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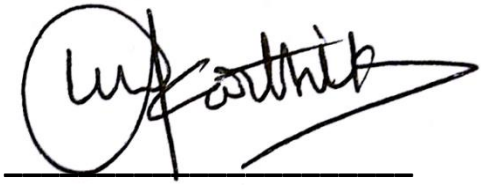
Amended

Test Report

Prepared for:	**Inovonics**
Address:	**11000 Westmoor Circle** **Building 10, Suite 250** **Westminster, CO 80021**
Product:	**EN2222S-60**
Test Report No:	**R20210831-20-E1D**
Approved by:	

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DATE:	**13 July 2022**
Total Pages:	**45**

REVISION PAGE

Rev. No.	Date	Description
0	31 December 2021	Original – NJohnson Prepared by KVepuri
A	20 January 2022	1. Address on the cover page was updated. 2. Section 2.2,4.0,4.1,4.2 and appendix C were modified. -KV/FL
B	14 June 2022	1. Section 4.0, 4.6 and appendix C were modified. -KV
C	22 June 2022	Model number is updated on manufacturers request-KV
D	13 July 2022	Conducted output powers have been added to section 4.0 -KV

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1.0 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

(1) US Code of Federal Regulations, Title 47, Part 15
(2) ISED RSS-Gen, Issue 5
(3) ISED RSS-247, Issue 2

SUMMARY			
Standard Section	**Test Type and Limit**	**Result**	**Remark**
FCC 15.203	Unique Antenna Requirement	Pass	PCB antenna
FCC 15.35 RSS-Gen, 6.10	Duty cycle of pulsed emissions	Pass	Pulsed emissions duty cycle was applied
FCC 15.209 RSS-Gen, 7.1	Receiver Radiated Emissions	Pass	Meets the requirement of the limit.
FCC 15.247(a)(1)(i) RSS-247, 5.1(c)	Minimum Bandwidth, Limit: Min. 250kHz	Pass	Meets the requirement of the limit.
FCC 15.247(b)(1) RSS-247, 5.1	Maximum Peak Output Power, Limit: Max. 24 dBm	Pass	Meets the requirement of the limit.
FCC 15.209 RSS-Gen, 8.9 RSS-247, 5.5	Transmitter Radiated Emissions	Pass	Meets the requirement of the limit.
FCC 15.247(a) (1) (i) RSS-247, 5.1(c)	Frequency hopping system, Limit: Max. 0.4 Seconds in 10 Second Period	Pass	Meets the requirement of the limit.
FCC 15.209, 15.205,15.247 RSS-Gen, 8.9 RSS-247, 5.5	Band Edge Measurement, Limit: 20dB less than the peak value of fundamental frequency	Pass	Meets the requirement of the limit.
FCC 15.207 RSS-Gen. 8.8	Conducted AC Emissions	NA	Battery Powered Equipment

2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

The Equipment Under Test (EUT) was a wireless FHSS transmitter, EN2222S-60.

EUT	EN2222S-60
EUT Received	12/1/2021
EUT Tested	12/2/2021- 12/23/2021
Serial No./ Tx ID	02905418; 02905413
Operating Band	902.0 – 928.0 MHz
Device Type	FHSS
Power Supply	3V Coin Cell Battery (CR2032)

NOTE: For more detailed features description, please refer to the manufacturer's specifications or user's manual.

2.2 DESCRIPTION OF TEST MODES

The EUT operates on, and was tested at the frequencies below:

Channel	Frequency
Low	902.4
Middle	914.8
High	927.6

These are the only three representative channels tested in the frequency range according to FCC Part 15.31 and RSS-Gen Table A1. See the operational description for a list of all channel frequency and designations.

Testing utilized two different EUTs. One EUT was modified to transmit at the highest practical duty cycle on the lowest, highest and one channel in the middle that was used for all RF tests. A second EUT contained the production firmware and was used for verifying production duty cycles.

2.3 DESCRIPTION OF SUPPORT UNITS

N/A

3.0 LABORATORY DESCRIPTION

3.1 LABORATORY DESCRIPTION

All testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs)
4740 Discovery Drive
Lincoln, NE 68521

A2LA Certificate Number:	1953.01
FCC Accredited Test Site Designation No:	US1060
Industry Canada Test Site Registration No:	4294A-1
CAB MRA Recognition Identification No:	US0177

Environmental conditions varied slightly throughout the tests:
Relative humidity of 35 ± 4%
Temperature of 22 ± 3° Celsius

3.2 TEST PERSONNEL

No.	PERSONNEL	TITLE	ROLE
1	Nic Johnson	Technical Manager	Review
2	Karthik Vepuri	EMC Test Engineer	Testing and Report
3	Fox Lane	EMC Test Engineer	Testing

Notes:
All personnel are permanent staff members of NCEE Labs. No testing or review was sub-contracted or performed by sub-contracted personnel.

3.3 TEST EQUIPMENT

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE
Keysight MXE Signal Analyzer (44GHz)	N9038A	MY59050109	July 21, 2021	July 21, 2023
Keysight MXE Signal Analyzer (26.5GHz)	N9038A	MY56400083	May 5, 2020	May 5, 2023
Keysight EXA Signal Analyzer	N9010A	MY56070862	July 20, 2021	July 20, 2023
SunAR RF Motion	JB1	A091418	July 27, 2021	July 27, 2022
EMCO Horn Antenna	3115	6415	March 16, 2020	March 16, 2022
EMCO Horn Antenna	3116	2576	March 9, 2020	March 9, 2022
8447F POT H64 Preamplifier*	8447F POT H64	3113AD4667	February 1, 2021	February 1, 2022
Rohde & Schwarz Preamplifier*	TS-PR18	3545700803	April 14, 2020	April 14, 2022
Trilithic High Pass Filter*	6HC330	23042	April 14, 2020	April 14, 2022
MiniCircuits High Pass Filter*	VHF-1320+	15542	April 14, 2020	April 14, 2022
ETS – Lindgren- VSWR on 10m Chamber	10m Semi-anechoic chamber-VSWR	4740 Discovery Drive	July 30, 2020	July 30, 2023
NCEE Labs-NSA on 10m Chamber	10m Semi-anechoic chamber-NSA	NCEE-001	October 25, 2019	October 25, 2022
TDK Emissions Lab Software	V11.25	700307	NA	NA
RF Cable (preamplifier to antenna)*	MFR-57500	01-07-002	April 14, 2020	April 14, 2022
RF Cable (antenna to 10m chamber bulkhead)*	FSCM 64639	01E3872	September 24, 2021	September 24, 2023
RF Cable (10m chamber bulkhead to control room bulkhead)*	FSCM 64639	01E3864	September 24, 2021	September 24, 2023
RF Cable (control room bulkhead to test receiver)*	FSCM 64639	01F1206	September 24, 2021	September 24, 2023
N connector bulkhead (10m chamber)**	PE9128	NCEEBH1	September 24, 2021	September 24, 2023
N connector bulkhead (control room)**	PE9128	NCEEBH2	September 24, 2021	September 24, 2023

*Internal Characterization

**2 year calibration cycle

Notes:

All equipment is owned by NCEE Labs and stored permanently at NCEE Labs facilities.

3.4 GENERAL TEST PROCEDURE AND SETUP FOR RADIO MEASUREMNTS

Measurement type presented in this report (Please see the checked box below):

Conducted ☐

The conducted measurements were performed by connecting the output of the transmitter directly into a spectrum analyzer using an impedance matched cable and connector soldered to the EUT in place of the antenna. The information regarding resolution bandwidth, video bandwidth, span and the detector used can be found in the graphs provided in the Appendix C. All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

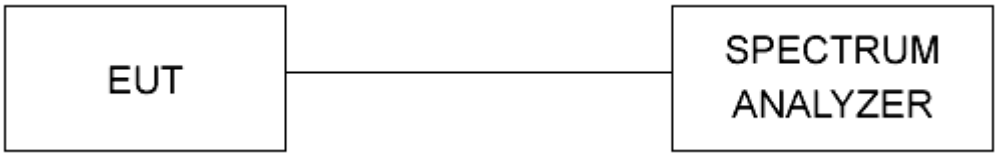


Figure 1 - Bandwidth Measurements Test Setup

Radiated ☒

All the radiated measurements were taken at a distance of 3m from the EUT. The information regarding resolution bandwidth, video bandwidth, span and the detector used can be found in the graphs provided in the Appendix C. All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

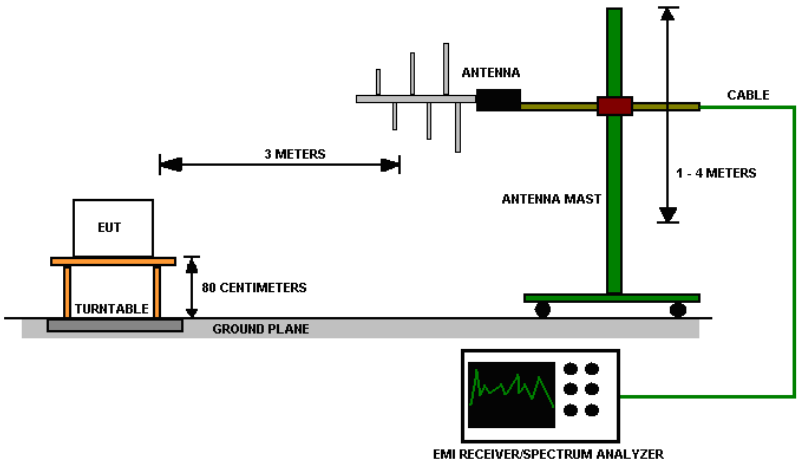


Figure 2 - Radiated Emissions Test Setup

4.0 DETAILED RESULTS

DTS Radio Measurements										
CHANNEL	Transmitter	Occupied Bandwidth (kHz)	20 dB Bandwidth (kHz)	EIRP PEAK OUTPUT POWER (dBm)	EIRP PEAK OUTPUT POWER (mW)	Gain (dB)	CONDUCTED PEAK OUTPUT POWER (dBm)	RESULT	No. of Hopping Channels	Time of Occupancy
									25	18 ms
Low	Continuous	250.79	256.79	12.228	16.703	0.8	11.428	PASS	Min Frequency Seperation	Duty Cycle Correction
Mid	Continuous	249.13	252.10	16.441	44.066	0.8	15.641	PASS		
High	Continuous	246.16	252.90	9.462	8.835	0.8	8.662	PASS	803.76 kHz	-10.45
Occupied Bandwidth = N/A; 20 dB Bandwidth Limit 250 kHz ≤ BW ≤ 500 kHz.				Peak Output Power Limit = 24 dBm; *corrections can be found in the last table of this section and in the graphs in Appendix C. Time of Occupancy<0.4 S in 10 S. Conducted Peak Output Power =EIRP Peak Output Power-Gain						

*EIRP Peak output power is the worst-case power. Antenna gain is declared by the manufacturer with the help of a data sheet provided to the test lab. Some of the results in this report can be affected by the declared antenna gain.

Unrestricted Band-Edge							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Relative Highest out of band level (dBm)	Relative Fundamental (dBm)	Delta (dB)	Min Delta (dB)	Result
Low	Continuous	902.40	-73.99	-32.33	41.66	20.00	PASS
Low	Hopping	902.40	-75.40	-32.34	43.07	20.00	PASS
High	Continuous	927.60	-76.06	-39.03	37.03	20.00	PASS
High	Hopping	927.60	-72.30	-36.22	36.07	20.00	PASS
Measurements were taken in dBuV and converted to dBm using: dBm = dBuV - 107							
Peak Restricted Band-Edge							
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Highest out of band level (dBuV/m @ 3m)	Measurement Type	Limit (dBuV/m @ 3m)	Margin	Result
Low	Continuous	610.89	29.76	Radiated	46.02	16.26	PASS
Low	Hopping	611.17	29.99	Radiated	46.02	16.04	PASS
High	Continuous	966.08	37.70	Radiated	53.98	16.28	PASS
High	Hopping	966.00	35.60	Radiated	53.98	18.38	PASS
*Limit shown is the peak limit taken from FCC Part 15.209							

Corrections and Raw Values for EIRP					
Channel	Antenna Factor (dB)	Cable Loss (dB)	dBm to dBuV	EIRP Conversion from 3m	Correction/Reference level offset
Low	26.50	5.32	107	95.23	43.59
Mid	26.64	5.39	107	95.23	43.80
High	26.60	5.43	107	95.23	43.80
EIRP (dBm) at 3 m test distance = Uncorrected Level (dBm) - 95.23 +107+Antenna Factor+ Cable					

4.1 DUTY CYCLE

Manufacturer declared that the maximum duty cycle possible is 36 ms in a given 100 ms period. So, Duty cycle correction factor is 20 log 36/100 = -8.87 dB.

4.2 RADIATED EMISSIONS

Test Method: ANSI C63.10-2013, Section 6.5, 6.6

Limits for radiated emissions measurements:

Emissions radiated outside of the specified bands shall be applied to the limits in 15.209 as followed:

FREQUENCIES (MHz)	FIELD STRENGTH (µV/m)	MEASUREMENT DISTANCE (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 * log * Emission level (µV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20dB under any condition of modulation.

Test procedures:

a. The EUT was placed on the top of a rotating table above the ground plane in a 10-meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The table was 0.8m high for measurements form 30MHz-1GHz and 1.5m for measurements from 1GHz to 10 GHz.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise, the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. The EUT was maximized in all 3 orthogonal positions. The results are presented for the axis that had the highest emissions.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.

2. The resolution bandwidth 1 MHz for all measurements and at frequencies above 1GHz, A peak detector was used for all measurements above 1GHz. Measurements were made with an EMI Receiver.

Deviations from test standard:

No deviation.

Test setup:

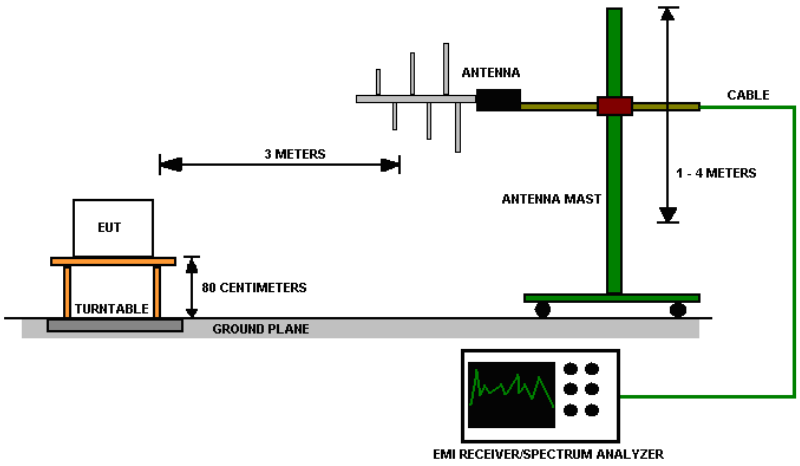


Figure 3 - Radiated Emissions Test Setup

EUT operating conditions
Details can be found in section 2.1 of this report.

Test results:

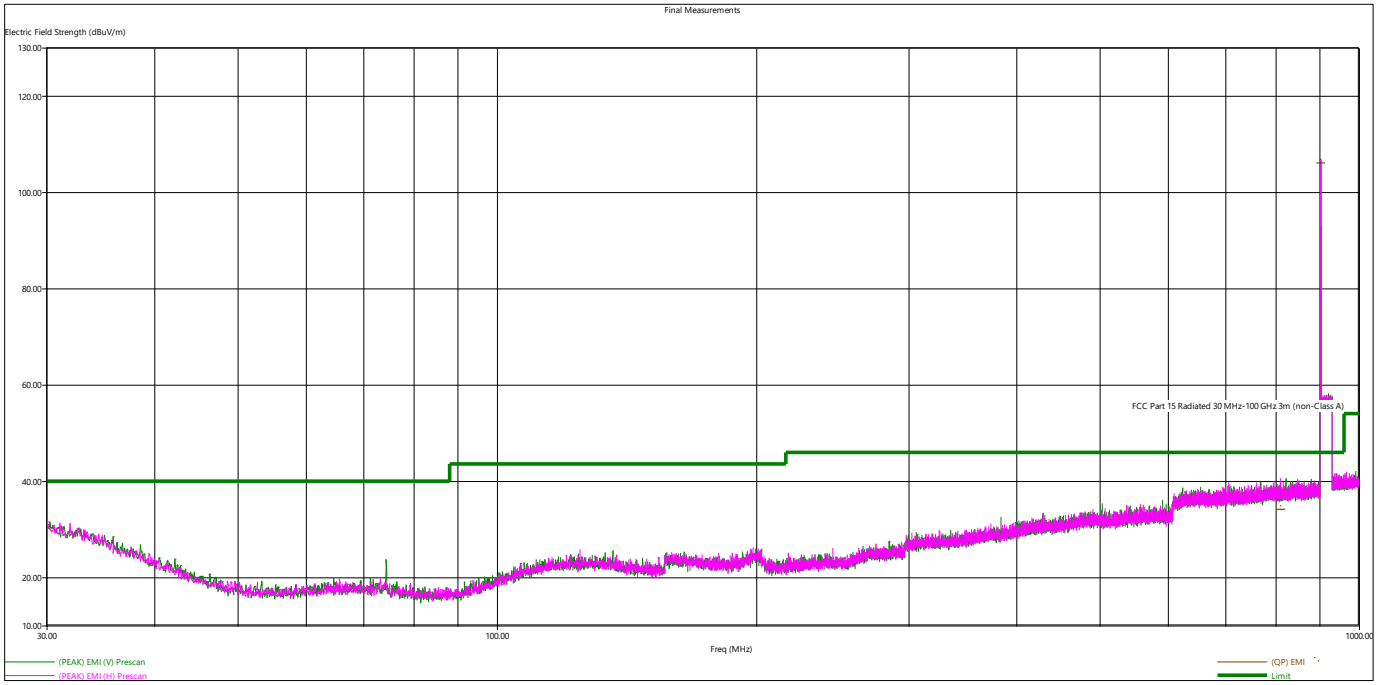


Figure 4 - Radiated Emissions Plot, Low Channel

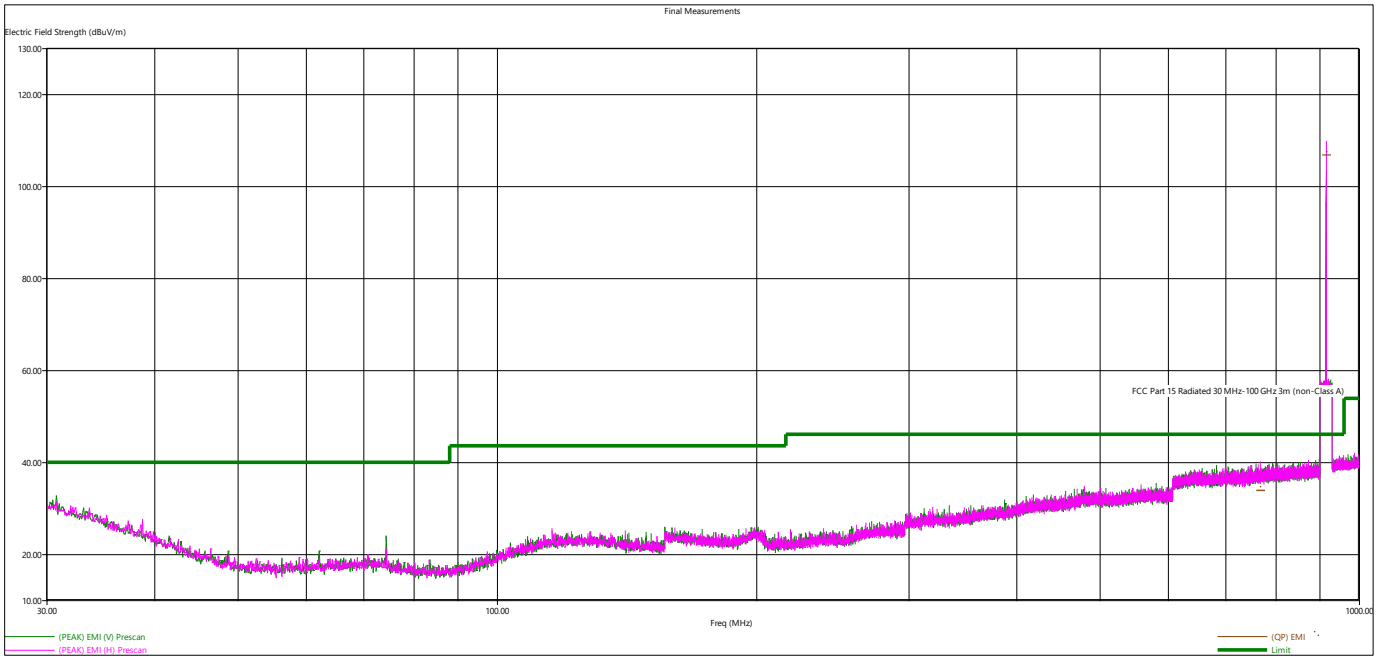


Figure 5 - Radiated Emissions Plot, Mid Channel

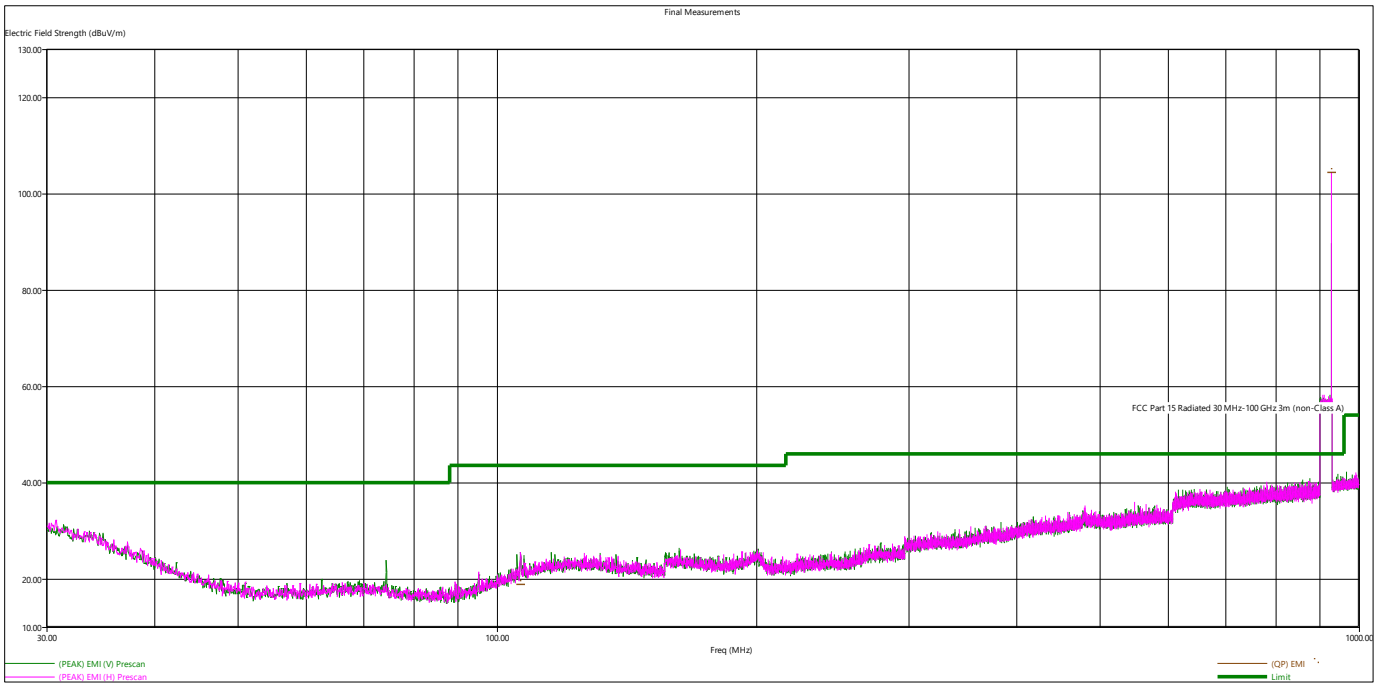


Figure 6 - Radiated Emissions Plot, High Channel

Quasi Peak Measurements								
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Radio Band
MHz	dBµV/m	dBµV/m	dB	cm.	deg.			MHz
809.581920	33.98	46.02	12.04	159	289	H	Low	900 - 928
767.143440	33.7	46.02	12.32	220	359	H	Mid	900 - 928
106.281600	18.79	43.52	24.73	180	135	H	High	900 - 928

The EUT was maximized in all 3 orthogonal positions. The results are presented for the axis that had the highest emissions. The worst-case emissions are reported. Manufacturer declared that the EUT doesn't have receive capabilities.

Peak Measurements, 900 MHz Radio,								
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Radio Band
MHz	dBµV/m	dBµV/m	dB	cm.	deg.			MHz
1804.762000	61.22	73.98	12.76	303	168	H	Low	900 - 928
2706.790000	45.26	73.98	28.72	474	136	H	Low	900 - 928
5413.268000	53.3	73.98	20.67	119	83	H	Low	900 - 928
3608.518000	50.25	73.98	23.75	170	199	V	Low	900 - 928
1829.792000	59.74	73.98	14.24	515	159	H	Mid	900 - 928
2745.144000	49.31	73.98	24.67	407	166	H	Mid	900 - 928
3660.608000	52.88	73.98	21.1	522	181	H	Mid	900 - 928
5488.972000	53.8	73.98	20.18	115	179	H	Mid	900 - 928
8006.354000	49.47	73.98	24.51	361	28	H	Mid	900 - 928
1855.594000	57.9	73.98	16.08	254	43	H	High	900 - 928
2782.350000	45.99	73.98	27.99	456	47	H	High	900 - 928
3711.552000	50.17	73.98	23.81	318	344	H	High	900 - 928
5565.862000	53.36	73.98	20.62	532	322	H	High	900 - 928

Average Measurements, 900 MHz Radio,								
Frequency	**Level**	**Limit**	**Margin**	**Height**	**Angle**	**Pol**	**Channel**	**Radio Band**
MHz	**dBµV/m**	**dBµV/m**	**dB**	**cm.**	**deg.**			**MHz**
1804.762000	52.35	53.98	1.63	303	168	H	Low	900 -928
2706.790000	36.39	53.98	17.59	474	136	H	Low	900 -928
5413.268000	44.43	53.98	9.55	119	83	H	Low	900 -928
3608.518000	41.38	53.98	12.60	170	199	V	Low	900 -928
1829.792000	50.87	53.98	3.11	515	159	H	Mid	900 -928
2745.144000	40.44	53.98	13.54	407	166	H	Mid	900 -928
3660.608000	44.01	53.98	9.97	522	181	H	Mid	900 -928
5488.972000	44.93	53.98	9.05	115	179	H	Mid	900 -928
8006.354000	40.60	53.98	13.38	361	28	H	Mid	900 -928
1855.594000	49.03	53.98	4.95	254	43	H	High	900 -928
2782.350000	37.12	53.98	16.86	456	47	H	High	900 -928
3711.552000	41.30	53.98	12.68	318	344	H	High	900 -928
5565.862000	44.49	53.98	9.49	532	322	H	High	900 -928

Average Level is obtained by adding duty cycle correction factor found in section 4.1 to the Peak level. All the measurements were compared to general limits from FCC part 15.209 to show compliance.

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Limit Value – Emission Level.
5. The EUT was measured in all 3 orthogonal axes. See the test setup photo exhibit for details on the orientations.

4.3 PEAK OUTPUT POWER

Test Method: ANSI C63.10, Section(s) 7.8.5

Limits of bandwidth measurements:
Per FCC Part 15
For an FHSS system with 25 channels, the output power is required to be less than 250 mW or 24 dBm.

Test procedures:
Spectrum analyzer was set with a resolution bandwidth greater than occupied bandwidth and centered on the operating channel.

Deviations from test standard:
No deviation.

Test setup:
Details can be found in section 3.4 of this report.

EUT operating conditions:
Details can be found in section 2.1 of this report.

Test results:

Pass

Comments:

1. All the output power plots can be found in the Appendix C.
2. All data is in the table in results section 4.0.
3. All the measurements were found to be compliant.

4.4 BANDWIDTH

Test Method: ANSI C63.10, Section(s) 6.9.2

Limits of bandwidth measurements:
The allowed 20 dB bandwidth of the hopping channel is 250 kHz ≤ BW ≤ 500 kHz.

Test procedures:
The bandwidth of the fundamental frequency was measured by spectrum analyzer with 3 kHz RBW and 30 kHz VBW.

The 20 dB bandwidth is defined as the bandwidth of which is higher than peak power minus 20dB.
The 99% bandwidth is defined as the bandwidth that contains 99% of the power.

Deviations from test standard:
No deviation.

Test setup:
Details can be found in section 3.4 of this report.

EUT operating conditions:
Details can be found in section 2.1 of this report.

Test results:

Pass

Comments:
1. All the bandwidth plots can be found in the Appendix C.
2. All data is in the table in results section 4.0.
3. All the measurements were found to be compliant.

4.5 BANDEDGES

Test Method: ANSI C63.10, Section(s) 6.10.6

Limits of band edge measurements:
For emissions outside of the allowed band of operation (902 – 928MHz), the emission level needs to be 20dB under the maximum fundamental field strength. However, if the emissions fall within one of the restricted bands from 15.205 the field strength levels need to be under that of the limits in 15.209.

Test procedures:
The resolution bandwidth was set to 100kHz and the EMI receiver was used to scan from the band edge to the fundamental frequency with a Peak detector. The highest emissions level beyond the band edge was measured and recorded. For restricted band edge measurements, the unit was tested to the same method as section 4.2 of this report.

Deviations from test standard:
No deviation.

Test setup:
Details can be found in section 3.4 of this report.

EUT operating conditions:
Details can be found in section 2.1 of this report.

Test results:

Pass

Comments:

1. All the band edge plots can be found in the Appendix C.
2. All data is in the table in results section 4.0.
3. If the device falls under FCC Part 15.247 (Details can be found in summary of test results), compliance is shown in the unrestricted band edges by showing minimum delta of 20 dB between peak and the band edge.
4. The restricted band edge compliance is shown by comparing to the general limit defined in Part 15.209. The limit shown in the graph accounts for the antenna gain of the device.

4.6 CARRIER FREQUENCY SEPERATION, NUMBER OF HOPPING CHANNELS, TIME OF OCCUPANCY

Test Method: ANSI C63.10, Section 7.8.2, 7.8.3, 7.8.4

Limits for Time of Occupancy

Average time of occupancy on any frequency, not to exceed 0.4 seconds within a 10 second period.

Test procedures:
The method from KDB 558074 D01 v05; Manufacturer declared the average time of occupancy.

Test setup:
Details can be found in section 3.4 of this report.

EUT operating conditions:
Details can be found in section 2.1 of this report.

.

Test results:

Pass

Comments:

1. All the plots can be found in the Appendix C.
2. All the measurements were found to be compliant.
3. The measurements are reported on the graph.
4. **Declaration from manufacturer:** The EchoStream protocol defines 64 channels spaced 400 kHz apart. Manufacturer uses only 25 channels from the set of 64. The minimum spacing between channels is ~ 800 kHz with some channels space ~1.2 MHz apart. The entire channel map uses a spacing of 400 kHz, but the used channels are either 800 kHz or 1.2 MHz apart.

APPENDIX A: SAMPLE CALCULATION

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF – (-CF + AG) + AV

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dBμV is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBμV/m.

FS = 55 + 12 – (-1.1 + 20) + 0 = 48.1 dBμV/m

The 48.1 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 254.1 μV/m

AV is calculated by the taking the 20*log(T_{on}/100) where T_{on} is the maximum transmission time in any 100ms window.

EIRP Calculations

In cases where direct antenna port measurement is not possible or would be inaccurate, output power is measured in EIRP. The maximum field strength is measured at a specified distance and the EIRP is calculated using the following equation;

EIRP (Watts) = [Field Strength (V/m) x antenna distance (m)]^2 / 30

Power (watts) = 10^[Power (dBm)/10] / 1000

Voltage (dBµV) = Power (dBm) + 107 (for 50Ω measurement systems)

Field Strength (V/m) = 10^[Field Strength (dBµV/m) / 20] / 10^6

Gain = 1 (numeric gain for isotropic radiator)

Conversion from 3m field strength to EIRP (d=3):

EIRP = [FS(V/m) x d^2]/30 = FS [0.3] for d = 3

EIRP(dBm) = FS(dBµV/m) – 10(log 10^9)+ 10log[0.3] = FS(dBµV/m) - 95.23

10log(10^9) is the conversion from micro to milli

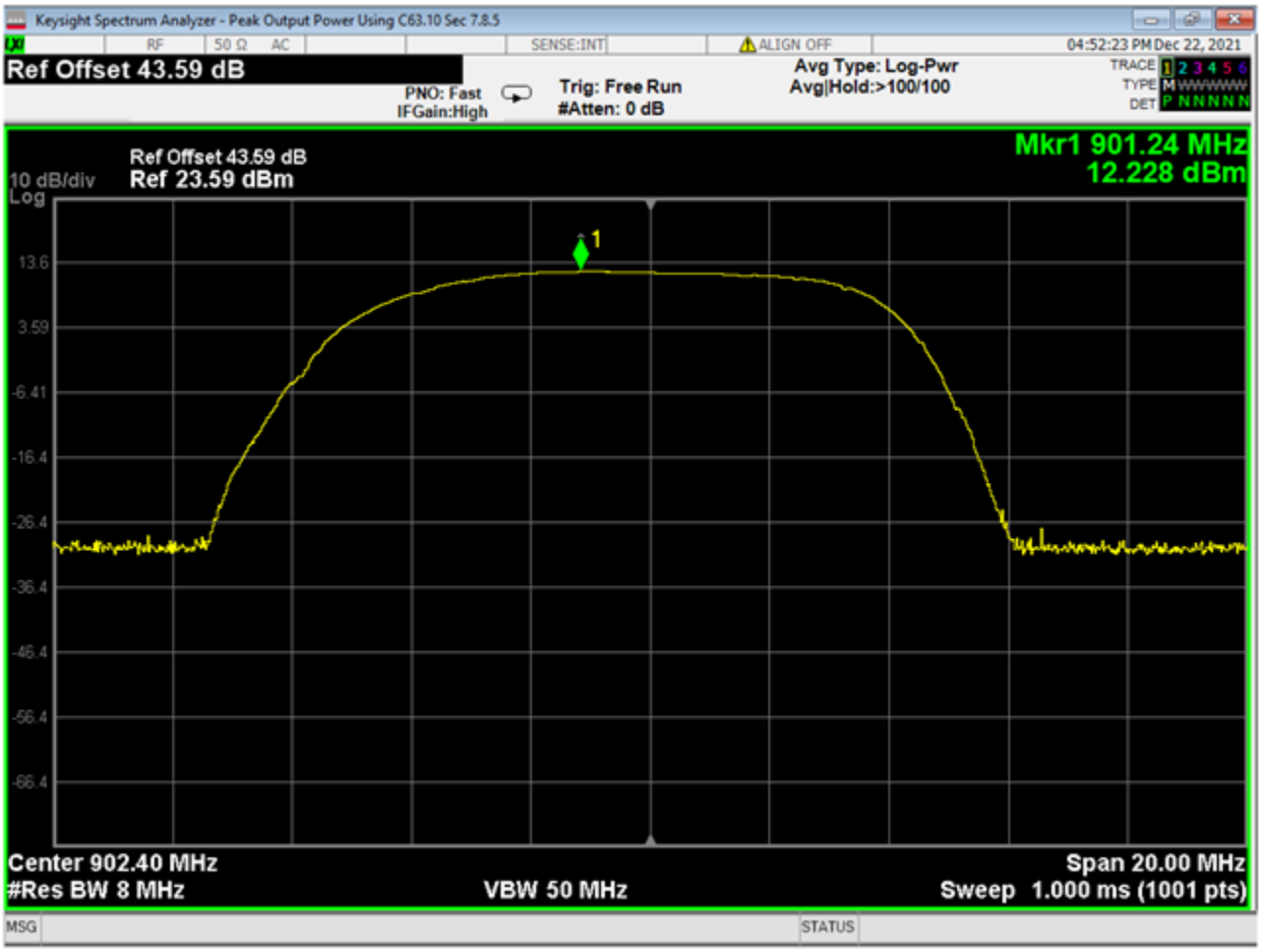
APPENDIX B – MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been for tests performed in this test report:

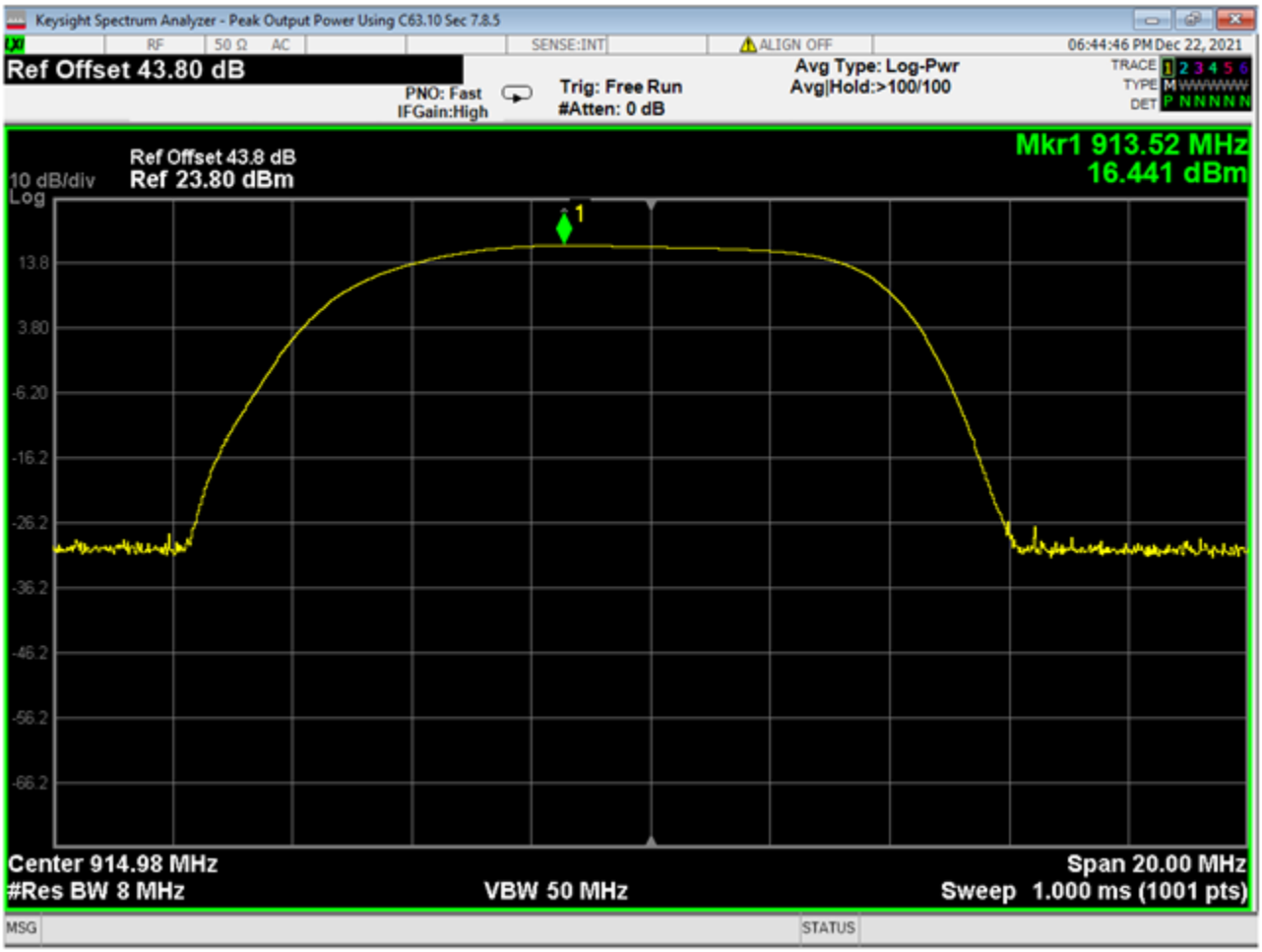
Test	Frequency Range	Uncertainty Value (dB)
Radiated Emissions, 3m	30MHz - 1GHz	3.82
Radiated Emissions, 3m	1GHz - 18GHz	4.44
Emissions limits, conducted	30MHz – 18GHz	±3.30 dB

Expanded uncertainty values are calculated to a confidence level of 95%.

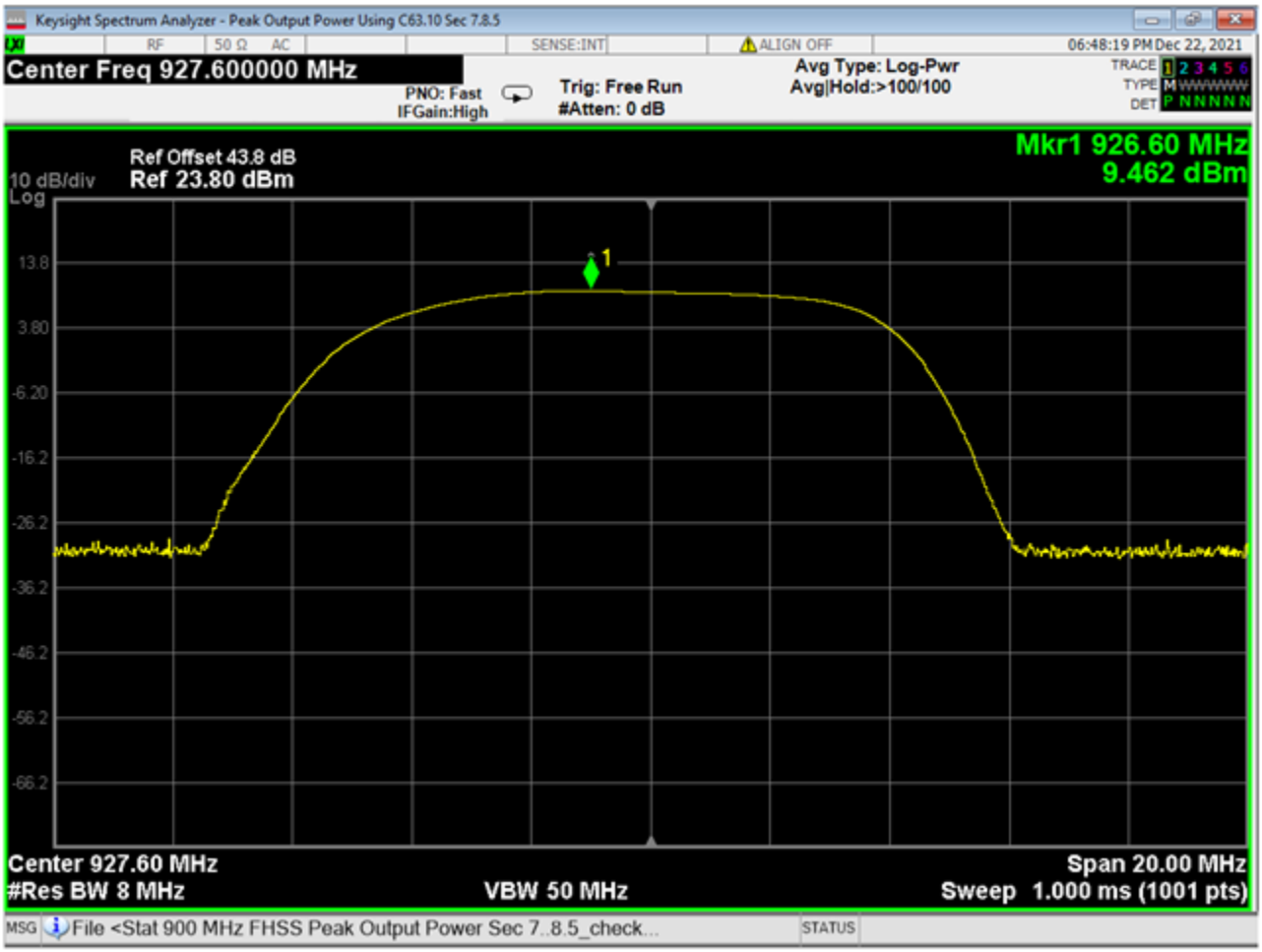
APPENDIX C – GRAPHS AND TABLES



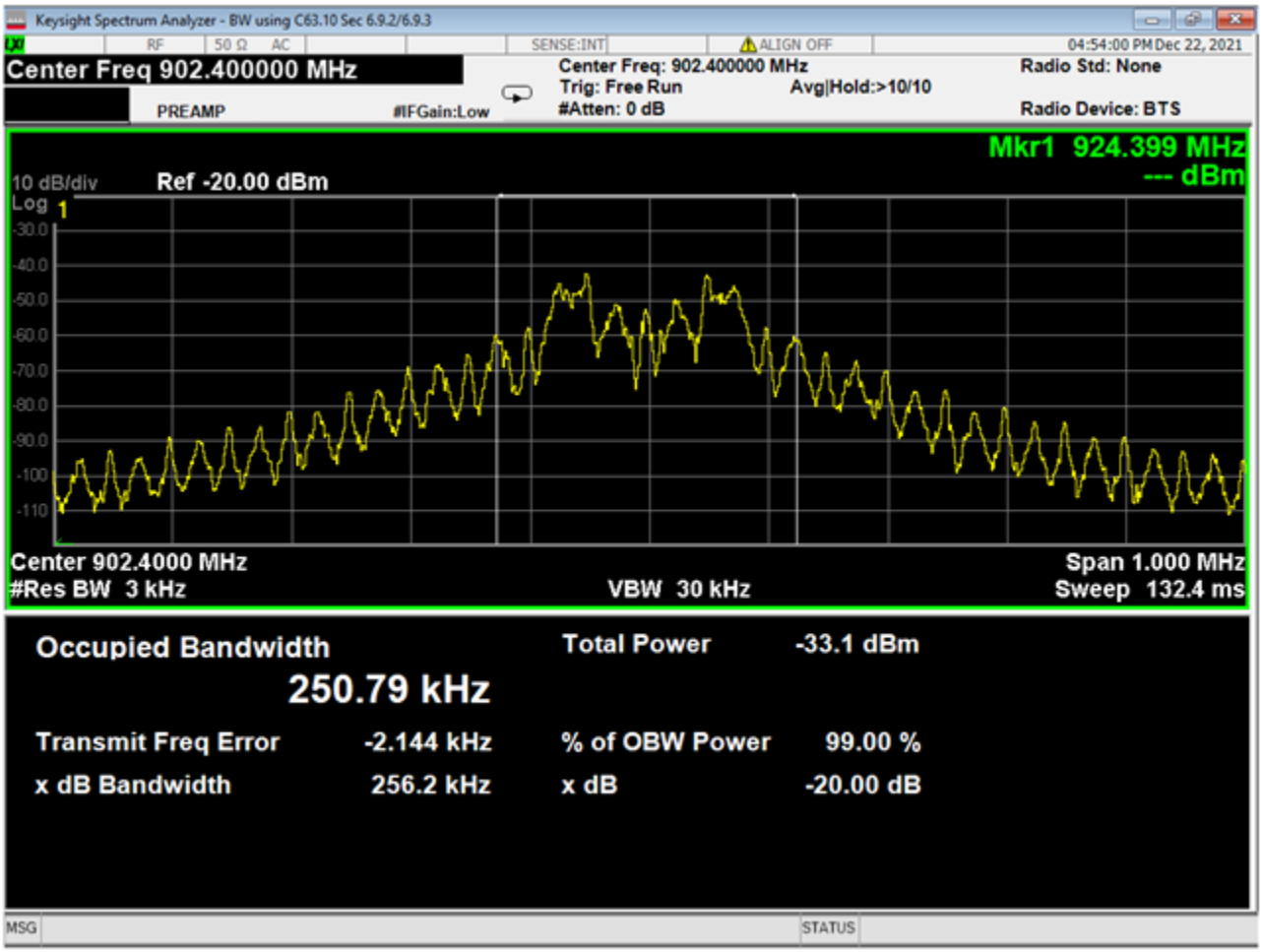
01 EIRP Low Channel with correction



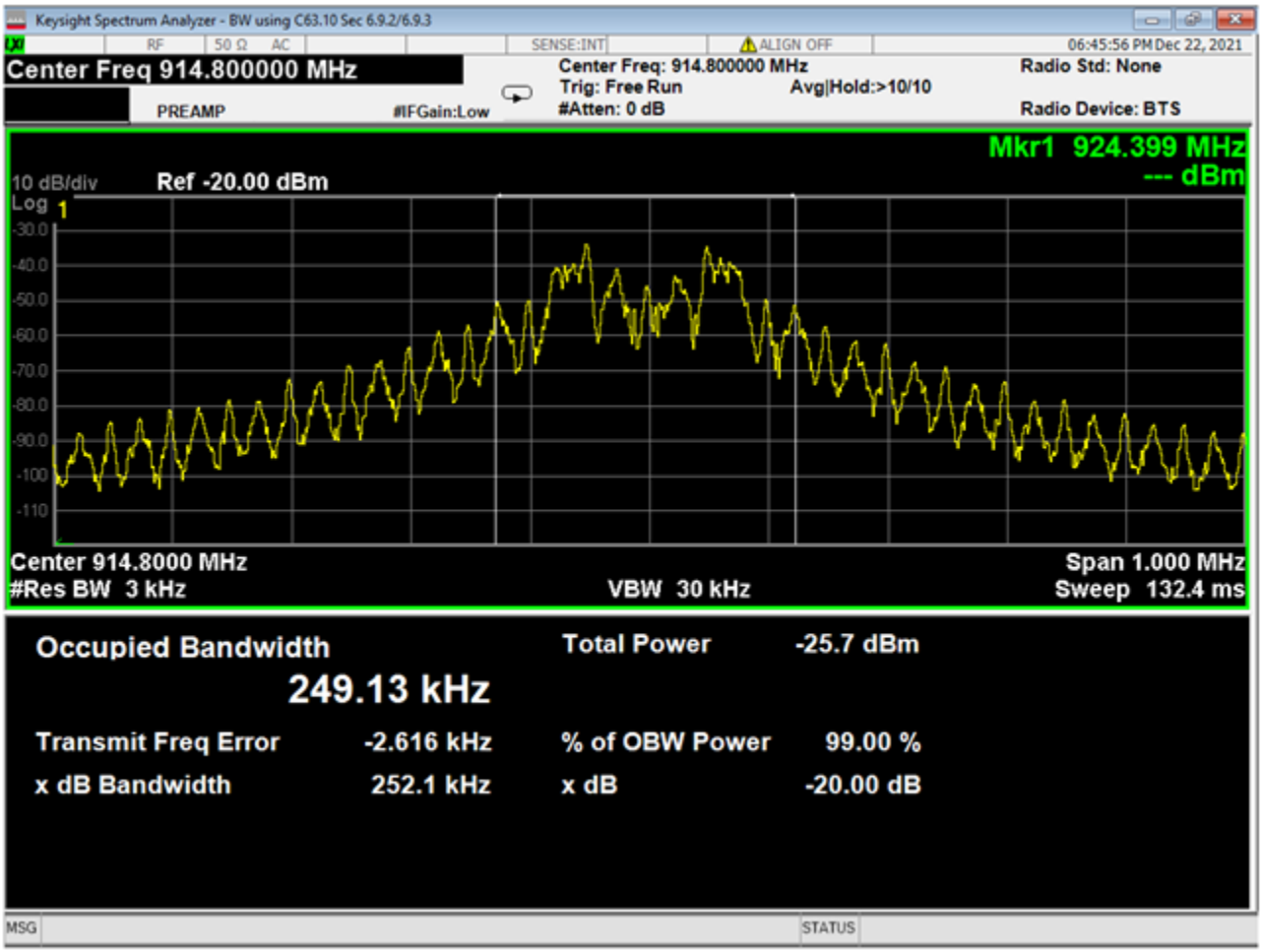
02 EIRP Mid Channel with correction



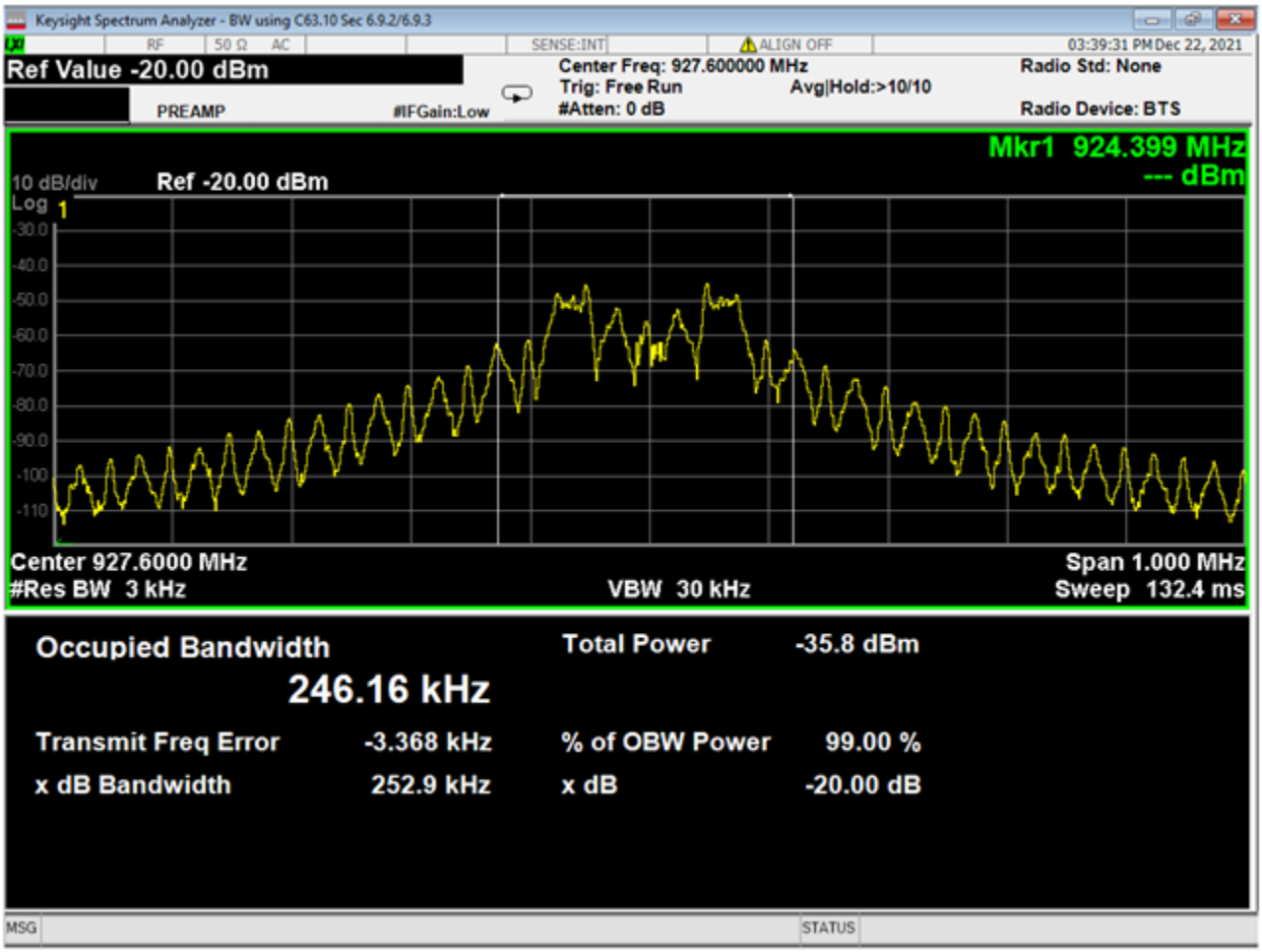
03 EIRP High Channel with correction



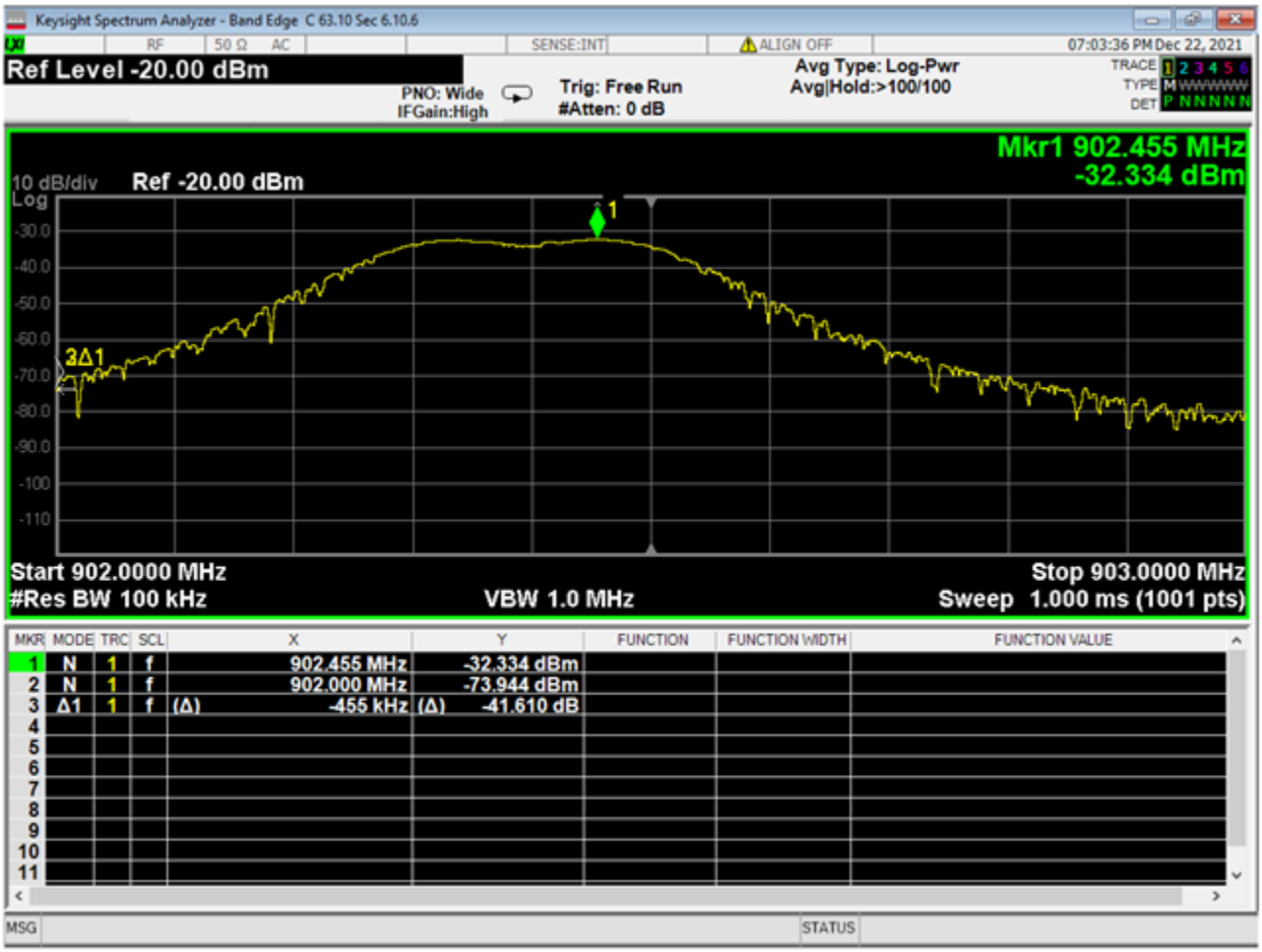
04 Bandwidth Low Channel



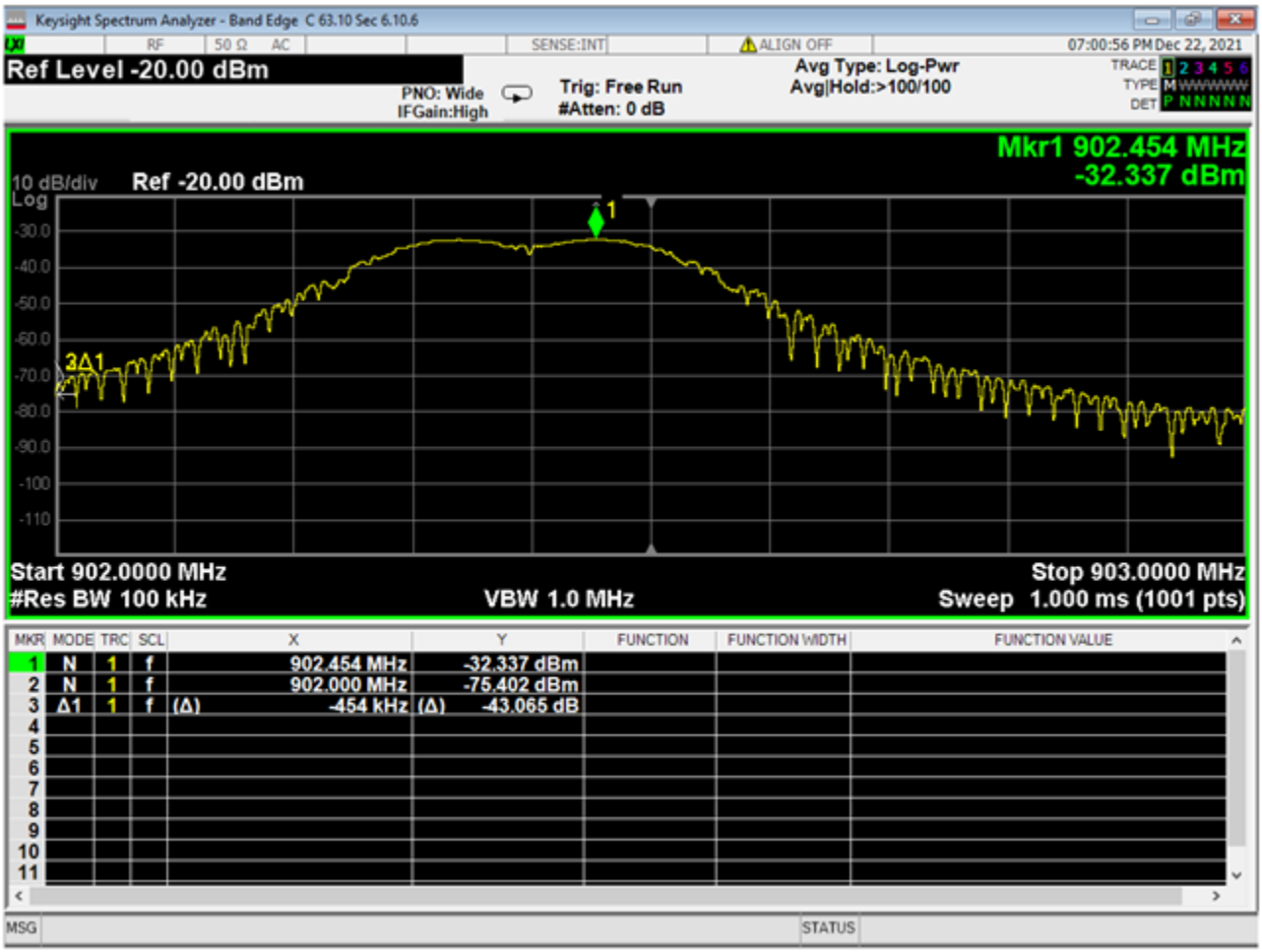
05 Bandwidth Mid Channel



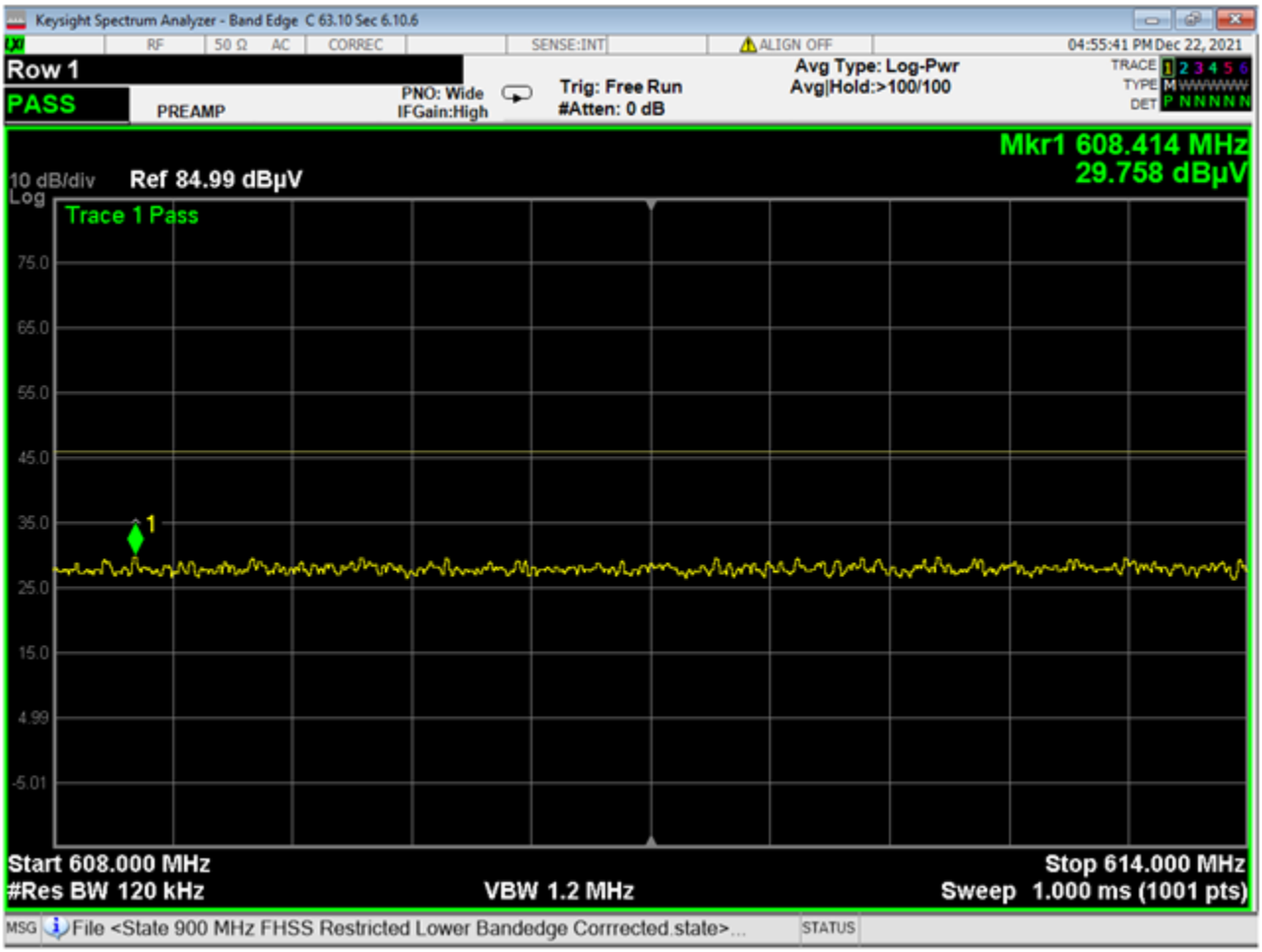
06 Bandwidth High Channel



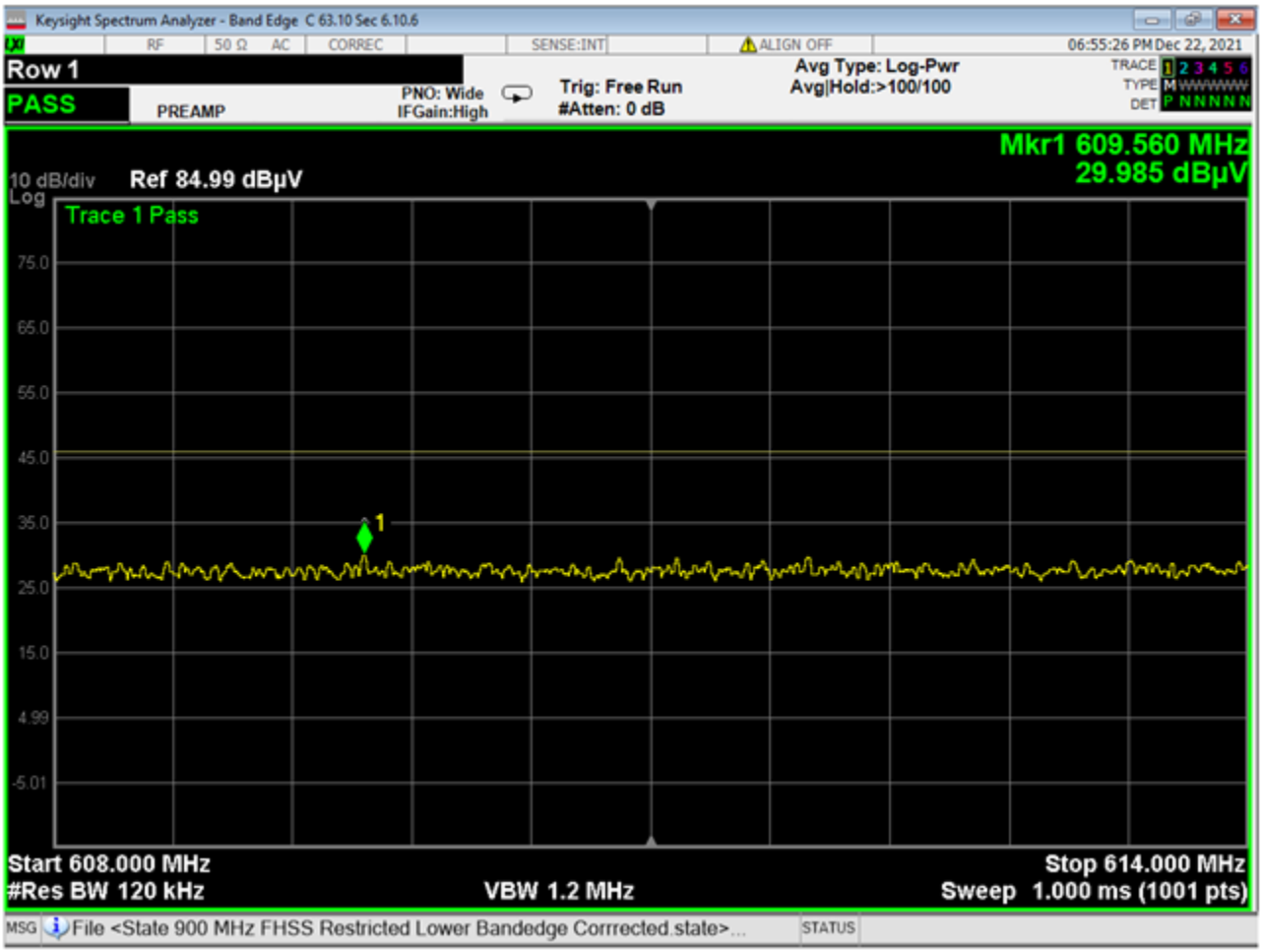
07 Bandedge Unrestricted Low Channel Relative



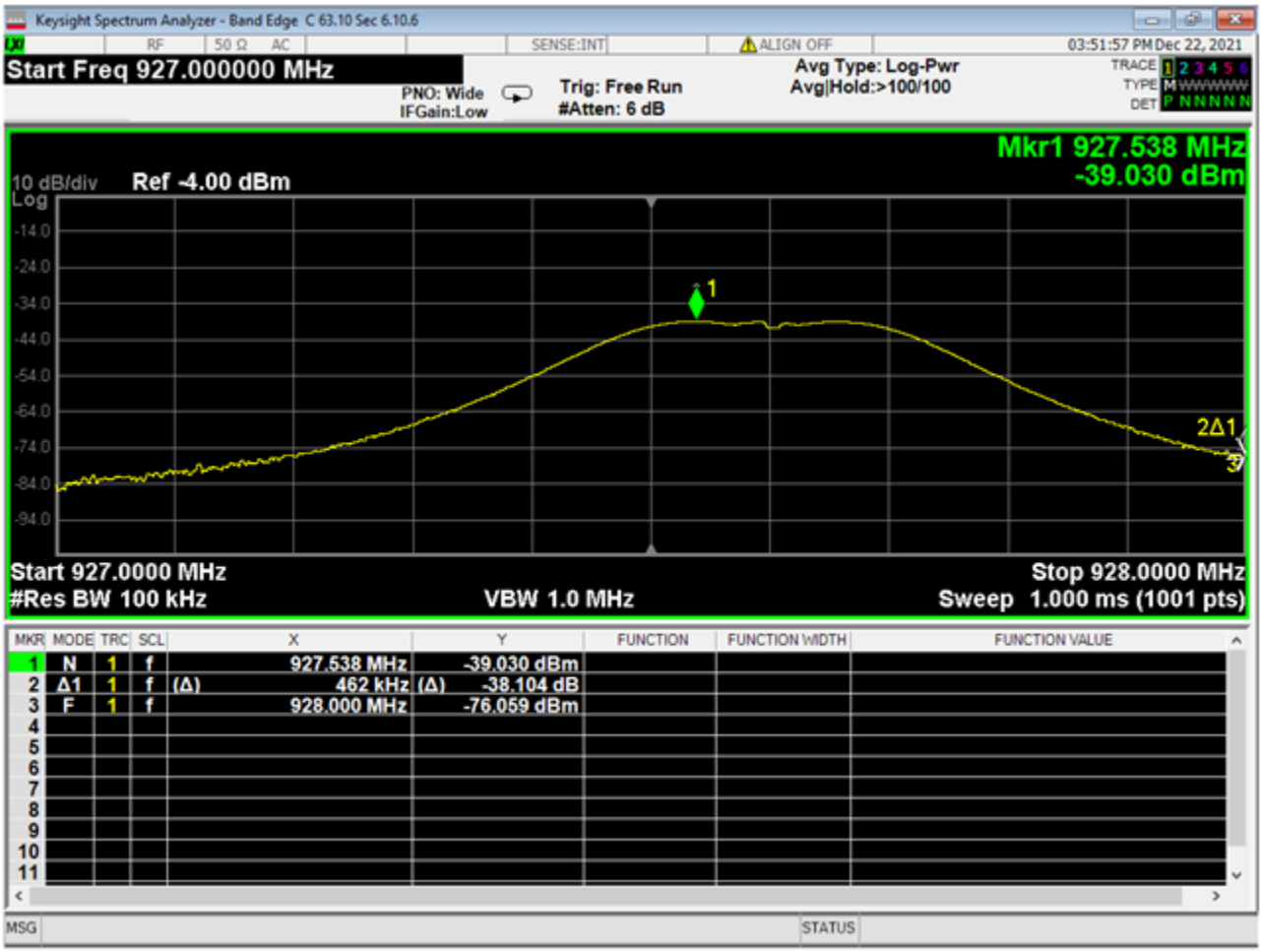
07 Bandedge Unrestricted Low Channel Relative Hopping



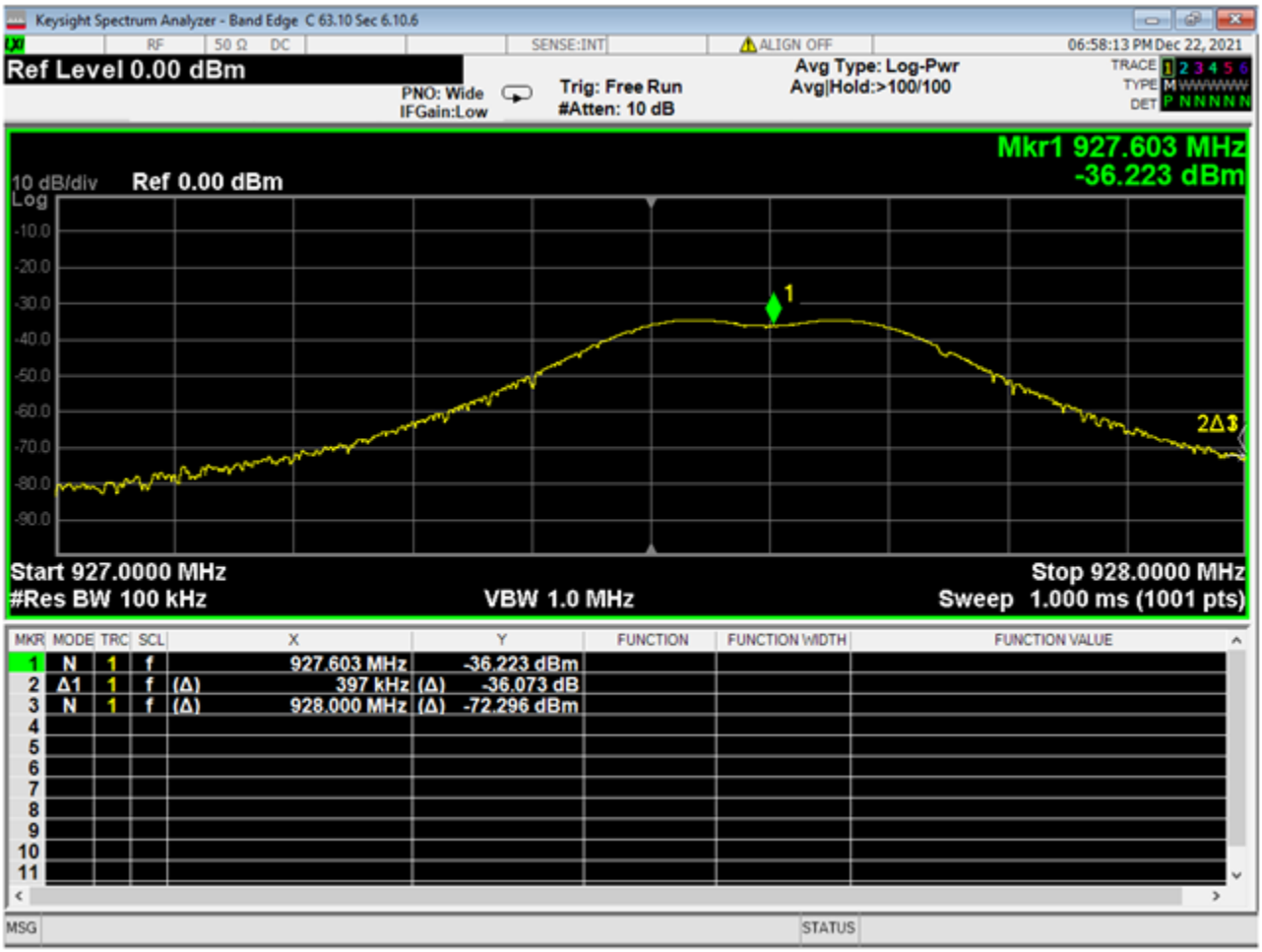
08 Bandedge Restricted Low Channel with Corrections



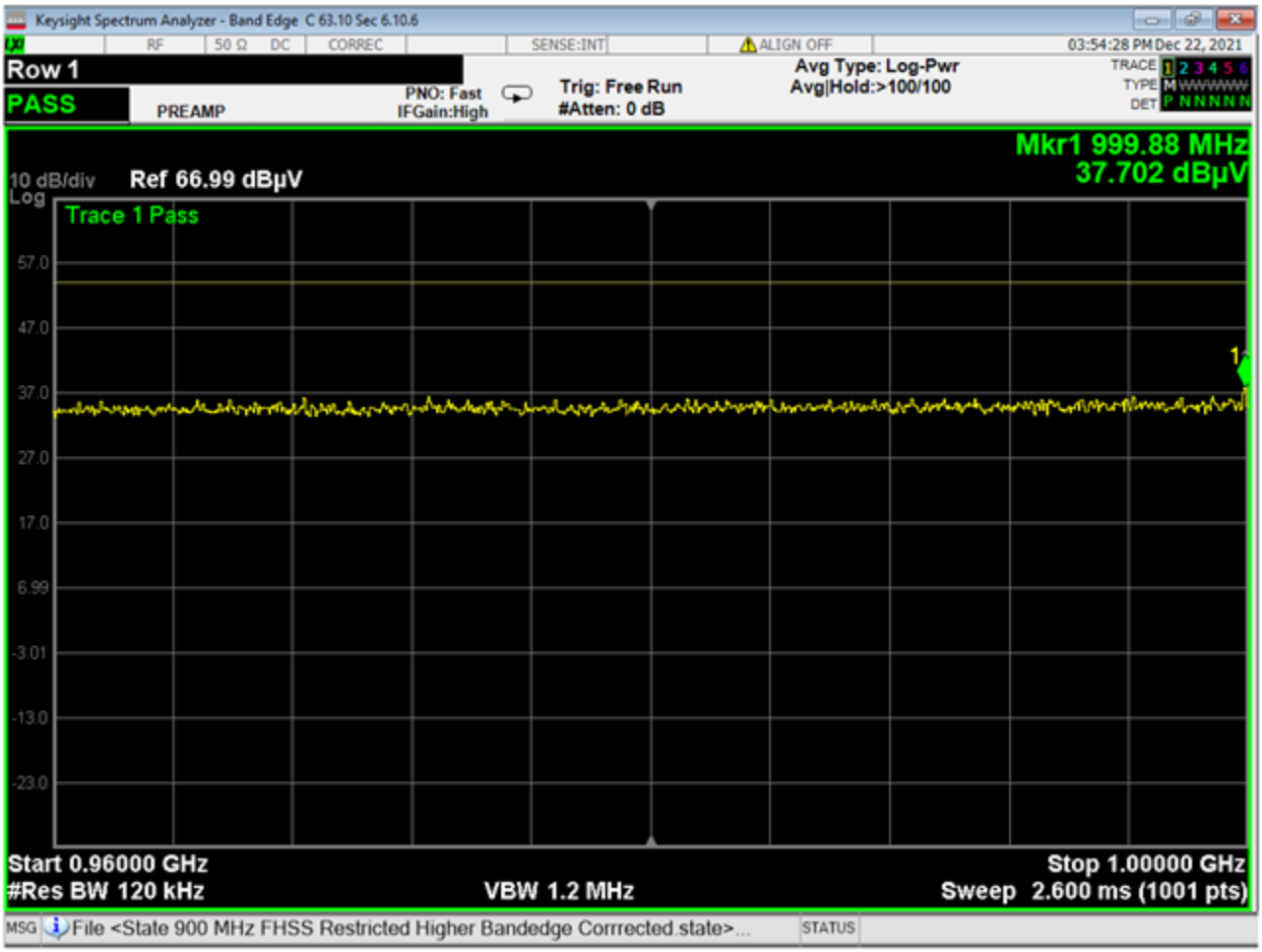
08 Bandedge Restricted Low Channel with Corrections Hopping



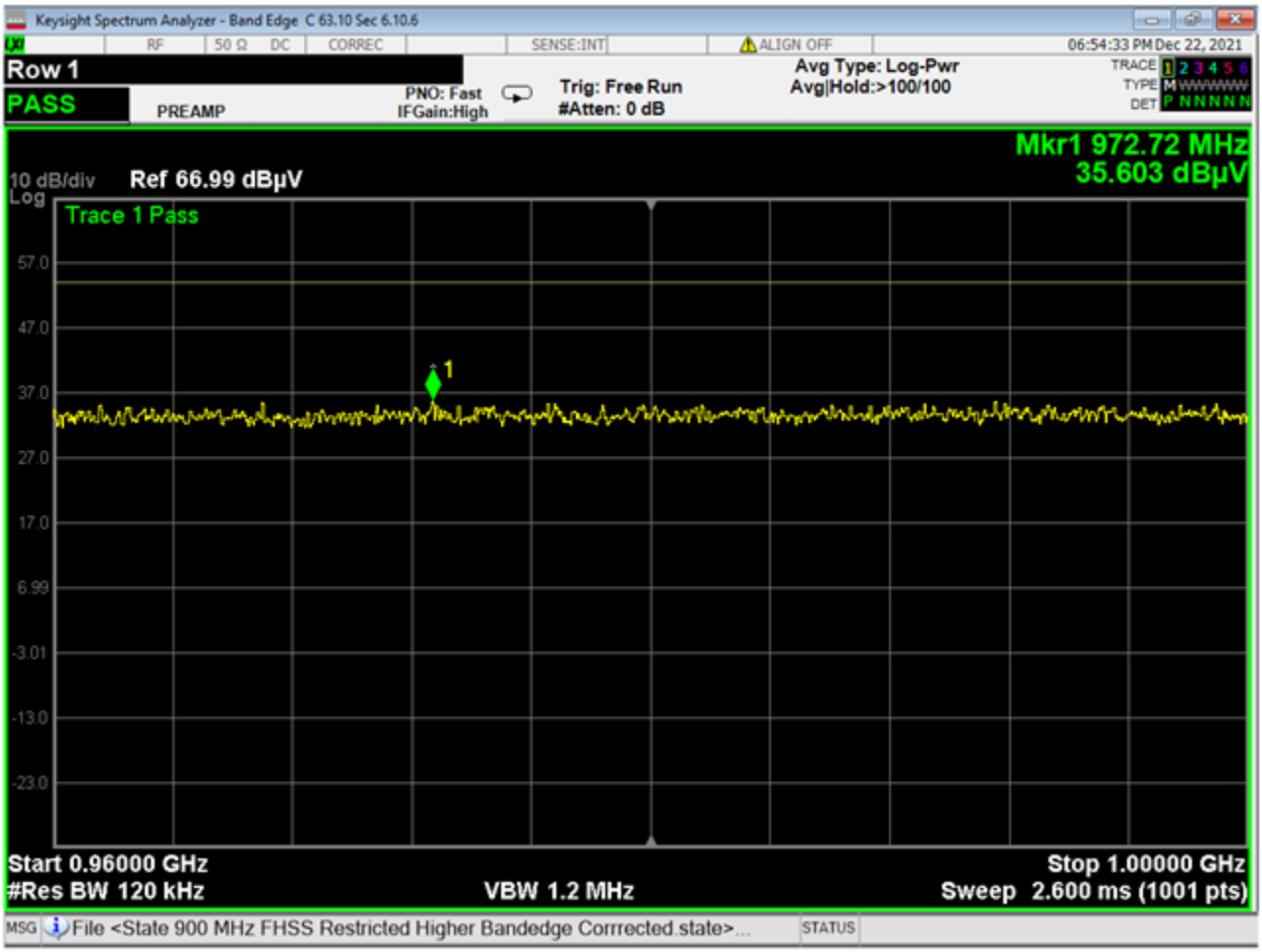
09 Bandedge Unrestricted High Channel-Relative



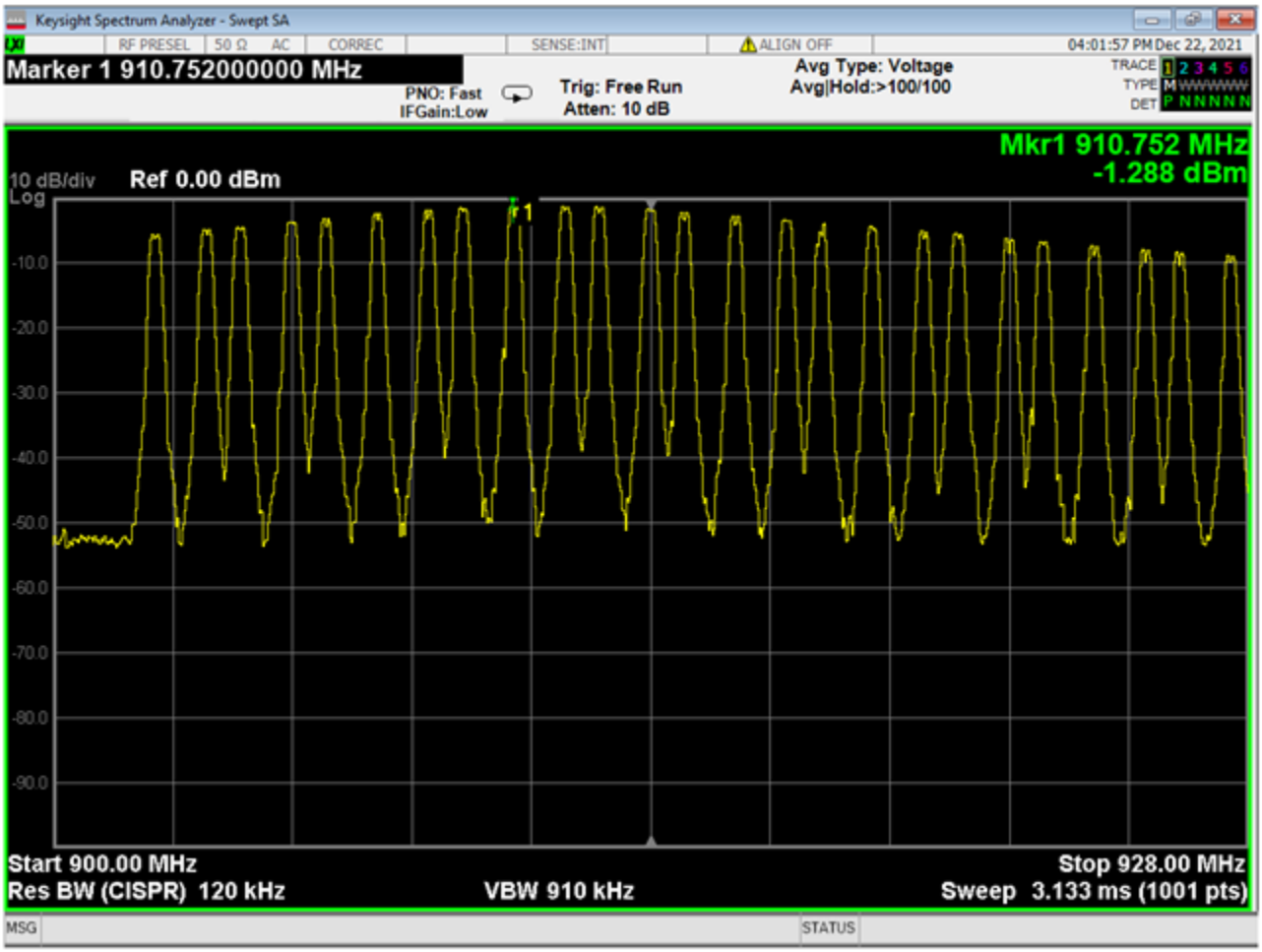
09 Bandedge Unrestricted High Channel Relative Hopping



10 Bandedge Restricted High Channel with Corrections

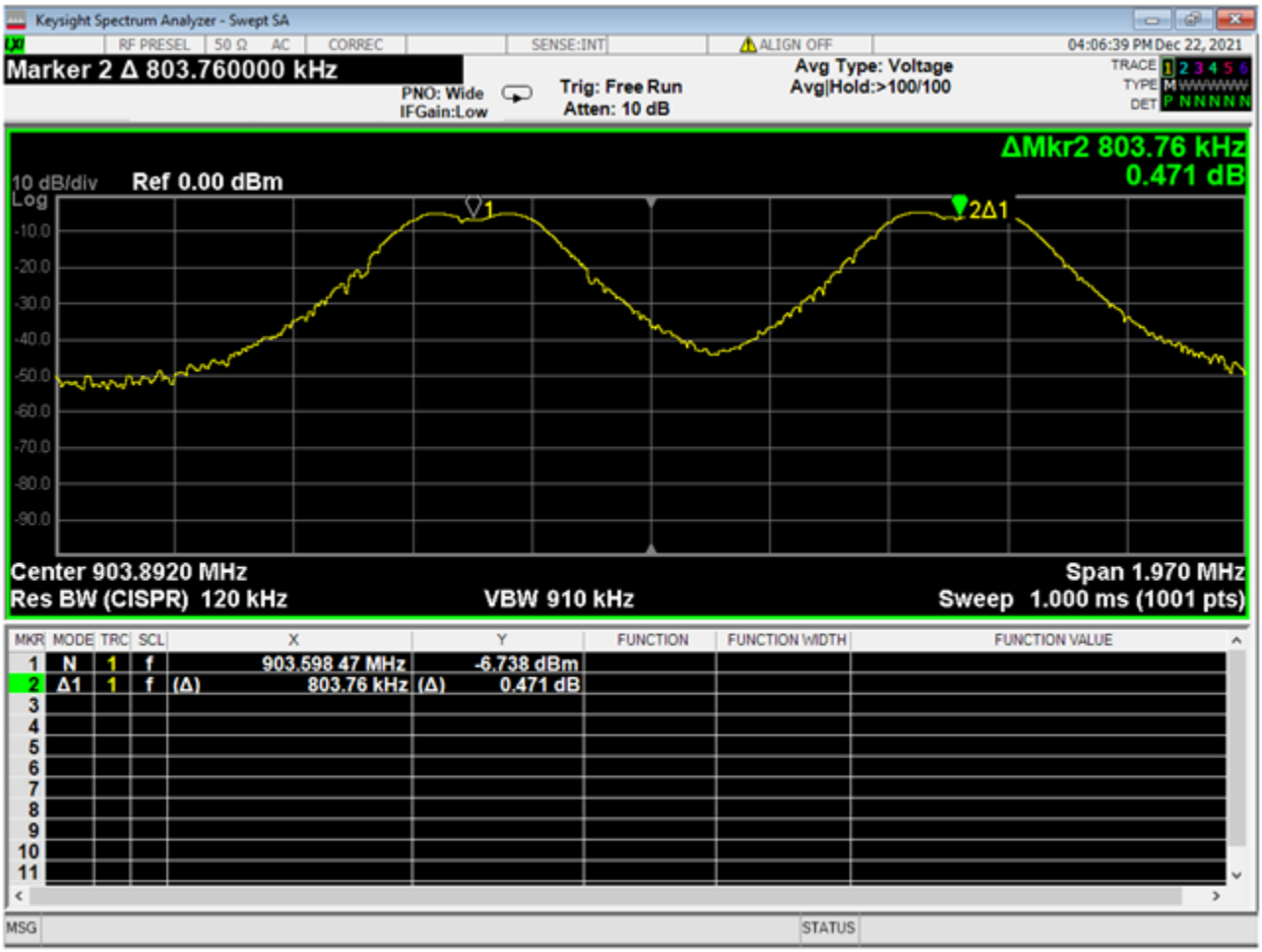


10 Bandedge Restricted High Channel with Corrections Hopping

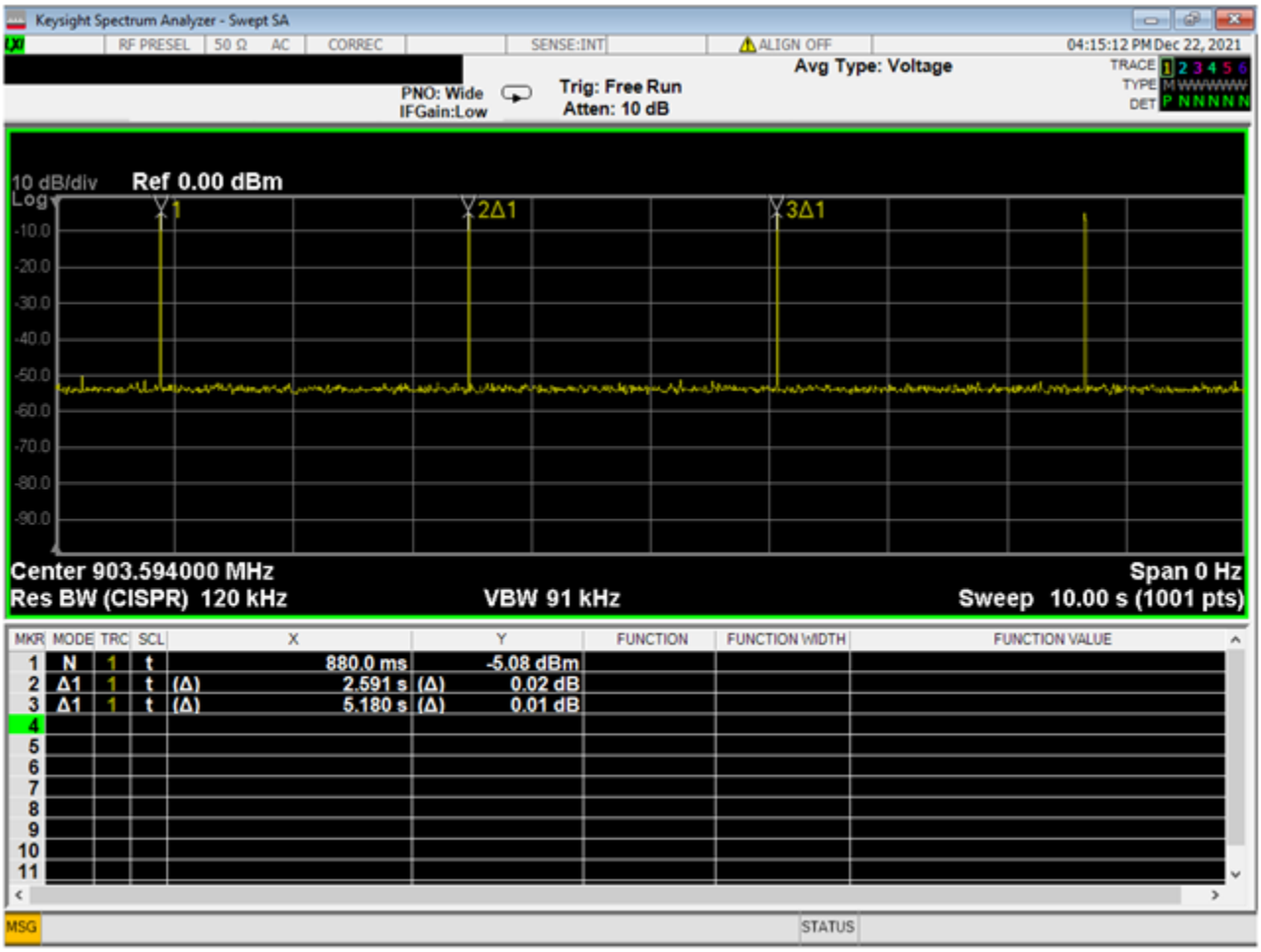


11 Hop Count, 25 Hops

Declaration from manufacturer: The EchoStream protocol defines 64 channels spaced 400 kHz apart. Manufacturer uses only 25 channels from the set of 64. The minimum spacing between channels is ~ 800 kHz with some channels space ~1.2 MHz apart. The entire channel map uses a spacing of 400 kHz, but the used channels are either 800 kHz or 1.2 MHz apart.

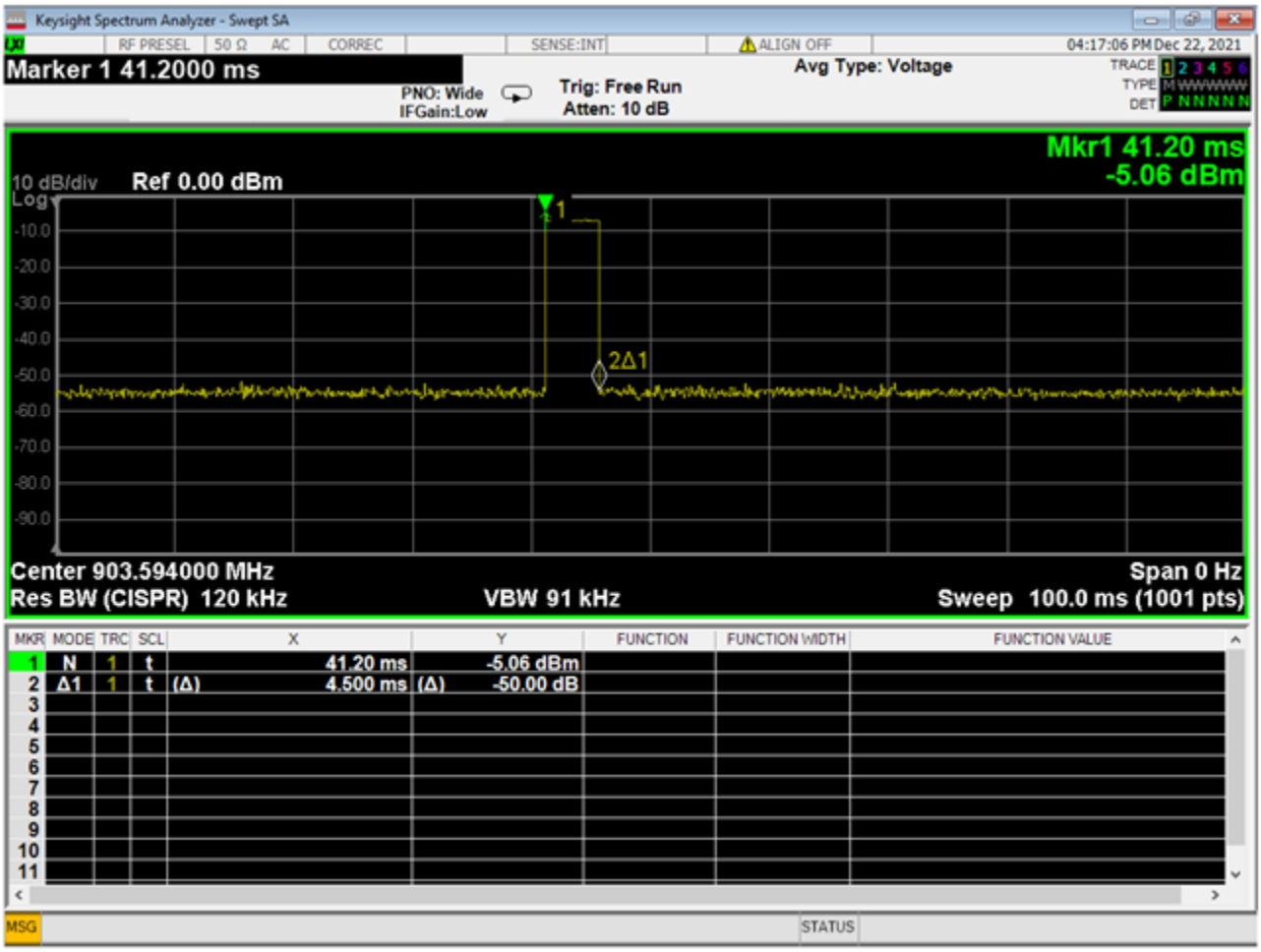


12 Minimum Frequency Separation



13 Period Over 10 S window

4 Transmissions are possible in a 10 S window



14 ON Time

On Time= 4.5 ms; Time of Occupancy=4.5*4 (from Figure 13) =18 ms

REPORT END