

# BAND EDGE COMPLIANCE - GSM



## 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

# BAND EDGE COMPLIANCE - GSM



EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHFIHA	Work Order:	NOKI0074
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:	Jarrold 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

Tested By

## TEST RESULTS

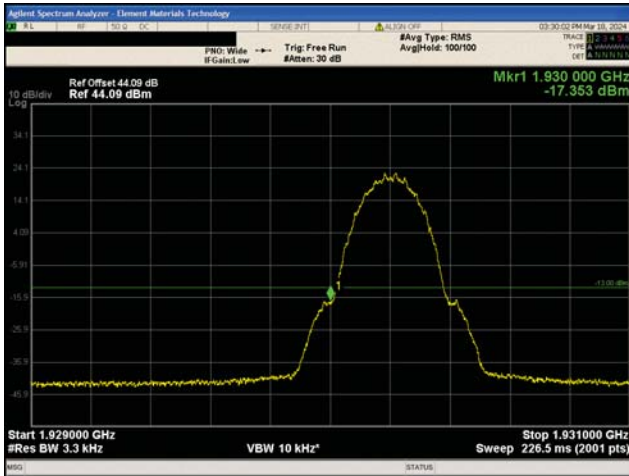
	Range	Value (dBm)	Limit (dBm)	Result
2G GSM/EDGE Band 2, 1930 MHz - 1990 MHz				
GMSK Modulation				
Reduced Power				
Low Channel, 1930.2 MHz	1929 MHz - 1931 MHz	-17.353	-13	Pass
	1928 MHz - 1929 MHz	-25.68	-13	Pass
	1908 MHz - 1928 MHz	-25.373	-13	Pass
High Channel, 1989.8 MHz	1989 MHz - 1991 MHz	-17.497	-13	Pass
	1991 MHz - 1992 MHz	-24.67	-13	Pass
	1992 MHz - 2012 MHz	-24.227	-13	Pass
One 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

# BAND EDGE COMPLIANCE - GSM

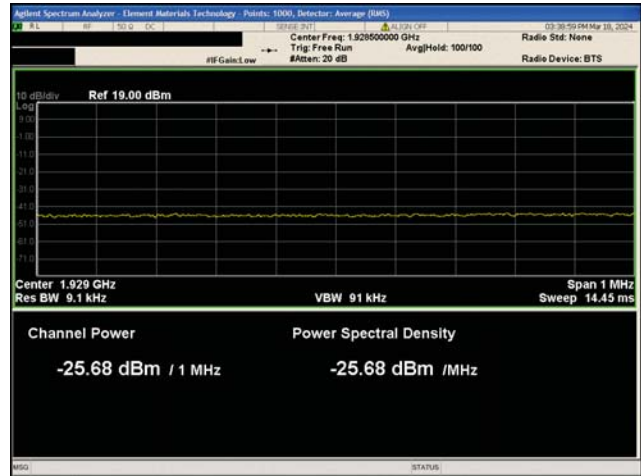


	Range	Value (dBm)	Limit (dBm)	Result
8PSK Modulation				
Reduced Power				
Low Channel, 1930.2 MHz	1929 MHz - 1931 MHz	-20.128	-13	Pass
	1928 MHz - 1929 MHz	-25.38	-13	Pass
	1908 MHz - 1928 MHz	-24.772	-13	Pass
High Channel, 1989.8 MHz	1989 MHz - 1991 MHz	-16.881	-13	Pass
	1991 MHz - 1992 MHz	-24.67	-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

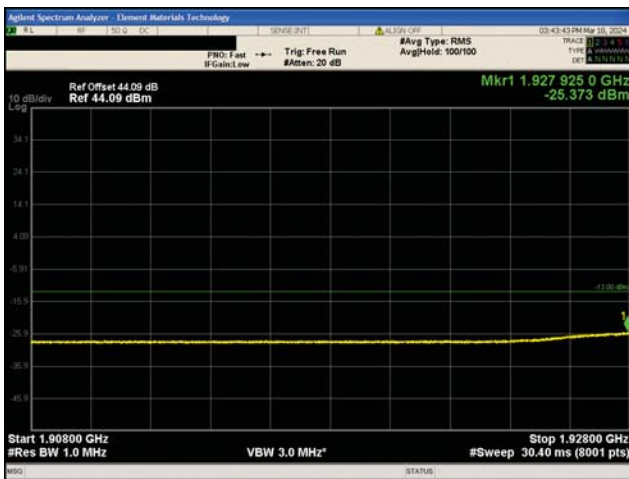
# BAND EDGE COMPLIANCE - GSM



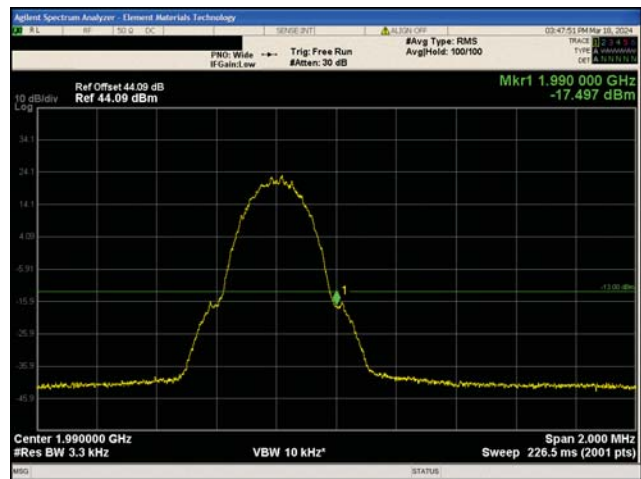
2G GSM/EDGE Band 2  
GMSK Modulation  
Reduced Power  
Low Channel, 1930.2 MHz



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

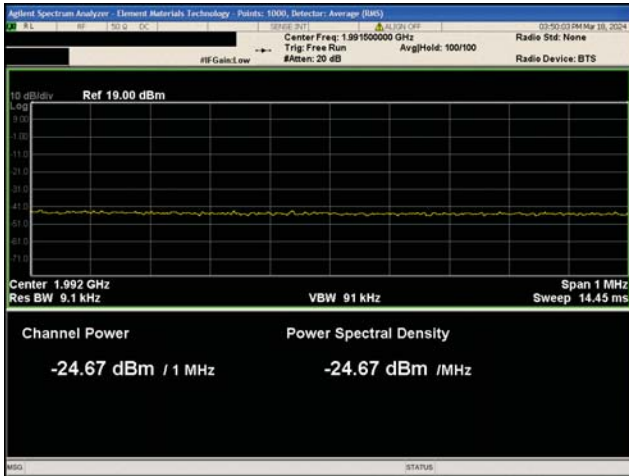


2G GSM/EDGE Band 2  
GMSK Modulation  
Reduced Power  
Low Channel, 1930.2 MHz

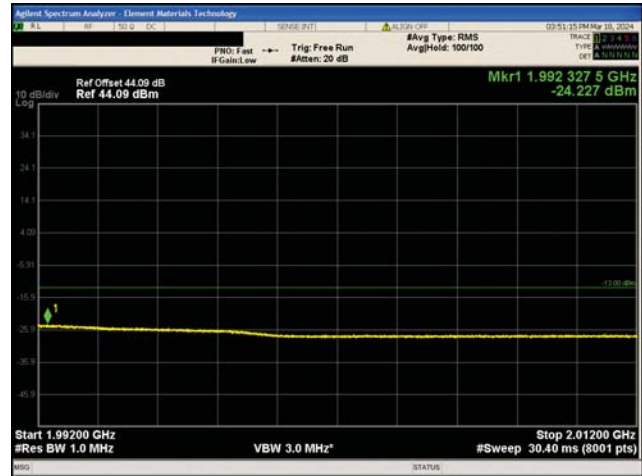


2G GSM/EDGE Band 2  
GMSK Modulation  
Reduced Power  
High Channel, 1989.8 MHz

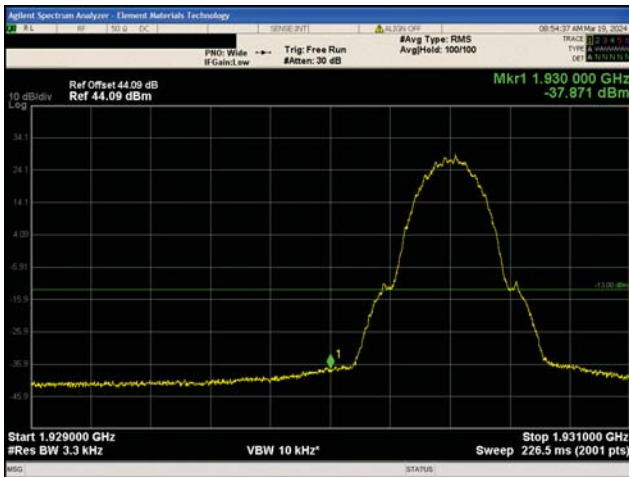
# BAND EDGE COMPLIANCE - GSM



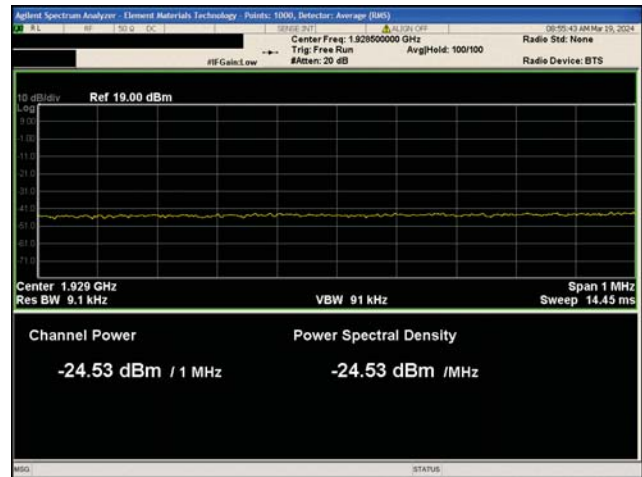
2G GSM/EDGE Band 2  
GMSK Modulation  
Reduced Power  
High Channel, 1989.8 MHz



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

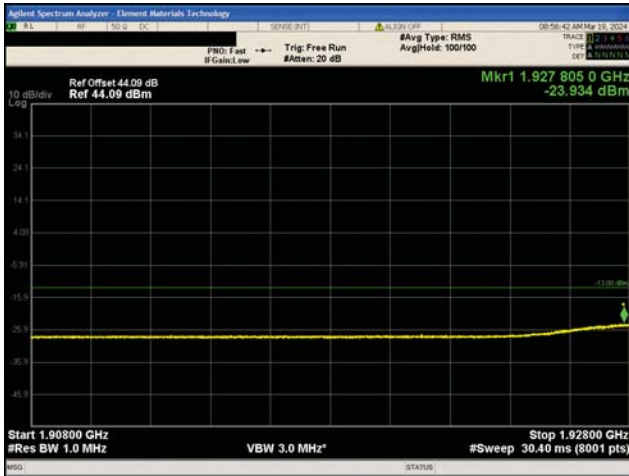


2G GSM/EDGE Band 2  
GMSK Modulation  
One Channel Inside  
Low Channel, 1930.4 MHz

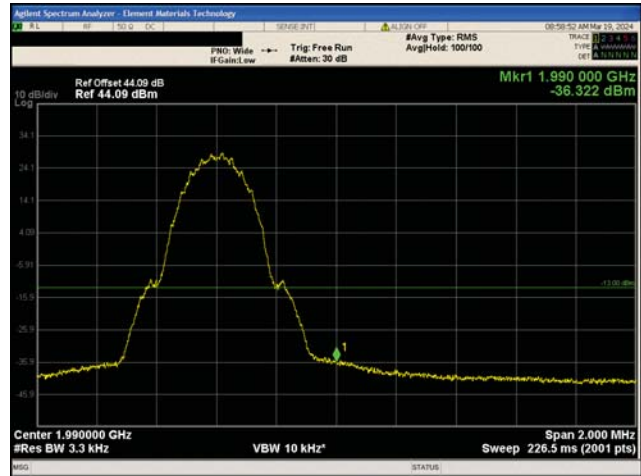


2G GSM/EDGE Band 2  
GMSK Modulation  
One Channel Inside  
Low Channel, 1930.4 MHz

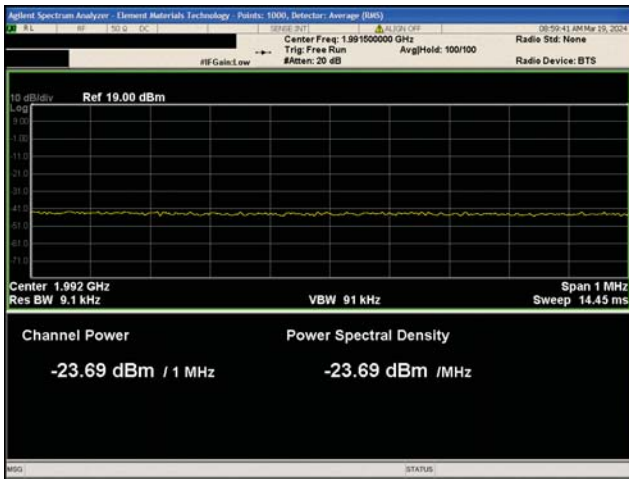
# BAND EDGE COMPLIANCE - GSM



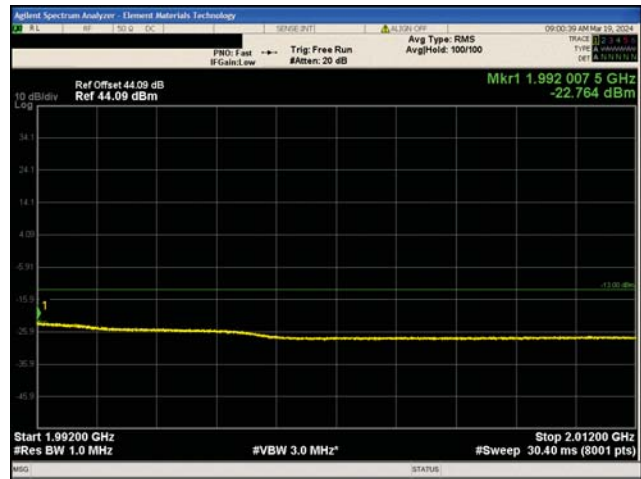
2G GSM/EDGE Band 2  
GMSK Modulation  
One Channel Inside  
Low Channel, 1930.4 MHz



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

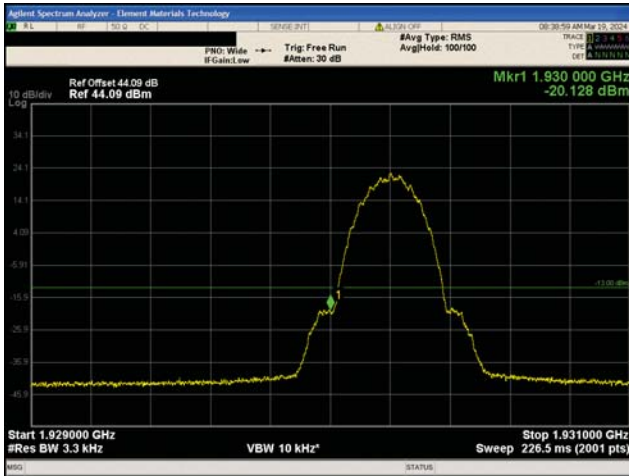


2G GSM/EDGE Band 2  
GMSK Modulation  
One Channel Inside  
High Channel, 1989.6 MHz

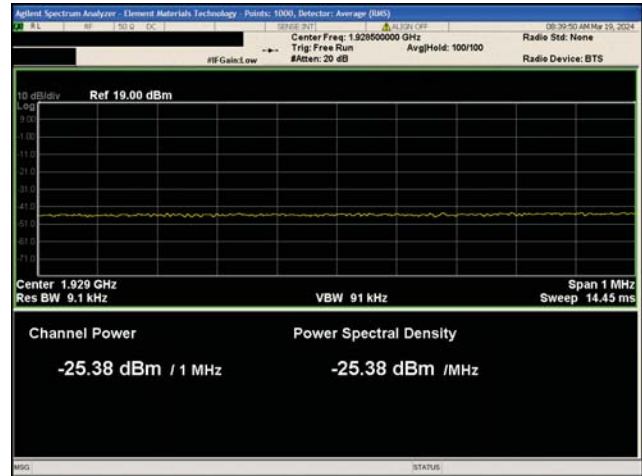


2G GSM/EDGE Band 2  
GMSK Modulation  
One Channel Inside  
High Channel, 1989.6 MHz

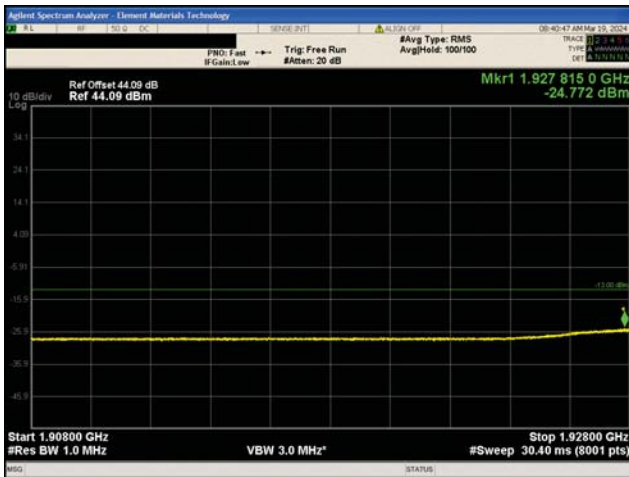
# BAND EDGE COMPLIANCE - GSM



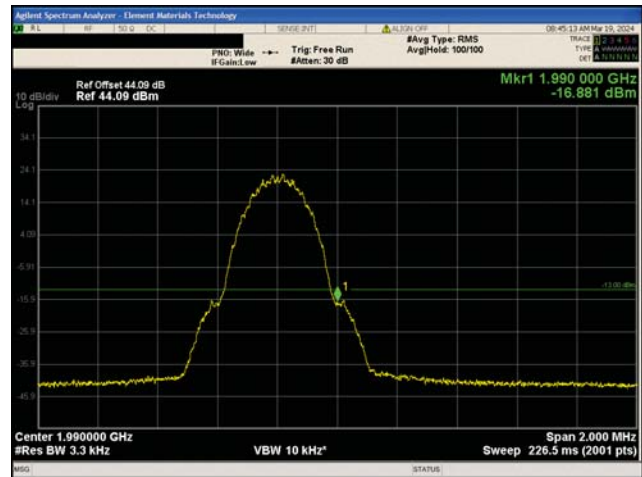
**2G GSM/EDGE Band 2  
8PSK Modulation  
Reduced Power  
Low Channel, 1930.2 MHz**



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

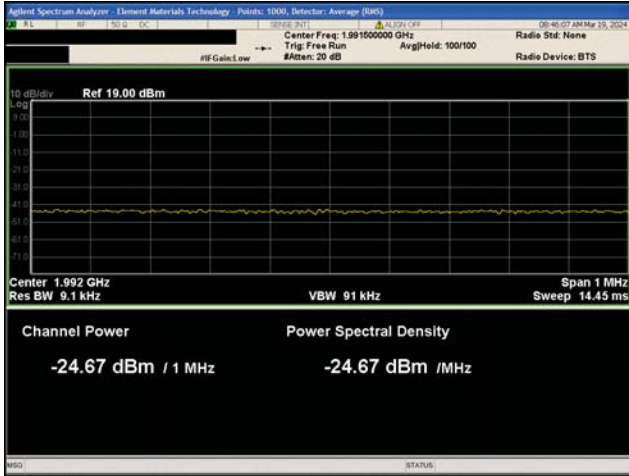


**2G GSM/EDGE Band 2  
8PSK Modulation  
Reduced Power  
Low Channel, 1930.2 MHz**

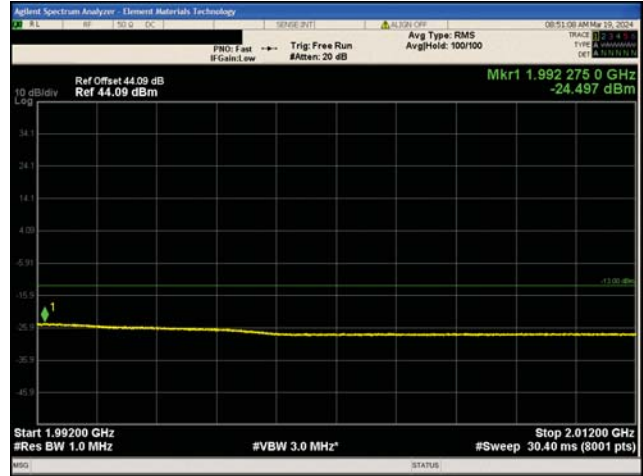


**2G GSM/EDGE Band 2  
8PSK Modulation  
Reduced Power  
High Channel, 1989.8 MHz**

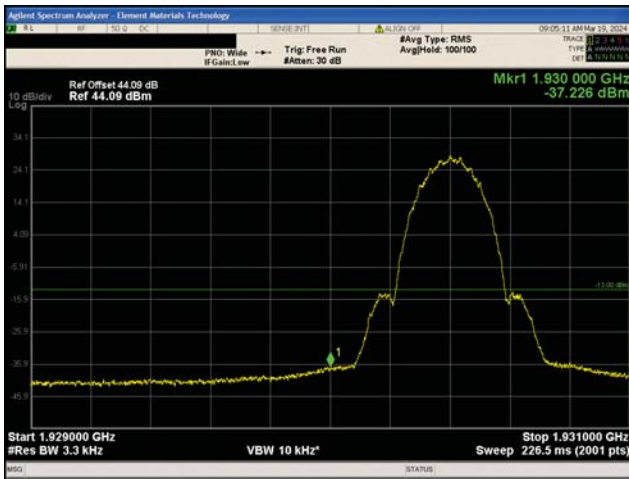
# BAND EDGE COMPLIANCE - GSM



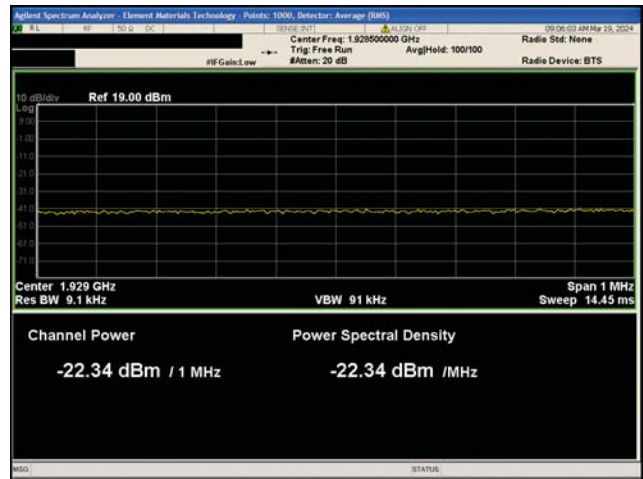
2G GSM/EDGE Band 2  
8PSK Modulation  
Reduced Power  
High Channel, 1989.8 MHz



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



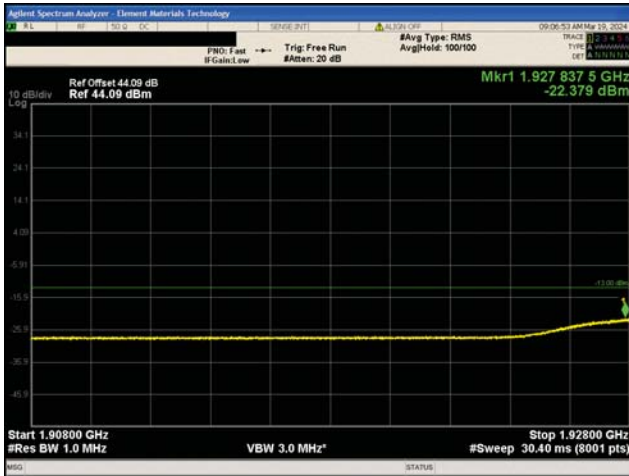
2G GSM/EDGE Band 2  
8PSK Modulation  
One Channel Inside  
Low Channel, 1930.4 MHz



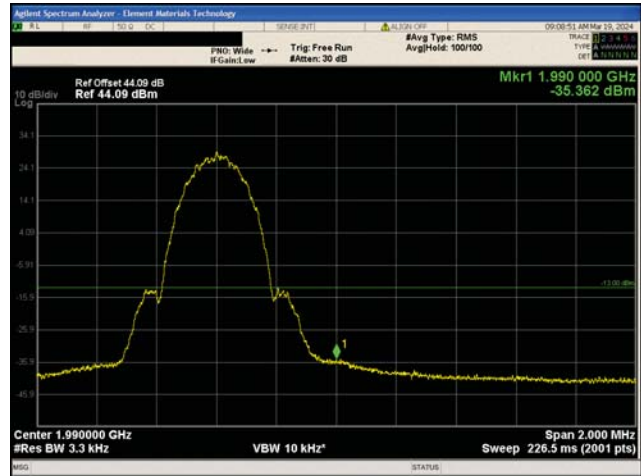
2G GSM/EDGE Band 2  
8PSK Modulation  
One Channel Inside  
Low Channel, 1930.4 MHz



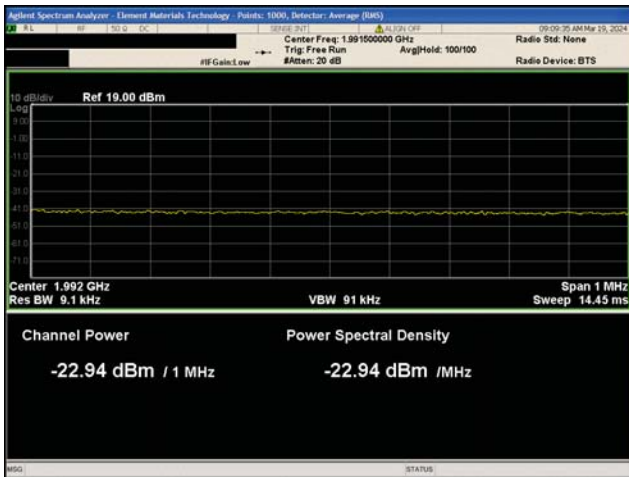
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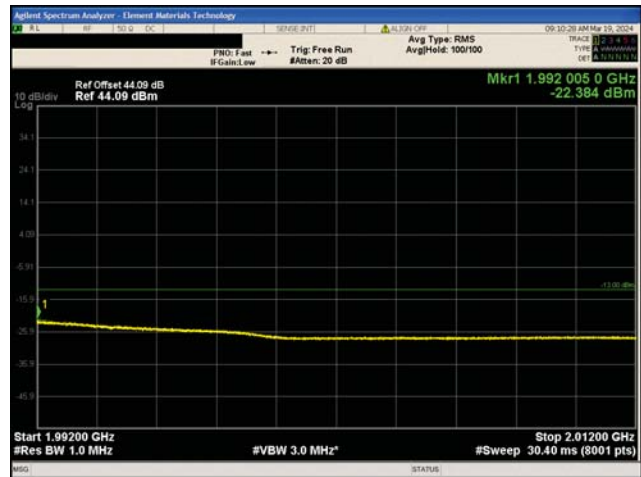
**2G GSM/EDGE Band 2  
8PSK Modulation  
One Channel Inside  
Low Channel, 1930.4 MHz**



**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**

# BAND EDGE COMPLIANCE - MULTICARRIER



## 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 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.

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

# BAND EDGE COMPLIANCE - MULTICARRIER



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

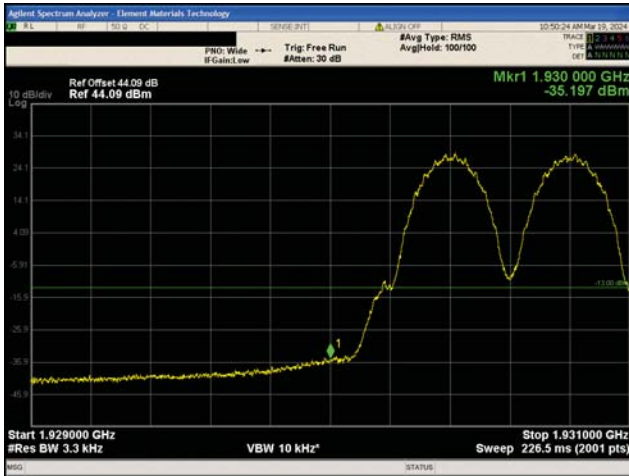
	Frequency Range	Max Value (dBm)	Limit (dBm)	Result
2G GSM/EDGE Band 2, 1930 MHz - 1990 MHz				
Test Case 1				
GMSK Modulation (GSM) and QPSK Modulation (LTE)				
Low Channel, 1930.2 MHz	1929 MHz - 1931 MHz	-35.197	-13	Pass
	1928 MHz - 1929 MHz	-22.42	-13	Pass
	1908 MHz - 1928 MHz	-22.866	-13	Pass
8PSK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

# BAND EDGE COMPLIANCE - MULTICARRIER

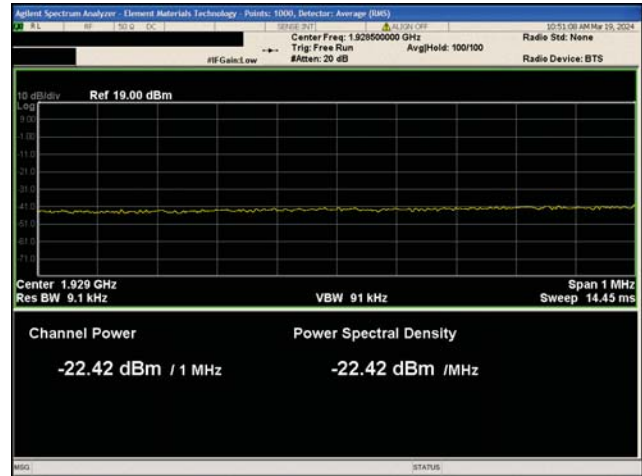


	Frequency Range	Max Value (dBm)	Limit (dBm)	Result
<b>Test Case 2</b>				
GMSK Modulation (GSM) and QPSK Modulation (LTE)				
High Channel, 1989.8 MHz	1989 MHz - 1991 MHz	-35.145	-13	Pass
	1991 MHz - 1992 MHz	-21.36	-13	Pass
	1992 MHz - 2012 MHz	-21.169	-13	Pass
8PSK Modulation (GSM) and QPSK Modulation (LTE)				
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
<b>Test Case 3</b>				
GMSK Modulation (GSM) and QPSK Modulation (LTE)				
Low Channel, 1930.2 MHz	1929 MHz - 1931 MHz	-36.79	-13	Pass
	1928 MHz - 1929 MHz	-24.06	-13	Pass
	1908 MHz - 1928 MHz	-24.281	-13	Pass
High Channel, 1989.8 MHz	1989 MHz - 1991 MHz	-35.36	-13	Pass
	1991 MHz - 1992 MHz	-23.11	-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	-23.654	-13	Pass
High Channel, 1989.6 MHz	1989 MHz - 1991 MHz	-35.004	-13	Pass
	1991 MHz - 1992 MHz	-22.1	-13	Pass
	1992 MHz - 2012 MHz	-22.816	-13	Pass
<b>3G WCDMA PCS Band II, 1930 MHz - 1990 MHz</b>				
<b>Test Case 1</b>				
QPSK Modulation (WCDMA) and QPSK Modulation (LTE)				
Low Channel, 1932.4 MHz	1929 MHz - 1931 MHz	-24.528	-16	Pass
	1928 MHz - 1929 MHz	-19.75	-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
	1992 MHz - 2012 MHz	-17.327	-16	Pass
16QAM Modulation (WCDMA) and QPSK Modulation (LTE)				
Low Channel, 1932.4 MHz	1929 MHz - 1931 MHz	-24.866	-16	Pass
	1928 MHz - 1929 MHz	-20.11	-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
	1992 MHz - 2012 MHz	-18.734	-16	Pass
64QAM Modulation (WCDMA) and QPSK Modulation (LTE)				
Low Channel, 1932.4 MHz	1929 MHz - 1931 MHz	-24.992	-16	Pass
	1928 MHz - 1929 MHz	-20.71	-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

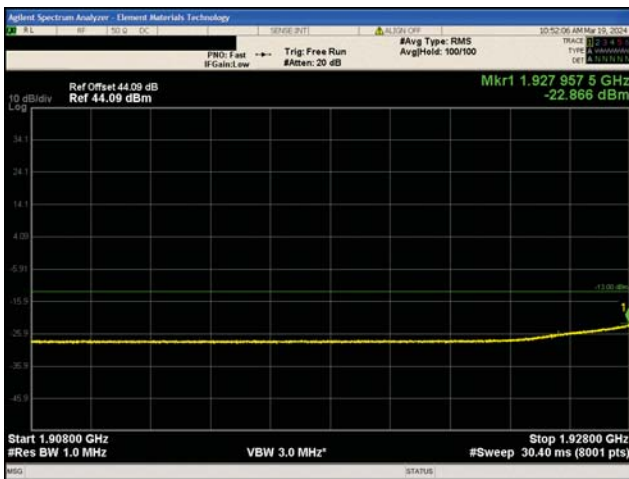
# BAND EDGE COMPLIANCE - MULTICARRIER



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

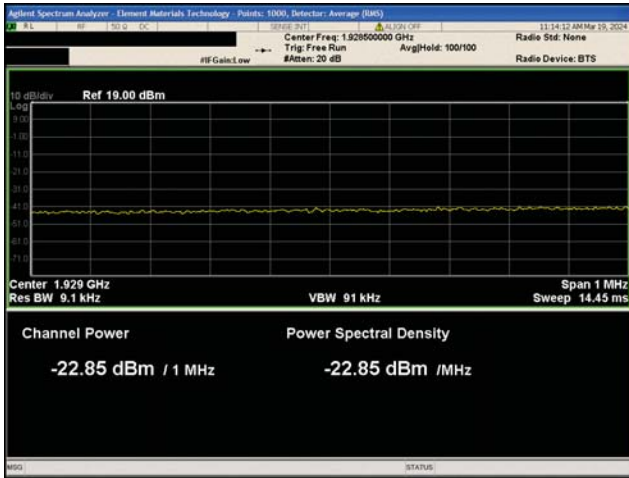


2G GSM/EDGE Band 2  
Test Case 1  
GMSK Modulation  
Lower Band Edge

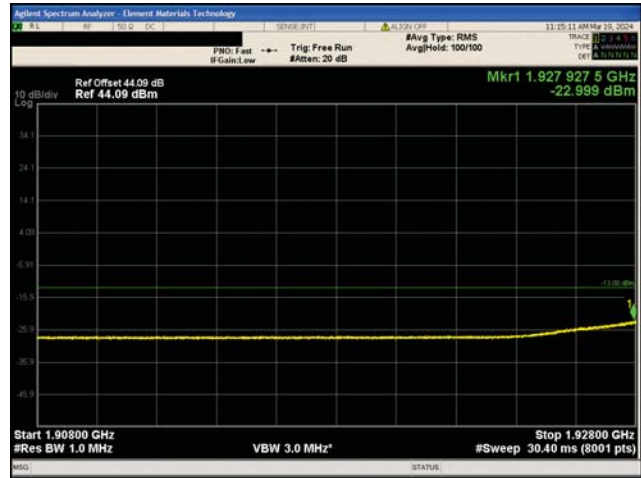


2G GSM/EDGE Band 2  
Test Case 1  
8PSK Modulation  
Lower Band Edge

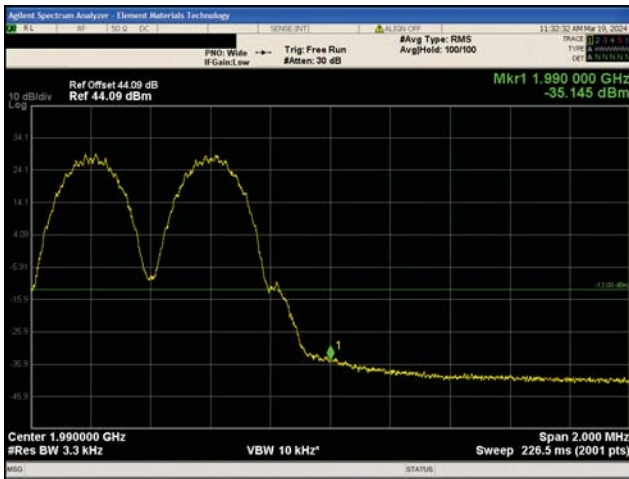
# BAND EDGE COMPLIANCE - MULTICARRIER



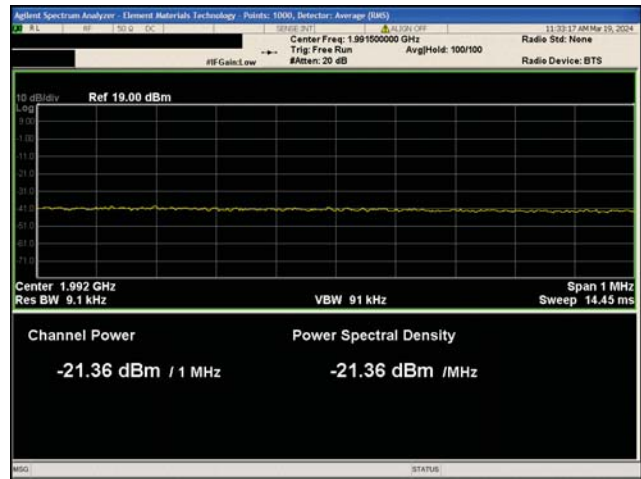
2G GSM/EDGE Band 2  
Test Case 1  
8PSK Modulation  
Lower Band Edge



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

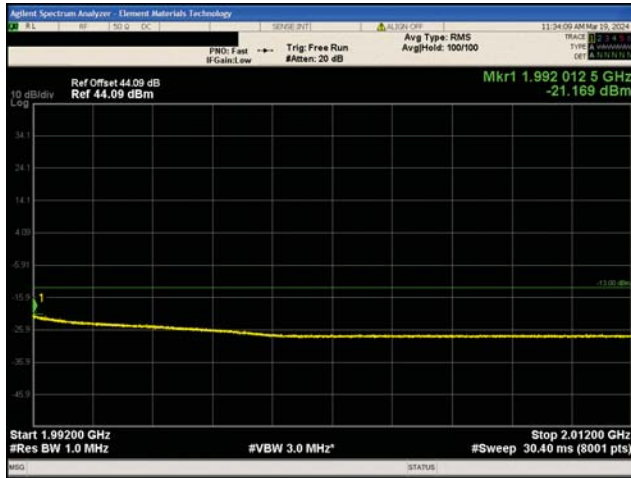


2G GSM/EDGE Band 2  
Test Case 2  
GMSK Modulation  
Upper Band Edge



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

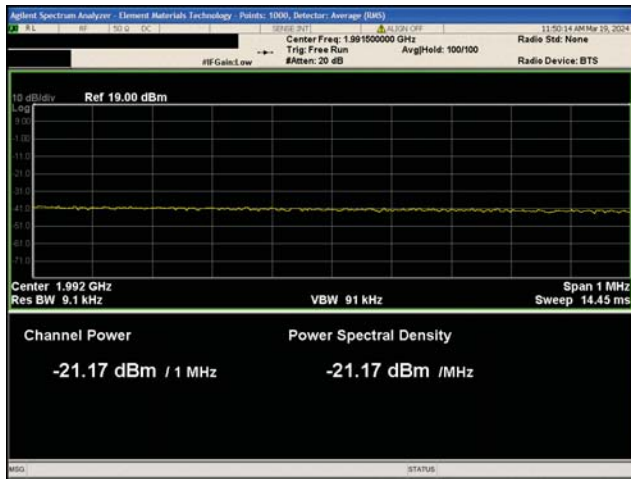
# BAND EDGE COMPLIANCE - MULTICARRIER



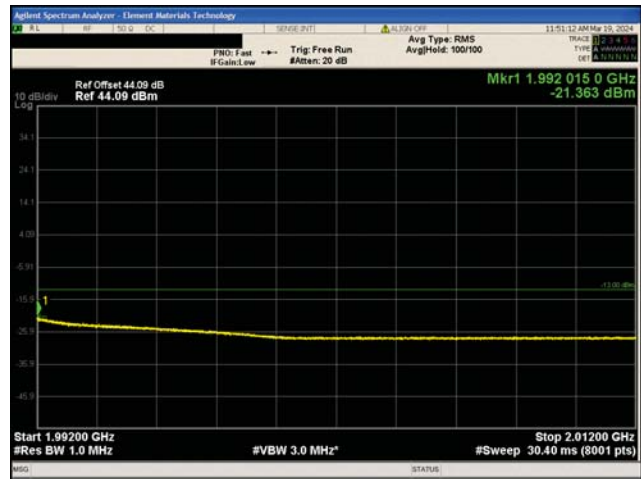
2G GSM/EDGE Band 2  
Test Case 2  
GMSK Modulation  
Upper Band Edge



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

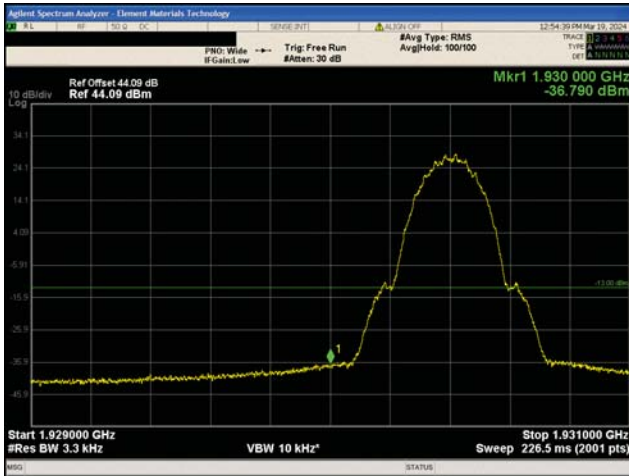


2G GSM/EDGE Band 2  
Test Case 2  
8PSK Modulation  
Upper Band Edge

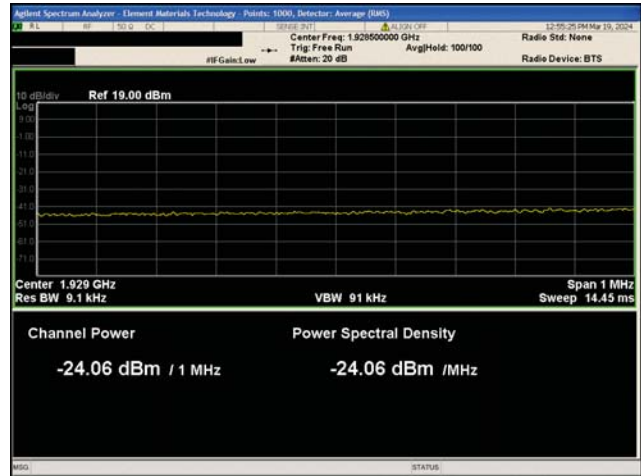


2G GSM/EDGE Band 2  
Test Case 2  
8PSK Modulation  
Upper Band Edge

# BAND EDGE COMPLIANCE - MULTICARRIER



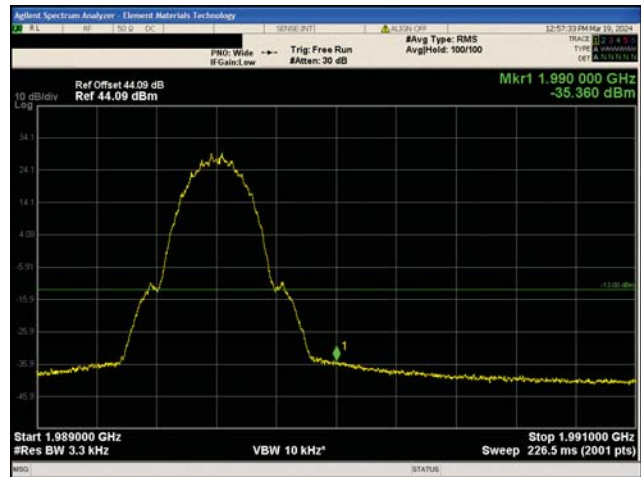
2G GSM/EDGE Band 2  
Test Case 3  
GMSK Modulation  
Lower Band Edge



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



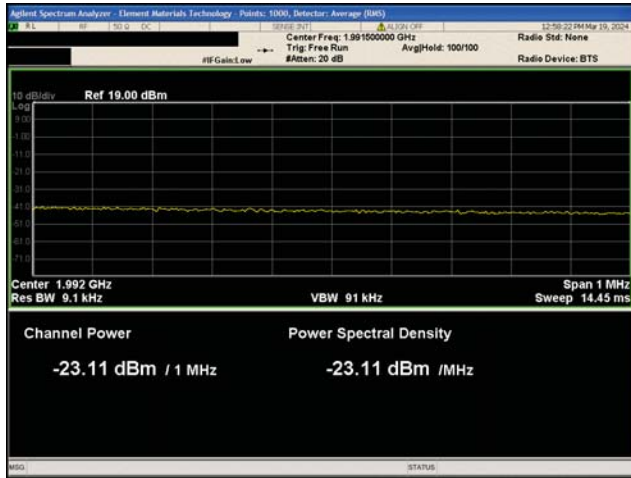
2G GSM/EDGE Band 2  
Test Case 3  
GMSK Modulation  
Lower Band Edge



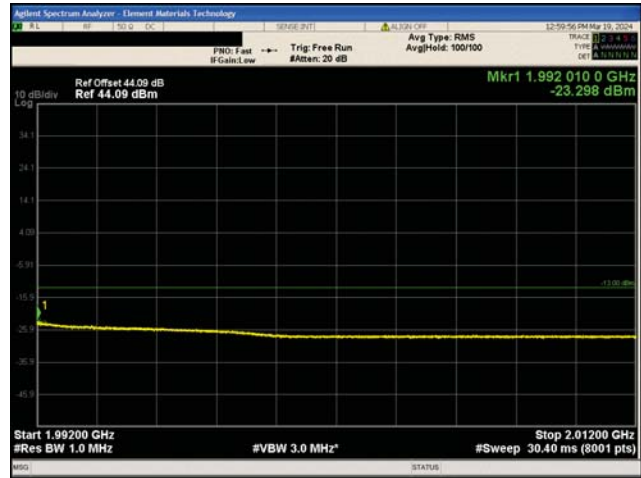
2G GSM/EDGE Band 2  
Test Case 3  
GMSK Modulation  
Upper Band Edge



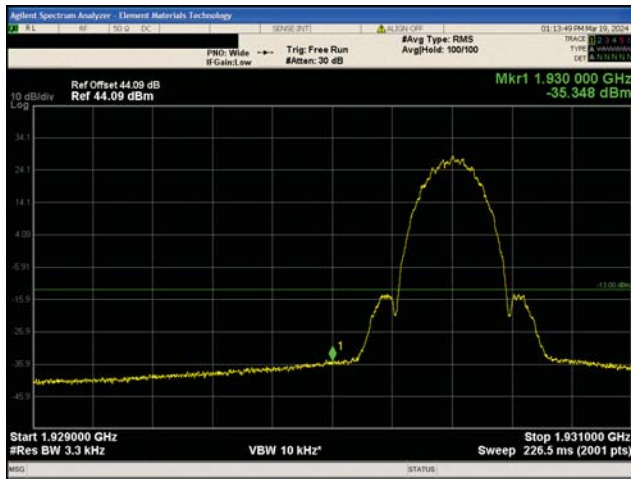
# BAND EDGE COMPLIANCE - MULTICARRIER



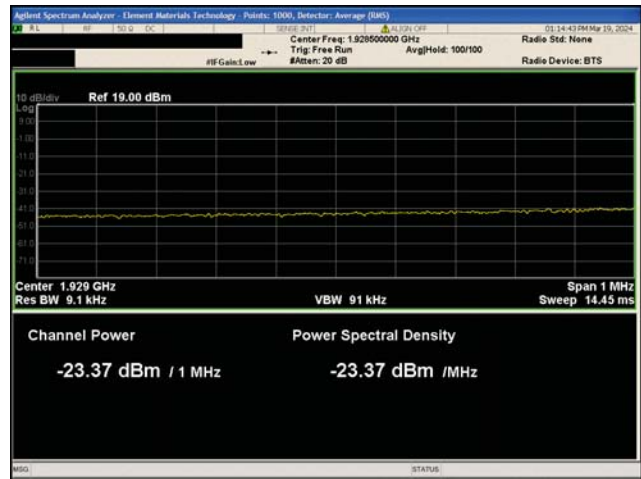
2G GSM/EDGE Band 2  
Test Case 3  
GMSK Modulation  
Upper Band Edge



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

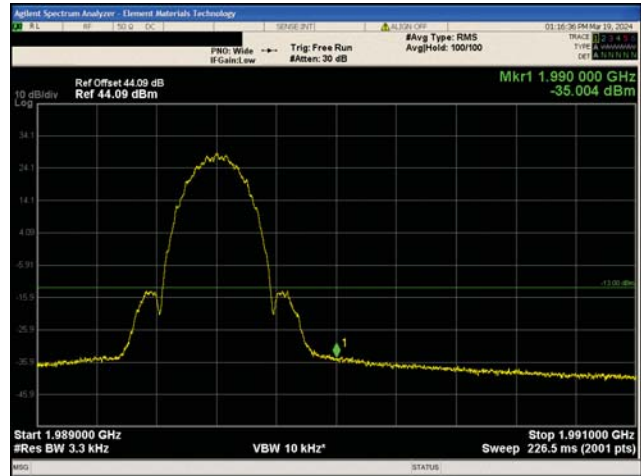


2G GSM/EDGE Band 2  
Test Case 3  
8PSK Modulation  
Lower Band Edge

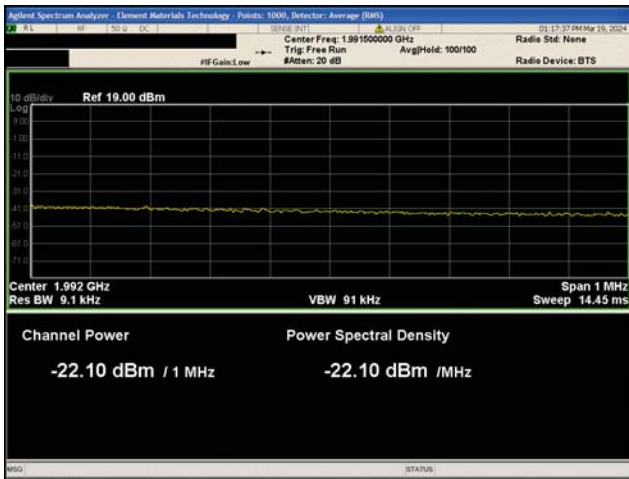
# BAND EDGE COMPLIANCE - MULTICARRIER



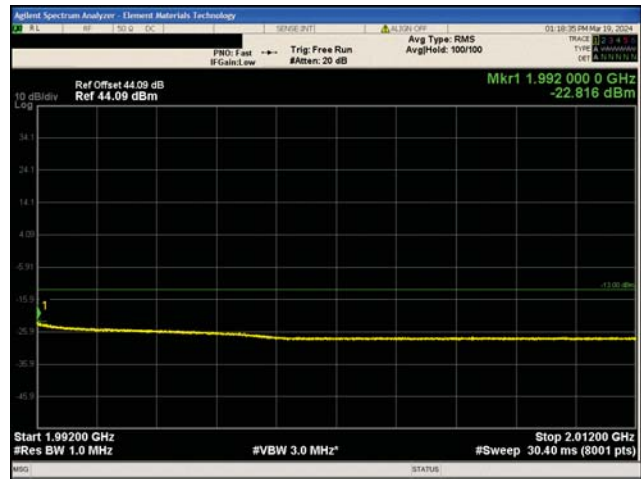
2G GSM/EDGE Band 2  
Test Case 3  
8PSK Modulation  
Lower Band Edge



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

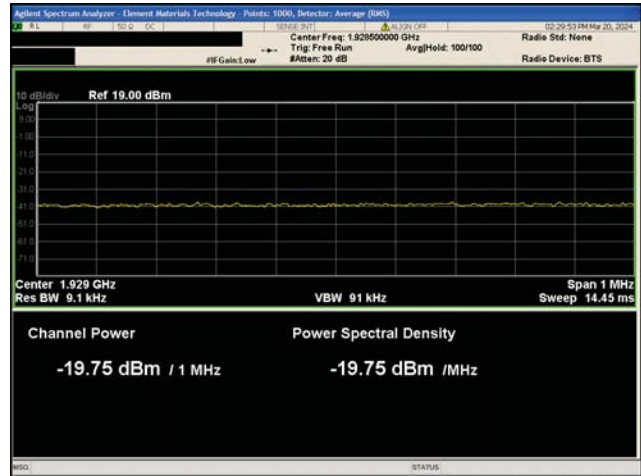


2G GSM/EDGE Band 2  
Test Case 3  
8PSK Modulation  
Upper Band Edge

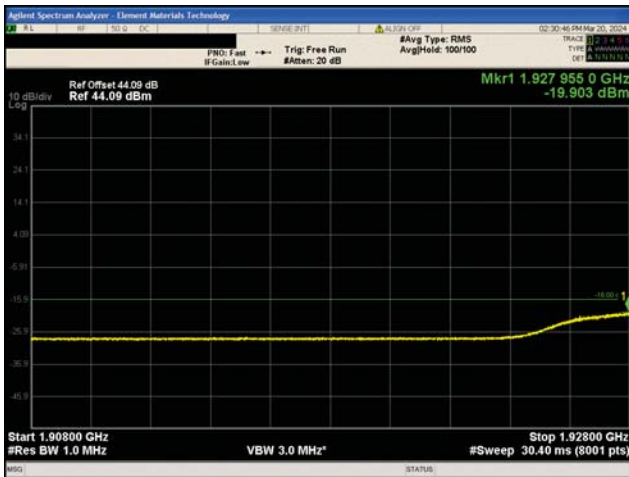
# BAND EDGE COMPLIANCE - MULTICARRIER



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

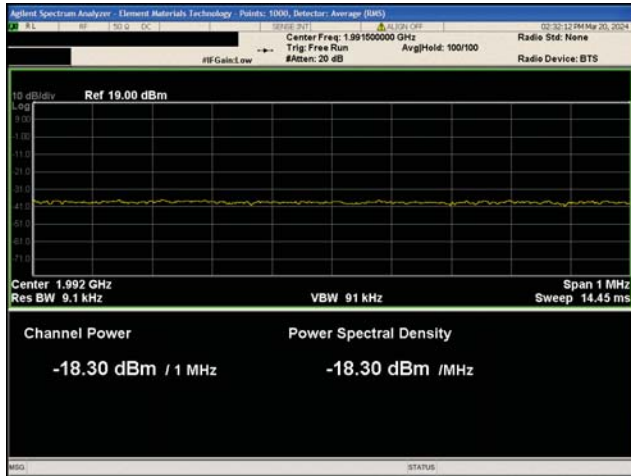


3G WCDMA PCS Band II  
Test Case 1  
QPSK Modulation  
Low Channel, 1932.4 MHz



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

# BAND EDGE COMPLIANCE - MULTICARRIER



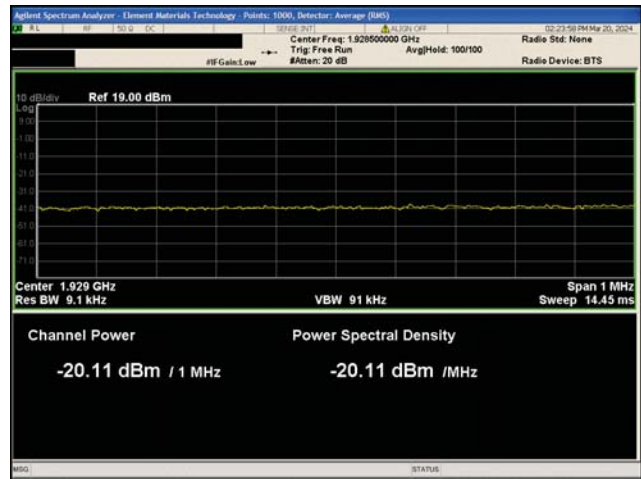
3G WCDMA PCS Band II  
Test Case 1  
QPSK Modulation  
High Channel, 1987.6 MHz



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

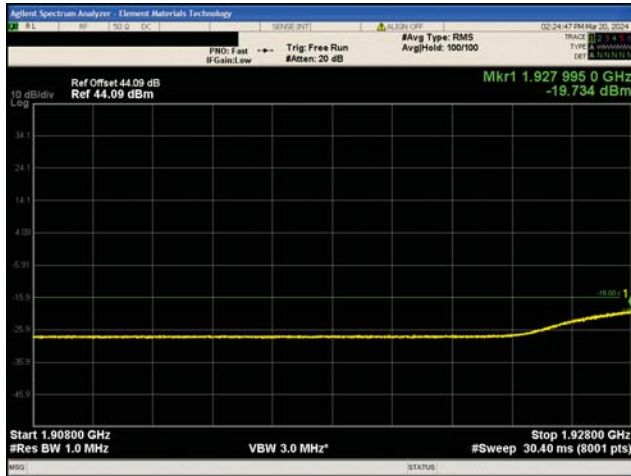


3G WCDMA PCS Band II  
Test Case 1  
16QAM Modulation  
Low Channel, 1932.4 MHz



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

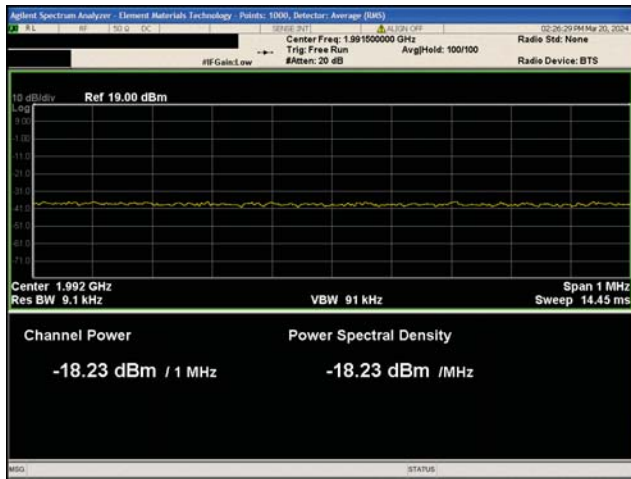
# BAND EDGE COMPLIANCE - MULTICARRIER



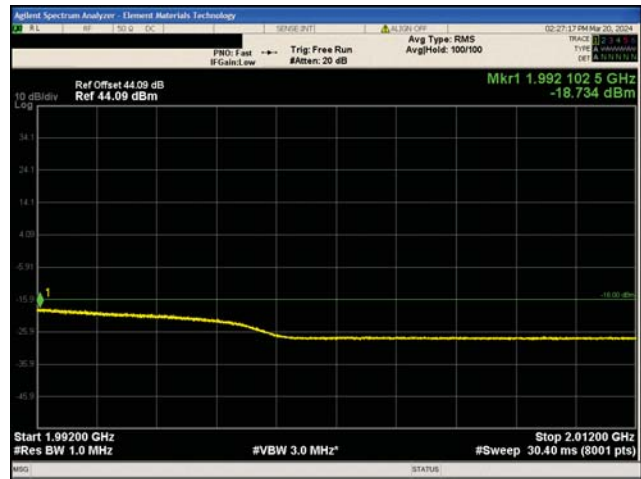
3G WCDMA PCS Band II  
Test Case 1  
16QAM Modulation  
Low Channel, 1932.4 MHz



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

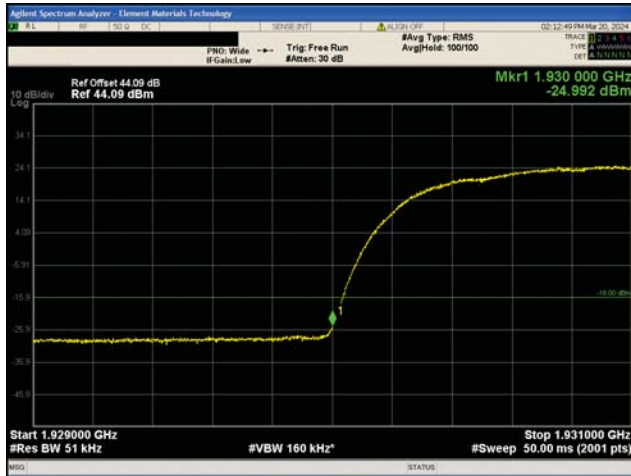


3G WCDMA PCS Band II  
Test Case 1  
16QAM Modulation  
High Channel, 1987.6 MHz

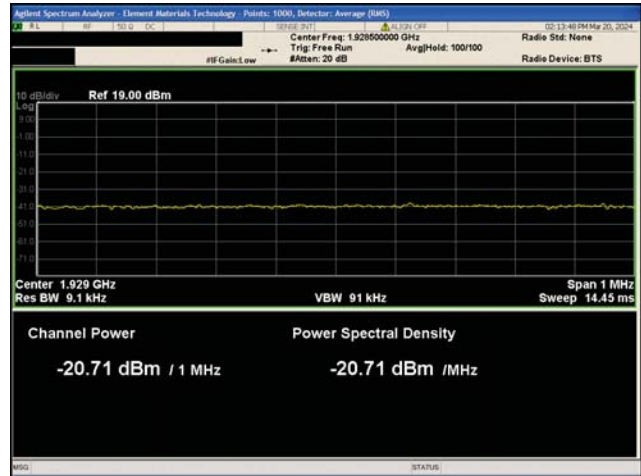


3G WCDMA PCS Band II  
Test Case 1  
16QAM Modulation  
High Channel, 1987.6 MHz

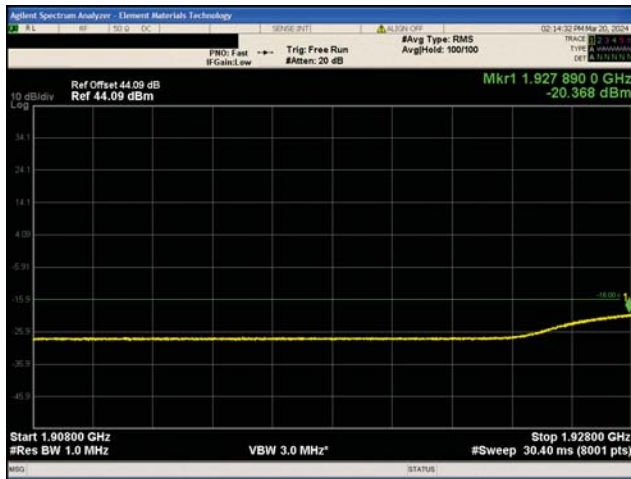
# BAND EDGE COMPLIANCE - MULTICARRIER



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

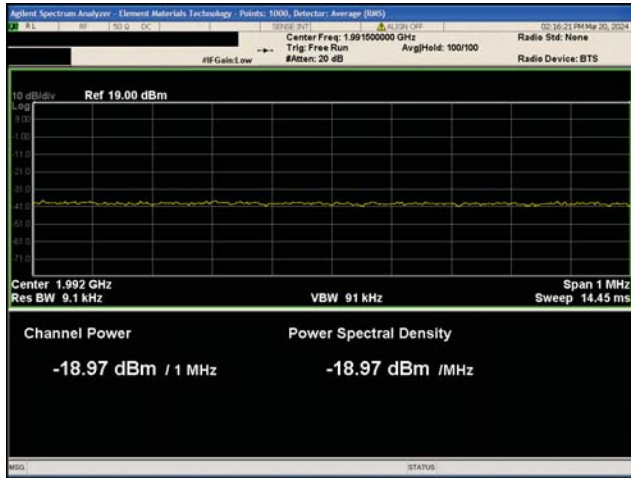


3G WCDMA PCS Band II  
Test Case 1  
64QAM Modulation  
Low Channel, 1932.4 MHz

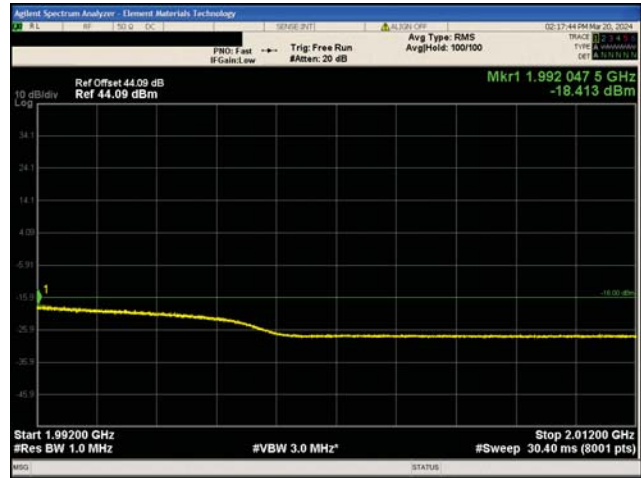


3G WCDMA PCS Band II  
Test Case 1  
64QAM Modulation  
High Channel, 1987.6 MHz

# BAND EDGE COMPLIANCE - MULTICARRIER



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

# BAND EDGE COMPLIANCE - WCDMA



## 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



# BAND EDGE COMPLIANCE - WCDMA



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:	Jarrold 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

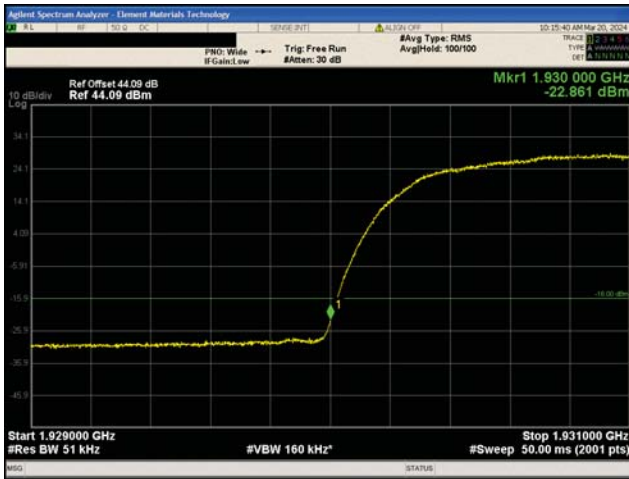
	Frequency Range	Value (dBm)	Limit (dBm)	Result
3G WCDMA PCS Band II, 1930 MHz - 1990 MHz				
QPSK Modulation				
Low Channel, 1932.4 MHz	1929 MHz - 1931 MHz	-22.861	-16	Pass
	1928 MHz - 1929 MHz	-24.68	-16	Pass
	1908 MHz - 1928 MHz	-23.935	-16	Pass
High Channel, 1987.6 MHz	1989 MHz - 1991 MHz	-22.576	-16	Pass
	1991 MHz - 1992 MHz	-23.61	-16	Pass
	1992 MHz - 2012 MHz	-23.512	-16	Pass
16QAM 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
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
64QAM 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

# BAND EDGE COMPLIANCE - WCDMA

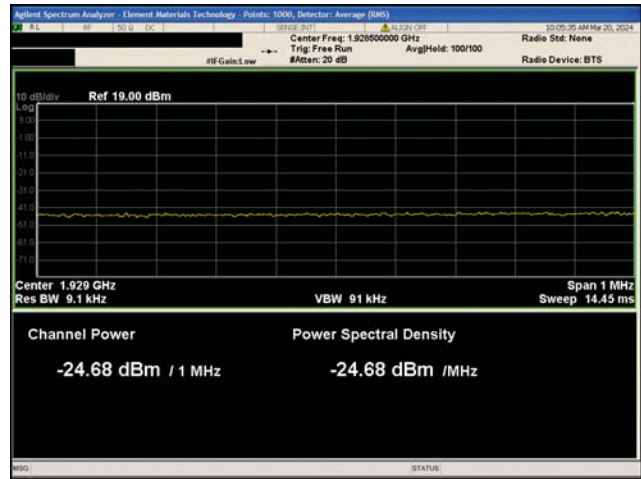


	Frequency Range	Value (dBm)	Limit (dBm)	Result
High Channel, 1987.6 MHz	1989 MHz - 1991 MHz	-22.927	-16	Pass
	1991 MHz - 1992 MHz	-23.98	-16	Pass
	1992 MHz - 2012 MHz	-23.856	-16	Pass

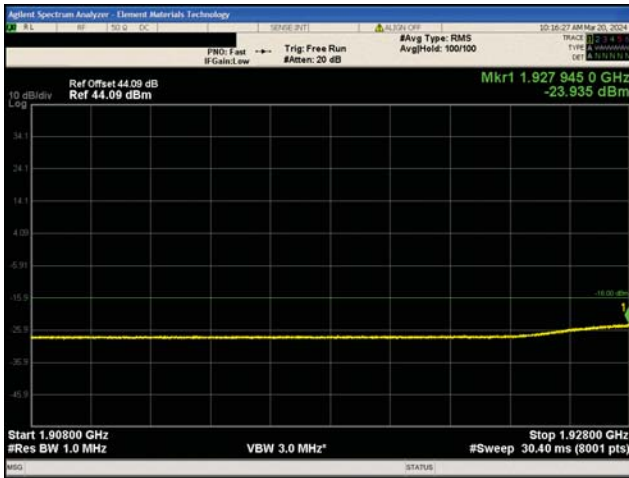
# BAND EDGE COMPLIANCE - WCDMA



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



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

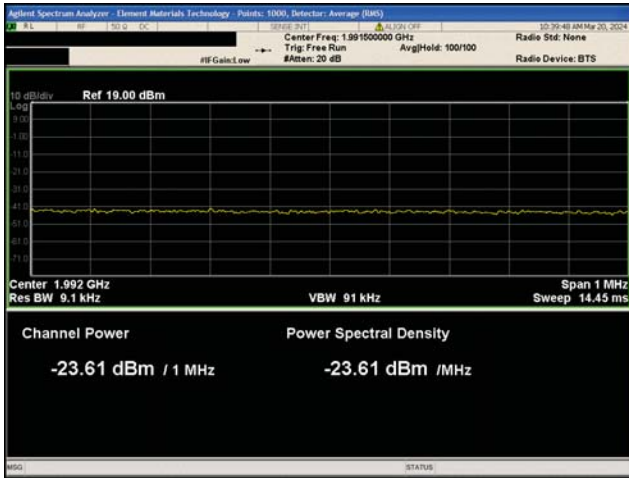


3G WCDMA PCS Band II  
QPSK Modulation  
Low Channel, 1932.4 MHz



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

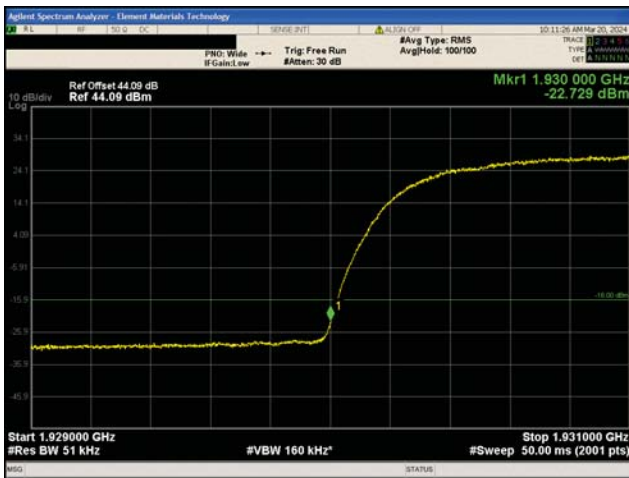
# BAND EDGE COMPLIANCE - WCDMA



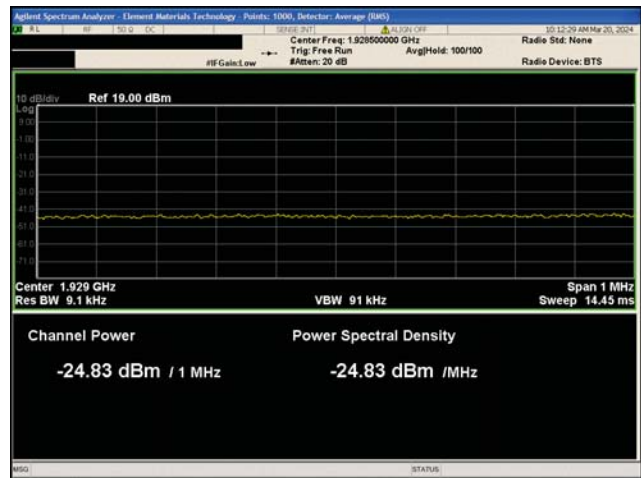
3G WCDMA PCS Band II  
QPSK Modulation  
High Channel, 1987.6 MHz



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

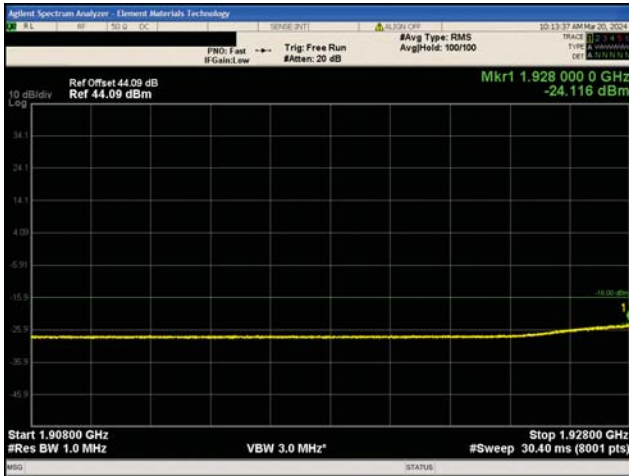


3G WCDMA PCS Band II  
16QAM Modulation  
Low Channel, 1932.4 MHz



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

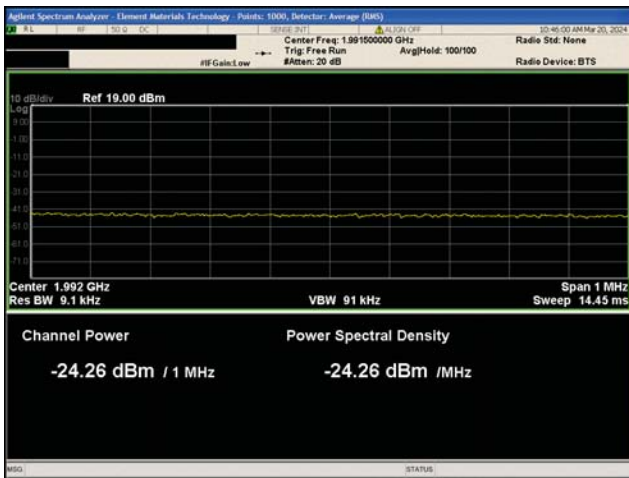
# BAND EDGE COMPLIANCE - WCDMA



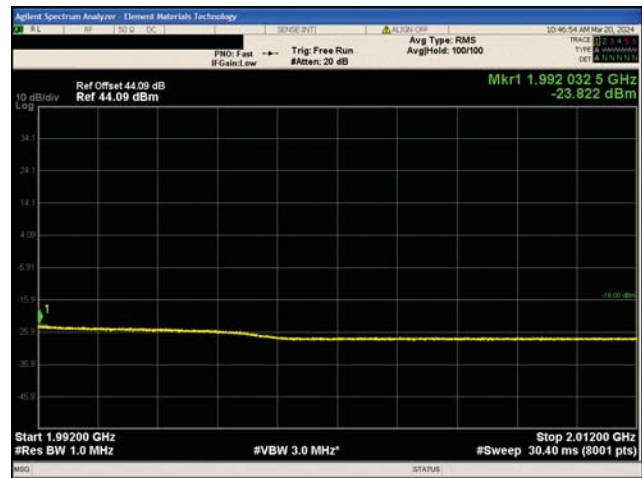
3G WCDMA PCS Band II  
16QAM Modulation  
Low Channel, 1932.4 MHz



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



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

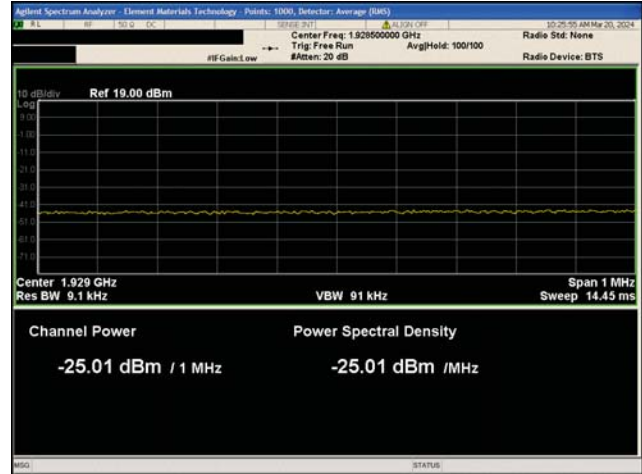


3G WCDMA PCS Band II  
16QAM Modulation  
High Channel, 1987.6 MHz

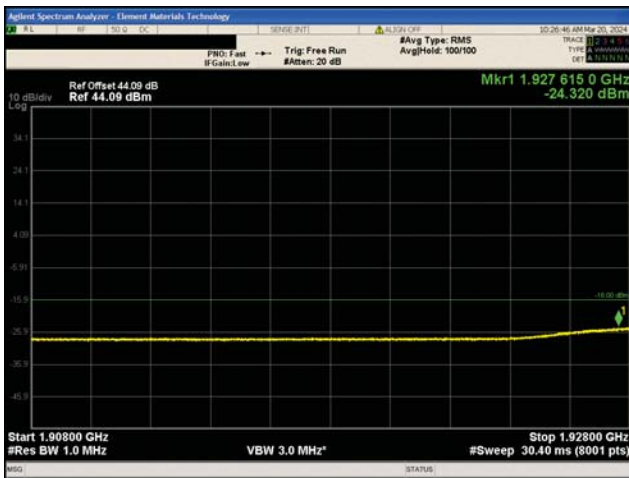
# BAND EDGE COMPLIANCE - WCDMA



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



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

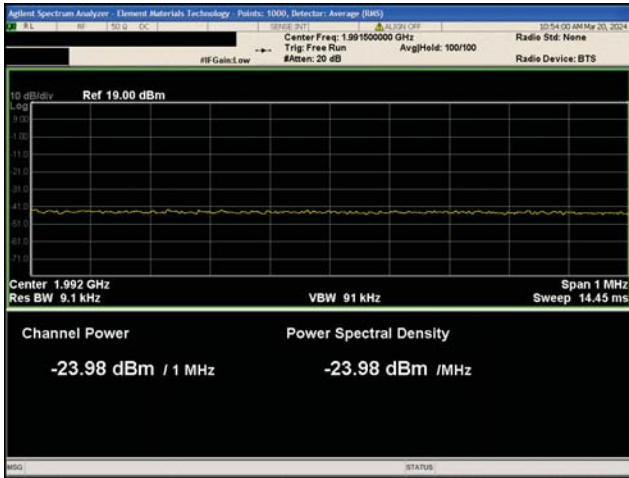


3G WCDMA PCS Band II  
64QAM Modulation  
Low Channel, 1932.4 MHz

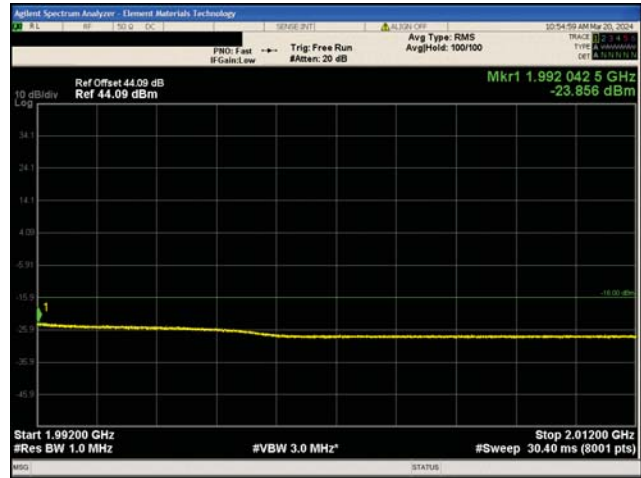


3G WCDMA PCS Band II  
64QAM Modulation  
High Channel, 1987.6 MHz

# BAND EDGE COMPLIANCE - WCDMA



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



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

# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - GSM



## 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



# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - GSM



EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHFIHA	Work Order:	NOKI0074
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:	Jarrold 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(5G NR) 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

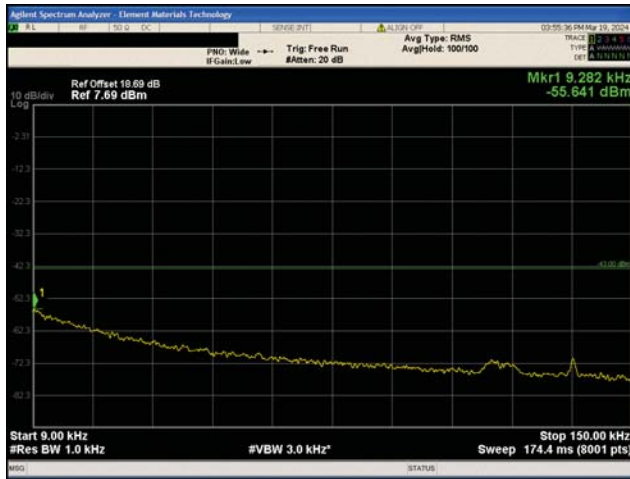
Pass

Tested By

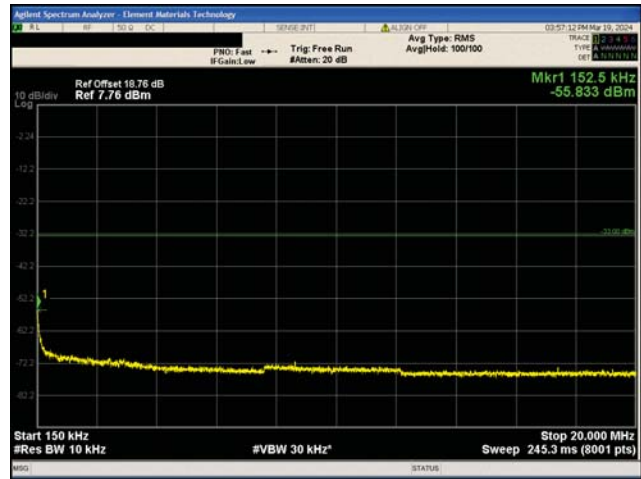
## TEST RESULTS

	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

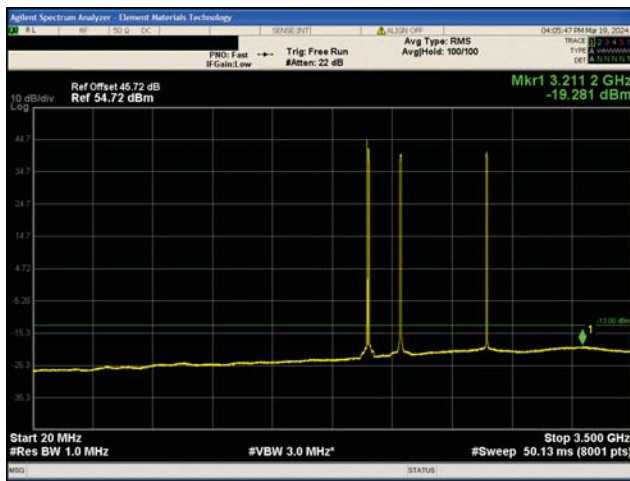
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - GSM



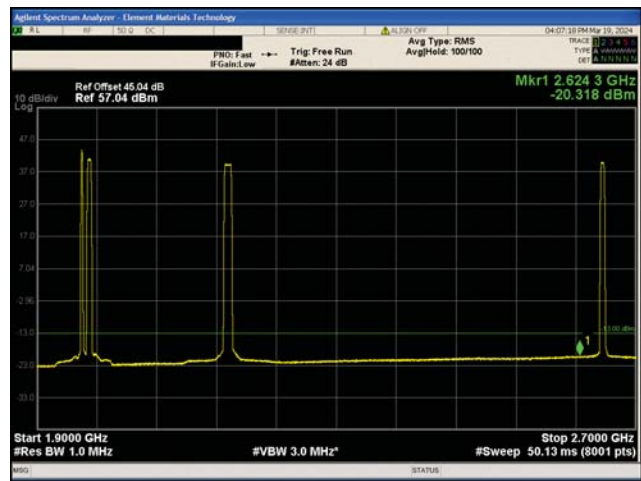
2G GSM/EDGE Band 2  
GMSK Modulation  
Mid Channel, 1960.0 MHz



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

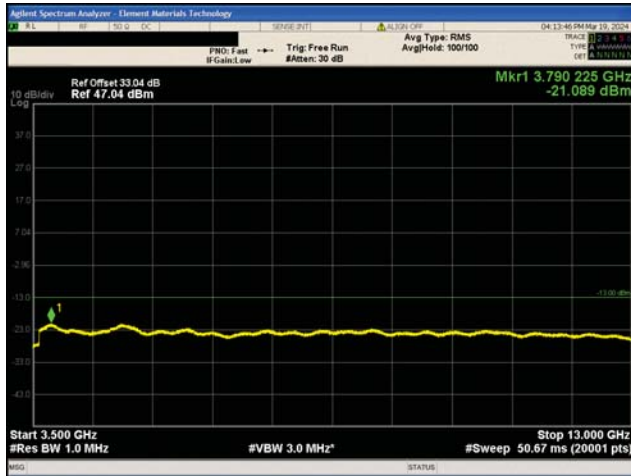


2G GSM/EDGE Band 2  
GMSK Modulation  
Mid Channel, 1960.0 MHz

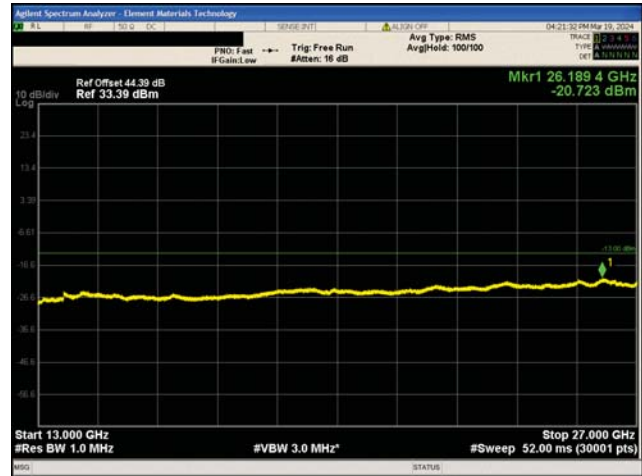


2G GSM/EDGE Band 2  
GMSK Modulation  
Mid Channel, 1960.0 MHz

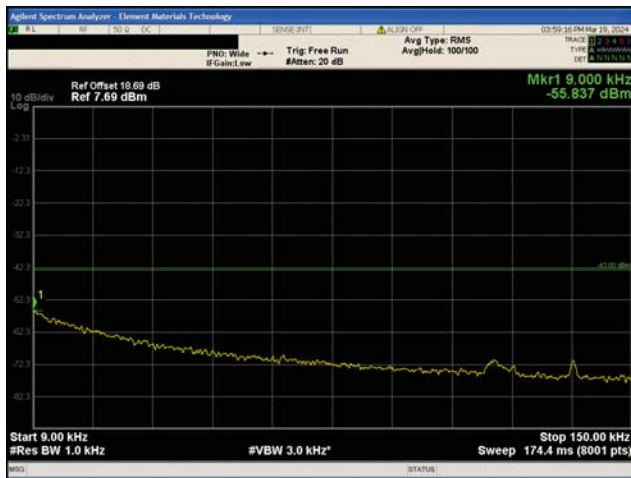
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - GSM



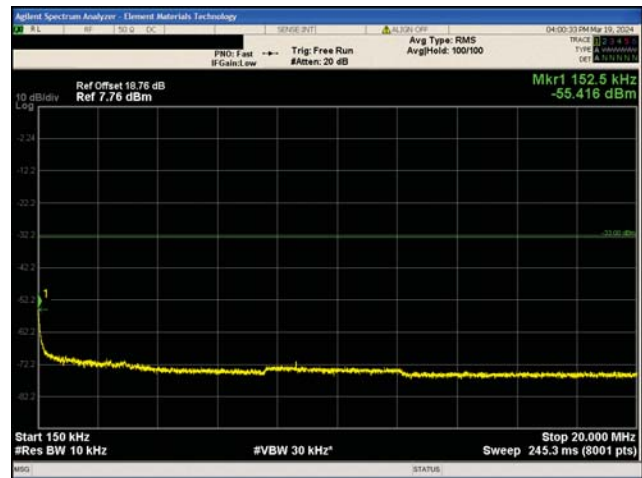
**2G GSM/EDGE Band 2  
GMSK Modulation  
Mid Channel, 1960.0 MHz**



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

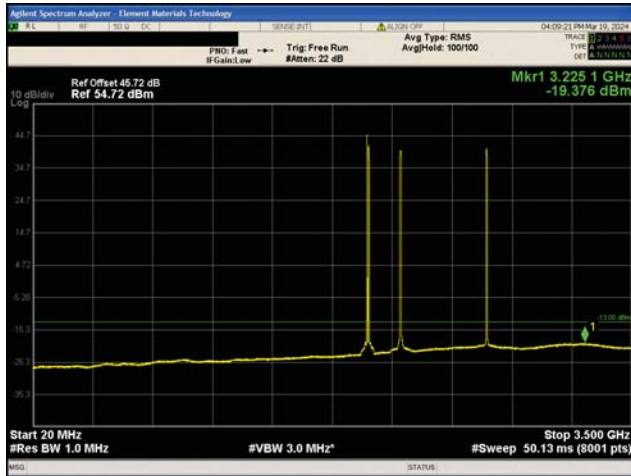


**2G GSM/EDGE Band 2  
8PSK Modulation  
Mid Channel, 1960.0 MHz**

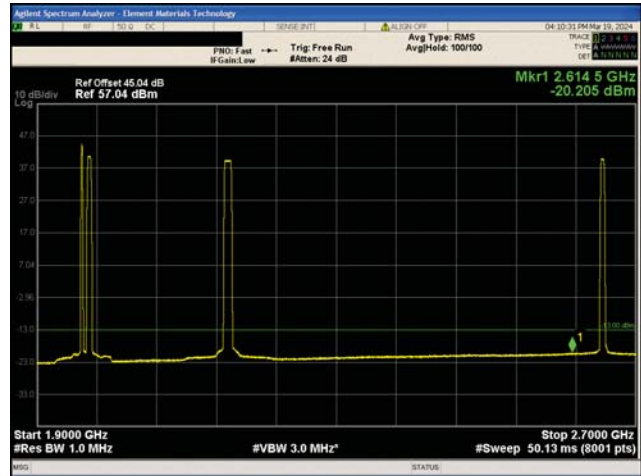


**2G GSM/EDGE Band 2  
8PSK Modulation  
Mid Channel, 1960.0 MHz**

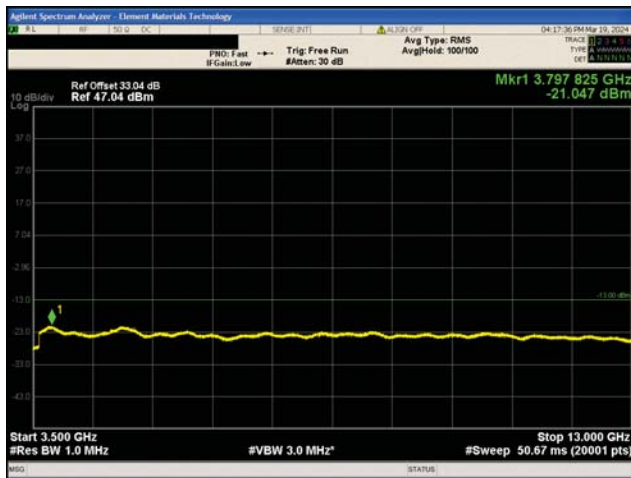
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - GSM



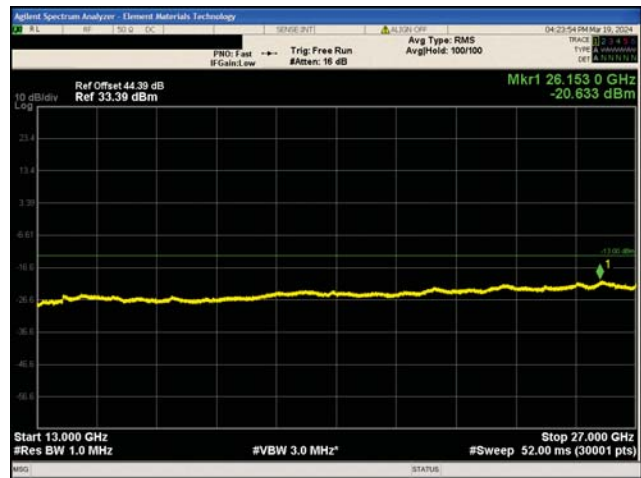
2G GSM/EDGE Band 2  
8PSK Modulation  
Mid Channel, 1960.0 MHz



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

# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



## 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 -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.

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/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

# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



EUT:	AirScale Base Transceiver Station Remote Radio Head Model AHFIHA	Work Order:	NOKI0074
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(5G NR) RAT carriers in the PCS band. Multi-Carrier 2G GSM/EDGE: in PCS band two contiguous/non-contiguous GSM/EDGE 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

# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	13 GHz - 27 GHz	26193.6	-20.781	-13	Pass
8PSK Modulation (GSM) and QPSK Modulation (LTE)					
	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					
GMSK Modulation (GSM) and QPSK Modulation (LTE)					
	9 kHz - 150 kHz	0.01	-55.87	-43	Pass
	150 kHz - 20 MHz	0.16	-55.7	-33	Pass
	20 MHz - 3.5 GHz	3228.56	-19.46	-13	Pass
	1.9 GHz - 2.7 GHz	1930.1	-19.018	-13	Pass
	3.5 GHz - 13 GHz	3802.1	-21.06	-13	Pass
	13 GHz - 27 GHz	26206.2	-20.9	-13	Pass
8PSK Modulation (GSM) and QPSK Modulation (LTE)					
	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	3760.3	-21.07	-16	Pass
	13 GHz - 27 GHz	26221.6	-20.7	-16	Pass
16QAM Modulation (WCDMA) and QPSK Modulation (LTE)					
	9 kHz - 150 kHz	0.01	-55.82	-46	Pass
	150 kHz - 20 MHz	0.15	-55.56	-36	Pass
	20 MHz - 3.5 GHz	3210.29	-19.65	-16	Pass
	1.9 GHz - 2.7 GHz	2628	-20.23	-16	Pass
	3.5 GHz - 13 GHz	3757.45	-20.94	-16	Pass

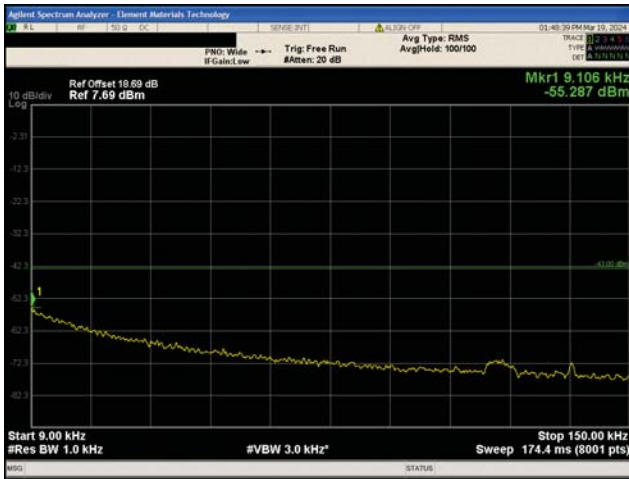
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



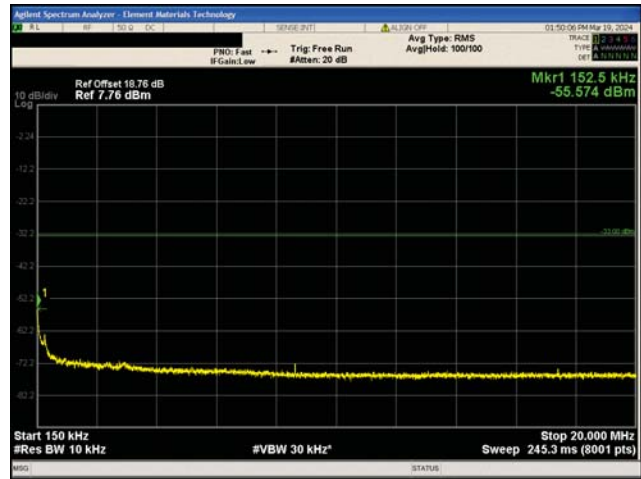
	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	13 GHz - 27 GHz	26170.73	-20.84	-16	Pass
64QAM Modulation (WCDMA) and QPSK Modulation (LTE)					
	9 kHz - 150 kHz	0.01	-55.42	-46	Pass
	150 kHz - 20 MHz	0.15	-55.09	-36	Pass
	20 MHz - 3.5 GHz	3214.64	-19.63	-16	Pass
	1.9 GHz - 2.7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



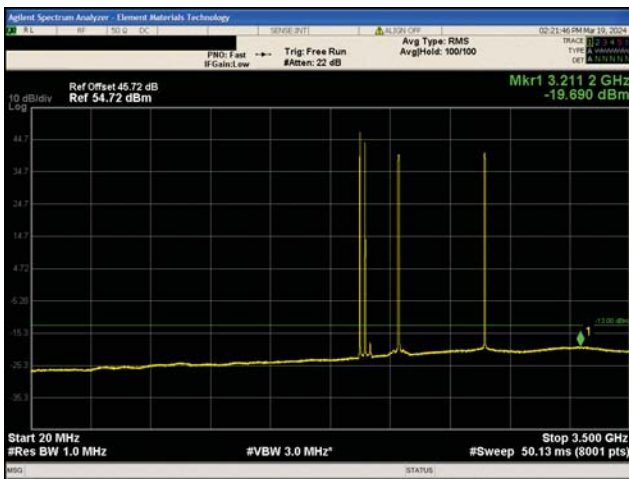
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



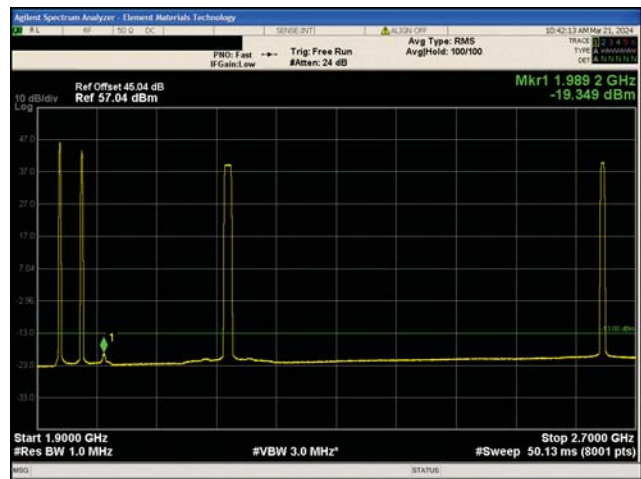
2G GSM/EDGE PCS Band 2  
 Test Case 1  
 GMSK Modulation (GSM) and QPSK Modulation (LTE)



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

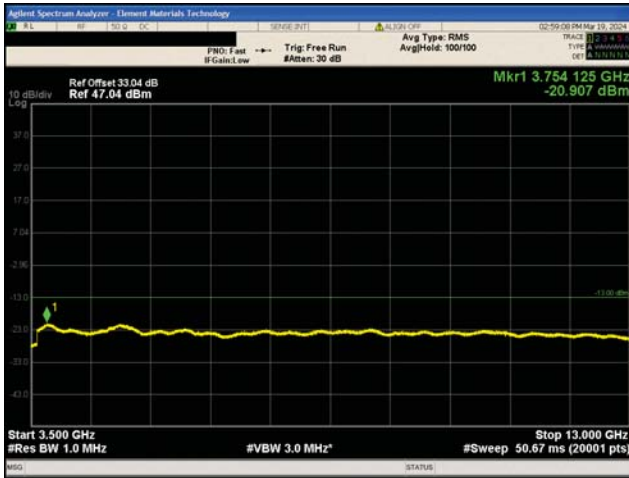


2G GSM/EDGE PCS Band 2  
 Test Case 1  
 GMSK Modulation (GSM) and QPSK Modulation (LTE)

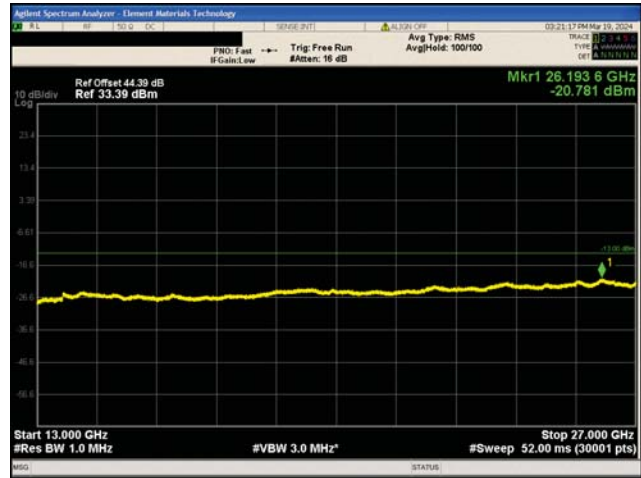


2G GSM/EDGE PCS Band 2  
 Test Case 1  
 GMSK Modulation (GSM) and QPSK Modulation (LTE)

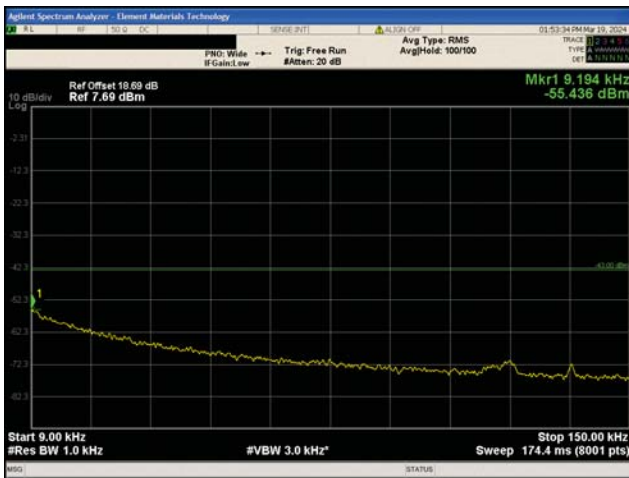
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



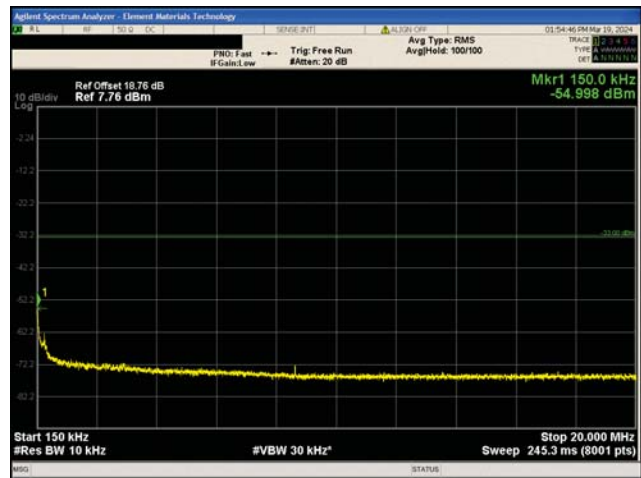
2G GSM/EDGE PCS Band 2  
Test Case 1  
GMSK Modulation (GSM) and QPSK Modulation (LTE)



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

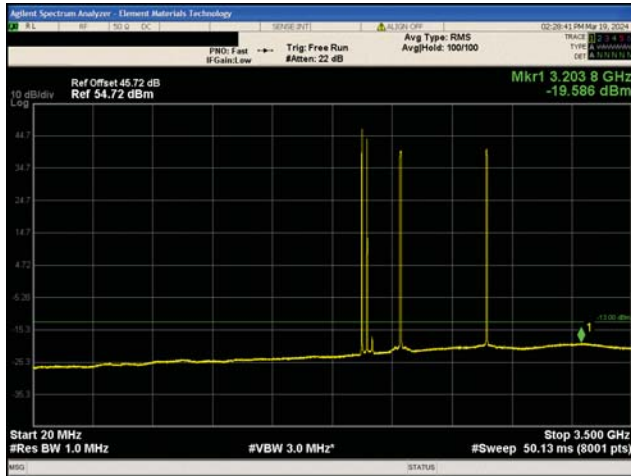


2G GSM/EDGE PCS Band 2  
Test Case 1  
8PSK Modulation (GSM) and QPSK Modulation (LTE)

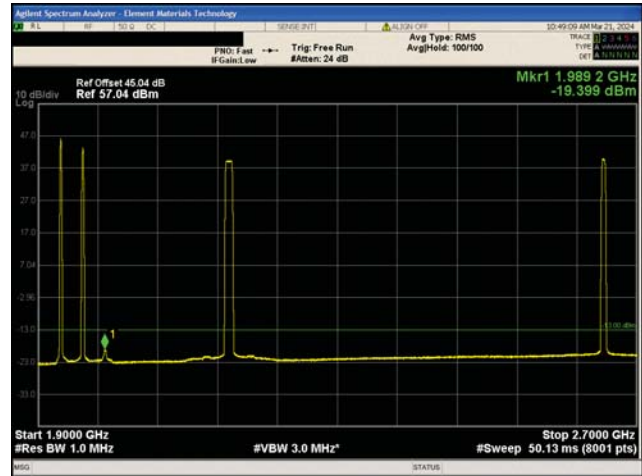


2G GSM/EDGE PCS Band 2  
Test Case 1  
8PSK Modulation (GSM) and QPSK Modulation (LTE)

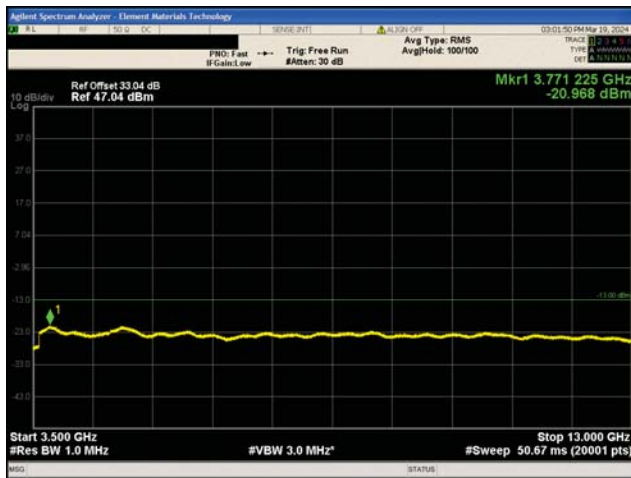
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



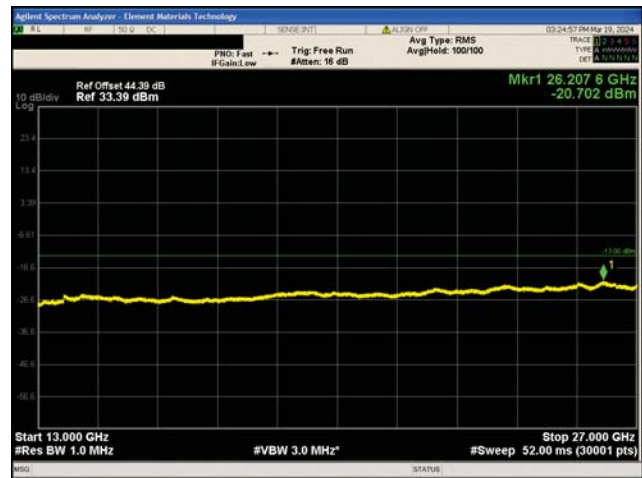
2G GSM/EDGE PCS Band 2  
 Test Case 1  
 8PSK Modulation (GSM) and QPSK Modulation (LTE)



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

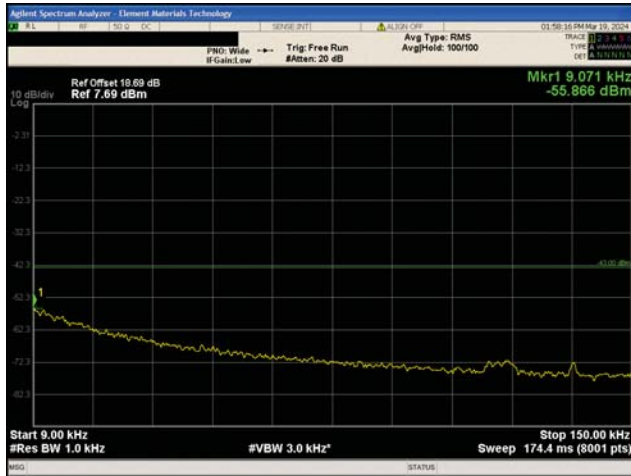


2G GSM/EDGE PCS Band 2  
 Test Case 1  
 8PSK Modulation (GSM) and QPSK Modulation (LTE)

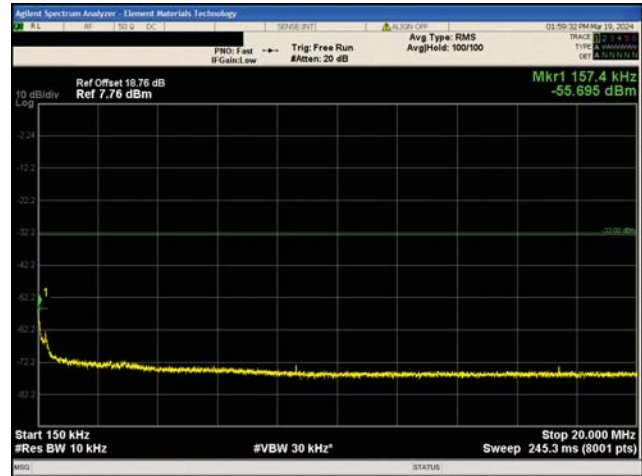


2G GSM/EDGE PCS Band 2  
 Test Case 1  
 8PSK Modulation (GSM) and QPSK Modulation (LTE)

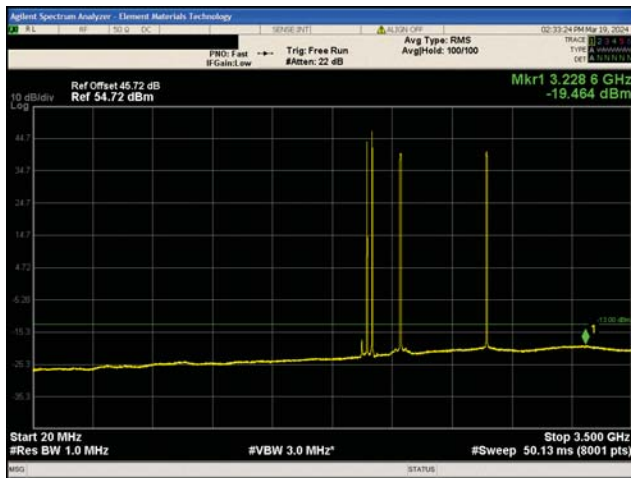
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



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)

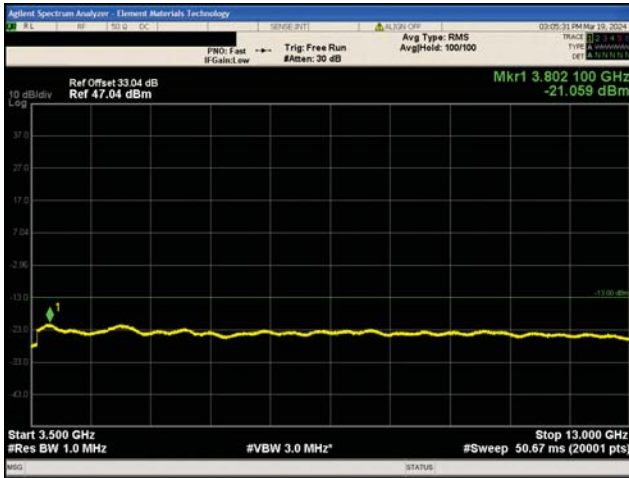


2G GSM/EDGE PCS Band 2  
Test Case 2  
GMSK Modulation (GSM) and QPSK Modulation (LTE)

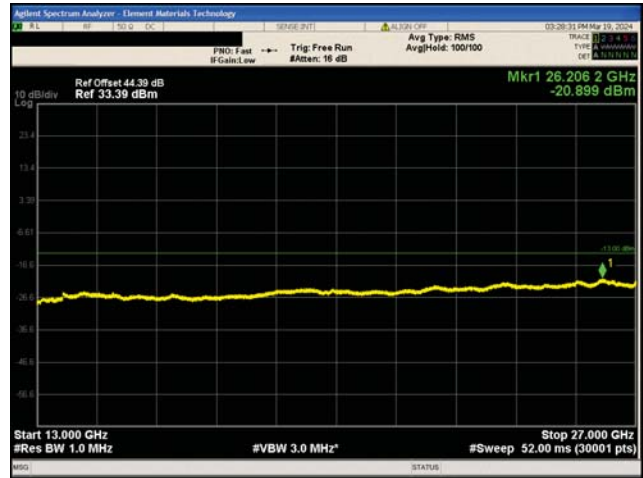


2G GSM/EDGE PCS Band 2  
Test Case 2  
GMSK Modulation (GSM) and QPSK Modulation (LTE)

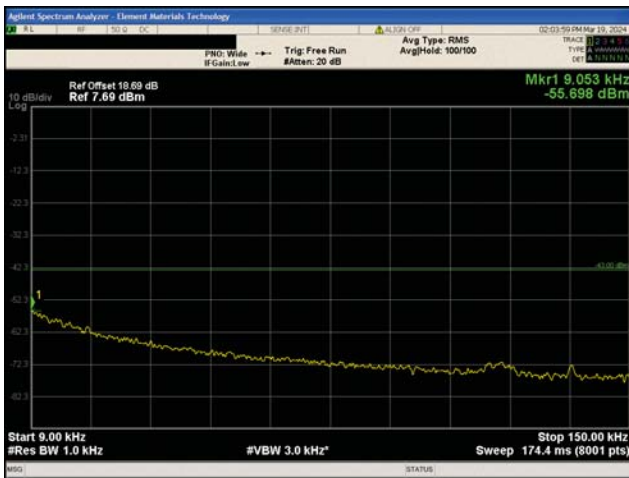
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



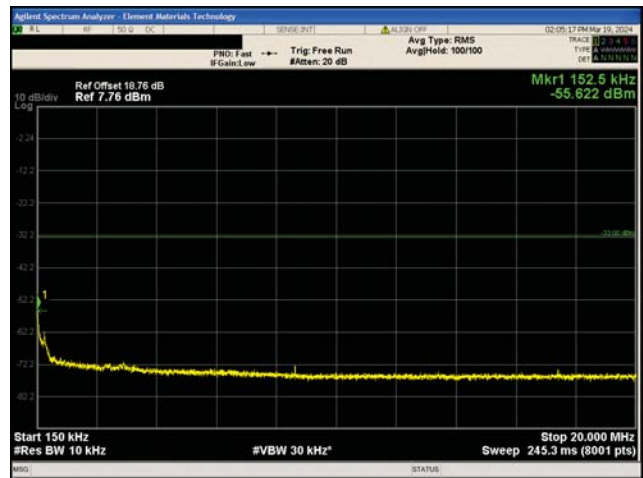
2G GSM/EDGE PCS Band 2  
 Test Case 2  
 GMSK Modulation (GSM) and QPSK Modulation (LTE)



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

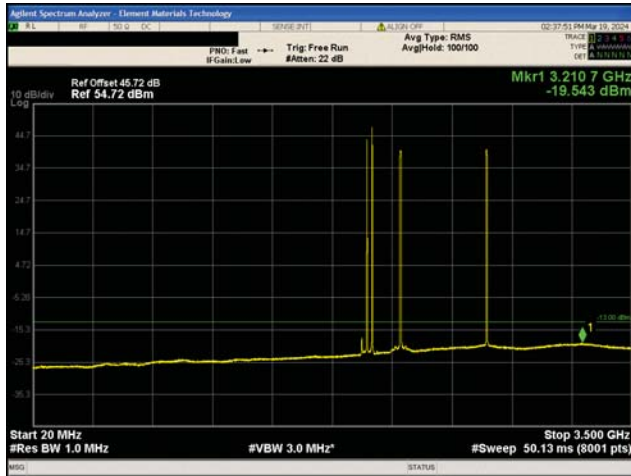


2G GSM/EDGE PCS Band 2  
 Test Case 2  
 8PSK Modulation (GSM) and QPSK Modulation (LTE)

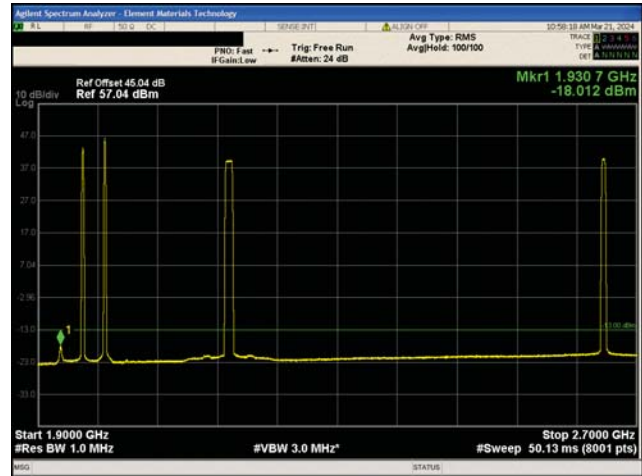


2G GSM/EDGE PCS Band 2  
 Test Case 2  
 8PSK Modulation (GSM) and QPSK Modulation (LTE)

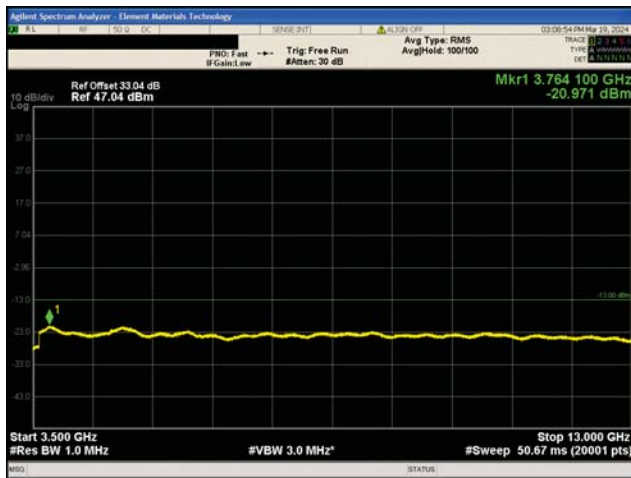
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



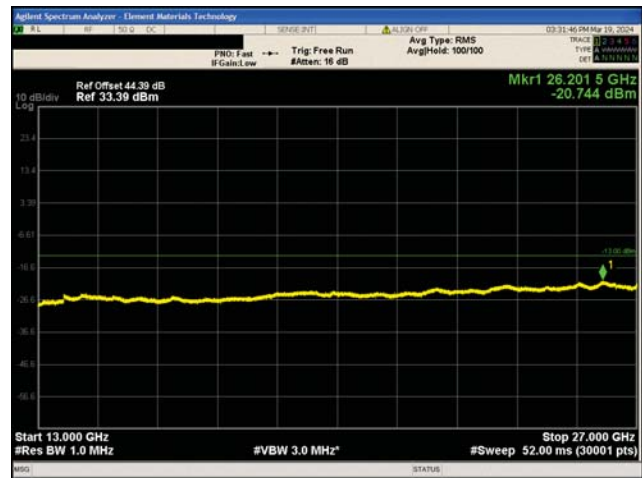
2G GSM/EDGE PCS Band 2  
Test Case 2  
8PSK Modulation (GSM) and QPSK Modulation (LTE)



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

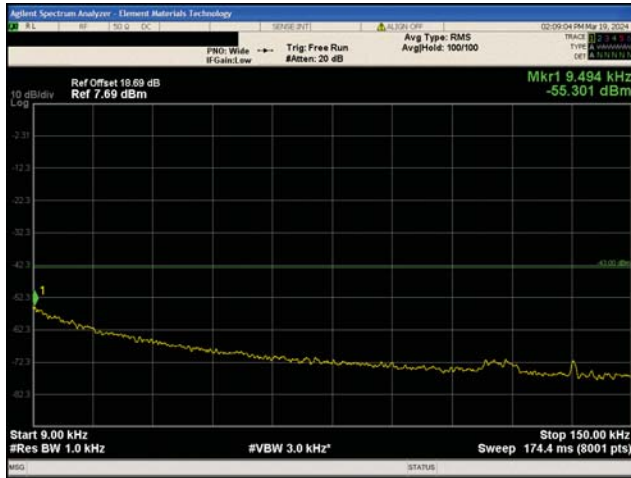


2G GSM/EDGE PCS Band 2  
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8PSK Modulation (GSM) and QPSK Modulation (LTE)

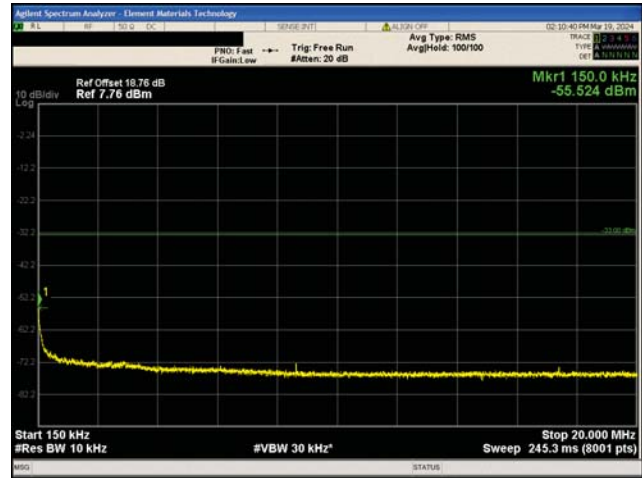


2G GSM/EDGE PCS Band 2  
Test Case 2  
8PSK Modulation (GSM) and QPSK Modulation (LTE)

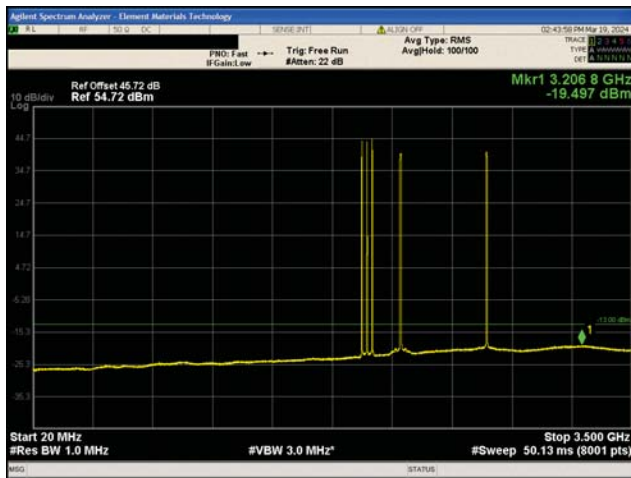
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



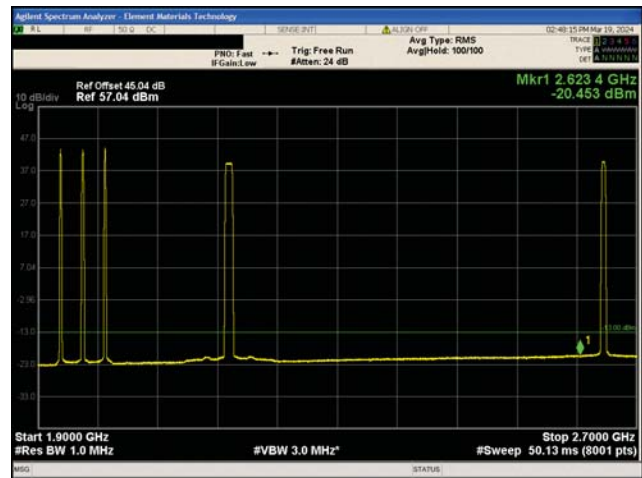
2G GSM/EDGE PCS Band 2  
 Test Case 3  
 GMSK Modulation (GSM) and QPSK Modulation (LTE)



2G GSM/EDGE PCS Band 2  
 Test Case 3  
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2G GSM/EDGE PCS Band 2  
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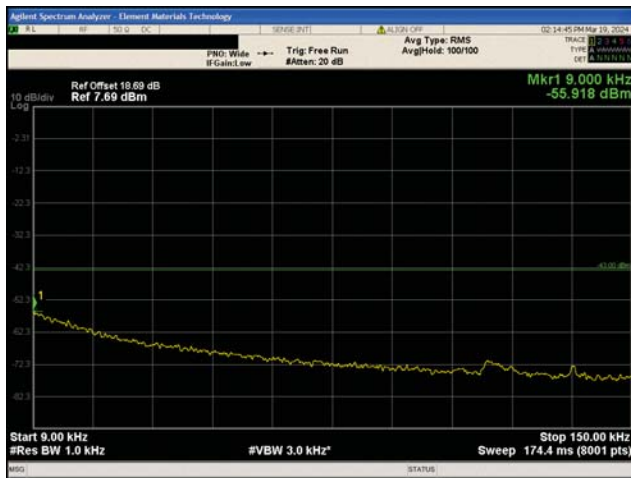
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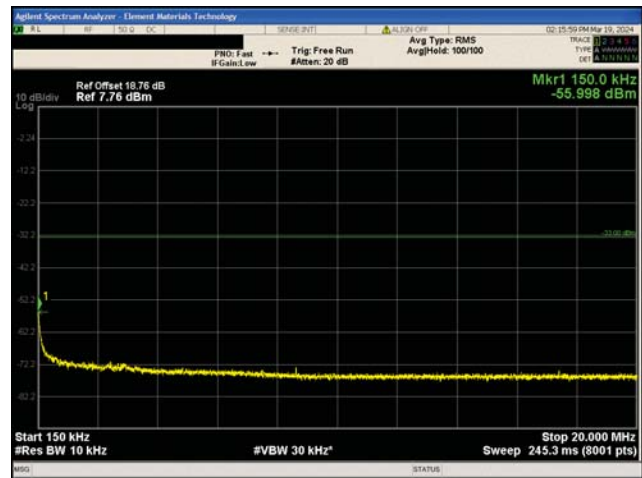
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2G GSM/EDGE PCS Band 2  
Test Case 3  
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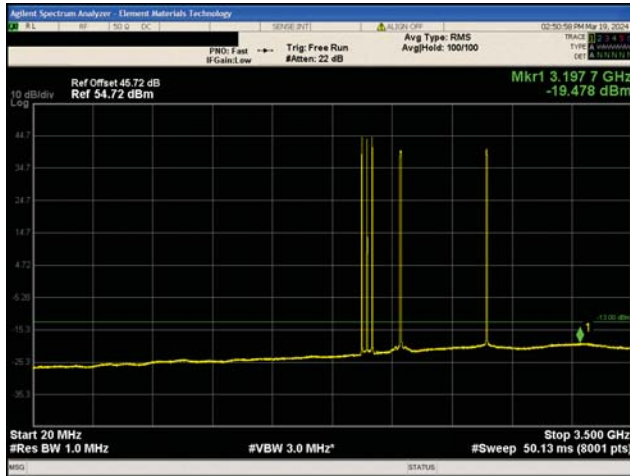
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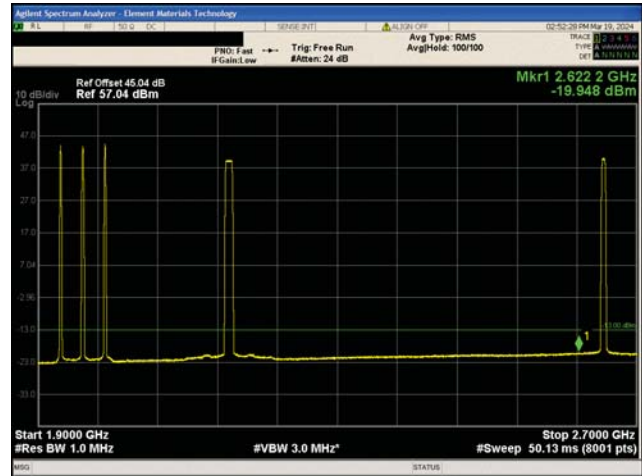
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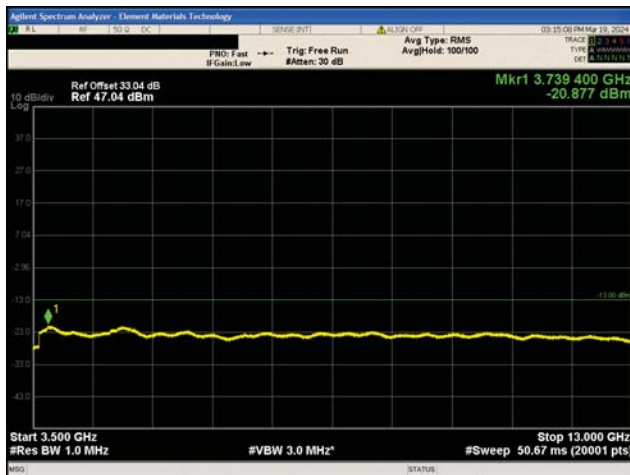
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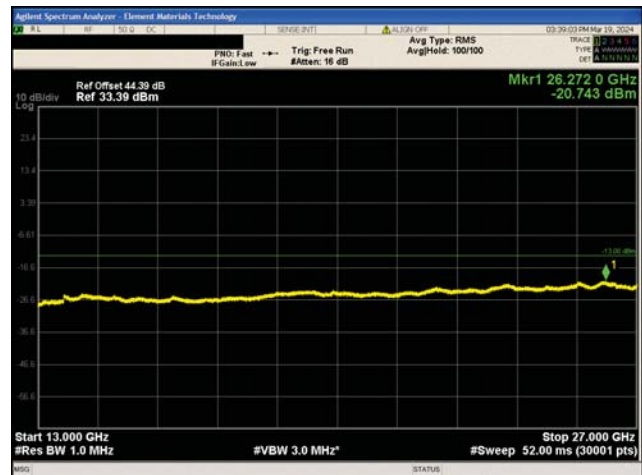
2G GSM/EDGE PCS Band 2  
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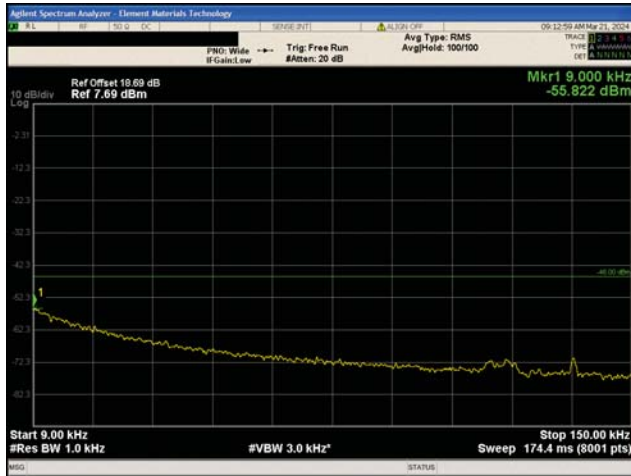


2G GSM/EDGE PCS Band 2  
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2G GSM/EDGE PCS Band 2  
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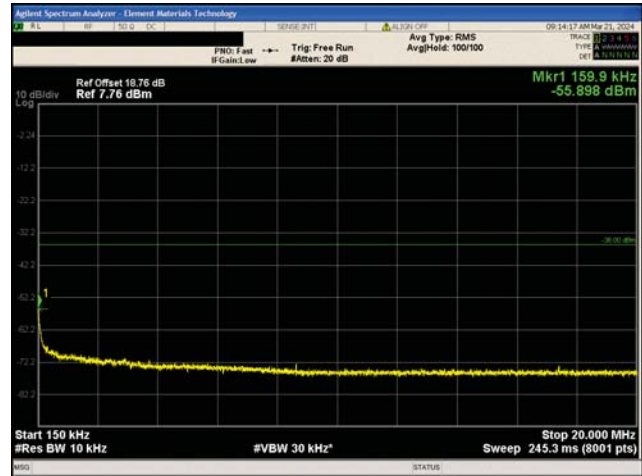
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



3G WCDMA PCS Band II

Test Case 1

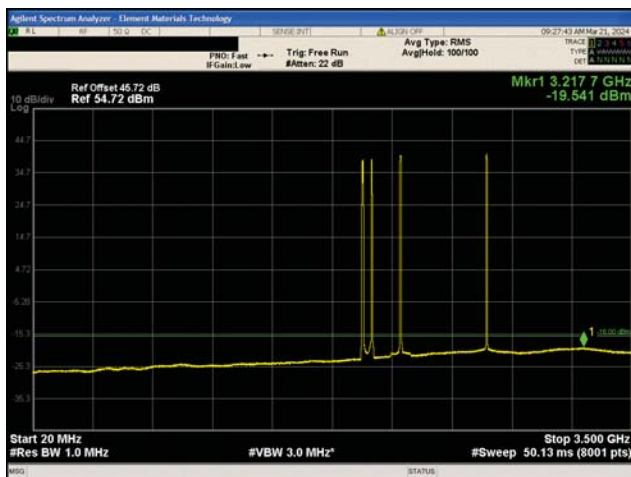
QPSK Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II

Test Case 1

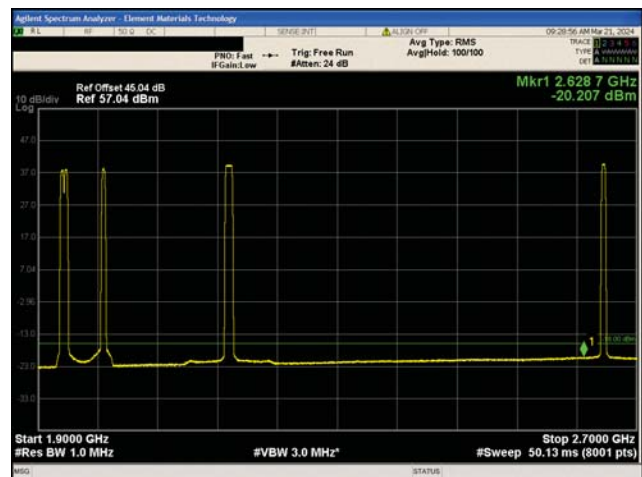
QPSK Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II

Test Case 1

QPSK Modulation (WCDMA) and QPSK Modulation (LTE)

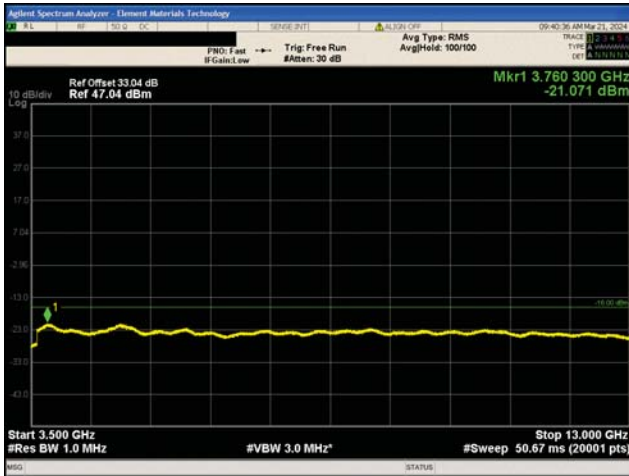


3G WCDMA PCS Band II

Test Case 1

QPSK Modulation (WCDMA) and QPSK Modulation (LTE)

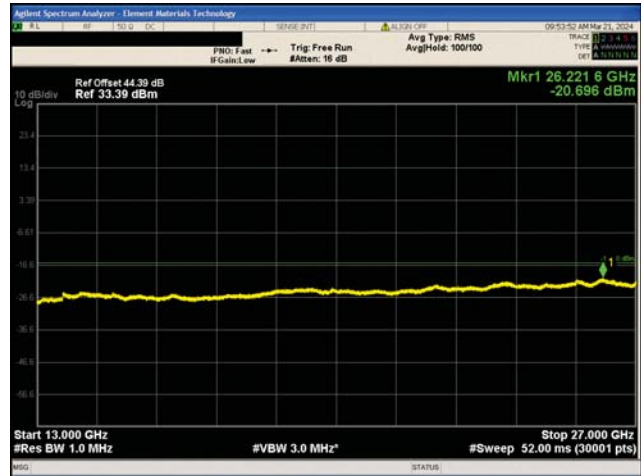
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



3G WCDMA PCS Band II

Test Case 1

QPSK Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II

Test Case 1

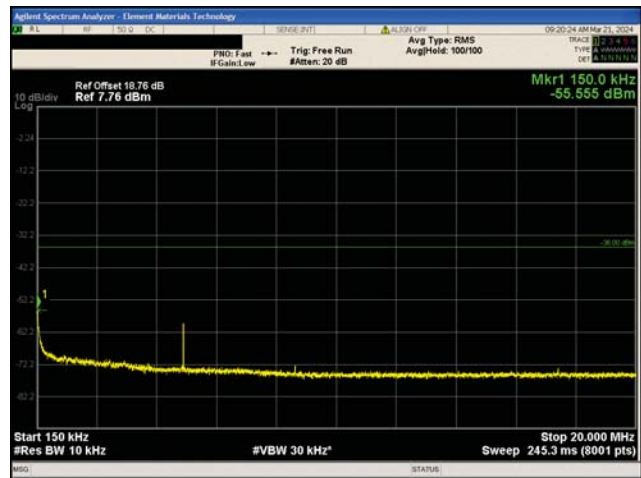
QPSK Modulation (WCDMA) and QPSK Modulation (LTE)



3G WCDMA PCS Band II

Test Case 1

16QAM Modulation (WCDMA) and QPSK Modulation (LTE)

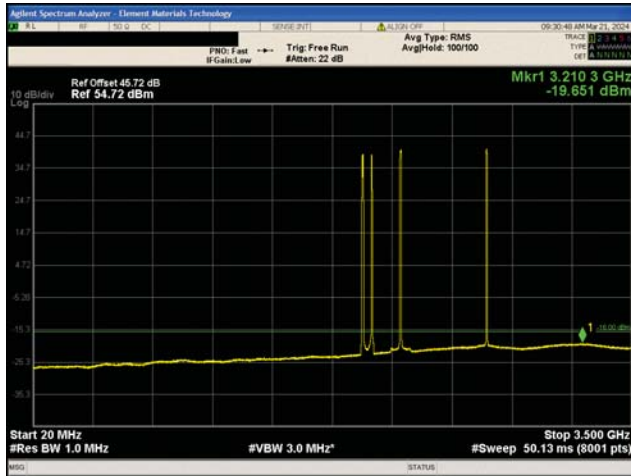


3G WCDMA PCS Band II

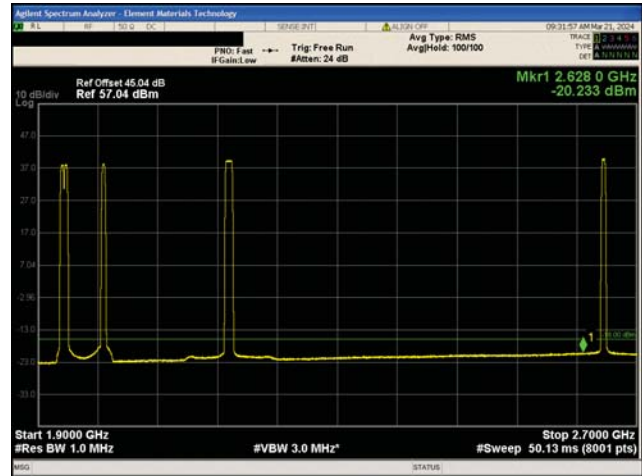
Test Case 1

16QAM Modulation (WCDMA) and QPSK Modulation (LTE)

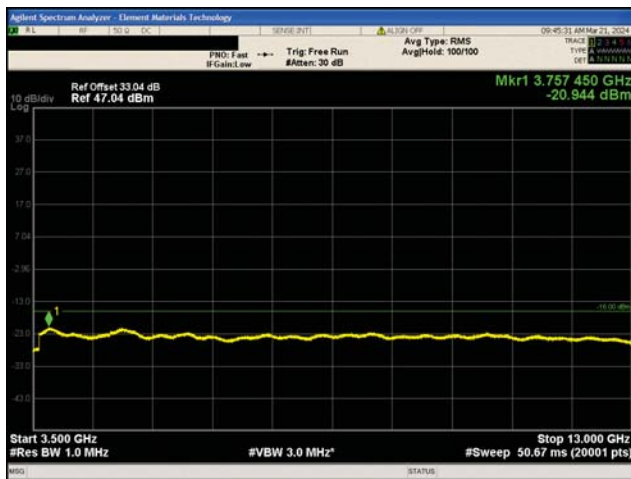
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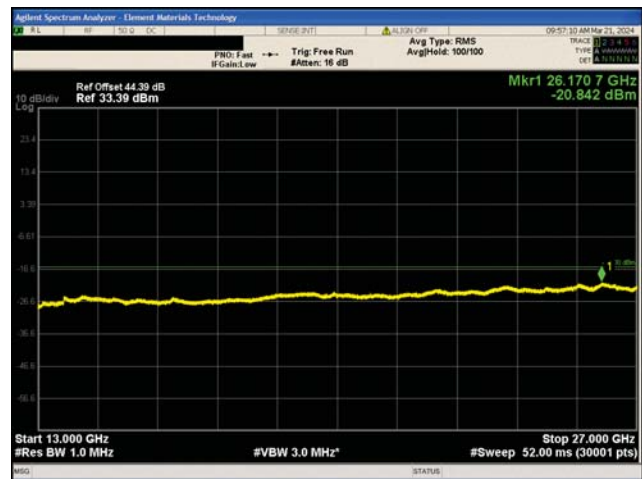
3G WCDMA PCS Band II  
Test Case 1  
16QAM Modulation (WCDMA) and  
QPSK Modulation (LTE)



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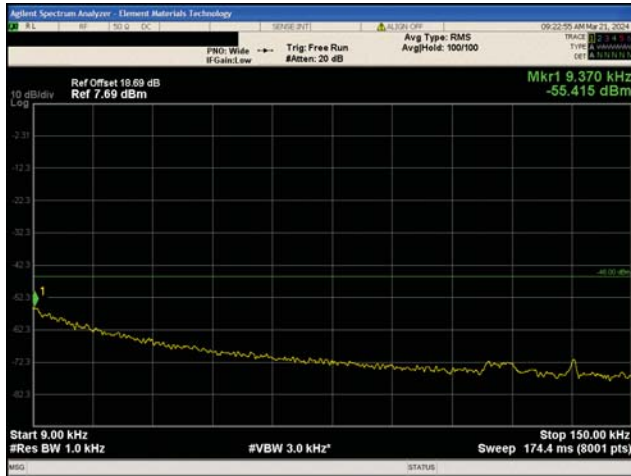


3G WCDMA PCS Band II  
Test Case 1  
16QAM Modulation (WCDMA) and  
QPSK Modulation (LTE)

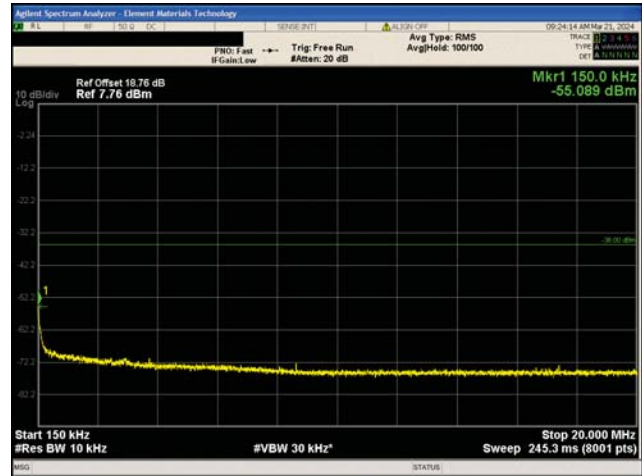


3G WCDMA PCS Band II  
Test Case 1  
16QAM Modulation (WCDMA) and  
QPSK Modulation (LTE)

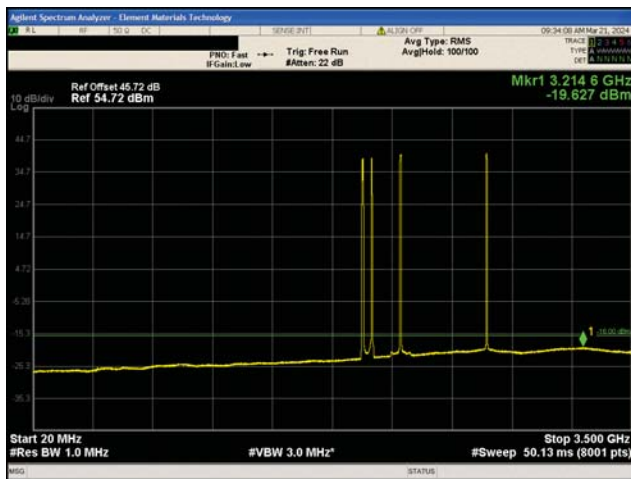
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



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)

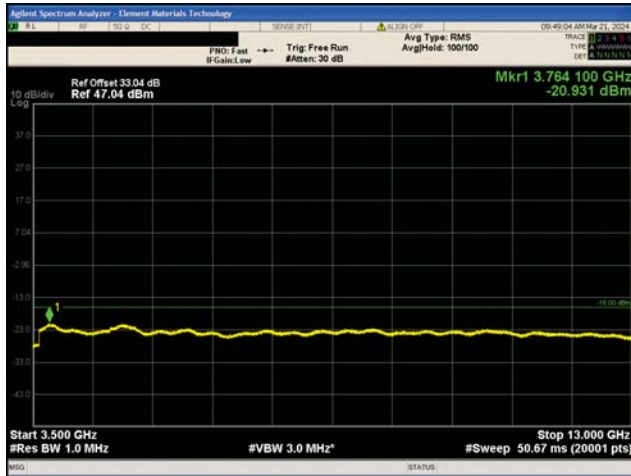


3G WCDMA PCS Band II  
Test Case 1  
64QAM Modulation (WCDMA) and  
QPSK Modulation (LTE)

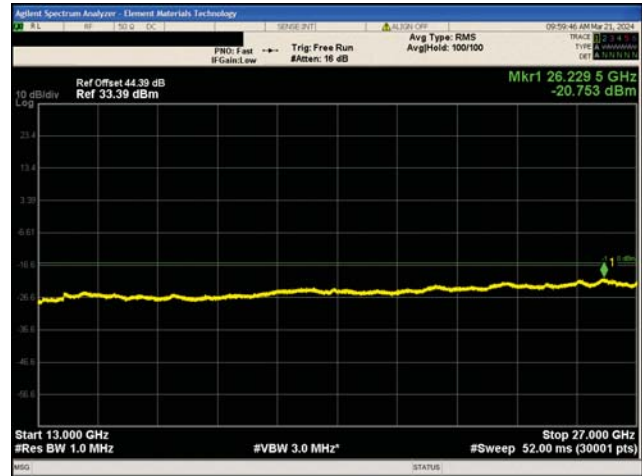


3G WCDMA PCS Band II  
Test Case 1  
64QAM Modulation (WCDMA) and  
QPSK Modulation (LTE)

# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - MULTICARRIER



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)

# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - WCDMA



## 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.

## 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

# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - WCDMA



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, 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						
QPSK Modulation						
	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

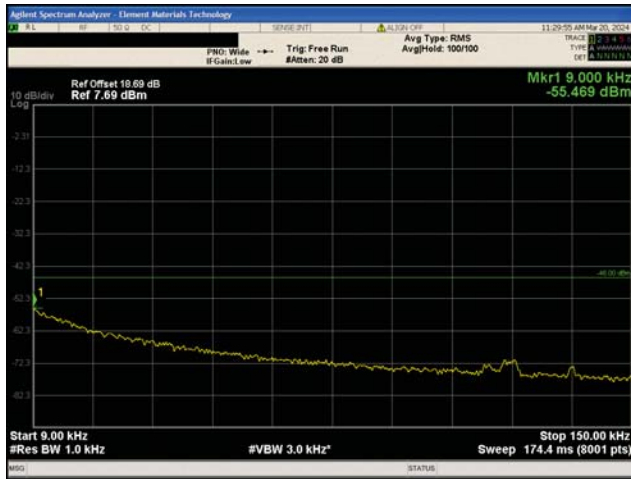


# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - WCDMA

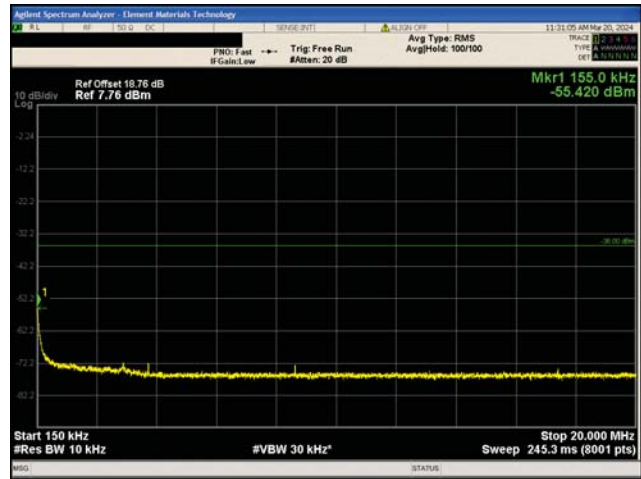


	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
64QAM Modulation					
Mid Channel, 1960.0 MHz	9 kHz - 150 kHz	0.01	-55.53	-46	Pass
	150 kHz - 20 MHz	0.15	-55.02	-36	Pass
	20 MHz - 3.5 GHz	3230.74	-19.43	-16	Pass
	1.9 GHz - 2.7 GHz	2626.5	-20.05	-16	Pass
	3.5 GHz - 13 GHz	3766.95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

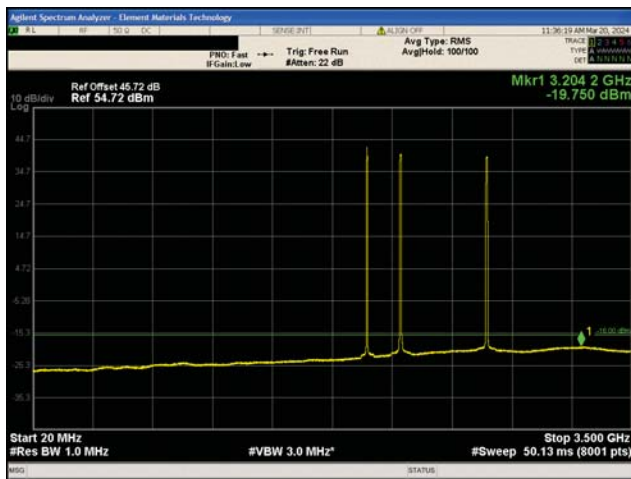
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - WCDMA



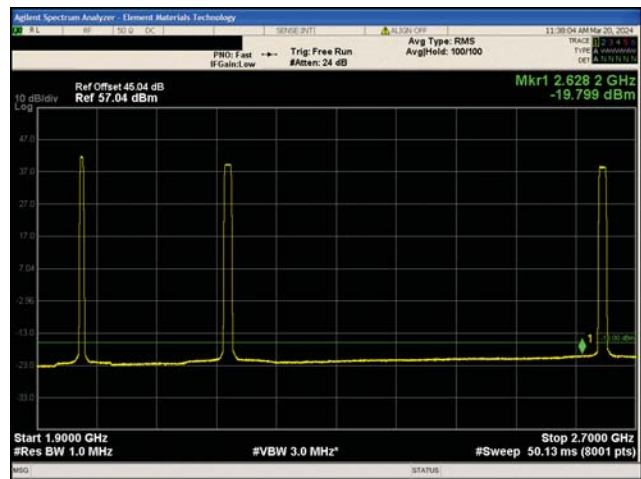
3G WCDMA PCS Band II  
 QPSK Modulation  
 Mid Channel, 1960.0 MHz



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 QPSK Modulation  
 Mid Channel, 1960.0 MHz



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

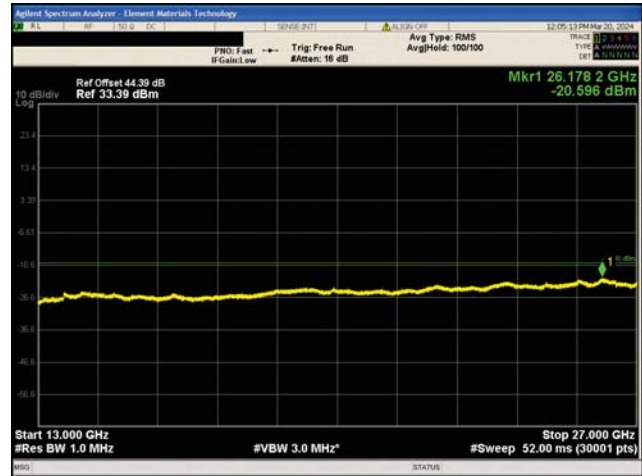


3G WCDMA PCS Band II  
 QPSK Modulation  
 Mid Channel, 1960.0 MHz

# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - WCDMA



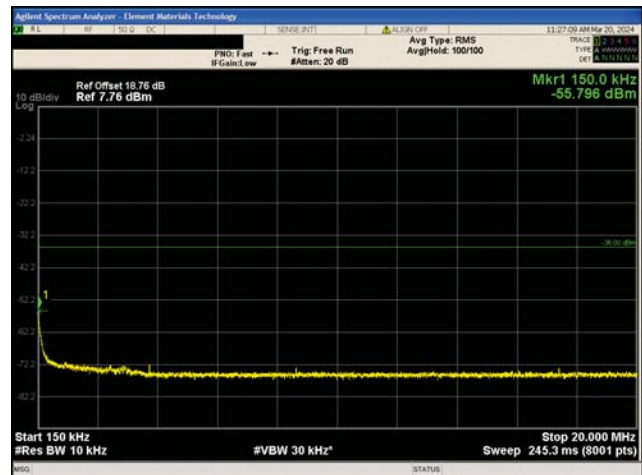
3G WCDMA PCS Band II  
QPSK Modulation  
Mid Channel, 1960.0 MHz



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

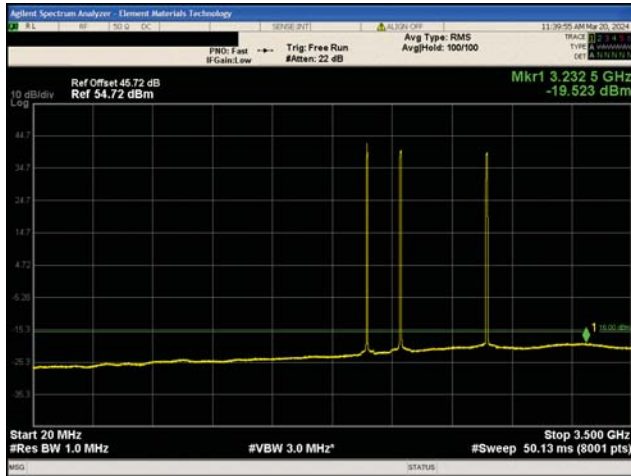


3G WCDMA PCS Band II  
16QAM Modulation  
Mid Channel, 1960.0 MHz

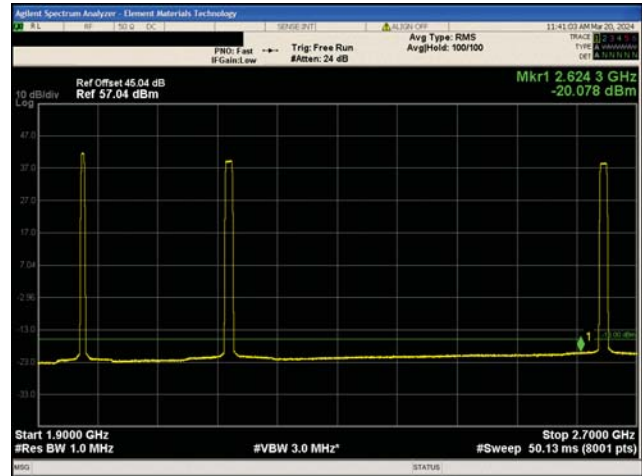


3G WCDMA PCS Band II  
16QAM Modulation  
Mid Channel, 1960.0 MHz

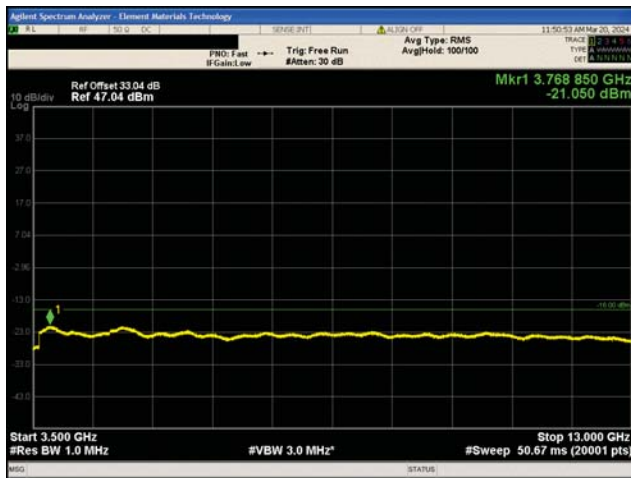
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - WCDMA



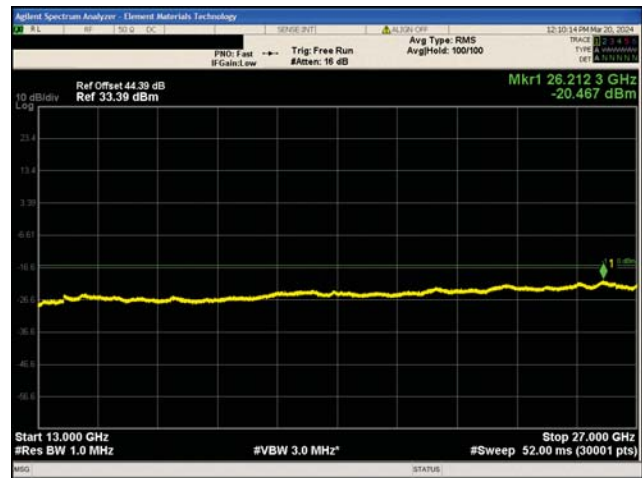
3G WCDMA PCS Band II  
 16QAM Modulation  
 Mid Channel, 1960.0 MHz



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

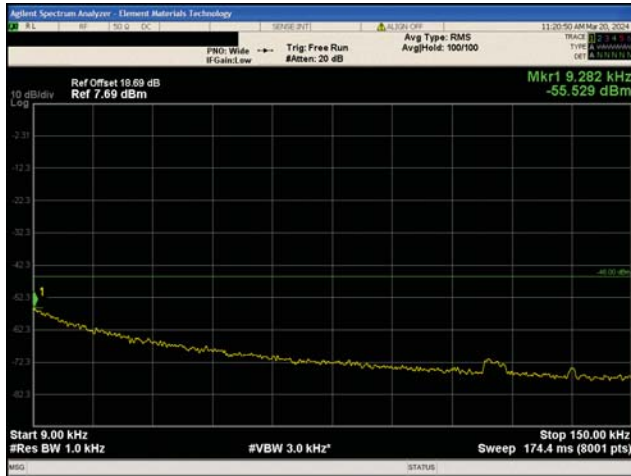


3G WCDMA PCS Band II  
 16QAM Modulation  
 Mid Channel, 1960.0 MHz

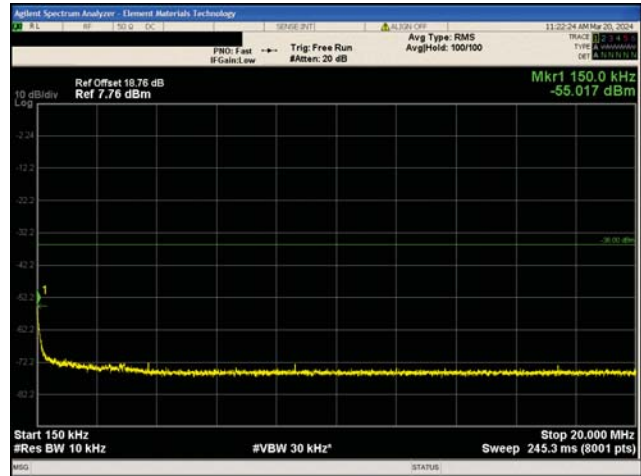


3G WCDMA PCS Band II  
 16QAM Modulation  
 Mid Channel, 1960.0 MHz

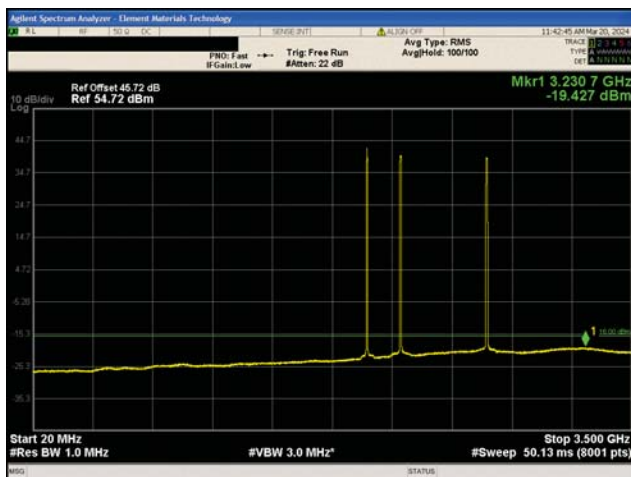
# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - WCDMA



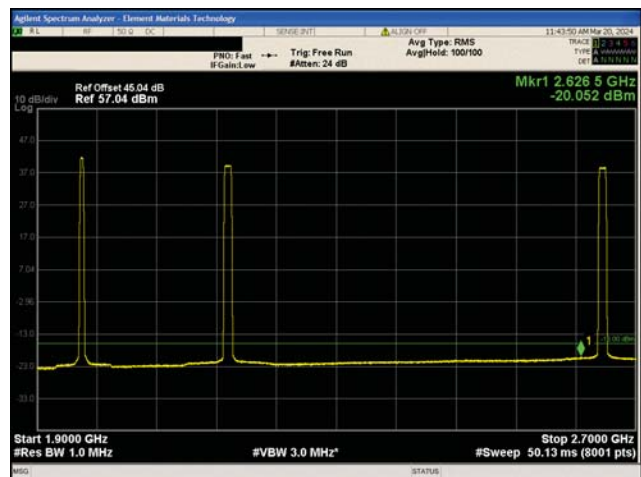
3G WCDMA PCS Band II  
64QAM Modulation  
Mid Channel, 1960.0 MHz



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

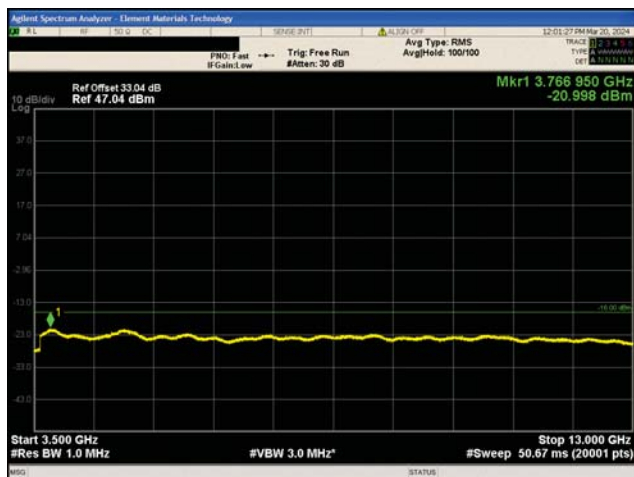


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64QAM Modulation  
Mid Channel, 1960.0 MHz

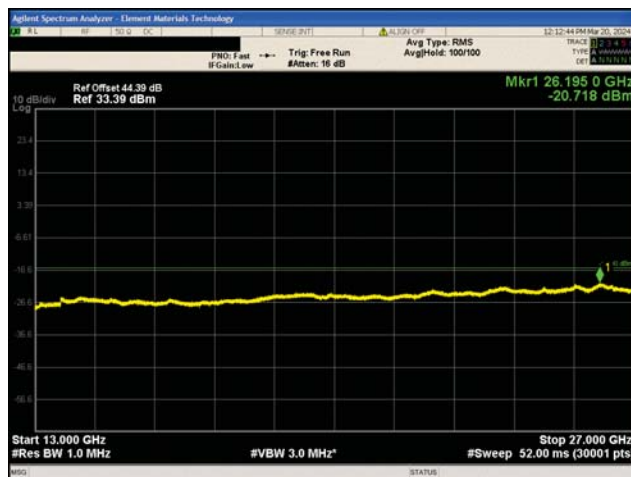


3G WCDMA PCS Band II  
64QAM Modulation  
Mid Channel, 1960.0 MHz

# SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS - WCDMA



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



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

End of Test Report