BAND EDGE COMPLIANCE - BAND n25 5G

XMit 2023.02.14.0

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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Attenuator	Fairview Microwave	SA18E 1648	TZW	2022-09-13	2023-09-13

TEST DESCRIPTION

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 in 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.

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

All limits were adjusted by a factor of [-10*log(4)] dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911.

Per FCC 24.238(a) and RSS 133 6.5.1 (i). the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

Per FCC 24.238(b) and RSS 133 6.5.1 (i). emissions seen up to 1 MHz outside of authorized operating frequency range band edges shell be measured with a RBW of 1% of the measured emission bandwidth. Any emission seen to be > 1 MHz further outside the band edges shall be measured with a RBW of 1 MHz. However, a narrower RBW of at least 1% of the emission bandwidth is still allowed provided that the measured power is integrated over the full reference bandwidth of 1 MHz.

RF conducted emissions testing was performed on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification testing) and antenna port 4 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.

BAND EDGE COMPLIANCE - BAND n25 5G

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	Airscale Base Transceiver Station Remote Radio Head Model AHFIB			Work Order:	NOKI0056
Serial Number:	K9181401111			Date:	03/17/23
Customer:	Nokia of America Corporation			Temperature:	25.4°C
Attendees:	David Le, Mitchel Hill			Humidity:	21.4%
Project:	None			Barometric Pres.:	994.2 mbar
Tested by:	Brandon Hobbs	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 24E:2023	ANSI C63.26:2015
RSS-133 Issue 6:2013+A1:2018	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n25 carriers are enabled at maximum power (40 watts/carrier).

DEVIATIONS FROM TEST STANDARD

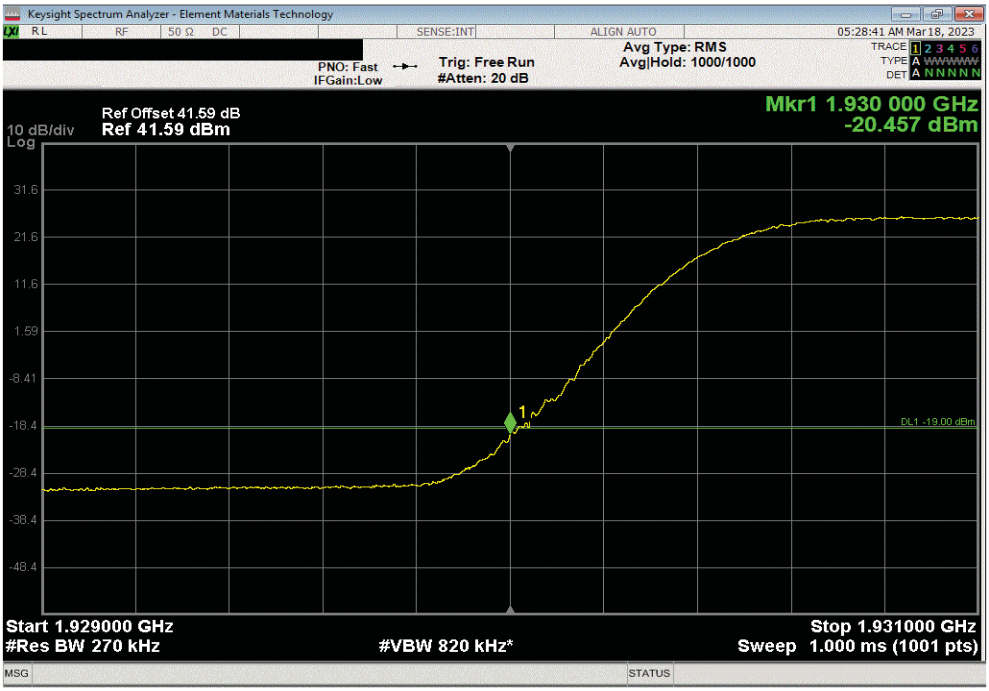
None

Configuration #	NOKI0056-2	Signature

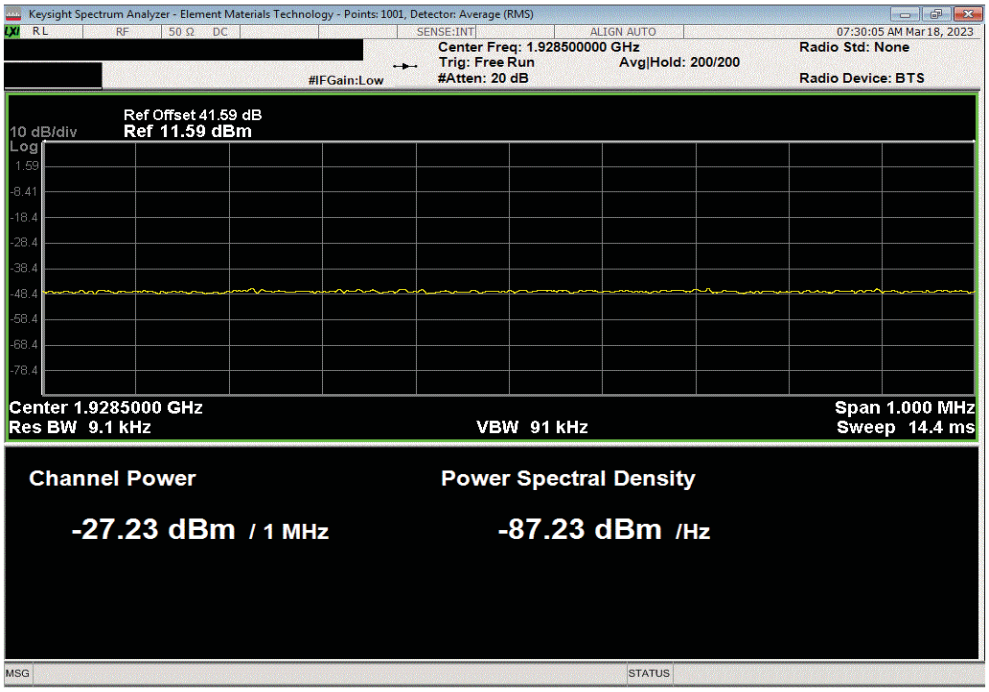
	Frequency Range	Value (dBm)	Limit (dBm)	Result
Band n25 1930 MHz - 1995 MHz, 5G NR				
Port 4				
25 MHz Bandwidth				
QPSK Modulation				
Low Channel 1942.5 MHz	1	-20.46	-19	Pass
Low Channel 1942.5 MHz	2	-27.23	-19	Pass
Low Channel 1942.5 MHz	3	-26.99	-19	Pass
High Channel 1982.5 MHz	1	-26.78	-19	Pass
High Channel 1982.5 MHz	2	-23.94	-19	Pass
High Channel 1982.5 MHz	3	-24.35	-19	Pass
16-QAM Modulation				
Low Channel 1942.5 MHz	1	-22.5	-19	Pass
Low Channel 1942.5 MHz	2	-27.16	-19	Pass
Low Channel 1942.5 MHz	3	-27.79	-19	Pass
High Channel 1982.5 MHz	1	-26.96	-19	Pass
High Channel 1982.5 MHz	2	-24.23	-19	Pass
High Channel 1982.5 MHz	3	-23.92	-19	Pass
64-QAM Modulation				
Low Channel 1942.5 MHz	1	-20.5	-19	Pass
Low Channel 1942.5 MHz	2	-27.05	-19	Pass
Low Channel 1942.5 MHz	3	-27.45	-19	Pass
High Channel 1982.5 MHz	1	-20.41	-19	Pass
High Channel 1982.5 MHz	2	-24.78	-19	Pass
High Channel 1982.5 MHz	3	-19.95	-19	Pass
256-QAM Modulation				
Low Channel 1942.5 MHz	1	-21.95	-19	Pass
Low Channel 1942.5 MHz	2	-27.03	-19	Pass
Low Channel 1942.5 MHz	3	-27.18	-19	Pass
High Channel 1982.5 MHz	1	-20.36	-19	Pass
High Channel 1982.5 MHz	2	-24.21	-19	Pass
High Channel 1982.5 MHz	3	-24.5	-19	Pass

BAND EDGE COMPLIANCE - BAND n25 5G

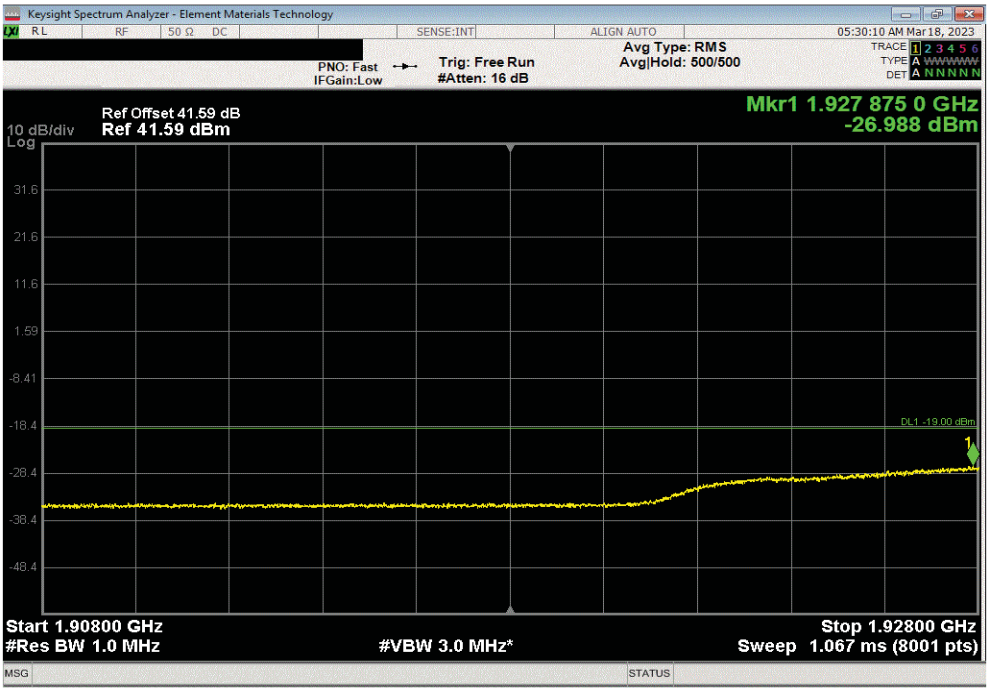
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-20.46	-19	Pass



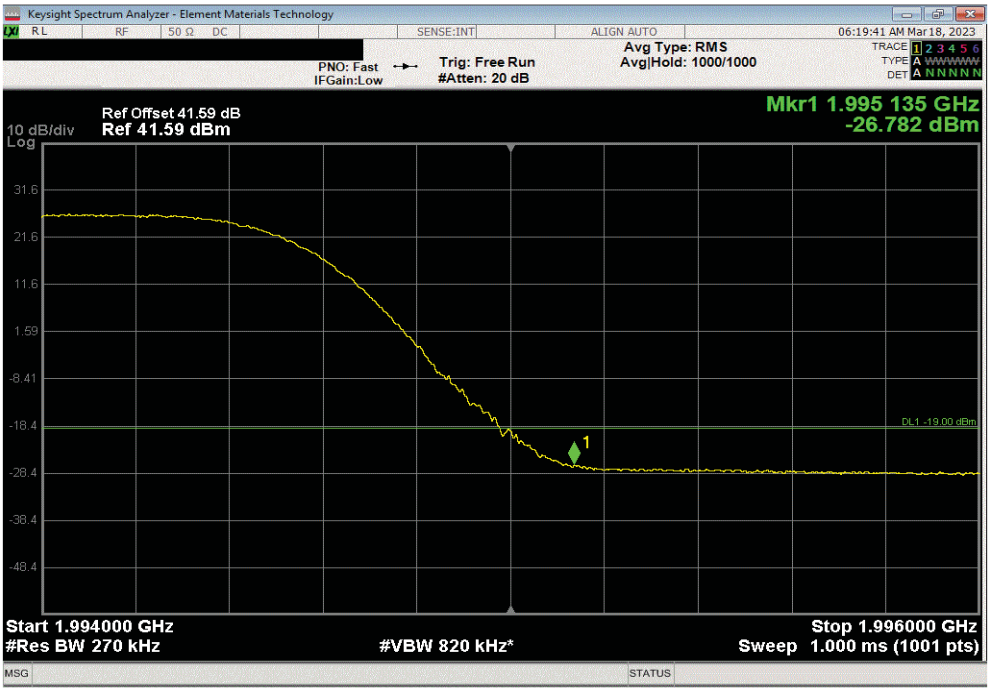
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-27.23	-19	Pass



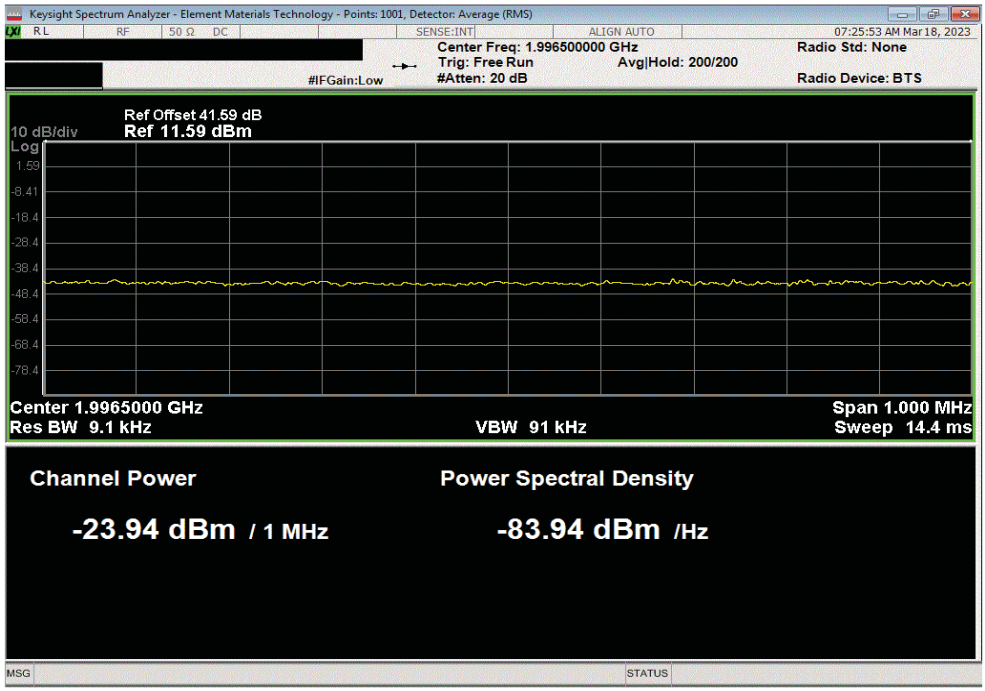
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-26.99	-19	Pass



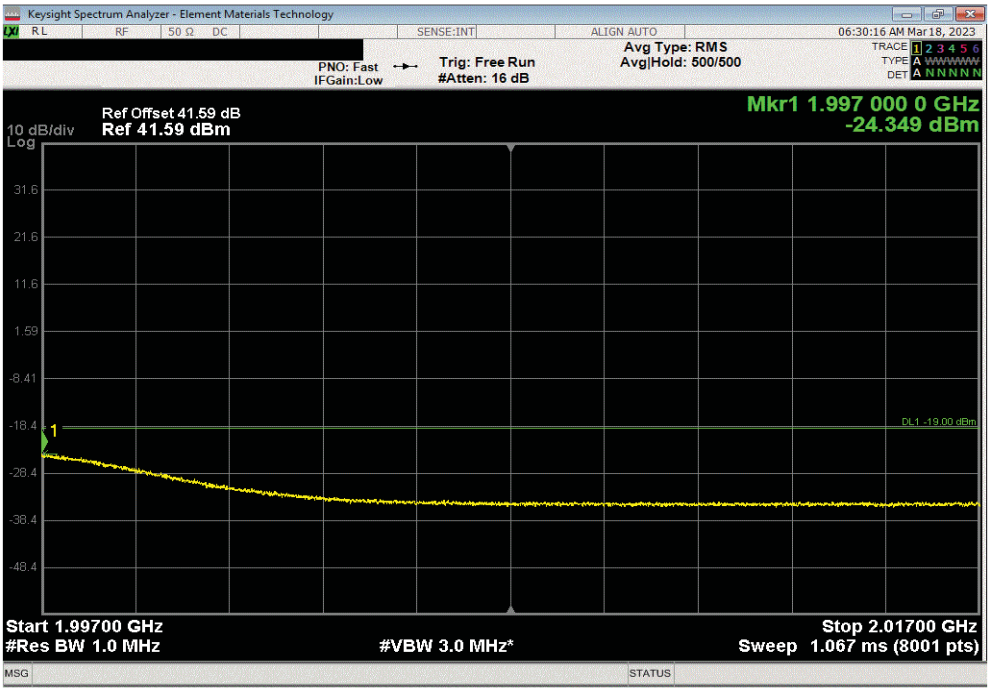
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-26.78	-19	Pass



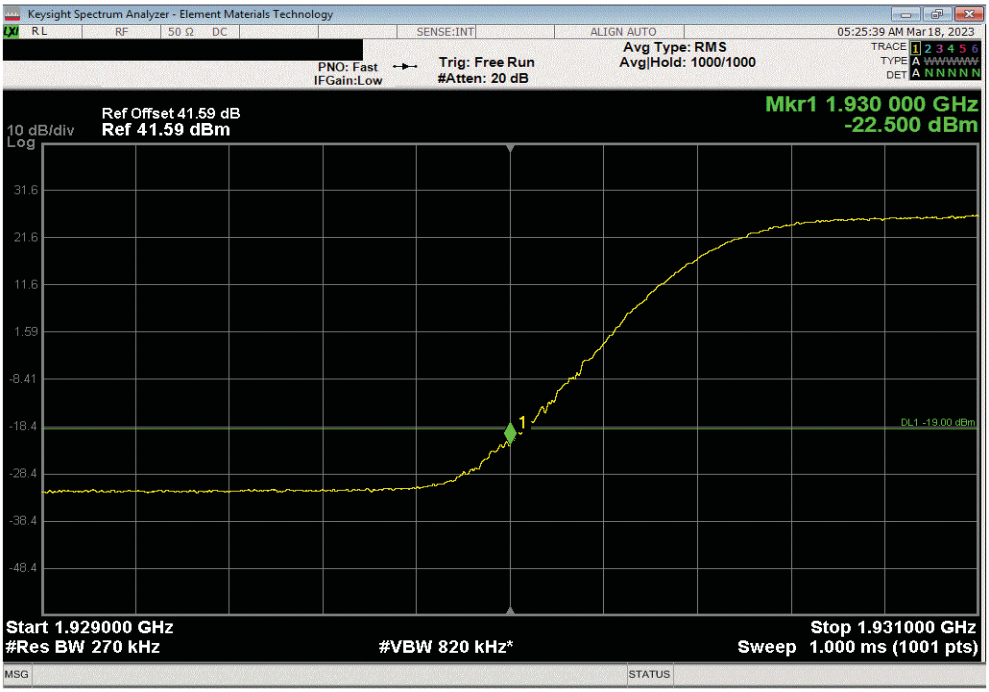
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-23.94	-19	Pass



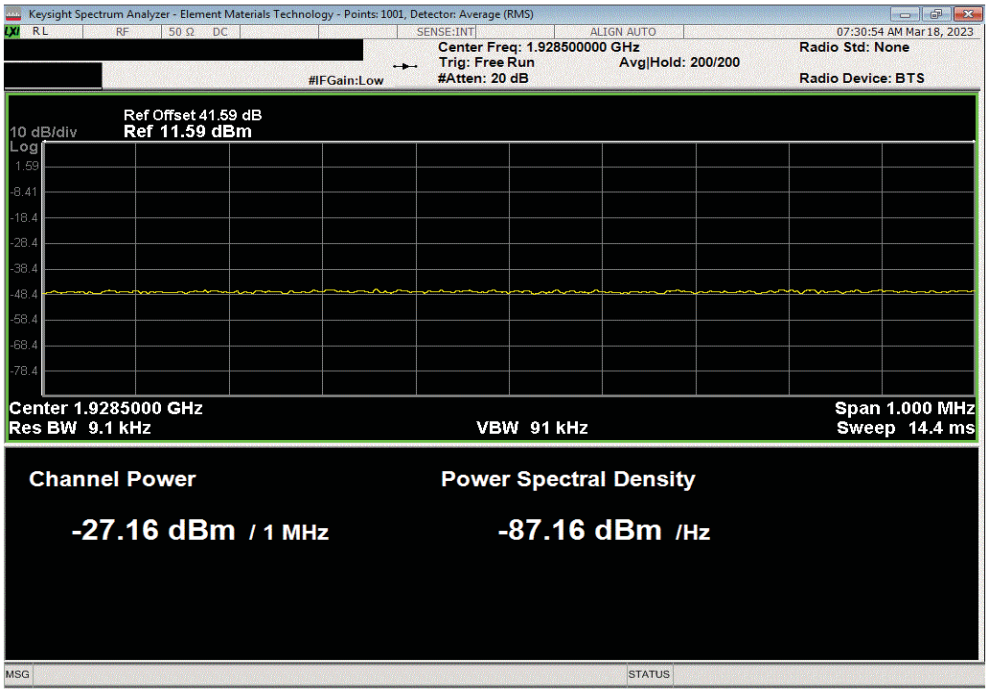
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-24.35	-19	Pass



Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-22.5	-19	Pass

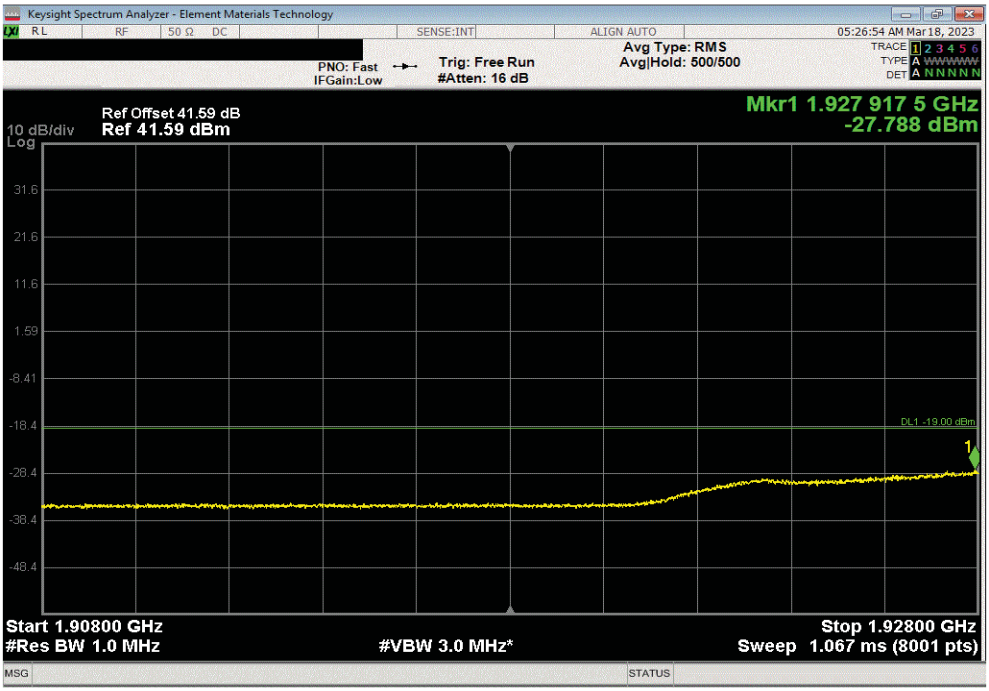


Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-2.72E+01	-19	Pass

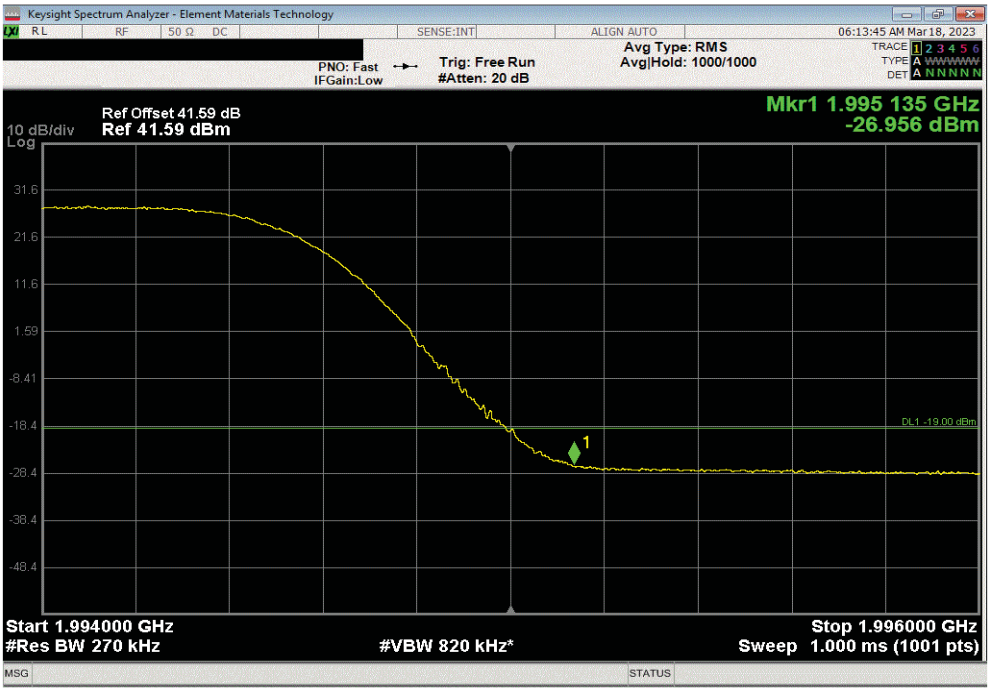


BAND EDGE COMPLIANCE - BAND n25 5G

Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-27.79	-19	Pass

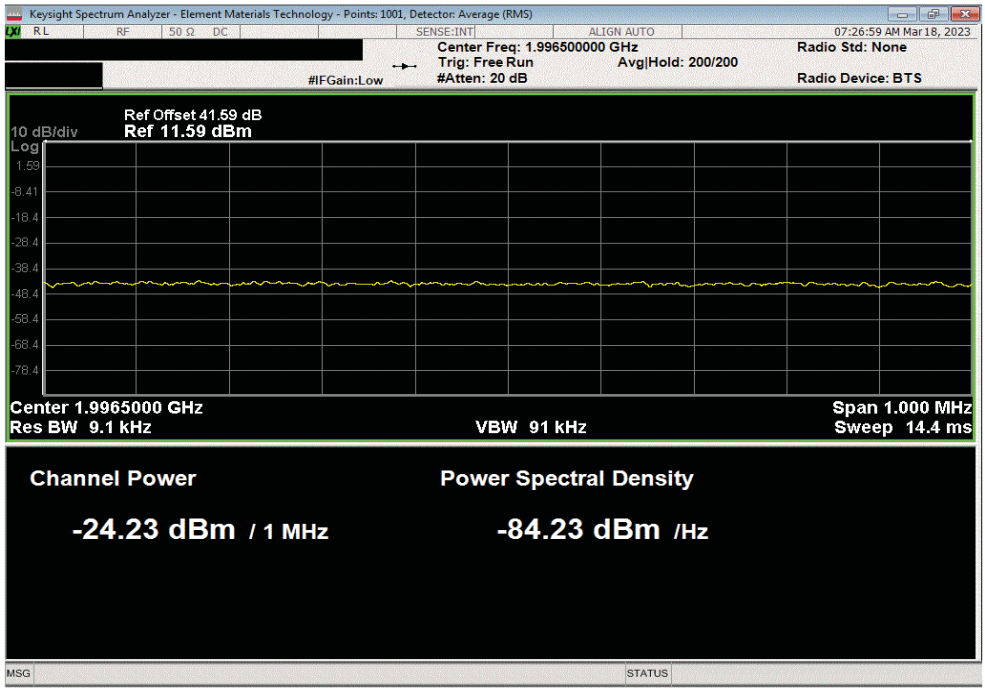


Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-26.96	-19	Pass

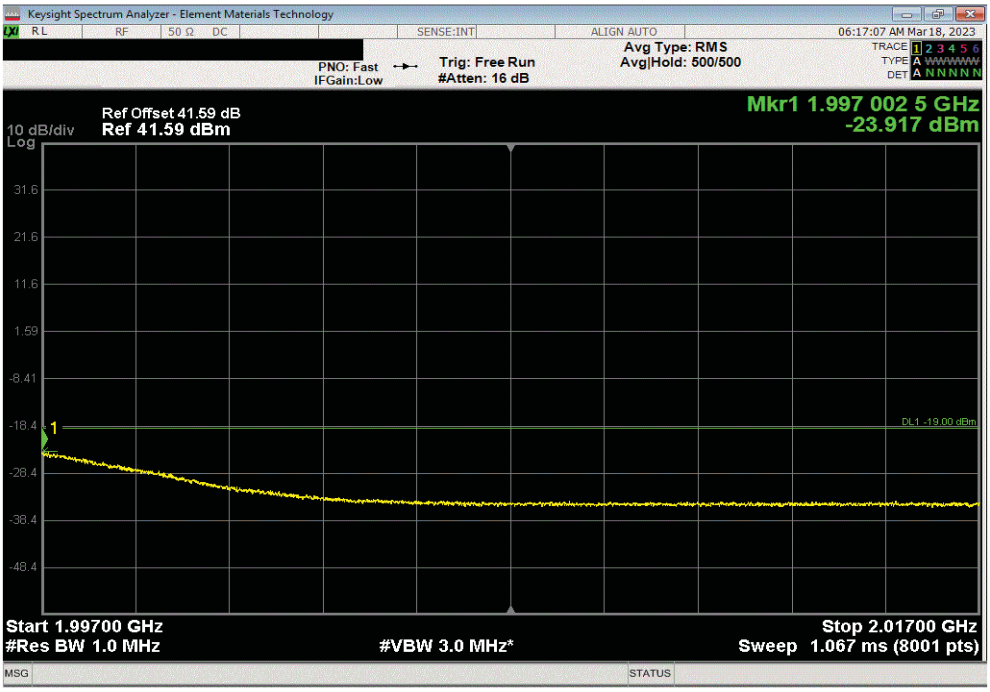


BAND EDGE COMPLIANCE - BAND n25 5G

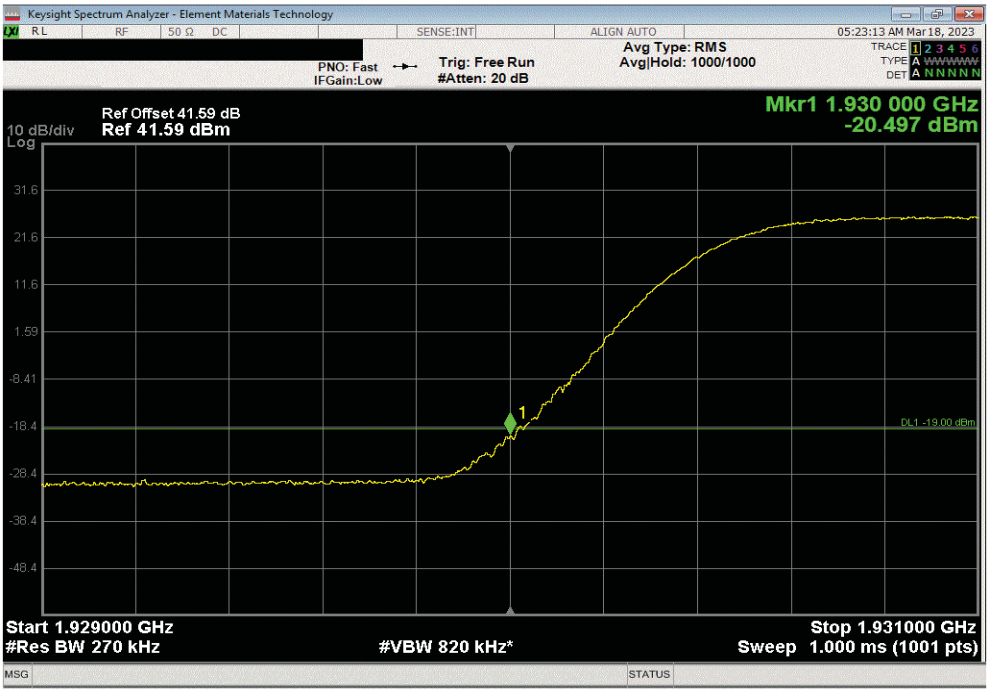
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-24.23	-19	Pass



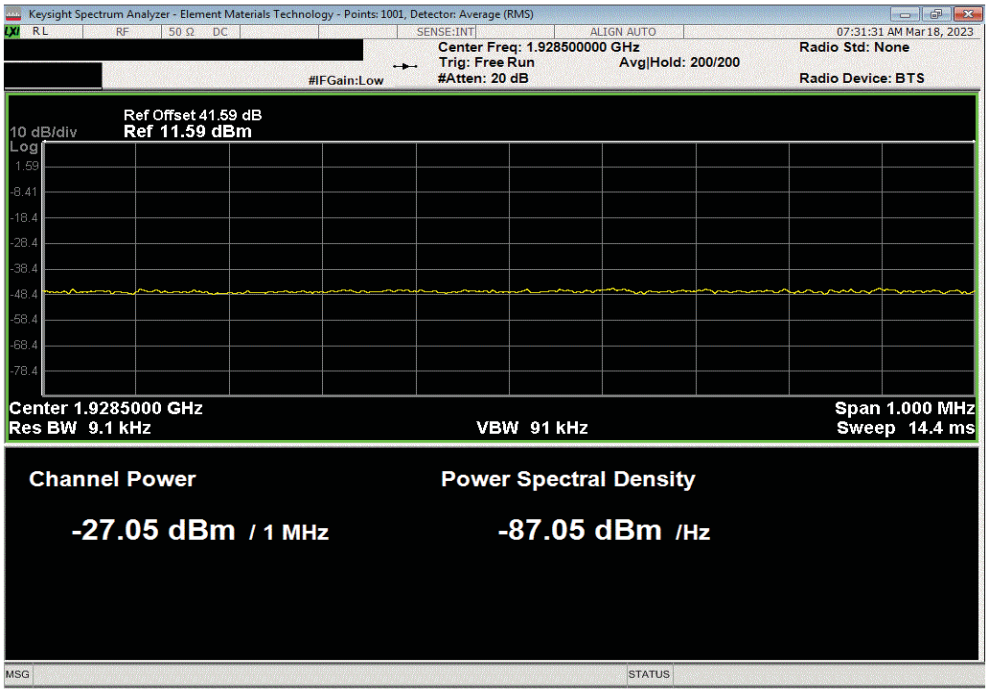
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-23.92	-19	Pass



Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-20.5	-19	Pass

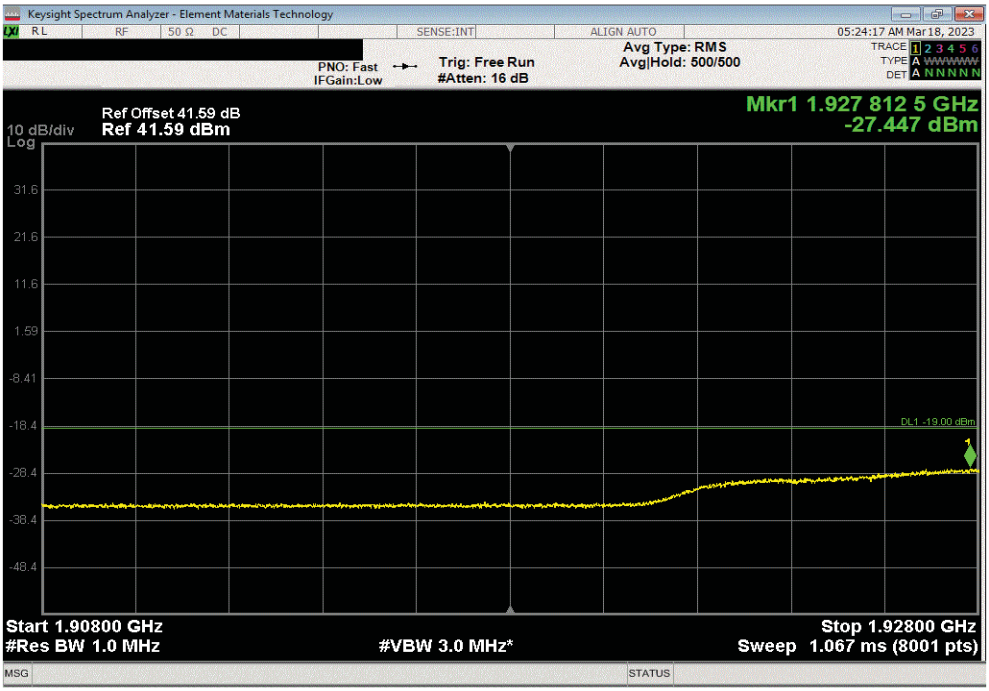


Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-2.71E+01	-19	Pass

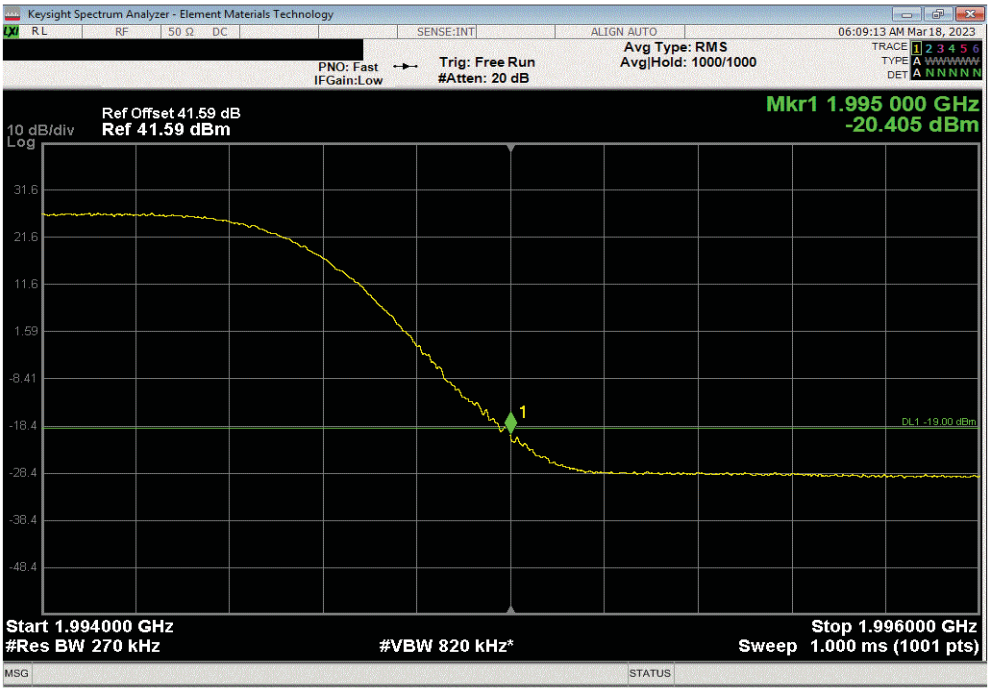


BAND EDGE COMPLIANCE - BAND n25 5G

Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-27.45	-19	Pass

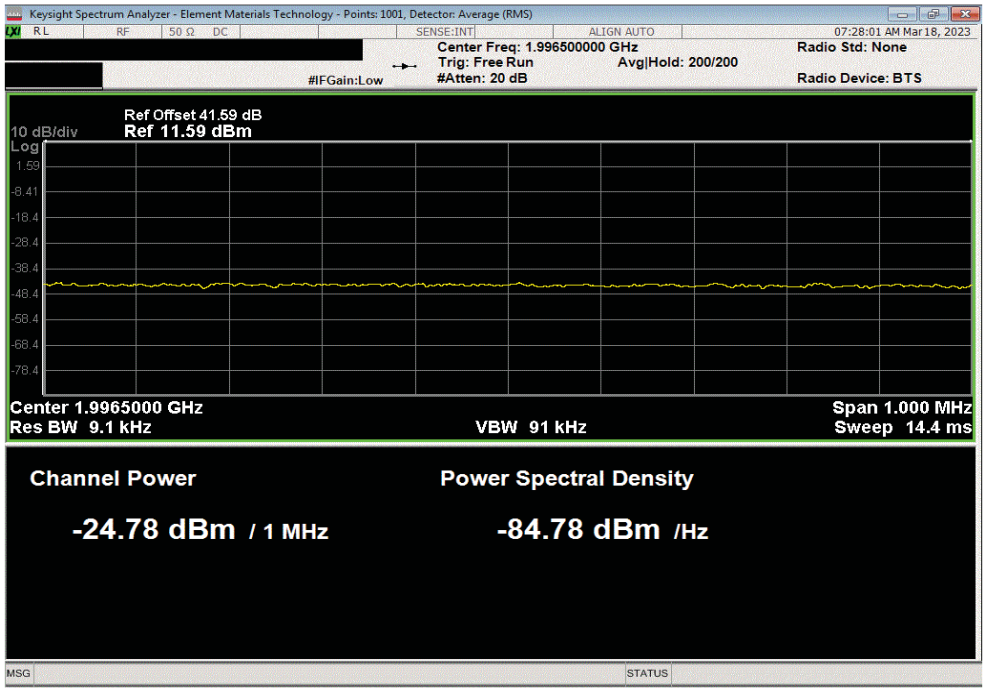


Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 64-QAM Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-20.41	-19	Pass

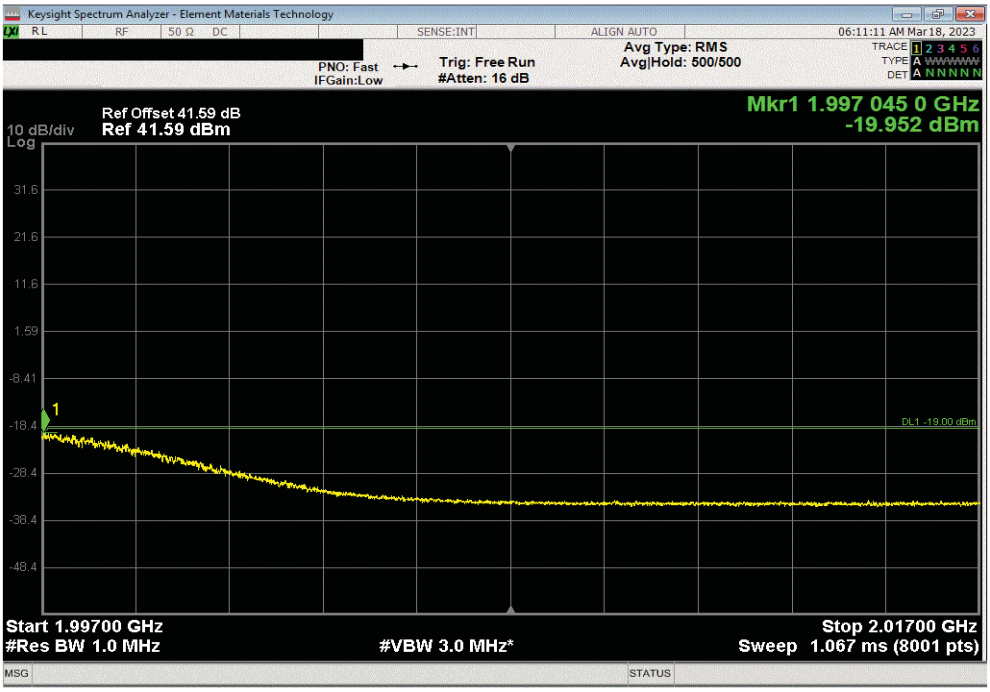


BAND EDGE COMPLIANCE - BAND n25 5G

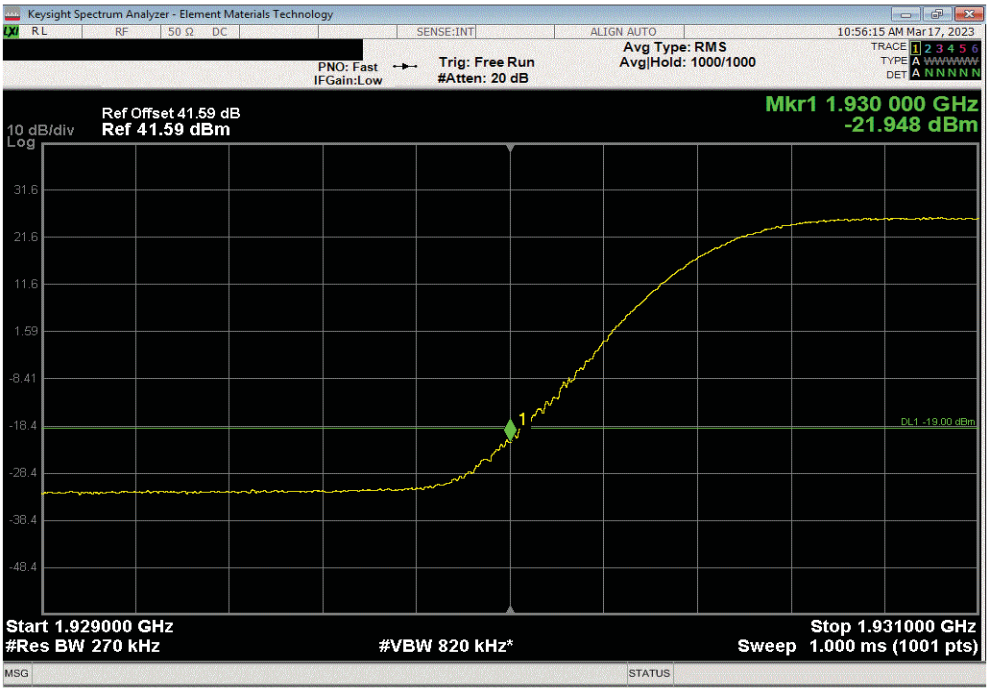
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-24.78	-19	Pass



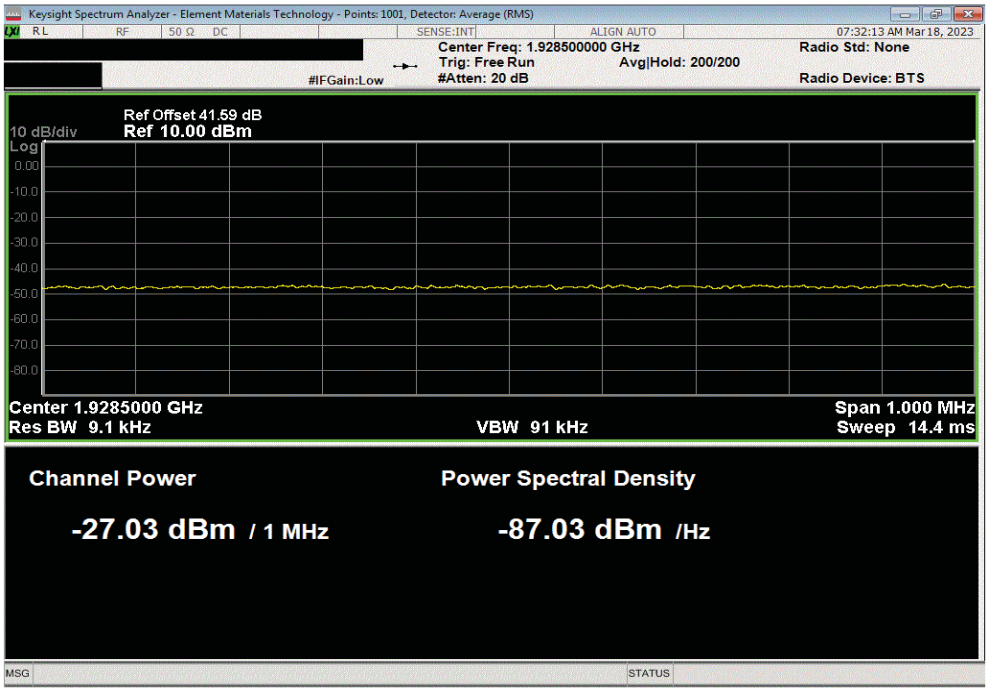
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-19.95	-19	Pass



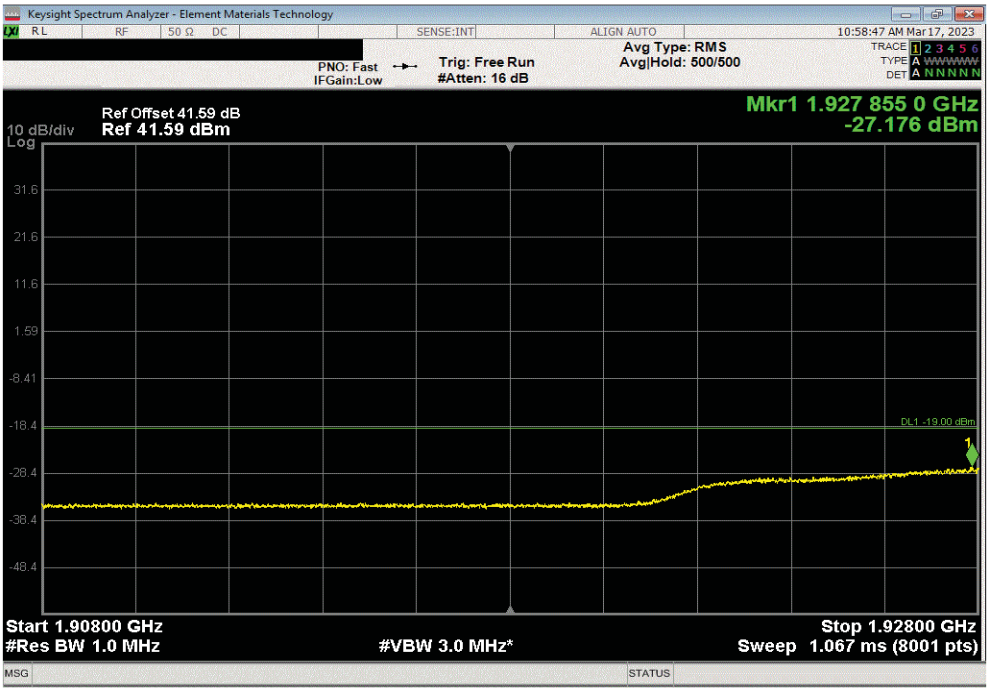
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-21.95	-19	Pass



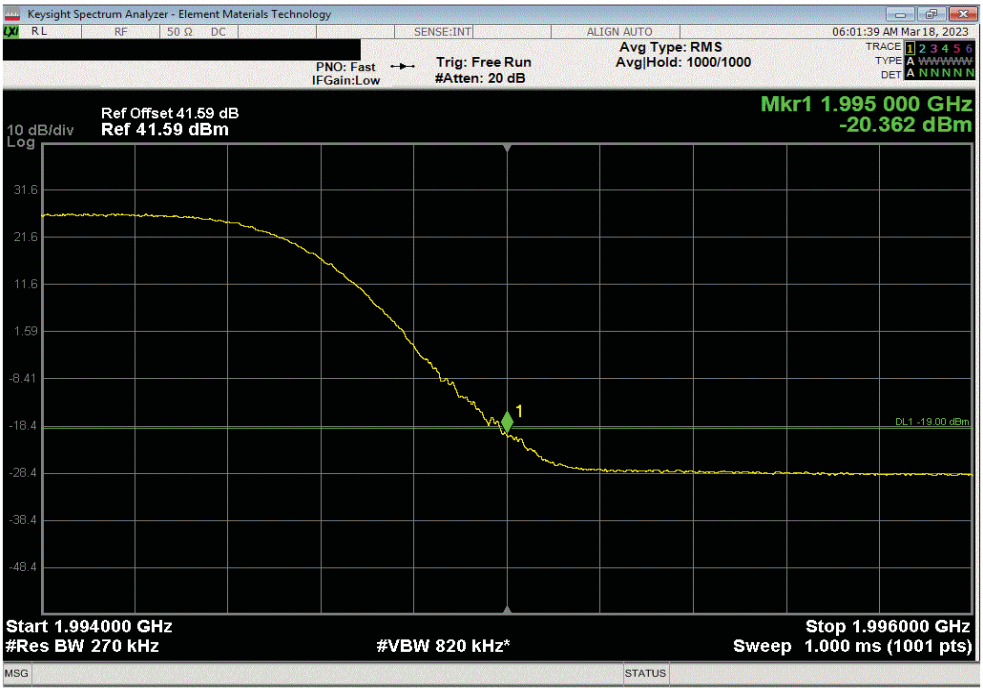
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-27.03	-19	Pass



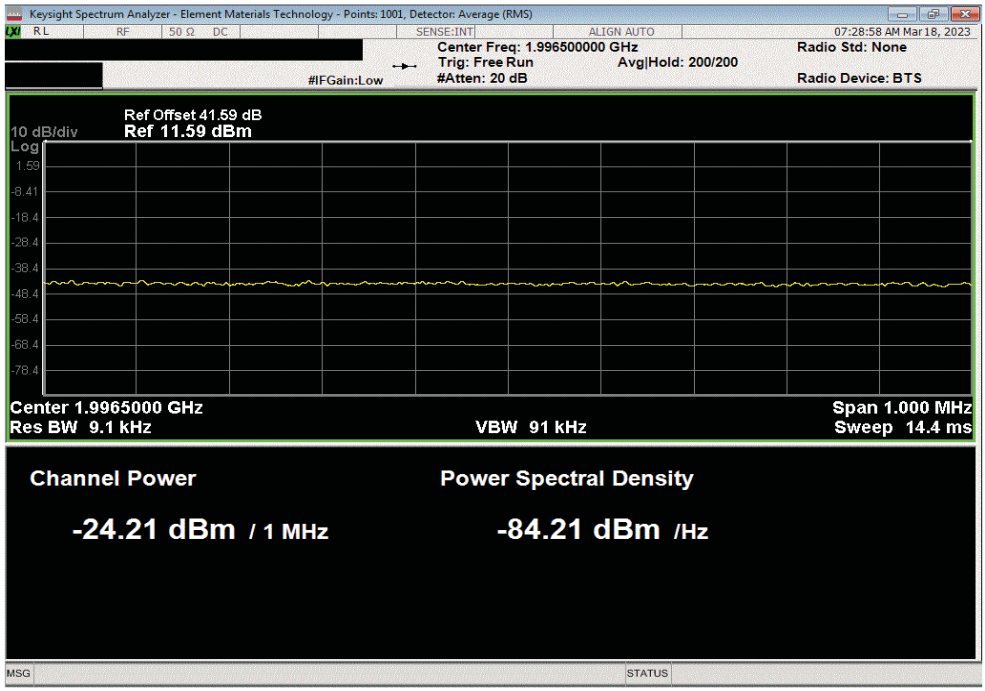
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Low Channel 1942.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-27.18	-19	Pass



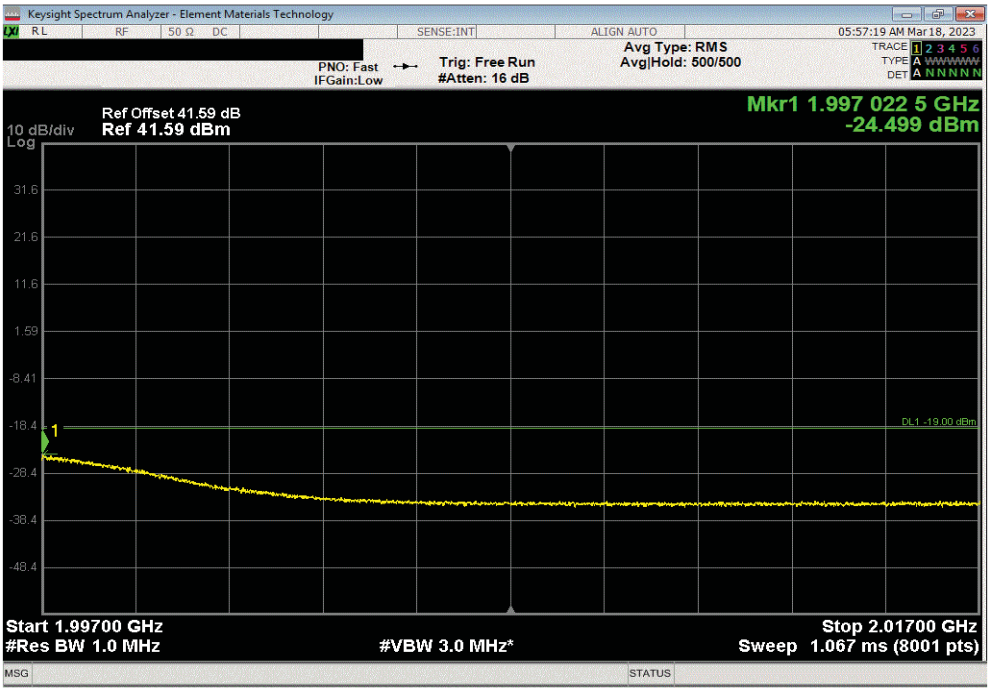
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-20.36	-19	Pass



Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-24.21	-19	Pass



Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, High Channel 1982.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-24.5	-19	Pass



BAND EDGE COMPLIANCE - BAND n66 5G

XMit 2023.02.14.0

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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Attenuator	Fairview Microwave	SA18E 1648	TZW	2022-09-13	2023-09-13

TEST DESCRIPTION

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 in 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.

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

All limits were adjusted by a factor of [-10*log(4)] dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911.

Per FCC 27.53(h) and RSS-139 6.6 the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

Per FCC 27.53(h) and RSS-139 6.6 emissions seen up to 1 MHz outside of authorized operating frequency range band edges shell be measured with a RBW of 1% of the measured emission bandwidth. Any emission seen to be > 1 MHz further outside the band edges shall be measured with a RBW of 1 MHz. However, a narrower RBW of at least 1% of the emission bandwidth is still allowed provided that the measured power is integrated over the full reference bandwidth of 1 MHz.

RF conducted emissions testing was performed on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification testing) and antenna port 4 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.

BAND EDGE COMPLIANCE - BAND n66 5G

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	Airscale Base Transceiver Station Remote Radio Head Model AHFIB			Work Order:	NOKI0056
Serial Number:	K9181401111			Date:	03/17/23
Customer:	Nokia of America Corporation			Temperature:	23.5°C
Attendees:	David Le, Mitchel Hill			Humidity:	27%
Project:	None			Barometric Pres.:	991.1 mbar
Tested by:	Brandon Hobbs	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023	ANSI C63.26:2015
RSS-139 Issue 4:2022	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n66 carriers are enabled as maximum power (40 watts/carrier).

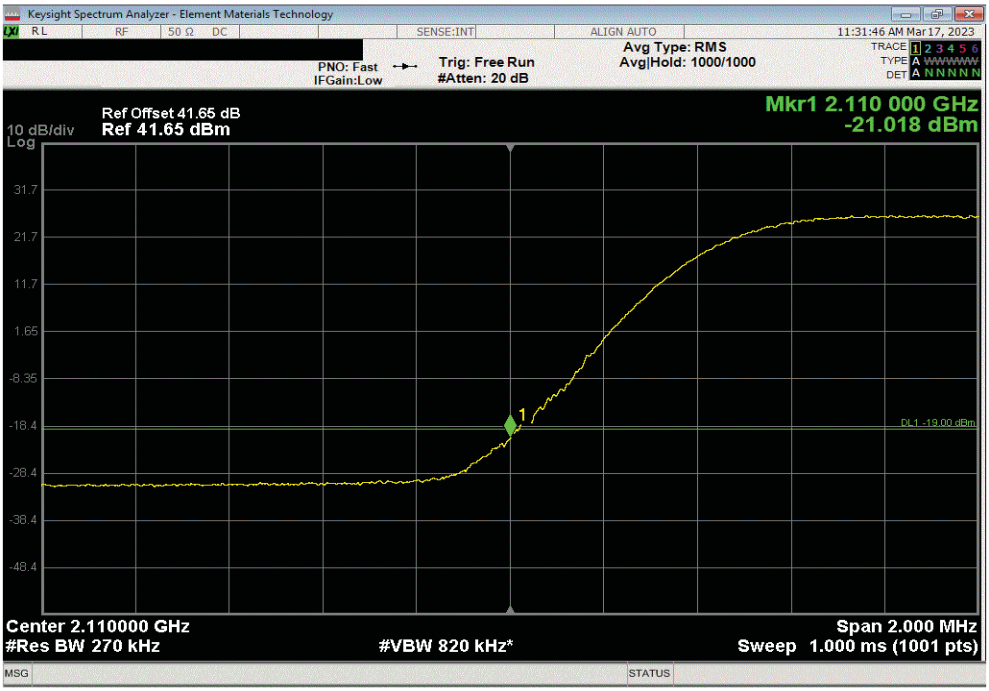
DEVIATIONS FROM TEST STANDARD

None

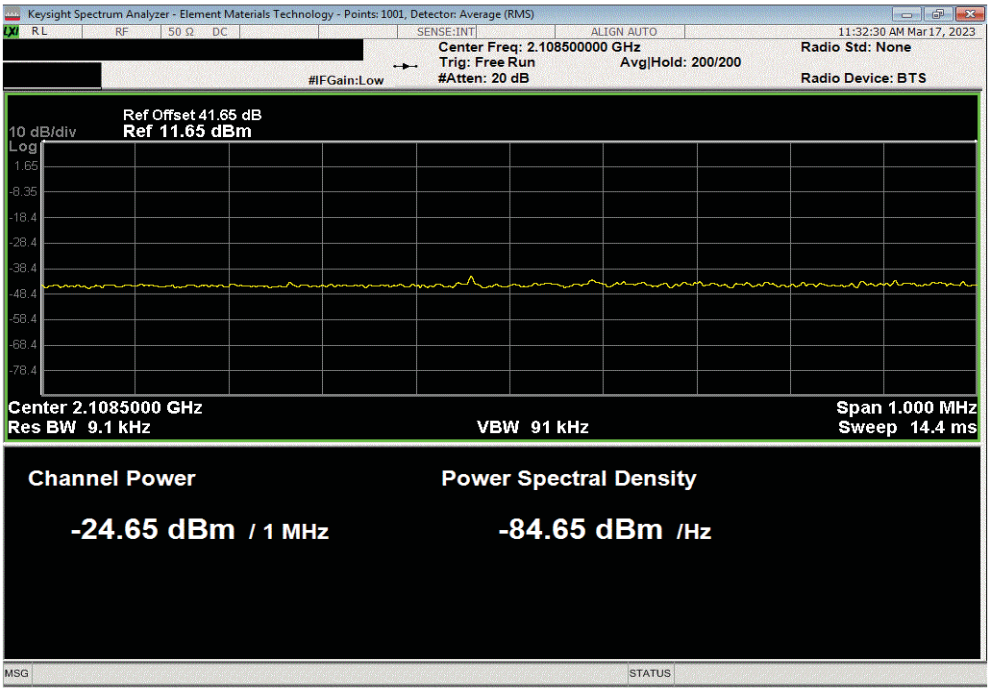
Configuration #	NOKI0056-2	Signature

		Frequency Range	Value (dBm)	Limit (dBm)	Result
Band n66 2110 MHz - 2200 MHz, 5G NR					
Port 4					
25 MHz Bandwidth					
QPSK Modulation					
	Low Channel 2122.5 MHz	1	-21.02	-19	Pass
	Low Channel 2122.5 MHz	2	-24.65	-19	Pass
	Low Channel 2122.5 MHz	3	-27.01	-19	Pass
	High Channel 2187.5 MHz	1	-24.03	-19	Pass
	High Channel 2187.5 MHz	2	-20.06	-19	Pass
	High Channel 2187.5 MHz	3	-20.24	-19	Pass
16-QAM Modulation					
	Low Channel 2122.5 MHz	1	-20.01	-19	Pass
	Low Channel 2122.5 MHz	2	-26.49	-19	Pass
	Low Channel 2122.5 MHz	3	-25.93	-19	Pass
	High Channel 2187.5 MHz	1	-24.45	-19	Pass
	High Channel 2187.5 MHz	2	-19.95	-19	Pass
	High Channel 2187.5 MHz	3	-20.36	-19	Pass
64-QAM Modulation					
	Low Channel 2122.5 MHz	1	-20.52	-19	Pass
	Low Channel 2122.5 MHz	2	-26.31	-19	Pass
	Low Channel 2122.5 MHz	3	-27.24	-19	Pass
	High Channel 2187.5 MHz	1	-24.47	-19	Pass
	High Channel 2187.5 MHz	2	-20.03	-19	Pass
	High Channel 2187.5 MHz	3	-20.66	-19	Pass
256-QAM Modulation					
	Low Channel 2122.5 MHz	1	-20.43	-19	Pass
	Low Channel 2122.5 MHz	2	-26.21	-19	Pass
	Low Channel 2122.5 MHz	3	-24.15	-19	Pass
	High Channel 2187.5 MHz	1	-24.17	-19	Pass
	High Channel 2187.5 MHz	2	-20.20	-10	Pass
	High Channel 2187.5 MHz	3	-20.67	-19	Pass

Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-21.02	-19	Pass

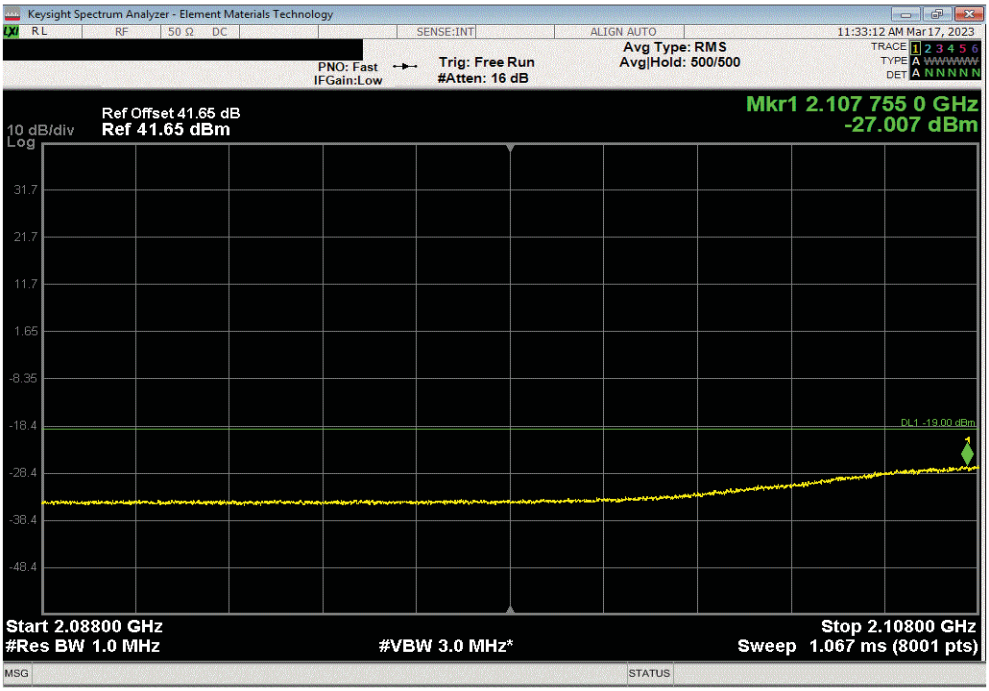


Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-24.65	-19	Pass

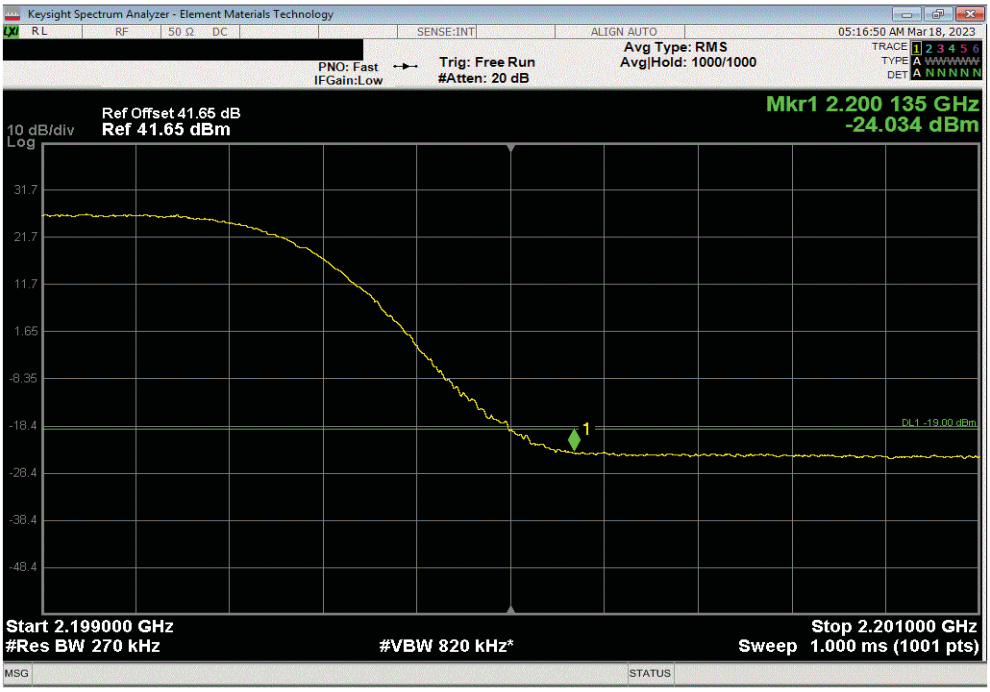


BAND EDGE COMPLIANCE - BAND n66 5G

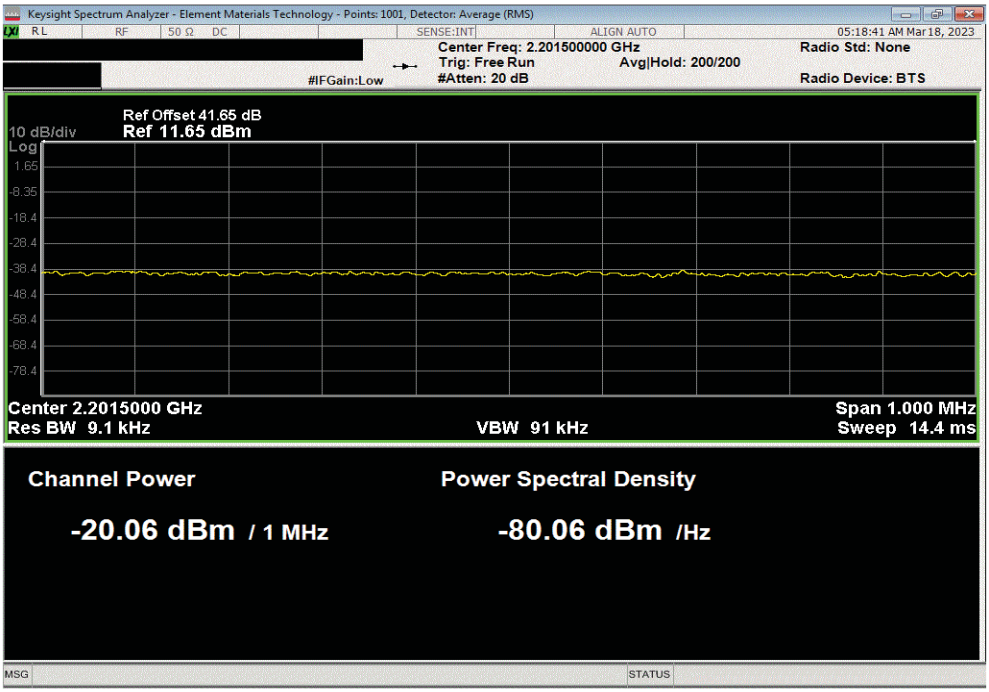
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-27.01	-19	Pass



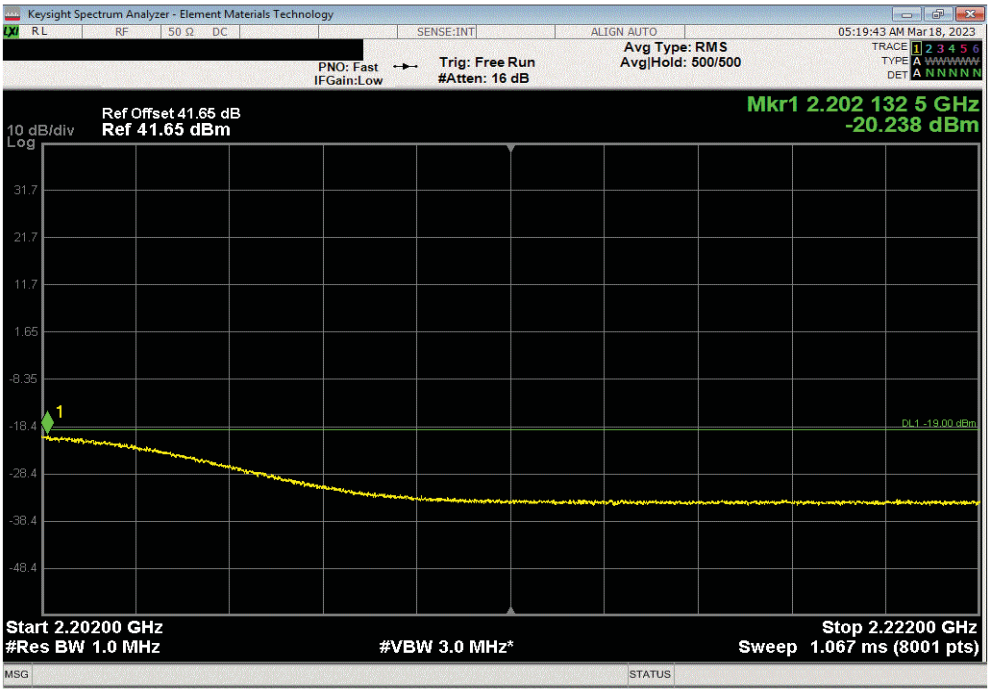
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-24.03	-19	Pass



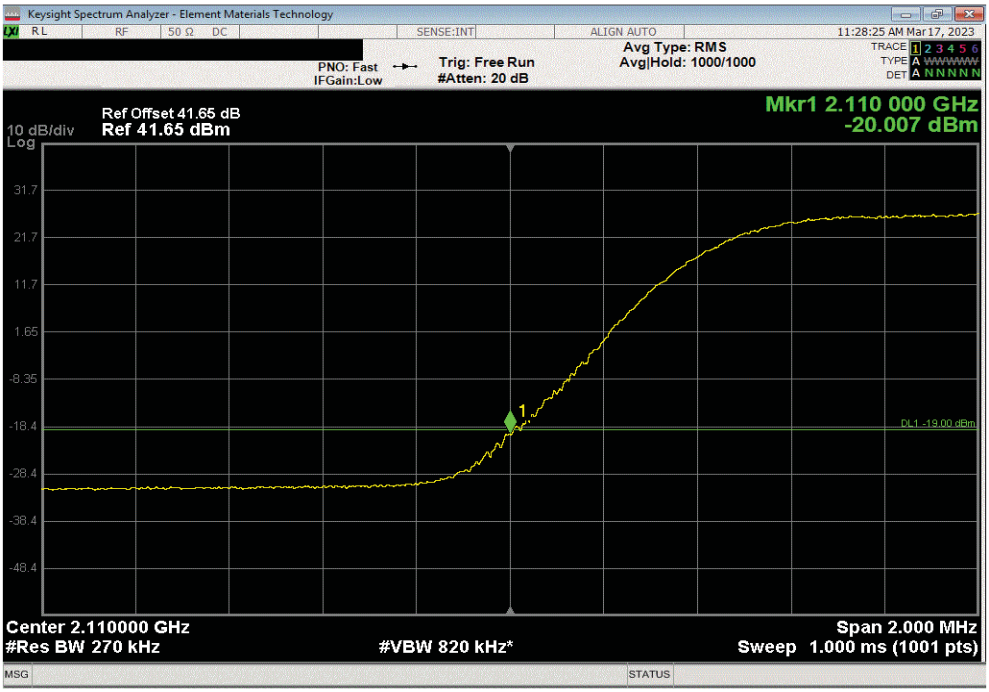
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-20.06	-19	Pass



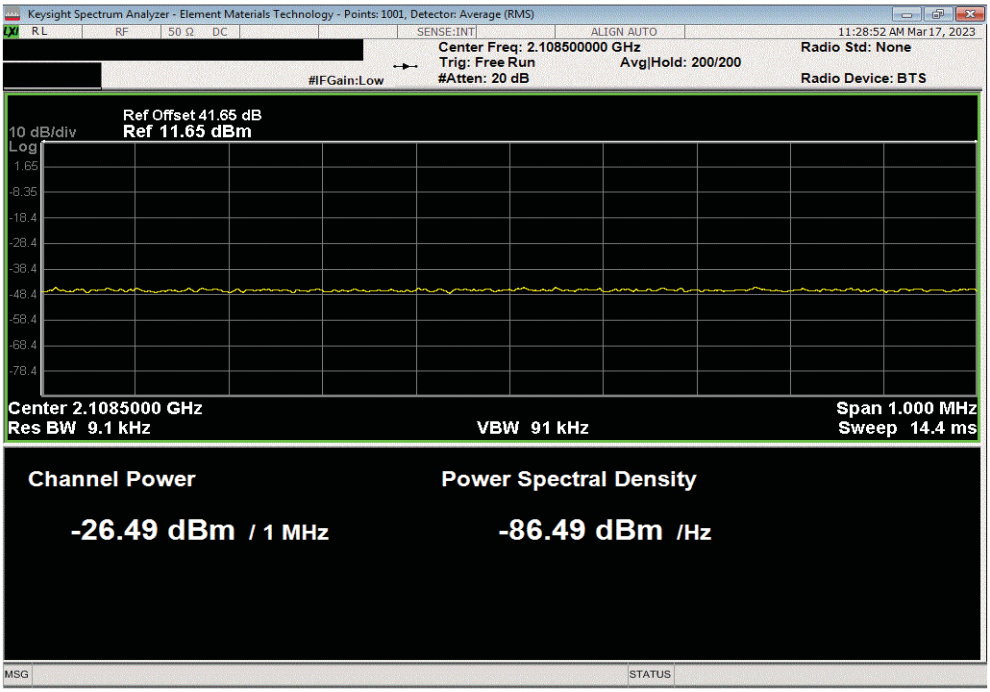
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-20.24	-19	Pass



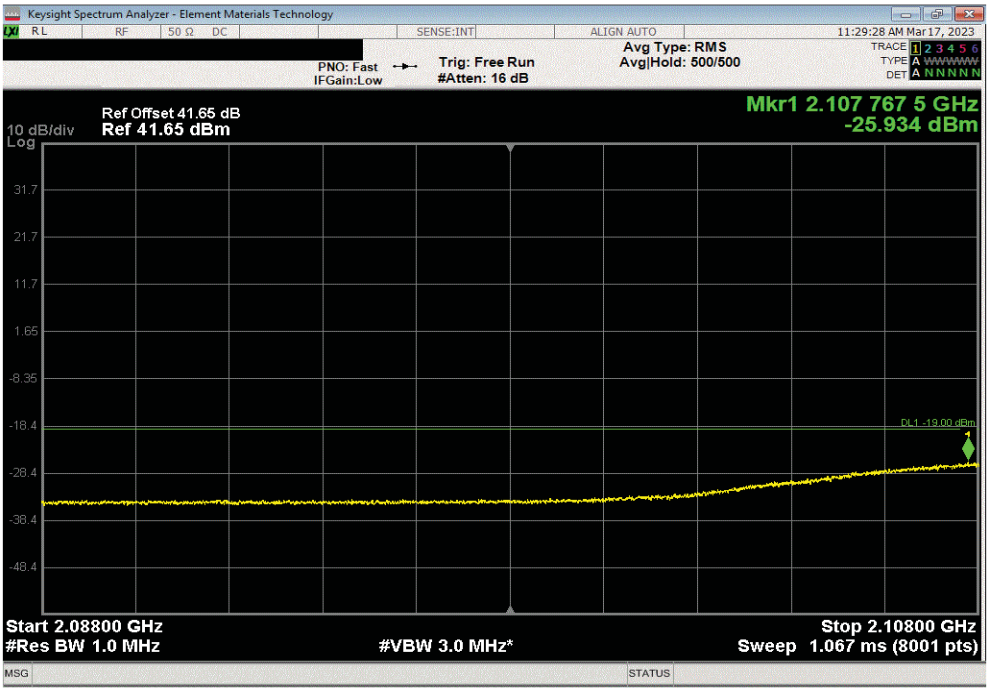
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-20.01	-19	Pass



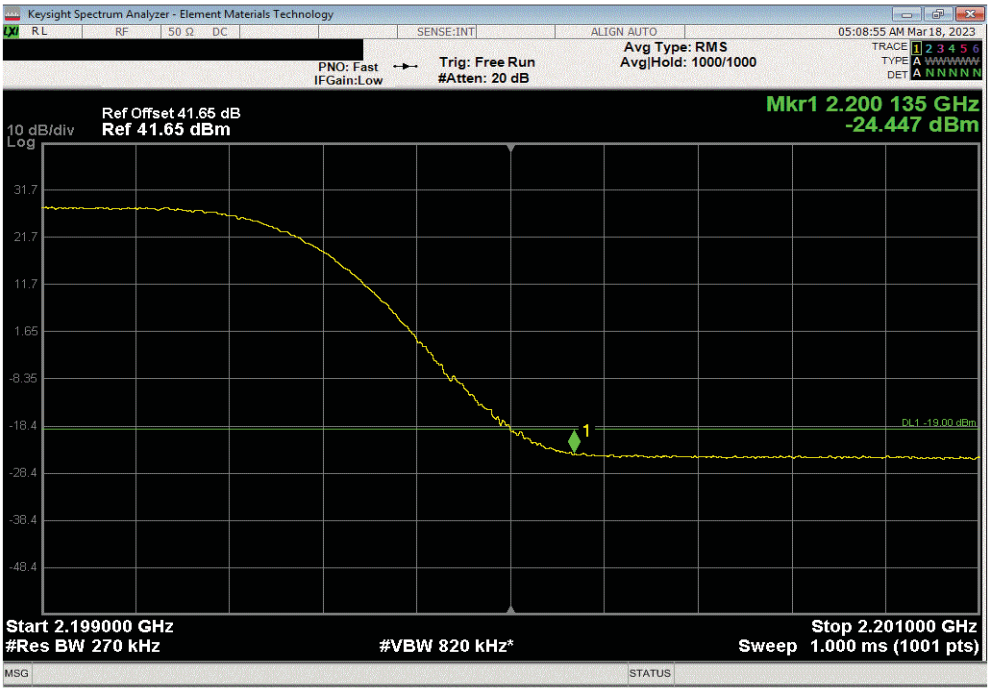
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-2.65E+01	-19	Pass



Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-25.93	-19	Pass

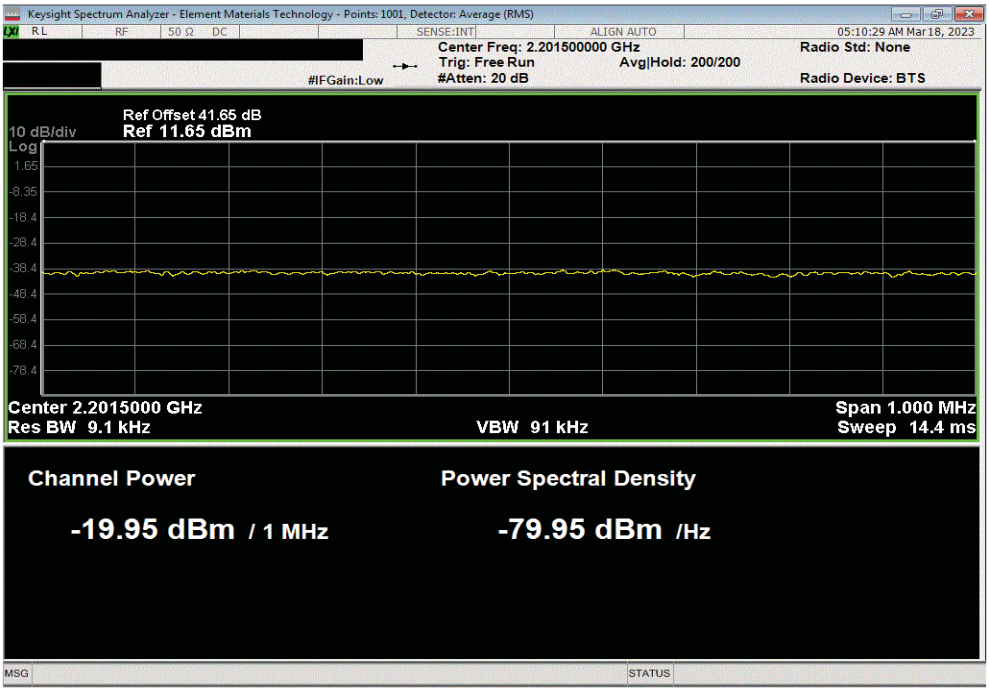


Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-24.45	-19	Pass

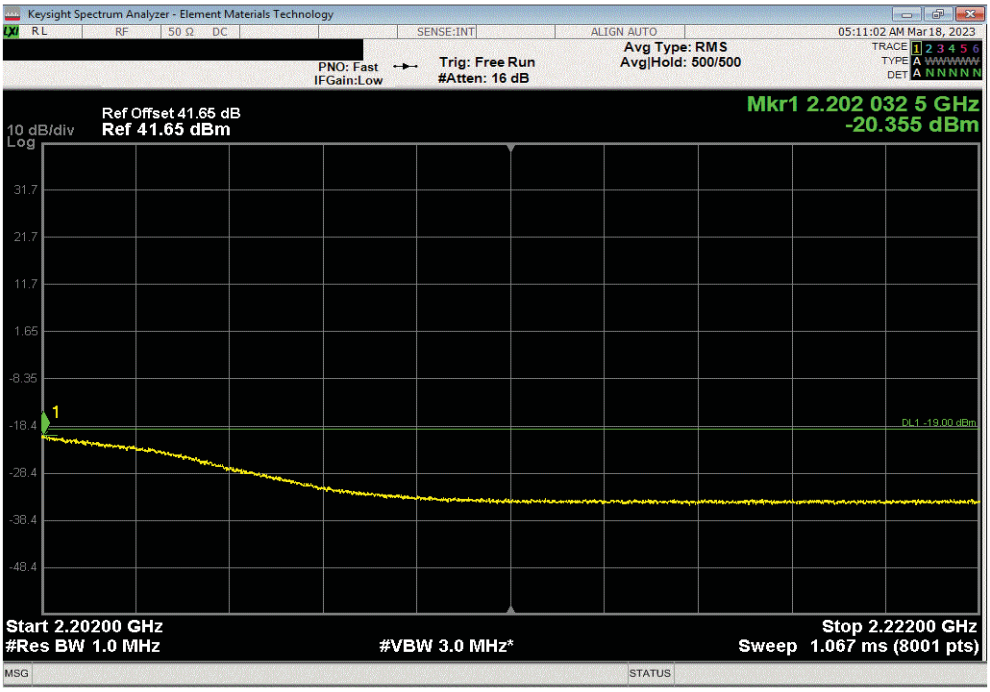


BAND EDGE COMPLIANCE - BAND n66 5G

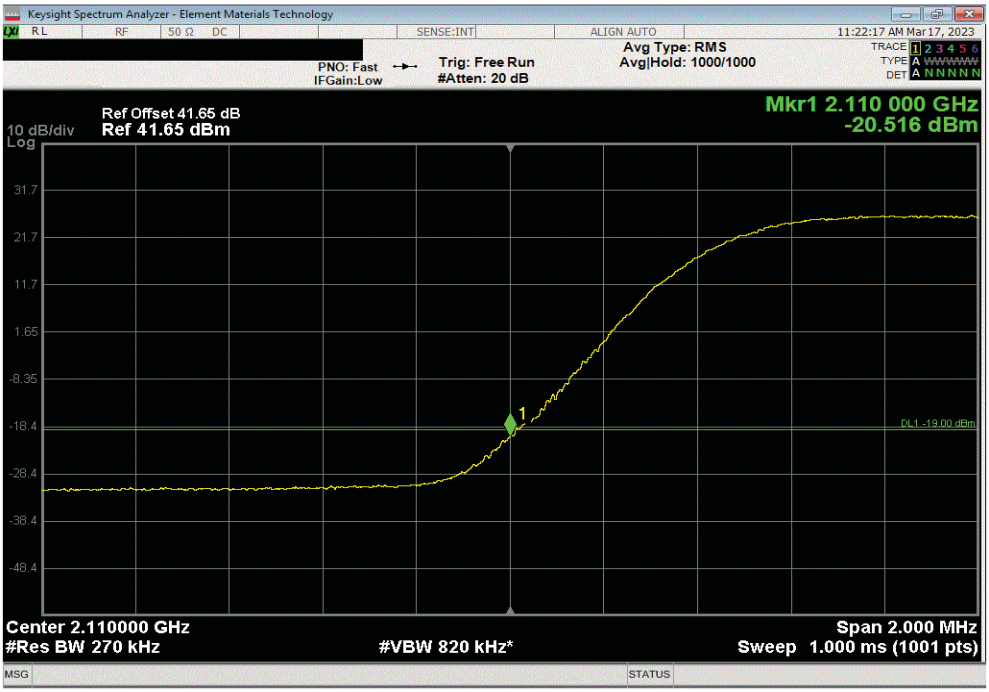
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-19.95	-19	Pass



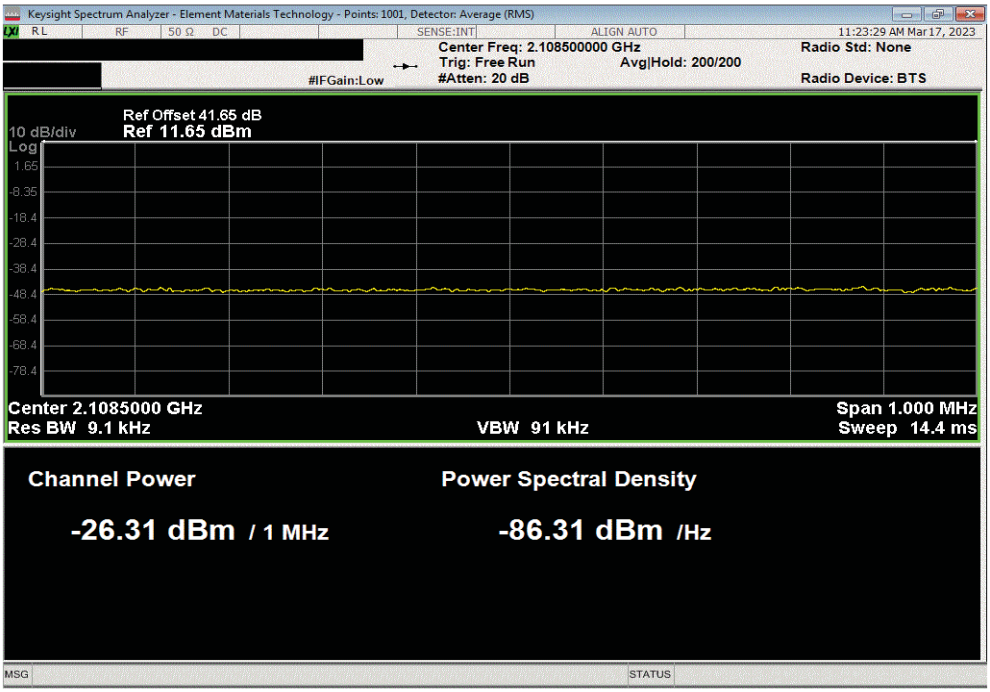
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-20.36	-19	Pass



Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-20.52	-19	Pass

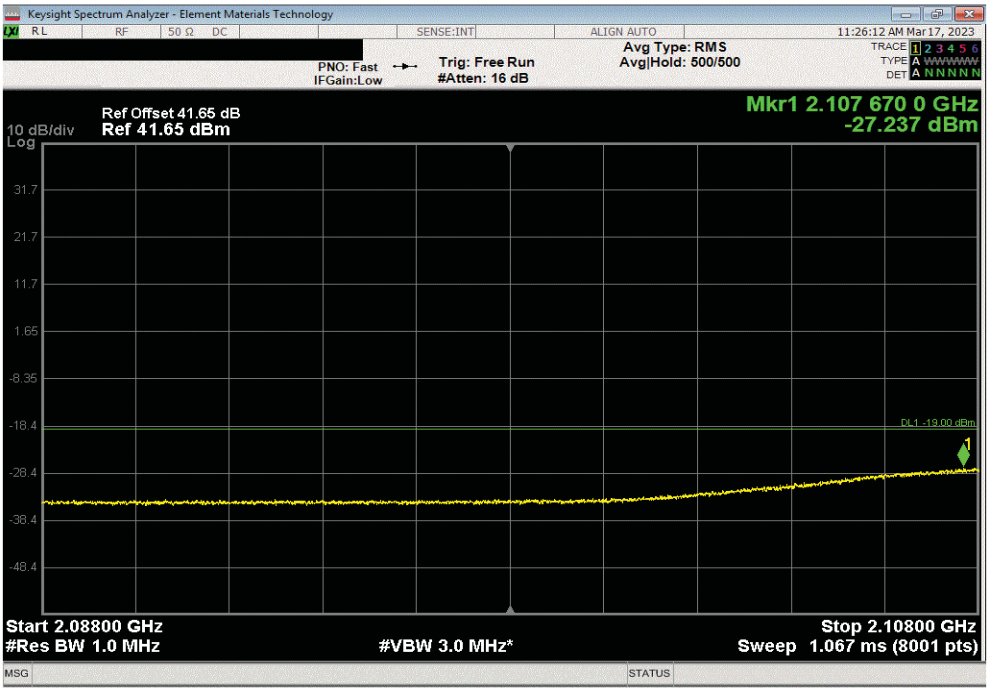


Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-2.63E+01	-19	Pass



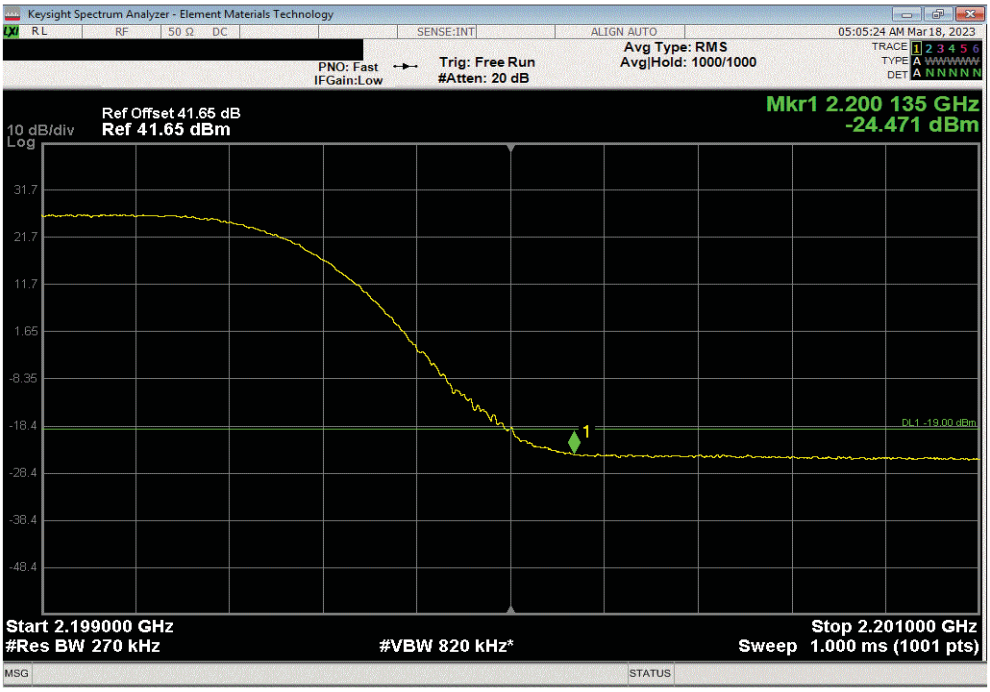
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, Low Channel 2122.5 MHz

	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-27.24	-19	Pass

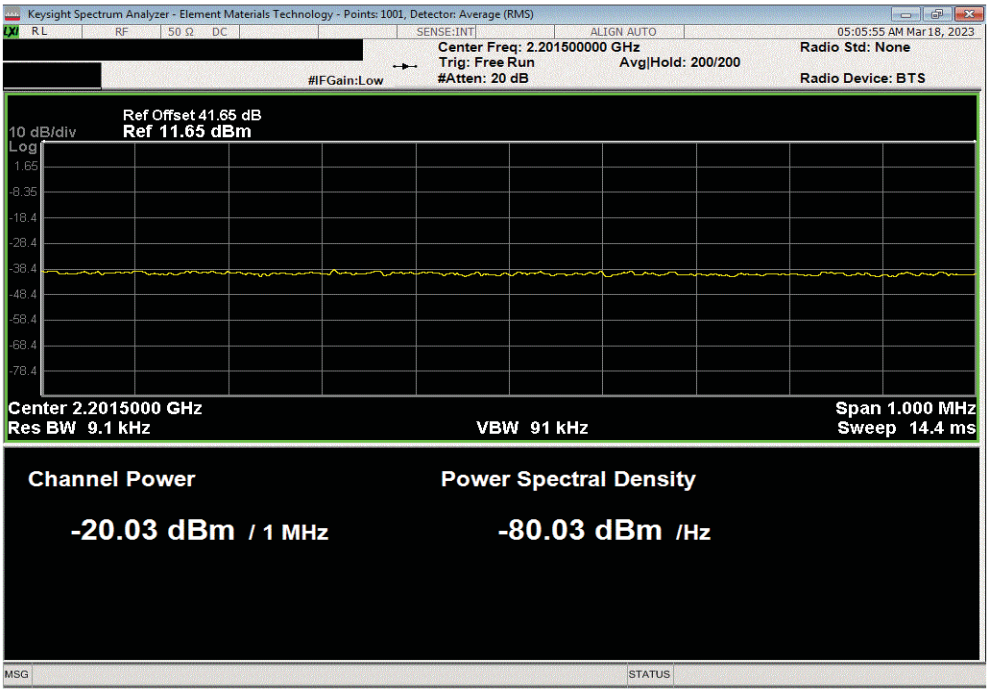


Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, High Channel 2187.5 MHz

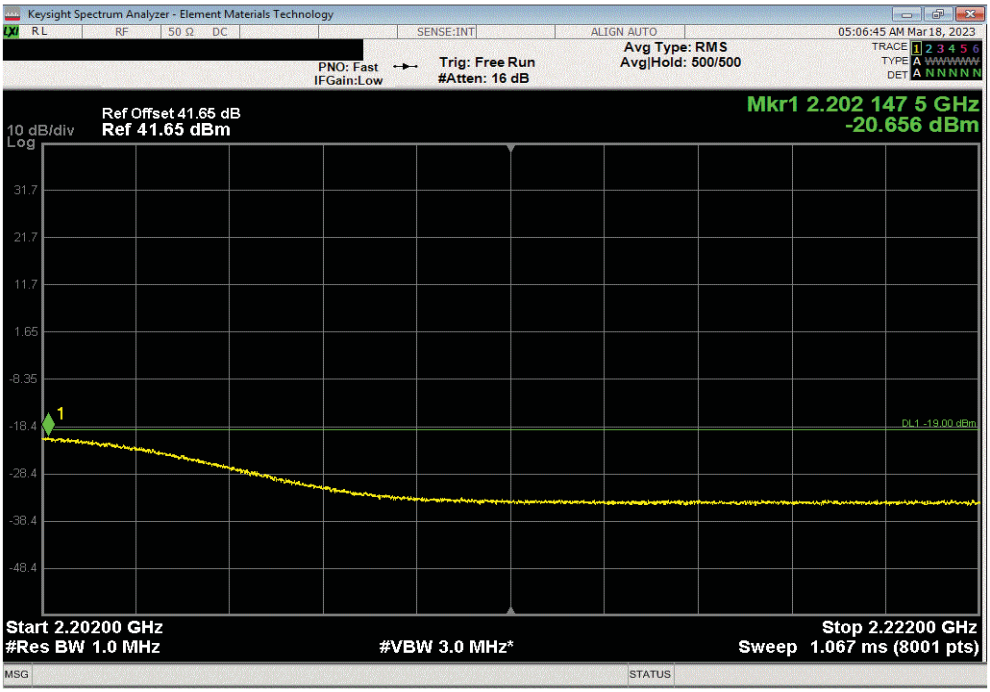
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-24.47	-19	Pass



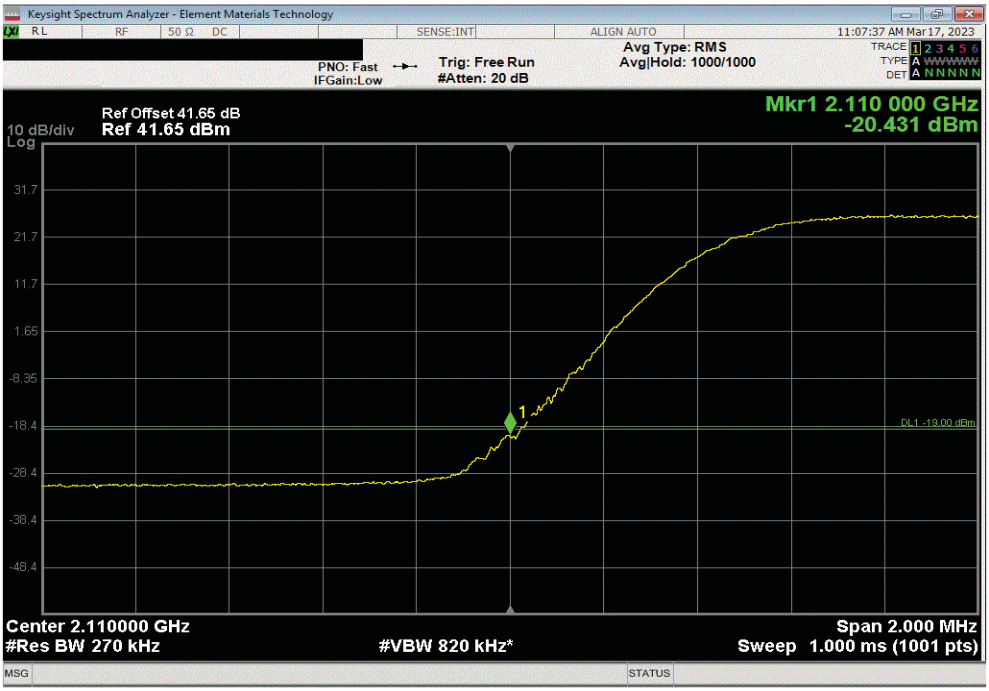
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-20.03	-19	Pass



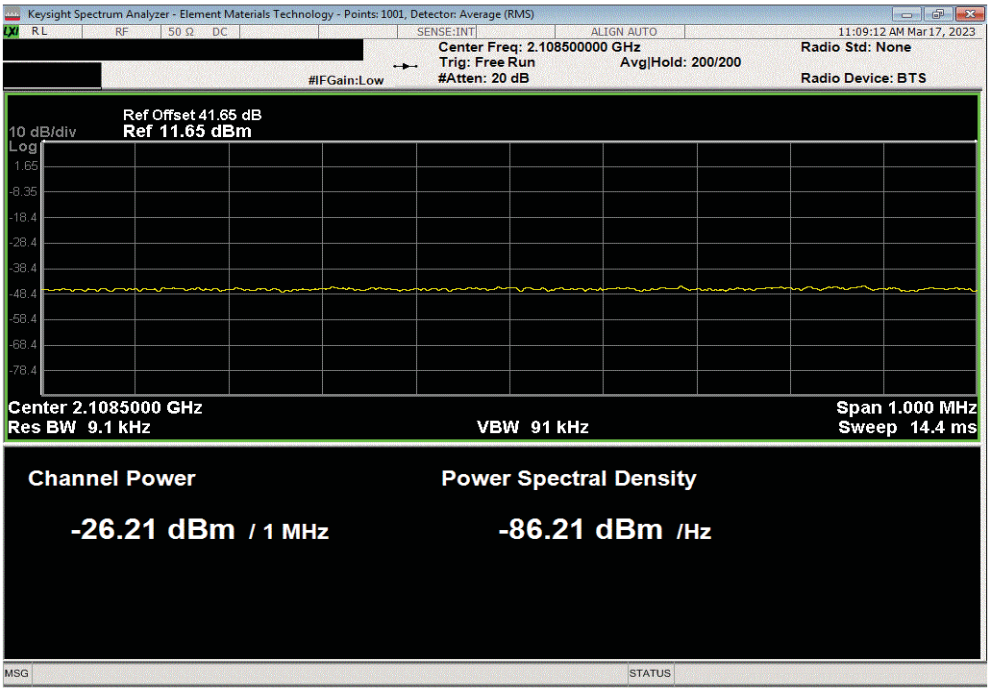
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-20.66	-19	Pass



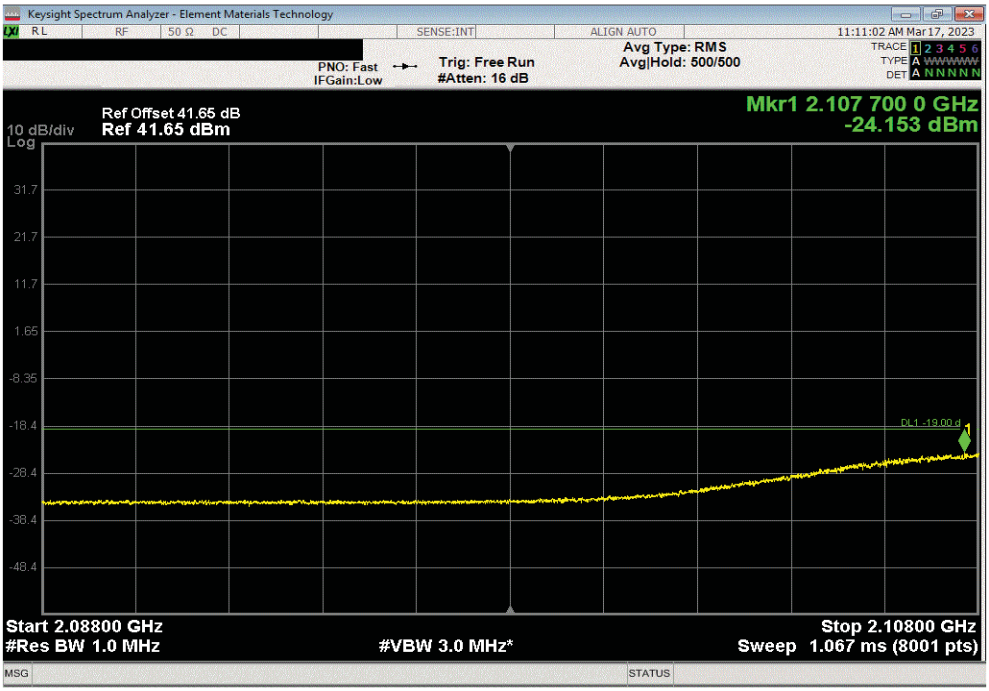
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-20.43	-19	Pass



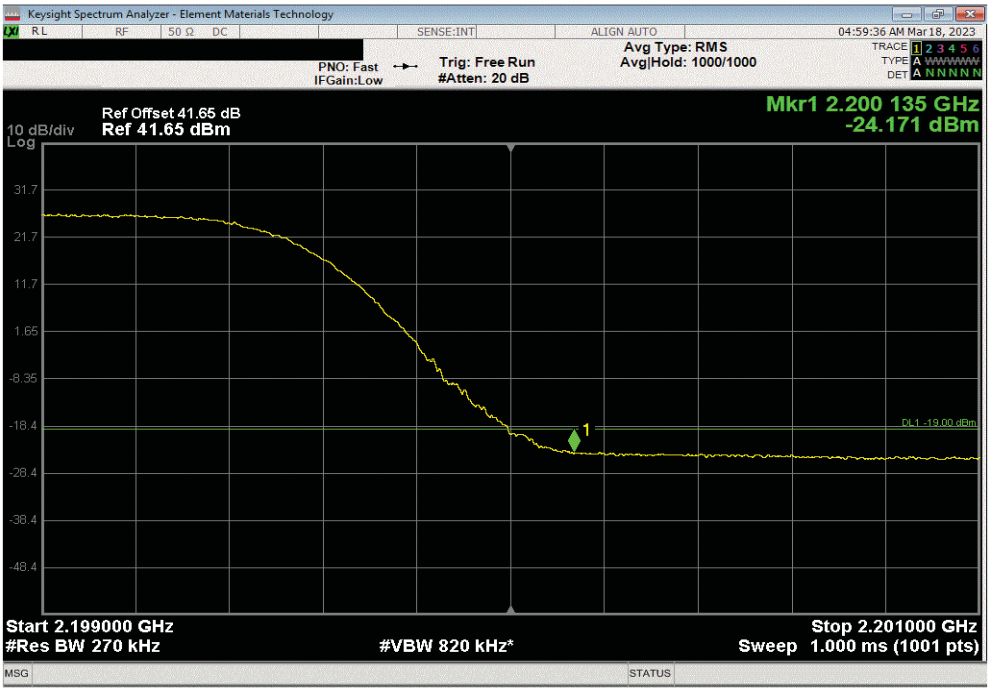
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-26.21	-19	Pass



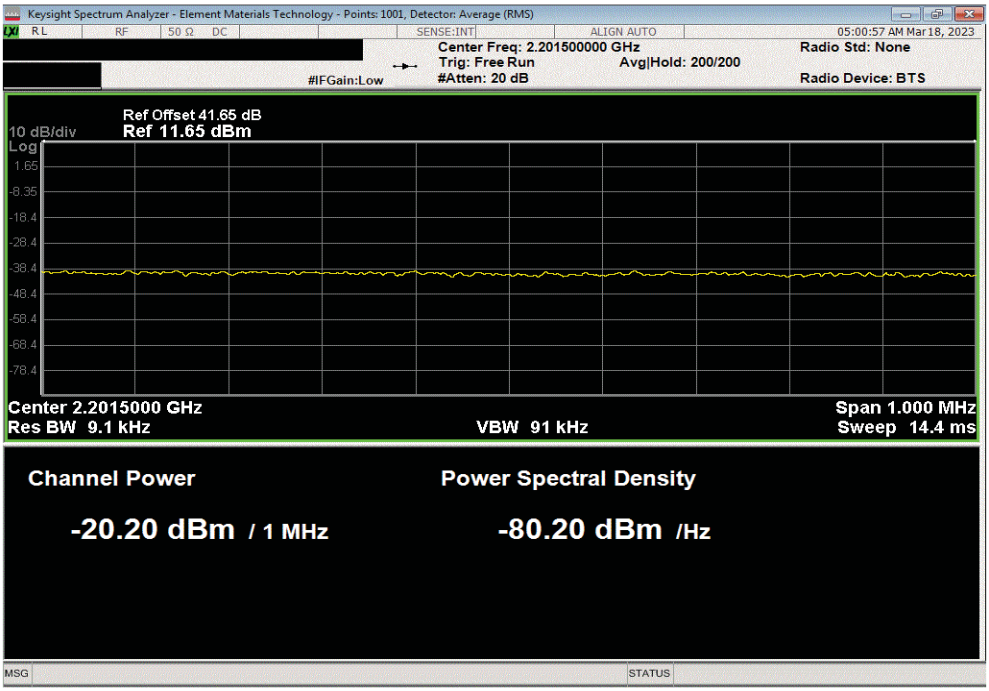
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Low Channel 2122.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-24.15	-19	Pass



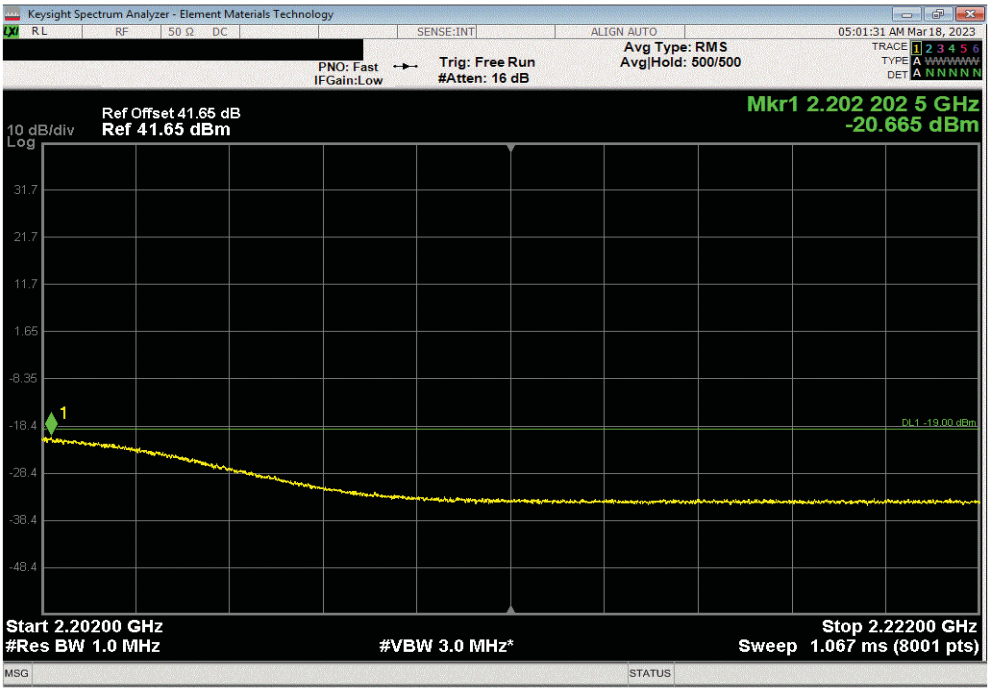
Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	1			-24.17	-19	Pass



Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	2			-20.20	-10	Pass



Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, High Channel 2187.5 MHz						
	Frequency Range			Value (dBm)	Limit (dBm)	Result
	3			-20.67	-19	Pass



POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n25 5G

XMit 2023.02.14.0

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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Attenuator	Fairview Microwave	SA18E 1648	TZW	2022-09-13	2023-09-13

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission power spectral density was measured using the channels and modes as called out on the following data sheets.

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

The total PSD for all antenna ports (at the radio output) were determined per ANSI C63.26-2015 paragraph 6.4.3.2.4.
The EIRP calculations are based upon ANSI C63.26-2015 paragraphs 6.4 for a four port MIMO base station.

EIRP Requirements:
FCC Requirements: Part 24.232 Power and antenna height limits.
(a)(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.
(a)(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; *see* Tables 1 and 2 of this section.
(b)(2) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth greater than 1 MHz are limited to 3280 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

ISED Requirements RSS-133 Section 6.4/SRSP-510 section 5.1.1:
SRSP-510 section 5.1 Radiated power and antenna height limits for base stations
For base stations with a channel bandwidth greater than 1 MHz, the maximum e.i.r.p. is limited to 3280 watts/MHz e.i.r.p. (i.e., no more than 3280 watts e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 meters. Fixed or base stations operating in urban areas are limited to a maximum allowable e.i.r.p. of 1640 watts/MHz e.i.r.p. Base station antenna heights above average terrain may exceed 300 meters with a corresponding reduction in e.i.r.p. according to the following table.

RF conducted emissions testing was performed on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification testing) and antenna port 4 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.

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n25 5G

element

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	Airscale Base Transceiver Station Remote Radio Head Model AHFIB			Work Order:	NOKI0056
Serial Number:	K9181401111			Date:	03/17/2023
Customer:	Nokia of America Corporation			Temperature:	22.8°C
Attendees:	David Le, Mitchel Hill			Humidity:	49.2%
Project:	None			Barometric Pres.:	990.3 mbar
Tested by:	Brandon Hobbs	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 24E:2023	ANSI C63.26:2015
RSS-133 Issue 6:2013+A1:2018	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n25 carriers are enabled at maximum power (40 watts/carrier). Power Spectral Density (PSD) was measured while transmitting one carrier on Port 4. The PSD for multiport (2x2 MIMO, 4x4 MIMO) operation was determined based upon ANSI C63.26 clause 6.4.3.2.4 (10 log Nout). The total PSD for two port operation is the single port power +3 dB [i.e. 10*log(2)]. The total power for four port operations is single port power +6 dB [i.e. 10*log(4)].

DEVIATIONS FROM TEST STANDARD

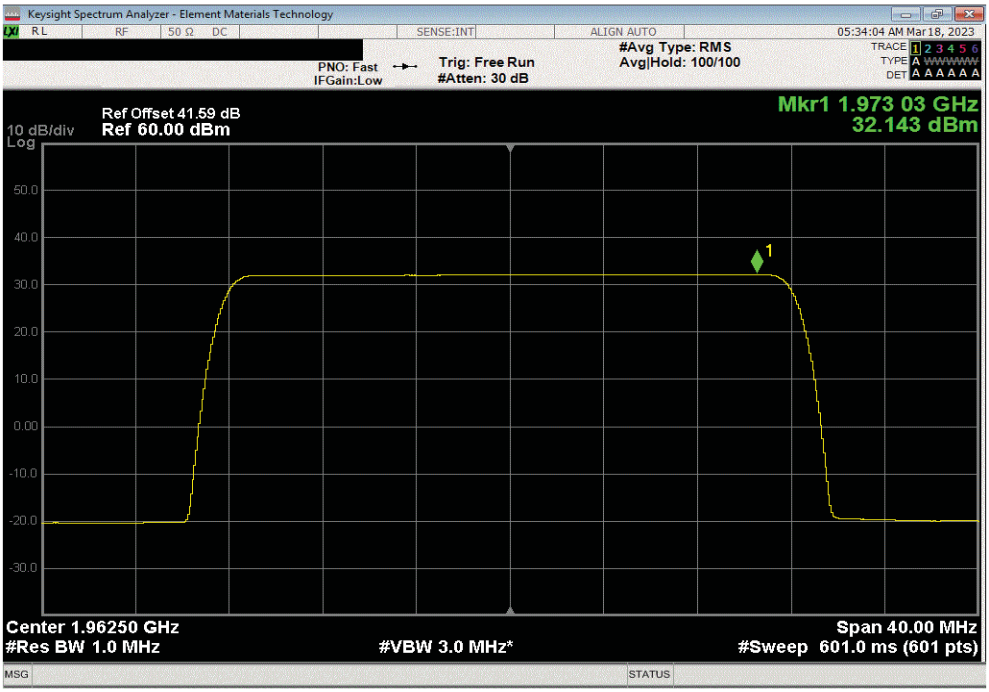
None

Configuration #	NOKI0056-2	Signature

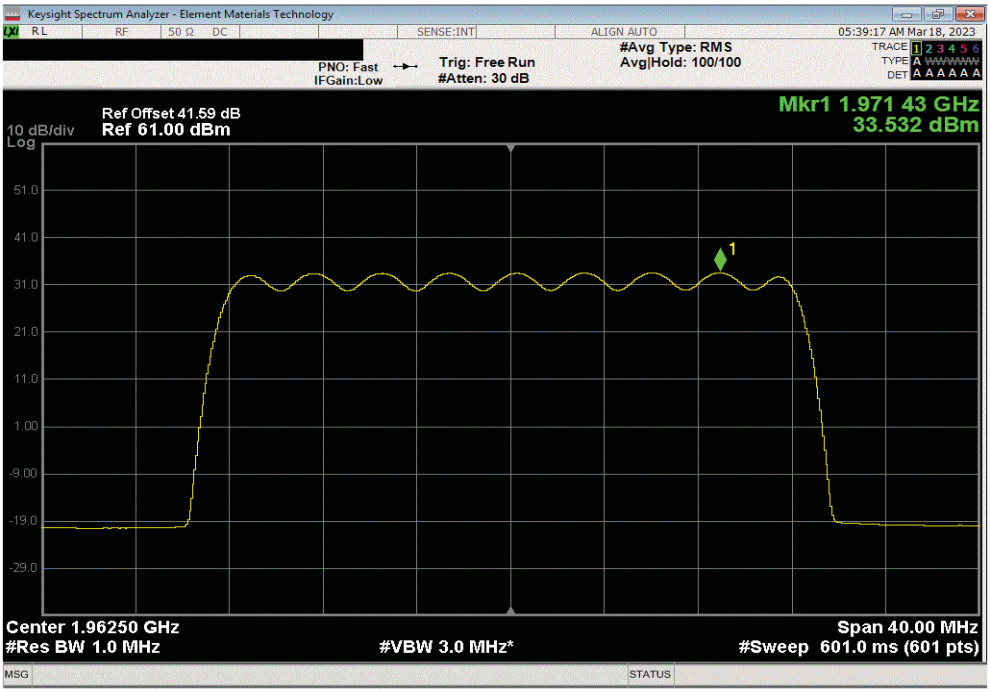
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Singel Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
Band n25 1930 MHz - 1995 MHz, 5G NR					
Port 4					
25 MHz Bandwidth					
QPSK Modulation					
Mid Channel 1962.5 MHz	32.143	0	32.143	32.143	32.143
16-QAM Modulation					
Mid Channel 1962.5 MHz	33.532	0	33.532	33.532	33.532
64-QAM Modulation					
Mid Channel 1962.5 MHz	32.126	0	32.126	32.126	32.126
256-QAM Modulation					
Low Channel 1942.5 MHz	31.913	0	31.913	31.913	31.913
Mid Channel 1962.5 MHz	32.166	0	32.166	32.166	32.166
High Channel 1982.5 MHz	32.112	0	32.112	32.112	32.112

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n25 5G

Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, Mid Channel 1962.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Singel Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	32.143	0	32.143	32.143	32.143	

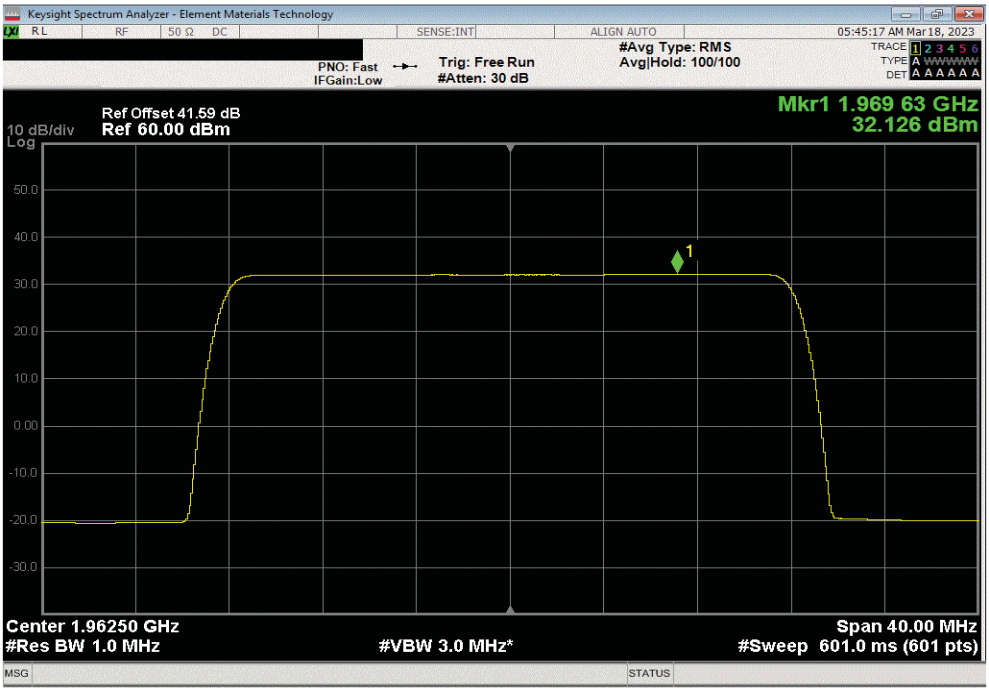


Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, Mid Channel 1962.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Singel Port dBm/MHz==PSD	ro Port (2x2 MIMur Port (4x4 MIN dBm/MHz==PSD	dBm/MHz==PSD	
	33.532	0	33.532	33.532	33.532	

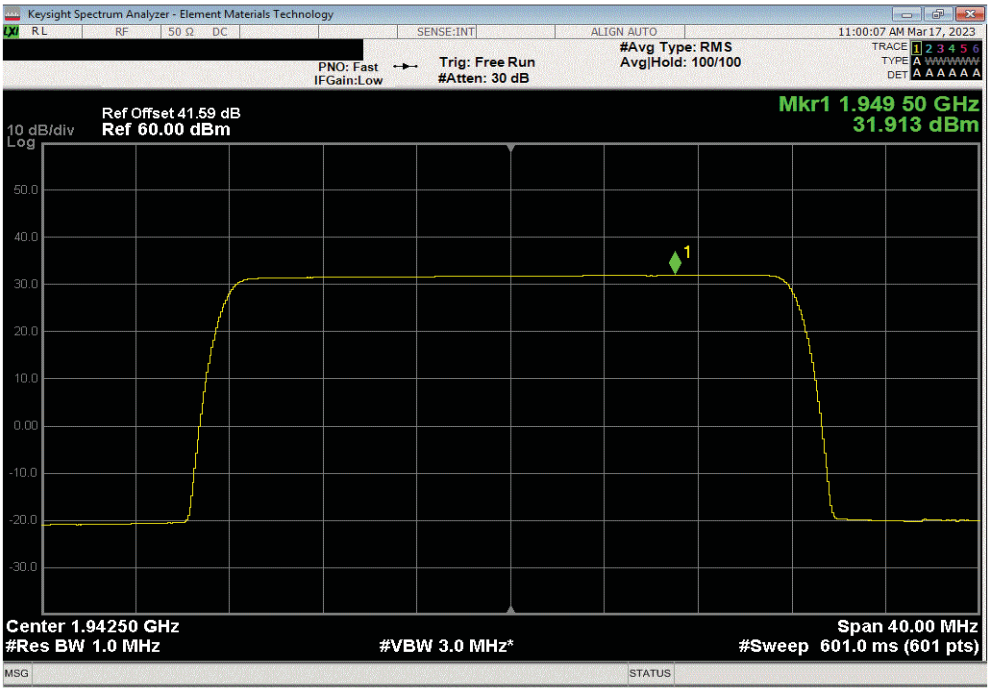


POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n25 5G

Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, Mid Channel 1962.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Singel Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	32.126	0	32.126	32.126	32.126	



Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Low Channel 1942.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Singel Port dBm/MHz==PSD	ro Port (2x2 MIMur Port (4x4 MIN dBm/MHz==PSD	dBm/MHz==PSD	
	31.913	0	31.913	31.913	31.913	

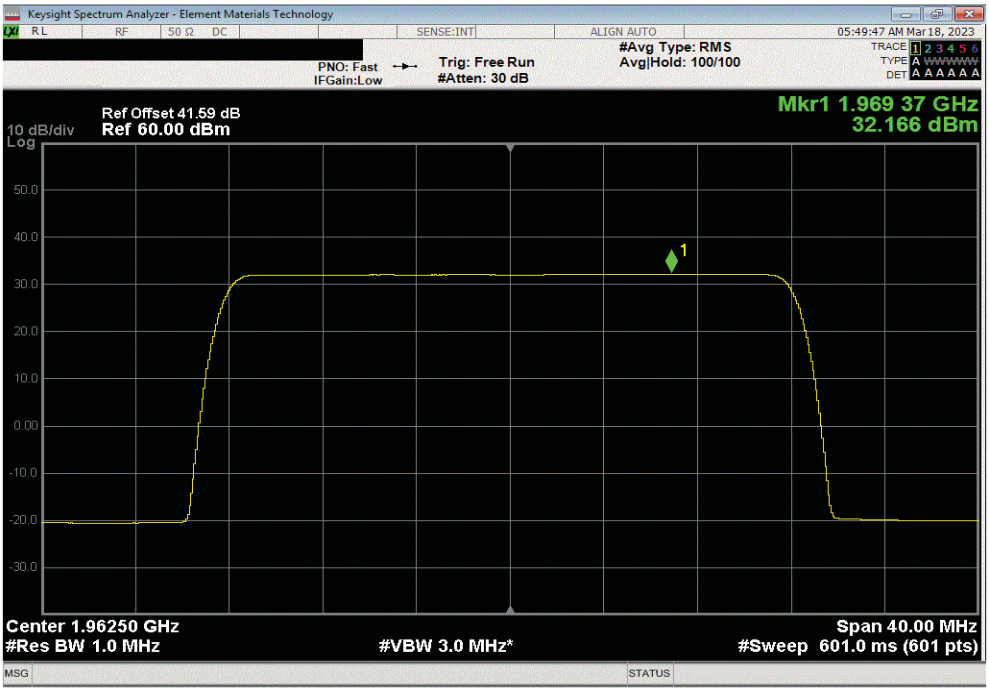


POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n25 5G

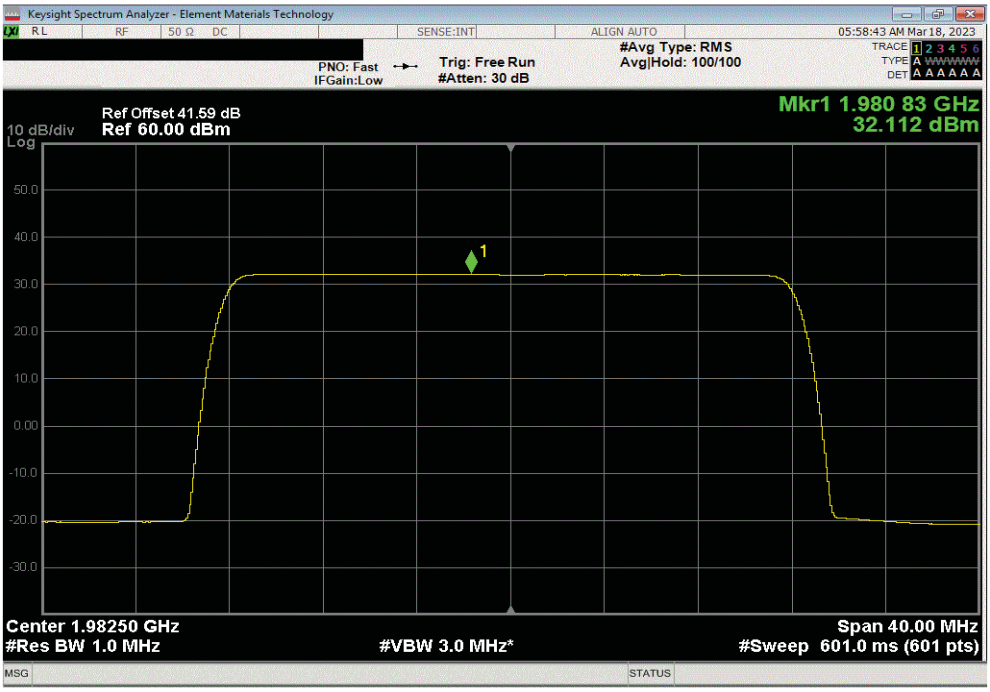
element

TbtTx 2022.05.02.0 XMit 2023.02.14.0

Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Mid Channel 1962.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Singel Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	32.166	0	32.166	32.166	32.166	



Band n25 1930 MHz - 1995 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, High Channel 1982.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Singel Port dBm/MHz==PSD	ro Port (2x2 MIMur Port (4x4 MIN dBm/MHz==PSD	dBm/MHz==PSD	
	32.112	0	32.112	32.112	32.112	



POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n25 5G

EIRP Calculations for Four Port MIMO Operations for Band n25 Single NR Carriers
EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements. Each cell site installation needs to consider the power measurements in the radio certification report as well as site specific regulatory requirements (such as antenna height, population density, etc.), site installation parameters (line loss between antenna and radio, antenna parameters, etc.) and base station operational parameters (MIMO operational setup, carrier power level, channel bandwidth, modulation type, etc.) to optimize performance. Transmitter output power may be reduced (from maximum) by base station setup parameters. Base station antennas are selected by the customer.

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Kathrein antenna assembly model "80011867". The maximum Band n25 gain (17.9dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of ±45° cross-polarized radiators used for Band n25. The four antenna RF inputs (used for Band n25) on the antenna assembly are as follows: Y1+ L5 (+45°), Y1- L6 (-45°), Y2+ R7 (+45°) and Y2- R8 (-45°). Four AHFII transmitter outputs are connected to the antenna assembly RF inputs.

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4 for uncorrelated output signals) from the results of power measurements (highest measured PSD for each channel bandwidth type). The maximum antenna gain was used for this calculation. The cable loss between the antenna and transmitter is site dependent (will not be 0 dB) but for this worst case EIRP calculation 0 dB was used. Calculations of worst-case EIRP for four port MIMO are as follows:

Parameter	25 MHz Ch BW
Worst Case PSD/Antenna Port	33.5dBm/MHz
Number of Ant Ports per Polarization	2
Total PSD per Polarization 10*Log (2) = +3	36.5
Cable Loss (site dependent)	0 dB
Dir Gain = Maximum Antenna Gain (GAnt) See Note 1	17.9 dBi
EIRP per Polarization	54.4dBm/MHz or 275.4 Watts/MHz
Number of Polarizations	2
EIRP Total = Y1 ± 45°and Y2 ± 45° See Note 2	54.4dBm/MHz or 275.4 Watts/MHz
Passing FCC and ISED EIRP Limits	62.15 & 65.16 dBm/MHz

Note 1: The directional gain is equal to antenna gain since the transmit signals are completely uncorrelated. See ANSI C63.26 secti ons 6.4.5.2.3b) and 6.4.5.3.1b) for guidance.
Note 2: The EIRP per antenna polarity is required to be below the regulatory limit as described in ANSI C63.26 -2015 section 6.4.6.3 b)2) and KDB 662911 D02v01 page 3 example (2) since the two transmitter outputs to each antenna are 90 degree-phase shifted relative to each other (cross-polarized radiators).

EIRP Calculation Summary
The worst case AHFIB four port MIMO Band n25 EIRP levels using antenna assembly model "80011867" are:
Less than the FCC and ISED (3280 W/MHz or 65.16 dBm/MHz) EIRP Regulatory Limits for 25MHz channel bandwidths.
Less than the FCC and ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits for 25MHz channel bandwidths.

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n66 5G

XMit 2023.02.14.0

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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Attenuator	Fairview Microwave	SA18E 1648	TZW	2022-09-13	2023-09-13

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission power spectral density was measured using the channels and modes as called out on the following data sheets.

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

RF conducted emissions testing was performed on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification testing) and antenna port 4 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The total PSD for all antenna ports (at the radio output) were determined per ANSI C63.26-2015 paragraph 6.4.3.2.4. The EIRP calculations are based upon ANSI C63.26-2015 paragraphs 6.4 for a four port MIMO base station.

EIRP Requirements:
FCC Requirements:
27.50(d) The following power and antenna height requirements apply to stations transmitting in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz and 2180-2200 MHz bands:
(1) The power of each fixed or base station transmitting in the 1995-2000 MHz, 2110-2155 MHz, 2155-2180 MHz or 2180-2200 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to:
(ii) An EIRP of 3280 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.
(2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:
(ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

ISED Requirements:
RSS-139 Issue 4 September 29, 2022. Section 5.5 SRSP-513 Issue 4 September 29, 2022. Section 6.1. E.i.r.p. limits and antenna height limits for non-AAS systems Sub-section 6.1.3. paragraph 21 and 22. 21. For fixed and base stations operating in the band 2110-2180 MHz with a channel bandwidth greater than 1 MHz, the maximum permissible e.i.r.p. is 62 dBm/MHz (i.e. no more than 62 dBm e.i.r.p. in any 1 MHz band segment), with an antenna HAAT of up to 300 m. 22. Fixed and base stations operating in the band 2110-2180 MHz and located in geographic areas at a distance greater than 26 km from large or medium population centers may increase their e.i.r.p. to a maximum of 65 dBm/MHz (i.e. no more than 65 dBm e.i.r.p. in any 1 MHz band segment), with an antenna HAAT of up to 300 m.

SRSP 519 Issue 4 September 29, 2022. Section 6.1 Radiated power and antenna height limits for base stations using non-AAS systems. Sub-section 6.1.3. paragraph 22 and 23. 22. For base stations operating in the bands 2000-2020 MHz and 2180-2200 MHz with an antenna HAAT of up to 300 m, the e.i.r.p. shall not exceed 62 dBm/MHz when transmitting with an emission bandwidth greater than 1 MHz. 23. Base stations located in geographic areas at a distance greater than 26 km from large or medium population centers may increase their e.i.r.p. to a maximum of 65 dBm when transmitting with an emission bandwidth of 1 MHz or less, and 65 dBm/MHz when transmitting with an emission bandwidth greater than 1 MHz are limited to 3280 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n66 5G

element

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	Airscale Base Transceiver Station Remote Radio Head Model AHFIB			Work Order:	NOKI0056
Serial Number:	K9181401111			Date:	03/17/2023
Customer:	Nokia of America Corporation			Temperature:	22.8°C
Attendees:	David Le, Mitchel Hill			Humidity:	48%
Project:	None			Barometric Pres.:	990.3 mbar
Tested by:	Brandon Hobbs	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2023	ANSI C63.26:2015
RSS-139 Issue 4:2022	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n66 carriers are enabled at maximum power (40 watts/carrier). Power Spectral Density (PSD) was measured while transmitting one carrier on Port 4. The PSD for multiport (2x2 MIMO, 4x4 MIMO) operation was determined based upon ANSI C63.26 clause 6.4.3.2.4 (10 log Nout). The total PSD for two port operation is the single port power +3 dB [i.e. 10*log(2)]. The total power for four port operations is single port power +6 dB [i.e. 10*log(4)].

DEVIATIONS FROM TEST STANDARD

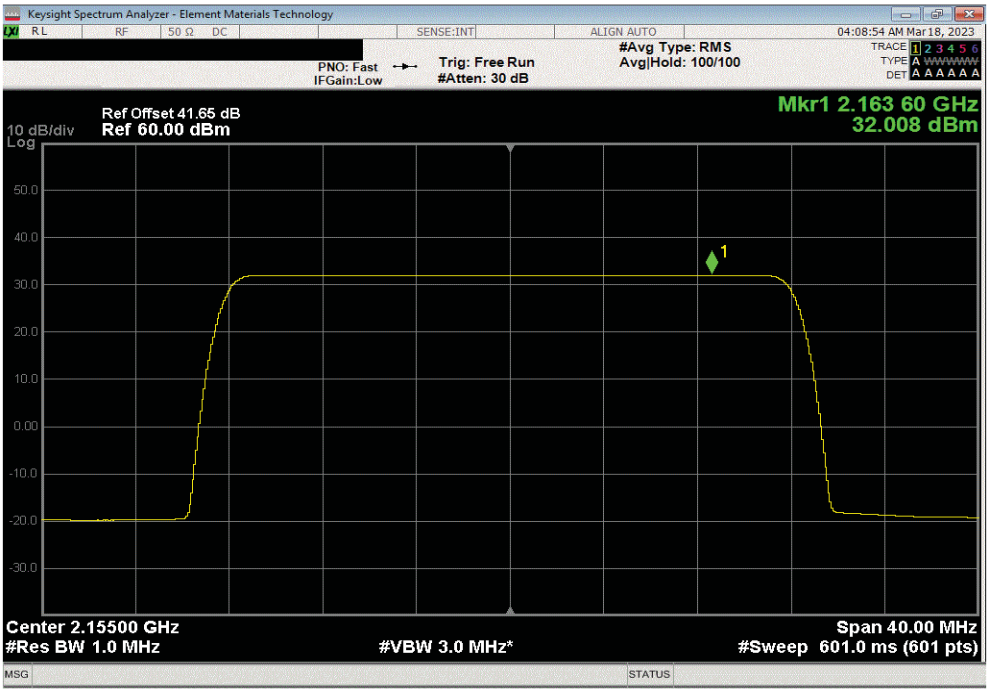
None

Configuration #	NOKI0056-2	Signature

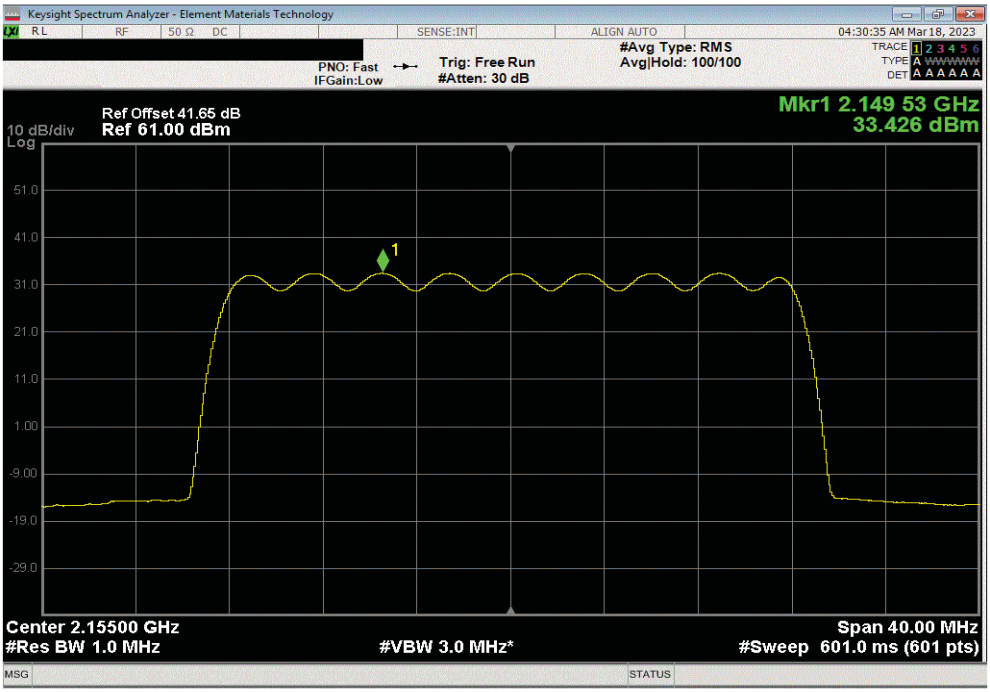
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
Band n66 2110 MHz - 2200 MHz, 5G NR					
Port 4					
25 MHz Bandwidth					
QPSK Modulation					
Mid Channel 2155 MHz	32.008	0	32.008	32.008	32.008
16-QAM Modulation					
Mid Channel 2155 MHz	33.426	0	33.426	33.426	33.426
64-QAM Modulation					
Mid Channel 2155 MHz	32.181	0	32.181	32.181	32.181
256-QAM Modulation					
Low Channel 2122.5 MHz	32.120	0	32.120	32.120	32.120
Mid Channel 2155 MHz	32.117	0	32.117	32.117	32.117
High Channel 2187.5 MHz	32.127	0	32.127	32.127	32.127

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n66 5G

Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, QPSK Modulation, Mid Channel 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	32.008	0	32.008	32.008	32.008	

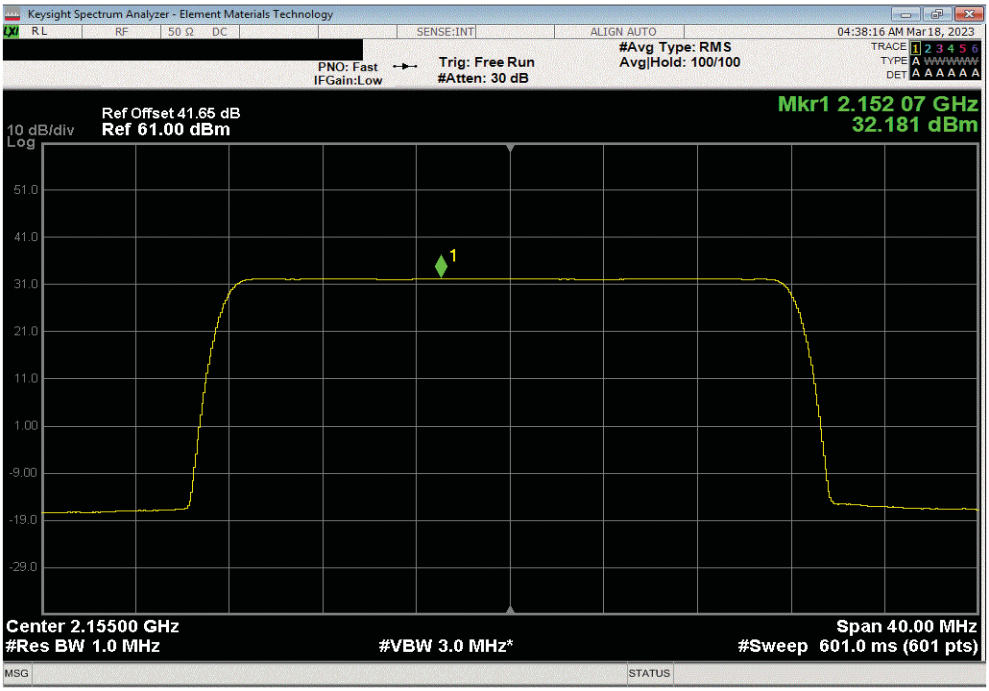


Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 16-QAM Modulation, Mid Channel 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	33.426	0	33.426	33.426	33.426	

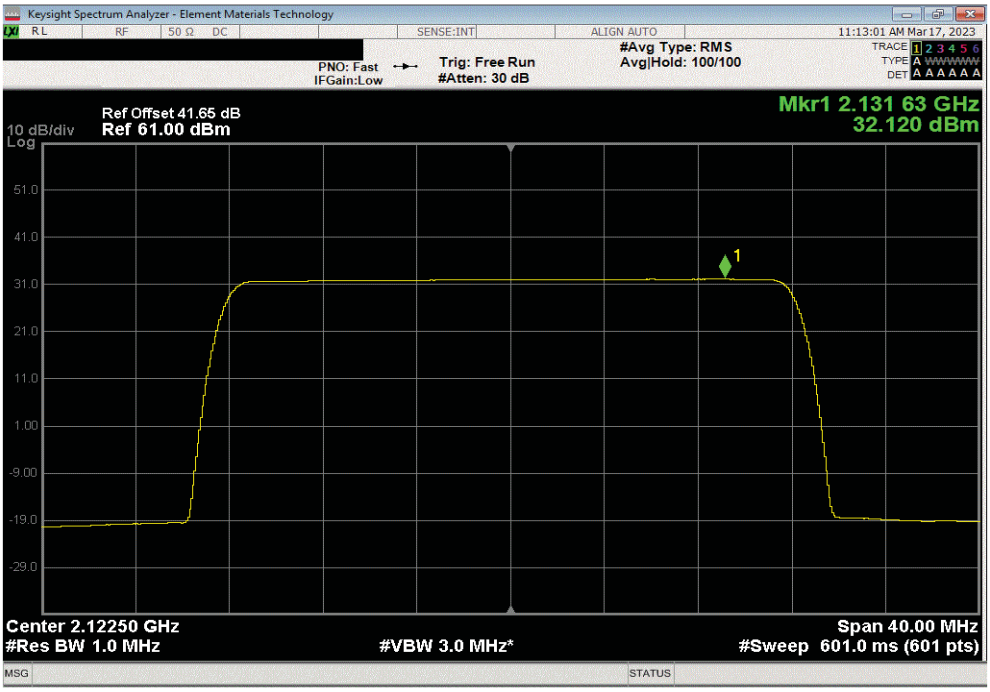


POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n66 5G

Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 64-QAM Modulation, Mid Channel 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	32.181	0	32.181	32.181	32.181	

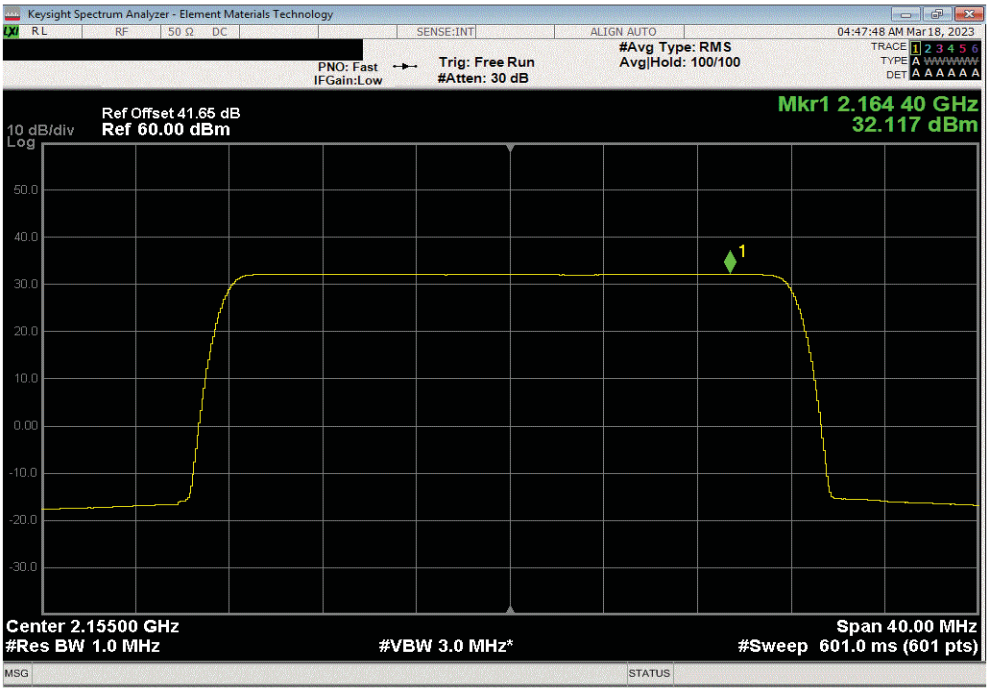


Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Low Channel 2122.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	ro Port (2x2 MIMur Port (4x4 MIM dBm/MHz==PSD	dBm/MHz==PSD	
	32.12	0	32.12	32.12	32.12	

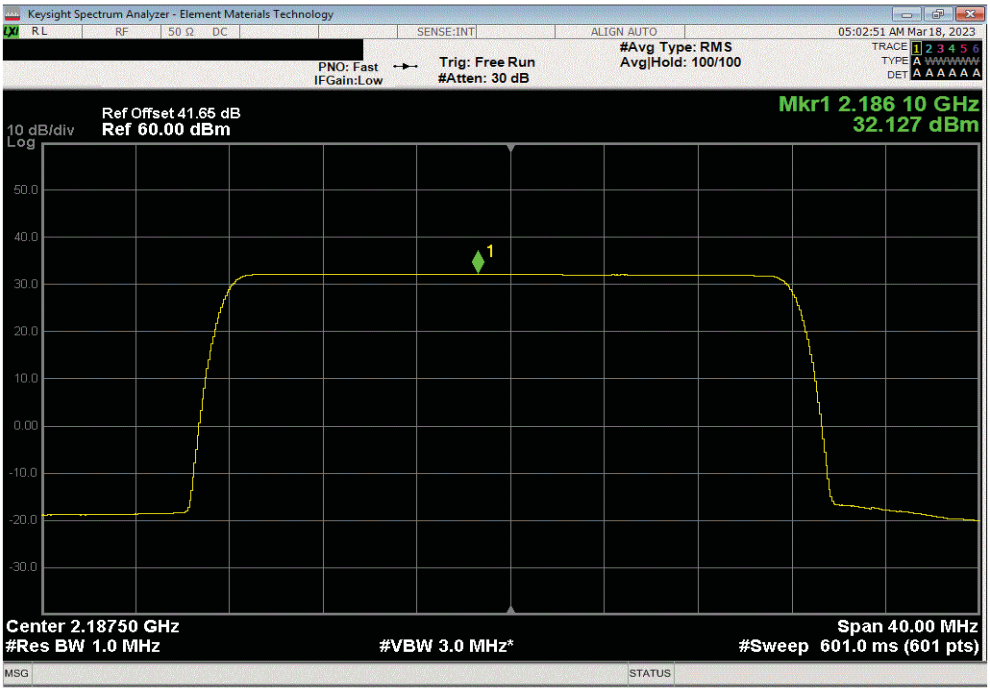


POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n66 5G

Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, Mid Channel 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	32.117	0	32.117	32.117	32.117	



Band n66 2110 MHz - 2200 MHz, 5G NR , Port 4, 25 MHz Bandwidth, 256-QAM Modulation, High Channel 2187.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	ro Port (2x2 MIMur Port (4x4 MIM dBm/MHz==PSD	dBm/MHz==PSD	
	32.127	0	32.127	32.127	32.127	



POWER SPECTRAL DENSITY AND EIRP CALCULATIONS - BAND n66 5G

EIRP Calculations for Four Port MIMO Operations for Band n66 Single NR Carriers
EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements. Each cell site installation needs to consider the power measurements in the radio certification report as well as site specific regulatory requirements (such as antenna height, population density, etc.), site installation parameters (line loss between antenna and radio, antenna parameters, etc.) and base station operational parameters (MIMO operational setup, carrier power level, channel bandwidth, modulation type, etc.) to optimize performance. Transmitter output power may be reduced (from maximum) by base station setup parameters. Base station antennas are selected by the customer.

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Kathrein antenna assembly model "80011867". The maximum Band n66 gain (18.2dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of ±45° cross-polarized radiators used for Band n66. The four antenna RF inputs (used for Band n66) on the antenna assembly are as follows: Y1+ L5 (+45°), Y1- L6 (-45°), Y2+ R7 (+45°) and Y2- R8 (-45°). Four AHFII transmitter outputs are connected to the antenna assembly RF inputs.

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4 for uncorrelated output signals) from the results of power measurements (highest measured PSD for each channel bandwidth type). The maximum antenna gain was used for this calculation. The cable loss between the antenna and transmitter is site dependent (will not be 0 dB) but for this worst case EIRP calculation 0 dB was used. EIRP was calculated as described in SRSP 513 clause 6.1.2 and SRSP 519 clause 6.1.2 "EIRP for non-AAS uncorrelated transmission". Calculations of worst-case EIRP for four port MIMO are as follows:

Parameter	25 MHz Ch BW
Worst Case PSD/Antenna Port	33.4dBm/MHz
Number of Ant Ports per Polarization	2
Total PSD per Polarization 10*log(2) = +3	36.4
Cable Loss (site dependent)	0 dB
Dir Gain = Maximum Antenna Gain (GAnt) See Note 1	18.2 dBi
EIRP per Polarization	54.6 dBm/MHz or 288.4 Watts/MHz
Number of Polarizations	2
EIRP Total = Y1 ±45°and Y2 ±45° See Note 2	54.6 dBm/MHz or 288.4 Watts/MHz
Passing FCC EIRP Limits	62.15 & 65.16 dBm/MHz
Passing ISED EIRP Limits	62 & 65 dBm/MHz

Note 1: The directional gain is equal to antenna gain since the transmit signals are completely uncorrelated. See ANSI C63.26 secti ons 6.4.5.2.3b) and 6.4.5.3.1b) for guidance.
Note 2: The EIRP per antenna polarity is required to be below the regulatory limit as described in ANSI C63.26 -2015 section 6.4.6.3 b)2) and KDB 662911 D02v01 page 3 example (2) since the two transmitter outputs to each antenna are 90 degree-phase shifted relative to each other (cross-polarized radiators).

EIRP Calculation Summary
(1) The worst case AHFIB four port MIMO Band n66 EIRP levels using antenna assembly model "80011867" are:
(2) Less than the FCC (65.16 dBm/MHz) EIRP Regulatory Limits for 25 MHz channel bandwidths.
(3) Less than the FCC (62.15 dBm/MHz) EIRP Regulatory Limits for 25 MHz channel bandwidths.
(4) Less than the ISED (65 dBm/MHz) EIRP Regulatory Limits for 25 MHz channel bandwidths.
(5) Less than the ISED (62 dBm/MHz) EIRP Regulatory Limits for 25 MHz channel bandwidths.

SPURIOUS CONDUCTED EMISSIONS - BAND n25 & Band n66 5G

XMit 2023.02.14.0

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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Block - DC	Fairview Microwave	SD3379	AMT	2022-09-09	2023-09-09
Block - DC	Fairview Microwave	SD3239	ANE	2023-02-16	2024-02-16
Attenuator	Fairview Microwave	SA18E 1913	TZV	2022-09-13	2023-09-13
Attenuator	Fairview Microwave	SA18E 1648	TZW	2022-09-13	2023-09-13

TEST DESCRIPTION

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 4 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 plan were made for each modulation type from 9 KHz to 22 GHz. The peak 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 shown below.

The measurement methods are detailed in KDB971168 D01v03 section 6 and ANSI C63.26-2015.

Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10th harmonic of the highest fundamental frequency.

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

Per section FCC 27.53(h)(1), FCC 24.238a, RSS-133 6.5(ii) and RSS-139 6.6, 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 -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. RF conducted emissions testing was performed on one port. The AHFII antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification report) and port 4 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The limit for the 9kHz to 150kHz frequency range was adjusted to –49dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -49dBm = -19dBm -10log(1MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to –39dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -39dBm = -19dBm -10log(1MHz/10kHz)]. The required limit of -19dBm with a RBW of > 1MHz was used for all other frequency ranges.

SPURIOUS CONDUCTED EMISSIONS - BAND n25 & Band n66 5G

element

TbtTx 2022.05.02.0 XMit 2023.02.14.0

EUT:	Airscale Base TransceAirscale Base Transceiver Station Remote Radio Head Model AHFIB			**Work Order:**	NOKI0056
Serial Number:	K9181401111			**Date:**	03/18/2023
Customer:	Nokia of America Corporation			**Temperature:**	22.4°C
Attendees:	David Le, Mitchel Hill			**Humidity:**	54.8%
Project:	None			**Barometric Pres.:**	991.5 mbar
Tested by:	Brandon Hobbs	**Power:**	54 VDC	**Job Site:**	TX07

TEST SPECIFICATIONS	Test Method
FCC 24E:2023	ANSI C63.26:2015
FCC 27:2023	ANSI C63.26:2015
RSS-133 Issue 6:2013+A1:2018	ANSI C63.26:2015
RSS-139 Issue 4:2022	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n25 carrier enabled on middle channel (1962.5 MHz) at maximum power (40 watts/carrier). Band n66 carrier enabled on middle channel (2155.0 MHz) ar 40 watts with the same channel bandwidth and modulation type as Band n25 carrier. The port power was set at the maximum level of 80 Watts [Band n25 carrier 40W and Band n66 carrier 40W].

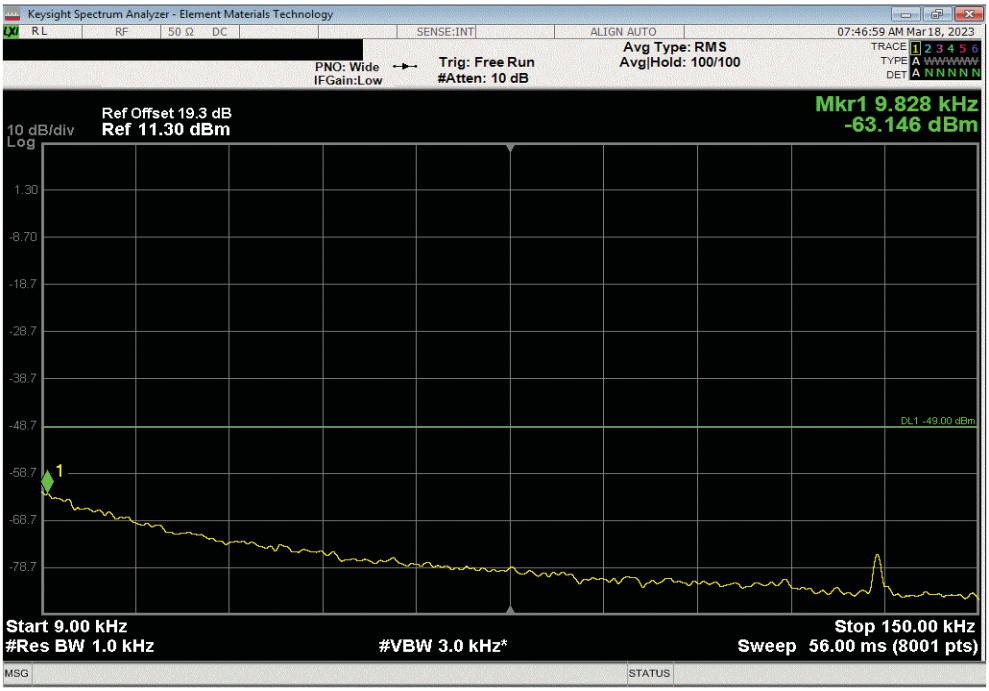
DEVIATIONS FROM TEST STANDARD

None

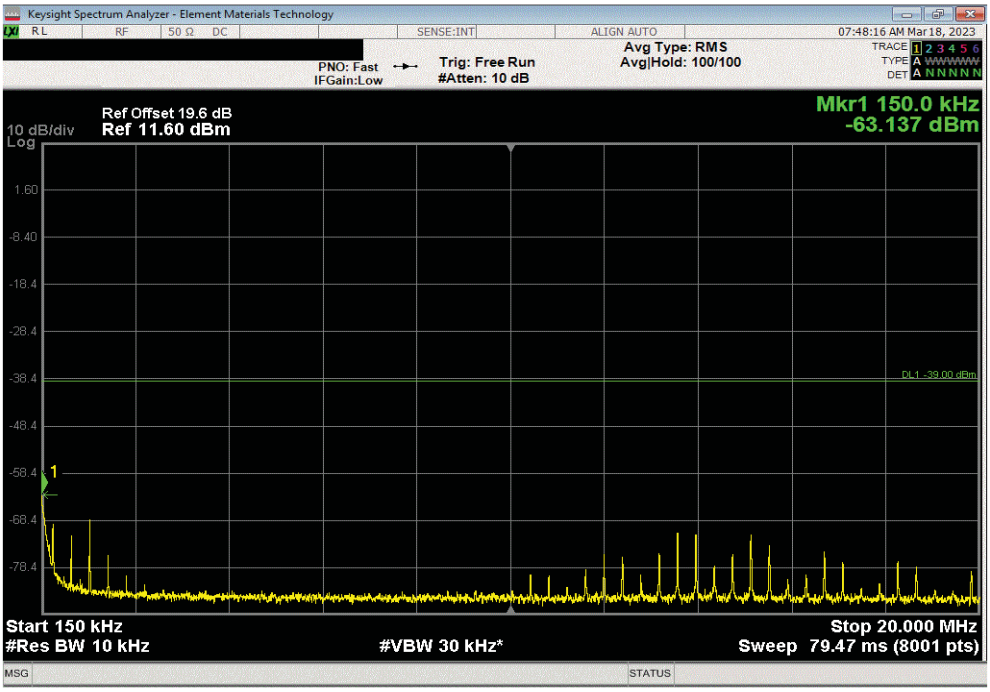
Configuration #	NOKI0056-1 NOKI0056-2 NOKI0056-3 NOKI0056-4	Signature

		Frequency Range	Value (dBm)	Limit (dBm)	Result
Band n25 1930 MHz - 1995 MHz & Band n66 2110 MHz - 2200 MHz, 5G NR					
Port 4					
25 MHz Bandwidth					
QPSK Modulation					
	Mid Channel 1962.5 MHz & 2155 MHz	9 kHz - 150 kHz	-63.15	-49	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	150 kHz - 20 MHz	-63.14	-39	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	20 MHz - 3.5 GHz	-25.84	-19	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	3.5 GHz - 13 GHz	-39.64	-19	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	13 GHz - 22 GHz	-27.58	-19	Pass
16-QAM Modulation					
	Mid Channel 1962.5 MHz & 2155 MHz	9 kHz - 150 kHz	-62.69	-49	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	150 kHz - 20 MHz	-62.86	-39	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	20 MHz - 3.5 GHz	-25.94	-19	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	3.5 GHz - 13 GHz	-39.17	-19	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	13 GHz - 22 GHz	-27.75	-19	Pass
64-QAM Modulation					
	Mid Channel 1962.5 MHz & 2155 MHz	9 kHz - 150 kHz	-63.1	-49	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	150 kHz - 20 MHz	-63.31	-39	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	20 MHz - 3.5 GHz	-26.32	-19	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	3.5 GHz - 13 GHz	-39.09	-19	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	13 GHz - 22 GHz	-27.74	-19	Pass
256-QAM Modulation					
	Mid Channel 1962.5 MHz & 2155 MHz	9 kHz - 150 kHz	-62.66	-49	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	150 kHz - 20 MHz	-63.24	-39	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	20 MHz - 3.5 GHz	-25.96	-19	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	3.5 GHz - 13 GHz	-39.27	-19	Pass
	Mid Channel 1962.5 MHz & 2155 MHz	13 GHz - 22 GHz	-27.75	-19	Pass

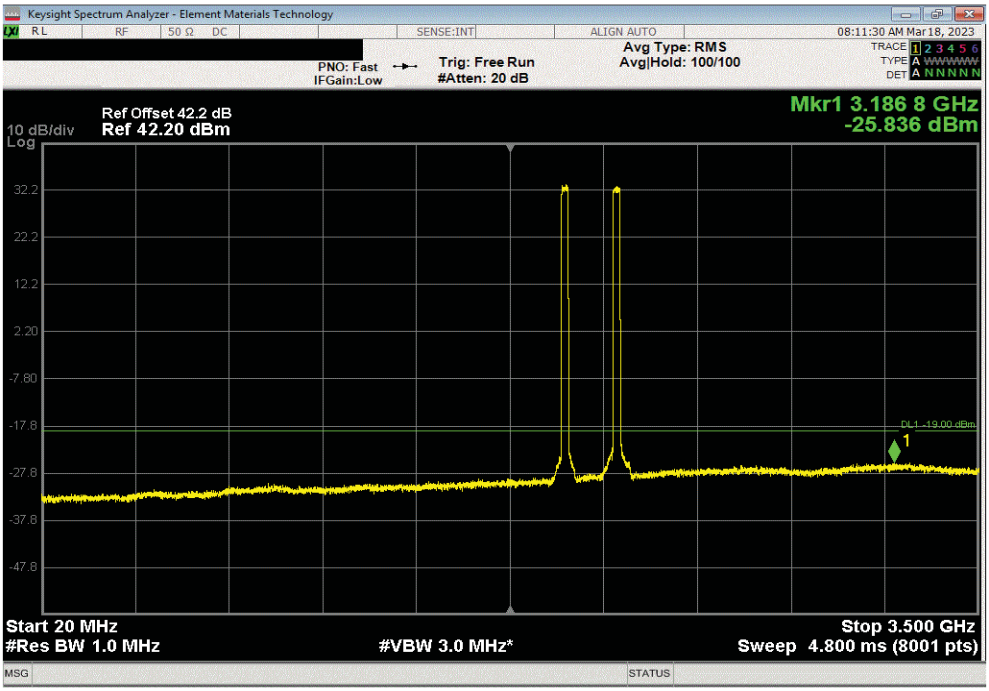
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, QPSK Modulation, Mid Channel 1962.5 MHz					
	Frequency Range		Value (dBm)	Limit (dBm)	Result
	9 kHz - 150 kHz		-63.15	-49	Pass



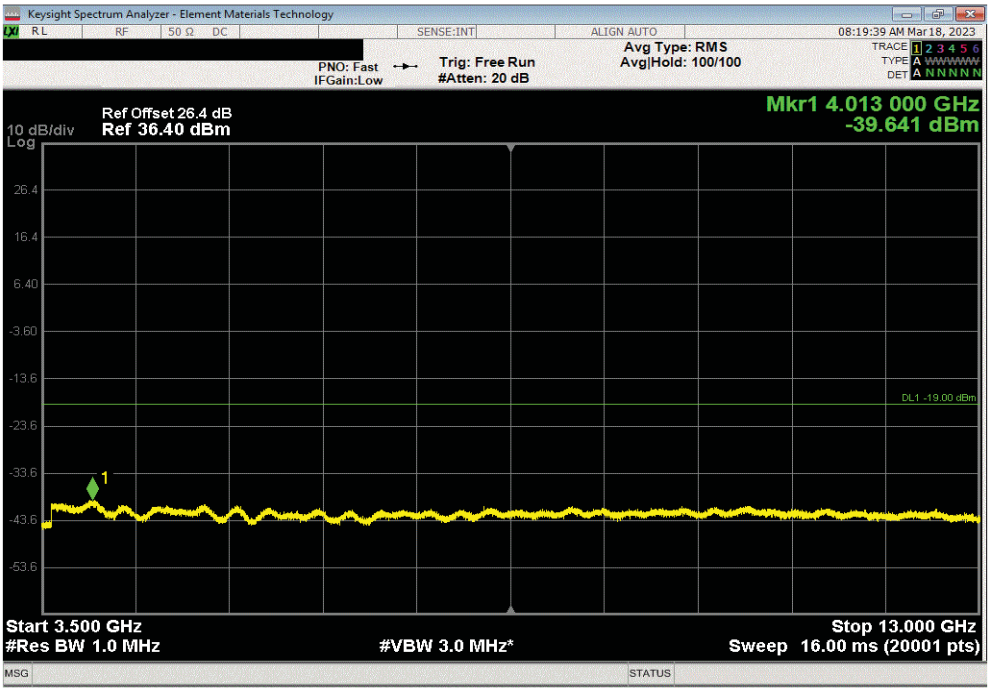
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, QPSK Modulation, Mid Channel 1962.5 MHz					
	Frequency Range		Value (dBm)	Limit (dBm)	Result
	150 kHz - 20 MHz		-63.14	-39	Pass



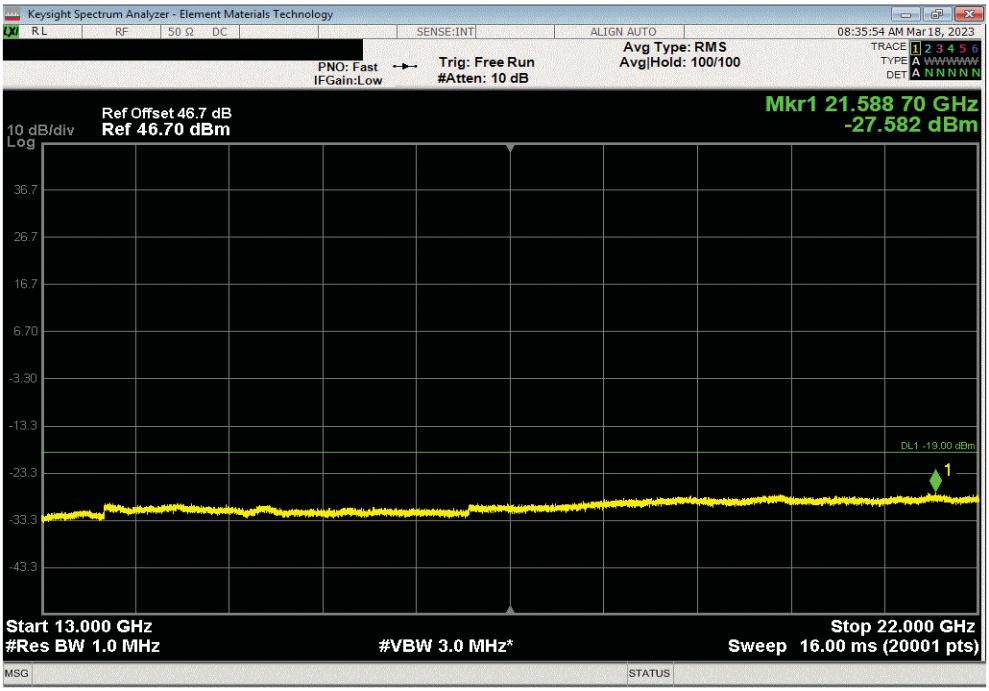
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, QPSK Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
20 MHz - 3.5 GHz		-25.84	-19	Pass



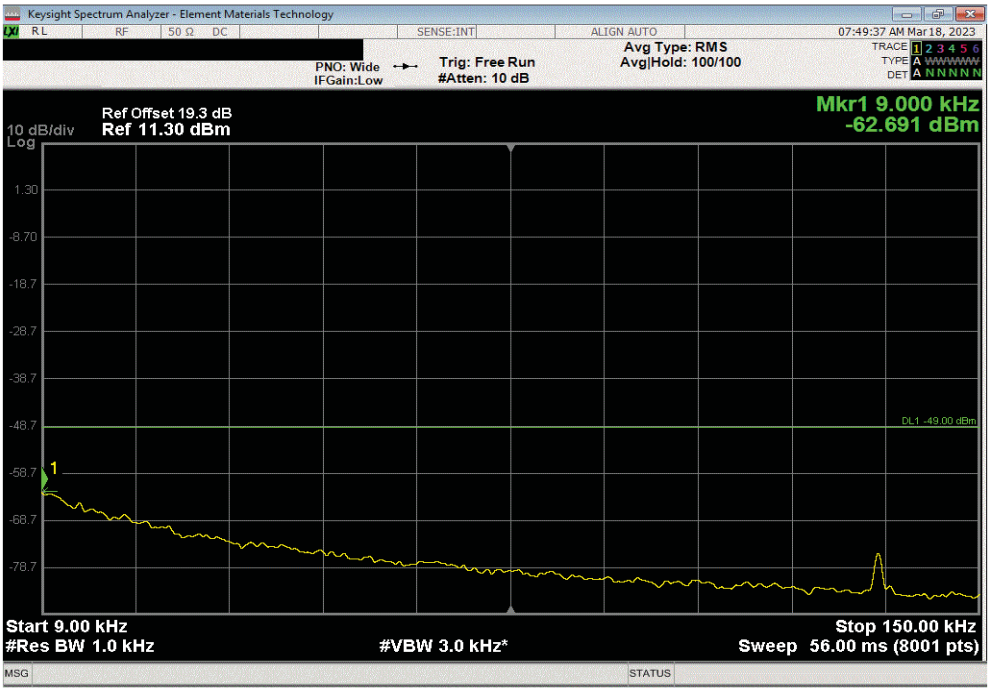
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, QPSK Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
3.5 GHz - 13 GHz		-39.64	-19	Pass



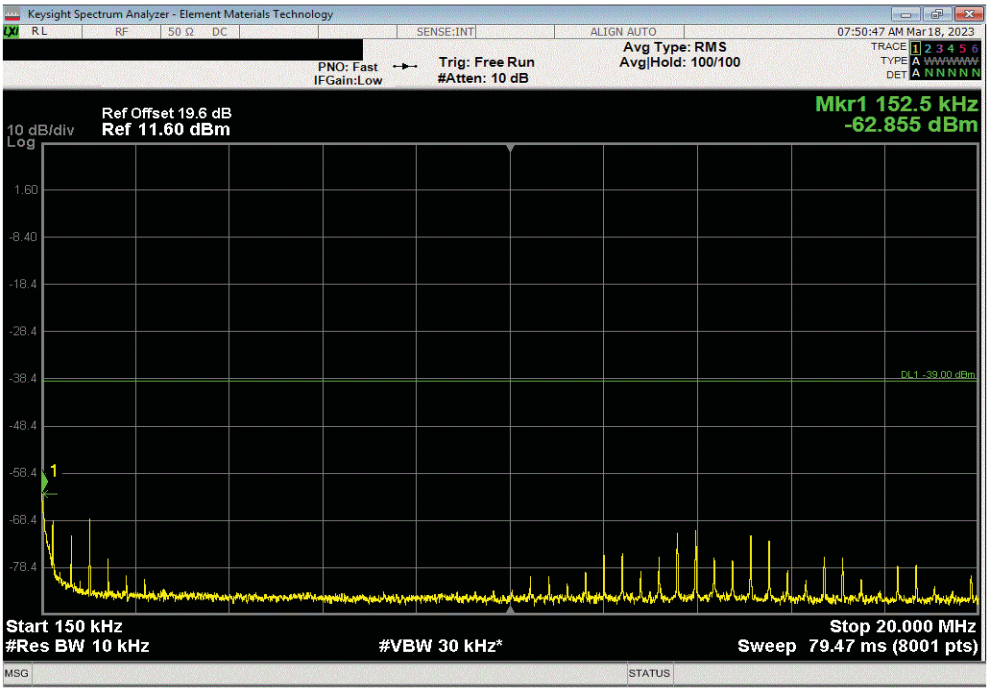
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, QPSK Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
13 GHz - 22 GHz		-27.58	-19	Pass



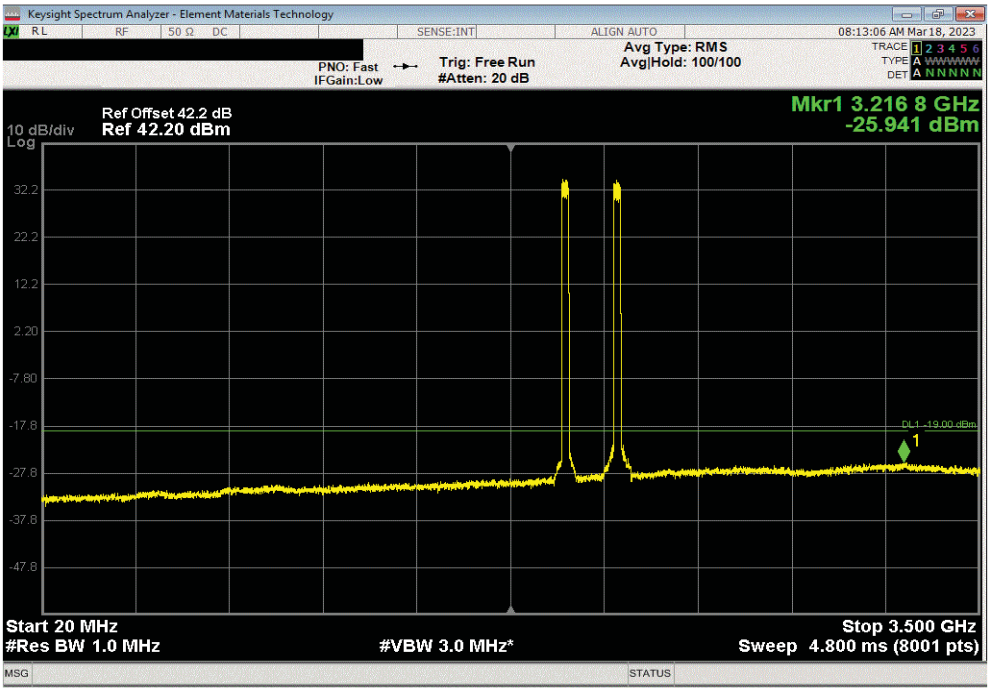
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 16-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
9 kHz - 150 kHz		-62.69	-49	Pass



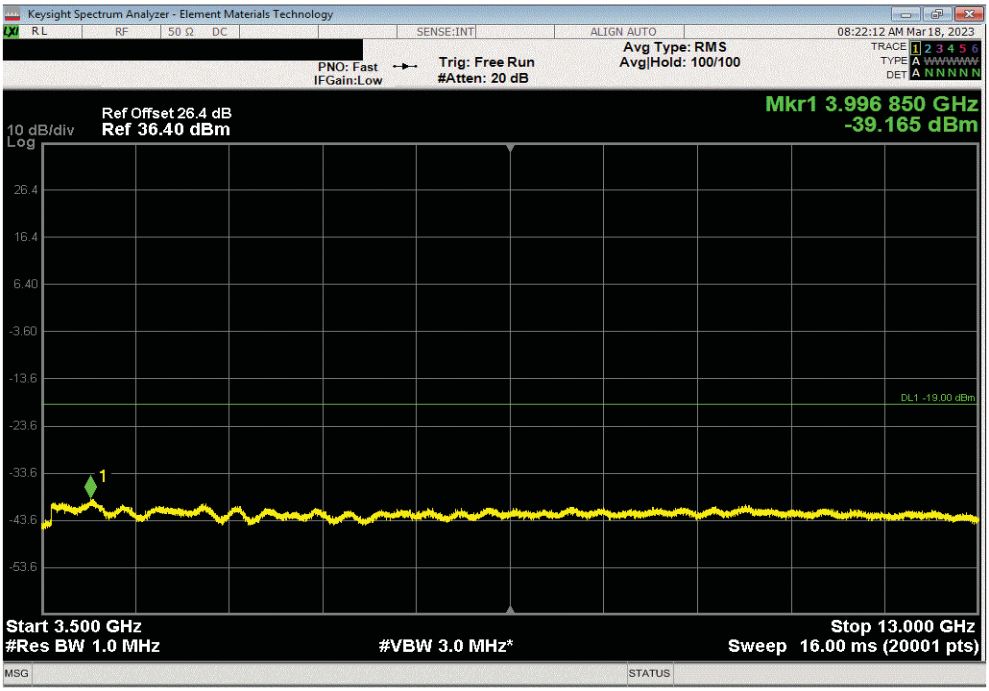
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 16-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
150 kHz - 20 MHz		-62.86	-39	Pass



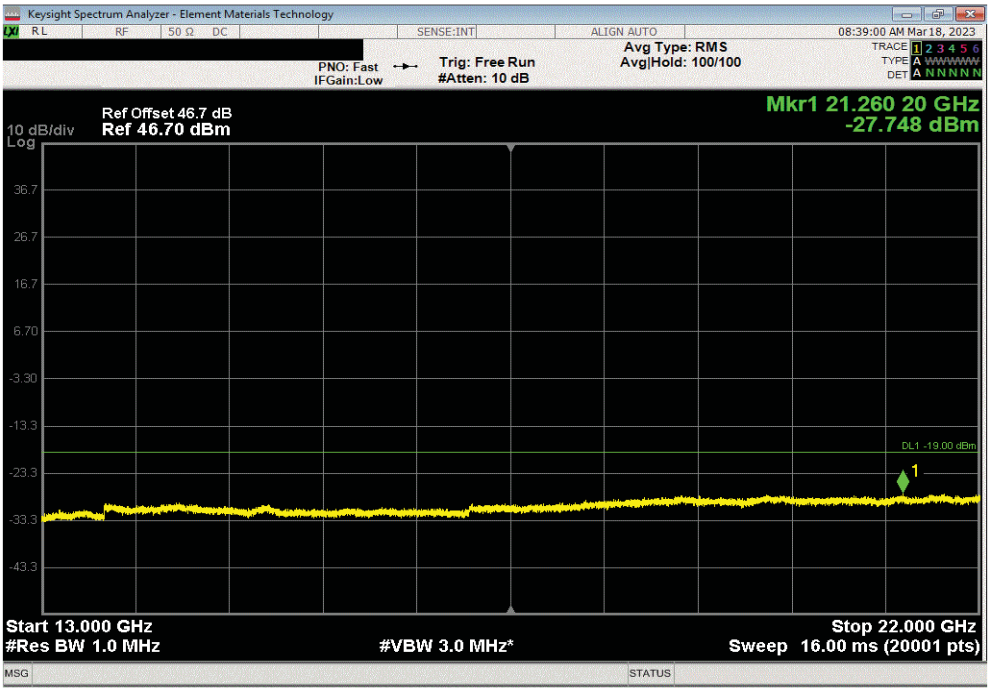
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 16-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
20 MHz - 3.5 GHz		-25.94	-19	Pass



Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 16-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
3.5 GHz - 13 GHz		-39.17	-19	Pass

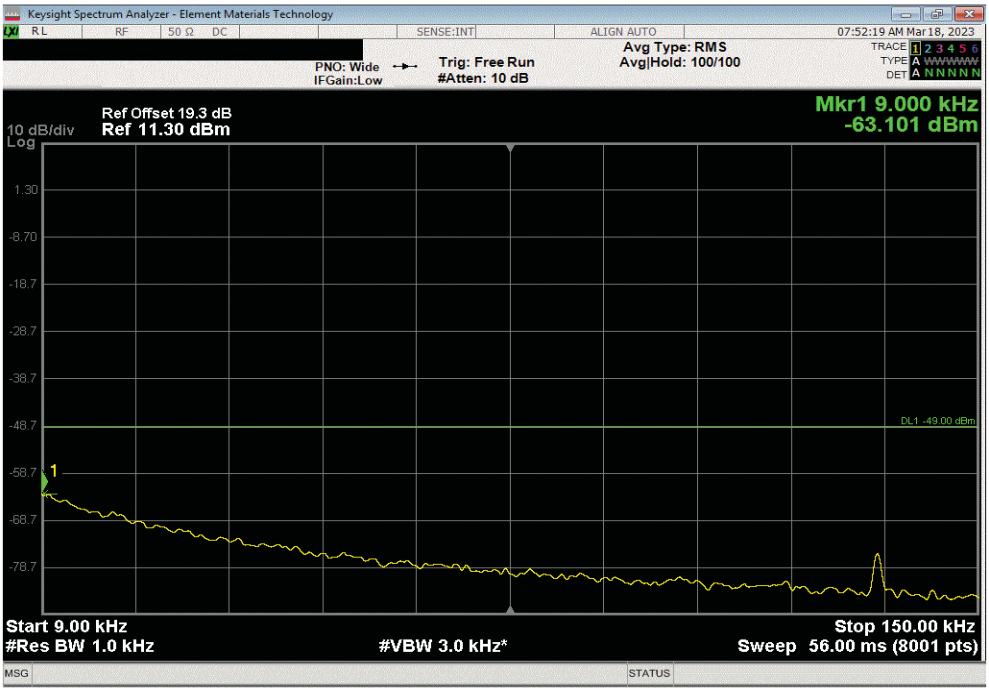


Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 16-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
13 GHz - 22 GHz		-27.75	-19	Pass

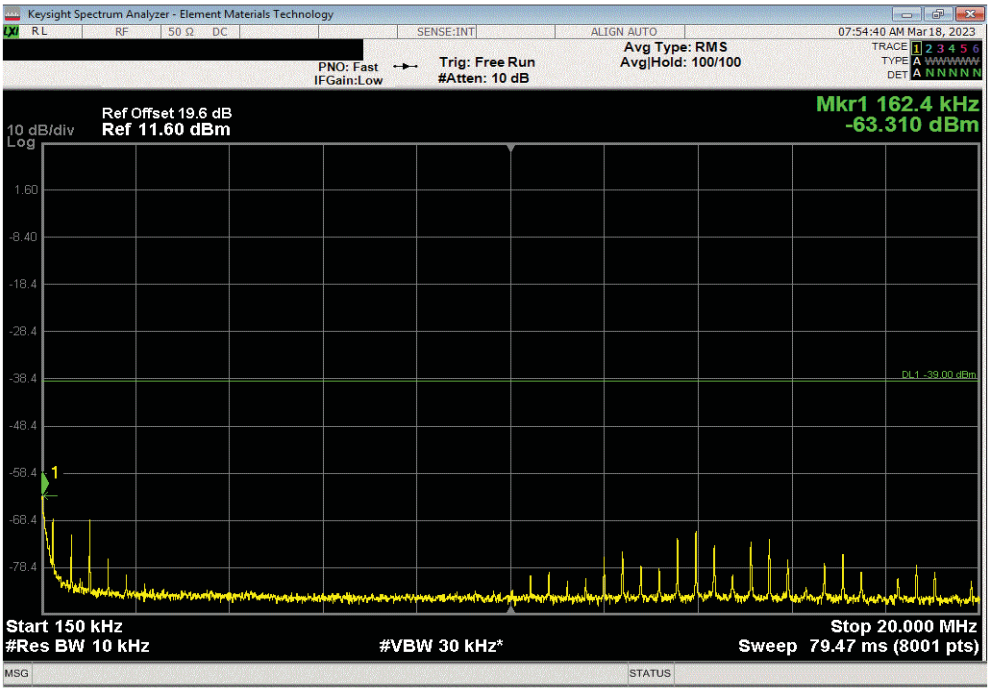


SPURIOUS CONDUCTED EMISSIONS - BAND n25 & Band n66 5G

Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 64-QAM Modulation, Mid Channel 1962.5 MHz					
Frequency Range			Value (dBm)	Limit (dBm)	Result
	9 kHz - 150 kHz		-63.1	-49	Pass

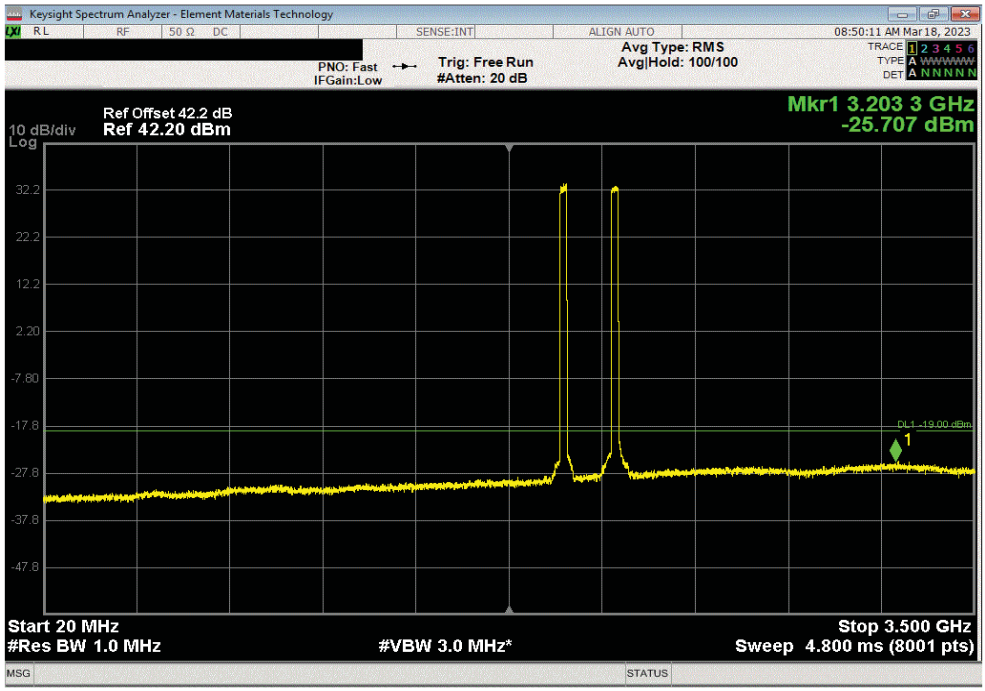


Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 64-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
150 kHz - 20 MHz		-63.31	-39	Pass

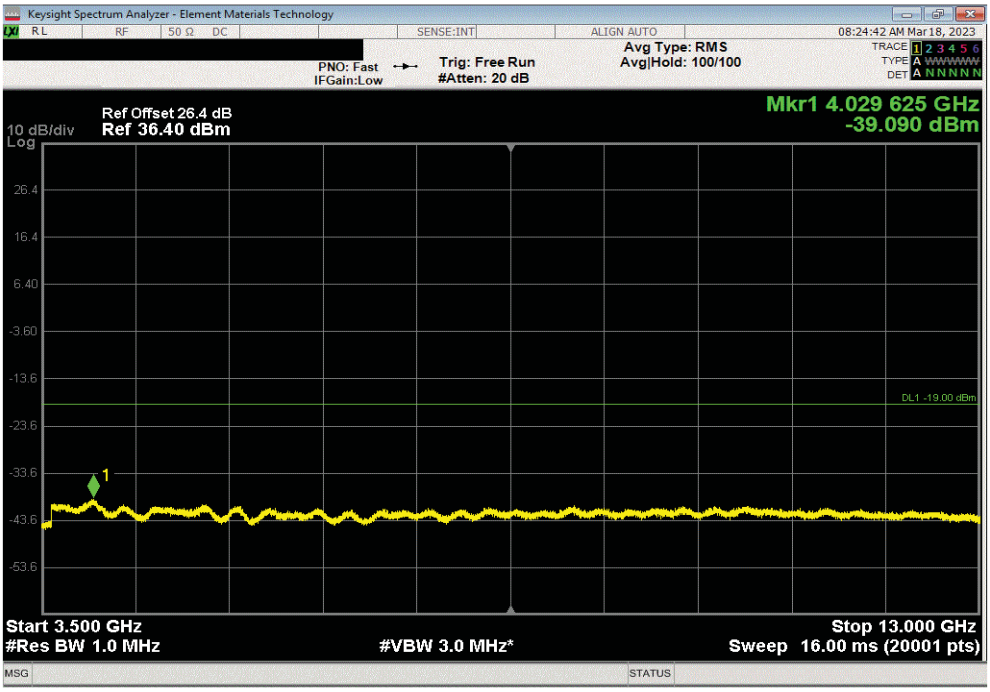


SPURIOUS CONDUCTED EMISSIONS - BAND n25 & Band n66 5G

Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 64-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
20 MHz - 3.5 GHz		-26.32	-19	Pass

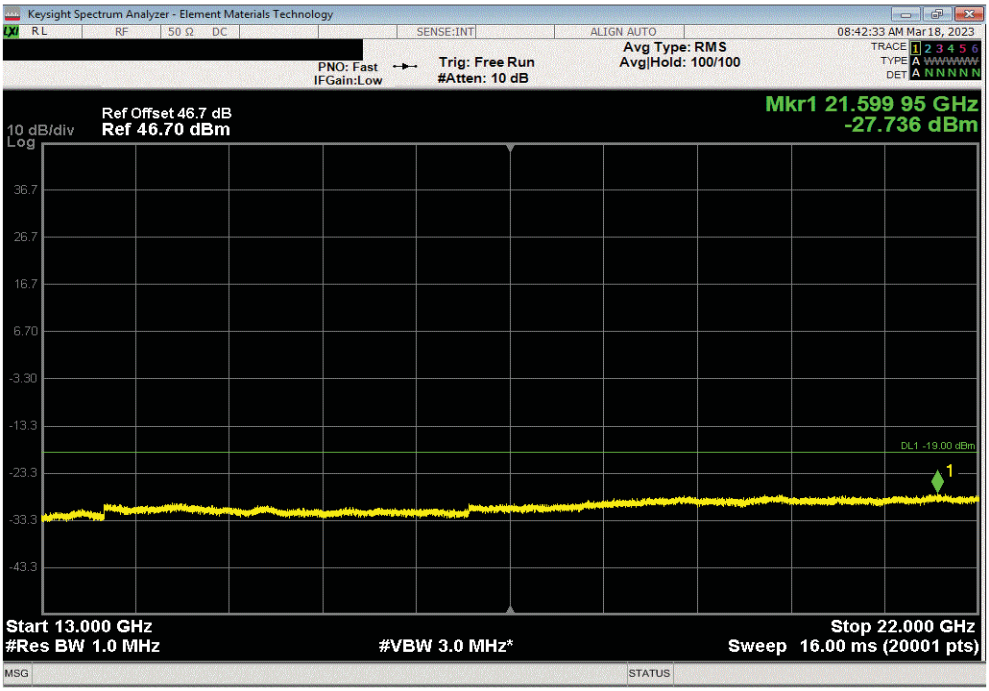


Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 64-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
3.5 GHz - 13 GHz		-39.09	-19	Pass

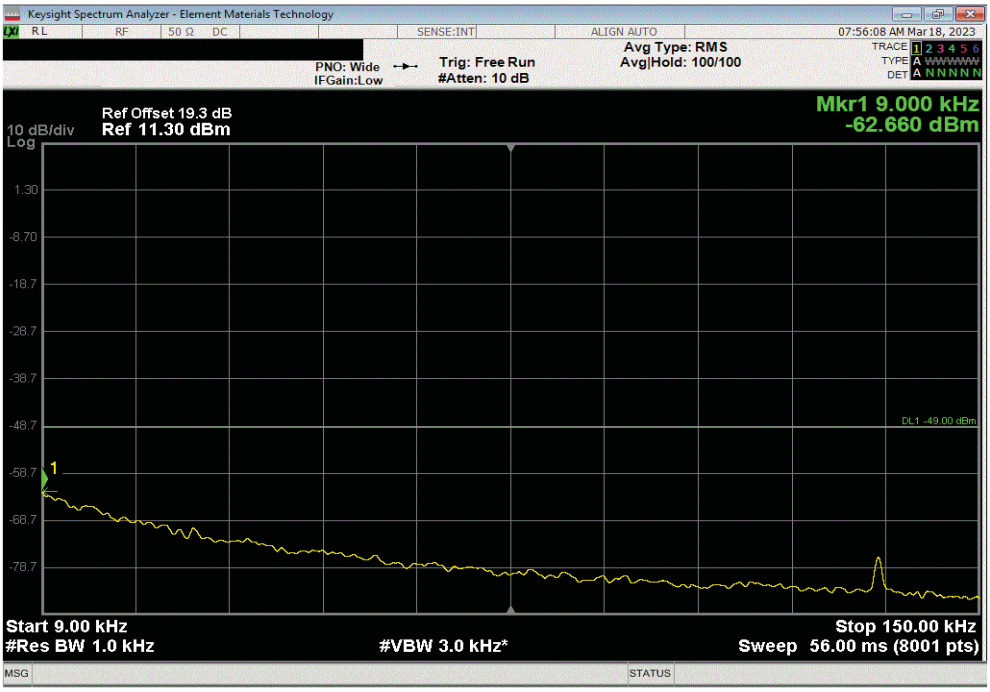


SPURIOUS CONDUCTED EMISSIONS - BAND n25 & Band n66 5G

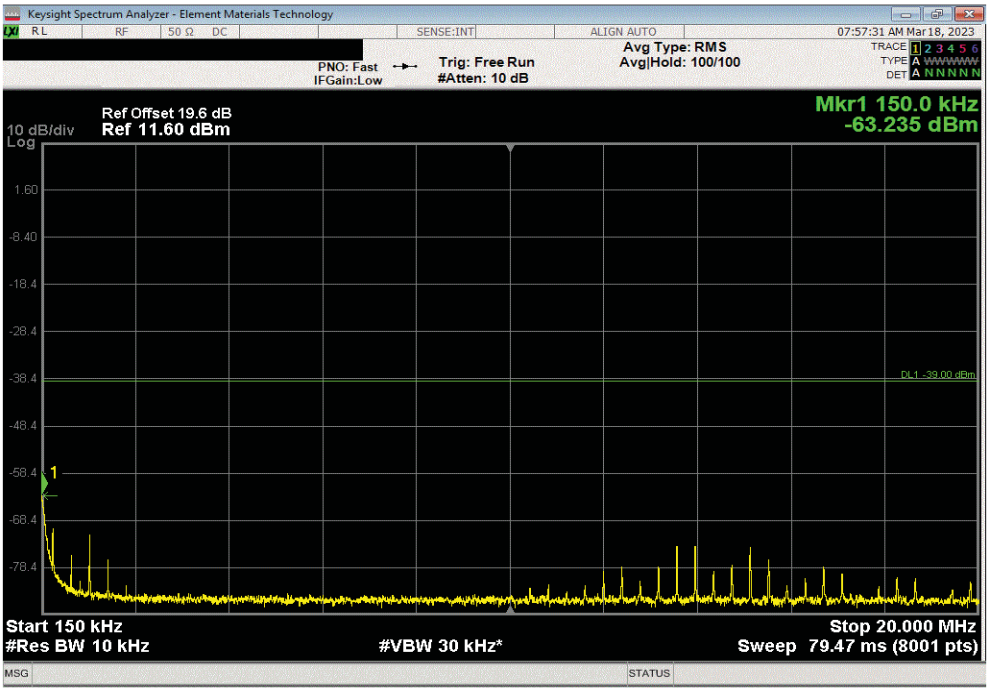
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 64-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
13 GHz - 22 GHz		-27.74	-19	Pass



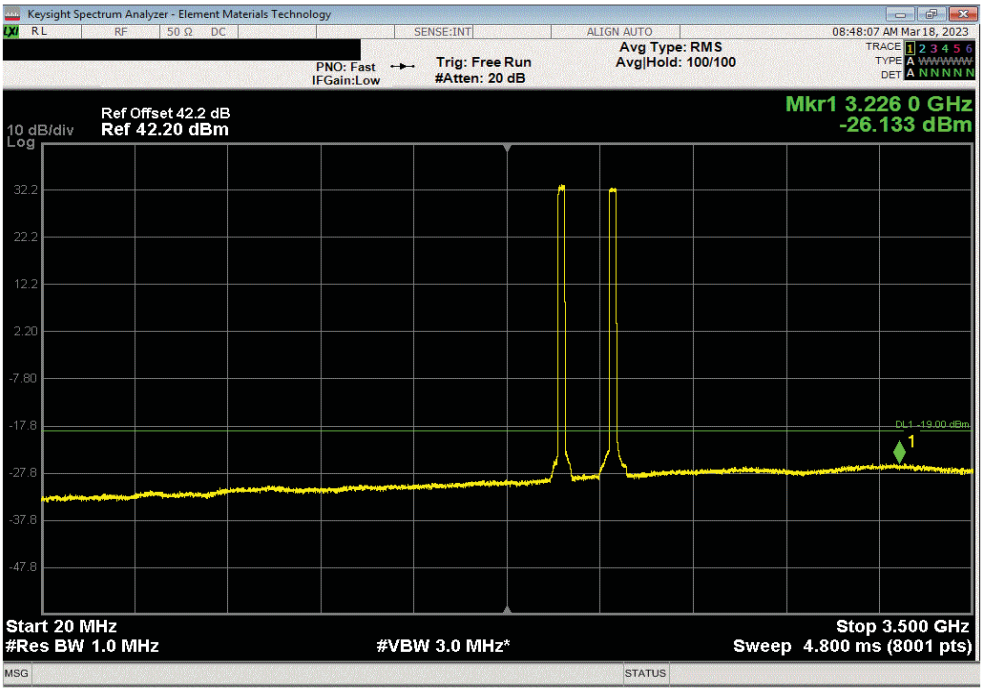
Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 256-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
9 kHz - 150 kHz		-62.66	-49	Pass



Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 256-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
150 kHz - 20 MHz		-63.24	-39	Pass

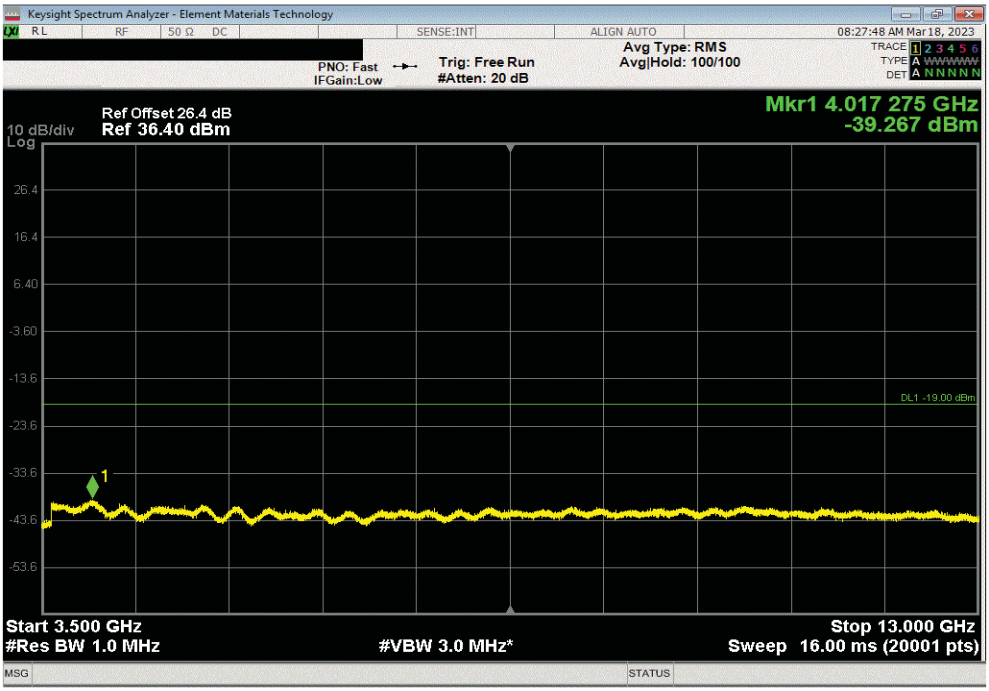


Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 256-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
20 MHz - 3.5 GHz		-25.96	-19	Pass

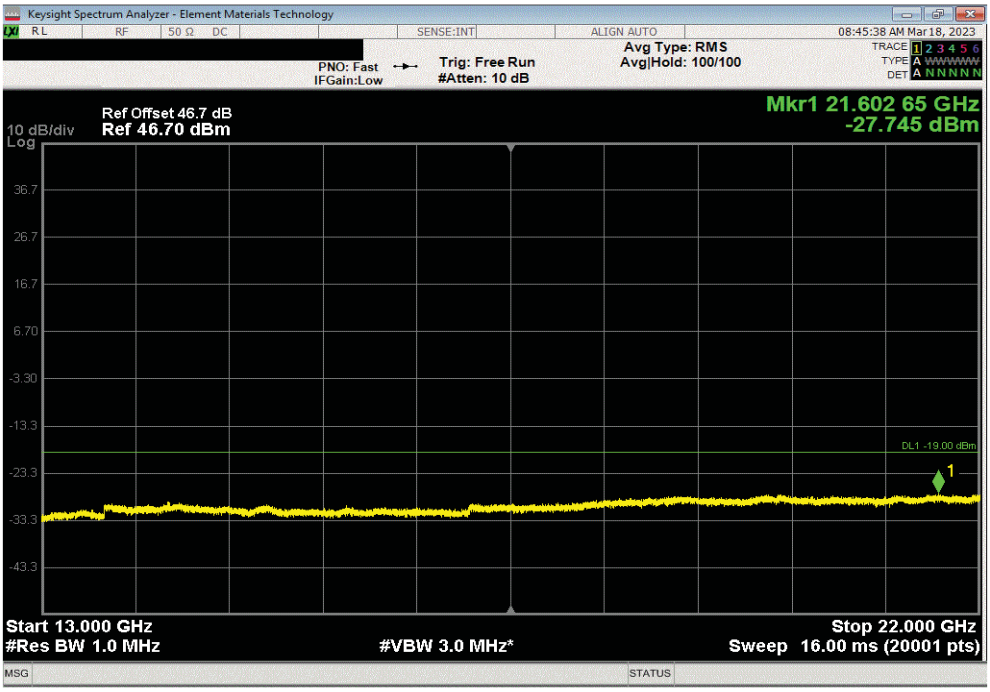


SPURIOUS CONDUCTED EMISSIONS - BAND n25 & Band n66 5G

Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 256-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
3.5 GHz - 13 GHz		-39.27	-19	Pass



Band n25 1930 MHz - 1995 MHz, 5G NR , Port 1, 25 MHz Bandwidth, 256-QAM Modulation, Mid Channel 1962.5 MHz				
Frequency Range		Value (dBm)	Limit (dBm)	Result
13 GHz - 22 GHz		-27.75	-19	Pass



End of Test Report