

#### **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 spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies of the available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHFIHA) as the original certification test. The AHFIHA 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 paragraph 5.7.2i.

The spectrum was scanned below the lower band edge and above the higher band edge.

Measurements shall be performed with 3GPP Band 2 transmitter at full power on the channels, bandwidths, and modulation types (specified by the compliance lab/TCB). These measurements are for first 1.0 MHz bands immediately outside and adjacent to the frequency block.

Per section 24.238(a) and RSS 133 6.5 (i), the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -16 dBm [-13 dBm -10 log (2)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 2 port MIMO WCDMA transmitter. The GSM/EDGE carriers are not MIMO.

The resolution bandwidth to be used for these measurements shall be 1% of the measured emission bandwidth per FCC 24.238(b) and RSS 133 6.5 (i). A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). The requirements for FCC/IC measurements are detailed in KDB971168 D01 v03r01 and ANSI 63.26.

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-02-14	2025-02-14
Block - DC	Fairview Microwave	SD3379	AMM	2023-08-04	2024-08-04
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07



EUT:	AirScale Base Transceiver Station Remote Radio Head Model	Work Order:	NOKI0074
	ANFINA		
Serial Number:	RW233800370	Date:	2024-03-19
Customer:	Nokia Solutions and Networks	Temperature:	22.9°C
Attendees:	John Rattanavong, Mitch Hill, David Le	Relative Humidity:	39.8%
Customer Project:	None	Bar. Pressure (PMSL):	998 mbar
Tested By:	Jarrod Brenden	Job Site:	TX07
Power:	54 VDC	Configuration:	NOKI0074-2

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 24E:2024	ANSI C63.26:2015
RSS-133 Issue 6:2013 +A1:2018	ANSI C63.26:2015

#### **COMMENTS**

All losses in the measurement path were accounted for in the spectrum analyzer reference level offsets for: attenuators, cables, DC block, and filters were used. While not displayed in the Spectrum analyzer/Channel power screen captures, measurements were performed with an internal reference level offsets of 44.09dB.

GSM/EDGE carriers are required to be operated with 3G(WCDMA) 4G(LTE) or 5G(5GNR) RAT carriers in the PCS band. Single 2G(GSM) carriers in PCS band: GSM/EDGE carriers were enabled at maximum power (20 watts/carrier) and LTE 5MHz carrier were enable at maximum power (40 watts/carrier) at 1970MHz. Also, GSM/EDGE carriers were enabled at reduce power and +/- one channel from low and high channel at full power.

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

None

CONCLUSION Pass

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#### **TEST RESULTS**

		Range	Value (dBm)	Limit (dBm)	Result
2G GSM/E	DGE Band 2, 1930 MHz - 1990 MHz				
GMSł	K Modulation				
F	Reduced Power				
	Low Channel, 1930.2 MHz	1929 MHz - 1931 MHz	-17.353	-13	Pass
		1928 MHz - 1929 MHz	-25.68	-13	Pass
		1908 MHz - 1928 MHz	-25.373	-13	Pass
	High Channel, 1989.8 MHz	1989 MHz - 1991 MHz	-17.497	-13	Pass
		1991 MHz - 1992 MHz	-24.67	-13	Pass
		1992 MHz - 2012 MHz	-24.227	-13	Pass
C	Dne Channel Inside				
	Low Channel, 1930.4 MHz	1929 MHz - 1931 MHz	-37.871	-13	Pass
		1928 MHz - 1929 MHz	-24.53	-13	Pass
		1908 MHz - 1928 MHz	-23.934	-13	Pass
	High Channel, 1989.6 MHz	1989 MHz - 1991 MHz	-36.322	-13	Pass
		1991 MHz - 1992 MHz	-23.69	-13	Pass
		1992 MHz - 2012 MHz	-22.764	-13	Pass



		Range	Value (dBm)	Limit (dBm)	Result
3PSK Modulation					
Reduced Power					
	Low Channel, 1930.2 MHz	1929 MHz - 1931 MHz	-20.128	-13	Pass
		1928 MHz - 1929 MHz	-25.38	-13	Pass
		1908 MHz - 1928 MHz	-24.772	-13	Pass
	High Channel, 1989.8 MHz	1989 MHz - 1991 MHz	-16.881	-13	Pass
		1991 MHz - 1992 MHz	-24.67	-13	Pass
		1992 MHz - 2012 MHz	-24.497	-13	Pass
One Channel Inside					
	Low Channel, 1930.4 MHz	1929 MHz - 1931 MHz	-37.226	-13	Pass
		1928 MHz - 1929 MHz	-22.34	-13	Pass
		1908 MHz - 1928 MHz	-22.379	-13	Pass
	High Channel, 1989.6 MHz	1989 MHz - 1991 MHz	-35.362	-13	Pass
		1991 MHz - 1992 MHz	-22.94	-13	Pass
		1992 MHz - 2012 MHz	-22.384	-13	Pass





2G GSM/EDGE Band 2 GMSK Modulation Reduced Power Low Channel, 1930.2 MHz



2G GSM/EDGE Band 2 GMSK Modulation Reduced Power Low Channel, 1930.2 MHz



2G GSM/EDGE Band 2 GMSK Modulation Reduced Power Low Channel, 1930.2 MHz



2G GSM/EDGE Band 2 GMSK Modulation Reduced Power High Channel, 1989.8 MHz





2G GSM/EDGE Band 2 GMSK Modulation Reduced Power High Channel, 1989.8 MHz



2G GSM/EDGE Band 2 GMSK Modulation Reduced Power High Channel, 1989.8 MHz



2G GSM/EDGE Band 2 GMSK Modulation One Channel Inside Low Channel, 1930.4 MHz

		Center Freq: 1.928500 Tria: Free Run	AvalHeld: 100/100	Radio Std: None
	#FGain:Low	#Atten: 20 dB		Radio Device: BTS
Ref 19 00	dBm			
	dbiii			
	-	and interferences and a	an marker of	
nter 1 929 GHz				Span 1 M
s BW 9.1 kHz		VBW 91 kH	z	Sweep 14.45 m
Channel Power		Power Spect	ral Density	
-24 53 dB	m / 1 MHz	-24 53	dBm /Mu-	
-24.00 UD		-24.00		

2G GSM/EDGE Band 2 GMSK Modulation One Channel Inside Low Channel, 1930.4 MHz





2G GSM/EDGE Band 2 GMSK Modulation One Channel Inside Low Channel, 1930.4 MHz



2G GSM/EDGE Band 2 GMSK Modulation One Channel Inside High Channel, 1989.6 MHz



2G GSM/EDGE Band 2 GMSK Modulation One Channel Inside High Channel, 1989.6 MHz



2G GSM/EDGE Band 2 GMSK Modulation One Channel Inside High Channel, 1989.6 MHz





2G GSM/EDGE Band 2 8PSK Modulation Reduced Power Low Channel, 1930.2 MHz



2G GSM/EDGE Band 2 8PSK Modulation Reduced Power Low Channel, 1930.2 MHz



2G GSM/EDGE Band 2 8PSK Modulation Reduced Power Low Channel, 1930.2 MHz



2G GSM/EDGE Band 2 8PSK Modulation Reduced Power High Channel, 1989.8 MHz





2G GSM/EDGE Band 2 8PSK Modulation Reduced Power High Channel, 1989.8 MHz



2G GSM/EDGE Band 2 8PSK Modulation Reduced Power High Channel, 1989.8 MHz



2G GSM/EDGE Band 2 8PSK Modulation One Channel Inside Low Channel, 1930.4 MHz

RL RF 50.0 OC	9	Center Freq: 1.928500 Tria: Free Run	AvelHeld: 100/100	09:06:00 AM Mar 19, 200 Radie Std: None
	#IFGain:Low	#Atten: 20 dB		Radio Device: BTS
Ref 10 00 dE	100			
x)				
10				
0				
0				
0				
1			man	
0				
0				
0				
enter 1.929 GHz		VBW 01 FH	4	Span 1 MH
5 DW 9.1 KH2		VOW STAN	<u> </u>	Sweep 14:45 III
Channel Power		Power Spect	ral Density	
-22.34 dBm	1 / 1 MHz	-22.34	dBm /MHz	

2G GSM/EDGE Band 2 8PSK Modulation One Channel Inside Low Channel, 1930.4 MHz





2G GSM/EDGE Band 2 8PSK Modulation One Channel Inside Low Channel, 1930.4 MHz



2G GSM/EDGE Band 2 8PSK Modulation One Channel Inside High Channel, 1989.6 MHz



2G GSM/EDGE Band 2 8PSK Modulation One Channel Inside High Channel, 1989.6 MHz



2G GSM/EDGE Band 2 8PSK Modulation One Channel Inside High Channel, 1989.6 MHz



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The spurious RF conducted emissions at the edges of the authorized bands were measured on the low and high transmit frequencies of the available band. The channels closest to the band edges were selected. The EUT was transmitting at the power and data rate(s) listed in the datasheet.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHFIHA) as the original certification test. The AHFIHA 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 paragraph 5.7.2i.

The spectrum was scanned below the lower band edge and above the higher band edge.

Measurements shall be performed with 3GPP Band 2 transmitter at full power on the channels, bandwidths, and modulation types (specified by the compliance lab/TCB). These measurements are for first 1.0 MHz bands immediately outside and adjacent to the frequency block.

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The resolution bandwidth to be used for these measurements shall be 1% of the measured emission bandwidth per FCC 24.238(b) and RSS 133 6.5 (i). A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). The requirements for FCC/IC measurements are detailed in KDB971168 D01 v03r01 and ANSI 63.26.

#### **TEST EQUIPMENT**

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Block - DC	Fairview Microwave	SD3379	AMM	2023-08-04	2024-08-04
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07



EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHFIHA	Work Order:	NOKI0074
Serial Number:	RW233800370	Date:	2024-03-20
Customer:	Nokia Solutions and Networks	Temperature:	23.3°C
Attendees:	John Rattanavong, Mitch Hill, David Le	Relative Humidity:	43.2%
Customer Project:	None	Bar. Pressure (PMSL):	997 mbar
Tested By:	Jarrod Brenden	Job Site:	TX07
Power:	54 VDC	Configuration:	NOKI0074-2

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 24E:2024	ANSI C63.26:2015
RSS-133 Issue 6:2013 +A1:2018	ANSI C63.26:2015

#### COMMENTS

All losses in the measurement path were accounted for in the spectrum analyzer reference level offsets for: attenuators, cables, DC block, and filters were used. While not displayed in the Spectrum analyzer/Channel power screen captures, measurements were performed with an internal reference level offsets of 44.09dB.

GSM/EDGE carriers are required to be operated with 3G(WCDMA) 4G(LTE) or 5G(5GNR) RAT carriers in the PCS band. Multi-Carrier 2G GSM/EDGE: in PCS band two contiguous/non-contiguous GSM/EDEG carriers were enabled +/- one channel from low/high channels at maximum power (20 watts/carrier) and single LTE 1.4MHz carrier were enabled at 20 watts for a total of 60 watts. In the AWS band a single LTE 10MHz carrier were enabled at maximum power 60 watts at the middle channel (2155.0MHz) and in the BRS band a single LTE 5MHz carrier were enabled at maximum power at 40 watts at the middle channel (2655.0MHz).

Multi-Carrier 3G (WCDMA): In PCS band three WCDMA carriers were enabled at maximum power using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (1932.4 & 1937.4MHz) and a third carrier with maximum spacing between the other two carrier frequencies (1987.6MHz) at the upper band edge. The carriers are operated at maximum power (20 watts/carrier) with a total in PCS band carrier power of 60 watts. In the AWS band one LTE10 carrier were enabled at maximum power (60 watts) at the middle channel (2155 MHz) and in the BRS band one LTE5 carrier were enabled at maximum power (40 watts) at the middle channel (2655 MHz)

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

None

#### CONCLUSION Pass

Tested By

#### **TEST RESULTS**

	Frequency Range	Max Value (dBm)	Limit (dBm)	Result
2G GSM/EDGE Band 2, 1930 MHz - 1990 MHz				
Test Case 1				
GMSK Modulation (GSM) and QPSK Modulation (LTE)				
Low Channel, 1930.2 MHz	1929 MHz - 1931 MHz	-35.197	-13	Pass
	1928 MHz - 1929 MHz	-22.42	-13	Pass
	1908 MHz - 1928 MHz	-22.866	-13	Pass
8PSK Modulation (GSM) and QPSK Modulation (LTE)				
Low Channel, 1930.4 MHz	1929 MHz - 1931 MHz	-35.278	-13	Pass
	1928 MHz - 1929 MHz	-22.85	-13	Pass
	1908 MHz - 1928 MHz	-22.999	-13	Pass



		Frequency Range	Max Value (dBm)	Limit (dBm)	Result
Те	st Case 2	~			
	GMSK Modulation (GSM) and QPSK Modulation (LTE)				
	High Channel, 1989.8 MHz	1989 MHz - 1991 MHz	-35.145	-13	Pass
		1991 MHz - 1992 MHz 1992 MHz - 2012 MHz	-21.36	-13 -13	Pass
	8PSK Modulation (GSM) and QPSK Modulation (LTE)	1992 WHZ - 2012 WHZ	-21.103	-15	1 435
	High Channel, 1989.6 MHz	1989 MHz - 1991 MHz	-31.423	-13	Pass
		1991 MHz - 1992 MHz	-21.17	-13	Pass
-		1992 MHz - 2012 MHz	-21.363	-13	Pass
le	st Case 3 GMSK Modulation (GSM) and QPSK Modulation (LTE)		I		
	Low Channel, 1930.2 MHz	1929 MHz - 1931 MHz	-36.79	-13	Pass
		1928 MHz - 1929 MHz	-24.06	-13	Pass
			-24.201	-13	Pass
	High Channel, 1989.8 MHZ	1989 MHZ - 1991 MHZ 1991 MHz - 1992 MHz	-35.30	-13 -13	Pass
		1992 MHz - 2012 MHz	-23.298	-13	Pass
	8PSK Modulation (GSM) and QPSK Modulation (LTE)				
	Low Channel, 1930.4 MHz	1929 MHz - 1931 MHz	-35.348	-13	Pass
		1928 MHz - 1929 MHz	-23.37	-13	Pass
		1908 MHz - 1928 MHz	-23.054	-13	Pass
	High Channel, 1989.6 MHz	1989 MHz - 1991 MHz 1991 MHz - 1992 MHz	-35.004	-13 -13	Pass Pass
		1992 MHz - 2012 MHz	-22.816	-13	Pass
3G WC	DMA PCS Band II, 1930 MHz - 1990 MHz				
Te	st Case 1				
		1020 MUz - 1021 MUz	24 529	16	Bass
	Low Channel, 1932.4 MHZ	1929 MHz - 1931 MHz 1928 MHz - 1929 MHz	-24.526	-16	Pass
		1908 MHz - 1928 MHz	-19.903	-16	Pass
	High Channel, 1987.6 MHz	1989 MHz - 1991 MHz	-23.509	-16	Pass
		1991 MHz - 1992 MHz	-18.3	-16	Pass
	160AM Modulation (MCDMA) and ODSK Modulation (LTE)	1992 MHz - 2012 MHz	-17.327	-16	Pass
		1020 MUZ 1021 MUZ	24.966	16	Deee
	Low Channel, 1932.4 MHZ	1929 MHz - 1931 MHz 1928 MHz - 1929 MHz	-24.000	-16	Pass
		1908 MHz - 1928 MHz	-19.734	-16	Pass
	High Channel, 1987.6 MHz	1989 MHz - 1991 MHz	-24.488	-16	Pass
		1991 MHz - 1992 MHz	-18.23	-16	Pass
	CACANA Madulatian (MCDMA) and ODCK Madulatian (LTE)	1992 MHz - 2012 MHz	-18.734	-16	Pass
	04QAIVI WIDDUIALION (WCDIVIA) and QPSK MIDDUIALION (LTE)		04.000	40	Dett
	Low Channel, 1932.4 MHz	1929 MHz - 1931 MHZ 1928 MHz - 1929 MHz	-24.992	-16 -16	Pass
		1908 MHz - 1928 MHz	-20.368	-16	Pass
	High Channel, 1987.6 MHz	1989 MHz - 1991 MHz	-24.541	-16	Pass
		1991 MHz - 1992 MHz	-18.97	-16	Pass
		1992 MHz - 2012 MHz	-18.413	-16	Pass





2G GSM/EDGE Band 2 Test Case 1 GMSK Modulation Lower Band Edge



2G GSM/EDGE Band 2 Test Case 1 GMSK Modulation Lower Band Edge



2G GSM/EDGE Band 2 Test Case 1 GMSK Modulation Lower Band Edge



2G GSM/EDGE Band 2 Test Case 1 8PSK Modulation Lower Band Edge





2G GSM/EDGE Band 2 Test Case 1 8PSK Modulation Lower Band Edge



2G GSM/EDGE Band 2 Test Case 1 8PSK Modulation Lower Band Edge



2G GSM/EDGE Band 2 Test Case 2 GMSK Modulation Upper Band Edge

Iter calls bewice: BTS     Ref 19.00 dBm       Image: space of the space o	RL RF 50.0 OC		Center Freq: 1.991500 Trig: Free Run	AUGN OFF 0000 GHz Avg[Held: 100/100	11:33:17 AM Mar 19, 20 Radio Std: None
Ref 19.00 dBm         Image: Specific Specifi		#IFGain:Low	#Atten: 20 dB		Radio Device: BTS
Channel Power Power Spectral Density -21.36 dBm / 1 MHz -21.36 dBm /MHz	D-1 10 00 dB-				
enter 1.992 GHz s BW 9.1 kHz Channel Power -21.36 dBm / 1 MHz -21.36 dBm / 1 MHz -21.36 dBm / MHz	a Kei 19.00 dBii				
nter 1.992 GHz s BW 9.1 kHz Channel Power -21.36 dBm / 1 MHz -21.36 dBm / 1 MHz -21.36 dBm / 1 MHz	0				
Image: constraint of the second se	0				
nter 1.992 CHz sBW 9.1 kHz Channel Power -21.36 dBm / 1 MHz -21.36 dBm / 1 MHz	0				
nter 1.992 GHz Span 11 Sweep 14.45 Channel Power Power Spectral Density -21.36 dBm / 1 MHz -21.36 dBm /MHz					
nter 1.992 GHz SBW 9.1 kHz SW 9.1 kHz Channel Power -21.36 dBm / 1 MHz -21.36 dBm / 1 MHz					
nter 1.992 GHz Span 1 SWeep 14.42 Channel Power Power Spectral Density -21.36 dBm / 1 MHz -21.36 dBm /MHz					
nter 1.992 GHz Span 11 Sweep 14.42 Channel Power Power Spectral Density -21.36 dBm / 1 MHz -21.36 dBm /MHz	)				
nter 1.992 GHz Span 11 SBW 9.1 kHz Sweep 14.42 Channel Power Power Spectral Density -21.36 dBm / 1 MHz -21.36 dBm /MHz					
nter 1.992 GHz Span 1 S BW 9.1 kHz Sweep 14.45 Channel Power Power Spectral Density -21.36 dBm / 1 MHz -21.36 dBm /MHz					
s BW 9.1 kHz VBW 91 kHz Sweep 14.45 Channel Power Power Spectral Density -21.36 dBm / 1 MHz -21.36 dBm /MHz	nter 1.992 GHz				Span 1 MH
Channel Power Power Spectral Density -21.36 dBm / 1 MHz -21.36 dBm /MHz	s BW 9.1 kHz		VBW 91 kH	z	Sweep 14.45 m
Channel Power Spectral Density -21.36 dBm / 1 мнz -21.36 dBm /мнz					
-21.36 dBm / 1 мнz -21.36 dBm /мнz	Channel Power		Power Spect	ral Density	
-21.36 dBm /1 MHz -21.36 dBm /MHz					
	-21.36 dBm	/ 1 MHz	-21.36	S dBm /MHz	

2G GSM/EDGE Band 2 Test Case 2 GMSK Modulation Upper Band Edge





2G GSM/EDGE Band 2 Test Case 2 GMSK Modulation Upper Band Edge



2G GSM/EDGE Band 2 Test Case 2 8PSK Modulation Upper Band Edge



2G GSM/EDGE Band 2 Test Case 2 8PSK Modulation Upper Band Edge



2G GSM/EDGE Band 2 Test Case 2 8PSK Modulation Upper Band Edge





2G GSM/EDGE Band 2 Test Case 3 GMSK Modulation Lower Band Edge



2G GSM/EDGE Band 2 Test Case 3 GMSK Modulation Lower Band Edge



2G GSM/EDGE Band 2 Test Case 3 GMSK Modulation Lower Band Edge



2G GSM/EDGE Band 2 Test Case 3 GMSK Modulation Upper Band Edge





2G GSM/EDGE Band 2 Test Case 3 GMSK Modulation Upper Band Edge



2G GSM/EDGE Band 2 Test Case 3 GMSK Modulation Upper Band Edge



2G GSM/EDGE Band 2 Test Case 3 8PSK Modulation Lower Band Edge

IBidiv		MPGBILLOW			Radia Davica: BTS
	Ref 19.00 dBm		Printing by the		Tall Control Dio
			······		
hter 1.92 s BW 9.1	9 GHz kHz		VBW 91 kH	z	Span 1 MH Sweep 14,45 m
Channe	Power		Power Spect	ral Density	
-23	.37 dBm /	1 MHz	-23.37	dBm /мнz	

2G GSM/EDGE Band 2 Test Case 3 8PSK Modulation Lower Band Edge





2G GSM/EDGE Band 2 Test Case 3 8PSK Modulation Lower Band Edge



2G GSM/EDGE Band 2 Test Case 3 8PSK Modulation Upper Band Edge



2G GSM/EDGE Band 2 Test Case 3 8PSK Modulation Upper Band Edge



2G GSM/EDGE Band 2 Test Case 3 8PSK Modulation Upper Band Edge





3G WCDMA PCS Band II Test Case 1 QPSK Modulation Low Channel, 1932.4 MHz



3G WCDMA PCS Band II Test Case 1 QPSK Modulation Low Channel, 1932.4 MHz



Test Case 1 QPSK Modulation Low Channel, 1932.4 MHz

3G WCDMA PCS Band II Test Case 1 QPSK Modulation High Channel, 1987.6 MHz





3G WCDMA PCS Band II Test Case 1 QPSK Modulation High Channel, 1987.6 MHz



3G WCDMA PCS Band II Test Case 1 QPSK Modulation High Channel, 1987.6 MHz



3G WCDMA PCS Band II Test Case 1 16QAM Modulation Low Channel, 1932.4 MHz

AL A	50.9 DC	_	Center Freq: 1.928500 Trig: Free Run	AUGH OFF 000 GHz Avg[Held: 100/100	02:23:58 PM Mar 20, 20 Radie Std: None
		#FGainLow	#Atten: 20 dB		Radio Device: BTS
dBidiv	Ref 19.00 dBm				
9 10					
0					
0					
0					
				······································	
0					
o					
0					
nter 1.929 s BW 9.11	GHz kHz		VBW 91 kHz		Span 1 MH Sweep 14.45 m
Channel	Power		Power Spectr	al Density	
-20.	11 dBm /	1 MHz	-20.11	dBm /MHz	

3G WCDMA PCS Band II Test Case 1 16QAM Modulation Low Channel, 1932.4 MHz





3G WCDMA PCS Band II Test Case 1 16QAM Modulation Low Channel, 1932.4 MHz



3G WCDMA PCS Band II Test Case 1 16QAM Modulation High Channel, 1987.6 MHz



3G WCDMA PCS Band II Test Case 1 16QAM Modulation High Channel, 1987.6 MHz



3G WCDMA PCS Band II Test Case 1 16QAM Modulation High Channel, 1987.6 MHz





3G WCDMA PCS Band II Test Case 1 64QAM Modulation Low Channel, 1932.4 MHz



3G WCDMA PCS Band II Test Case 1 64QAM Modulation Low Channel, 1932.4 MHz



Test Case 1 64QAM Modulation Low Channel, 1932.4 MHz

3G WCDMA PCS Band II Test Case 1 64QAM Modulation High Channel, 1987.6 MHz





3G WCDMA PCS Band II Test Case 1 64QAM Modulation High Channel, 1987.6 MHz



3G WCDMA PCS Band II Test Case 1 64QAM Modulation High Channel, 1987.6 MHz



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The spectrum was scanned below the lower band edge and above the higher band edge.

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EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHFIHA	Work Order:	NOKI0074
Serial Number:	RW233800370	Date:	2024-03-20
Customer:	Nokia Solutions and Networks	Temperature:	23.1°C
Attendees:	John Rattanavong, Mitch Hill, David Le	Relative Humidity:	41.3%
Customer Project:	None	Bar. Pressure (PMSL):	997 mbar
Tested By:	Jarrod Brenden	Job Site:	TX07
Power:	54 VDC	Configuration:	NOKI0074-2

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 24E:2024	ANSI C63.26:2015
RSS-133 Issue 6:2013 +A1:2018	ANSI C63.26:2015

#### **COMMENTS**

All losses in the measurement path were accounted for in the spectrum analyzer reference level offsets for: attenuators, cables, DC block, and filters were used. While not displayed in the Spectrum analyzer/Channel power screen captures, measurements were performed with an internal reference level offsets of 44.09dB.

Single 3G(WCDMA) carriers in PCS band; WCDMA carriers were enable at maximum power (40 watts/carrier) at middle channel (1960MHz).

### **DEVIATIONS FROM TEST STANDARD**

None

#### CONCLUSION

Pass

Tested By

#### **TEST RESULTS**

		Frequency Range	Value (dBm)	Limit (dBm)	Result
3G WCE	MA PCS Band II. 1930 MHz - 1990 MHz		()	()	
QPS	SK Modulation				
	Low Channel 1032 / MHz	1020 MHz - 1031 MHz	-22.861	-16	Pass
	Low Gharmer, 1932.4 Minz	1029 MHZ - 1020 MHZ	-22.001	-10	Pass
			-24.00	-10	Pass
		1908 MHz - 1928 MHz	-23.935	-16	Pass
	High Channel, 1987.6 MHz	1989 MHz - 1991 MHz	-22.576	-16	Pass
	-	1991 MHz - 1992 MHz	-23.61	-16	Pass
		1992 MHz - 2012 MHz	-23.512	-16	Pass
160	AM Modulation				
	Low Channel, 1932.4 MHz	1929 MHz - 1931 MHz	-22.729	-16	Pass
		1928 MHz - 1929 MHz	-24.83	-16	Pass
		1908 MHz - 1928 MHz	-24.116	-16	Pass
			00 504	10	_
	High Channel, 1987.6 MHz	1989 MHz - 1991 MHz	-23.531	-16	Pass
		1991 MHz - 1992 MHz	-24.26	-16	Pass
		1992 MHz - 2012 MHz	-23.822	-16	Pass
640	AM Modulation				
	Low Channel. 1932.4 MHz	1929 MHz - 1931 MHz	-22.762	-16	Pass
	- ,	1928 MHz - 1929 MHz	-25.01	-16	Pass
		1908 MHz - 1928 MHz	-24.32	-16	Pass



	Frequency Range	Value (dBm)	Limit (dBm)	Result
High Channel, 1987.6 MHz	1989 MHz - 1991 MHz	-22.927	-16	Pass
	1991 MHz - 1992 MHz 1992 MHz - 2012 MHz	-23.98	-16	Pass





3G WCDMA PCS Band II QPSK Modulation Low Channel, 1932.4 MHz



3G WCDMA PCS Band II QPSK Modulation Low Channel, 1932.4 MHz



3G WCDMA PCS Band II QPSK Modulation Low Channel, 1932.4 MHz



3G WCDMA PCS Band II QPSK Modulation High Channel, 1987.6 MHz





3G WCDMA PCS Band II QPSK Modulation High Channel, 1987.6 MHz



3G WCDMA PCS Band II QPSK Modulation High Channel, 1987.6 MHz



3G WCDMA PCS Band II 16QAM Modulation Low Channel, 1932.4 MHz



3G WCDMA PCS Band II 16QAM Modulation Low Channel, 1932.4 MHz





3G WCDMA PCS Band II 16QAM Modulation Low Channel, 1932.4 MHz



3G WCDMA PCS Band II 16QAM Modulation High Channel, 1987.6 MHz

RL RF 50.0 OC		Center Freg: 1.99150	ALION OFF	10-46-00 AM Mar 20, 2024 Radio Std: None
	/IFGain:Low	Trig: Free Run #Atten: 20 dB	Avg Hold: 100/100	Radio Device: BTS
Ref 19 00 dBr				
.0g				
10				
10				
1.0				
1.0				
.0			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	*****
1.0				
1.0				
enter 1.992 GHz es BW 9.1 kHz		VBW 91kH	iz	Span 1 MH Sweep 14.45 m
Channel Power		Power Spec	tral Density	
-24.26 dBm	/ 1 MHz	-24.2	6 dBm /мнz	
0			STATUS	

3G WCDMA PCS Band II 16QAM Modulation High Channel, 1987.6 MHz



3G WCDMA PCS Band II 16QAM Modulation High Channel, 1987.6 MHz





3G WCDMA PCS Band II 64QAM Modulation Low Channel, 1932.4 MHz

Tig Free Run Augiteld: 100/00 Radio Device: BTS Radio Device: BTS	NE NF 50.0 OC		Center Freq: 1.92850	ALION OFF	10-25-55 AM Mar 20, 3 Radio Std: None
Ref 19.00 dBm ter 19.00 dBm hter 1920 GHz s BW 9.1 kHz Channel Power -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz		#IFGain:Low	Trig: Free Run #Atten: 20 dB	Avg Held: 100/100	Radio Device: BTS
Atter 1920 GHz s BW 9.1 kHz s BW 9.1 kHz Channel Power -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz	Ref 10.00 dBm				
nter 1.929 GHz Span 1 SBW 91 kHz Span 1 Sweep 14.4: Channel Power Power Spectral Density -25.01 dBm / 1 MHz -25.01 dBm /MHz	Ref 19.00 dBill				
ter 1.929 GHz BW 9.1 kHz Channel Power -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz					
hter 1.929 GHz SBW 9.1 kHz SBW 9.1 kHz SWeep 14.4: Channel Power -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz					
nter 1.929 GHz BW 91 kHz Channel Power -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz					
Her 1.929 GHz BW 9.1 kHz Span 1 Sweep 14.4: Schannel Power -25.01 dBm / 1 MHz -25.01 dBm / MHz					
ter 1.929 GHz Span 1 Sweep 14.4: Channel Power Power Spectral Density -25.01 dBm / 1 MHz -25.01 dBm /MHz					
Iter 1.929 GHz IBW 91 kHz Channel Power -25.01 dBm / 1 MHz -25.01 dBm / 1 MHz	- marine ma	main	·······		mmmmmm
ter 1.929 GHz Span 1 IBW 9.1 kHz Sweep 14.4: Channel Power Power Spectral Density -25.01 dBm / 1 MHz -25.01 dBm /MHz					
ter 1.929 GHz Span 1 I BW 9.1 kHz Sweep 14.4: Channel Power Power Spectral Density -25.01 dBm / 1 MHz -25.01 dBm /MHz					
ter 1.929 GHz Span 1 IBW 91 kHz Sweep 14.4: Channel Power Power Spectral Density -25.01 dBm / 1 MHz -25.01 dBm /MHz					
s BW 91. kHz VBW 91. kHz Sweep 14.4: Channel Power Power Spectral Density -25.01 dBm / 1 MHz -25.01 dBm /MHz	ter 1.929 GHz				Span 1 N
Channel Power Spectral Density -25.01 dBm / 1 мнz -25.01 dBm /мнz	s BW 9.1 kHz		VBW 91 kH	łz	Sweep 14.45
-25.01 dBm / 1 мнz -25.01 dBm /мнz	Channel Power		Power Spec	tral Density	
-25.01 dBm / 1 мнz -25.01 dBm /мнz				, and a second second	
	-25 01 dBm	/ 1 MH7	-25.0	1 dBm /MHz	
	Loto I dibili		20.0		

3G WCDMA PCS Band II 64QAM Modulation Low Channel, 1932.4 MHz

RL RF 10.0 DC		266.2011	ALION OFF	10-26-46 AM Mar 20, 2024
	PNO: Fast -+- IFGain:Low	Trig: Free Run #Atten: 20 dB	#Avg Type: RMS Avg[Hold: 100/100	TRACE 2 2 4 4 Tyle A DET A REPORT
Ref Offset 44.09 dB			Mkr	1 1.927 615 0 GH: -24.320 dBm
£1				
4.1				
09				
91				
(s)				
55				•
5.9				
5.9				
tart 1.90800 GHz				Stop 1.92800 GH
Res BW 1.0 MHz	VBW	3.0 MHz*	#Swee	p 30.40 ms (8001 pts

3G WCDMA PCS Band II 64QAM Modulation Low Channel, 1932.4 MHz



3G WCDMA PCS Band II 64QAM Modulation High Channel, 1987.6 MHz





3G WCDMA PCS Band II 64QAM Modulation High Channel, 1987.6 MHz



3G WCDMA PCS Band II 64QAM Modulation High Channel, 1987.6 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 antenna port spurious emissions were measured at the RF output terminal of the EUT through four different attenuation configurations which continues through to the RF input of the spectrum analyzer. Analyzer plots utilizing a resolution bandwidth called out by the client's test approach were made for each modulation type from 9 kHz to 27 GHz. The conducted power of spurious emissions, up to the 10th harmonic of the transmit frequency, were investigated to ensure they were less than the limits also called out by the client's test plan (included elsewhere in this report).

RF conducted emissions testing was performed only on one port. The AHFIHA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in output power 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.

Measurements shall be performed with the transmitters at full power on the middle channel for all bandwidths and modulation types. These measurements are for frequency band after the first 1.0 MHz bands immediately outside and adjacent to the frequency block.

Per section FCC 24.238(a) and RSS 133 6.5 (ii), the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm for a 1 MHz measurement bandwidth. The limit is adjusted to -16 dBm [-13 dBm -10 log (2)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 2 port MIMO WCDMA transmitter. The GSM/EDGE carriers are not MIMO. The WCDMA (Two Port MIMO) and GSM/EDGE (One Port) conducted emissions limits are shown below. The requirements for FCC/IC measurements are detailed in KDB971168 D01 v03r01 and ANSI 63.26.

Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10<sup>th</sup> harmonic of the highest fundamental frequency. As such, the upper level of measurement is approximately 20 GHz for the AHFIHA RRH operating in the PCS band.

The limit for the 9kHz to 150kHz frequency range was adjusted to -43dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -43dBm = -13dBm -10log(1MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -33dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -33dBm = -13dBm -10log(1MHz/10kHz)]. The required limit of -13dBm with a RBW of  $\geq$  1MHz was used for all other frequency ranges.

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-02-14	2025-02-14
Block - DC	Fairview Microwave	SD3235-2148	ANF	2023-05-24	2024-05-24
Block - DC	Fairview Microwave	SD3379	AMM	2023-08-04	2024-08-04
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07



FUT	AirScale Base Transceiver Station Remote Radio Head	Work Order	
LUT.	Model AHFIHA	Work Order.	
Serial Number:	RW233800370	Date:	2024-03-19
Customer:	Nokia Solutions and Networks	Temperature:	23.8°C
Attendees:	John Rattanavong, Mitch Hill	Relative Humidity:	33.8%
Customer Project:	None	Bar. Pressure (PMSL):	998 mbar
Tested By:	Jarrod Brenden	Job Site:	TX07
Power:	54 VDC	Configuration:	NOKI0074-1
			NOKI0074-2
			NOKI0074-3
			NOKI0074-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 24E:2024	ANSI C63.26:2015
RSS-133 Issue 6:2013 +A1:2018	ANSI C63.26:2015

#### COMMENTS

All losses in the measurement path were accounted for in the spectrum analyzer reference level offsets for: attenuators, cables, DC block, and filters were used.

GSM/EDGE carriers are required to be operated with 3G(WCDMA) 4G(LTE) or 5G(5GNR) RAT carriers in the PCS band. Single 2G(GSM) carriers in PCS band: GSM/EDGE carriers were enabled at maximum power (20 watts/carrier) and LTE 5MHz carrier were enable at maximum power (40 watts/carrier) at 1970MHz. In AWS band a LTE 10MHz carrier were simultaneously enabled at maximum power (60 watts/carrer) at (2155MHz) and in BRS band a LTE 5MHz carrier were simultaneously enabled at maximum power (40 watts/carrer) at (2655MHz).

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

None

### CONCLUSION

Pass

Tested By

#### TEST RESULTS

	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
2G GSM/EDGE PCS Band 2, 1930 MHz - 1990 MHz GMSK Modulation					
Mid Channel, 1960.0 MHz	9 kHz - 150 kHz	0.01	-55.64	-43	Pass
	150 kHz - 20 MHz	0.15	-55.83	-33	Pass
	20 MHz - 3.5 GHz	3211.16	-19.28	-13	Pass
	1.9 GHz - 2.7 GHz	2624.3	-20.32	-13	Pass
	3.5 GHz - 13 GHz	3790.23	-21.09	-13	Pass
	13 GHz - 27 GHz	26189.4	-20.72	-13	Pass
8PSK Modulation					
Mid Channel, 1960.0 MHz	9 kHz - 150 kHz	0.01	-55.84	-43	Pass
	150 kHz - 20 MHz	0.15	-55.42	-33	Pass
	20 MHz - 3.5 GHz	3225.08	-19.38	-13	Pass
	1.9 GHz - 2.7 GHz	2614.5	-20.21	-13	Pass
	3.5 GHz - 13 GHz	3797.83	-21.05	-13	Pass
	13 GHz - 27 GHz	26153	-20.63	-13	Pass





2G GSM/EDGE Band 2 GMSK Modulation Mid Channel, 1960.0 MHz



2G GSM/EDGE Band 2 GMSK Modulation Mid Channel, 1960.0 MHz



2G GSM/EDGE Band 2 GMSK Modulation Mid Channel, 1960.0 MHz



2G GSM/EDGE Band 2 GMSK Modulation Mid Channel, 1960.0 MHz





2G GSM/EDGE Band 2 GMSK Modulation Mid Channel, 1960.0 MHz



2G GSM/EDGE Band 2 GMSK Modulation Mid Channel, 1960.0 MHz



2G GSM/EDGE Band 2 8PSK Modulation Mid Channel, 1960.0 MHz



2G GSM/EDGE Band 2 8PSK Modulation Mid Channel, 1960.0 MHz





2G GSM/EDGE Band 2 8PSK Modulation Mid Channel, 1960.0 MHz



2G GSM/EDGE Band 2 8PSK Modulation Mid Channel, 1960.0 MHz



2G GSM/EDGE Band 2 8PSK Modulation Mid Channel, 1960.0 MHz



2G GSM/EDGE Band 2 8PSK Modulation Mid Channel, 1960.0 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 antenna port spurious emissions were measured at the RF output terminal of the EUT through four different attenuation configurations which continues through to the RF input of the spectrum analyzer. Analyzer plots utilizing a resolution bandwidth called out by the client's test approach were made for each modulation type from 9 kHz to 27 GHz. The conducted power of spurious emissions, up to the 10th harmonic of the transmit frequency, were investigated to ensure they were less than the limits also called out by the client's test plan (included elsewhere in this report).

RF conducted emissions testing was performed only on one port. The AHFIHA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in output power 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.

These measurements are for frequency band after the first 1.0 MHz bands immediately outside and adjacent to the frequency block.

Per section FCC 24.238(a) and RSS 133 6.5 (ii), the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm for a 1 MHz measurement bandwidth. The limit is adjusted to -16 dBm [-13 dBm -10 log (2)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 2 port MIMO WCDMA transmitter. The GSM/EDGE carriers are not MIMO. The WCDMA (Two Port MIMO) and GSM/EDGE (One Port) conducted emissions limits are shown below. The requirements for FCC/IC measurements are detailed in KDB971168 D01 v03r01 and ANSI 63.26.

Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10<sup>th</sup> harmonic of the highest fundamental frequency. As such, the upper level of measurement is approximately 20 GHz for the AHFIHA RRH operating in the PCS band.

For the GSM PCS Band carrier, the limit for the 9kHz to 150kHz frequency range was adjusted to -43dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -43dBm = -13dBm  $-10\log(1$ MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -33dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -33dBm = -13dBm  $-10\log(1$ MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -33dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -33dBm = -13dBm  $-10\log(1$ MHz/10kHz)]. The required limit of -13dBm with a RBW of  $\geq 1$ MHz was used for all other frequency ranges.

For the WCDMA PCS Band carrier, the limit for the 9kHz to 150kHz frequency range was adjusted to -46dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -46dBm = -16dBm -10log(1MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -36dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -36dBm = -16dBm -10log(1MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -36dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -36dBm = -16dBm -10log(1MHz/10kHz)]. The required limit of -13dBm with a RBW of  $\geq$  1MHz was used for all other frequency ranges.

#### **TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-02-14	2025-02-14
Block - DC	Fairview Microwave	SD3235-2148	ANF	2023-05-24	2024-05-24
Block - DC	Fairview Microwave	SD3379	AMM	2023-08-04	2024-08-04
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07



EUT:	AirScale Base Transceiver Station Remote Radio Head Model	Work Order:	NOKI0074
	AHFIHA		
Serial Number:	RW233800370	Date:	2024-03-21
Customer:	Nokia Solutions and Networks	Temperature:	23.4°C
Attendees:	John Rattanavong, Mitch Hill, David Le	Relative Humidity:	42.1%
Customer Project:	None	Bar. Pressure (PMSL):	998 mbar
Tested By:	Jarrod Brenden	Job Site:	TX07
Power:	54 VDC	Configuration:	NOKI0074-1
			NOKI0074-2
			NOKI0074-3
			NOKI0074-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 24E:2024	ANSI C63.26:2015
RSS-133 Issue 6:2013 +A1:2018	ANSI C63.26:2015

#### COMMENTS

All losses in the measurement path were accounted for in the spectrum analyzer reference level offsets for: attenuators, cables, DC block, and filters were used.

GSM/EDGE carriers are required to be operated with 3G(WCDMA) 4G(LTE) or 5G(5GNR) RAT carriers in the PCS band. Multi-Carrier 2G GSM/EDGE: in PCS band two contiguous/non-contiguous GSM/EDEG carriers were enabled at maximum power (20 watts/carrier) and single LTE 1.4MHz carrier were enabled at 20 watts for a total of 60 watts. In the AWS band a single LTE 10MHz carrier were enabled at maximum power 60 watts at the middle channel (2155.0MHz) and in the BRS band a single LTE 5MHz carrier were enabled at maximum power at 40 watts at the middle channel (2655.0MHz).

Multi-carrier 3G(WCDMA): In PCS band three WCDMA carriers were enabled at maximum power using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (1932.4 & 1937.4MHz) and a third carrier with maximum spacing between the other two carrier frequencies (1987.6MHz) at the upper band edge. The carriers are operated at maximum power (20 watts/carrier) with a total in PCS band carrier power of 60 watts. In the AWS band one LTE10 carrier were enabled at maximum power (60 watts) at the middle channel (2155 MHz) and in the BRS band one LTE5 carrier were enabled at maximum power (40 watts) at the middle channel (2655 MHz)

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

None

CONCLUSION Pass

Tested By

#### **TEST RESULTS**

	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
2G GSM/EDGE PCS Band 2, 1930 MHz - 1990 MHz					
Test Case 1					
GMSK Modulation (GSM) and QPSK Modulation (LTE)					
	9 kHz - 150 kHz	0.01	-55.29	-43	Pass
	150 kHz - 20 MHz	0.15	-55.57	-33	Pass
	20 MHz - 3.5 GHz	3211.16	-19.69	-13	Pass
	1.9 GHz - 2.7 GHz	1989.2	-19.349	-13	Pass
	3.5 GHz - 13 GHz	3754.13	-20.91	-13	Pass



	Frequency	Measured Freq	Max Value	Limit	Pequit
	13 CHz - 27 CHz	26103.6	-20 781	_13	Pass
8PSK Modulation (GSM) and OPSK Modulation (LTE)		20100.0	-20.701	-10	1 433
	9 kHz - 150 kHz	0.01	-55 44	-43	Pass
	150 kHz - 20 MHz	0.15	-55	-33	Pass
	20 MHz - 3 5 GHz	3203 77	-19 59	-13	Pass
	1.9 GHz - 2.7 GHz	1989.2	-19.399	-13	Pass
	3.5 GHz - 13 GHz	3771.23	-20.97	-13	Pass
	13 GHz - 27 GHz	26207.6	-20.7	-13	Pass
Test Case 2					
		0.01	55.87	13	Page
	9 KHZ - 150 KHZ	0.01	-55.67	-43	Pass
	20 MHz - 3 5 GHz	3228 56	-10.46	-13	Pass
	1 0 CHz - 2 7 CHz	1030 1	-10.018	-13	Pass
	3.5 GHz - 13 GHz	3802.1	-21.06	-13	Pass
	13 GHz - 27 GHz	26206.2	-21.00	-13	Pass
8PSK Modulation (GSM) and OPSK Modulation (LTE)		20200.2	-20.5	-10	1 433
	9 kHz - 150 kHz	0.01	-55.7	-43	Pass
	150 kHz - 20 MHz	0.15	-55.62	-33	Pass
	20 MHz - 3 5 GHz	3210 73	-19 54	-13	Pass
	1.9 GHz - 2.7 GHz	1930 7	-18 012	-13	Pass
	3 5 GHz - 13 GHz	3764 1	-20.97	-13	Pass
	13 GHz - 27 GHz	26201.53	-20.74	-13	Pass
Test Case 3					
GMSK Modulation (GSM) and QPSK Modulation (LTE)					
	9 kHz - 150 kHz	0.01	-55.3	-43	Pass
	150 kHz - 20 MHz	0.15	-55.52	-33	Pass
	20 MHz - 3.5 GHz	3206.81	-19.5	-13	Pass
	1.9 GHz - 2.7 GHz	2623.4	-20.45	-13	Pass
	3.5 GHz - 13 GHz	3749.85	-21.02	-13	Pass
	13 GHz - 27 GHz	26219.27	-20.73	-13	Pass
8PSK Modulation (GSM) and QPSK Modulation (LTE)					
	9 kHz - 150 kHz	0.01	-55.92	-43	Pass
	150 kHz - 20 MHz	0.15	-56	-33	Pass
	20 MHz - 3.5 GHz	3197.68	-19.48	-13	Pass
	1.9 GHz - 2.7 GHz	2622.2	-19.95	-13	Pass
	3.5 GHz - 13 GHz	3739.4	-20.88	-13	Pass
	13 GHz - 27 GHz	26272	-20.74	-13	Pass
3G WCDMA PCS Band II, 1930 MHz - 1990 MHz					
Test Case 1					
QPSK Modulation (WCDMA) and QPSK Modulation (LTE)					
	9 kHz - 150 kHz	0.01	-55.82	-46	Pass
	150 kHz - 20 MHz	0.16	-55.9	-36	Pass
	20 MHz - 3.5 GHz	3217.69	-19.54	-16	Pass
	1.9 GHz - 2.7 GHz	2628.7	-20.21	-16	Pass
	3.5 GHz - 13 GHz	3/60.3	-21.07	-16	Pass
	13 GHz - 27 GHz	26221.6	-20.7	-16	Pass
TOQAIN MODULATION (WODMA) and QPSK MODULATION (LTE)		0.04	EE 00	40	Dess
		0.01	-00.02	-40	Pass
		0.15	-00.00	-30	Pass
		3210.29	-19.00	-10	Pass
	3.5 CH- 12 CH-	2020	-20.23	-10	FdSS Pass
	5.5 GHZ - 15 GHZ	5151.45	-20.94	-10	F d 5 5



	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	13 GHz - 27 GHz	26170.73	-20.84	-16	Pass
64QAM Modulation (WCDMA) and QPSK Modulation (LTE)					
	9 kHz - 150 kHz	0.01	-55.42	-46	Pass
	150 kHz - 20 MHz	0.15	-55.09	-36	Pass
	20 MHz - 3.5 GHz	3214.64	-19.63	-16	Pass
	1.9 GHz - 2.7 GHz	2628.3	-20.15	-16	Pass
	3.5 GHz - 13 GHz	3764.1	-20.93	-16	Pass
	13 GHz - 27 GHz	26229.53	-20.75	-16	Pass





2G GSM/EDGE PCS Band 2 Test Case 1 GMSK Modulation (GSM) and QPSK Modulation (LTE)







2G GSM/EDGE PCS Band 2 Test Case 1 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 1 GMSK Modulation (GSM) and QPSK Modulation (LTE)





2G GSM/EDGE PCS Band 2 Test Case 1 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 1 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 1 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 1 8PSK Modulation (GSM) and QPSK Modulation (LTE)





2G GSM/EDGE PCS Band 2 Test Case 1 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 1 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 1 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 1 8PSK Modulation (GSM) and QPSK Modulation (LTE)





2G GSM/EDGE PCS Band 2 Test Case 2 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 2 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 2 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 2 GMSK Modulation (GSM) and QPSK Modulation (LTE)





2G GSM/EDGE PCS Band 2 Test Case 2 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 2 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 2 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 2 8PSK Modulation (GSM) and QPSK Modulation (LTE)





2G GSM/EDGE PCS Band 2 Test Case 2 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 2 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 2 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 2 8PSK Modulation (GSM) and QPSK Modulation (LTE)





2G GSM/EDGE PCS Band 2 Test Case 3 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 3 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 3 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 3 GMSK Modulation (GSM) and QPSK Modulation (LTE)





2G GSM/EDGE PCS Band 2 Test Case 3 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 3 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 3 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 3 8PSK Modulation (GSM) and QPSK Modulation (LTE)





2G GSM/EDGE PCS Band 2 Test Case 3 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 3 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 3 8PSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2 Test Case 3 8PSK Modulation (GSM) and QPSK Modulation (LTE)





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3G WCDMA PCS Band II Test Case 1 QPSK Modulation (WCDMA) and QPSK Modulation (LTE)





3G WCDMA PCS Band II Test Case 1 QPSK Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II Test Case 1 QPSK Modulation (WCDMA) and QPSK Modulation (LTE)







3G WCDMA PCS Band II Test Case 1 QPSK Modulation (WCDMA) and QPSK Modulation (LTE) QP

3G WCDMA PCS Band II Test Case 1 QPSK Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II Test Case 1 16QAM Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II Test Case 1 16QAM Modulation (WCDMA) and QPSK Modulation (LTE)





3G WCDMA PCS Band II Test Case 1 16QAM Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II Test Case 1 16QAM Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II Test Case 1 16QAM Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II Test Case 1 16QAM Modulation (WCDMA) and QPSK Modulation (LTE)



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3G WCDMA PCS Band II Test Case 1 64QAM Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II Test Case 1 64QAM Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II Test Case 1 64QAM Modulation (WCDMA) and QPSK Modulation (LTE)

3G WCDMA PCS Band II Test Case 1 64QAM Modulation (WCDMA) and QPSK Modulation (LTE)





3G WCDMA PCS Band II Test Case 1 64QAM Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II Test Case 1 64QAM Modulation (WCDMA) and QPSK Modulation (LTE)



#### **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 antenna port spurious emissions were measured at the RF output terminal of the EUT through four different attenuation configurations which continues through to the RF input of the spectrum analyzer. Analyzer plots utilizing a resolution bandwidth called out by the client's test approach were made for each modulation type from 9 kHz to 27 GHz. The conducted power of spurious emissions, up to the 10th harmonic of the transmit frequency, were investigated to ensure they were less than the limits also called out by the client's test plan (included elsewhere in this report).

RF conducted emissions testing was performed only on one port. The AHFIHA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in output power 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.

Measurements shall be performed with the transmitters at full power on the middle channel for all bandwidths and modulation types. These measurements are for frequency band after the first 1.0 MHz bands immediately outside and adjacent to the frequency block.

Per section FCC 24.238(a) and RSS 133 6.5 (ii), the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm for a 1 MHz measurement bandwidth. The limit is adjusted to -16 dBm [-13 dBm -10 log (2)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 2 port MIMO WCDMA transmitter. The GSM/EDGE carriers are not MIMO. The WCDMA (Two Port MIMO) and GSM/EDGE (One Port) conducted emissions limits are shown below. The requirements for FCC/IC measurements are detailed in KDB971168 D01 v03r01 and ANSI 63.26.

Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10<sup>th</sup> harmonic of the highest fundamental frequency. As such, the upper level of measurement is approximately 20 GHz for the AHFIHA RRH operating in the PCS band.

The limit for the 9kHz to 150kHz frequency range was adjusted to -46dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -46dBm = -16dBm -10log(1MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -36dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -33dBm = -16dBm -10log(1MHz/10kHz)]. The required limit of -13dBm with a RBW of  $\geq$  1MHz was used for all other frequency ranges.

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-02-14	2025-02-14
Block - DC	Fairview Microwave	SD3235-2148	ANF	2023-05-24	2024-05-24
Block - DC	Fairview Microwave	SD3379	AMM	2023-08-04	2024-08-04
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

#### **TEST EQUIPMENT**



EUT:	AirScale Base Transceiver Station Remote Radio Head	Work Order:	NOKI0074
	Model AHFIHA		
Serial Number:	RW233800370	Date:	2024-03-20
Customer:	Nokia Solutions and Networks	Temperature:	23.1°C
Attendees:	John Rattanavong, David Le	Relative Humidity:	43.3%
Customer Project:	None	Bar. Pressure (PMSL):	1001 mbar
Tested By:	Jarrod Brenden	Job Site:	TX07
Power:	54 VDC	Configuration:	NOKI0074-1
			NOKI0074-2
			NOKI0074-3
			NOKI0074-4

#### **TEST SPECIFICATIONS**

Specification:	Method:
FCC 24E:2024	ANSI C63.26:2015
RSS-133 Issue 6:2013 +A1:2018	ANSI C63.26:2015

#### COMMENTS

All losses in the measurement path were accounted for in the spectrum analyzer reference level offsets for: attenuators, cables, DC block, and filters were used.

Single 3G(WCDMA) carriers in PCS band; WCDMA carriers were enable at maximum power (40 watts/carrier) at middle channel (1960MHz). In AWS band a LTE 10MHz carrier were simultaneously enabled at maximum power (60 watts/carrier) at (2155MHz) and in BRS band a LTE 10MHz carrier were simultaneously enabled at maximum power (60 watts/carrier) at (2655MHz).

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

None

### CONCLUSION

Pass

Tested By

#### **TEST RESULTS**

		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
3G WCDMA PCS Band II,	, 1930 MHz - 1990 MHz					
<b>QPSK Modulation</b>						
	Mid Channel, 1960.0 MHz	9 kHz - 150 kHz	0.01	-55.47	-46	Pass
		150 kHz - 20 MHz	0.15	-55.42	-36	Pass
		20 MHz - 3.5 GHz	3204.2	-19.75	-16	Pass
		1.9 GHz - 2.7 GHz	2628.2	-19.8	-16	Pass
		3.5 GHz - 13 GHz	3763.15	-20.96	-16	Pass
		13 GHz - 27 GHz	26178.2	-20.6	-16	Pass
16QAM Modulation						
	Mid Channel, 1960.0 MHz	9 kHz - 150 kHz	0.01	-56.09	-46	Pass
		150 kHz - 20 MHz	0.15	-55.8	-36	Pass
		20 MHz - 3.5 GHz	3232.48	-19.52	-16	Pass
		1.9 GHz - 2.7 GHz	2624.3	-20.08	-16	Pass
		3.5 GHz - 13 GHz	3768.85	-21.05	-16	Pass
		13 GHz - 27 GHz	26212.27	-20.47	16	Pass



		Frequency	Measured	Max Value	Limit	
		Range	Freq (MHz)	(dBm)	(dBm)	Result
64QAM Modulation						
	Mid Channel, 1960.0 MHz	9 kHz - 150 kHz	0.01	-55.53	-46	Pass
		150 kHz - 20 MHz	0.15	-55.02	-36	Pass
		20 MHz - 3.5 GHz	3230.74	-19.43	-16	Pass
		1.9 GHz - 2.7 GHz	2626.5	-20.05	-16	Pass
		3.5 GHz - 13 GHz	3766.95	-21	-16	Pass
		13 GHz - 27 GHz	26195	-20.72	-16	Pass





3G WCDMA PCS Band II QPSK Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II QPSK Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II QPSK Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II QPSK Modulation Mid Channel, 1960.0 MHz





3G WCDMA PCS Band II QPSK Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II QPSK Modulation Mid Channel, 1960.0 MHz

11 RL 117 50.0 CC	PNO: Wide Trig: Free Run IFGain:Low #Atten: 20 dB	Avg Type: RMS Avg[Hold: 100/100	11:25:56 AM Mar 20, 2024 TRACE 12:25:44 Tryve Free American
Ref Offset 18.69 dB			Mkr1 9,053 kHz -56.089 dBm
2.31			
12.3			
23			
32.3			
23			
23 1			
	man		
723		man	Journ Municipal
start 9.00 kHz Res BW 1.0 kHz	#VBW 3.0 kHz*	Swee	Stop 150.00 kHz p 174.4 ms (8001 pts)

3G WCDMA PCS Band II 16QAM Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II 16QAM Modulation Mid Channel, 1960.0 MHz





3G WCDMA PCS Band II 16QAM Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II 16QAM Modulation Mid Channel, 1960.0 MHz

AL # 50.0 DC	PNO: Fast	Trig: Free Run	Avg Type: RMS Avg[Hold: 100/100	11:50:53 AMM# 20, 2024 TRACE 22:34 5 TYPE A
Ref Offset 33.04 dB o dBidiy Ref 47.04 dBm	Poantow	south, or op		Mkr1 3.768 850 GHz -21.050 dBm
2.0				
77.9				
7.0				
D4				
96				
30				
10				
0.0				
tart 3.500 GHz Res BW 1.0 MHz	#VBV	V 3.0 MHz*	#Sw	Stop 13.000 GHz eep 50.67 ms (20001 pts

3G WCDMA PCS Band II 16QAM Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II 16QAM Modulation Mid Channel, 1960.0 MHz





3G WCDMA PCS Band II 64QAM Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II 64QAM Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II 64QAM Modulation Mid Channel, 1960.0 MHz



3G WCDMA PCS Band II 64QAM Modulation Mid Channel, 1960.0 MHz





3G WCDMA PCS Band II 64QAM Modulation Mid Channel, 1960.0 MHz



<sup>3</sup>G WCDMA PCS Band II 64QAM Modulation Mid Channel, 1960.0 MHz



End of Test Report