

Wireless Monitor Module

Model No.: FW-MM



Date: 2017-06-16

Report Prepared By:

Christopher Locke

EMC Test Report

Report Number	20293-1
EUT Nomenclature	Wireless Monitor Module
Sample Identification	Model No. : FW-MM
	Sl. No. : MEL-156
	Software Version : 5.83
	Hardware Version : Rev 2
Number of Samples	1
Date of receipt of Sample	2016-06-27
Condition of Sample on receipt	Good
Client name	Honeywell International Inc.
Client Address	System Sensor, 3825, Ohio Ave,
Testing Laboratory	Honeywell Home & Building Technologies RF & EMC HWVA
Address	2 Corporate Center Dr. Suite 100 PO Box 9040 Melville, NY 11747 USA
Test Dates	2016-06-27 to 2017-04-24
Applicable Standard	FCC Part 15:2010,ANSI C63.10:2013
Test Results	PASS

Prepared By: Name: Christopher Locke  Signature: Date: 2017-06-16	Reviewed By: Name: Michael Antola  Signature: Date: 2017-06-16
Authorized By: Name: Ted Ramos Signature:  Date: 2017-06-16	

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	✓		
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 and 15.209	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 and 6dB bandwidth	± 0.22 dB
2	Maximum Peak Output Power	± 0.22 dB
3	Maximum Power Spectral Density	± 0.22 dB
4	Band-edge Emissions	± 0.22 dB
5	Spurious RF Conducted Emissions	± 0.22 dB
6	Radiated Spurious Emissions <1GHz	± 10.92 dB
7	Radiated Spurious Emissions >1GHz	± 8.53 dB

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	:55
Channel Bandwidth (20 dB)	DTS	:1MHz
	FHSS	:320kHz
Transmitted Power	DTS	:12dBm
	FHSS	:17dBm
Modulation Type	FSK	
Data Rate	DTS	:300Kbps
	FHSS	:150Kbps
Antenna Type	Inverter F Patch Antenna	
No. of Antenna	3	
Antenna Gain	ANT 1	:0.65dBi
	ANT 2	:2dBi
	ANT3	:1.3dBi
Supply Voltage and Current	3.3V, 21.5mA	
Dimensions (L x B x H)	4.263mm x 4.171mm x 1.465mm	
Environmental Conditions	Operating Temperature	:0 to 50°C
	Storage Temperature	:-10 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. Test is performed at Antenna 2 as this is the high gain antenna
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 Hyper Terminal. Test is performed at all 3 antennas

OPERATING MODES

Mode #	Description
DTS	Following DTS channels have been used for Conducted (Continuous Transmission) and Radiated (Continuous Transmission) Tests Channel 1 : 902.875MHz Channel 3 : 914.325MHz 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 28 : 916.00MHz Channel 55 : 926.45MHz

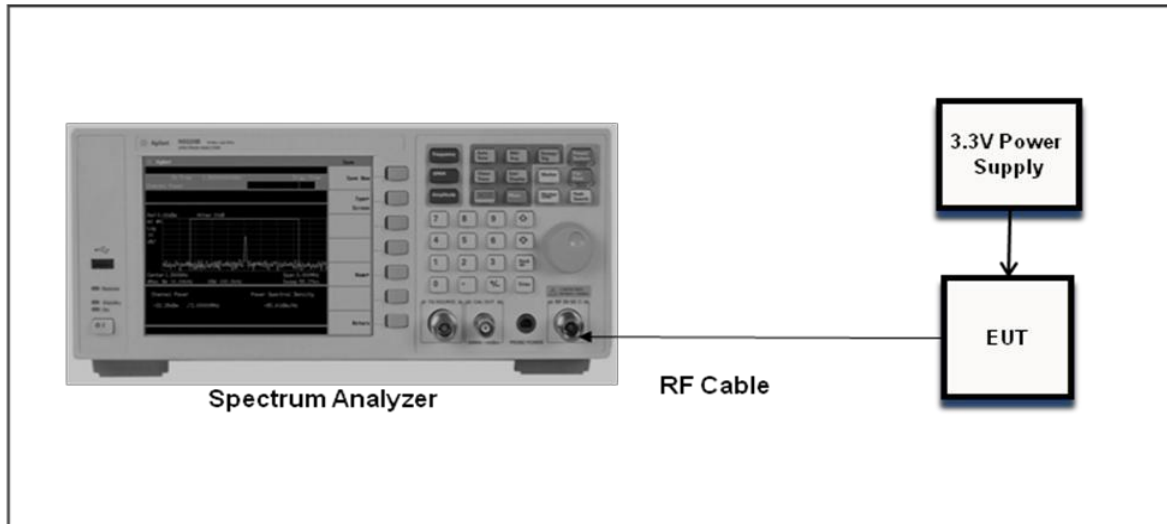
INPUT AND OUTPUT CABLES

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

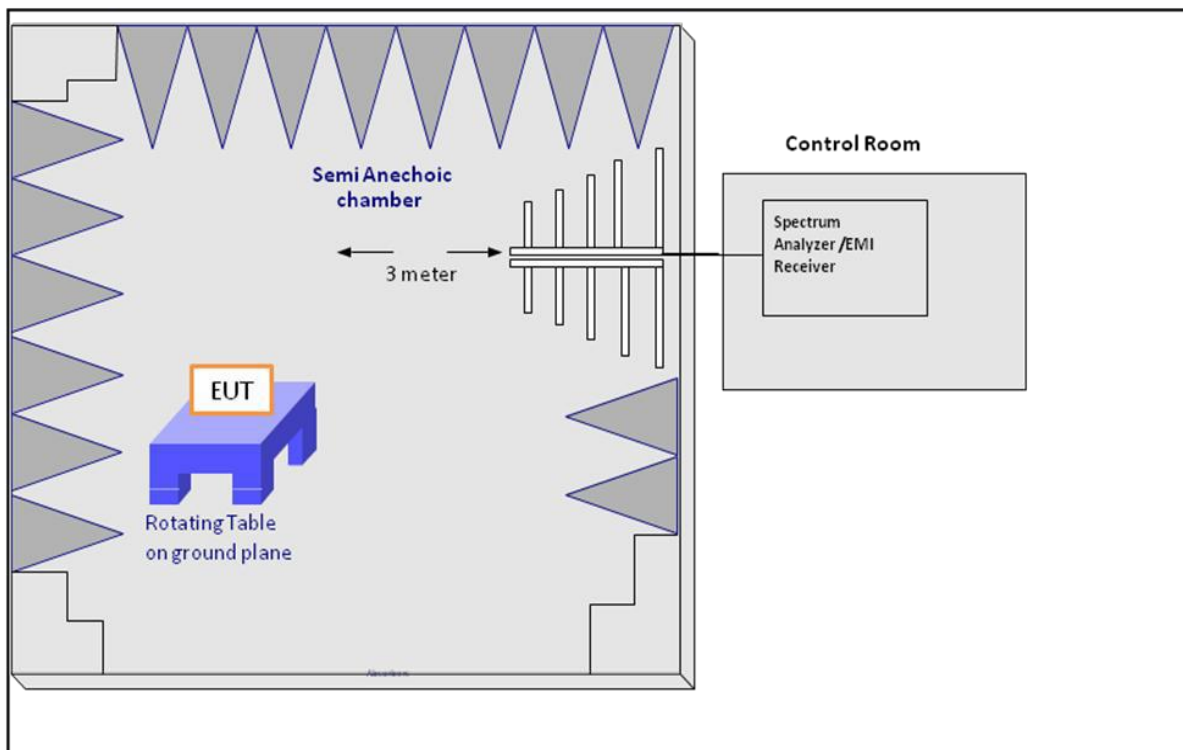
SUPPORT EQUIPMENTS AND ACCESSORIES USED

#	Item Description	Make	Model	Part No. / SI. No	Cal Due Date
1	Laptop	Dell	CORPMDTW10X64IMAGEV2	339YSC2	NA
2	USB to UART Cable	FTDI	NA	TTL-232R-3V3	NA
3	DC Power Supply	HP	E3611A	KR83015320	NA

CONNECTION DIAGRAM AND SETUP DIAGRAM



Conducted RF Test Setup

Radiated Emission Test Prescan Setup
Final Measurements Performed on an OATS

2 FHSS CHANNELS

2.1 20dB BANDWIDTH

EUT Nomenclature	Wireless Monitor Module	Test Request No.	20293-1
Model No.	FW-MM	Serial No.	MEL-156
Test Start Date	2016-08-25	Temperature (°C)	23.6°C
Test End Date	2016-08-25	Humidity RH (%)	51.9%RH
Tested By	Jose Badia/Arnoldo Garcia	Pressure (mbar)	NR
Input Voltage / Freq.	3.3Vdc		
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 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

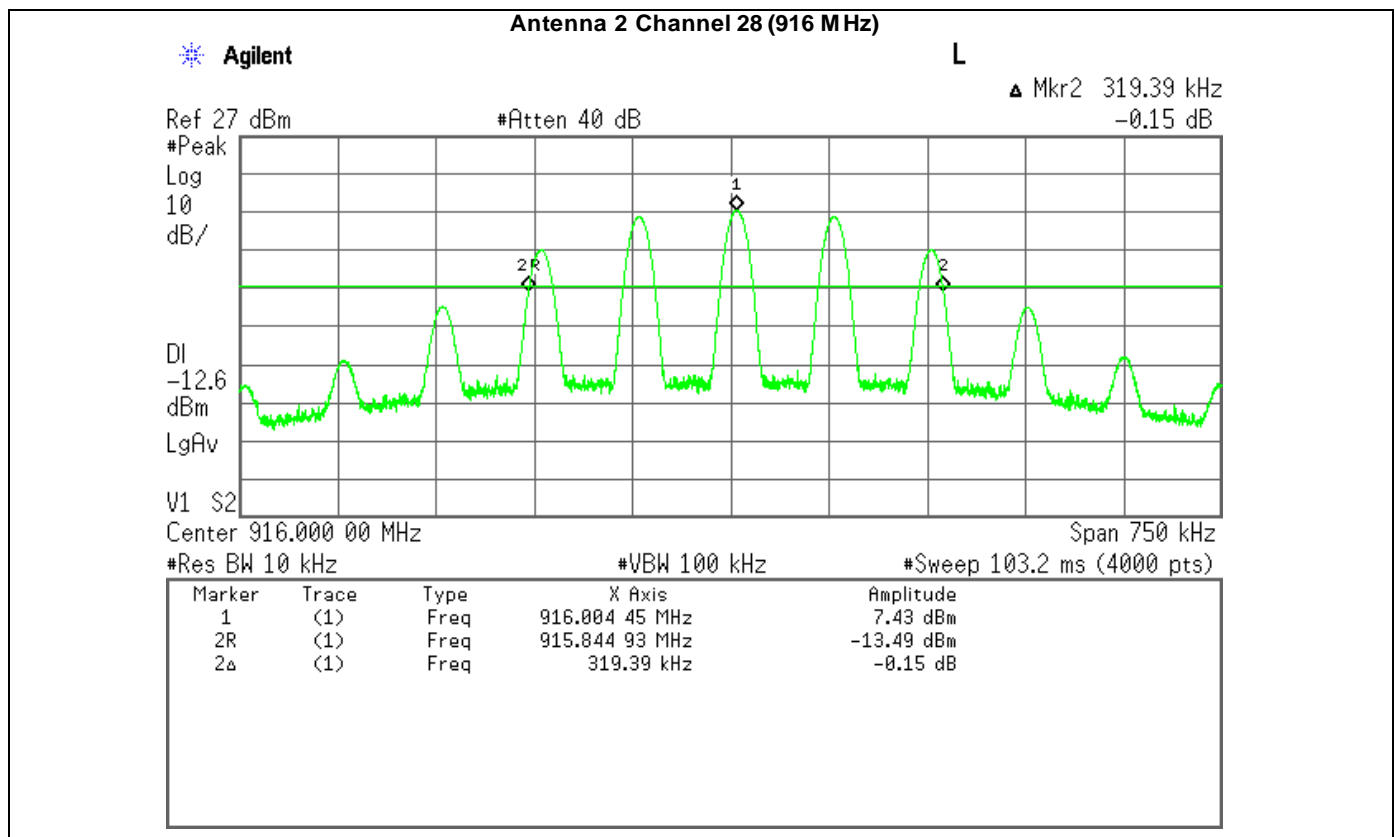
Method	Radiated <input type="checkbox"/>	Conducted <input checked="" type="checkbox"/>
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TEST PARAMETERS

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

TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	E4440A	192484	2017-05-18
Y	RF Cable	Digikey	1	NA	NA

**TEST RESULT**

Channel	Frequency	Measured Bandwidth	Limit	Result
#	MHz	KHz	KHz	
28	916	319.39	≥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.	20293-1
Model No.	FW-MM	Serial No.	MEL-156
Test Start Date	2016-08-03	Temperature (°C)	23.6
Test End Date	2016-08-04	Humidity RH (%)	51.9
Tested By	Arnoldo Garcia	Pressure (mbar)	NA
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 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

Method	Radiated <input type="checkbox"/>	Conducted <input checked="" type="checkbox"/>
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TEST PARAMETERS

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

TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	E4440A	192484	2017-05-18
Y	RF Cable	Digikey	1	NA	NA

Antenna 1 Channel 1

* Agilent 15:56:34 Aug 4, 2016

Mkr1 903.640 4 MHz
9.81 dBm

Ref 23 dBm

Atten 40 dB

#Peak

Log

10

dB/

LgAv

V1 S2

S3 FC

 $\mathcal{E}(f)$:

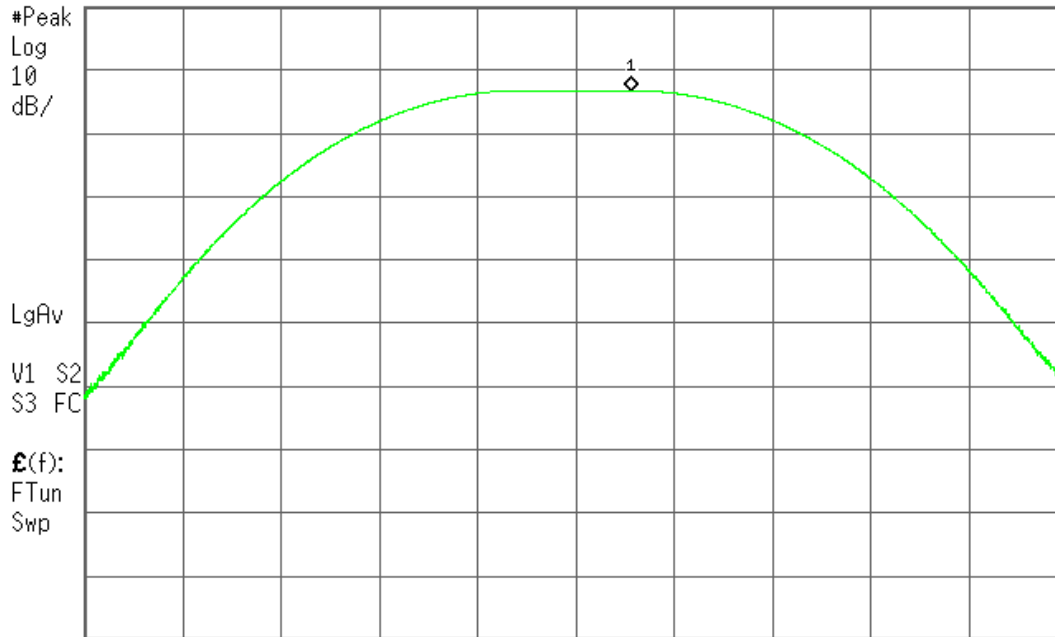
FTun

Swp

Center 903.550 0 MHz

#Res BW 360 kHz

VBW 1.1 MHz

Span 1.6 MHz
Sweep 1.067 ms (4001 pts)Antenna 1 Channel 28

* Agilent 15:50:52 Aug 4, 2016

Mkr1 915.910 4 MHz
9.73 dBm

Ref 23 dBm

Atten 40 dB

#Peak

Log

10

dB/

LgAv

V1 S2

S3 FC

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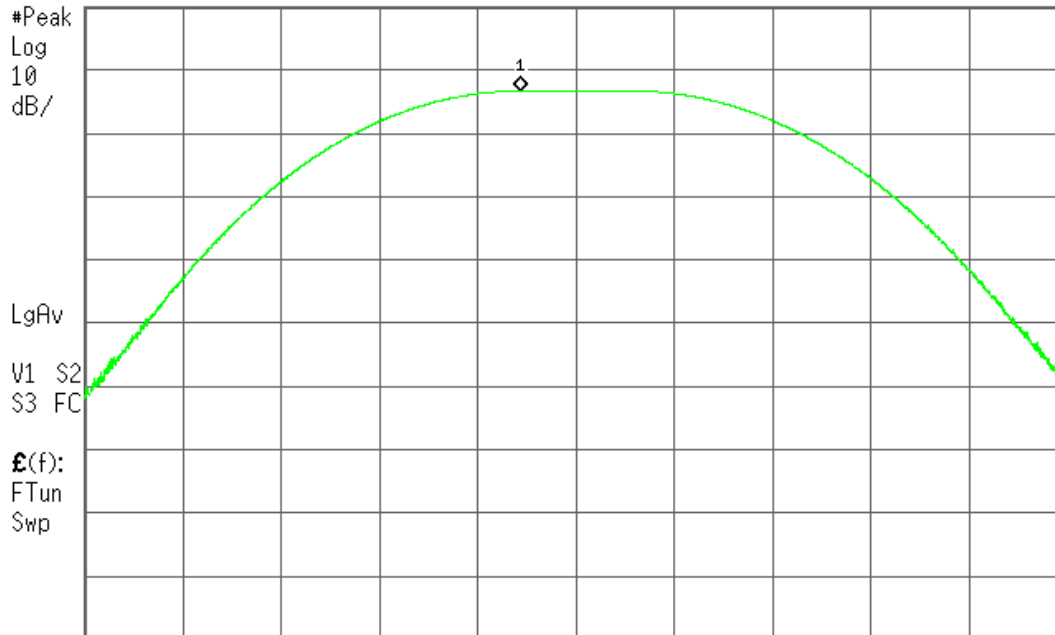
FTun

Swp

Center 916.000 0 MHz

#Res BW 360 kHz

VBW 1.1 MHz

Span 1.6 MHz
Sweep 1.067 ms (4001 pts)

Antenna 1 Channel 55

* Agilent 15:59:59 Aug 4, 2016

Mkr1 926.349 2 MHz

9.69 dBm

Ref 23 dBm

Atten 40 dB

#Peak

Log

10

dB/

LgAv

V1 S2

S3 FC

£(f):

FTun

Swp

Center 926.450 0 MHz

#Res BW 360 kHz

VBW 1.1 MHz

Span 1.6 MHz

Sweep 1.067 ms (4001 pts)

Antenna 2 Channel 1

* Agilent 18:29:33 Aug 3, 2016

Tester: A. Garcia

Mkr1 903.454 2 MHz

9.86 dBm

Ref 23 dBm

Atten 40 dB

#Peak

Log

10

dB/

LgAv

V1 S2

S3 FC

£(f):

FTun

Swp

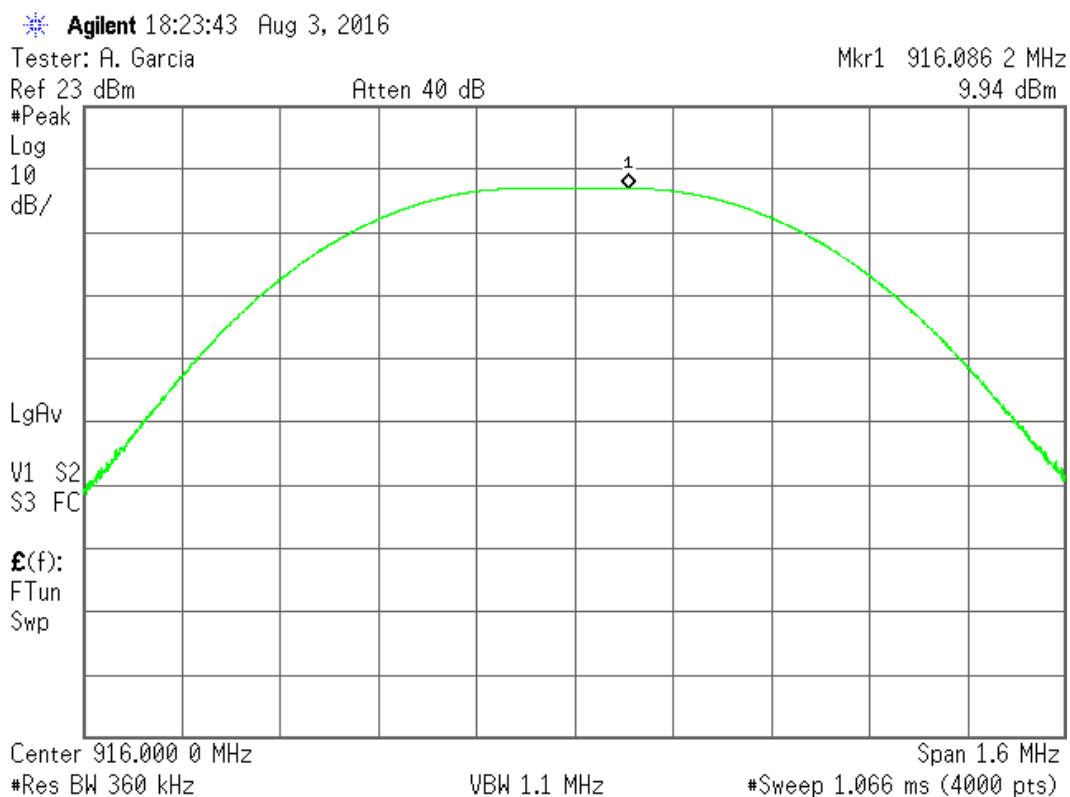
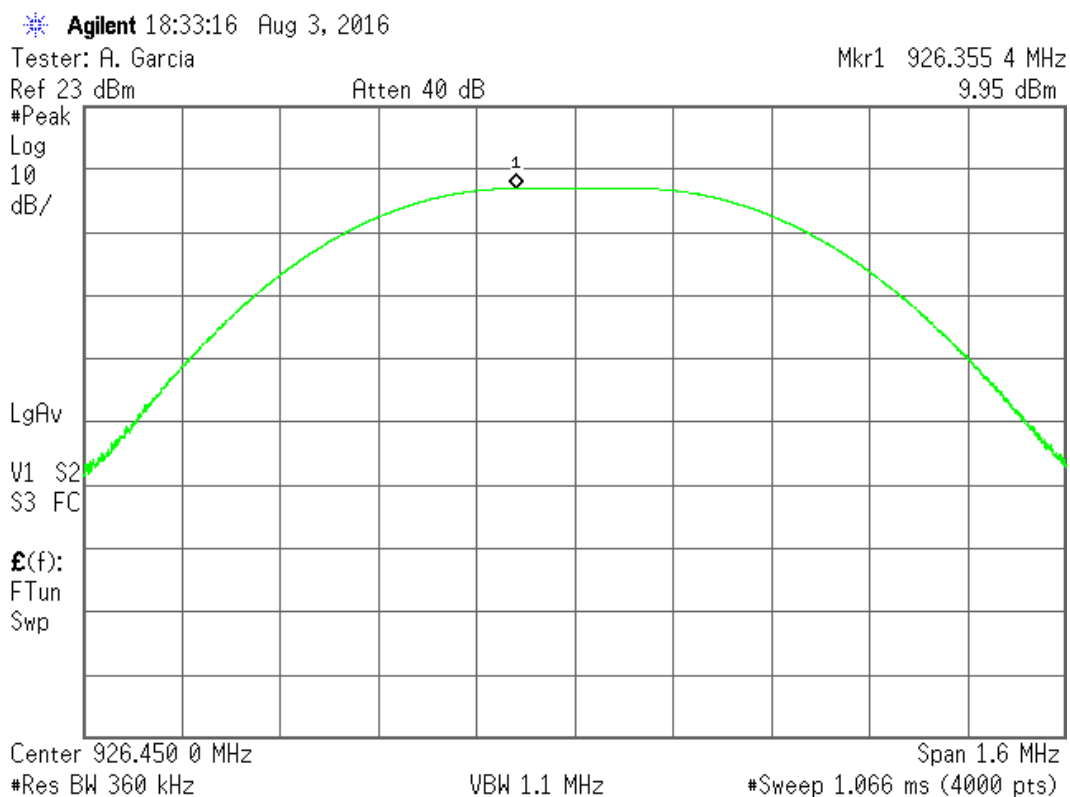
Center 903.550 0 MHz

#Res BW 360 kHz

VBW 1.1 MHz

Span 1.6 MHz

#Sweep 1.066 ms (4000 pts)

Antenna 2 Channel 28**Antenna 2 Channel 55**

Antenna 3 Channel 1

* Agilent 18:27:56 Aug 4, 2016

Tester: A. Garcia

Mkr1 903.468 8 MHz

Ref 23 dBm

Atten 40 dB

9.69 dBm

#Peak

Log

10

dB/

LgAv

V1 S2

S3 FC

 $\mathcal{E}(f)$:

FTun

Swp

Center 903.550 0 MHz

#Res BW 360 kHz

VBW 1.1 MHz

Span 1.6 MHz

Sweep 1.067 ms (4001 pts)

Antenna 3 Channel 28

* Agilent 18:24:57 Aug 4, 2016

Tester: A. Garcia

Mkr1 916.007 6 MHz

Ref 23 dBm

Atten 40 dB

9.55 dBm

#Peak

Log

10

dB/

LgAv

V1 S2

S3 FC

 $\mathcal{E}(f)$:

FTun

Swp

Center 916.000 0 MHz

#Res BW 360 kHz

VBW 1.1 MHz

Span 1.6 MHz

Sweep 1.067 ms (4001 pts)

Antenna 3 Channel 55

* Agilent 18:30:57 Aug 4, 2016

Tester: R. Garcia

Mkr1 926.357 6 MHz

Ref 23 dBm

Atten 40 dB

9.55 dBm

#Peak

Log

10

dB/

LgAv

V1 S2

S3 FC

£(f):

FTun

Swp

Center 926.450 0 MHz

#Res BW 360 kHz

VBW 1.1 MHz

Span 1.6 MHz

Sweep 1.067 ms (4001 pts)

TEST RESULT

Antenna	Channel	Frequency	Measured Power Level	Cable + Attenuation	Transmitter Power Level	Limit	Result
#	#	MHz	dBm	dB	dBm	dBm	
1	1	903.55	9.81	6.33	16.14	≤23.979	Pass
1	28	916	9.73	6.34	16.07	≤23.979	Pass
1	55	926.45	9.69	6.49	16.18	≤23.979	Pass
2	1	903.55	9.86	6.33	16.19	≤23.979	Pass
2	28	916	9.94	6.34	16.28	≤23.979	Pass
2	55	926.45	9.95	6.49	16.44	≤23.979	Pass
3	1	903.55	9.69	6.33	16.02	≤23.979	Pass
3	28	916	9.55	6.34	15.89	≤23.979	Pass
3	55	926.45	9.55	6.49	16.04	≤23.979	Pass

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

TEST SETUP PHOTOGRAPHS

Refer Annexure -1

2.3 CARRIER FREQUENCY SEPARATION

EUT Nomenclature	Wireless Monitor Module	Test Request No.	20293-1
Model No.	FW-MM	Serial No.	MEL-156
Test Start Date	2017-04-19	Temperature (°C)	23.6°C
Test End Date	2017-04-20	Humidity RH (%)	51.9%RH
Tested By	Arnoldo Garcia	Pressure (mbar)	NA
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 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

Method	Radiated <input type="checkbox"/>	Conducted <input checked="" type="checkbox"/>
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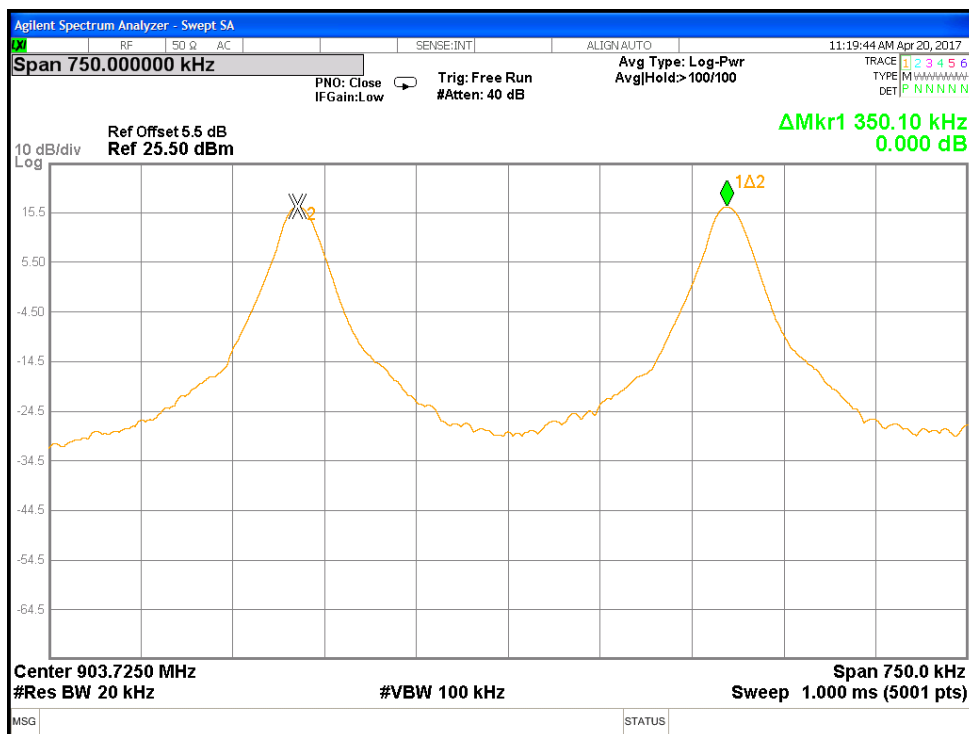
TEST PARAMETERS

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

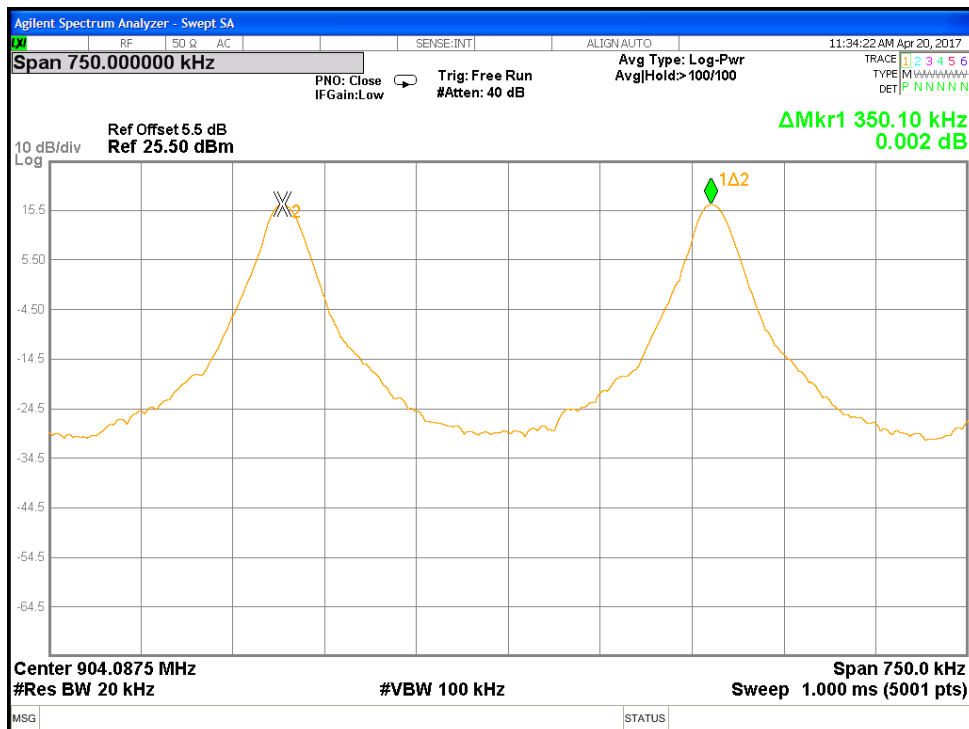
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9030A (PXA)	MY49431596	2018-01-27
Y	RF Cable	Digikey	1	NA	NA

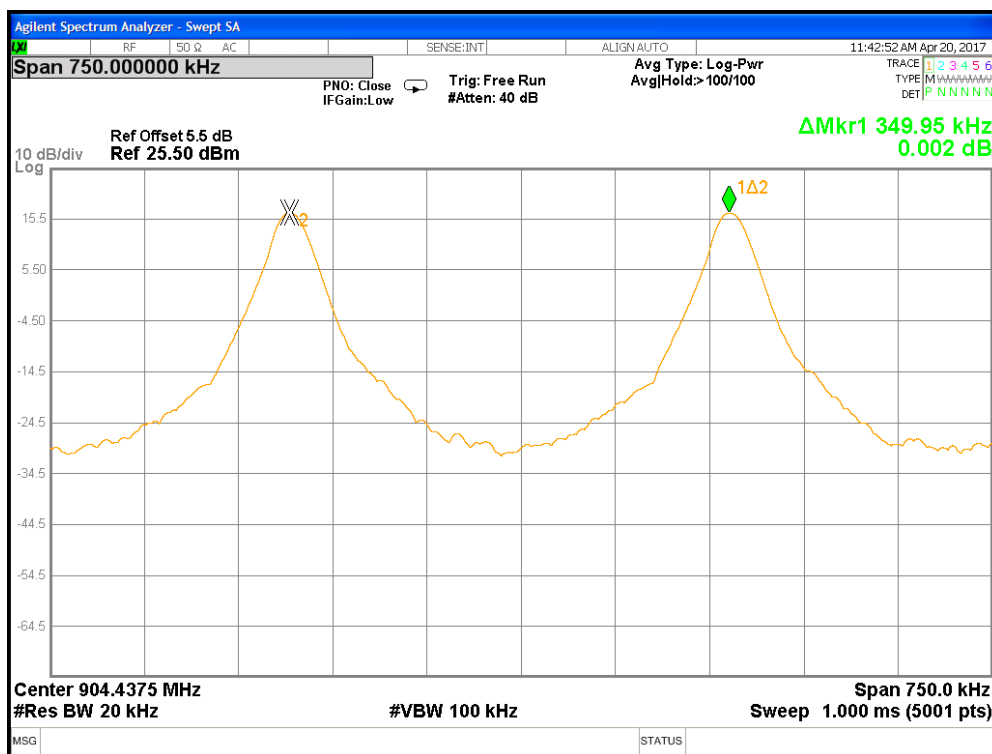
TEST GRAPHS



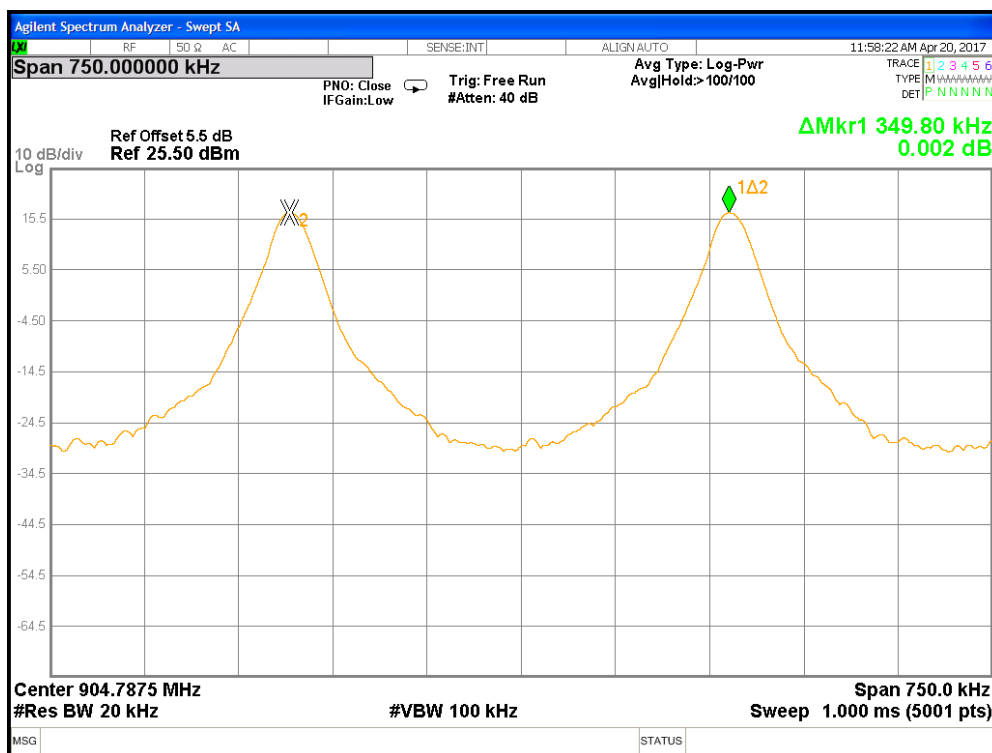
Channel 1 to 2 Walkie Talkie



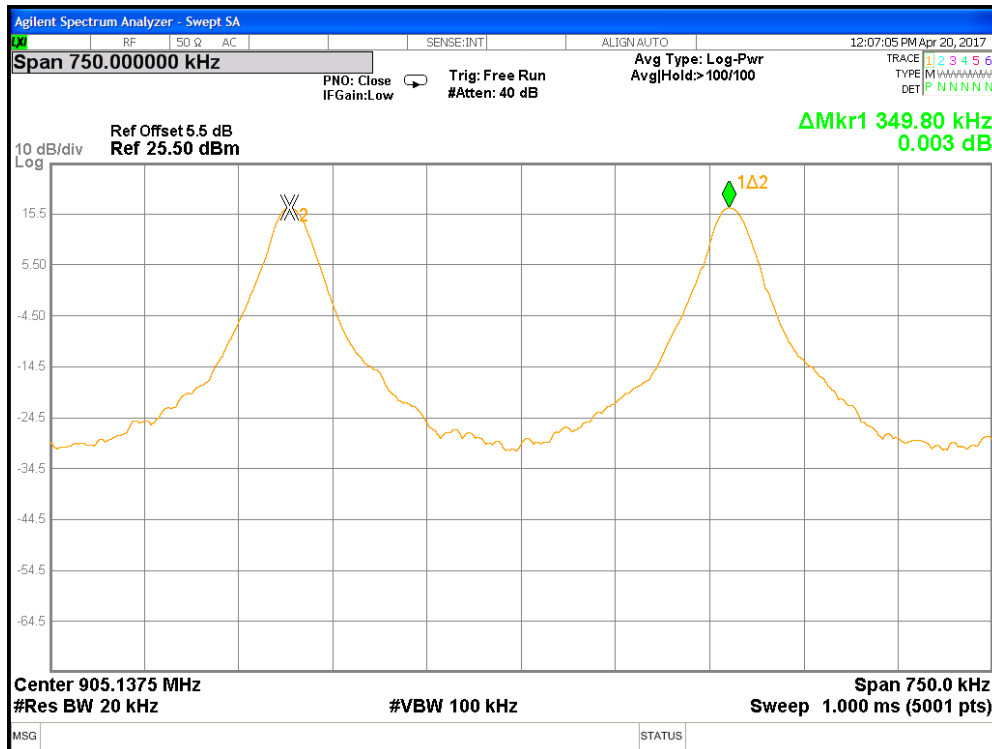
Channel 2 to 3 Walkie Talkie



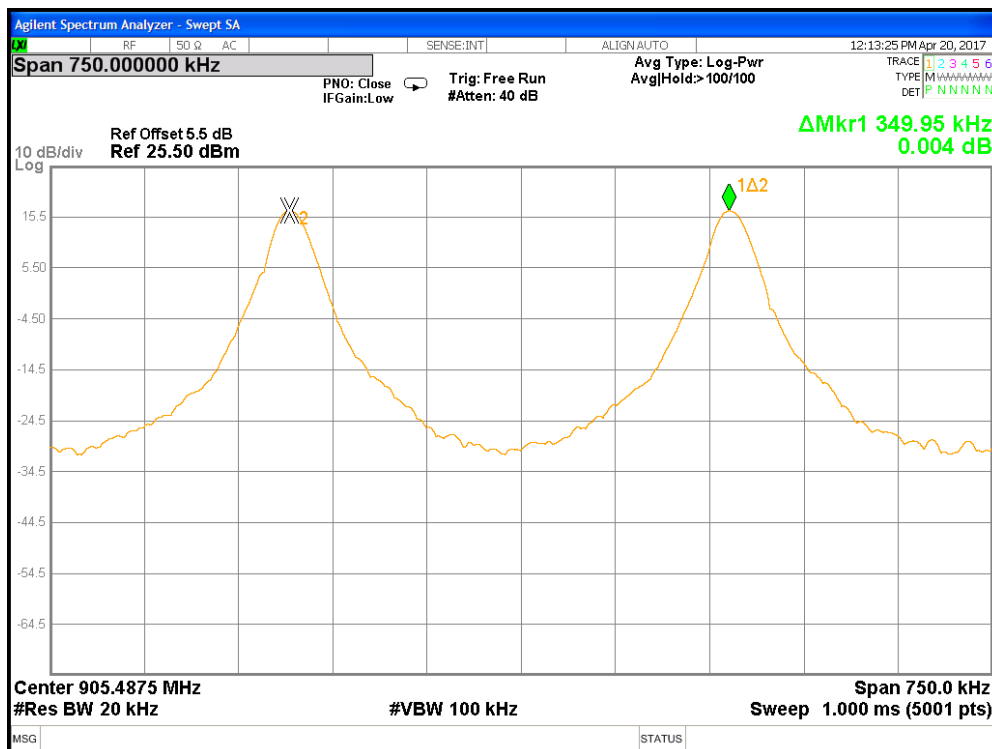
Channel 3 to 4 Walkie Talkie



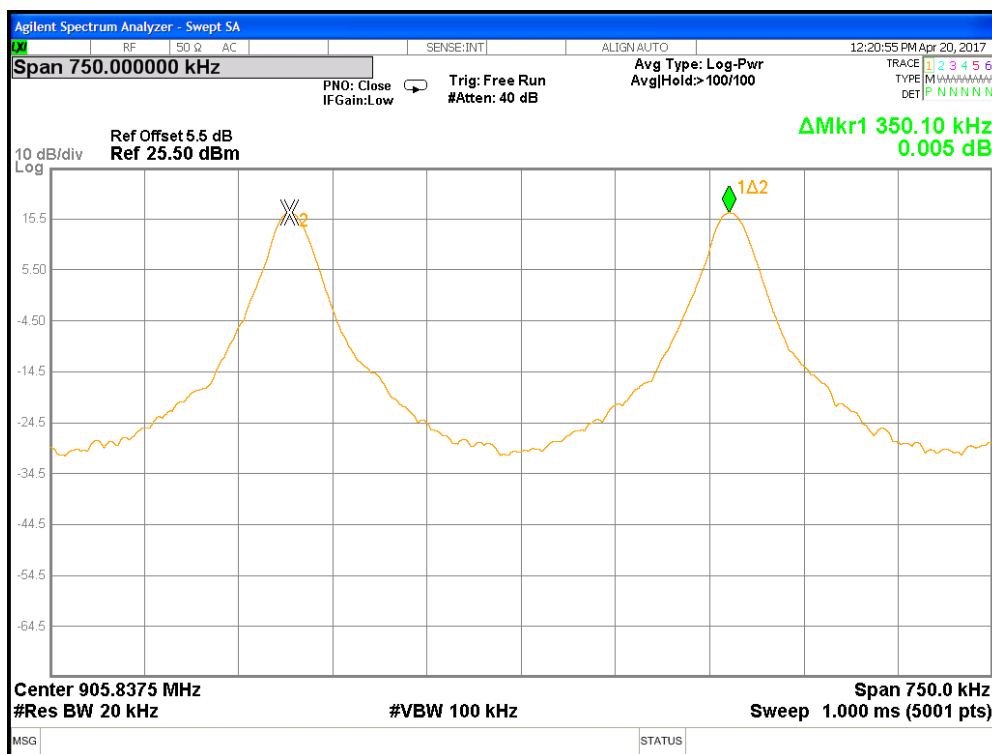
Channel 4 to 5 Walkie Talkie



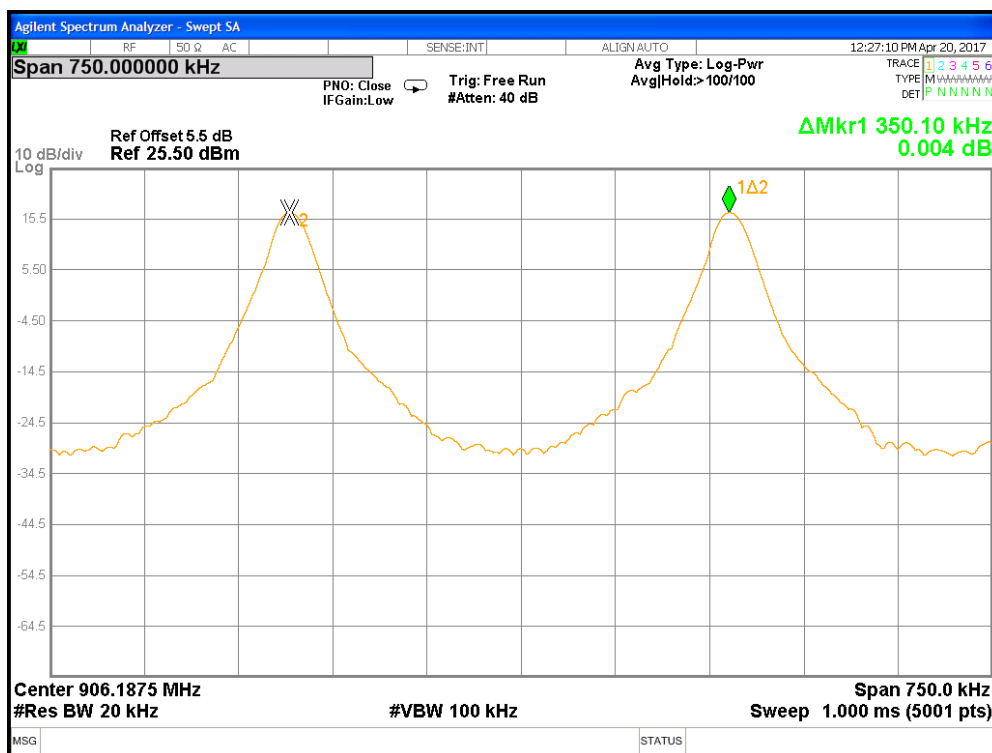
Channel 5 to 6 Walkie Talkie



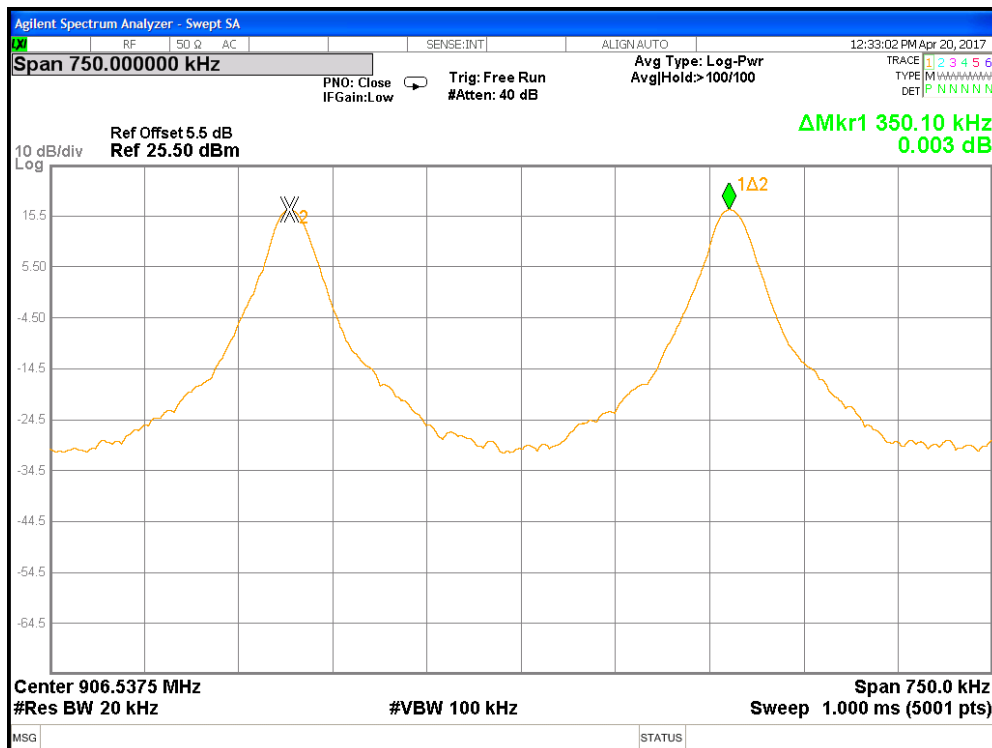
Channel 6 to 7 Walkie Talkie



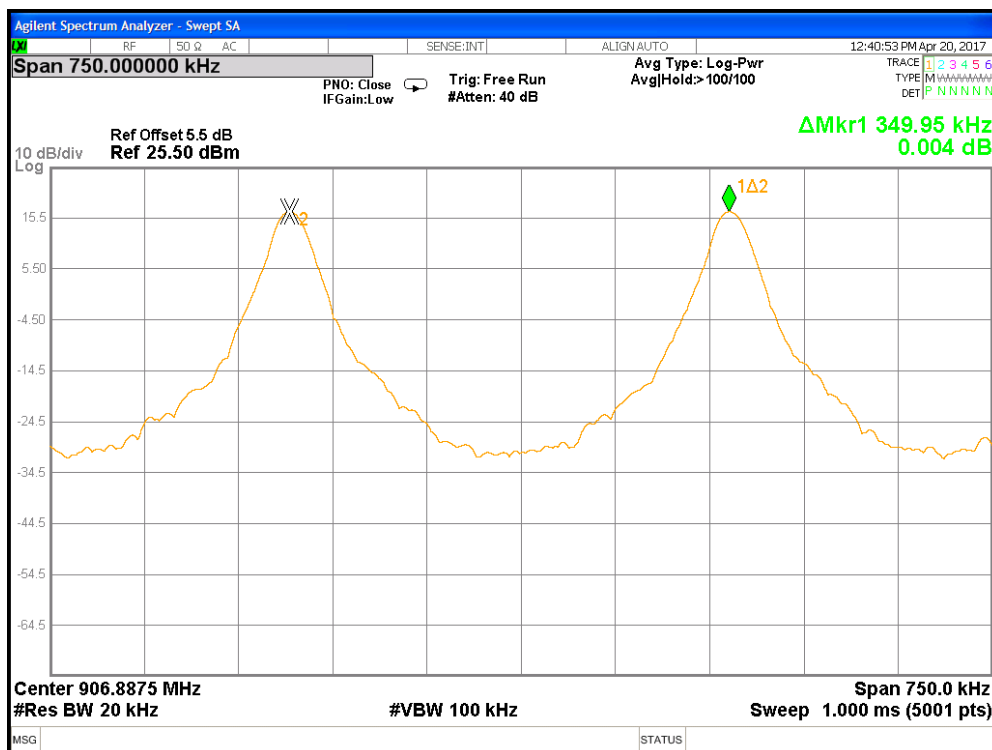
Channel 7 to 8 Walkie Talkie



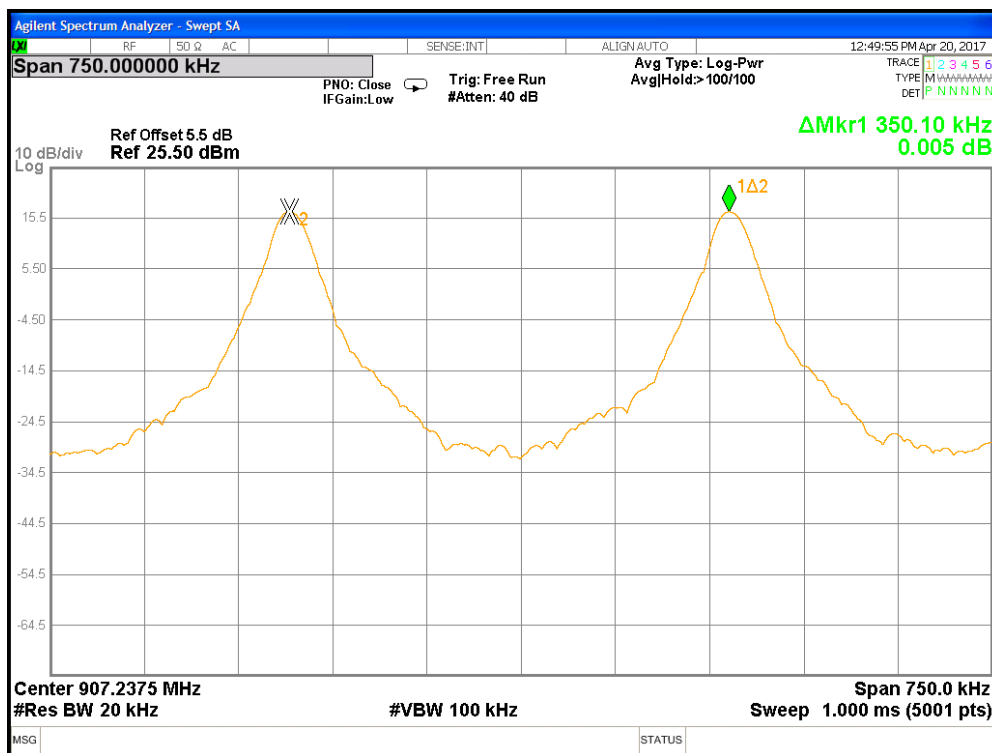
Channel 8 to 9 Walkie Talkie



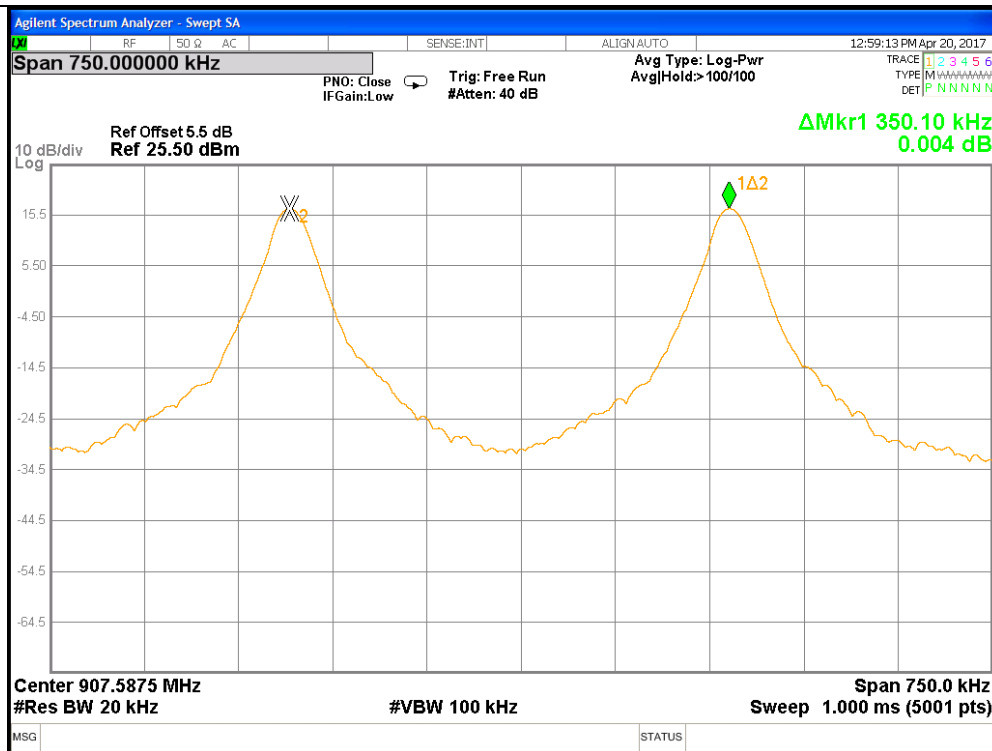
Channel 9 to 10 Walkie Talkie



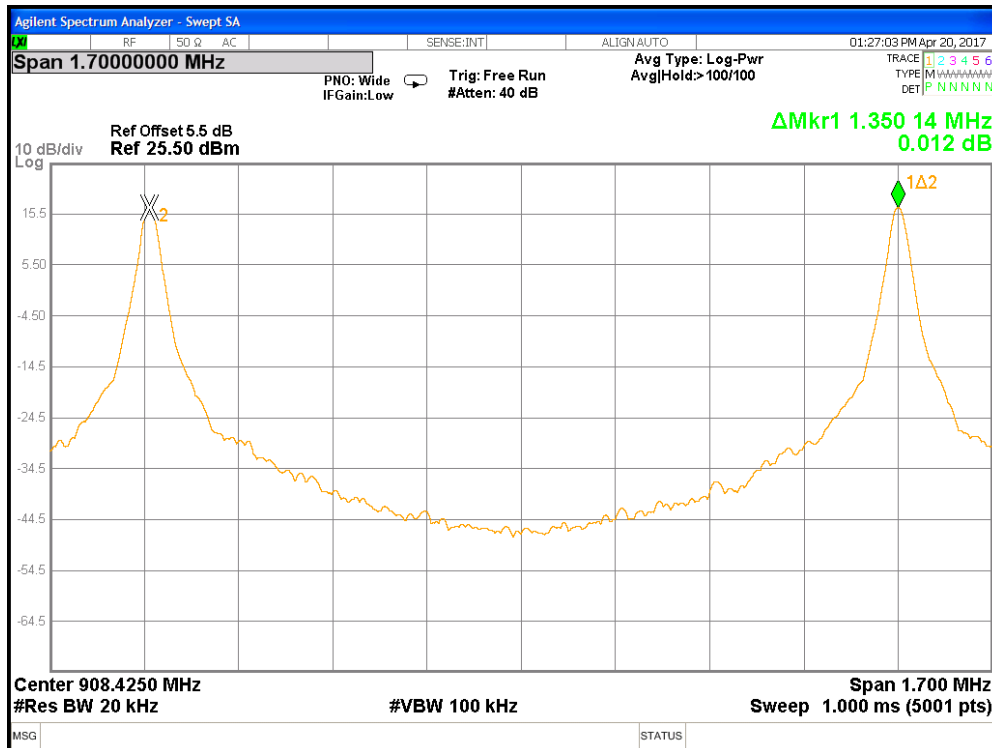
Channel 10 to 11 Walkie Talkie



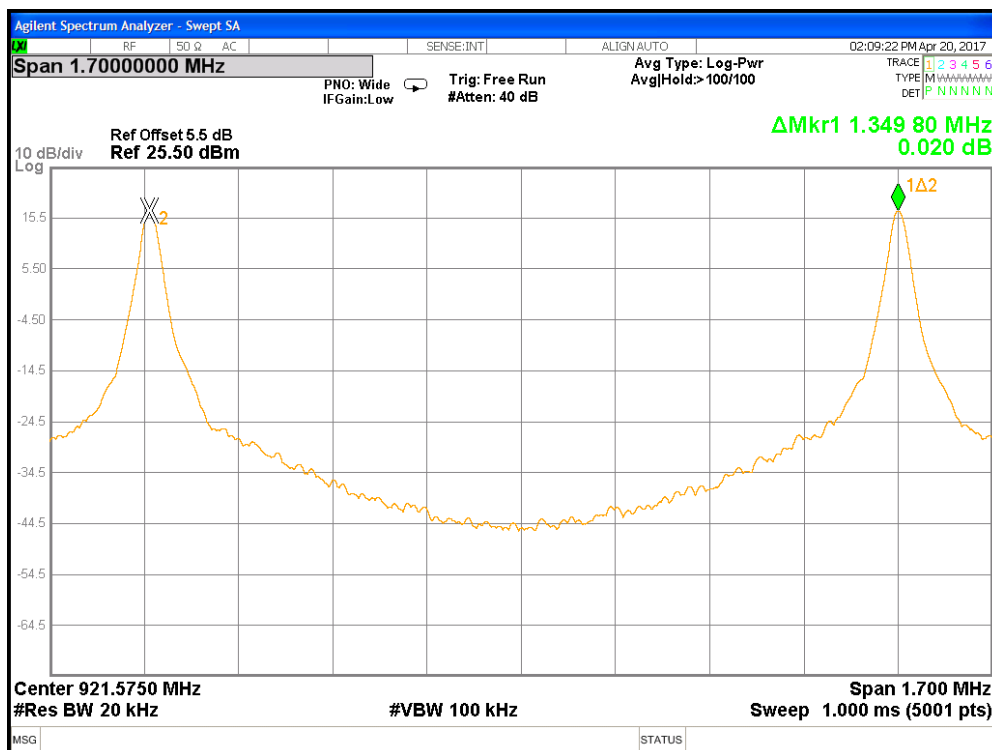
Channel 11 to 12 Walkie Talkie



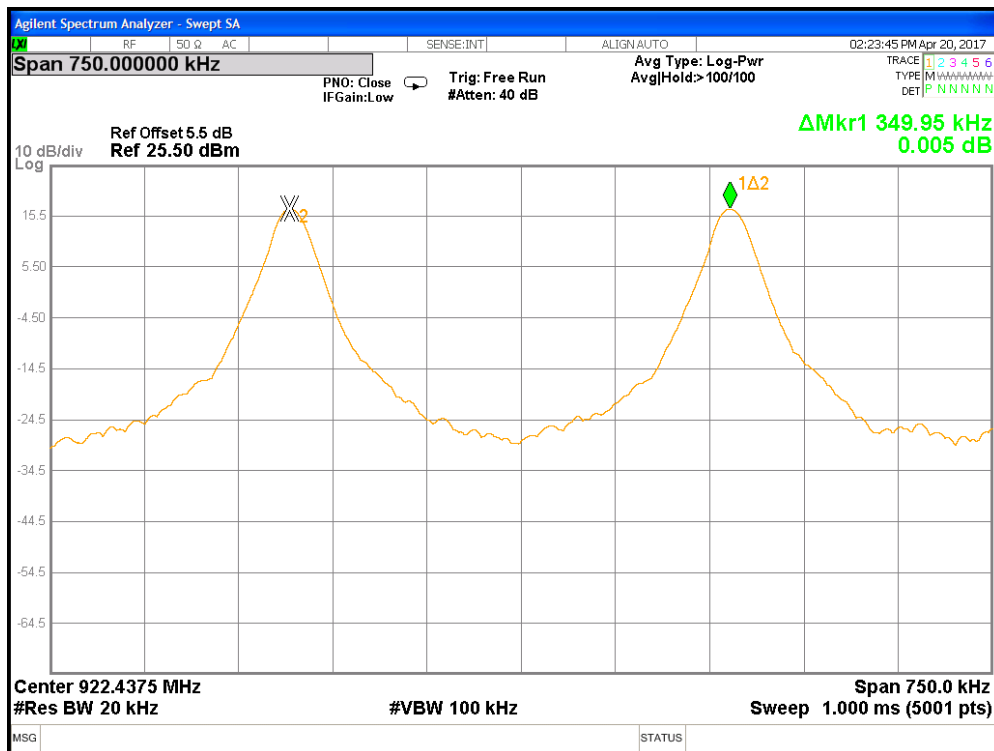
Channel 12 to 13 Walkie Talkie



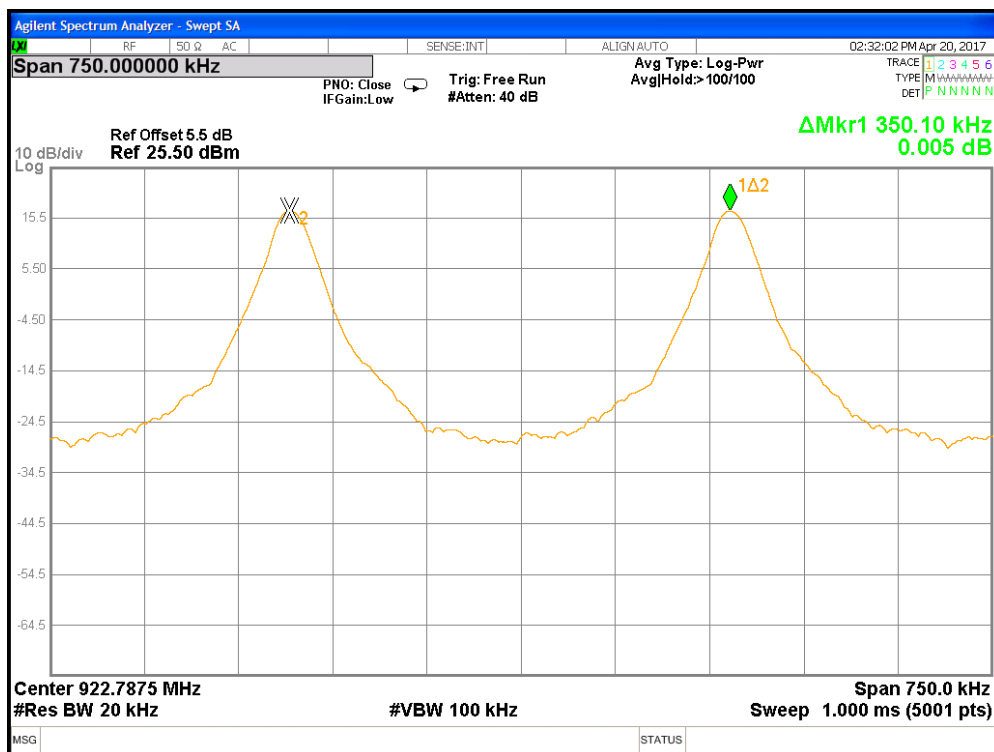
Channel 13 to 14 Walkie Talkie



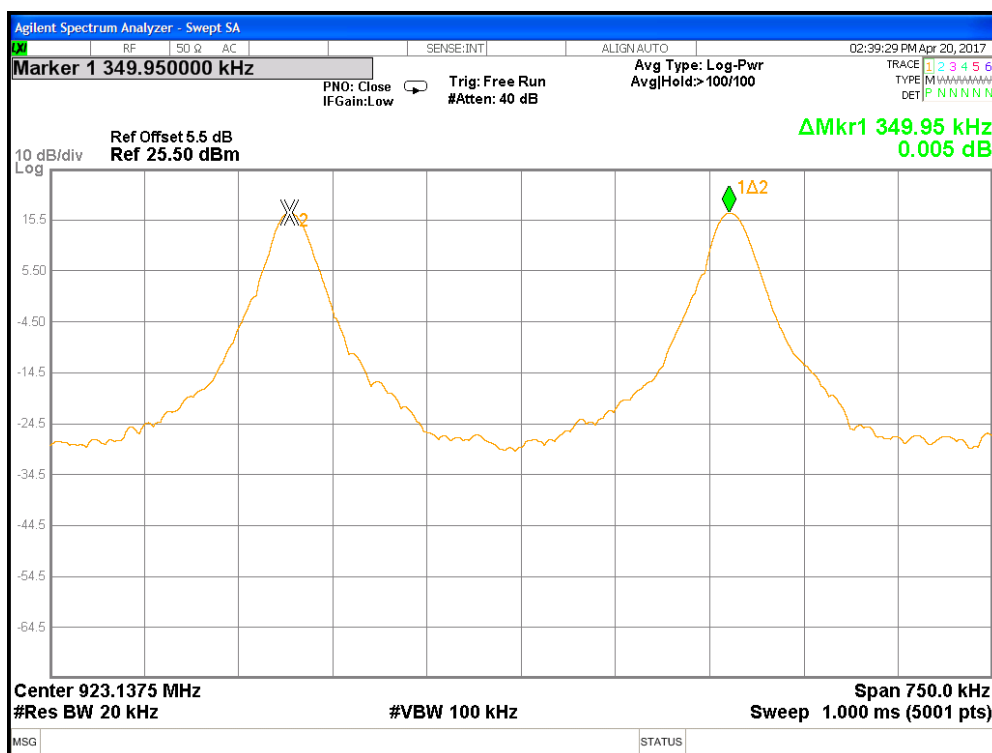
Channel 15 to 16 Walkie Talkie



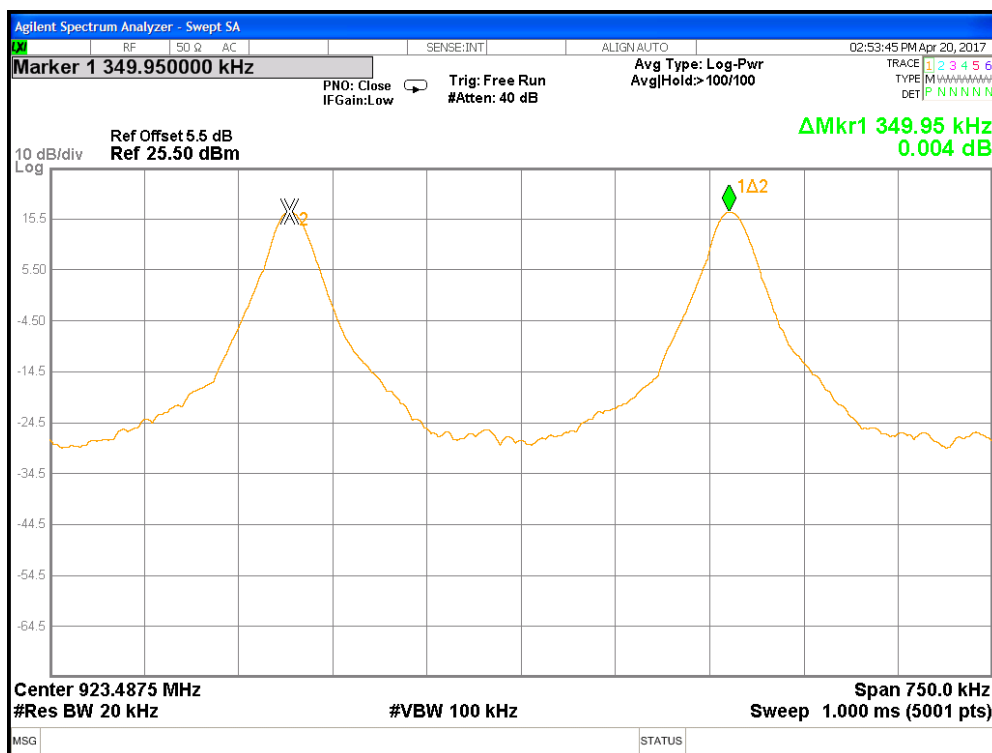
Channel 16 to 17 Walkie Talkie



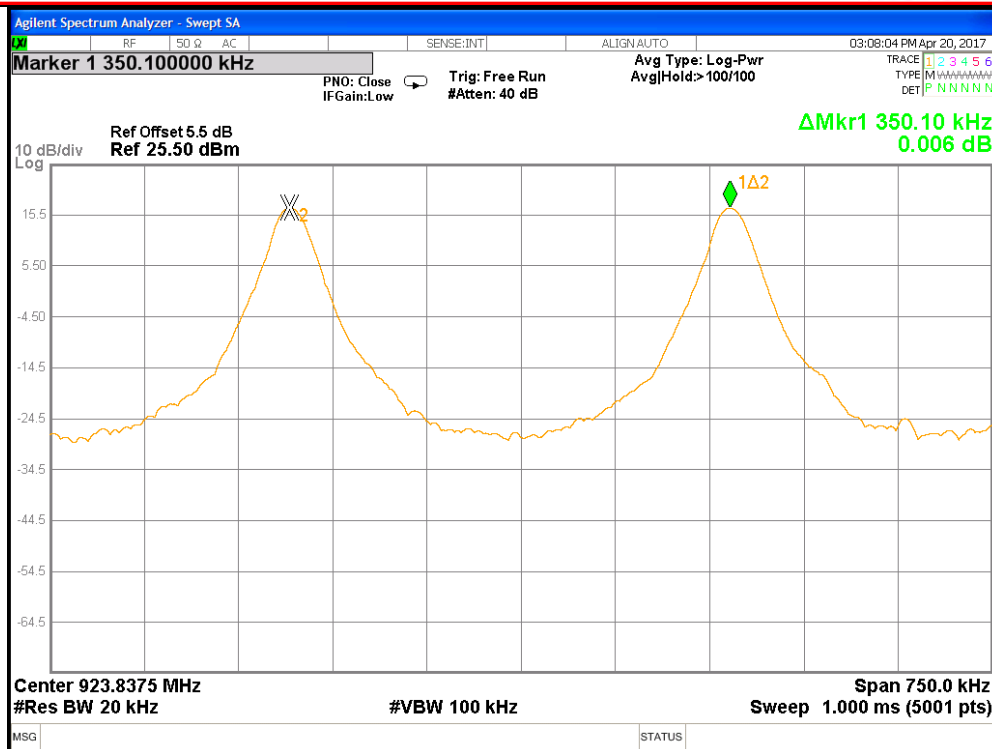
Channel 17 to 18 Walkie Talkie



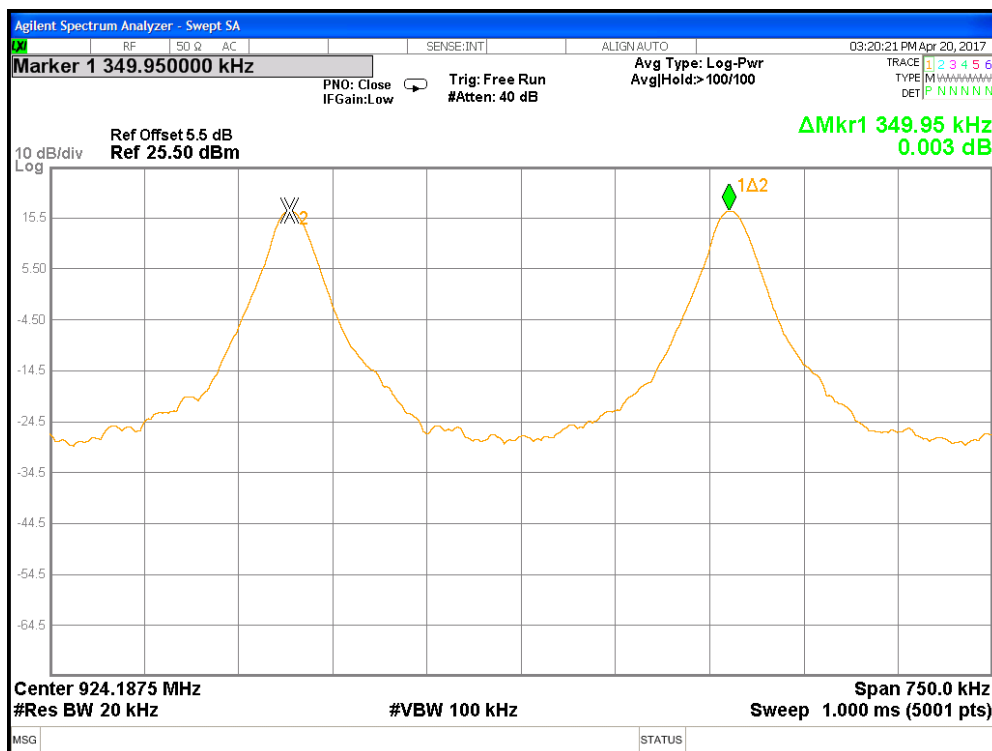
Channel 18 to 19 Walkie Talkie



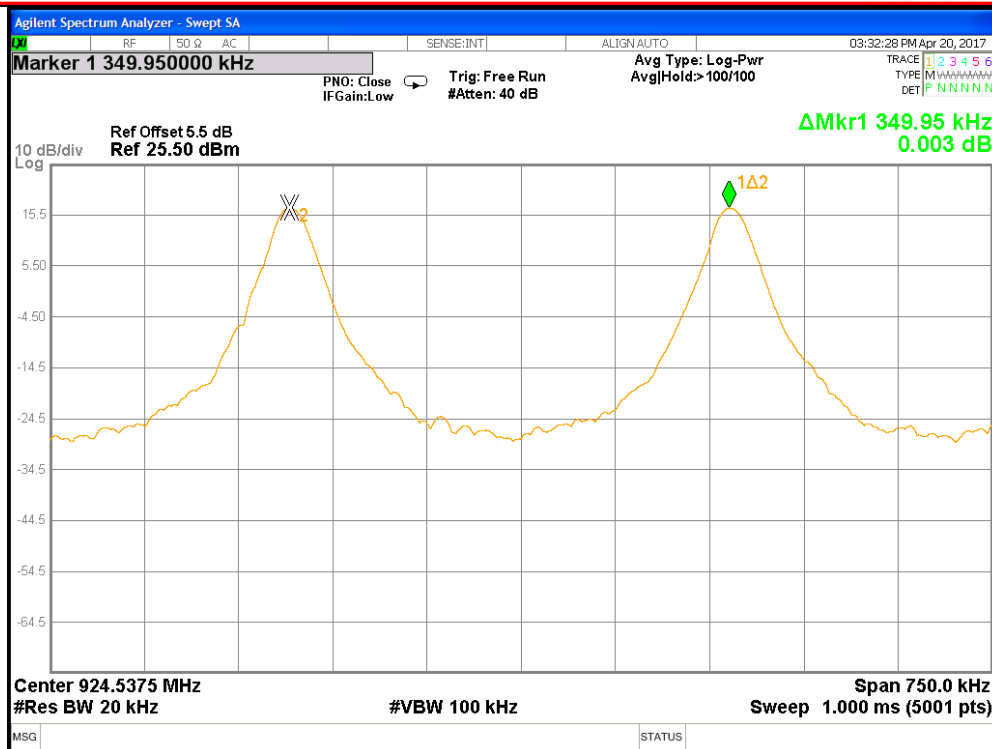
Channel 19 to 20 Walkie Talkie



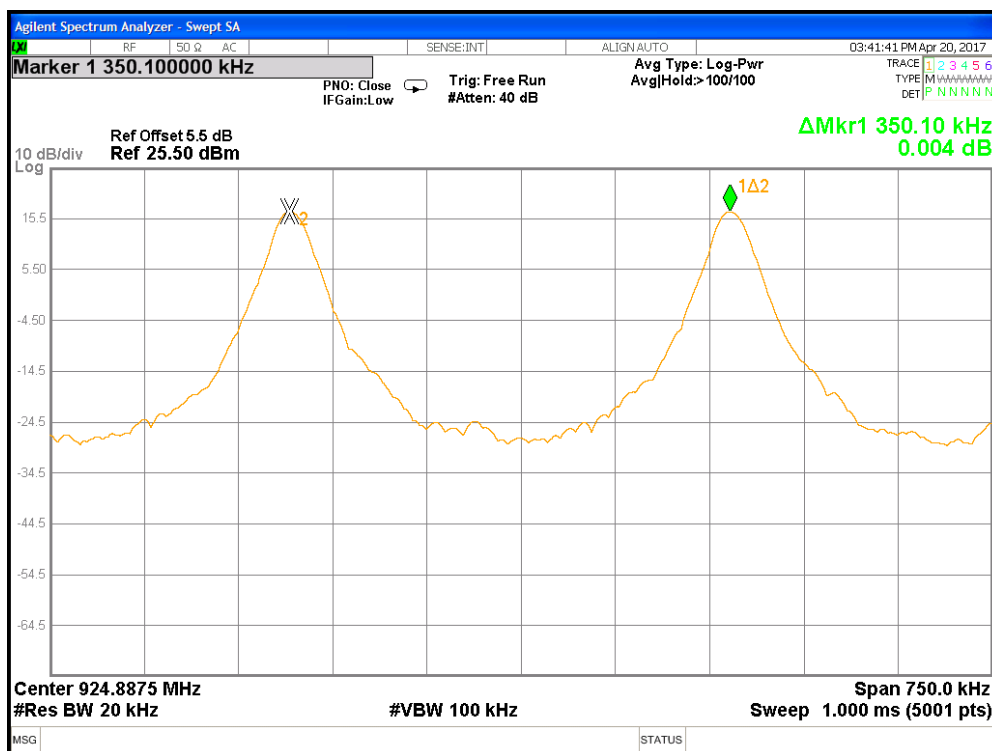
Channel 20 to 21 Walkie Talkie



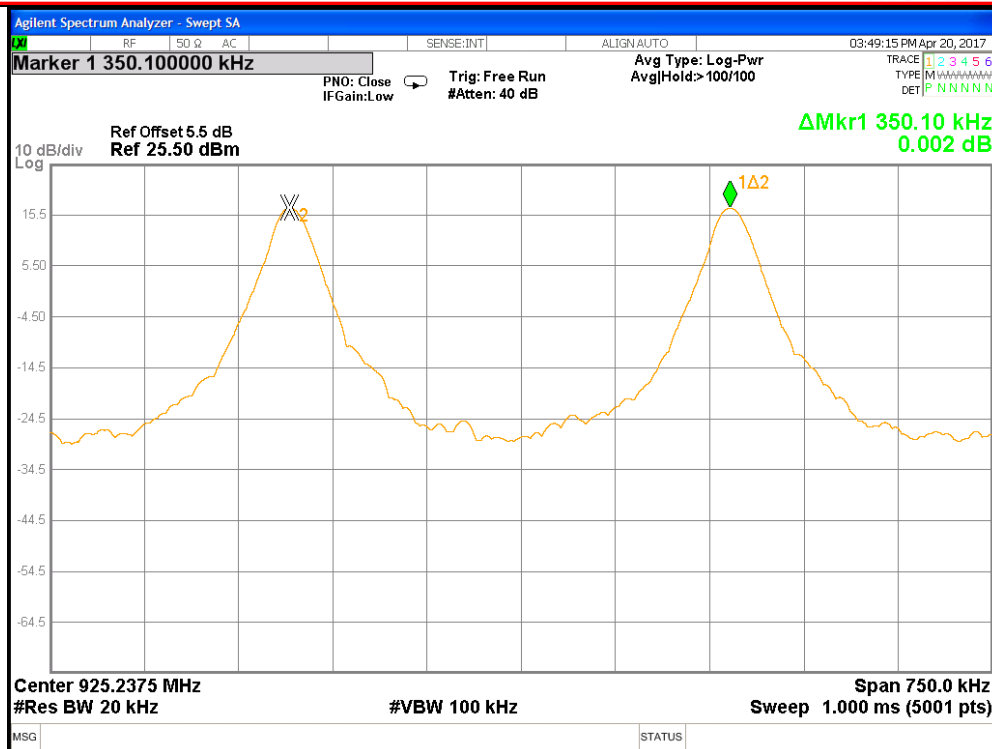
Channel 21 to 22 Walkie Talkie



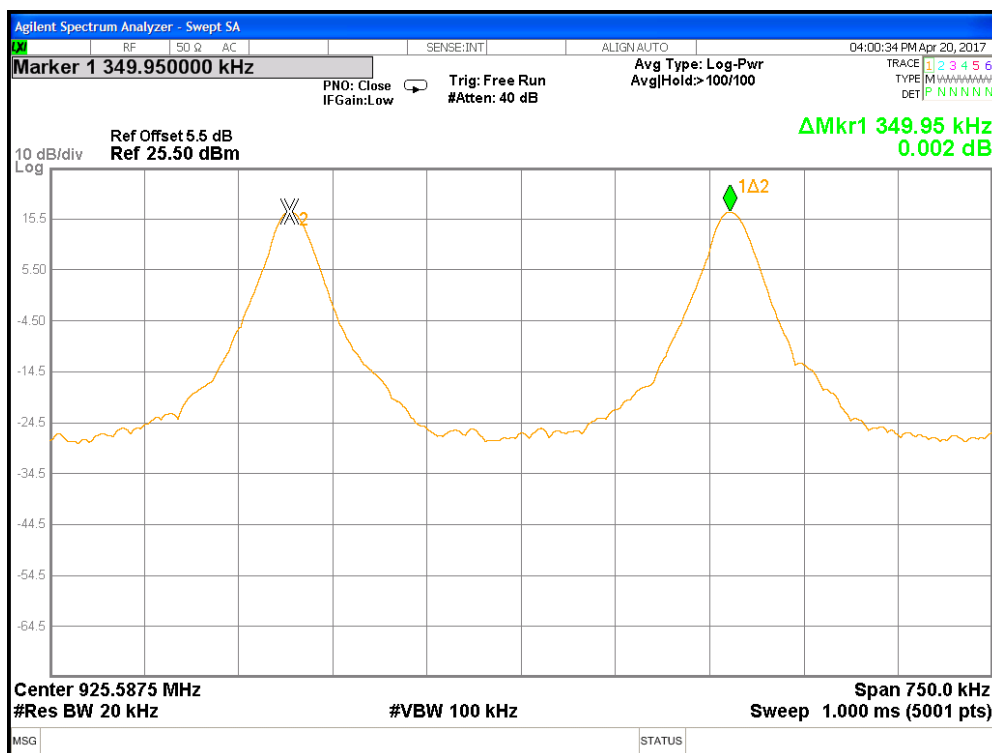
Channel 22 to 23 Walkie Talkie



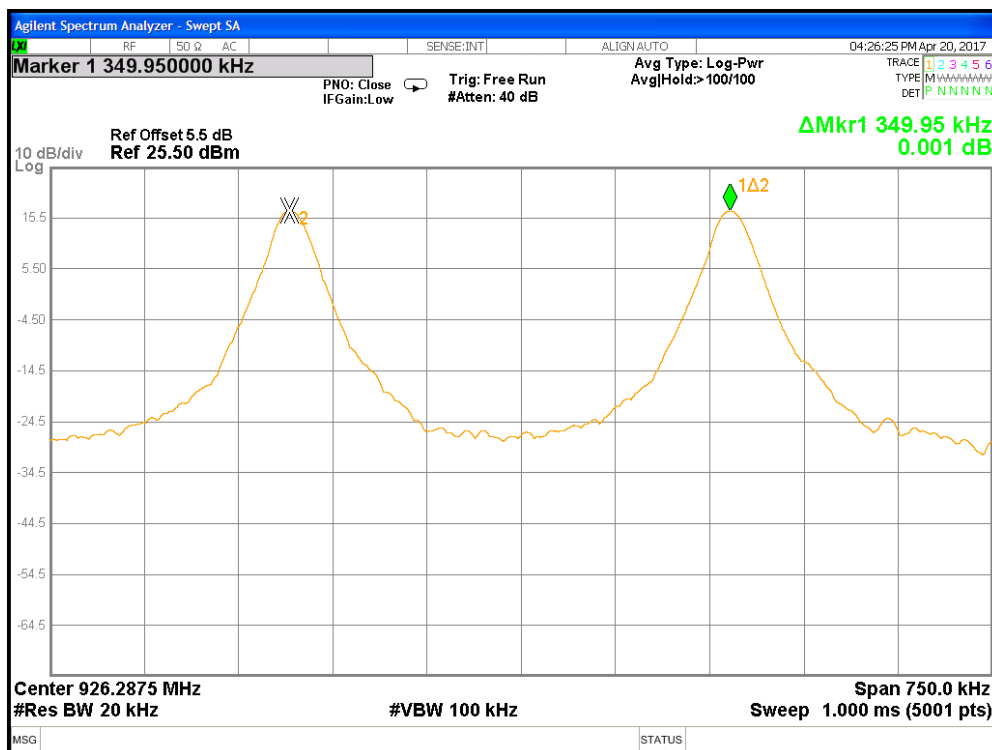
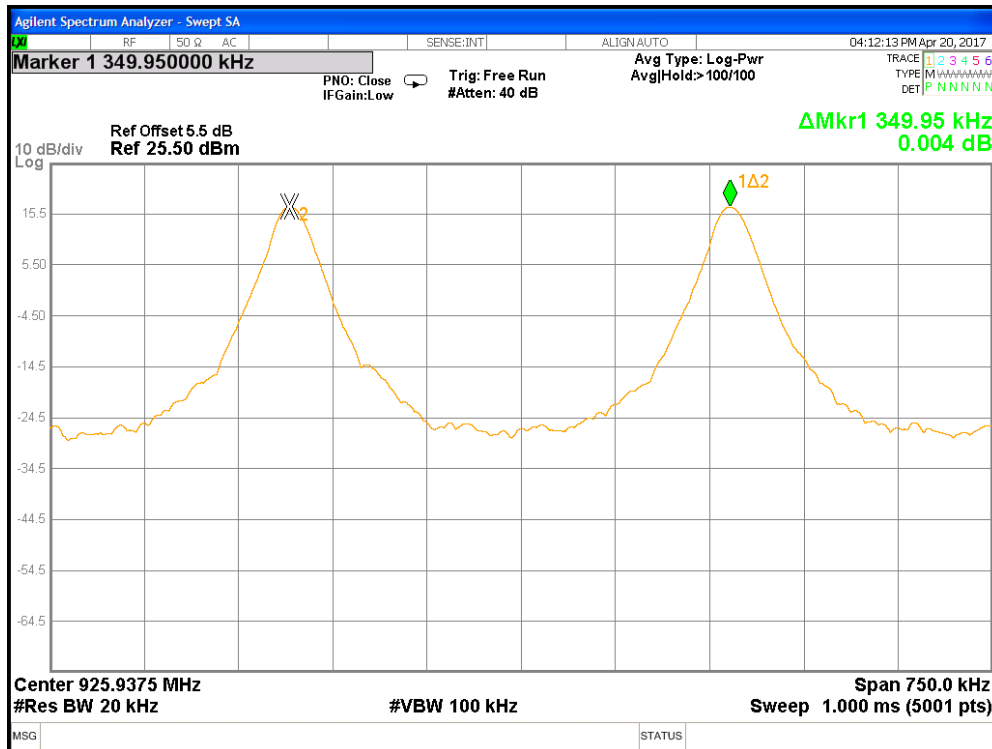
Channel 23 to 24 Walkie Talkie

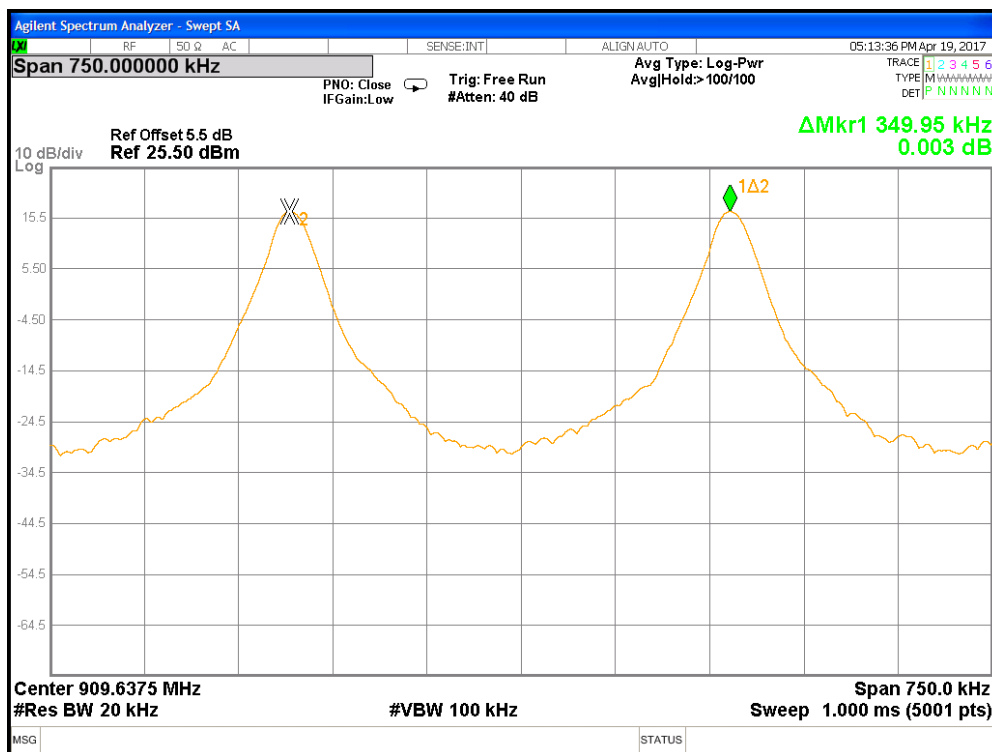
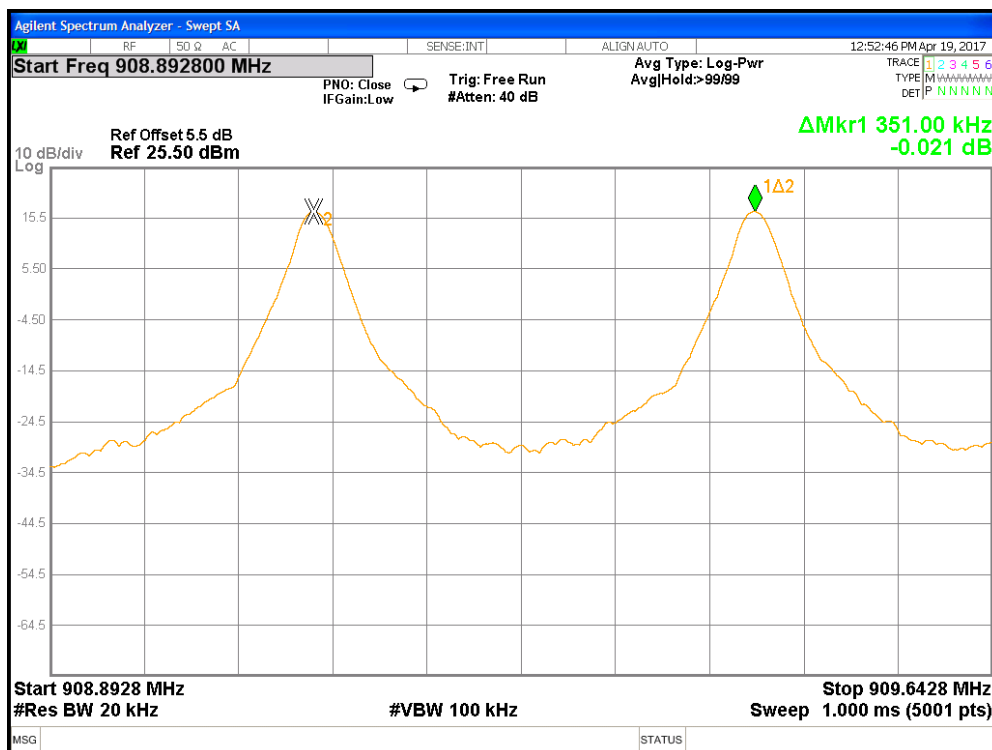


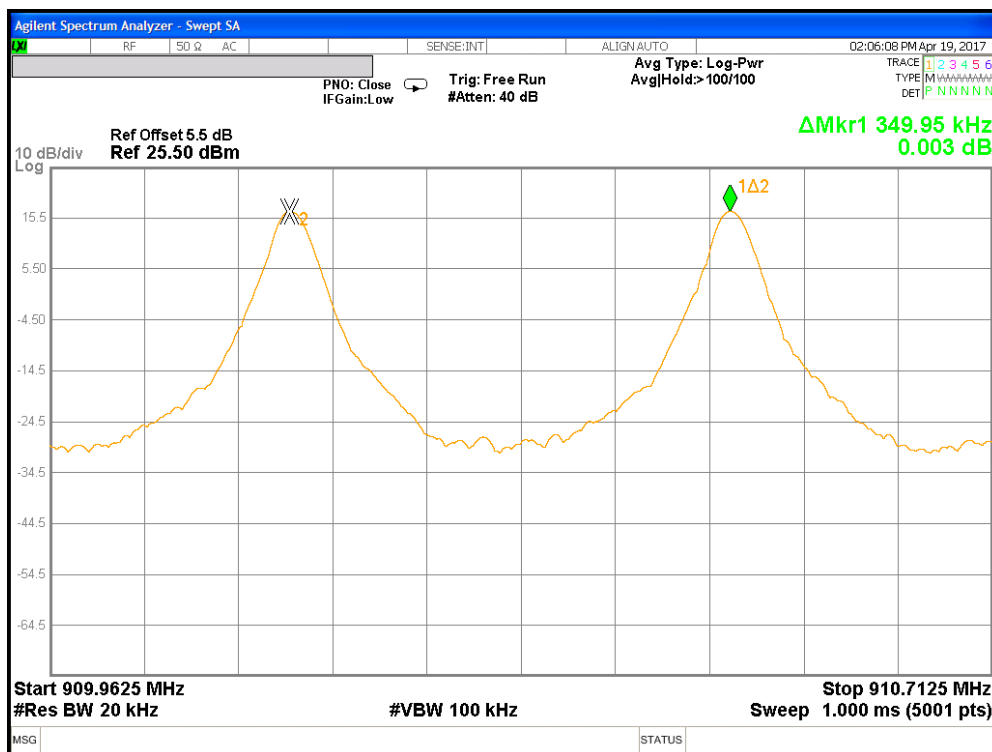
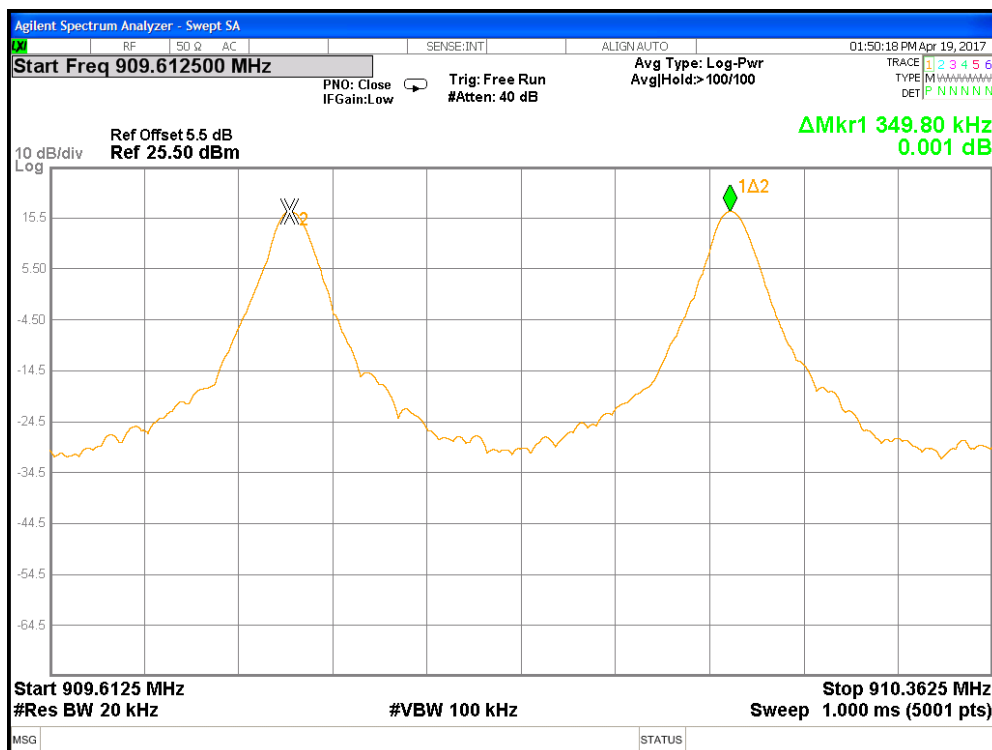
Channel 24 to 25 Walkie Talkie

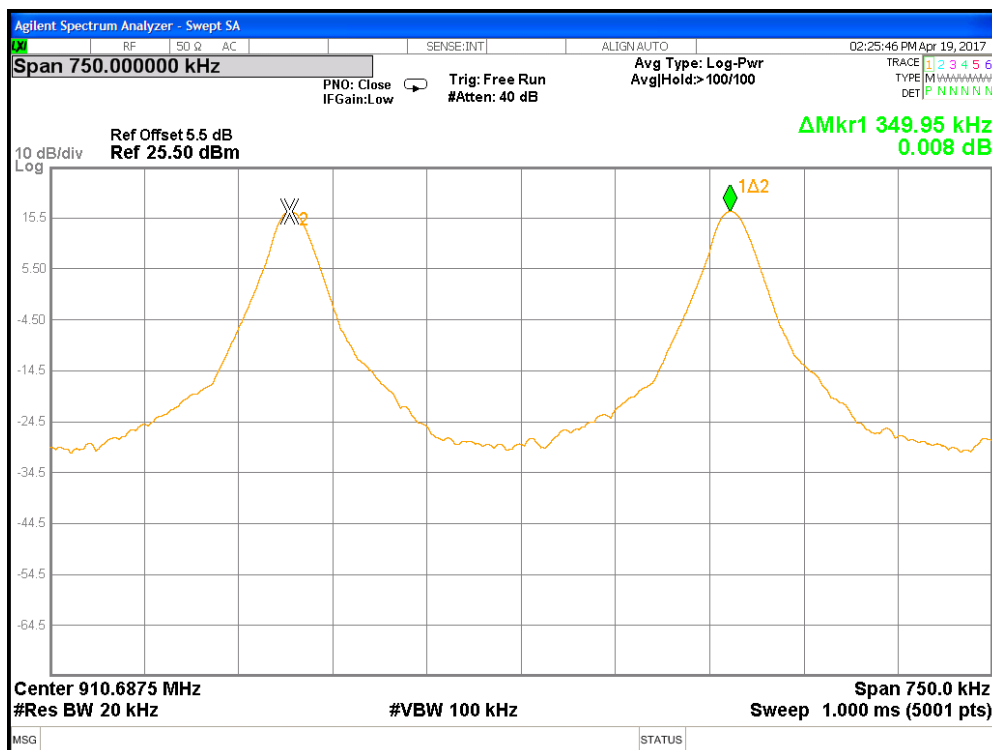


Channel 25 to 26 Walkie Talkie

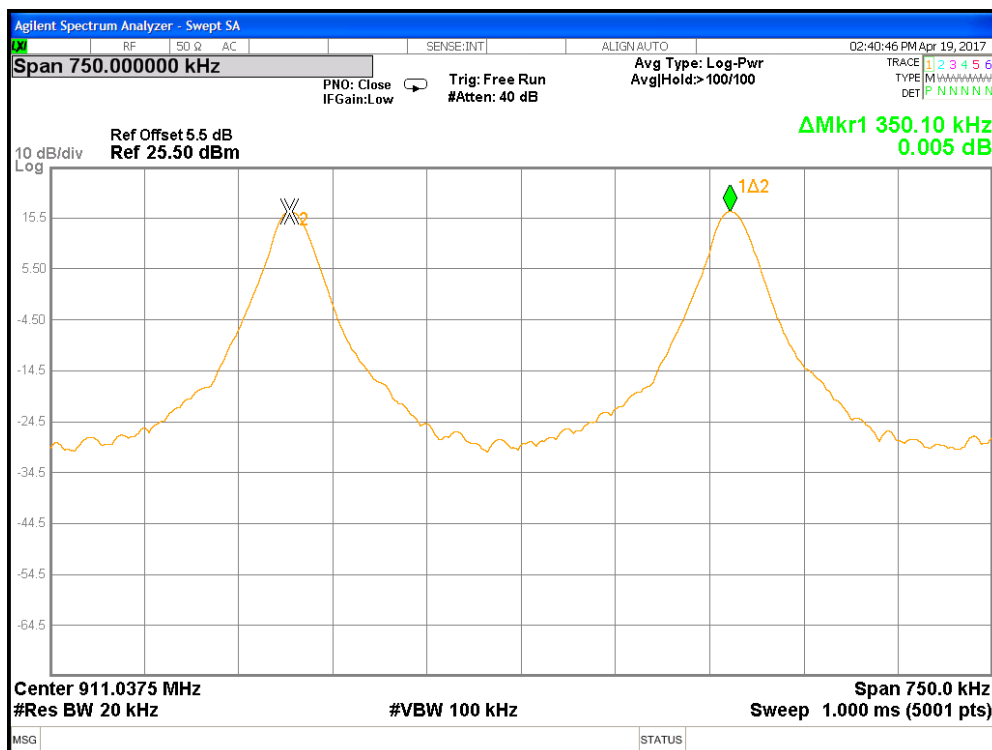




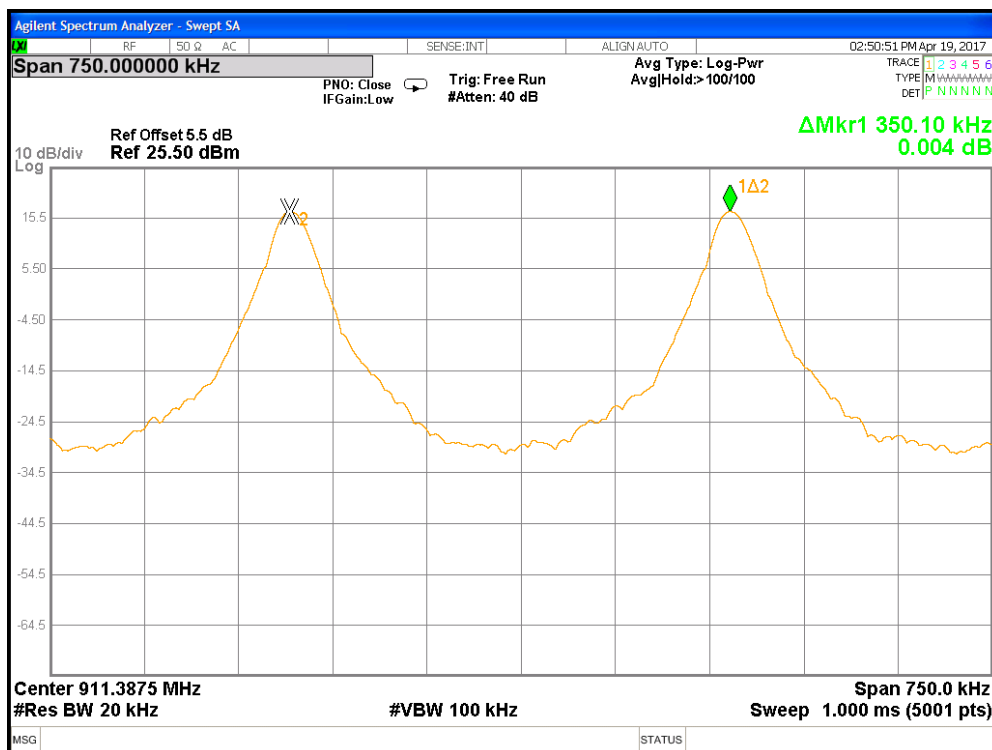




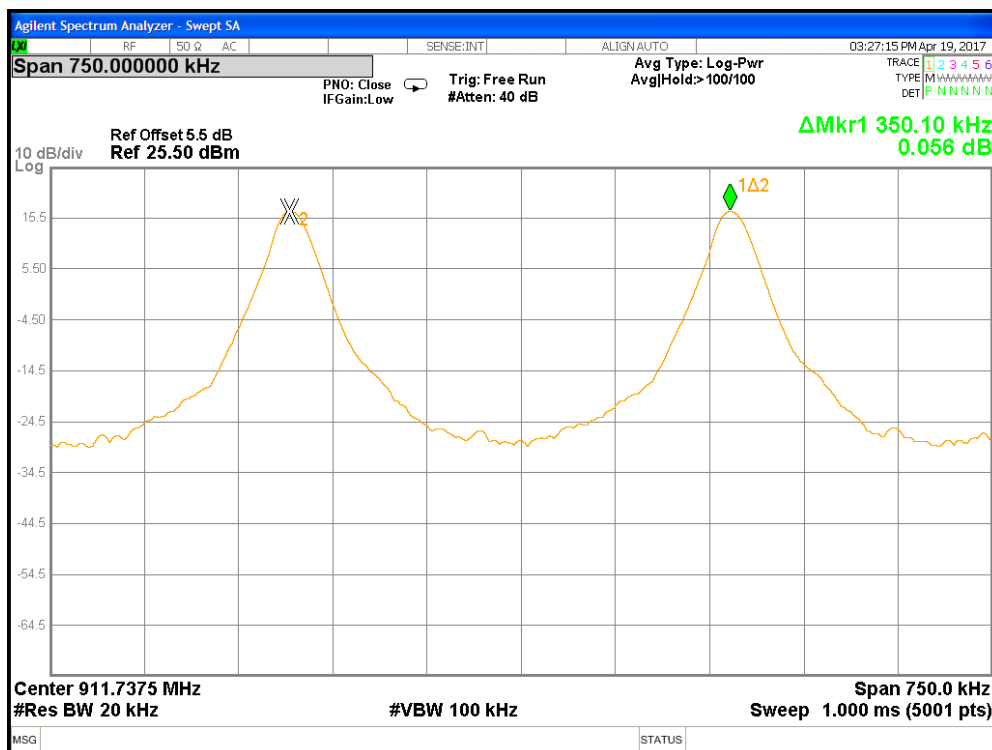
Channel 5 to 6 Normal



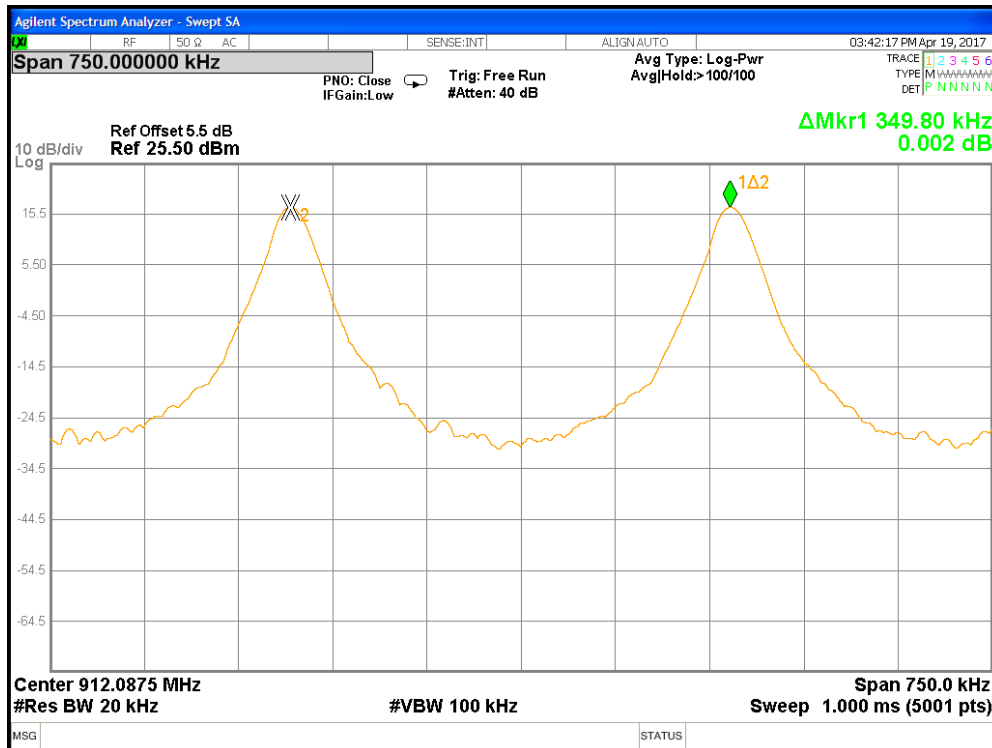
Channel 6 to 7 Normal



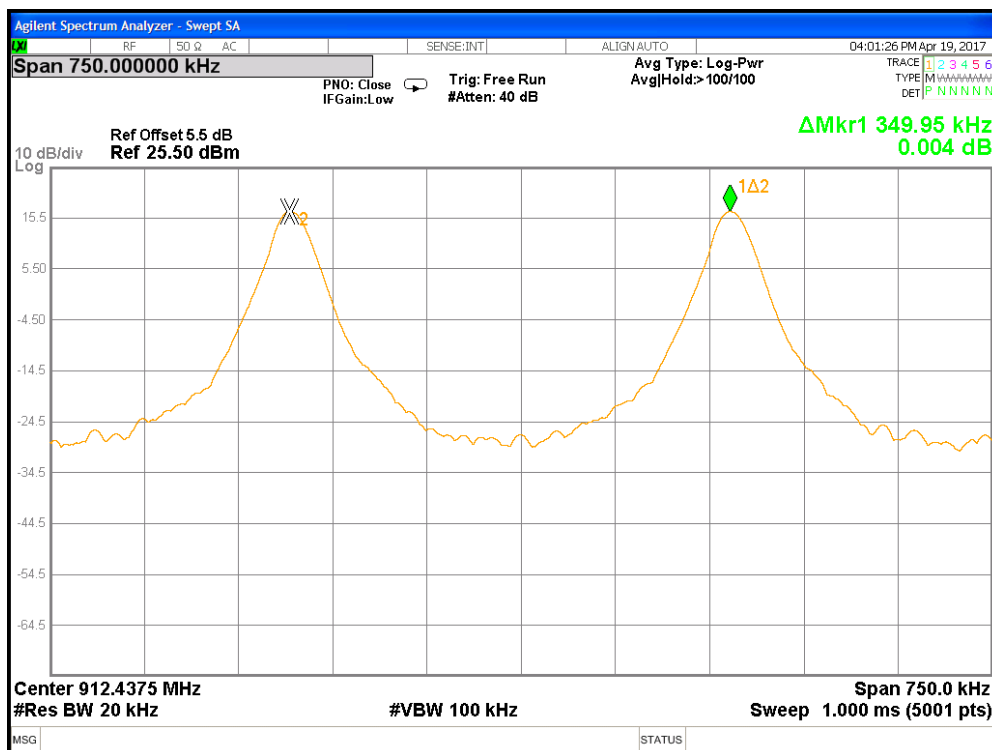
Channel 7 to 8 Normal



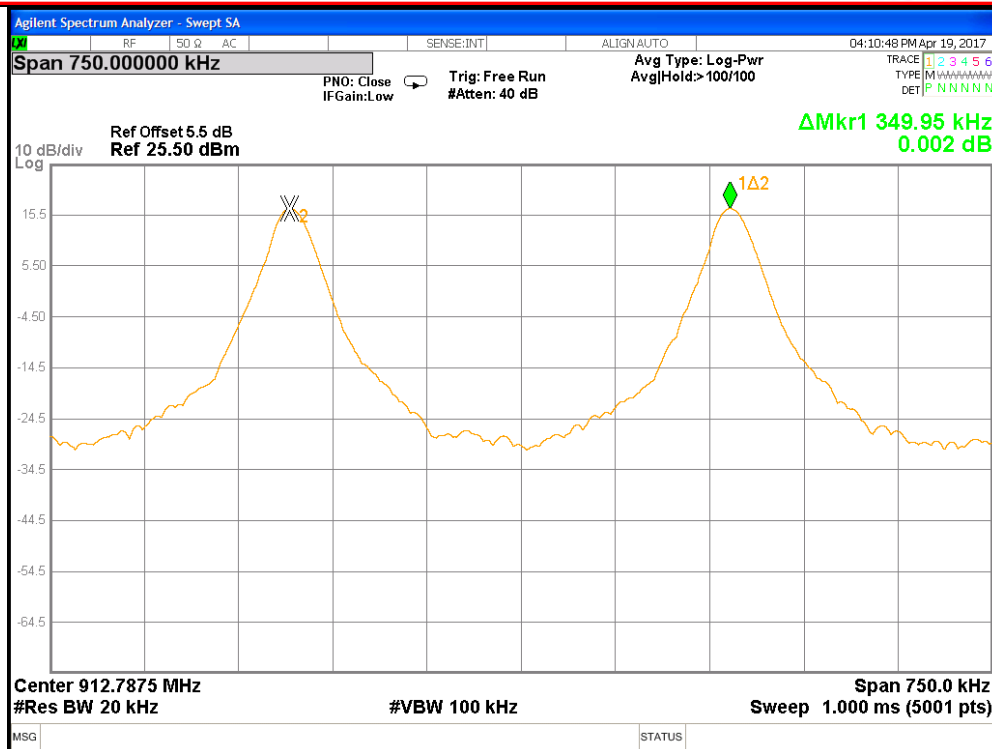
Channel 8 to 9 Normal



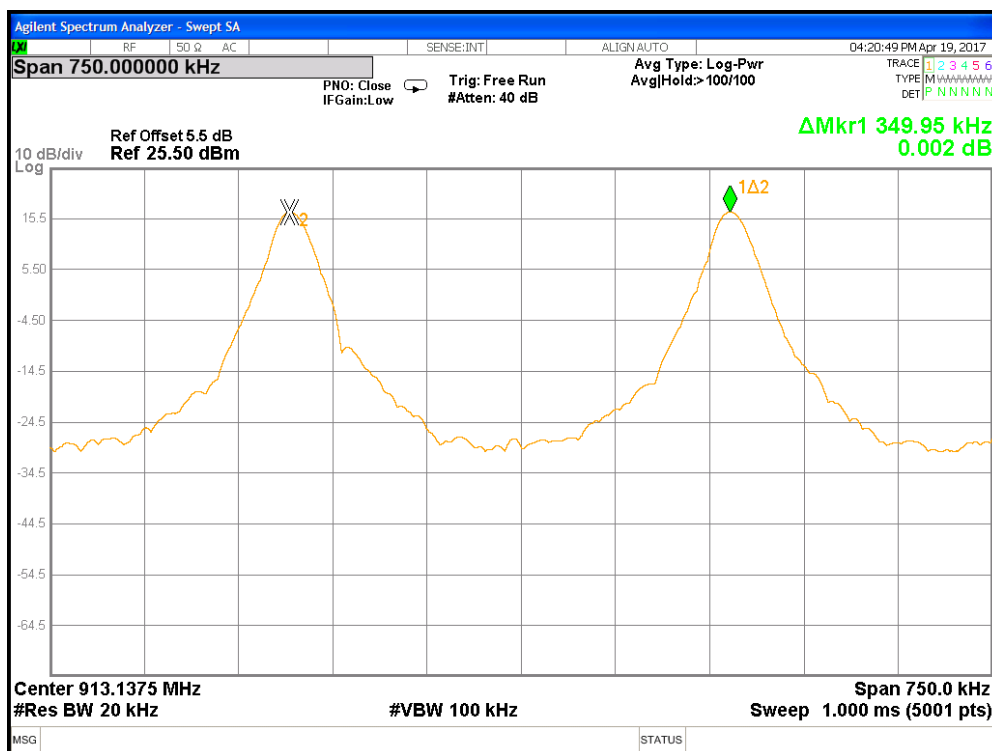
Channel 9 to 10 Normal



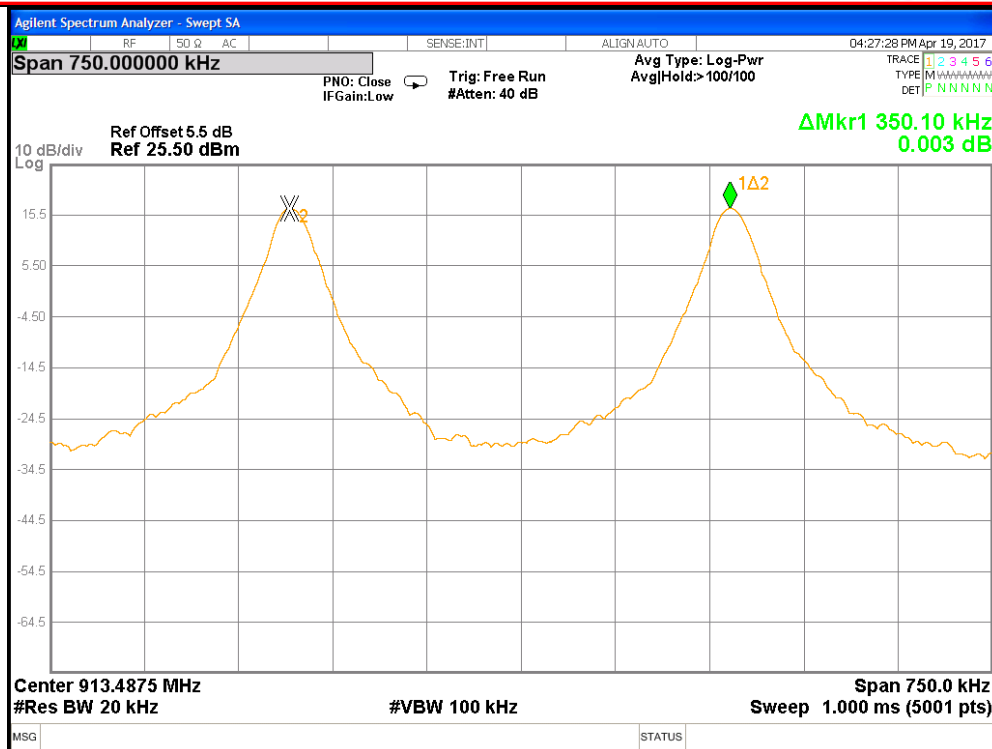
Channel 10 to 11 Normal



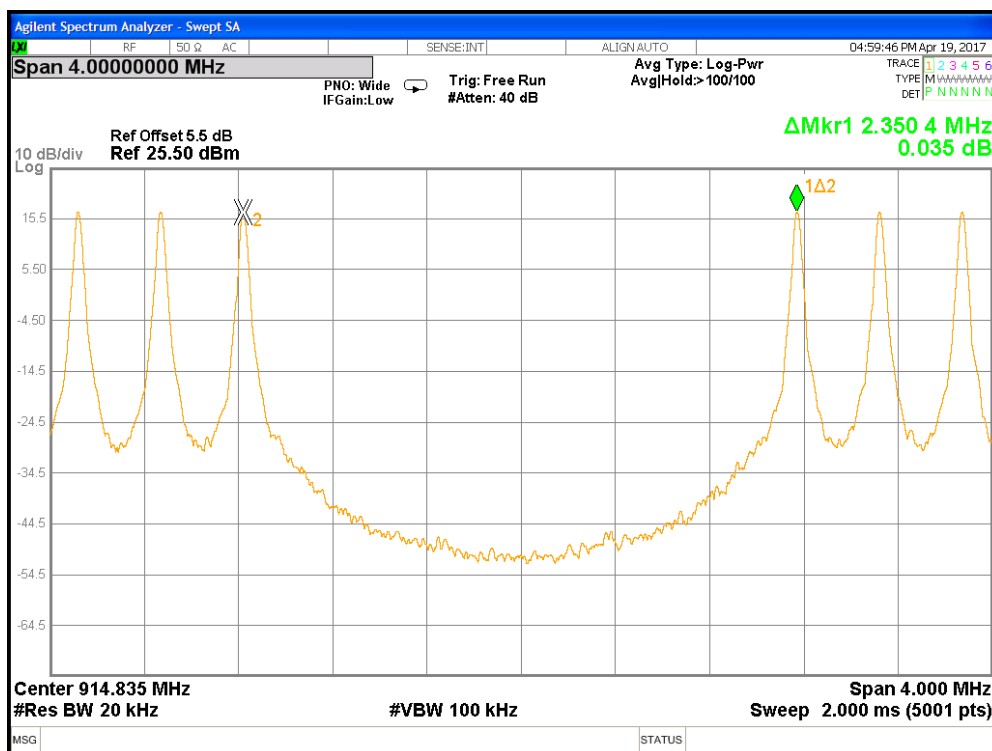
Channel 11 to 12 Normal



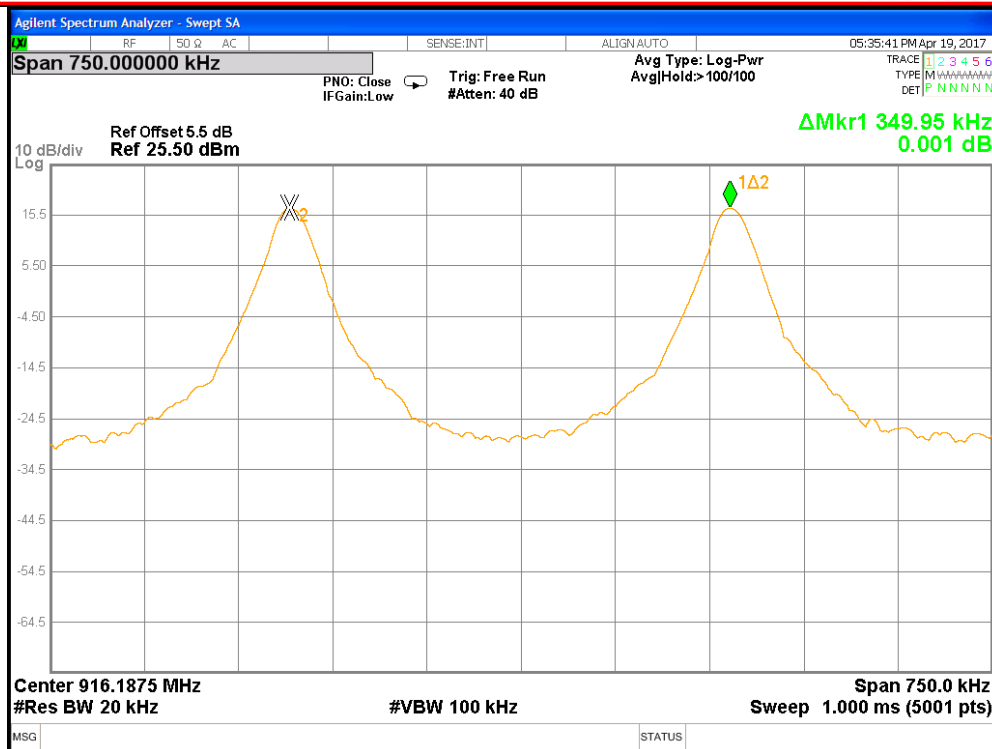
Channel 12 to 13 Normal



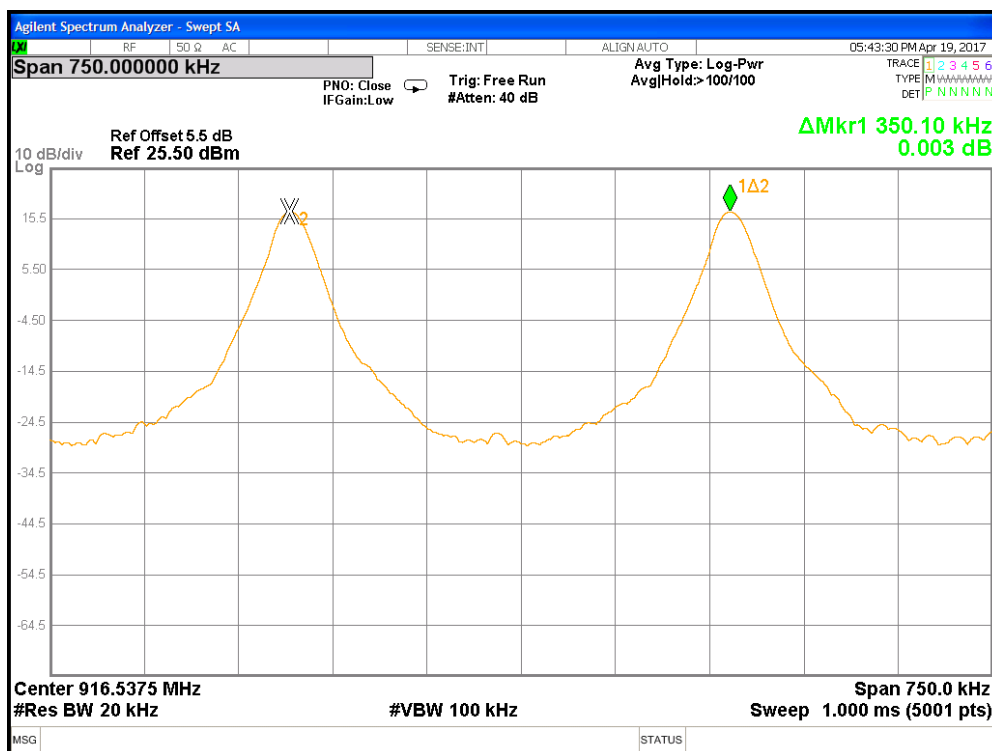
Channel 13 to 14 Normal



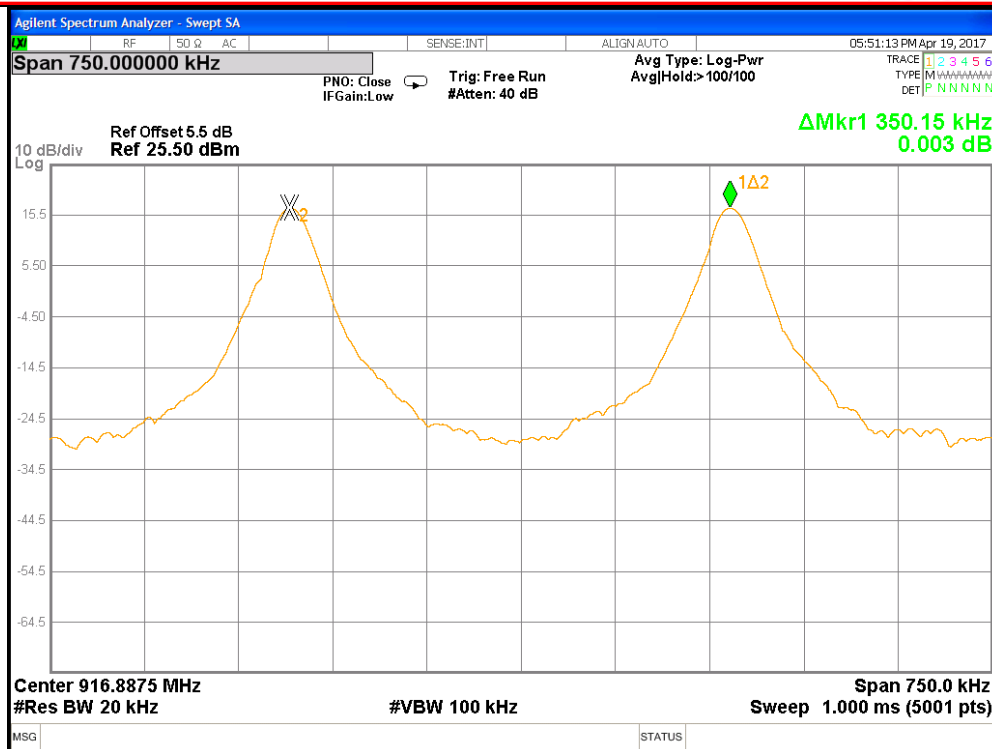
Channel 14 to 15 Normal



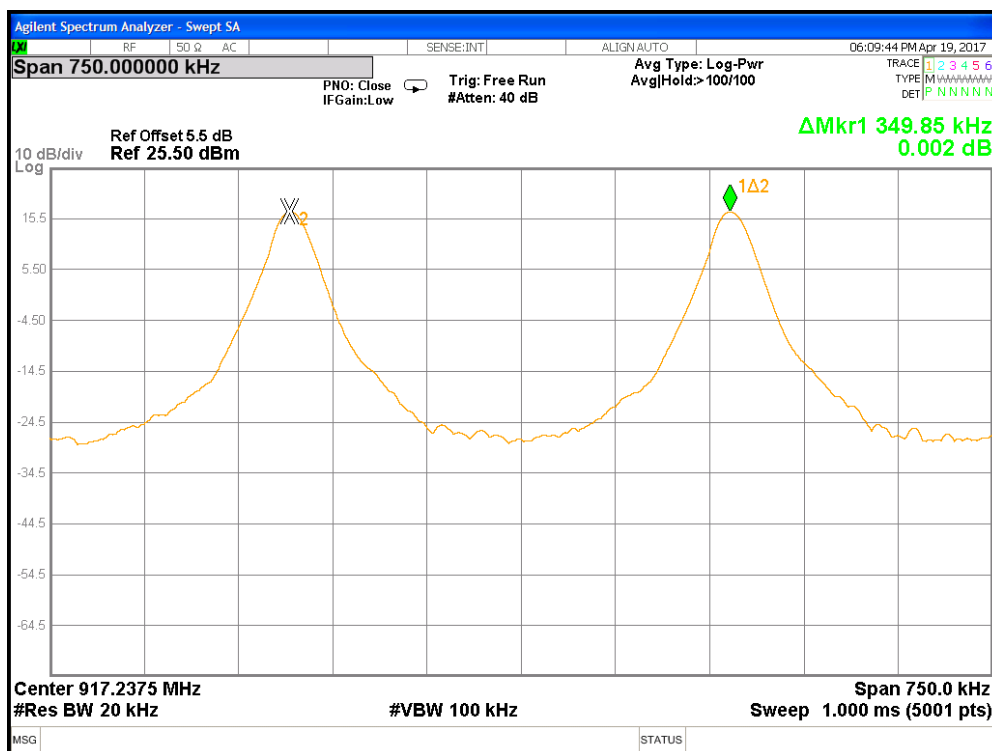
Channel 15 to 16 Normal



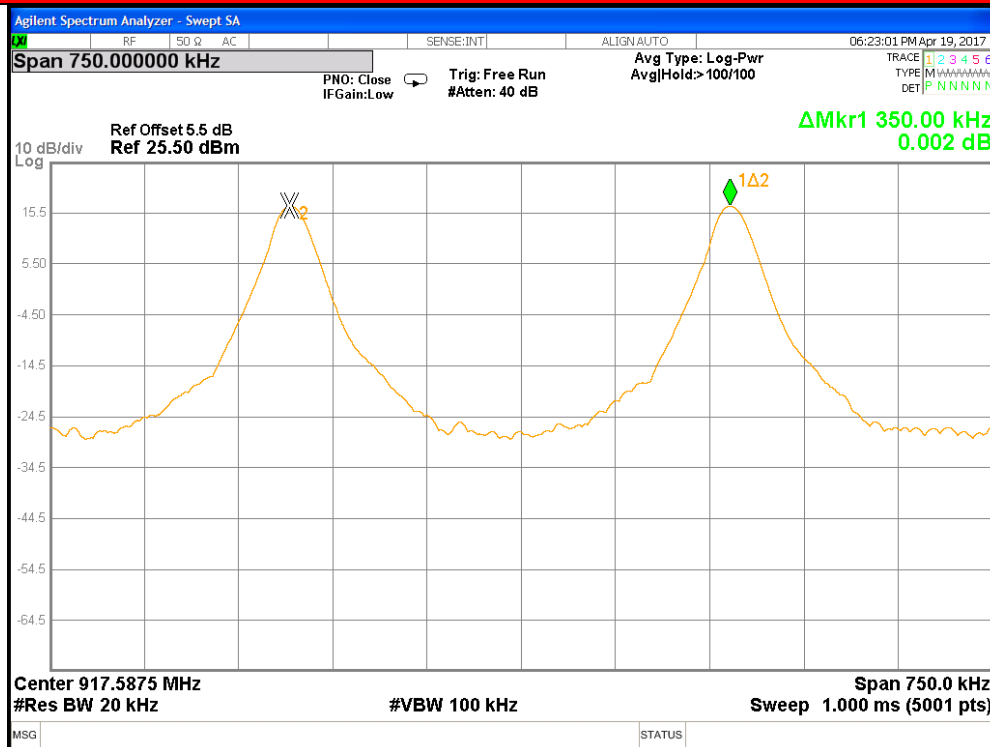
Channel 16 to 17 Normal



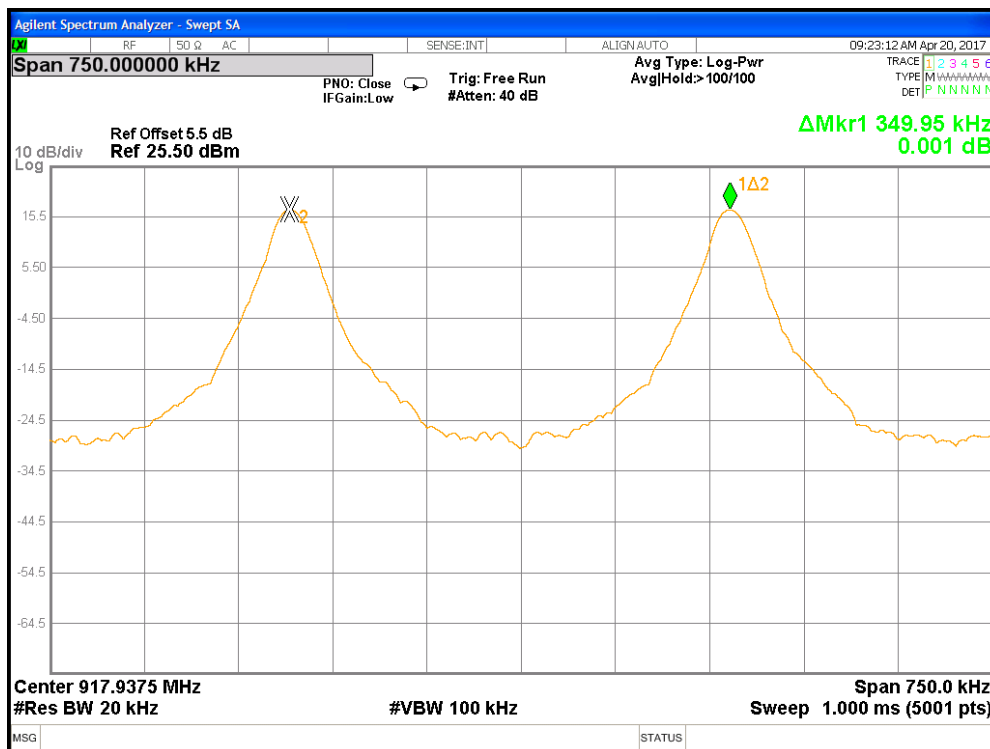
Channel 17 to 18 Normal



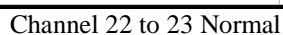
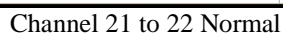
Channel 18 to 19 Normal

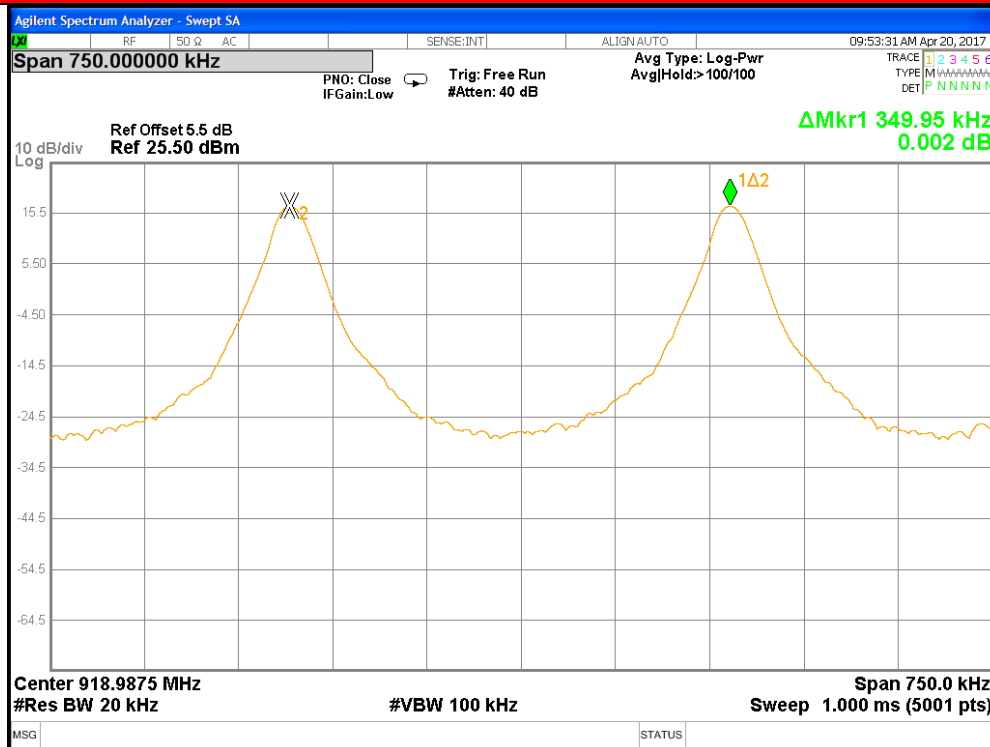


Channel 19 to 20 Normal

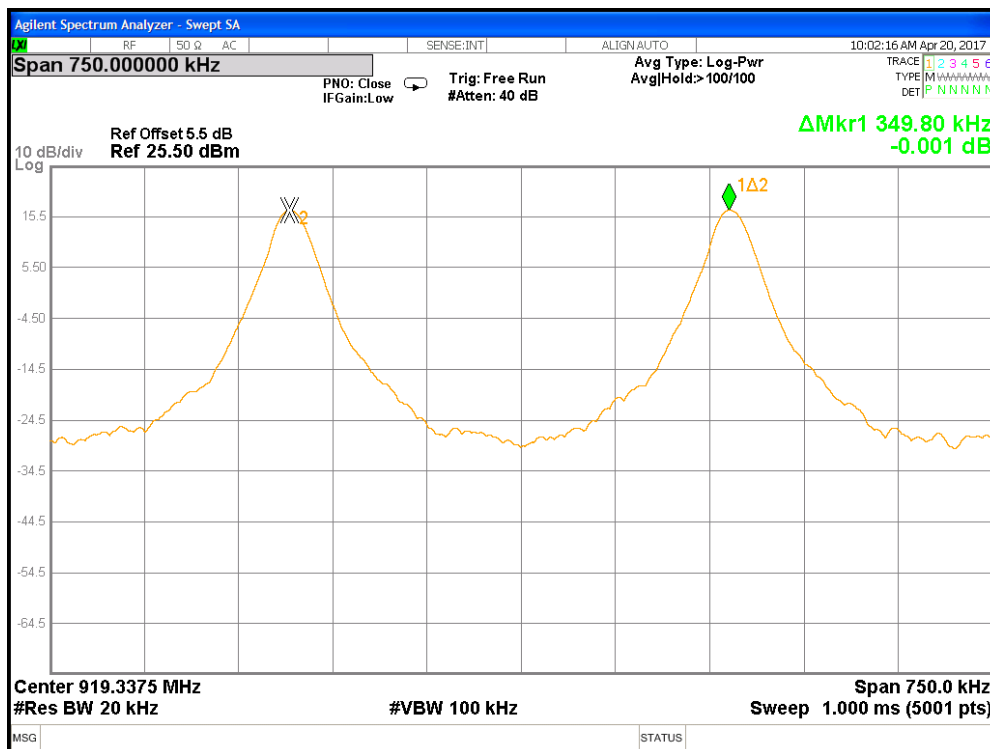


Channel 20 to 21 Normal

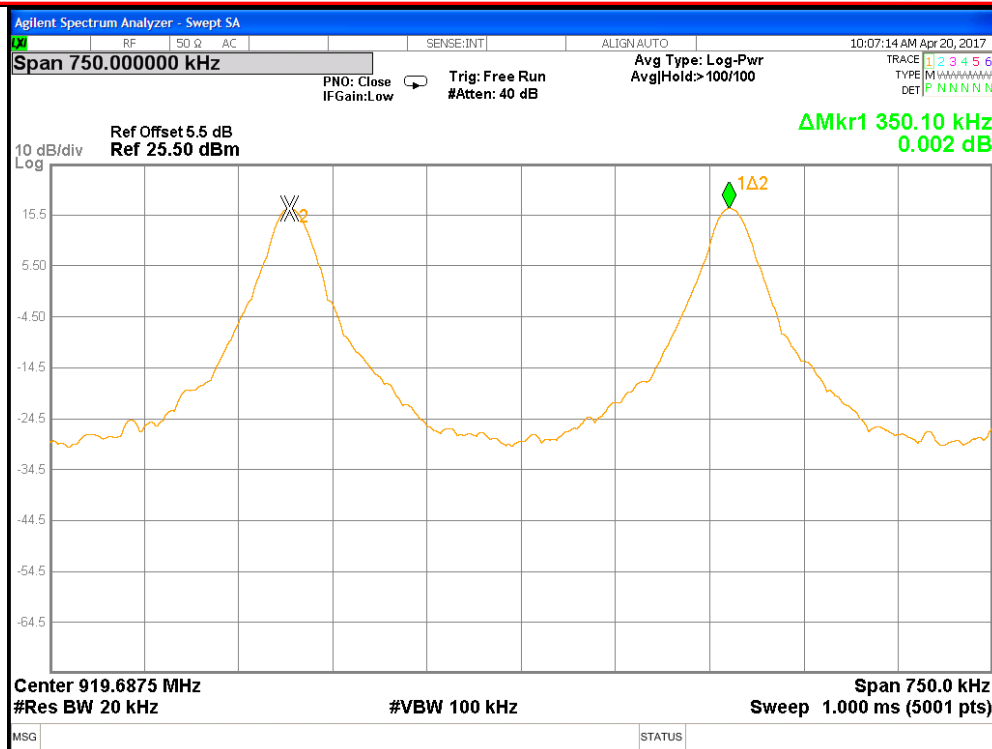




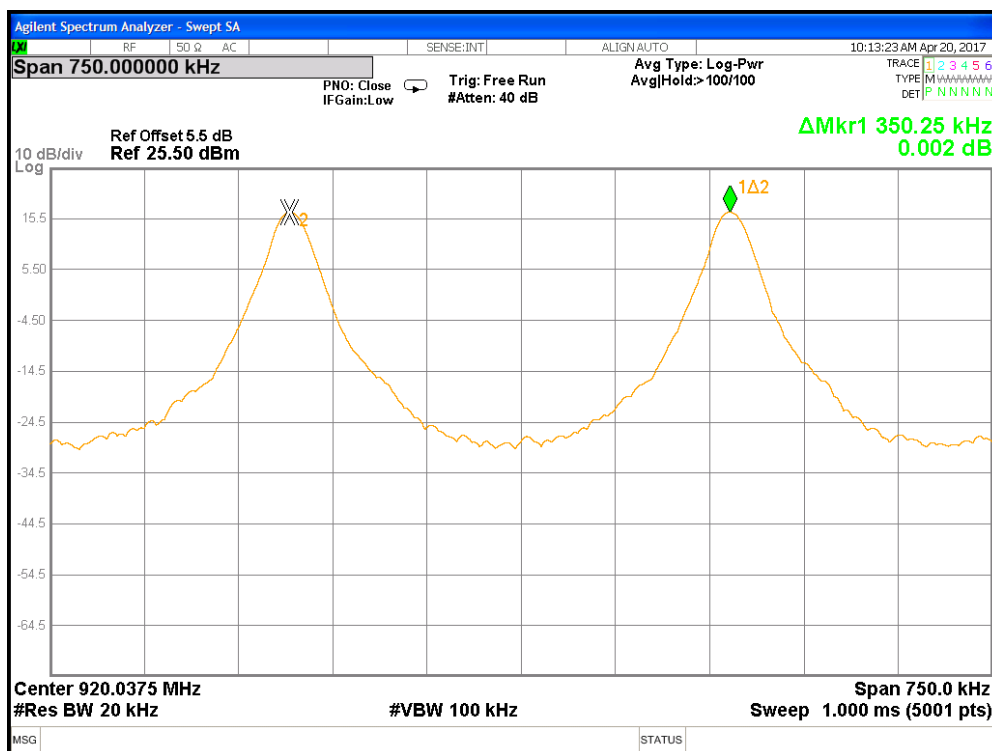
Channel 23 to 24 Normal



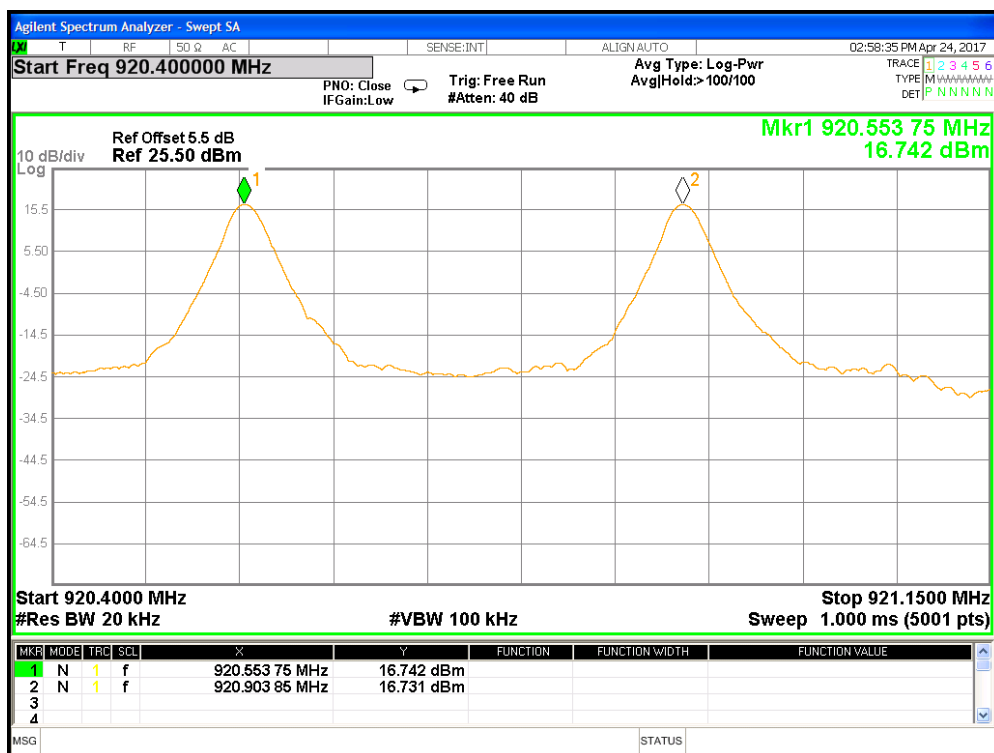
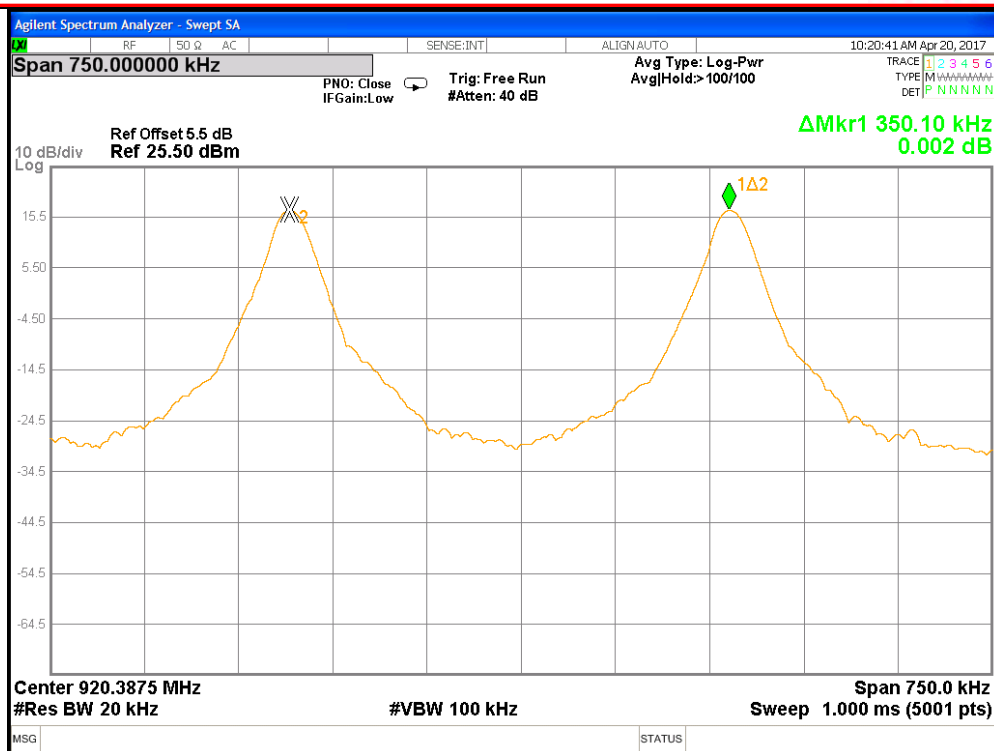
Channel 24 to 25 Normal



Channel 25 to 26 Normal



Channel 26 to 27 Normal



TEST RESULT			
Channel (Walkie Talkie)	Measured value	Limit	Result
#	KHz		
1 to 2	350.1	>20dB BW	Pass
2 to 3	350.1	>20dB BW	Pass
3 to 4	349.95	>20dB BW	Pass
4 to 5	349.8	>20dB BW	Pass
5 to 6	349.8	>20dB BW	Pass
6 to 7	349.95	>20dB BW	Pass
7 to 8	350.1	>20dB BW	Pass
8 to 9	350.1	>20dB BW	Pass
9 to 10	350.1	>20dB BW	Pass
10 to 11	349.95	>20dB BW	Pass
11 to 12	350.1	>20dB BW	Pass
12 to 13	350.1	>20dB BW	Pass
13 to 14	1.350	>20dB BW	Pass
28 (Normal) to 15 (Walkie Talkie)	350.1	>20dB BW	Pass
15 to 16	1.350	>20dB BW	Pass
16 to 17	349.95	>20dB BW	Pass
17 to 18	350.1	>20dB BW	Pass
18 to 19	349.95	>20dB BW	Pass
19 to 20	349.95	>20dB BW	Pass
20 to 21	350.1	>20dB BW	Pass
21 to 22	349.95	>20dB BW	Pass
22 to 23	349.95	>20dB BW	Pass
23 to 24	350.1	>20dB BW	Pass
24 to 25	350.1	>20dB BW	Pass
25 to 26	349.95	>20dB BW	Pass
26 to 27	349.95	>20dB BW	Pass
27 to 28	349.95	>20dB BW	Pass
Channel (Normal)	Measured value	Limit	Result
#	KHz		
1 to 2	351	>20dB BW	Pass
2 to 3	349.95	>20dB BW	Pass
3 to 4	349.8	>20dB BW	Pass
4 to 5	349.95	>20dB BW	Pass
5 to 6	349.95	>20dB BW	Pass
6 to 7	350.1	>20dB BW	Pass
7 to 8	350.1	>20dB BW	Pass
8 to 9	350.1	>20dB BW	Pass
9 to 10	349.8	>20dB BW	Pass
10 to 11	349.95	>20dB BW	Pass
11 to 12	349.95	>20dB BW	Pass
12 to 13	349.95	>20dB BW	Pass
13 to 14	350.1	>20dB BW	Pass
14 to 15	2.350	>20dB BW	Pass
15 to 16	349.95	>20dB BW	Pass
16 to 17	350.1	>20dB BW	Pass
17 to 18	350.15	>20dB BW	Pass
18 to 19	349.85	>20dB BW	Pass
19 to 20	350	>20dB BW	Pass
20 to 21	349.95	>20dB BW	Pass

21 to 22	349.95	>20dB BW	Pass
22 to 23	349.65	>20dB BW	Pass
23 to 24	349.95	>20dB BW	Pass
24 to 25	349.8	>20dB BW	Pass
25 to 26	350.1	>20dB BW	Pass
26 to 27	350.25	>20dB BW	Pass
27 to 28	350.1	>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.	20293-1
Model No.	FW-MM	Serial No.	MEL-156
Test Start Date	2017-04-21	Temperature (°C)	23.6°C
Test End Date	2017-04-24	Humidity RH (%)	51.9%RH
Tested By	Arnoldo Garcia	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 15.247:2010		
Test Method	DA 00-705		
Comment	NA		

TEST DETAILS

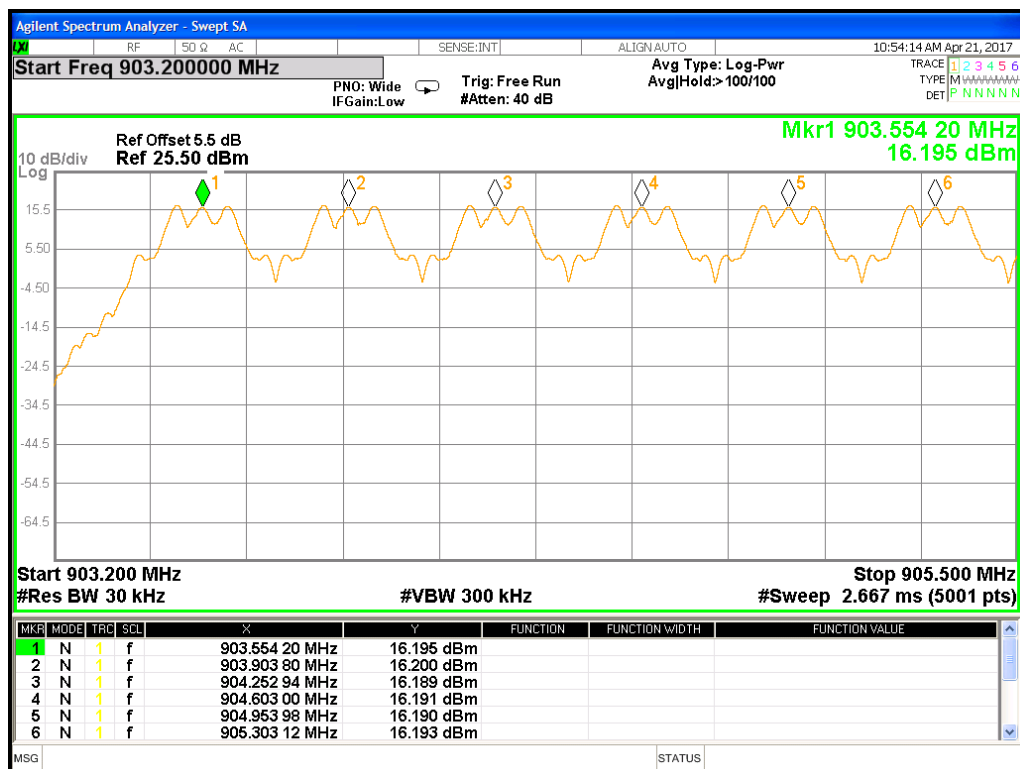
Method	Radiated <input type="checkbox"/>	Conducted <input checked="" type="checkbox"/>
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TEST PARAMETERS

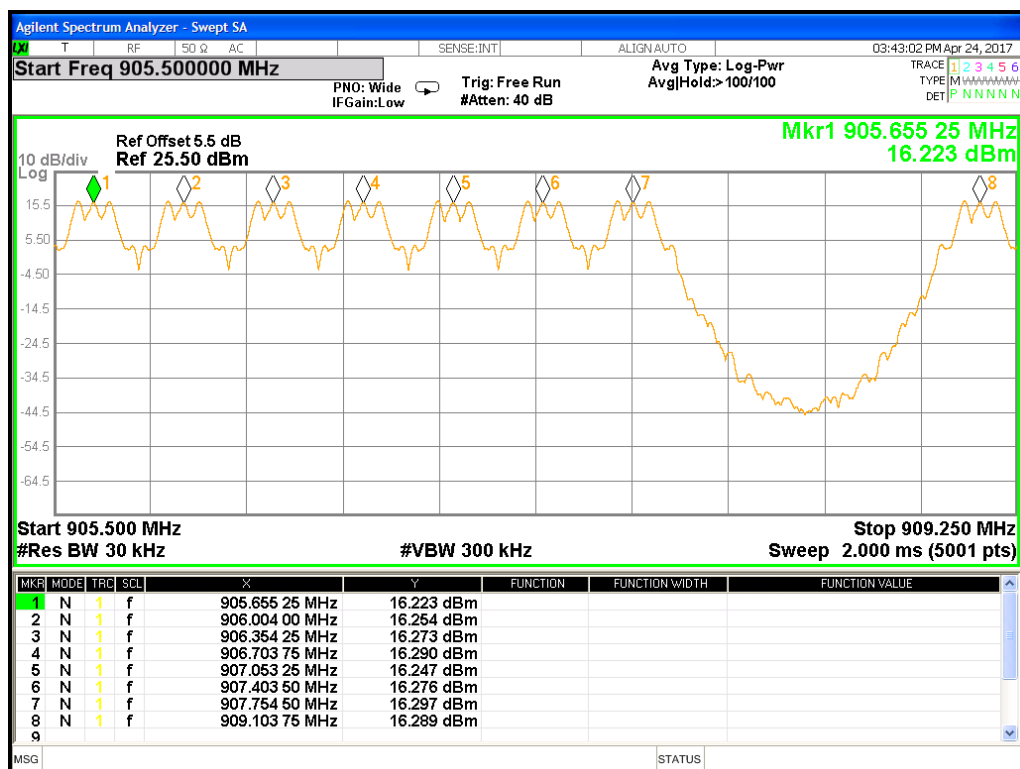
Antenna Height	NA	Turntable Rotation	NA
Equipment Class	NA	Measurement Distance	NA

TEST EQUIPMENT

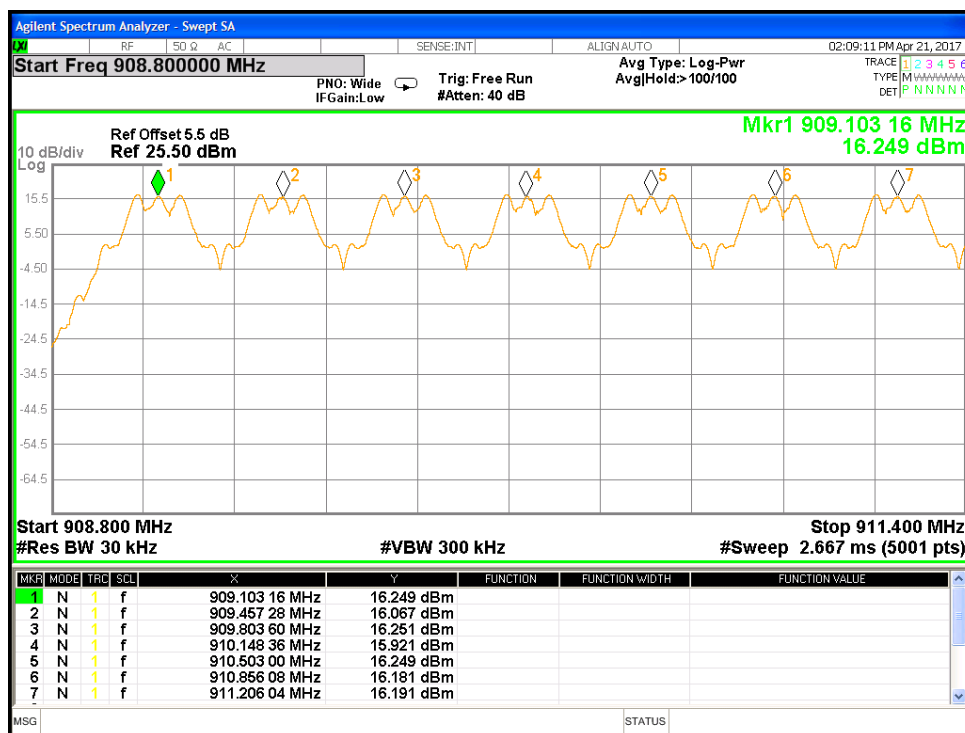
Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Keysight	N9030A (PXA)	MY49431596	2018-01-27
Y	RF Cable	Digikey	1	NA	NA



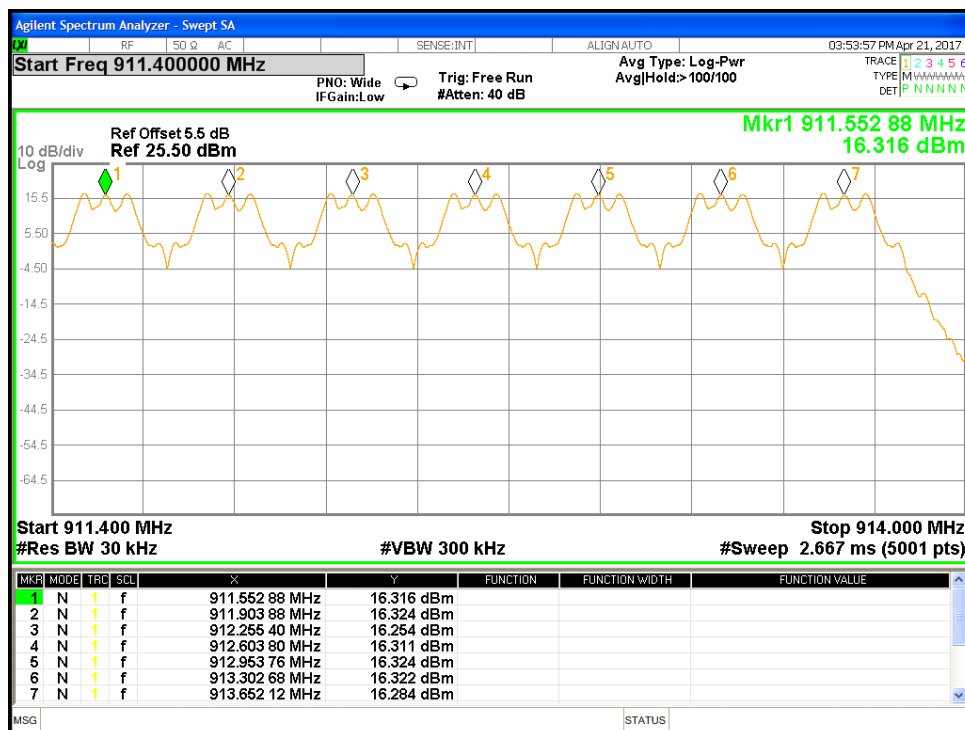
Channels 1-6 (Walkie-Talkie Mode)



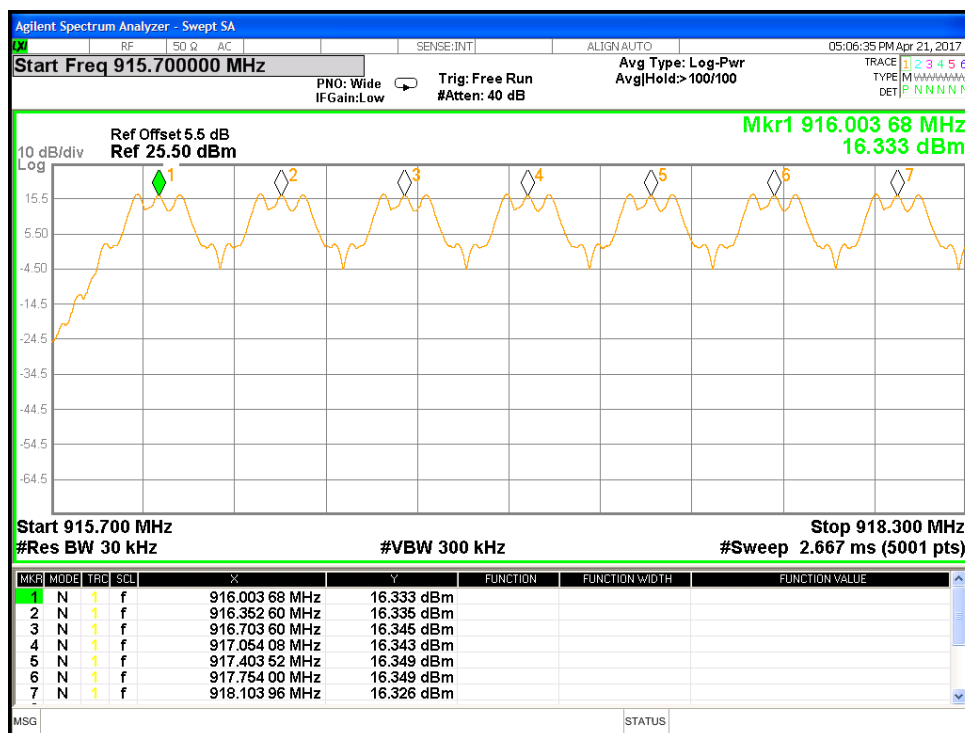
Channels 7-14 (Walkie-Talkie Mode)



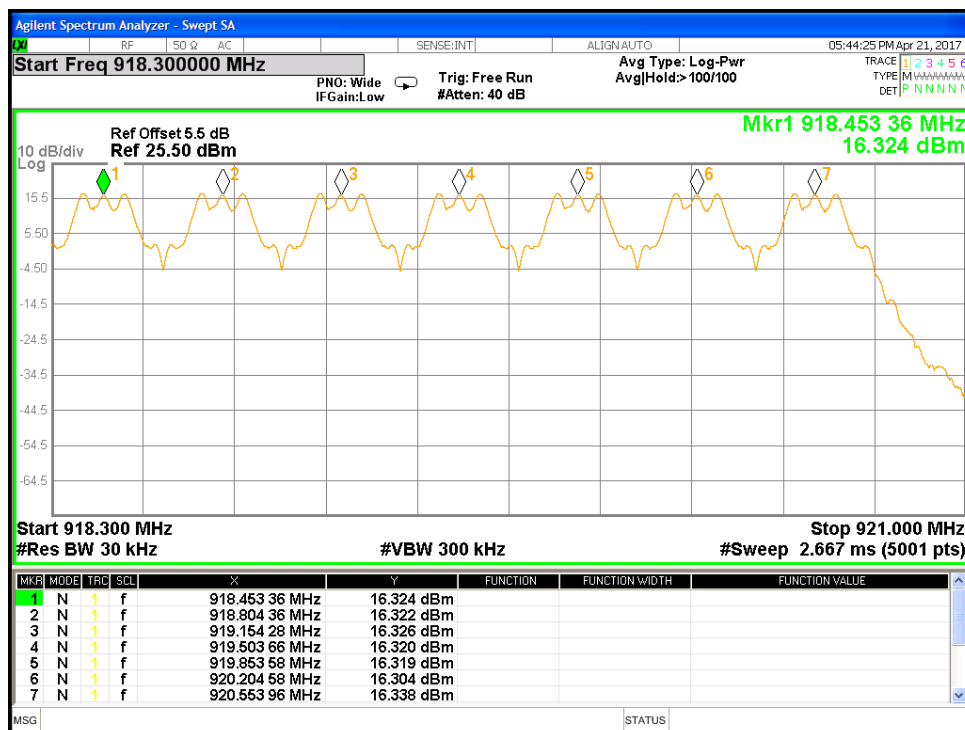
Channels 1-7 (Normal Mode)



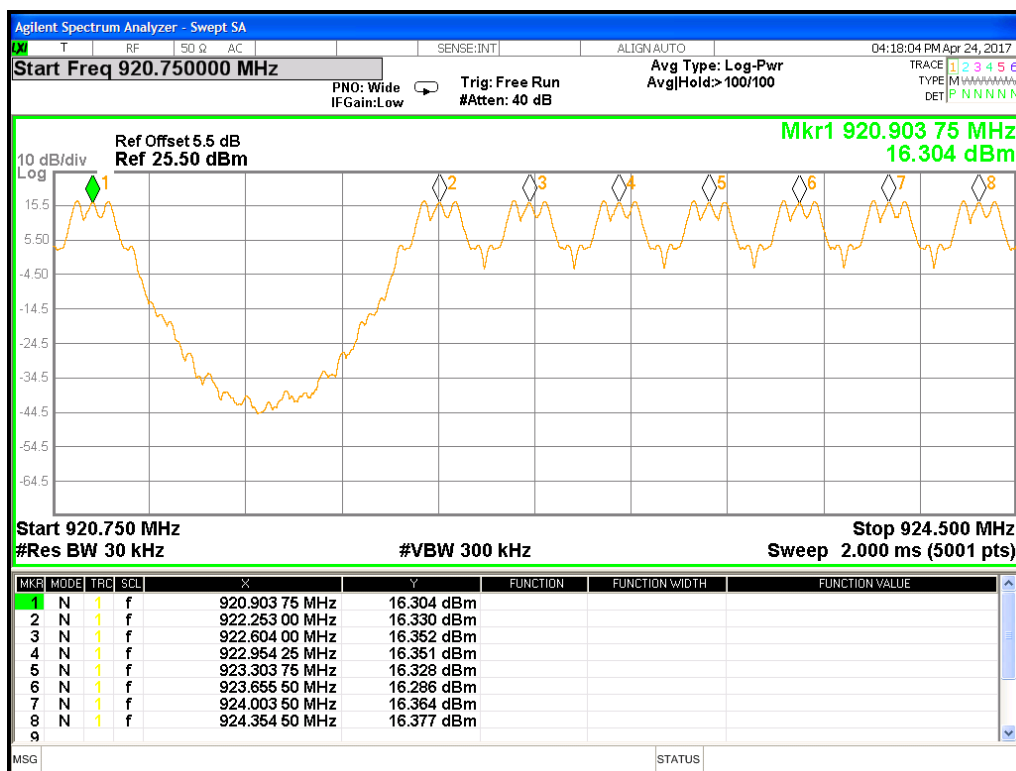
Channels 8-14 (Normal Mode)



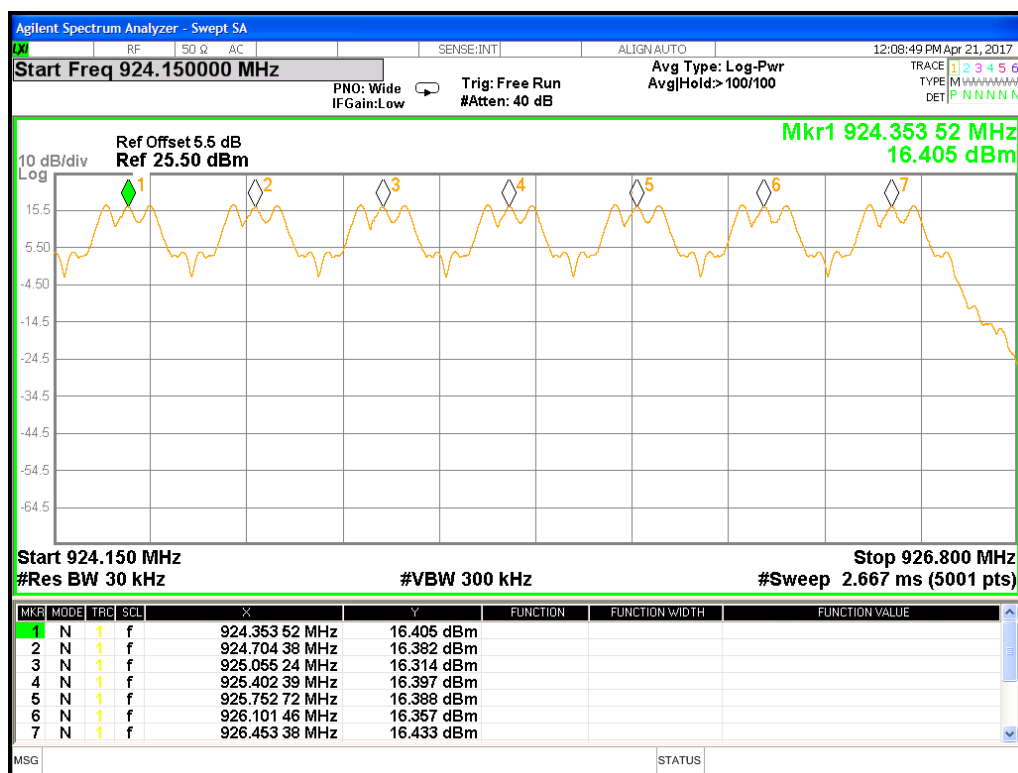
Channels 15-21 (Normal Mode)



Channels 22-28 (Normal Mode)



Channels 15-21 (Walkie-Talkie Mode)



Channels 22-27 (Walkie-Talkie Mode)

TEST RESULT			
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 RFT test setup