BAND EDGE COMPLIANCE - MULTICARRIER MULTIBAND

element

XMit 2022.02.07.0

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	SD3239	ANE	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

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

Per FCC section 27.53(g), 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 RRH may operate as a 4 port MIMO transmitter for Band n12.

FCC 27.53(g) requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. FCC 27.53(g) 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.

Per section 90.543(e)(3), 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 RRH may operate as a 4 port MIMO transmitter for Band n14.

FCC 90.543(e)(5) requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. FCC 90.543(e)(5) 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.

FCC 90.543(e)(1) requires an emission limit of -46dBm for any 6.25 kHz bandwidth between frequency bands 769-775 MHz and 799-805 MHz. The limit is adjusted to -52 dBm per 6.25kHz bandwidth [-46 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

Spectrum analyzer reference level offset corrections were applied for the Band n14 band edge measurements from 769MHz-775MHz and 799MHz to 805MHz as follows:

Frequency	Sig Gen Output	Analyzer Reading	Cable Loss
769	0.0	-48.1	48.1
769.05	0.0	-47.7	47.7
769.1	0.0	-47.4	47.4
769.15	0.0	-47.1	47.1
769.2	0.0	-46.8	46.8
769.25	0.0	-46.6	46.6
769.3	0.0	-46.4	46.4
769.35	0.0	-46.2	46.2
769.4	0.0	-46.0	46.0
769.45	0.0	-45.8	45.8
769.5	0.0	-45.7	45.7
769.55	0.0	-45.5	45.5
769.6	0.0	-45.4	45.4
769.65	0.0	-45.3	45.3
769.7	0.0	-45.2	45.2
769.75	0.0	-45.1	45.1
769.8	0.0	-45.0	45.0
769.85	0.0	-44.9	44.9
769.9	0.0	-44.8	44.8
769.95	0.0	-44.7	44.7
770	0.0	-44.7	44.7
770.05	0.0	-44.6	44.6
771	0.0	-43.7	43.7
775	0.0	-43.2	43.2
798	0.0	-42.5	42.5
805	0.0	-42.2	42.2
806	0.0	-42.2	42.2

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

Multicarrier Test Cases
Multi-Carrier Test Case 1 (3GPP Band n12 Multicarrier): Three NR5 carriers using two carriers (with minimum spacing between carrier frequencies) at the lower band (731.5MHz & 736.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (742.5MHz) 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 80 watts (~26.6W/Band n12 carriers).

Multi-Carrier Test Case 2 (3GPP Band n12 and Band n14 Multicarrier/Multiband): In the Band n12 _ Two NR5 carriers at the lower band edge (731.5 & 736.5MHz). In Band n14 one NR5 carrier at the upper band edge (765.5MHz). 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 80 watts (~26.6W/Band n12/n14 carriers).

BAND EDGE COMPLIANCE - MULTICARRIER MULTIBAND

element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLBA			Work Order:	NOKI0046
Serial Number:	K9180844519			Date:	19-Aug-22
Customer:	Nokia Solutions and Networks			Temperature:	21.9 °C
Attendees:	David Le			Humidity:	53.2% RH
Project:	None			Barometric Pres.:	1017 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
FCC 90R:2022	ANSI C63.26:2015

COMMENTS

All measurement path loses accounted for in the reference level offest including any attenuators, filters, and DC blocks. Band n12 and Band n14 carriers were operating at maximum power in each applicable test case to achieve a total port power of 80 watts.

DEVIATIONS FROM TEST STANDARD

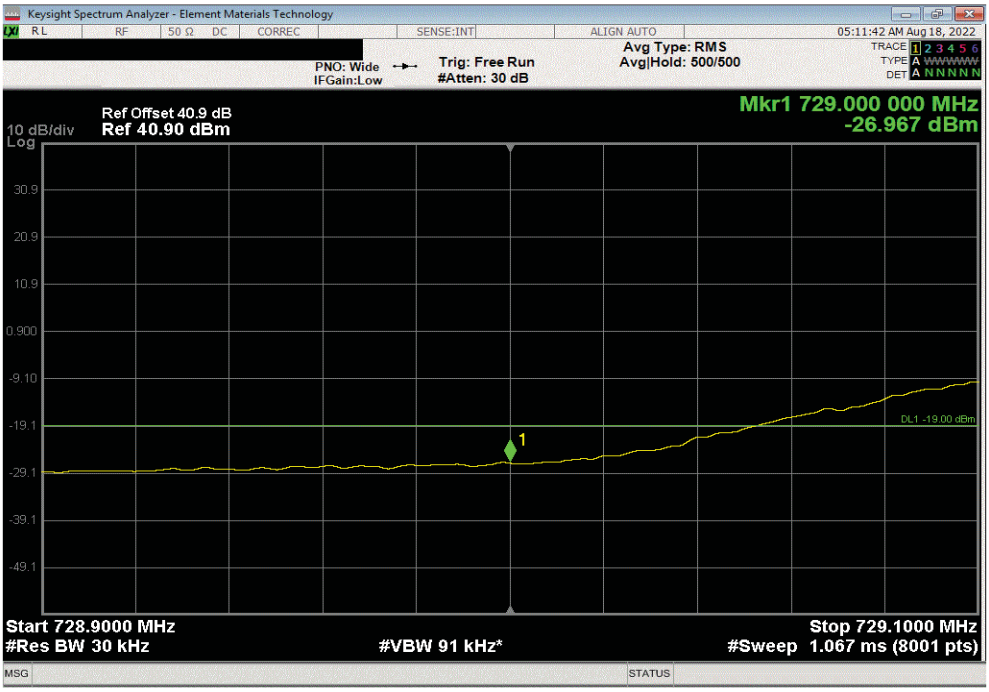
None

Configuration #	2, 4	Signature

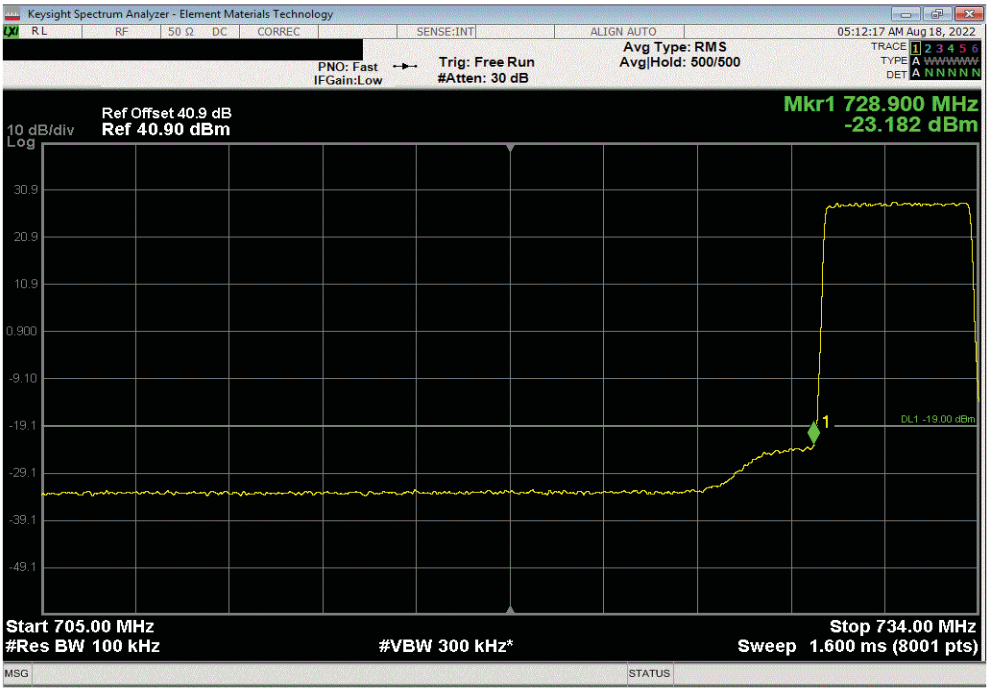
	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
Port 1, Multi-Carrier Test Case 1					
5G NR, Band n12, 729 - 745 MHz					
5 MHz Bandwidth					
QPSK Modulation					
Low Channel, 731.5 MHz	1	729	-26.97	-19	Pass
Low Channel, 731.5 MHz	2	728.9	-23.18	-19	Pass
High Channel, 742.5 MHz	1	745	-26.5	-19	Pass
High Channel, 742.5 MHz	2	745.1	-22.46	-19	Pass
Port 1, Multi-Carrier Test Case 2					
5G NR, Band n12, 729 - 745 MHz, Band n14 758 - 768 MHz					
5 MHz Bandwidth					
QPSK Modulation					
Low Channel, 731.5 MHz	1	729	-26.3	-19	Pass
Low Channel, 731.5 MHz	2	728.9	-21.68	-19	Pass
High Channel, 765.5 MHz	1	768	-29.41	-19	Pass
High Channel, 765.5 MHz	2	768.1	-26.91	-19	Pass
High Channel, 765.5 MHz	3	769.17	-57.38	-52	Pass
High Channel, 765.5 MHz	4	799.13	-72.98	-52	Pass

BAND EDGE COMPLIANCE - MULTICARRIER MULTIBAND

Port 1, 5G NR, Multi-Carrier Test Case 1, Band n12, 729 - 745 MHz, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		729	-26.97	-19	Pass



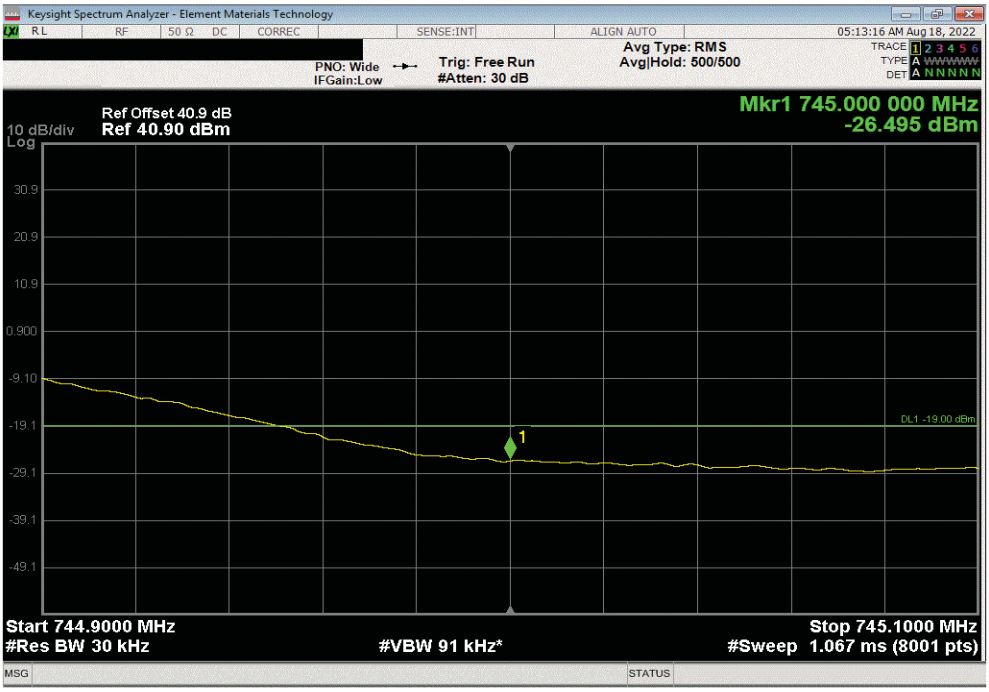
Port 1, 5G NR, Multi-Carrier Test Case 1, Band n12, 729 - 745 MHz, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		728.9	-23.18	-19	Pass



BAND EDGE COMPLIANCE - MULTICARRIER MULTIBAND

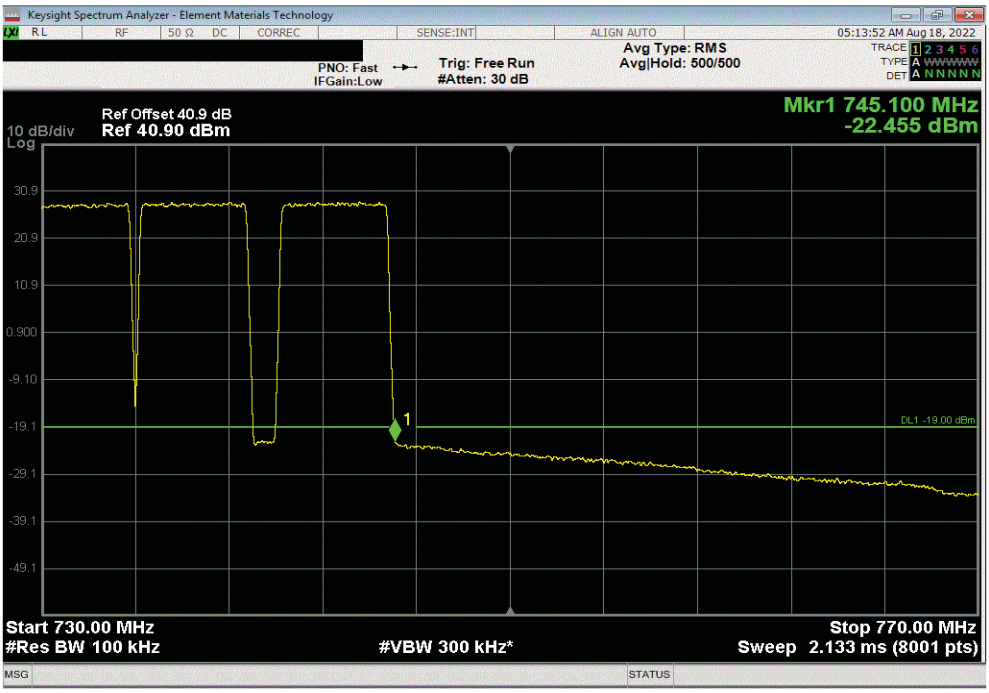
Port 1, 5G NR, Multi-Carrier Test Case 1, Band n12, 729 - 745 MHz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 742.5 MHz

	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		745	-26.5	-19	Pass



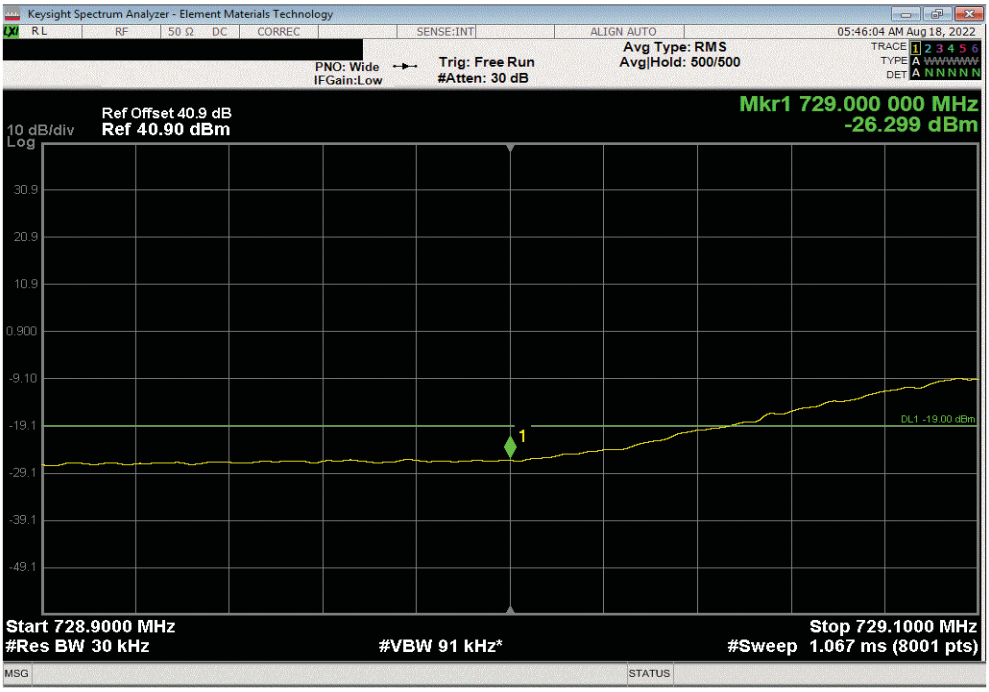
Port 1, 5G NR, Multi-Carrier Test Case 1, Band n12, 729 - 745 MHz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 742.5 MHz

	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.1	-22.46	-19	Pass



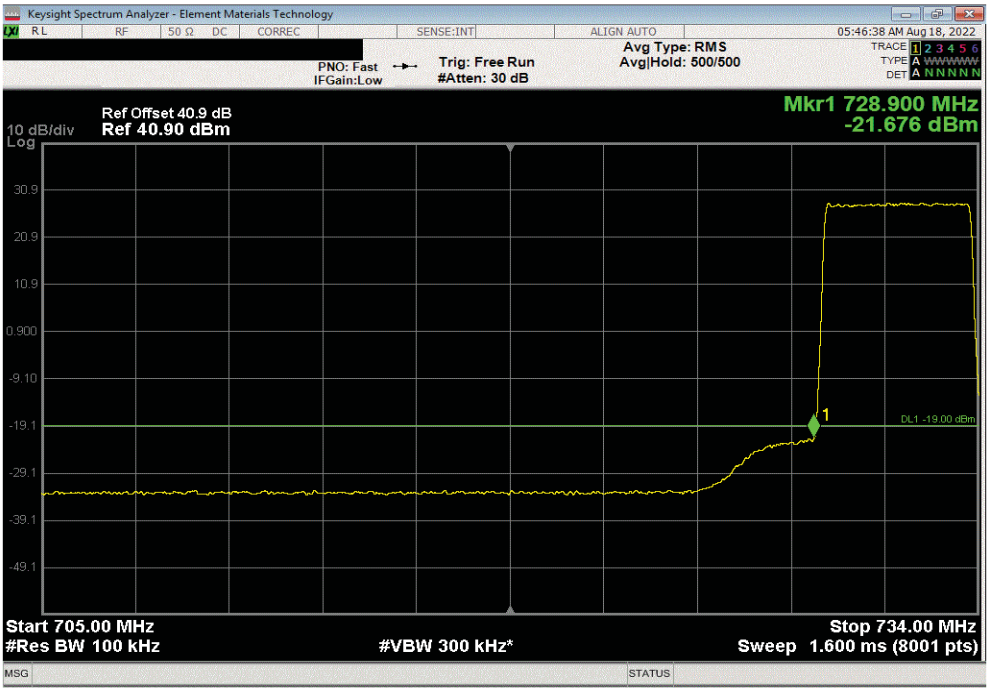
Port 1, 5G NR, Multi-Carrier Test Case 2, Band n12, 729 - 745 MHz, Band n14 758 - 768 MHz, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 731.5 MHz

	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		729	-26.3	-19	Pass

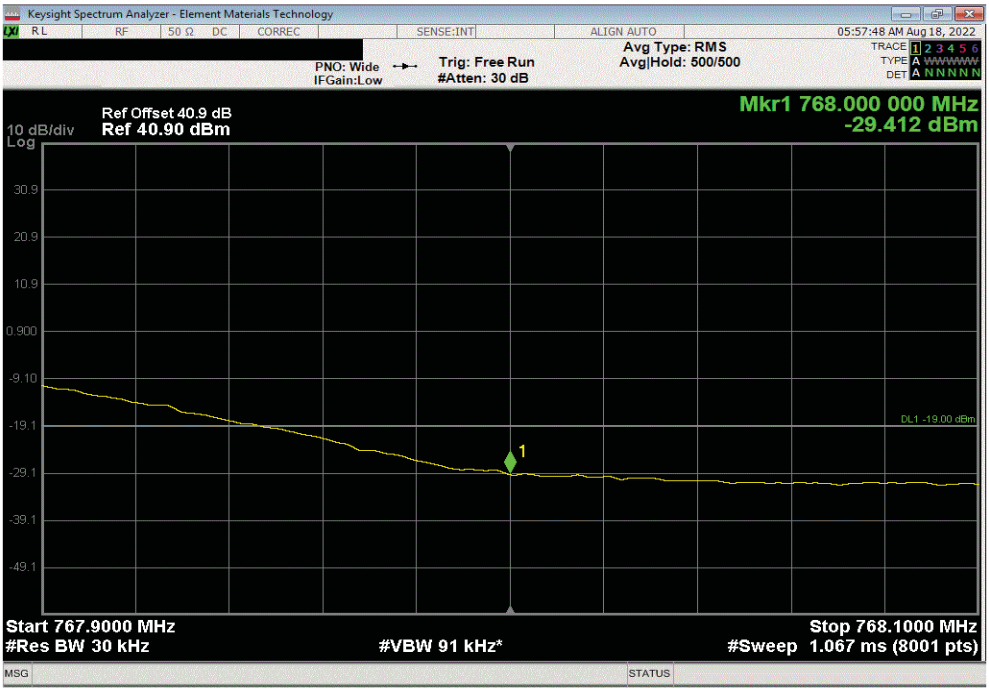


Port 1, 5G NR, Multi-Carrier Test Case 2, Band n12, 729 - 745 MHz, Band n14 758 - 768 MHz, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 731.5 MHz

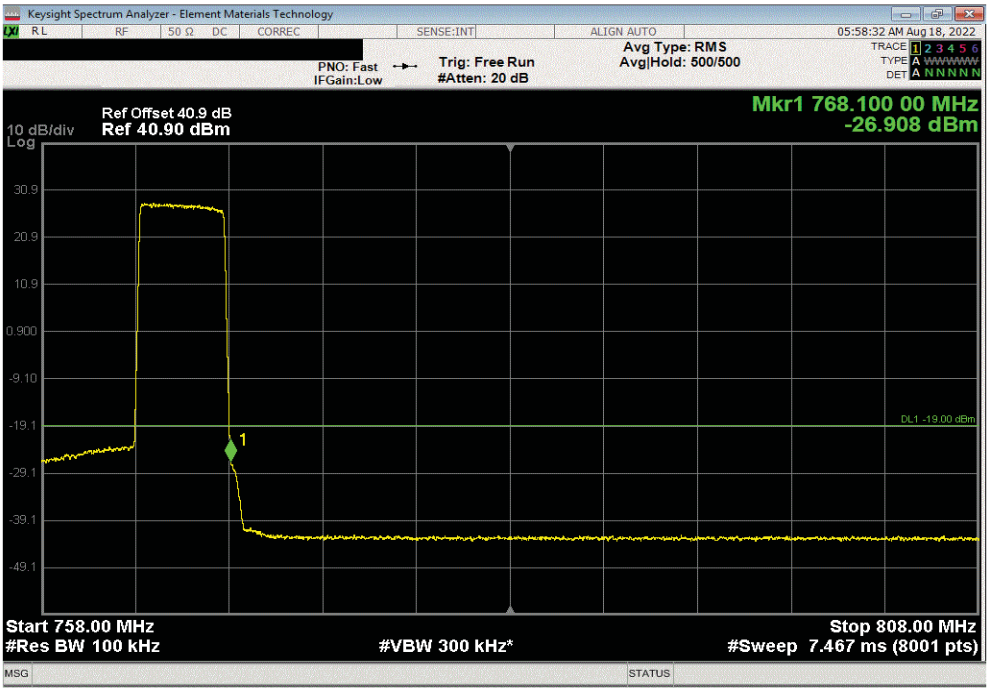
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		728.9	-21.68	-19	Pass



Port 1, 5G NR, Multi-Carrier Test Case 2, Band n12, 729 - 745 MHz, Band n14 758 - 768 MHz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 765.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		768	-29.41	-19	Pass

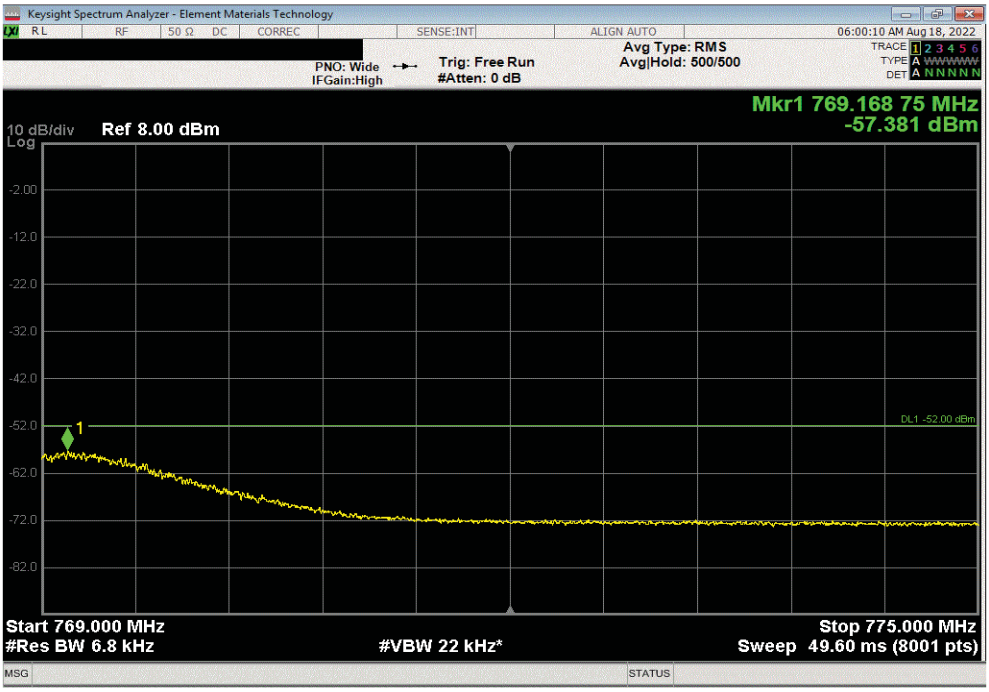


Port 1, 5G NR, Multi-Carrier Test Case 2, Band n12, 729 - 745 MHz, Band n14 758 - 768 MHz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 765.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		768.1	-26.91	-19	Pass



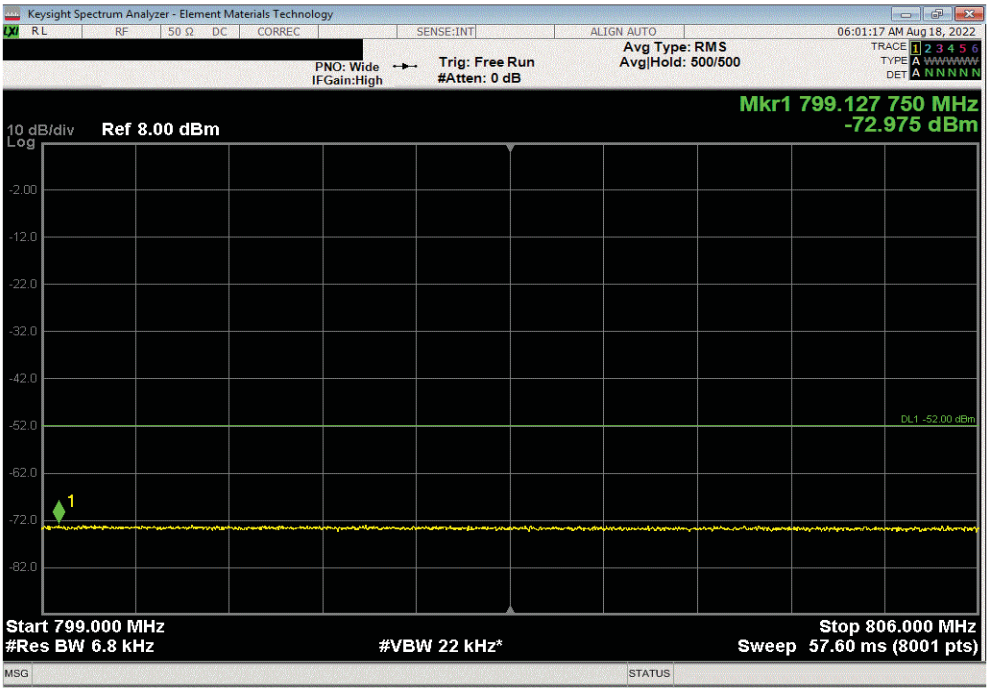
Port 1, 5G NR, Multi-Carrier Test Case 2, Band n12, 729 - 745 MHz, Band n14 758 - 768 MHz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	3		769.17	-57.38	-52	Pass



Port 1, 5G NR, Multi-Carrier Test Case 2, Band n12, 729 - 745 MHz, Band n14 758 - 768 MHz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	4		799.13	-72.98	-52	Pass



BAND EDGE COMPLIANCE - BAND n12

XMit 2022.02.07.0

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	SD3239	ANE	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

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

Per FCC section 27.53(g), 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 RRH may operate as a 4 port MIMO transmitter for Band n12.

FCC 27.53(g) requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range.
FCC 27.53(g) 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.

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

BAND EDGE COMPLIANCE - BAND n12

element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLBA			Work Order:	NOKI0046
Serial Number:	K9180844519			Date:	18-Aug-22
Customer:	Nokia Solutions and Networks			Temperature:	20 °C
Attendees:	David Le			Humidity:	60% RH
Project:	None			Barometric Pres.:	1017 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
FCC 90R:2022	ANSI C63.26:2015

COMMENTS

All measurement path loses accounted for in the reference level offest including any attenuators, filters, and DC blocks. Carriers were enabled at maximum power.

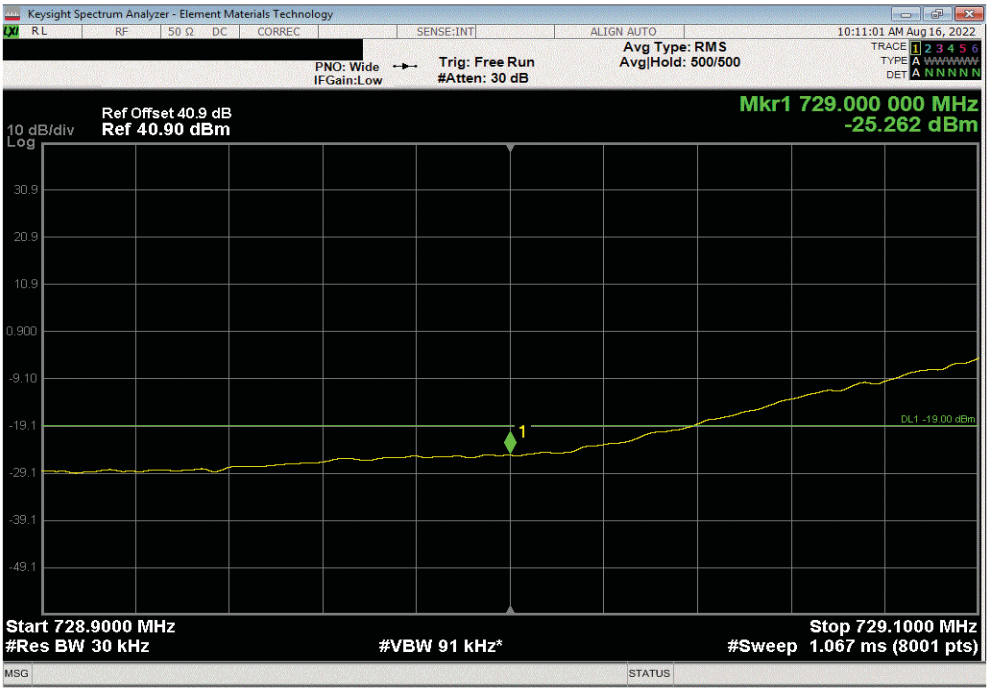
DEVIATIONS FROM TEST STANDARD

None

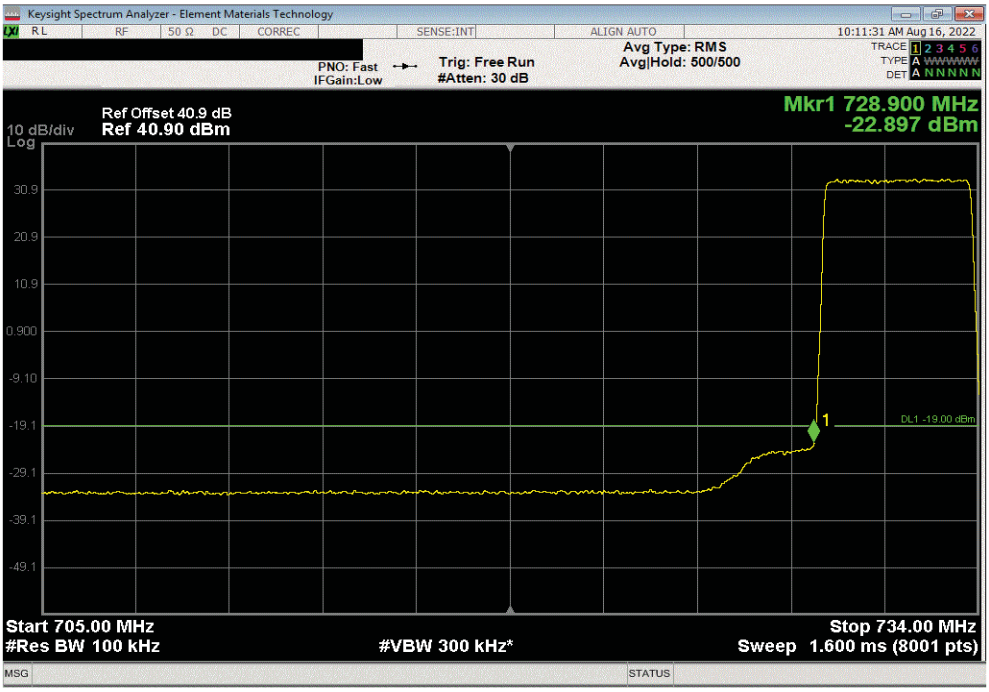
Configuration #	2	Signature

		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
Port 1						
5G NR, Band n12, 729 - 745 Mhz						
5 MHz Bandwidth						
QPSK Modulation						
	Low Channel, 731.5 MHz	1	729	-25.26	-19	Pass
	Low Channel, 731.5 MHz	2	728.9	-22.9	-19	Pass
	High Channel, 742.5 MHz	1	745	-25.07	-19	Pass
	High Channel, 742.5 MHz	2	745.1	-24.23	-19	Pass
16QAM Modulation						
	Low Channel, 731.5 MHz	1	729	-25.36	-19	Pass
	Low Channel, 731.5 MHz	2	728.9	-22.93	-19	Pass
	High Channel, 742.5 MHz	1	745	-24.83	-19	Pass
	High Channel, 742.5 MHz	2	745.1	-24.03	-19	Pass
64QAM Modulation						
	Low Channel, 731.5 MHz	1	729	-25.26	-19	Pass
	Low Channel, 731.5 MHz	2	728.9	-23.23	-19	Pass
	High Channel, 742.5 MHz	1	745	-25.31	-19	Pass
	High Channel, 742.5 MHz	2	745.1	-23.8	-19	Pass
256QAM Modulation						
	Low Channel, 731.5 MHz	1	729	-24.78	-19	Pass
	Low Channel, 731.5 MHz	2	728.9	-23.01	-19	Pass
	High Channel, 742.5 MHz	1	745	-25.16	-19	Pass
	High Channel, 742.5 MHz	2	745.1	-24.15	-19	Pass
10 MHz Bandwidth						
256QAM Modulation						
	Low Channel, 734 MHz	1	729	-28.11	-19	Pass
	Low Channel, 734 MHz	2	728.9	-23.32	-19	Pass
	High Channel, 740 MHz	1	745	-29.13	-19	Pass
	High Channel, 740 MHz	2	745.1	-24.25	-19	Pass
15 MHz Bandwidth						
256QAM Modulation						
	Low Channel, 736.5 MHz	1	729	-28.19	-19	Pass
	Low Channel, 736.5 MHz	2	728.9	-23.76	-19	Pass
	High Channel, 737.5 MHz	1	745	-28.23	-19	Pass
	High Channel, 737.5 MHz	2	745.1	-23.1	-19	Pass

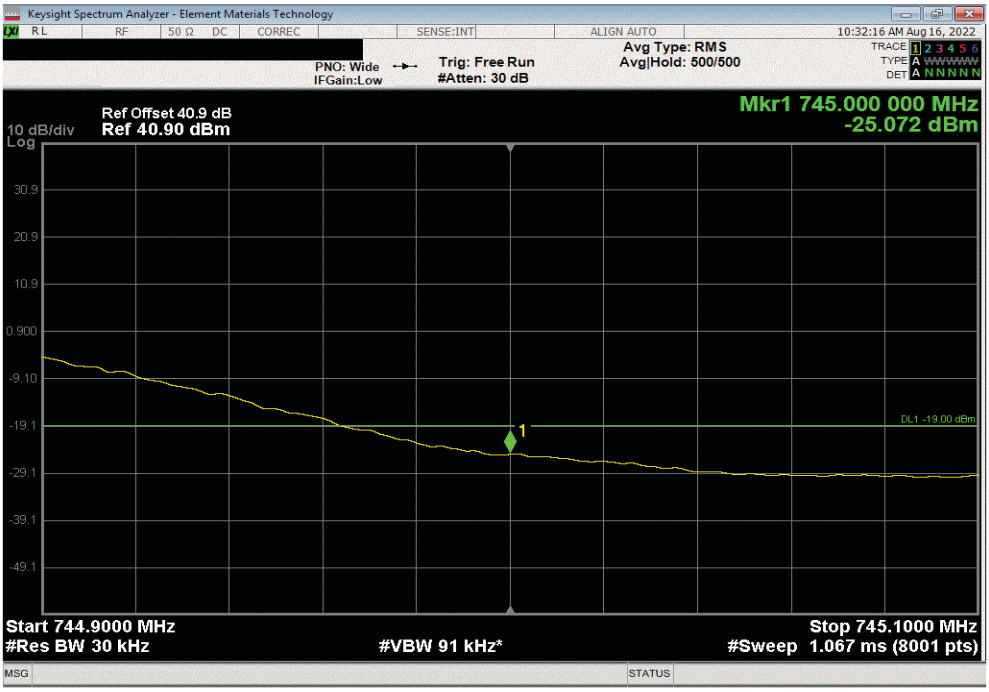
Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		729	-25.26	-19	Pass



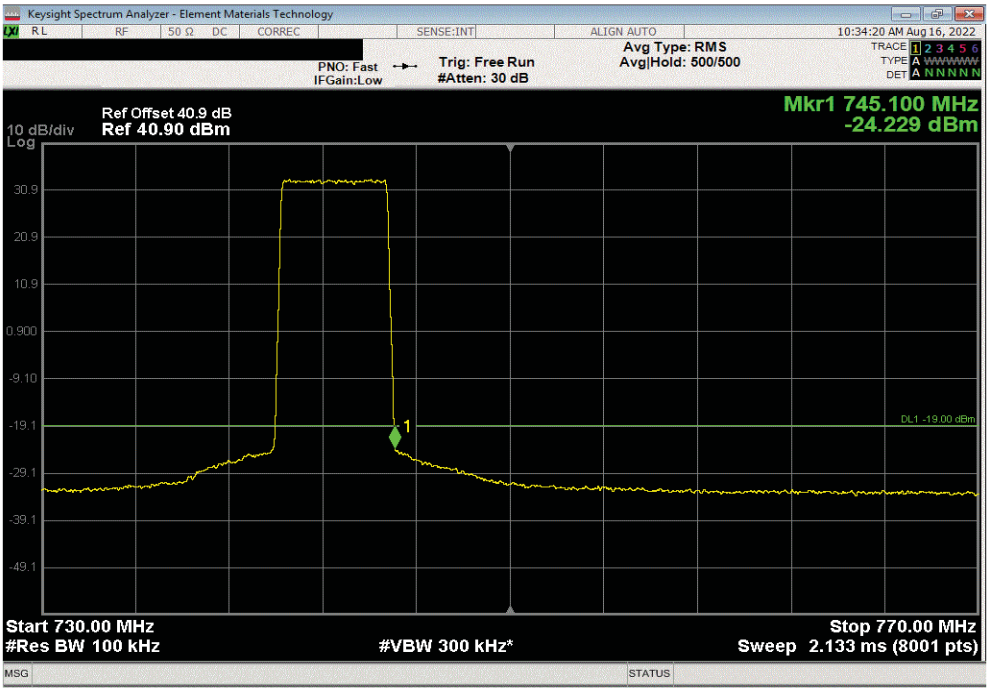
Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		728.9	-22.9	-19	Pass



Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 742.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		745	-25.07	-19	Pass

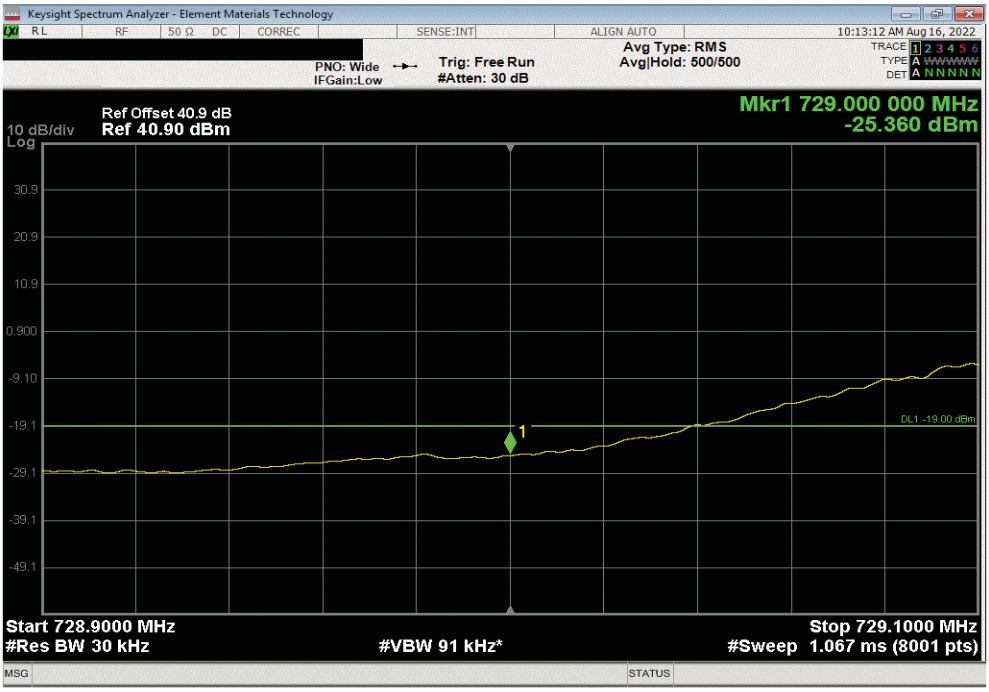


Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 742.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.1	-24.23	-19	Pass

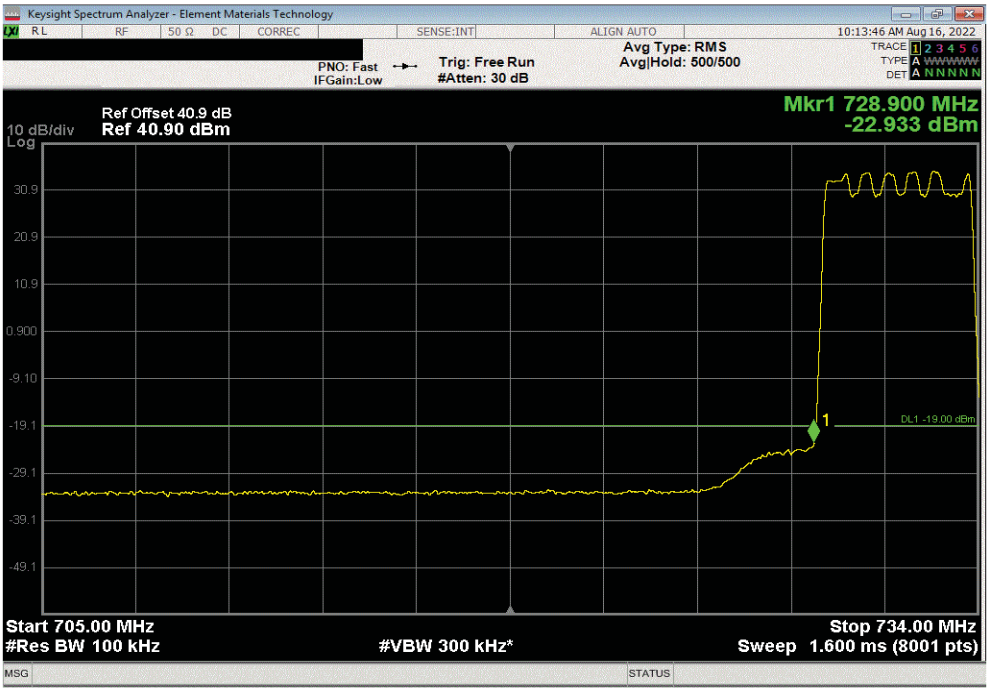


BAND EDGE COMPLIANCE - BAND n12

Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 16QAM Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		729	-25.36	-19	Pass

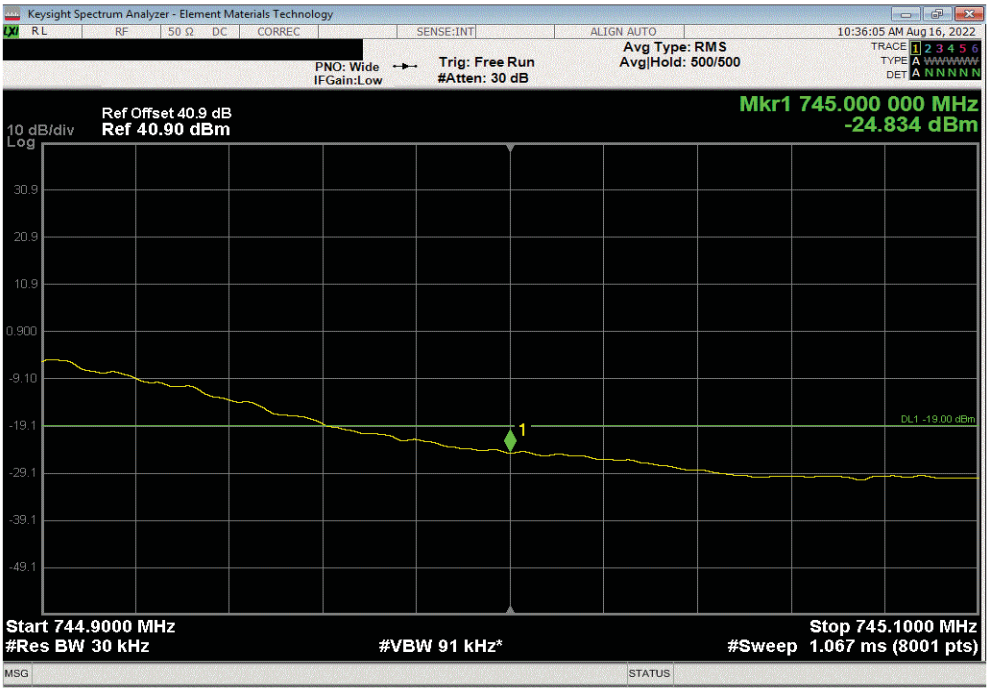


Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 16QAM Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		728.9	-22.93	-19	Pass

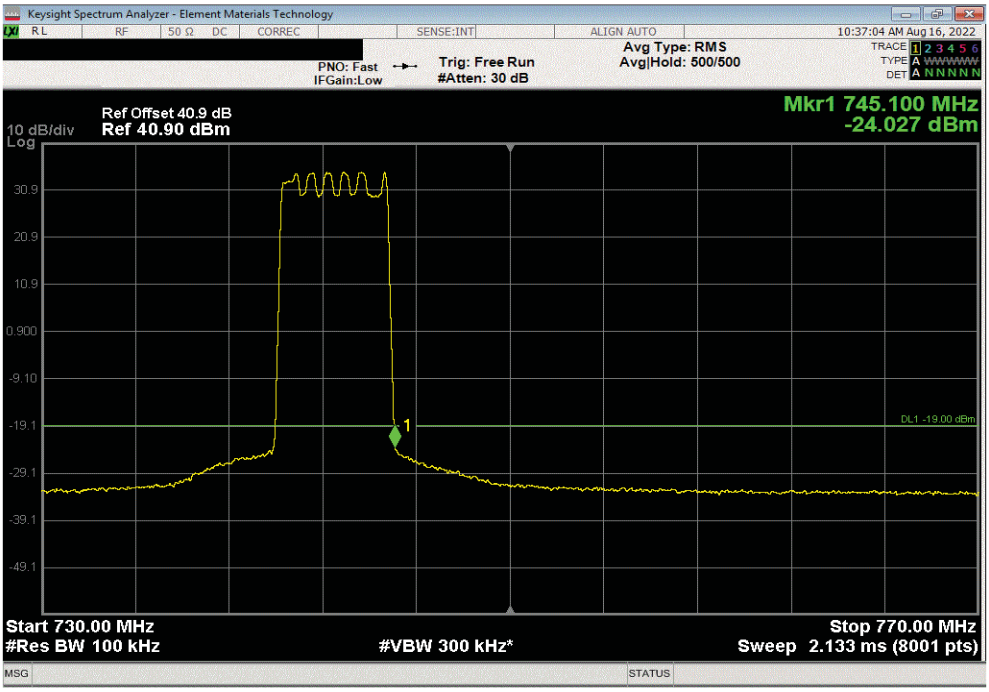


BAND EDGE COMPLIANCE - BAND n12

Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 16QAM Modulation, High Channel, 742.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		745	-24.83	-19	Pass

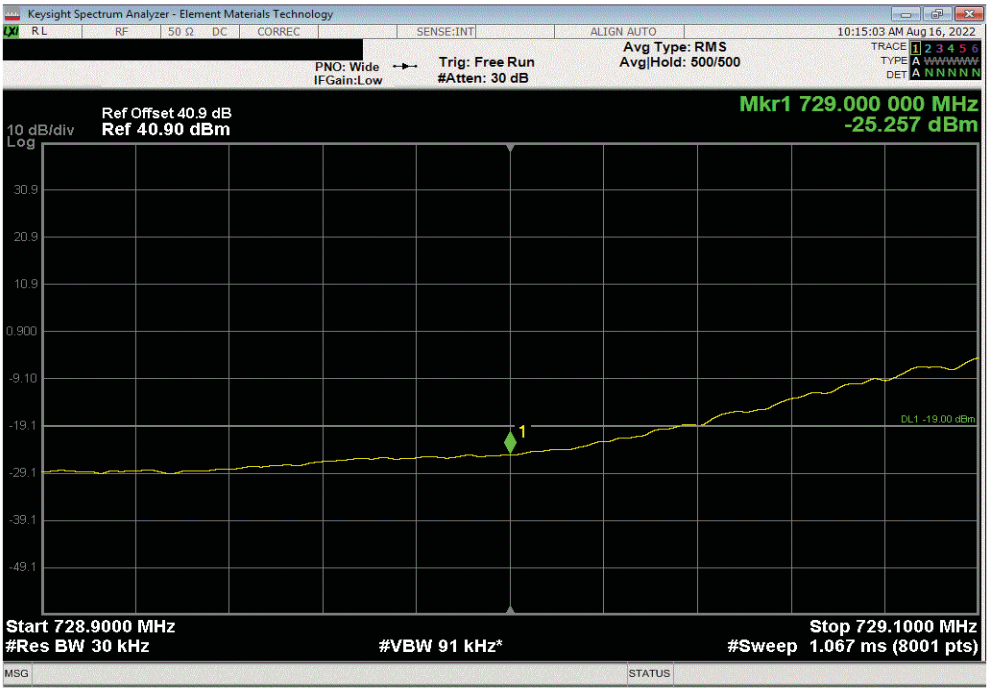


Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 16QAM Modulation, High Channel, 742.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.1	-24.03	-19	Pass

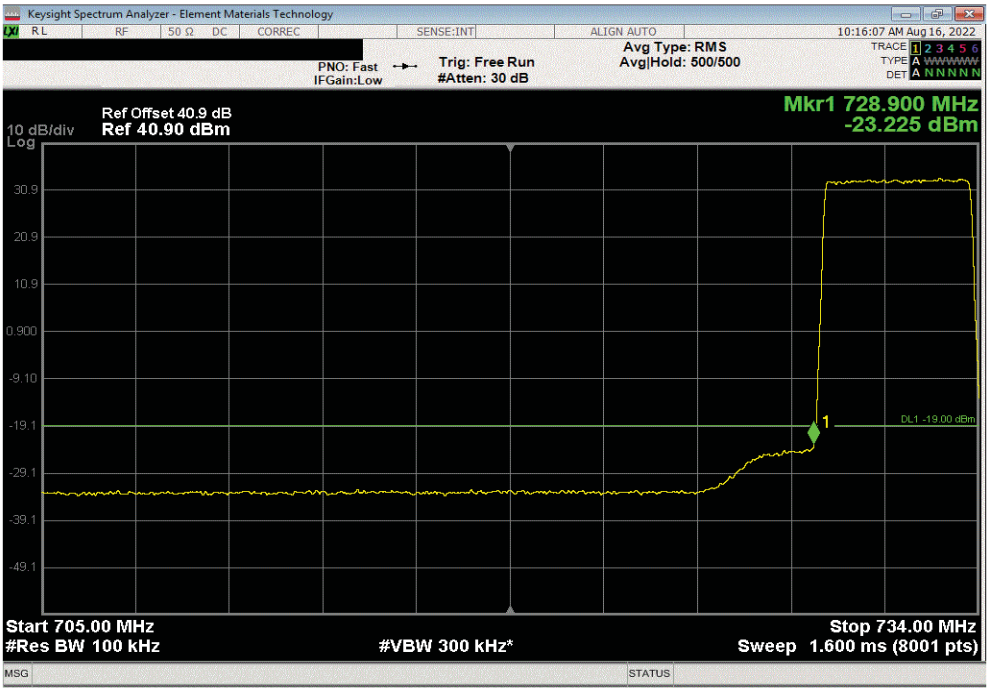


BAND EDGE COMPLIANCE - BAND n12

Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 64QAM Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		729	-25.26	-19	Pass

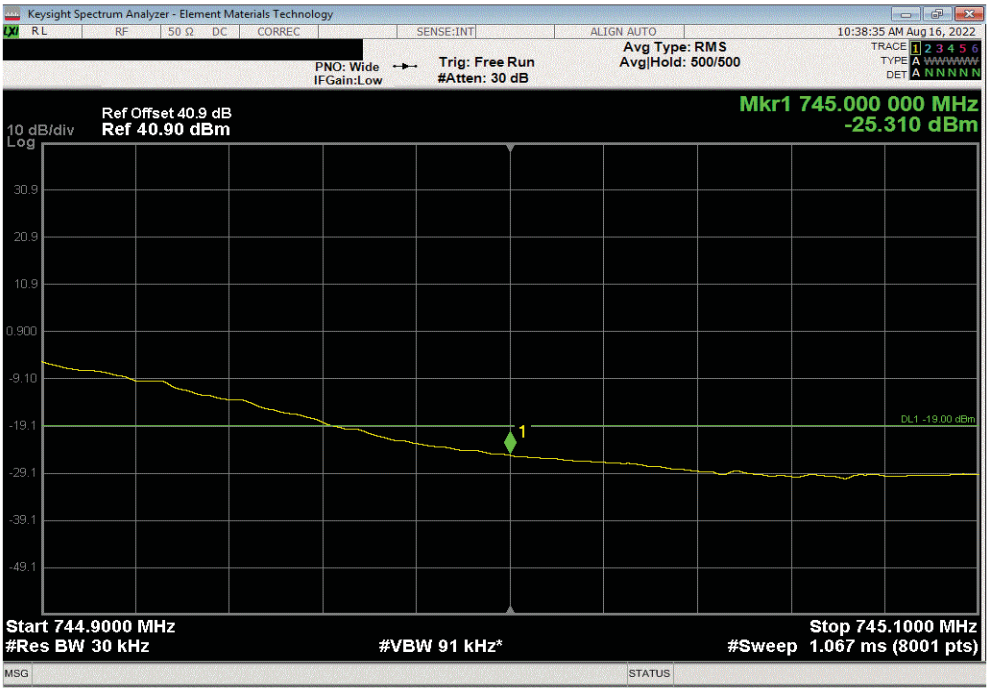


Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 64QAM Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		728.9	-23.23	-19	Pass

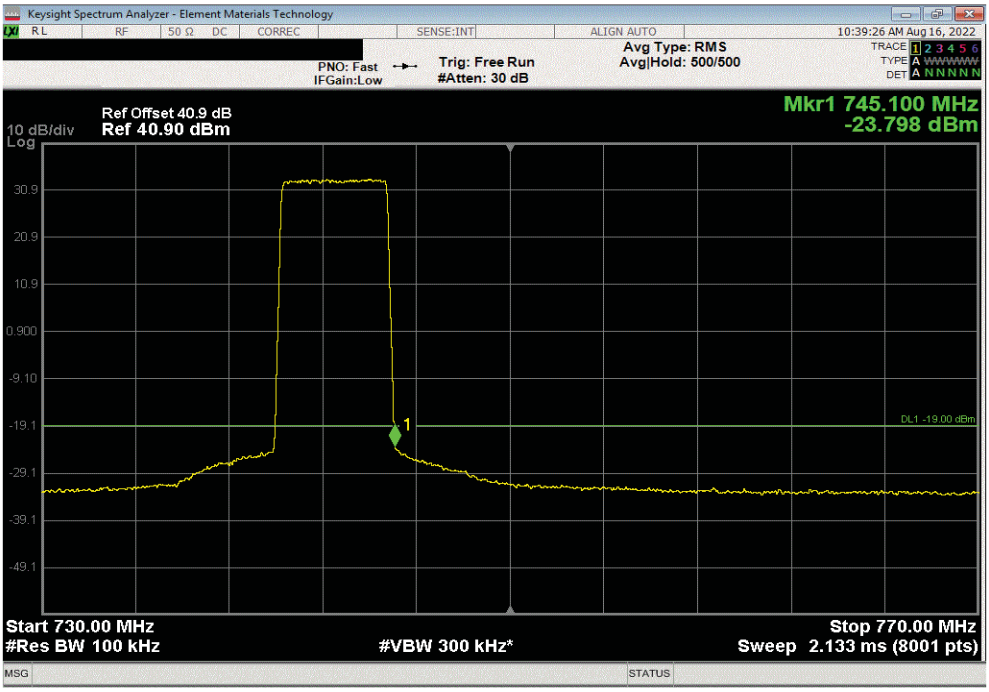


BAND EDGE COMPLIANCE - BAND n12

Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 64QAM Modulation, High Channel, 742.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		745	-25.31	-19	Pass



Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 64QAM Modulation, High Channel, 742.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.1	-23.8	-19	Pass

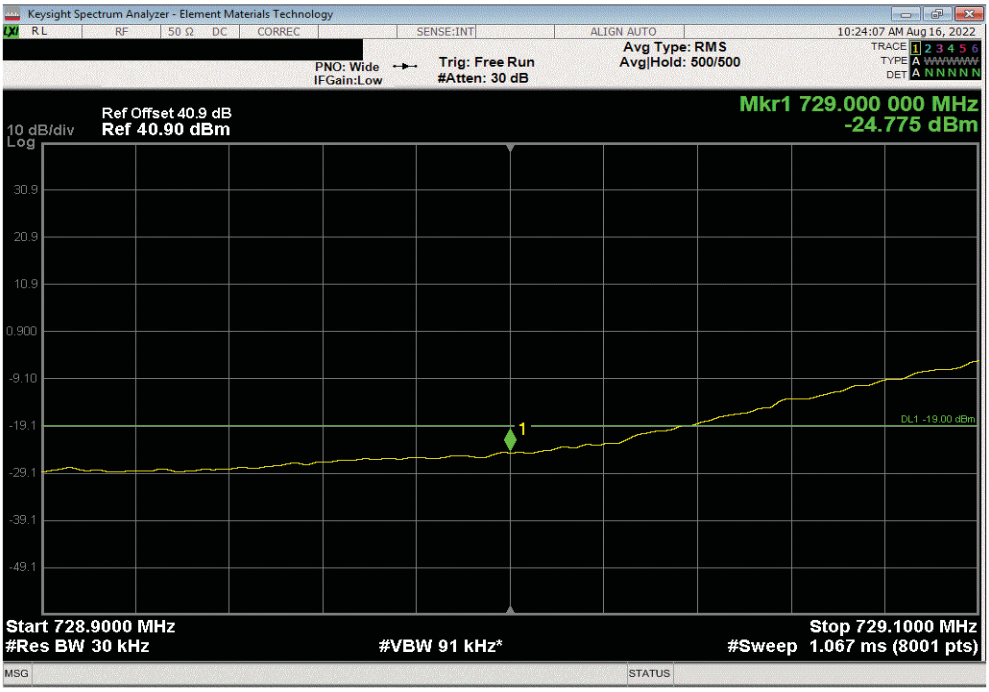


BAND EDGE COMPLIANCE - BAND n12

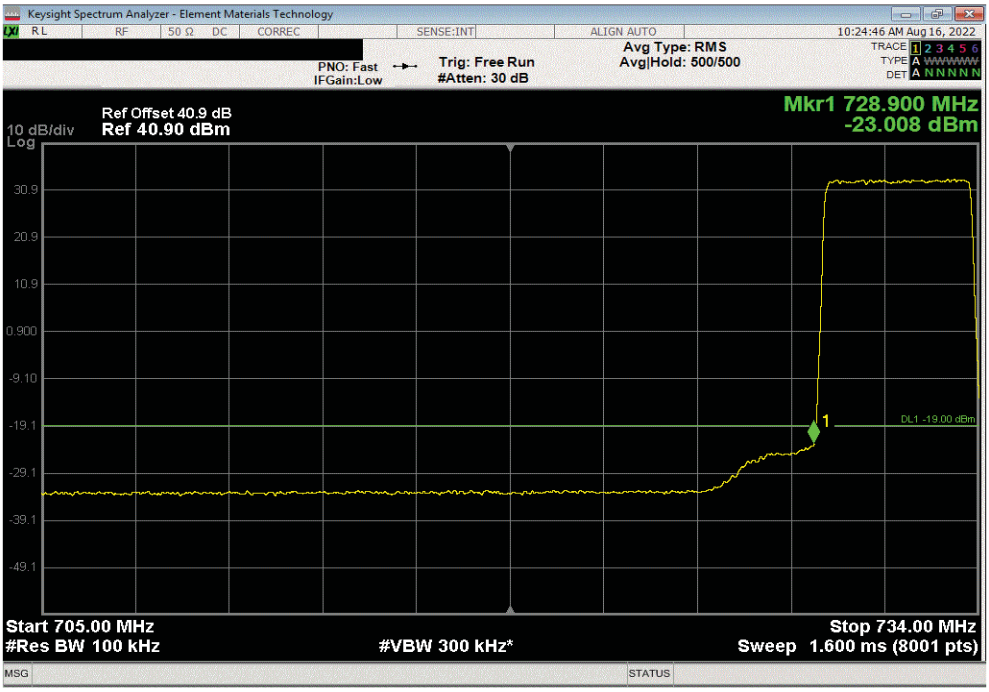
element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		729	-24.78	-19	Pass

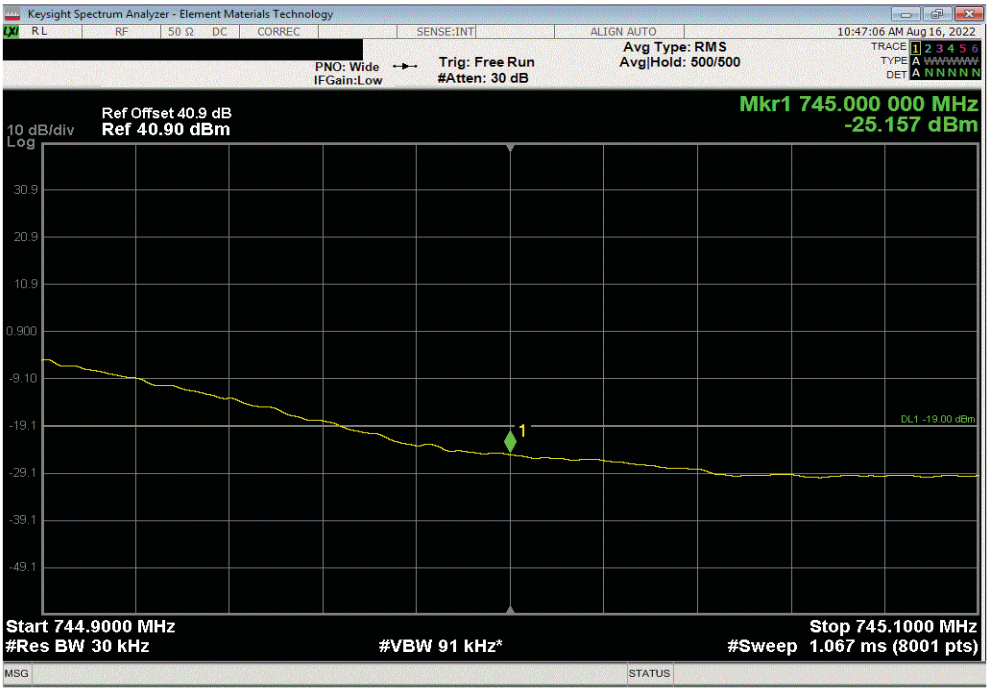


Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 731.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		728.9	-23.01	-19	Pas

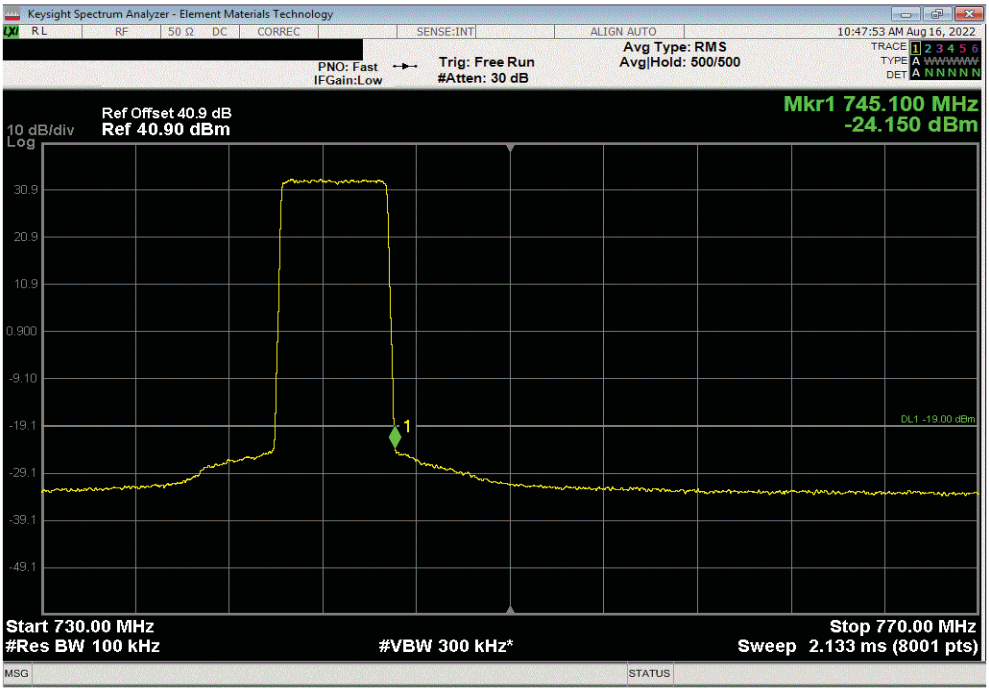


BAND EDGE COMPLIANCE - BAND n12

Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 742.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		745	-25.16	-19	Pass

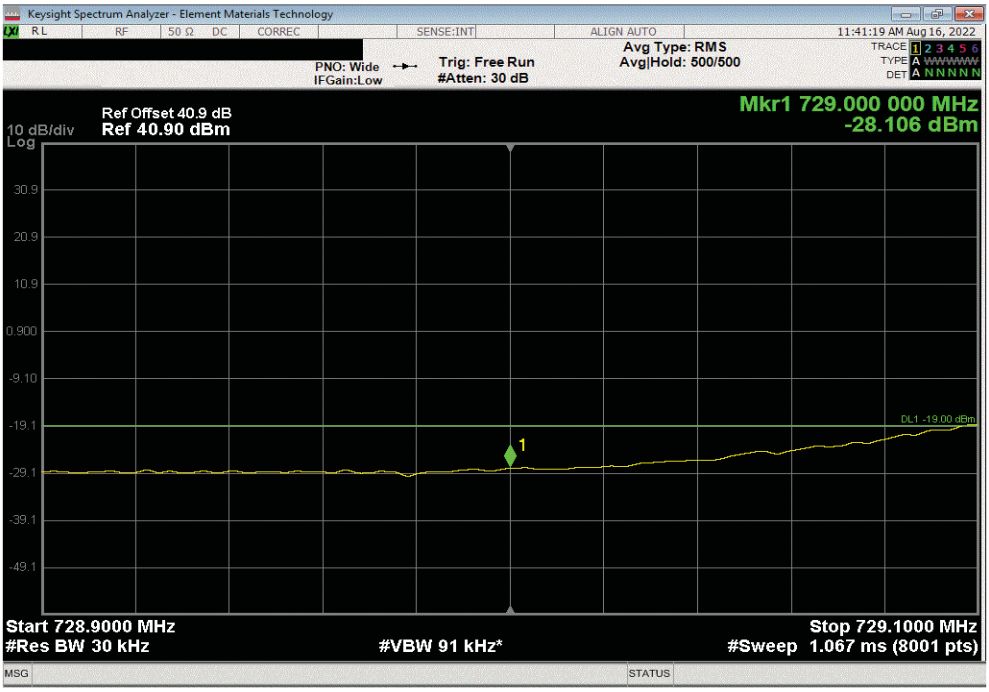


Port 1, 5G NR, Band n12, 729 - 745 Mhz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 742.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.1	-24.15	-19	Pass

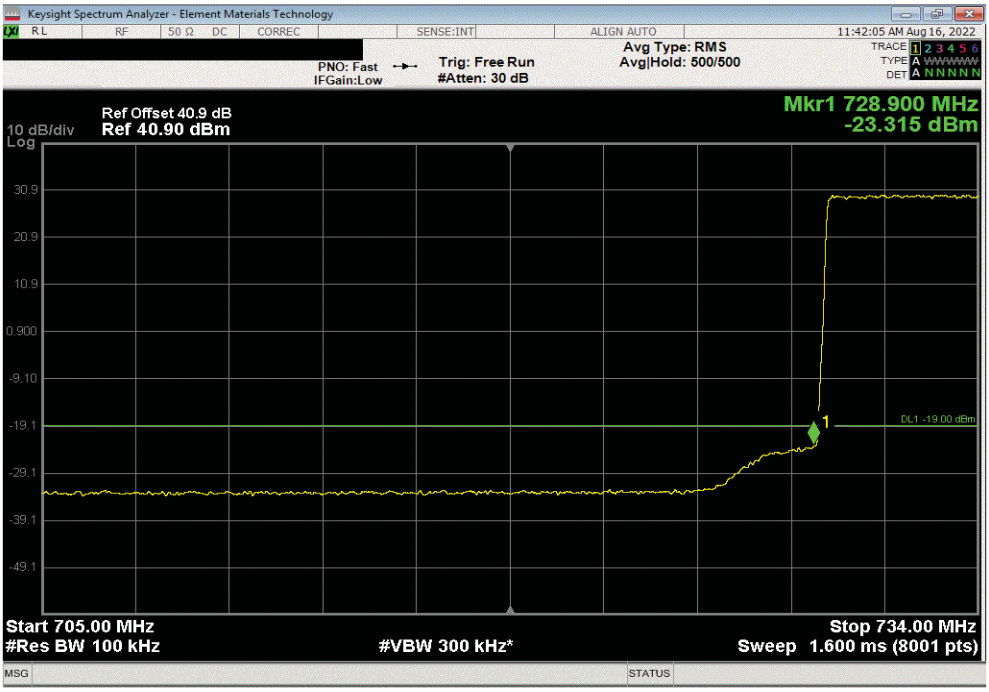


BAND EDGE COMPLIANCE - BAND n12

Port 1, 5G NR, Band n12, 729 - 745 Mhz, 10 MHz Bandwidth, 256QAM Modulation, Low Channel, 734 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		729	-28.11	-19	Pass



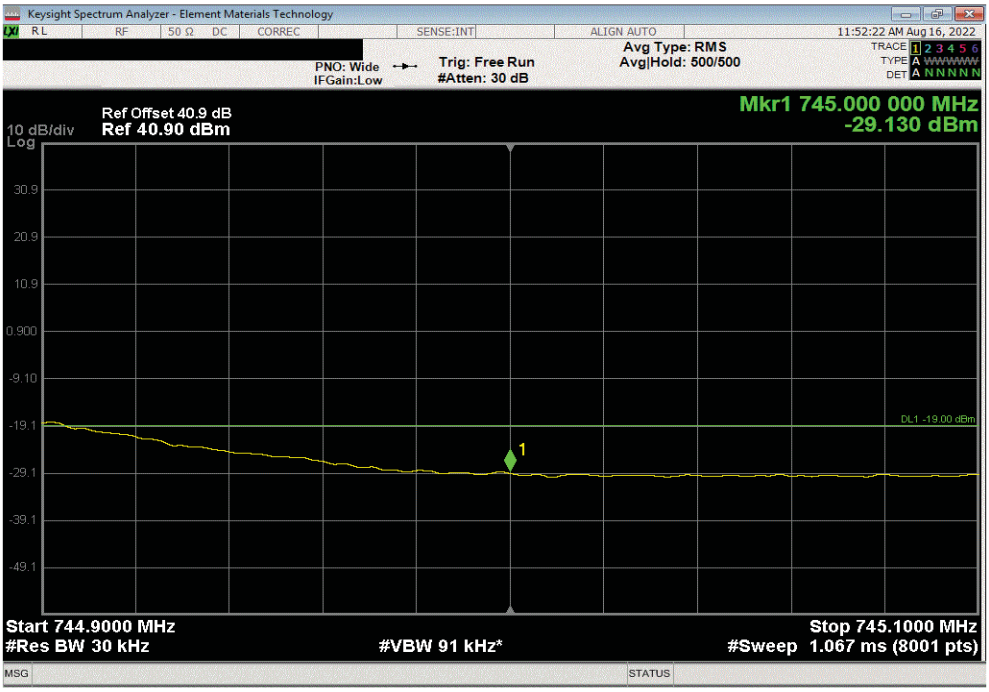
Port 1, 5G NR, Band n12, 729 - 745 Mhz, 10 MHz Bandwidth, 256QAM Modulation, Low Channel, 734 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		728.9	-23.32	-19	Pass



BAND EDGE COMPLIANCE - BAND n12

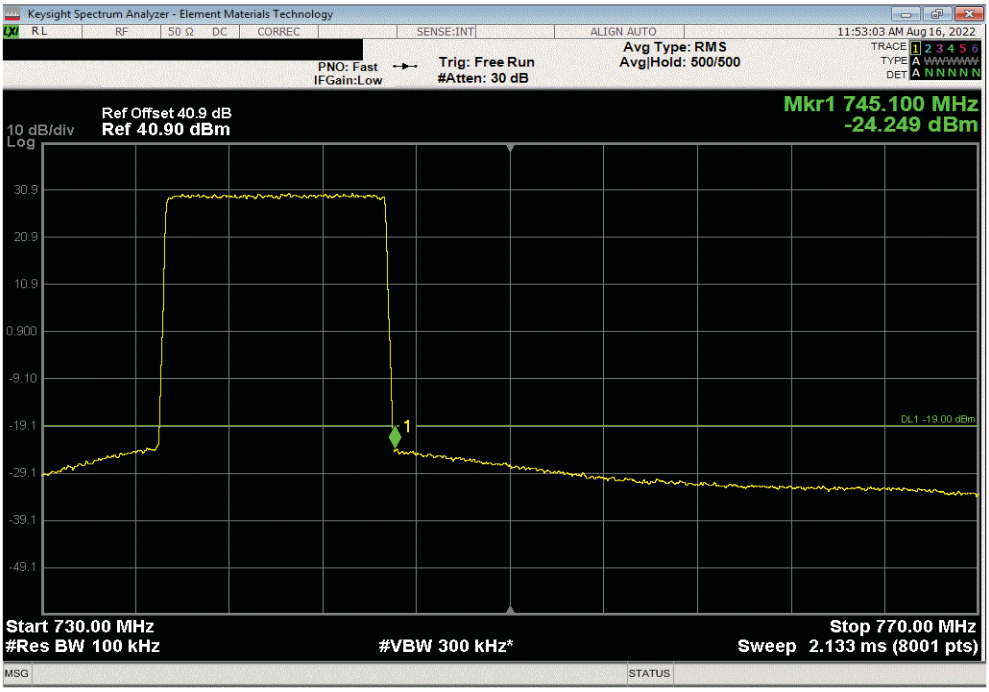
Port 1, 5G NR, Band n12, 729 - 745 Mhz, 10 MHz Bandwidth, 256QAM Modulation, High Channel, 740 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		745	-29.13	-19	Pass



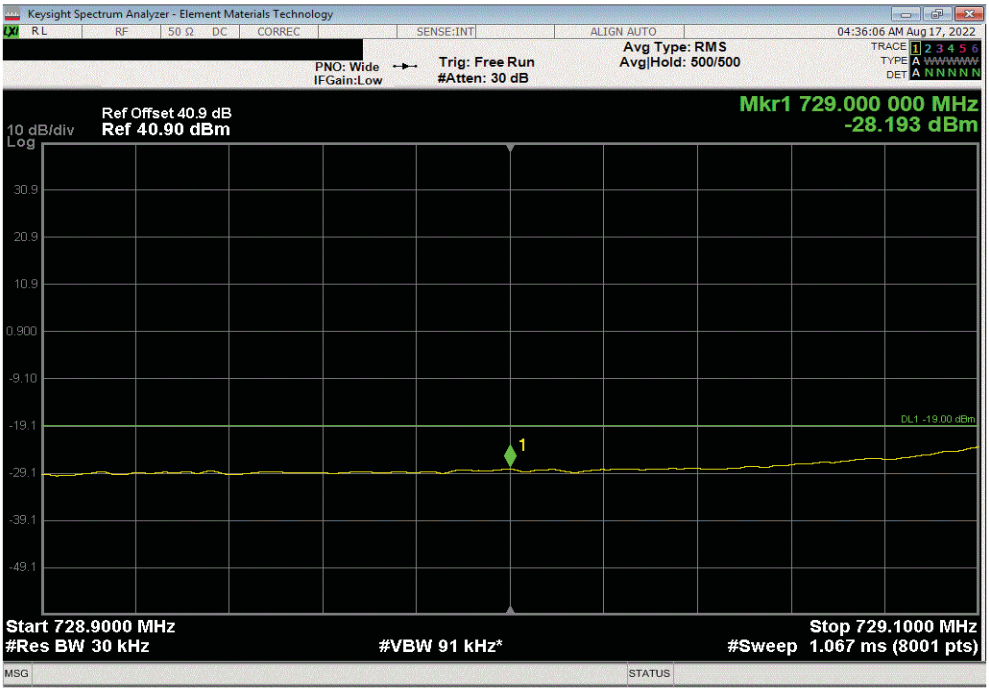
Port 1, 5G NR, Band n12, 729 - 745 Mhz, 10 MHz Bandwidth, 256QAM Modulation, High Channel, 740 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.1	-24.25	-19	Pass

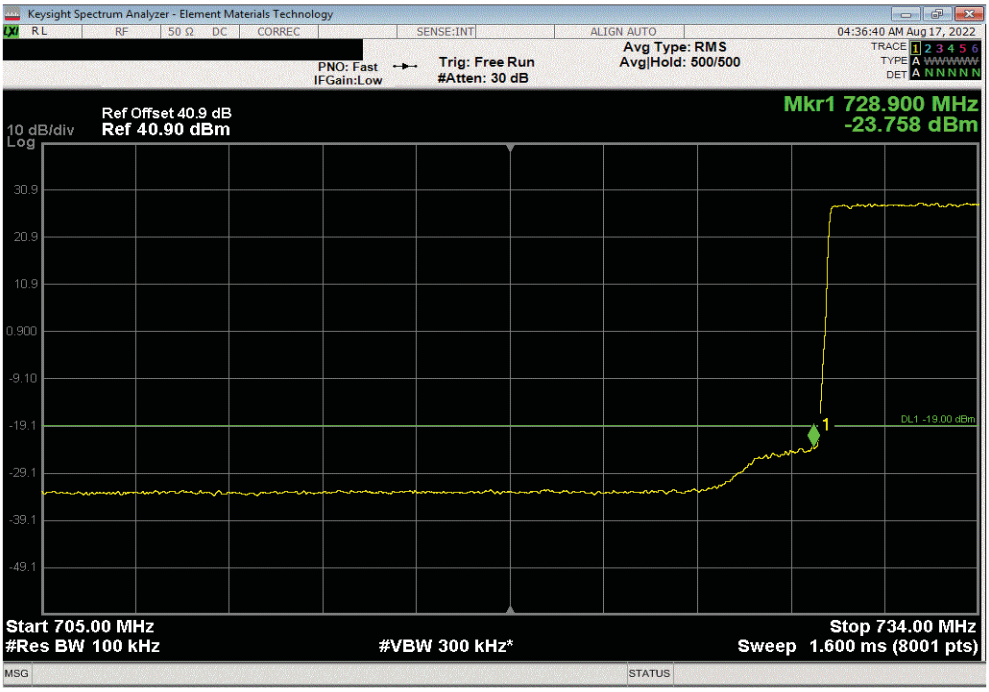


BAND EDGE COMPLIANCE - BAND n12

Port 1, 5G NR, Band n12, 729 - 745 Mhz, 15 MHz Bandwidth, 256QAM Modulation, Low Channel, 736.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		729	-28.19	-19	Pass

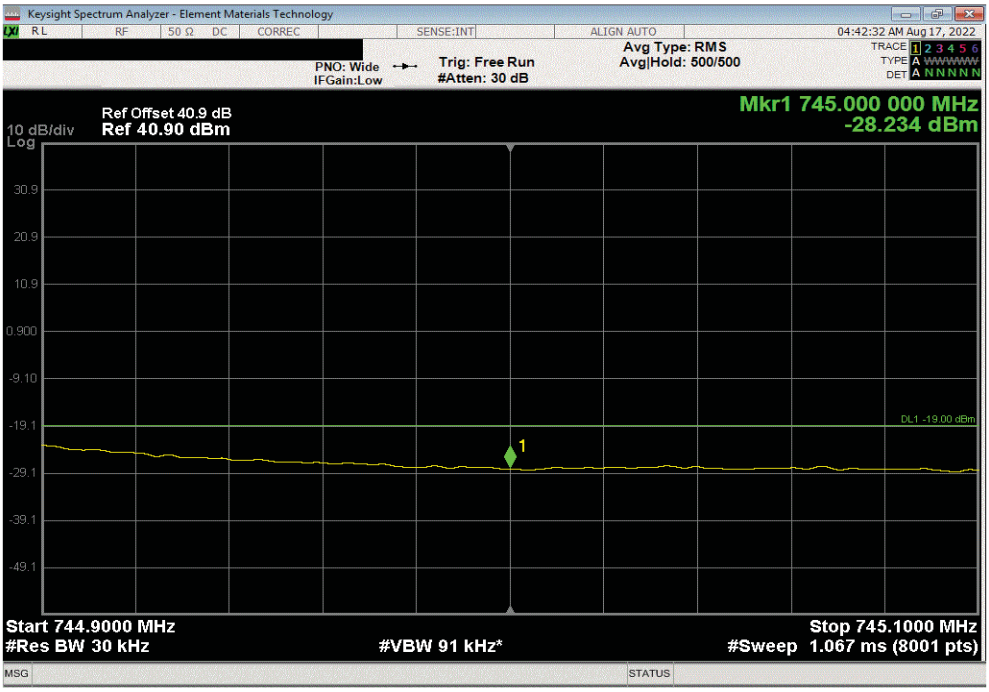


Port 1, 5G NR, Band n12, 729 - 745 Mhz, 15 MHz Bandwidth, 256QAM Modulation, Low Channel, 736.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		728.9	-23.76	-19	Pass

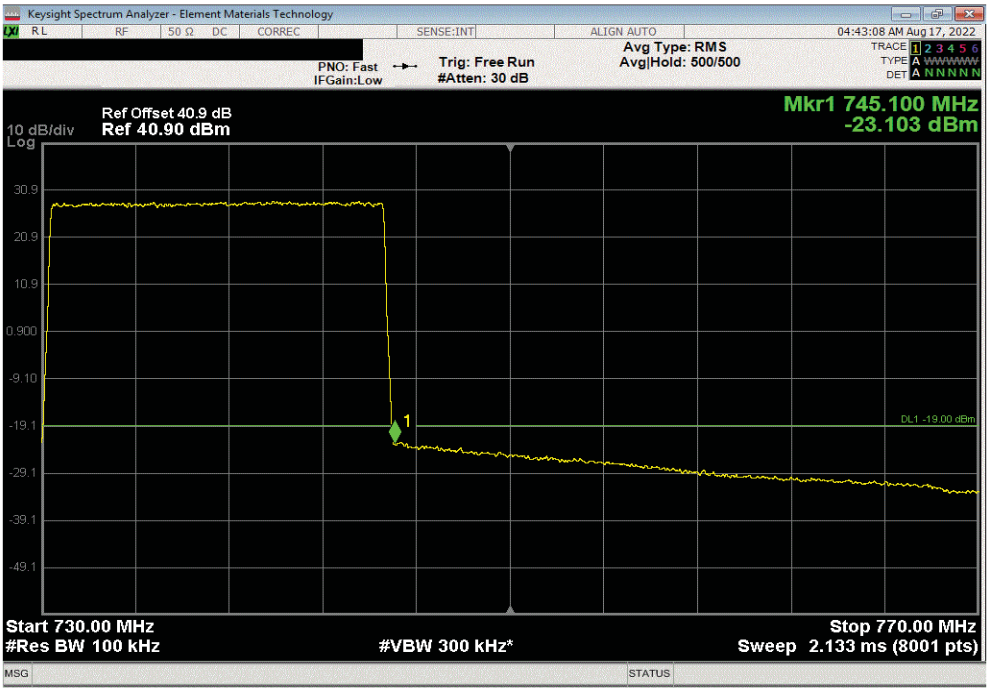


BAND EDGE COMPLIANCE - BAND n12

Port 1, 5G NR, Band n12, 729 - 745 Mhz, 15 MHz Bandwidth, 256QAM Modulation, High Channel, 737.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		745	-28.23	-19	Pass



Port 1, 5G NR, Band n12, 729 - 745 Mhz, 15 MHz Bandwidth, 256QAM Modulation, High Channel, 737.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		745.1	-23.1	-19	Pass



BAND EDGE COMPLIANCE - BAND n14

element

XMit 2022.02.07.0

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	SD3239	ANE	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

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.

For Band n14 band edge measurements from 769MHz-775MHz and 799MHz-805MHz, reference level offset corrections were applied to the spectrum analyzer, according to the following table:

Frequency	Sig Gen Output	Analyzer Reading	Cable Loss
769	0.0	-48.1	48.1
769.05	0.0	-47.7	47.7
769.1	0.0	-47.4	47.4
769.15	0.0	-47.1	47.1
769.2	0.0	-46.8	46.8
769.25	0.0	-46.6	46.6
769.3	0.0	-46.4	46.4
769.35	0.0	-46.2	46.2
769.4	0.0	-46.0	46.0
769.45	0.0	-45.8	45.8
769.5	0.0	-45.7	45.7
769.55	0.0	-45.5	45.5
769.6	0.0	-45.4	45.4
769.65	0.0	-45.3	45.3
769.7	0.0	-45.2	45.2
769.75	0.0	-45.1	45.1
769.8	0.0	-45.0	45.0
769.85	0.0	-44.9	44.9
769.9	0.0	-44.8	44.8
769.95	0.0	-44.7	44.7
770	0.0	-44.7	44.7
770.05	0.0	-44.6	44.6
771	0.0	-43.7	43.7
775	0.0	-43.2	43.2
798	0.0	-42.5	42.5
805	0.0	-42.2	42.2
806	0.0	-42.2	42.2

Per section 90.543(e)(3), 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 RRH may operate as a 4 port MIMO transmitter for Band n14.

FCC 90.543(e)(5) requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. FCC 90.543(e)(5) 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.

FCC 90.543(e)(1) requires an emission limit of -46dBm for any 6.25 kHz bandwidth between frequency bands 769-775 MHz and 799-805 MHz. The limit is adjusted to -52 dBm per 6.25kHz bandwidth [-46 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

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

BAND EDGE COMPLIANCE - BAND n14

element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLBA			Work Order:	NOKI0046
Serial Number:	K9180844519			Date:	19-Aug-22
Customer:	Nokia Solutions and Networks			Temperature:	20.8 °C
Attendees:	David Le			Humidity:	57% RH
Project:	None			Barometric Pres.:	1018 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
FCC 90R:2022	ANSI C63.26:2015

COMMENTS

All measurement path loses accounted for in the reference level offest including any attenuators, filters, and DC blocks. Carriers were enabled at maximum power.

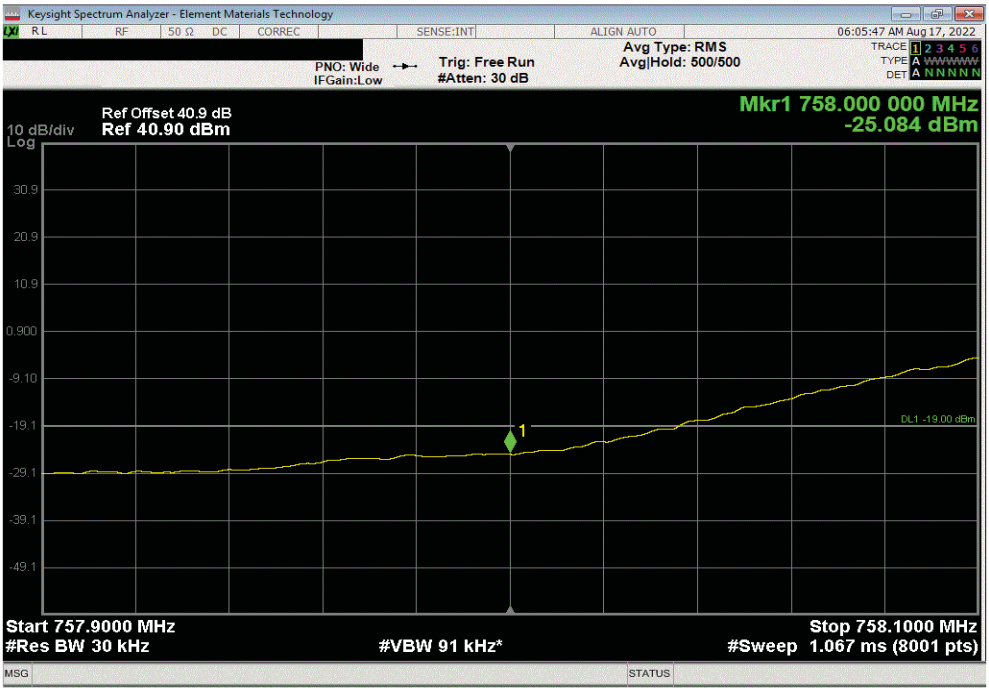
DEVIATIONS FROM TEST STANDARD

None

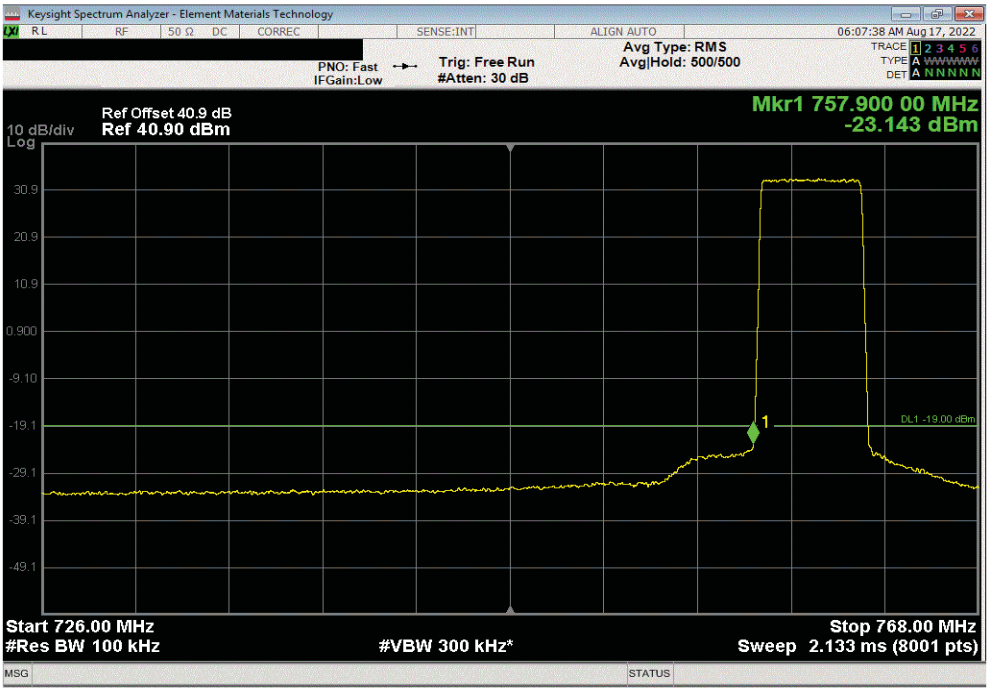
Configuration #	2, 4	Signature

		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
Port 1						
5G NR, Band n14, 758 - 768 Mhz						
5 MHz Bandwidth						
QPSK Modulation						
	Low Channel, 760.5 MHz	1	758	-25.08	-19	Pass
	Low Channel, 760.5 MHz	2	757.9	-23.14	-19	Pass
	High Channel, 765.5 MHz	1	768	-26.78	-19	Pass
	High Channel, 765.5 MHz	2	768.1	-26.7	-19	Pass
	High Channel, 765.5 MHz	3	769.18	-59.15	-52	Pass
	High Channel, 765.5 MHz	4	799.81	-72.86	-52	Pass
16QAM Modulation						
	Low Channel, 760.5 MHz	1	758	-25.09	-19	Pass
	Low Channel, 760.5 MHz	2	757.9	-23.07	-19	Pass
	High Channel, 765.5 MHz	1	768	-26.62	-19	Pass
	High Channel, 765.5 MHz	2	768.1	-26.5	-19	Pass
	High Channel, 765.5 MHz	3	769.13	-59.65	-52	Pass
	High Channel, 765.5 MHz	4	799.54	-72.92	-52	Pass
64QAM Modulation						
	Low Channel, 760.5 MHz	1	758	-24.54	-19	Pass
	Low Channel, 760.5 MHz	2	757.9	-23.17	-19	Pass
	High Channel, 765.5 MHz	1	768	-27.06	-19	Pass
	High Channel, 765.5 MHz	2	768.1	-26.35	-19	Pass
	High Channel, 765.5 MHz	3	769.12	-59.36	-52	Pass
	High Channel, 765.5 MHz	4	800.79	-72.96	-52	Pass
256QAM Modulation						
	Low Channel, 760.5 MHz	1	758	-24.66	-19	Pass
	Low Channel, 760.5 MHz	2	757.9	-23.09	-19	Pass
	High Channel, 765.5 MHz	1	768	-27.06	-19	Pass
	High Channel, 765.5 MHz	2	768.1	-26.83	-19	Pass
	High Channel, 765.5 MHz	3	769.17	-58.96	-52	Pass
	High Channel, 765.5 MHz	4	799.05	-72.94	-52	Pass
10 MHz Bandwidth						
256QAM Modulation						
	Low Channel, 763.0 MHz	1	758	-29.03	-19	Pass
	Low Channel, 763.0 MHz	2	757.9	-24.15	-19	Pass
	High Channel, 763.0 MHz	1	768	-32.06	-19	Pass
	High Channel, 763.0 MHz	2	768.1	-29.43	-19	Pass
	High Channel, 763.0 MHz	3	769.2	-59.79	-52	Pass
	High Channel, 763.0 MHz	4	800.4	-72.88	-52	Pass

Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 760.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		758	-25.08	-19	Pass

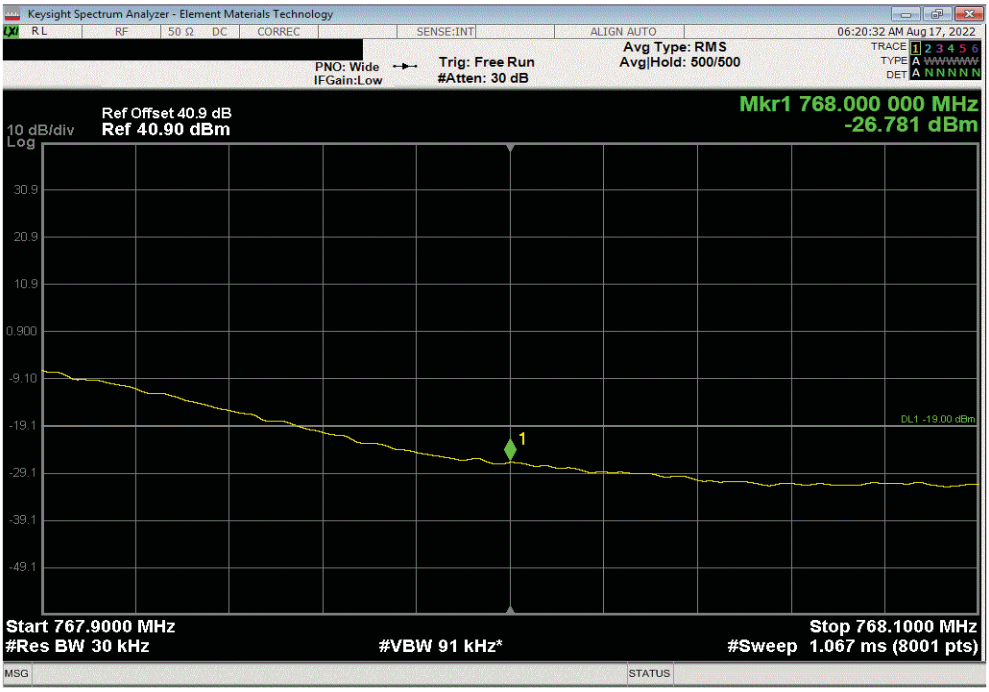


Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 760.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		757.9	-23.14	-19	Pass



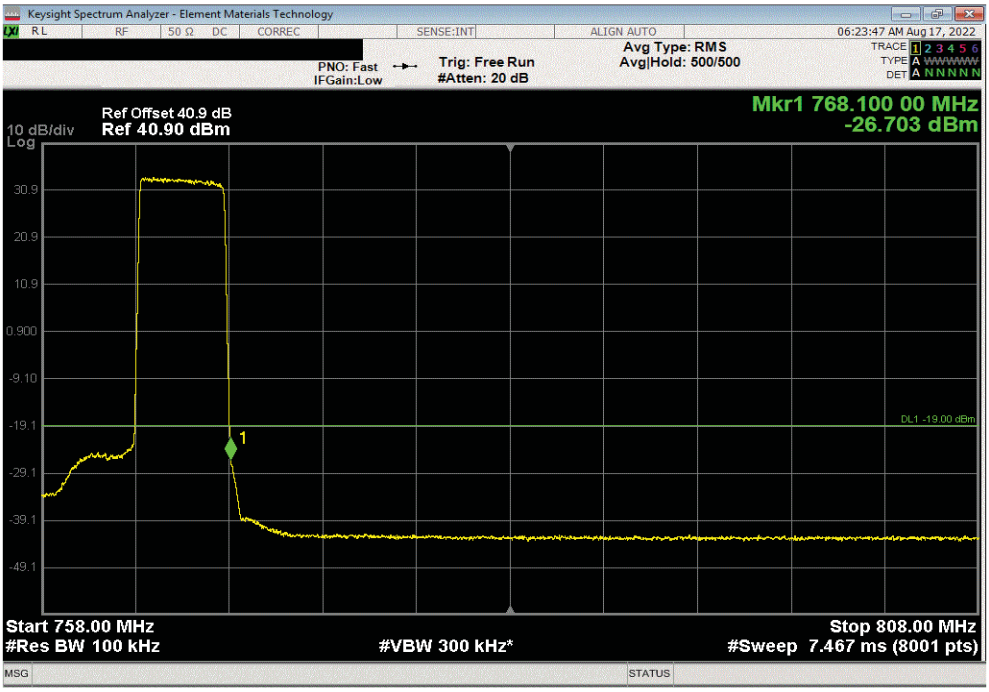
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		768	-26.78	-19	Pass



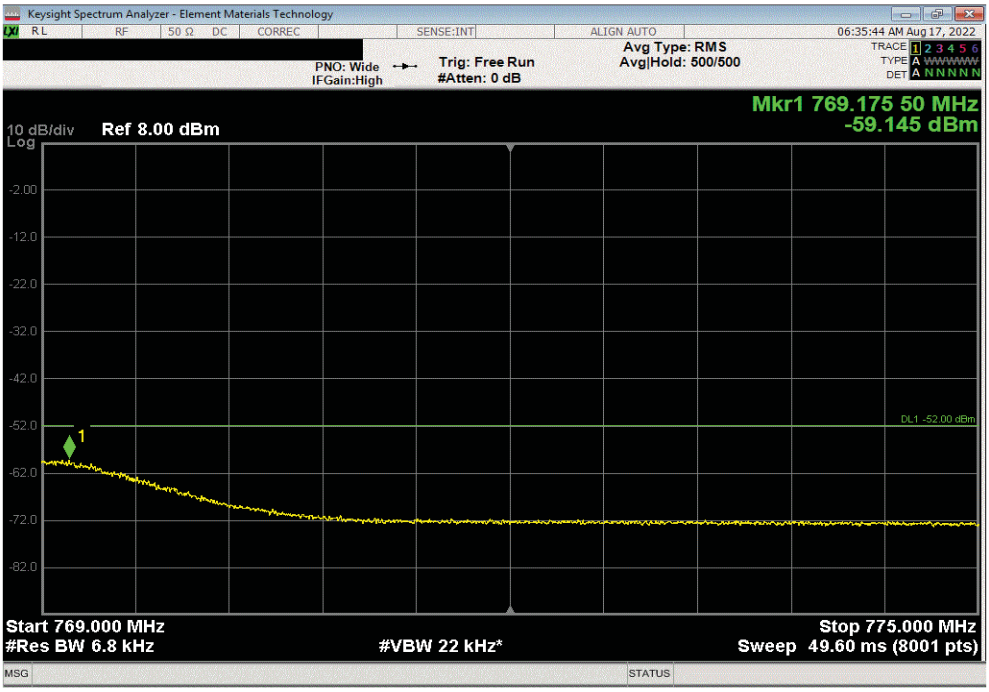
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		768.1	-26.7	-19	Pass



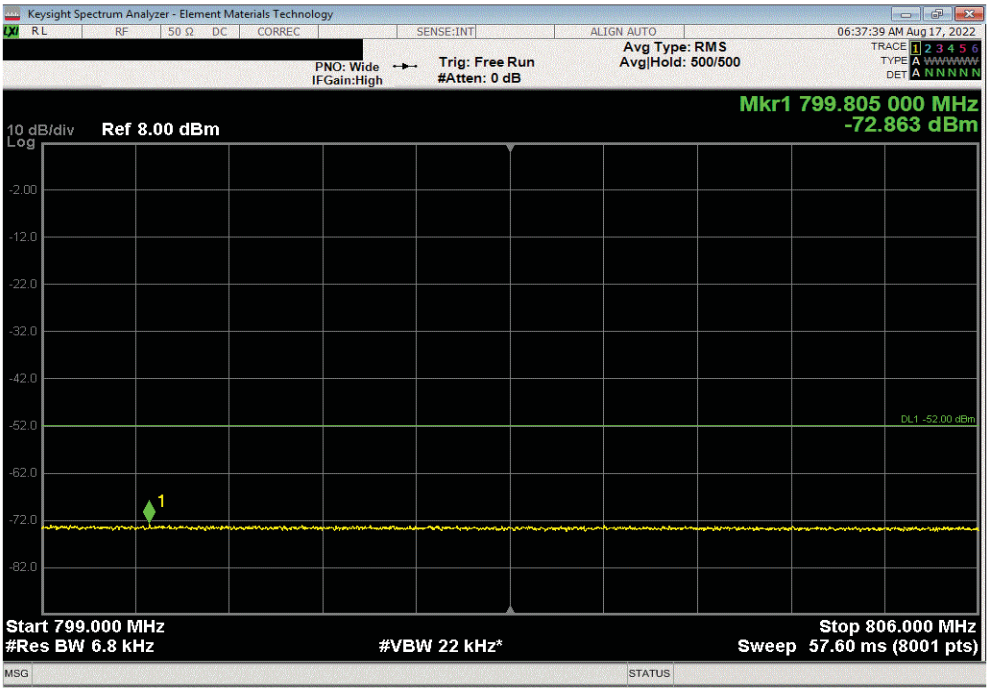
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	3		769.18	-59.15	-52	Pass



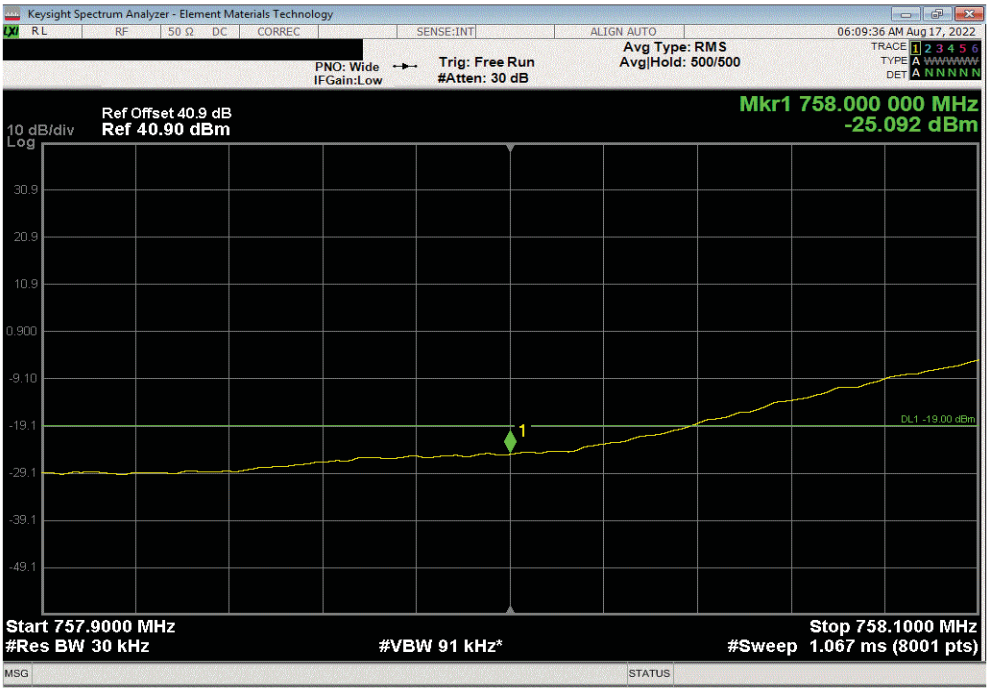
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, QPSK Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	4		799.81	-72.86	-52	Pass

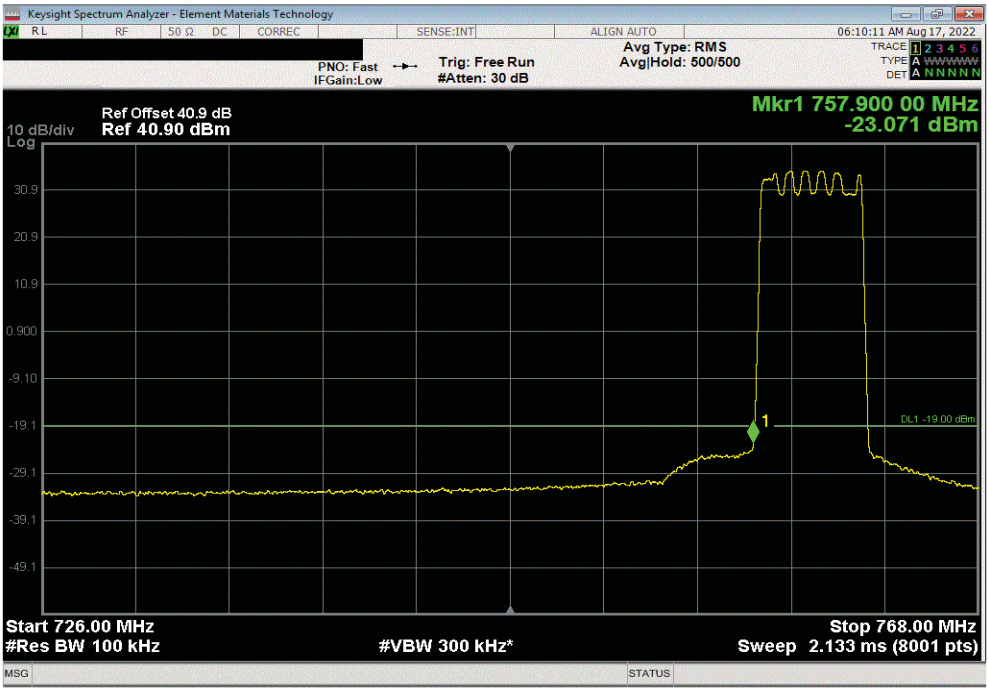


BAND EDGE COMPLIANCE - BAND n14

Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 16QAM Modulation, Low Channel, 760.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		758	-25.09	-19	Pass

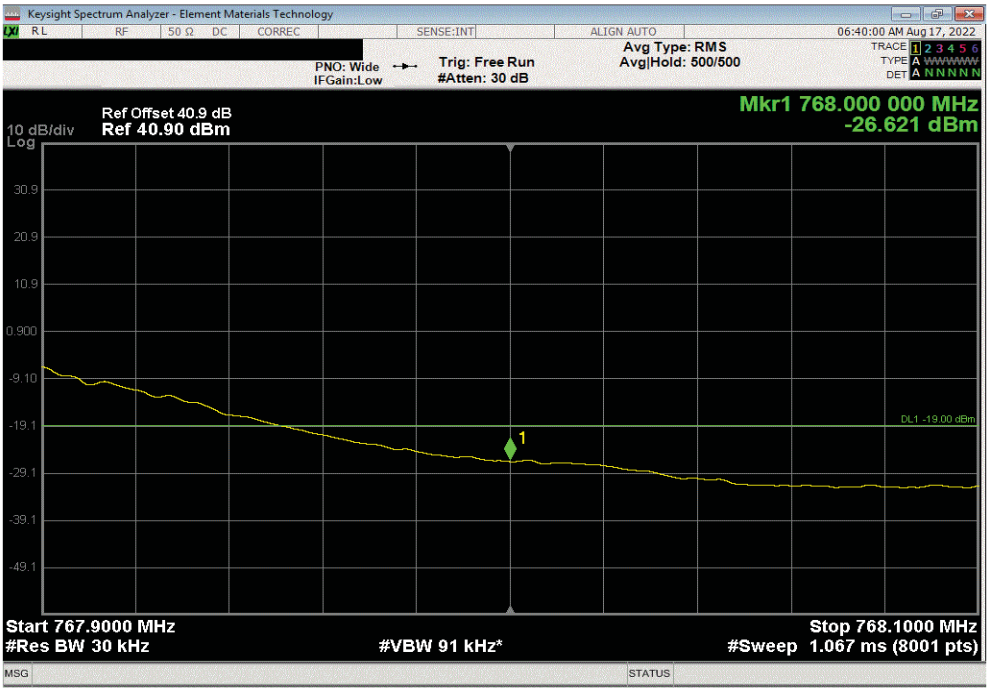


Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 16QAM Modulation, Low Channel, 760.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		757.9	-23.07	-19	Pass



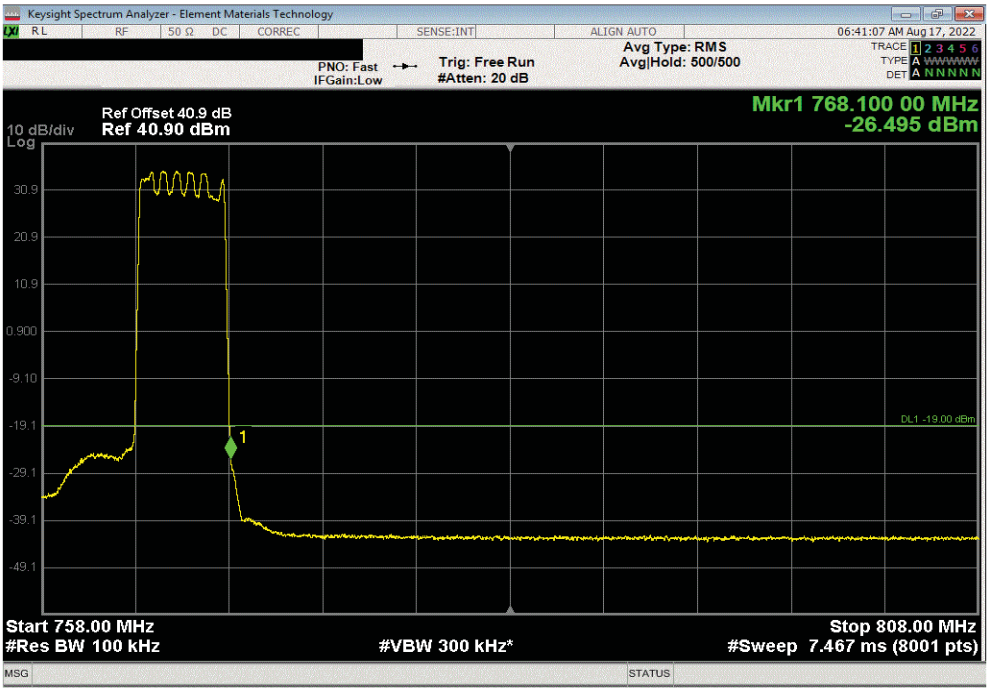
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 16QAM Modulation, High Channel, 765.5 MHz

Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
1		768	-26.62	-19	Pass



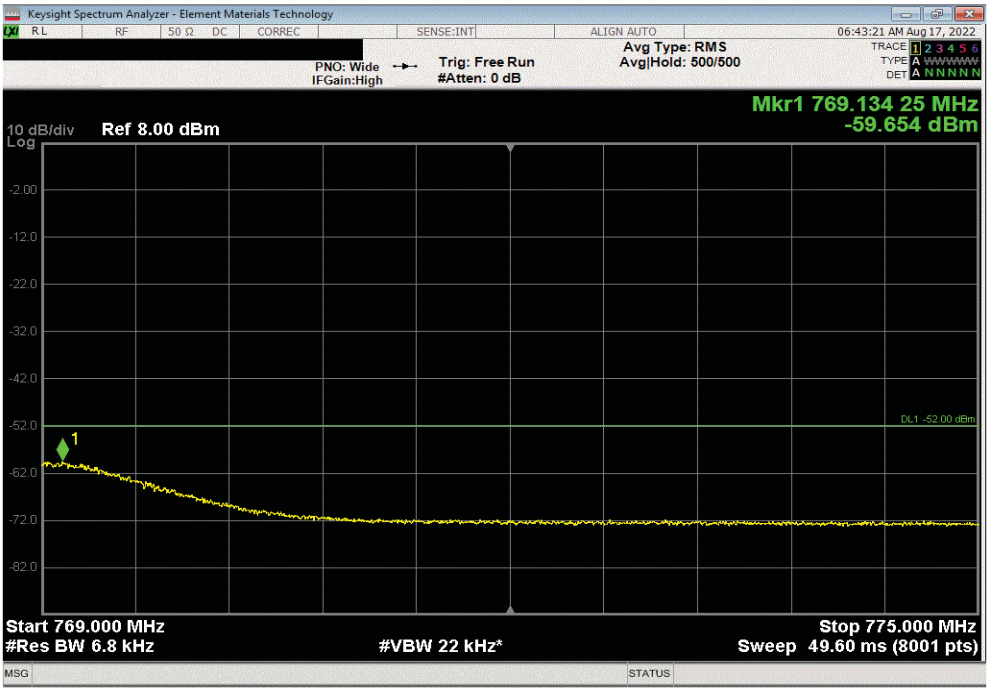
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 16QAM Modulation, High Channel, 765.5 MHz

Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
2		768.1	-26.5	-19	Pass



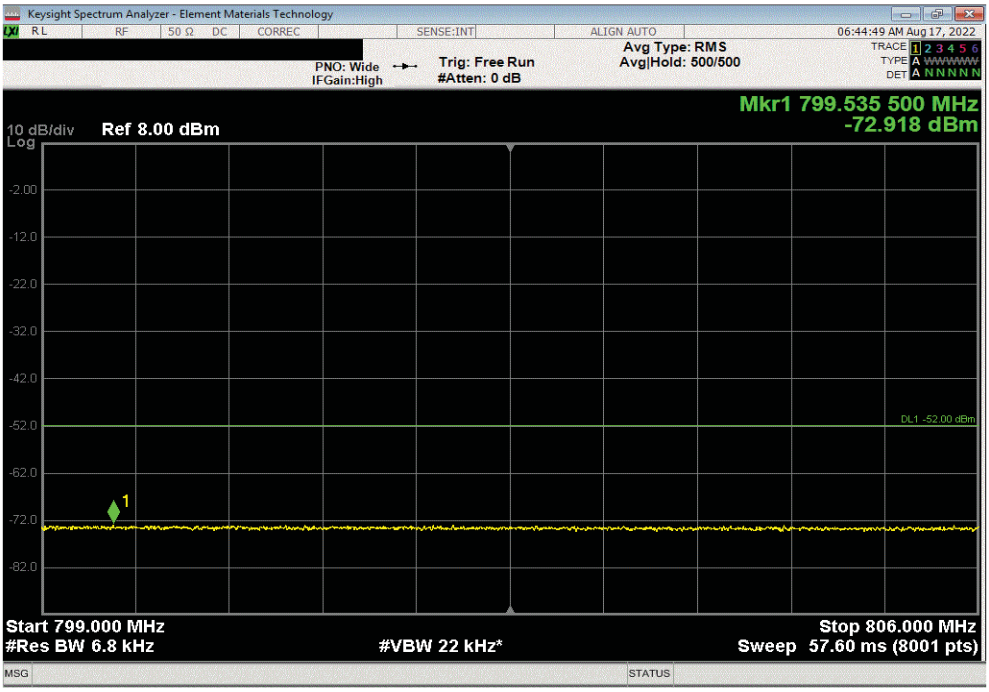
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 16QAM Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	3		769.13	-59.65	-52	Pass



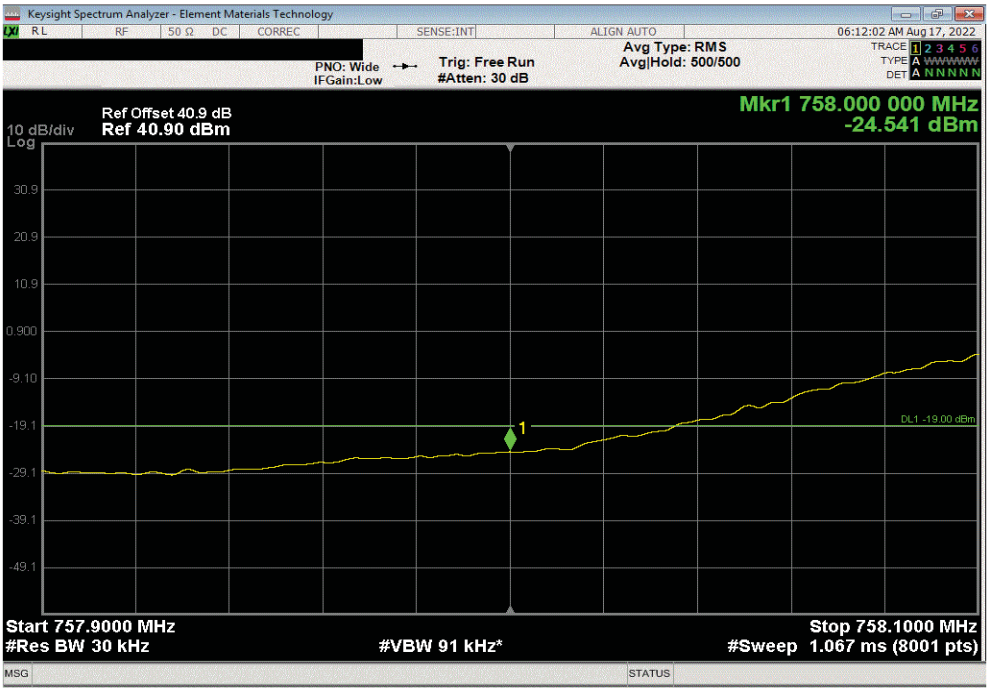
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 16QAM Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	4		799.54	-72.92	-52	Pass

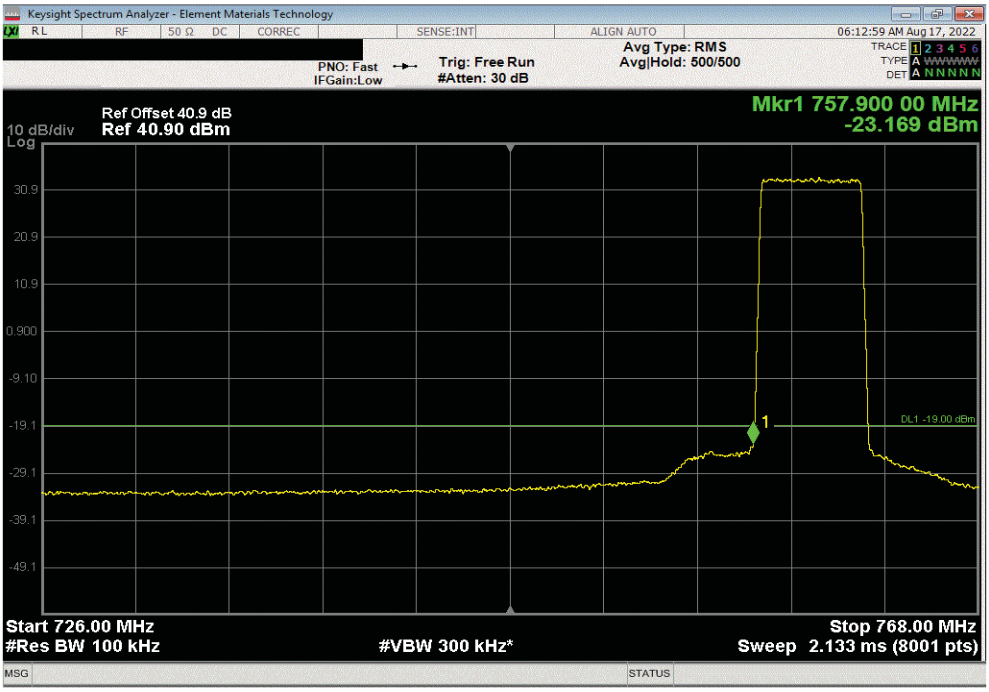


BAND EDGE COMPLIANCE - BAND n14

Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 64QAM Modulation, Low Channel, 760.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		758	-24.54	-19	Pass



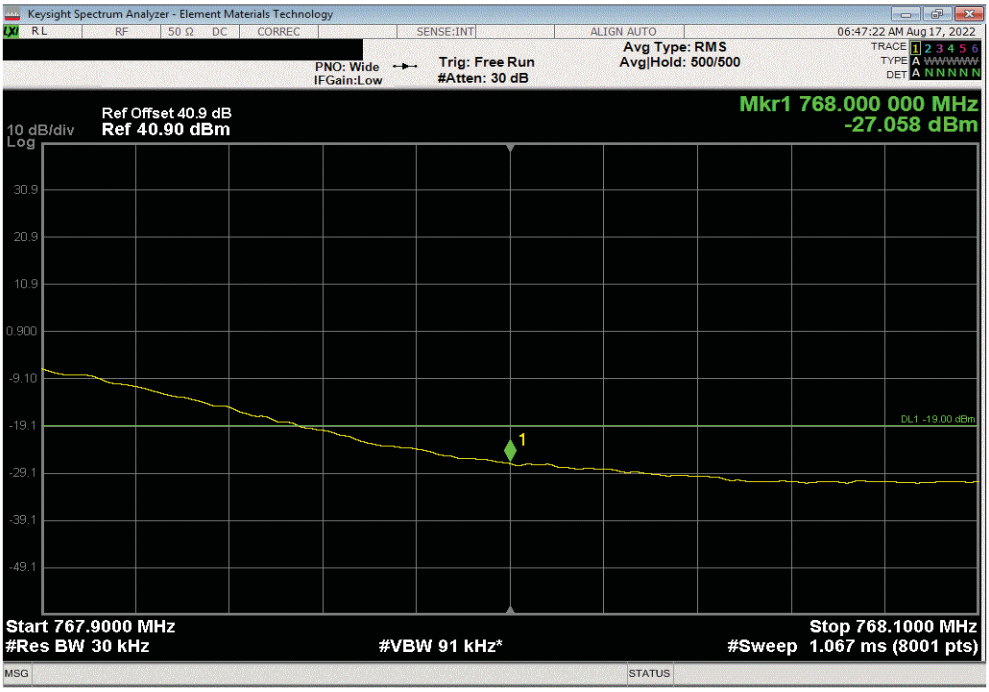
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 64QAM Modulation, Low Channel, 760.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		757.9	-23.17	-19	Pass



BAND EDGE COMPLIANCE - BAND n14

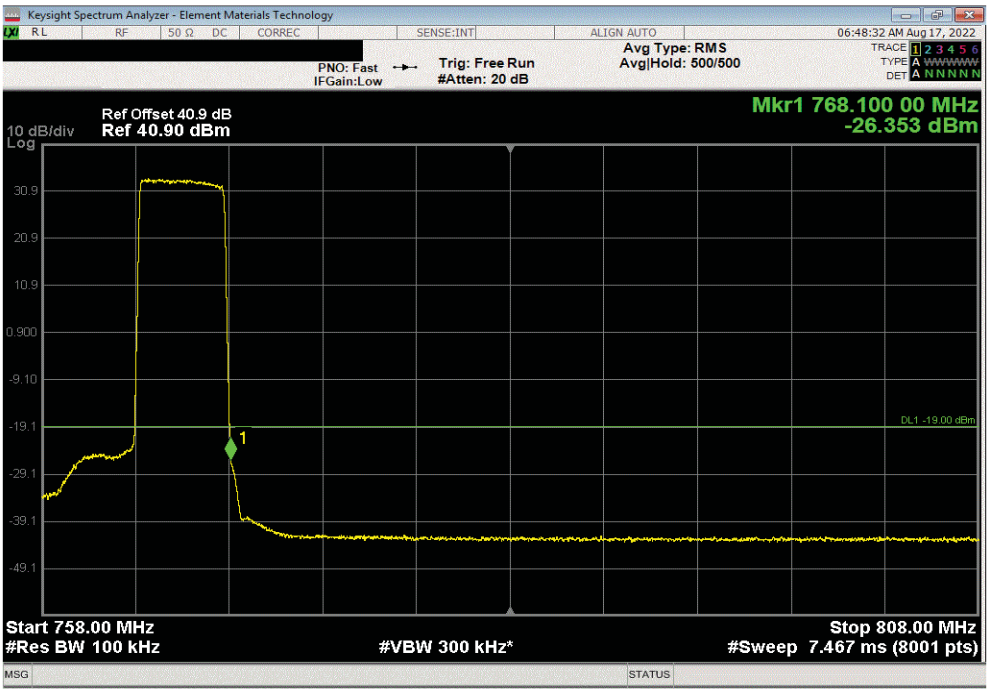
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 64QAM Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		768	-27.06	-19	Pass



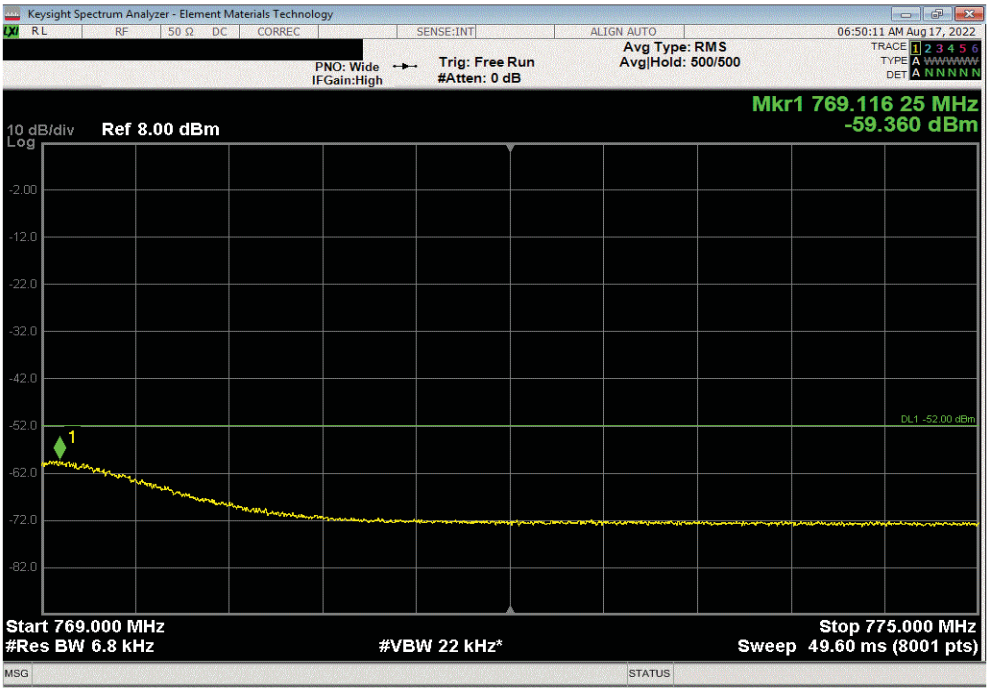
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 64QAM Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		768.1	-26.35	-19	Pass

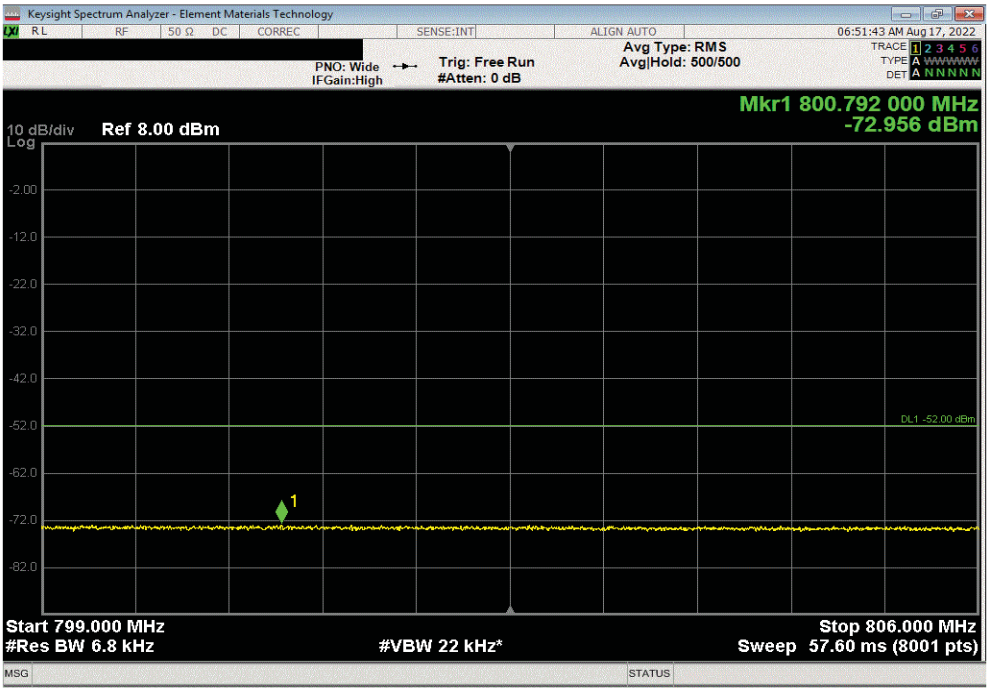


BAND EDGE COMPLIANCE - BAND n14

Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 64QAM Modulation, High Channel, 765.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	3		769.12	-59.36	-52	Pass



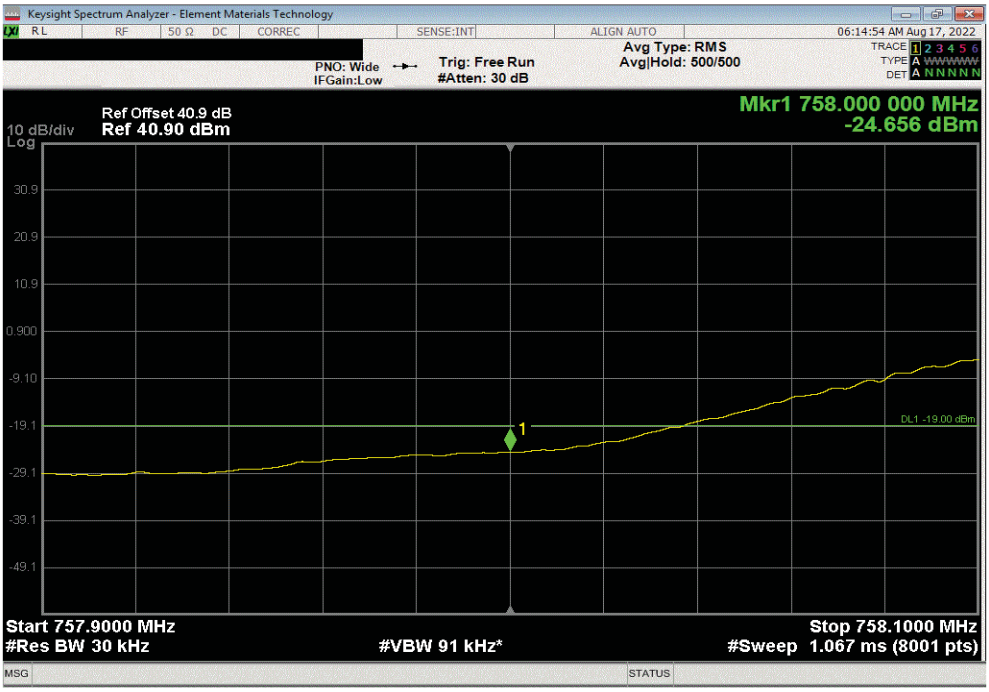
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 64QAM Modulation, High Channel, 765.5 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	4		800.79	-72.96	-52	Pass



BAND EDGE COMPLIANCE - BAND n14

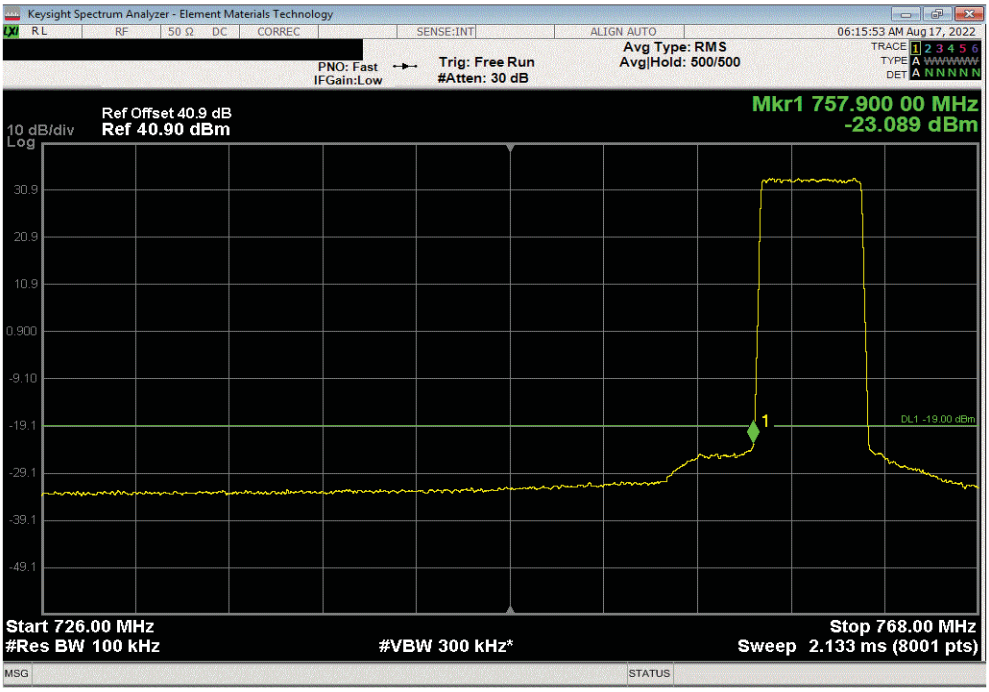
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 760.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		758	-24.66	-19	Pass



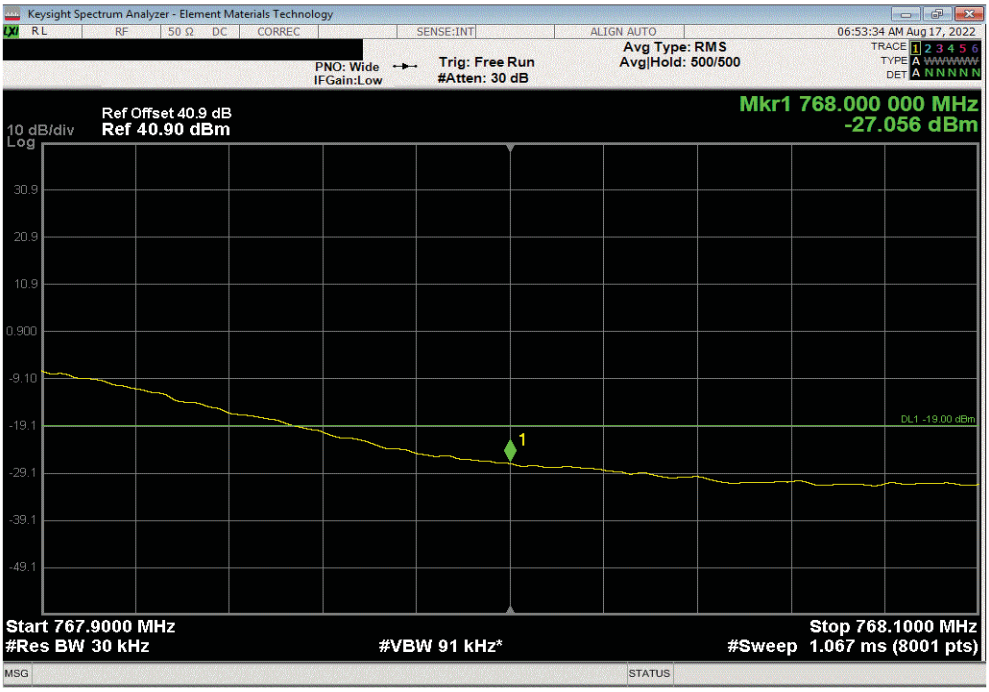
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 256QAM Modulation, Low Channel, 760.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		757.9	-23.09	-19	Pass



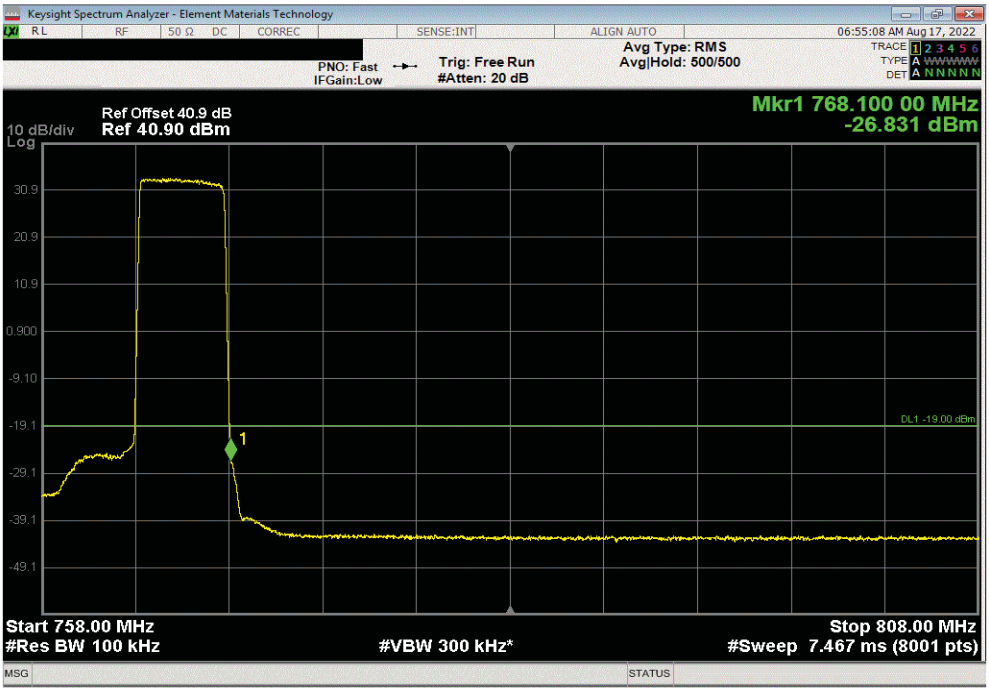
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 765.5 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		768	-27.06	-19	Pass



Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 765.5 MHz

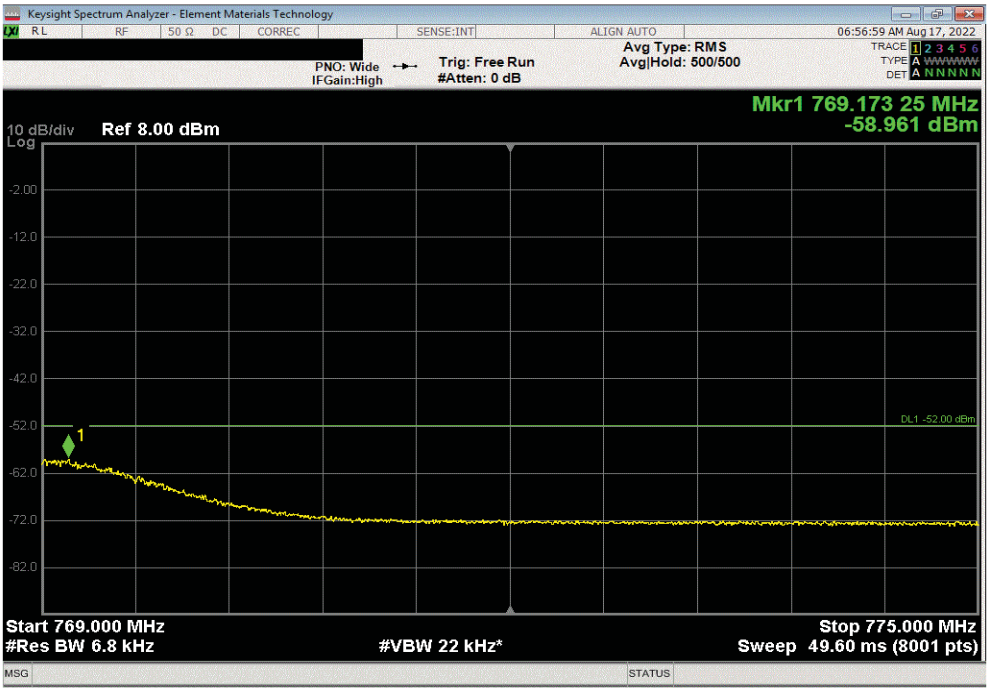
Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		768.1	-26.83	-19	Pass



BAND EDGE COMPLIANCE - BAND n14

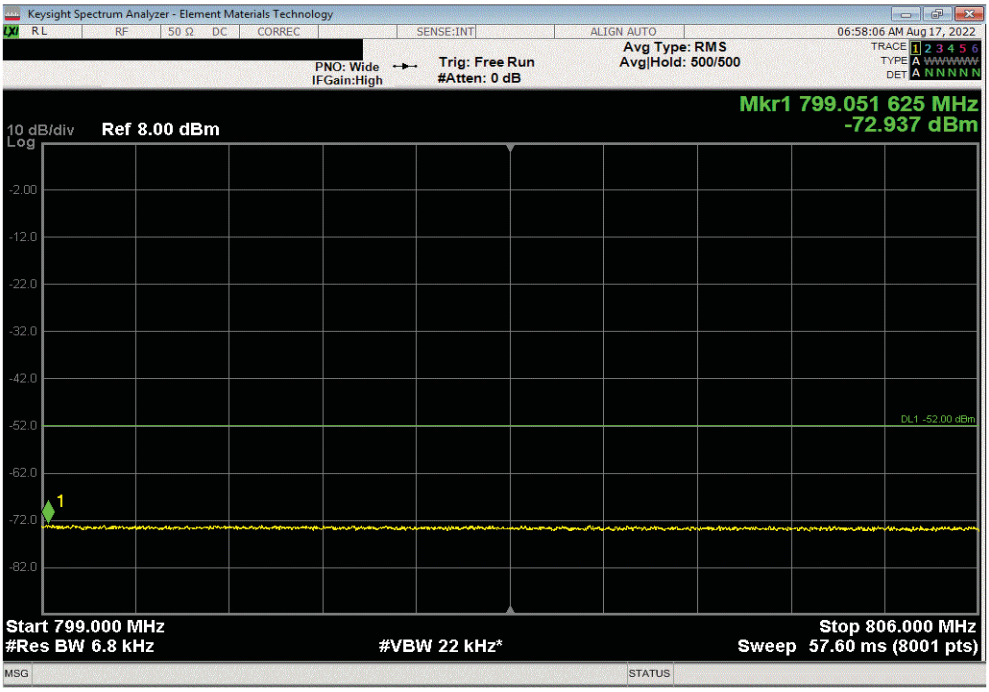
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 765.5 MHz

Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
3		769.17	-58.96	-52	Pass



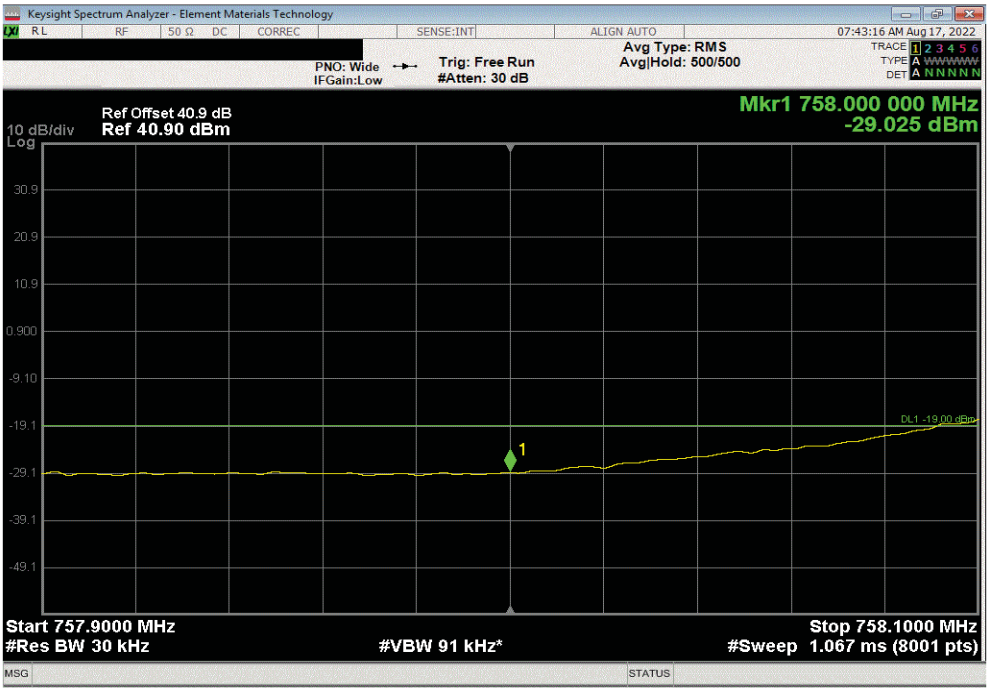
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 5 MHz Bandwidth, 256QAM Modulation, High Channel, 765.5 MHz

Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
4		799.05	-72.94	-52	Pass

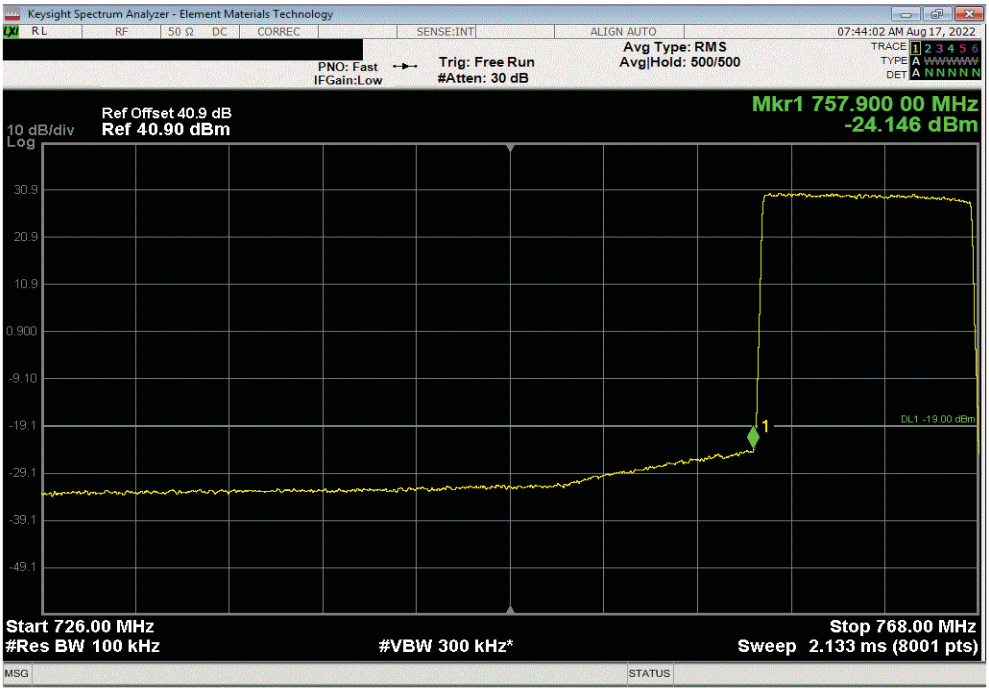


BAND EDGE COMPLIANCE - BAND n14

Port 1, 5G NR, Band n14, 758 - 768 Mhz, 10 MHz Bandwidth, 256QAM Modulation, Low Channel, 763.0 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		758	-29.03	-19	Pass

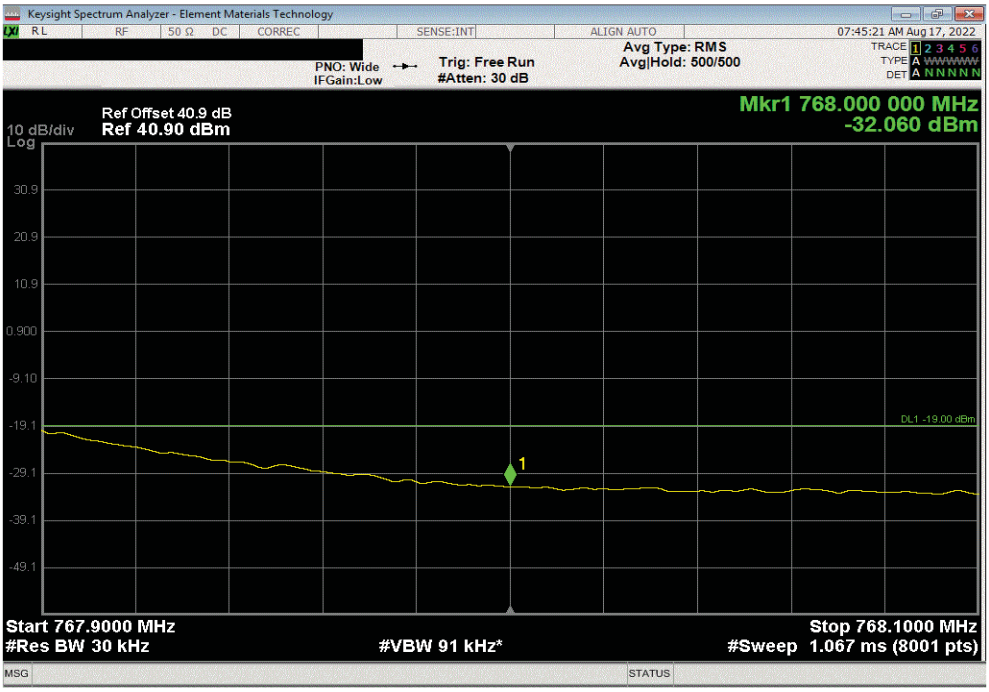


Port 1, 5G NR, Band n4, 758 - 768 Mhz, 10 MHz Bandwidth, 256QAM Modulation, Low Channel, 763.0 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		757.9	-24.15	-19	Pass

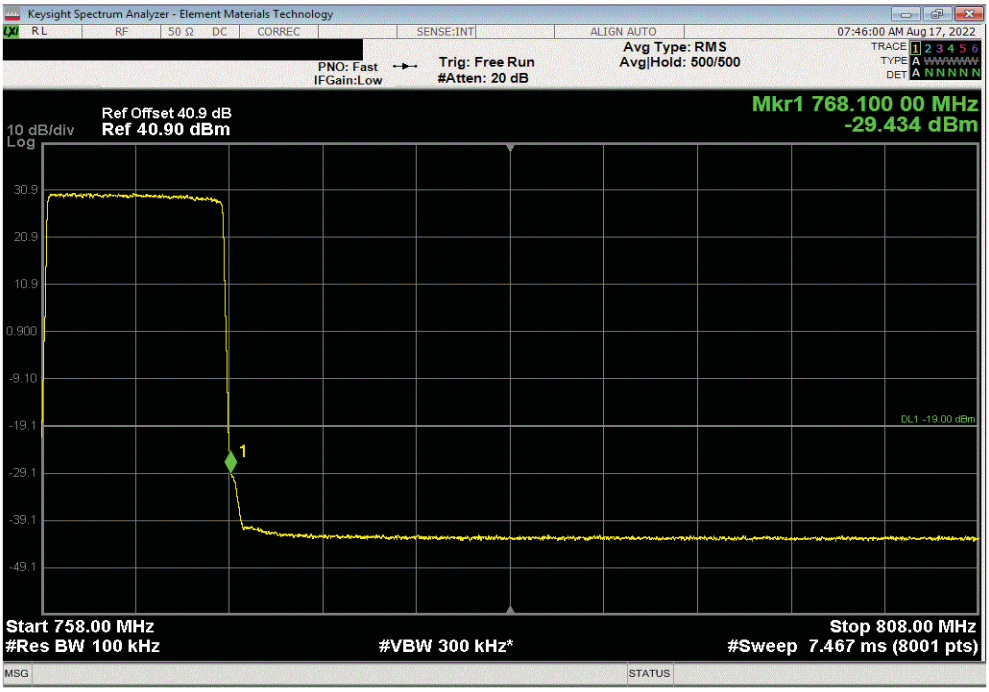


BAND EDGE COMPLIANCE - BAND n14

Port 1, 5G NR, Band n14, 758 - 768 Mhz, 10 MHz Bandwidth, 256QAM Modulation, High Channel, 763.0 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	1		768	-32.06	-19	Pass

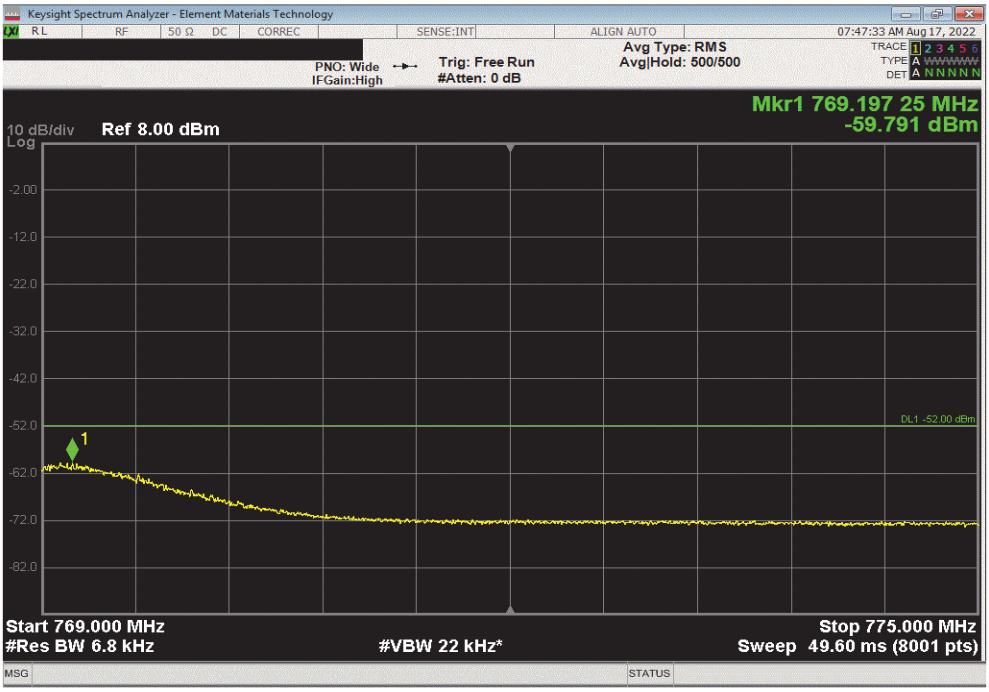


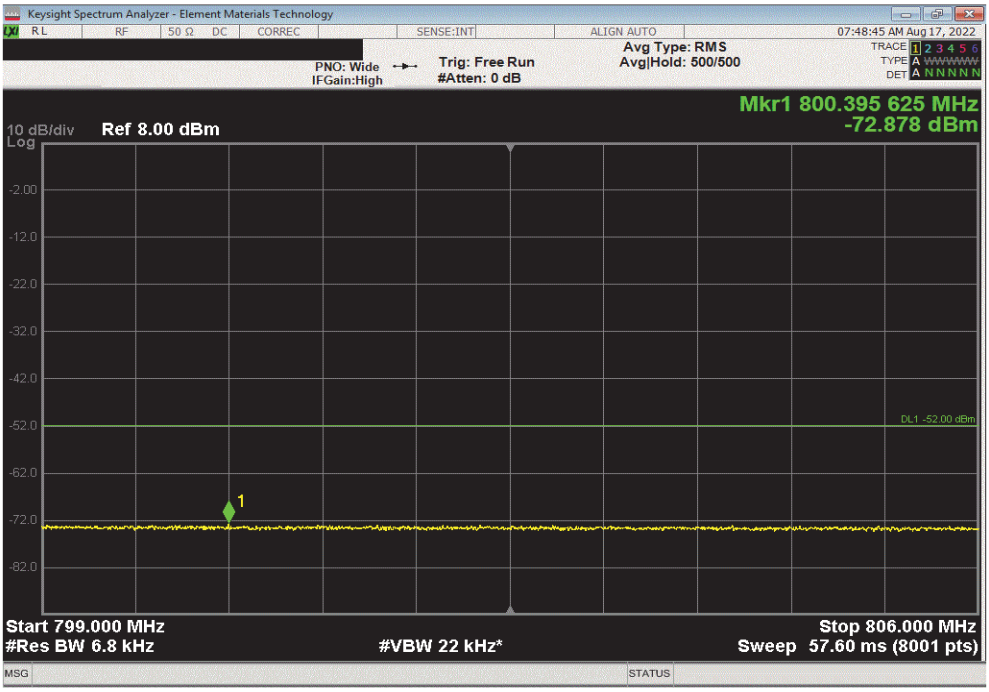
Port 1, 5G NR, Band n14, 758 - 768 Mhz, 10 MHz Bandwidth, 256QAM Modulation, High Channel, 763.0 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	2		768.1	-29.43	-19	Pass



Port 1, 5G NR, Band n14, 758 - 768 Mhz, 10 MHz Bandwidth, 256QAM Modulation, High Channel, 763.0 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	3		769.2	-59.79	-52	Pass



Port 1, 5G NR, Band n14, 758 - 768 Mhz, 10 MHz Bandwidth, 256QAM Modulation, High Channel, 763.0 MHz

Frequency Range			Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
	4		800.4	-72.88	-52	Pass