POWER SPECTRAL DENSITY AND EIRP CALCULATIONS

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
Generator - Signal	Keysight	N5182B	TEV	2021-04-27	2024-04-27
Block - DC	Fairview Microwave	SD3379	AMM	2021-09-14	2022-09-14
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 AHFII 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.

EIRP Requirements:

FCC Requirements: Part 24.232 Power and antenna height limits.
(a)(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.
a)(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; *see* Tables 1 and 2 of this section.
b)(2) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth greater than 1 MHz are limited to 3280 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.
ISED Requirements RSS-133 Section 6.4/SRSP-510 section 5.1.1:
SRSP-510 section 5.1 Radiated power and antenna height limits for base stations
For base stations with a channel bandwidth greater than 1 MHz, the maximum e.i.r.p. is limited to 3280 watts/MHz e.i.r.p. (i.e., no more than 3280 watts e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 metres. Fixed or base stations operating in urban areas are limited to a maximum allowable e.i.r.p. of 1640 watts/MHz e.i.r.p. Base station antenna heights above average terrain may exceed 300 metres with a corresponding reduction in e.i.r.p. according to the following table:
FCC Requirements: Part 27.50(d)
The following power and antenna height requirements apply to stations transmitting in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz and 2180-2200 MHz bands:
(1) The power of each fixed or base station transmitting in the 1995-2000 MHz, 2110-2155 MHz, 2155-2180 MHz or 2180-2200 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to:
(ii) An EIRP of 3280 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.
(2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:
(ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

ISED Requirements for the AWS Band are provided in RSS-139 Section 6.5/SRSP-513 Section 5.1.1 and RSS-170 Section 5.3.1/SRSP-519 Section 5.1

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS

element

TbiTx 2021.12.14.1 XMit 2022.02.07.0

EUT:	AHFII Remote Radio Head			**Work Order:**	NOKI0038
Serial Number:	YK214000035			**Date:**	18-Mar-22
Customer:	Nokia of America Corporation			**Temperature:**	22.7 °C
Attendees:	Mitchell Hill			**Humidity:**	25% RH
Project:	None			**Barometric Pres.:**	1024 mbar
Tested by:	Brandon Hobbs	**Power:**	54 VDC	**Job Site:**	TX06

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

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n25 carriers are enabled at maximum power (80 watts/carrier). The PSD was measured while transmitting one carrier on Port 1. The total PSD for multiport (2x2 MIMO, 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)].

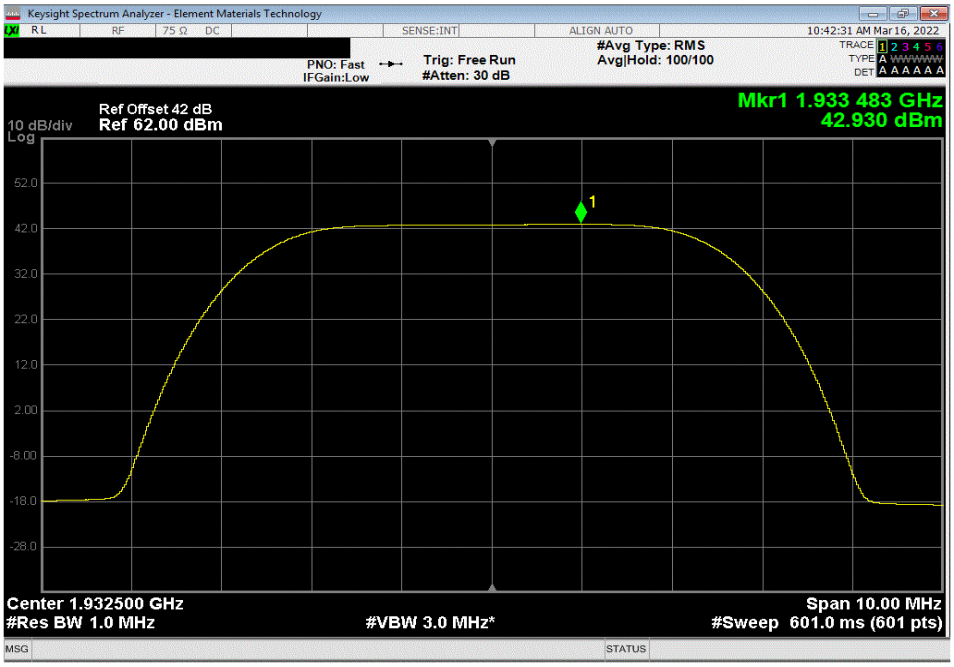
DEVIATIONS FROM TEST STANDARD

None

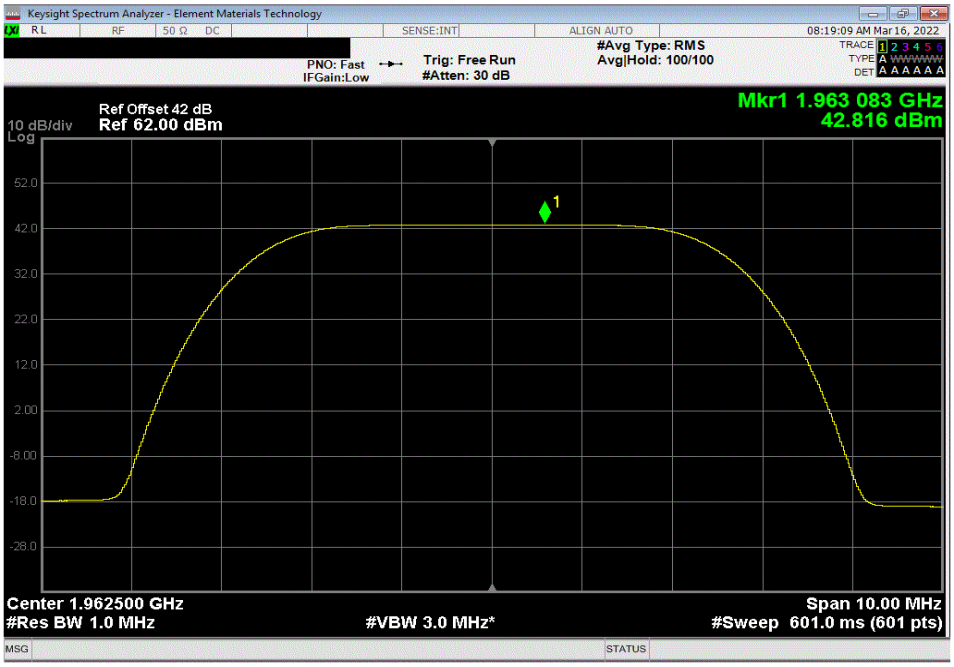
Configuration #	2	Signature

	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
Band n25, 1930 MHz - 1995 MHz, 5G NR					
Port 1					
5 MHz Bandwidth					
QPSK Modulation					
Low Channel, 1932.5 MHz	42.930	0	42.9	45.9	48.9
Mid Channel, 1962.5 MHz	42.816	0	42.8	45.8	48.8
High Channel, 1992.5 MHz	42.770	0	42.8	45.8	48.8
16-QAM Modulation					
Low Channel, 1932.5 MHz	42.917	0	42.9	45.9	48.9
Mid Channel, 1962.5 MHz	42.802	0	42.8	45.8	48.8
High Channel, 1992.5 MHz	42.764	0	42.8	45.8	48.8
64-QAM Modulation					
Low Channel, 1932.5 MHz	42.965	0	43.0	46.0	49.0
Mid Channel, 1962.5 MHz	42.816	0	42.8	45.8	48.8
High Channel, 1992.5 MHz	42.807	0	42.8	45.8	48.8
256-QAM Modulation					
Low Channel, 1932.5 MHz	42.981	0	43.0	46.0	49.0
Mid Channel, 1962.5 MHz	42.858	0	42.9	45.9	48.9
High Channel, 1992.5 MHz	42.820	0	42.8	45.8	48.8
10 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 1962.5 MHz	39.651	0	39.7	42.7	45.7
16-QAM Modulation					
Mid Channel, 1962.5 MHz	40.307	0	40.3	43.3	46.3
64-QAM Modulation					
Mid Channel, 1962.5 MHz	39.658	0	39.7	42.7	45.7
256-QAM Modulation					
Mid Channel, 1962.5 MHz	39.667	0	39.7	42.7	45.7
15 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 1962.5 MHz	37.852	0	37.9	40.9	43.9
16-QAM Modulation					
Mid Channel, 1962.5 MHz	39.383	0	39.4	42.4	45.4
64-QAM Modulation					
Mid Channel, 1962.5 MHz	37.893	0	37.9	40.9	43.9
256-QAM Modulation					
Mid Channel, 1962.5 MHz	37.880	0	37.9	40.9	43.9
20 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 1962.5 MHz	36.668	0	36.7	39.7	42.7
16-QAM Modulation					
Mid Channel, 1962.5 MHz	38.324	0	38.3	41.3	44.3
64-QAM Modulation					
Mid Channel, 1962.5 MHz	36.691	0	36.7	39.7	42.7
256-QAM Modulation					
Mid Channel, 1962.5 MHz	36.734	0	36.7	39.7	42.7
30 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 1962.5 MHz	34.888	0	34.9	37.9	40.9
16-QAM Modulation					
Mid Channel, 1962.5 MHz	36.586	0	36.6	39.6	42.6
64-QAM Modulation					
Mid Channel, 1962.5 MHz	34.970	0	35.0	38.0	41.0
256-QAM Modulation					
Mid Channel, 1962.5 MHz	34.922	0	34.9	37.9	40.9

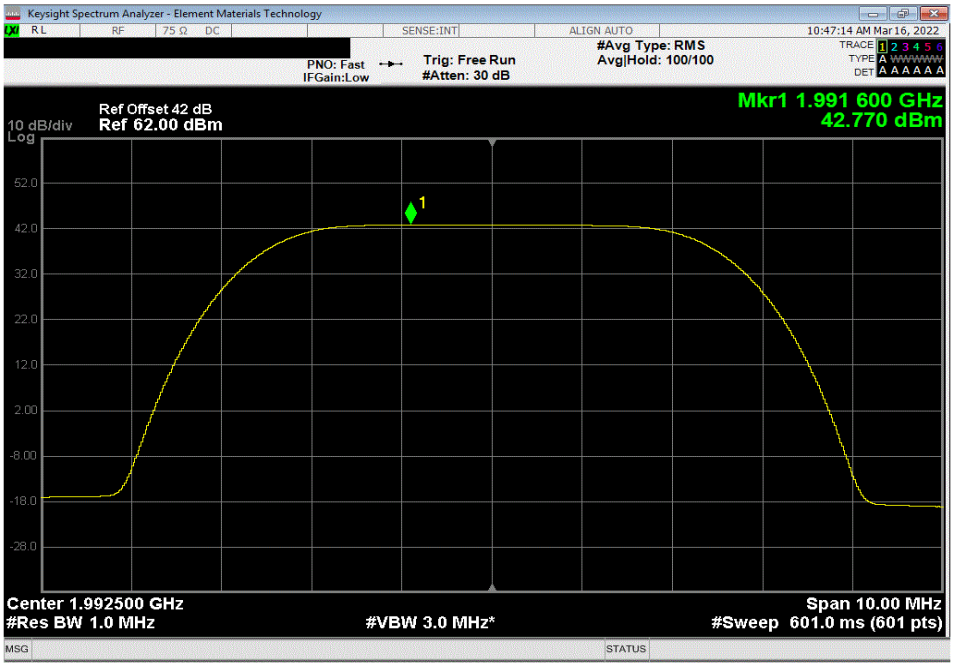
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 1932.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.93	0	42.93	45.93	48.93



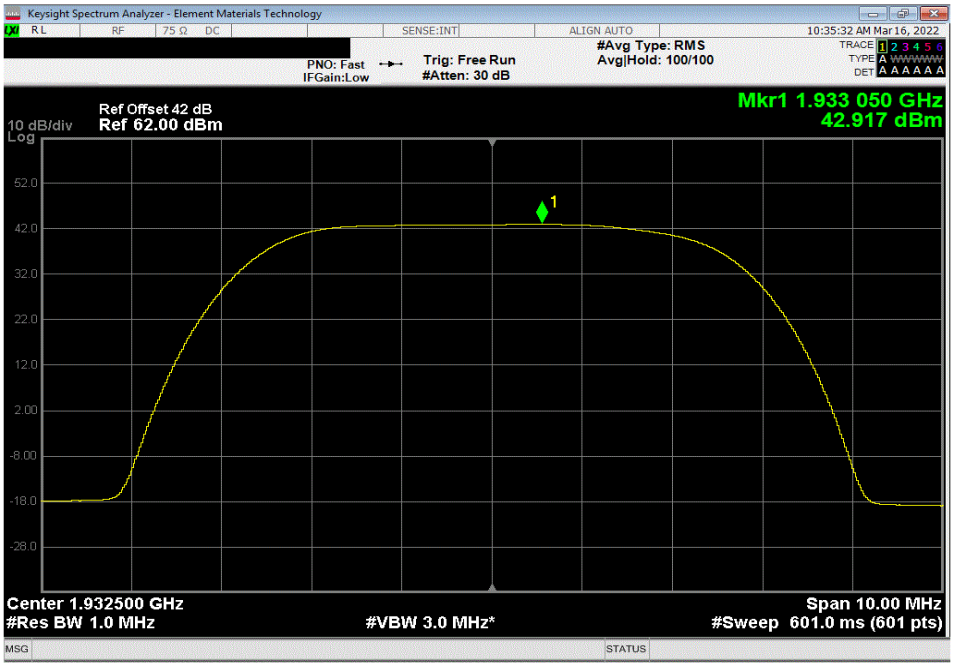
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, QPSK Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.816	0	42.816	45.816	48.816



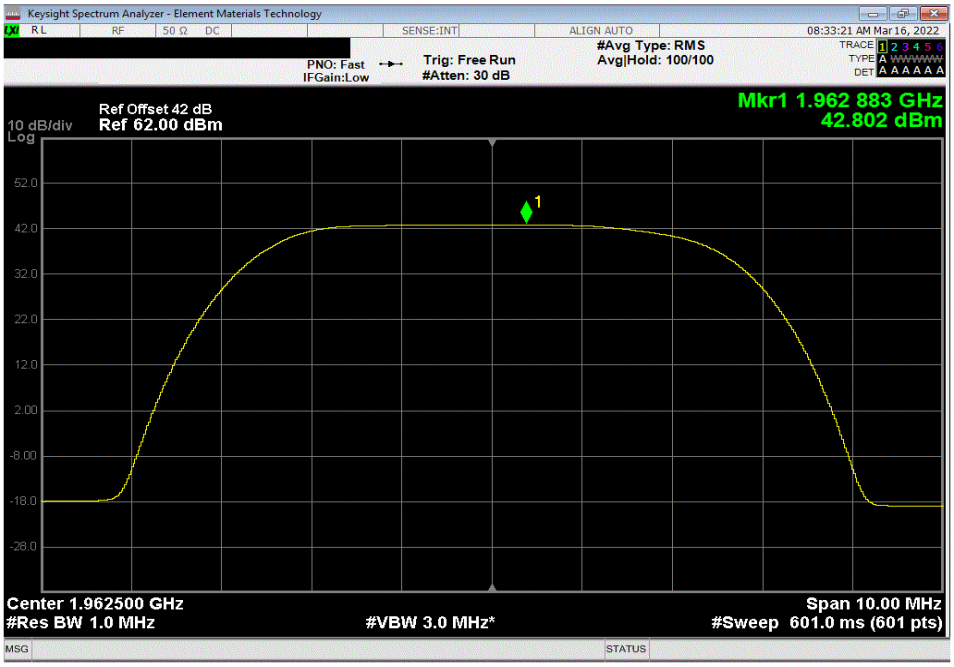
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, QPSK Modulation, High Channel, 1992.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.77	0	42.77	45.77	48.77



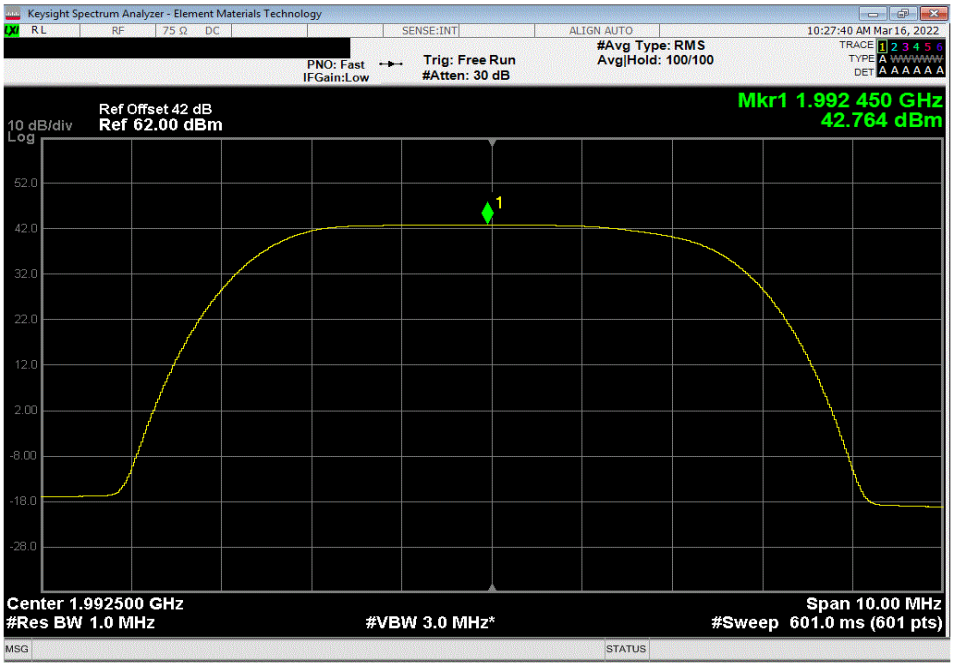
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 16-QAM Modulation, Low Channel, 1932.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.917	0	42.917	45.917	48.917



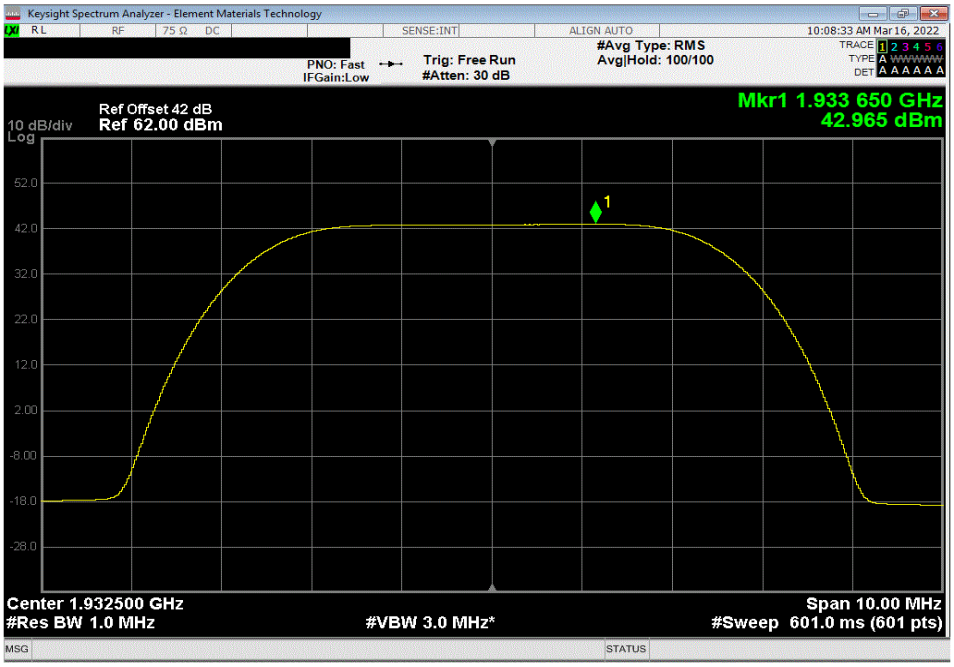
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.802	0	42.802	45.802	48.802



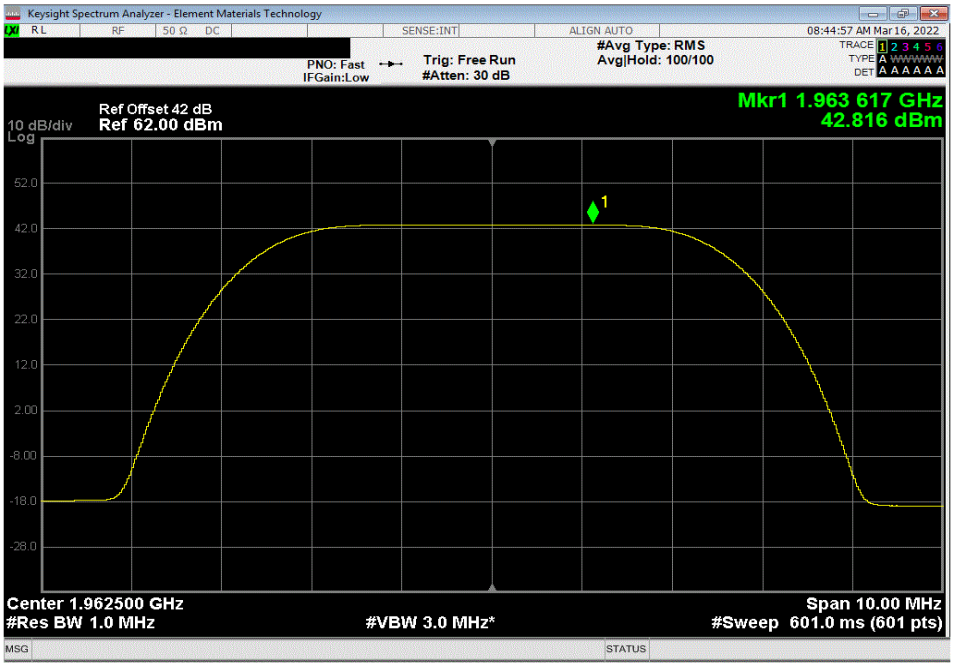
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 16-QAM Modulation, High Channel, 1992.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.764	0	42.764	45.764	48.764



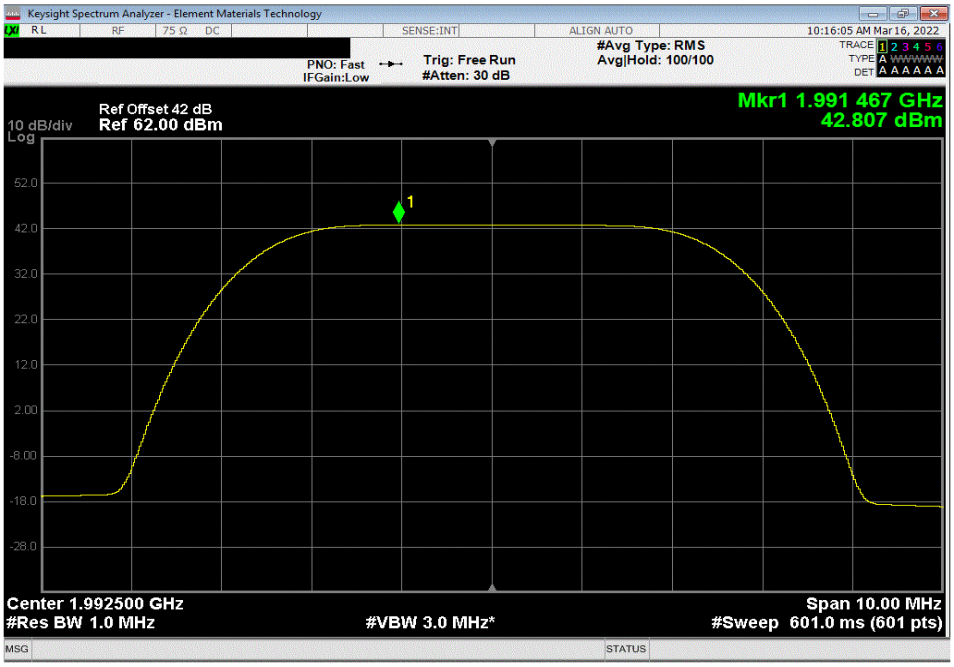
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 64-QAM Modulation, Low Channel, 1932.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.965	0	42.965	45.965	48.965



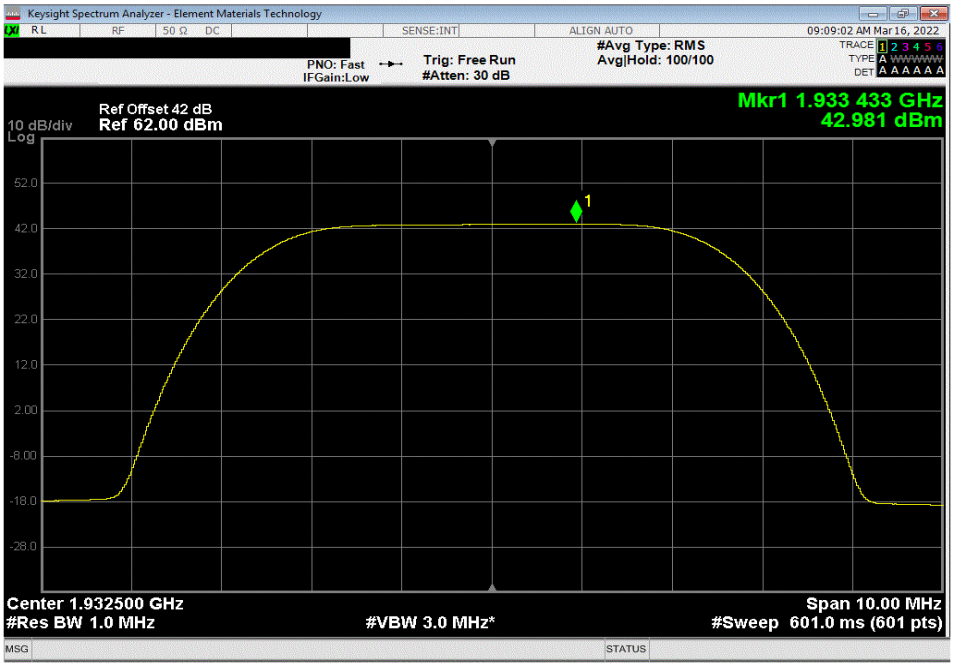
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.816	0	42.816	45.816	48.816



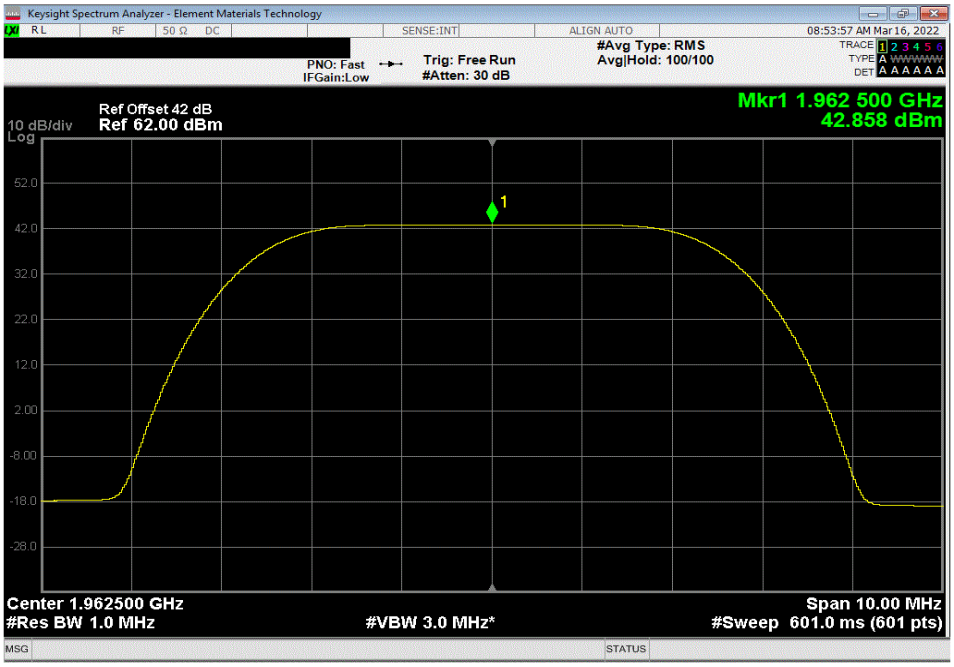
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 64-QAM Modulation, High Channel, 1992.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.807	0	42.807	45.807	48.807



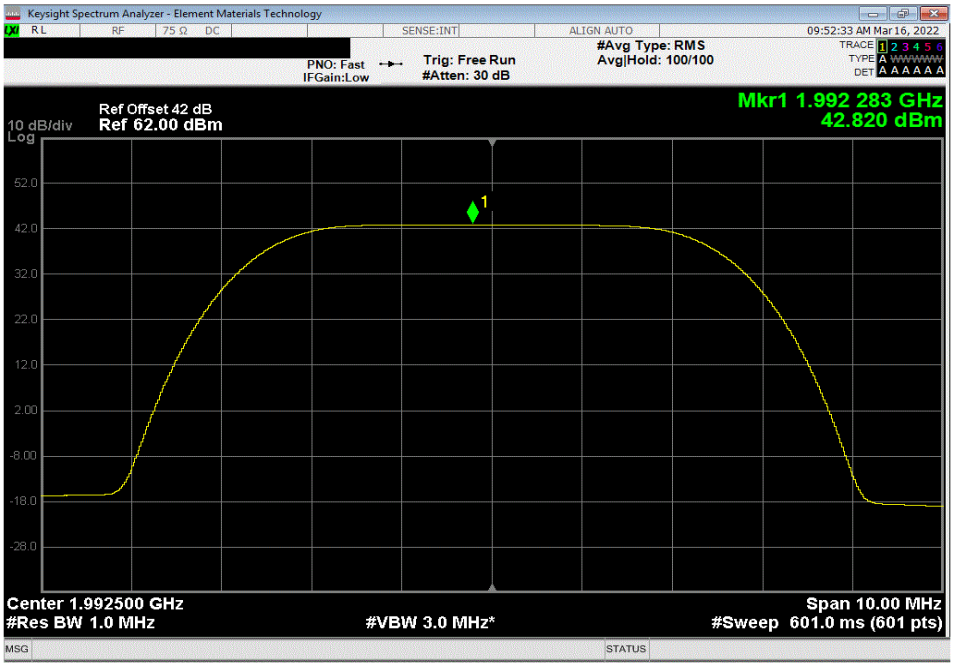
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Low Channel, 1932.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.981	0	42.981	45.981	48.981



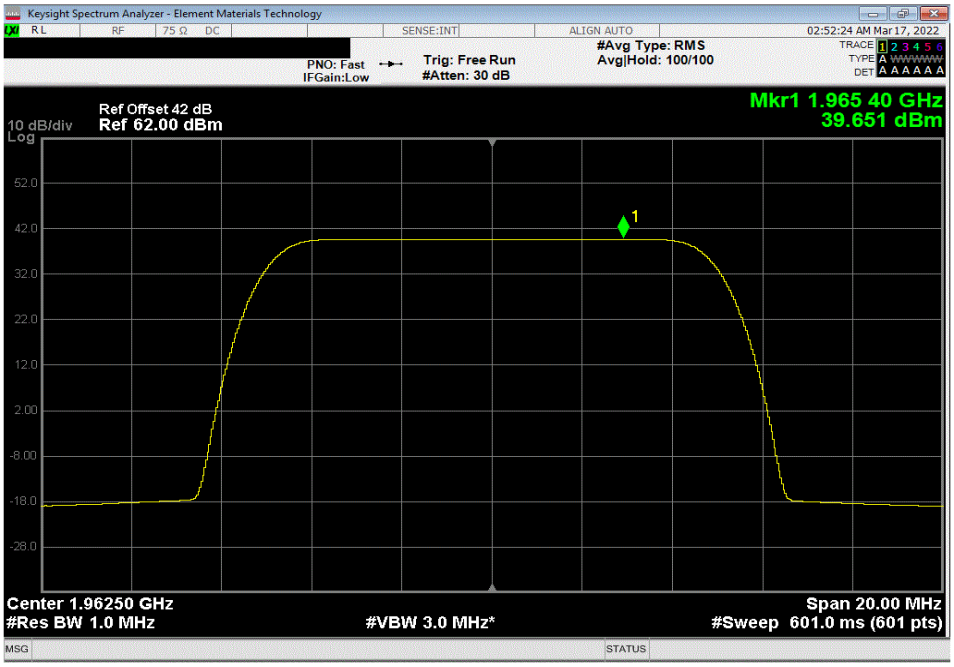
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.858	0	42.858	45.858	48.858



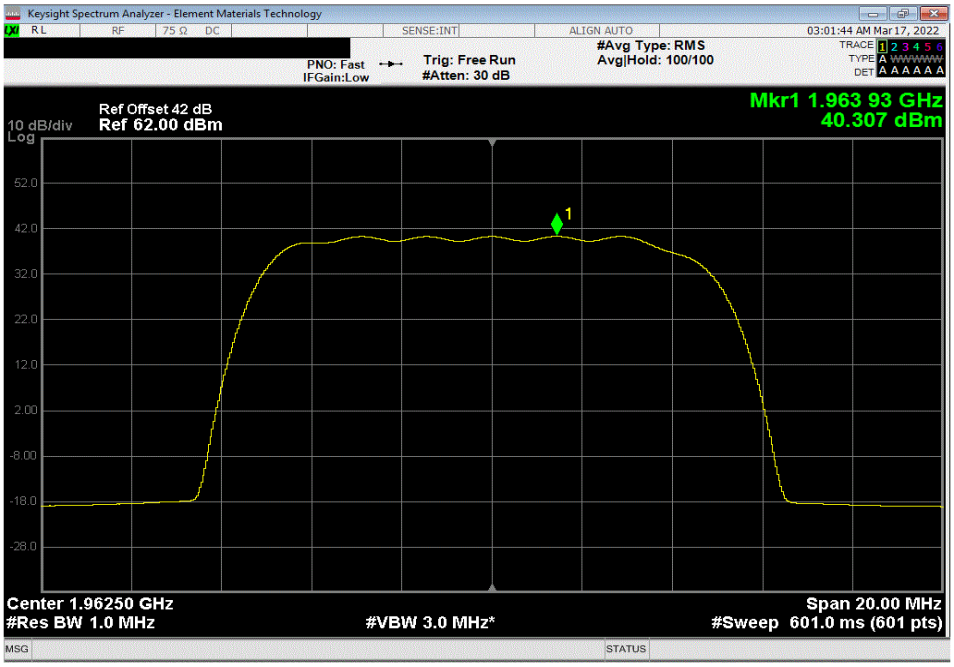
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 256-QAM Modulation, High Channel, 1992.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		42.82	0	42.82	45.82	48.82



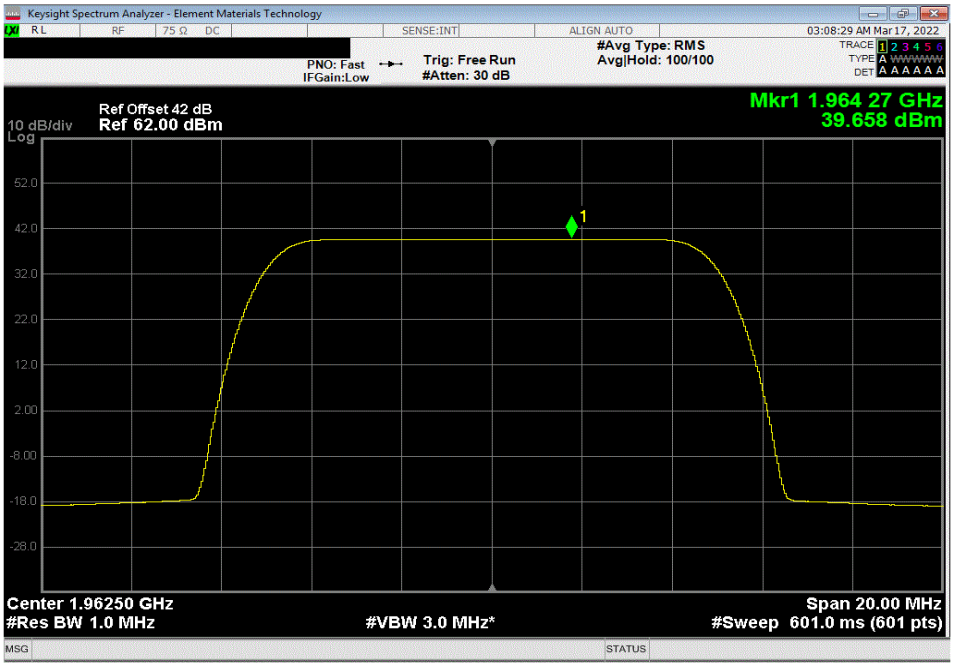
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 10 MHz Bandwidth, QPSK Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		39.651	0	39.651	42.651	45.651



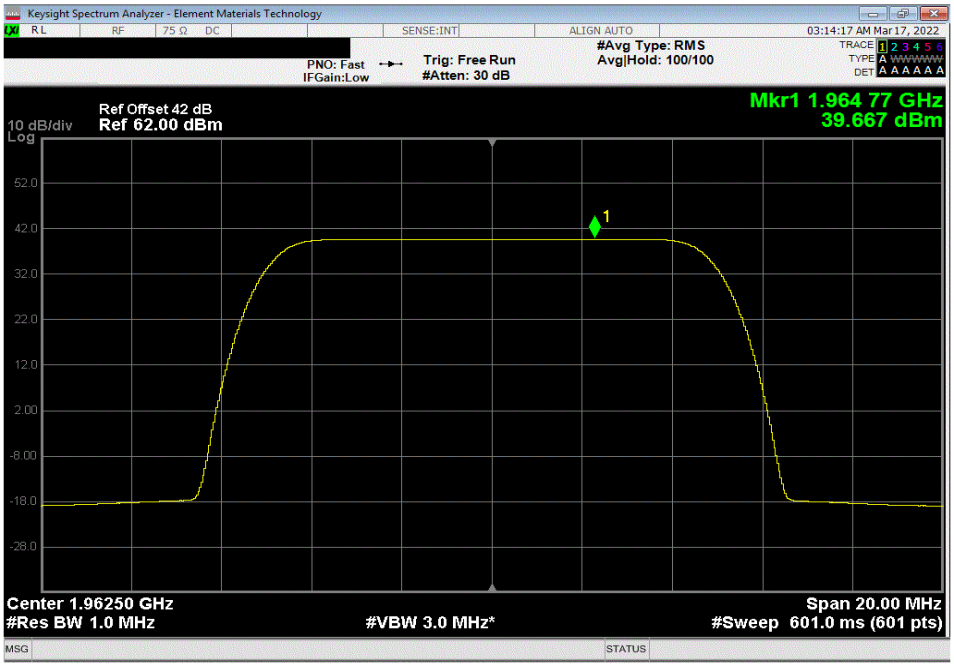
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 10 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		40.307	0	40.307	43.307	46.307



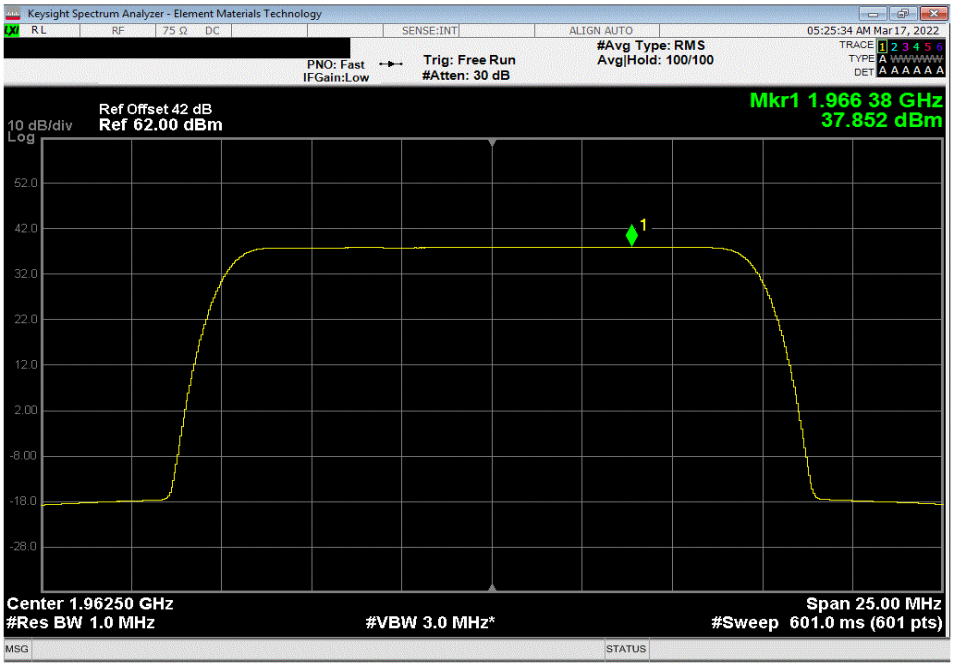
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 10 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		39.658	0	39.658	42.658	45.658



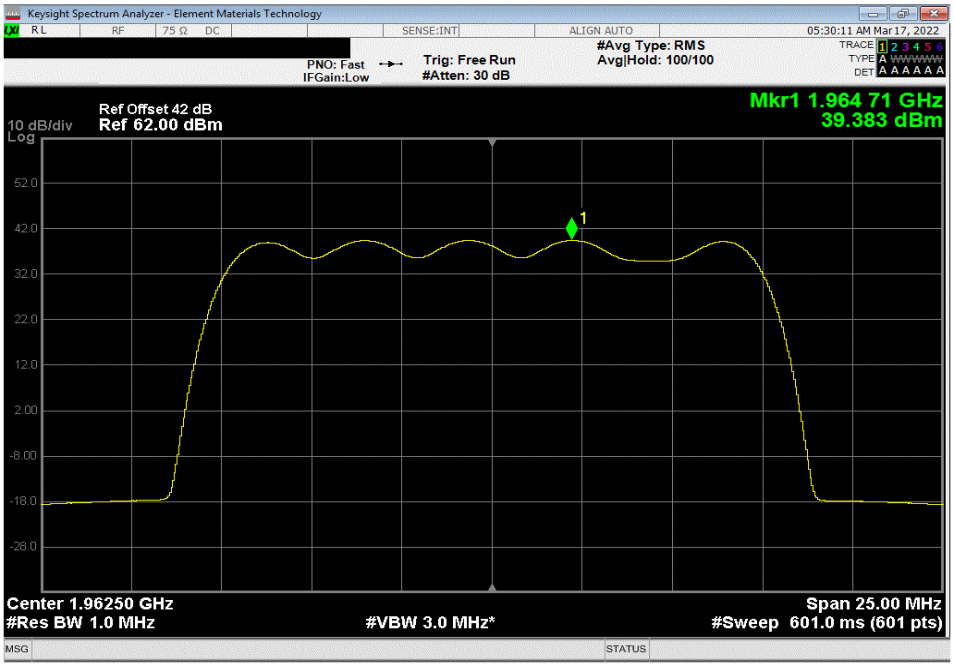
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		39.667	0	39.667	42.667	45.667



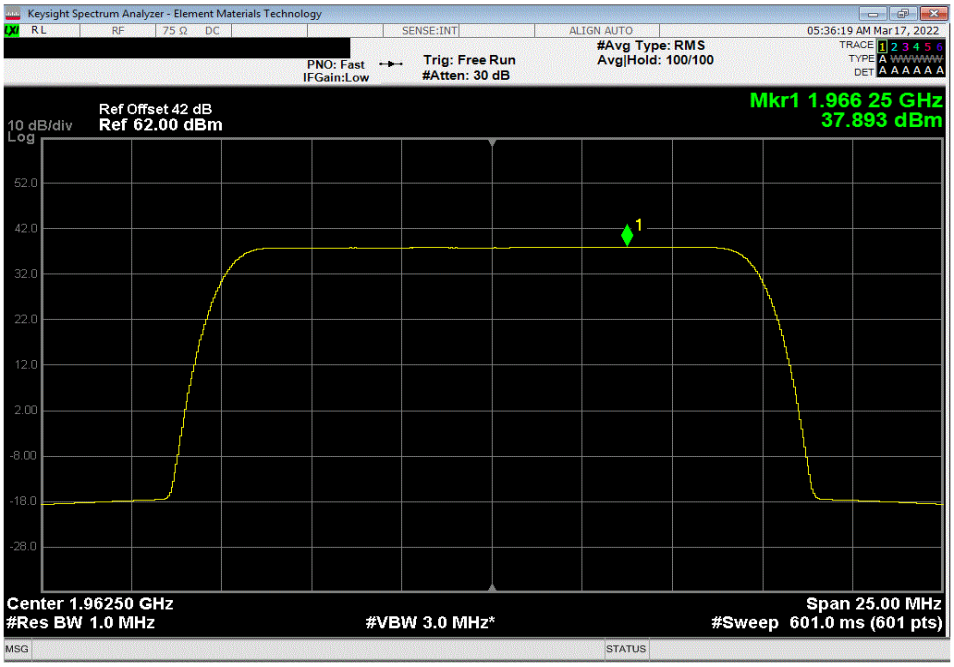
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 15 MHz Bandwidth, QPSK Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		37.852	0	37.852	40.852	43.852



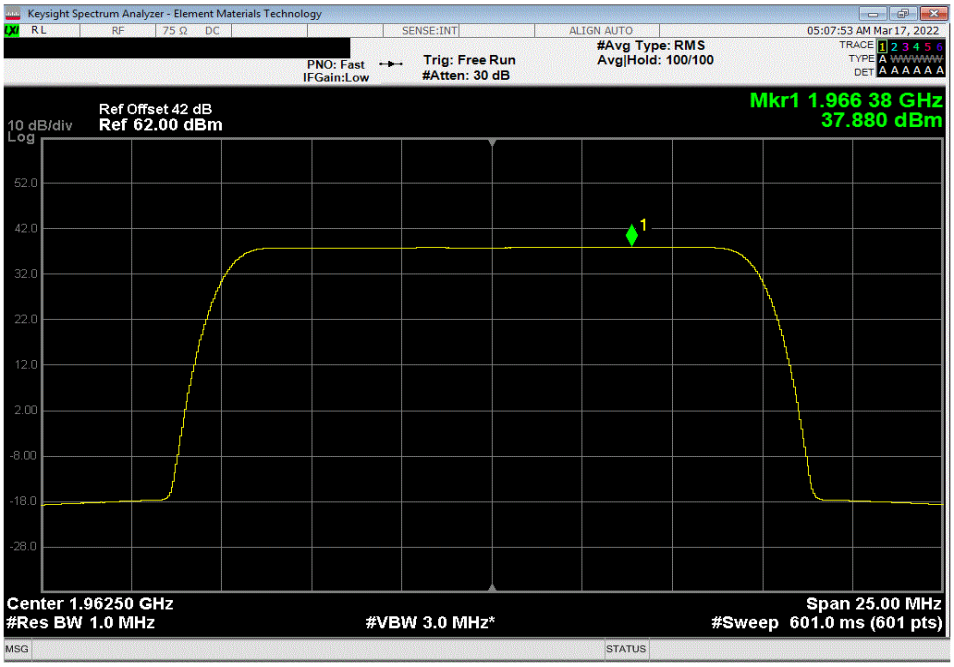
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		39.383	0	39.383	42.383	45.383



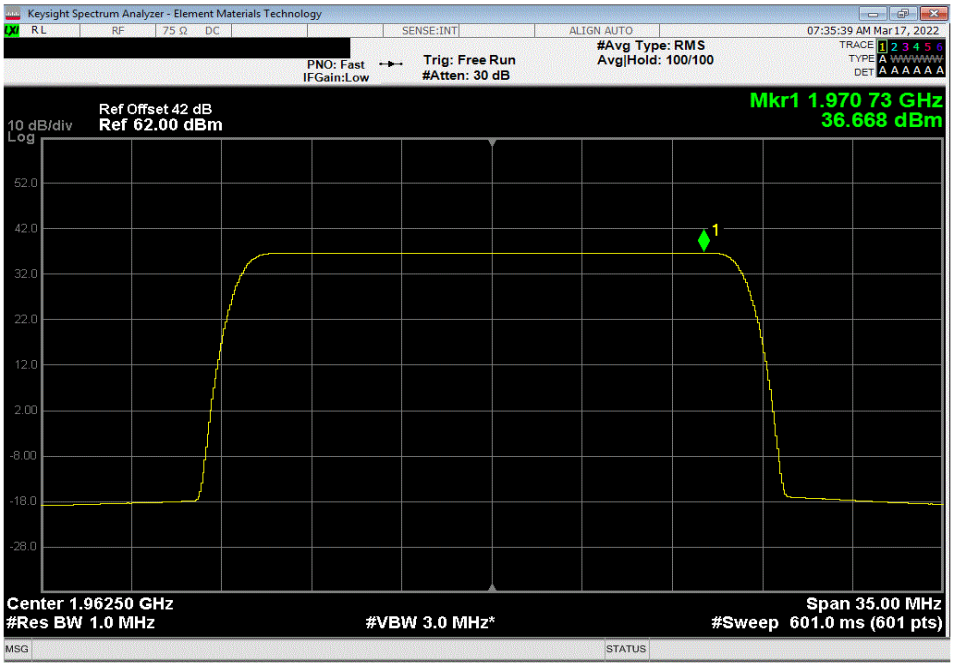
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		37.893	0	37.893	40.893	43.893



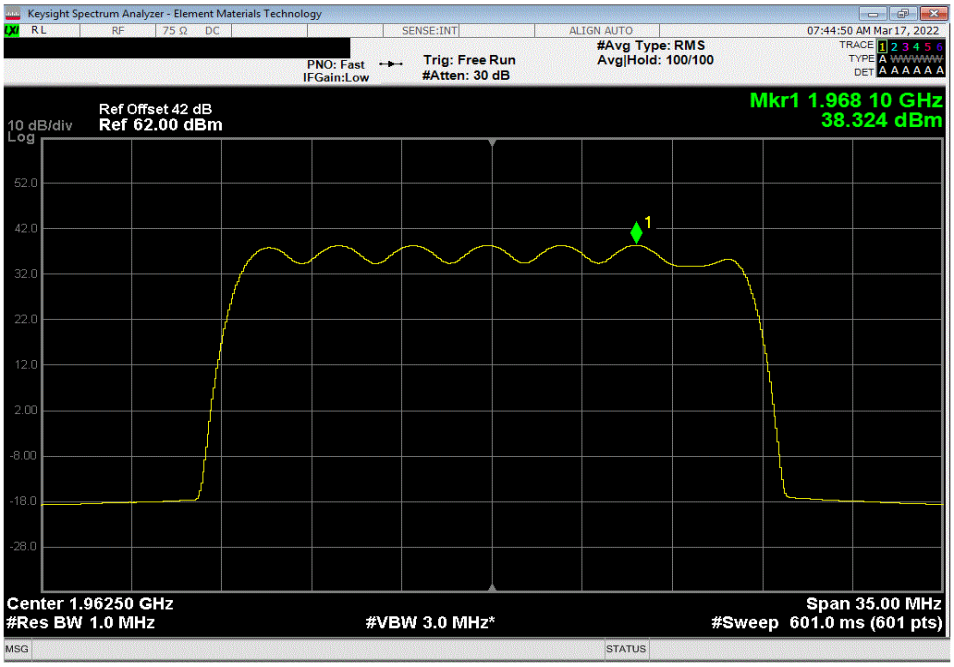
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		37.88	0	37.88	40.88	43.88



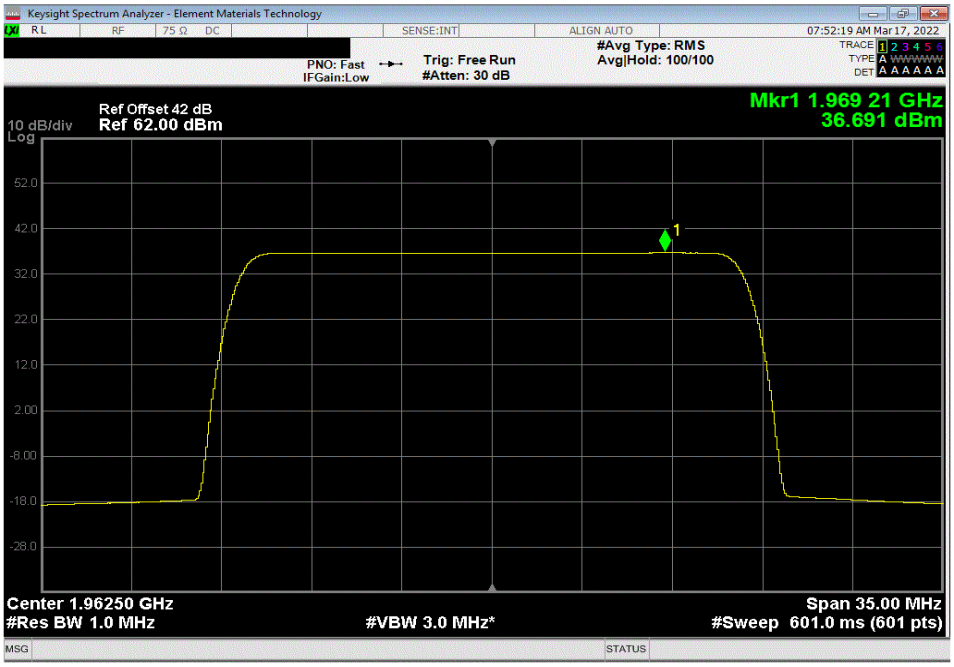
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 20 MHz Bandwidth, QPSK Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		36.668	0	36.668	39.668	42.668



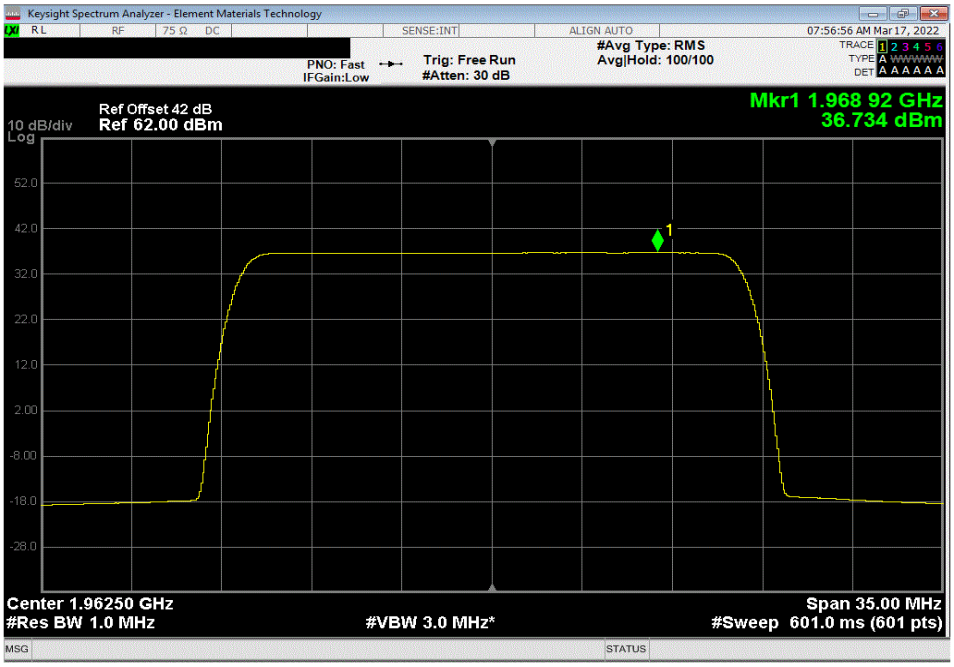
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 20 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		38.324	0	38.324	41.324	44.324



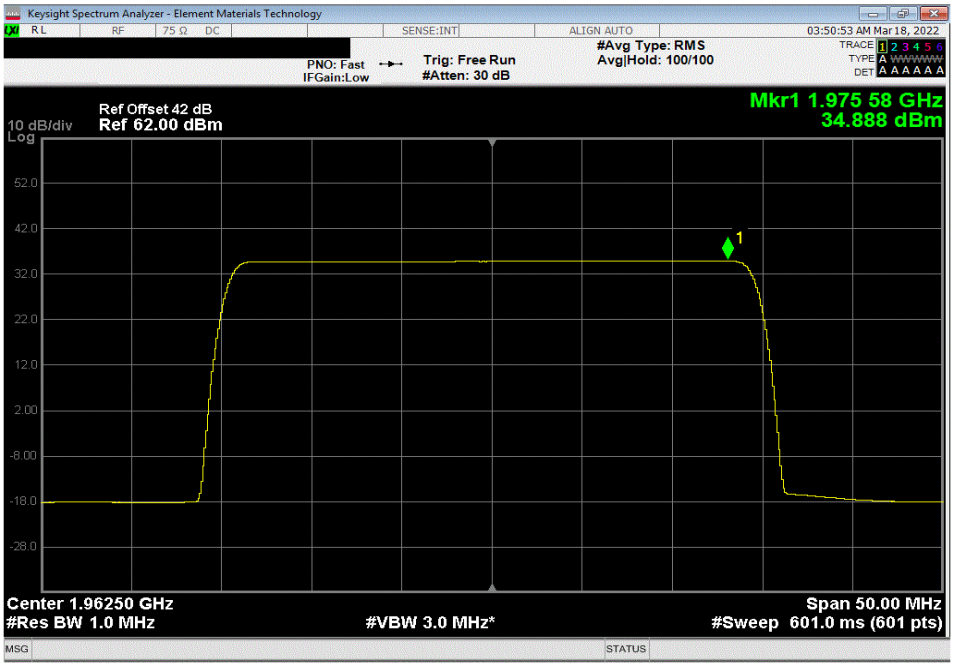
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 20 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		36.691	0	36.691	39.691	42.691



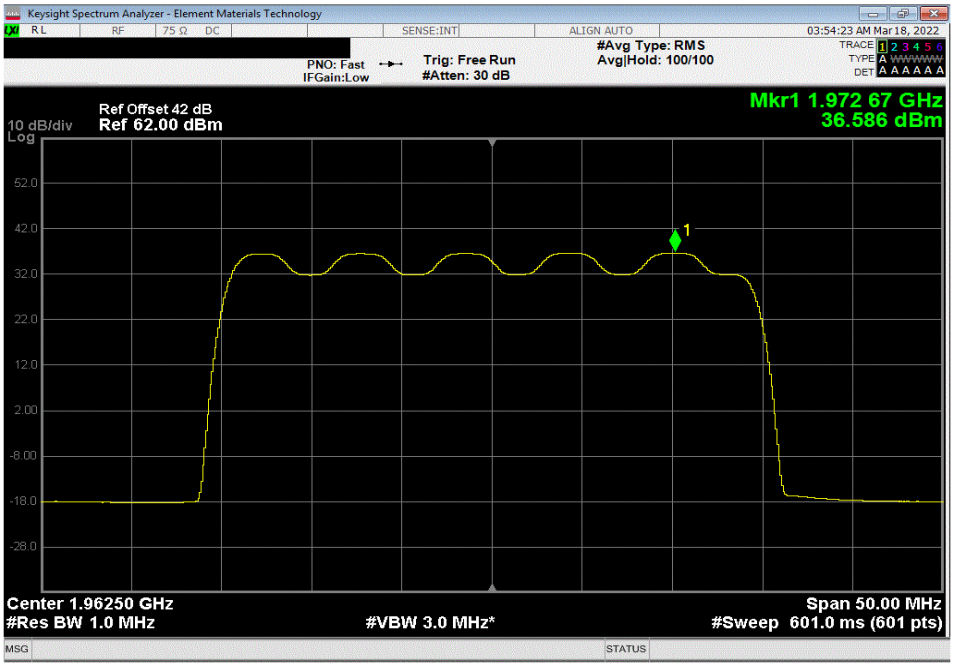
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 20 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		36.734	0	36.734	39.734	42.734



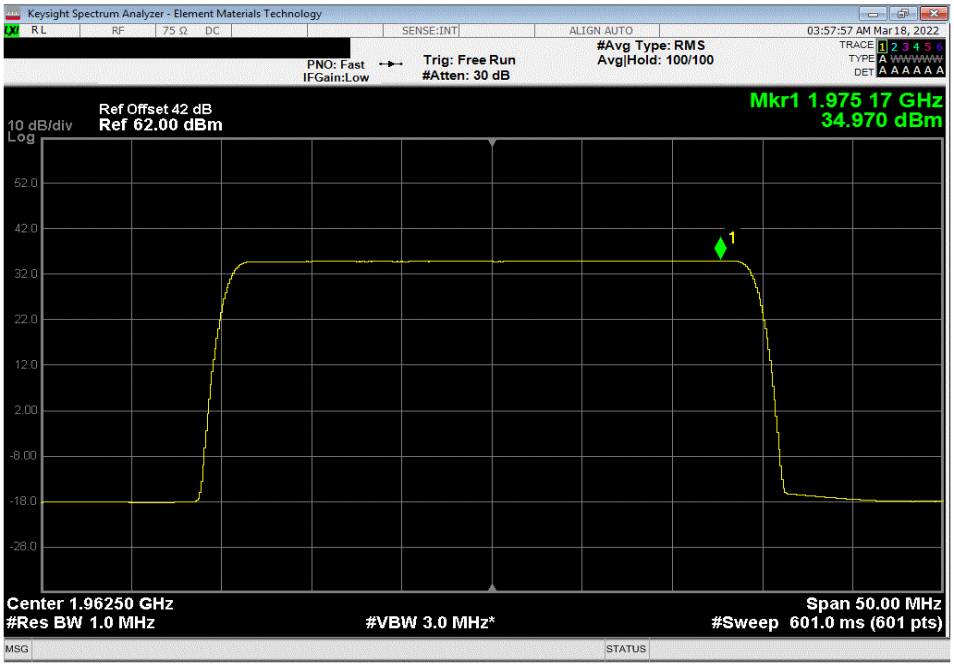
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 30 MHz Bandwidth, QPSK Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		34.888	0	34.888	37.888	40.888



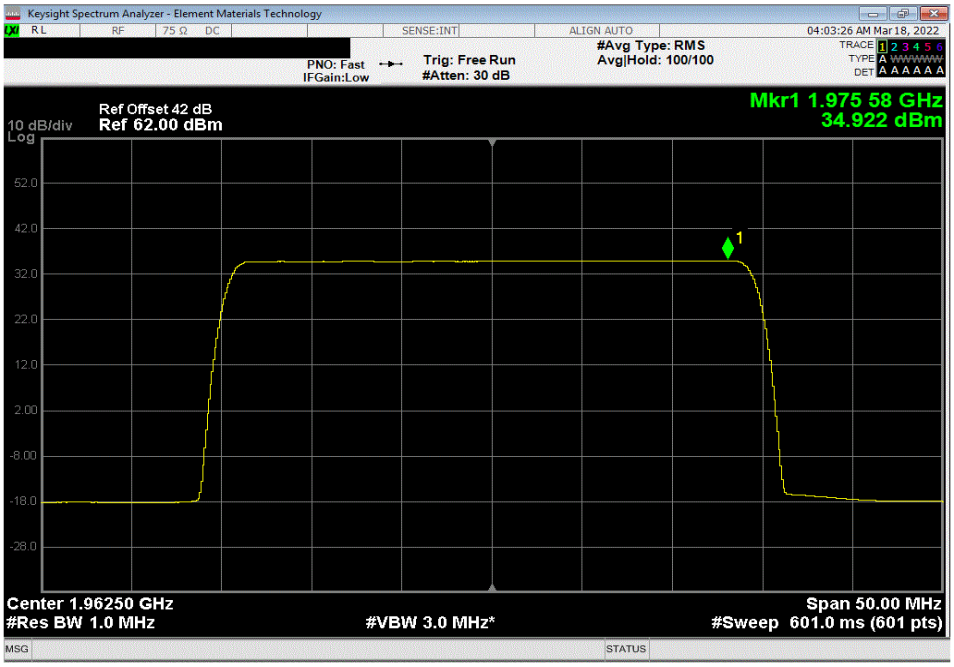
Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 30 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		36.586	0	36.586	39.586	42.586



Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 30 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		34.97	0	34.97	37.97	40.97



Band n25, 1930 MHz - 1995 MHz, 5G NR, Port 1, 30 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
		34.922	0	34.922	37.922	40.922



EIRP Calculations for Four Port MIMO Operations for Band n25 Single NR Carriers

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

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Kathrein antenna assembly model "80011867". The maximum Band n25 gain (17.9dBi) for this antenna was used for the EIRP calculation.

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4 for four port MIMO) from the results of power measurements (highest measured PSD for each channel bandwidth type). The total worst case PSD for four port MIMO is calculated as the worst case PSD for a single port + 6dB [10log (4)] based upon ANSI C63.26 clause 6.4.3.2.4 (10 Log N_{out}). 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	30 MHz Ch BW
Worst Case PSD/Antenna Port	43.0 dBm/MHz	40.3 dBm/MHz	39.4 dBm/MHz	38.3 dBm/MHz	36.6 dBm/MHz
Total PSD for Four Port MIMO 10Log 4 = + 6dB	49.0 dBm/MHz	46.3 dBm/MHz	45.4 dBm/MHz	44.3 dBm/MHz	42.6 dBm/MHz
Cable Loss (site dependent)	0 dB	0 dB	0 dB	0 dB	0 dB
Maximum Antenna Gain	17.9 dBi	17.9 dBi	17.9 dBi	17.9 dBi	17.9 dBi
Worst Case Four Port MIMO EIRP Total	66.9 dBm/MHz	64.2 dBm/MHz	63.3 dBm/MHz	62.2 dBm/MHz	60.5 dBm/MHz

Calculation Summary

The worst case AHFII four port MIMO Band n25 EIRP levels using antenna assembly model "80011867" are:
(1) Less than the FCC and ISED (3280 W/MHz or 65.16 dBm/MHz) EIRP Regulatory Limits for 10, 15, 20 & 30MHz channel bandwidths.
(2)Over the FCC/ISED (3280 W/MHz or 65.16 dBm/MHz) EIRP Regulatory Limits by 1.74 dB (66.9dBm/MHz - 65.16dBm/MHz) for the 5MHz channel bandwidth. EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements as noted above.
(3)Less than the FCC and ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits for 30MHz channel bandwidths.
(4)Over the FCC/ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits by 4.75 dB (66.9dBm/MHz - 62.15dBm/MHz) for the 5MHz channel bandwidth, by 2.05 dB (64.2dBm/MHz - 62.15dBm/MHz) for the 10MHz channel bandwidth, by 1.15 dB (63.3dBm/MHz - 62.15dBm/MHz) for the 15MHz channel bandwidth and by 0.05 dB (62.2dBm/MHz - 62.15dBm/MHz) for the 20MHz channel bandwidth. EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements as noted above.
(5) See "Output Power - Lowered Power" and the Power Spectral Density - Lowered Power" sections of this report for details of compliance verification by changing BTS configuration file power output parameters.

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS

element

TbtTx 2022.03.14.0 XMit 2022.02.07.0

EUT:	AHFII Remote Radio Head			**Work Order:**	NOKI0038
Serial Number:	YK214000035			**Date:**	19-Mar-22
Customer:	Nokia of America Corporation			**Temperature:**	22.3 °C
Attendees:	Mitchell Hill			**Humidity:**	42.8% RH
Project:	None			**Barometric Pres.:**	1019 mbar
Tested by:	Brandon Hobbs	**Power:**	54 VDC	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-139 Issue 3:2015, RSS-170 Issue 3:2015	RSS-139 Issue 3:2015, RSS-170 Issue 3:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. Band n66 carriers are enabled at maximum power (80 watts/carrier).The PSD was measured while transmitting one carrier on Port 1. The total PSD for multiport (2x2 MIMO and 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)].

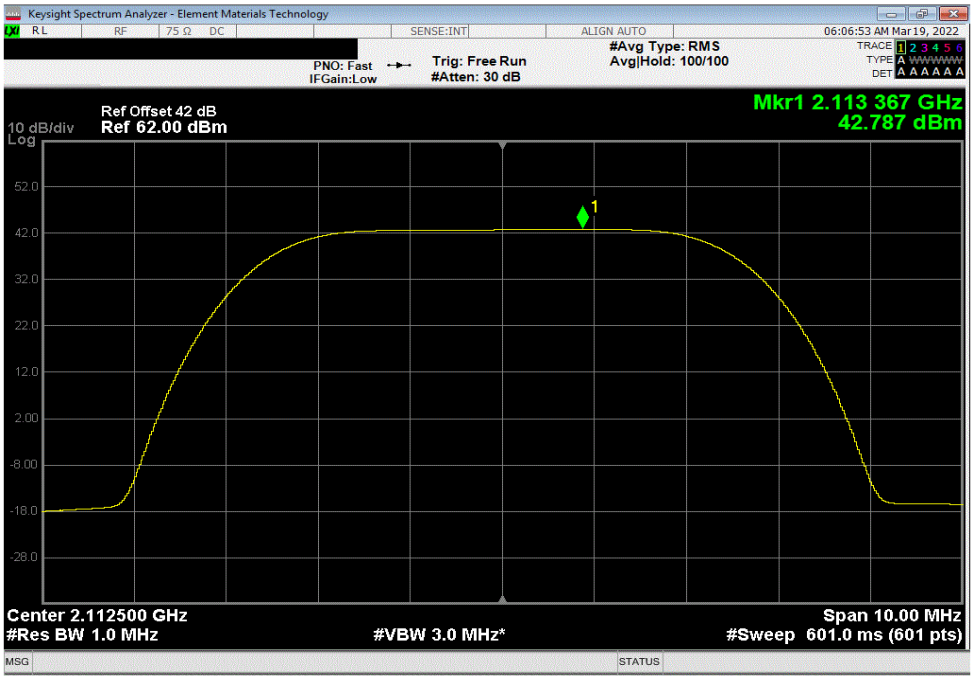
DEVIATIONS FROM TEST STANDARD

None

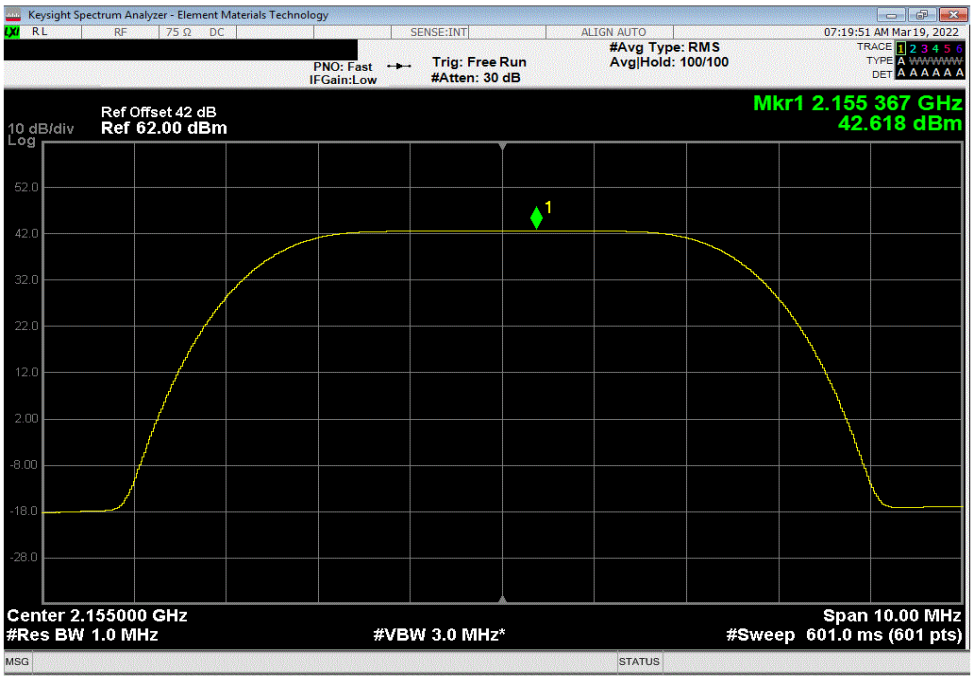
Configuration #	**2**	*Signature*

	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD
Band n66, 2110 MHz - 2200 MHz, 5G NR					
Port 1					
5 MHz Bandwidth					
QPSK Modulation					
Low Channel, 2112.5 MHz	42.787	0	42.8	45.8	48.8
Mid Channel, 2155 MHz	42.618	0	42.6	45.6	48.6
High Channel, 2197.5 MHz	42.690	0	42.7	45.7	48.7
16-QAM Modulation					
Low Channel, 2112.5 MHz	42.714	0	42.7	45.7	48.7
Mid Channel, 2155 MHz	42.507	0	42.5	45.5	48.5
High Channel, 2197.5 MHz	42.615	0	42.6	45.6	48.6
64-QAM Modulation					
Low Channel, 2112.5 MHz	42.770	0	42.8	45.8	48.8
Mid Channel, 2155 MHz	42.517	0	42.5	45.5	48.5
High Channel, 2197.5 MHz	42.631	0	42.6	45.6	48.6
256-QAM Modulation					
Low Channel, 2112.5 MHz	42.744	0	42.7	45.7	48.7
Mid Channel, 2155 MHz	42.503	0	42.5	45.5	48.5
High Channel, 2197.5 MHz	42.614	0	42.6	45.6	48.6
10 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 2155 MHz	39.254	0	39.3	42.3	45.3
16-QAM Modulation					
Mid Channel, 2155 MHz	39.931	0	39.9	42.9	45.9
64-QAM Modulation					
Mid Channel, 2155 MHz	39.255	0	39.3	42.3	45.3
256-QAM Modulation					
Mid Channel, 2155 MHz	39.266	0	39.3	42.3	45.3
15 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 2155 MHz	37.551	0	37.6	40.6	43.6
16-QAM Modulation					
Mid Channel, 2155 MHz	39.036	0	39.0	42.0	45.0
64-QAM Modulation					
Mid Channel, 2155 MHz	37.590	0	37.6	40.6	43.6
256-QAM Modulation					
Mid Channel, 2155 MHz	37.566	0	37.6	40.6	43.6
20 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 2155 MHz	36.401	0	36.4	39.4	42.4
16-QAM Modulation					
Mid Channel, 2155 MHz	37.940	0	37.9	40.9	43.9
64-QAM Modulation					
Mid Channel, 2155 MHz	36.360	0	36.4	39.4	42.4
256-QAM Modulation					
Mid Channel, 2155 MHz	36.329	0	36.3	39.3	42.3
30 MHz Bandwidth					
QPSK Modulation					
Mid Channel, 2155 MHz	34.589	0	34.6	37.6	40.6
16-QAM Modulation					
Mid Channel, 2155 MHz	36.325	0	36.3	39.3	42.3
64-QAM Modulation					
Mid Channel, 2155 MHz	34.652	0	34.7	37.7	40.7
256-QAM Modulation					
Mid Channel, 2155 MHz	34.629	0	34.6	37.6	40.6

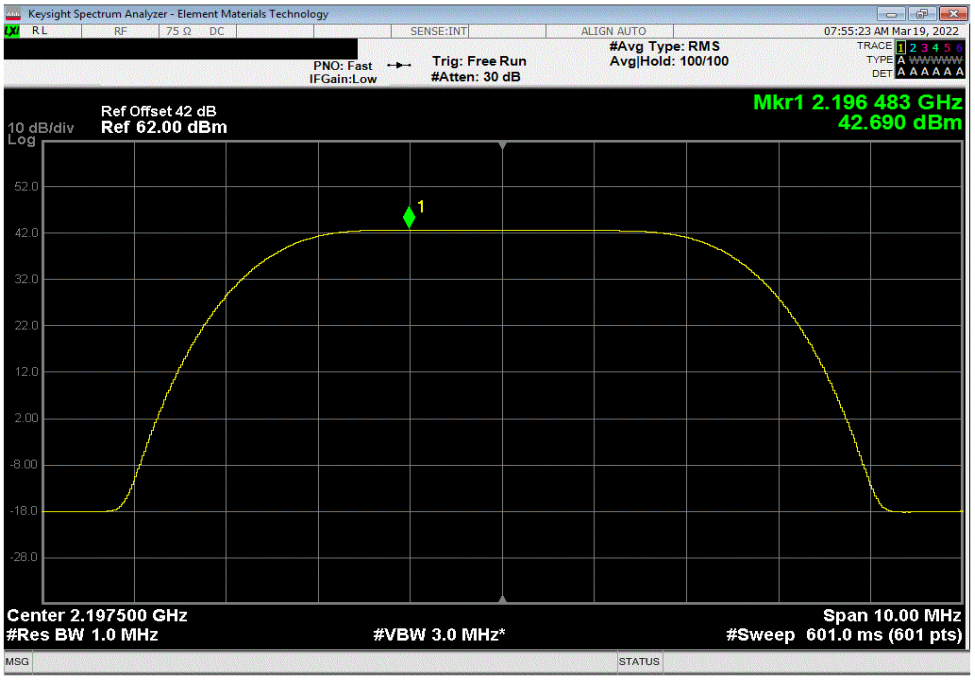
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, QPSK Modulation, Low Channel, 2112.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.787	0	42.787	45.787	48.787	



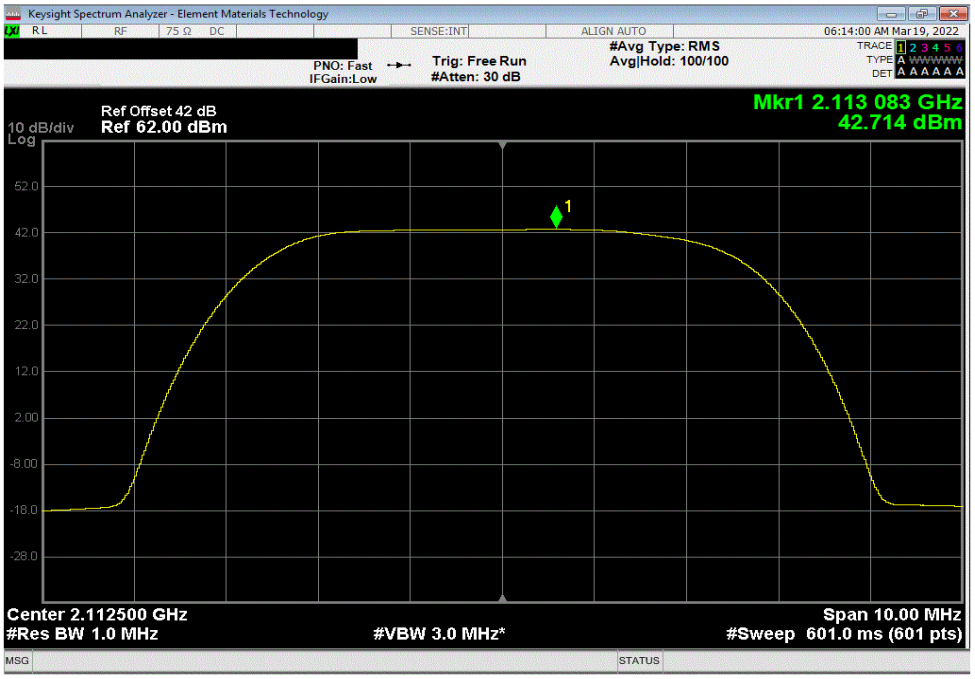
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, QPSK Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.618	0	42.618	45.618	48.618	



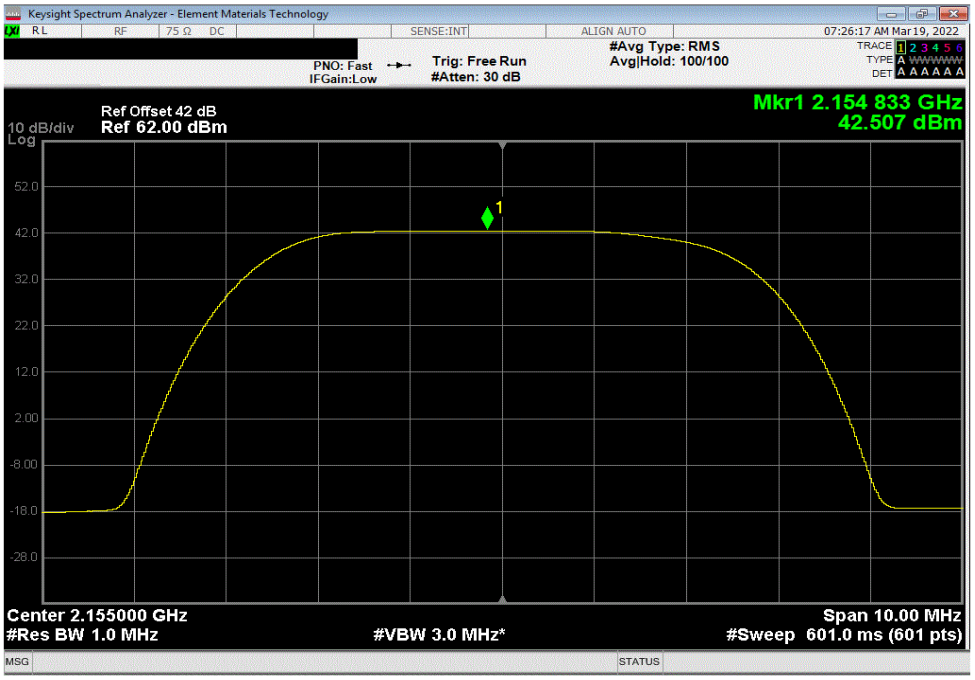
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, QPSK Modulation, High Channel, 2197.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.69	0	42.69	45.69	48.69	



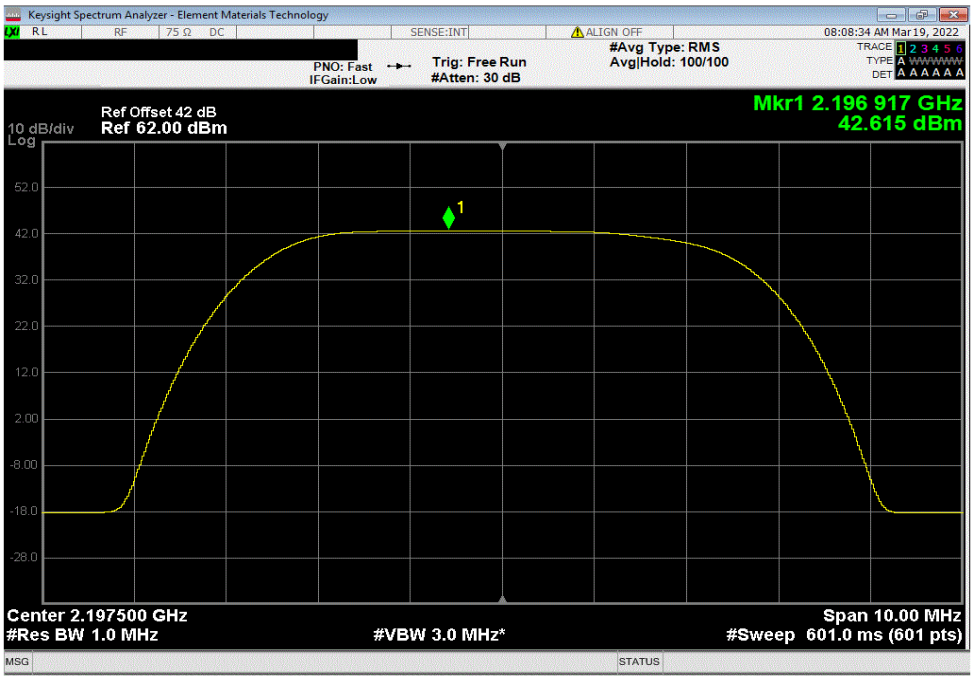
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 16-QAM Modulation, Low Channel, 2112.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.714	0	42.714	45.714	48.714	



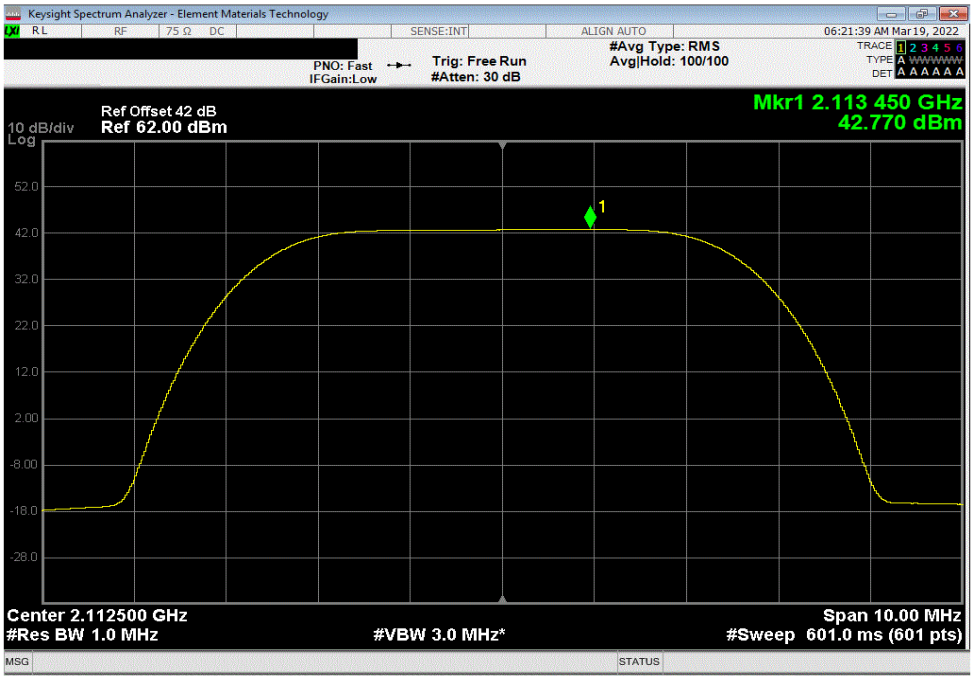
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.507	0	42.507	45.507	48.507	



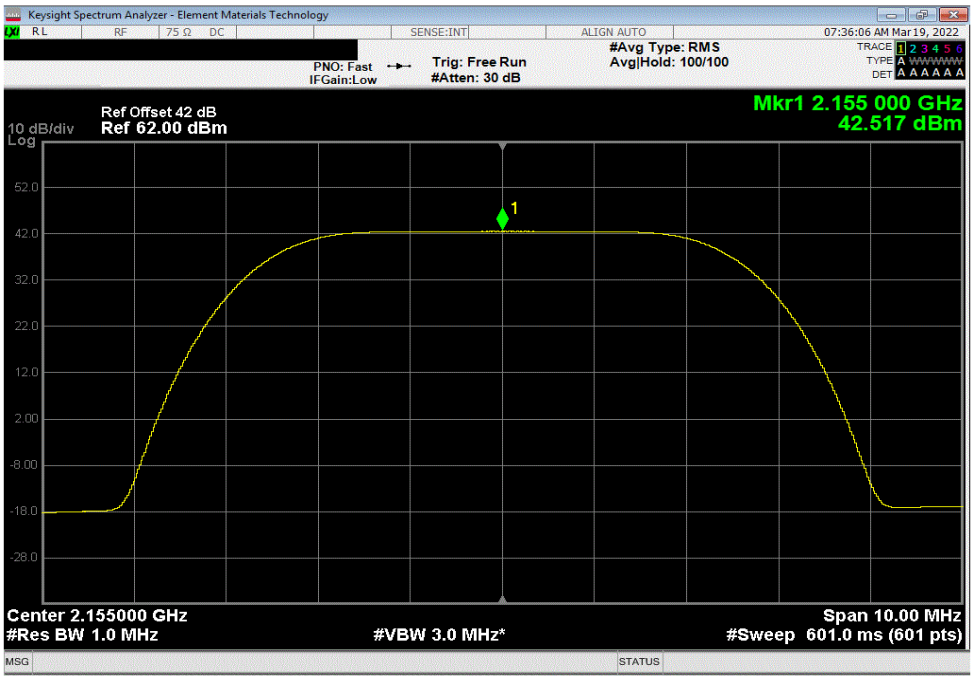
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 16-QAM Modulation, High Channel, 2197.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.615	0	42.615	45.615	48.615	



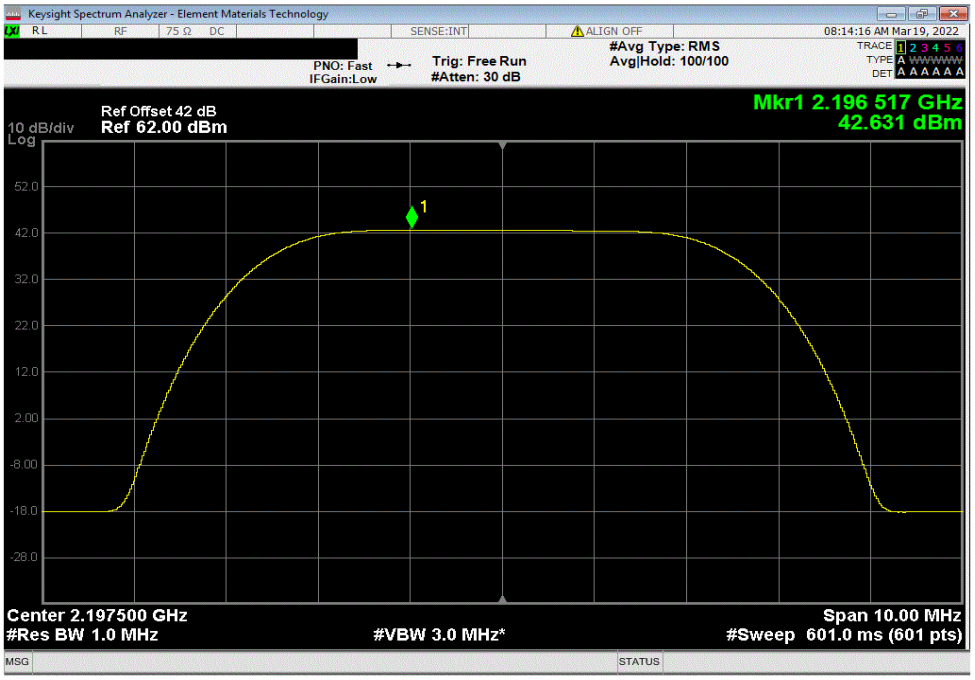
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 64-QAM Modulation, Low Channel, 2112.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.77	0	42.77	45.77	48.77	



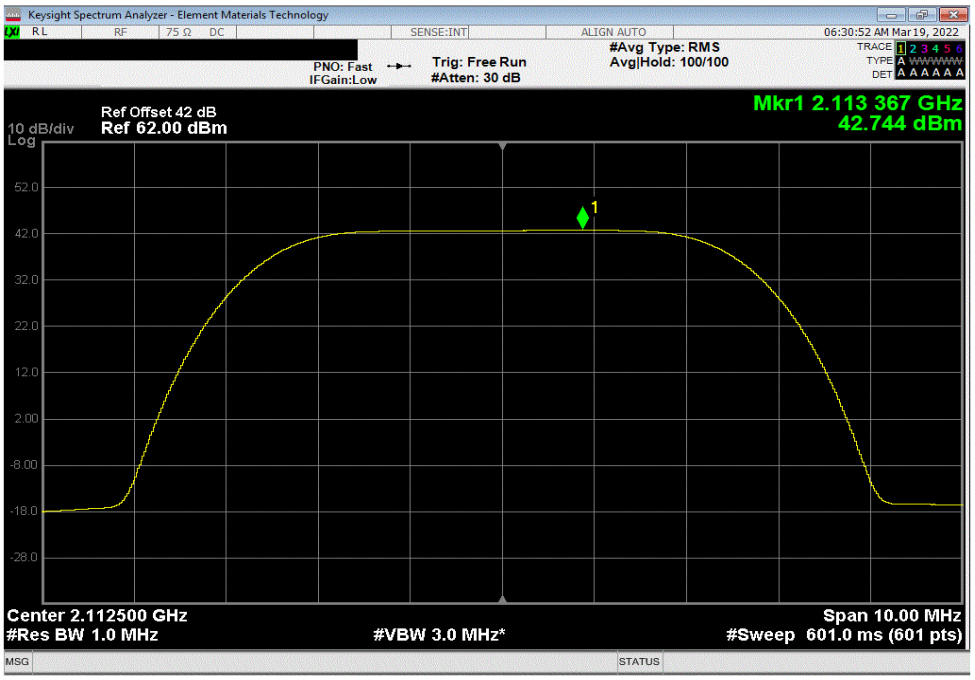
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.517	0	42.517	45.517	48.517	



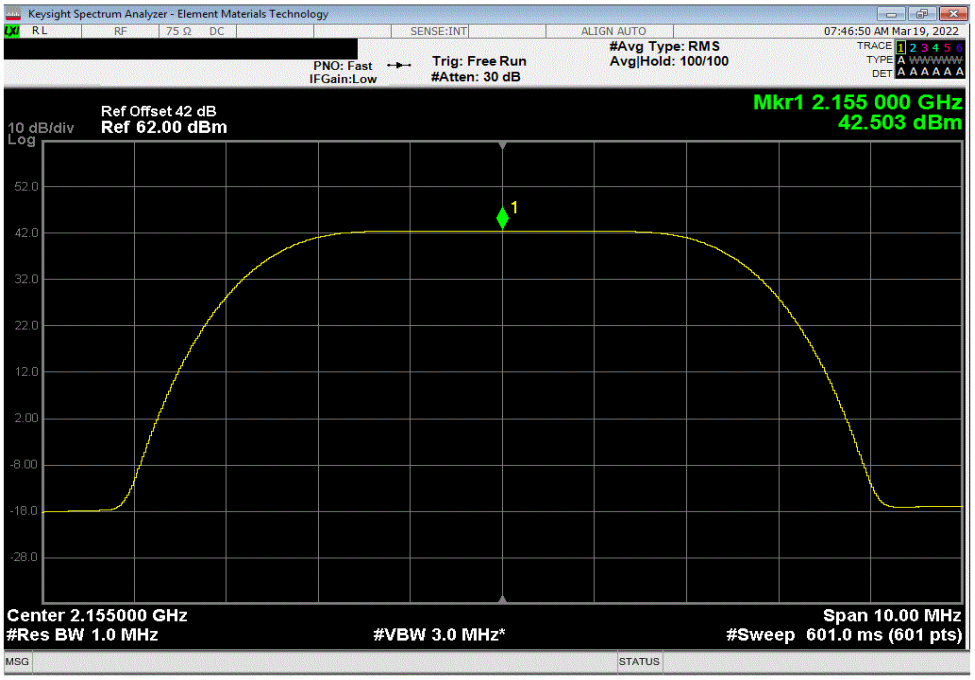
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 64-QAM Modulation, High Channel, 2197.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.631	0	42.631	45.631	48.631	



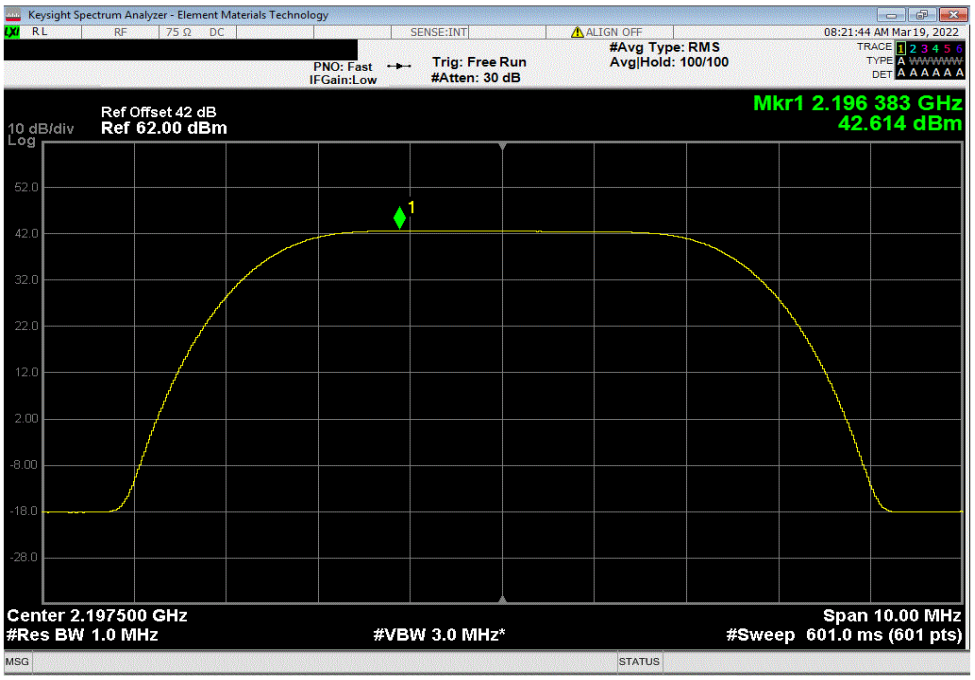
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Low Channel, 2112.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.744	0	42.744	45.744	48.744	



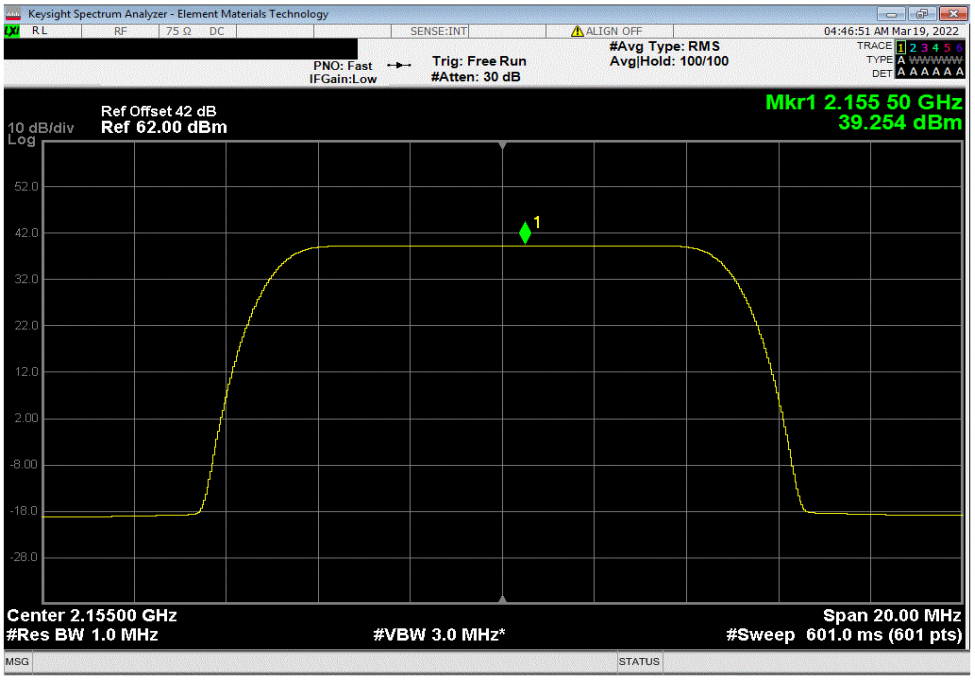
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.503	0	42.503	45.503	48.503	



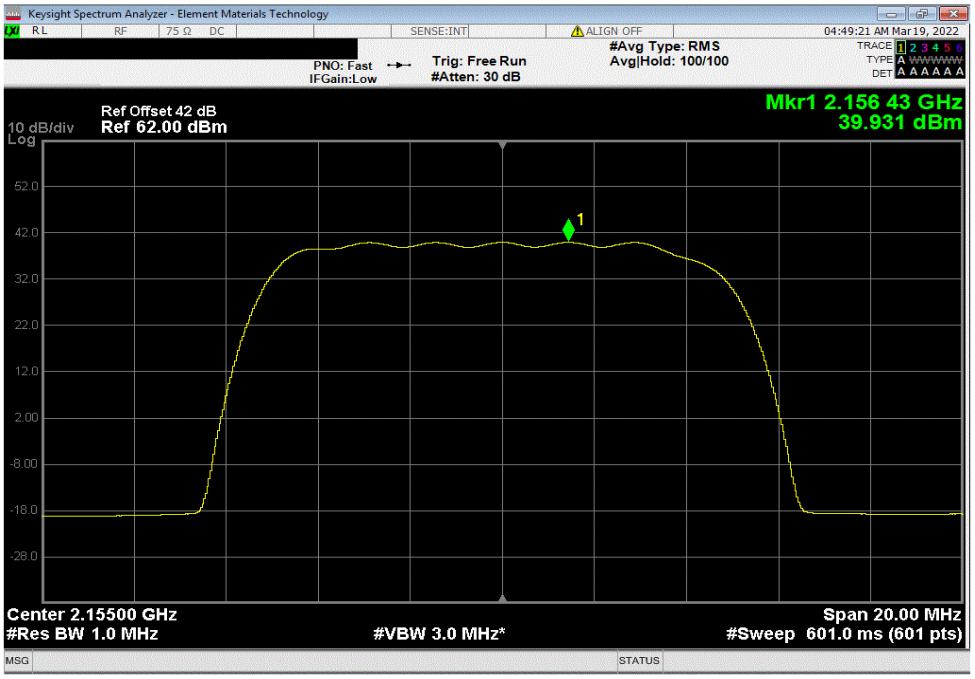
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 5 MHz Bandwidth, 256-QAM Modulation, High Channel, 2197.5 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	42.614	0	42.614	45.614	48.614	



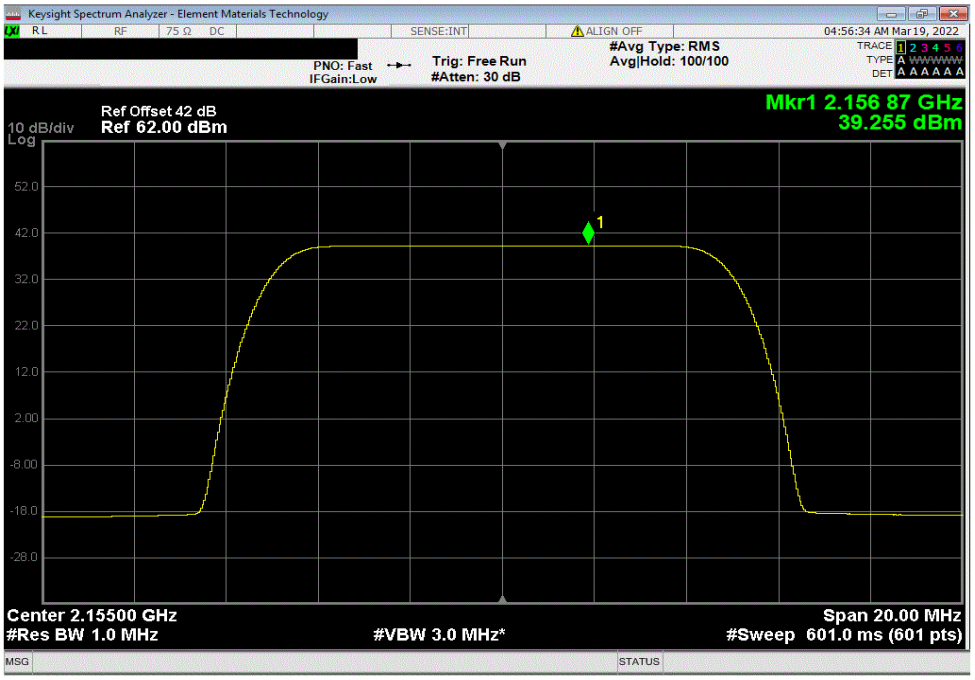
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 10 MHz Bandwidth, QPSK Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.254	0	39.254	42.254	45.254	



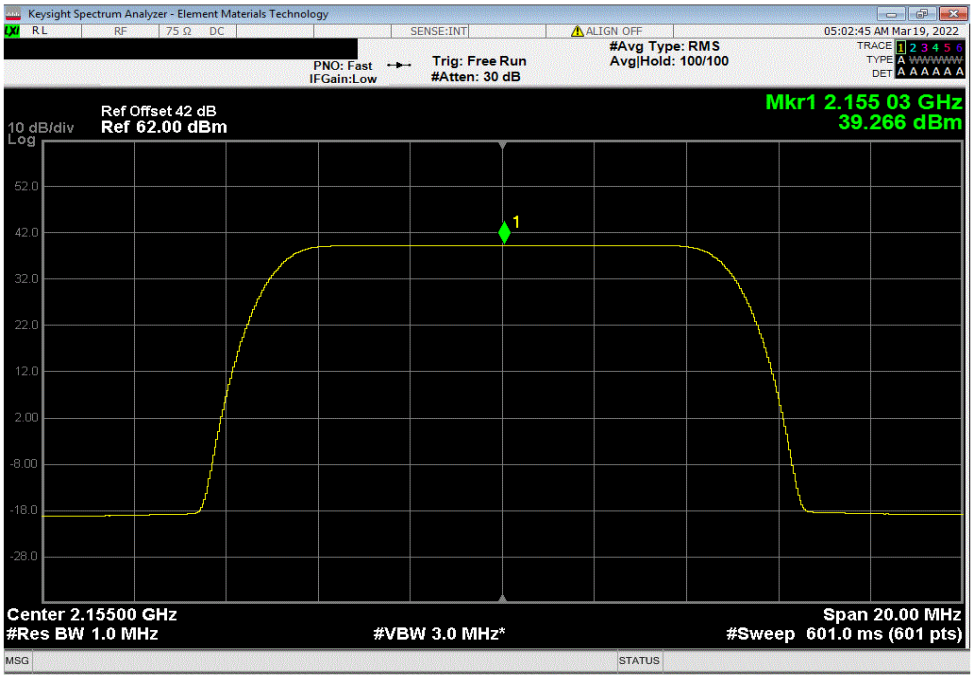
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 10 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.931	0	39.931	42.931	45.931	



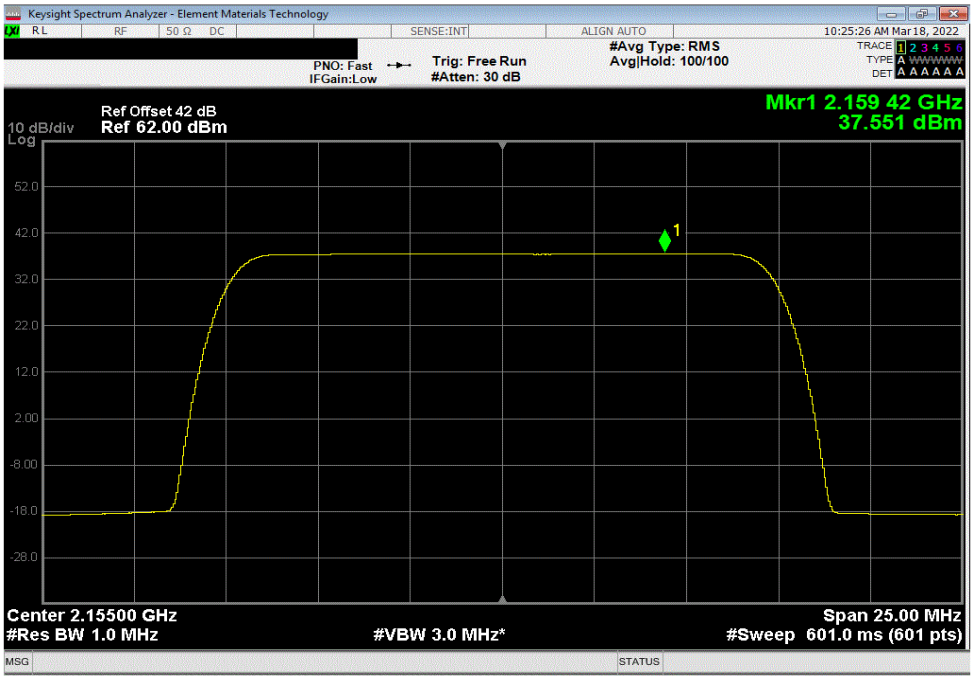
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 10 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.255	0	39.255	42.255	45.255	



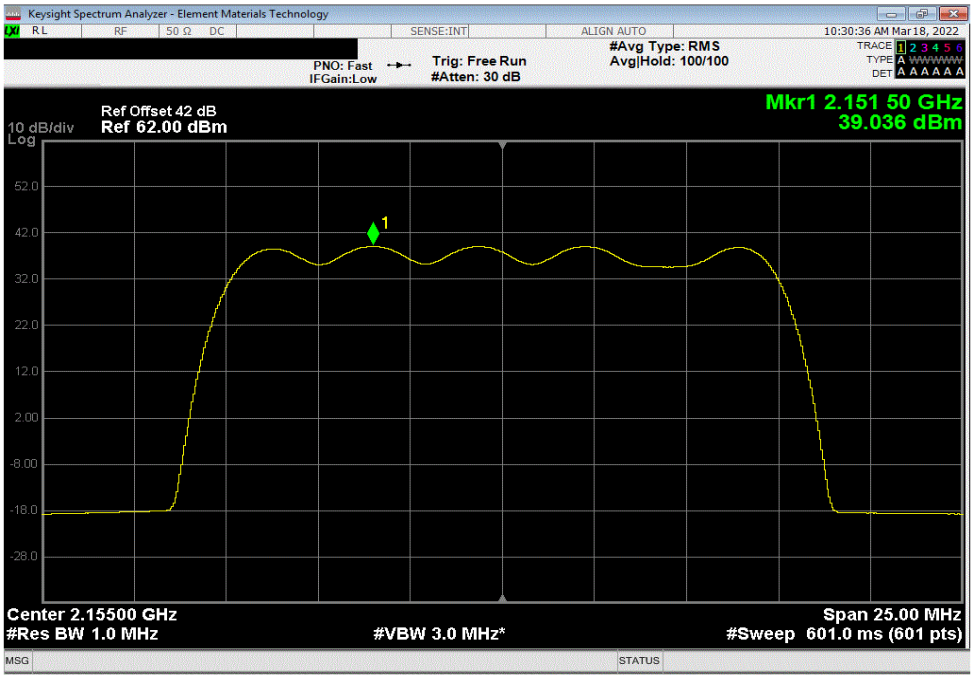
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 10 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.266	0	39.266	42.266	45.266	



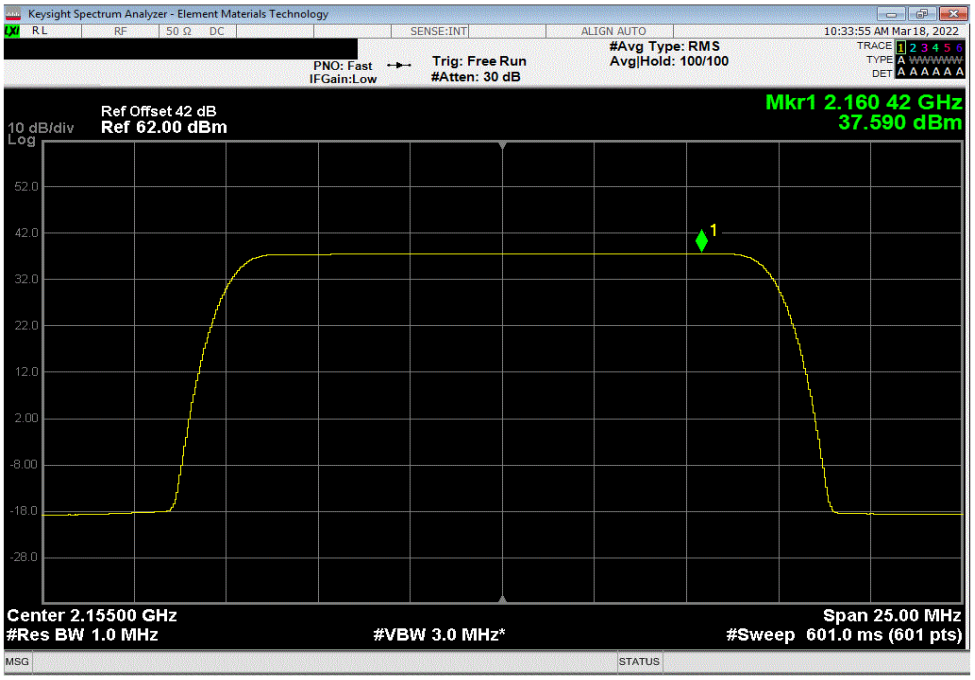
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 15 MHz Bandwidth, QPSK Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	37.551	0	37.551	40.551	43.551	



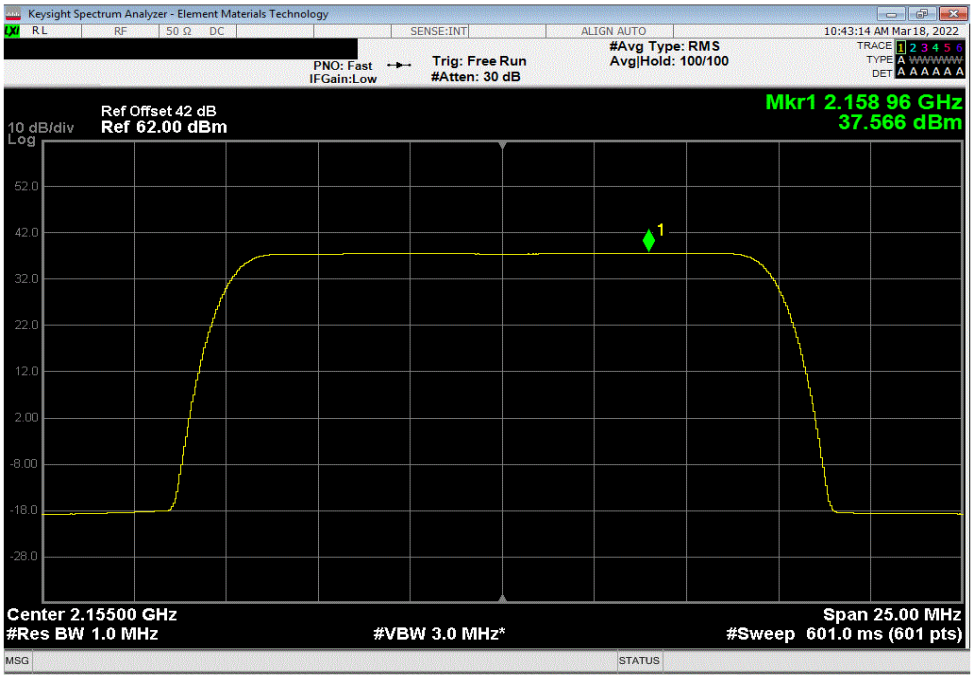
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	39.036	0	39.036	42.036	45.036	



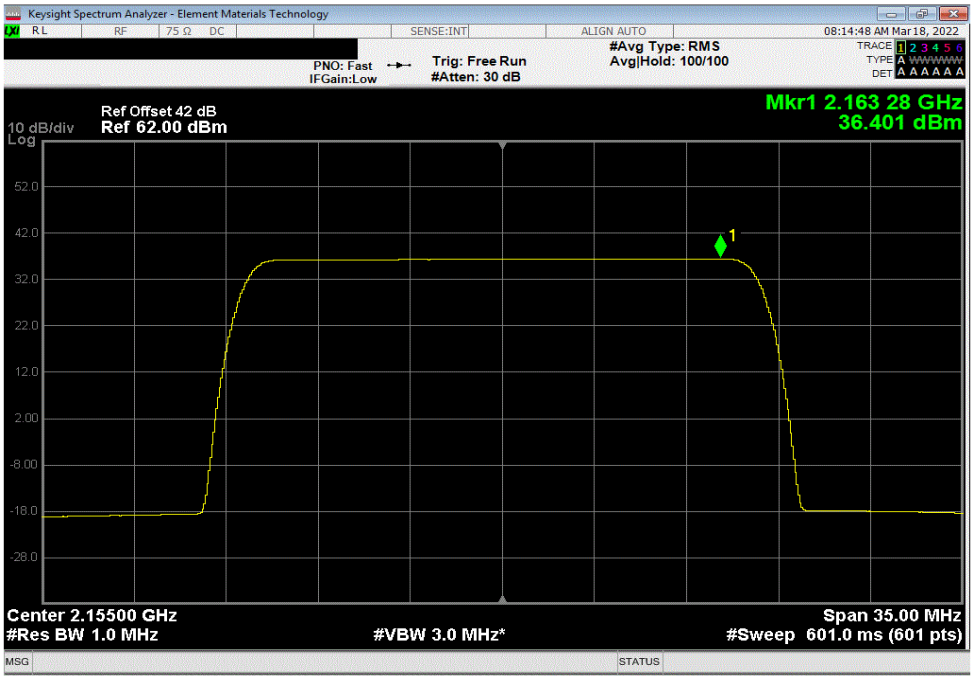
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	37.59	0	37.59	40.59	43.59	



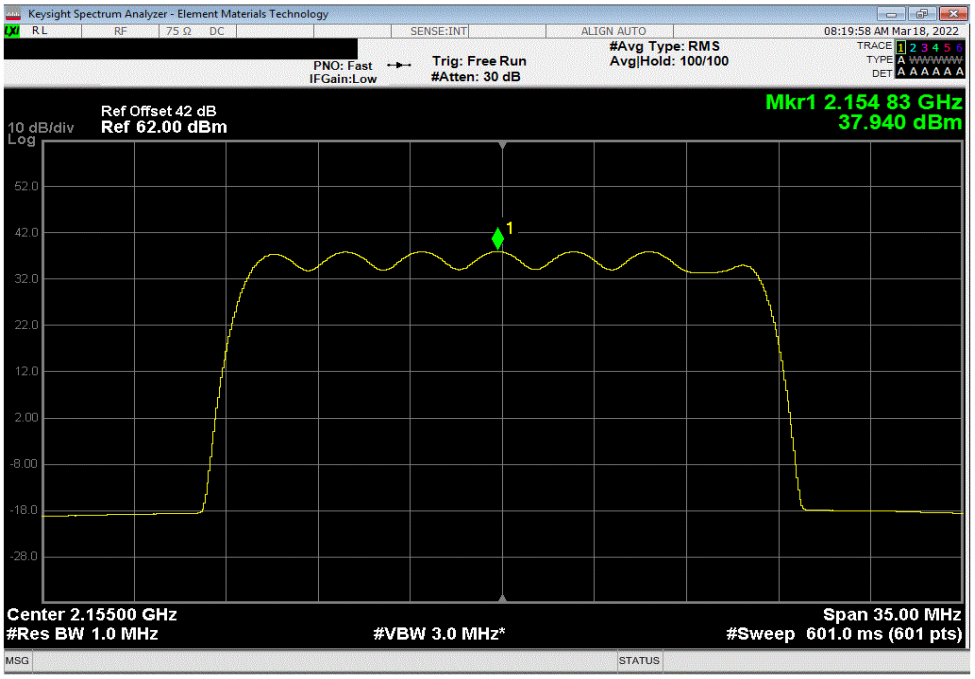
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 15 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	37.566	0	37.566	40.566	43.566	



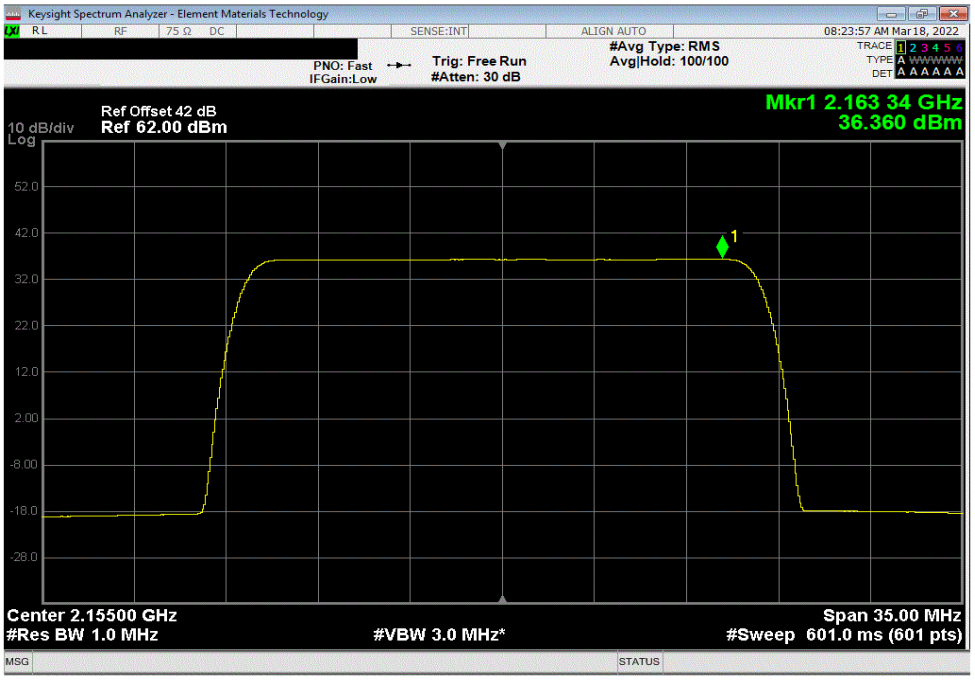
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 20 MHz Bandwidth, QPSK Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	36.401	0	36.401	39.401	42.401	



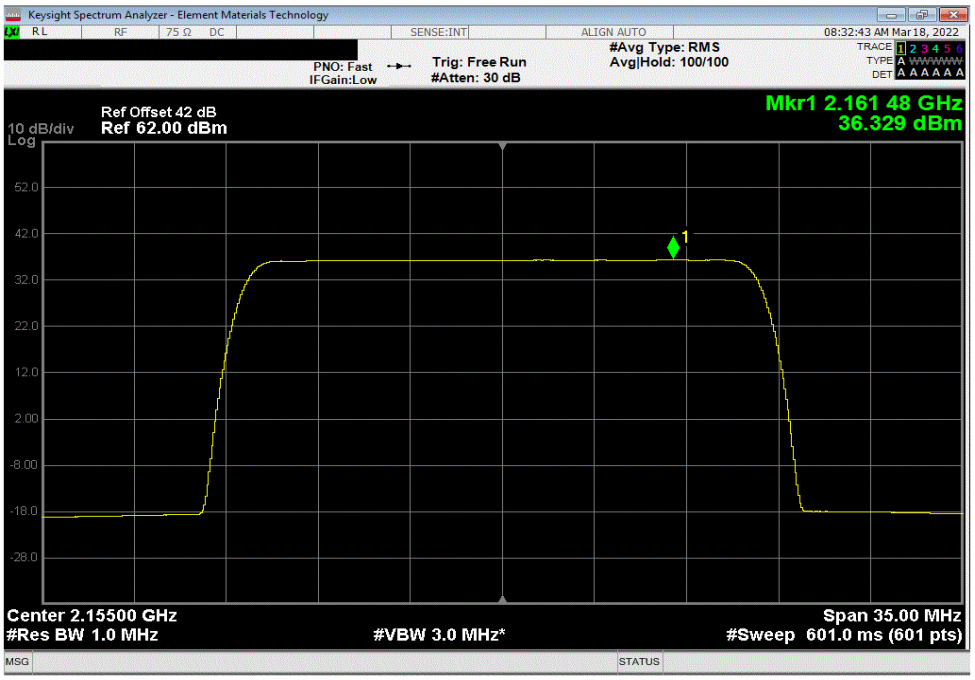
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 20 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	37.94	0	37.94	40.94	43.94	



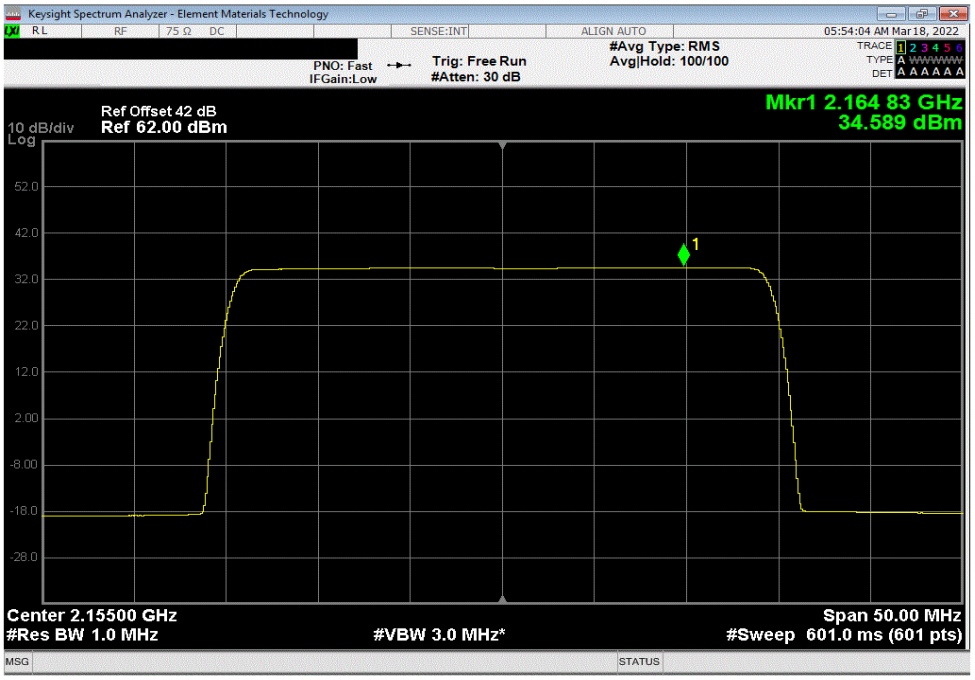
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 20 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	36.36	0	36.36	39.36	42.36	



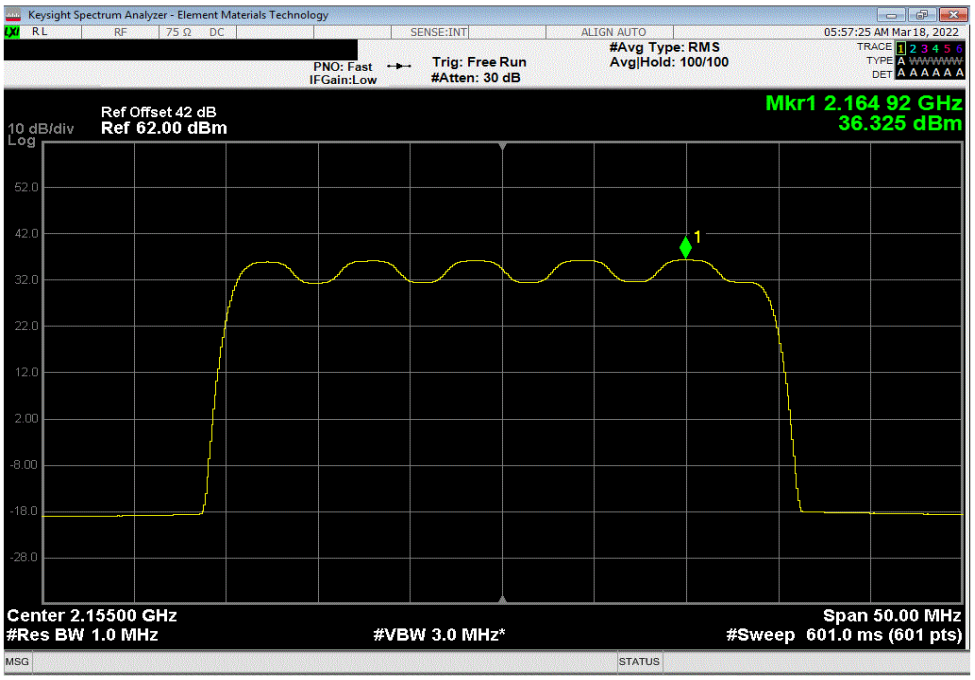
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 20 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	36.329	0	36.329	39.329	42.329	



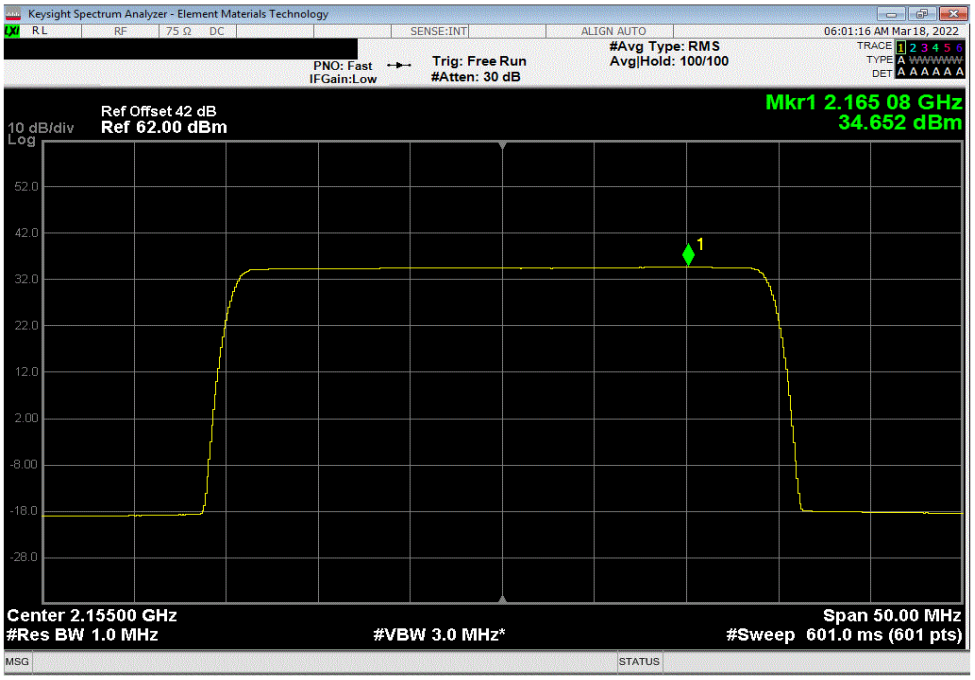
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 30 MHz Bandwidth, QPSK Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	34.589	0	34.589	37.589	40.589	



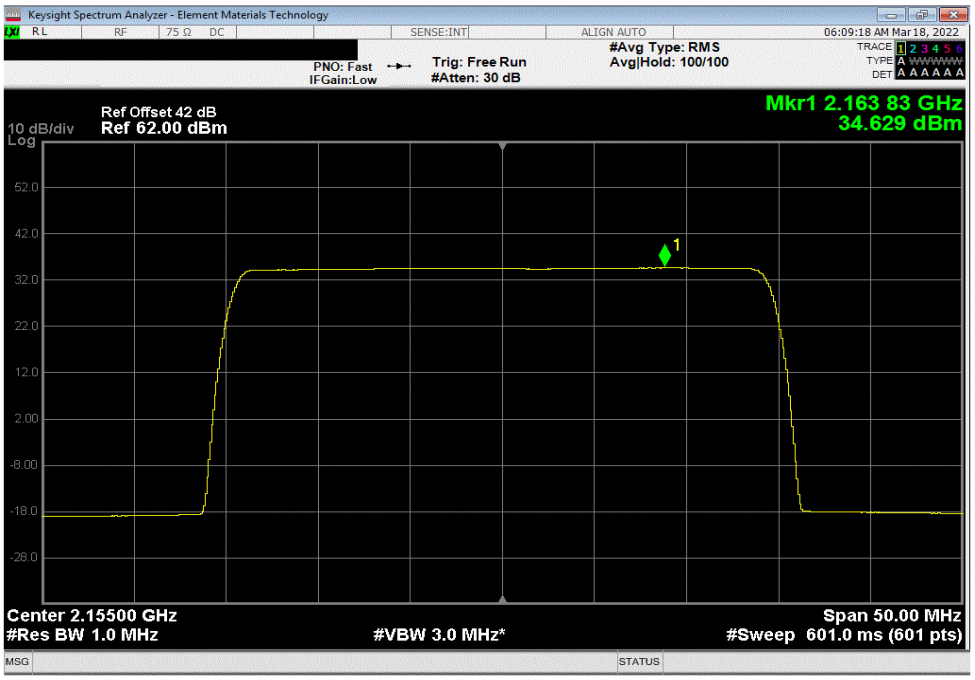
Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 30 MHz Bandwidth, 16-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	36.325	0	36.325	39.325	42.325	



Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 30 MHz Bandwidth, 64-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	34.652	0	34.652	37.652	40.652	



Band n66, 2110 MHz - 2200 MHz, 5G NR, Port 1, 30 MHz Bandwidth, 256-QAM Modulation, Mid Channel, 2155 MHz						
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	34.629	0	34.629	37.629	40.629	



EIRP Calculations for Four Port MIMO Operations for Band n66 Single NR Carriers

EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regu latory 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, popu lation 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 bandw idth, modulation type, etc.) to optimize performance. Transmitter output power may be reduced (from maximum) by base station setup parameters. Base station antennas are selected by the customer.

The base station antenna is selected by the customer and this EIRP calculation is based upon a sample worst case antenna. The EIRP calculation is based upon Kathrein antenna assembly model "80011867". The maximum Band n66 gain (18.2dBi) for this antenna was used for the EIRP calculation.

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26 -2015 section 6.4 for four port MIMO) from the results of power measurements (highest measured PSD for each channel bandwidth type). The total worst case PSD for four port MIMO is calculated as the worst case PSD for a single port + 6dB [10l og (4)] based upon ANSI C63.26 clause 6.4.3.2.4 (10 Log N_{out}). 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) b ut 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	30 MHz Ch BW
Worst Case PSD/Antenna Port	42.8 dBm/MHz	39.9 dBm/MHz	39 dBm/MHz	37.9 dBm/MHz	36.3 dBm/MHz
Total PSD for Four Port MIMO 10Log 4 = + 6dB	48.8 dBm/MHz	45.9 dBm/MHz	45 dBm/MHz	43.9 dBm/MHz	42.3 dBm/MHz
Cable Loss (site dependent)	0 dB	0 dB	0 dB	0 dB	0 dB
Maximum Antenna Gain	18.2 dBi	18.2 dBi	18.2 dBi	18.2 dBi	18.2 dBi
Worst Case Four Port MIMO EIRP Total	67.0 dBm/MHz	64.1 dBm/MHz	63.2 dBm/MHz	62.1 dBm/MHz	60.5 dBm/MHz

Calculation Summary

The worst case AHFII four port MIMO Band n66 EIRP levels using antenna assembly model "80011867" are:

(1) Less than the FCC and ISED (3280 W/MHz or 65.16 dBm/MHz) EIRP Regulatory Limits for 10, 15, 20 & 30MHz channel bandwidths

(2)Over the FCC/ISED (3280 W/MHz or 65.16 dBm/MHz) EIRP Regulatory Limits by 1.84 dB (67.0dBm/MHz - 65.16dBm/MHz) for the 5MHz channel bandwidth. EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements as noted above.

(3)Less than the FCC and ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits for 20 & 30MHz channel bandwidths.

(4)Over the FCC/ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits by 4.85 dB (67.0dBm/MHz - 62.15dBm/MHz) for the 5MHz channel bandwidth, by 1.95 dB (64.1dBm/MHz - 62.15dBm/MHz) for the 10MHz channel bandwidth, and by 1.05 dB (63.2dBm/MHz - 62.15dBm/MHz) for the 15MHz channel bandwidth. EIRP calculations are needed at each transmitter l ocation to optimize base station operational performance while meeting regulatory requirements as noted above.

(5) See "Output Power - Lowered Power" and the Power Spectral Density - Lowered Power" sections of this report for details of compliance verification by changing BTS configuration file power output parameters.

POWER SPECTRAL DENSITY - LOWERED POWER

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
Generator - Signal	Keysight	N5182B	TEV	2021-04-27	2024-04-27
Block - DC	Fairview Microwave	SD3379	AMM	2021-09-14	2022-09-14
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 transmit power was set to levels seen in the datasheet.

The method of section 5.2.4.5 of ANSI C63.26 was used to make the measurement. The method uses trace averaging across ON and OFF times of EUT transmissions using the spectrum analyzer's RMS detector. Following the measurement a duty cycle correction was applied by adding [10log(1/D)], where D is the duty cycle, to the measured power to compute the PSD during the transmit times.

RF conducted emissions testing was performed on one port. The AHFII antenna ports are essentially electrically identical (the RF power variation between antenna ports is small) and 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 of all antenna ports (at the radio output) was determined per ANSI C63.26-2015 paragraph 6.4.3.2.4.

The EIRP calculations were based upon ANSI C63.26-2015 sections 6.4.3.2.4, section 6.4.5.3 and section 6.4.5.2 for a four port MIMO base station.

Compliance check for EIRP Limit of 3280W/MHz or 65.16dBm/MHz:
As shown in the EIRP calculation tables in the "PSD and EIRP Calculations" report sections, the highest AHFII antenna port 1 PSD level that will not cause the calculated EIRP to exceed the EIRP limit is 41.2dBm/MHz for Band n25 and 40.9dBm/MHz for Band n66. The maximum carrier power levels were reduced by changing the carrier power parameters in the configuration file for the base station to comply with the EIRP limit.

Compliance check for EIRP Limit of 1640W/MHz or 62.15dBm/MHz:
As shown in the EIRP calculation tables in the "PSD and EIRP Calculations" report sections, the highest AHFII antenna port 1 PSD level that will not cause the calculated EIRP to exceed the EIRP limit is 38.2dBm/MHz for Band n25 and 37.9dBm/MHz for Band n66. The maximum carrier power levels were reduced by changing the carrier power parameters in the configuration file for the base station to comply with the EIRP limit.

POWER SPECTRAL DENSITY - LOWERED POWER

element

TbiTx 2022.03.14.0 XMit 2022.02.07.0

EUT:	AHFII Remote Radio Head			Work Order:	NOKI0038
Serial Number:	YK214000035			Date:	22-Mar-22
Customer:	Nokia of America Corporation			Temperature:	22.7 °C
Attendees:	Mitchell Hill			Humidity:	24.4% RH
Project:	None			Barometric Pres.:	1023 mbar
Tested by:	Brandon Hobbs	Power:	54 VDC	Job Site:	TX06

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

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. The Band n25 NR5, NR10, NR15 and NR20 carrier power levels were reduced to demonstrate compliance with EIRP limits. The maximum port 1 PSD Lower limit level is 38.2 dBm/MHz for the base station calculated EIRP level not to exceed the EIRP limit (1640Watts/MHz). The maximum port 1 PSD higher limit level is 41.2 dBm/MHz for the base station calculated EIRP level not to exceed the EIRP limit (3280 Watts/MHz).

DEVIATIONS FROM TEST STANDARD

None

Configuration #	2	Signature

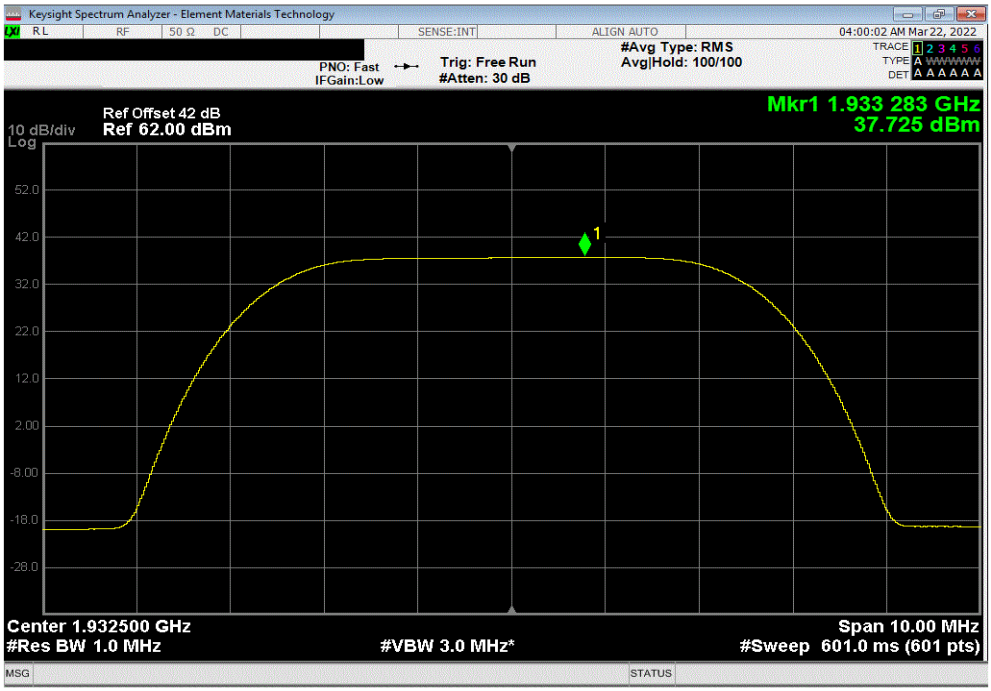
	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
Port 1, Band n25, 1930 MHz - 1995 MHz, 5G NR					
256-QAM Modulation					
Single Carrier					
5 MHz Bandwidth, Low Limit					
Low Channel, 1932.5 MHz	37.725	0	37.7	38.2	Pass
5 MHz Bandwidth, High Limit					
Low Channel, 1932.5 MHz	40.664	0	40.7	41.2	Pass
16-QAM Modulation					
Single Carrier					
10 MHz Bandwidth, Low Limit					
Mid Channel, 1962.5 MHz	37.772	0	37.8	38.2	Pass
15 MHz Bandwidth, Low Limit					
Mid Channel, 1962.5 MHz	37.712	0	37.7	38.2	Pass
20 MHz Bandwidth, Low Limit					
Mid Channel, 1962.5 MHz	37.678	0	37.7	38.2	Pass

POWER SPECTRAL DENSITY - LOWERED POWER

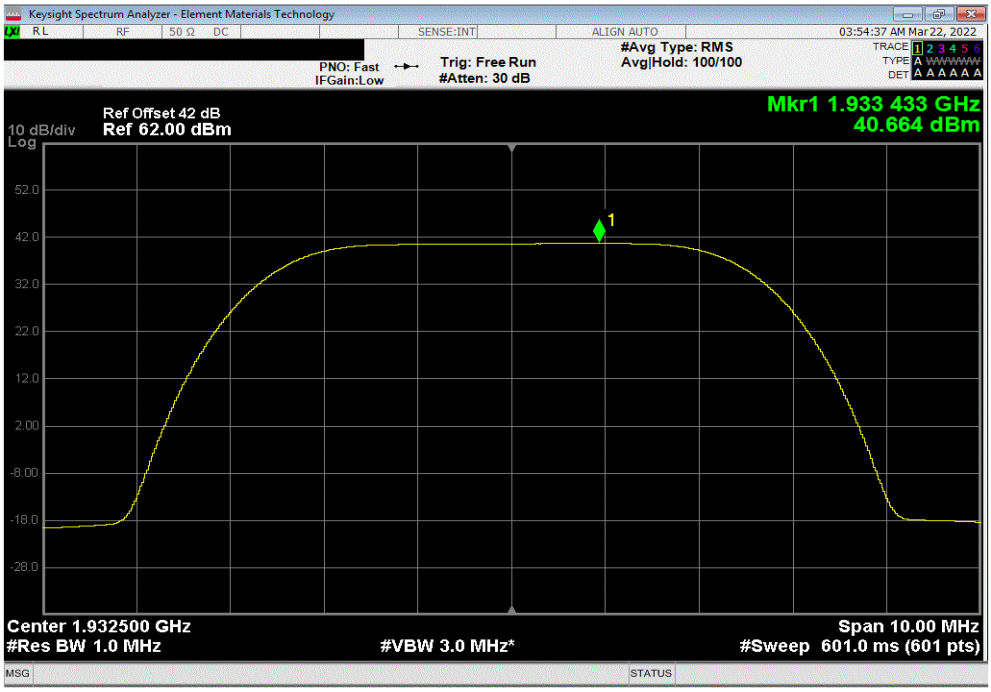
element

TbtTx 2022.03.14.0 XMit 2022.02.07.0

Port 1, Band n25, 1930 MHz - 1995 MHz, 5G NR, 256-QAM Modulation, Single Carrier, 5 MHz Bandwidth, Low Limit , Low Channel, 1932.5 MHz						
	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	37.725	0		37.73	38.2	Pass



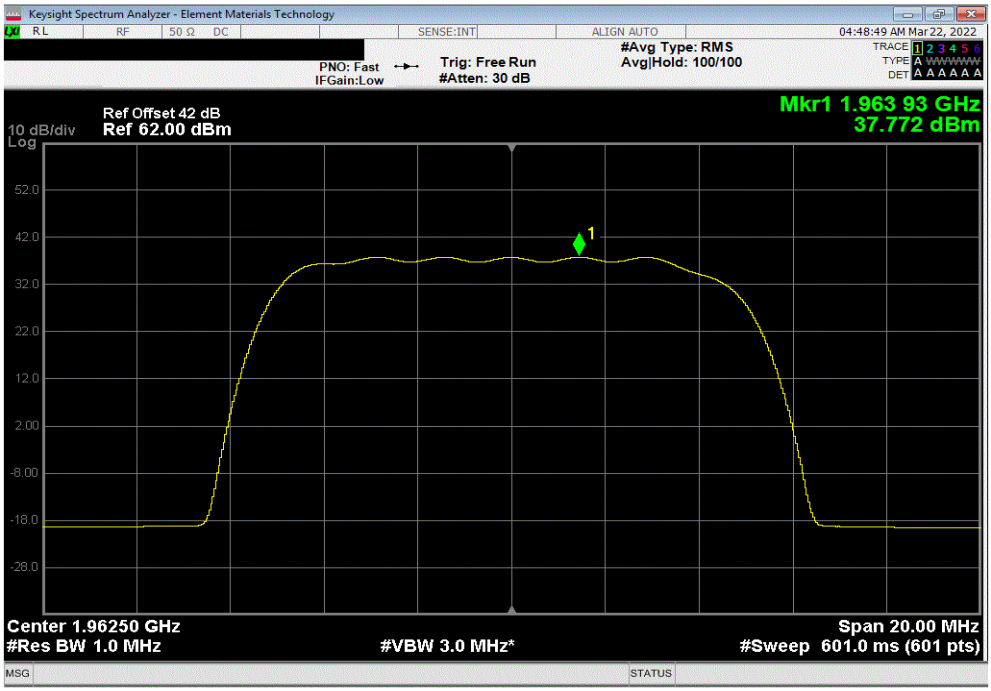
Port 1, Band n25, 1930 MHz - 1995 MHz, 5G NR, 256-QAM Modulation, Single Carrier, 5 MHz Bandwidth, High Limit, Low Channel, 1932.5 MHz						
	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	40.664	0		40.66	41.2	Pass



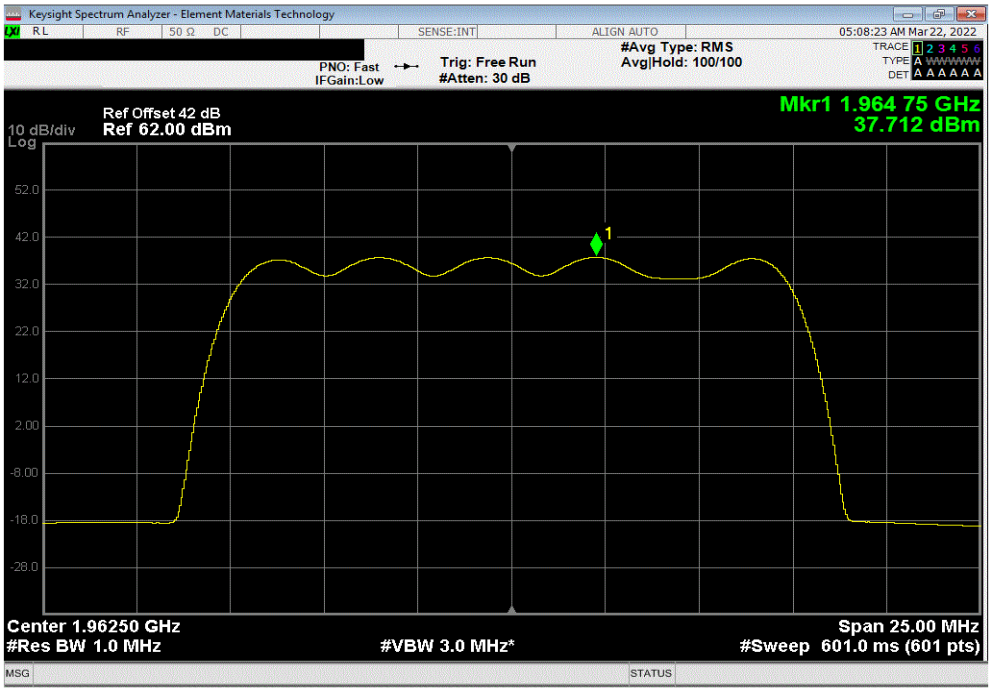
POWER SPECTRAL DENSITY - LOWERED POWER

TbtTx 2022.03.14.0 XMit 2022.02.07.0

Port 1, Band n25, 1930 MHz - 1995 MHz, 5G NR, 16-QAM Modulation, Single Carrier, 10 MHz Bandwidth, Low Limit, Mid Channel, 1962.5 MHz						
	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	37.772	0		37.77	38.2	Pass



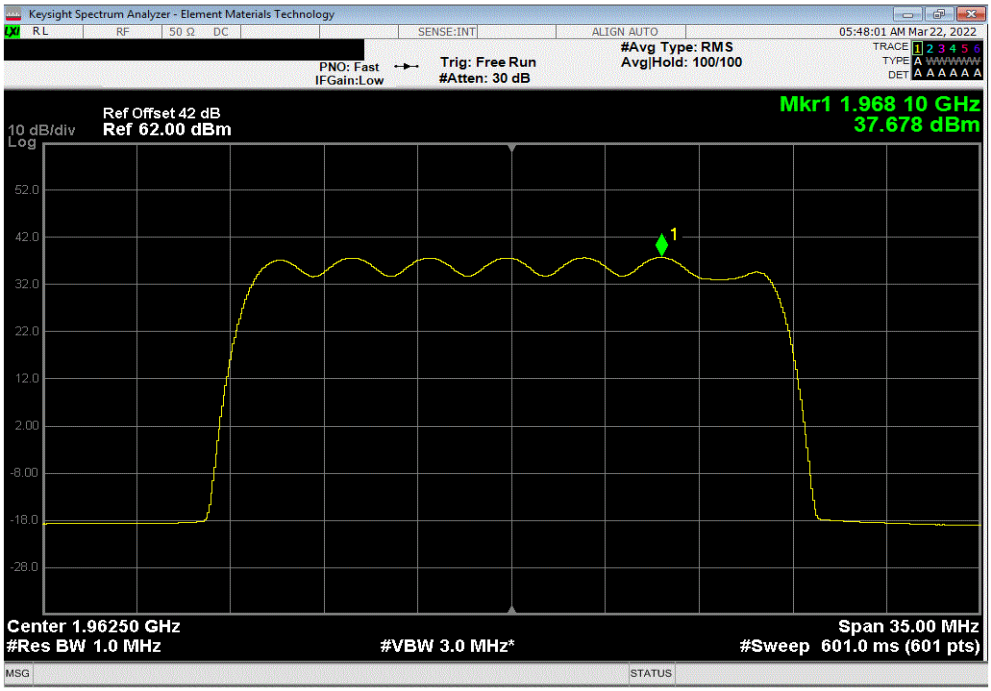
Port 1, Band n25, 1930 MHz - 1995 MHz, 5G NR, 16-QAM Modulation, Single Carrier, 15 MHz Bandwidth, Low Limit, Mid Channel, 1962.5 MHz						
	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	37.712	0		37.71	38.2	Pass



POWER SPECTRAL DENSITY - LOWERED POWER

TbtTx 2022.03.14.0 XMit 2022.02.07.0

Port 1, Band n25, 1930 MHz - 1995 MHz, 5G NR, 16-QAM Modulation, Single Carrier, 20 MHz Bandwidth, Low Limit, Mid Channel, 1962.5 MHz						
	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	37.678	0		37.68	38.2	Pass



POWER SPECTRAL DENSITY - LOWERED POWER

element

TbiTx 2022.03.14.0 XMit 2022.02.07.0

EUT:	AHFII Remote Radio Head			**Work Order:**	NOKI0038
Serial Number:	YK214000036			**Date:**	22-Mar-22
Customer:	Nokia of America Corporation			**Temperature:**	22.6 °C
Attendees:	Mitchell Hill			**Humidity:**	23.7% RH
Project:	None			**Barometric Pres.:**	1026 mbar
Tested by:	Mark Baytan	**Power:**	54 VDC	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-139 Issue 3:2015	RSS-139 Issue 3:2015
RSS-170 Issue 3:2015	RSS-170 Issue 3:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. The Band n66 NR5, NR10, NR15 and NR20 carrier power levels were reduced to demonstrate compliance with EIRP limits. The maximum port 1 PSD Lower limit level is 37.9 dBm/MHz for the base station calculated EIRP level not to exceed the EIRP limit (1640Watts/MHz). The maximum port 1 PSD higher limit level is 40.9 dBm/MHz for the base station calculated EIRP level not to exceed the EIRP limit (3280 Watts/MHz).

DEVIATIONS FROM TEST STANDARD

None

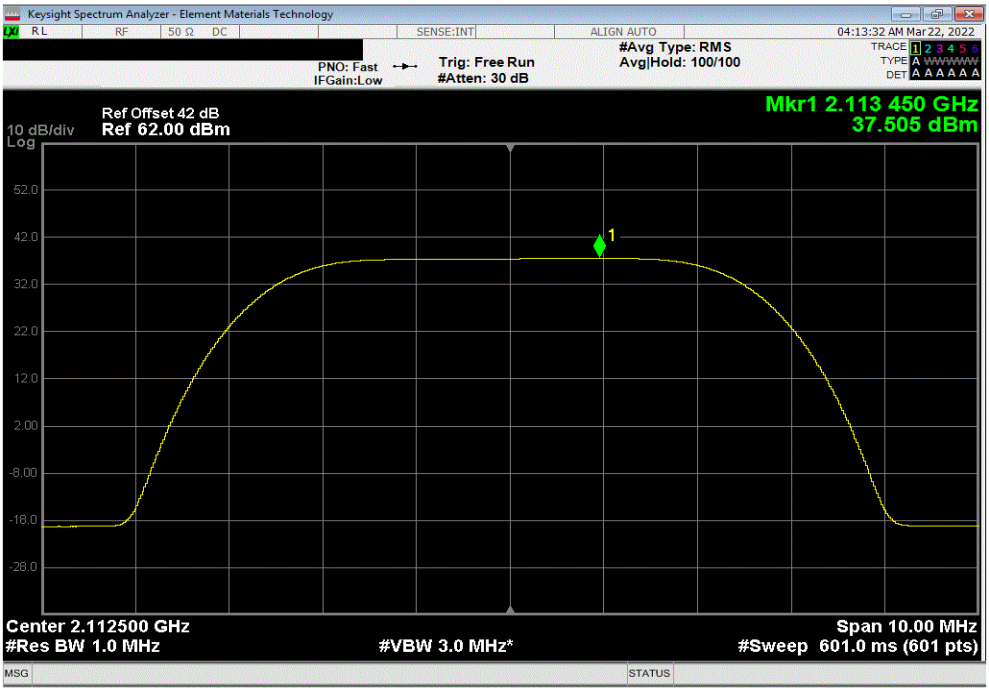
Configuration #	2	*Signature*

	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
Port 1, Band n66, 2110 MHz - 2200 MHz, 5G NR					
QPSK Modulation					
Single Carrier					
5 MHz Bandwidth, Low Limit					
Low Channel, 2112.5 MHz	37.505	0	37.5	37.9	Pass
5 MHz Bandwidth, High Limit					
Low Channel, 2112.5 MHz	40.491	0	40.5	40.9	Pass
16-QAM Modulation					
Single Carrier					
10 MHz Bandwidth, Low Limit					
Mid Channel, 2155.0 MHz	37.601	0	37.6	37.9	Pass
15 MHz Bandwidth, Low Limit					
Mid Channel, 2155.0 MHz	37.405	0	37.4	37.9	Pass
20 MHz Bandwidth, Low Limit					
Mid Channel, 2155.0 MHz	37.331	0	37.3	37.9	Pass

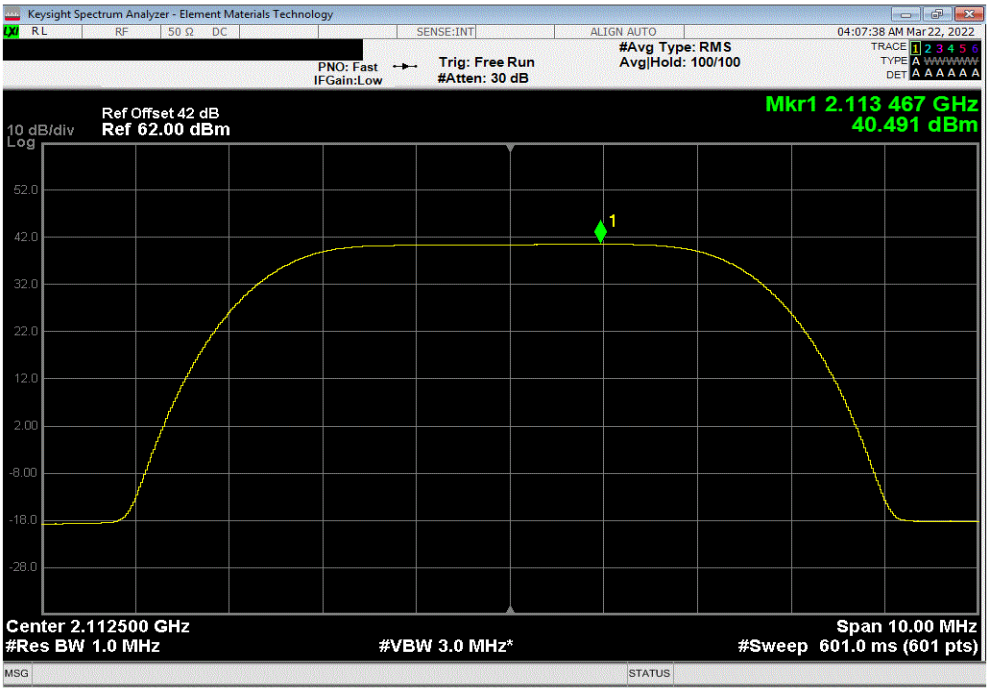
POWER SPECTRAL DENSITY - LOWERED POWER

TbtTx 2022.03.14.0 XMit 2022.02.07.0

Port 1, Band n66, 2110 MHz - 2200 MHz, 5G NR, QPSK Modulation, Single Carrier, 5 MHz Bandwidth, Low Limit , Low Channel, 2112.5 MHz						
	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	37.505	0		37.5	37.9	Pass

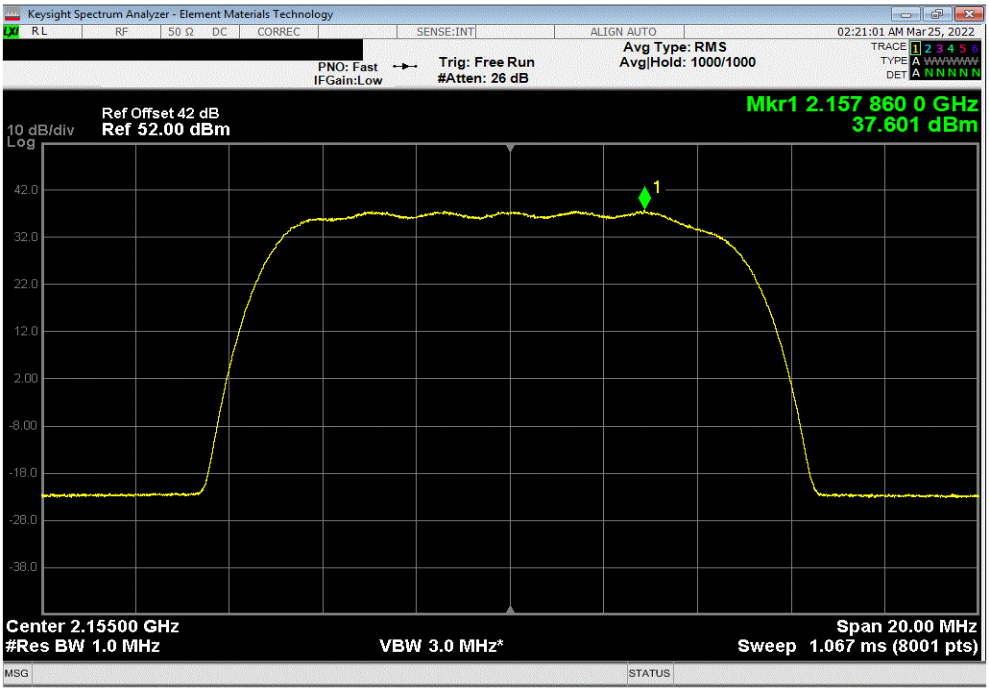


Port 1, Band n66, 2110 MHz - 2200 MHz, 5G NR, QPSK Modulation, Single Carrier, 5 MHz Bandwidth, High Limit, Low Channel, 2112.5 MHz						
	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	40.491	0		40.5	40.9	Pass



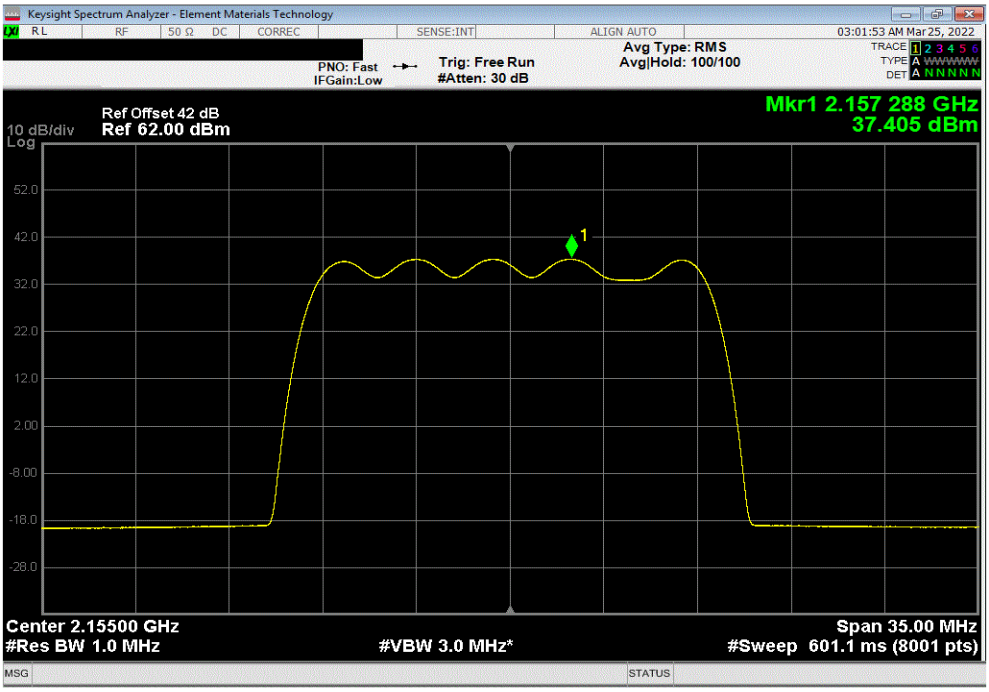
Port 1, Band n66, 2110 MHz - 2200 MHz, 5G NR, 16-QAM Modulation, Single Carrier, 10 MHz Bandwidth, Low Limit, Mid Channel, 2155.0 MHz

	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	37.601	0		37.6	37.9	Pass



Port 1, Band n66, 2110 MHz - 2200 MHz, 5G NR, 16-QAM Modulation, Single Carrier, 15 MHz Bandwidth, Low Limit, Mid Channel, 2155.0 MHz

	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	37.405	0		37.4	37.9	Pass



POWER SPECTRAL DENSITY - LOWERED POWER

TbtTx 2022.03.14.0 XMit 2022.02.07.0

Port 1, Band n66, 2110 MHz - 2200 MHz, 5G NR, 16-QAM Modulation, Single Carrier, 20 MHz Bandwidth, Low Limit, Mid Channel, 2155.0 MHz						
	Initial Value dBm/MHz == PSD	Duty Cycle Factor (dB)		Single Port dBm/MHz == PSD	Limit (dBm/MHz)	Results
	37.331	0		37.3	37.9	Pass