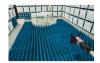


ELEMENT WASHINGTON DC LLC

7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. 410.290.6652 / Fax 410.290.6654 http://www.element.com



PART 20 & 30 MEASUREMENT REPORT

Applicant Name:

Pivotal Commware 10801 120th Ave NE #200, Kirkland, WA 98033 United States Date of Testing: 02/24/2022-04/14/2022 Test Report Issue Date: 04/18/2022 Test Site/Location: Element Lab., Columbia, MD, USA Test Report Serial No.: 1M2202210020-02.2AUVU

FCC ID: APPLICANT:

2AUVU-ESB261

Pivotal Commware

Application Type:	Certification
Model:	ESBoost-n261
EUT Type:	5G mmWave Repeater
FCC Classification(s):	Part 20 Industrial Booster (CMRS) (B2I)
FCC Rule Part(s):	2, 20, 30
Test Procedure(s):	ANSI C63.26-2015, KDB 842590 D01 v01r02, KDB 935210 D02 v04r02, KDB 935210 D05 v01r04

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

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

RJ Ortanez Executive Vice President



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PART 20 & 30 MEASUREMENT REPORT

						E	RP		
Band	Ant. Pol.	Bandwidth (MHz)	CCs Active	FCC Rule Part	Tx Frequency (MHz)	Max. Power (W)	Max. Power (dBm)	Emission Designator	Modulation
n261	MIMO	50	1	30	27500 - 28350	0.586	27.68	46M1G7D	QPSK
n261	MIMO	50	1	30	27500 - 28350	0.531	27.25	46M0W7D	16QAM
n261	MIMO	100	4	30	27500 - 28350	0.624	27.95	398MG7D	QPSK
n261	MIMO	100	4	30	27500 - 28350	0.527	27.22	398MW7D	16QAM

EUT Overview (Band n261 - IDU)

						EI	RP		
Band	Ant. Pol.	Bandwidth (MHz)	CCs Active	FCC Rule Part	Tx Frequency (MHz)	Max. Power (W)	Max. Power (dBm)	Emission Designator	Modulation
n261	Н	50	1	30	27500 - 28350	1.377	31.39	46M0G7D	QPSK
n261	V	50	1	30	27500 - 28350	1.303	31.15	46M0W7D	16QAM
n261	Н	100	4	30	27500 - 28350	1.122	30.50	398MG7D	QPSK
n261	V	100	4	30	27500 - 28350	1.107	30.44	396MW7D	16QAM

EUT Overview (Band n261 - ODU)

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1.0 INTRODUCTION

1.1 Scope

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

1.2 Element Test Location

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

1.3 Test Facility / Accreditations

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

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

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Pivotal Commware 5G mmWave Repeater FCC ID: 2AUVU-ESB261**. The test data contained in this report pertains only to the emissions due to the EUT's 5G mmWave function.

The EUT is a two-unit repeater system consisting of an Outdoor Unit (ODU) and an Indoor Unit (IDU). Each unit is mounted on opposite sides of low emissivity glass. Both units are required for operation as neither can be operated in a standalone mode.

Both units are capable of transmitting boosted 5G mmWave signals. For transmission of such signals, the ODU has a holographic beam-forming antenna and the IDU has an open-ended waveguide horn antenna. For each unit, the antenna configuration is comprised of two separate linearly polarized antenna feeds: one for horizontally polarized transmission and one for vertically polarized transmission. For IDU 5G mmWave transmission, the input feeds are located on the ODU. These feeds are labelled as "H-DL" and "V-DL." For ODU 5G mmWave transmission, the input feeds are located on the IDU and are labelled as "H-UL" and "V-UL."

The EUT supports any combination of bandwidths, number of carriers, and modulations as input signals. It will transmit all signals within the 5G NR n261 band that are received.

Test Device Serial No.: 600024, 700027

2.2 Device Capabilities

This device contains the following capabilities:

5G FR2 (NR Band n261), LTE Cat M1 (Band 13), Bluetooth, BLE

The integrated modules providing LTE Cat M1 capability (FCC ID: 2AUVU-UBR410M) and Bluetooth/BLE capability (FCC ID: Z64-WL18SBMOD) have been authorized in separate filings.

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015 and KDB 842590 D01 and KDB 935210 D05. See Section 7.0 of this test report for a description of the conducted and radiated tests.

All conducted testing was performed using a signal generator connected via coaxial cable to waveguide adapters on the input port of one unit of the EUT and measured via adapter connected to coaxial cable from the output port of the other unit. All radiated testing was performed by using a signal generator connected to a horn antenna to transmit to one unit of the EUT and then measuring the radiated output transmission from other unit.

For both conducted and radiated testing, the signal generator was set to transmit representative 5G mmWave NR signals in various sized bandwidths and modulations.

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2.4 Software and Firmware

The test was conducted with firmware version 1.6.0 installed on the EUT.

2.5 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Measurement Procedure

The measurement procedures described in the document titled "American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services" (ANSI C63.26-2015) and the guidance provided in KDB 842590 D01 v01r02 were used in the measurement of the EUT. KDB 935210 D05 v01r04 was referenced for testing the EUT as well.

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary for radiated emissions measurements in the spurious domain. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m for measurements above 1GHz.

If direct measurements of radiated power (EIRP) were required, they were performed in a full anechoic chamber (FAC) conforming to the site validation requirements of CISPR 16-1-4. Radiated spurious emission measurements from 30MHz - 18GHz were performed in a semi anechoic chamber (SAC) conforming to the site validation requirements of CISPR 16-1-4. A positioner was used to manipulate the EUT through several positions in space by rotating about the roll axis as shown in the figure below. The positioner was mounted on top of a turntable bringing the total EUT height to 1.5m.

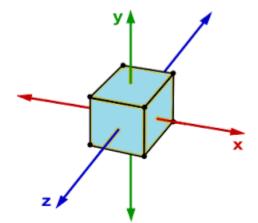


Figure 3-1. Rotation of the EUT Through Three Orthogonal Planes

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The equipment under test was transmitting while connected to its patch or HBF antenna and is placed on a positioner. The measurement antenna is in the far field of the EUT per formula $2D^2/\lambda$ where D is the larger between the dimension of the measurement antenna and the transmitting antenna of the EUT. In this case, "D" is the largest dimension of the measurement antenna. The EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

Frequency Range (GHz)	Wavelength(cm)	Far Field Distance (m)	Measurement Distance (m)
18-40	0.749	0.54	1.00
40-60	0.500	1.39	1.50
60-90	0.333	0.91	1.00
90-140	0.214	0.58	1.00
140-200	0.150	0.39	1.00

Table 3-1. Far-Field Distance & Measurment Distance per Frequency Range

If direct measurements of radiated power levels are required, the power levels are investigated while the receive antenna is rotated through all angles to determine the worst case (i.e. maximized) polarization/positioning. The maximized power level is recorded using the spectrum analyzer's "Channel Power" function with the integration bandwidth set to at least the emissions' occupied bandwidth. The EIRP is calculated from the raw power level measured with the spectrum analyzer using the formulas shown below.

Effective Isotropic Radiated Power Sample Calculation

The measured e.i.r.p is converted to E-field in V/m. Then, the distance correction is applied before converting back to calculated e.i.r.p, as explained in ANSI C63.26-2015.

Field Strength [dB μ V/m]	= Measured Value [dBm] + AFCL [dB/m] + 107
	= - 32.74 dBm + (40.7dB/m + 8.78dB) + 107 = 123.74dBuV/m
	= 10^(123.74/20)/1000000 = 1.54 V/m
e.i.r.p. [dBm]	= 10 * log((E-Field*D _m)^2/30) + 30dB
	= 10*log((1.54V/m * 1.00m)^2/30) + 30dB

= 18.98 dBm e.i.r.p.

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3.3 Industrial Booster Test Cases

Per the requirements of KDB 935210 D05 v01r04, the following test cases shall be investigated for Industrial Boosters under FCC Part 20.21:

- 1. AGC Threshold Level
- 2. Out-of-Band Rejection
- 3. Input-versus-Output Signal Comparison
- 4. Mean Output Power and Amplifier/Booster Gain
- 5. Out-of-Band/Out-of-Block Emissions and Spurious Emissions
- 6. Frequency Stability
- 7. Radiated Spurious Emissions

3.4 Environmental Conditions

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

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to an accredited ISO/IEC 17025 calibration facility. Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
N/A	ETS-001	EMC Cable and Switch System	12/9/2021	Annual	12/9/2022	ETS-001
N/A	ETS-002	EMC Cable and Switch System	12/10/2021	Annual	12/10/2022	ETS-002
Sunol Sciences	JB5	Bi-Log Antenna (30M-5GHz)	7/27/2020	Biennial	7/27/2022	A051107
ETS-Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
EMCO	3116	Horn Antenna (18-40GHz)	7/20/2021	Biennial	7/20/2023	9203-2178
Narda	180-422-KF	Horn (Small)	11/5/2020	Biennial	11/5/2022	U157403-01
Virginia Diodes, Inc.	SAX679	SAX Module (40 - 60GHz)	8/28/2020	Biennial	8/28/2022	SAX679
Virginia Diodes, Inc.	SAX680	SAX Module (60 - 90GHz)	8/14/2020	Biennial	8/14/2022	SAX680
Virginia Diodes, Inc.	SAX681	SAX Module (90 - 140GHz)	10/22/2020	Biennial	10/22/2022	SAX681
OML, Inc.	M19RH	Horn Antenna (40 - 60GHz)	10/12/2021	Biennial	10/12/2023	17111701
OML, Inc.	M12RH	Horn Antenna (60 - 90GHz)	11/16/2021	Biennial	11/16/2023	17111701
OML, Inc.	M08RH	Horn Antenna (90 - 140GHz)	10/6/2021	Biennial	10/6/2023	17111701
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/3/2021	Annual	8/3/2022	100342
Rohde & Schwarz	FSV40-N	Spectrum Analyzer	1/14/2021	Annual	4/14/2022	101814
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/25/2021	Annual	8/25/2022	103200
Rohde & Schwarz	SMW200A	Vector Signal Generator	N/A		109456	
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	N/A			165450

Table 5-1. Test Equipment

Notes:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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6.0 SAMPLE CALCULATIONS

Emission Designator

π/2 BPSK/ QPSK Modulation

Emission Designator = 800MG7D

BW = 800 MHz

- G = Phase Modulation
- 7 = Quantized/Digital Info
- D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 802MW7D

BW = 802 MHz W = Amplitude/Angle Modulated 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

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7.0 TEST RESULTS

7.1 Summary

Company Name:	Pivotal Commware
FCC ID:	2AUVU-ESB261
FCC Classification(s):	Part 20 Industrial Booster (CMRS) (B2I)
Mode(s):	TDD

FCC Part Section(s)	KDB 935210 D05 Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049, 20.21	3.4	Input-Versus-Output Signal Comparison	NA	CONDUCTED	PASS	Section 7.2
20.21	3.3	Out-of-band Rejection	NA		PASS	Section 7.3
2.1046, 20.21	3.2, 3.5	Measuring AGC Threshold Level, Mean Output Pow er & Amplifier/Booster Gain	NA		PASS	Section 7.4
2.1049	-	Occupied Bandw idth	NA		PASS	Section 7.5
2.1046, 30.202(c)	-	Conducted Pow er & Equivalent Isotropic Radiated Pow er	≤ 55 dBm		PASS	Section 7.6
2.1051, 20.21, 30.203	3.6	Band Edge / Out-of-Band Emissions	 ≤ -5dBm/MHz from the band edge up to 10% of the channel BW ≤-13dBm/MHz for all out-of-band emissions 		PASS	Section 7.8
2.1055, 20.21	3.7	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 7.9
2.1051, 20.21, 30.203	3.8	Radiated Spurious Emissions	≤ -13 dBm/MHz for spurious emissions	RADIATED	PASS	Section 7.7

Table 7-1. Summary of Radiated Test Results

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Notes:

- 1. Per 2.1057(a)(2), spurious emissions were investigated up to 100GHz.
- Testing was completed with a signal generator creating a representative mmWave 5G NR signal, using DFTs-OFDM and CP-OFDM schemes, various modulations including QPSK, and QAM, 120kHz subcarrier spacing, 50MHz-single carrier, 50MHz-dual carrier, and 100MHz-four carrier bandwidths, and full and single resource block allocations.
- 3. The input signal was fed from the signal generator to the EUT via a coaxial cable and it was set at a level so as to produce the maximum output power of the AGC range.
- 4. Based upon investigations of all possible modulations, testing was mainly performed with QPSK modulation.
- 5. Unless otherwise specified, triggering from the signal generator was used in order to more accurately gate on the TDD signal with the analyzer.
- 6. For conducted testing only, the EUT was fitted with waveguide-to-coax RF adapters that allowed for direct measurements. With the exception of radiated spurious emissions, all measurements were performed in a conducted test setup.
- 7. Per the guidance of KDB 644041, conducted spurious emission measurements were not applicable due to the design of the device with frequency-restrictive waveguides.

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7.2 Input-Versus-Output Signal Comparison

Test Overview

The Input-versus-Output Signal Comparison checks for the change in occupied bandwidth of the output signal from the booster at 3dB above the AGC threshold level and just below the AGC threshold level while not more than 0.5dB below the threshold level. All modes of operation were investigated and the worst case configuration results are reported in this section. Per KDB 935210 D05 clause 3.4, this is to be measured on both the input signal and the output signal.

Test Procedure Used

ANSI C63.26-2015 – Section 5.4.3 KDB 935210 D05 – Section 3.4

Test Settings

- 1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
- 2. RBW = 1 5% of the expected OBW
- 3. VBW \geq 3 x RBW
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep = auto couple
- 7. The trace was allowed to stabilize

Test Notes

1. Per the guidance of KDB 644041, a 50MHz 5G NR mmWave signal was used as the input signal as opposed to the 4.1MHz AWGN required in KDB 935210 D05.

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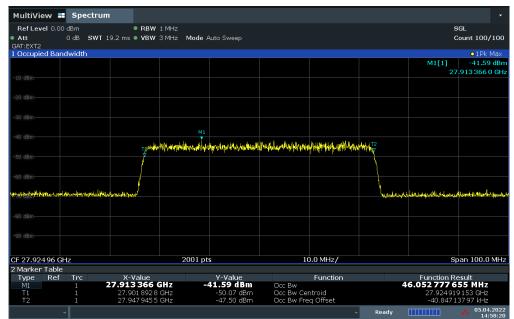
Band n261 - IDU

AGC Threshold Level	EUT Antenna Polarization	Channel	Bandwidth [MHz]	Modulation	Input OBW [MHz]	Output OBW [MHz]
0.5dB below Threshold	H-DL	Mid	50	QPSK	46.05	45.77
3dB above Threshold	H-DL	Mid	50	QPSK	45.82	46.10
0.5dB below Threshold	V-DL	Mid	50	QPSK	46.05	45.75
3dB above Threshold	V-DL	Mid	50	QPSK	45.82	45.89

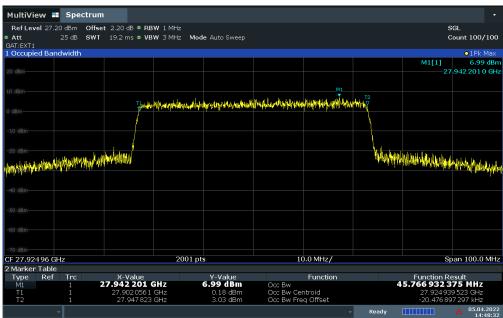
Table 7-2. n261 Occupied Bandwidth by AGC Threshold Level – IDU

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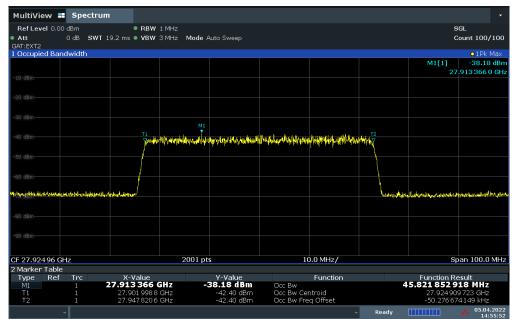
Plot 7-1. Occupied Bandwidth Input at 0.5dB below AGC Threshold – IDU – H-DL Polarization.



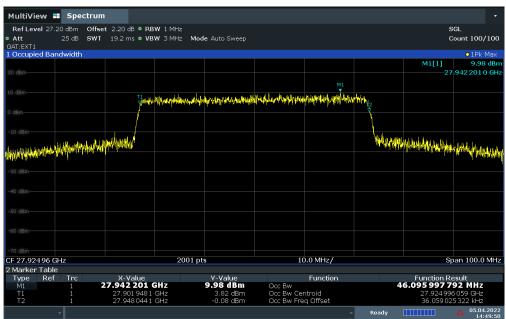
Plot 7-2. Occupied Bandwidth Output at 0.5dB below AGC Threshold – IDU – H-DL Polarization.

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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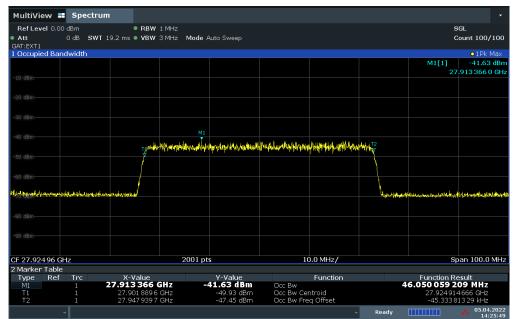
Plot 7-3. Occupied Bandwidth Input at 3dB above AGC Threshold – IDU – H-DL Polarization.



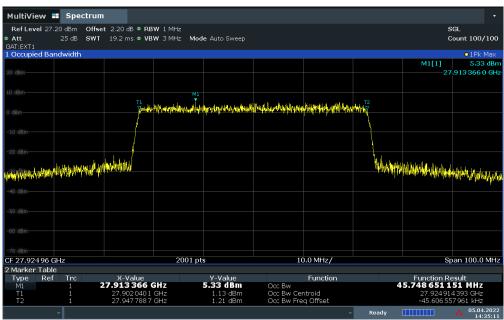
Plot 7-4. Occupied Bandwidth Output at 3dB above AGC Threshold – IDU – H-DL Polarization.

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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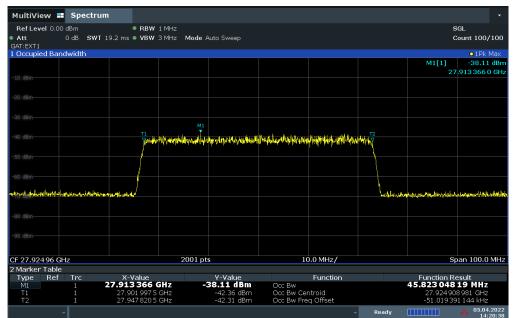
Plot 7-5. Occupied Bandwidth Input at 0.5dB below AGC Threshold – IDU – V-DL Polarization.



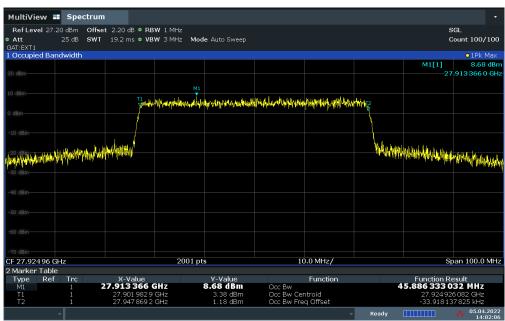
Plot 7-6. Occupied Bandwidth Output at 0.5dB below AGC Threshold – IDU – V-DL Polarization.

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-7. Occupied Bandwidth Input at 3dB above AGC Threshold – IDU – V-DL Polarization.



Plot 7-8. Occupied Bandwidth Output at 3dB above AGC Threshold – IDU – V-DL Polarization.

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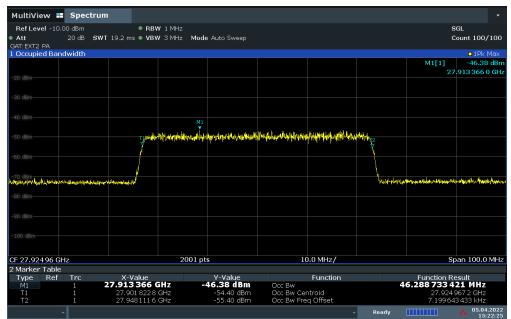
Band n261 - ODU

AGC Threshold Level	EUT Antenna Polarization	Channel	Bandwidth	Modulation	Input OBW [MHz]	Output OBW [MHz]
0.5dB below Threshold	H-UL	Mid	50	QPSK	46.29	45.73
3dB above Threshold	H-UL	Mid	50	QPSK	46.44	45.74
0.5dB below Threshold	V-UL	Mid	50	QPSK	46.57	45.77
3dB above Threshold	V-UL	Mid	50	QPSK	46.66	45.78

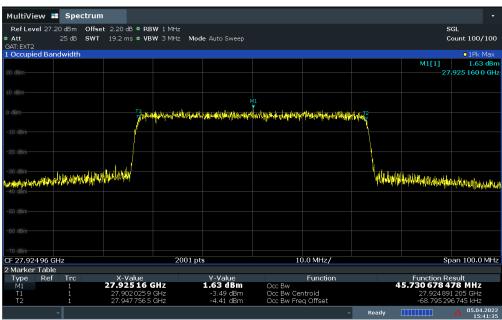
Table 7-3. n261 Occupied Bandwidth by AGC Threshold Level – ODU

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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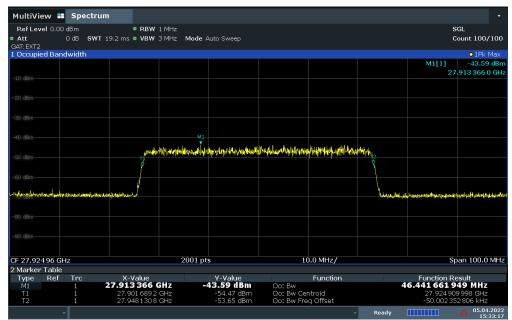
Plot 7-9. Occupied Bandwidth Input at 0.5dB below AGC Threshold – ODU – H-UL Polarization.



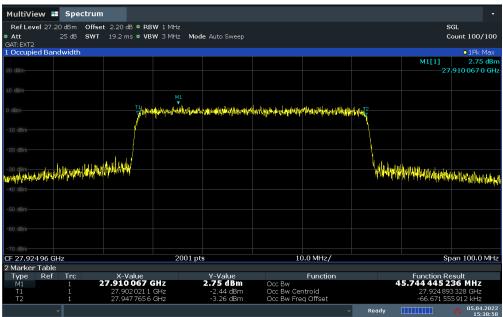
Plot 7-10. Occupied Bandwidth Output at 0.5dB below AGC Threshold – ODU – H-UL Polarization.

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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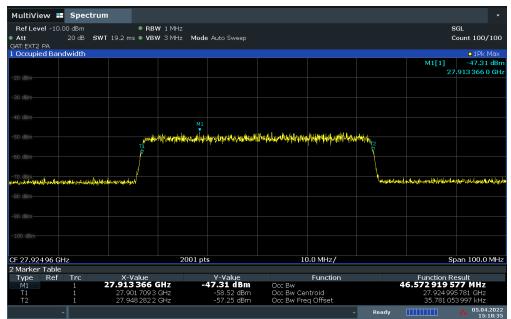
Plot 7-11. Occupied Bandwidth Input at 3dB above AGC Threshold – ODU – H-UL Polarization.



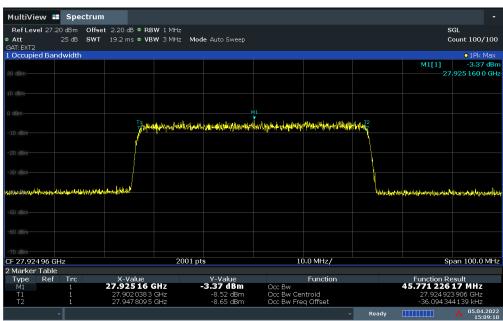
Plot 7-12. Occupied Bandwidth Output at 3dB above AGC Threshold – ODU – H-UL Polarization.

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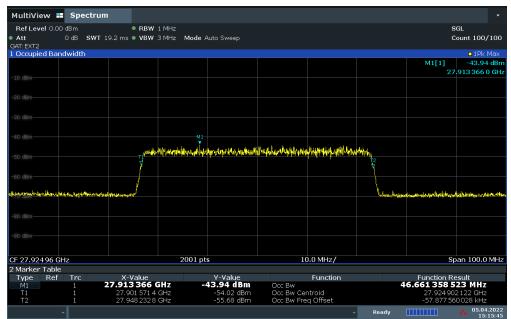
Plot 7-13. Occupied Bandwidth Input at 0.5dB below AGC Threshold – ODU – V-UL Polarization.



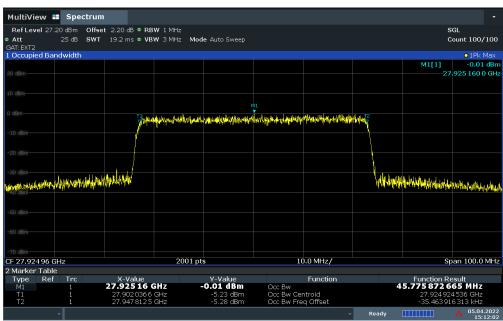
Plot 7-14. Occupied Bandwidth Output at 0.5dB below AGC Threshold – ODU – V-UL Polarization.

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-15. Occupied Bandwidth Input at 3dB above AGC Threshold – ODU – V-UL Polarization.



Plot 7-16. Occupied Bandwidth Output at 3dB above AGC Threshold – ODU – V-UL Polarization.

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7.3 Out-of-band Rejection

Test Overview

A signal generator is set to the input port of the EUT, and the output of the EUT shall be connected to a spectrum analyzer. Per KDB 935210 D05 Section 3.3, the signal generator will sweep a CW signal to ± 250 % of the passband. Per FCC Part 20, an industrial booster shall have its 20dB bandwidth analyzed in order to assess the pass band of the booster.

Test Procedure Used

KDB 935210 D05 v01r04 - Section 3.3

Test Settings

- 1. Start and stop frequency of the signal generator shall be \pm 250 % of the passband, for each applicable CMRS band
- 2. Span same as the frequency range of the signal generator
- 3. RBW \geq 1 % to 5 % of the EUT passband
- 4. VBW <u>></u> 3 x RBW
- 5. Detector = Peak/Max Hold
- 6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

Test Notes

- The spectrum plots in this section show a CW signal sweeping across each input feed of each unit of the EUT. Per the guidance from Section 3.3 of KDB 935210 D05, the frequency range of the sweep should be from 25.375GHz to 30.475GHz [250% x (28.35GHz–27.5GHz) = 2.125GHz below and above lower and upper band edges, respectively]. However, in order to more clearly display the 20dB bandwidth, a larger frequency range is displayed in the these plots.
- 2. In each plot, the marker "M1" is used to display the peak of the output frequency response. The "D1" and "D2" markers are provided to indicate the approximate lower and upper bounds of the 20dB bandwidth of the output frequency response.

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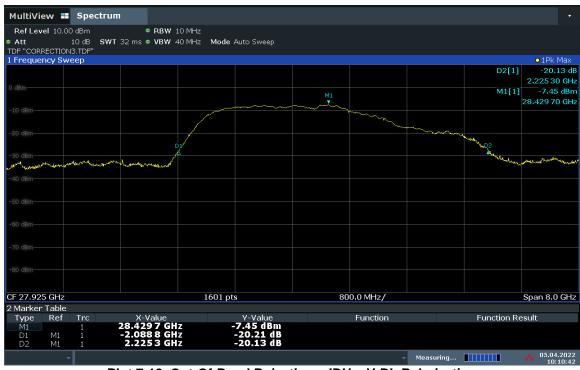
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Band n261 - IDU



Plot 7-17. Out-Of-Band Rejection – IDU – H-DL Polarization



Plot 7-18. Out-Of-Band Rejection – IDU – V-DL Polarization

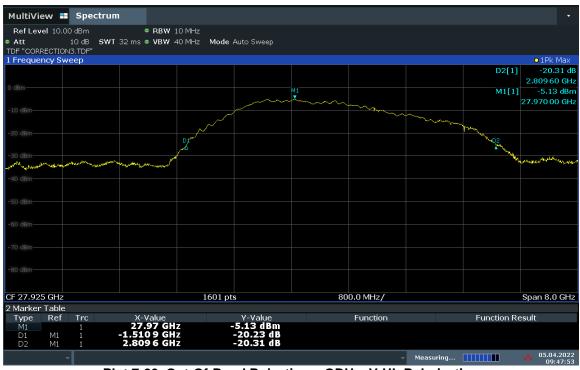
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Band n261 - ODU



Plot 7-19. Out-Of-Band Rejection – ODU – H-UL Polarization



Plot 7-20. Out-Of-Band Rejection - ODU - V-UL Polarization

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7.4 Measuring AGC Threshold Level, Mean Output Power & Amplifier/Booster Gain

Test Overview

A signal generator supplies a 5G NR mmWave signal directly into the input port of the device. The output port of the EUT is connected to the input of a signal analyzer. The AGC threshold level is measured by output power of the EUT until a 1dB increase in the input signal power no longer causes a 1dB increase in the output signal power. The Booster Gain is measured by calculating the gain between the input and the output power of the EUT at the signal generator level just below the AGC threshold level, but not more than 0.5dB below.

Test Procedures Used

KDB 935210 D05 V01R04 – Section 3.2 - Measuring AGC threshold level KDB 935210 D05 V01R04 – Section 3.5 - Mean output power and amplifier/booster gain

Test Settings

- 1. Conducted power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
- 2. RBW = 1 5% of the expected OBW, not to exceed 1MHz
- 3. VBW \geq 3 x RBW
- 4. Span = 2x to 3x the OBW
- 5. No. of sweep points > 2 x span / RBW
- 6. Detector = RMS
- 7. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
- 8. Trace mode = trace averaging (RMS) over 100 sweeps

Test Notes

1. Per the guidance of KDB 644041, a 50MHz 5G NR mmWave signal was used as the input signal as opposed to the 4.1MHz AWGN required in KDB 935210 D05.

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Band n261 - IDU

Bandwidth [MHz]	Frequency [MHz]	Channel	Modulation	RB Size / Offset	EUT Input Power Level [dBm]	Conducted Power [dBm]	Output Power Step [dB]	Calculated Gain [dB]
50	27924.96	Mid	QPSK	Full RB	-40.30	11.91	0.97	52.21
50	27924.96	Mid	QPSK	Full RB	-39.33	12.88	0.97	52.21
50	27924.96	Mid	QPSK	Full RB	-38.32	13.82	0.94	52.14
50	27924.96	Mid	QPSK	Full RB	-37.33	14.77	0.95	52.10
50	27924.96	Mid	QPSK	Full RB	-36.34	15.69	0.92	52.03
50	27924.96	Mid	QPSK	Full RB	-35.32	16.57	0.88	51.89
50	27924.96	Mid	QPSK	Full RB	-34.33	17.42	0.85	51.75
50	27924.96	Mid	QPSK	Full RB	-33.33	18.20	0.78	51.53

Table 7-4. Full RB AGC Threshold and Booster Gain – 50MHz 1CC – IDU – H-DL Polarization

Note: AGC Threshold is found at -35.32dBm EUT Input Power Level.

Bandwidth [MHz]	Frequency [MHz]	Channel	Modulation	RB Size / Offset	EUT Input Power Level [dBm]	Conducted Power [dBm]	Output Power Step [dB]	Calculated Gain [dB]
100	27924.96	Mid	QPSK	Full RB	-41.03	11.50	0.95	52.53
100	27924.96	Mid	QPSK	Full RB	-40.03	12.47	0.97	52.50
100	27924.96	Mid	QPSK	Full RB	-39.06	13.41	0.94	52.47
100	27924.96	Mid	QPSK	Full RB	-38.05	14.34	0.93	52.39
100	27924.96	Mid	QPSK	Full RB	-37.07	15.24	0.90	52.31
100	27924.96	Mid	QPSK	Full RB	-36.06	16.14	0.90	52.20
100	27924.96	Mid	QPSK	Full RB	-35.07	16.95	0.81	52.02
100	27924.96	Mid	QPSK	Full RB	-34.08	16.56	-0.39	50.64
100	27924.96	Mid	QPSK	Full RB	-33.08	17.03	0.47	50.11

Table 7-5. Full RB AGC Threshold and Booster Gain – 100MHz 4CC – IDU – H-DL Polarization

Note: AGC Threshold is found at -35.07dBm EUT Input Power Level.

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Bandwidth [MHz]	Frequency [MHz]	Channel	Modulation	RB Size / Offset	EUT Input Power Level [dBm]	Conducted Power [dBm]	Output Power Step [dB]	Calculated Gain [dB]
50	27924.96	Mid	QPSK	Full RB	-39.38	10.87	0.94	50.25
50	27924.96	Mid	QPSK	Full RB	-38.40	11.84	0.97	50.24
50	27924.96	Mid	QPSK	Full RB	-37.39	12.81	0.97	50.20
50	27924.96	Mid	QPSK	Full RB	-36.41	13.77	0.96	50.18
50	27924.96	Mid	QPSK	Full RB	-35.41	14.72	0.95	50.13
50	27924.96	Mid	QPSK	Full RB	-34.42	15.64	0.92	50.06
50	27924.96	Mid	QPSK	Full RB	-33.41	16.56	0.92	49.97
50	27924.96	Mid	QPSK	Full RB	-32.41	17.42	0.86	49.83
50	27924.96	Mid	QPSK	Full RB	-31.42	17.47	0.05	48.89
50	27924.96	Mid	QPSK	Full RB	-30.42	17.68	0.21	48.10

Table 7-6. Full RB AGC Threshold and Booster Gain – 50MHz 1CC – IDU – V-DL Polarization

Note: AGC Threshold is found at -32.41dBm EUT Input Power Level.

Bandwidth [MHz]	Frequency [MHz]	Channel	Modulation	RB Size / Offset	EUT Input Power Level [dBm]	Conducted Power [dBm]	Output Power Step [dB]	Calculated Gain [dB]
100	27924.96	Mid	QPSK	Full RB	-39.83	9.87	0.95	49.70
100	27924.96	Mid	QPSK	Full RB	-38.83	10.83	0.96	49.66
100	27924.96	Mid	QPSK	Full RB	-37.83	11.80	0.97	49.63
100	27924.96	Mid	QPSK	Full RB	-36.84	12.75	0.95	49.59
100	27924.96	Mid	QPSK	Full RB	-35.86	13.70	0.95	49.56
100	27924.96	Mid	QPSK	Full RB	-34.85	14.62	0.92	49.47
100	27924.96	Mid	QPSK	Full RB	-33.88	15.56	0.94	49.44
100	27924.96	Mid	QPSK	Full RB	-32.88	15.51	-0.05	48.39
100	27924.96	Mid	QPSK	Full RB	-31.88	16.18	0.67	48.06
100	27924.96	Mid	QPSK	Full RB	-30.88	16.00	-0.18	46.88

Table 7-7. Full RB AGC Threshold and Booster Gain – 100MHz 4CC – IDU – V-DL Polarization

Note: AGC Threshold is found at -32.88dBm EUT Input Power Level.

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Band n261 - ODU

Bandwidth [MHz]	Frequency [MHz]	Channel	Modulation	RB Size / Offset	EUT Input Power Level [dBm]	Conducted Power [dBm]	Output Power Step [dB]	Calculated Gain [dB]
50	27924.96	Mid	QPSK	Full RB	-45.34	4.28	0.99	49.62
50	27924.96	Mid	QPSK	Full RB	-44.37	5.28	1.00	49.65
50	27924.96	Mid	QPSK	Full RB	-43.40	6.27	0.99	49.67
50	27924.96	Mid	QPSK	Full RB	-42.42	7.26	0.99	49.68
50	27924.96	Mid	QPSK	Full RB	-41.49	8.23	0.97	49.72
50	27924.96	Mid	QPSK	Full RB	-40.49	9.20	0.97	49.69
50	27924.96	Mid	QPSK	Full RB	-39.50	10.14	0.94	49.64
50	27924.96	Mid	QPSK	Full RB	-38.50	11.10	0.96	49.60
50	27924.96	Mid	QPSK	Full RB	-37.50	11.27	0.17	48.77
50	27924.96	Mid	QPSK	Full RB	-36.53	11.35	0.08	47.88

Table 7-8. Full RB AGC Threshold and Booster Gain – 50MHz 1CC – ODU – H-UL Polarization

Note: AGC Threshold is found at -37.50dBm EUT Input Power Level.

Bandwidth [MHz]	Frequency [MHz]	Channel	Modulation	RB Size / Offset	EUT Input Power Level [dBm]	Conducted Power [dBm]	Output Power Step [dB]	Calculated Gain [dB]
100	27924.96	Mid	QPSK	Full RB	-46.04	3.51	0.98	49.55
100	27924.96	Mid	QPSK	Full RB	-45.08	4.50	0.99	49.58
100	27924.96	Mid	QPSK	Full RB	-44.13	5.49	0.99	49.62
100	27924.96	Mid	QPSK	Full RB	-43.13	6.48	0.99	49.61
100	27924.96	Mid	QPSK	Full RB	-42.17	7.46	0.98	49.63
100	27924.96	Mid	QPSK	Full RB	-41.20	8.42	0.96	49.62
100	27924.96	Mid	QPSK	Full RB	-40.20	9.37	0.95	49.57
100	27924.96	Mid	QPSK	Full RB	-39.21	10.34	0.97	49.55
100	27924.96	Mid	QPSK	Full RB	-38.22	10.22	-0.12	48.44
100	27924.96	Mid	QPSK	Full RB	-37.23	10.33	0.11	47.56

Table 7-9. Full RB AGC Threshold and Booster Gain – 100MHz 4CC – ODU – H-UL Polarization

Note: AGC Threshold is found at -38.22dBm EUT Input Power Level.

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Bandwidth [MHz]	Frequency [MHz]	Channel	Modulation	RB Size / Offset	EUT Input Power Level [dBm]	Conducted Power [dBm]	Output Power Step [dB]	Calculated Gain [dB]
50	27924.96	Mid	QPSK	Full RB	-45.34	5.53	0.97	50.87
50	27924.96	Mid	QPSK	Full RB	-44.37	6.49	0.96	50.86
50	27924.96	Mid	QPSK	Full RB	-43.40	7.50	1.01	50.90
50	27924.96	Mid	QPSK	Full RB	-42.42	8.47	0.97	50.89
50	27924.96	Mid	QPSK	Full RB	-41.49	9.37	0.90	50.86
50	27924.96	Mid	QPSK	Full RB	-40.49	10.31	0.94	50.80
50	27924.96	Mid	QPSK	Full RB	-39.50	11.22	0.91	50.72
50	27924.96	Mid	QPSK	Full RB	-38.50	11.30	0.08	49.80
50	27924.96	Mid	QPSK	Full RB	-37.50	11.41	0.11	48.91

Table 7-10. Full RB AGC Threshold and Booster Gain – 50MHz 1CC – ODU – V-UL Polarization

Note: AGC Threshold is found at -38.50dBm EUT Input Power Level.

Bandwidth [MHz]	Frequency [MHz]	Channel	Modulation	RB Size / Offset	EUT Input Power Level [dBm]	Conducted Power [dBm]	Output Power Step [dB]	Calculated Gain [dB]
100	27924.96	Mid	QPSK	Full RB	-47.01	3.70	1.00	50.71
100	27924.96	Mid	QPSK	Full RB	-46.04	4.67	0.97	50.71
100	27924.96	Mid	QPSK	Full RB	-45.08	5.62	0.95	50.70
100	27924.96	Mid	QPSK	Full RB	-44.13	6.57	0.95	50.70
100	27924.96	Mid	QPSK	Full RB	-43.13	7.53	0.96	50.66
100	27924.96	Mid	QPSK	Full RB	-42.17	8.45	0.92	50.62
100	27924.96	Mid	QPSK	Full RB	-41.20	9.38	0.93	50.58
100	27924.96	Mid	QPSK	Full RB	-40.20	10.05	0.67	50.25
100	27924.96	Mid	QPSK	Full RB	-39.21	9.93	-0.12	49.14

Table 7-11. Full RB AGC Threshold and Booster Gain – 100MHz 4CC – ODU – V-UL Polarization

Note: AGC Threshold is found at -40.20dBm EUT Input Power Level.

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7.5 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers measured are each equal to 0.5 percent of the total mean power measured for a given emission. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 - Section 5.4.3

Test Settings

- 1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
- 2. RBW = 1 5% of the expected OBW
- 3. VBW \geq 3 x RBW
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep = auto couple
- 7. The trace was allowed to stabilize
- 8. If necessary, steps 2 7 were repeated after changing the RBW such that it would be within

1-5% of the 99% occupied bandwidth observed in Step 7

Test Notes

- 1. The OBW was measured for multiple transmission schemes and modulations and the worst case results have been included in the report.
- 2. The plots shown in this section include the appropriate offsets to correct for the frequency-dependent cable loss of the coaxial cable that connects the output port of the EUT to the spectrum analyzer.

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Channel	Ant Pol.	Bandwidth [MHz]	CCs Active	Modulation	OBW [MHz]
		50	1	QPSK	45.98
	H-DL V-DL			16QAM	45.98
		100	4	QPSK	398.25
Mid				16QAM	398.20
IVIIU		50	1	QPSK	46.15
				16QAM	46.18
		100	4	QPSK	398.35
			4	16QAM	398.05

Table 7-12. Summary of IDU Occupied Bandwidths

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Plot 7-21. Occupied Bandwidth Plot – IDU – H-DL Polarization (50MHz-1CC – QPSK – Mid Channel)



Plot 7-22. Occupied Bandwidth Plot – IDU – H-DL Polarization (50MHz-1CC – 16QAM – Mid Channel)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager			
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ACLRResi	ults									
MultiVi	ew	Spectru	um							•
RefLev	/el 32.3	20 dBm Of	fset 2.20 dB • RB	N 10 MHz						SGL
Att		30 dB SV	VT 4 ms ● VBV	N 50 MHz M	ode Auto Sweep					Count 100/100
1 Occupi	ed Bar	ndwidth								O1Pk Max
30 dBm-									M1[1]	1.78 dBm
										27.974 900 GHz
20 dBm										
LO GDIT										
10 dBm										
				Augura wales	mannen	M1	alle a calmba a			
0 dBm			I	To a contraction of the second second	Marine Crowdowy	Manager and the	When we we we will be the	2		
								X		
-10 dBm-										
								1		
-20 dBm-								11		
-20 ubiii	Mande	rupphanon	monormaniputibil					Moundanne	which have mark	markenberg hander
	14-10 MA.17									and a manual rice on anticipal
-30 dBm										
-40 dBm-										
-50 dBm-										
-60 dBm										
-60 dBm-										
CF 27.92				1001 p	ts	10	0.0 MHz/			Span 1.0 GHz
2 Markei										
Туре	Ref	Trc	X-Value 27.974 9 G	1 7	Y-Value 1.78 dBm	Occ Bw	Function		Function 398.245 111	
M1 T1		1 1	27.725193 (-2.81 dBm	Occ Bw Occ Bw Ce	ptroid			315271 GHz
T2		1	28.123 438 0		-3.50 dBm	Occ Bw Fre				8651 39 kHz
								Ready		14.04.2022 18:00:55

Plot 7-23. Occupied Bandwidth Plot – IDU – H-DL Polarization (100MHz-4CC – QPSK – Mid Channel)

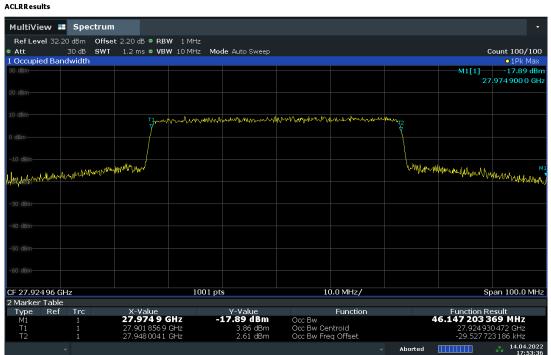


Plot 7-24. Occupied Bandwidth Plot – IDU – H-DL Polarization (100MHz-4CC – 16QAM – Mid Channel)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager						
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Plot 7-25. Occupied Bandwidth Plot – IDU – V-DL Polarization (50MHz-1CC – QPSK – Mid Channel)



Plot 7-26. Occupied Bandwidth Plot – IDU – V-DL Polarization (50MHz-1CC – 16QAM – Mid Channel)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager					
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ACLRResu	ilts									
MultiVi	ew	Spectrum	1							
RefLev	/el 32.2	20 dBm Offse	t 2.20 dB 🔍 RB	W 10 MHz						
Att		30 dB SWT	4 ms 🗢 VBN	🖌 50 MHz 🛛 🛚	Mode Auto Sweep				с	ount 100/100
1 Occupie	ed Ban	dwidth								o1Pk Max
30 dBm									M1[1]	9.16 dBm
									2	7.974900 GHz
20 dBm										
10 dBm						M1				
TO OBIII			1	1 mloomant	moutherman	Jan markene	munich	2		
				7				7		
0 dBm										
								1		
-10 dBm-								lanta		
		1 an deliver alound the	wheeler					www.www.www.www.	nonanananan ang hanang han hanang hanang han	
Mr. Nort My	Annahan.	and a real								Mun munder
an daw										
-30 dBm										
-40 dBm-										
-50 dBm										
-60 dBm										
oo abiii										
CF 27.92				1001	pts	10	0.0 MHz/			Span 1.0 GHz
2 Marker	• Table Ref	Trc	X-Value		Y-Value		Function		Function Re	
Type M1	Rer	1	27.974 9 G	Hz	9.16 dBm	Occ Bw	Function	30	€UNCTION RE	
T1		1	27.726.084.0		3.13 dBm	Occ Bw Ce	ntroid			0 903 GHz
T2			28.124 438 0		2.43 dBm	Occ Bw Fre			360.903.04	
								Aborted		14.04.2022 17:50:07

Plot 7-27. Occupied Bandwidth Plot – IDU – V-DL Polarization (100MHz-4CC – QPSK – Mid Channel)



Plot 7-28. Occupied Bandwidth Plot – IDU – V-DL Polarization (100MHz-4CC – 16QAM – Mid Channel)

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Channel	Ant Pol.	Ant Pol. Bandwidth CCs [MHz] Active		Modulation	OBW [MHz]
		50	1	QPSK	46.01
	H-UL V-UL	50	1	16QAM	46.04
		100	4	QPSK	397.96
Mid		100	4	16QAM	397.64
IVIIU		50	1	QPSK	45.91
			1	16QAM	45.95
		100	4	QPSK	395.64
		100	4	16QAM	396.14

Table 7-13. Summary of ODU Occupied Bandwidths

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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ACLRResi	ults									
MultiVi	ew 🖿	Spectrun	n							-
RefLev	vel 32.0	2 dBm Offse	et 2.02 dB • RB	✔ 1 MHz						
Att		30 dB SWT	1.2 ms 🗢 VBV	₩ 10 MHz I	Mode Auto Sweep				c	ount 100/100
1 Occupi	ed Ban	dwidth								o1Pk Max
30 dBm									M1[1]	-29.08 dBm
									27	.974 900 0 GHz
20 dBm										
10 dBm										
0. d0m			T1,mM	mapping	munnhunnumum.	distant on the day	Mundha Andraga	Mm 12		
0 dBm			Y					7		
-10 dBm-										
-20 dBm-		say all see	well have a					h.M. Walata		
Muches	North	_{WWW} WWWWW	Man Las Alsa					h nuMant	moundarity	Katt Wash MI
ANALINA AL	(***)									A MARINA MARINA
-40 dBm-										
-50 dBm-										
-50 dBm-										
-60 dBm										
CF 27.92	24 96 GI	lz		1001	pts	1	0.0 MHz/		S	oan 100.0 MHz
2 Markei										
Туре	Ref	Trc	X-Value	-	Y-Value		Function		Function R	
M1 T1			27.9749 27.901 8745		-29.08 dBm -1.39 dBm	Occ Bw Occ Bw Ce	otroid		46.006 130	78 MHZ 7557 GHz
T2			27.901 874 5		-1.60 dBm	Occ Bw Ce Occ Bw Fre			-82,443.09	
								A location of		14.04.2022
								 Aborted 		17:41:22

Plot 7-29. Occupied Bandwidth Plot – ODU – H-UL Polarization (50MHz-1CC – QPSK – Mid Channel)



Plot 7-30. Occupied Bandwidth Plot – ODU – H-UL Polarization (50MHz-1CC – 16QAM – Mid Channel)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager						
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ACLRResu	ilts										
MultiVie	ew	Spec	trum								•
RefLev	el 32.0	02 dBm	Offset	2.02 dB • RB	W 10 MHz						
Att		30 dB	swr	4 m s 🗢 VB	W 50 MHz M	ode Auto Sweep				c	ount 100/100
1 Occupie	ed Ban	dwidth									o1Pk Max
30 dBm										M1[1]	3.50 dBm
											27.974900 GHz
20 dBm											
10 dBm											
TO OBW-							M1				
					10 marsh way way water	, which makes my	Martin porabition	montheman	10		
0 dBm					Ý			Ve	\$		
					[]		
-10 dBm									<u>}</u>		
				/							
-20 dBm-				1 MANNA					La che he have		
mallow & March	month	when Marken	pmMargh	Marghe-Hawlad an M. Marchol					10410 Andrew	manumund	agon had shown
-30 dBm											
-40 dBm											
-50 dBm											
-60 dBm											
oo abiii											
CF 27.92					1001 p	ots	10	00.0 MHz/			Span 1.0 GHz
2 Marker		Trc		X-Value		Y-Value		Function		Function R	o ou dt
Type M1	Ref	1 Irc		27.9749 G	iHz	3.50 dBm	Occ Bw	Function		97.960 573 (
T1		1		27.725922 (-2.20 dBm	Occ Bw Ce	ntroid			02 239 GHz
T2				28.123883 (-2.41 dBm	Occ Bw Fre				51 545 kHz
									Aborted		14.04.2022 17:42:27

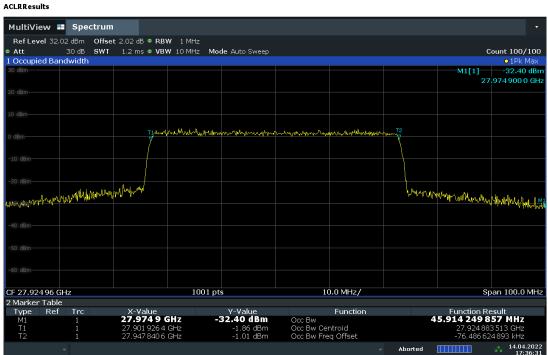
Plot 7-31. Occupied Bandwidth Plot – ODU – H-UL Polarization (100MHz-4CC – QPSK – Mid Channel)

ACLRResult	ts						
MultiVie	w 📰 Specti	rum					•
Ref Leve	1 32.02 dBm C	offset 2.02 dB ● RBW 10 MH	łz				
Att		WT 4 ms ● VBW 50 MH	iz Mode Auto Sweep				Count 100/100
	d Bandwidth						o 1Pk Max
30 dBm						M1[1]	2.03 dBm
							27.974900 GHz
20 dBm							
10 dBm							
		TING	house allowedrances	M1 Maduman Marin Marin Mark			
0 dBm				A CONTRACTOR OF A DATA	Ŷ		
-10 dBm							
					11		
-20 dBm	م المعامية الم	mounterspersions			Mindromanne	Antomana and	and an an and the second
	V. Mar . M. Mar and a second					1.	a dharar a dharar Annon
-30 dBm							
-40 dBm							
-50 dBm							
-60 dBm							
CF 27.924 2 Marker 1			1001 pts	100.0 MHz/			Span 1.0 GHz
	Ref Trc	X-Value	Y-Value	Function		Function F	Result
M1	1	27.974 9 GHz	2.03 dBm	Occ Bw	3	97.638 411	835 MHz
T1 T2		27.725981 GHz 28.12362 GHz	-1.78 dBm -2.96 dBm	Occ Bw Centroid Occ Bw Freg Offset			300 523 GHz 494 534 kHz
	-	20.123 02 GHZ	-2.90 dBm	Ucc BW Freq Uffset	Aborted	-99.477	14.04.2022
					HBOICEG		17:43:06

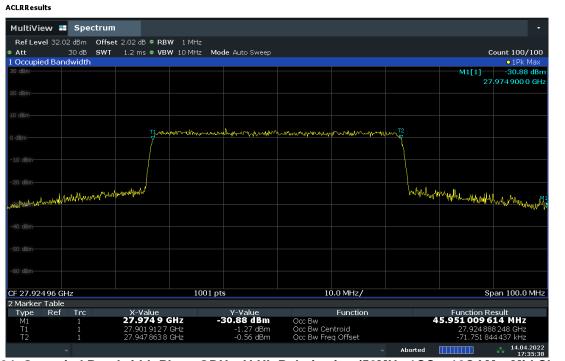
Plot 7-32. Occupied Bandwidth Plot – ODU – H-UL Polarization (100MHz-4CC – 16QAM – Mid Channel)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager						
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Plot 7-33. Occupied Bandwidth Plot – ODU – V-UL Polarization (50MHz-1CC – QPSK – Mid Channel)



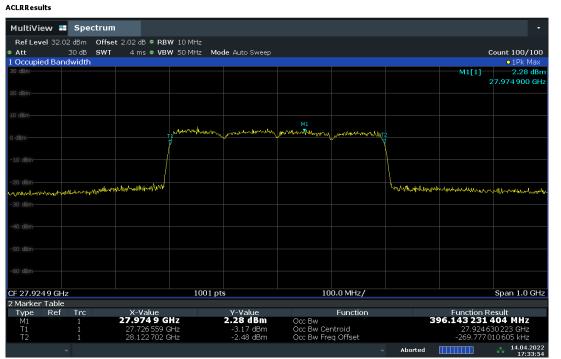
Plot 7-34. Occupied Bandwidth Plot – ODU – V-UL Polarization (50MHz-1CC – 16QAM – Mid Channel)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager				
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ACLRResu	lts									
MultiVie	ew 📲	Spectru	ım							
Ref Lev	el 32.02	2 dBm Off	set 2.02 dB • RB	₩ 10 MHz						
 Att 		30 dB 🛛 SW	/T 4 m s ● VB \	N 50 MHz Mo	de Auto Sweep					Count 100/100
1 Occupie	ed Banc	lwidth								O1Pk Max
30 dBm									M1[1]	2.29 dBm
										27.974 900 GHz
20 dBm										
10 dBm										
10 0.011										
				1, Mr. Marman	mannon	marminum	waterwater			
0 dBm				Ϋ	Ŷ		1	1		
								l .		
-10 dBm-			(1		
								1		
-20 dBm			/					<u>\</u>		
. A wells on hills be	n skinde	molination	when the mathematic					historenedter	Marinutration maker	
	~ .									
-30 dBm										
-40 dBm										
-50 dBm-										
-60 dBm										
-00 dBIII-										
CF 27.924				1001 pt	ts	10	0.0 MHz/			Span 1.0 GHz
2 Marker		-								
Type M1	Ref	Trc 1	X-Value 27.974 9 G	47	Y-Value 2.29 dBm	Occ Bw	Function		Function F 95.642 255	
T1		1	27.726.697 0		-1.34 dBm	Occ Bw Ce	ntroid	3		517873 GHz
T2			28.122339 0		-2.68 dBm	Occ Bw Fre				592379 kHz
							*	Aborted		14.04.2022 17:33:04

Plot 7-35. Occupied Bandwidth Plot – ODU – V-UL Polarization (100MHz-4CC – QPSK – Mid Channel)



Plot 7-36. Occupied Bandwidth Plot – ODU – V-UL Polarization (100MHz-4CC – 16QAM – Mid Channel)

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7.6 Conducted Power & Equivalent Isotropic Radiated Power

Test Overview

A transmitter port of the EUT is connected to the input of a signal analyzer. A signal generator supplies a 5G NR signal directly into the input port of the device. All measurements are performed as RMS average measurements while the EUT is operating at the appropriate frequencies with the max power condition as specified by the AGC software of the EUT. The Equivalent Isotripic Radiated Power (EIRP) is then calculated using these conducted power measurements.

The average power of the sum of all antenna elements is limited to a maximum EIRP of +55 dBm.

Test Procedures Used

ANSI C63.26-2015 Section 5.2.4.4.1

Test Settings

- 1. Conducted power measurements are performed using the signal analyzer's "channel power" measurement capability.
- 2. For pulsed signals, triggering was set to enable measurements only during full power bursts, with the sweep time set less than or equal to the transmission burst duration. For continuously transmitted signals, triggering was set to Free Run.
- 3. RBW = 1 5% of the expected OBW, not to exceed 1MHz
- 4. VBW \ge 3 x RBW
- 5. Span = 2x to 3x the OBW
- 6. No. of sweep points \geq 2 x span / RBW
- 7. Detector = RMS
- 8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
- 9. Trace mode = trace averaging (RMS) over 100 sweeps
- 10. The trace was allowed to stabilize.

Test Notes

- The EUT was tested with all possible input signal configurations. The worst case emissions are reported with the regards to modulations, RB sizes and offsets, and channel bandwidth configurations as shown in the tables below. It was determined that full RB allocations provided the worst case results.
- 2) As the IDU is only designed to boost 5G NR downlink signals, its power levels were only investigated with CP-OFDM transmission schemes. The power levels of the ODU, which is designed to boost 5G NR uplink signals, were investigated with both CP-OFDM and DFT-s-OFDM transmission schemes.
- 3) The input signal to the EUT was set in order to produce the maximum power allowed by the AGC software of the EUT.
- 4) The MIMO Conducted Powers were calculated by using the "measure and sum the spectral maxima across the outputs" technique specified in Section 6.4.3.2.3 of ANSI C63.26-2015. The spectra were summed linearly and converted to dBm for comparison with the limit.

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- 5) The MIMO Conducted Powers shown in the tables in this section are the mathematical summations (in linear units) of the measured conducted powers of the horizonally polarized and vertically polarized antenna feeds of an individual unit (i.e either the IDU or ODU).
- 6) The single-polarization EIRP levels shown in the tables in this section are the mathematical summations (in logarithmic units) of the corresponding single-polarization conducted powers and the gain of the transmit antenna for that polarization.
- 7) Per the guidance of ANSI C63.26-2015 Section 6.4.5.3.3(a) for cross-polarized antennas, the MIMO EIRP levels shown in the tables in this section are the mathematical summations (in logarithmic units) of the corresponding MIMO conducted powers and the gain of an individual transmit antenna.
- 8) The gain of the transmit antenna for each unit is provided by the manufacturer.
- 9) The conducted power plots shown in this section include the appropriate offsets to correct for the frequencydependent cable loss of the coaxial cable that connects the output port of the EUT to the spectrum analyzer.

Sample Conducted MIMO Calculation:

Antenna 1 + Antenna 2 = MIMO

(21.32dBm + 21.39dBm) = (135.52mW + 137.72mW) = 273.24mW = 24.37dBm

Sample EIRP Calculation:

Conducted Power + Antenna Gain = EIRP

12.57dBm + 10.50dBi = 23.07dBm

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Band n261 - IDU

Center Frequency [MHz]	Ant.Pol.	Transmission Scheme	Modulation	Bandwidth [MHz]	# of Carriers [CCs]	RB	Conducted Power [dBm]	Tx Ant Gain [dBi]	EIRP [dBm]
27525.00	H-DL	CP-OFDM	QPSK	50	1	Full	18.05	7.00	25.05
27924.96	H-DL	CP-OFDM	QPSK	50	1	Full	18.00	7.00	25.00
27924.96	H-DL	CP-OFDM	QPSK	50	1	1 / 16	13.52	7.00	20.52
28324.92	H-DL	CP-OFDM	QPSK	50	1	Full	17.92	7.00	24.92
27525.00	H-DL	CP-OFDM	16-QAM	50	1	Full	17.84	7.00	24.84
27700.08	H-DL	CP-OFDM	QPSK	100	4	Full	18.39	7.00	25.39
27924.96	H-DL	CP-OFDM	QPSK	100	4	Full	18.09	7.00	25.09
27924.96	H-DL	CP-OFDM	QPSK	100	4	1/33	15.76	7.00	22.76
28149.96	H-DL	CP-OFDM	QPSK	100	4	Full	18.17	7.00	25.17
27700.08	H-DL	CP-OFDM	16-QAM	100	4	Full	17.60	7.00	24.60

Table 7-14. NR Band n261 - Conducted Power and EIRP – IDU – H-DL Polarization

Center Frequency [MHz]	Ant.Pol.	Transmission Scheme	Modulation	Bandwidth [MHz]	# of Carriers [CCs]	RB Size/Offset	Conducted Power [dBm]	Tx Ant Gain [dBi]	EIRP [dBm]
27525.00	V-DL	CP-OFDM	QPSK	50	1	Full	17.22	7.00	24.22
27924.96	V-DL	CP-OFDM	QPSK	50	1	Full	17.31	7.00	24.31
27924.96	V-DL	CP-OFDM	QPSK	50	1	1 / 16	13.18	7.00	20.18
28324.92	V-DL	CP-OFDM	QPSK	50	1	Full	16.23	7.00	23.23
27924.96	V-DL	CP-OFDM	16-QAM	50	1	Full	16.55	7.00	23.55
27700.08	V-DL	CP-OFDM	QPSK	100	4	Full	17.44	7.00	24.44
27924.96	V-DL	CP-OFDM	QPSK	100	4	Full	17.05	7.00	24.05
27924.96	V-DL	CP-OFDM	QPSK	100	4	1/33	14.29	7.00	21.29
28149.96	V-DL	CP-OFDM	QPSK	100	4	Full	16.67	7.00	23.67
27700.08	V-DL	CP-OFDM	16-QAM	100	4	Full	16.77	7.00	23.77

Table 7-15. NR Band n261 - Conducted Power and EIRP – IDU – V-DL Polarization

Center Frequency [MHz]	Ant.Pol.	Transmission Scheme	Modulation	Bandwidth [MHz]	# of Carriers [CCs]	RB Size/Offset	MIMO Conducted Power [dBm]	Tx Ant Gain [dBi]	MIMO EIRP [dBm]
27525.00	MIMO	CP-OFDM	QPSK	50	1	Full	20.67	7.00	27.67
27924.96	MIMO	CP-OFDM	QPSK	50	1	Full	20.68	7.00	27.68
27924.96	MIMO	CP-OFDM	QPSK	50	1	1 / 16	16.36	7.00	23.36
28324.92	MIMO	CP-OFDM	QPSK	50	1	Full	20.17	7.00	27.17
27924.96	MIMO	CP-OFDM	16-QAM	50	1	Full	20.25	7.00	27.25
27700.08	MIMO	CP-OFDM	QPSK	100	4	Full	20.95	7.00	27.95
27924.96	MIMO	CP-OFDM	QPSK	100	4	Full	20.61	7.00	27.61
27924.96	MIMO	CP-OFDM	QPSK	100	4	1/33	18.10	7.00	25.10
28149.96	MIMO	CP-OFDM	QPSK	100	4	Full	20.49	7.00	27.49
27700.08	MIMO	CP-OFDM	16-QAM	100	4	Full	20.22	7.00	27.22

Table 7-16. NR Band n261 - Conducted Power – IDU – MIMO

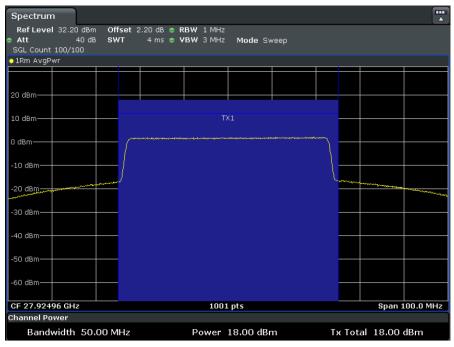
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dega 47 of 100	
1M2202210020-02.2AUVU	02/24/2022-04/14/2022	5G mmWave Repeater	Page 47 of 122	
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Spectrum	Spectrum									
Ref Level Att SGL Count	I 31.95 dBm 40 dB 100/100		1.95 dB 😑 R 4 ms 🗢 V	BW 1 MHz BW 3 MHz	Mode Sv	veep				
🔾 1Rm AvgP	wr									
20 dBm			l							
10 dBm				τ	(1					
0 dBm										
-10 dBm—	and a state of the	and the second se					<u></u>	****		and the state of t
~20 dBm—										
-30 dBm							_			
-40 dBm										
-50 dBm										
-60 dBm										
CF 27.525 Channel Po				1001	pts				Span 1	00.0 MHz
	width 50.	00 MHz		Power	18.05 dBr	m	Тх	Total	18.05	dBm

Date: 4.MAR.2022 04:48:00

Plot 7-37. Conducted Power Plot – IDU – H-DL Polarization (50MHz-1CC – QPSK – Low Ch. – Full RB)

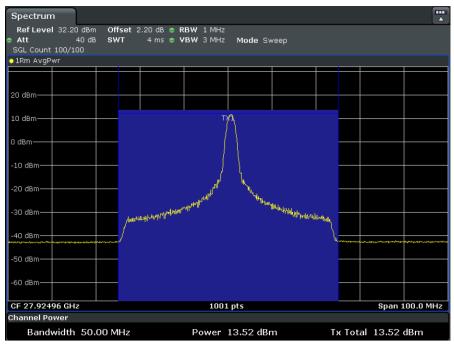


Date: 4.MAR.2022 04:38:06

Plot 7-38. Conducted Power Plot – IDU – H-DL Polarization (50MHz-1CC – QPSK – Mid Ch. – Full RB)

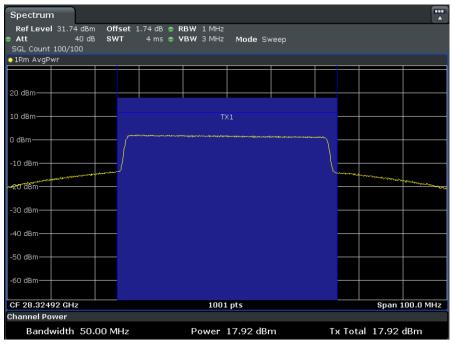
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 49 of 100	
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Date: 4.MAR.2022 04:41:10





Date: 4.MAR.2022 04:52:52

Plot 7-40. Conducted Power Plot – IDU – H-DL Polarization (50MHz-1CC – QPSK – High Ch. – Full RB)

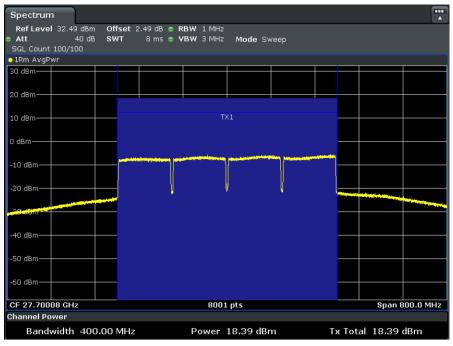
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dega 40 of 100
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Spectrum	٦									
SGL Count			t 1.95 dB 👄 R 4 ms 👄 V	BW 1 MHz BW 3 MHz	Mode Sv	veep				
01Rm AvgP	wr									
20 dBm										
10 dBm				נד	(1		-			
0 dBm		_ (L	provenska konstruktioner (konstruktioner (konstruktioner (konstruktioner (konstruktioner (konstruktioner (konst	lanan Marum Innun Sunan Palanan				
-10 dBm— -20 dBm—	a na faran an a								alannan (anak) di kanan	and a standard and the strategiest
-30 dBm										
-40 dBm										
-50 dBm										
CF 27.525				1001	pts				Span 1	00.0 MHz
Channel Po	wer									
Bandy	width 50.	00 MHz		Power	17.84 dBr	n	Тж	Tota	l 17.84	dBm

Date: 4.MAR.2022 05:03:40

Plot 7-41. Conducted Power Plot – IDU – H-DL Polarization (50MHz-1CC – 16QAM – Low Ch. – Full RB)

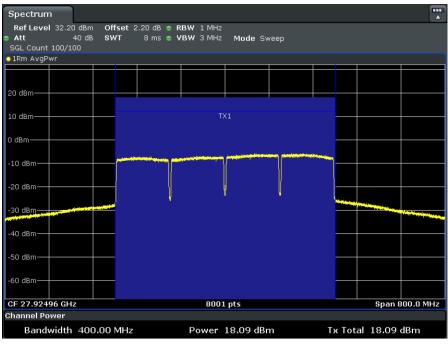


Date: 4.MAR.2022 07:43:31

Plot 7-42. Conducted Power Plot – IDU – H-DL Polarization (100MHz-4CC – QPSK – Low Ch. – Full RB)

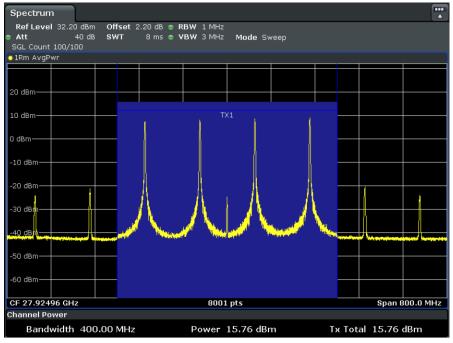
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga 50 of 100
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Date: 4.MAR.2022 07:28:54

Plot 7-43. Conducted Power Plot – IDU – H-DL Polarization (100MHz-4CC – QPSK – Mid Ch. – Full RB)



Date: 4.MAR.2022 07:32:16

Plot 7-44. Conducted Power Plot – IDU – H-DL Polarization (100MHz-4CC – QPSK – Mid Ch. – 1RB)

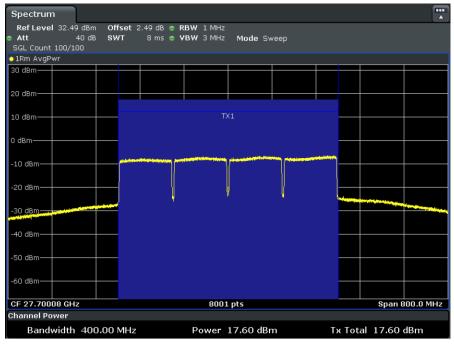
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga 51 of 100
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Spectrum									
Ref Level 3. Att SGL Count 10	40 dB SV			BW 1 MHz BW 3 MHz	Mode Sv	veep			
1Rm AvgPwr									
20 dBm									
10 dBm				נד	(1				
0 dBm		_							
-10 dBm				*****		tions photosocial			
-20 dBm									
-30 dBm			v	1	ſ	Ų			
-40 dBm									
-50 dBm									
-60 dBm									
CF 28.14996				8001	pts			Span 8	00.0 MHz
Channel Powe Bandwic	er dth 400.00	MHz		Power	18.17 dBr	m	Tx To	otal 18.17	dBm

Date: 4.MAR.2022 07:46:08

Plot 7-45. Conducted Power Plot – IDU – H-DL Polarization (100MHz-4CC – QPSK – High Ch. – Full RB)



Date: 4.MAR.2022 07:50:13

Plot 7-46. Conducted Power Plot – IDU – H-DL Polarization (100MHz-4CC – 16QAM – Low Ch. – Full RB)

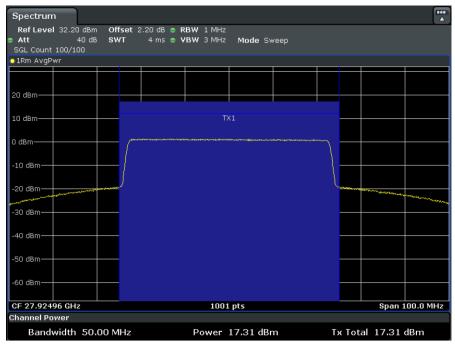
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga 50 of 100
1M2202210020-02.2AUVU	02/24/2022-04/14/2022	5G mmWave Repeater	Page 52 of 122
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Spectrun	ı									
Att SGL Count			1.95 dB 🗢 R 4 ms 🗢 V	BW 1 MHz BW 3 MHz	Mode Sv	veep				
01Rm AvgP	wr									
20 dBm										
10 dBm				מ	(1					
0 dBm		ſ		Manada ang kapatan kanang kapat	~~~~	\$*************************************				
-10 dBm-							l	har have a harden	Variable and the second se	
-30 dBm—										and the second se
-40 dBm										
-50 dBm—										
-60 dBm										
CF 27.525	GHz			1001	pts				Span 1	.00.0 MHz
Channel Po	wer									
Band	width 50	.00 MHz		Power	17.22 dBr	n	Т	(Tota	l 17.22	dBm

Date: 3.MAR.2022 06:40:14

Plot 7-47. Conducted Power Plot – IDU – V-DL Polarization (50MHz-1CC – QPSK – Low Ch. – Full RB)

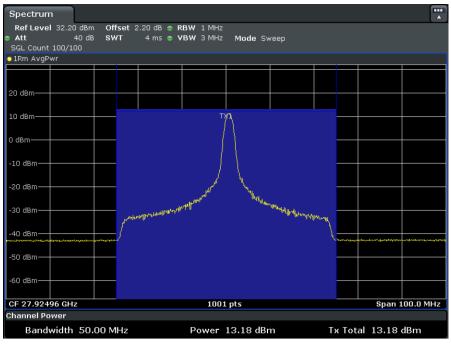


Date: 3.MAR.2022 07:17:14

Plot 7-48. Conducted Power Plot – IDU – V-DL Polarization (50MHz-1CC – QPSK – Mid Ch. – Full RB)

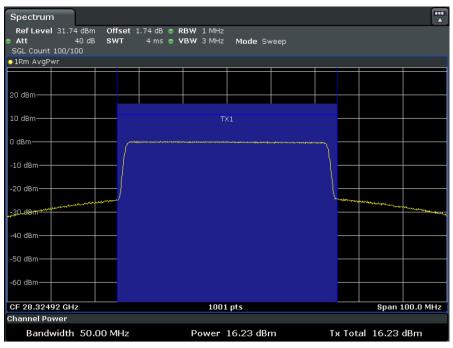
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dega 52 of 100
1M2202210020-02.2AUVU	02/24/2022-04/14/2022	5G mmWave Repeater	Page 53 of 122
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Date: 3.MAR.2022 07:11:38





Date: 3.MAR.2022 07:14:24

Plot 7-50. Conducted Power Plot – IDU – V-DL Polarization (50MHz-1CC – QPSK – High Ch. – Full RB)

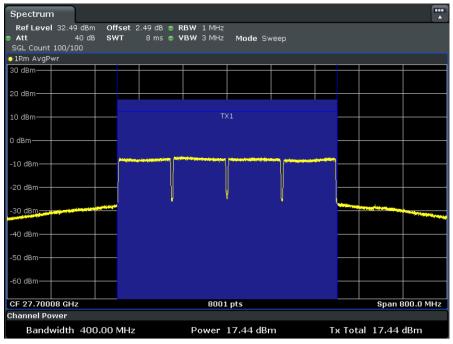
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga 54 of 100
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Spectrum	r								
Att SGL Count		Offse SWT		RBW 1 MHz VBW 3 MHz	Mode Sv	veep			
01Rm AvgP	wr								
20 dBm									
10 dBm				Т	X1				
0 dBm				-2010-2019-2019-2019-2019-2019-2019-2019	******				
-20 dBm							l l		
-30 dBm—									and a second second second
-40 dBm									
-60 dBm									
CF 27.924	96 GHz			100	1 pts			Span 1	L00.0 MHz
	Channel Power								
Bandy	width 50.0	DO MHz		Power	16.55 dBr	n	Тх Т	otal 16.55	dBm

Date: 3.MAR.2022 07:18:20

Plot 7-51. Conducted Power Plot – IDU – V-DL Polarization (50MHz-1CC – 16QAM – Mid Ch. – Full RB)



Date: 3.MAR.2022 07:40:43

Plot 7-52. Conducted Power Plot – IDU – V-DL Polarization (100MHz-4CC – QPSK – Low Ch. – Full RB)

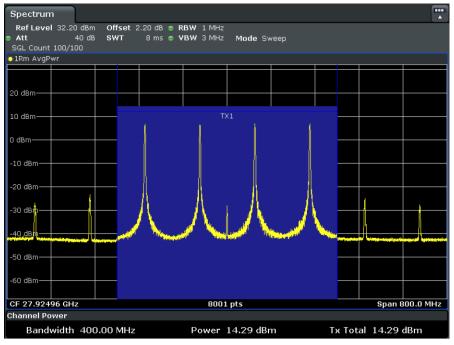
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga FE of 100
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Spectrum								
Ref Level 32.20 (Att 40 SGL Count 100/100	db SWT	2.20 dB 👄 R 8 ms 👄 V	BW 1 MHz BW 3 MHz	Mode Sw	veep			
01Rm AvgPwr]
20 dBm								
10 dBm			T	1				
0 dBm						-		
-10 dBm				12.4.)				
-20 dBm								
-30 dBm						<u> </u>		l taniyi daga dinis derjaya
-40 dBm						_		
-50 dBm								
-60 dBm								
CF 27.92496 GHz			8001	pts			Span	800.0 MHz
Channel Power								
Bandwidth	400.00 MH2	2	Power	17.05 dBr	n	Tx 1	otal 17.05	dBm

Date: 3.MAR.2022 07:42:49

Plot 7-53. Conducted Power Plot – IDU – V-DL Polarization (100MHz-4CC – QPSK – Mid Ch. – Full RB)



Date: 3.MAR.2022 07:44:38

Plot 7-54. Conducted Power Plot – IDU – V-DL Polarization (100MHz-4CC – QPSK – Mid Ch. – 1RB)

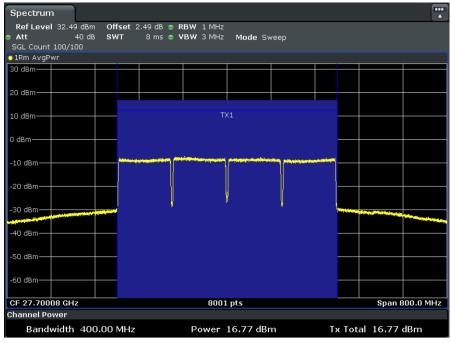
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage FC of 100
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Spectrum												
Ref Level Att SGL Count	I 32.25 dBm 40 dB 100/100	Offs SW1				RBW 1 MHz VBW 3 MHz	Mode Sw	veep				
🔾 1Rm AvgP	wr											
20 dBm——												
10 dBm						נד	(1					
0 dBm												
-10 dBm—					۳			-				
-20 dBm—												
-30 dBm					Į			Į				
-												
-40 dBm												
-50 dBm												
-60 dBm—												
CF 28.149	96 GHz					8001	. pts				Span 8	00.0 MHz
Channel Po	wer											
Bandy	width 400	0.00 N	/Hz			Power	16.67 dBr	n	T	(Tota	al 16.67	dBm

Date: 3.MAR.2022 07:48:47

Plot 7-55. Conducted Power Plot – IDU – V-DL Polarization (100MHz-4CC – QPSK – High Ch. – Full RB)



Date: 3.MAR.2022 07:53:18

Plot 7-56. Conducted Power Plot - IDU - V-DL Polarization (100MHz-4CC - 16QAM - Low Ch. - Full RB)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager					
Test Report S/N:	Test Dates:	EUT Type:	Daga 57 of 100					
1M2202210020-02.2AUVU	02/24/2022-04/14/2022	5G mmWave Repeater	Page 57 of 122					
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Band n261 - ODU

Center Frequency [MHz]	Ant.Pol.	Transmission Scheme	Modulation	Bandwidth [MHz]	# of Carriers [CCs]	RB Size/Offset	Conducted Power [dBm]	Tx Ant Gain [dBi]	EIRP [dBm]
27525.00	H-UL	DFT-s-OFDM	QPSK	50	1	Full	11.40	17.00	28.40
27924.96	H-UL	DFT-s-OFDM	QPSK	50	1	Full	11.47	17.00	28.47
27924.96	H-UL	DFT-s-OFDM	QPSK	50	1	1 / 16	11.01	17.00	28.01
28324.92	H-UL	DFT-s-OFDM	QPSK	50	1	Full	11.00	17.00	28.00
27924.96	H-UL	DFT-s-OFDM	16-QAM	50	1	Full	11.15	17.00	28.15
27700.08	H-UL	DFT-s-OFDM	QPSK	100	4	Full	10.45	17.00	27.45
27924.96	H-UL	DFT-s-OFDM	QPSK	100	4	Full	10.14	17.00	27.14
27924.96	H-UL	DFT-s-OFDM	QPSK	100	4	1/33	9.79	17.00	26.79
28149.96	H-UL	DFT-s-OFDM	QPSK	100	4	Full	10.67	17.00	27.67
28149.96	H-UL	DFT-s-OFDM	16-QAM	100	4	Full	10.41	17.00	27.41

Table 7-17. NR Band n261 - Conducted Power and EIRP – ODU – H-UL Polarization

Center Frequency [MHz]	Ant.Pol.	Transmission Scheme	Modulation	Bandwidth [MHz]	# of Carriers [CCs]	RB Size/Offset	Conducted Power [dBm]	Tx Ant Gain [dBi]	EIRP [dBm]
27525.00	V-UL	DFT-s-OFDM	QPSK	50	1	Full	10.94	17.00	27.94
27924.96	V-UL	DFT-s-OFDM	QPSK	50	1	Full	11.28	17.00	28.28
27924.96	V-UL	DFT-s-OFDM	QPSK	50	1	1 / 16	10.68	17.00	27.68
28324.92	V-UL	DFT-s-OFDM	QPSK	50	1	Full	11.01	17.00	28.01
27924.96	V-UL	DFT-s-OFDM	16-QAM	50	1	Full	11.13	17.00	28.13
27700.08	V-UL	DFT-s-OFDM	QPSK	100	4	Full	10.53	17.00	27.53
27924.96	V-UL	DFT-s-OFDM	QPSK	100	4	Full	9.71	17.00	26.71
27924.96	V-UL	DFT-s-OFDM	QPSK	100	4	1/33	9.42	17.00	26.42
28149.96	V-UL	DFT-s-OFDM	QPSK	100	4	Full	9.89	17.00	26.89
27700.08	V-UL	DFT-s-OFDM	16-QAM	100	4	Full	10.44	17.00	27.44

Table 7-18. NR Band n261 - Conducted Power and EIRP – ODU – V-UL Polarization

Center Frequency [MHz]	Ant.Pol.	Transmission Scheme	Modulation	Bandwidth [MHz]	# of Carriers [CCs]	RB Size/Offset	MIMO Conducted Power [dBm]	Tx Ant Gain [dBi]	MIMO EIRP [dBm]
27525.00	MIMO	DFT-s-OFDM	QPSK	50	1	Full	14.19	17.00	31.19
27924.96	MIMO	DFT-s-OFDM	QPSK	50	1	Full	14.39	17.00	31.39
27924.96	MIMO	DFT-s-OFDM	QPSK	50	1	1 / 16	13.86	17.00	30.86
28324.92	MIMO	DFT-s-OFDM	QPSK	50	1	Full	14.02	17.00	31.02
27924.96	MIMO	DFT-s-OFDM	16-QAM	50	1	Full	14.15	17.00	31.15
27700.08	MIMO	DFT-s-OFDM	QPSK	100	4	Full	13.50	17.00	30.50
27924.96	MIMO	DFT-s-OFDM	QPSK	100	4	Full	12.94	17.00	29.94
27924.96	MIMO	DFT-s-OFDM	QPSK	100	4	1/33	12.62	17.00	29.62
28149.96	MIMO	DFT-s-OFDM	QPSK	100	4	Full	13.31	17.00	30.31
27700.08	MIMO	DFT-s-OFDM	16-QAM	100	4	Full	13.44	17.00	30.44

Table 7-19. NR Band n261 - Conducted Power – ODU – MIMO

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Page 58 of 122	
1M2202210020-02.2AUVU	02/24/2022-04/14/2022	5G mmWave Repeater	Fage 56 01 122	
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Spectrum	ı											
Att SGL Count			4 ms 😑 🗸	BW 1 MHz BW 3 MHz	Mode Sv	veep						
01Rm AvgP	wr											
00.45												
20 dBm												
10 dBm				CT.	k1							
0 dBm	о авт											
-10 dBm		∫*``	••••		T	.01.046						
-20 dBm												
-40.dBm	للماس والالاس	artal fr					ļ	undula	houthnakadama	kalingta production of		
-50 dBm												
-60 dBm—												
CF 27.525	CF 27.525 GHz 1001 pts Span 100.0 MHz											
Channel Po	wer											
Bandy	Bandwidth 50.00 MHz Power 11.40 dBm Tx Total 11.40 dBm											

Date: 10.MAR.2022 12:28:55

Plot 7-57. Conducted Power Plot – ODU – H-UL Polarization (50MHz-1CC – QPSK – Low Ch. – Full RB)

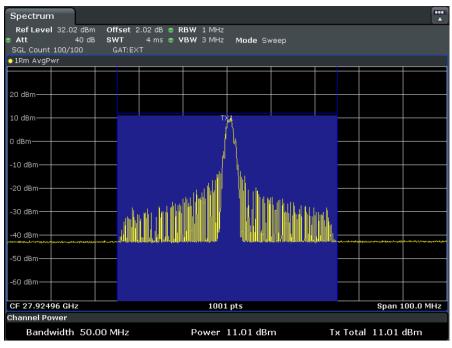
Spectrum	٦												•••
Ref Level Att SGL Count	l 32.02 dBm 40 dB 100/100	s sw		4 ms 😑	RBW 1 MH VBW 3 MH		swee	∋p					
01Rm AvgPy	wr												
20 dBm													
20 UBIII													
10 dBm						TX1							
0 dBm				a dah	tratical of			ال الجيدا	. In				
-10 dBm—			_ ľ¶	propagation	phymosolalical	Mand And And And And And And And And And A	锄峒	hlippi, han para	սոր				
-10 dBm			1						١				
-20 dBm—			1										
			4						1				
-30 dBm									- {				
10 10			}							<u>к.</u> ,			
,40.dBm+++	hlywrthilfaryda	ertellererter								mentad	Whiteman gale was included	lannyalar	Antoholy
-50 dBm—													
-60 dBm—													
CF 27.9249					10	01 pts					Span 1	LOO.0 M	Hz
Channel Po		~~			5				-		1		
Bandy	width 50.	.00 M	Hz		Powe	11.47	dBm		T	x fot	al 11.47	dBm	

Date: 10.MAR.2022 12:21:10

Plot 7-58. Conducted Power Plot – ODU – H-UL Polarization (50MHz-1CC – QPSK – Mid Ch. – Full RB)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager						
Test Report S/N:	Test Dates:	EUT Type:	Dega 50 of 100						
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Date: 10.MAR.2022 12:22:35

Plot 7-59. Conducted Power Plot – ODU – H-UL Polarization (50MHz-1CC – QPSK – Mid Ch. – 1RB)

Spectrun	n													
Ref Leve Att Count 100	l 31.50 dBm 40 dB /100		т			BW 1 MH BW 3 MH		Sw	veep					
🔾 1Rm AvgP	wr													
20 dBm														
10 dBm							T Ú 4							
10 0.0111							TX1							
0 dBm														
			a de la	u kan kan ji keri	Adrew	վազիեր	9.494 U.am	ekhi	141phphphpul	NUA				
-10 dBm—						a Man	a sullas a	ΪM'	alshe of the last of	, Ind	_			
			ľ					U		٦				
-20 dBm—														
00.10														
-30 dBm—														
-40. dBm		Later	{											
UNIO ULICANIA)	wheelper and the second	V). of bills, o,									1990 Barrelle	Hayy Human and the	hard and a start of the second	n franke
-50 dBm—														
-60 dBm—											_			
CF 28.324						10	1 pts					Span 1	.00.0 M	Hz
Channel Po	ower													
Band	width 50.	00 M	Hz			Power	11.00	dBr	n	T	х Tot	al 11.00	dBm	

Date: 10.MAR.2022 12:27:43

Plot 7-60. Conducted Power Plot – ODU – H-UL Polarization (50MHz-1CC – QPSK – High Ch. – Full RB)

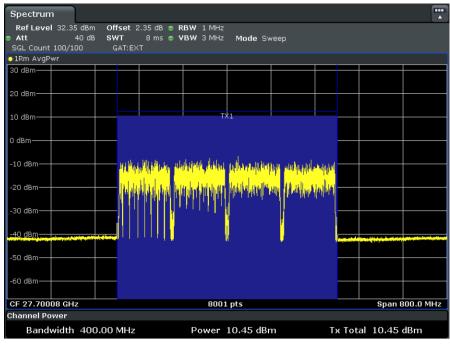
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager						
Test Report S/N:	Test Dates:	EUT Type:	Dage 60 of 100						
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Spectrun	r									
SGL Count	40 dB 100/100	Offset 2 SWT GAT:EX	4 ms 😑 🗸	BW 1 MHz BW 3 MHz	Mode Sv	veep				
01Rm AvgP	wr									
20 dBm										
10 dBm				נד	(1					
0 dBm		WH	ina Andrea Alie	khohabila	Milila Machalla	tpudyprotection	ada.			
-10 dBm—		_ / `		լ անդերութ,	, flavol fil or i	1. 1 . 1	"]\(
-20 dBm—										
-30 dBm										
	an shenned was get and	4thr					Ľ	watan	1946, Halidovila, and	Alger and the second second
-50 dBm							·			
-60 dBm										
CF 27.924				1001	. pts				Span 1	.00.0 MHz
Channel Po Band	width 50.00	MHz		Power	11.15 dBr	m	Ъ	(Tota	al 11.15	dBm

Date: 10.MAR.2022 12:24:51

Plot 7-61. Conducted Power Plot – ODU – H-UL Polarization (50MHz-1CC – 16QAM – Mid Ch. – Full RB)

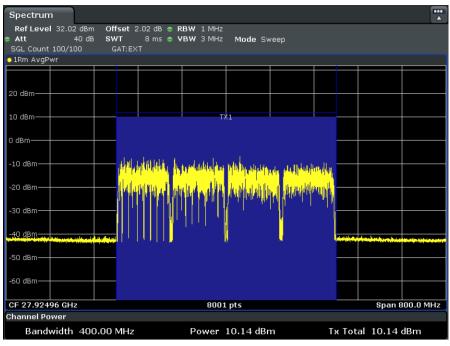


Date: 10.MAR.2022 11:46:46

Plot 7-62. Conducted Power Plot – ODU – H-UL Polarization (100MHz-4CC – QPSK – Low Ch. – Full RB)

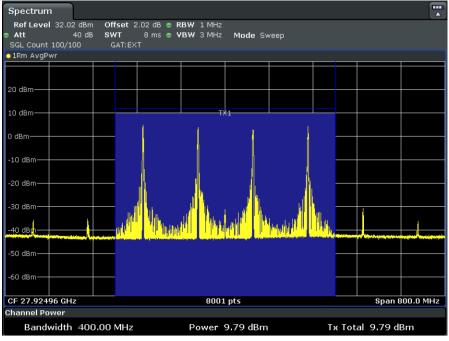
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dege 61 of 100
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Date: 10.MAR.2022 11:48:06





Date: 10.MAR.2022 11:54:16

Plot 7-64. Conducted Power Plot – ODU – H-UL Polarization (100MHz-4CC – QPSK – Mid Ch. – 1RB)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga 62 of 102
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Spectrum										
SGL Count	40 dB 100/100	Offset 2. SWT GAT:EX1	8 ms 😑 🗸	BW 1 MHz BW 3 MHz	Mode Sw	/еер				
01Rm AvgPv	/r									
20 dBm										
10 dBm				kт	1					
0 dBm										
-10 dBm		e <mark>l debe</mark>	publiphed de	hind days of	alan kati pita	an Andrikany	<mark>lineal</mark> ,			
-20 dBm		1000	N-AMANA MA	n Hell	and monthly	ull <mark>igend_e fleet</mark>	NAMA -			
	in the second second	<u>'गतत'</u>					Ţ	and the second		
-50 dBm							-			
-60 dBm										
CF 28.1499				8001	pts				Span 8	00.0 MHz
Channel Pov Bandw	vidth 400.0	0 MHz		Power	10.67 dBn	n	Тх	Total	10.67	dBm

Date: 10.MAR.2022 11:51:42

Plot 7-65. Conducted Power Plot – ODU – H-UL Polarization (100MHz-4CC – QPSK – High Ch. – Full RB)

Spectrun	n									
Ref Leve Att Count 100	32.18 dBm 40 dB			RBW 1 MHz VBW 3 MHz	Mode S	weep				
01Rm AvgP		GALLAT								
- Internet										
20 dBm										
10 dBm				Т	1					
10 0.0111										
0 dBm							-			
				la						
-10 dBm—		al of the second	<mark>ni habbu i</mark>	MARKA ALABANA	diluter based	edility, habit data, et	(dankila)			
-20 dBm			la la calificia d	uth constant	ulida da se di se	بالمراب الملاح العماه				
		In Last	nati dun 1 di 🕯 🔥	, dit , bud	aldhelah Lam	t , te al loter a Millia de	作順門			
-30 dBm										
40 d9m-		4.16								
.1 9.dBm777			· ·				1			
-50 dBm							-			
-60 dBm							-			
CF 28.149				8001	pts				Span 8	800.0 MHz
Channel Pc										
Band	width 400	0.00 MHz		Power	10.41 dB	sm	Тх	Tota	al 10.41	dBm

Date: 8.APR.2022 21:23:10

Plot 7-66. Conducted Power Plot – ODU – H-UL Polarization (100MHz-4CC – 16QAM – High Ch. – Full RB)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 62 of 100
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Spectrum	n									
Ref Level Att SGL Count	I 32.18 dBm 40 dB 100/100	Offset SWT GAT:EX	4 ms 😑 🗸	BW 1 MHz BW 3 MHz	Mode Sv	veep				
💿 1Rm AvgP	wr									
20 dBm										
10 dBm			ł	CT	1					
0 dBm		أمار	ilden and an da	kusi ndanavad aalu	in na Analantia	adadd affadaad	er ithe			
-10 dBm—		— Mu	Manandaha	10 Mar all in	փավ Մ. դով լո	la ali internetione di				
-20 dBm—							l			
-30 dBm		_/								
_{ւ*} ։«Աստերոպ»»։	- Andrew (Criter of the	and a start of the					(www.dogglov	toportal produced	the-realized and a second
-50 dBm										
-60 dBm										
CF 27.525	GHz			1001	pts				Span 1	.00.0 MHz
Channel Po	ower									
Bandy	width 50.	00 MHz		Power	10.94 dBr	n	T	(Tota	10.94	dBm

Date: 9.MAR.2022 23:00:07

Plot 7-67. Conducted Power Plot – ODU – V-UL Polarization (50MHz-1CC – QPSK – Low Ch. – Full RB)

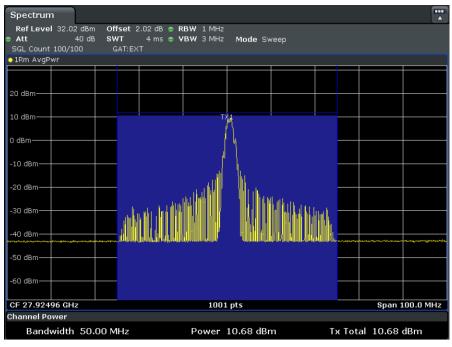
Spectrur	n											
Ref Leve Att SGL Count	l 32.02 dBm 40 dB 100/100	sw		4 ms 🧃		1 MHz 3 MHz	Mode Sv	veep				
🖸 1Rm AvgF	wr											
20 dBm												
10 dBm						נד	(1		1			
0 dBm			μŴ	WKK (LANKKA) A	hhipapi	llyotypun	nyyhhhh	ntheoremyblighter	1444			
-20 dBm—			ļ							_		
-30 dBm	hau des dates light services in	a alaya asaa								Jahaha	outer di ana	
ւ րակ թ ելուկը։ -50 dBm—	առուլիս տվիլ է թ										alation line and a straight st	ANCHINE BARUAD
-60 dBm—												
CF 27.924						1001	pts				Span 1	00.0 MHz
Channel Po	ower											
Band	width 50.	.00 M	Hz		Р	ower	11.28 dBr	n	Т	x Tot	al 11.28	dBm

Date: 9.MAR.2022 22:27:08

Plot 7-68. Conducted Power Plot – ODU – V-UL Polarization (50MHz-1CC – QPSK – Mid Ch. – Full RB)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Date: 9.MAR.2022 22:57:17



Spectrun	n											
Att SGL Count		sw.		4 ms 😑 🗸	BW 1 MHz BW 3 MHz	Mode Sv	veep					
01Rm AvgP	'wr											
20 dBm												
10 dBm					מ	(1						
0 dBm			u d) Notri alta I. Jacob Ju	lates folgentett dage	a kalinhaita	orfoofforten <mark>l</mark> oote	Hilm				
-10 dBm			<i>p</i> p	a. Radolindi dhananaa	. Al al an Albit of	المريمية بالط	ւ չոփվես վիրվի					
-20 dBm—												
hartonglestarlying	ne filfered filler fak	<u>haruhanan</u>							mylw	cibyeren yeren general	htter	ntut-Ai
-50 dBm												
-60 dBm—												
CF 28.324					1001	. pts				Span 1	.00.0 M	IHz
Channel Po												
Band	width 50	.00 MI	Hz		Power	11.01 dBr	n	Т	x Tot	al 11.01	dBm	

Date: 9.MAR.2022 23:01:29

Plot 7-70. Conducted Power Plot – ODU – V-UL Polarization (50MHz-1CC – QPSK – High Ch. – Full RB)

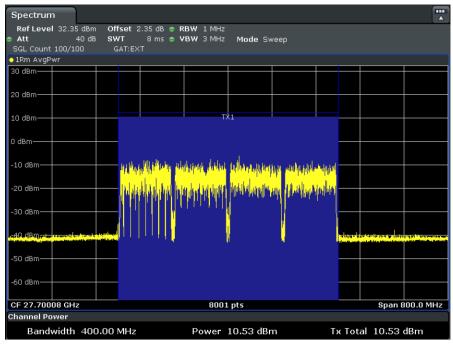
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dege (E of 100
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Spectrum	r									
SGL Count		Offset 2 SWT GAT:EX	4 ms 😑 🗸	BW 1 MHz BW 3 MHz	Mode Sv	veep				
01Rm AvgP	wr									
20 dBm										
10 dBm				מ	(1					
0 dBm		udult	munitian	hithwohalantin	nuMarithddard	hikanyulikhan	with			
-10 dBm—		— Λ'*'	n 1. e. 1.eta	te o.h.fle, addit	11 AU. A	. 9. 9.90 (a)	** U			
-20 dBm										
-30 dBm	uh Munder of the state of the s	istaria						herry	հիմիստություն	unbalka
-50 dBm										
-60 dBm										
CF 27.924	96 GHz			1001	nts				Snap 1	.00.0 MHz
Channel Po				1001					epun i	
	width 50.0	0 MHz		Power	11.13 dBr	n	Т	(Tot	al 11.13	dBm

Date: 9.MAR.2022 23:03:12

Plot 7-71. Conducted Power Plot – ODU – V-UL Polarization (50MHz-1CC – 16QAM – Mid Ch. – Full RB)

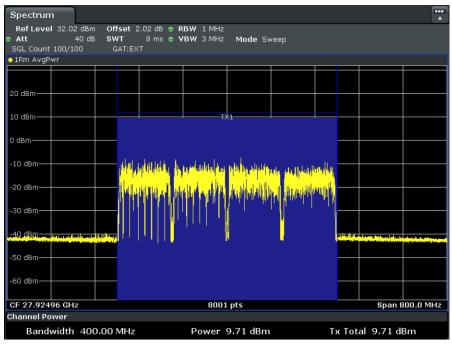


Date: 10.MAR.2022 11:31:11

Plot 7-72. Conducted Power Plot – ODU – V-UL Polarization (100MHz-4CC – QPSK – Low Ch. – Full RB)

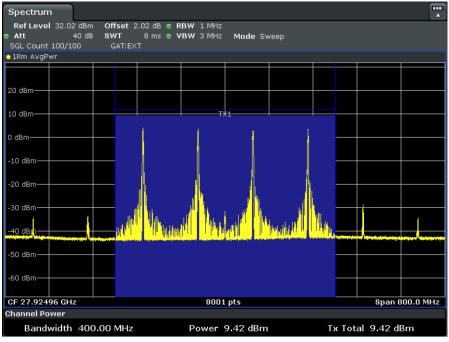
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	
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Date: 10.MAR.2022 11:27:06





Date: 10.MAR.2022 11:28:37

Plot 7-74. Conducted Power Plot – ODU – V-UL Polarization (100MHz-4CC – QPSK – Mid Ch. – 1RB)

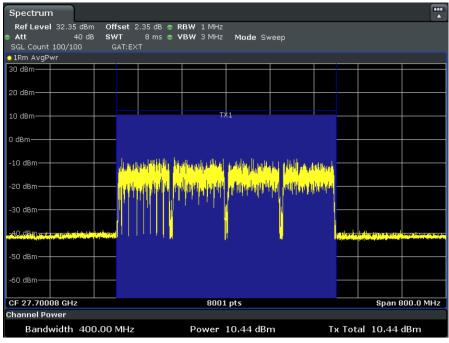
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager			
Test Report S/N:	Test Dates:	EUT Type:	Dage 67 of 100			
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Spectrum								····
Ref Level 33 Att	2.18 dBm Off 40 dB SW		RBW 1 MHz /BW 3 MHz	Mode Sw	/eep			
SGL Count 10	0/100 G	AT: EXT						
o1Rm AvgPwr								
20 dBm								
20 0011								
10 dBm			Т	(1				
0 dBm						-		
-10 dBm		Internet the second	and ta					
-10 0811		a <mark>lakaka keresalanan</mark> aka	here a start a	Addukadi juli g	ally desidents	ALCONAL		
-20 dBm		allulati tatan atlak m	is stabilized at	Undelse stade	NU. Wanth Law	that -		
		a na an in the second second	i i i in india i	իրով վերու է	and the standard	Uladard		
-30 dBm								
40 d9m						ľ		
THU CENT			Į	t	. <mark>.</mark>		de di telle di sed	
-50 dBm						_		
-60 dBm								
05 00 14006	011-		0001					000 0 MU-
CF 28.14996 Channel Powe			8001	pts			sp	an 800.0 MHz
	 1th 400.001	MHz	Power	9.89 dBm		Тx	Total 9.89	∂ dBm

Date: 10.MAR.2022 11:33:07

Plot 7-75. Conducted Power Plot – ODU – V-UL Polarization (100MHz-4CC – QPSK – High Ch. – Full RB)



Date: 10.MAR.2022 11:34:49

Plot 7-76. Conducted Power Plot – ODU – V-UL Polarization (100MHz-4CC – 16QAM – Low Ch. – Full RB)

FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 69 of 100
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7.7 Radiated Spurious and Harmonic Emissions

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

The conductive power or total radiated power of any emissions outside a licensee's frequency block shall be -13dBm/1MHz.

Test Procedure Used

ANSI C63.26-2015 – Section 5.5.4 KDB 842590 D01 – Section 4.4.3

Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to 100 GHz. Several plots are used to show investigations in this entire span.
- 2. Trace / Detector =
 - a. Average / RMS for all emissions
 - b. MaxHold / Peak for emissions solely due to unlicensed transmitters (in addition to part a)
- 3. For measurements made with Trace Averaging:
 - a. These measurements were averaged over at least 100 traces.
 - b. For signals with continuous operation, triggering was set to "free run" and the sweep time was set to "auto". For pulsed signals, triggering was set to enable measurements only during full power bursts with the sweep time set less than or equal to the transmission burst duration.
- 4. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 5. The trace was allowed to stabilize
- 6. RBW = 1MHz, VBW = 3MHz

Test Notes

- The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below. The worst case found was 50MHz-1CC bandwidth/component carrier, QPSK Modulation, with 1RB. The EUT was tested under such signaling conditions.
- 2) All radiated spurious emissions were measured as EIRP to compare with the §30.203 TRP limits.
- 3) The plots in this section were taken with the analyzer set to max hold. All final measurements shown in the tables that accompany the plots were taken with trace averaging performed over 100 sweeps while the analyzer was triggering on a specific emission of interest.

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- 4) The plots from 1 100GHz show corrected average EIRP levels. The average EIRP reported below is calculated per section 5.2.7 of ANSI C63.26-2015 which states: EIRP (dBm) = E (dBµV/m) + 20log(D) 104.8; where D is the measurement distance (in the far field region) in m. The field strength E is calculated E (dBµV/m) = Spectrum Analyzer Level (dBm) + Antenna Factor (dB/m) + Cable Loss (dB) + Harmonic Mixer Conversion Loss (dB) + 107. All appropriate Antenna Factors and Cable Losses have been applied in the spectrum analyzer for each measurement. For measurements > 40GHz, a Harmonic Mixer Conversion Loss was also applied to the spectrum analyzer.
- 5) Emissions below 18GHz were measured at a 3 meter test distance, while emissions above 18GHz were measured at the appropriate far field distance. The far field of the mmWave signal is based on formula: R > 2D^2/wavelength, where D is the larger between the dimension of the measurement antenna and the transmitting antenna of the EUT. In this case, D is the largest dimension of the measurement antenna.

Frequency Range (GHz)	Wavelength(cm)	Far Field Distance (m)	Measurement Distance (m)
18-40	0.749	0.54	1.00
40-60	0.500	1.39	1.50
60-90	0.333	0.91	1.00
90-140	0.214	0.58	1.00
140-200	0.150	0.39	1.00

Table 7-20. Far-Field Distance & Measurement Distance per Frequency Range

- 6) All emissions from 30MHz 40GHz were measured using a spectrum analyzer with an internal preamplifier. Emissions >40GHz were measured using a harmonic mixer with the spectrum analyzer.
- 7) To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. Therefore, the EUT is simultaneously transmitting: the 5G NR Band n261 mmWave signal, Bluetooth LE at 2440MHz, and an LTE Cat M1 Band 13 signal.
- 8) The spectrum scan plots in this section are used for the purpose of signal identification. Each emission is subject to a unique limit based on the rule under which the transmitter operates. For instances where an emission is the product of co-located transmitters (i.e. an intermodulation product), the limit on that emission is the least strict between the rule parts under which each transmitter operates.
- 9) The limit lines on the spectrum scan plots in this section are displayed in regards to the part 30 limits for n261 mmWave spurious emissions. The limits for spurious emissions solely due to the other transmitters are not displayed on the plots. Instead, the applicable limits are displayed in the accompanying tables.
- 10) The fundamental emissions from multiple co-located transmitters may appear on spectrum scan plots. These are not investigated as spurious emissions.
- 11) None of the observed spurious emissions were due the unlicensed transmitter. That is, the Bluetooth module (FCC ID: Z64-WL18SBMOD) yielded no measurable harmonics nor any measurable intermodulation products. Therefore, all final Spurious Emission Levels presentend in the tables of the section were measured with an RMS detector and trace averaging.
- 12) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

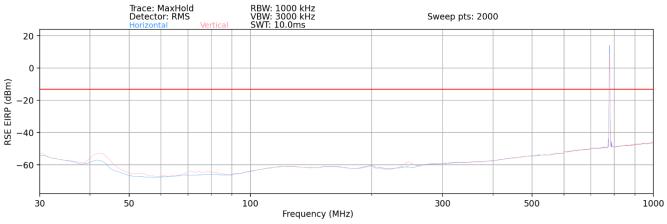
FCC ID: 2AUVU-ESB261	element	PART 20 & 30 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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<u> Band n261 – IDU</u>

30MHz - 1GHz



Plot 7-77. n261 Radiated Spurious Plot (1CC QPSK Mid Channel) - IDU

Spurious Emissions ERP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE ERP level is calculated by applying the additional factors shown below for a test distance of 3 meter.

RSE ERP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) - 104.8 - 2.15 (dB)

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Antenna Height [cm]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
73.50	Low	50	MIMO	QPSK	V	-	-	-61.28	-13.00	-48.28
77.47	Mid	50	MIMO	QPSK	V	-	-	-61.26	-13.00	-48.26
200.25	High	50	MIMO	QPSK	V	-	-	-58.30	-13.00	-45.30

 Table 7-21. n261 Radiated Spurious Emissions Table (30MHz - 1GHz) - IDU

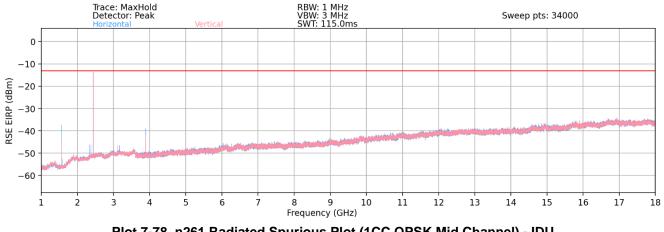
- 1. The RSE ERP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, cable losses. Measurements were performed at a distance of 3 meters.
- To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.
- 3. The emission at 778MHz is the fundamental signal from the LTE module and, as such, it is not investigated as a spurious emission.

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1GHz - 18GHz



Plot 7-78. n261 Radiated Spurious Plot (1CC QPSK Mid Channel) - IDU

Spurious Emissions EIRP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE EIRP level is calculated by applying the additional factors shown below for a test distance of 3 meter.

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Antenna Height [cm]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1556.40	Low	50	MIMO	QPSK	Н	225	151	-44.90	-13.00	-31.90
1583.90	Low	50	MIMO	QPSK	Н	258	142	-53.76	-40.00	-13.76
2334.60	Mid	50	MIMO	QPSK	Н	237	247	-56.64	-13.00	-43.64
2376.60	Mid	50	MIMO	QPSK	Н	247	258	-50.06	-13.00	-37.06
3112.60	High	50	MIMO	QPSK	Н	139	275	-58.81	-13.00	-45.81
3891.20	High	50	MIMO	QPSK	Н	207	398	-44.29	-13.00	-31.29

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) - 104.8

Table 7-22. n261 Radiated Spurious Emissions Table (1GHz - 18GHz) - IDU

Notes

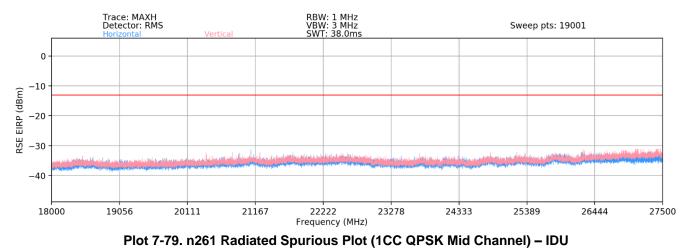
- 1. The RSE EIRP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, cable losses. Measurements were performed at a distance of 3 meters.
- To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.
- 3. The emission at 2440MHz is the fundamental signal from the Bluetooth module and, as such, it is not investigated as a spurious emission.
- 4. The emission at 1583.90MHz is assumed to be due to the LTE Cat M1 Band 13 transmission. Therefore, it is investigated as if it is subject to the spurious emission limits indicated in FCC Part 27 Subpart C (§27.53f).
- 5. It was verified that none of the spurious emissions present were due to the unlicensed transmitter. Therefore, all final measurements displayed in the table above were performed with trace averaging and an RMS detector.

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18GHz - 27.5GHz



Spurious Emissions EIRP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE EIRP level is calculated by applying the additional factors shown below for a test distance of 1 meter.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) - 104.8

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
19622.56	Low	50	MIMO	QPSK	V	-	-	-42.76	-13.00	-29.76
23329.59	Mid	50	MIMO	QPSK	V	-	-	-41.55	-13.00	-28.55
26419.37	High	50	MIMO	QPSK	V	-	-	-40.46	-13.00	-27.46

Table 7-23. n261 Radiated Spurious Emissions Table (18GHz - 27.5GHz) - IDU

Notes

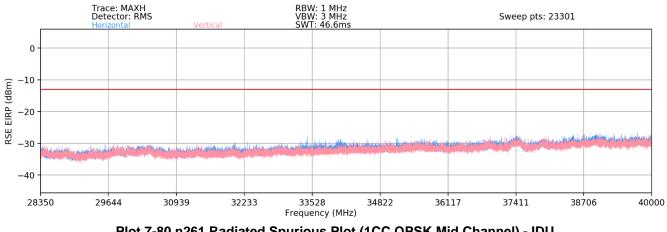
- 1. The RSE ERP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, cable losses. Measurements were performed at a distance of 1 meter.
- To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.

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28.35GHz - 40GHz



Plot 7-80 n261 Radiated Spurious Plot (1CC QPSK Mid Channel) - IDU

Spurious Emissions EIRP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE EIRP level is calculated by applying the additional factors shown below for a test distance of 1 meter.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) - 104.8

	quency MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
30	491.73	Low	50	MIMO	QPSK	V	-	-	-36.73	-13.00	-23.73
34	155.57	Mid	50	MIMO	QPSK	V	-	-	-36.52	-13.00	-23.52
38	351.28	High	50	MIMO	QPSK	V	-	-	-34.49	-13.00	-21.49

Table 7-24. n261 Radiated Spurious Emissions Table (28.35GHz - 40GHz) - IDU

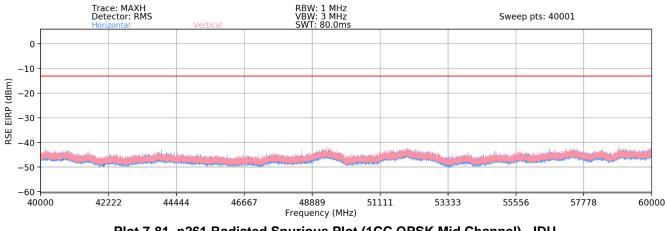
- 1. The RSE ERP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, cable losses. Measurements were performed at a distance of 1 meter.
- To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.

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40GHz - 60GHz





Spurious Emissions EIRP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE EIRP level is calculated by applying the additional factors shown below for a test distance of 1.5 meter.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) – 104.8 + Harmonic Mixer Conversion Loss [dB]

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
55050.00	Low	50	MIMO	QPSK	V	-	-	-50.46	-13.00	-37.46
55849.92	Mid	50	MIMO	QPSK	V	-	-	-50.11	-13.00	-37.11
56649.84	High	50	MIMO	QPSK	V	-	-	-49.63	-13.00	-36.63

Table 7-25. n261 Radiated Spurious Emissions Table (40GHz - 60GHz) - IDU

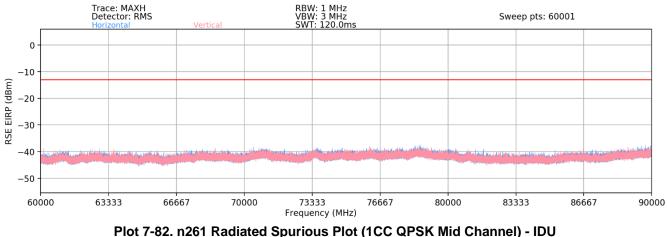
- 1. The RSE ERP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, cable losses. Measurements were performed at a distance of 1.5 meters.
- To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.

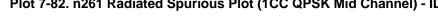
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60GHz - 90GHz





Spurious Emissions EIRP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE EIRP level is calculated by applying the additional factors shown below for a test distance of 1 meter.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) - 104.8 + Harmonic Mixer Conversion Loss [dB]

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
82575.00	Low	50	MIMO	QPSK	V	-	-	-47.24	-13.00	-34.24
83774.88	Mid	50	MIMO	QPSK	V	-	-	-47.33	-13.00	-34.33
84974.76	High	50	MIMO	QPSK	V	-	-	-47.54	-13.00	-34.54

Table 7-26. n261 Radiated Spurious Emissions Table (60GHz - 90GHz) - IDU

Notes

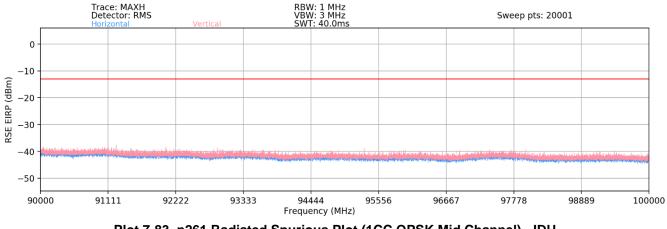
- The RSE ERP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, 1 cable losses. Measurements were performed at a distance of 1 meter.
- 2. To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.

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90GHz - 100GHz





Spurious Emissions EIRP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE EIRP level is calculated by applying the additional factors shown below for a test distance of 1 meter.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) – 104.8 + Harmonic Mixer Conversion Loss [dB]

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
92454.45	Low	50	MIMO	QPSK	V	-	-	-46.18	-13.00	-33.18
95501.25	Mid	50	MIMO	QPSK	V	-	-	-47.13	-13.00	-34.13
98298.88	High	50	MIMO	QPSK	V	-	-	-47.48	-13.00	-34.48

Table 7-27. n261 Radiated Spurious Emissions Table (90GHz - 100GHz) - IDU

- 1. The RSE ERP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, cable losses. Measurements were performed at a distance of 1 meter.
- To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.

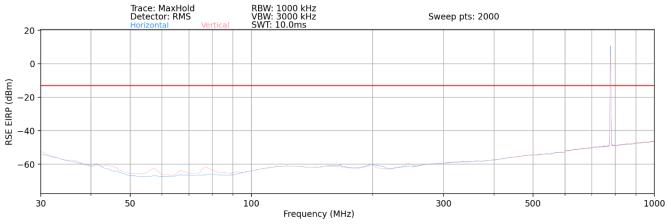
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Band n261 – ODU

30MHz - 1GHz



Plot 7-84. n261 Radiated Spurious Plot (1CC QPSK Mid Channel) - ODU

Spurious Emissions ERP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE ERP level is calculated by applying the additional factors shown below for a test distance of 3 meter.

RSE ERP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) - 104.8 - 2.15 (dB)

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Antenna Height [cm]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
76.70	Low	50	MIMO	QPSK	V	-	-	-60.24	-13.00	-47.24
201.63	Mid	50	MIMO	QPSK	V	-	-	-58.60	-13.00	-45.60
249.31	High	50	MIMO	QPSK	V	-	-	-58.13	-13.00	-45.13

 Table 7-28. n261 Radiated Spurious Emissions Table (30MHz - 1GHz) - ODU

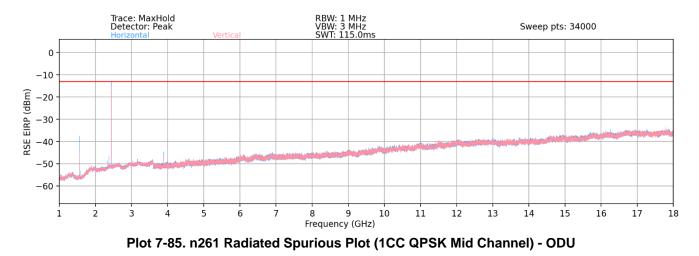
- 1. The RSE ERP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, cable losses. Measurements were performed at a distance of 3 meters.
- To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.
- 3. The emission at 778MHz is the fundamental signal from the LTE module and, as such, it is not investigated as a spurious emission.

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1GHz - 18GHz



Spurious Emissions EIRP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE EIRP level is calculated by applying the additional factors shown below for a test distance of 3 meter.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) -	104.8
---	-------

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Antenna Height [cm]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1556.40	Low	50	MIMO	QPSK	Н	4	153	-42.10	-13.00	-29.10
1583.90	Low	50	MIMO	QPSK	Н	77	178	-53.55	-40.00	-13.55
2334.60	Mid	50	MIMO	QPSK	Н	53	131	-59.53	-13.00	-46.53
2376.10	Mid	50	MIMO	QPSK	Н	331	149	-48.53	-13.00	-35.53
3891.20	High	50	MIMO	QPSK	Н	27	389	-51.73	-13.00	-38.73

Table 7-29. n261 Radiated Spurious Emissions Table (1GHz - 18GHz) - ODU

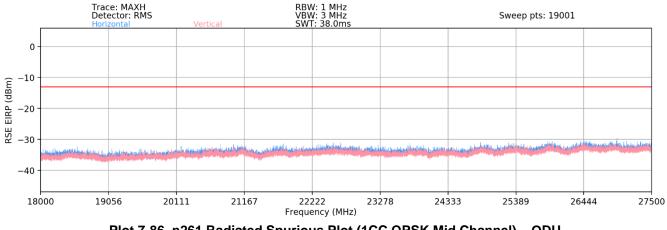
- 1. The RSE EIRP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, cable losses. Measurements were performed at a distance of 3 meters.
- To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.
- 3. The emission at 2440MHz is the fundamental signal from the Bluetooth module and, as such, it is not investigated as a spurious emission.
- 4. The emission at 1583.90MHz is assumed to be due to the LTE Cat M1 Band 13 transmission. Therefore, it is investigated as if it is subject to the spurious emission limits indicated in FCC Part 27 Subpart C (§27.53f).
- 5. It was verified that none of the spurious emissions present were due to the unlicensed transmitter. Therefore, all final measurements displayed in the table above were performed with trace averaging and an RMS detector.

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18GHz - 27.5GHz



Plot 7-86. n261 Radiated Spurious Plot (1CC QPSK Mid Channel) – ODU

Spurious Emissions EIRP Sample Calculation (n261)

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the RSE EIRP level is calculated by applying the additional factors shown below for a test distance of 1 meter.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) - 104.8

Frequency [MHz]	Channnel	Bandwidth (MHz)	EUT Beam Pol.	Modulation	Antenna Polarization [H/V]	Turntable Azimuth [degrees]	Positioner Azimuth [degrees]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
21145.23	Low	50	MIMO	QPSK	V	-	-	-40.97	-13.00	-27.97
24576.11	Mid	50	MIMO	QPSK	V	-	-	-40.40	-13.00	-27.40
27061.82	High	50	MIMO	QPSK	V	-	-	-38.46	-13.00	-25.46

Table 7-30. n261 Radiated Spurious Emissions Table (18GHz - 27.5GHz) - ODU

- 1. The RSE ERP level is taken directly from the spectrum analyzer which includes the appropriate antenna factors, cable losses. Measurements were performed at a distance of 1 meter.
- To cover the simultaneous transmissions, both the LTE module (FCC ID: 2AUVU-UBR410M) and Bluetooth module (FCC ID: Z64-WL18SBMOD) are set to transmit at the same time as the mmWave functionality of the host. EUT is transmitting Bluetooth LE at 2440MHz simultaneously with the LTE Cat M1 Band 13 signal.

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