Global Product Compliance Laboratory
600-700 Mountain Avenue
Room 5B-108
Murray Hill, New Jersey 07974-0636 USA

TESTING
NVLAP LAB CODE: 100275-0

Test Report

Regulation:
FCC Part 2 and 27

Client:
Nokia Mobility

Product Evaluated:
AHNA AirScale RRH 4T4R B30 100W (AHNA)

Report Number:
TR-2018-0259-FCC2-27

Date Issued:
January 25, 2019

Table of Contents

Revisions

Date	Revision	Section	Change
1/25/2019	0		Initial Release

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Prepared By:

Signed: Steve Gordon 1/25/2019
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Approved By:

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Signed: 1/25/2019
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1. System Information and Requirements

Equipment Under Test (EUT):	AHNA AirScale RRH 4T4R B30 100W (AHNA)
Serial Number:	1M184225310 1M184225329
Cell Name / Number	GPCL Project Number: 2019-0259
Company:	NOKIA SOLUTIONS AND NETWORKS OY KARAPORTTI 3, FI-02610 ESPOO FINLAND
Manufacturer:	NOKIA SOLUTIONS AND NETWORKS OY
Test Requirement(s):	47 CFR FCC Part 2 and Part 27 KDB 971168 D01 Power Measurement License Digital Systems v03r01 April 9, 2018. KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013
Measurement Procedure(s):	ANSI C63.26 (2015) 47 CFR FCC Part 2 and FCC Part 27 ANSI C63.4 (2014)
Test Date(s):	November 26, 2018 – January 16, 2019
Test Performed By:	Nokia Global Product Compliance Laboratory 600-700 Mountain Ave. P.O. Box 636 Murray Hill, NJ 07974-0636 **FCC Registration Number: 395774**
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Product Engineer(s):	Ron Remy
Lead Engineer	Steve Gordon
Test Engineer (s):	Jaideep Yadav, Eugene Mitchell, Mike Soli
Test Results: The AHNA AirScale RRH 4T4R B30 100W (AHNA), *as tested* met the above listed requirements. Report copies and other information not contained in this report are held by either the product engineer or in an identified file at the Global Product Compliance Laboratory in New Providence, NJ.	

1.1 Introduction

This Conformity Assessment Report applies to the AHNA AirScale RRH 4T4R B30 100W (AHNA), hereinafter referred to as the Equipment Under Test (EUT).

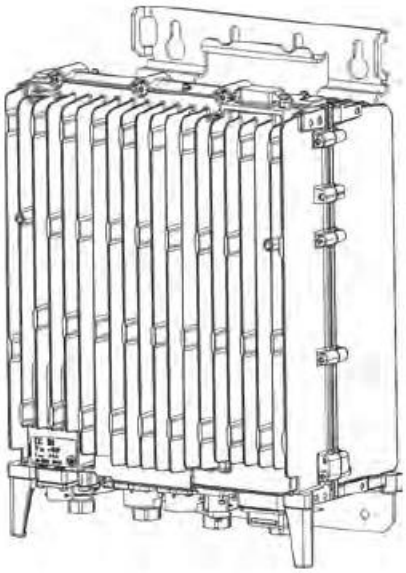
1.2 Purpose and Scope

The purpose of this document is to provide the testing data required for qualifying the EUT in compliance with FCC Parts 2 and 27, measured in accordance with the procedures set out in Section 2.1033 (c) (14) of the Rules.

1.3 EUT Description

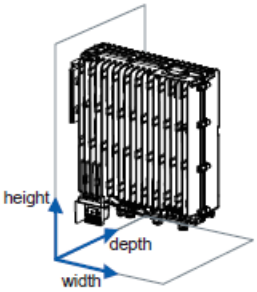
The AHNA is part of AirScale Micro RRH Rel5.1 Quasar Program. It functions as a remote RF head designed to support 5 MHz and 10 MHz bandwidths in addition to the following modulations: QPSK, 16QAM, 64QAM and 256QAM.

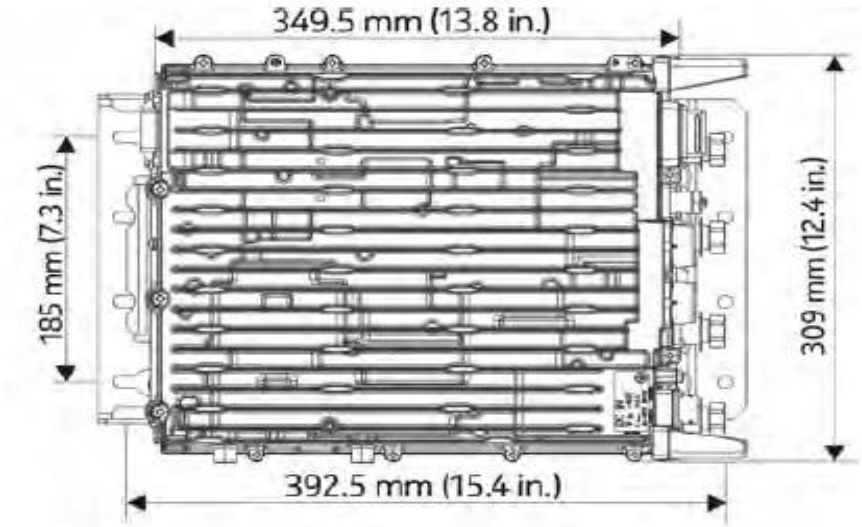
Frequency of operation:
3GPP band 30
DL 2350-2360 MHz
UL 2305-2315 MHz

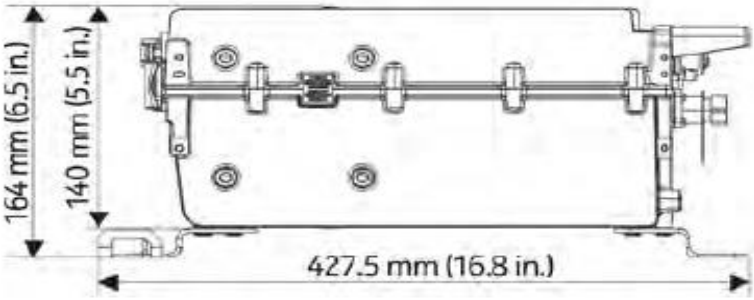


AHNA AirScale RRH 4T4R B30 100 W

AHNA Dimensions and Weight

Property	Value	Dimensions orientation
Height	Core RRH: 336.5 mm (13.25 in.) With upper and lower mounting brackets 427.5 mm (16.83 in.)	
Depth	Core RRH: 140 mm (5.51 in.) With mounting brackets: 164 mm (6.46 in.) With cover and mounting brackets: 183.5 mm (7.22 in.)	
Width	Core RRH: 306 mm (12.05 in.) With cover: 324 mm (12.76 in.)	
Weight	Core RRH: 15.5 kg (34.17 lbs) Core with brackets and cover: 17.7 kg (39.02 lbs)	
Volume	Core RRH: 14.4 l	


349.5 mm (13.8 in.)
185 mm (7.3 in.)
309 mm (12.4 in.)
392.5 mm (15.4 in.)


164 mm (6.5 in.)
140 mm (5.5 in.)
427.5 mm (16.8 in.)

1.3.1 Test Requirements

Each required measurement is listed below:

47 CFR FCC Sections	Description of Tests	Test Required
2.1046	RF Power Output	Yes
2.1047	Modulation Characteristics	Yes
2.1049	(a) Occupied Bandwidth (b) Out-of-Band Emissions	Yes
2.1051	Spurious Emissions at Antenna Terminals	Yes
2.1053	Field Strength of Spurious Radiation	Yes
2.1055	Measurement of Frequency Stability	Yes

1.4 Reference Documents, Test Specifications & Procedures

A list of the applicable documents is provided herein.

1.4.1 Test Specifications

- Title 47 Code of Federal Regulations, Federal Communications Commission Part 2.
- Title 47 Code of Federal Regulations 47, Federal Communications Commission Part 27.

1.4.2 Procedures

1. FCC-IC-0B and FCC-IC-SE

2. C63.26 - American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

3. ANSI C63.4 (2014) entitled: "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz", American National Standards Institute, Institute of Electrical and Electronic Engineers, Inc., New York, NY 10017-2394, USA.

4. KDB 971168 D01 Power Measurement License Digital Systems v03r01 April 9, 2018.
KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013

1.4.3 MEASUREMENT UNCERTAINTY

The results of the calculations to estimate uncertainties for the several test methods and standards are shown in the Table below. These are the worst-case values.

Worst-Case Estimated Measurement Uncertainties

Standard, Method or Procedure	Condition	Frequency MHz	Expanded Uncertainty (k=2)
a. Classical Emissions, (*e.g.*, ANSI C63.4, CISPR 11, 14, 22, *etc.*, using ESHS 30,	Conducted Emissions	0.009 - 30	±3.5 dB
	Radiated Emissions (AR-6 Semi-Anechoic Chamber)	30 MHz – 200MHz H 30 MHz – 200 MHz V 200 MHz – 1000 MHz H 200 MHz – 1000 MHz V 1 GHz - 18 GHz	±5.1 dB ±5.1 dB ±4.7 dB ±4.7 dB ±3.3 dB

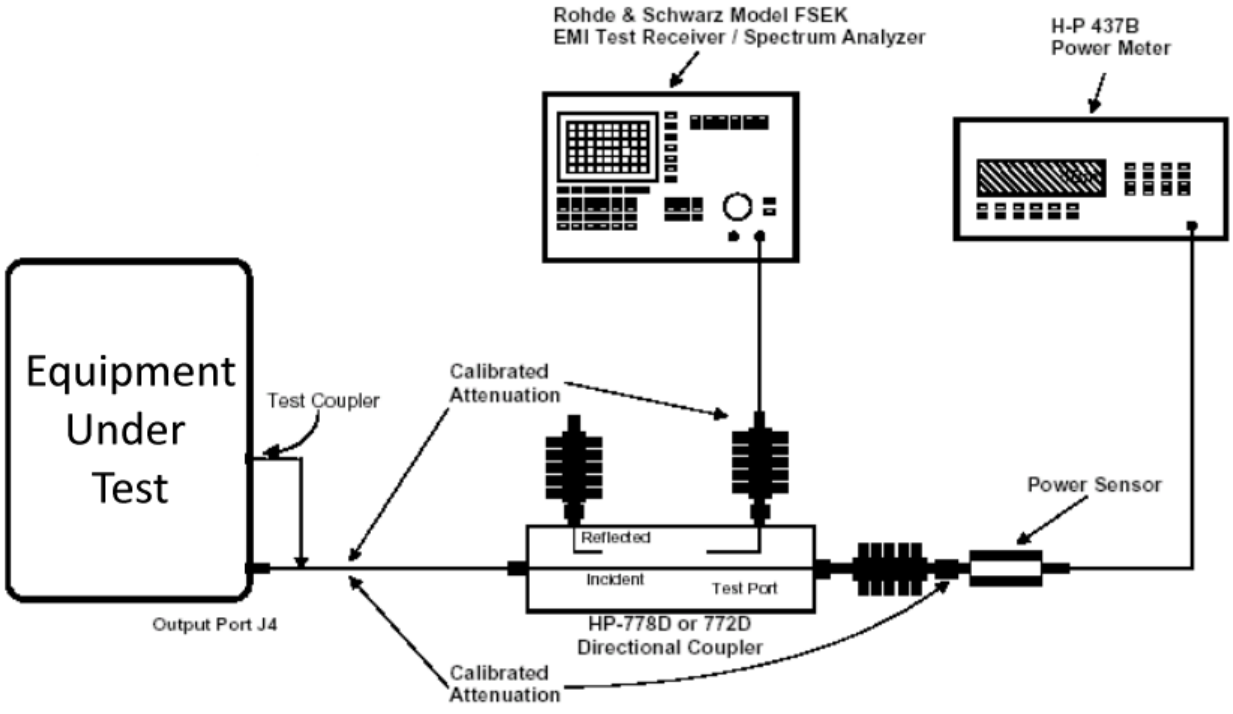
Antenna Port Test	Signal Bandwidth	Frequency Range	Expanded Uncertainty (k=2), Amplitude
Occupied Bandwidth, Edge of Band, Conducted Spurious Emissions	10 Hz 100 Hz 10 kHz to 1 MHz 1MHz	9 kHz to 20 MHz 20 MHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 40 GHz:	1.78 dB
RF Power	10 Hz to 20 MHz	50 MHz to 18 GHz	0.5 dB

1.5 Executive Summary

Requirement	Description	Result
47 CFR FCC Parts 2 and 27		
2.1046	RF Power Output Peak to Average Power Ratio	COMPLIES
2.1047	Modulation Characteristics	COMPLIES
2.1049	Occupied Bandwidth (a) Emissions Signal Bandwidth (b) Occupied Bandwidth/ Edge of Band Emissions	COMPLIES
2.1051	Spurious Emissions at Antenna Terminals	COMPLIES
2.1053	Field Strength of Spurious Radiation	COMPLIES
2.1055	Measurement of Frequency Stability	COMPLIES

1. **COMPLIES -** Passed all applicable tests.
2. **N/A –** Not Applicable.
3. **NT –** Not Tested.

1.6 Test Configuration for all Antenna Port Measurements



2. FCC Section 2.1046 - RF Power Output

2.1 RF Power Output

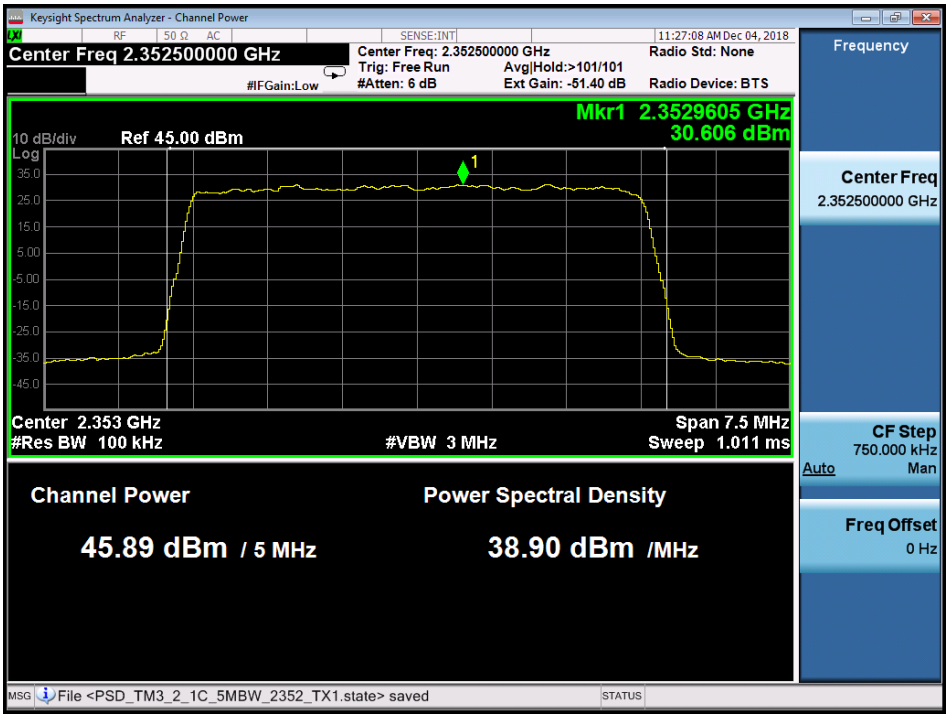
This test is a measurement of the total RF power level transmitted at the antenna-transmitting terminal (J4), as shown in the accompanying test set-up diagram.

Power measurements were made with a broadband Power Meter in the average mode. Before the testing was started, the Base Station was given a sufficient "warm-up" period as required.

NOTE: Only a sample of all the data taken has been used in this report. The full suite of raw data resides at the MH, New Jersey location.

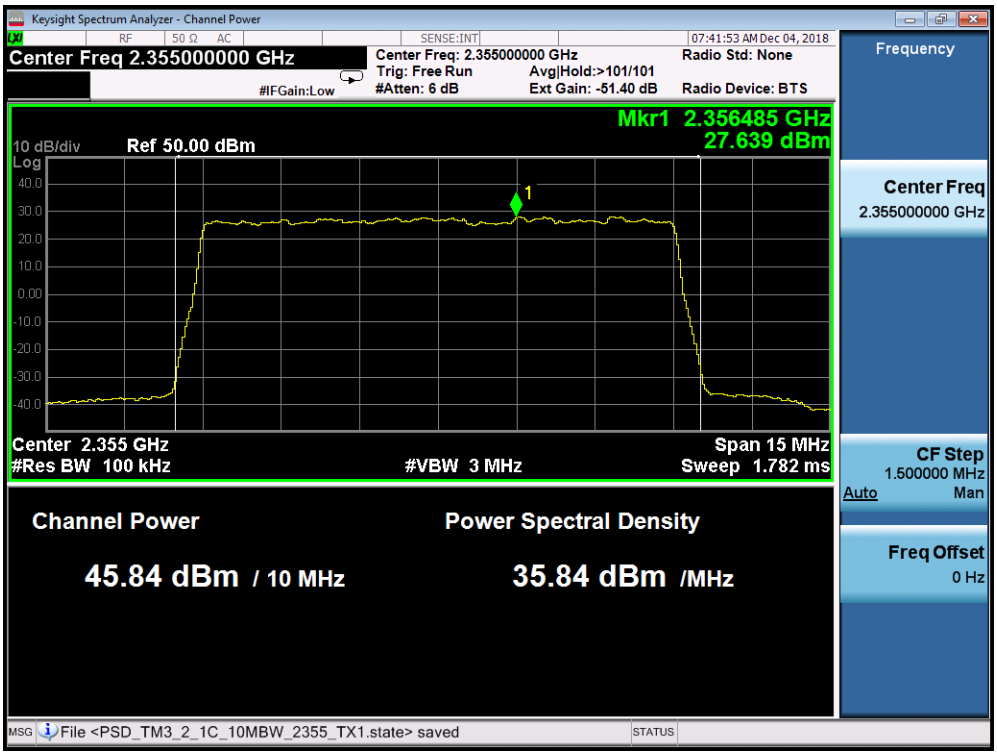
2.1.1 Single Carrier (5 MHz Bandwidth)

Channel Power, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2352.5 MHz



2.1.2 Single Carrier (10 MHz Bandwidth)

Channel Power, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2355 MHz



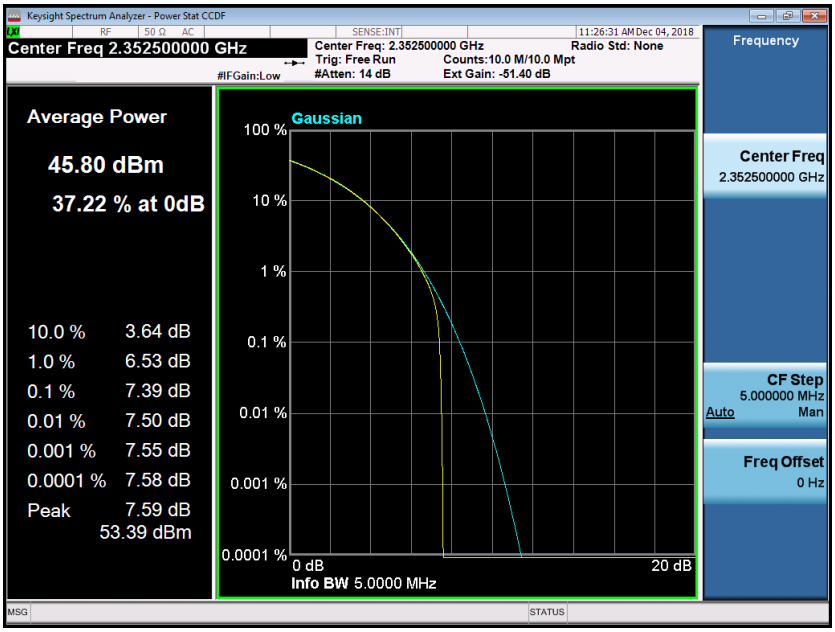
2.2 Peak-to-Average Power Ratio (PAPR) 47CFR 27.50

This measurement of the Peak-to-Average Power Ratio (PAPR) was performed using the Complementary Cumulative Distribution Function (CCDF) feature of a Keysight MXA Signal Analyzer. All the measured values were below the required 13dB limit at the required 0.1 percent of the time.

NOTE: Only a sample of all the data taken has been used in this report. The full suite of raw data resides at the MH, New Jersey location.

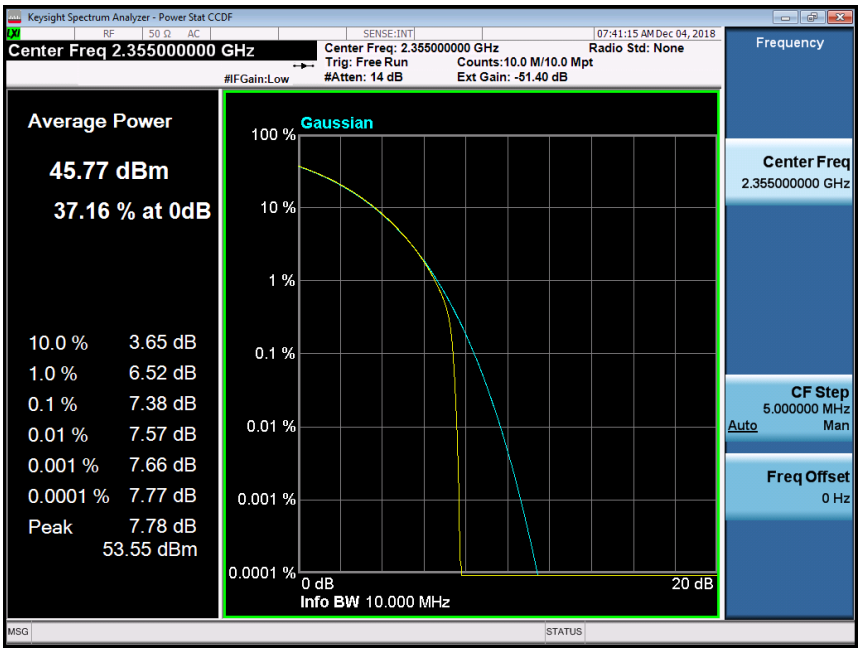
2.2.1 Single Carrier (5 MHz Bandwidth)

PAR, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2355 MHz



2.2.2 Single Carrier (10 MHz Bandwidth)

PAR, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2355 MHz



3. FCC Section 2.1047 - Modulation Characteristics

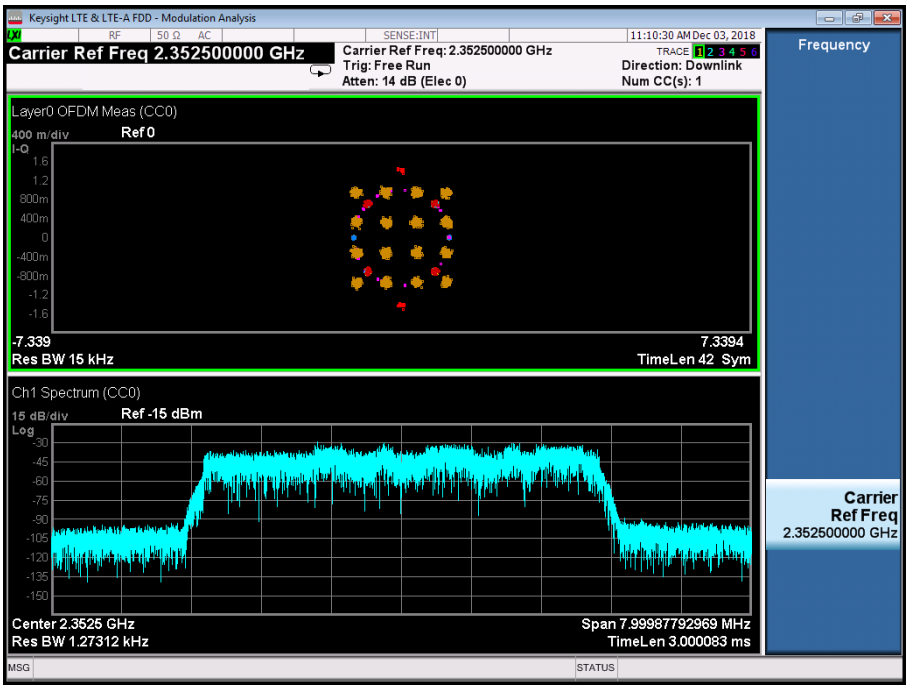
3.1 Modulation Characteristics

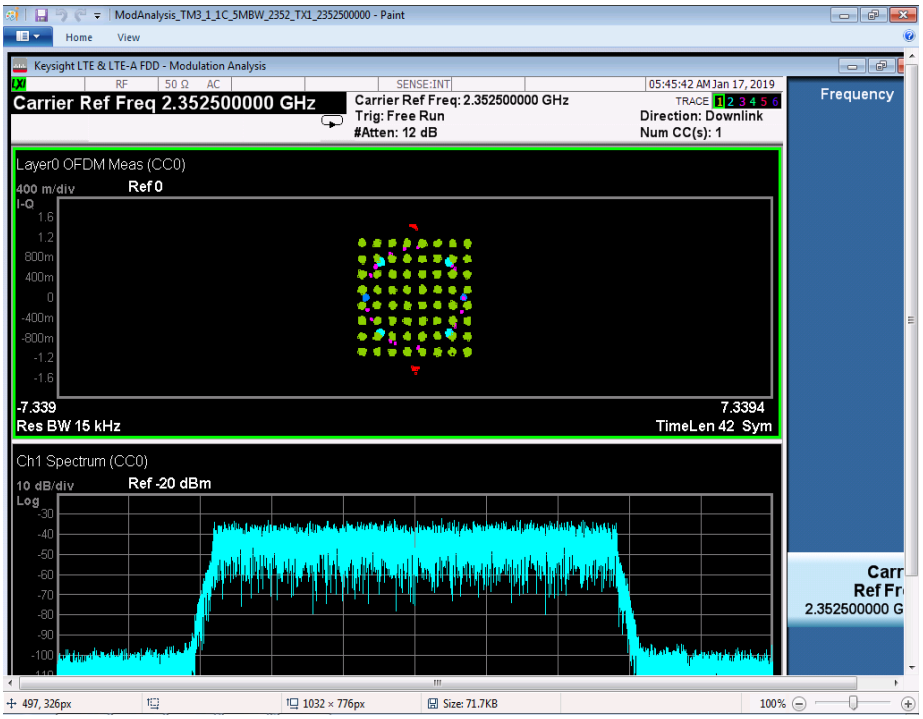
The RF signal at the antenna port was demodulated and verified for correctness of the modulation signal used before each test was performed. For these products the operation with 256QAM modulation was evaluated and verified.

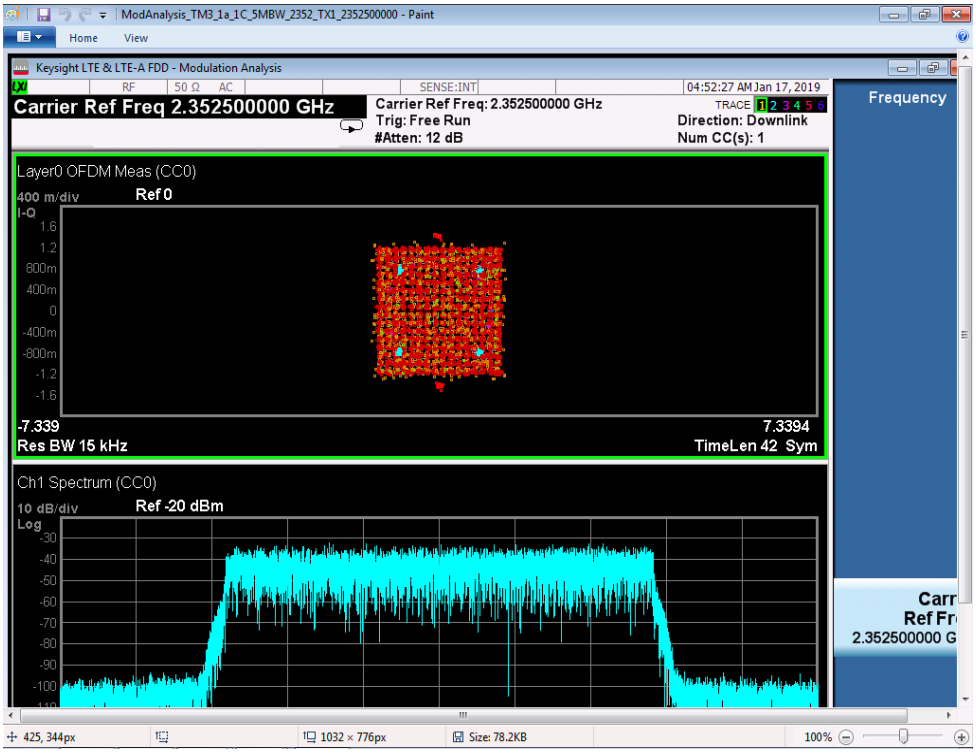
NOTE: Only a sample of all the data taken has been used in this report. The full suite of raw data resides at the MH, New Jersey location.

3.1.1 Single Carrier (5 MHz Bandwidth)

AHNA AirScale RRH 4T4R B30 100W, B30, 1C, 44dBm, 5 MBW, TM3.2, 2352.5 MHz

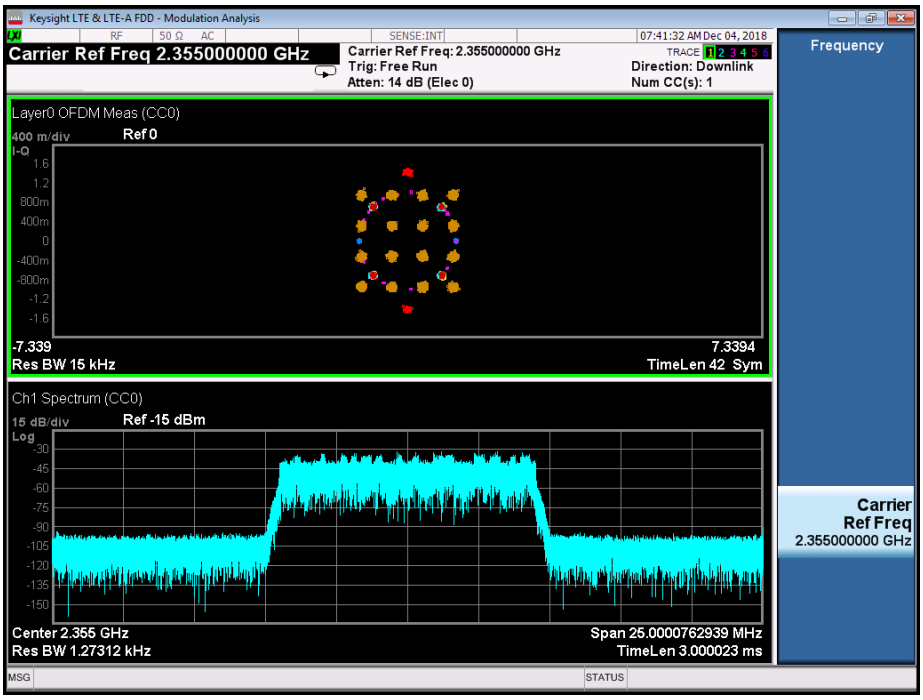


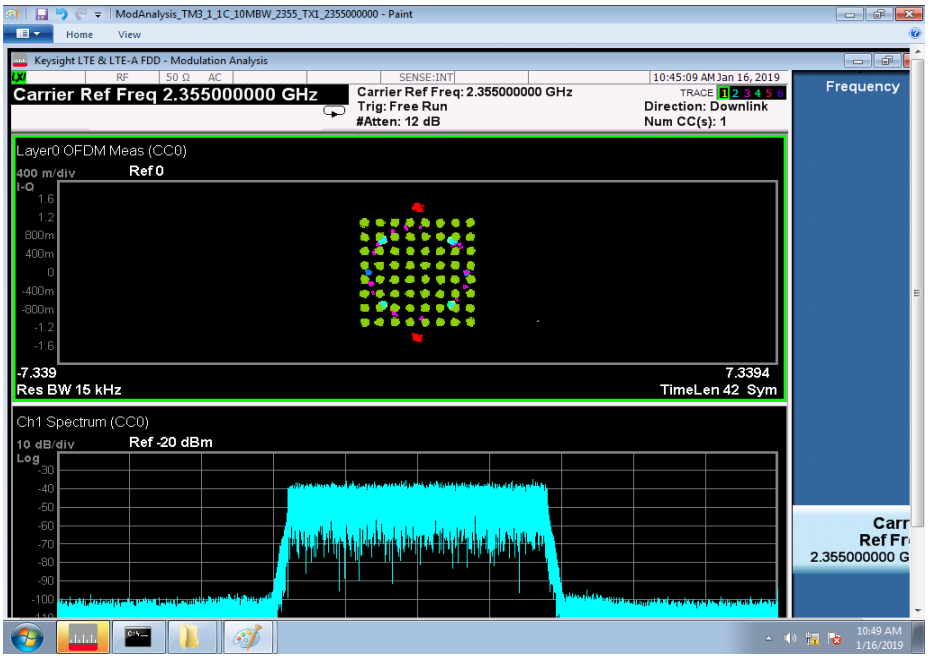


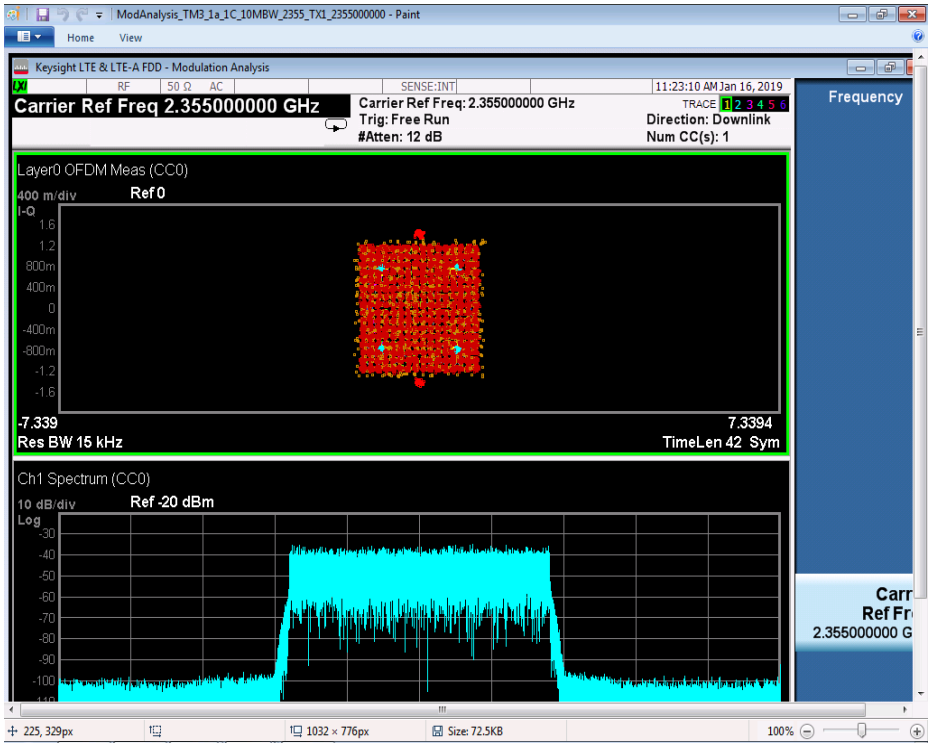

ModAnalysis_TM3_1a_1C_5MBW_2352_TX1_2352500000 - Paint
Home
View
Keysight LTE & LTE-A FDD - Modulation Analysis
RF
50 Ω
AC
SENSE:INT
04:52:27 AM Jan 17, 2019
Carrier Ref Freq 2.352500000 GHz
Carrier Ref Freq: 2.352500000 GHz
Trig: Free Run
#Atten: 12 dB
TRACE 1 2 3 4 5 6
Direction: Downlink
Num CC(s): 1
Frequency
Layer0 OFDM Meas (CC0)
400 m/div
Ref 0
I-Q
1.6
1.2
800m
400m
0
-400m
-800m
-1.2
-1.6
-7.339
7.3394
Res BW 15 kHz
TimeLen 42 Sym
Ch1 Spectrum (CC0)
10 dB/div
Ref -20 dBm
Log
-30
-40
-50
-60
-70
-80
-90
-100
Carr
Ref Fr
2.352500000 G
425, 344px
1032 × 776px
Size: 78.2KB
100%

3.1.2 Single Carrier (10 MHz Bandwidth)

AHNA AirScale RRH 4T4R B30 100W, B30, 1C, 44dBm, 10 MBW, TM3.2, 2355 MHz






ModAnalysis_TM3_1a_1C_10MBW_2355_TX1_2355000000 - Paint
Home
View
Keysight LTE & LTE-A FDD - Modulation Analysis
RF
50 Ω AC
SENSE:INT
11:23:10 AM Jan 16, 2019
Carrier Ref Freq 2.355000000 GHz
Carrier Ref Freq: 2.355000000 GHz
Trig: Free Run
#Atten: 12 dB
TRACE 1 2 3 4 5 6
Direction: Downlink
Num CC(s): 1
Frequency
Layer0 OFDM Meas (CC0)
400 m/div
Ref 0
I-Q
1.6
1.2
800m
400m
0
-400m
-800m
-1.2
-1.6
-7.339
7.3394
Res BW 15 kHz
TimeLen 42 Sym
Ch1 Spectrum (CC0)
10 dB/div
Ref -20 dBm
Log
-30
-40
-50
-60
-70
-80
-90
-100
Carr
Ref Fr
2.355000000 G
225, 329px
1032 × 776px
Size: 72.5KB
100%

4. FCC Section 2.1049 – Occupied Bandwidth

4.1 Occupied Bandwidth

In 47CFR 2.1049 the FCC requires:

> "The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable."

This measurement is performed using either the 99% Occupied Bandwidth or the 26 dB Bandwidth method. For this product both measurements were recorded, but the 99% measurement results were used to determine the Emissions Designator.

During these measurements it is customary to evaluate the Edge of Band emissions at block/band edges.

The transmitted signal occupied bandwidth and 26dB bandwidth were measured using a Keysight MXA Signal Analyzer. All emissions were within the test parameters. Sample Charts are below.

NOTE: Only a sample of all the data taken has been used in this report. The full suite of raw data resides at the MH, New Jersey location.

Tabular Data – Occupied Bandwidth

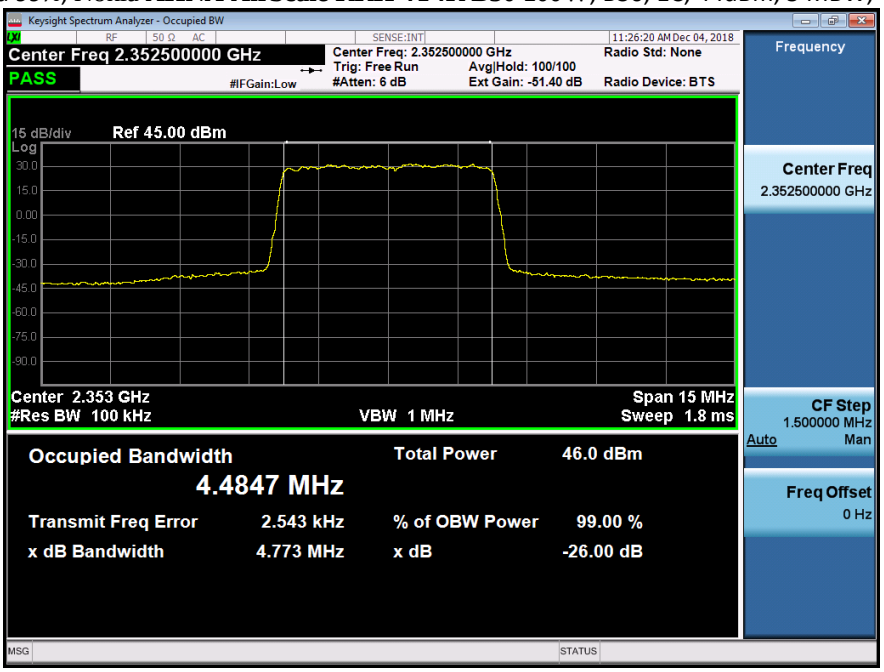
Channel Frequency MHz	Signal BW MHz	Modulation	OBW MHz
2352.5	5	QPSK/16QAM	4.4847
2352.5	5	64QAM	4.4986
2352.5	**5**	**256QAM**	**4.5063**
2357.5	5	QPSK/16QAM	4.4874
2357.5	5	64QAM	4.4942
2357.5	5	256QAM	4.5038
2355.0	10	QPSK/16QAM	8.9289
2355.0	**10**	**64QAM**	**8.9298**
2355.0	10	256QAM	8.9279

Tabular Data – 26dB Bandwidth

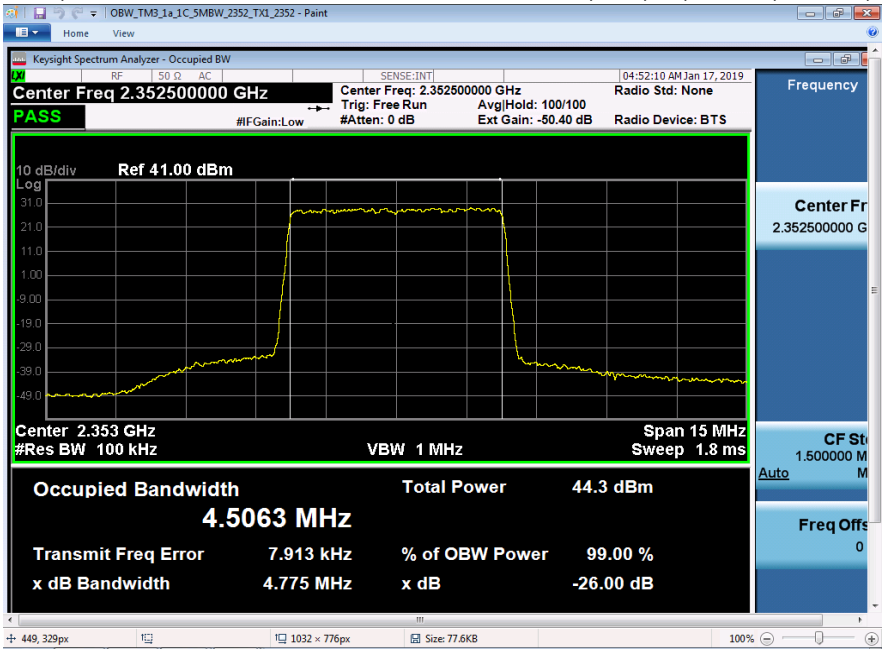
Channel Frequency MHz	Signal BW MHz	Modulation	26dB BW MHz
2352.5	5	QPSK/16QAM	4.773
2352.5	5	64QAM	4.790
2352.5	5	256QAM	4.775
2357.5	5	QPSK/16QAM	4.768
2357.5	5	64QAM	4.803
2357.5	5	256QAM	4.775
2355.0	10	QPSK/16QAM	9.292
2355.0	10	64QAM	9.315
2355.0	10	256QAM	9.295

4.1.1 Single Carrier (5 MHz Bandwidth)

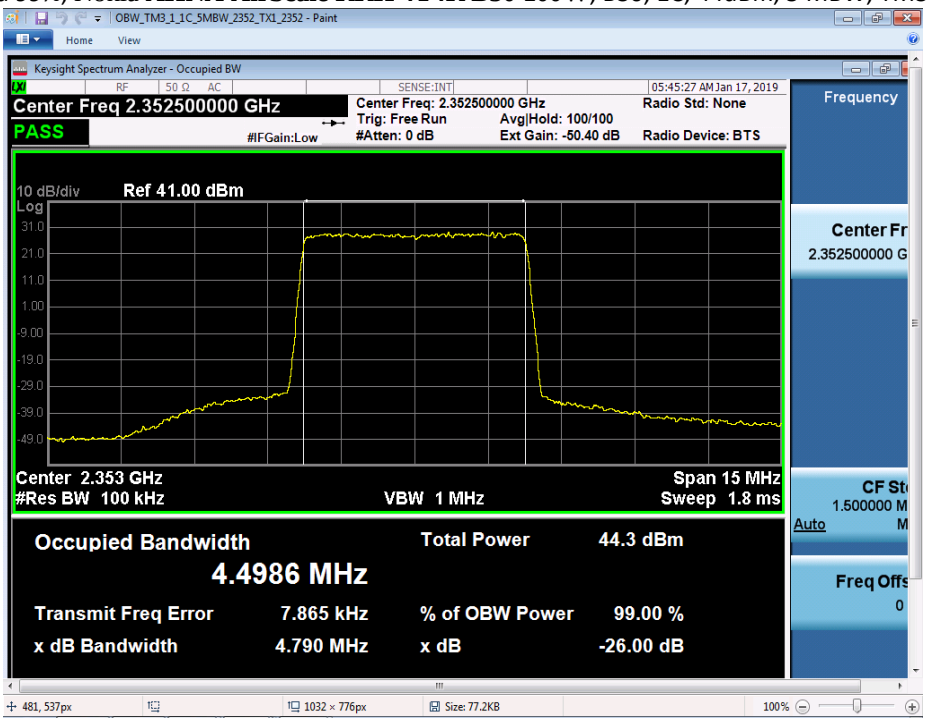
26dB and 99%, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2352.5 MHz



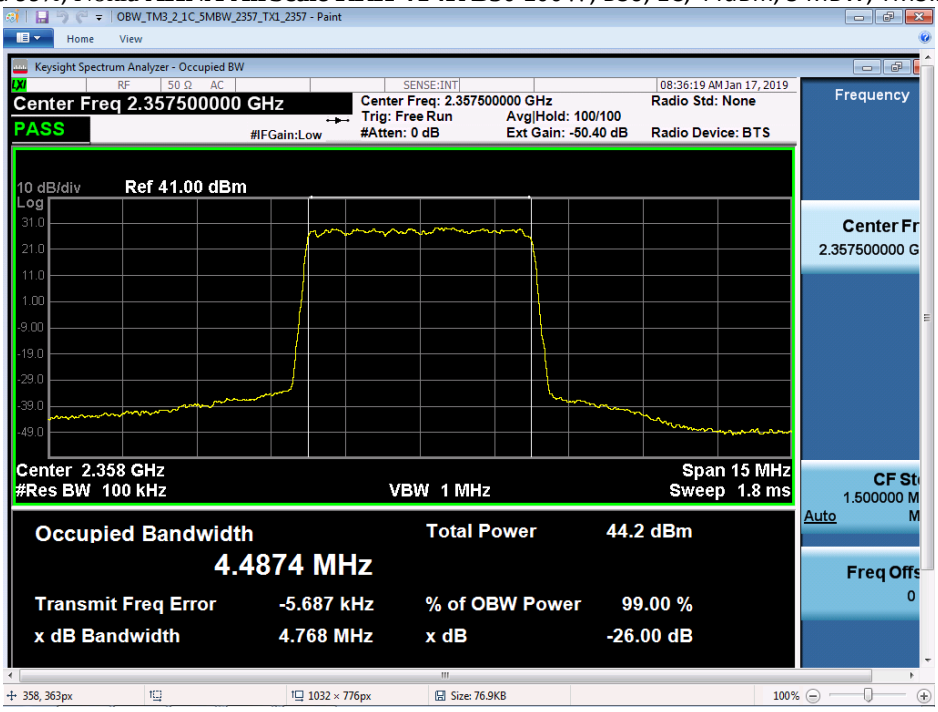
26dB and 99%, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.1A, 2352.5 MHz



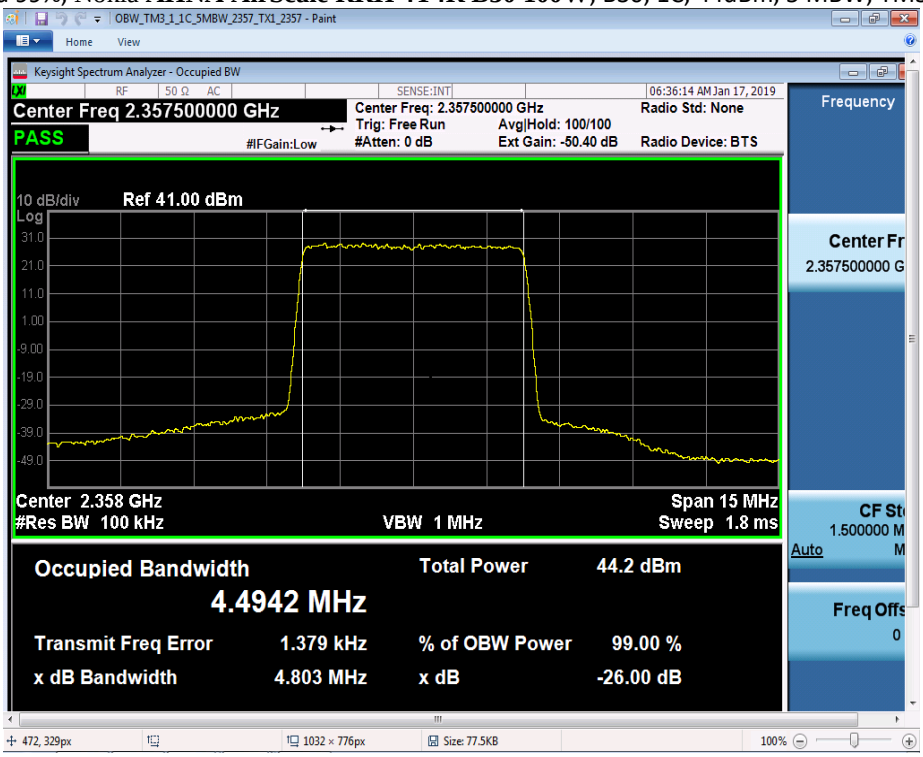
26dB and 99%, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.1, 2352.5 MHz



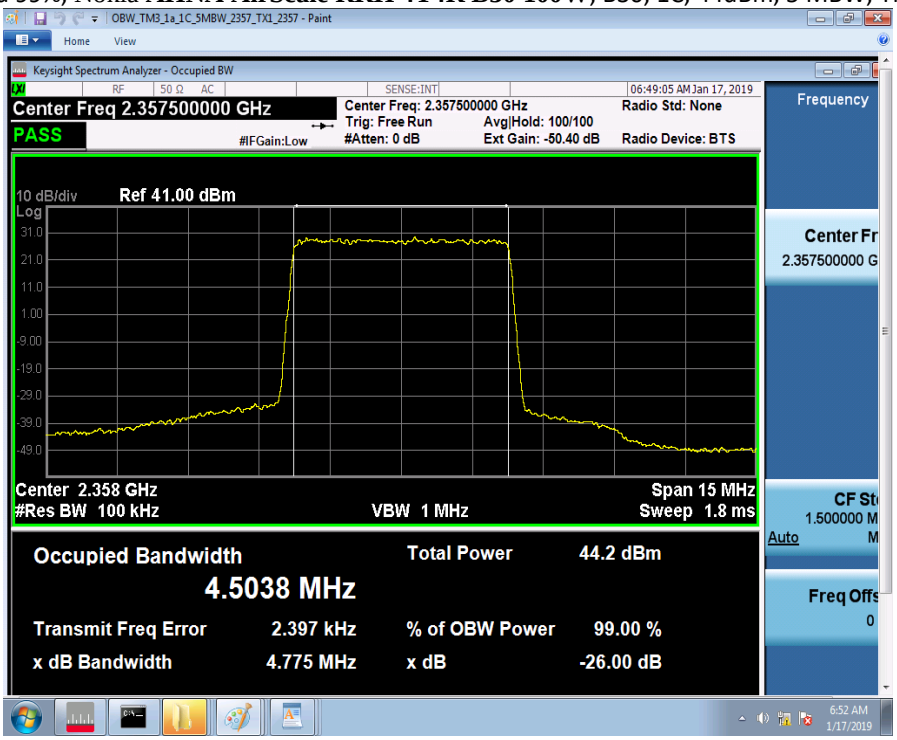
26dB and 99%, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2357.5 MHz



26dB and 99%, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.1, 2357.5 MHz

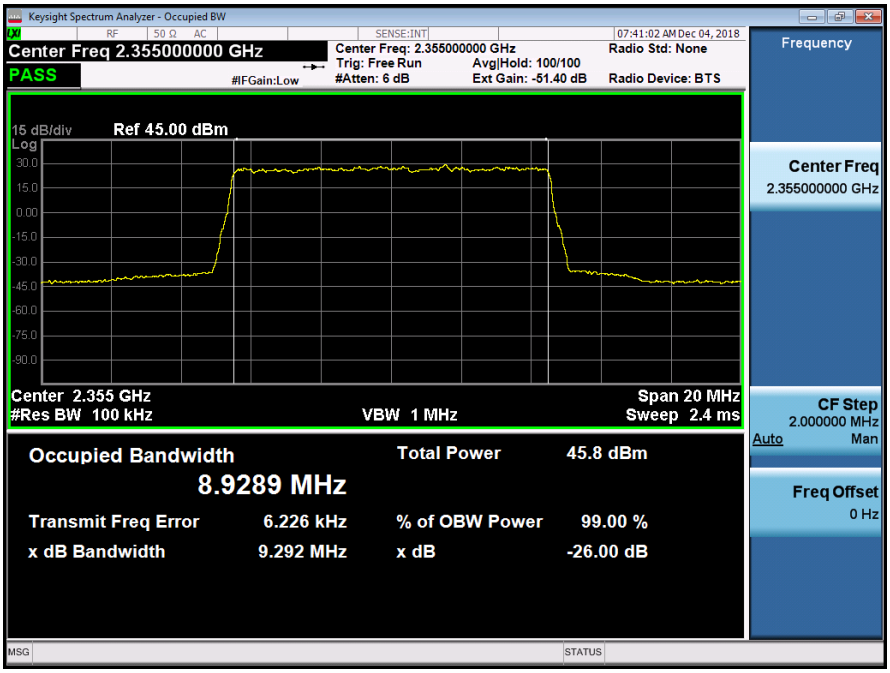


26dB and 99%, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.1A, 2357.5 MHz

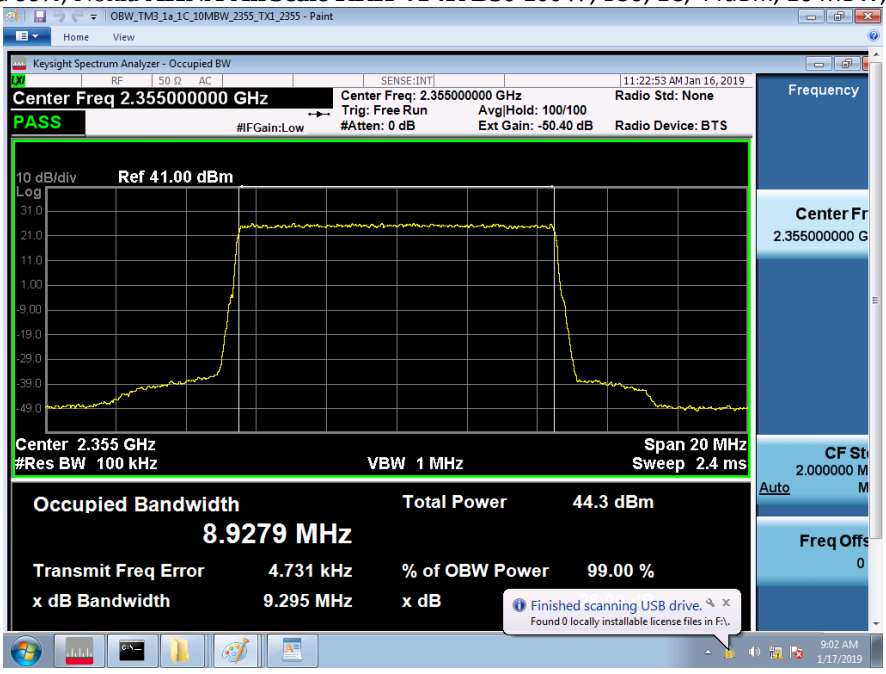


4.1.2 Single Carrier (10 MHz Bandwidth)

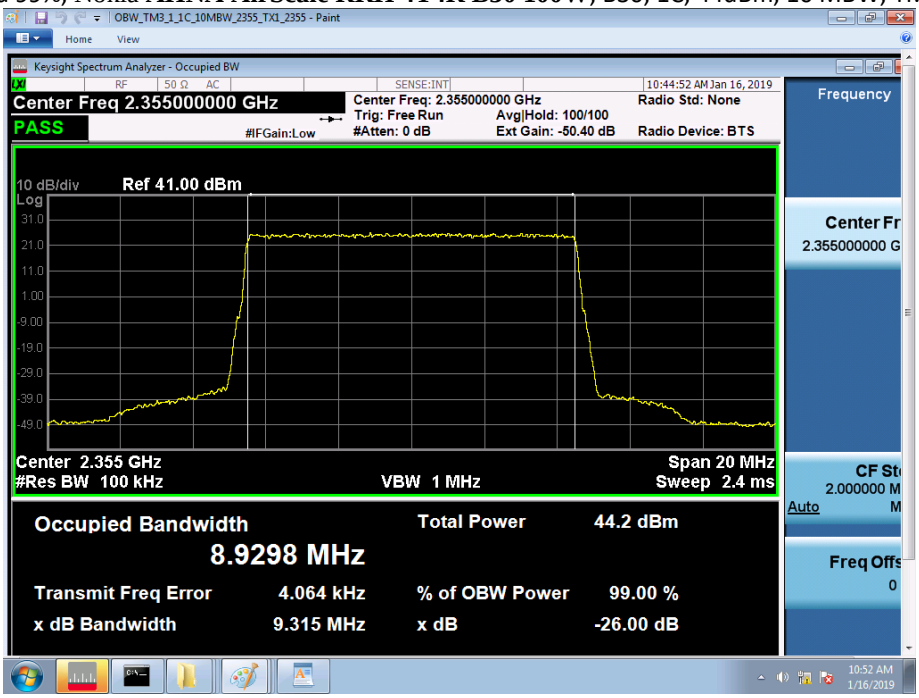
26dB and 99%, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2355 MHz



26dB and 99%, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.1A, 2355 MHz



26dB and 99%, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.1, 2355 MHz



4.2 Occupied Bandwidth/ Edge of band Emissions

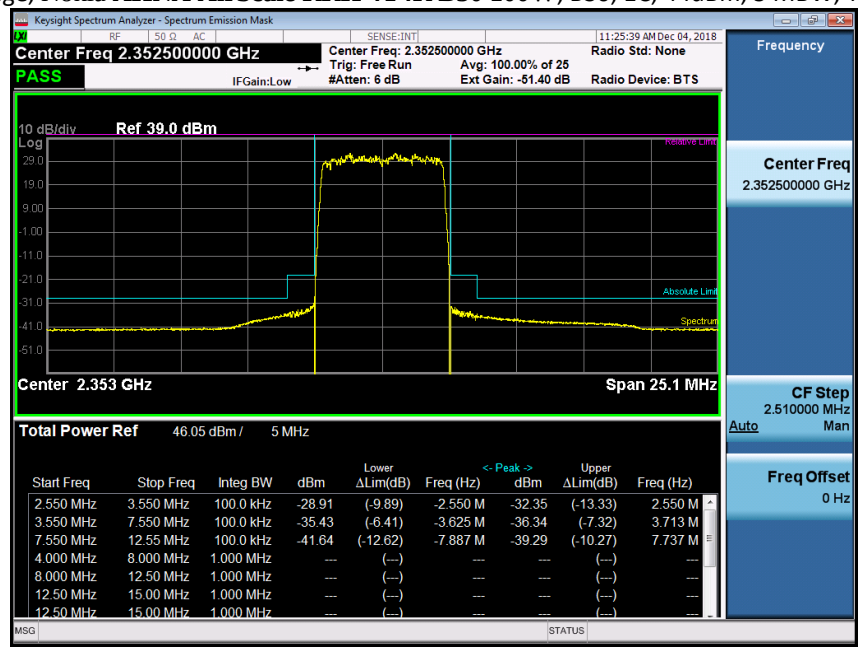
The Occupied Bandwidth / Edge of band emissions of the EUT at the external antenna connector (EAC) were measured using an Agilent MXA Spectrum Analyzer. The RF power level was continuously measured using a RF broadband power meter. The RF output from the EAC port to spectrum analyzer was reduced (to an amplitude usable by the spectrum analyzer) by using a calibrated attenuator and test coupler. The path attenuation was offset on the display and the signal for single carrier was adjusted to the corrected RF power level for the resolution bandwidth used for the transmit signal. All mask values were adjusted based upon the designated signal bandwidth and measurement bandwidths. The Top of Mask corresponds to the set rated power level as confirmed by the RF power meter. The Power reference line corresponds to the rated power adjusted for a resolution bandwidth of 3 MHz. This allows confirmation that the measured trace is properly calibrated to the mask. The signal reference line corresponds to the rated power adjusted for the proper resolution bandwidth for the mask.

The Block edge requirements as specified in 47CFR 27.53 were followed.

NOTE: Only a sample of all the data taken has been used in this report. The full suite of raw data resides at the MH, New Jersey location.

4.2.1 Single Carrier (5 MHz Bandwidth)

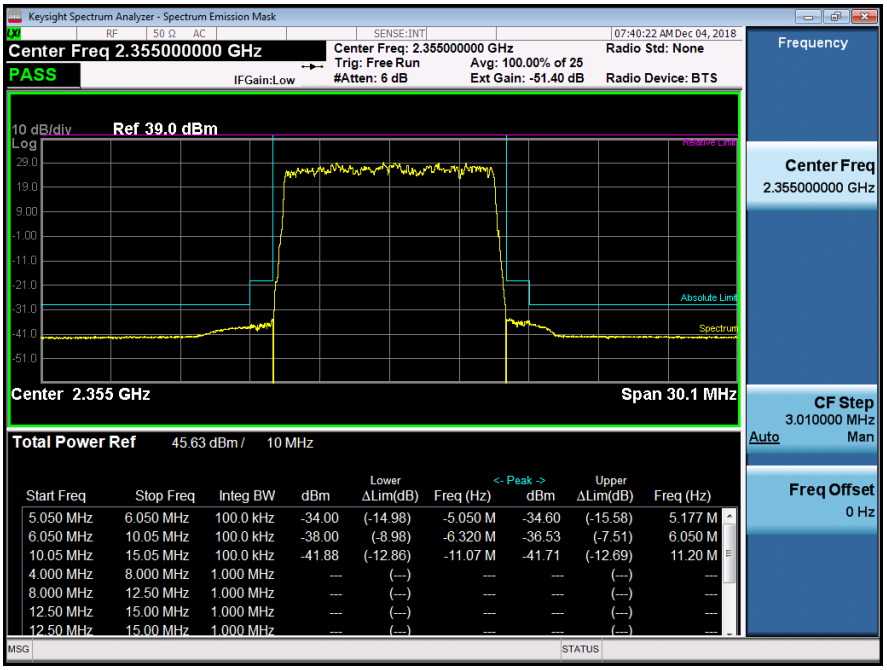
Band Edge, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2352.5 MHz



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
2.550 MHz	3.550 MHz	100.0 kHz	-28.91	(-9.89)	-2.550 M	-32.35	(-13.33)	2.550 M
3.550 MHz	7.550 MHz	100.0 kHz	-35.43	(-6.41)	-3.625 M	-36.34	(-7.32)	3.713 M
7.550 MHz	12.55 MHz	100.0 kHz	-41.64	(-12.62)	-7.887 M	-39.29	(-10.27)	7.737 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

4.2.2 Single Carrier (10 MHz Bandwidth)

Band Edge, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2355 MHz



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
5.050 MHz	6.050 MHz	100.0 kHz	-34.00	(-14.98)	-5.050 M	-34.60	(-15.58)	5.177 M
6.050 MHz	10.05 MHz	100.0 kHz	-38.00	(-8.98)	-6.320 M	-36.53	(-7.51)	6.050 M
10.05 MHz	15.05 MHz	100.0 kHz	-41.88	(-12.86)	-11.07 M	-41.71	(-12.69)	11.20 M
4.000 MHz	8.000 MHz	1.000 MHz	---	(---)	---	---	(---)	---
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

5. FCC Section 2.1051 - Spurious Emissions at Transmit Antenna Port

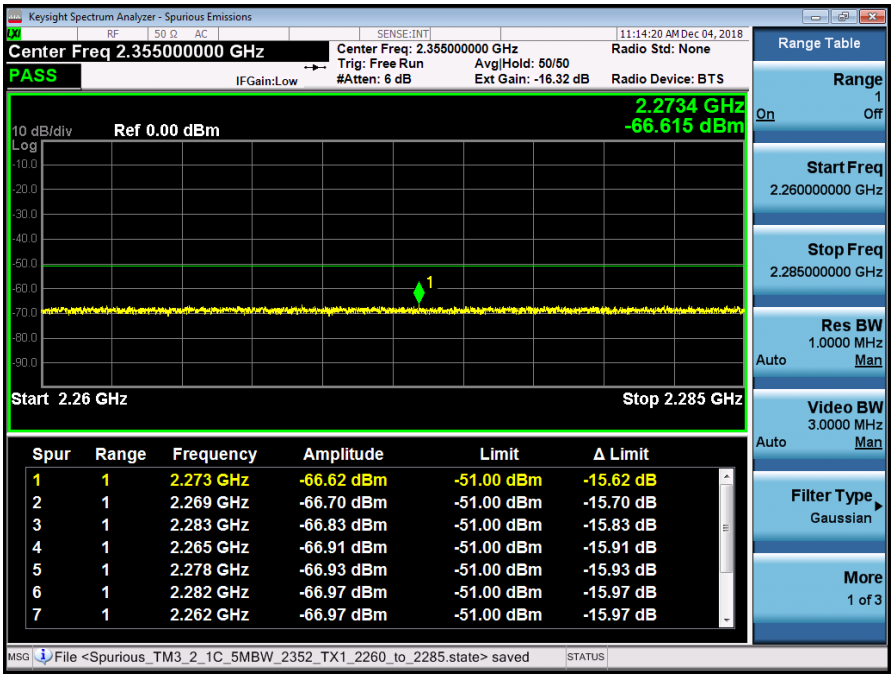
5.1 Measurement of Spurious Emissions at Transmit Antenna Port

Spurious Emissions at the transmit-antenna terminals were investigated over the frequency range of 10 MHz to the 10th harmonic of the specific transmit band. Depending on the specific band of operation, the measurements were performed up to 27GHz. Measurements were made either by using a Rohde & Schwarz ESIB40 / ESU40 (9 kHz to 40 GHz) EMI Test receiver or a Keysight MXA Signal Analyzer. The RF output from the transmitter was reduced (to an amplitude usable by the receivers) using calibrated attenuators. The RF power level was continuously monitored via a coupled RF Power Meter.

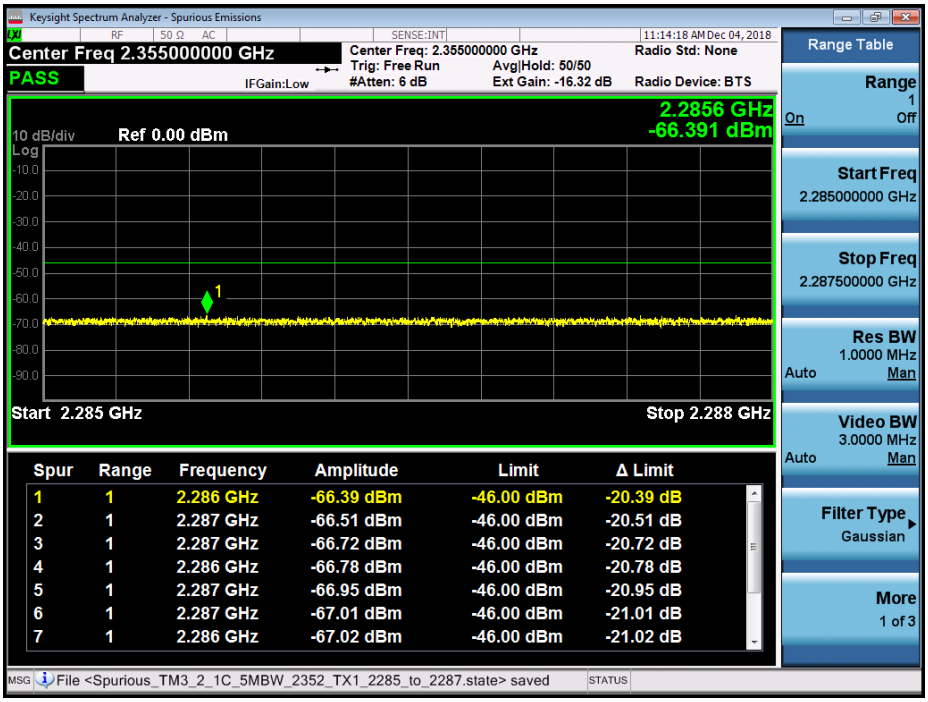
The required emission limitation is specified as appropriate in 27.53. The measured spurious emission levels were plotted for the frequency range as specified in 2.1057. Data below documents performance up to 10 GHz.
NOTE: Only a sample of all the data taken has been used in this report. The full suite of raw data resides at the MH, New Jersey location.

5.1.1 Single Carrier (5 MHz Bandwidth)

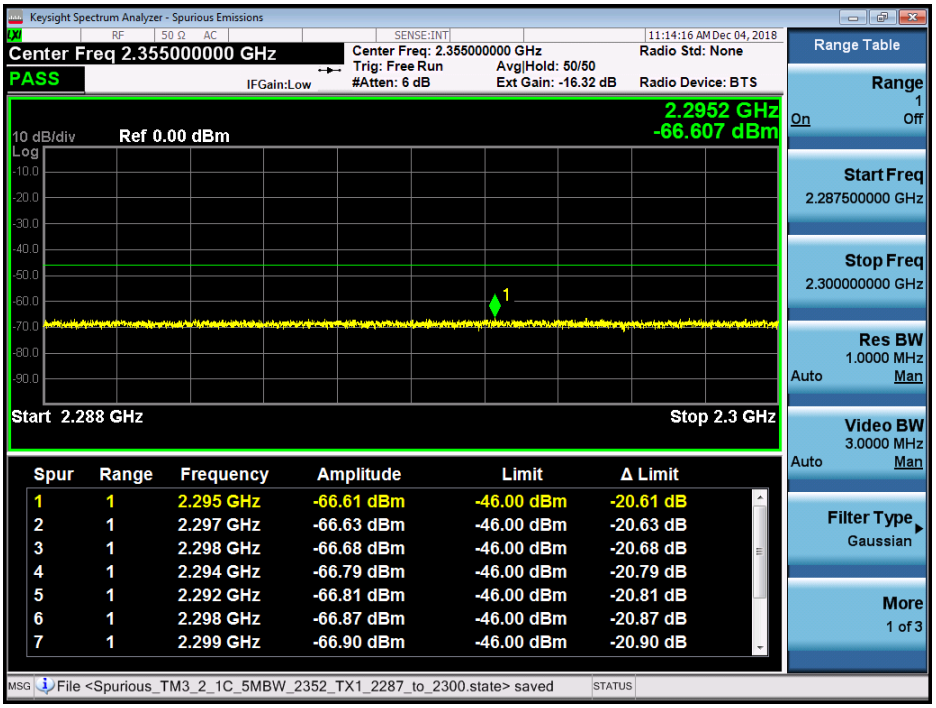
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2260 - 2285 MHz



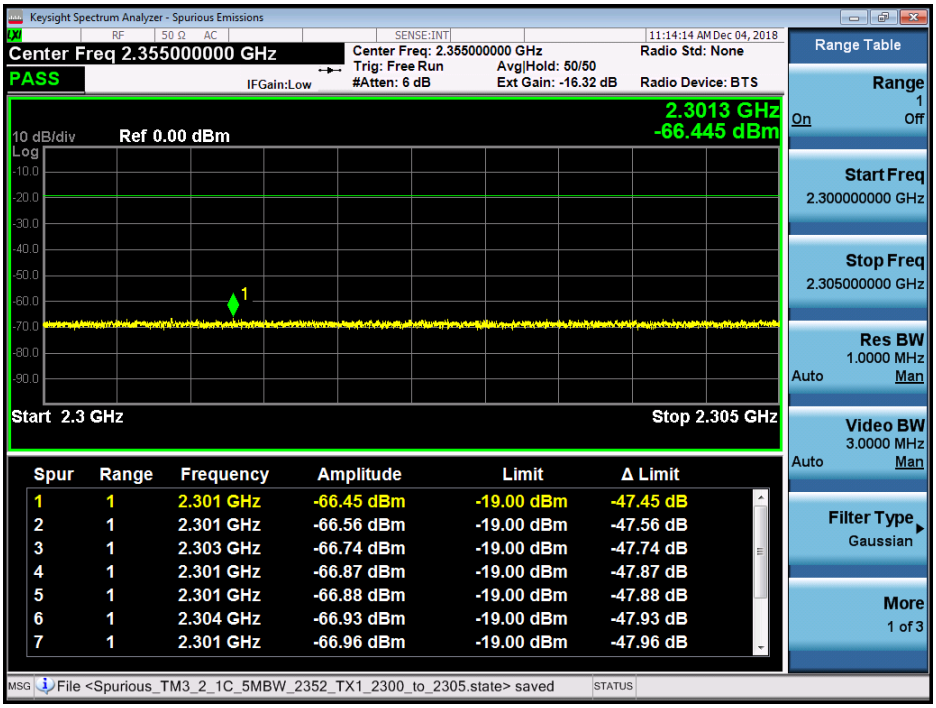
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2285 – 2287.5 MHz



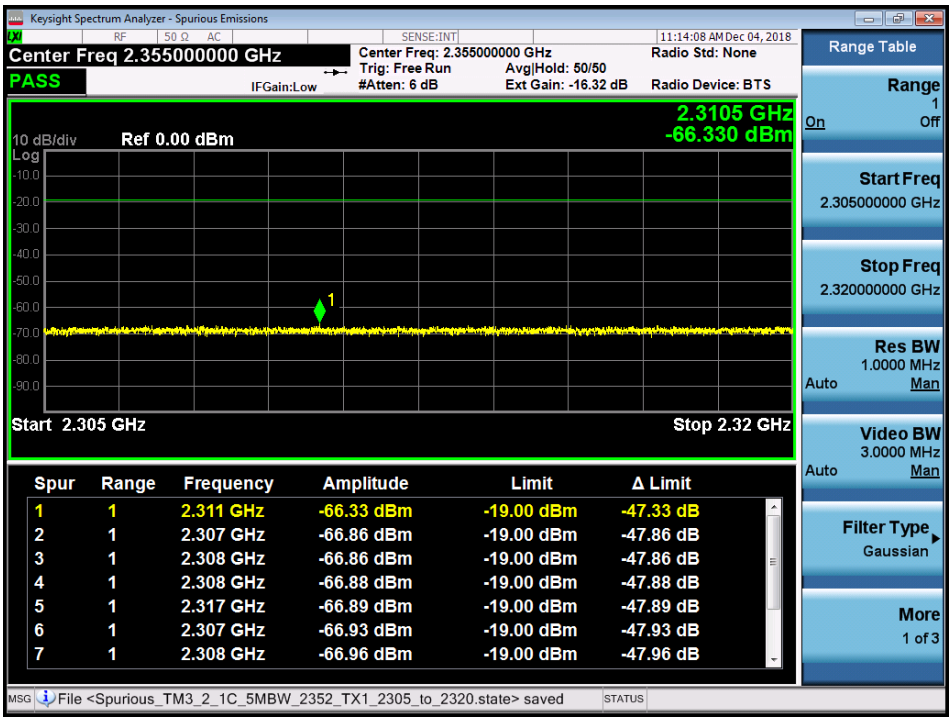
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2287.5 – 2300 MHz



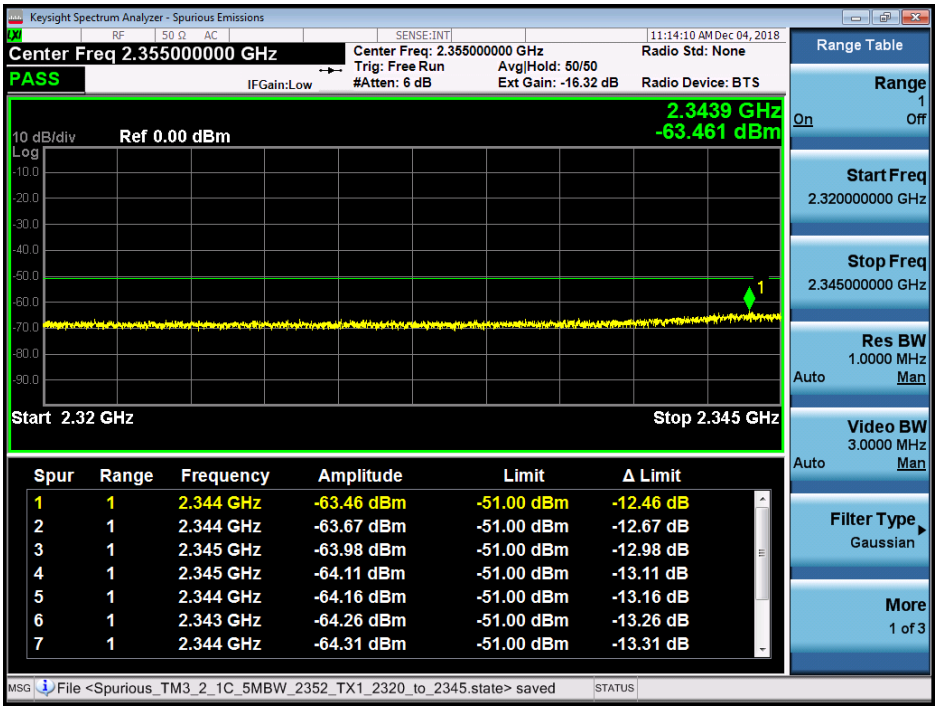
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2300 – 2305 MHz



Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2305 – 2320 MHz

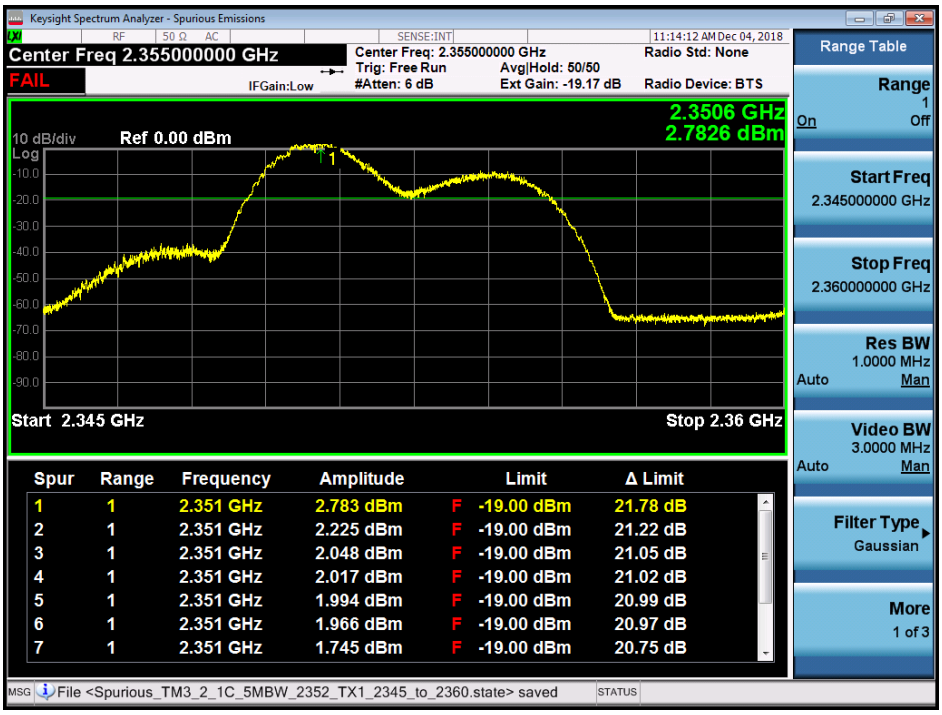


Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2320 – 2345 MHz



Spur	Range	Frequency	Amplitude	Limit	Δ Limit
1	1	2.344 GHz	-63.46 dBm	-51.00 dBm	-12.46 dB
2	1	2.344 GHz	-63.67 dBm	-51.00 dBm	-12.67 dB
3	1	2.345 GHz	-63.98 dBm	-51.00 dBm	-12.98 dB
4	1	2.345 GHz	-64.11 dBm	-51.00 dBm	-13.11 dB
5	1	2.344 GHz	-64.16 dBm	-51.00 dBm	-13.16 dB
6	1	2.343 GHz	-64.26 dBm	-51.00 dBm	-13.26 dB
7	1	2.344 GHz	-64.31 dBm	-51.00 dBm	-13.31 dB

Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2345 – 2360 MHz

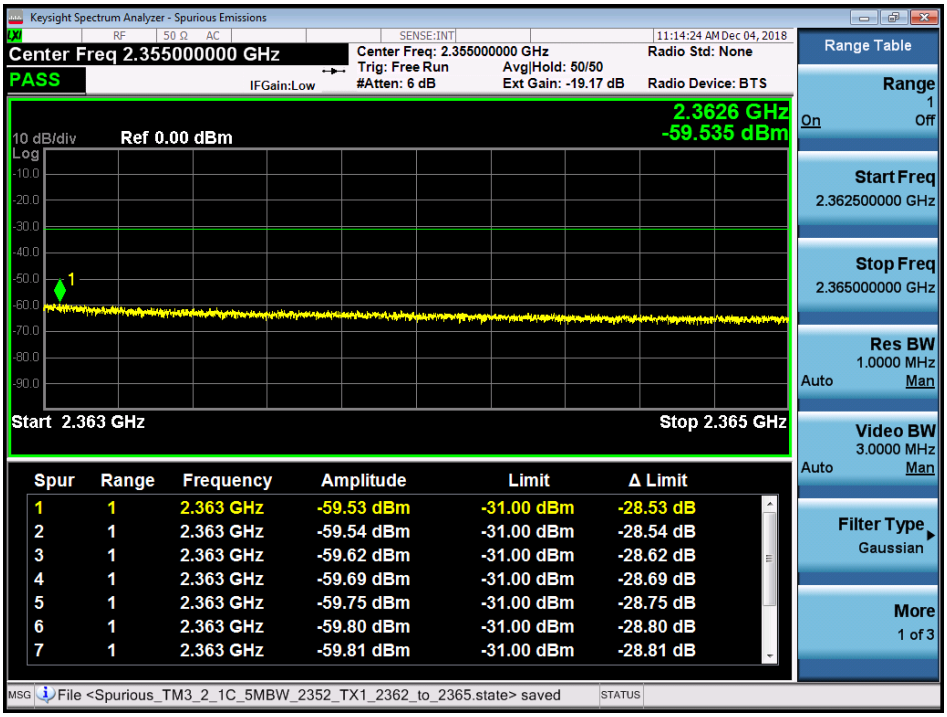


Spur	Range	Frequency	Amplitude		Limit	Δ Limit
1	1	2.351 GHz	2.783 dBm	F	-19.00 dBm	21.78 dB
2	1	2.351 GHz	2.225 dBm	F	-19.00 dBm	21.22 dB
3	1	2.351 GHz	2.048 dBm	F	-19.00 dBm	21.05 dB
4	1	2.351 GHz	2.017 dBm	F	-19.00 dBm	21.02 dB
5	1	2.351 GHz	1.994 dBm	F	-19.00 dBm	20.99 dB
6	1	2.351 GHz	1.966 dBm	F	-19.00 dBm	20.97 dB
7	1	2.351 GHz	1.745 dBm	F	-19.00 dBm	20.75 dB

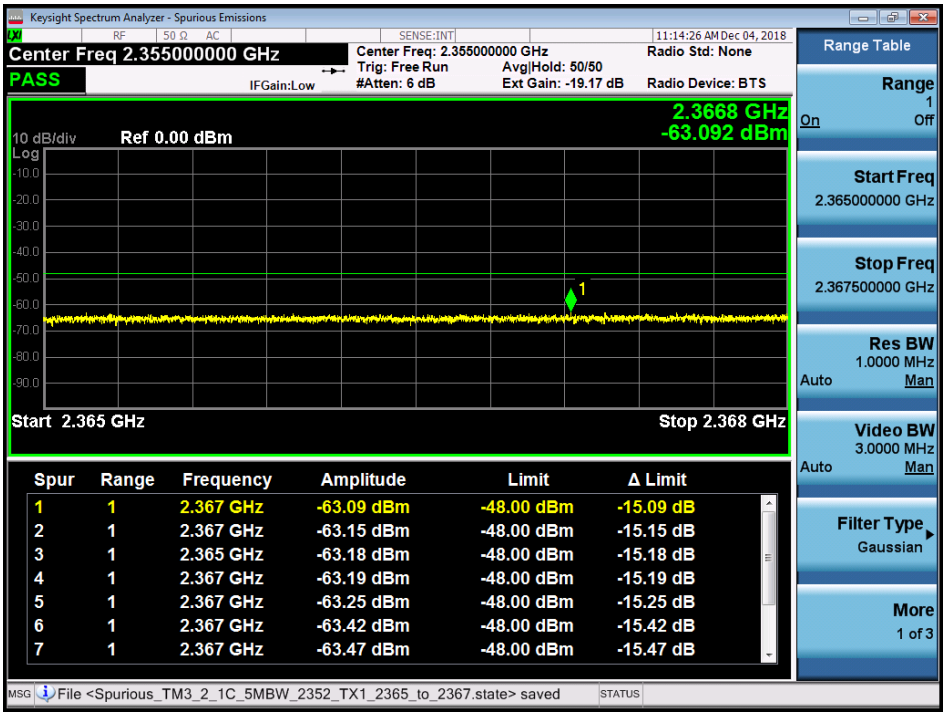
TX Exempt

Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2360 – 2362.5 MHz

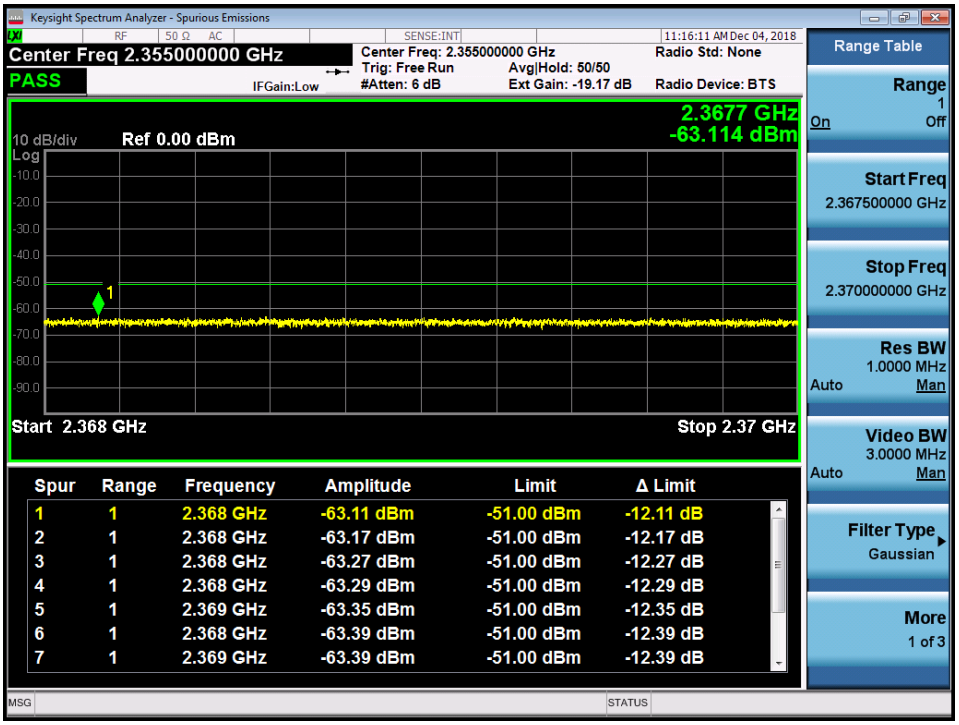
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2362.5 – 2365 MHz



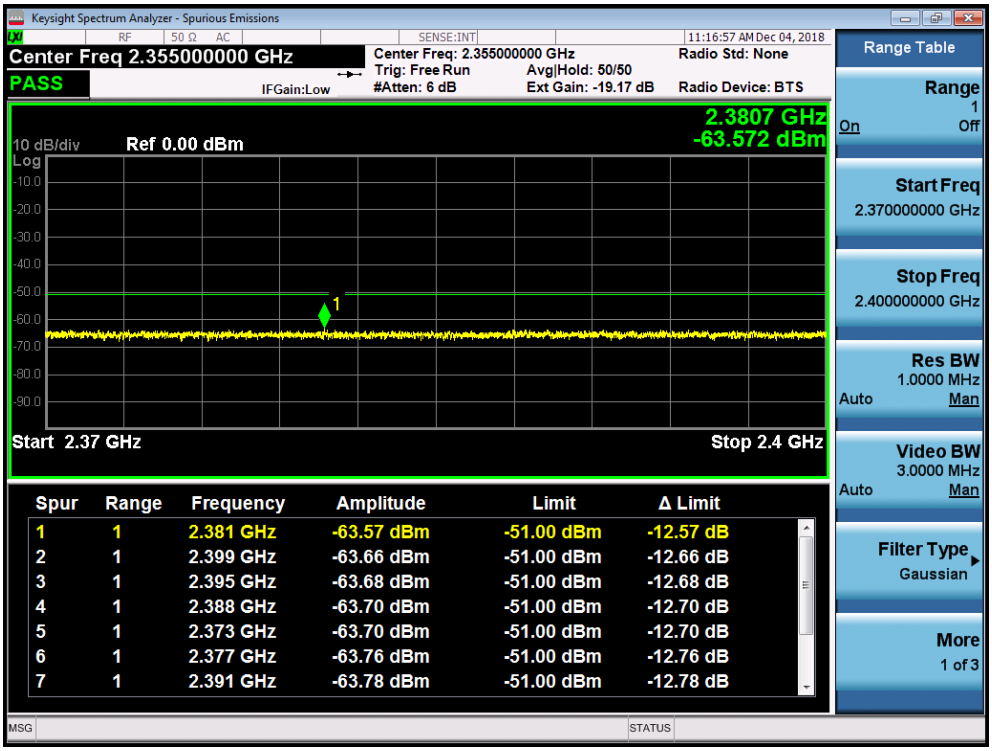
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2365 – 2367.5 MHz



Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2367.5 – 2370 MHz

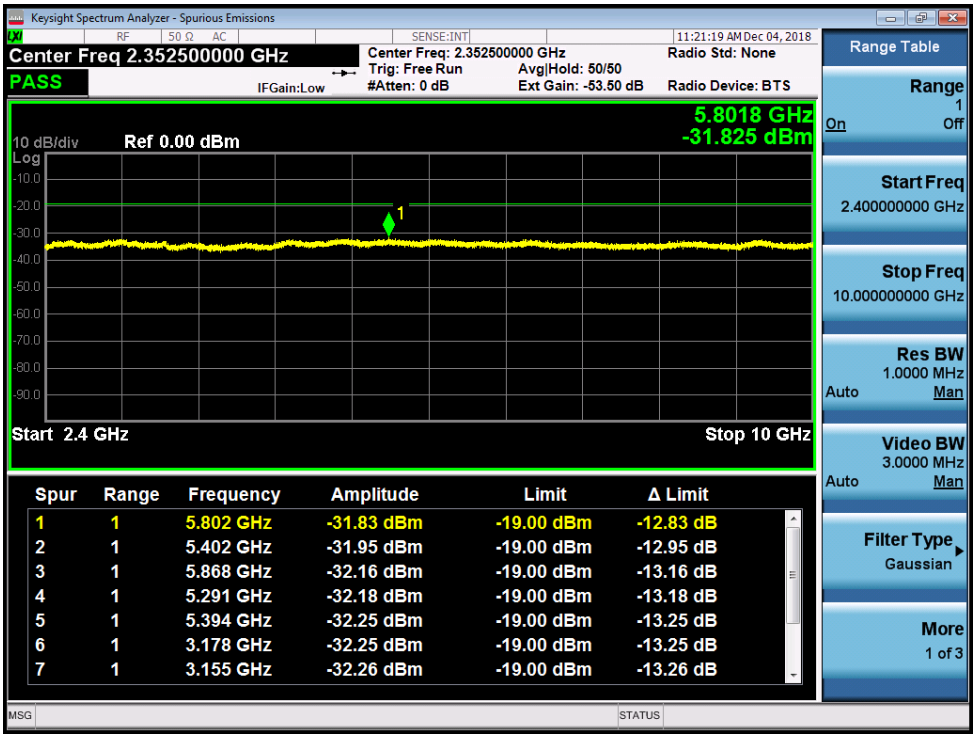


Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2370– 2400 MHz



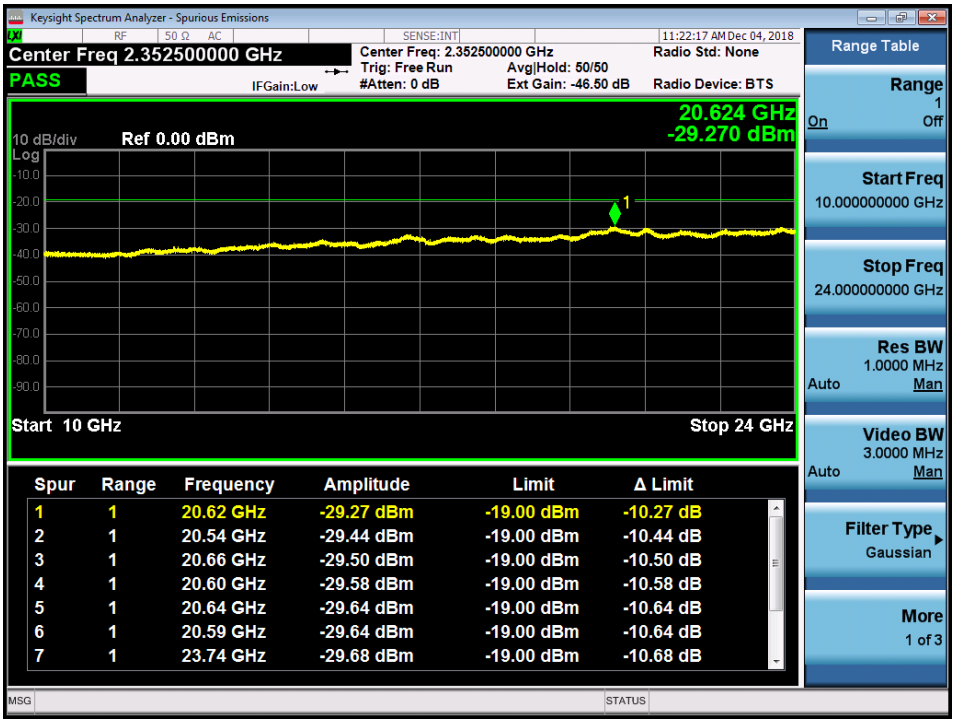
Spur	Range	Frequency	Amplitude	Limit	Δ Limit
1	1	2.381 GHz	-63.57 dBm	-51.00 dBm	-12.57 dB
2	1	2.399 GHz	-63.66 dBm	-51.00 dBm	-12.66 dB
3	1	2.395 GHz	-63.68 dBm	-51.00 dBm	-12.68 dB
4	1	2.388 GHz	-63.70 dBm	-51.00 dBm	-12.70 dB
5	1	2.373 GHz	-63.70 dBm	-51.00 dBm	-12.70 dB
6	1	2.377 GHz	-63.76 dBm	-51.00 dBm	-12.76 dB
7	1	2.391 GHz	-63.78 dBm	-51.00 dBm	-12.78 dB

Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 2400– 10000 MHz



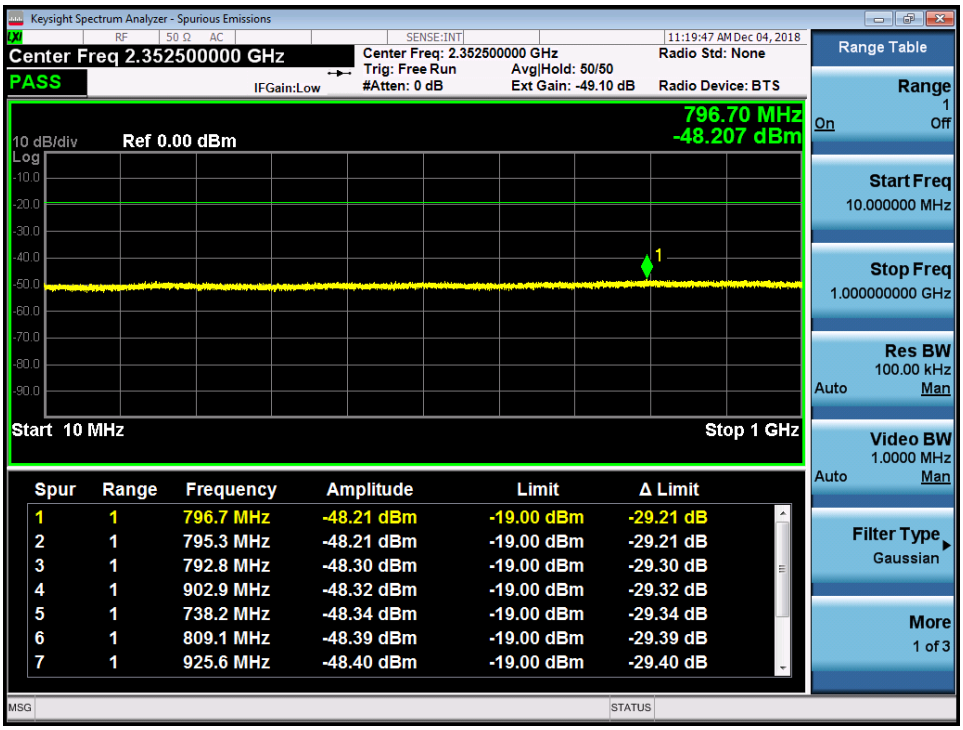
Spur	Range	Frequency	Amplitude	Limit	Δ Limit
1	1	5.802 GHz	-31.83 dBm	-19.00 dBm	-12.83 dB
2	1	5.402 GHz	-31.95 dBm	-19.00 dBm	-12.95 dB
3	1	5.868 GHz	-32.16 dBm	-19.00 dBm	-13.16 dB
4	1	5.291 GHz	-32.18 dBm	-19.00 dBm	-13.18 dB
5	1	5.394 GHz	-32.25 dBm	-19.00 dBm	-13.25 dB
6	1	3.178 GHz	-32.25 dBm	-19.00 dBm	-13.25 dB
7	1	3.155 GHz	-32.26 dBm	-19.00 dBm	-13.26 dB

Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 10 GHz – 24 GHz



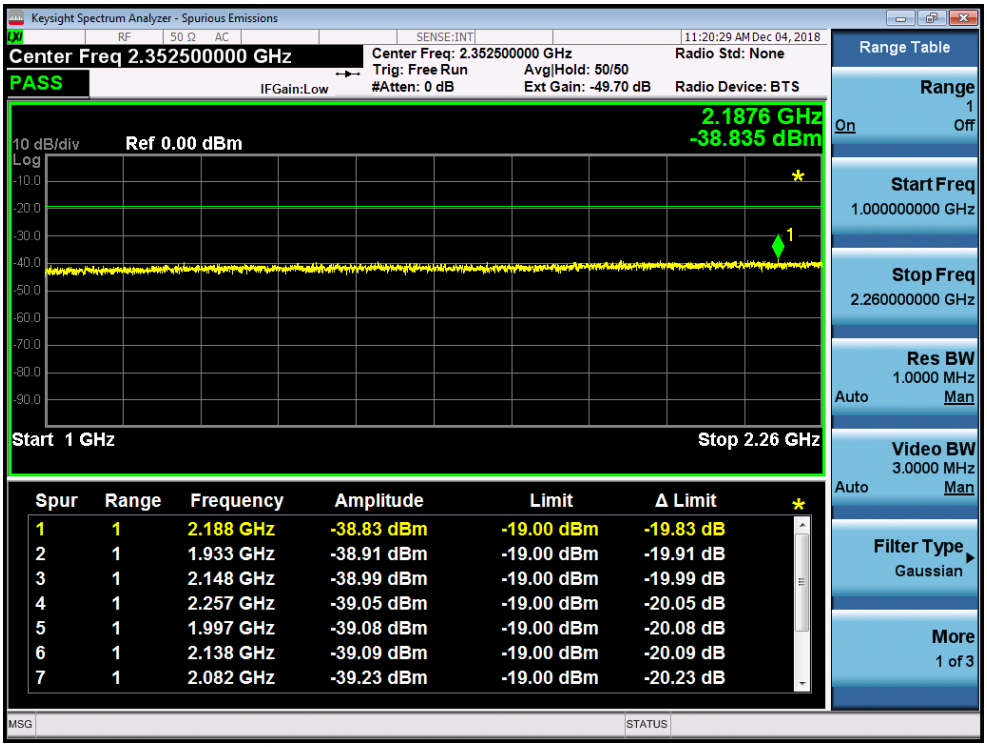
Spur	Range	Frequency	Amplitude	Limit	Δ Limit
1	1	20.62 GHz	-29.27 dBm	-19.00 dBm	-10.27 dB
2	1	20.54 GHz	-29.44 dBm	-19.00 dBm	-10.44 dB
3	1	20.66 GHz	-29.50 dBm	-19.00 dBm	-10.50 dB
4	1	20.60 GHz	-29.58 dBm	-19.00 dBm	-10.58 dB
5	1	20.64 GHz	-29.64 dBm	-19.00 dBm	-10.64 dB
6	1	20.59 GHz	-29.64 dBm	-19.00 dBm	-10.64 dB
7	1	23.74 GHz	-29.68 dBm	-19.00 dBm	-10.68 dB

Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 10 MHz – 1 GHz



Spur	Range	Frequency	Amplitude	Limit	Δ Limit
1	1	796.7 MHz	-48.21 dBm	-19.00 dBm	-29.21 dB
2	1	795.3 MHz	-48.21 dBm	-19.00 dBm	-29.21 dB
3	1	792.8 MHz	-48.30 dBm	-19.00 dBm	-29.30 dB
4	1	902.9 MHz	-48.32 dBm	-19.00 dBm	-29.32 dB
5	1	738.2 MHz	-48.34 dBm	-19.00 dBm	-29.34 dB
6	1	809.1 MHz	-48.39 dBm	-19.00 dBm	-29.39 dB
7	1	925.6 MHz	-48.40 dBm	-19.00 dBm	-29.40 dB

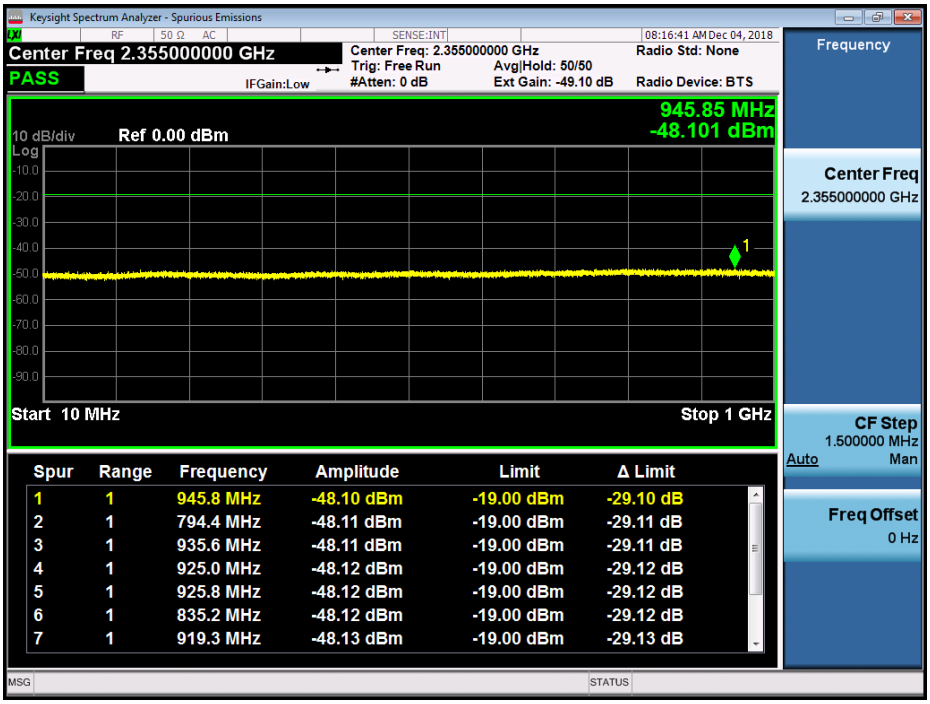
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 5 MBW, TM3.2, 1 GHz – 2.26 GHz



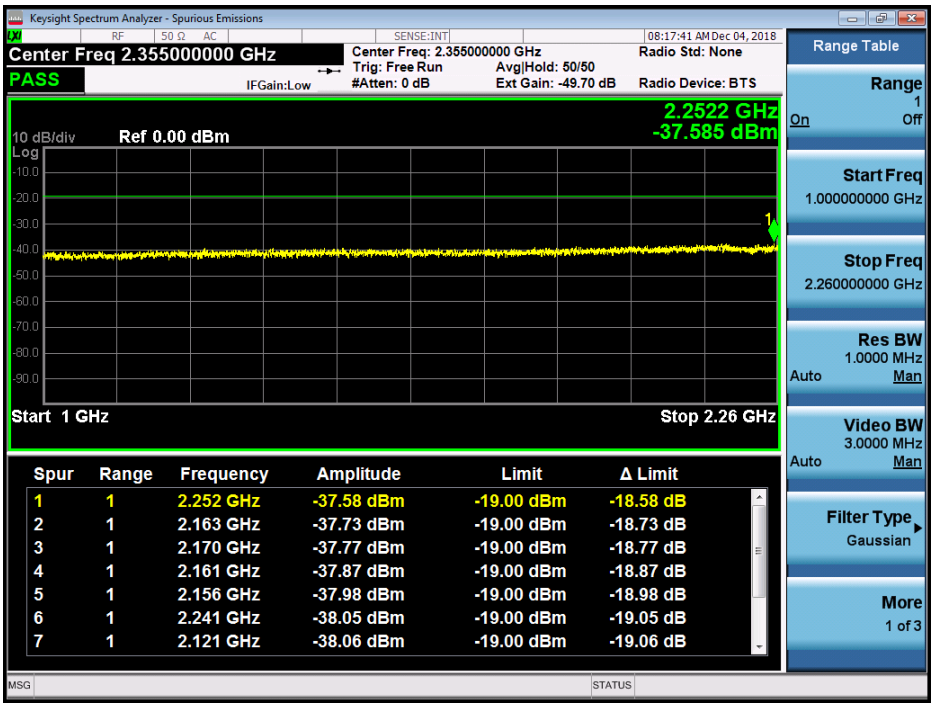
Spur	Range	Frequency	Amplitude	Limit	Δ Limit
1	1	2.188 GHz	-38.83 dBm	-19.00 dBm	-19.83 dB
2	1	1.933 GHz	-38.91 dBm	-19.00 dBm	-19.91 dB
3	1	2.148 GHz	-38.99 dBm	-19.00 dBm	-19.99 dB
4	1	2.257 GHz	-39.05 dBm	-19.00 dBm	-20.05 dB
5	1	1.997 GHz	-39.08 dBm	-19.00 dBm	-20.08 dB
6	1	2.138 GHz	-39.09 dBm	-19.00 dBm	-20.09 dB
7	1	2.082 GHz	-39.23 dBm	-19.00 dBm	-20.23 dB

5.1.2 Single Carrier (10 MHz Bandwidth)

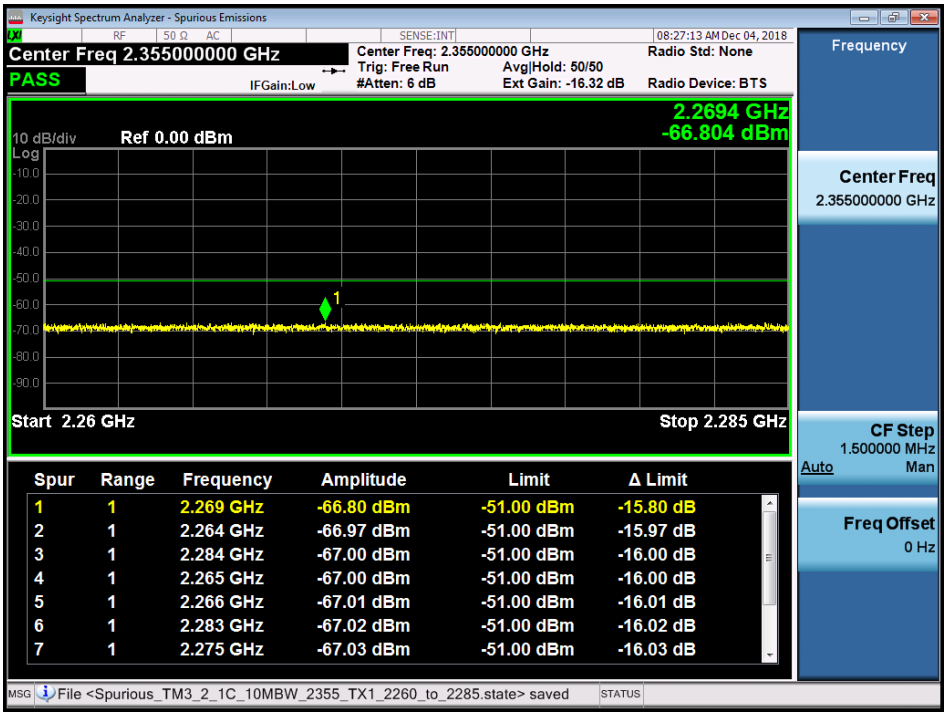
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 10 MHz – 1 GHz



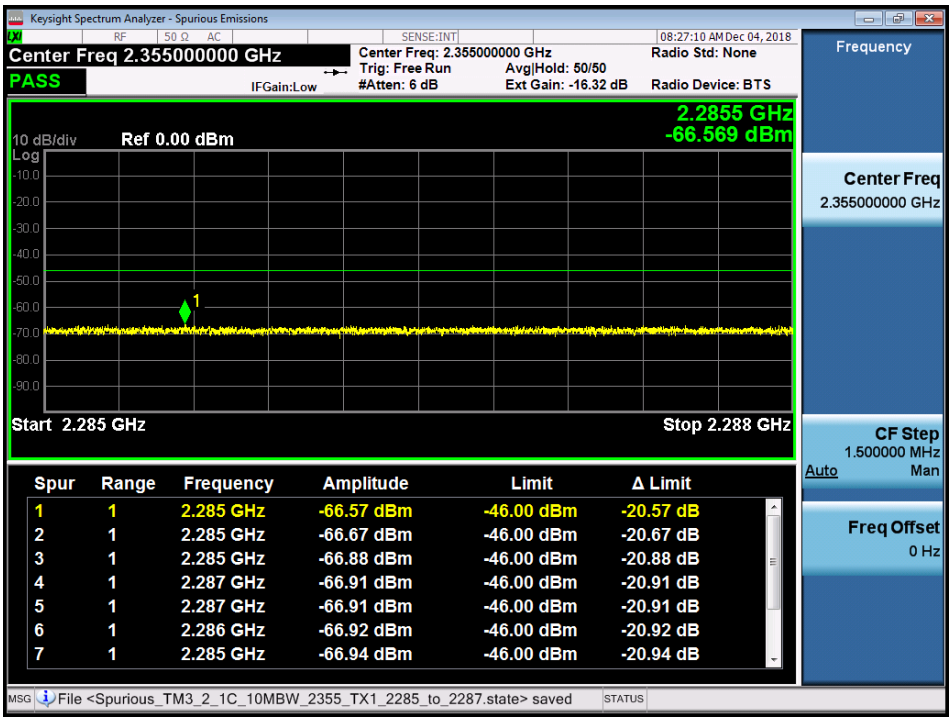
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 1 GHz – 2.26 GHz



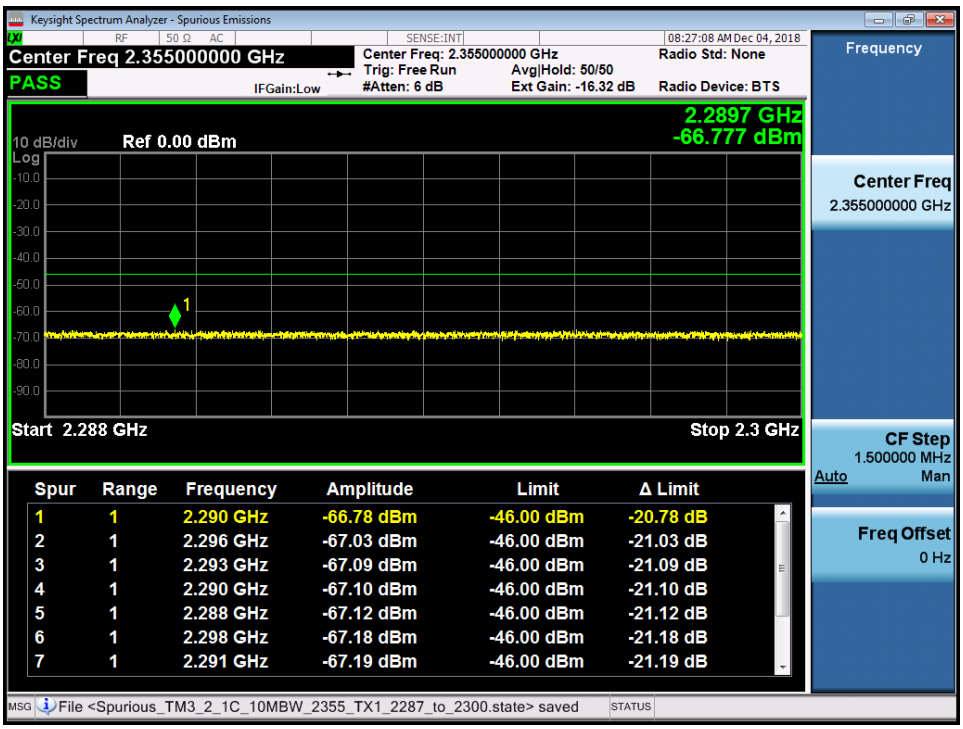
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.26 GHz – 2.285 GHz



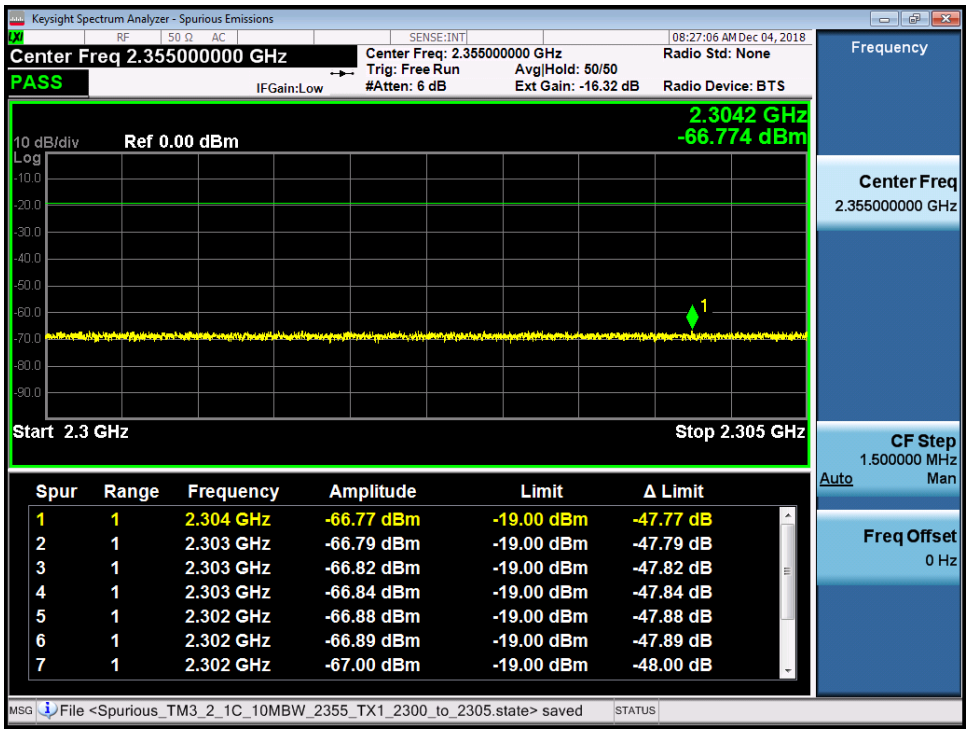
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.285 GHz – 2.2875 GHz



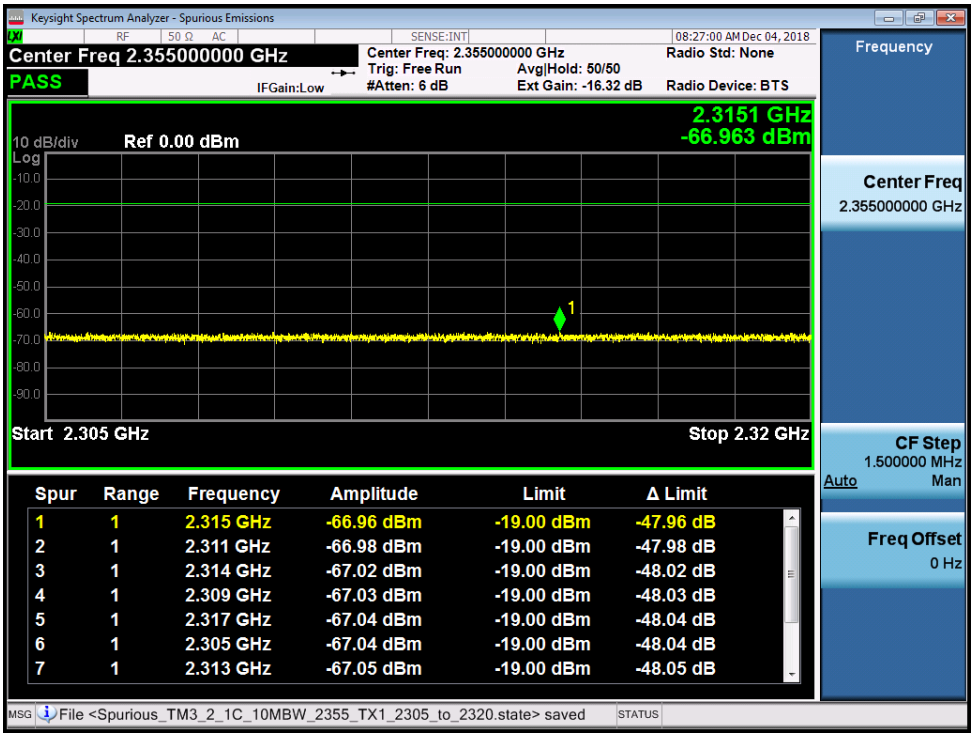
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.2875 GHz – 2.30 GHz



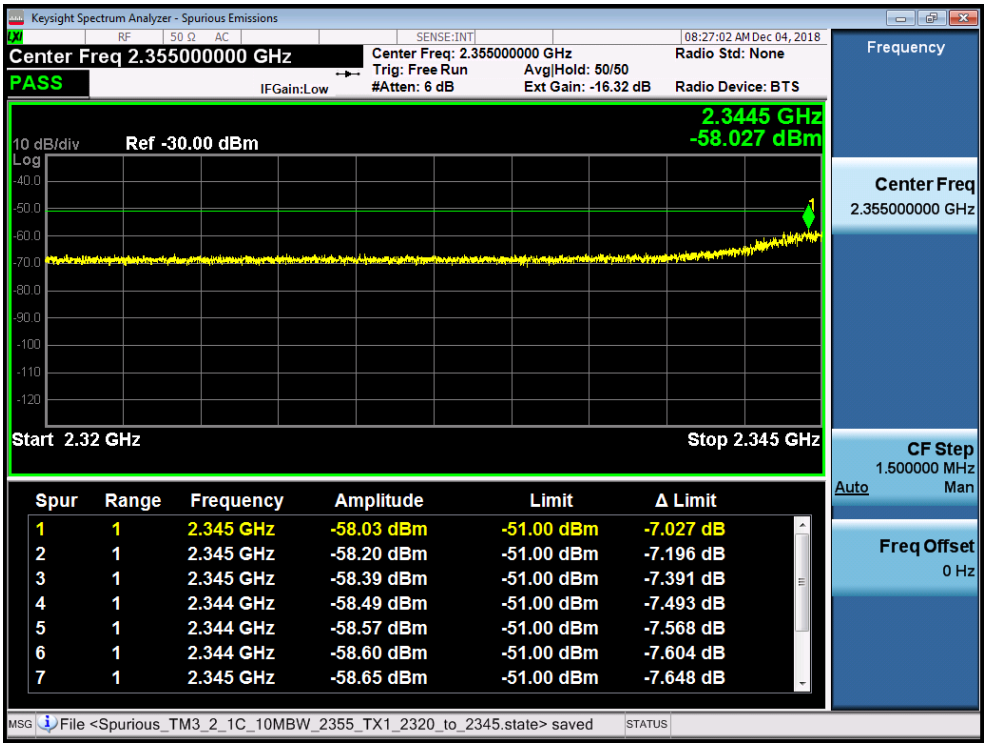
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.30 GHz – 2.305 GHz



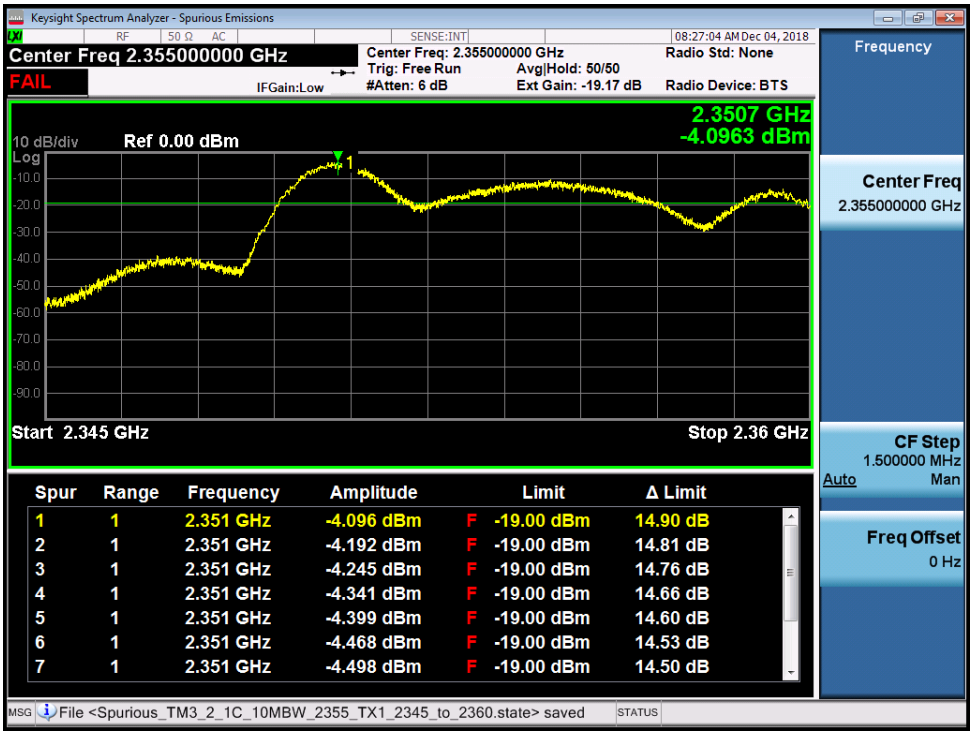
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.305 GHz – 2.320 GHz



Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.320 GHz – 2.345 GHz

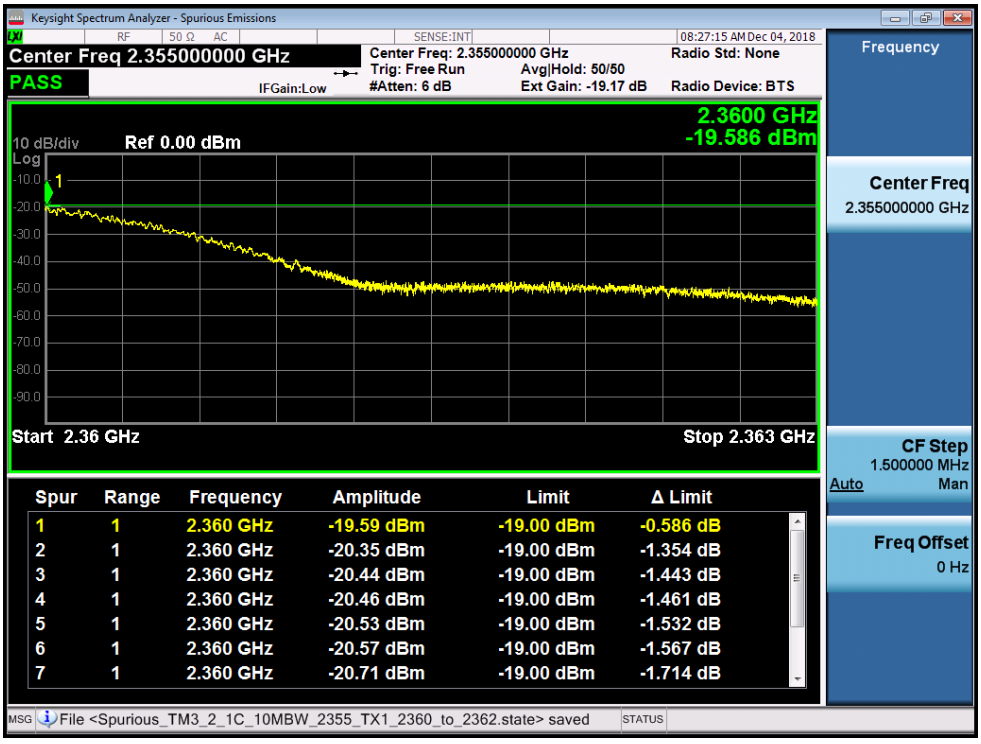


Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.345 GHz – 2.360 GHz

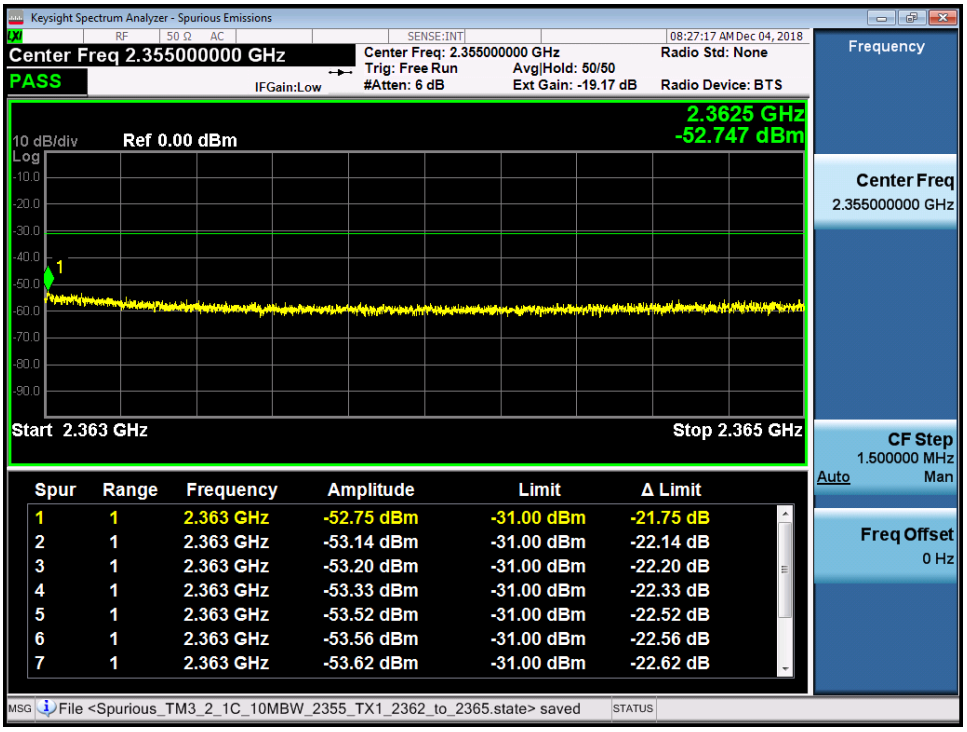


TX Exempt

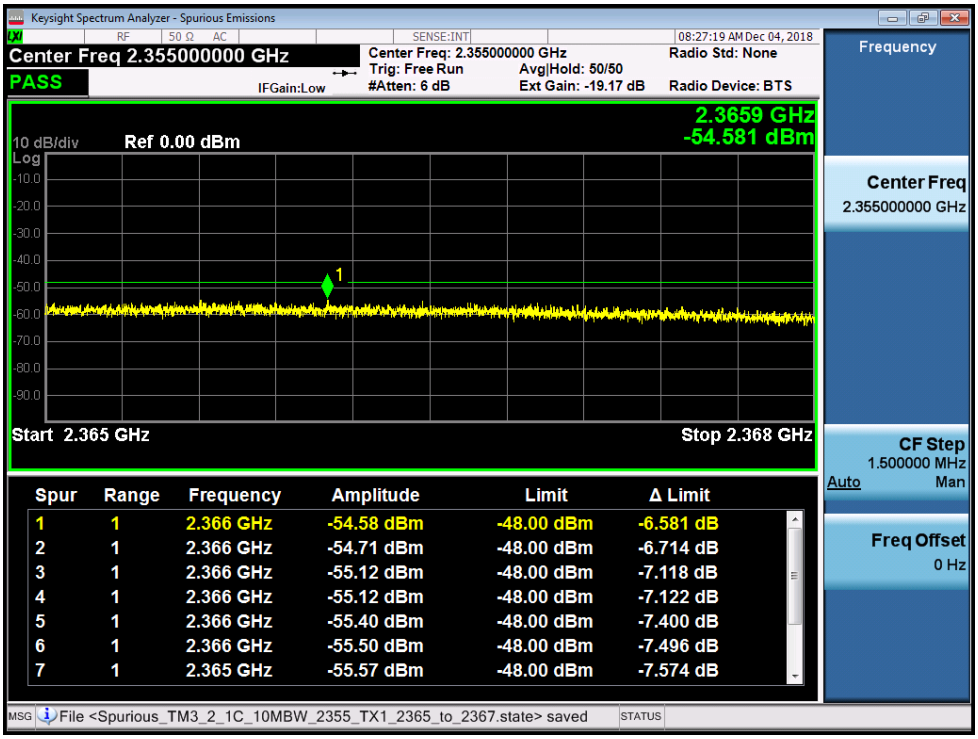
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.360 GHz – 2.362 GHz



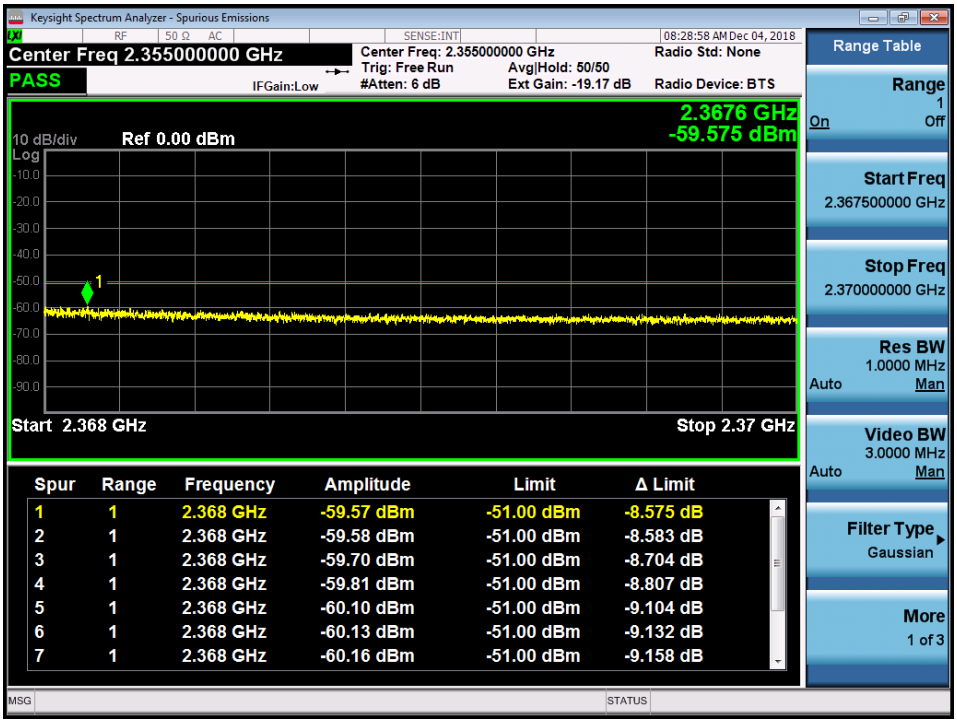
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.362 GHz – 2.365 GHz



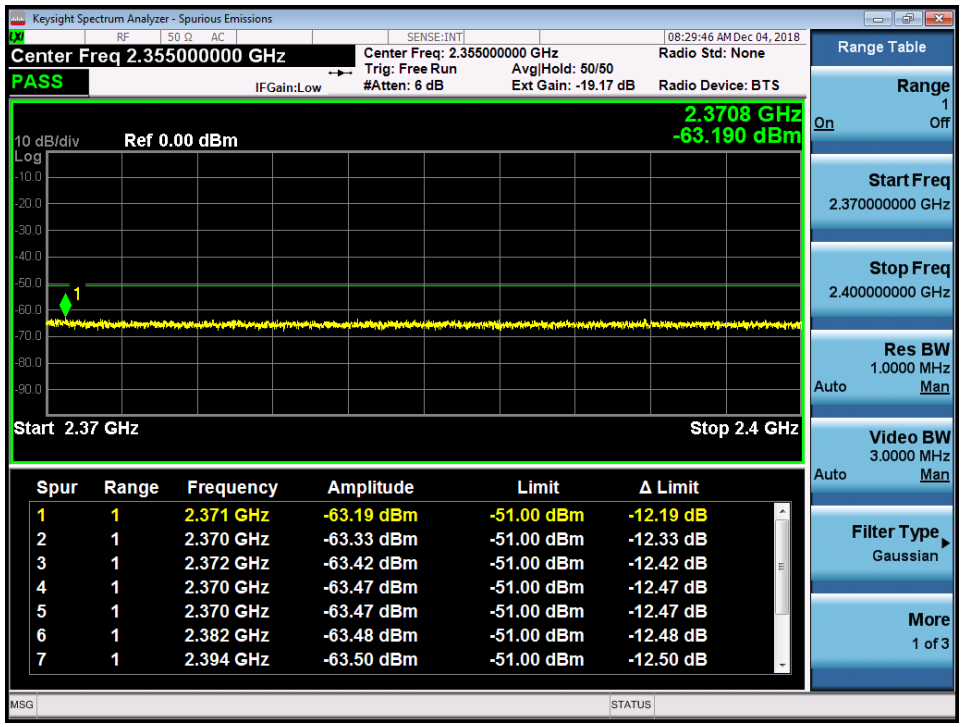
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.365 GHz – 2.367 GHz



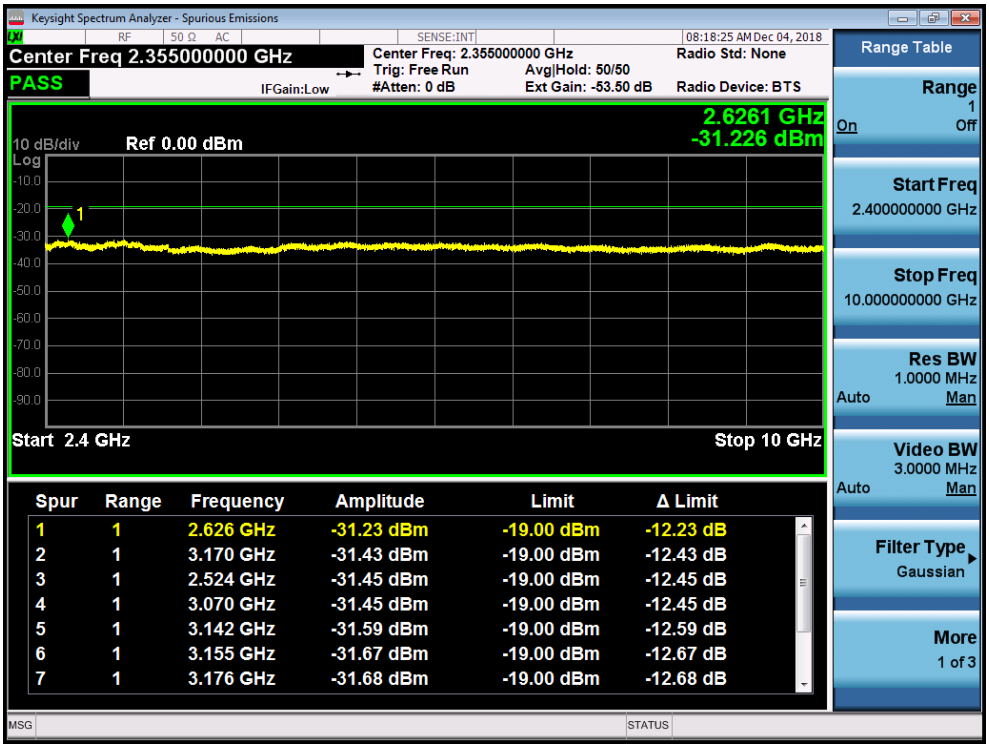
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.367 GHz – 2.37 GHz



Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.37 GHz – 2.40 GHz

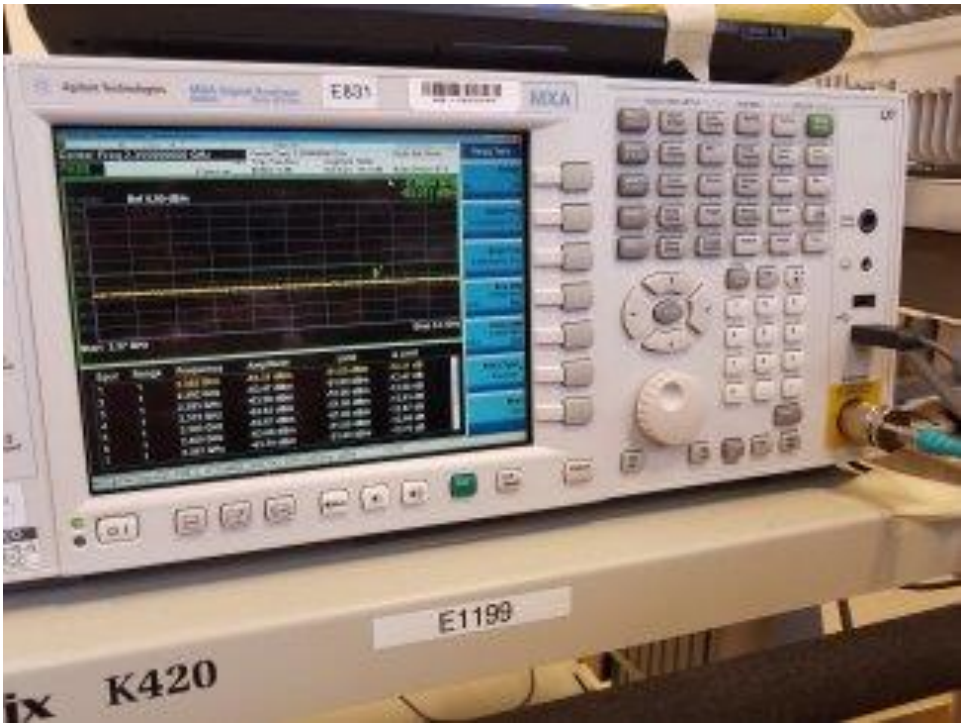


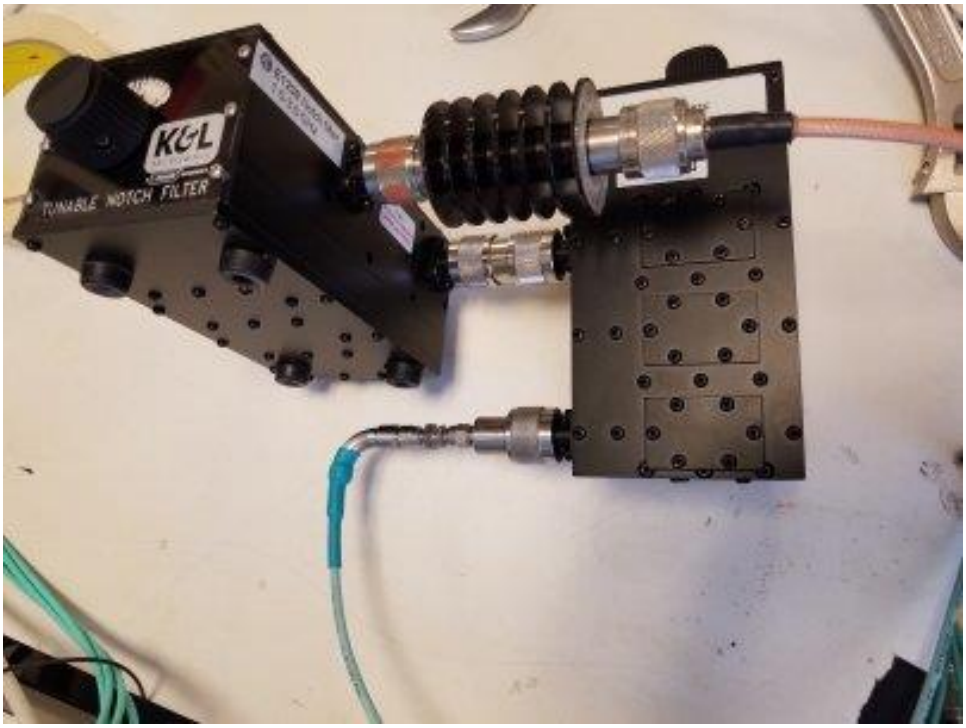
Spurious Emissions, Nokia **AHNA AirScale RRH 4T4R B30 100W**, B30, 1C, 44dBm, 10 MBW, TM3.2, 2.37 GHz – 10.0 GHz



Spur	Range	Frequency	Amplitude	Limit	Δ Limit
1	1	2.626 GHz	-31.23 dBm	-19.00 dBm	-12.23 dB
2	1	3.170 GHz	-31.43 dBm	-19.00 dBm	-12.43 dB
3	1	2.524 GHz	-31.45 dBm	-19.00 dBm	-12.45 dB
4	1	3.070 GHz	-31.45 dBm	-19.00 dBm	-12.45 dB
5	1	3.142 GHz	-31.59 dBm	-19.00 dBm	-12.59 dB
6	1	3.155 GHz	-31.67 dBm	-19.00 dBm	-12.67 dB
7	1	3.176 GHz	-31.68 dBm	-19.00 dBm	-12.68 dB

6. Photographs




KGL
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7. Test Instrumentation

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due	Calibration Type	Status
E831	Agilent Technologies	MXA Signal Analyzer	20Hz-26.5GHz	N9020A	MY48011791	2018-02-15	2020-02-15	Requires Calibration	Active
E1238	K & L Microwave	Notch Filter	1.5 to 3.0 GHz Notch filter	3TNF-1500/3000-N/N	166	N/A	N/A	Calibration Not Required, Must Be Verified	Active
E1239	K & L Microwave	Notch Filter	1.5 to 3.0 GHz Notch filter	3TNF-1500/3000-N/N	167	N/A	N/A	Calibration Not Required, Must Be Verified	Active
E1208	RLC Electronics Inc	High Pass Filter	2.5Ghz to 26Ghz High Pass Filter	F-19391	1440-001	N/A	N/A	Calibration Not Required, Must Be Verified	Active
E1156	Weinschel	Attenuator	10dB 0.05GHz-26GHz 25W	74-10-12	1069	N/A	N/A	Calibration Not Required, Must Be Verified	Active
E1237	Weinschel	Attenuator	10dB 25 Watt	46-10-34	BH8105	N/A	N/A	Calibration Not Required, Must Be Verified	Active
E1155	Weinschel	Attenuator	10dB 25Watt 0.05GHz - 26GHz	74-10-12	1068	N/A	N/A	Calibration Not Required, Must Be Verified	Active
E1154	Weinschel	Attenuator	30dB 25W 0.05GHz-26GHz	74-30-12	1065	N/A	N/A	Calibration Not Required, Must Be Verified	Active

8. FCC Section 2.1053 and Part 15.109

8.1 Section 2.1053 Field Strength of Spurious Emissions

Field strength measurements of radiated spurious emissions were made in 3m Semi-Anechoic Chambers the of Global Product Compliance Laboratories of Nokia Bell Labs in Murray Hill NJ. A complete description and full measurement data for the site is on file with the Commission (FCC File 515091).

The spectrum from 30 MHz to the tenth harmonic of the carrier, as high as 27 GHz depending upon the product, was searched for spurious radiation. Measurements were made using both horizontally and vertically polarized broadband antennas. Per FCC regulations, the comparison of out of band spurious emissions directly to the limit is appropriately made using the substitution method. However, when the emissions are more than 20 dB below the specification limit, the use of field strength measurements for compliance determination is acceptable and those emissions are considered not reportable (Section 2.1053 and the FCC Interpretive database for 2.1053). For this case the evaluation of acceptable radiated field strength is as follows.

Sections 2.1053 and 27.53 contain the requirements for the levels of spurious radiation as a function of the level of the unmodulated carrier. The reference level for the unmodulated carrier is calculated as the field produced by an ideal dipole excited by the transmitter output power according to the following relation taken from Reference Data for Radio Engineers, page 676, 4th edition, IT&T Corp.

$$E= [(30*P)^{1/2}]/R$$

$$20 \log (E*10^{6}) – (43 + 10 \log P) = 82.23 \text{ dB}\mu\text{V/meter}$$

Where:
E = Field Intensity in Volts/meter P = Transmitted Power in Watts
R = Measurement distance in meters = 3 m

The Part 27 Limit is 82.23 dBuV/m at 3m and 91.77 dBuV/m at 1m
The Part 27 non-report level is 62.23 dBuV/m at 3m.

The calculated emission levels were found by:

Measured level (dBμV) + Cable Loss(dB)+Antenna Factor(dB) = Field Strength (dBμV/m)

RESULTS:

For compliance with 47CFR Parts 2 and 27, the field strength of any spurious radiation, measured at 3m, is required to be less than 82.23 dBμV/meter (82.23 @ 3m). Emissions equal to or less than 62.23 dBμV/meter at 3m are not reportable and may be verified using field strength measurements and broadband antennas. Over the out of band spectrum investigated from 30 MHz to beyond the tenth harmonic of the carrier (up to 27 GHz), no reportable spurious emissions were detected.

9. Frequency Stability

Frequency Stability (FS) is the measurement of the EUT's frequency deviation from its assigned frequency, and is expressed in both Hz and parts-per-million (ppm). Frequency Tolerance (FT) is the deviation limit set by either the Regulatory Agency, in their Rules, Regulations and Standards, or the specific Design Standard (domestic or international) that an EUT is designed to comply with. Hence, the measured deviation value (FS) cannot exceed the frequency tolerance (FT) limit to which the radio/transceiver is designed to meet.

The frequency stability was measured with variation of ambient temperature and voltage as follows:
From −30° to +50° centigrade for all equipment (If the EUT under test does not operate to the temperature range required, EUT status should be indicated at the temperature of departure.)

Frequency measurements were made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level was allowed prior to frequency measurement.

Vary primary supply voltage from 85 to 115 percent of the nominal value.
The supply voltage was measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

Frequency Block Tested: *(CF = 2355MHz)*

1. **(a)Set the power supply to nominal Voltage. (b) Record the frequency at ~25°C. (c)Raise EUT operating temperature to 50°C. (d)Record the frequency difference. (e) Repeat step (d) at each 10°C step down to -30°C. Result will be 10 readings and take temperature readings to establish thermal stability at each point.**

Baseline Measurement at +25°C

Transmit Frequency Deviation at +25°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	9.290
0.5	7.118
1.0	8.902
1.5	9.715
2.0	7.255
2.5	8.426
3.0	11.939
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +50°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	9.333
0.5	7.168
1.0	10.749
1.5	6.543

Transmit Frequency Deviation at +50°C at 100% of Nominal Voltage, -48VDC	
2.0	9.777
2.5	7.498
3.0	9.089
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +40°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	7.172
0.5	10.677
1.0	8.962
1.5	9.439
2.0	12.902
2.5	8.426
3.0	8.801
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +30°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	10.322
0.5	8.933
1.0	7.889
1.5	9.002
2.0	8.116
2.5	10.844
3.0	4.936
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +20°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	9.892
0.5	10.207
1.0	8.361
1.5	9.079
2.0	10.896
2.5	8.252
3.0	7.499
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +10°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	10.981
0.5	8.593
1.0	4.996
1.5	8.871
2.0	10.789
2.5	8.612
3.0	11.421
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at 0°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	11.372
0.5	9.929
1.0	10.774
1.5	7.710
2.0	8.394
2.5	10.731
3.0	9.855
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at -10°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	10.381
0.5	8.629
1.0	9.513
1.5	8.107
2.0	12.311
2.5	9.097
3.0	5.395
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at -20°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	7.261
0.5	5.624
1.0	11.737
1.5	8.302
2.0	11.944
2.5	9.961
3.0	10.885
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at -30°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	9.411
0.5	10.843
1.0	8.266
1.5	6.832
2.0	10.209
2.5	9.621
3.0	11.289
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Upon return to +25°C.

2. **At ambient, vary voltage to +15% and -15% of nominal and record frequency difference. Result will be 12 readings for each voltage (nominal, ~+ 3%, ~+6%, ~+%9, ~+12%, +15%, and nominal, ~- 3%, ~-6%, ~-%9, ~-12%, -15%).**

Transmit Frequency Deviation at +25°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	9.047
0.5	8.922
1.0	11.693
1.5	12.476
2.0	9.317
2.5	11.092
3.0	10.606
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 103% of Nominal Voltage, -49.44VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	12.273
0.5	5.496
1.0	9.141
1.5	7.970
2.0	10.577
2.5	9.077
3.0	12.599
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 106% of Nominal Voltage, -50.88VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	8.721
0.5	11.289
1.0	7.410
1.5	10.506
2.0	9.493
2.5	12.376
3.0	7.350
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 109% of Nominal Voltage, -52.32VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	10.250
0.5	9.006
1.0	8.349
1.5	11.727
2.0	8.621
2.5	11.281
3.0	9.984
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 112% of Nominal Voltage, -53.76VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	9.113
0.5	11.319
1.0	10.852
1.5	7.961
2.0	12.682
2.5	7.269
3.0	9.117
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 115% of Nominal Voltage, -55.20VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	11.988
0.5	8.276
1.0	10.350
1.5	9.489
2.0	9.822
2.5	11.587
3.0	10.036
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 100% of Nominal Voltage, -48.0VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	10.603
0.5	7.389
1.0	9.997
1.5	6.690
2.0	11.543
2.5	10.880
3.0	8.521
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

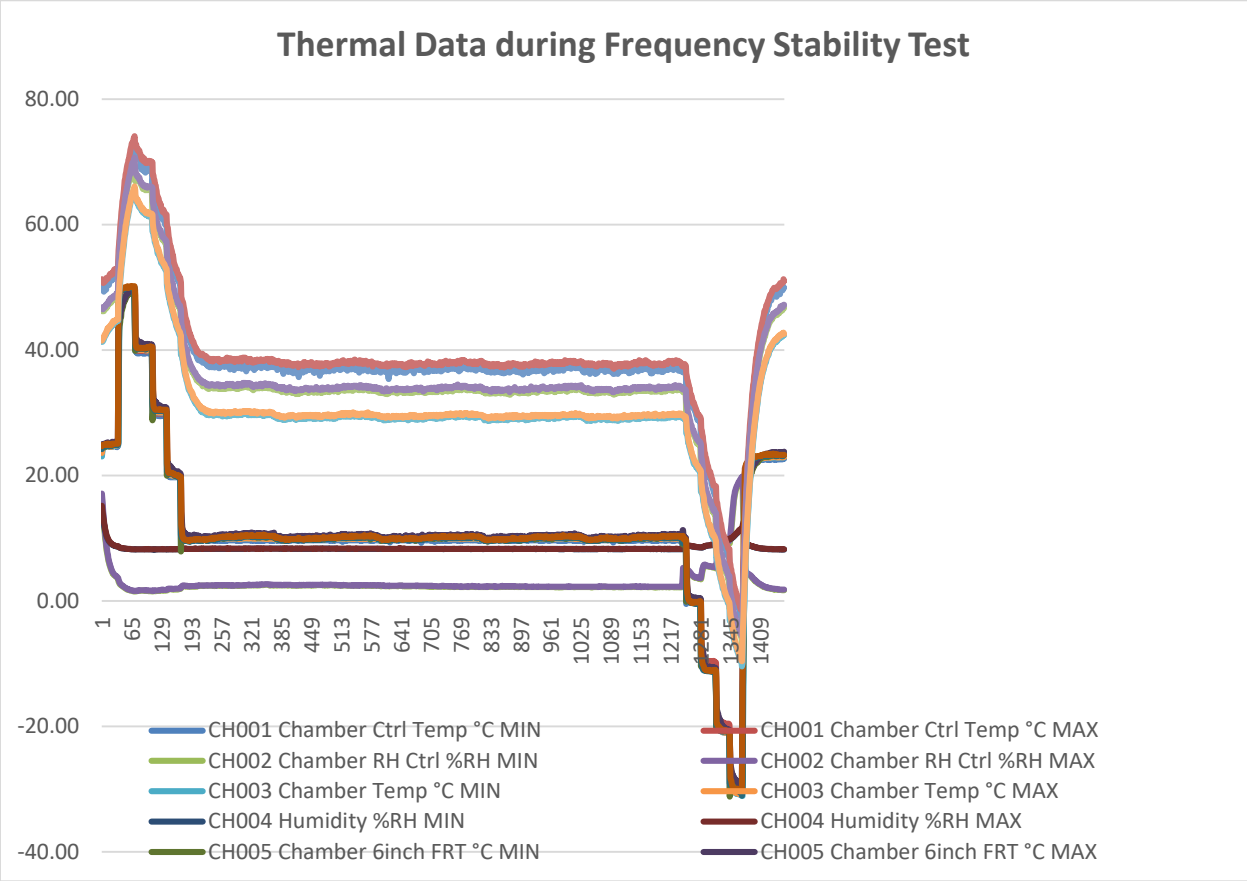
Transmit Frequency Deviation at +25°C at -3% of Nominal Voltage, -46.56VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	10.145
0.5	7.982
1.0	8.527
1.5	10.935
2.0	7.417
2.5	9.862
3.0	11.986
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at -6% of Nominal Voltage, -45.12VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	9.762
0.5	10.525
1.0	11.391
1.5	9.964
2.0	11.330
2.5	7.602
3.0	8.791
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at -9% of Nominal Voltage, -43.68VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	12.369
0.5	9.782
1.0	11.926
1.5	10.583
2.0	9.457
2.5	12.101
3.0	9.520
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at -12% of Nominal Voltage, -42.24VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	11.768
0.5	10.890
1.0	12.976
1.5	9.556
2.0	11.713
2.5	10.020
3.0	9.491
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at -15% of Nominal Voltage, -40.80VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	12.072
0.5	8.669
1.0	11.157
1.5	10.139
2.0	9.721
2.5	10.550
3.0	11.121
FCC SPECIFICATION	±2355 MHz (±0.05ppm) ±0.05ppm = ±117.75 Hz
FCC RESULT	PASS



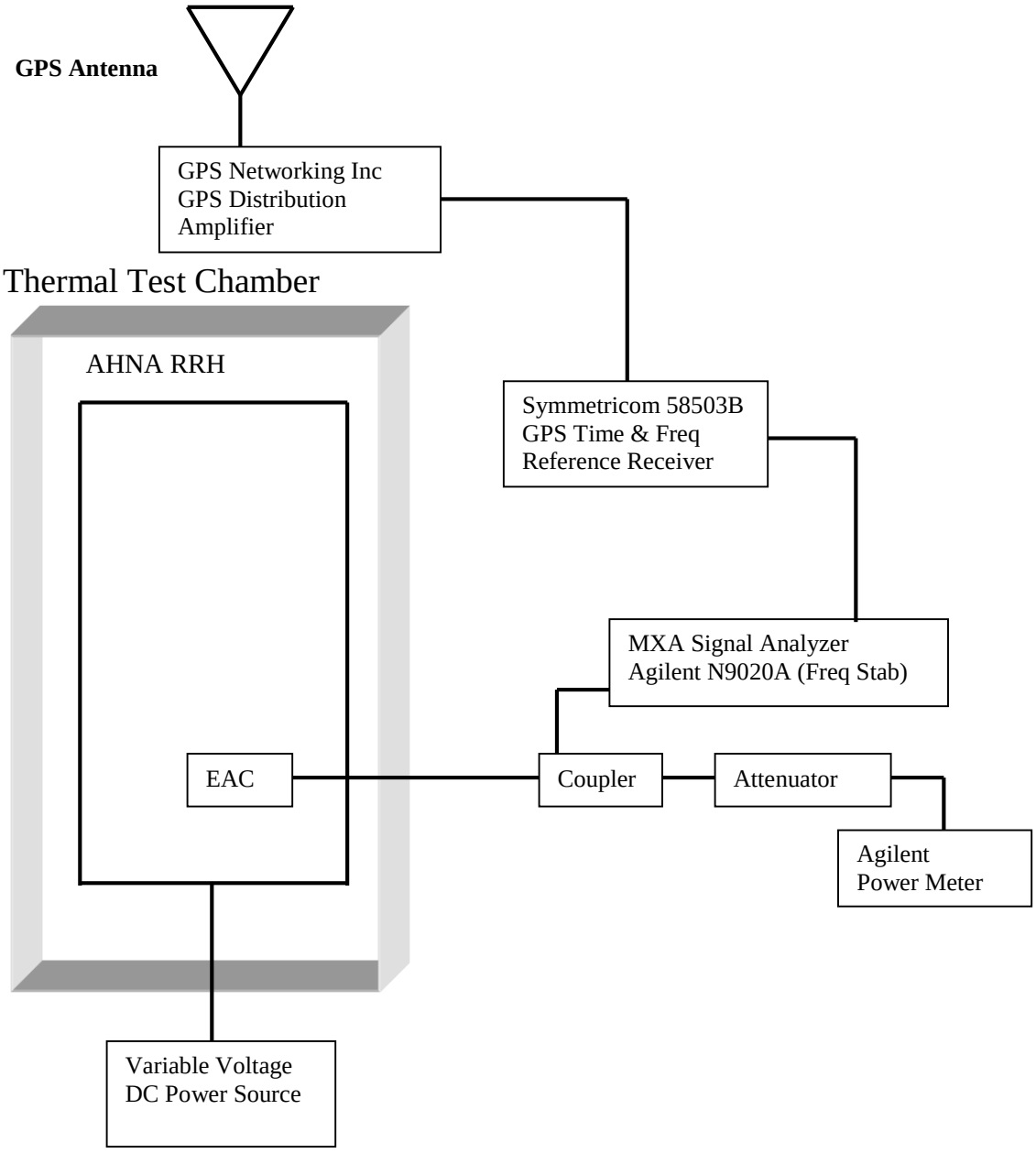
Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E1152	Agilent Technologies	MXA Signal Analyzer	20Hz-26.5GHz Analyzer	N9020A	MY53420147	2017-03-13	2019-03-13
TH044	Fluke	Multimeter		83III	74910377	2018-02-12	2020-02-12
TH501-T02	Synergy	Controller	Solutions Plus Controller	SPPCM	SP001628	2018-02-02	2020-02-02
TH-T02	Thermotron	Thermal Chamber	Chamber	N/A	6632	Not Required	Not Required
TH014	Yokogawa	Recorder	MVAdvanced portable paperless recorder	MV2048	S5JC04072	2017-06-02	2019-06-02

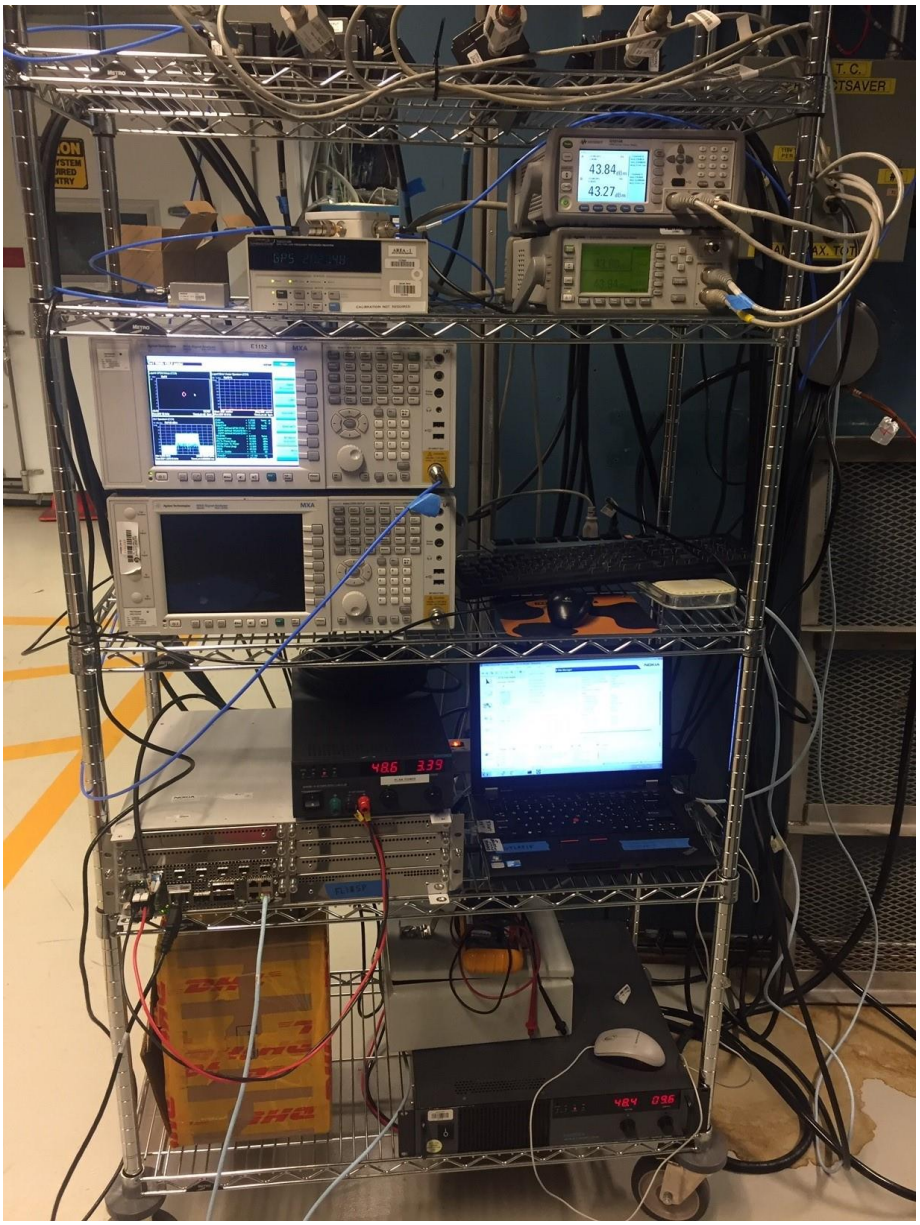
Additional Support Equipment

Instrument Type	Serial Number	Vendor	Cal Due Date
Power Meter	MY40511034	AGILENT E4419B	01/10/2020
Power Sensor	MY52280001	AGILENT E9301A	02/08/2020
Power Sensor	MY52280011	AGILENT E9301A	02/08/2020
GPS Receiver	KR93200773	SYMMETRICOM 58503B	No Cal Req.
Power supply	13N5112J	TDK-LAMBDA GEN60-85-3P208	No Cal Req.

Test Setup


GPS Antenna
GPS Networking Inc
GPS Distribution
Amplifier
Thermal Test Chamber
AHNA RRH
Symmetricom 58503B
GPS Time & Freq
Reference Receiver
MXA Signal Analyzer
Agilent N9020A (Freq Stab)
EAC
Coupler
Attenuator
Agilent
Power Meter
Variable Voltage
DC Power Source

Setup Photos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10. NVLAP Certificate of Accreditation

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100275-0

Nokia, Global Product Compliance Lab
Murray Hill, NJ

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2018-09-05 through 2019-09-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program