

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

TESTING NVLAP LAB CODE: 100275-0

# **Test Report**

Regulation: FCC Part 2 and 27

<u>Client:</u> Nokia Mobility

Product Evaluated: UHBC-Comscope TRDU 2x40W-07U

> <u>Report Number:</u> TR-2018-0085-FCC2-27

### Date Issued: September 24, 2018

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## Table of Contents

1. SY	STEM INFORMATION AND REQUIREMENTS	
1.1 1.2 1.3	INTRODUCTION PURPOSE AND SCOPE EUT DETAILS	5
1.5 1.4 1.5 1.6	REFERENCE DOCUMENTS, TEST SPECIFICATIONS & PROCEDURES EXECUTIVE SUMMARY TEST CONFIGURATION FOR ALL ANTENNA PORT MEASUREMENTS	
	CC SECTION 2.1046 - RF POWER OUTPUT	
2.1	RF Power Output	9
3. F(	CC SECTION 2.1047 - MODULATION CHARACTERISTICS	
3.1	MODULATION CHARACTERISTICS	
4. FC	CC SECTION 2.1049 – OCCUPIED BANDWIDTH	
4.1 4.2	Occupied Bandwidth Occupied Bandwidth/ Edge of band Emissions	
5. FC	CC SECTION 2.1051 - SPURIOUS EMISSIONS AT TRANSMIT ANTENNA PORT	
5.1	MEASUREMENT OF SPURIOUS EMISSIONS AT TRANSMIT ANTENNA PORT	
6. FC	CC SECTION 2.1053	
6.1 6.2	Section 2.1053 Field Strength of Spurious Emissions Field Strength of Spurious Emissions - Limits	
7. N	VLAP CERTIFICATE OF ACCREDITATION	

#### Revisions

Date	Revision	Section	Change
9/24/2018	0		Initial Release

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9/24/2018 Steve Gordon

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## **1.** System Information and Requirements

Equipment Under Test (EUT):	UHBC-Comscope TRDU 2x40W-07U
Equipment Under Test (EUT):	FCCID: AS5BBTRX-01
Serial Number:	LBALLU-BG1021D0505
Cell Name / Number	GPCL Project Number:2018-0085
Company:	NOKIA SOLUTIONS AND NETWORKS OY
Company:	KARAPORTTI 3, FI-02610 ESPOO
	FINLAND
Manufacturer:	NOKIA SOLUTIONS AND NETWORKS OY
Test Requirement(s):	47 CFR FCC Part 2 and Part 27
• • • •	
Test Standards	• 47 CFR FCC Parts 2 and 27
	KDB 971168 D01 Power Measurement Licensed Digital Systems
	v03r01 April 9, 2018
	KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013
Measurement Procedure(s):	FCC-IC-OBSC – GPCL FCC and IC Occupied Bandwidth and Spurious
	Emission Test Procedure 3-15-2016
	FCC-IC-OB - GPCL Occupied Bandwidth and Power Measurement Test
	Procedure 12-4-2017
	FCC-IC-SE - GPCL Spurious Emissions Test Procedure 12-4-2017
Reference(s):	• ANSI C63.26 (2015)
	• ANSI C63.4 (2014)
Test Date(s):	July/August 2018
Test Performed By:	Nokia
	Global Product Compliance Laboratory
	600-700 Mountain Ave.
	P.O. Box 636
	Murray Hill, NJ 07974-0636
	ries is accredited by the National Voluntary Laboratory Accreditation Program cope of Accreditation, for: Electromagnetic Compatibility and Telecommunications.
	ith the recognized International Standard ISO/IEC 17025:2005. This accreditation
	ed scope and the operation of a laboratory quality management system (refer to joint
ISO-ILAC-IAF Communiqué dated January 20	
Product Engineer(s):	Ron Remy
Lead Engineer	Steve Gordon
Test Engineer (s):	Jaideep Yadav, Eugene Mitchell, Mike Soli
	U 2x40W-07U, as tested met the above listed requirements. Report copies
	report are held by either the product engineer or in an identified file at the
Global Product Compliance Laboratory in	New Providence, NJ.

### **1.1 Introduction**

This Conformity test report applies to the UHBC-Comscope TRDU 2x40W-07U, hereinafter referred to as the Equipment Under Test (EUT).

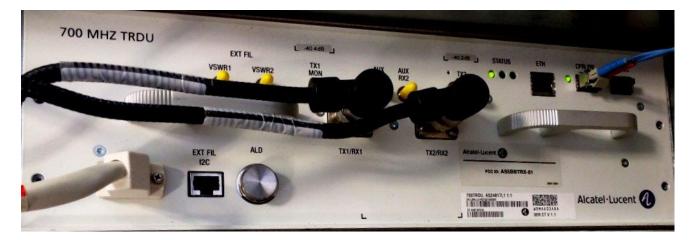
#### **1.2 Purpose and Scope**

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

The EUT was tested for Class II Permissive change to add 5 MHz (No NB-IoT) and 10 MHz NB IoT Guard Band operation to the existing Grant.

Only the specific NB-IoT channel configuration that can be supported was tested.

#### **1.3 EUT Details**





### **1.3.1 Test Requirements**

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

Each required measurement is listed below:

### **1.4 Reference Documents, Test Specifications & Procedures**

A list of the applicable documents is provided in Section 1.0.

### **1.4.1 Test Specifications**

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

### **1.4.2 Procedures**

- 1. FCC-IC-0B and FCC-IC-SE
- ANSI C63.4 (2014) entitled: "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz", American National Standards Institute, Institute of Electrical and Electronic Engineers, Inc., New York, NY 10017-2394, USA.
- 3. KDB 971168 D01 Power Measurement Licensed Digital Systems v03r01 April 9, 2018 FCC KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013

#### **1.4.3 MEASUREMENT UNCERTAINTY**

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

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

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

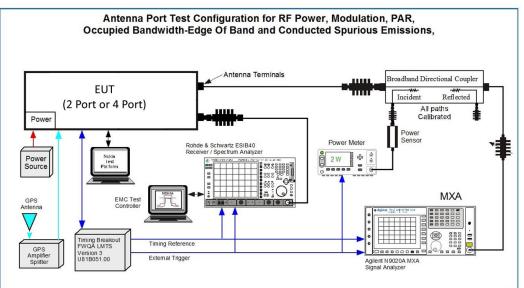
Antenna Port Test	Signal Bandwidth	Frequency Range	Expanded Uncertainty (k=2), Amplitude
	10 Hz	9 kHz to 20 MHz	
Occupied Bandwidth, Edge of Band,	100 Hz	20 MHz to 1 GHz	1.78 dB
Conducted Spurious Emissions	10 kHz to 1 MHz	1 GHz to 10 GHz	1.78 dB
	1MHz	10 GHz to 40 GHz:	
RF Power	10 Hz to 20 MHz	50 MHz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

#### **1.5 Executive Summary**

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

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

### **1.6** Test Configuration for all Antenna Port Measurements.



## 2. FCC Section 2.1046 - RF Power Output

### 2.1 RF Power Output

This test is a measurement of the total RF power level transmitted at the antenna-transmitting terminal. The product was configured for test as shown in section 1.6 above and allowed to warm up and stabilize per KDB 971168 D01 and ANSI C63.26.

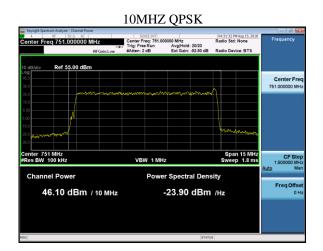
Power measurements were made with a broadband Power Meter in the average mode. Before the testing was started, the Base Station was given a sufficient "warm-up" period as required.

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

Channel Frequency MHz	Signal BW MHz	Modulation	Channel Power dBm
748.5	5	64QAM	46.31
		256QAM	46.30
		QPSK+16QAM	46.25
751	10	QPSK	46.10
753.5	5	64QAM	46.16
		256QAM	46.19
		QPSK+16QAM	46.39

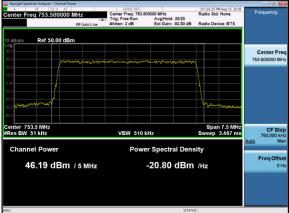
Tabular Data - Channel RF Power	•
---------------------------------	---

### 2.1.1 Channel RF Power - Sample Plots.



enter Freq 7	nalyzer - Channel 50 Ω M 48.50000		Center Freq: 748.5	00000 MHz Avg Hold: 20/20 Ext Gain: -52.50 dB	02:05:54 PM Aug 15, 2018 Radio Std: None Radio Device: BTS	Frequency
0 dB/div R	ef 50.00 d					
		*****	an a			Center Fre 748.500000 MH
Center 748.5 F Res BW 51 k			VBW 510	kHz	Span 7.5 MHz Sweep 3.467 ms	CF Ste 750.000 kł <u>Auto</u> Mł
Channel F 46.3		n / 5 MHz		er Spectral Dens -20.68 dBm		Freq Offs 0 F

5MHz 256QAM



PUBLIC

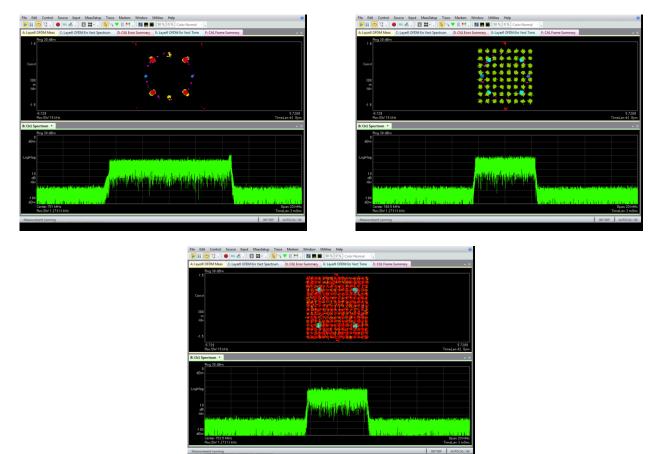
## **3.** FCC Section **2.1047** - Modulation Characteristics

### 3.1 Modulation Characteristics

The RF signal at the antenna port was demodulated and verified for correctness of the modulation signal used before each test was performed. Other modulations were tested as demonstrated in constellation plots below.

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

### 3.1.1 Modulation Characteristics – Sample Plots.



## 4. FCC Section 2.1049 – Occupied Bandwidth

### 4.1 Occupied Bandwidth

#### In 47CFR 2.1049 the FCC requires:

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

This required measurement is the 99% Occupied Bandwidth, also called the designated signal bandwidth and needs to be within the parameters of the products specified emissions designator. The -26 dB bandwidth values were also recorded.

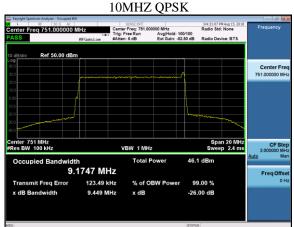
During these measurements it is customary to evaluate the Edge of Band emissions at block/band edges.

The transmitted signal occupied bandwidth was measured using a Keysight MXA Signal Analyzer. All emissions were within the parameters as previously filed. Sample Charts are below.

Channel Frequency	Signal BW	Modulation	OBW
MHz	MHz		MHz
748.5	5	64QAM	4.5089
		256QAM	4.5071
		QPSK+16QAM	4.4757
751	10	QPSK	9.1747
753.5	5	64QAM	4.5012
		256QAM	4.5051
		QPSK+16QAM	4.4836

Tabular	Data –	Occupied	Bandwidth

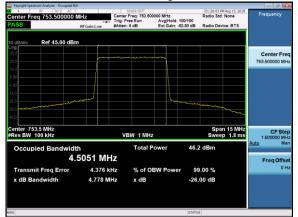
### 4.1.1 Occupied Bandwidth – Sample Plots.



#### 5MHz 64QAM 02:05:32 PM Aug 15, Radio Std: None ea 748.5 Center Freq: 748.500000 MHz Trig: Free Run Avg|H e: BTS Ref 45.00 dBm Center Fre 748.500000 MH Center 748.5 MHz #Res BW 100 kHz Span 15 MHz Sweep 1.8 ms VBW 1 MHz



5MHz 256QAM



#### 4.2 Occupied Bandwidth/ Edge of band Emissions

The Edge of Band emissions of the EUT at the external antenna connector (EAC) were measured using a Keysight MXA Signal Analyzer. The RF power level was continuously measured using a RF broadband power meter. The RF output from the EAC port to spectrum analyzer was reduced (to an amplitude usable by the spectrum analyzer) by using a calibrated attenuator and test coupler. The path attenuation was offset on the display and the signal for single carrier was adjusted to the corrected RF power level for the resolution bandwidth used for the transmit signal. All mask values were adjusted based upon the designated signal bandwidth and measurement bandwidths. The Top of Mask corresponds to the set rated power level as confirmed by the RF power meter.

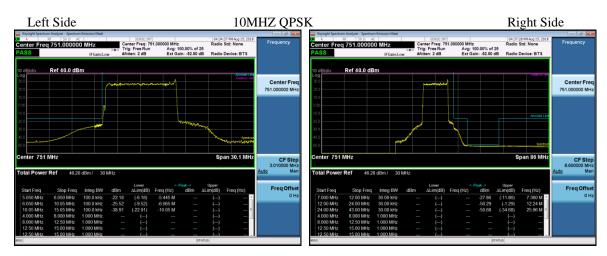
#### 4.2.1 Occupied Bandwidth Results.

The Occupied Bandwidth was measured for all three modulations, at each signal bandwidth and at left center and right side of band. The mask on the plots meet the Block Edge requirements as specified in 47CFR 27.53.

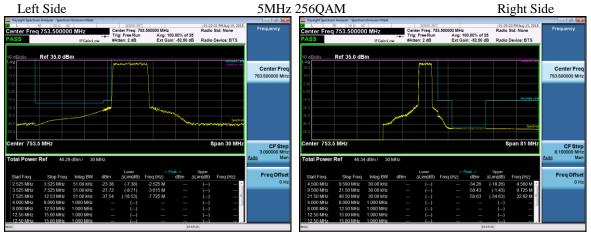
All of the measurements met the requirements of Part 27.53 when measured per Part 2.1049.

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

### 4.2.2 Edge of band Emissions - Sample Plots.







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

#### 5.1 Measurement of Spurious Emissions at Transmit Antenna Port

Spurious Emissions at the transmit-antenna terminals were investigated over the frequency range of 10 MHz to beyond the 10th harmonic of the specific transmit band. For this band of operation, the measurements were performed up to 13 GHz. Measurements were made using a Keysight MXA Signal Analyzer. The RF output from the transmitter was reduced (to an amplitude usable by the receivers) using calibrated attenuators. The RF power level was continuously monitored via a coupled RF Power Meter.

The required emission limitation is specified as appropriate in 27.53. The measured spurious emission levels were plotted for the frequency range as specified in 2.1057. There were no reportable emissions. Data below documents performance up to 13 GHz.

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

### 5.1.1 Sample Plots – Spurious Emissions at Tx Port

#### 751MHz, 10MHZ, QPSK

nter F		50 Ω▲DC 000000 MHz IEGain:	Center Fr Trig: Free		Radio St 10/10	PM Aug 15, 2018 d: None evice: BTS	Frequency
dB/div	Ref 0.	.00 dBm	Low #Atten. o	ub Ext Gain.	16	.551 kHz 636 dBm	
							Center Fre 751.000000 MH
	1						
	(helene				and the place of the barriers.	ingitan panin National paning	
art 9 k						op 150 kHz FFT	CF Ste 8.600000 MH Auto Ma
art 9 k Spur	Range	Frequency	Amplitude	Limit	Δ Limit		8.600000 MH
art 9 k Spur 1	Range 1	16.55 kHz	-47.64 dBm	-16.00 dBn	∆ Limit n -31.64 dB		8.600000 MH
art 9 k Spur 1 2	Range 1 1	16.55 kHz 16.48 kHz	-47.64 dBm -48.85 dBm	-16.00 dBn -16.00 dBn	Δ Limit n -31.64 dB n -32.85 dB		8.600000 MH <u>Auto</u> Ma
art 9 k Spur 1 2 3	Range 1 1 1	16.55 kHz 16.48 kHz 13.92 kHz	-47.64 dBm -48.85 dBm -48.91 dBm	-16.00 dBn -16.00 dBn -16.00 dBn	Δ Limit n -31.64 dB n -32.85 dB n -32.91 dB		8.600000 Mi Auto Ma
art 9 k Spur 1 2 3 4	Range 1 1	16.55 kHz 16.48 kHz	-47.64 dBm -48.85 dBm	-16.00 dBn -16.00 dBn	Δ Limit n -31.64 dB n -32.85 dB n -32.91 dB n -33.06 dB		8.600000 MH Auto Ma
art 9 k Spur 1 2 3	Range 1 1 1 1	16.55 kHz 16.48 kHz 13.92 kHz 13.56 kHz	-47.64 dBm -48.85 dBm -48.91 dBm -49.06 dBm	-16.00 dBn -16.00 dBn -16.00 dBn -16.00 dBn	Δ Limit n -31.64 dB n -32.85 dB n -32.91 dB n -33.06 dB n -33.12 dB		8.600000 Mi Auto Ma

asg UFile <Spurious\_0\_to\_0.state> saved

enter F AIL		000000 MHz IFGain:	Center Fr Trig: Free	Run	000000 MHz Avg Hold: 1 Ext Gain: -5		Radio Ste	PM Aug 15, 2018 d: None vice: BTS	Frequency
5 dB/div	Ref 4	0.00 dBm						.66 MHz 13 dBm	
10.0									Center Fre 751.000000 MH
80.0 16.0						$\mathbb{A}$			
10.0 <b>******</b>		and Colora Bandinan di Kalana (C	annan IV. y Sanna Lapaini a		alaan Astoriaalaa Aadaa ahaa				
6.0									
tart 30	MHz						6	top 1 GHz	CF Ste 8.600000 MH
Spur	Range	Frequency	Amplitude		Limit		∆ Limit		Auto Ma
1	1	755.7 MHz	32.41 dBm		-16.00 dBm	48	3.41 dB	<u>^</u>	
2		750.6 MHz	26.28 dBm		-16.00 dBm		2.28 dB		Freq Offs
3		749.0 MHz	25.90 dBm		-16.00 dBm		1.90 dB		01
4	1	748.3 MHz	25.66 dBm		-16.00 dBm		1.66 dB		
5	1	754.3 MHz	25.57 dBm		-16.00 dBm		1.57 dB		
6	1	752.6 MHz	25.38 dBm		-16.00 dBm		1.38 dB		
7	1	754.5 MHz	25.36 dBm		-16.00 dBm	41	1.36 dB	~	

Tx Exempt

enter F		000000 MHz	Trig: Free Ru	751.000000 MHz		Frequency
dB/div	Ref 0	.00 dBm			3.1354 GHz -18.334 dBm	
9		<b>♦</b> 1				Center Free
0	and the second division of				Station of the local division of the local d	751.000000 MH
5						
0						
.5						
art 1 G	Hz				Stop 13 GHz	CF Step 8.600000 MH
Spur	Range	Frequency	Amplitude	Limit	∆ Limit	Auto Ma
1	1	3.135 GHz	-18.33 dBm	-16.00 dBm	-2.334 dB 📫	Ener Offer
2	1	12.91 GHz	-18.83 dBm	-16.00 dBm	-2.827 dB	Freq Offse
3	1	12.84 GHz	-18.83 dBm	-16.00 dBm	-2.832 dB	on
4 5	1 1	12.97 GHz 3.168 GHz	-18.84 dBm -19.05 dBm	-16.00 dBm -16.00 dBm	-2.838 dB -3.047 dB	
5 6	1	3.168 GHZ 12.49 GHZ	-19.05 dBm -19.17 dBm	-16.00 dBm	-3.047 dB	
	1	12.76 GHz	-19.20 dBm	-16.00 dBm	-3.200 dB	

748.5MHz, 5MHz, 64QAM



Keysight Spectrum An	alyzer - Spurious Emissions					- 4 🔜
L RF	50 Ω AC		SE:INT eg: 751.000000 MHz	04:41:42 Radio St	PM Aug 15, 2018	Frequency
PASS		Trig: Free	Run Avg Hold	10/10		
PA55	IFGair	:Low #Atten: 2	dB Ext Gain:		vice: BTS	
					.53 MHz	
	ef 0.00 dBm			-40.3	314 dBm	
15.0						Center Fred
30.0 1						751.000000 MH:
45.0 Aller Westernet Line	and the second states of the second	where a day the barry of dataset	a more the starting of a	a lana a tanàna mandritra dia		751.000000 MPI.
60.0	et an a star and a star and a star and a star and a star a st	in a collige of the last to a	واردام والمعاومة والاراد والمراد والمراد	and the second	a a a a a a a a a a a a a a a a a a a	
75.0						
-90.0						
-105						
-120						
-135						
Start 763 MHz				Stor	305 MHz	
start 705 WHZ				310	5 805 WHZ	CF Step 8.600000 MH
						Auto Mar
Spur Rang		Amplitude	Limit	Δ Limit		
1 1	764.5 MHz	-40.31 dBm	-37.00 dBr		<u></u>	
2 1	767.8 MHz	-40.42 dBm	-37.00 dBr	n -3.423 dB		Freq Offse
3 1	778.8 MHz	-40.52 dBm	-37.00 dBr		-	0 H:
4 1	764.4 MHz	-40.64 dBm	-37.00 dBr			
5 1	782.5 MHz	-40.76 dBm	-37.00 dBr			
6 1	771.2 MHz	-40.85 dBm	-37.00 dBr			
7 1	763.6 MHz	-40.92 dBm	-37.00 dBr	n -3.923 dB	~	
isg 🤣 File <spurio< td=""><td>us_763_to_805.state&gt;</td><td>saved</td><td></td><td>STATUS</td><td></td><td></td></spurio<>	us_763_to_805.state>	saved		STATUS		

#### **Global Product Compliance Laboratory** Report No.: TR-2018-0085-FCC2-27 Product: UHBC-Comscope TRDU 2x40W-07U

🔤 Keysight Sp		Spurious Emissions					
Center F		50 Ω▲ DC 500000 MHz IFGain	Center Fr Trig: Free		Radio St 10/10	PM Aug 15, 2018 d: None wice: BTS	Frequency
10 dB/div	Ref 0	.00 dBm				.508 kHz I35 dBm	
-10.0							Center Freq 748.500000 MHz
30.0 40.0 50.0	1						
60.0 <b></b>	the second				with the second second		
90.0							
Start 9 k	Hz				Sto	p 150 kHz FFT	CF Step 5.00000 MHz Auto Man
Spur	Range	Frequency	Amplitude	Limit	∆ Limit		Auto Mari
1		16.51 kHz	-47.13 dBm	-16.00 dBn		<u></u>	
2		16.35 kHz	-47.52 dBm	-16.00 dBn			Freq Offset
3	1	16.32 kHz	-48.03 dBm	-16.00 dBn		-	0 Hz
4	1	16.60 kHz	-48.48 dBm	-16.00 dBn			
5	1	13.79 kHz	-49.15 dBm	-16.00 dBn			
6 7	1 1	13.43 kHz 13.07 kHz	-49.20 dBm -49.35 dBm	-16.00 dBn -16.00 dBn			

ASG VFile <Spurious\_0\_to\_0.state> saved

ter Freq 748.500000 MHz 02:08:03 PM Aug 15, 2 Radio Std: None 748.50 Avg|H Ext G Radio Device: BTS 748.82 M 30.067 d Ref 0.00 dBm Center Fr 748.500000 Mi 30 M Stop 1 GH CF Step 5.000000 MH Ma Δ Limit 46.07 dB 45.87 dB 45.20 dB 45.16 dB 44.95 dB 44.88 dB -12.55 dB Limit Spur Amplitu Freq Offse 0 H 746.6 MH 28.95 dBr -16.0 748.3 MH 28.88 dBn -28.55 dBi -16.00 753.2 MH

MSG VFile <Spurious\_30\_to\_1000.state> s

Tx Exempt

enter F		50 Q AC 500000 MHz IFGain:1	Trig: Free Ru	748.500000 MHz		8 Frequency
dB/div	Ref 0	.00 dBm			12.836 GH -18.743 dBn	
				(networks) and a second s		Center Free 748.500000 MH
1.0 <b></b>	a a de la constitución de la const	الكريطيني يتتبيكا بالك	تغلبت والمعالية الخطا المالية الم	and and spice in a statistics of the second		
art 10	Hz				Stop 13 GH	2 CF Step 5.000000 MH
Spur	Range	Frequency	Amplitude	Limit	∆ Limit	<u>Auto</u> Mar
1		12.84 GHz	-18.74 dBm	-16.00 dBm	-2.743 dB	Freq Offse
2	1	3.157 GHz 12.02 GHz	-18.80 dBm -19.03 dBm	-16.00 dBm -16.00 dBm	-2.804 dB -3.027 dB	OH
3	1	12.02 GHz	-19.03 dBm	-16.00 dBm	-3.146 dB	
5	1	12.76 GHz	-19.29 dBm	-16.00 dBm	-3.293 dB	
6	1	12.83 GHz	-19.45 dBm	-16.00 dBm	-3.450 dB	
7	1	12.88 GHz	-19,50 dBm	-16.00 dBm	-3,498 dB	



nter F SS	RF S	- Spurious Emissions 50 Q AC 500000 MHz IEGain:	Center From Trig: Free			ne Trace/Detecto
		IFGain:	Low #Atten: 2	uB Ext Gain03.		
					765.87 -41.051	
B/div	Rei U	.00 dBm			41.001	
L						
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	<b>\</b>					
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τ /6	3 MHz				Stop 80	5 MHZ
Spur	Range	Frequency	Amplitude	Limit	∆ Limit	
		765.9 MHz	-41.05 dBm	-37.00 dBm	-4.051 dB	<u> </u>
		788.2 MHz	-41.07 dBm	-37.00 dBm	-4.067 dB	
		768.4 MHz	-41.12 dBm	-37.00 dBm	-4.124 dB	£
		779.4 MHz	-41.14 dBm	-37.00 dBm	-4.143 dB	
		781.3 MHz	-41.18 dBm	-37.00 dBm	-4.176 dB	
	1	788.0 MHz	-41.27 dBm	-37.00 dBm	-4.267 dB	

#### **Global Product Compliance Laboratory** Report No.: TR-2018-0085-FCC2-27 Product: UHBC-Comscope TRDU 2x40W-07U

#### 753.5MHz, 5MHz, 256QAM

lech Att		- Spurious Emissions 50 Q 🔥 DC   IFGain:	Trig: Free Ru	753.500000 MHz	Radio Std: 0		File
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itart 9 k						150 kHz FFT	Restore
	Range	Frequency	Amplitude	Limit	∆ Limit		
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1	1	16.32 kHz	-49.16 dBm	-16.00 dBm	-33.16 dB	<u> </u>	
1 2	1	16.42 kHz	-49.29 dBm	-16.00 dBm	-33.29 dB	Â	Minimize
1 2 3	1 1	16.42 kHz 16.61 kHz	-49.29 dBm -49.31 dBm	-16.00 dBm -16.00 dBm	-33.29 dB -33.31 dB	=	- Minimiz
1 2 3 4	1 1 1	16.42 kHz 16.61 kHz 16.37 kHz	-49.29 dBm -49.31 dBm -50.47 dBm	-16.00 dBm -16.00 dBm -16.00 dBm	-33.29 dB -33.31 dB -34.47 dB	=	- Minimiz
1 2 3 4 5	1 1 1 1	16.42 kHz 16.61 kHz 16.37 kHz 16.51 kHz	-49.29 dBm -49.31 dBm -50.47 dBm -50.72 dBm	-16.00 dBm -16.00 dBm -16.00 dBm -16.00 dBm	-33.29 dB -33.31 dB -34.47 dB -34.72 dB		Minimiz
1 2 3 4	1 1 1	16.42 kHz 16.61 kHz 16.37 kHz	-49.29 dBm -49.31 dBm -50.47 dBm	-16.00 dBm -16.00 dBm -16.00 dBm	-33.29 dB -33.31 dB -34.47 dB	с Ш	_

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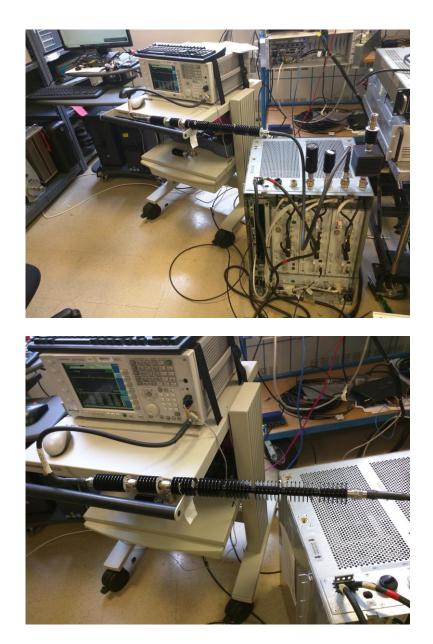
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L		- Spurious Emissions 50 Q AC	Center Fre	SE:INT eg: 753.500000 MHz	Radio St	PM Aug 15, 2018 d: None	File
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1	1	12.78 GHz	-18.64 dBm	-16.00 dBm		÷.	
2	1	12.69 GHz	-18.66 dBm	-16.00 dBm	-2.664 dB		Minimize
3	1	12.82 GHz	-18.93 dBm	-16.00 dBm		-	_
4	1	12.48 GHz	-19.12 dBm	-16.00 dBm			
5 6	1 1	12.74 GHz 12.82 GHz	-19.17 dBm -19.23 dBm	-16.00 dBm -16.00 dBm	-3.171 dB -3.232 dB		Z Exi
6 7	1	12.82 GHz 12.40 GHz	-19.23 dBm -19.29 dBm	-16.00 dBm -16.00 dBm		-	
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01:21:26 PM Aug 15 Radio Std: None 753.5 n 8 dE Avg|H Ext G Radio Device: BTS File Explorer.. 150.00 kl -67.701 dB Ref 0.00 dBm Page Setup Print. Stop 30 MHz FFT nt 150 kHz Restor ∆ Limit -51.70 dE Limit Spur Range Freq 150.0 Amplitude -16.00 di Minimia Exi

L		- Spurious Emissions 10 Ω AC IIFGain:	Center Fr Trig: Free	Run	00000 MHz Avg Hold: 10/ Ext Gain: -53.	Radio St 10	PM Aug 15, 2018 cd: None evice: BTS	~	File File
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Spur	Range	Frequency	Amplitude		Limit	Δ Limit		_	2011
1 2	1	792.5 MHz 771.2 MHz	-35.60 dBm -36.12 dBm		-37.00 dBm -37.00 dBm	1.403 dB 0.882 dB	<u> </u>		
3	1	771.2 MHZ 765.0 MHz	-36.12 dBm -36.19 dBm		-37.00 dBm -37.00 dBm	0.882 dB 0.809 dB			Minimiz
4	1	799.9 MHz	-36.40 dBm		-37.00 dBm	0.603 dB			
5		763.6 MHz	-36.48 dBm		-37.00 dBm	0.521 dB			
6		795.5 MHz	-36.64 dBm		-37.00 dBm	0.364 dB		X	Ex
7	1	782.7 MHz	-36.67 dBm		-37.00 dBm	0.334 dB	*		
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### Photographs



#### **Global Product Compliance Laboratory** Report No.: TR-2018-0085-FCC2-27 Product: UHBC-Comscope TRDU 2x40W-07U

### **Test Equipment**

Asset ID	Manufacturer	cturer Type Description		Model	Serial	Calibration Date	Calibration Due	Calibration Type	Status
<u>E831</u>	Agilent Technologies	MXA Signal Analyzer	20Hz-26.5GHz	N9020A	MY48011791	2018-02-15	2020-02-15	Requires Calibration	Active
<u>E1005</u>	Weinschel	Attenuator	20 dB DC-18GHz 25W	46-20-34-LIM	BN3127			CNR, Must Be Verified	Active
<u>E1272</u>	Weinschel	Attenuator	30 dB / 150 W	66-30-33	BV2473			CNR, Must Be Verified	Active
<u>E1250</u>	Weinschel	Attenuator	3dB Attenuator 100W	24-3-43	BB9072			CNR, Must Be Verified	Active

CNR = Calibration Not Required

### 6. FCC Section 2.1053

#### 6.1 Section 2.1053 Field Strength of Spurious Emissions

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

The spectrum from 30 MHz to beyond the tenth harmonic of the carrier, 8 GHz, was searched for spurious radiation. Measurements were made using both horizontally and vertically polarized broadband antennas. Per FCC regulations, the comparison of out of band spurious emissions directly to the limit is appropriately made using the substitution method. However, when the emissions are more than 20 dB below the specification limit, the use of field strength measurements for compliance determination is acceptable and those emissions are considered not reportable (Section 2.1053 and the FCC Interpretive database for 2.1053). For this case the evaluation of acceptable radiated field strength is as follows.

### 6.2 Field Strength of Spurious Emissions - Limits

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

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

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

Where:

E = Field Intensity in Volts/meter P = Transmitted Power in Watts

R = Measurement distance in meters = 3 m

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

The calculated emission levels were found by:

 $Measured \ level \ (dB\mu V) + Cable \ Loss(dB) + Antenna \ Factor(dB) = Field \ Strength \ (dB\mu V/m)$ 

#### RESULTS:

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

### 7. NVLAP Certificate of Accreditation

