### EXHIBIT 4

#### TEST REPORT

#### SECTION 2.1033(c)(14)

The data required by Section 2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in Section 2.1041.

#### SECTION 2.911 (e)

Technical test data submitted to the TCB and to the Commission shall be signed by the person who performed or supervised the tests. The person signing the test data shall attest to the accuracy of such data. The Commission or TCB may require the person signing the test data to submit a statement showing that they are qualified to make or supervise the required measurements.

#### <u>Response</u>

A RF test report meeting the above requirements was attached.

Bell Labs



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



TESTING NVLAP LAB CODE: 100275-0

# RF Transmitter Certification Test Report (FCC ID: 2AD8UFW2IMBOM1) (IC ID: 109D-FW2IMBOM1)

Regulation

FCC CFR 47 Part 27 Subpart C IC RSS-139

Client

## Nokia Solutions and Networks Oy

Product Evaluated

# **MBO B66 Dual Carriers**

## (PRI20183480)

GPCL Report Number TR2018-0042 FCC/IC

GPCL Project Number 2018-0042

## Date Issued

June 5, 2018

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Revision	s			
Date	Revision	Section	Change	

Nokia Global Product Compliance Laboratory represents to the client that testing was done in accordance with standard procedures as applicable, and that reported test results are accurate within generally accepted commercial ranges of accuracy in accordance with the scope of our NVLAP Accreditation. Nokia Global Product Compliance reports only apply to the specific samples tested. This report is the property of the client. This report shall not be reproduced except in full without the written approval of the Nokia Global Product Compliance Laboratory.

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Nokia Global Product Compliance Laboratory represents to the client that the laboratory's accreditation or any of its calibration or test reports in no way constitutes or implies product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

The test results documented in this report refer exclusively to the test model/sample specified, under the conditions and modes of operation as described herein.

Reviewed By:

Prepared By:

Signed:

Steve Gurdon

Steve Gordon GPCL Compliance Engineer NVLAP Approved Signatory <u>6/5/2018</u> Date

Signed: Kaymond Johnson Ray Johnson

<u>6/5/2018</u>

Ray Johnson Technical Manager Date

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# **1** ATTESTATION OF TEST RESULTS

<b>Company Name (Manufacturer)</b>	Nokia Solutions and Networks Oy
	2000 W. Lucent Lane
	Naperville, IL 60563
FCC ID	2AD8UFW2IMBOM1
Industry Canada ID	109D-FW2IMBOM1
Product Name	Flexi Zone Multiband Outdoor Micro Base Station RF
	Transceiver Band 66 Module
Model Name	MBO B66 Module: FW2IMBOM1
Serial Number(s)	EB181111199
Test Requirement(s)	47 CFR FCC Part 27 Subpart C, IC RSS-139
<b>Test Procedures/Methods</b>	• ANSI C63.26-2015
	• FCC KDB 971168 D01, v03r01, April 2018
	• FCC KDB 662911 D01, v02r01, October 2013
	• RSS-GEN, Issue 5, April 2018
	• RSS-139, Issue 3, July 2015
	• SRSP-513, Issue 3, July 2015
Frequency Band	1710-1780 MHz (Rx); 2110-2180 MHz (Tx)
	E-UTRAN Band 66
<b>Operation Mode(s)</b>	MIMO: 2x5W
FCC Part 15 Subpart B Section	Passed (Data in FCC Part 15 Test Report)
15.109 Class B, ICES-003 Date Tested	March 12 – May 29, 2018
	-
Type of Application	Class II Permissive Change of Authorized Equipment
Submission Type Test Laboratory	N/A Nokia Global Product Compliance Laboratory
Test Laboratory	600-700 Mountain Avenue
	Murray Hill, New Jersey 07974-0636 USA
	FCC Registration No/Designation No: 515091/US5302
Test Engineers	J. Yadav, M. Soli

The above product has been evaluated and found to be in compliance with the Commission's Rules and Regulations set forth in the above standards.

## FCC Section 2.911(e) Certification of Technical Test Data

The technical test data presented in this report are accurate.

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## 2 SUMMARY OF THE TEST RESULTS

Section	FCC/IC Rules	Description of Tests	Test Condition	Results In Compliance
4.4	FCC 2.1046 & 27.50(d), RSS- GEN Section 6.12, RSS-139 Sections 4.1 & 6.5	RF Power Output	Conducted	Yes
4.5	FCC 2.1051 & 27.53, RSS-GEN Section 6.13, RSS-139 Section 6.6	Out-of-Band Emissions at Antenna Terminals		Yes
4.6	FCC 2.1051 & 27.53, RSS-GEN Section 6.13, RSS-139 Section 6.6	Spurious Emissions at Antenna Terminals		Yes
4.7	FCC 2.1053 & 27.53, RSS-GEN Section 8.9 & RSS-139 Section 6.6	Field Strength of Spurious Radiation	Radiated	Yes
4.8	RSS-Gen Sections 5.3 & 7.3	Spurious Emissions at Receiver Antenna Terminals	Conducted	Yes

## 2.1. Measurement Uncertainties for EMC Conducted and Radiated Emissions

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.

Standard, Method or Procedure	Condition	Frequency MHz	Expanded Uncertainty (k=2)
a. EMC Emissions, (e.g., ANSI	Conducted Emissions	0.009 - 30	$\pm 2.0 \text{ dB}$
C63.4, CISPR 11, 14, 22, etc.,	Radiated Emissions (AR4 -	30 - 200	±5.1 ~ ±5.4 dB
using ESHS 30, EMC-60,	AR9 Semi-Anechoic	200 - 1000	±4.3 ~ ±4.7 dB
LISNs/AMNs and antennas)	Chambers)		
	Radiated Emissions (OATS)	1000 - 18,000	±3.3 dB

#### **Worst-Case Estimated Measurement Uncertainties**

## 2.2. Measurement Uncertainties for Antenna Port Conducted Testing

	Expanded Uncertainty
Standard, Method or Procedure	( <b>k</b> =2)
RF Power	± 1.4 dB
Occupied Bandwidth	± 2.2 dB
Conducted Spurious Emissions	± 2.8 dB

### **Worst-Case Estimated Measurement Uncertainties**

## **3** GENERAL INFORMATION

## 3.1 Product Descriptions

	Table 5.1.1 Froduct Specifications
Specification Items	Description
Product Type	MBO B66
Radio Type	Intentional Transceiver
Power Type	-48VDC
FCC/IC Rules	47 CFR Part 27 Subpart C
Modulation	OFDM (QPSK, 16QAM, 64QAM, 256QAM)
Technology	LTE-FDD
Frequency Range	1710-1780 MHz (Rx); 2110-2200 MHz (Tx) E-UTRAN Band
	66
Channel Bandwidth(s)	5/10/15/20MHz
MIMO	2x5W
Max Rated Conducted RF Power	5W (37.0 dBm) per port and 10W (40dBm) total
Maximum No of Carrier per Port	2
Software Version	FLF18P
Hardware Version	101
Antennas	Detached

#### **Table 3.1.1 Product Specifications**

The above equipment has been certified for operating in the Band 66 with the maximum rated RF output power of 5W (37.0 dBm) per port. Single carrier configurations were authorized for 5MHz, 10MHz, 15MHz and 20MHz bandwidth. The measurement results for the above evaluations can be found in the test report under TR2016-0155. This new change is to add contiguous and non-contiguous dual carriers of 5+5, 10+10, 15+15 and 20+20 MHz configurations. The total output power and modulations remain unchanged. Since 5MHz, 10MHz, 15MHz and 20MHz carriers have been authorized, only the RF output power and unwanted emissions need to be evaluated for its compliance with FCC and IC requirements.

## 3.2 Accessories

A Nokia BBU, ASMi, was used for all testing. ASMi consists of an ASIA system module circuit pack and an ABIA baseband sub-module circuit pack. The ASMi was connected to the MBO through fiber connection. The above accessory device is unmodified and is commercially available.

## 3.3 **Description of Antenna(s)**

The product does not incorporate integrated antennas.

## 4 REQUIRED MEASUREMENTS AND RESULTS

## 4.1 Regulatory Requirements

The tests in this report were performed for AWS equipment operating in the 2110-2180 MHz (Tx)/1710-1780 MHz (Rx) in accordance with the requirements of FCC CFR 47 Part 27 Subpart C and IC RSS-GEN and RSS-139. The requirements are provided in the following:

(1) RF Power Output (FCC 27.50(d), RSS-139 Sections 4.1 & 6.5) & SRSP-513 Section 5)

Power measurements for transmissions may be made either in accordance with a Commission-approved average power technique or in compliance with peak transmit power. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

FCC 27.50(d) and SRSP-513 stated that for fixed and base stations operating within the frequency range 2110-2180 MHz with a channel bandwidth greater than 1 MHz, the maximum permissible EIRP is 1640 watts/MHz EIRP with an antenna height above average terrain (HAAT) up to 300 metres.

When multiple antennas are used at a station to transmit the same digital data in a given symbol period (even with different coding or phase shifts) for transmit diversity or to steer signal energy towards a particular direction for enhanced directional gain (i.e. beamforming) or to devise any other transmission mode where signals from different antennas are correlated, the EIRP shall be calculated based on the aggregate power conducted across all antennas and resulting directional gain  $10 \log 10(N) + G \max dBi$ . Here, N is the number of antennas and G max is the highest gain in dBi among all antennas.

When multiple antennas are used at a station in which each antenna transmits different digital data during any given symbol period (i.e. space-time codes) or independent parallel data stream over the same frequency bandwidth in order to increase data rates (i.e. spatial multiplexing), or forms any other transmission mode where signals from different antennas are completely uncorrelated, the EIRP shall be calculated based on the aggregate power conducted across all antennas and maximum antenna gain *G*max.

(2) Unwanted Emission Limitations (FCC 2.1051 & 27.53, IC RSS-139 Section 6.6 & RSS-GEN Section 6.13).

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P) dB$ .

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified).

The power of any unwanted emissions measured shall be attenuated (in dB) below the transmitter power, P (dBW), by at least  $43 + 10 \log_{10} P$ .

Frequency	Limits w/o MIMO	Minimum Resolution Bandwidth of Spectrum Analyzer*
1MHz Bands Immediately Outside	-13dBm	1% of the occupied bandwidth
Transmitting Channel Edges		
Beyond 1MHz Bands Immediately	-13dBm	1MHz
Outside Transmitting Channel Edge		

\*A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

RSS-GEN Section 6.13 stated when limits are expressed in absolute terms, compliance with the emission limits below 1GHz shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limits can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization as required, with an equal or greater measurement bandwidth relative to the applicable CISPR quasi-peak bandwidth. Above 1G Hz, compliance with the emission limits shall be demonstrated using an average detector with a minimum resolution bandwidth of 1 MHz.FCC 2.1057 and RSS-GEN stated that in measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower if the equipment operates below 10 GHz.Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency, as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. *Radiation* at the frequencies of multiplier stages should also be checked.

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value need not be reported.

(3) Field Strength of Spurious Radiation (FCC 2.1053, FCC KDB 971168 D01 Section 7, RSS-139 Section 6.6, RSS-Gen Section 8.9)

FCC KDB 971168 D01 Section 7 stated that when antenna-port *conducted* measurements (per Section 2.1051) are performed to demonstrate compliance to the applicable unwanted emission limits, a separate radiated measurement (per Section 2.1053) is required to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation.

These measurements are performed with the transmit antenna port(s) terminated. Unless otherwise specified in the applicable rule section, the same limits applicable to spurious (unwanted) emissions at the antenna terminals also apply to radiated spurious emissions. For example, the out-of-band emission limit has been generally applied for conducted and radiated unwanted emission test data for equipment authorization compliance reporting purposes.

### (4) Receiver Spurious Emissions (RSS-GEN Sections 5.3 and 7.4)

RSS-GEN Section 5.3 stated that all receivers in all frequency bands shall comply with the limits set forth in RSS-Gen.

The radiated method is preferred. Radiated emission measurements *shall be performed with the receiver antenna* connected. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 5x the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz. The radiated limits specified for spurious emissions from receivers are identical to ICES-003 Class B emission limits.

If the receiver has a detachable antenna of known impedance, an antenna-conducted spurious emissions measurement is permitted as an alternative to radiated measurement. The antenna-conducted test shall be performed with the antenna disconnected and with the receiver antenna terminals connected to a measuring instrument having equal impedance to that specified for the antenna. The receiver-spurious emissions measured at the antenna terminals by the antenna-conducted method shall not exceed 2 nW (57dBm) in the band 30-1000 MHz, nor 5 nW (53dBm) above 1000 MHz.

For emissions at frequencies below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. At frequencies above 1 GHz, measurements shall be performed using a linear average detector with a minimum resolution bandwidth of 1 MHz. As an alternative to CISPR quasi-peak or average measurements, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization, as required, with a measurement bandwidth equal to, or greater than, the applicable CISPR quasi-peak bandwidth or 1 MHz bandwidth, respectively.

Ī	Frequency	Limit (dBm)	Minimum RBW of Spectrum Analyzer
Ī	Max{ <i>f</i> <sub>L</sub> , 30 MHz} – 1GHz	-57	100 kHz, QP or Peak
	$1$ GHz – 5 x $f_{\rm H}$	-53	1MHz, Ave or Peak

Table 4.1.2 RSS-GEN Receiver Conducted Spurious Emission Limits\*

\*The impact of MIMO on the limits has not been included.

# 4.2 AWS Band Carrier Frequencies

PCS Blocks	Tx Frequency (MHz)	Rx Frequency (MHz)	Bandwidth (MHz)
А	2110 - 2120	1710 - 1720	10
В	2120 - 2130	1720 - 1730	10
С	2130 - 2135	1730 - 1735	5
D	2135 - 2140	1735 - 1740	5
E	2140 - 2145	1740 - 1745	5
F	2145 - 2155	1745 - 1755	10
G	2155 - 2160	1755 - 1760	5
Н	2160 - 2165	1760 - 1765	5
Ι	2165 - 2170	1765 - 1770	5

## Table 4.2.1 PCS (2110-2170MHz) Frequency Band

Table 4.2.2(a) Test Configurations for Contiguous Dual Carriers 2x5W with 2.5W (34.0dBm) Per
Carrier Per Port

Test Configuration	Carrier Freq (MHz)	Channel Bandwidth (MHz)		
1	2112.5 + 2117.5	5+5 MHz Contiguous		
	2172.5.0 + 2177.5	5+5 MHz Contiguous		
2	2115.0 + 2125.0	10+10 MHz Contiguous		
	2165.0 + 2175.0	10+10 MHz -Contiguous		
3	2117.5 + 2132.5	15+15 MHz Contiguous		
	2157.5.0 + 2172.5	15+15 MHz Contiguous		
4	2120.0 + 2140.0	20+20 MHz Contiguous		
	2150.0 + 2170.0	20+20 MHz -Contiguous		

Table 4.2.2(b) Test Configurations for Non-Contiguous Dual Carriers 2x5W with 2.5W (34.0dBm)
Per Carrier Per Port

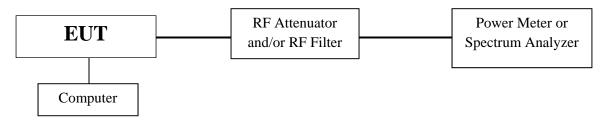
Test Configuration	Carrier Freq (MHz)	Channel Bandwidth (MHz)
1	2112.5 + 2167.5	5+5 MHz Non-Contiguous
2	2115.0 + 2165	10+10 MHz Non-Contiguous
3	2117.5.0 + 2162.5	15+15 MHz Non-Contiguous
4	2120.0 + 2160.0	20+20 MHz Non-Contiguous

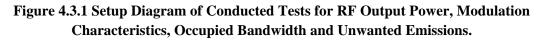
## 4.3 Test Configurations and Setup

All measurements were performed with the EUT (Equipment Under Test) transmitting at 100% duty cycle (at least 98% if required by the EUT for amplitude control purposes) at the maximum rated power control level.

RF power output and unwanted emissions were evaluated for the compliance with FCC/IC requirements for all modulation types QPSK/16QAM, 64QAM and 256QAM. Both the modulation characteristics and 26dB emission bandwidth for QPSK/16QAM, 64QAM and 256QAM were verified as well.

The test setup diagrams are given below.





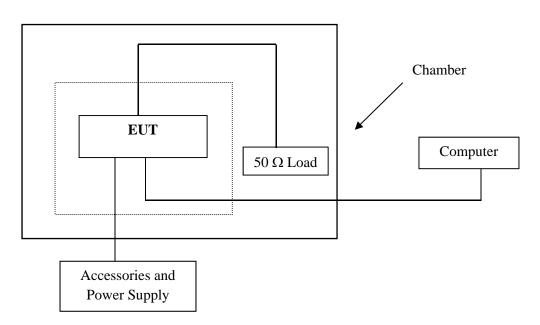


Figure 4.3.2 Setup Diagram of Radiated Test

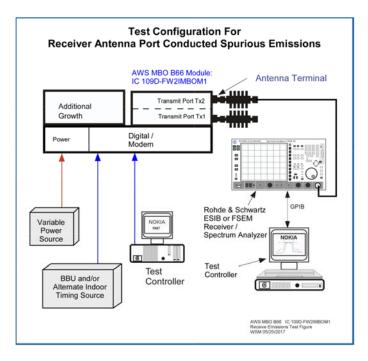


Figure 4.3.3. Receiver Spurious Test Set-up Diagram

# 4.4 MEASUREMENT REQUIRED: MAXIMUM POWER OUTPUT – FCC SECTIONS 2.1046 & 27.50(d) & IC RSS-GEN SECTION 6.12, RSS-139 SECTIONS 4.1 & 6.5)

The maximum ouput power was measured at one antenna port (port 1) during the Unwanted Out of Band Emissions tests. The measurement follows the procedures given in ANSI C63.26-2015 and FCC KDB 971168 D01.

The output power of the EUT was first verified by a power meter and then measured by a spectrum analyzer.

The Peak-to-Average Power Ratio (PAPR) of RRH has also been verified per KDB 971168 procedures for each of 5, 10, 15 and 20 MHz LTE carriers. The PAPR values (0.1% probability) measured are all below the 13dB requirement per 27.50 (b) and RSS-139 Section 6.5.

Configurations	Modulation	PAR for Contiguous Carriers (dB)	Limit (dB)	Test Results
	Q/16QAM	7.22		Pass
2112.5 (5MHz) +	64QAM	7.20	-	Pass
2117.5 (5MHz)	256QAM	724		Pass
2172.5.0 (5MHz) +	Q/16QAM	7.24	13	Pass
2177.5 (5MHz)	64QAM	7.24		Pass
	256QAM	7.25		Pass

## Table 4.4.1 (a) PAPR for 5+5 MHz Carriers

#### Table 4.4.1 b) PAPR for 10+10 MHz Carriers

Configurations	Modulation	PAR for	Limit	Test
		Contiguous	( <b>dB</b> )	Results
		Carriers (dB)		
	Q/16QAM	7.23		Pass
2115 (10MHz) +	64QAM	7.24		Pass
2125 (10MHz)	256QAM	729		Pass
2165.0 (10MHz) +	Q/16QAM	7.27	13	Pass
2175 (10MHz)	64QAM	7.31		Pass
	256QAM	7.28		Pass

#### Table 4.4.1 (c) PAPR for 15+15 MHz Carriers

Configurations	Modulation	PAR for	Limit	Test
		Contiguous Carriers (dB)	( <b>dB</b> )	Results
	Q/16QAM	8.17		Pass
2117.5 (15MHz) +	64QAM	8.06		Pass
2132.5 (15MHz)	256QAM	8.04		Pass
2157.5.0 (15MHz)	Q/16QAM	8.14	13	Pass
+ 2172.5 (15MHz)	64QAM	8.10		Pass
	256QAM	8.04		Pass

## Table 4.4.1 (d) PAPR for 20+20 MHz Carriers

Configurations	Modulation	PAR for Contiguous Carriers (dB)	Limit (dB)	Test Results
	Q/16QAM	8.12		Pass
2120 (20MHz) +	64QAM	8.14		Pass
2140 (20MHz)	256QAM	8.25		Pass
2150 (20MHz) +	Q/16QAM	8.14	13	Pass
2170 (20MHz)	64QAM	8.11		Pass
	256QAM	8.25		Pass

Table 4.4.1 (e) PAPR for 5+5 MHz Non-Contiguous Carriers

Configurations	Modulation	PAR for Non- Limit		Test
		Contiguous	(dB)	Results
		Carriers (dB)		
	Q/16QAM	8.02		Pass
2112.5 (5MHz)	64QAM	7.89		Pass
	256QAM	8.03		Pass
2167.5.0 (5MHz)	Q/16QAM	8.07	13	Pass
	64QAM	8.06		Pass
	256QAM	8.03		Pass

Configurations	Modulation	PAR for Non- Contiguous Carriers (dB)	Limit (dB)	Test Results
	Q/16QAM	7.97		Pass
2115 (10MHz)	64QAM	8.03		Pass
	256QAM	8.1		Pass
2165.0 (10MHz)	Q/16QAM	8.04	13	Pass
	64QAM	8.03		Pass
	256QAM	8.03		Pass

## Table 4.4.1 (f) PAPR for 10+10 MHz Carriers

#### Table 4.4.1 (g) PAPR for 15+15 MHz Carriers

Configurations	Modulation	PAR for Non-	Limit	Test
		Contiguous	( <b>dB</b> )	Results
		Carriers (dB)		
	Q/16QAM	8.02		Pass
2117.5 (15MHz)	64QAM	7.98		Pass
	256QAM	8.14		Pass
2162.5 (15MHz)	Q/16QAM	8.04	13	Pass
	64QAM	8.03		Pass
	256QAM	8.14		Pass

#### Table 4.4.1 (h) PAPR for 20+20 MHz Carriers

Configurations	Modulation	PAR for Non-	Limit	Test
		Contiguous	( <b>dB</b> )	Results
		Carriers (dB)		
	Q/16QAM	8.08		Pass
2120 (20MHz)	64QAM	8.02		Pass
	256QAM	8.06		Pass
2160 (20MHz)	Q/16QAM	8.06	13	Pass
	64QAM	8.02		Pass
	256QAM	8.06		Pass

The measured results are all below FCC/IC required limits and are in full compliance with the Rules of the Commission.

# 4.5 MEASUREMENT REQUIRED: UNWANTED OUT-OF-BAND EMISSIONS – FCC SECTIONS 2.1051 & 27.53, IC RSS-GEN SECTION 6.13 & RSS-139 SECTION 6.6

The requirements of the out-of-band emissions are provided in Section 4.1. The minimum emission requirements and the setting of measurement equipment for the out-of-band and spurious emissions measurement are tabulated in the following table:

Frequency	Limit/Port @ 2x5 (dBm)	Min RBW	Detector
1MHz Bands Immediately Outside the Tx Freq Band	-16	50 kHz for 5 MHz 100 kHz for 10 MHz 150 kHz for 15 MHz and 200 kHz for 20 MHz carrier	Ave
Outside the Above Freq Spectrum	-16	1MHz	

#### Table 4.5.1 FCC Part 27 and RSS-139 Transmitter Unwanted Emission Limits

The out-of-band emissions provided in this section are the unwanted emissions outside and near the band edges. The unwanted emissions at the frequencies away from the band edges were provided in the next section.

# The out-of-band emissions plots which give the minimum emission margin evaluated were shown below in Figures 4.5.1.

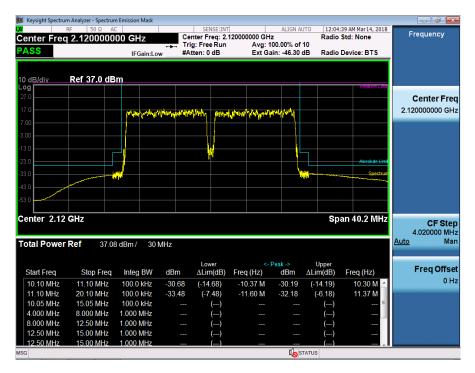
The unwanted out-of-band emissions with the EUT transmitting in the AWS band measured are all below FCC/IC required limits and are in full compliance with the Rules of the Commission.

#### Figure 4.5.1 The Unwanted Conducted Out-of-Band Emissions of the EUT, Port 1, with 2 Carriers



#### 2112.5 & 2117.5 MHz Contiguous 64QAM (5+5 MHz)

2115 & 2125 MHz Contiguous QPSK/16QAM (10+10 MHz)





### 2117.5 & 2132.5 MHz Contiguous QPSK/16QAM (15+15 MHz)

2150 & 2170 MHz Contiguous QPSK/16QAM (20+20 MHz)

	n Analyzer - Spectrur	m Emission Mask							- 5 🔀
Center Freq	RF 50 Ω A				160000000 GH		Radio	:06 PM Mar 15, 2018 Std: None	Frequency
PASS		IFGain:Lo		g: Free Run tten: 6 dB		00.00% of ain: -46.30		Device: BTS	
		ii damied							
10 dB/div	Ref 40.0 dB	m							
Log								Relative Limit	
30.0									Center Freq
20.0									2.160000000 GHz
10.0		And a support	فيرجله وترجي فالإيداني	and when	aller after the state	entrugeny			
0.00									
-10.0									
-20.0		┏┛╹		<b>V</b>				Absolute Limit	
						\		ADSORIO LINI	
-30.0	phone and the second of the	w <sup>a</sup>				T I	Martin Martin		
-40.0							1 Y Portugue	Spectrum MMM/W/W/MM/	
-50.0									
Center 2.16									
Center 2.16	GHZ						sp	an 82.4 MHz	CF Step
									8.240000 MHz Auto Man
Total Power	Ref 37.48	8 dBm / 40	MHz						Auto Wan
				Lower		Peak ->	Upper		
Start Freq	Stop Freq	Integ BW	dBm	ΔLim(dB)	Freq (Hz)	dBm	ΔLim(dB)	Freq (Hz)	Freq Offset
20.20 MHz	21.20 MHz	200.0 kHz	-28.47	(-12.47)	-20.95 M	-26.78	(-10.78)	20.62 M	0 Hz
21.20 MHz	41.20 MHz	200.0 kHz	-28.97	(-5.97)	-22.12 M	-28.81	(-5.81)	22.45 M	
3.515 MHz	4.000 MHz	30.00 kHz		()			()		
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 1.000 MHz		()			()		
12.50 MHz	15.00 MHz	1.000 MHz		()		Í.	()		
MOG						40°	NATUS		

## Figure 4.5.2 The Unwanted Conducted Out-of-Band Emissions of the EUT, Port 1, with 2 Carriers

Keysight Spectru									5 론
	r⊧ 50 Ω A0 <b>2.1400000</b>		🛶 Tri	SENSE:INT nter Freq: 2.14 g: Free Run tten: 0 dB		ALIGN AU 0.00% of 1 n: -46.30 c	Radio 10	46 PM Mar 16, 2018 Std: None Device: BTS	Frequency
) dB/div	Ref 37.0 dB	m				Mkr		8103 GHz 3296 dBm	
og 7.0 7.0							1		Center Fre 2.140000000 GH
.00									
3.0								Absolute Limit	
3.0 3.0 3.0		Karawan M. Parting Party	Rectant Contract	ang pang pang pang pang pang pang pang p	Martidan made setterid	and the state of t		Spectrum	
3.0			MHz	ang pang ang pang ang pang ang pang pang	19 <sup>1</sup> 01/201-pjk-pjky <sup>tel</sup>		Sp	Spectrum an 100 MHz	10.210000 MH
enter 2.14				Lower ALim(dB)		tteg -> dBc	Upper ALim(dB)		10.210000 MH <u>Auto</u> Ma
enter 2.14	<b>Ref</b> 36.92	2 dBm / 60 M	MHz	Lower	<- In	iteg ->	Upper	an 100 MHz	CF Ste 10.210000 MH <u>Auto</u> Ma Freq Offsi 0 H
enter 2.14 otal Power Start Freq 30.05 MHz 31.05 MHz	Ref 36.92 Stop Freq 31.05 MHz 51.05 MHz	2 dBm / 60 M Integ BW 51.00 kHz 51.00 kHz	MHz dBc	Lower ΔLim(dB) (-16.52) (-7.77)	<- In dBm	tteg -> dBc	Upper ∆Lim(dB)	an 100 MHz	10.210000 MH <u>Auto</u> Ma <b>Freq Offs</b>
3.0	Ref 36.92 Stop Freq 31.05 MHz 51.05 MHz 15.05 MHz	2 dBm / 60 M Integ BW 51.00 kHz 51.00 kHz 100.0 kHz	MHz dBc -60.05	Lower ∆Lim(dB) (-16.52) (-7.77) ()	<- In dBm -23.13	tteg -> dBc -58.46	Upper ΔLim(dB) (-14.16) (-6.18) ()	an 100 MHz dBm -21.55	10.210000 Mł <u>Auto</u> Mł <b>Freq Offs</b>
3.0 enter 2.14 otal Power Start Freq 30.05 MHz 31.05 MHz 4.000 MHz	Ref 36.92 Stop Freq 31.05 MHz 51.05 MHz 15.05 MHz 8.000 MHz	2 dBm / 60 M Integ BW 51.00 kHz 51.00 kHz 100.0 kHz 1.000 MHz	MHz dBc -60.05	Lower ΔLim(dB) (-16.52) (-7.77) () ()	<- In dBm -23.13	tteg -> dBc -58.46 -55.23	Upper ΔLim(dB) (-14.16) (-6.18) () ()	an 100 MHz dBm -21.55	10.210000 Mł <u>Auto</u> Mł <b>Freq Offs</b>
3.0 enter 2.14 otal Power Start Freq 30.05 MHz 31.05 MHz 10.05 MHz 4.000 MHz 8.000 MHz	Ref 36.92 Stop Freq 31.05 MHz 51.05 MHz 15.05 MHz 8.000 MHz 12.50 MHz	2 dBm / 60 f Integ BW 51.00 kHz 51.00 kHz 100.0 kHz 10.00 KHz 1.000 MHz	MHz dBc -60.05	Lower ΔLim(dB) (-16.52) (-7.77) () () ()	<- In dBm -23.13	tteg -> dBc -58.46 -55.23	Upper ΔLim(dB) (-14.16) (-6.18) () () ()	an 100 MHz dBm -21.55	10.210000 MH <u>Auto</u> Ma <b>Freq Offs</b>
3.0 enter 2.14 otal Power Start Freq 30.05 MHz 31.05 MHz 4.000 MHz	Ref 36.92 Stop Freq 31.05 MHz 51.05 MHz 15.05 MHz 8.000 MHz	2 dBm / 60 M Integ BW 51.00 kHz 51.00 kHz 100.0 kHz 1.000 MHz	MHz dBc -60.05	Lower ΔLim(dB) (-16.52) (-7.77) () ()	<- In dBm -23.13	tteg -> dBc -58.46 -55.23	Upper ΔLim(dB) (-14.16) (-6.18) () ()	an 100 MHz dBm -21.55	10.210000 MH <u>Auto</u> Ma <b>Freq Offs</b>

## 2112.5 & 2167.5 MHz Non-Contiguous 64QAM (5+5 MHz)

2115 & 2165 MHz Contiguous 64QAM (10+10 MHz)

Center Freq 2.140000000 GHz       Center Freq: 2.140000000 GHz       Radio Std: None       Radio Std: None         ASS       IFGain:Low       Trig: Freq Run       Avg: 100.00% of 10       Radio Device: BTS         0 dB/div       Ref 37.0 dBm       Ref 37.0 dBm       Ref 37.0 dBm       Radio Device: BTS         0 dB/div       Ref 37.0 dBm         0 dB/div       Ref 37.0 dBm       Ref	📕 Keysight Spectru	m Analyzer - Spectrum								_ 0 💌
ASS       IFGain:Low       #Atten: 0 dB       Ext Gain: -46.30 dB       Radio Device: BTS         0 dB/div       Ref 37.0 dBm       Image: Comparison of the state of t		RF 50 Ω AC <b>2.1400000</b>				140000000 GHz	2	Radio		Frequency
0.00       0.00	PASS		IFGain:Lo						Device: BTS	
ZZ 0       ZZ 0 <thz 0<="" th="">       ZZ 0       <thz 0<="" th=""> <th< td=""><td>10 dB/div</td><td>Ref 37.0 dB</td><td>m</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<></thz></thz>	10 dB/div	Ref 37.0 dB	m							
170       1000000000000000000000000000000000000	27.0								Retainertuinte	Contor From
Start Freq         Stop Freq         Integ BW         Lower         CF step         Upper         Upper         Upper         CF step         Statt         Freq (Hz)         Man         Man <td>17.0</td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td>ne presidente de la compacta de la c</td> <td>W.</td> <td></td> <td>2.140000000 GHz</td>	17.0		-				ne presidente de la compacta de la c	W.		2.140000000 GHz
130       Absolute Link         230       Absolute Link         330       Absolute Link         330       Absolute Link         330       Span 102.2 MHz         Center 2.14 GHz       Span 102.2 MHz         Conter 2.14 GHz       Span 102.2 MHz         Total Power Ref       37.16 dBm / 60 MHz         Start Freq       Stop Freq         10.0 MHz       31.0 MHz         31.0 MHz       51.00 MHz         31.10 MHz       100.0 kHz         31.10 MHz       100.0 kHz         30.00 MHz       10.00 kHz         4.000 MHz       10.00 kHz         1.10 MHz       10.00 kHz         1.10 MHz       10.00 kHz         1.10 MHz       10.00 kHz             4.000 MHz       10.00 MHz   <	7.00									
230       Abooke Link         330       Spectrue         330       Spectrue         331       Max         Start Freq       Stop Freq         100 MHz       31.0 MHz         31.0 MHz       51.00 MHz         31.0 MHz       51.00 MHz         31.0 MHz       51.00 MHz         31.0 MHz       51.00 MHz         31.0 MHz       100.0 KHz         31.0 MHz       100.0 KHz         32.00 MHz       100.0 KHz         4.000 MHz       100.0 KHz         1.00 MHz       100.0 MHz         1.00 MHz       100.0 MHz         1.00 MHz       1.000 MHz         1.00 MHz       1.000 MHz         1.250 MHz       1.000 MHz <t< td=""><td>-3.00</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	-3.00									
Start Freq         Stop Freq         Integration         Start Stop Stop Freq         Stop Stop Freq         Integration         Stop Stop Stop Stop Stop Stop Stop Stop		t d						h	Alter ta Lind	
43.0       43.0       43.0       44.0	-23.0								Absolute Lim	
Start Freq         Stop Freq         Integration         Start Strep         CF Step         Start Strep	-43.0		Windows	With the second second		Mary Harden and State	en d	· · · · ·	Spectrum	
CF Step 10.220000 MHz           Start Freq         Stop Freq         Integ BW         dBm         Upper           30.10 MHz         31.10 MHz         100.0 kHz         .34.90         (.18.90)         -30.41 M         -34.55         (.18.55)         30.53 M         0         0.412           30.10 MHz         15.05 MHz         100.0 kHz         -38.70         (.12.70)         -31.10 M         -36.91         (.10.91)         31.10 M         0.412         0.412	-53.0				dennin ekservi	ana ka sa				
Fotal Power Ref         37.16 dBm / 60 MHz         Auto         Auto         Mate           Start Freq         Integ BW         dBm         Jum(dB)         Freq (Hz)         Auto         Mate           30.10 MHz         31.10 MHz         100.0 kHz         -34.90         (-18.90)         -30.41 M         -34.55         (-18.55)         30.53 M         0         -         0 Hz         0 Hz         0 Hz         0 Hz         0 Hz         -         -         -         -         0 Hz         0 Hz         0 Hz         -         0 Hz         -         -         -         -         -         -         0 Hz         0 Hz         0 Hz         -         0 Hz         -	Center 2.14	GHz						Spa	ın 102.2 MHz	CF Step
Start Freq         Stop Freq         Integ BW         dBm $\Delta Lim(dB)$ Freq (Hz)         dBm $\Delta Lim(dB)$ Freq (Hz)         Other         30.0         MHz         100.0 kHz         34.90         (-18.90)         -30.41 M         -34.59         (-19.91)         31.10 MHz         100.0 kHz          ()	Total Power	<b>Ref</b> 37.16	dBm / 60 l	MHz						
Start Freq         Stop Freq         Integ BW         dBm $\Delta Lim(dB)$ Freq (Hz)         dBm $\Delta Lim(dB)$ Freq (Hz)         Other         30.0         MHz         100.0 kHz         34.90         (-18.90)         -30.41 M         -34.59         (-19.91)         31.10 MHz         100.0 kHz          ()										
30:10 MHz         51:10 MHz         51:10 MHz         54:30         (-16:30)         -30:41 M         -36:39         (-16:35)         30:35 M         -30:42 M           31:10 MHz         51:10 MHz         100.0 KHz         -38:70         (-12:70)         -30:41 M         -36:91         (-10:35)         30:35 M	Start Freq	Stop Freq	Integ BW	dBm					Freq (Hz)	Freq Offset
10.05 MHz       15.05 MHz       100.0 kHz        ()        5         4.000 MHz       8.000 MHz       1.000 MHz        ()         ()          8.000 MHz       12.50 MHz       1.000 MHz        ()         ()          12.50 MHz       12.50 MHz       1.000 MHz        ()        ()          12.50 MHz       15.00 MHz       1.000 MHz        ()        ()										0 Hz
4.000 MHz         8.000 MHz         1.000 MHz          ()           ()           1000 MHz         1000 MHz         1000 MHz          ()          1000 MHz         1000 MHz         1000 MHz          ()          1000 MHz         1000 MHz          ()          1000 MHz         1000 MHz          ()           1000 MHz         1000 MHz          ()           1000 MHz           1000 MHz           1000 MHz         1000 MHz          ()           1000 MHz          1000 MHz				-38.70		-31.10 M			31.10 M	
12.50 MHz 15.00 MHz 1.000 MHz () ()										
					()			()		
12 50 MHZ 15 00 MHZ 1 000 MHZ () () ()					()			()		
	12.50 MHz MSG	15.00 MHz	1.000 MHz		()		T- otta	()		



### 2117.5 & 2162.5 MHz Non-Contiguous 256QAM (15+15 MHz)

2120 & 2160 MHz Contiguous QPSK/16QAM (20+20 MHz)

	Analyzer - Spectrur								
Center Freq			Tri	g: Free Run	140000000 GHz Avg: 10	ALIGN AUTO	Radio	:12 AM Mar 20, 2018 Std: None	Frequency
PASS		IFGain:Lov	w #A1	tten: 6 dB	Ext Gai	n: -46.30 dB	Radio	Device: BTS	
	Ref 40.0 dB	m							
Log 30.0								Relative Limit	
									Center Freq
20.0					an anti-				2.14000000 GHz
10.0	<i>f</i> *	un han an a	al an		Part Party	harmonican	\──		
0.00									
-10.0									
-20.0	r <sup>1</sup> /				1		<mark> </mark> 4	Absolute Limit	
			l l		ļ			Absolute citi	
-30.0	م. الماري						1 march	Spectrum	
-40.0 Janaparthan	hywm m		informed	nestingel fearership	ter seiter		1.1.1	A CONTRACTOR OF THE OWNER	
-50.0	۳						-		
Center 2.14	GHZ						spa	in 102.4 MHz	CF Step
									10.240000 MHz
Total Power	Ref 37.30	0 dBm / 60 M	MHz						<u>Auto</u> Man
Start Freq	Stop Freq	Integ BW	dBm	Lower ∆Lim(dB)	<- P Freg (Hz)	eak-> dBm ∆	Upper Lim(dB)	Freq (Hz)	Freq Offset
30 20 MHz	31.20 MHz	200.0 kHz	-33.13	(-17.13)	-30.54 M		(-15.26)	30.71 M	0 Hz
31.20 MHz	51.20 MHz	200.0 kHz 200.0 kHz	-33.13	(-11.37)	-30.54 M	-31.20	(-15.26)	37.58 M	
3.515 MHz	4.000 MHz	30.00 kHz	-34.37	(-11.37)	-52. TO W	-02.10	(-9.70)	57450-Wi	
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		()			()		
MSG						🚺 STAT	rus		

Keysight Sp		- Spurious Emissions 50 Ω AC		NSE:INT	ALIGN A	12,07-52	AM May 30, 2018	_	
		5000000 GHz	Center Fr	eq: 2.115000000 G	Hz	Radio St		Ra	nge Table
ASS		IFGain:	Low Trig: Free #Atten: 4		Hold: 100/1 Gain: -46.60		evice: BTS		Rang
								On	c
0 dB/div .og	Ref 4	0.00 dBm							
.0 <b>9</b> :0.0									Start Fr
20.0								2.12	0000000 G
10.0									
									Stop Fr
0.0								2.16	0000000 G
20.0									
.0.0									Res E
10.0									1.0000 M
50.0								Auto	M
tart 2.1	2 GHz					Sto	o 2.16 GHz		Video E
									3.0000 M
Spur	Range	Frequency	Amplitude	Lin	nit	<b>∆</b> Limit		Auto	N
1	1	2.140 GHz	-16.57 dBm	-16.00	dBm	-0.571 dB			
								F	ilter Typ Gaussia
									Gaussia
									M
									1
G					ų 👔	STATUS			

Unwanted Emissions of MBO B66 Between 2C, 5W, 5+5 MBW, TM3.1A, 2112.5 and 2167.5 MHz.

Unwanted Emissions of MBO B66 Between 2C, 5W, 5+5 MBW, TM3.1A, 2112.5 and 2167.5 MHz

🎉 Keysight Spe	ectrum Analyzer	- Spurious Emissions								
x Avg/Holo FAIL	RF S Number	<sup>50</sup> Ω AC <b>100</b>	Center Free				12:04:07 A Radio Std			eas Setup g/Hold Num
10 dB/div	Ref 4	0.00 dBm							<u>On</u>	100 Of
30.0 20.0 10.0									Exp	Avg Mode Repea
-10.0						لمر				
-30.0 -40.0 -50.0									Ra	nge Table
Start 2.1	GHz						Stop	2.18 GHz	Exami	Meas Type
Spur	Range	Frequency	Amplitude		Limit	Δ	Limit			
1 2 3	1 1 1	2.166 GHz 2.113 GHz 2.140 GHz	34.25 dBm 33.88 dBm -17.95 dBm	F -	16.00 dBm 16.00 dBm 16.00 dBm	49.	25 dB 88 dB 952 dB			Spu
										Mor 1 of:
ISG						<b>K</b> STATUS				

(The "F"s were due to the carrier signals)

# 4.6 MEASUREMENT REQUIRED: UNWANTED SPURIOUS EMISSIONS – FCC 2.1051 & 27.53, IC RSS-GEN SECTION 6.13 & RSS-139 SECTION 6.6

The requirements of the spurious emissions are provided in Section 4.1. The minimum emission requirements and the setting of measurement equipment for the out-of-band and spurious emissions measurement are given in the above section.

The out-of-band emissions provided in the above section are the unwanted emissions outside and near the band edges. The unwanted emissions at the frequencies away from the band edges were provided in this section.

The spurious emissions between 10MHz to 22GHz were measured at one antenna port (port 1) for the configurations listed in Table 4.2.2 which has the largest seperation and usually is the worst case and with the maximum rated mean power, all modulations and all bandwidths. The measurement follows the procedures given in ANSI C63.26-2015 and FCC KDB 971168 D01.

The conducted spurious emissions plots which give the minimum emission margin among evaluated were shown below in Figure 4.6.1.

The unwanted spurious emissions with the EUT transmitting in the AWS band measured for all modulations are all below FCC/IC required limits and are in full compliance with the Rules of the Commission.

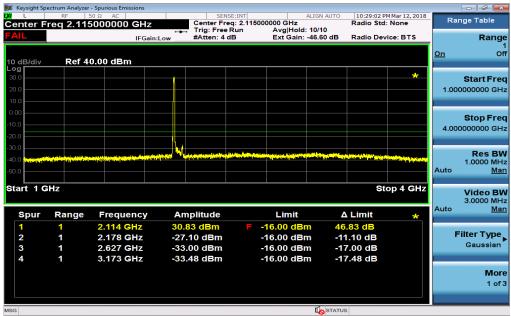
# Figure 4.6.1 The Unwanted Conducted Spurious Emissions of the EUT in 30MHz-22GHz, Port 1, with 2 Carriers

Keysight Spe		- Spurious Emissions	SENSE:IN		GN AUTO 10:19:32 F	PM Mar 12, 2018		
		5000000 GHz		2.115000000 GHz	Radio Std		Ra	nge Table
ASS		IFGain:	ow #Atten: 0 dB	Ext Gain: -4	4.30 dB Radio Dev	vice: BTS		Rang
0 dB/div	Ref 2	0.00 dBm					<u>On</u>	C
. <b>og</b> 10.0 5.00 10.0						*		Start Fre 9.000 k⊢
20.0 30.0 40.0	Δ	Ma de o						Stop Fre 200.000 kH
50.0 <b>0000</b> 50.0 <b>0000</b> 70.0 <b>0000</b>	Aprox			mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	Auto	Res BI 1.0000 kH <u>Ma</u>
start 9 kH	lz					p 200 kHz FFT	Auto	Video B 3.0000 kH Ma
Spur	Range	Frequency	Amplitude	Limit	Δ Limit	*		
1 2	1 1	102.2 kHz 51.19 kHz	-24.09 dBm -34.37 dBm	-16.00 dBm -16.00 dBm	-8.088 dB -18.37 dB		F	ilter Type
3	1	89.23 kHz	-35.20 dBm	-16.00 dBm	-19.20 dB	=		Gaussiar
4	1	64.46 kHz	-39.61 dBm	-16.00 dBm	-23.61 dB			
5	1	24.27 kHz	-43.10 dBm	-16.00 dBm	-27.10 dB			Мо
6 7	1 1	58.08 kHz 71.89 kHz	-44.03 dBm -44.06 dBm	-16.00 dBm -16.00 dBm	-28.03 dB -28.06 dB	÷		1 of
G					STATUS			

## 2112.5 & 2117.5 MHz Contiguous QPSK & 16QAM (5+5 MHz)

<ul> <li>Reysigne op</li> </ul>		- Spurious Emissions						
enter F		50 Ω <u>A</u> DC 5000000 GHz		GE:INT q: 2.115000000 GHz		2:08 PM Mar 12, 2018 o Std: None	Rar	nge Table
ASS		IFGain:	Low Trig: Free #Atten: 0 c			o Device: BTS		Range
							<u>On</u>	Of
0 dB/div .og	Ref 2	0.00 dBm						
10.0								Start Fre
3.00								150.000 kH
10.0								
20.0								
30.0								Stop Fre
40.0							40	.000000 MH
50.0 <b>x</b>								
so.o <mark>Malala</mark>								Res BI 10.000 kH
	<b>he di kar</b> an			all and the second attack to the second	an a fair da dhuin mì an an ta	and the second	Auto	10.000 KF Ma
			and he had a fair of the second second	a and a state of the second second				
Start 150	) kHz					Stop 40 MHz		Video B
						FFT	Auto	30.000 kH
Spur	Range	Frequency	Amplitude	Limit	Δ Limi	it	Auto	Ma
1	1	10.00 MHz	-40.60 dBm	-16.00 dBi	n -24.60 c	iB 🔶		
2	1	403.0 kHz	-48.64 dBm	-16.00 dBi	n -32.64 c	iB	F	ilter Type
3	1	500.7 kHz	-48.89 dBm	-16.00 dBi	n -32.89 c	iB ≡		Gaussian
4	1	8.744 MHz	-51.75 dBm	-16.00 dBi				
5	1	8.863 MHz	-52.32 dBm	-16.00 dBi				Mor
6	1	9.280 MHz	-52.53 dBm	-16.00 dBi				1 of
7	1	9.160 MHz	-52.64 dBm	-16.00 dBi	n -36.64 c	IB 🗸		
G					STATUS			

optor E		50 Ω AC 5000000 GH		SENSE:INT			24:39 PM Mar 12, 2018 io Std: None	Ra	nge Table
ASS	1eq 2.113			Trig: Free Run #Atten: 0 dB	Avg Hold: Ext Gain: -	10/10	io Device: BTS		Rang
0 dB/div	Ref 3	5.00 dBm						<u>On</u>	0
25.0 5.00								30	Start Fre 0.000000 MH
5.00								1.00	<b>Stop Fre</b> 0000000 G⊦
35.0 45.0 55.0 <mark>11.4 11.4 11.4</mark>					ntes monthis da factoral deve data Terra complete data da factoral	a di Sama da ka sa ka sa ka		Auto	Res B\ 100.00 k⊦ <u>Ma</u>
Start 30	MHz						Stop 1 GHz		Video B 300.00 ki
Spur	Range	Frequency	y Amp	olitude	Limit	Δ Lim	it	Auto	Ma
Spur 1	Range 1	Frequency 125.0 MHz		olitude 6 dBm	Limit -16.00 dBn				
Spur 1 2		·	-45.3			n -29.36	dB ^		Filter Type
1	1	125.0 MHz	-45.3 -47.5	6 dBm	-16.00 dBn	1 -29.36 1 -31.54	dB dB		Filter Type
1 2	1 1	125.0 MHz 864.7 MHz	-45.3 -47.5 -47.7	6 <mark>dBm</mark> 4 dBm	-16.00 dBn -16.00 dBn	n -29.36 n -31.54 n -31.74	dB dB dB ⊨		Filter Type
1 2 3	1 1 1	125.0 MHz 864.7 MHz 863.3 MHz 872.1 MHz 944.1 MHz	-45.3 -47.5 -47.7 -48.9 -50.3	6 dBm 4 dBm 4 dBm 0 dBm 1 dBm	-16.00 dBn -16.00 dBn -16.00 dBn -16.00 dBn -16.00 dBn	1 -29.36 1 -31.54 1 -31.74 1 -32.90 1 -34.31	dB dB dB ≡ dB dB		Filter Type Gaussiar
1 2 3 4	1 1 1 1 1	125.0 MHz 864.7 MHz 863.3 MHz 872.1 MHz 944.1 MHz 891.2 MHz	-45.3 -47.5 -47.7 -48.9 -50.3 -50.3	6 dBm 4 dBm 4 dBm 0 dBm 1 dBm 6 dBm	-16.00 dBn -16.00 dBn -16.00 dBn -16.00 dBn -16.00 dBn -16.00 dBn	n -29.36 n -31.54 n -31.74 n -32.90 n -34.31 n -34.36	dB dB dB ≡ dB dB		Filter Type Gaussiar Mo
1 2 3 4 5	1 1 1 1 1	125.0 MHz 864.7 MHz 863.3 MHz 872.1 MHz 944.1 MHz	-45.3 -47.5 -47.7 -48.9 -50.3 -50.3	6 dBm 4 dBm 4 dBm 0 dBm 1 dBm	-16.00 dBn -16.00 dBn -16.00 dBn -16.00 dBn -16.00 dBn	n -29.36 n -31.54 n -31.74 n -32.90 n -34.31 n -34.36	dB ▲ dB ■ dB ■ dB ■ dB ■		<u>Ma</u> Filter Type Gaussian Moi 1 of



(The "F" was due to carrier signals)

🎉 Keysight Sp		- Spurious Emissions								_	
Center F		50 Ω AC	z	Center F	NSE:INT req: 2.115000	0000 GHz	ALIGN AUTO	Radio Std	MMar 12, 2018 None	Rai	nge Table
PASS			ain:Low	Trig: Fre #Atten: 4		Avg Hold Ext Gain:		Radio Dev	ice: BTS		Range
										<u>On</u>	1 Off
10 dB/div	Ref 4	0.00 dBm									<b>U</b>
Log 30.0											Start Freq
20.0										4.000	0000000 GHz
10.0											
0.00											Stop Freq
-10.0										22.00	0000000 GHz
-20.0											
-30.0									A second second		Res BW
-40.0	a data ya a shi na a sa shi na a sa shi na shi n		and the second secon	All adding to the second s	And a second					0	1.0000 MHz
-50.0										Auto	<u>Man</u>
Start 4 G	Hz							Sto	p 22 GHz		Video BW
											3.0000 MHz
Spur	Range	Frequency	Ar Ar	nplitude		Limit	Δ	Limit		Auto	<u>Man</u>
1	1	10.57 GHz		.02 dBm		16.00 dBi		016 dB			liter Trees
2	1	16.94 GHz		.08 dBm		16.00 dBr		4.08 dB		-	Gaussian
3	1	5.927 GHz	-34	.42 dBm	-1	16.00 dBı	n -18	8.42 dB			Guassian
											More 1 of 3
											1013
MSG							STATUS				
Mag							STATUS	2			

## 2192.5 & 2197.5 MHz Contiguous QPSK & 16QAM (5+5 MHz)

LXI L	RF 5	- Spurious Emissions 50 Ω ⚠ DC   50000000 GHz		: 2.195000000 GHz	Radio Std	MMar 12, 2018 : None	Ra	nge Table
PASS		IFGain:	Low #Atten: 0 de			/ice: BTS		Range
10 dB/div	Ref 2	0.00 dBm					<u>On</u>	-1 Off
Log 10.0 0.00 -10.0						*		Start Freq 9.000 kHz
-20.0 -30.0 -40.0								Stop Freq 200.000 kHz
-50.0 -60.0	~~~~^	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mmh		www.www	·····	Auto	<b>Res BW</b> 1.0000 kHz <u>Man</u>
Start 9 k						200 kHz FFT	Auto	Video BW 3.0000 kHz Man
Spur	Range	Frequency	Amplitude	Limit	Δ Limit	*		
1 2	1 1	102.2 kHz 51.46 kHz	-44.10 dBm -48.92 dBm	-16.00 dBm -16.00 dBm	-28.10 dB -32.92 dB		F	ilter Type
3	1	77.05 kHz	-48.92 dBm	-16.00 dBm	-35.49 dB			Gaussian
4	1	87.31 kHz	-53.10 dBm	-16.00 dBm	-37.10 dB			
5	1	37.53 kHz	-54.34 dBm	-16.00 dBm	-38.34 dB			More
6	1	133.1 kHz	-56.08 dBm	-16.00 dBm	-40.08 dB			1 of 3
7	1	166.0 kHz	-59.00 dBm	-16.00 dBm	-43.00 dB			. 510
MSG					<b>I</b> o status			

	RF 5	- Spurious Emissions 50 Ω ▲ DC   50000000 GHz		ISE:INT eq: 2.195000000 GHz	ALIGN AUTO 11:19:48 Radio St	PM Mar 12, 2018	Ra	nge Table
PASS	rcq 2. 130	IFGain	Low Trig: Free #Atten: 0			evice: BTS		Range
10 dB/div	Ref 20	0.00 dBm					<u>On</u>	Of
Log 10.0 0.00						*		Start Fred 150.000 kHz
-20.0							40	Stop Fred 0.000000 MHz
-50.0 -60.0 -70.0				Harlin al an Albahar Albahar Angera. Malan dan sana sana sana sana sana sana san			Auto	Res BW 10.000 kHz <u>Man</u>
Start 150	kHz				St	op 40 MHz FFT		Video BW 30.000 kHz
Spur	Range	Frequency	Amplitude	Limit	Δ Limit	*	Auto	Mar
1 2	1 1	502.7 kHz 6.536 MHz	-51.48 dBm -58.70 dBm	-16.00 dBi -16.00 dBi	m -42.70 dB		F	Filter Type
3	1	10.00 MHz	-59.20 dBm	-16.00 dBi		E		Gaussian
4 5	1 1	365.2 kHz 22.58 MHz	-59.74 dBm -63.57 dBm	-16.00 dBı -16.00 dBı				
5 6 7	1 1	741.8 kHz 30.55 MHz	-64.33 dBm -64.52 dBm	-16.00 dBi -16.00 dBi -16.00 dBi	m -48.33 dB			More 1 of 3
MSG					STATUS			

🎉 Keysight Sp	ectrum Analyzer	- Spurious Emissions					
		50 Ω AC		SE:INT eq: 2.195000000 GHz		:03 PM Mar 12, 2018 Std: None	Range Table
	req 2.19:	5000000 GHz	🛶 Trig: Free	Run Avg Hold	: 10/10		
PASS		IFGain:	Low #Atten: 0	dB Ext Gain:	-46.40 dB Radio	Device: BTS	Range
							On Off
10 dB/div	Ref 3	5.00 dBm					
Log 25.0						*	Start Freq
15.0							30.000000 MHz
5.00							00.000000 11112
-5.00							
-15.0							Stop Freq
-25.0							1.00000000 GHz
-35.0							
-45.0							Res BW
-45.0	in dans binnediani	أحرب والمراجع المراجع والمراجع والمراجع والمراجع والمراجع			a tracks with the filler of a second selected	din although a builder distantion	100.00 kHz Auto Man
-55.U Meteroph	A CALLER OF STREET, ST	Construction and a state of the second s	and a second state ( second state and second state of second second second second second second second second s	a na ana ang ang ang ang ang ang ang ang		a for a second secon	
Start 30	MHz					Stop 1 GHz	Video BW
							300.00 kHz
Spur	Range	Frequency	Amplitude	Limit	∆ Limit	*	Auto <u>Man</u>
1	1	874.7 MHz	-50.78 dBm	-16.00 dB	m -34.78 d	3	
2	1	760.1 MHz	-50.85 dBm	-16.00 dB	m -34.85 d	в	Filter Type
3	1	828.2 MHz	-50.91 dBm	-16.00 dB			Gaussian
4	1	732.9 MHz	-50.91 dBm	-16.00 dB			
5	1	805.6 MHz	-51.24 dBm	-16.00 dB			More
6	1	783.0 MHz	-51.26 dBm	-16.00 dB			1 of 3
7	1	383.4 MHz	-51.33 dBm	-16.00 dB	m -35.33 d	-	
MSG					STATUS		
					<b>U</b>		

📕 Keysight Spe		- Spurious Emissions					_	
Center F		50 Ω AC 5000000 GHz	Center Fre	q: 2.175000000 GHz	Radio Sto	M Mar 13, 2018 I: None	Ra	nge Table
FAIL	•	IFGain:	Low #Atten: 4 d			vice: BTS		Range
							0.7	Ŭ1 Off
10 dB/div	Ref 4	0.00 dBm					<u>On</u>	UI
Log 30.0			4			*		Start Free
20.0							1.00	0000000 GHz
10.0							1.00	
0.00								
-10.0							1.00	Stop Fred
-20.0							4.00	0000000 GHz
-30.0			<u>_</u>					
-40.0 <b>- 1/1 - 1/1</b>			nanista i <sup>nn</sup> anisasinalising disentit		and the state of the second second second second	and the second		Res BW 1.0000 MH;
-50.0							Auto	Mar
Start 1 G						top 4 GHz		
Start IG	<b>H</b> 2				5	lop 4 GHZ		Video BW 3.0000 MH;
Spur	Range	Frequency	Amplitude	Limit	Δ Limit	*	Auto	Mar
1	1	2.173 GHz	32.71 dBm	F -16.00 dBr				
2	1	2.112 GHz	-28.63 dBm	-16.00 dBr			F	ilter Type
3	1	3.159 GHz	-32.87 dBm	-16.00 dBr	n -16.87 dB			Gaussian
4	1	2.706 GHz	-33.73 dBm	-16.00 dBr	n -17.73 dB			
5	1	3.570 GHz	-33.73 dBm	-16.00 dBr				More
6	1	3.937 GHz	-36.76 dBm	-16.00 dBr	n -20.76 dB			1 of 3
ISG					STATUS			

(The "F" was due to carrier signals)



# 4.7 MEASUREMENT REQUIRED: FIELD STRENGTH OF SPURIOUS RADIATION – FCC SECTIONS 2.1053 & 27.53 & IC RSS-GEN SECTION 8.9 & RSS-139 SECTION 6.6

The field strength measurements of radiated spurious emissions were conducted in a FCC (Site Registration Number: 515091) and IC (Filing Number: 6933F-5) registered three-meter semi-anechoic chamber AR5.

The emission limitations and the setting of measurement equipment for the conducted spurious emissions measurement of a AWS carrier were specified in FCC Sections 2.1053 & 27.53, RSS-GEN Section 8.9 & RSS-139 Section 6.6 and shown in Section 4.6.

Per KDB 971168 D01, for the radiated measurement, the field strength limit E is obtained from the Friss Transmission formula by

$$E = \frac{\sqrt{30 \cdot EIRP}}{d},$$

where

- E is the field strength in V/m;
- d is the measurement distance in m;
- EIRP is the equivalent isotropically radiated power in W.

Therefore,

$$E (dB\mu V/m) = EIRP(dBm) - 20 * \log(d) + 104.77.$$

At 3m with  $P^{lim} = -13$ dBm, the limit of the field strength becomes

$$E\left(dB\mu\frac{V}{m}\right) = P(dBm) + G(dBi) + 95.22$$
$$= G(dBi) + 82.22.$$

Hence, the field strength from an ideal dipole (G=2.15dBi) is equal to 84.4 dBµV/m. The field strength of radiated spurious emissions measured was determined by

 $E (dB\mu V/m) = V_{meas} (dB\mu V) + Cable Loss (dB) + Antenna Factor (dB1/m).$ 

FCC Sections 2.1051 and 2.1057(c) and IC RSS-GEN Section 6.13 specify that the spurious emissions attenuated more than 20 dB below the permissible value need not be reported.

The EUT was investigated from 30 MHz to the  $10^{\text{th}}$  harmonic of the carrier or 22 GHz, per Section 2.1057(a)(1). The EUT was setup as in the normal mode of the installation and operation and was configured to transmit two Contiguous 5MHz LTE carriers in A Block at 2112.5 MHz and 2117.5 MHz, with the maximum mean power of 5W at each antenna port of TX1 and TX2. All carriers were transmitting to non-radiating 50  $\Omega$  resistive loads. The EUT setup diagram is given in the Figure 4.3.2. The recommendations of ANSI C63.4 were followed for EUT testing setup and cabling.

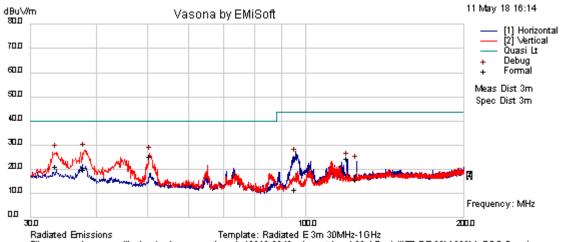
### Table 4.7.1 Equivalent Field Strength Limit for Spurious Emissions with 2x2 MIMO

Frequency of Emissions (MHz)	Separation Distance (m)	E (dBµV/m)	Reportable Limit (dBµV/m)	Detector/RBW
10-220,000	3	81.4	61.4	Average/1MHz

Frequency	Field Stength at 3m	RBW	Detector
(MHz)	(dBuV/m)	(kHz)	
30 - 88	40		
88 - 216	43.5		
216 - 230	46	100	QP
230 - 960	46		
960 - 1000	54		
1000 - 3000	54		Ave.
	74	1000	Peak
$> 3000 - 5 f_{\rm c}$	54		Ave.
	74	1000	Peak
$5f_{\rm c}$ - $10f_{\rm c}$ / 40GHz			Ave.
		1000	Peak

Over the frequency spectrum investigated (10MHz to 22GHz), no reportable radiated spurious emissions were detected. The plots were provided below for information only. The EUT demonstrated the full compliance with the Rules of the Commission.

## Figure 4.7.1 The Radiated Spurious Emissions of the EUT in 30MHz-22GHz with 2 Carriers at 2112.5MHz (5MHz) and 2117.5MHz (5MHz), 256QAM,



#### T7 RE 30M-200MHz FCC Class B Limits

Radiated Emissions Template: Radiated E 3m 30MHz-1GHz Filename: c:\program files\emisoft - vasona\results\2018-0042 mbo outdoor b66+b7+wi-fi\T7 RE 30M-200M FCC B.emi

<b>Results Title:</b>	Radiated E 3m 30MHz-1GHz
File Name:	c:\program files\emisoft - vasona\results\2018-0042 mbo outdoor b66+b7+wi-fi\T7 RE 30M-200M. FCC B.emi
Test	
Laboratory:	GPCL AR6MH 22C,40%RH, 1006mB
<b>Test Engineer:</b>	MJS
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	MBO Outdoor B66+B7+Wi-Fi Model: FW2HIWB Multiband Outdoor (S) EB181111199 B66 Module: , WIFI Module: B7 Module: 120VAC 60Hz, POE Connected on Port C (Inactive), Wi-Fi Optical Ethernet on Port D , Band-7 2630 MHz , 5MHz BW 256QAM, Tx Output =37 dBm Wi-Fi 2452 MHz & 5775 MHz, TX Output = 19 dBm Dual Carrier Band-66: 2112.5 MHz (5MHz BW) & 2117.5 MHz (5 MHz BW) TM3.1, 256QAM, Each Carrier Tx Power Output Set for 34dBm (2.5 W), Pole Mount 80cm, Optical Wi-Fi cable Port D, Port B Disconnected. EUT was replaced with production model.
Configuration:	Radiated Emissions 30 MHz - 200 MHz., Test Spec: FCC Part 15 B Class B, RCVR E908, Preamp E507, 6dB pad – E1131, Bicon Antenna E051, 3M Distance, ESI- detector; Preview BW (default RBW/ default VBW); Formal BW (default RBW)
Date:	2018-05-11 16:14:26

FORMA DATA	L											
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
50.5852	36.9	6.83	-21.5	22.23	Quasi Max	V	102	82	40	-17.77	Pass	
120.023	34.43	7.54	-20.4	21.62	Quasi Max	Н	132	124	43.5	-21.88	Pass	
33.5591	30.01	6.8	-18.7	18.1	Quasi Max	v	103	214	40	-21.9	Pass	
37.984	29.49	6.81	-19.4	16.89	Quasi Max	V	131	189	40	-23.11	Pass	
125.139	25.02	7.57	-19.9	12.65	Quasi Max	Н	147	115	43.5	-30.85	Pass	

#### FCC Part 27, RSS-139 FCC ID: **2AD8UFW2IMBOM1** IC ID: **109D-FW2IMBOM1**

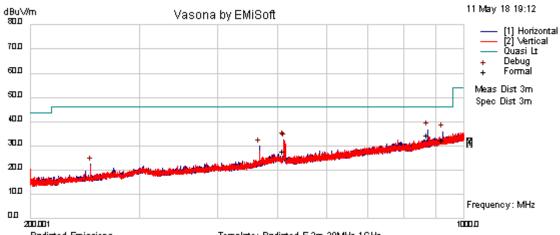
#### Global Product Compliance Laboratory Test Report No: TR2018-0042 FCC/IC **MBO B66 Dual Carriers** (PRI20183480)

FORMA DATA	L											
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
95.7065	24.69	7.36	-23.5	8.58	Quasi Max	Н	295	308	43.5	-34.92	Pass	

PREVIEW	DATA											
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
37.984	40.45	6.81	-19.4	27.85	Preview	V	105	270	40	-12.15	Pass	
33.5591	39.06	6.8	-18.7	27.15	Preview	V	105	315	40	-12.85	Pass	
50.5852	41.22	6.83	-21.5	26.55	Preview	V	205	45	40	-13.45	Pass	
95.7065	41.8	7.36	-23.5	25.69	Debug	Н	105	316	43.5	-17.81	Pass	
125.139	35.25	7.57	-19.9	22.88	Debug	Н	105	316	43.5	-20.62	Pass	
120.023	36.89	7.54	-20.4	24.08	Debug	Н	105	316	43.5	-19.42	Pass	

120.02336.897.54-20.424.08DebugH10531643.5-19.42PassNote: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement.Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies.Failure in preview data does not necessarily constitute failure in formal data.

FCC Part 27, RSS-139 FCC ID: **2AD8UFW2IMBOM1** IC ID: **109D-FW2IMBOM1** 



#### T8 RE 200M-1 GHz FCC Class B

Radiated Emissions Template: Radiated E 3m 30MHz-1GHz Filename: c:\program files\emisoft - vasona\results\2018-0042 mbo outdoor b66+b7+wi-fi\T8 RE 200M-1GHz FCC B.emi

<b>Results Title:</b>	Radiated E 3m 30MHz-1GHz
File Name:	c:\program files\emisoft - vasona\results\2018-0042 mbo outdoor b66+b7+wi-fi\T8 RE 200M-1GHz. FCC
	B.emi
Test	
Laboratory:	GPCL AR6MH 22C,40%RH, 1006mB
<b>Test Engineer:</b>	MJS
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	MBO Outdoor B66+B7+Wi-Fi Model: FW2HIWB Multiband Outdoor (S) EB181111199 B66 Module: , WIFI Module: B7 Module: 120VAC 60Hz, POE Connected on Port C (Inactive), Wi-Fi Optical Ethernet on Port D , Band-7 2630 MHz , 5MHz BW 256QAM, Tx Output =37 dBm Wi-Fi 2452 MHz & 5775 MHz, TX Output = 19 dBm Dual Carrier Band-66: 2112.5 MHz (5MHz BW) & 2117.5 MHz (5 MHz BW) TM3.1, 256QAM, Each Carrier Tx Power Output Set for 34dBm (2.5 W), Pole Mount 80cm, Optical Wi-Fi cable Port D, Port B Disconnected. EUT was replaced with production model.
Configuration:	Radiated Emissions 200 MHz - 1000 MHz, Test Spec: FCC Part 15 B Class B, RCVR E908, 6dB pad-E1131, Preamp E507, Log-Periodic Antenna E060, 3M Distance, ESI- detector; Preview BW (default RBW/ default VBW); Formal BW (default RBW)
Date:	2018-05-11 19:12:55

FORMA DATA	L											
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
874.988	29.68	9.97	-8.32	31.33	Quasi Max	Н	201	188	46	-14.67	Pass	
925.036	26.23	10.1	-7.13	29.2	Quasi Max	Н	208	182	46	-16.8	Pass	
511.645	28.99	8.92	-13	24.95	Quasi Peak	Н	141	182	46	-21.05	Pass	

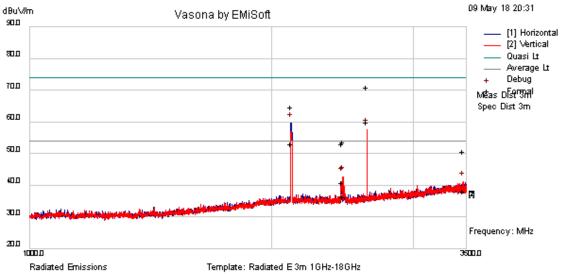
PREVIEW	DATA											
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
875.05	35.07	9.97	-8.32	36.72	Preview	Н	105	0	46	-9.28	Pass	

PREVIEW DATA												
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
925.07	32.82	10.1	-7.13	35.79	Preview	Н	105	0	46	-10.21	Pass	
511.731	36.52	8.92	-13	32.47	Preview	Н	290	90	46	-13.53	Pass	
513.559	36.21	8.92	-13	32.12	Preview	V	105	180	46	-13.88	Pass	
468.757	34.89	8.79	-14.1	29.57	Debug	Н	105	316	46	-16.43	Pass	
250.071	33.15	8.06	-19.1	22.1	Debug	V	105	316	46	-23.9	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

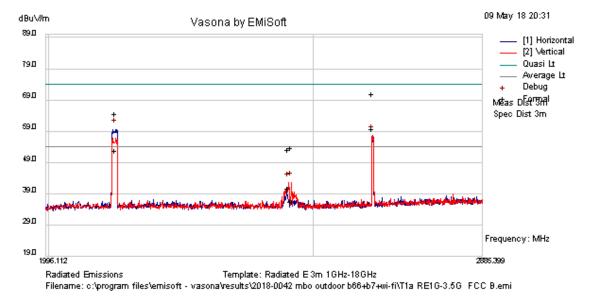
#### FCC Part 27, RSS-139 FCC ID: 2AD8UFW2IMBOM1 IC ID: 109D-FW2IMBOM1

Global Product Compliance Laboratory Test Report No: TR2018-0042 FCC/IC **MBO B66 Dual Carriers** (PRI20183480)



#### T1a RE 1G-3.5GHz FCC Class B

Filename: c:/program files/emisoft - vasona/results/2018-0042 mbo outdoor b66+b7+wi-fi/T1a RE1G-3.5G FCC B.emi



<b>Results Title:</b>	Radiated E 3m 1GHz-18GHz
File Name:	c:\program files\emisoft - vasona\results\2018-0042 MBO outdoor b66+b7+wi-fi\T1a RE1G-3.5G FCC B.emi
Test	
Laboratory:	GPCL AR6MH 22C,43%RH, 1006mB
Test Engineer:	MJS
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia

	Tionia
<b>EUT Details:</b>	MBO Outdoor B66+B7+Wi-Fi Model: FW2HIWB Multiband Outdoor (S) EB181111199 B66 Module: ,
	WIFI Module: B7 Module: 120VAC 60Hz, POE Connected on Port C (Inactive), Wi-Fi Optical Ethernet on
	Port D , Band-7 2630 MHz , 5MHz BW 256QAM, Tx Output =37 dBm Wi-Fi 2452 MHz & 5775 MHz, TX
	Output = 19 dBm Dual Carrier Band-66: 2112.5 MHz (5MHz BW) & 2117.5 MHz (5 MHz BW) TM3.1,
	Output = 19 dBm Dual Carrier Band-66: 2112.5 MHz (5MHz BW) & 2117.5 MHz (5 MHz BW) TM3.1,

#### FCC Part 27, RSS-139 FCC ID: **2AD8UFW2IMBOM1** IC ID: **109D-FW2IMBOM1**

	256QAM, Each Carrier Tx Power Output Set for 34dBm (2.5 W), Pole Mount 80cm, Optical Wi-Fi cable Port D, Port B Disconnected. EUT was replaced with production model.
Configuration:	Radiated Emissions 1 GHz - 3 GHz Test Spec: FCC Part 15 B Class B, RCVR E908, Preamp E1166, 6dB pad
	E1132, Horn E057, 3M Distance, Straight, ESI-1G detector; Preview BW (100 kHz RBW/ 3MHz VBW);
	Formal BW (1 MHz RBW)
Date:	2018-05-09 20:31:07

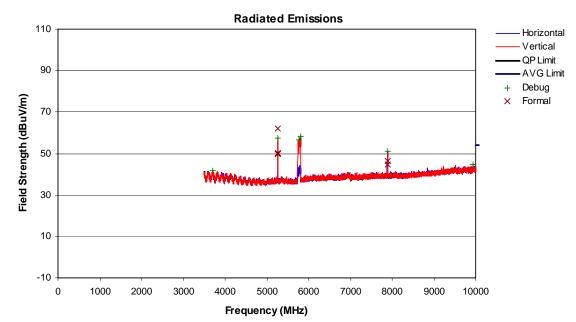
#### FORMAL DATA

DATA												
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
2629.2	56.02	10.43	-9.72	56.72	Average	V	186	269	54	2.72	Fail	Tx Signal B7
2117.21	50.62	9.13	-9.85	49.9	Average	Н	291	84	54	-4.1	Pass	
2629.2	67.24	10.43	-9.72	67.94	Peak	v	186	269	74	-6.06	Pass	
2117.21	62.42	9.13	-9.85	61.7	Peak	Н	291	84	74	-12.3	Pass	
2449.96	37.69	10.01	-10	37.67	Average	V	125	14	54	-16.33	Pass	
3465.31	30.5	12.33	-7.84	34.99	Average	V	102	239	54	-19.01	Pass	
2455.77	33.38	10.02	-10	33.37	Average	V	102	236	54	-20.63	Pass	
2455.77	50.69	10.02	-10	50.68	Peak	v	102	236	74	-23.32	Pass	
2449.96	50.02	10.01	-10	50	Peak	V	125	14	74	-24	Pass	
3465.31	43.1	12.33	-7.84	47.59	Peak	V	102	239	74	-26.41	Pass	

#### PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
2117.21	60.39	9.13	-9.85	59.67	Preview	Н	105	90	54	5.67	Fail	
		10.4										
2629.2	56.96	3	-9.72	57.66	Preview	V	190	270	54	3.66	Fail	
		10.0										
2455.59	42.73	2	-10	42.72	Preview	V	105	225	54	-11.28	Pass	
		10.0										
2449.96	42.62	1	-10	42.6	Preview	V	190	0	54	-11.4	Pass	
		12.3										
3465.31	36.68	3	-7.84	41.17	Preview	V	190	225	54	-12.83	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.



### T6a RE 3.5 GHz-10 GHz FCC Class B

Results Title: File Name:	Radiated E 3m 1GHz-18GHz c:\program files\emisoft - vasona\results\2018-0042 mbo outdoor b66+b7+wi-fi\T6 A RE 3.5GHz-10GHz FCC B.emi
Test	
Laboratory:	GPCL AR6MH 22C,43%RH, 1006mB
Test	
Engineer:	GM
Test	
Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	MBO Outdoor B66+B7+Wi-Fi Model: FW2HIWB Multiband Outdoor (S) EB181111199 B66 Module: , WIFI Module: B7 Module: 120VAC 60Hz, POE Connected on Port C (Inactive), WiFi Optical Ethernet on Port D , Band-7 2630 MHz , 5MHz BW 256QAM, Tx Output =37 dBm WiFi 2452 MHz & 5775 MHz, TX Output = 19 dBm Dual Carrier Band-66: 2112.5 MHz (5MHz BW) & 2117.5 MHz (5 MHz BW) TM3.1, 256QAM, Each Carrier Tx Power Output Set for 34dBm (2.5 W), Pole Mount 80cm, Optical Wi-Fi cable Port D, Port B Disconnected. EUT was replaced with production model.
Configuration	Radiated Emissions 1 GHz - 18 GHz. Test Spec: FCC Part 15 B Class B, RCVR E908, Preamp E1166,
:	Horn E057, 3M Distance, Straight, ESI-1G detector; Preview BW (100 kHz RBW/ 3MHz VBW); Formal
	BW (1 MHz RBW)
Date:	2018-05-09 14:17:50

#### FORMAL DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
5260.06	45.68	8.91	-4.37	50.22	AvgMax	v	154	360	54	-3.78	Pass	
5260.06	45.38	8.91	-4.37	49.92	AvgMax	v	147	360	54	-4.08	Pass	
5260.06	45.05	8.91	-4.37	49.59	AvgMax	V	235	2	54	-4.41	Pass	

#### FCC Part 27, RSS-139 FCC ID: **2AD8UFW2IMBOM1** IC ID: **109D-FW2IMBOM1**

FORMAL

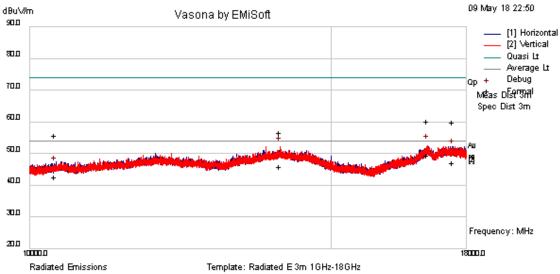
DATA									-			
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
7890.08	38.92	8.78	-1.24	46.46	AvgMax	Н	145	340	54	-7.54	Pass	
7890.08	37.2	8.78	-1.24	44.74	AvgMax	Н	136	344	54	-9.26	Pass	
5260.06	57.44	8.91	-4.37	61.98	Peak	V	154	360	74	-12.02	Pass	
5260.06	57.08	8.91	-4.37	61.63	Peak	v	147	360	74	-12.37	Pass	
5260.06	56.84	8.91	-4.37	61.38	Peak	v	235	2	74	-12.62	Pass	
9929.98	28.62	10.8	-0.15	39.27	AvgMax	Н	245	333	54	-14.73	Pass	
7890.08	51.63	8.78	-1.24	59.16	Peak	Н	145	340	74	-14.84	Pass	
7890.08	50.42	8.78	-1.24	57.96	Peak	Н	136	344	74	-16.04	Pass	
3713.21	30.72	13.09	-7.13	36.69	AvgMax	v	127	216	54	-17.31	Pass	
5809.98	29.09	8.89	-3.23	34.75	AvgMax	V	272	285	54	-19.25	Pass	
5772.53	28.35	8.89	-3.32	33.92	AvgMax	v	345	168	54	-20.08	Pass	
9929.98	41.6	10.8	-0.15	52.25	Peak	Н	245	333	74	-21.75	Pass	
3713.21	44.95	13.09	-7.13	50.92	Peak	v	127	216	74	-23.08	Pass	
5809.98	41.82	8.89	-3.23	47.48	Peak	v	272	285	74	-26.52	Pass	
5772.53	41.57	8.89	-3.32	47.13	Peak	v	345	168	74	-26.87	Pass	

#### PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
5808.02	52.45	8.89	-3.24	58.1	Preview	V	105	0	54	4.1	Fail	
5260.67	52.99	8.91	-4.37	57.53	Preview	V	190	0	54	3.53	Fail	
5770.24	50.98	8.89	-3.33	56.55	Preview	v	105	0	54	2.55	Fail	
7888.12	43.4	8.78	-1.24	50.94	Preview	Н	105	0	54	-3.06	Pass	
9929.98	33.9	10.8	-0.15	44.55	Preview	Н	390	180	54	-9.45	Pass	
		13.0										
3713.21	35.64	9	-7.13	41.6	Preview	V	190	270	54	-12.4	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

### T3a RE 10G-18 GHz FCC Class B



Filename: c:/program files/emisoft - vasona/vesults/2018-0042 mbo outdoor b66+b7+wi-fi\T3a RE10g-18g FCC B.emi

<b>Results Title:</b>	Radiated E 3m 1GHz-18GHz
File Name:	c:\program files\emisoft - vasona\results\2018-0042 MBO outdoor b66+b7+wi-fi\T3a RE10g-18g FCC B.emi
Test	
Laboratory:	GPCL AR6MH 22C,43%RH, 1006mB
Test Engineer:	MJS
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	MBO Outdoor B66+B7+Wi-Fi Model: FW2HIWB Multiband Outdoor (S) EB181111199 B66 Module: , WIFI Module: B7 Module: 120VAC 60Hz, POE Connected on Port C (Inactive), WiFi Optical Ethernet on Port D , Band-7 2630 MHz , 5MHz BW 256QAM, Tx Output =37 dBm WiFi 2452 MHz & 5775 MHz, TX Output = 19 dBm Dual Carrier Band-66: 2112.5 MHz (5MHz BW) & 2117.5 MHz (5 MHz BW) TM3.1, 256QAM, Each Carrier Tx Power Output Set for 34dBm (2.5 W), Pole Mount 80cm, Optical Wi-Fi cable Port D, Port B Disconnected. EUT was replaced with production model.
Configuration:	Radiated Emissions 10 GHz - 18 GHz Test Spec: FCC Part 15 B Class B, RCVR E908, Preamp E1166, HPF E1208, Horn E057, 3M Distance, Straight, ESI-1G detector; Preview BW (100 kHz RBW/ 3MHz VBW); Formal BW (1 MHz RBW)
Date:	2018-05-09 22:50:19

FORMA DATA	L											
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
17072.5	29.15	12.58	4.53	46.26	Average	Н	174	268	54	-7.74	Pass	
17675	25.87	12.03	5.99	43.89	Average	v	363	176	54	-10.11	Pass	
14011.1	26.37	11.13	5.17	42.68	Average	v	181	92	54	-11.32	Pass	
10346.8	28.19	11.07	0.35	39.6	Average	v	368	243	54	-14.4	Pass	
17072.5	40.06	12.58	4.53	57.18	Peak	Н	174	268	74	-16.82	Pass	

#### FCC Part 27, RSS-139 FCC ID: **2AD8UFW2IMBOM1** IC ID: **109D-FW2IMBOM1**

#### Global Product Compliance Laboratory Test Report No: TR2018-0042 FCC/IC **MBO B66 Dual Carriers** (PRI20183480)

FORMAL DATA Freq. Raw												
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
17675	38.85	12.03	5.99	56.87	Peak	v	363	176	74	-17.13	Pass	
14011.1	37.27	11.13	5.17	53.57	Peak	v	181	92	74	-20.43	Pass	
10346.8	41.31	11.07	0.35	52.72	Peak	v	368	243	74	-21.28	Pass	

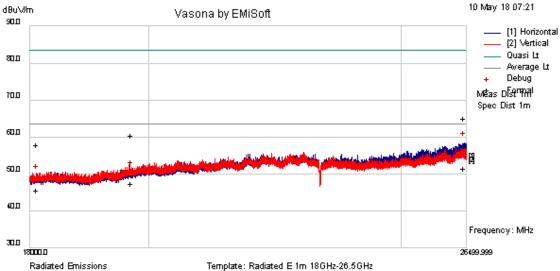
PREVIEW	DATA											
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
17072.5	35.53	12.58	4.53	52.64	Preview	Н	105	315	54	-1.36	Pass	
14011.1	35.9	11.13	5.17	52.21	Preview	V	105	180	54	-1.79	Pass	
17675	33.3	12.03	5.99	51.32	Debug	V	102	317	54	-2.68	Pass	
10346.8	34.3	11.07	0.35	45.71	Debug	V	102	317	54	-8.29	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

#### FCC Part 27, RSS-139 FCC ID: **2AD8UFW2IMBOM1** IC ID: **109D-FW2IMBOM1**

Global Product Compliance Laboratory Test Report No: TR2018-0042 FCC/IC **MBO B66 Dual Carriers** (PRI20183480)

T4a RE 18G-26.5 GHz FCC B



Filename: o:\program files\emisoft - vasona\results\2018-0042 mbo outdoor b66+b7+wi-fi\T4a 18-26.5G FCC B.emi

Results Title:	Radiated E 1m 18GHz-26.5GHz
File Name:	c:\program files\emisoft - vasona\results\2018-0042 mbo outdoor b66+b7+wi-fi\T4a 18-26.5G FCC B.emi
Test	
Laboratory:	GPCL AR6MH 22C,43%RH, 1006mB
Test Engineer:	MJS / EEM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	MBO Outdoor B66+B7+Wi-Fi Model: FW2HIWB Multiband Outdoor (S) EB181111199 B66 Module: , WIFI Module: B7 Module: 120VAC 60Hz, POE Connected on Port C (Inactive), Wi-Fi Optical Ethernet on Port D , Band-7 2630 MHz , 5MHz BW 256QAM, Tx Output =37 dBm Wi-Fi 2452 MHz & 5775 MHz, TX Output = 19 dBm Dual Carrier Band-66: 2112.5 MHz (5MHz BW) & 2117.5 MHz (5 MHz BW) TM3.1, 256QAM, Each Carrier Tx Power Output Set for 34dBm (2.5 W), Pole Mount 80cm, Optical Wi-Fi cable Port D, Port B Disconnected. EUT was replaced with production model.
Configuration:	Radiated Emissions 18 GHz - 26.5 GHz Test Spec: FCC Part 15 B Class B, RCVR E908, Preamp E1166 Horn E513, 1M Distance, Straight, ESI-1G detector; Preview BW (100 kHz RBW/ 3MHz VBW); Formal BW (1 MHz RBW)
Date:	2018-05-10 07:21:40

FORMA DATA	L											
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
26451.8	27.42	10.35	11.02	48.8	Average	Н	114	349	63.5	-14.7	Pass	
19697.5	28.41	8.44	7.8	44.65	Average	V	142	327	63.5	-18.85	Pass	
18118.7	28.01	7.82	7.12	42.96	Average	V	148	26	63.5	-20.54	Pass	
26451.8	40.92	10.35	11.02	62.3	Peak	Н	120	347	83.5	-21.2	Pass	
19697.5	41.57	8.44	7.8	57.81	Peak	V	142	327	83.5	-25.69	Pass	
18118.7	40.18	7.82	7.12	55.12	Peak	V	148	26	83.5	-28.38	Pass	

#### PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
		10.3										
26451.8	37.03	5	11.02	58.41	Preview	Н	105	286	63.5	-5.09	Pass	
19697.5	34.3	8.44	7.8	50.55	Debug	V	102	354	63.5	-12.95	Pass	
18118.7	34.63	7.82	7.12	49.57	Debug	V	102	354	63.5	-13.93	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

# 4.8 SPURIOUS EMISSIONS AT THE RECEIVER ANTENNA TERMINALS -RSS-GEN SECTIONS 5.3 & 7.4

The spurious emissions at the receiver antenna transmitting terminal were investigated from 10 MHz to the 10<sup>th</sup> harmonic of the carrier or 22 GHz, per RSS-Gen (6.2).

The carrier setup and configurations were the same but the transmit carrier was set to off.

Refer to Section 4.1 for the full requirements.

The measurements were performed with a Rohde & Schwarz EMI Receiver, which was calibrated in accordance with ISO 9001 process. The spectrum analyzer was set to a 1MHz resolution bandwidth and used the specified detector functions. Measurements were performed in compliance with ANSI C63.26.

The spurious emissions at each of the receiver antenna ports were investigated from 10 MHz to 22 GHz which is beyond the 5<sup>th</sup> harmonic of the carrier (10 GHz). The results and limits are displayed below. The measurement results demonstrate that the subject of the application is in full compliance with the Requirements of RSS-Gen (7.4).

Keysight Spec		opurious Emission	IS								- 6 <b>-</b> ×
enter Er		Ω AC 00000 GI	47		NSE:INT rea: 1.7400	00000 GHz	ALIGN AUTO	12:46:01 A Radio Std	M Mar 21, 2018	Ra	nge Table
ASS	eq 1.7400			Trig: Fre #Atten: 0	e Run	Avg Hold	: 10/10 -11.00 dB	Radio Dev	vice: BTS		Rang
0 dB/div	Ref 0.0	0 dBm								<u>On</u>	0
og 0.0 20.0 30.0										30	Start Fre 0.000000 MH
0.0										1.00	<b>Stop Fre</b> 0000000 GF
0.0		and performance of the second state of the sec						piatos produktiona projektor de la pia		Auto	<b>Res B</b> 100.00 kl <u>M</u> a
tart 30 №	IHz							St	op 1 GHz		Video B 300.00 kł
Spur	Range	Frequenc	y /	Amplitude		Limit	L	Limit		Auto	<u>M</u> :
										F	Filter Type Gaussian
											<b>Мо</b> 1 о

## Figure 4.8.1 The Receiver Spurious Emissions of the EUT in 30MHz-22GHz



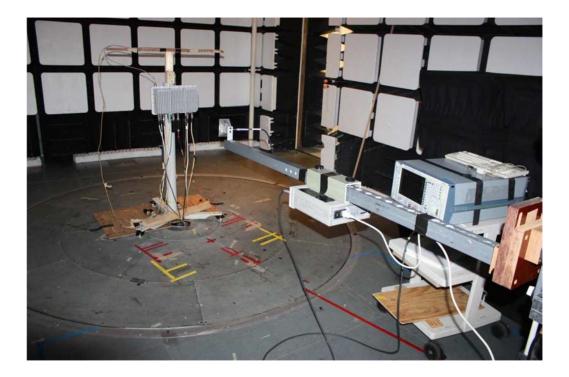
# **5** PHOTOGRAPHS OF EUT SETUP

The setup photos of the conducted and radiated emissions tests were provided below.











# 6 LIST OF TEST EQUIPMENT

All the measurement equipment used, including antennas, was calibrated in accordance with ISO 9001 process.

	Table 0.1 Radiated Emissions Elst of Test Equipment								
Manufacturer	Туре	Description	Model	Serial	Calibration Date	Calibration Due	Calibration Type		
Agilent Technologies	Amplifier	Pre-Amplifier 1- 26.5GHz	8449B	3008A01740	2016-02-25	2018-05-25	Requires Calibration		
EMC Test Systems	Horn Antenna	Double Ridged Horn 18-40 GHz	3116	2539	2017-06-16	2019-06-16	Requires Calibration		
EMC Test Systems	Multi-Device Controller		2090	1600			Calibration Not Required		
ЕМСО	Horn Antenna	Double Ridged Horn 1-18 GHz	3115	9006-3460	2017-05-24	2019-05-24	Requires Calibration		
RLC Electronics Inc	High Pass Filter	2.5Ghz to 26Ghz High Pass Filter	F- 19391	1440-001			Calibration Not Required, Must Be Verified		
Rohde & Schwarz	Test Receiver	EMI (20Hz to 40 GHz) -150 +30dBM	ESIB40	100100	2018-03-12	2020-03-12	Requires Calibration		
Weinschel	Attenuator	6dB	2-6	CD2534	2017-05-23	2019-05-23	Requires Calibration		

Table 6.1 Radiated	Emissions	List of '	Test	Equipment
Lable of Maulaicu	Linostons		LOU.	Lympment

Manufacturer	Туре	Description	Model	Serial	Calibratio n Date	Calibratio n Due	Calibration Type	
KeySight Technologies	EMI Receiver	MXE EMI Receiver 26.5GHz	N9038A	MY54130 087	2016-12- 28	2018-12- 28	Requires Calibration	
Trilithic	High Pass Filter	PCS 2.85GHz - 18.05GHz	5HC2850/18 050-1.8-KK	200113078			Calibration Not Required	
Weinschel	Attenuato r	10dB 25W DC-18GHz	46-10-34	BF0123	2016-06- 06	2018-06- 06	Requires Calibration	
Weinschel	Attenuato r	20dB 25W DC-18GHz	46-20-34	BJ2718	2018-05- 10	2020-05- 10	Requires Calibration	
Weinschel	Attenuato r	30 dB / 150 W	66-30-33	BV2473			Calibration Not Required, Must Be Verified	
Weinschel	Attenuato r	6dB Attenuator 25W	46-6-34	BH9330			Calibration Not Required, Must Be Verified	

# 7 TEST FACILITIES

All measurement facilities used to collect the measurement data under normal condition are located at 600-700 Mountain Avenue, Murray Hill, New Jersey 07974-0636 USA. The field strength measurements of radiated spurious emissions are made in a FCC and IC registered 3-meter semi-anechoic chamber AR5 (FCC Site Registration Number: 515091, IC Filing Number: 6933F-5). The sites were constructed and are continuously in conformance with the requirements of ANSI C63.4 and CISPR Publication 22.

Nokia Global Product Compliance Laboratory is accredited with the US Department of Commerce National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 7 Code of Federal Regulations for offering test services for selected test methods in Electromagnetic Compatibility; Voluntary Control Council for Interference (VCCI), Japan; Australian Communications and Media Authority (ACMA). The laboratory is ISO 9001:2008 Certified.



## 8 REFERENCES

- [1]. Title 47 Code of Federal Regulations (CFR) Parts 2 and 27.
- [2]. ANSI C63.26-2015, American Nation Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.
- [3]. FCC KDB 971168 D01, Measurement Guidance for Certification of Licensed Digital Transmitters, April 2018, v03r01.
- [4]. FCC KDB 662911D01, Emissions Testing of Transmitters with Multiple Outputs in the Same Band, October 2013, v02r01.
- [5]. ANSI C63.4-2014, American Nation 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.
- [6]. RSS-GEN, General Requirements for Compliance of Radio Apparatus, Issue 5, April 2018.
- [7]. RSS-139, Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz, Issue 3, July 2015.
- [8]. SRSP-513, Technical Requirements for Advanced Wireless Services (AWS) in the Bands 1710-1780 MHz and 2110-2180 MHz, Issue 3, July 2015