

### **TEST DESCRIPTION**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Output Power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The RMS average power measurement method for FCC/IC is detailed in section 5.2 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.4.4. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1/D)], where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times.

The output power was measured for a single carrier over the carrier channel bandwidth. The power was measured for a single carrier over the channel bandwidth indicated in the table. The total power for multi-port (64x64 MIMO) operation was based upon ANSI C63.26 clauses 6.4.3.1 and 6.4.3.2.4 (10 log N<sub>out</sub>). The total output power for Sixty-Four port operation is single power +18.1 dB [i.e.  $10*\log(64)$ ].

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2024-03-12	2025-03-12
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Block - DC	Fairview Microwave	SD3239	ANE	2024-02-14	2025-02-14



EUT:	AVQQA Remote Radio Head	Work Order:	NOKI0075
Serial Number:	L1242403137	Date:	2024-08-15
Customer:	Nokia Solutions and Networks	Temperature:	23.3°C
Attendees:	David Le, John Rattanavong	Relative Humidity:	52.1%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54VDC	Configuration:	NOKI0075-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 27:2024	ANSI C63.26:2015

### COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.7 GHz band in the single carrier operating mode configuration. All measured power values are within tolerance (i.e.: Rated Power ±2.0 dB).

### **DEVIATIONS FROM TEST STANDARD**

None

### CONCLUSION

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### **TEST RESULTS**

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Sixty-four Port (64x64 MIMO) dBm/carrier BW
ort 1	· · ·			
20 MHz Channel Bandwidth				
QPSK Modulation				
Low Channel, 3710.01 MHz	31.007	0	31.0	49.1
Mid Channel, 3840.00 MHz	31.787	0	31.8	49.9
High Channel, 3969.99 MHz	30.693	0	30.7	48.8
40 MHz Channel Bandwidth QPSK Modulation				
Low Channel, 3720.00 MHz	34.073	0	34.1	52.2
Mid Channel, 3840.00 MHz	34.735	0	34.7	52.8
High Channel, 3960.00 MHz	34.066	0	34.1	52.2
60 MHz Channel Bandwidth QPSK Modulation				
Low Channel, 3730.02 MHz	36.483	0	36.5	54.6
Mid Channel, 3840.00 MHz	36.911	0	36.9	55.0
High Channel, 3949.98 MHz	36.582	0	36.6	54.7
80 MHz Channel Bandwidth QPSK Modulation				
Low Channel, 3740.01 MHz	36.394	0	36.4	54.5
Mid Channel, 3840.00 MHz	36.713	0	36.7	54.8
High Channel, 3939.99 MHz	36.342	0	36.3	54.4



	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Sixty-four Port (64x64 MIMO) dBm/carrier BW
100 MHz Channel Bandwidth QPSK Modulation				
Low Channel, 3750.00 MHz	36.15	0	36.2	54.3
Mid Channel, 3840.00 MHz	36.611	0	36.6	54.7
High Channel, 3930.00 MHz	36.444	0	36.4	54.5
16QAM Modulation				
Mid Channel, 3840.00 MHz	36.689	0	36.7	54.8
64QAM Modulation				
Mid Channel, 3840.00 MHz	36.742	0	36.7	54.8
256QAM Modulation				
Mid Channel, 3840.00 MHz	36.783	0	36.8	54.9



11:58:52 AH Aug 16, 2024 Radio Std: None

> Span 45.00 MH Sweep 601.1 m

Radio Device: BT:

50/50

Keysight Spec	trum Analyzer - Element Materials	Technology - Points: 1000		ALIGN OFF	12:25:09 PM Aug 16, 202
	Gate: LO	#FGain1.ow	Center Freq: 3.710010 Trig: External1 #Atten: 30 dB	0000 GHz Avg(Hold: 50/50	Radio Std: None Radio Device: BTS
) dB/div	Ref Offset 33.1 dB Ref 35.00 dBm				
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enter 3.7 es BW 4	1001 GHz 30 kHz		#VBW 1.3 N	IHz	Span 45.00 MH #Sweep 601.1 m
Chann	el Power		Power Spect	ral Density	
3	1.01 dBm /:	20 MHz	18.00	dBm /MHz	

Port 1 20 MHz Channel Bandwidth QPSK Modulation Low Channel, 3710.01 MHz

	4.00			
Span 45.00 MHz Sweep 601.1 ms	Center 3.84000 GHz Res BW 430 kHz	#VBW 1.3 MHz		
	Channel Power 31.79 dBm / 20 MHz	Power Spectral Density 18.78 dBm /MHz		
	M5G)	STATUS		
	20 MH	Port 1 20 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz		

Ref Offset 33.1 dB Ref 36.00 dBm

£L.	RF 50 0 DC Gate: LO	#FGain:Low	Center Freq: 3.9 Trig: External1 #Atten: 30 dB	69990000 GHz Avg(Hc	old: 50/50	12:37:11 PH Aug 16, 2 Radio Std: None Radio Device: BTS
0 dBldiv	Ref Offset 33.1 dB Ref 35.00 dBm					
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enter 3.9 es BW 4	96999 GHz 430 kHz		#VBW	I.3 MHz		Span 45.00 M #Sweep 601.1
Chanr	nel Power		Power Sp	ectral Dens	ity	
3	30.69 dBm /	20 MHz	17	.68 dBm	/MHz	

Port 1 20 MHz Channel Bandwidth QPSK Modulation High Channel, 3969.99 MHz

RL	trum Analyzer - Bernent Materials RF 50 0 0C   Gate: LO		Center Freq: 3.720000 Trig: External1	ALIGN OFF 000 GHz Avg(Hold: 50/50	11:15:31 AH Aug 16, 20 Radio Std: None
	Office Ed	#FGainLow	#Atten: 30 dB		Radio Device: BTS
dBldiv	Ref Offset 33.1 dB Ref 38.00 dBm	_			
0					
0		(			
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0					
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0					
0					
	2000 GHz				0
	820 kHz		#VBW 2.7 M	Hz	Span 100.0 MH #Sweep 601.1 m
Chann	el Power		Power Spectr	al Density	
3	4.07 dBm /4	40 MHz	18.05	dBm /мнz	

Port 1 40 MHz Channel Bandwidth QPSK Modulation Low Channel, 3720.00 MHz



Ref 38.00 dBm Ref 38	Power Spectral Density	RL	RF SER DC Gate: LO	#FGain1.ow	Center Freq: 3.84000 Trig: External1 #Atten: 30 dB	Auton ore 0000 GHz Avg[Hold: 50/50	10:46:44 MH Aug 16, 20 Radio Std: None Radio Device: BTS
channel Power Power Spectral Density	#VBW 2.7 MHz #Sweep 601.1 m Power Spectral Density		Ref Offset 33.1 dB Ref 38.00 dBm				
channel Power Channel Power Spectral Density	#VBW 2.7 MHz #Sweep 601.1 m Power Spectral Density	0					
channel Power Channel Power Spectral Density	#VBW 2.7 MHz #Sweep 601.1 m Power Spectral Density	4		/			
channel Power Channel Power Spectral Density	#VBW 2.7 MHz #Sweep 601.1 m Power Spectral Density						
Inter 3.84000 GHz es BW 820 kHz Channel Power Channel Power Spectral Density	#VBW 2.7 MHz #Sweep 601.1 n Power Spectral Density	ų —					
Inter 3.84000 GHz Les BW 820 kHz #VBW 2.7 MHz #Sweep Channel Power Power Spectral Density	#VBW 2.7 MHz #Sweep 601.1 n Power Spectral Density	0					
ees BW 820 kHz #VBW 2.7 MHz #Sweep Channel Power Power Spectral Density	#VBW 2.7 MHz #Sweep 601.1 n Power Spectral Density						
ees BW 820 kHz #VBW 2.7 MHz #Sweep Channel Power Power Spectral Density	#VBW 2.7 MHz #Sweep 601.1 n Power Spectral Density	0					
					#VBW 2.7 M	ИНz	Span 100.0 Mi #Sweep 601.1 n
34.73 dBm / 40 MHz 18.71 dBm /мHz	z 18.71 dBm /мнz	Chann	el Power		Power Spect	ral Density	
		3	4.73 dBm /	40 MHz	18.71	dBm /мнz	

Port 1 40 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz

RL	RF SP 0 DC		Center Freq: 3.96000 Trig: External1 #Atten: 30 dB	Auton off 0000 GHz AvgiHold: 50/50	11:35:17 AH Aug 16, Radio Std: None Radio Device: BTS
0 dB/div	Ref Offset 33.1 de Ref 38.00 dBm				
29.0	ار المحديد الت				
18.0					
1.00		/			
.00					
12.0					
2.0					
2.0					
2.0					
	96000 GHz ¥ 820 kHz		#VBW 2.71	MHz	Span 100.0 M #Sweep 601.1
Chan	nnel Power		Power Spect	tral Density	
34.07 dBm / 40 MHz		/ 40 MHz	18.04	4 dBm /MHz	

Port 1 40 MHz Channel Bandwidth QPSK Modulation High Channel, 3960.00 MHz

£L.	RF SER DC Gate: LO		Center Freq: 3.730020 Trig: External1 #Atten: 30 dB	Aughoid: 50/50 Avg/Hold: 50/50	08:27:46 AH Aug 16, 20 Radio Std: None Radio Device: BTS
dBldiv	Ref Offset 33.1 dB Ref 40.00 dBm				
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0					
0					
	3002 GHz 1.2 MHz		#VBW 4 MH	z	Span 150.0 MH #Sweep 601.1 m
Chann	nel Power		Power Spect	ral Density	
3	6.48 dBm /	60 MHz	18.70	dBm /MHz	
				STATUS	

Port 1 60 MHz Channel Bandwidth QPSK Modulation Low Channel, 3730.02 MHz

RL	AF 50 0 DC	#FGainLow	Center Freq: 3.840000	AugiHold: 50/50	07:58:25 AH Aug 16, 202 Radio Std: None Radio Device: BTS
0 dBldiv	Ref Offset 33.1 dB Ref 41.00 dBm				
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10					
0					
0					
	34000 GHz 1.2 MHz		#VBW 4 MH	z	Span 150.0 MH #Sweep 601.1 m
Chann	nel Power		Power Spect	ral Density	
3	6.91 dBm / 6	0 MHz	19.13	dBm /MHz	

Port 1 60 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz



Keysight Speci R.L.	ctrum Analyzer - Element Materia RF 54 R DC		SENSE-EXT	ALICN OFF	09:02:13 AM Aug 16, 202 Radio Std: None
	Gate: LO	#FGain:Low	Center Freq: 3.949980 Trig: External1 #Atten: 30 dB	Avg Hold: 50/50	Radio Std: None Radio Device: BTS
) dB/div	Ref Offset 33.1 dB Ref 40.00 dBm				
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	4998 GHz 1.2 MHz		#VBW 4 MH	lz	Span 150.0 MH #Sweep 601.1 m
Chann	nel Power		Power Spect	ral Density	
3	6.58 dBm /	60 MHz	18.80	dBm /MHz	
				STATUS	

				STATU	5		MSG	
		QPS	K Mod	l Bandv ulation 949.98				
chum Analyzer - Demen RF 58 D 0 Gate: LO	×		Center Freq: 3.1 Center Freq: 3.1 Trig: External1 #Atten: 30 dB		old: 50/50	Radio Device: BTS		pht Spectrum A AF
Ref Offset 33 Ref 40.00 c	1 dB JBm						10 dBJ	div R
							30.0 30.0 10.0 0.00 	
3400 GHz 1.6 MHz			#VBW	5 MH2		Span 200.0 #Sweep 601		er 3.9400 BW 1.6
nel Power 6.71 dBr	n / 80 MHz	2	Power Sp	bectral Dens .68 dBm				annel I 36.3

Port 1 80 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz

£L	RF SER DC Gate: LO	#FGaintow	Center Freq: 3.740010 Trig: External1 #Atten: 30 dB	Aughoid: 50/50 Avg(Hold: 50/50	07:16:31 AH Aug 16, 202 Radio Std: None Radio Device: BTS
dBldiv	Ref Offset 33.1 dB Ref 40.00 dBm				
0					
0					
0					
0					
	400 GHz 1.6 MHz		#VBW 5 MH	z	Span 200.0 MH #Sweep 601.1 m
Chann	el Power		Power Spectr	al Density	
3	6.39 dBm /	80 MHz	17.36	dBm /MHz	

Port 1 80 MHz Channel Bandwidth QPSK Modulation Low Channel, 3740.01 MHz

	RF SR D DC		Center Freq: 3.939990 Trig: External1	ALION OFF 000 GHz Avg(Hold: 50/50	07:32:51 AH Aug 16, 20 Radio Std: None
		#FGaintow	#Atten: 30 dB		Radio Device: BTS
0 dBldiv	Ref Offset 33.1 dB Ref 40.00 dBm				
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enter 3.9 Res BW	4400 GHz 1.6 MHz		#VBW 5 MH	z	Span 200.0 MH #Sweep 601.1 m
Chann	nel Power		Power Spectr	al Density	
3	6.34 dBm /	80 MHz	17.31	dBm /MHz	

Port 1 80 MHz Channel Bandwidth QPSK Modulation High Channel, 3939.99 MHz

Char



	schum Analyzer - Bernent Materials RF   50 Ω DC		Center Freq: 3.7500	ALIGN OFF	05:59:47 AM Aug 16, 20 Radio Std: None
	Gate: LO	#IFGaint.ow	Trig: External1 #Atten: 30 dB	Avg Hold: 50/50	Radio Device: BTS
) dBldiv	Ref Offset 33.1 dB Ref 40.00 dBm				
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enter 3.7 Res BW	7500 GHz 2 MHz		#VBW 6 N	IHz	Span 250.0 Mł #Sweep 601.1 n
Chanr	nel Power		Power Spec	tral Density	
3	36.15 dBm / 1	IOO MHz	16.1	5 dBm /MHz	
1				STATUS	

Port 1 100 MHz Channel Bandwidth QPSK Modulation Low Channel, 3750.00 MHz

n1;	RF SP D DC Gate: LO		Center F Trig: Ext #Atten: 3	req: 3.93000000 email	0 GHz Avg(Hold: 50/50	Radio Std: Radio Devi	
dB/div	Ref Offset 33.1 dB Ref 40.00 dBm						
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6							
nter 3.9 es BW	300 GHz 2 MHz		#\	BW 6 MHz			p 601.1 ms
Chann	el Power		Powe	er Spectra	I Density		
2	6.44 dBm / 1	00 101-		16 44	dBm /мнz		
3	0.44 UBIN / 1	UU MHZ		10.44			

Port 1 100 MHz Channel Bandwidth QPSK Modulation High Channel, 3930.00 MHz

RL	RF SER DC		Center Freq: 3.8400000 Trig: External1 #Atten: 30 dB	Aughold: 50/50	41:16:48 PH Aug 15, 20 Radio Std: None Radio Device: BTS
dBldiv	Ref Offset 33.1 dB Ref 40.00 dBm			_	
0					
o					
0					
0 5					
	8400 GHz 2 MHz		#VBW 6 MHz		Span 250.0 M #Sweep 601.1 r
Chan	nel Power		Power Spectr	al Density	
	36.61 dBm /	100 MHz	16 61	dBm /MHz	
	Joior ability		10.01	CIDIN ANAL	

Port 1 100 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz

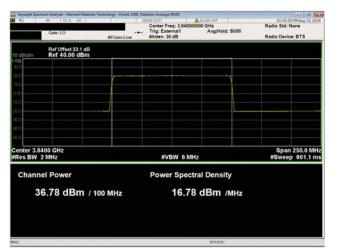
RL RL	chum Analyzer - Bernent Materials 1 RF 59 0 DC Gate: LO	#FGainLow	Center Freq: 3.8400	Auton on 00000 GHz AvgiHeld: 50/50	et 26-49 PH Aug 15, 202 Radio Std: None Radio Device: BTS
0 dBldiv	Ref Offset 33.1 dB Ref 42.00 dBm				
2.0		$\sim$	$\sim\sim\sim$	$\sim$	
00 00					
enter 3.8 Res BW	4400 GHz 2 MHz		#VBW 6 N	Hz	Span 250.0 MH #Sweep 601.1 m
Chann	nel Power		Power Spec	tral Density	
3	6.69 dBm / 1	00 MHz	16.6	9 dBm /MHz	
0				STATUS	

Port 1 100 MHz Channel Bandwidth 16QAM Modulation Mid Channel, 3840.00 MHz



Reysight Spec	trum Analyzer - Bernent Material RF   56 0. DC   Gate: LO			Auton off 000 GHz Avg(Hold: 50/50	01:36:43 PH Aug 15, 202 Radio Std: None Radio Device: BTS
0 dBldiv	Ref Offset 33.1 dB Ref 40.00 dBm	an dance an			
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10					
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0.0					
enter 3.8 Res BW			#VBW 6 MH	z	Span 250.0 MH #Sweep 601.1 m
Chann	el Power		Power Spect	ral Density	
2	6.74 dBm /		46 74	dBm /MHz	
3	6.74 abin /	100 MHZ	10.74		

Port 1 100 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3840.00 MHz



Port 1 100 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3840.00 MHz



### **TEST DESCRIPTION**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Output Power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The RMS average power measurement method for FCC/IC is detailed in section 5.2 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.4.4. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1/D)], where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times.

The output power was measured for a single carrier over the carrier channel bandwidth on the antenna port 1. The total output power for all port (64x64 MIMO) operation was determined based upon ANSI 63.26 clauses 6.4.3.1 and 6.4.3.2.4 (10 log Nout). The total output power for a Sixty-Four port operation is single port power +18.1 dB [i.e. 10log(64)].

#### Dual band with 3.45G and 3.7G Band carriers operations test cases using QPSK only:

- a) *Test Case 1*. 3.7GHz Band NR20 Carrier at maximum power at the Top channel. 3.45GHz Band NR20 Carrier at maximum power at the bottom channel operating simultaneously. Both carriers are operating at the same power level (1.56W/carrier). Total radio power is 200W.
- b) Test Case 2. 3.7GHz Band NR20 Carrier at maximum power at the Bottom channel. 3.45GHz Band NR20 Carrier at maximum power at the top channel operating simultaneously. Both carriers are operating at the same power level (1.56W/carrier). Total radio power is 200W.
- c) Test Case 3. 3.7GHz Band NR100 Carrier at the top channel. 3.45GHz Band NR40 Carrier at the bottom channel operating simultaneously. Both carriers are operating at the same PSD level (3.75W/carrier for NR100 carrier or PSD level at 2.4W/MHz and 1.56W/carrier for NR40 carrier or PSD level at 2.5W/MHz). Total radio power is 340W.

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2024-03-12	2025-03-12
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Block - DC	Fairview Microwave	SD3239	ANE	2024-02-14	2025-02-14



EUT:	AVQQA Remote Radio Head	Work Order:	NOKI0075
Serial Number:	L1242403137	Date:	2024-08-16
Customer:	Nokia Solutions and Networks	Temperature:	23.3°C
Attendees:	David Le, John Rattanavong	Relative Humidity:	52.1%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54VDC	Configuration:	NOKI0075-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 27:2024	ANSI C63.26:2015

### COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. All measured power values are within tolerance (i.e.: Rated Power ±2.0 dB).

#### DEVIATIONS FROM TEST STANDARD None

### CONCLUSION

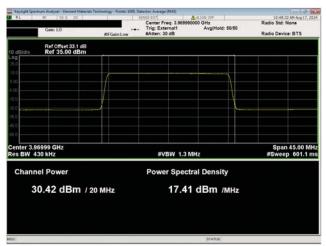
Pass

Tested By

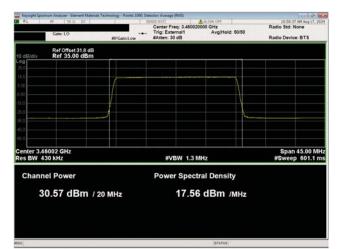
### **TEST RESULTS**

	Avg Cond Pwr (dBm)	Single Port (dBm)	Single Port (W)	64x64 MIMO (dBm)	Result
Port 1					
QPSK Modulation					
Test Case 1					
3.7G Band, 20 MHz Bandwidth, High Channel, 3969.99 MHz	30.417	30.4	1.10	48.5	Pass
3.45G Band, 20 MHz Bandwidth, Low Channel, 3460.02 MHz	30.572	30.6	1.15	48.7	Pass
Dual Band Power	N/A	N/A	2.24	51.6	Pass
Test Case 2				1	
3.7G Band, 20 MHz Bandwidth, Low Channel, 3710.01 MHz	30.775	30.8	1.20	48.9	Pass
3.45G Band, 20 MHz Bandwidth, High Channel, 3540.00 MHz	30.527	30.5	1.12	48.6	Pass
Dual Band Power	N/A	N/A	2.32	51.7	Pass
Test Case 3					
3.7G Band, 100 MHz Bandwidth, High Channel, 3930.00 MHz	34.801	34.8	3.02	52.9	Pass
3.45G Band, 40 MHz Bandwidth, Low Channel, 3470.01 MHz	30.873	30.9	1.23	49	Pass
Dual Band Power	N/A	N/A	4.25	54.4	Pass





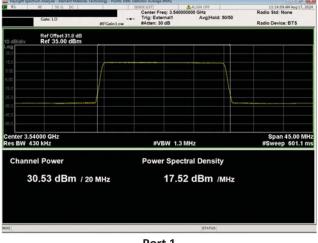
Port 1 QPSK Modulation Test Case 1

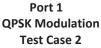


Port 1 QPSK Modulation Test Case 1

RL.	RF SR DC Gate: LO	#FGain.Low	Center Freq: 3.7100000 GHz Trig: External Avg Hold: 50/50 #Atten: 30 dB			Radio Std: N Radio Devic		
dBldiv	Ref Offset 33.1 dB Ref 35.00 dBm					_		
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0								
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0								
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	'1001 GHz						Span	45.00 MH
s BW 4	30 kHz		#VB	W 1.3 MHz			#Sweep	601.1 m
Chann	el Power		Power	Spectral D	ensity			
30.77 dBm / 20 мнz				17.76 dE				
					STATUS			

Port 1 QPSK Modulation Test Case 2







Reysight Spec	trum Analyser - Element Materials RF 58 0 DC		Center Freg: 3.930000	ALIGN OFF	12:02:51 PH Aug 17, 20 Radio Std: None
	Gate: LO	#FGain:Low	Trig: External1 #Atten: 30 dB	Avg(Hold: 50/50	Radio Device: BTS
dBldiv	Ref Offset 33.1 dB Ref 38.00 dBm				
0		r			
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1.0					
ntor 2.0	300 GHz				Span 250.0 MH
tes BW			#VBW 6 MH	z	#Sweep 601.1 n
Chann	el Power		Power Spectr	ral Density	
2	4.80 dBm / 1	00 111-	14 90	dBm /мнz	
5	4.00 ubiii / 1	00 MHZ	14.00	CIDITI-/MHZ	
				STATUS	

Port 1 QPSK Modulation Test Case 3

RL	Sectrum Analyser - Bernent Materi RF 56 D DC Gate: LO		Center Freq: 3,470010	Auton ore 0000 GHz Avg(Hold: 50/50	12 05:17 PH Aug 17, 2024 Radio Std: None Radio Device: BTS
0 dB/div	Ref Offset 31.8 dB Ref 35.00 dBm				
5.0					
5.00		(			
10					
10					
5.0					
	,47001 GHz / 820 kHz		#VBW 2.7 N	1Hz	Span 100.0 MH #Sweep 601.1 m
Chan	nel Power		Power Spect	ral Density	
30.87 dBm / 40 MHz		14.85			

Port 1 QPSK Modulation Test Case 3



### **TEST DESCRIPTION**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The RMS average power measurement method for FCC is detailed in section 5.2 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.4.4. The CCDF measurement method for FCC/IC is detailed in section 5.7.2 of KDB971168 D01v03r01 and ANSI C63.26-2015 section 5.2.3.4. The average power spectral density measurement method for the FCC is detailed in section 5.4 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.4.5.

#### Multicarrier test cases have been developed as shown below:

- a. 3.7G Band Multicarrier Test Case 1: Two contiguous NR20 carriers with minimum spacing between carrier frequencies at the lower band edge (3710.01 & 3730.02MHz). The smallest channel bandwidth is selected to maximize carrier power spectral density. The carriers are operated at maximum power (~1.56W/carrier) with a total radio power of 200 watts.
- b. 3.7G Band Multicarrier Test Case 2: Two contiguous NR20 carriers with minimum spacing between carrier frequencies at the upper band edge (3949.98 & 3969.99 MHz). The smallest channel bandwidth is selected to maximize carrier power spectral density. The carriers are operated at maximum power (~1.56W/carrier) with a total radio power of 200 watts.
- c. 3.7G Band Multicarrier Test Case 3: Two contiguous NR100 carriers with minimum spacing between carrier frequencies at the lower band edge (3750.00 & 3850.02MHz). The largest channel bandwidth is selected to maximize radio power. The carrier power for NR100 is ~2.65W/carrier. The total radio power is 340 watts.
- d. 3.7G Band Multicarrier Test Case 4: Two contiguous NR100 carriers with minimum spacing between carrier frequencies at the upper band edge (3830.01 & 3930.00 MHz). The largest channel bandwidth is selected to maximize radio power The carrier power for NR100 is ~2.65W/carrier. The total radio power is 340 watts.
- e. 3.7G Band Multicarrier Test Case 5: Two non-contiguous NR20 carriers with maximum spacing between carrier frequencies at the lower band edge (3710.01 & 3889.995MHz). The smallest channel bandwidth is selected to maximize carrier power spectral density. The carriers are operated at maximum power (~1.56W/carrier) with a total radio power of 200 watts.
- f. 3.7G Band Multicarrier Test Case 6: Two non-contiguous NR20 carriers with maximum spacing between carrier frequencies at the upper band edge (3789.99 & 3969.99MHz). The smallest channel bandwidth is selected to maximize carrier power spectral density. The carriers are operated at maximum power (~1.56W/carrier) with a total radio power of 200 watts.

### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2024-03-12	2025-03-12
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Block - DC	Fairview Microwave	SD3239	ANE	2024-02-14	2025-02-14



EUT:	AVQQA Remote Radio Head	Work Order:	NOKI0075
Serial Number:	L1242403137	Date:	2024-08-21
Customer:	Nokia Solutions and Networks	Temperature:	23.3°C
Attendees:	David Le, John Rattanavong	Relative Humidity:	52.1%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54VDC	Configuration:	NOKI0075-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 27:2024	ANSI C63.26:2015

### COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.7 GHz band per the Multicarrier test cases. All measured power values are within tolerance (i.e.: Rated Power ±2.0 dB).

### **DEVIATIONS FROM TEST STANDARD**

None

### CONCLUSION

Pass

gran 1

Tested By

### **TEST RESULTS**

	Avg Cond Pwr (dBm)	Single Port (dBm)	Single Port (W)	Single Port, Band (dBm)	64x64 MIMO Pwr (dBm)	Results
Port 1						
QPSK Modulation						
Test Case 1						
NR20, Low Channel, 3710.01 MHz	30.18	30	1.00	N/A	48.1	Pass
NR20, Low Channel 3730.02 MHz	30.57	30.6	1.15	N/A	48.7	Pass
Dual Carrier Power	N/A	N/A	2.15	33.3	51.4	Pass
Test Case 2						
NR20, High Channel 3949.98 MHz	30.548	30.5	1.12	N/A	48.6	Pass
NR20, High Channel 3969.99 MHz	30.44	30.4	1.10	N/A	48.5	Pass
Dual Carrier Power	N/A	N/A	2.22	33.5	51.6	Pass
Test Case 3			1			
NR100, Low Channel 3750.00 MHz	32.7	32.7	1.86	N/A	50.8	Pass
NR100, Low Channel 3850.02 MHz	33.149	33.1	2.04	N/A	51.2	Pass
Dual Carrier Power	N/A	N/A	3.90	35.9	54	Pass
Test Case 4			1			
NR100, High Channel 3830.01 MHz	33.186	33.2	2.09	N/A	51.3	Pass
NR100, High Channel 3930.00 MHz	32.827	32.8	1.91	N/A	50.9	Pass
Dual Carrier Power	N/A	N/A	3.99	36.0	54.1	Pass
Test Case 5						
NR20, Low Channel 3710.01 MHz	30.315	30.3	1.07	N/A	48.4	Pass
NR20, Low Channel, 3889.995 MHz	30.931	30.9	1.23	N/A	49	Pass



	Avg Cond Pwr (dBm)	Single Port (dBm)	Single Port (W)	Single Port, Band (dBm)	64x64 MIMO Pwr (dBm)	Results
Dual Carrier Power	N/A	N/A	2.30	33.6	51.7	Pass
Test Case 6			1			
NR20, High Channel 3789.99 MHz	30.642	30.6	1.15	N/A	48.7	Pass
NR20, High Channel 3969.99 MHz	30.137	30.1	1.02	N/A	48.2	Pass
Dual Carrier Power	N/A	N/A	2.17	33.4	51.5	Pass

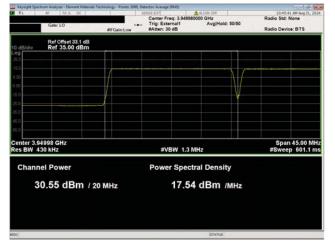


	pectrum Analyzer - Element Materials RF 50 Ω DC		Center Freq: 3.710010	ALIGN OFF		CE:07:49 AM / Radio Std: None	og 21, 202
	Gate: LO	#FGainLow	Trig: External1 #Atten: 30 dB	Avg(Hold:	50/50	Radio Device: B	rs
0 dBldiv	Ref Offset 33.1 dB Ref 35.00 dBm						
<b>09</b> 5.0							
5.0							
		/			M		
.u					V		
5.0							
5.0							
50							
optor 2	3.71001 GHz					Span 45.	00 141
	430 kHz		#VBW 1.3 N	IHz		#Sweep 6	01.1 m
Char	nnel Power		Power Spect	ral Density	y		
	30.18 dBm / 2		17 17	dBm /	-uu		
	00.10 ubin /2			ubiii /	1112		
3				STATUS			

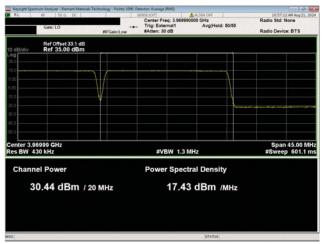
Port 1 QPSK Modulation Test Case 1 NR20, Low Channel, 3710.01 MHz

	RF SHID DC	#FGainLow	Center Freq: 3.73002 Trig: External1 #Atten: 30 dB	A 41GN OFF 0000 GHz Avg/Hold: 50/50	08:12:34 AM Aug 21, 203 Radio Std: None Radio Device: BTS
0 dBldiv	Ref Offset 33.1 di Ref 35.00 dBn				
5.0					
00					
		-			
10					
0					
.0					
enter 3.7 es BW 4	73002 GHz 130 kHz		#VBW 1.3 P	ИНZ	Span 45.00 Mi #Sweep 601.1 n
Chann	nel Power		Power Spect	ral Density	
3	0.57 dBm	/ 20 MHz	17.56	dBm /MHz	
à				STATUS	

Port 1 QPSK Modulation Test Case 1 NR20, Low Channel 3730.02 MHz



Port 1 QPSK Modulation Test Case 2 NR20, High Channel 3949.98 MHz



Port 1 QPSK Modulation Test Case 2 NR20, High Channel 3969.99 MHz



RL RL	ectrum Analyzer - Bernent Materials RF 54 Ω DC	1 9	Center Freq: 3.750000		11:37:03 AM Aug 21, 20 Radio Std: None
	Gate: LO	#FGain:Low	Trig: External1 #Atten: 30 dB	Avg(Hold: 50/50	Radio Device: BTS
dBldiv	Ref Offset 33.1 dB Ref 37.00 dBm				
7.0					
0					
00					
10					
0.0					
1.0					
10					
enter 3.5 Res BW	7500 GHz 2 MHz		#VBW 6 MH2		Span 250.0 Mł #Sweep 601.1 n
Chanr	nel Power		Power Spectr	al Density	
32.70 dBm / 100 MHz		00 MHz	12.70		
		oo mine	12.110		
1				STATUS	

Port 1 QPSK Modulation Test Case 3 NR100, Low Channel 3750.00 MHz

RL.	NF 58 R DC	#FGain1.ow	Center Freq: 3. Trig: External1 #Atten: 30 dB	ALION OFF 850020000 GHz AvgiHold: 50/50	11:42:01 AH Aug 21, 20 Radio Std: None Radio Device: BTS
0 dBldiv	Ref Offset 33.1 dB Ref 37.00 dBm				
7.0					
00 10					
0					
enter 3.9	3500 GHz				Span 250.0 M
Res BW			#VBW	6 MHz	#Sweep 601.1 r
Chann	nel Power		Power Sp	pectral Density	
33.15 dBm / 100 мнz		100 MHz	13	.15 dBm /мнz	

Port 1 QPSK Modulation Test Case 3 NR100, Low Channel 3850.02 MHz

RL RF 50 D DC Gate: LO		Center Freq: 3.8300100 Trig: External1 #Atten: 30 dB	00 GHz Avg(Hold: 50/50	12:12:28 PH Aug 21, 202 Radio Std: None Radio Device: BTS
Ref Offset 33.1 dB dB/div Ref 37.00 dBm				
9				
0				
x)				
0				
0				
0				
0				
0				
enter 3.8300 GHz Res BW 2 MHz		#VBW 6 MHz	:	Span 250.0 MH #Sweep 601.1 m
Channel Power		Power Spectr	al Density	
33.19 dBm /	100 MHz	13.19	dBm /MHz	

Port 1 QPSK Modulation Test Case 4 NR100, High Channel 3830.02 MHz

 Control Stateward Market Technology 7 Meth. 200. Ender Alwards (1900)
 Control State Price 3.3000000 GHz
 Radio Stat. None

 Control Free 3.3000000 GHz
 Radio Stat. None
 Radio Stat. None

 Control Free 3.3000000 GHz
 Radio Stat. None
 Radio Stat. None

 Control Free 3.3000000 GHz
 Radio Stat. None
 Radio Stat. None

 Control Free 3.3000000 GHz
 Radio Stat. None
 Radio Stat. None

 Control Free 3.3000000 GHz
 Radio Stat. None
 Radio Stat. None

 Control Free 3.3000000 GHz
 Radio Stat. None
 Radio Stat. None

 Control Free 3.3000000 GHz
 Span 250.0 MHz

 Span 250.0 MHz
 Span 250.0 MHz

 Span 250.0 MH

Port 1 QPSK Modulation Test Case 4 NR100, High Channel 3930.00 MHz



	RF SR DC		ENSE:EXT	ALIGN OFF	12:51:32 PH Aug 21, 20
	Gate: LO	#FGaintow	Center Freq: 3.710010 Trig: External1 #Atten: 30 dB	Avg Hold: 50/50	Radio Std: None Radio Device: BTS
0 dB/div	Ref Offset 33.1 dB Ref 35.00 dBm				
5.0					
5.0		1			
00					
.u				- A	
0					
0					
.o					
	.71001 GHz 430 kHz		#VBW 1.3 N	IHz	Span 45.00 MH #Sweep 601.1 m
Chan	nel Power		Power Spect	ral Density	
	30.31 dBm / 2	0 MHz	17.30	dBm /MHz	
a				STATUS	

Port 1 QPSK Modulation Test Case 5 NR20, Low Channel 3710.01 MHz

	Gate: LO	#FGain:Low	Center Freq: 3.889995	Auton orr 1000 GHz Avg(Hold: 50/50	12:54:31 PH Aug 21, 20 Radio Std: None Radio Device: BTS
dBldiv	Ref Offset 33.1 dB Ref 35.00 dBm				
50					
4 x)		- T			
10 10					
η				1	
0					
0					
enter 3.89 es BW 43			#VBW 1.3 N	IHz	Span 45.00 Mi #Sweep 601.1 n
Channe	el Power		Power Spect	ral Density	
30.93 dBm / 20 мнz		20 MHz	17.92		

Port 1 QPSK Modulation Test Case 5 NR20, Low Channel, 3889.995 MHz

RL	NF SR D DC	#FGaint.ow	Center Freq: 3.789990	Auton orr 000 GHz Avg(Hold: 50/50	85:51:51 AH Avg 22, 20 Radio Std: None Radio Device: BTS
dBldiv	Ref Offset 33.1 dB Ref 35.00 dBm				
0		1			
00		/			
υ				V	
0					
0					
0					
Ĩ					
enter 3.7 es BW 4	78999 GHz 130 kHz		#VBW 1.3 N	IHz	Span 45.00 MH #Sweep 601.1 m
Chann	nel Power		Power Spect	ral Density	
3	0.64 dBm /	20 MHz	17.63	dBm /MHz	

Port 1 QPSK Modulation Test Case 6 NR20, High Channel 3789.99 MHz

Conter 5, 96699 CH2 Res BW 430 kH2 Conter Fig. 3, 9699 CH2 Res BW 430 kH2 Conter Fig. 3, 96699 CH2 Res BW 430 kH2 Res BW 430 kH2 Conter 7, 96699 CH2 Res BW 430 kH2 Res BW 430 kH2 Conter 7, 96699 CH2 Res BW 430 kH2 Re

Port 1 QPSK Modulation Test Case 6 NR20, High Channel 3969.99 MHz



### **TEST DESCRIPTION**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The RF conducted emission testing was performed on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the "Output Power" report section) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The fundamental emission Power Spectral Density (PSD) was measured using the channels and modes as called out on the following data sheets.

The method of ANSI C63.26-2015 section 5.2.4.5 was used to make this measurement.

The Power Spectral Density was measured while transmitting on one carrier. The total PSD for multiport operation was determined based upon ANSI C63.26 clause 6.4.3.2.4 (10 Log  $N_{out}$ ). The EIRP calculations are based upon ANSI C63.26-2015 paragraphs 6.4 and 6.4.6.3.

#### FCC Requirements: §27.50 Power limits and duty cycle.

27.50 (k) The following power requirements apply to stations transmitting in the 3450-3550 MHz band:

(1) The power of each fixed or base station transmitting in the 3450-3550 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to an equivalent isotropically radiated power (EIRP) of 3280 Watts/MHz. This limit applies to the aggregate power of all antenna elements in any given sector of a base station. (2) The power of each fixed or base station transmitting in the 3450-3550 MHz band and situated in any geographic location other than that described in paragraph (k)(1) of this section is limited to an EIRP of 1640 Watts/MHz. This limit applies to the aggregate power of all antenna elements in any given sector of a base station.

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2024-03-12	2025-03-12
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Block - DC	Fairview Microwave	SD3239	ANE	2024-02-14	2025-02-14



#### 5G NR EIRP Calculations for Sixty-Four Port MIMO Operations

EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements. Each cell site installation needs to consider the power measurements in the radio certification report as well as site specific regulatory requirements (such as antenna height, population density, etc.), site installation parameters (line loss between antenna and radio, antenna parameters, etc.) and base station operational parameters (MIMO operational setup, carrier power level, channel bandwidth, modulation type, etc.) to optimize performance. Transmitter output power may be reduced (from maximum) by base station setup parameters.

The AVQQA antenna assembly has an array of 4 rows and 8 columns of ( $\pm$ 45°) cross-polarized (orthogonal) radiators. This antenna assembly has a beamforming gain of 25.0dBi  $\pm$  1.0dB. The sixty-four AVQQA transmitter outputs are connected to the antenna array (thirty-two are connected to  $\pm$ 45° radiators/antennas and thirty-two are connected to the -45° radiators/antennas).

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4 for a system of correlated output signals) from the results of power measurements (highest measured PSD for each channel bandwidth type). The maximum antenna assembly beamforming gain was used for this calculation. Calculations of worst-case EIRP for sixty-four port MIMO are as follows:

Parameter	10 MHz Ch BW	20 MHz Ch BW	30 MHz Ch BW	40 MHz Ch BW
Worst Case PSD/Antenna Port	20.5 dBm/MHz	20.8 dBm/MHz	21.3 dBm/MHz	21.3 dBm/MHz
Cable Loss	0 dB	0 dB	0 dB	0 dB
Number of Ant Ports per Polarization	32	32	32	32
Total PSD per Polarization 10 Log 32 = +15.1 dB	35.6 dBm/MHz	35.9 dBm/MHz	36.4 dBm/MHz	36.4 dBm/MHz
Maximum Antenna Beamforming Gain per Polarization	26 dBi	26 dBi	26 dBi	26 dBi
EIRP per Polarization	61.6 dBm/MHz	61.9 dBm/MHz	62.4 dBm/MHz	62.4 dBm/MHz
Number of Polarizations	2	2	2	2
EIRP Total (See Note 1)	61.6 dBm/MHz	61.9 dBm/MHz	62.4 dBm/MHz	62.4 dBm/MHz
Passing EIRP Limit	62.15 dBm/MHz and 65.16 dBm/MHz	62.15 dBm/MHz and 65.16 dBm/MHz	65.16 dBm/MHz	65.16 dBm/MHz

Note 1: The EIRP per antenna polarization is required to be below the regulatory limit as described in ANSI C63.26-2015 section 6.4.6.3 b)2) and KDB 662911 D02v01 page 3 example (2) since the two transmitter outputs to each antenna are 90 degree-phase shifted relative to each other (cross-polarized radiators).

#### Calculation Summary for the 3.45G Band

- (1) The worst case AVQQA sixty-four port MIMO EIRP levels for all 5G NR channel bandwidths (10MHz, 20MHz, 30MHz & 40MHz) are less than the 3280 W/MHz (65.16 dBm/MHz) FCC regulatory limit.
- (2) The worst case AVQQA sixty-four port MIMO EIRP levels for the 5G NR 10MHz & 20MHz channel bandwidths are less than the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit.
- (3) The worst case AVQQA sixty-four port MIMO EIRP levels for the 5G NR 30MHz & 40MHz channel bandwidths exceed the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit by 0.25 dB (62.4 dBm/MHz - 62.15 dBm/MHz). The AVQQA 5G NR 30MHz & 40MHz channel bandwidth carrier power levels using sixty-four port MIMO operation need to be reduced to meet the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit.



EUT:	AVQQA Remote Radio Head	Work Order:	NOKI0075
Serial Number:	L1242403137	Date:	2024-08-09
Customer:	Nokia Solutions and Networks	Temperature:	23.3°C
Attendees:	David Le, John Rattanavong	Relative Humidity:	52.8%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54VDC	Configuration:	NOKI0075-4

### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 27:2024	ANSI C63.26:2015

### COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.45 GHz band in single carrier operating mode configuration.

### **DEVIATIONS FROM TEST STANDARD**

None

### CONCLUSION

Pass

gan .

Tested By

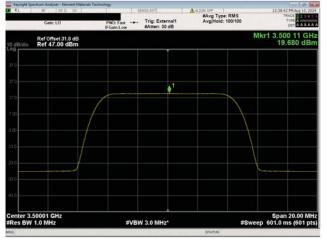
### **TEST RESULTS**

	Initial Value dBm/MHz	Duty cycle Factor (dB)	Single Port dBm/MHz == PSD	Sixty-four Port (64x64 MIMO) dBm/MHz == PSD
Port 1				
10 MHz Channel Bandwidth				
QPSK Modulation				
Mid Channel, 3500.01 MHz	19.68	0	19.7	37.8
16QAM Modulation				
Mid Channel, 3500.01 MHz	20.545	0	20.5	38.6
64QAM Modulation				
Mid Channel, 3500.01 MHz	19.814	0	19.8	37.9
256QAM Modulation				
Mid Channel, 3500.01 MHz	19.805	0	19.8	37.9
20 MHz Channel Bandwidth				
QPSK Modulation				
Mid Channel, 3500.01 MHz	19.322	0	19.3	37.4
16QAM Modulation				
Mid Channel, 3500.01 MHz	20.833	0	20.8	38.9
64QAM Modulation				
Mid Channel, 3500.01 MHz	19.545	0	19.5	37.6
256QAM Modulation				
Mid Channel, 3500.01 MHz	19.471	0	19.5	37.6
30 MHz Channel Bandwidth				'
QPSK Modulation				
Mid Channel, 3500.01 MHz	19.403	0	19.4	37.5

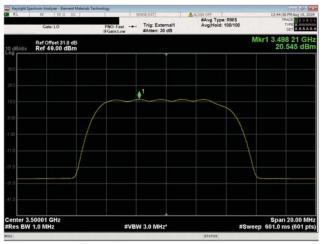


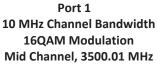
	Initial Value dBm/MHz	Duty cycle Factor (dB)	Single Port dBm/MHz == PSD	Sixty-four Port (64x64 MIMO) dBm/MHz == PSD
16QAM Modulation				
Mid Channel, 3500.01 MHz	21.327	0	21.3	39.4
64QAM Modulation				
Mid Channel, 3500.01 MHz	19.607	0	19.6	37.7
256QAM Modulation				
Mid Channel, 3500.01 MHz	19.587	0	19.6	37.7
40 MHz Channel Bandwidth QPSK Modulation				
Low Channel, 3470.01 MHz	18.645	0	18.6	36.7
Mid Channel, 3500.01 MHz	19.207	0	19.2	37.3
High Channel, 3529.98 MHz	18.522	0	18.5	36.6
16QAM Modulation				
Low Channel, 3470.01 MHz	20.477	0	20.5	38.6
Mid Channel, 3500.01 MHz	21.334	0	21.3	39.4
High Channel, 3529.98 MHz	17.475	0	17.5	35.6
64QAM Modulation				
Low Channel, 3470.01 MHz	18.762	0	18.8	36.9
Mid Channel, 3500.01 MHz	19.487	0	19.5	37.6
High Channel, 3529.98 MHz	15.585	0	15.6	33.7
256QAM Modulation				
Low Channel, 3470.01 MHz	18.758	0	18.8	36.9
Mid Channel, 3500.01 MHz	19.533	0	19.5	37.6
High Channel, 3529.98 MHz	15.771	0	15.8	33.9

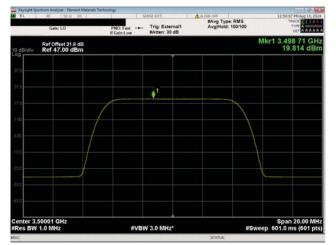




Port 1 10 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz





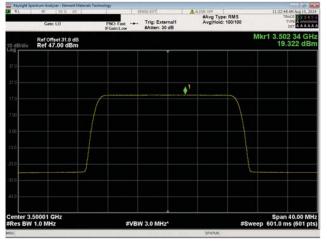


Port 1 10 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3500.01 MHz

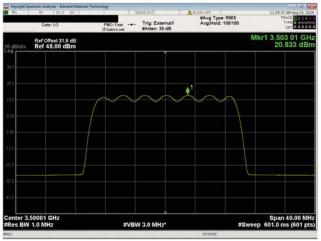
 By partners Adaptive: Thermark Manual Translegy
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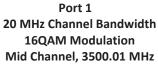
Port 1 10 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3500.01 MHz

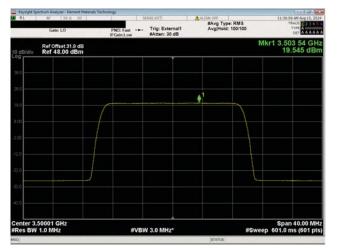




Port 1 20 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz







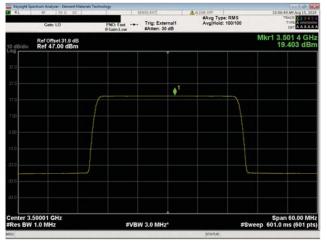
Port 1 20 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3500.01 MHz

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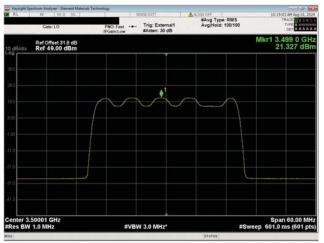
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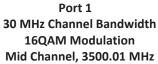
Port 1 20 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3500.01 MHz

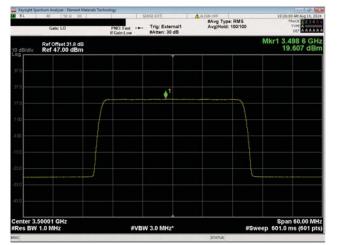




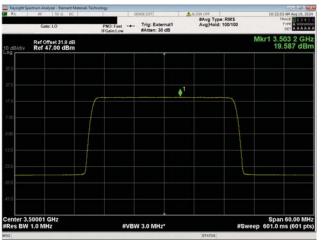
Port 1 30 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz





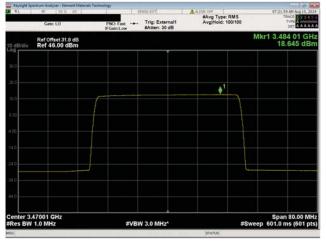


Port 1 30 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3500.01 MHz

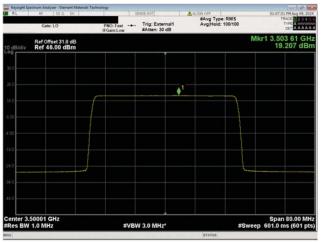


Port 1 30 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3500.01 MHz

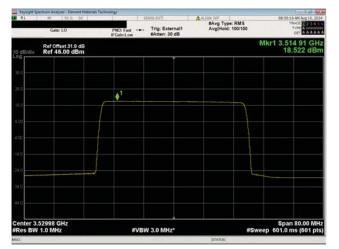




Port 1 40 MHz Channel Bandwidth QPSK Modulation Low Channel, 3470.01 MHz





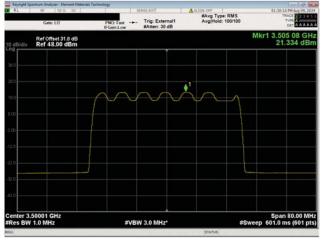


Port 1 40 MHz Channel Bandwidth QPSK Modulation High Channel, 3529.98 MHz

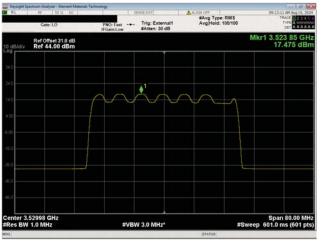
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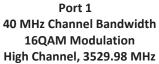
Port 1 40 MHz Channel Bandwidth 16QAM Modulation Low Channel, 3470.01 MHz

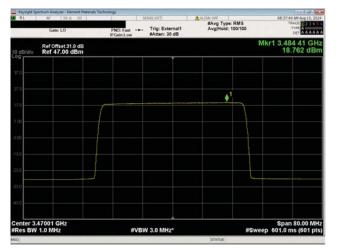




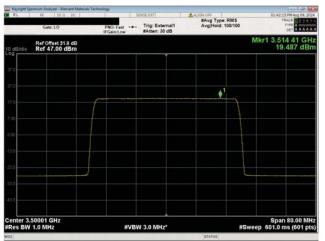
Port 1 40 MHz Channel Bandwidth 16QAM Modulation Mid Channel, 3500.01 MHz





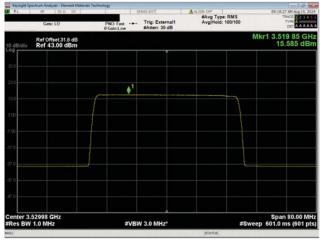


Port 1 40 MHz Channel Bandwidth 64QAM Modulation Low Channel, 3470.01 MHz

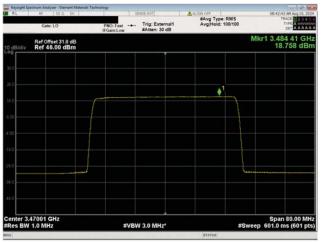


Port 1 40 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3500.01 MHz

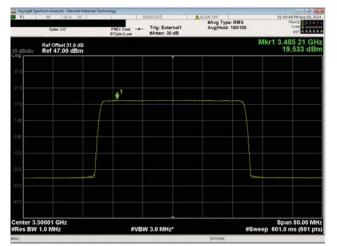




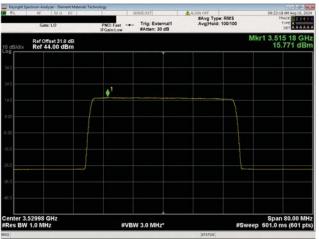
Port 1 40 MHz Channel Bandwidth 64QAM Modulation High Channel, 3529.98 MHz







Port 1 40 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3500.01 MHz



Port 1 40 MHz Channel Bandwidth 256QAM Modulation High Channel, 3529.98 MHz



### **TEST DESCRIPTION**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The RF conducted emission testing was performed on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the "Output Power" report section) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The fundamental emission Power Spectral Density (PSD) was measured using the channels and modes as called out on the following data sheets.

The method of ANSI C63.26-2015 section 5.2.4.5 was used to make this measurement.

The Power Spectral Density was measured while transmitting on one carrier. The total PSD for multiport operation was determined based upon ANSI C63.26 clause 6.4.3.2.4 (10 Log  $N_{out}$ ). The EIRP calculations are based upon ANSI C63.26-2015 paragraphs 6.4 and 6.4.6.3.

#### FCC Requirements: §27.50 Power limits and duty cycle.

27.50 (j) The following power requirements apply to stations transmitting in the 3700-3980 MHz band:

(1) The power of each fixed or base station transmitting in the 3700-3980 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to an equivalent isotropically radiated power (EIRP) of 3280 Watts/MHz. This limit applies to the aggregate power of all antenna elements in any given sector of a base station.

(2) The power of each fixed or base station transmitting in the 3700-3980 MHz band and situated in any geographic location other than that described in paragraph (j)(1) of this section is limited to an EIRP of 1640 Watts/MHz. This limit applies to the aggregate power of all antenna elements in any given sector of a base station.

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2024-03-12	2025-03-12
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Block - DC	Fairview Microwave	SD3239	ANE	2024-02-14	2025-02-14



#### 5G NR EIRP Calculations for Sixty-Four Port MIMO Operations

EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements. Each cell site installation needs to consider the power measurements in the radio certification report as well as site specific regulatory requirements (such as antenna height, population density, etc.), site installation parameters (line loss between antenna and radio, antenna parameters, etc.) and base station operational parameters (MIMO operational setup, carrier power level, channel bandwidth, modulation type, etc.) to optimize performance. Transmitter output power may be reduced (from maximum) by base station setup parameters.

The AVQQA antenna assembly has an array of 4 rows and 8 columns of ( $\pm$ 45°) cross-polarized (orthogonal) radiators. This antenna assembly has a beamforming gain of 25.0dBi  $\pm$  1.0dB. The sixty-four AVQQA transmitter outputs are connected to the antenna array (thirty-two are connected to  $\pm$ 45° radiators/antennas and thirty-two are connected to the -45° radiators/antennas).

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4 for a system of correlated output signals) from the results of power measurements (highest measured PSD for each channel bandwidth type). The maximum antenna assembly beamforming gain was used for this calculation. Calculations of worst-case EIRP for sixty-four port MIMO are as follows:

Parameter	20 MHz Ch BW	40 MHz Ch BW	60 MHz Ch BW	80 MHz Ch BW	100 MHz Ch BW
Worst Case PSD/Antenna Port	21.0 dBm/MHz	21.3 dBm/MHz	21.5 dBm/MHz	20.1 dBm/MHz	19.3 dBm/MHz
Cable Loss	0 dB				
Number of Ant Ports per Polarization	32	32	32	32	32
Total PSD per Polarization	36.1 dBm/MHz	36.4 dBm/MHz	36.6 dBm/MHz	35.2 dBm/MHz	34.4 dBm/MHz
10 Log 32 = +15.1 dB					
Maximum Antenna Beamforming Gain	26 dBi				
per Polarization	20 001	20 001	20 001	20 001	20 001
EIRP per Polarization	62.1 dBm/MHz	62.4 dBm/MHz	62.6 dBm/MHz	61.2 dBm/MHz	60.4 dBm/MHz
Number of Polarizations	2	2	2	2	2
EIRP Total (See Note 1)	62.1 dBm/MHz	62.4 dBm/MHz	62.6 dBm/MHz	61.2 dBm/MHz	60.4 dBm/MHz
	62.15 dBm/MHz			62.15 dBm/MHz	62.15 dBm/MHz
Passing EIRP Limit	and	65.16 dBm/MHz	65.16 dBm/MHz	and	and
	65.16 dBm/MHz			65.16 dBm/MHz	65.16 dBm/MHz

Note 1: The EIRP per antenna polarization is required to be below the regulatory limit as described in ANSI C63.26-2015 section 6.4.6.3 b)2) and KDB 662911 D02v01 page 3 example (2) since the two transmitter outputs to each antenna are 90 degree-phase shifted relative to each other (cross-polarized radiators).

#### **Calculation Summary**

- (1) The worst case AVQQA sixty-four port MIMO EIRP levels for all 5G NR channel bandwidths (20MHz, 40MHz, 60MHz, 80MHz, & 100MHz) are less than the 3280 W/MHz (65.16 dBm/MHz) FCC regulatory limit.
- (2) The worst case AVQQA sixty-four port MIMO EIRP levels for the 5G NR 20MHz, 80MHz & 100MHz channel bandwidths are less than the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit.
- (3) The worst case AVQQA sixty-four port MIMO EIRP levels for the 5G NR 40MHz & 60MHz channel bandwidths exceed the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit by 0.25 dB (62.4 dBm/MHz - 62.15 dBm/MHz) and 0.45 dB (62.6 dBm/MHz - 62.15 dBm/MHz), respectively. The AVQQA 5G NR 40MHz & 60MHz channel bandwidths carrier power levels using sixty-four port MIMO operation need to be reduced to meet the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit.



EUT:	AVQQA Remote Radio Head	Work Order:	NOKI0075
Serial Number:	L1242403137	Date:	2024-08-15
Customer:	Nokia Solutions and Networks	Temperature:	23.3°C
Attendees:	David Le, John Rattanavong	Relative Humidity:	52.1%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54VDC	Configuration:	NOKI0075-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 27:2024	ANSI C63.26:2015

#### **COMMENTS**

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.7 GHz band in the single carrier operating mode configuration.

#### **DEVIATIONS FROM TEST STANDARD**

None

#### CONCLUSION Pass

Tested By

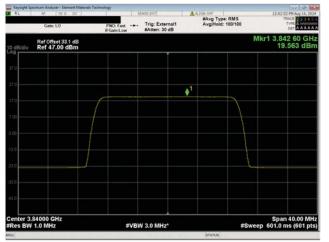
### **TEST RESULTS**

	Initial Value dBm/MHz	Duty cycle Factor (dB)	Single Port dBm/MHz == PSD	Sixty-four Port (64x64 MIMO) dBm/MHz == PSD
Port 1				
20 MHz Channel Bandwidth QPSK Modulation				
Mid Channel, 3840.00 MHz 16QAM Modulation	19.563	0	19.6	37.7
Mid Channel, 3840.00 MHz 64QAM Modulation	21.037	0	21.0	39.1
Mid Channel, 3840.00 MHz 256QAM Modulation	19.627	0	19.6	37.7
Mid Channel, 3840.00 MHz 40 MHz Channel Bandwidth QPSK Modulation	19.605	0	19.6	37.7
Mid Channel, 3840.00 MHz 16QAM Modulation	19.359	0	19.4	37.5
Mid Channel, 3840.00 MHz 64QAM Modulation	21.336	0	21.3	39.4
Mid Channel, 3840.00 MHz 256QAM Modulation	19.47	0	19.5	37.6
Mid Channel, 3840.00 MHz	19.507	0	19.5	37.6

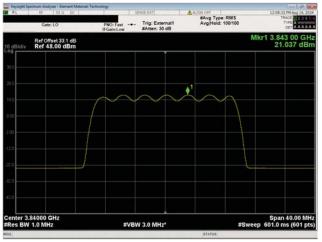


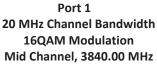
	Initial Value dBm/MHz	Duty cycle Factor (dB)	Single Port dBm/MHz == PSD	Sixty-four Port (64x64 MIMO) dBm/MHz == PSD
60 MHz Channel Bandwidth QPSK Modulation				
Low Channel, 3730.02 MHz	19.324	0	19.3	37.4
Mid Channel, 3840.00 MHz	19.747	0	19.7	37.8
High Channel, 3949.98 MHz 16QAM Modulation	19.476	0	19.5	37.6
Low Channel, 3730.02 MHz	21.242	0	21.2	39.3
Mid Channel, 3840.00 MHz	21.481	0	21.5	39.6
High Channel, 3949.98 MHz 64QAM Modulation	21.209	0	21.2	39.3
Low Channel, 3730.02 MHz	19.593	0	19.6	37.7
Mid Channel, 3840.00 MHz	19.859	0	19.9	38.0
High Channel, 3949.98 MHz 256QAM Modulation	19.524	0	19.5	37.6
Low Channel, 3730.02 MHz	19.581	0	19.6	37.7
Mid Channel, 3840.00 MHz	19.872	0	19.9	38.0
High Channel, 3949.98 MHz	19.487	0	19.5	37.6
80 MHz Channel Bandwidth QPSK Modulation				
Mid Channel, 3840.00 MHz 16QAM Modulation	18.289	0	18.3	36.4
Mid Channel, 3840.00 MHz 64QAM Modulation	20.142	0	20.1	38.2
Mid Channel, 3840.00 MHz 256QAM Modulation	18.427	0	18.4	36.5
Mid Channel, 3840.00 MHz 100 MHz Channel Bandwidth QPSK Modulation	18.381	0	18.4	36.5
Mid Channel, 3840.00 MHz 16QAM Modulation	17.163	0	17.2	35.3
Mid Channel, 3840.00 MHz 64QAM Modulation	19.253	0	19.3	37.4
Mid Channel, 3840.00 MHz 256QAM Modulation	17.448	0	17.4	35.5
Mid Channel, 3840.00 MHz	17.42	0	17.4	35.5

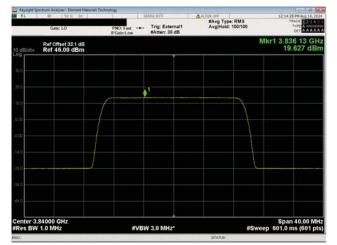




Port 1 20 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz







Port 1 20 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3840.00 MHz

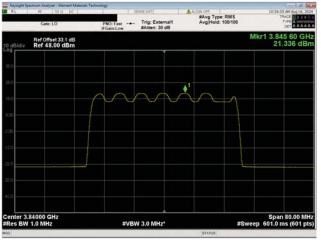
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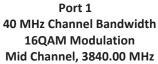
Port 1 20 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3840.00 MHz

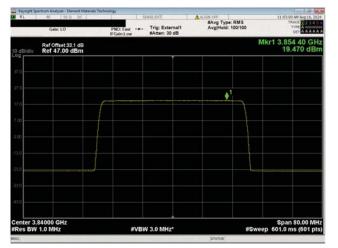




Port 1 40 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz



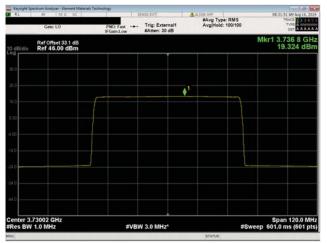




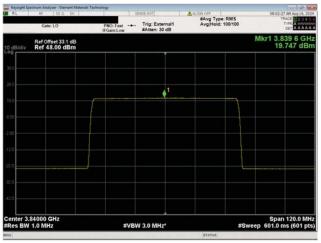
Port 1 40 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3840.00 MHz

Port 1 40 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3840.00 MHz

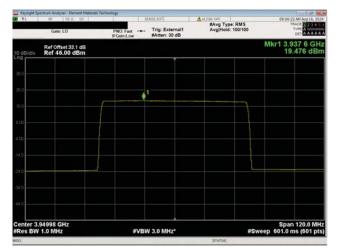




Port 1 60 MHz Channel Bandwidth QPSK Modulation Low Channel, 3730.02 MHz





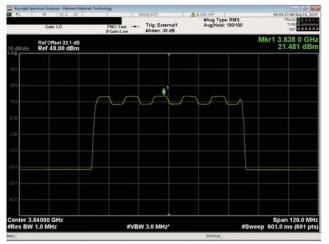


Port 1 60 MHz Channel Bandwidth QPSK Modulation High Channel, 3949.98 MHz

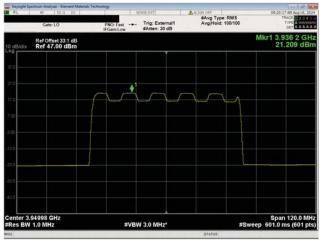
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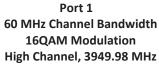
Port 1 60 MHz Channel Bandwidth 16QAM Modulation Low Channel, 3730.02 MHz

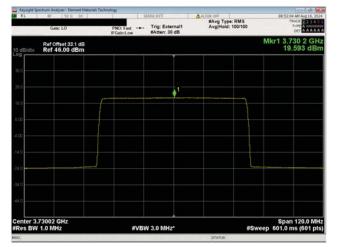




Port 1 60 MHz Channel Bandwidth 16QAM Modulation Mid Channel, 3840.00 MHz







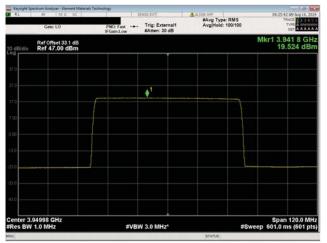
Port 1 60 MHz Channel Bandwidth 64QAM Modulation Low Channel, 3730.02 MHz

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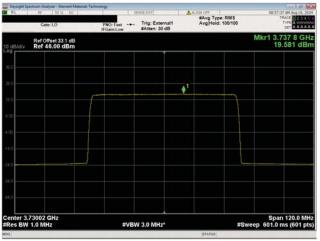
Port 1 60 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3840.00 MHz

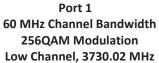
# **POWER SPECTRAL DENSITY - BAND 3.7G**

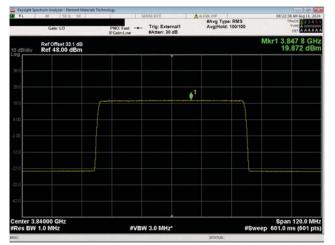




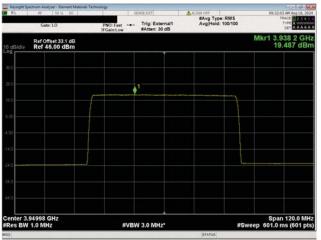
Port 1 60 MHz Channel Bandwidth 64QAM Modulation High Channel, 3949.98 MHz







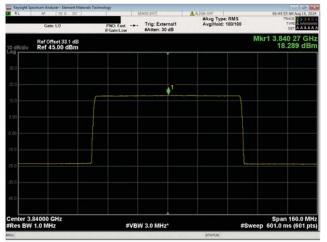
Port 1 60 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3840.00 MHz



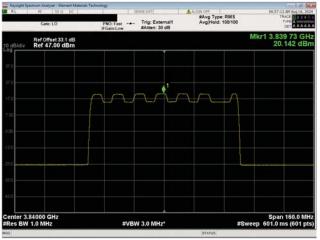
Port 1 60 MHz Channel Bandwidth 256QAM Modulation High Channel, 3949.98 MHz

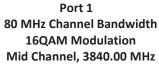
# **POWER SPECTRAL DENSITY - BAND 3.7G**

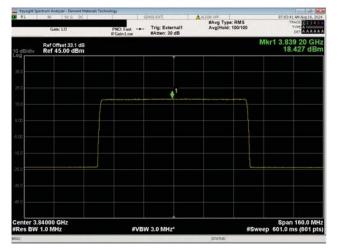




Port 1 80 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz







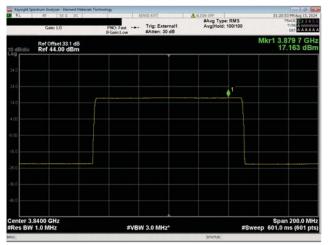
Port 1 80 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3840.00 MHz

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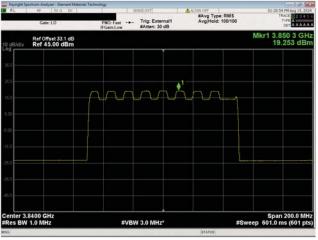
Port 1 80 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3840.00 MHz

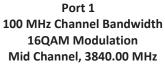
# **POWER SPECTRAL DENSITY - BAND 3.7G**

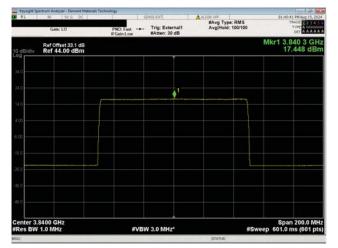




Port 1 100 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz







Port 1 100 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3840.00 MHz

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Port 1 100 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3840.00 MHz



#### **TEST DESCRIPTION**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Peak to Average Power was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed the rule part defined limit.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

Per FCC 27.50(k) (4), the peak to average ratio may not exceed 13dB for more than the ANSI described 0.1% of the time.

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Spectrum Analyzer	Keysight Technologies, Inc.	N9030B	R336	2023-10-03	2024-10-03



EUT:	AVQQA Remote Radio Head	Work Order:	NOKI0075
Serial Number:	L1242403137	Date:	2024-08-12
Customer:	Nokia Solutions and Networks	Temperature:	23.3°C
Attendees:	David Le, John Rattanavong	Relative Humidity:	57.2%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54VDC	Configuration:	NOKI0075-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 27:2024	ANSI C63.26:2015

#### COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.45 GHz band in single carrier operating mode configuration.

#### **DEVIATIONS FROM TEST STANDARD**

None

#### CONCLUSION

Pass

MA 1

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#### **TEST RESULTS**

	0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
Port 1	(u2)		
10 MHz Channel Bandwidth			
QPSK Modulation			
Low Channel, 3455.01 MHz	8.59	13	Pass
Mid Channel, 3500.01 MHz	8.54	13	Pass
High Channel, 3544.995 MHz	8.55	13	Pass
20 MHz Channel Bandwidth QPSK Modulation			
Low Channel, 3460.02 MHz	8.54	13	Pass
Mid Channel, 3500.01 MHz	8.4	13	Pass
High Channel, 3540.00 MHz	8.3	13	Pass
30 MHz Channel Bandwidth QPSK Modulation			
Low Channel, 3465.00 MHz	8.49	13	Pass
Mid Channel, 3500.01 MHz	8.56	13	Pass
High Channel, 3534.99 MHz	8.41	13	Pass
40 MHz Channel Bandwidth QPSK Modulation			
Low Channel, 3470.01 MHz	8.44	13	Pass
Mid Channel, 3500.01 MHz	8.4	13	Pass
High Channel, 3529.98 MHz	8.41	13	Pass
16QAM Modulation			



	0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
Mid Channel, 3500.01 MHz	8.4	13	Pass
64QAM Modulation			
Mid Channel, 3500.01 MHz	8.56	13	Pass
256QAM Modulation			
Mid Channel, 3500.01 MHz	8.58	13	Pass





Port 1 10 MHz Channel Bandwidth QPSK Modulation Low Channel, 3455.01 MHz



Port 1 10 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz





Port 1 10 MHz Channel Bandwidth QPSK Modulation High Channel, 3544.995 MHz



Port 1 20 MHz Channel Bandwidth QPSK Modulation Low Channel, 3460.02 MHz



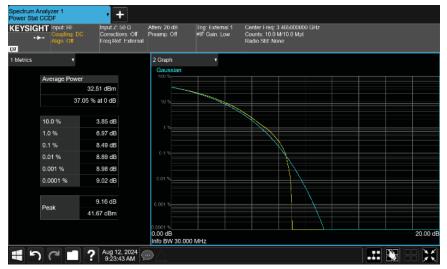


Port 1 20 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz



Port 1 20 MHz Channel Bandwidth QPSK Modulation High Channel, 3540.00 MHz





Port 1 30 MHz Channel Bandwidth QPSK Modulation Low Channel, 3465.00 MHz



Port 1 30 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz





Port 1 30 MHz Channel Bandwidth QPSK Modulation High Channel, 3534.99 MHz

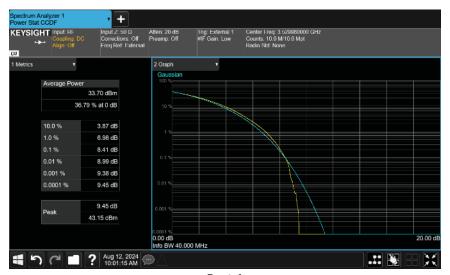


Port 1 40 MHz Channel Bandwidth QPSK Modulation Low Channel, 3470.01 MHz





Port 1 40 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz

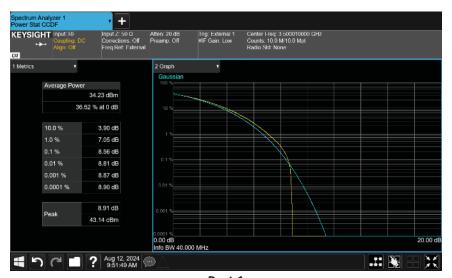


Port 1 40 MHz Channel Bandwidth QPSK Modulation High Channel, 3529.98 MHz





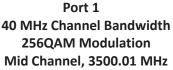
Port 1 40 MHz Channel Bandwidth 16QAM Modulation Mid Channel, 3500.01 MHz



Port 1 40 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3500.01 MHz









#### **TEST DESCRIPTION**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Peak to Average Power was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed the rule part defined limit.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

Per FCC 27.50(j) (4), the peak to average ratio may not exceed 13dB for more than the ANSI described 0.1% of the time.

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Spectrum Analyzer	Keysight Technologies, Inc.	N9030B	R336	2023-10-03	2024-10-03



EUT:	AVQQA Remote Radio Head	Work Order:	NOKI0075
Serial Number:	L1242403137	Date:	2024-08-19
Customer:	Nokia Solutions and Networks	Temperature:	23.3°C
Attendees:	David Le, John Rattanavong	Relative Humidity:	52.1%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54VDC	Configuration:	NOKI0075-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 27:2024	ANSI C63.26:2015

#### COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.7 GHz band in the single carrier operating mode configuration.

#### **DEVIATIONS FROM TEST STANDARD**

None

#### CONCLUSION

Pass

gran 1

Tested By

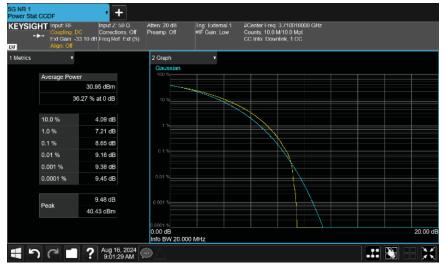
#### **TEST RESULTS**

	0.1% PAPR	0.1% PAPR	
	Value (dB)	Limit (dB)	Results
ort 1			
20 MHz Channel Bandwidth			
QPSK Modulation			
Low Channel, 3710.01 MHz	8.65	13	Pass
Mid Channel, 3840.00 MHz	8.74	13	Pass
High Channel, 3969.99 MHz	8.69	13	Pass
40 MHz Channel Bandwidth QPSK Modulation			
Low Channel, 3720.00 MHz	8.55	13	Pass
Mid Channel, 3840.00 MHz	8.82	13	Pass
High Channel, 3960.00 MHz	8.91	13	Pass
60 MHz Channel Bandwidth QPSK Modulation			
Low Channel, 3730.02 MHz	8.85	13	Pass
Mid Channel, 3840.00 MHz	8.86	13	Pass
High Channel, 3949.98 MHz	8.79	13	Pass
80 MHz Channel Bandwidth QPSK Modulation			
Low Channel, 3740.01 MHz	8.89	13	Pass
Mid Channel, 3840.00 MHz	8.78	13	Pass
High Channel, 3939.99 MHz	8.8	13	Pass



	0.1% PAPR Value (dB)	0.1% PAPR Limit (dB)	Results
100 MHz Channel Bandwidth			
QPSK Modulation			
Low Channel, 3750.00 MHz	8.85	13	Pass
Mid Channel, 3840.00 MHz	8.59	13	Pass
High Channel, 3930.00 MHz	8.79	13	Pass
16QAM Modulation			
Mid Channel, 3840.00 MHz	8.4	13	Pass
64QAM Modulation			
Mid Channel, 3840.00 MHz	8.52	13	Pass
256QAM Modulation			
Mid Channel, 3840.00 MHz	8.53	13	Pass





Port 1 20 MHz Channel Bandwidth QPSK Modulation Low Channel, 3710.01 MHz



Port 1 20 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz





Port 1 20 MHz Channel Bandwidth QPSK Modulation High Channel, 3969.99 MHz



Port 1 40 MHz Channel Bandwidth QPSK Modulation Low Channel, 3720.00 MHz





Port 1 40 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz

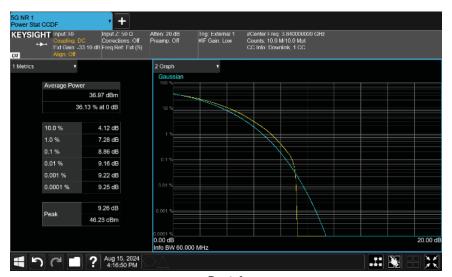


Port 1 40 MHz Channel Bandwidth QPSK Modulation High Channel, 3960.00 MHz



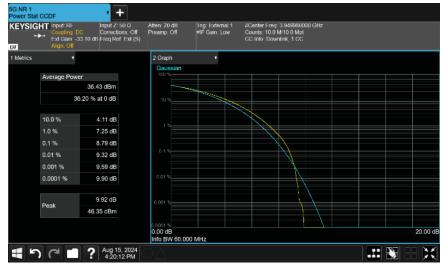


Port 1 60 MHz Channel Bandwidth QPSK Modulation Low Channel, 3730.02 MHz



Port 1 60 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz





Port 1 60 MHz Channel Bandwidth QPSK Modulation High Channel, 3949.98 MHz



Port 1 80 MHz Channel Bandwidth QPSK Modulation Low Channel, 3740.01 MHz





Port 1 80 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz



Port 1 80 MHz Channel Bandwidth QPSK Modulation High Channel, 3939.99 MHz





Port 1 100 MHz Channel Bandwidth QPSK Modulation Low Channel, 3750.00 MHz



Port 1 100 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3840.00 MHz





Port 1 100 MHz Channel Bandwidth QPSK Modulation High Channel, 3930.00 MHz



Port 1 100 MHz Channel Bandwidth 16QAM Modulation Mid Channel, 3840.00 MHz





Port 1 100 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3840.00 MHz



Port 1 100 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3840.00 MHz



#### **TEST DESCRIPTION**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Occupied Bandwidth was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The method in section 5.4 of ANSI C63.26 was used to make this measurement. The spectrum analyzer settings were as follows:

- RBW is 1% 5% of the occupied bandwidth
- VBW is ≥ 3x the RBW
- Peak Detector was used
- Trace max hold was used

The 26dB emission bandwidth is measured in accordance with section 4 of FCC KDB 971168 D01v03r01 and ANSI C63.26 section 5.4. FCC 2.1049 requires an emission bandwidth measurement. FCC 27.53(n)(1) defines the emission bandwidth to be used as 26 dB down.

	FCC 5G En	nission Designators f	or 3.45G Band (3450	VHz to 3550MHz)	
Channel Bandwidth	Radio Channel	5G-NR: QPSK	5G-NR: 16QAM	5G-NR: 64QAM	5G-NR: 256QAM
	Low	9M75G7W			
10MHz	Mid	9M76G7W	9M69G7W	9M74G7W	9M75G7W
	High	9M76G7W			
	Low	19M8G7W			
20MHz	Mid	19M9G7W	19M8G7W	19M8G7W	19M8G7W
-	High	19M8G7W			
	Low	30M0G7W			
30MHz	Mid	30M0G7W	29M9G7W	30M0G7W	29M9G7W
-	High	29M9G7W			
	Low	40M2G7W			
40MHz	Mid	40M4G7W	40M2G7W	40M3G7W	40M3G7W
	High	40M4G7W			
Note: FCC emissi	on designators a	re based on 26dB en	nission bandwidth me	asurement data.	

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2024-03-12	2025-03-12
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Block - DC	Fairview Microwave	SD3239	ANE	2024-02-14	2025-02-14



EUT:	AVQQA Remote Radio Head	Work Order:	NOKI0075
Serial Number:	L1242403137	Date:	2024-08-09
Customer:	Nokia Solutions and Networks	Temperature:	23.3°C
Attendees:	David Le, John Rattanavong	Relative Humidity:	52.7%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	54VDC	Configuration:	NOKI0075-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 27:2024	ANSI C63.26:2015

#### COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.45 GHz band in single carrier operating mode configuration.

#### **DEVIATIONS FROM TEST STANDARD**

None

#### CONCLUSION

Pass

MA 1

Tested By

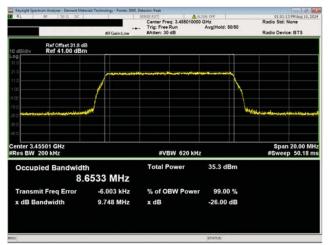
#### **TEST RESULTS**

	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
Port 1	5576 (WITZ)		Linit	Result
10 MHz Channel Bandwidth				
QPSK Modulation				
Low Channel, 3455.01 MHz	8.6533 MHz	9.748 MHz	Within Band	Pass
Mid Channel, 3500.01 MHz	8.6592 MHz	9.758 MHz	Within Band	Pass
High Channel, 3544.995 MHz	8.6701 MHz	9.756 MHz	Within Band	Pass
16QAM Modulation				
Mid Channel, 3500.01 MHz	8.6103 MHz	9.69 MHz	Within Band	Pass
64QAM Modulation				
Mid Channel, 3500.01 MHz	8.6567 MHz	9.738 MHz	Within Band	Pass
256QAM Modulation				
Mid Channel, 3500.01 MHz	8.6643 MHz	9.749 MHz	Within Band	Pass
20 MHz Channel Bandwidth				
QPSK Modulation				
Low Channel, 3460.02 MHz	18.316 MHz	19.813 MHz	Within Band	Pass
Mid Channel, 3500.01 MHz	18.310 MHz	19.897 MHz	Within Band	Pass
High Channel, 3540.00 MHz	18.306 MHz	19.81 MHz	Within Band	Pass
16QAM Modulation				
Mid Channel, 3500.01 MHz	18.382 MHz	19.823 MHz	Within Band	Pass
64QAM Modulation				
Mid Channel, 3500.01 MHz	18.314 MHz	19.848 MHz	Within Band	Pass



	Value 99% (MHz)	Value 26dB (MHz)	Limit	Result
256QAM Modulation				
Mid Channel, 3500.01 MHz	18.329 MHz	19.781 MHz	Within Band	Pass
30 MHz Channel Bandwidth QPSK Modulation				
Low Channel, 3465.00 MHz	27.904 MHz	29.984 MHz	Within Band	Pass
Mid Channel, 3500.01 MHz	27.933 MHz	29.958 MHz	Within Band	Pass
High Channel, 3534.99 MHz	27.918 MHz	29.879 MHz	Within Band	Pass
16QAM Modulation				
Mid Channel, 3500.01 MHz	28.046 MHz	29.855 MHz	Within Band	Pass
64QAM Modulation				
Mid Channel, 3500.01 MHz	27.931 MHz	29.95 MHz	Within Band	Pass
256QAM Modulation				
Mid Channel, 3500.01 MHz	27.901 MHz	29.932 MHz	Within Band	Pass
40 MHz Channel Bandwidth QPSK Modulation				
Low Channel, 3470.01 MHz	37.855 MHz	40.247 MHz	Within Band	Pass
Mid Channel, 3500.01 MHz	37.922 MHz	40.419 MHz	Within Band	Pass
High Channel, 3529.98 MHz	37.876 MHz	40.356 MHz	Within Band	Pass
16QAM Modulation				
Mid Channel, 3500.01 MHz	38.036 MHz	40.231 MHz	Within Band	Pass
64QAM Modulation				
Mid Channel, 3500.01 MHz	38.022 MHz	40.279 MHz	Within Band	Pass
256QAM Modulation				
Mid Channel, 3500.01 MHz	37.930 MHz	40.296 MHz	Within Band	Pass

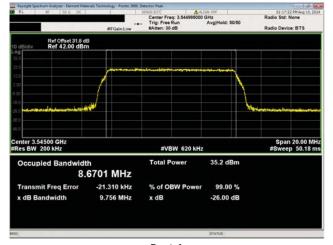




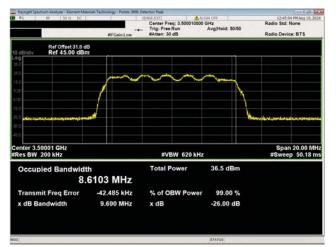
Port 1 10 MHz Channel Bandwidth QPSK Modulation Low Channel, 3455.01 MHz



Port 1 10 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz

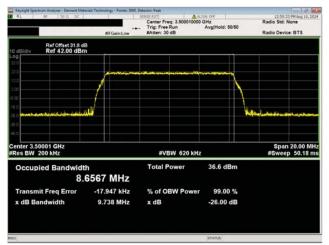


Port 1 10 MHz Channel Bandwidth QPSK Modulation High Channel, 3544.995 MHz

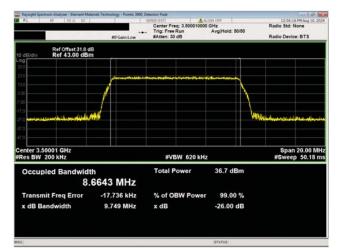


Port 1 10 MHz Channel Bandwidth 16QAM Modulation Mid Channel, 3500.01 MHz

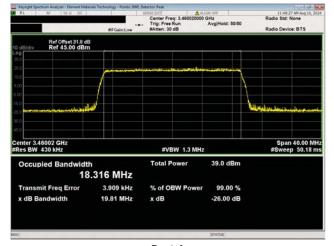




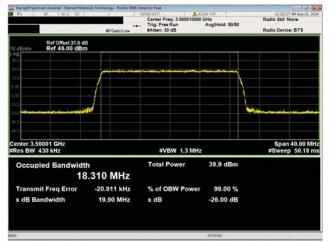
Port 1 10 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3500.01 MHz



Port 1 10 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3500.01 MHz

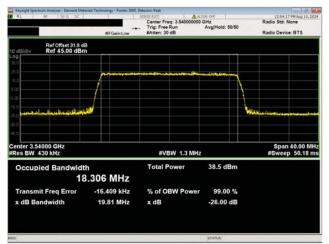


Port 1 20 MHz Channel Bandwidth QPSK Modulation Low Channel, 3460.02 MHz

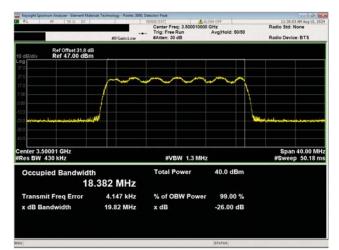


Port 1 20 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz

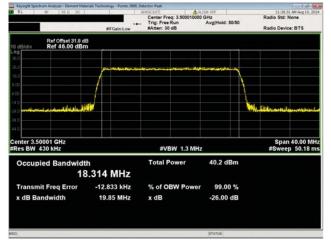




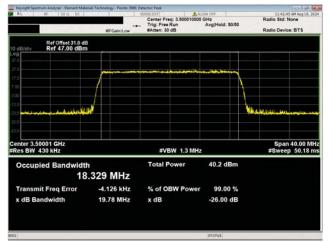
Port 1 20 MHz Channel Bandwidth QPSK Modulation High Channel, 3540.00 MHz



Port 1 20 MHz Channel Bandwidth 16QAM Modulation Mid Channel, 3500.01 MHz

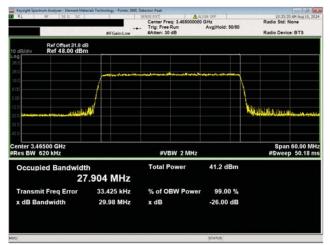


Port 1 20 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3500.01 MHz

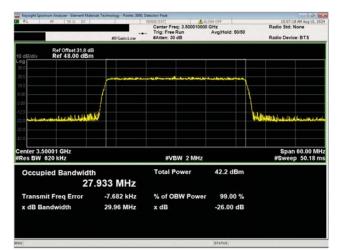


Port 1 20 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3500.01 MHz

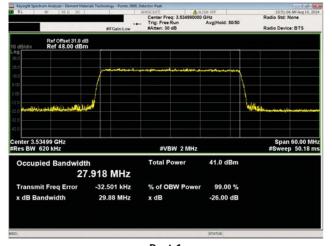




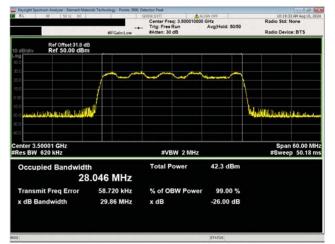
Port 1 30 MHz Channel Bandwidth QPSK Modulation Low Channel, 3465.00 MHz



Port 1 30 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz

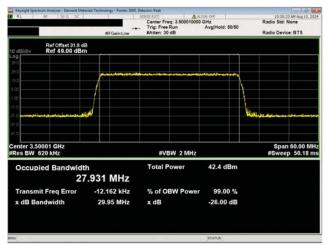


Port 1 30 MHz Channel Bandwidth QPSK Modulation High Channel, 3534.99 MHz

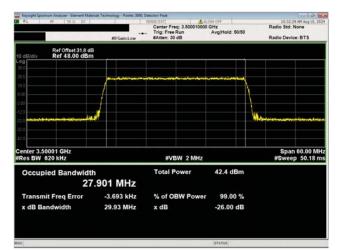


Port 1 30 MHz Channel Bandwidth 16QAM Modulation Mid Channel, 3500.01 MHz

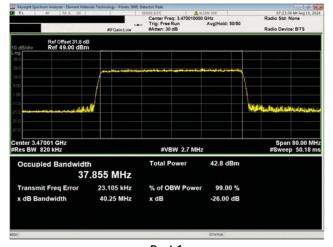




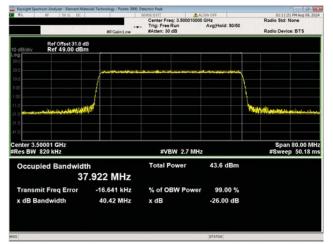
Port 1 30 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3500.01 MHz



Port 1 30 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3500.01 MHz

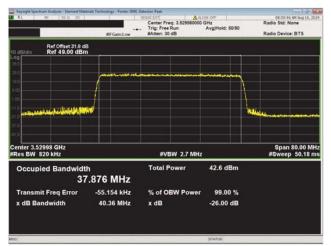


Port 1 40 MHz Channel Bandwidth QPSK Modulation Low Channel, 3470.01 MHz

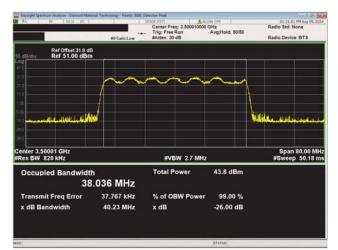


Port 1 40 MHz Channel Bandwidth QPSK Modulation Mid Channel, 3500.01 MHz

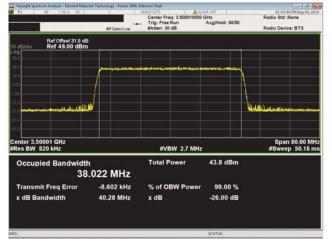




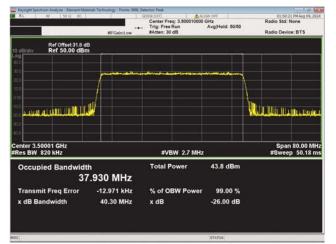
Port 1 40 MHz Channel Bandwidth QPSK Modulation High Channel, 3529.98 MHz



Port 1 40 MHz Channel Bandwidth 16QAM Modulation Mid Channel, 3500.01 MHz



Port 1 40 MHz Channel Bandwidth 64QAM Modulation Mid Channel, 3500.01 MHz



Port 1 40 MHz Channel Bandwidth 256QAM Modulation Mid Channel, 3500.01 MHz