

PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER



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
Block - DC	Fairview Microwave	SD3379	AMM	2022-09-09	2023-09-09
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17

TEST DESCRIPTION

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

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

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

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

Per FCC part 27.50(d)(5) and RSS-130 section 4.6.1, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

The RF conducted emission testing was performed on one port. The AHLOA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification effort) 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.

PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER



TstTx 2022.05.02.0 XMit 2023.02.14.0

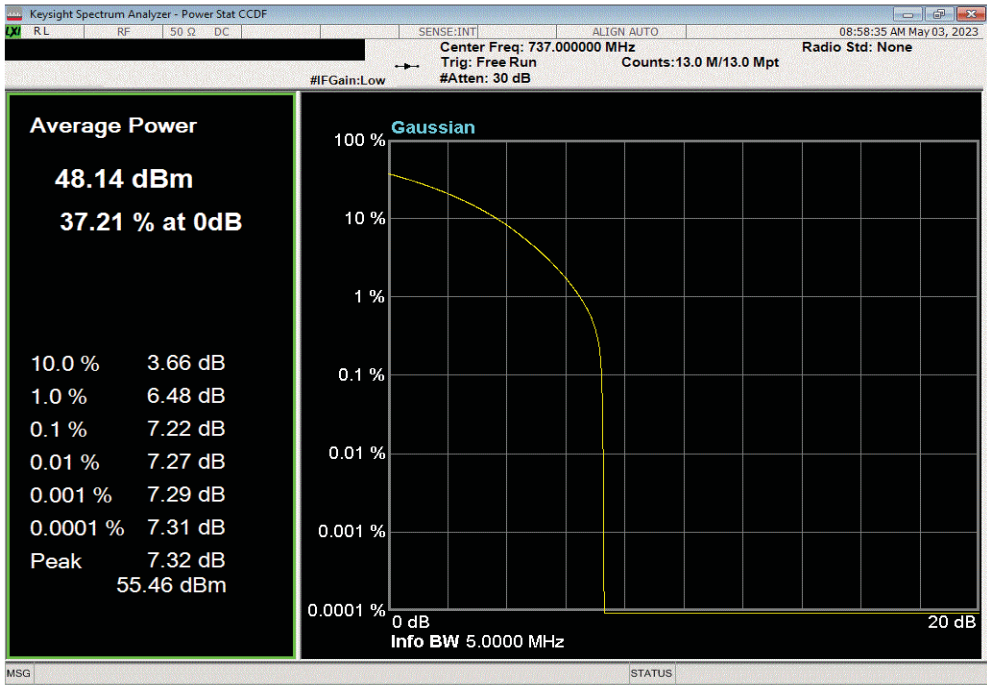
EUT: AHLOA (FCC/ISED C2PC)		Work Order: NOKI0058
Serial Number: K9180540675		Date: 05/02/2023
Customer: Nokia Solutions and Networks		Temperature: 21°C
Attendees: John Rattanaovong, Mitchel Hill		Humidity: 42.7%
Project: None		Barometric Pres.: 1012 mbar
Tested by: Brandon Hobbs	Power: 54 VDC	Job Site: TX07
TEST SPECIFICATIONS		
FCC 27:2023		Test Method
RSS-130 Issue 2:2019		ANSI C63.26:2015
COMMENTS		ANSI C63.26:2015
All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. Band n85 carriers are enabled at maximum power (60 watts/carrier).		
DEVIATIONS FROM TEST STANDARD		
None		
Configuration #	NOKI0058-2	Signature
		PAPR 0.1% Value (dB) PAPR Limit (dB) Results
Band n85 728 MHz - 746 MHz, 5G NR		
Port 1		
5 MHz Bandwidth		
QPSK Modulation		
Mid Channel 737 MHz		7.22 13 Pass
16-QAM Modulation		
Mid Channel 737 MHz		7.39 13 Pass
64-QAM Modulation		
Mid Channel 737 MHz		7.23 13 Pass
256-QAM Modulation		
Low Channel 730.5 MHz		7.21 13 Pass
Mid Channel 737 MHz		7.21 13 Pass
High Channel 743.5 MHz		7.21 13 Pass
10 MHz Bandwidth		
QPSK Modulation		
Mid Channel 737 MHz		7.24 13 Pass
16-QAM Modulation		
Mid Channel 737 MHz		7.36 13 Pass
64-QAM Modulation		
Mid Channel 737 MHz		7.25 13 Pass
256-QAM Modulation		
Low Channel 733 MHz		7.29 13 Pass
Mid Channel 737 MHz		7.24 13 Pass
High Channel 741 MHz		7.27 13 Pass
15 MHz Bandwidth		
QPSK Modulation		
Mid Channel 737 MHz		7.23 13 Pass
16-QAM Modulation		
Mid Channel 737 MHz		7.34 13 Pass
64-QAM Modulation		
Mid Channel 737 MHz		7.23 13 Pass
256-QAM Modulation		
Low Channel 735.5 MHz		7.30 13 Pass
Mid Channel 737 MHz		7.23 13 Pass
High Channel 738.5 MHz		7.24 13 Pass

PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER

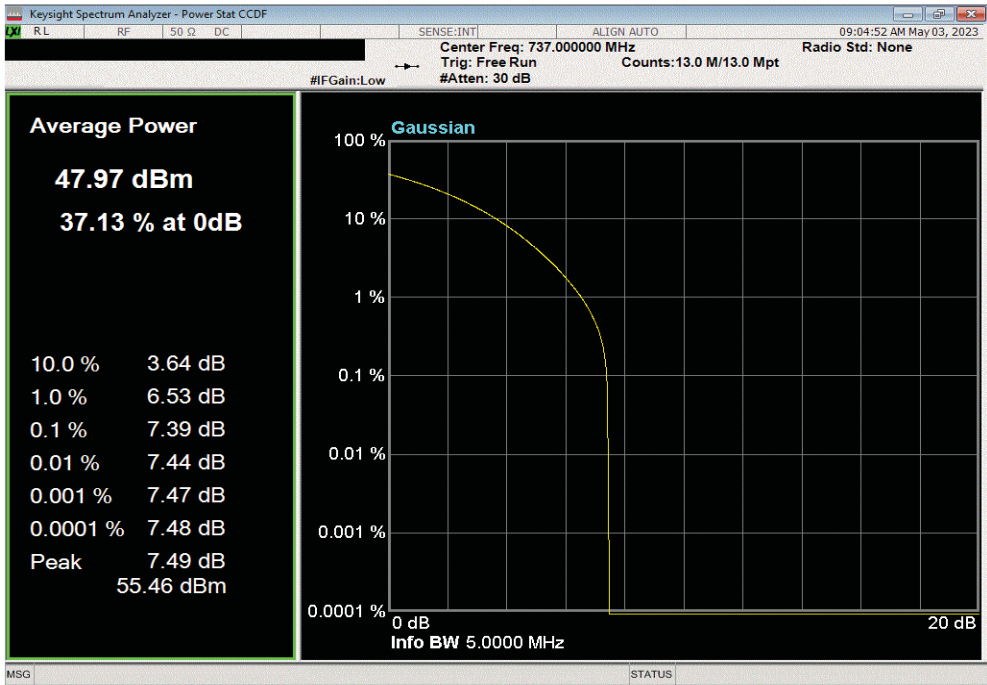


TbTtx 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, QPSK Modulation, Mid Channel 737 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.22	13	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 16-QAM Modulation, Mid Channel 737 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.39	13	Pass	

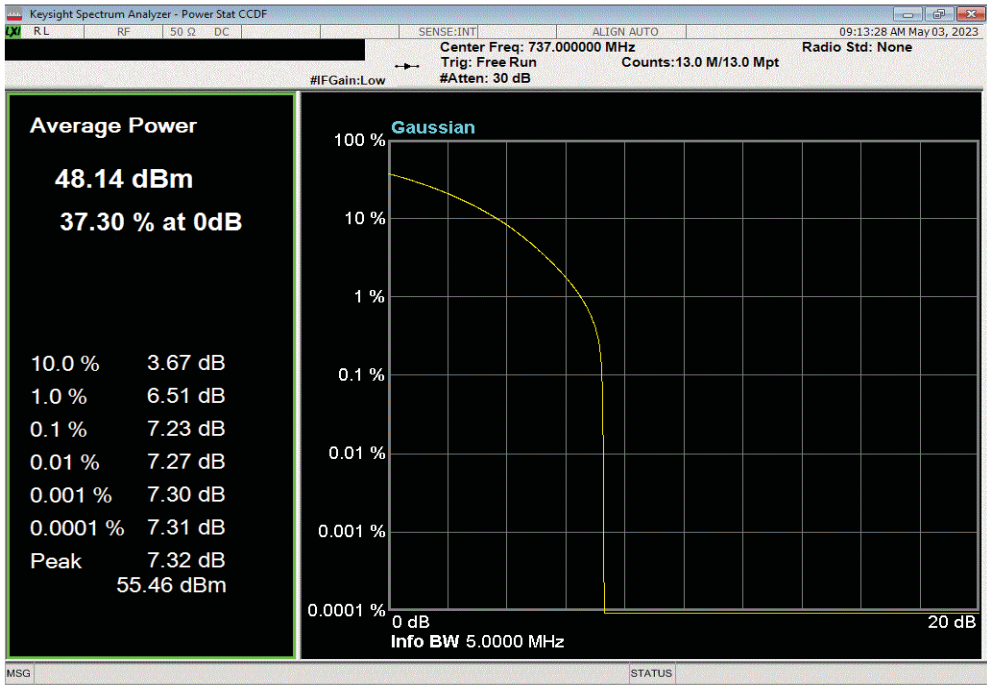


PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER

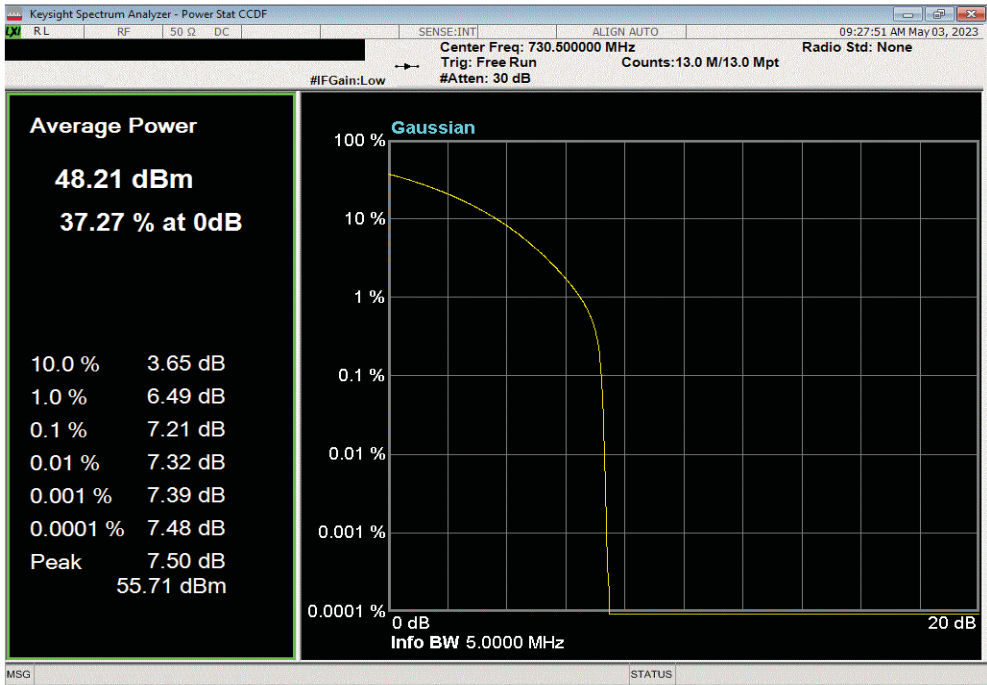


TbTb 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 64-QAM Modulation, Mid Channel 737 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.23	13	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Low Channel 730.5 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.21	13	Pass	

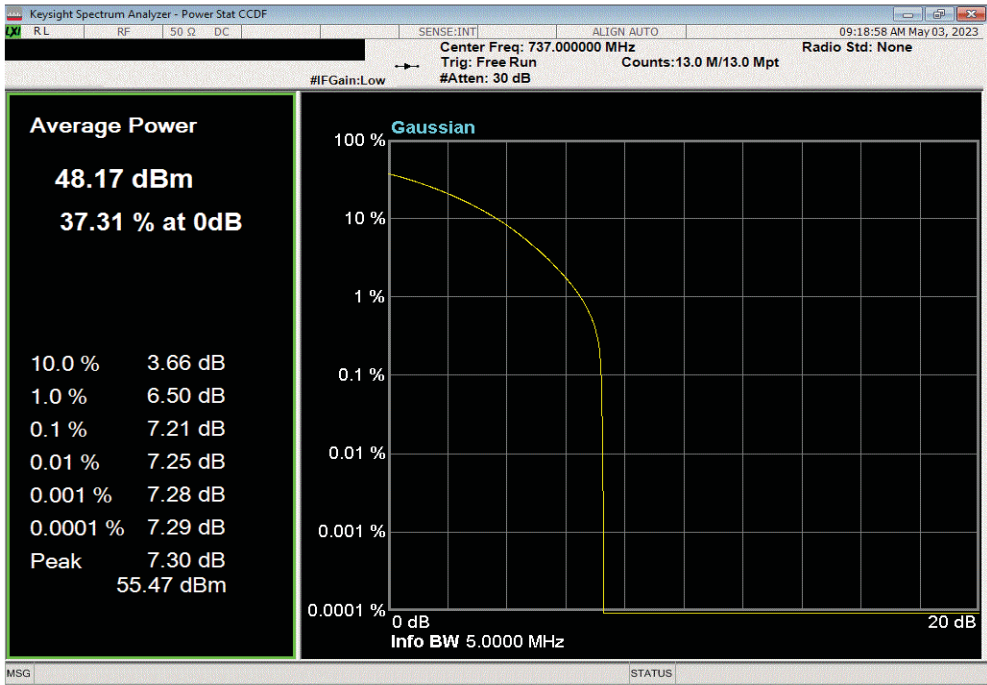


PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER

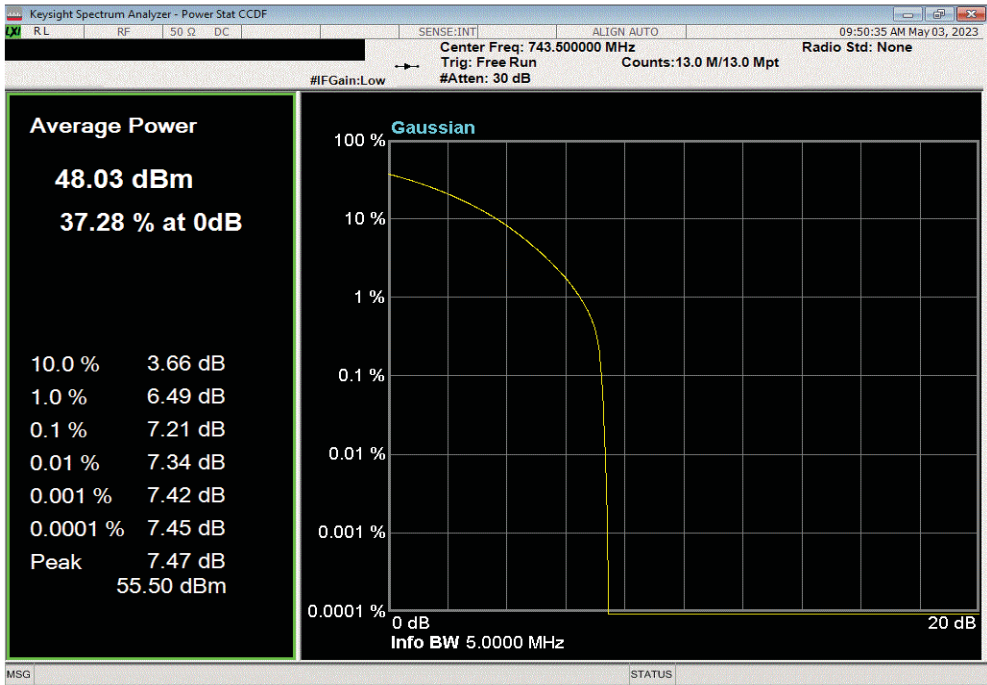


TbTb 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.21	13	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, High Channel 743.5 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.21	13	Pass	

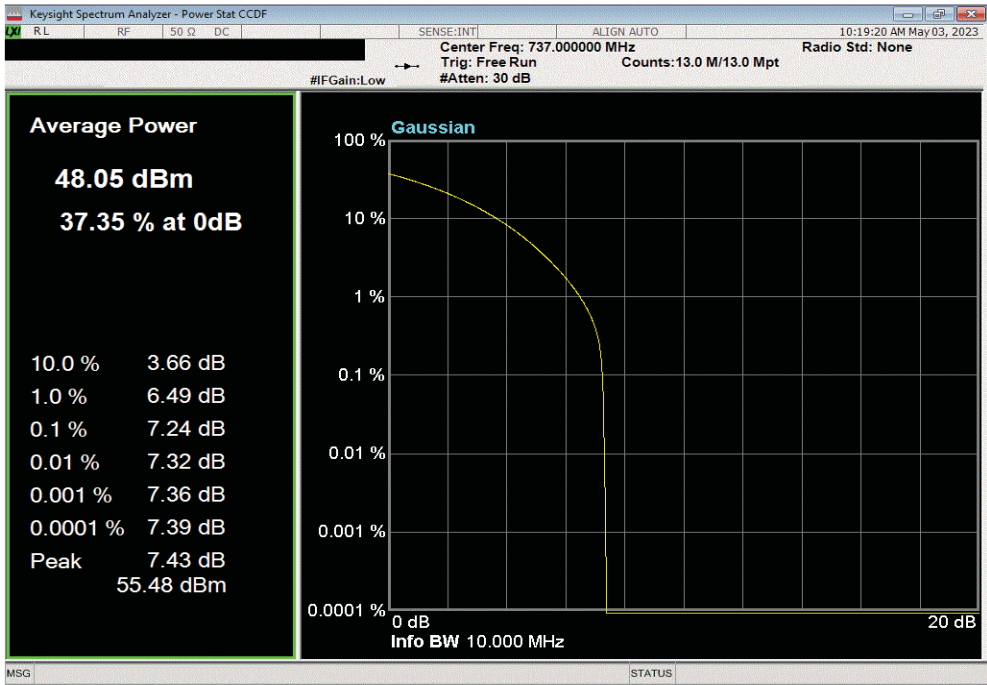


PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER

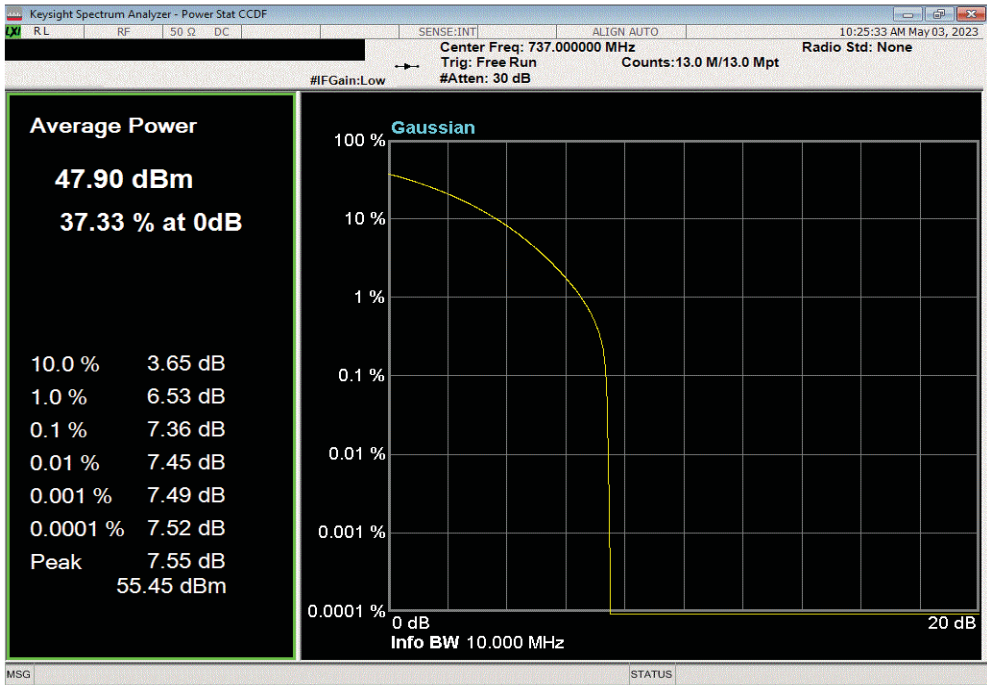


TbTb 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, QPSK Modulation, Mid Channel 737 MHz						
				PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results
				7.24	13	Pass



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 16-QAM Modulation, Mid Channel 737 MHz						
				PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results
				7.36	13	Pass

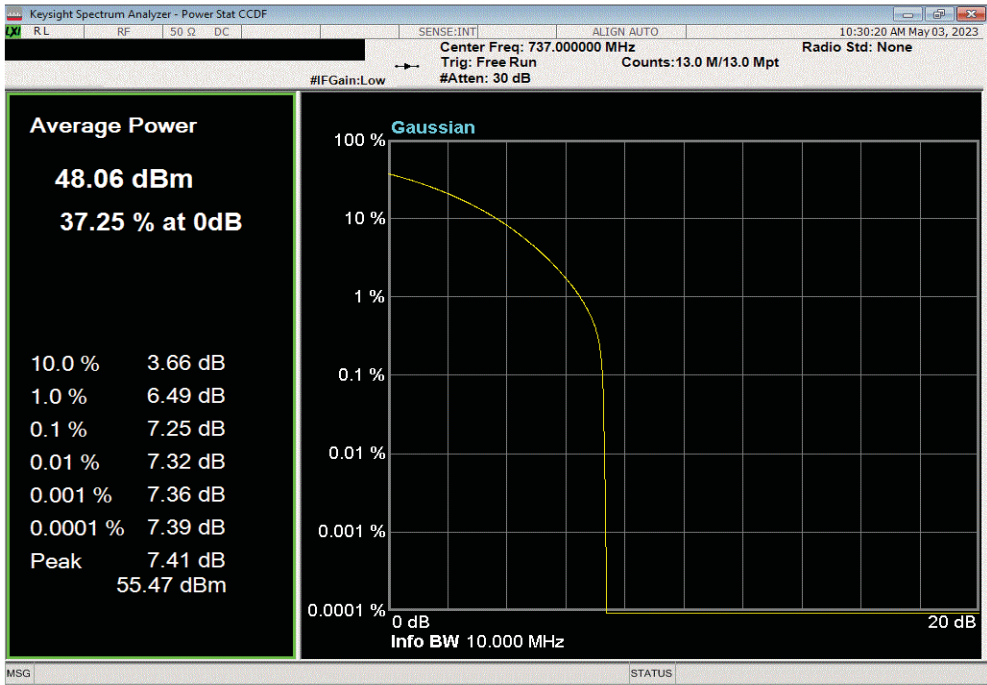


PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER

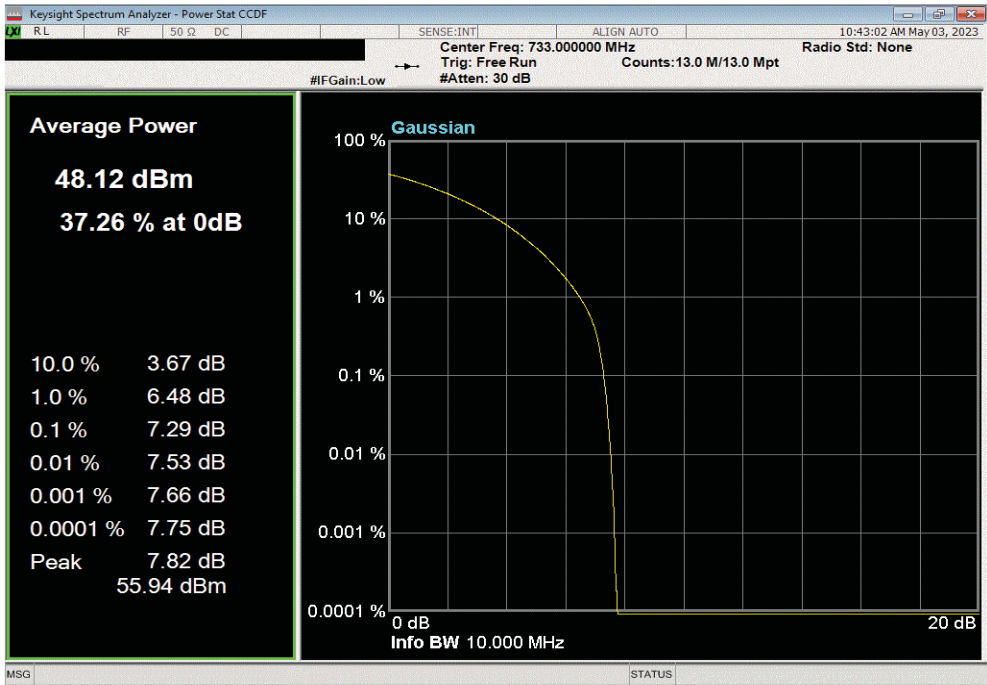


TbTb 2022.05.02.0 XMT 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 64-QAM Modulation, Mid Channel 737 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.25	13	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Low Channel 733 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.29	13	Pass	

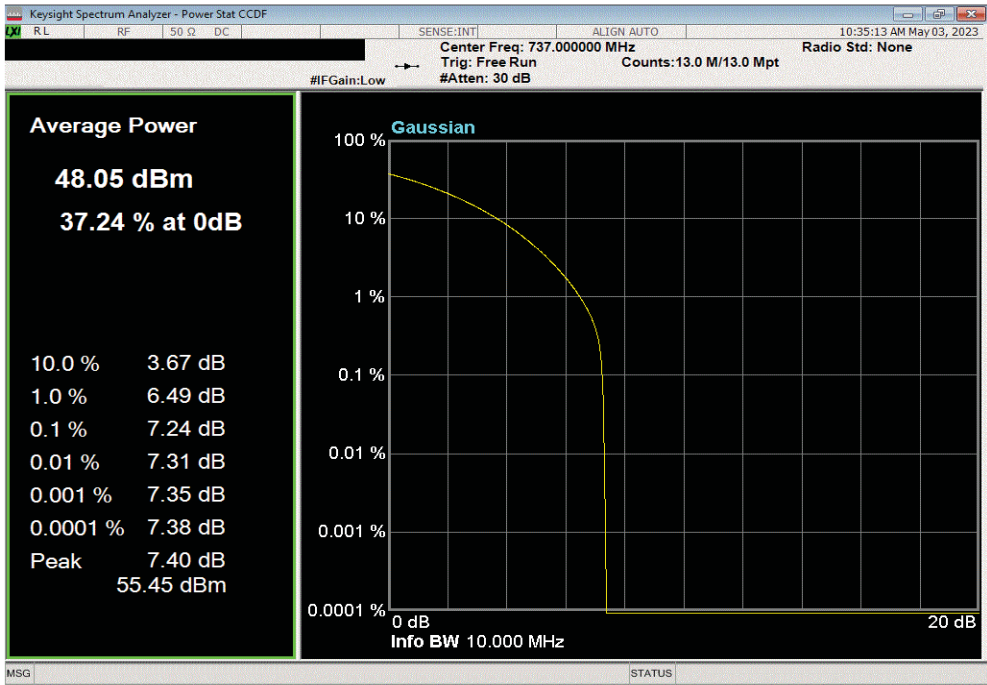


PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER

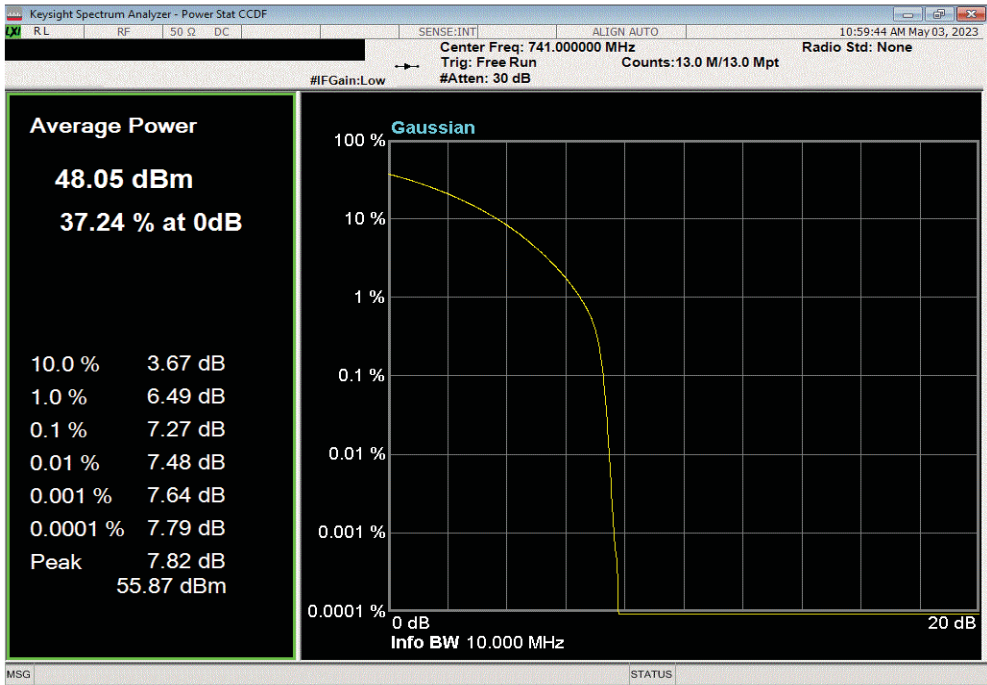


TbTb 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.24	13	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, High Channel 741 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.27	13	Pass	

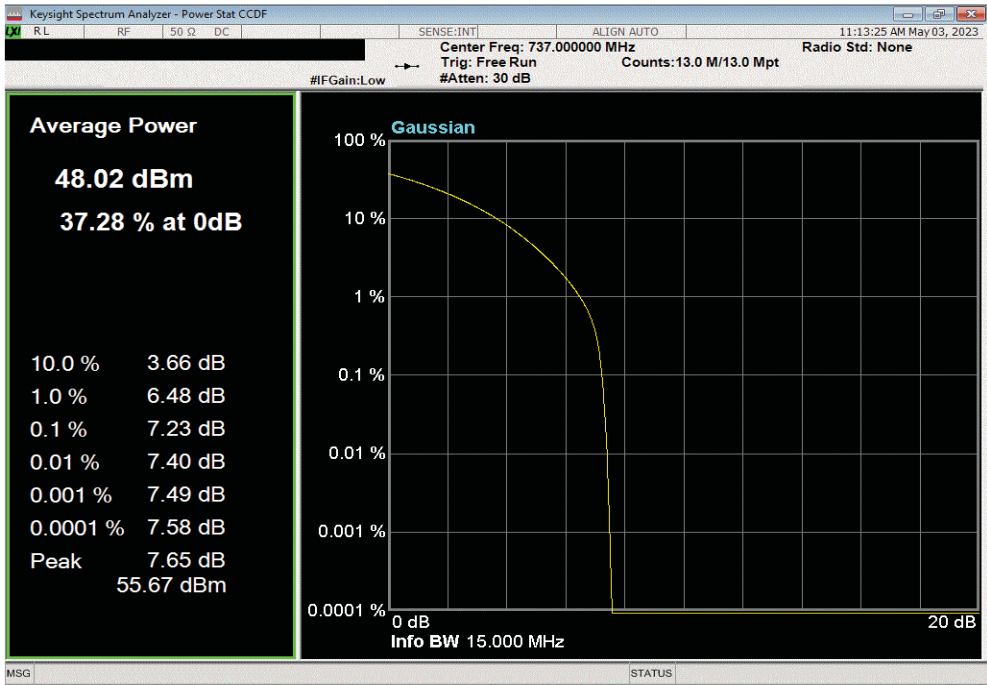


PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER

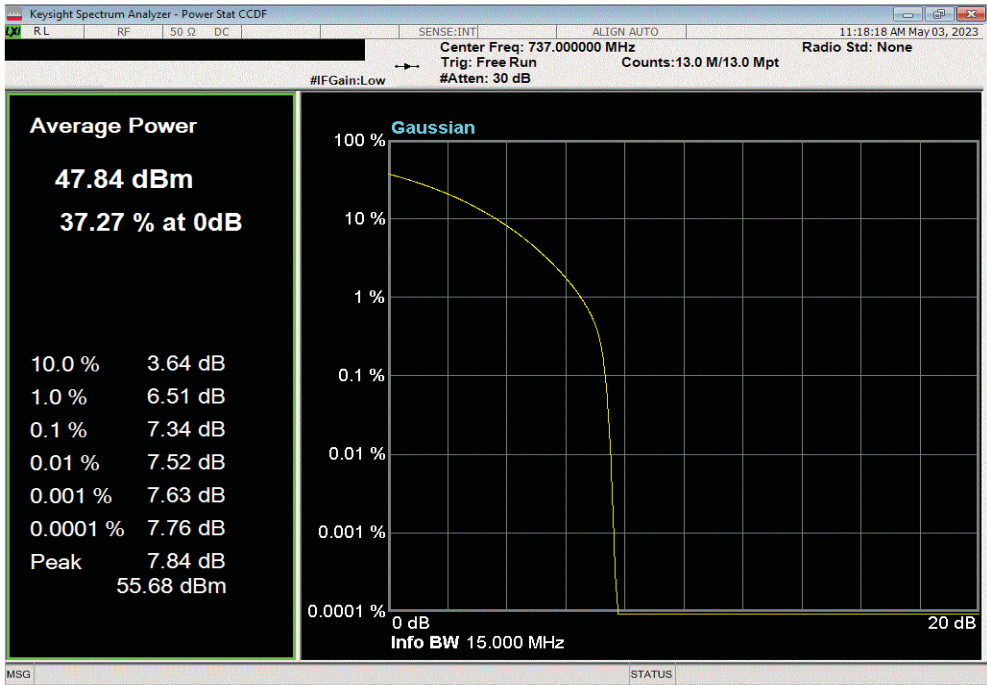


TbTb 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, QPSK Modulation, Mid Channel 737 MHz						
				PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results
				7.23	13	Pass



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, 16-QAM Modulation, Mid Channel 737 MHz						
				PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results
				7.34	13	Pass

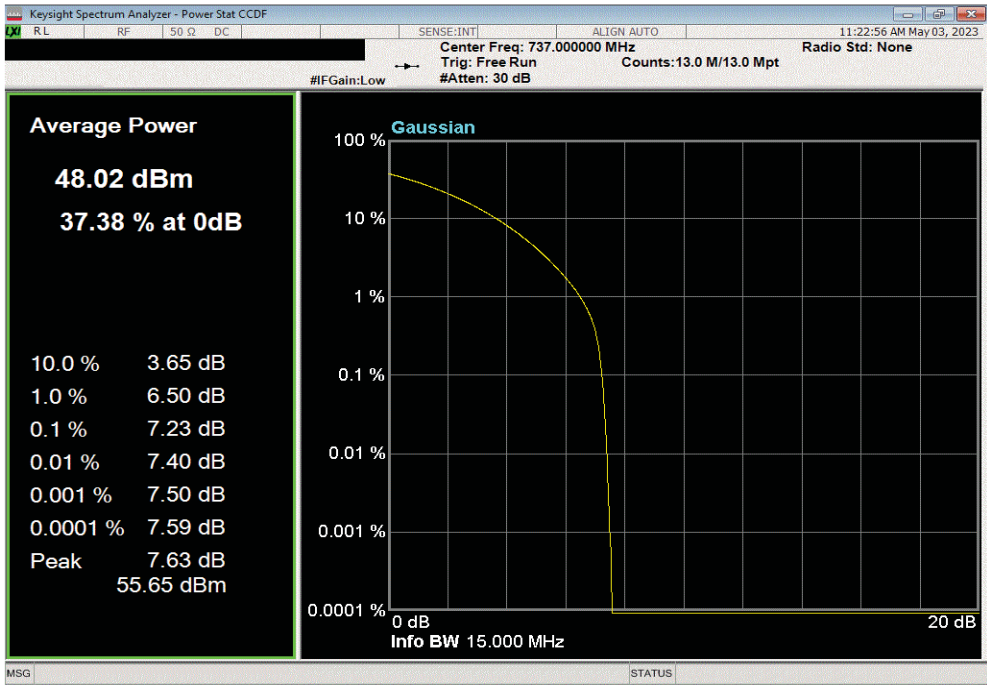


PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER

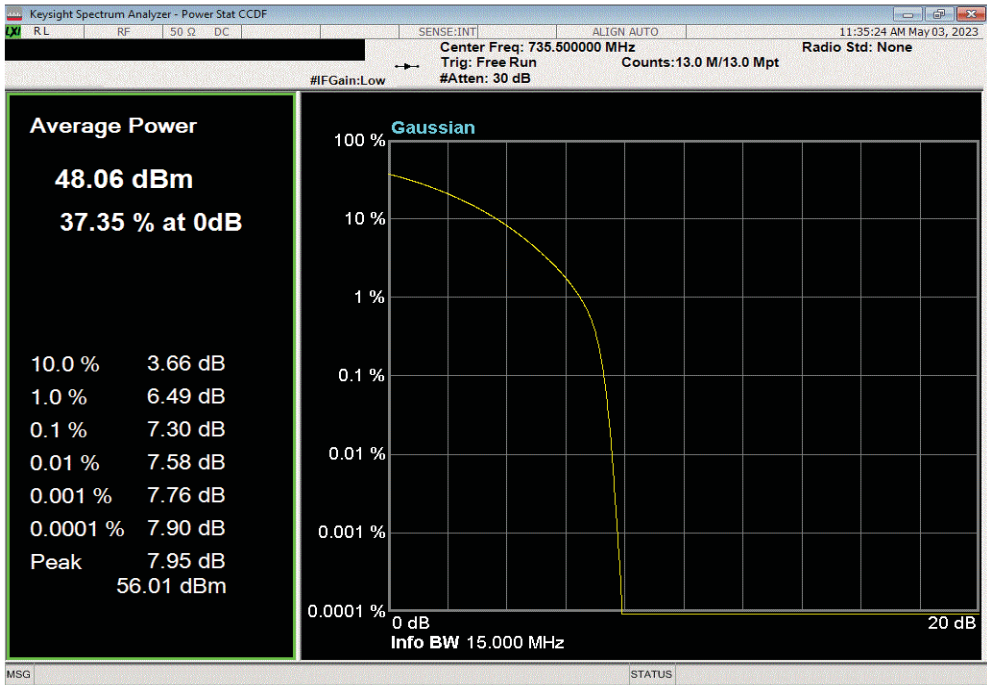


TbTb 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, 64-QAM Modulation, Mid Channel 737 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.23	13	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Low Channel 735.5 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.3	13	Pass	

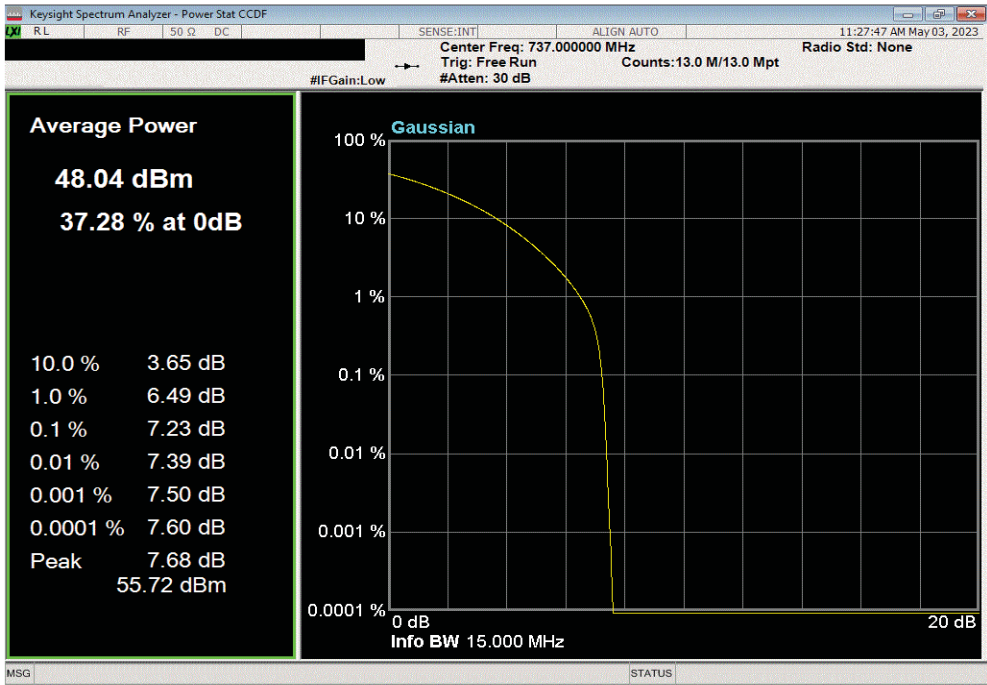


PEAK TO AVERAGE POWER (PAPR)/CCDF - SINGLE CARRIER

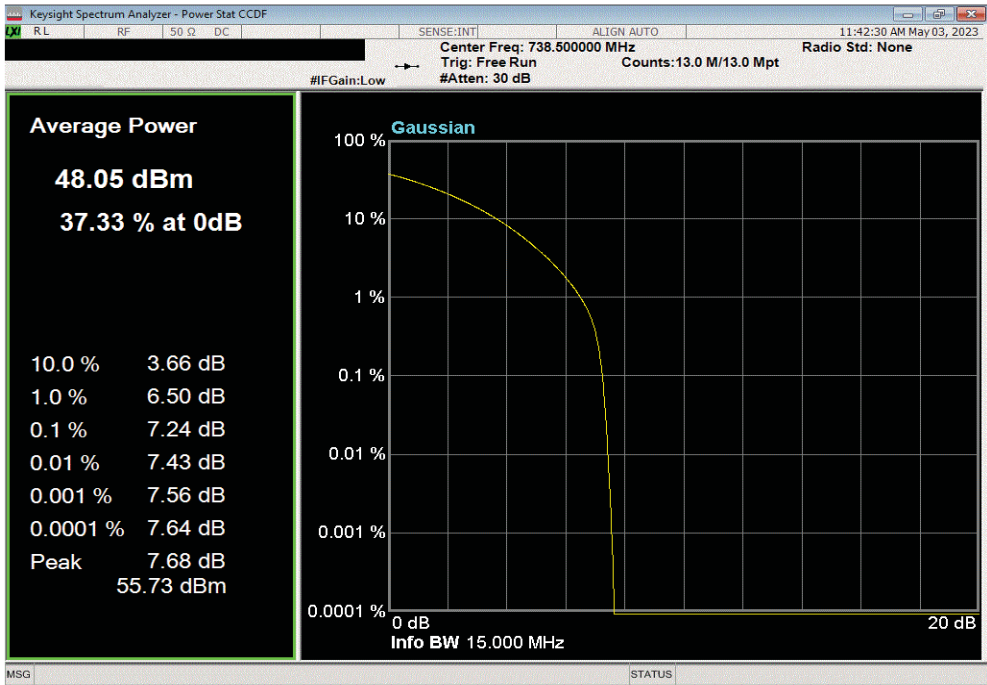


TbTb 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.23	13	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, 256-QAM Modulation, High Channel 738.5 MHz						
			PAPR 0.1% Value (dB)	PAPR Limit (dB)	Results	
			7.24	13	Pass	



BAND EDGE COMPLIANCE - MULTICARRIER



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
Block - DC	Fairview Microwave	SD3379	AMM	2022-09-09	2023-09-09
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17

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 $[-10 \cdot \log(4)]$ dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911.

Multicarrier test cases have been developed as shown below:

Notes: Max port power (60watts is shared between Bands n71/n85)

Multi-Carrier Test Case 1): 3GPP Band n71 Multicarrier In the Band n71 _Three NR5 carriers using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (619.5 & 624.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (649.5MHz) at the upper band edge. The NR 5MHz channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power for a total port power of 60 watts (~20W/Band n71 carriers). 3GPP Band n85 carrier is not enable.

Multi-Carrier Test Case 2): 3GPP Band n71 Multicarrier: In the Band n71 _ One NR 20MHz carriers and one NR 15MHz carriers (with minimum spacing between carrier frequencies) at the lower band edge (627.0 & 644.5MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power for a total port power of 60 watts (~30W/Band n71 carriers). 3GPP Band n85 carrier is not enable.

Multi-Carrier Test Case 3): 3GPP Band n85 Multicarrier: In the Band n85 _Two NR5 carriers using one carrier at the lower band edge (730.5MHz) and a second carrier at maximum spacing at the upper band edge (743.5MHz). The NR5 channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power for a total port power of 60 watts (~30W/Band n85 carrier). 3GPP Band n71 carrier is not enable.

Multi-Carrier Test Case 4): 3GPP Band n71 and Band n85 Multicarrier Multiband: Three NR 5MHz carriers using two carriers (with minimum spacing between carrier frequencies) at the Band n71 lower band edge (619.5 & 624.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (743.5MHz) at the Band n85 upper band edge. The smallest channel bandwidth was selected to maximize carrier power spectral density. The carriers were operated at maximum power (~20/ Band n71 carrier and ~20W Band n85 carrier) for a total port power of 60 watts.

Per section 27.53(g) and RSS-130 4.7, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm $[-13 \text{ dBm} - 10 \log(4)]$ per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

Per section 27.53(g) and RSS 130 4.7 requires a ≥ 100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. FCC 27.53(g) and RSS 130 4.7 requires a ≥ 30 kHz measurement bandwidth for emissions between 100 kHz outside of the RRH operating frequency range and band edge of the operating frequency range

A narrower resolution bandwidth of at least 30 kHz is permitted and used to improve measurement accuracy in the transition regions provided that the measured power is integrated over the full required measurement bandwidth (i.e.: 100kHz).

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

BAND EDGE COMPLIANCE - MULTICARRIER



TstTx 2022.05.02.0 XMit 2023.02.14.0

EUT: AHLOA (FCC/ISED C2PC)		Work Order: NOKI0058				
Serial Number: K9180540675		Date: 05/03/2023				
Customer: Nokia Solutions and Networks		Temperature: 21.8°C				
Attendees: John Rattanaovong, Mitchel Hill		Humidity: 42.1%				
Project: None		Barometric Pres.: 1014 mbar				
Tested by: Brandon Hobbs	Power: 54 VDC	Job Site: TX07				
TEST SPECIFICATIONS						
FCC 27:2023		Test Method				
RSS-130 Issue 2:2019		ANSI C63.26:2015				
COMMENTS		ANSI C63.26:2015				
All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. Bands n85/n75 carriers are enabled at maximum power (60 watts/port).						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	NOKI0058-2	Signature				
		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
Port 1, 5G NR Multi-Carrier Operation						
QPSK Modulation						
Test Case 1, n71 NR5						
	Low Channel 619.5 MHz	1	617.0	-29.3	-19	Pass
	Low Channel 619.5 MHz	2	616.9	-24.7	-19	Pass
	High Channel 649.5 MHz	1	652.0	-29.4	-19	Pass
	High Channel 649.5 MHz	2	652.1	-25.8	-19	Pass
Test Case 2, n71 NR20						
	Low Channel 627 MHz	1	617.0	-32.8	-19	Pass
	Low Channel 627 MHz	2	616.9	-27.7	-19	Pass
Test Case 2, n71 NR15						
	High Channel 644.5 MHz	1	652.0	-33.0	-19	Pass
	High Channel 644.5 MHz	2	652.1	-28.0	-19	Pass
Test Case 3, n85 NR5						
	Low Channel 730.5 MHz	1	728.0	-29.1	-19	Pass
	Low Channel 730.5 MHz	2	727.9	-24.5	-19	Pass
	High Channel 743.5 MHz	1	746.0	-26.7	-19	Pass
	High Channel 743.5 MHz	2	746.1	-22.5	-19	Pass
Test Case 4, n71 NR5						
	Low Channel 619.5 MHz	1	617.0	-28.8	-19	Pass
	Low Channel 619.5 MHz	2	616.9	-24.4	-19	Pass
Test Case 4, n85 NR5						
	High Channel 743.5 MHz	1	746.0	-28.5	-19	Pass
	High Channel 743.5 MHz	2	746.1	-25.1	-19	Pass

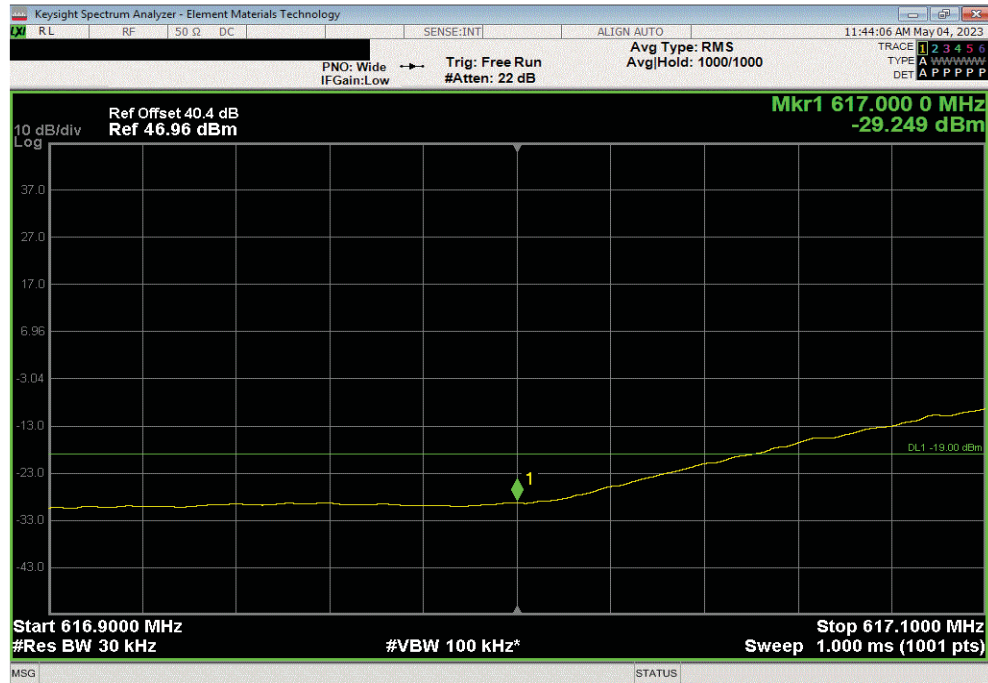
BAND EDGE COMPLIANCE - MULTICARRIER



TbTx 2022.05.02.0 XMI 2023.02.14.0

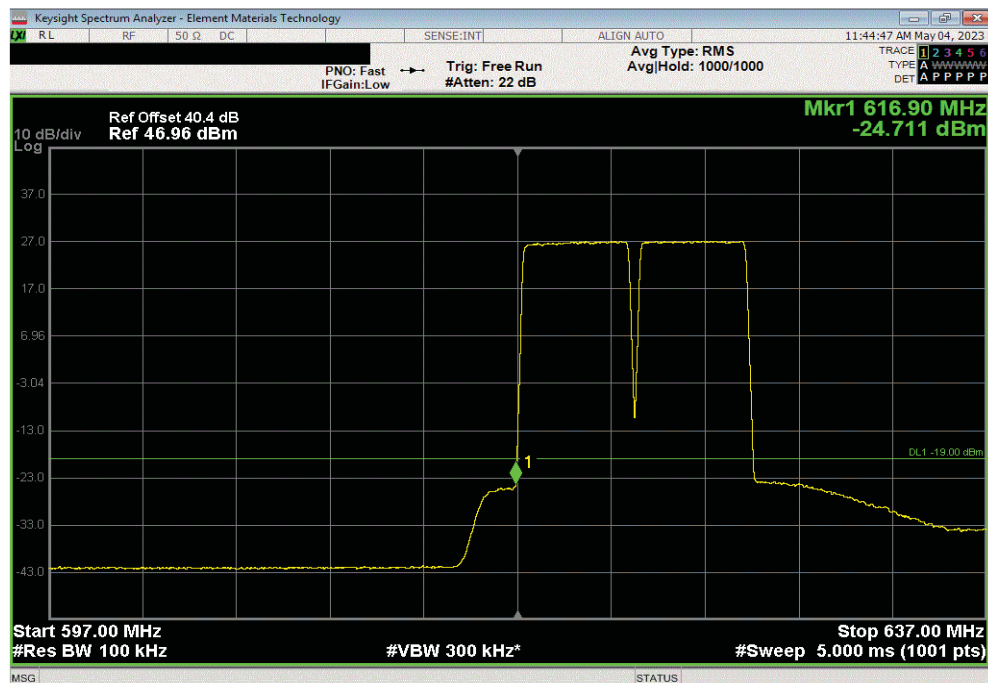
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 1, n71 NR5, Low Channel 619.5 MHz

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1	617	-29.25	-19	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 1, n71 NR5, Low Channel 619.5 MHz

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
2	616.9	-24.71	-19	Pass



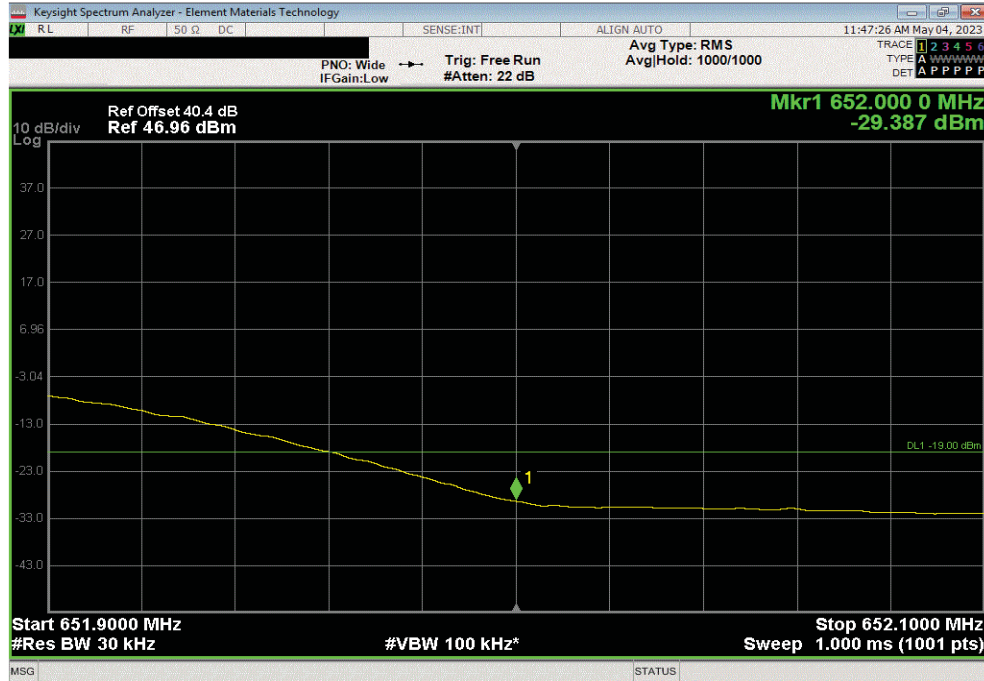
BAND EDGE COMPLIANCE - MULTICARRIER



TbTx 2022.05.02.0 XMt 2023.02.14.0

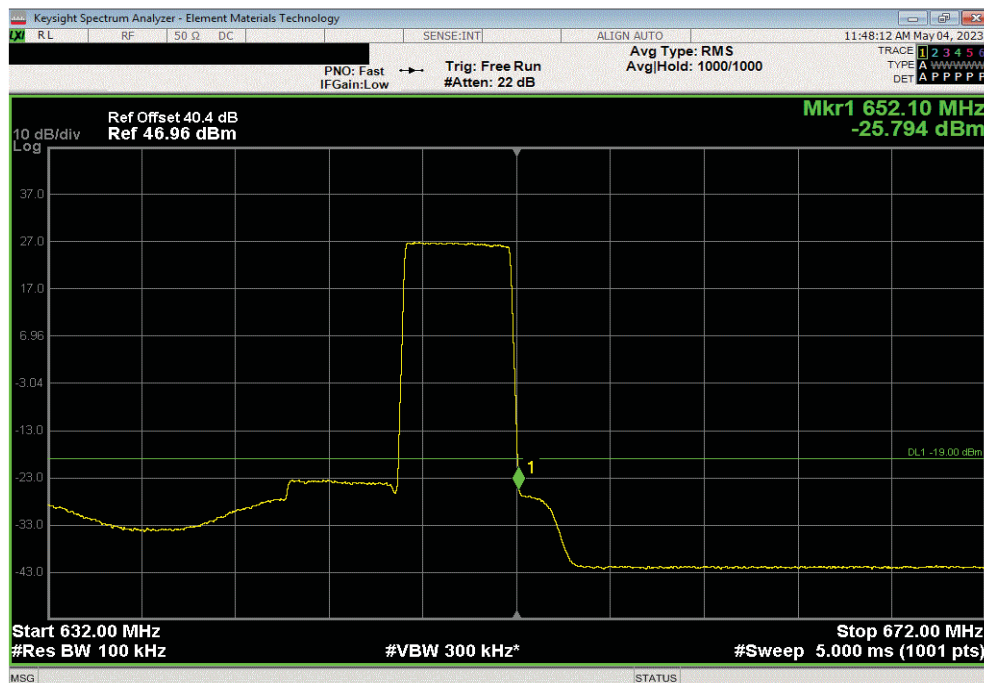
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 1, n71 NR5, High Channel 649.5 MHz

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1	652	-29.39	-19	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 1, n71 NR5, High Channel 649.5 MHz

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
2	652.1	-25.79	-19	Pass

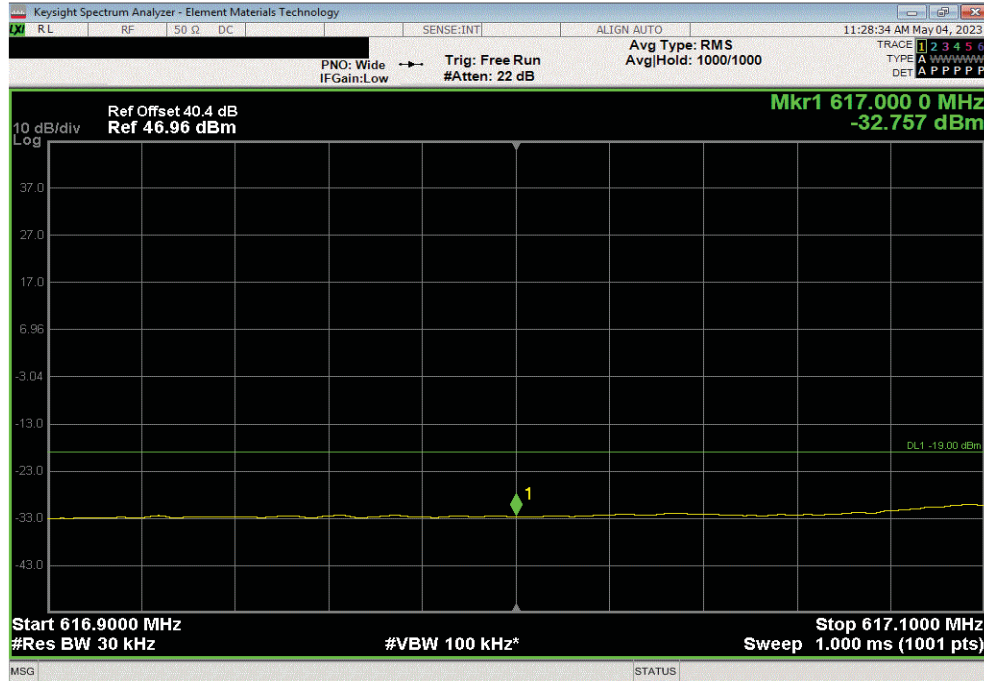


BAND EDGE COMPLIANCE - MULTICARRIER

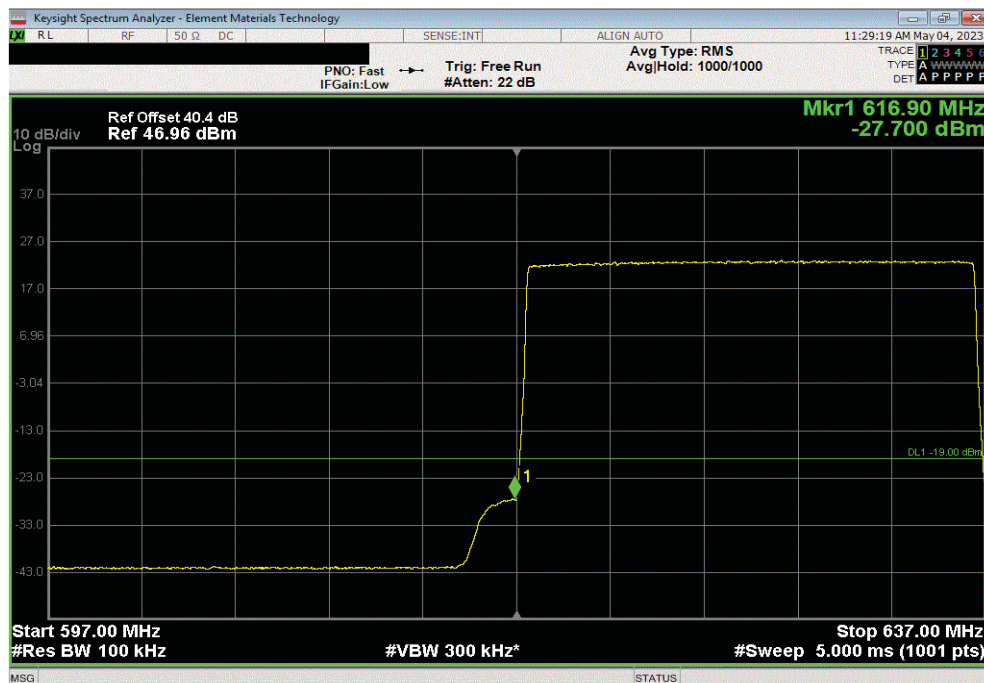


TbTtx 2022.05.02.0 XMt 2023.02.14.0

Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 2, n71 NR20, Low Channel 627 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	617	-32.76	-19	Pass		



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 2, n71 NR20, Low Channel 627 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	616.9	-27.7	-19	Pass		

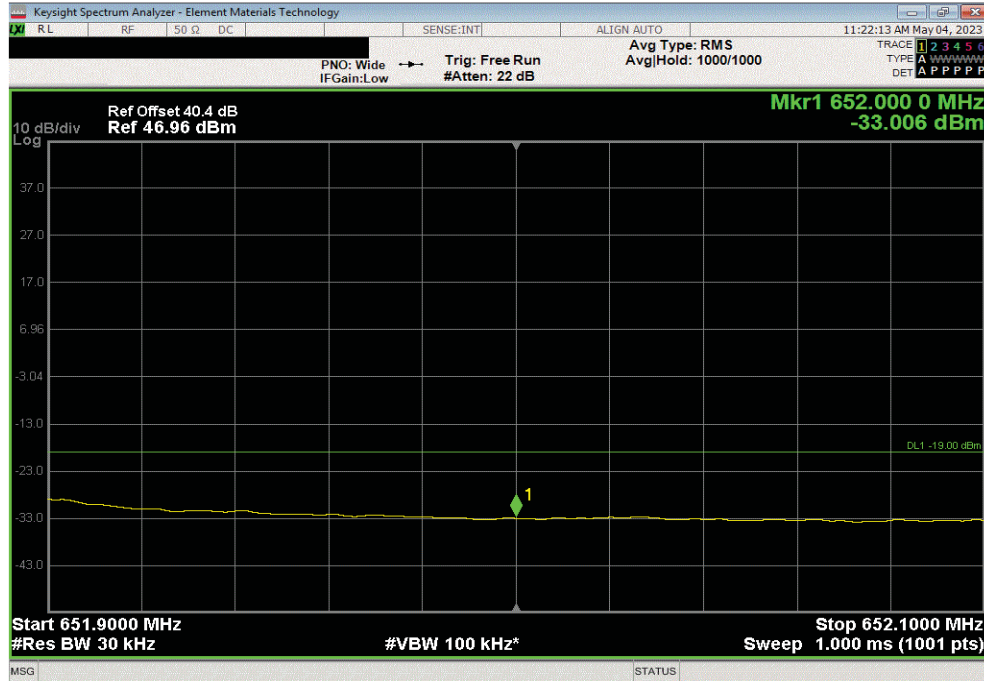


BAND EDGE COMPLIANCE - MULTICARRIER

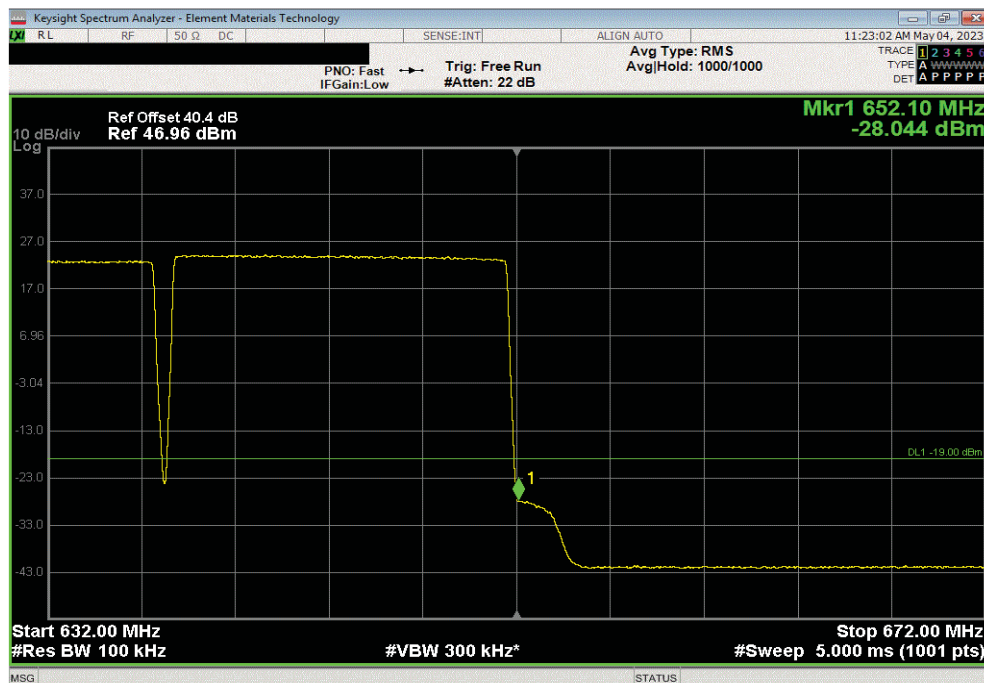


TbTx 2022.05.02.0 XMt 2023.02.14.0

Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 2, n71 NR15, High Channel 644.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	652	-33.01	-19	Pass		



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 2, n71 NR15, High Channel 644.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	652.1	-28.04	-19	Pass		

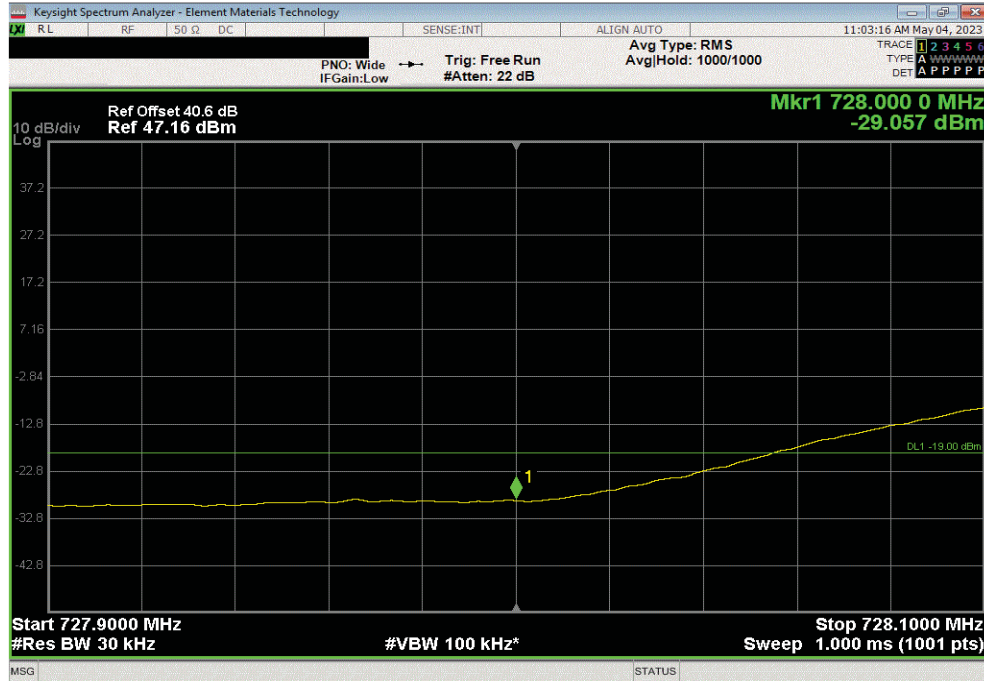


BAND EDGE COMPLIANCE - MULTICARRIER

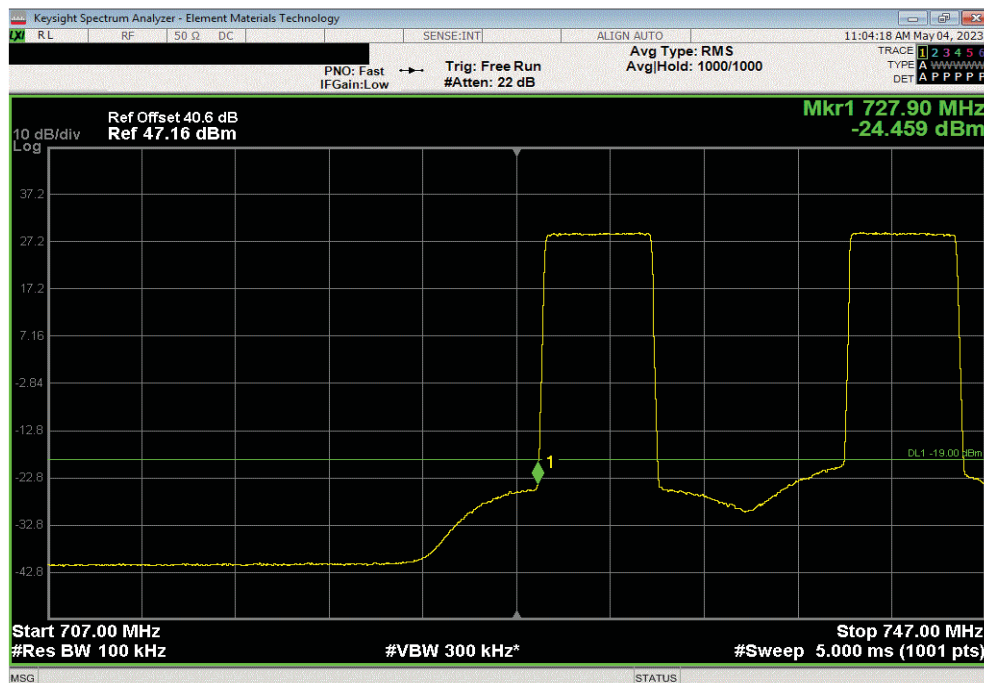


TbTx 2022.05.02.0 XMit 2023.02.14.0

Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 3, n85 NR5, Low Channel 730.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	728	-29.06	-19	Pass		



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 3, n85 NR5, Low Channel 730.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	727.9	-24.46	-19	Pass		



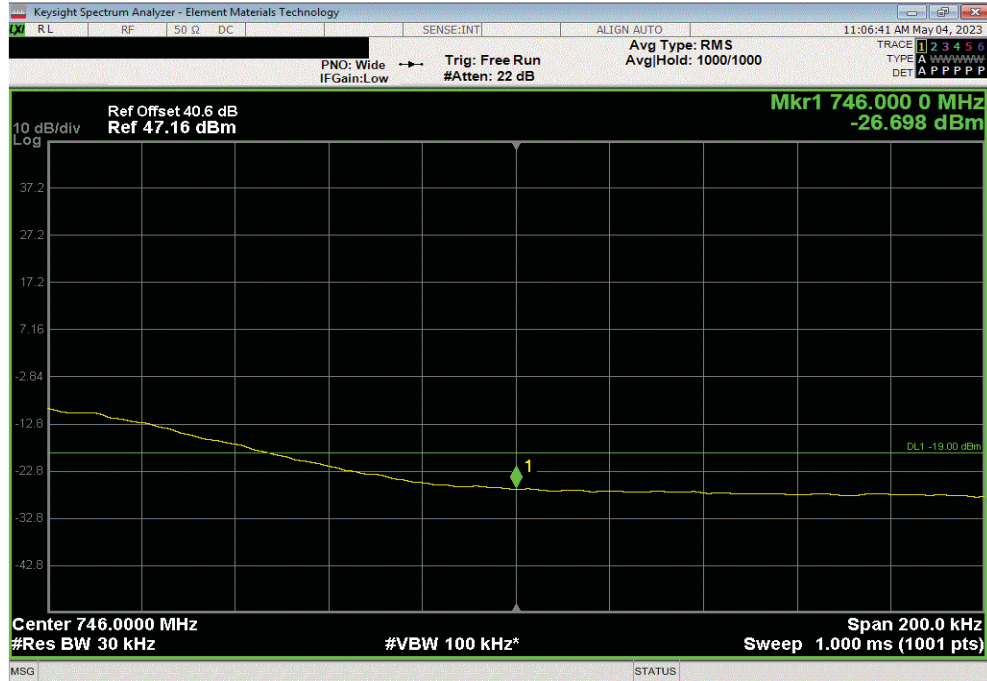
BAND EDGE COMPLIANCE - MULTICARRIER



TbTtx 2022.05.02.0 XMt 2023.02.14.0

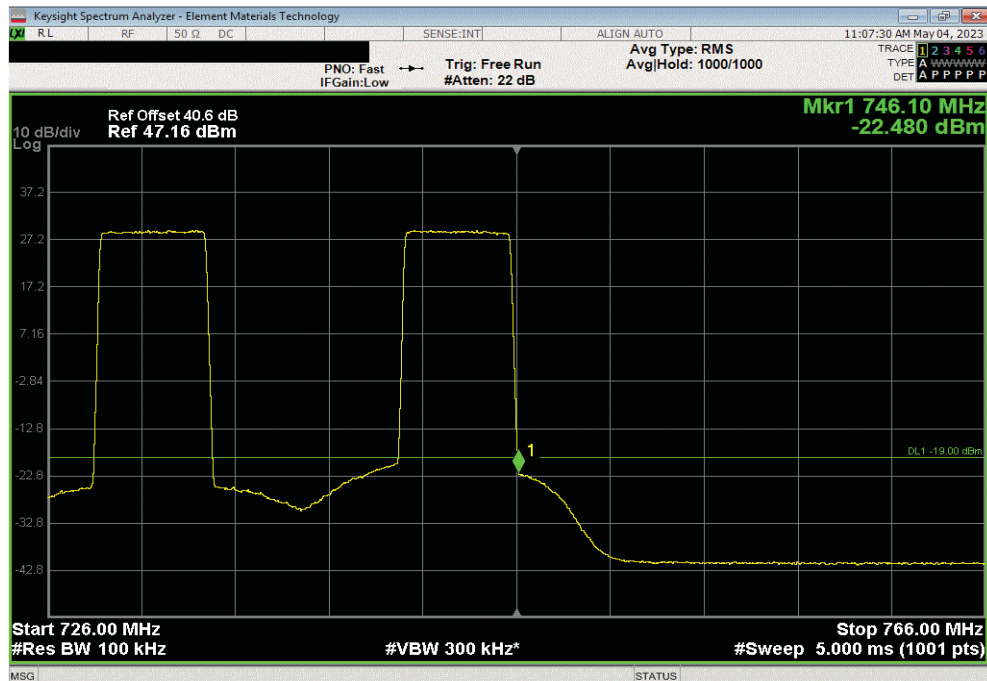
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 3, n85 NR5, High Channel 743.5 MHz

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1	746	-26.7	-19	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 3, n85 NR5, High Channel 743.5 MHz

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
2	746.1	-22.48	-19	Pass

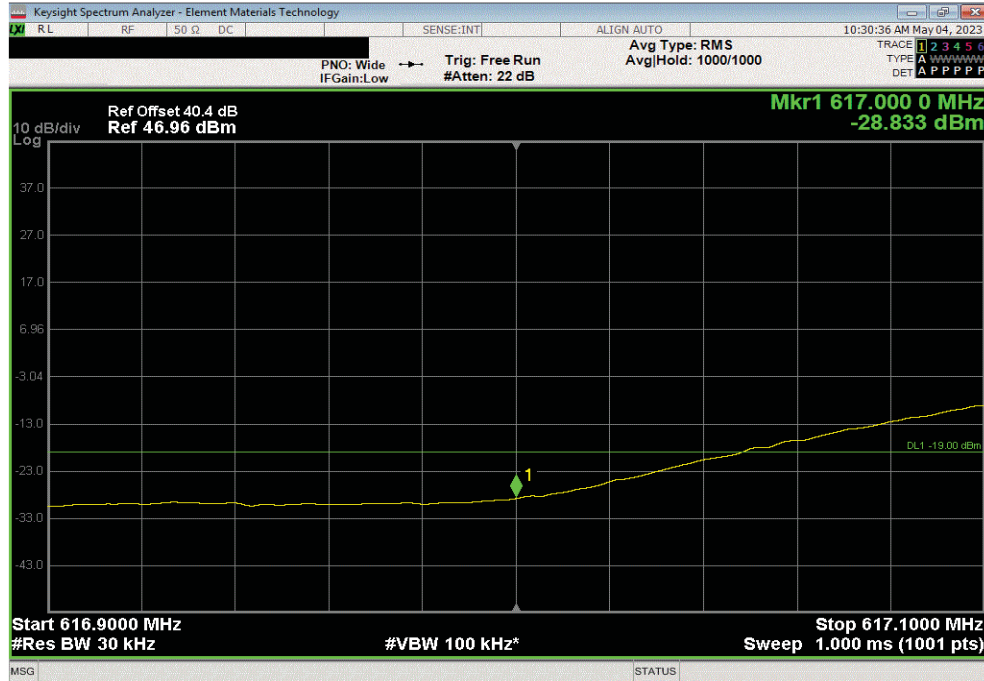


BAND EDGE COMPLIANCE - MULTICARRIER

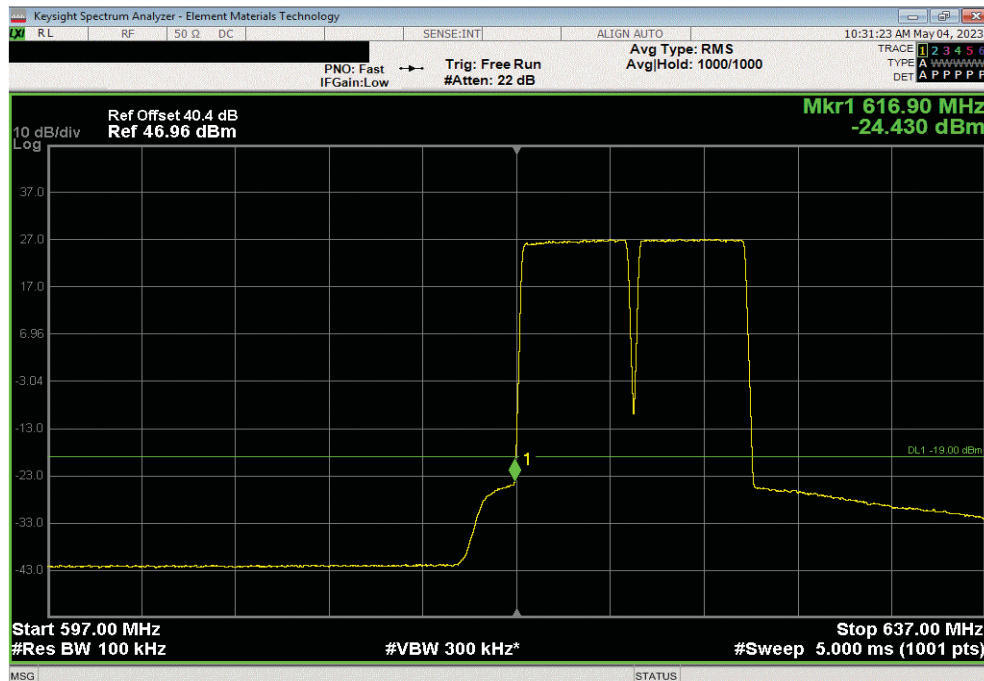


TbTx 2022.05.02.0 XMt 2023.02.14.0

Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 4, n71 NR5, Low Channel 619.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	617	-28.83	-19	Pass		



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 4, n71 NR5, Low Channel 619.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	616.9	-24.43	-19	Pass		

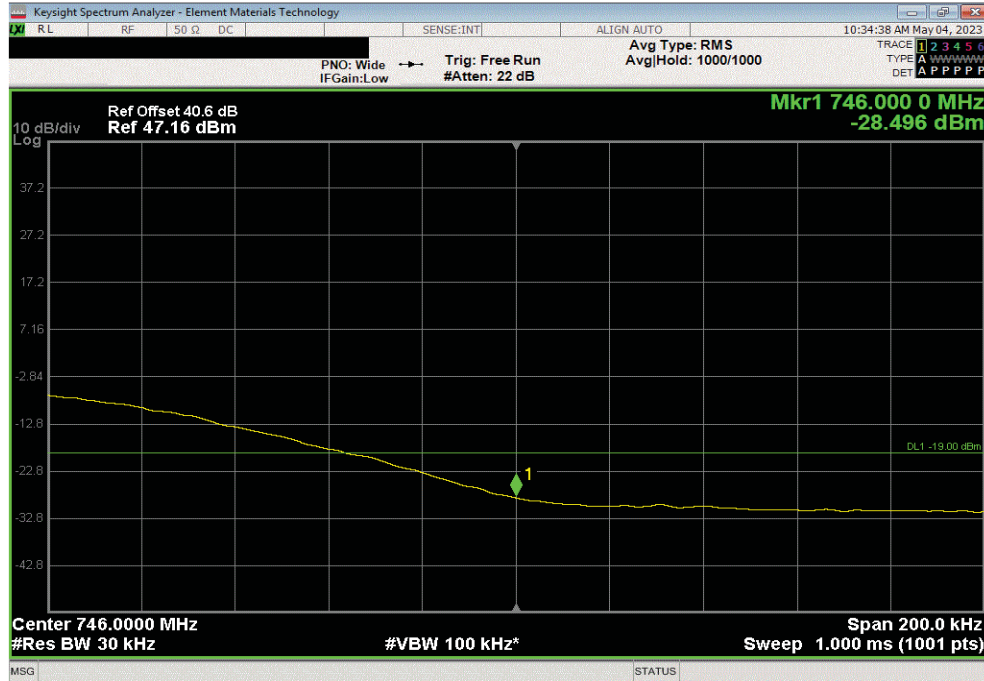


BAND EDGE COMPLIANCE - MULTICARRIER

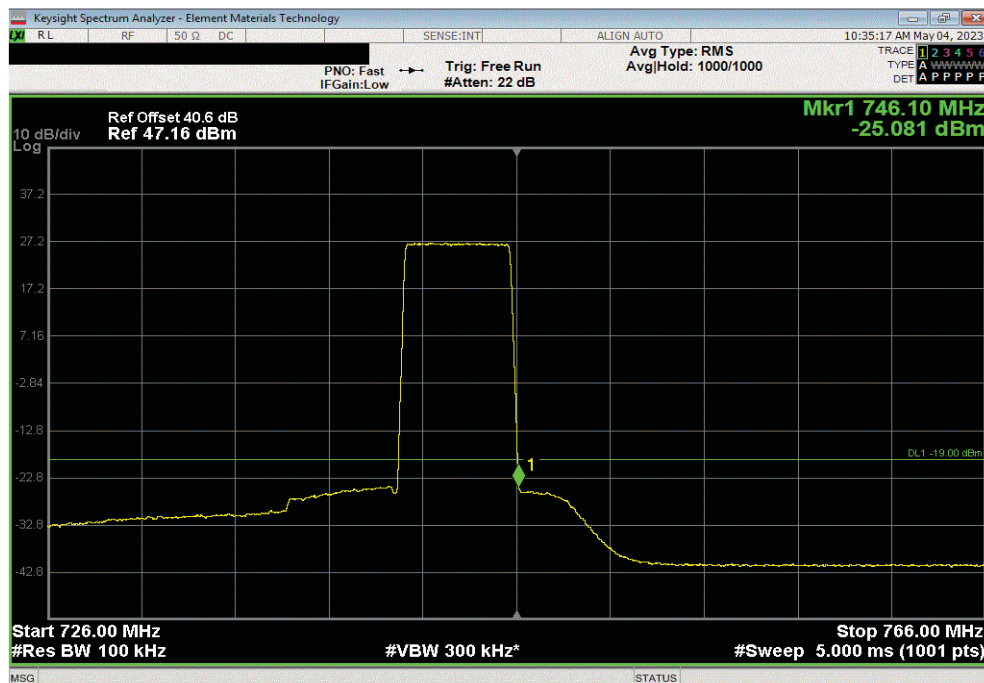


TbTtx 2022.05.02.0 XMt 2023.02.14.0

Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 4, n85 NR5, High Channel 743.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	746	-28.5	-19	Pass		



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 4, n85 NR5, High Channel 743.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	746.1	-25.08	-19	Pass		



BAND EDGE COMPLIANCE - SINGLE CARRIER



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
Block - DC	Fairview Microwave	SD3379	AMM	2022-09-09	2023-09-09
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09

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 $[-10 \cdot \log(4)]$ dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911.

Per section 27.53(g) and RSS-130 4.7, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm $[-13 \text{ dBm} - 10 \log(4)]$ per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

Per section 27.53(g) and RSS 130 4.7 requires a ≥ 100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. RSS 130 4.7 requires a ≥ 30 kHz measurement bandwidth for emissions between 100 kHz outside of the RRH operating frequency range and band edge of the operating frequency range

A narrower resolution bandwidth of at least 30 kHz is permitted and used to improve measurement accuracy in the transition regions provided that the measured power is integrated over the full required measurement bandwidth (i.e.: 100kHz).

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHLOA) as the original certification test. The AHLOA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification effort) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraph 5.7.2i.

BAND EDGE COMPLIANCE - SINGLE CARRIER



TstTx 2022.05.02.0 XMt 2023.02.14.0

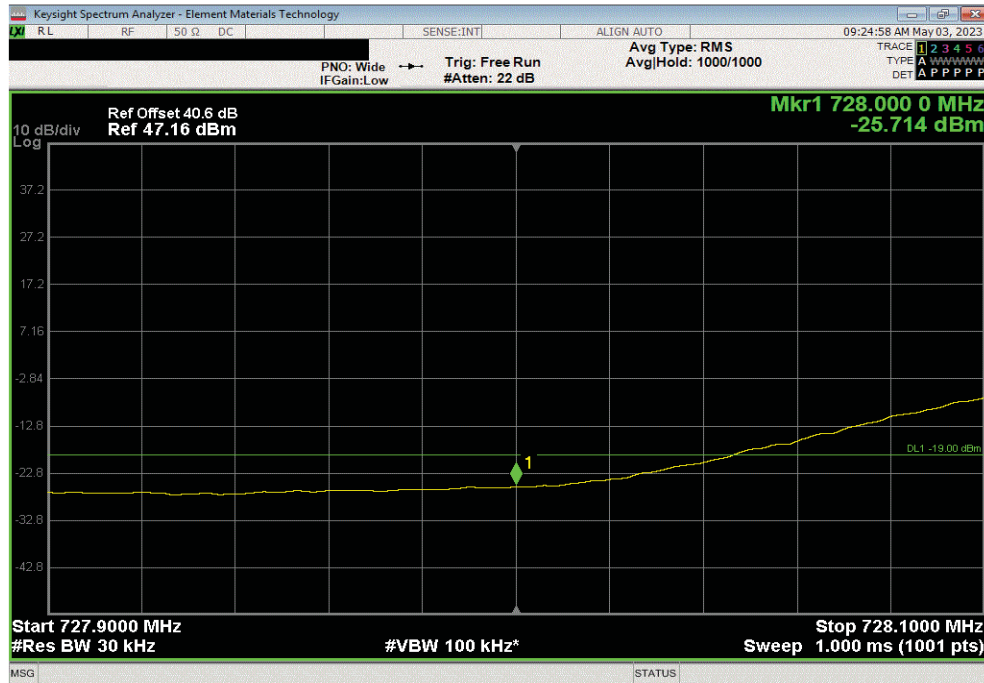
EUT: AHLOA (FCC/ISED C2PC)		Work Order: NOKI0058	
Serial Number: K9180540675		Date: 05/02/2023	
Customer: Nokia Solutions and Networks		Temperature: 22.5°C	
Attendees: John Rattavong, Mitchel Hill		Humidity: 39.4%	
Project: None		Barometric Pres.: 1012 mbar	
Tested by: Brandon Hobbs	Power: 54 VDC	Job Site: TX07	
TEST SPECIFICATIONS			
FCC 27:2023		Test Method	
RSS-130 Issue 2:2019		ANSI C63.26:2015	
ANSI C63.26:2015			
COMMENTS			
All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. Band n85 carriers are enabled at maximum power (60 watts/carrier).			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	NOKI0058-2	Signature	
		Frequency Range	Measured Freq (MHz)
			Max Value (dBm)
			Limit < (dBm)
			Result
Band n85 728 MHz - 746 MHz, 5G NR			
Port 1			
5 MHz Bandwidth			
256-QAM Modulation			
	Low Channel 730.5 MHz	1	728.0
	Low Channel 730.5 MHz	2	727.9
	High Channel 743.5 MHz	1	746.0
	High Channel 743.5 MHz	2	746.1
10 MHz Bandwidth			
256-QAM Modulation			
	Low Channel 733 MHz	1	728.0
	Low Channel 733 MHz	2	727.9
	High Channel 741 MHz	1	746.0
	High Channel 741 MHz	2	746.1
15 MHz Bandwidth			
256-QAM Modulation			
	Low Channel 735.5 MHz	1	728.0
	Low Channel 735.5 MHz	2	727.9
	High Channel 738.5 MHz	1	746.0
	High Channel 738.5 MHz	2	746.1

BAND EDGE COMPLIANCE - SINGLE CARRIER

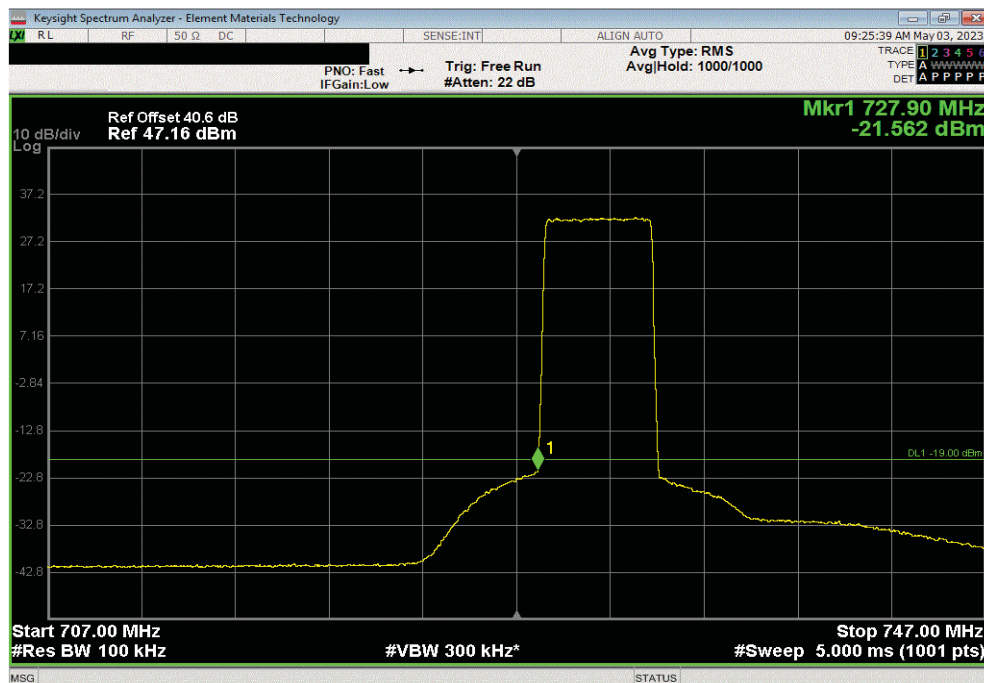


TbTtx 2022.05.02.0 XMit 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Low Channel 730.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	728	-25.71	-19	Pass		



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Low Channel 730.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	727.9	-21.56	-19	Pass		

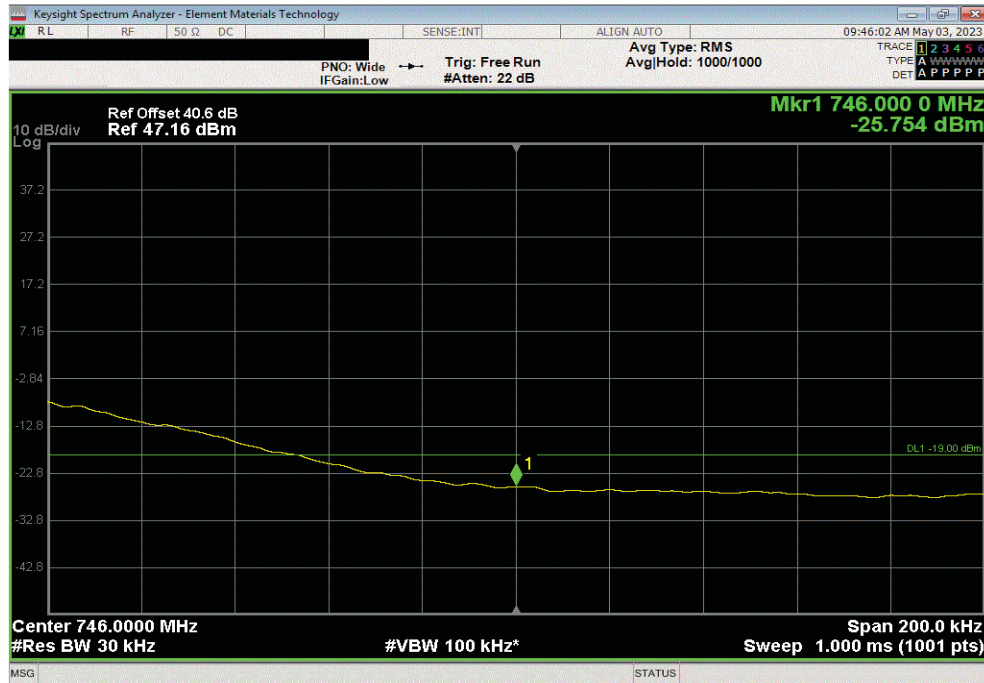


BAND EDGE COMPLIANCE - SINGLE CARRIER

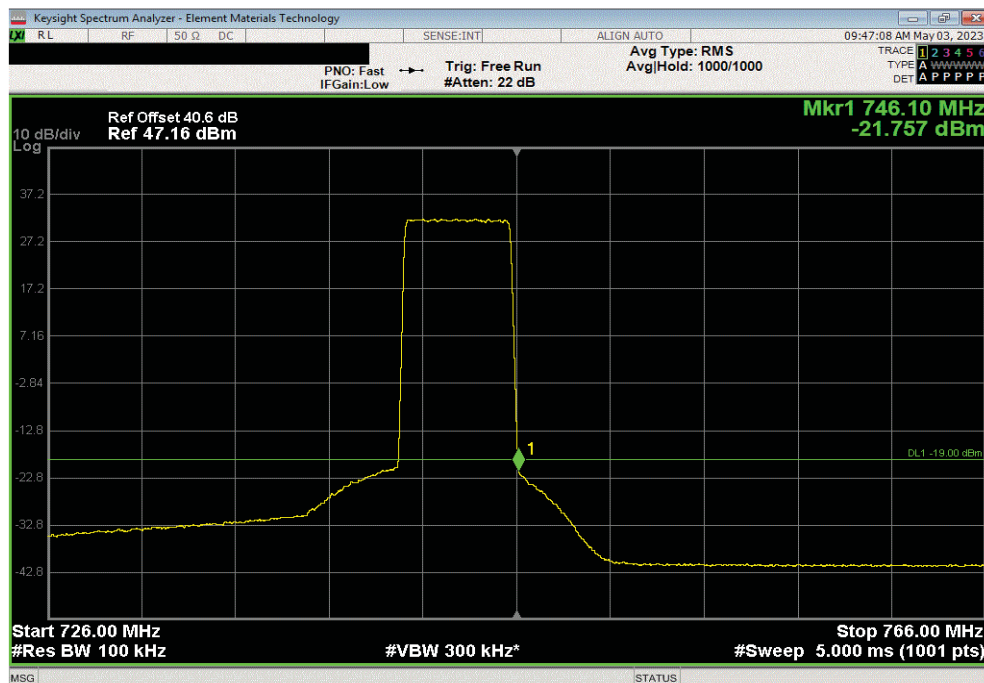


TbTtx 2022.05.02.0 XMit 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, High Channel 743.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	746	-25.75	-19	Pass		



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, High Channel 743.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	746.1	-21.76	-19	Pass		

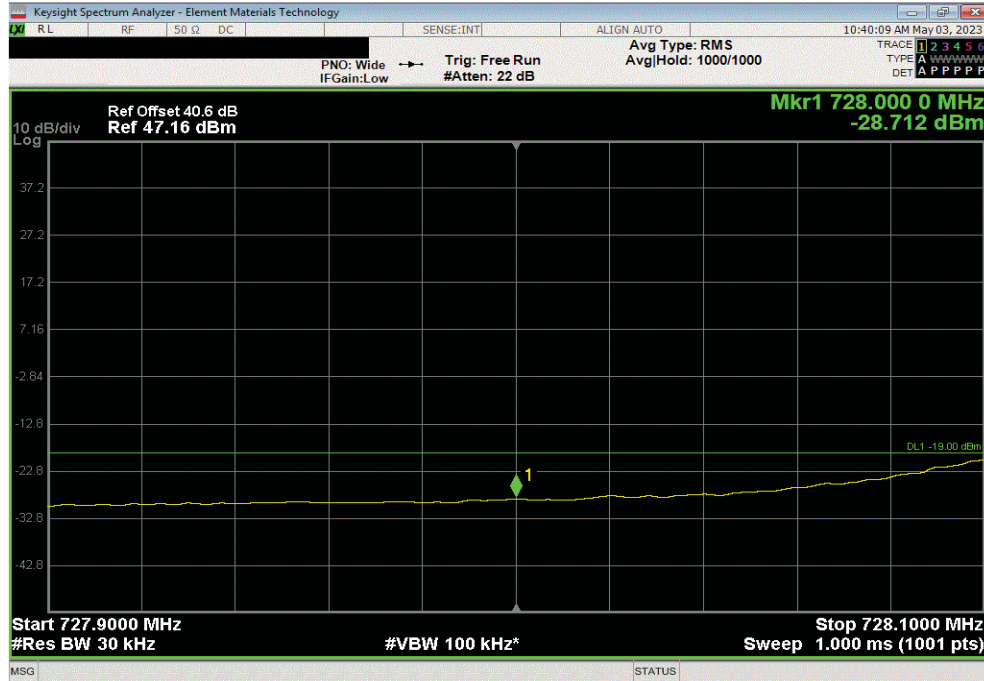


BAND EDGE COMPLIANCE - SINGLE CARRIER

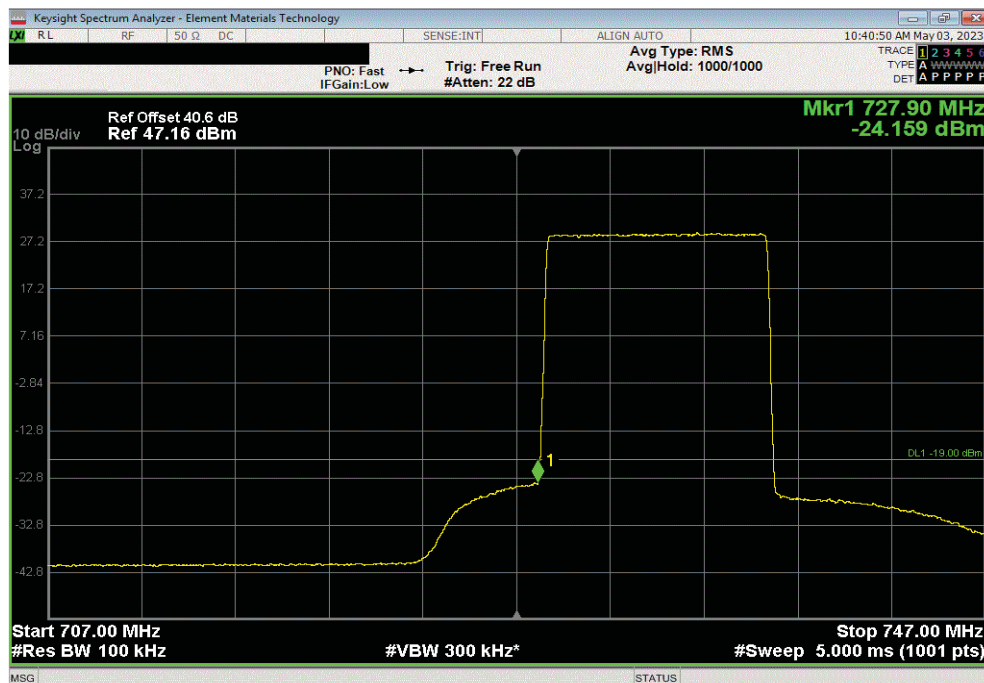


TbTx 2022.05.02.0 XMt 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Low Channel 733 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	728	-28.71	-19	Pass		



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Low Channel 733 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	727.9	-24.16	-19	Pass		

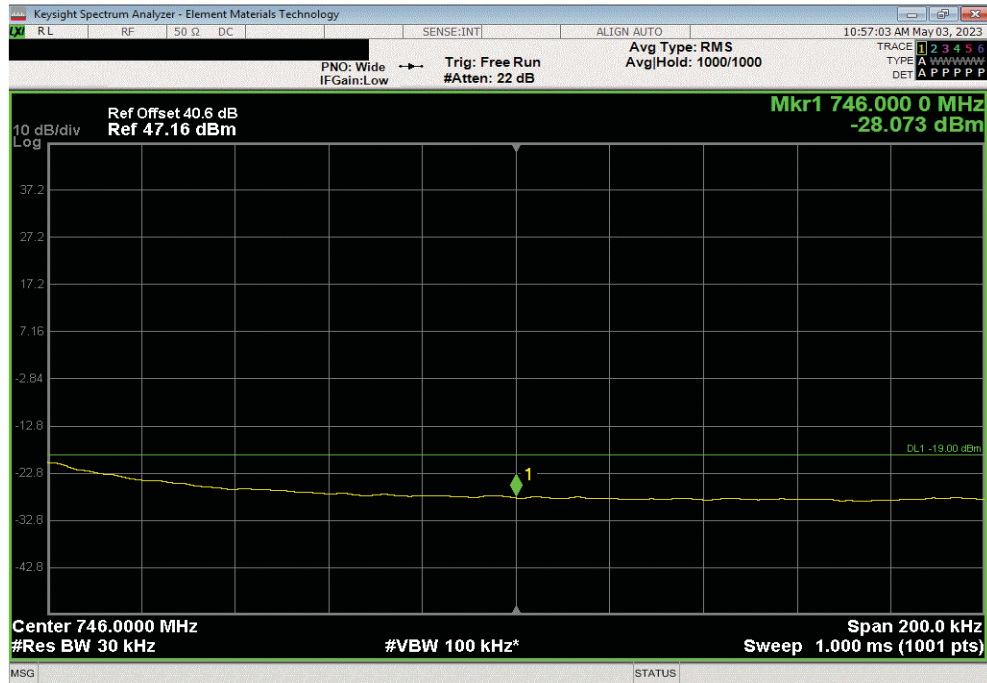


BAND EDGE COMPLIANCE - SINGLE CARRIER

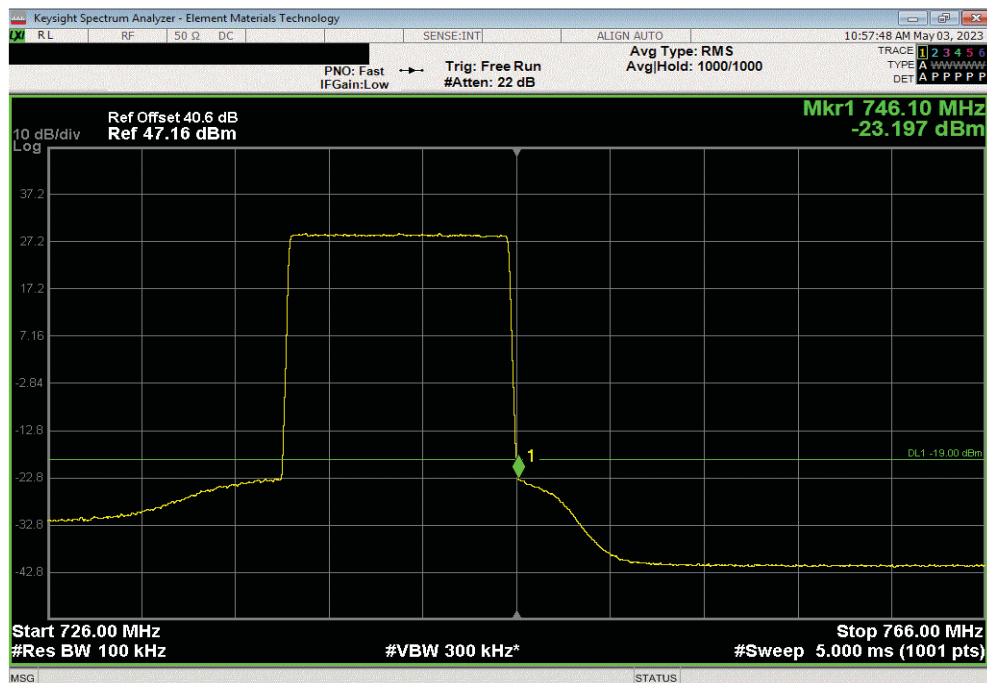


TbTtX 2022.05.02.0 XMt 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, High Channel 741 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	746	-28.07	-19	Pass		



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, High Channel 741 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	746.1	-23.2	-19	Pass		

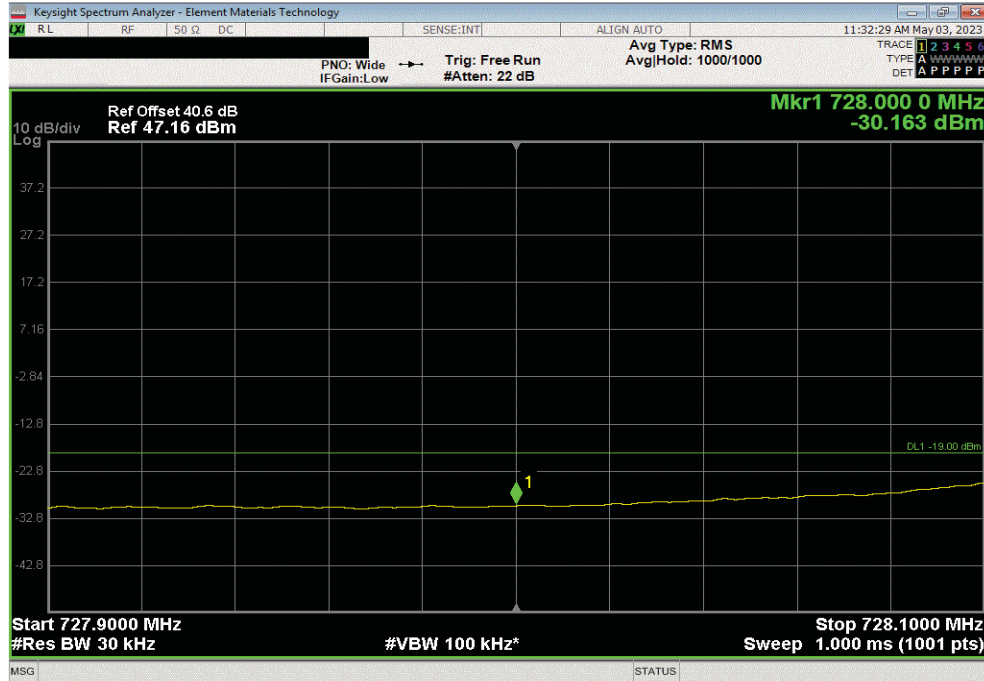


BAND EDGE COMPLIANCE - SINGLE CARRIER

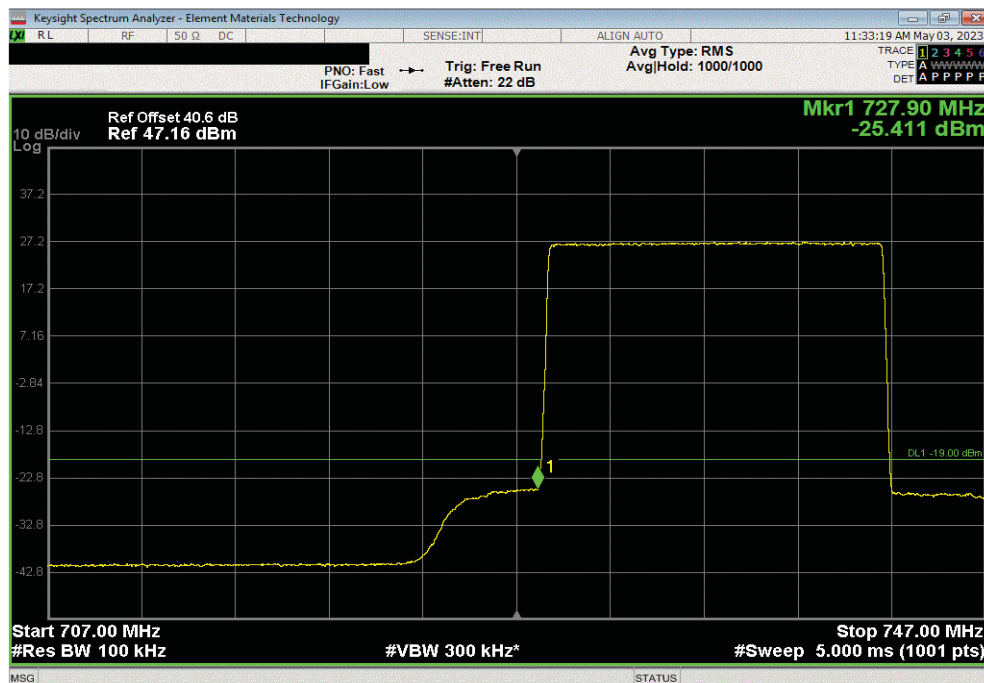


TbTx 2022.05.02.0 XbTx 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Low Channel 735.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	728	-30.16	-19	Pass		



Band n85 728 MHz - 746 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Low Channel 735.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	727.9	-25.41	-19	Pass		

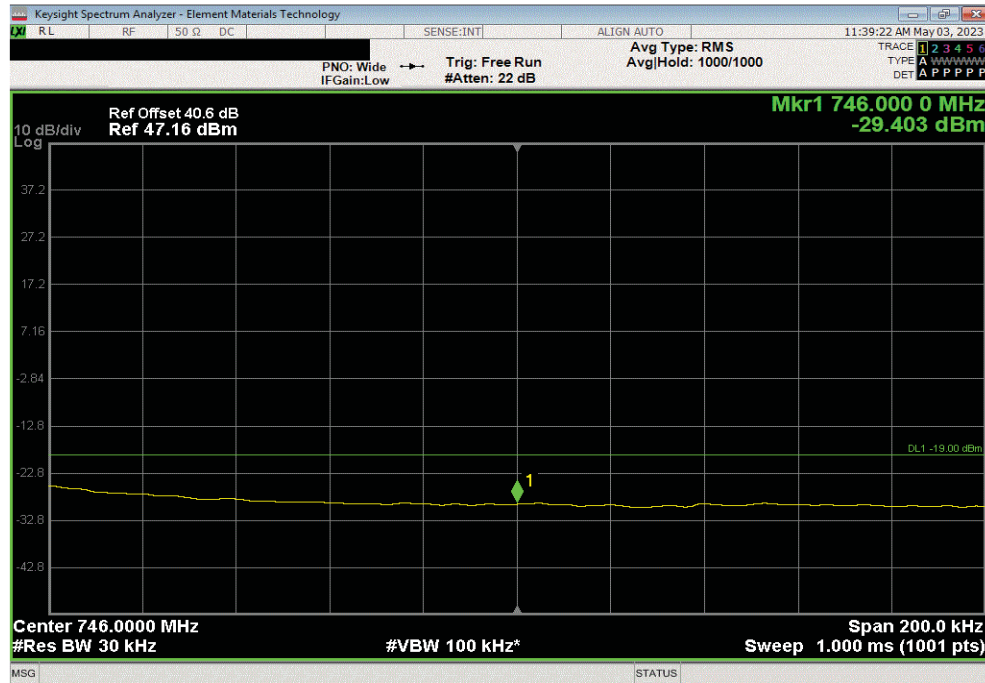


BAND EDGE COMPLIANCE - SINGLE CARRIER

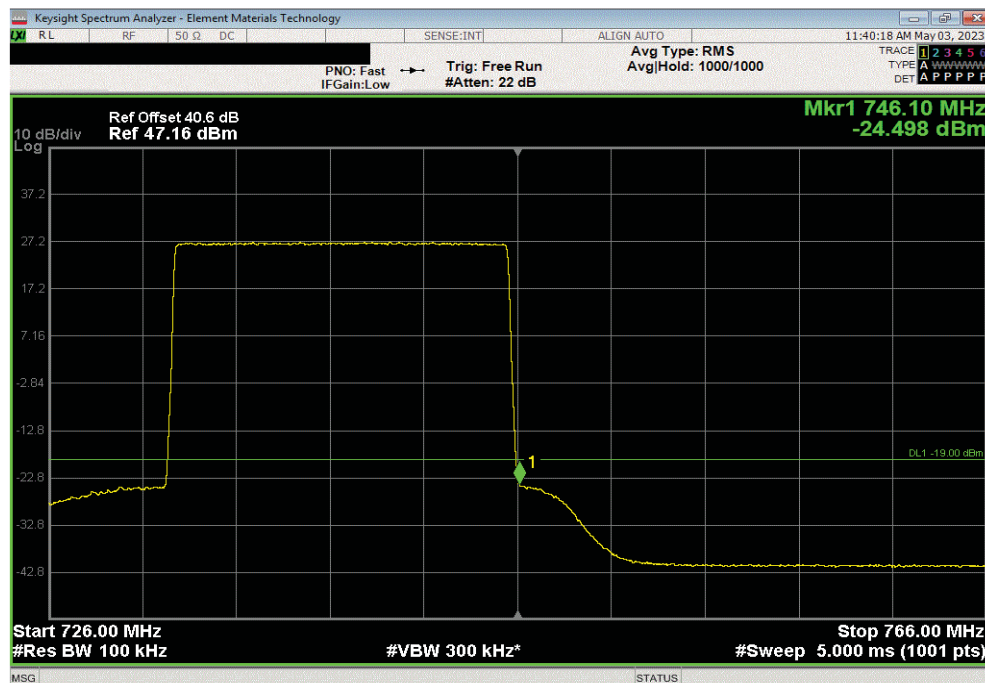


TbTx 2022.05.02.0 XMt 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 256-QAM Modulation, High Channel 738.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
1	746	-29.4	-19	Pass		



Band n85 728 MHz - 746 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 256-QAM Modulation, High Channel 738.5 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result		
2	746.1	-24.5	-19	Pass		



SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



element

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
Block - DC	Fairview Microwave	SD3379	AMM	2022-09-09	2023-09-09
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17

TEST DESCRIPTION

The antenna port spurious emissions were measured at the RF output terminal of the EUT through 3 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 8 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) RSS Gen 6.13, the upper level of measurement is the 10th harmonic of the highest fundamental frequency.

Per section 27.53(g) and RSS 130 4.7, 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.

Multicarrier test cases have been developed as shown below:

Notes: Max port power (60watts is shared between Bands n71/n85)

Multi-Carrier Test Case 1): 3GPP Band n71 Multicarrier In the Band n71 _Three NR5 carriers using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (619.5 & 624.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (649.5MHz) at the upper band edge. The NR 5MHz channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power for a total port power of 60 watts (~20W/Band n71 carriers). 3GPP Band n85 carrier is not enable.

Multi-Carrier Test Case 2): 3GPP Band n71 Multicarrier: In the Band n71 _ One NR 20MHz carriers and one NR 15MHz carriers (with minimum spacing between carrier frequencies) at the lower band edge (627.0 & 644.5MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power for a total port power of 60 watts (~30W/Band n71 carriers). 3GPP Band n85 carrier is not enable.

Multi-Carrier Test Case 3): 3GPP Band n85 Multicarrier: In the Band n85 _Two NR5 carriers using one carrier at the lower band edge (730.5MHz) and a second carrier at maximum spacing at the upper band edge (743.5MHz). The NR5 channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power for a total port power of 60 watts (~30W/Band n85 carrier). 3GPP Band n71 carrier is not enable.

Multi-Carrier Test Case 4): 3GPP Band n71 and Band n85 Multicarrier Multiband: Three NR 5MHz carriers using two carriers (with minimum spacing between carrier frequencies) at the Band n71 lower band edge (619.5 & 624.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (743.5MHz) at the Band n85 upper band edge. The smallest channel bandwidth was selected to maximize carrier power spectral density. The carriers were operated at maximum power (~20/ Band n71 carrier and ~20W Band n85 carrier) for a total port power of 60 watts.

The limit for the 9kHz to 150kHz frequency range was adjusted to -39dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 100kHz [i.e.: -39dBm = -19dBm -10log(100kHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -29dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 100kHz [i.e.: -29dBm = -19dBm -10log(100kHz/10kHz)]. The required limit of -19dBm with a RBW of > 100kHz was used for all other frequency ranges.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHLOA) as the original certification test. The AHLOA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification effort) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraph 5.7.2i.

SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



TstTx 2022.05.02.0 XMt 2023.02.14.0

EUT: AHLOA (FCC/ISED C2PC)		Work Order: NOKI0058			
Serial Number: K9180540675		Date: 05/03/2023			
Customer: Nokia Solutions and Networks		Temperature: 22.2°C			
Attendees: John Rattanaovong, Mitchel Hill		Humidity: 41.1%			
Project: None		Barometric Pres.: 1014 mbar			
Tested by: Brandon Hobbs	Power: 54 VDC	Job Site: TX07			
TEST SPECIFICATIONS					
FCC 27:2023		Test Method			
RSS-130 Issue 2:2019		ANSI C63.26:2015			
COMMENTS					
All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. Bands n85/n71 carriers are enabled at maximum power (60 watts/port). The following is the output power measurements at the radio's single output port.					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	NOKI0058-1 NOKI0058-2 NOKI0058-3	Signature			
	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
Port 1, 5G NR Multi-Carrier Operation					
QPSK Modulation					
Test Case 1, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 649.5 MHz n71 NR5 Channels					
	Middle 9 kHz - 150 kHz	0.01	-57.6	-39	Pass
	Middle 150 kHz - 20 MHz	0.15	-57.9	-29	Pass
	Middle 20 MHz - 1.2 GHz	729.77	-26.2	-19	Pass
	Middle 1.2 GHz - 8 GHz	4014.29	-41.5	-19	Pass
Test Case 2, 627 MHz n71 NR20 and 644.5 MHz n71 NR15 Channels					
	Middle 9 kHz - 150 kHz	0.13	-56.9	-39	Pass
	Middle 150 kHz - 20 MHz	0.27	-55.7	-29	Pass
	Middle 20 MHz - 1.2 GHz	730.05	-19.3	-19	Pass
	Middle 1.2 GHz - 8 GHz	4015.65	-41.4	-19	Pass
Test Case 3, 730.5 MHz n85 NR5 and 743.5 MHz n85 NR5 Channels					
	Middle 9 kHz - 150 kHz	0.01	-58.1	-39	Pass
	Middle 150 kHz - 20 MHz	0.15	-58.9	-29	Pass
	Middle 20 MHz - 1.2 GHz	900.87	-31.4	-19	Pass
	Middle 1.2 GHz - 8 GHz	4014.52	-41.2	-19	Pass
Test Case 4, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 743.5 MHz n85 NR5 Channels					
	Middle 9 kHz - 150 kHz	0.01	-57.7	-39	Pass
	Middle 150 kHz - 20 MHz	0.15	-58.2	-29	Pass
	Middle 20 MHz - 1.2 GHz	1138.13	-31.9	-19	Pass
	Middle 1.2 GHz - 8 GHz	4051.24	-41.6	-19	Pass

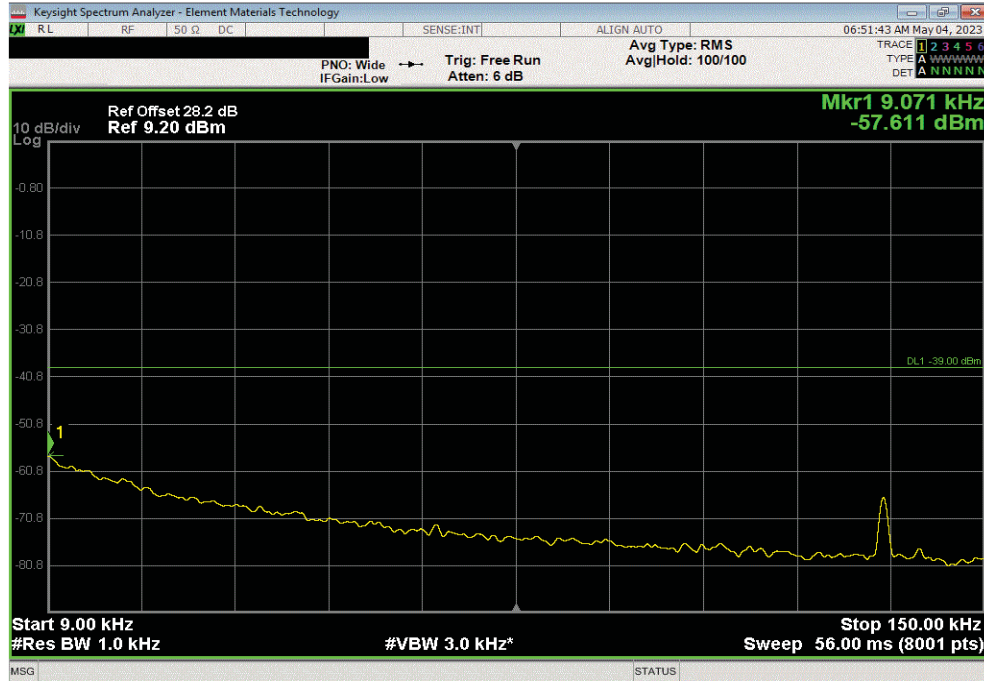
SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



TbTtx 2022.05.02.0 XMit 2023.02.14.0

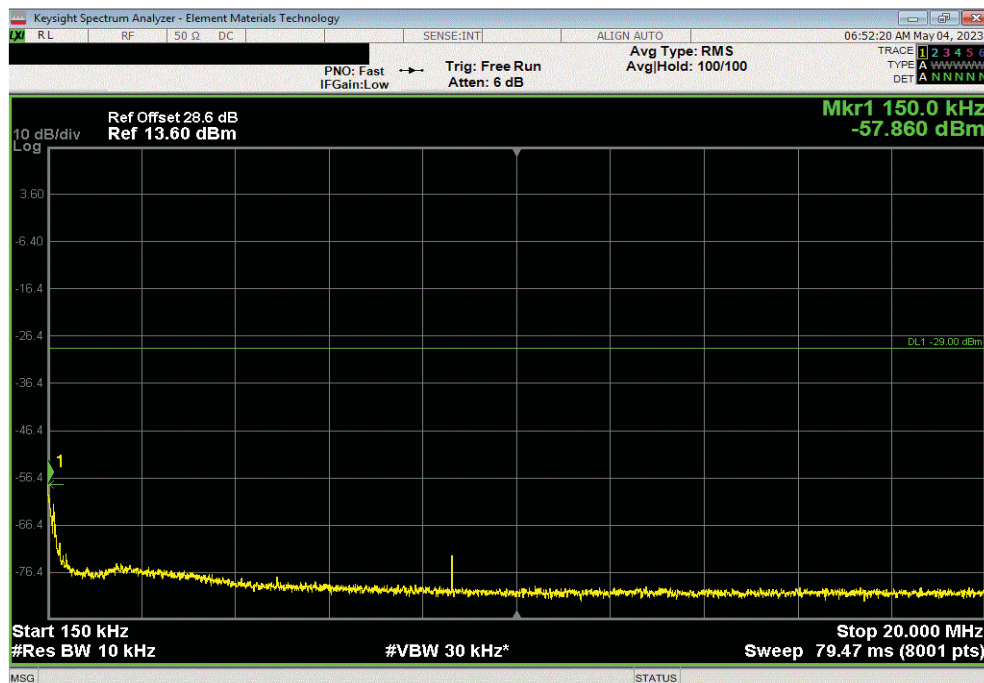
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 1, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 649.5 MHz n71 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
9 kHz - 150 kHz	0.01	-57.61	-39	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 1, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 649.5 MHz n71 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
150 kHz - 20 MHz	0.15	-57.86	-29	Pass



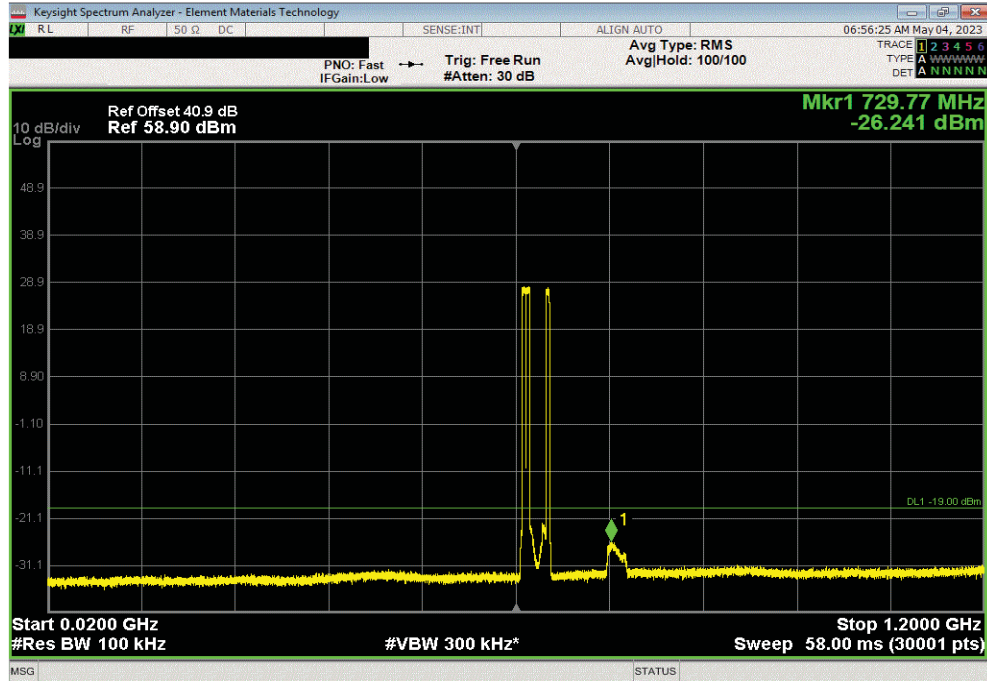
SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



TbTtx 2022.05.02.0 XMit 2023.02.14.0

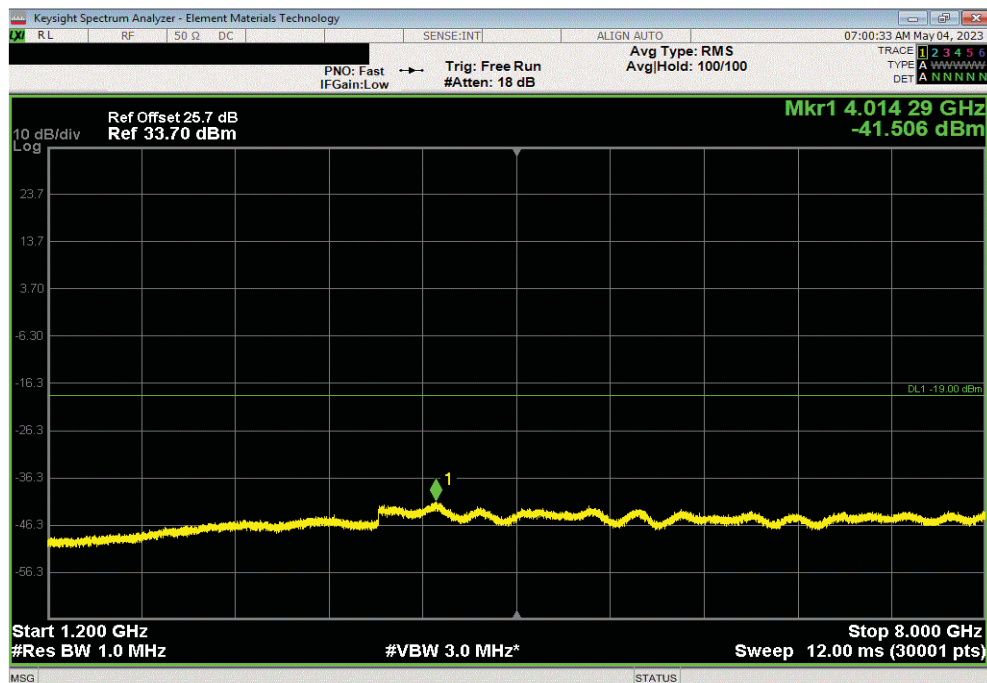
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 1, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 649.5 MHz n71 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
20 MHz - 1.2 GHz	729.77	-26.24	-19	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 1, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 649.5 MHz n71 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1.2 GHz - 8 GHz	4014.29	-41.51	-19	Pass



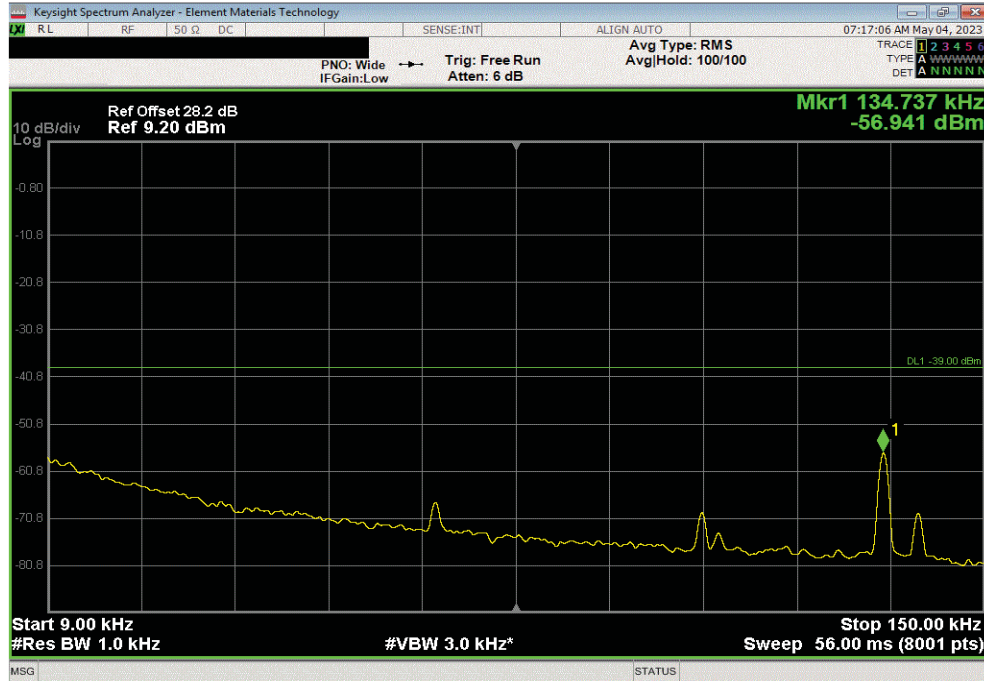
SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



TbTtx 2022.05.02.0 XMit 2023.02.14.0

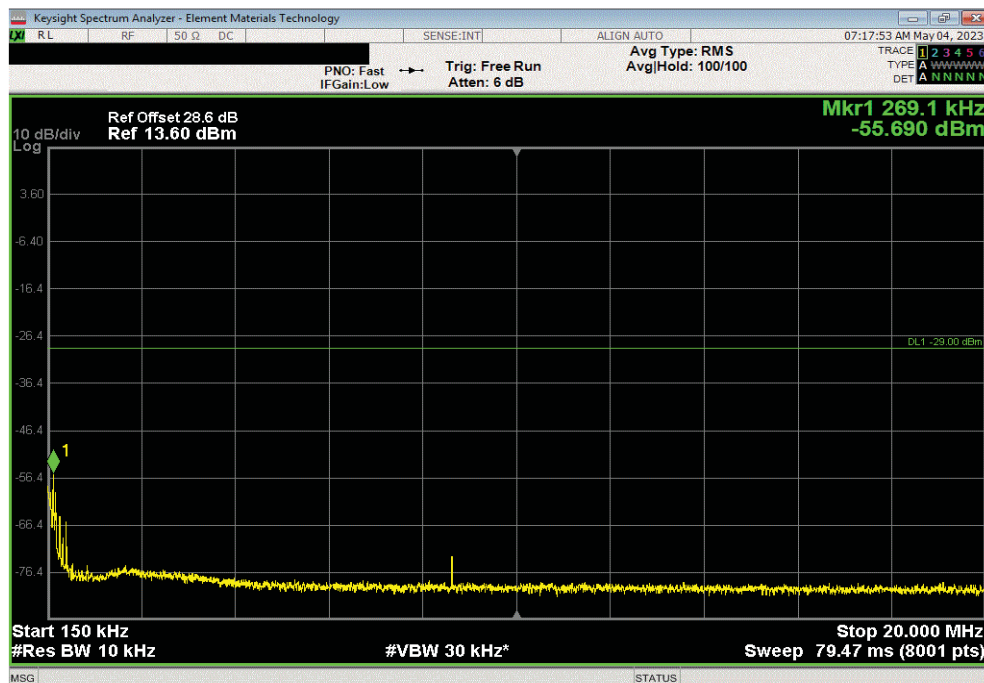
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 2, 627 MHz n71 NR20 and 644.5 MHz n71 NR15 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
9 kHz - 150 kHz	0.13	-56.94	-39	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 2, 627 MHz n71 NR20 and 644.5 MHz n71 NR15 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
150 kHz - 20 MHz	0.27	-55.69	-29	Pass



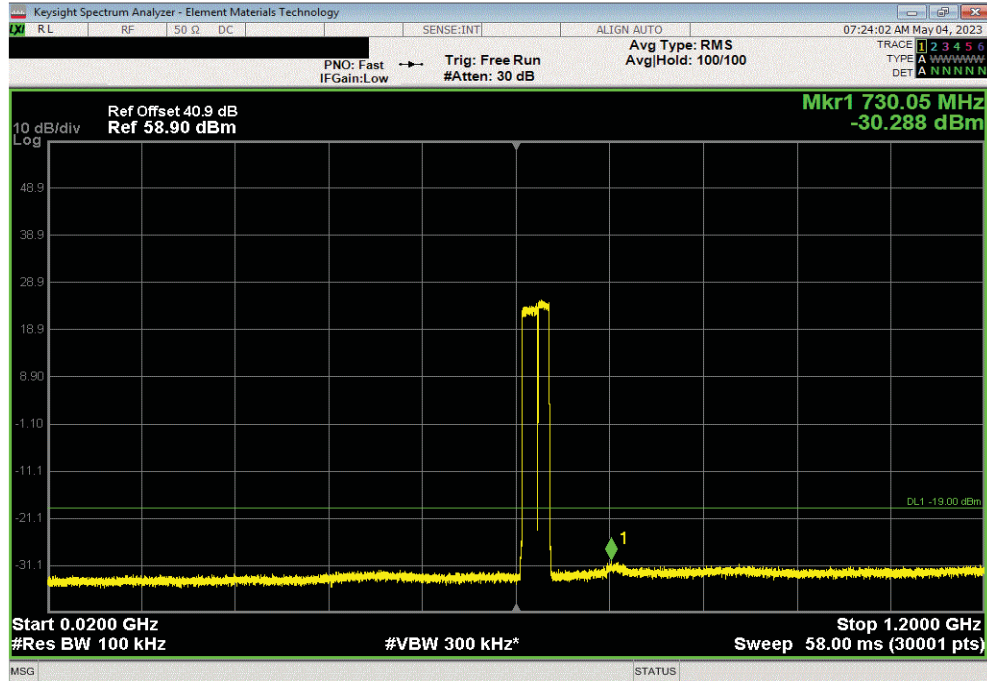
SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



TbTtx 2022.05.02.0 XMt 2023.02.14.0

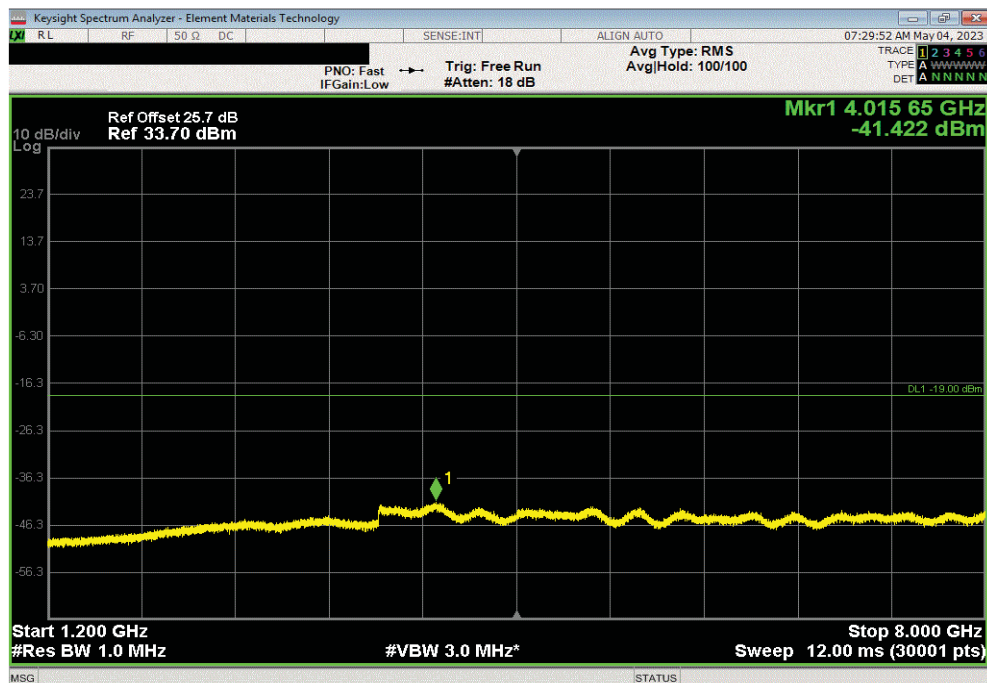
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 2, 627 MHz n71 NR20 and 644.5 MHz n71 NR15 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
20 MHz - 1.2 GHz	730.05	-19.29	-19	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 2, 627 MHz n71 NR20 and 644.5 MHz n71 NR15 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1.2 GHz - 8 GHz	4015.65	-41.42	-19	Pass



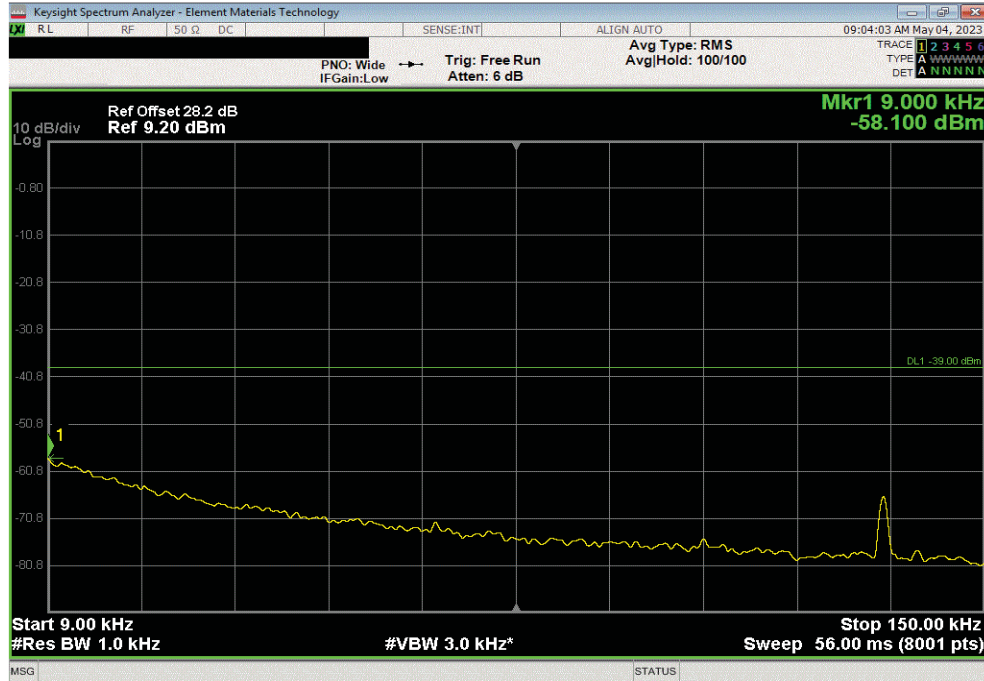
SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



TbTtx 2022.05.02.0 XMit 2023.02.14.0

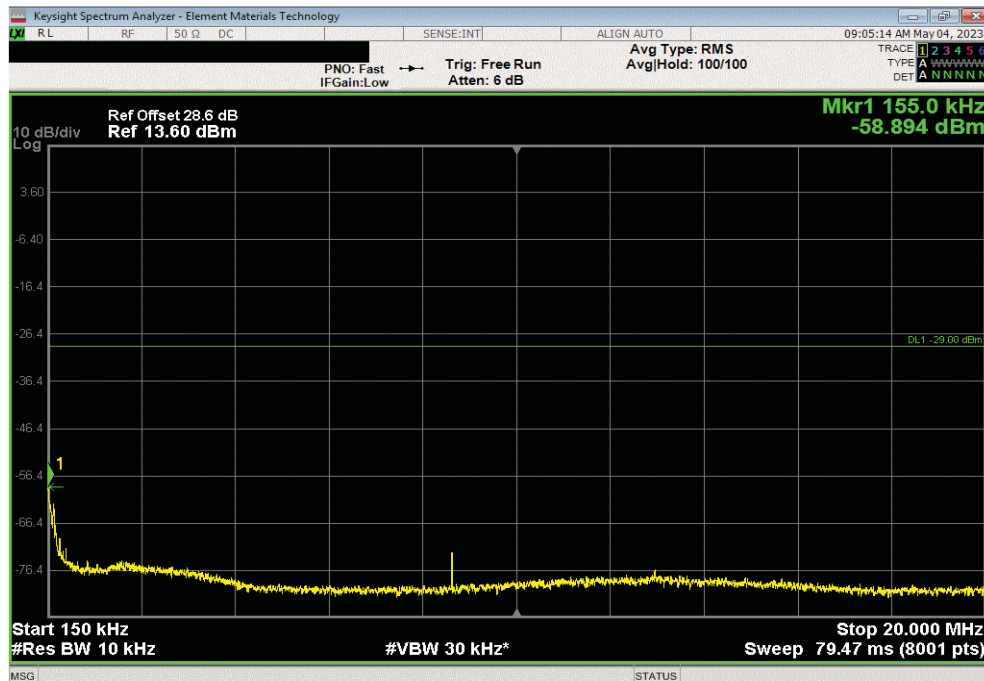
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 3, 730.5 MHz n85 NR5 and 743.5 MHz n85 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
9 kHz - 150 kHz	0.01	-58.1	-39	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 3, 730.5 MHz n85 NR5 and 743.5 MHz n85 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
150 kHz - 20 MHz	0.15	-58.89	-29	Pass



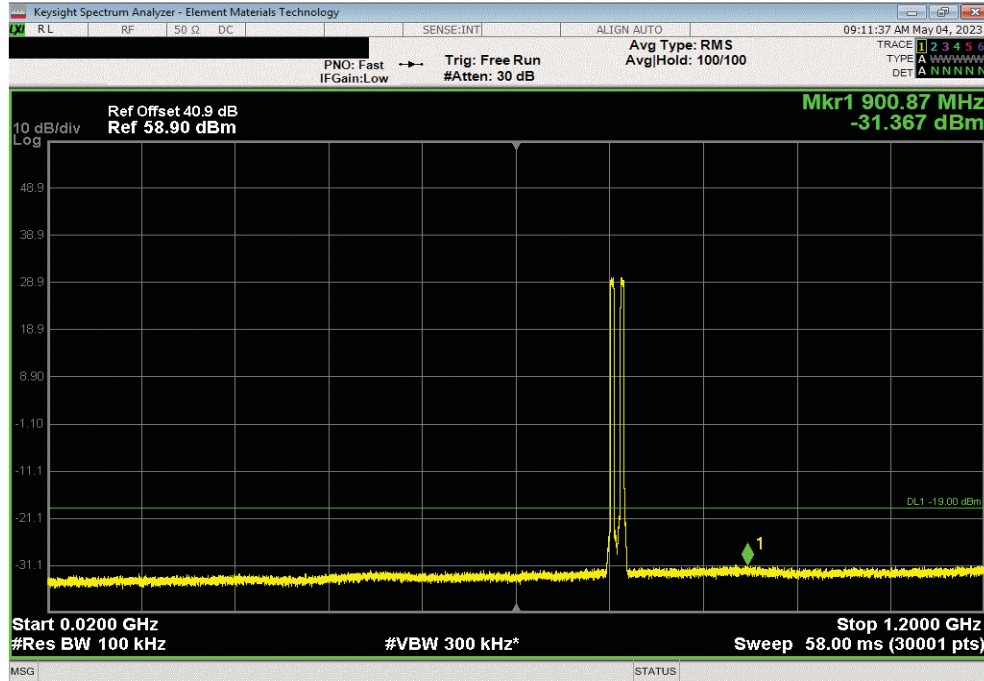
SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



TbTx 2022.05.02.0 XMI 2023.02.14.0

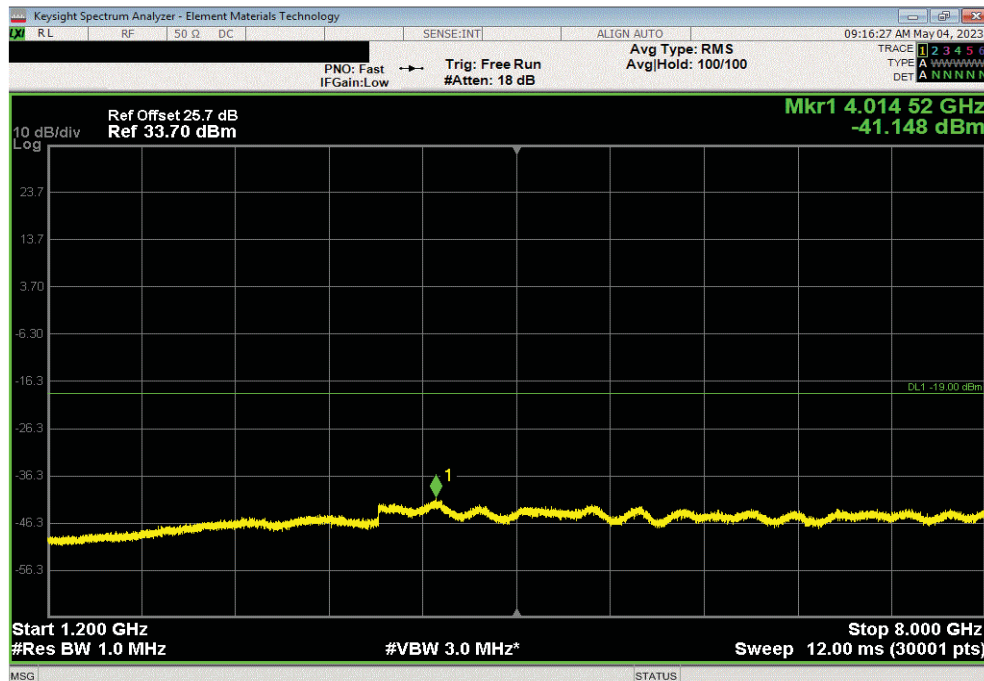
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 3, 730.5 MHz n85 NR5 and 743.5 MHz n85 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
20 MHz - 1.2 GHz	900.87	-31.37	-19	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 3, 730.5 MHz n85 NR5 and 743.5 MHz n85 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1.2 GHz - 8 GHz	4014.52	-41.15	-19	Pass



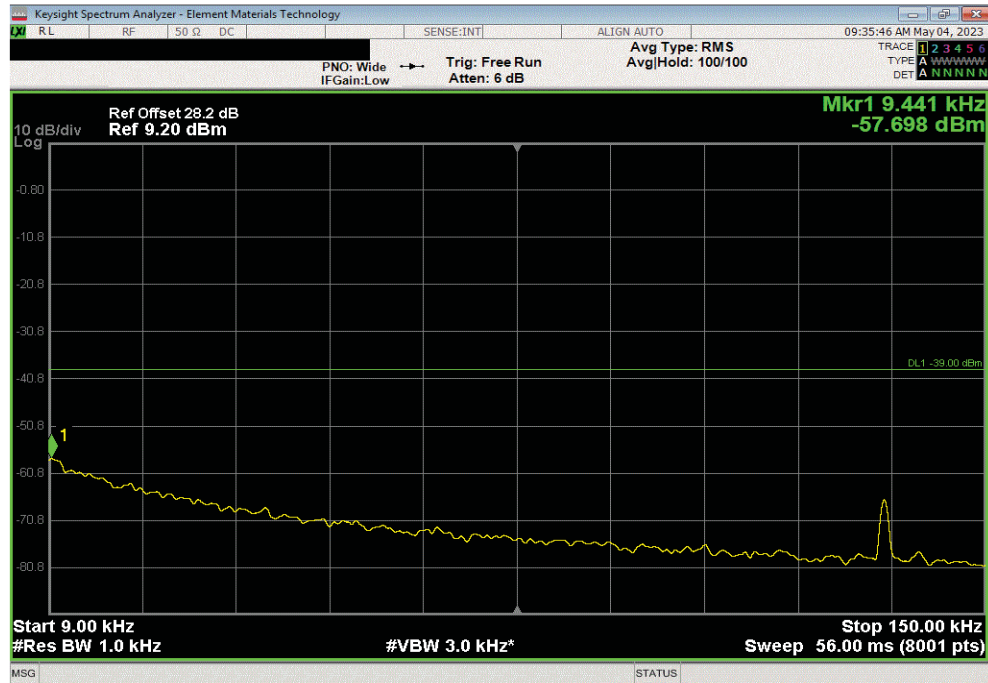
SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



TbTtx 2022.05.02.0 XMit 2023.02.14.0

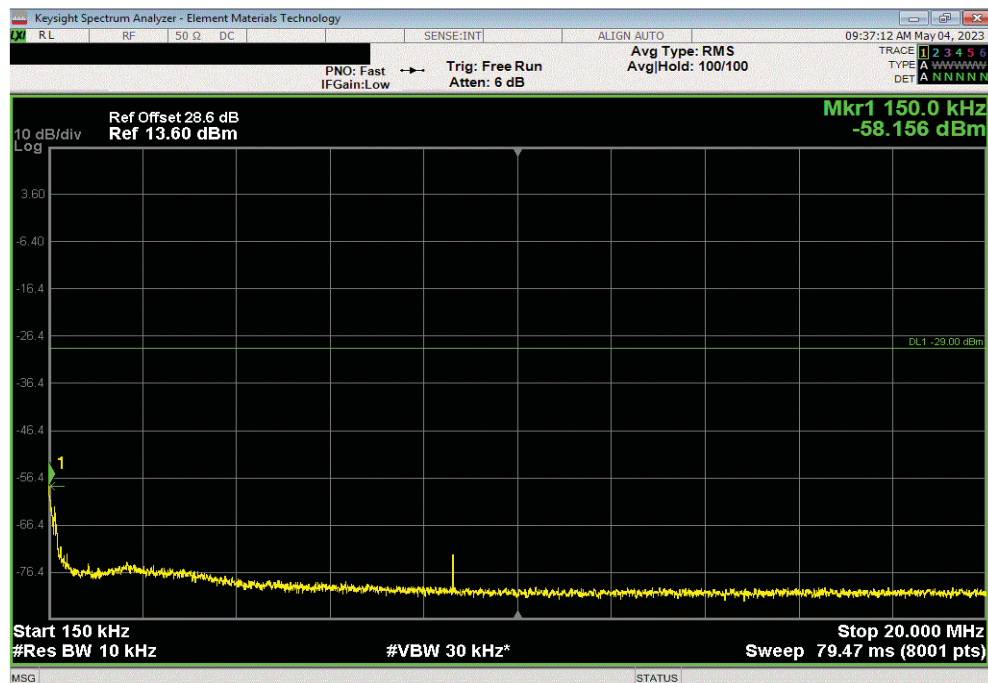
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 4, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 743.5 MHz n85 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
9 kHz - 150 kHz	0.01	-57.7	-39	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 4, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 743.5 MHz n85 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
150 kHz - 20 MHz	0.15	-58.16	-29	Pass



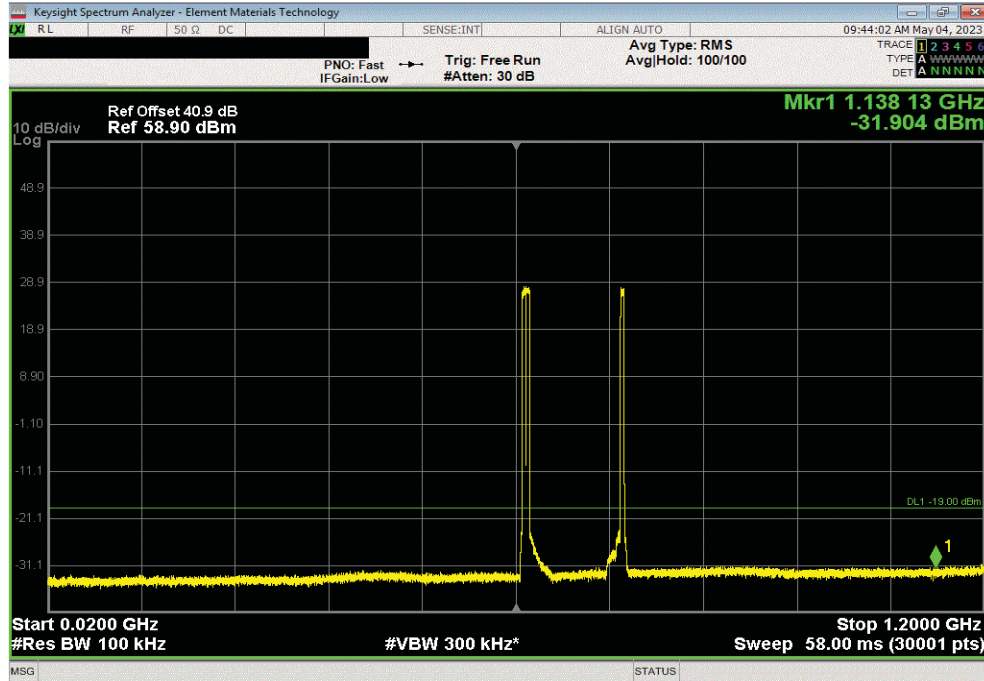
SPURIOUS CONDUCTED EMISSIONS - MULTICARRIER



TbTx 2022.05.02.0 XMit 2023.02.14.0

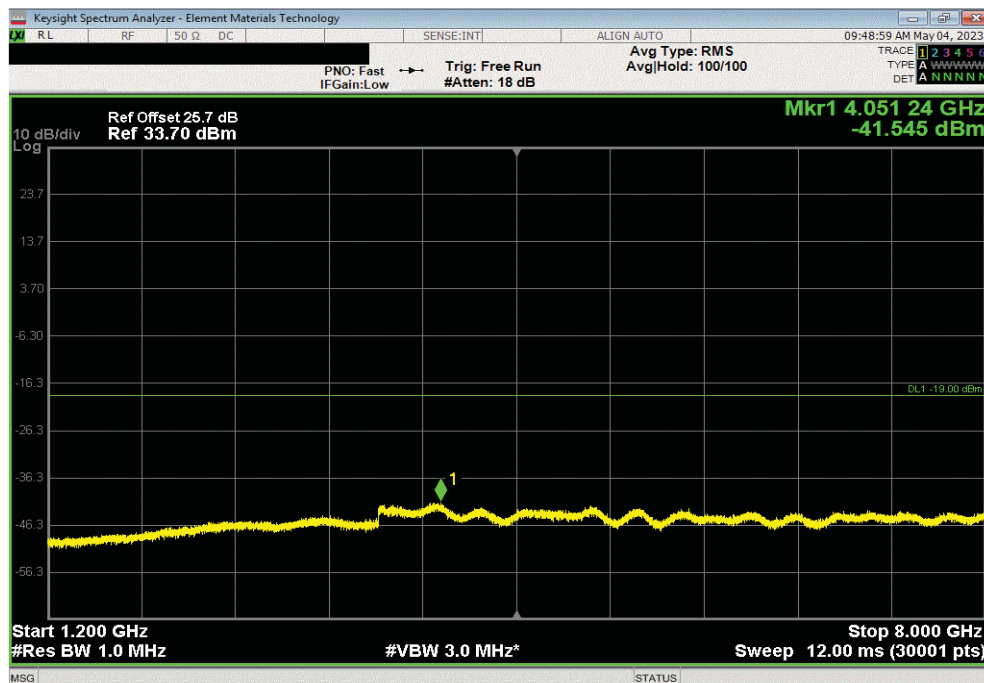
Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 4, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 743.5 MHz n85 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
20 MHz - 1.2 GHz	1138.13	-31.9	-19	Pass



Port 1, 5G NR Multi-Carrier Operation, QPSK Modulation, Test Case 4, 619.5 MHz n71 NR5 and 624.5 MHz n71 NR5, 743.5 MHz n85 NR5 Channels, Middle

Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1.2 GHz - 8 GHz	4051.24	-41.55	-19	Pass



SPURIOUS CONDUCTED EMISSIONS - SINGLE CARRIER



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
Block - DC	Fairview Microwave	SD3379	AMM	2022-09-09	2023-09-09
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2023-02-09	2024-02-09
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17

TEST DESCRIPTION

The antenna port spurious emissions were measured at the RF output terminal of the EUT through 3 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 8 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.

Per section 27.53(g) and RSS 130 4.7, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm $[-13 \text{ dBm} - 10 \log(4)]$ per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

The limit for the 9kHz to 150kHz frequency range was adjusted to -39dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 100kHz [i.e.: $-39\text{dBm} = -19\text{dBm} - 10\log(100\text{kHz}/1\text{kHz})$]. The limit for the 150kHz to 20MHz frequency range was adjusted to -29dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 100kHz [i.e.: $-29\text{dBm} = -19\text{dBm} - 10\log(100\text{kHz}/10\text{kHz})$]. The required limit of -19dBm with a RBW of $> 100\text{kHz}$ was used for all other frequency ranges.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHLOA) as the original certification test. The AHLOA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the certification effort) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraph 5.7.2i.

SPURIOUS CONDUCTED EMISSIONS - SINGLE CARRIER



TstTx 2022.05.02.0 XMt 2023.02.14.0

EUT: AHLOA (FCC/ISED C2PC)

Serial Number: K9180540675

Customer: Nokia Solutions and Networks

Attendees: John Rattanavong, Mitchel Hill

Project: None

Tested by: Brandon Hobbs

Power: 54 VDC

Work Order: NOKI0058

Date: 05/03/2023

Temperature: 20.9°C

Humidity: 42.5%

Barometric Pres.: 1016 mbar

Job Site: TX07

TEST SPECIFICATIONS

FCC 27:2023

RSS-130 Issue 2:2019

Test Method

ANSI C63.26:2015

ANSI C63.26:2015

COMMENTS

All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. Band n85 carriers are enabled at maximum power (60 watts/carrier).

DEVIATIONS FROM TEST STANDARD

None

Configuration #

NOKI0058-3

NOKI0058-2

NOKI0058-1

Signature



Frequency Range

Measured Freq (MHz)

Max Value (dBm)

Limit < (dBm)

Result

Band n85 728 MHz - 746 MHz, 5G NR

Port 1

5 MHz Bandwidth

256-QAM Modulation

Mid Channel 737 MHz

9 kHz - 150 kHz

0.01

-58.0

-39

Pass

Mid Channel 737 MHz

150 kHz - 20 MHz

0.15

-58.4

-29

Pass

Mid Channel 737 MHz

20 MHz - 1.2 GHz

1167.24

-31.7

-19

Pass

Mid Channel 737 MHz

1.2 GHz - 8 GHz

4015.43

-41.5

-19

Pass

10 MHz Bandwidth

256-QAM Modulation

Mid Channel 737 MHz

9 kHz - 150 kHz

0.01

-57.9

-39

Pass

Mid Channel 737 MHz

150 kHz - 20 MHz

0.15

-58.7

-29

Pass

Mid Channel 737 MHz

20 MHz - 1.2 GHz

1158.66

-32.0

-19

Pass

Mid Channel 737 MHz

1.2 GHz - 8 GHz

3987.77

-41.5

-19

Pass

15 MHz Bandwidth

256-QAM Modulation

Mid Channel 737 MHz

9 kHz - 150 kHz

0.01

-57.5

-39

Pass

Mid Channel 737 MHz

150 kHz - 20 MHz

0.15

-58.4

-29

Pass

Mid Channel 737 MHz

20 MHz - 1.2 GHz

881.64

-31.5

-19

Pass

Mid Channel 737 MHz

1.2 GHz - 8 GHz

3988.23

-41.5

-19

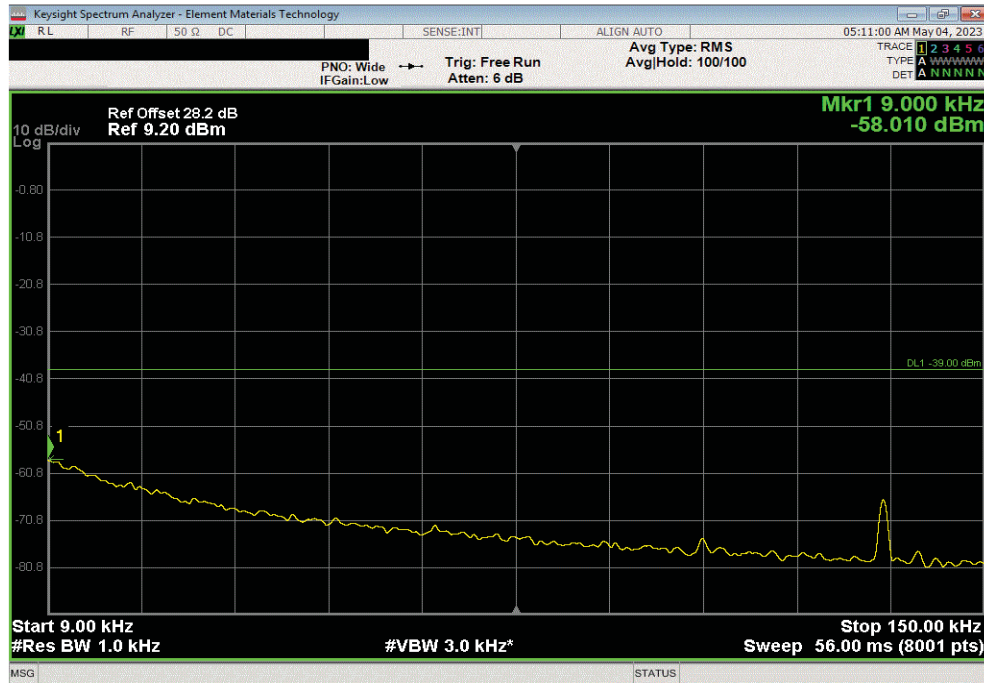
Pass

SPURIOUS CONDUCTED EMISSIONS - SINGLE CARRIER

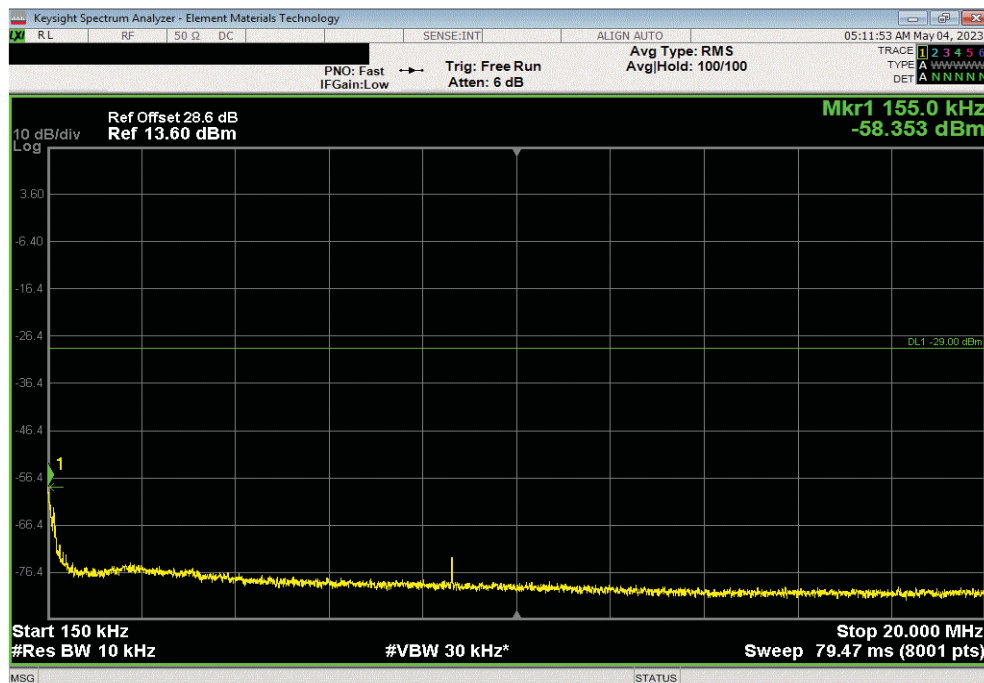


TbTx 2022.05.02.0 XMit 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
9 kHz - 150 kHz	0.01	-58.01	-39	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
150 kHz - 20 MHz	0.15	-58.35	-29	Pass	

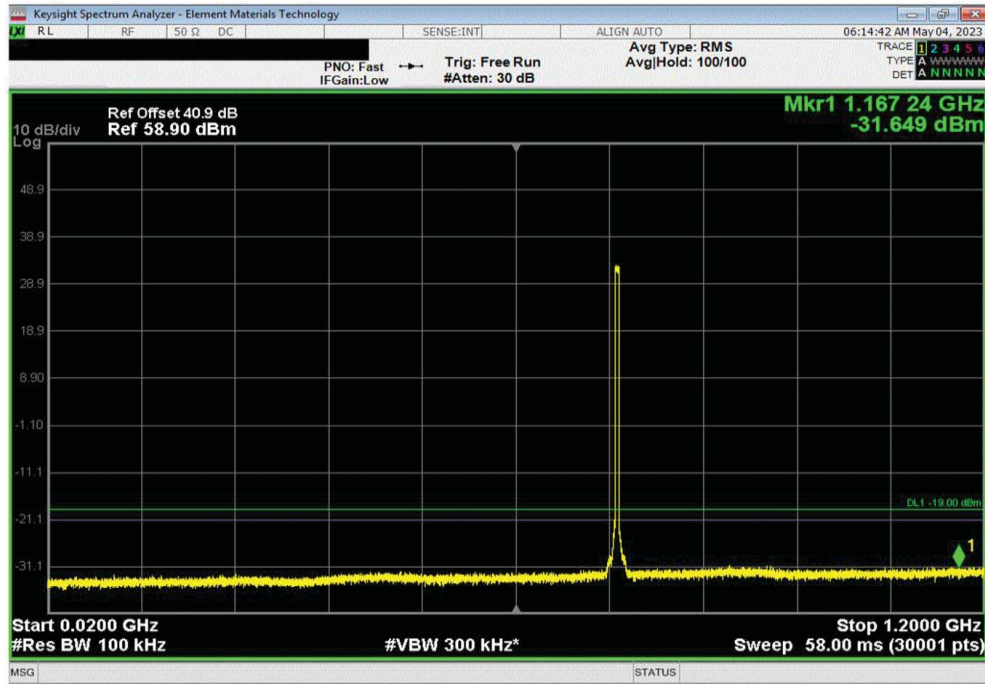


SPURIOUS CONDUCTED EMISSIONS - SINGLE CARRIER

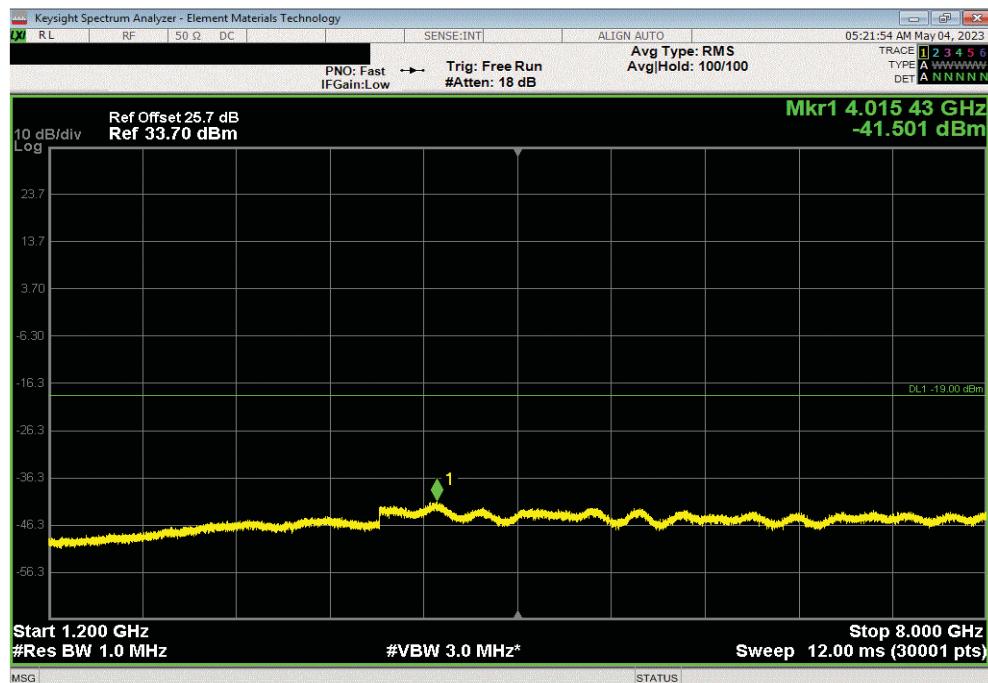


TbTx 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
20 MHz - 1.2 GHz	1167.24	-31.65	-19	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
1.2 GHz - 8 GHz	4015.43	-41.5	-19	Pass	

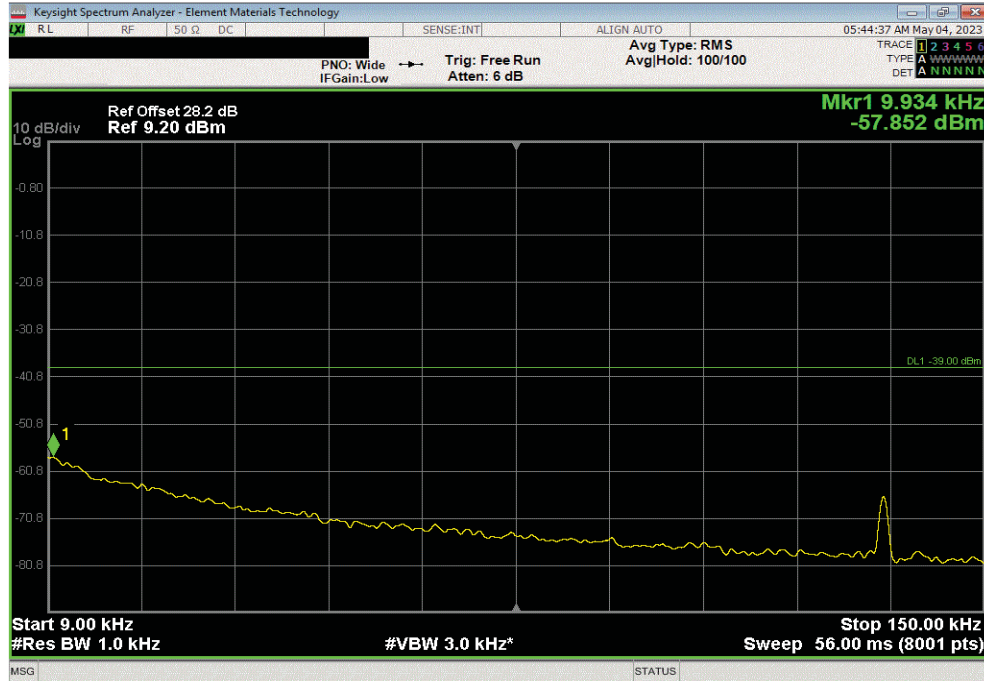


SPURIOUS CONDUCTED EMISSIONS - SINGLE CARRIER

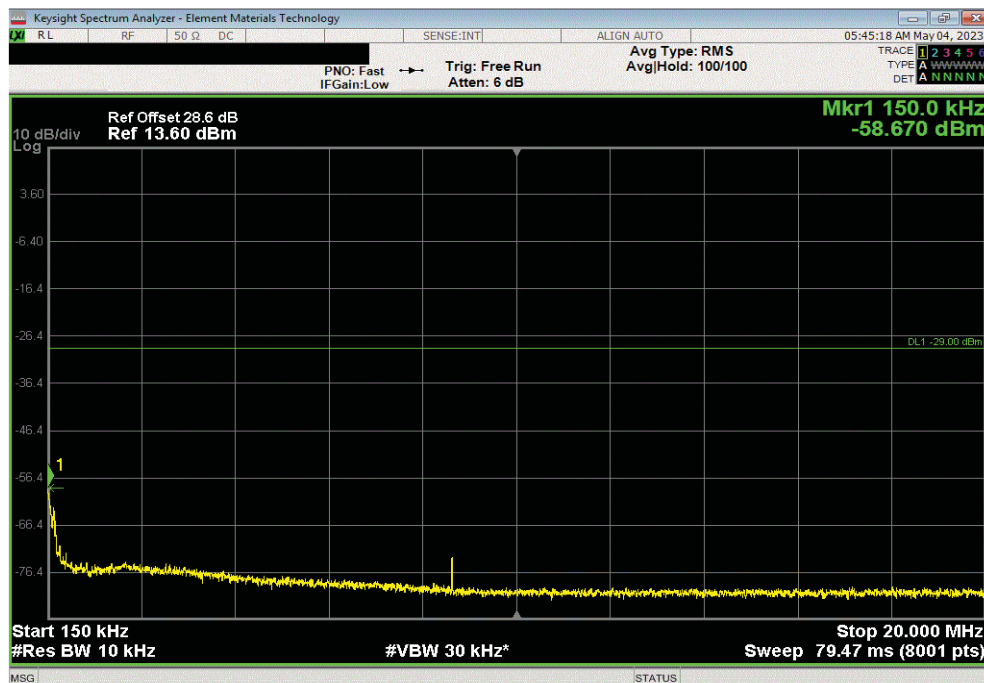


TbTx 2022.05.02.0 XMit 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
9 kHz - 150 kHz	0.01	-57.85	-39	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
150 kHz - 20 MHz	0.15	-58.67	-29	Pass	

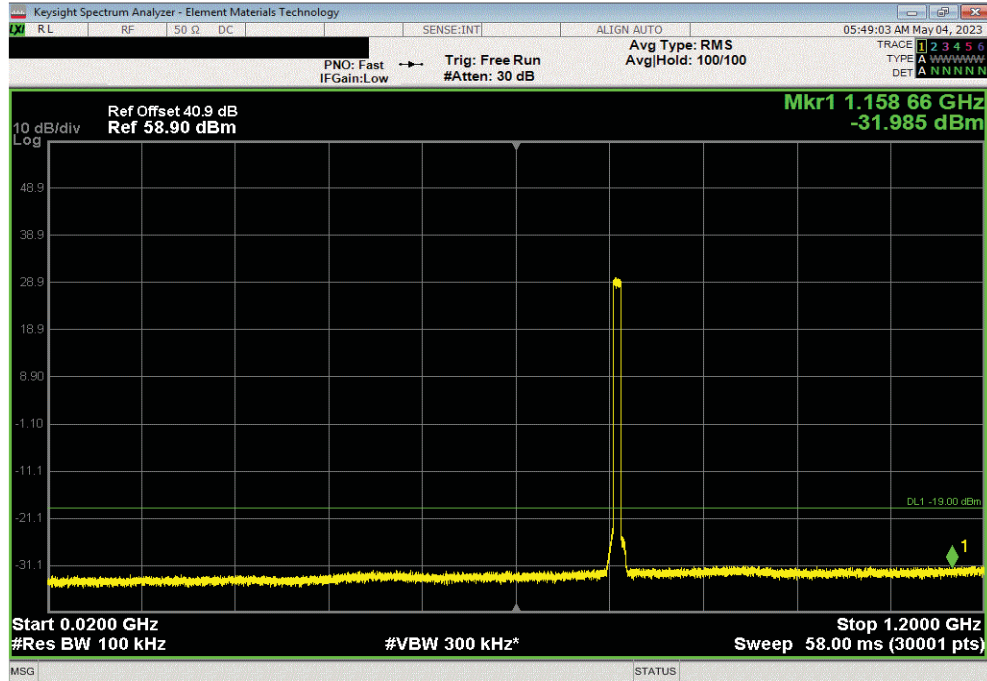


SPURIOUS CONDUCTED EMISSIONS - SINGLE CARRIER

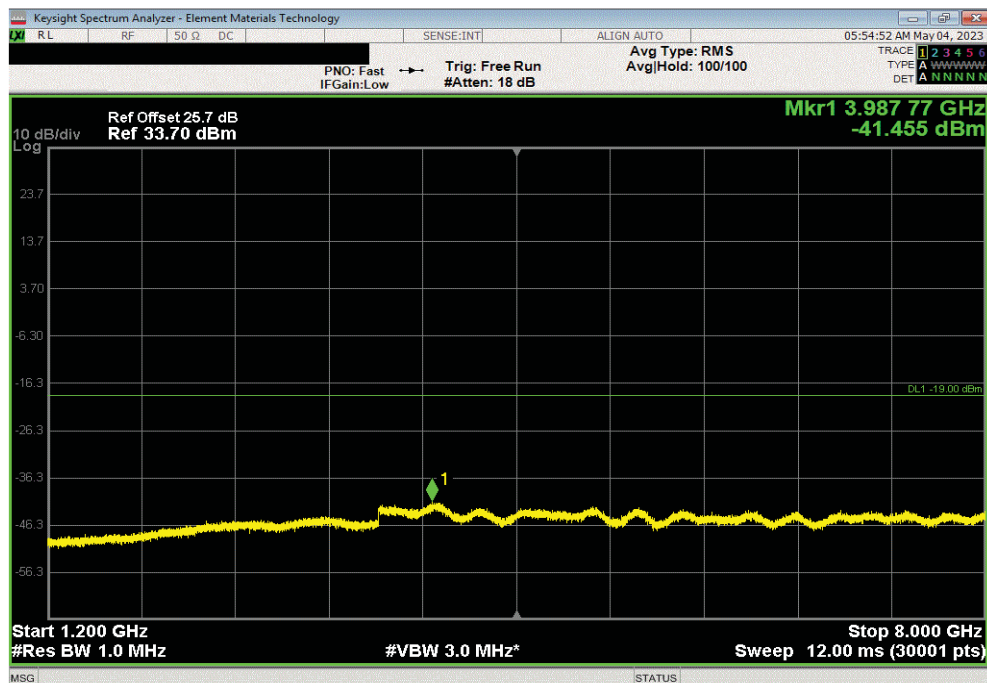


TbTx 2022.05.02.0 XMt 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
20 MHz - 1.2 GHz	1158.66	-31.99	-19	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
1.2 GHz - 8 GHz	3987.77	-41.46	-19	Pass	

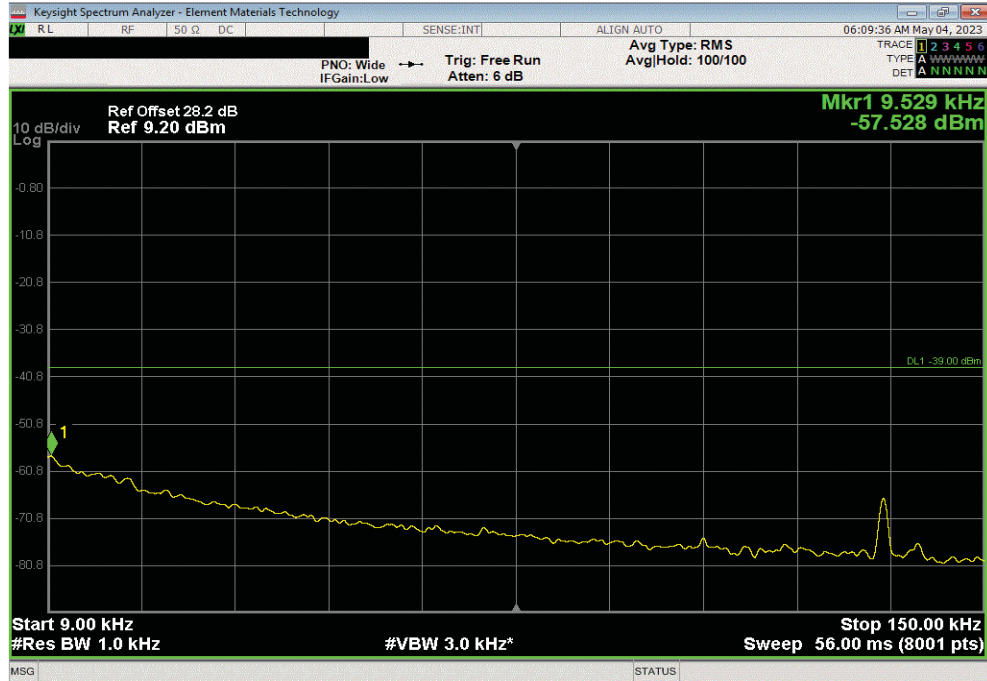


SPURIOUS CONDUCTED EMISSIONS - SINGLE CARRIER

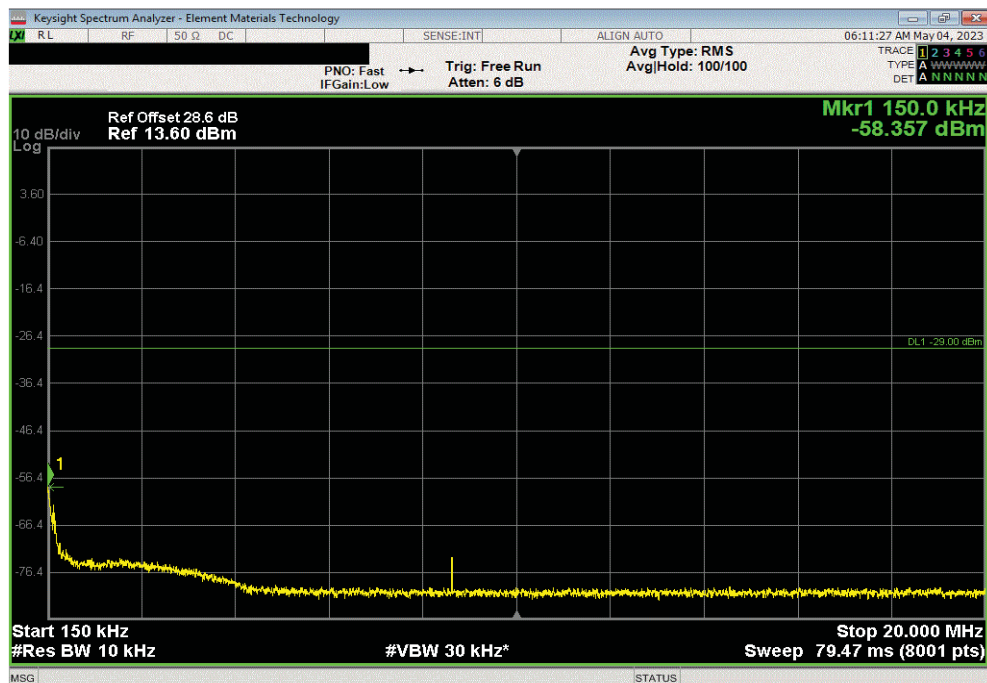


TbTx 2022.05.02.0 XMit 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
9 kHz - 150 kHz	0.01	-57.53	-39	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
150 kHz - 20 MHz	0.15	-58.36	-29	Pass	

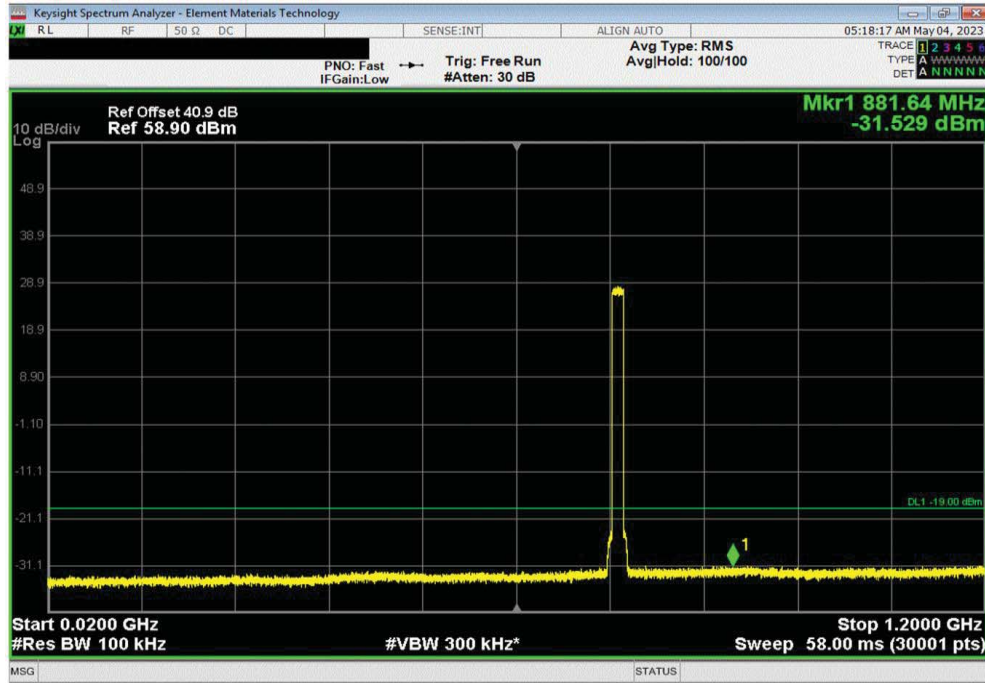


SPURIOUS CONDUCTED EMISSIONS - SINGLE CARRIER

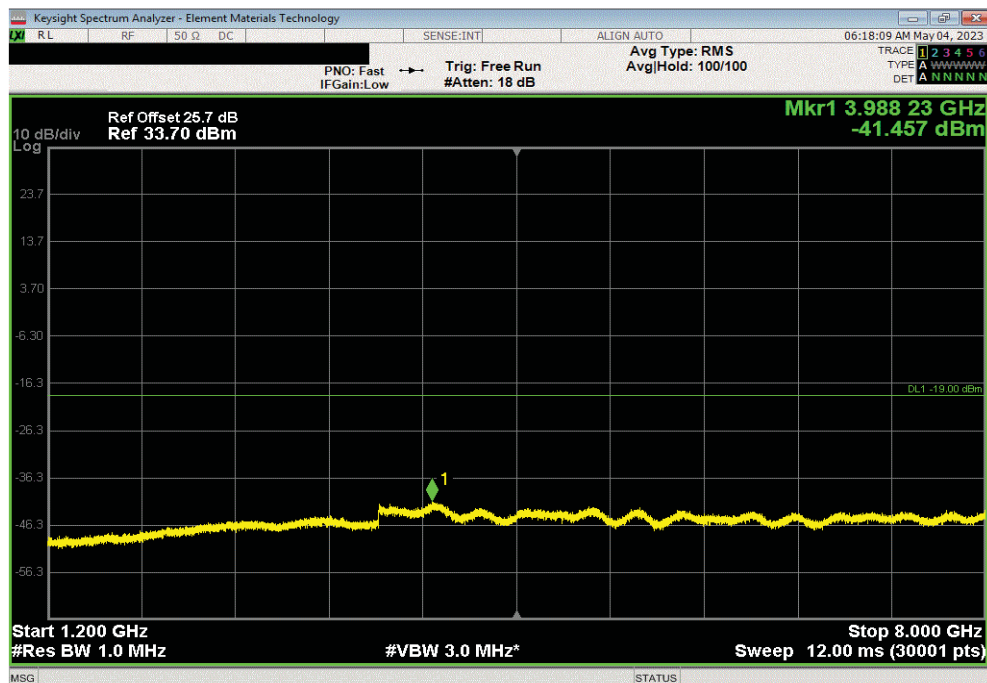


TbTx 2022.05.02.0 XMI 2023.02.14.0

Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
20 MHz - 1.2 GHz	881.64	-31.53	-19	Pass	



Band n85 728 MHz - 746 MHz, 5G NR , Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Mid Channel 737 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
1.2 GHz - 8 GHz	3988.23	-41.46	-19	Pass	



End of Test Report