



Product Service

---

**Choose certainty.  
Add value.**

# Report On

Radio Testing of the  
Nokia Solutions and Networks Oy  
Flexi Multiradio 10 BTS RRH 2.6GHz  
Radio Access Technology: E-UTRA (TDD)  
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 27

COMMERCIAL-IN-CONFIDENCE

FCC ID: VBNFZHN-01

Document 75934961 Report 01 Issue 1

October 2016



Product Service

TÜV SÜD Product Service, Octagon House, Concorde Way, Segensworth North,  
Fareham, Hampshire, United Kingdom, PO15 5RL  
Tel: +44 (0) 1489 558100. Website: [www.tuv-sud.co.uk](http://www.tuv-sud.co.uk)

COMMERCIAL-IN-CONFIDENCE

**REPORT ON**

Radio Testing of the  
Nokia Solutions and Networks Oy  
Flexi Multiradio 10 BTS RRH 2.6GHz  
Radio Access Technology: E-UTRA (TDD)  
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 27

Document 75934961 Report 01 Issue 1

October 2016

**PREPARED FOR**

Nokia Solutions and Networks Oy  
PO Box 319  
Kaapelitie 4  
FI-90620  
Oulu  
Finland

**PREPARED BY**

A handwritten signature in black ink, appearing to read 'Maggie Whiting', written over a horizontal line.

**Maggie Whiting**  
Key Account Manager, Telecoms Business Line

**APPROVED BY**

A handwritten signature in black ink, appearing to read 'Steve Scarfe', written over a horizontal line.

**Steve Scarfe**  
Authorised Signatory

**DATED**

25 October 2016



Product Service

**CONTENTS**

<b>Section</b>	<b>Page No</b>
<b>1 REPORT SUMMARY .....</b>	<b>3</b>
1.1 Introduction .....	4
<b>2 DISCLAIMERS AND COPYRIGHT .....</b>	<b>5</b>
2.1 Disclaimers and Copyright.....	6
<b>ANNEX A Nokia Solutions and Networks OY Test Report No: D547351042 .....</b>	<b>A.2</b>



Product Service

## **SECTION 1**

### **REPORT SUMMARY**

Radio Testing of the  
Nokia Solutions and Networks Oy  
Flexi Multiradio 10 BTS RRH 2.6GHz  
Radio Access Technology: E-UTRA (TDD)  
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 27



Product Service

## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Radio Testing of the Nokia Solutions and Networks Oy Flexi Multiradio 10 BTS RRH 2.6GHz Radio Access Technology: E-UTRA (TDD) In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 27.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Nokia Solutions and Networks Oy
Model Number(s)	FZHN
Serial Number(s)	RY161902861
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 2 (2015) FCC CFR 47 Part 27 (2015)
Order Number	90700968
Date	18 May 2016
Start of Test	08 August 2016
Finish of Test	20 September 2016
Name of Engineer(s)	Jari Vähämäki Sami Riuttanen



Product Service

## **SECTION 2**

### **DISCLAIMERS AND COPYRIGHT**



Product Service

## 2.1 DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

This report must not be reproduced, except in its entirety, without the written permission of  
TÜV SÜD Product Service

© 2016 TÜV SÜD Product Service



Product Service

**ANNEX A**

**NOKIA SOLUTIONS AND NETWORKS OY TEST REPORT NO: D536187693**



**NOKIA**

Nokia Networks

**TEST REPORT NO: D547351042****ID: VBNFZHN-01**

---

**Date:** Oulu 23. Sep 2016**Pages:** 262**Appendices:** -

---

Equipment Under Test: Flexi Multiradio 10 BTS RRH 2.6 GHz  
Radio Access technology: E-UTRA (TDD)

Type: FZHN

Manufacturer: Nokia Solutions and Networks Oy

Address: P.O. Box 319,  
Kaapelitie 4, FI-90620, Oulu, FinlandTask: Conformance test according to the specifications  
mentioned belowTest Specification(s): FCC 47 CFR part 2 (2015) and  
FCC 47 CFR part 27 (2015)Result: The EUT complies with the requirements of the  
specification



Product Service



Nokia Networks

The results relate only to the items tested as described in this test report.

<b>Approved by:</b>	<b>Date</b>	<b>Signature</b>
Jari Virta R&D Line Manager Nokia Solutions and Networks Oy	23. Sep 2016	 _____

**CONTENTS**

1. SUMMARY.....5

    1.1 Test Laboratory .....5

    1.2 Time Schedule .....6

    1.3 Participants .....6

2. EQUIPMENT UNDER TEST .....6

    2.1 Configuration of EUT.....6

    2.2 Operating Conditions .....8

3. TEST CONFIGURATION .....8



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---

3.1 Calibration of the Test Equipment .....9

4. TEST RESULTS .....10

4.1 Test No. 1: RF Power Output (§ 2.1046, § 27.50).....10

4.1.1 Limits.....10

4.1.2 Test Procedure and Results .....10

4.2 Test No. 2: Modulation Characteristics (§ 2.1047, § 2.201).....22

4.3 Test No. 3: Occupied Bandwidth (§ 2.1049) .....23

4.3.1 Limits.....23

4.3.2 Test Procedure and Results .....23

4.4 Test No. 4: Spurious Emissions at Antenna Terminals (§ 2.1051, § 2.1057, § 27.53).....33

4.4.1 Limits.....33

4.4.2 Test Procedure and Results .....33

4.5 Test No. 5: Field Strength of Spurious Radiation (§ 2.1053, § 2.1057, § 27.53).....52

4.5.1 Limits.....52

4.5.2 Test Configuration.....52

4.5.3 Test Procedure and Results .....52

4.6 Test No. 6: Frequency Stability (§ 2.1055, § 27.54).....54

4.6.1 Purpose.....54



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---

4.6.2 Limits.....54

4.6.3 Test Configuration.....55

4.6.4 Frequency Stability with Temperature Variation .....55

4.6.5 Frequency Stability with Voltage Variation: .....61

5 TEST DATA AND SCREENSHOTS .....65

5.1 Part List of the RF Measurement Test Equipment.....65

5.2 Spectral Plots.....67

5.2.1 Test No. 2: Modulation Characteristics .....67

5.2.2 Test No. 3: Occupied Bandwidth .....71

5.2.3 Test No. 4: Spurious Emissions at the Antenna Terminals..119

5.2.4 Test No. 5: Field Strength of Spurious Radiation.....264



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

## 1. SUMMARY

The following tests were performed according to the FCC rules in order to verify the compliance of the EUT with the FCC requirements:

**Table 1 Results – Summary**

Test No.	Measurement	FCC Rule	Page Number of this Report	Result
1	RF Power Output	§ 2.1046, § 27.50	8	compliant
2	Modulation Characteristics	§ 2.1047, § 2.201	18	compliant
3	Occupied Bandwidth	§ 2.1049	19	compliant
4	Spurious Emissions at Antenna Terminals	§ 2.1051, § 2.1057, § 27.53	28	compliant
5	Field Strength of Spurious Radiation	§ 2.1053, § 2.1057, § 27.53, § 27.55	43	compliant
6	Frequency Stability	§ 2.1055, § 27.54	45	compliant

In accordance with the FCC Rule §15.3 (z) the equipment was tested with the limits that are valid for an unintentional radiator.

Measurements guidance: FCC OET laboratory KDB: 662911 D01 Multiple Transmitter Output v02.

### 1.1 Test Laboratory

Nokia Solutions and Networks Oy

Kaapelitie 4,

FI-90620, Oulu, Finland

Jari Virta

FCC Reg. No: 411251



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

## 1.2 Time Schedule

**Table 2**

Test No.	1, 2, 3, 4	5	6
Start of Test:	08 Aug 2016	08 Aug 2016	14 Sep 2016
End of Test:	09 Sep 2016	09 Sep 2016	20 Sep 2016

## 1.3 Participants

**Table 3**

Name	Function	Signature
RF Test person (Nokia)	Testing, Setup of EUT	Jari Vähämäki
EMC Test person (Nokia)	Testing, Setup of EUT	Sami Riuttanen

## 2. EQUIPMENT UNDER TEST

The EUT is a LTE Base transceiver station RRH 2.6 GHz with 8 power amplifiers.

The BTS performs the full RAN function of LTE system (evolved UTRA). This is sometimes referred to as collapsed RAN, where equivalent functions of former 3G BTS and 3G RNC are all integrated into BTS. BTS is connected directly to the core network via S1 interface, and to mobile stations via Air interface (Uu). In addition BTSs are optionally connected directly to each other via X2 interface for handover purposes.

The tested equipment is representative for serial production.

### 2.1 Configuration of EUT

**Table 4 Used different EUT configurations are shown by the following table**

Module Type	Flexi Multiradio BTS RRH x.xGHz
Radio Access Technology	E-UTRA
Duplex mode	Time Division Duplex (TDD)
Channel Bandwidth	Single carrier 20 MHz (Configuration A), Dual carrier 20 MHz (Configuration B), Triple carrier 20 MHz (Configuration C)



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

Supply Voltage	48.0 V DC	
<b>Frequency Bands</b>		
Channel Bandwidth 20MHz	Lowest tunable freq. Single carrier	2506.0 MHz
	Dual carriers	2506.0/2526.0 MHz
	Triple carriers	2506.0/2526.0/2546.0 MHz
	Middle freq. Single carrier	2593.0 MHz
	Dual carriers	2583.0/2603.0 MHz
	Triple carriers	2573.0/2593.0/2613.0 MHz
	Highest tunable freq. Single carrier	2680.0 MHz
	Dual carriers	2660.0/2680.0 MHz
	Triple carriers	2640.0/2660.0/2680.0 MHz
<b>Single carrier</b>		
Rated Output Power (Prat)	20W (43.0 dBm) conducted / carrier	
<b>Dual carrier</b>		
Rated Output Power (Prat)	10W (40.0 dBm) conducted / carrier	
<b>Triple carrier</b>		
Rated Output Power (Prat)	6.61 W (38.2 dBm) conducted / carrier	
Downlink/Uplink ratio	6/3 to 8/1	
	<b>RX</b>	<b>TX</b>
Number of Antenna Ports	8 (ANT1 to ANT8)	8 (ANT1 to ANT8)
MIMo	Yes	Yes

The tests were performed with one EUT at the antenna ports 1 (ANT1), 2 (ANT2), 3 (ANT3), 4 (ANT4), 5 (ANT5), 6 (ANT6), 7 (ANT7) and 8 (ANT8).

The used different EUT configurations are shown by the following table:

**Table 5 Configuration of EUT**

Module Name	Serial-No.	Module Type	Config.
FZHN	RY161902861	RRH	A, B, C
Other Modules	Module Type	Config.	
FSIH	System module	A, B, C	

For a functional description of the modules, please refer to the appropriate related parts and exhibit sections of this certification application.



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

## 2.2 Operating Conditions

The EUT supports QPSK, 16QAM and 64QAM modulation. If not stated otherwise, the following standard setup procedure for the EUT was used:

The transmitter was set up according to 3GPP TS 36.141 E-UTRA Test Models (E-TM) for all tests:

- E-TM 1.1: All QPSK modulation testing
- E-TM 3.1: All 64QAM modulation testing
- E-TM 3.2: All 16QAM modulation testing

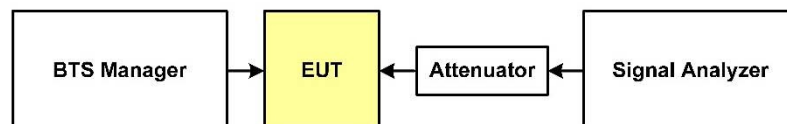
During the measurements, one carrier channel was tested at a time. The carrier was set to the maximum power level to ensure the maximum emission amplitudes during all measurements.

During the tests, the Flexi Multiradio BTS is transmitting a pseudo random bit pattern on the data channels. This ensures that the measurements of the emission characteristics of the transmitter are pursuant to § 2.1049.

Test models E-TM1.1, E-TM3.1 and E-TM3.2 have uplink/downlink ratio 3:6.

## 3. TEST CONFIGURATION

If not stated otherwise, the following measurement configuration was used to perform all measurements (see figure below).



**Figure 1 Test Configuration (single output)**





FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---

The RF output of the transceiver (cell) under test is connected to a signal analyzer via a high power attenuator to protect the input of the signal analyzer from high RF power levels. A description of the analyzer settings is given in each of the sections describing the measurements. The other transceivers are terminated.

A complete list of the measurement equipment is included on page 56 of this measurement report.

### **3.1 Calibration of the Test Equipment**

All relevant test equipment has a valid calibration from an external calibration laboratory. Additionally the signal analyzer has a built-in self-calibration procedure. This calibration procedure was activated prior to the measurements so that the analyzer is deemed accurate. High quality cables were used to connect the measurement equipment to the EUT. The actual loss of the attenuator and the cables was measured with a high precision network analyzer and taken into account for all measurements.



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---

## 4. TEST RESULTS

### 4.1 Test No. 1: RF Power Output (§ 2.1046, § 27.50)

#### 4.1.1 Limits

Para. No. 27.50 (h).(1) Main, booster and base stations. (i) The maximum EIRP of a main, booster or base station shall not exceed  $33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$ , where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

Sample calculation:  $33\text{dBW} + 10\log(10\text{MHz}/5.5\text{MHz}) \text{ dBW} = 34.26 \text{ dBW} = \sim 2667\text{W}$

#### 4.1.2 Test Procedure and Results

Detachable Antenna: The maximum output power at the antenna terminals was measured using a signal analyzer.

The RF power was measured with a frequency sweep across the carrier. The carrier power was calculated from the signal analyzer by integration over the result. The base station maximum output power is the sum of the measured carrier power and the external attenuation (cable loss of the test set up).

For the MiMo output, RF power output was measured from each antenna port individually and the results summed mathematically in accordance to FCC KDB 662911 D01 -guidance.



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---

Peak to average power (PAPR) was examined using CCDF method and 0.1% value recorded in dB to the tables below.



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

The following table shows the measured output powers at the antenna connector.

**Table 6 Configuration A**

Carrier Frequency [MHz]	RF Power Output		PAPR 0.1%	Result
	[dBm]	[W]	[dB]	
QPSK-Modulation ANT1				
2506	42.5718	18.0791	7.6231	compliant
2593	42.4266	17.4848	7.5652	compliant
2680	42.2428	16.7602	7.5942	compliant
QPSK-Modulation ANT2				
2506	42.7087	18.6581	7.6231	compliant
2593	42.4935	17.7562	7.56521	compliant
2680	42.1657	16.4653	7.5942	compliant
QPSK-Modulation ANT3				
2506	42.5386	17.9413	7.6231	compliant
2593	42.5949	18.1757	7.5652	compliant
2680	42.3539	17.1945	7.5942	compliant
QPSK-Modulation ANT4				
2506	42.7345	18.7695	7.6231	compliant
2593	42.4830	17.7133	7.5652	compliant
2680	42.4912	17.7468	7.5942	compliant
QPSK-Modulation ANT5				
2506	42.7727	18.9351	7.62318	compliant
2593	42.4083	17.4112	7.5652	compliant
2680	42.3504	17.1806	7.5942	compliant
QPSK-Modulation ANT6				
2506	42.6832	18.5489	7.6231	compliant
2593	42.4694	17.6579	7.5652	compliant
2680	42.2657	16.8486	7.5942	compliant
QPSK-Modulation ANT7				
2506	42.7674	18.9121	7.6231	compliant
2593	42.4467	17.5658	7.5652	compliant
2680	42.2781	16.8970	7.5942	compliant
QPSK-Modulation ANT8				
2506	42.5938	18.1710	7.5942	compliant
2593	42.4272	17.4872	7.5652	compliant
2680	42.2109	16.6376	7.5942	compliant



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

QPSK-Modulation ANT1+ANT2+ANT3+ANT4+ANT5+ANT6+ANT7+ANT8 Calculated Total				
2506	51.70	148.02	-	compliant
2593	51.50	141.25	-	compliant
2680	51.33	135.73	-	compliant
64QAM-Modulation ANT1				
2506	42.5428	17.9591	7.5942	compliant
2593	42.4667	17.6470	7.5621	compliant
2680	42.2380	16.7417	7.6231	compliant
64QAM-Modulation ANT2				
2506	42.6753	18.5153	7.5942	compliant
2593	42.5039	17.7987	7.5942	compliant
2680	42.1989	16.5917	7.5942	compliant
64QAM-Modulation ANT3				
2506	42.4995	17.7808	7.5942	compliant
2593	42.5116	17.8305	7.56217	compliant
2680	42.3868	17.3252	7.5942	compliant
64QAM-Modulation ANT4				
2506	42.8154	19.1222	7.5942	compliant
2593	42.4966	17.7689	7.5652	compliant
2680	42.5127	17.8349	7.5942	compliant
64QAM-Modulation ANT5				
2506	42.8271	19.1738	7.5942	compliant
2593	42.4129	17.4295	7.5652	compliant
2680	42.3879	17.3297	7.6232	compliant
64QAM-Modulation ANT6				
2506	42.7263	18.7339	7.5942	compliant
2593	42.5081	17.8160	7.5652	compliant
2680	42.3323	17.1092	7.6231	compliant
64QAM-Modulation ANT7				
2506	42.7269	18.7366	7.5942	compliant
2593	42.4177	17.4488	7.5652	compliant
2680	42.2219	16.6798	7.6231	compliant
64QAMK-Modulation ANT8				
2506	42.6490	18.4035	7.5942	compliant
2593	42.4254	17.4799	7.5652	compliant
2680	42.1774	16.5097	7.5942	compliant
64QAM-Modulation ANT1+ANT2+ANT3+ANT4+ANT5+ANT6+ANT7+ANT8 Calculated Total				
2506	51.72	148.43	-	compliant
2593	51.50	141.22	-	compliant



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

2680	51.34	136.12	-	compliant
16QAM-Modulation ANT1				
2506	42.5618	18.0376	7.5942	compliant
2593	42.4571	17.6080	7.5621	compliant
2680	42.2332	16.7232	7.5652	compliant
16QAM-Modulation ANT2				
2506	42.6404	18.3669	7.5942	compliant
2593	42.4621	17.6283	7.5621	compliant
2680	42.1441	16.3835	7.5652	compliant
16QAM-Modulation ANT3				
2506	42.5241	17.8817	7.5942	compliant
2593	42.5994	18.1944	7.5652	compliant
2680	42.3943	17.3552	7.5362	compliant
16QAM-Modulation ANT4				
2506	42.7815	18.9736	7.5942	compliant
2593	42.5232	17.8780	7.5652	compliant
2680	42.5380	17.9391	7.3623	compliant
16QAM-Modulation ANT5				
2506	42.7939	19.0279	7.5942	compliant
2593	42.4366	17.5252	7.5652	compliant
2680	42.4009	17.3816	7.5652	compliant
16QAM-Modulation ANT6				
2506	42.6972	18.6087	7.5942	compliant
2593	42.5416	17.9539	7.5362	compliant
2680	42.3676	17.2488	7.5652	compliant
16QAM-Modulation ANT7				
2506	42.6900	18.5780	7.5942	compliant
2593	42.4573	17.6088	7.5362	compliant
2680	42.2480	16.7803	7.5362	compliant
16QAM-Modulation ANT8				
2506	42.5950	18.1761	7.5942	compliant
2593	42.3962	17.3628	7.5652	compliant
2680	42.1857	16.5413	7.5362	compliant
16QAM-Modulation ANT1+ANT2+ANT3+ANT4+ANT5+ANT6+ANT7+ANT8 Calculated Total				
2506	51.69	147.65	-	compliant
2593	51.52	141.76	-	compliant
2680	51.34	136.35	-	compliant



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

**Table 7 Configuration B**

Carrier Frequency [MHz]	RF Power Output		PAPR 0.1%	Result
	[dBm]	[W]	[dB]	
<b>QPSK-Modulation ANT1</b>				
2506/2526	40.1167/ 40.237	10.2724/ 10.5609	-	compliant
2583/2603	39.33719/ 39.13464	8.5846/ 8.1934	-	compliant
2660/2680	39.30745/ 39.10745	8.526/ 8.1423	-	compliant
<b>QPSK-Modulation ANT2</b>				
2506/2526	40.23603/ 40.39159	10.5585/ 10.9436	-	compliant
2583/2603	40.21991/ 39.95024	10.5194/ 9.8861	-	compliant
2660/2680	39.89463/ 39.7425	9.7603/ 9.4243	-	compliant
<b>QPSK-Modulation ANT3</b>				
2506/2526	40.31168/ 40.45615	10.744/ 11.1075	-	compliant
2583/2603	40.35665/ 40.11219	10.8559/ 10.2617	-	compliant
2660/2680	40.283/ 40.19728	10.6733/ 10.4647	-	compliant
<b>QPSK-Modulation ANT4</b>				
2506/2526	40.33889/ 40.42161	10.8116/ 11.0195	-	compliant
2583/2603	40.30724/ 40.0733	10.7331/ 10.1702	-	compliant
2660/2680	40.35769/ 40.07678	10.8585/ 10.1784	-	compliant
<b>QPSK-Modulation ANT5</b>				
2506/2526	40.43051/ 40.50673	11.0421/ 11.2376	-	compliant
2583/2603	40.24627/ 39.96488	10.5834/ 9.9195	-	compliant
2660/2680	40.06653/ 39.905	10.1544/ 9.7836	-	compliant
<b>QPSK-Modulation ANT6</b>				
2506/2526	40.30148/ 40.41126	10.7188/ 10.9932	-	compliant
2583/2603	40.23189/ 40.10848	10.5485/ 10.2529	-	compliant
2660/2680	40.08052/ 40.00081	10.1871/ 10.0019	-	compliant
<b>QPSK-Modulation ANT7</b>				
2506/2526	40.39561/ 40.47723	10.9537/ 11.1615	-	compliant
2583/2603	40.19443/ 40.00765	10.4579/ 10.0176	-	compliant
2660/2680	40.12493/ 39.90012	10.2918/ 9.7726	-	compliant
<b>QPSK-Modulation ANT8</b>				
2506/2526	40.26634/ 40.39158	10.6325/ 10.9435	-	compliant
2583/2603	40.24869/ 39.97801	10.5893/ 9.9495	-	compliant
2660/2680	40.04609/ 39.79962	10.1067/ 9.5491	-	compliant
<b>QPSK-Modulation ANT1+ANT2+ANT3+ANT4+ANT5+ANT6+ANT7+ANT8 Calculated Total</b>				
2506 + 2562	52.40	173.70	-	compliant
2583 + 2603	52.08	161.52	-	compliant
2660 + 2680	51.98	157.88	-	compliant



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

64QAM-Modulation ANT1				
2506/2526	39.3092 /39.437	8.5293/ 8.7841	-	compliant
2583/2603	39.3254 /39.1371	8.5613/ 8.198	-	compliant
2660/2680	39.2691 /39.0742	8.451/ 8.0801	-	compliant
64QAM-Modulation ANT2				
2506/2526	39.3691 /39.5118	8.6479/ 8.9367	-	compliant
2583/2603	39.4193 /39.4235	8.7484/ 8.7569	-	compliant
2660/2680	39.1743 /39.0425	8.2686/ 8.0214	-	compliant
64QAM-Modulation ANT3				
2506/2526	39.4694 /39.6683	8.8499/ 9.2646	-	compliant
2583/2603	39.4905 /39.337	8.8929/ 8.5841	-	compliant
2660/2680	39.4859 /39.277	8.8836/ 8.4664	-	compliant
64QAM-Modulation ANT4				
2506/2526	39.5645 /39.665	9.0459/ 9.2576	-	compliant
2583/2603	39.2541 /39.4568	8.422/ 8.8242	-	compliant
2660/2680	39.4926 /39.3124	8.8973/ 8.5356	-	compliant
64QAM-Modulation ANT5				
2506/2526	39.5723 /39.7611	9.0622/ 9.4649	-	compliant
2583/2603	39.4328 /39.2155	8.7756/ 8.3474	-	compliant
2660/2680	39.236 /39.1547	8.3868/ 8.2314	-	compliant
64QAM-Modulation ANT6				
2506/2526	39.4467 /39.5645	8.8038/ 9.0459	-	compliant
2583/2603	39.377 /39.3317	8.6636/ 8.5738	-	compliant
2660/2680	39.3578 /39.2033	8.6255/ 8.3239	-	compliant
64QAM-Modulation ANT7				
2506/2526	39.5235 /39.6443	8.9608/ 9.2137	-	compliant
2583/2603	39.4014 /39.2352	8.7123/ 8.3853	-	compliant
2660/2680	39.2226 /39.1543	8.3611/ 8.2306	-	compliant
64QAMK-Modulation ANT8				
2506/2526	39.4312 /39.5589	8.7724/ 9.0342	-	compliant
2583/2603	39.3812 /39.1621	8.672/ 8.2454	-	compliant
2660/2680	39.2294 /39.0445	8.3742/ 8.0251	-	compliant
64QAM-Modulation ANT1+ANT2+ANT3+ANT4+ANT5+ANT6+ANT7+ANT8 Calculated Total				
2506 + 2526	51.57	143.67	-	compliant
2583 + 2603	51.38	137.36	-	compliant
2660 + 2680	51.28	134.16	-	compliant
16QAM-Modulation ANT1				
2506/2562	39.3707 /39.4724	8.651/ 8.856	-	compliant
2583/2603	39.3433 /39.124	8.5967/ 8.1733	-	compliant





FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

2660/2680	39.2684 /39.0547	8.4497/ 8.0439	-	compliant
16QAM-Modulation ANT2				
2506/2526	39.4006 /39.5174	8.7108/ 8.9482	-	compliant
2583/2603	39.4235 /39.143	8.7568/ 8.2092	-	compliant
2660/2680	39.1446 /38.983	8.2122/ 7.9122	-	compliant
16QAM-Modulation ANT3				
2506/2526	39.48 /39.6229	8.8716/ 9.1683	-	compliant
2583/2603	39.5518 /39.3513	9.0195/ 8.6124	-	compliant
2660/2680	39.4413 /39.2521	8.7929/ 8.4181	-	compliant
16QAM-Modulation ANT4				
2506/2526	39.5172 /39.6841	8.9478/ 9.2985	-	compliant
2583/2603	39.4568 /39.2711	8.8242/ 8.4549	-	compliant
2660/2680	39.4475 /39.2588	8.8055/ 8.4309	-	compliant
16QAM-Modulation ANT5				
2506/2526	39.5739 /39.788	9.0655/ 9.5235	-	compliant
2583/2603	39.3708 /39.2675	8.6513/ 8.4479	-	compliant
2660/2680	39.2382 /39.1916	8.3912/ 8.3015	-	compliant
16QAM-Modulation ANT6				
2506/2526	39.391 /39.6449	8.6917/ 9.2149	-	compliant
2583/2603	39.4432 /39.2999	8.7966/ 8.5111	-	compliant
2660/2680	39.2701 /39.2074	8.453/ 8.3319	-	compliant
16QAM-Modulation ANT7				
2506/2526	39.5368 /39.6121	8.9884/ 9.1456	-	compliant
2583/2603	39.4417 /39.2423	8.7936/ 8.3991	-	compliant
2660/2680	39.2698 /39.0987	8.4523/ 8.1259	-	compliant
16QAM-Modulation ANT8				
2506/2526	39.5018 /39.5446	8.9162/ 9.0045	-	compliant
2583/2603	39.3899 /39.2028	8.6893/ 8.323	-	compliant
2660/2680	39.2692 /39.0782	8.4513/ 8.0875	-	compliant
16QAM-Modulation ANT1+ANT2+ANT3+ANT4+ANT5+ANT6+ANT7+ANT8 Calculated Total				
2506 + 2526	51.58	144.01	-	compliant
2583 + 2603	51.36	137.26	-	compliant
2660 + 2680	51.26	133.65	-	compliant



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

**Table 8 Configuration C**

Carrier Frequency [MHz]	RF Power Output		PAPR 0.1%	Result
	[dBm]	[W]	[dB]	
QPSK-Modulation ANT1				
2506/ 2526/ 2546	38.15 /38.38 /38.35	6.53 /6.89 /6.84	-	compliant
2573/ 2593/ 2613	38.24 /38.29 /38.11	6.67 /6.75 /6.47	-	compliant
2640/ 2660/ 2680	38.13 /38.17 /37.71	6.5 /6.56 /5.9	-	compliant
QPSK-Modulation ANT2				
2506/ 2526/ 2546	38.35 /38.61 /38.36	6.84 /7.26 /6.85	-	compliant
2573/ 2593/ 2613	38.33 /38.35 /37.51	6.81 /6.84 /5.64	-	compliant
2640/ 2660/ 2680	38.1 /38.2 /37.3	6.46 /6.61 /5.37	-	compliant
QPSK-Modulation ANT3				
2506/ 2526/ 2546	38.41 /38.64 /38.45	6.93 /7.31 /7	-	compliant
2573/ 2593/ 2613	38.67 /38.71 /38.2	7.36 /7.43 /6.61	-	compliant
2640/ 2660/ 2680	38.34 /38.3 /38.38	6.82 /6.76 /6.89	-	compliant
QPSK-Modulation ANT4				
2506/ 2526/ 2546	38.43 /38.63 /37.88	6.97 /7.29 /6.14	-	compliant
2573/ 2593/ 2613	38.59 /38.65 /38.3	7.23 /7.33 /6.76	-	compliant
2640/ 2660/ 2680	38.4 /38.51 /37.89	6.92 /7.1 /6.15	-	compliant
QPSK-Modulation ANT5				
2506/ 2526/ 2546	38.37 /38.79 /38.82	6.87 /7.57 /7.62	-	compliant
2573/ 2593/ 2613	38.26 /38.45 /38.49	6.7 /7 /7.06	-	compliant
2640/ 2660/ 2680	38.07 /38.29 /38.33	6.41 /6.75 /6.81	-	compliant
QPSK-Modulation ANT6				
2506/ 2526/ 2546	38.31 /38.7 /38.8	6.78 /7.41 /7.59	-	compliant
2573/ 2593/ 2613	38.62 /38.71 /38.48	7.28 /7.43 /7.05	-	compliant
2640/ 2660/ 2680	38.25 /38.46 /38.49	6.68 /7.01 /7.06	-	compliant
QPSK-Modulation ANT7				
2506/ 2526/ 2546	38.4 /38.63 /38.79	6.92 /7.29 /7.57	-	compliant
2573/ 2593/ 2613	38.69 /38.72 /38.5	7.4 /7.45 /7.08	-	compliant
2640/ 2660/ 2680	38.38 /38.44 /38.12	6.89 /6.98 /6.49	-	compliant
QPSK-Modulation ANT8				
2506/ 2526/ 2546	38.41 /38.68 /38.57	6.93 /7.38 /7.19	-	compliant
2573/ 2593/ 2613	38.57 /38.58 /38.3	7.19 /7.21 /6.76	-	compliant
2640/ 2660/ 2680	38.27 /38.34 /38.01	6.71 /6.82 /6.32	-	compliant
QPSK-Modulation ANT1+ANT2+ANT3+ANT4+ANT5+ANT6+ANT7+ANT8 Calculated Total				
2506 + 2526 + 2546	52.30	169.97	-	compliant



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

2573 + 2593 + 2613	52.24	167.51	-	compliant
2640 + 2660 + 2680	52.01	158.97	-	compliant
64QAM-Modulation ANT1				
2506/ 2526/ 2546	38.24 /38.45 /38.4	6.67 /7 /6.92	-	compliant
2573/ 2593/ 2613	38.38 /38.31 /37.89	6.89 /6.78 /6.15	-	compliant
2640/ 2660/ 2680	38.18 /38.22 /37.83	6.58 /6.64 /6.07	-	compliant
64QAM-Modulation ANT2				
2506/ 2526/ 2546	38.29 /38.53 /38.5	6.75 /7.13 /7.08	-	compliant
2573/ 2593/ 2613	38.43 /38.44 /38.28	6.97 /6.98 /6.73	-	compliant
2640/ 2660/ 2680	38.09 /38.09 /37.87	6.44 /6.44 /6.12	-	compliant
64QAM-Modulation ANT3				
2506/ 2526/ 2546	38.36 /38.6 /38.57	6.85 /7.24 /7.19	-	compliant
2573/ 2593/ 2613	38.57 /38.59 /38.67	7.19 /7.23 /7.36	-	compliant
2640/ 2660/ 2680	38.5 /38.52 /38.23	7.08 /7.11 /6.65	-	compliant
64QAM-Modulation ANT4				
2506/ 2526/ 2546	38.51 /38.54 /38.49	7.1 /7.14 /7.06	-	compliant
2573/ 2593/ 2613	38.39 /38.38 /38.49	6.9 /6.89 /7.06	-	compliant
2640/ 2660/ 2680	38.28 /38.34 /38.4	6.73 /6.82 /6.92	-	compliant
64QAM-Modulation ANT5				
2506/ 2526/ 2546	38.46 /38.72 /38.63	7.01 /7.45 /7.29	-	compliant
2573/ 2593/ 2613	38.46 /38.54 /38.33	7.01 /7.14 /6.81	-	compliant
2640/ 2660/ 2680	38.09 /38.23 /38.32	6.44 /6.65 /6.79	-	compliant
64QAM-Modulation ANT6				
2506/ 2526/ 2546	38.32 /38.68 /38.77	6.79 /7.38 /7.53	-	compliant
2573/ 2593/ 2613	38.54 /38.64 /38.43	7.14 /7.31 /6.97	-	compliant
2640/ 2660/ 2680	38.29 /38.39 /38.11	6.75 /6.9 /6.47	-	compliant
64QAM-Modulation ANT7				
2506/ 2526/ 2546	38.35 /38.53 /38.66	6.84 /7.13 /7.35	-	compliant
2573/ 2593/ 2613	38.54 /38.53 /38.59	7.14 /7.13 /7.23	-	compliant
2640/ 2660/ 2680	38.4 /38.4 /38.14	6.92 /6.92 /6.52	-	compliant
64QAMK-Modulation ANT8				
2506/ 2526/ 2546	38.41 /38.63 /38.73	6.93 /7.29 /7.46	-	compliant
2573/ 2593/ 2613	38.46 /38.51 /38.52	7.01 /7.1 /7.11	-	compliant
2640/ 2660/ 2680	38.31 /38.37 /38.03	6.78 /6.87 /6.35	-	compliant
64QAM-Modulation ANT1+ANT2+ANT3+ANT4+ANT5+ANT6+ANT7+ANT8 Calculated Total				
2506 + 2526 + 2546	52.32	170.57	-	compliant
2573 + 2593 + 2613	52.26	168.23	-	compliant
2640 + 2660 + 2680	52.04	159.96	-	compliant
16QAM-Modulation ANT1				



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

2506/ 2526/ 2546	38.17 /38.4 /38.32	6.56 /6.92 /6.79	-	compliant
2573/ 2593/ 2613	38.25 /38.31 /38.94	6.68 /6.78 /7.83	-	compliant
2640/ 2660/ 2680	38.17 /38.22 /37.83	6.56 /6.64 /6.07	-	compliant
16QAM-Modulation ANT2				
2506/ 2526/ 2546	38.32 /38.54 /38.4	6.79 /7.14 /6.92	-	compliant
2573/ 2593/ 2613	38.34 /38.33 /38.14	6.82 /6.81 /6.52	-	compliant
2640/ 2660/ 2680	38.05 /38.11 /37.9	6.38 /6.47 /6.17	-	compliant
16QAM-Modulation ANT3				
2506/ 2526/ 2546	38.35 /38.6 /38.58	6.84 /7.24 /7.21	-	compliant
2573/ 2593/ 2613	38.65 /38.71 /38.47	7.33 /7.43 /7.03	-	compliant
2640/ 2660/ 2680	38.43 /38.4 /38.39	6.97 /6.92 /6.9	-	compliant
16QAM-Modulation ANT4				
2506/ 2526/ 2546	38.44 /38.72 /38.61	6.98 /7.45 /7.26	-	compliant
2573/ 2593/ 2613	38.56 /38.63 /38.38	7.18 /7.29 /6.89	-	compliant
2640/ 2660/ 2680	38.2 /38.35 /38.05	6.61 /6.84 /6.38	-	compliant
16QAM-Modulation ANT5				
2506/ 2526/ 2546	38.44 /38.72 /38.61	6.98 /7.45 /7.26	-	compliant
2573/ 2593/ 2613	38.56 /38.63 /38.38	7.18 /7.29 /6.89	-	compliant
2640/ 2660/ 2680	38.2 /38.35 /38.05	6.61 /6.84 /6.38	-	compliant
16QAM-Modulation ANT6				
2506/ 2526/ 2546	38.42 /38.69 /38.58	6.95 /7.4 /7.21	-	compliant
2573/ 2593/ 2613	38.56 /38.65 /38.42	7.18 /7.33 /6.95	-	compliant
2640/ 2660/ 2680	38.29 /38.42 /38.14	6.75 /6.95 /6.52	-	compliant
16QAM-Modulation ANT7				
2506/ 2526/ 2546	38.46 /38.65 /38.54	7.01 /7.33 /7.14	-	compliant
2573/ 2593/ 2613	38.59 /38.6 /38.37	7.23 /7.24 /6.87	-	compliant
2640/ 2660/ 2680	38.41 /38.44 /38.12	6.93 /6.98 /6.49	-	compliant
16QAM-Modulation ANT8				
2506/ 2526/ 2546	38.38 /38.64 /38.52	6.89 /7.31 /7.11	-	compliant
2573/ 2593/ 2613	38.52 /38.53 /38.24	7.11 /7.13 /6.67	-	compliant
2640/ 2660/ 2680	38.25 /38.34 /38	6.68 /6.82 /6.31	-	compliant
16QAM-Modulation ANT1+ANT2+ANT3+ANT4+ANT5+ANT6+ANT7+ANT8 Calculated Total				
2506 + 2526 + 2546	52.16	164.46	-	compliant
2573 + 2593 + 2613	52.30	169.66	-	compliant
2640 + 2660 + 2680	52.02	159.17	-	compliant



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---

The base station maximum output power was found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---

#### 4.2 Test No. 2: Modulation Characteristics (§ 2.1047, § 2.201)

The occupied bandwidth was measured to be 18 MHz (Configuration A), which represents the 99% power bandwidth (see the following section and screenshots on pages 71).

Therefore, the modulation characteristic of the base stations transceiver is:

##### **Configuration A: 18M0D9W** (Channel bandwidth 20 MHz)

No further testing is required under this section of the FCC rules. No measurements other than the occupied bandwidth are required.

Sample modulation screenshots are on page 62, in I/Q constellation diagrams and tables, showing QPSK, 16QAM and 64QAM –modulation generation.

The modulation characteristics were found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

**4.3 Test No. 3: Occupied Bandwidth (§ 2.1049)**

**4.3.1 Limits**

Para. No. 2.1049. The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the emitted power.

**4.3.2 Test Procedure and Results**

The 99% occupied bandwidth of the carrier emission is measured using a signal analyzer with Resolution Bandwidth set according to reference document *971168 D01 Power Meas License Digital Systems v02r02*, section 4.2 Occupied bandwidth 99% measurement procedure (see screenshots for details). The following tables summarize the results:

**Table 9 Configuration A**

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation ANT1		
2506	17.80	compliant
2593	17.83	compliant
2680	17.83	compliant
QPSK-Modulation ANT2		
2506	17.83	compliant
2593	17.83	compliant
2680	17.83	compliant
QPSK-Modulation ANT3		
2506	17.83	compliant
2593	17.83	compliant
2680	17.83	compliant
QPSK-Modulation ANT4		
2506	17.83	compliant
2593	17.83	compliant
2680	17.83	compliant



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

QPSK-Modulation ANT5		
2506	17.80	compliant
2593	17.83	compliant
2680	17.80	compliant
QPSK-Modulation ANT6		
2506	17.83	compliant
2593	17.83	compliant
2680	17.80	compliant
QPSK-Modulation ANT7		
2506	17.80	compliant
2593	17.83	compliant
2680	17.83	compliant
QPSK-Modulation ANT8		
2506	17.83	compliant
2593	17.83	compliant
2680	17.83	compliant
64QAM-Modulation ANT1		
2506	17.80	compliant
2593	17.83	compliant
2680	17.83	compliant
64QAM-Modulation ANT2		
2506	17.80	compliant
2593	17.83	compliant
2680	17.8	compliant
64QAM-Modulation ANT3		
2506	17.80	compliant
2593	17.83	compliant
2680	17.83	compliant
64QAM-Modulation ANT4		
2506	17.80	compliant
2593	17.83	compliant
2680	17.83	compliant
64QAM-Modulation ANT5		
2506	17.80	compliant
2593	17.83	compliant
2680	17.80	compliant
64QAM-Modulation ANT6		
2506	17.80	compliant
2593	17.83	compliant





FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

2680	17.8	compliant
64QAM-Modulation ANT7		
2506	17.80	compliant
2593	17.83	compliant
2680	17.83	compliant
64QAM-Modulation ANT8		
2506	17.80	compliant
2593	17.83	compliant
2680	17.83	compliant
16QAM-Modulation ANT1		
2506	17.80	compliant
2593	17.83	compliant
2680	17.8	compliant
16QAM-Modulation ANT2		
2506	17.80	compliant
2593	17.83	compliant
2680	17.8	compliant
16QAM-Modulation ANT3		
2506	17.80	compliant
2593	17.83	compliant
2680	17.8	compliant
16QAM-Modulation ANT4		
2506	17.80	compliant
2593	17.83	compliant
2680	17.8	compliant
16QAM-Modulation ANT5		
2506	17.80	compliant
2593	17.83	compliant
2680	17.77	compliant
16QAM-Modulation ANT6		
2506	17.80	compliant
2593	17.83	compliant
2680	17.77	compliant
16QAM-Modulation ANT7		
2506	17.80	compliant
2593	17.83	compliant
2680	17.8	compliant
16QAM-Modulation ANT8		
2506	17.80	compliant

FCC 47 CFR part 27 (2015)  
and CFR Part 2 (2015)

23. Sep 2016  
Page 25 of 273



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---

2593	17.83	compliant
2680	17.77	compliant
Measurement Uncertainty:		±48kHz



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

**Table 10 Configuration B**

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation ANT1		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
QPSK-Modulation ANT2		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
QPSK-Modulation ANT3		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.86	compliant
QPSK-Modulation ANT4		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
QPSK-Modulation ANT5		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
QPSK-Modulation ANT6		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
QPSK-Modulation ANT7		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
QPSK-Modulation ANT8		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
64QAM-Modulation ANT1		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant

FCC 47 CFR part 27 (2015)  
and CFR Part 2 (2015)

23. Sep 2016  
Page 27 of 273



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

64QAM-Modulation ANT2		
2506/ 2526	37.85	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
64QAM-Modulation ANT3		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
64QAM-Modulation ANT4		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
64QAM-Modulation ANT5		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
64QAM-Modulation ANT6		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
64QAM-Modulation ANT7		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	38.09	compliant
64QAM-Modulation ANT8		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.97	compliant
16QAM-Modulation ANT1		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.86	compliant
16QAM-Modulation ANT2		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.86	compliant
16QAM-Modulation ANT3		
2506/ 2526	37.86	compliant
2583/ 2603	37.97	compliant



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

2660/ 2680	37.86	compliant
16QAM-Modulation ANT4		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.86	compliant
16QAM-Modulation ANT5		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.86	compliant
16QAM-Modulation ANT6		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.86	compliant
16QAM-Modulation ANT7		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.86	compliant
16QAM-Modulation ANT8		
2506/ 2526	37.97	compliant
2583/ 2603	37.97	compliant
2660/ 2680	37.86	compliant
Measurement Uncertainty:		±48kHz

**Table 11 Configuration C**

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation ANT1		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
QPSK-Modulation ANT2		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
QPSK-Modulation ANT3		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
QPSK-Modulation ANT4		

FCC 47 CFR part 27 (2015)  
and CFR Part 2 (2015)

23. Sep 2016  
Page 29 of 273



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
QPSK-Modulation ANT5		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
QPSK-Modulation ANT6		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
QPSK-Modulation ANT7		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
QPSK-Modulation ANT8		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
64QAM-Modulation ANT1		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.48	compliant
64QAM-Modulation ANT2		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
64QAM-Modulation ANT3		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
64QAM-Modulation ANT4		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
64QAM-Modulation ANT5		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

64QAM-Modulation ANT6		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
64QAM-Modulation ANT7		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
64QAM-Modulation ANT8		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
16QAM-Modulation ANT1		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.48	compliant
16QAM-Modulation ANT2		
2506/ 2526/ 2546	57.55	compliant
2573/ 2593/ 2613	57.55	compliant
2640/ 2660/ 2680	57.66	compliant
16QAM-Modulation ANT3		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.48	compliant
2640/ 2660/ 2680	57.48	compliant
16QAM-Modulation ANT4		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
16QAM-Modulation ANT5		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.48	compliant
2640/ 2660/ 2680	57.48	compliant
16QAM-Modulation ANT6		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.66	compliant
16QAM-Modulation ANT7		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

2640/ 2660/ 2680	57.48	compliant
16QAM-Modulation ANT8		
2506/ 2526/ 2546	57.66	compliant
2573/ 2593/ 2613	57.66	compliant
2640/ 2660/ 2680	57.48	compliant

The occupied bandwidths were found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.





FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

#### 4.4 Test No. 4: Spurious Emissions at Antenna Terminals (§ 2.1051, § 2.1057, § 27.53)

##### 4.4.1 Limits

Para. No. 27.53(l). For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts.

(l)(2) For fixed and temporary fixed digital stations, the attenuation shall be not less than  $43 + 10 \log(P)$  dB (P = transmitter power in Watts).

The compliance limit was calculated in the following way:

Maximum transmitter output power [W]: P

Maximum transmitter output power [dBm]:  $30 + 10 \log_{10} P$   
(conversion from W to dBm)

Attenuation required by FCC:  $43 + 10 \log_{10} P$

Compliance limit = Maximum transmitter output power - Required  
attenuation

$$= 30 + 10 \log_{10} P - (43 + 10 \log_{10} P) = \underline{-13 \text{ dBm}}$$

For MiMo output from 8 TX -antenna connectors, each antenna connectors were measured individually and each individual limit lime was reduced by  $10 \log(8)$ . Limit line was calculated to show -22.03dB emission limit, according to FCC KDB 662911 D01 guidance.

##### 4.4.2 Test Procedure and Results



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

The tests were carried out in accordance with § 27.53. For all frequency ranges except two (immediately below and above the carrier frequency block) a 1 MHz resolution bandwidth was used for the measurements.

In the 1 MHz frequency bands immediately outside and adjacent to the carrier frequency block the resolution bandwidth is lowered to 1% of the 26 dB occupied bandwidth of the transmitted carrier.

According to § 2.1057, all emissions including the fundamental frequency from the lowest radio frequency generated in the equipment, without going below 9 kHz, up to the 10th harmonic were investigated.

The following tables summarize the worst case detected emission levels (see screenshots on page 119 for details). The external attenuation (cable loss of the set up) is already added in the results. It can be seen separately as the 'Offset' value in the screenshots.

**Table 12 Configuration A, Lower band edge**

Carrier Frequency: 2506 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation ANT1			
	2496	-31.19	compliant
QPSK-Modulation ANT2			
	2496	-28.64	compliant
QPSK-Modulation ANT3			
	2496	-26.85	compliant
QPSK-Modulation ANT4			
	2496	-26.75	compliant
QPSK-Modulation ANT5			
	2496	-26.49	compliant
QPSK-Modulation ANT6			
	2496	-26.58	compliant
QPSK-Modulation ANT7			



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

	2496	-25.99	compliant
QPSK-Modulation ANT8			
	2498	-26.6	compliant
64QAM-Modulation ANT1			
	2496	-29.27	compliant
64QAM-Modulation ANT2			
	2496	-28.91	compliant
64QAM-Modulation ANT3			
	2496	-28.74	compliant
64QAM-Modulation ANT4			
	2496	-28.42	compliant
64QAM-Modulation ANT5			
	2496	-28.44	compliant
64QAM-Modulation ANT6			
	2496	-28.57	compliant
64QAM-Modulation ANT7			
	2496	-27.71	compliant
64QAM-Modulation ANT8			
	2496	-26.91	compliant
16QAM-Modulation ANT1			
	2496	-27.68	compliant
16QAM-Modulation ANT2			
	2496	-28.95	compliant
16QAM-Modulation ANT3			
	2496	-28.77	compliant
16QAM-Modulation ANT4			
	2496	-28.49	compliant
16QAM-Modulation ANT5			
	2496	-27.02	compliant
16QAM-Modulation ANT6			
	2496	-28.72	compliant
16QAM-Modulation ANT7			
	2496	-27.72	compliant
16QAM-Modulation ANT8			
	2496	-27.42	compliant

FCC 47 CFR part 27 (2015)  
and CFR Part 2 (2015)

23. Sep 2016  
Page 35 of 273



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

Measurement Uncertainty:	$f < 1.0\text{GHz}: \pm 1.1\text{dB},$ $1.0\text{GHz} \leq f < 3.6\text{GHz}: \pm 1.2\text{dB},$ $3.6\text{GHz} \leq f < 8.0\text{GHz}: \pm 1.6\text{dB},$
--------------------------	--

**Table 13 Configuration A, Upper band edge**

Carrier Frequency: 2680 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation ANT1			
	2690	-29.55	compliant
QPSK-Modulation ANT2			
	2690	-28.92	compliant
QPSK-Modulation ANT3			
	2690	-29.16	compliant
QPSK-Modulation ANT4			
	2690	-28.29	compliant
QPSK-Modulation ANT5			
	2690	-30.26	compliant
QPSK-Modulation ANT6			
	2690	-28.89	compliant
QPSK-Modulation ANT7			
	2690	-28.8	compliant
QPSK-Modulation ANT8			
	2690	-27.39	compliant
64QAM-Modulation ANT1			
	2690	-29.58	compliant
64QAM-Modulation ANT2			
	2690	-28.85	compliant
64QAM-Modulation ANT3			
	2690	-30.68	compliant
64QAM-Modulation ANT4			
	2690	-29.38	compliant
64QAM-Modulation ANT5			
	2690	-30.51	compliant
64QAM-Modulation ANT6			

FCC 47 CFR part 27 (2015)  
and CFR Part 2 (2015)

23. Sep 2016  
Page 36 of 273



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

	2691	-28.42	compliant
64QAM-Modulation ANT7			
	2691	-28.5	compliant
64QAM-Modulation ANT8			
	2691	-29.99	compliant
16QAM-Modulation ANT1			
	2690	-29.54	compliant
16QAM-Modulation ANT2			
	2690	-29.12	compliant
16QAM-Modulation ANT3			
	2690	-28.22	compliant
16QAM-Modulation ANT4			
	2690	-27.41	compliant
16QAM-Modulation ANT5			
	2690	-30.33	compliant
16QAM-Modulation ANT6			
	2691	-28.47	compliant
16QAM-Modulation ANT7			
	2690	-28.64	compliant
16QAM-Modulation ANT8			
	2690	-29.63	compliant
Measurement Uncertainty:		f < 1.0GHz: ±1.1dB, 1.0GHz ≤ f < 3.6GHz: ±1.2dB, 3.6GHz ≤ f < 8.0GHz: ±1.6dB,	



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

**Table 14 Configuration A, Spurious emissions (Upper band edge)**

Carrier Frequency: 2593 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation ANT1			
0.009 - 26900	5181	-30.95	compliant
QPSK-Modulation ANT2			
0.009 - 26900	5193	-29.85	compliant
QPSK-Modulation ANT3			
0.009 - 26900	5193	-29.27	compliant
QPSK-Modulation ANT4			
0.009 - 26900	5193	-29.43	compliant
QPSK-Modulation ANT5			
0.009 - 26900	5193	-28.45	compliant
QPSK-Modulation ANT6			
0.009 - 26900	5193	-30.57	compliant
QPSK-Modulation ANT7			
0.009 - 26900	5193	-30.18	compliant
QPSK-Modulation ANT8			
0.009 - 26900	5193	-30.04	compliant
64QAM-Modulation ANT1			
0.009 - 26900	5193	-28.42	compliant
64QAM-Modulation ANT2			
0.009 - 26900	5193	-31.38	compliant
64QAM-Modulation ANT3			
0.009 - 26900	5193	-28.13	compliant
64QAM-Modulation ANT4			
0.009 - 26900	5193	-28.52	compliant
64QAM-Modulation ANT5			
0.009 - 26900	5193	-28.29	compliant
64QAM-Modulation ANT6			
0.009 - 26900	5193	-28.83	compliant
64QAM-Modulation ANT7			
0.009 - 26900	5193	-28.78	compliant
64QAM-Modulation ANT8			
0.009 - 26900	5193	-29.62	compliant
16QAM-Modulation ANT1			
0.009 - 26900	5193	-29.88	compliant
16QAM-Modulation ANT2			



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

0.009 - 26900	5193	-29.37	compliant
16QAM-Modulation ANT3			
0.009 - 26900	5193	-27.99	compliant
16QAM-Modulation ANT4			
0.009 - 26900	5193	-30.97	compliant
16QAM-Modulation ANT5			
0.009 - 26900	5193	-29.54	compliant
16QAM-Modulation ANT6			
0.009 - 26900	5193	-29.21	compliant
16QAM-Modulation ANT7			
0.009 - 26900	5193	-29.48	compliant
16QAM-Modulation ANT8			
0.009 - 26900	5193	-29.41	compliant
Measurement Uncertainty:		f < 1.0GHz: ±1.1dB, 1.0GHz ≤ f < 3.6GHz: ±1.2dB, 3.6GHz ≤ f < 8.0GHz: ±1.6dB,	

**Table 15 Configuration B, Lower band edge**

Carrier Frequency: 2506.0 MHz/ 2526.0 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation ANT1			
	2496	-28.3	compliant
QPSK-Modulation ANT2			
	2496	-26.62	compliant
QPSK-Modulation ANT3			
	2496	-27.42	compliant
QPSK-Modulation ANT4			
	2496	-26.6	compliant
QPSK-Modulation ANT5			
	2496	-26.84	compliant
QPSK-Modulation ANT6			
	2496	-26.65	compliant
QPSK-Modulation ANT7			
	2496	-29.66	compliant
QPSK-Modulation ANT8			



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

	2496	-27.43	compliant
64QAM-Modulation ANT1			
	2496	-27.24	compliant
64QAM-Modulation ANT2			
	2496	-28.27	compliant
64QAM-Modulation ANT3			
	2496	-28.36	compliant
64QAM-Modulation ANT4			
	2496	-26.53	compliant
64QAM-Modulation ANT5			
	2496	-27.76	compliant
64QAM-Modulation ANT6			
	2496	-26.90	compliant
64QAM-Modulation ANT7			
	2496	-27.55	compliant
64QAM-Modulation ANT8			
	2496	-27.1	compliant
16QAM-Modulation ANT1			
	2496	-28.09	compliant
16QAM-Modulation ANT2			
	2496	-30.09	compliant
16QAM-Modulation ANT3			
	2496	-28	compliant
16QAM-Modulation ANT4			
	2496	-27.44	compliant
16QAM-Modulation ANT5			
	2496	-26.73	compliant
16QAM-Modulation ANT6			
	2496	-28.33	compliant
16QAM-Modulation ANT7			
	2496	-27.68	compliant
16QAM-Modulation ANT8			
	2496	-25.72	compliant
Measurement Uncertainty:		f < 1.0GHz: ±1.1dB, 1.0GHz ≤ f < 3.6GHz: ±1.2dB,	





Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---

	3.6GHz ≤ f < 8.0GHz: ±1.6dB,
--	------------------------------



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

**Table 16 Configuration B, Upper band edge**

Carrier Frequency: 2660 MHz/ 2680 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation ANT1			
	2690	-30.37	compliant
QPSK-Modulation ANT2			
	2690	-27.47	compliant
QPSK-Modulation ANT3			
	2690	-31.38	compliant
QPSK-Modulation ANT4			
	2690	-27.59	compliant
QPSK-Modulation ANT5			
	2691	-30.54	compliant
QPSK-Modulation ANT6			
	2690	-31.78	compliant
QPSK-Modulation ANT7			
	2691	-29.94	compliant
QPSK-Modulation ANT8			
	2690	-28.08	compliant
64QAM-Modulation ANT1			
	2690	-32.21	compliant
64QAM-Modulation ANT2			
	2690	-31.57	compliant
64QAM-Modulation ANT3			
	2690	-30.52	compliant
64QAM-Modulation ANT4			
	2690	-31.51	compliant
64QAM-Modulation ANT5			
	2690	-32.21	compliant
64QAM-Modulation ANT6			
	2691	-30.55	compliant
64QAM-Modulation ANT7			
	2691	-29.71	compliant
64QAM-Modulation ANT8			

FCC 47 CFR part 27 (2015)  
and CFR Part 2 (2015)

23. Sep 2016  
Page 42 of 273



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

	2691	-30.87	compliant
16QAM-Modulation ANT1			
	2690	-29.48	compliant
16QAM-Modulation ANT2			
	2690	-29.6	compliant
16QAM-Modulation ANT3			
	2690	-32.11	compliant
16QAM-Modulation ANT4			
	2690	-27.93	compliant
16QAM-Modulation ANT5			
	2690	-30.92	compliant
16QAM-Modulation ANT6			
	2691	-30.7	compliant
16QAM-Modulation ANT7			
	2690	-31.08	compliant
16QAM-Modulation ANT8			
	2690	-27.15	compliant
Measurement Uncertainty:		f < 1.0GHz: ±1.1dB, 1.0GHz ≤ f < 3.6GHz: ±1.2dB, 3.6GHz ≤ f < 8.0GHz: ±1.6dB,	

**Table 17 Configuration B, Spurious emissions**

Carrier Frequency: 2583/2603 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation ANT1			
0.009 - 26900	5193	-31.89	compliant
QPSK-Modulation ANT2			
0.009 - 26900	5193	-28.72	compliant
QPSK-Modulation ANT3			
0.009 - 26900	5181	-28.33	compliant
QPSK-Modulation ANT4			
0.009 - 26900	5181	-27.97	compliant
QPSK-Modulation ANT5			
0.009 - 26900	5193	-29.21	compliant
QPSK-Modulation ANT6			
0.009 - 26900	5181	-28.83	compliant



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

QPSK-Modulation ANT7			
0.009 - 26900	5181	-28.95	compliant
QPSK-Modulation ANT8			
0.009 - 26900	5181	-29.76	compliant
64QAM-Modulation ANT1			
0.009 - 26900	5193	-29.04	compliant
64QAM-Modulation ANT2			
0.009 - 26900	5193	-28.9	compliant
64QAM-Modulation ANT3			
0.009 - 26900	5181	-28.48	compliant
64QAM-Modulation ANT4			
0.009 - 26900	5181	-27.07	compliant
64QAM-Modulation ANT5			
0.009 - 26900	5193	-30.28	compliant
64QAM-Modulation ANT6			
0.009 - 26900	5193	-29.00	compliant
64QAM-Modulation ANT7			
0.009 - 26900	5181	-30.38	compliant
64QAM-Modulation ANT8			
0.009 - 26900	5181	-29.87	compliant
16QAM-Modulation ANT1			
0.009 - 26900	5181	-31.14	compliant
16QAM-Modulation ANT2			
0.009 - 26900	5181	-27.93	compliant
16QAM-Modulation ANT3			
0.009 - 26900	5193	-29.81	compliant
16QAM-Modulation ANT4			
0.009 - 26900	5193	-30.83	compliant
16QAM-Modulation ANT5			
0.009 - 26900	5193	-29.27	compliant
16QAM-Modulation ANT6			
0.009 - 26900	5193	-30.56	compliant
16QAM-Modulation ANT7			
0.009 - 26900	5181	-30.12	compliant
16QAM-Modulation ANT8			
0.009 - 26900	5193	-28.00	compliant
Measurement Uncertainty:		f < 1.0GHz: ±1.1dB, 1.0GHz ≤ f < 3.6GHz: ±1.2dB, 3.6GHz ≤ f < 8.0GHz: ±1.6dB,	



Product Service

FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

---



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

**Table 18 Configuration C, Lower band edge**

Carrier Frequency: 2506 2526/2546 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation ANT1			
	2496	-29.74	compliant
QPSK-Modulation ANT2			
	2496	-25.92	compliant
QPSK-Modulation ANT3			
	2496	-26.59	compliant
QPSK-Modulation ANT4			
	2496	-27.25	compliant
QPSK-Modulation ANT5			
	2496	-26.2	compliant
QPSK-Modulation ANT6			
	2496	-26.57	compliant
QPSK-Modulation ANT7			
	2496	-28.45	compliant
QPSK-Modulation ANT8			
	2498	-25.78	compliant
64QAM-Modulation ANT1			
	2496	-28.87	compliant
64QAM-Modulation ANT2			
	2496	-27.06	compliant
64QAM-Modulation ANT3			
	2496	-28.76	compliant
64QAM-Modulation ANT4			
	2496	-28.48	compliant
64QAM-Modulation ANT5			
	2496	-26.43	compliant
64QAM-Modulation ANT6			
	2496	-26.57	compliant
64QAM-Modulation ANT7			
	2496	-28.09	compliant
64QAM-Modulation ANT8			

FCC 47 CFR part 27 (2015)  
and CFR Part 2 (2015)

23. Sep 2016  
Page 46 of 273



FCC ID:  
VBNFZHN-01

Test Report No:  
D547351042

	2496	-27.95	compliant
16QAM-Modulation ANT1			
	2496	-26.89	compliant
16QAM-Modulation ANT2			
	2496	-26.24	compliant
16QAM-Modulation ANT3			
	2496	-29.55	compliant
16QAM-Modulation ANT4			
	2496	-28.74	compliant
16QAM-Modulation ANT5			
	2496	-28.76	compliant
16QAM-Modulation ANT6			
	2496	-28.22	compliant
16QAM-Modulation ANT7			
	2496	-28.27	compliant
16QAM-Modulation ANT8			
	2496	-27.96	compliant
Measurement Uncertainty:		f < 1.0GHz: ±1.1dB, 1.0GHz ≤ f < 3.6GHz: ±1.2dB, 3.6GHz ≤ f < 8.0GHz: ±1.6dB,	

**Table 19 Configuration C Upper band edge**

Carrier Frequency: 2640/2660 /2680 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation ANT1			
	2690	-31.06	compliant
QPSK-Modulation ANT2			
	2690	-29.98	compliant
QPSK-Modulation ANT3			
	2690	-31.14	compliant
QPSK-Modulation ANT4			
	2690	-27.23	compliant
QPSK-Modulation ANT5			
	2691	-31.67	compliant

FCC 47 CFR part 27 (2015)  
and CFR Part 2 (2015)

23. Sep 2016  
Page 47 of 273