

**MEASUREMENT REPORT**  
**FCC Part 15C/ ISED RSS-247 902-928MHz Test Report**

**Applicant Name:**

Elster Solutions, LLC  
208 South Rogers Lane  
Raleigh, NC, 27610  
United States

**Date of Testing:**

03/15/2022 - 03/24/2022

**Test Site/Location:**

Element Lab., Columbia, MD, USA

**Test Report Serial No.:**

1M2203310044-01.QZC

<b>FCC ID:</b>	<b>QZC-SNRGK4</b>
<b>IC:</b>	<b>4557A-SNRGK4</b>
<b>APPLICANT:</b>	<b>Elster Solutions, LLC</b>

**Application Type:**

Certification

**Model/HVIN:**

SNRGK4 G01

**EUT Type:**

Non-Metering Gatekeeper/Synergynet Router

**Max. RF Output Power:**

28.44 dBm (698.072 mW)

**Frequency Range:**

902 – 928 MHz

**Type of Modulation:**

2FSK

**ISED Specification:**

RSS-247 Issue 2

**FCC Classification:**

FCC Part 15 Spread Spectrum Transmitter (DSS)

**Test Procedure(s):**

ANSI C63.10-2013

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



**RJ Ortanez**  
**Executive Vice President**



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## 1.0 INTRODUCTION

### 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

### 1.2 Element Test Location

These measurement tests were conducted at the Element Laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

### 1.3 Test Facility / Accreditations

**Measurements were performed at Element Lab located in Columbia, MD 21046, U.S.A.**

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Elster Solutions, LLC Non-Metering Gatekeeper/Synergynet Router FCC ID: QZC-SNRGK4**. The test data contained in this report pertains only to the emissions due to the EUT's 900MHz transmitter operating in both EA and SynergyNet modes.

**Test Device Serial No.:** 35H01

### 2.2 Device Capabilities

This device contains the following capabilities:

ISM 900MHz

Ch.	Frequency (MHz)
0	902.4
:	:
32	915.2
:	:
63	927.6

**Table 2-1. Frequency/ Channel Operations: Non-hopping mode**

Ch.	Frequency (MHz)
0	902.4
:	:
32	915.2
:	:
61	926.8

**Table 2-2. Frequency/ Channel Operations: Synergynet hopping mode**

Ch.	Frequency (MHz)
0	902.4
:	:
31	914.8

**Table 2-3. Frequency/ Channel Operations: EA Hopping mode**

**Note:** This device is capable of operating in hopping and non-hopping mode. The EUT can hop between 25 different channels in the EA mode and 50 different channels in the Synergynet mode within the 902-928MHz band.

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### 2.3 Antenna Description

The following antenna was used for the testing.

Frequency [MHz]	Antenna Gain (dBi)
900	3.0

Table 2-4. Antenna Peak Gain

### 2.4 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was also used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, and 7.8 for antenna port conducted emissions test setups.

### 2.5 Software and Firmware

The test was conducted with software/firmware version 255.29 installed on the EUT.

### 2.6 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement of the EUT.

Deviation from measurement procedure.....None

### 3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1-meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that the cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst-case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.11. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

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### 3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3-meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst-case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

### 3.4 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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## 4.0 ANTENNA REQUIREMENTS

**Excerpt from §15.203 of the FCC Rules/Regulations:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antennas of the EUT are **permanently attached**.
- There are no provisions for connection to an external antenna.

**Conclusion:**

The EUT complies with the requirement of §15.203 since the host unit will be professionally installed and locked shut when installed at a facility.

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## 5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ( $\pm$ dB)
Conducted Bench Top Measurements	1.13
Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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## 6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurement antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
ETS-Lindgren	3816/2NM	LISN	7/9/2020	Biennial	7/9/2022	114451
Keysight Technologies	N9038A	MXE EMI Receiver	1/21/2022	Annual	1/21/2023	MY51210133
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	2/14/2022	Annual	2/14/2023	MY52350166
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2022	Annual	3/15/2023	MY54500644
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/3/2021	Annual	8/3/2022	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	5/25/2021	Annual	5/25/2022	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	9/3/2021	Annual	9/3/2022	102134
Solar Electronics	8012-50-R-24-BNC	Line Impedance Stabilization Network	9/21/2021	Biennial	9/21/2022	310233
Sunol Science	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107

**Table 6-1. Annual Test Equipment Calibration Schedule**

### Notes:

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Elster Solutions, LLC  
 FCC ID: QZC-SNRGK4  
 Method/System: Frequency Hopping Spread Spectrum (FHSS)  
 Number of Channels: 25 (EA), 50 (SynergyNet)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(1)(i)	RSS-247 [5.1(c)]	20dB Bandwidth	≤500kHz	CONDUCTED	PASS	Section 7.2
15.247(b)(2)	RSS-247 [5.4(a)]	Peak Transmitter Output Power	<0.25 W for <50 hopping channels, <1W for ≥50 hopping channels		PASS	Section 7.3
n/a	RSS-247 [5.4(a)]	Peak Transmitter e.i.r.p.	<1 W for <50 hopping channels, <4W for ≥50 hopping channels		PASS	Section 7.3
15.247(a)(1)	RSS-247 [5.1(b)]	Channel Separation	25kHz or 20dB BW, whichever is greater		PASS	Section 7.5
15.247(a)(1)(i)	RSS-247 [5.1(c)]	Number of Channels	≥ 25 Channels		PASS	Section 7.7
15.247(a)(1)(i)	RSS-247 [5.1(c)]	Time of Occupancy	≤ 0.4s in 10/20s for >25/50 hopping channels respectively		PASS	Section 7.6
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	Conducted > 20dBc		PASS	Section 7.4, Section 7.8
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-247 limits)	RADIATED	PASS	Section 7.9, Section 7.10
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen [8.8] limits)	LINE CONDUCTED	PASS	Section 7.11

**Table 7-1. Summary of Test Results**

**Notes:**

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used .
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST “Chamber Automation,” Version 1.3.1.

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## 7.2 20dB Bandwidth Measurement

§15.247 (a.1.i); RSS-247 [5.1(c)]

### Test Overview and Limit

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

*The maximum allowed 20 dB bandwidth of the hopping channel is 500kHz.*

### Test Procedure Used

ANSI C63.10-2013 – Section 6.9.2

### Test Settings

1. The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 20dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 20. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% OBW
3. VBW ≥ 3 x RBW
4. Reference level set to keep signal from exceeding maximum input mixer level for linear operation.
5. Detector = Peak
6. Trace mode = max hold
7. Sweep = auto couple
8. The trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 7-1. Test Instrument & Measurement Setup**

### Test Notes

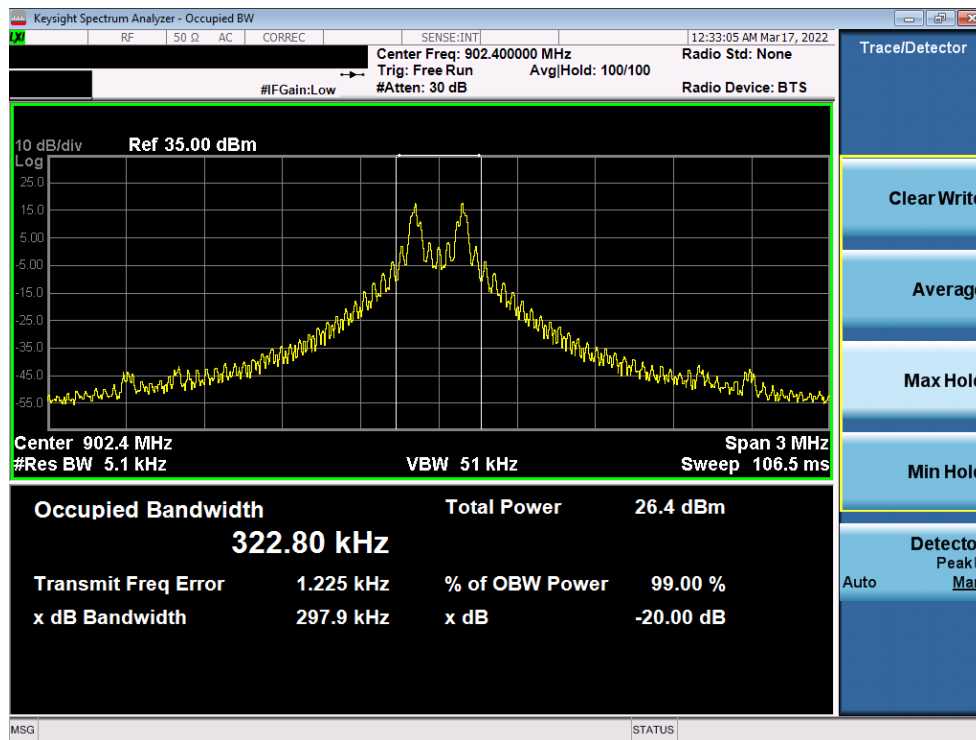
None

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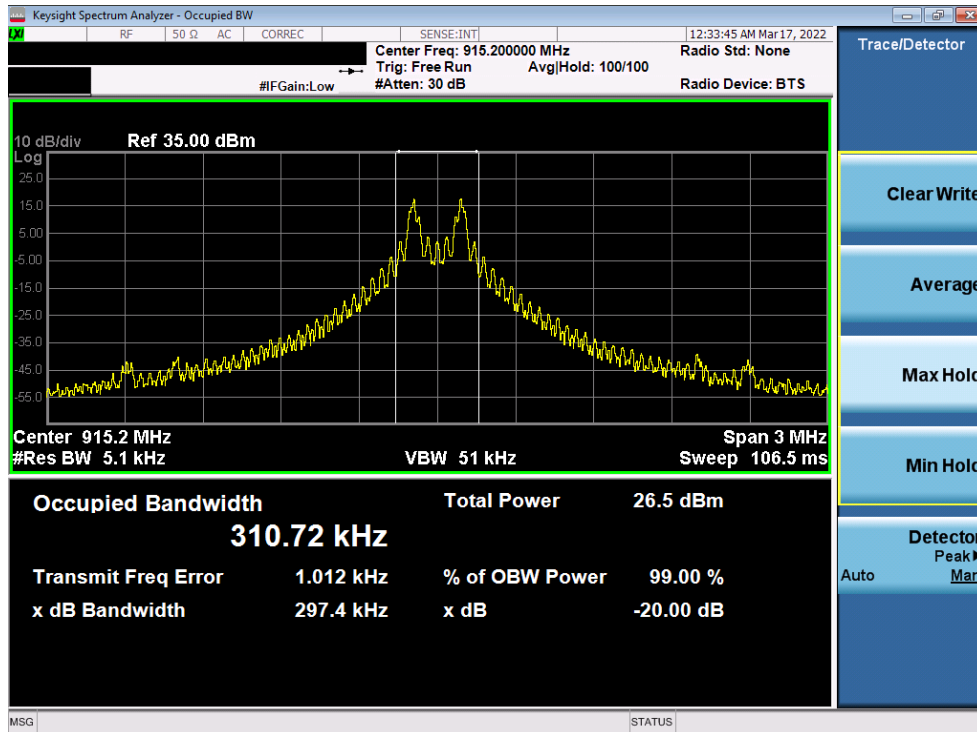
Frequency [MHz]	Mode	Data Rate [kbps]	Channel No.	20dB Bandwidth [kHz]
902.4	EA LAN1	35.56	0	297.9
915.2	EA LAN1	35.56	32	297.4
927.6	EA LAN1	35.56	63	297.3
902.4	EA LAN2	142.22	0	304.4
915.2	EA LAN2	142.22	32	307.6
927.6	EA LAN2	142.22	63	315.5
902.4	SN 50K	50.0	0	109.1
915.2	SN 50K	50.0	32	108.5
927.6	SN 50K	50.0	63	108.4
902.4	SN 150K	150.0	0	198.7
915.2	SN 150K	150.0	32	198.4
927.6	SN 150K	150.0	63	198.2
902.4	SN 200K	200.0	0	265.4
915.2	SN 200K	200.0	32	264.6
927.6	SN 200K	200.0	63	265.0

**Table 7-2. Conducted 20dB Bandwidth Measurements**

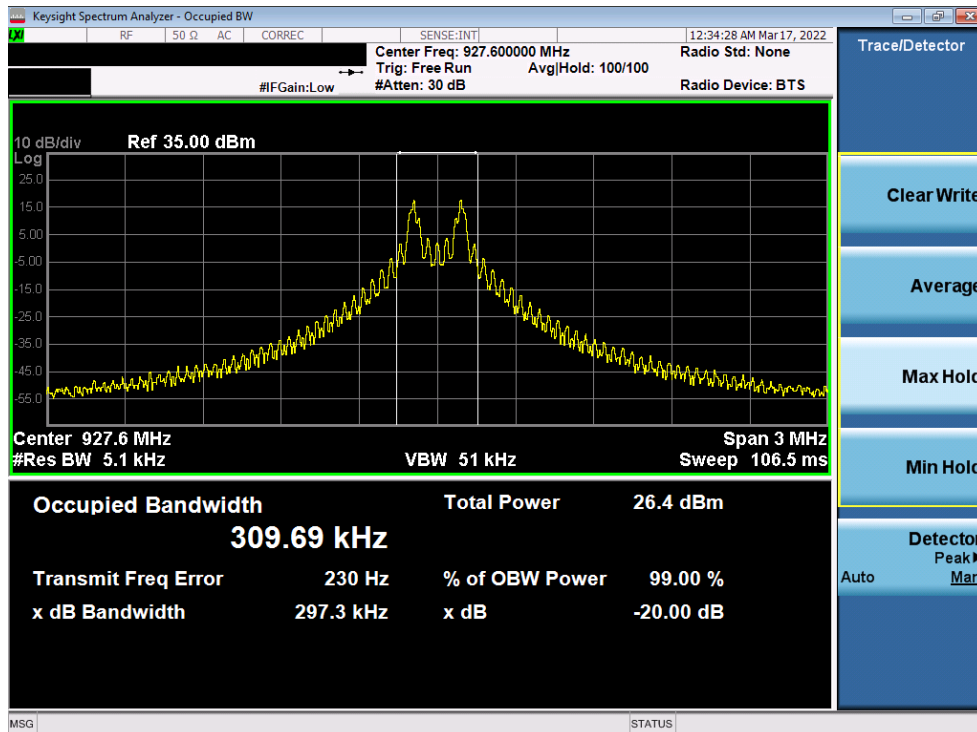


**Plot 7-1. 20dB Bandwidth Plot (EA LAN1, 35.56kbps – Ch. 0)**

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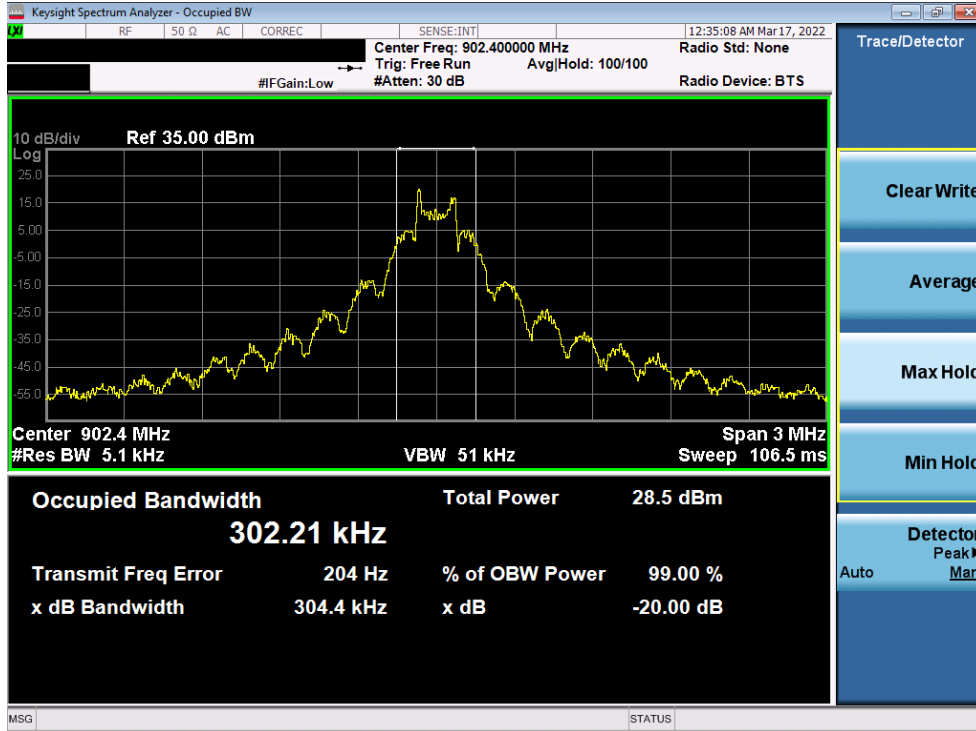


Plot 7-2. 20dB Bandwidth Plot (EA LAN1, 35.56kbps – Ch. 32)

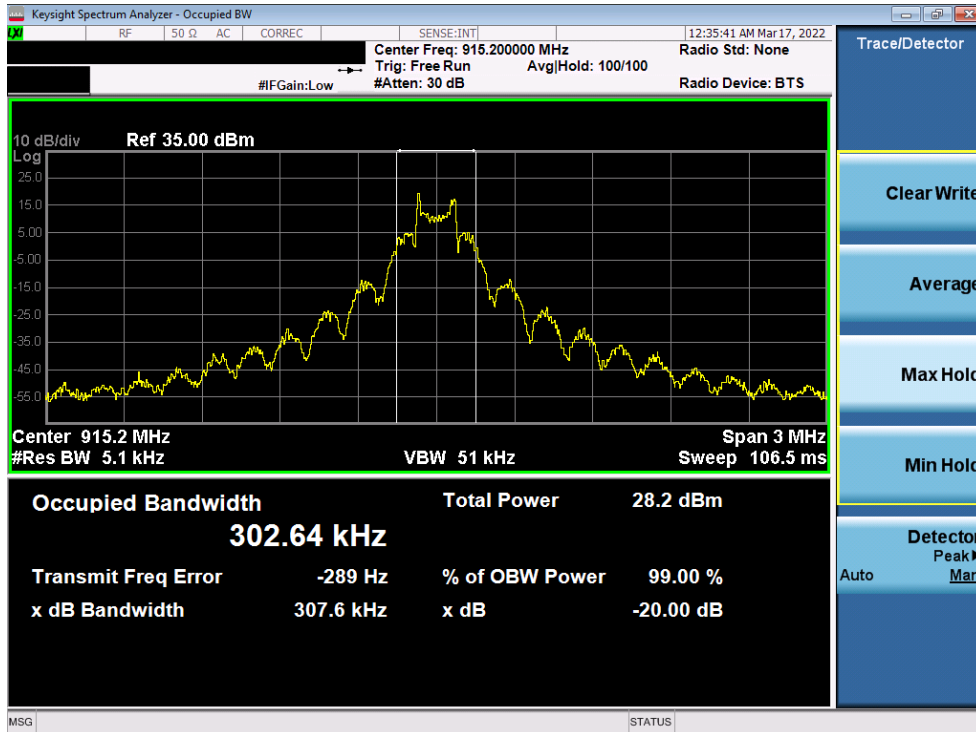


Plot 7-3. 20dB Bandwidth Plot (EA LAN1, 35.56kbps – Ch. 63)

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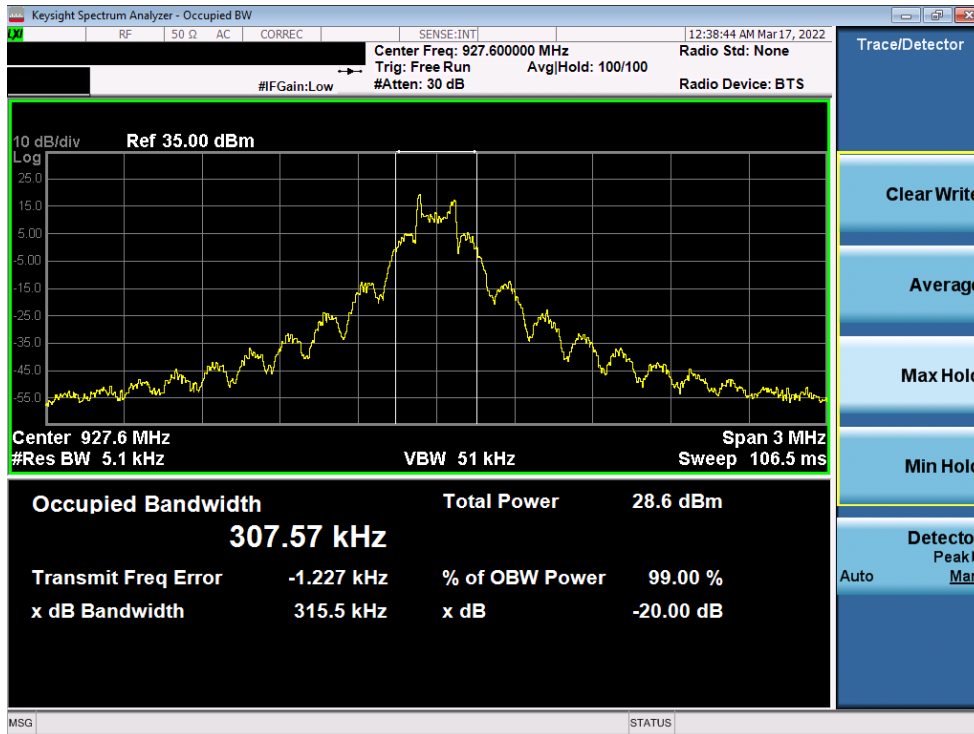


Plot 7-4. 20dB Bandwidth Plot (EA LAN2, 142.22kbps – Ch. 0)

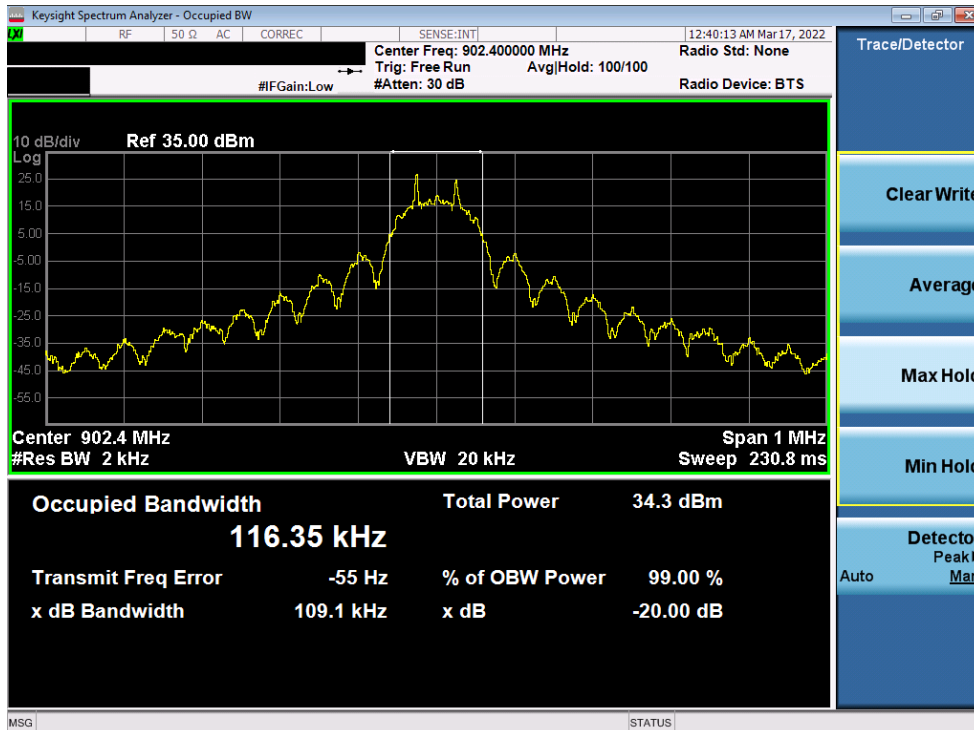


Plot 7-5. 20dB Bandwidth Plot (EA LAN2, 142.22kbps – Ch. 32)

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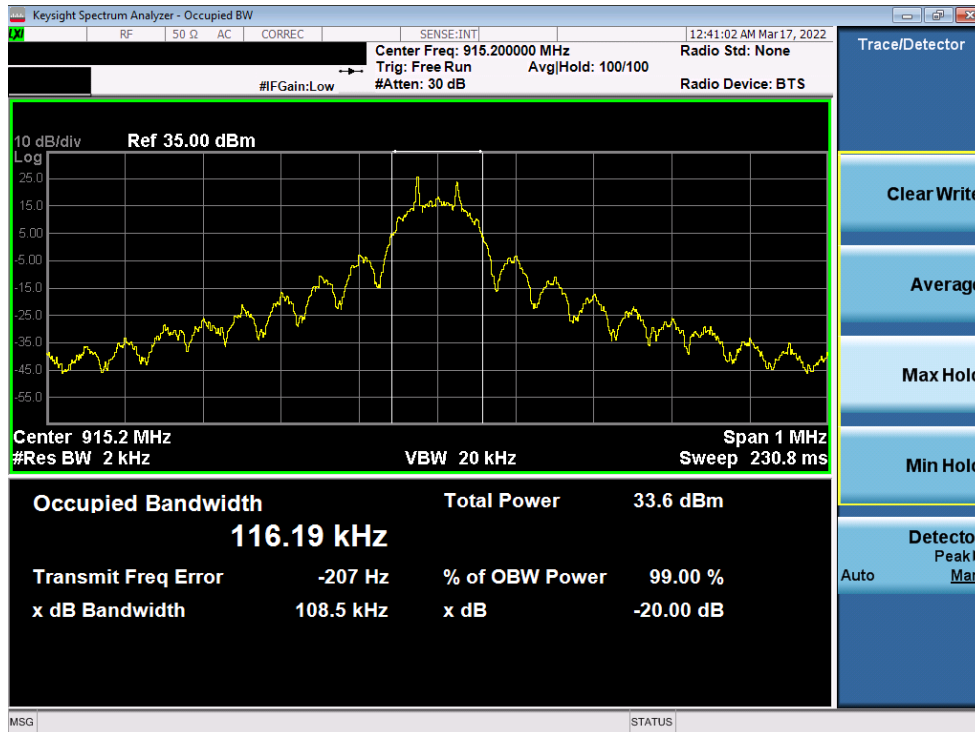
Plot 7-6. 20dB Bandwidth Plot (EA LAN2, 142.22kbps – Ch. 63)



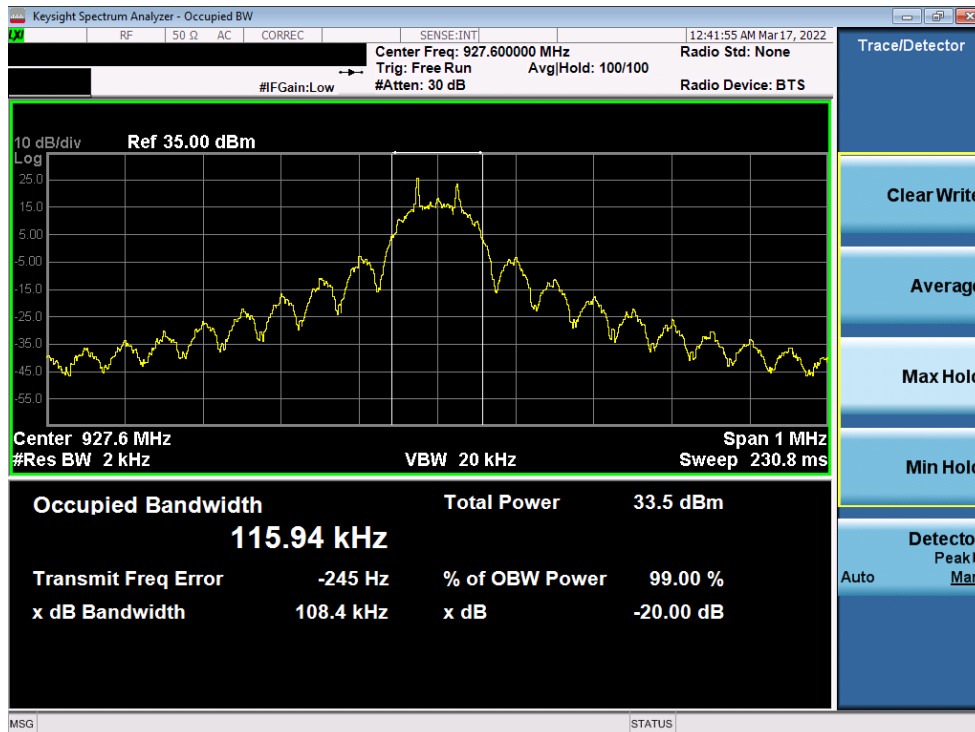
Plot 7-7. 20dB Bandwidth Plot (SN 50K, 50kbps – Ch. 0)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 16 of 78



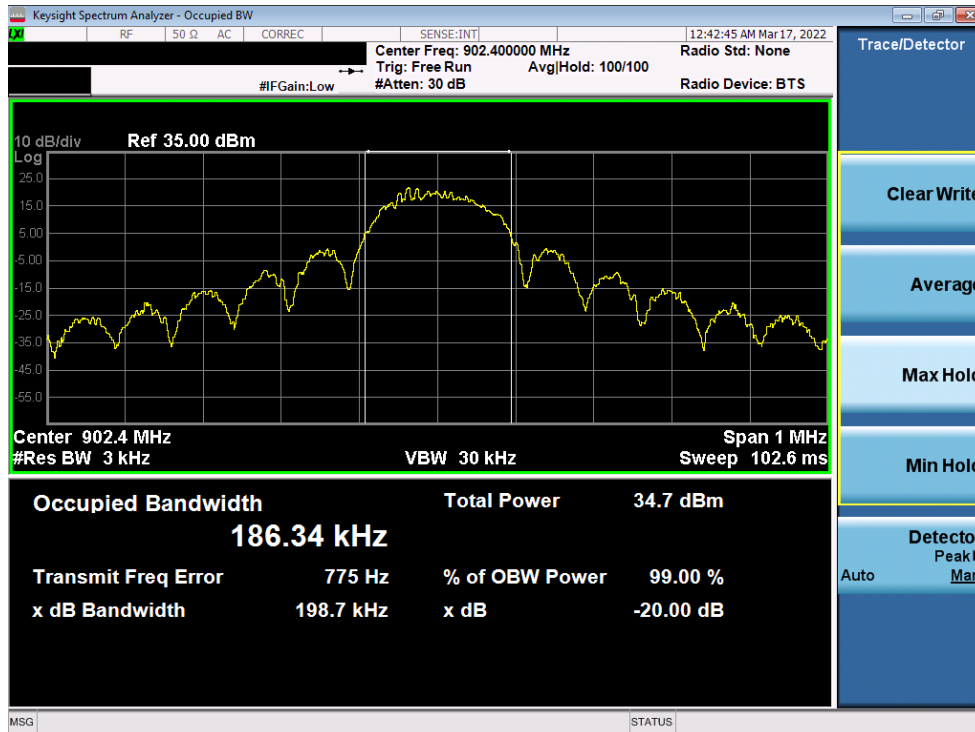


Plot 7-8. 20dB Bandwidth Plot (SN 50K, 50kbps – Ch. 32)

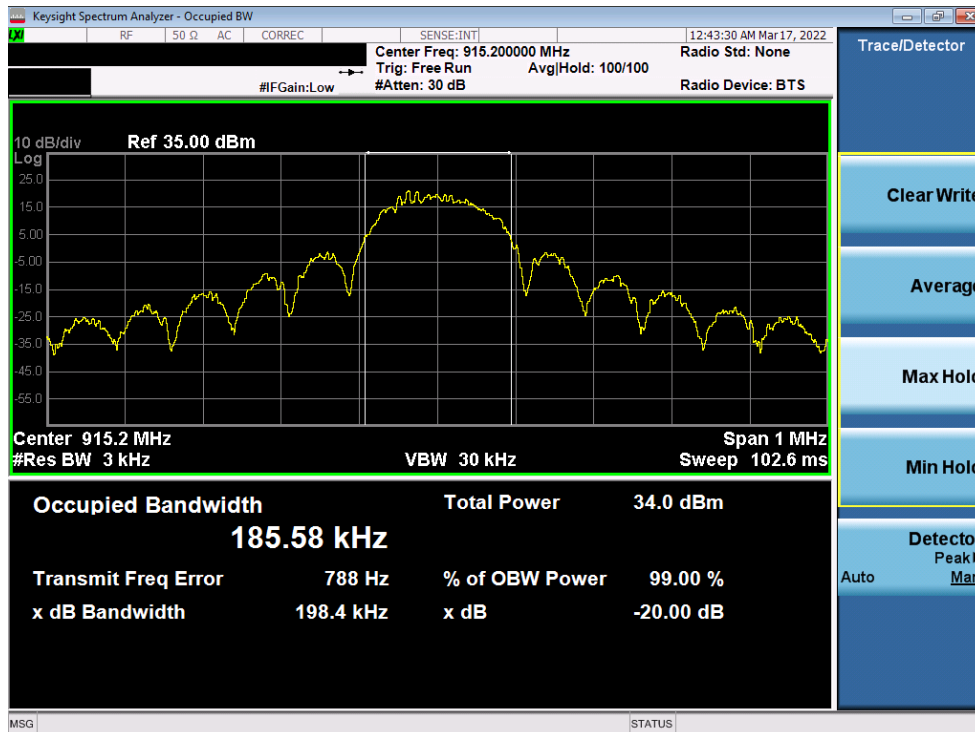


Plot 7-9. 20dB Bandwidth Plot (SN 50K, 50kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 17 of 78

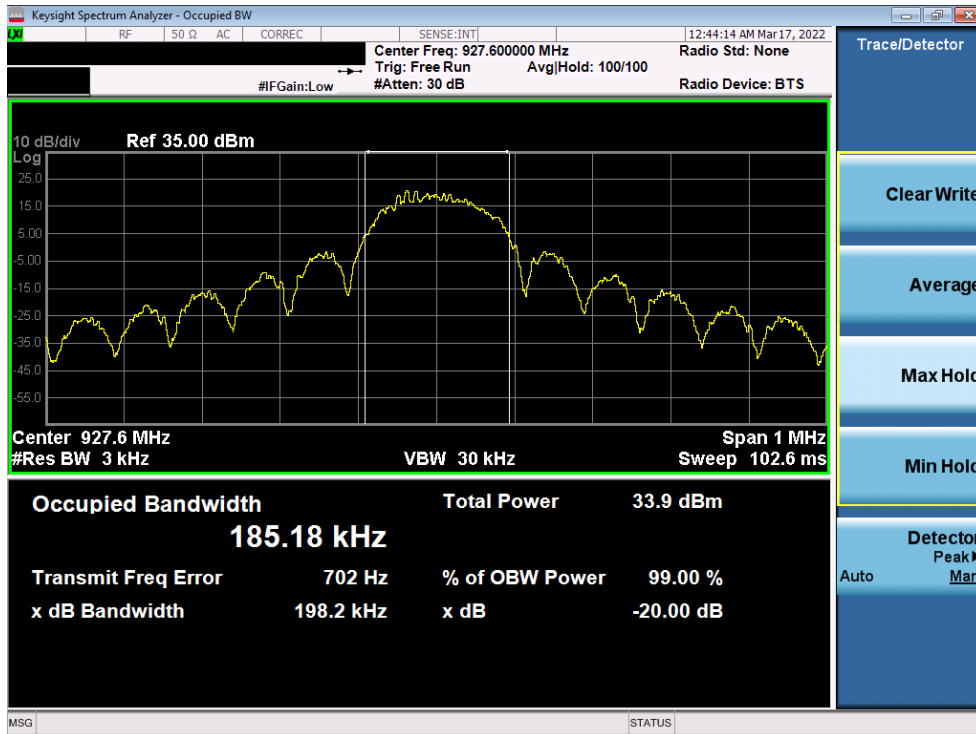


Plot 7-10. 20dB Bandwidth Plot (SN 150K, 150kbps – Ch. 0)

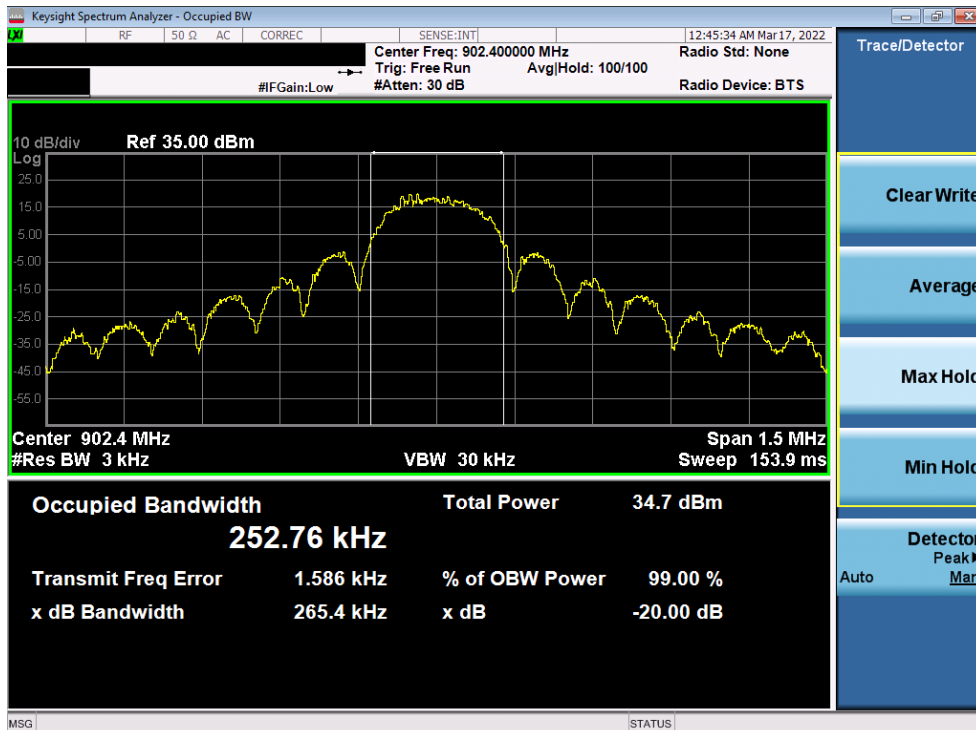


Plot 7-11. 20dB Bandwidth Plot (SN 150K, 150kbps – Ch. 32)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 18 of 78

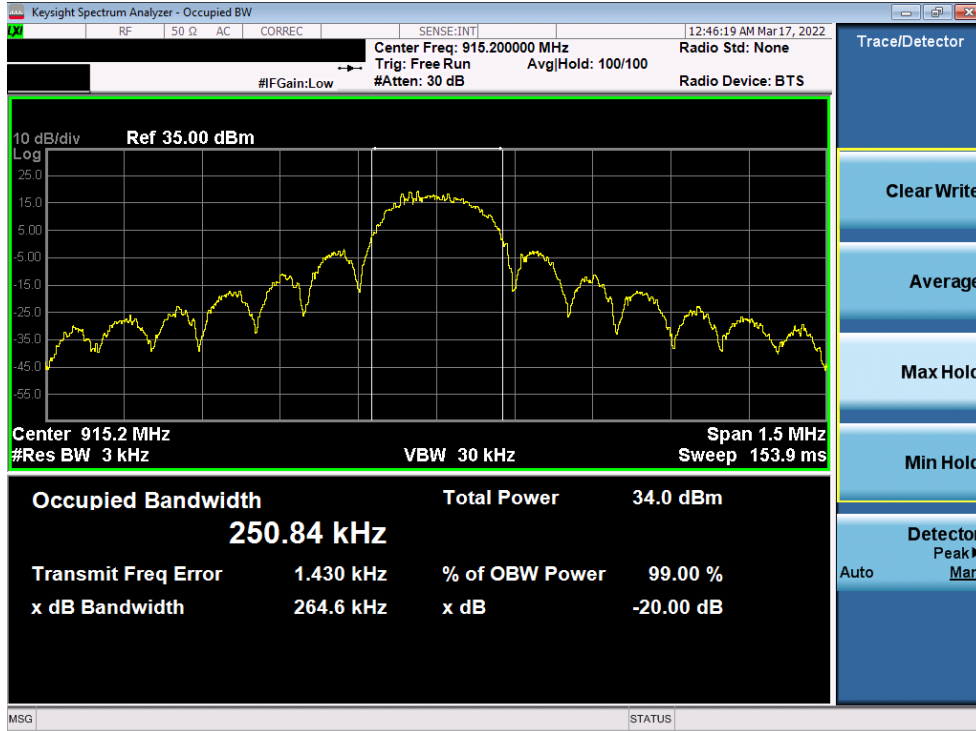


Plot 7-12. 20dB Bandwidth Plot (SN 150K, 150kbps – Ch. 63)

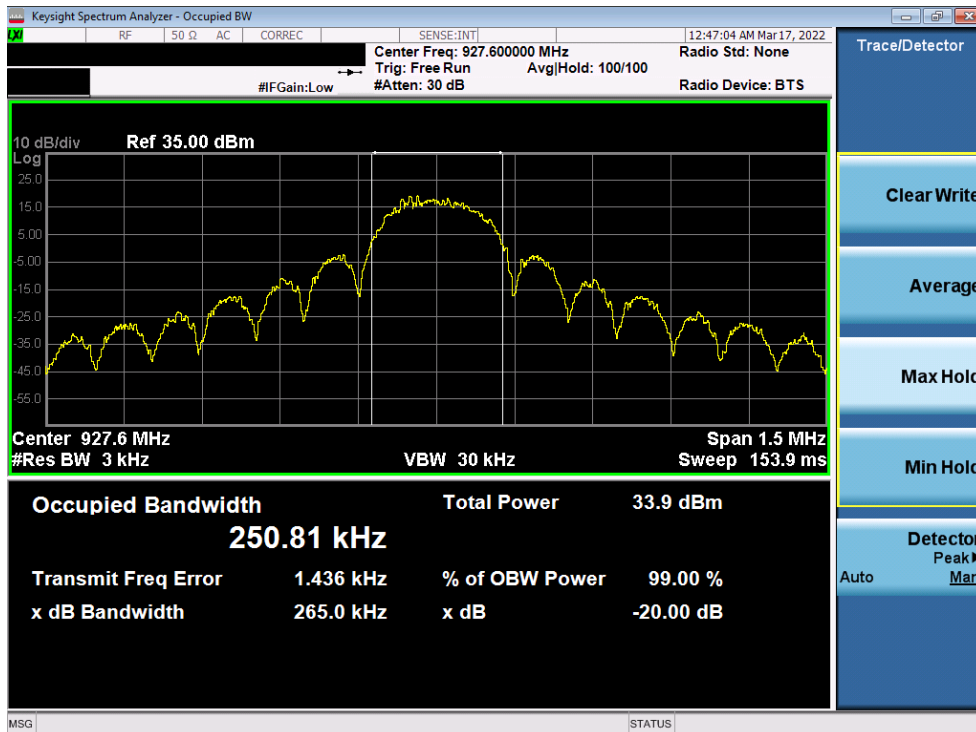


Plot 7-13. 20dB Bandwidth Plot (SN 200K, 200kbps – Ch. 0)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 19 of 78



Plot 7-14. 20dB Bandwidth Plot (SN 200K, 200kbps – Ch. 32)



Plot 7-15. 20dB Bandwidth Plot (SN 200K, 200kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 20 of 78

### 7.3 Output Power Measurement

§15.247 (b.2); RSS-247 [5.4(a)]

#### Test Overview and Limits

Measurement is made while the EUT is operating in non-hopping transmission mode. The powers shown below were measured using a spectrum analyzer.

***The maximum permissible output power is 1W conducted and 4W e.i.r.p. for 50 channels or more and 0.25W conducted and 1W e.i.r.p. for 25 channels.***

#### Test Procedure Used

ANSI C63.10-2013 – Section 7.8.5

#### Test Settings

##### Peak Power Measurement

1. Span = approximately 5x 20dB bandwidth, centered on hopping channel
2. RBW > 20dB bandwidth of emission being measured
3. VBW ≥ RBW
4. Sweep = auto
5. Detector = peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

#### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 7-2. Test Instrument & Measurement Setup**

#### Note

Final results were obtained using calibrated attenuators and cables. The following formula was used:

$$\text{Output Power (dBm)} = \text{Raw Analyzer Level (dBm)} + \text{Cable Loss (dB)}$$

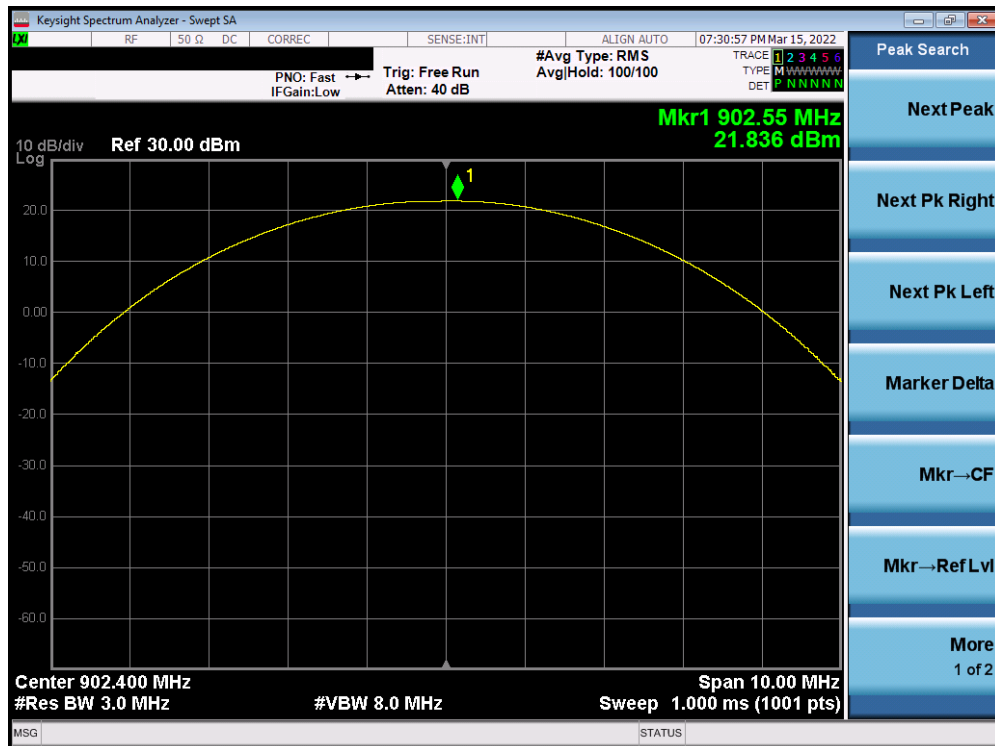
$$\text{e.i.r.p} = \text{Output Power (dBm)} + \text{Antenna Gain (dBi)}$$

FCC ID: QZC-SNRGK4	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
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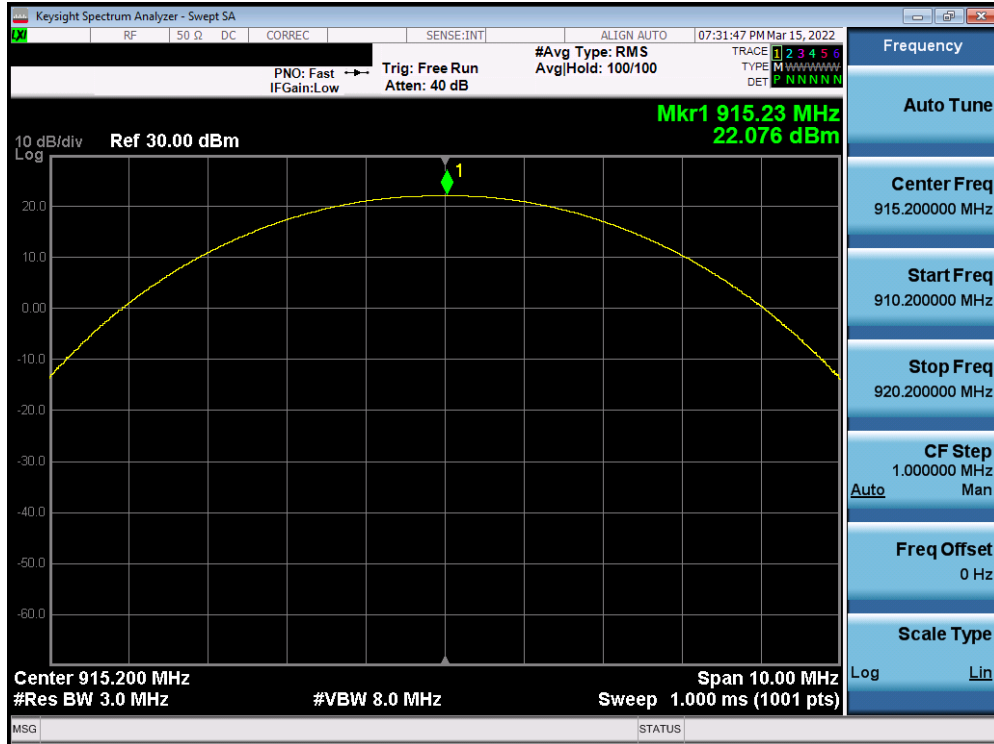
Frequency [MHz]	Mode	Data Rate [kbps]	Channel No.	Peak Conducted Power		Antenna Gain [dBi]	Peak e.i.r.p	
				[dBm]	[mW]		[dBm]	[mW]
902.4	EA LAN1	35.56	0	21.84	152.616	3	24.84	304.509
915.2	EA LAN1	35.56	32	22.08	161.287	3	25.08	321.810
927.6	EA LAN1	35.56	63	22.18	165.272	3	25.18	329.762
902.4	EA LAN2	142.22	0	21.92	155.704	3	24.92	310.670
915.2	EA LAN2	142.22	32	22.10	162.069	3	25.10	323.370
927.6	EA LAN2	142.22	63	22.02	159.038	3	25.02	317.322
902.4	SN 50K	50.0	0	28.44	698.072	3	31.44	1392.836
915.2	SN 50K	50.0	32	27.51	563.248	3	30.51	1123.828
927.6	SN 50K	50.0	63	27.77	598.412	3	30.77	1193.988
902.4	SN 150K	150.0	0	28.26	670.193	3	31.26	1337.211
915.2	SN 150K	150.0	32	27.56	570.296	3	30.56	1137.889
927.6	SN 150K	150.0	63	27.42	552.332	3	30.42	1102.047
902.4	SN 200K	200.0	0	28.11	646.696	3	31.11	1290.328
915.2	SN 200K	200.0	32	27.50	562.082	3	30.50	1121.502
927.6	SN 200K	200.0	63	27.58	572.796	3	30.58	1142.878

**Table 7-3. Conducted Output Power Measurements and e.i.r.p**

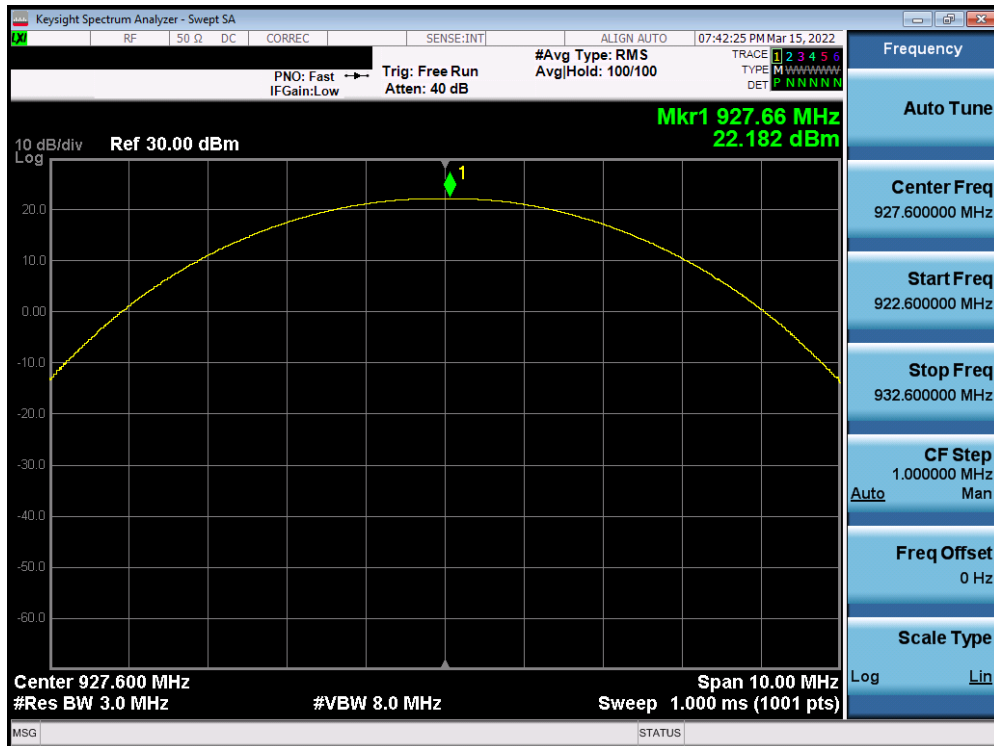


**Plot 7-16. Peak Conducted Power (EA LAN1, 35.56kbps – Ch. 0)**

FCC ID: QZC-SNRGK4	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
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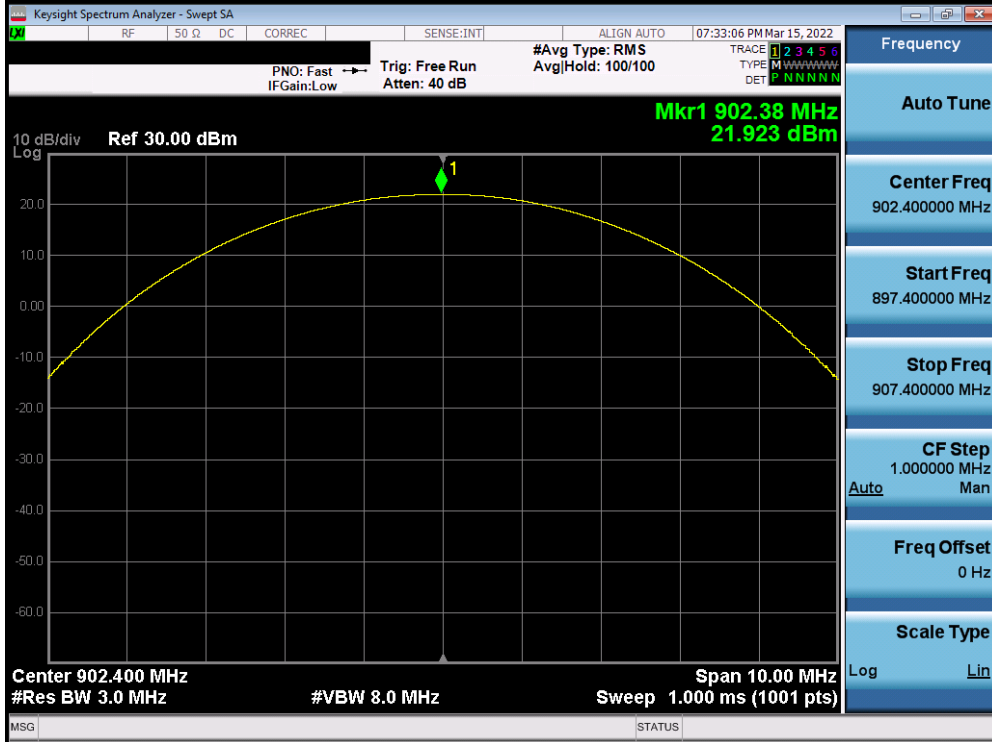


Plot 7-17. Peak Conducted Power (EA LAN1, 35.56kbps – Ch. 32)

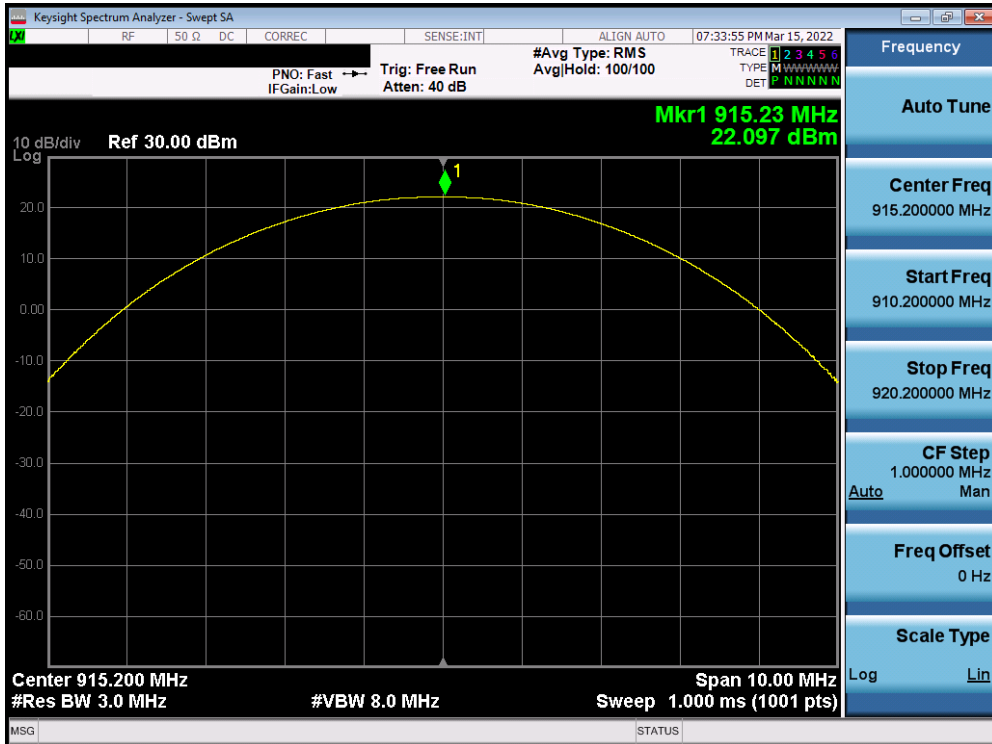


Plot 7-18. Peak Conducted Power (EA LAN1, 35.56kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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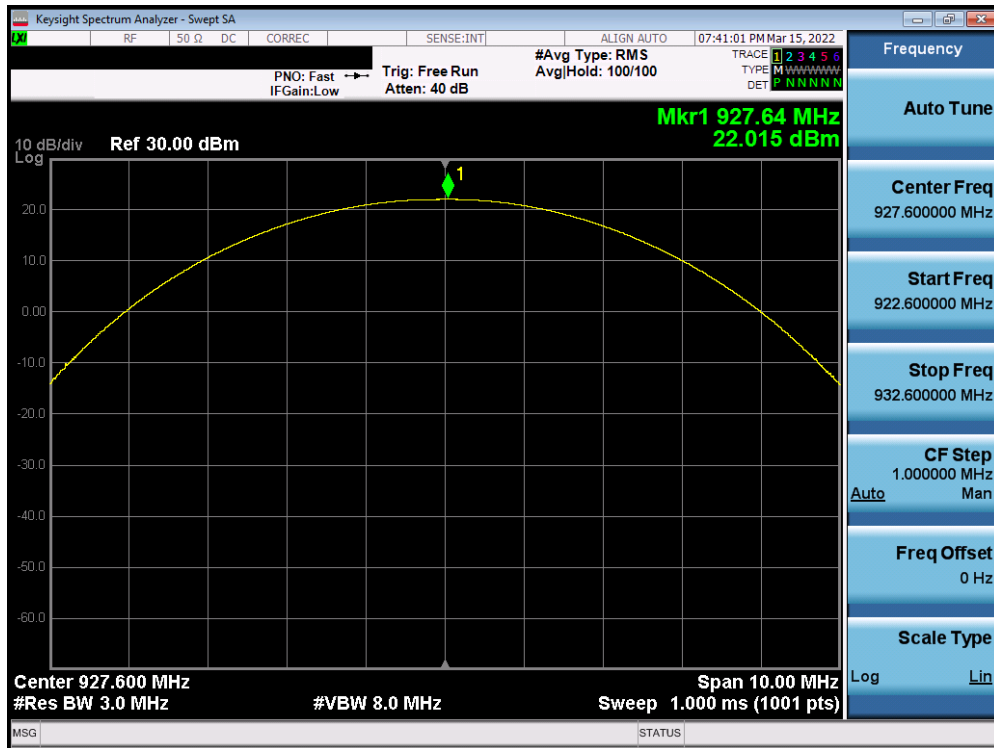
Plot 7-19. Peak Conducted Power (EA LAN2, 142.22kbps – Ch. 0)



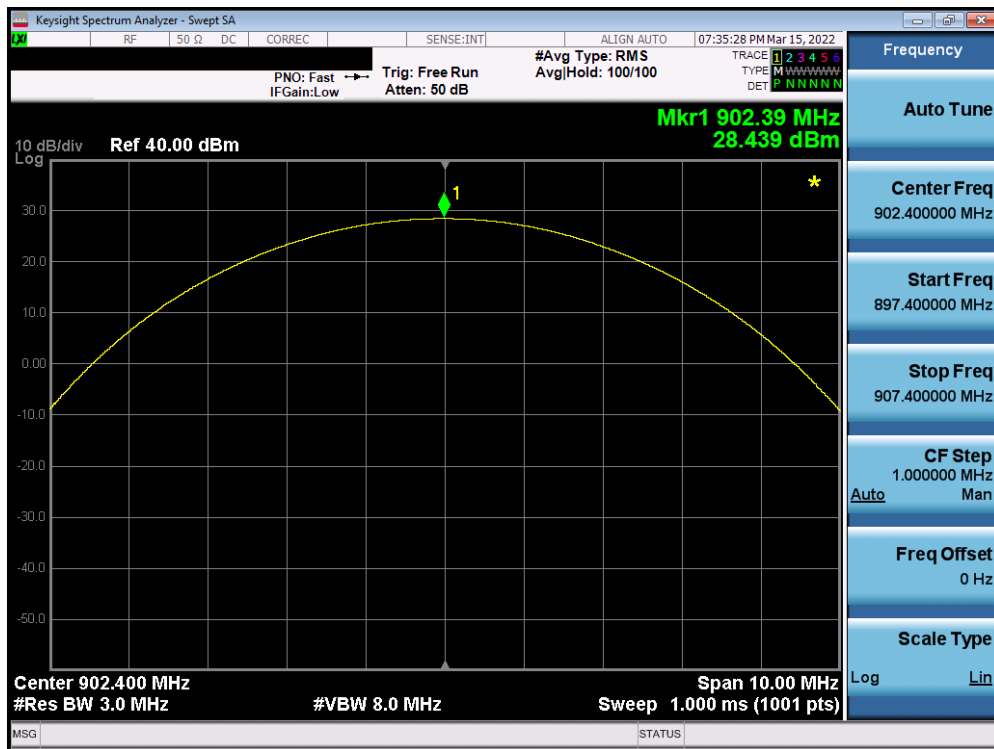
Plot 7-20. Peak Conducted Power (EA LAN2, 142.22kbps – Ch. 32)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 24 of 78



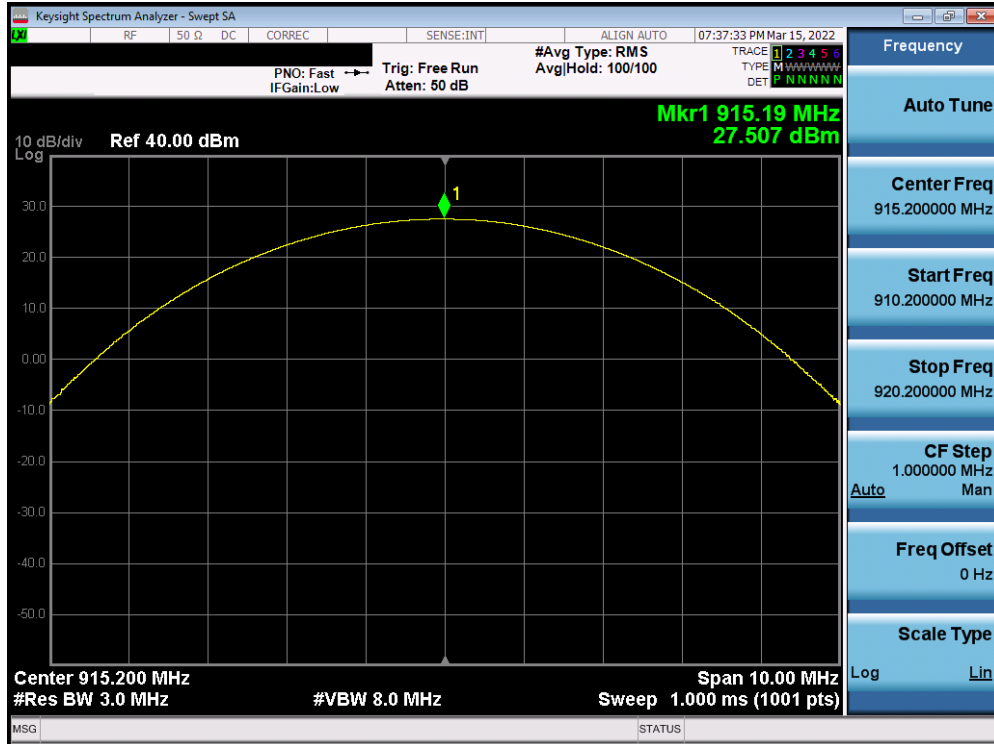


Plot 7-21. Peak Conducted Power (EA LAN2, 142.22kbps – Ch. 63)

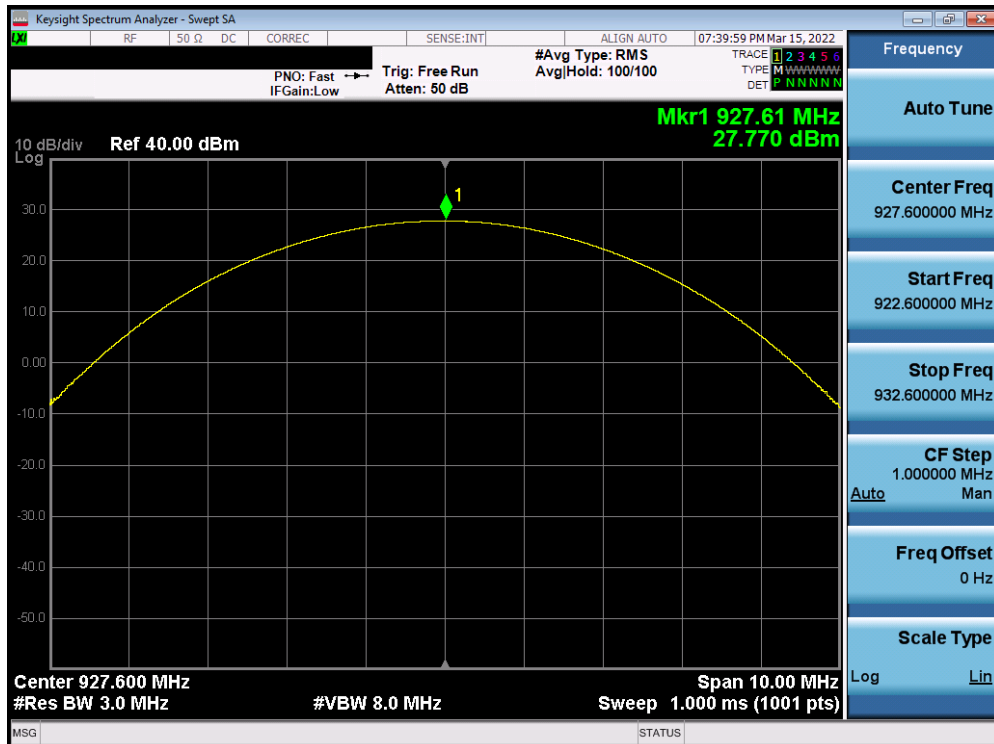


Plot 7-22. Peak Conducted Power (SN 50K, 50kbps – Ch. 0)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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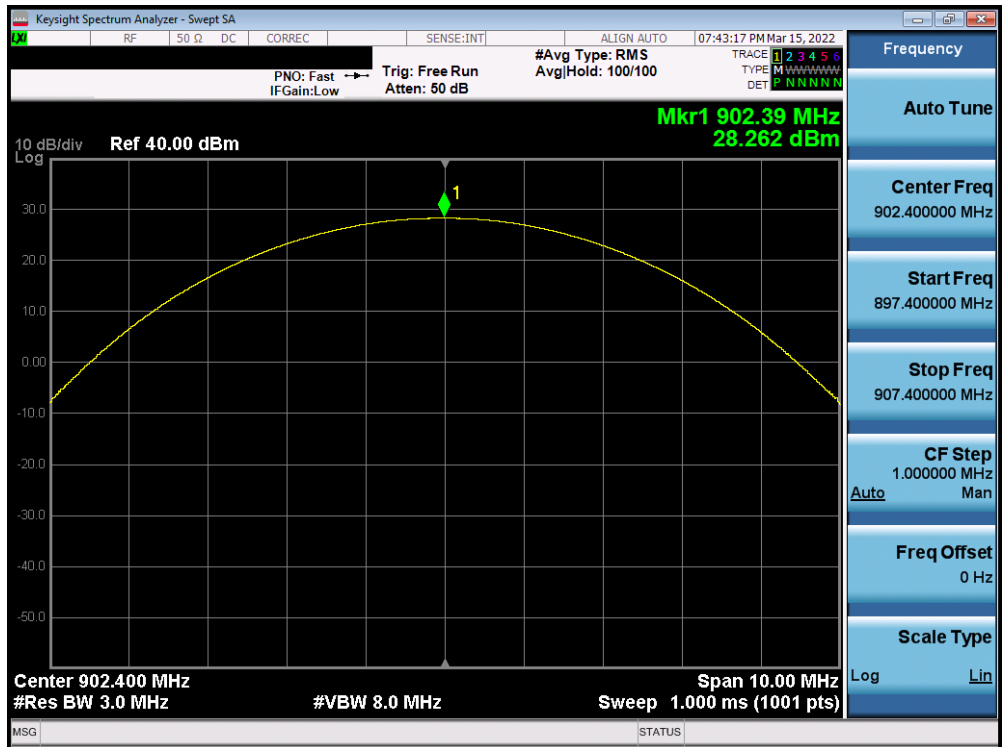


Plot 7-23. Peak Conducted Power (SN 50K, 50kbps – Ch. 32)

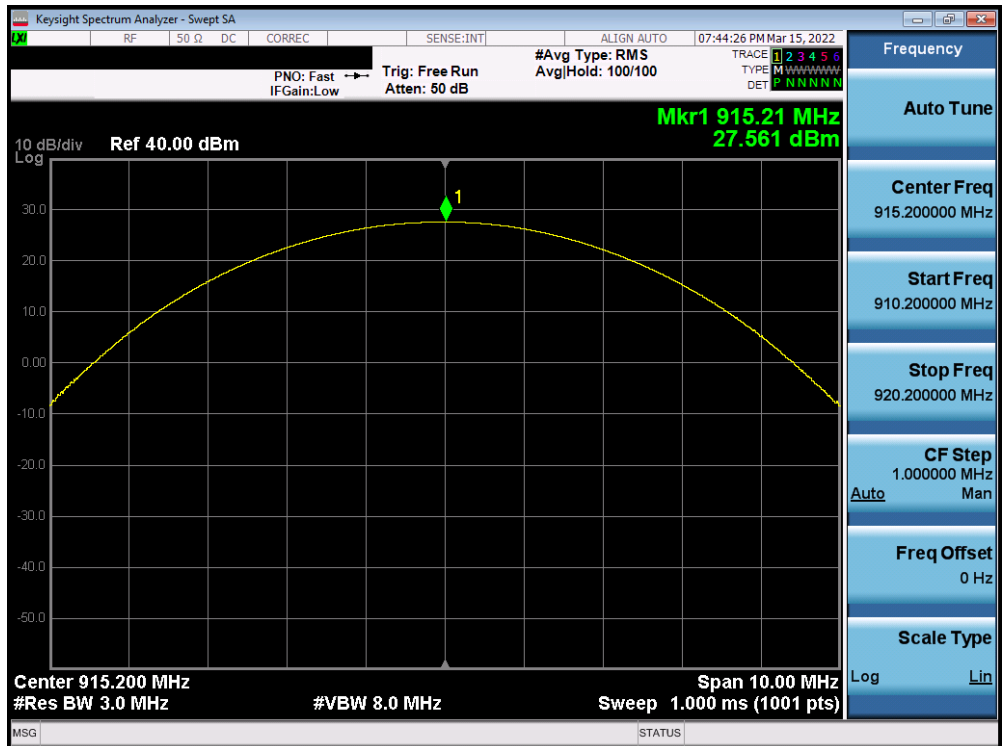


Plot 7-24. Peak Conducted Power (SN 50K, 50kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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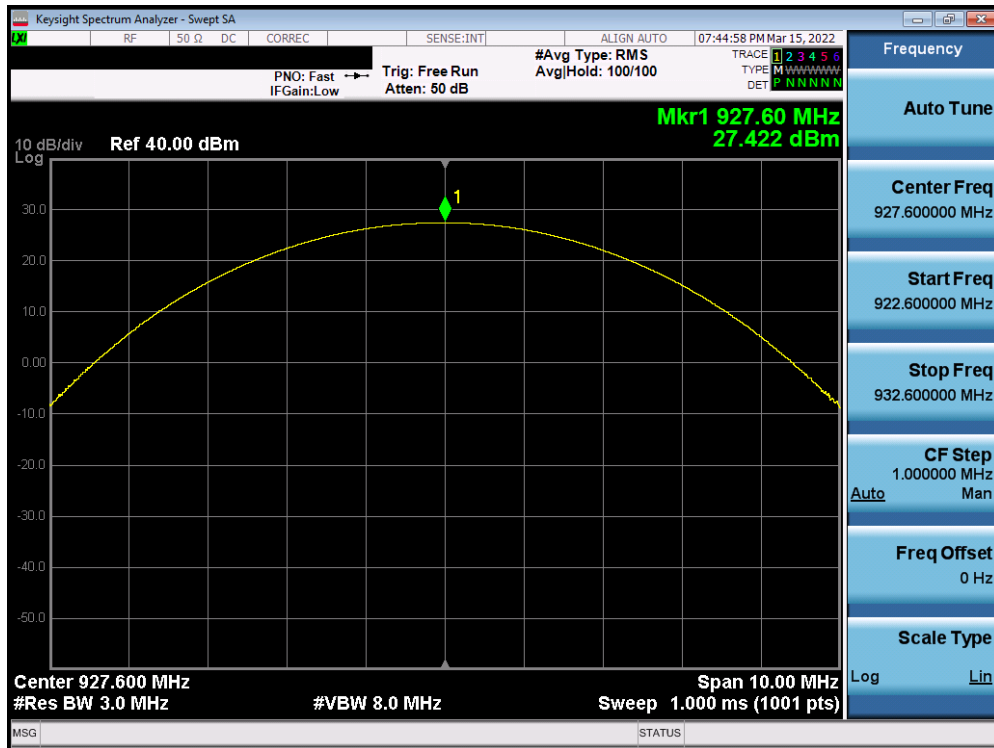


Plot 7-25. Peak Conducted Power (SN 150K, 150kbps – Ch. 0)

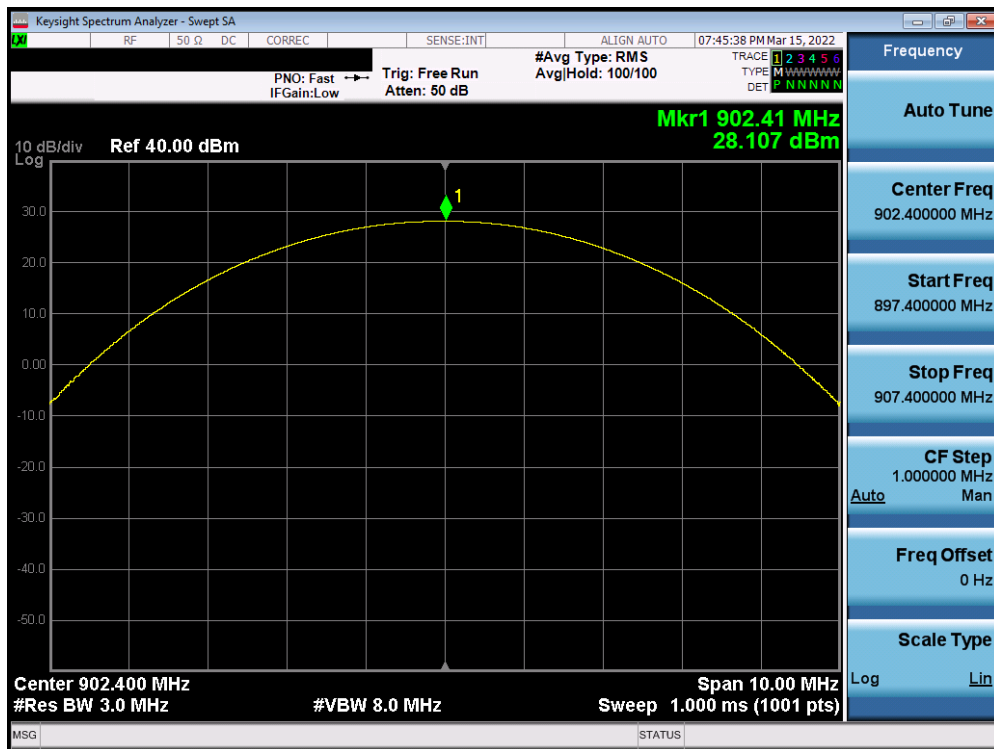


Plot 7-26. Peak Conducted Power (SN 150K, 150kbps – Ch. 32)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 27 of 78

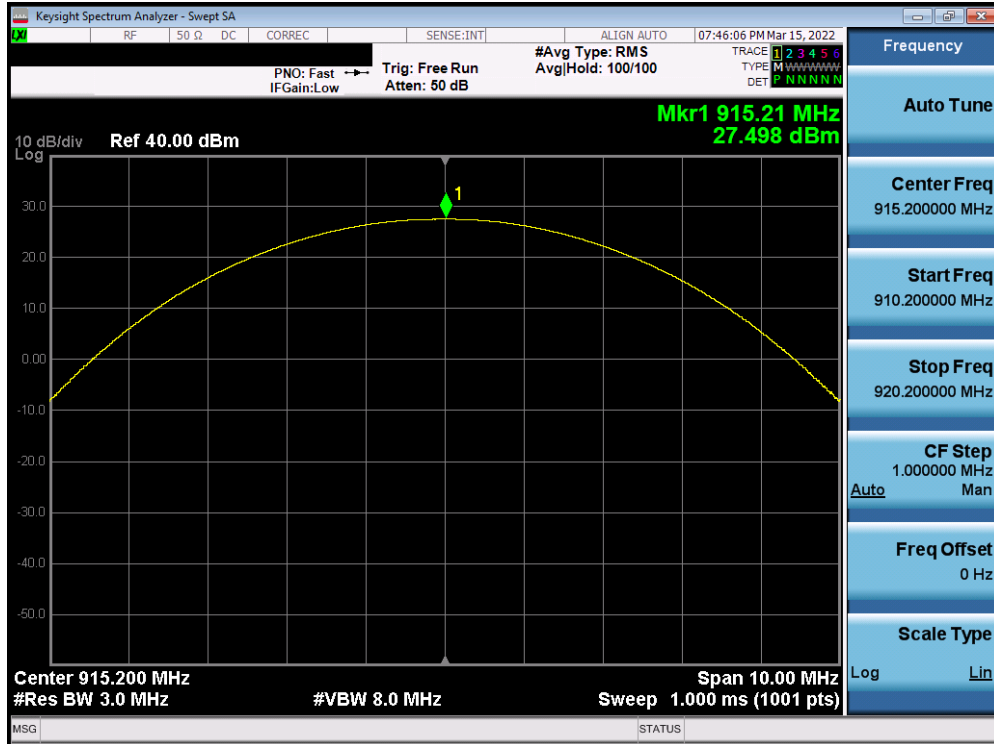


Plot 7-27. Peak Conducted Power (SN 150K, 150kbps – Ch. 63)

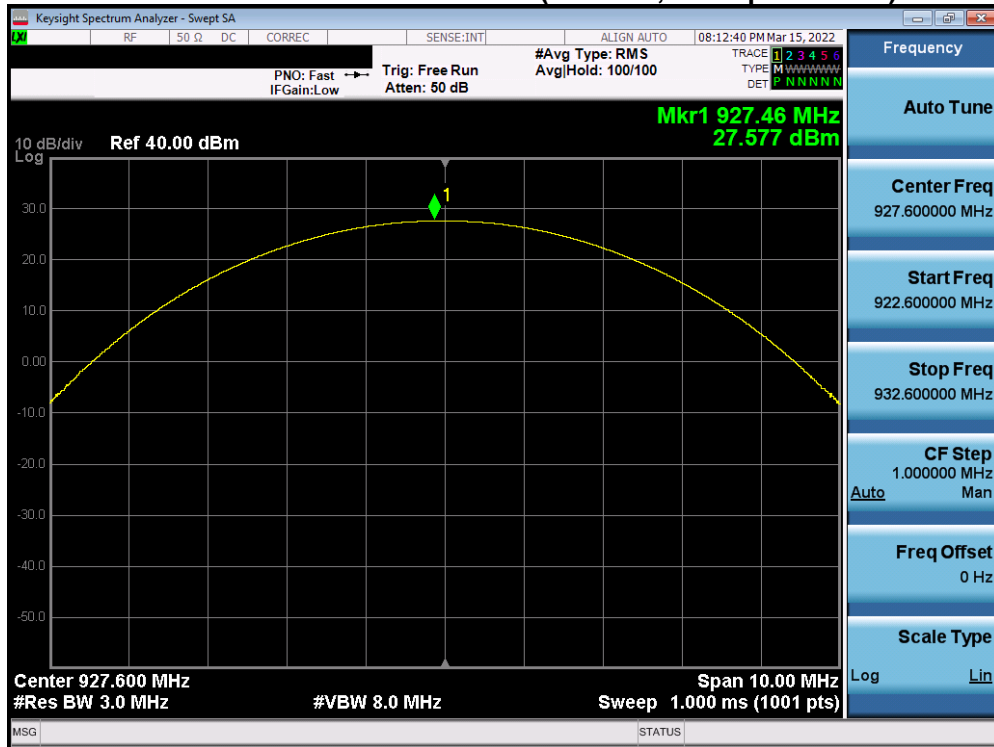


Plot 7-28. Peak Conducted Power (SN 200K, 200kbps – Ch. 0)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 28 of 78



Plot 7-29. Peak Conducted Power (SN 200K, 200kbps – Ch. 32)



Plot 7-30. Peak Conducted Power (SN 200K, 200kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 29 of 78

## 7.4 Band Edge Compliance

§15.247 (d); RSS-247 [5.5]

### Test Overview and Limits

EUT operates in hopping and non-hopping transmission mode. Measurement is taken at the highest point located outside of the emission bandwidth. **The maximum permissible out-of-band emission level is 20 dBc.**

### Test Procedure Used

ANSI C63.10-2013 – Section 6.10.4

### Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100kHz
4. VBW = 300kHz
5. Detector = Peak
6. Number of sweep points  $\geq 2 \times \text{Span/RBW}$
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

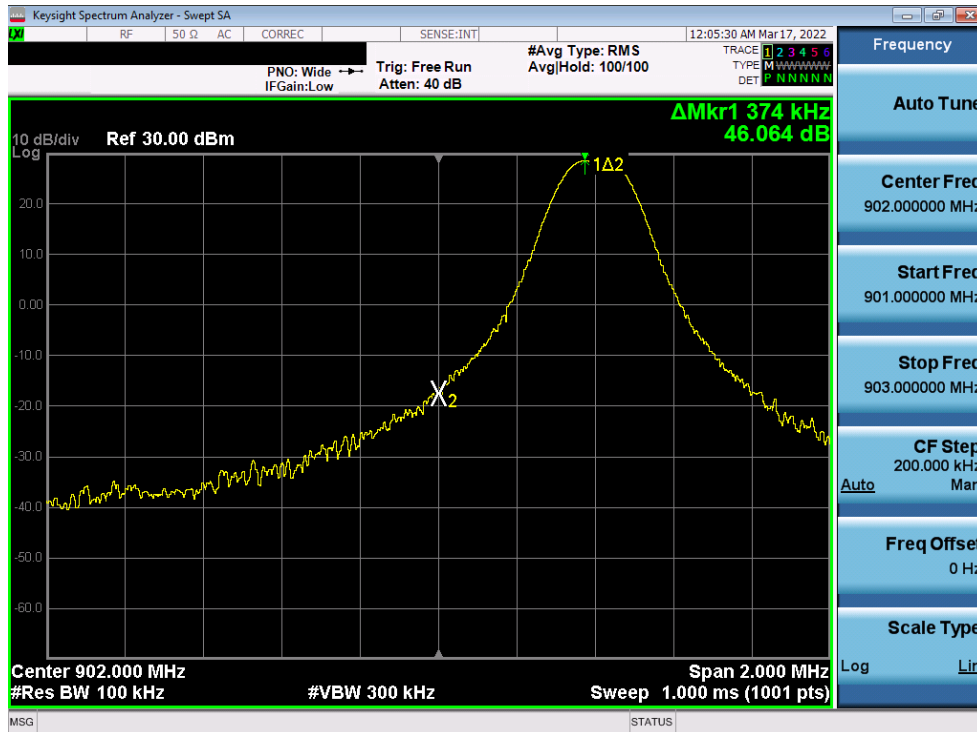


**Figure 7-3. Test Instrument & Measurement Setup**

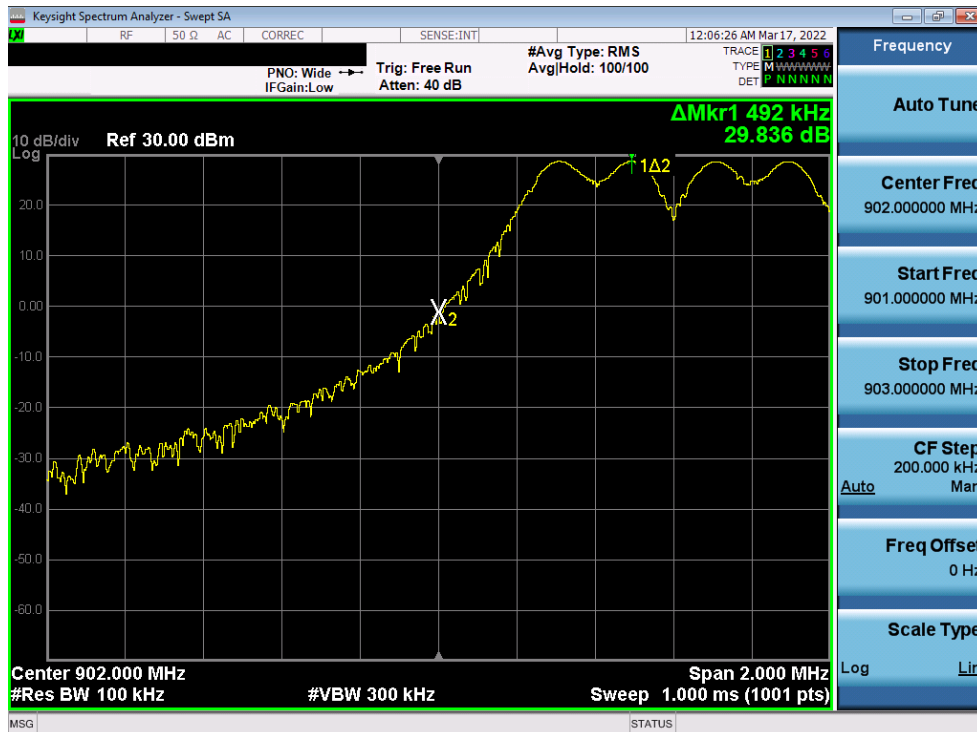
### Note

With hopping mode enabled, in EA LAN1/2 the device does not transmit on channels adjacent to the band edge. In SN 50/150/200 the device does not transmit on the channel adjacent to the upper band edge

FCC ID: QZC-SNRGK4	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
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Plot 7-31. Band Edge Plot (Hopping Disabled, SN 50K, 50kbps – Ch. 0)



Plot 7-32. Band Edge Plot (Hopping Enabled, SN 50K, 50kbps)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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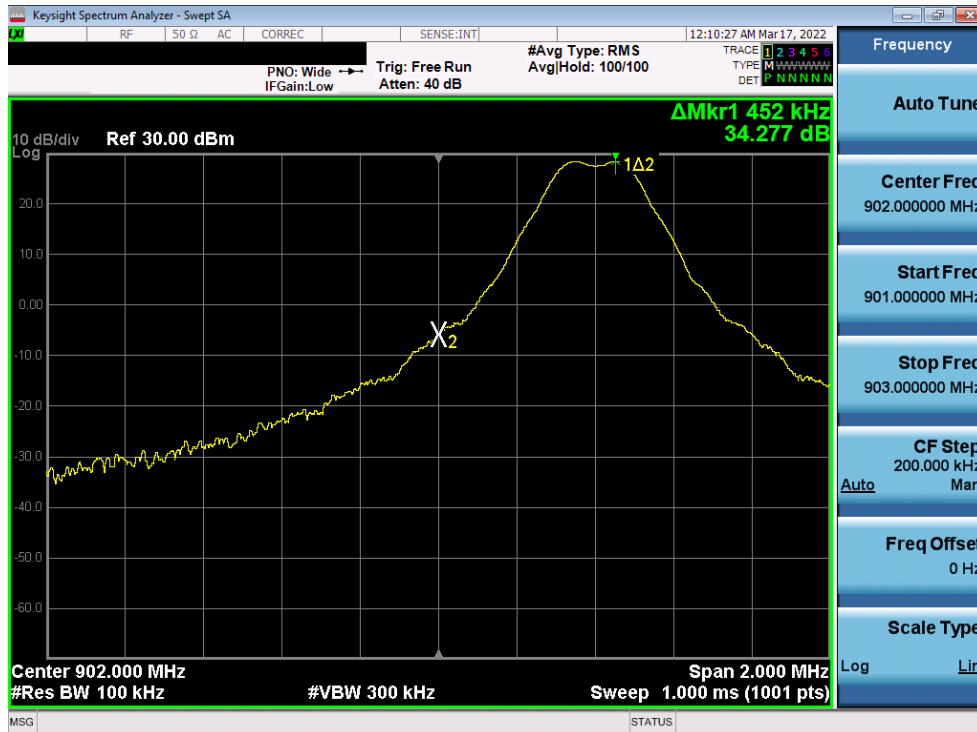
Plot 7-33. Band Edge Plot (Hopping Disabled, SN 150K, 150kbps – Ch. 0)



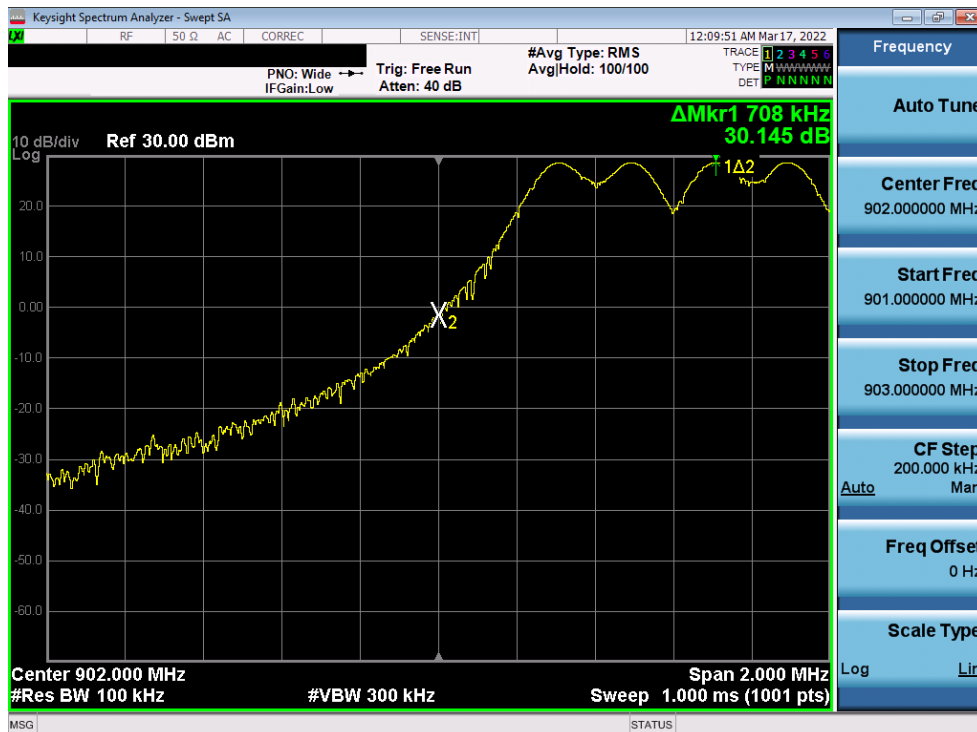
Plot 7-34. Band Edge Plot (Hopping Enabled, SN 150K, 150kbps)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 32 of 78





Plot 7-35. Band Edge Plot (Hopping Disabled, SN 200K, 200kbps – Ch. 0)



Plot 7-36. Band Edge Plot (Hopping Enabled, SN 200K, 200kbps)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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## 7.5 Carrier Frequency Separation

§15.247 (a.1); RSS-247 [5.1(b)]

### Test Overview and Limit

Measurement is made with EUT operating in hopping mode. **The minimum permissible channel separation for this system is 25kHz or the value of the 20dB BW, whichever is lower.**

### Test Procedure Used

ANSI C63.10-2013 – Section 7.8.2

### Test Settings

1. Span = Wide enough to capture peaks of two adjacent channels
2. RBW = 30% of channel spacing. Adjust as necessary to best identify center of each individual channel
3. VBW  $\geq$  RBW
4. Sweep = Auto
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize.
8. Marker-delta function used to determine separation between peaks of the adjacent channels

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 7-4. Test Instrument & Measurement Setup**

### Test Notes

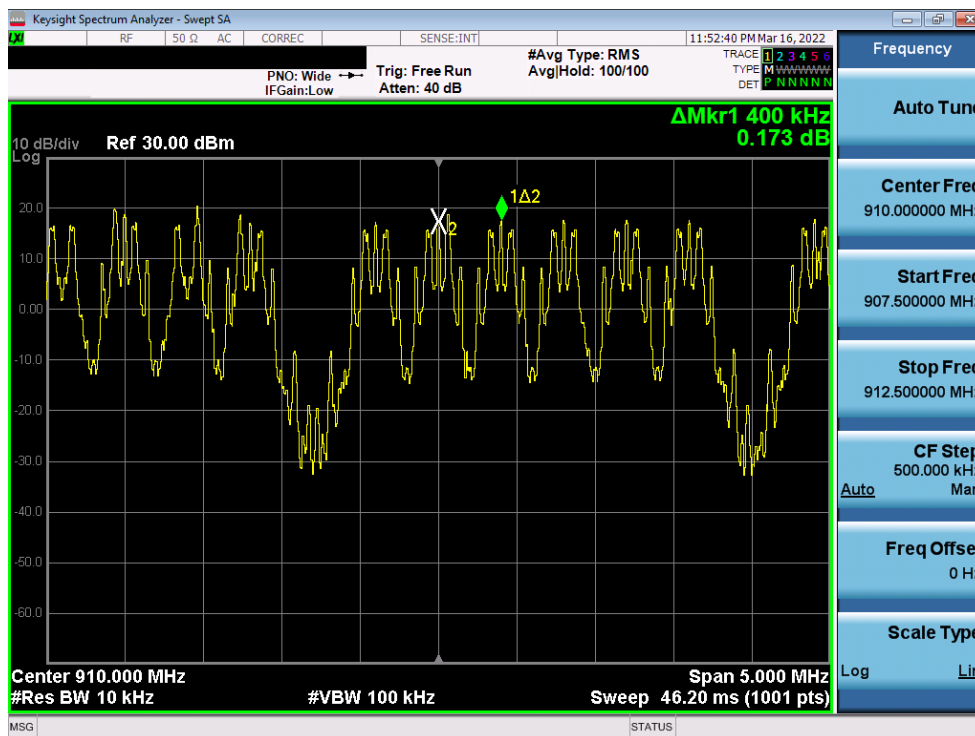
The minimum channel separation is equal to the 20dB bandwidth in all cases.

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Frequency [MHz]	Mode	Data Rate [kbps]	Channel No.	Min. Channel Separation [kHz]
902.4	EA LAN1	35.56	0	297.9
915.2	EA LAN1	35.56	32	297.4
927.6	EA LAN1	35.56	63	297.3
902.4	EA LAN2	142.22	0	304.4
915.2	EA LAN2	142.22	32	307.6
927.6	EA LAN2	142.22	63	315.5
902.4	SN 50K	50.0	0	109.1
915.2	SN 50K	50.0	32	108.5
927.6	SN 50K	50.0	63	108.4
902.4	SN 150K	150.0	0	198.7
915.2	SN 150K	150.0	32	198.4
927.6	SN 150K	150.0	63	198.2
902.4	SN 200K	200.0	0	265.4
915.2	SN 200K	200.0	32	264.6
927.6	SN 200K	200.0	63	265.0

Table 7-4. Minimum Channel Separation



Plot 7-37. Channel Spacing Plot (EA)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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## 7.6 Time of Occupancy

§15.247 (a.1.iii); RSS-247 [5.1(4)]

### Test Overview and Limit

Measurement is made while EUT is operating in hopping mode with the spectrum analyzer set to zero span.

***If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.***

### Test Procedure Used

ANSI C63.10-2013 – Section 7.8.4

### Test Settings

1. Span = zero span, centered on a hopping channel
2. RBW  $\leq$  channel spacing and  $\gg 1/T$ , where T is expected dwell time per channel
3. Sweep = as necessary to capture entire dwell time. Second plot may be required to demonstrate two successive hops on a channel
4. Trigger is set with appropriate trigger delay to place pulse near the center of the plot
5. Detector = peak
6. Trace mode = max hold
7. Marker-delta function used to determine transmit time per hop

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 7-5. Test Instrument & Measurement Setup**

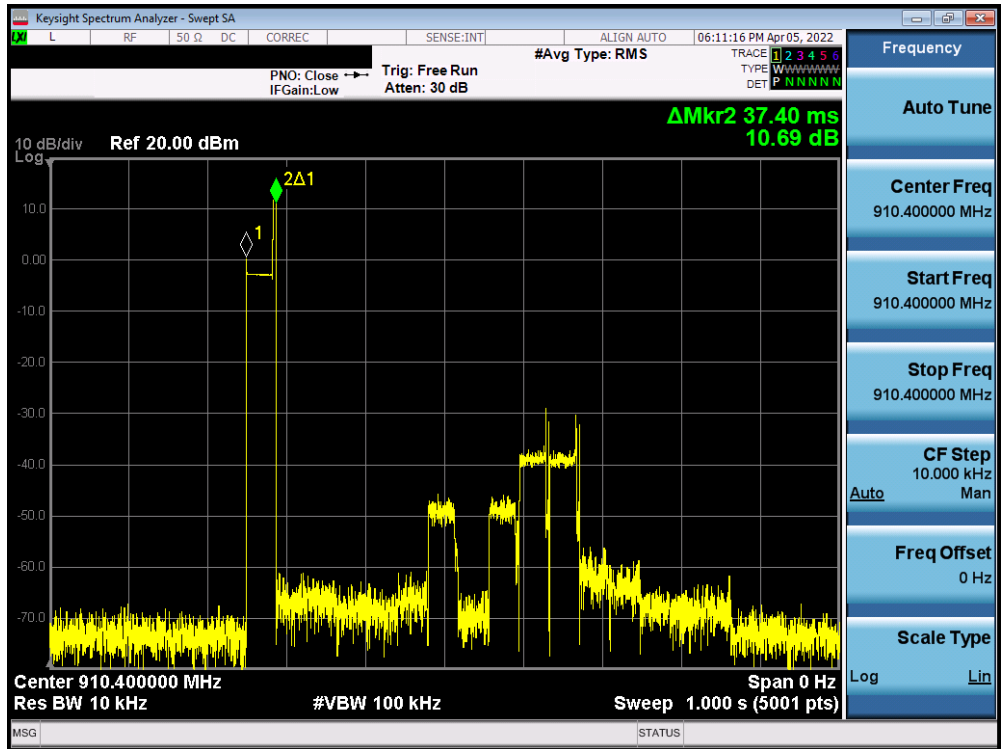
### Test Notes

None

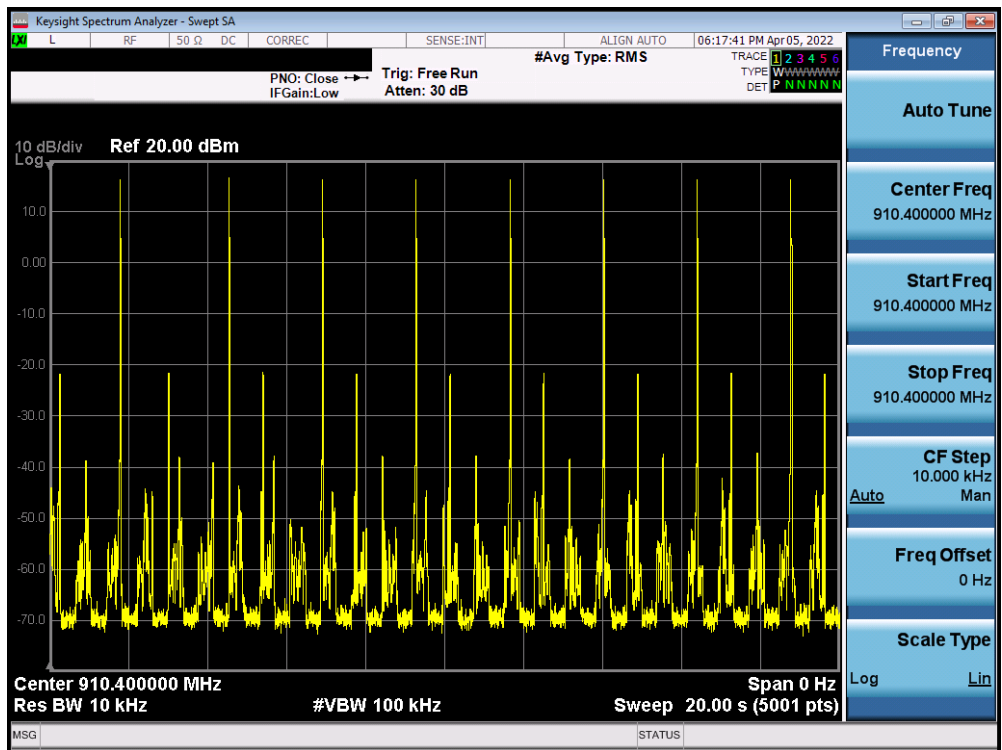
FCC ID: QZC-SNRGK4	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
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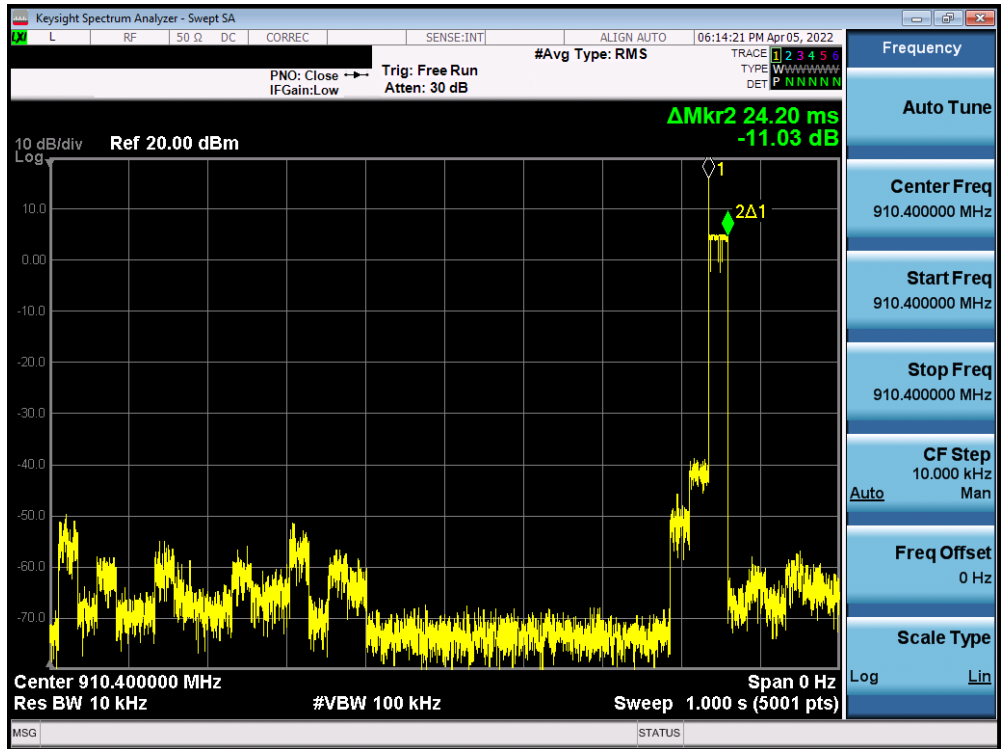


Plot 7-41. Time of Occupancy Plot (EA LAN2)

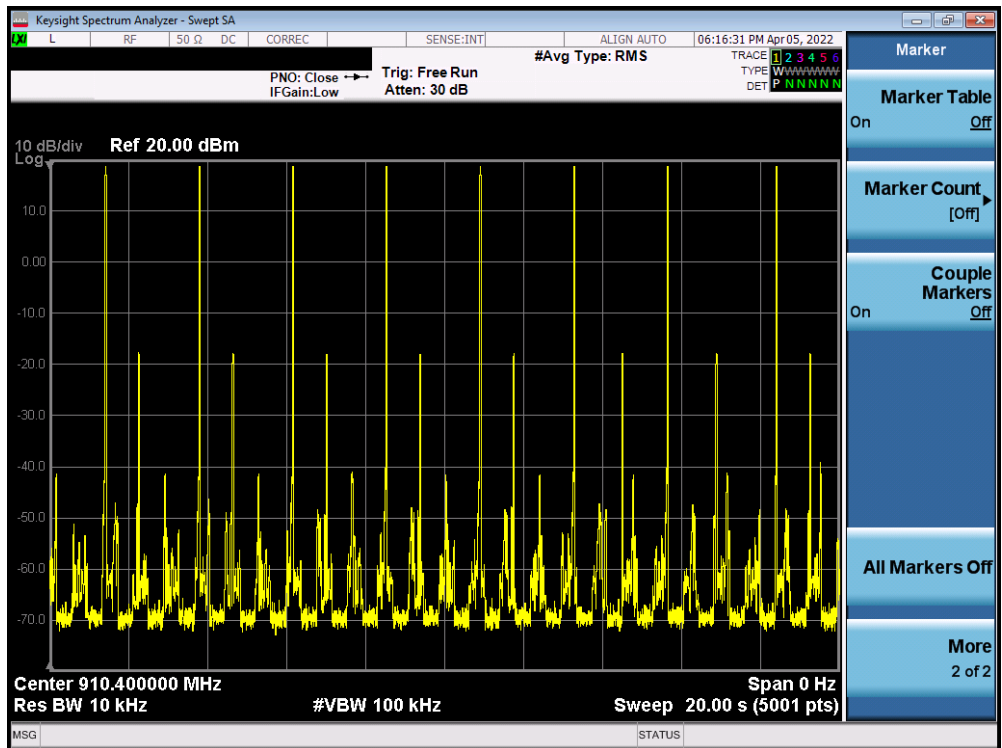


Plot 7-42. Time of Occupancy Plot (SN 50K)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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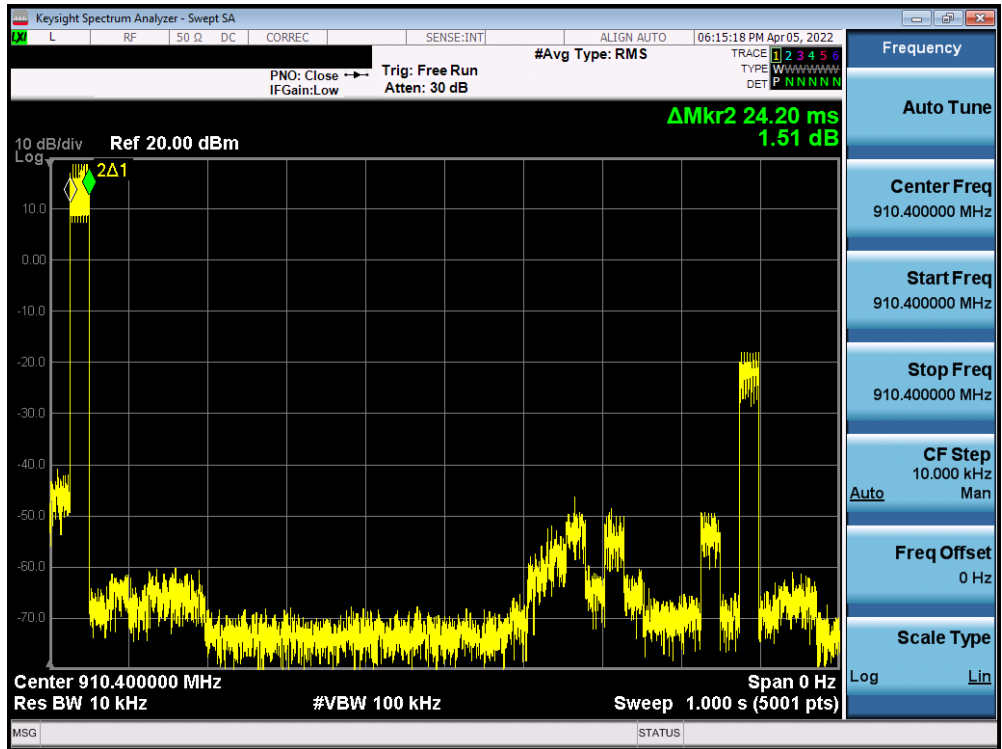
Plot 7-43. Time of Occupancy Plot (SN 50K)



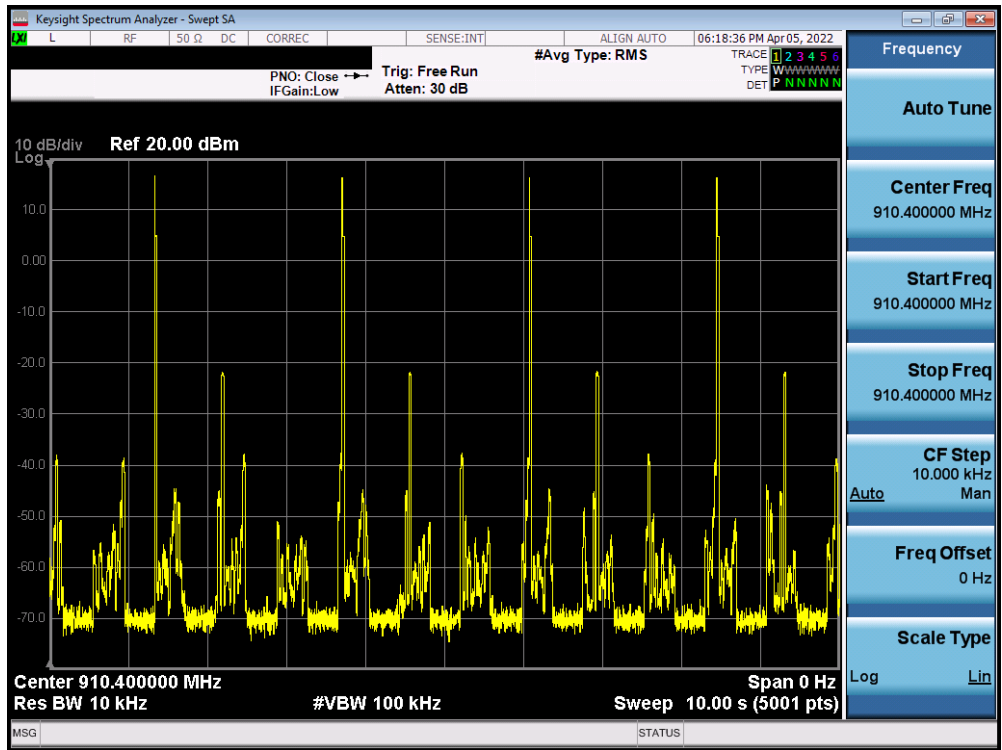
Plot 7-44. Time of Occupancy Plot (SN 150K)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 40 of 78



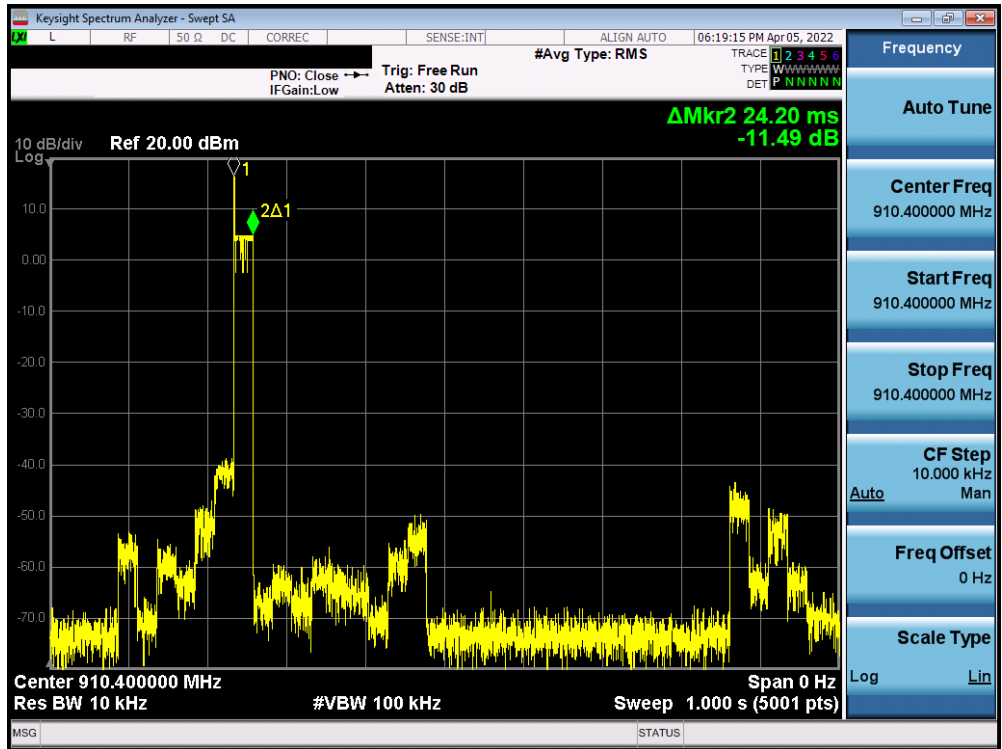


Plot 7-45. Time of Occupancy Plot (SN 150K)



Plot 7-46. Time of Occupancy Plot (SN 200K)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 41 of 78



Plot 7-47. Time of Occupancy Plot (SN 200K)

### Time of Occupancy Calculation

#### EA LAN1

- 400ms in a 10s period (Time of Occupancy Limit)
- 1 hop = 100ms
- 2 hops per 10s
- 2 hops \* 100ms = 200ms Time of Occupancy

#### EA LAN2

- 400ms in a 10s period (Time of Occupancy Limit)
- 1 hop = 37.4ms
- 6 hops per 10s
- 6 hops \* 37.4ms = 224.40ms Time of Occupancy

#### SN 50K

- 400ms in a 20s period (Time of Occupancy Limit)
- 1 hop = 24.2ms
- 8 hops per 20s
- 8 hops \* 24.2ms = 193.6ms Time of Occupancy

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 42 of 78



SN 150K

- 400ms in a 20s period (Time of Occupancy Limit)
- 1 hop = 24.2ms
- 8 hops per 20s
- $8 \text{ hops} * 24.2\text{ms} = 193.6\text{ms}$  Time of Occupancy

SN 200K

- 400ms in a 10s period (Time of Occupancy Limit)
- 1 hop = 24.2ms
- 4 hops per 10s
- $4\text{hops} * 24.2\text{ms} = 96.8\text{ms}$  Time of Occupancy

<b>FCC ID:</b> QZC-SNRGK4	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2203310044-01.QZC	<b>Test Dates:</b> 03/15/2022 - 03/24/2022	<b>EUT Type:</b> Non-Metering Gatekeeper/Synergynet Router	Page 43 of 78

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## 7.7 Number of Hopping Channels

**§15.247 (a.1.i); RSS-247 [5.1(c)]**

### Test Overview and Limit

Measurement is made while EUT is operating in hopping mode.

***If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies***

***If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies***

### Test Procedure Used

ANSI C63.10-2013 – Section 7.8.3

### Test Settings

1. Span = frequency of band of operation (divided into two plots)
2. RBW < 30% of channel spacing or 20dB bandwidth, whichever is smaller
3. VBW ≥ RBW
4. Sweep = auto
5. Detector = peak
6. Trace mode = max hold
7. Trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

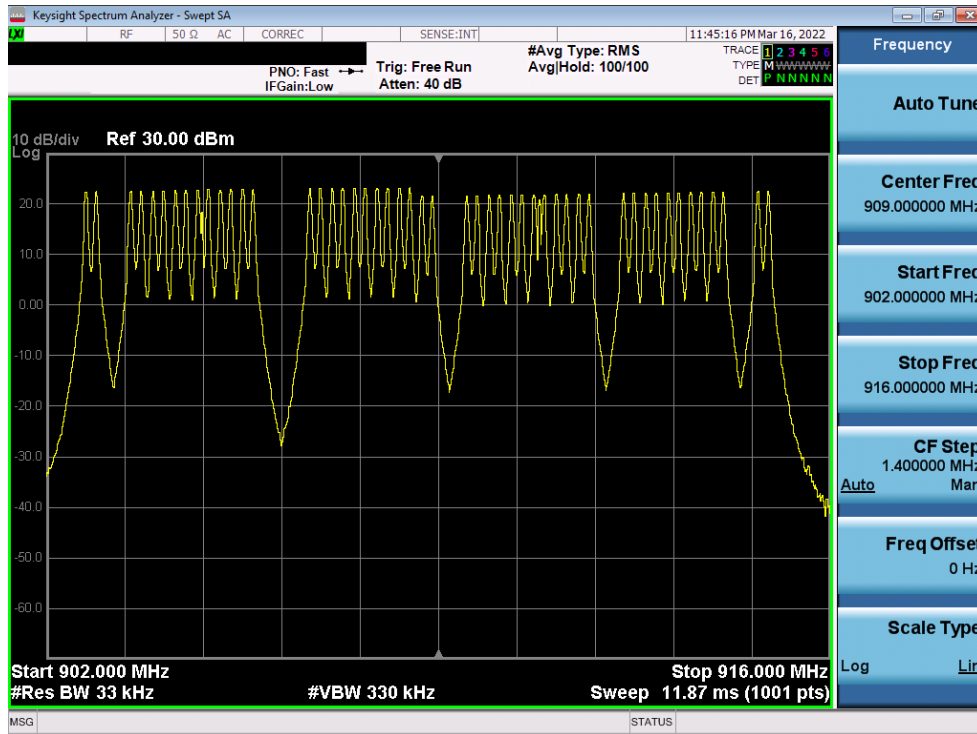


**Figure 7-6. Test Instrument & Measurement Setup**

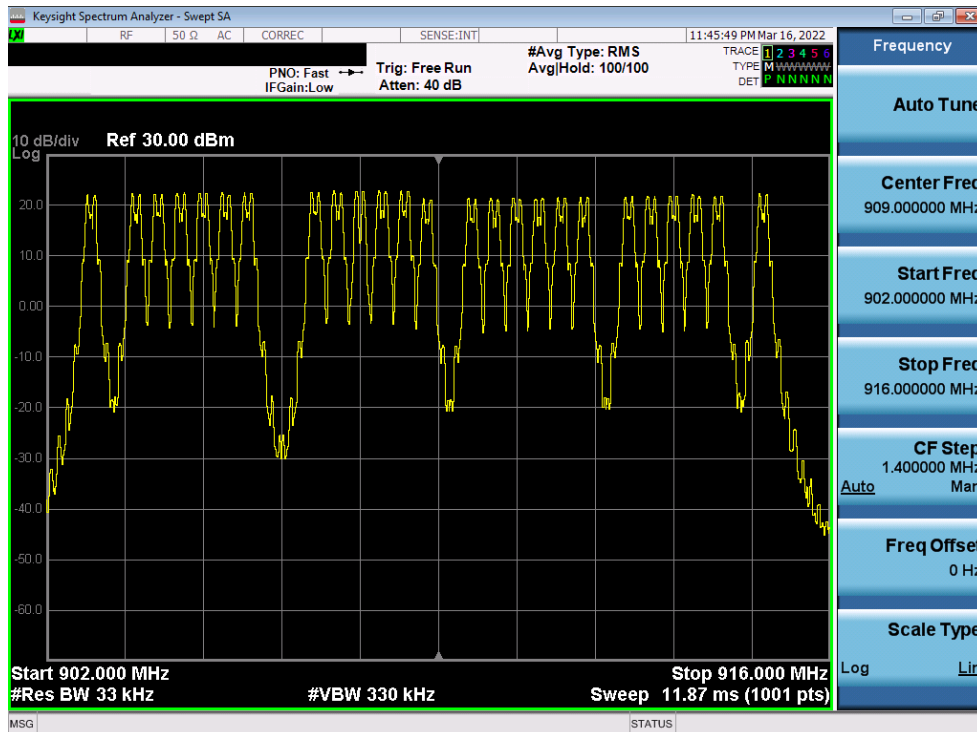
### Test Notes

For SynergyNet mode, the frequency spectrum was broken up into two sub-ranges to clearly show all the hopping frequencies.

FCC ID: QZC-SNRGK4	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 44 of 78

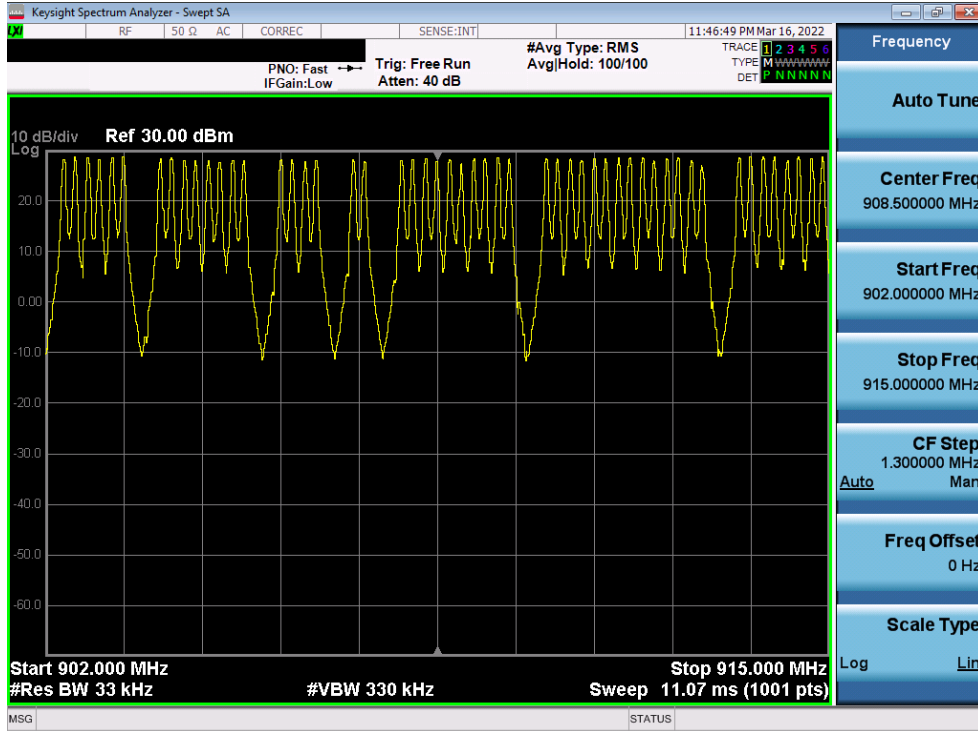


Plot 7-48. Channel Hopping Plot (EA LAN1)

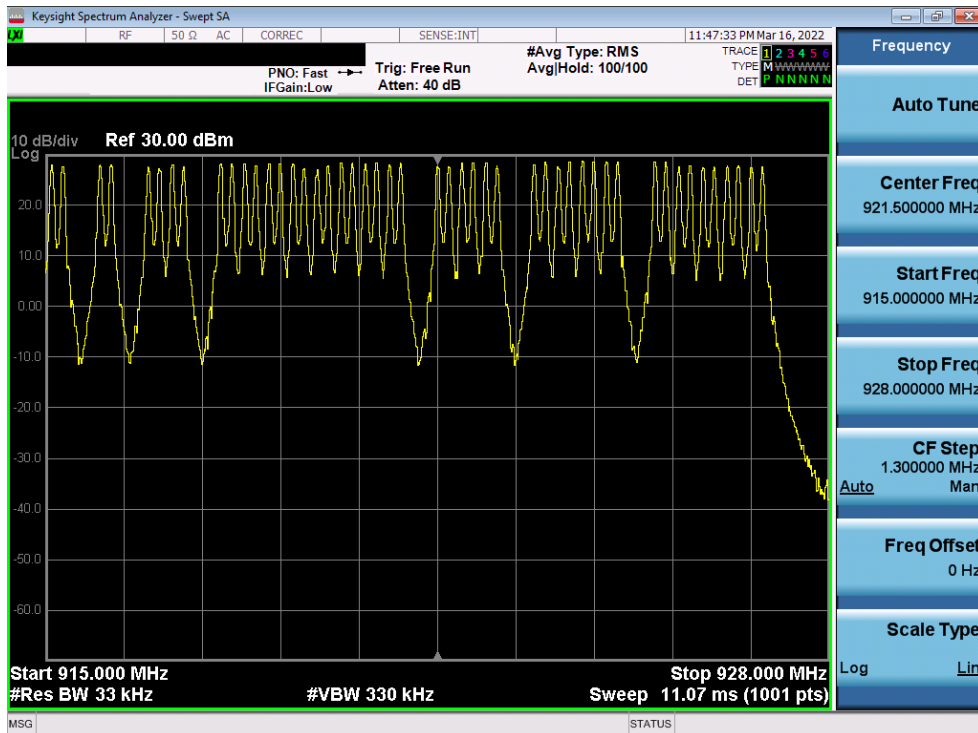


Plot 7-49. Channel Hopping Plot (EA LAN2)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 45 of 78

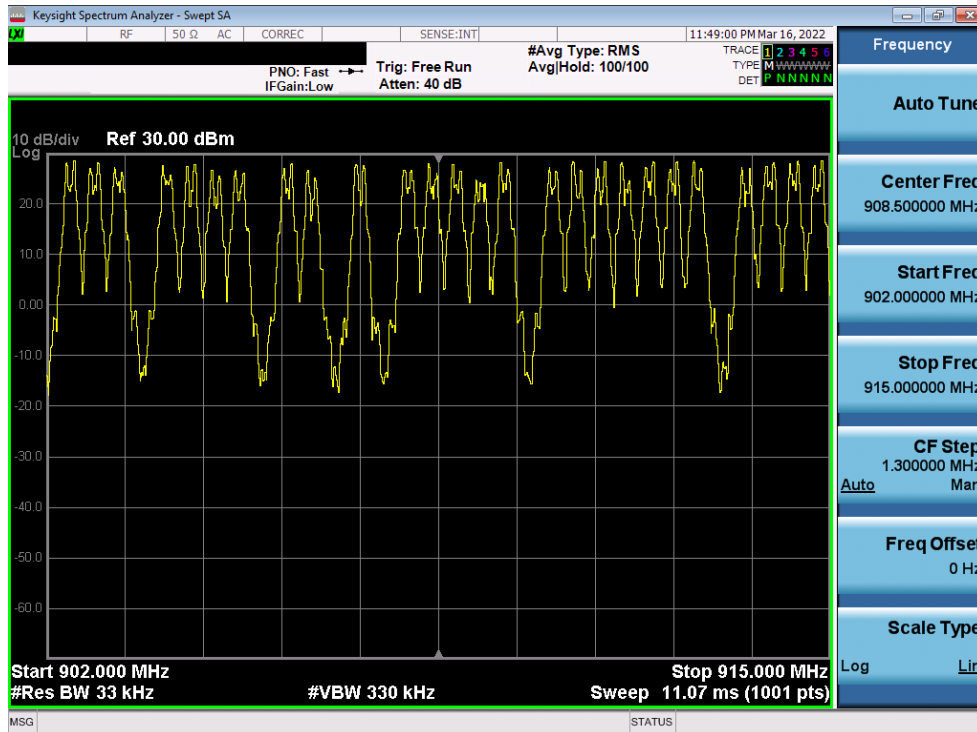


**Plot 7-50. Low End Spectrum Channel Hopping Plot (SN 50K)**

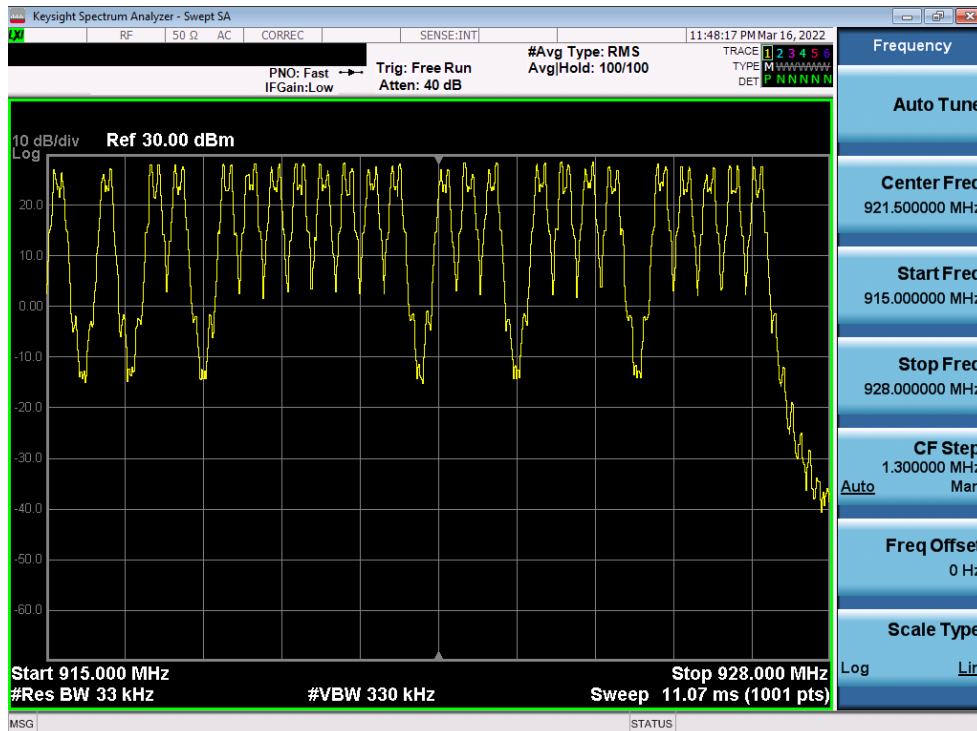


**Plot 7-51. High End Spectrum Channel Hopping Plot (SN 50K)**

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 46 of 78

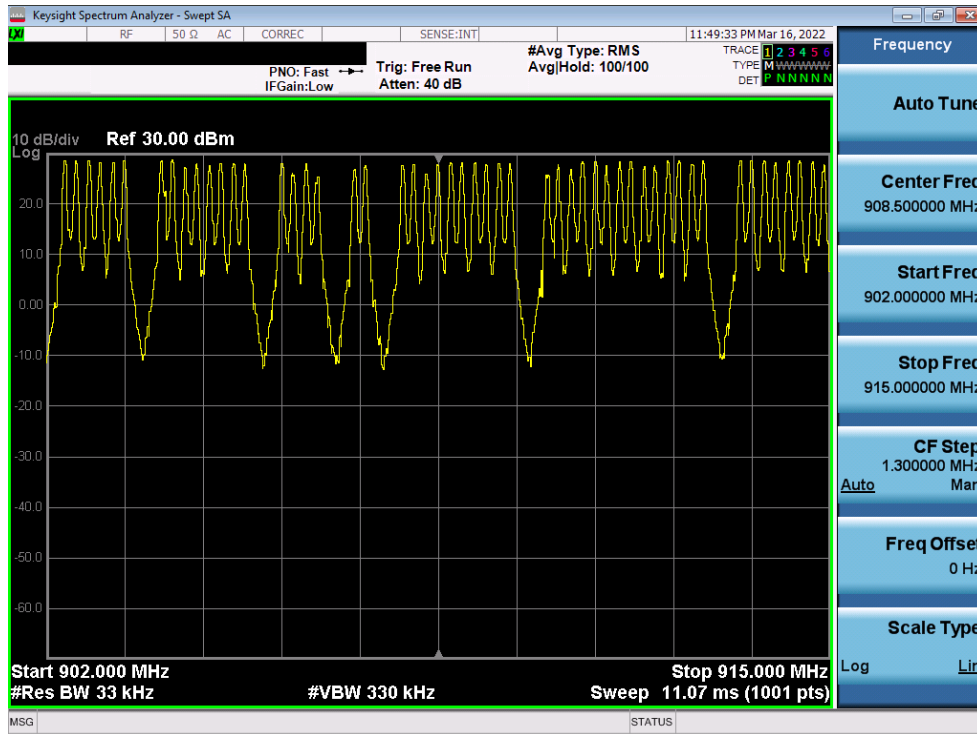


**Plot 7-52. Low End Spectrum Channel Hopping Plot (SN 150K)**

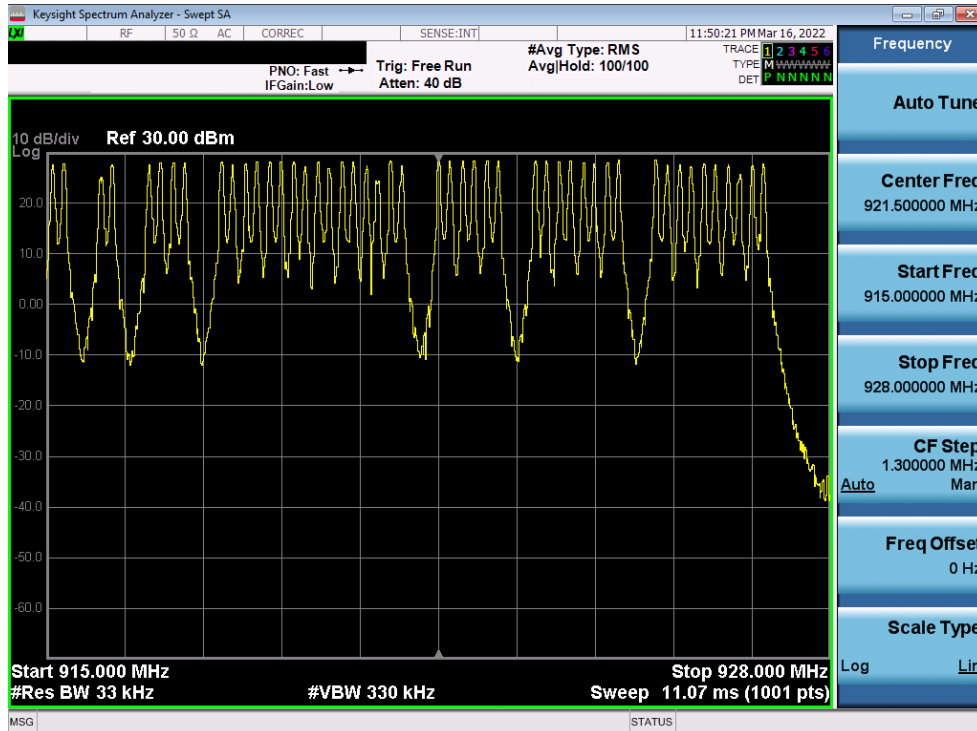


**Plot 7-53. High End Spectrum Channel Hopping Plot (SN 150K)**

FCC ID: QZC-SNRGK4	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 47 of 78



Plot 7-54. Low End Spectrum Channel Hopping Plot (SN 200K)



Plot 7-55. High End Spectrum Channel Hopping Plot (SN 200K)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 48 of 78



## 7.8 Conducted Spurious Emissions

§15.247 (d); RSS-247 [5.5]

### Test Overview and Limit

Conducted out-of-band spurious emissions were investigated from 30MHz up to 25GHz to include the 10<sup>th</sup> harmonic of the fundamental transmit frequency. **The maximum permissible out-of-band emission level is 20 dBc.**

### Test Procedure Used

ANSI C63.10-2013 – Section 7.8.8

### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
2. RBW = 1MHz\* (See note below)
3. VBW = 3MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



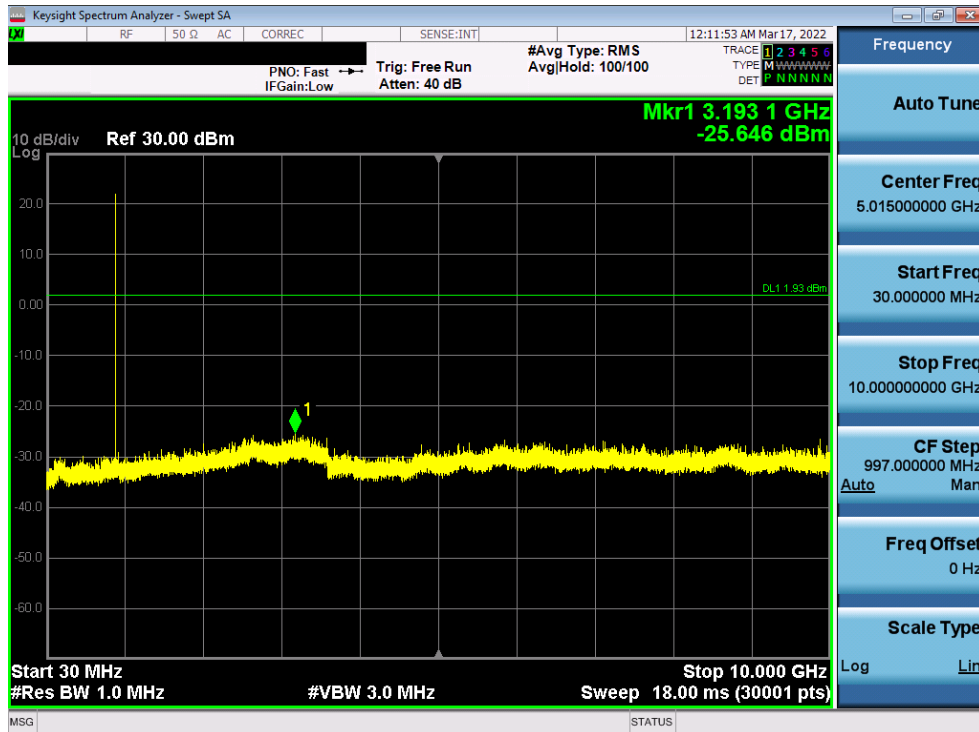
**Figure 7-7. Test Instrument & Measurement Setup**

### Test Notes

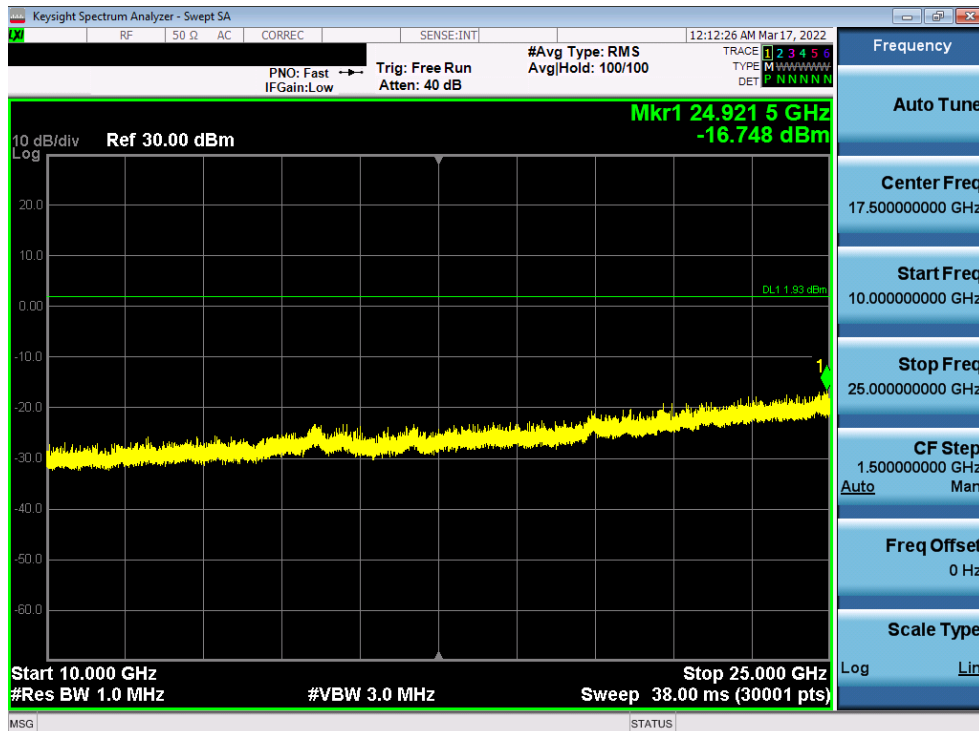
The display line shown in the following plots is the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, the traces in the following plots are measured with a 1MHz RBW to reduce test time, so the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1MHz bandwidth.

FCC ID: QZC-SNRGK4	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 49 of 78

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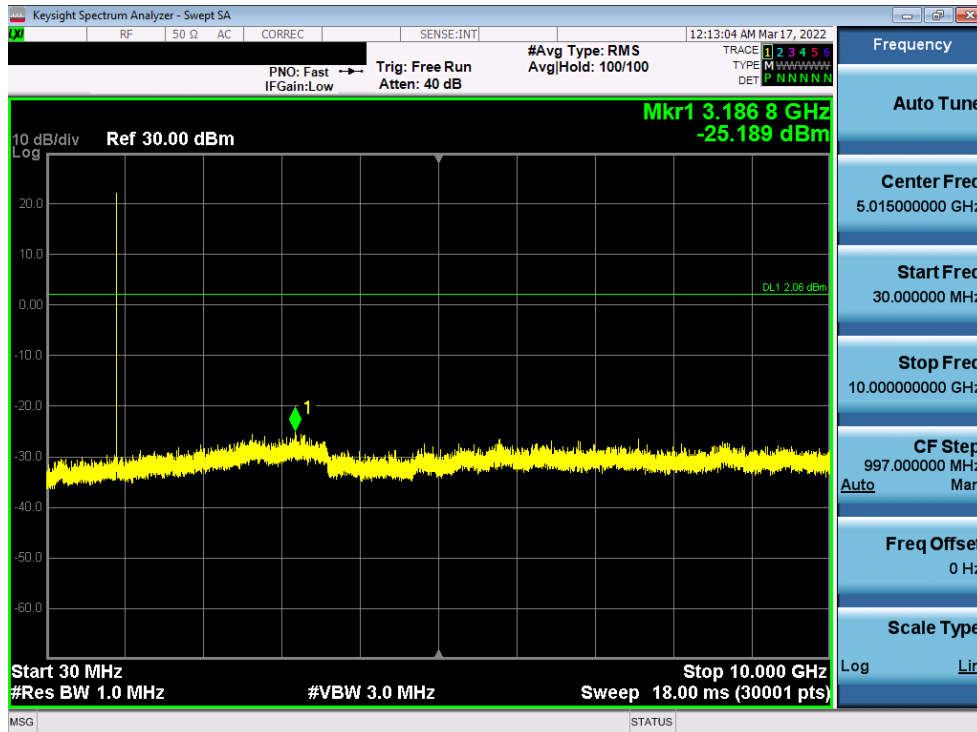


Plot 7-56. Conducted Spurious Plot (EA LAN1, 35.56kbps – Ch. 0)

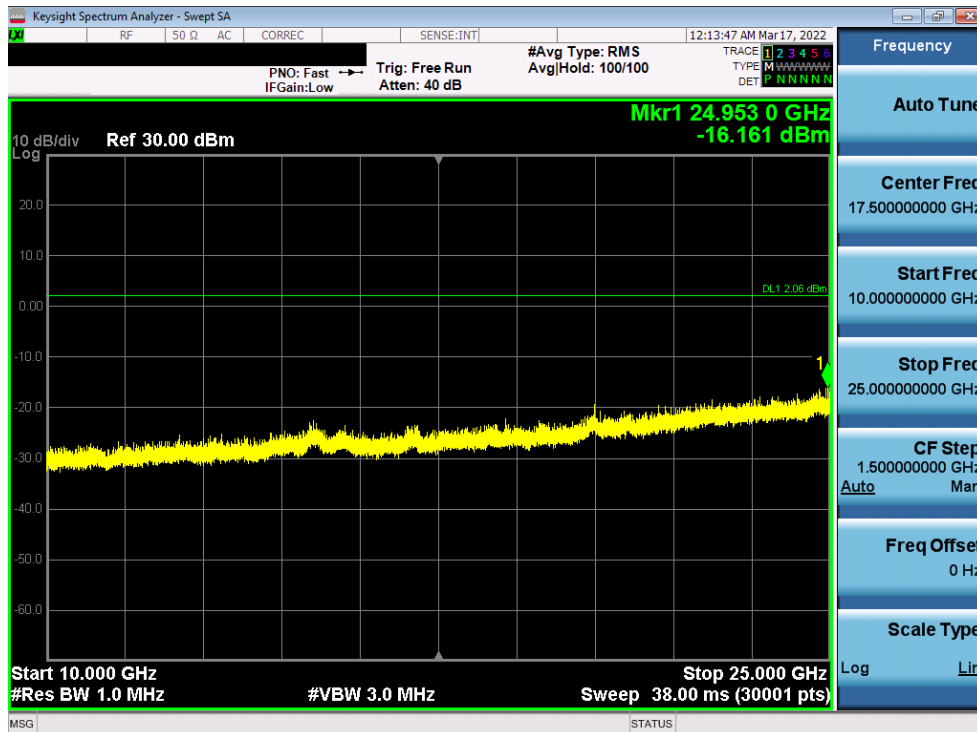


Plot 7-57. Conducted Spurious Plot (EA LAN1, 35.56kbps – Ch. 0)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 50 of 78

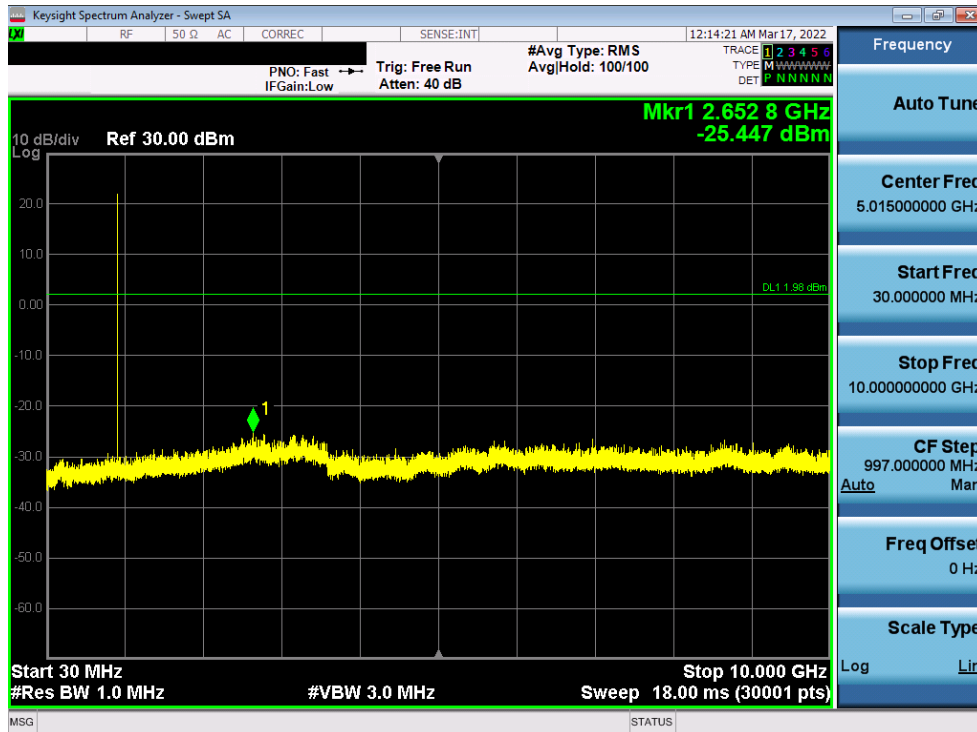


Plot 7-58. Conducted Spurious Plot (EA LAN1, 35.56kbps – Ch. 32)

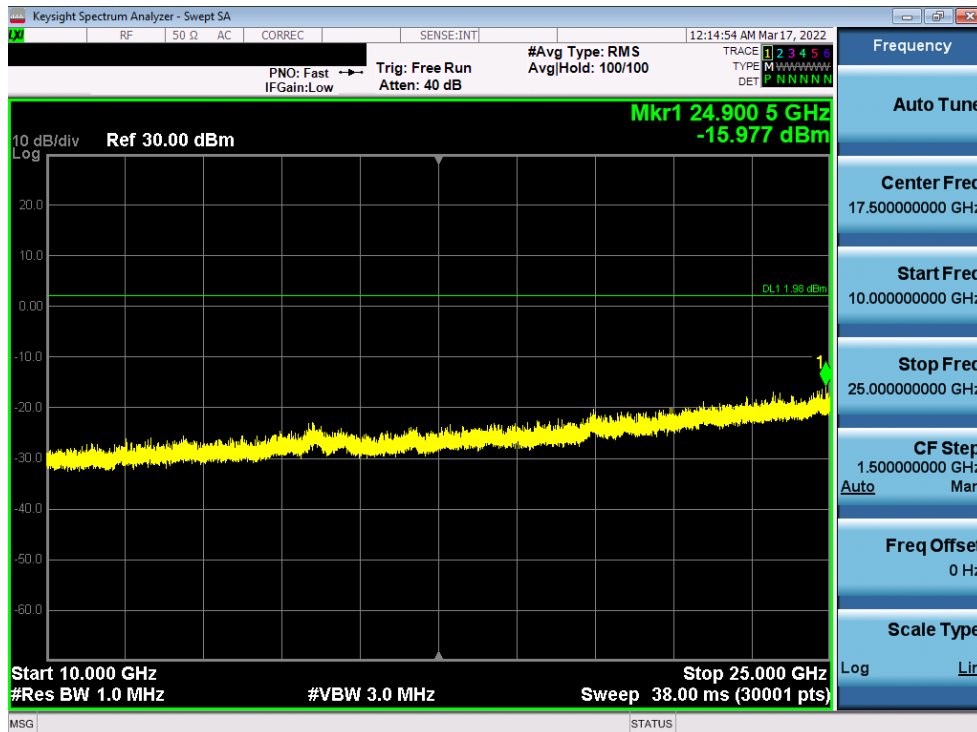


Plot 7-59. Conducted Spurious Plot (EA LAN1, 35.56kbps – Ch. 32)

FCC ID: QZC-SNRGK4	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 51 of 78

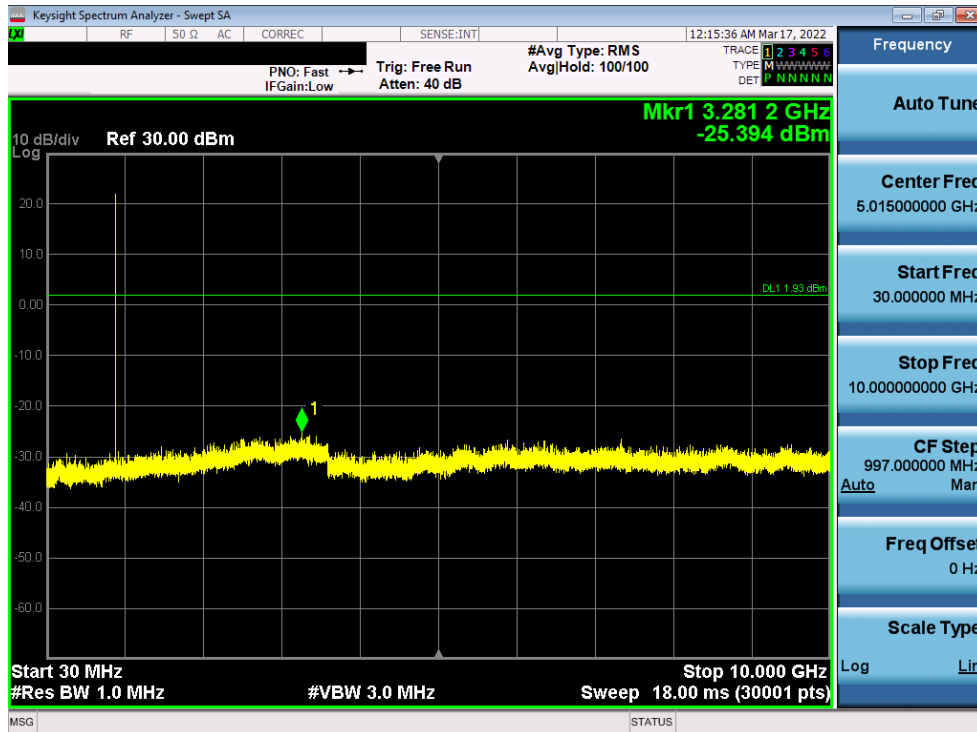


Plot 7-60. Conducted Spurious Plot (EA LAN1, 35.56kbps – Ch. 63)

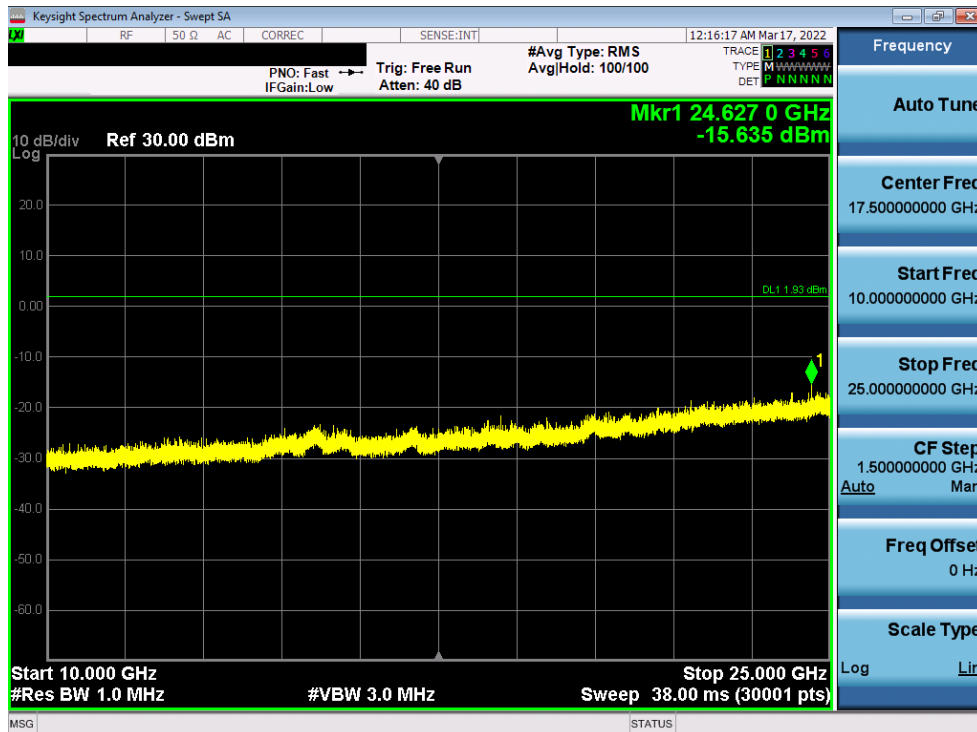


Plot 7-61. Conducted Spurious Plot (EA LAN1, 35.56kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 52 of 78

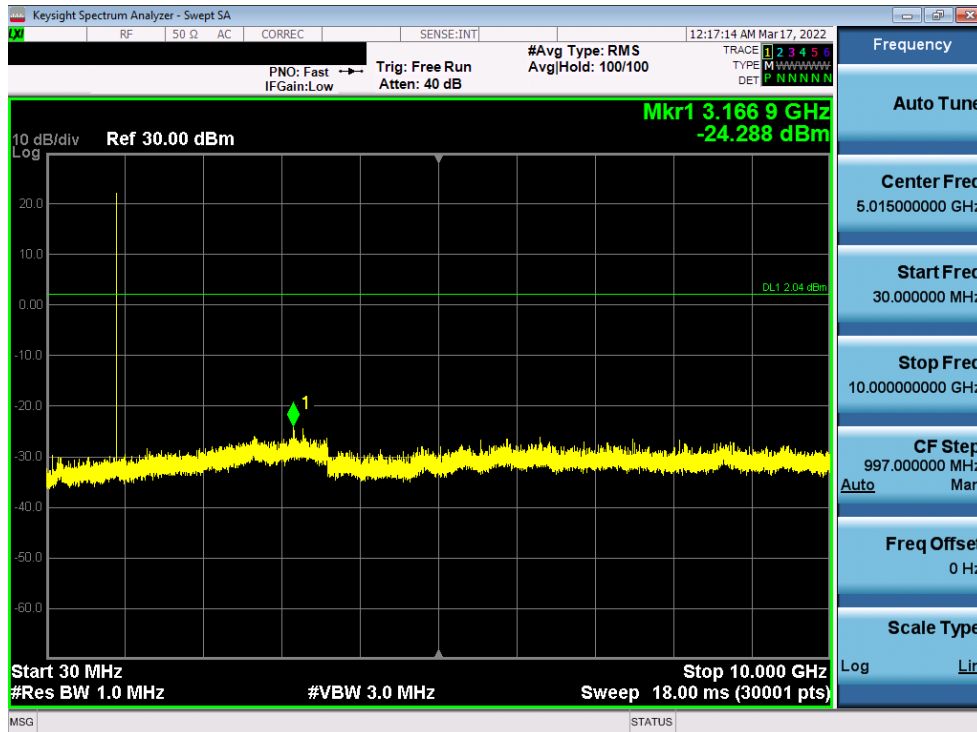


Plot 7-62. Conducted Spurious Plot (EA LAN2, 142.22kbps – Ch. 0)

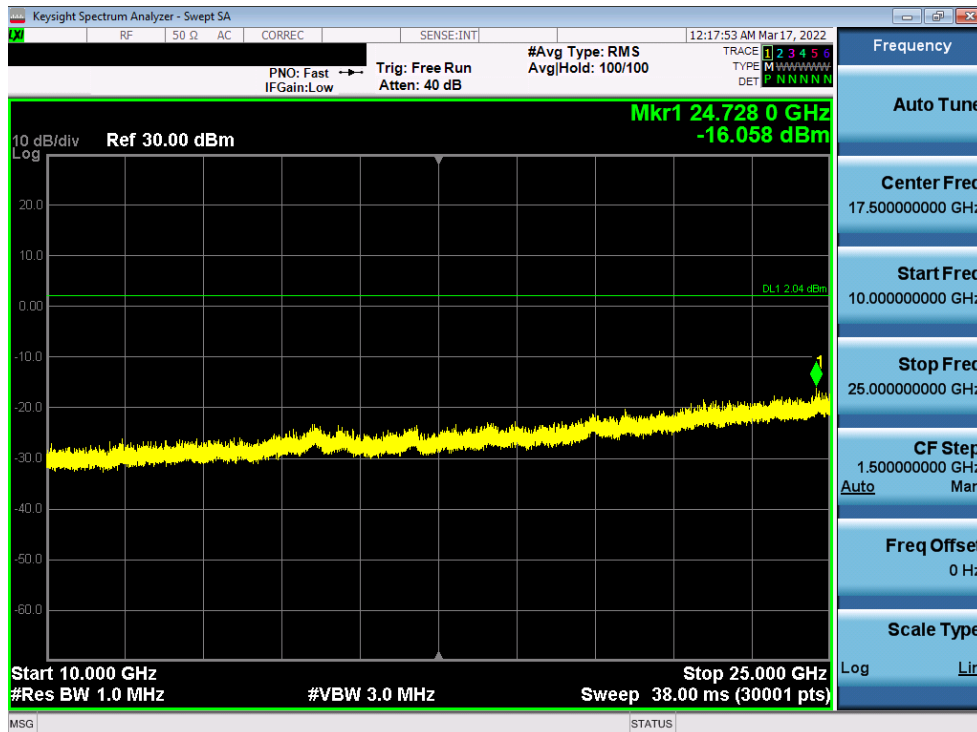


Plot 7-63. Conducted Spurious Plot (EA LAN2, 142.22kbps – Ch. 0)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 53 of 78

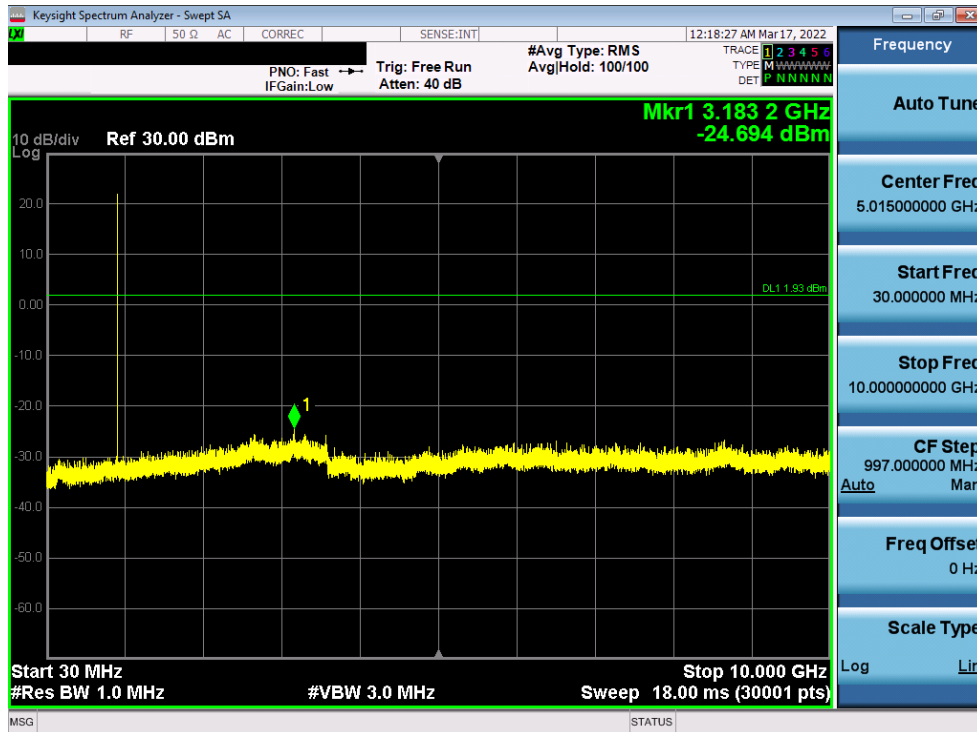


Plot 7-64. Conducted Spurious Plot (EA LAN2, 142.22kbps – Ch. 32)

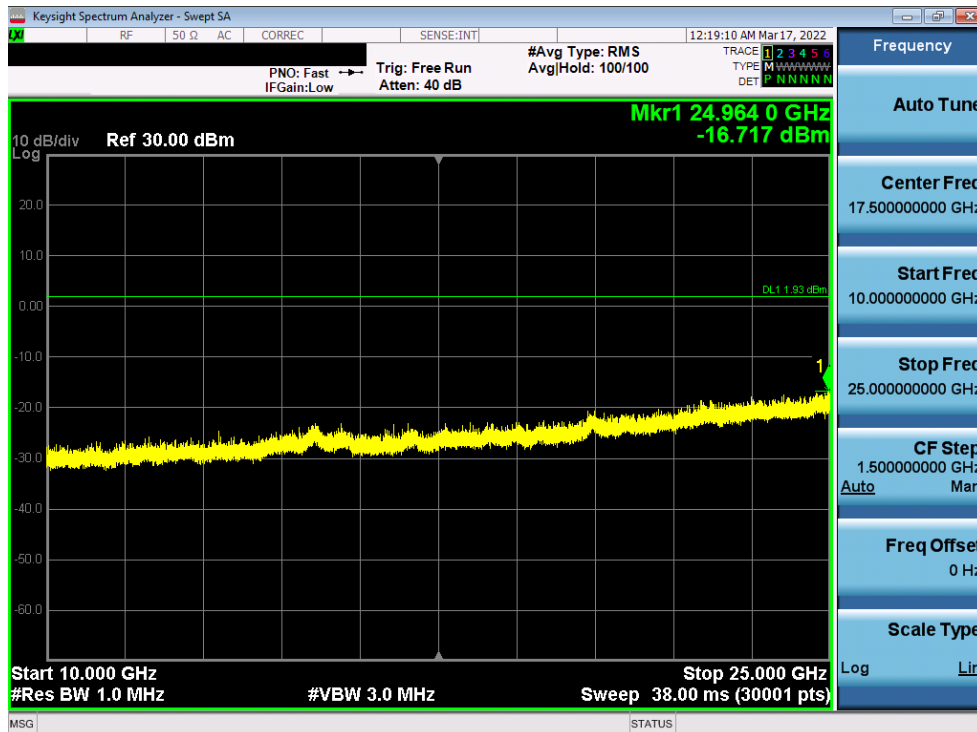


Plot 7-65. Conducted Spurious Plot (EA LAN2, 142.22kbps – Ch. 32)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 54 of 78

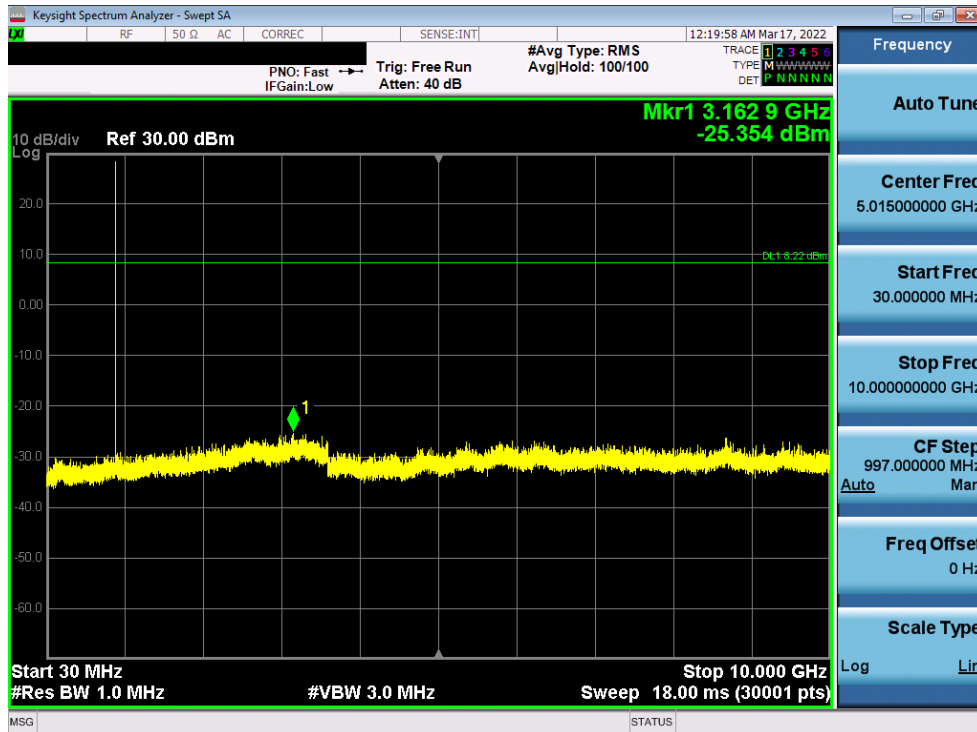


Plot 7-66. Conducted Spurious Plot (EA LAN2, 142.22kbps – Ch. 63)

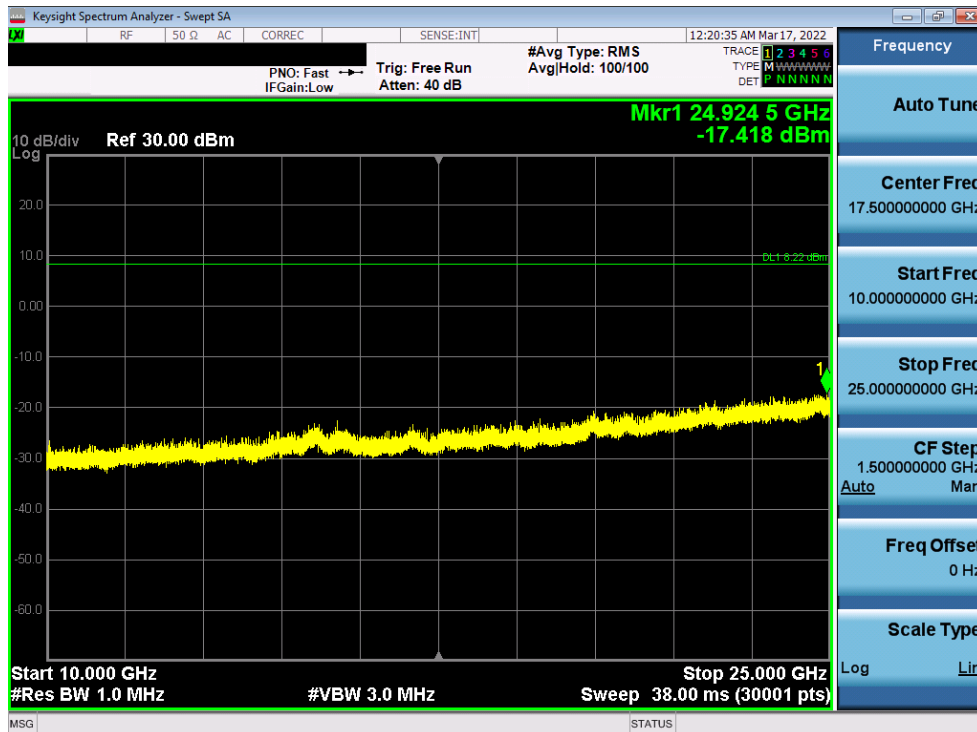


Plot 7-67. Conducted Spurious Plot (EA LAN2, 142.22kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 55 of 78



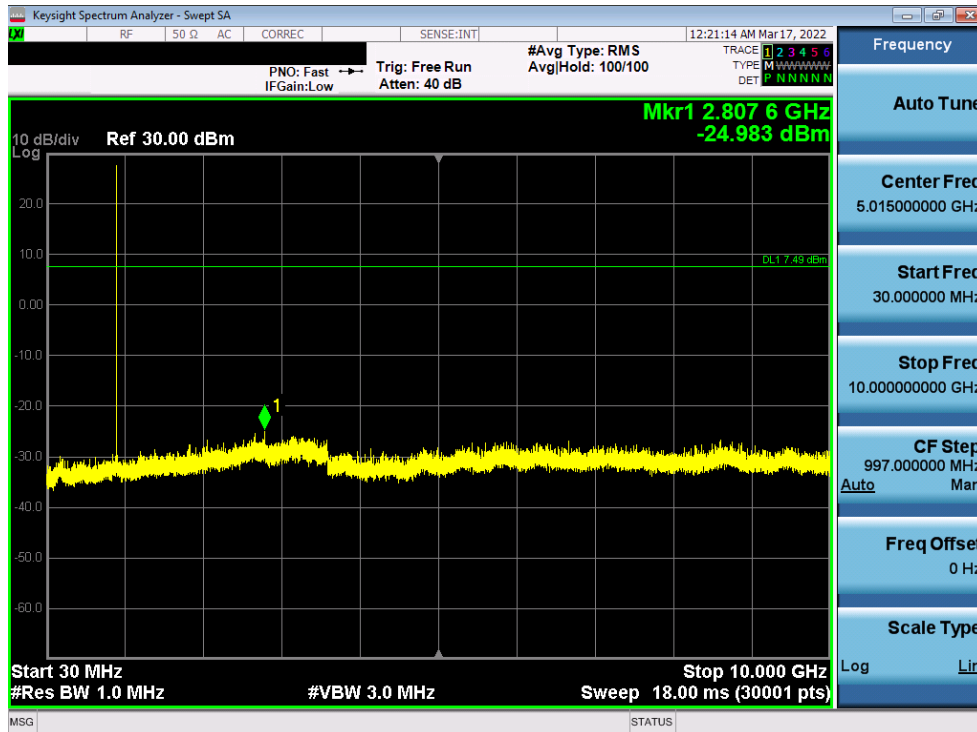
Plot 7-68. Conducted Spurious Plot (SN 50K, 50kbps – Ch. 0)



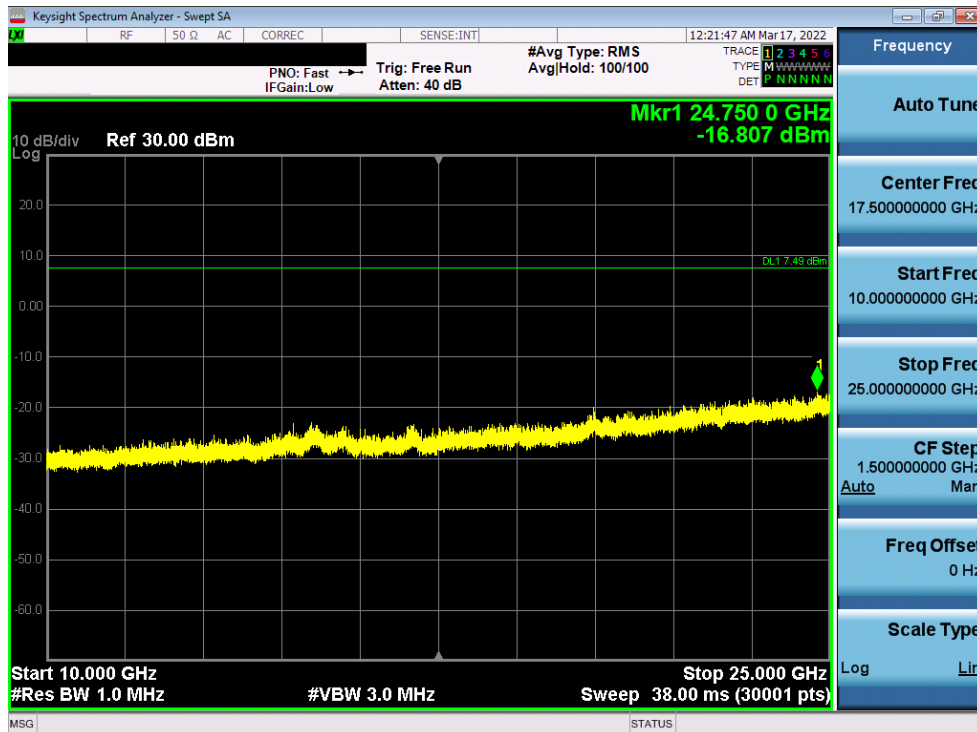
Plot 7-69. Conducted Spurious Plot (SN 50K, 50kbps – Ch. 0)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 56 of 78



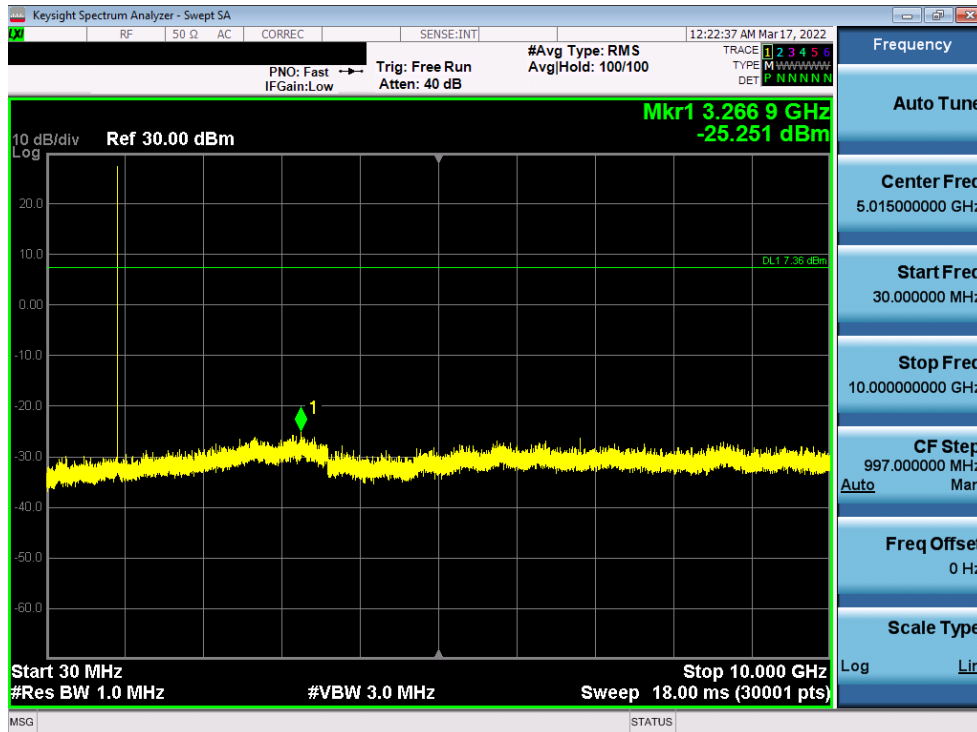


Plot 7-70. Conducted Spurious Plot (SN 50K, 50kbps – Ch. 32)

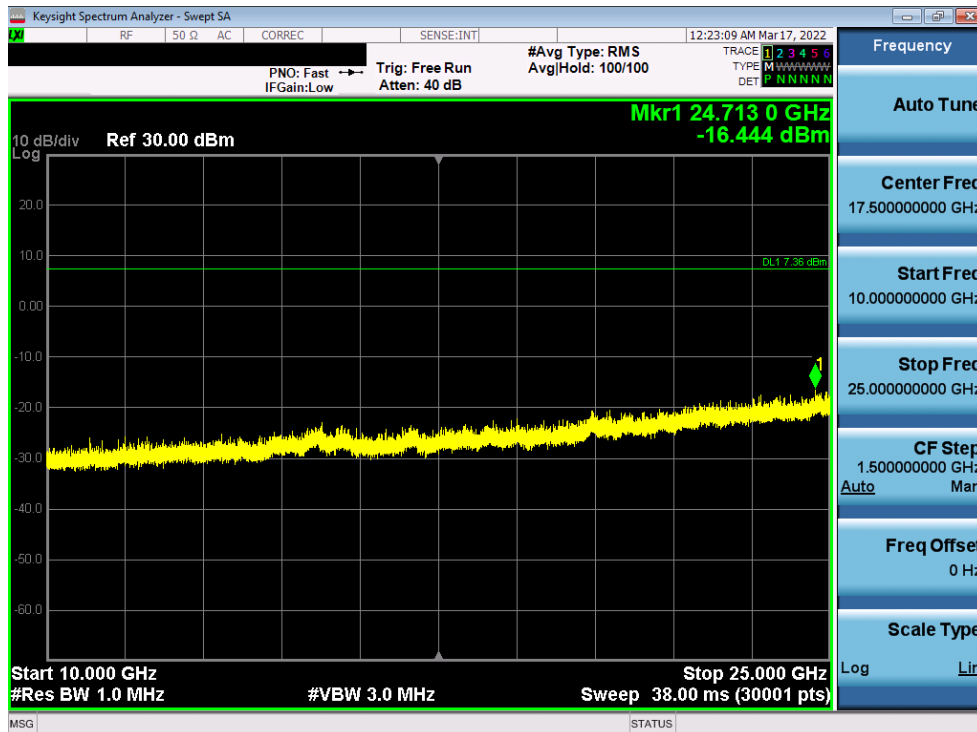


Plot 7-71. Conducted Spurious Plot (SN 50K, 50kbps – Ch. 32)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 57 of 78



Plot 7-72. Conducted Spurious Plot (SN 50K, 50kbps – Ch. 63)

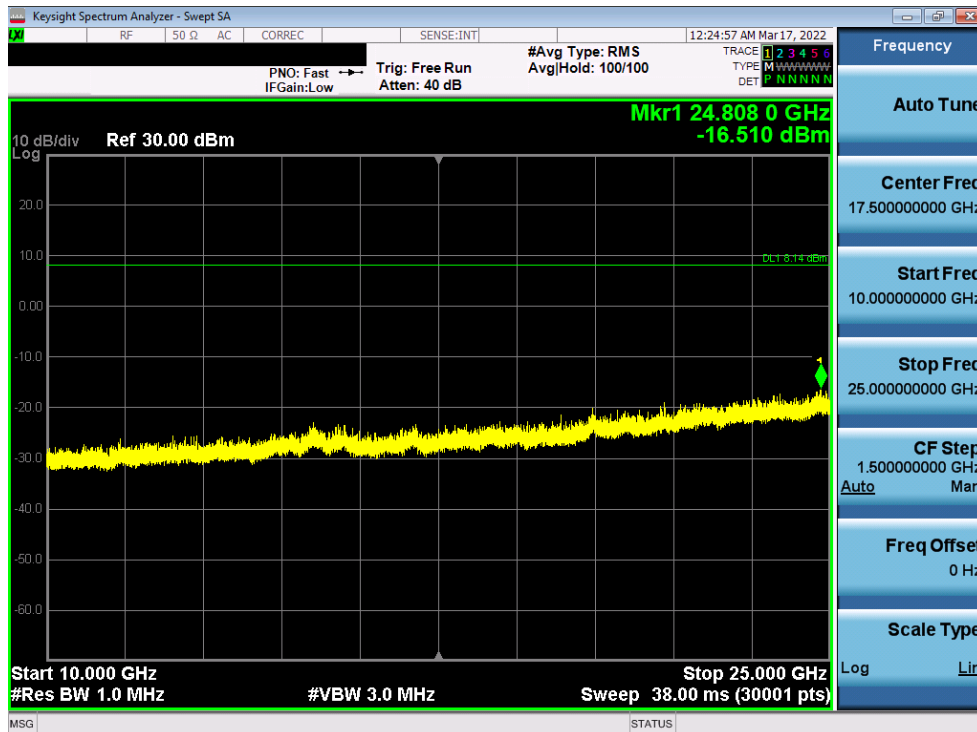


Plot 7-73. Conducted Spurious Plot (SN 50K, 50kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 58 of 78

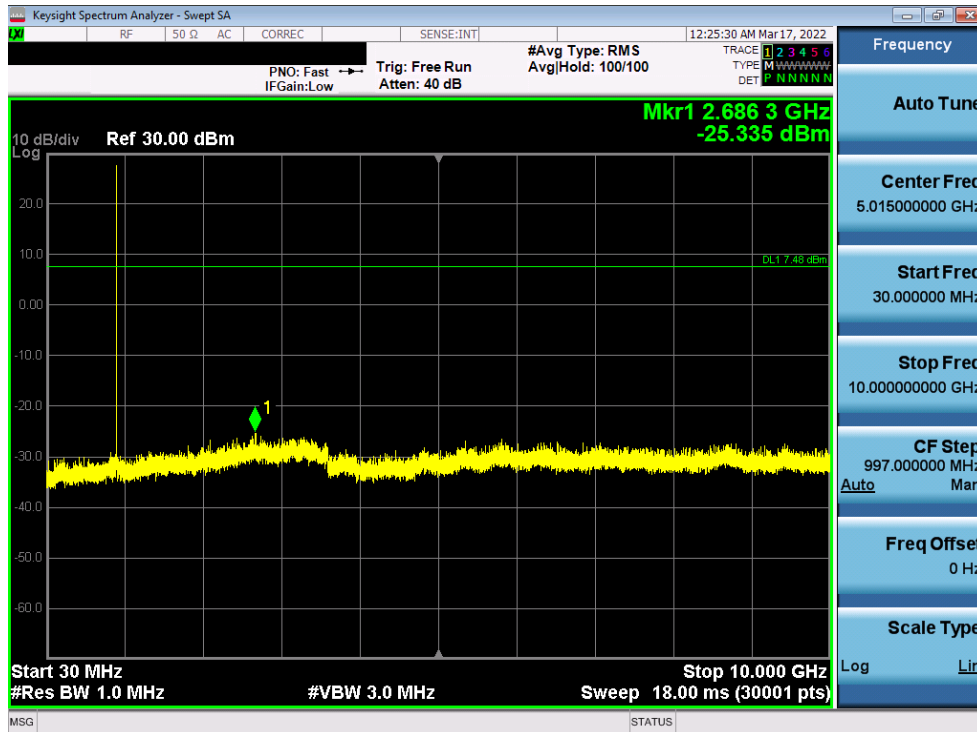


Plot 7-74. Conducted Spurious Plot (SN 150K, 150kbps – Ch. 0)

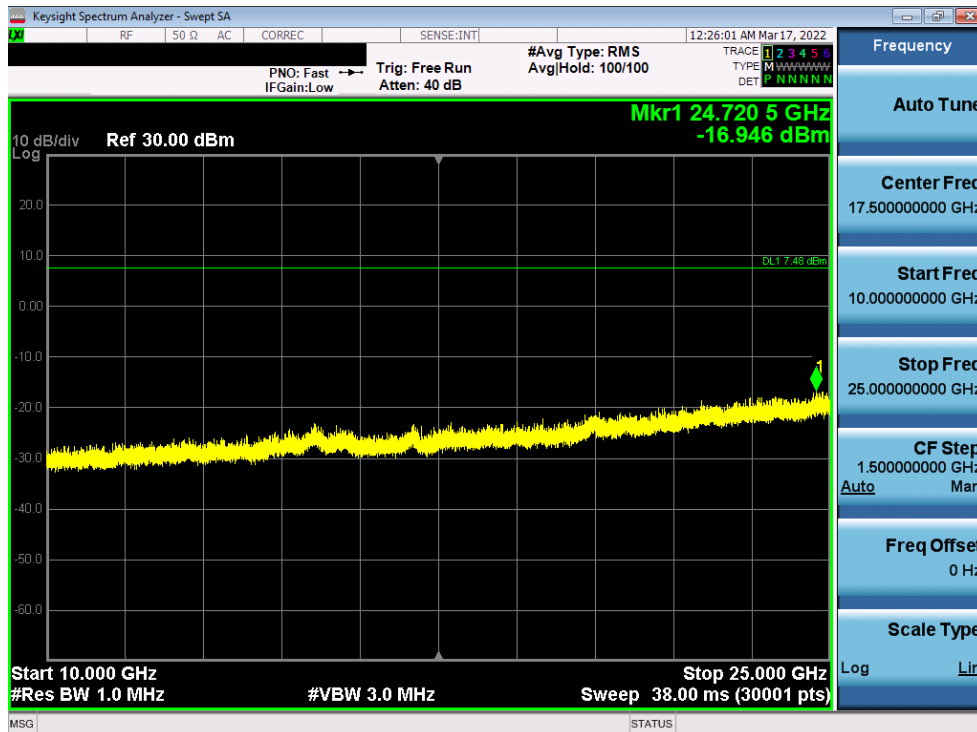


Plot 7-75. Conducted Spurious Plot (SN 150K, 150kbps – Ch. 0)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 59 of 78

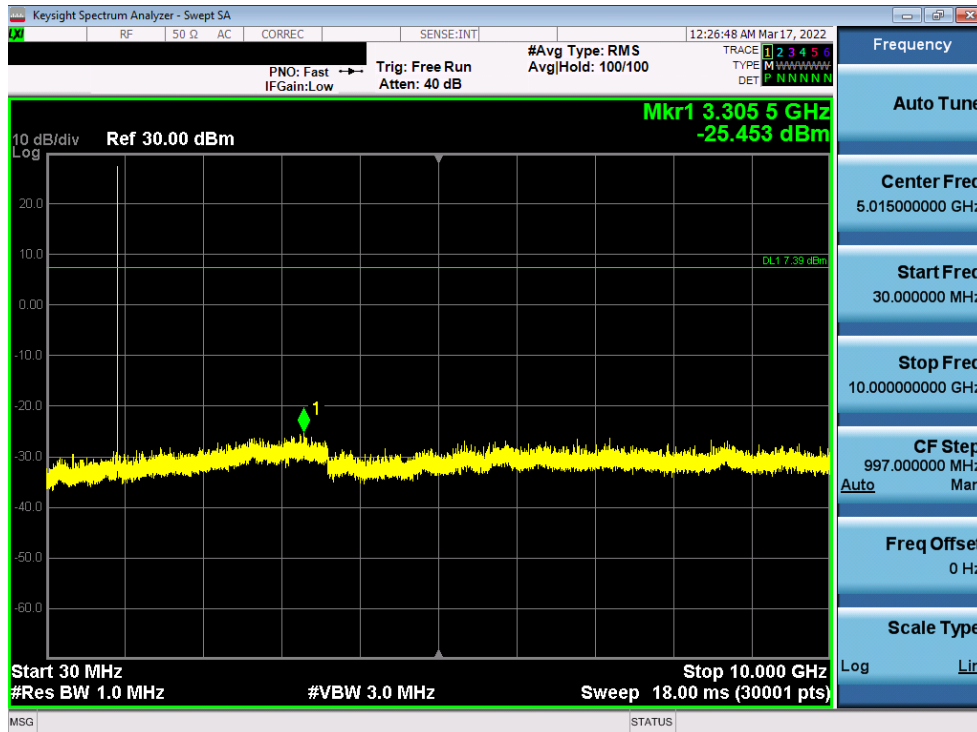


Plot 7-76. Conducted Spurious Plot (SN 150K, 150kbps – Ch. 32)

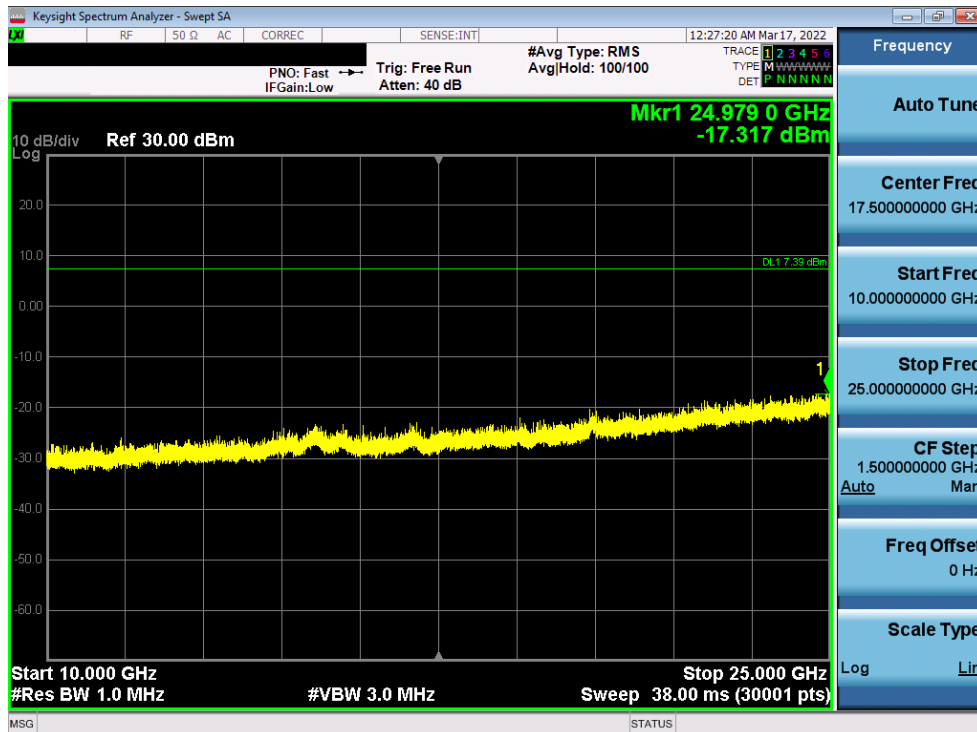


Plot 7-77. Conducted Spurious Plot (SN 150K, 150kbps – Ch. 32)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 60 of 78

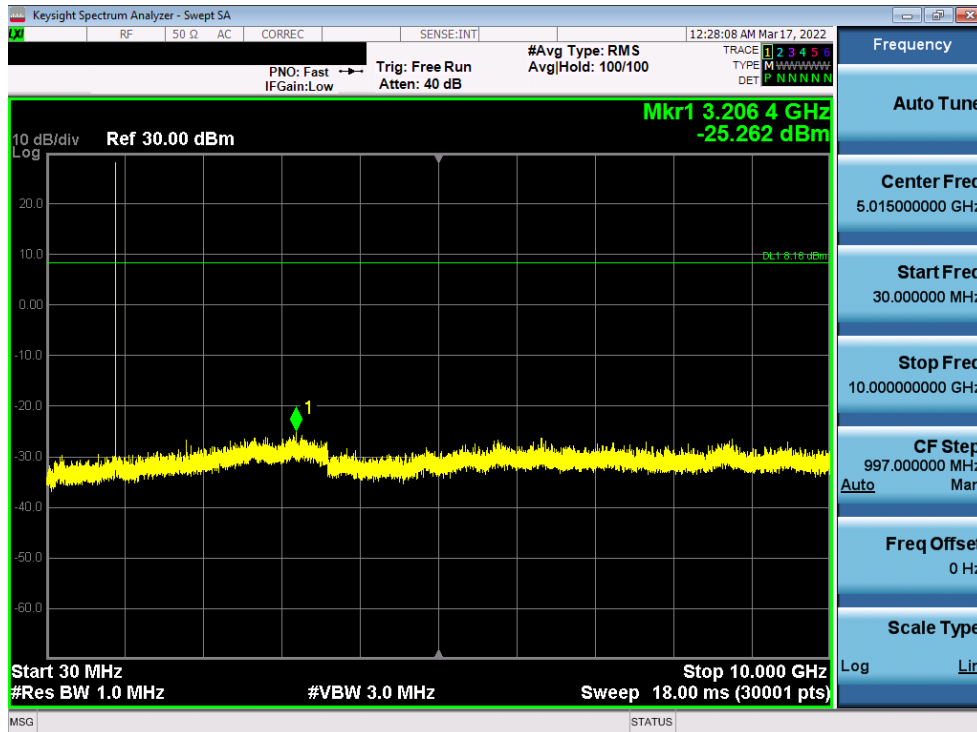


Plot 7-78. Conducted Spurious Plot (SN 150K, 150kbps – Ch. 63)

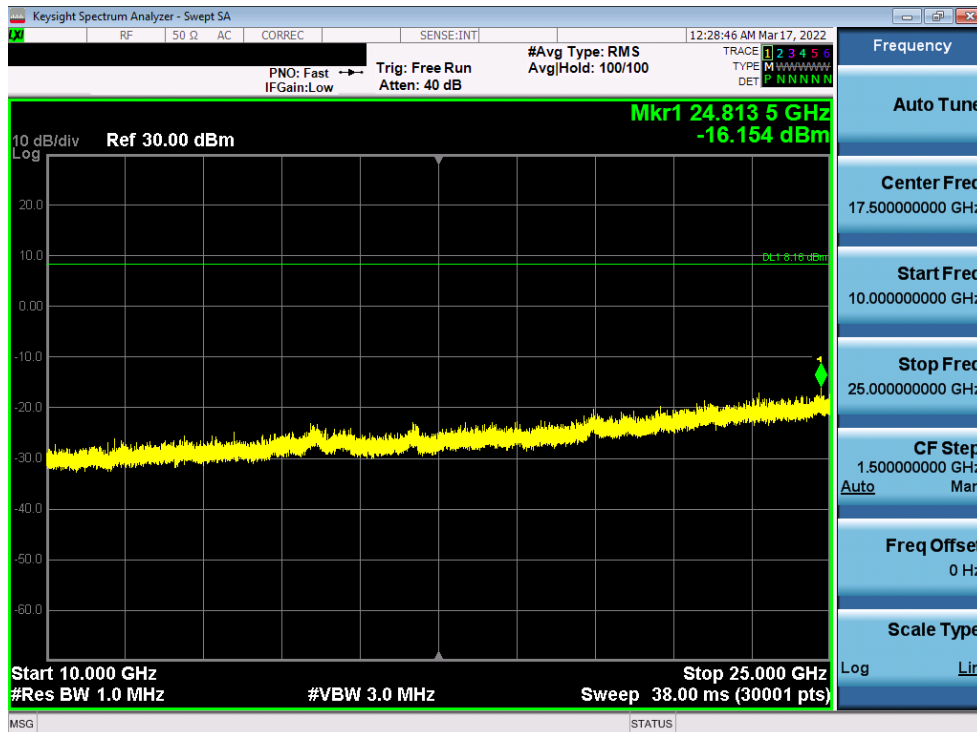


Plot 7-79. Conducted Spurious Plot (SN 150K, 150kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 61 of 78

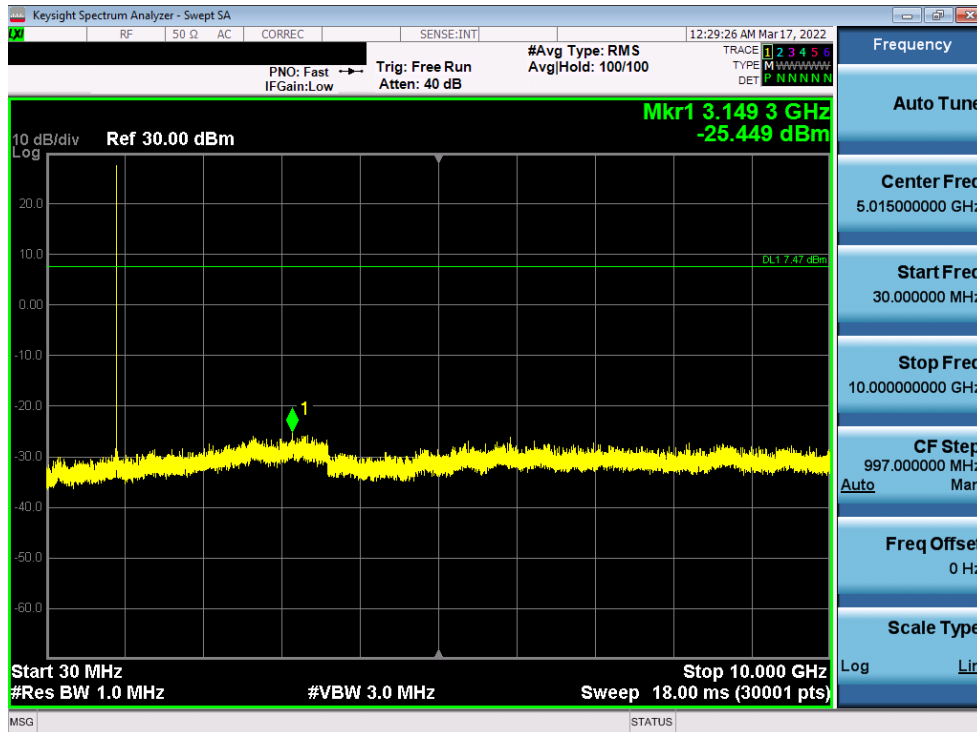


Plot 7-80. Conducted Spurious Plot (SN 200K, 200kbps – Ch. 0)

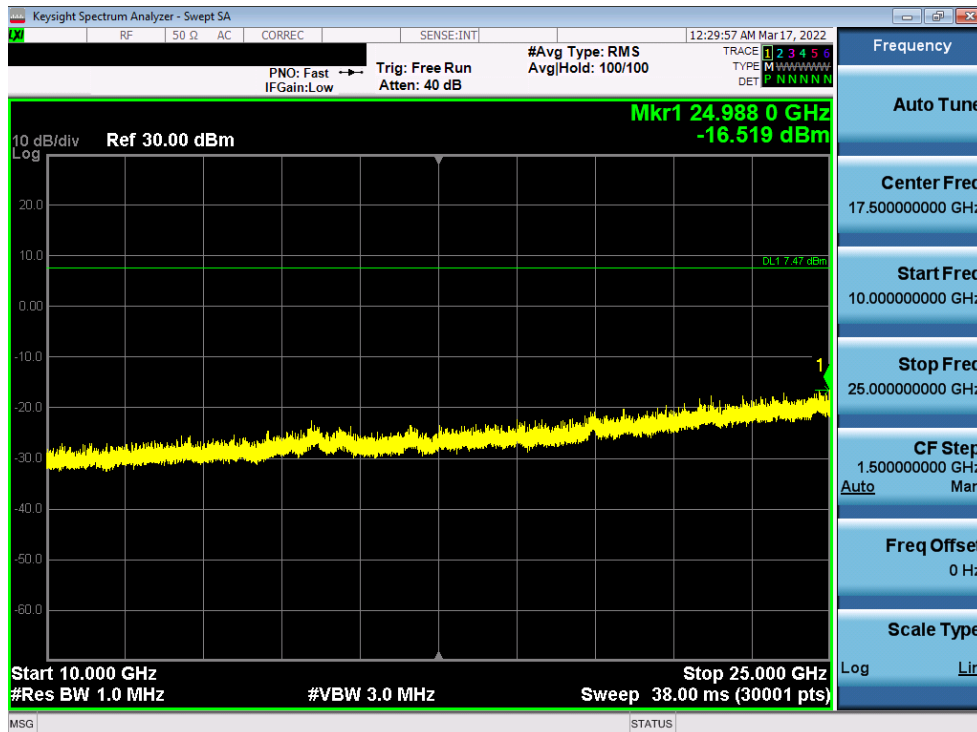


Plot 7-81. Conducted Spurious Plot (SN 200K, 200kbps – Ch. 0)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 62 of 78

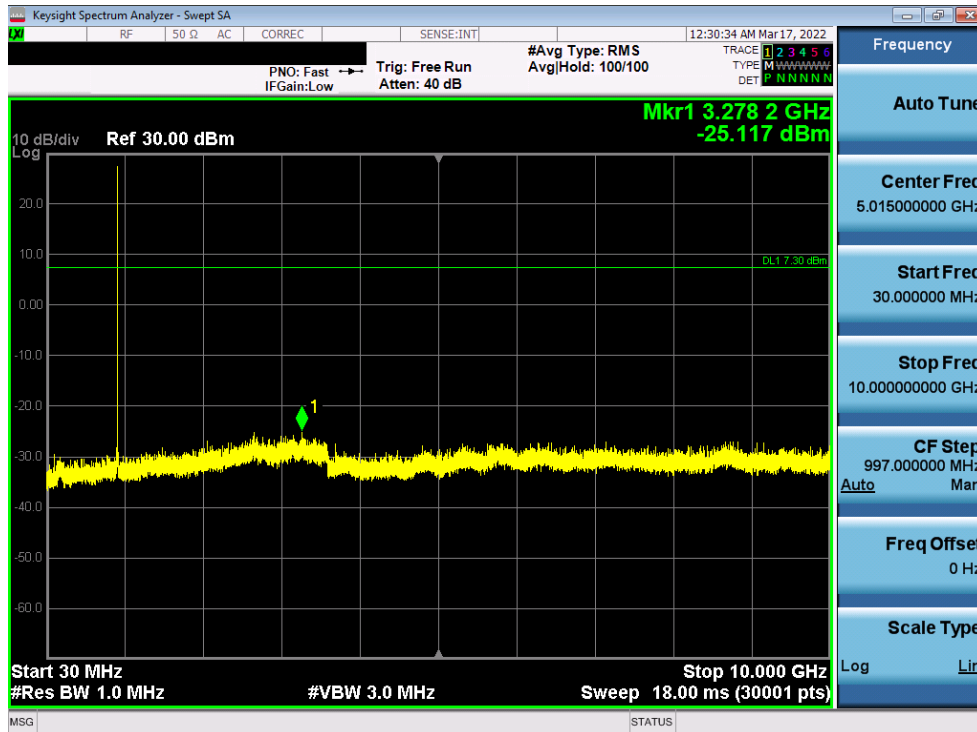


Plot 7-82. Conducted Spurious Plot (SN 200K, 200kbps – Ch. 32)

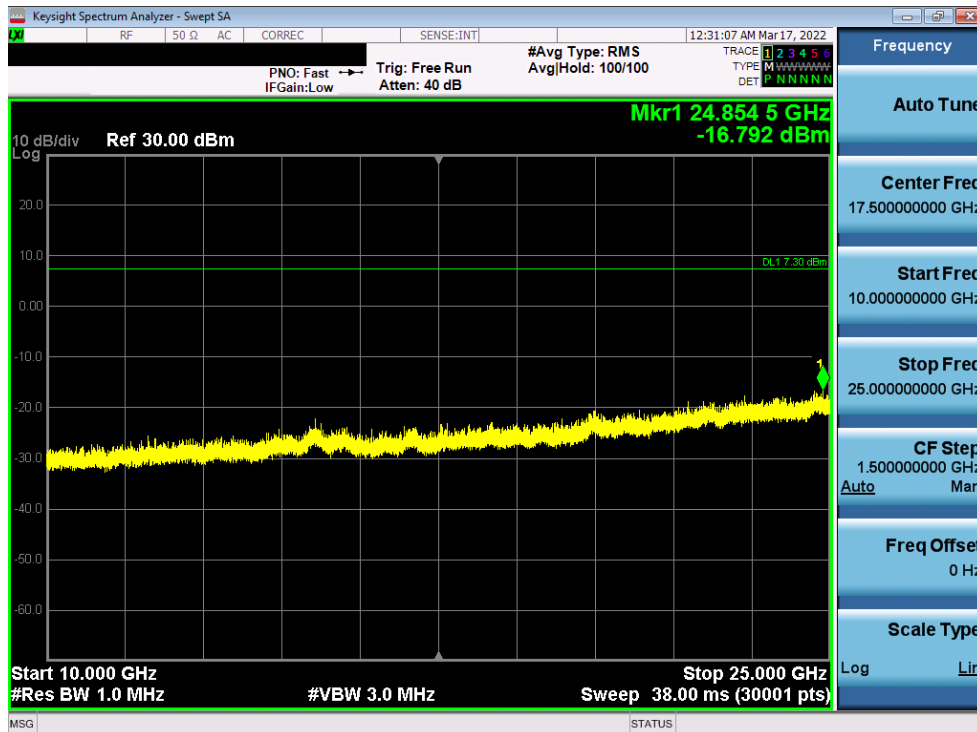


Plot 7-83. Conducted Spurious Plot (SN 200K, 200kbps – Ch. 32)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 63 of 78



Plot 7-84. Conducted Spurious Plot (SN 200K, 200kbps – Ch. 63)



Plot 7-85. Conducted Spurious Plot (SN 200K, 200kbps – Ch. 63)

FCC ID: QZC-SNRGK4	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2203310044-01.QZC	Test Dates: 03/15/2022 - 03/24/2022	EUT Type: Non-Metering Gatekeeper/Synergynet Router	Page 64 of 78





## 7.9 Radiated Spurious Emission Measurements – Above 1GHz

§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]

### Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst-case emissions are reported in this section.

***All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown below per Section 15.209 and RSS-Gen (8.9).***

Frequency	Field Strength [ $\mu\text{V/m}$ ]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-5. Radiated Limits

### Test Procedure Used

ANSI C63.10-2013 – Section 6.6.4.3

### Test Settings

#### Average Field Strength Measurements per Section 4.1.4.2.3 of ANSI C63.10-2013

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 1kHz  $\geq 1/\tau$  Hz, where  $\tau$  = pulse width in seconds
4. Averaging type was set to RMS to ensure that video filtering was applied in the power domain
5. Detector = peak
6. Sweep time = auto
7. Trace mode = max hold
8. Trace was allowed to stabilize

#### Peak Field Strength Measurements per Section 4.1.4.2.2 of ANSI C63.10-2013

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW is set depending on measurement frequency, as specified in Table 7-6 below
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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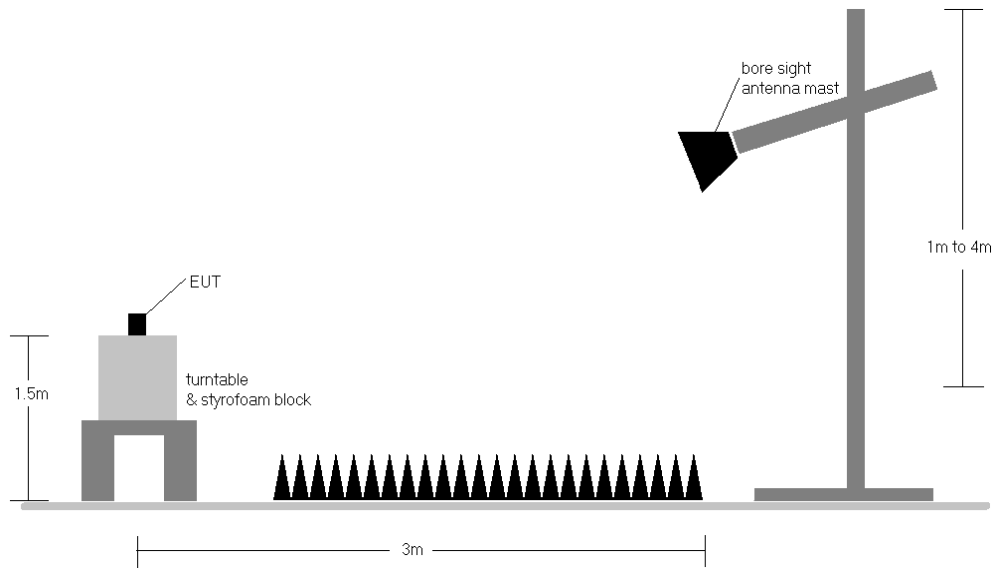
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Frequency	RBW
9 – 150kHz	200 – 300Hz
0.15 – 30MHz	9 – 10kHz
30 – 1000MHz	100 – 120kHz
> 1000MHz	1MHz

**Table 7-6. RBW as a Function of Frequency**

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 7-8. Radiated Test Setup >1GHz**

### Test Notes

1. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in §15.209.
2. The antenna is manipulated through typical positions, polarity, and length during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested while powered by an AC power source.
4. The spectrum is measured from 30MHz to the 10<sup>th</sup> harmonic and the worst-case emissions are reported.
5. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
6. The "-" shown in the following RSE tables is used to denote a noise floor measurement.
7. All modes were investigated for RSEs and only the worst case is reported (SN 50K)

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**Sample Calculation**

- Field Strength Level  $_{[dB\mu V/m]} = \text{Analyzer Level }_{[dBm]} + 107 + \text{AFCL }_{[dB/m]}$
- $\text{AFCL }_{[dB/m]} = \text{Antenna Factor }_{[dB/m]} + \text{Cable Loss }_{[dB]}$
- $\text{Margin }_{[dB]} = \text{Field Strength Level }_{[dB\mu V/m]} - \text{Limit }_{[dB\mu V/m]}$

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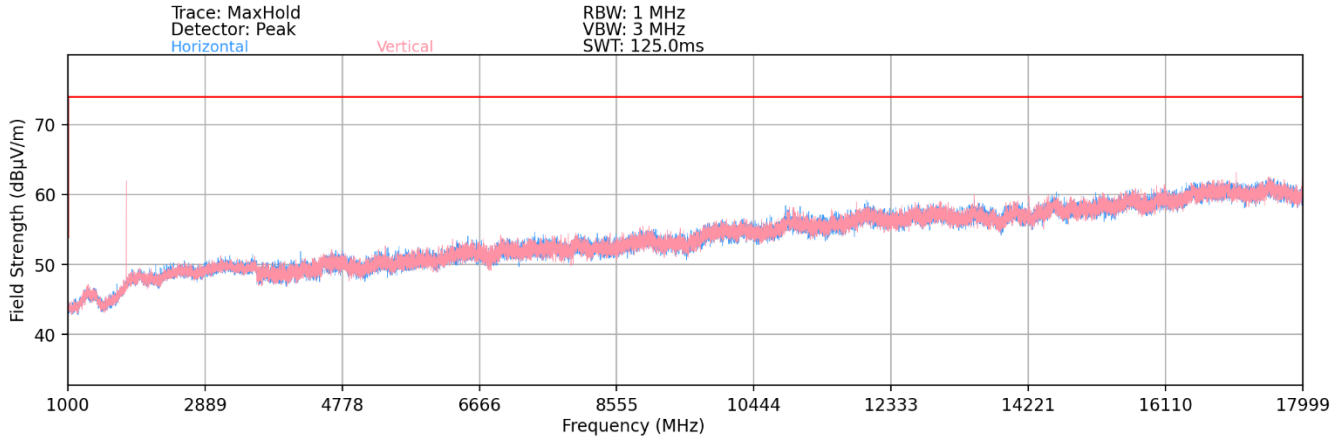
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## Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]



Plot 7-86. Radiated Spurious Plot above 1GHz (SN 50K– Ch. 0)

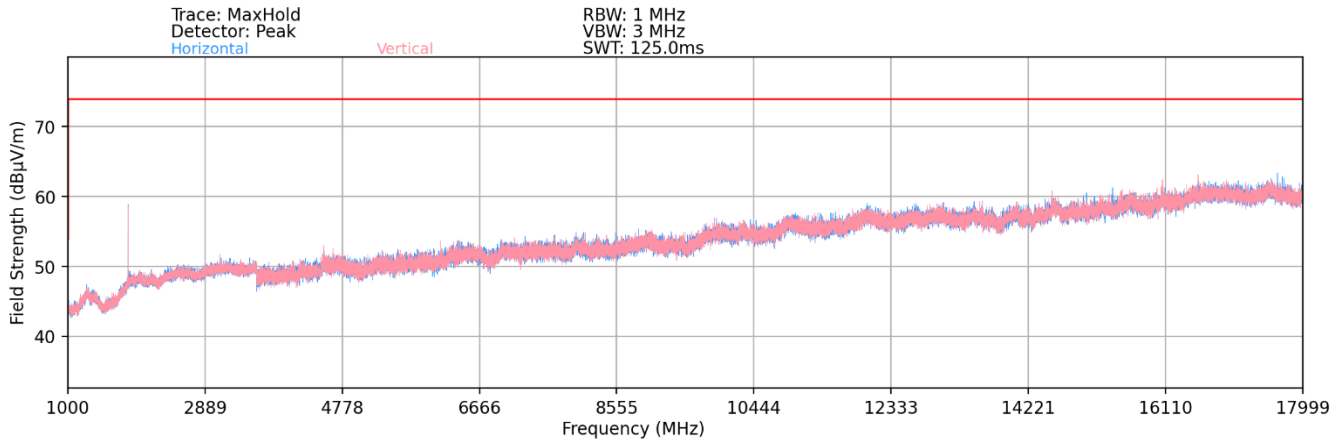
Worst Case Mode: SN 50K  
 Worst Case Data Rate: 50kbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 902.4MHz  
 Channel: 0

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
2707.20	Avg	V	202	291	-64.22	1.00	43.78	53.98	-10.20
2707.20	Peak	V	202	291	-61.93	1.00	46.07	73.98	-27.91
3609.60	Avg	V	145	189	-69.07	2.83	40.76	53.98	-13.22
3609.60	Peak	V	145	189	-63.92	2.83	45.91	73.98	-28.07
4512.00	Avg	V	382	285	-67.22	3.77	43.55	53.98	-10.43
4512.00	Peak	V	382	285	-60.56	3.77	50.21	73.98	-23.77

Table 7-7. Radiated Measurements

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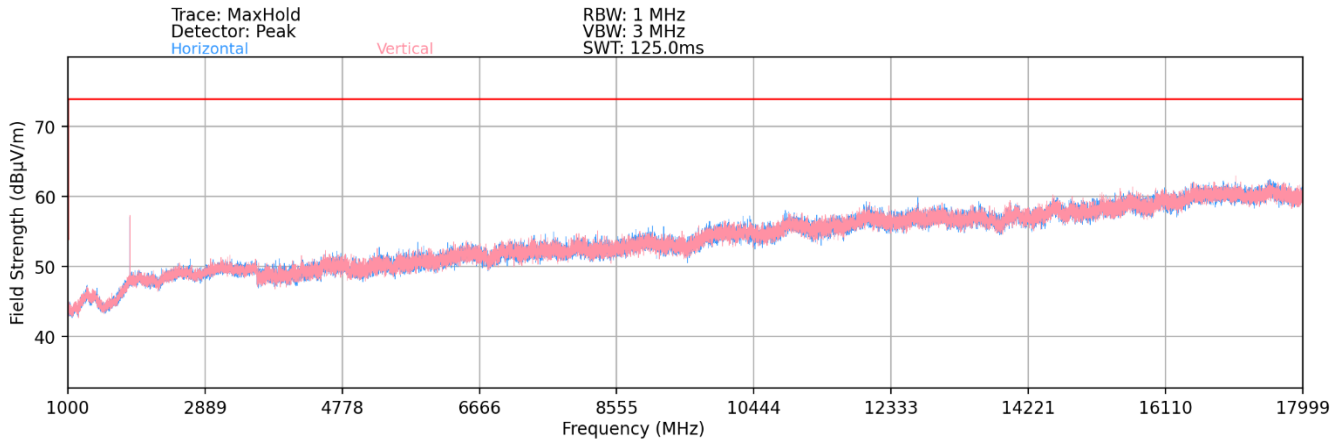
**Plot 7-87. Radiated Spurious Plot above 1GHz (SN 50K– Ch. 32)**

Worst Case Mode: SN 50K  
Worst Case Data Rate: 50kbps  
Measurement Distance: 3 Meters  
Operating Frequency: 915.2MHz  
Channel: 32

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
2745.60	Avg	V	160	303	-74.48	0.61	33.13	53.98	-20.85
2745.60	Peak	V	160	303	-65.30	0.61	42.31	73.98	-31.67
3660.80	Avg	V	400	103	-67.52	3.05	42.53	53.98	-11.45
3660.80	Peak	V	400	103	-62.37	3.05	47.68	73.98	-26.30
4576.00	Avg	V	157	92	-77.14	4.46	34.32	53.98	-19.66
4576.00	Peak	V	157	92	-66.24	4.46	45.22	73.98	-28.76

**Table 7-8. Radiated Measurements**

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**Plot 7-88. Radiated Spurious Plot above 1GHz (SN 50K- Ch. 63)**

Worst Case Mode: SN 50K  
 Worst Case Data Rate: 50kbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 928.4MHz  
 Channel: 63

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
2782.80	Avg	V	226	301	-70.64	0.72	37.08	53.98	-16.90
2782.80	Peak	V	226	301	-64.83	0.72	42.89	73.98	-31.09
3710.40	Avg	V	400	108	-66.79	3.09	43.30	53.98	-10.68
3710.40	Peak	V	400	108	-62.43	3.09	47.66	73.98	-26.32
4638.00	Avg	V	393	233	-74.45	4.65	37.20	53.98	-16.78
4638.00	Peak	V	393	233	-65.56	4.65	46.09	73.98	-27.89

**Table 7-9. Radiated Measurements**

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**7.10 Radiated Spurious Emissions Measurements – Below 1GHz**  
**§15.209; RSS-Gen [8.9]**

**Test Overview and Limit**

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

***All out of band emissions must not exceed the limits shown below per Section 15.209 and RSS-Gen (8.9).***

Frequency	Field Strength [ $\mu$ V/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

**Table 7-10. Radiated Limits**

**Test Procedures Used**

ANSI C63.10-2013

**Test Settings**

**Quasi-Peak Field Strength Measurements**

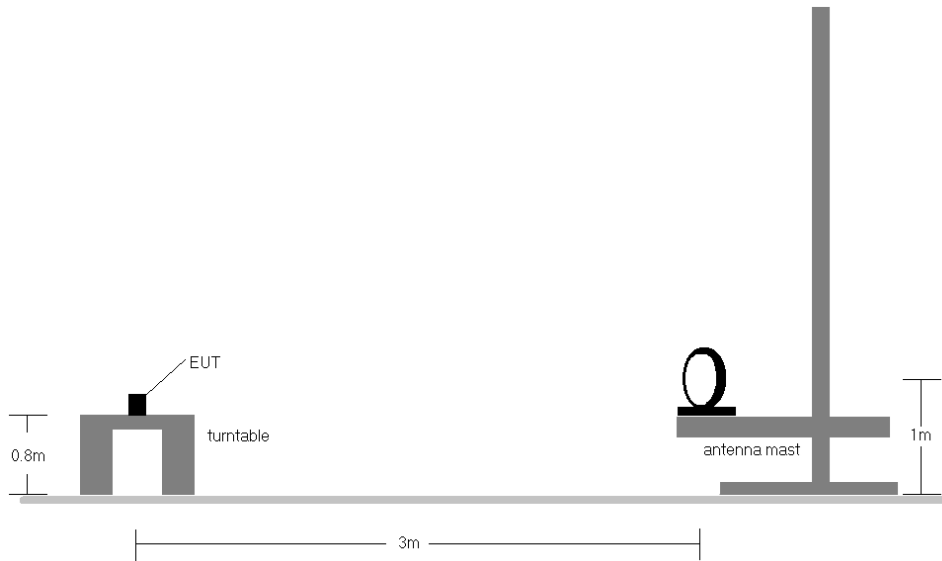
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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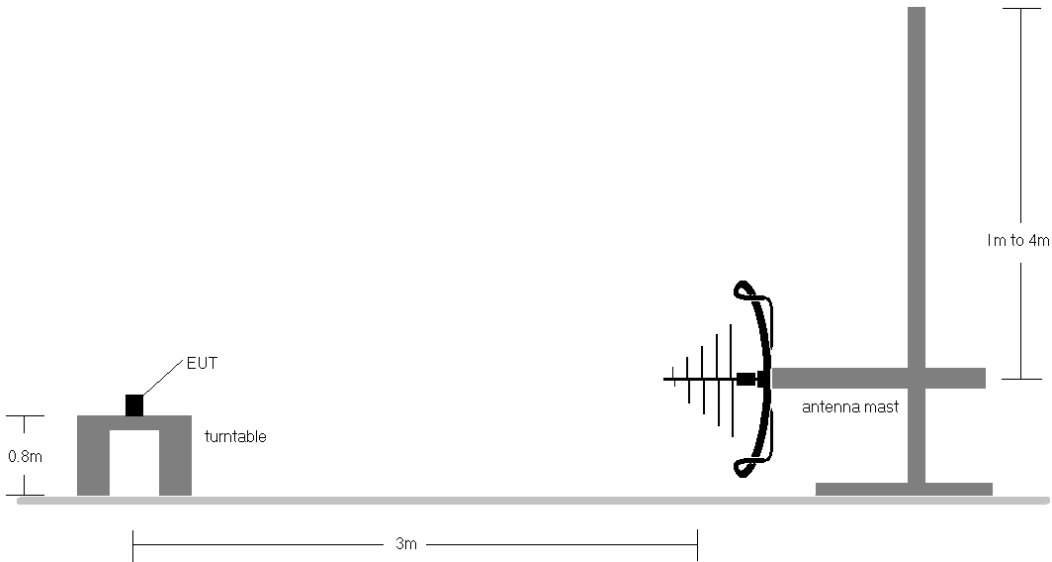
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**Test Setup**

The EUT and measurement equipment were set up as shown in the diagrams below.



**Figure 7-9. Radiated Test Setup < 30Mhz**



**Figure 7-10. Radiated Test Setup < 1GHz**

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**Test Notes**

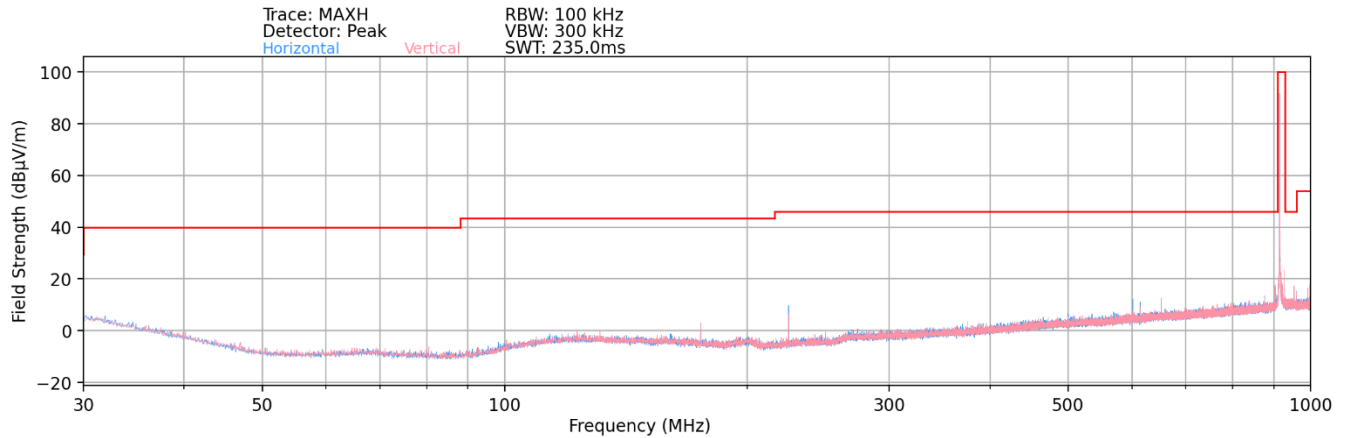
1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen (8.10) are below the limits shown in §15.209.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested while powered by an AC power source.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
9. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

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## Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209; RSS-Gen [8.9]



Plot 7-89. Radiated Spurious Plot below 1GHz

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
215.00	Quasi-Peak	H	-	-	-93.11	17.43	31.32	46.02	-14.70
600.00	Quasi-Peak	H	-	-	-92.72	26.87	41.15	46.02	-4.87

Table 7-11. Radiated Measurements

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## 7.11 Line Conducted Measurement Data

§15.207; RSS-Gen [8.8]

### Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

**All conducted emissions must not exceed the limits shown in the table below per Section 15.207 and RSS-Gen (8.8).**

Frequency of emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Table 7-12. Conducted Limits

\*Decreases with the logarithm of the frequency.

### Test Procedures Used

ANSI C63.10-2013, Section 6.2

### Test Settings

#### Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

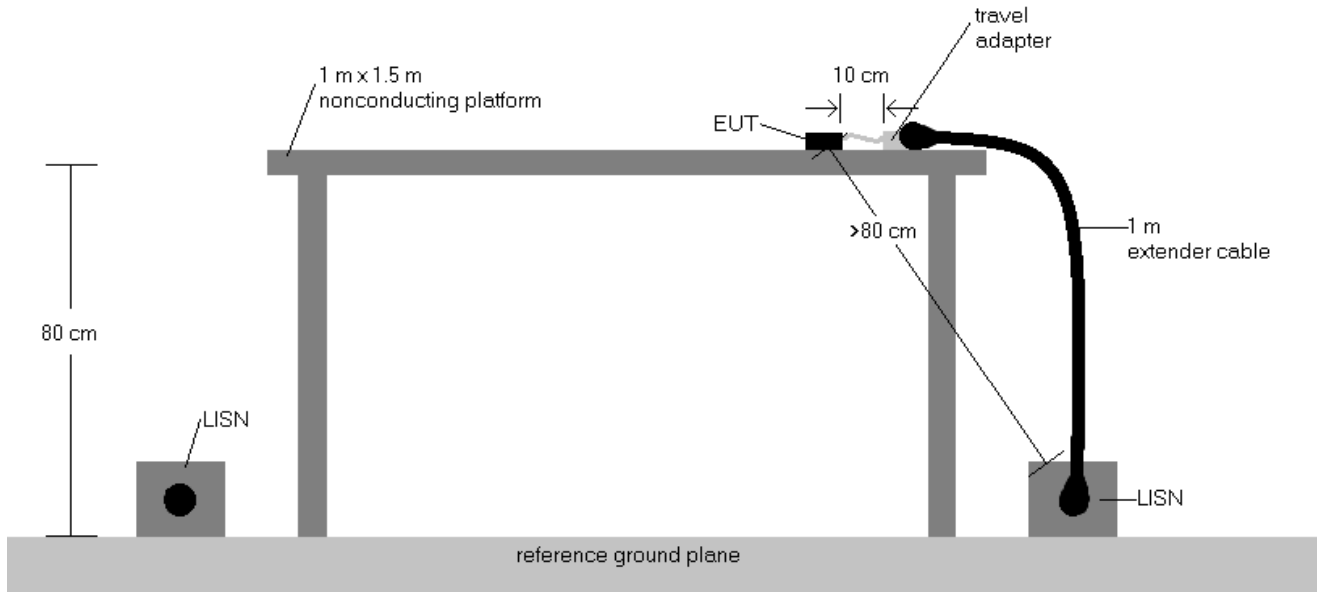
#### Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = RMS
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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**Test Setup**

The EUT and measurement equipment were set up as shown in the diagram below.

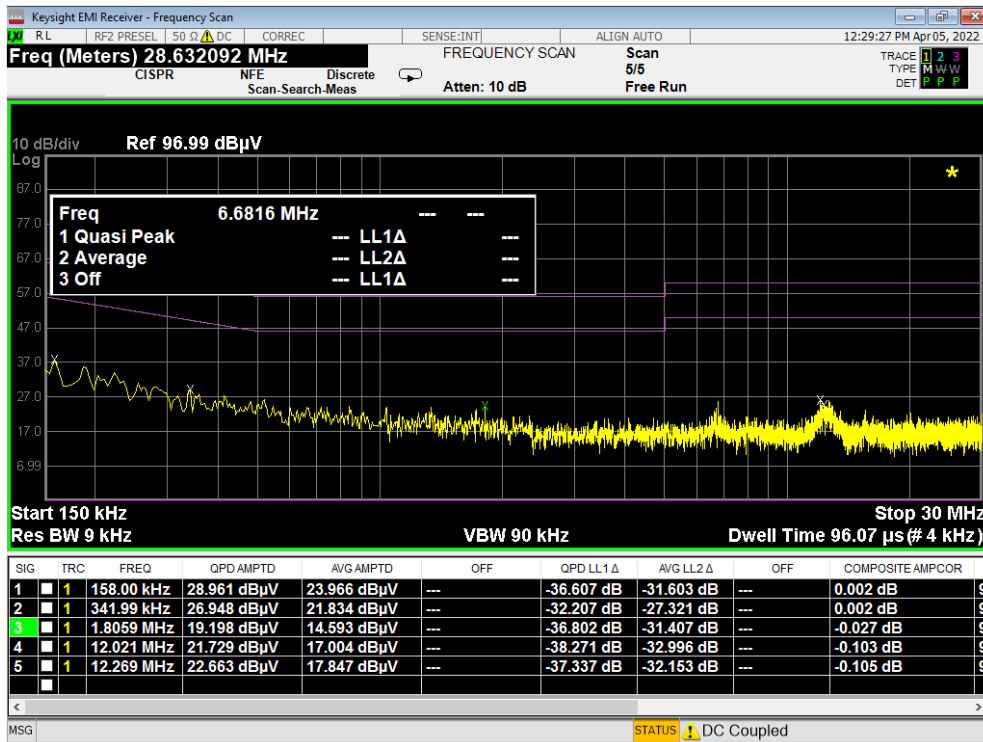


**Figure 7-11. Test Instrument & Measurement Setup**

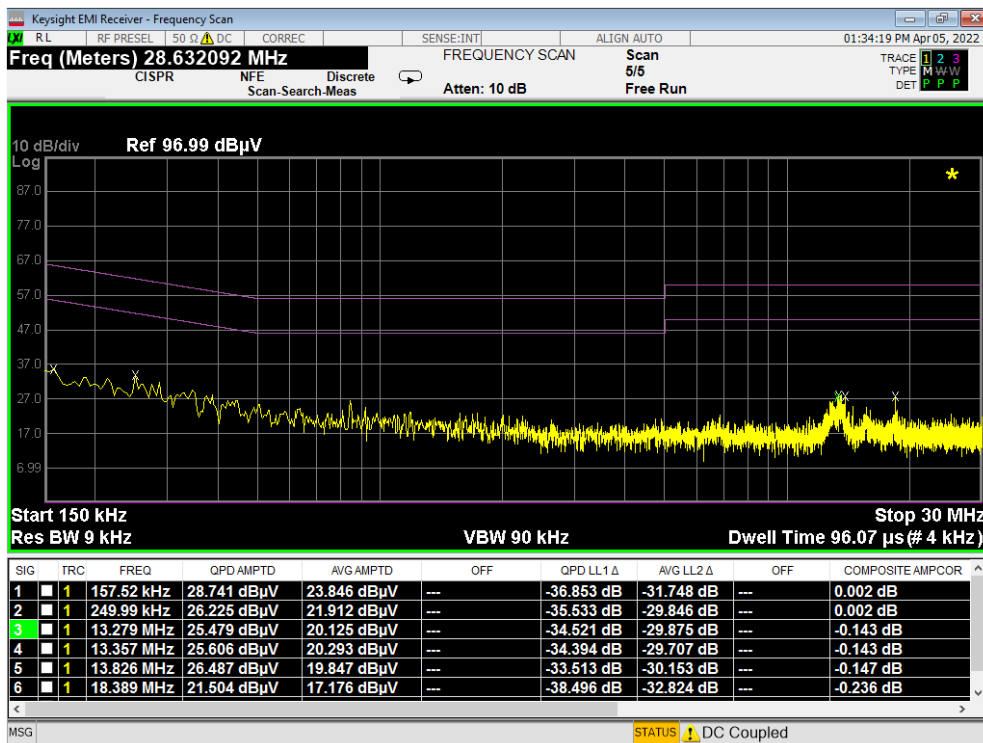
**Test Notes**

1. All modes of operation were investigated, and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207 and RSS-Gen (8.8).
3.  $Corr. (dB) = Cable\ loss (dB) + LISN\ insertion\ factor (dB)$
4.  $QP/AV\ Level (dB\mu V) = QP/AV\ Analyzer/Receiver\ Level (dB\mu V) + Corr. (dB)$
5.  $Margin (dB) = QP/AV\ Limit (dB\mu V) - QP/AV\ Level (dB\mu V)$
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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Plot 7-90. Line-Conducted Test Plot (L1)



Plot 7-91. Line-Conducted Test Plot (N)

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## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Elster Solutions, LLC Non-Metering Gatekeeper/Synergynet Router FCC ID: QZC-SNRGK4** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and with RSS-247 Issue 2 of the Innovation, Science, and Economic Development Canada rules.

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