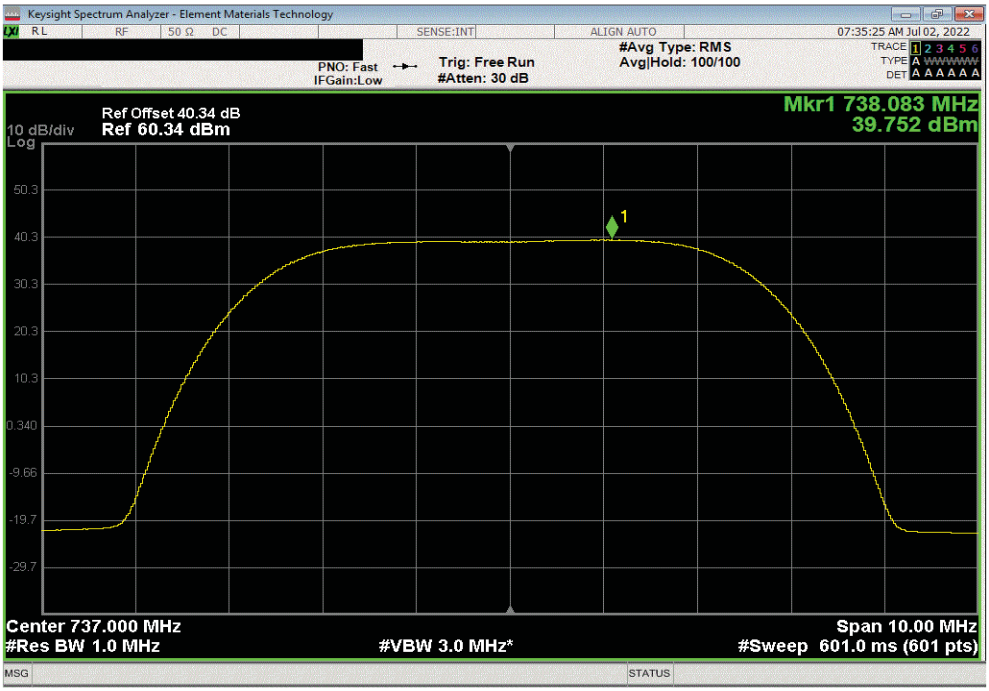
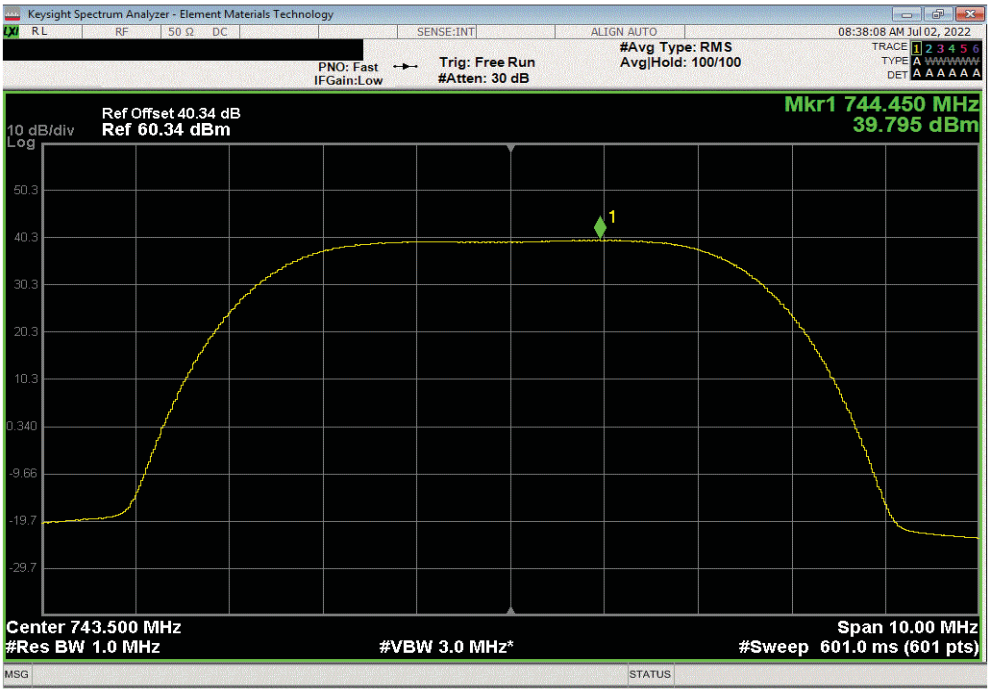
POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 85 LTE

Port 2, LTE, Band 85,, 728 MHz - 746 MHz, 5 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	o Port (2x2 MIMO dBm/MHz==PSD	ur Port (4x4 MIMO) dBm/MHz==PSD
		39.752	0	39.8	42.8	45.8

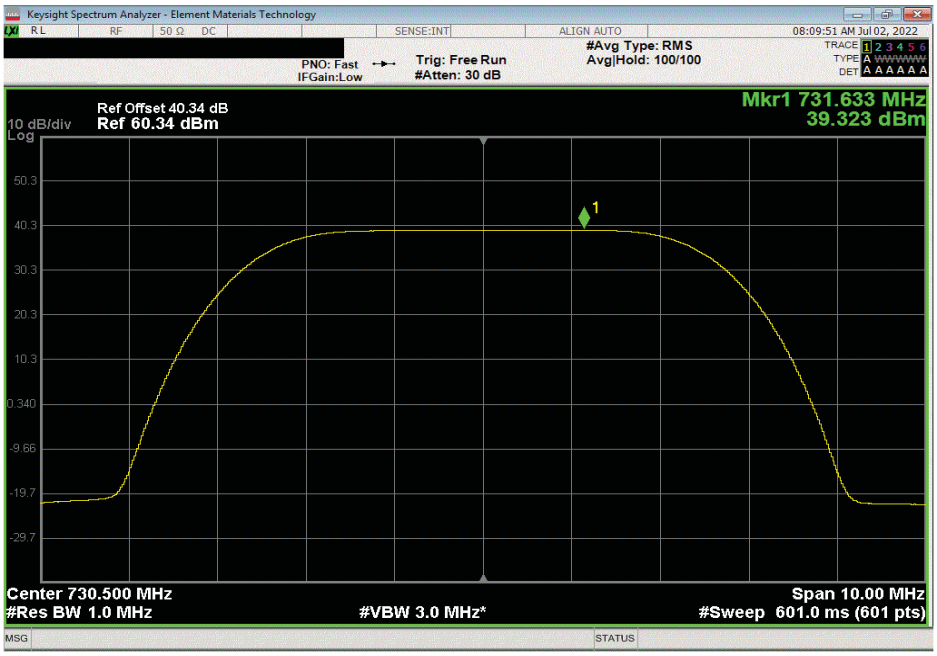


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 16-QAM Modulation, High Ch. 743.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	o Port (2x2 MIMO dBm/MHz==PSD	ur Port (4x4 MIMO) dBm/MHz==PSD
		39.795	0	39.8	42.8	45.8

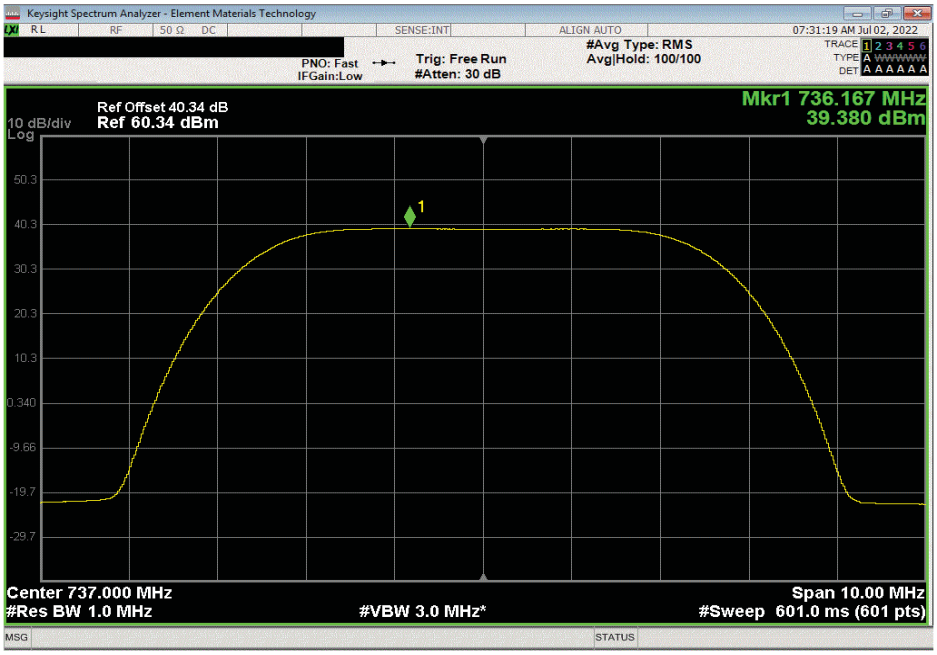


POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 85 LTE

Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 64-QAM Modulation, Low Ch. 730.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		39.323	0	39.3	42.3	45.3

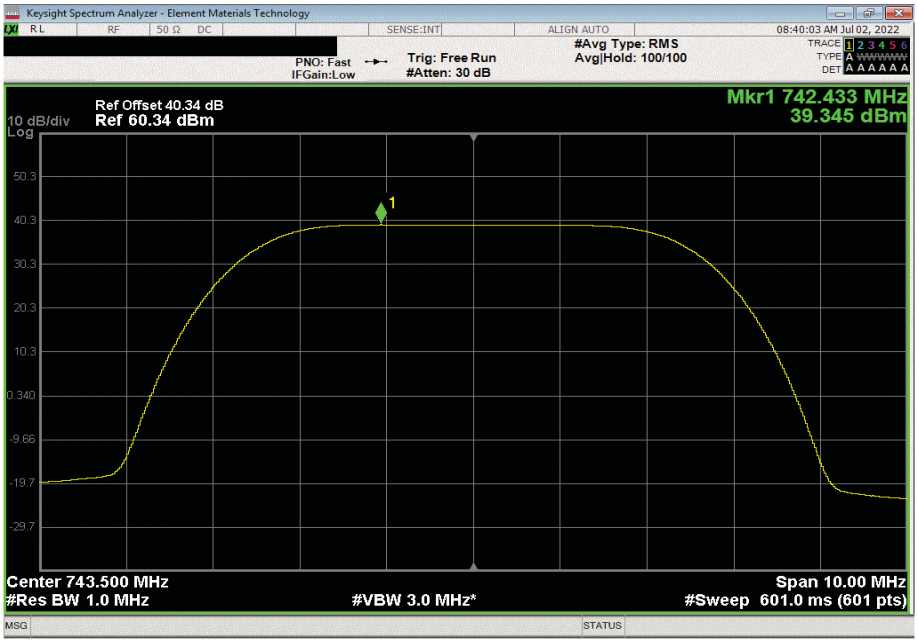


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		39.38	0	39.4	42.4	45.4

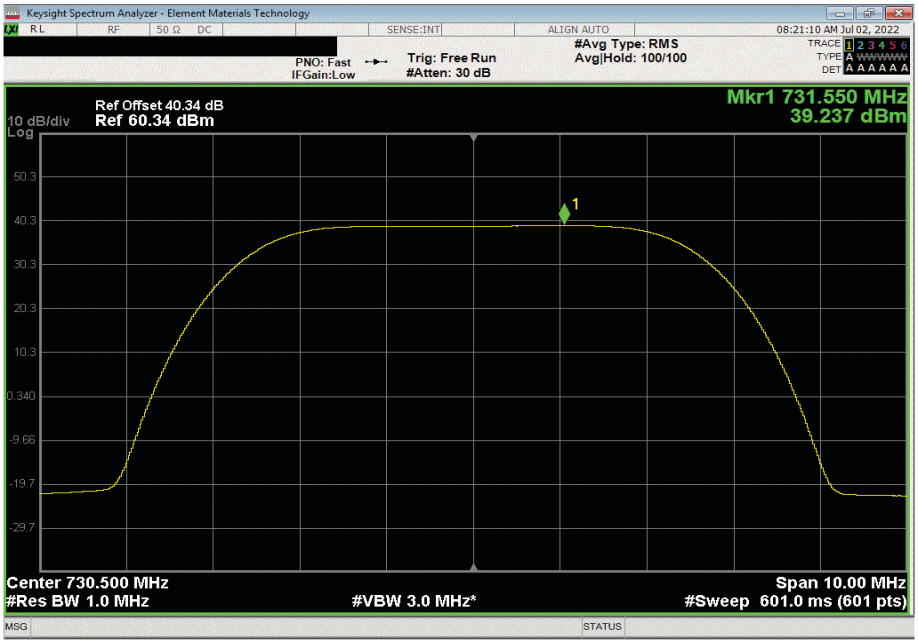


POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 85 LTE

Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 64-QAM Modulation, High Ch. 743.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		39.345	0	39.3	42.3	45.3



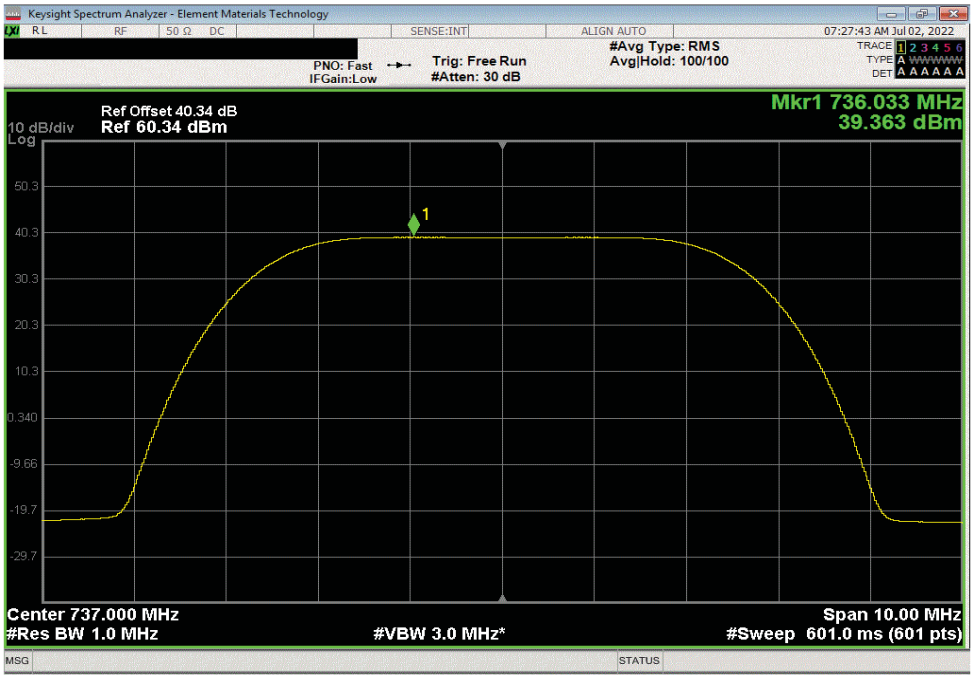
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 730.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		39.237	0	39.2	42.2	45.2



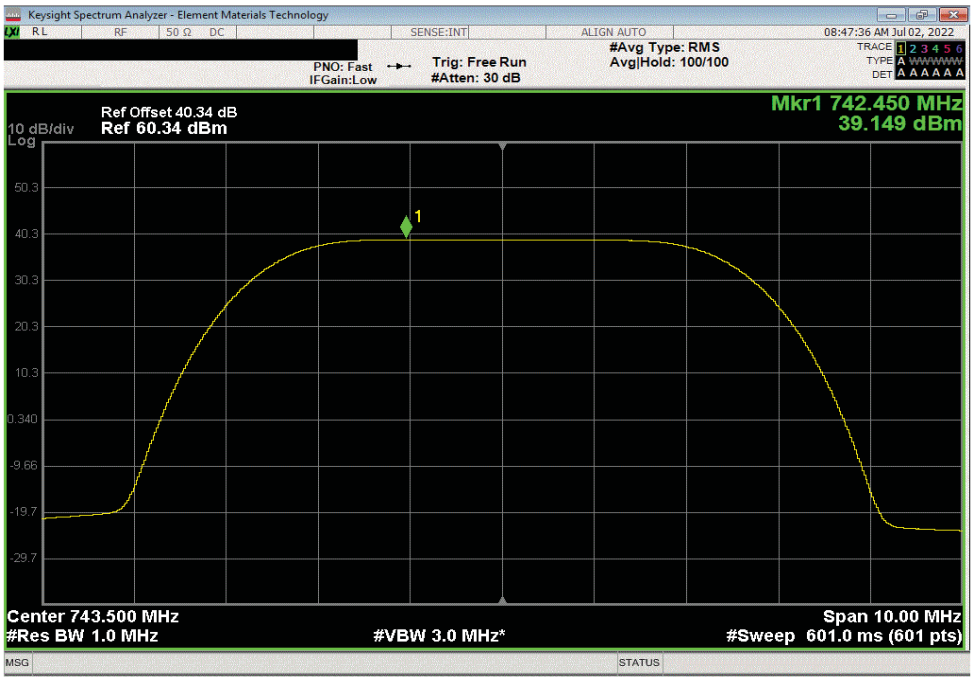
POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 85 LTE

TbtTx 2022.05.02.0 XMit 2022.02.07.0

Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		39.363	0	39.4	42.4	45.4

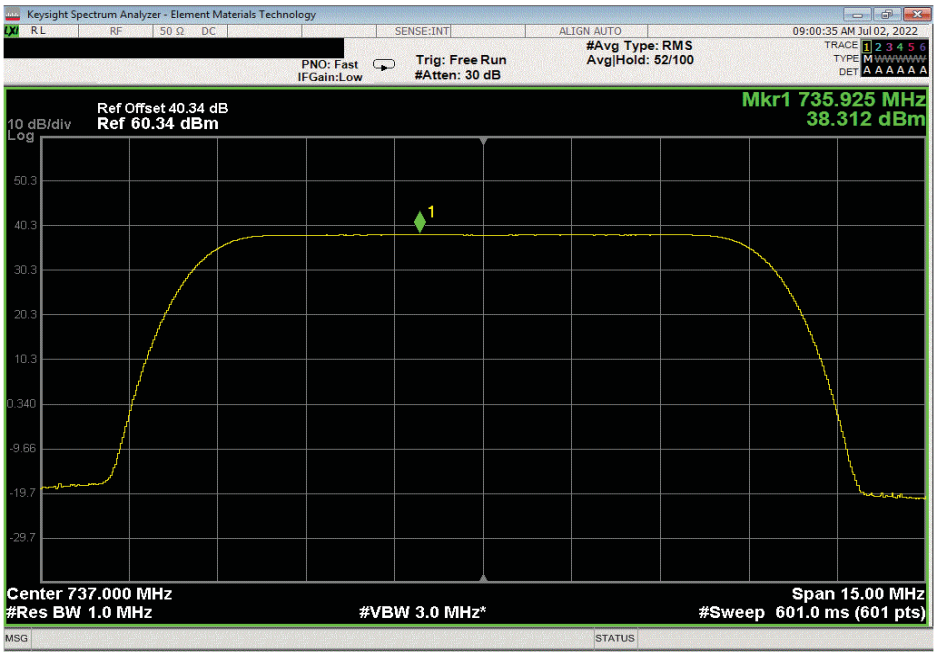


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 743.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		39.149	0	39.1	42.1	45.1

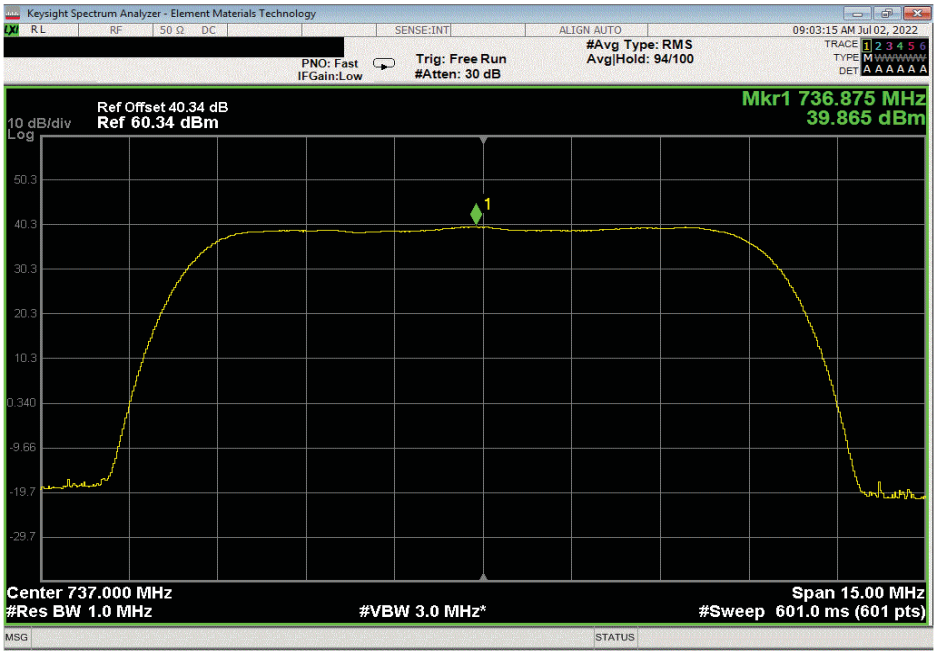


POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 85 LTE

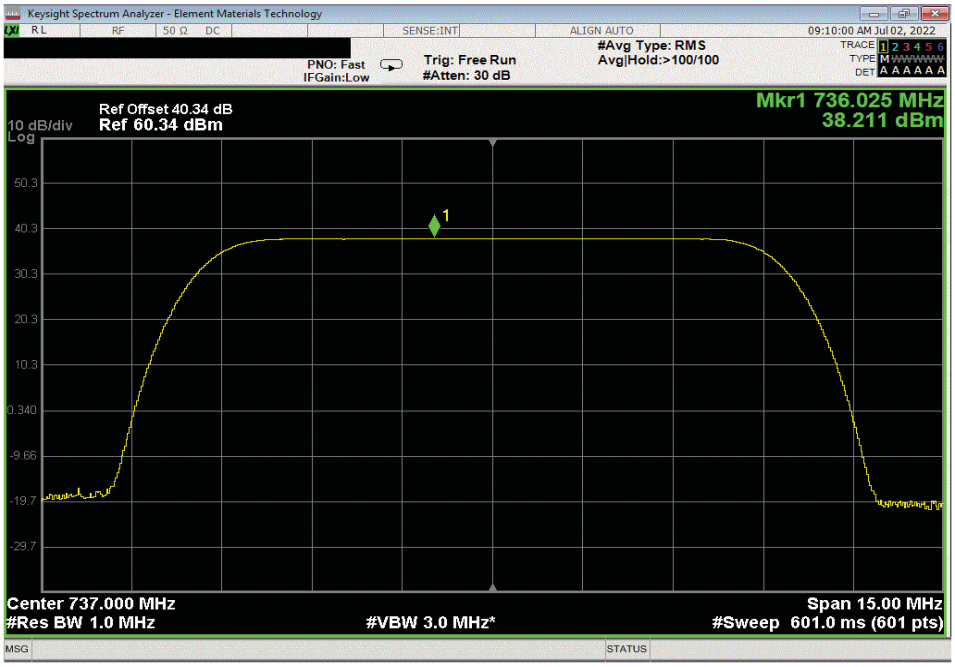
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10 MHz Bandwidth, QPSK Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		38.312	0	38.3	41.3	44.3



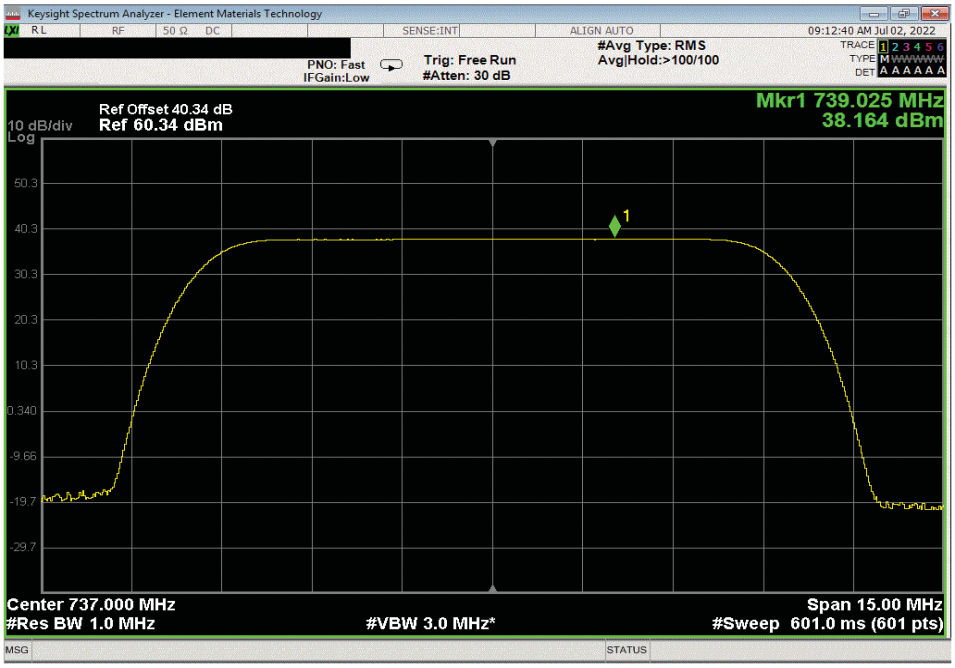
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		39.865	0	39.9	42.9	45.9



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		38.211	0	38.2	41.2	44.2

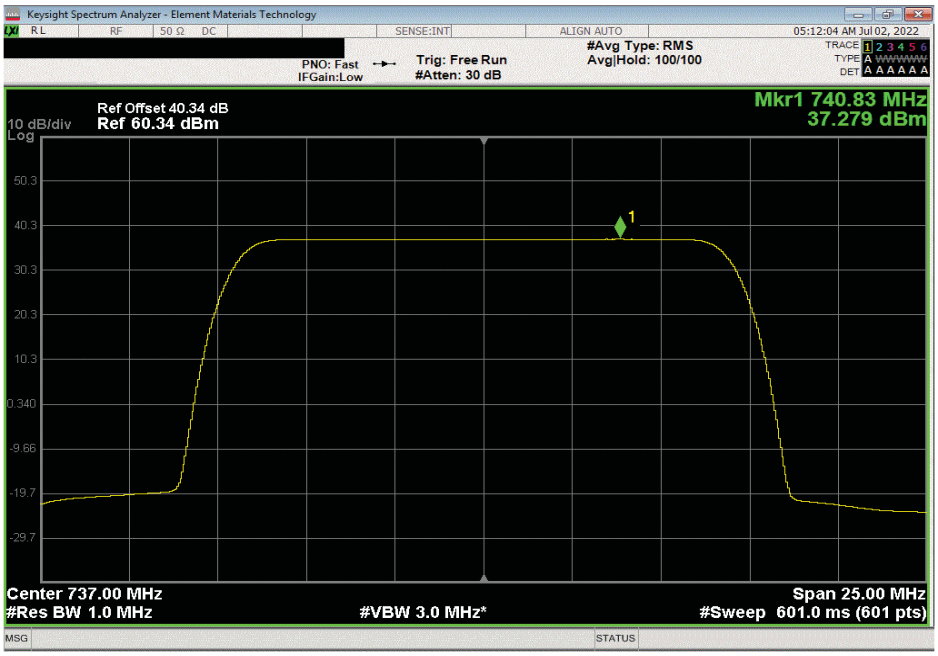


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		38.164	0	38.2	41.2	44.2

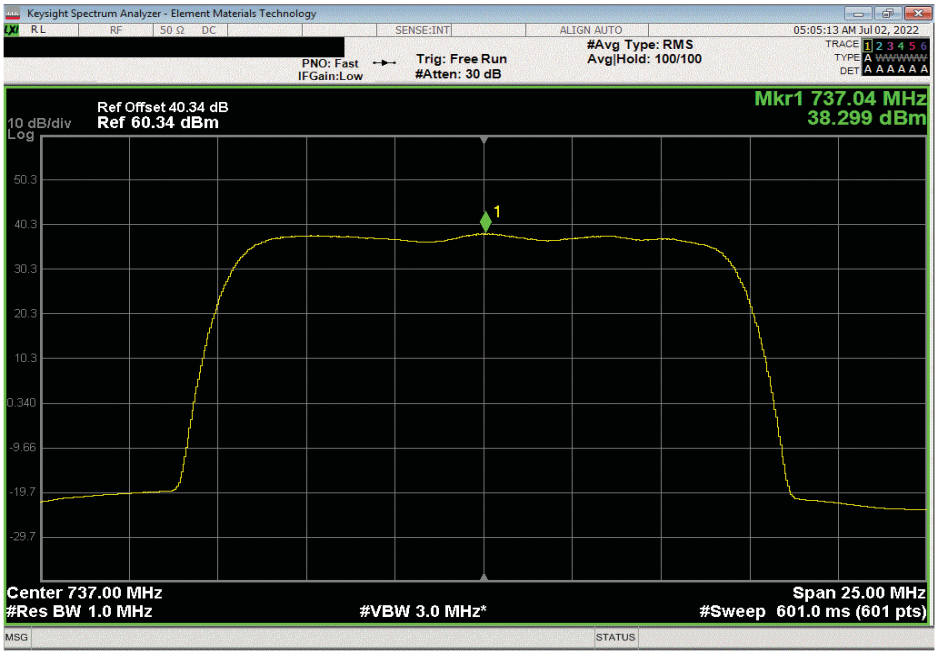


POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 85 LTE

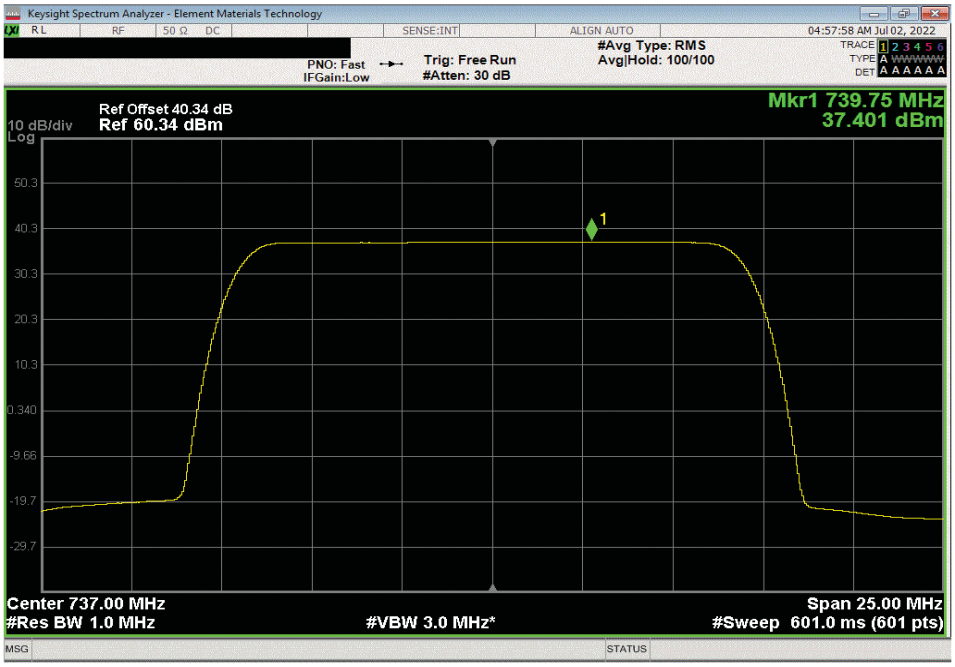
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, QPSK Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		37.279	0	37.3	40.3	43.3



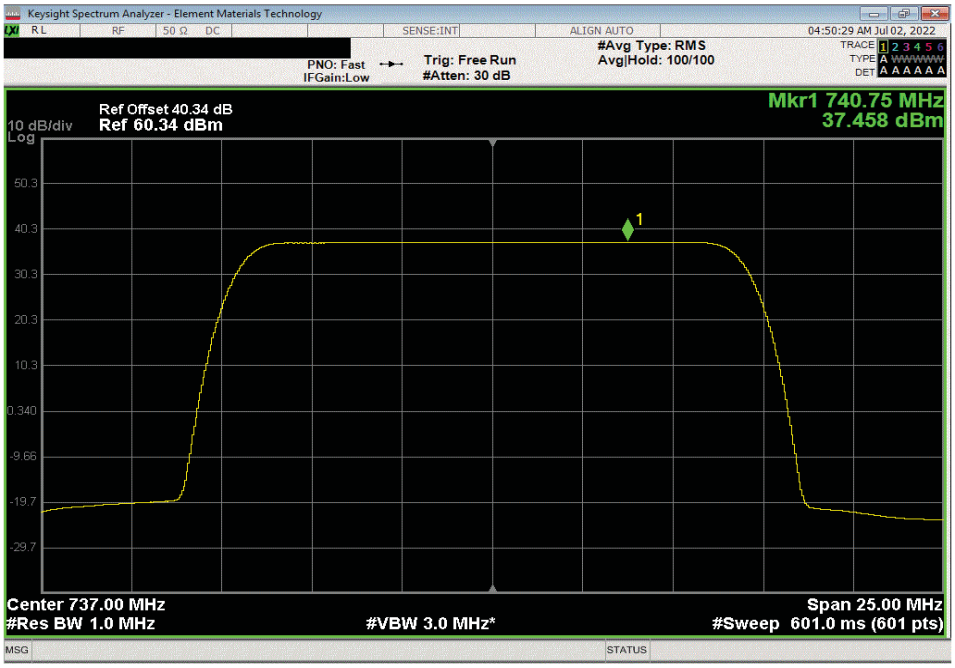
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		38.299	0	38.3	41.3	44.3



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		37.401	0	37.4	40.4	43.4



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
		37.458	0	37.5	40.5	43.5



POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 85 LTE

EIRP Calculations

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

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Commscope antenna assembly model "FF-65C-R1". The maximum Band 85 gain (15.9dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of ±45° cross-polarized radiators. The four antenna RF inputs on the antenna assembly are labeled as R1 +45°, R1 -45°, R2 +45° and R2 -45°. The four AHLOB transmitter outputs are connected to the antenna assembly RF inputs.

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

Parameter	5 MHz Ch BW	10 MHz Ch BW	15 MHz Ch BW
Worst Case PSD/Antenna Port	39.8 dBm/MHz	39.9 dBm/MHz	38.3 dBm/MHz
Number of Ant Ports per Polarization	2	2	2
Total PSD per Polarization	42.8	42.9	41.3
Cable Loss (site dependent)	0 dB	0 dB	0 dB
Dir Gain = Maximum Antenna Gain (G_{Ant}) See Note 1	15.9 dBi	15.9 dBi	15.9 dBi
EIRP per Polarization	58.7 dBm/MHz or 741 Watts/MHz	58.8 dBm/MHz or 759 Watts/MHz	57.2 dBm/MHz or 525 Watts/MHz
Number of Polarizations	2	2	2
EIRP Total = R1 ±45°and R2 ±45° See Note 2	58.7 dBm/MHz or 741 Watts/MHz	58.8 dBm/MHz or 759 Watts/MHz	57.2 dBm/MHz or 525 Watts/MHz

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

EIRP Calculation Summary

The worst case AHLOB Band 85 four port MIMO EIRP levels using antenna assembly model "FF-65C-R1" are less than the FCC and ISED (65.16 dBm/MHz and 62.15 dBm/MHz) EIRP Regulatory Limits for all (5, 10, 15 & 20MHz) channel bandwidths.

POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 71 NB IoT SA

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 fundamental emission power spectral density was measured using the channels and modes as called out on the following data sheets.

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

The RF conducted emission testing was performed on one port. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the “Output Power - All Ports” report section) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

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

FCC Requirements:
FCC 27.50(c) (3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;
FCC 27.50(c) (4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section;

Note: EIRP = ERP + 2.15dB
1000 watts = 60.00 dBm, EIRP = (60 dBm + 2.15dB) /MHz = 62.15dBm/MHz or 1640W/MHz
2000 watts = 63.01 dBm, EIRP = (63 dBm + 2.15dB) /MHz = 65.16dBm/MHz or 3280W/MHz

ISED Requirements RSS-130 Section 4.6/SRSP-518 section 5.1:
SRSP-518 section 5.1 Radiated power and antenna height limits for fixed and base stations
21. For fixed and base stations transmitting in accordance with section 4, the maximum permissible equivalent isotropically radiated power (e.i.r.p.) is 1640 watts and 1640 watts/MHz for a channel bandwidth less than or equal to 1 MHz and greater than 1 MHz, respectively. These e.i.r.p. limits apply for stations with an antenna height above average terrain (HAAT) up to 305 metres.
22. Fixed and base stations located in geographical areas at a distance greater than 26 km from large or medium population centres and transmitting in accordance with section 4, may increase their e.i.r.p. up to a maximum of 3280 watts/MHz (i.e. no more than 3280 watts e.i.r.p. in any 1 MHz band segment), with an antenna HAAT up to 305 metres.

POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 71 NB IoT SA

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	19-Aug-22
Customer:	Nokia Solutions and Networks			Temperature:	20.7 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	55% RH
Project:	None			Barometric Pres.:	1013 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offset including any attenuators, filters and DC blocks. The following is the output power measurements at the radio output ports. The output power was measured for a single carrier over the carrier channel bandwidth on port 2. The total output power for multiport (2x2, 4x4 MIMO) operation was determined based upon ANSI 63.26 clauses 6.4.3.1 and 6.4.3.2.4 (10 log Nout). The total output power for two port operation is single port power + 3dB [i.e. 10log(2)] and the total output power for a four port operation is single port power + 6dB [i.e. 10log(4)]. The carriers were enabled at maximum power.

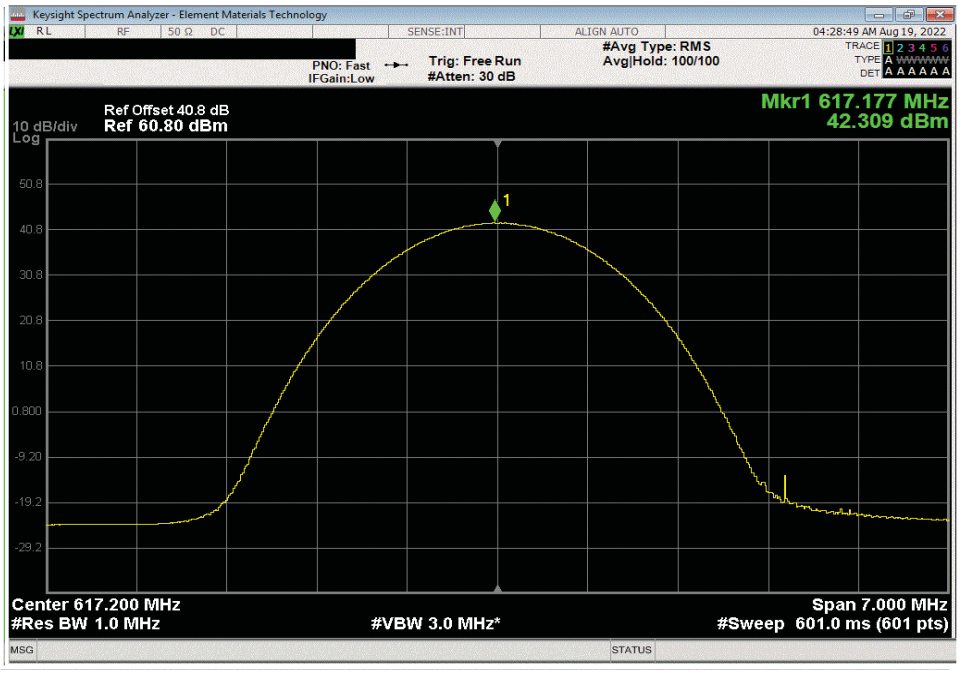
DEVIATIONS FROM TEST STANDARD

None

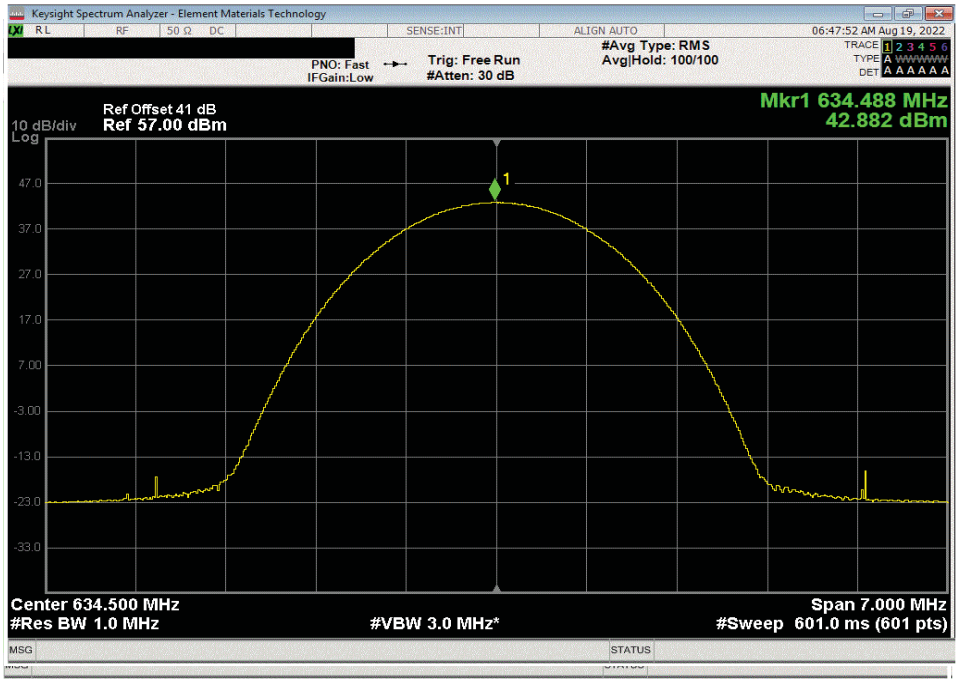
Configuration #	2	Signature

	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/carrier BW	Four Port (4x4 MIMO) dBm/MHz==PSD
Port 2, LTE, Band 71, 617 MHz - 652 MHz					
200 kHz Bandwidth					
Standalone NB-IoT					
Low Ch. 617.2 MHz	42.309	0	42.3	45.3	48.3
Mid Ch. 634.5 MHz	42.882	0	42.9	45.9	48.9
High Ch. 651.8 MHz	42.312	0	42.3	45.3	48.3

Port 2, LTE, Band 71, 617 MHz - 652 MHz, 200 kHz Bandwidth, Standalone NB-IoT, Low Ch. 617.2 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/carrier BW	Four Port (4x4 MIMO) dBm/MHz==PSD
		42.309	0	42.3	45.3	48.3

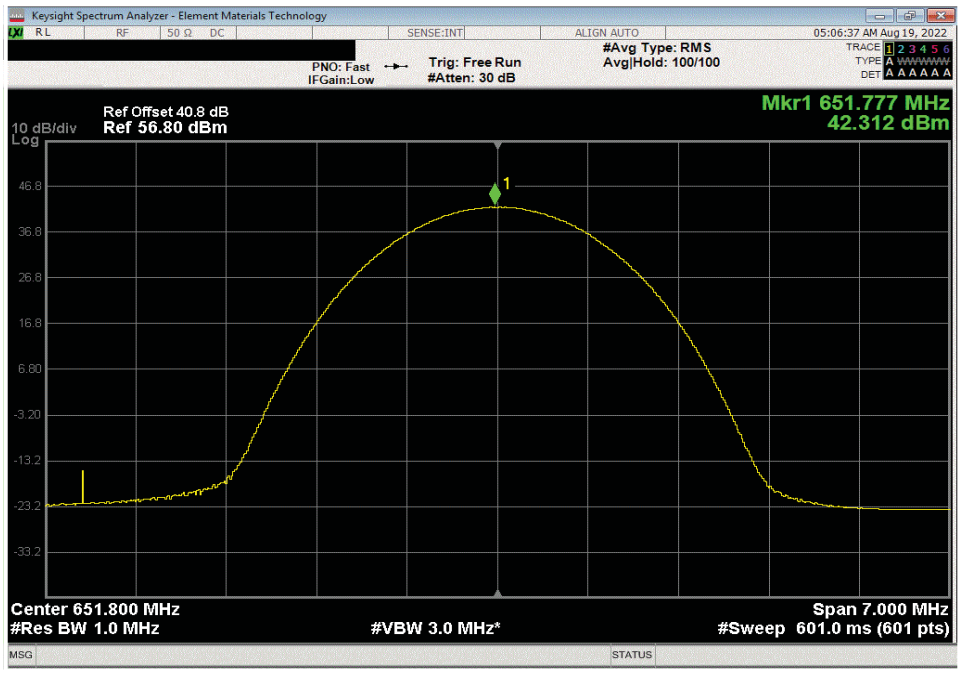


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 200 kHz Bandwidth, Standalone NB-IoT, Mid Ch. 634.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/carrier BW	Four Port (4x4 MIMO) dBm/MHz==PSD
		42.882	0	42.9	45.9	48.9



POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 71 NB IoT SA

Port 2, LTE, Band 71, 617 MHz - 652 MHz, 200 kHz Bandwidth, Standalone NB-IoT, High Ch. 651.8 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/carrier BW	Four Port (4x4 MIMO) dBm/MHz==PSD
		42.312	0	42.3	45.3	48.3



POWER SPECTRAL DENSITY AND EIRP CALCULATION - Band 71 NB IoT SA

EIRP Calculations

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

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Commscope antenna assembly model "FF-65C-R1". The maximum Band 71 gain (15.7dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of ±45° cross-polarized radiators. The four antenna RF inputs on the antenna assembly are labeled as R1 +45°, R1 -45°, R2 +45° and R2 -45°. The four AHLOB transmitter outputs are connected to the antenna assembly RF inputs.

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

Parameter	NB IoT SA
Worst Case PSD/Antenna Port	42.9 dBm/MHz
Number of Ant Ports per Polarization	2
Total PSD per Polarization	45.9
Cable Loss (site dependent)	0 dB
Dir Gain = Maximum Antenna Gain (G_{Ant}) See Note 1	15.7 dBi
EIRP per Polarization	61.6 dBm/MHz or 1445 Watts/MHz
Number of Polarizations	2
EIRP Total = R1 ±45°and R2 ±45° See Note 2	61.6 dBm/MHz or 1445 Watts/MHz

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

EIRP Calculation Summary

The worst case AHLOB Band 71 four port MIMO EIRP levels using antenna assembly model "FF-65C-R1" are less than the FCC and ISED (65.16 dBm/MHz and 62.15 dBm/MHz) EIRP Regulatory Limits for the LTE NB IoT Stand Alone carrier.

POWER SPECTRAL DENSITY and EIRP CALCULATION - Band 85 NB IoT SA

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 fundamental emission power spectral density was measured using the channels and modes as called out on the following data sheets.

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

The RF conducted emission testing was performed on one port. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the “Output Power - All Ports” report section) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

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

FCC Requirements:
FCC 27.50(c) (3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;
FCC 27.50(c) (4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section;

Note: EIRP = ERP + 2.15dB
1000 watts = 60.00 dBm, EIRP = (60 dBm + 2.15dB) /MHz = 62.15dBm/MHz or 1640W/MHz
2000 watts = 63.01 dBm, EIRP = (63 dBm + 2.15dB) /MHz = 65.16dBm/MHz or 3280W/MHz

ISED Requirements RSS-130 Section 4.6/SRSP-518 section 5.1:
SRSP-518 section 5.1 Radiated power and antenna height limits for fixed and base stations
21. For fixed and base stations transmitting in accordance with section 4, the maximum permissible equivalent isotropically radiated power (e.i.r.p.) is 1640 watts and 1640 watts/MHz for a channel bandwidth less than or equal to 1 MHz and greater than 1 MHz, respectively. These e.i.r.p. limits apply for stations with an antenna height above average terrain (HAAT) up to 305 metres.
22. Fixed and base stations located in geographical areas at a distance greater than 26 km from large or medium population centres and transmitting in accordance with section 4, may increase their e.i.r.p. up to a maximum of 3280 watts/MHz (i.e. no more than 3280 watts e.i.r.p. in any 1 MHz band segment), with an antenna HAAT up to 305 metres.

POWER SPECTRAL DENSITY and EIRP CALCULATION - Band 85
NB IoT SA

element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	19-Aug-22
Customer:	Nokia Solutions and Networks			Temperature:	21.6 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	51.9% RH
Project:	None			Barometric Pres.:	1016 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. The PSD was measured while transmitting one carrier on Port 1. The total PSD for multiport (2x2, 4x4 MIMO) operation was determinded based upon ANSI 63.26 clause 6.4.3.2.4 (10 Log Nout). The total PSD for two port operation is single port PSD +3dB [i.e. 10 Log(2)]. The total PSD for four port operation is single port PSD +6dB [i.e. 10 Log(4)]. The carriers were enabled at maximum power.

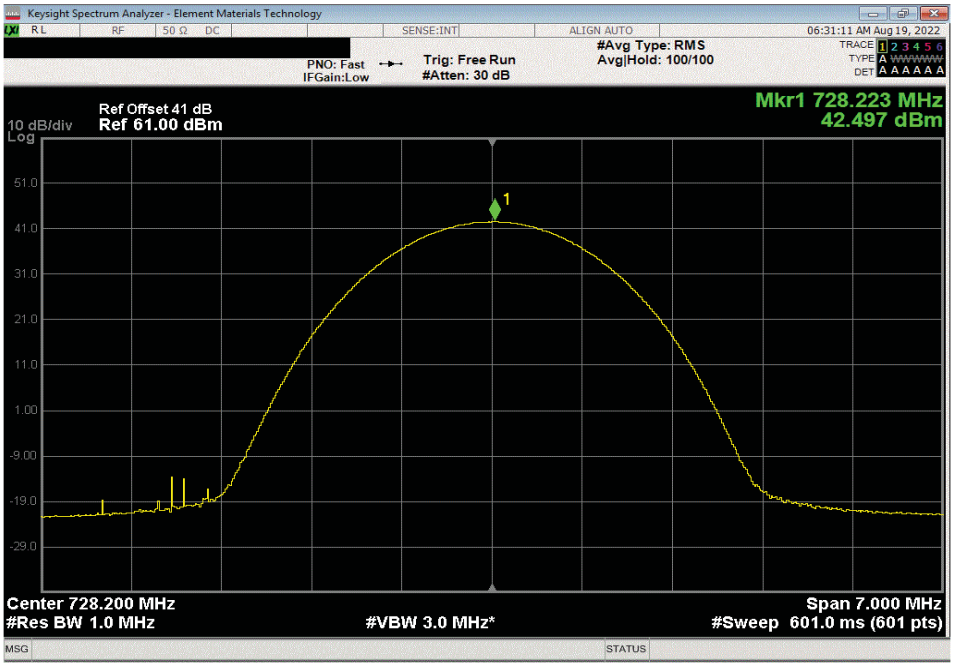
DEVIATIONS FROM TEST STANDARD

None

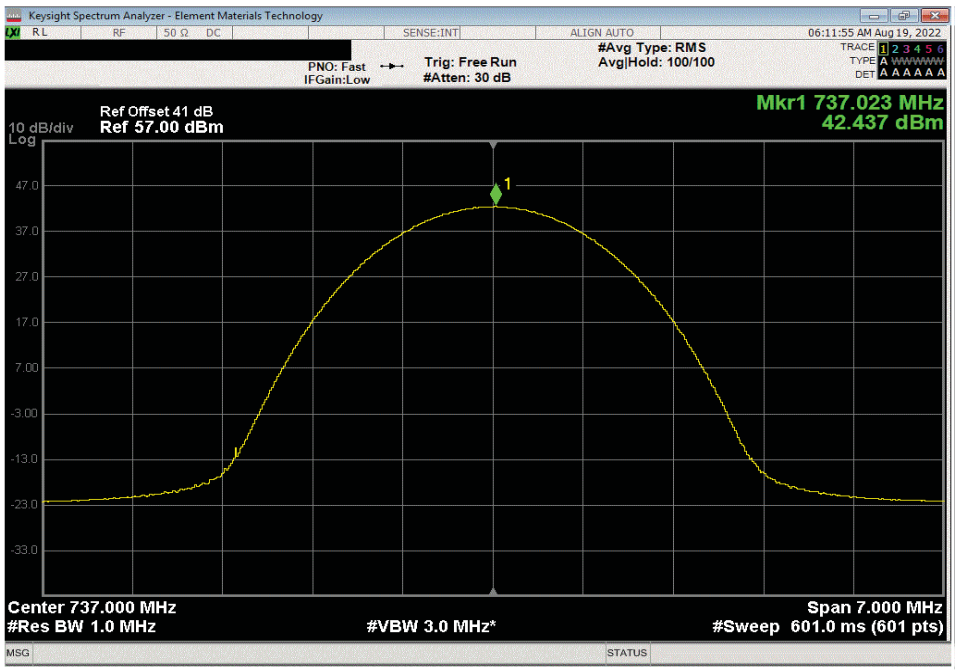
Configuration #	2	Signature

	Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
Port 2, LTE, Band 85, 728 MHz - 746 MHz					
200 kHz Bandwidth					
Standalone NB-IoT Modulation					
Low Ch. 728.2 MHz	42.497	0	42.5	45.5	48.5
Mid Ch. 737 MHz	42.437	0	42.4	45.4	48.4
High Ch. 745.8 MHz	42.231	0	42.2	45.2	48.2

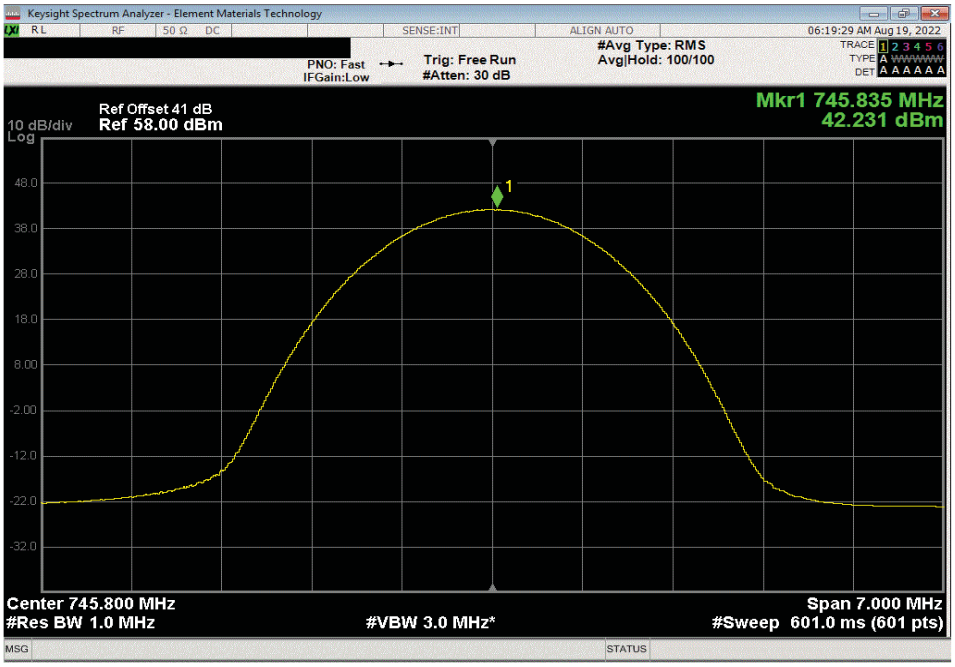
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 200 kHz Bandwidth, Standalone NB-IoT Modulation, Low Ch. 728.2 MHz						
	Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.497	0	42.5	45.5	48.5	



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 200 kHz Bandwidth, Standalone NB-IoT Modulation, Mid Ch. 737 MHz						
	Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.437	0	42.4	45.4	48.4	



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 200 kHz Bandwidth, Standalone NB-IoT Modulation, High Ch. 745.8 MHz						
	Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.231	0	42.2	45.2	48.2	



EIRP Calculations

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

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon CommScope antenna assembly model "FF-65C-R1". The maximum Band 85 gain (15.9dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of ±45° cross-polarized radiators. The four antenna RF inputs on the antenna assembly are labeled as R1 +45°, R1 -45°, R2 +45° and R2 -45°. The four AHLOB transmitter outputs are connected to the antenna assembly RF inputs.

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

Parameter	NB IoT SA
Worst Case PSD/Antenna Port	42.5 dBm/MHz
Number of Ant Ports per Polarization	2
Total PSD per Polarization	45.5
Cable Loss (site dependent)	0 dB
Dir Gain = Maximum Antenna Gain (G_{Ant}) See Note 1	15.9 dBi
EIRP per Polarization	61.4 dBm/MHz or 1380 Watts/MHz
Number of Polarizations	2
EIRP Total = R1 ±45°and R2 ±45° See Note 2	61.4 dBm/MHz or 1380 Watts/MHz

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

EIRP Calculation Summary

The worst case AHLOB Band 85 four port MIMO EIRP levels using antenna assembly model "FF-65C-R1" are less than the FCC and ISED (65.16 dBm/MHz and 62.15 dBm/MHz) EIRP Regulatory Limits for the LTE NB IoT Stand Alone carrier.

POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 71 NB IoT GB

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 fundamental emission power spectral density was measured using the channels and modes as called out on the following data sheets.

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

The RF conducted emission testing was performed on one port. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the “Output Power - All Ports” report section) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

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

FCC Requirements:
FCC 27.50(c) (3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;
FCC 27.50(c) (4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section;

Note: EIRP = ERP + 2.15dB
1000 watts = 60.00 dBm, EIRP = (60 dBm + 2.15dB) /MHz = 62.15dBm/MHz or 1640W/MHz
2000 watts = 63.01 dBm, EIRP = (63 dBm + 2.15dB) /MHz = 65.16dBm/MHz or 3280W/MHz

ISED Requirements RSS-130 Section 4.6/SRSP-518 section 5.1:
SRSP-518 section 5.1 Radiated power and antenna height limits for fixed and base stations
21. For fixed and base stations transmitting in accordance with section 4, the maximum permissible equivalent isotropically radiated power (e.i.r.p.) is 1640 watts and 1640 watts/MHz for a channel bandwidth less than or equal to 1 MHz and greater than 1 MHz, respectively. These e.i.r.p. limits apply for stations with an antenna height above average terrain (HAAT) up to 305 metres.
22. Fixed and base stations located in geographical areas at a distance greater than 26 km from large or medium population centres and transmitting in accordance with section 4, may increase their e.i.r.p. up to a maximum of 3280 watts/MHz (i.e. no more than 3280 watts e.i.r.p. in any 1 MHz band segment), with an antenna HAAT up to 305 metres.

POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 71 NB IoT GB

element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	13-Jul-22
Customer:	Nokia Solutions and Networks			Temperature:	20.9 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	56.3% 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
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. The PSD was measured while transmitting one carrier on Port 2. The total PSD for multiport (2x2, 4x4 MIMO) operation was determinded based upon ANSI 63.26 clause 6.4.3.2.4 (10 Log Nout). The total PSD for two port operation is single port PSD +3dB [i.e. 10 Log(2)]. The total PSD for four port operation is single port PSD +6dB [i.e. 10 Log(4)]. The carriers were enabled at maximum power.

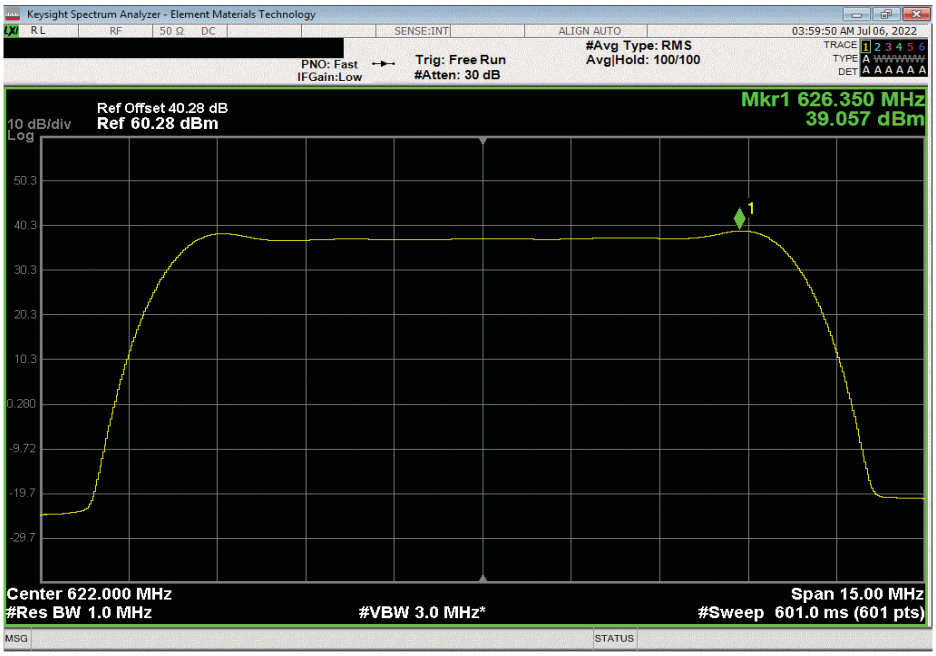
DEVIATIONS FROM TEST STANDARD

None

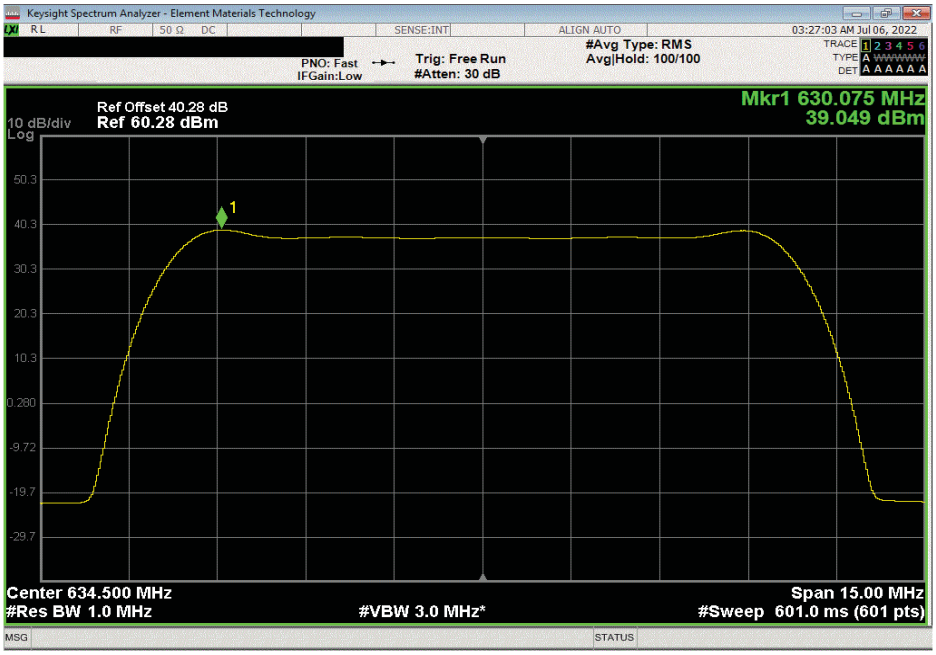
Configuration #	2	Signature

	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD
Port 2, LTE, Band 71, 617 MHz - 652 MHz					
10 MHz Bandwidth					
QPSK Modulation					
Low Ch. 622 MHz	39.057	0	39.1	42.1	45.1
Mid Ch. 634.5 MHz	39.049	0	39	42	45
High Ch. 647 MHz	39.134	0	39.1	42.1	45.1
15 MHz Bandwidth					
QPSK Modulation					
Low Ch. 624.5 MHz	38.697	0	38.7	41.7	44.7
Mid Ch. 634.5 MHz	38.475	0	38.5	41.5	44.5
High Ch. 644.5 MHz	38.502	0	38.5	41.5	44.5
20 MHz Bandwidth					
QPSK Modulation					
Low Ch. 627 MHz	37.568	0	37.6	40.6	43.6
Mid Ch. 634.5 MHz	37.376	0	37.4	40.4	43.4
High Ch. 642 MHz	37.438	0	37.4	40.4	43.4

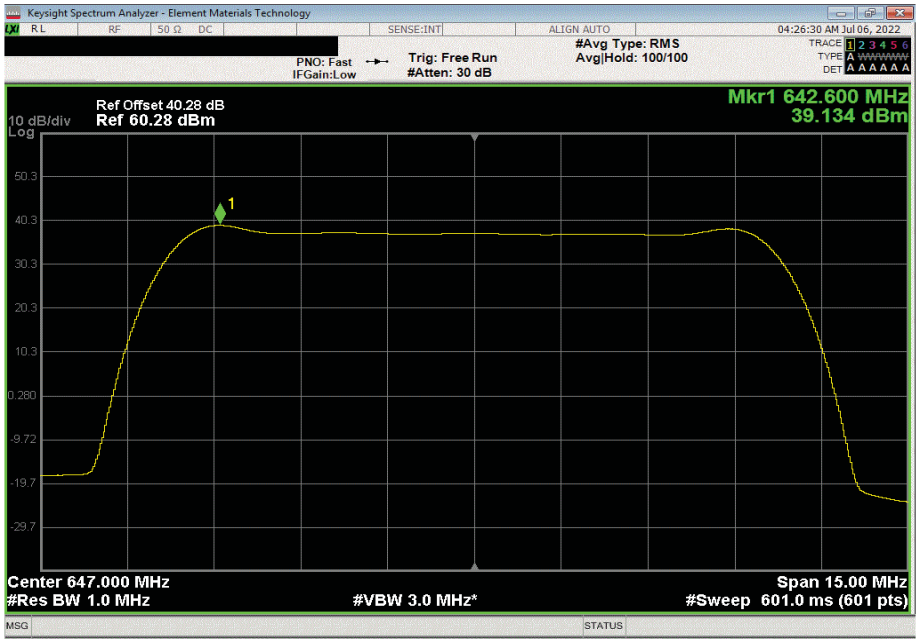
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, QPSK Modulation, Low Ch. 622 MHz						
	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	39.057	0	39.1	42.1	45.1	



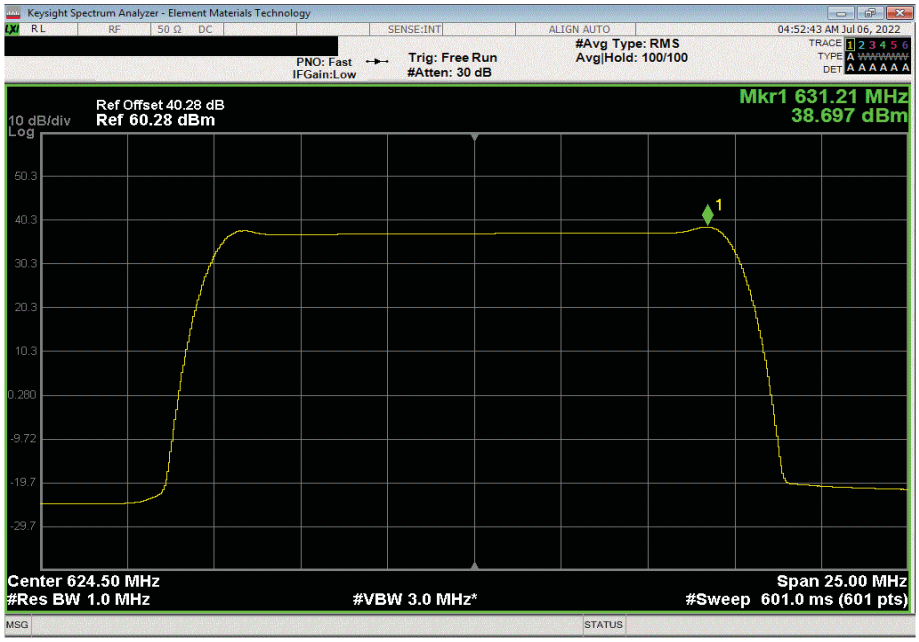
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, QPSK Modulation, Mid Ch. 634.5 MHz						
	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	39.049	0	39	42	45	



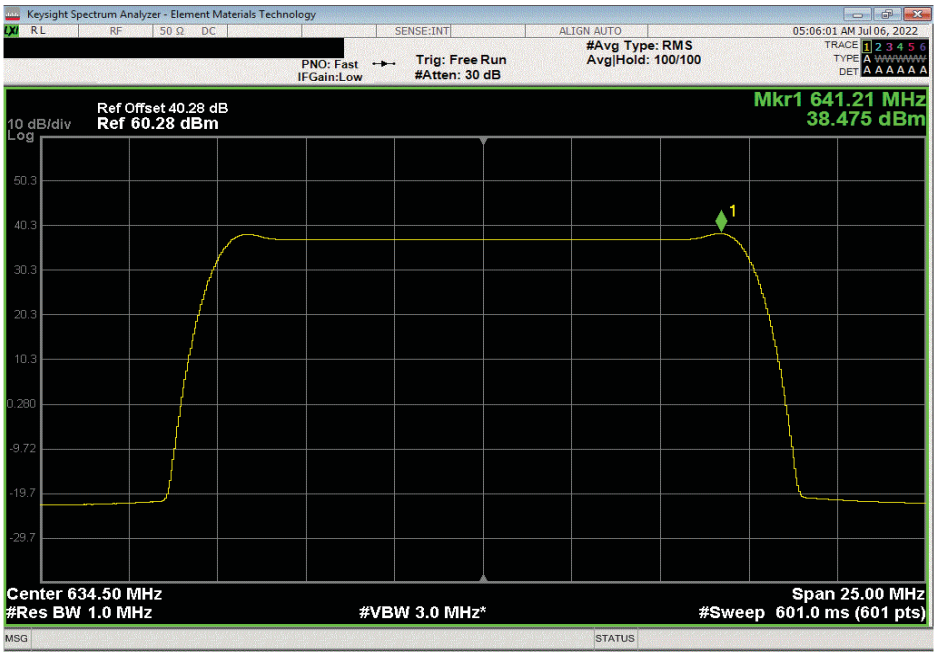
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, QPSK Modulation, High Ch. 647 MHz						
	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	39.134	0	39.1	42.1	45.1	



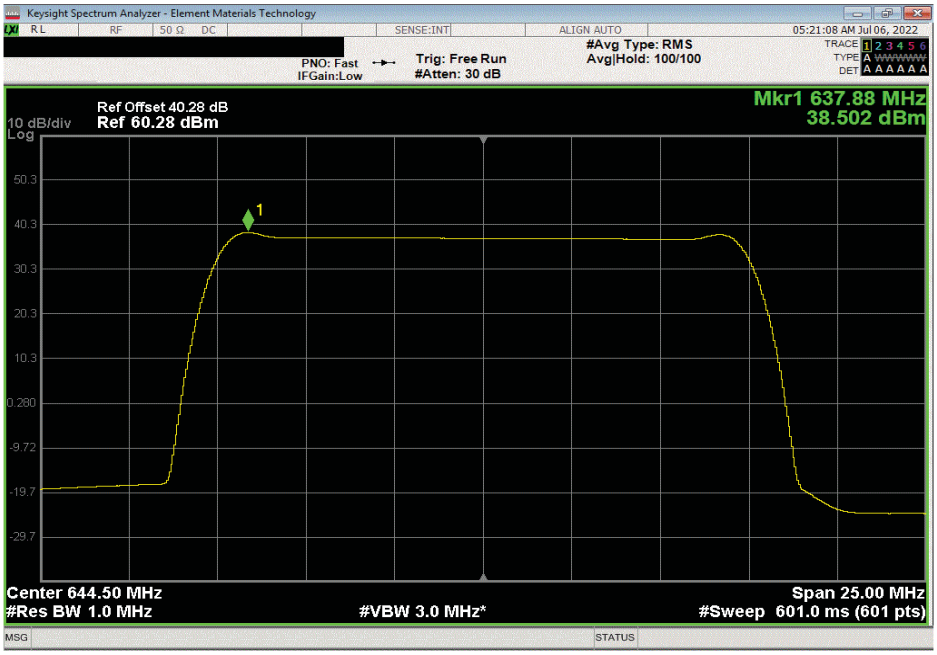
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, QPSK Modulation, Low Ch. 624.5 MHz						
	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	38.697	0	38.7	41.7	44.7	



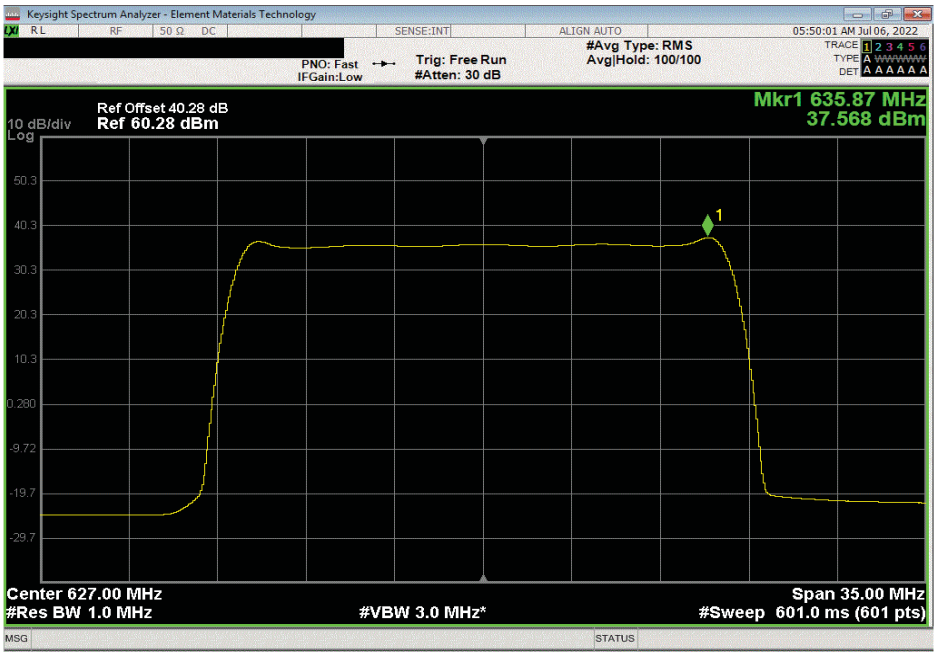
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, QPSK Modulation, Mid Ch. 634.5 MHz						
	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	38.475	0	38.5	41.5	44.5	



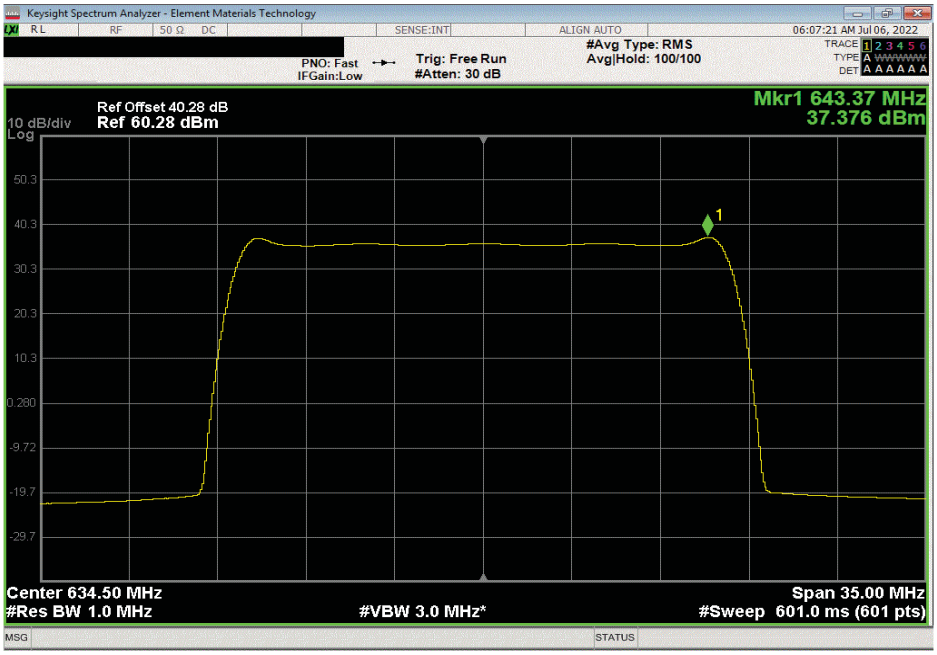
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, QPSK Modulation, High Ch. 644.5 MHz						
	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	38.502	0	38.5	41.5	44.5	



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, QPSK Modulation, Low Ch. 627 MHz						
	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	37.568	0	37.6	40.6	43.6	

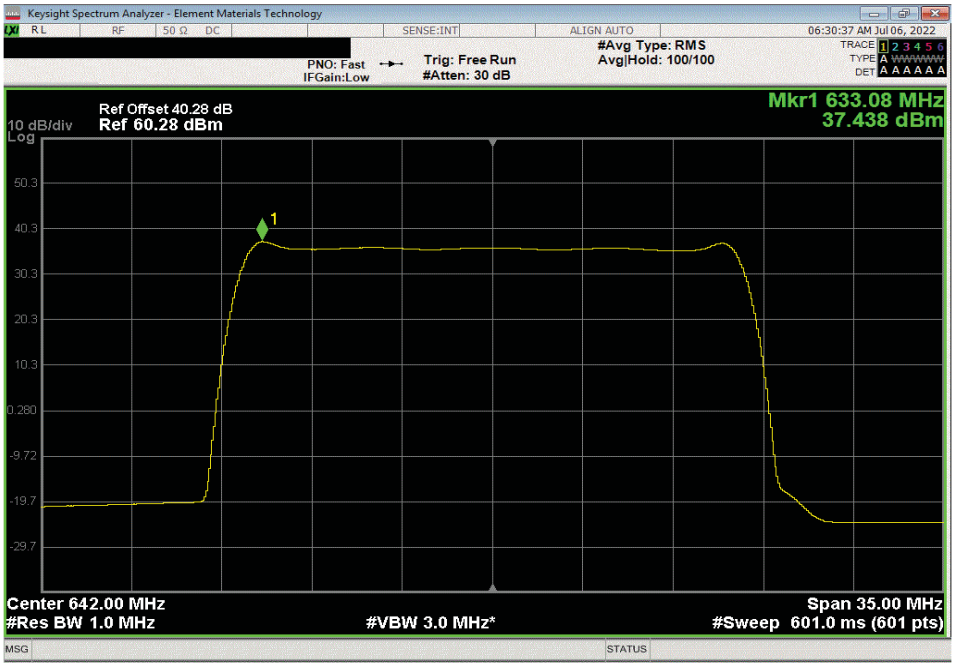


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, QPSK Modulation, Mid Ch. 634.5 MHz						
	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	37.376	0	37.4	40.4	43.4	



POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 71 NB IoT GB

Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, QPSK Modulation, High Ch. 642 MHz						
	Initial value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz==PSD	Two Port (2x2 MIMO) dBm/MHz==PSD	Four Port (4x4 MIMO) dBm/MHz==PSD	
	37.438	0	37.4	40.4	43.4	



POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 71 NB IoT GB

EIRP Calculations

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

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Commscope antenna assembly model "FF-65C-R1". The maximum Band 71 gain (15.7dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of ±45° cross-polarized radiators. The four antenna RF inputs on the antenna assembly are labeled as R1 +45°, R1 -45°, R2 +45° and R2 -45°. The four AHLOB transmitter outputs are connected to the antenna assembly RF inputs.

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

Parameter	10 MHz Ch BW	15 MHz Ch BW	20 MHz Ch BW
Worst Case PSD/Antenna Port	39.1 dBm/MHz	38.7 dBm/MHz	37.6 dBm/MHz
Number of Ant Ports per Polarization	2	2	2
Total PSD per Polarization	42.1	41.7	40.6
Cable Loss (site dependent)	0 dB	0 dB	0 dB
Dir Gain = Maximum Antenna Gain (G_{Ant}) See Note 1	15.7 dBi	15.7 dBi	15.7 dBi
EIRP per Polarization	57.8 dBm/MHz or 603 Watts/MHz	57.4 dBm/MHz or 550 Watts/MHz	56.3 dBm/MHz or 427 Watts/MHz
Number of Polarizations	2	2	2
EIRP Total = R1 ±45°and R2 ±45° See Note 2	57.8 dBm/MHz or 603 Watts/MHz	57.4 dBm/MHz or 550 Watts/MHz	56.3 dBm/MHz or 427 Watts/MHz

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

EIRP Calculation Summary

The worst case AHLOB Band 71 four port MIMO EIRP levels using antenna assembly model "FF -65C-R1" are less than the FCC and ISED (65.16 dBm/MHz and 62.15 dBm/MHz) EIRP Regulatory Limits for all (10, 15 & 20MHz) channel bandwidths.

POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 85 NB IoT GB

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 fundamental emission power spectral density was measured using the channels and modes as called out on the following data sheets.

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

The RF conducted emission testing was performed on one port. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the “Output Power - All Ports” report section) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

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

FCC Requirements:
FCC 27.50(c) (3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;
FCC 27.50(c) (4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section;

Note: EIRP = ERP + 2.15dB
1000 watts = 60.00 dBm, EIRP = (60 dBm + 2.15dB) /MHz = 62.15dBm/MHz or 1640W/MHz
2000 watts = 63.01 dBm, EIRP = (63 dBm + 2.15dB) /MHz = 65.16dBm/MHz or 3280W/MHz

ISED Requirements RSS-130 Section 4.6/SRSP-518 section 5.1:
SRSP-518 section 5.1 Radiated power and antenna height limits for fixed and base stations
21. For fixed and base stations transmitting in accordance with section 4, the maximum permissible equivalent isotropically radiated power (e.i.r.p.) is 1640 watts and 1640 watts/MHz for a channel bandwidth less than or equal to 1 MHz and greater than 1 MHz, respectively. These e.i.r.p. limits apply for stations with an antenna height above average terrain (HAAT) up to 305 metres.
22. Fixed and base stations located in geographical areas at a distance greater than 26 km from large or medium population centres and transmitting in accordance with section 4, may increase their e.i.r.p. up to a maximum of 3280 watts/MHz (i.e. no more than 3280 watts e.i.r.p. in any 1 MHz band segment), with an antenna HAAT up to 305 metres.

POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 85 NB IoT GB

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	13-Jul-22
Customer:	Nokia Solutions and Networks			Temperature:	21.3 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	54.3% 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
RSS-130 Issue 2:2019	ANSI C63.26:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. The PSD was measured while transmitting one carrier on Port 2. The total PSD for multiport (2x2, 4x4 MIMO) operation was determinded based upon ANSI 63.26 clause 6.4.3.2.4 (10 Log Nout). The total PSD for two port operation is single port PSD +3dB [i.e. 10 Log(2)]. The total PSD for four port operation is single port PSD +6dB [i.e. 10 Log(4)]. The carriers were enabled at maximum power.

DEVIATIONS FROM TEST STANDARD

None

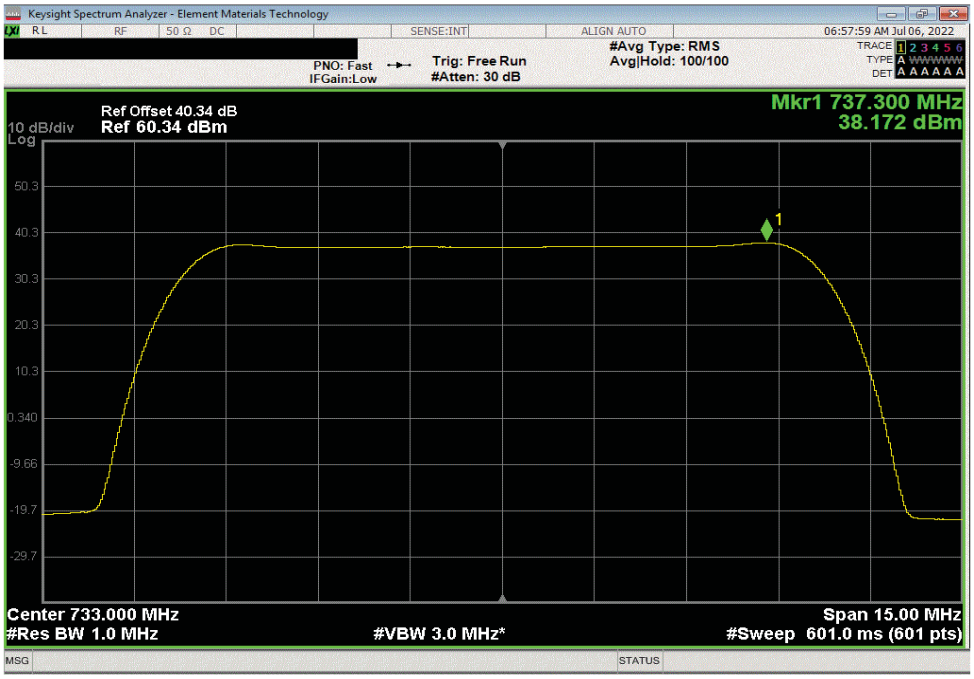
Configuration #	2	Signature

		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
Port 2, LTE, Band 85, 728 MHz - 746 MHz						
10MHz Bandwidth						
NB IoT GB						
	Low Ch. 733 MHz	38.172	0	38.2	41.2	44.2
	Mid Ch. 737 MHz	39.132	0	39.1	42.1	44.1
	High Ch. 741 MHz	39.081	0	39.1	42.1	44.1
Port 2, LTE, Band 85, 728 MHz - 746 MHz						
15MHz Bandwidth						
NB IoT GB						
	Low Ch. 735.5 MHz	38.322	0	38.3	41.3	44.3
	Mid Ch. 737 MHz	38.305	0	38.3	41.3	44.3
	High Ch. 738.5 MHz	38.442	0	38.4	41.4	44.4

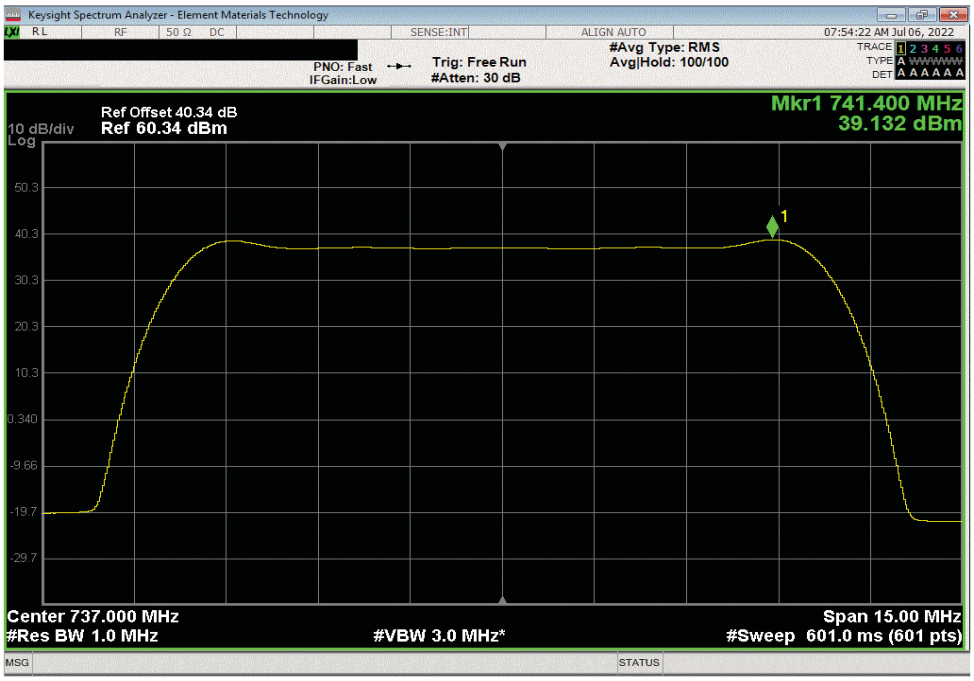
POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 85 NB IoT GB

TbtTx 2022.05.02.0 XMit 2022.02.07.0

Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10MHz Bandwidth, NB IoT GB, Low Ch. 733 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	38.172	0	38.2	41.2	44.2	

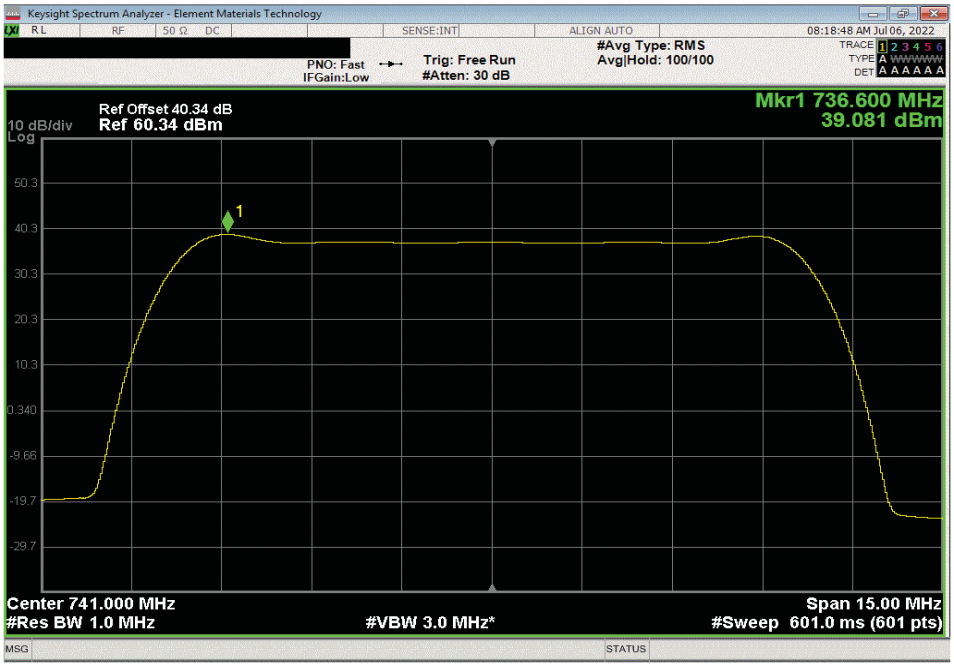


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10MHz Bandwidth, NB IoT GB, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.1	0	39.1	42.1	45.1	

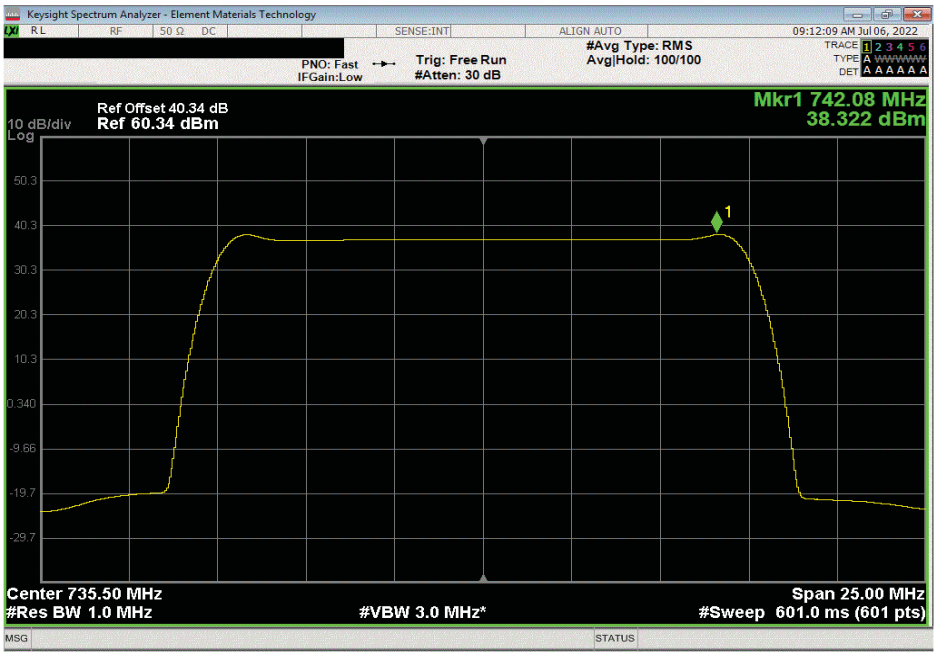


POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 85 NB IoT GB

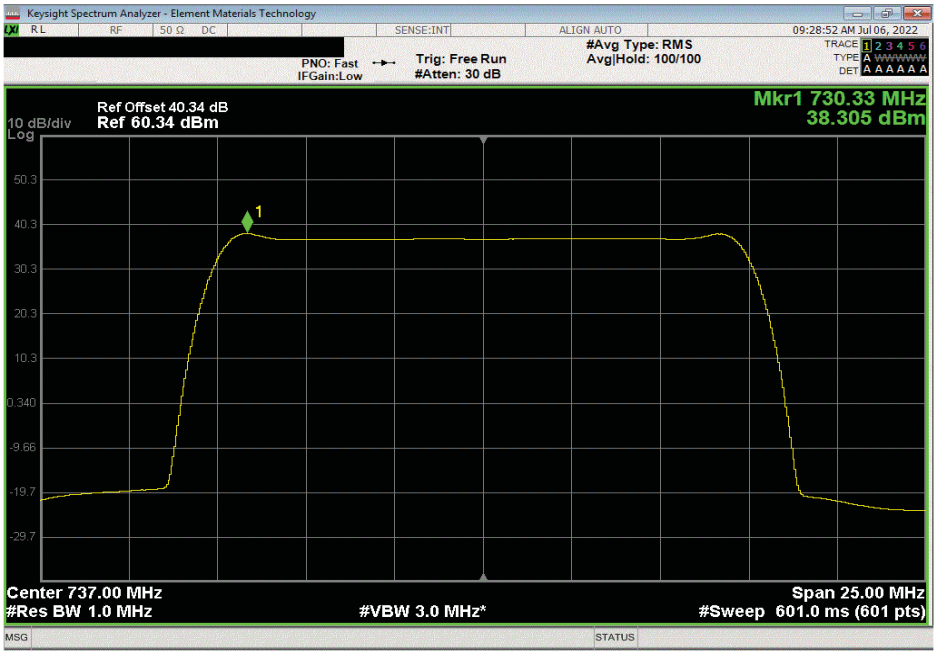
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10MHz Bandwidth, NB IoT GB, High Ch. 741 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.081	0	39.1	42.1	45.1	



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15MHz Bandwidth, NB IoT GB, Low Ch. 735.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	38.322	0	38.3	41.3	44.3	

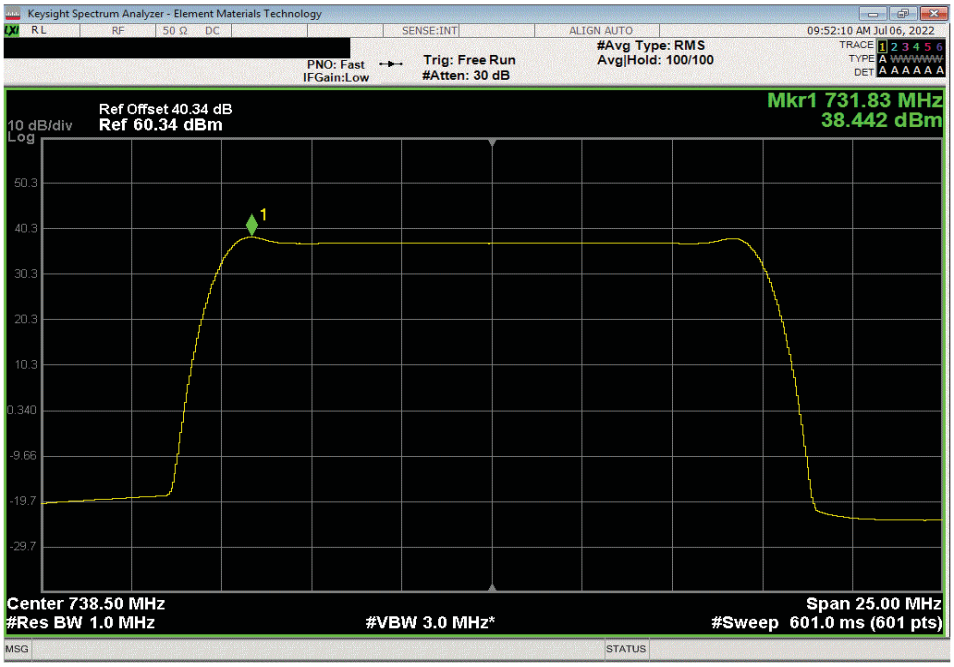


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15MHz Bandwidth, NB IoT GB, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	38.305	0	38.3	41.3	44.3	



POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 85 NB IoT GB

Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15MHz Bandwidth, NB IoT GB, High Ch. 738.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	38.4	0	38.4	41.4	44.4	



POWER SPECTRAL DENSITY and EIRP CALCULATIONS - Band 85 NB IoT GB

EIRP Calculations

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

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Commscope antenna assembly model "FF-65C-R1". The maximum Band 85 gain (15.9dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of ±45° cross-polarized radiators. The four antenna RF inputs on the antenna assembly are labeled as R1 +45°, R1 -45°, R2 +45° and R2 -45°. The four AHLOB transmitter outputs are connected to the antenna assembly RF inputs.

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

Parameter	10 MHz Ch BW	15 MHz Ch BW
Worst Case PSD/Antenna Port	39.1 dBm/MHz	38.4 dBm/MHz
Number of Ant Ports per Polarization	2	2
Total PSD per Polarization	42.1	41.4
Cable Loss (site dependent)	0 dB	0 dB
Dir Gain = Maximum Antenna Gain (G_{Ant}) See Note 1	15.9 dBi	15.9 dBi
EIRP per Polarization	58.0 dBm/MHz or 631 Watts/MHz	57.3 dBm/MHz or 537 Watts/MHz
Number of Polarizations	2	2
EIRP Total = R1 ±45°and R2 ±45° See Note 2	58.0 dBm/MHz or 631 Watts/MHz	57.3 dBm/MHz or 537 Watts/MHz

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

EIRP Calculation Summary

The worst case AHLOB Band 85 four port MIMO EIRP levels using antenna assembly model "FF-65C-R1" are less than the FCC and ISED (65.16 dBm/MHz and 62.15 dBm/MHz) EIRP Regulatory Limits for all (5, 10, 15 & 20MHz) channel bandwidths.

BAND EDGE COMPLIANCE - Band 71 LTE

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.

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

Per 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.

Per FCC 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.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHLOB) as the original certification test. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraph 5.7.2i.

BAND EDGE COMPLIANCE - Band 71 LTE

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	11-Jul-22
Customer:	Nokia Solutions and Networks			Temperature:	21.5 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	56.8% RH
Project:	None			Barometric Pres.:	1015 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
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. The carriers were enabled at maximum power.

DEVIATIONS FROM TEST STANDARD

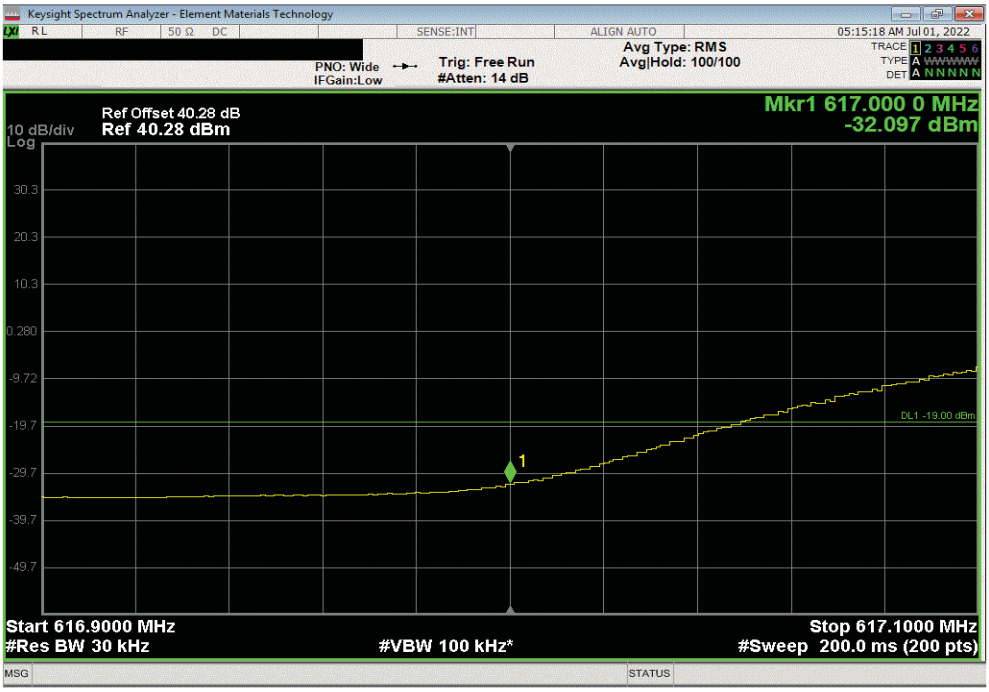
None

Configuration #	2	Signature

	Frequency Range	Max Value (dBm)	Limit < (dBm)	Result
Port 2, LTE, Band 71, 617 MHz - 652 MHz				
5 MHz Bandwidth				
256-QAM Modulation				
Low Ch. 619.5 MHz	1	-32.1	-19	Pass
Low Ch. 619.5 MHz	2	-29.51	-19	Pass
High Ch. 649.5 MHz	1	-33.64	-19	Pass
High Ch. 649.5 MHz	2	-30.87	-19	Pass
10 MHz Bandwidth				
256-QAM Modulation				
Low Ch. 622 MHz	1	-33.91	-19	Pass
Low Ch. 622 MHz	2	-29.74	-19	Pass
High Ch. 647 MHz	1	-32.71	-19	Pass
High Ch. 647 MHz	2	-28.71	-19	Pass
15 MHz Bandwidth				
QPSK Modulation				
Low Ch. 624.5 MHz	1	-28.99	-19	Pass
Low Ch. 624.5 MHz	2	-27.1	-19	Pass
High Ch. 644.5 MHz	1	-27.46	-19	Pass
High Ch. 644.5 MHz	2	-25.02	-19	Pass
16-QAM Modulation				
Low Ch. 624.5 MHz	1	-29.32	-19	Pass
Low Ch. 624.5 MHz	2	-27.88	-19	Pass
High Ch. 644.5 MHz	1	-27.52	-19	Pass
High Ch. 644.5 MHz	2	-25.47	-19	Pass
64-QAM Modulation				
Low Ch. 624.5 MHz	1	-29.23	-19	Pass
Low Ch. 624.5 MHz	2	-27.79	-19	Pass
High Ch. 644.5 MHz	1	-27.73	-19	Pass
High Ch. 644.5 MHz	2	-25.79	-19	Pass
256-QAM Modulation				
Low Ch. 624.5 MHz	1	-28.8	-19	Pass
Low Ch. 624.5 MHz	2	-27.67	-19	Pass
High Ch. 644.5 MHz	1	-27.33	-19	Pass
High Ch. 644.5 MHz	2	-25.6	-19	Pass
20 MHz Bandwidth				
256-QAM Modulation				
Low Ch. 627 MHz	1	-32.71	-19	Pass
Low Ch. 627 MHz	2	-29.04	-19	Pass
High Ch. 642 MHz	1	-30.34	-19	Pass
High Ch. 642 MHz	2	-26.68	-19	Pass

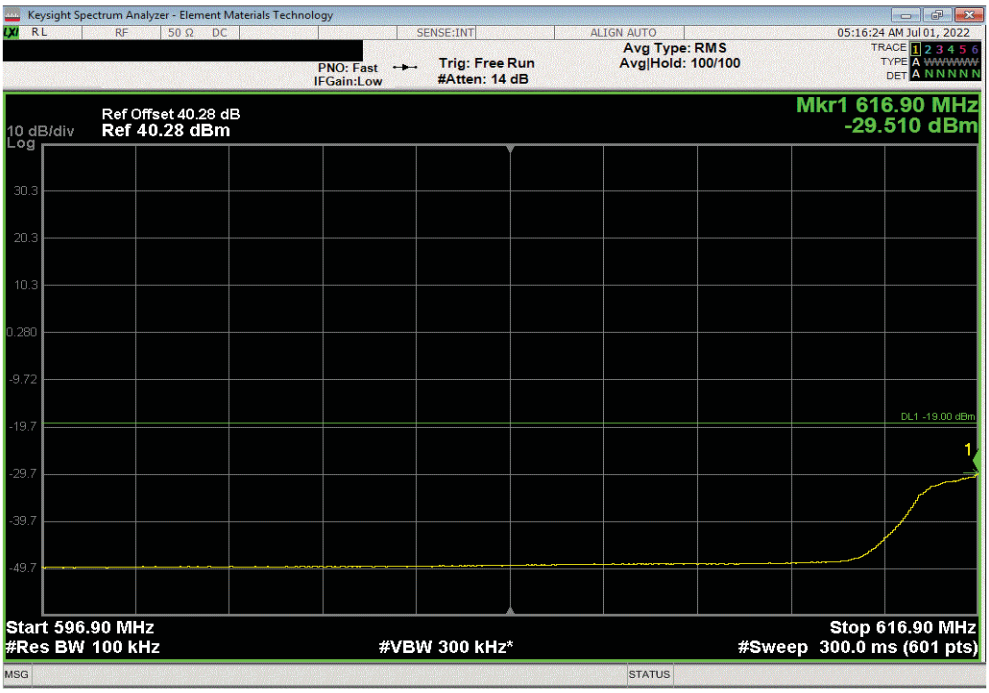
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 619.5 MHz

Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	1			-32.1	-19	Pass

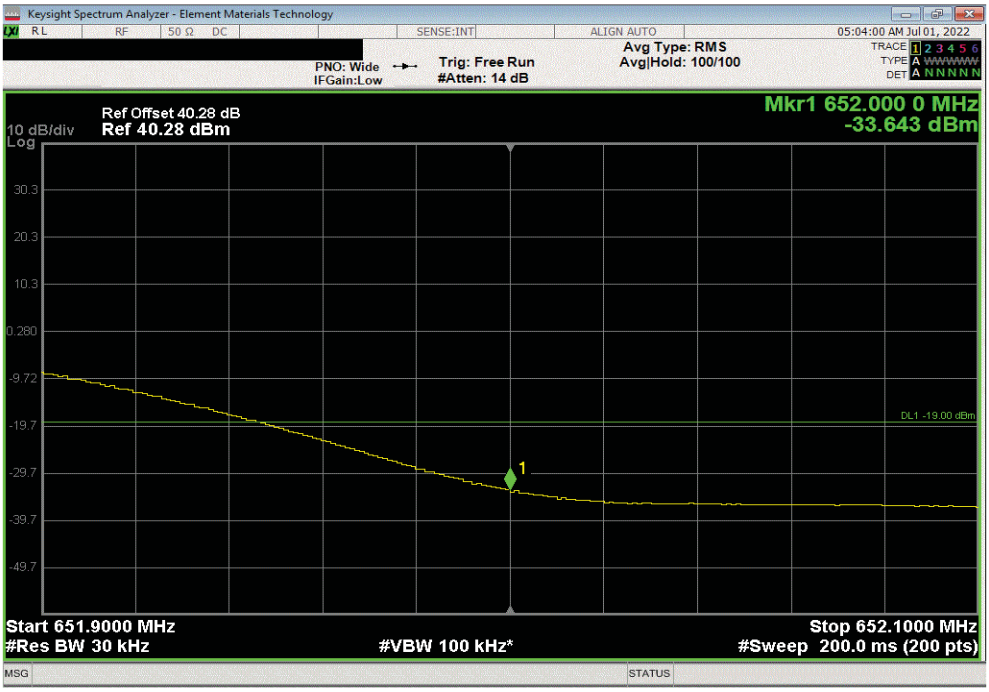


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 619.5 MHz

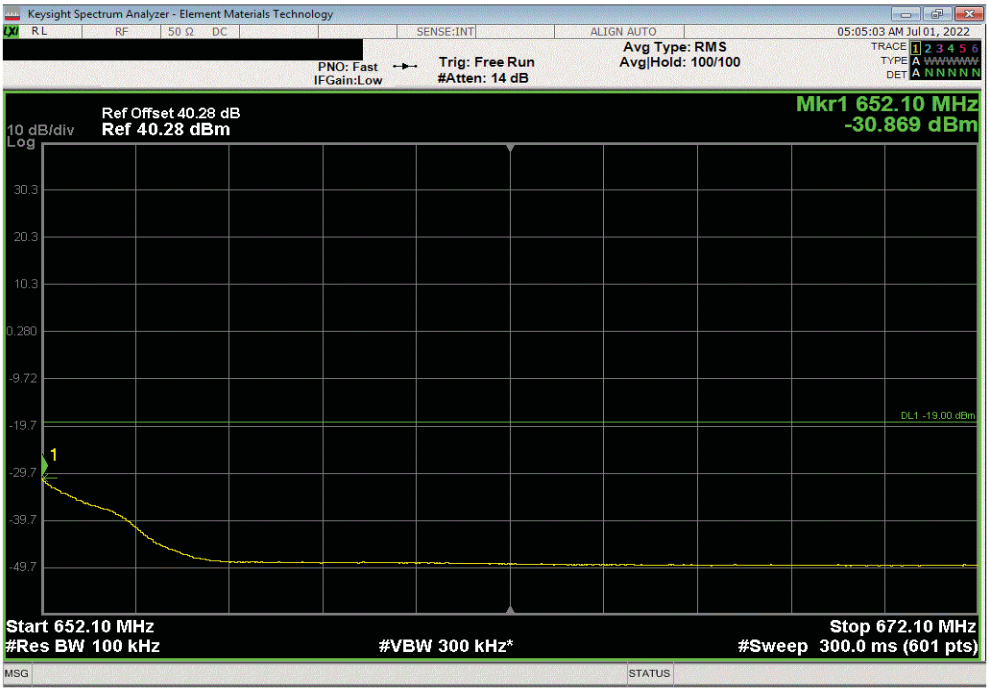
Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	2			-29.51	-19	Pass



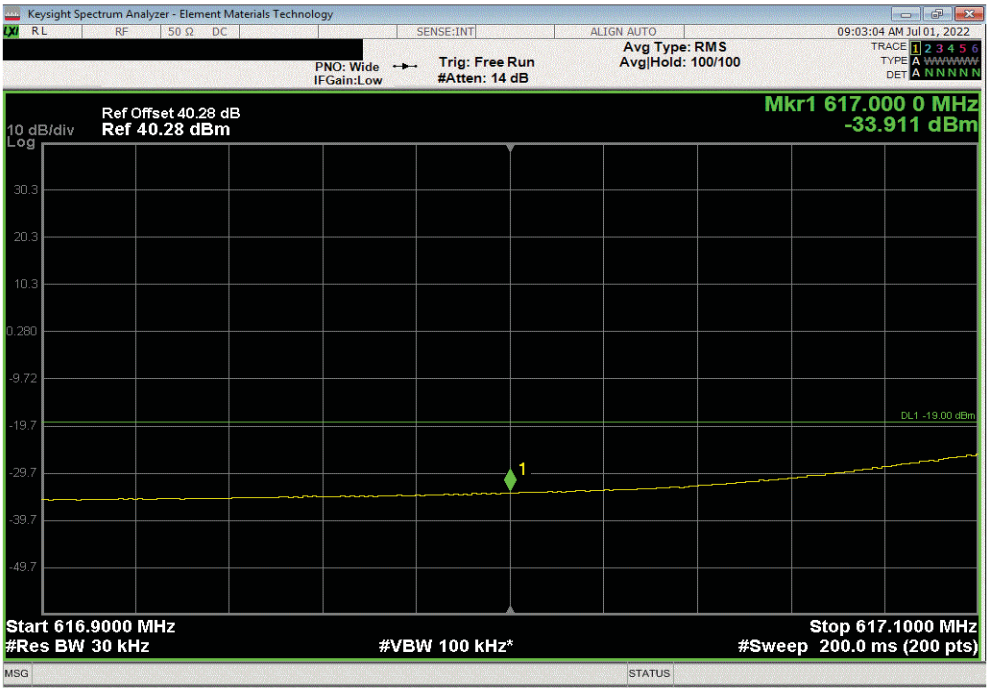
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 649.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-33.64	-19	Pass



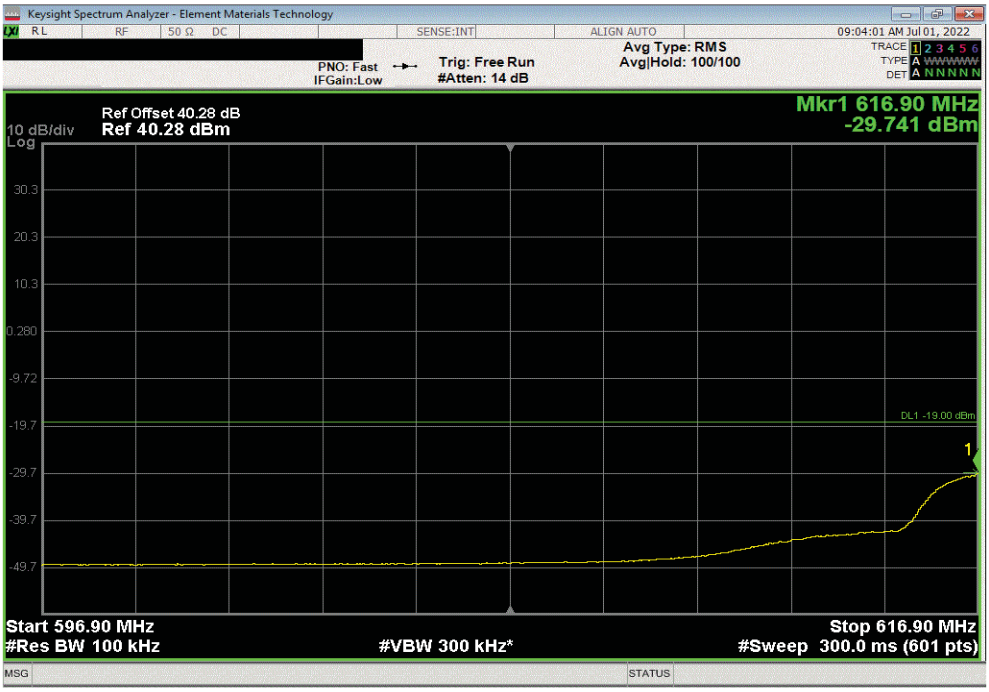
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 649.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-30.87	-19	Pass



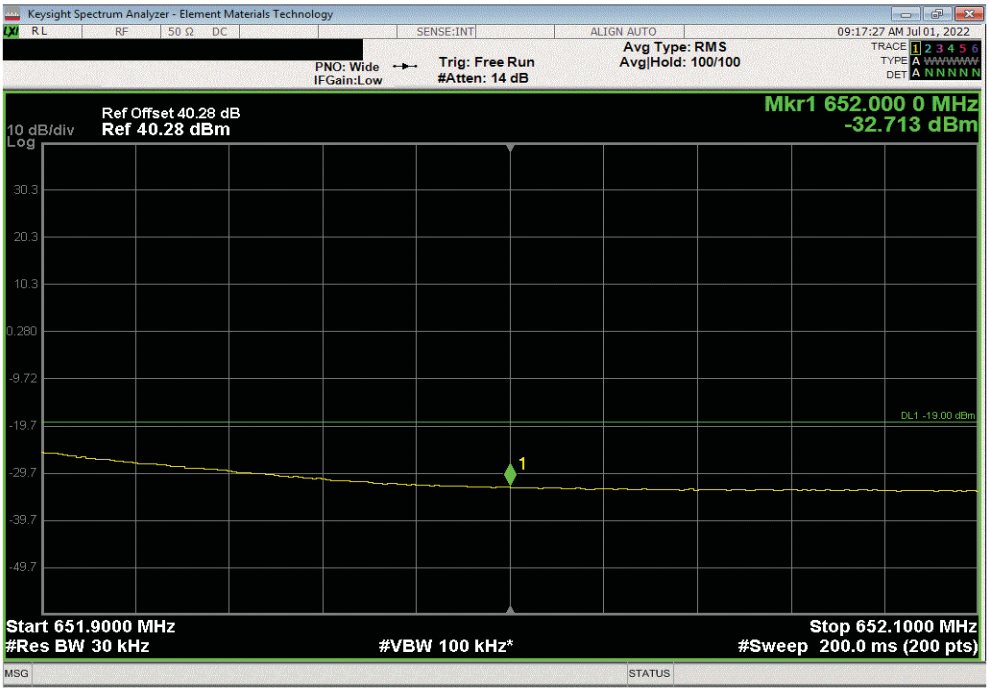
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Low Ch. 622 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-33.91	-19	Pass



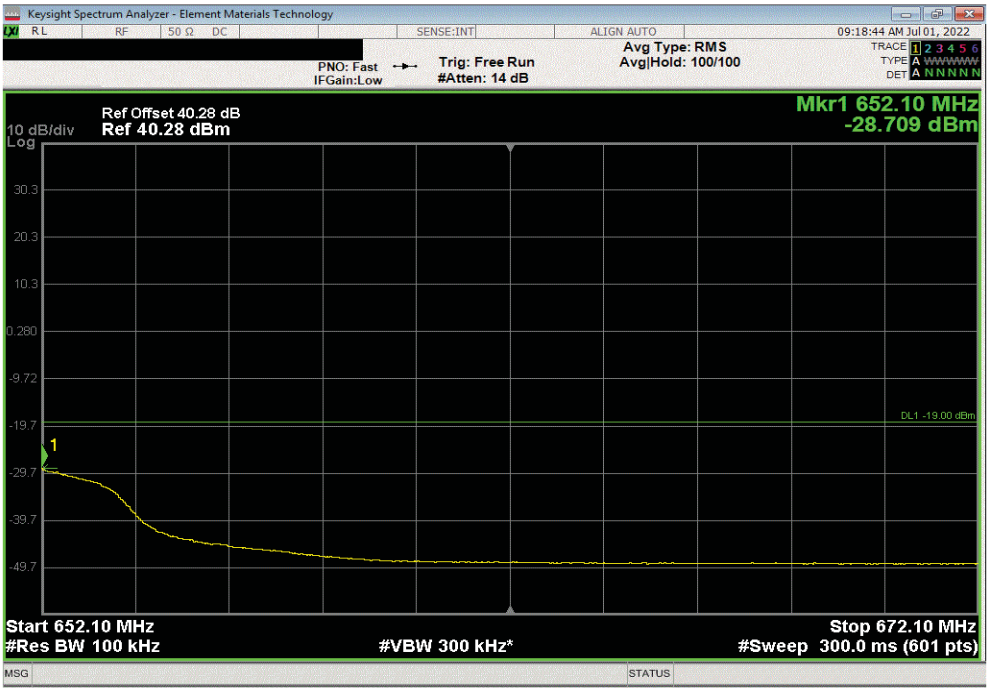
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Low Ch. 622 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-29.74	-19	Pass



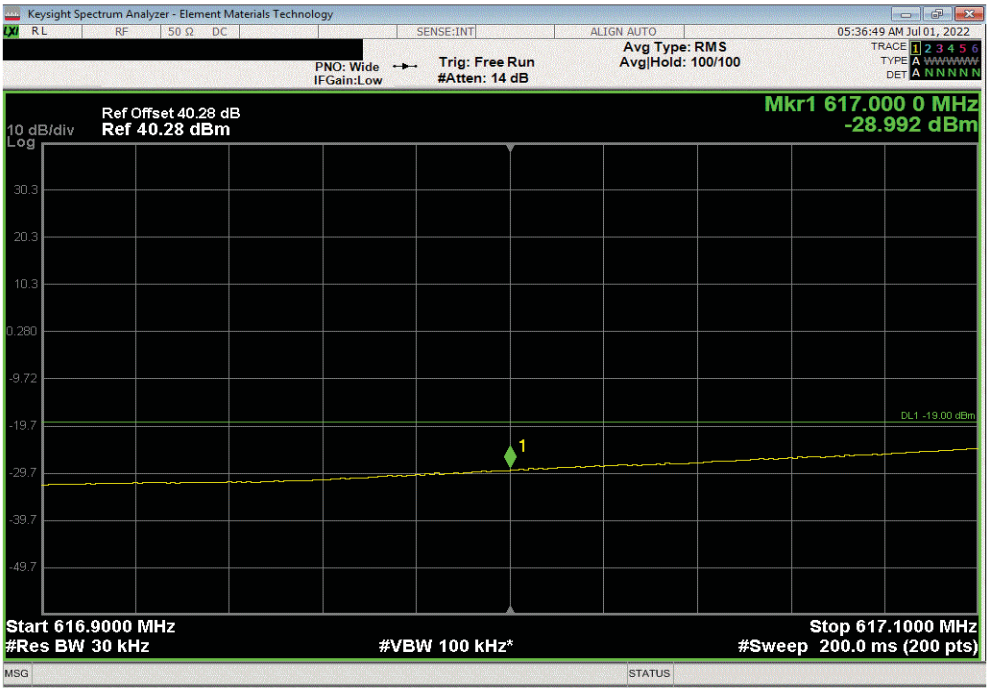
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, High Ch. 647 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-32.71	-19	Pass



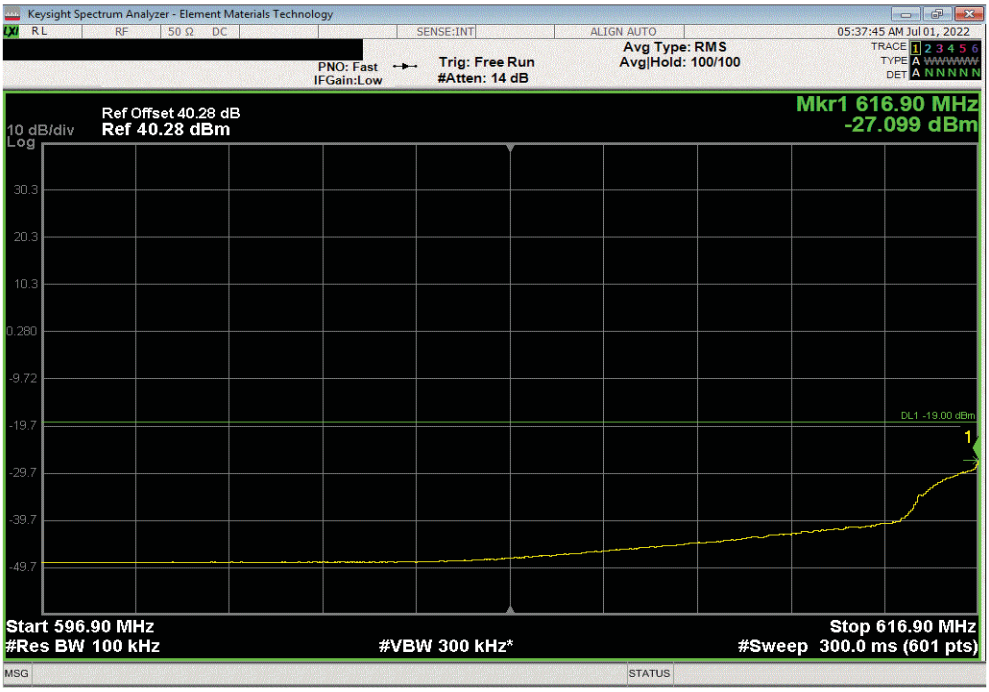
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, High Ch. 647 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-28.71	-19	Pass



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, QPSK Modulation, Low Ch. 624.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-28.99	-19	Pass

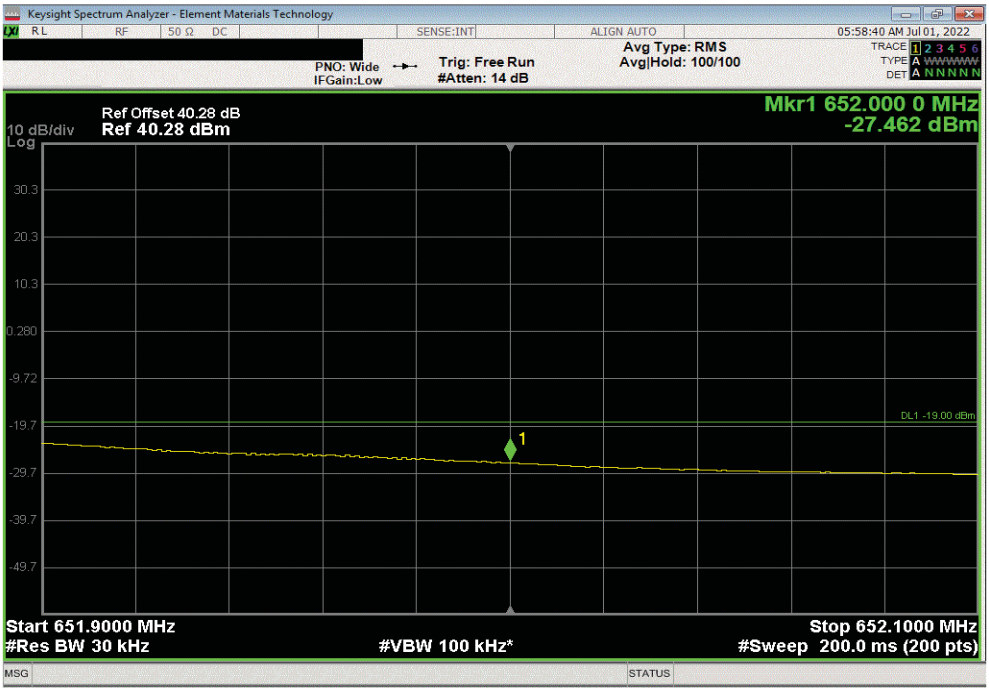


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, QPSK Modulation, Low Ch. 624.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-27.1	-19	Pass



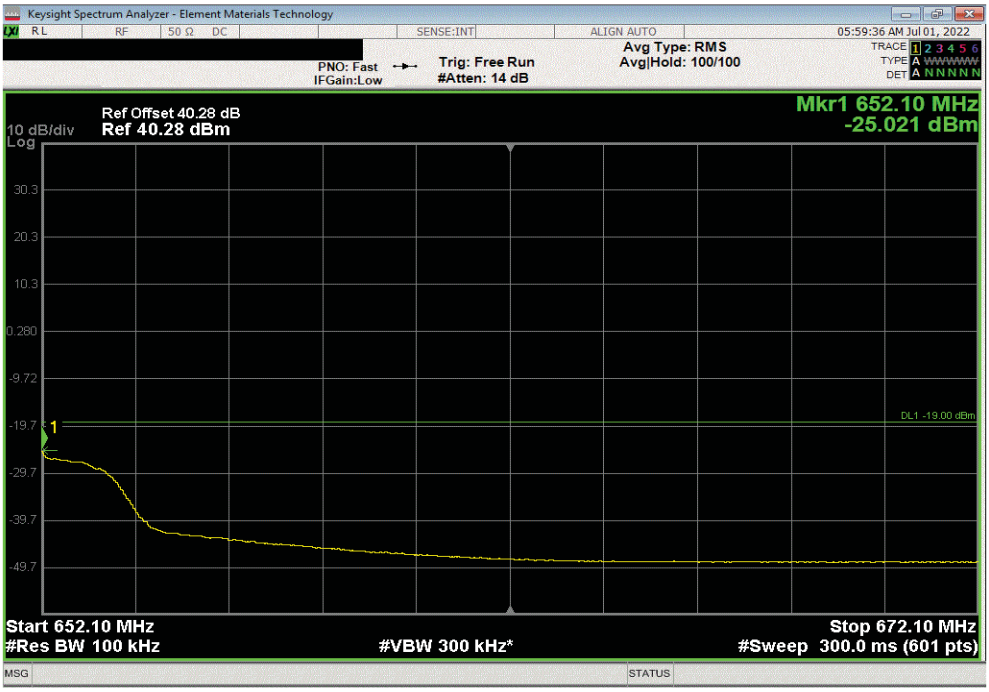
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, QPSK Modulation, High Ch. 644.5 MHz

	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-27.46	-19	Pass



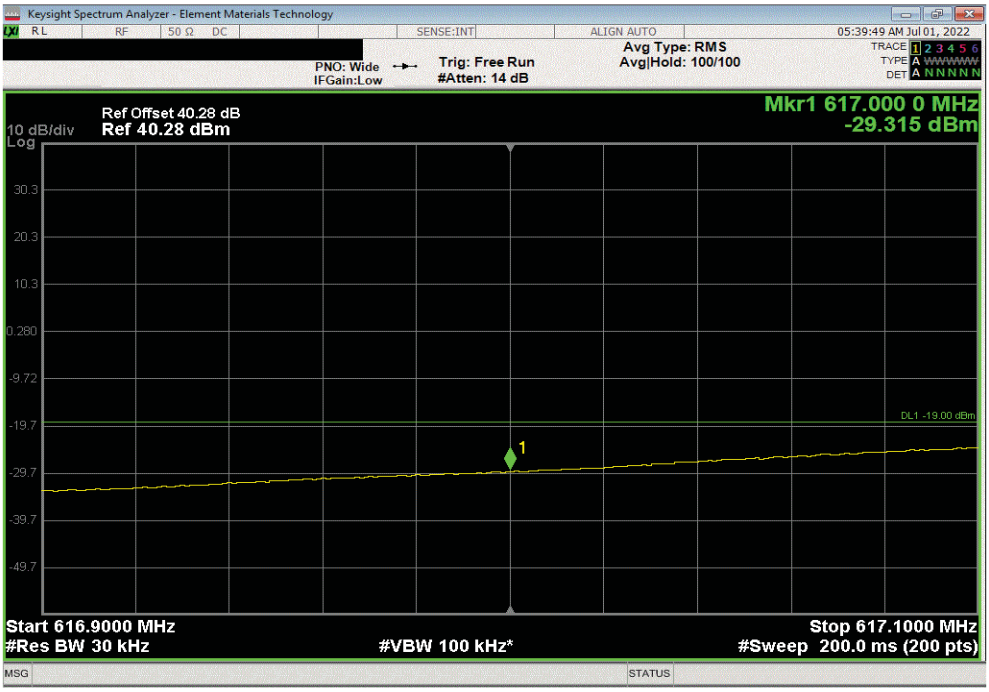
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, QPSK Modulation, High Ch. 644.5 MHz

	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-25.02	-19	Pass



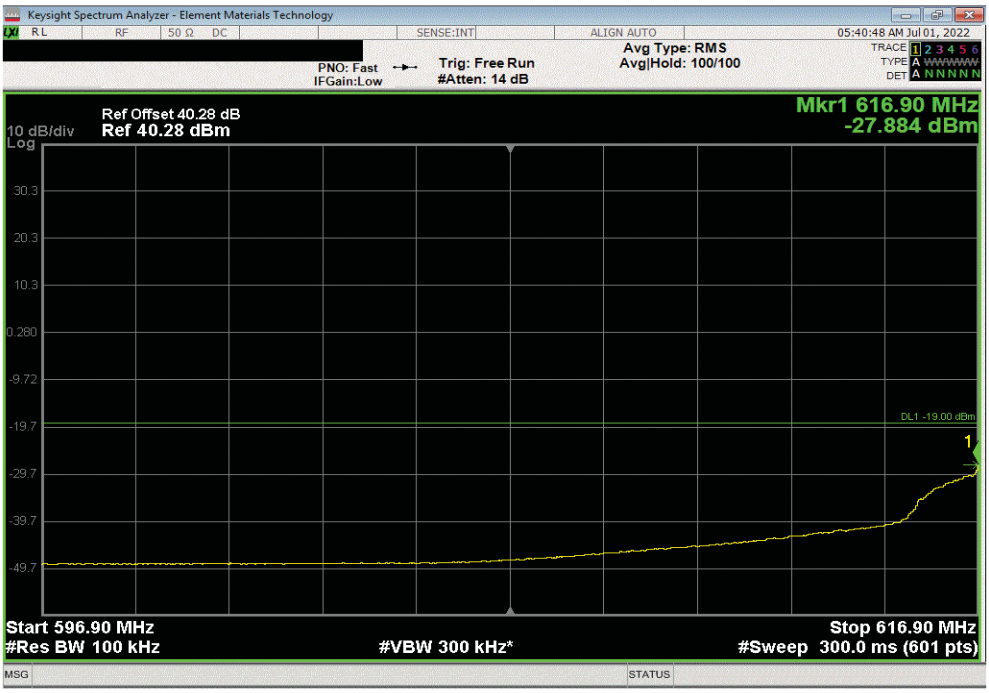
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Low Ch. 624.5 MHz

Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	1			-29.32	-19	Pass

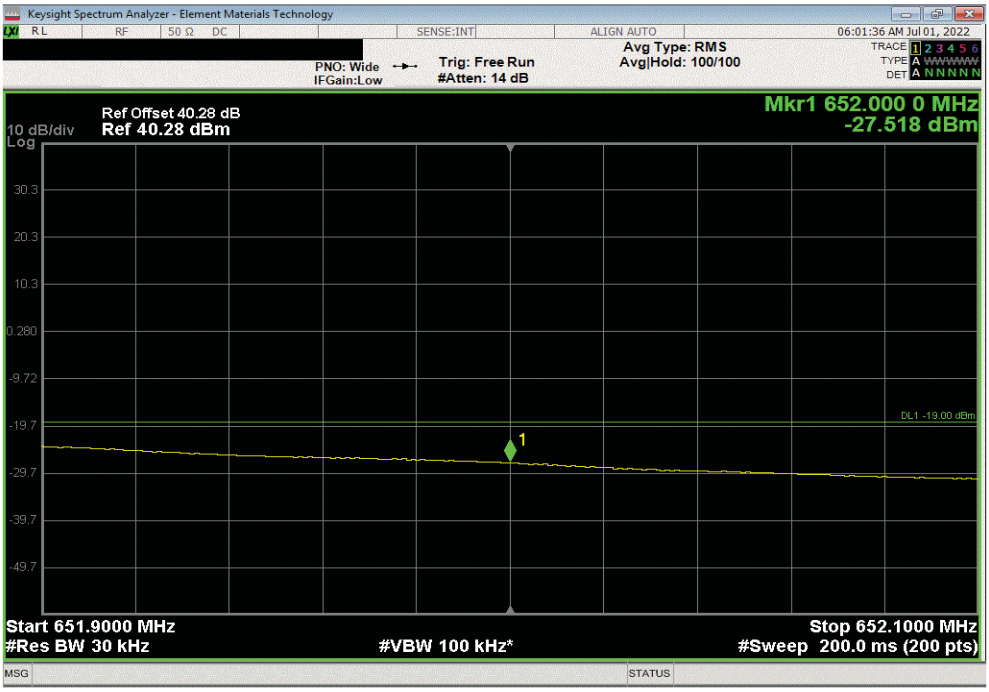


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Low Ch. 624.5 MHz

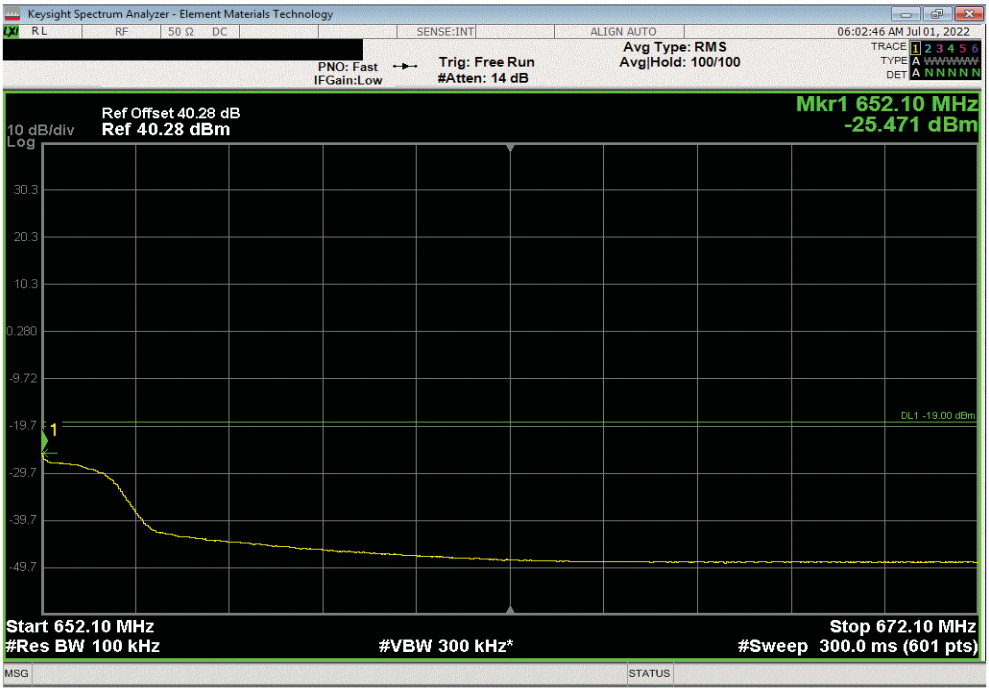
Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	2			-27.88	-19	Pass



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 16-QAM Modulation, High Ch. 644.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-27.52	-19	Pass

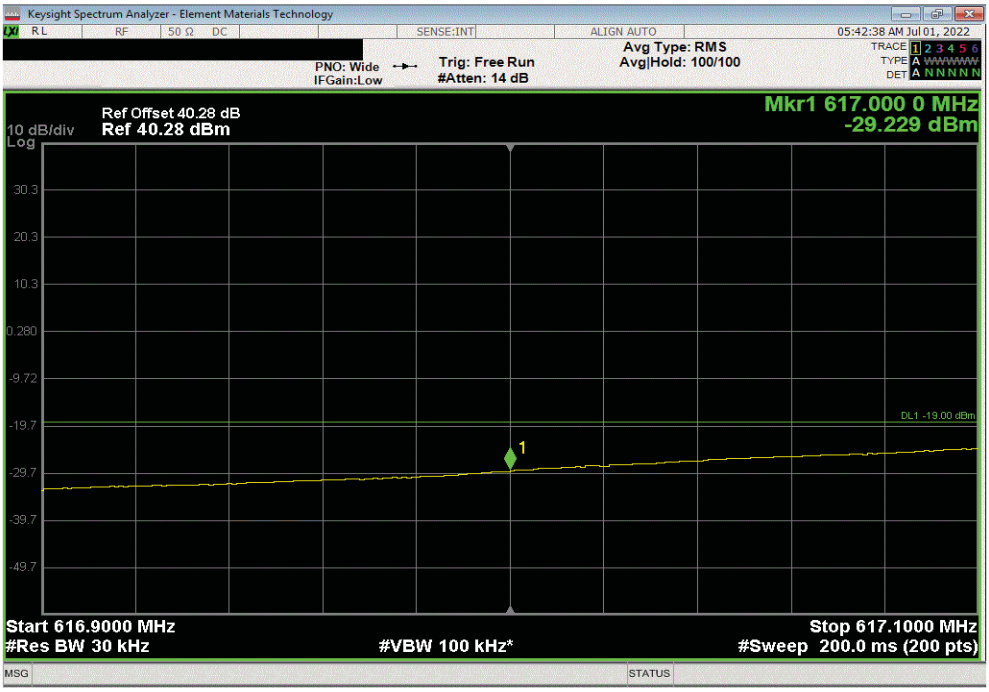


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 16-QAM Modulation, High Ch. 644.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-25.47	-19	Pass



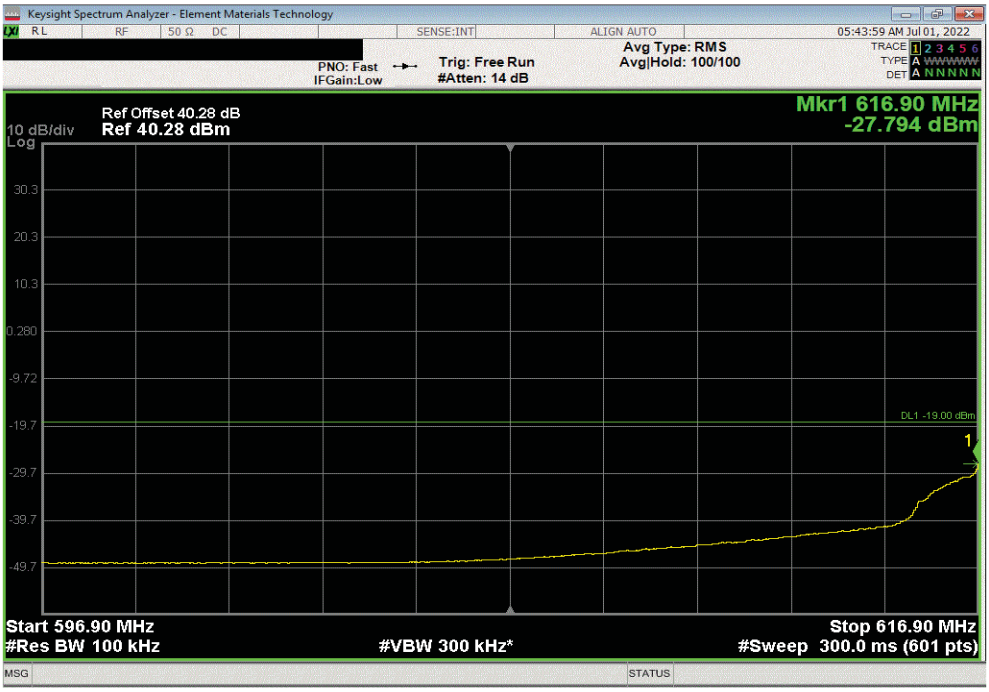
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 64-QAM Modulation, Low Ch. 624.5 MHz

Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	1			-29.23	-19	Pass

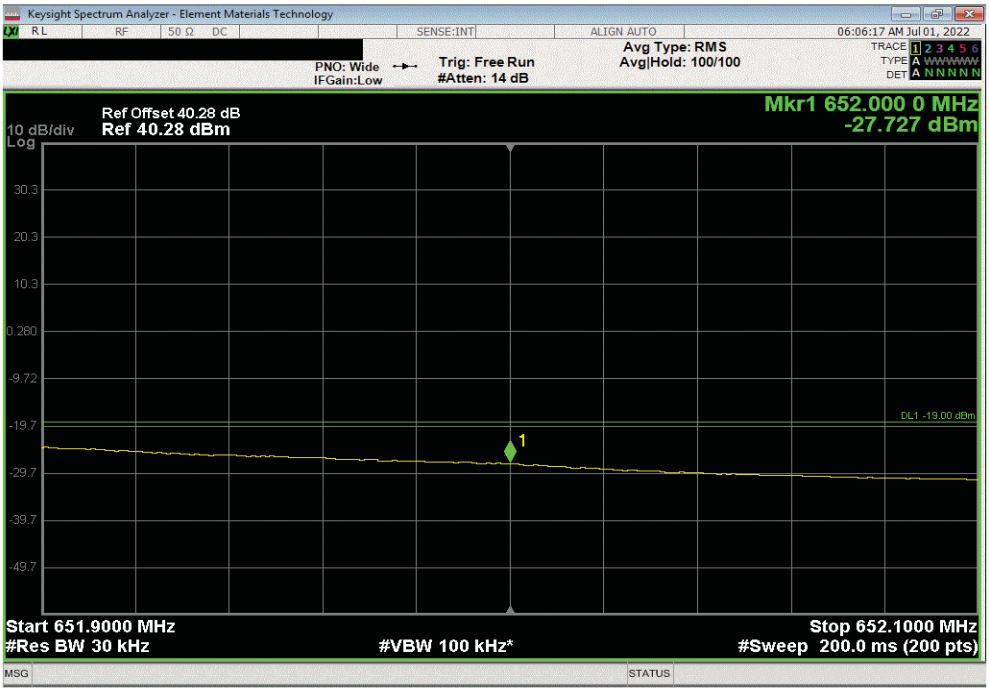


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 64-QAM Modulation, Low Ch. 624.5 MHz

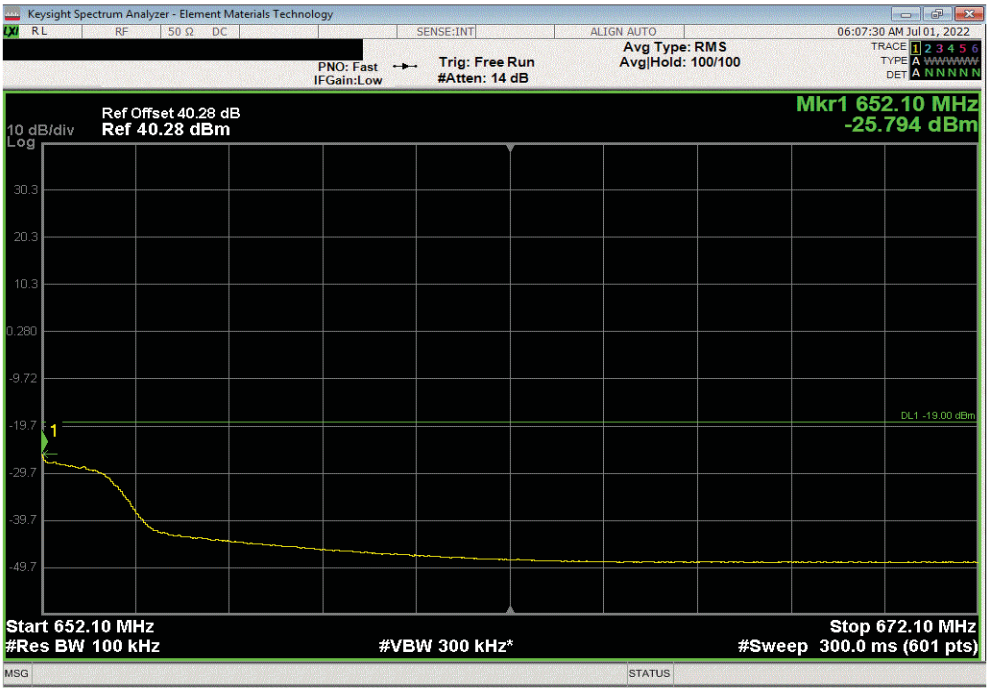
Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	2			-27.79	-19	Pass



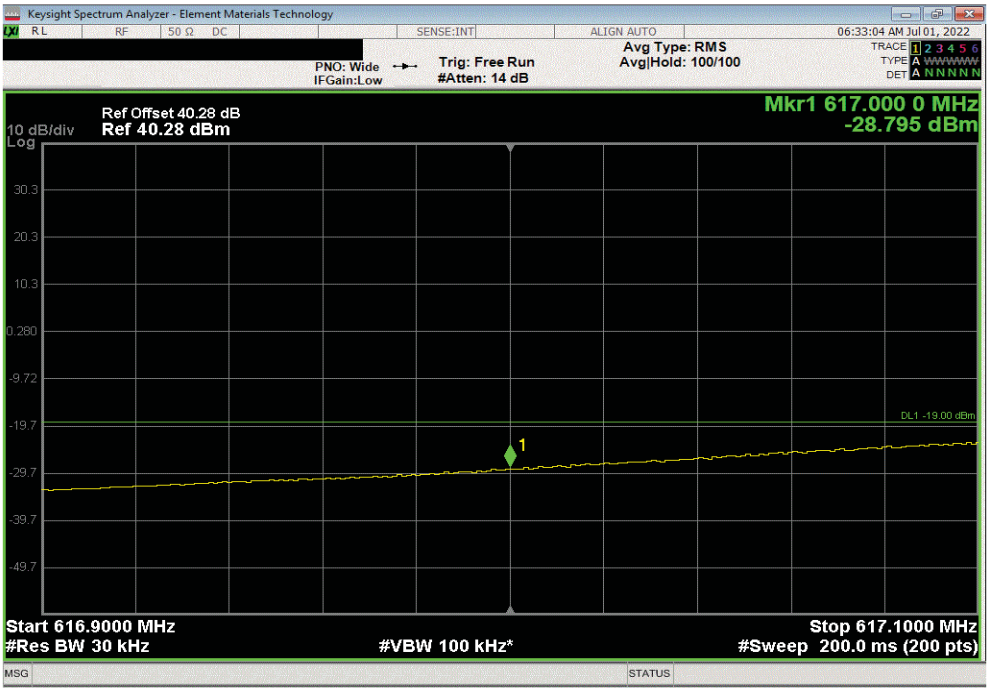
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 64-QAM Modulation, High Ch. 644.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-27.73	-19	Pass



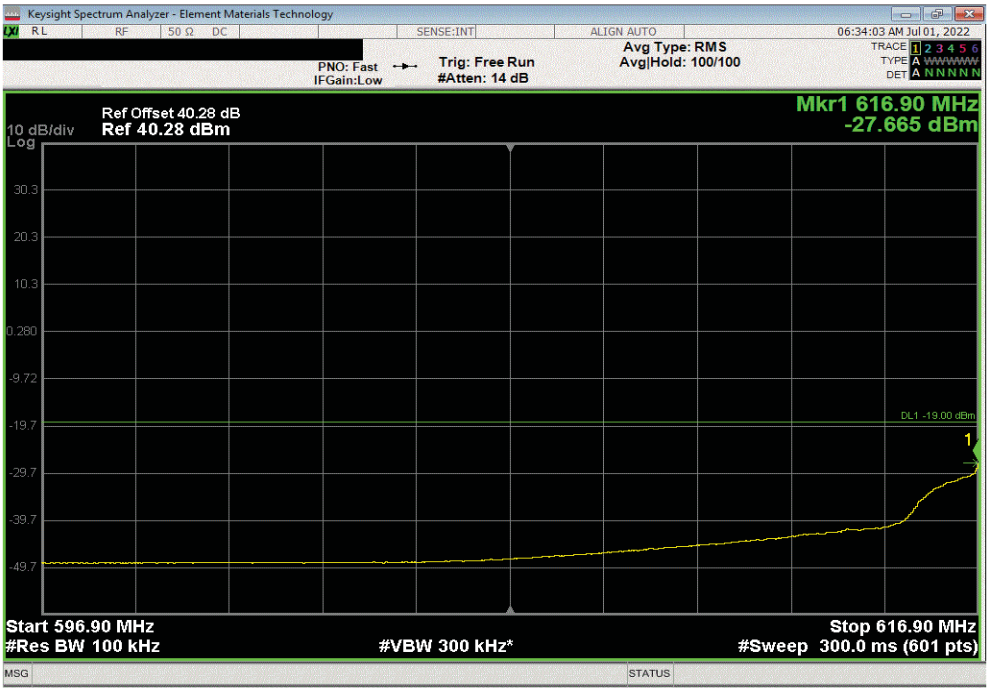
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 64-QAM Modulation, High Ch. 644.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-25.79	-19	Pass



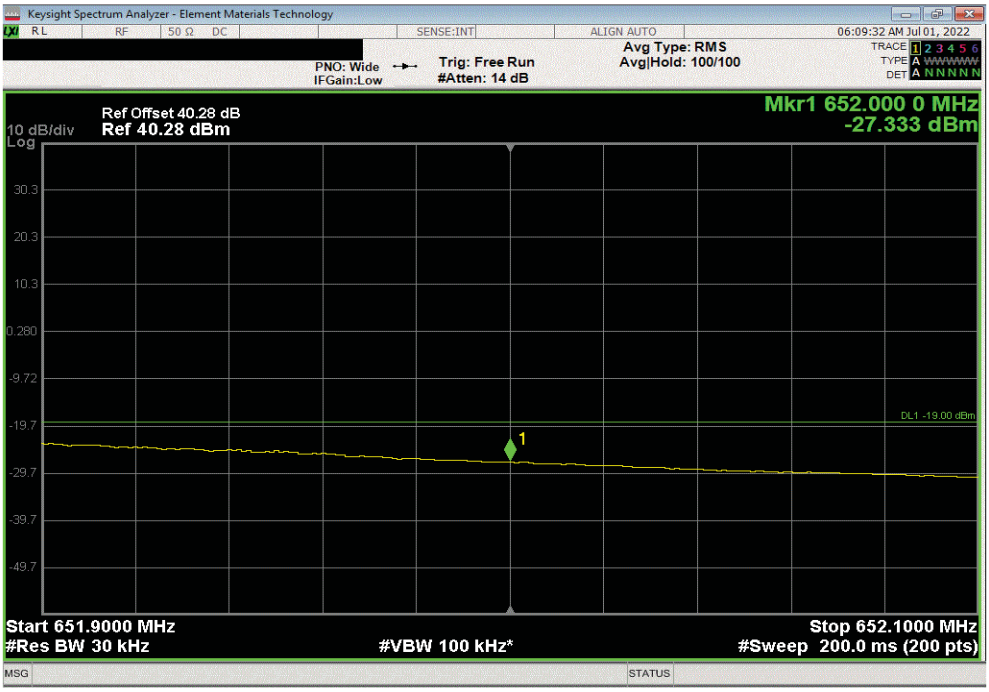
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Low Ch. 624.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-28.8	-19	Pass



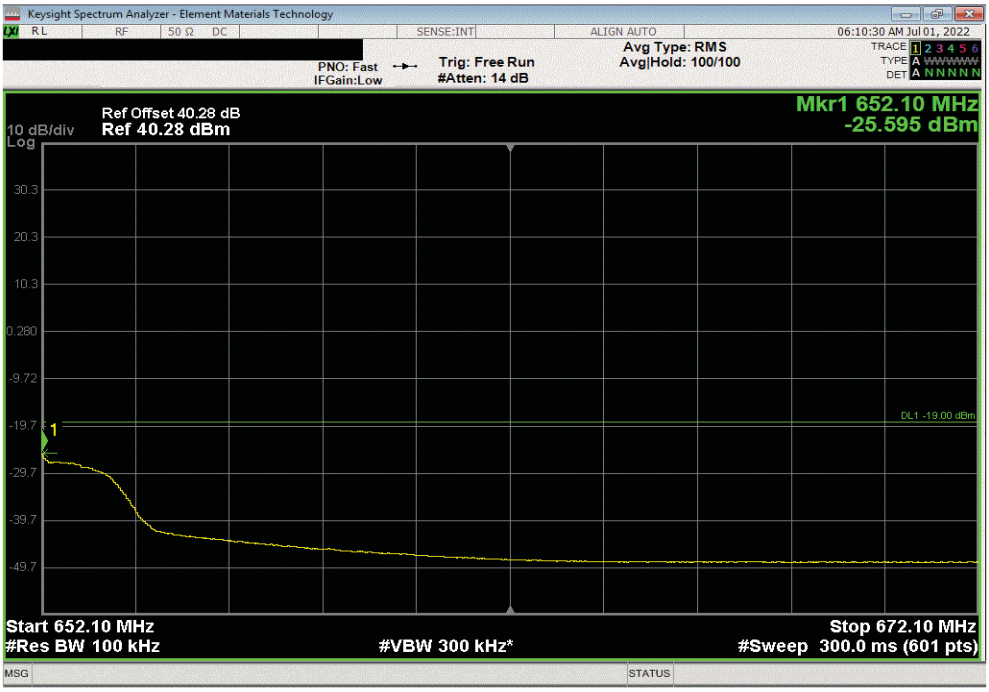
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Low Ch. 624.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-27.67	-19	Pass



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, High Ch. 644.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-27.33	-19	Pass

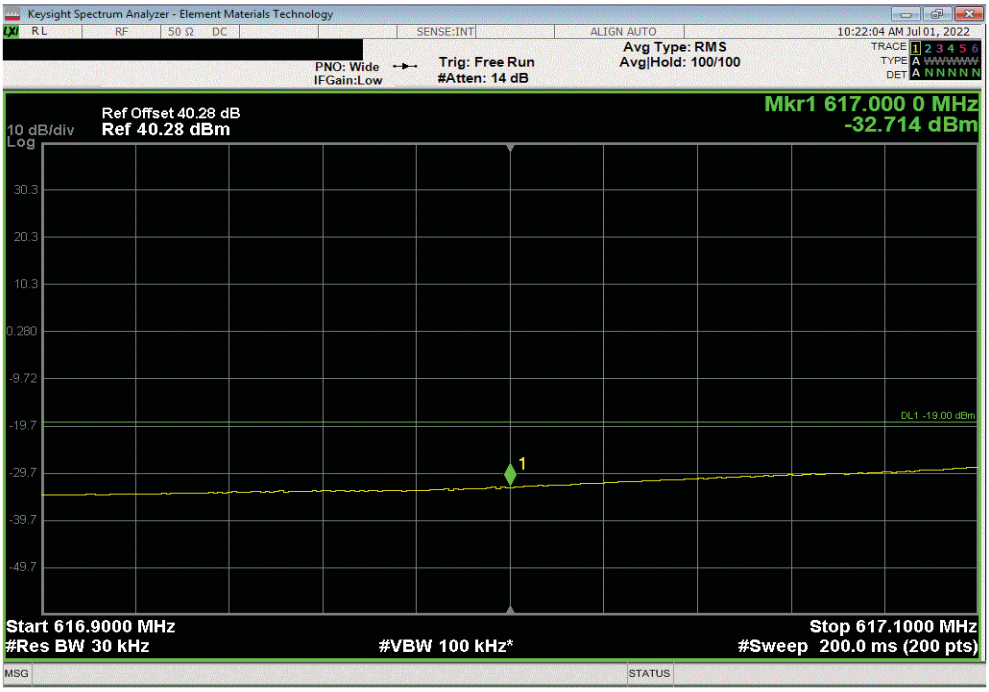


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, High Ch. 644.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-25.6	-19	Pass



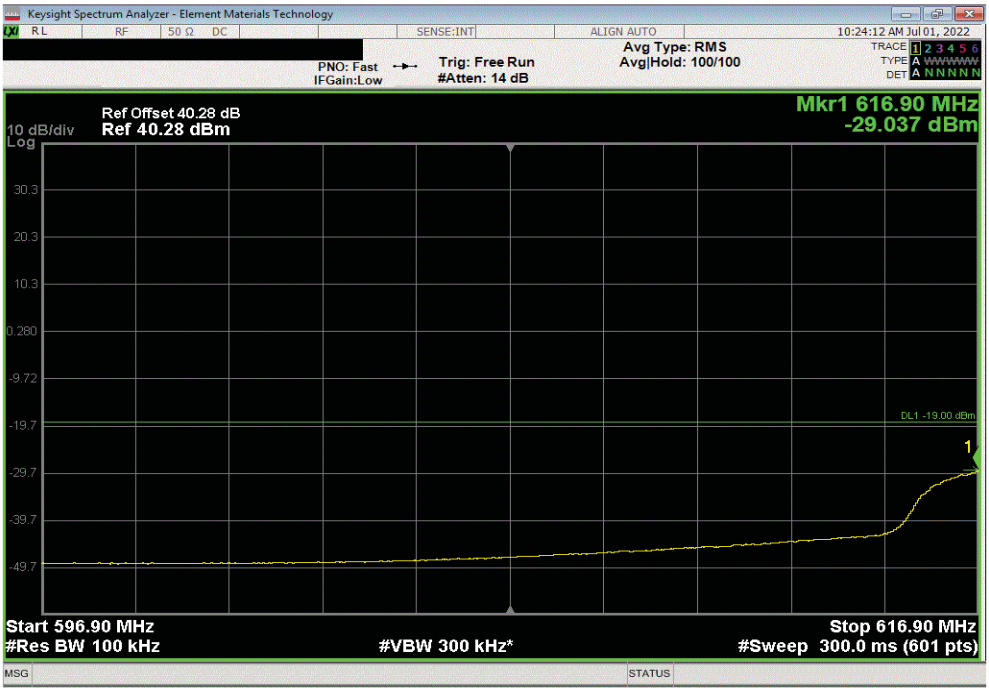
Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, Low Ch. 627 MHz

Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	1			-32.71	-19	Pass

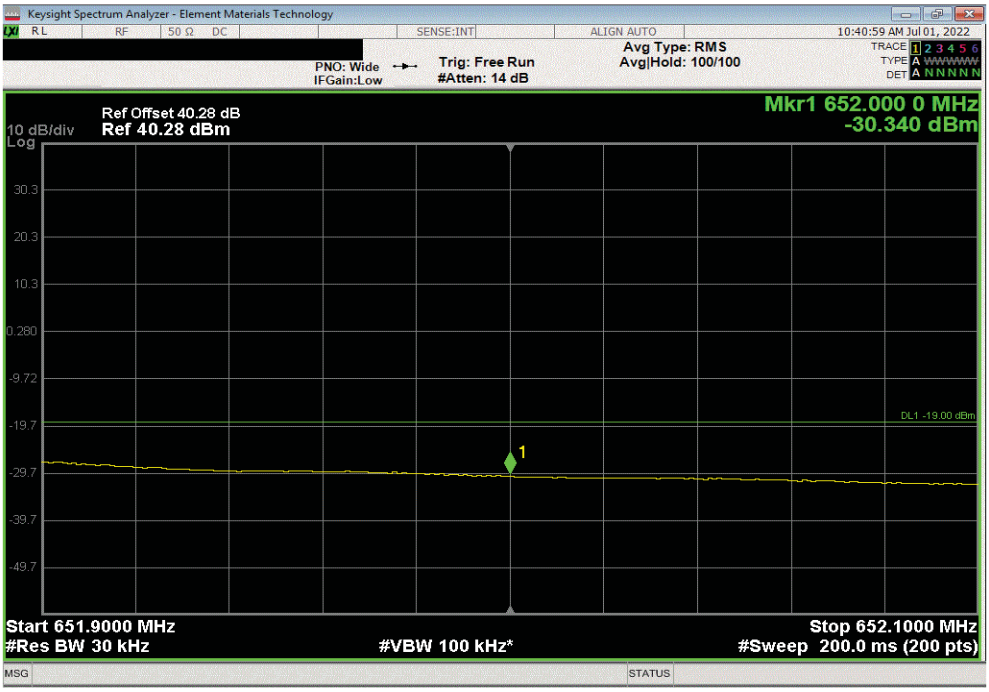


Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, Low Ch. 627 MHz

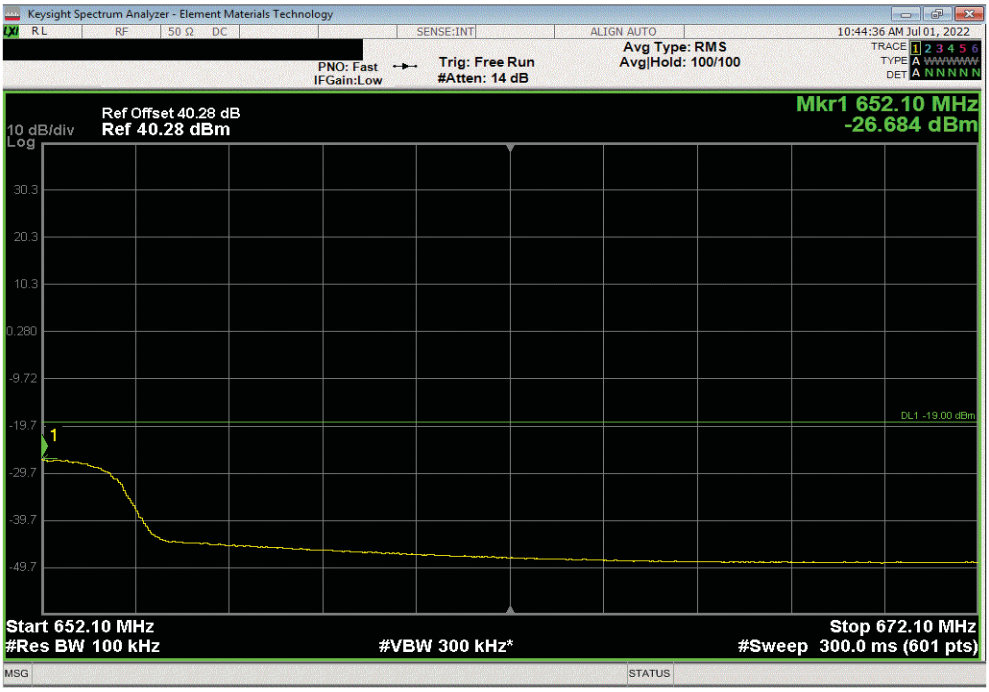
Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	2			-29.04	-19	Pass



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, High Ch. 642 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-30.34	-19	Pass



Port 2, LTE, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, High Ch. 642 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-26.68	-19	Pass



BAND EDGE COMPLIANCE - Band 85 LTE

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.

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

Per 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.

Per FCC 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.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHLOB) as the original certification test. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 2 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraph 5.7.2i.

BAND EDGE COMPLIANCE - Band 85 LTE

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB			Work Order:	NOKI0043
Serial Number:	YK220900029			Date:	12-Jul-22
Customer:	Nokia Solutions and Networks			Temperature:	21.4 °C
Attendees:	Mitchell Hill, John Rattanavong			Humidity:	54% RH
Project:	None			Barometric Pres.:	1015 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
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. The carriers were enabled at maximum power.

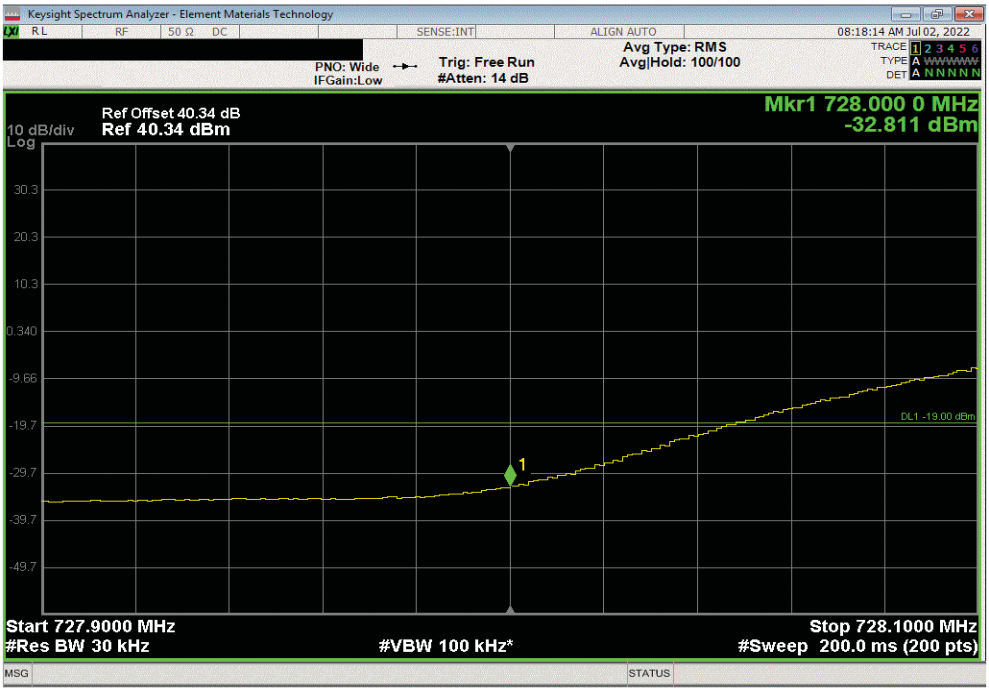
DEVIATIONS FROM TEST STANDARD

None

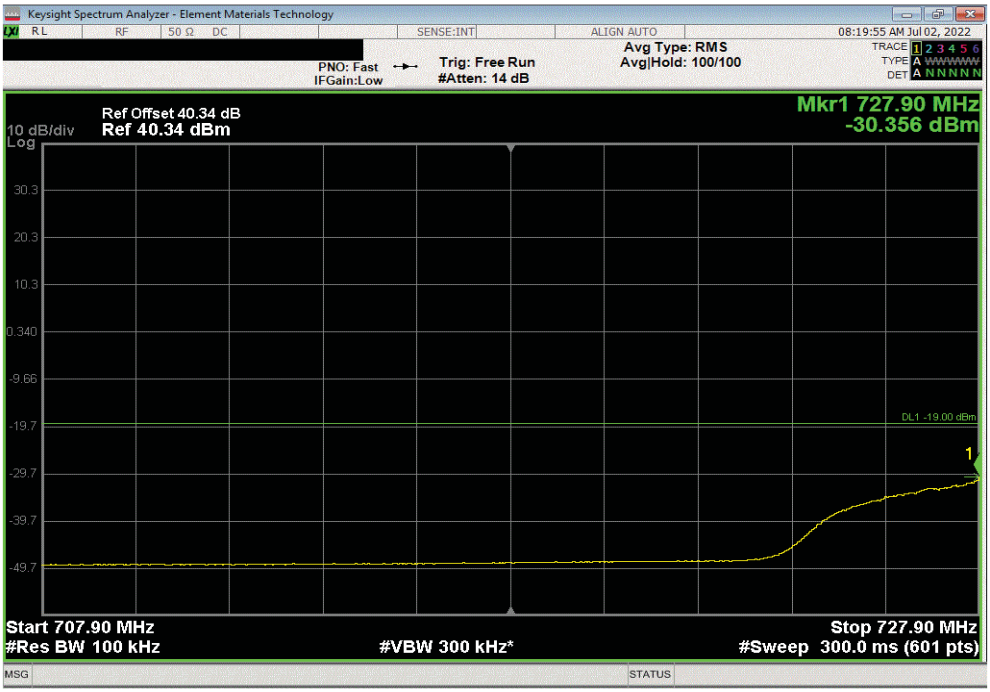
Configuration #	2	Signature

		Frequency Range	Max Value (dBm)	Limit < (dBm)	Result
Port 2, LTE, Band 85, 728 MHz - 746 MHz					
5 MHz Bandwidth					
256-QAM Modulation					
	Low Ch. 730.5 MHz	1	-32.81	-19	Pass
	Low Ch. 730.5 MHz	2	-30.36	-19	Pass
	High Ch. 743.5 MHz	1	-32.83	-19	Pass
	High Ch. 743.5 MHz	2	-29.76	-19	Pass
10 MHz Bandwidth					
256-QAM Modulation					
	Low Ch. 733 MHz	1	-33.78	-19	Pass
	Low Ch. 733 MHz	2	-30	-19	Pass
	High Ch. 741 MHz	1	-34.21	-19	Pass
	High Ch. 741 MHz	2	-31.45	-19	Pass
15 MHz Bandwidth					
QPSK Modulation					
	Low Ch. 735.5 MHz	1	-27.5	-19	Pass
	Low Ch. 735.5 MHz	2	-26.49	-19	Pass
	High Ch. 738.5 MHz	1	-28.5	-19	Pass
	High Ch. 738.5 MHz	2	-27.82	-19	Pass
16-QAM Modulation					
	Low Ch. 735.5 MHz	1	-28.33	-19	Pass
	Low Ch. 735.5 MHz	2	-26.62	-19	Pass
	High Ch. 738.5 MHz	1	-29.19	-19	Pass
	High Ch. 738.5 MHz	2	-28.88	-19	Pass
64-QAM Modulation					
	Low Ch. 735.5 MHz	1	-28.35	-19	Pass
	Low Ch. 735.5 MHz	2	-26.44	-19	Pass
	High Ch. 738.5 MHz	1	-29.07	-19	Pass
	High Ch. 738.5 MHz	2	-28.14	-19	Pass
256-QAM Modulation					
	Low Ch. 735.5 MHz	1	-27.86	-19	Pass
	Low Ch. 735.5 MHz	2	-26.29	-19	Pass
	High Ch. 738.5 MHz	1	-28.99	-19	Pass
	High Ch. 738.5 MHz	2	-28.19	-19	Pass

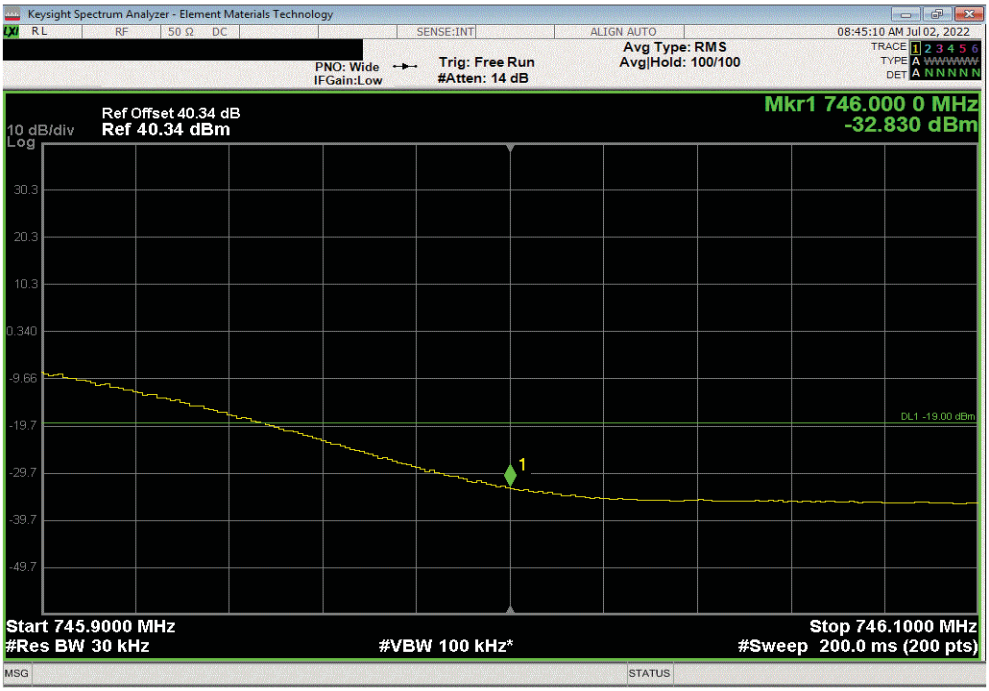
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 730.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-32.81	-19	Pass



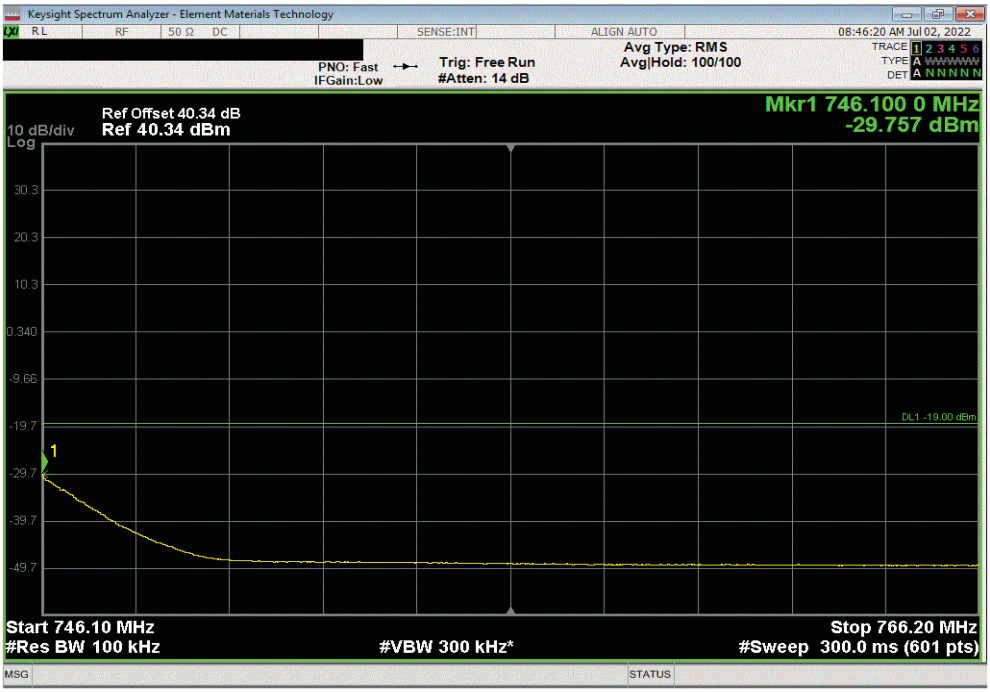
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 730.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-30.36	-19	Pass



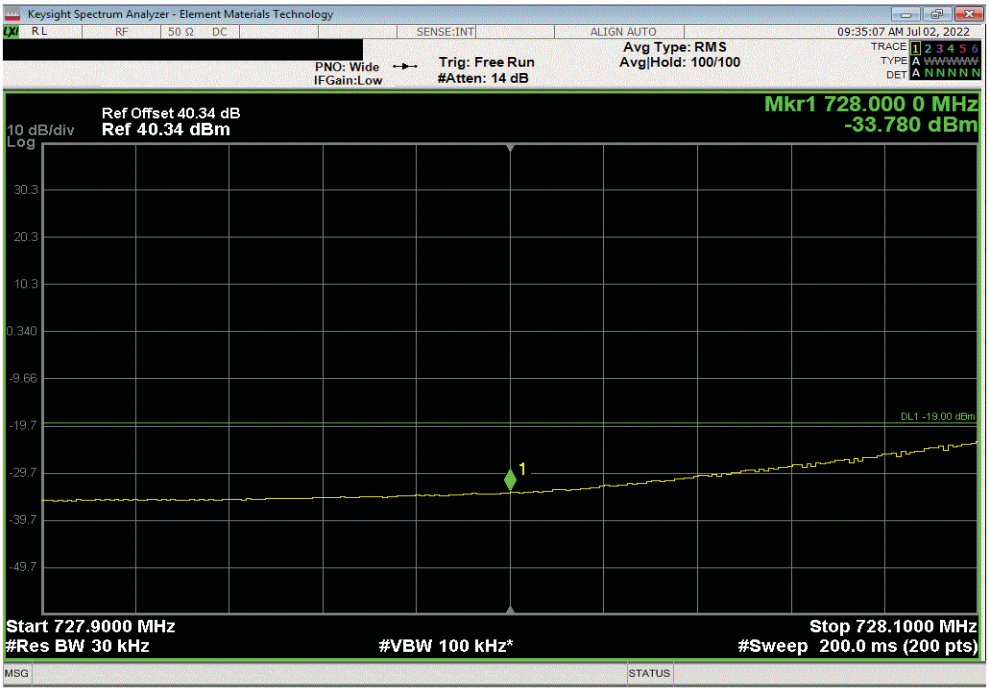
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 743.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-32.83	-19	Pass



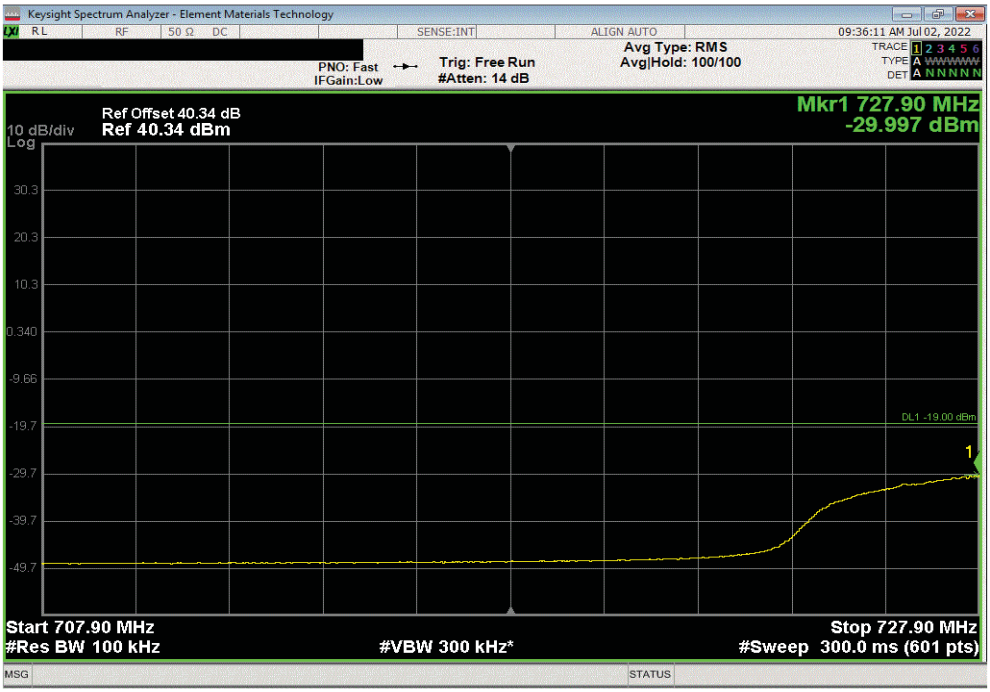
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 743.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-29.76	-19	Pass



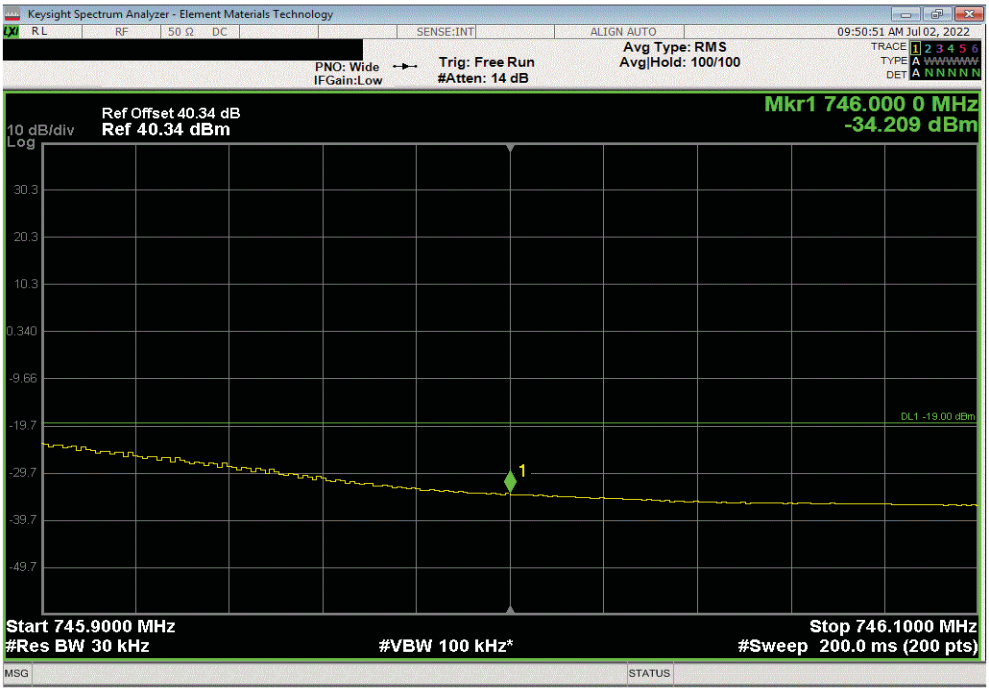
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Low Ch. 733 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-33.78	-19	Pass



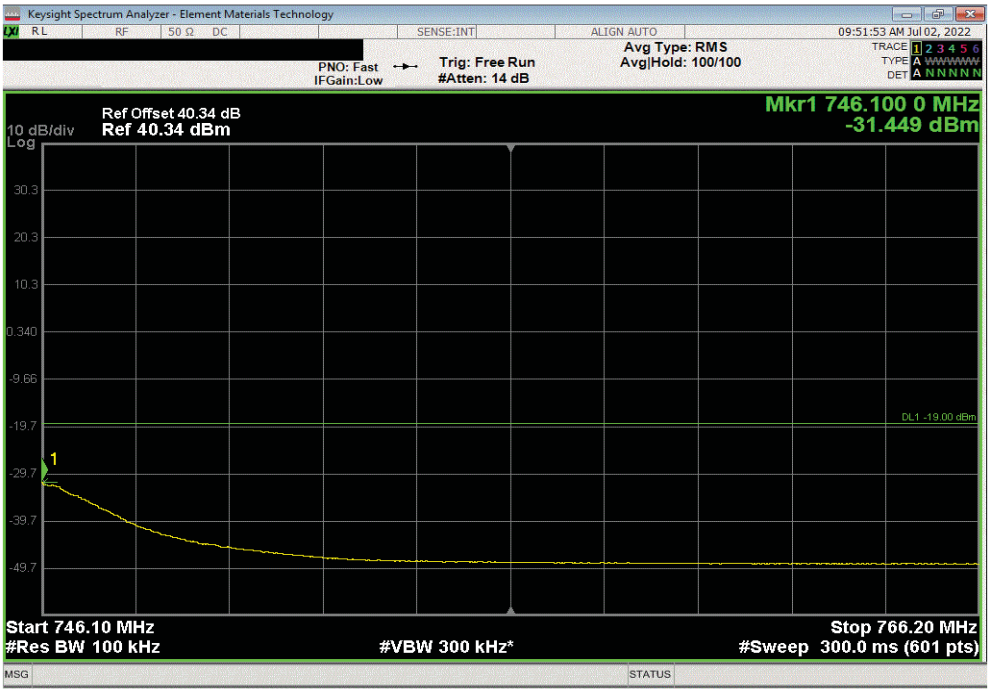
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Low Ch. 733 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-30	-19	Pass



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, High Ch. 741 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-34.21	-19	Pass

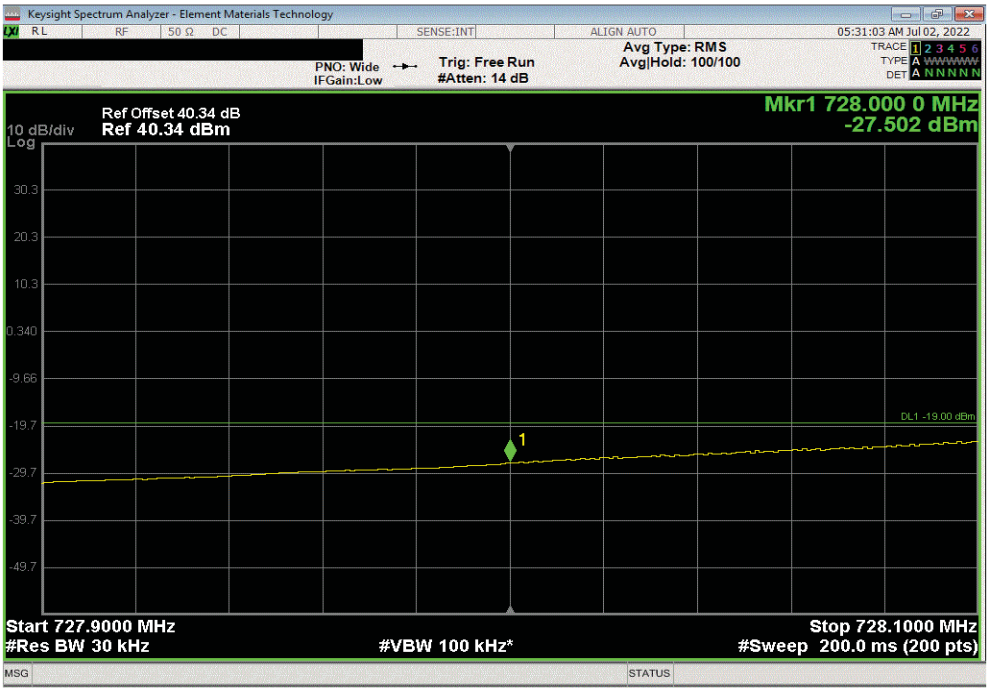


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, High Ch. 741 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-31.45	-19	Pass



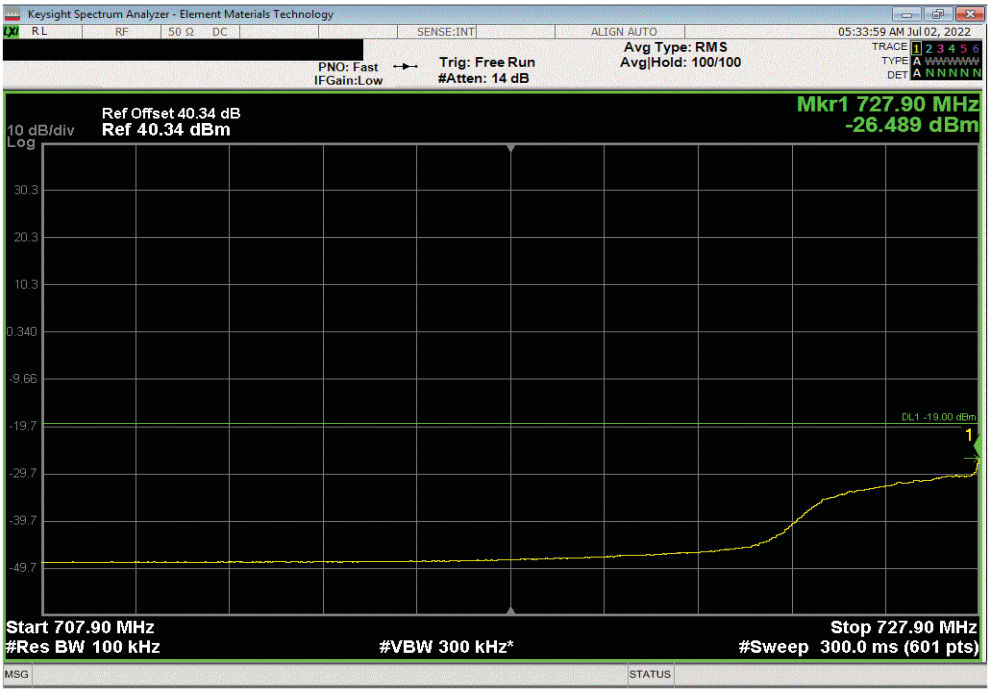
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, QPSK Modulation, Low Ch. 735.5 MHz

Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	1			-27.5	-19	Pass



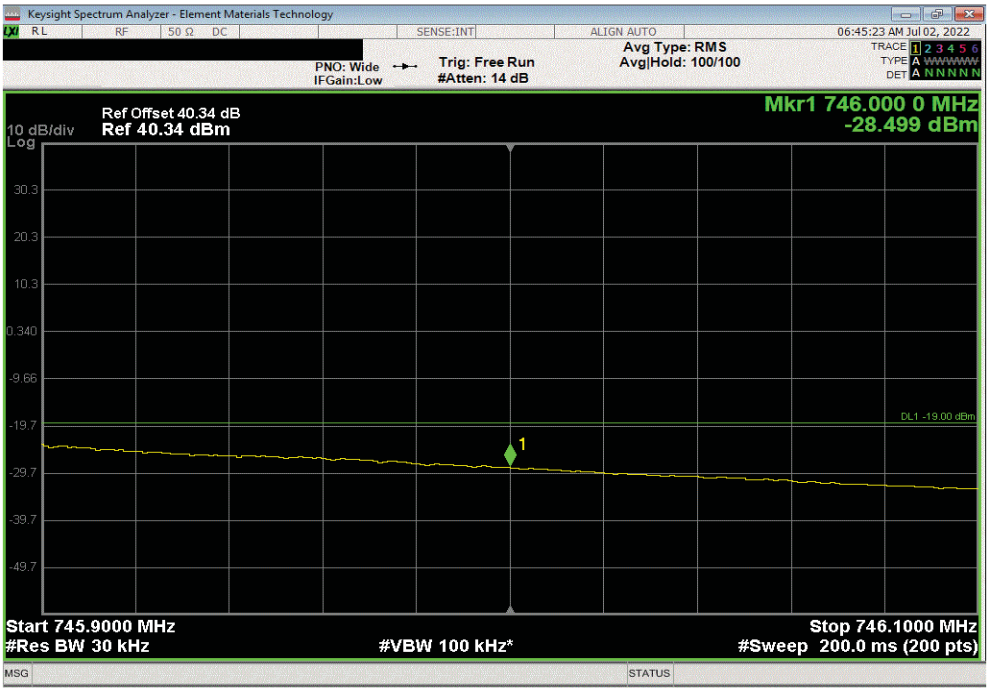
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, QPSK Modulation, Low Ch. 735.5 MHz

Frequency Range				Max Value (dBm)	Limit < (dBm)	Result
	2			-26.49	-19	Pass



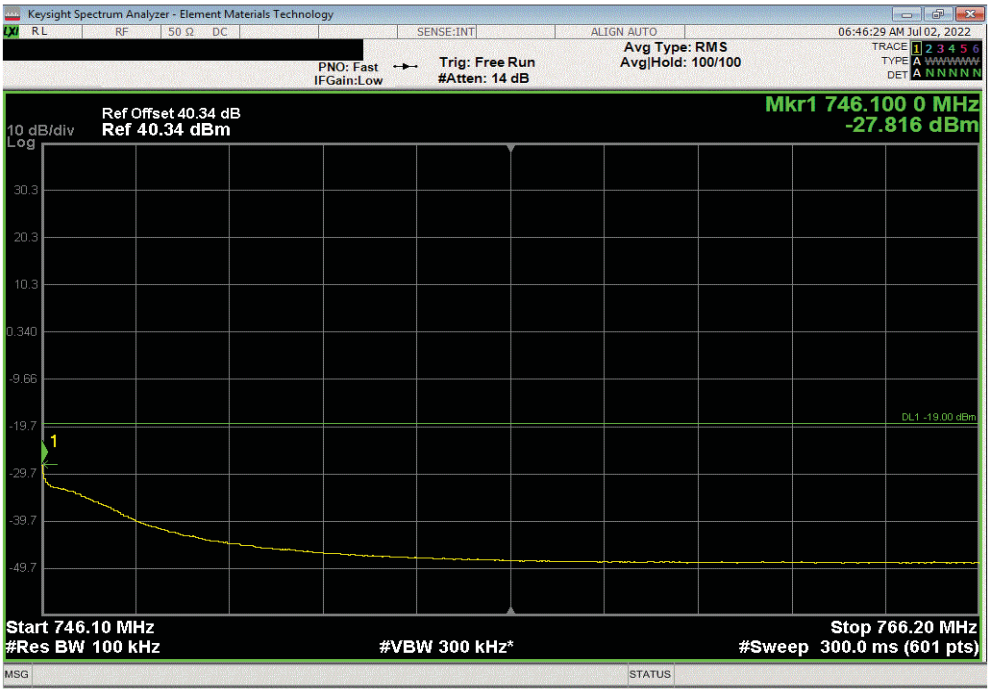
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, QPSK Modulation, High Ch. 738.5 MHz

	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-28.5	-19	Pass

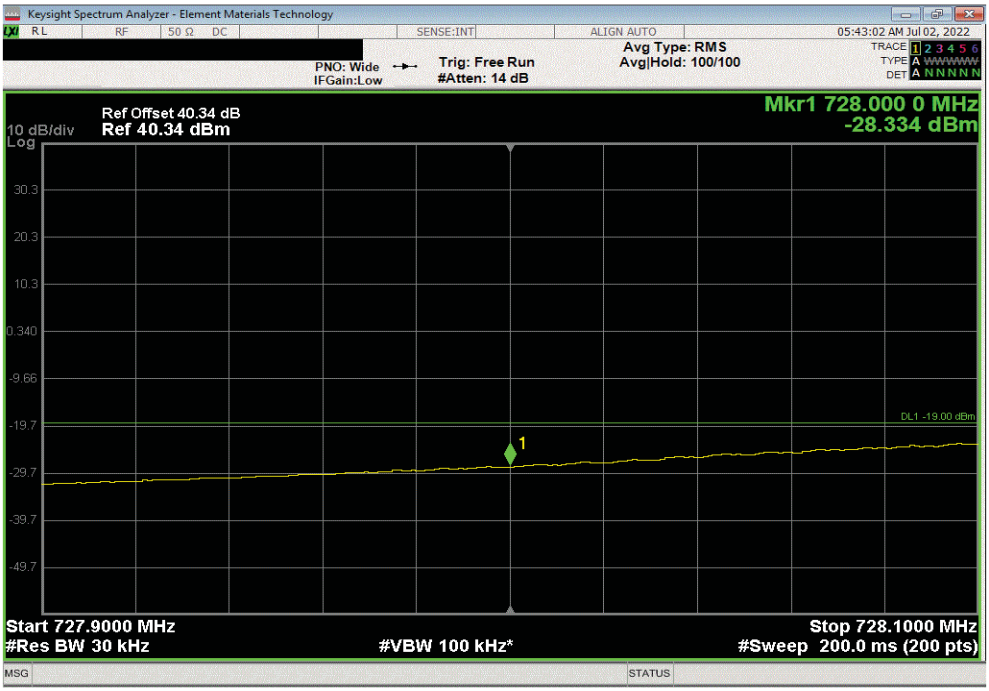


Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, QPSK Modulation, High Ch. 738.5 MHz

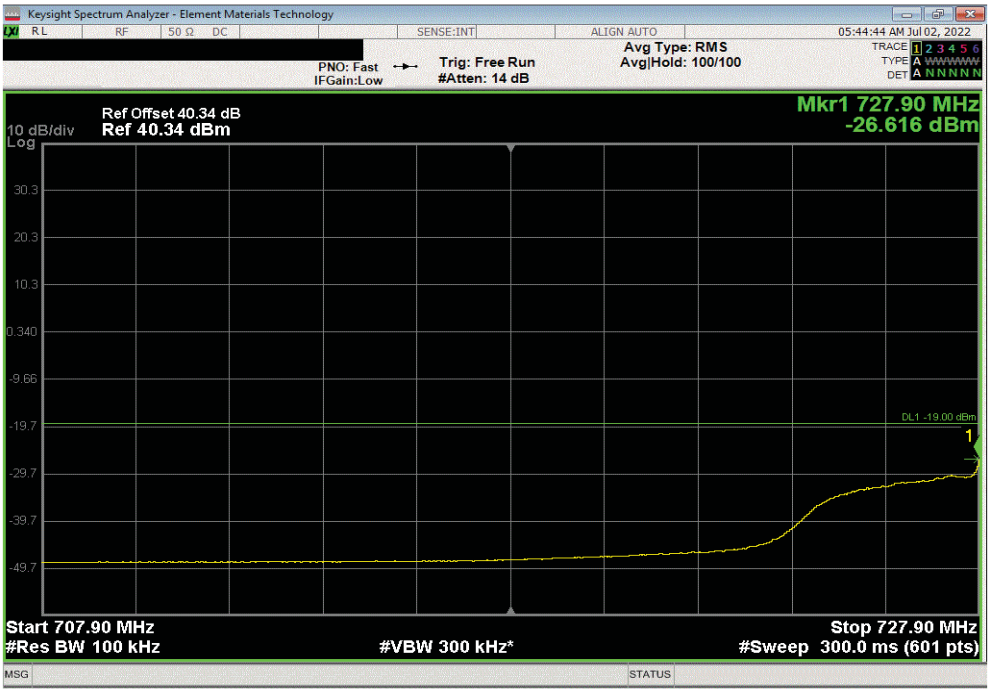
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-27.82	-19	Pass



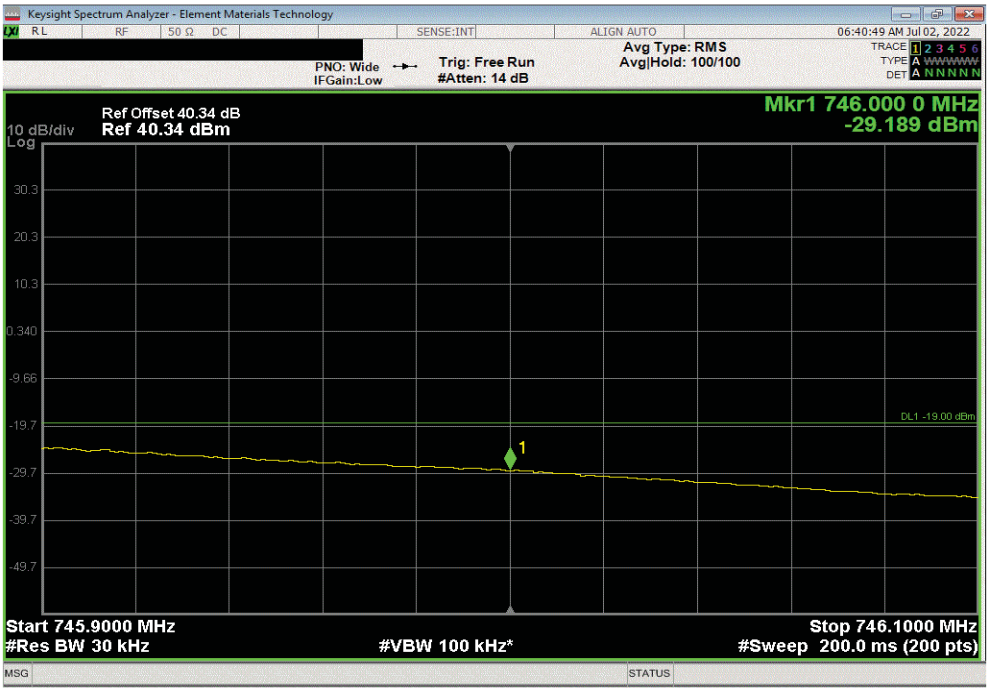
Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Low Ch. 735.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-28.33	-19	Pass



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Low Ch. 735.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-26.62	-19	Pass



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 16-QAM Modulation, High Ch. 738.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	1			-29.19	-19	Pass



Port 2, LTE, Band 85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 16-QAM Modulation, High Ch. 738.5 MHz						
	Frequency Range			Max Value (dBm)	Limit < (dBm)	Result
	2			-28.88	-19	Pass