AVERAGE POWER - MULTIBAND MULTICARRIER

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

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurements. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1/D)], where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times.

RF conducted emissions testing was performed only on one port. The AHLOB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown during 4 port output power testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

Multicarrier test cases have been developed as shown below:
Notes: Max port power (80watts is shared between Bands n71/n85)

Multi-Carrier Test Case 1): 3GPP Band n71 Multicarrier In the Band n71 _Three NR5 carriers using two carriers (with minimum spacing between carrier frequencies) at the lower band edge (619.5 & 624.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (649.5MHz) at the upper band edge. The NR 5Mhz channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power for a total port power of 80 watts (~26.6W/Band n71 carriers). 3GPP Band n85 carrier is not enable.

Multi-Carrier Test Case 2): 3GPP Band n71 Multicarrier: In the Band n71 _ One NR 20MHz carriers and one NR 15MHz carriers (with minimum spacing between carrier frequencies) at the lower band edge (627.0 & 644.5MHz). The largest channel bandwidth is selected to maximize carrier OBW. The carriers are operated at maximum power for a total port power of 80 watts (~40W/Band n71 carriers). 3GPP Band n85 carrier is not enable.

Multi-Carrier Test Case 3): 3GPP Band n85 Multicarrier In the Band n85 _Two NR5 carriers using two carriers (with maximum spacing between carrier frequencies) at the lower band edge (730.5MHz) and a second carrier at maximum spacing at the upper band edge (743.5MHz). The NR5 channel bandwidth was selected to maximize carrier power spectral density. The carriers are operated at maximum power for a total port power of 80 watts (~40W/Band n85 carrier). 3GPP Band n71 carrier is not enable.

Multi-Carrier Test Case 4): 3GPP Band n71 and Band n85 Multicarrier Multiband: Three NR 5MHz carriers using two carriers (with minimum spacing between carrier frequencies) at the Band n71 lower band edge (619.5 & 624.5MHz) and a third carrier with maximum spacing between the other two carrier frequencies (743.5MHz) at the Band n85 upper band edge. The smallest channel bandwidth was selected to maximize carrier power spectral density. The carriers were operated at maximum power (~26.6/ Band n71 carrier and ~26.6W Band n85 carrier) for a total port power of 80 watts.

AVERAGE POWER - MULTIBAND MULTICARRIER

element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB (FCC/ISED)	Work Order:	NOKI0042
Serial Number:	YK220900026	Date:	23-Jun-22
Customer:	Nokia Solutions and Networks	Temperature:	21.5 °C
Attendees:	David Le, John Rattanavong	Humidity:	55.2% RH
Project:	None	Barometric Pres.:	1020 mbar
Tested by:	Brandon Hobbs	Job Site:	TX07
Power:	54 VDC		

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. P5G NR Band n71 / Band n85 carriers were operating at maximum power in each applicable test case to achieve a total port power of 80 watts. The following is the output power measurements at the radio's single output port.

DEVIATIONS FROM TEST STANDARD

None

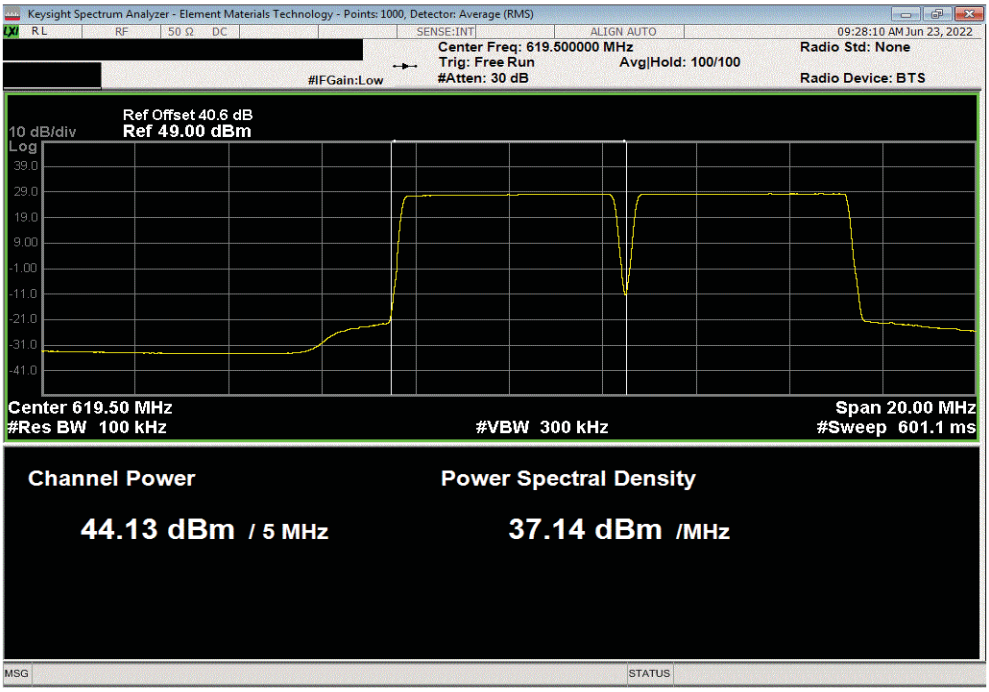
Configuration #	2	Signature

	Avg Cond Initial Pwr (dBm)	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
5G NR, Multicarrier Multiband							
Port 1							
QPSK Modulation							
Test Case 1, NR5 Carrier 1, 619.5 MHz	44.130	0	44.1	N/A	N/A	Within Tolerance	Pass
Test Case 1, NR5 Carrier 2, 624.5 MHz	44.425	0	44.4	N/A	N/A	Within Tolerance	Pass
Test Case 1, NR5 Carrier 3, 649.5 MHz	44.072	0	44.1	N/A	N/A	Within Tolerance	Pass
Test Case 2, NR20 Carrier 1, 627 MHz	46.283	0	46.3	N/A	N/A	Within Tolerance	Pass
Test Case 2, NR15 Carrier 2, 644.5 MHz	46.023	0	46.0	N/A	N/A	Within Tolerance	Pass
Test Case 3, NR5 Carrier 1, 730.5 MHz	45.729	0	45.7	N/A	N/A	Within Tolerance	Pass
Test Case 3, NR5 Carrier 2, 743.5 MHz	45.625	0	45.6	N/A	N/A	Within Tolerance	Pass
Test Case 4, NR5 n85 Carrier 1, 743.5 MHz	43.897	0	43.9	N/A	N/A	Within Tolerance	Pass
Test Case 4, NR5 n71 Carrier 1, 619.5 MHz	43.846	0	43.8	N/A	N/A	Within Tolerance	Pass
Test Case 4, NR5 n71 Carrier 2, 624.5 MHz	44.196	0	44.2	N/A	N/A	Within Tolerance	Pass
5G NR, Multicarrier Multiband							
Port 1							
QPSK Modulation							
Multicarrier Multiband Test Case 1	N/A	0	N/A	View Table	View Table	Within Tolerance	Pass
Multicarrier Multiband Test Case 2	N/A	0	N/A	View Table	View Table	Within Tolerance	Pass
Multicarrier Multiband Test Case 3	N/A	0	N/A	View Table	View Table	Within Tolerance	Pass
Multicarrier Multiband Test Case 4	N/A	0	N/A	View Table	View Table	Within Tolerance	Pass

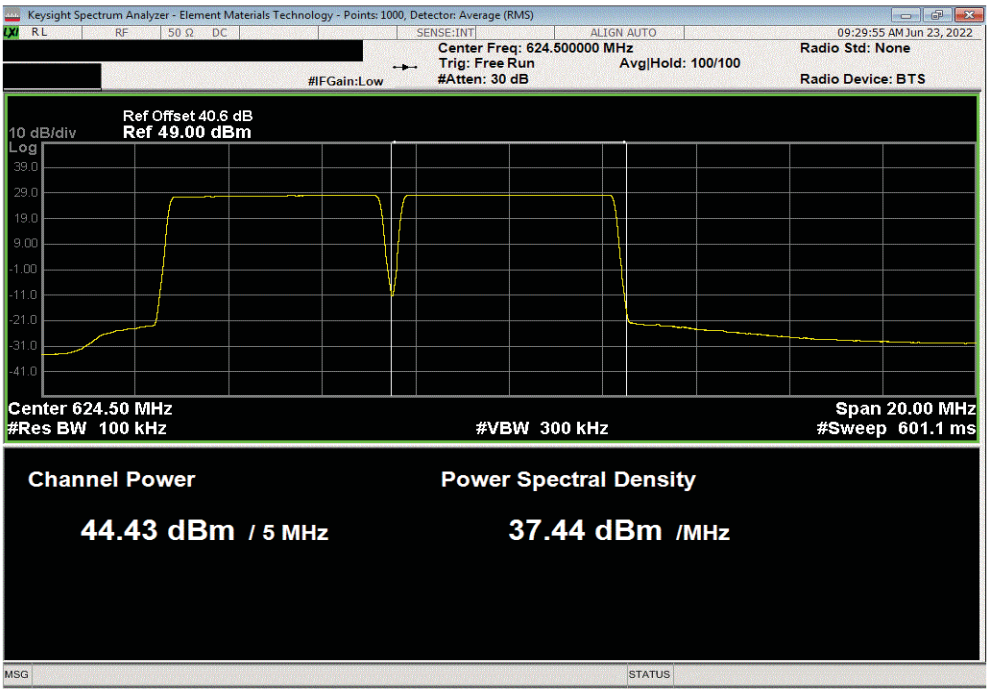
AVERAGE POWER - MULTIBAND MULTICARRIER

TbtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 1, NR5 Carrier 1, 619.5 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
44.13	0	44.1	N/A	N/A	Within Tolerance	Pass



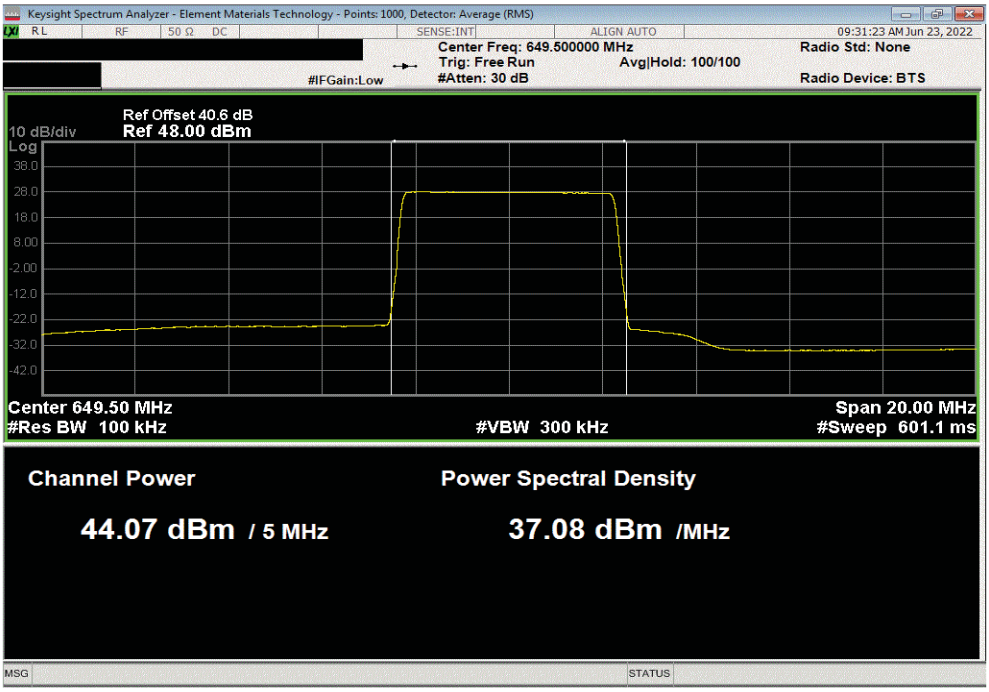
5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 1, NR5 Carrier 2, 624.5 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
44.425	0	44.4	N/A	N/A	Within Tolerance	Pass



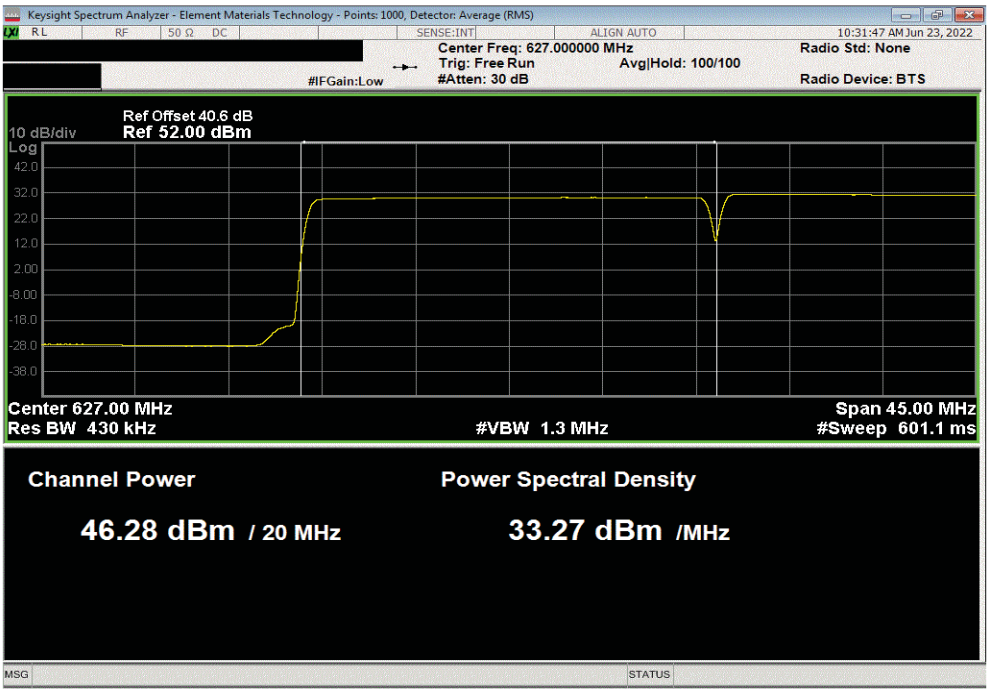
AVERAGE POWER - MULTIBAND MULTICARRIER

TbtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 1, NR5 Carrier 3, 649.5 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
44.072	0	44.1	N/A	N/A	Within Tolerance	Pass



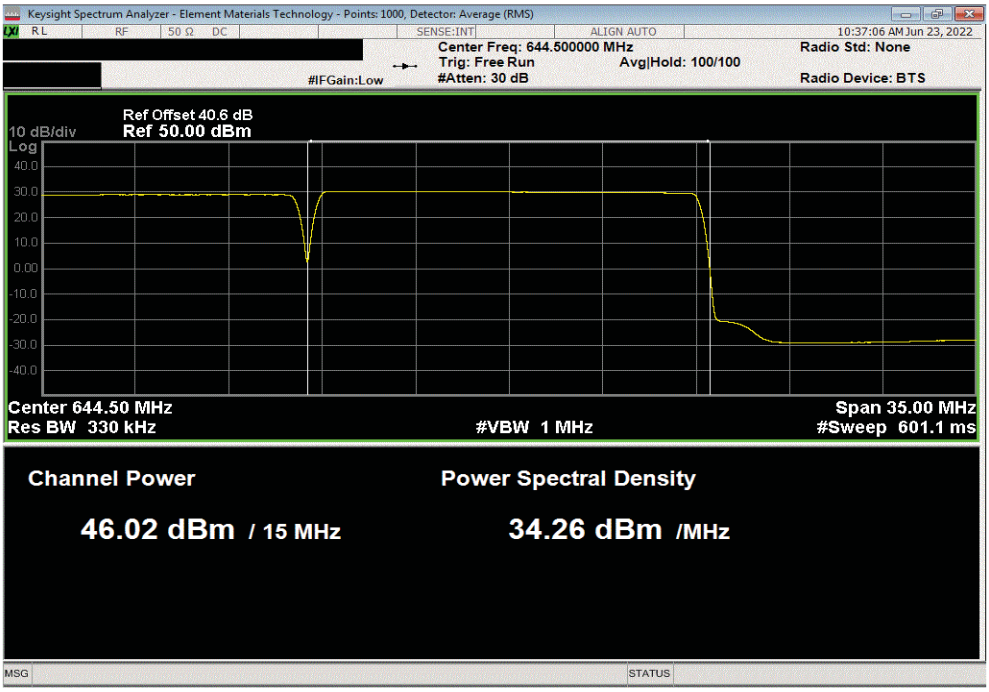
5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 2, NR20 Carrier 1, 627 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
46.283	0	46.3	N/A	N/A	Within Tolerance	Pass



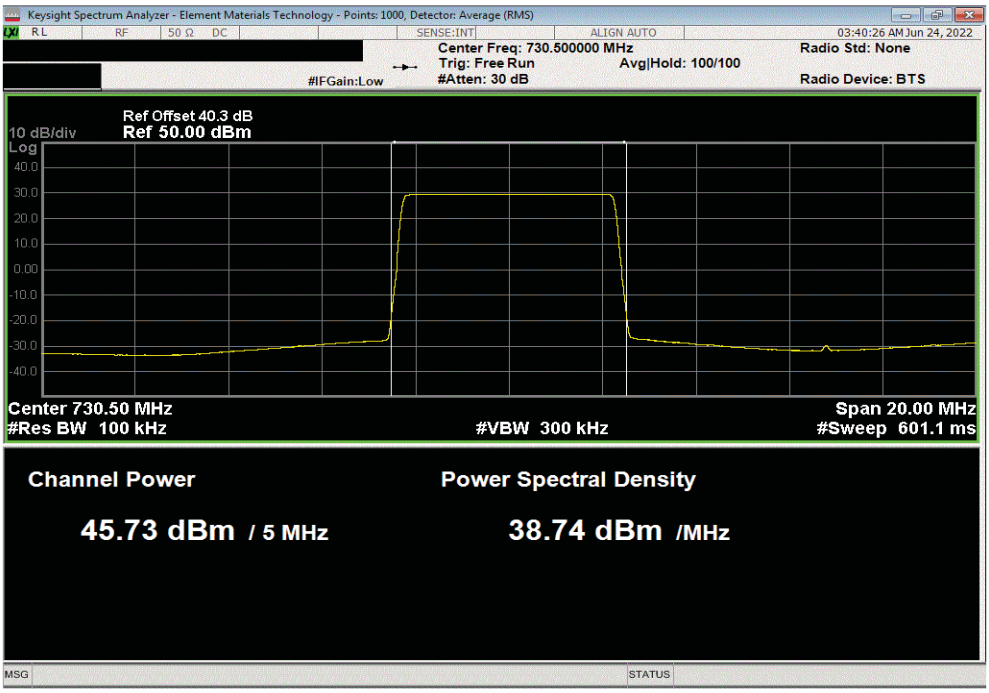
AVERAGE POWER - MULTIBAND MULTICARRIER

TbtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 2, NR15 Carrier 2, 644.5 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
46.023	0	46	N/A	N/A	Within Tolerance	Pass



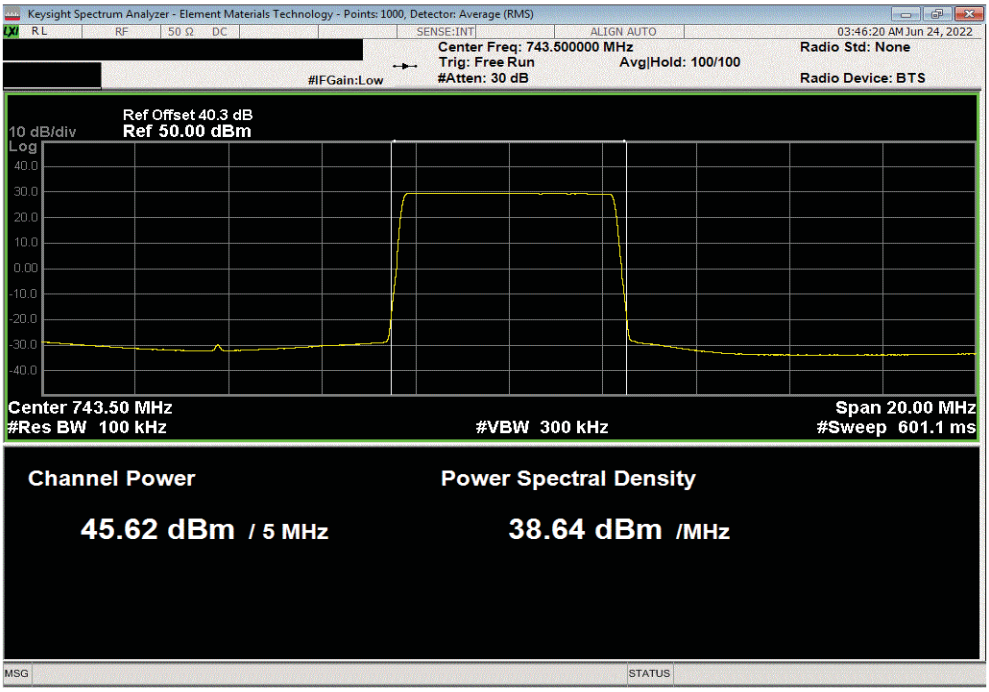
5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 3, NR5 Carrier 1, 730.5 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
45.729	0	45.7	N/A	N/A	Within Tolerance	Pass



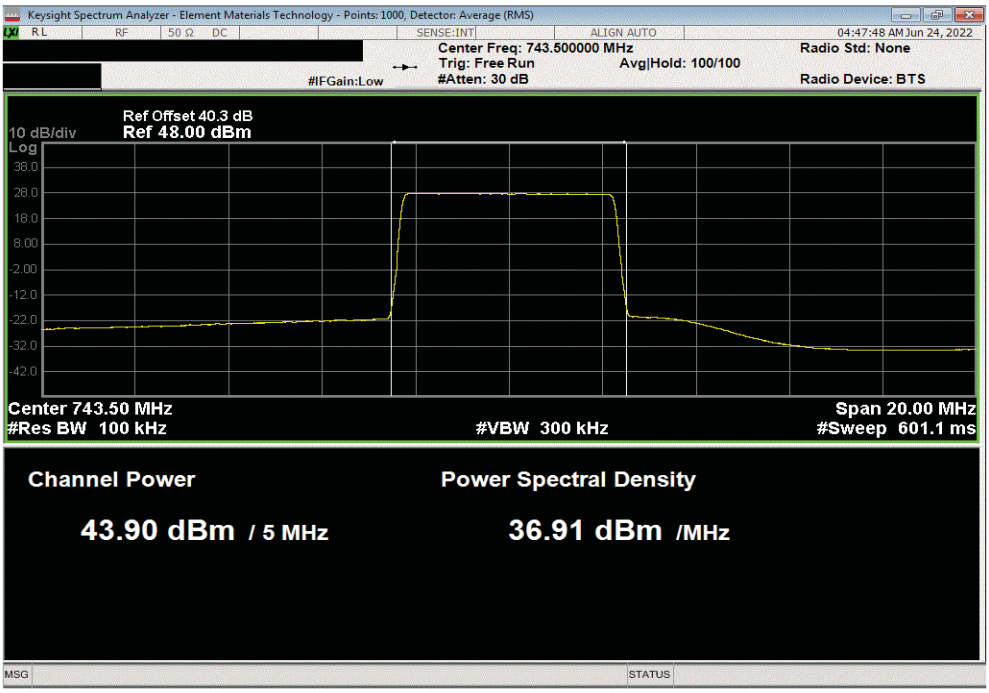
AVERAGE POWER - MULTIBAND MULTICARRIER

TbtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 3, NR5 Carrier 2, 743.5 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
45.625	0	45.6	N/A	N/A	Within Tolerance	Pass



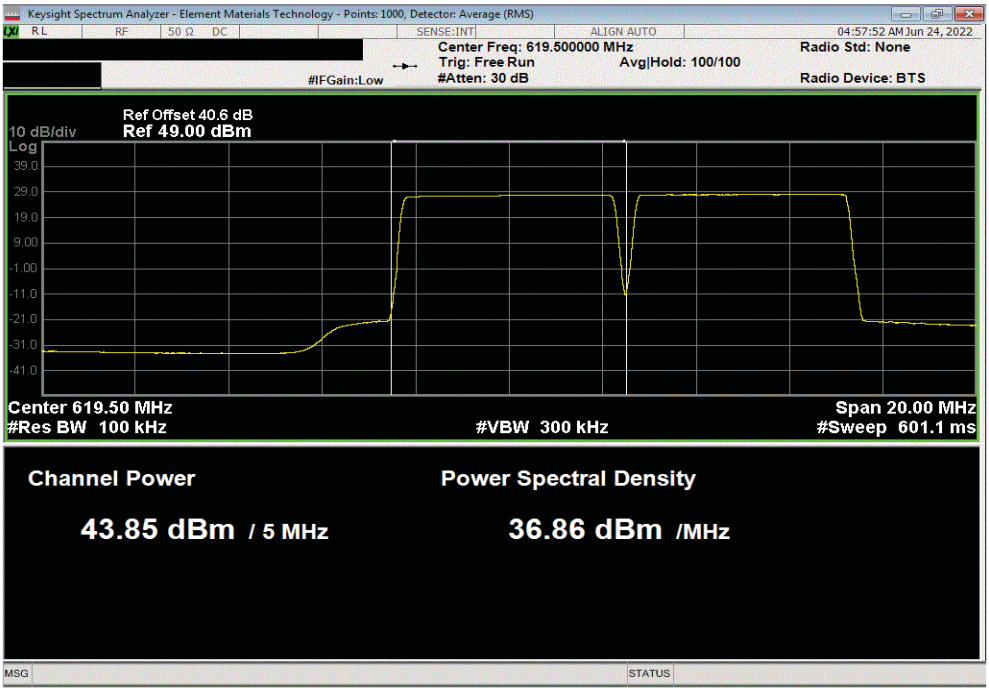
5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 4, NR5 n85 Carrier 1, 743.5 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
43.897	0	43.9	N/A	N/A	Within Tolerance	Pass



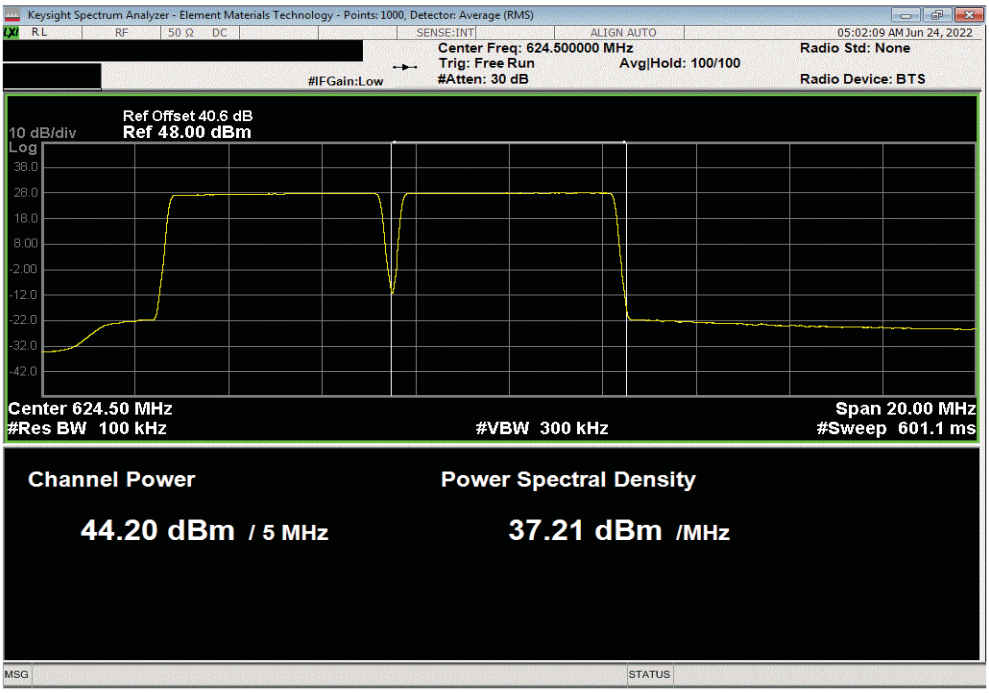
AVERAGE POWER - MULTIBAND MULTICARRIER

TbtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 4, NR5 n71 Carrier 1, 619.5 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
43.846	0	43.8	N/A	N/A	Within Tolerance	Pass



5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Test Case 4, NR5 n71 Carrier 2, 624.5 MHz						
Avg Cond Initial Pwr (dBm	Duty Cycle Factor (dB)	Avg Cond Carrier Pwr (dBm)	Avg Cond Band Pwr (dBm)	Avg Cond Port Pwr (dBm)	Limit (dBm)	Results
44.196	0	44.2	N/A	N/A	Within Tolerance	Pass



AVERAGE POWER - MULTIBAND MULTICARRIER

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TbtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Multicarrier Multiband Test Case 1						
Avg Cond Initial Pwr (dBm)	**Duty Cycle Factor (dB)**	**Avg Cond Carrier Pwr (dBm)**	**Avg Cond Band Pwr (dBm)**	**Avg Cond Port Pwr (dBm)**	**Limit (dBm)**	**Results**
N/A	0	N/A	View Table	View Table	Within Tolerance	Pass

Carrier Band	Carrier Freqencies	Carrier Power (dBm)	Carrier Power (Watts)	Band Total Pwr (Watts)	Band Total Pwr (dBm)	Port Total Pwr (Watts)	Port Total Pwr (dBm)
n71, NR5	619.5 MHz	**44.1**	25.7	N/A	N/A	N/A	N/A
n71, NR5	624.5 MHz	**44.4**	27.5	N/A	N/A	N/A	N/A
n71, NR5	649.5 MHz	**44.1**	25.7	N/A	N/A	N/A	N/A
n71, NR5	N/A	N/A	N/A	78.9	**49.0**	**78.9**	**49**

5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Multicarrier Multiband Test Case 2						
Avg Cond Initial Pwr (dBm)	**Duty Cycle Factor (dB)**	**Avg Cond Carrier Pwr (dBm)**	**Avg Cond Band Pwr (dBm)**	**Avg Cond Port Pwr (dBm)**	**Limit (dBm)**	**Results**
N/A	0	N/A	View Table	View Table	Within Tolerance	Pass

Carrier Band	Carrier Freqencies	Carrier Power (dBm)	Carrier Power (Watts)	Band Total Pwr (Watts)	Band Total Pwr (dBm)	Port Total Pwr (Watts)	Port Total Pwr (dBm)
n71, NR15	627 MHz	**46.3**	42.7	N/A	N/A	N/A	N/A
n71, NR20	644.5 MHz	**46.0**	39.8	N/A	N/A	N/A	N/A
n71, NR15 and NR20	N/A	N/A	N/A	82.5	**49.2**	**82.5**	**49.2**

AVERAGE POWER - MULTIBAND MULTICARRIER

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TbtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Multicarrier Multiband Test Case 3						
Avg Cond Initial Pwr (dBm)	**Duty Cycle Factor (dB)**	**Avg Cond Carrier Pwr (dBm)**	**Avg Cond Band Pwr (dBm)**	**Avg Cond Port Pwr (dBm)**	**Limit (dBm)**	**Results**
N/A	0	N/A	View Table	View Table	Within Tolerance	Pass

Carrier Band	Carrier Freqencies	Carrier Power (dBm)	Carrier Power (Watts)	Band Total Pwr (Watts)	Band Total Pwr (dBm)	Port Total Pwr (Watts)	Port Total Pwr (dBm)
n85, NR5	730.5 MHz	**45.7**	37.2	N/A	N/A	N/A	N/A
n85, NR5	743.5 MHz	**45.6**	36.3	N/A	N/A	N/A	N/A
n85	N/A	N/A	N/A	73.5	**48.7**	**73.5**	**48.7**

5G NR, Multicarrier Multiband, Port 1, QPSK Modulation, Multicarrier Multiband Test Case 4						
Avg Cond Initial Pwr (dBm)	**Duty Cycle Factor (dB)**	**Avg Cond Carrier Pwr (dBm)**	**Avg Cond Band Pwr (dBm)**	**Avg Cond Port Pwr (dBm)**	**Limit (dBm)**	**Results**
N/A	0	N/A	View Table	View Table	Within Tolerance	Pass

Carrier Band	Carrier Freqencies	Carrier Power (dBm)	Carrier Power (Watts)	Band Total Pwr (Watts)	Band Total Pwr (dBm)	Port Total Pwr (dBm)	Port Total Pwr (Watts)
n71, NR5	619.5 MHz	**43.8**	24.0	N/A	N/A	N/A	N/A
n71, NR5	624.5 MHz	**44.2**	26.3	N/A	N/A	N/A	N/A
n71, NR5	N/A	N/A	N/A	50.3	**47.0**	N/A	N/A
n85, NR5	743.5 MHz	**43.9**	24.6	N/A	N/A	N/A	N/A
n85, NR5	N/A	N/A	N/A	24.6	**43.9**	N/A	N/A
n85 and n71, NR5	N/A	N/A	N/A	N/A	N/A	**48.8**	**74.9**

AVERAGE POWER - ALL PORTS BAND n85

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 output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurements. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1/D)], where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times.

RF conducted emissions testing was performed on all ports at 15 MHz middle channel in order to prove the AHLOB antenna ports are essentially electrically identical. 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.

AVERAGE POWER - ALL PORTS BAND n85

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB (FCC/ISED)			Work Order:	NOKI0042
Serial Number:	YK220900026			Date:	22-Jun-22
Customer:	Nokia Solutions and Networks			Temperature:	22.2 °C
Attendees:	David Le, John Rattanavong			Humidity:	49.7% RH
Project:	None			Barometric Pres.:	1021 mbar
Tested by:	Brandon Hobbs	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.

DEVIATIONS FROM TEST STANDARD

None

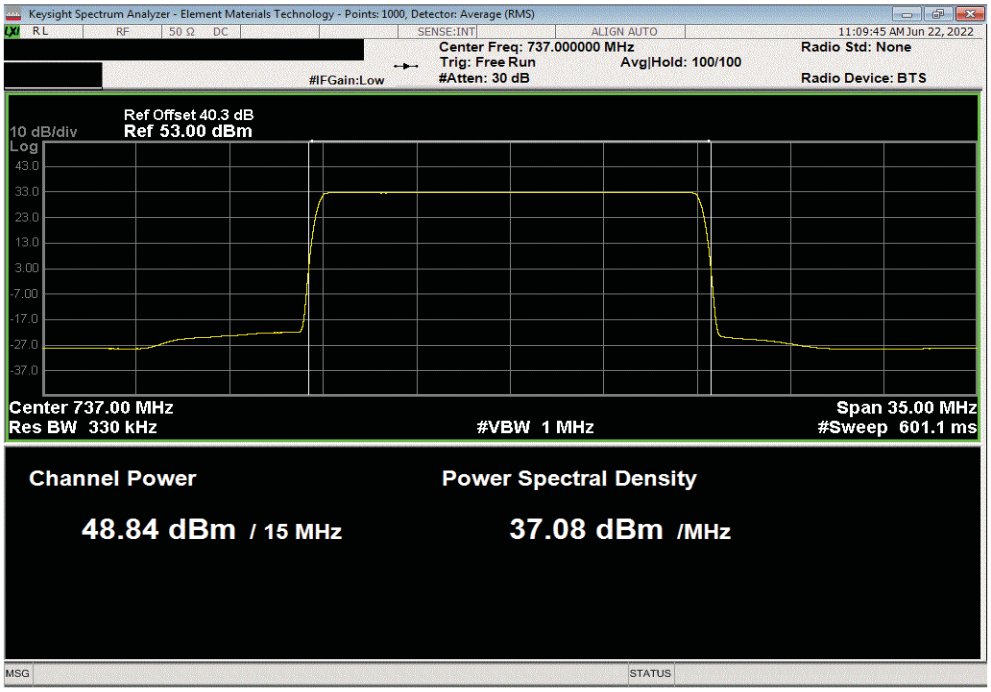
Configuration #	2	Signature

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
5G NR, Band 85, 728 MHz - 746 MHz						
Port 1						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 737 MHz	48.840	0	48.8	N/A	Within Tolerance	N/A
Port 2						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 737 MHz	48.778	0	48.8	N/A	Within Tolerance	N/A
Port 3						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 737 MHz	48.777	0	48.8	N/A	Within Tolerance	N/A
Port 4						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 737 MHz	48.762	0	48.8	N/A	Within Tolerance	N/A
All Ports						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 737 MHz	N/A	0	N/A	54.8	N/A	N/A

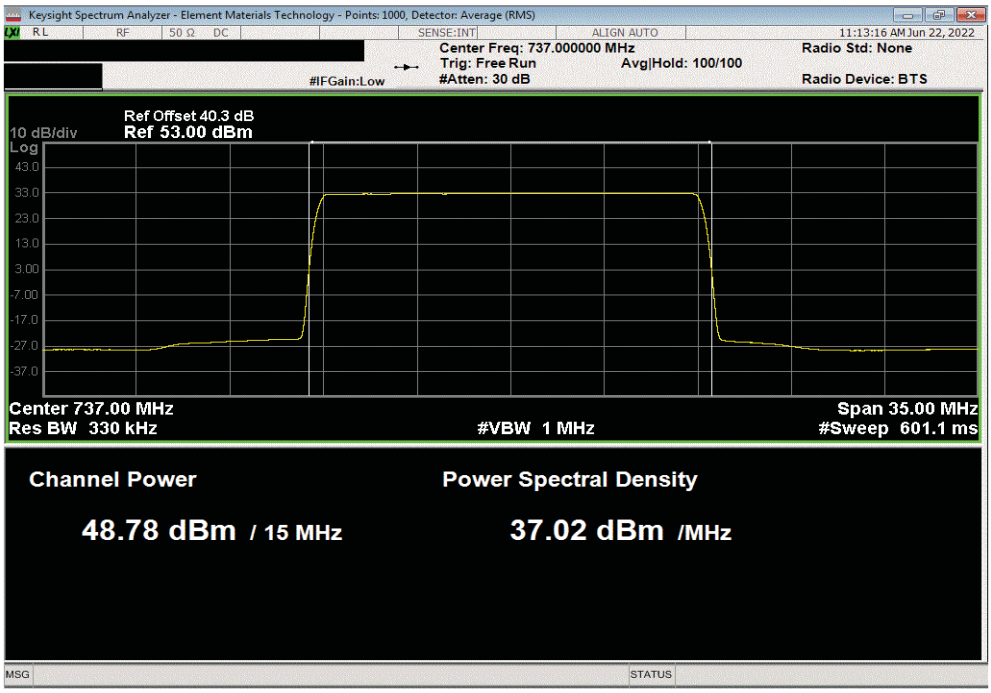
AVERAGE POWER - ALL PORTS BAND n85

TbtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Band 85, 728 MHz - 746 MHz, Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	48.84	0	48.8	N/A	Within Tolerance	N/A



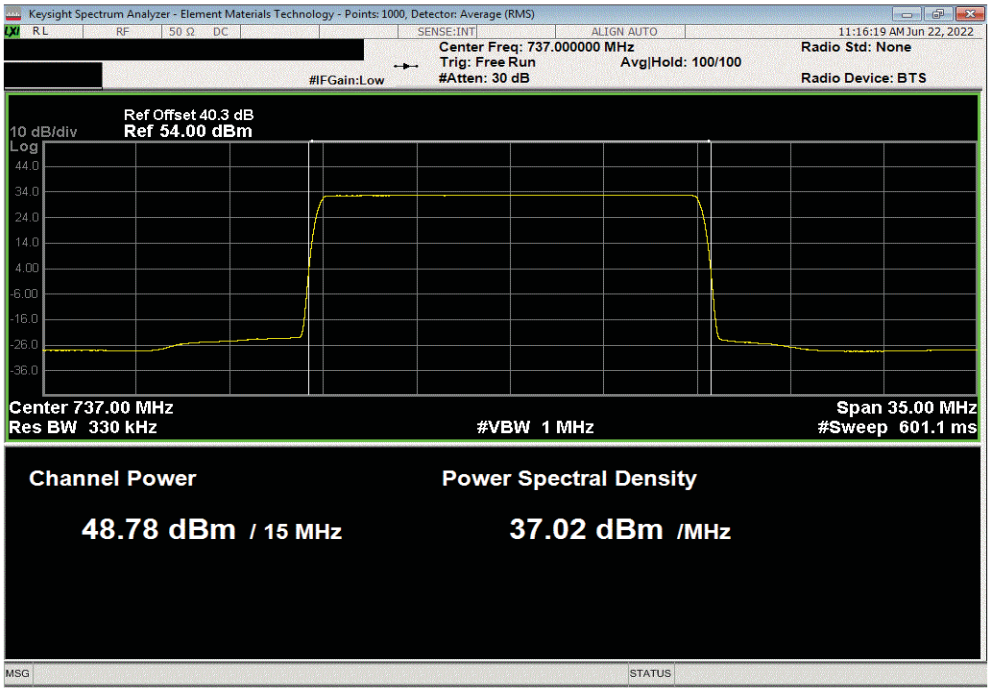
5G NR, Band 85, 728 MHz - 746 MHz, Port 2, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	48.778	0	48.8	N/A	Within Tolerance	N/A



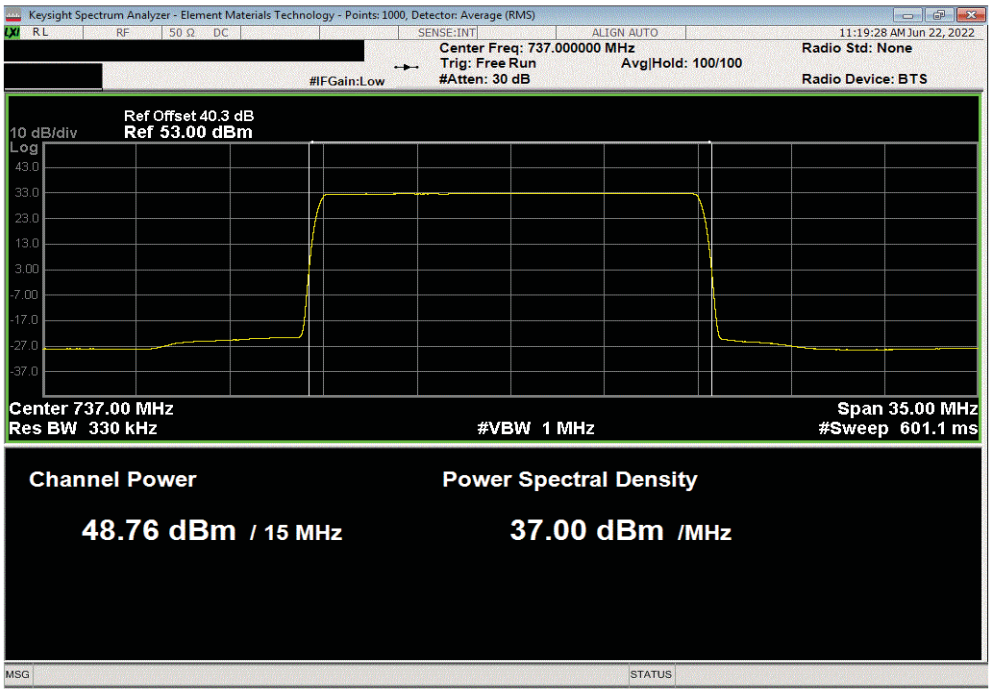
AVERAGE POWER - ALL PORTS BAND n85

TbtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Band 85, 728 MHz - 746 MHz, Port 3, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	48.777	0	48.8	N/A	Within Tolerance	N/A



5G NR, Band 85, 728 MHz - 746 MHz, Port 4, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	48.762	0	48.8	N/A	Within Tolerance	N/A



AVERAGE POWER - ALL PORTS BAND n85

TxtTx 2022.05.02.0 XMit 2022.02.07.0

5G NR, Band 85, 728 MHz - 746 MHz, All Ports, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	N/A	0	N/A	54.8	N/A	N/A

AVERAGE POWER PORT SUMMING					
	PORT 1	PORT 2	PORT 3	PORT 4	SUM TOTAL
INITIAL VALUE (dBm)	48.8	48.8	48.8	48.8	N/A
INITIAL VALUE (Watts)	75.9	75.9	75.9	75.9	303.6
TOTAL VALUE (dBm)	N/A	N/A	N/A	N/A	54.8

AVERAGE POWER - ALL PORTS BAND n71

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 output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurements. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1/D)], where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times.

RF conducted emissions testing was performed on all ports at 15 MHz middle channel in order to prove the AHLOB antenna ports are essentially electrically identical. 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.

AVERAGE POWER - ALL PORTS BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

EUT:	AHLOB (FCC/ISED)			Work Order:	NOKI0042
Serial Number:	YK220900026			Date:	21-Jun-22
Customer:	Nokia Solutions and Networks			Temperature:	21.6 °C
Attendees:	David Le, John Rattanavong			Humidity:	52.1% RH
Project:	None			Barometric Pres.:	1022 mbar
Tested by:	Brandon Hobbs	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.

DEVIATIONS FROM TEST STANDARD

None

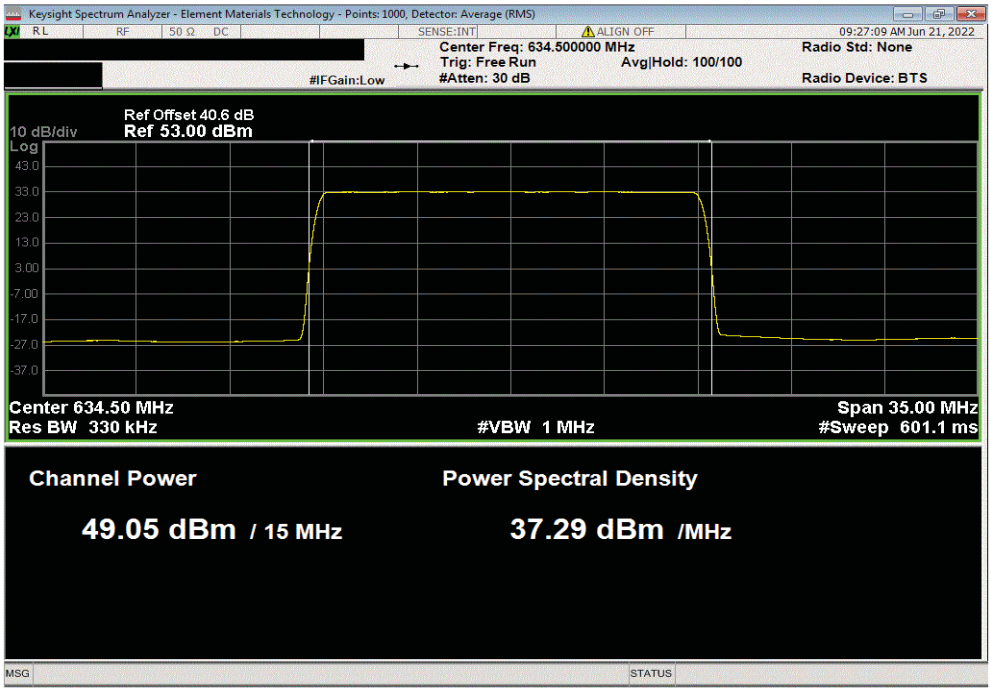
Configuration #	2	Signature

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
5G NR, Band n71, 617 MHz - 652 MHz						
Port 1						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 634.5 MHz	49.050	0	49.1	N/A	Within Tolerance	N/A
Port 2						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 634.5 MHz	49.068	0	49.1	N/A	Within Tolerance	N/A
Port 3						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 634.5 MHz	49.093	0	49.1	N/A	Within Tolerance	N/A
Port 4						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 634.5 MHz	48.985	0	49.0	N/A	Within Tolerance	N/A
All Ports						
15 MHz Bandwidth						
256-QAM Modulation						
Mid Ch. 634.5 MHz	N/A	0	N/A	55.1	N/A	N/A

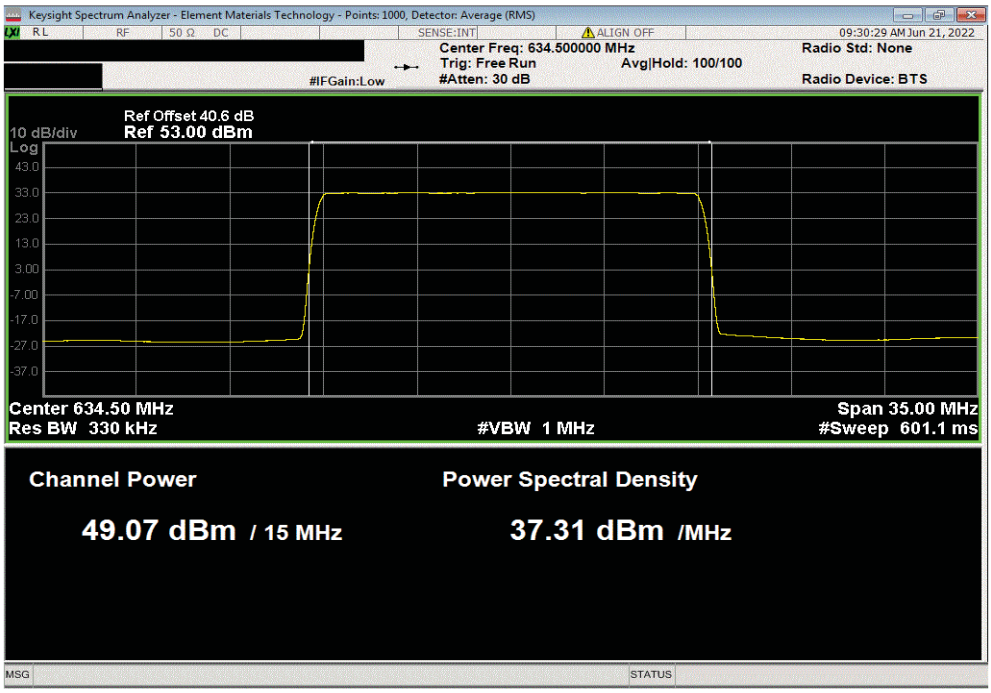
AVERAGE POWER - ALL PORTS BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

5G NR, Band n71, 617 MHz - 652 MHz, Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	49.05	0	49.1	N/A	Within Tolerance	N/A



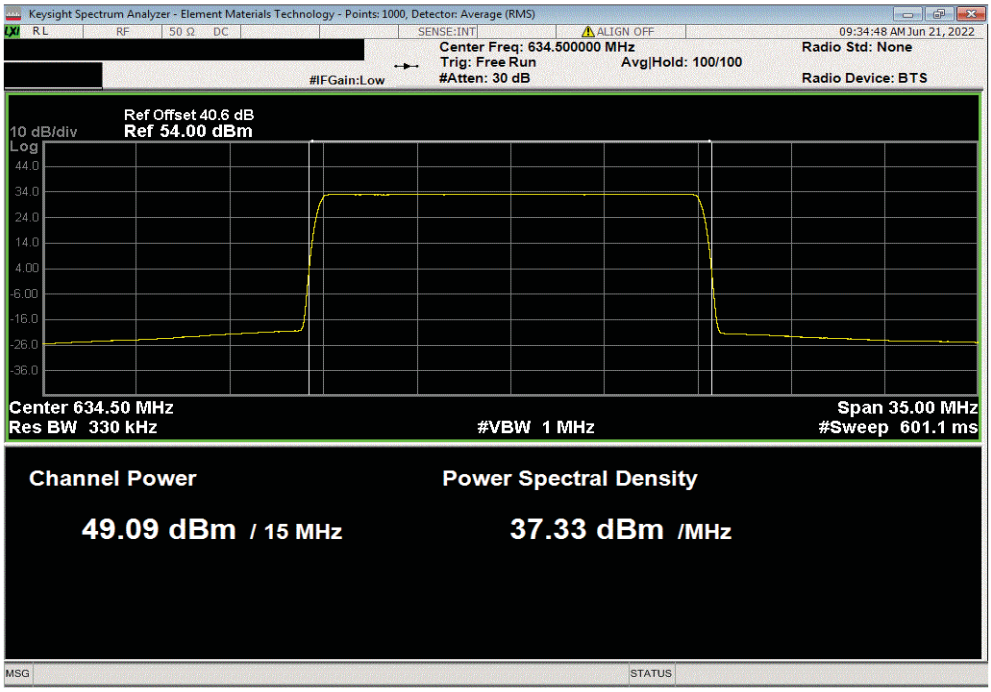
5G NR, Band n71, 617 MHz - 652 MHz, Port 2, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	49.068	0	49.1	N/A	Within Tolerance	N/A



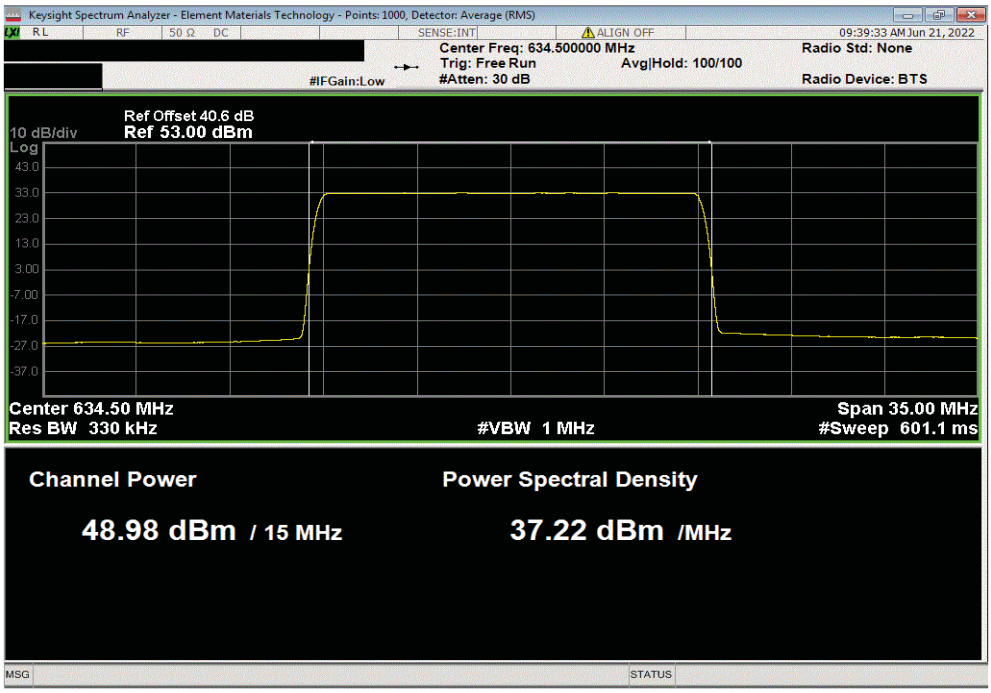
AVERAGE POWER - ALL PORTS BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

5G NR, Band n71, 617 MHz - 652 MHz, Port 3, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	49.093	0	49.1	N/A	Within Tolerance	N/A



5G NR, Band n71, 617 MHz - 652 MHz, Port 4, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	48.985	0	49	N/A	Within Tolerance	N/A



AVERAGE POWER - ALL PORTS BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

5G NR, Band n71, 617 MHz - 652 MHz, All Ports, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	All Ports Value (dBm)	Limit	Results
	N/A	0	N/A	55.1	N/A	N/A

AVERAGE POWER PORT SUMMING					
	PORT 1	PORT 2	PORT 3	PORT 4	SUM TOTAL
INITIAL VALUE (dBm)	49.1	49.1	49.1	49.0	N/A
INITIAL VALUE (Watts)	81.3	81.3	81.3	79.4	323.3
TOTAL VALUE (dBm)	N/A	N/A	N/A	N/A	55.1

AVERAGE POWER - BAND n71

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 output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurements. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1/D)], where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times

RF conducted emissions testing was performed only on one port. 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 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.

The total average transmit power of all antenna ports was determined per ANSI C63.26-2105 paragraph 6.4.3.1

AVERAGE POWER - BAND n71

element

TbtTx 2022.06.03.0 XMit 2022.02.07.0

EUT:	AHLOB (FCC/ISED)	Work Order:	NOKI0042
Serial Number:	YK220900026	Date:	21-Jun-22
Customer:	Nokia Solutions and Networks	Temperature:	21.3 °C
Attendees:	David Le, John Rattanavong	Humidity:	52.6% RH
Project:	None	Barometric Pres.:	1022 mbar
Tested by:	Brandon Hobbs	Job Site:	TX07
Power:	54 VDC		

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 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 1. 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)].

DEVIATIONS FROM TEST STANDARD

None

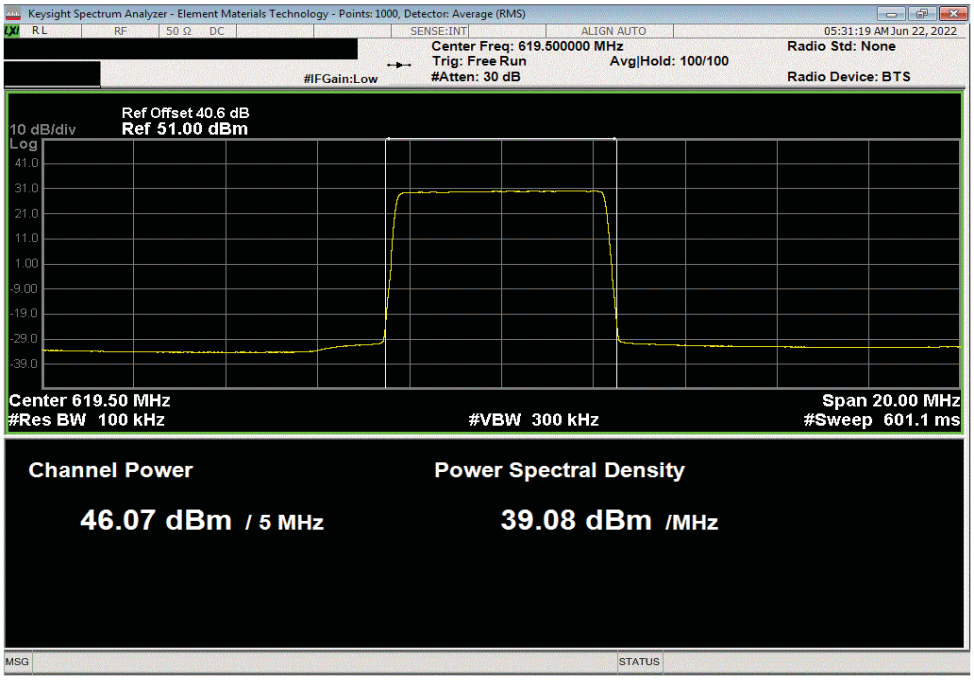
Configuration #	2	Signature

	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz					
5 MHz Bandwidth					
256-QAM Modulation					
Low Ch. 619.5 MHz	46.070	0	46.1	49.1	52.1
Mid Ch. 634.5 MHz	46.074	0	46.1	49.1	52.1
High Ch. 649.5 MHz	46.043	0	46.0	49.0	52.0
10 MHz Bandwidth					
256-QAM Modulation					
Low Ch. 622 MHz	47.870	0	47.9	50.9	53.9
Mid Ch. 634.5 MHz	47.742	0	47.7	50.7	53.7
High Ch. 647 MHz	47.818	0	47.8	50.8	53.8
15 MHz Bandwidth					
QPSK Modulation					
Mid Ch. 634.5 MHz	48.920	0	48.9	51.9	54.9
16-QAM Modulation					
Mid Ch. 634.5 MHz	48.878	0	48.9	51.9	54.9
64-QAM Modulation					
Mid Ch. 634.5 MHz	48.897	0	48.9	51.9	54.9
256-QAM Modulation					
Low Ch. 624.5 MHz	49.028	0	49.0	52.0	55.0
Mid Ch. 634.5 MHz	48.925	0	48.9	51.9	54.9
High Ch. 644.5 MHz	48.993	0	49.0	52.0	55.0
20 MHz Bandwidth					
256-QAM Modulation					
Low Ch. 627 MHz	49.066	0	49.1	52.1	55.1
Mid Ch. 634.5 MHz	48.946	0	48.9	51.9	54.9
High Ch. 642 MHz	49.024	0	49.0	52.0	55.0

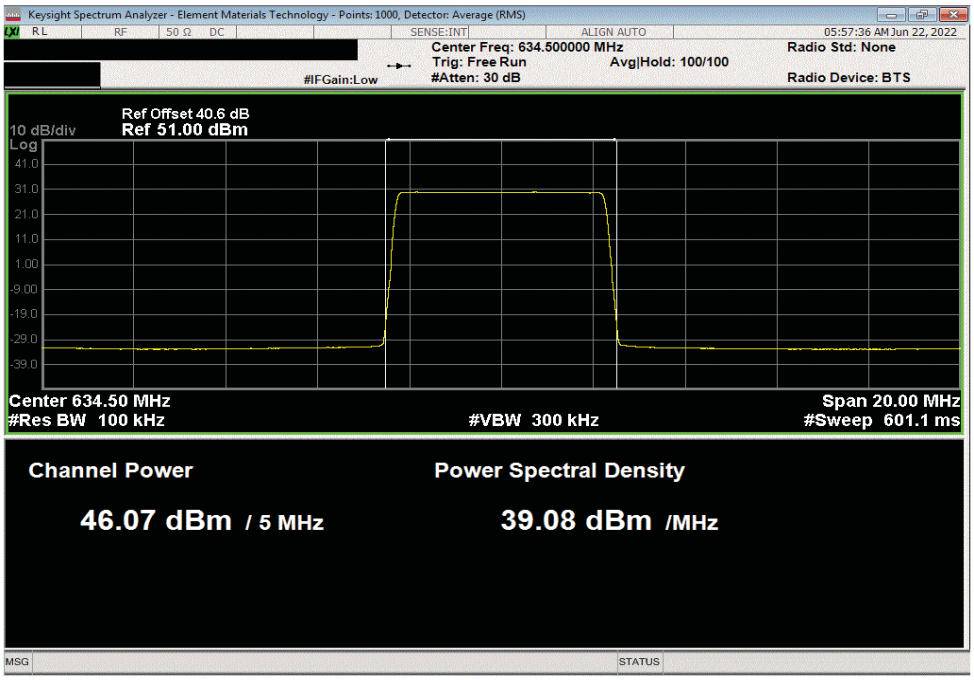
AVERAGE POWER - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 619.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	46.07	0	46.1	49.1	52.1	



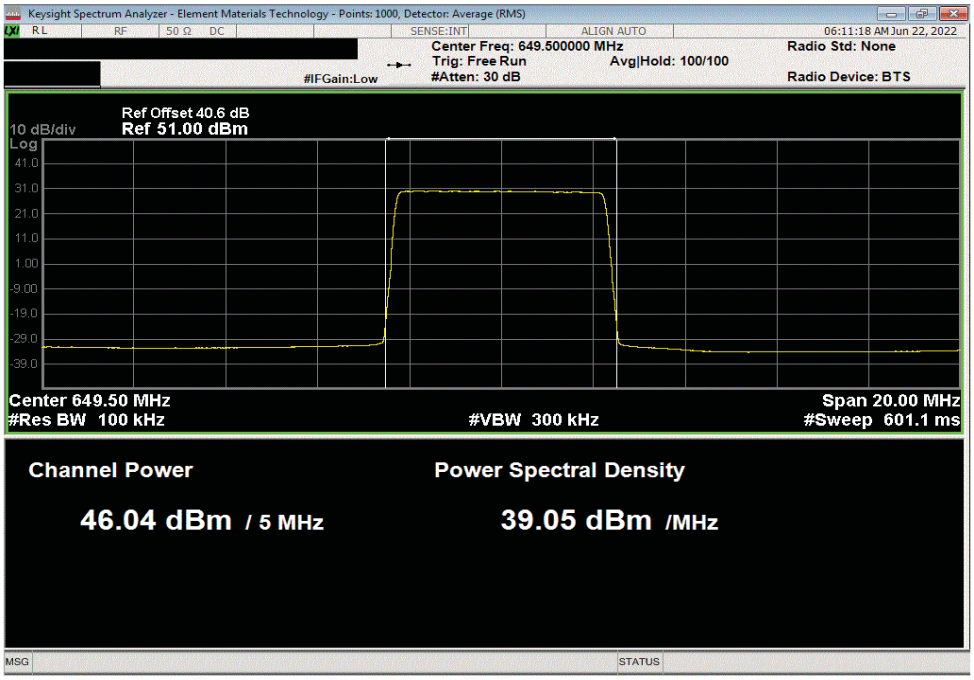
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	46.074	0	46.1	49.1	52.1	



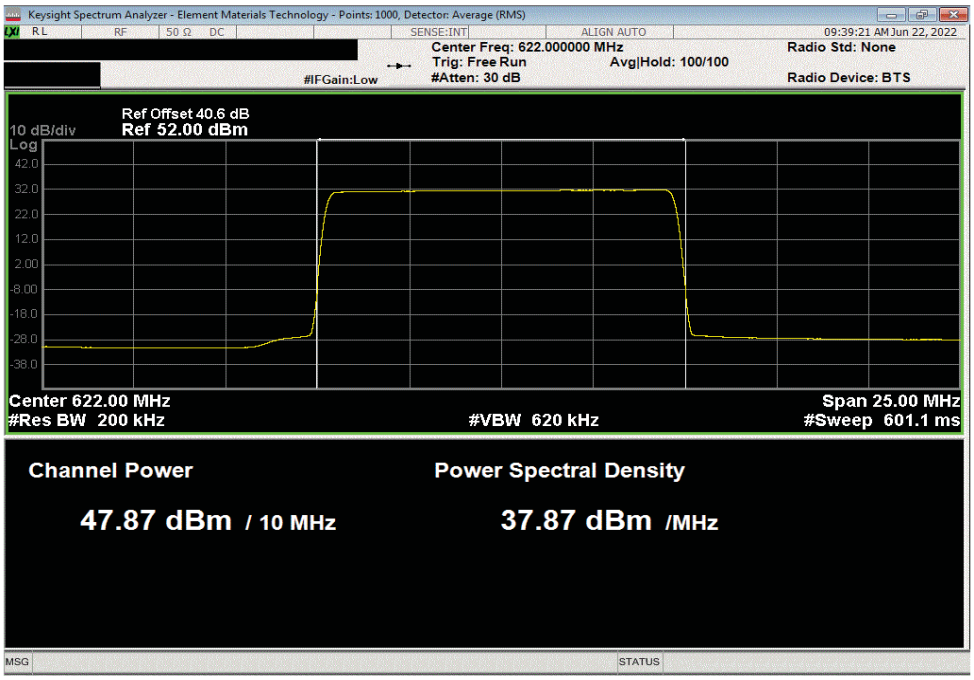
AVERAGE POWER - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 649.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	46.043	0	46	49	52	



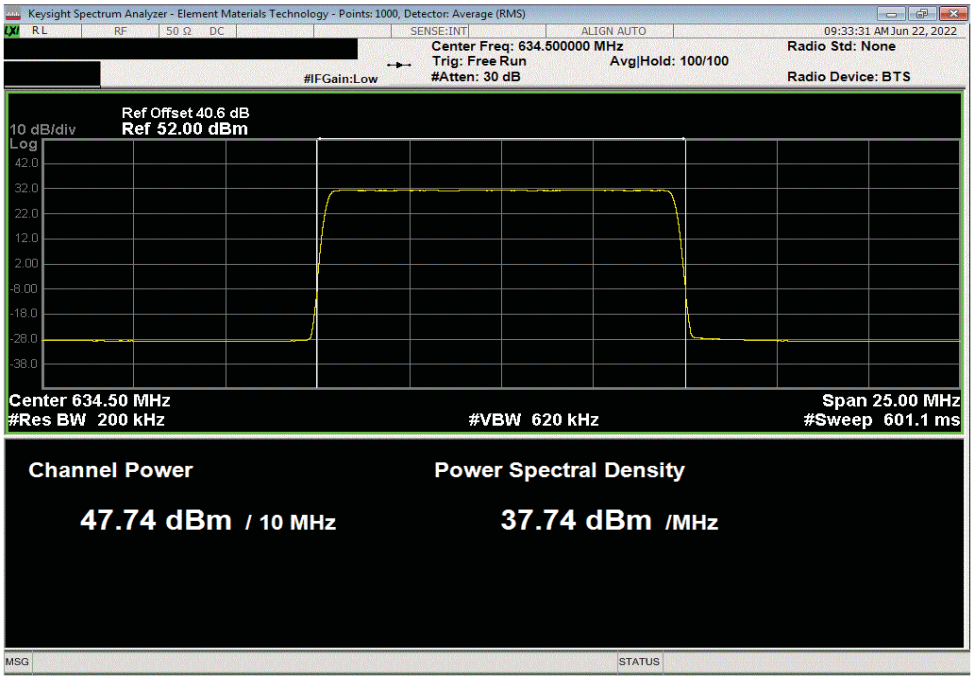
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Low Ch. 622 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	47.87	0	47.9	50.9	53.9	



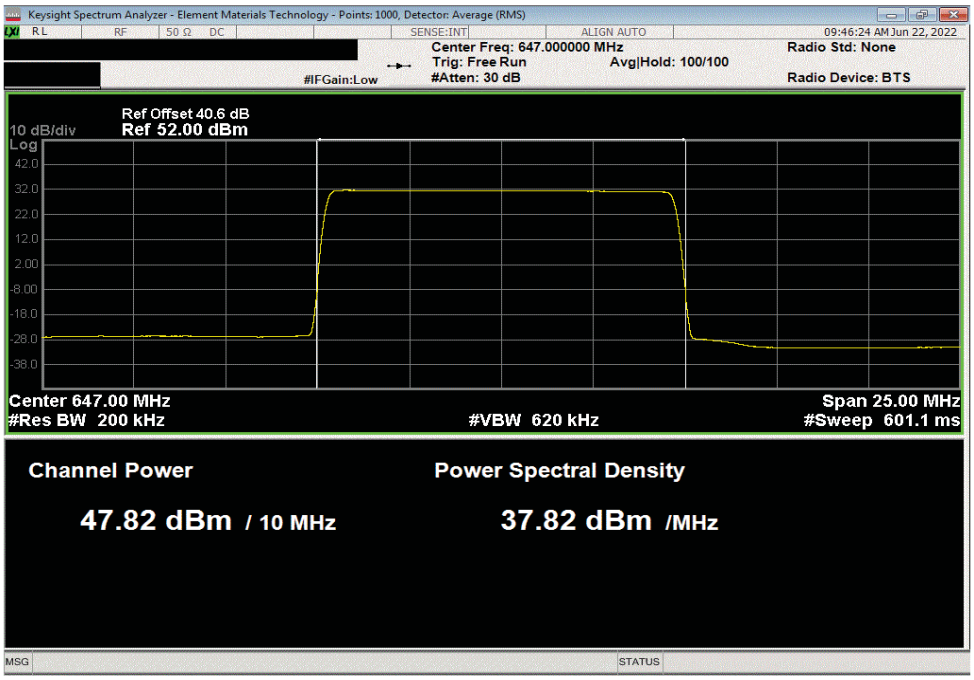
AVERAGE POWER - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	47.742	0	47.7	50.7	53.7	



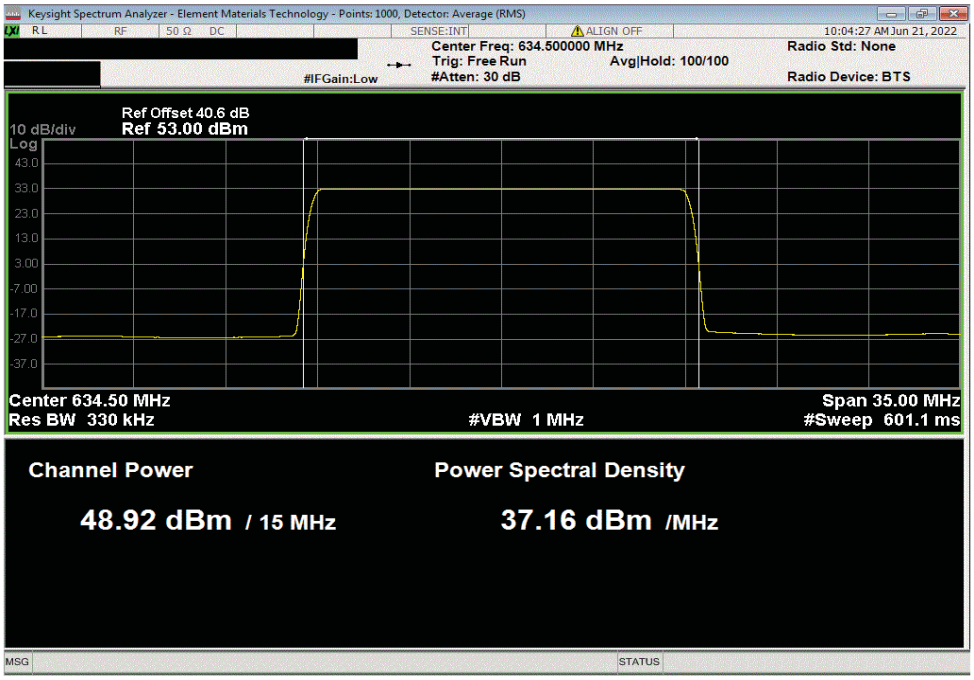
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, High Ch. 647 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	47.818	0	47.8	50.8	53.8	



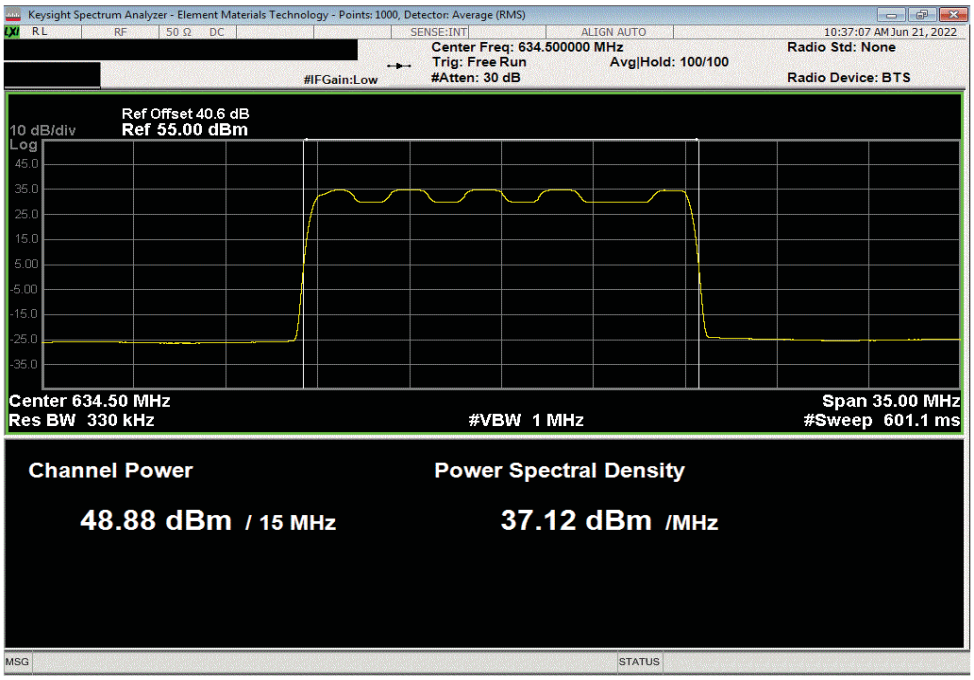
AVERAGE POWER - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, 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/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.92	0	48.9	51.9	54.9	



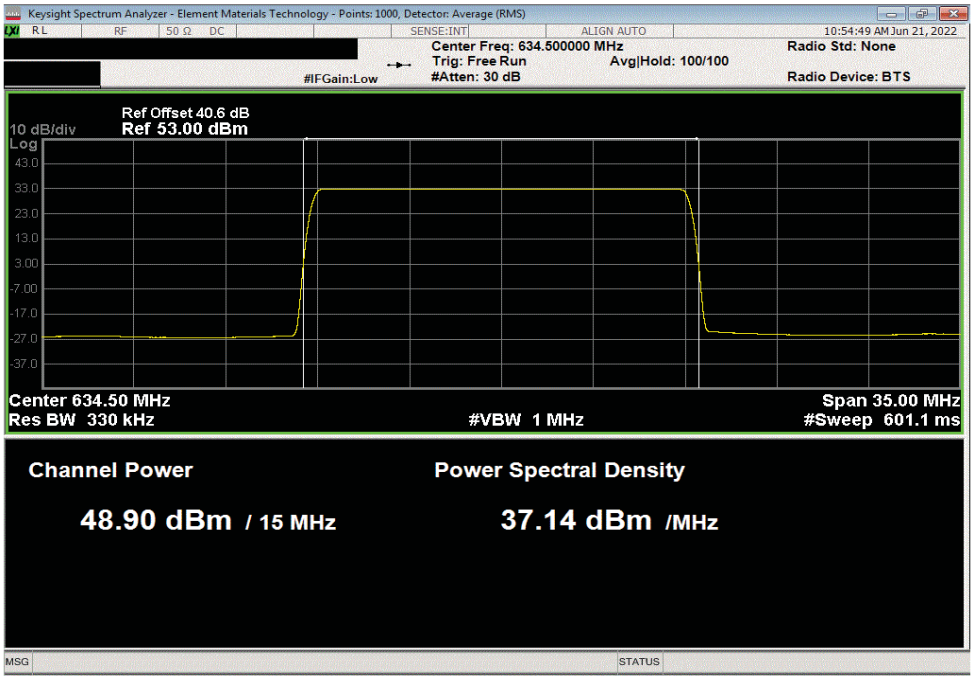
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.878	0	48.9	51.9	54.9	



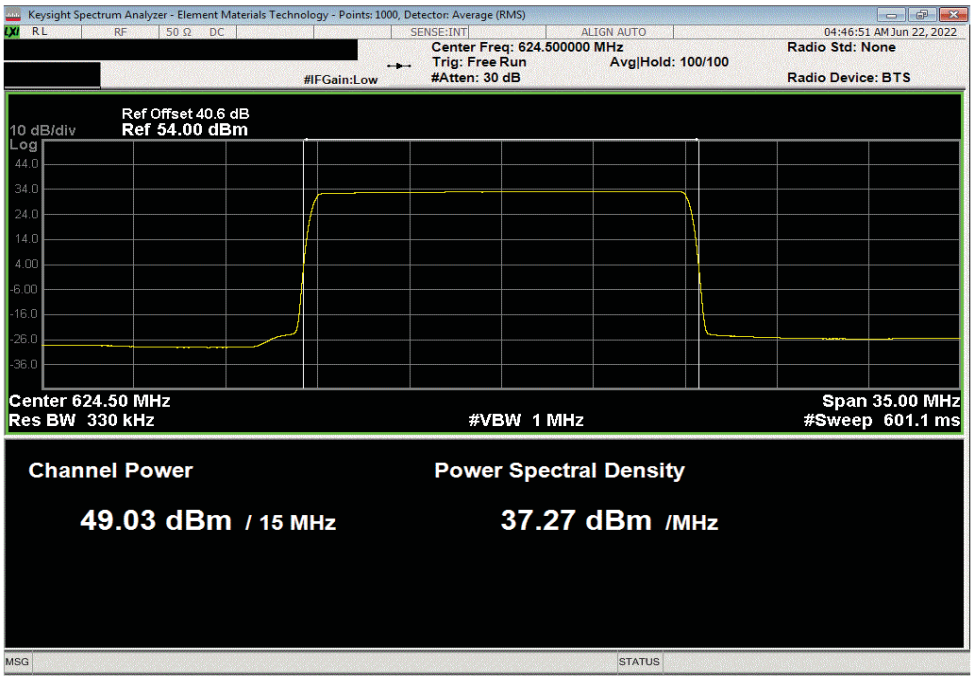
AVERAGE POWER - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.897	0	48.9	51.9	54.9	



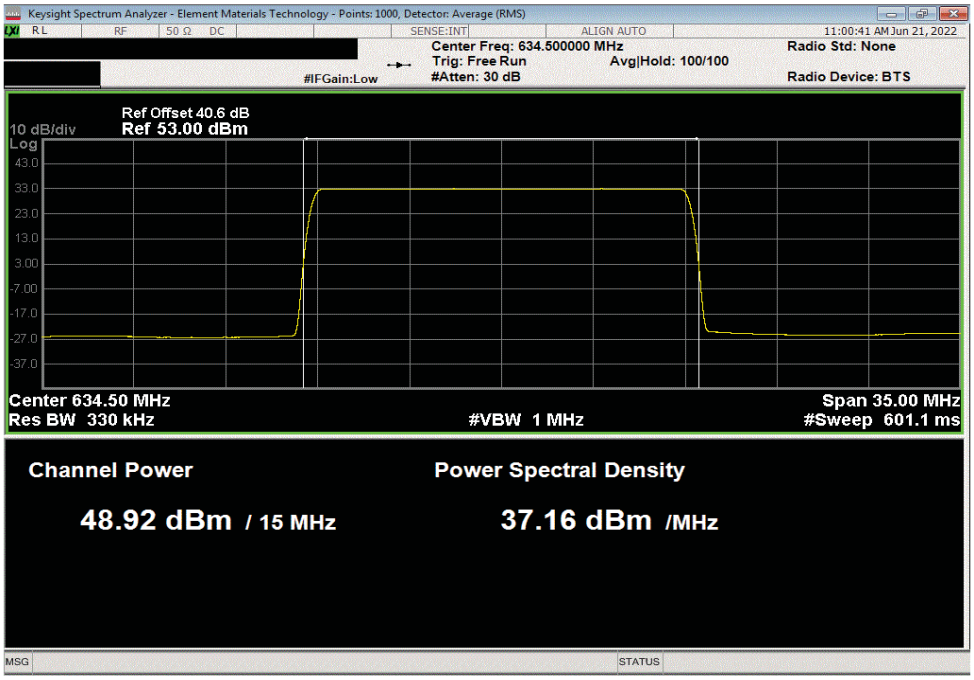
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Low Ch. 624.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	49.028	0	49	52	55	



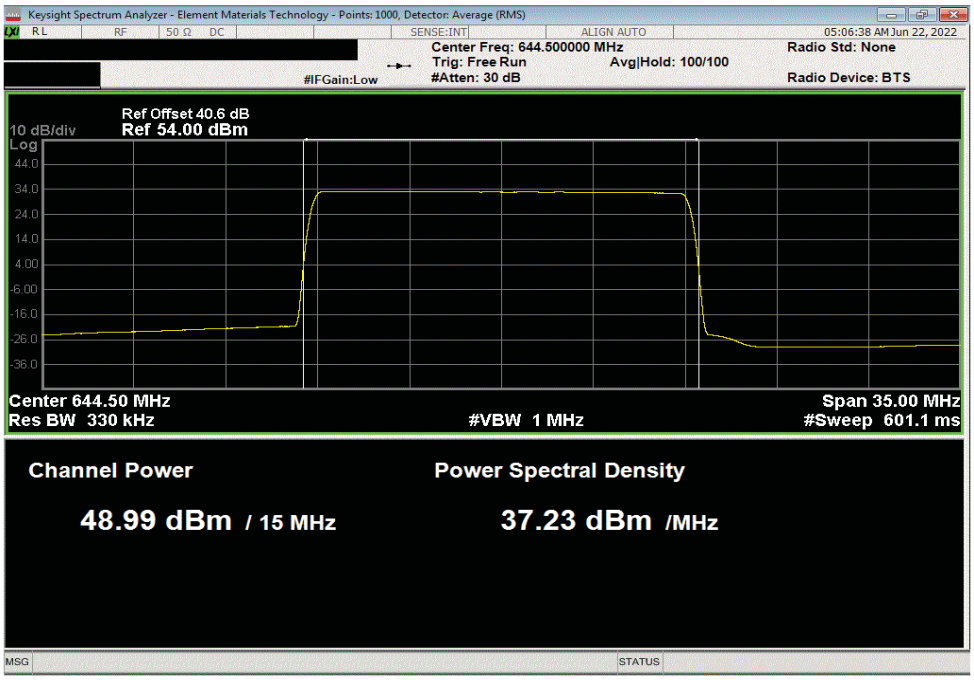
AVERAGE POWER - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.925	0	48.9	51.9	54.9	



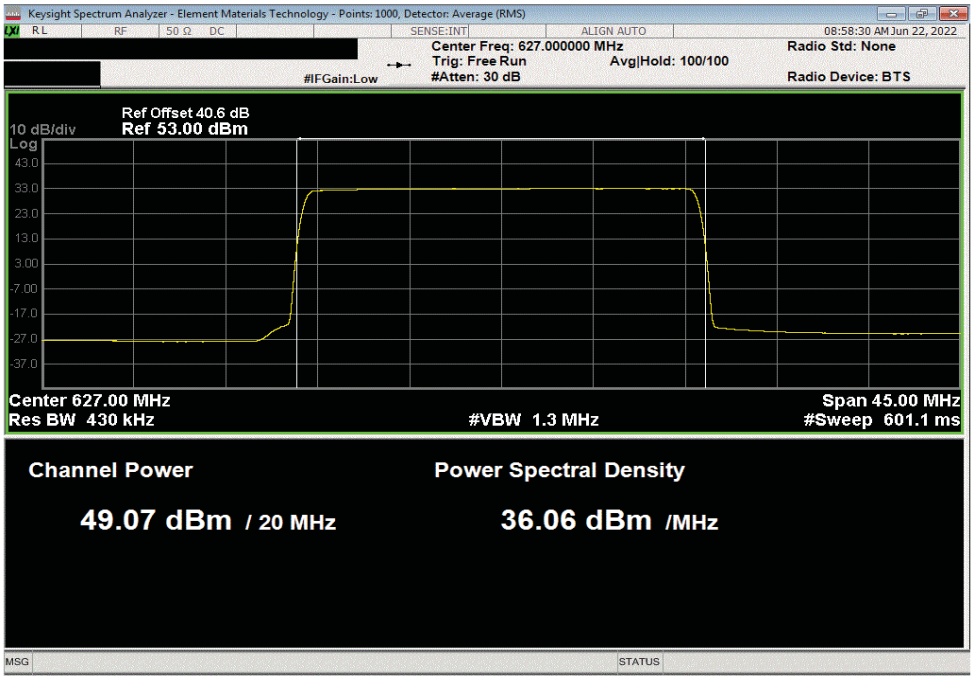
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, High Ch. 644.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.993	0	49	52	55	



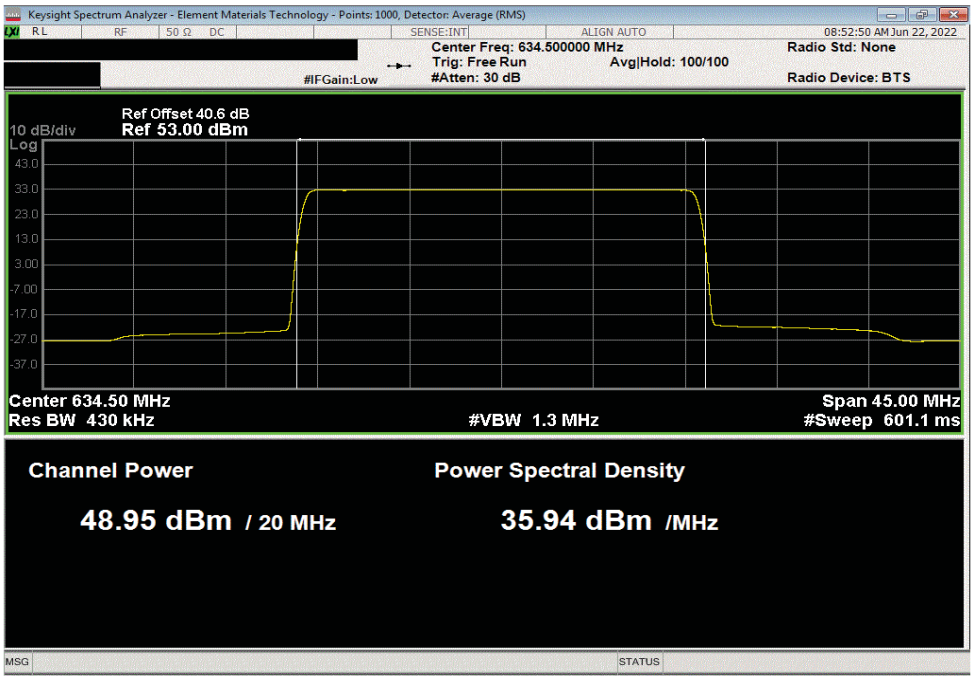
AVERAGE POWER - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, Low Ch. 627 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	49.066	0	49.1	52.1	55.1	



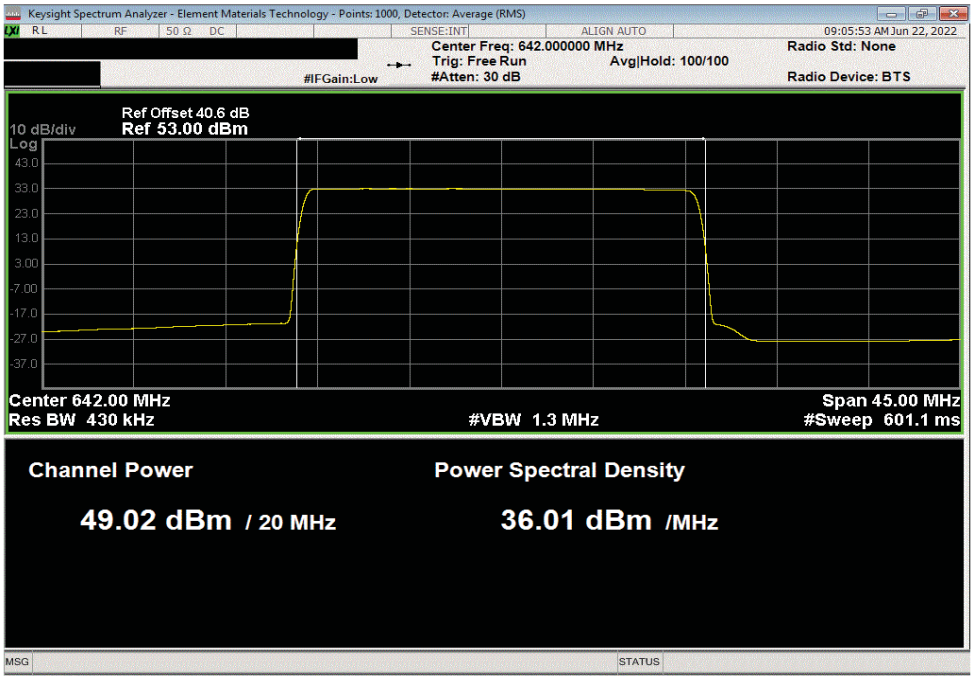
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.946	0	48.9	51.9	54.9	



AVERAGE POWER - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM Modulation, High Ch. 642 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	49.024	0	49	52	55	



3 6

AVERAGE POWER - BAND n85

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 output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurements. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1/D)], where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times

RF conducted emissions testing was performed only on one port. 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 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.

The total average transmit power of all antenna ports was determined per ANSI C63.26-2105 paragraph 6.4.3.1

AVERAGE POWER - BAND n85

TbtTx 2022.06.03.0 XMit 2022.02.07.0

EUT:	AHLOB (FCC/ISED)	Work Order:	NOKI0042
Serial Number:	YK220900026	Date:	22-Jun-22
Customer:	Nokia Solutions and Networks	Temperature:	21.8 °C
Attendees:	David Le, John Rattanavong	Humidity:	51.9% RH
Project:	None	Barometric Pres.:	1021 mbar
Tested by:	Brandon Hobbs	Job Site:	TX07
Power:	54 VDC		

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 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 1. 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)].

DEVIATIONS FROM TEST STANDARD

None

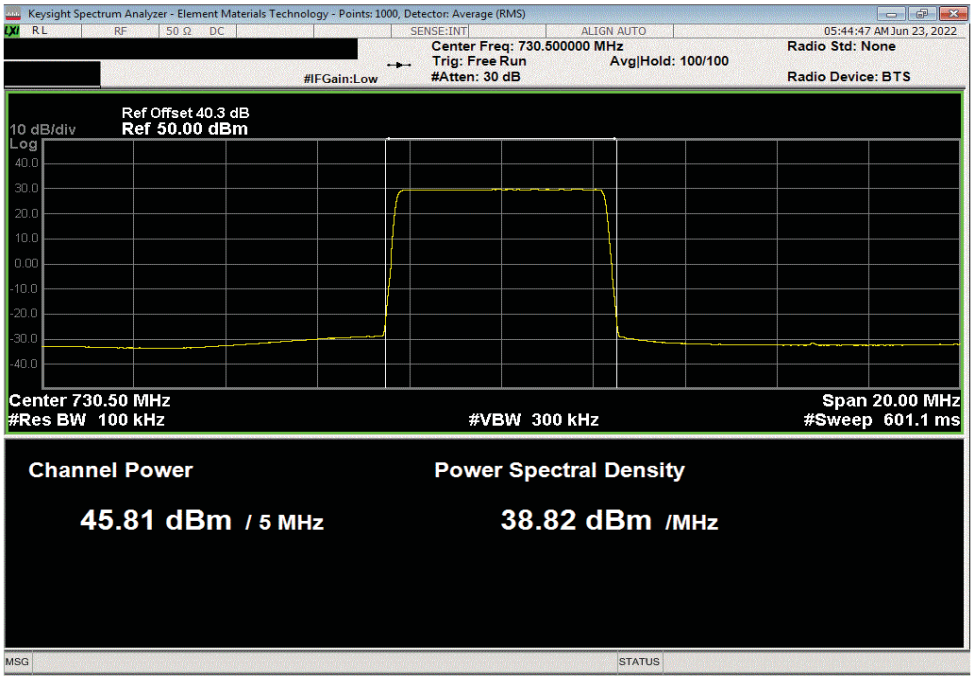
Configuration #	2	Signature

	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz					
5 MHz Bandwidth					
256-QAM Modulation					
Low Ch. 730.5 MHz	45.813	0	45.8	48.8	51.8
Mid Ch. 737 MHz	45.705	0	45.7	48.7	51.7
High Ch. 743.5 MHz	45.713	0	45.7	48.7	51.7
10 MHz Bandwidth					
256-QAM Modulation					
Low Ch. 733 MHz	47.557	0	47.6	50.6	53.6
Mid Ch. 737 MHz	47.482	0	47.5	50.5	53.5
High Ch. 741 MHz	47.448	0	47.4	50.4	53.4
15 MHz Bandwidth					
QPSK Modulation					
Mid Ch. 737 MHz	48.433	0	48.4	51.4	54.4
16-QAM Modulation					
Mid Ch. 737 MHz	48.366	0	48.4	51.4	54.4
64-QAM Modulation					
Mid Ch. 737 MHz	48.417	0	48.4	51.4	54.4
256-QAM Modulation					
Low Ch. 735.5 MHz	48.627	0	48.6	51.6	54.6
Mid Ch. 737 MHz	48.433	0	48.4	51.4	54.4
High Ch. 738.5 MHz	48.574	0	48.6	51.6	54.6

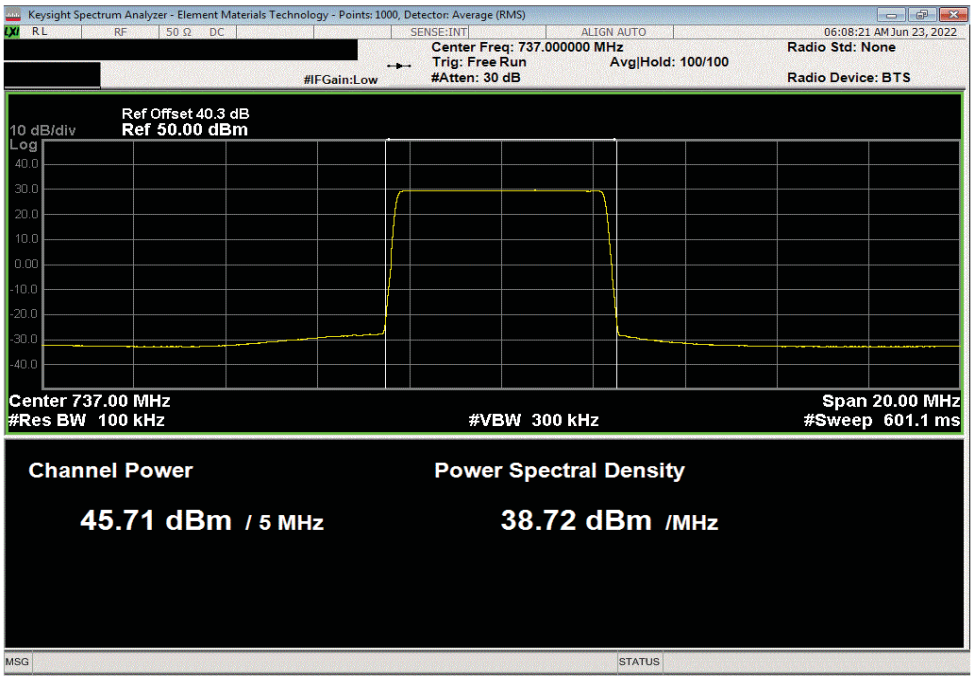
AVERAGE POWER - BAND n85

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band n85, 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/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	45.813	0	45.8	48.8	51.8	



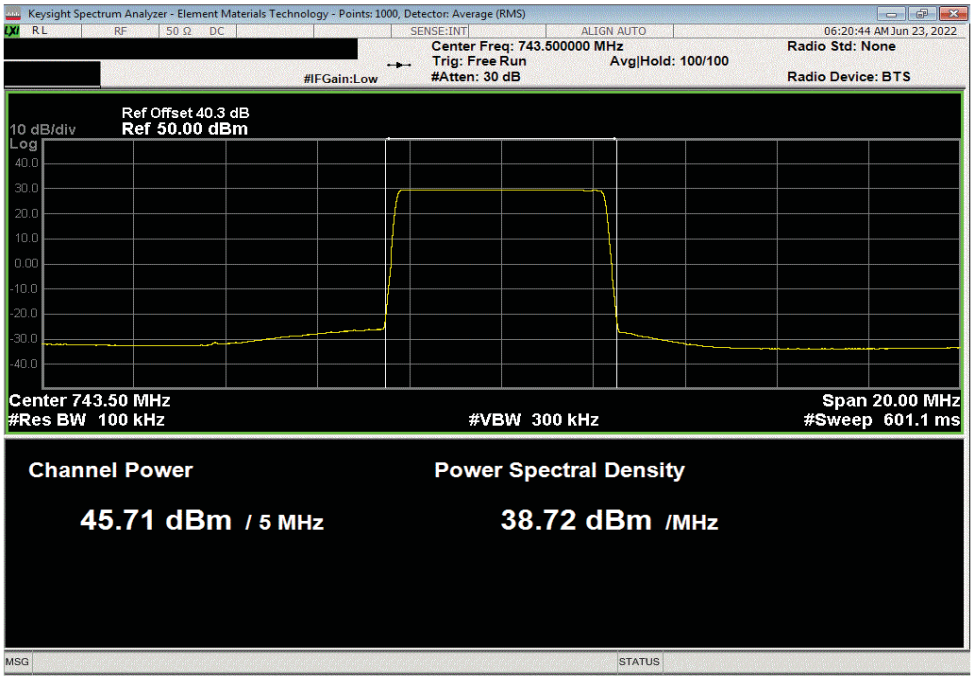
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	45.705	0	45.7	48.7	51.7	



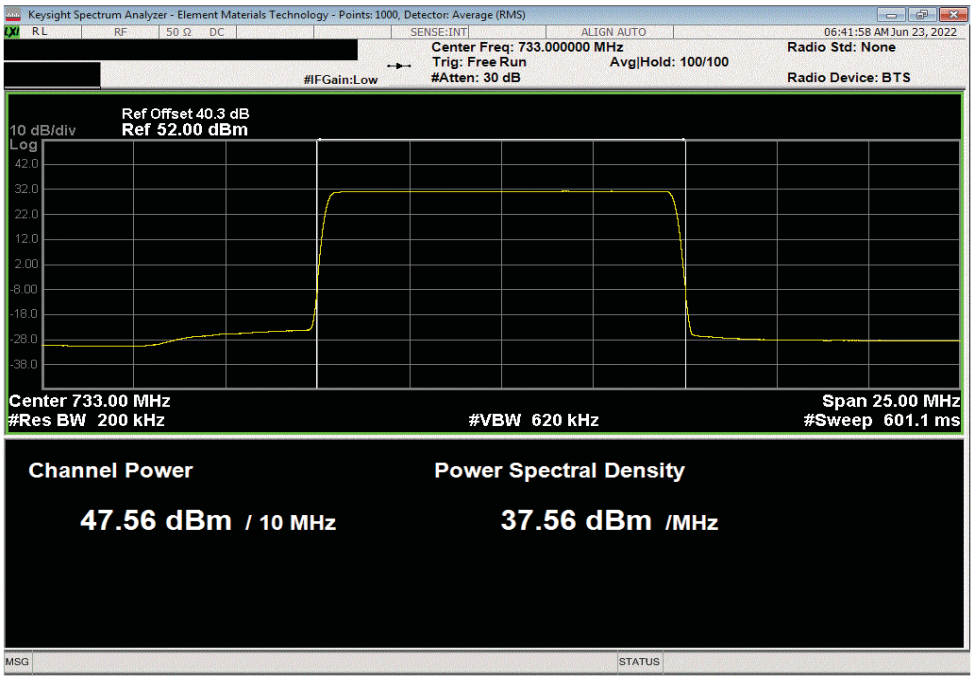
AVERAGE POWER - BAND n85

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band n85, 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/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	45.713	0	45.7	48.7	51.7	



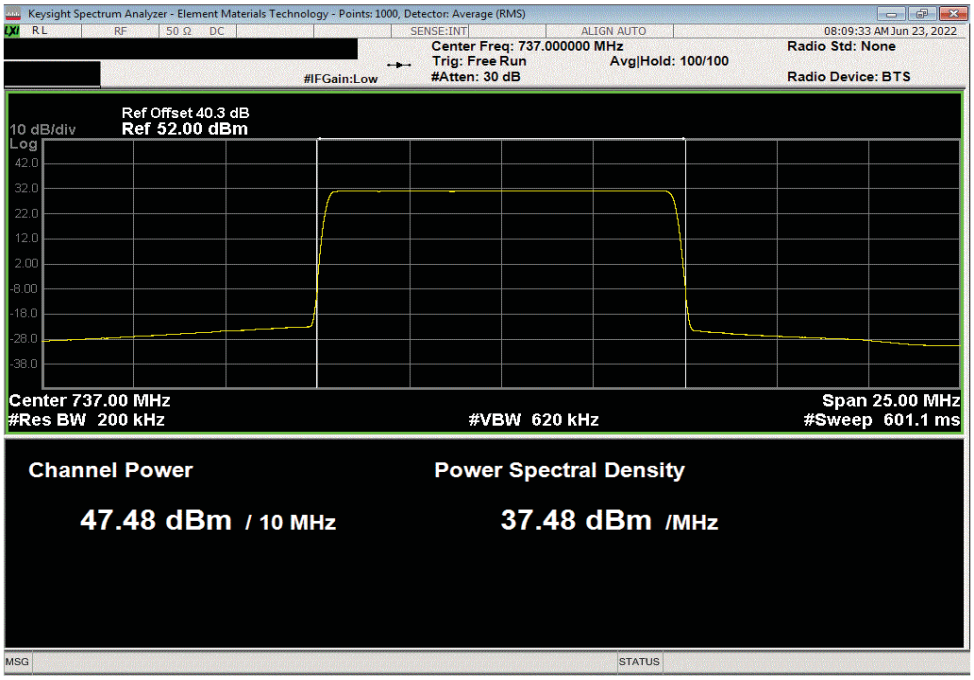
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Low Ch. 733 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	47.557	0	47.6	50.6	53.6	



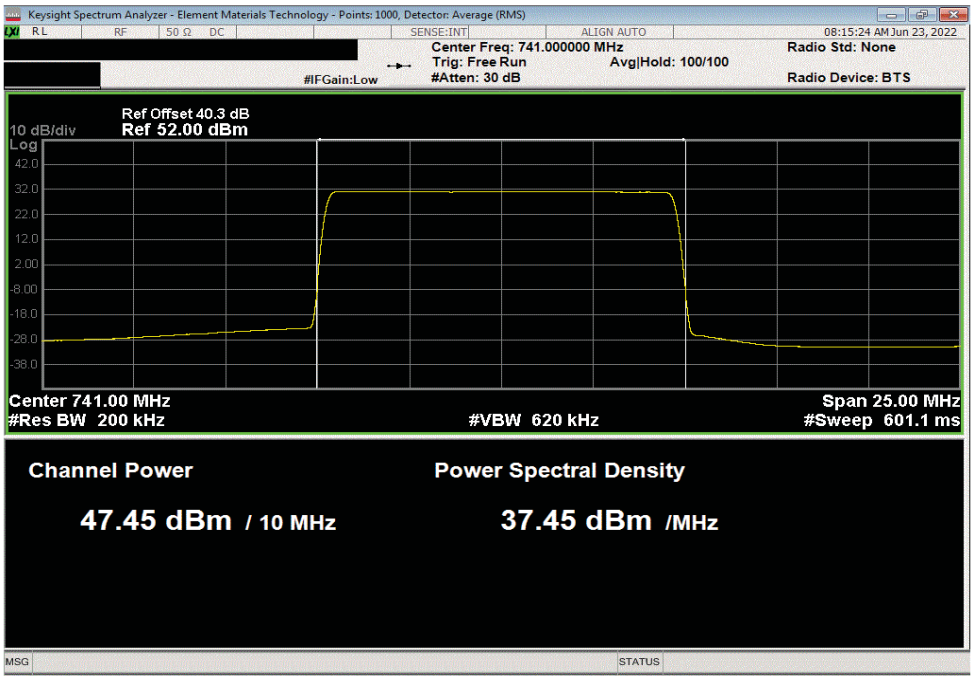
AVERAGE POWER - BAND n85

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band n85, 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/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	47.482	0	47.5	50.5	53.5	



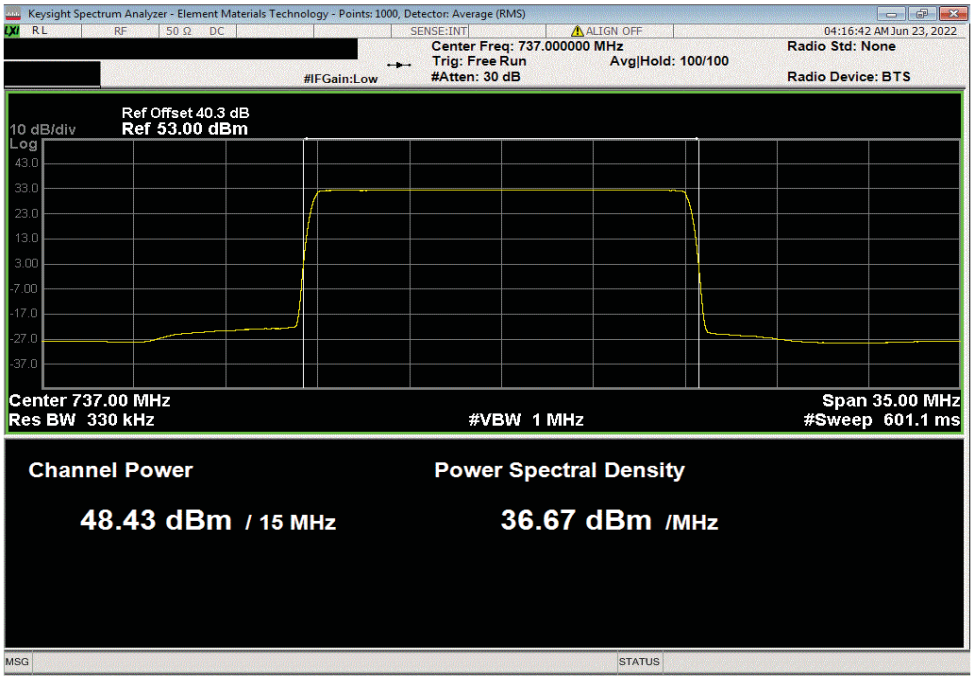
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, High Ch. 741 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	47.448	0	47.4	50.4	53.4	



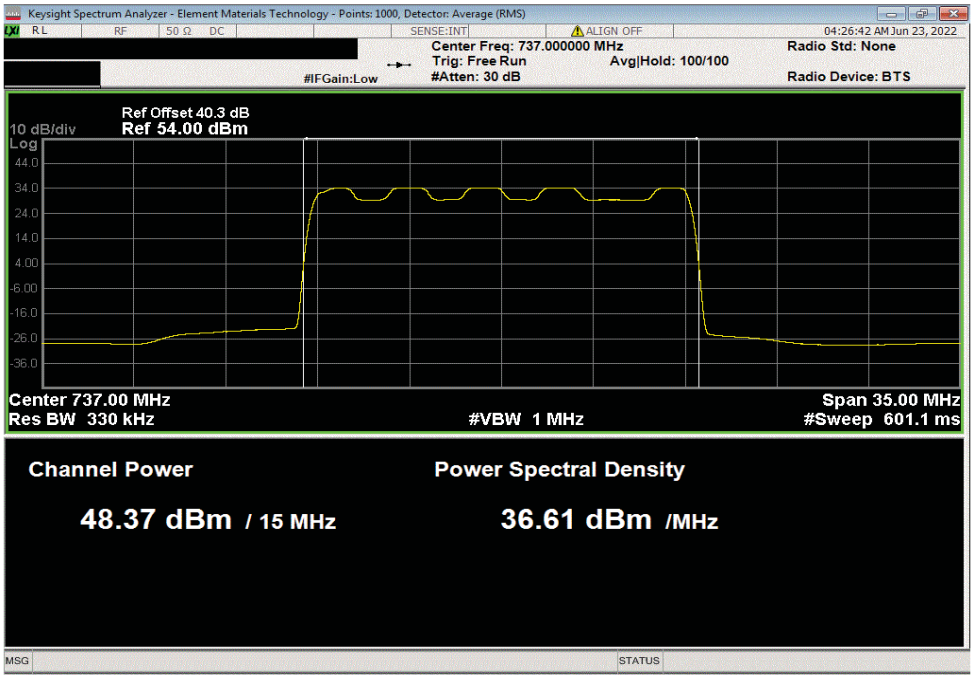
AVERAGE POWER - BAND n85

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, QPSK Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.433	0	48.4	51.4	54.4	



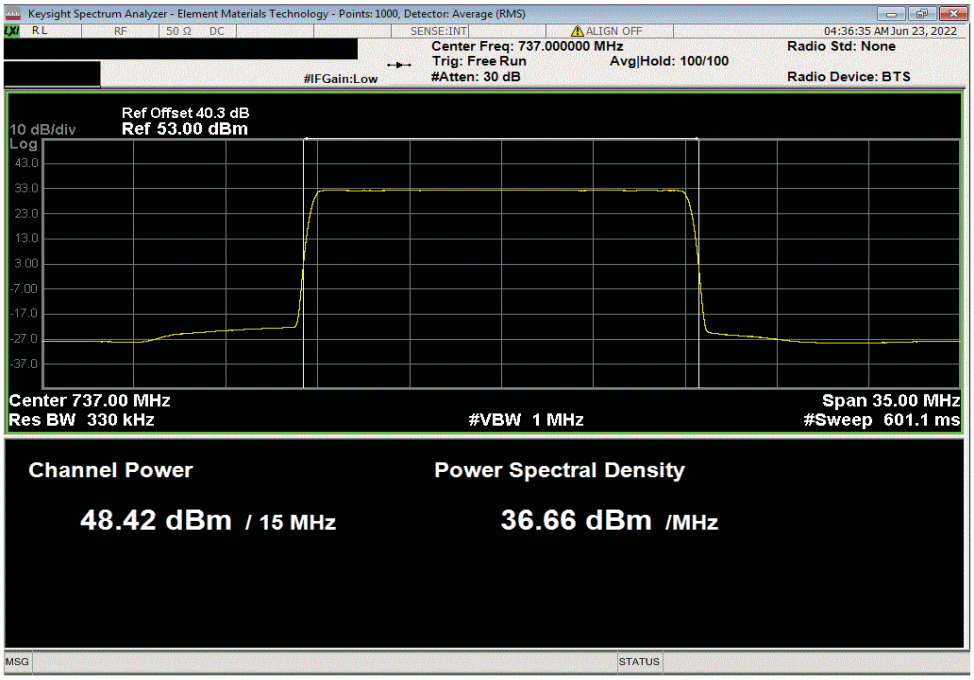
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.366	0	48.4	51.4	54.4	



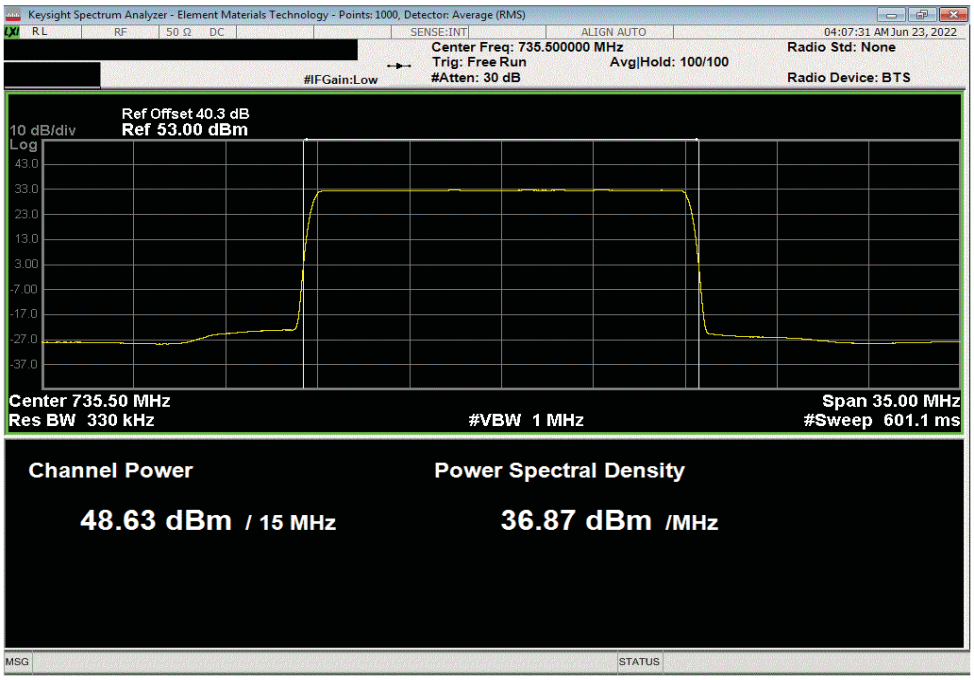
AVERAGE POWER - BAND n85

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band n85, 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/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.417	0	48.4	51.4	54.4	



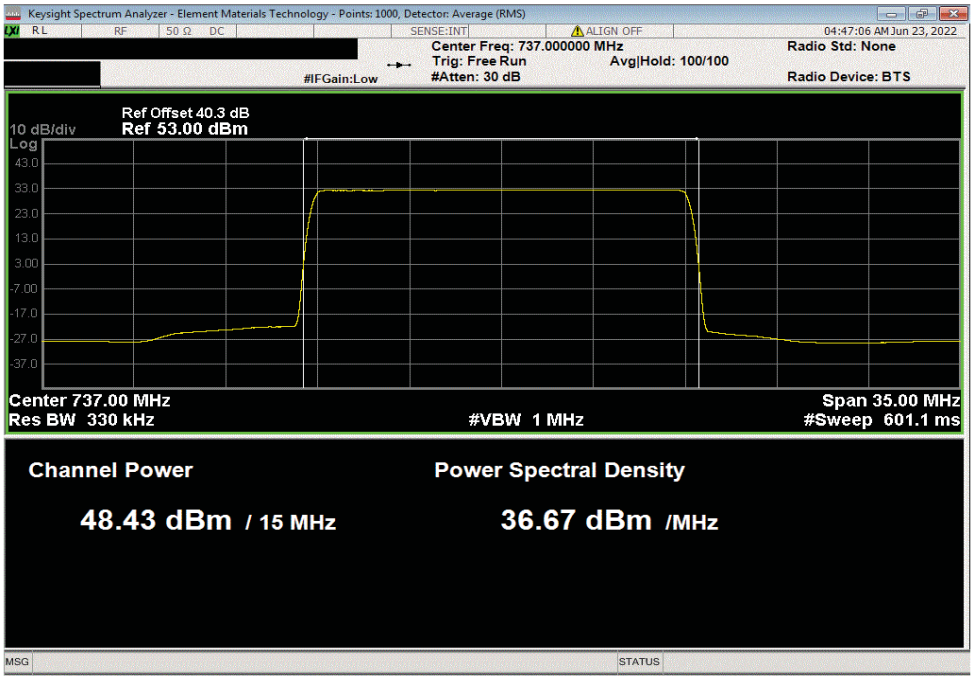
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Low Ch. 735.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.627	0	48.6	51.6	54.6	



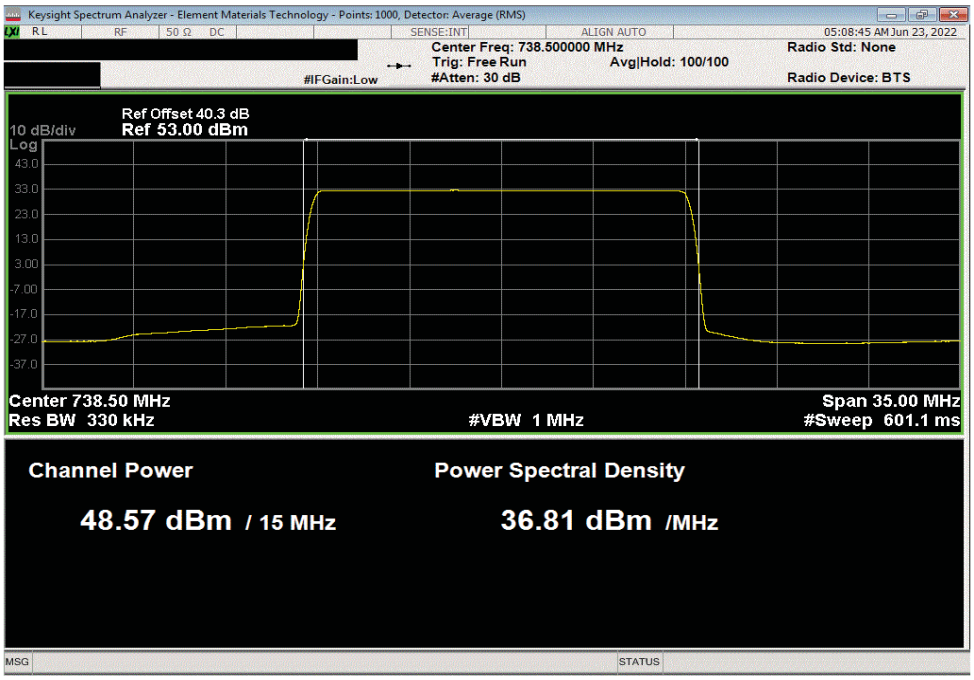
AVERAGE POWER - BAND n85

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band n85, 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/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.433	0	48.4	51.4	54.4	



Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 256-QAM Modulation, High Ch. 738.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/Carrier BW	Two Port (2x2 MIMO) dBm/Carrier BW	Four Port (4x4 MIMO) dBm/Carrier BW	
	48.574	0	48.6	51.6	54.6	



POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

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 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.

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 n71

element

TbtTx 2022.06.03.0 XMit 2022.02.07.0

EUT:	AHLOB (FCC/ISED)	Work Order:	NOKI0042
Serial Number:	YK220900026	Date:	21-Jun-22
Customer:	Nokia Solutions and Networks	Temperature:	20.8 °C
Attendees:	David Le, John Rattanavong	Humidity:	53.5% RH
Project:	None	Barometric Pres.:	1022 mbar
Tested by:	Brandon Hobbs	Job Site:	TX07
Power:	54 VDC		

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 are enabled at maximum power.

DEVIATIONS FROM TEST STANDARD

None

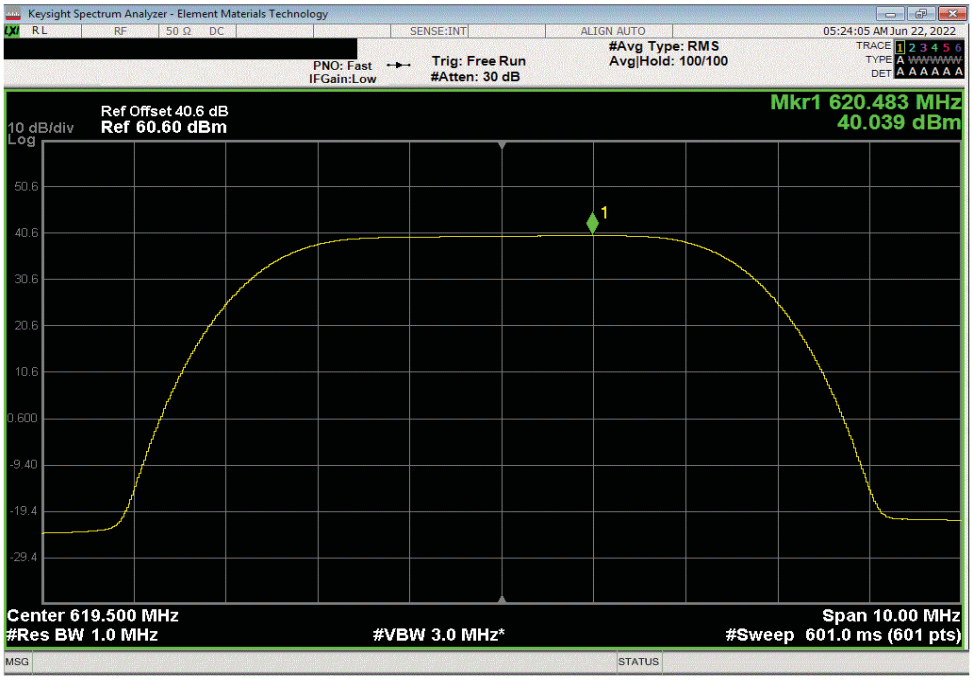
Configuration #	2	Signature

	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz					
5 MHz Bandwidth					
QPSK Modulation					
Low Ch. 619.5 MHz	40.039	0	40.0	43.0	46.0
Mid Ch. 634.5 MHz	39.777	0	39.8	42.8	45.8
High Ch. 649.5 MHz	39.831	0	39.8	42.8	45.8
16-QAM Modulation					
Low Ch. 619.5 MHz	39.924	0	39.9	42.9	45.9
Mid Ch. 634.5 MHz	39.741	0	39.7	42.7	45.7
High Ch. 649.5 MHz	39.784	0	39.8	42.8	45.8
64-QAM Modulation					
Low Ch. 619.5 MHz	39.990	0	40.0	43.0	46.0
Mid Ch. 634.5 MHz	39.776	0	39.8	42.8	45.8
High Ch. 649.5 MHz	39.884	0	39.9	42.9	45.9
256-QAM Modulation					
Low Ch. 619.5 MHz	39.903	0	39.9	42.9	45.9
Mid Ch. 634.5 MHz	39.805	0	39.8	42.8	45.8
High Ch. 649.5 MHz	39.865	0	39.9	42.9	45.9
10 MHz Bandwidth					
QPSK Modulation					
Mid Ch. 634.5 MHz	38.387	0	38.4	41.4	44.4
16-QAM Modulation					
Mid Ch. 634.5 MHz	39.005	0	39.0	42.0	45.0
64-QAM Modulation					
Mid Ch. 634.5 MHz	38.316	0	38.3	41.3	44.3
256-QAM Modulation					
Mid Ch. 634.5 MHz	38.310	0	38.3	41.3	44.3
15 MHz Bandwidth					
QPSK Modulation					
Mid Ch. 634.5 MHz	37.781	0	37.8	40.8	43.8
16-QAM Modulation					
Mid Ch. 634.5 MHz	39.193	0	39.2	42.2	45.2
64-QAM Modulation					
Mid Ch. 634.5 MHz	37.679	0	37.7	40.7	43.7
256-QAM Modulation					
Mid Ch. 634.5 MHz	37.697	0	37.7	40.7	43.7
20 MHz Bandwidth					
QPSK Modulation					
Mid Ch. 634.5 MHz	36.594	0	36.6	39.6	42.6
16-QAM Modulation					
Mid Ch. 634.5 MHz	38.157	0	38.2	41.2	44.2
64-QAM Modulation					
Mid Ch. 634.5 MHz	36.473	0	36.5	39.5	42.5
256-QAM Modulation					
Mid Ch. 634.5 MHz	36.450	0	36.5	39.5	42.5

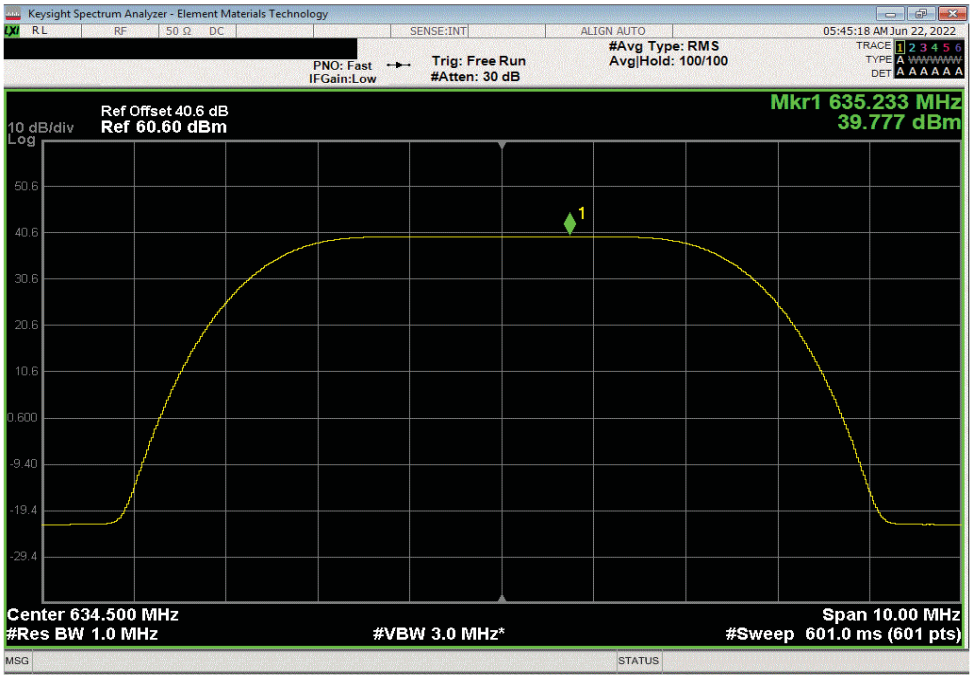
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, QPSK Modulation, Low Ch. 619.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	40.039	0	40.039	43.039	46.039	



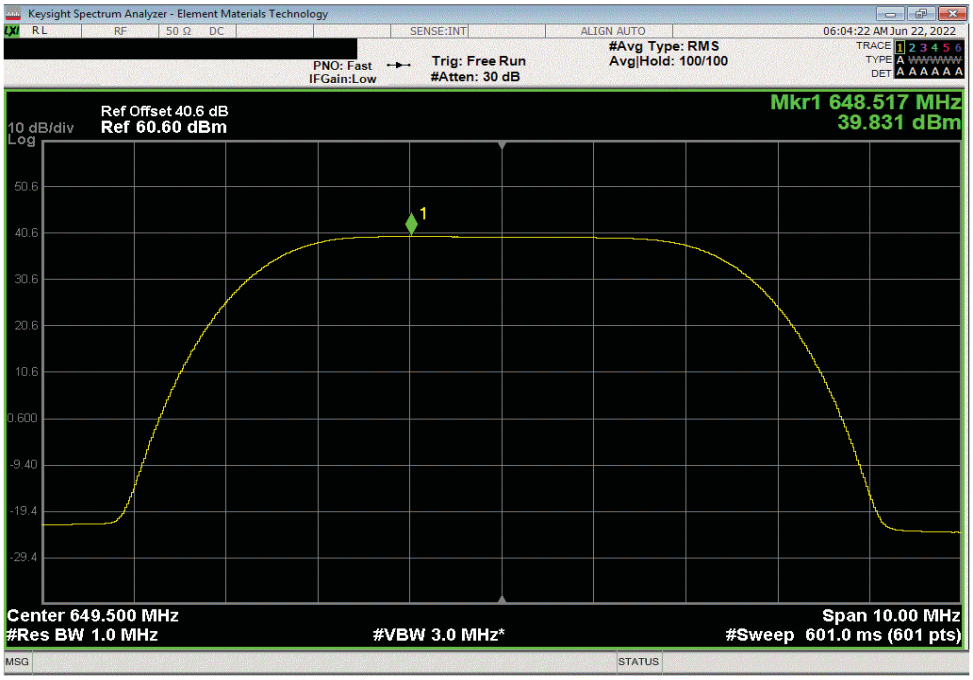
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, QPSK Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.777	0	39.777	42.777	45.777	



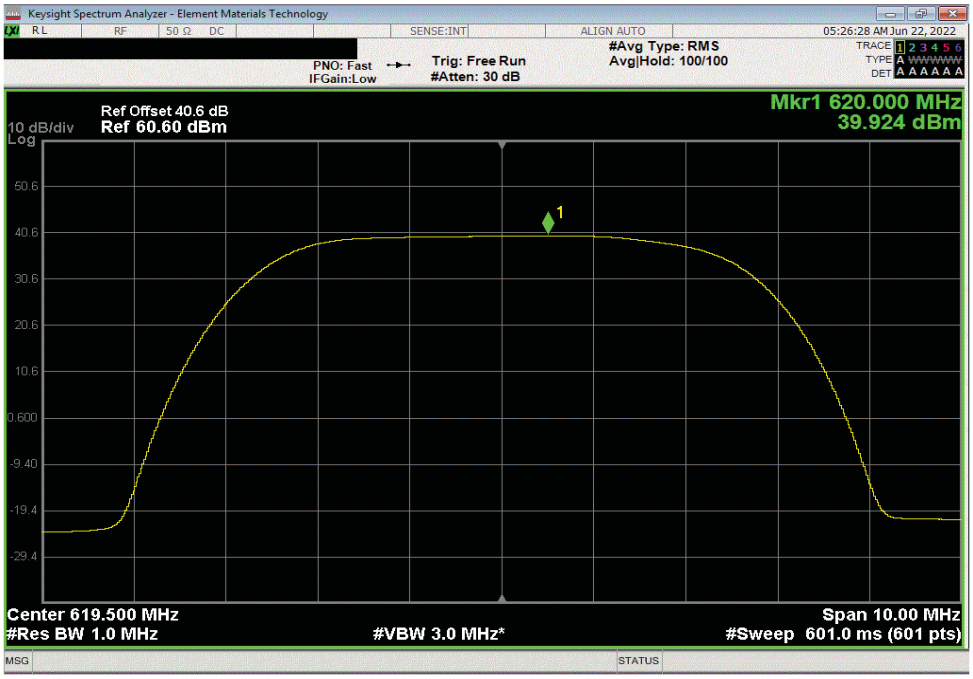
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, QPSK Modulation, High Ch. 649.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.831	0	39.831	42.831	45.831	



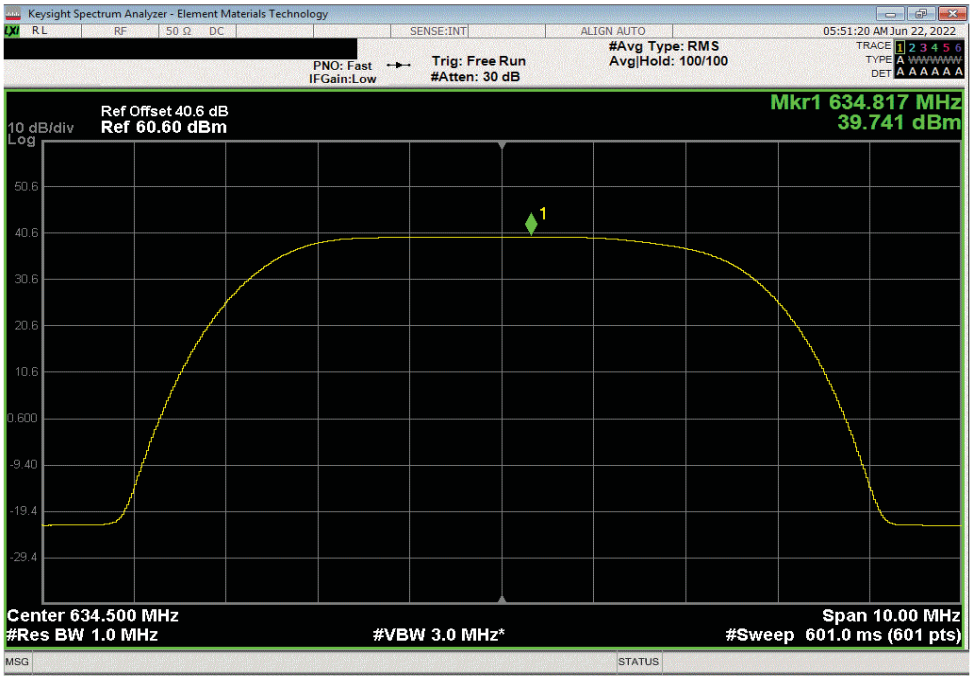
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 16-QAM Modulation, Low Ch. 619.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.924	0	39.924	42.924	45.924	



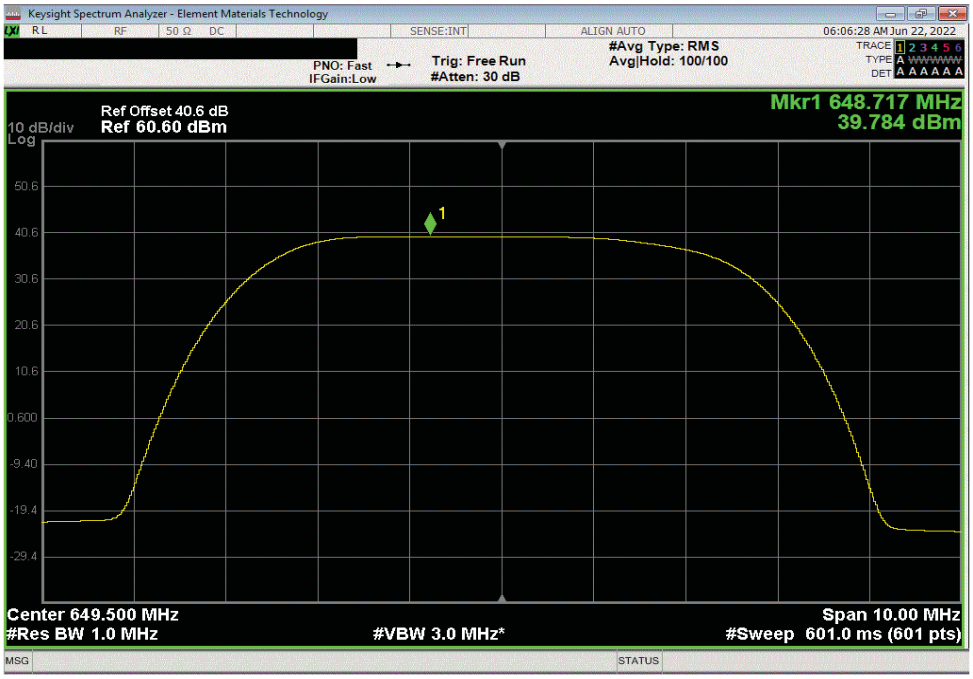
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 16-QAM 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.741	0	39.741	42.741	45.741	



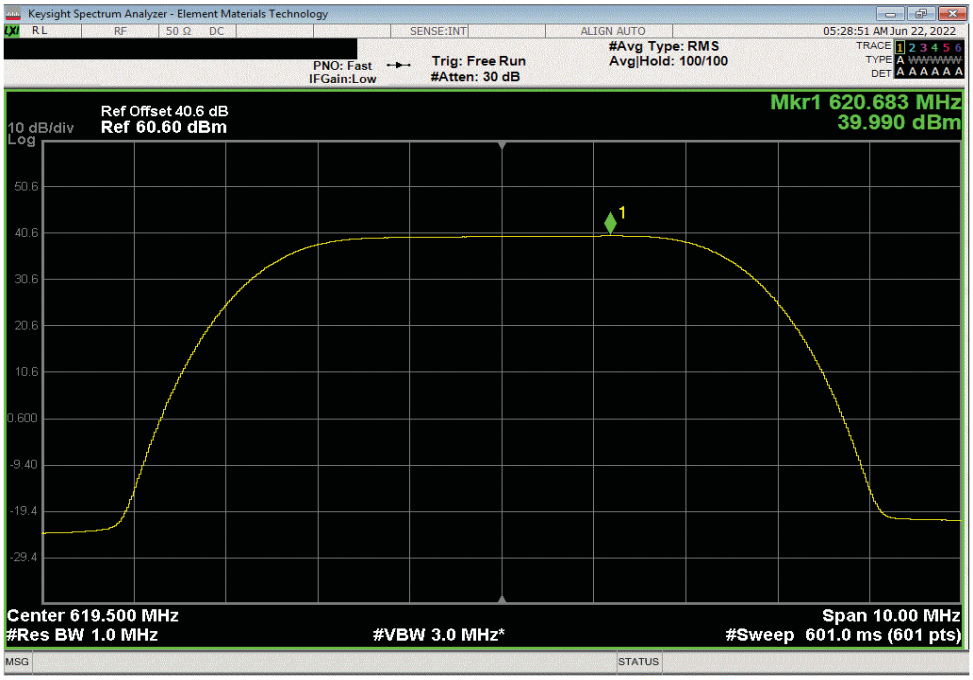
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 16-QAM Modulation, High Ch. 649.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.784	0	39.784	42.784	45.784	



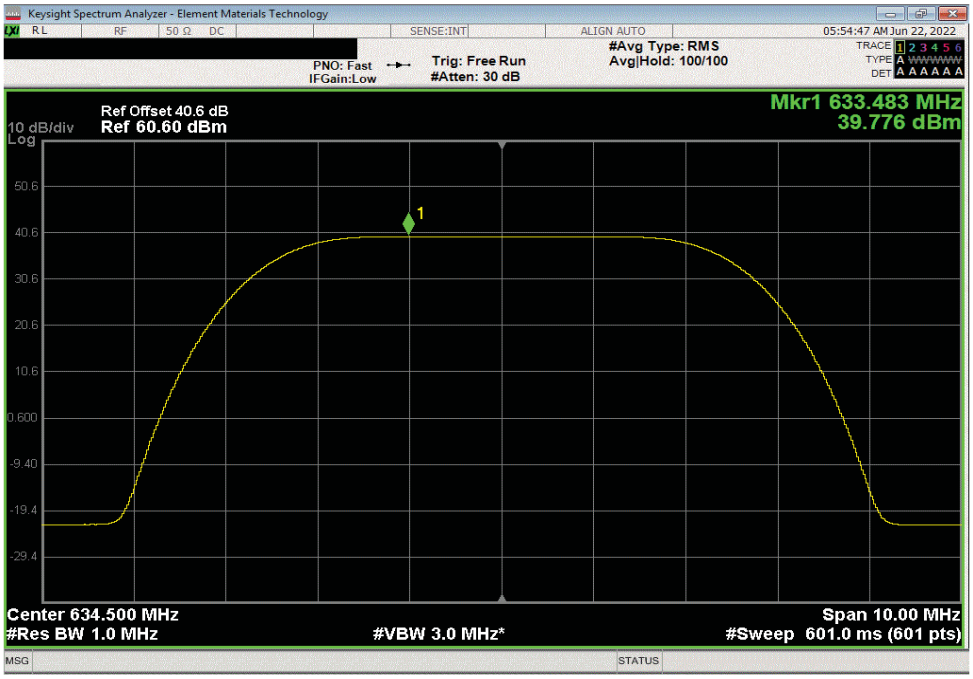
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 64-QAM Modulation, Low Ch. 619.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.99	0	39.99	42.99	45.99	



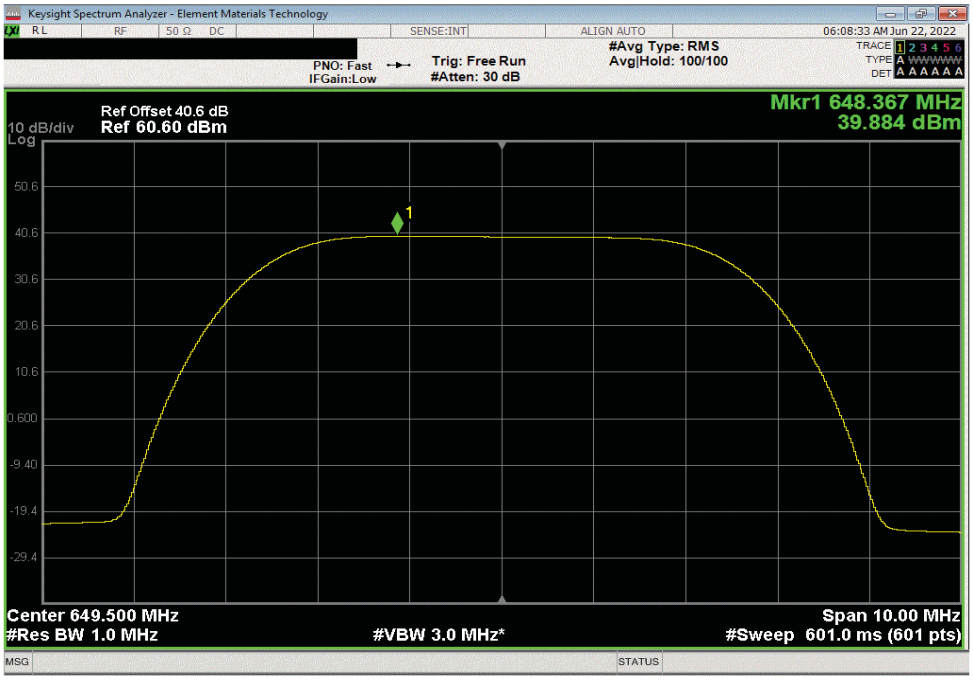
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.776	0	39.776	42.776	45.776	



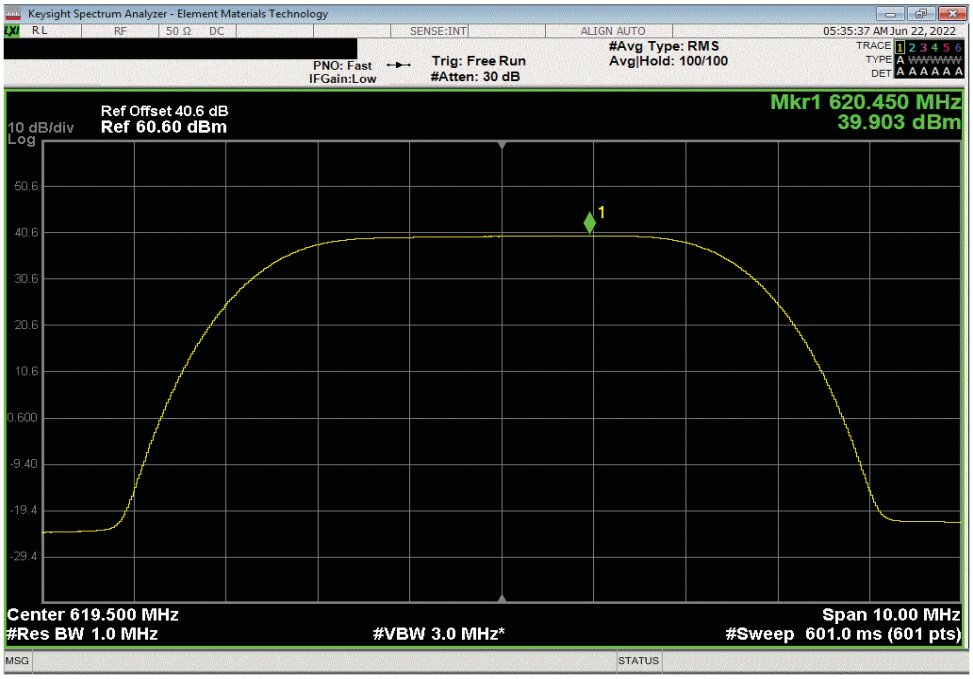
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 64-QAM Modulation, High Ch. 649.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.884	0	39.884	42.884	45.884	



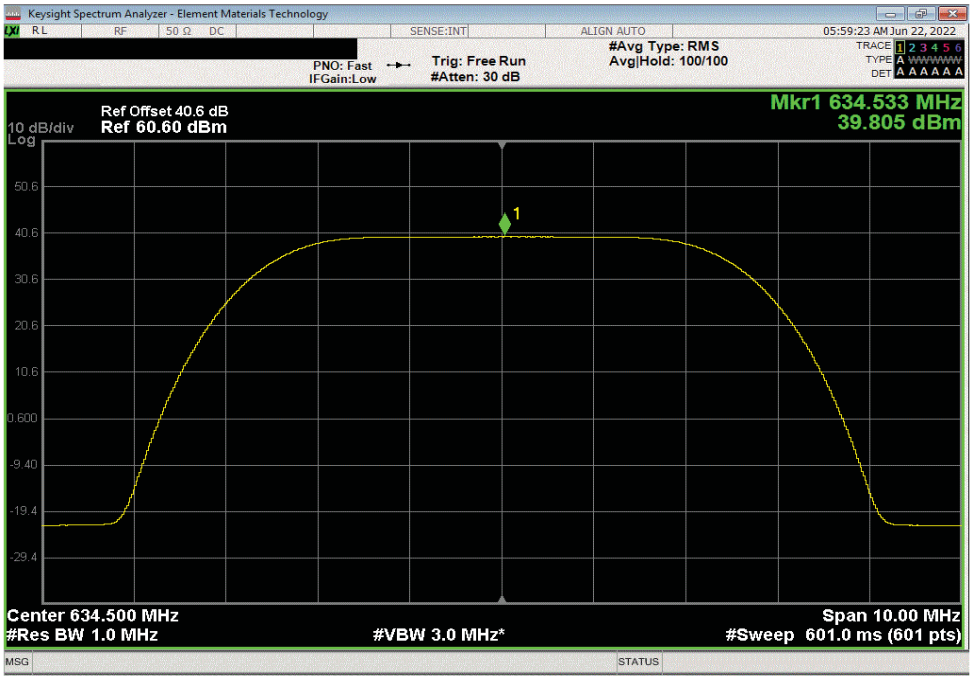
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 619.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.903	0	39.903	42.903	45.903	



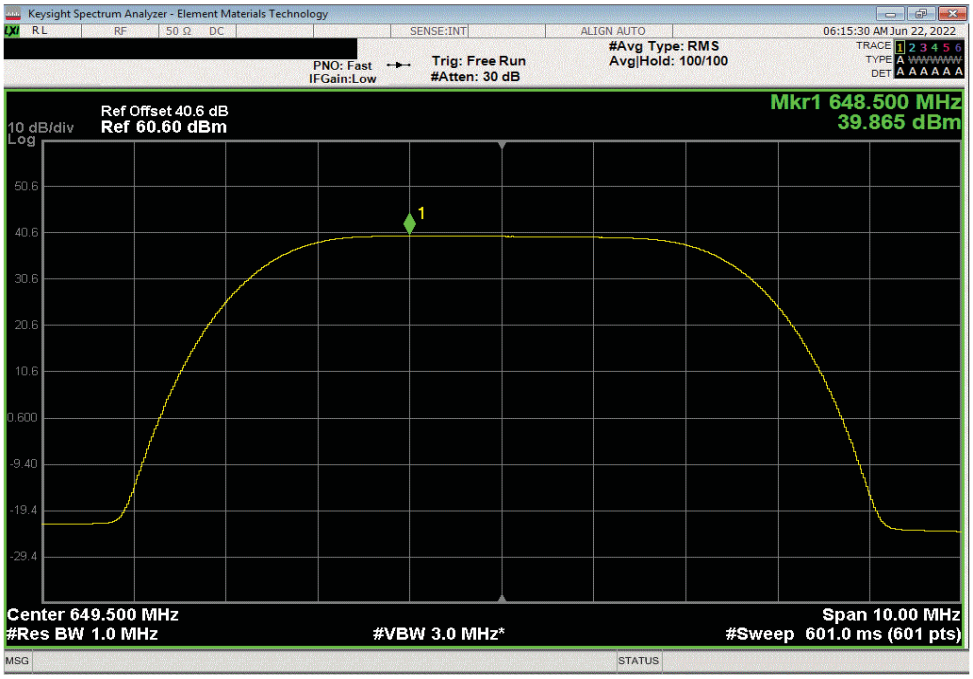
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.805	0	39.805	42.805	45.805	



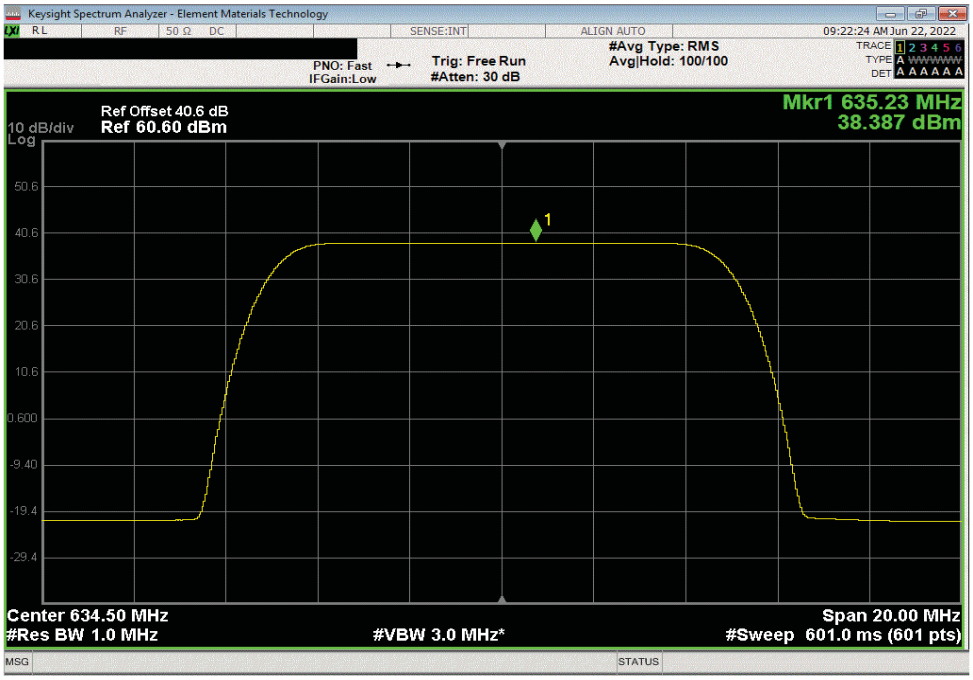
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 649.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.865	0	39.865	42.865	45.865	



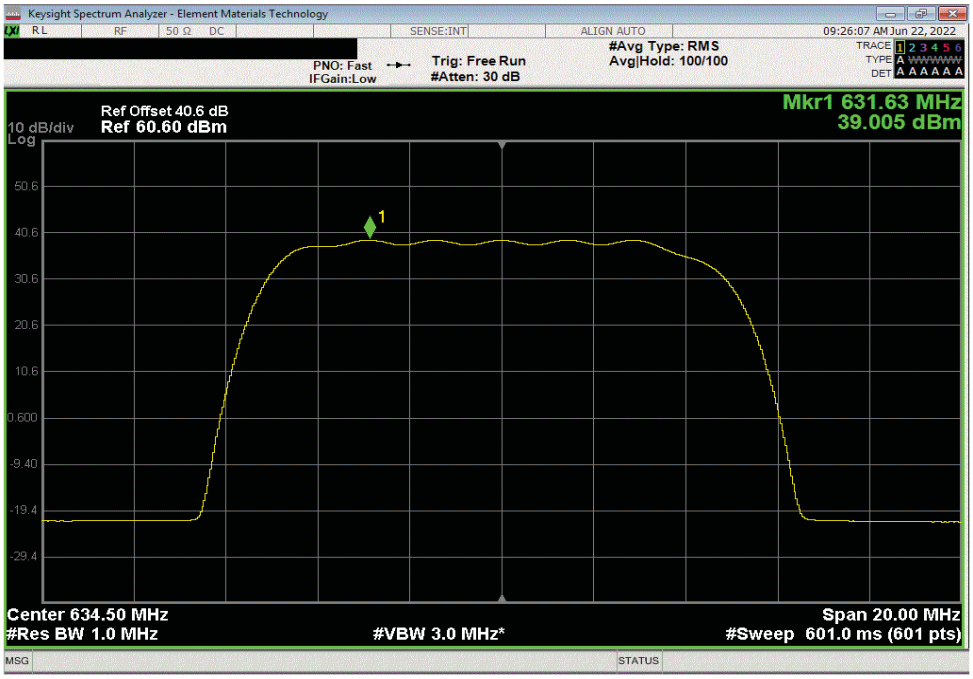
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	38.387	0	38.387	41.387	44.387	



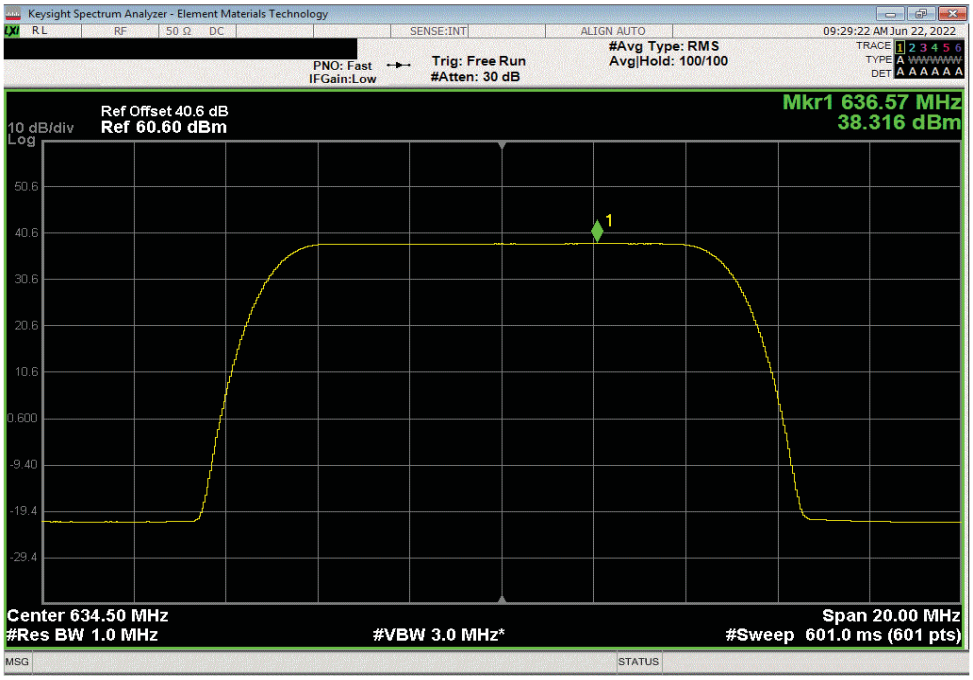
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.005	0	39.005	42.005	45.005	



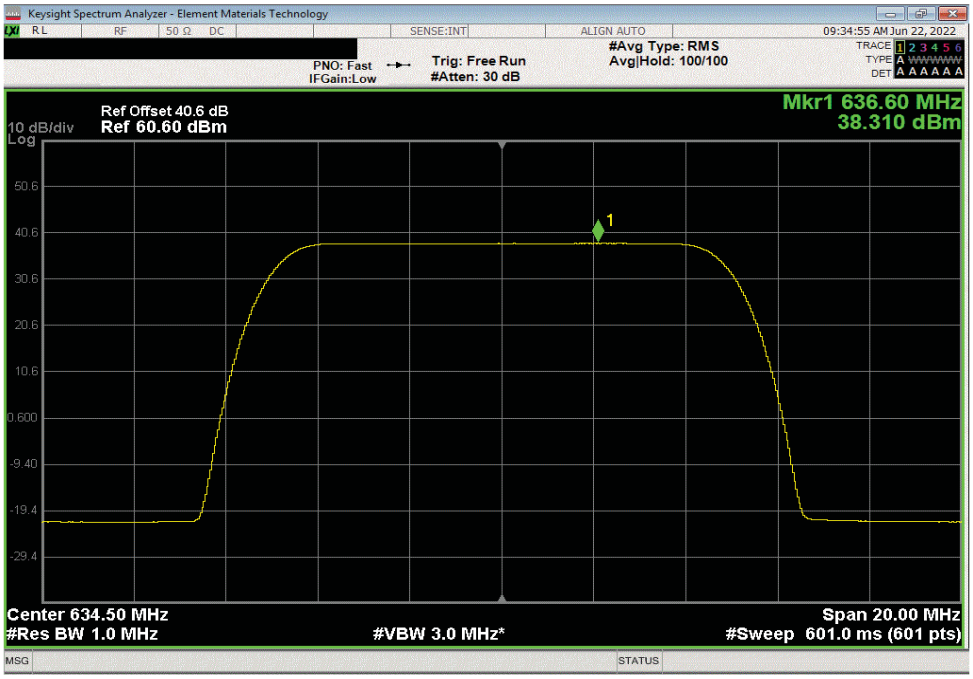
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 64-QAM 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	38.316	0	38.316	41.316	44.316	



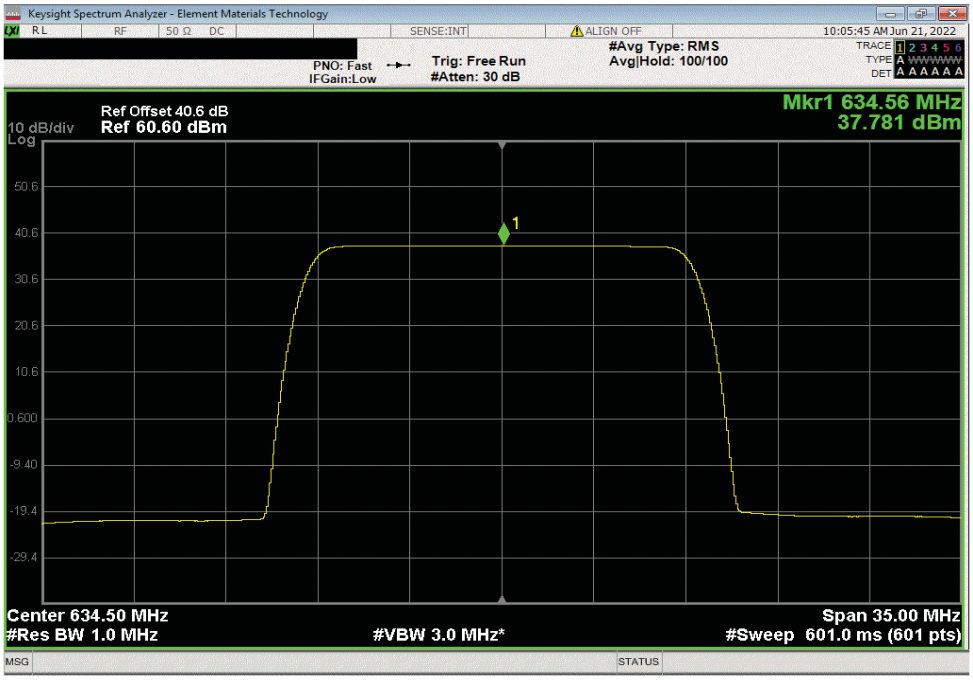
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	38.31	0	38.31	41.31	44.31	



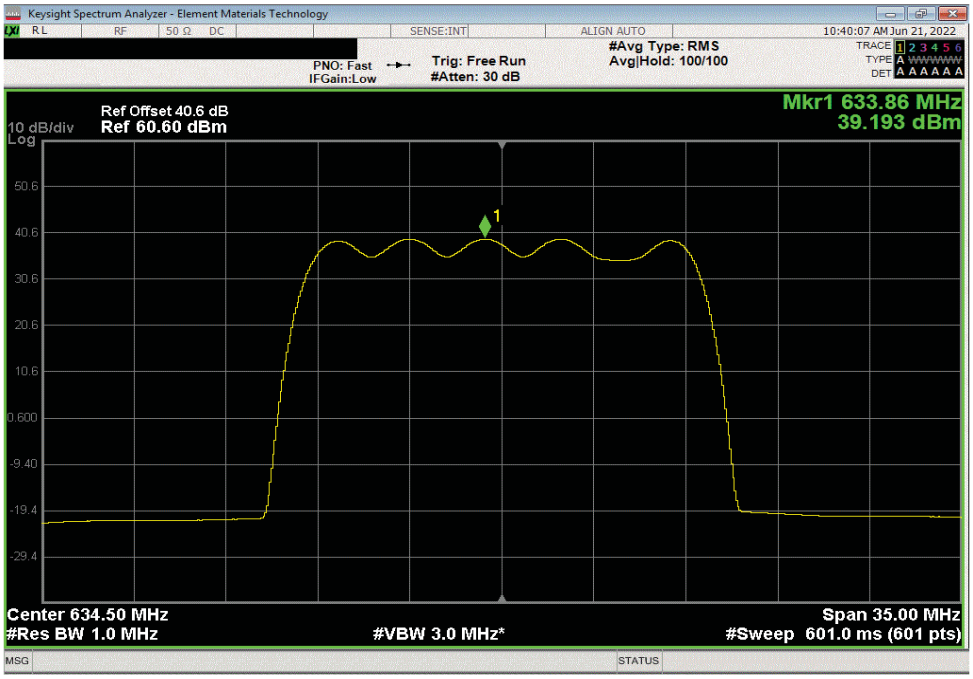
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	37.781	0	37.781	40.781	43.781	



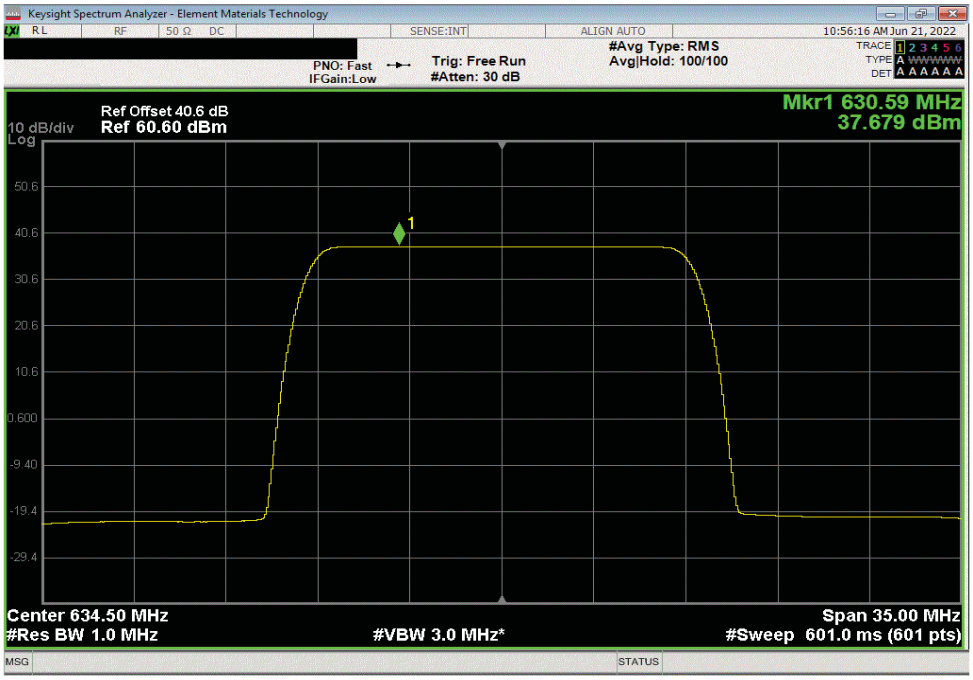
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.193	0	39.193	42.193	45.193	



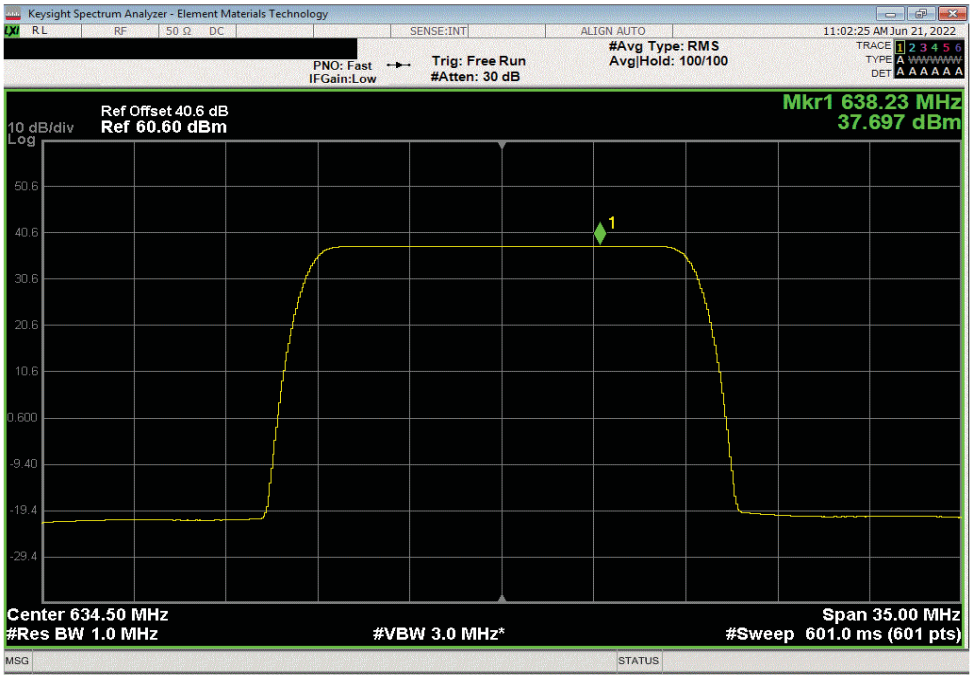
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 64-QAM 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	37.679	0	37.679	40.679	43.679	



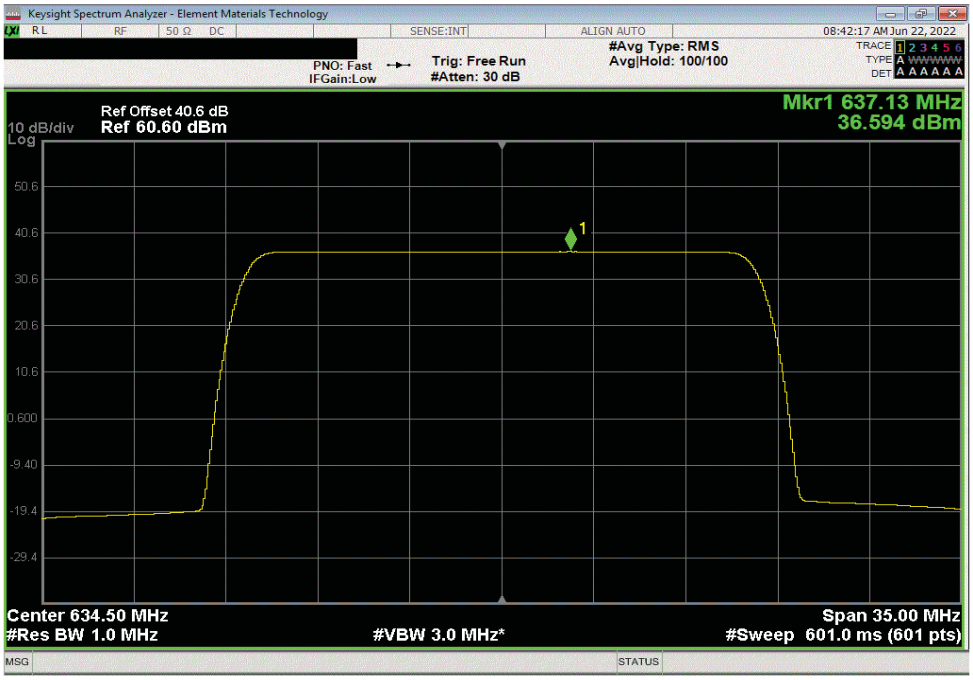
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 15 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	37.697	0	37.697	40.697	43.697	



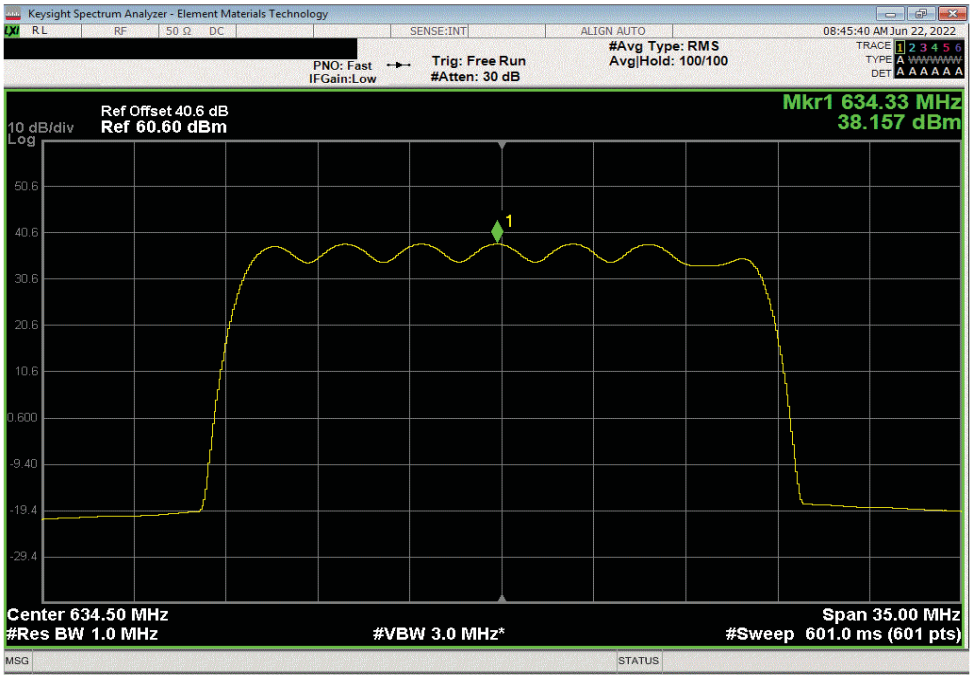
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	36.594	0	36.594	39.594	42.594	



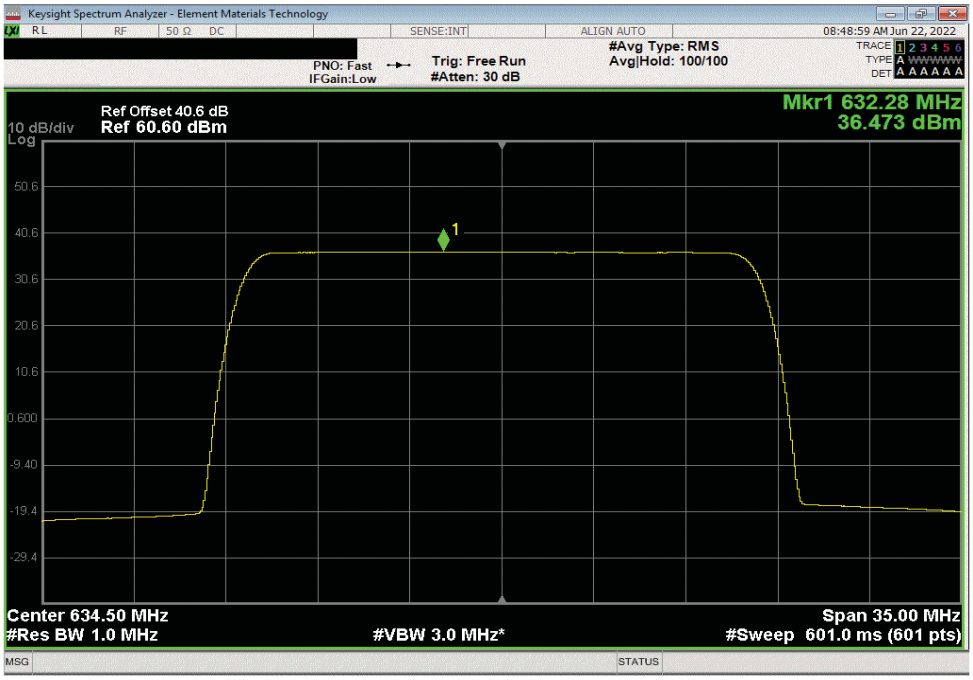
Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 634.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	38.157	0	38.157	41.157	44.157	



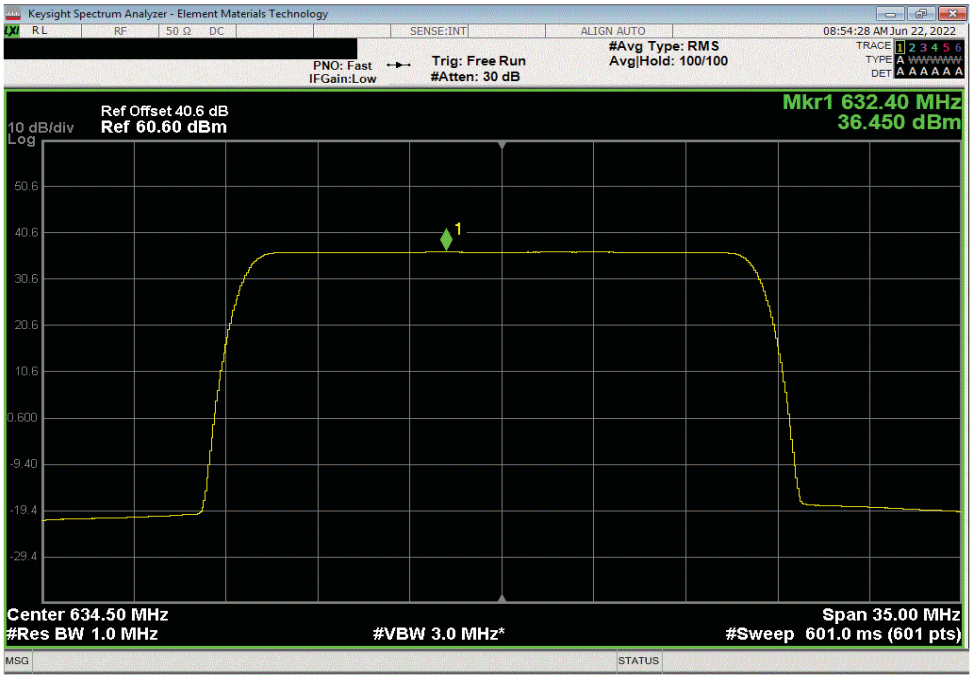
POWER SPECTRAL DENSITY AND EIRP CALCULATION - BAND n71

TbtTx 2022.06.03.0 XMit 2022.02.07.0

Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 64-QAM 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	36.473	0	36.473	39.473	42.473	



Port 1, 5G NR, Band 71, 617 MHz - 652 MHz, 20 MHz Bandwidth, 256-QAM 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	36.45	0	36.45	39.45	42.45	



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 n71 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	5 MHz Ch BW	10 MHz Ch BW	15 MHz Ch BW	20 MHz Ch BW
Worst Case PSD/Antenna Port	40.0 dBm/MHz	39.0 dBm/MHz	39.2 dBm/MHz	38.2 dBm/MHz
Number of Ant Ports per Polarization	2	2	2	2
Total PSD per Polarization	43.0	42.0	42.2	41.2
Cable Loss (site dependent)	0 dB	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	15.7 dBi
EIRP per Polarization	58.7 dBm/MHz or 741 Watts/MHz	57.7 dBm/MHz or 589 Watts/MHz	57.9 dBm/MHz or 617 Watts/MHz	56.9 dBm/MHz or 490 Watts/MHz
Number of Polarizations	2	2	2	2
EIRP Total = R1 ±45°and R2 ±45° See Note 2	58.7 dBm/MHz or 741 Watts/MHz	57.7 dBm/MHz or 589 Watts/MHz	57.9 dBm/MHz or 617 Watts/MHz	56.9 dBm/MHz or 490 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 (5, 10, 15 & 20MHz) channel bandwidths

POWER SPECTRAL DENSITY AND EIRP CALCULATION - n85

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 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.

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 - n85

element

TbtTx 2022.05.02.0 XMit 2022.02.07.0

EUT:	AHLOB (FCC/ISED)	Work Order:	NOKI0042
Serial Number:	YK220900026	Date:	22-Jun-22
Customer:	Nokia Solutions and Networks	Temperature:	22.2 °C
Attendees:	David Le, John Rattanavong	Humidity:	51.1% RH
Project:	None	Barometric Pres.:	1021 mbar
Tested by:	Brandon Hobbs	Job Site:	TX07
Power:	54 VDC		

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 are enabled at maximum power.

DEVIATIONS FROM TEST STANDARD

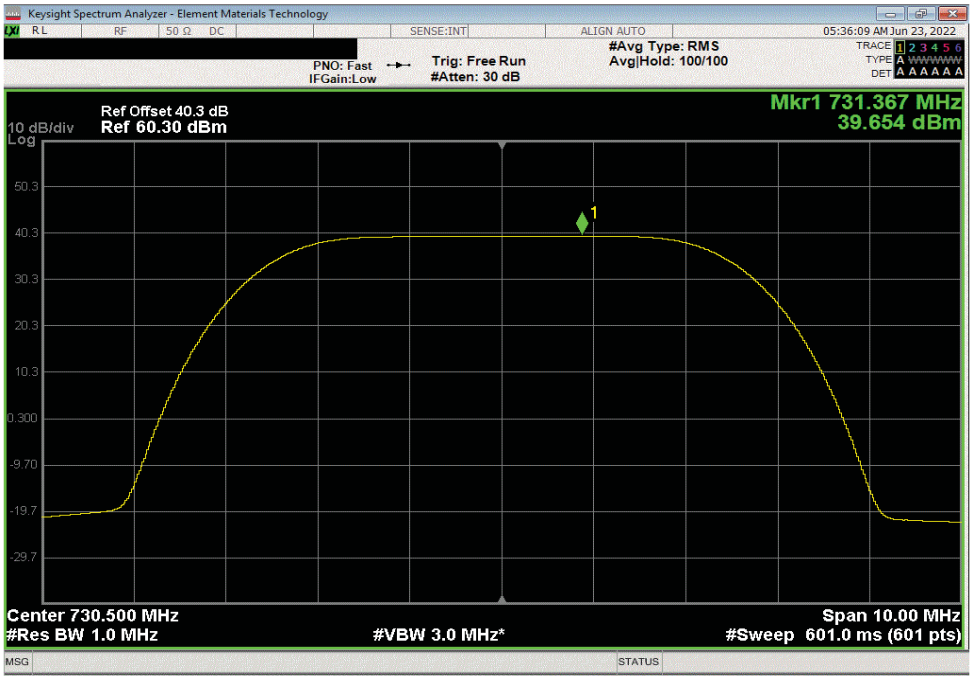
None

Configuration #	2	Signature

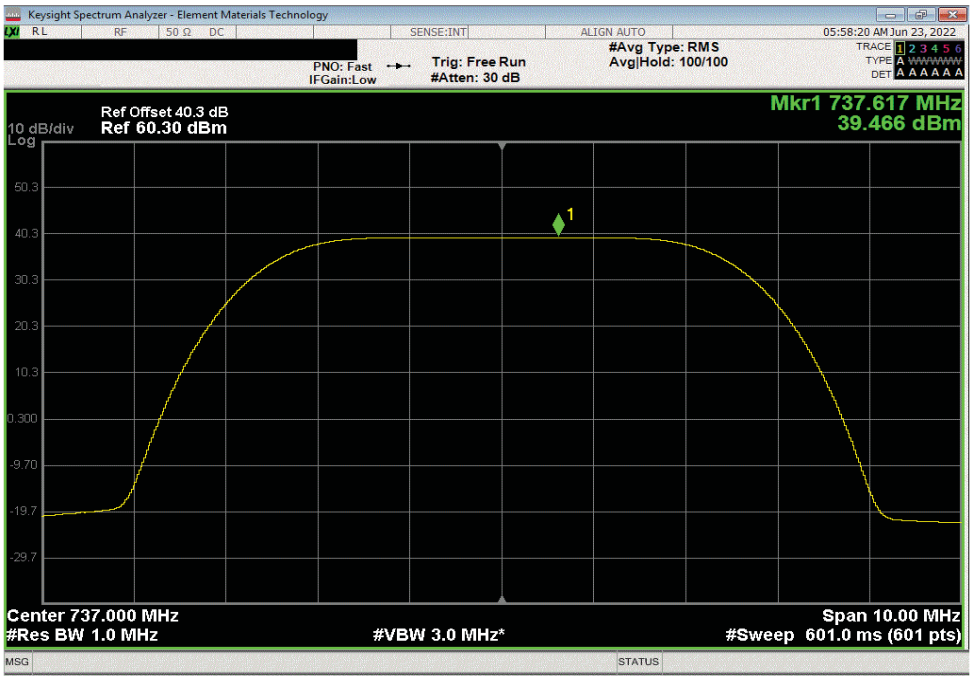
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz					
5 MHz Bandwidth					
QPSK Modulation					
Low Ch. 730.5 MHz	39.654	0	39.7	42.7	45.7
Mid Ch. 737 MHz	39.466	0	39.5	42.5	45.5
High Ch. 743.5 MHz	39.424	0	39.4	42.4	45.4
16-QAM Modulation					
Low Ch. 730.5 MHz	39.593	0	39.6	42.6	45.6
Mid Ch. 737 MHz	39.431	0	39.4	42.4	45.4
High Ch. 743.5 MHz	39.385	0	39.4	42.4	45.4
64-QAM Modulation					
Low Ch. 730.5 MHz	39.598	0	39.6	42.6	45.6
Mid Ch. 737 MHz	39.423	0	39.4	42.4	45.4
High Ch. 743.5 MHz	39.476	0	39.5	42.5	45.5
256-QAM Modulation					
Low Ch. 730.5 MHz	39.549	0	39.5	42.5	45.5
Mid Ch. 737 MHz	39.454	0	39.5	42.5	45.5
High Ch. 743.5 MHz	39.453	0	39.5	42.5	45.5
10 MHz Bandwidth					
QPSK Modulation					
Mid Ch. 737 MHz	37.924	0	37.9	40.9	43.9
16-QAM Modulation					
Mid Ch. 737 MHz	38.759	0	38.8	41.8	44.8
64-QAM Modulation					
Mid Ch. 737 MHz	38.072	0	38.1	41.1	44.1
256-QAM Modulation					
Mid Ch. 737 MHz	38.029	0	38.0	41.0	44.0
15 MHz Bandwidth					
QPSK Modulation					
Mid Ch. 737 MHz	37.332	0	37.3	40.3	43.3
16-QAM Modulation					
Mid Ch. 737 MHz	38.838	0	38.8	41.8	44.8
64-QAM Modulation					
Mid Ch. 737 MHz	37.316	0	37.3	40.3	43.3
256-QAM Modulation					
Mid Ch. 737 MHz	37.320	0	37.3	40.3	43.3

POWER SPECTRAL DENSITY AND EIRP CALCULATION - n85

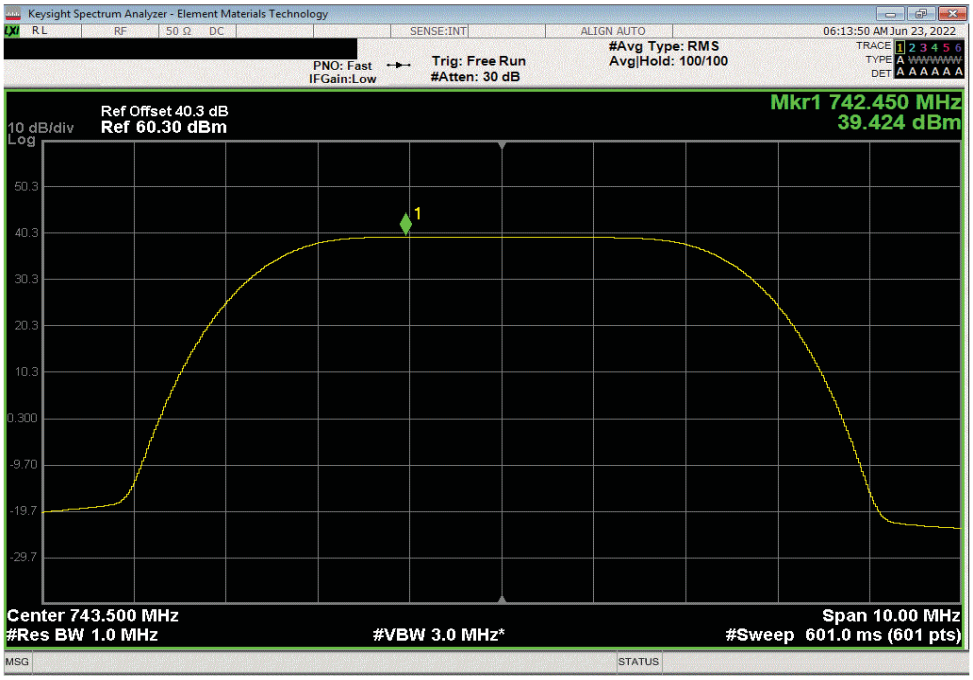
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, QPSK Modulation, Low Ch. 730.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.654	0	39.654	42.654	45.654	



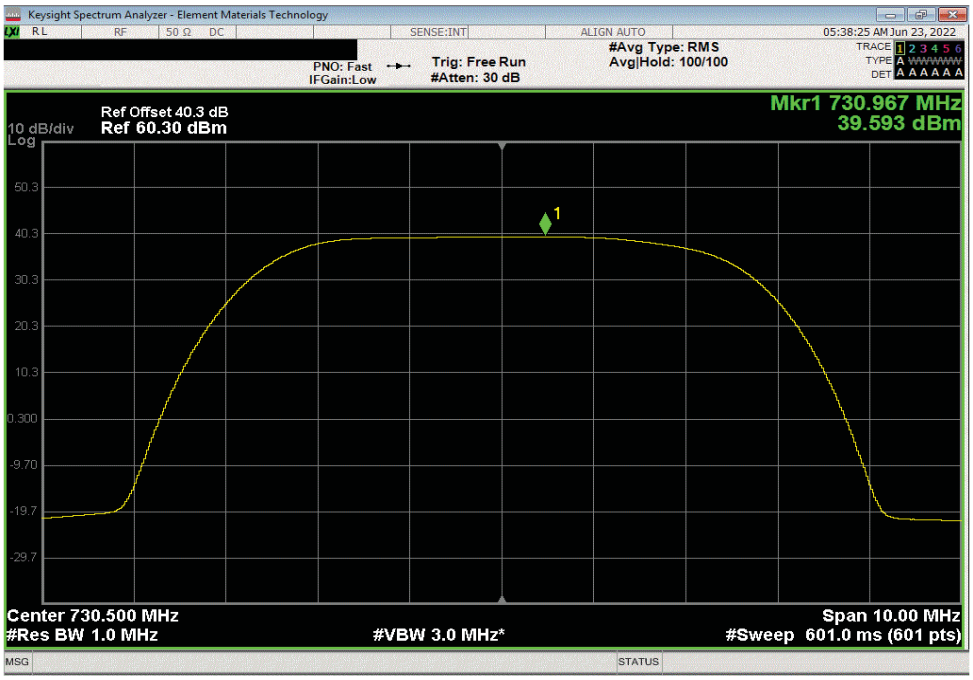
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, QPSK Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.466	0	39.466	42.466	45.466	



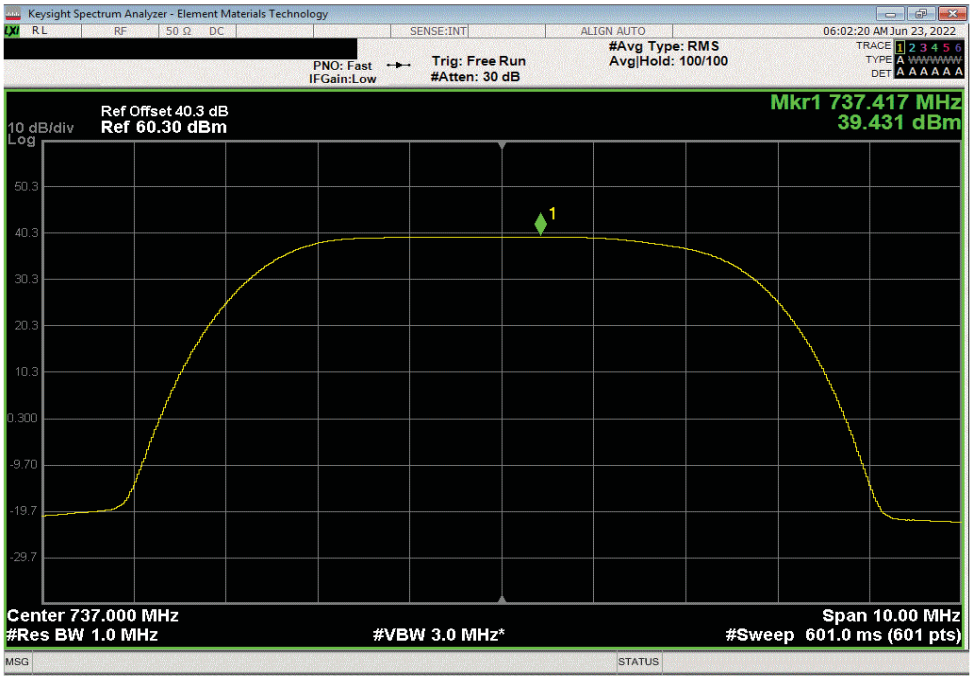
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, QPSK Modulation, High Ch. 743.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.424	0	39.424	42.424	45.424	



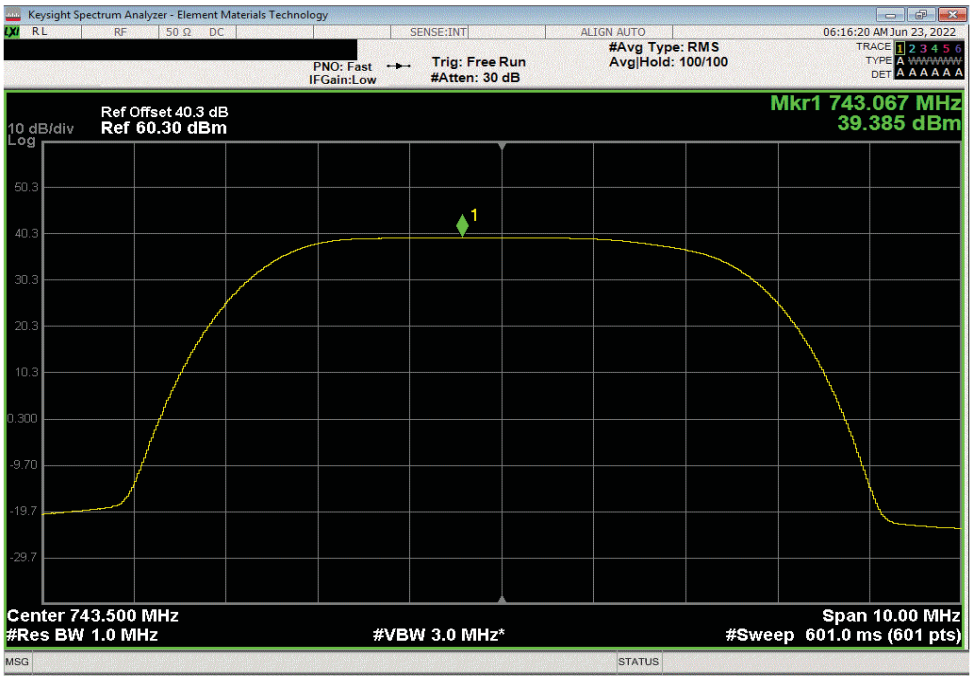
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 16-QAM Modulation, Low Ch. 730.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.593	0	39.593	42.593	45.593	



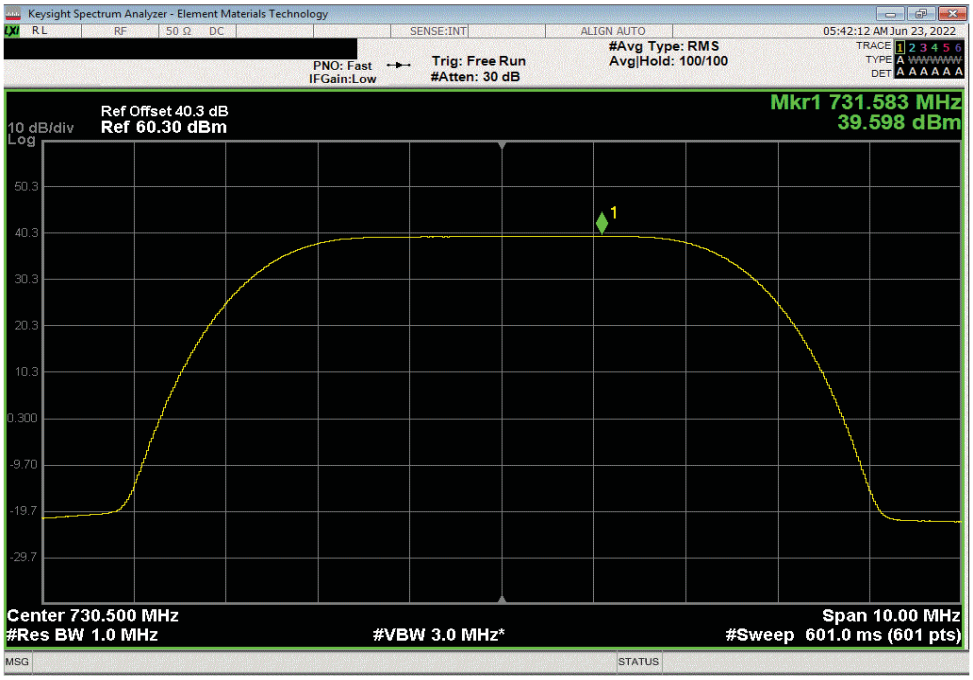
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.431	0	39.431	42.431	45.431	



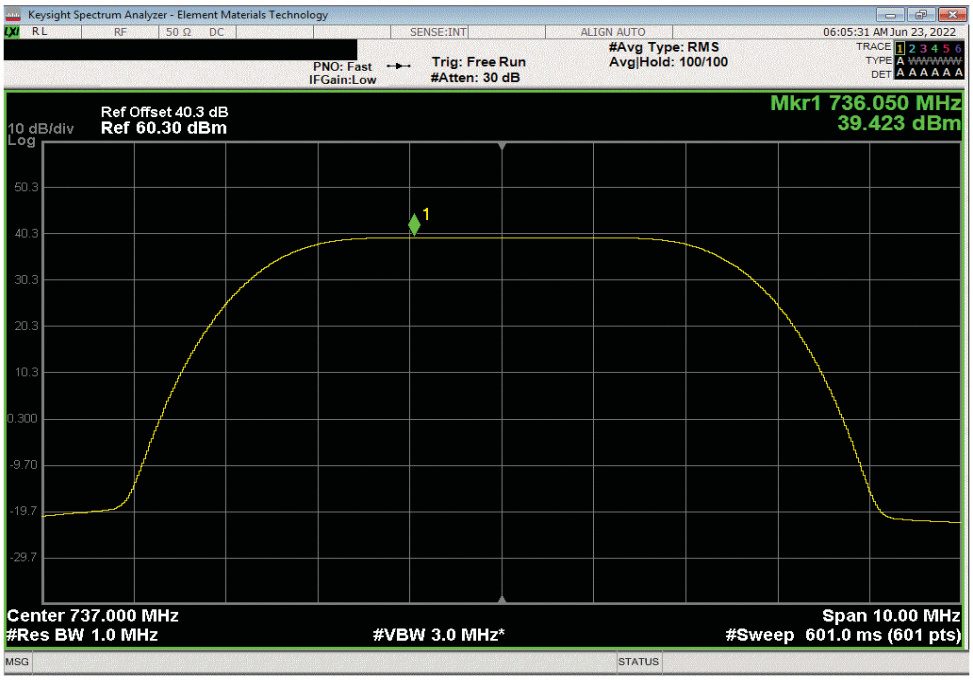
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 16-QAM Modulation, High Ch. 743.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.385	0	39.385	42.385	45.385	



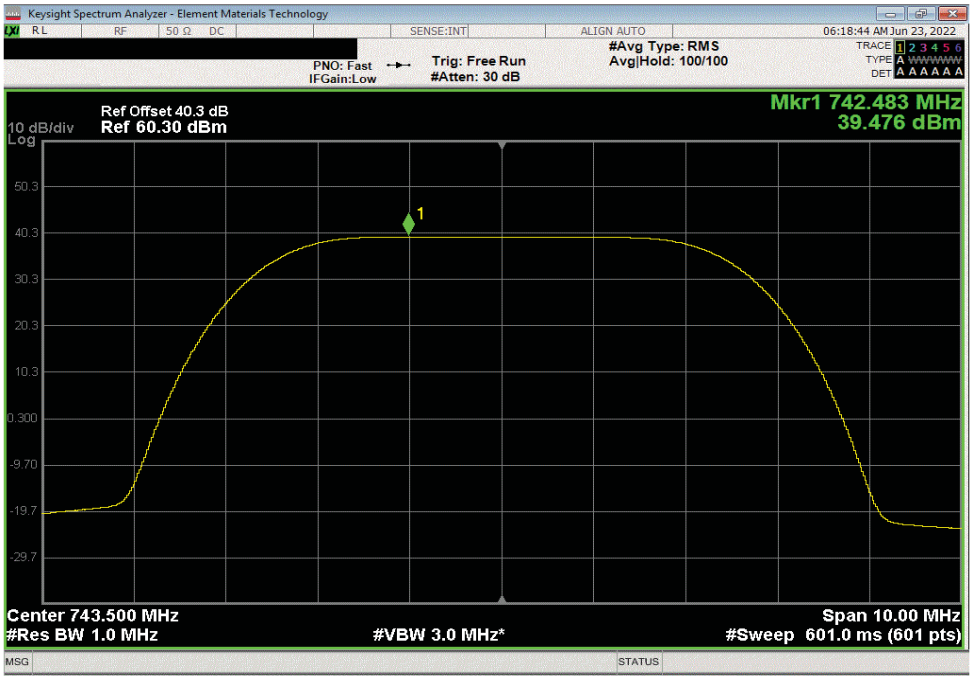
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 64-QAM Modulation, Low Ch. 730.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.598	0	39.598	42.598	45.598	



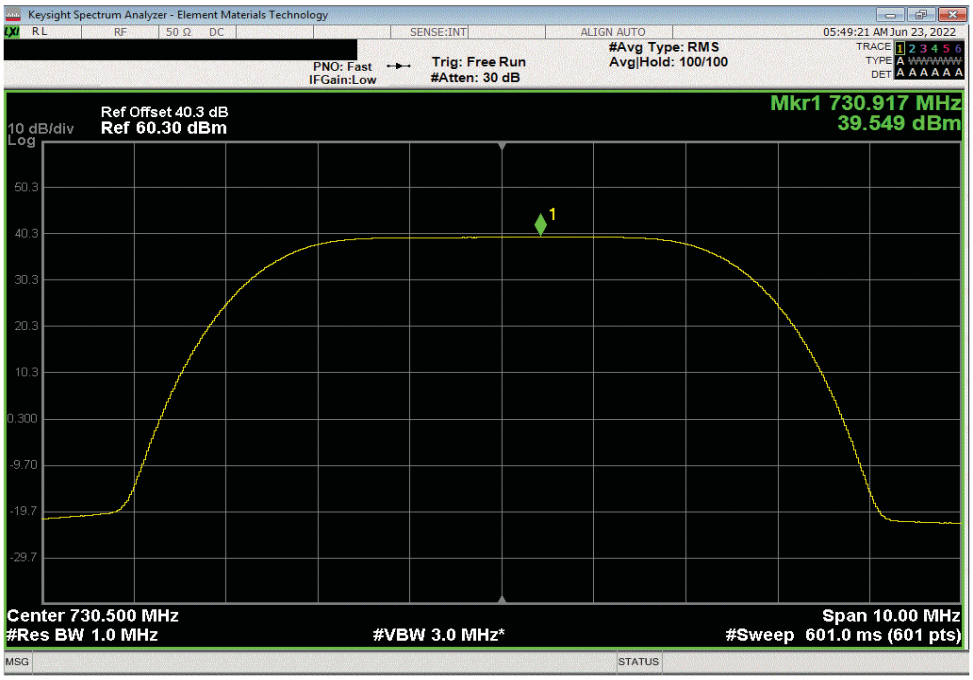
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 64-QAM Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.423	0	39.423	42.423	45.423	



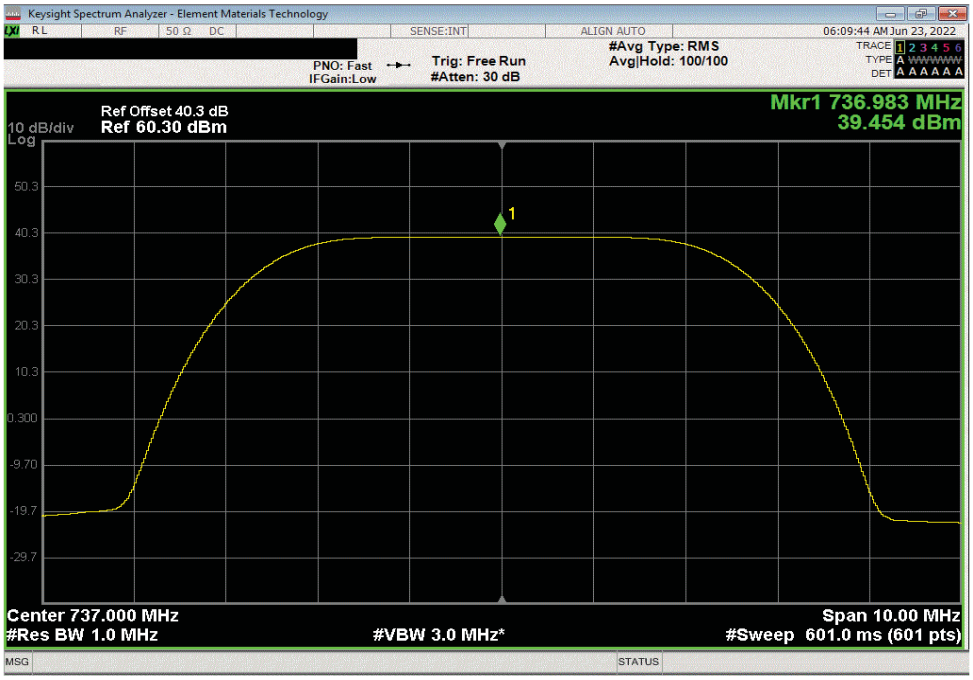
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 64-QAM Modulation, High Ch. 743.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.476	0	39.476	42.476	45.476	



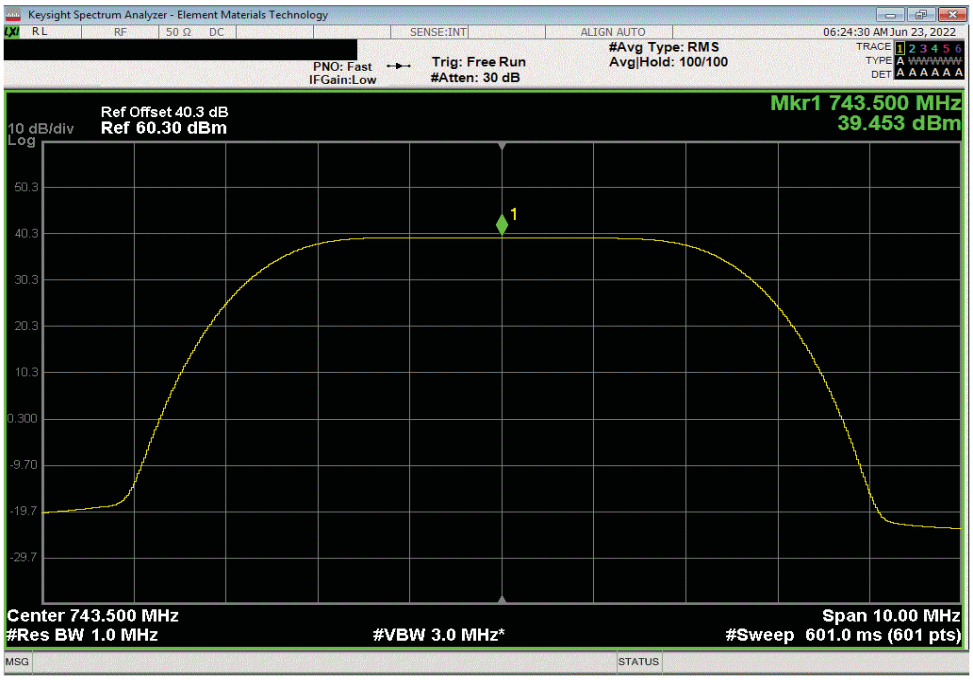
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Low Ch. 730.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.549	0	39.549	42.549	45.549	



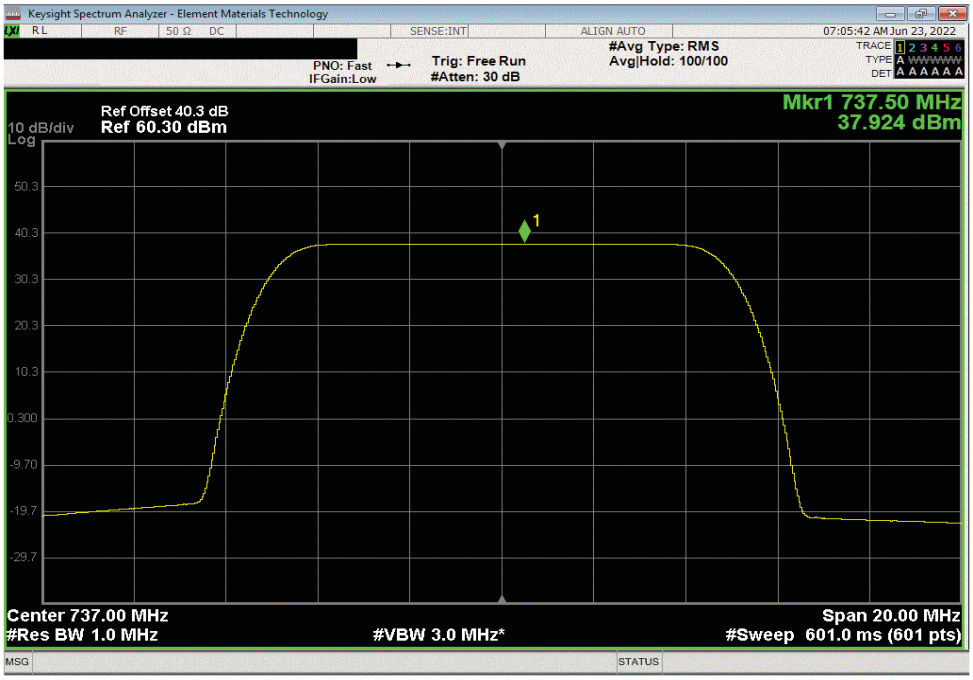
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.454	0	39.454	42.454	45.454	



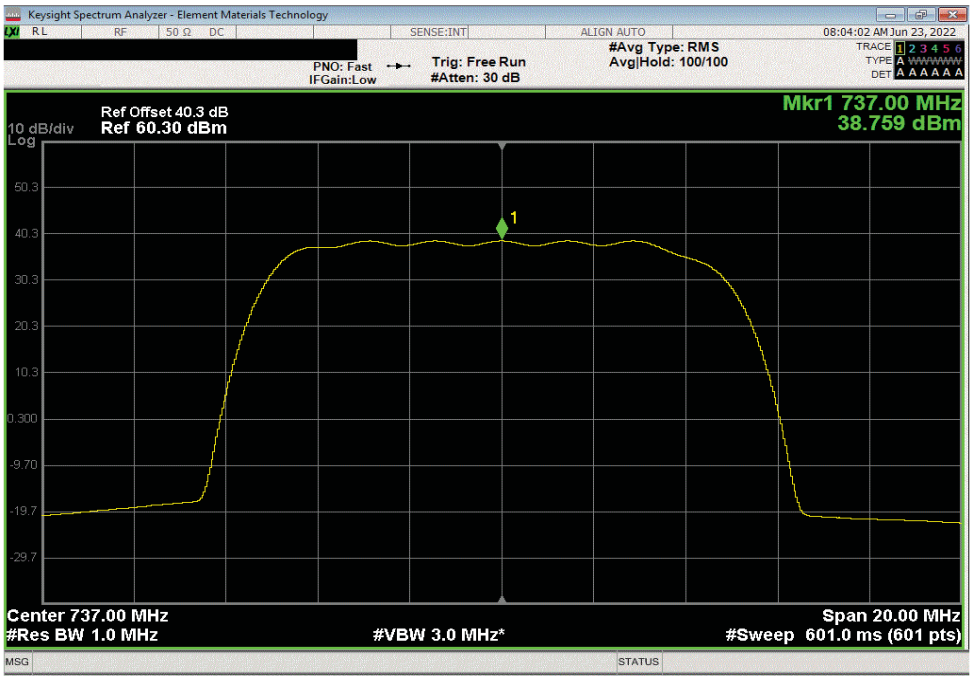
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 5 MHz Bandwidth, 256-QAM Modulation, High Ch. 743.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	39.453	0	39.453	42.453	45.453	



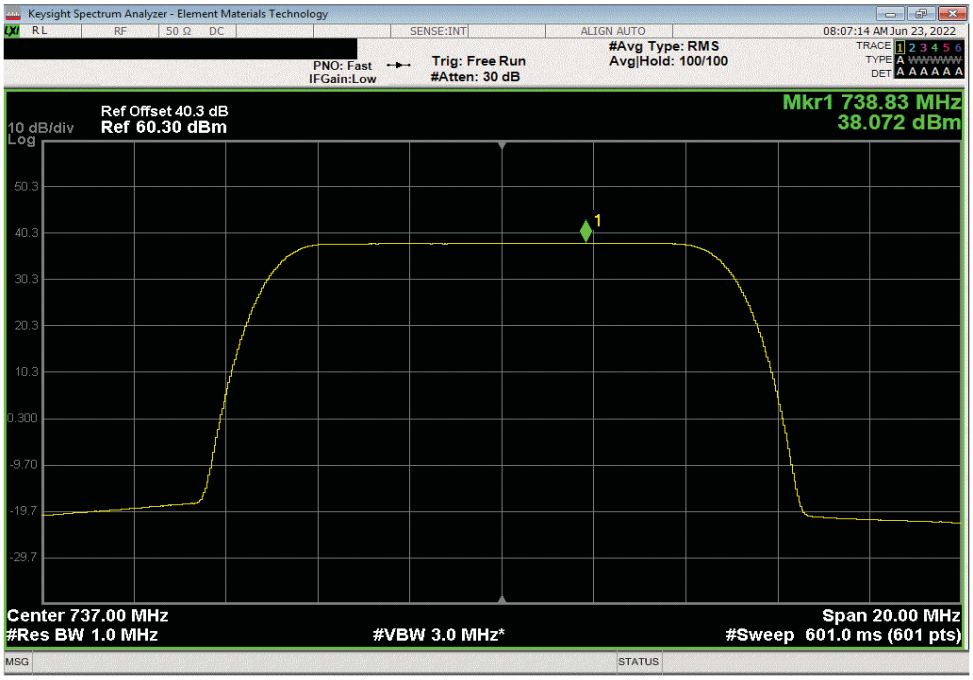
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, QPSK Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	37.924	0	37.924	40.924	43.924	



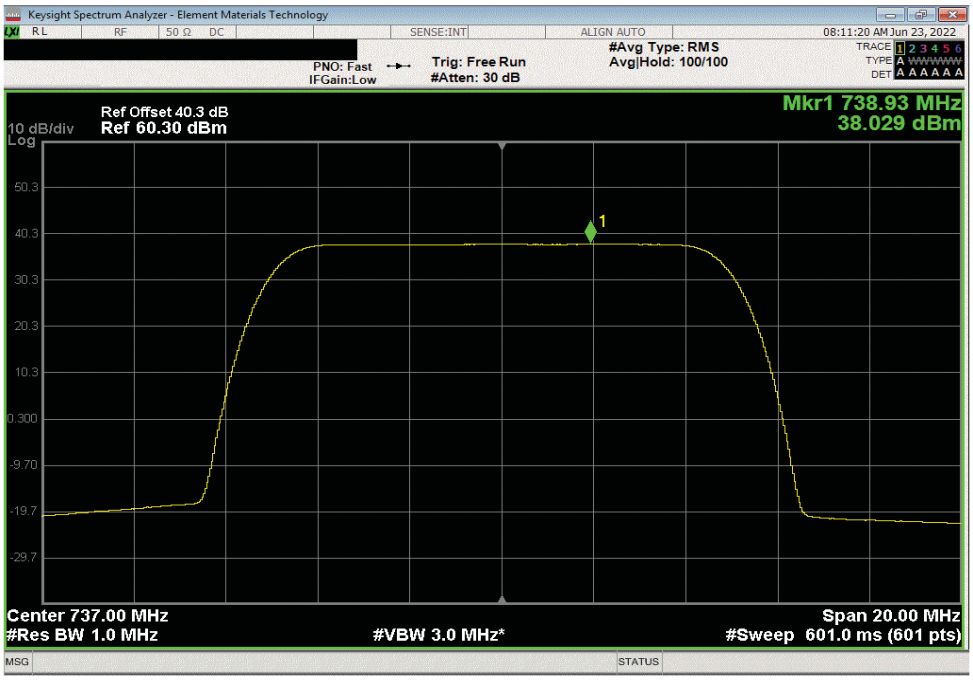
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	38.759	0	38.759	41.759	44.759	



Port 1, 5G NR, Band n85, 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	38.072	0	38.072	41.072	44.072	

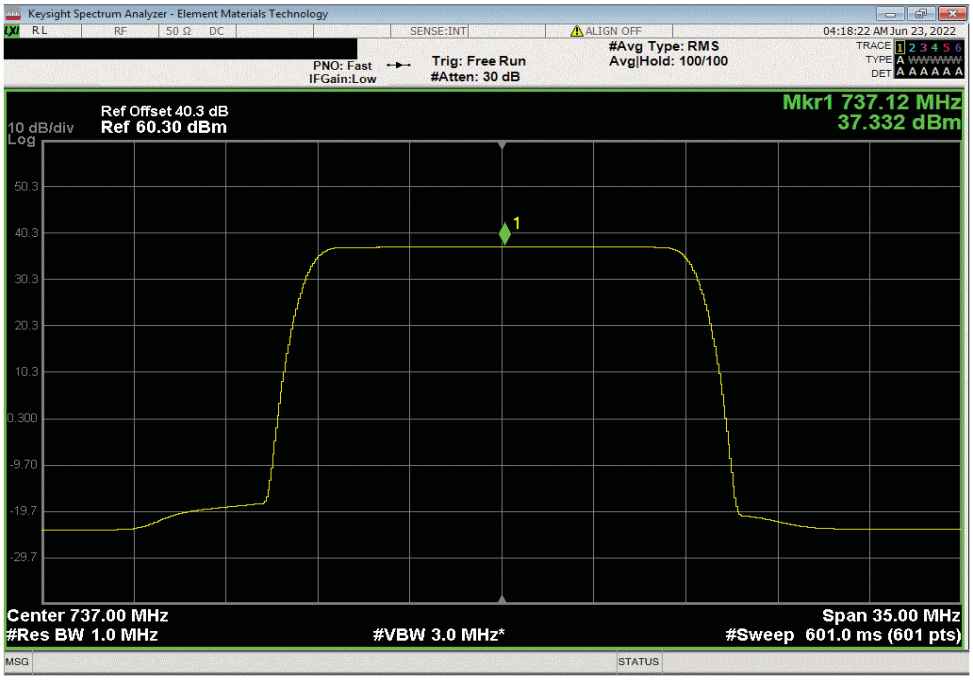


Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 10 MHz Bandwidth, 256-QAM Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	38.029	0	38.029	41.029	44.029	

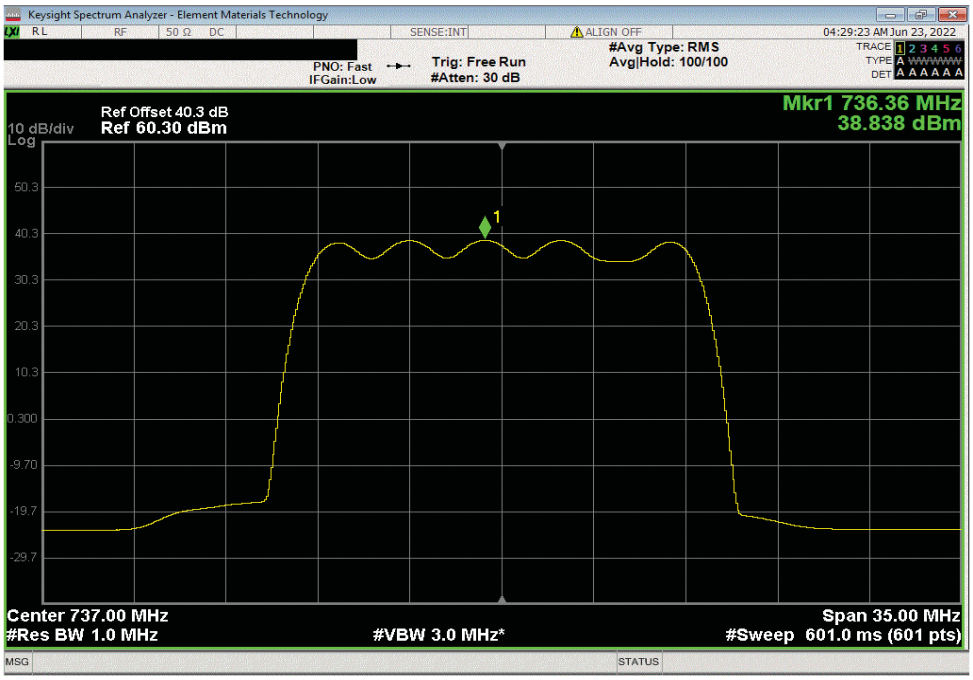


POWER SPECTRAL DENSITY AND EIRP CALCULATION - n85

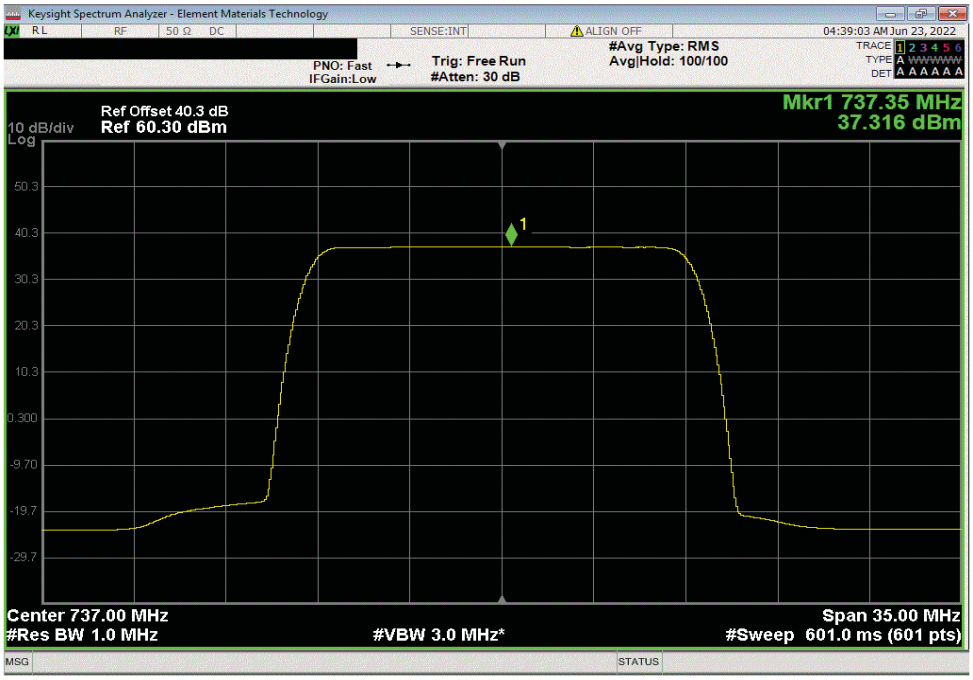
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, QPSK Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	37.332	0	37.332	40.332	43.332	



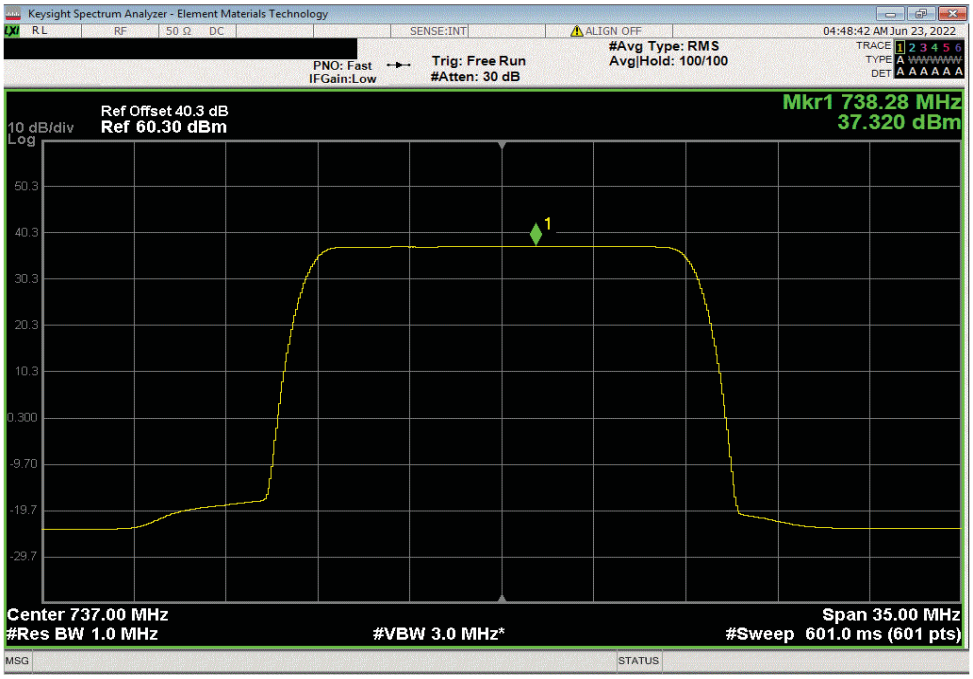
Port 1, 5G NR, Band n85, 728 MHz - 746 MHz, 15 MHz Bandwidth, 16-QAM Modulation, Mid Ch. 737 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Two Port (4x4 MIMO) dBm/MHz == PSD	
	38.838	0	38.838	41.838	44.838	



Port 1, 5G NR, Band n85, 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	37.316	0	37.316	40.316	43.316	



Port 1, 5G NR, Band n85, 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	Two Port (4x4 MIMO) dBm/MHz == PSD	
	37.32	0	37.32	40.32	43.32	



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 n85 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	39.7 dBm/MHz	38.8 dBm/MHz	38.8 dBm/MHz
Number of Ant Ports per Polarization	2	2	2
Total PSD per Polarization	42.7	41.8	41.8
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	58.6 dBm/MHz or 724 Watts/MHz	57.7 dBm/MHz or 589 Watts/MHz	57.7 dBm/MHz or 589 Watts/MHz
Number of Polarizations	2	2	2
EIRP Total = R1 ±45°and R2 ±45° See Note 2	58.6 dBm/MHz or 724 Watts/MHz	57.7 dBm/MHz or 589 Watts/MHz	57.7 dBm/MHz or 589 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