

Test Report

Prepared for: Inovonics

Address: 11000 Westmoor Circle
Building 10, Suite 250
Westminster, CO 80021

Product: EN1262HT

Test Report No: R20211022-21-E1B

Approved by:



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Technical Manager

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DATE: 5 May 2022

Total Pages: 44

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REVISION PAGE

Rev. No.	Date	Description
0	11 March 2022	Original – NJohnson Prepared by KVepuri
A	29 March 2022	Section 4.0, section 4.1, and section 4.2 were modified -KV
B	5 May 2022	1. Section 4.6 was modified 2. Plots were added to Appendix C 3. Section 1 was modified -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 15.109 RSS-Gen, 7.3	Receiver Radiated Emissions	NA	The EUT does not receive
FCC 15.247(a)(1)(i) RSS-247, 5.1(c)	Minimum Bandwidth, Limit: Min. 250kHz, Frequency Separation	Pass	Meets the requirement of the limit.
FCC 15.247(b)(2) 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



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2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

The Equipment Under Test (EUT) was a wireless FHSS transmitter, EN1262HT.

EUT	EN1262HT
EUT Received	1/25/2022
EUT Tested	2/4/2022- 2/24/2022
Serial No./ Tx ID	4216874
Operating Band	902.0 – 928.0 MHz
Device Type	FHSS
Power Supply	3VDC (2xAA (Lithium))

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



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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.

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.

2.3 DESCRIPTION OF SUPPORT UNITS

N/A

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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 $35 \pm 4\%$
 Temperature of $22 \pm 3^\circ$ 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
4	Blake Winter	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.



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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, 2022
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
8447F POT H64 Preamplifier*	8447F POT H64	3113AD4667	February 1, 2021	February 1, 2023
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 MEASUREMENTS

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.

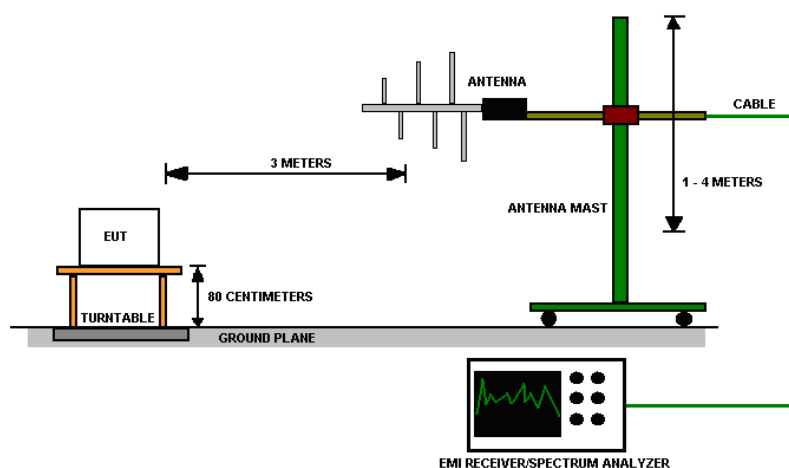



Figure 2 - Radiated Emissions Test Setup

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4.0 DETAILED RESULTS

DSS Radiated Radio Measurements								
CHANNEL	Transmitter	99% Occupied Bandwidth (kHz)	20 dB Bandwidth (kHz)	PEAK EIRP (dBm)	PEAK EIRP (mW)	RESULT	No. of Hopping Channels	Time of Occupancy*
							25	0.0876 s*
							Min Frequency Separation	Duty Cycle Correction
							804 kHz	-13.31
Low	Continuous	251.21	302.70	13.681	23.340	PASS		
Mid	Continuous	250.93	302.00	14.259	26.662	PASS		
High	Continuous	250.74	302.10	19.348	86.060	PASS		
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				
				*Manufacturer declares that the worst-case average channel occupancy time is 0.0876 s within any 10 second period.				
Unrestricted Band-Edge								
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Relative Highest out of band level (dBuV/m)	Relative Fundamental (dBuV/m)	Delta (dB)	Min Delta (dB)	Result	
Low	Continuous	902.4	70.136	107.009	36.873	20	PASS	
Low*	Hopping	902.4	49.485	86.729	37.244	20	PASS	
High	Continuous	927.6	76.502	112.597	36.095	20	PASS	
High	Hopping	927.6	73.099	110.702	37.603	20	PASS	
*Measurement was taken in dBm and converted to dBuV using: dBuV = dBm +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	610.916	32.57	Radiated	46.02	13.450	PASS	
Low	Hopping	609.512	32.82	Radiated	46.02	13.200	PASS	
High	Continuous	964.84	48.333	Radiated	53.98	8.612	PASS	
High	Hopping	965.92	45.368	Radiated	53.98	5.647	PASS	
*Limit shown is the peak limit taken from FCC Part 15.209								

Corrections and Raw Values for EIRP					
Channel	Antenna Factor	Cable Loss	dBm to dBuV	EIRP Conversion from 3m	Correction/Reference level offset
	(dB)	(dB)			
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					



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4.1 DUTY CYCLE

Manufacturer declared that the maximum on time possible per channel is 21.6 ms in a given 100 ms period. So, Duty cycle correction factor for spurious emissions related to the transmitter is $20 \log 21.6/100 = -13.31 \text{ dB}$.

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 ($\mu\text{V/m}$)	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) = $20 * \log * \text{Emission level } (\mu\text{V/m})$.
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.



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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 from 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.

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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:

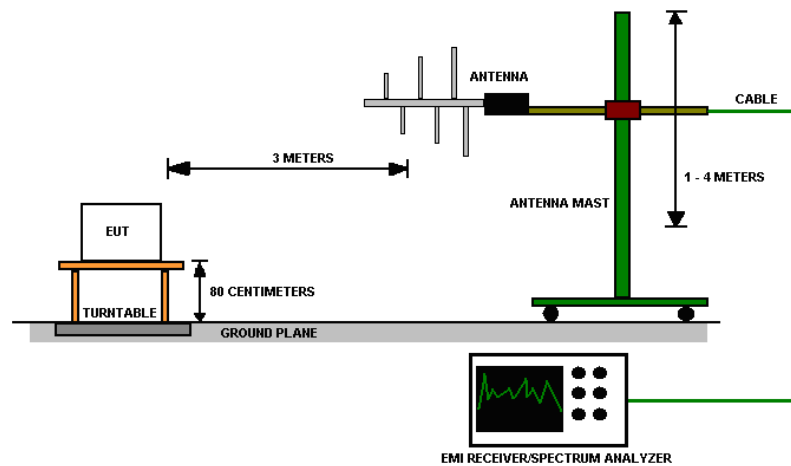


Figure 3 - Radiated Emissions Test Setup

EUT operating conditions

Details can be found in section 2.1 of this report.

Test results:

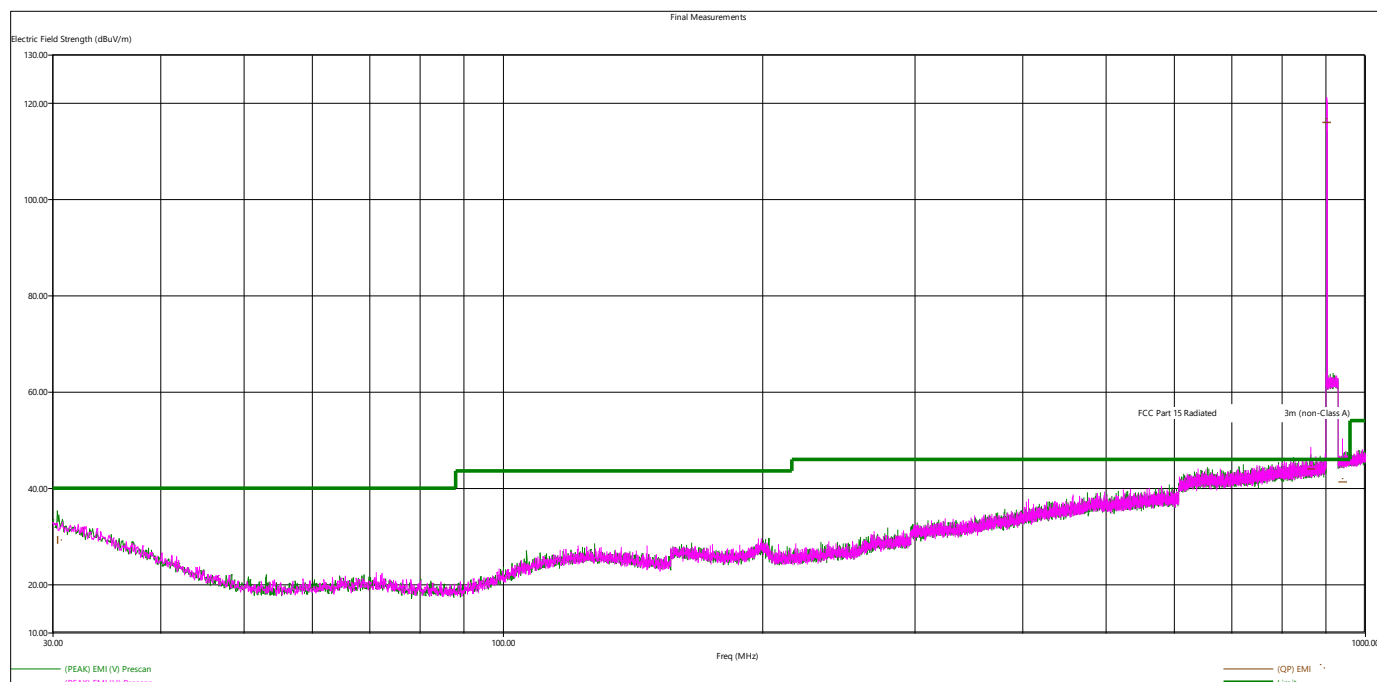


Figure 4 - Radiated Emissions Plot, Low Channel, 30 MHz-1GHz

*Noise floor on this plot looks higher than the other plots because of the receiver settings during the test to avoid saturation. The worst-case measurements are listed in the tables below, all other measurements were found to be at least 6 dB below the limit.

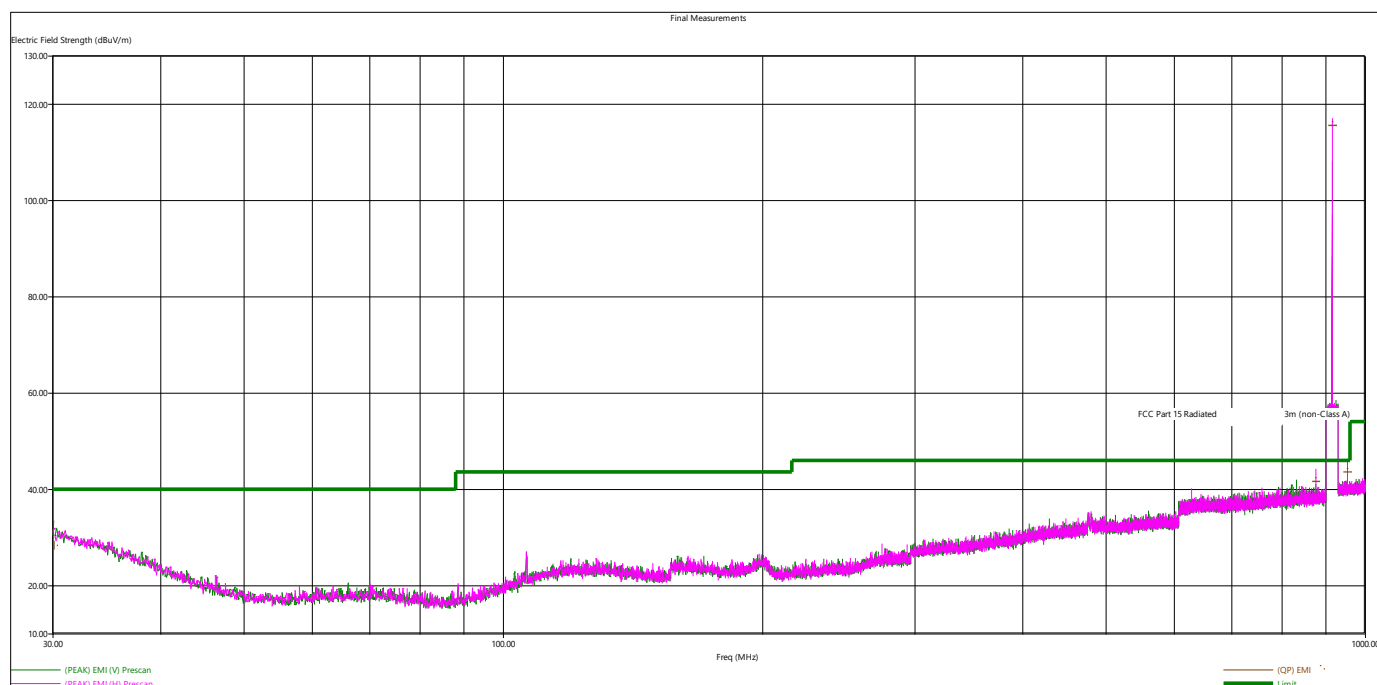


Figure 5 - Radiated Emissions Plot, Mid Channel, 30 MHz-1GHz

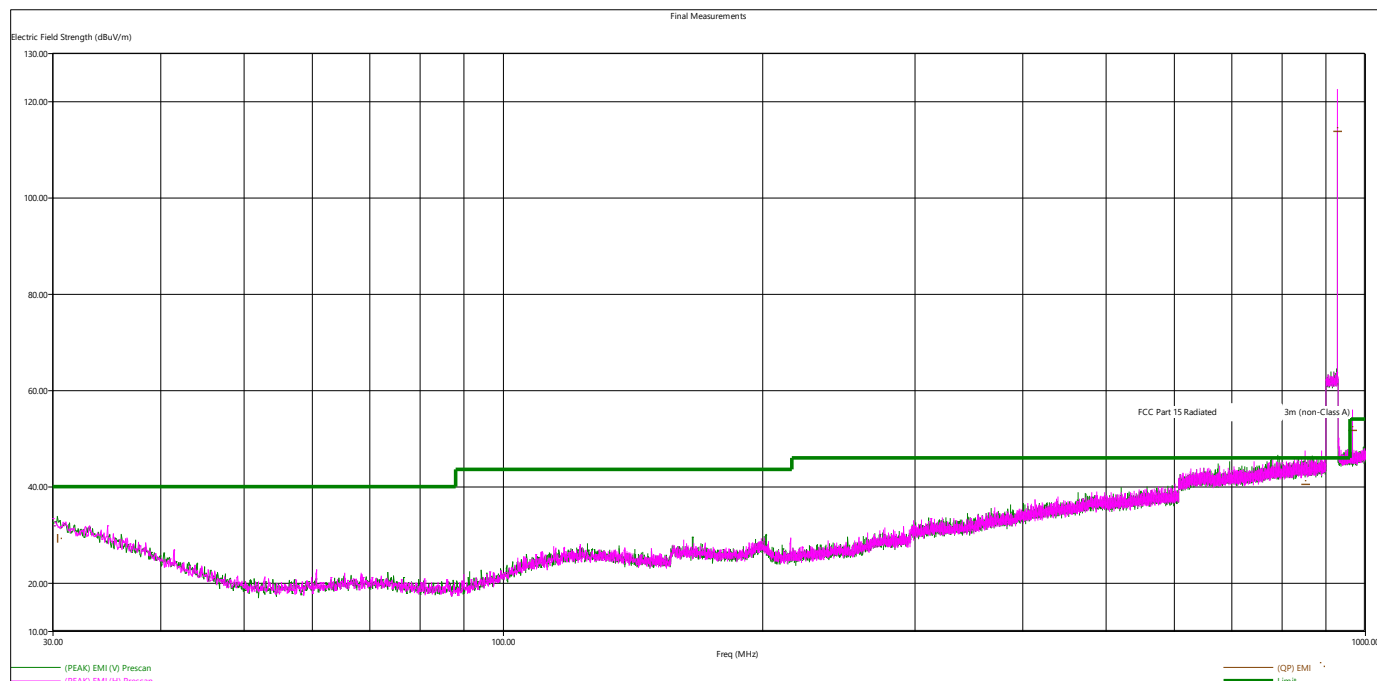


Figure 6 - Radiated Emissions Plot, High Channel, 30 MHz-1GHz

*Noise floor on this plot looks higher than the other plots because of the receiver settings during the test to avoid saturation. The worst-case measurements are listed in the tables below, all other measurements were found to be at least 6 dB below the limit.



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Quasi Peak Measurements

Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Radio Band
MHz	dB μ V/m	dB μ V/m	dB	cm.	deg.			MHz
863.94456	43.85	46.02	2.17	192	256	H	Low	902-928
30.51504	29.09	40	10.91	349	269	V	Low	902-928
940.63512	41.22	46.02	4.80	340	1	H	Low	902-928
876.38016	41.45	46.02	4.57	176	117	H	Mid	902-928
30.11952	28.16	40	11.84	304	176	V	Mid	902-928
953.154	43.46	46.02	2.56	106	282	H	Mid	902-928
850.98576	40.22	46.02	5.80	202	9	H	High	902-928
30.52008	29.06	40	10.94	395	246	V	High	902-928
965.9904	51.48	53.98	2.50	108	66	H	High	902-928

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	dB μ V/m	dB μ V/m	dB	cm.	deg.			MHz
2707.058000	48.92	73.98	25.06	484	358	H	Low	900 -928
1804.712000	61.15	73.98	12.83	549	110	V	Low	900 -928
3609.672000	51.71	73.98	22.27	237	199	V	Low	900 -928
6316.712000	52.10	73.98	21.88	466	78	V	Low	900 -928
9021.618000	52.47	73.98	21.51	219	358	V	Low	900 -928
1829.524000	63.07	73.98	10.91	528	352	H	Mid	900 -928
2744.280000	48.50	73.98	25.48	286	34	V	Mid	900 -928
9148.312000	53.07	73.98	20.91	347	61	H	Mid	900 -928
3659.150000	53.25	73.98	20.73	310	205	V	Mid	900 -928
6403.598000	52.11	73.98	21.87	353	90	V	Mid	900 -928
1855.206000	64.91	73.98	9.07	500	207	H	High	900 -928
2782.634000	47.27	73.98	26.71	246	41	V	High	900 -928
3710.372000	52.75	73.98	21.23	439	18	V	High	900 -928
5565.768000	52.43	73.98	21.55	528	105	V	High	900 -928
9275.762000	50.62	73.98	23.36	194	212	V	High	900 -928



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Average Measurements, 900 MHz Radio,

Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Radio Band
MHz	dBμV/m	dBμV/m	dB	cm.	deg.			MHz
2707.058000	35.61	53.98	18.37	484	358	H	Low	900 -928
1804.712000	47.84	53.98	6.14	549	110	V	Low	900 -928
3609.672000	38.40	53.98	15.58	237	199	V	Low	900 -928
6316.712000	38.79	53.98	15.19	466	78	V	Low	900 -928
9021.618000	39.16	53.98	14.82	219	358	V	Low	900 -928
1829.524000	49.76	53.98	4.22	528	352	H	Mid	900 -928
2744.280000	35.19	53.98	18.79	286	34	V	Mid	900 -928
9148.312000	39.76	53.98	14.22	347	61	H	Mid	900 -928
3659.150000	39.94	53.98	14.04	310	205	V	Mid	900 -928
6403.598000	38.80	53.98	15.18	353	90	V	Mid	900 -928
1855.206000	51.60	53.98	2.38	500	207	H	High	900 -928
2782.634000	33.96	53.98	20.02	246	41	V	High	900 -928
3710.372000	39.44	53.98	14.54	439	18	V	High	900 -928
5565.768000	39.12	53.98	14.86	528	105	V	High	900 -928
9275.762000	37.31	53.98	16.67	194	212	V	High	900 -928

Average Level is obtained by adding the 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.



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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. Output power was measured radiated as EIRP.

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.



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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 $250 \text{ kHz} \leq \text{BW} \leq 500 \text{ kHz}$.

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.



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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.

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4.6 CARRIER FREQUENCY SEPARATION, 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;

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.



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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 dB μ V 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 dB μ V/m.

$$FS = 55 + 12 - (-1.1 + 20) + 0 = 48.1 \text{ dB}\mu\text{V/m}$$

The 48.1 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(48.1 \text{ dB}\mu\text{V/m})/20] = 254.1 \mu\text{V/m}$$

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



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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;

$$EIRP \text{ (Watts)} = [Field \text{ Strength (V/m)} \times \text{antenna distance (m)}]^2 / 30$$

$$Power \text{ (watts)} = 10^{[Power \text{ (dBm)}/10]} / 1000$$

$$Voltage \text{ (dB}\mu\text{V)} = Power \text{ (dBm)} + 107 \text{ (for } 50\Omega \text{ measurement systems)}$$

$$Field \text{ Strength (V/m)} = 10^{[Field \text{ Strength (dB}\mu\text{V/m)} / 20]} / 10^6$$

$$Gain = 1 \text{ (numeric gain for isotropic radiator)}$$

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

$$EIRP = [FS(V/m) \times d^2]/30 = FS [0.3] \quad \text{for } d = 3$$

$$EIRP(dBm) = FS(dB\mu V/m) - 10(\log 10^9) + 10\log[0.3] = FS(dB\mu V/m) - 95.23$$

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



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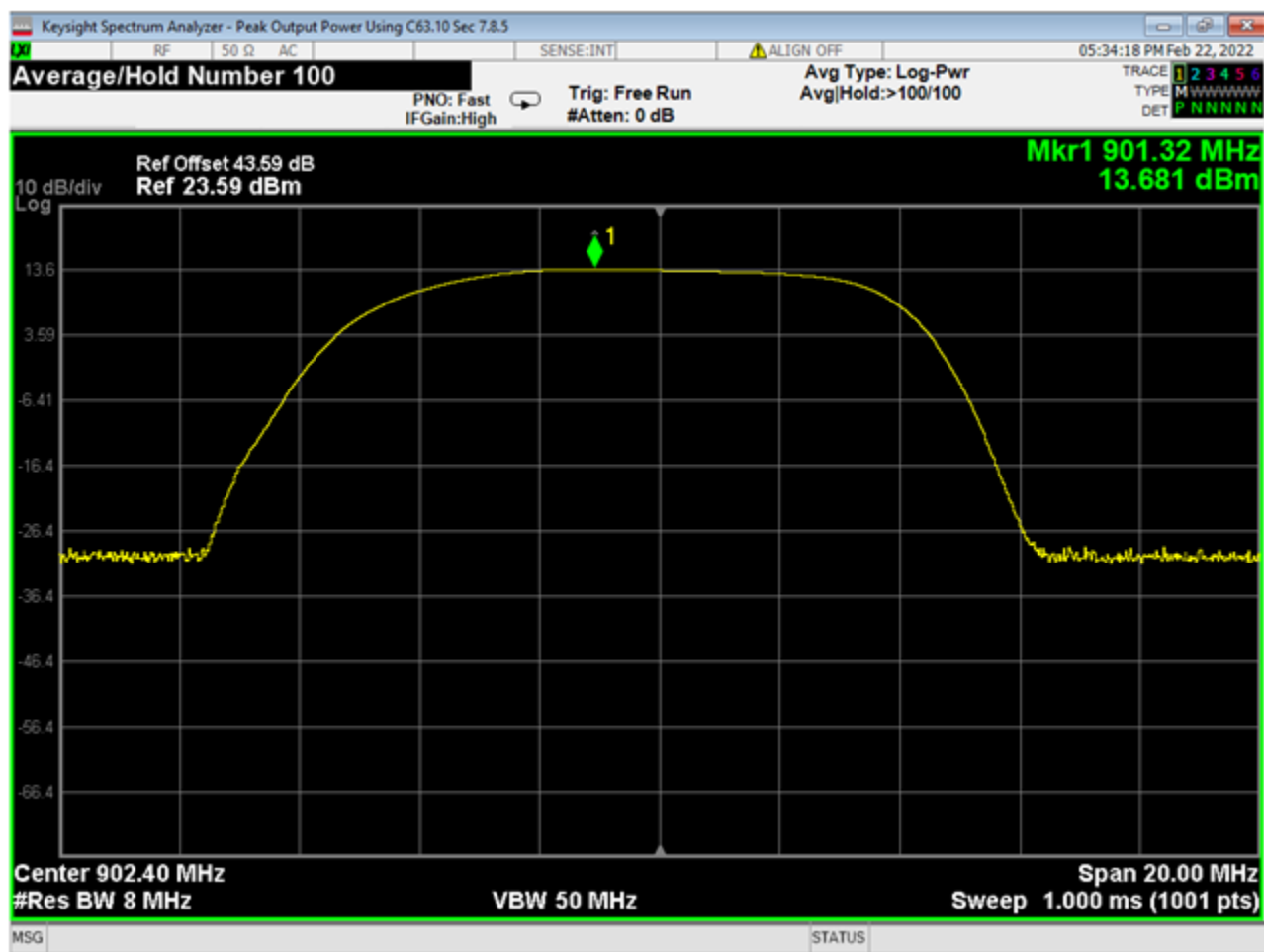
APPENDIX B – MEASUREMENT UNCERTAINTY

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

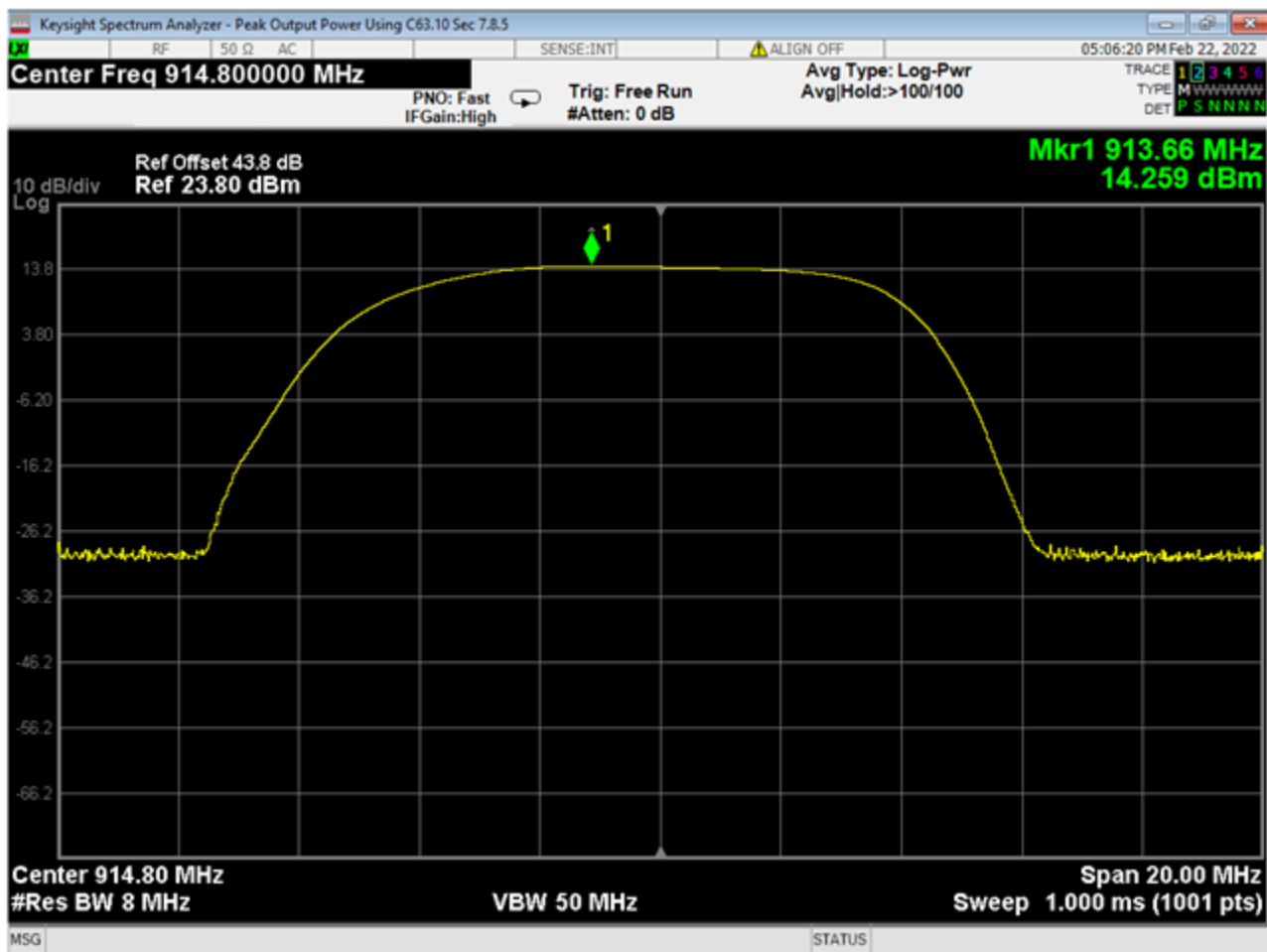
Expanded uncertainty values are calculated to a confidence level of 95%.

APPENDIX C – GRAPHS AND TABLES

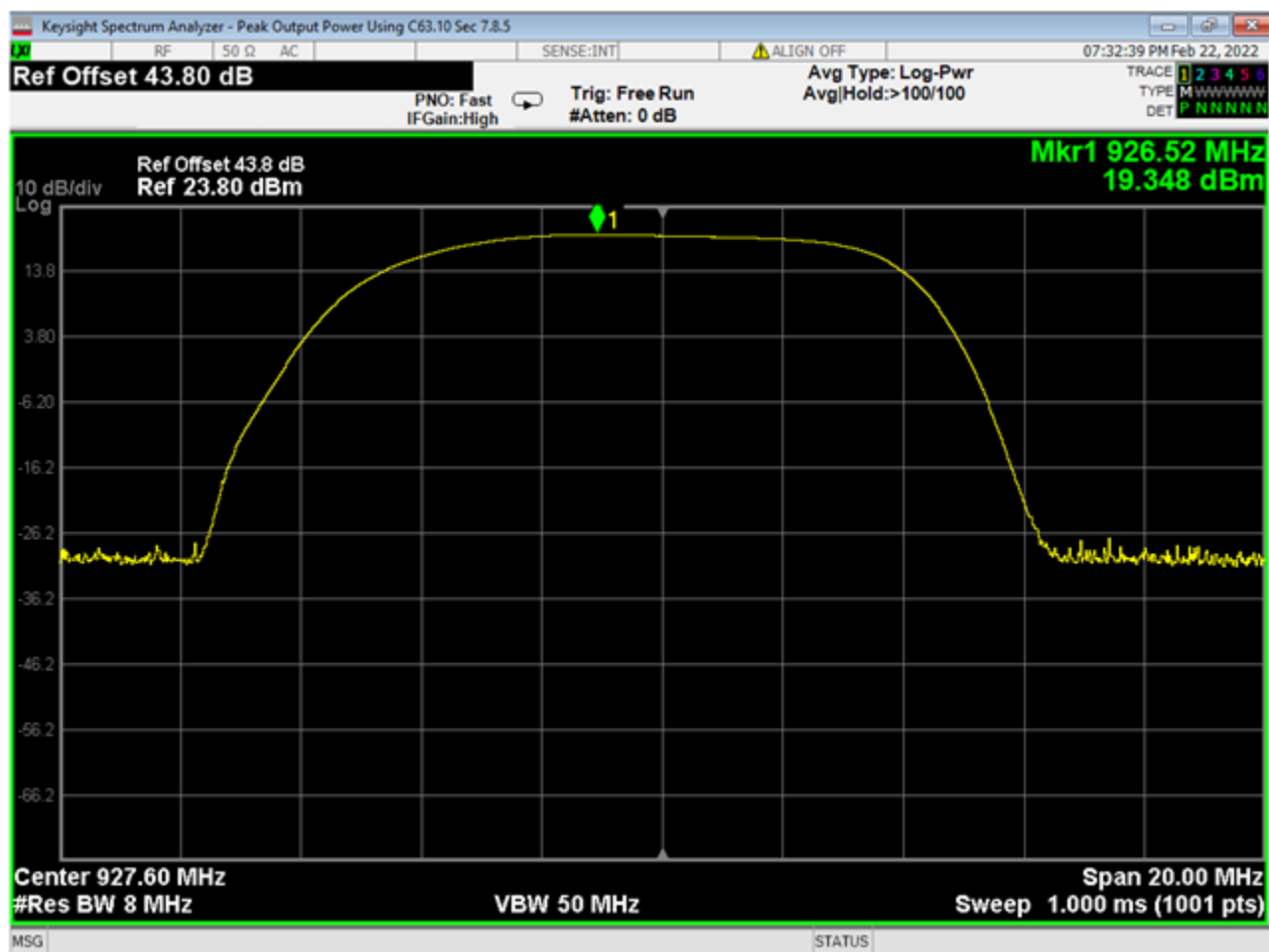


01 EIRP Low Channel with correction

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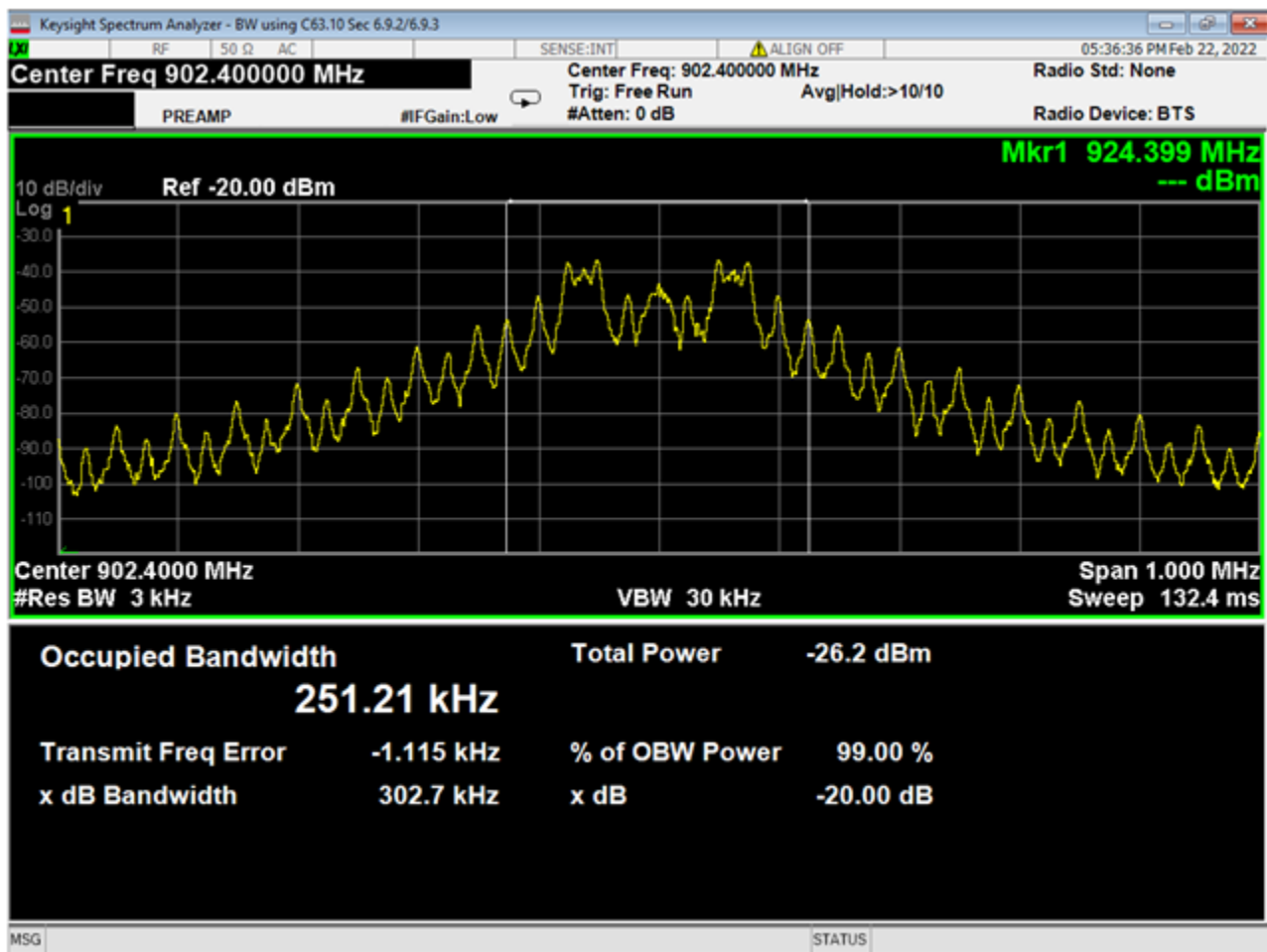


02. EIRP Mid Channel with corrections



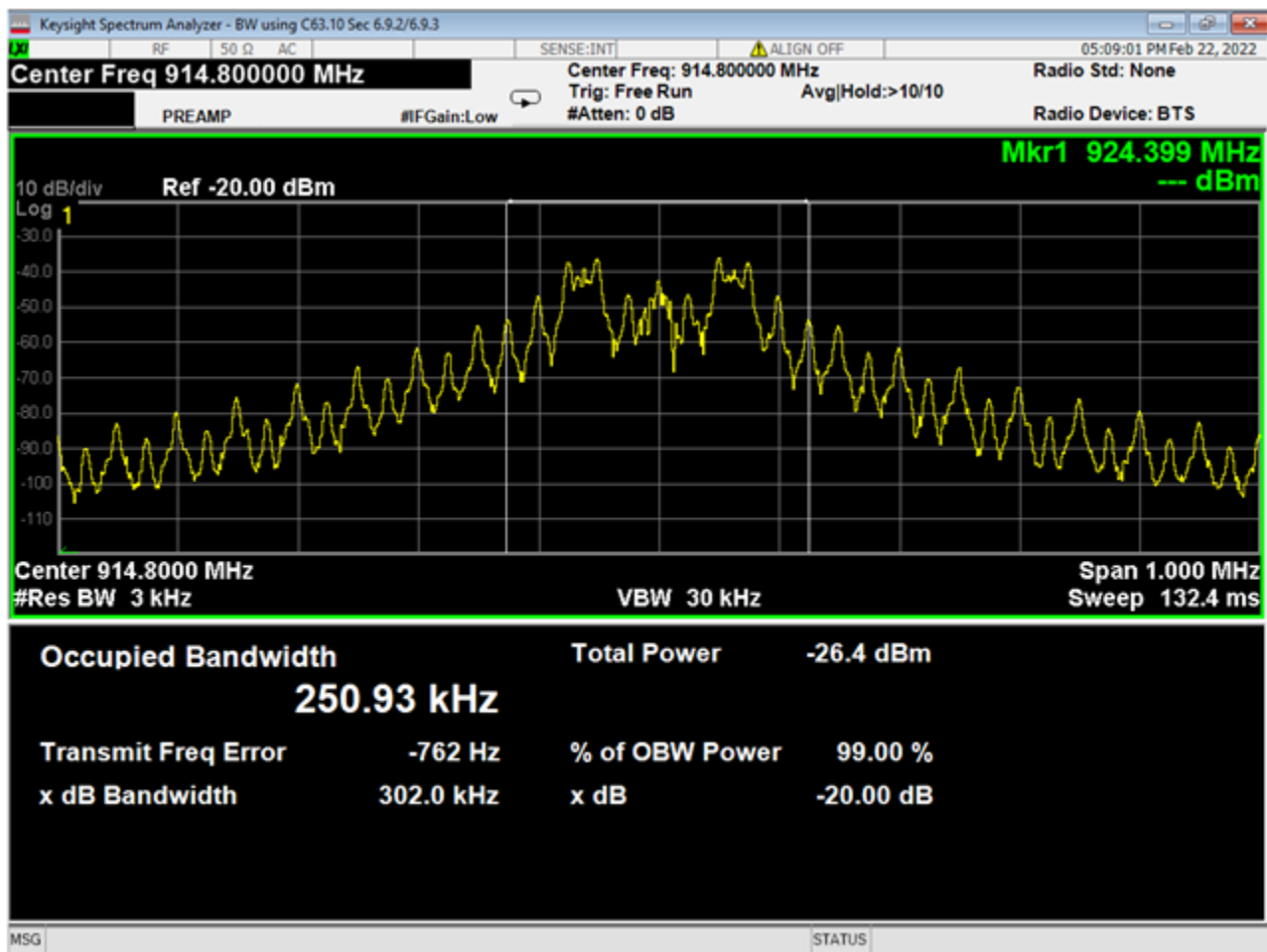
03 EIRP High Channel with correction

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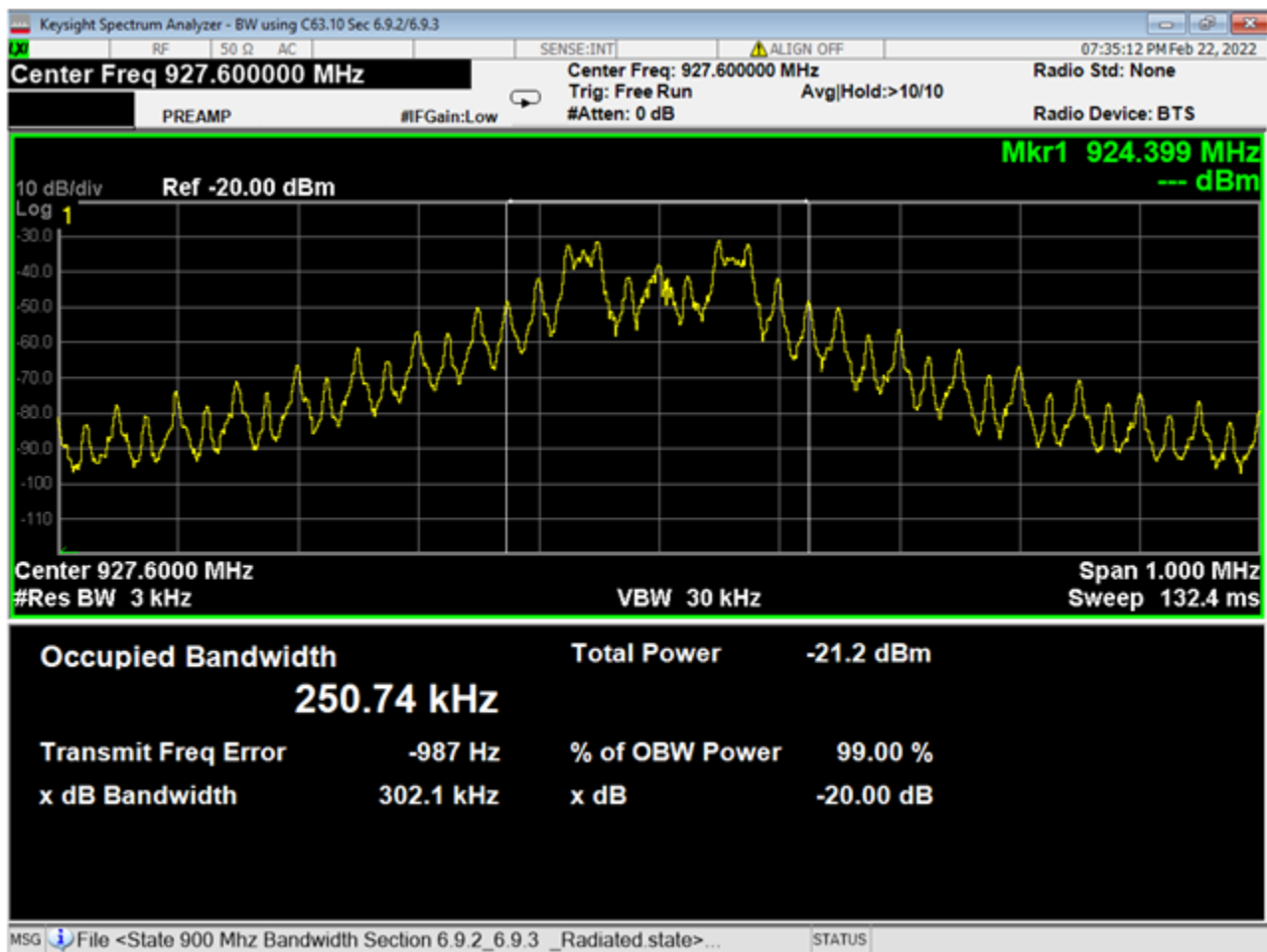
04 Bandwidth Low Channel

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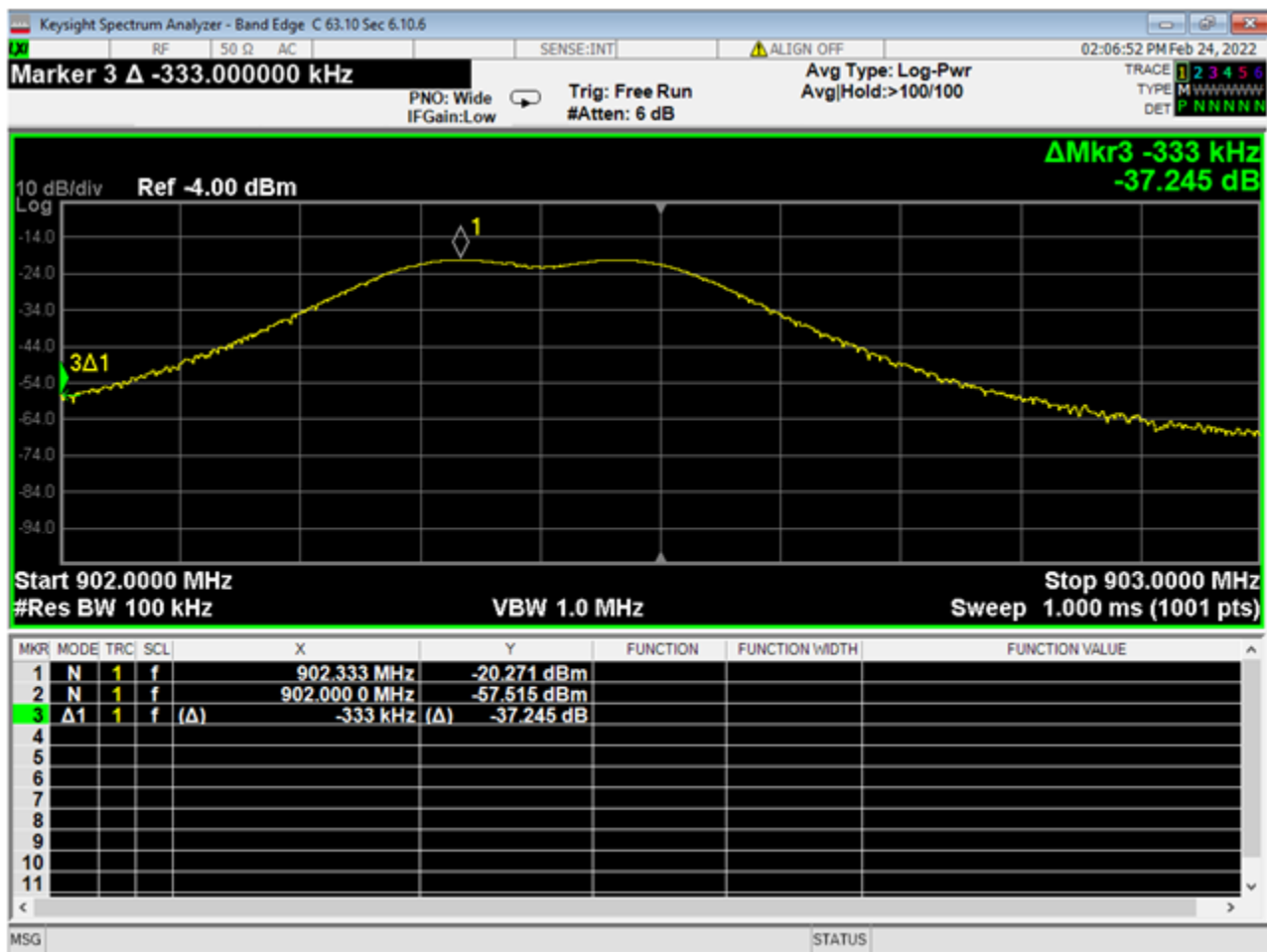


05. Bandwidth Mid Channel

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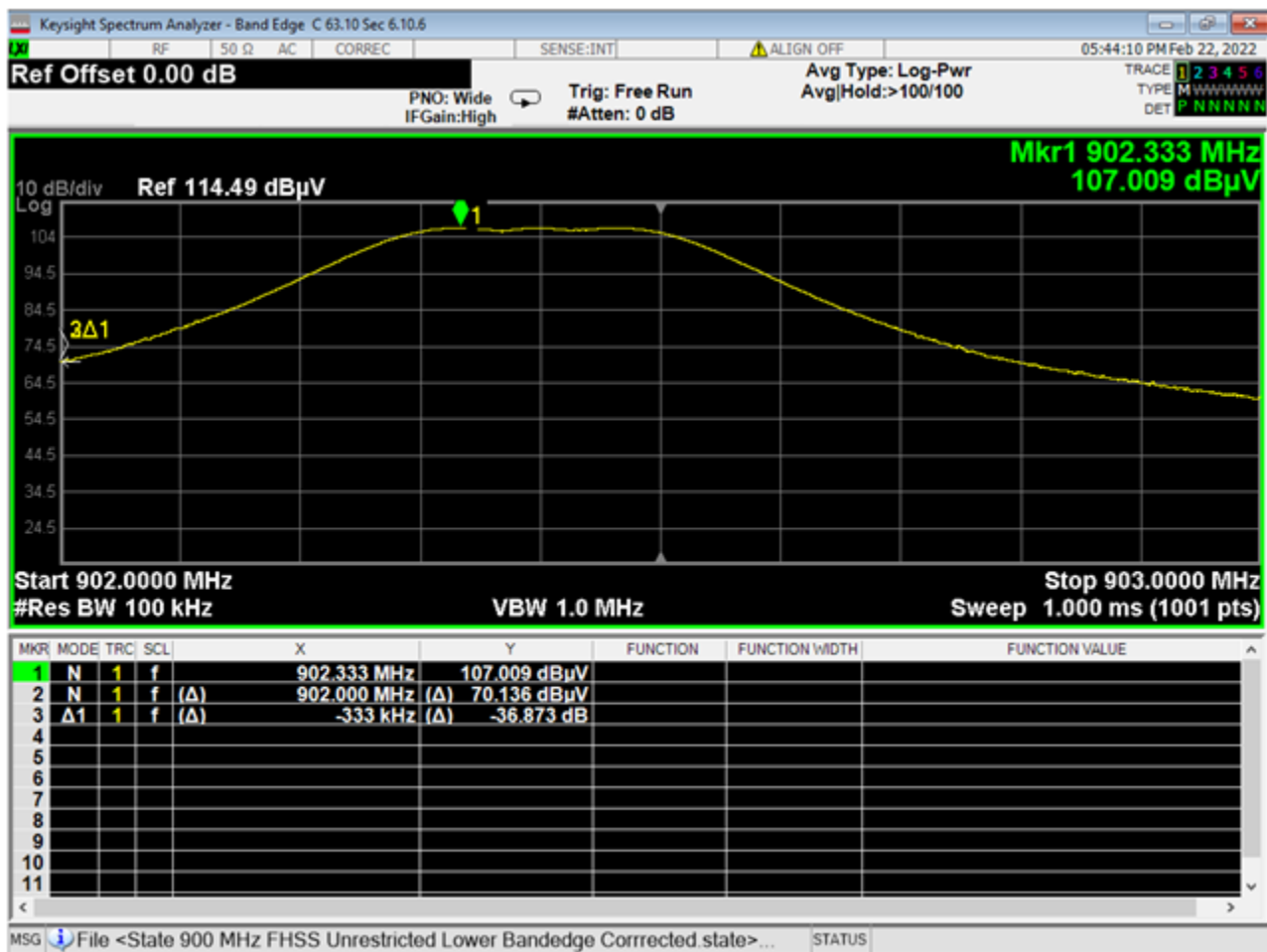


06 Bandwidth High Channel



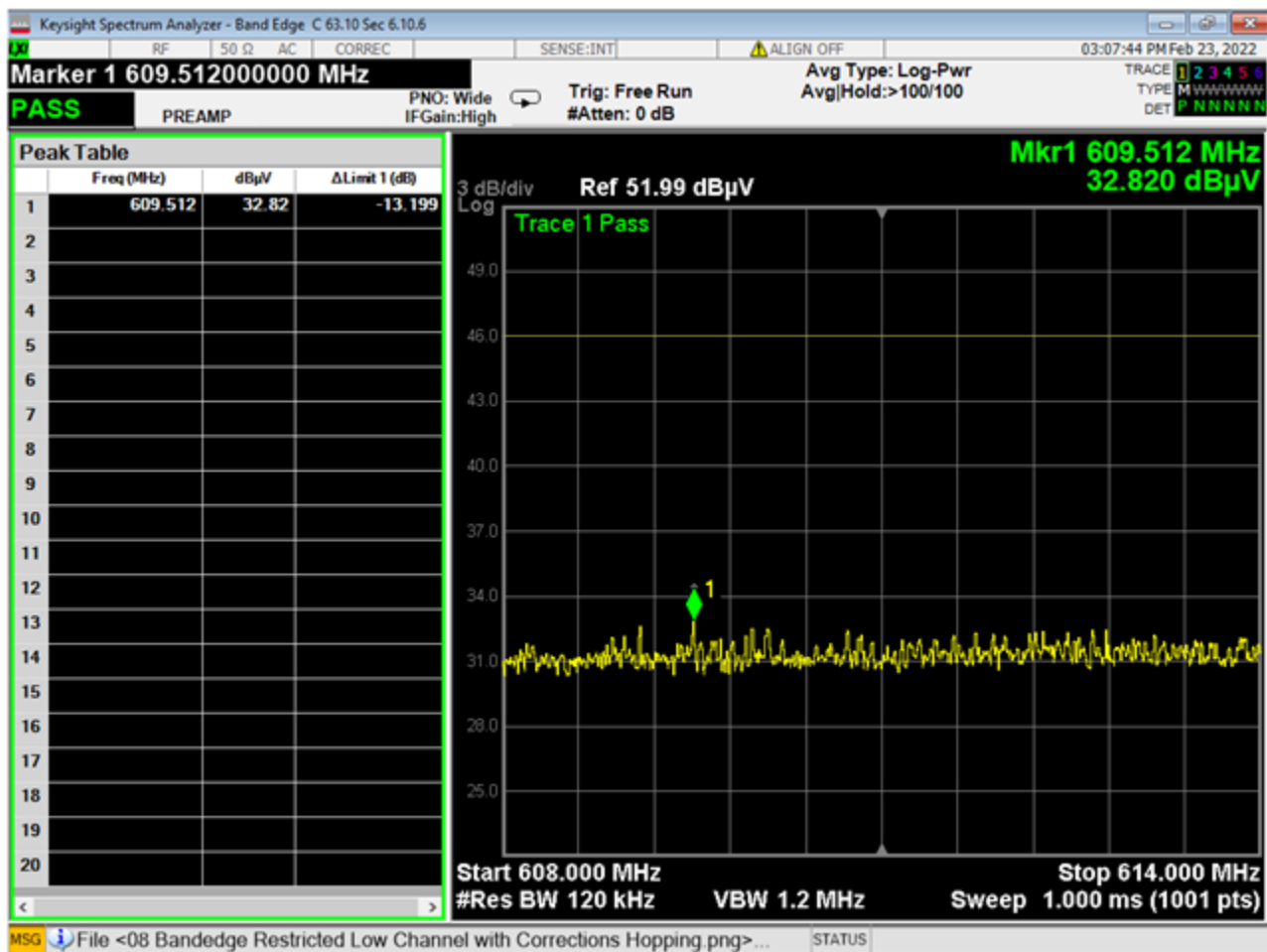
07 Bandedge Unrestricted Low Channel Hopping

Measurement was taken in dBm and converted to dBuV using: $\text{dBuV} = \text{dBm} + 107$, in results table. eg: $-20.271 + 107 = 86.729$.

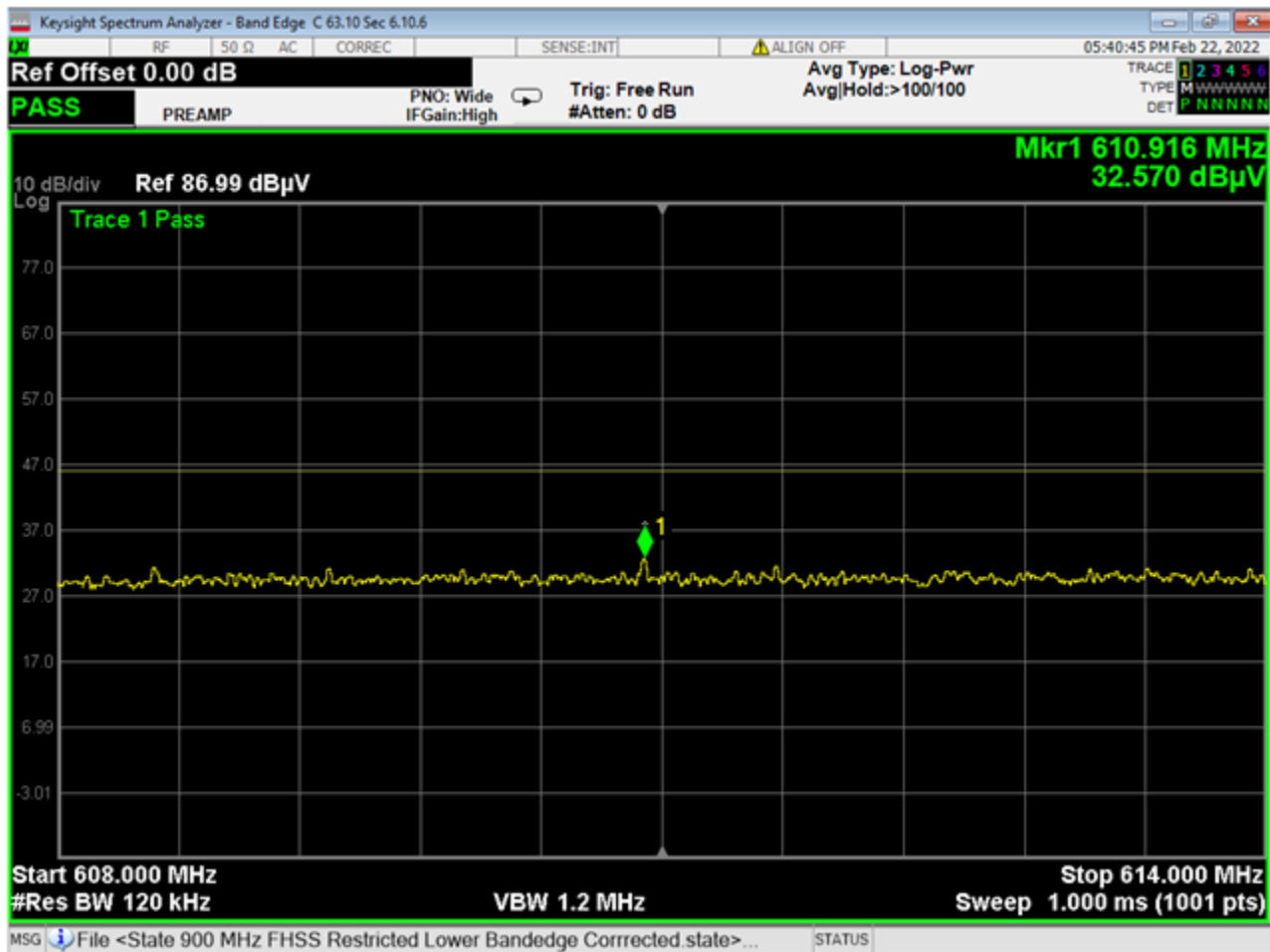


07 Bandedge Unrestricted Low Channel Relative

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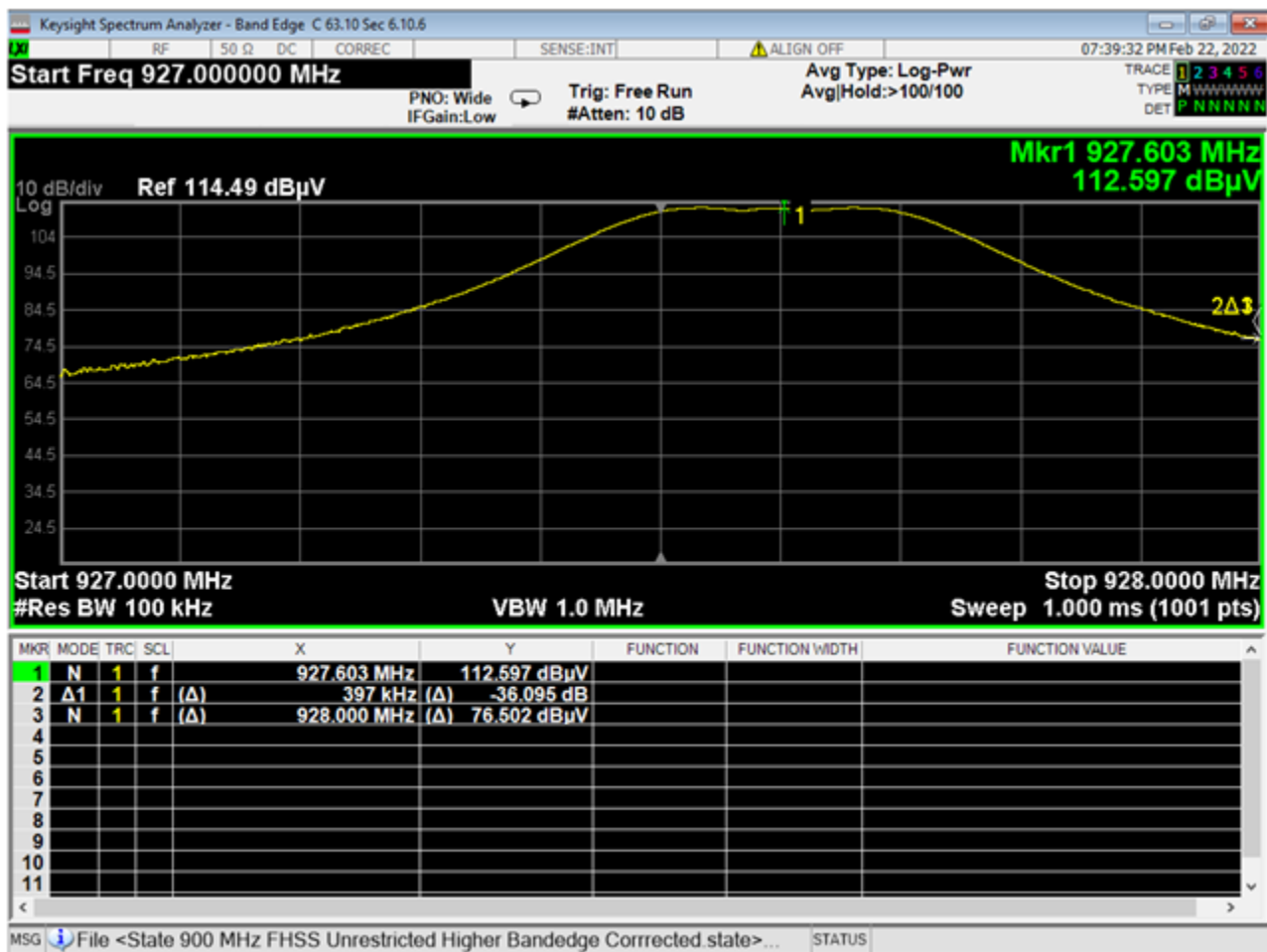


08 Bandedge Restricted Low Channel with Corrections Hopping

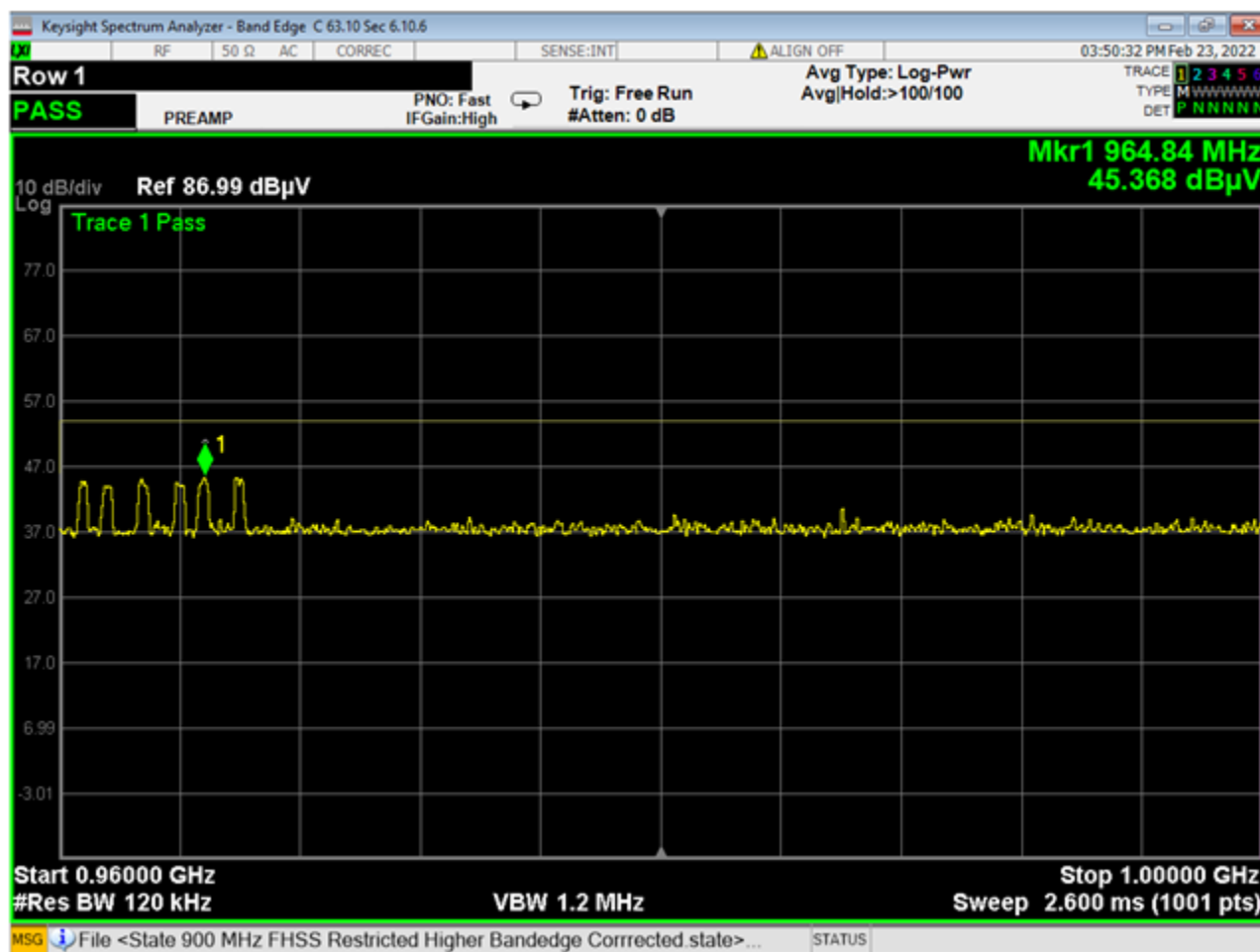


08 Bandedge Restricted Low Channel with Corrections

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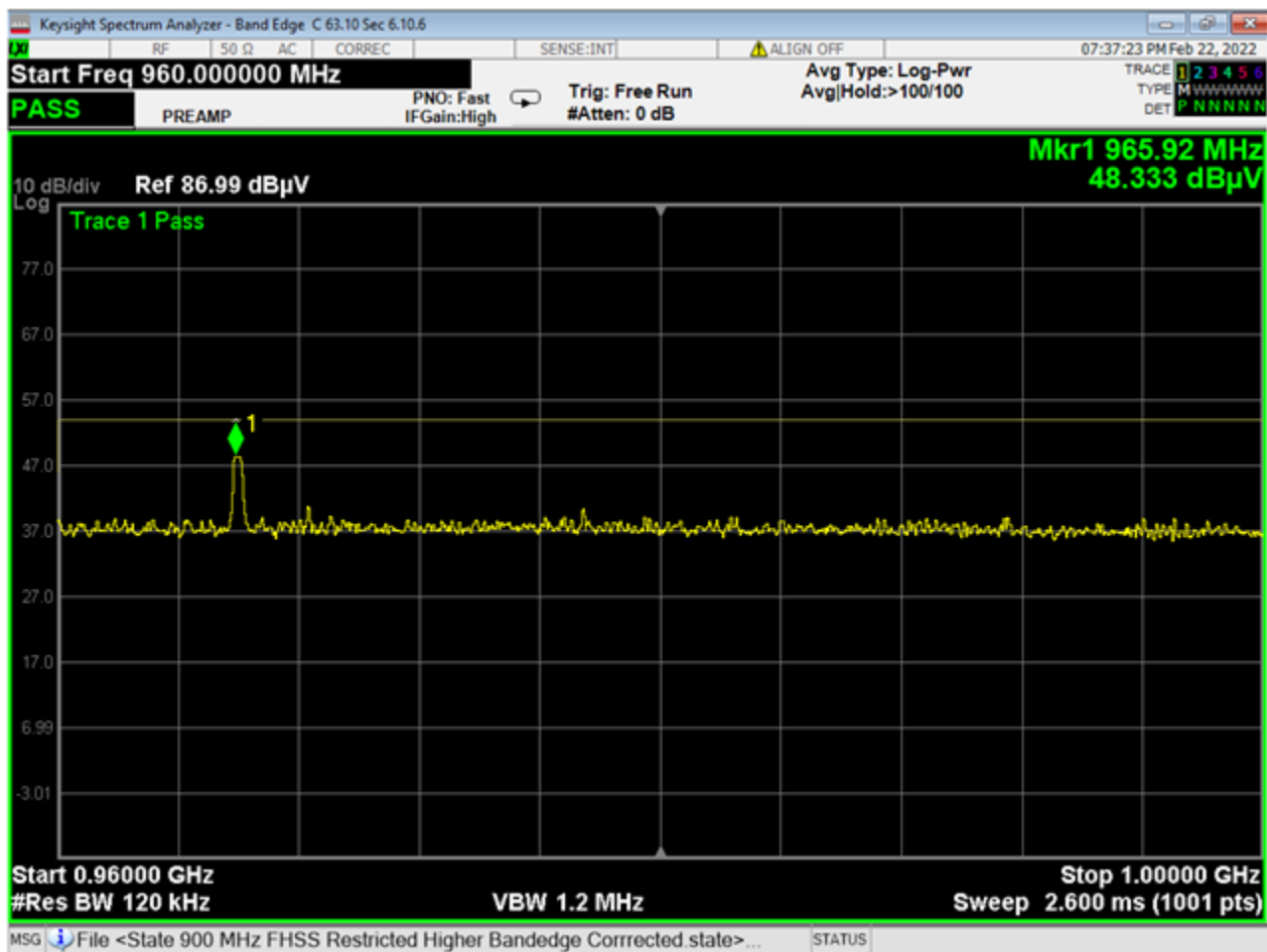


09 Bandedge Unrestricted High Channel



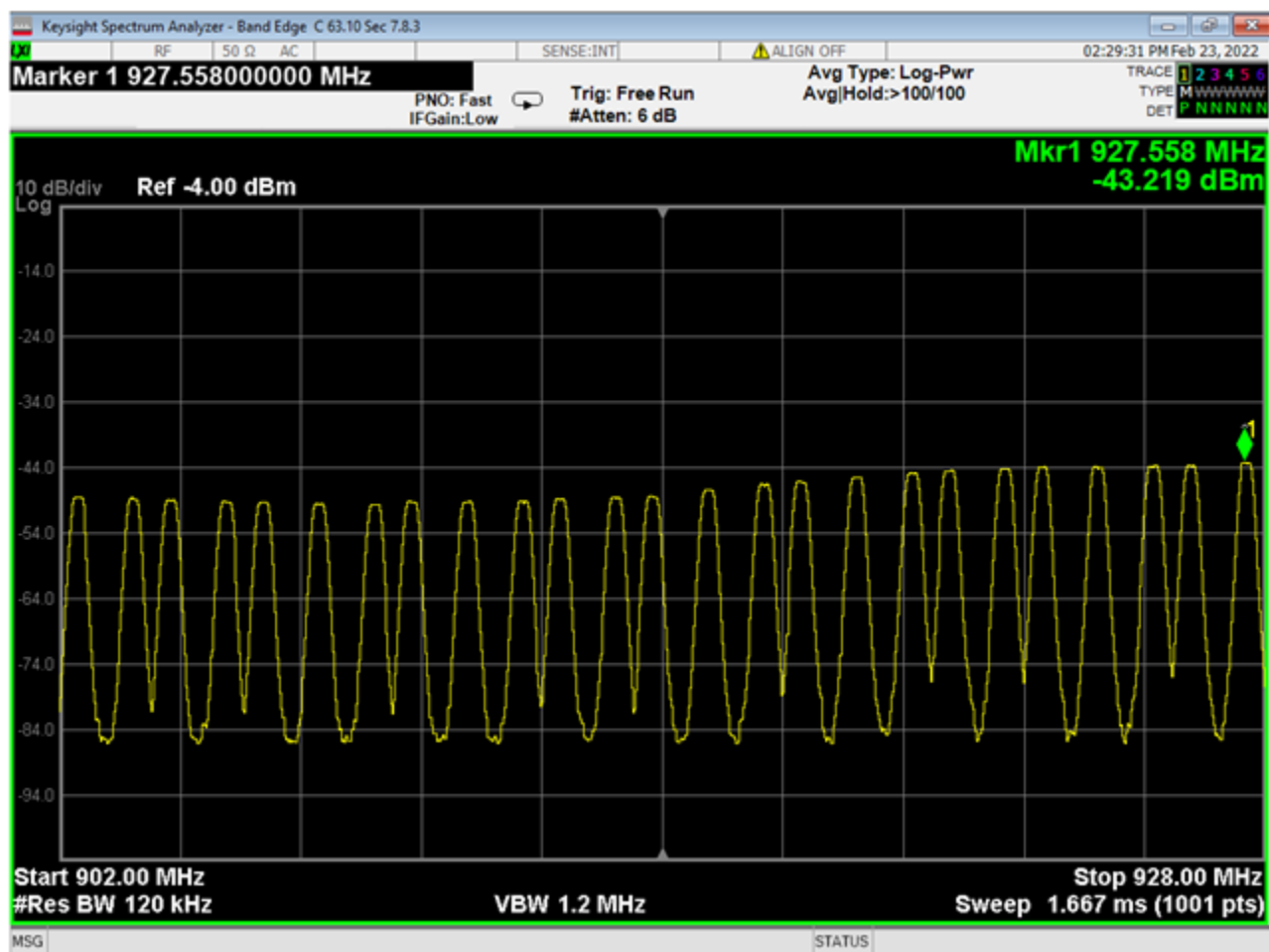
10 Bandedge Restricted High Channel with Corrections Hopping

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10 Bandedge Restricted High Channel with Corrections

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11 Hop Count, 25 Hops

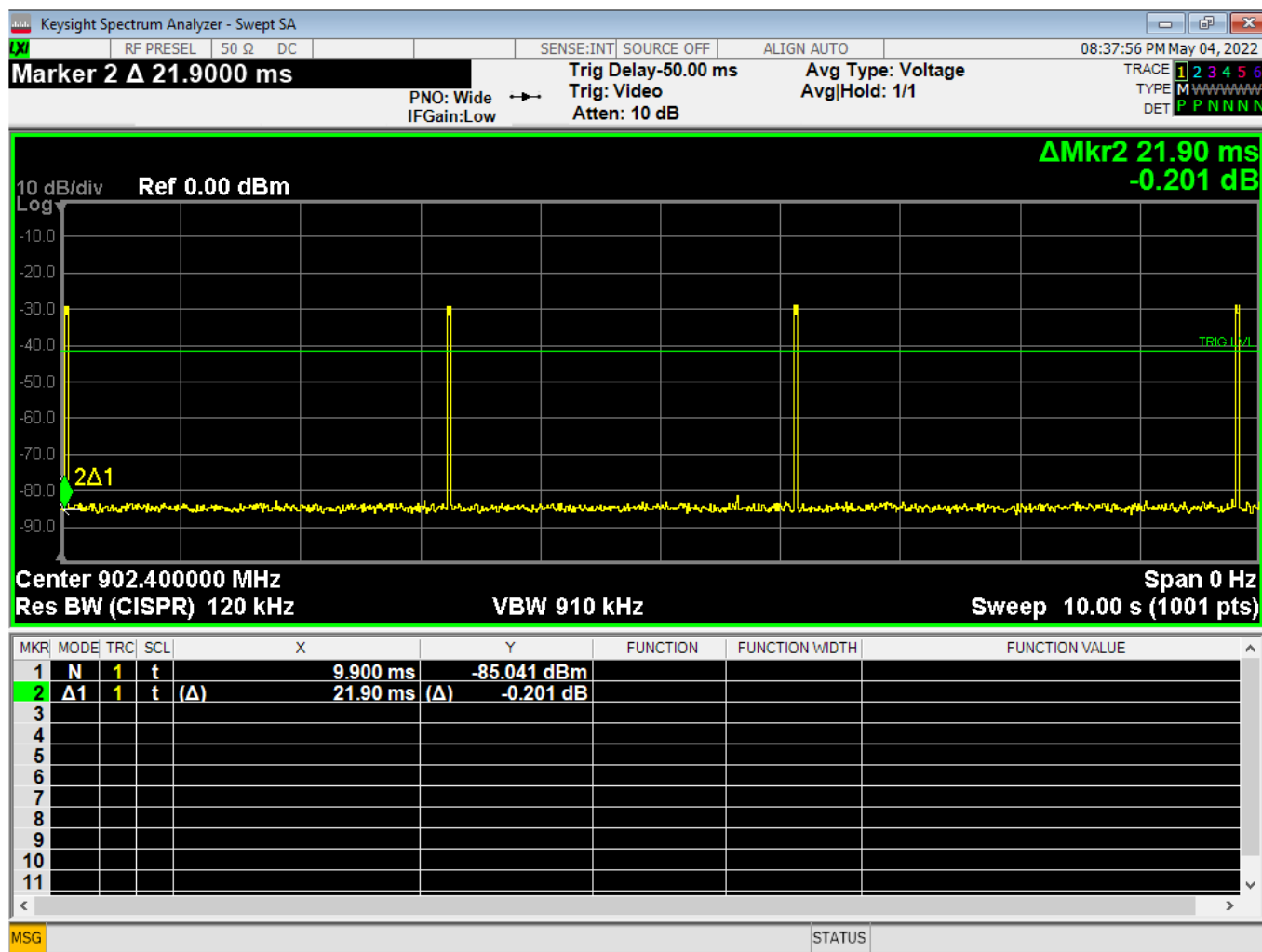


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14 Channel Occupancy in 10 s window, 4 Hops possible*

*Measured in hopping mode provided by the manufacturer.

$$21.9 \text{ ms} \times 4 = 87.6 \text{ ms} = 0.0876 \text{ s}$$



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