

Wireless Relay Module

Model No.: FW-RM

Date: 02-Mar-2020

Report Prepared By:
Shaithanya C

EMC Test Report



Report Number	EMC0419-1
EUT Nomenclature	Wireless Relay Module
Sample Identification	Model No : FW-RM SL. No : 107 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

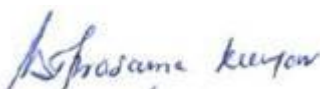
 Signature: 

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

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

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.

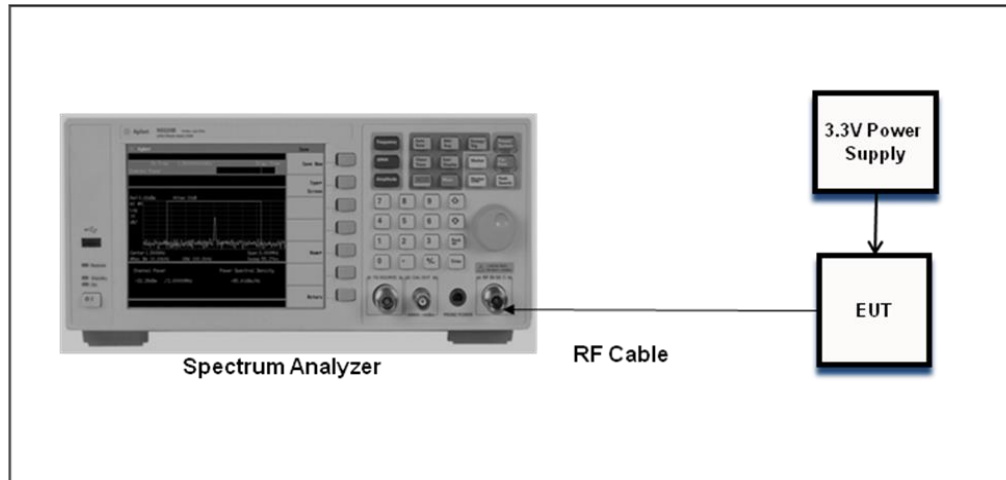
RATINGS AND SYSTEM DETAILS	
Operating Frequency	902MHz to 928MHz
Number of Channels	DTS :6
	FHSS :55
Channel Bandwidth (20dB)	DTS :1MHz
	FHSS :320KHz
Transmitted Power	DTS :12dBm
	FHSS :17dBm
Modulation Type	FSK
Data Rate	DTS :300Kbps
	FHSS :150Kbps
Antenna Type	Inverted F Patch Antenna
No. of Antenna	3
Antenna Gain	ANT 1 :0.65dBi
	ANT 2 :2.00dBi
	ANT 3 :1.30dBi
Supply Voltage and Current	3.3V, 21.5mA
Dimensions (Diameter x Height)	4.263mm x 4.171mm x 1.465mm
Environmental Conditions	Operating Temperature :0°C to 49°C
	Storage Temperature: -20°C to 60°C
	Humidity :10% to 93% RH

TEST CONFIGURATION	
Config #	Description
Conducted Test	EUT is Powered by 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 2 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 2

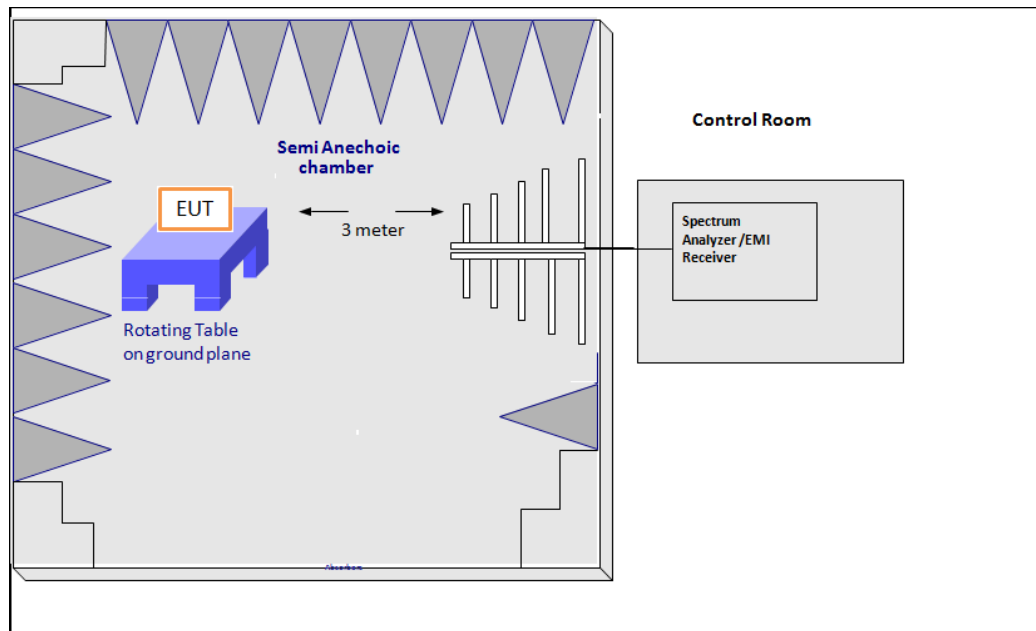
OPERATING MODES	
Mode #	Description
DTS	Following DTS channels have been used for Conducted (Continuous Trans mission) and Radiated (Continuous Trans mission) Tests Channel 1: 902.875MHz Channel 4: 915.325MHz Channel 6: 927.125MHz
FHSS	Following FHSS channels have been used for Conducted (Continuous 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 DC = DC Power Port TP = Telecommunication Ports (E.g. Ethernet) DI / DO = Digital Input / Output N / E = Non Electrical AI / AO = Analog Input / Output					

SUPPORT EQUIPMENTS AND ACCESSORIES USED					
#	Item Description	Make	Model	Part No. / SI. 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

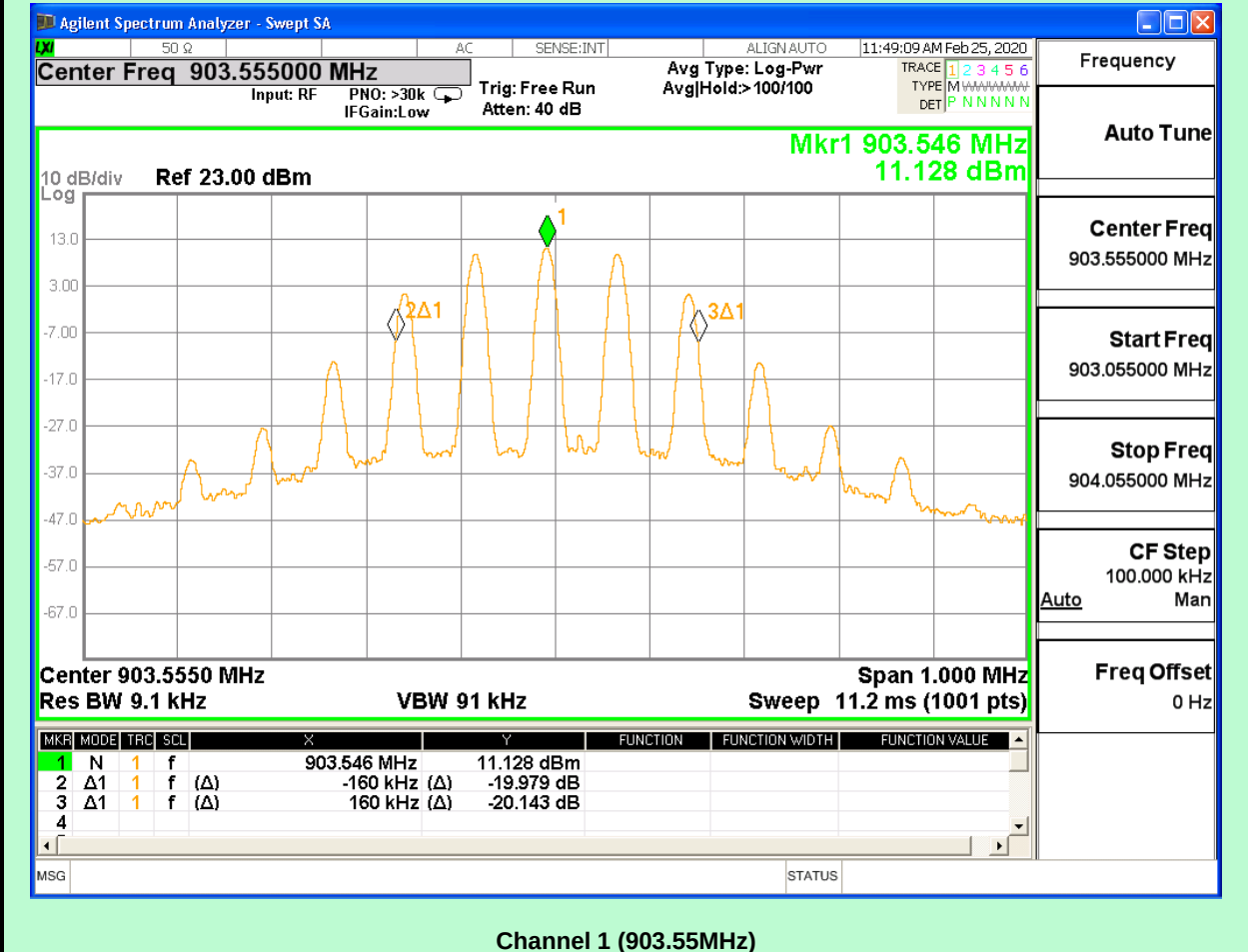
2.1 20dB BANDWIDTH

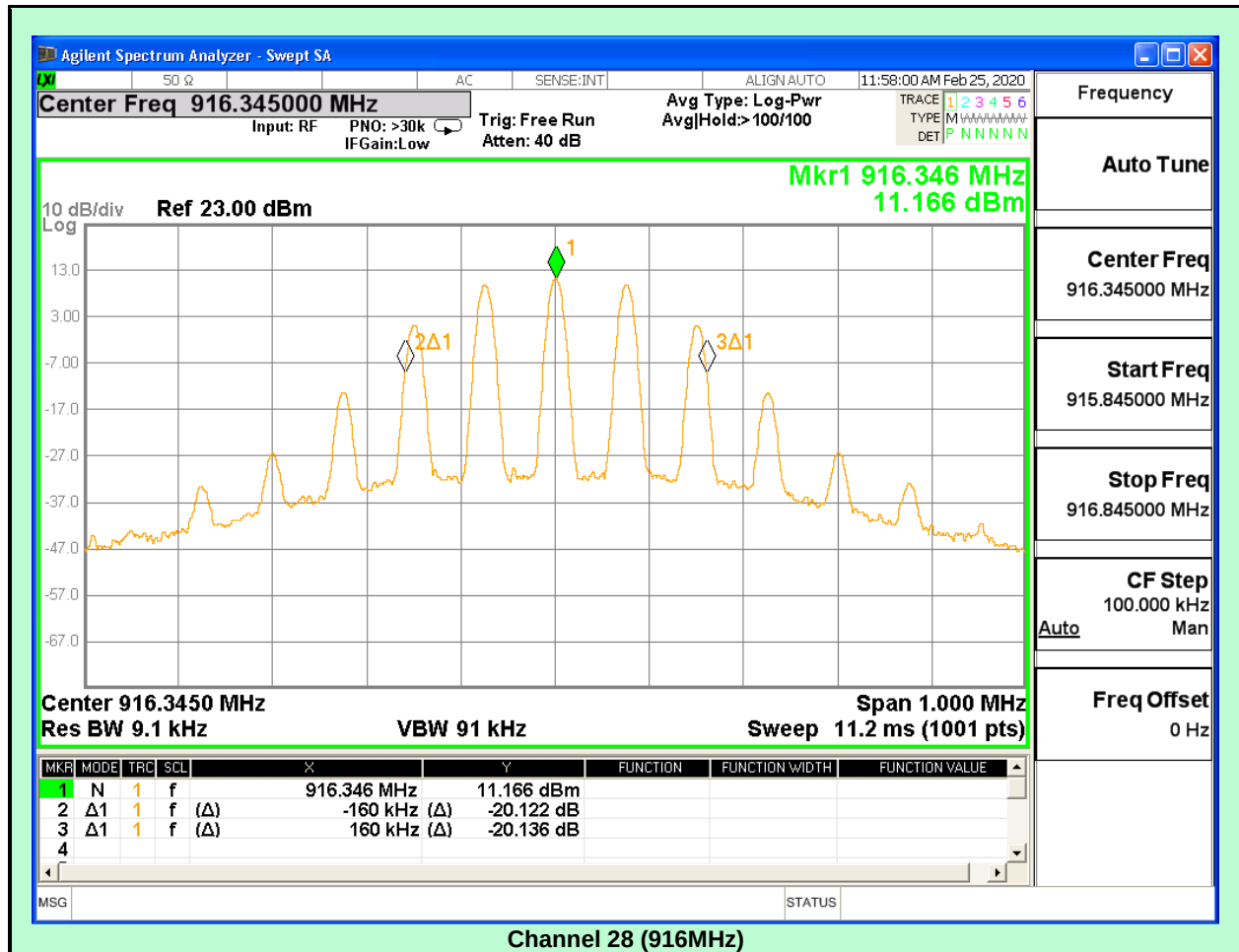
EUT Nomenclature	Wireless Relay Module	Test Request No.	EMC0419-1
Model No.	FW-RM	Serial No.	107
Test Start Date	14-Dec-2019	Temperature (°C)	23.6°C
Test End Date	28-Feb-2020	Humidity RH (%)	51.9%RH
Tested By	Shaithanya C	Pressure (mbar)	NR
Input Voltage /	3.3V, 21.5mA		
Operating Mode	Refer Page 6 for 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

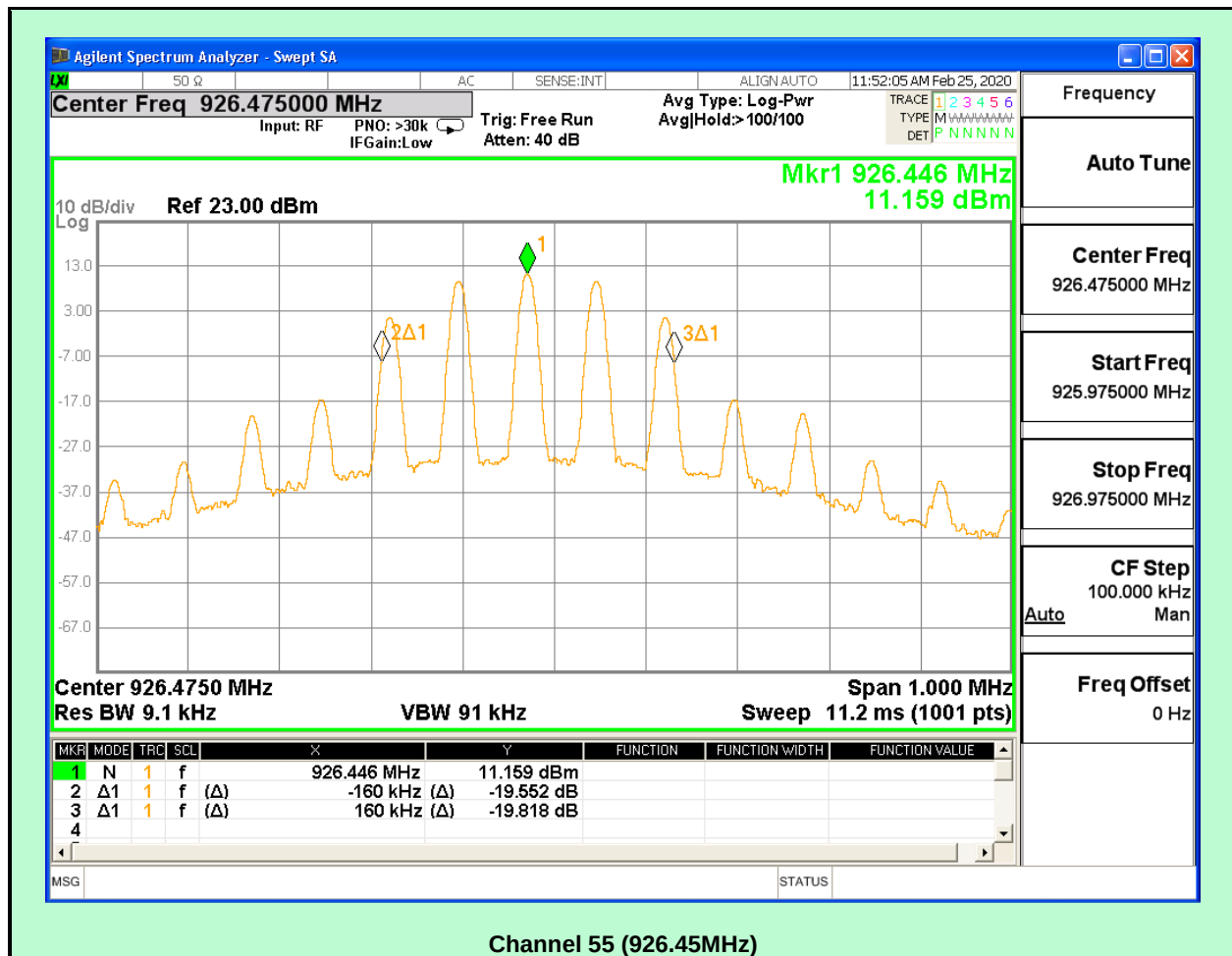
TEST EQUIPMENT

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







TEST RESULT				
Channel	Frequency	Measured Bandwidth	Limit	Result
#	MHz	KHz	KHz	
1	903.55	320	≥250 & ≤500	PASS
28	916	320	≥250 & ≤500	PASS
55	926.45	320	≥250 & ≤500	PASS

TEST SETUP PHOTOGRAPH

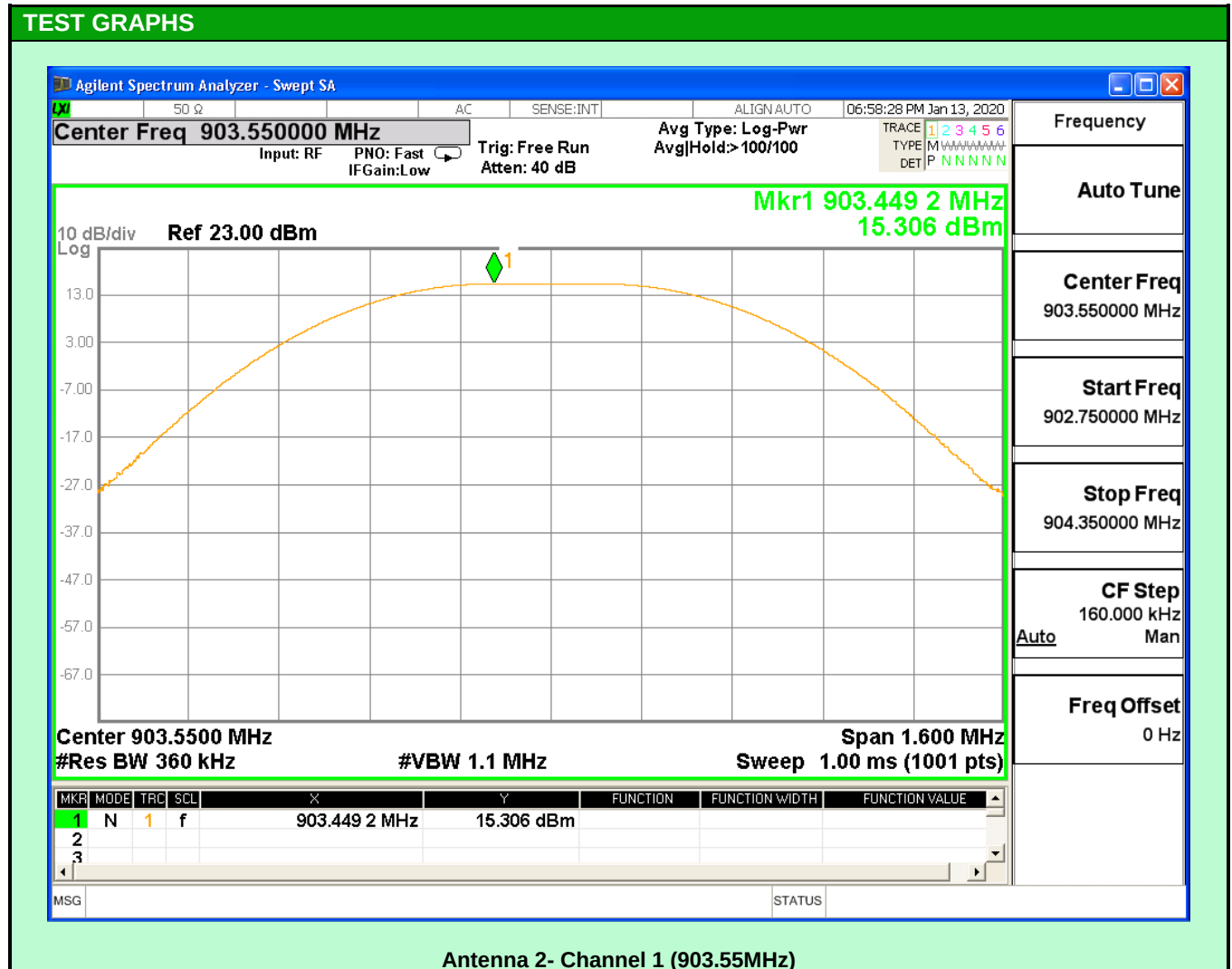
Refer Annexure -1

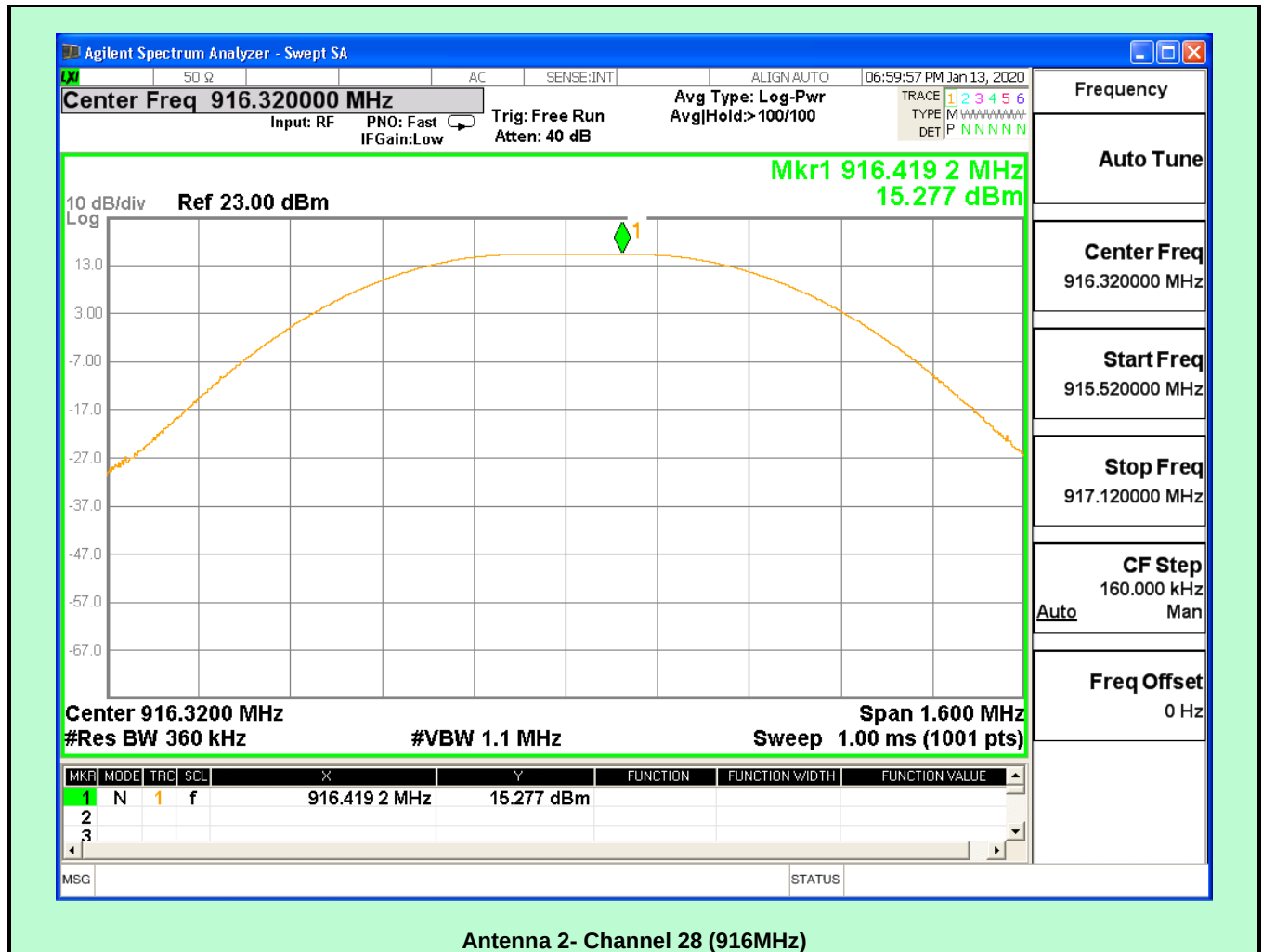
Conducted RF Test setup

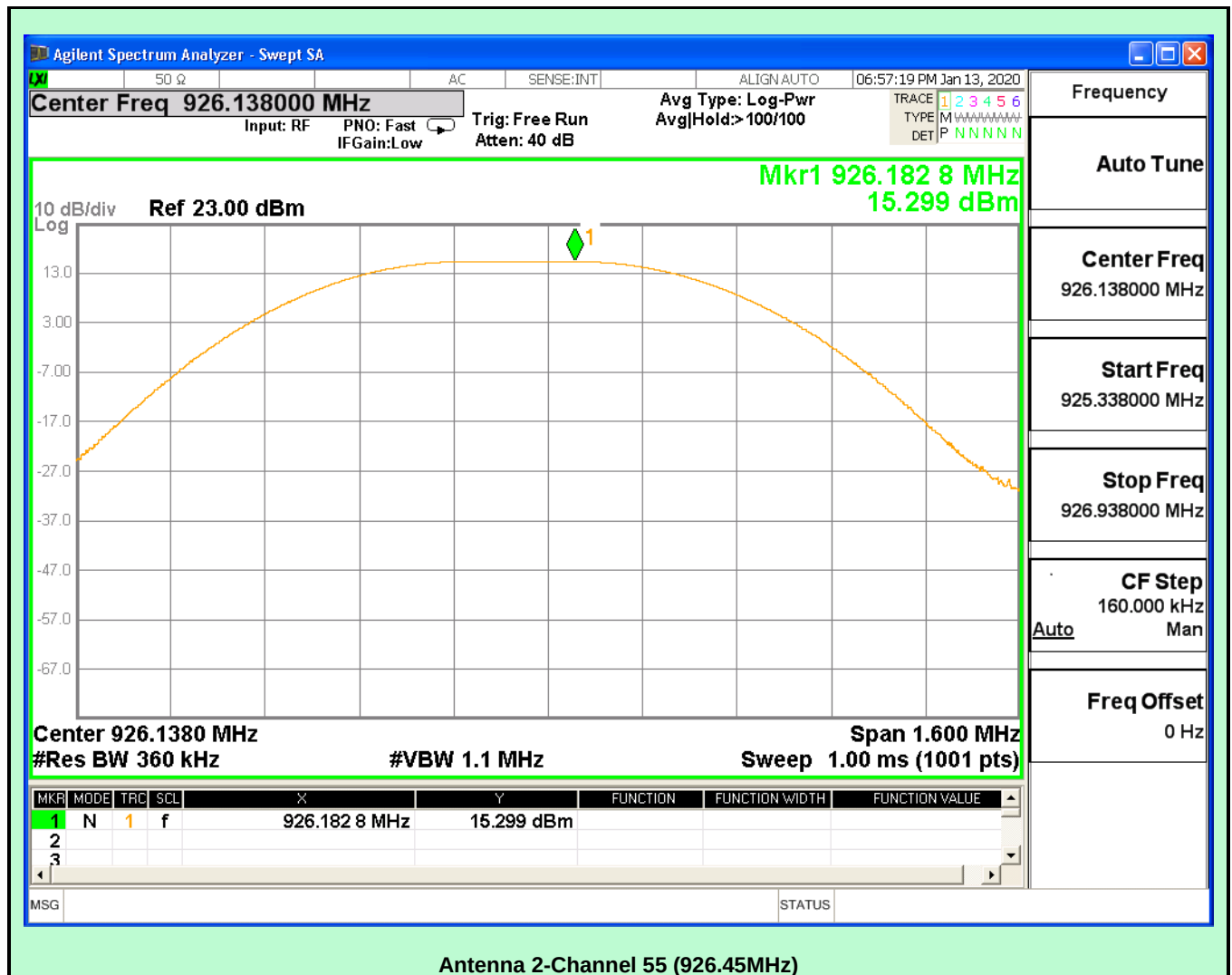
2.2 MAXIMUM PEAK OUTPUT POWER LEVEL			
EUT Nomenclature	Wireless Relay Module	Test Request No.	EMC0419-1
Model No.	FW-RM	Serial No.	107
Test Start Date	14-Dec-2019	Temperature (°C)	23.6°C
Test End Date	28-Feb-2020	Humidity RH (%)	51.9%RH
Tested By	Shaithanya C	Pressure (mbar)	NR
Input Voltage /	3.3Vdc		
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







TEST RESULT						
Channel	Frequency	Measured Power Level	Cable Loss	Transmitter Power Level	Limit	Result
#	MHz	dBm	dB	dBm	dBm	
Antenna 2						
1	903.55	15.30	0.8	16.10	<=23.979	PASS
28	916.00	15.27	0.8	16.07	<=23.979	PASS
55	926.45	15.29	0.8	16.09	<=23.979	PASS
Note: Transmitter Output Power = Measured Level (dBm) + Cable Loss (dB)						

TEST SETUP PHOTOGRAPH	
Refer Annexure -1	
Conducted RF Test setup	

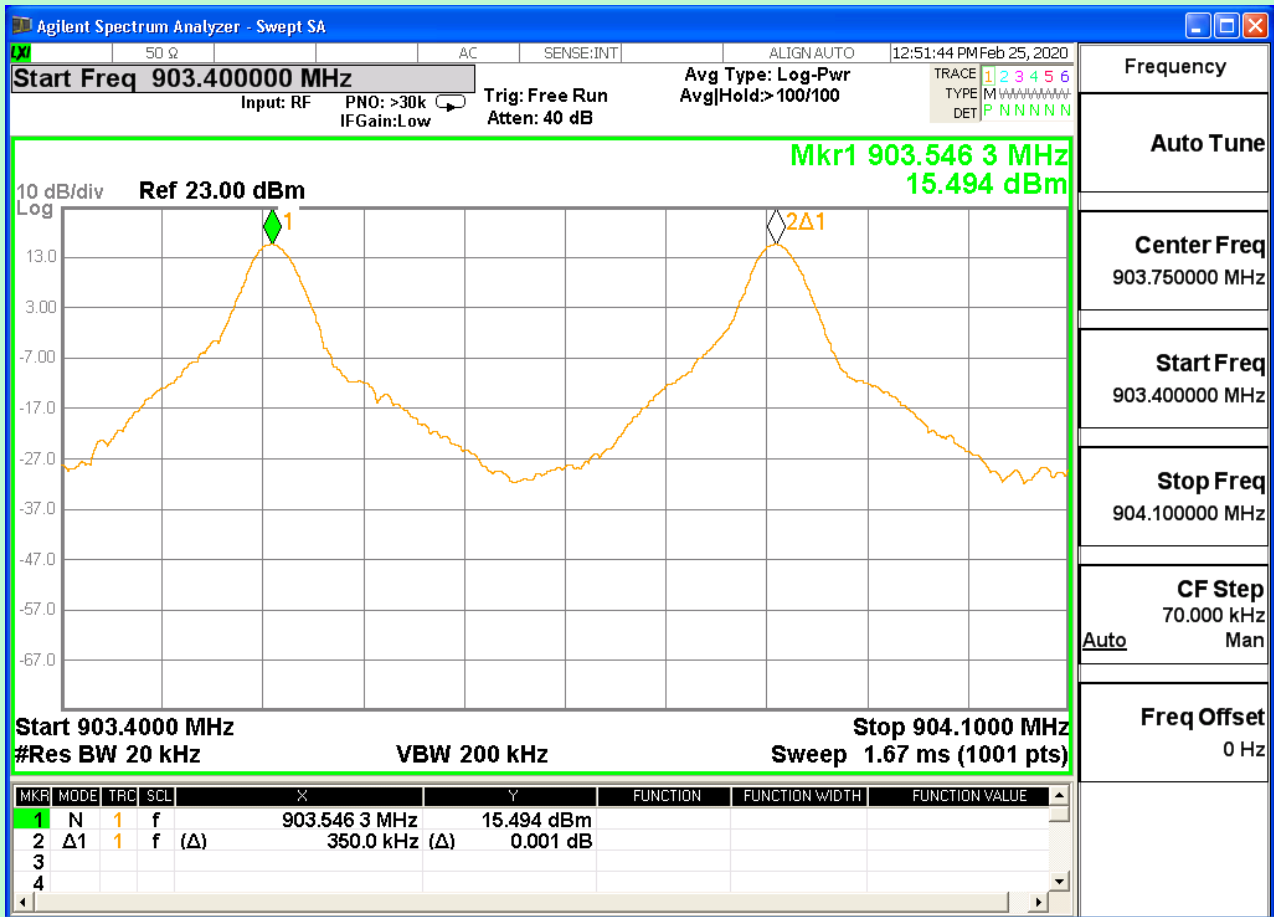
2.3 CARRIER FREQUENCY SEPERATION

EUT	Wireless Relay Module	Test Request No.	EMC0419-1
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	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

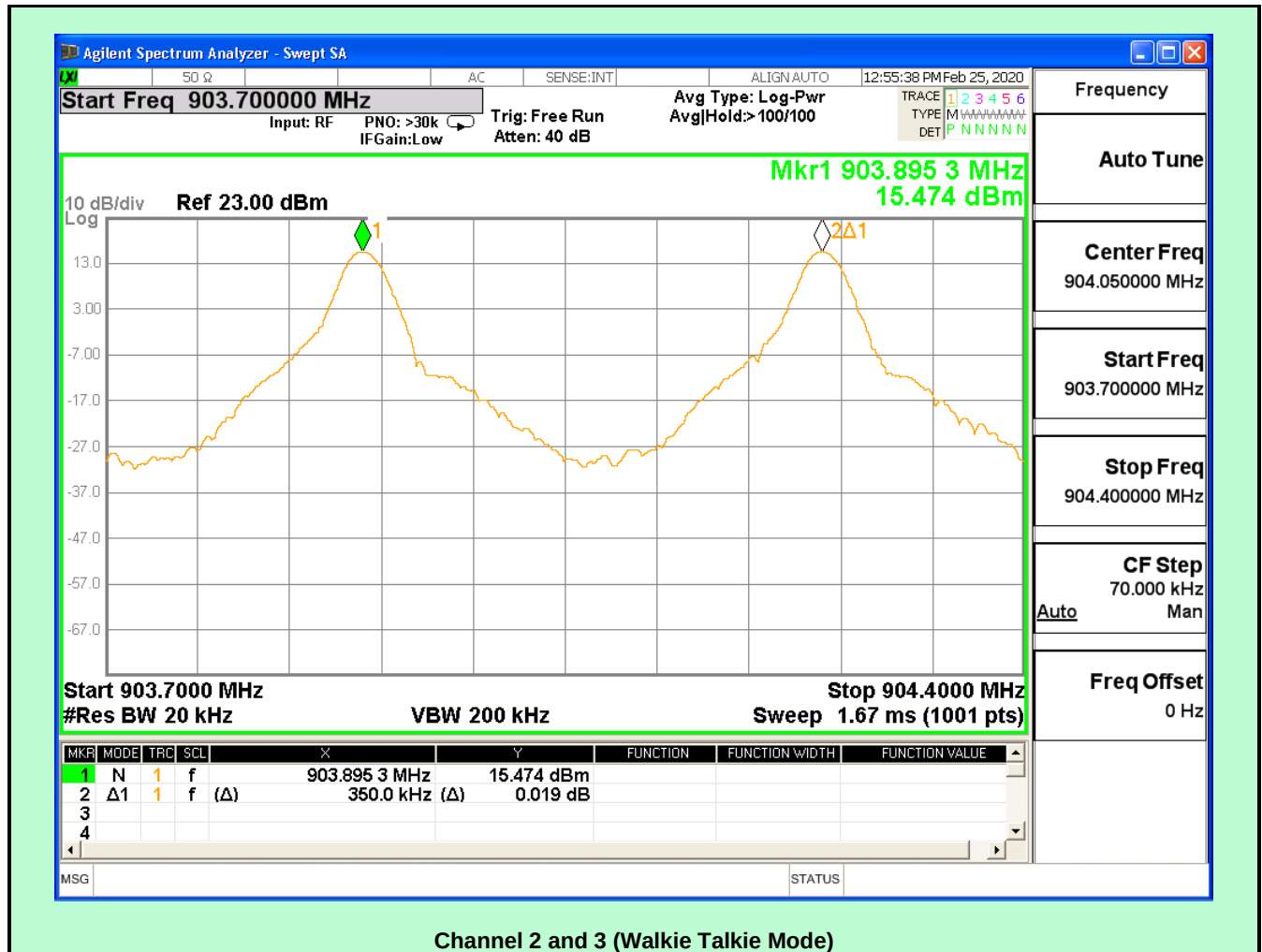
TEST EQUIPMENT

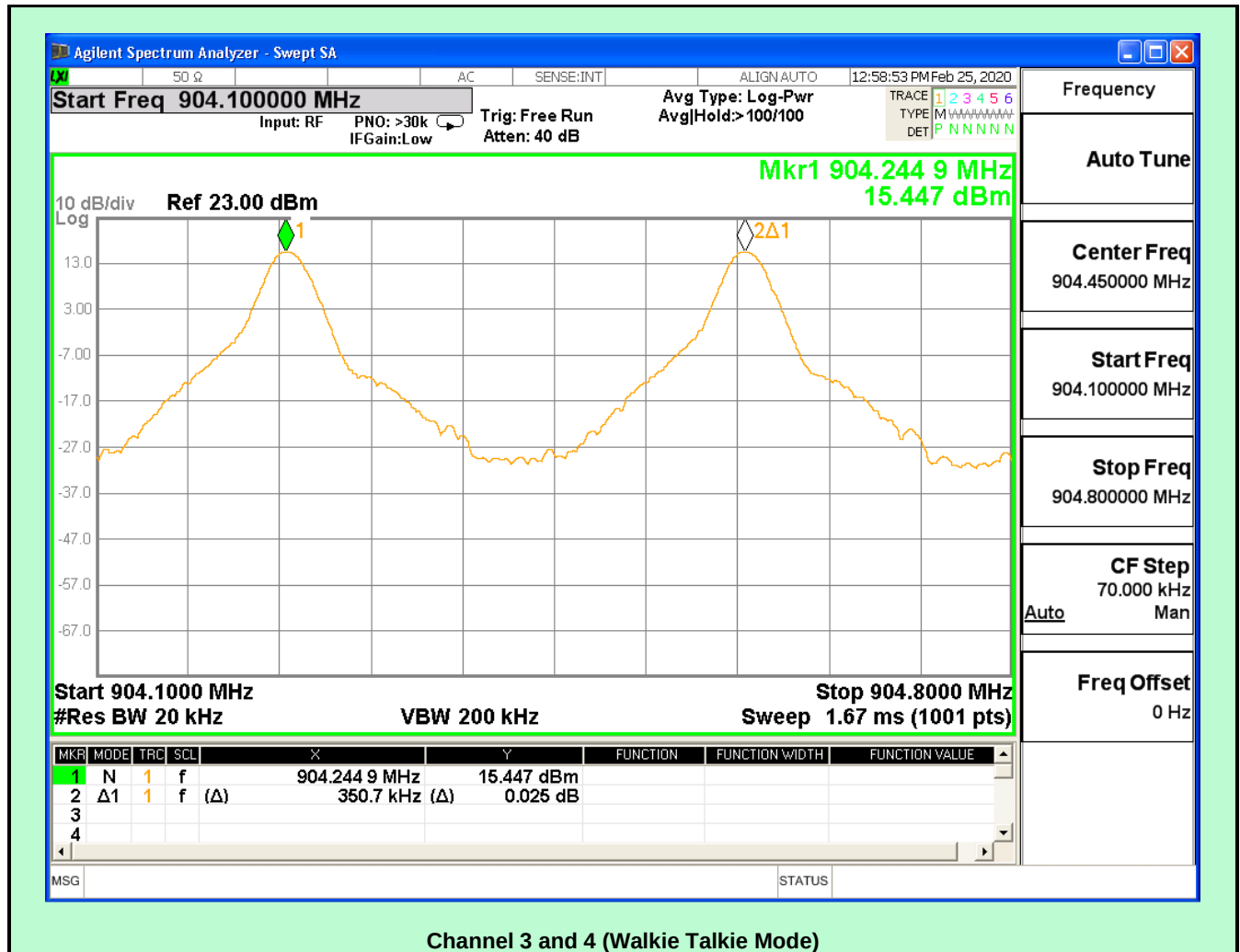
Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Shunner	SF104/2X11PC3542/500	NA	NA

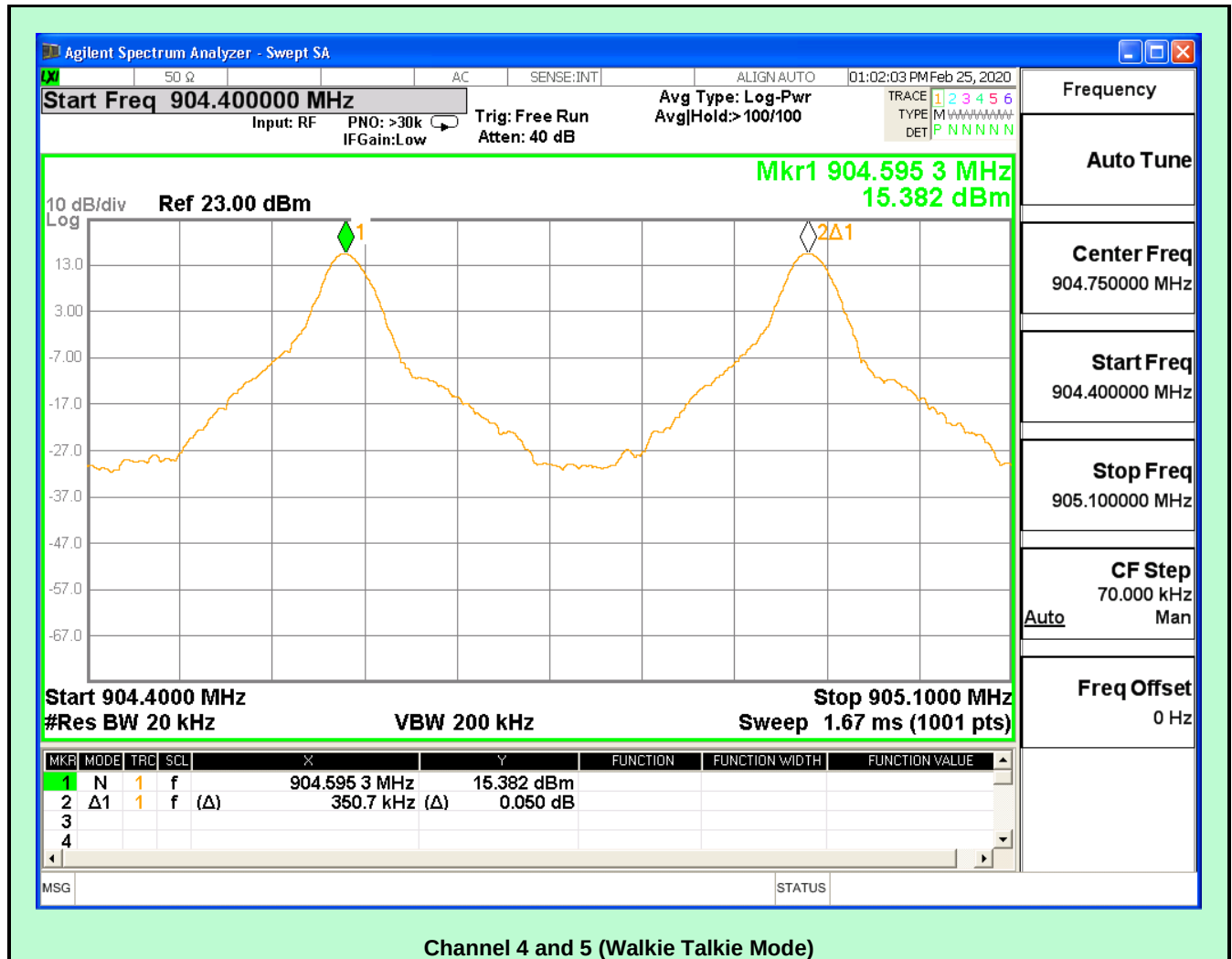
TEST GRAPHS

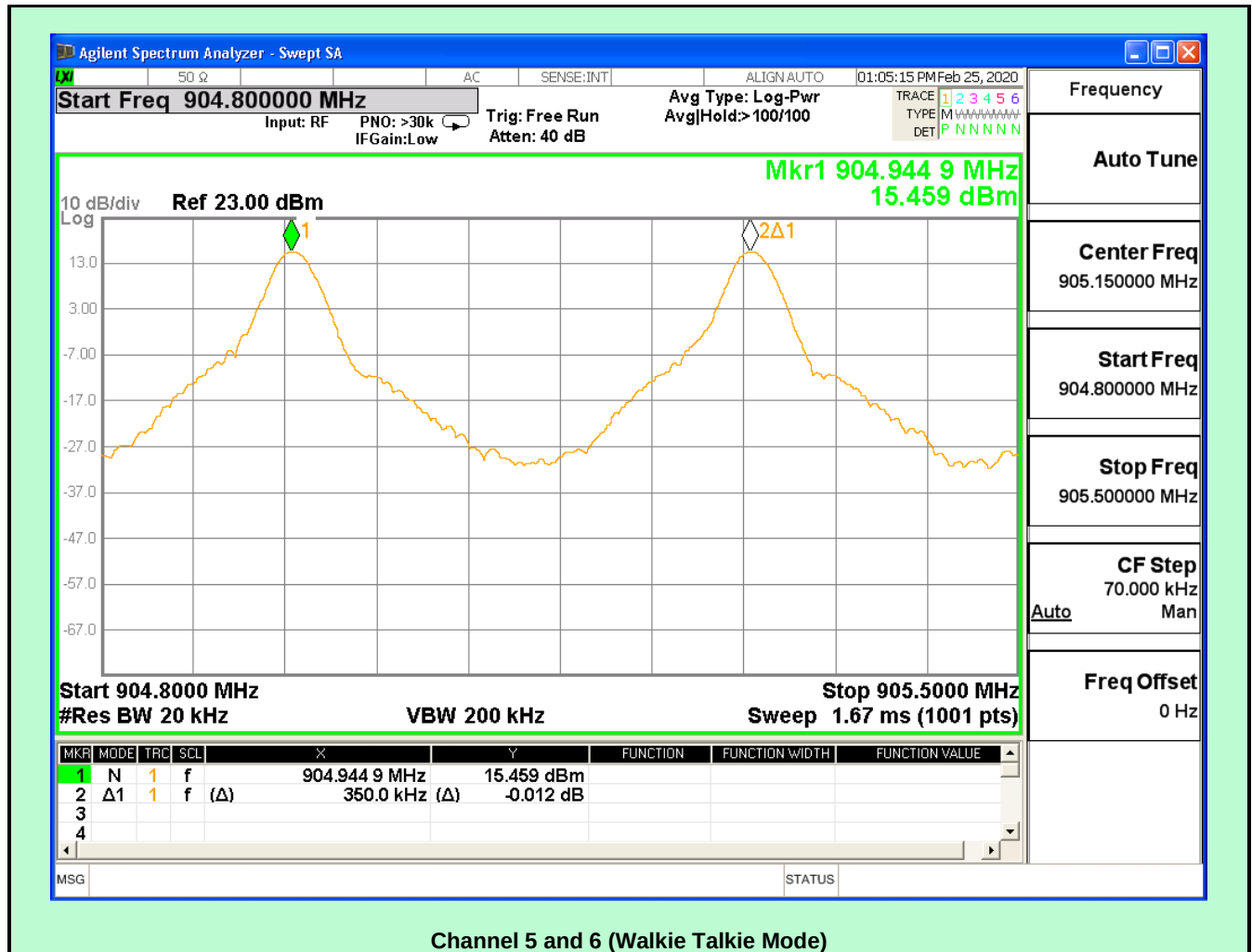


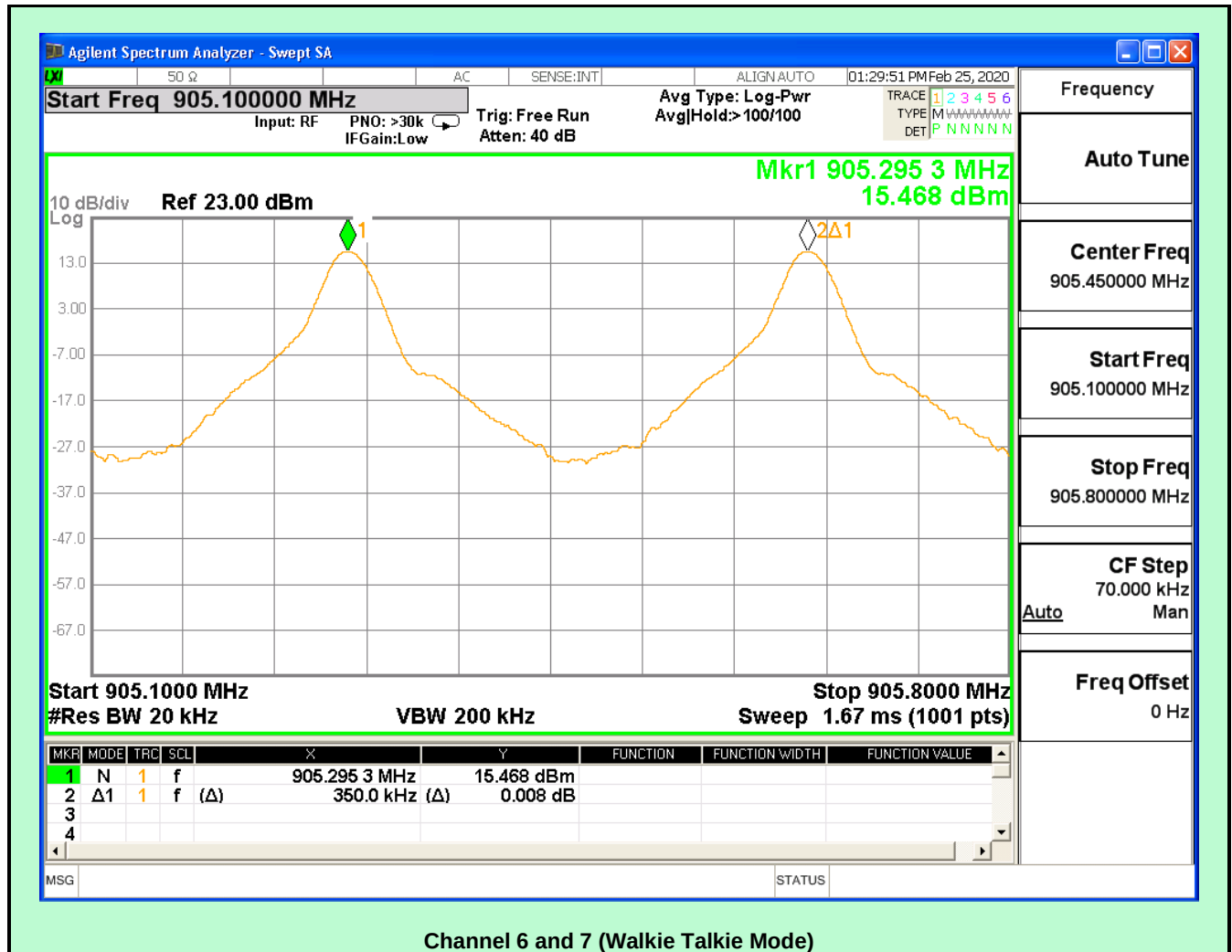
Channel 1 and 2 (Walkie Talkie Mode)

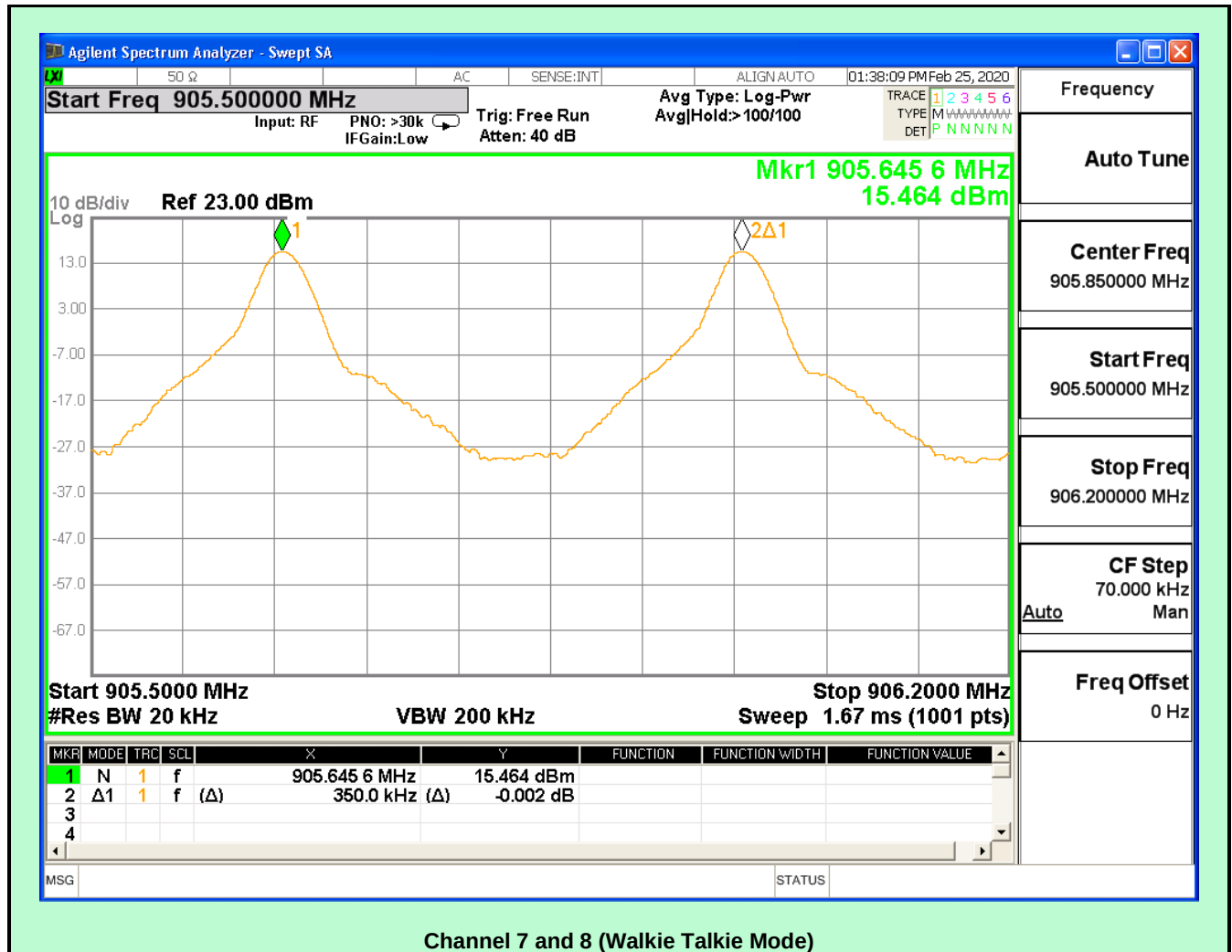


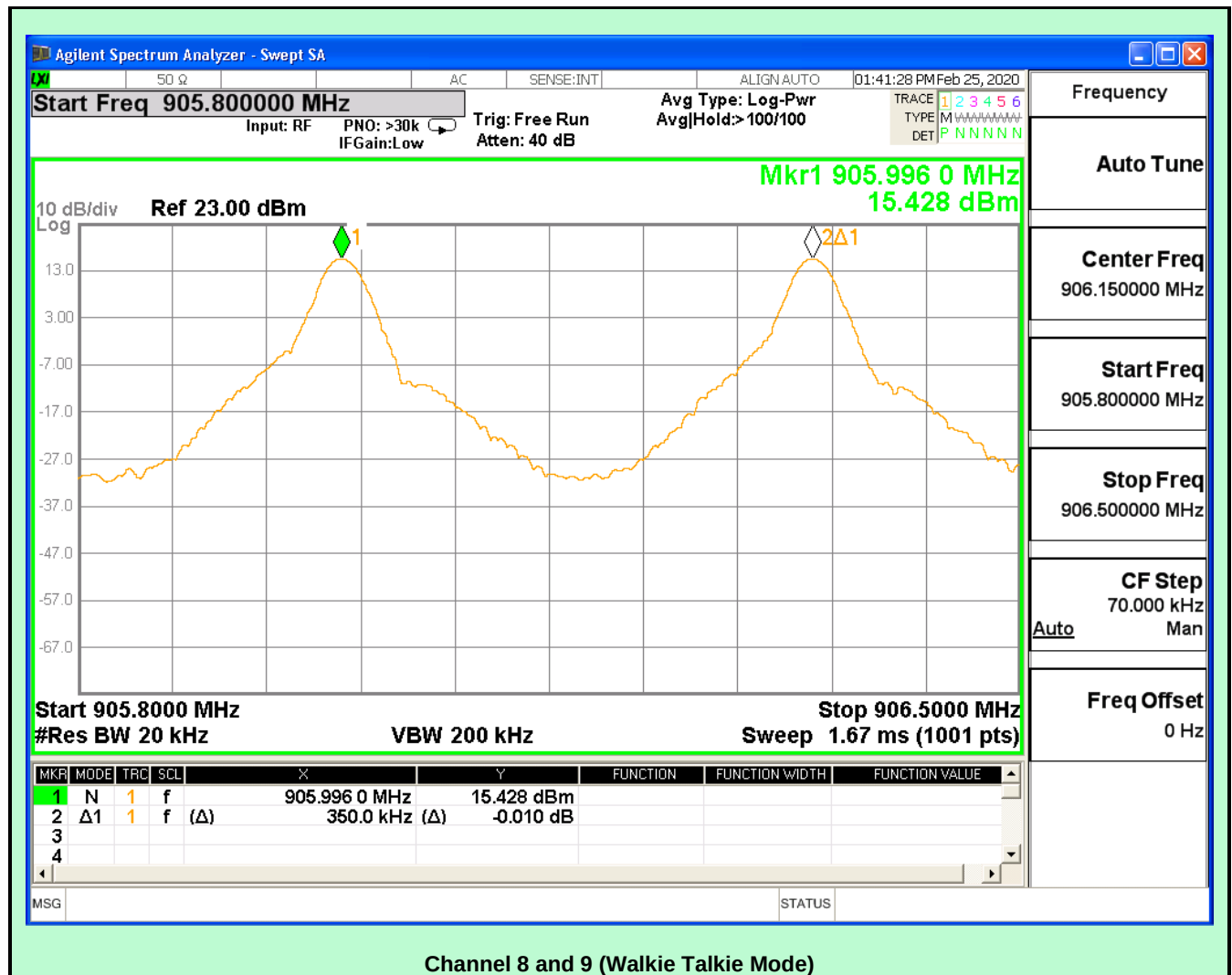


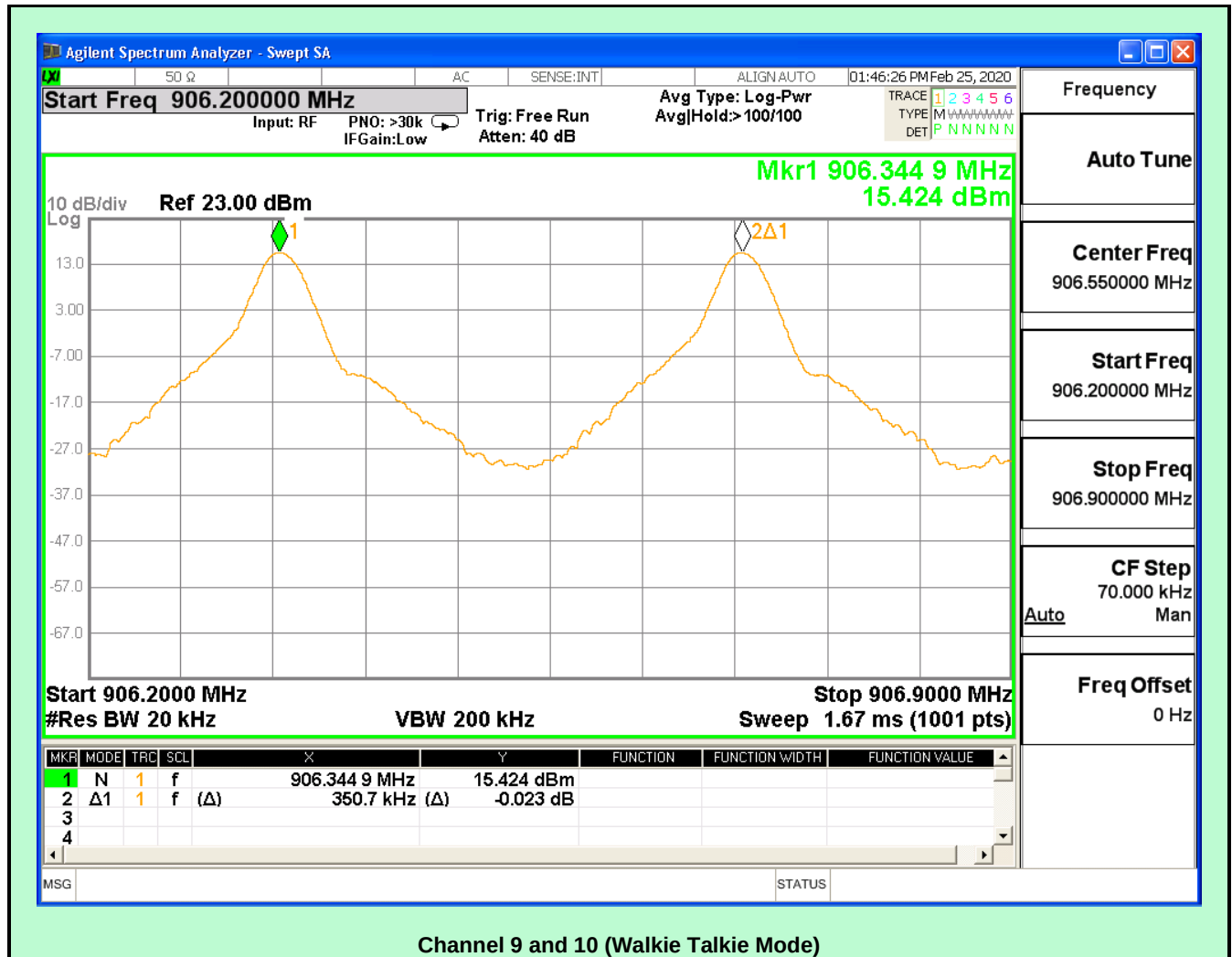


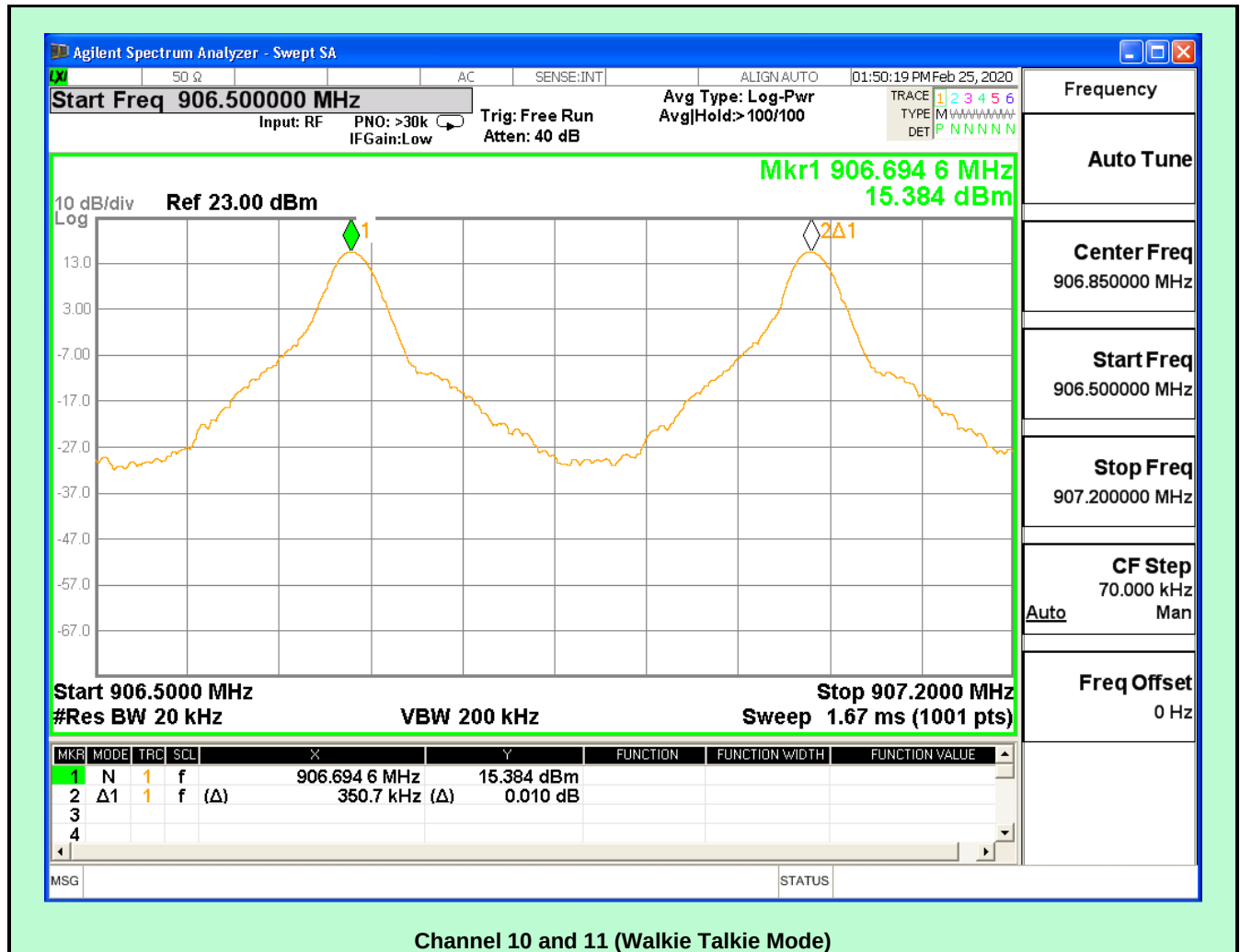


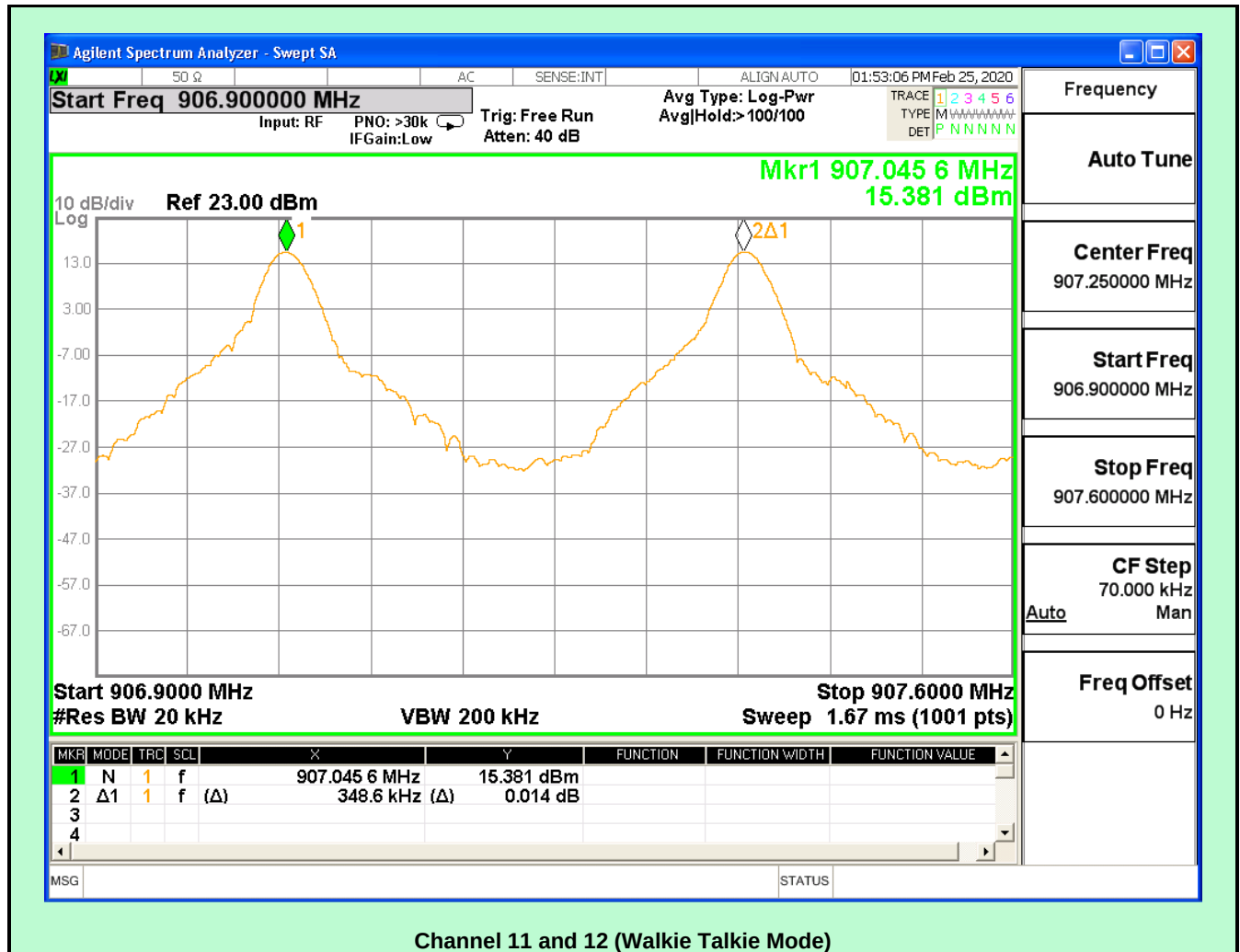


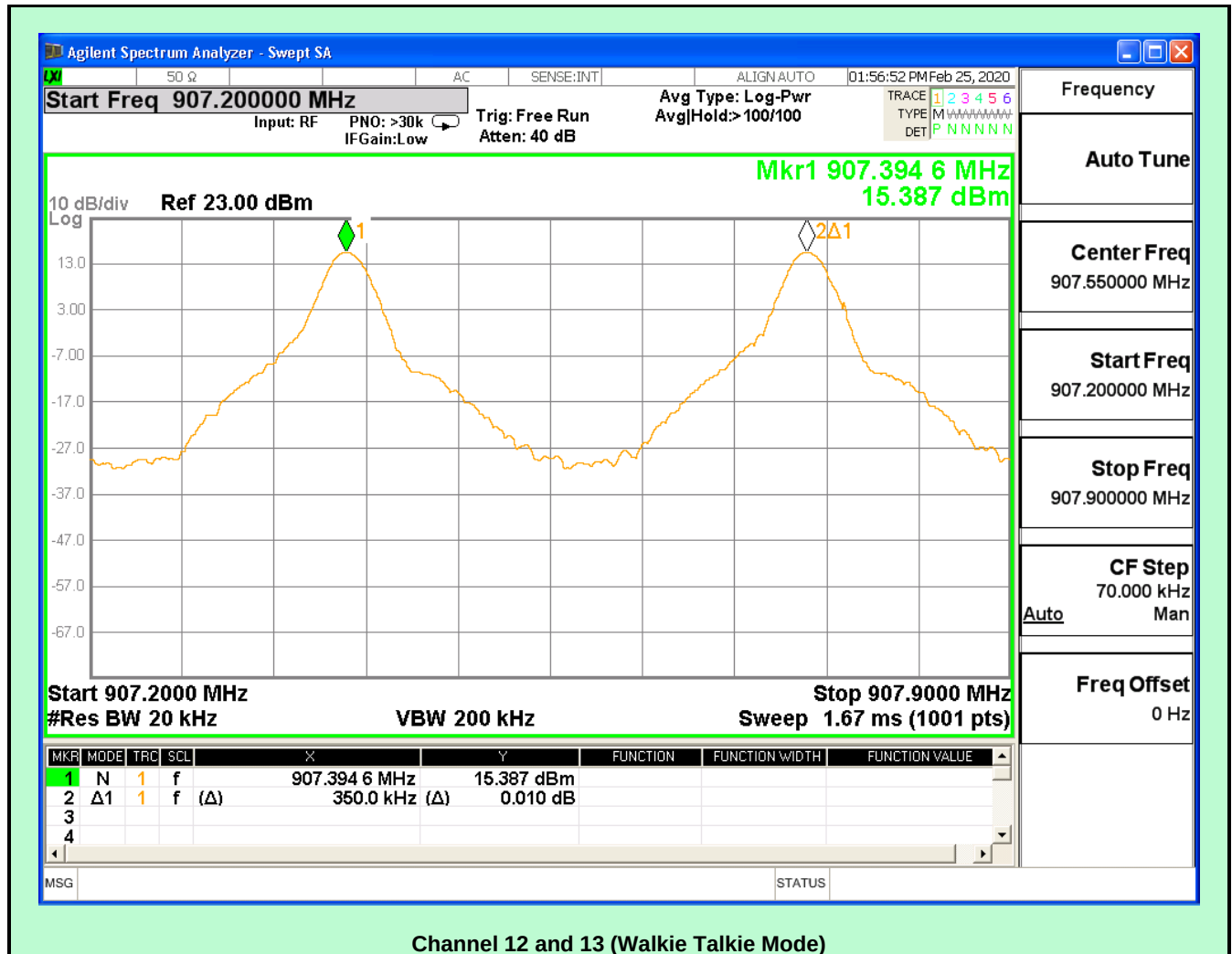


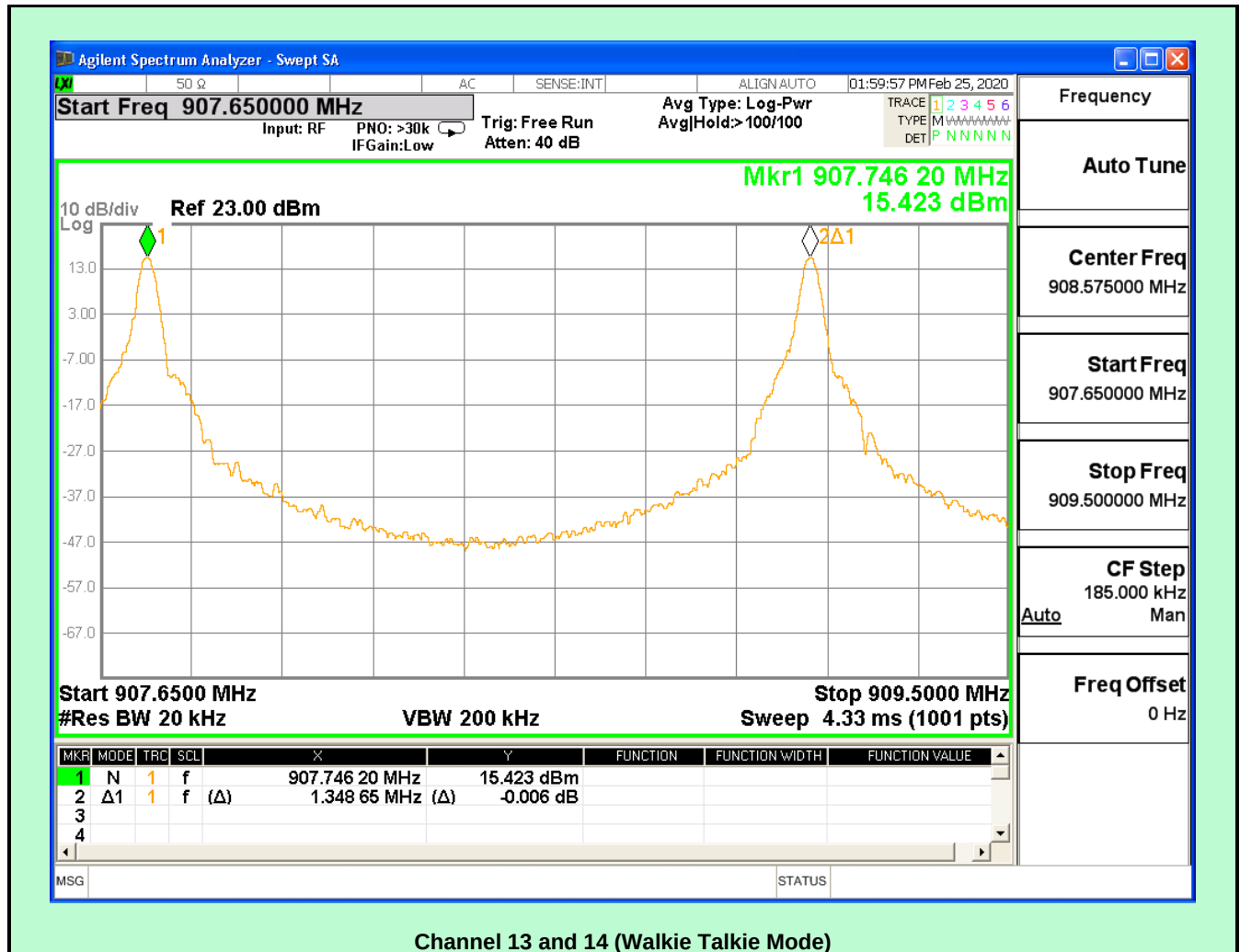


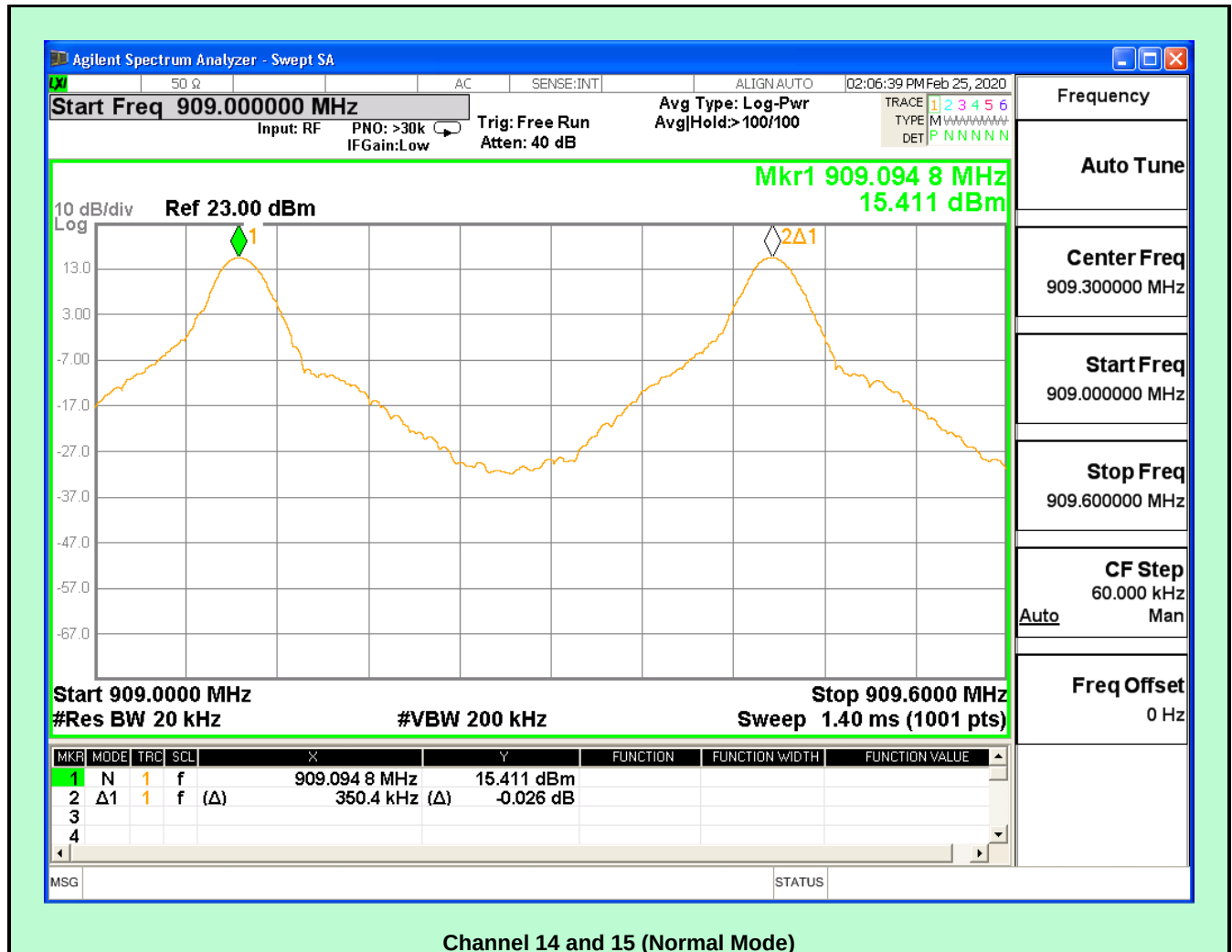


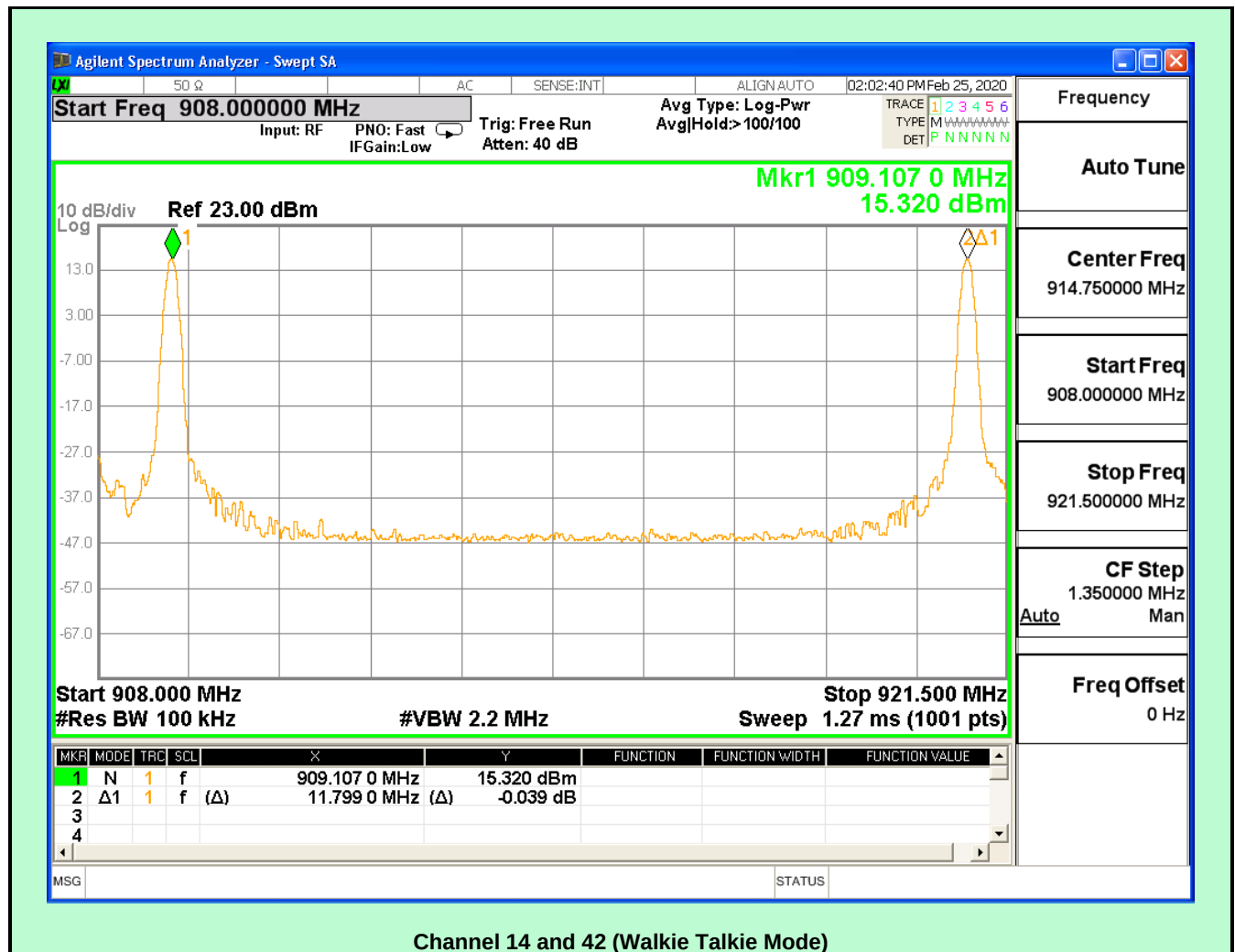


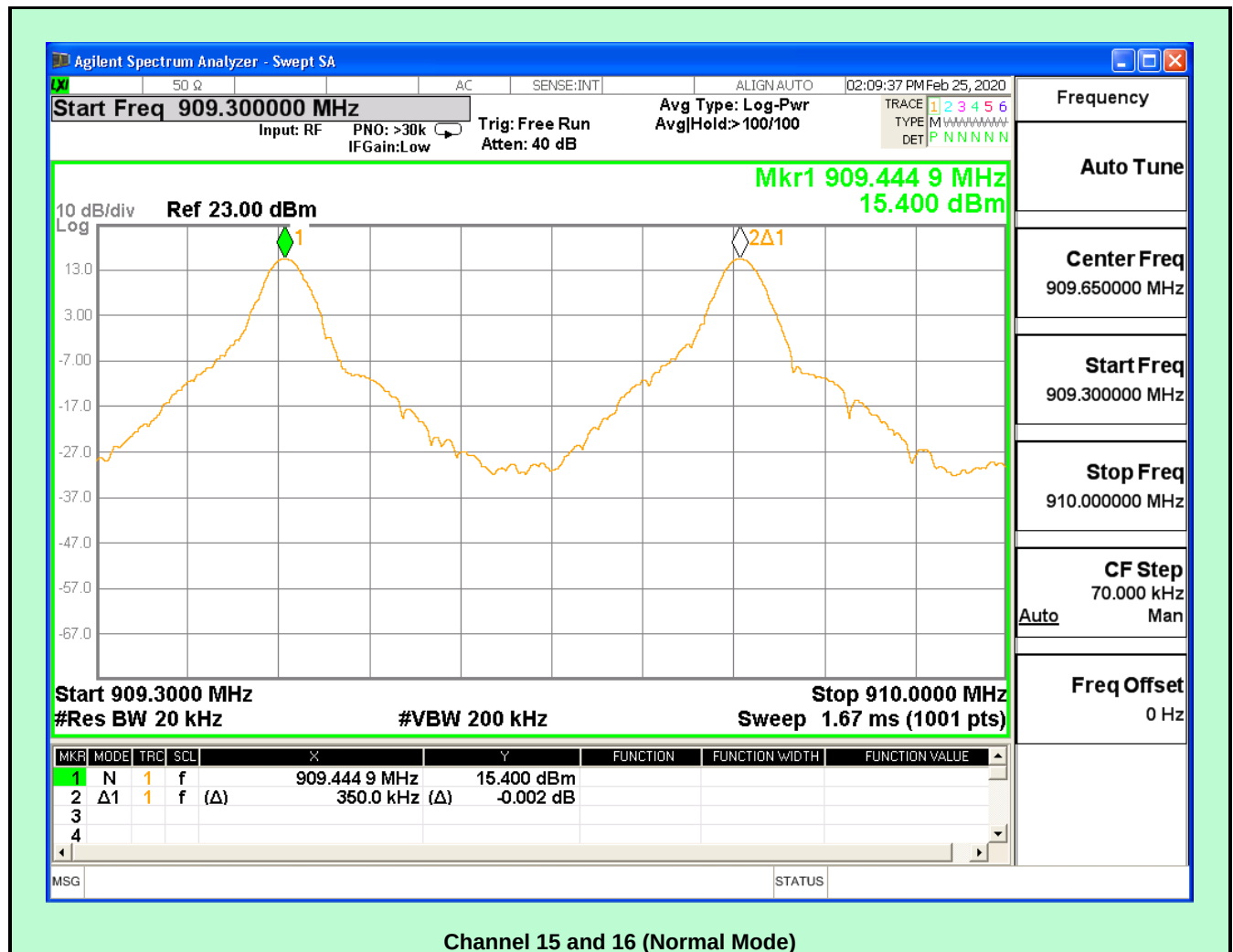


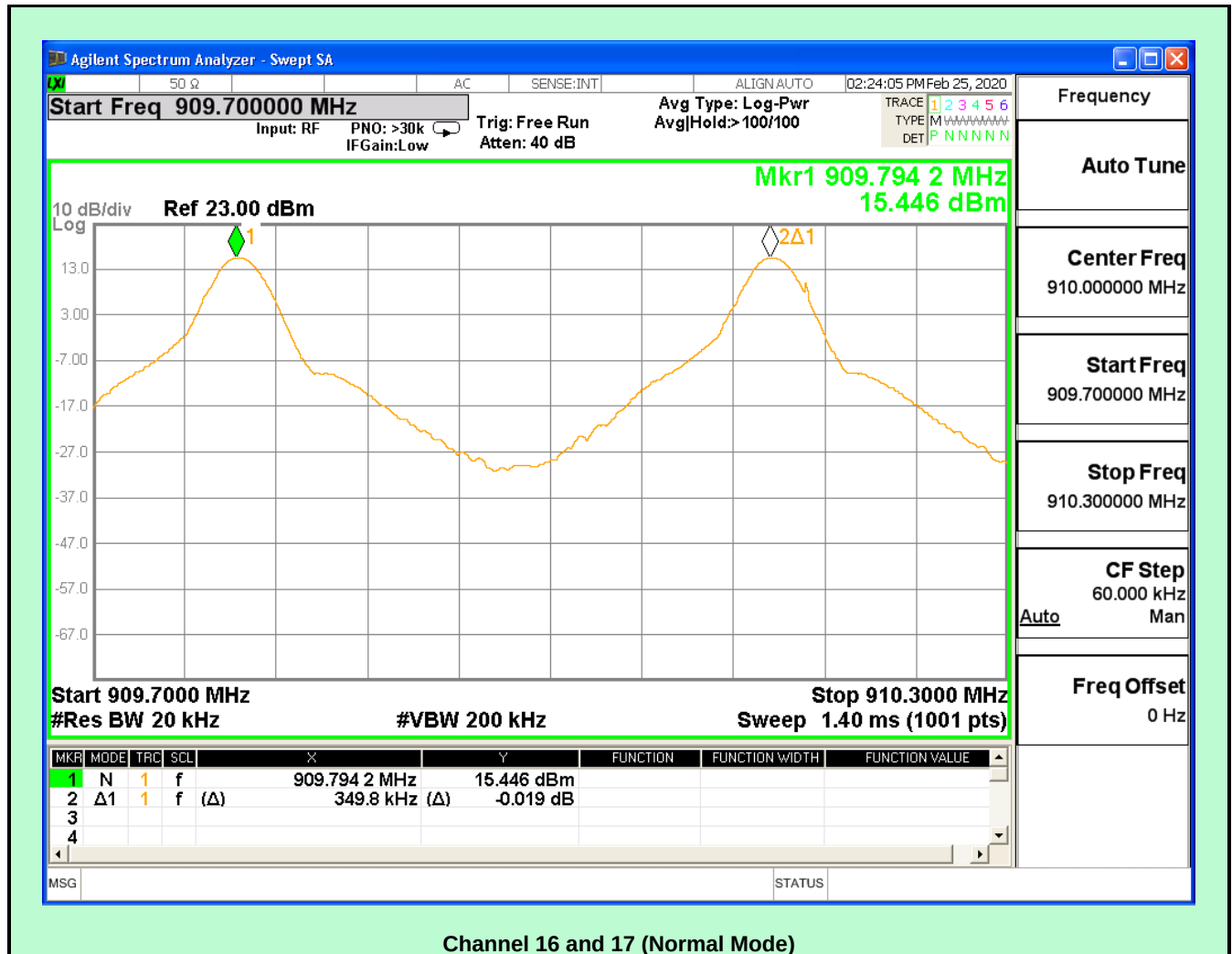


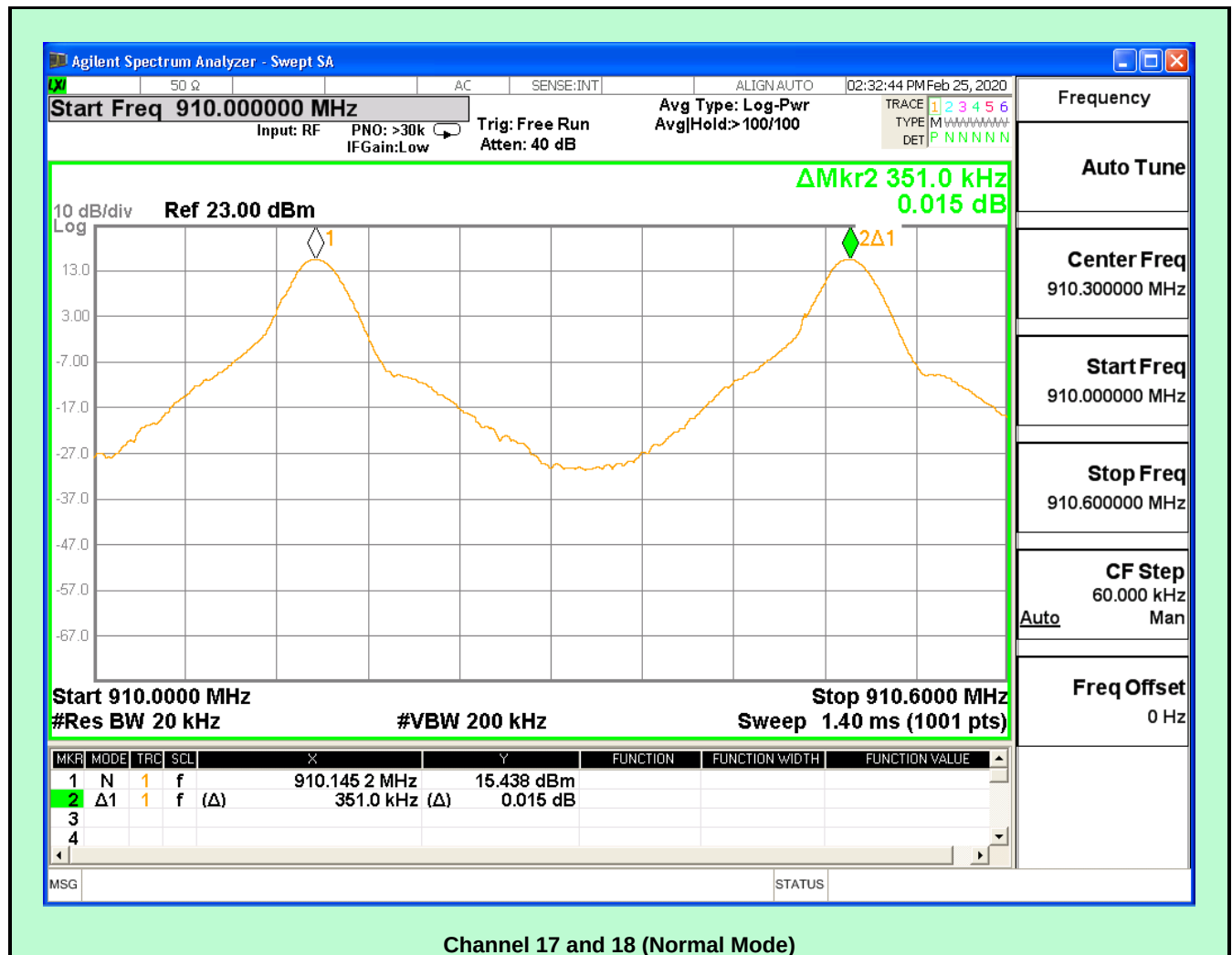


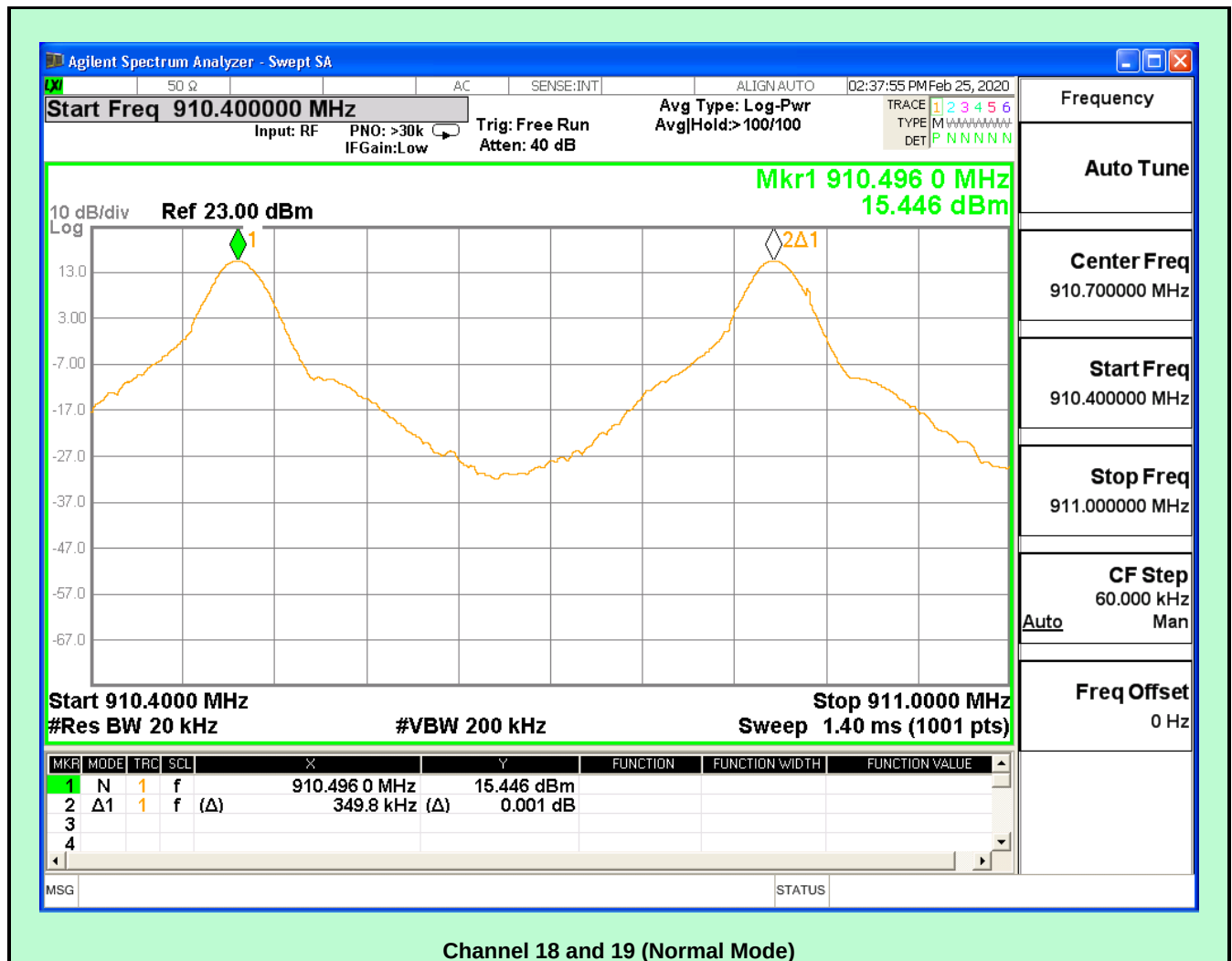


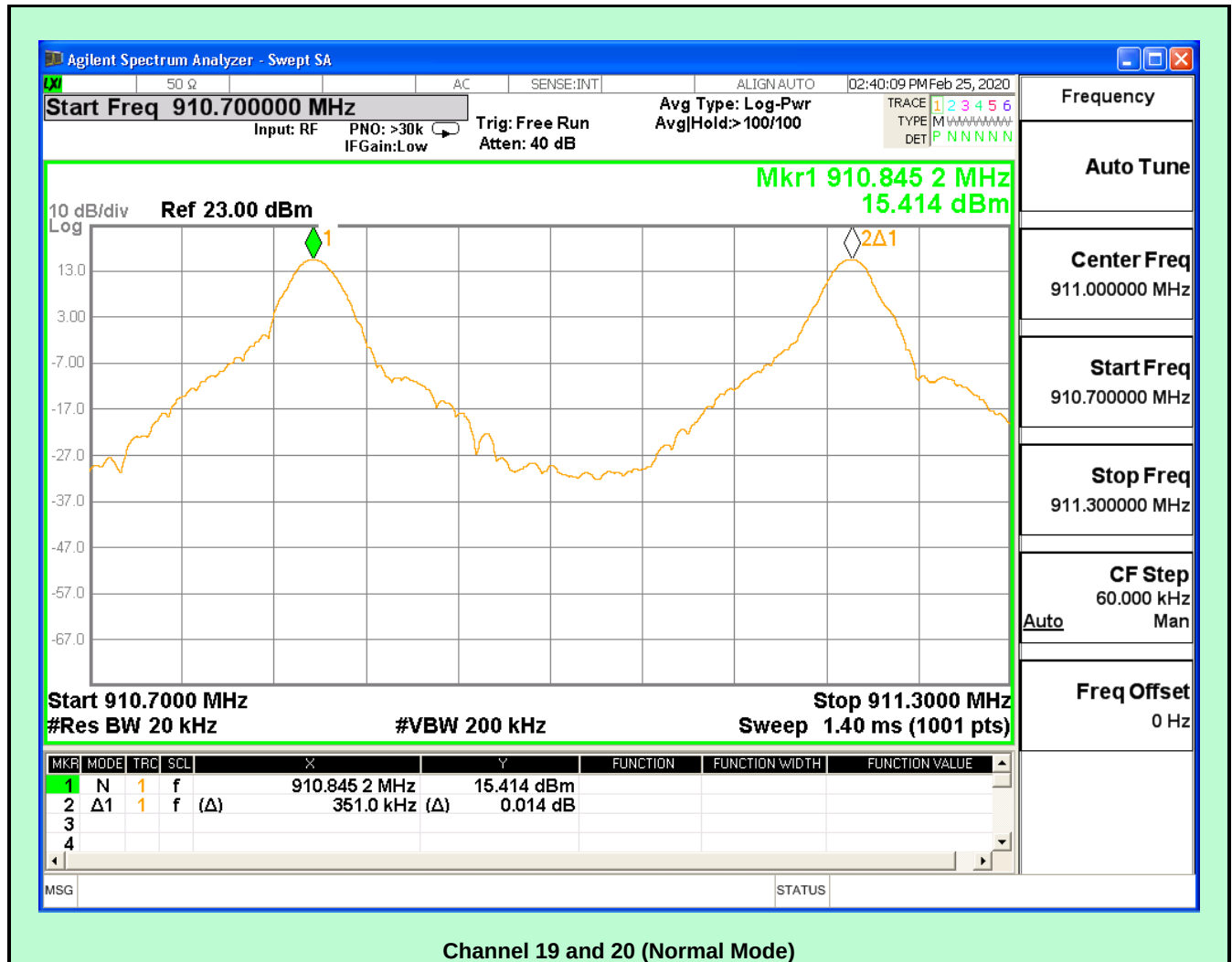


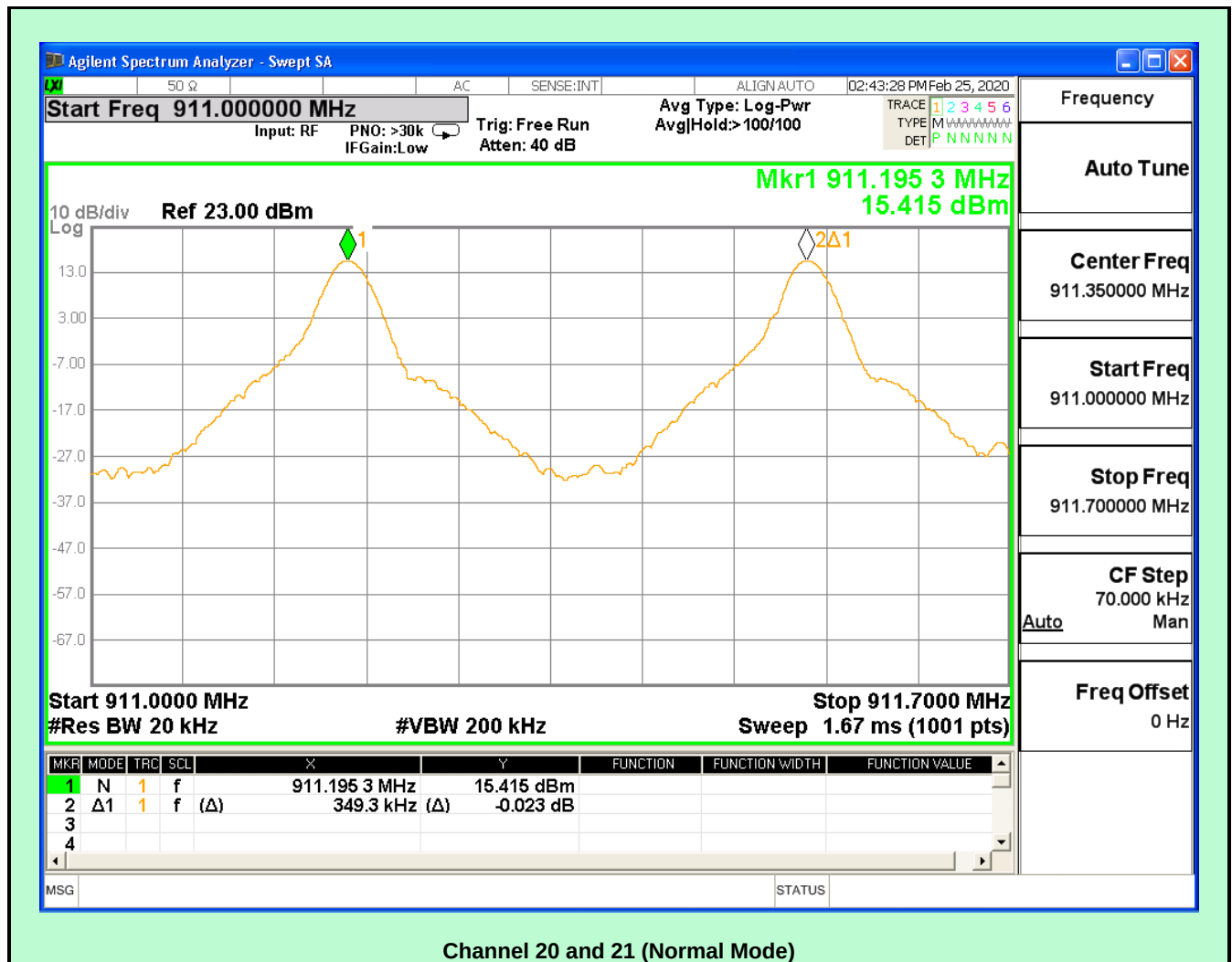


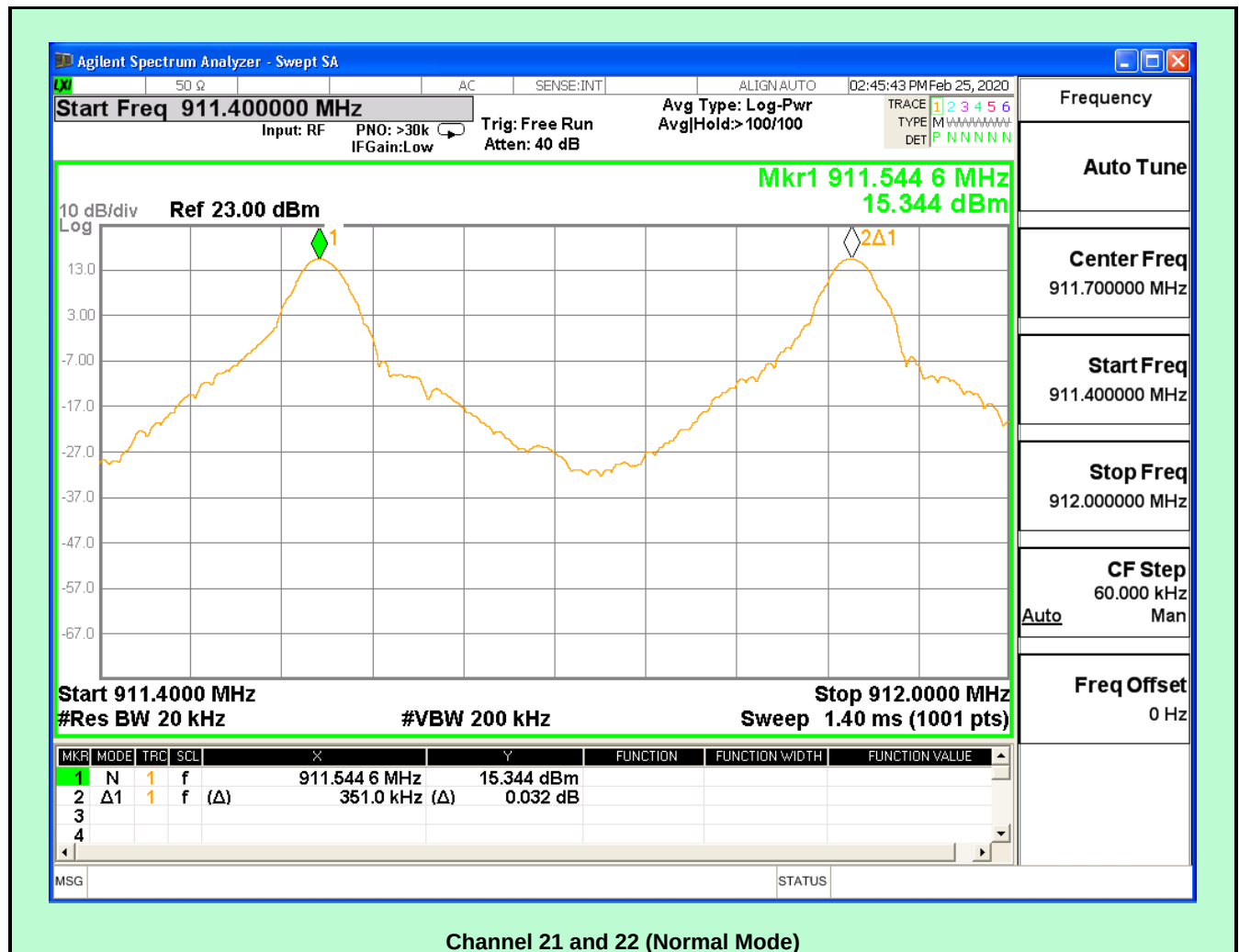


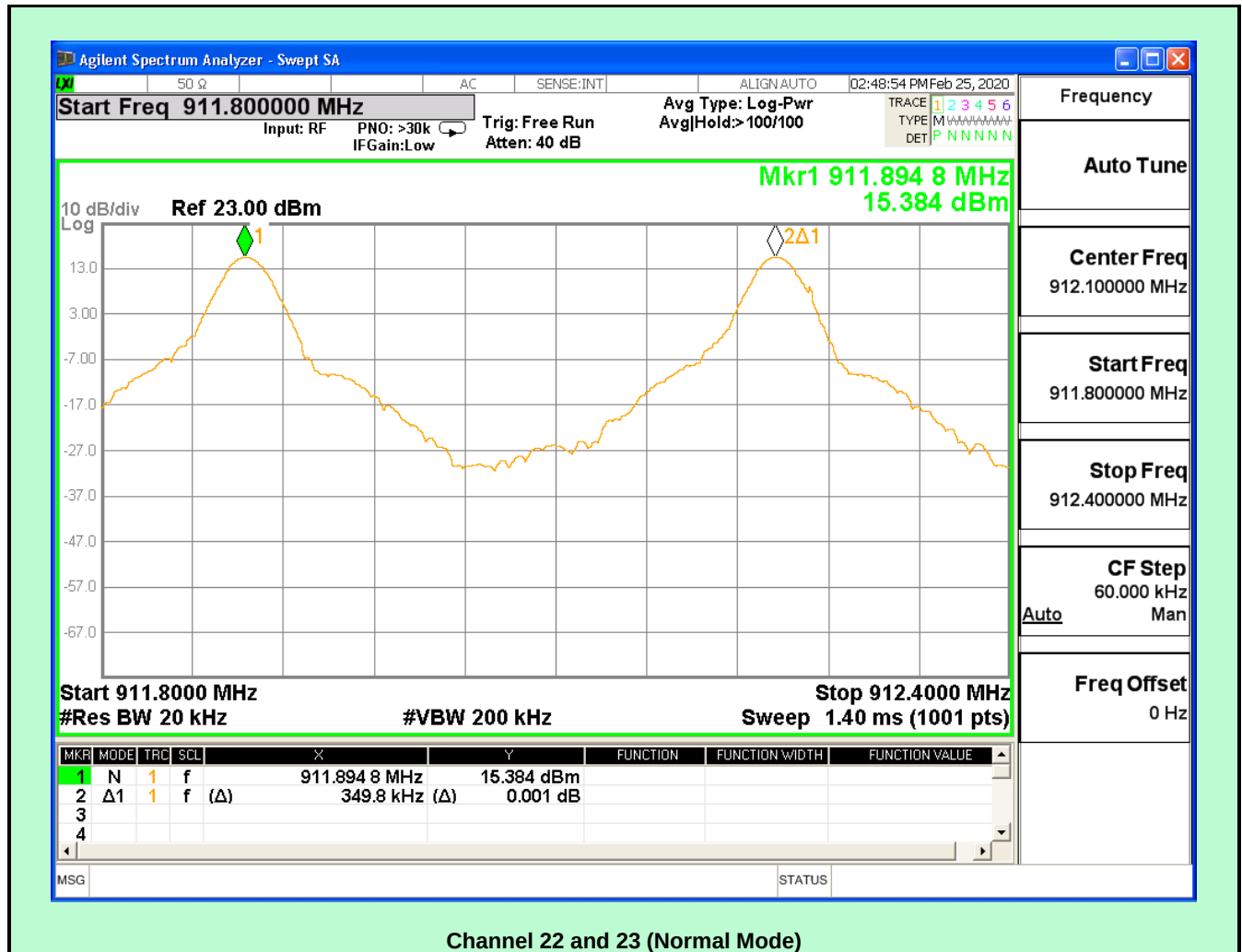


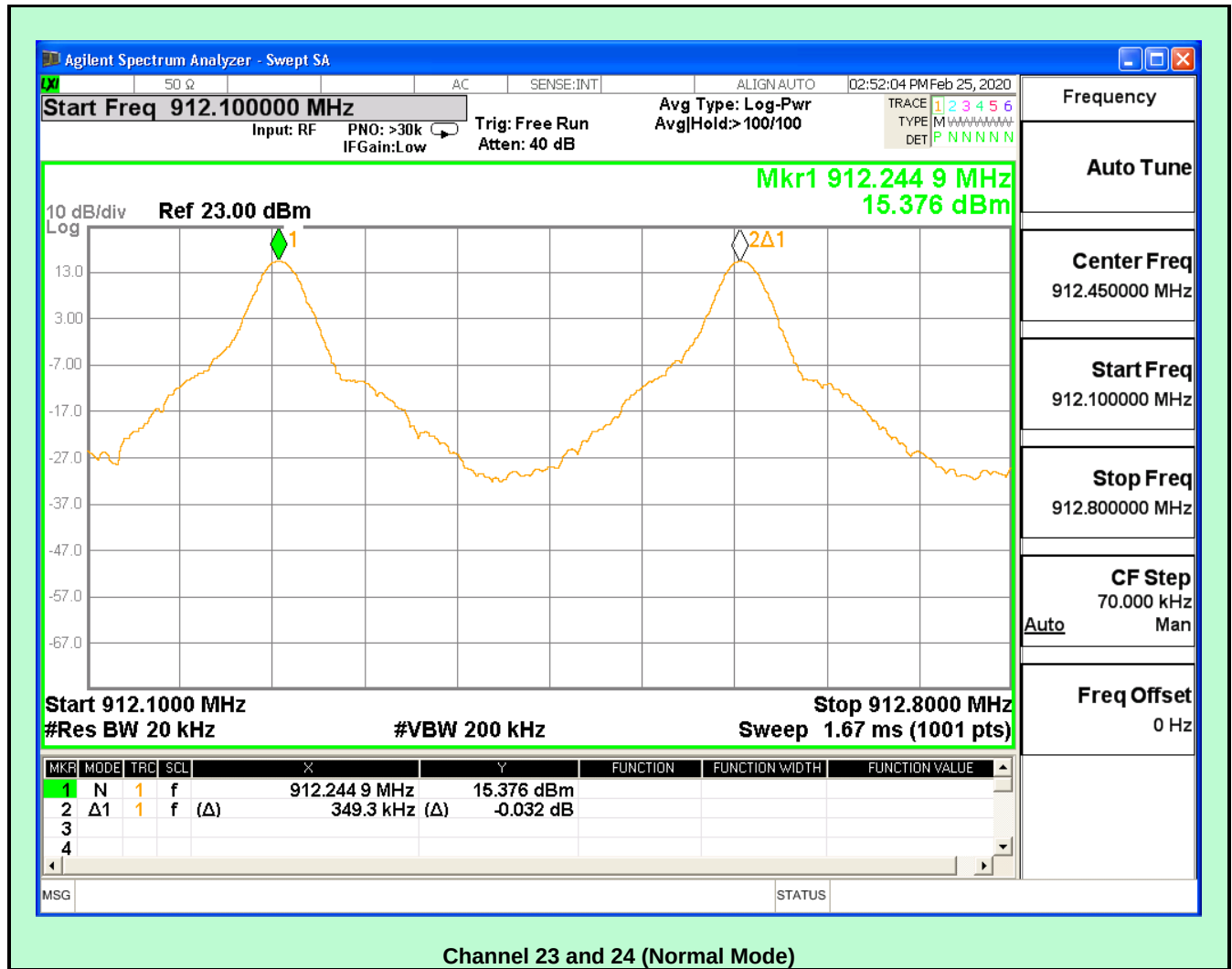


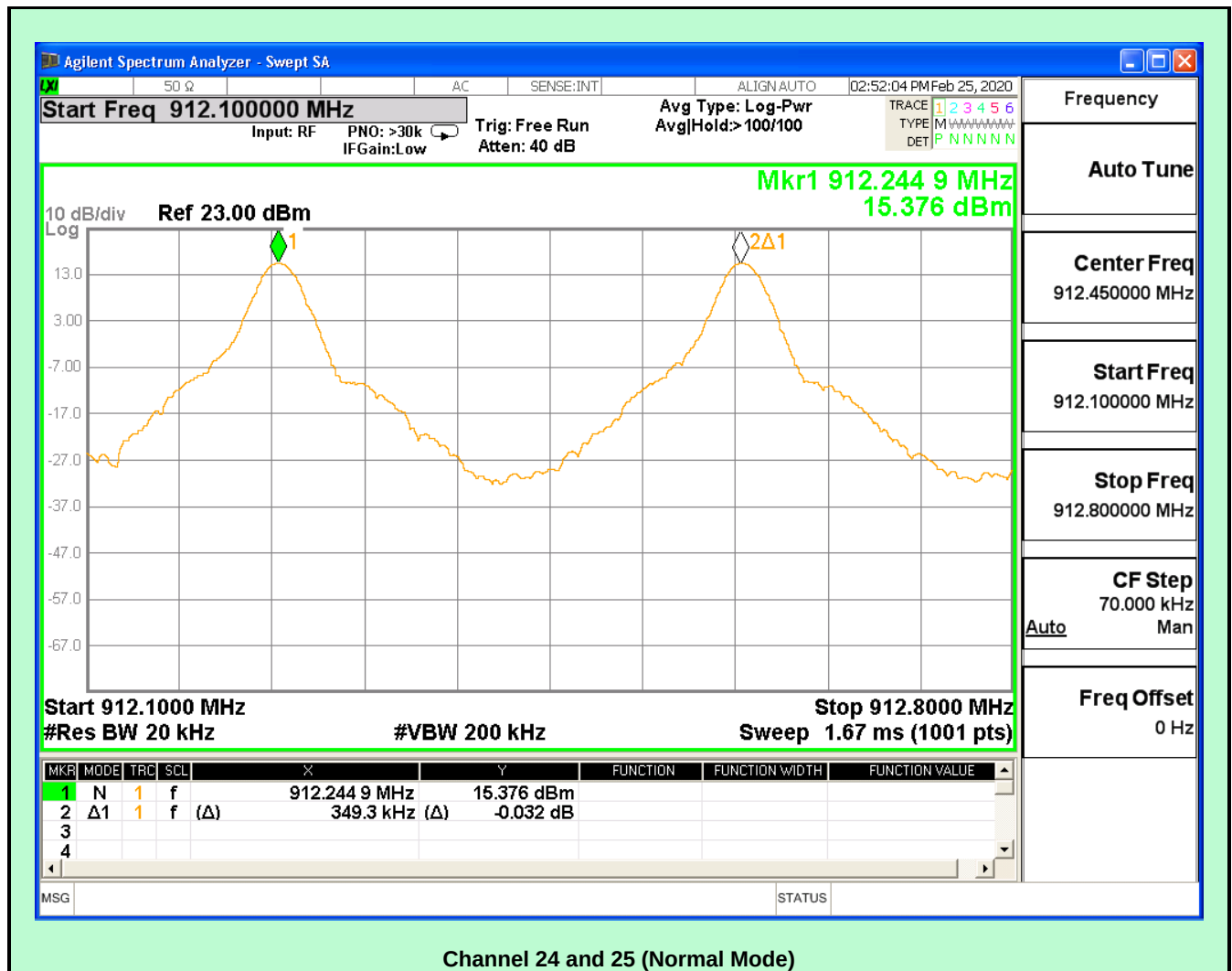


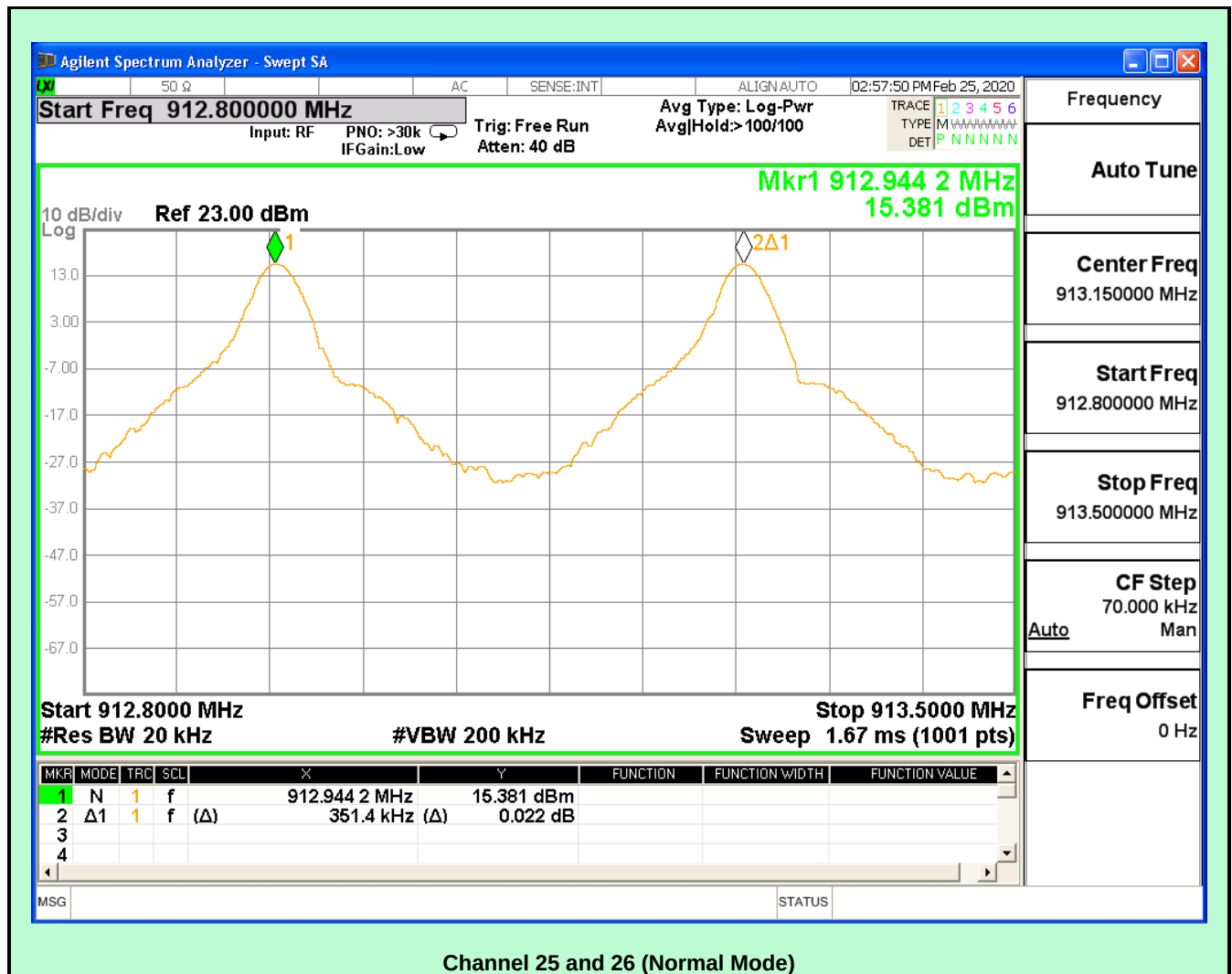


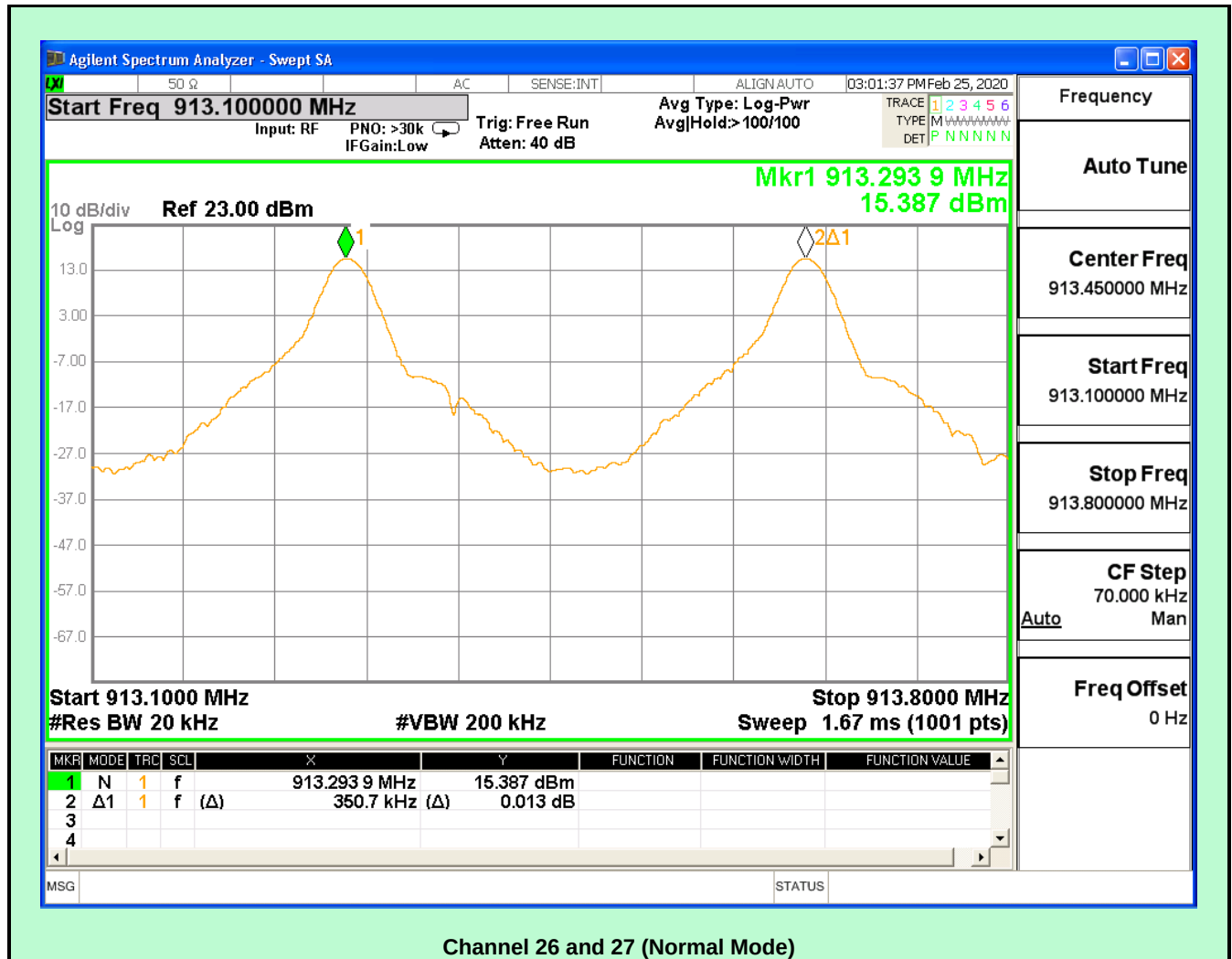


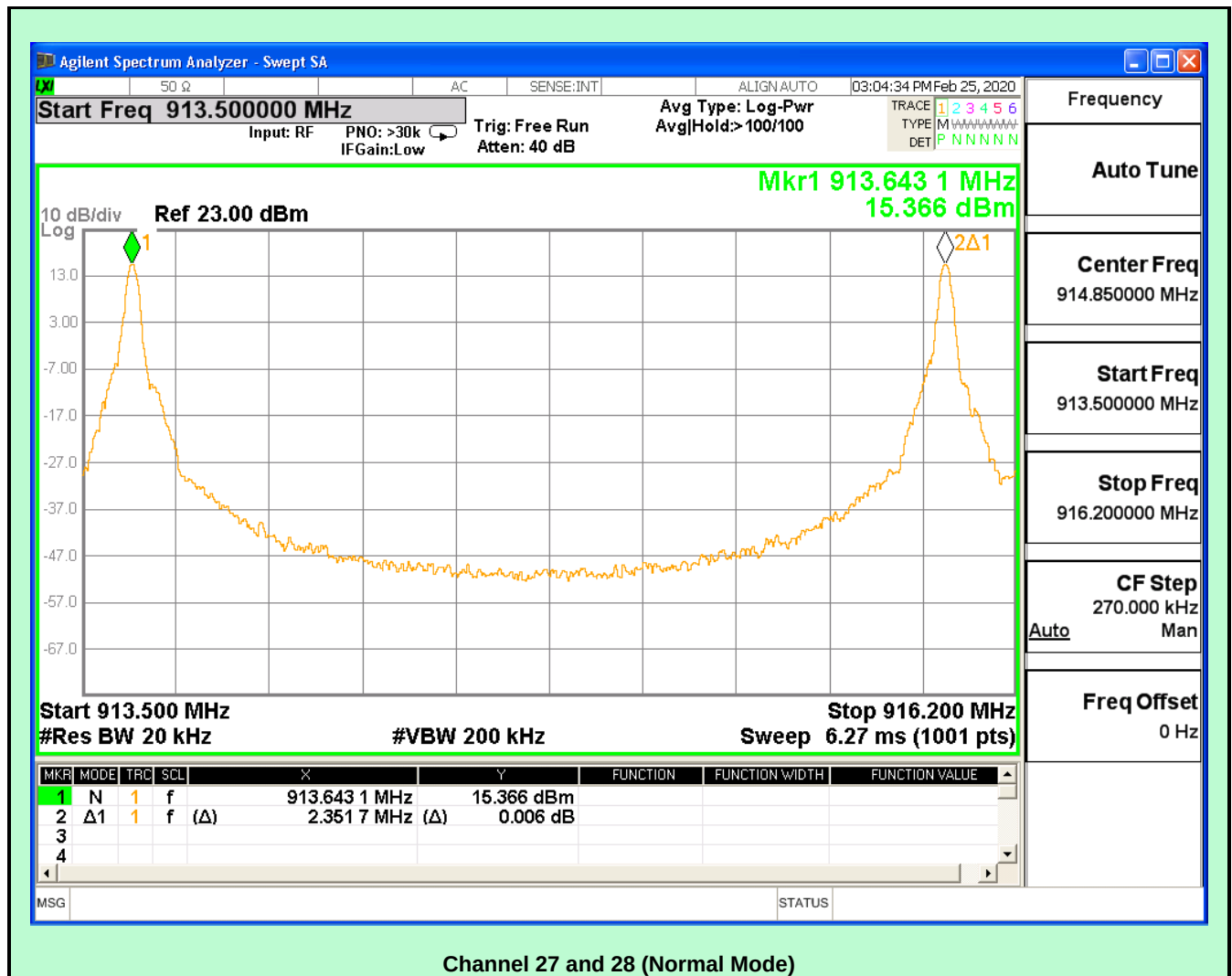


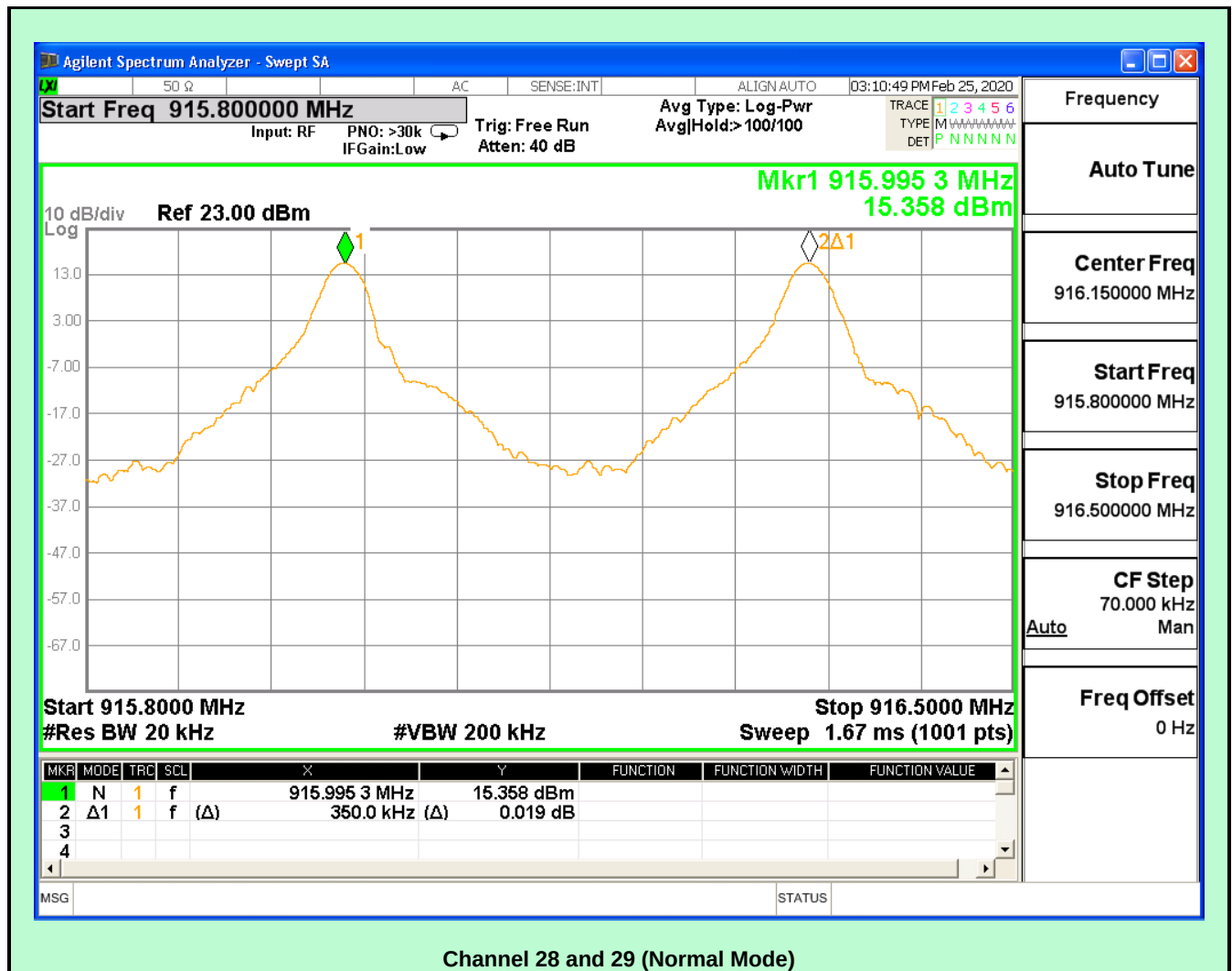


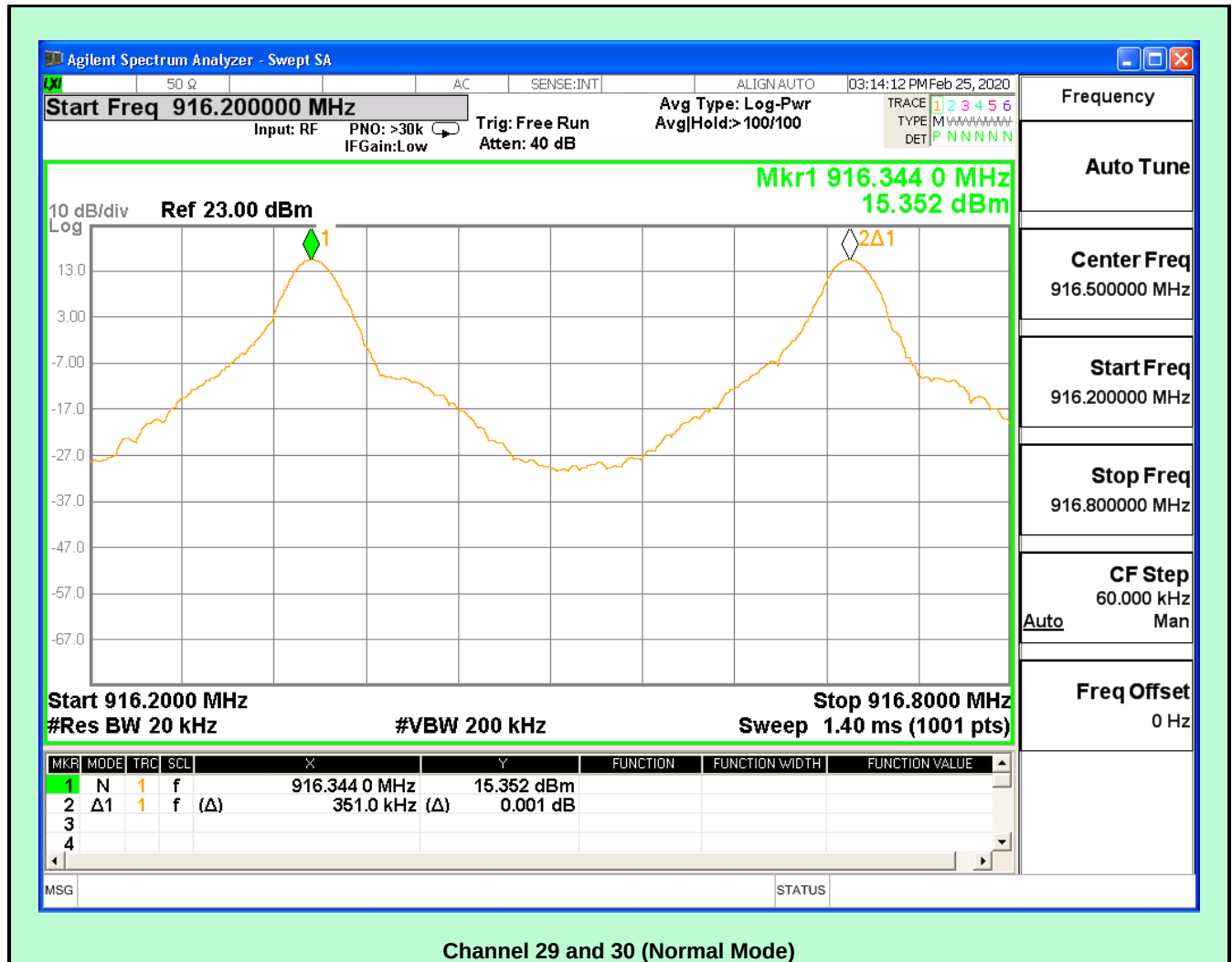


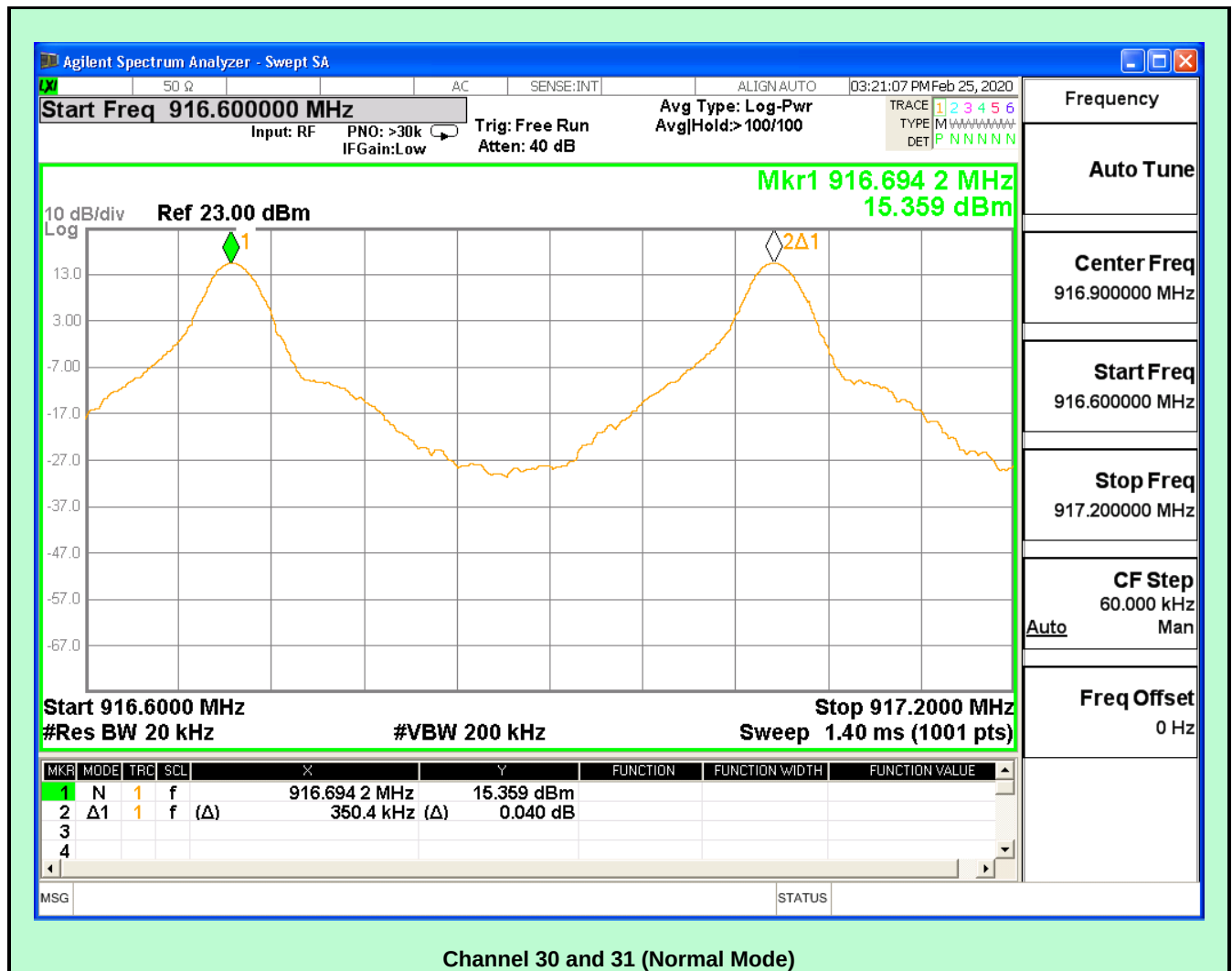


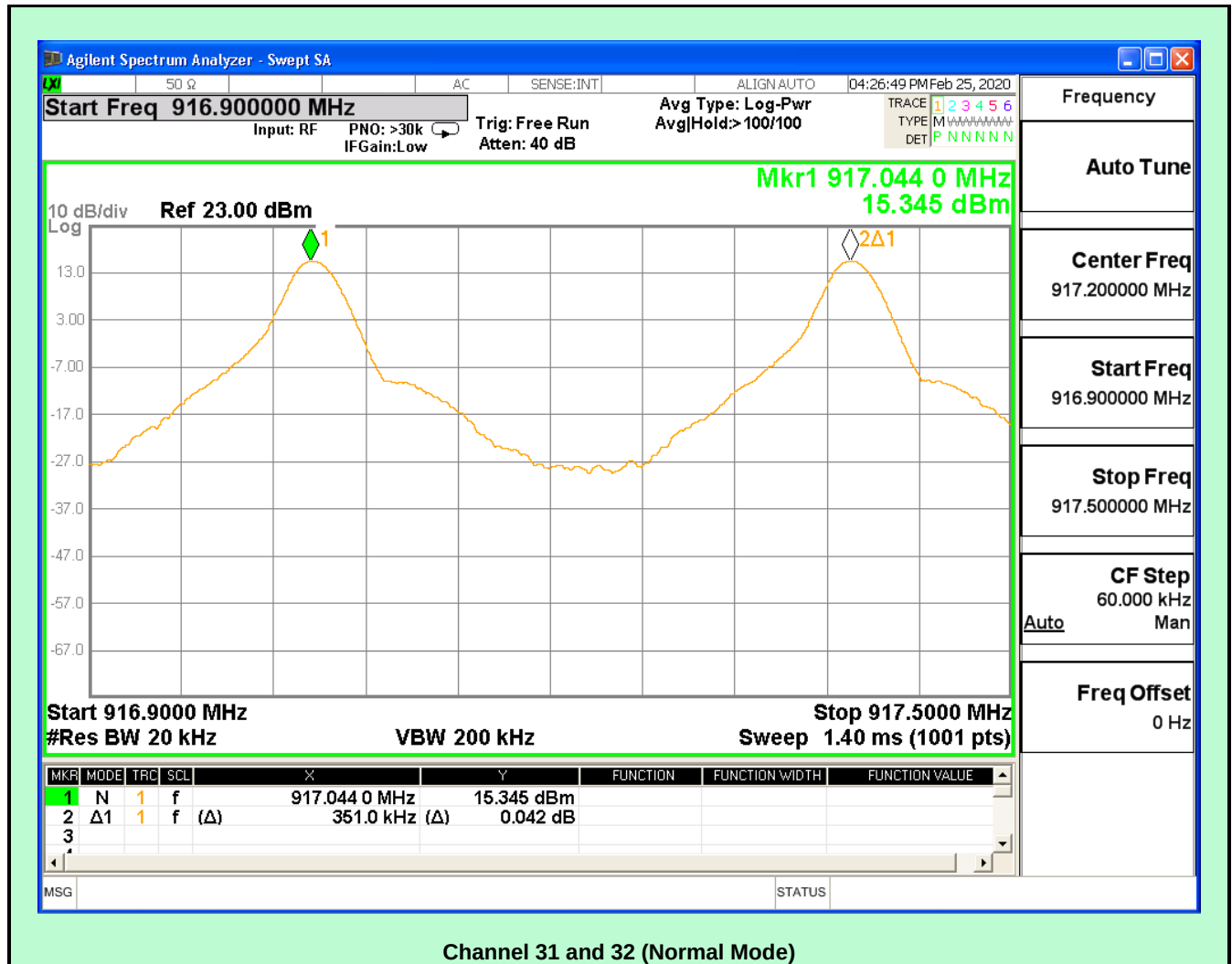


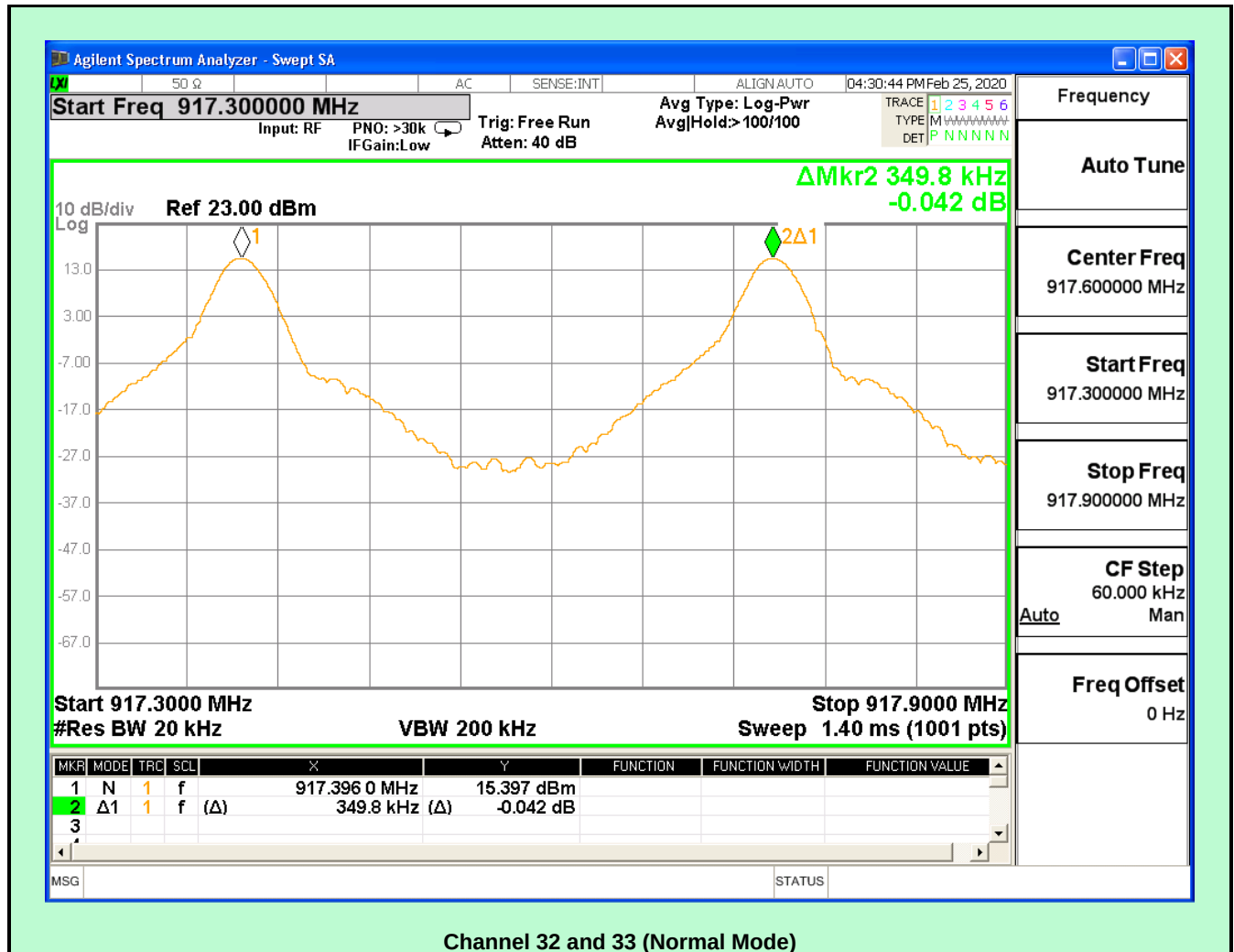


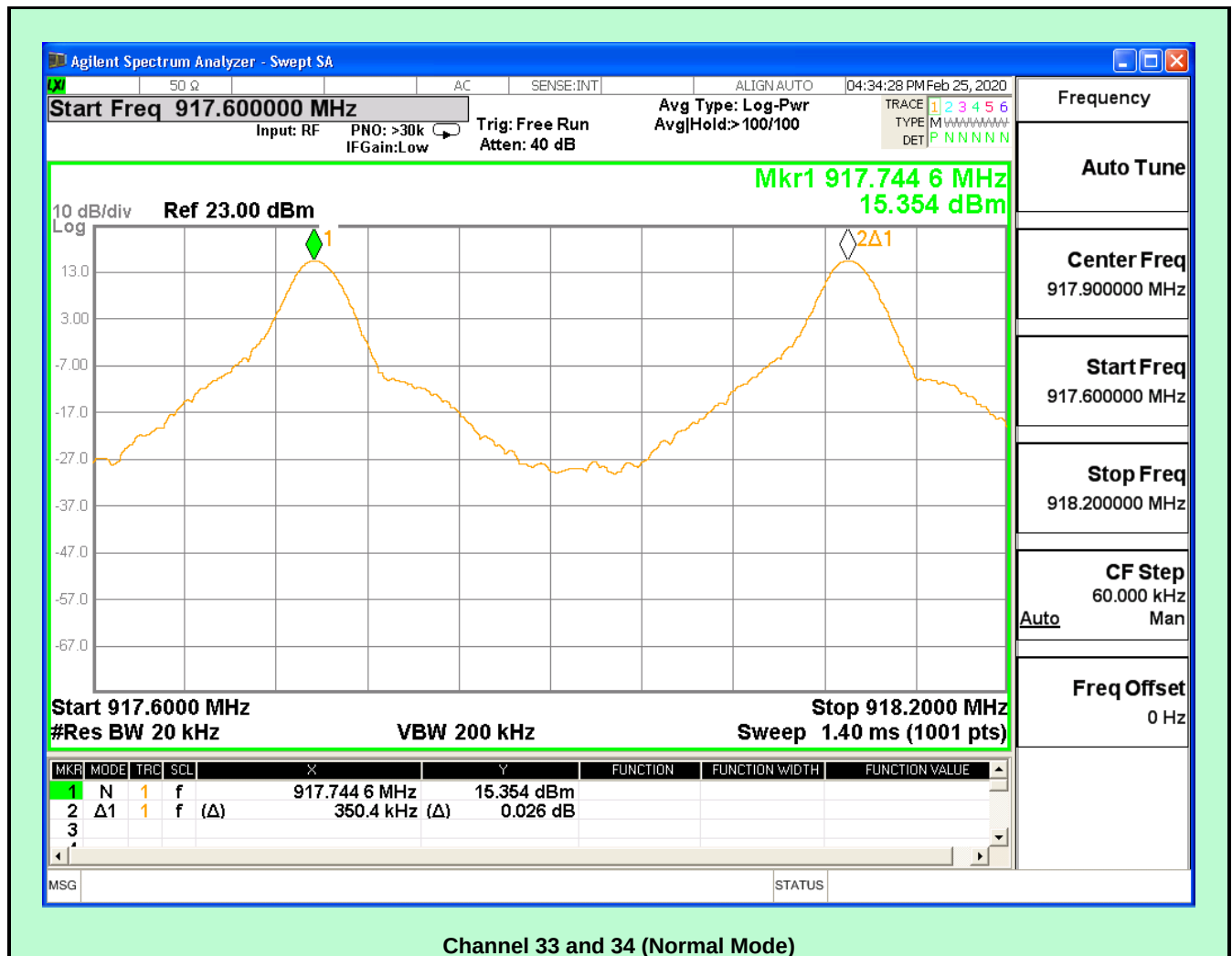


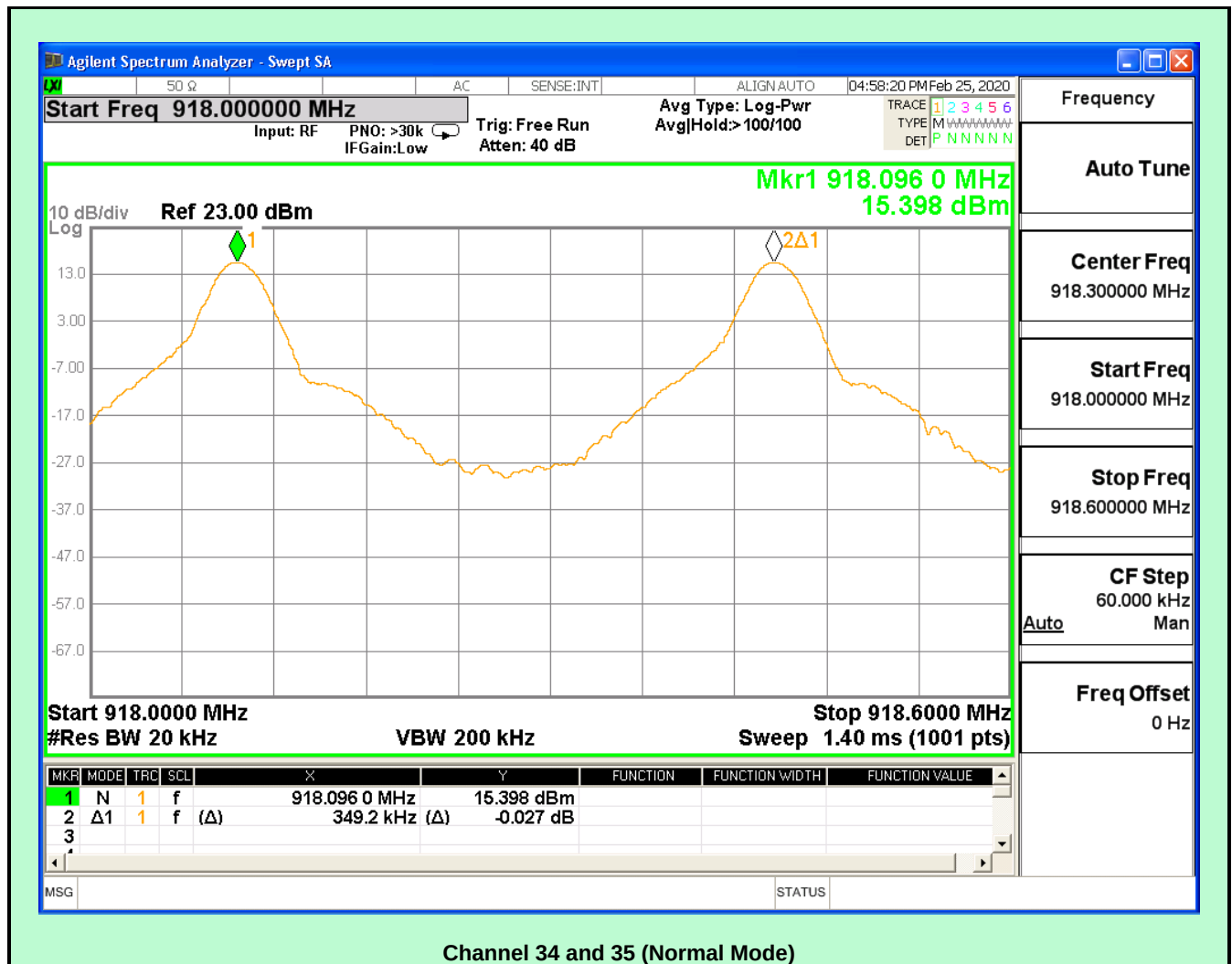


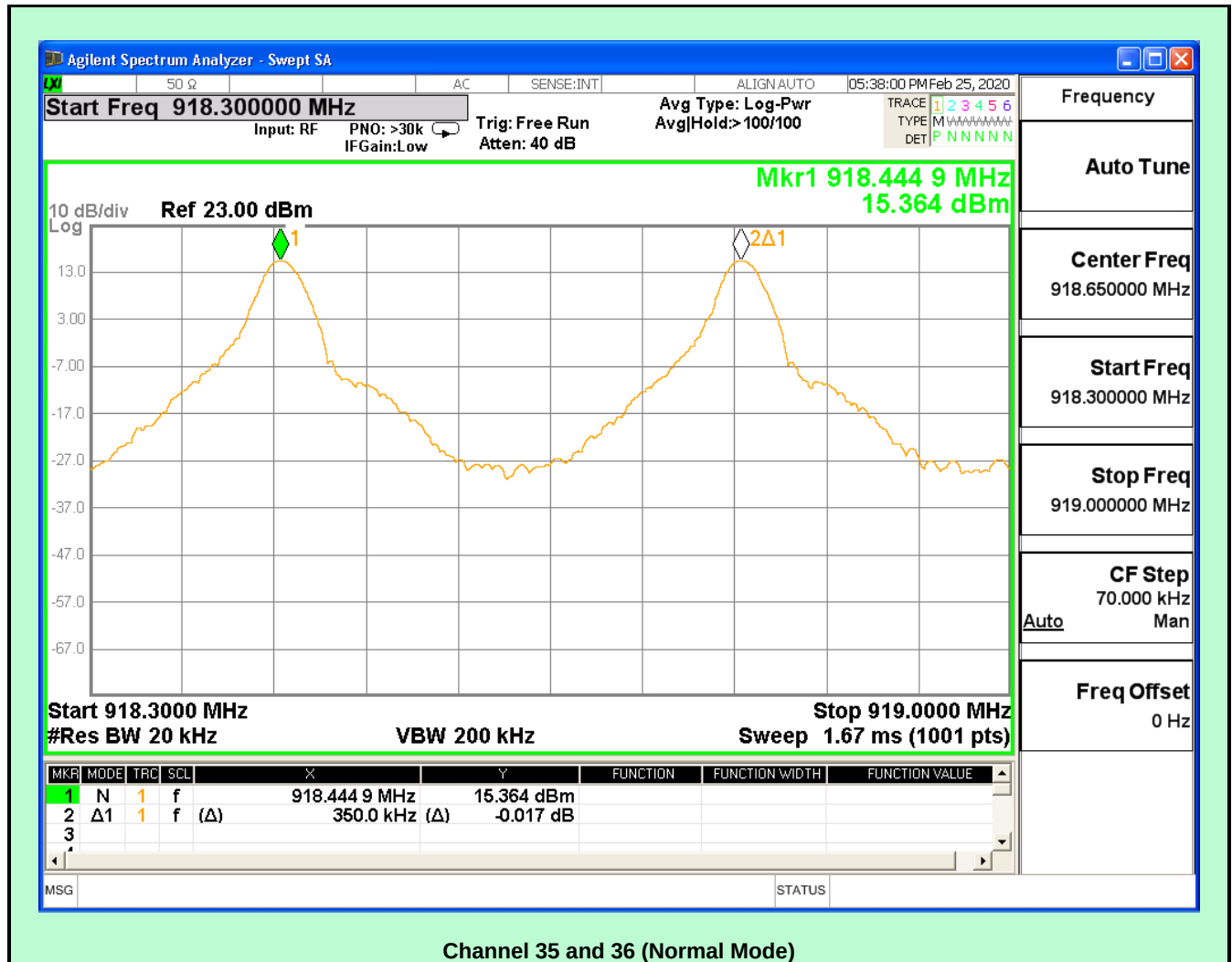


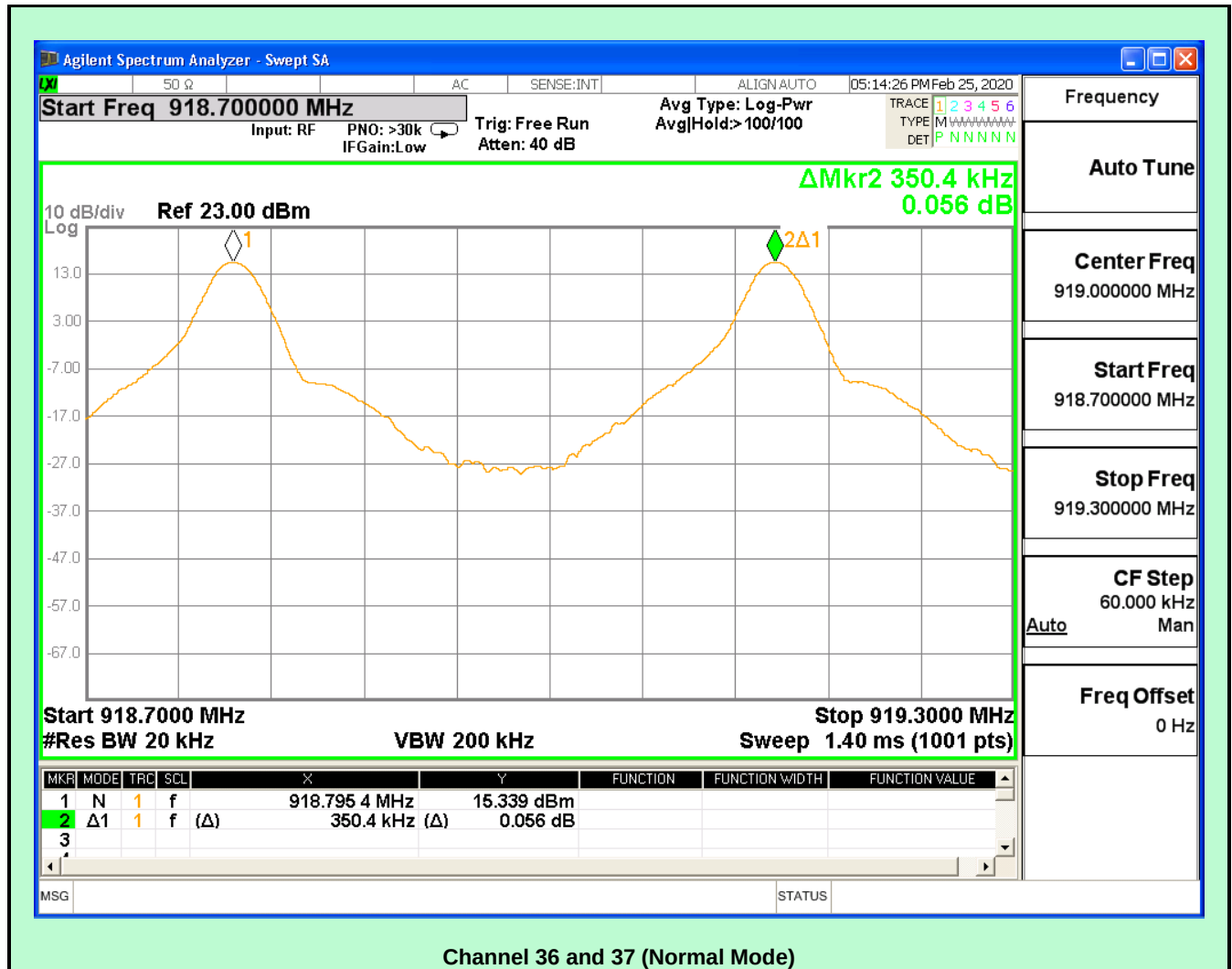


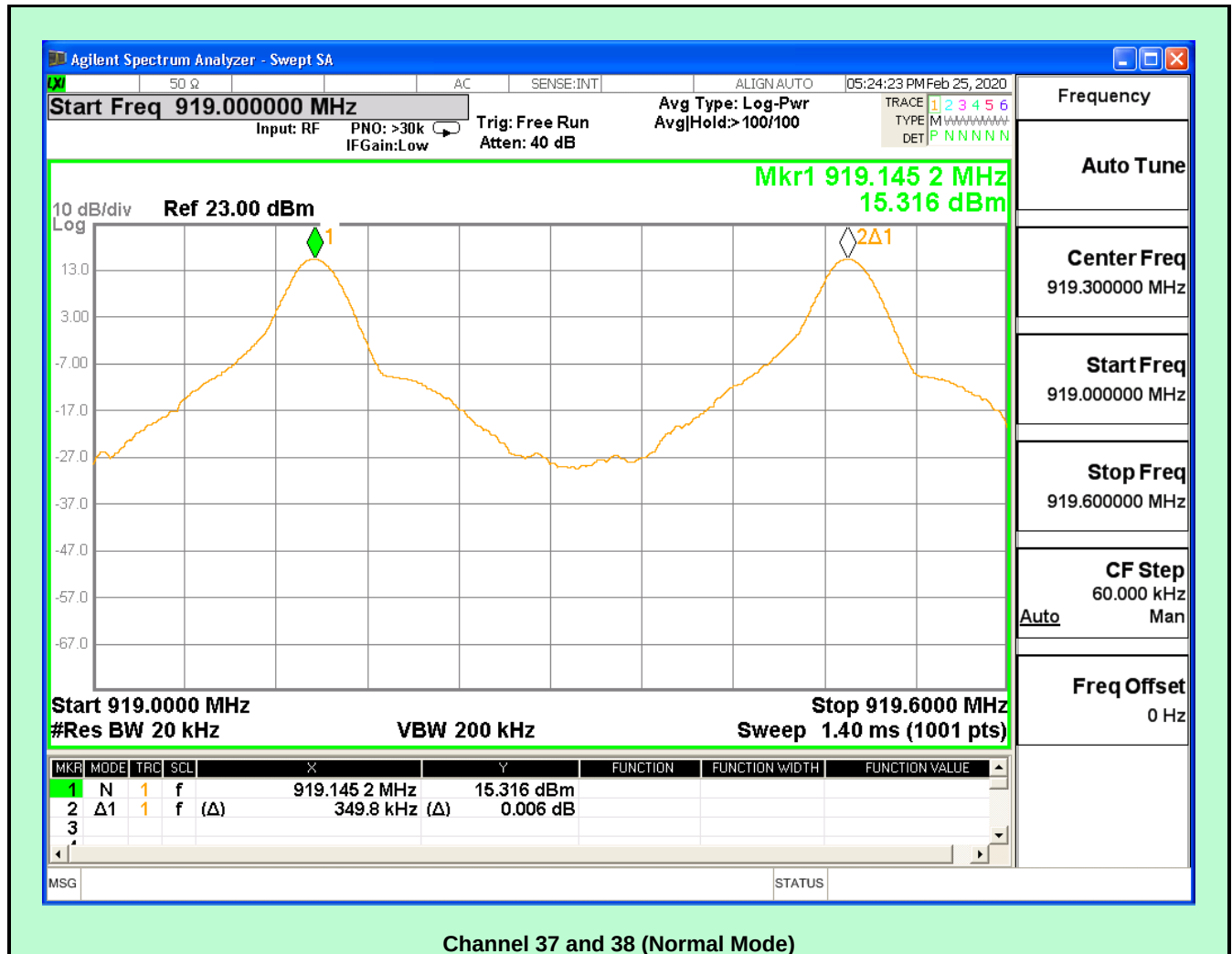


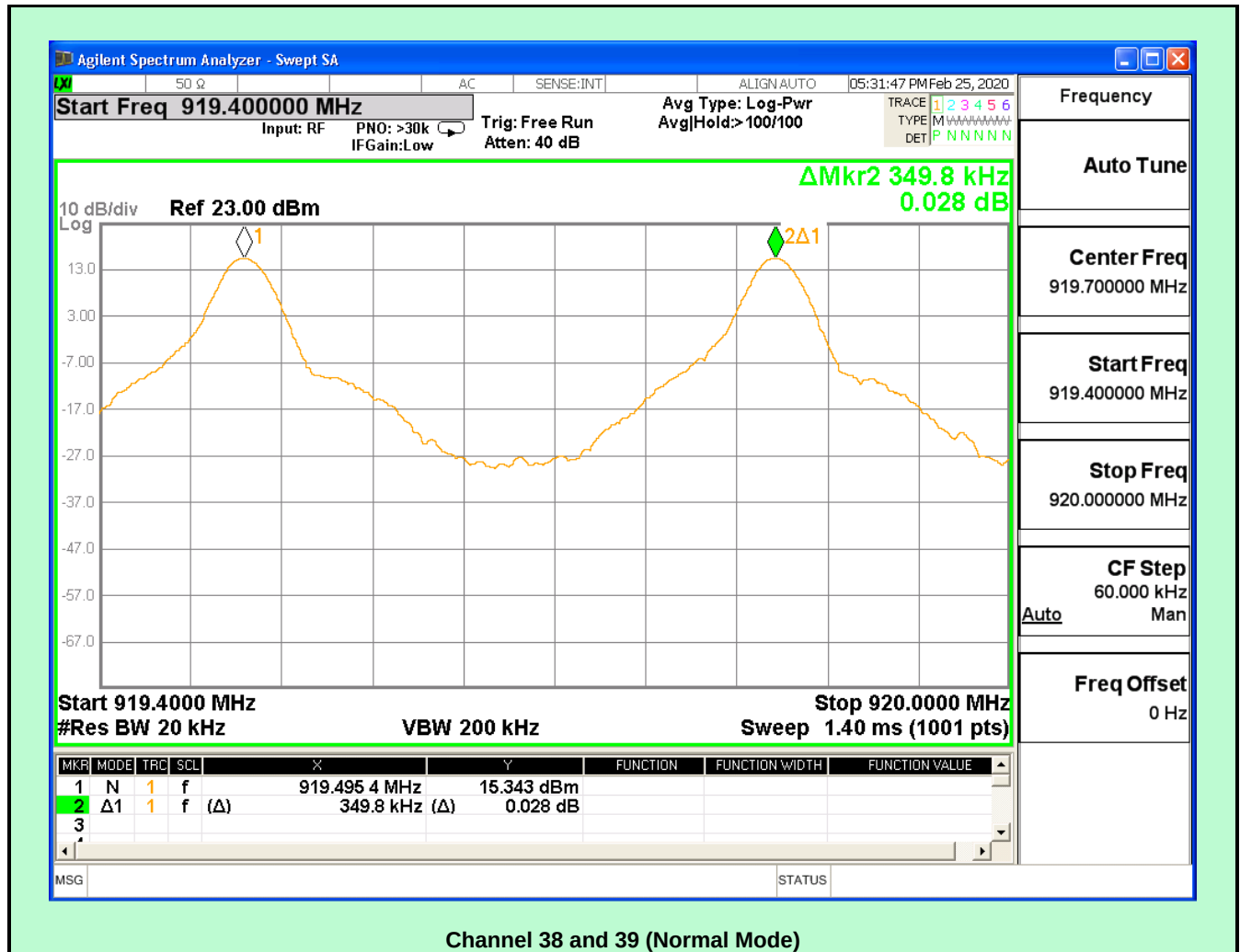


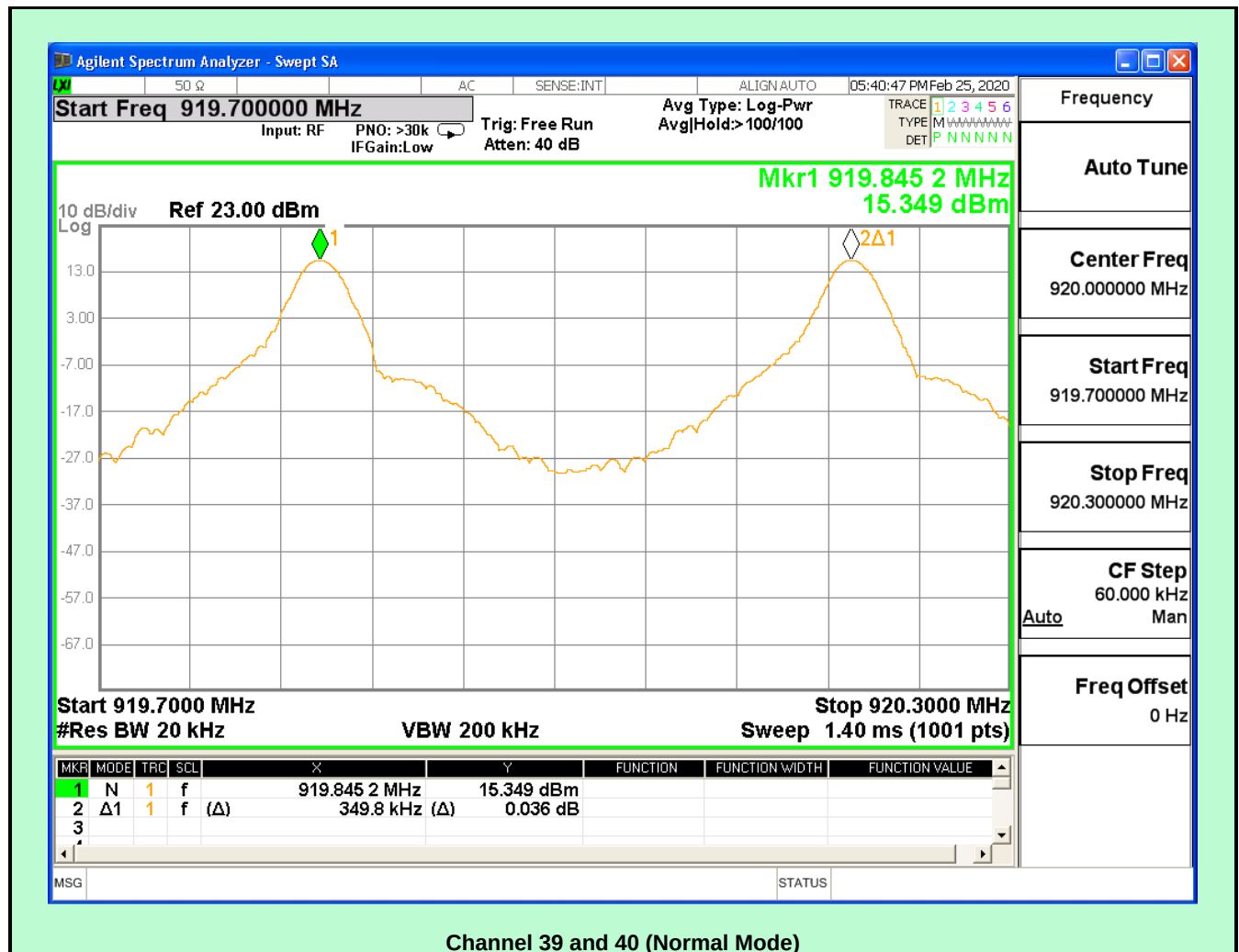


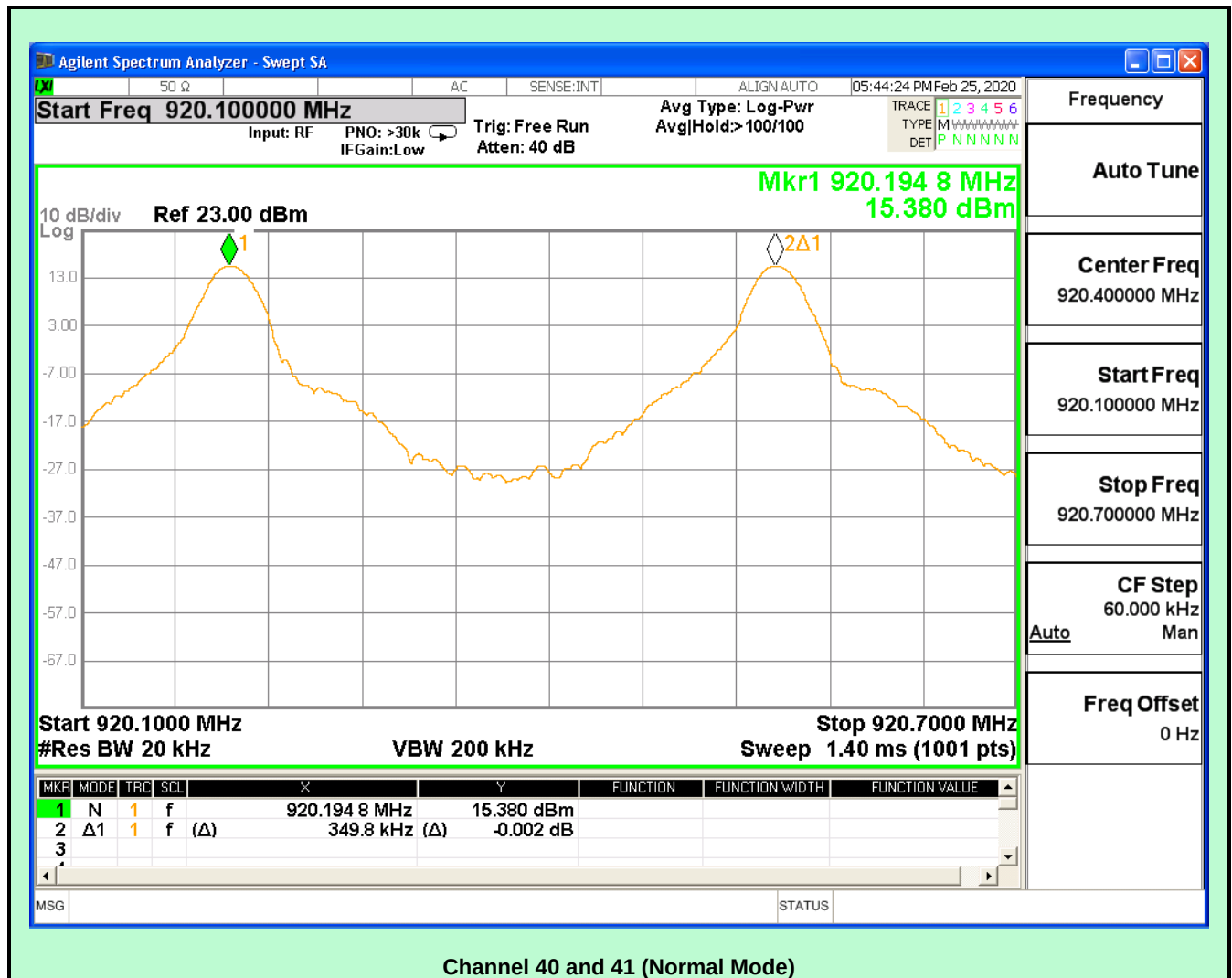


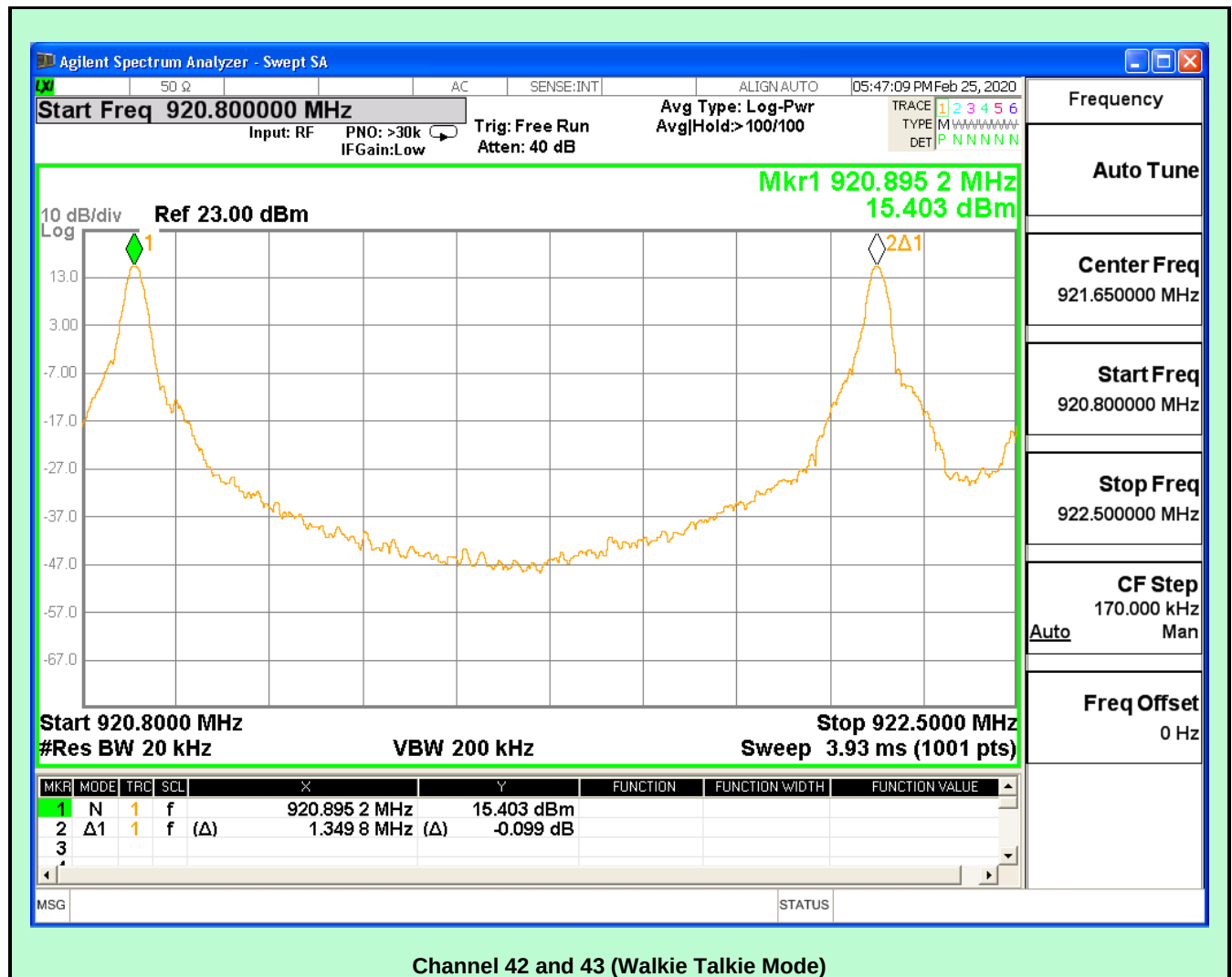


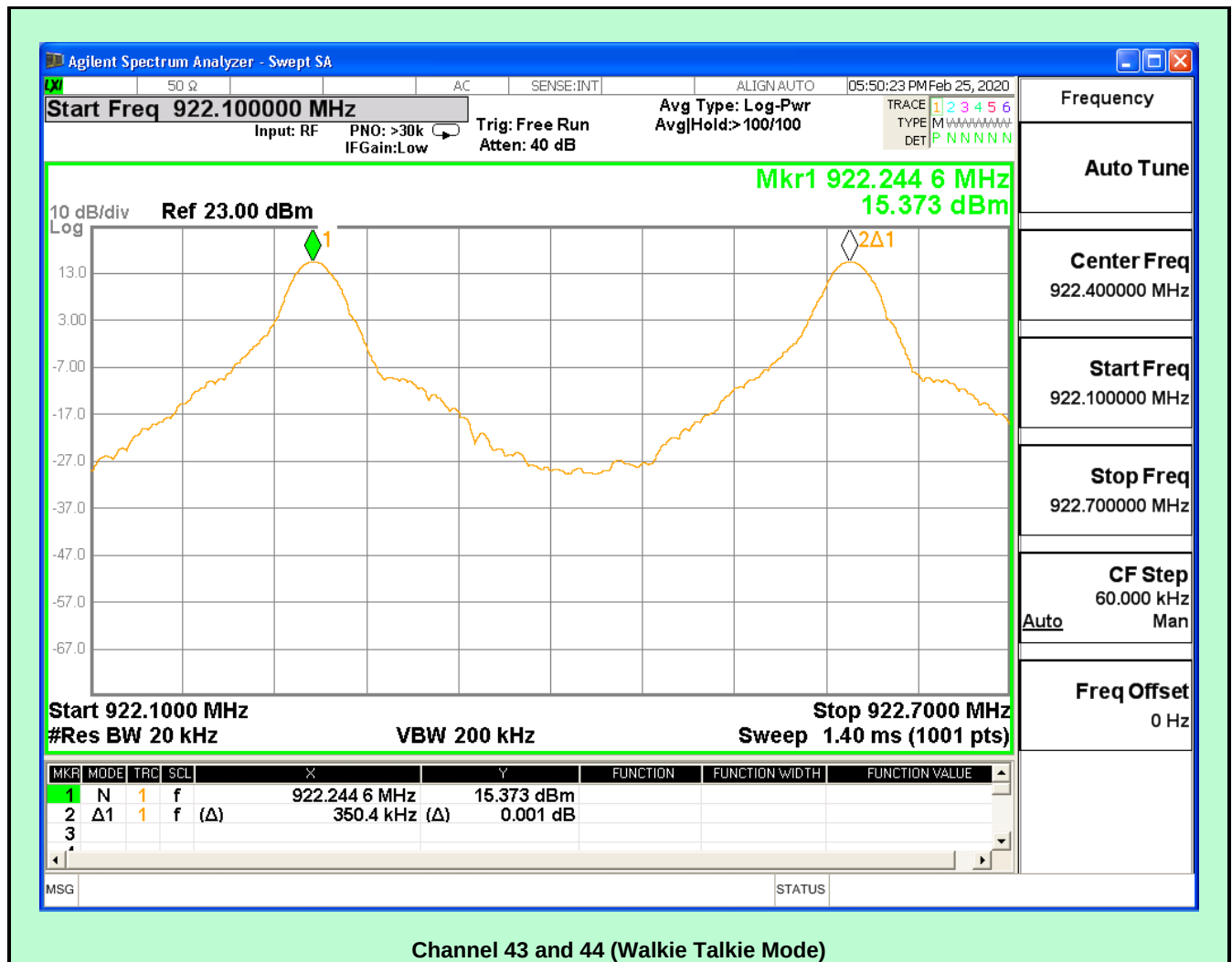


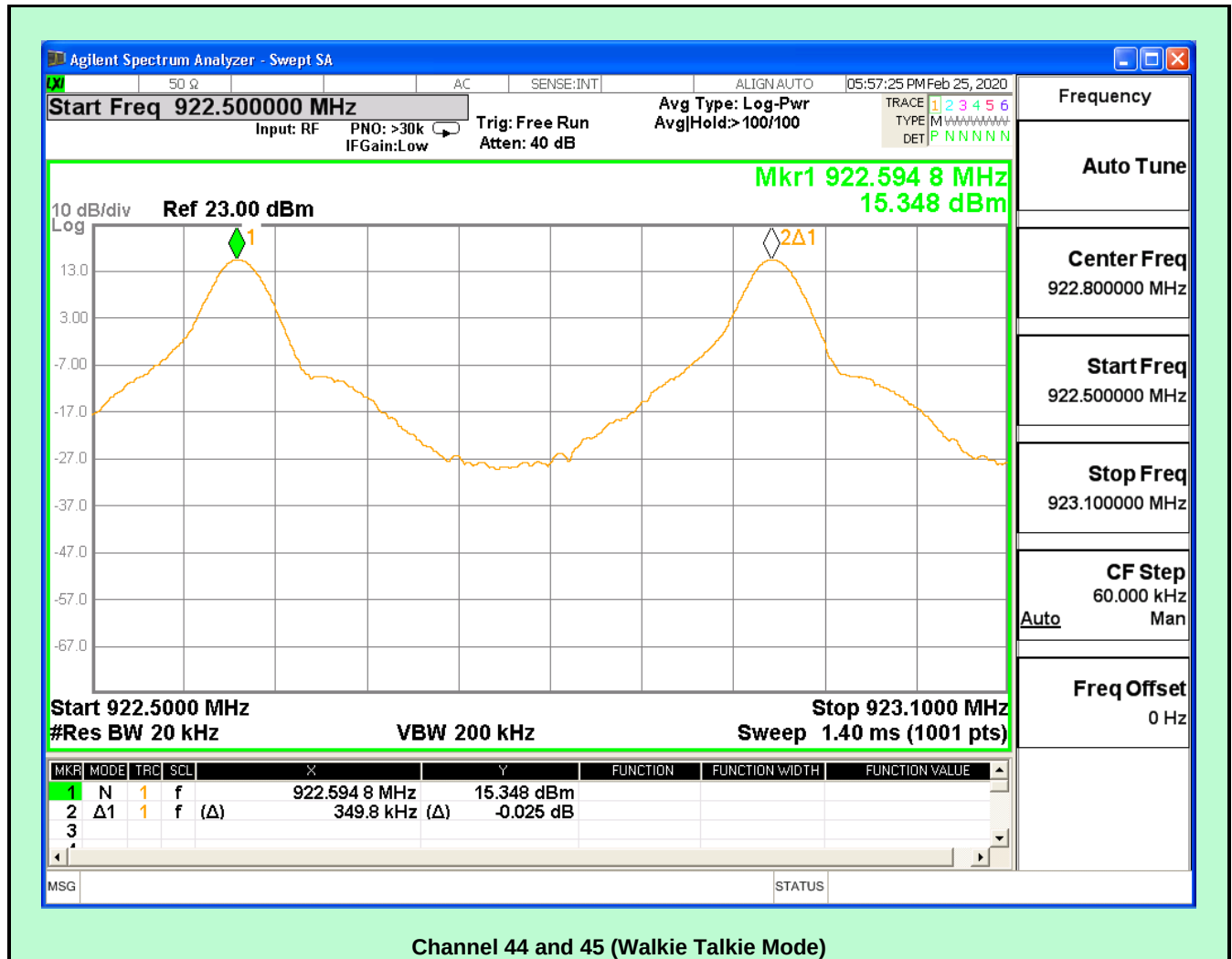


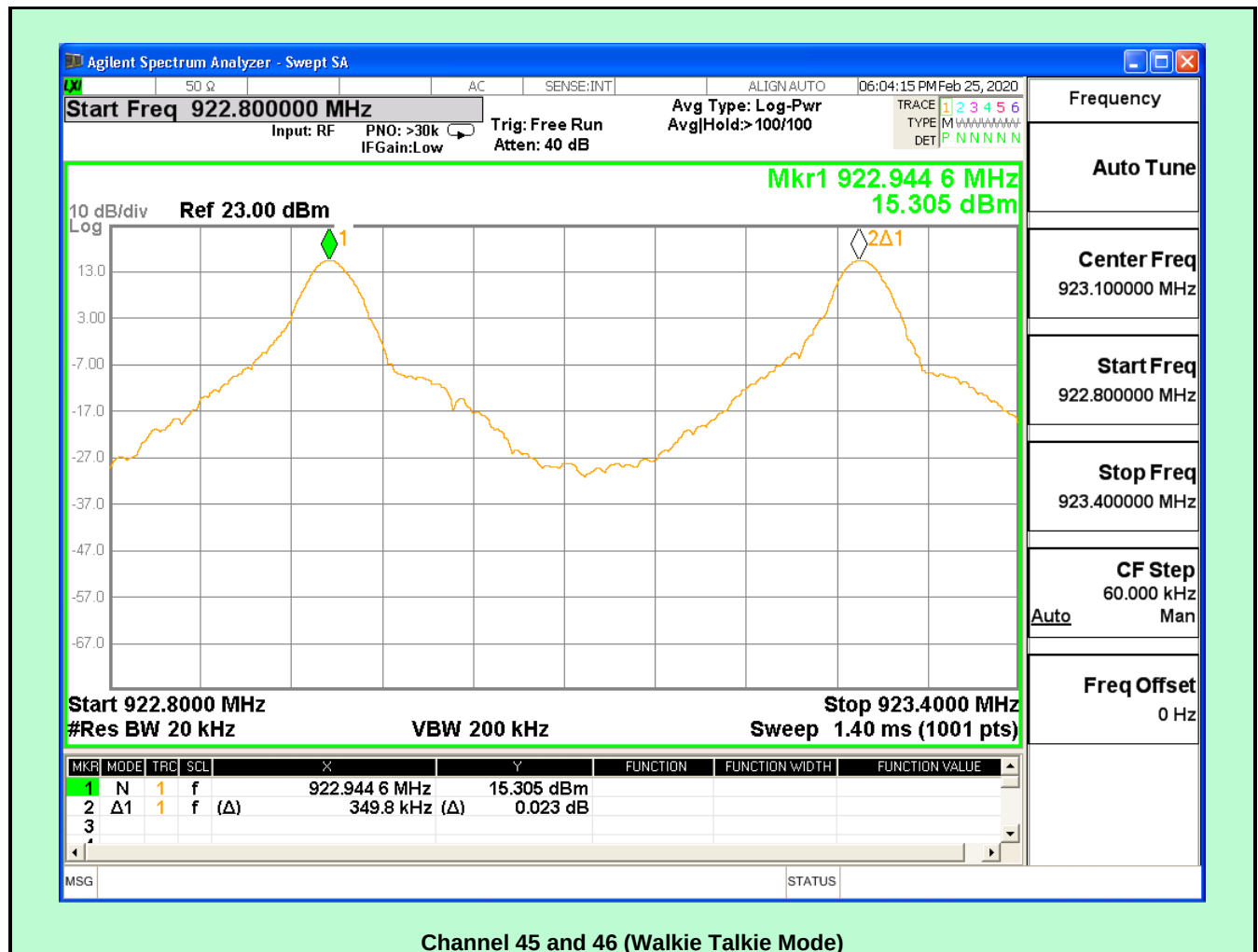


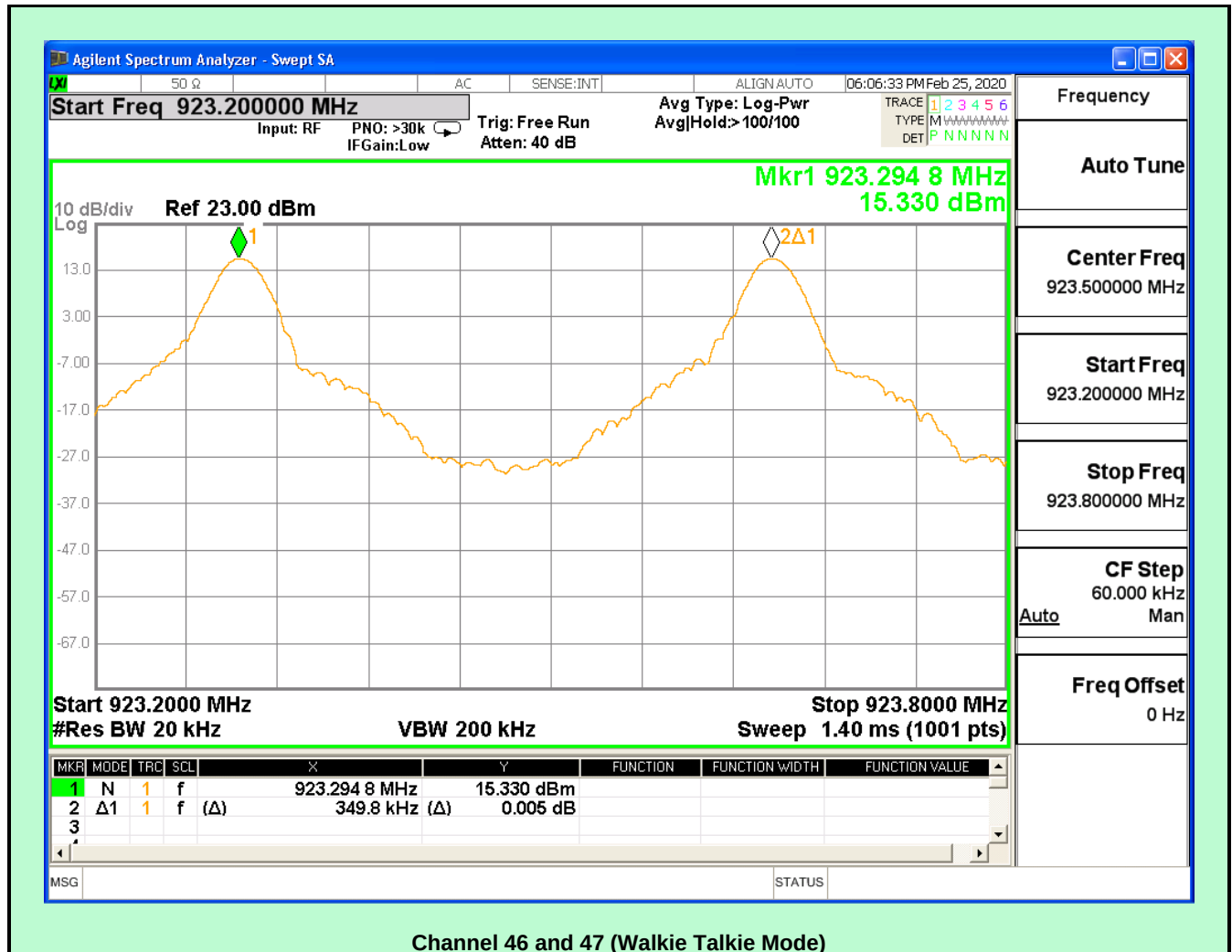


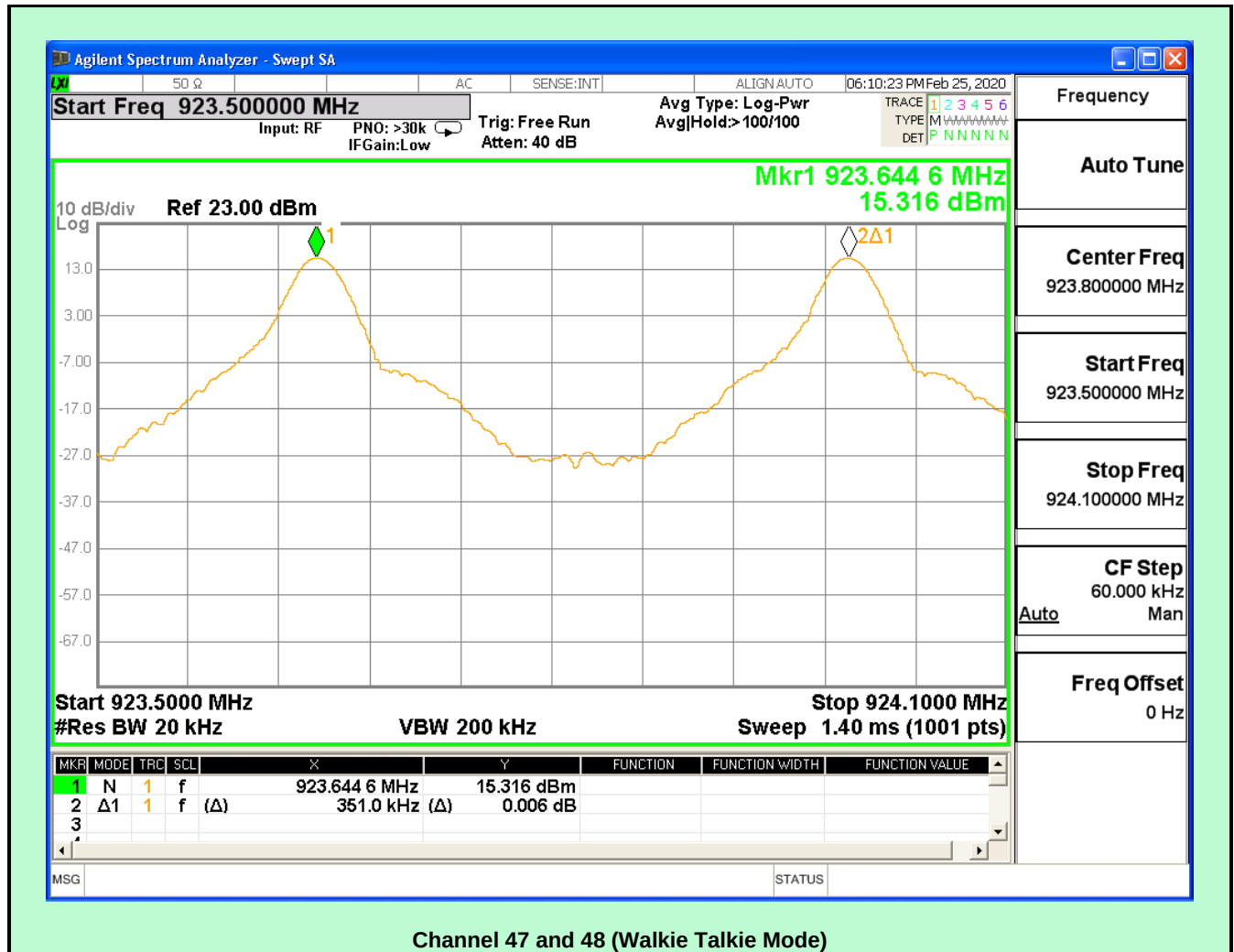


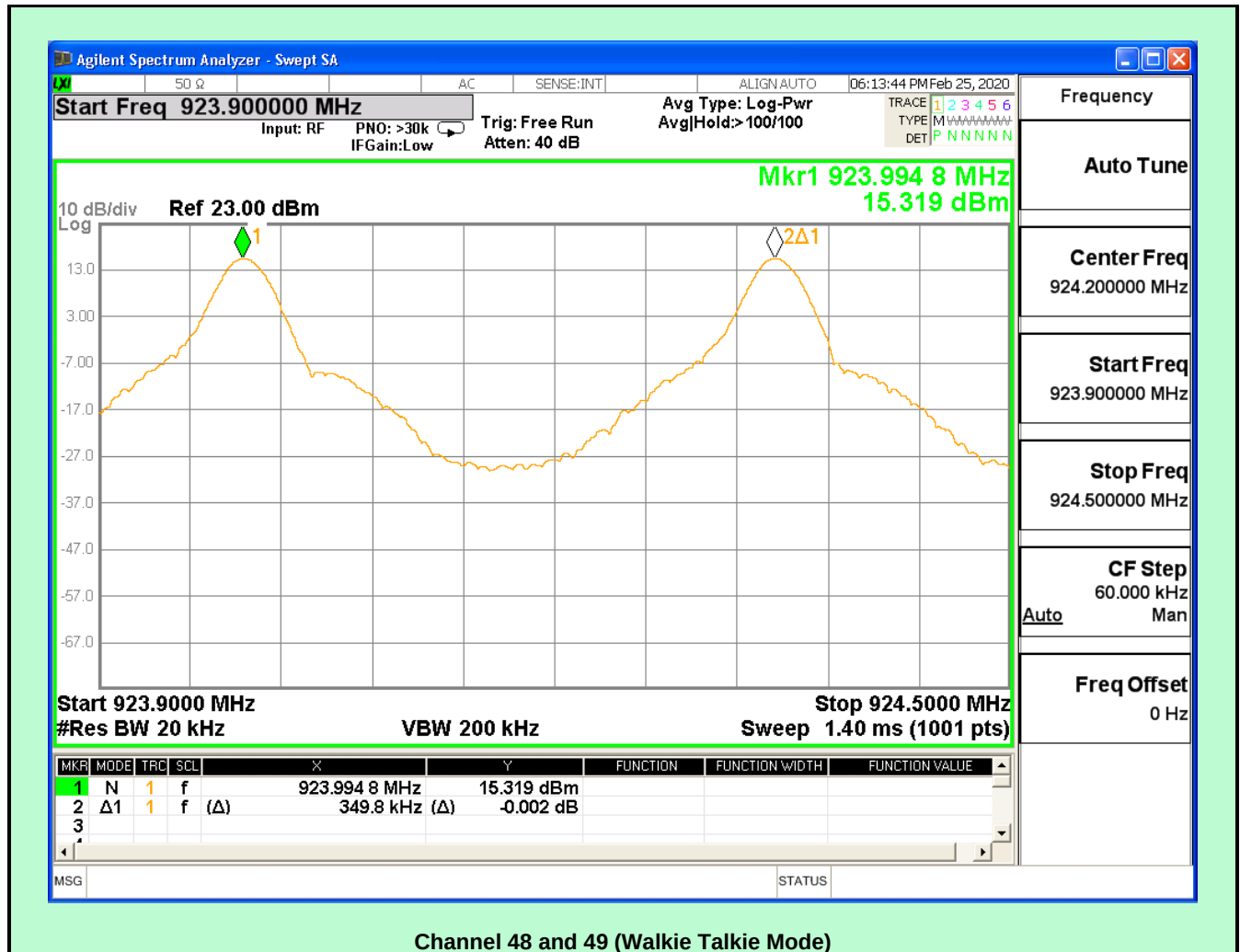


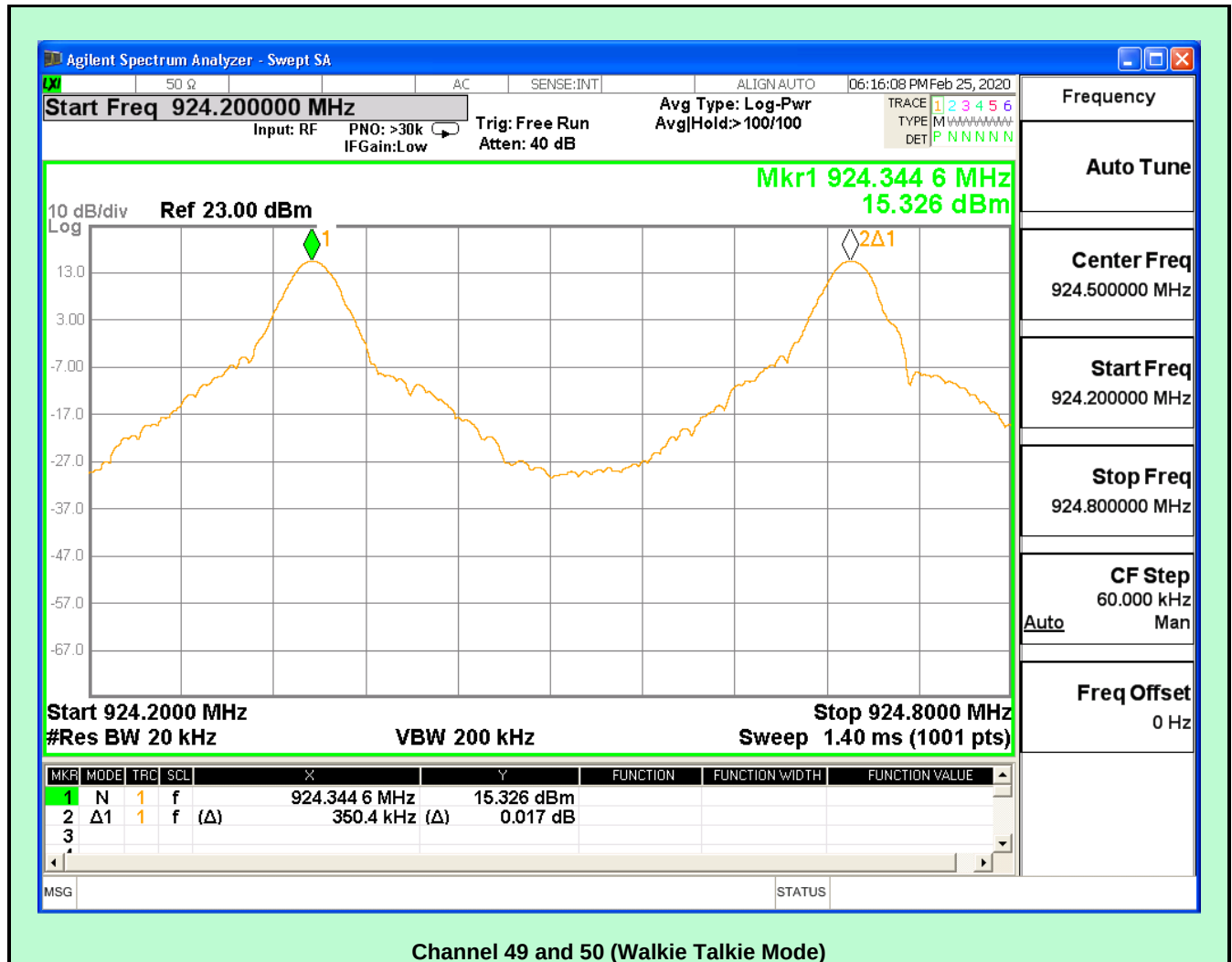


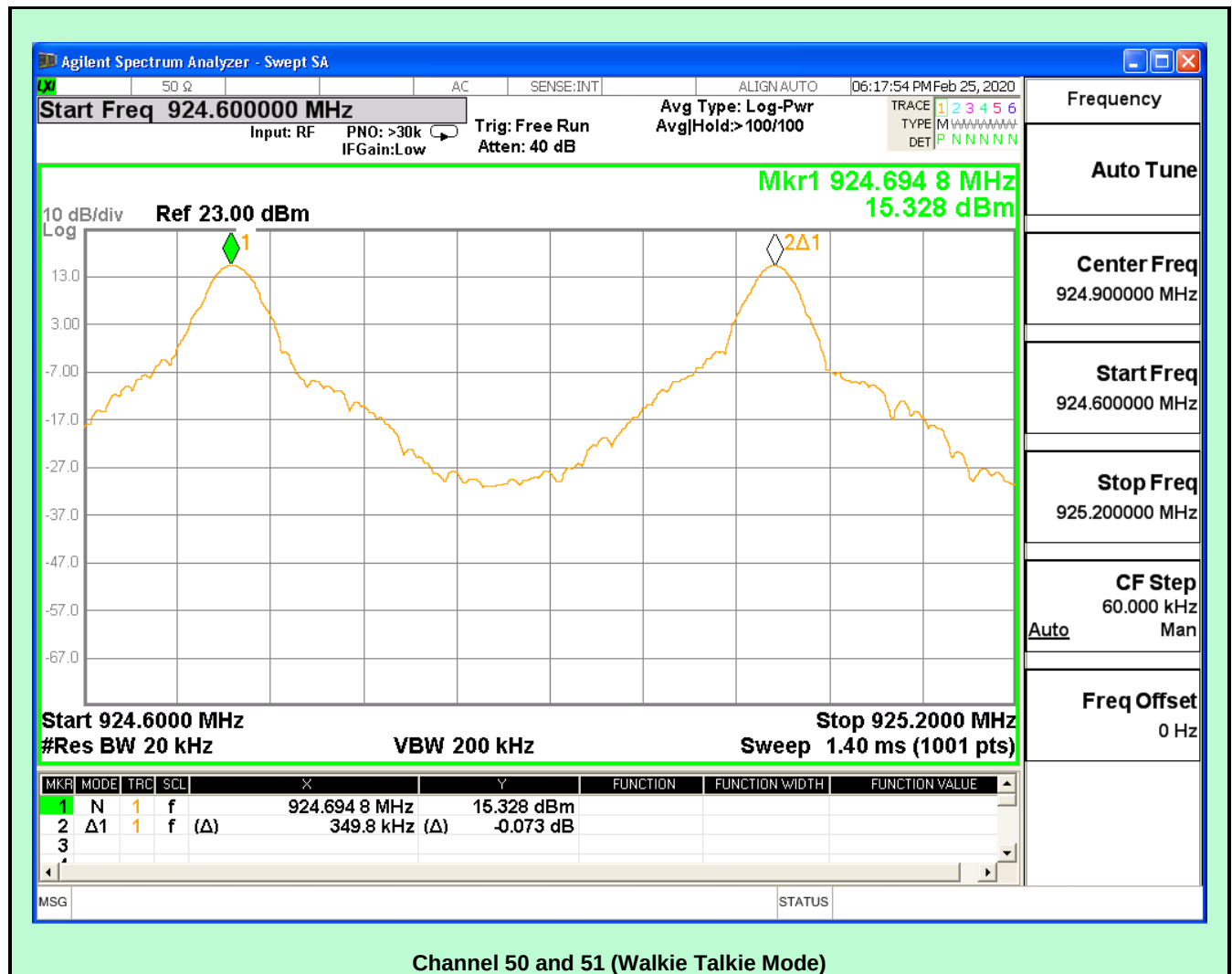


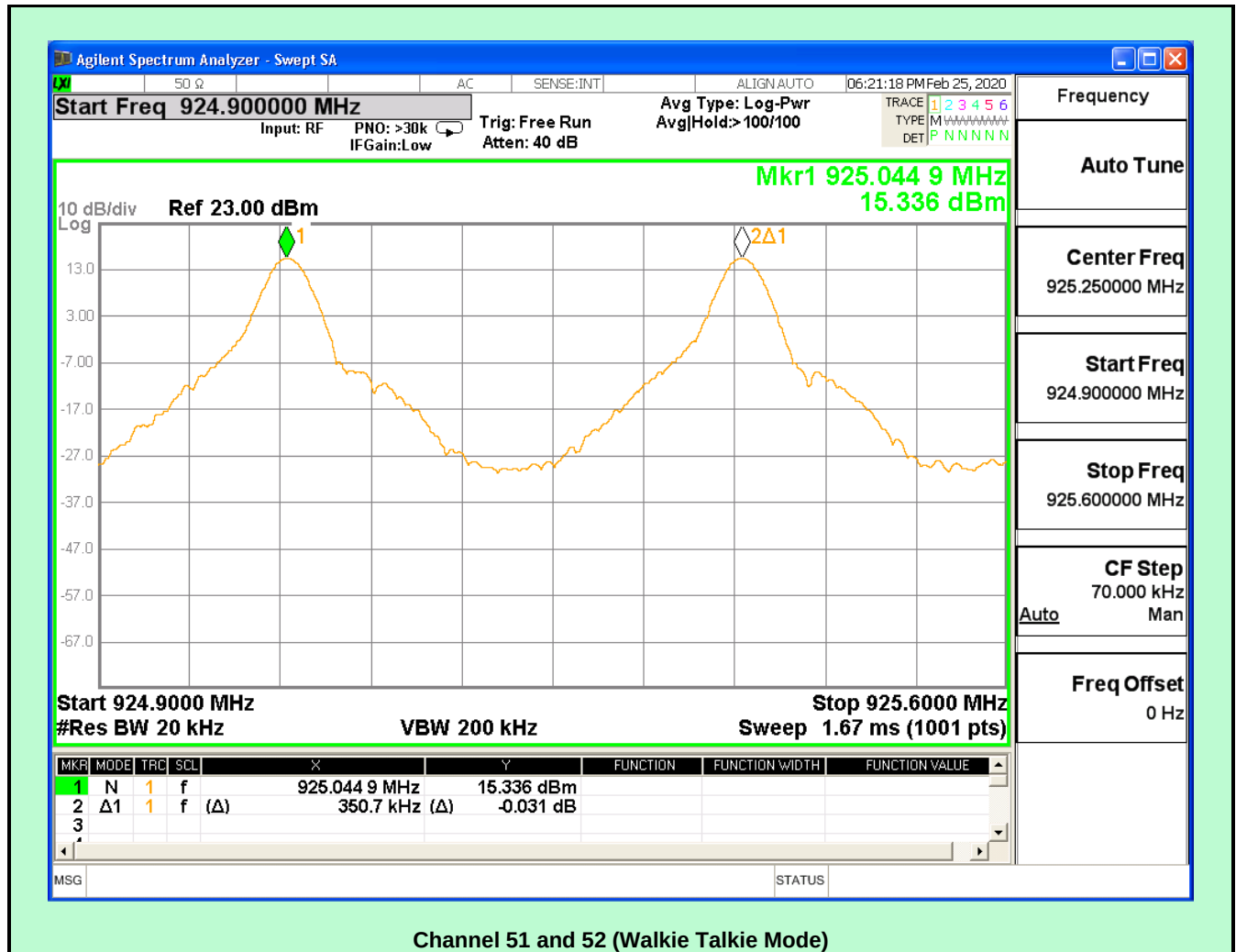


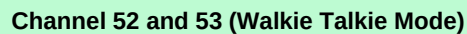


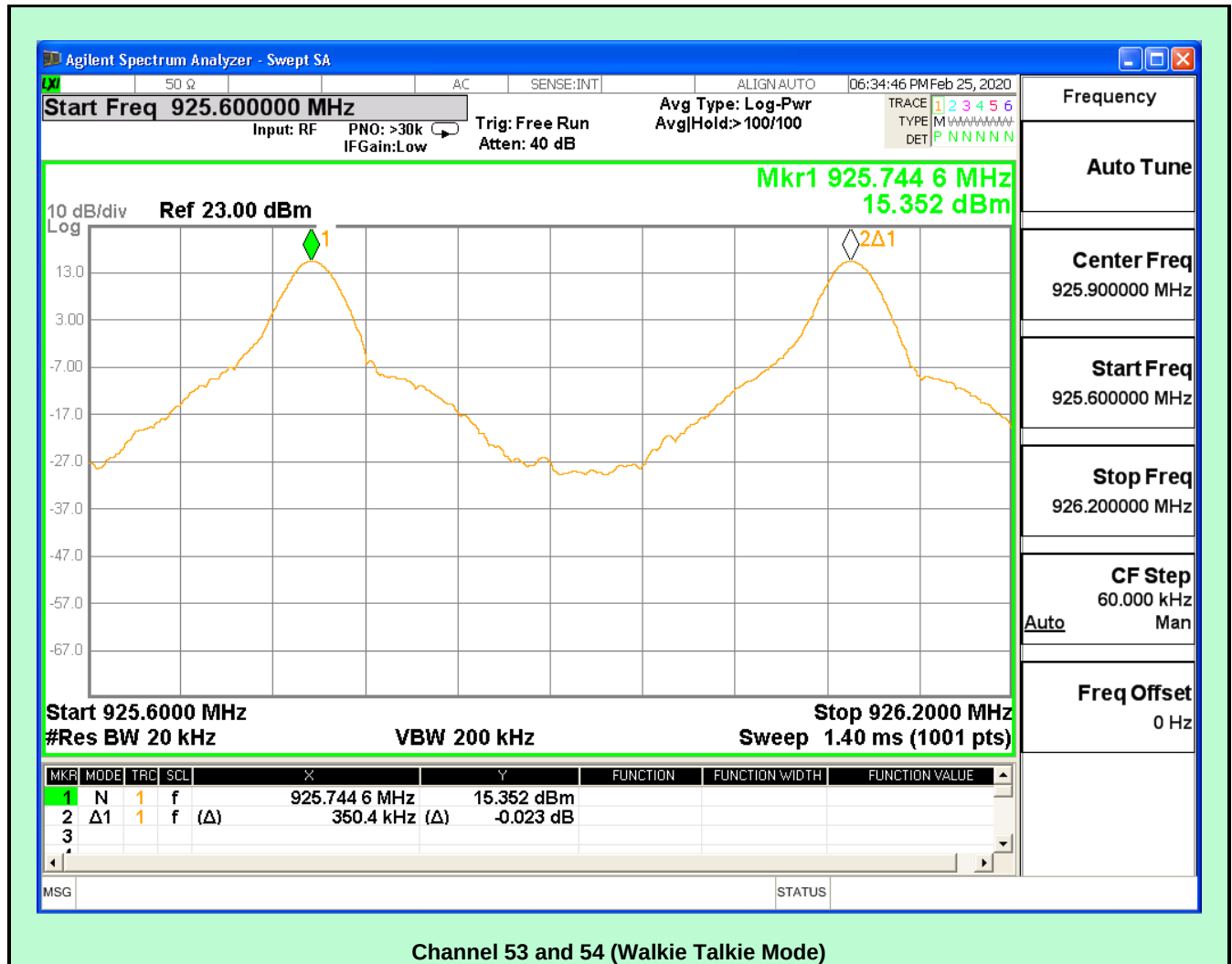


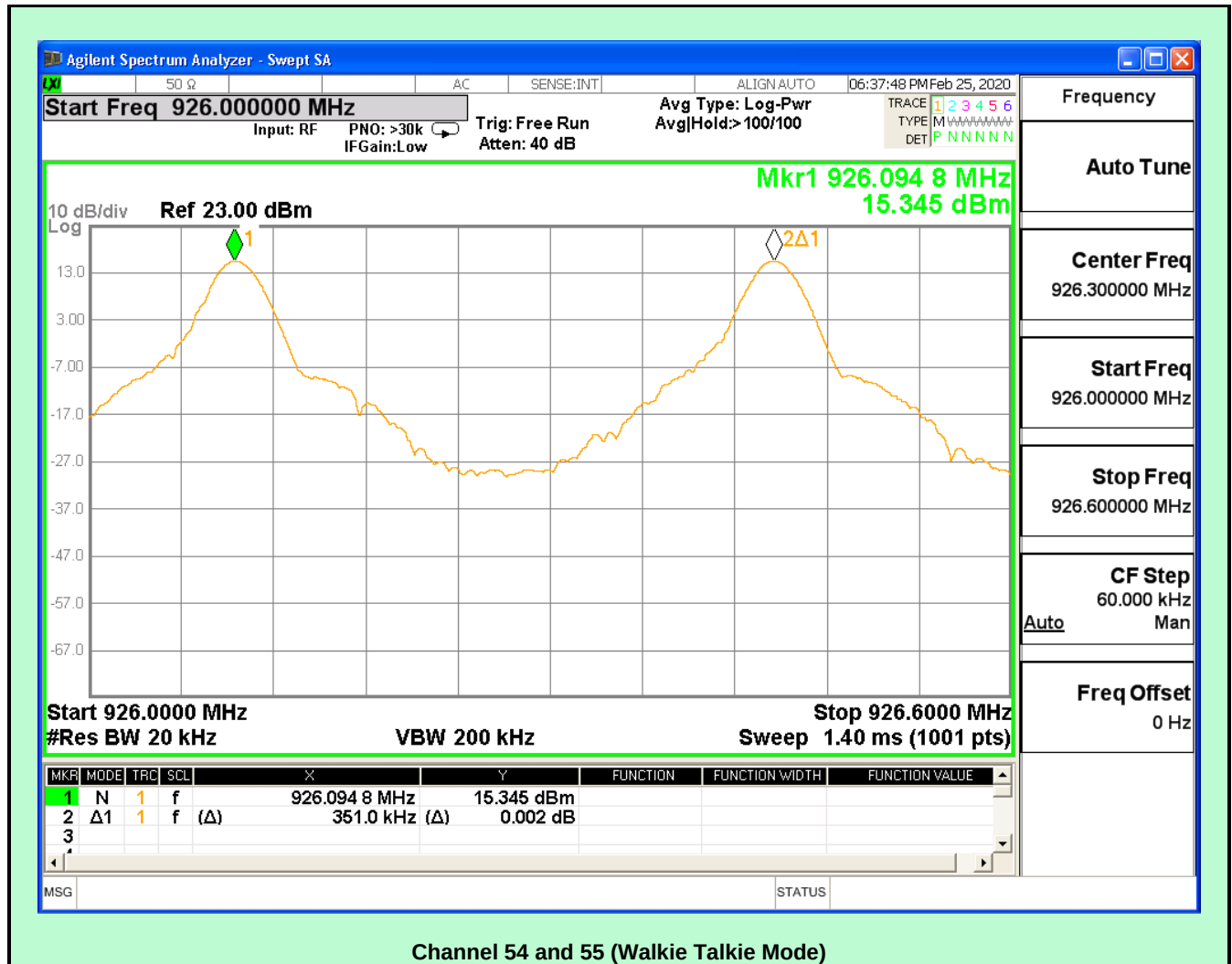












TEST RESULTS			
Channel No	Measured Value	Limit	Test Results
#	KHz		
1 and 2	350	>20dB BW(320KHz)	PASS
2 and 3	350	>20dB BW(320KHz)	PASS
3 and 4	350.7	>20dB BW(320KHz)	PASS
4 and 5	350.7	>20dB BW(320KHz)	PASS
5 and 6	350	>20dB BW(320KHz)	PASS
6 and 7	350	>20dB BW(320KHz)	PASS
7 and 8	350	>20dB BW(320KHz)	PASS
8 and 9	350	>20dB BW(320KHz)	PASS
9 and 10	350.7	>20dB BW(320KHz)	PASS
10 and 11	350.7	>20dB BW(320KHz)	PASS
11 and 12	348.6	>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	>20dB BW(320KHz)	PASS
16 and 17	349.8	>20dB BW(320KHz)	PASS
17 and 18	351	>20dB BW(320KHz)	PASS
18 and 19	349.8	>20dB BW(320KHz)	PASS
19 and 20	351	>20dB BW(320KHz)	PASS
20 and 21	349.3	>20dB BW(320KHz)	PASS
21 and 22	351	>20dB BW(320KHz)	PASS
22 and 23	349.8	>20dB BW(320KHz)	PASS
23 and 24	349.3	>20dB BW(320KHz)	PASS
24 and 25	350.4	>20dB BW(320KHz)	PASS
25 and 26	351.4	>20dB BW(320KHz)	PASS
26 and 27	350.7	>20dB BW(320KHz)	PASS
27 and 28	2351.7	>20dB BW(320KHz)	PASS
28 and 29	350	>20dB BW(320KHz)	PASS
29 and 30	351	>20dB BW(320KHz)	PASS
30 and 31	350.4	>20dB BW(320KHz)	PASS
31 and 32	351	>20dB BW(320KHz)	PASS
32 and 33	349.8	>20dB BW(320KHz)	PASS
33 and 34	350.4	>20dB BW(320KHz)	PASS
34 and 35	349.2	>20dB BW(320KHz)	PASS
35 and 36	350	>20dB BW(320KHz)	PASS
36 and 37	350.4	>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	349.8	>20dB BW(320KHz)	PASS
40 and 41	349.8	>20dB BW(320KHz)	PASS
42 and 43	1349.8	>20dB BW(320KHz)	PASS
43 and 44	350.4	>20dB BW(320KHz)	PASS
44 and 45	349.8	>20dB BW(320KHz)	PASS
45 and 46	349.8	>20dB BW(320KHz)	PASS
46 and 47	349.8	>20dB BW(320KHz)	PASS

47 and 48	351	>20dB BW(320KHz)	PASS
48 and 49	349.8	>20dB BW(320KHz)	PASS
49 and 50	350.4	>20dB BW(320KHz)	PASS
50 and 51	349.8	>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	350.4	>20dB BW(320KHz)	PASS
54 and 55	351	>20dB BW(320KHz)	PASS

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Conducted RF Test setup

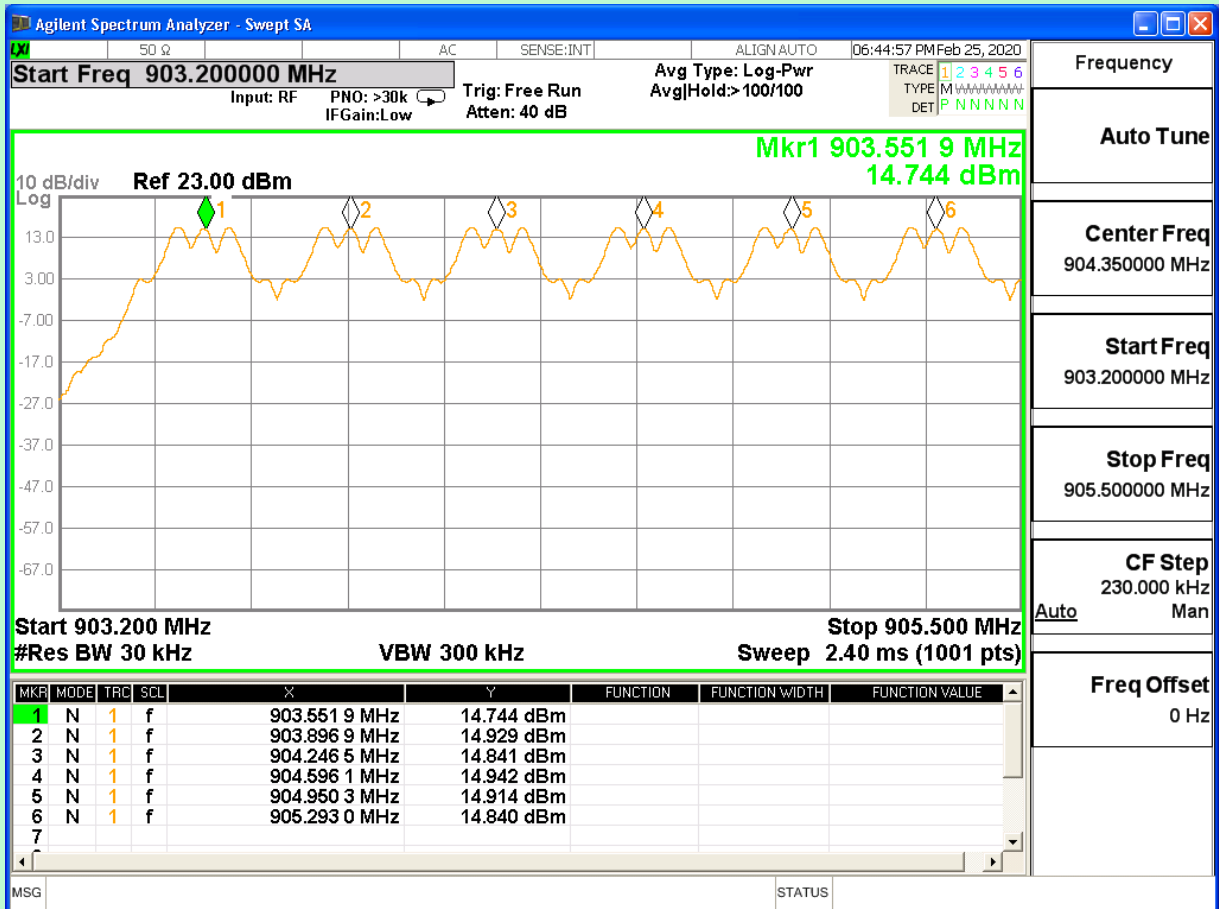
2.4 NUMBER OF HOPPING CHANNELS

EUT	Wireless Relay Module	Test Request No.	EMC0419-1
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	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

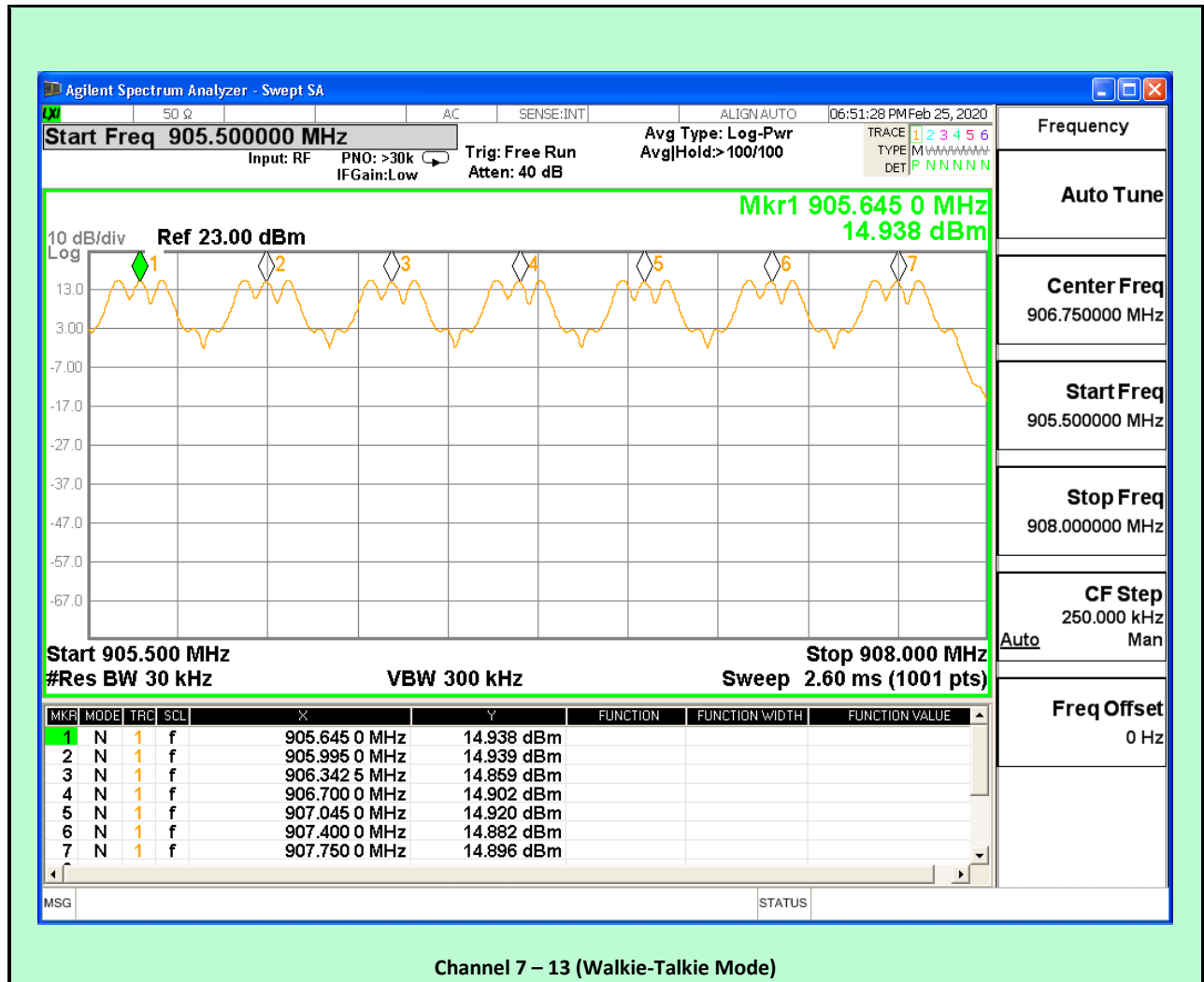
TEST EQUIPMENT

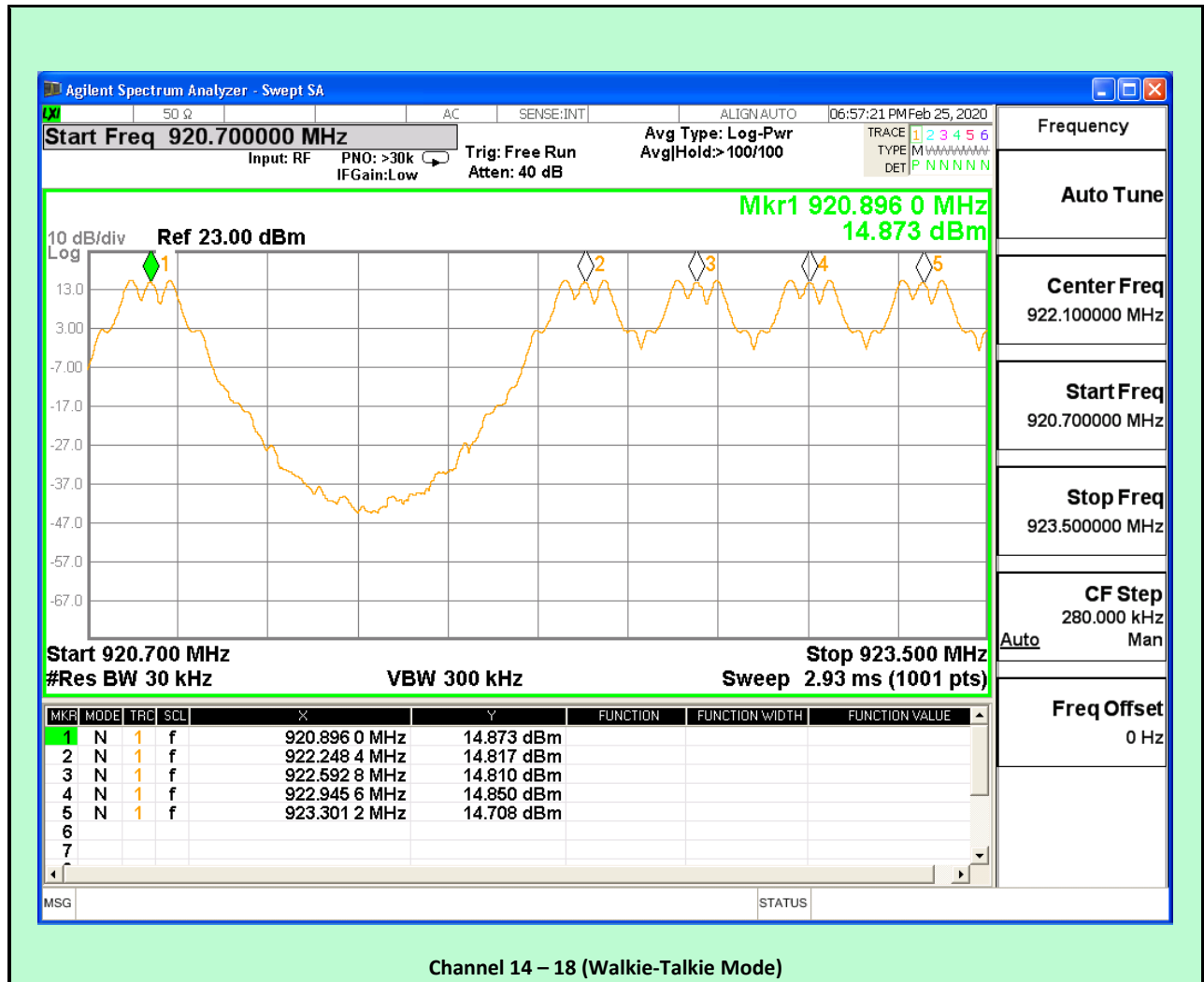
Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Shunner	SF104/2X11PC3542/500	NA	NA

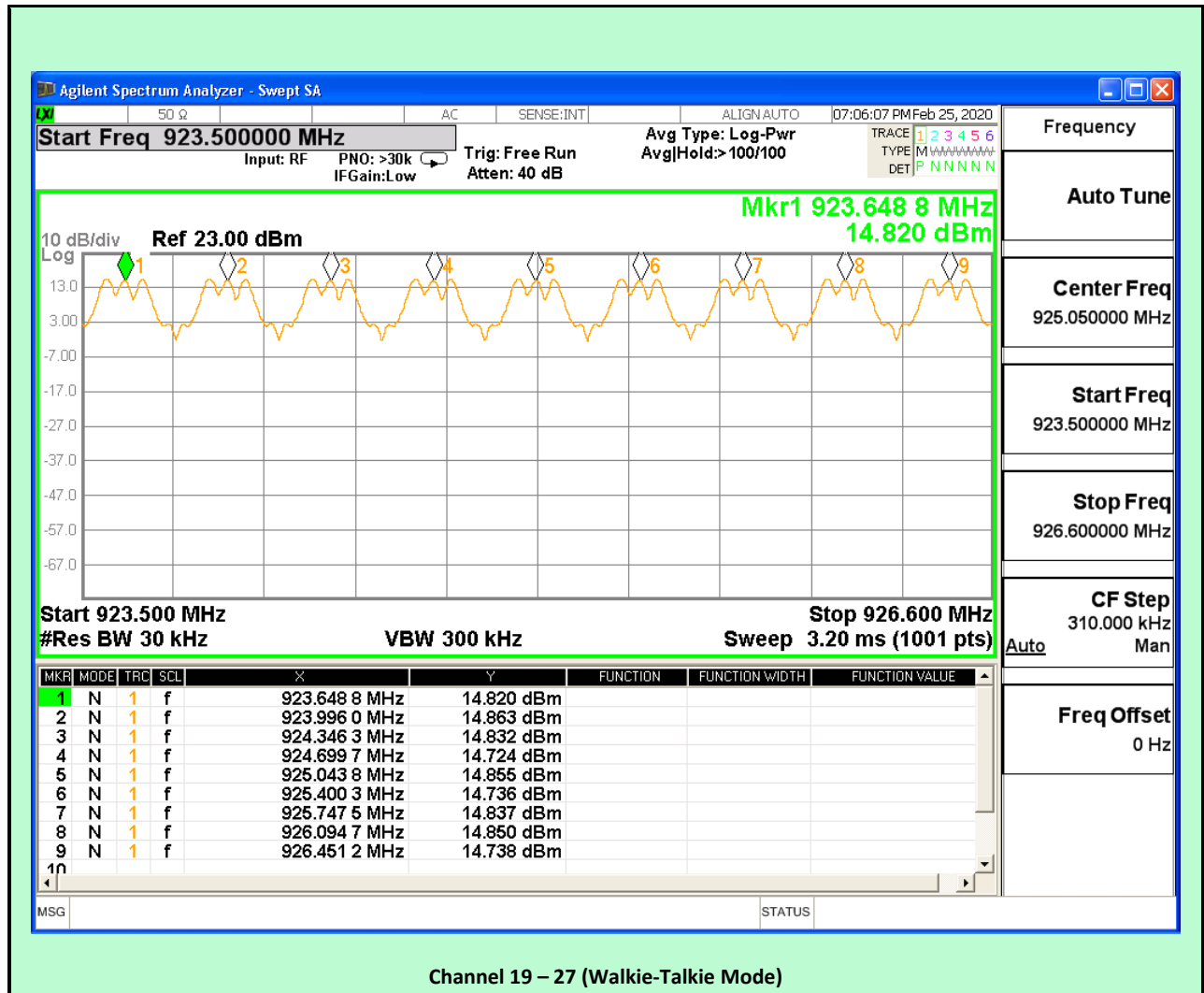
TEST GRAPHS

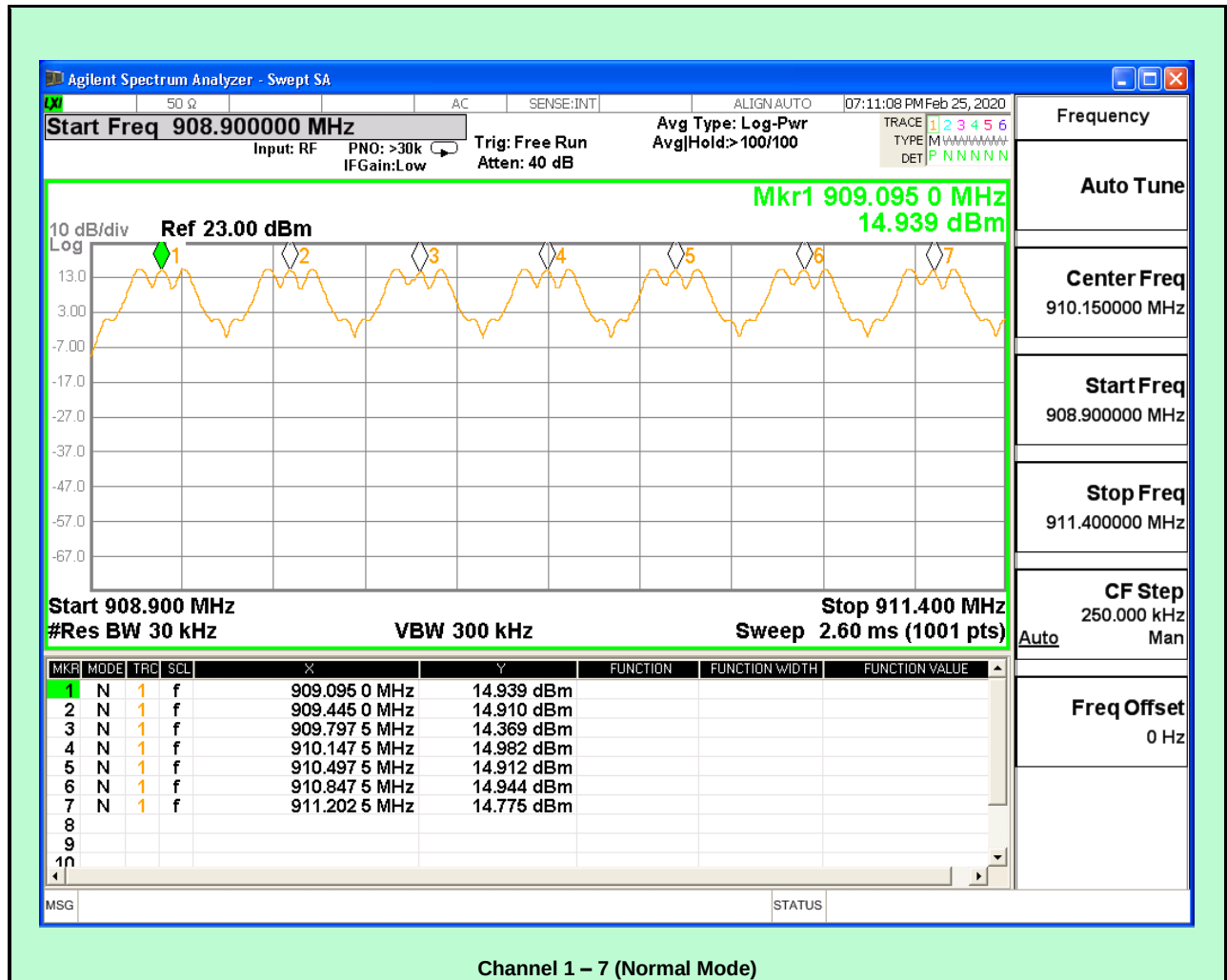


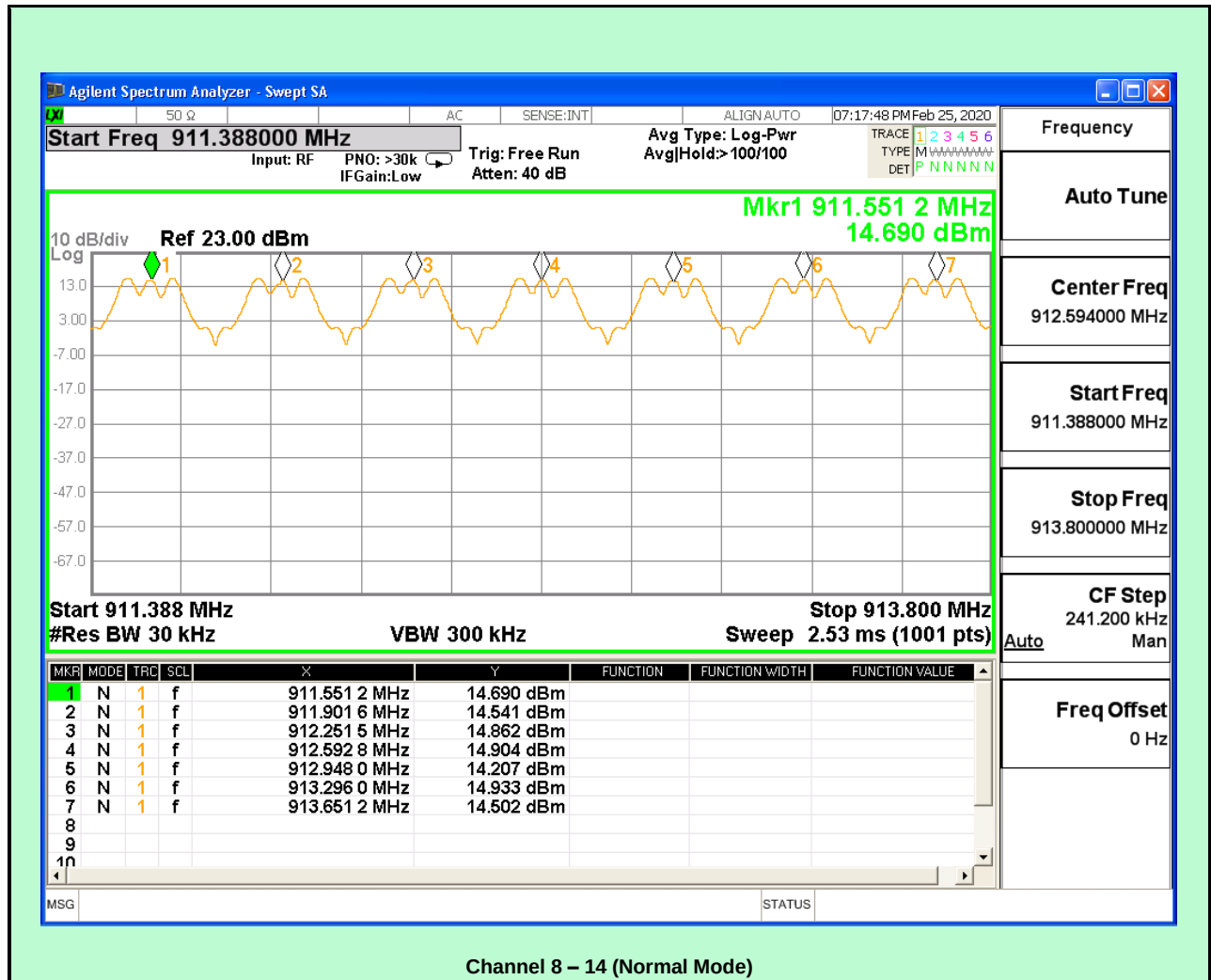
Channel 1 – 6 (Walkie-Talkie Mode)

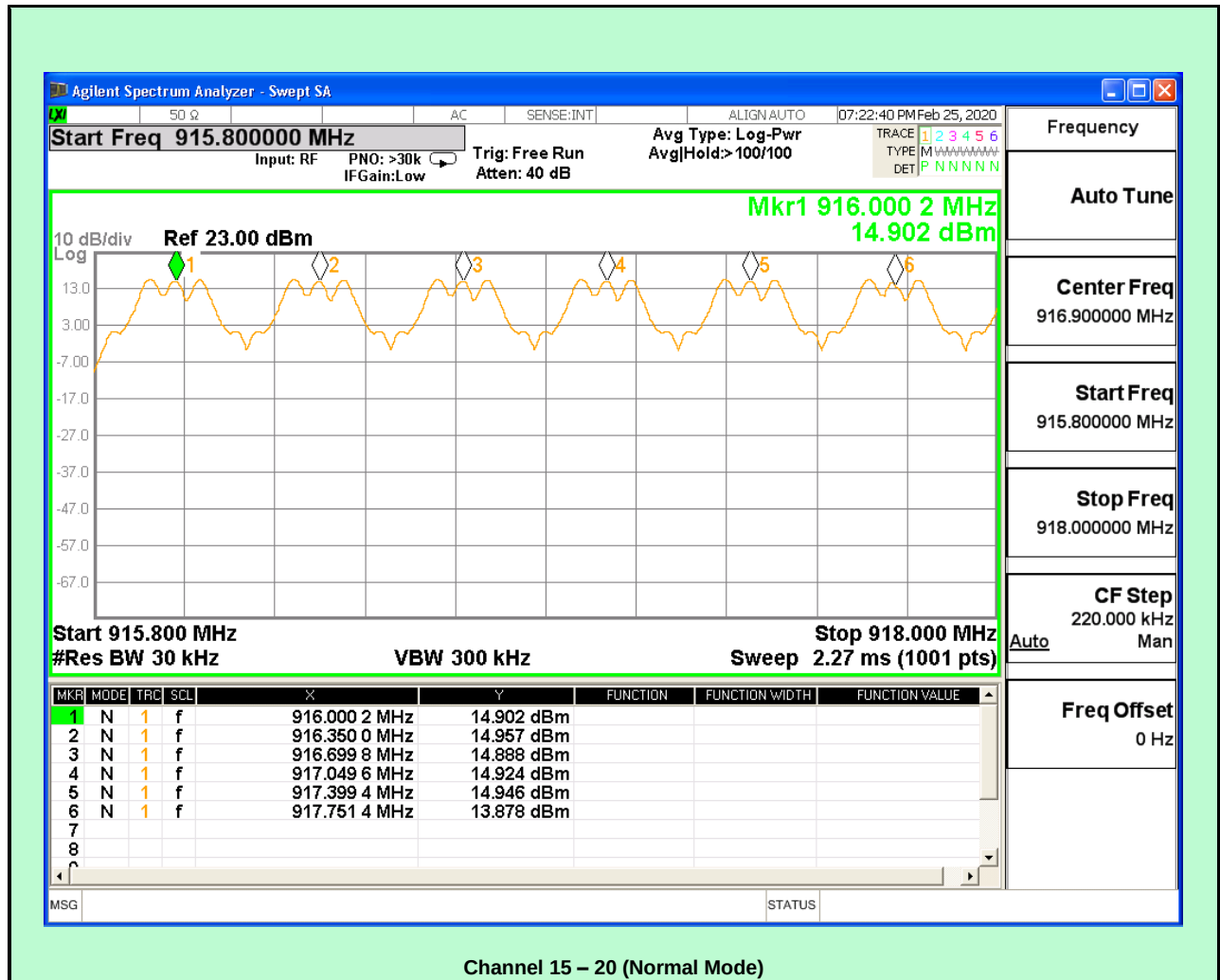


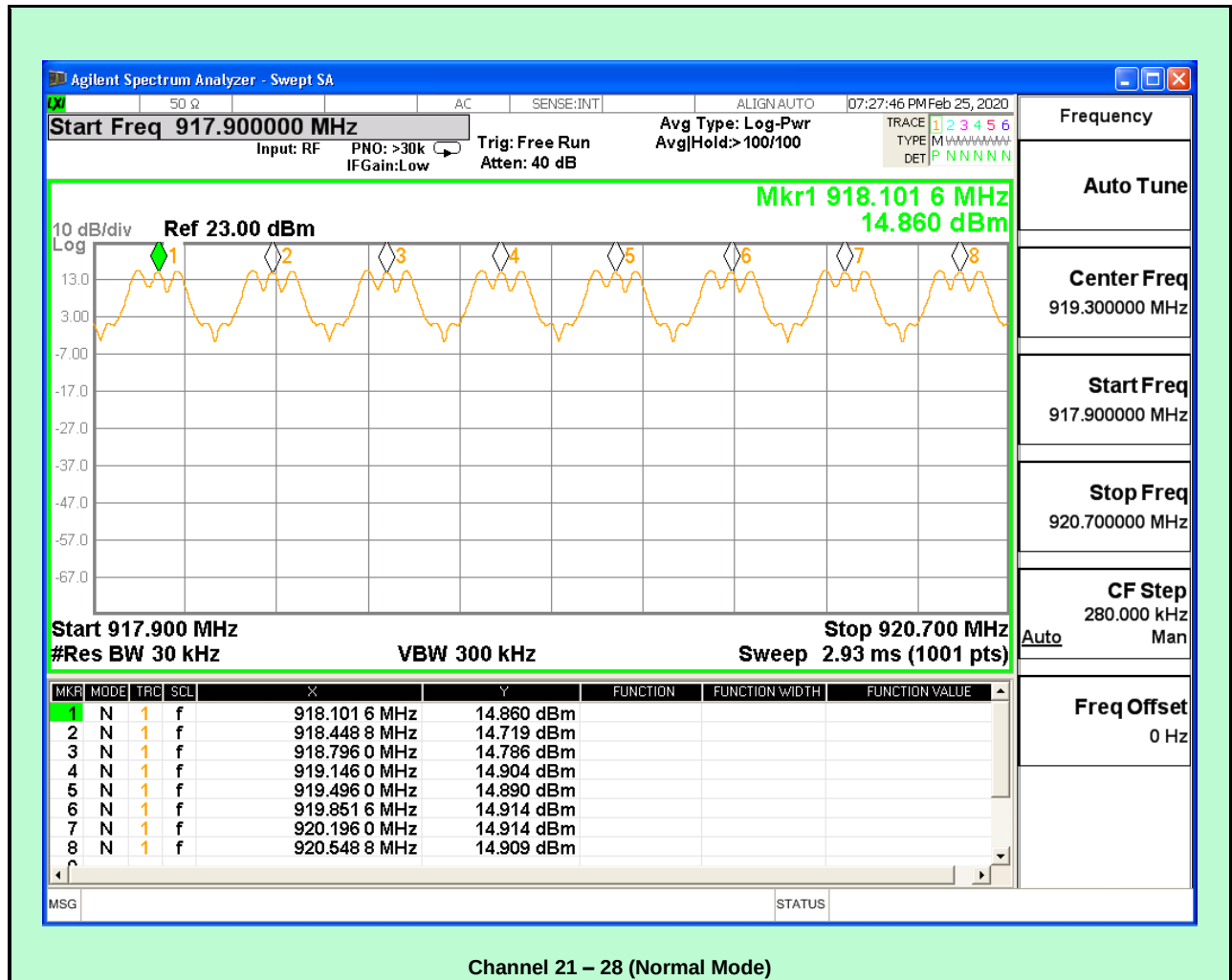












TEST RESULTS			
Mode of Operation	No. of Channels Measured	Limit (No. of Channels)	Test Results
#	#	#	
Normal Mode	28	≥25	PASS
Walkie-Talkie Mode	27	≥25	PASS

TEST SETUP PHOTOGRAPH

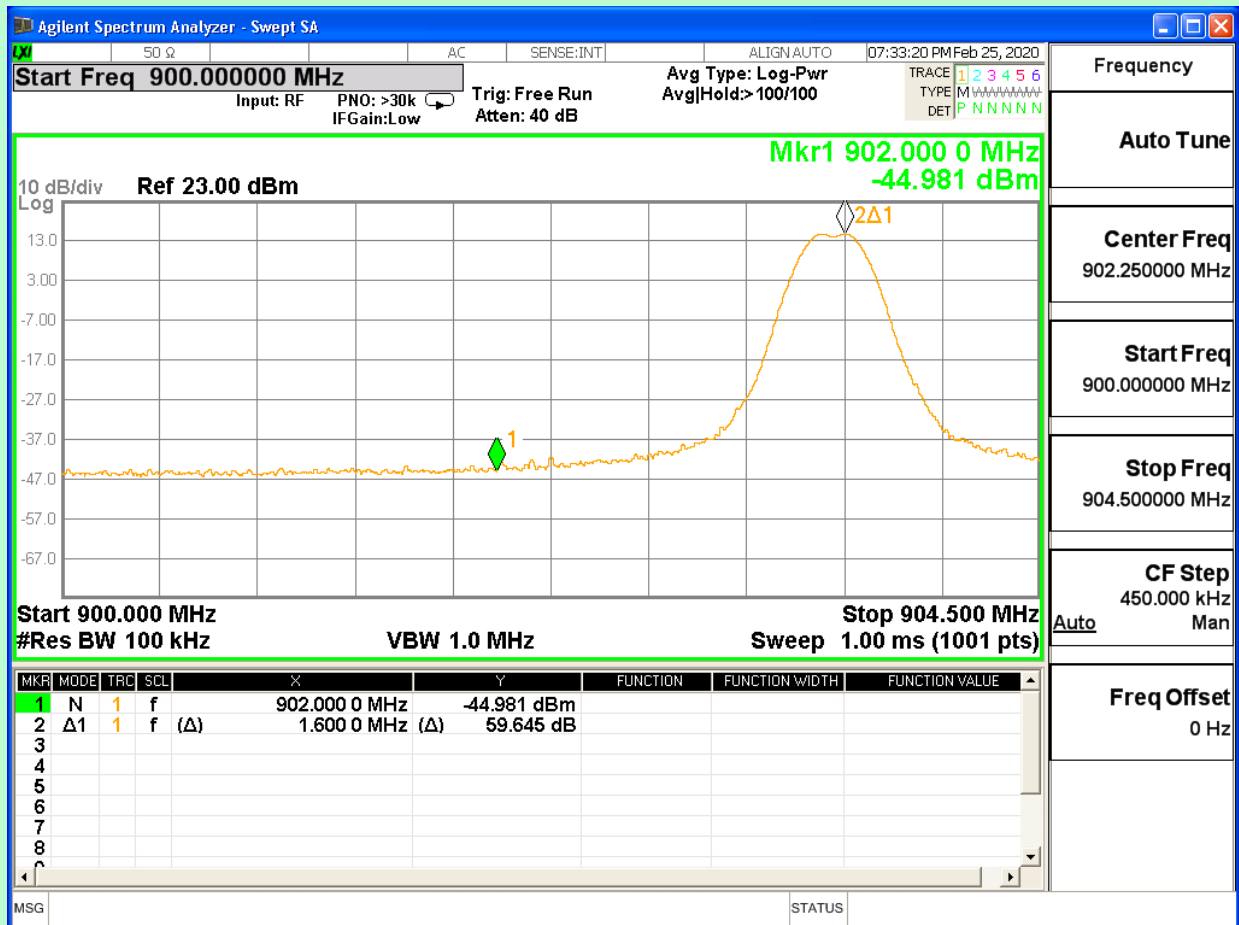
Refer Annexure -1

Conducted RF Test setup

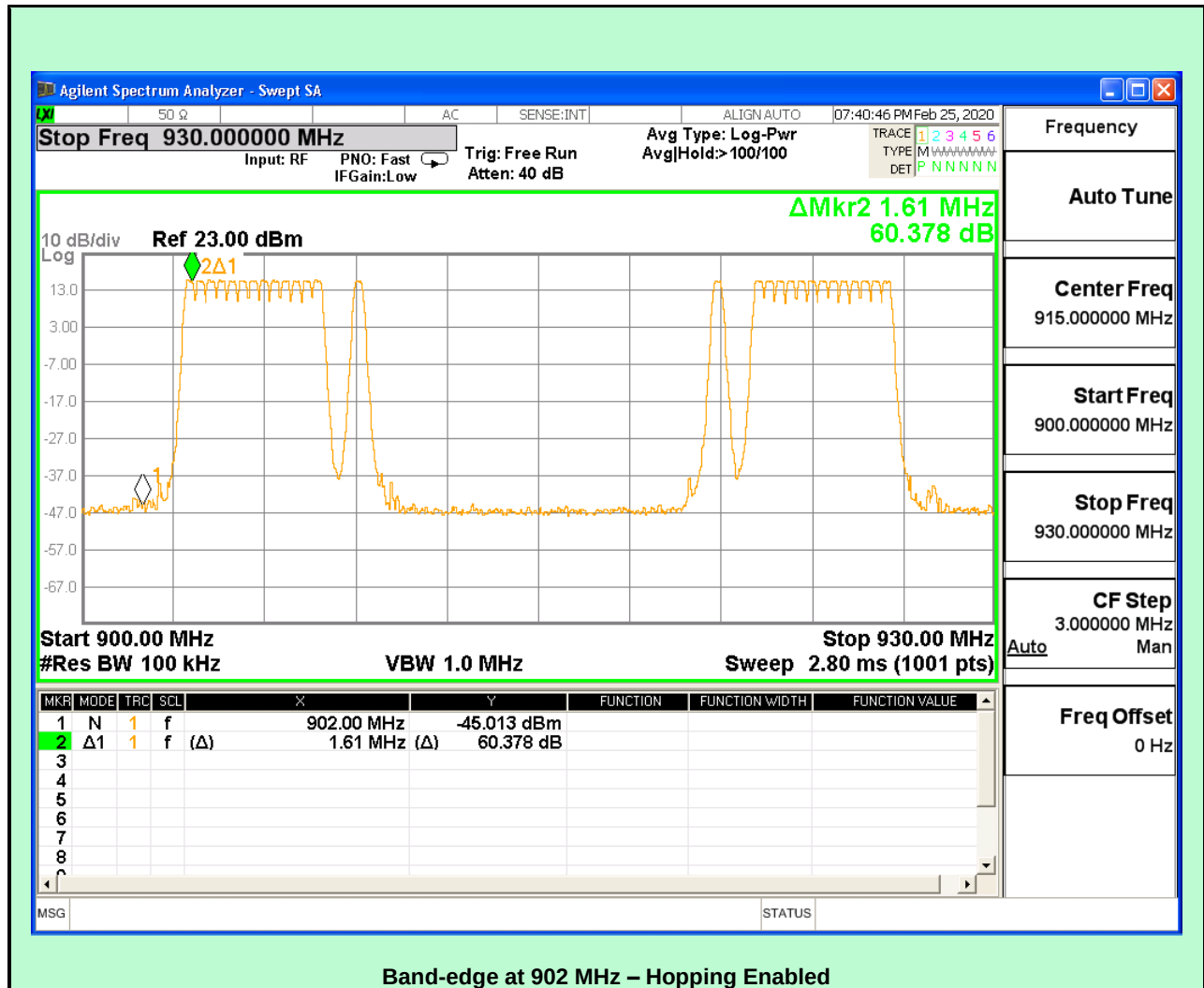
2.5 BAND EDGE COMPLIANCE			
EUT Nomenclature	Wireless Relay Module	Test Request No.	EMC0419-1
Model No.	FW-RM	Serial No.	107
Test Start Date	14-Dec-2019	Temperature (°C)	23.6°C
Test End Date	28-Feb-2020	Humidity RH (%)	51.9%RH
Tested By	Shaithanya C	Pressure (mbar)	NR
Input Voltage /	3.3Vdc		
Operating 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

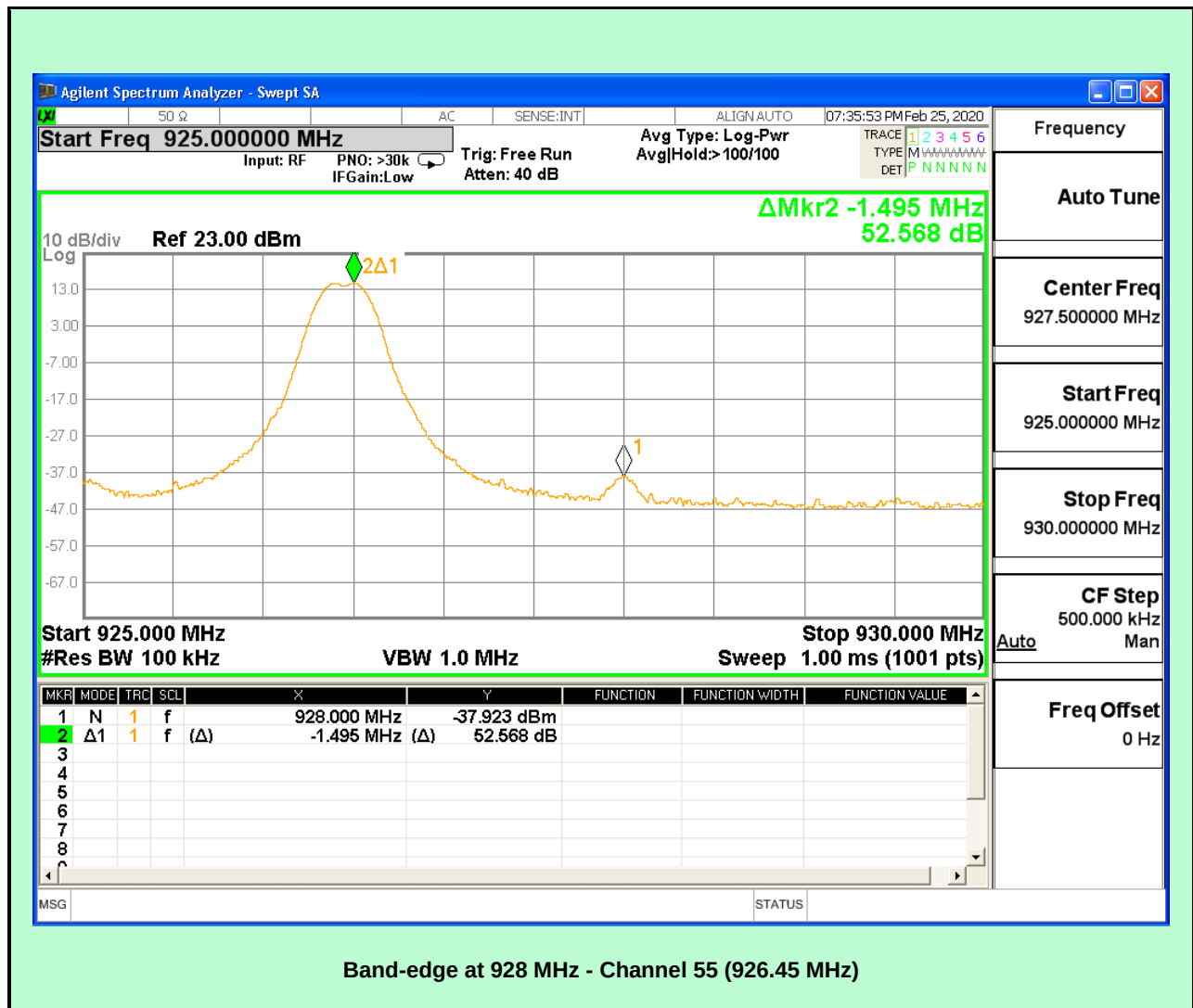
TEST EQUIPMENT					
Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Shunner	SF104/2X11PC3542/500	NA	NA

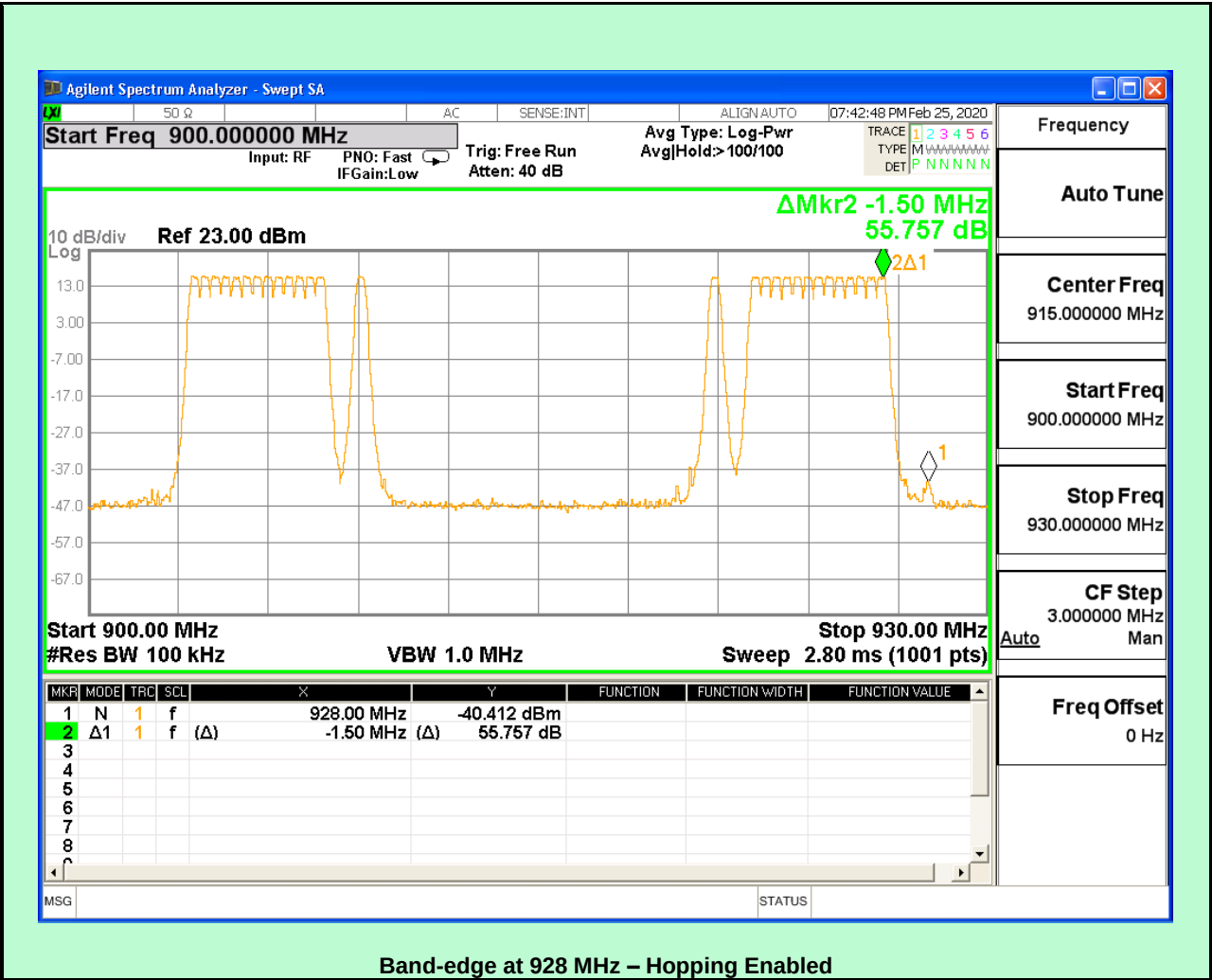
TEST GRAPHS



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







TEST RESULTS					
Channel	Frequency	Measured Level- Single Channel	Measured Level – FHSS Enabled	Limit	Test Results
#	MHz	dBc	dBc	dBc	
1	903.55	59.64	60.37	≥20	PASS
55	926.45	52.56	55.75	≥20	PASS

TEST SETUP PHOTOGRAPH	
Refer Annexure -1	
Conducted RF Test setup	

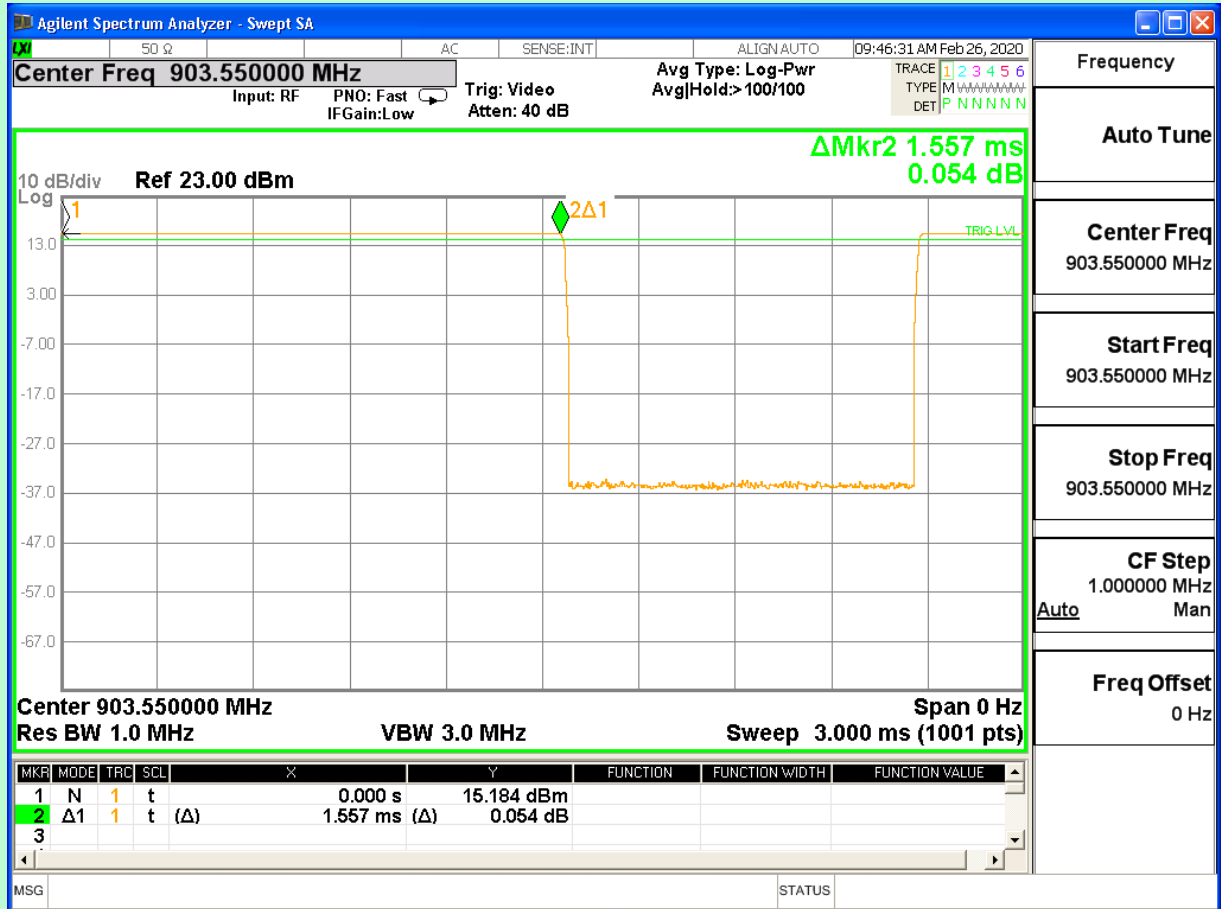
2.6 TIME OF OCCUPANCY (DWELL TIME)

EUT Nomenclature	Wireless Relay Module	Test Request No.	EMC0419-1
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 Distance	NA

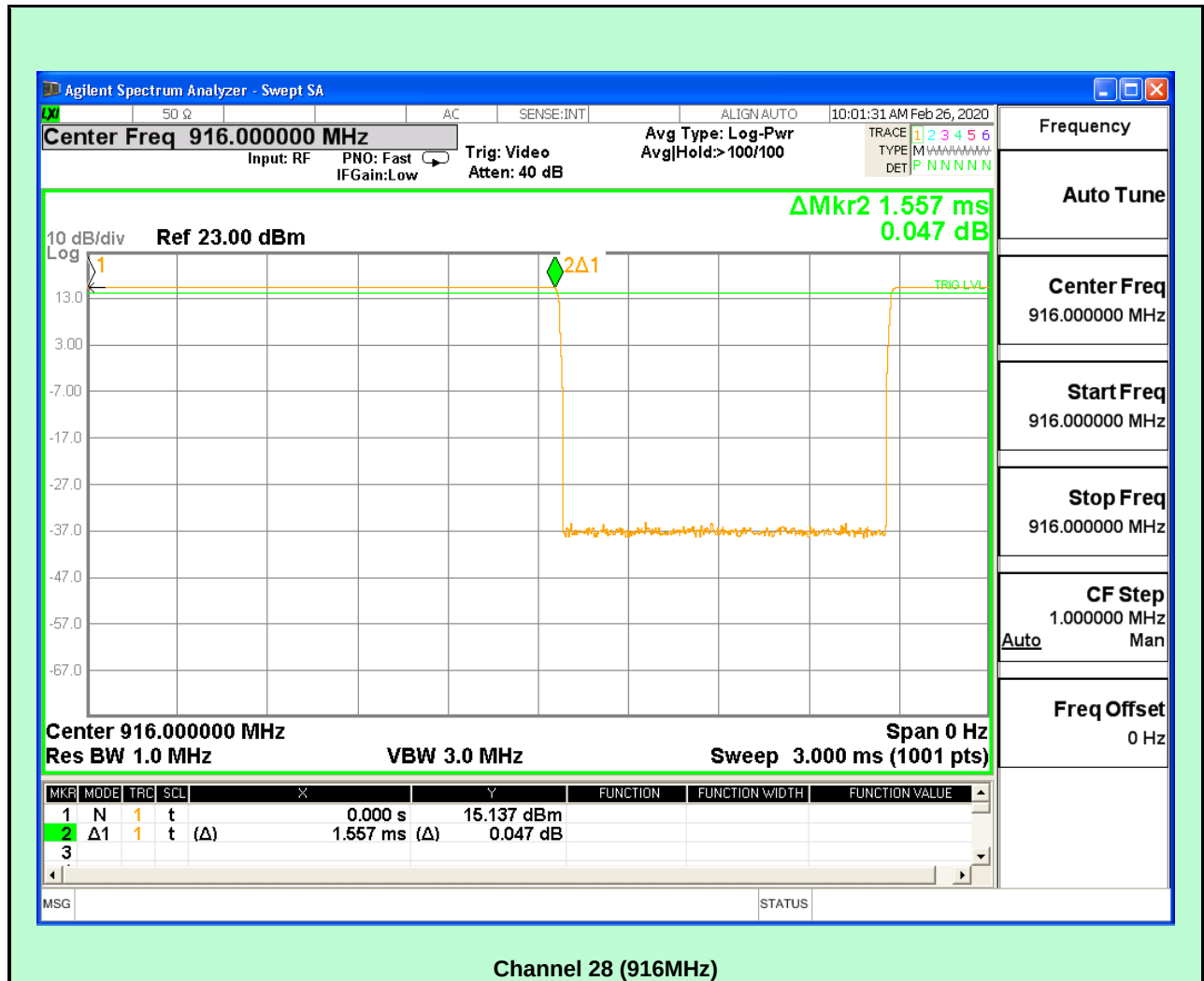
TEST EQUIPMENT

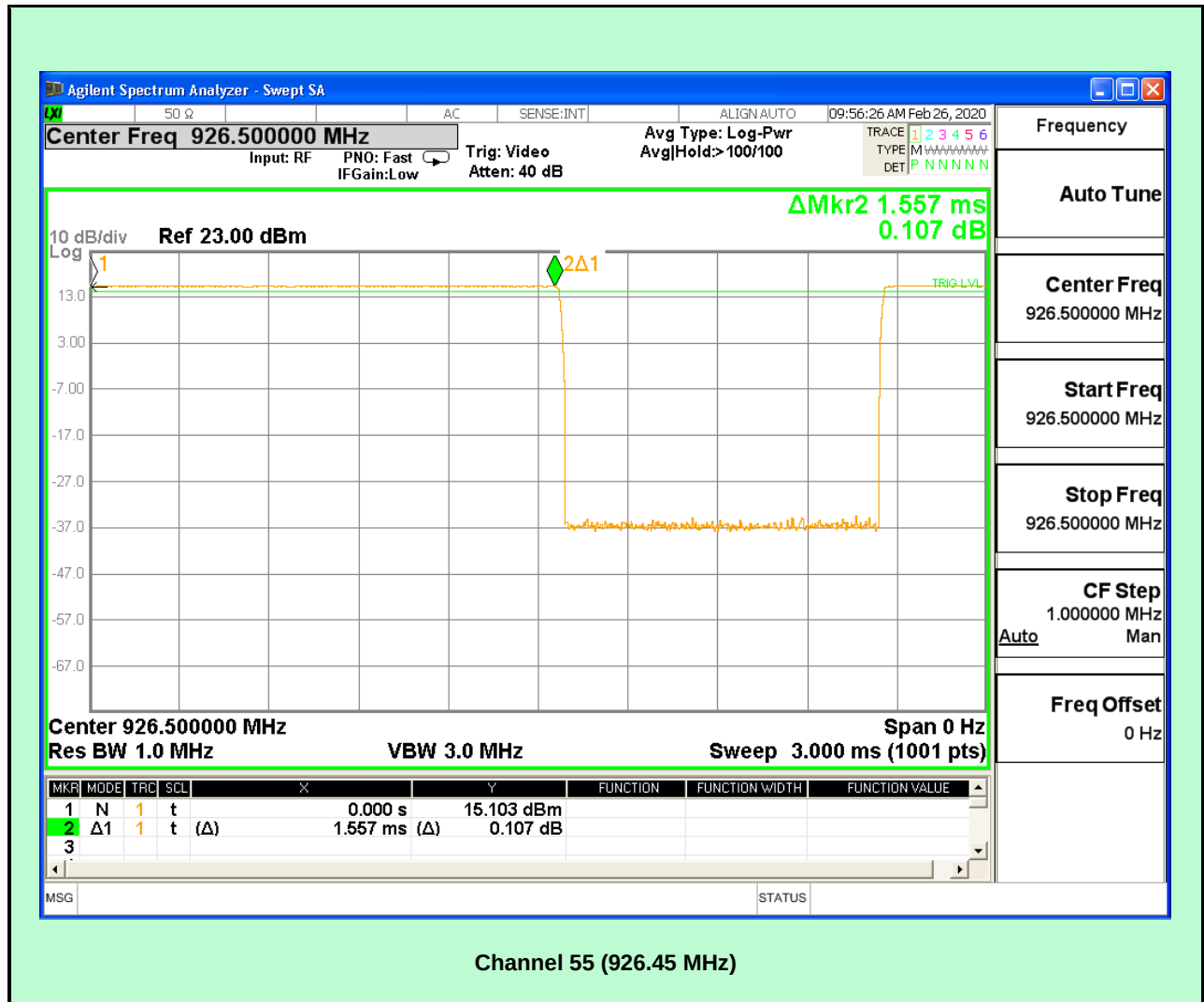
Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

TEST GRAPHS



Channel 1 (903.55 MHz)





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

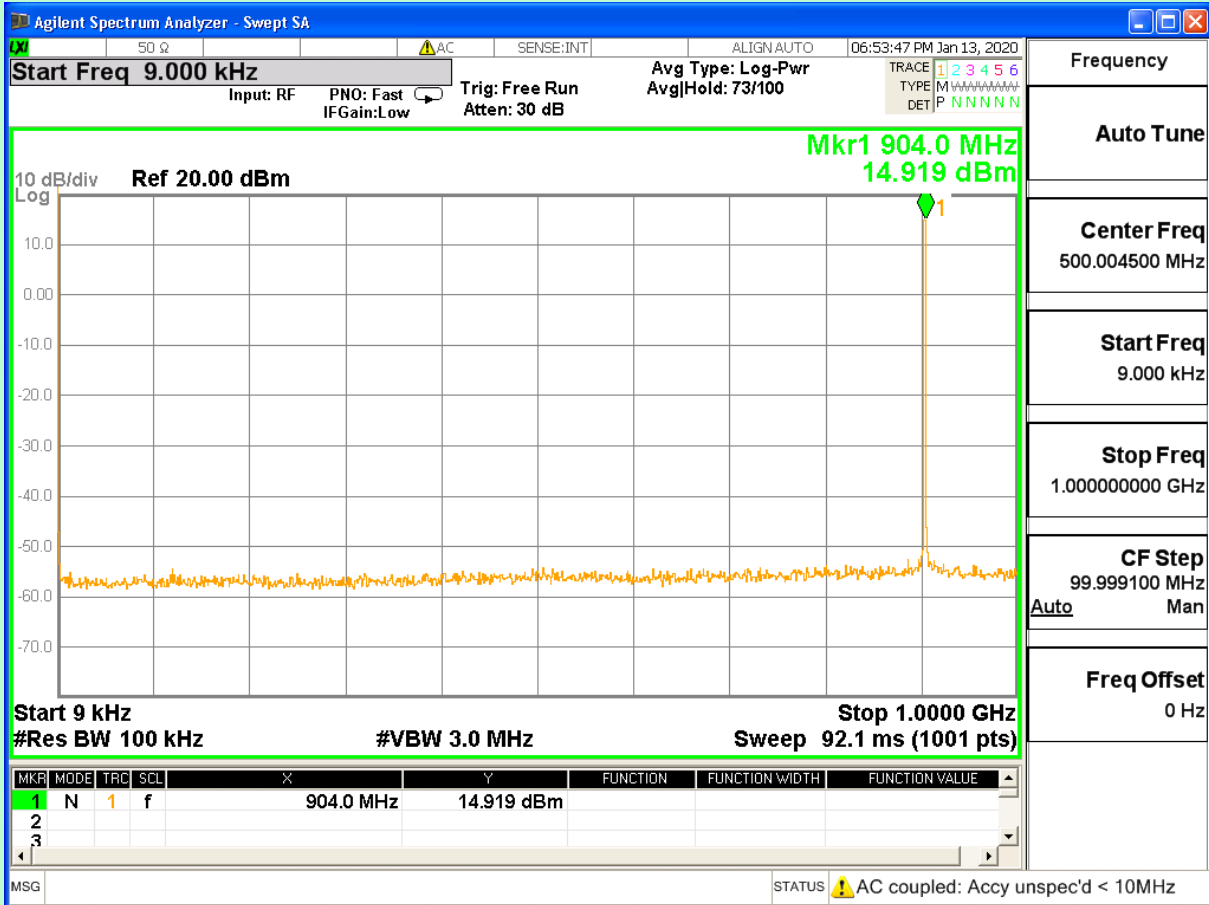
TEST SETUP PHOTOGRAPH	
Refer Annexure -1	
Conducted RF Test setup	

2.7 SPURIOUS RF CONDUCTED EMISSIONS

EUT Nomenclature	Wireless Relay Module	Test Request No.	EMC0419-1
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

