Wireless Photo Detector

EMC Test Report

Model No.: FWD-200P

Date: 02-Mar-2020

Report Prepared By:

Shaithanya C

Report Number	EMC0420-1
EUT Nomenclature	Wireless Photo Detector
Sample Identification	Model No : FWD-200P SL. No : 138 Software Version : 5.88 Hardware Version : Rev 3
Number of Samples	1
Date of receipt of Sample	12-Nov-2019
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 **FCC FRN No.**	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	14-Dec-2019 to 28-Feb-2020
Applicable Standard	FCC Part 15: 2010, ANSI C63.10:2013
Test Results	PASS

Prepared By: Test Engineer
Name : Shaithanya C
Signature:
Date : 03-Mar-2020

Reviewed By:

Authorised Signatory :
Name : Prasanna Kumar BT
Signature:
Date of Issue : 05-Mar-2020

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	Effective Isotropic Radiated Power	FCC Part 15.247: 2010 and 15.209: 2010	KDB 412172	☒	☐	☐
9	Spurious Radiated Emissions	FCC Part 15.247: 2010 and 15.209: 2010	DA 00-705 ANSI C63.10 - 2013	☒	☐	☐
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	Effective Isotropic Radiated Power	FCC Part 15.247: 2010 and 15.209: 2010	KDB 412172	☒	☐	☐
6	Spurious Radiated Emissions	FCC Part 15.247: 2010 and 15.209: 2010	KDB 558074 ANSI C63.10 - 2013	☒	☐	☐

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 & 6dB Occupied Bandwidth	1.4dB
2	Maximum Peak Output Power Level	1.4dB
3	Power Spectral Density	1.4dB
4	Band Edge Conducted Emission	1.4dB
5	Spurious RF Conducted Emission	1.4dB
6	Radiated Spurious Emission < 1GHz	4.3dB
7	Radiated Spurious Emission > 1GHz	5.5dB

Decision Rule Applied	
☒	*Measurement Uncertainty is not accounted while reporting statement of conformity to specification / standard. (shared risk)*
☐	*Measurement uncertainty is accounted and results reported as per ILAC-G8 guidelines*

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 :55
Channel Bandwidth (20dB)	DTS :1MHz
	FHSS :320KHz
Transmitted Power	DTS :12dBm
	FHSS :17dBm
Modulation Type	FSK
Data Rate	DTS :300Kbps
	FHSS :150Kbps
Antenna Type	Inverted F Patch Antenna
No. of Antenna	3
Antenna Gain	ANT 1 : 5.18dBi ANT 2 : 4.9dBi ANT 3 : 4.8dBi
Supply Voltage and Current	3.3V, 24mA
Dimensions (Diameter x Height)	4inch x 2.1 inch
Environmental Conditions	Operating Temperature : 0°C to 50°C
	Storage Temperature : -10°C to 60°C
	Humidity :10% to 93% RH

TEST CONFIGURATION

Config #	Description
Conducted Test	EUT is Powered by 3.3V Batteries. EUT Debug port (UART) is connected to Laptop through USB to UA RT converter cable. EUT is configured to the respective operating mode through Hyper Terminal. Test is performed at Antenna 1 as this is the high gain antenna
Radiated Test	EUT is Powered from Battery. EUT Debug port (UA RT) is connected to Laptop through USB to UA RT converter cable. EUT is configured to the respective operating mode through Hyper Terminal. Test is performed at Antenna 1

OPERATING MODES

Mode #	Description
DTS	Following DTS channels have been used for Conducted (Continuous Trans mission) and Radiated (Continuous Trans mission) Tests Channel 1: 902.875MHz Channel 4: 915.325MHz Channel 6: 927.125MHz
FHSS	Following FHSS channels have been used for Conducted (Continuous Trans mission) and Radiated (Continuous Trans mission) Tests Channel 1: 903.55MHz Channel 28: 916.00MHz Channel 55: 926.45MHz

INPUT AND OUTPUT CABLES

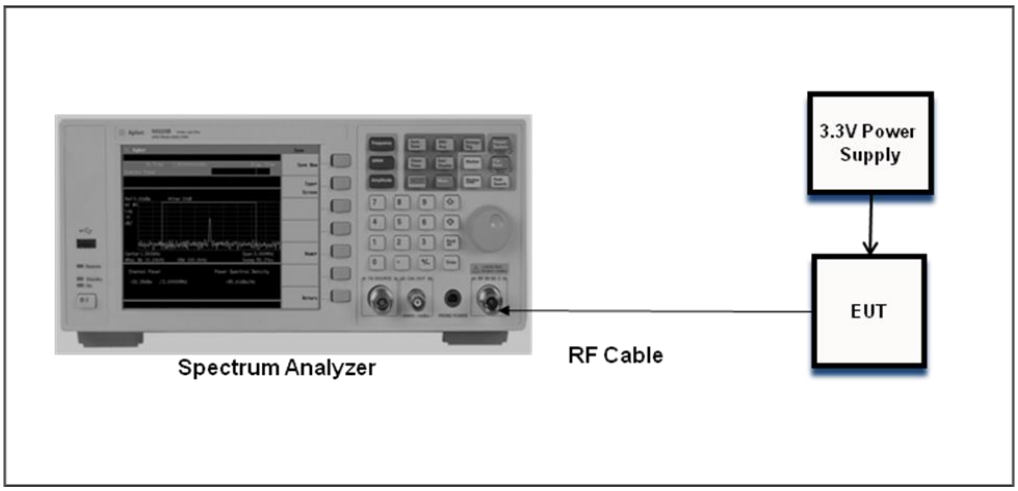
Port #	Name	Port Type	Cable Length	Cable type Shielded/ Unshielded	Comments
	Nil				Nil

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

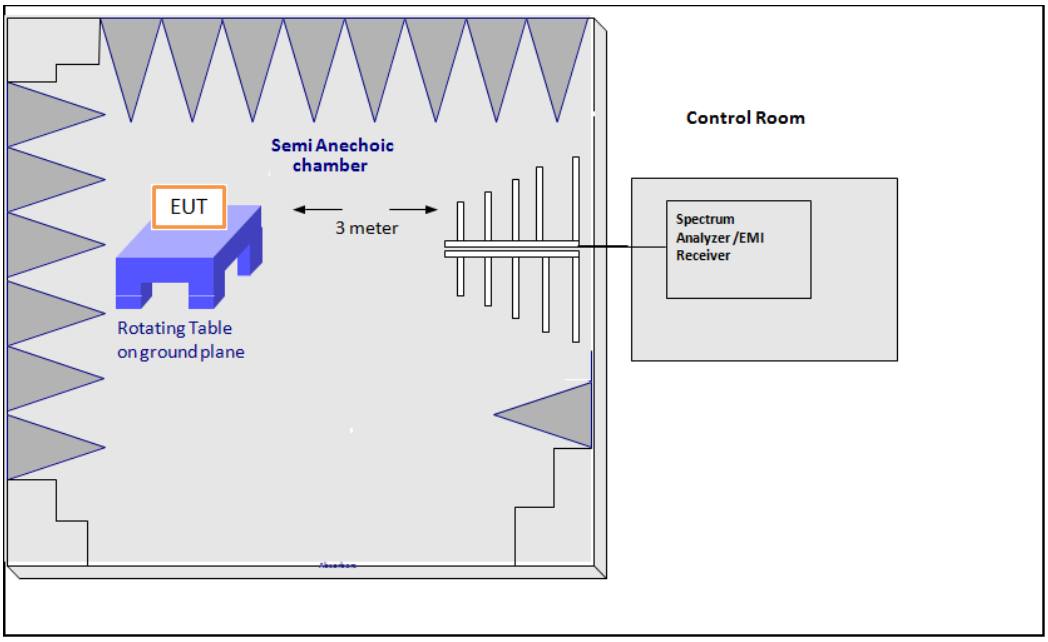
SUPPORT EQUIPMENTS AND ACCESSORIES USED

#	Item Description	Make	Model	Part No. / Sl. No	Cal Due Date
1	Laptop	DELL	P72G	4329171074	NA
2	USB to UART Cable	FTDI	TTL-232R-3V3	NA	NA

CONNECTION DIAGRAM AND SETUP DIAGRAM



Conducted RF Test Setup



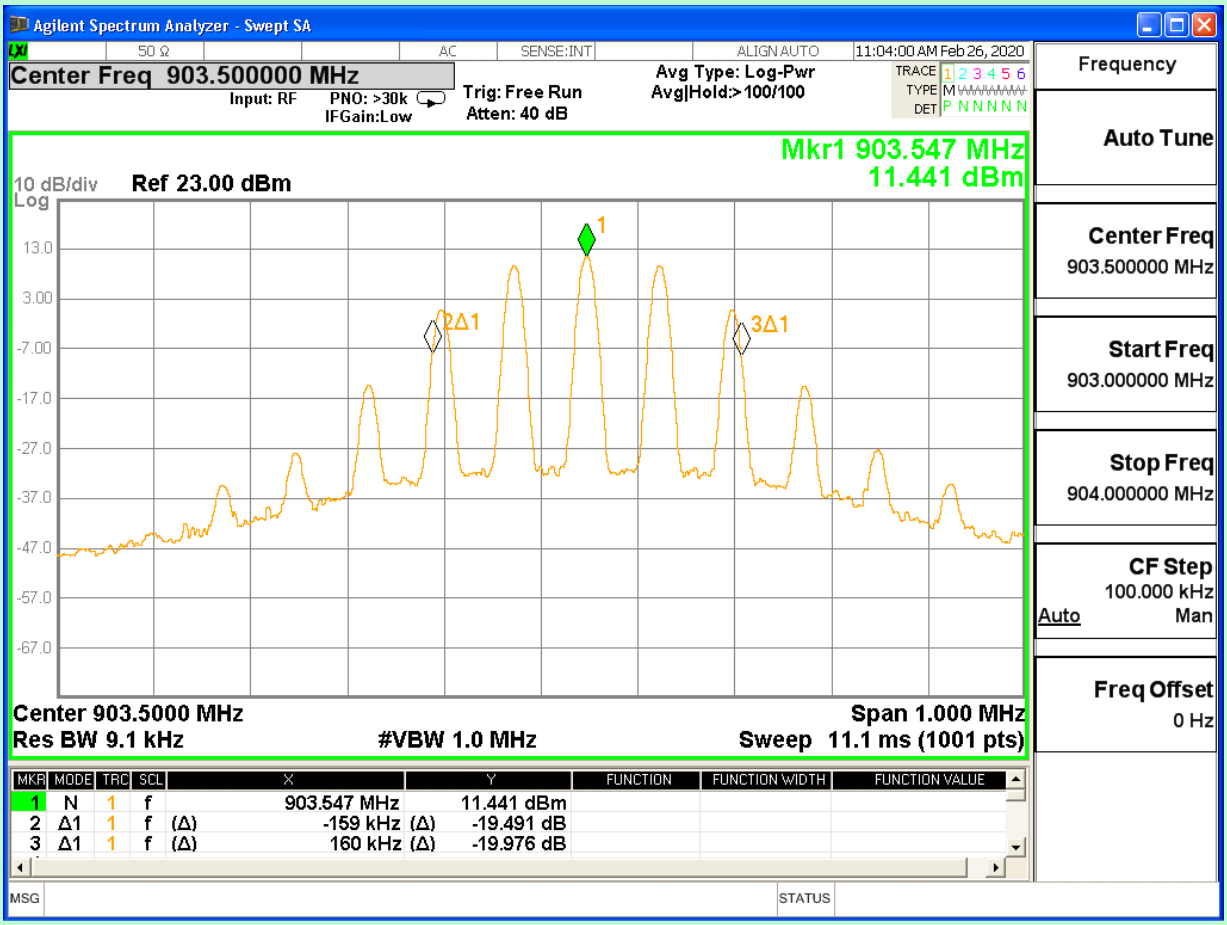
Radiated Emission Test Setup

2 FHSS CHANNELS

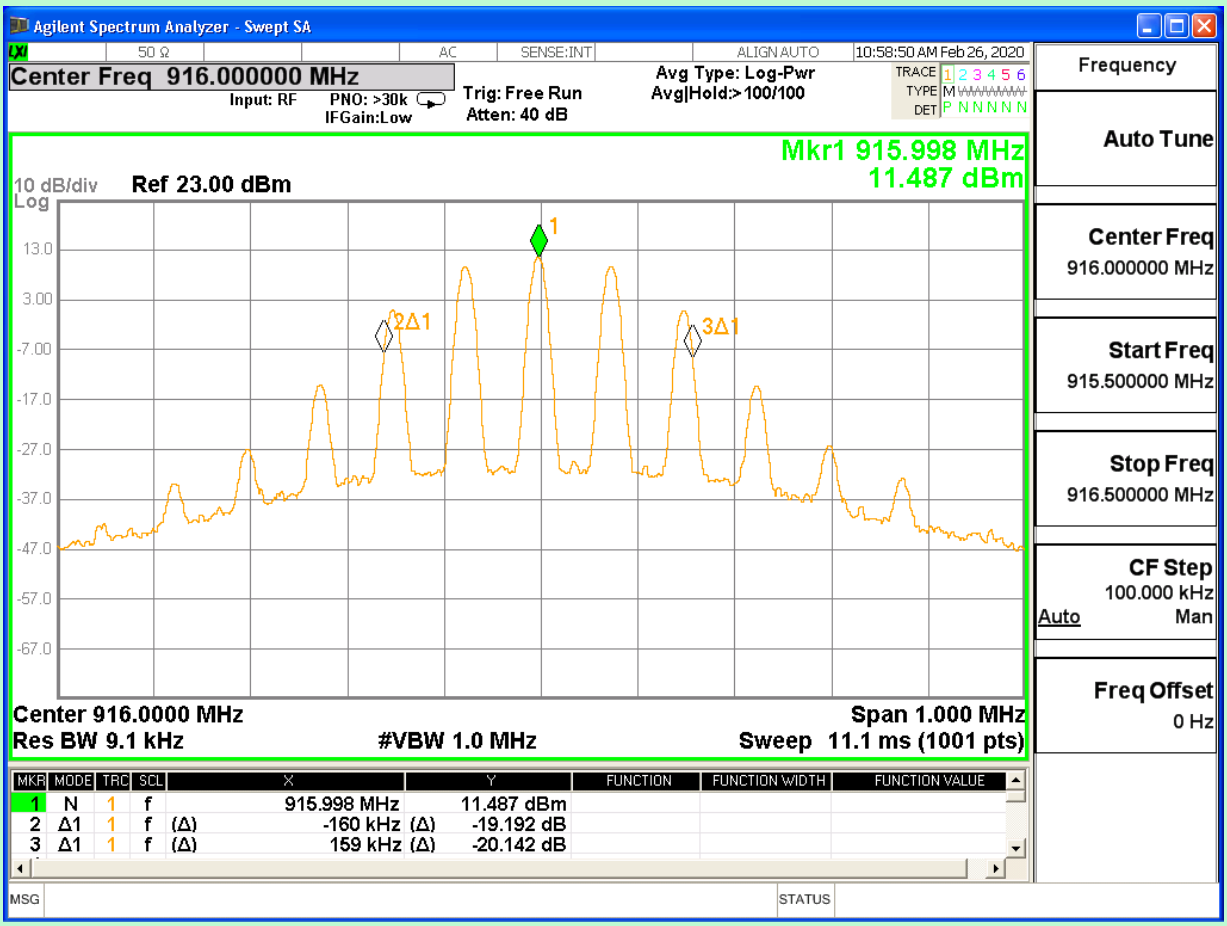
2.1 20dB BANDWIDTH			
EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std.	NA		
Applicable	FCC Part 15.247:2010		
Test Method	DA 00-705		
Comment	NA		
TEST DETAILS			
Method	Radiated ☐	Conducted ☒	
TEST PARAMETERS			
Antenna Height	NA	**Turntable Rotation**	NA
Equipment Class	NA	**Measurement Distance**	NA

TEST EQUIPMENT					
Y/N	**Equipment**	**Make**	**Model**	**Sl. No.**	**Cal Due Date**
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Shunner	SF104/2X11PC3542/500	NA	NA

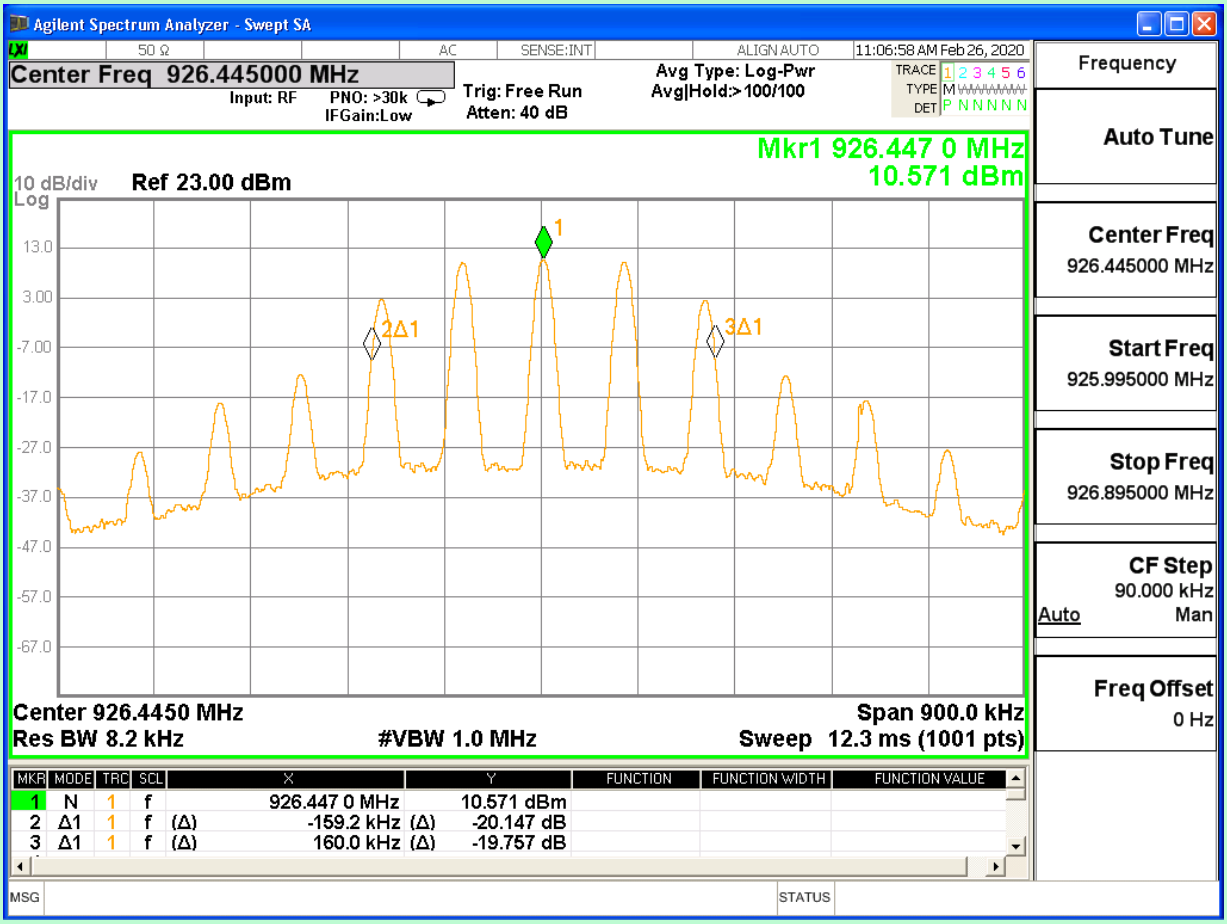
TEST GRAPHS



Channel 1 (903.55MHz)



Channel 28 (916MHz)



Channel 55 (926.45MHz)

TEST RESULT				
Channel #	Frequency MHz	Measured Bandwidth KHz	Limit KHz	Result
1	903.55	319	≥250 & ≤500	PASS
28	916	319	≥250 & ≤500	PASS
55	926.45	319.2	≥250 & ≤500	PASS

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Conducted RF Test setup

2.2 MAXIMUM PEAK OUTPUT POWER LEVEL

EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std.	NA		
Applicable	FCC Part 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

Method	Radiated ☐	Conducted ☒

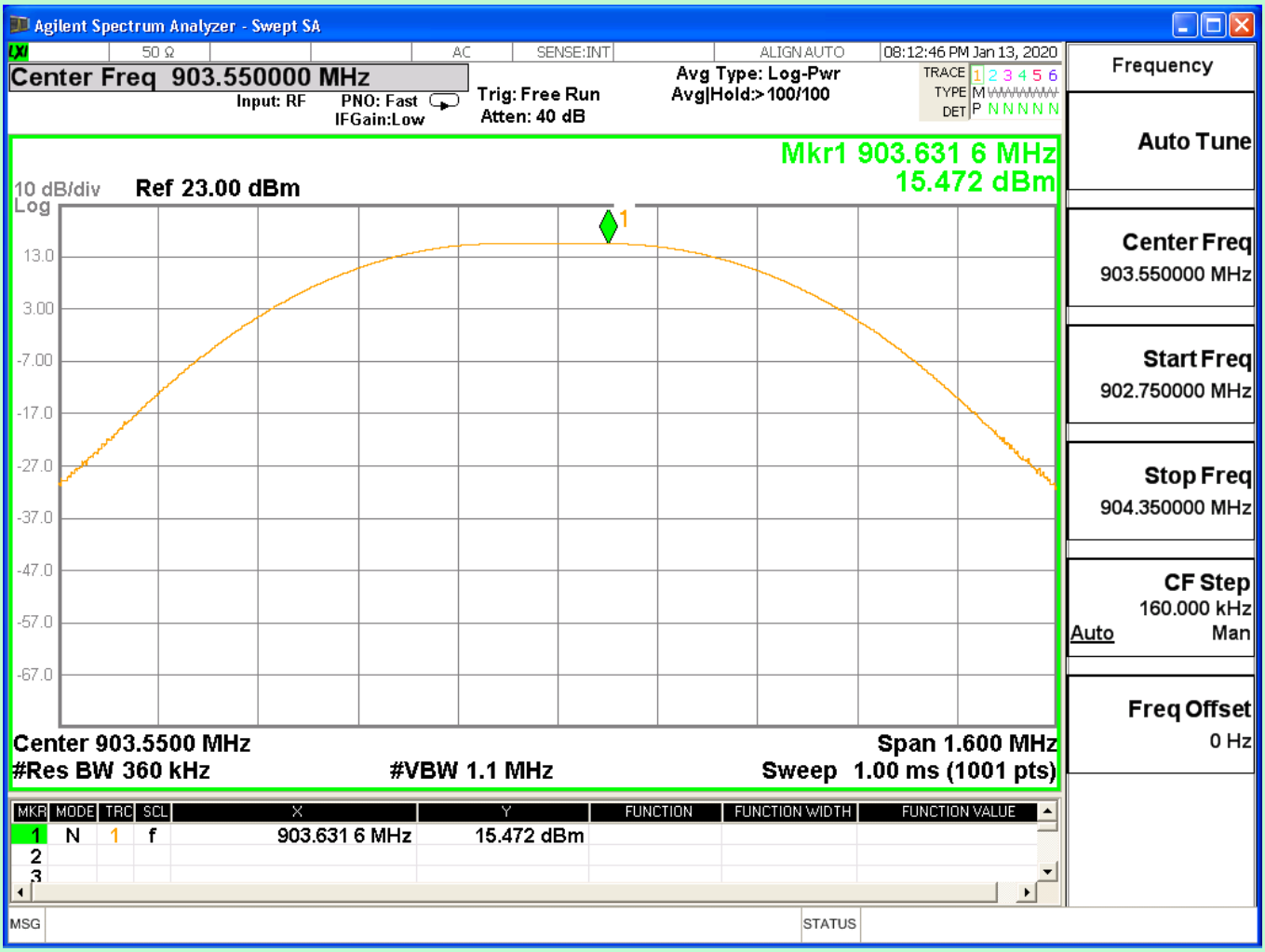
TEST PARAMETERS

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

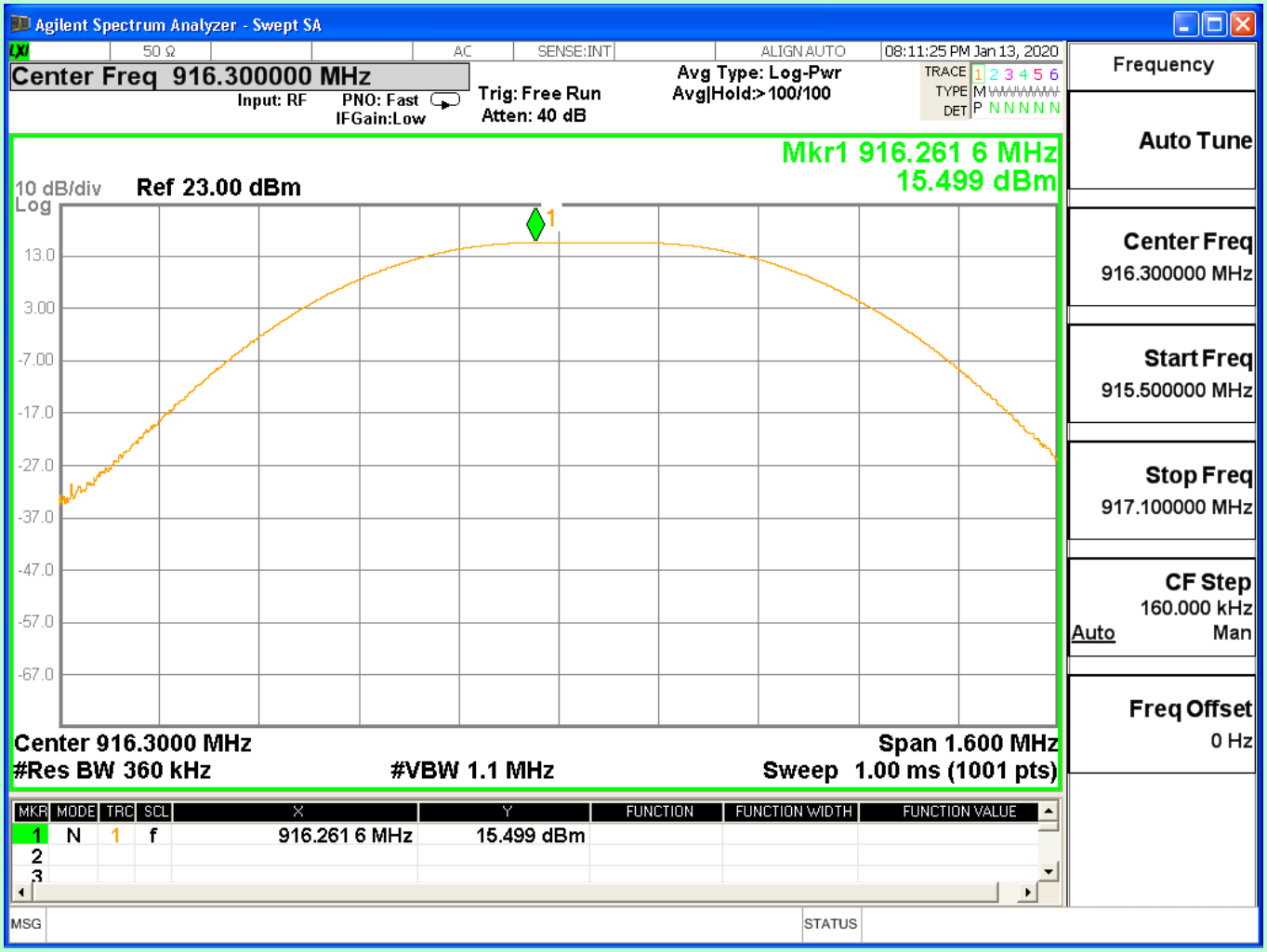
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

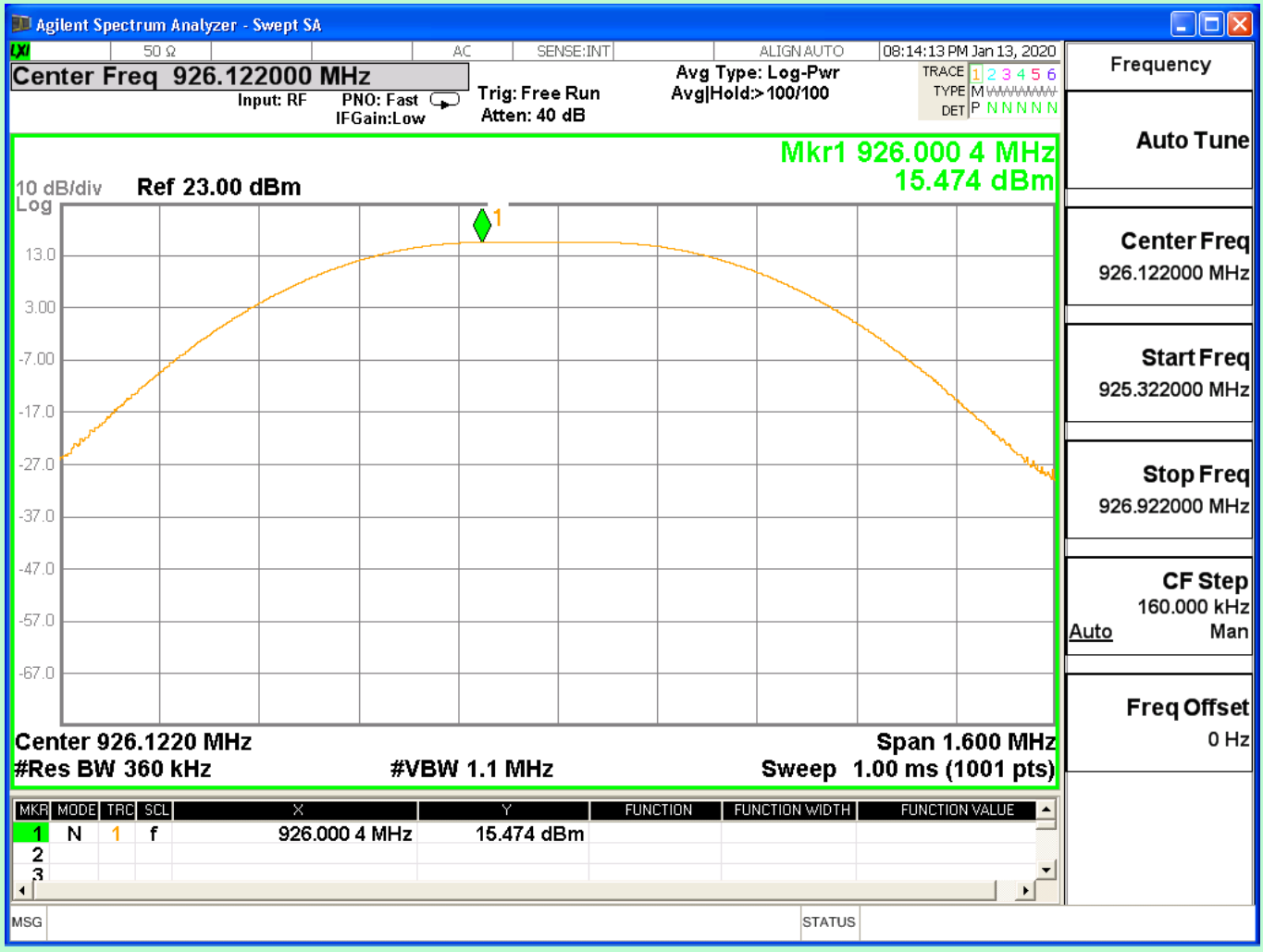
TEST GRAPHS



Antenna 1- Channel 1 (903.55MHz)



Antenna 1- Channel 28 (916MHz)



Antenna 1-Channel 55 (926.45MHz)

TEST RESULT						
Channel	**Frequency**	**Measured Power Level**	**Cable Loss**	**Transmitter Power Level**	**Limit**	**Result**
#	**MHz**	**dBm**	**dB**	**dBm**	**dBm**	
Antenna 1						
1	903.55	15.47	0.8	16.27	<=23.979	PASS
28	916.00	15.49	0.8	16.29	<=23.979	PASS
55	926.45	15.47	0.8	16.27	<=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 SEPERATION

EUT	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from	NA		
Applicable	FCC Part 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

Method	Radiated ☐	Conducted ☒

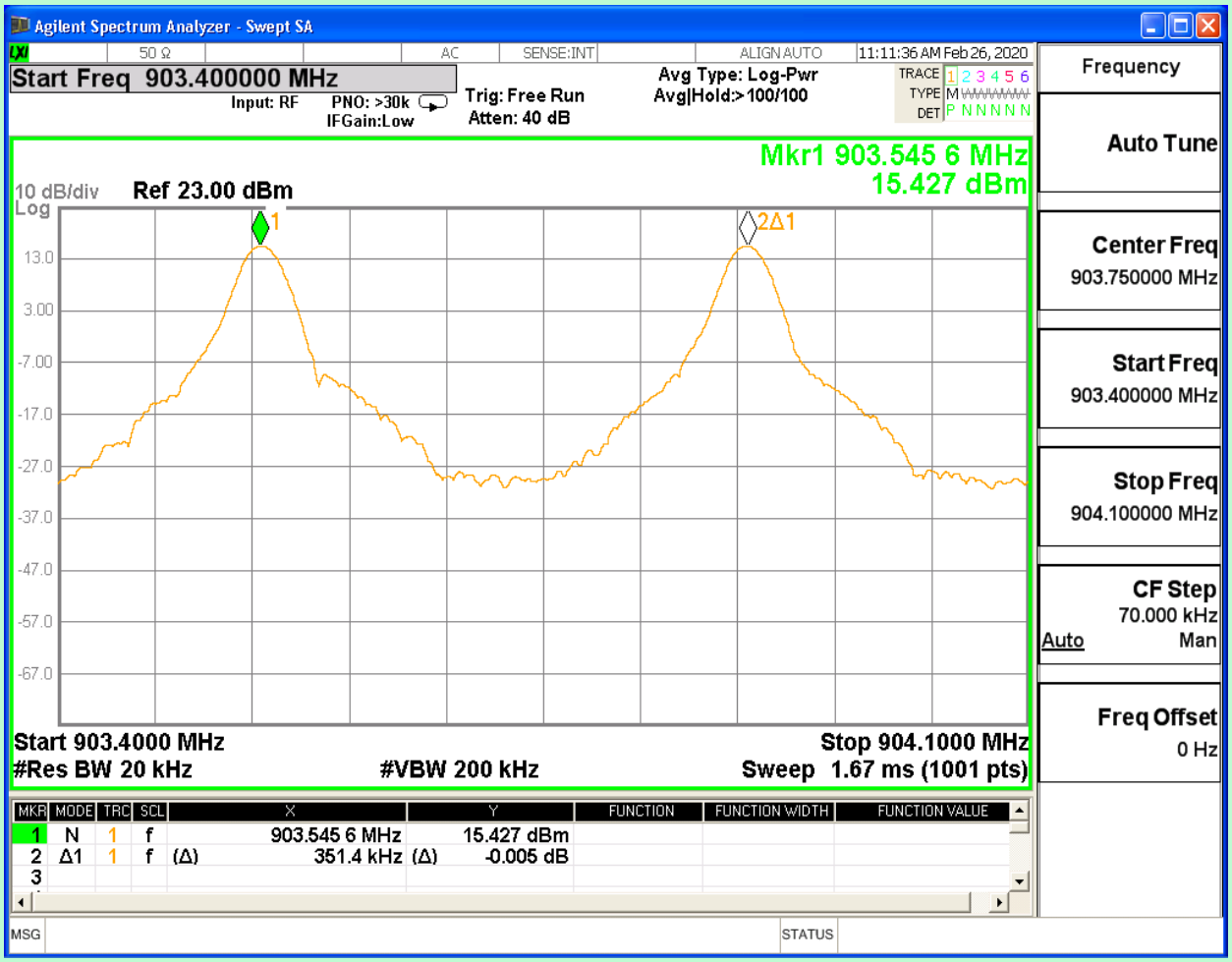
TEST PARAMETERS

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

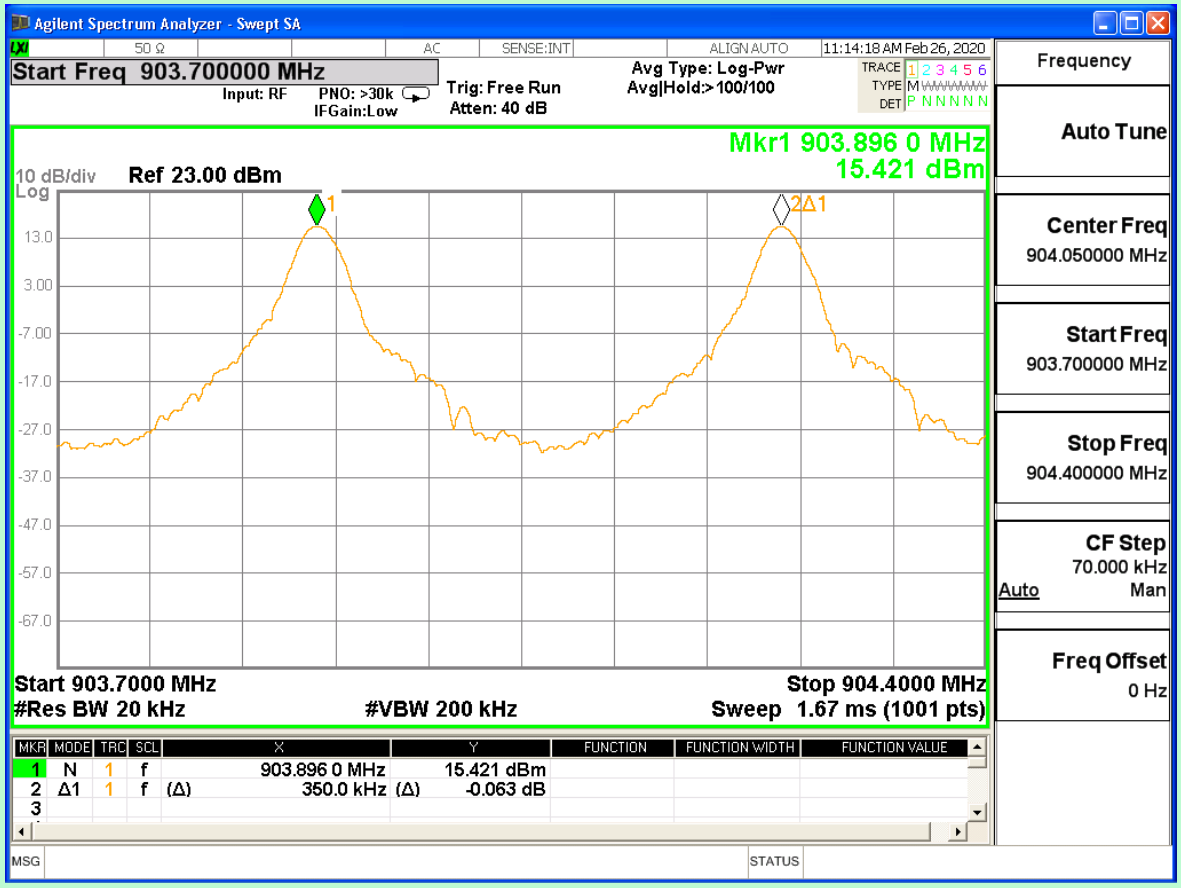
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Shunner	SF104/2X11PC3542/500	NA	NA

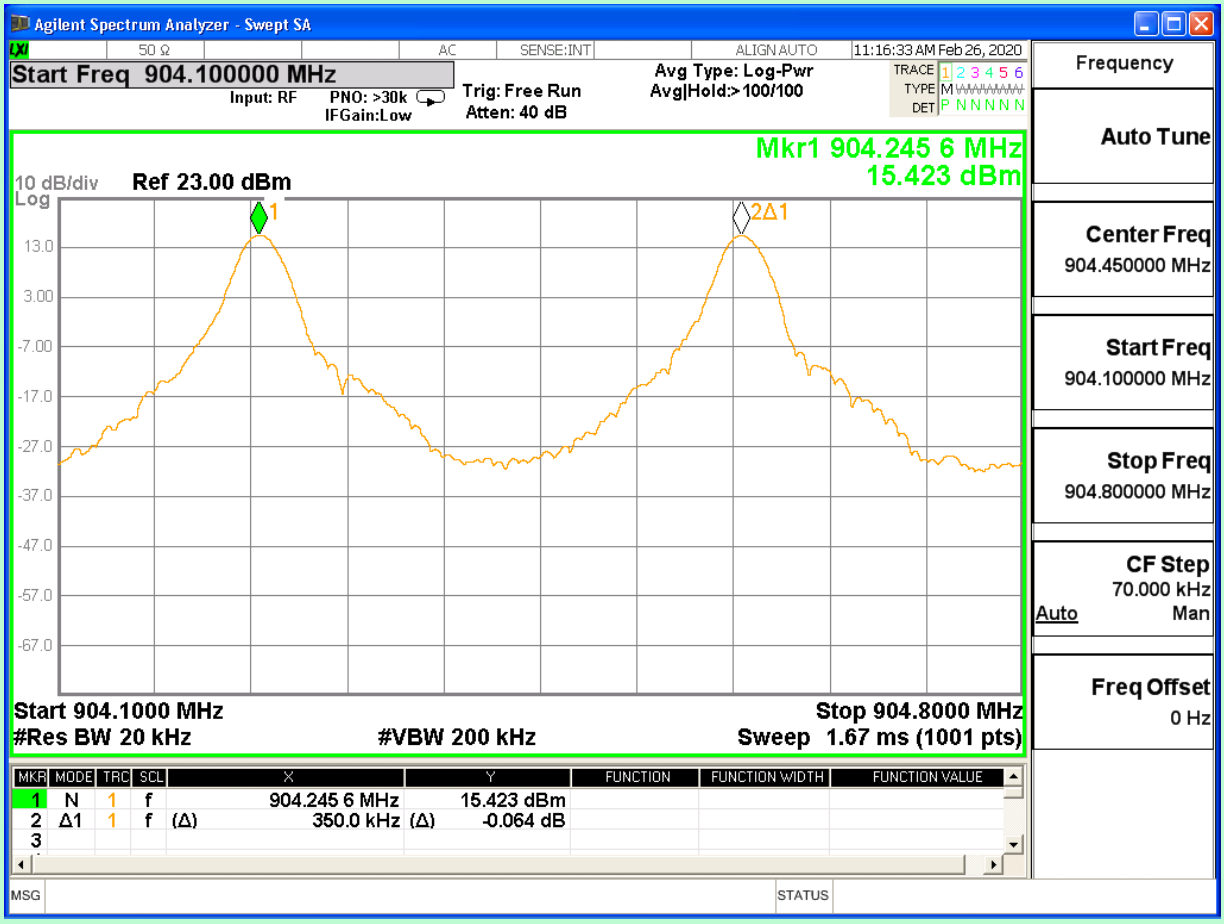
TEST GRAPHS



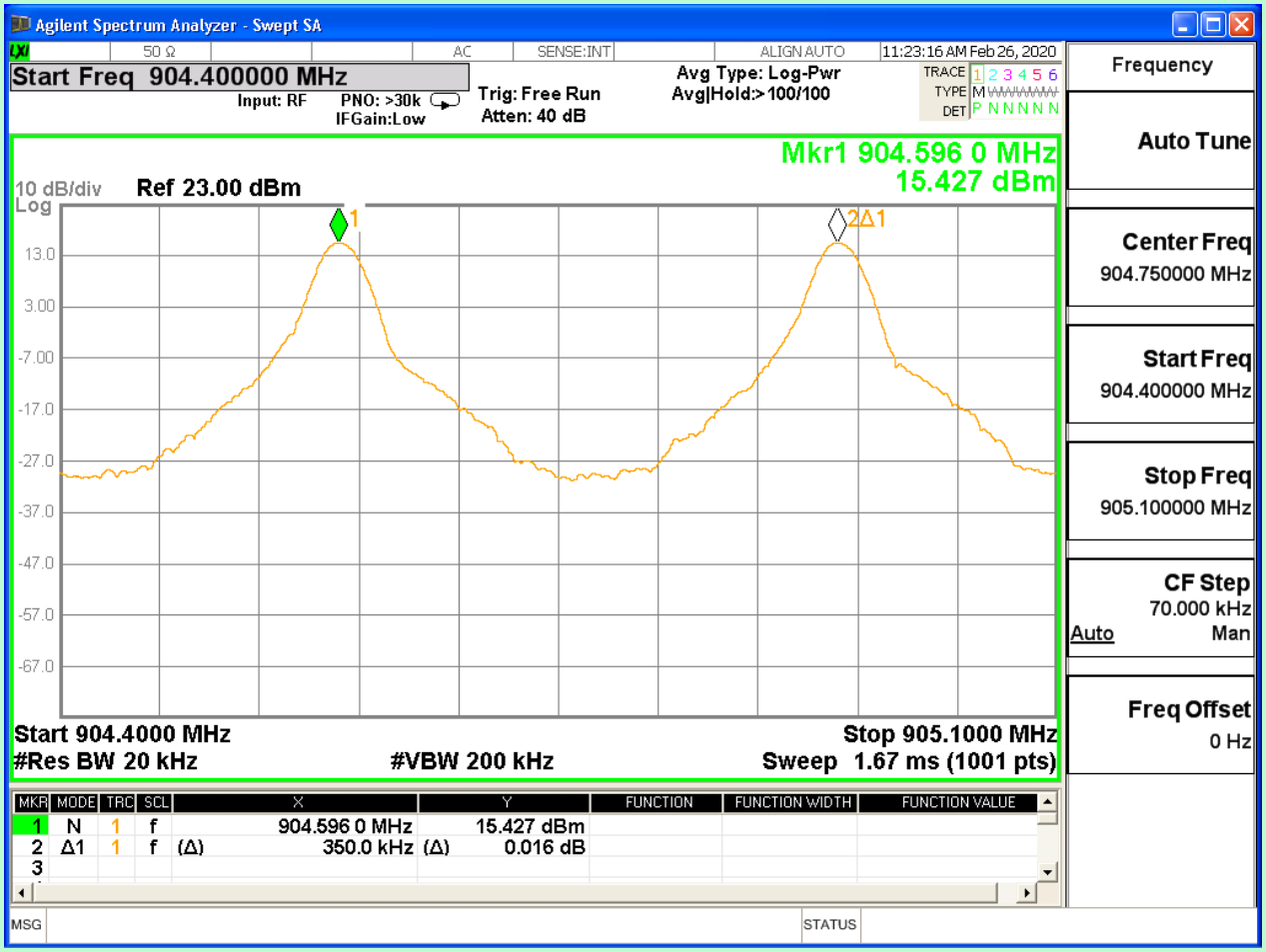
Channel 1 and 2 (Walkie Talkie Mode)



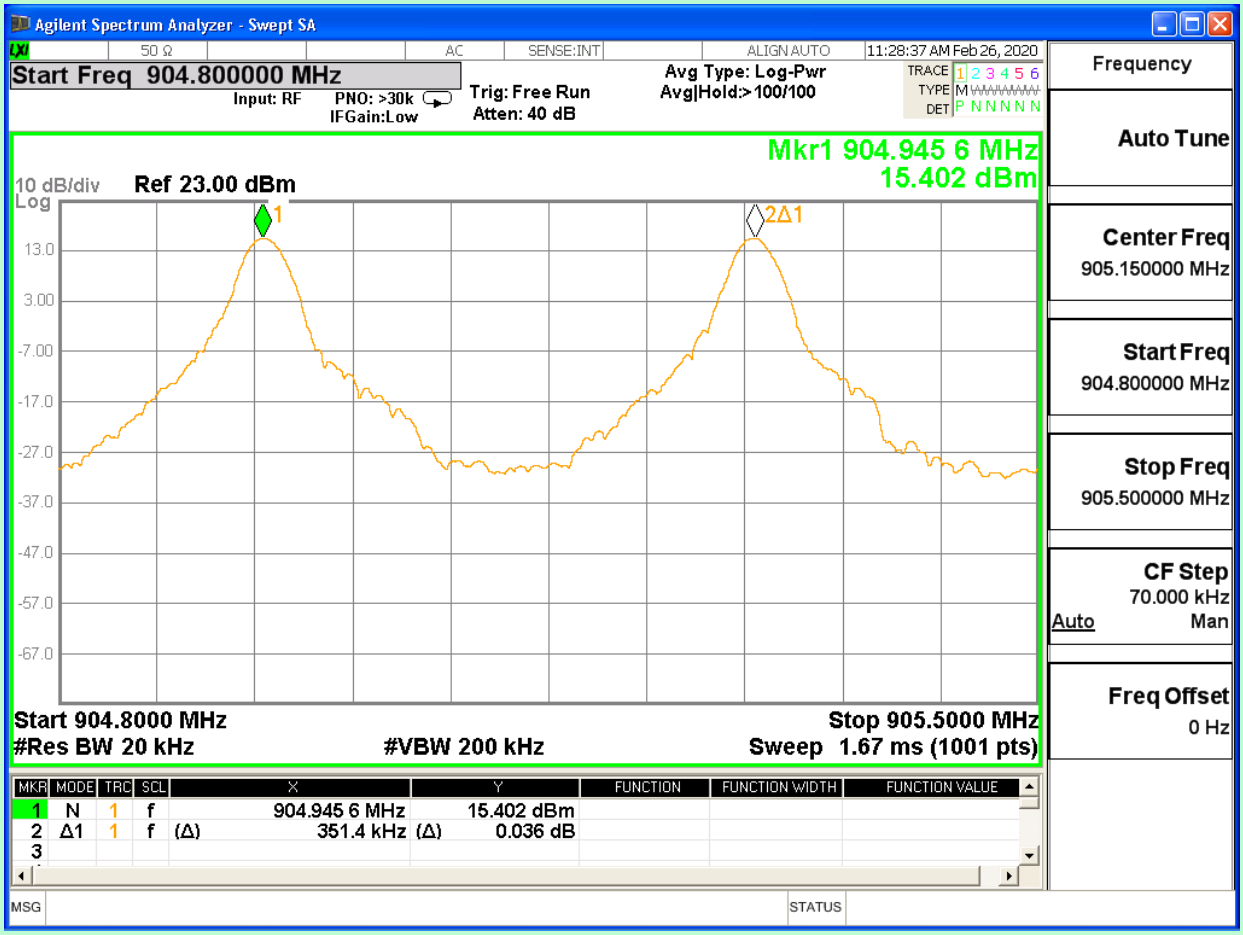
Channel 2 and 3 (Walkie Talkie Mode)



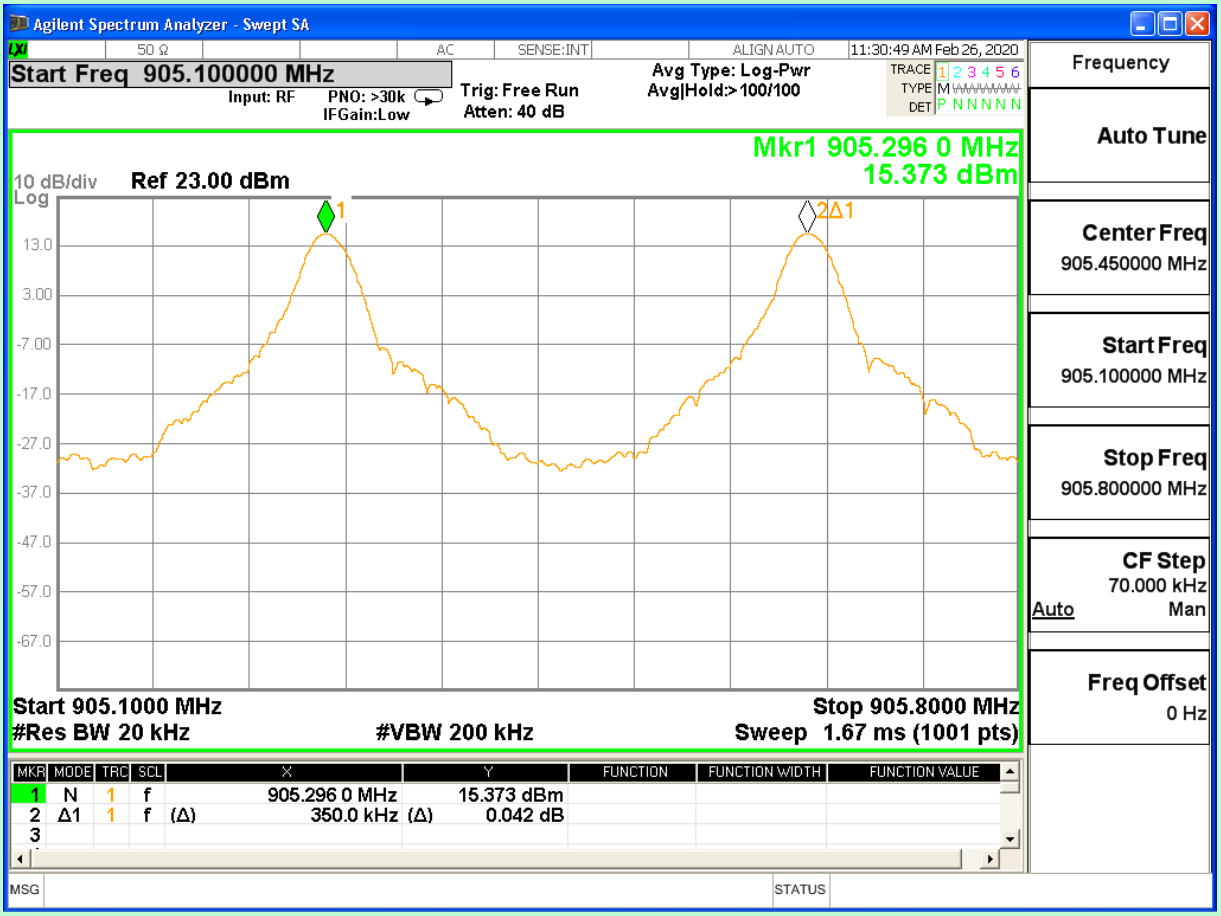
Channel 3 and 4 (Walkie Talkie Mode)



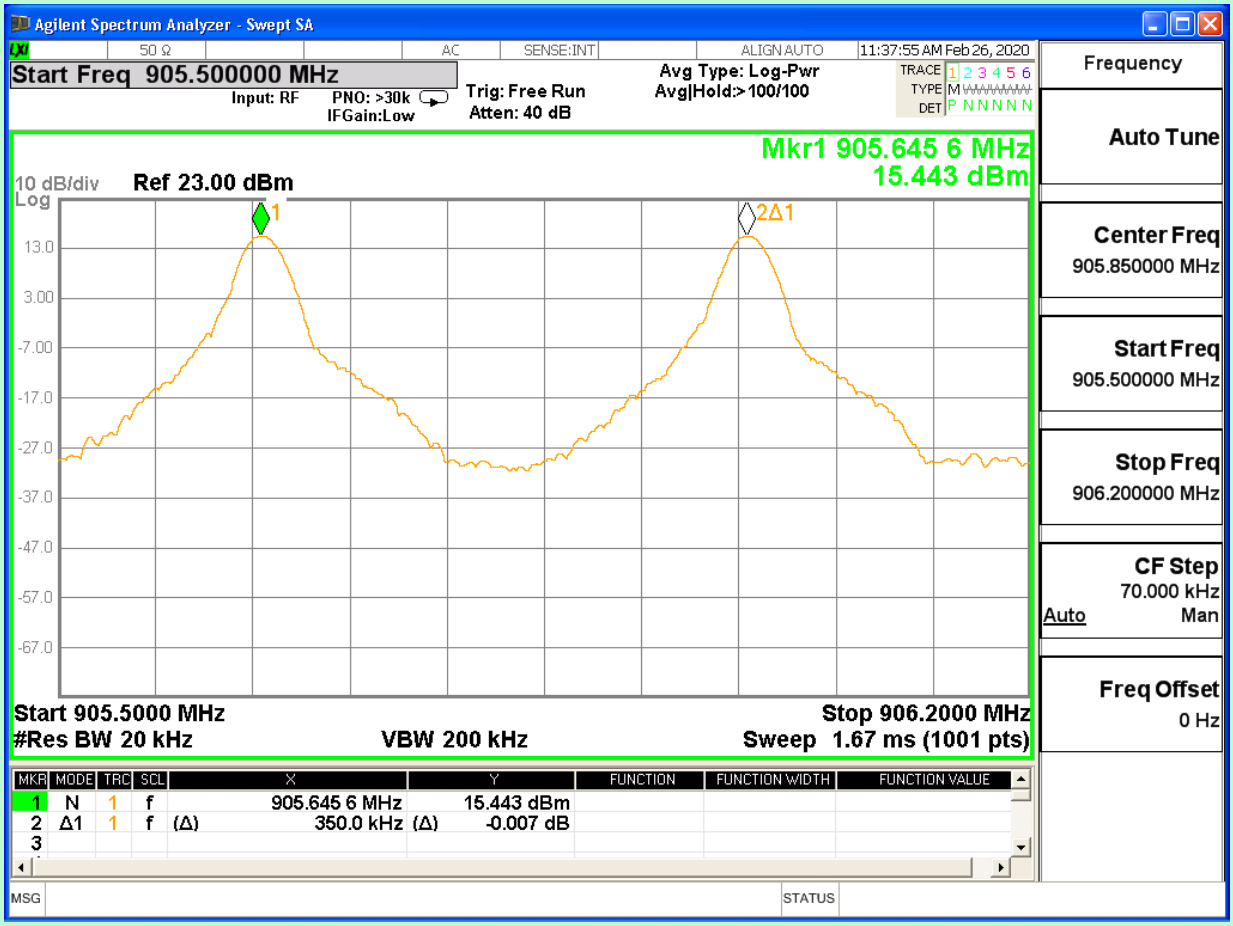
Channel 4 and 5 (Walkie Talkie Mode)



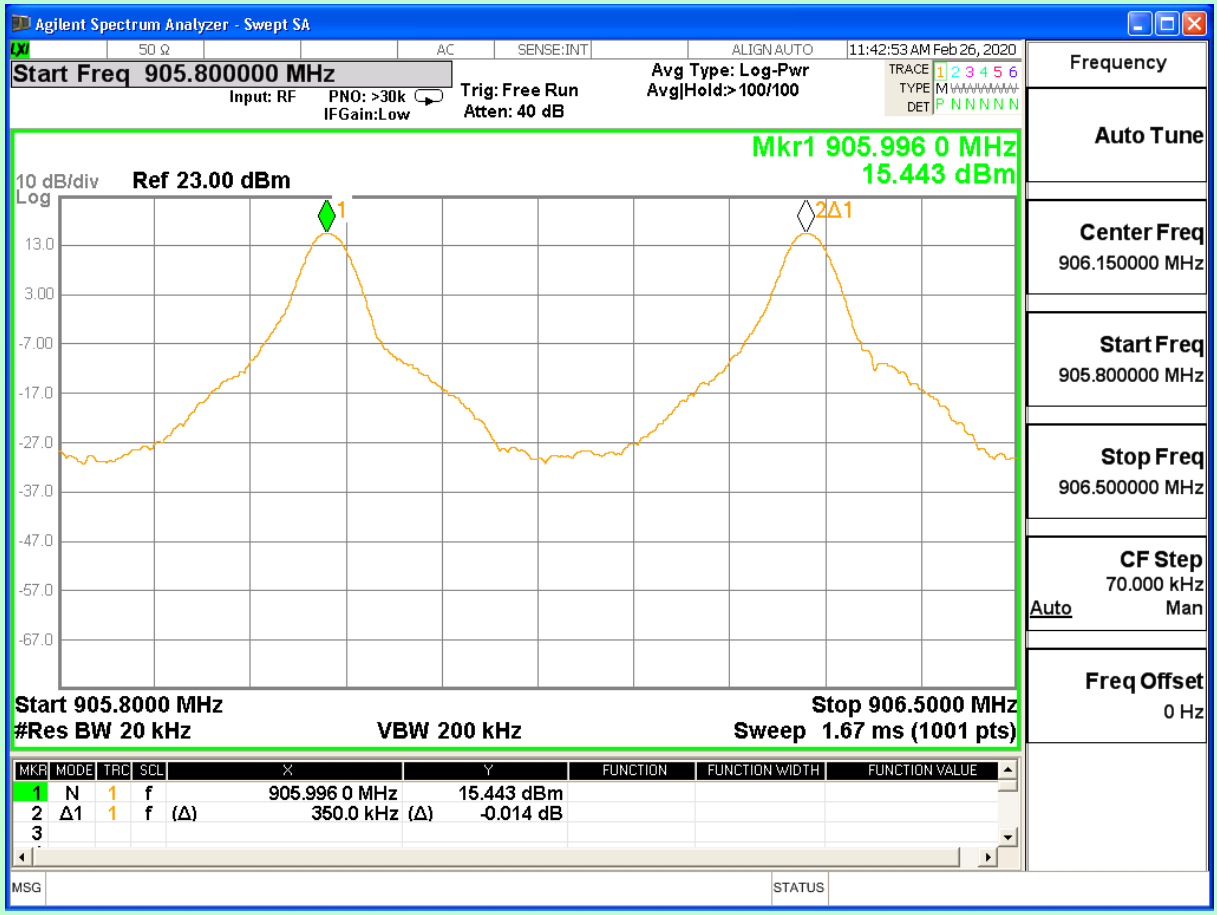
Channel 5 and 6 (Walkie Talkie Mode)



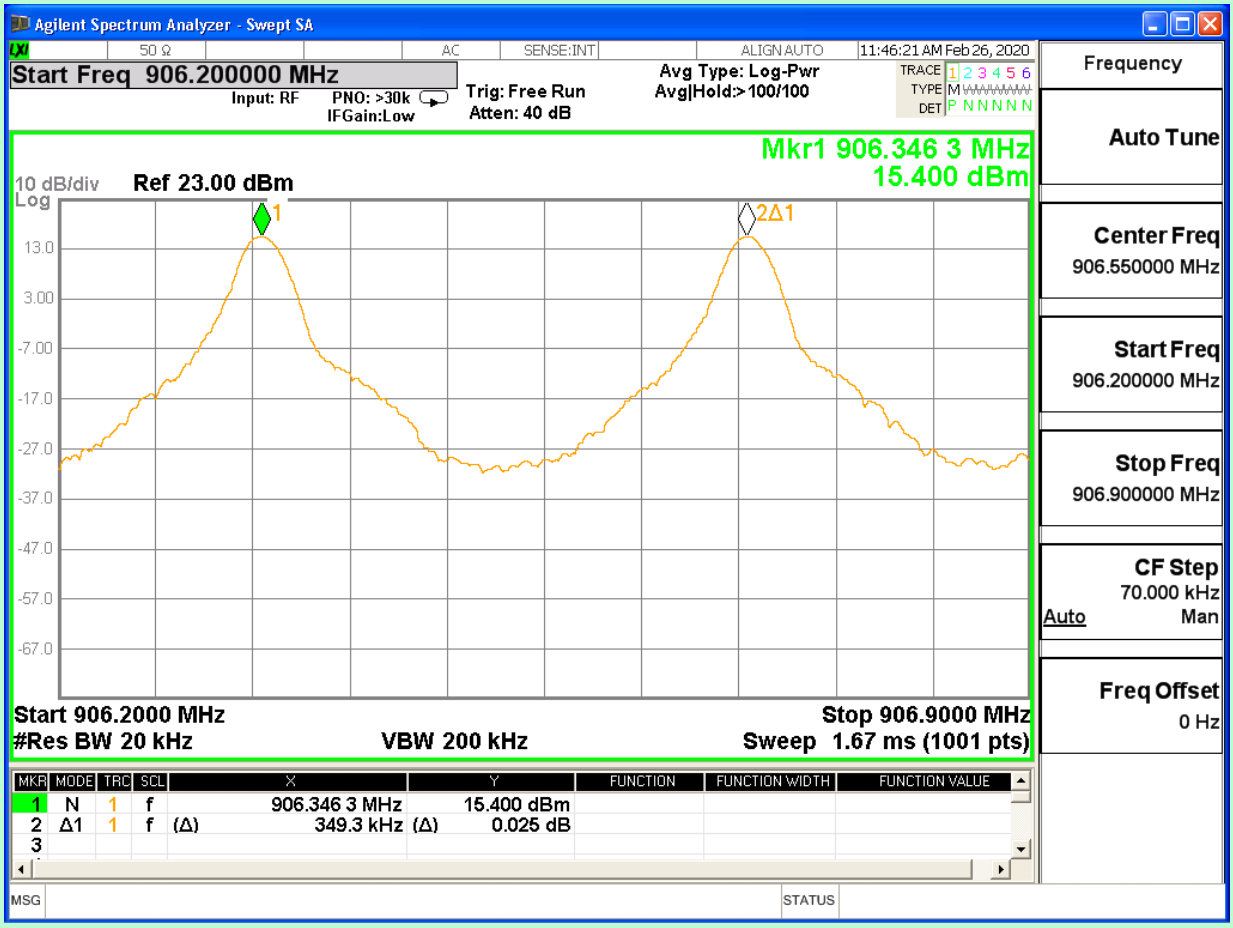
Channel 6 and 7 (Walkie Talkie Mode)



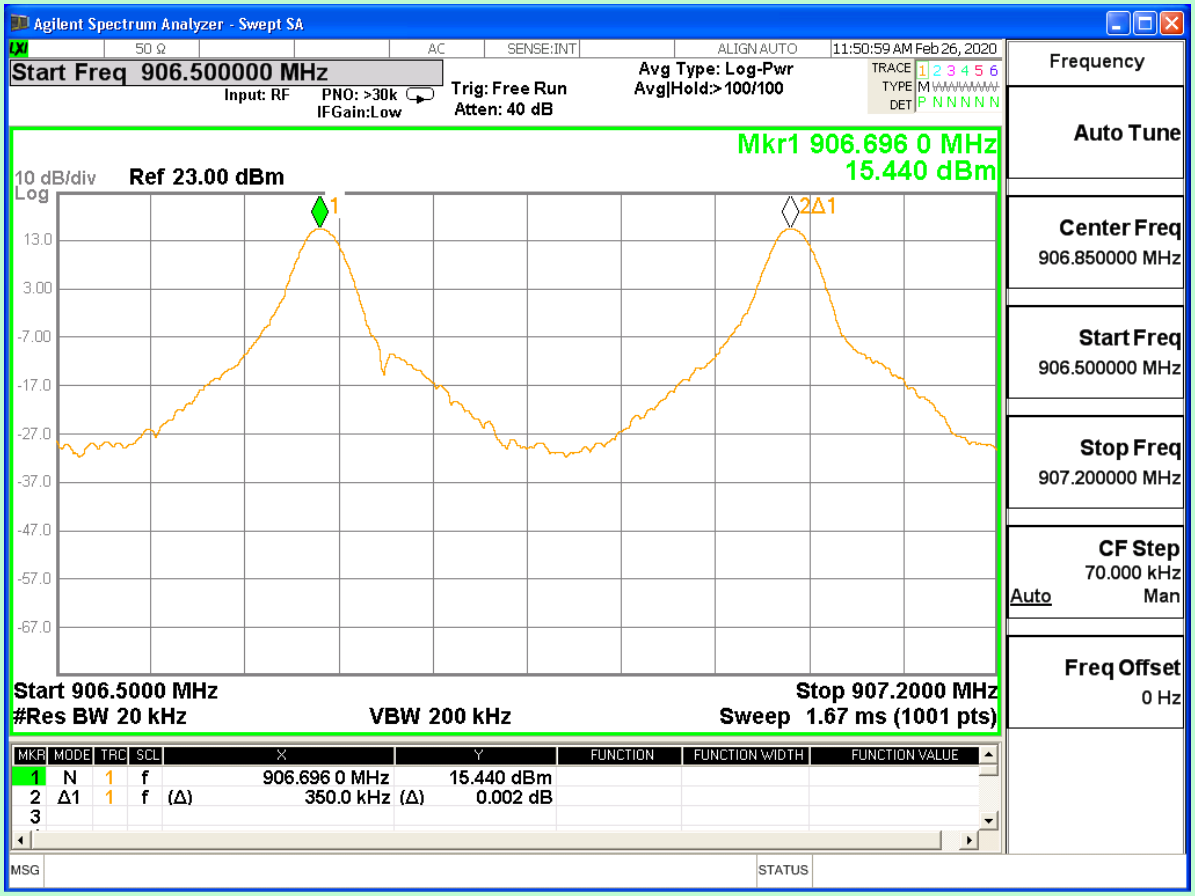
Channel 7 and 8 (Walkie Talkie Mode)



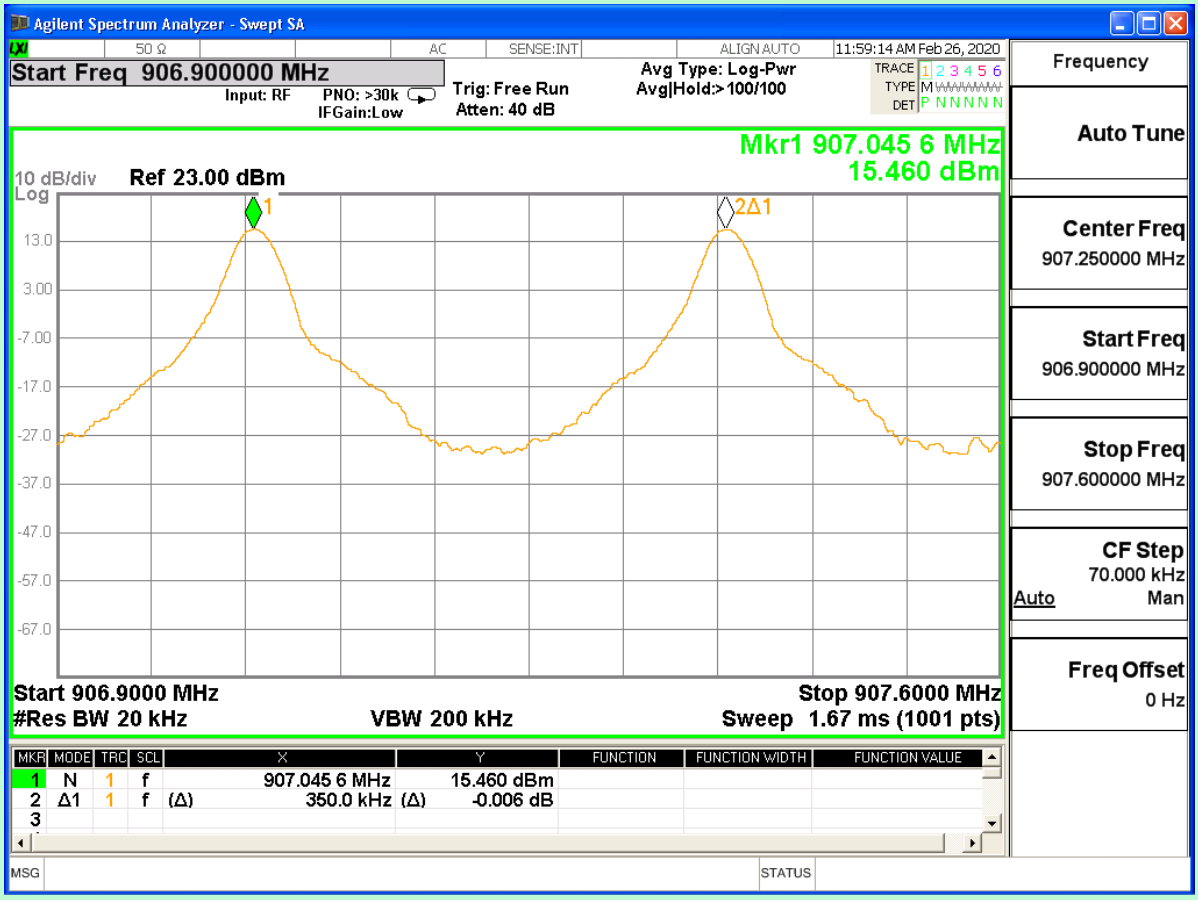
Channel 8 and 9 (Walkie Talkie Mode)



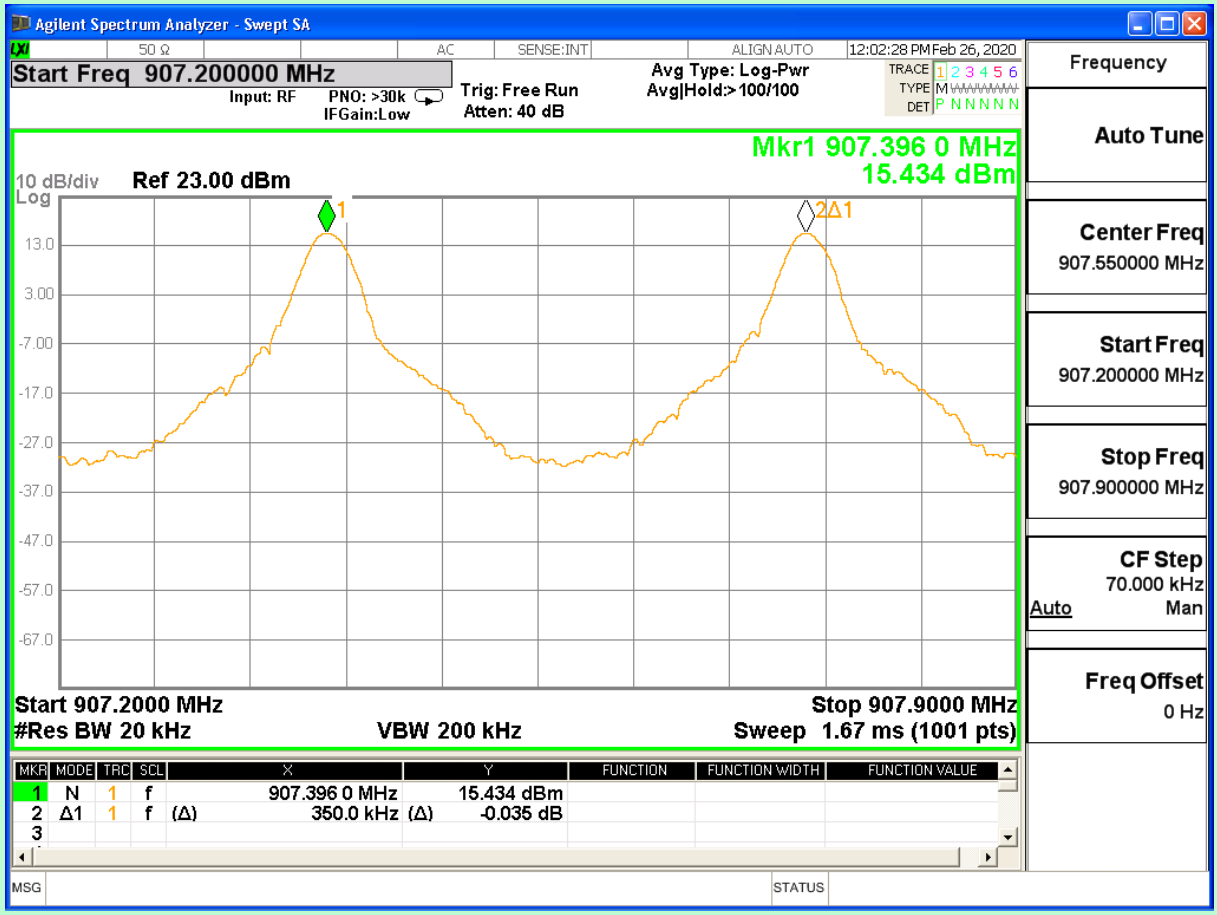
Channel 9 and 10 (Walkie Talkie Mode)



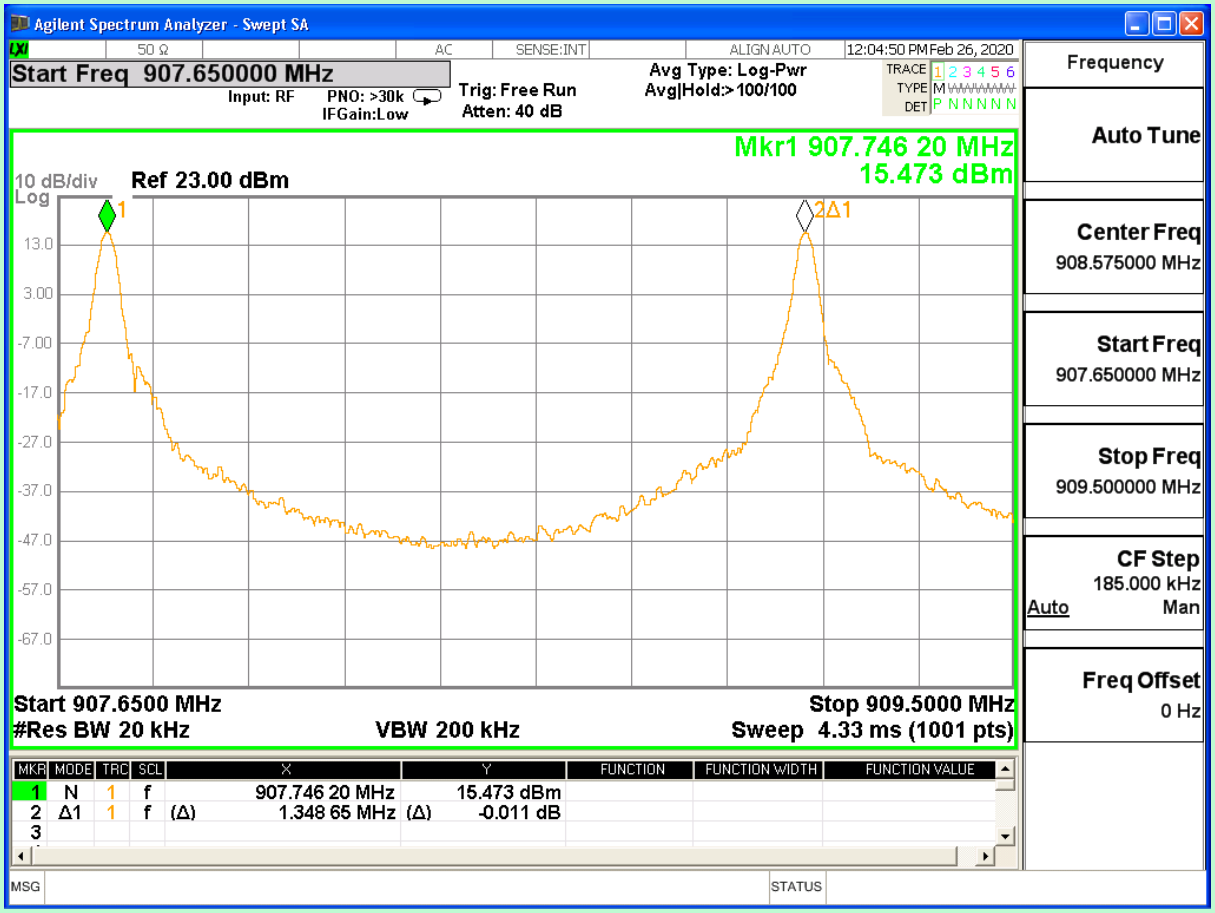
Channel 10 and 11 (Walkie Talkie Mode)



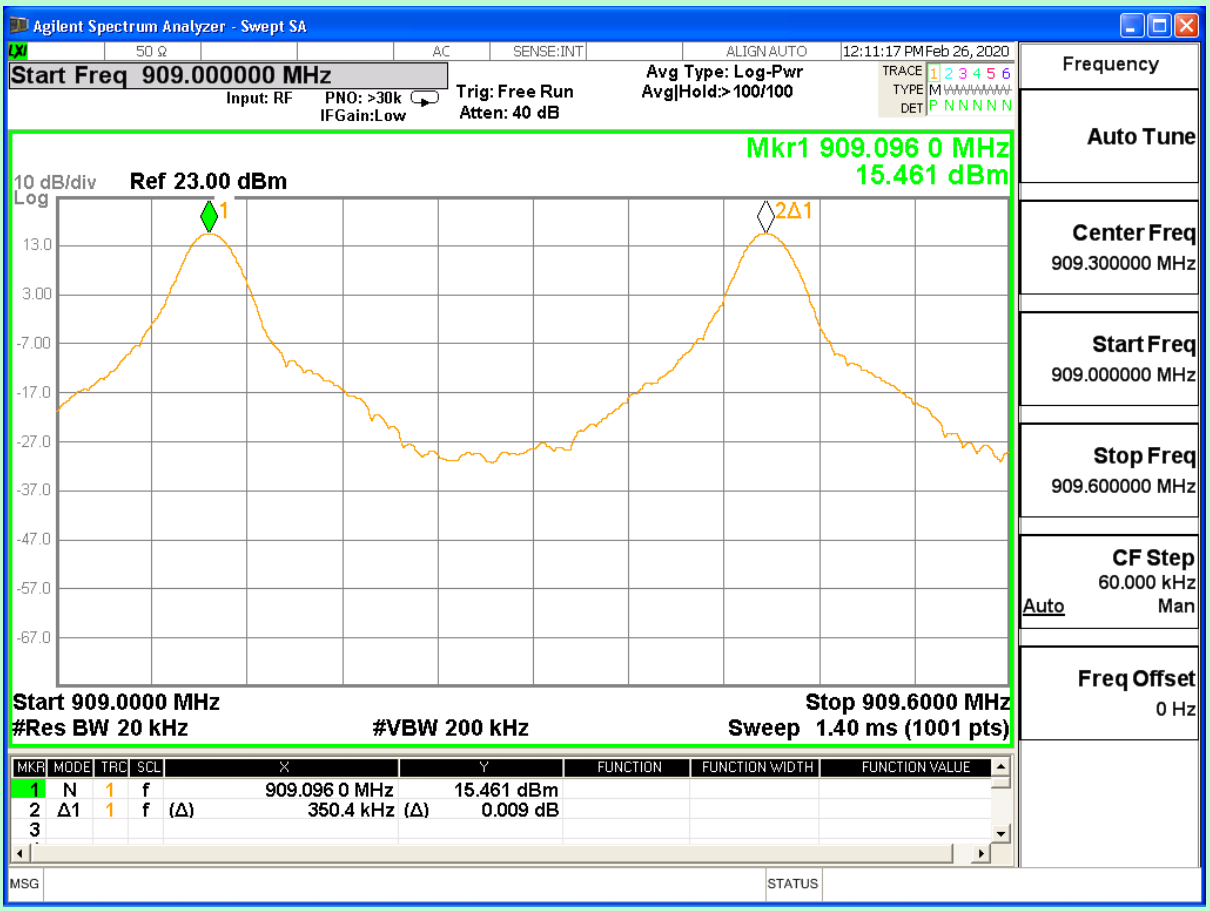
Channel 11 and 12 (Walkie Talkie Mode)



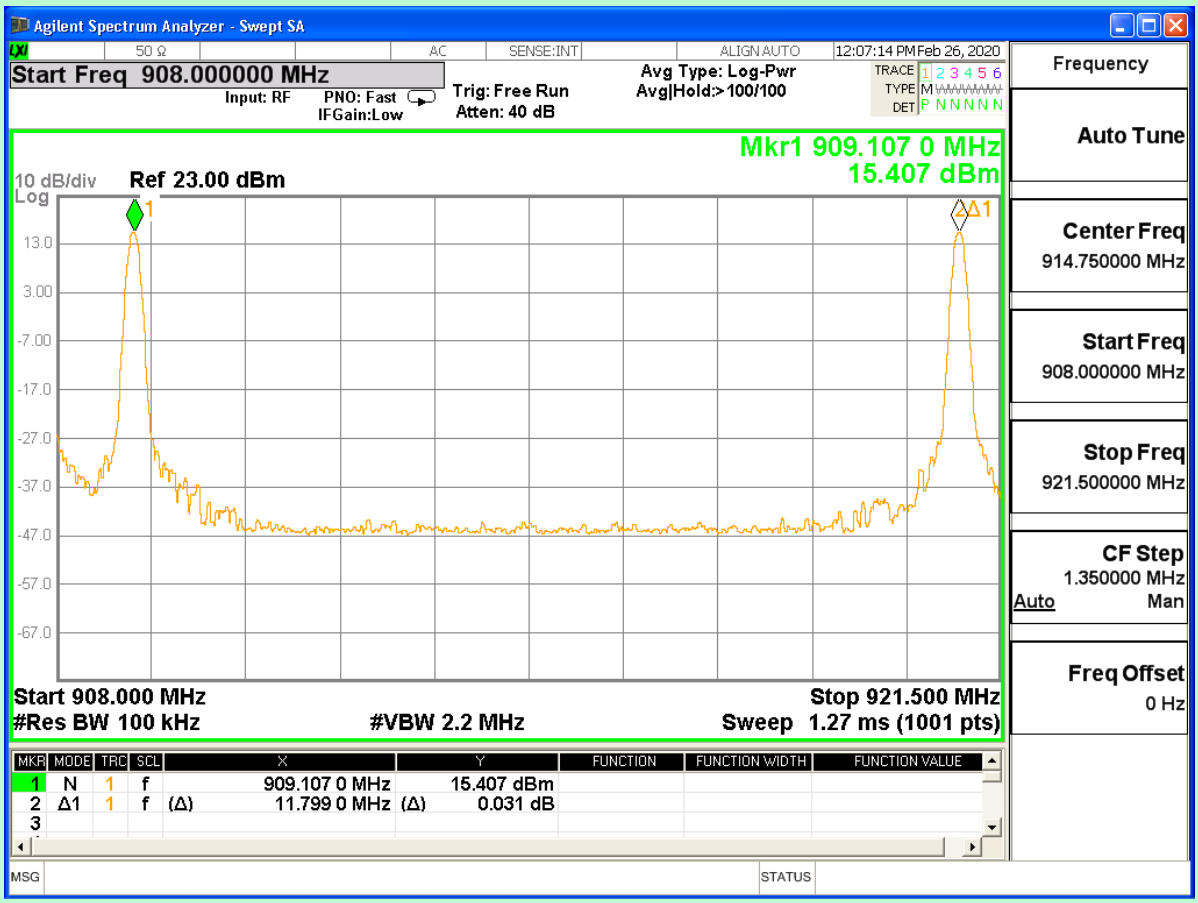
Channel 12 and 13 (Walkie Talkie Mode)



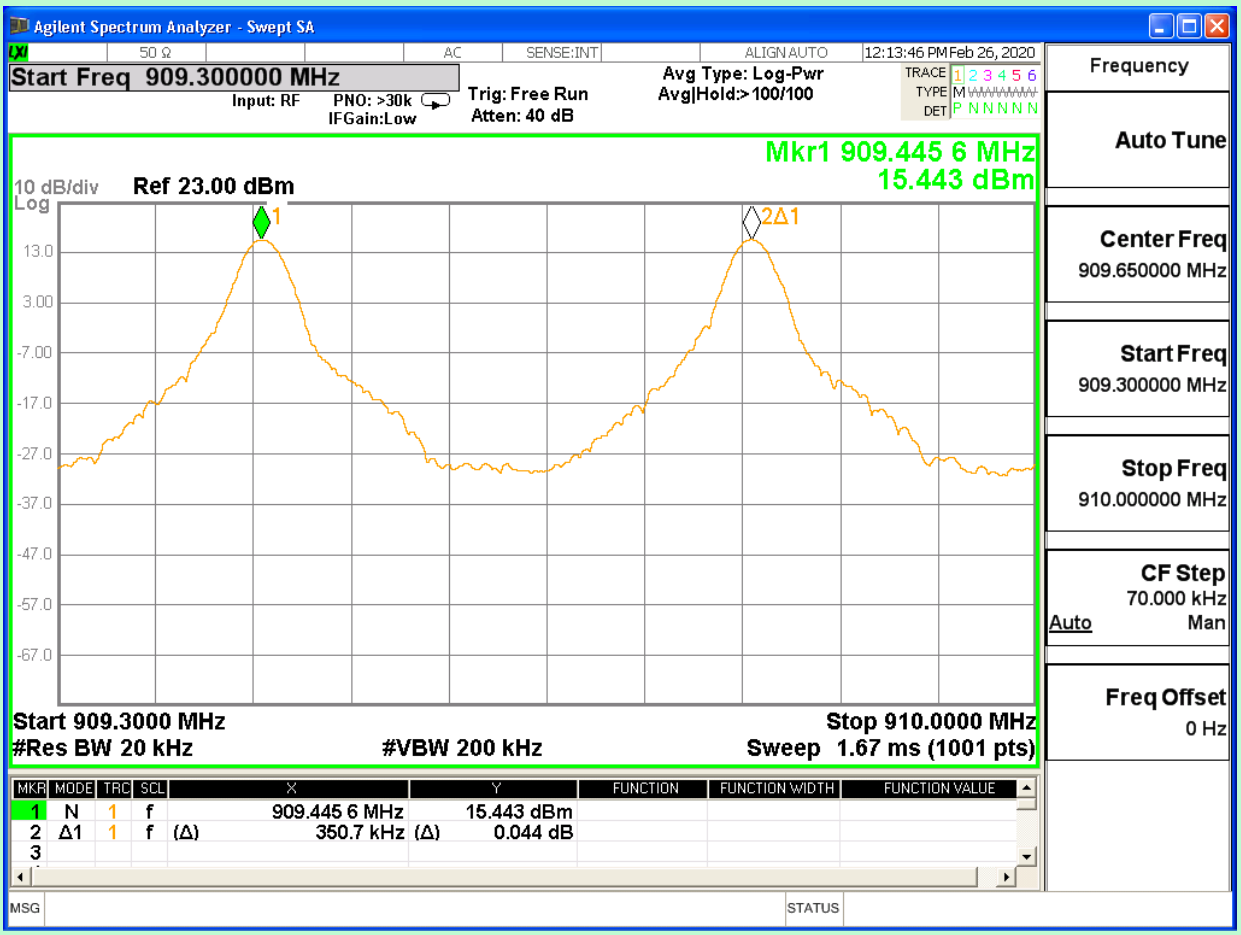
Channel 13 and 14 (Walkie Talkie Mode)



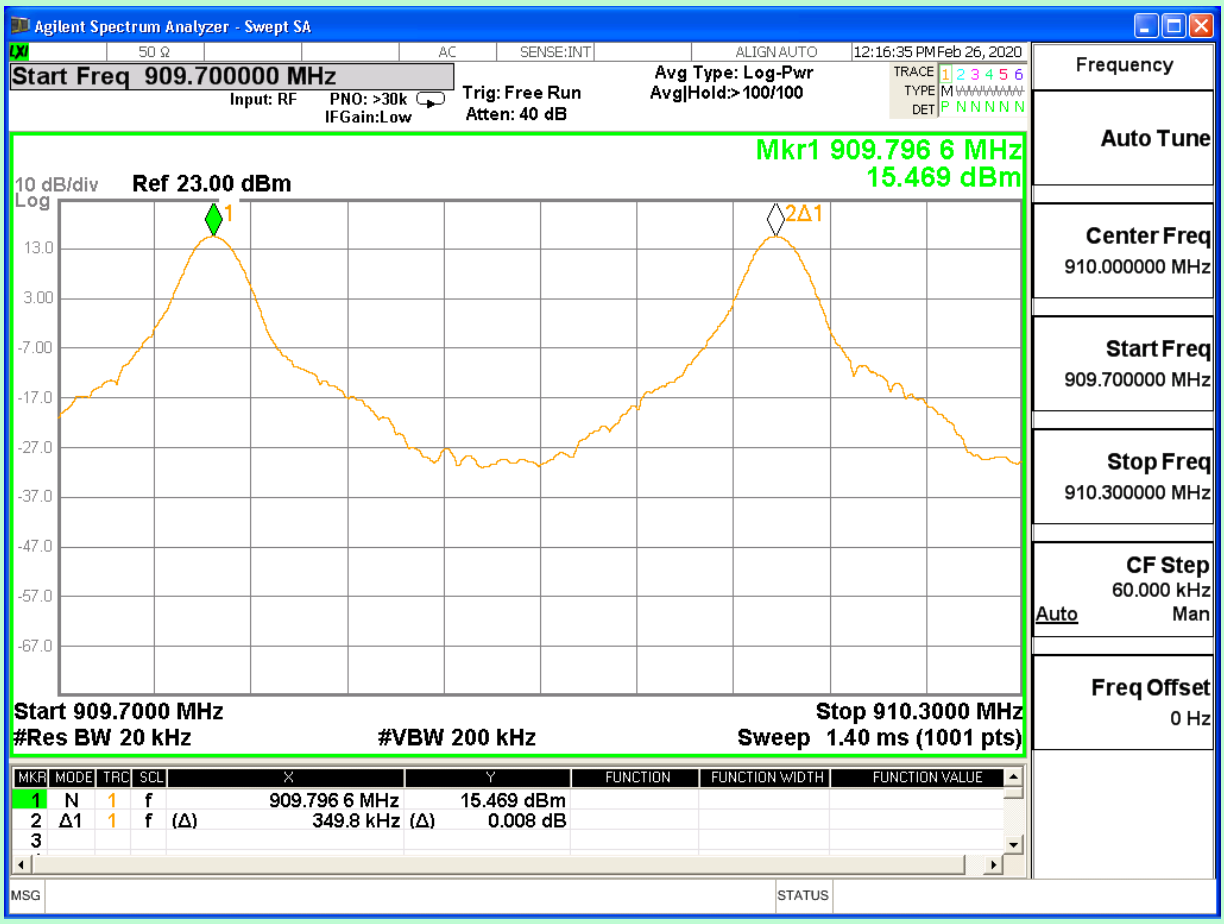
Channel 14 and 15 (Normal Mode)



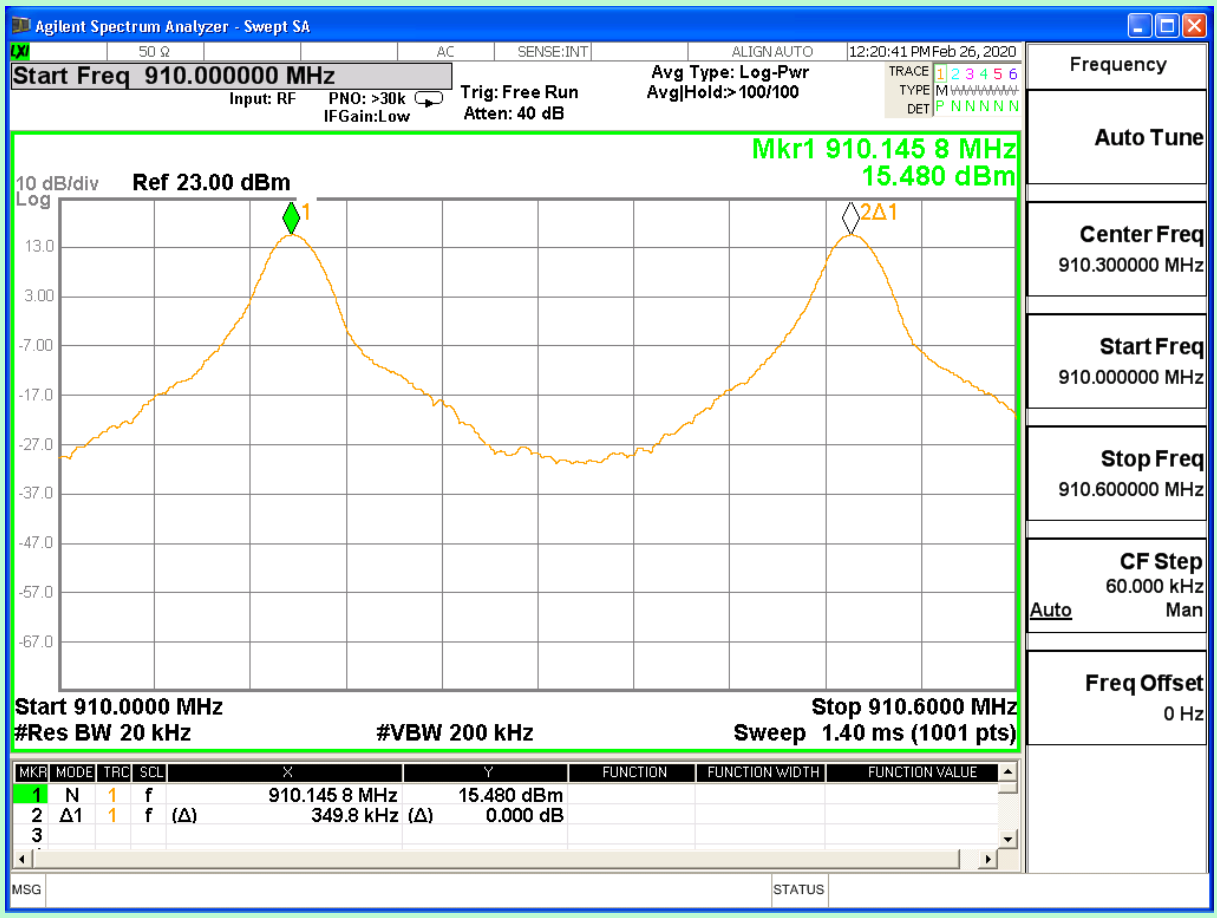
Channel 14 and 42 (Walkie Talkie Mode)



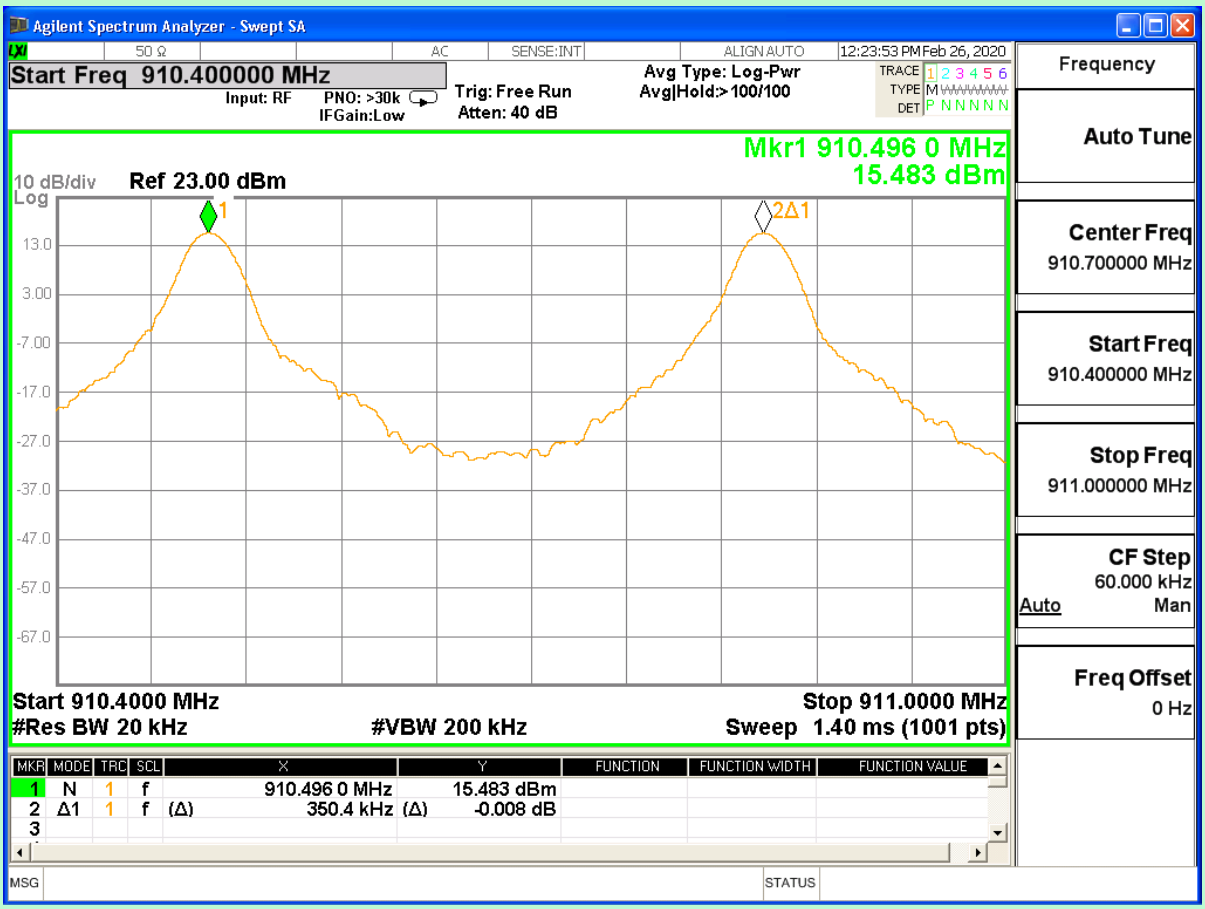
Channel 15 and 16 (Normal Mode)



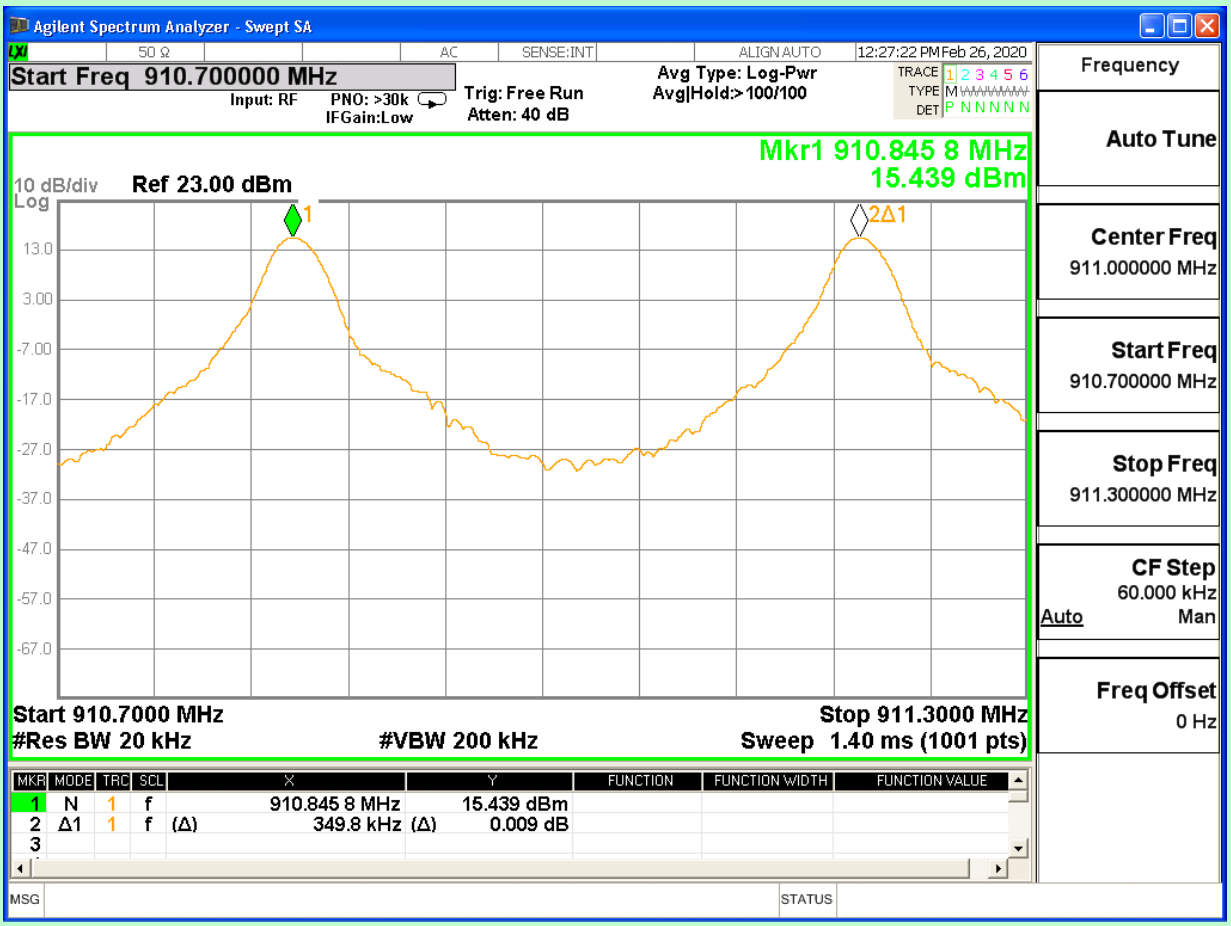
Channel 16 and 17 (Normal Mode)



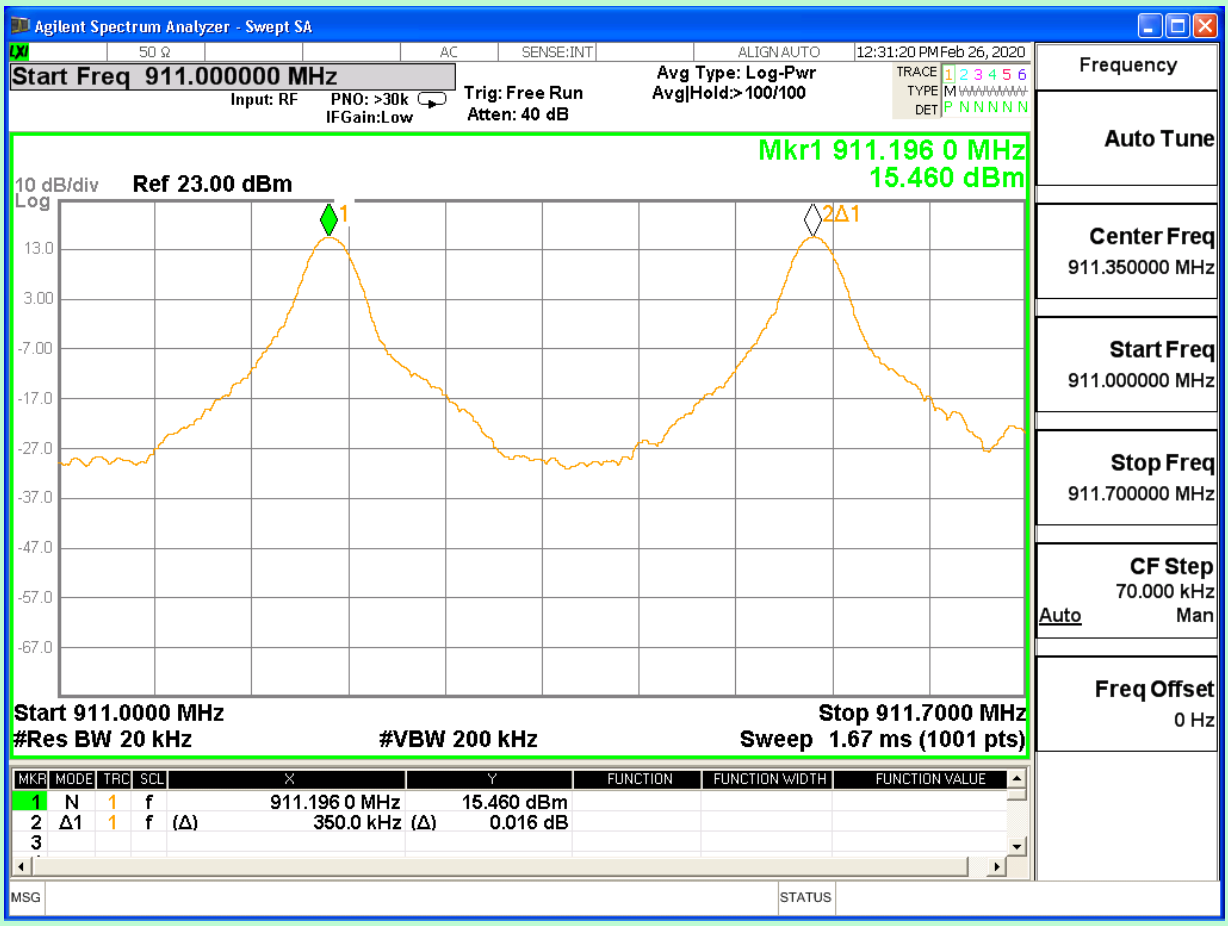
Channel 17 and 18 (Normal Mode)



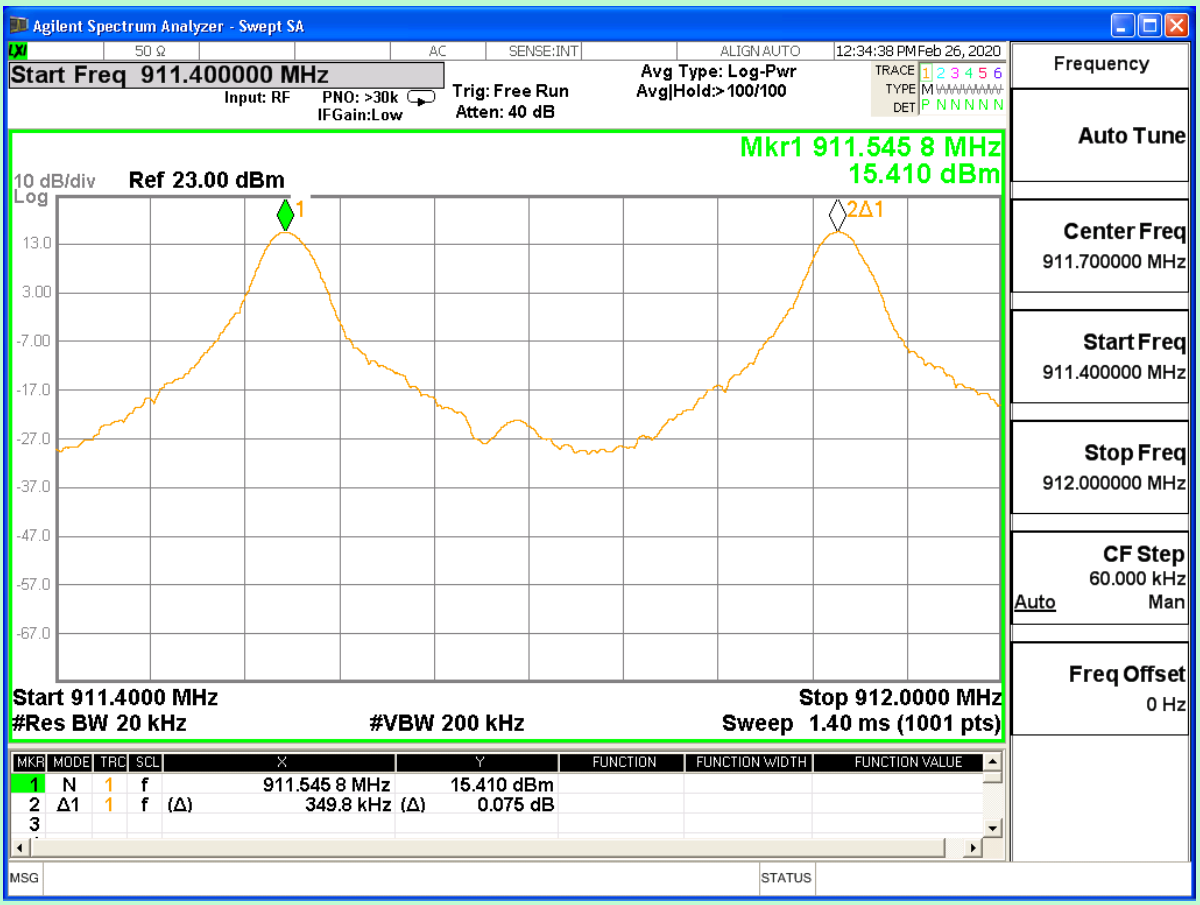
Channel 18 and 19 (Normal Mode)



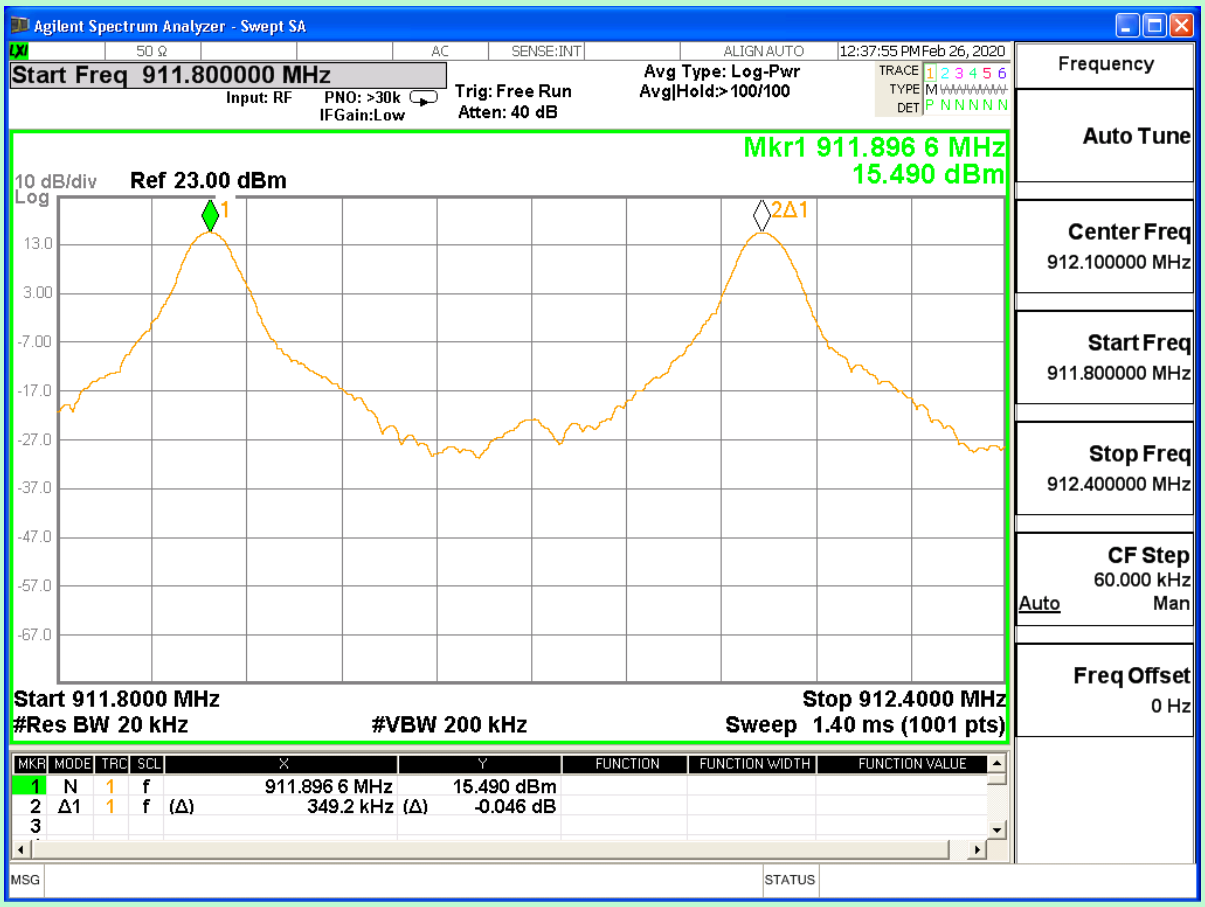
Channel 19 and 20 (Normal Mode)



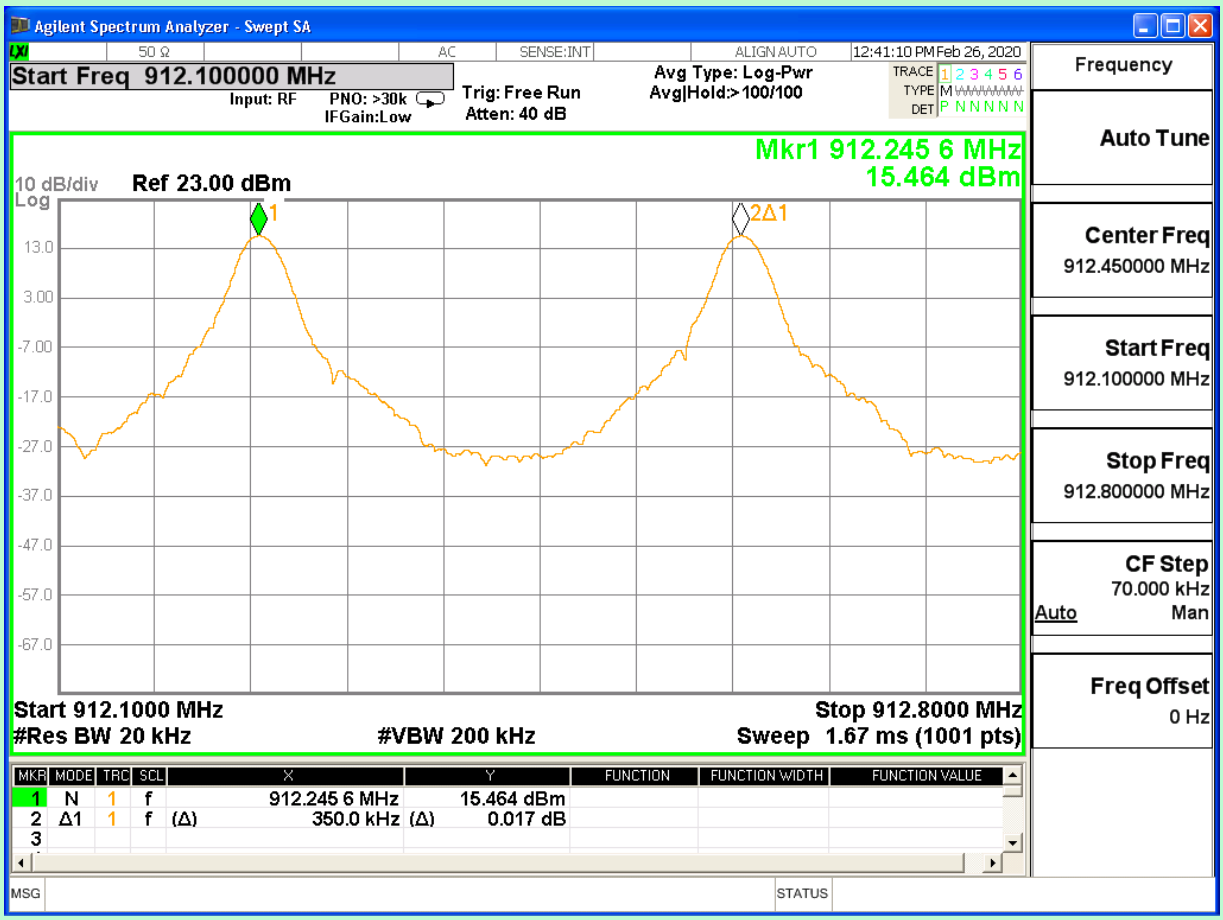
Channel 20 and 21 (Normal Mode)



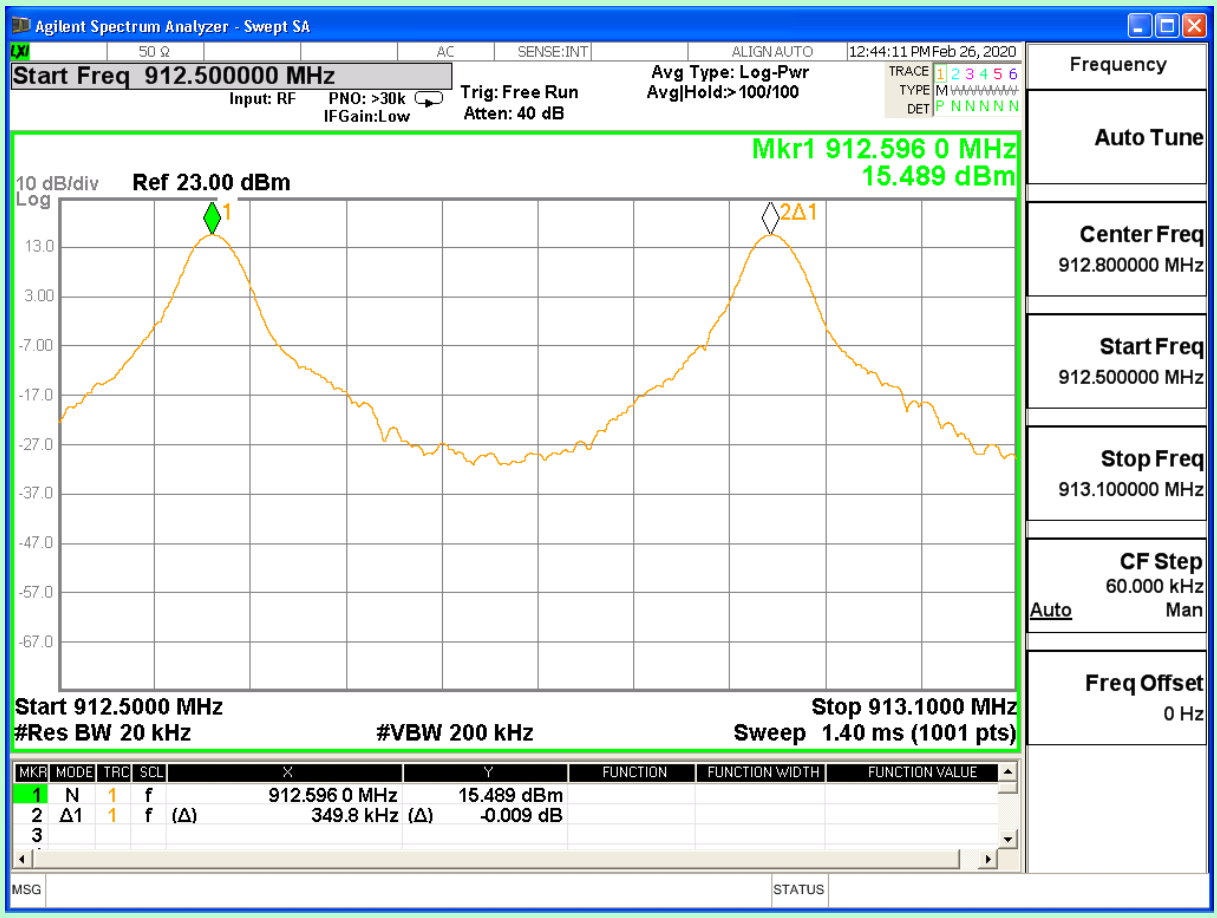
Channel 21 and 22 (Normal Mode)



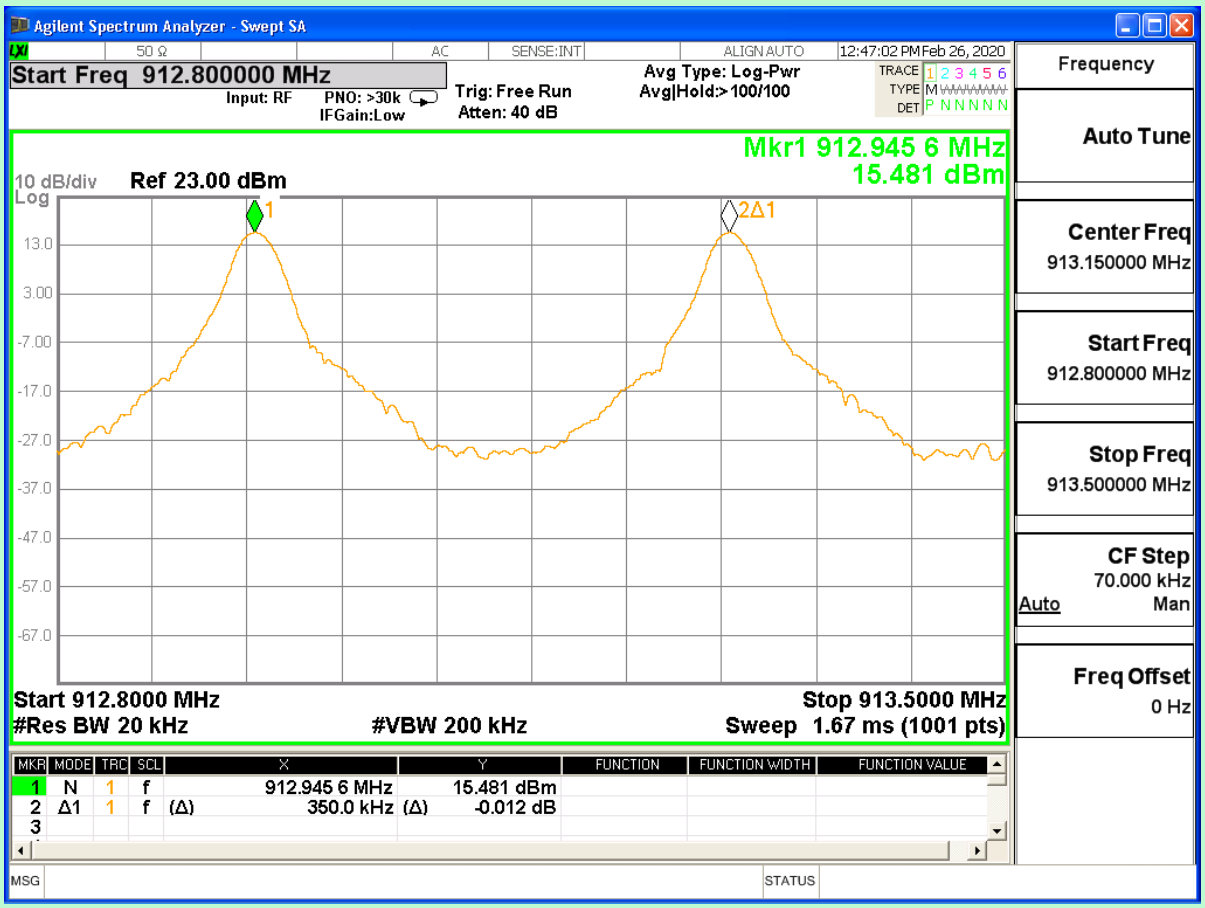
Channel 22 and 23 (Normal Mode)



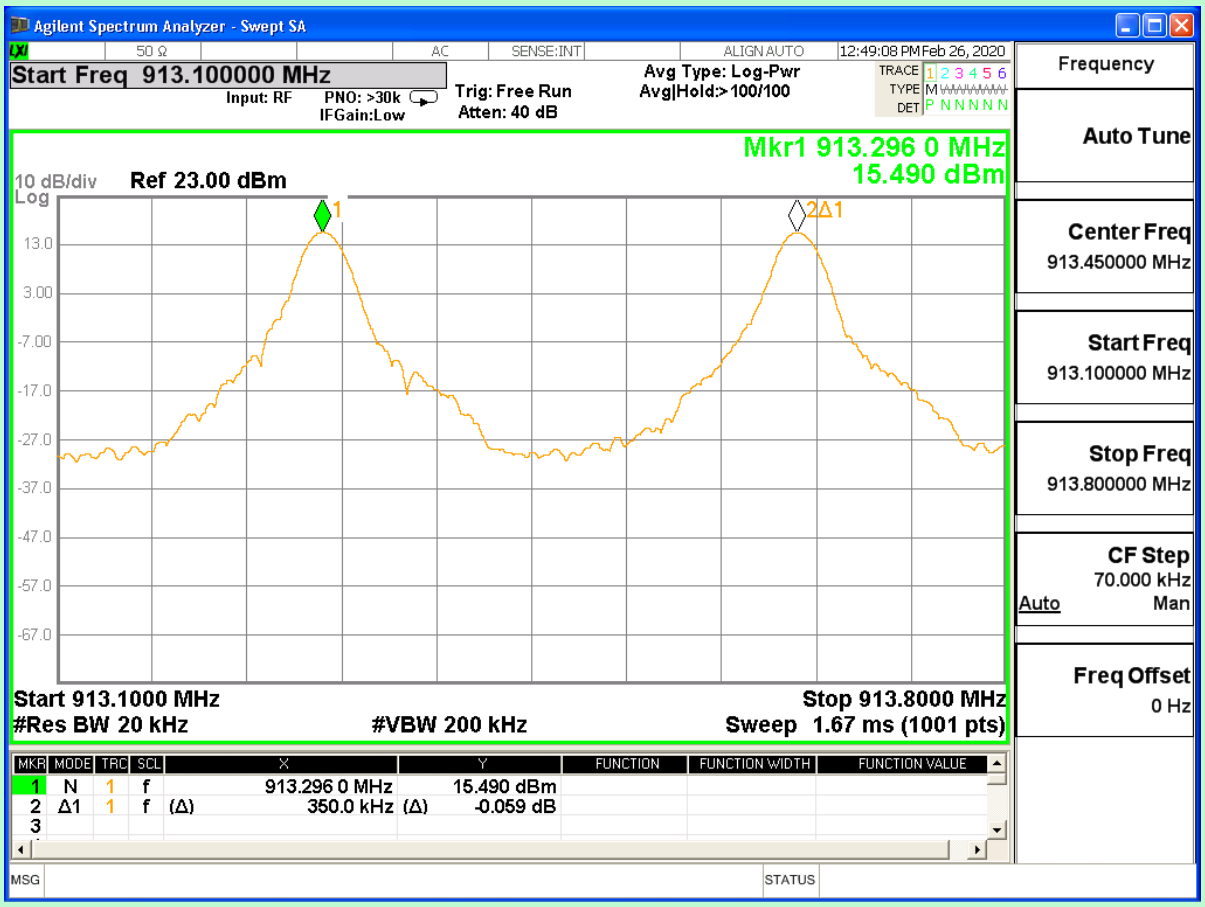
Channel 23 and 24 (Normal Mode)



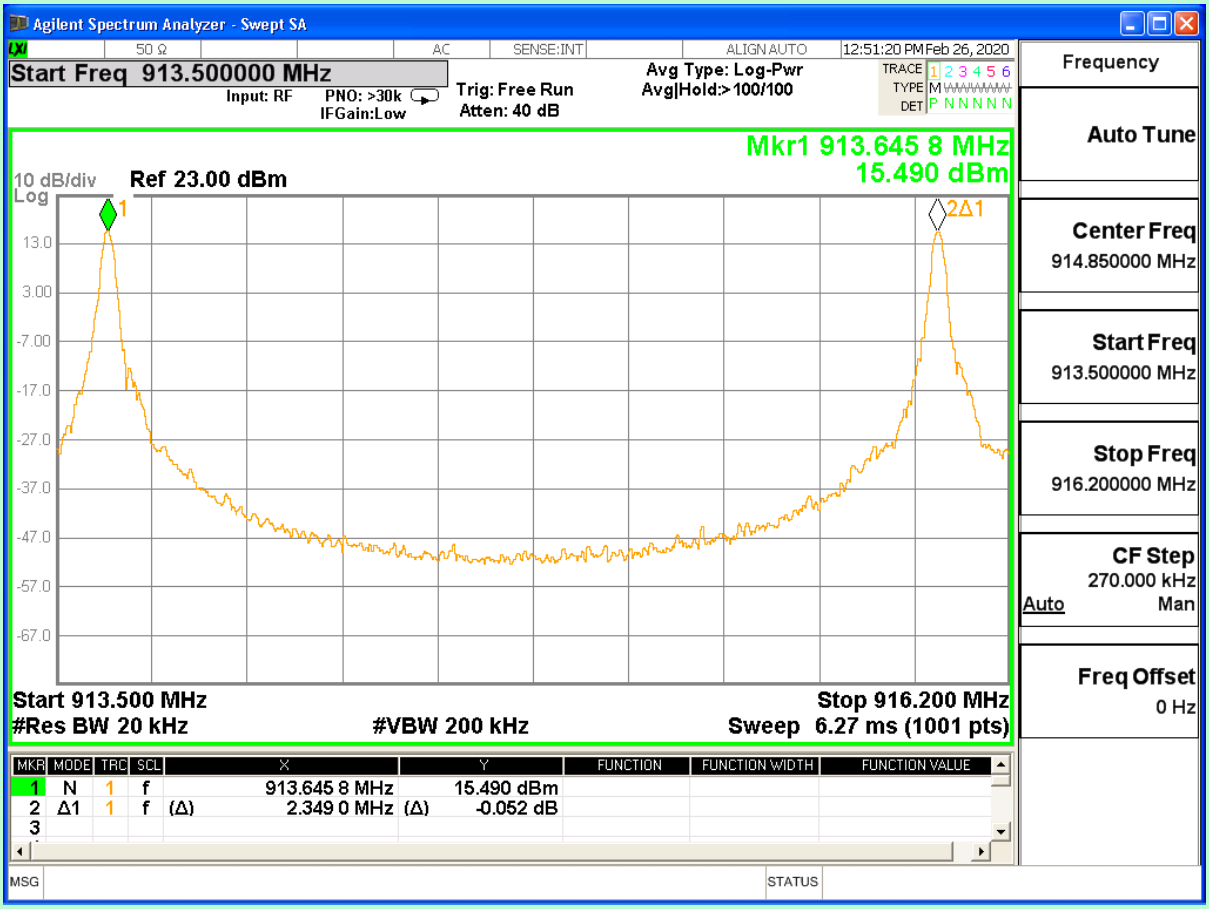
Channel 24 and 25 (Normal Mode)



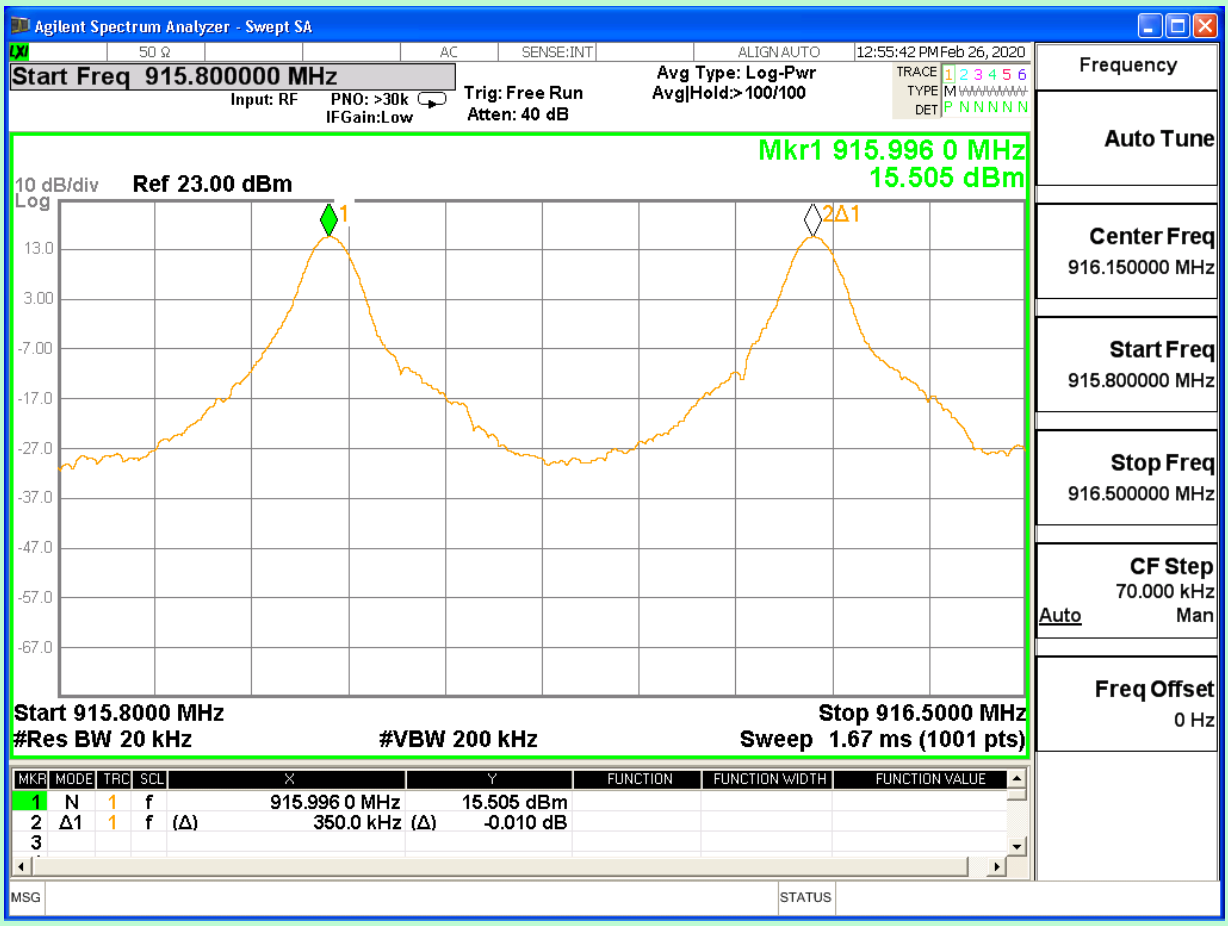
Channel 25 and 26 (Normal Mode)



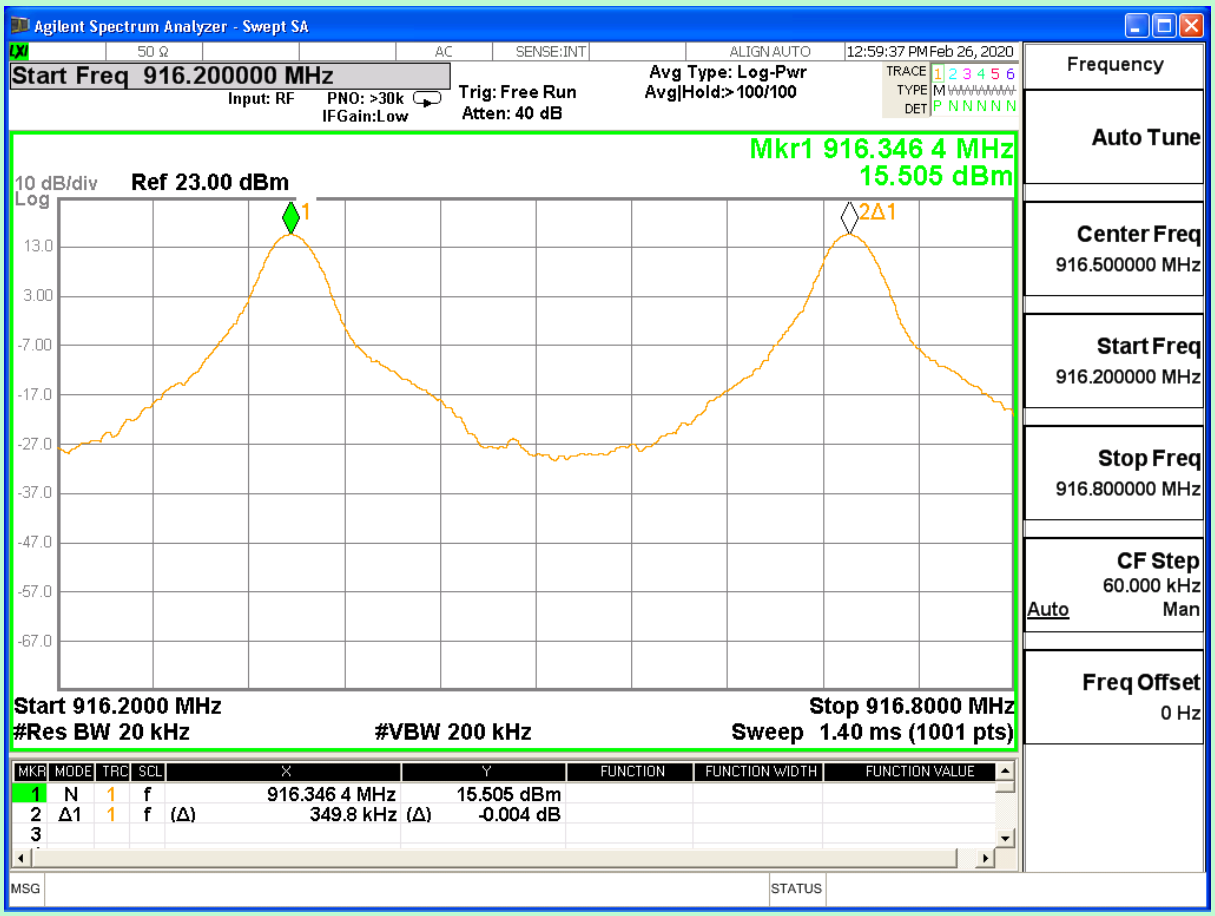
Channel 26 and 27 (Normal Mode)



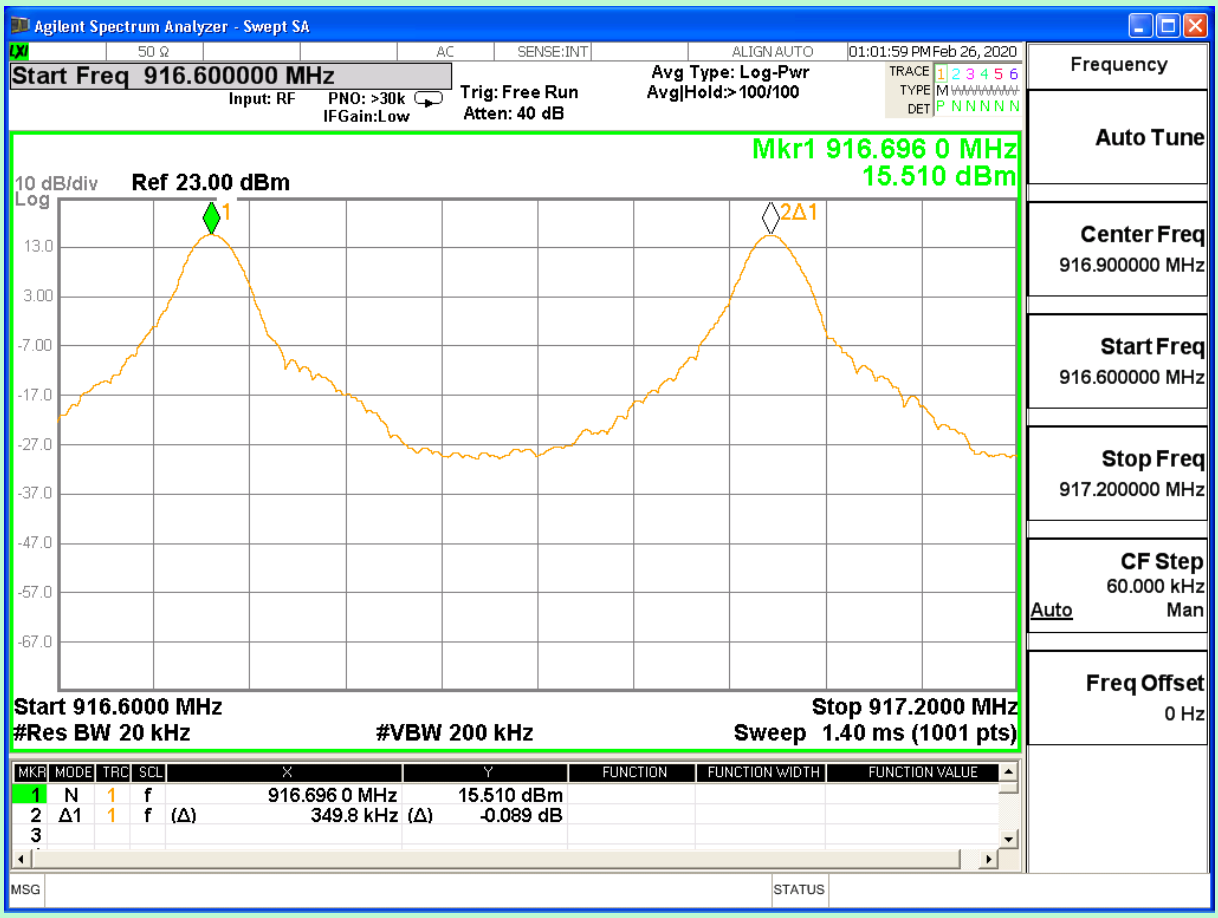
Channel 27 and 28 (Normal Mode)



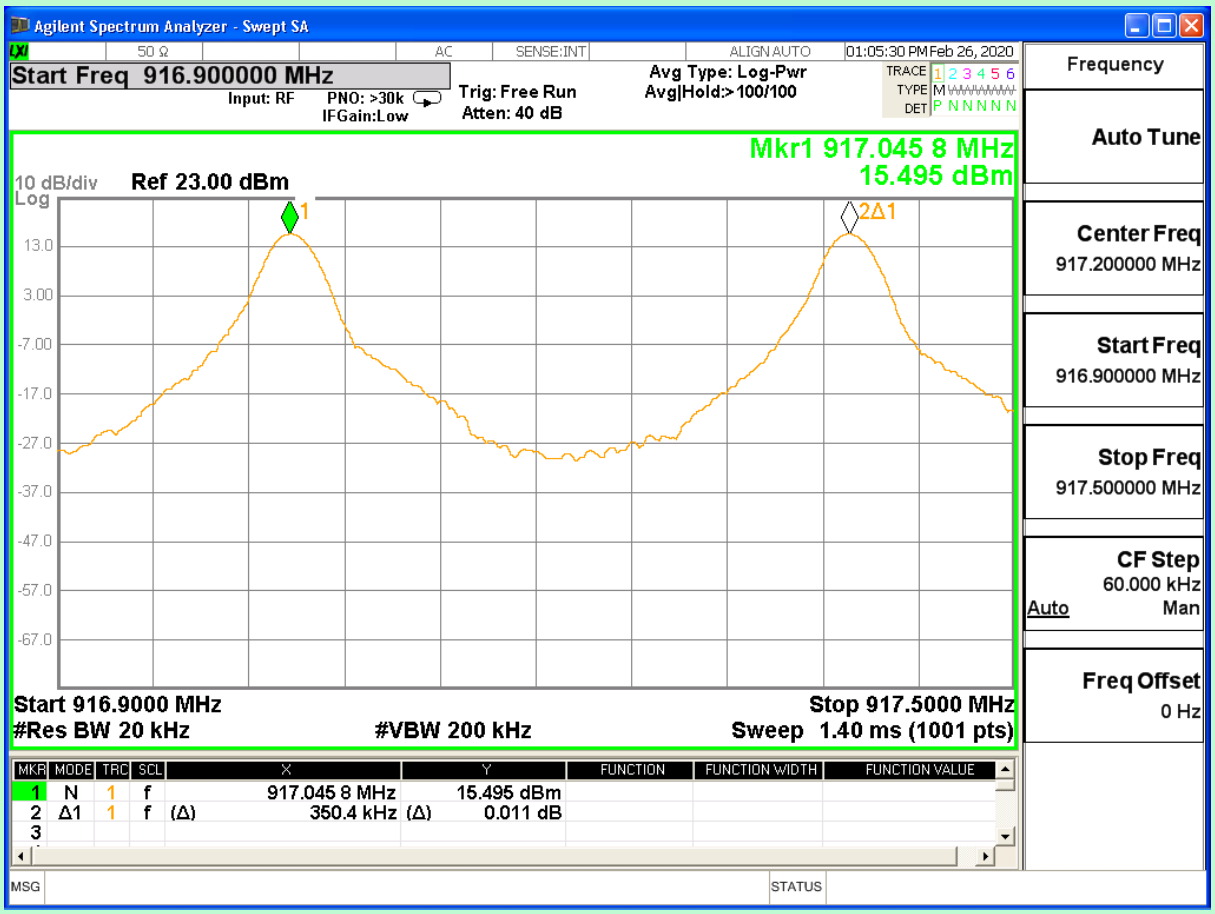
Channel 28 and 29 (Normal Mode)



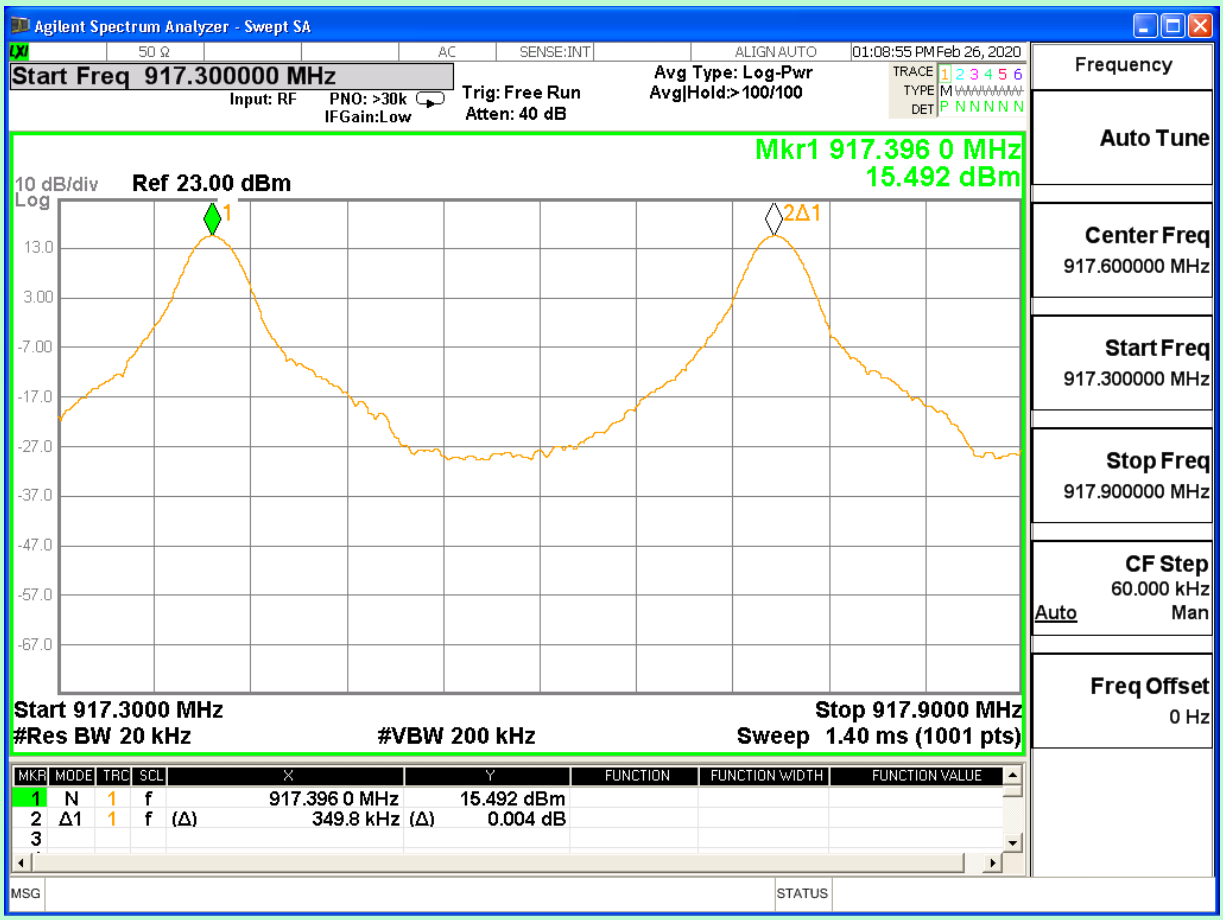
Channel 29 and 30 (Normal Mode)



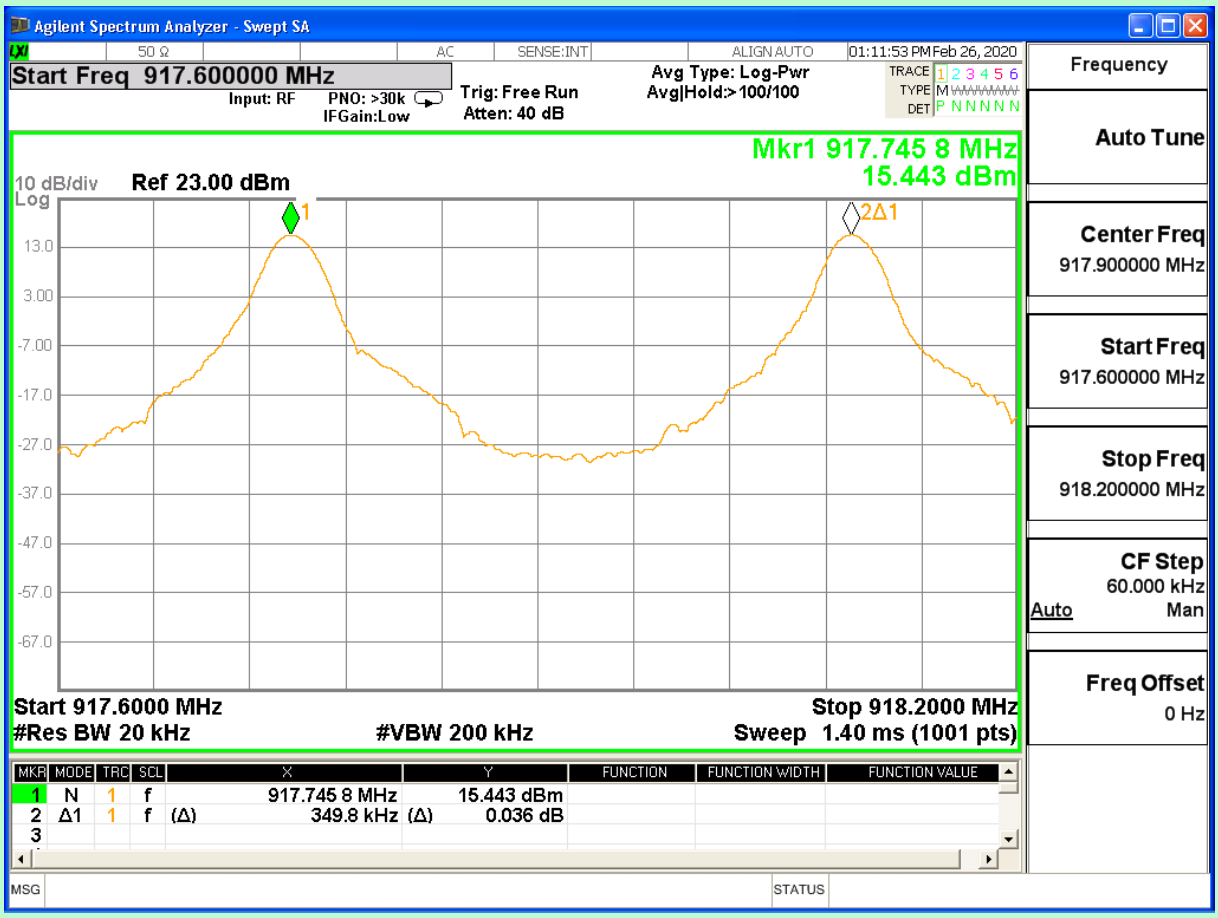
Channel 30 and 31 (Normal Mode)



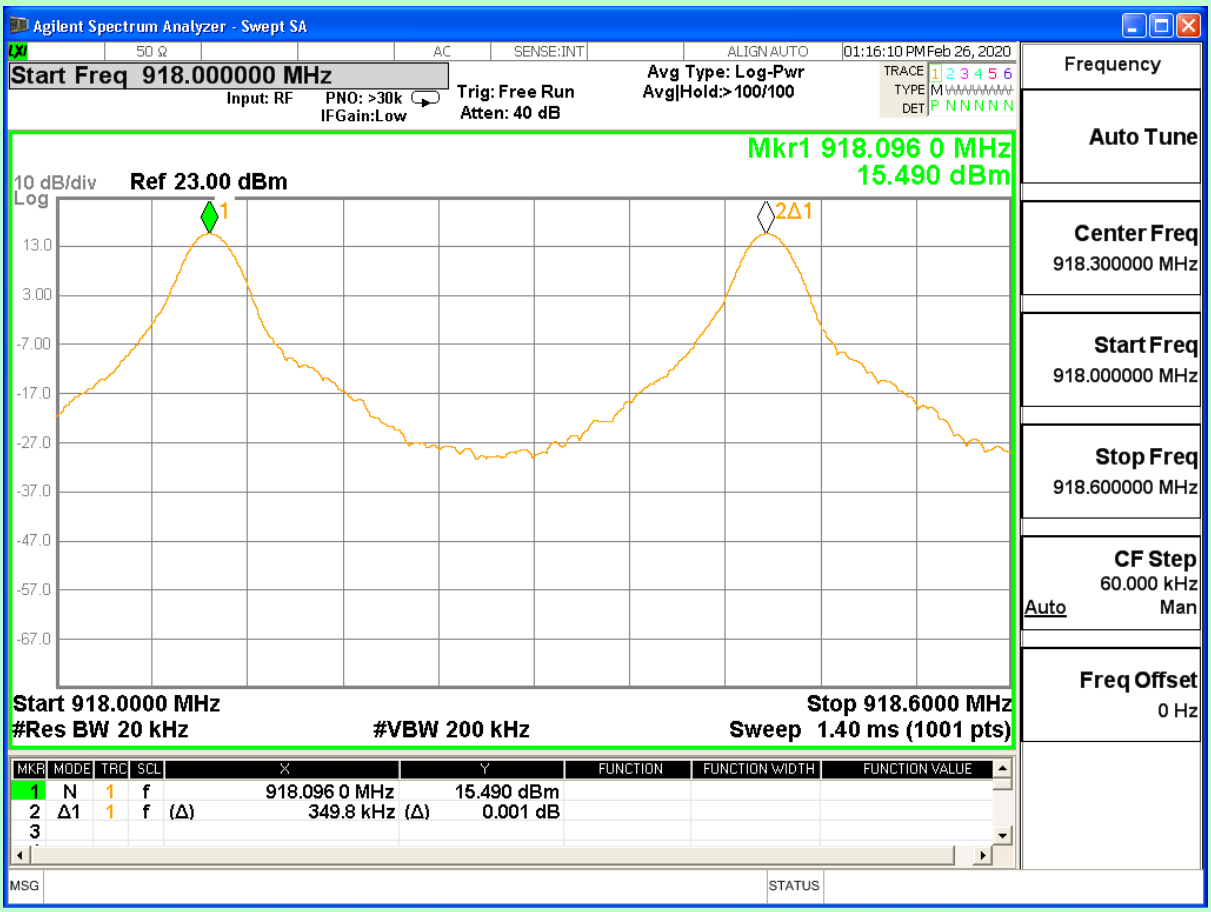
Channel 31 and 32 (Normal Mode)



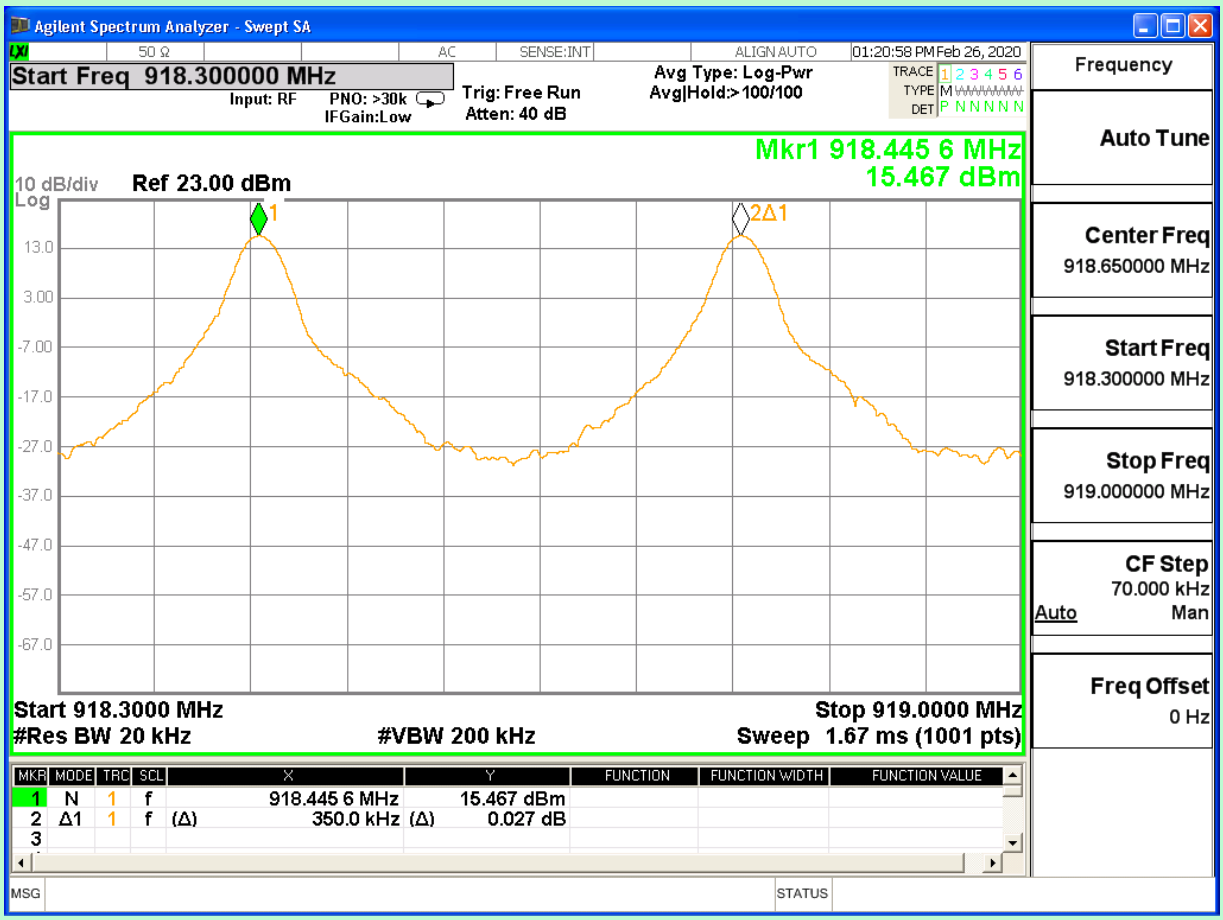
Channel 32 and 33 (Normal Mode)



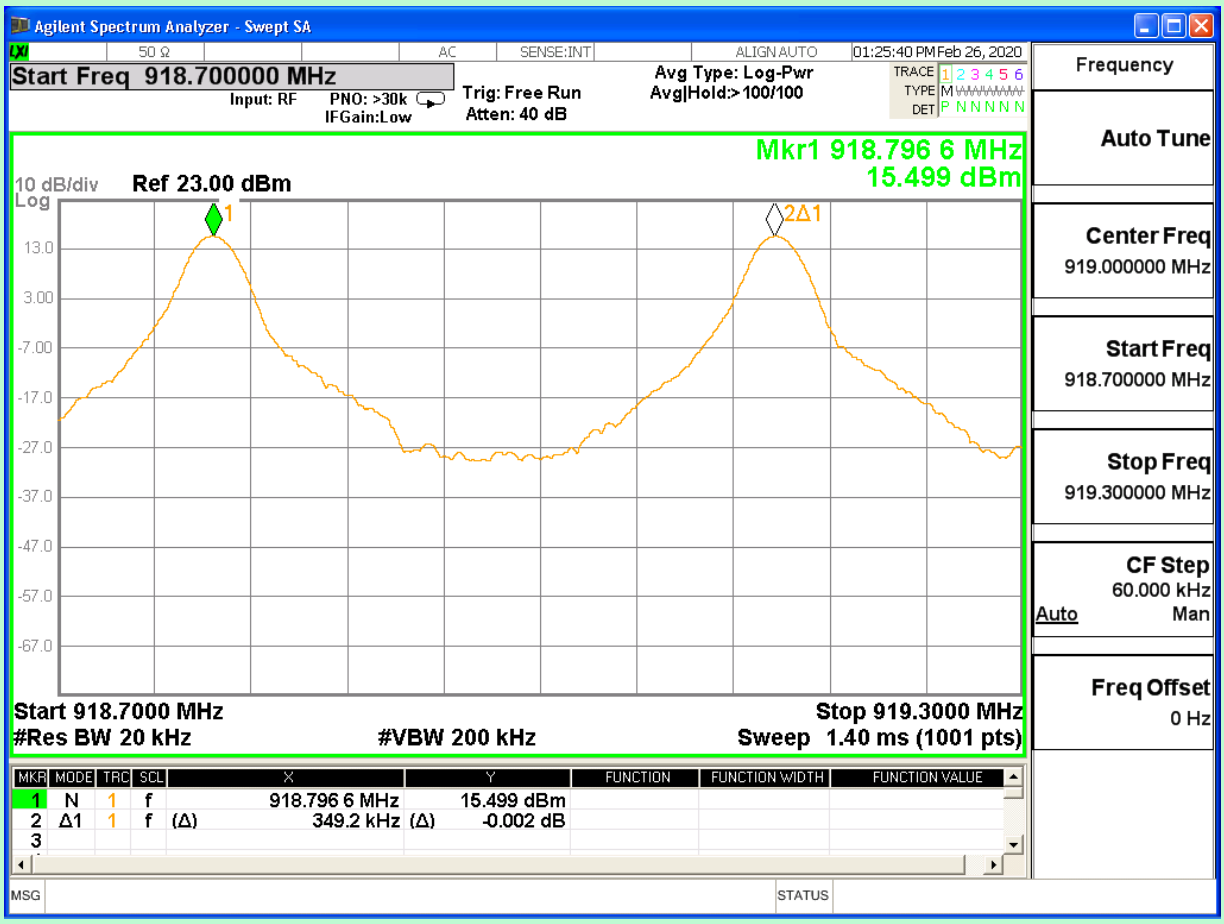
Channel 33 and 34 (Normal Mode)



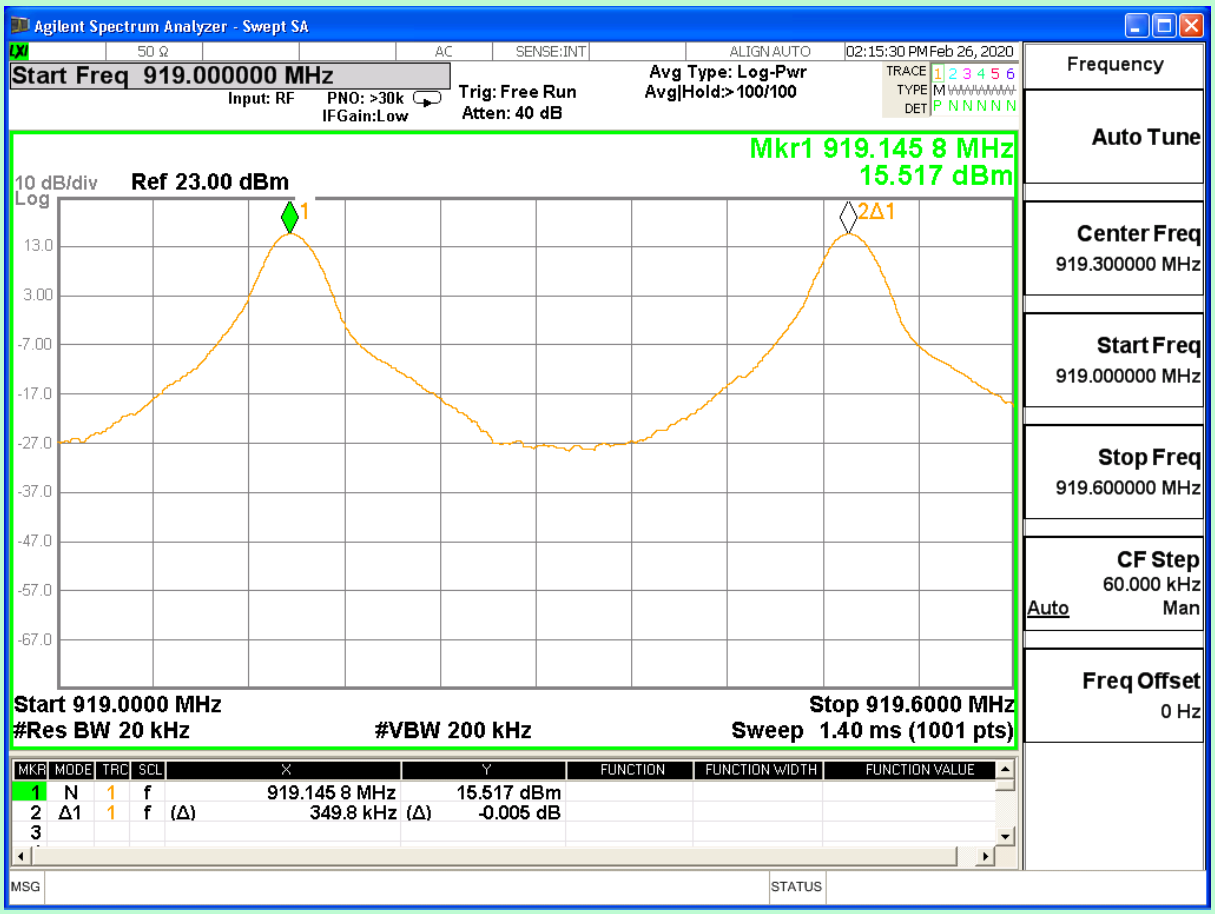
Channel 34 and 35 (Normal Mode)



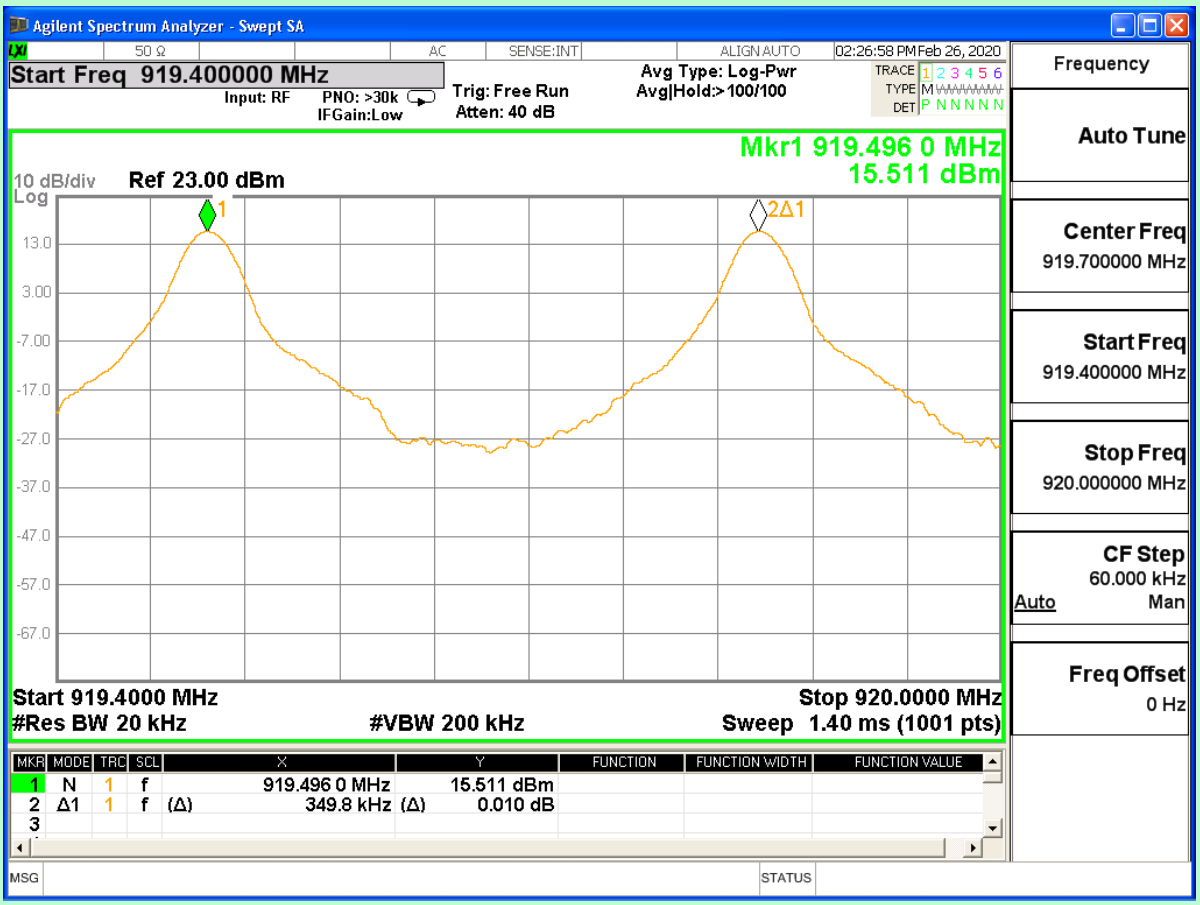
Channel 35 and 36 (Normal Mode)



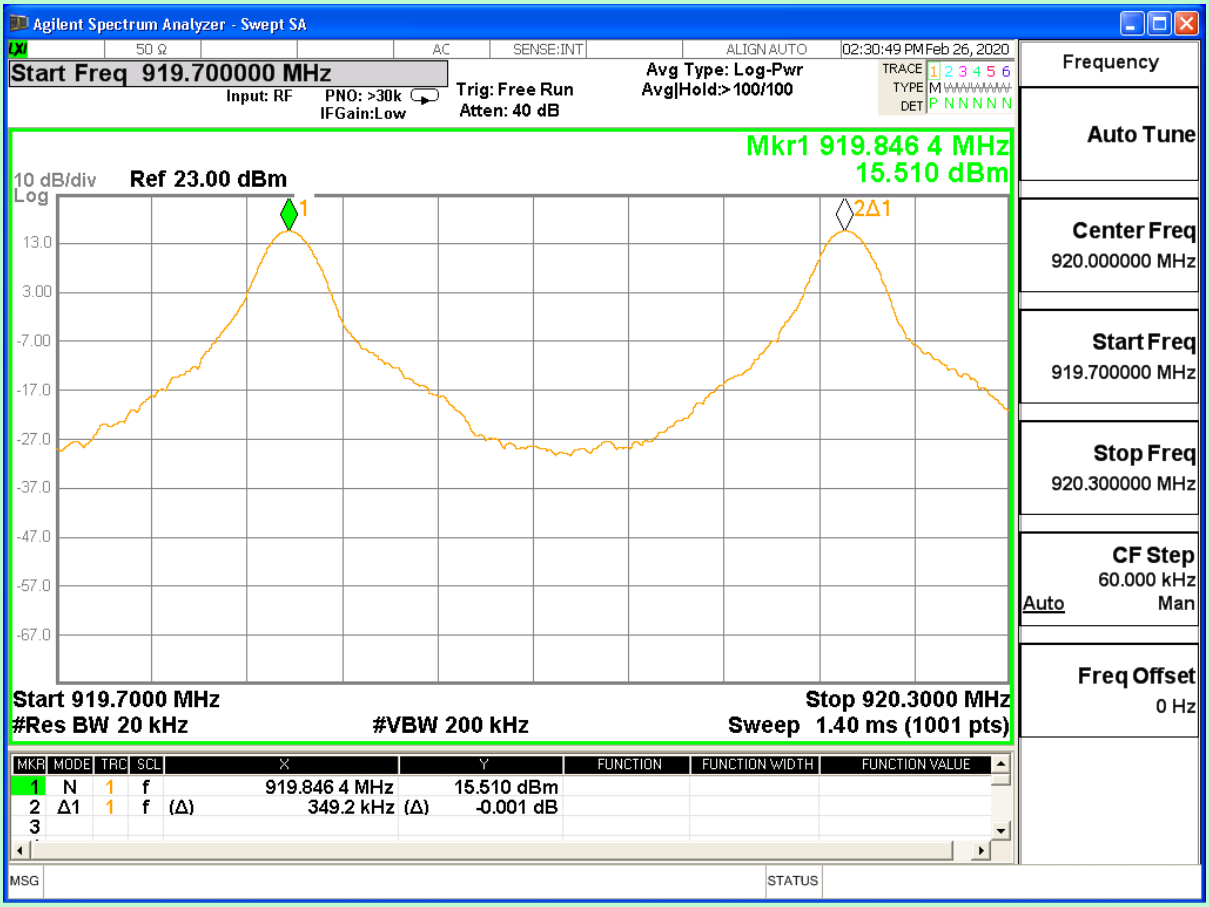
Channel 36 and 37 (Normal Mode)



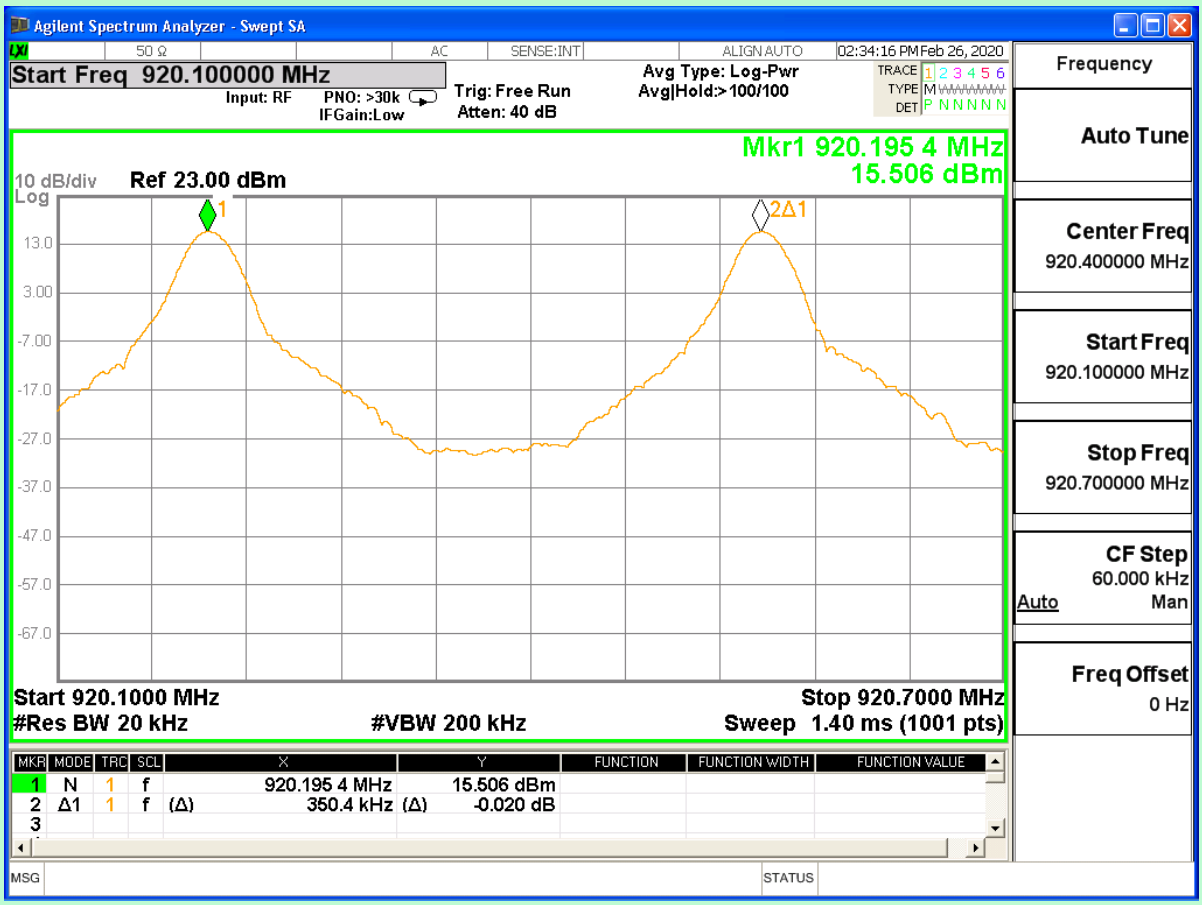
Channel 37 and 38 (Normal Mode)



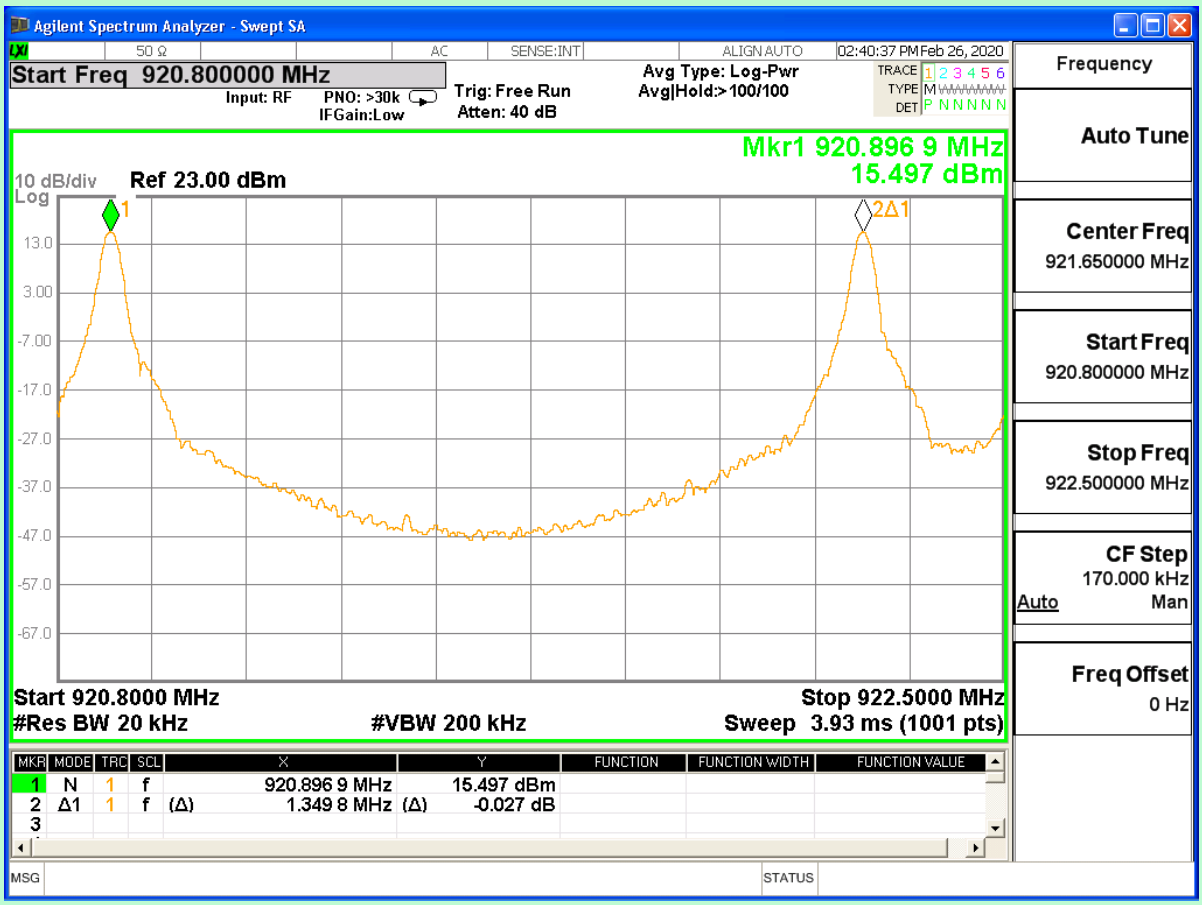
Channel 38 and 39 (Normal Mode)



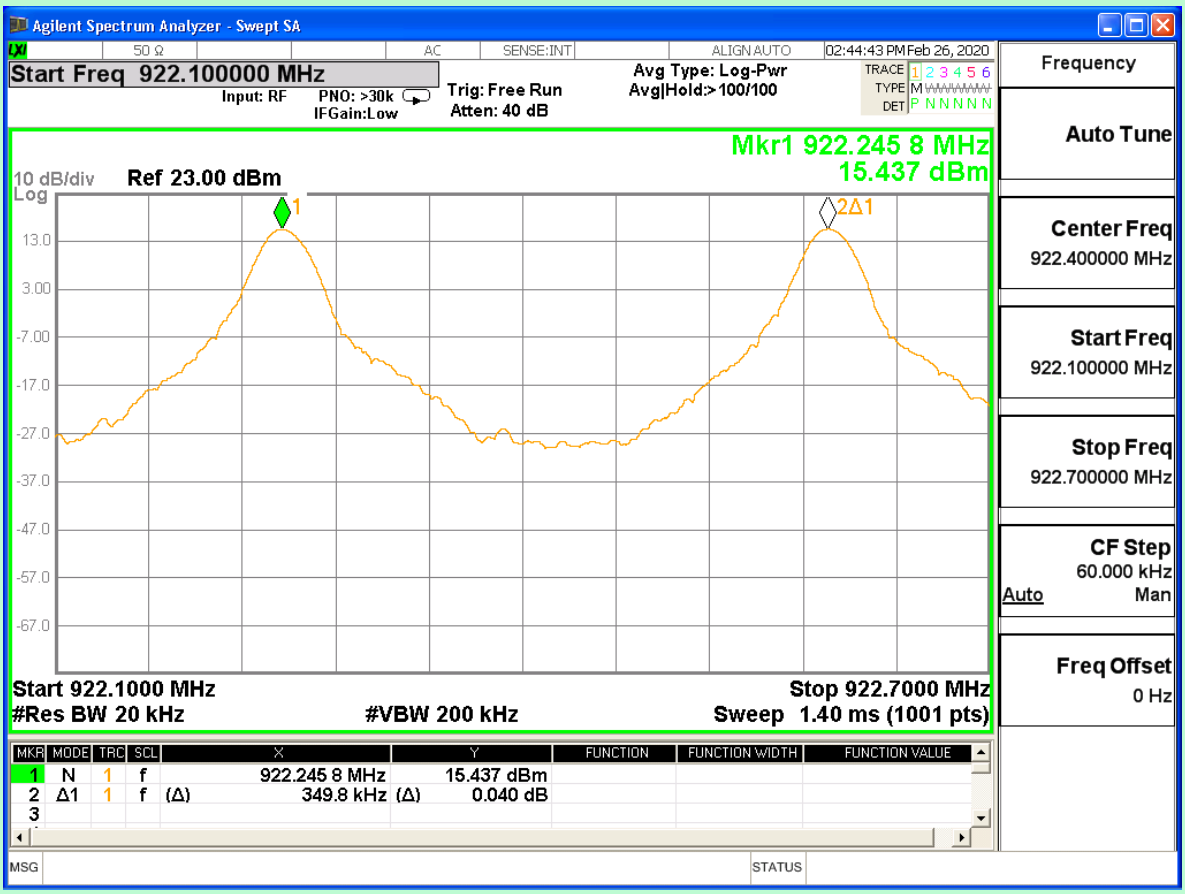
Channel 39 and 40 (Normal Mode)



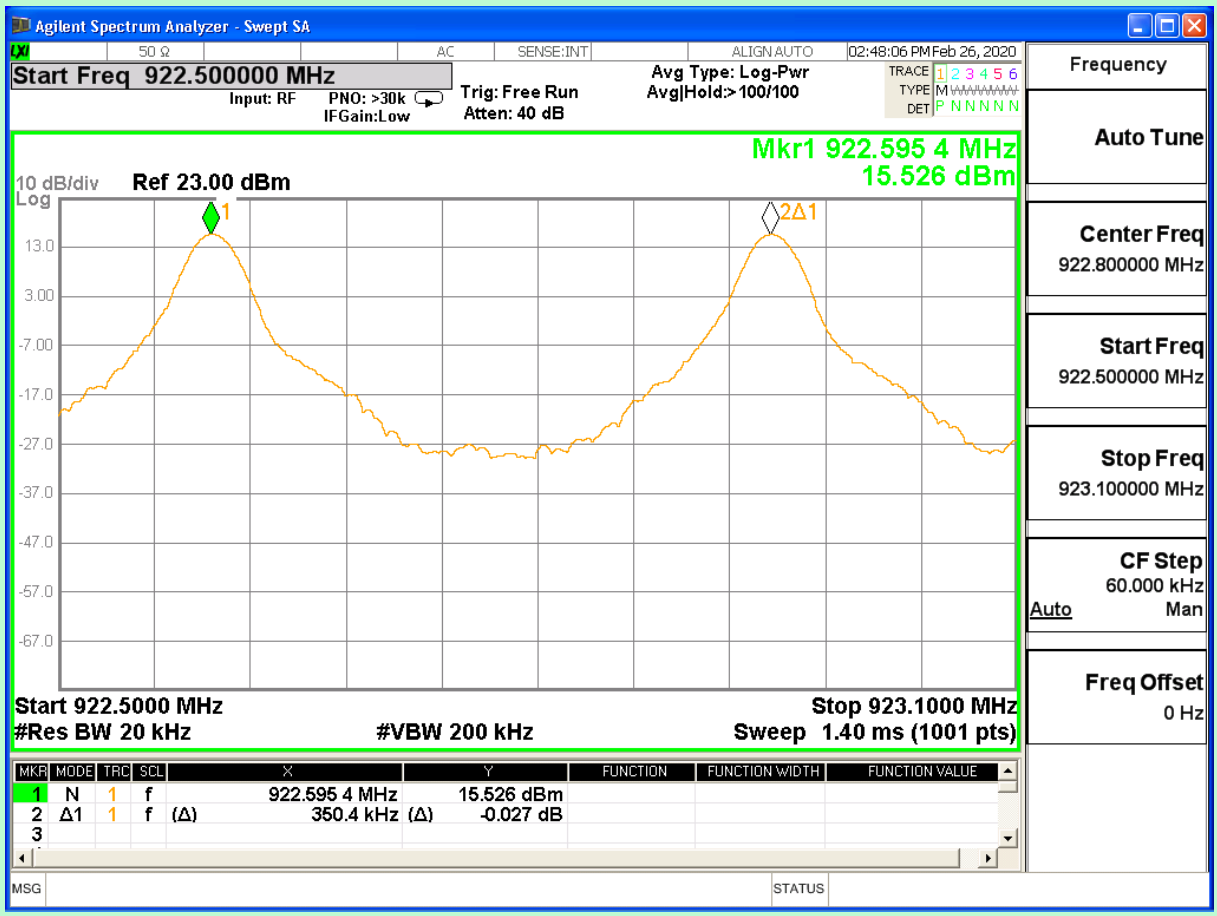
Channel 40 and 41 (Normal Mode)



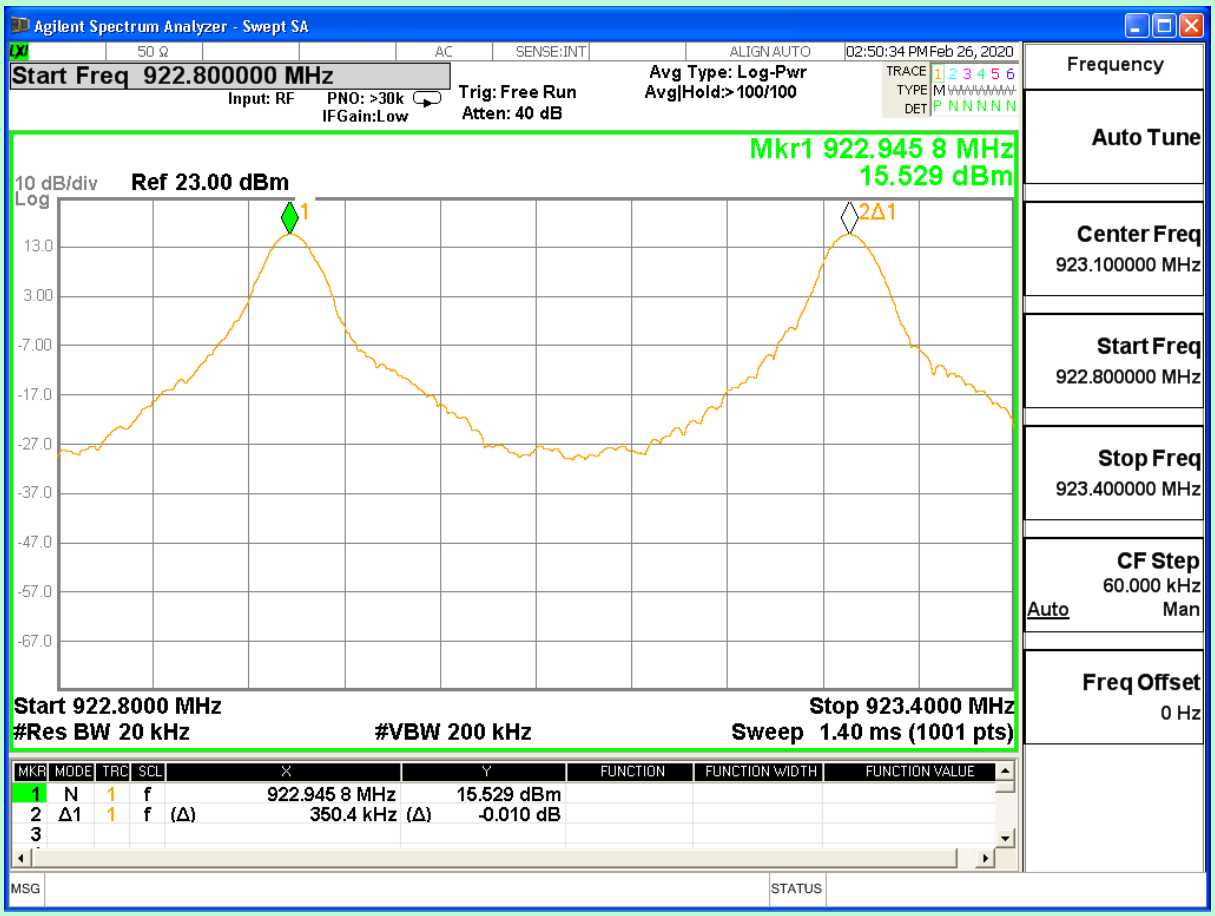
Channel 42 and 43 (Walkie Talkie Mode)



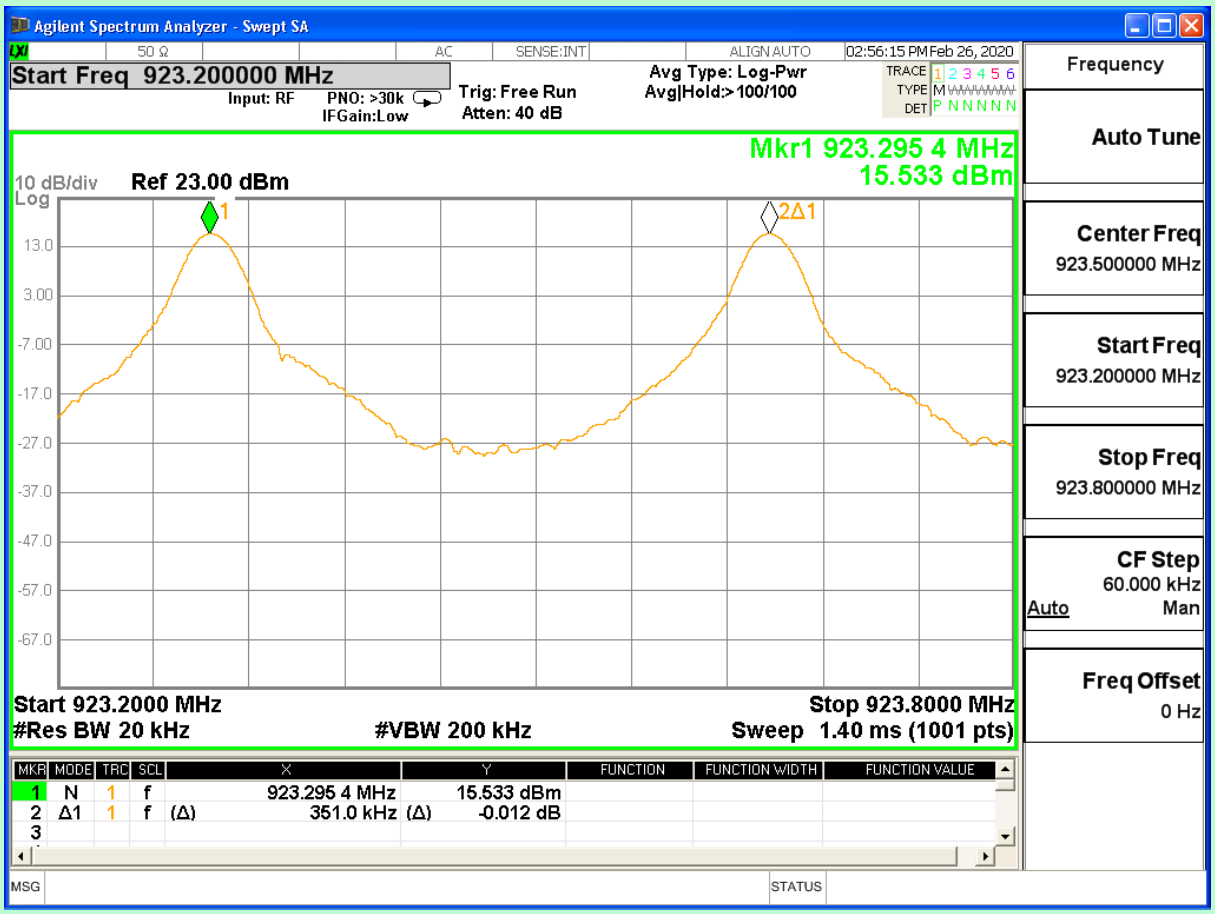
Channel 43 and 44 (Walkie Talkie Mode)



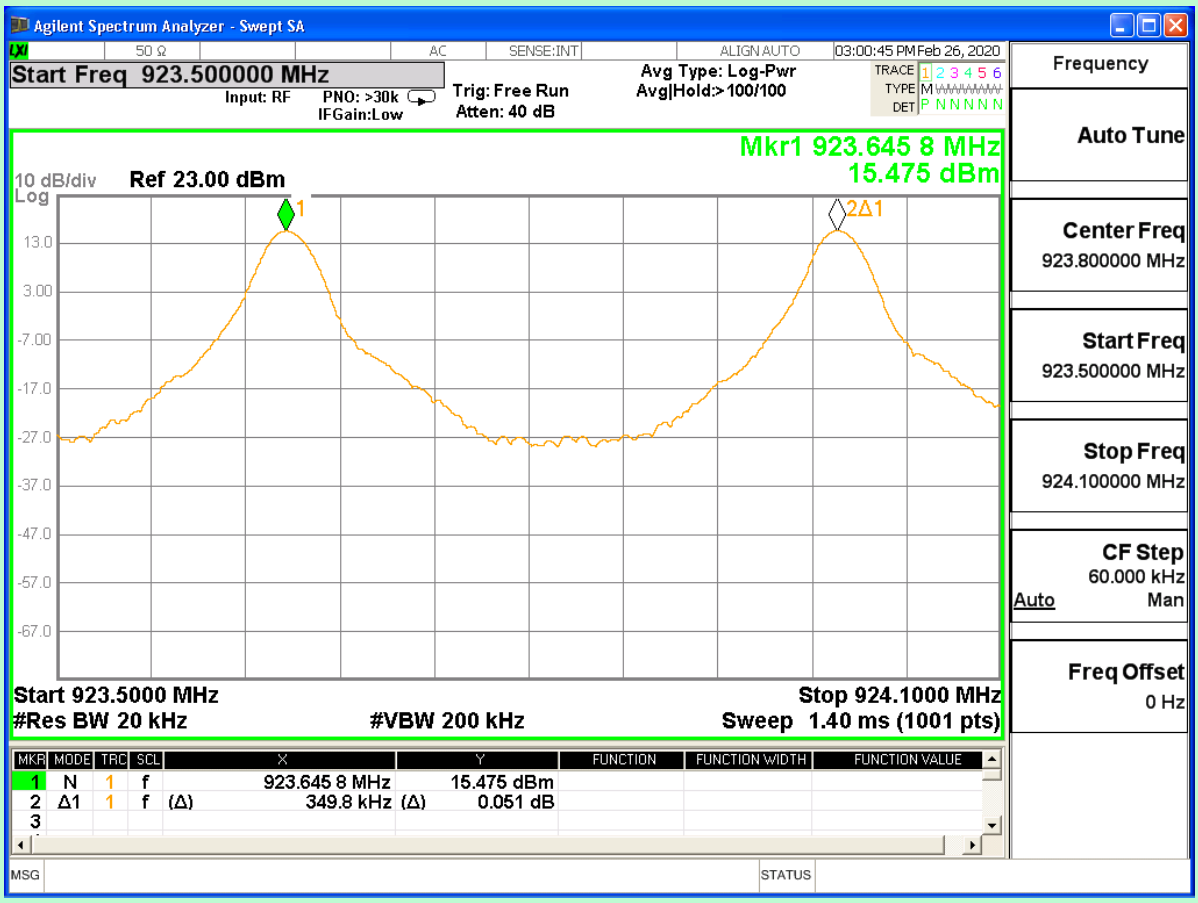
Channel 44 and 45 (Walkie Talkie Mode)



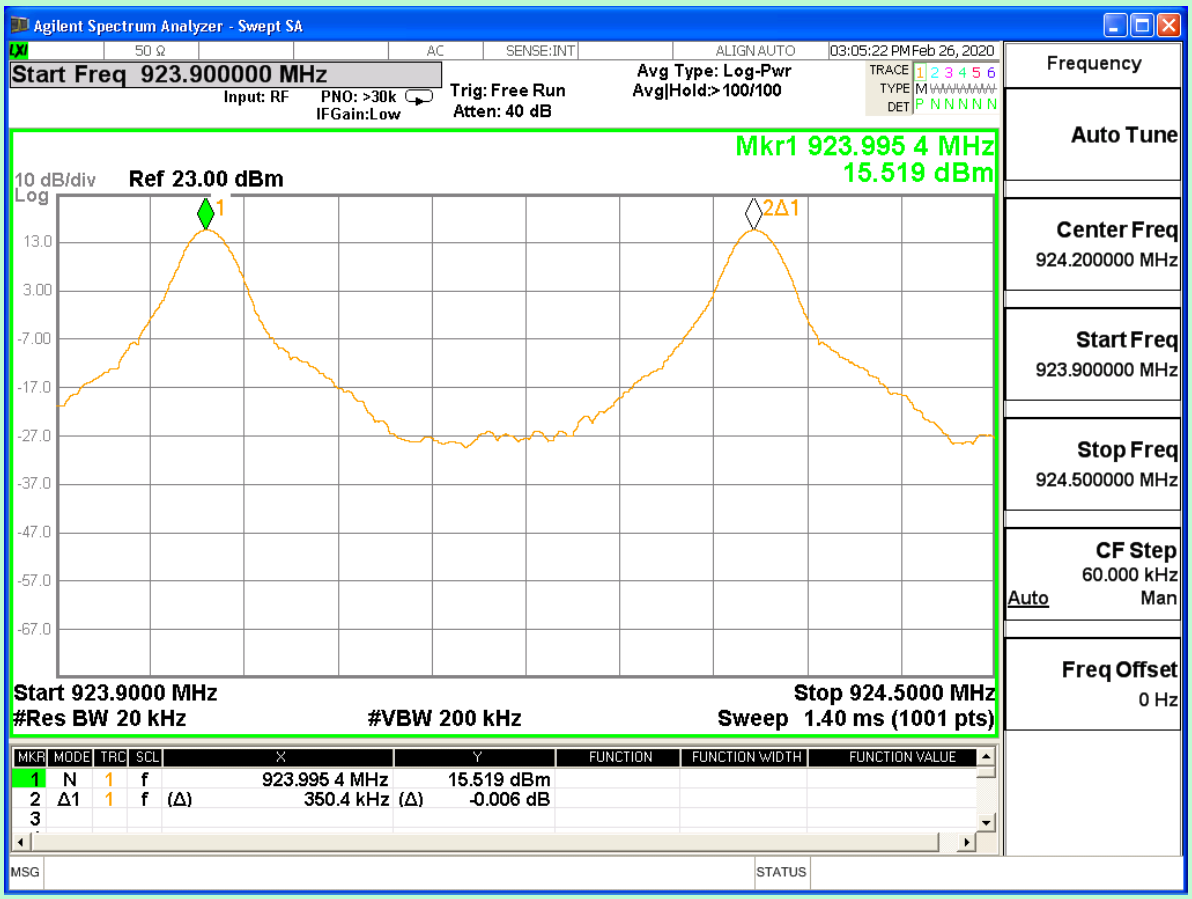
Channel 45 and 46 (Walkie Talkie Mode)



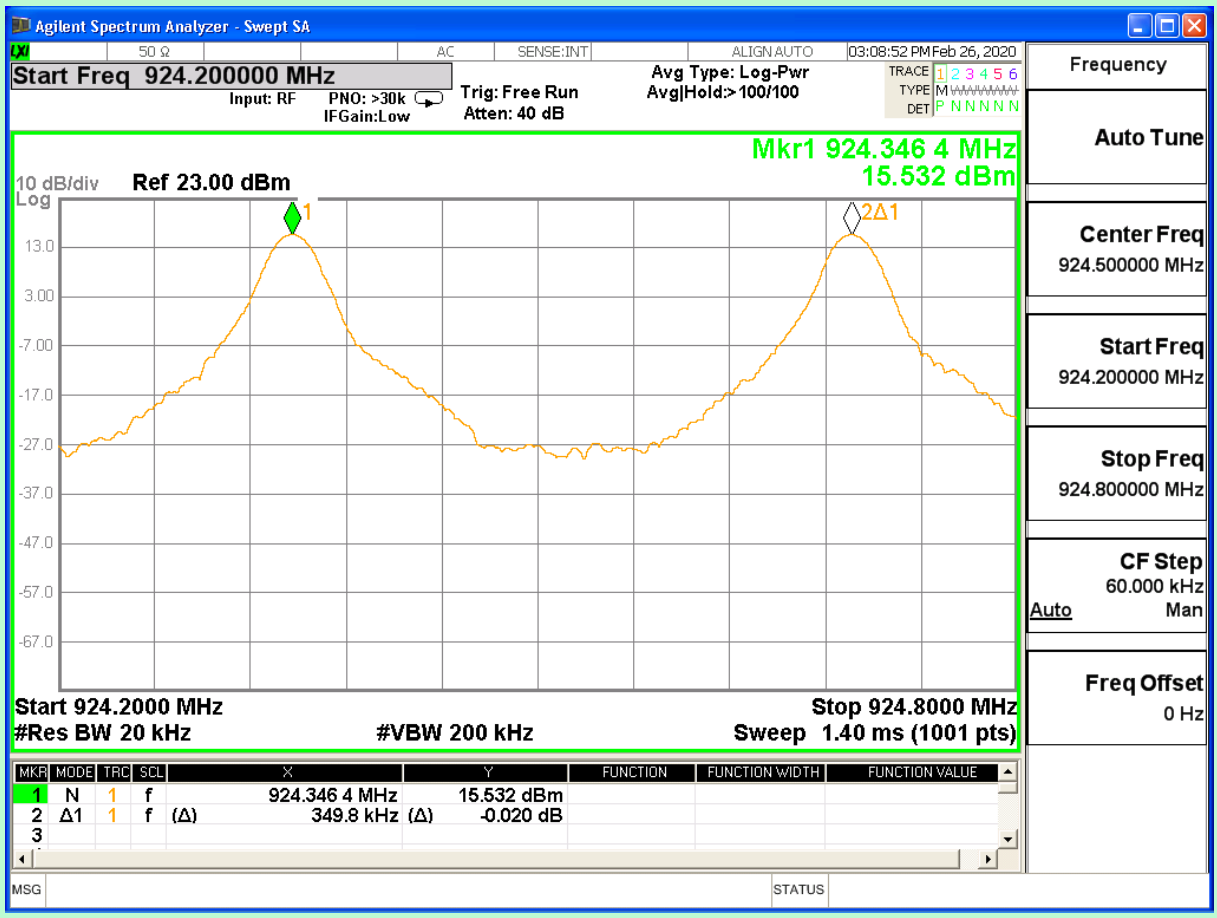
Channel 46 and 47 (Walkie Talkie Mode)



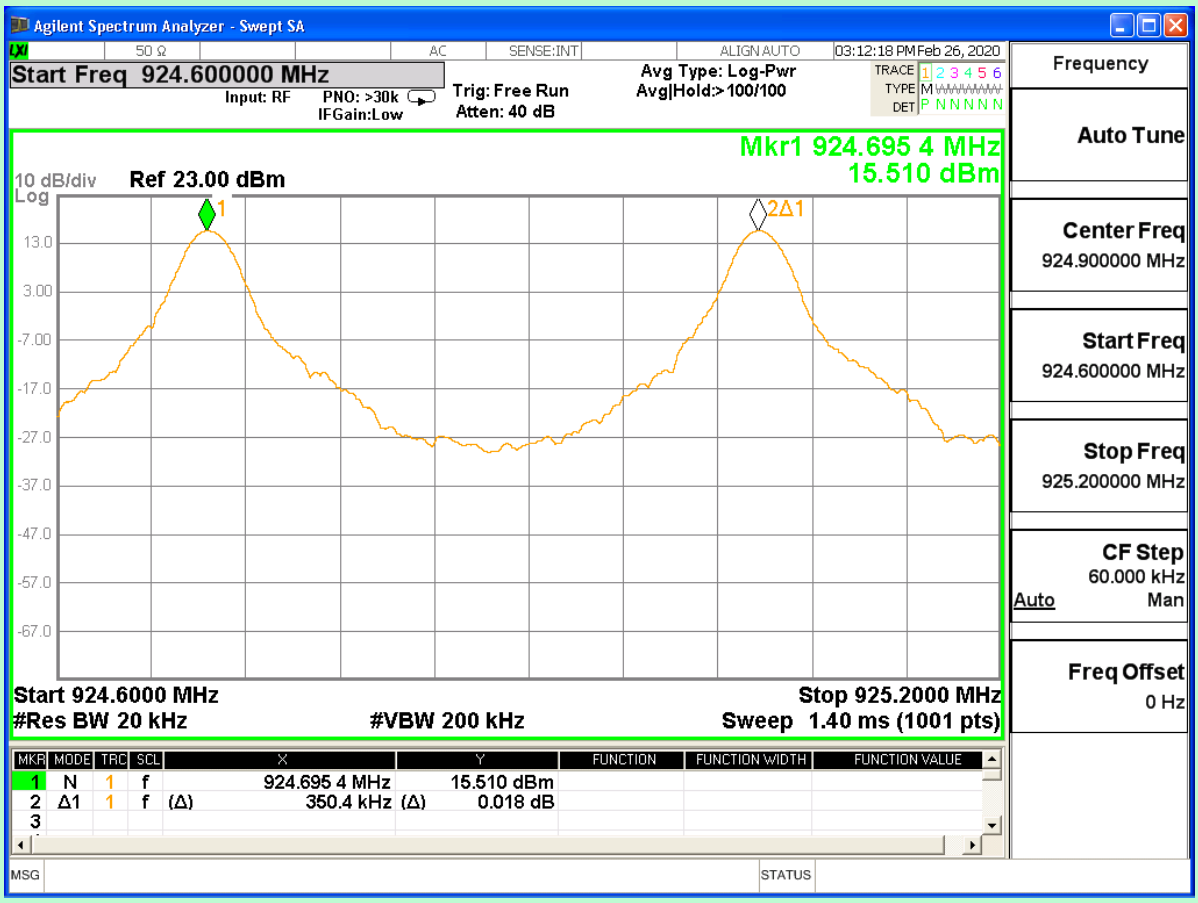
Channel 47 and 48 (Walkie Talkie Mode)



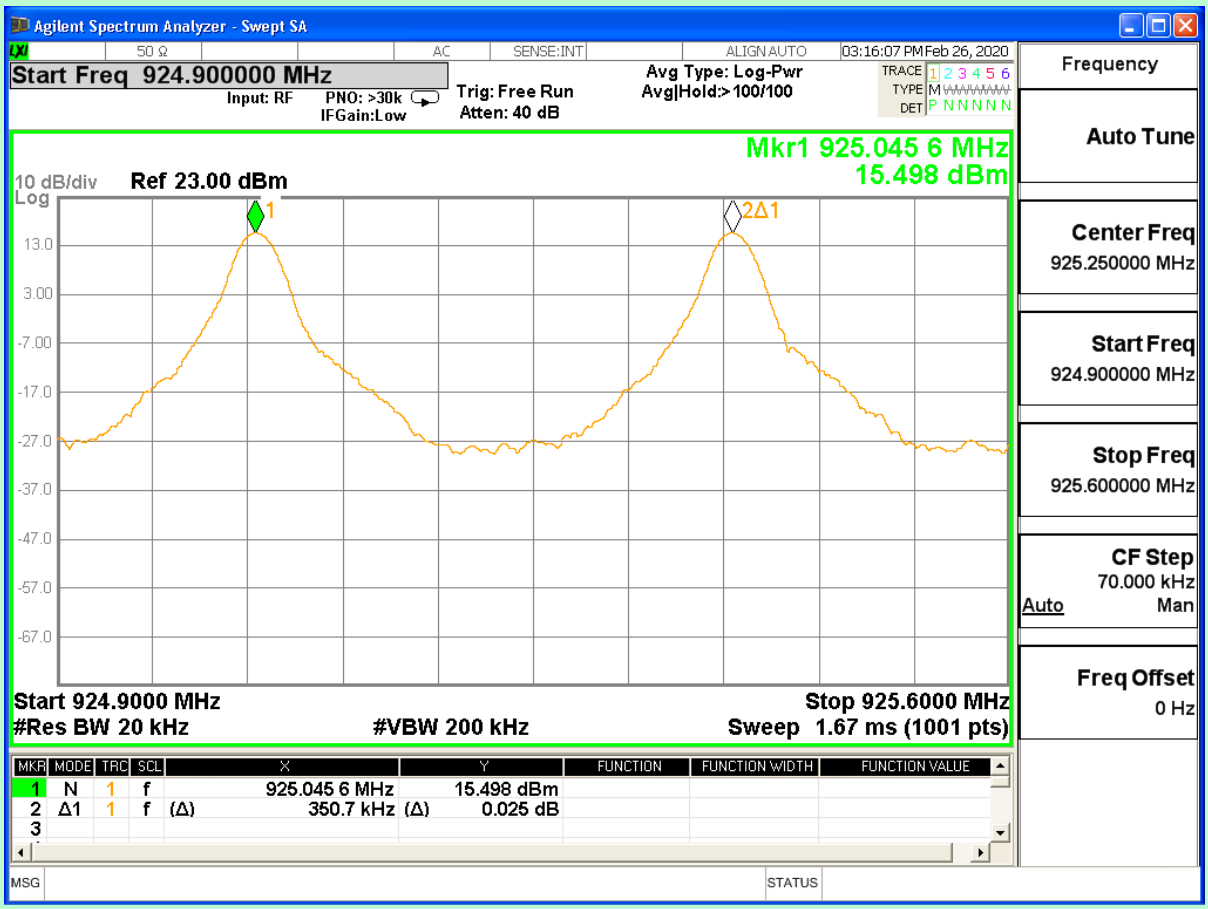
Channel 48 and 49 (Walkie Talkie Mode)



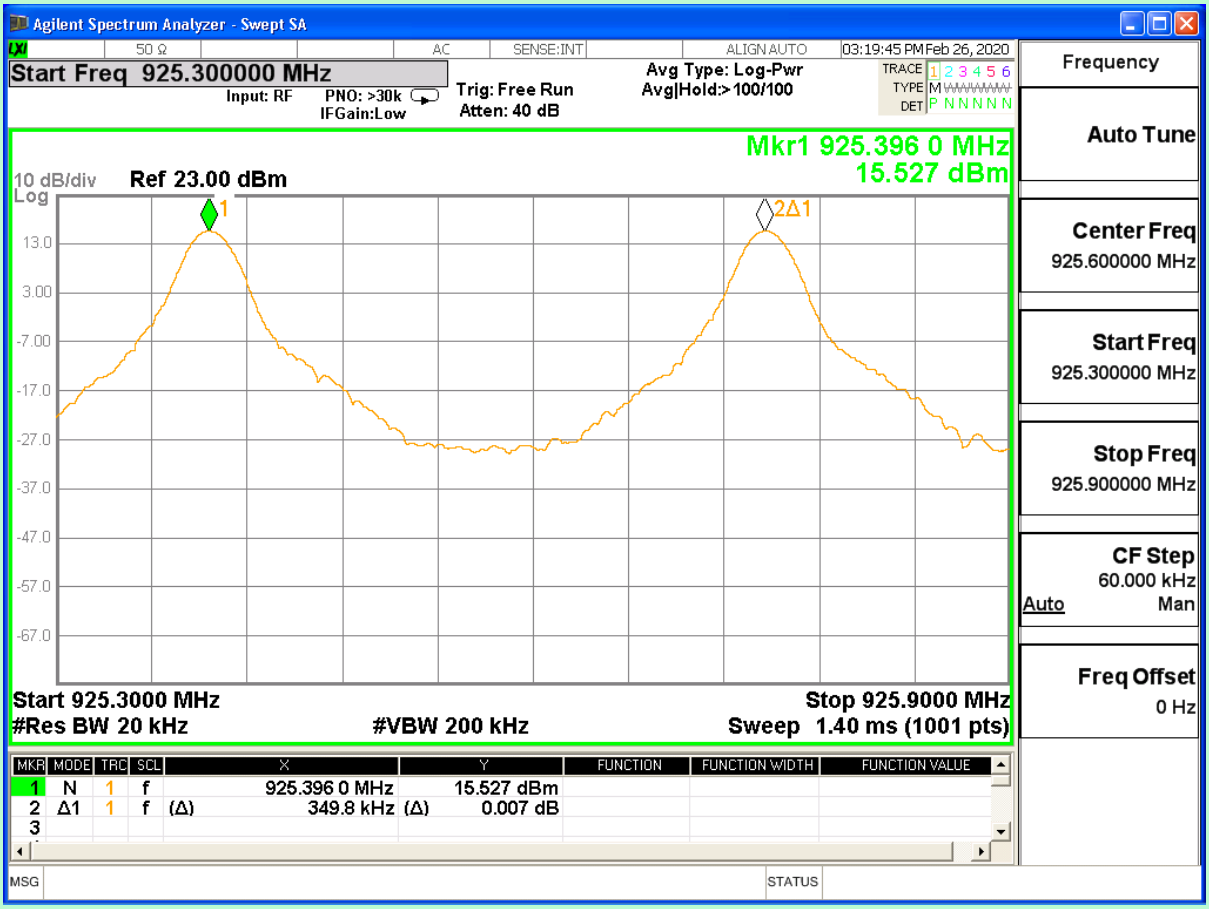
Channel 49 and 50 (Walkie Talkie Mode)



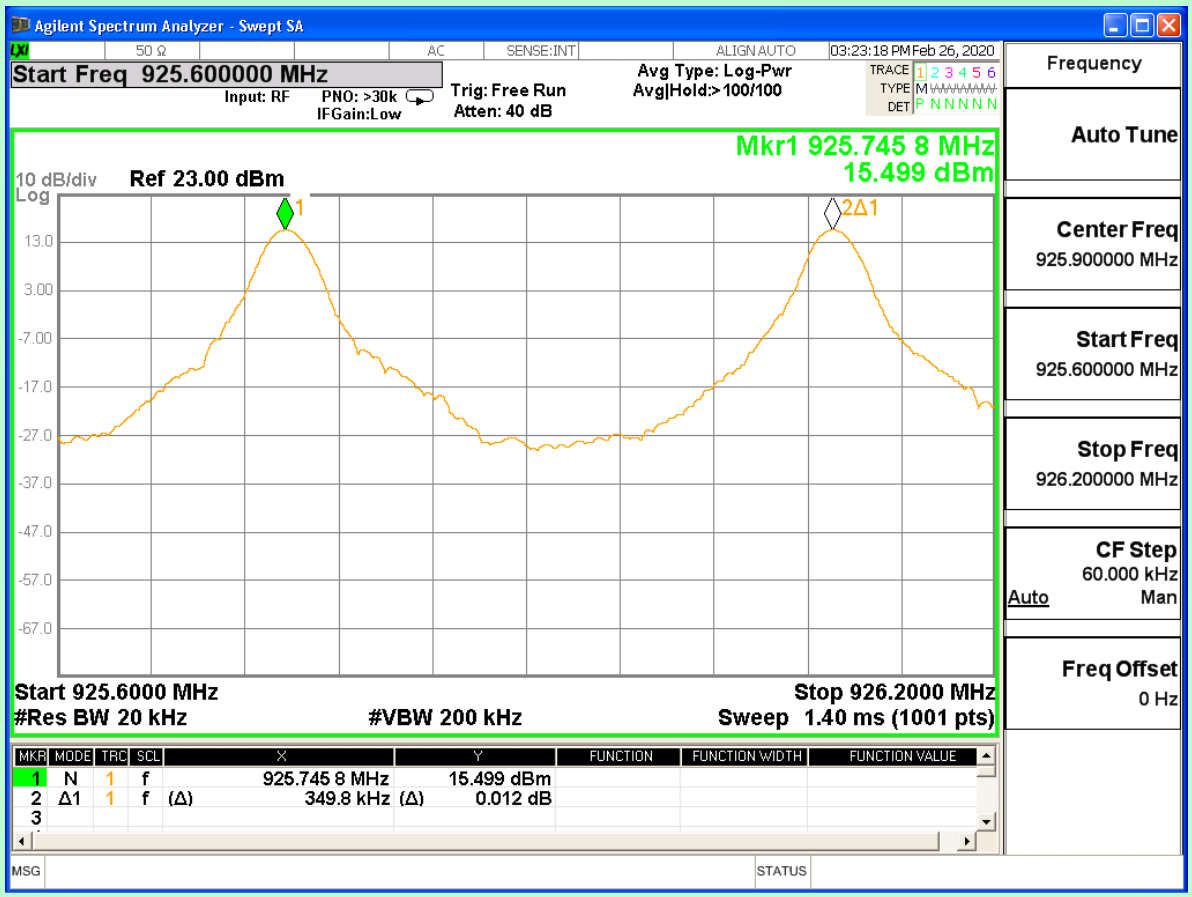
Channel 50 and 51 (Walkie Talkie Mode)



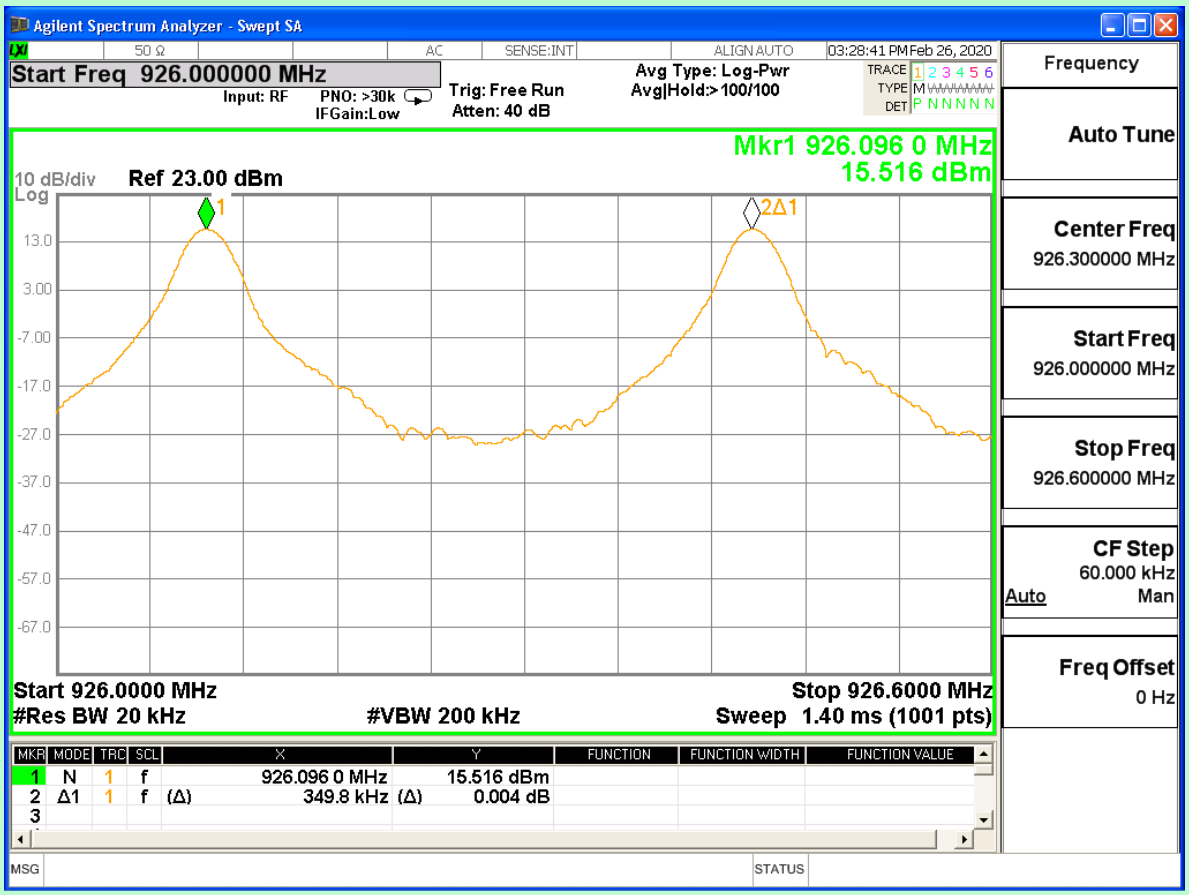
Channel 51 and 52 (Walkie Talkie Mode)



Channel 52 and 53 (Walkie Talkie Mode)



Channel 53 and 54 (Walkie Talkie Mode)



Channel 54 and 55 (Walkie Talkie Mode)

TEST RESULTS			
Channel No	Measured Value	Limit	Test Results
#	KHz		
1 and 2	351.4	>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	351.4	>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	349.3	>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	1348.65	>20dB BW(320KHz)	PASS
14 and 42	11799	>20dB BW(320KHz)	PASS
15 and 16	350.7	>20dB BW(320KHz)	PASS
16 and 17	349.8	>20dB BW(320KHz)	PASS
17 and 18	349.8	>20dB BW(320KHz)	PASS
18 and 19	350.4	>20dB BW(320KHz)	PASS
19 and 20	349.8	>20dB BW(320KHz)	PASS
20 and 21	350	>20dB BW(320KHz)	PASS
21 and 22	349.8	>20dB BW(320KHz)	PASS
22 and 23	349.2	>20dB BW(320KHz)	PASS
23 and 24	350	>20dB BW(320KHz)	PASS
24 and 25	349.8	>20dB BW(320KHz)	PASS
25 and 26	350	>20dB BW(320KHz)	PASS
26 and 27	350	>20dB BW(320KHz)	PASS
27 and 28	2349	>20dB BW(320KHz)	PASS
28 and 29	350	>20dB BW(320KHz)	PASS
29 and 30	349.8	>20dB BW(320KHz)	PASS
30 and 31	349.8	>20dB BW(320KHz)	PASS
31 and 32	350.4	>20dB BW(320KHz)	PASS
32 and 33	349.8	>20dB BW(320KHz)	PASS
33 and 34	349.8	>20dB BW(320KHz)	PASS
34 and 35	349.8	>20dB BW(320KHz)	PASS
35 and 36	350	>20dB BW(320KHz)	PASS
36 and 37	349.2	>20dB BW(320KHz)	PASS
37 and 38	349.8	>20dB BW(320KHz)	PASS
38 and 39	349.8	>20dB BW(320KHz)	PASS
39 and 40	349.2	>20dB BW(320KHz)	PASS
40 and 41	350.4	>20dB BW(320KHz)	PASS
42 and 43	1349.8	>20dB BW(320KHz)	PASS
43 and 44	349.8	>20dB BW(320KHz)	PASS
44 and 45	350.4	>20dB BW(320KHz)	PASS
45 and 46	350.4	>20dB BW(320KHz)	PASS
46 and 47	351	>20dB BW(320KHz)	PASS
47 and 48	349.8	>20dB BW(320KHz)	PASS
48 and 49	350.4	>20dB BW(320KHz)	PASS

49 and 50	349.8	>20dB BW(320KHz)	PASS
50 and 51	350.4	>20dB BW(320KHz)	PASS
51 and 52	350.7	>20dB BW(320KHz)	PASS
52 and 53	349.8	>20dB BW(320KHz)	PASS
53 and 54	349.8	>20dB BW(320KHz)	PASS
54 and 55	349.8	>20dB BW(320KHz)	PASS

TEST SETUP PHOTOGRAPH
Refer Annexure -1 **Conducted RF Test setup**

2.4 NUMBER OF HOPPING CHANNELS

EUT	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from	NA		
Applicable	FCC Part 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

Method	Radiated ☐	Conducted ☒

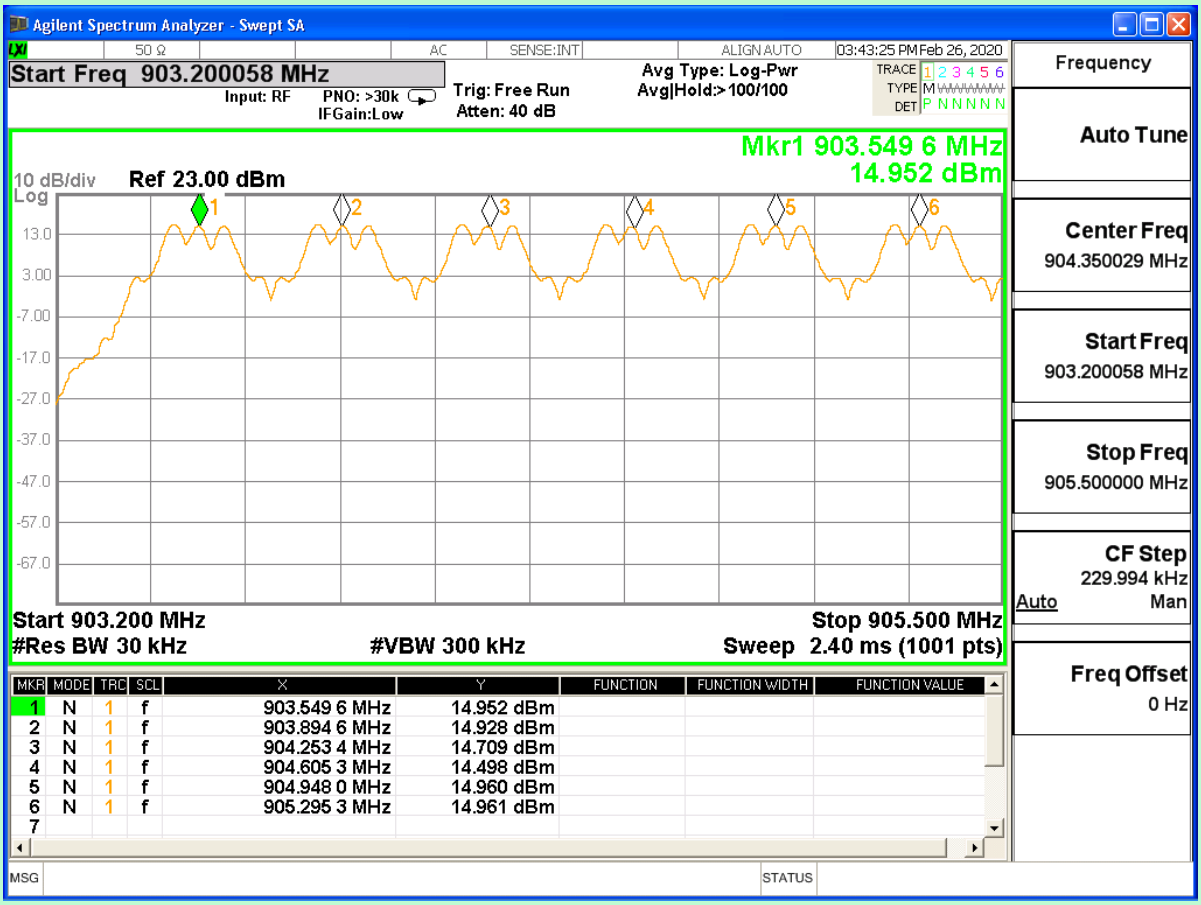
TEST PARAMETERS

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

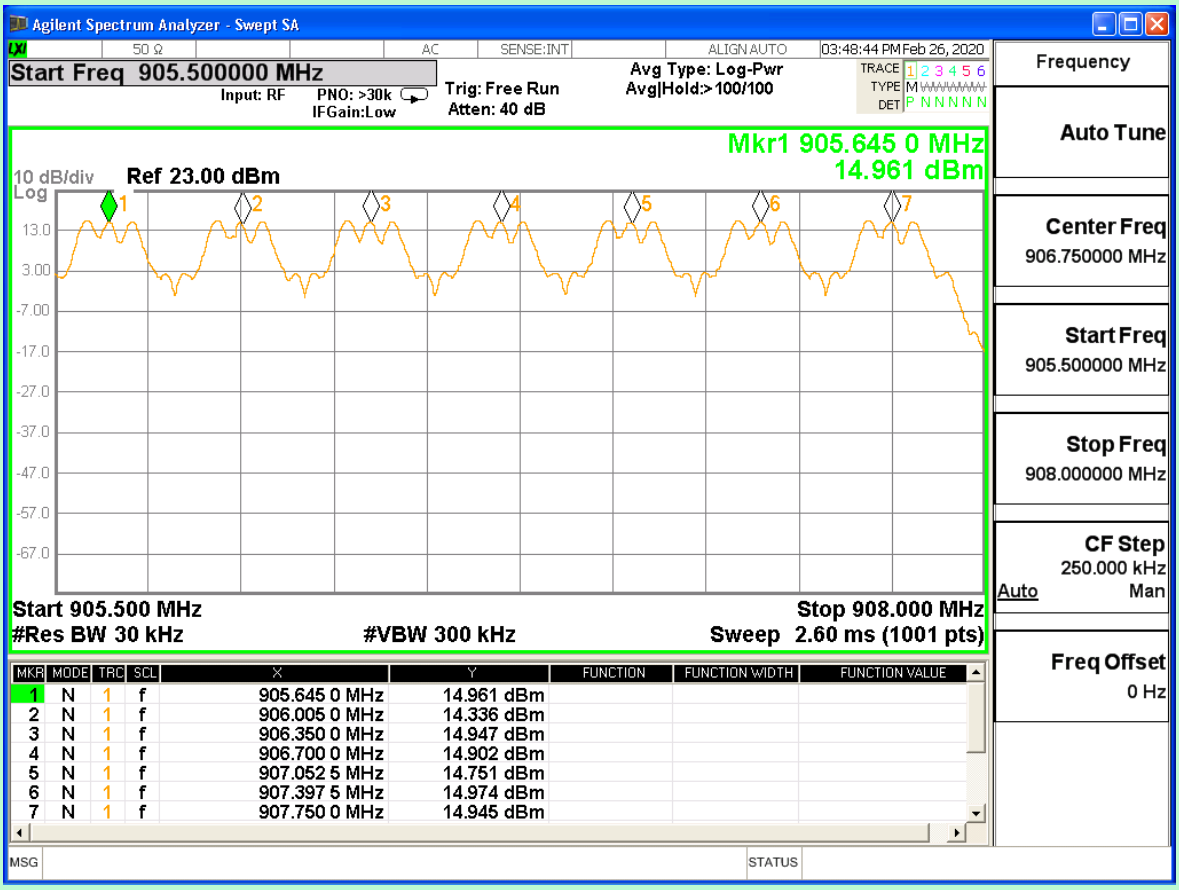
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Shunner	SF104/2X11PC3542/500	NA	NA

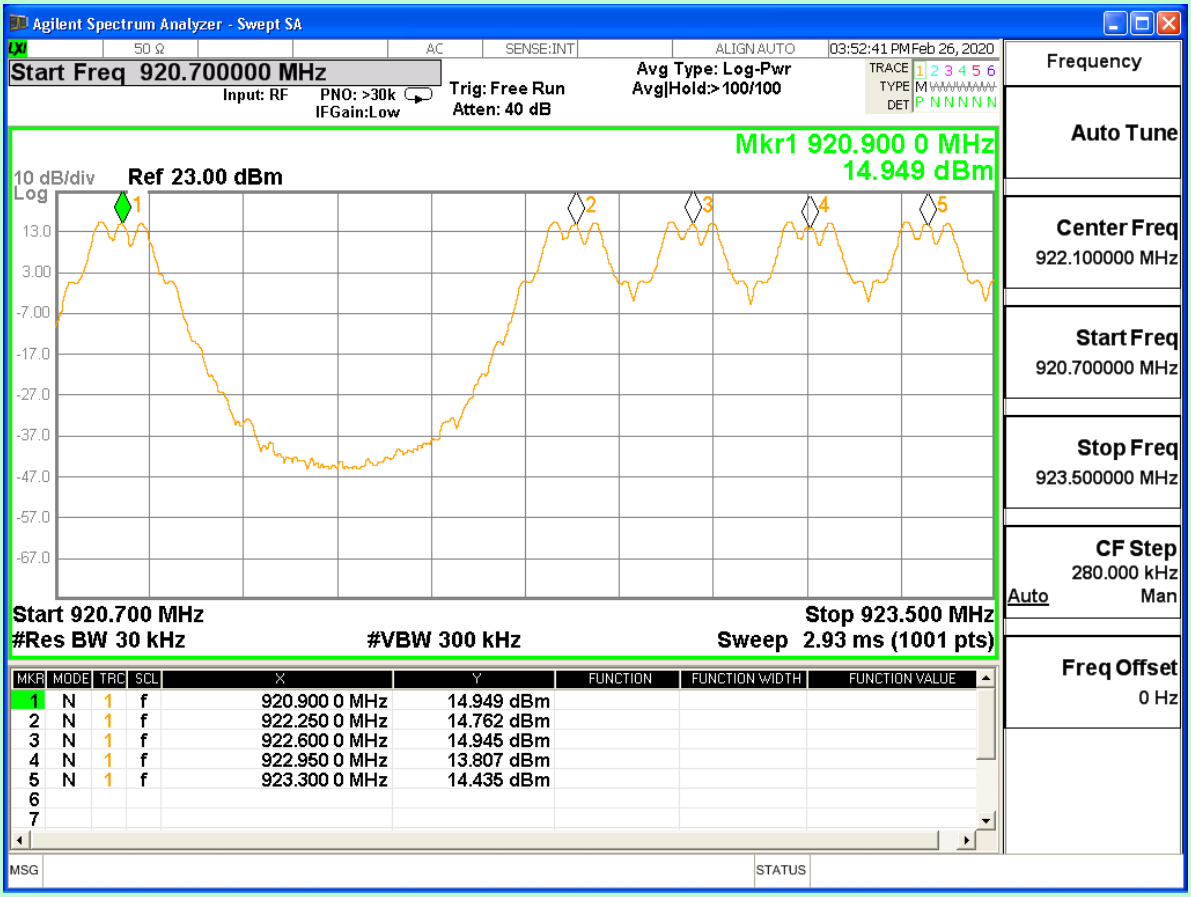
TEST GRAPHS



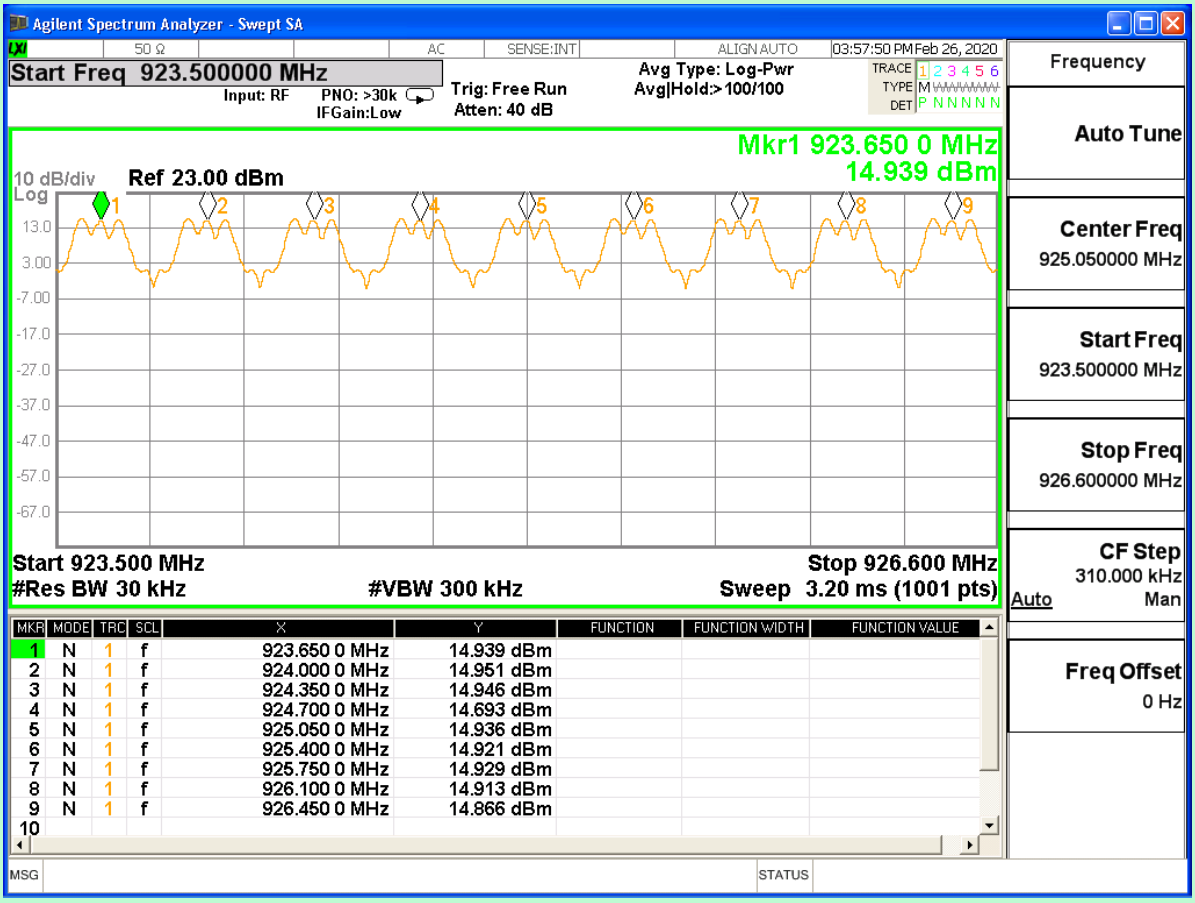
Channel 1 – 6 (Walkie-Talkie Mode)



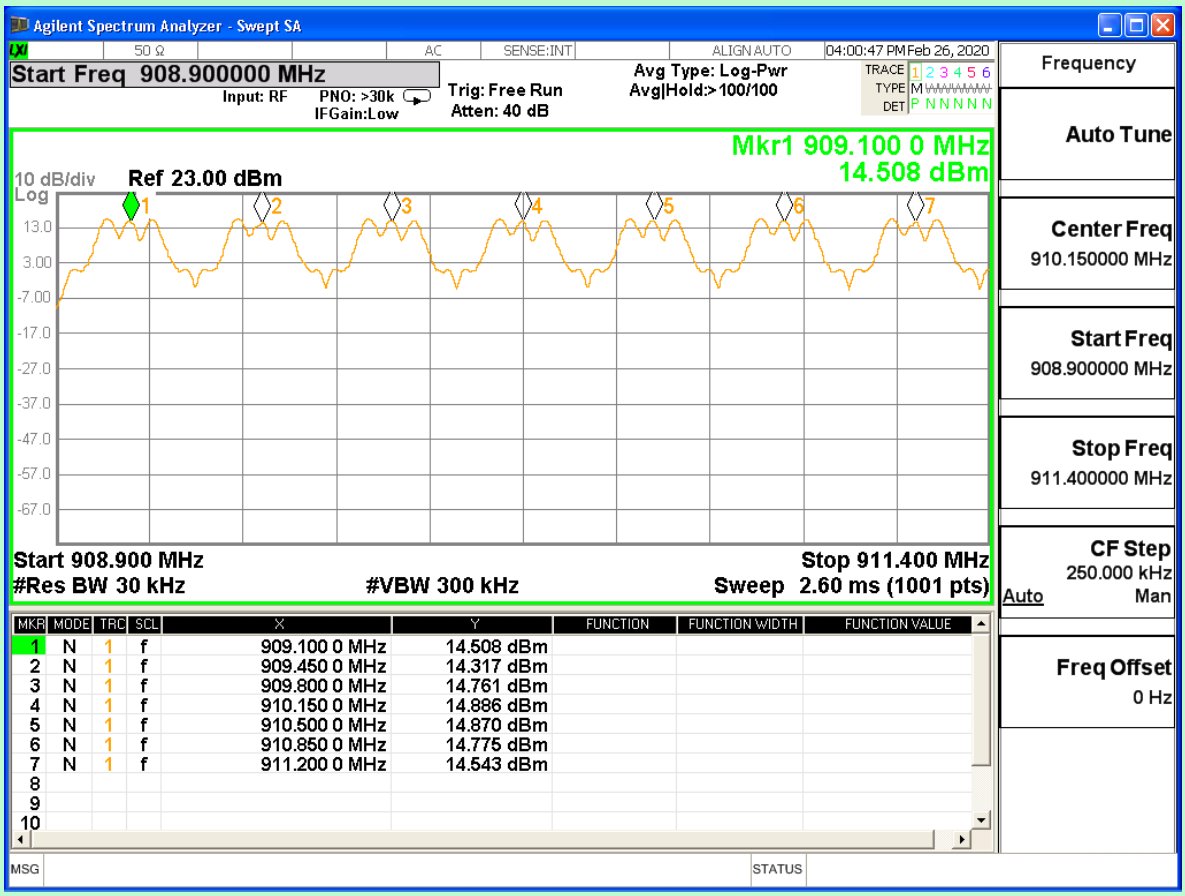
Channel 7 – 13 (Walkie-Talkie Mode)



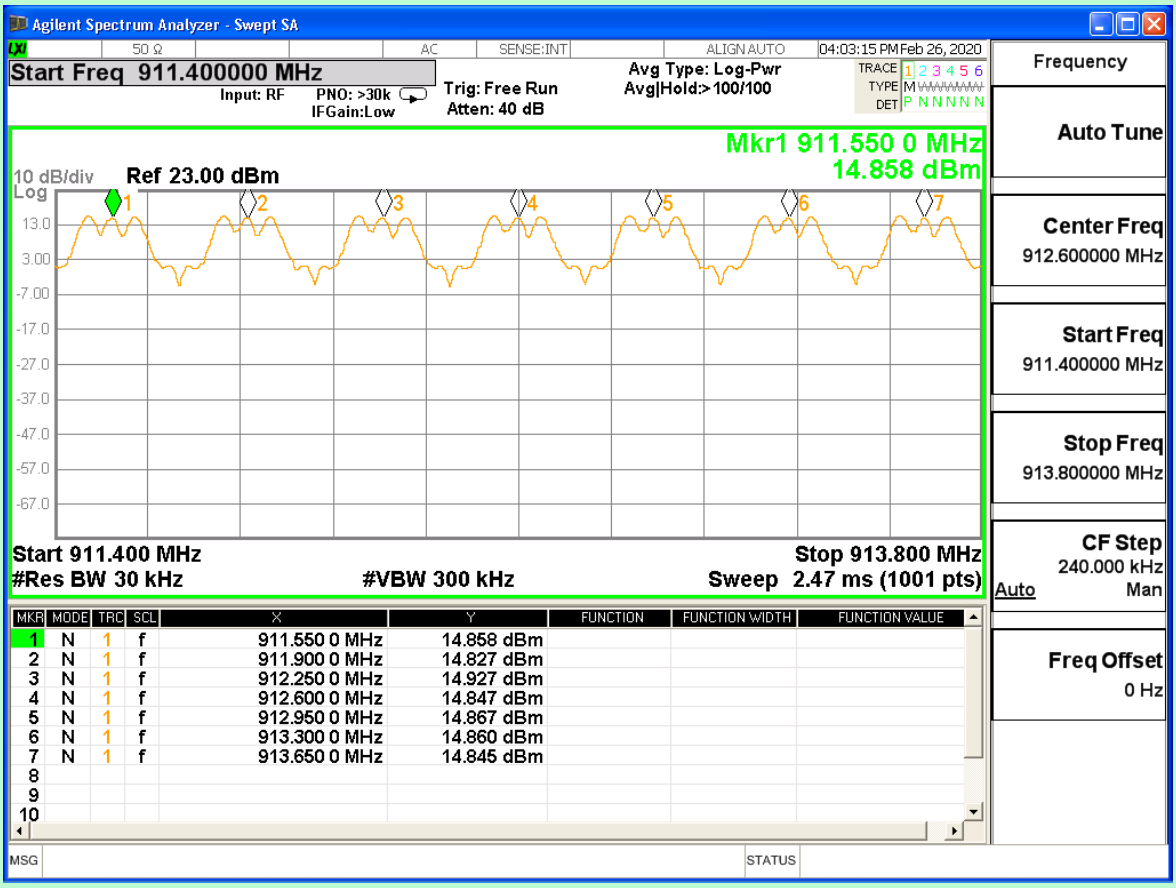
Channel 14 – 18 (Walkie-Talkie Mode)



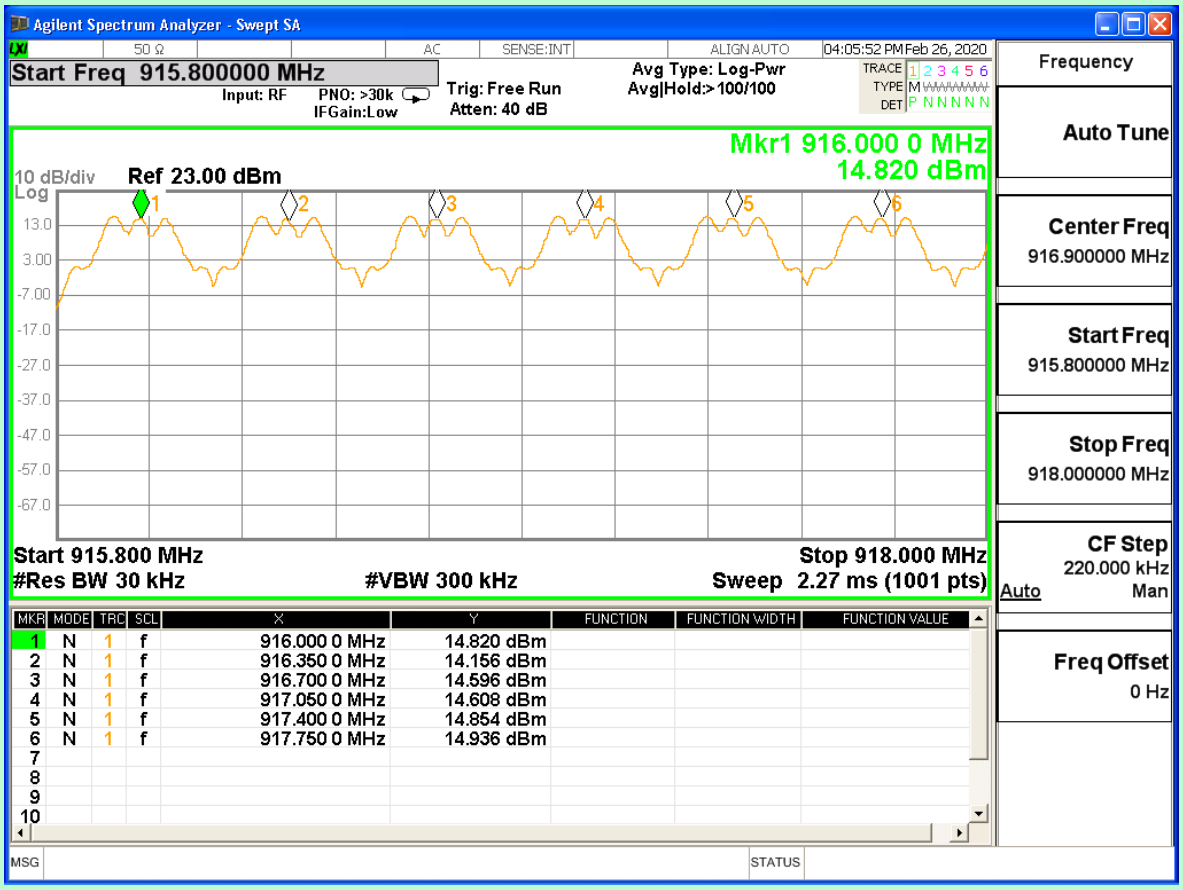
Channel 19 – 27 (Walkie-Talkie Mode)



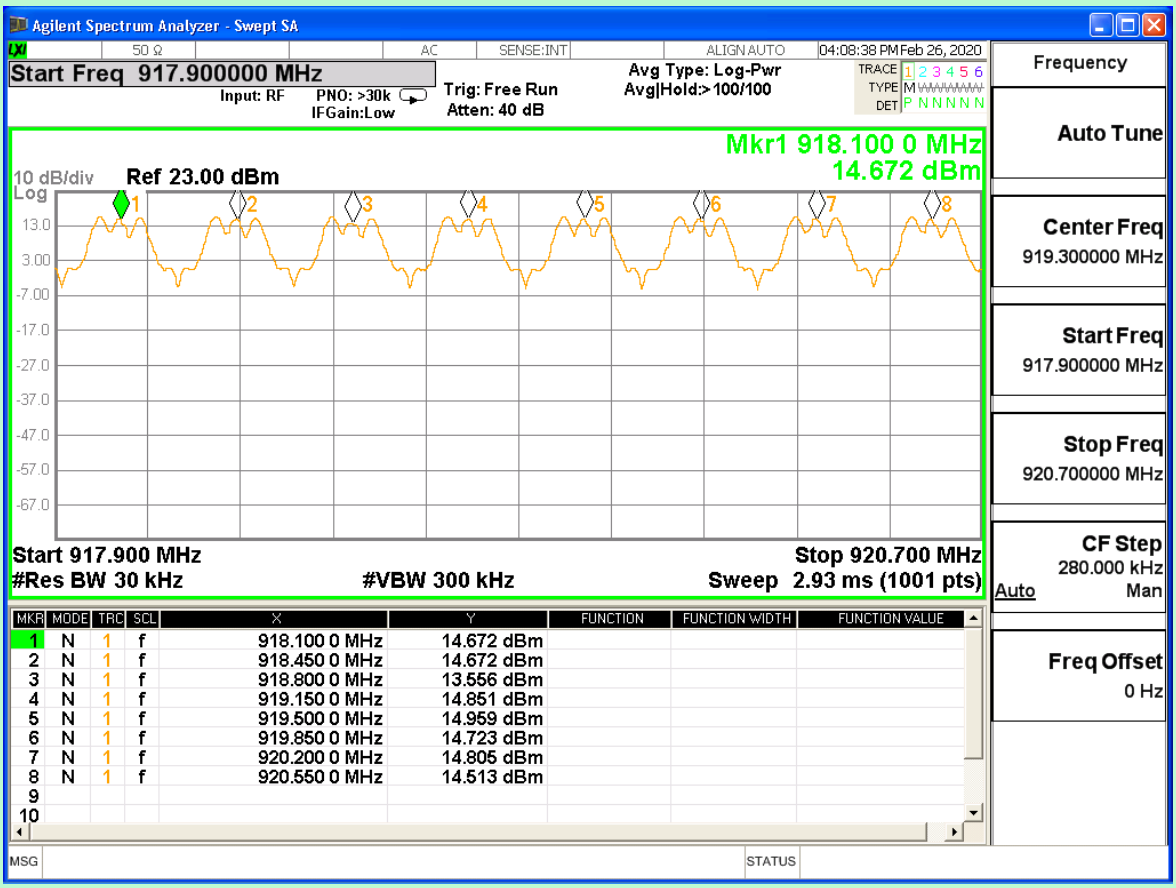
Channel 1 – 7 (Normal Mode)



Channel 8 – 14 (Normal Mode)



Channel 15 – 20 (Normal Mode)



Channel 21 – 28 (Normal Mode)

TEST RESULTS			
Mode of Operation	No. of Channels Measured	Limit (No. of Channels)	Test Results
#	#	#	
Normal Mode	28	≥25	PASS
Walkie-Talkie Mode	27	≥25	PASS

TEST SETUP PHOTOGRAPH
Refer Annexure -1 **Conducted RF Test setup**

2.5 BAND EDGE COMPLIANCE

EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std.	NA		
Applicable	FCC Part 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

Method	Radiated ☐	Conducted ☒

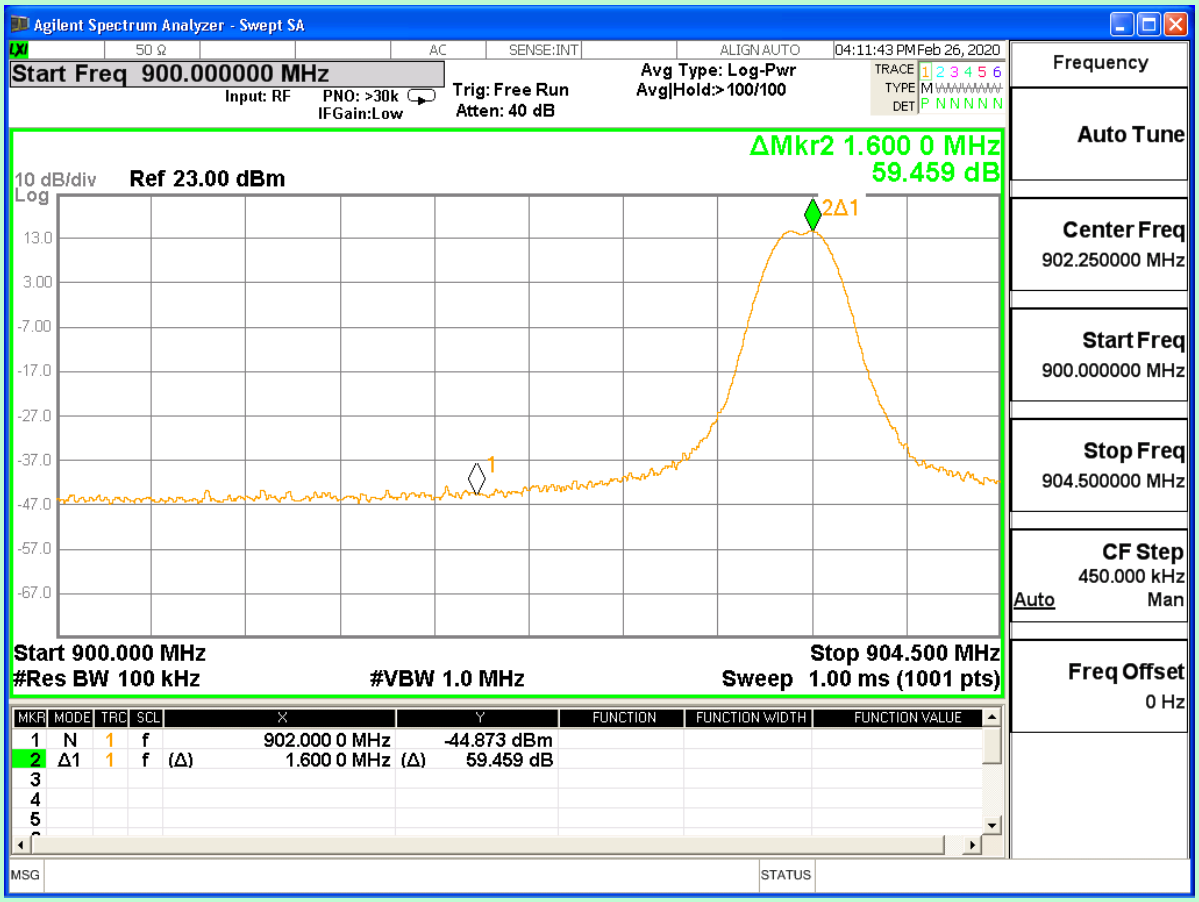
TEST PARAMETERS

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

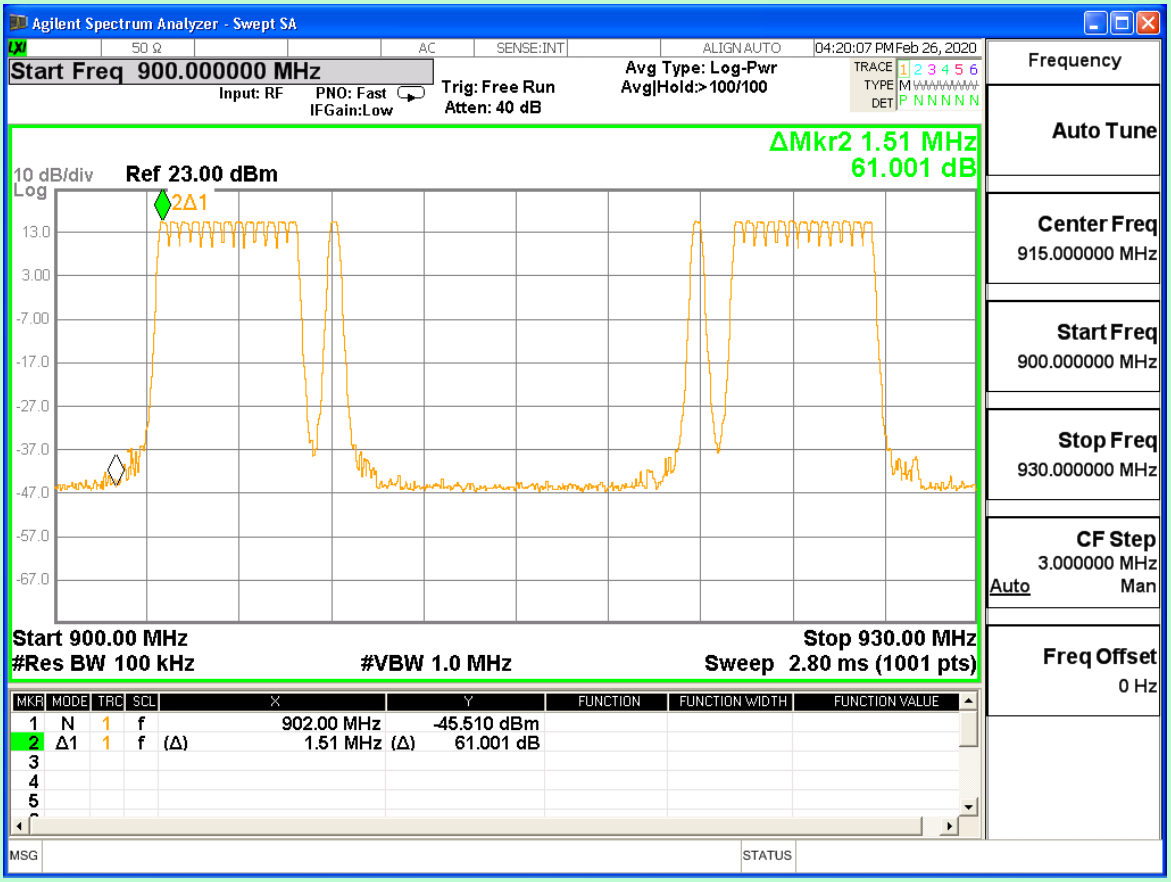
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Shunner	SF104/2X11PC3542/500	NA	NA

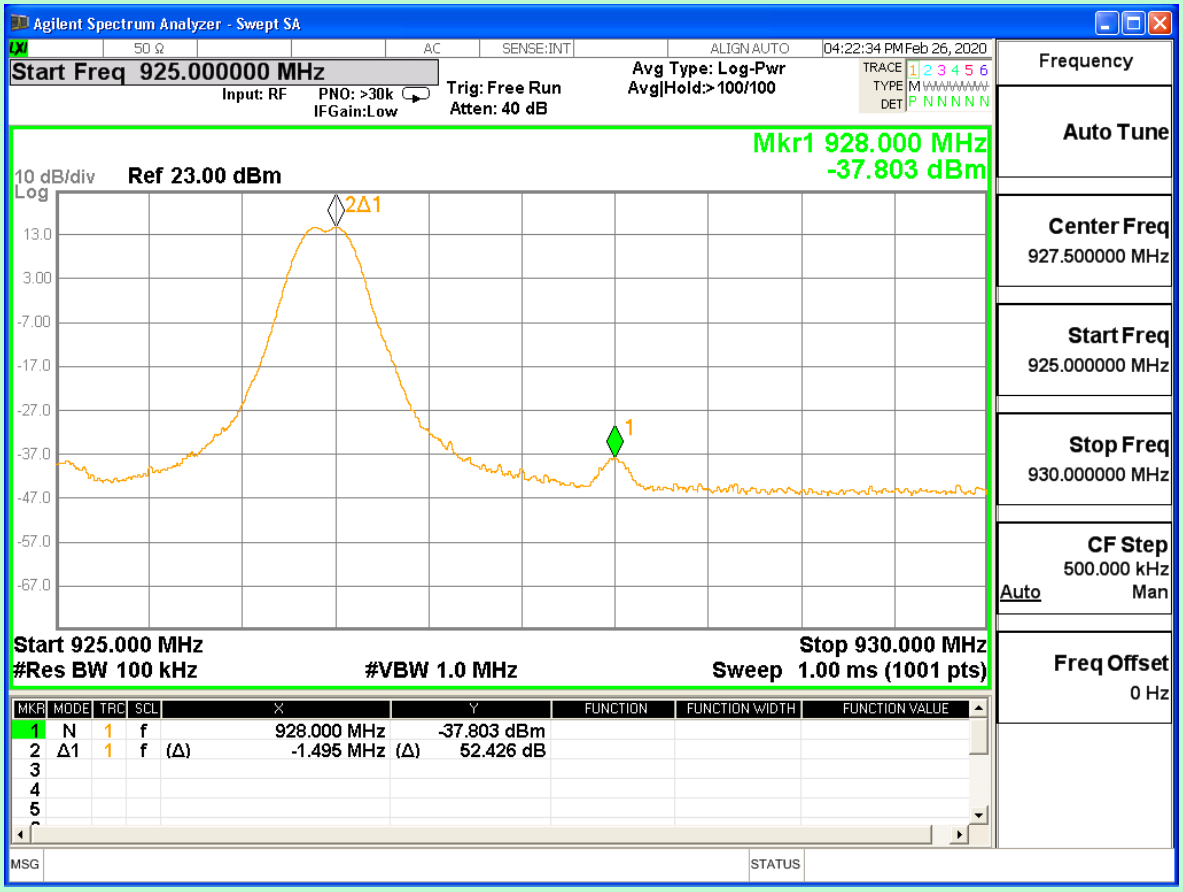
TEST GRAPHS



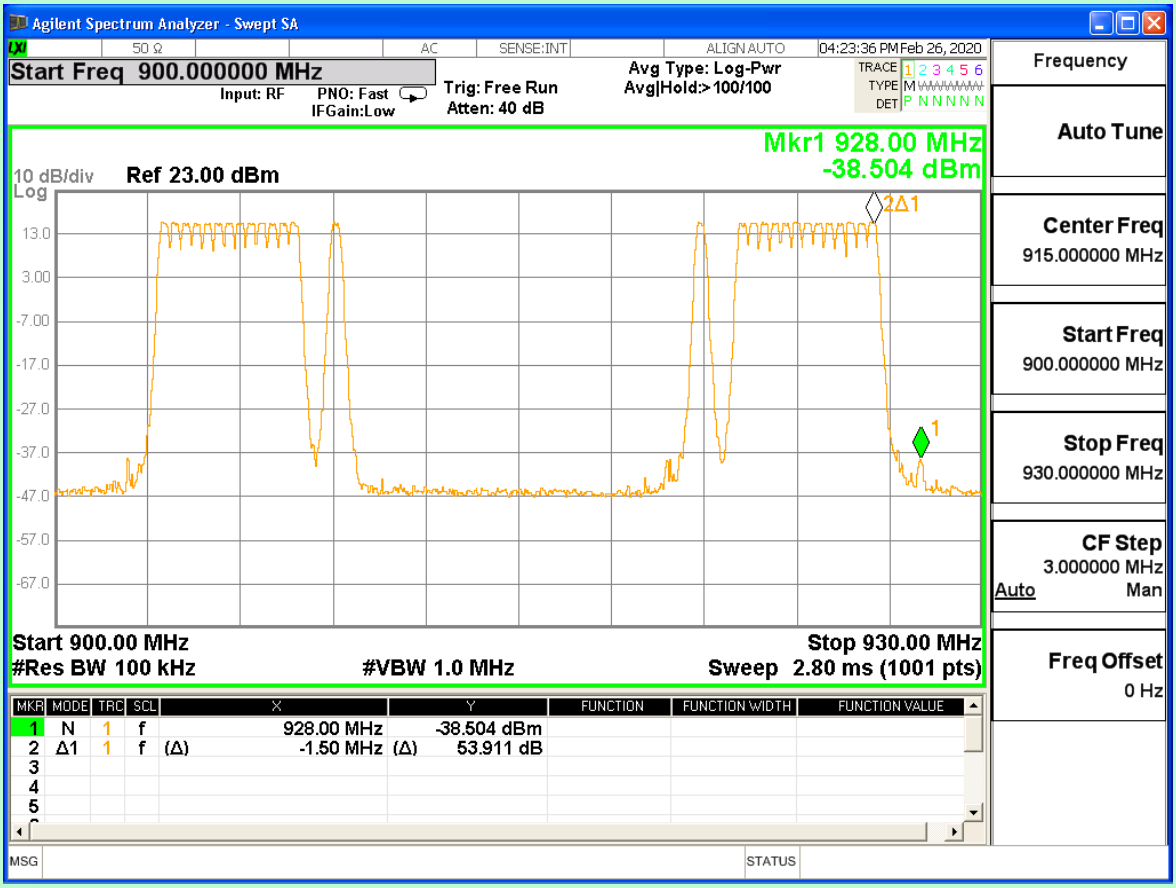
Band-edge at 902 MHz - Channel 1 (903.55 MHz)



Band-edge at 902 MHz – Hopping Enabled



Band-edge at 928 MHz - Channel 55 (926.45 MHz)



Band-edge at 928 MHz – Hopping Enabled

TEST RESULTS					
Channel	Frequency	Measured Level-Single Channel	Measured Level – FHSS Enabled	Limit	Test Results
#	MHz	dBc	dBc	dBc	
1	903.55	59.45	61.00	≥20	PASS
55	926.45	52.42	53.91	≥20	PASS

TEST SETUP PHOTOGRAPH
Refer Annexure -1 **Conducted RF Test setup**

2.6 TIME OF OCCUPANCY (DWELL TIME)

EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std.	NA		
Applicable	FCC Part 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

Method	Radiated ☐	Conducted ☒

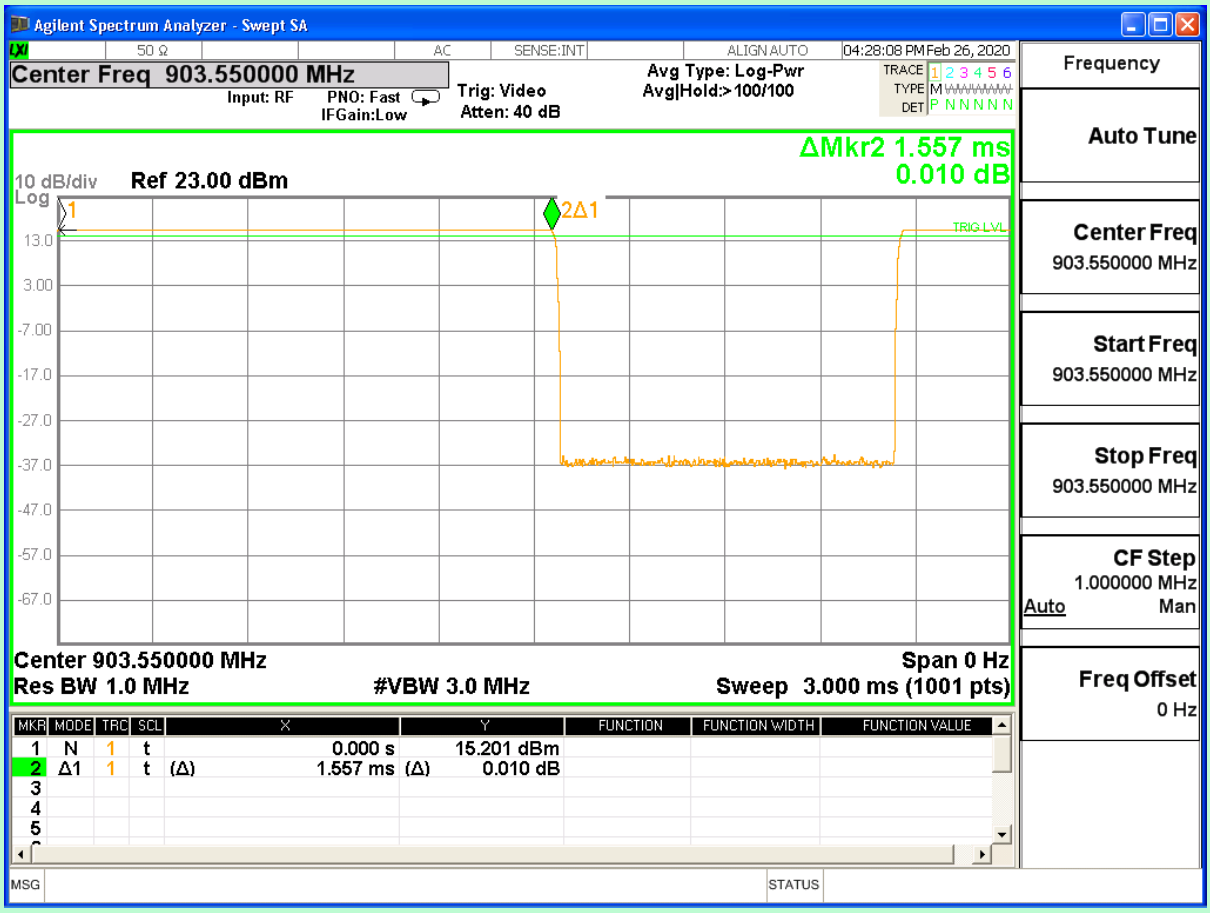
TEST PARAMETERS

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

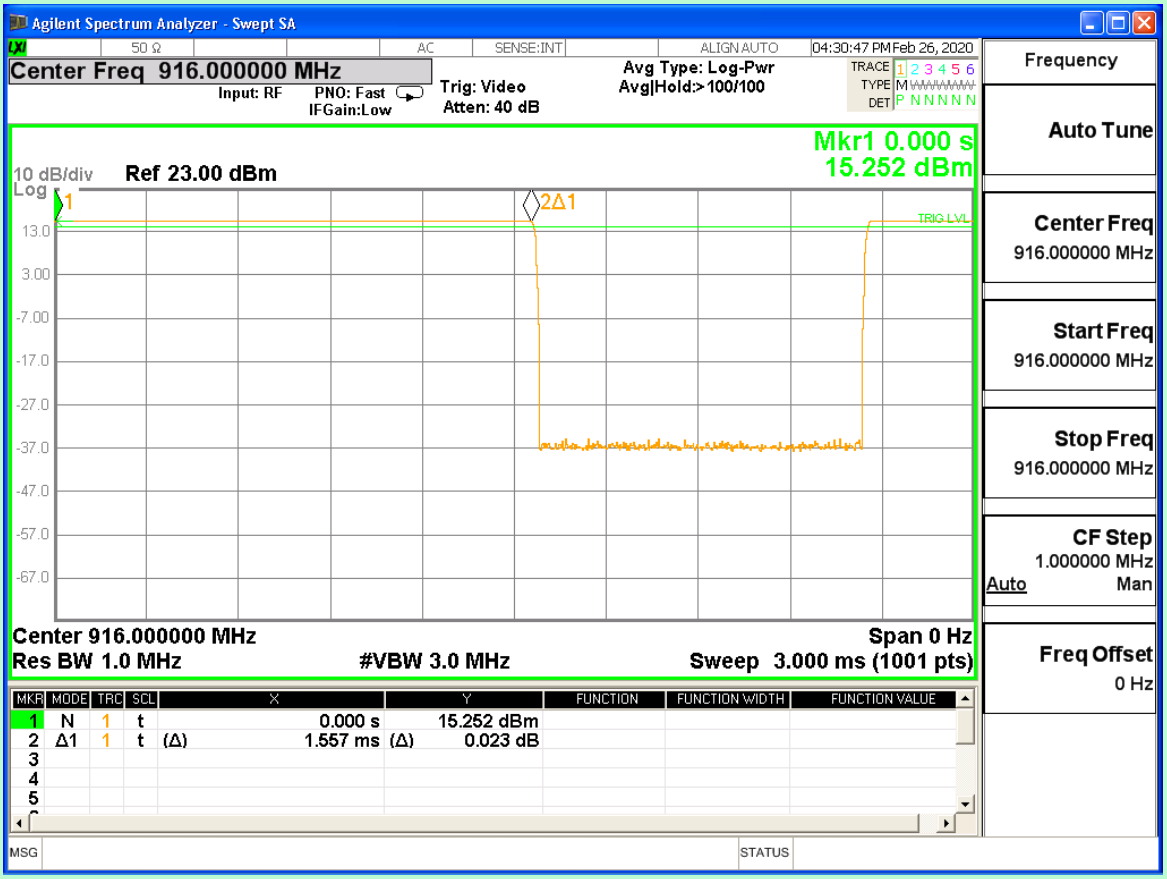
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

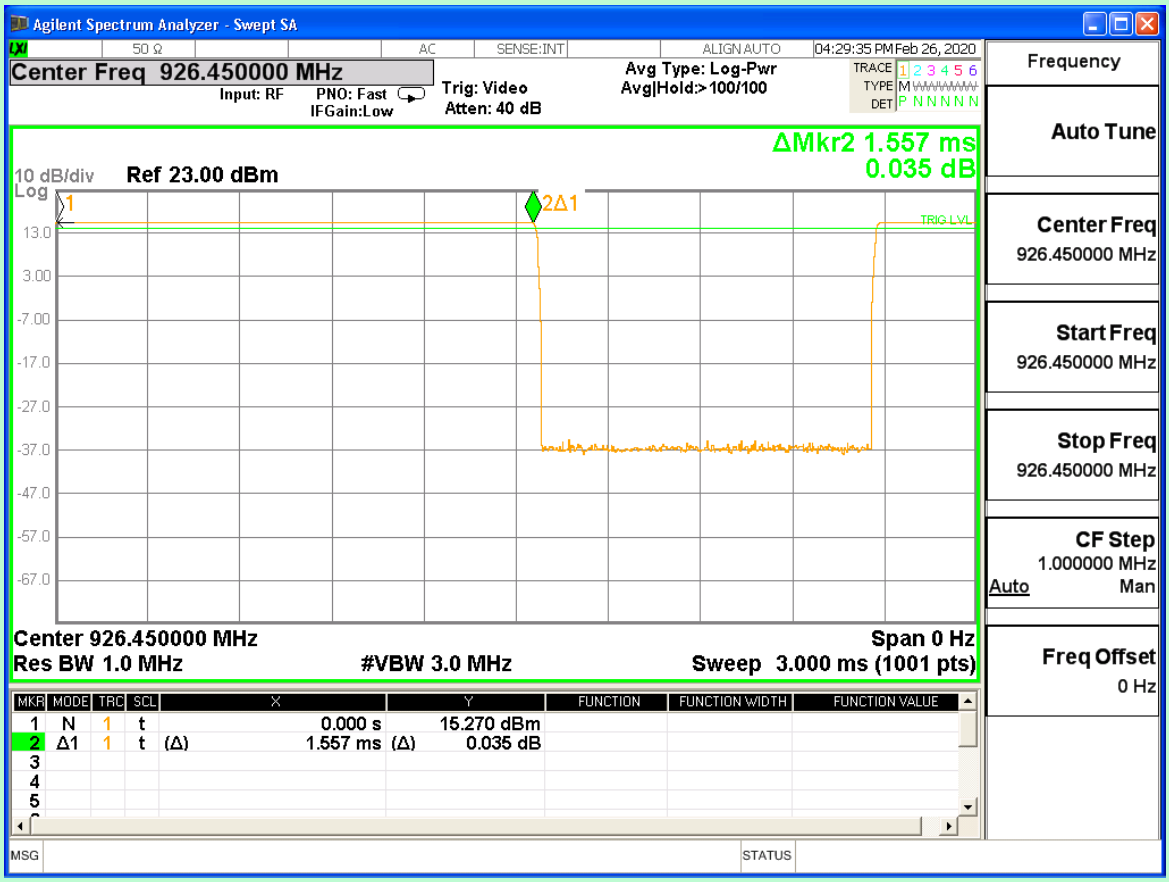
TEST GRAPHS



Channel 1 (903.55 MHz)



Channel 28 (916MHz)



Channel 55 (926.45 MHz)

TEST RESULTS						
Channel	Frequency	Measured Dwell Time	No. of Bursts	Total Dwell Time in 10Sec	Limit	Test Results
#	MHz	msec	#	msec	msec	
1	903.55	1.557	15	23.35	≤400	PASS
28	916	1.557	15	23.35	≤400	PASS
55	926.45	1.557	15	23.35	≤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 No.**	EMC0420-1
Model No.	FW-RM	**Serial No.**	107
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3Vdc		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std.	NA		
Applicable	FCC Part 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

Method	Radiated ☐	Conducted ☒

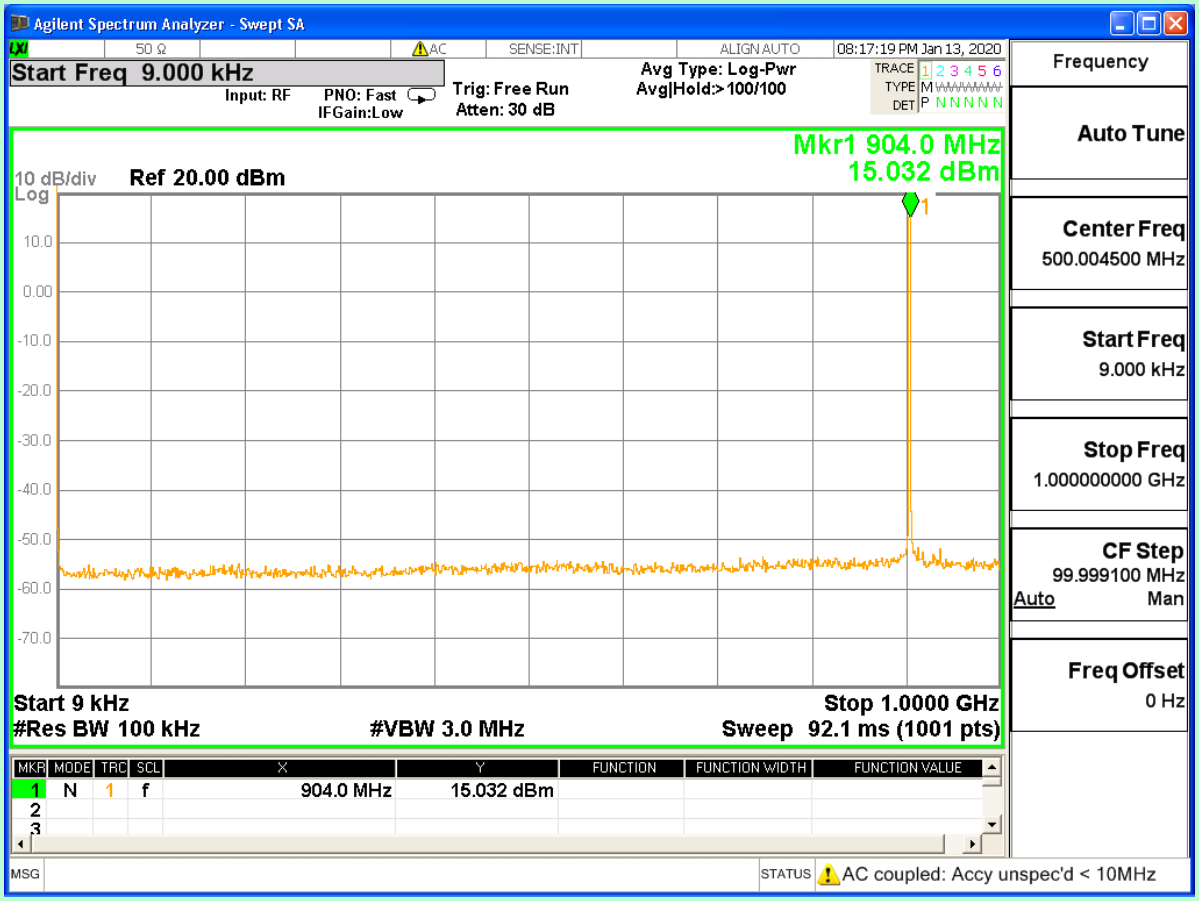
TEST PARAMETERS

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

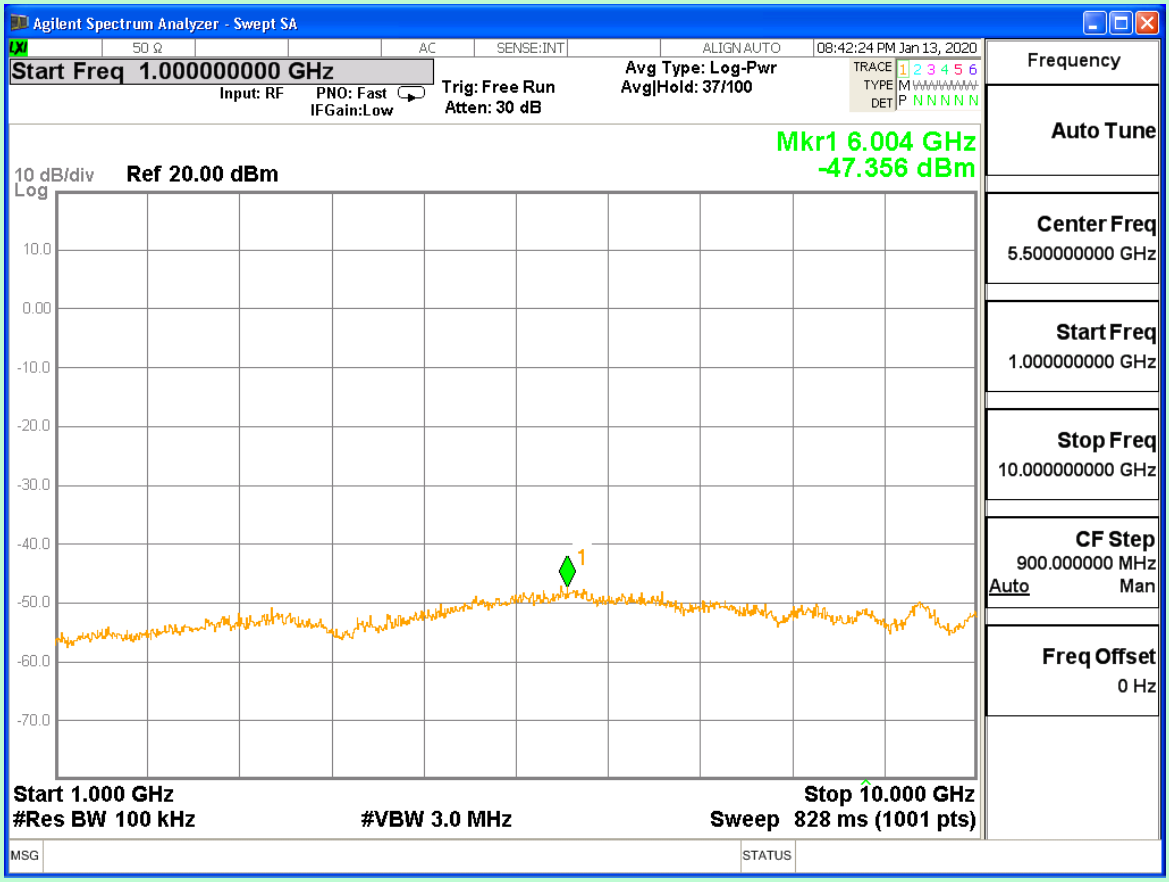
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

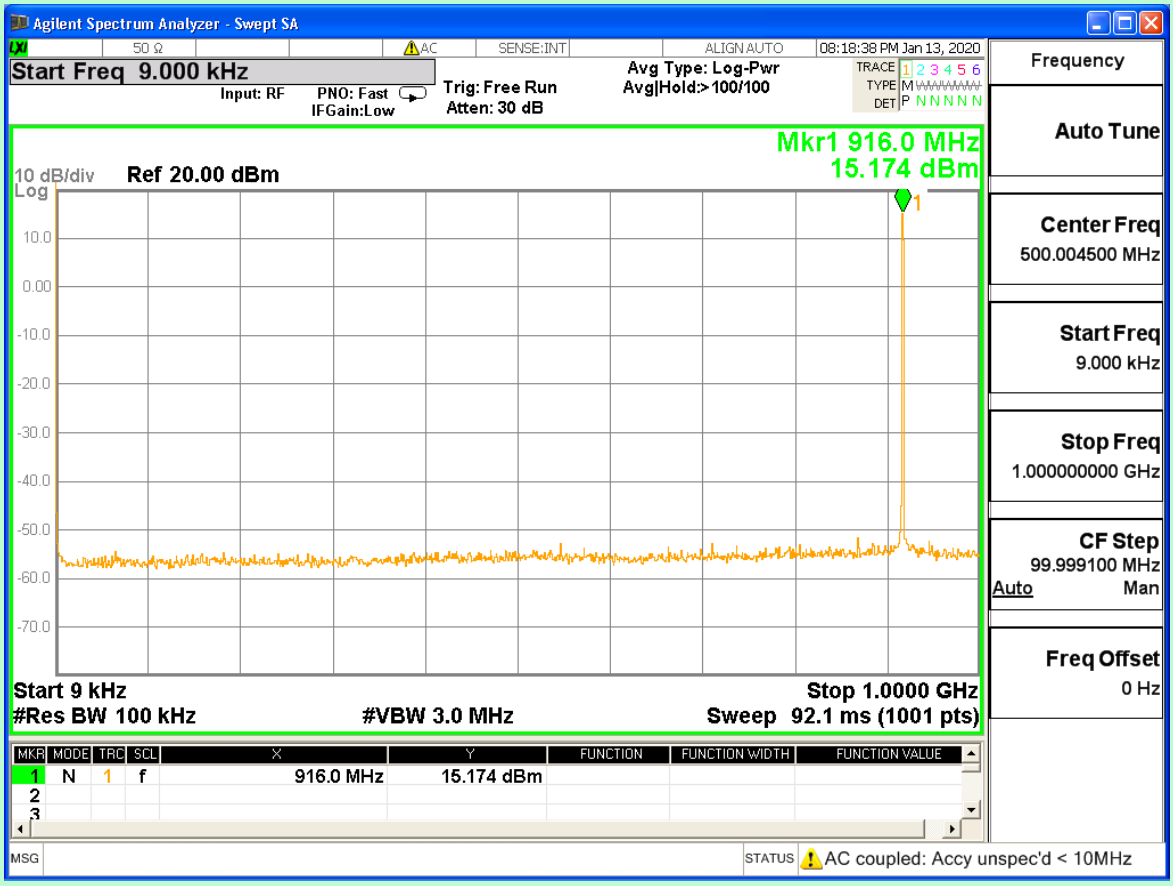
TEST GRAPHS



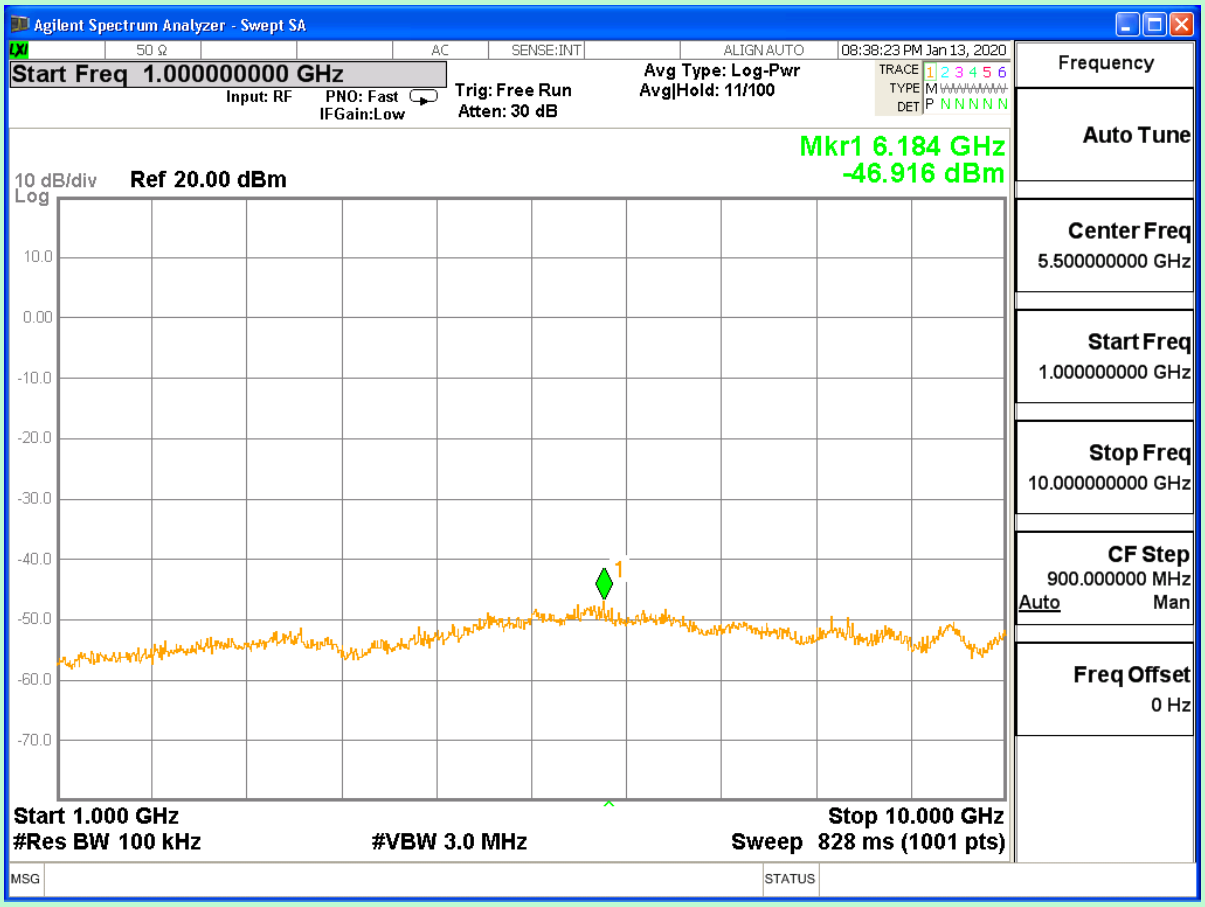
Channel 1 (903.55 MHz) 9KHz to 1GHz



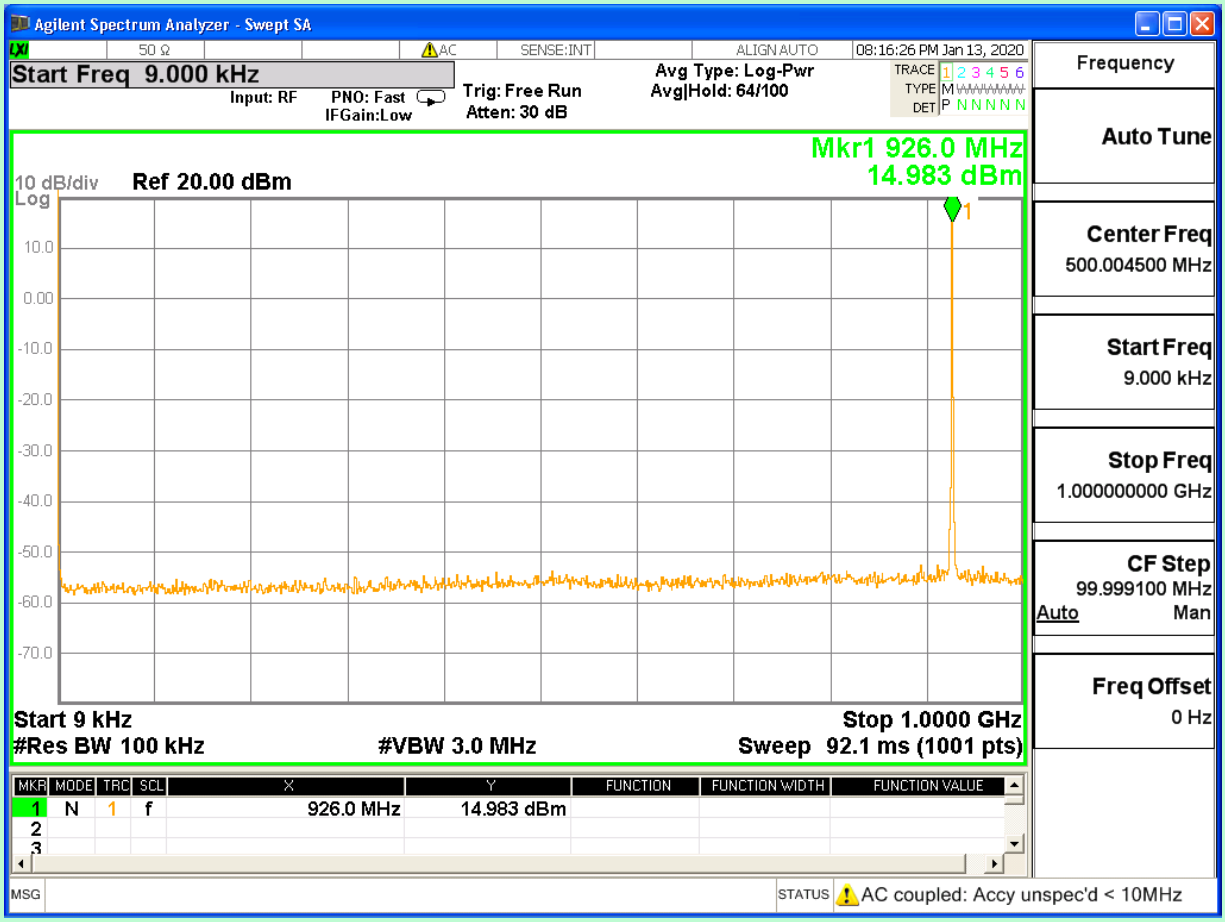
Channel 1 (903.55 MHz) 1GHz to 10GHz



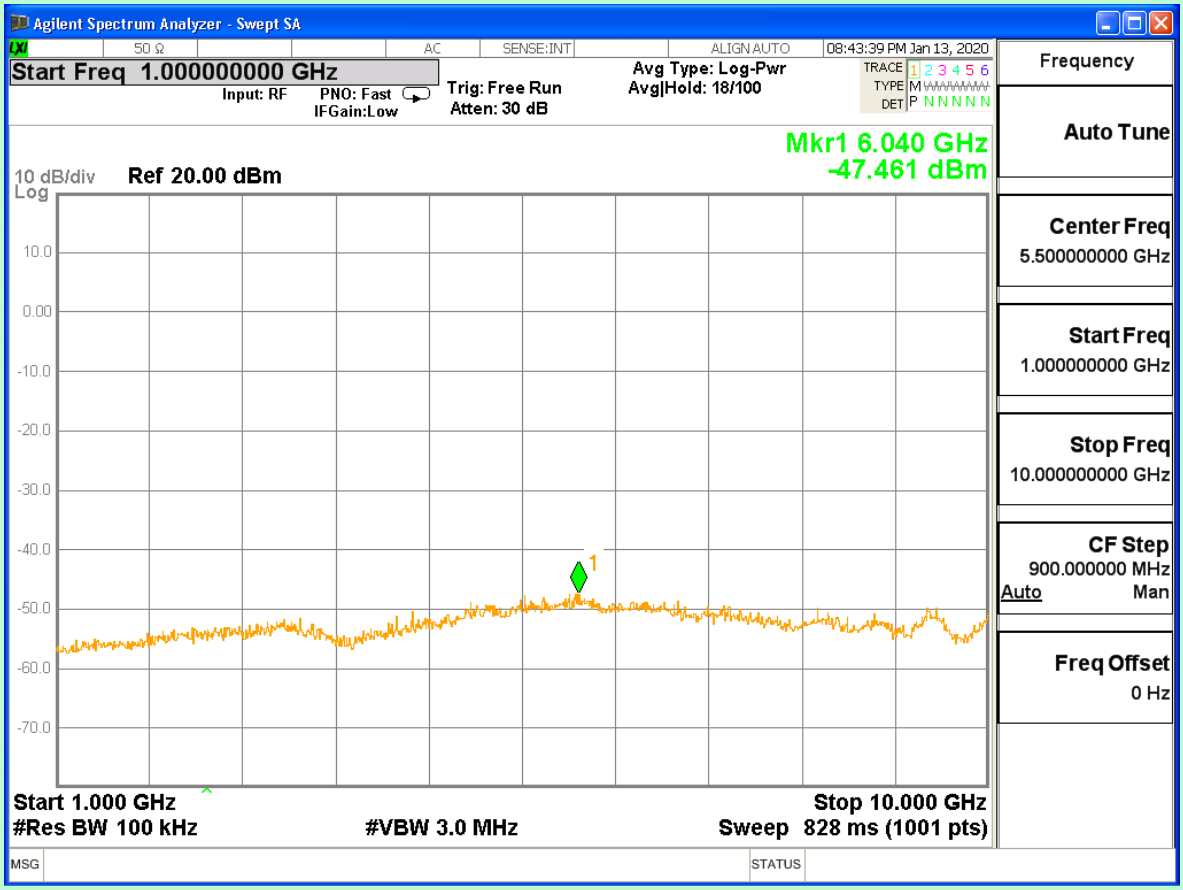
Channel 28 (916MHz) 9KHz to 1GHz



Channel 28 (916MHz) 1GHz to 10GHz



Channel 55 (926.45 MHz) 9KHz to 1GHz



Channel 55 (926.45 MHz) 1GHz to 10GHz

TEST RESULTS							
Channel	Frequency	Measured Parameters			Difference (B-A)	Limit	Test Results
#	MHz	Spurious Frequency (GHz)	Spurious Level (dBm)-(A)	Fundamental Level(dBm) – (B)	dBc	dBc	
1	903.55	6.00	-47.35	15.03	62.28	>20	PASS
28	916.00	6.18	-46.91	15.17	62.45	>20	PASS
55	926.45	6.07	-47.31	14.98	62.00	>20	PASS

TEST SETUP PHOTOGRAPH
Refer Annexure -1 **Conducted RF Test setup**

2.8 EFFECTIVE ISOTROPIC RADIATED POWER

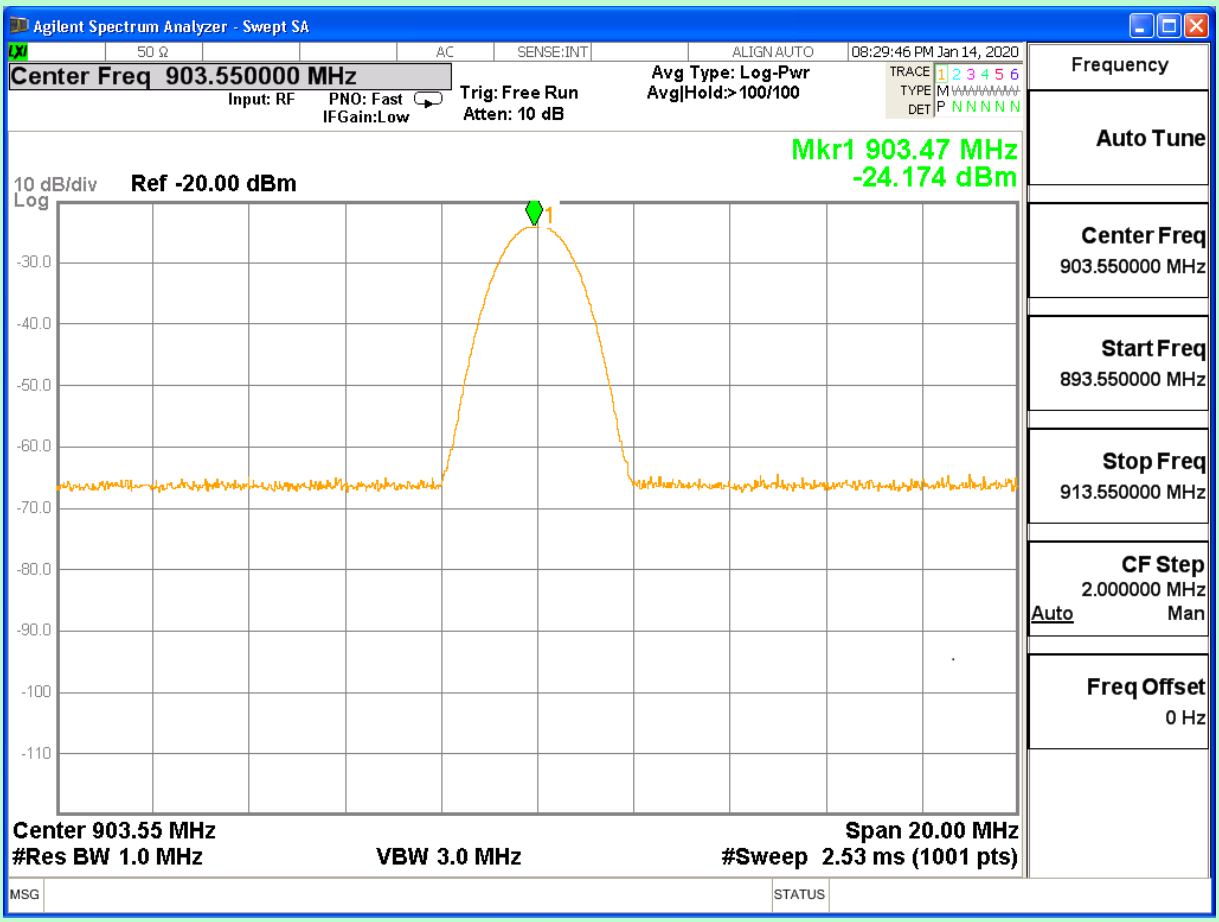
EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23 ± 2
Test End Date	28-Feb-2020	**Humidity RH (%)**	55 ± 3
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247: 2010 & 15.209 :2010		
Test Method	KDB 412172		
Comment	NA		
TEST DETAILS			
Method	☒ Radiated	☐ Conducted	
TEST PARAMETERS			
Antenna Height	1m to 4m	**Turntable Rotation**	0° to 360°
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	100525	7-Aug-20
Y	3m Semi Anechoic Chamber	ETS Lindgren	DKE 6X7 DBL.DR	1625	30-Jul-22
Y	Bilog Antenna	ETS Lindgren	HLP3003C	130525	5-Nov-21
Y	RF cable (9KHz to 18GHz)	Huber + Schuner	Sucoflex100	515518/126E	04-Oct-21

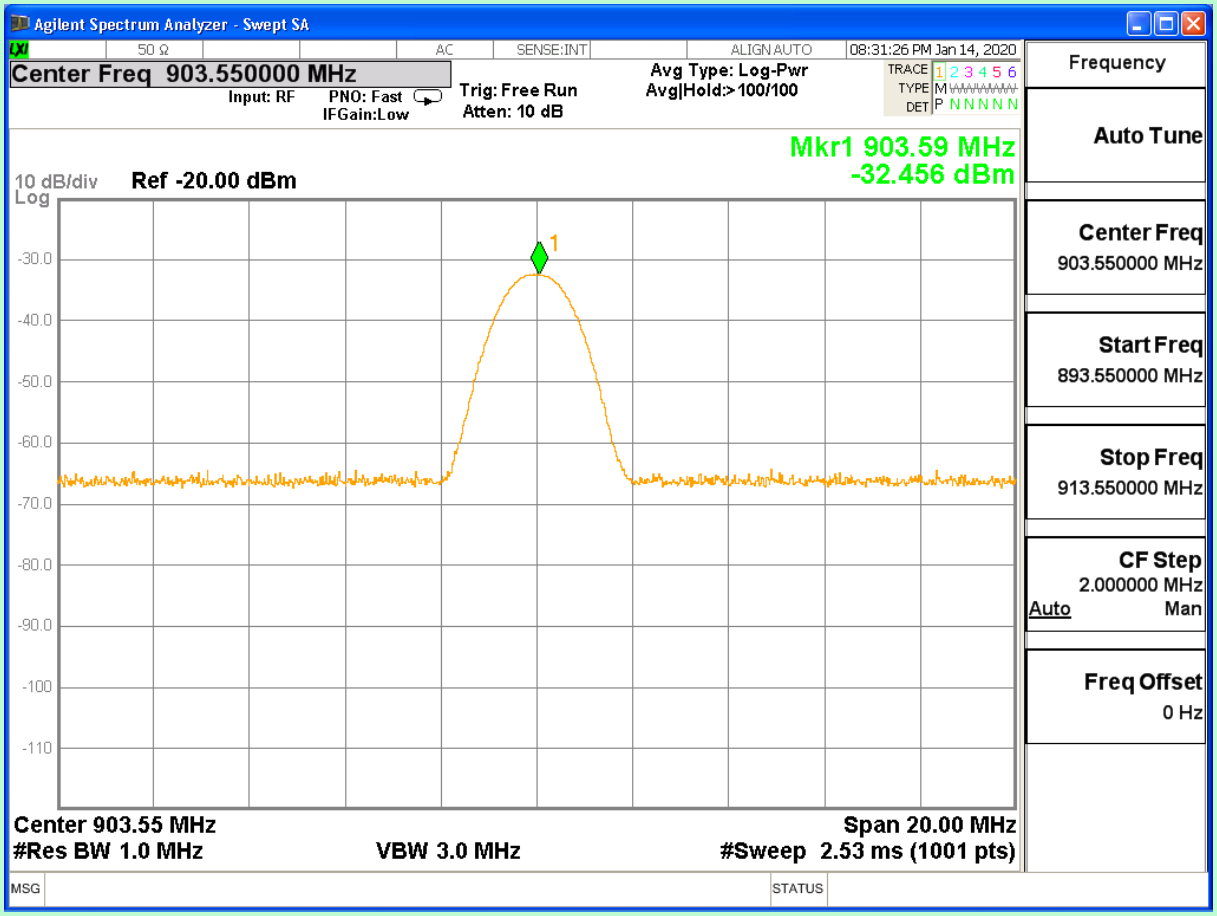
Note: Switch ON /OFF the Internal Preamplifier based on carrier level and or noise floor without overloading the receiver

TEST GRAPHS – EIRP



Antenna-1, Channel 1 (903.55 MHz)

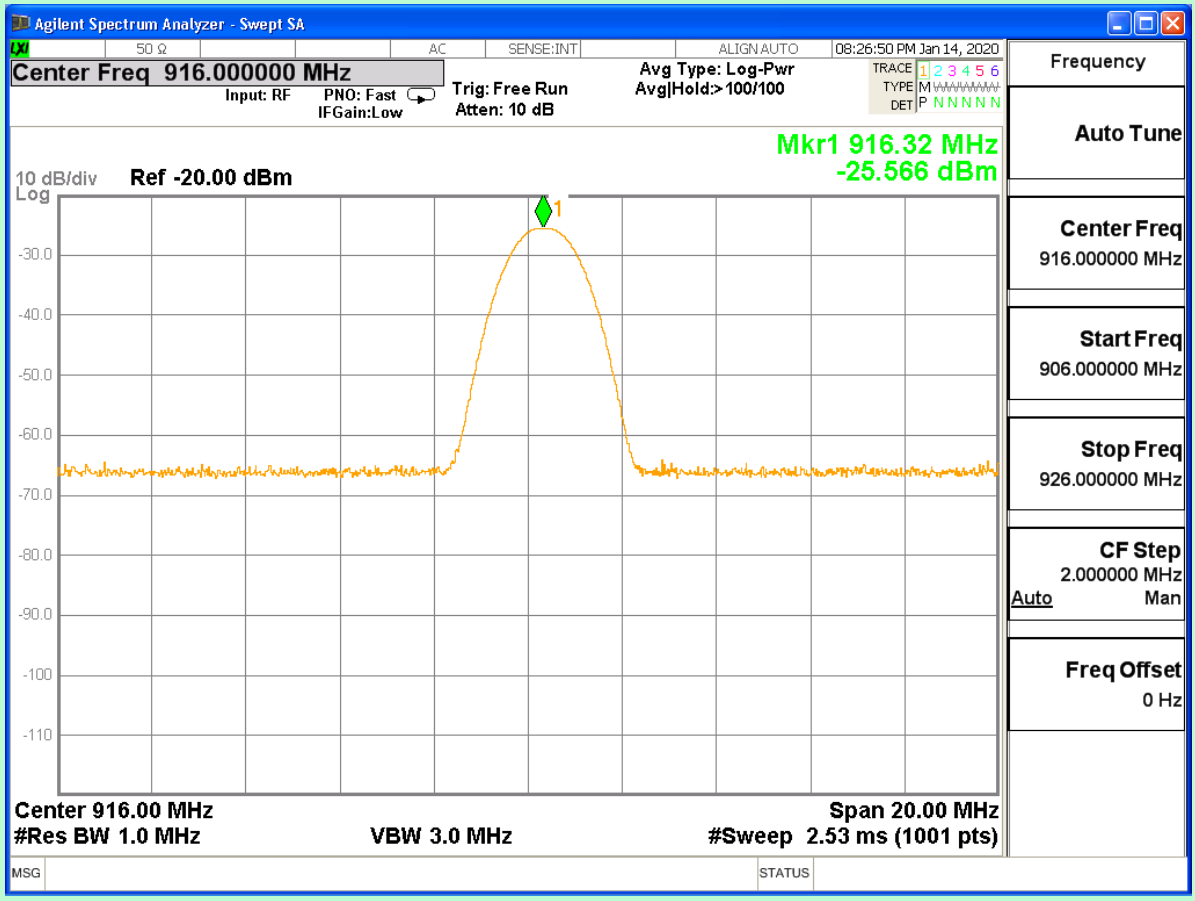
Note : Peak Graph - Horizontal polarization



Antenna-1, Channel 1 (903.55 MHz)

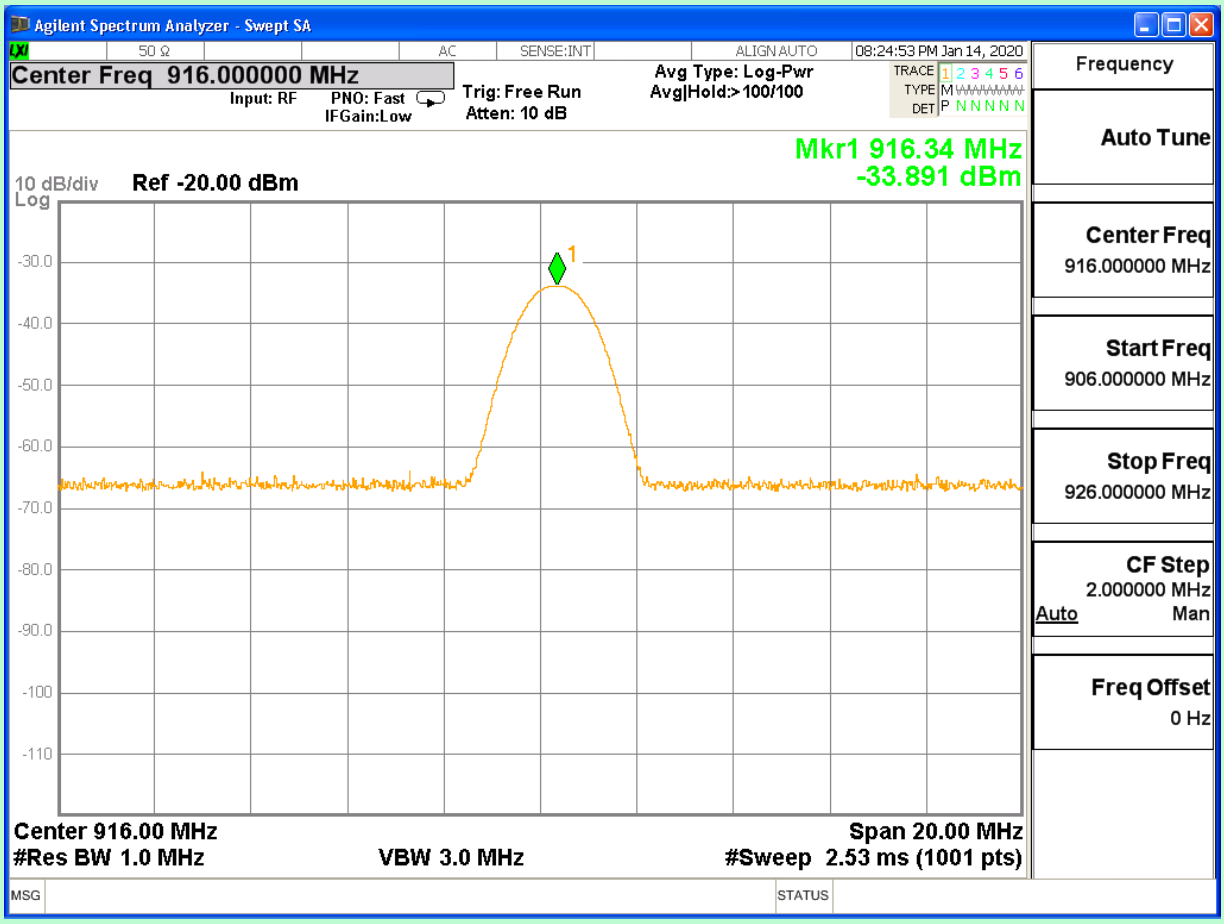
Note : Peak Graph - Vertical polarization

TEST GRAPHS – EIRP



Antenna-1, Channel 28 (916 MHz)

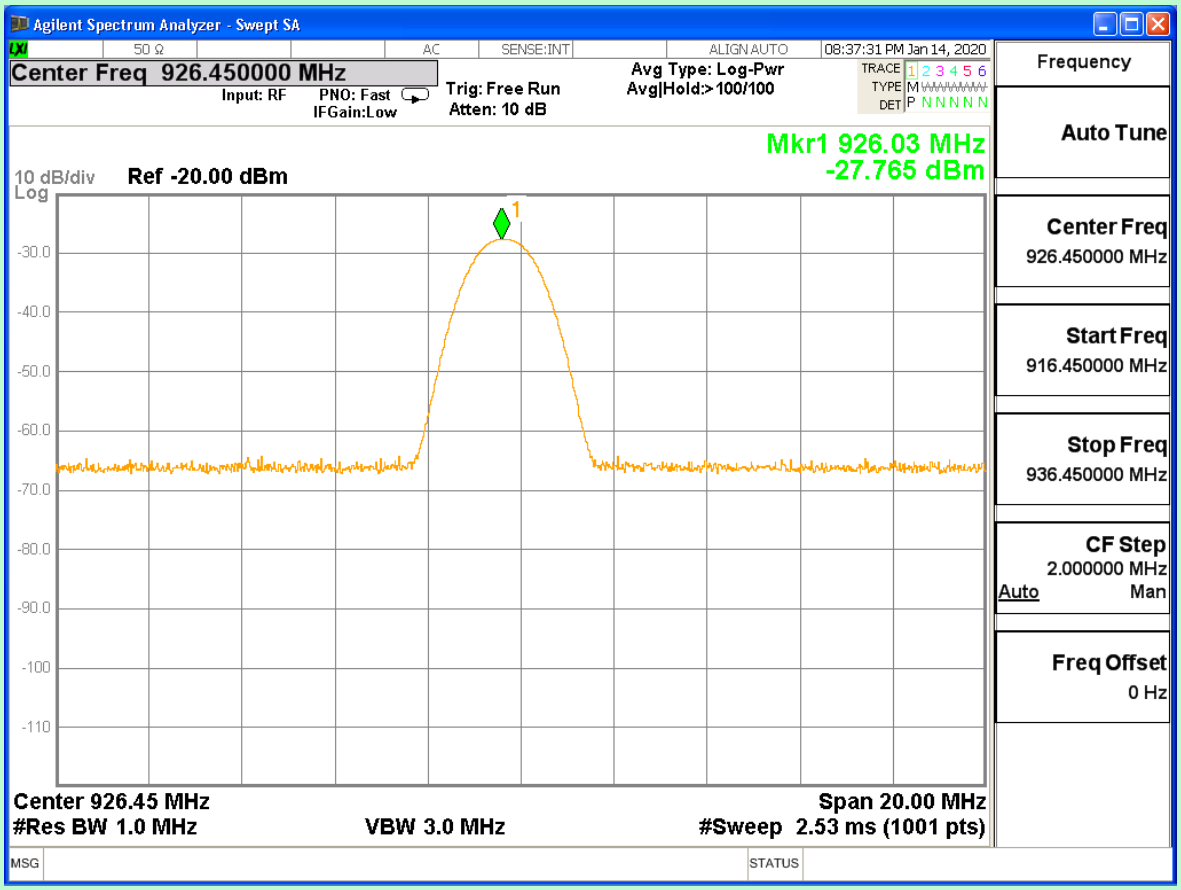
Note : Peak Graph - Horizontal polarization



Antenna-1, Channel 28 (916 MHz)

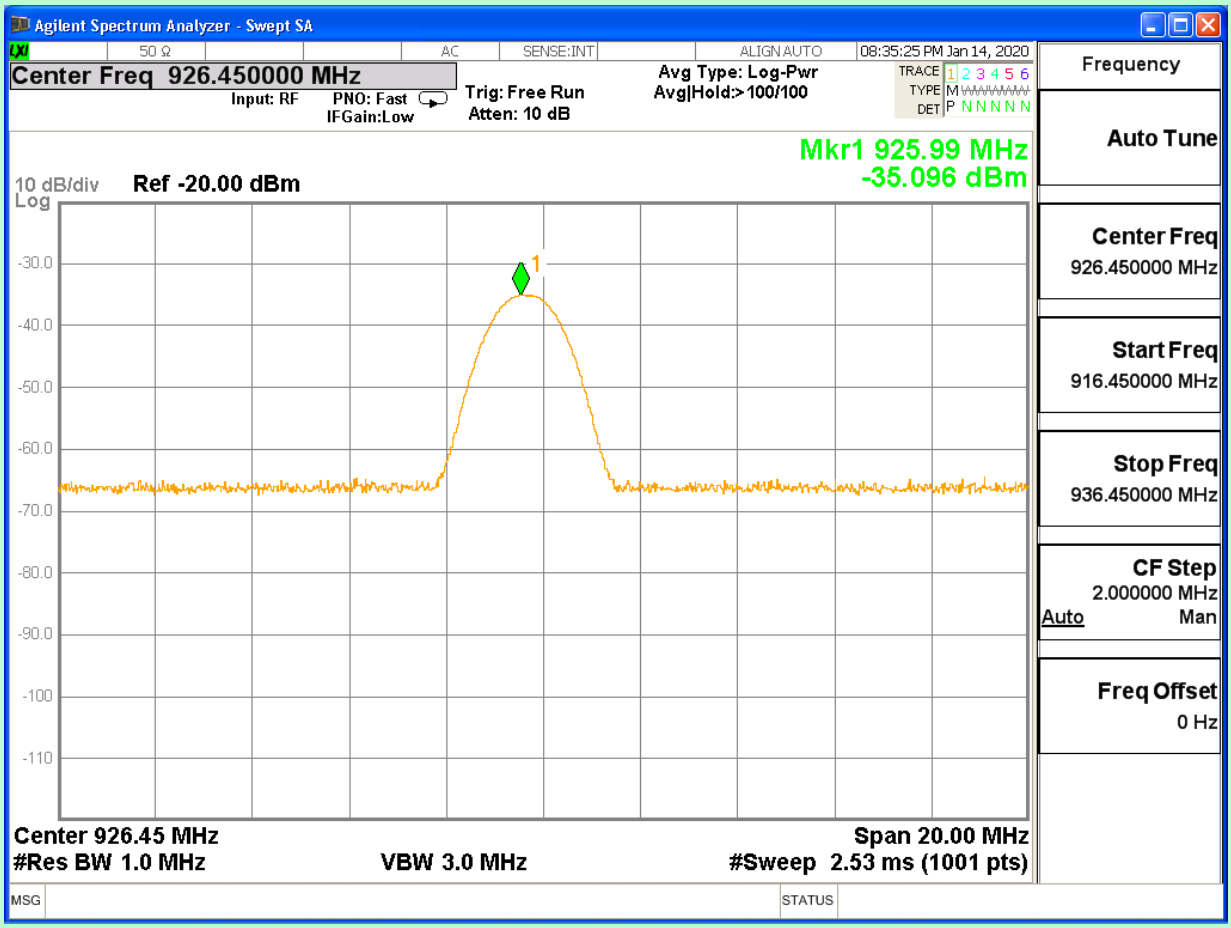
Note : Peak Graph - Vertical polarization

TEST GRAPHS – EIRP



Antenna-1, Channel 55 (926.45 MHz)

Note : Peak Graph - Horizontal polarization



Antenna-1, Channel 55 (926.45 MHz)

Note : Peak Graph - Vertical polarization

TEST RESULT – EIRP

Channel	Channel Freq	Rx Antenna Height	Rx Ant Pol	Measured Level	Cable Loss	External Att	Path loss @ 3m	Rx Antenna Gain	Calculated Rx Power	Calculated EIRP
#	MHz	cm	H/V	dBm	dB	dB	dB	dBi	dBm	dBm
Antenna – 1 (FHSS Mode)										
CH-1	903.55	175	H	-24.174	2.91	6	41.21	6.3	-21.564	19.646
CH-1	903.55	112	V	-32.45	2.91	6	41.21	6.3	-29.84	11.37
CH-28	916	135	H	-25.56	2.91	6	41.21	6.3	-22.95	18.26
CH-28	916	116	V	-33.89	2.91	6	41.21	6.3	-31.28	9.93
CH-55	926.45	200	H	-27.76	2.91	6	41.21	6.3	-25.15	16.06
CH-55	926.45	114	V	-35.09	2.91	6	41.21	6.3	-32.48	8.73

Note: Effective Isotropic Radiated Power (dBm)= Pr(dBm) +Lp(dB)
Pr = Pmeas(dBm)-Gr(dBi)+Lc(dB)+Latt(dB)
Lp =20Log F+20LogD-27.5
Where:
Pr =Calculated Received Power Level(dBm)
Lp= Free Space Path Loss(dB)
Pmeas= Measured Power Level(dBm)
Gr = Receiver Antenna Gain(dBi)
Lc = Cable Loss (dB)
Latt= External Attenuator(dB)
F = Frequency (MHz)
D= Distance (m)

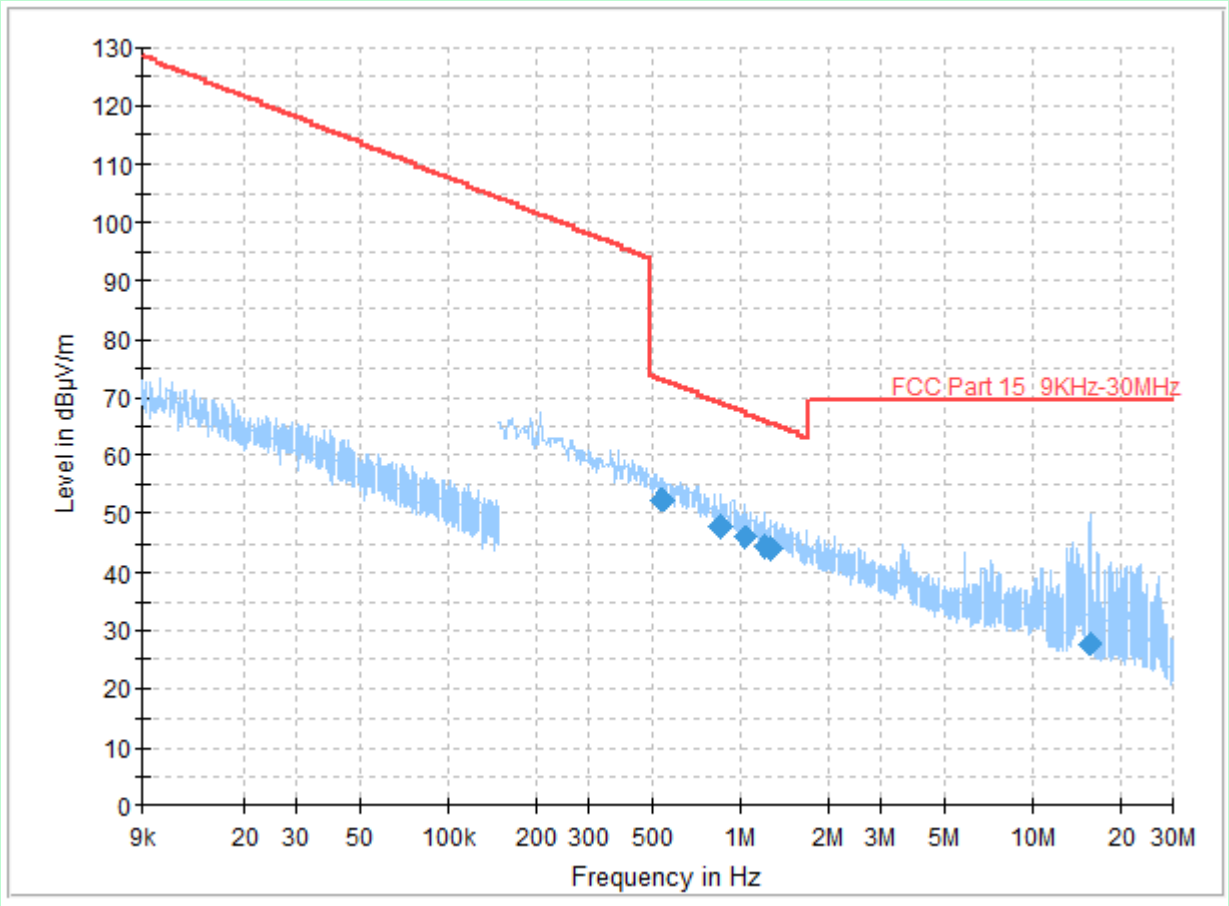
2.9 SPURIOUS RADIATED EMISSIONS			
EUT Nomenclature	Wireless Photo Detector	**Test Report No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23 ± 2
Test End Date	28-Feb-2020	**Humidity RH (%)**	55 ± 3
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3V, 24mA		
Operating Mode	Refer Page 6 Operating Modes Table		
Test configuration	Refer Page 6 Test Configuration Table		
Deviation from Std	NA		
Comment			
TEST FREQUENCY RANGE			
Start Frequency	9KHz	**Stop Frequency**	10GHz
MAXIMUM OPERATING FREQUENCY			
902MHz to 928MHz			
TEST PARAMETERS			
Antenna Height	1m to 4m	**Turntable Rotation**	0° to 360°
Applicable standard	FCC Part 15.247 & 15.209 :2010	**Test Method**	DA 00-705, ANSI C63.10 - 2013
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	7-Aug-20
Y	3m Semi Anechoic Chamber	ETS Lindgren	DKE 6X7 DBL.DR	1625	30-Jul-22
Y	Double Ridge Guide Horn Antenna	ETS Lindgren	3117	64055	1-Nov-21
Y	Bilog Antenna	ETS Lindgren	HLP3003C	130525	5-Nov-21
Y	Loop Antenna	ETS Lindgren	6507	103694	15-Nov-21
Y	RF cable (9KHz to 18GHz)	Huber + Schuner	Sucoflex100	515518/126E	04-Oct-21
Y	Signal Conditioning unit	R&S	SCU-18	10178	5-Jun-20
Y	High Pass Filter	Wainwright	WHKX1.5/15G-12ST	1	24-Feb-21
Y	EMC32 Software	R&S	8.30.0	820-OT101248	NA

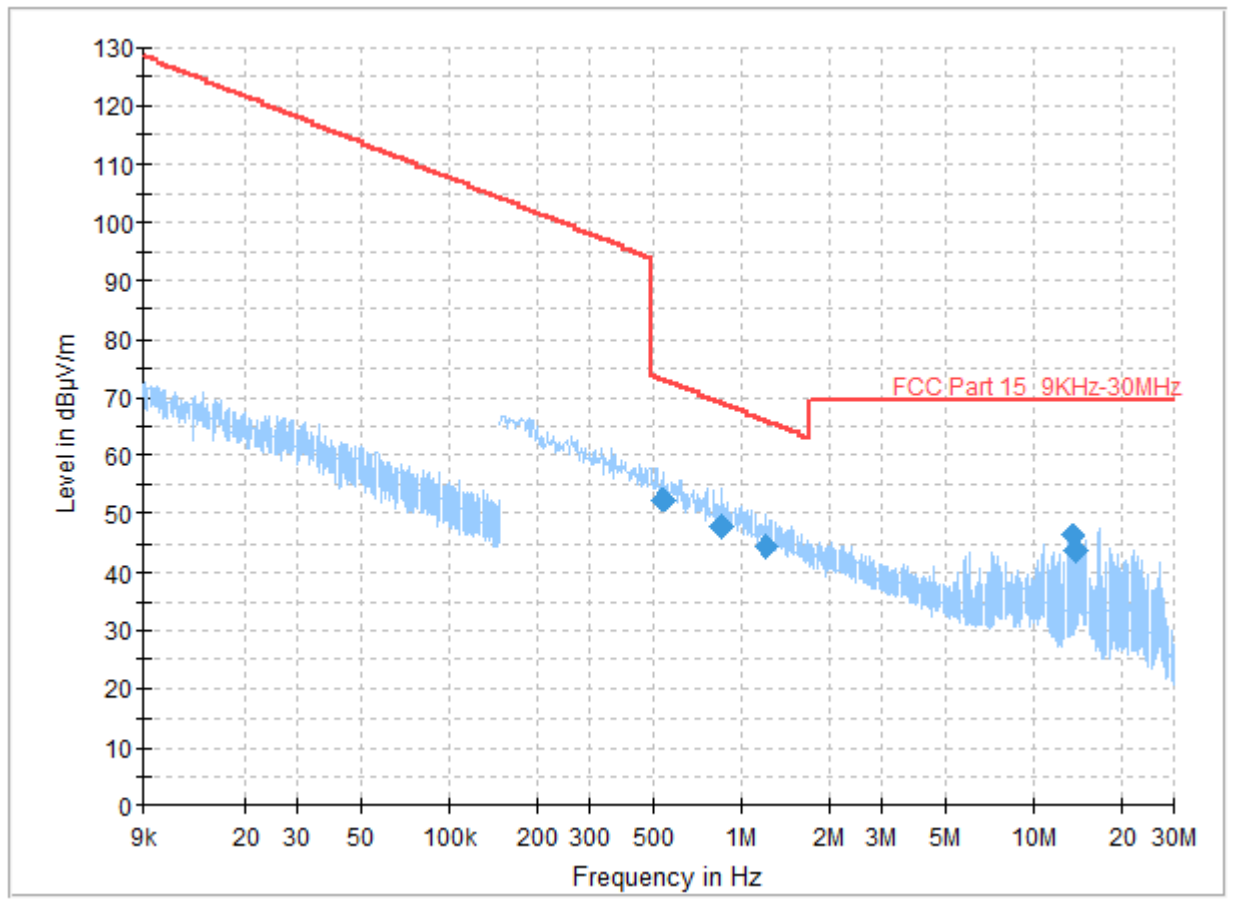
Note: Switch ON /OFF the Internal Preamplifier based on carrier level and or noise floor without overloading the receiver

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



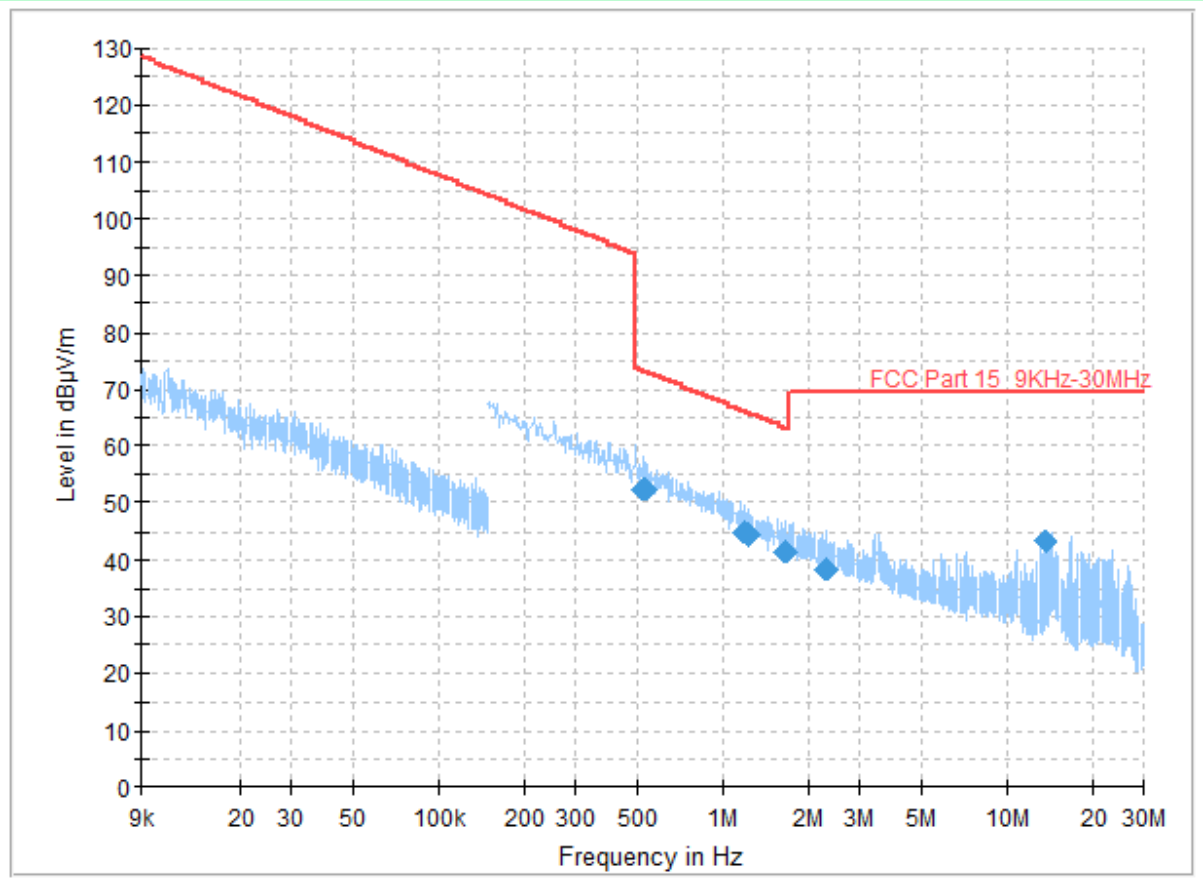
Channel 1 (903.55MHz) – Parallel

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



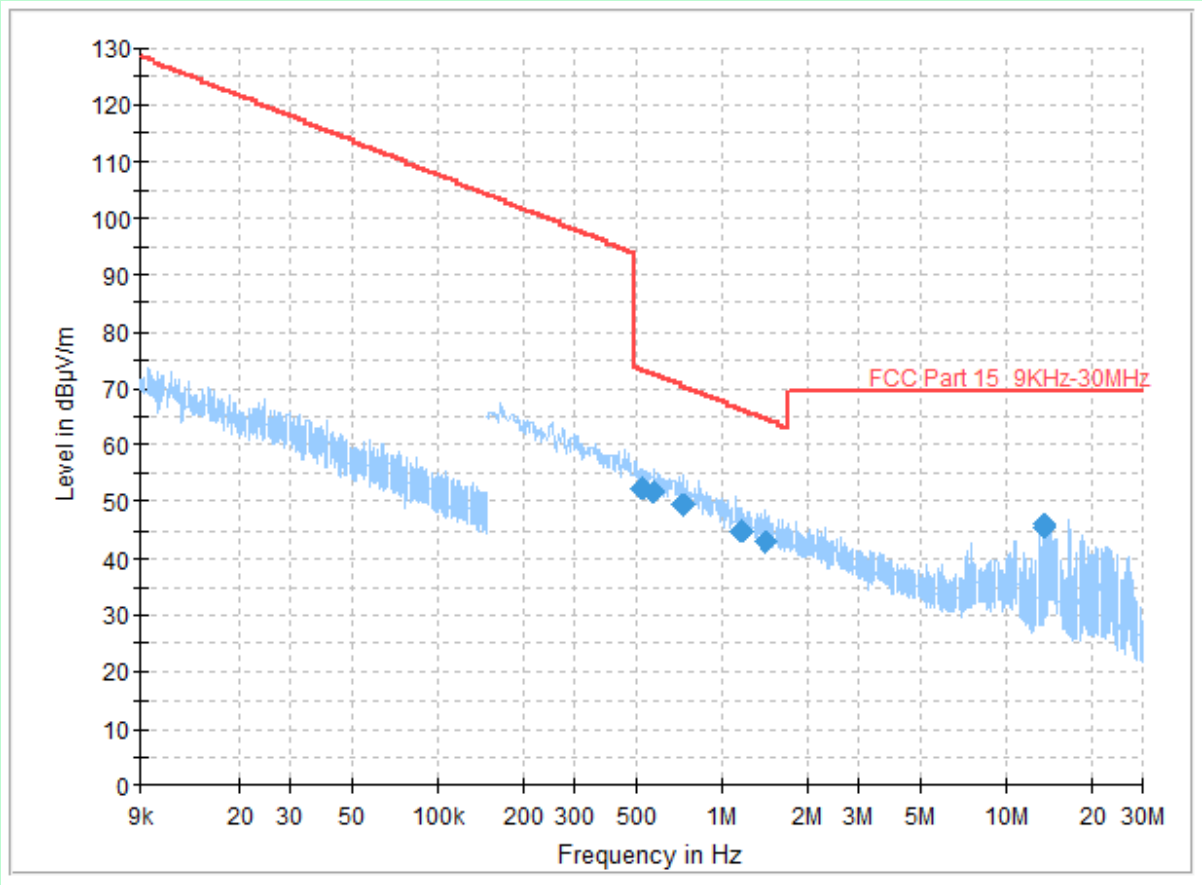
Channel 1 (903.55MHz) – Perpendicular

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



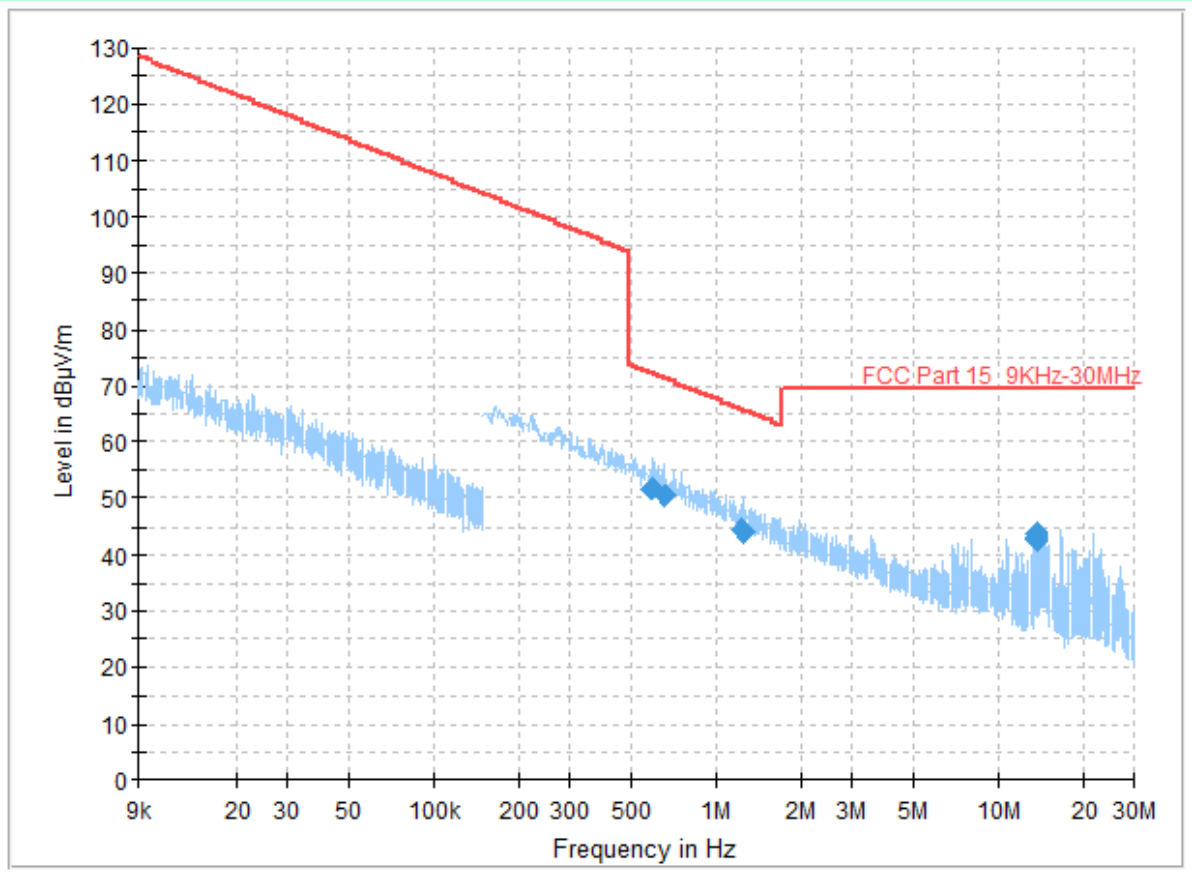
Channel 28 (916 MHz) – Parallel

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



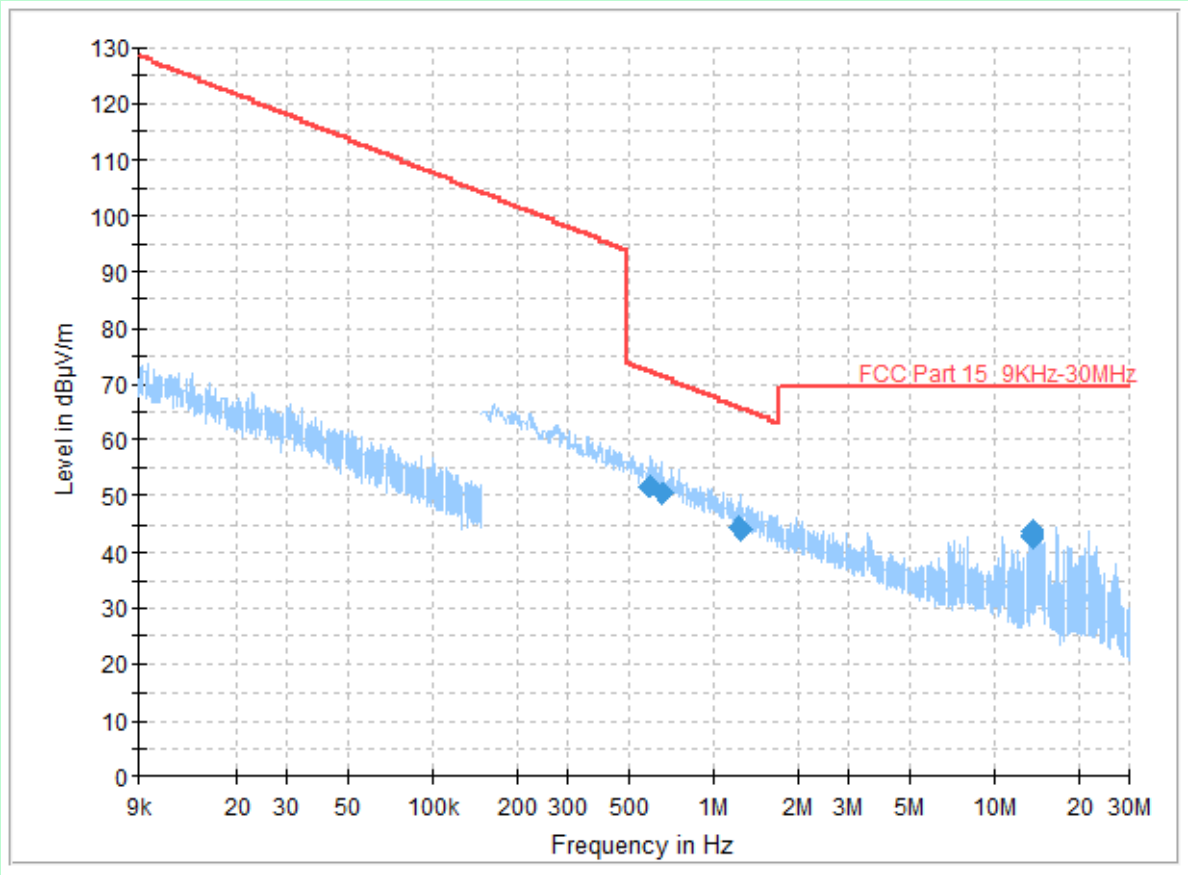
Channel 28 (916 MHz) – Perpendicular

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



Channel 55 (926.45MHz) – Parallel

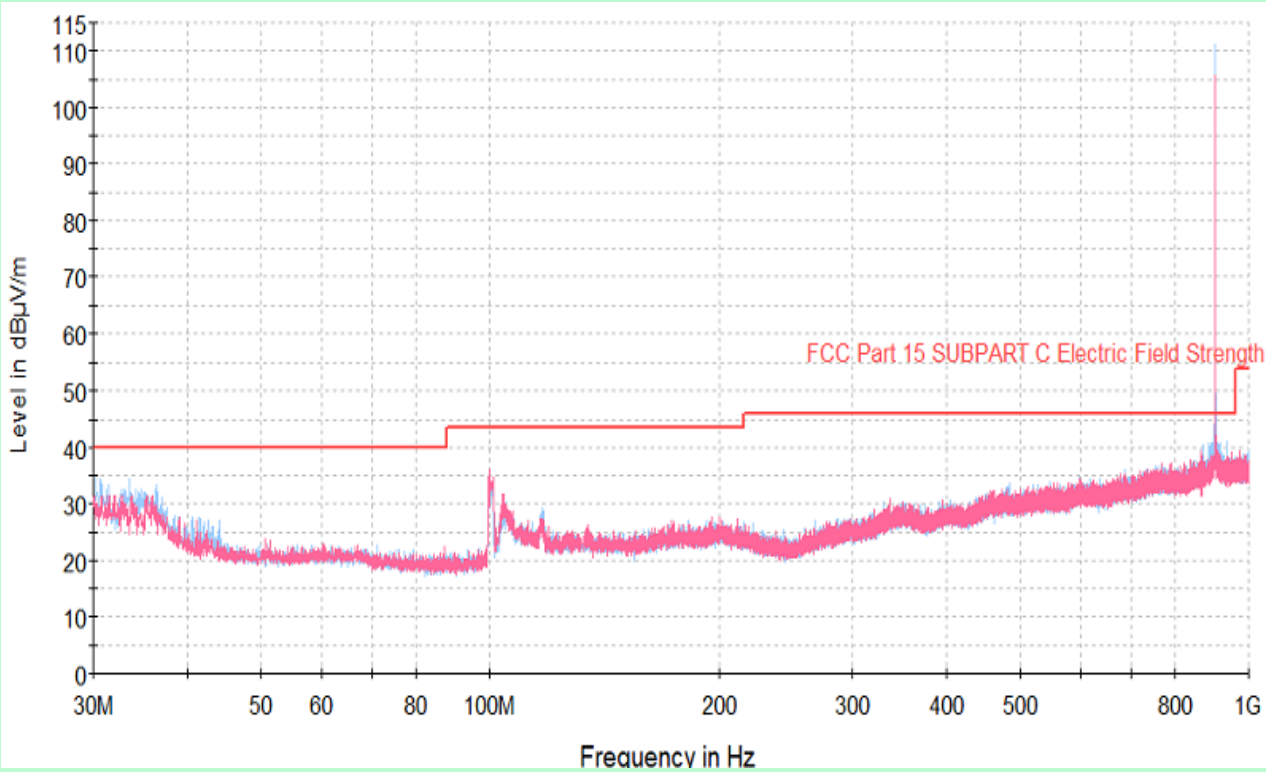
TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



Channel 55 (926.45MHz) – Perpendicular

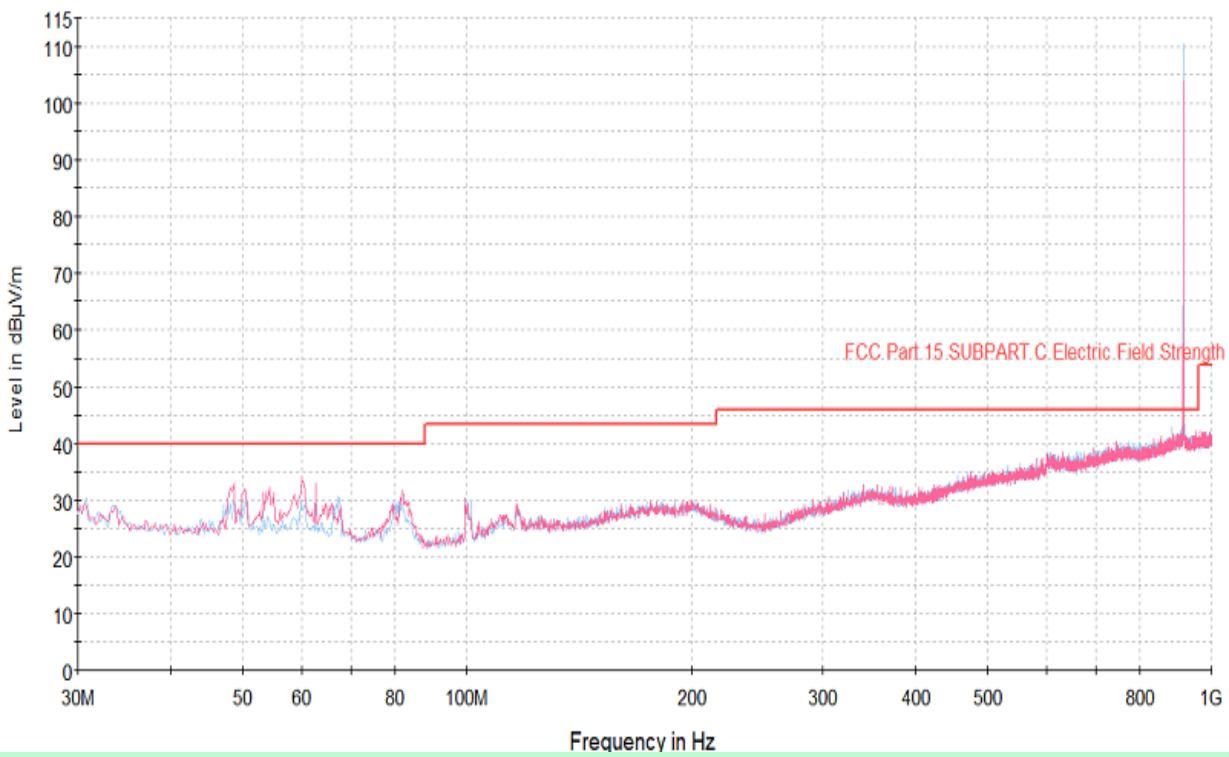
TEST RESULT – 9 KHz to 30 MHz									
Channel	Channel Frequency	Measured Spurious	Quasi Peak	Height	Ant Pol	Azimuth	Margin	Limit @ 3m Distance	Results
#	MHz	MHz	dBµV/m	cm	Parallel / Perpendicular	deg	dB	dBµV/m	
No emissions detected that are a product of the transmitter. Emissions shown in the plot are related to the chamber ambient									
NOTE: Measured Field Strength –dBuV/m (9 KHz to 1 GHz) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)									

TEST GRAPHS – 30MHz to 1GHz (Antenna 1)



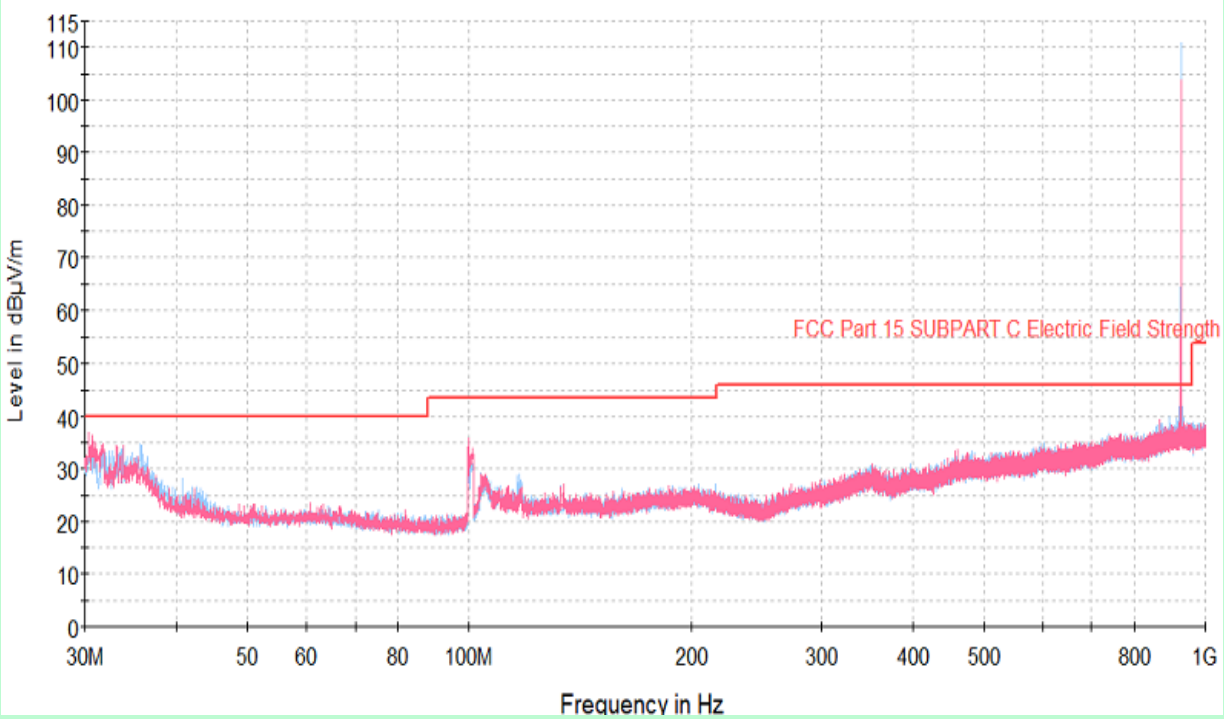
Channel 1 (903.55MHz) – Antenna 1

TEST GRAPHS – 30MHz to 1GHz (Antenna 1)



Channel 28 (916.0MHz) – Antenna 1

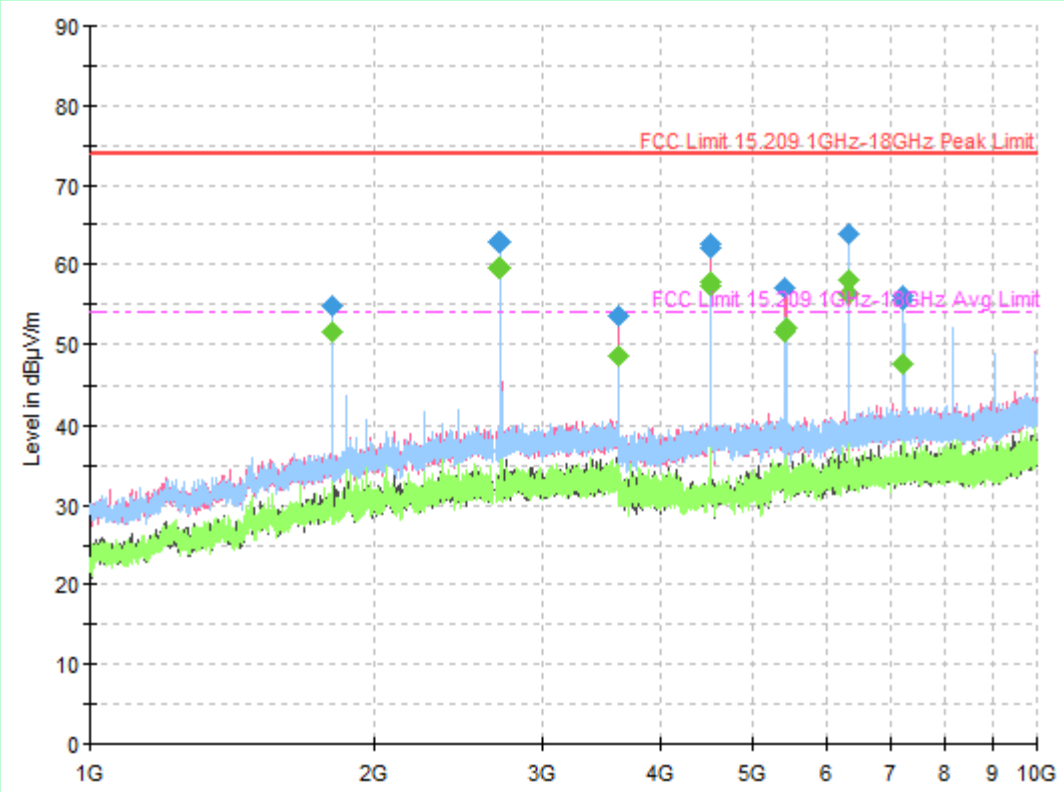
TEST GRAPHS – 30MHz to 1GHz (Antenna 1)



Channel 55 (926.45MHz) – Antenna 1

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**	
Antenna – 1								
CH-1	687.66	32.45	100	H	271	13.55	46	Pass
CH-1	692.89	32.55	400	H	101	13.45	46	Pass
CH-1	697.74	32.70	200	V	29	13.3	46	Pass
CH-1	819.38	33.91	300	V	177	12.09	46	Pass
CH-1	820.93	33.91	300	V	183	12.09	46	Pass
CH-1	832.19	34.33	400	H	0	11.67	46	Pass
CH-1	903.58	111.15	100	H	236	-	-	Intended Frequency
CH-28	672.72	32.13	100	H	226	13.87	46	Pass
CH-28	694.83	32.66	200	V	324	13.34	46	Pass
CH-28	696.77	32.64	200	H	143	13.36	46	Pass
CH-28	744.11	33.74	300	V	272	12.26	46	Pass
CH-28	836.26	34.30	400	V	17	11.7	46	Pass
CH-28	848.09	34.54	100	H	39	11.46	46	Pass
CH-28	916.38	110.77	100	H	272	-	-	Intended Frequency
CH-55	599.97	31.20	200	V	329	14.8	46	Pass
CH-55	690.95	32.47	200	V	185	13.53	46	Pass
CH-55	695.61	32.62	100	V	12	13.38	46	Pass
CH-55	772.24	34.10	200	V	126	11.9	46	Pass
CH-55	785.24	33.90	100	V	149	12.1	46	Pass
CH-55	834.71	34.29	200	V	274	11.71	46	Pass
CH-55	926.15	110.81	100	H	258	-	-	Intended Frequency
NOTE: Measured Field Strength –dBuV/m (9 KHz to 1 GHz) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)								

TEST GRAPHS – 1GHz to 10GHz (Antenna 1)

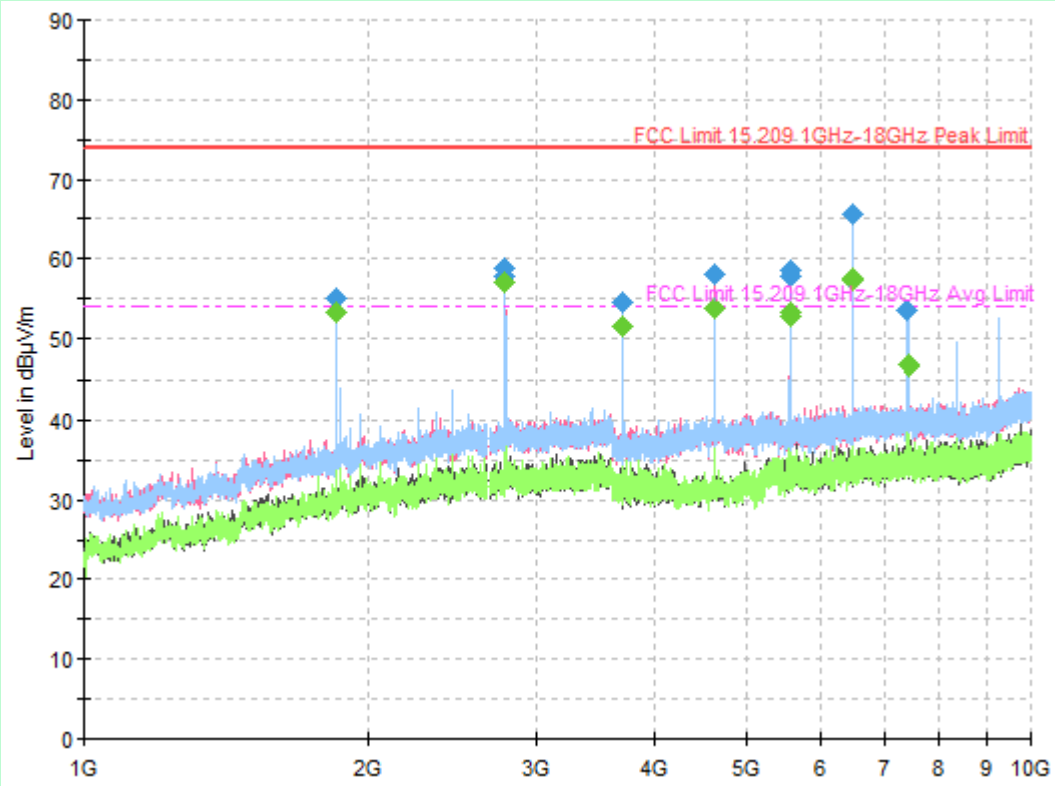


Channel 1 (903.55MHz) – Antenna 1

TEST GRAPHS – 1GHz to 10GHz (Antenna 1)

Channel 28 (916.0MHz) – Antenna 1

TEST GRAPHS – 1GHz to 10GHz (Antenna 1)



Channel 55 (926.45MHz) – Antenna 1

TEST RESULT – 1 GHz to 10 GHz						RESTRICTED BAND – PEAK		
Channel	Frequency	Measured Field Strength	Height	Ant Pol	Azimuth	Margin	Limit	Result
#	(MHz)	(dBµV/m)	(cm)	H / V	(deg)	(dB)	(dBµV/m)	
Antenna – 1								
CH-1	2710.32	58.14	300	V	0	15.86	74	PASS
CH-1	3614.50	54.61	300	V	343	19.39	74	PASS
CH-1	4517.39	54.7	300	V	348	19.3	74	PASS
CH-1	5421.57	53.62	300	V	348	20.38	74	PASS
CH-28	3664.96	53.58	400	V	327	20.42	74	PASS
CH-28	3665.61	53.01	400	V	322	20.99	74	PASS
CH-28	4581.68	58.1	200	V	12	15.9	74	PASS
CH-28	7330.21	55.06	200	H	33	18.94	74	PASS
CH-55	2777.82	57.89	200	V	0	16.11	74	PASS
CH-55	3704.50	52.77	100	V	0	21.23	74	PASS
CH-55	7408.00	55.24	200	H	0	18.76	74	PASS
Note :								
Measured Field Strength (dBuV/m) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB) + Filter Insertion loss - Pre amplifier Gain (dB)								

TEST RESULT – 1 GHz to 10 GHz							RESTRICTED BAND – AVERAGE			
Channel	Frequency	Measured Average	Height	Ant Pol	Azimuth	Duty Cycle	Corrected Reading	Margin	Limit	Result
#	(MHz)	(dBµV/m)	(cm)	H / V	(deg)	(dB)	(dBuV/m)	(dB)	(dBµV/m)	
Antenna – 1										
CH-1	3614.50	49.52	400	H	266	0	49.52	4.48	54	PASS
CH-1	4517.39	49.6	300	H	275	0	49.6	4.4	54	PASS
CH-1	5421.57	48.07	300	V	58	0	48.07	5.93	54	PASS
CH-28	3664.96	47.57	400	V	327	0	47.57	6.43	54	PASS
CH-28	3665.61	48.96	400	V	322	0	48.96	5.04	54	PASS
CH-28	4581.36	53.42	200	V	339	0	53.42	0.58	54	PASS
CH-28	7330.21	47.27	200	H	33	0	47.27	6.73	54	PASS
CH-55	2777.82	50.31	300	V	79	0	50.31	3.69	54	PASS
CH-55	3704.50	49.69	400	H	20	0	49.69	4.31	54	PASS
CH-55	7408.00	48.56	400	V	7	0	48.56	5.44	54	PASS

Note :

Measured Field Strength (dBuV/m) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB) + Filter Insertion loss - Pre amplifier Gain (dB)
Corrected Reading (dBuV/m) = Measured Average (dBuV/m) - Duty Cycle (dB)

TEST RESULT – 1 GHz to 10 GHz							NON- RESTRICTED BAND - PEAK		
Channel	Measured Fundamental	Spurious Emission	Measured Harmonic	Height	Ant Pol	Azimuth	Limit [Fundamental – 20 dB]	Margin	Results
#	dBµV/m	MHz	dBµV/m	cm	H / V	deg	dBµV/m	dB	
Antenna – 1									
CH-1	111.15	1806.79	57.16	100	H	333	91.15	33.99	PASS
CH-1	111.15	6324.14	56	300	V	323	91.15	35.15	PASS
CH-28	110.77	1832.50	55.84	100	V	0	90.77	34.93	PASS
CH-28	110.77	1864.96	44.48	400	H	21	90.77	46.29	PASS
CH-28	110.77	2454.14	43.81	400	H	286	90.77	46.96	PASS
CH-28	110.77	5497.43	57.41	400	V	334	90.77	33.36	PASS
CH-28	110.77	5498.39	57.32	200	V	352	90.77	33.45	PASS
CH-28	110.77	6414.14	64.93	400	H	128	90.77	25.84	PASS
CH-28	110.77	6414.79	64.93	400	H	128	90.77	25.84	PASS
CH-55	110.81	1852.11	61.54	100	V	8	90.81	29.27	PASS
CH-55	110.81	5555.93	52.12	300	V	347	90.81	38.69	PASS
Note :									
Measured Harmonic Field Strength (dBuV/m) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB) + Filter Insertion loss - Pre amplifier Gain (dB)									