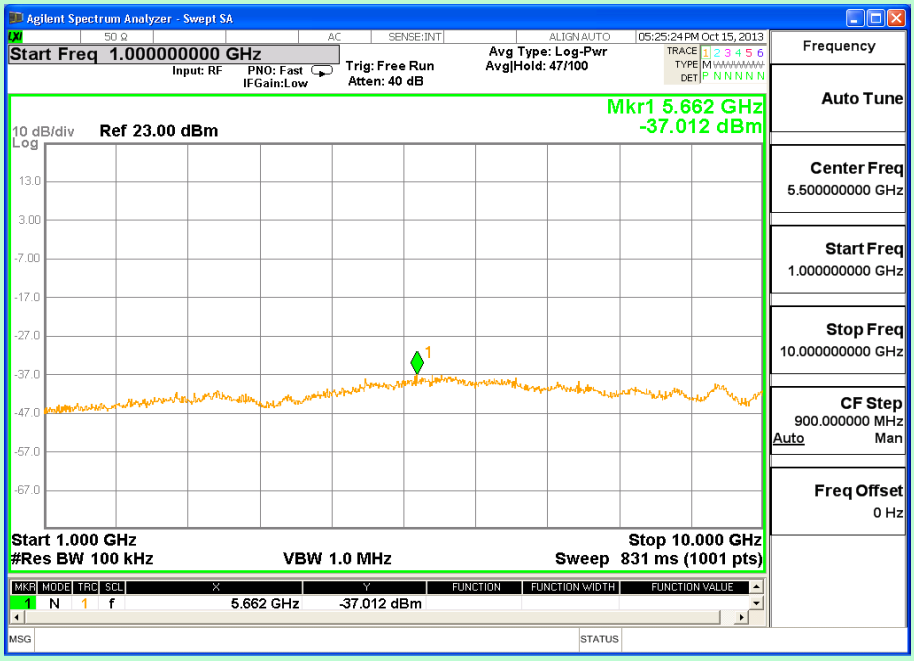
Channel 27 (916.35 MHz) – 9 KHz to 1 GHz



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



Channel 52 (926.45 MHz) – 9 KHz to 1 GHz



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

TEST RESULT					
Channel	Channel Frequency	Measured Parameters		Limit	Result
#	MHz	Frequency (GHz)	Level (dBm)	dBc	
1	903.55	5.617	-37.008	>20	PASS
27	916.35	6.157	-36.302	>20	PASS
52	926.45	5.662	-37.012	>20	PASS

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Conducted RF Test setup

2.8 SPURIOUS RADIATED EMISSIONS

EUT Nomenclature	Wireless Monitor Module	**Test Request No.**	EMC-0004-2
Model No.	FW-MM	**Serial No.**	05879
Test Start Date	16-Sep-2013	**Temperature (˚C)**	23.3
Test End Date	18-Sep-2013	**Humidity RH (%)**	55.5
Tested By	Sasikala Subramani	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3 Vdc		
Operating Mode	Refer Page 5 for Operating Mode Table		
Test configuration	Refer Page 5 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247		
Test Method	DA 00-705		
Comment			

TEST FREQUENCY RANGE

Start Frequency	9 KHz	**Stop Frequency**	10 GHz

MAXIMUM OPERATING FREQUENCY

902 MHz to 928 MHz

TEST PARAMETERS

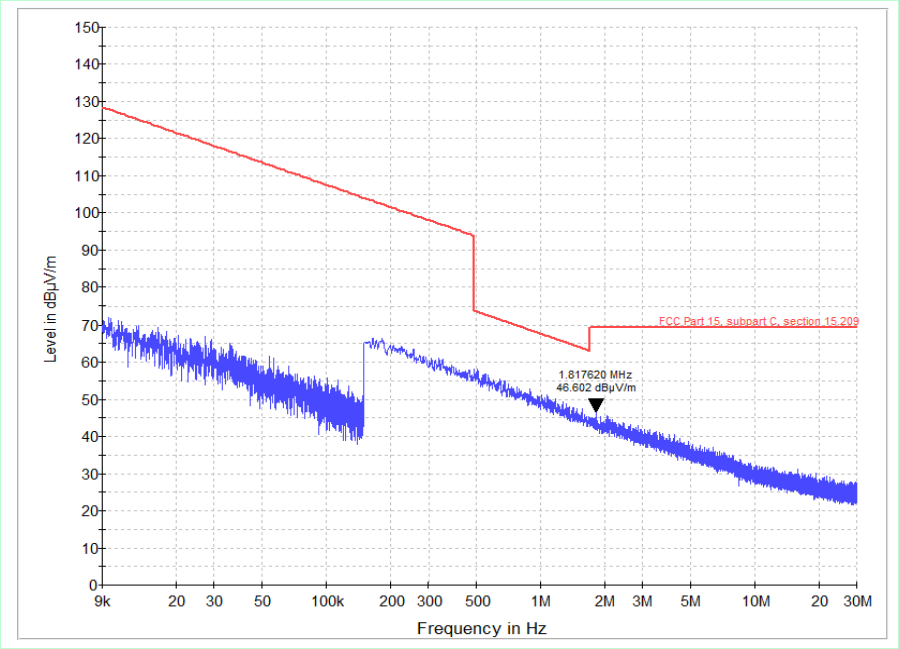
Antenna Height	1m to 4m	**Turntable Rotation**	0° to 360°
Applicable standard	FCC Part 15.247 & 15.209	**Test Method**	DA 00-705
Equipment Class	NA	**Measurement Distance**	3m

TEST EQUIPMENT

Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	EMI Test Receiver	R&S	ESU26	100229	04-Feb-2014
Y	3m Semi Anechoic Chamber	ETS Lindgren	DKE 6X7 DBL.DR	1625	31-Dec-2013
Y	Double Ridge Guide Horn Antenna	ETS Lindgren	3117	00064055	07-Nov-2013
Y	Bilog Antenna	ETS Lindgren	HLP3003C	130525	30-Nov-2013
Y	Loop Antenna	ETS Lindgren	6507	000103694	12-Mar-2014
Y	RF cable (9KHz to 1GHz)	COLEMAN	RG214	RE-1A	09-May-2014
Y	RF cable (9KHz to 1GHz)	COLEMAN	RG214	RE-1B	09-May-2014
Y	RF cable (1GHz to 18GHz)	AH Systems	SAC-18G-06	RE-2A	09-May-2014
Y	RF cable (1GHz to 18GHz)	AH Systems	SAC-18G-06	RE-2B	09-May-2014
Y	High Pass Filter	Wainwright	WHKX1.5/15G-12ST	1	09-May-2014
Y	Signal Conditioning Unit	R&S	SCU-18	10178	13-June-2014
Y	EMC32 Software	R&S	8.30.0	820-OT101248	NA

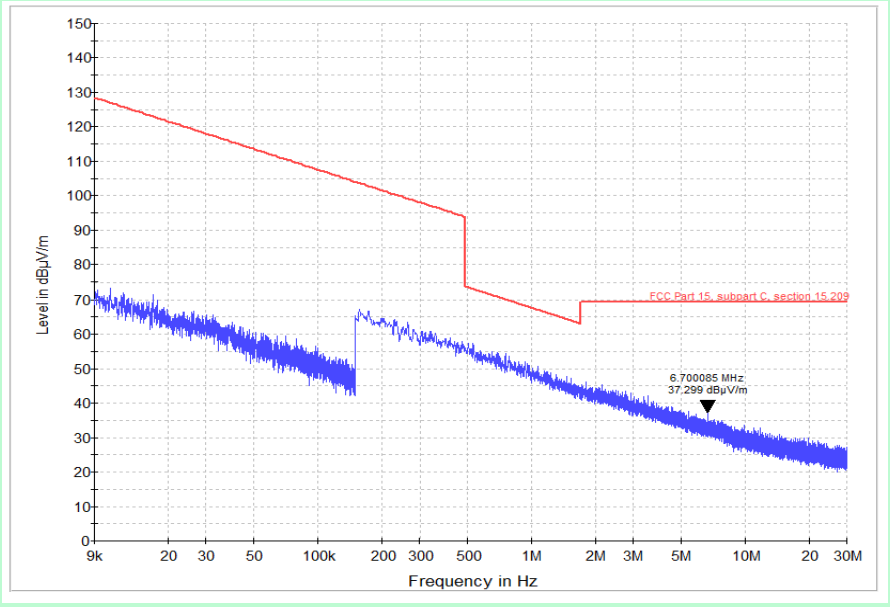
Note: Switch ON /OFF the Internal Preamplifier based on carrier level and or noise floor without overloading the receiver

TEST GRAPHS – 9 KHz to 30 MHz



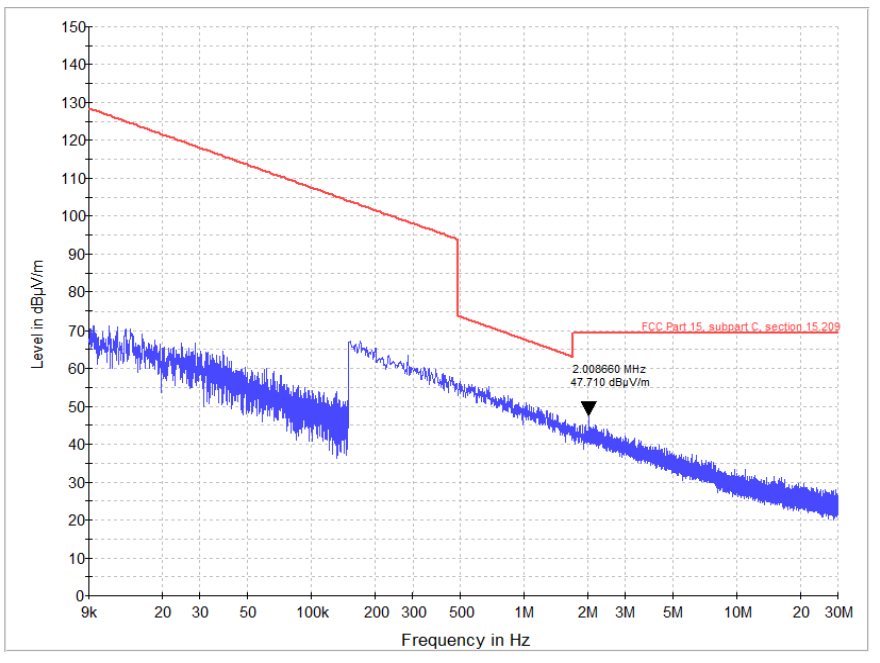
Channel 1 (903.55 M Hz)

Note : Peak Graph - Parallel



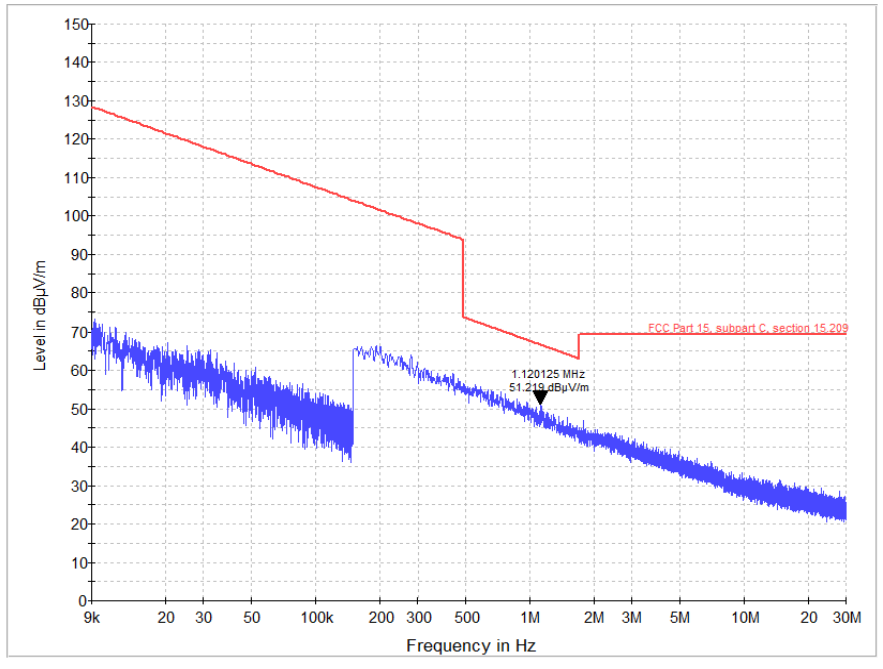
Channel 1 (903.55 M Hz)

Note : Peak Graph - Perpendicular



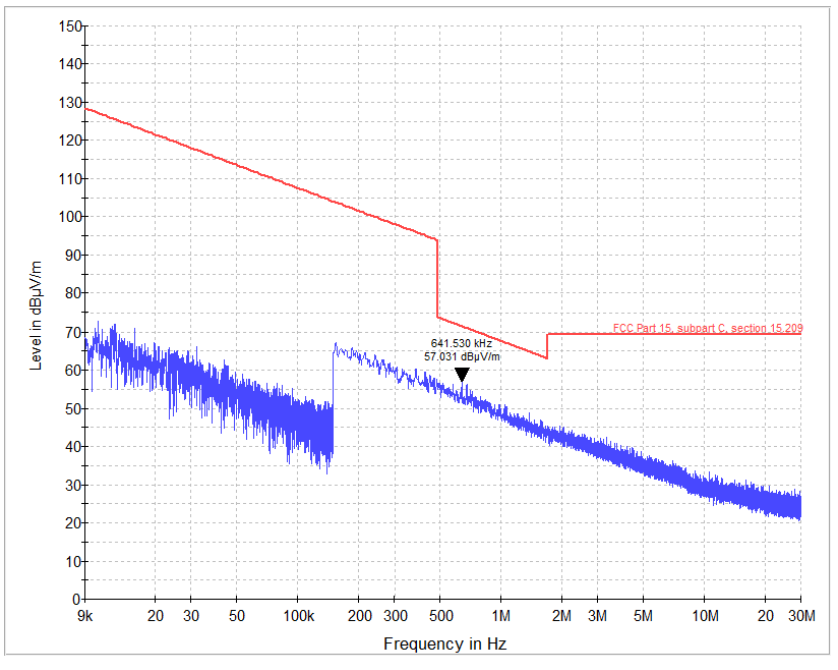
Channel 27 (916.35 MHz)

Note : Peak Graph - Parallel



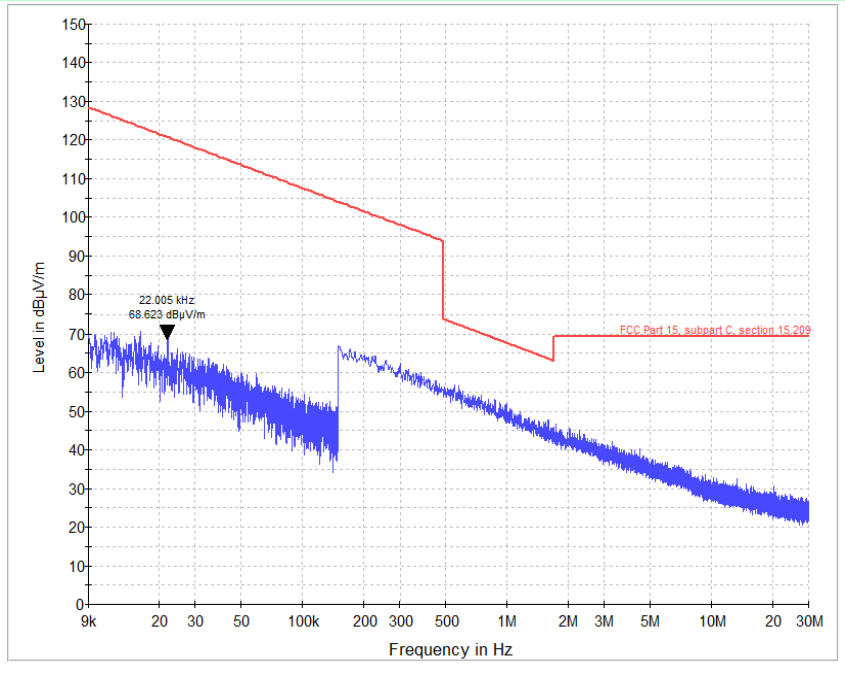
Channel 27 (916.35 MHz)

Note : Peak Graph - Perpendicular



Channel 52 (926.45 MHz)

Note : Peak Graph - Parallel



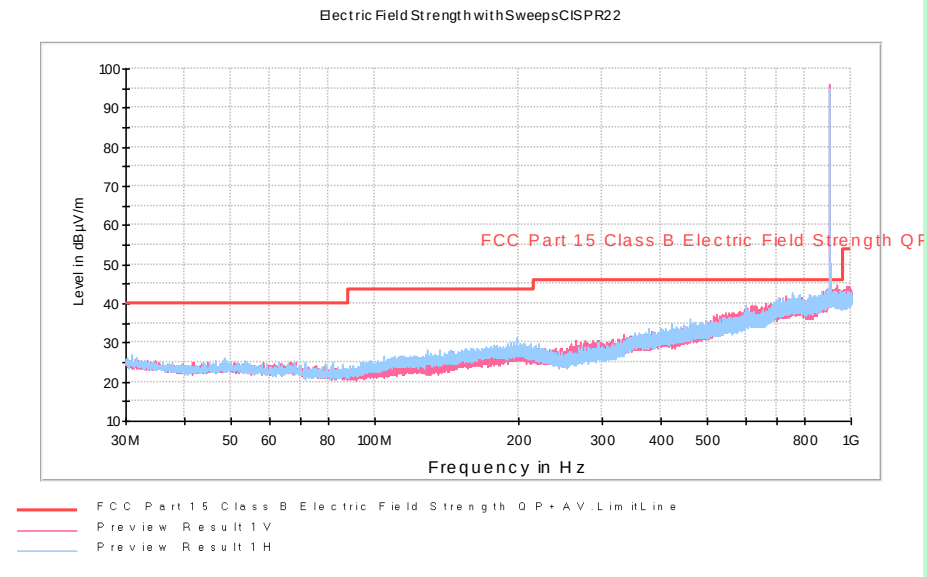
Channel 52 (926.45 MHz)

Note : Peak Graph - Perpendicular

TEST RESULT – 9 KHz to 30 MHz									
Channel	Channel Frequency	Measured Spurious	Quasi Peak	Height	Ant Pol	Azimuth	Margin	Limit @ 3m Distance	Results
#	MHz	MHz	dBµV/m	cm	Parallel / Perpendicular	deg	dB	dBµV/m	
1	903.55	1.8176	46.602	100	Parallel	30	22.938	69.54	PASS
1	903.55	6.700	37.299	100	Perpendicular	30	36.701	74	PASS
27	916.35	2.0086	47.71	100	Parallel	40	79.29	127	PASS
27	916.35	1.1201	51.219	100	Perpendicular	40	22.781	74	PASS
52	926.45	6.4153	57.031	100	Parallel	20	69.969	127	PASS
52	926.45	0.0220	68.623	100	Perpendicular	20	58.377	127	PASS

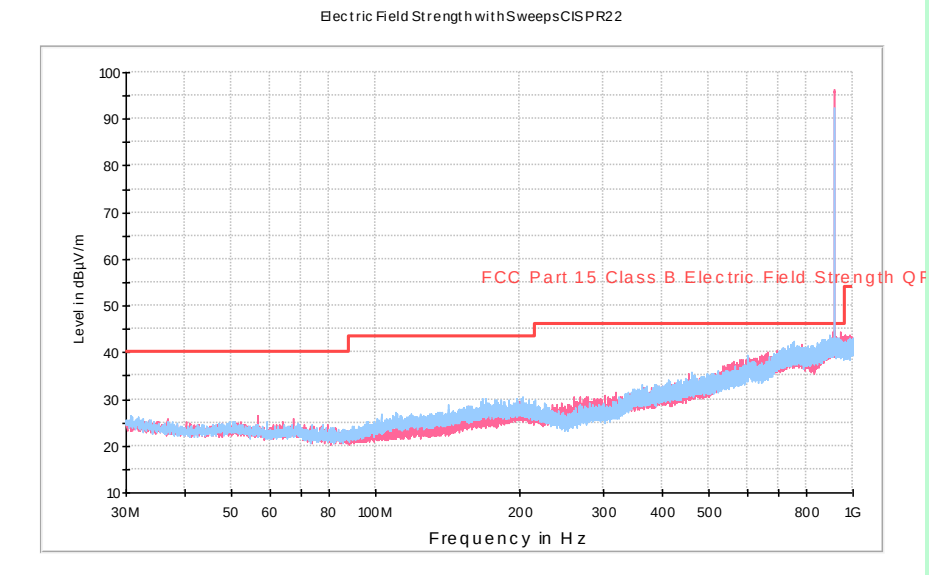
Note : Measured Field Strength –dBuV/m = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)

TEST GRAPHS – 30 MHz to 1 GHz



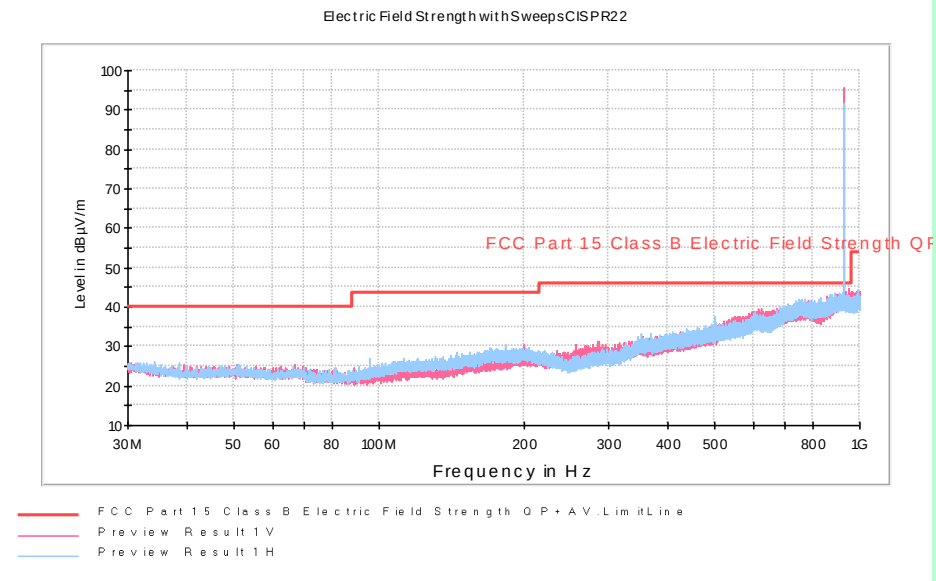
Channel 1 (903.55 MHz)

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



Channel 27 (916.35 MHz)

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



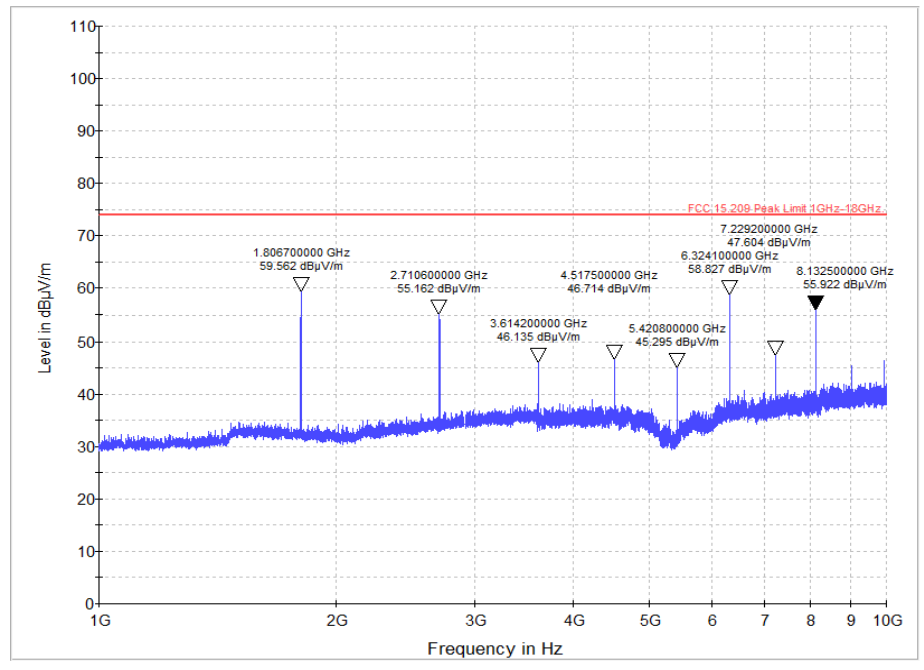
Channel 52 (926.45 MHz)

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

TEST RESULT – 30 MHz to 1 GHz								
Channel	Measured Spurious	Quasi Peak	Height	Ant Pol	Azimuth	Margin	Limit @ 3m Distance	Results
#	MHz	dBµV/m	cm	H / V	deg	dB	dBµV/m	
1	30.28	19.8	100.0	H	240.0	20.2	40.0	PASS
1	48.71	18.5	200.0	H	120.0	21.5	40.0	PASS
1	62.13	18.0	400.0	V	90.0	22.0	40.0	PASS
1	85.87	17.6	400.0	H	240.0	22.4	40.0	PASS
1	171.44	23.1	100.0	H	60.0	20.4	43.5	PASS
1	197.86	23.4	300.0	H	30.0	20.1	43.5	PASS
1	333.45	24.7	400.0	H	90.0	21.3	46.0	PASS
1	458.43	28.3	200.0	H	0.0	17.7	46.0	PASS
1	699.50	34.4	400.0	H	60.0	11.6	46.0	PASS
1	903.60	102.3	100.0	V	240.0	-44.3	46.0	Intended Frequency
27	30.46	19.4	200.0	V	240.0	20.6	40.0	PASS
27	57.31	18.0	100.0	V	90.0	22.0	40.0	PASS
27	66.89	18.2	100.0	V	90.0	21.8	40.0	PASS
27	111.00	20.1	100.0	H	0.0	23.4	43.5	PASS
27	166.14	22.8	300.0	H	300.0	20.7	43.5	PASS
27	203.37	23.4	400.0	H	60.0	20.1	43.5	PASS
27	347.42	25.5	300.0	V	270.0	20.5	46.0	PASS
27	458.35	28.3	400.0	H	300.0	17.7	46.0	PASS
27	692.31	33.8	200.0	V	90.0	12.2	46.0	PASS
27	916.39	103.2	100.0	V	240.0	-45.2	46.0	Intended Frequency
52	33.99	19.0	100.0	H	0.0	21.0	40.0	PASS
52	51.74	18.5	400.0	H	120.0	21.5	40.0	PASS
52	67.13	18.1	100.0	V	30.0	21.9	40.0	PASS
52	86.95	17.6	400.0	H	0.0	22.4	40.0	PASS
52	169.56	23.1	200.0	H	270.0	20.4	43.5	PASS
52	200.80	23.6	400.0	H	0.0	19.9	43.5	PASS
52	346.35	25.8	300.0	H	180.0	20.2	46.0	PASS
52	490.78	28.3	100.0	V	210.0	17.7	46.0	PASS
52	702.98	34.5	300.0	H	60.0	11.5	46.0	PASS
52	926.38	103.1	100.0	V	240.0	-45.1	46.0	Intended Frequency

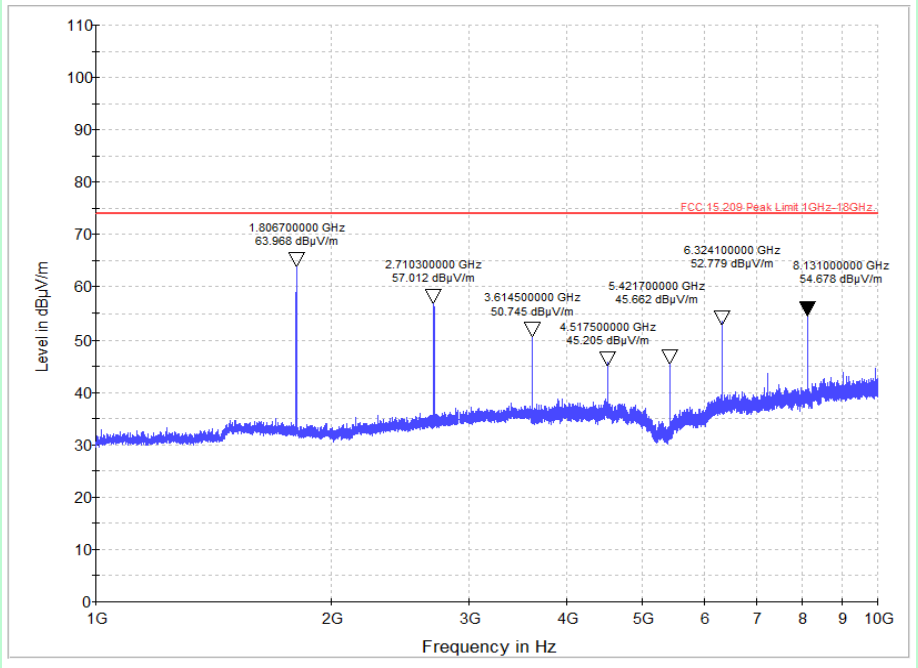
NOTE: Measured Field Strength –dBuV/m (9 KHz to 1GHz) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)

TEST GRAPHS – 1 GHz to 10 GHz



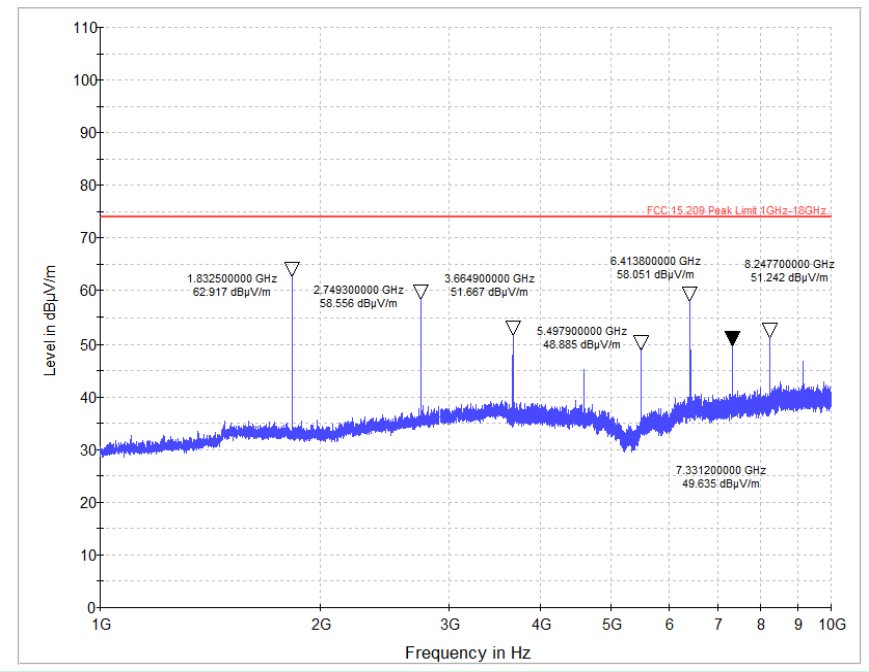
Channel 1 (903.55 MHz)

Note : Peak Graph - Horizontal



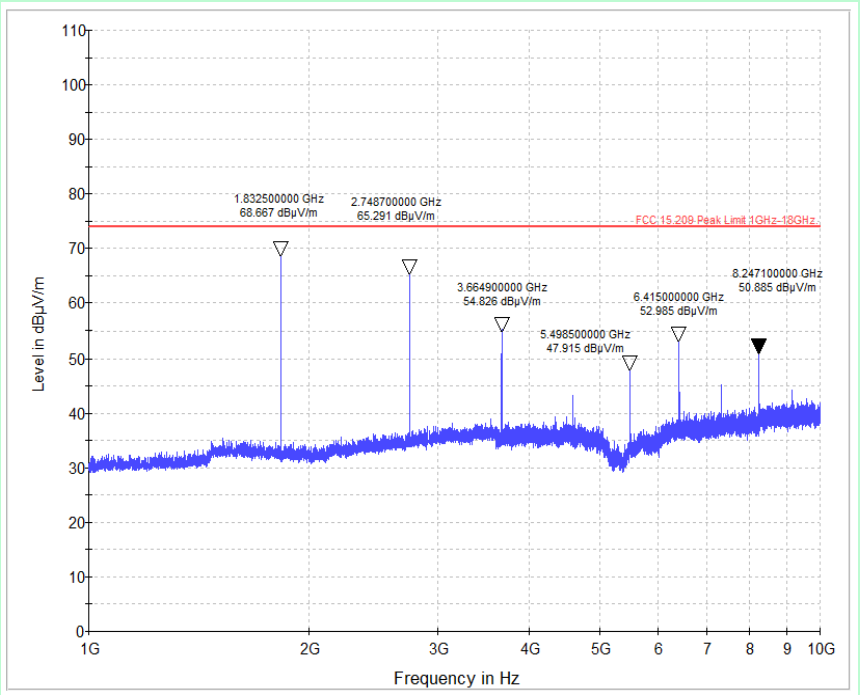
Channel 1 (903.55 MHz)

Note : Peak Graph - Vertical



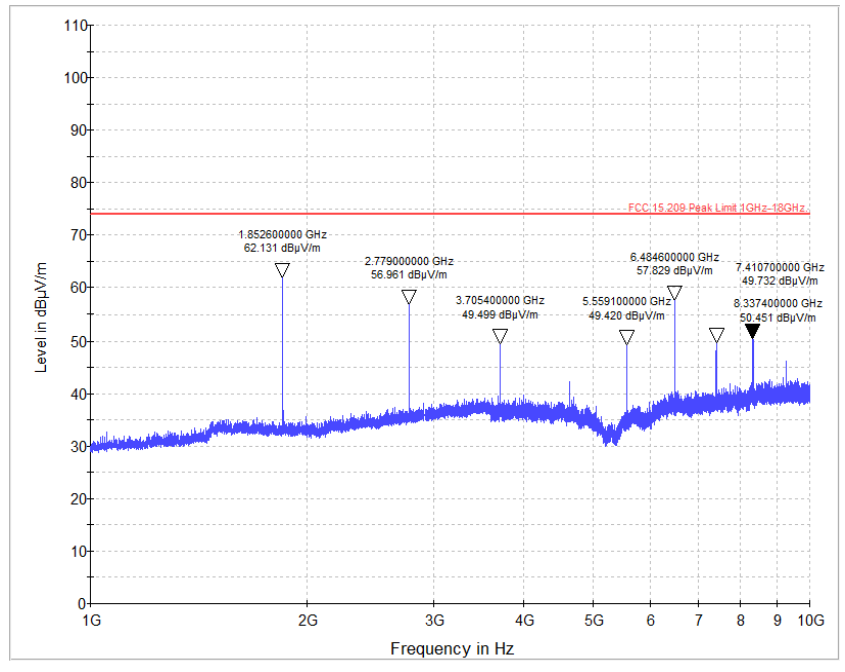
Channel 27 (916.35 M Hz)

Note : Peak Graph - Horizontal



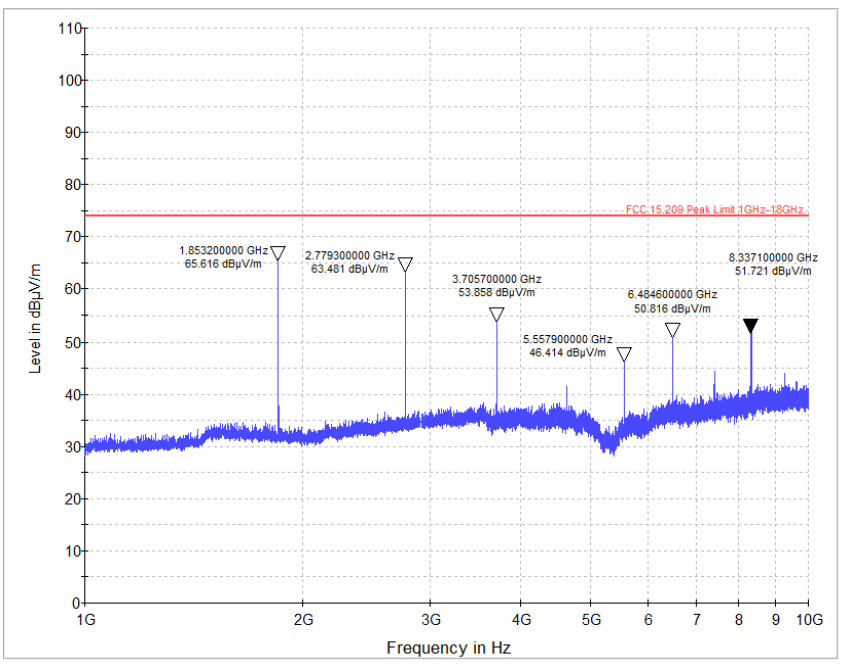
Channel 27 (916.35 M Hz)

Note : Peak Graph - Vertical



Channel 52 (926.45 MHz)

Note : Peak Graph - Horizontal



Channel 52 (926.45 MHz)

Note : Peak Graph - Vertical

TEST RESULT – 1 GHz to 10 GHz							RESTRICTED BAND – PEAK & AVERAGE			
Channel	Spurious Frequency	Spurious Peak Level	Height	Ant Pol	Peak Limit	Peak Margin	Calculated Average Reading [Peak – Duty cycle]	Average Limit	Margin	Result
#	GHz	dBµV/m	cm	H/V	dBµV/m	dB	dBµV/m		dB	
1	2.71	55.162	100	H	74	18.838	37.082	54	16.947	PASS
1	3.61	46.135	200	H	74	27.865	28.026	54	25.974	PASS
1	4.51	46.714	300	H	74	27.286	28.605	54	25.395	PASS
1	5.42	45.295	300	H	74	28.705	27.186	54	26.814	PASS
1	8.13	55.922	100	H	74	18.078	37.813	54	16.187	PASS
1	2.71	57.012	100	V	74	16.988	38.903	54	15.097	PASS
1	3.61	50.745	200	V	74	23.255	32.636	54	21.364	PASS
1	4.51	45.205	300	V	74	28.795	27.096	54	26.904	PASS
1	5.42	45.662	300	V	74	28.338	27.553	54	26.447	PASS
1	8.13	54.678	100	V	74	19.322	36.569	54	17.431	PASS
27	2.74	58.556	100	H	74	15.444	40.447	54	13.553	PASS
27	3.66	51.667	200	H	74	22.333	33.558	54	20.442	PASS
27	7.33	49.635	300	H	74	24.365	31.526	54	22.474	PASS
27	8.247	51.242	400	H	74	22.758	33.133	54	20.867	PASS
27	8.246	54.395	400	H	74	19.605	36.286	54	17.714	PASS
27	2.74	65.291	100	V	74	8.709	47.182	54	6.818	PASS
27	3.66	54.826	200	V	74	19.174	36.717	54	17.283	PASS
27	8.24	50.885	400	V	74	23.115	32.776	54	21.224	PASS
52	2.77	56.961	100	H	74	17.039	38.852	54	9.978	PASS
52	3.70	49.499	100	H	74	24.501	31.39	54	22.61	PASS
52	7.41	49.732	300	H	74	24.268	31.623	54	22.377	PASS
52	8.33	50.451	400	H	74	23.549	32.342	54	21.658	PASS
52	2.77	63.481	100	V	74	10.519	45.372	54	8.628	PASS
52	3.70	53.858	100	V	74	20.142	35.749	54	18.251	PASS
52	8.33	51.721	400	V	74	22.279	33.612	54	20.388	PASS

Note :

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

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

Duty Cycle Factor =20*log (Dwell time /100msec) , Number of Transmission for 100msec: 8, Dwell time per Transmission: 1.554msec
Duty Cycle correction Factor =20 log (1.554*8/100) = -18.109dB

TEST RESULT – 1 GHz to 10 GHz						NON-RESTRICTED BAND - PEAK		
Channel	Spurious Emission	Measured Fundamental	Measured Harmonic	Height	Ant Pol	Limit [Fundamental – 20dBc]	Margin	Results
#	GHz	dBµV/m	dBµV/m	cm	H / V	dBuV/m	dB	
1	1.80	102.3	59.56	100	H	82.3	22.73	PASS
1	6.32	102.3	58.82	200	H	82.3	23.48	PASS
1	7.22	102.3	47.60	400	H	82.3	34.70	PASS
1	1.80	102.3	63.968	100	V	82.3	18.34	PASS
1	6.32	102.3	52.779	200	V	82.3	29.521	PASS
27	1.83	103.2	62.917	200	H	83.2	20.283	PASS
27	5.49	103.2	48.885	100	H	83.2	34.315	PASS
27	6.41	103.2	58.051	400	H	83.2	25.149	PASS
27	1.83	103.2	68.667	200	V	83.2	14.533	PASS
27	5.49	103.2	47.915	100	V	83.2	35.285	PASS
27	6.41	103.2	52.985	400	V	83.2	30.215	PASS
52	1.85	103.1	62.131	100	H	83.1	20.969	PASS
52	5.55	103.1	49.42	200	H	83.1	33.68	PASS
52	6.48	103.1	57.829	200	H	83.1	25.271	PASS
52	1.85	103.1	65.616	100	V	83.1	17.484	PASS
52	5.55	103.1	46.414	200	V	83.1	36.686	PASS
52	6.48	103.1	50.816	200	V	83.1	32.284	PASS

Note :
Field Strength –dBuV/m = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB) + Filter Insertion loss - Pre amplifier Gain (dB)

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Radiated Emission Test Setup