POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n25

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	SD3379	AMM	2022-09-09	2023-09-09
Block - DC	Fairview Microwave	SD3239	ANC	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.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original 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 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:

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n25

TbtTx 2022.06.03.0 XMit 2022.02.07.0

EUT:	AHFIB			Work Order:	NOKI0049
Serial Number:	K9181401111			Date:	30-Sep-22
Customer:	Nokia of America Corporation			Temperature:	21.8 °C
Attendees:	John Rattanavong			Humidity:	46.2% RH
Project:	None			Barometric Pres.:	1012 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	
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 25 carriers are enabled at maximum power (40 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

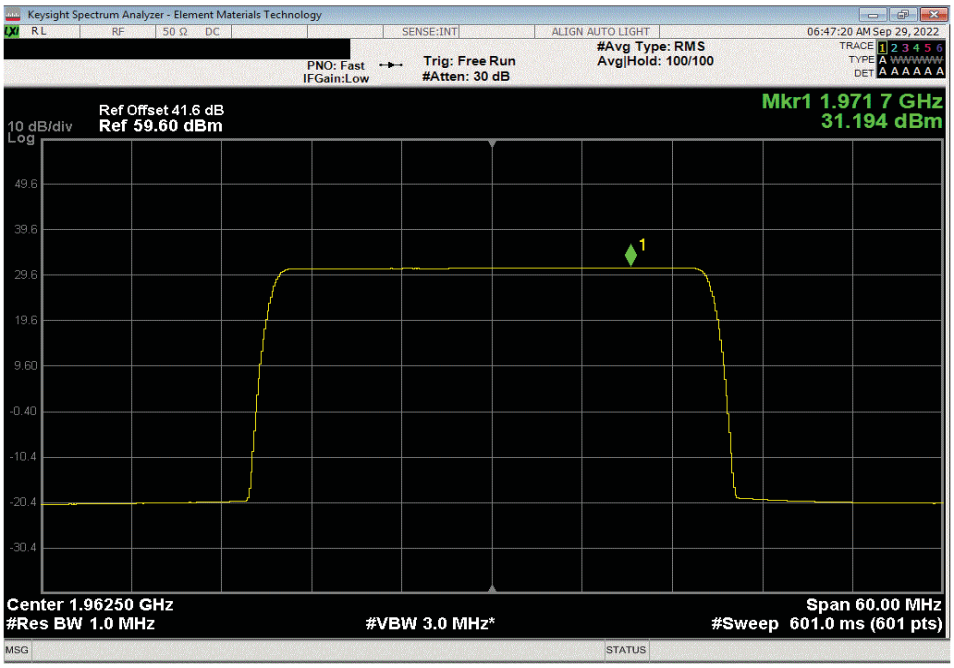
None

Configuration #	2	Signature	Marty Martin

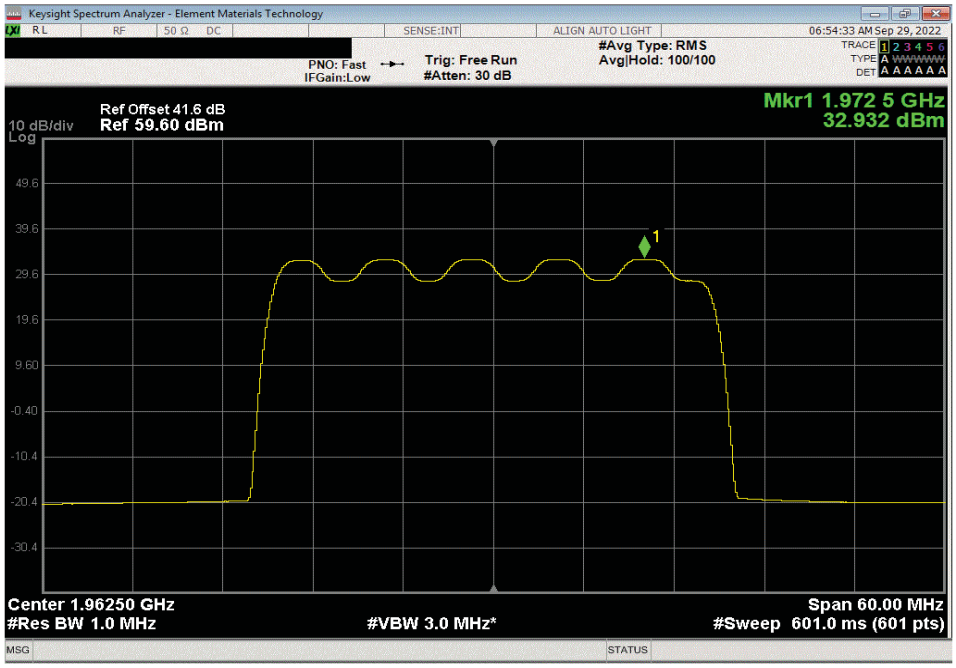
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz = PSD	Two Port (2x2 MIMO) dBm/MHz = PSD	Four Port (4x4 MIMO) dBm/MHz = PSD
Port 1, NR, Band n25, 1930 - 1995 MHz						
30 MHz						
QPSK						
	Mid Channel, 1962.5 MHz	31.194	0	31.19	34.19	37.19
16QAM						
	Mid Channel, 1962.5 MHz	32.932	0	32.93	35.93	38.93
64QAM						
	Mid Channel, 1962.5 MHz	31.253	0	31.25	34.25	37.25
256QAM						
	Low Channel, 1945 MHz	31.65	0	31.65	34.65	37.65
	Mid Channel, 1962.5 MHz	31.508	0	31.51	34.51	37.51
	High Channel, 1980 MHz	31.583	0	31.58	34.58	37.58

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n25

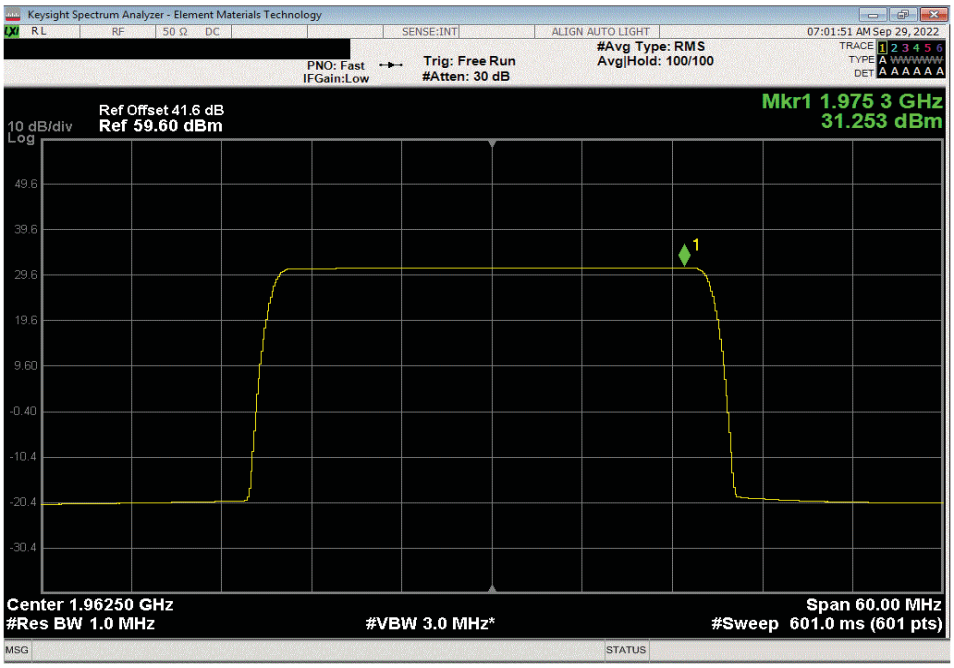
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, QPSK, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz = PSD	Two Port (2x2 MIMO) dBm/MHz = PSD	Four Port (4x4 MIMO) dBm/MHz = PSD
		31.194	0	31.19	34.19	37.19



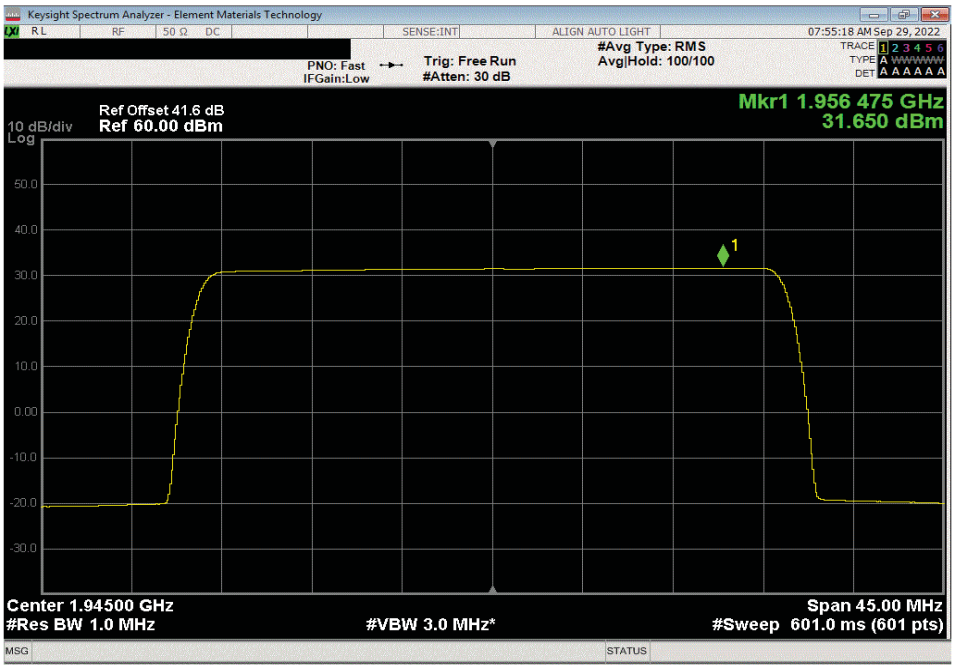
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 16QAM, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz = PSD	Two Port (2x2 MIMO) dBm/MHz = PSD	Four Port (4x4 MIMO) dBm/MHz = PSD
		32.932	0	32.93	35.93	38.93



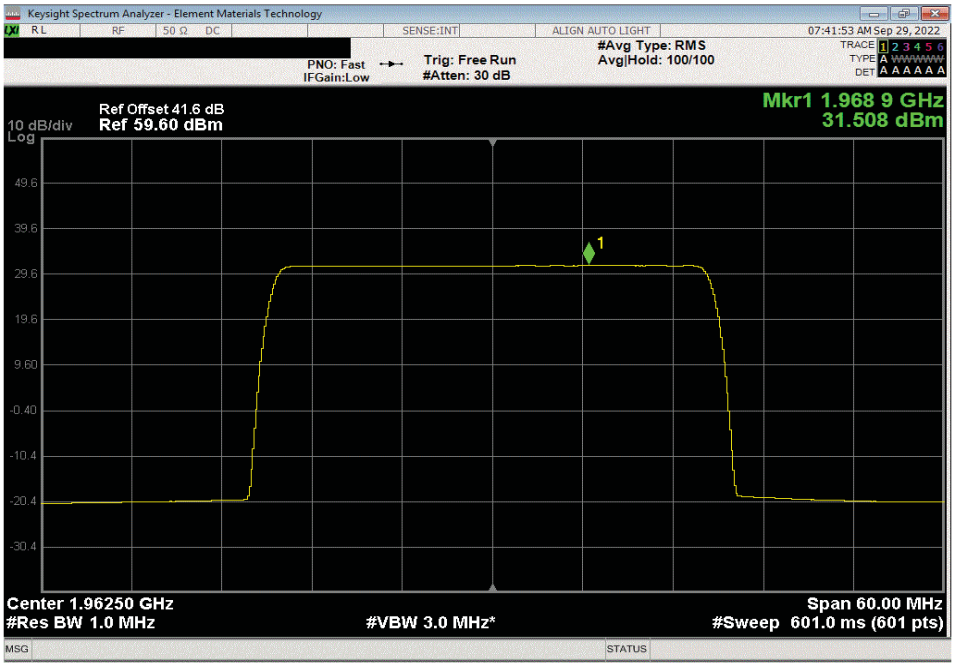
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 64QAM, Mid Channel, 1962.5 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz = PSD	Two Port (2x2 MIMO) dBm/MHz = PSD	Four Port (4x4 MIMO) dBm/MHz = PSD
		31.253	0	31.25	34.25	37.25



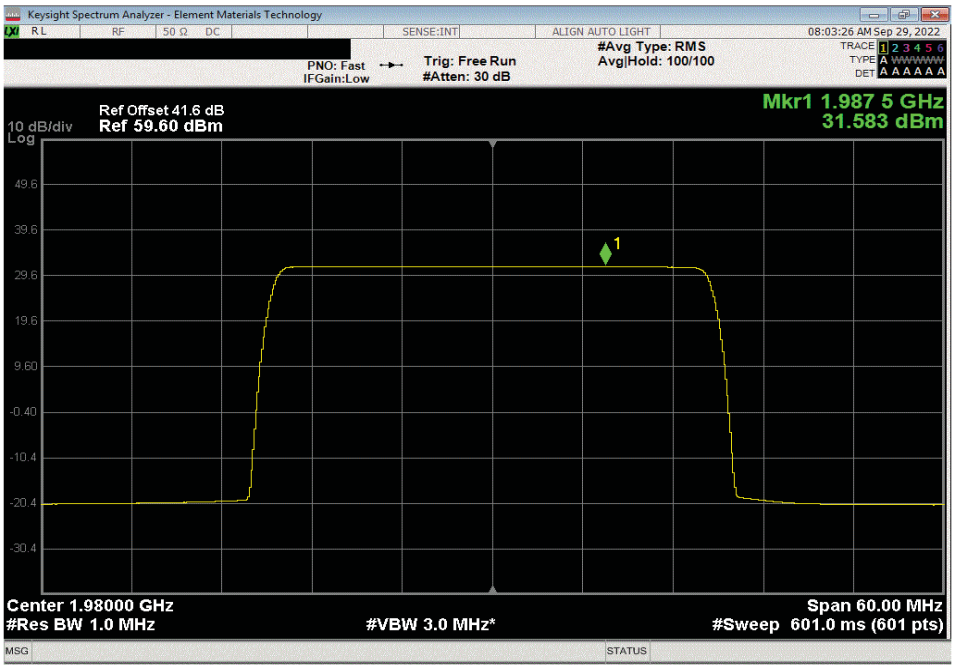
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, Low Channel, 1945 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz = PSD	Two Port (2x2 MIMO) dBm/MHz = PSD	Four Port (4x4 MIMO) dBm/MHz = PSD
		31.65	0	31.65	34.65	37.65



Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, 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
		31.508	0	31.51	34.51	37.51



Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, High Channel, 1980 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
		31.583	0	31.58	34.58	37.58



POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n25

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. This antenna assembly has a pair of +45° cross-polarized radiators used for Band n25. The four antenna RF inputs (used for Band n25) on the antenna assembly are as follows: Y1+ L5 (+45°), Y1- L6 (-45°), Y2+ R7 (+45°) and Y2- R8 (-45°). Four AHFII transmitter outputs are connected to the antenna assembly RF inputs.

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4 for uncorrelated 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	30 MHz Ch BW
Worst Case PSD/Antenna Port	32.9dBm/MHz
Number of Ant Ports per Polarization	2
Total PSD per Polarization 10*Log (2) = +3	35.9
Cable Loss (site dependent)	0 dB
Dir Gain = Maximum Antenna Gain (GAnt) See Note 1	17.9 dBi
EIRP per Polarization	53.8 dBm/MHz
Number of Polarizations	2
EIRP Total = Y1 ±45°and Y2 ±45° See Note 2	53.8 dBm/MHz
Passing EIRP Limit	62.15 & 65.16 dBm/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 AHFIB 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 30MHz channel bandwidths.
-2 Less than the FCC and ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits for 30MHz channel bandwidths.

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n66

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	SD3379	AMM	2022-09-09	2023-09-09
Block - DC	Fairview Microwave	SD3239	ANC	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.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original 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 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 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:

RSS-139 Issue 4 September 29, 2022. Section 5.5
SRSP-513 Issue 4 September 29, 2022. Section 6.1. E.i.r.p. limits and antenna height limits for non-AAS systems
Sub-section 6.1.3. paragraph 21 and 22. 21. For fixed and base stations operating in the band 2110-2180 MHz with a channel bandwidth greater than 1 MHz, the maximum permissible e.i.r.p. is 62 dBm/MHz (i.e. no more than 62 dBm e.i.r.p. in any 1 MHz band segment), with an antenna HAAT of up to 300 m. 22. Fixed and base stations operating in the band 2110-2180 MHz and located in geographic areas at a distance greater than 26 km from large or medium population centres may increase their e.i.r.p. to a maximum of 65 dBm/MHz (i.e. no more than 65 dBm e.i.r.p. in any 1 MHz band segment), with an antenna HAAT of up to 300 m.

SRSP 519 Issue 4 September 29, 2022. Section 6.1 Radiated power and antenna height limits for base stations using non-AAS systems.Sub-section 6.1.3. paragraph 22 and 23. 22. For base stations operating in the bands 2000-2020 MHz and 2180-2200 MHz with an antenna HAAT of up to 300 m, the e.i.r.p.shall not exceed 62 dBm/MHz when transmitting with an emission bandwidth greater than 1 MHz.
23. Base stations located in geographic areas at a distance greater than 26 km from large or medium population centres may increase their e.i.r.p. to a maximum of 65 dBm when transmitting with an emission bandwidth of 1 MHz or less, and 65 dBm/MHz when transmitting 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.

POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n66

element

TbtTx 2022.06.03.0 XMit 2022.02.07.0

EUT:	AHFIB			Work Order:	NOKI0049
Serial Number:	K9181401111			Date:	30-Sep-22
Customer:	Nokia of America Corporation			Temperature:	22.6 °C
Attendees:	John Rattanavong			Humidity:	50.3% RH
Project:	None			Barometric Pres.:	1008 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	
FCC 27:2022	ANSI C63.26:2015
RSS-139 Issue 4: 2022	RSS-139 Issue 4: 2022

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 (40 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)].

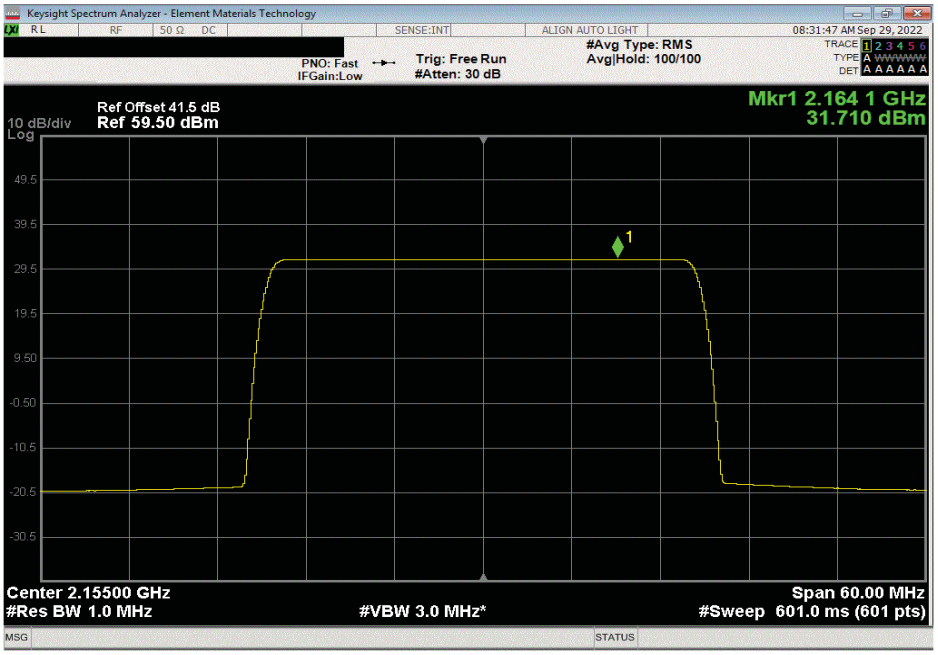
DEVIATIONS FROM TEST STANDARD

None

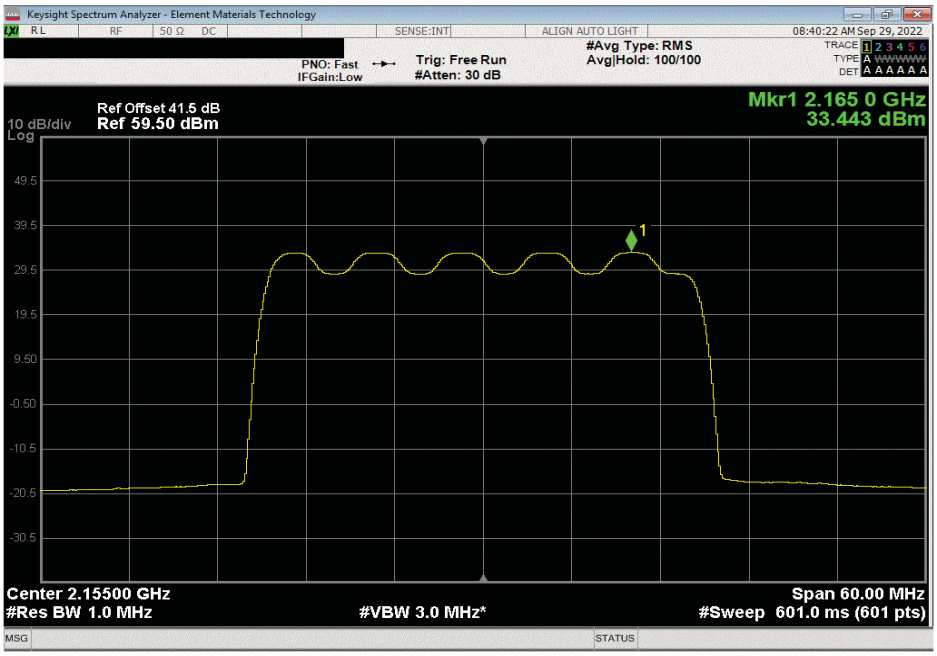
Configuration #	2	Signature	Marty Martin

		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz = PSD	Two Port (2x2 MIMO) dBm/MHz = PSD	Four Port (4x4 MIMO) dBm/MHz = PSD
Port 1, NR, Band n66, 2110 - 2200 MHz						
30 MHz						
QPSK						
	Mid Channel, 2155 MHz	31.71	0	31.71	34.71	37.71
16QAM						
	Mid Channel, 2155 MHz	33.443	0	33.44	36.44	39.44
64QAM						
	Mid Channel, 2155 MHz	31.698	0	31.7	34.7	37.7
256QAM						
	Low Channel, 2125 MHz	31.8	0	31.8	34.8	37.8
	Mid Channel, 2155 MHz	31.761	0	31.76	34.76	37.76
	High Channel, 2185 MHz	31.732	0	31.73	34.73	37.73

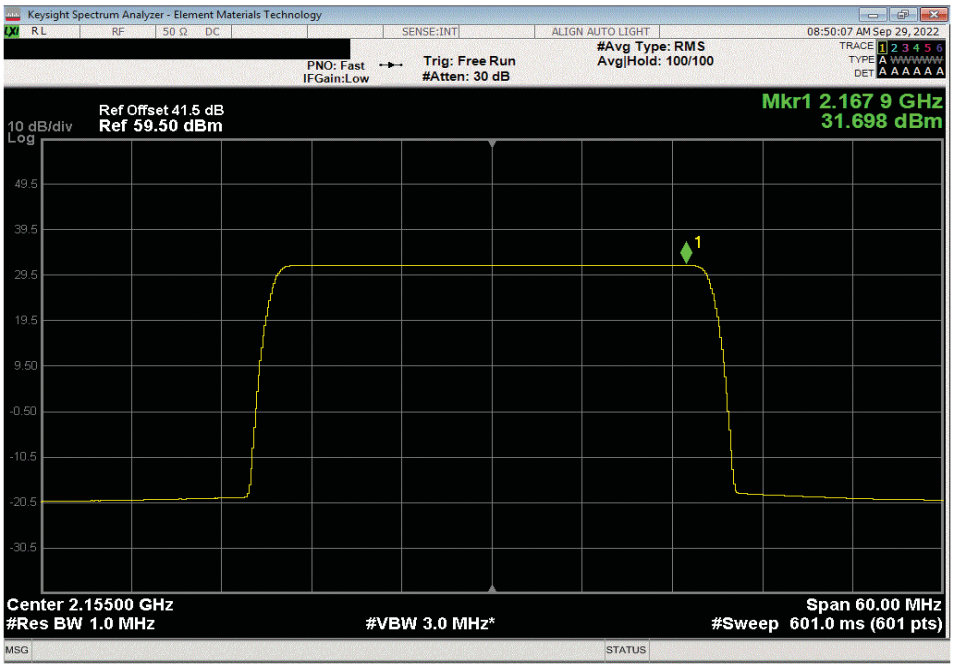
Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, QPSK, Mid Channel, 2155 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz = PSD	Two Port (2x2 MIMO) dBm/MHz = PSD	Four Port (4x4 MIMO) dBm/MHz = PSD
		31.71	0	31.71	34.71	37.71



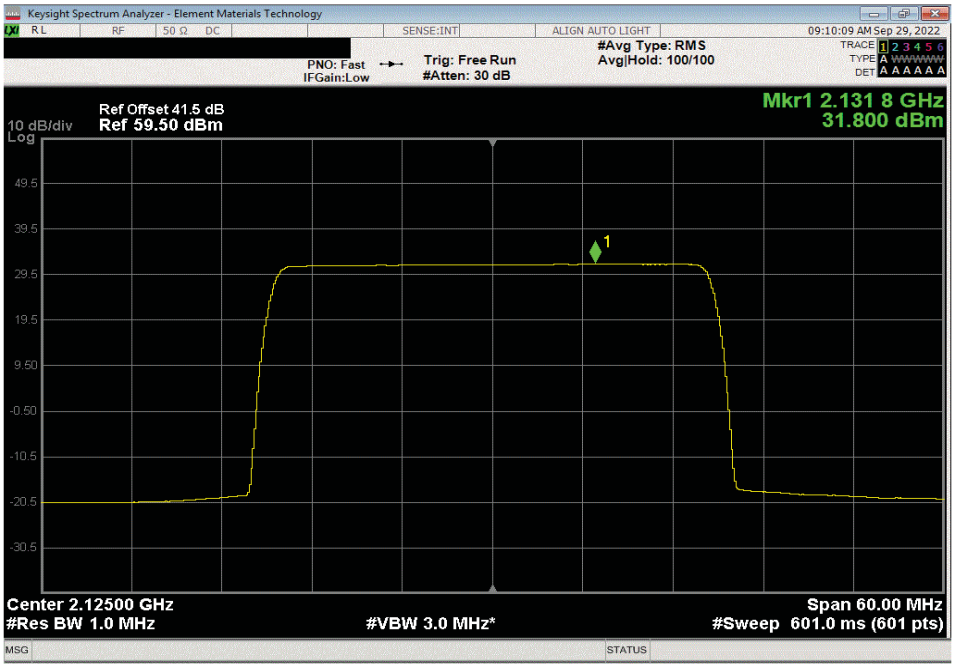
Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 16QAM, Mid Channel, 2155 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz = PSD	Two Port (2x2 MIMO) dBm/MHz = PSD	Four Port (4x4 MIMO) dBm/MHz = PSD
		33.443	0	33.44	36.44	39.44



Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 64QAM, 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
		31.698	0	31.7	34.7	37.7

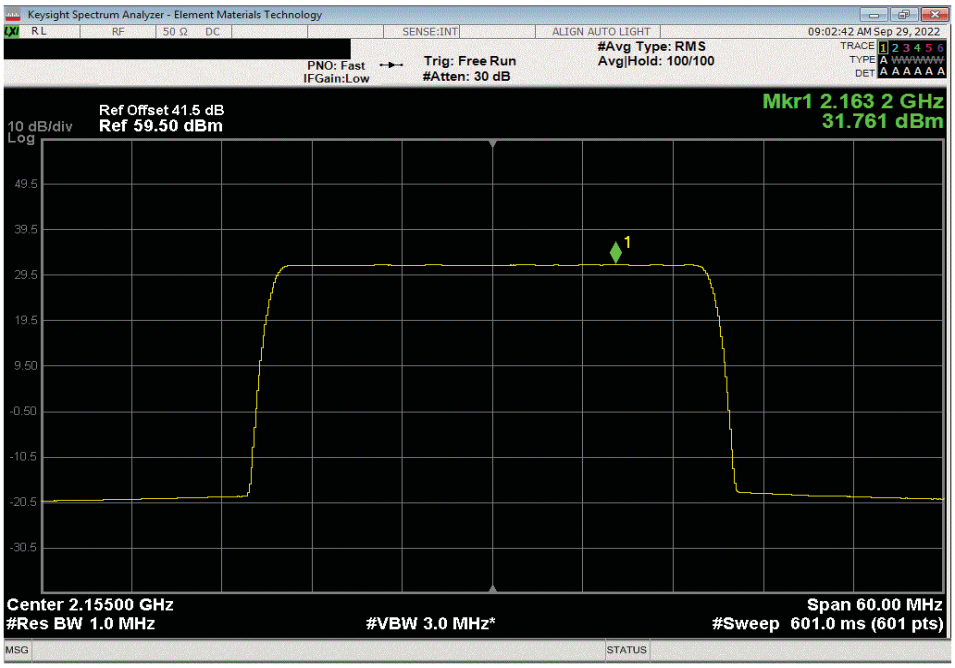


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, Low Channel, 2125 MHz						
		Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz = PSD	Two Port (2x2 MIMO) dBm/MHz = PSD	Four Port (4x4 MIMO) dBm/MHz = PSD
		31.8	0	31.8	34.8	37.8

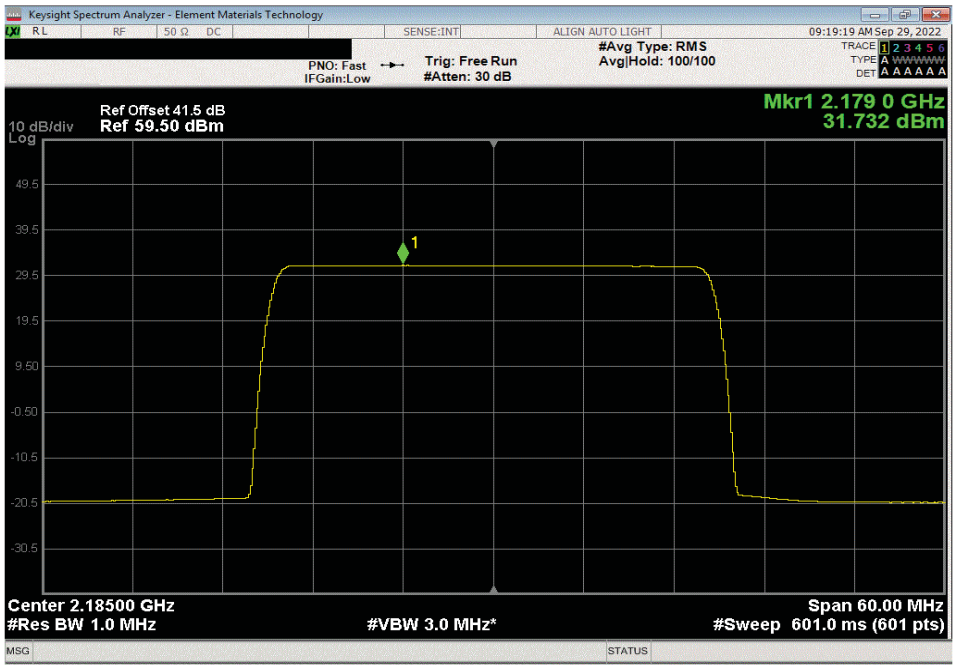


POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n66

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, 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
		31.761	0	31.76	34.76	37.76



Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, High Channel, 2185 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
		31.732	0	31.73	34.73	37.73



POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n66

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 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 n66 gain (18.2dBi) for this antenna was used for the EIRP calculation. This antenna assembly has a pair of +45° cross-polarized radiators used for Band n66. The four antenna RF inputs (used for Band n66) on the antenna assembly are as follows: Y1+ L5 (+45°), Y1- L6 (-45°), Y2+ R7 (+45°) and Y2- R8 (-45°). Four AHFII 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 or 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. EIRP was calculated as described in SRSP 513 clause 6.1.2 and SRSP 519 clause 6.1.2 "EIRP for non-AAS uncorrelated transmission. Calculations of worst-case EIRP for four port MIMO are as follows:

Parameter	30 MHz Ch BW
Worst Case PSD/Antenna Port	33.4dBm/MHz
Number of Ant Ports per Polarization	2
Total PSD per Polarization 10*log(2) = +3	36.4
Cable Loss (site dependent)	0 dB
Dir Gain = Maximum Antenna Gain (GAnt) See Note 1	18.2 dBi
EIRP per Polarization	54.6 dBm/MHz
Number of Polarizations	2
EIRP Total = Y1 ±45°and Y2 ±45° See Note 2	54.6 dBm/MHz
Passing EIRP Limit	FCC (62.15 & 65.16 dBm/MHz, ISED 62.0 & 65.0 dBm/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 AHFIB four port MIMO Band n66 EIRP levels using antenna assembly model "80011867" are:

-1 Less than the FCC (65.16 dBm/MHz) EIRP Regulatory Limits for 30 MHz channel bandwidths.
-2 Less than the FCC (62.15 dBm/MHz) EIRP Regulatory Limits for 30 MHz channel bandwidths.
-3 Less than the ISED (65 dBm/MHz) EIRP Regulatory Limits for 30 MHz channel bandwidths.
-4 Less than the ISED (62 dBm/MHz) EIRP Regulatory Limits for 30 MHz channel bandwidths.

PEAK TO AVERAGE POWER (CCDF) - BAND n25

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	SD3379	AMM	2022-09-09	2023-09-09
Block - DC	Fairview Microwave	SD3239	ANC	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9030B	R325	2022-06-22	2023-06-28

TEST DESCRIPTION

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

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

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.
The PAPR was measured using the CCDF function of the spectrum analyzer.

Per FCC part 24.232(d) and RSS 133 6.4, the PAPR limit shall not exceed 13 dB for more than the ANSI described 0.1% of the time.

Per FCC part 27.50(d)(5) and RSS-139 section 5.5. the maximum peak-to-average power ratio (PAPR) is 13dB.

RF conducted emissions was performed only on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in original 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.

PEAK TO AVERAGE POWER (CCDF) - BAND n25

XMit 2022.02.07.0

EUT:	AHFIB			Work Order:	NOKI0049
Serial Number:	K9181401111			Date:	30-Sep-22
Customer:	Nokia of America Corporation			Temperature:	21.4 °C
Attendees:	John Rattanavong			Humidity:	48.1% RH
Project:	None			Barometric Pres.:	1012 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 24E:2022	ANSI C63.26:2015
RSS-133:2018	RSS-133:2018

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 (40 watts/carrier).

DEVIATIONS FROM TEST STANDARD

None

Configuration #	2	Signature Marty Martin

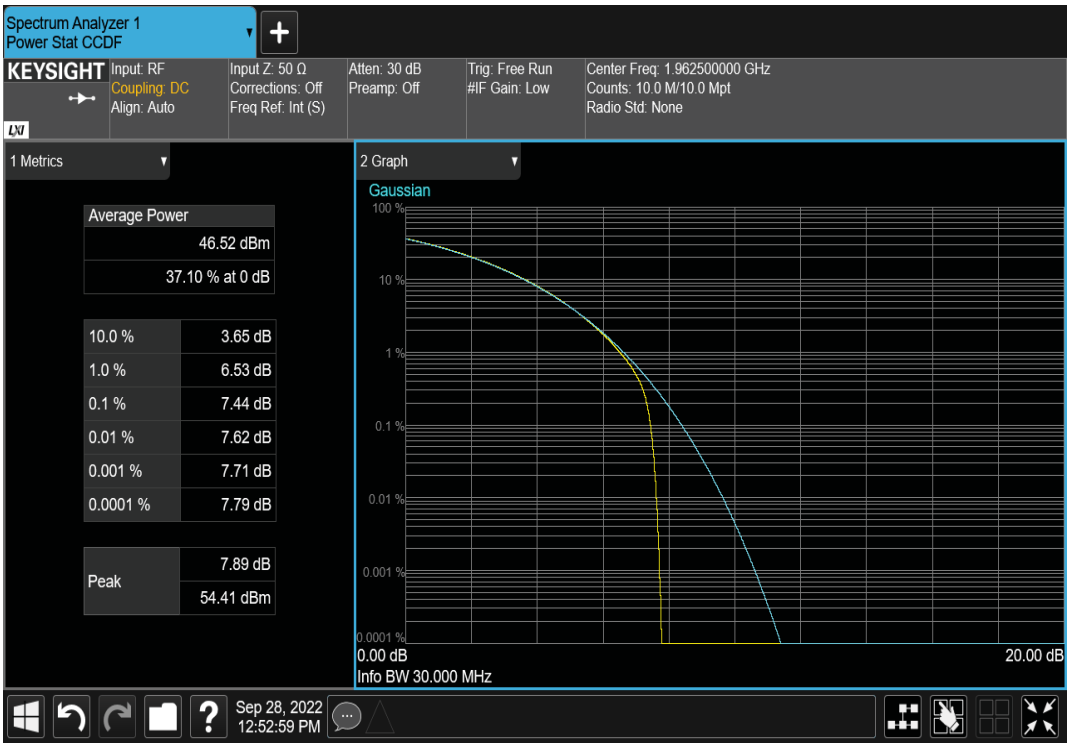
		Value	Limit	Result
Port 1, NR, Band n25 1930 - 1995 MHz, 30 MHz Bandwidth				
QPSK				
	Mid Channel 1962.5 MHz	7.44	13	Pass
16QAM				
	Mid Channel 1962.5 MHz	7.55	13	Pass
64QAM				
	Mid Channel 1962.5 MHz	7.45	13	Pass
256QAM				
	Low Channel 1945 MHz	7.67	13	Pass
	Mid Channel 1962.5 MHz	7.46	13	Pass
	High Channel 1980 MHz	7.51	13	Pass

PEAK TO AVERAGE POWER (CCDF) - BAND n25

element

XMit 2022.02.07.0

Port 1, NR, Band n25 1930 - 1995 MHz, 30 MHz Bandwidth, QPSK, Mid Channel 1962.5 MHz						
				Value	Limit	Result
				7.44	13	Pass

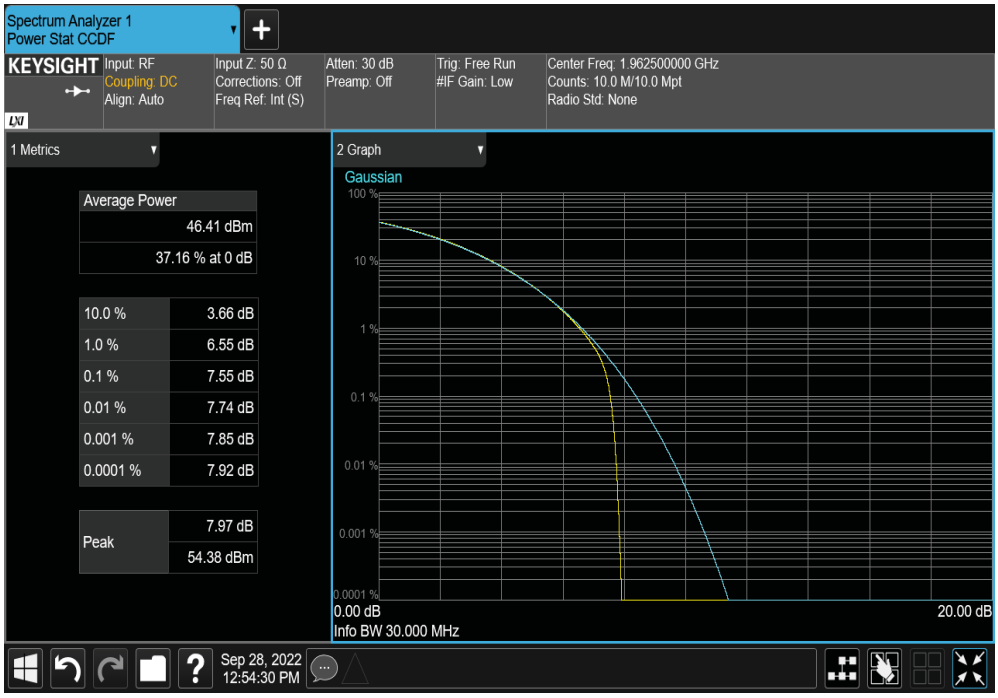


PEAK TO AVERAGE POWER (CCDF) - BAND n25

element

XMit 2022.02.07.0

Port 1, NR, Band n25 1930 - 1995 MHz, 30 MHz Bandwidth, 16QAM, Mid Channel 1962.5 MHz						
				Value	Limit	Result
				7.55	13	Pass

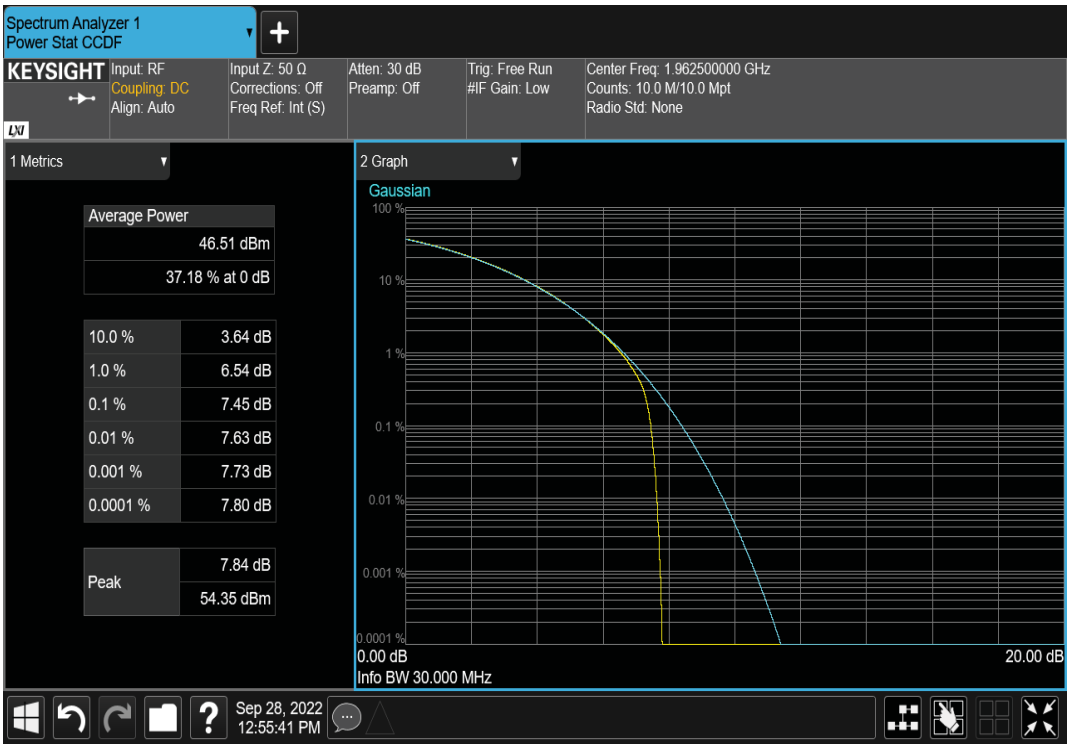


PEAK TO AVERAGE POWER (CCDF) - BAND n25

element

XMit 2022.02.07.0

Port 1, NR, Band n25 1930 - 1995 MHz, 30 MHz Bandwidth, 64QAM, Mid Channel 1962.5 MHz						
				Value	Limit	Result
				7.45	13	Pass



PEAK TO AVERAGE POWER (CCDF) - BAND n25

element

XMit 2022.02.07.0

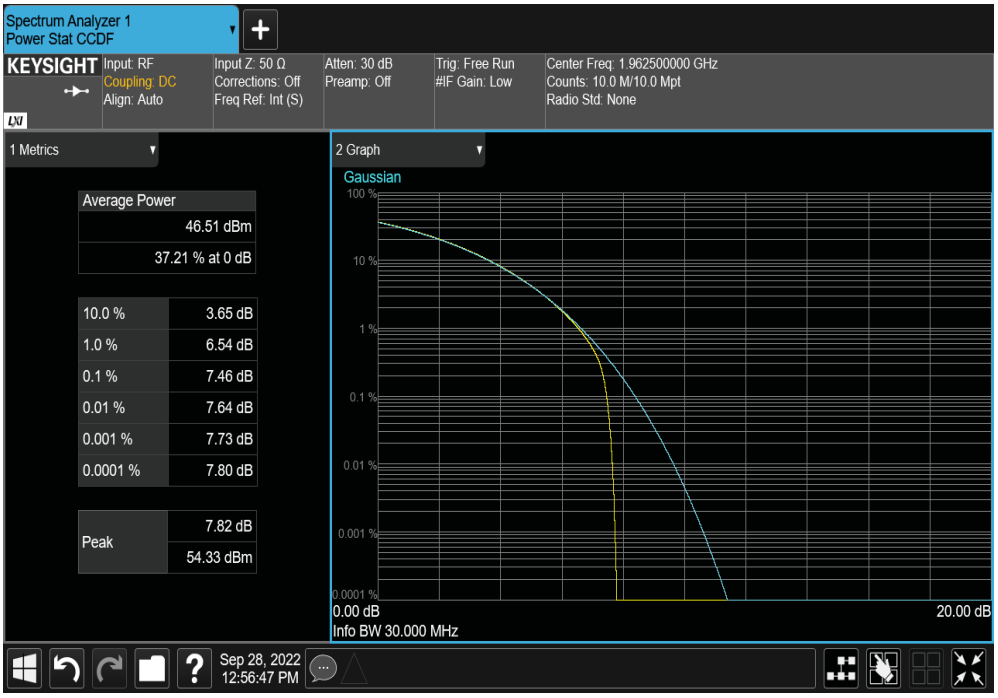
Port 1, NR, Band n25 1930 - 1995 MHz, 30 MHz Bandwidth, 256QAM, Low Channel 1945 MHz						
				Value	Limit	Result
				7.67	13	Pass

PEAK TO AVERAGE POWER (CCDF) - BAND n25

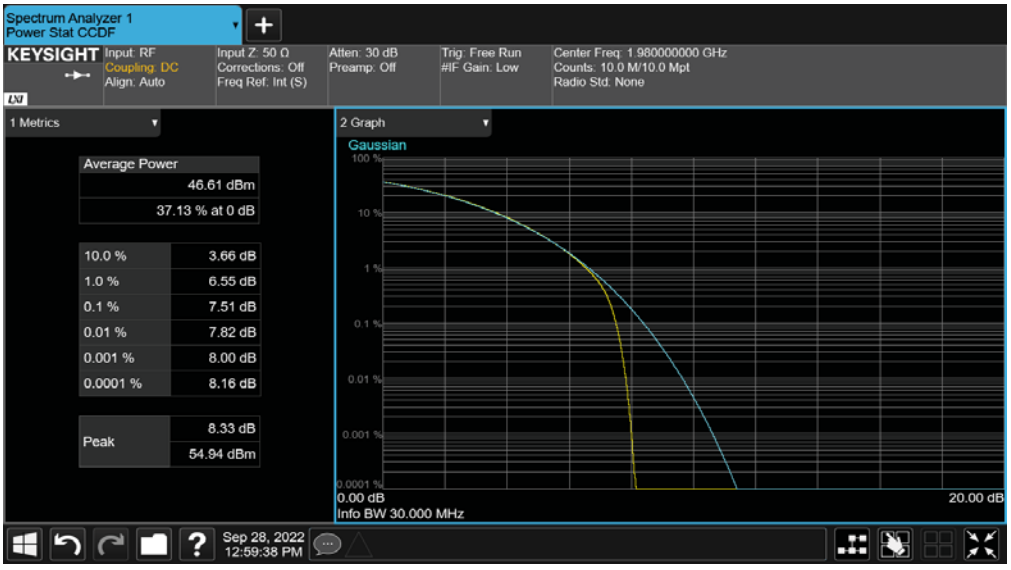
element

XMit 2022.02.07.0

Port 1, NR, Band n25 1930 - 1995 MHz, 30 MHz Bandwidth, 256QAM, Mid Channel 1962.5 MHz						
				Value	Limit	Result
				7.46	13	Pass



Port 1, NR, Band n25 1930 - 1995 MHz, 30 MHz Bandwidth, 256QAM, High Channel 1980 MHz						
				Value	Limit	Result
				7.51	13	Pass



PEAK TO AVERAGE POWER (CCDF) - BAND n66

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	SD3379	AMM	2022-09-09	2023-09-09
Block - DC	Fairview Microwave	SD3239	ANC	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9030B	R325	2022-06-22	2023-06-28

TEST DESCRIPTION

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

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

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.
The PAPR was measured using the CCDF function of the spectrum analyzer.

Per FCC part 24.232(d) and RSS 133 6.4, the PAPR limit shall not exceed 13 dB for more than the ANSI described 0.1% of the time.
Per FCC part 27.50(d)(5) and RSS-139 section 5.5. the maximum peak-to-average power ratio (PAPR) is 13dB.

RF conducted emissions was performed only on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in original 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.

PEAK TO AVERAGE POWER (CCDF) - BAND n66

XMit 2022.02.07.0

EUT:	AHFIB			Work Order:	NOKI0049
Serial Number:	K9181401111			Date:	30-Sep-22
Customer:	Nokia of America Corporation			Temperature:	21.8 °C
Attendees:	John Rattanavong			Humidity:	46.2% RH
Project:	None			Barometric Pres.:	1012 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-139 Issue 4: 2022	RSS-139 Issue 4: 2022

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 (40 watts/carrier).

DEVIATIONS FROM TEST STANDARD

None

Configuration #	2	Signature

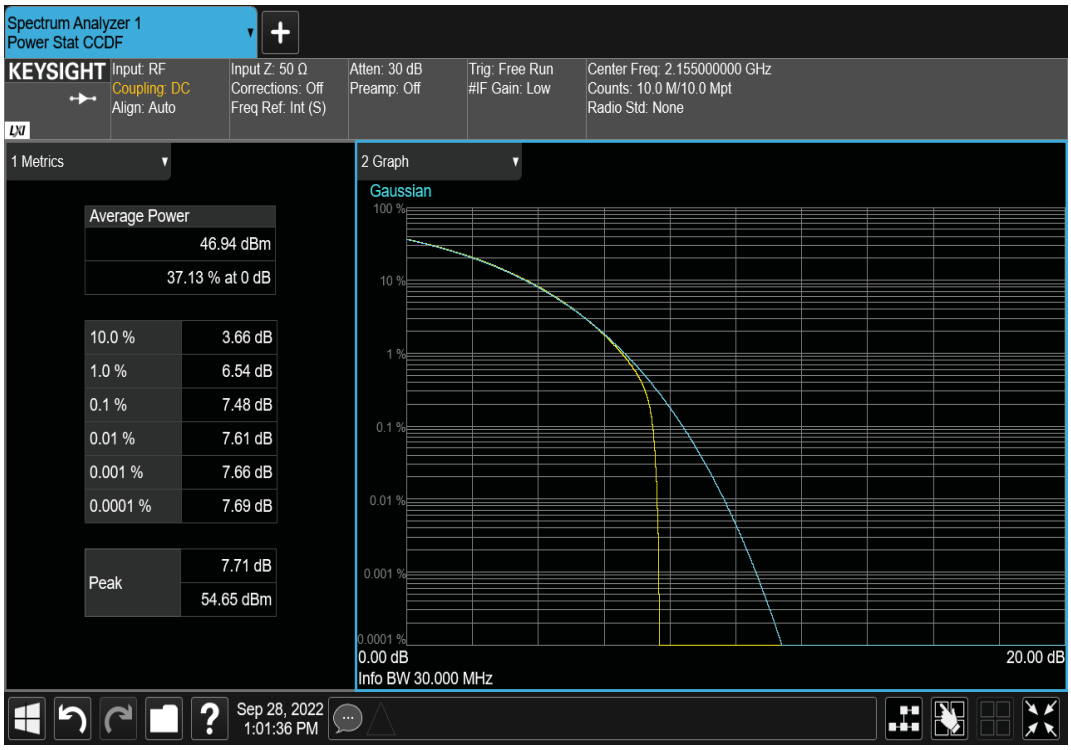
	PAPR Value (dB)	PAPR Limit (dB)	Result
Port 1, NR, Band 66, 2110 - 2200 MHz 30 MHz Bandwidth			
QPSK			
Mid Channel 2155 MHz	7.48	13	Pass
16QAM			
Mid Channel 2155 MHz	7.52	13	Pass
64QAM			
Mid Channel 2155 MHz	7.44	13	Pass
256QAM			
Low Channel 2125 MHz	7.51	13	Pass
Mid Channel 2155 MHz	7.43	13	Pass
High Channel 2185 MHz	7.51	13	Pass

PEAK TO AVERAGE POWER (CCDF) - BAND n66

element

XMit 2022.02.07.0

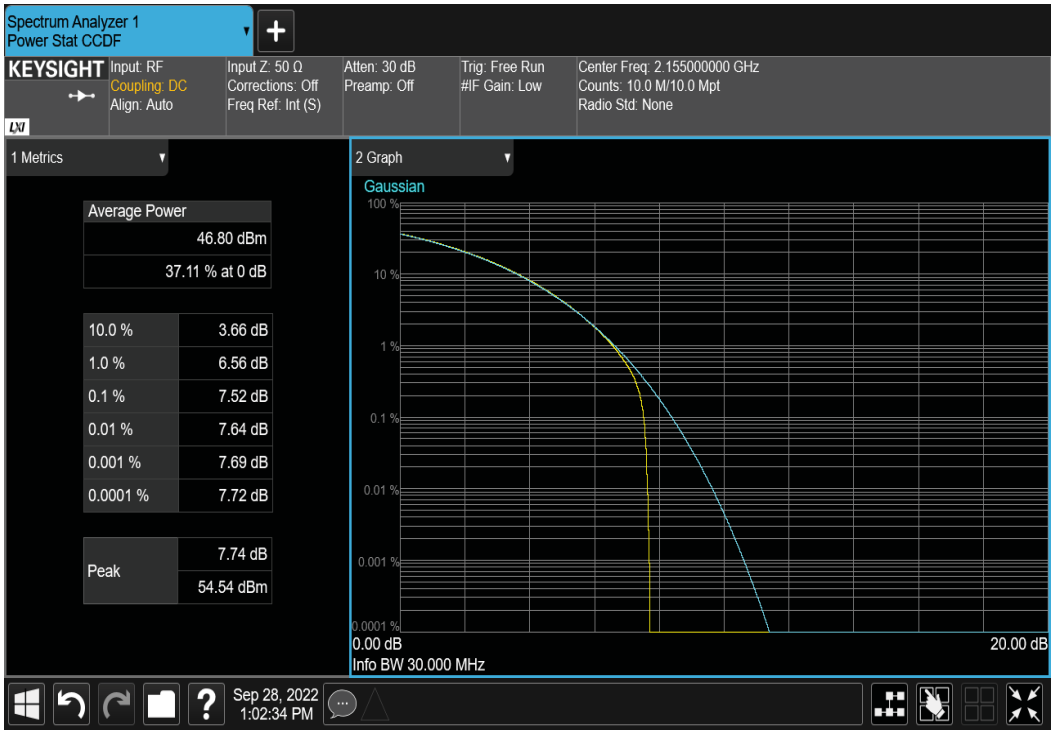
Port 1, NR, Band 66, 2110 - 2200 MHz 30 MHz Bandwidth , QPSK, Mid Channel 2155 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Result
				7.48	13	Pass



PEAK TO AVERAGE POWER (CCDF) - BAND n66

XMit 2022.02.07.0

Port 1, NR, Band 66, 2110 - 2200 MHz 30 MHz Bandwidth , 16QAM, Mid Channel 2155 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Result
				7.52	13	Pass

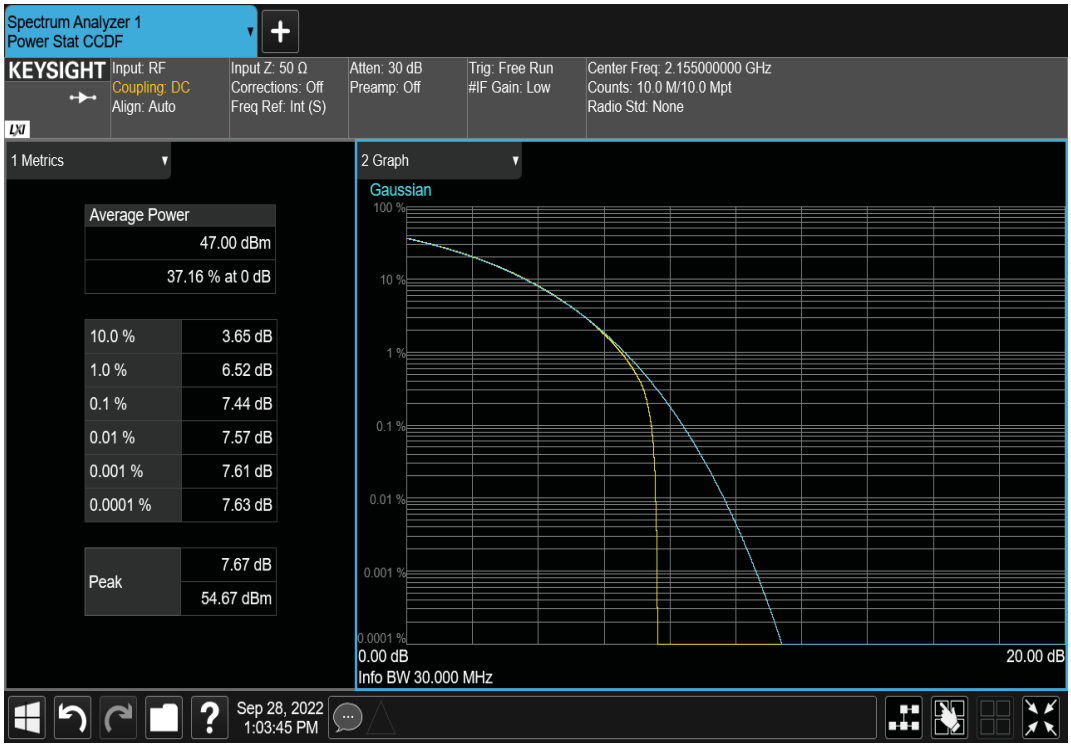


PEAK TO AVERAGE POWER (CCDF) - BAND n66

element

XMit 2022.02.07.0

Port 1, NR, Band 66, 2110 - 2200 MHz 30 MHz Bandwidth , 64QAM, Mid Channel 2155 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Result
				7.44	13	Pass

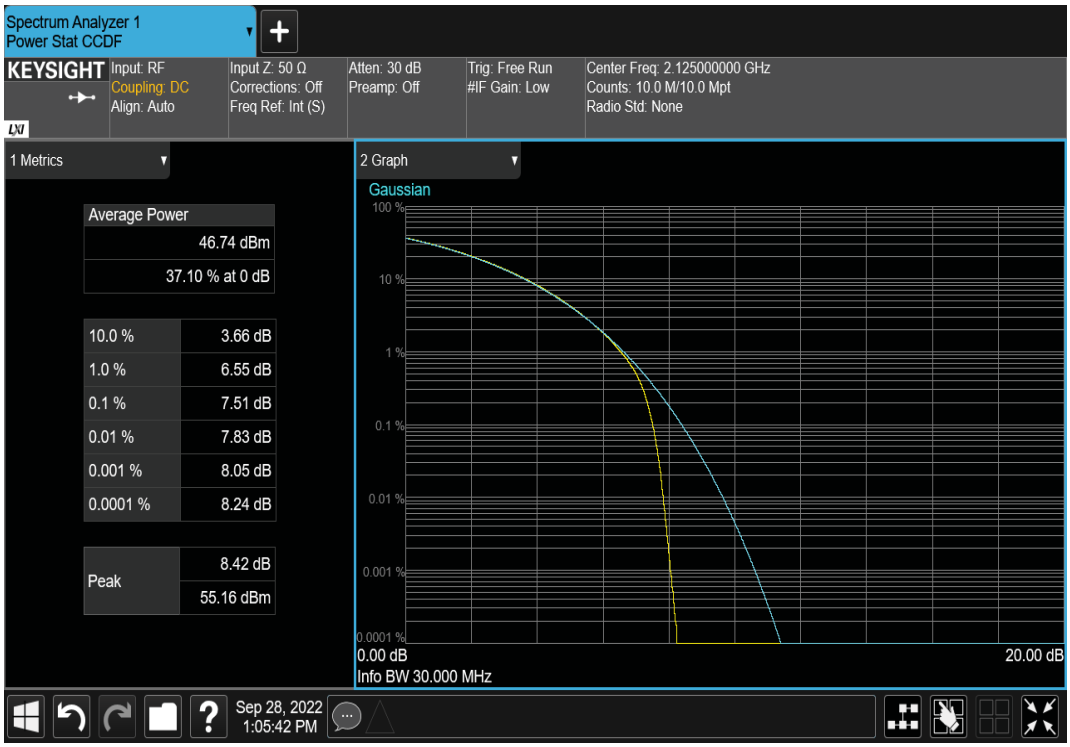


PEAK TO AVERAGE POWER (CCDF) - BAND n66

element

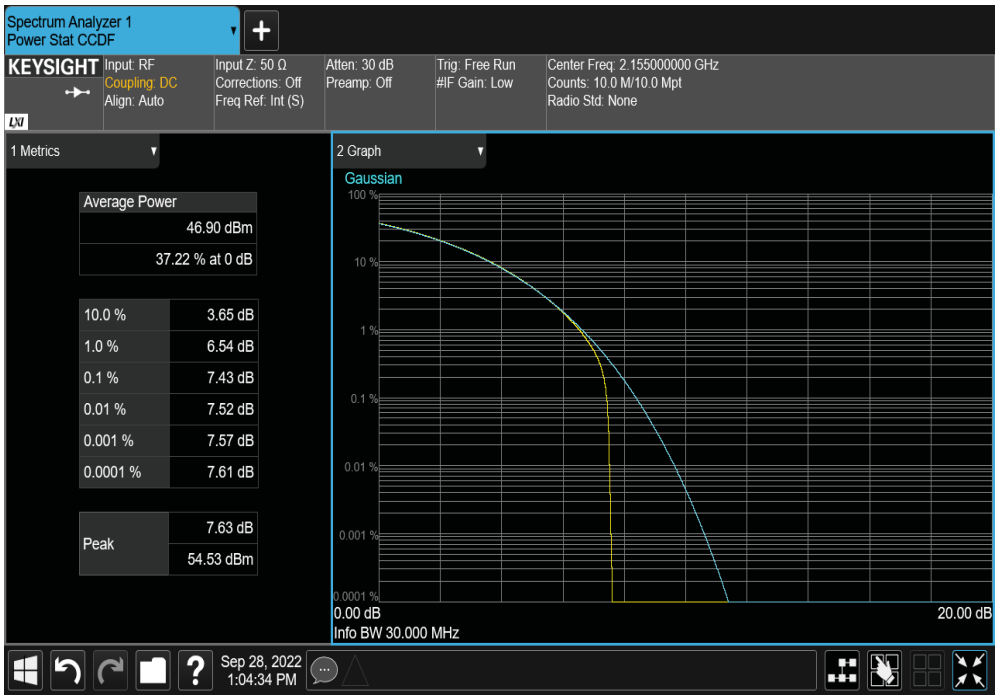
XMit 2022.02.07.0

Port 1, NR, Band 66, 2110 - 2200 MHz 30 MHz Bandwidth , 256QAM, Low Channel 2125 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Result
				7.51	13	Pass

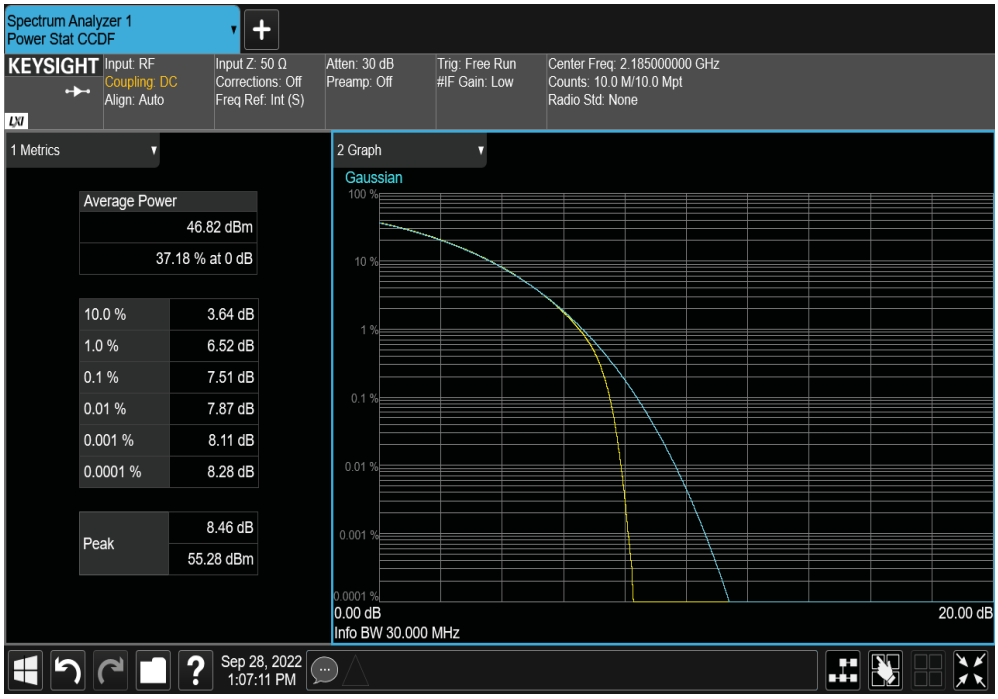


PEAK TO AVERAGE POWER (CCDF) - BAND n66

Port 1, NR, Band 66, 2110 - 2200 MHz 30 MHz Bandwidth , 256QAM, Mid Channel 2155 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Result
				7.43	13	Pass



Port 1, NR, Band 66, 2110 - 2200 MHz 30 MHz Bandwidth , 256QAM, High Channel 2185 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Result
				7.51	13	Pass



BAND EDGE COMPLIANCE- BAND n25

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	SD3379	AMM	2022-09-09	2023-09-09
Block - DC	Fairview Microwave	SD3239	ANC	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in the available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

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

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

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in original 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.

Per section FCC 24.238(a), 27.53(h)(1), RSS 133 6.5 (i), RSS-139 5.6 table 6
The power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. The RBW to be used for these measurements are per FCC 24.238(b), 27.53(h)(3), RSS 133 6.5 (i), RSS-139 5.6 table 6.

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified).The requirements for FCC/IC measurements are detailed in KDB971168 D01 v03r01 and ANSI 63.26.

BAND EDGE COMPLIANCE- BAND n25

element

TbtTx 2022.06.03.0 XMit 2022.02.07.0

EUT:	AHFIB			Work Order:	NOKI0049
Serial Number:	K9181401111			Date:	30-Sep-22
Customer:	Nokia of America Corporation			Temperature:	22.3 °C
Attendees:	John Rattanavong			Humidity:	47.1% RH
Project:	None			Barometric Pres.:	1010 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 24E:2022	ANSI C63.26:2015
RSS-133:2018	RSS-133:2018

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 (40 watts/carrier).

DEVIATIONS FROM TEST STANDARD

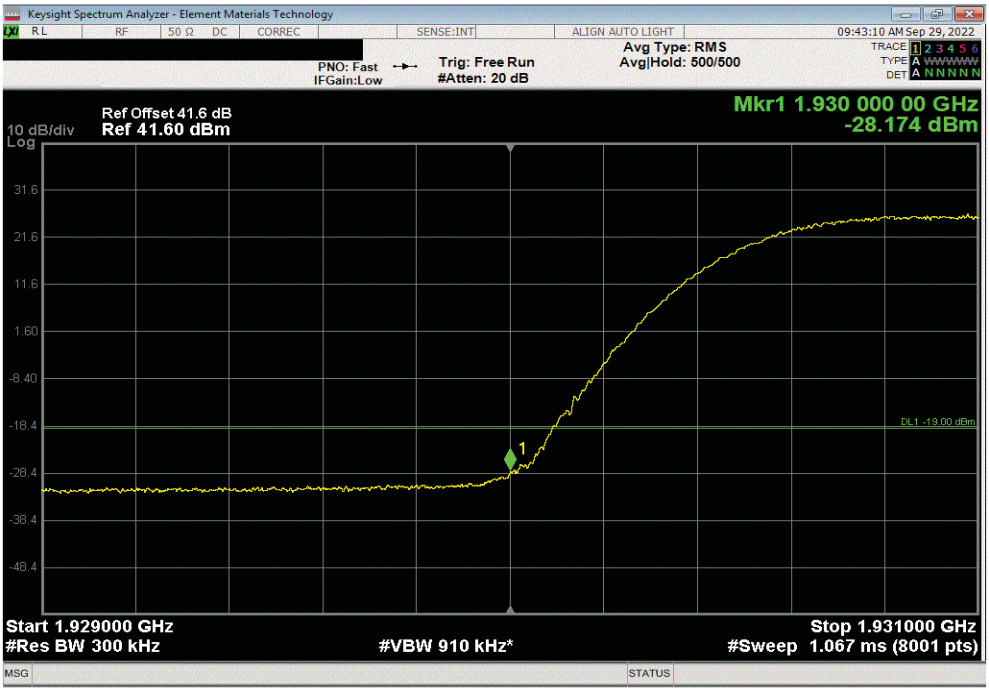
None

Configuration #	2	Signature

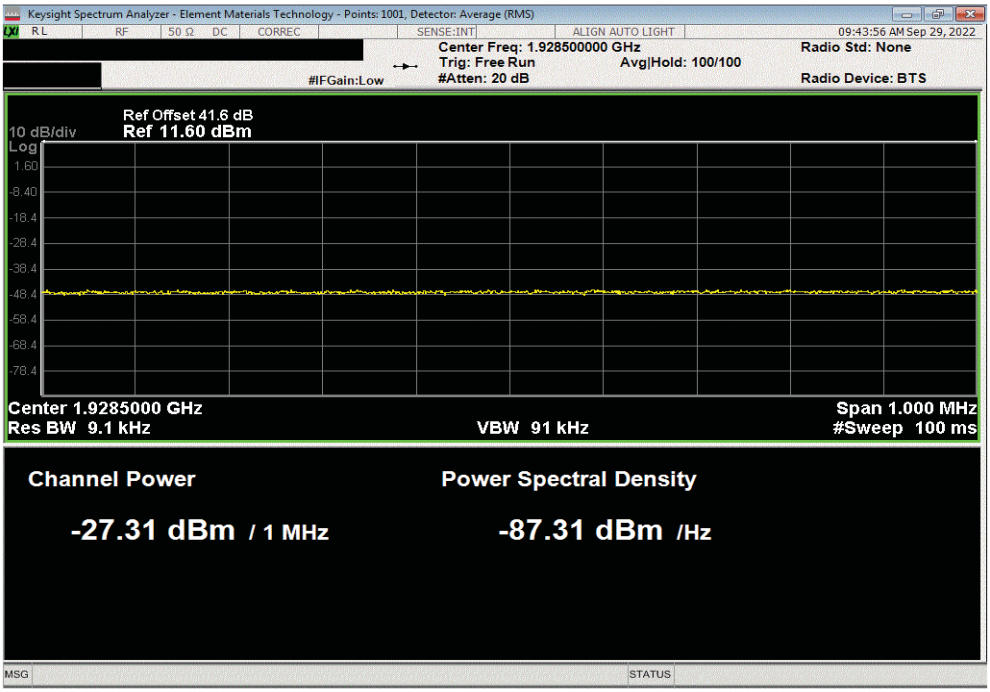
		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
Port 1, NR, Band n25, 1930 - 1995 MHz						
30 MHz						
QPSK						
	Low Channel, 1945 MHz	1	1930	-28.17	-19	Pass
	Low Channel, 1945 MHz	2	1928.5	-27.31	-19	Pass
	Low Channel, 1945 MHz	3	1927.95	-27.37	-19	Pass
	High Channel, 1980 MHz	1	1995	-26.92	-19	Pass
	High Channel, 1980 MHz	2	1996.5	-24.54	-19	Pass
	High Channel, 1980 MHz	3	1997	-24.485	-19	Pass
16QAM						
	Low Channel, 1945 MHz	1	1930	-28.97	-19	Pass
	Low Channel, 1945 MHz	2	1928.5	-27.19	-19	Pass
	Low Channel, 1945 MHz	3	1927.39	-26.85	-19	Pass
	High Channel, 1980 MHz	1	1995	-27.8	-19	Pass
	High Channel, 1980 MHz	2	1996.5	-25.21	-19	Pass
	High Channel, 1980 MHz	3	1997	-24.9	-19	Pass
64QAM						
	Low Channel, 1945 MHz	1	1930	-29.19	-19	Pass
	Low Channel, 1945 MHz	2	1928.5	-27.16	-19	Pass
	Low Channel, 1945 MHz	3	1927.96	-26.63	-19	Pass
	High Channel, 1980 MHz	1	1995	-26.85	-19	Pass
	High Channel, 1980 MHz	2	1996.5	-24.75	-19	Pass
	High Channel, 1980 MHz	3	1997	-24.42	-19	Pass
256QAM						
	Low Channel, 1945 MHz	1	1930	-28.25	-19	Pass
	Low Channel, 1945 MHz	2	1928.5	-27.13	-19	Pass
	Low Channel, 1945 MHz	3	1927.82	-26.82	-19	Pass
	High Channel, 1980 MHz	1	1995	-26.67	-19	Pass
	High Channel, 1980 MHz	2	1996.5	-24.64	-19	Pass
	High Channel, 1980 MHz	3	1997	-24.585	-19	Pass

BAND EDGE COMPLIANCE- BAND n25

Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, QPSK, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		1930	-28.17	-19	Pass

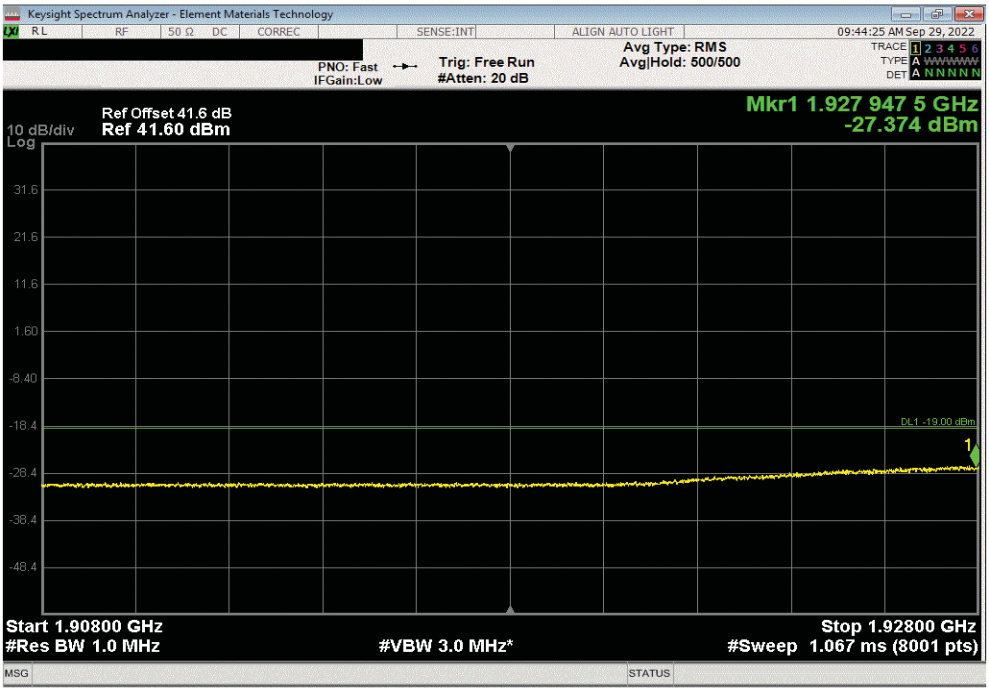


Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, QPSK, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		1928.5	-27.31	-19	Pass

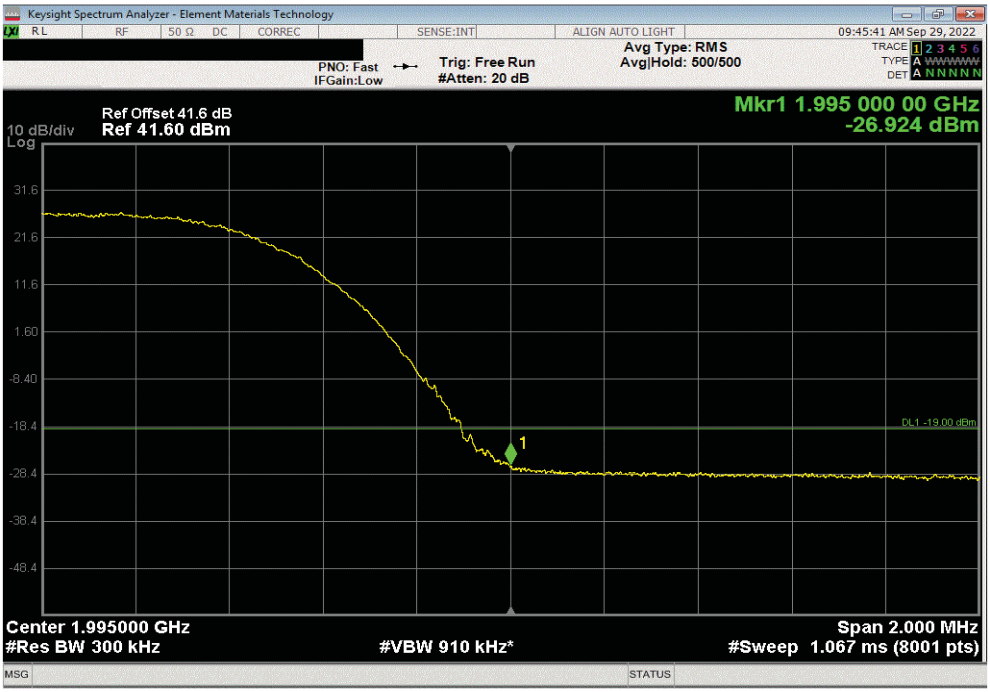


BAND EDGE COMPLIANCE- BAND n25

Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, QPSK, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		1927.95	-27.37	-19	Pass

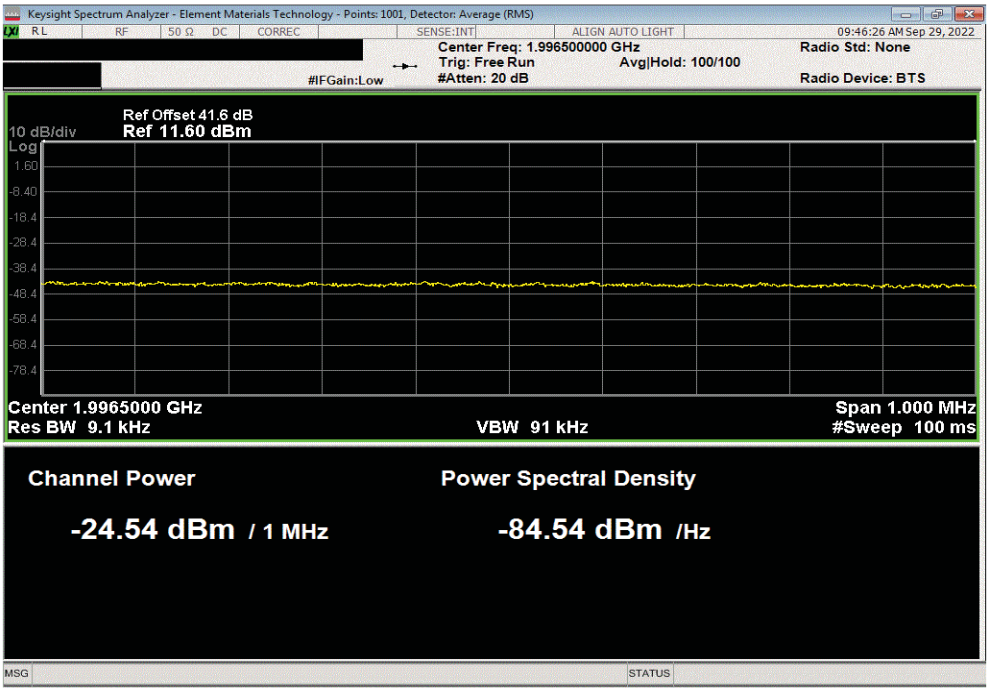


Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, QPSK, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		1995	-26.92	-19	Pass

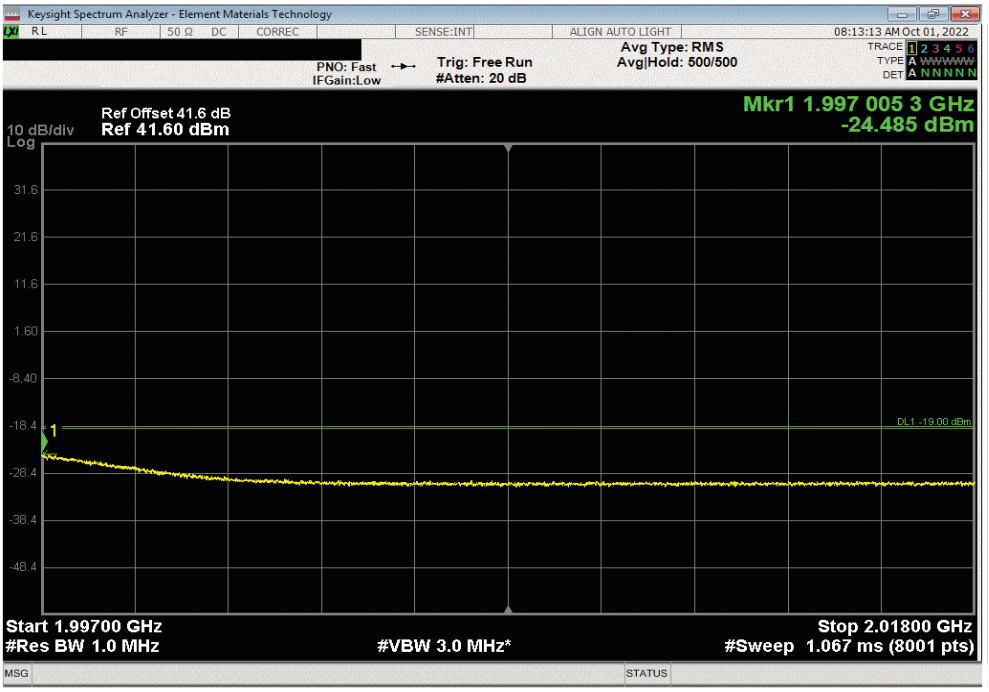


BAND EDGE COMPLIANCE- BAND n25

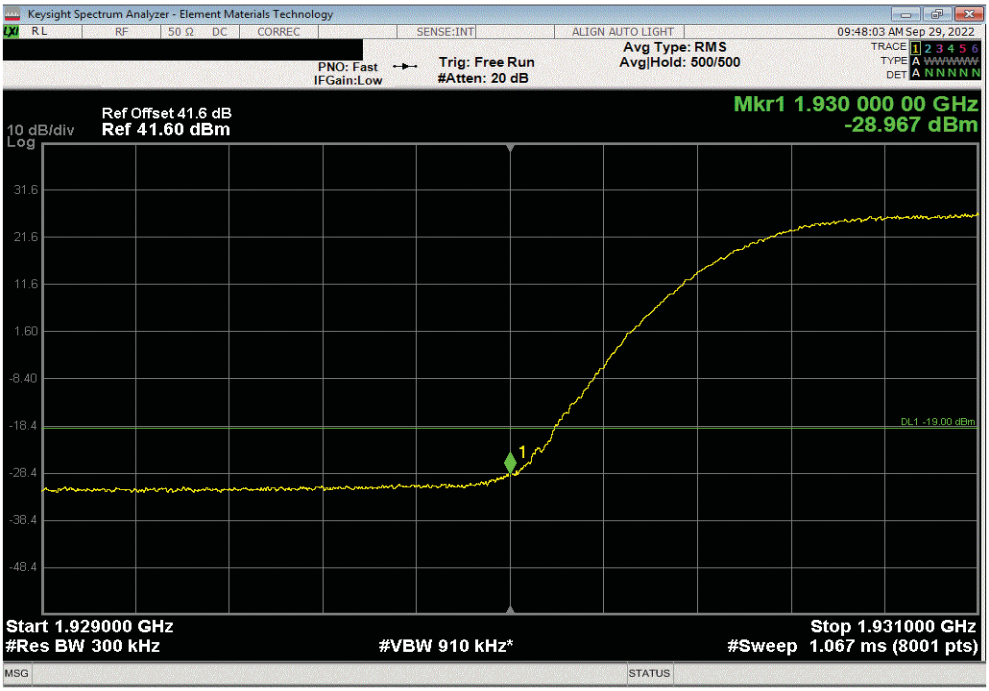
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, QPSK, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		1996.5	-24.54	-19	Pass



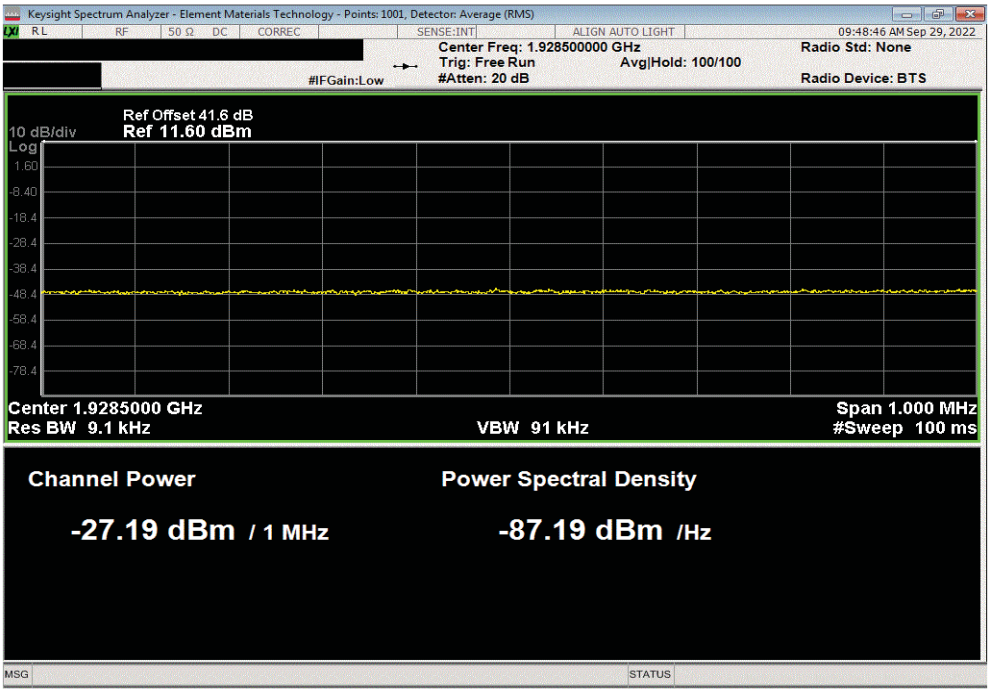
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, QPSK, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		1997	-24.485	-19	Pass



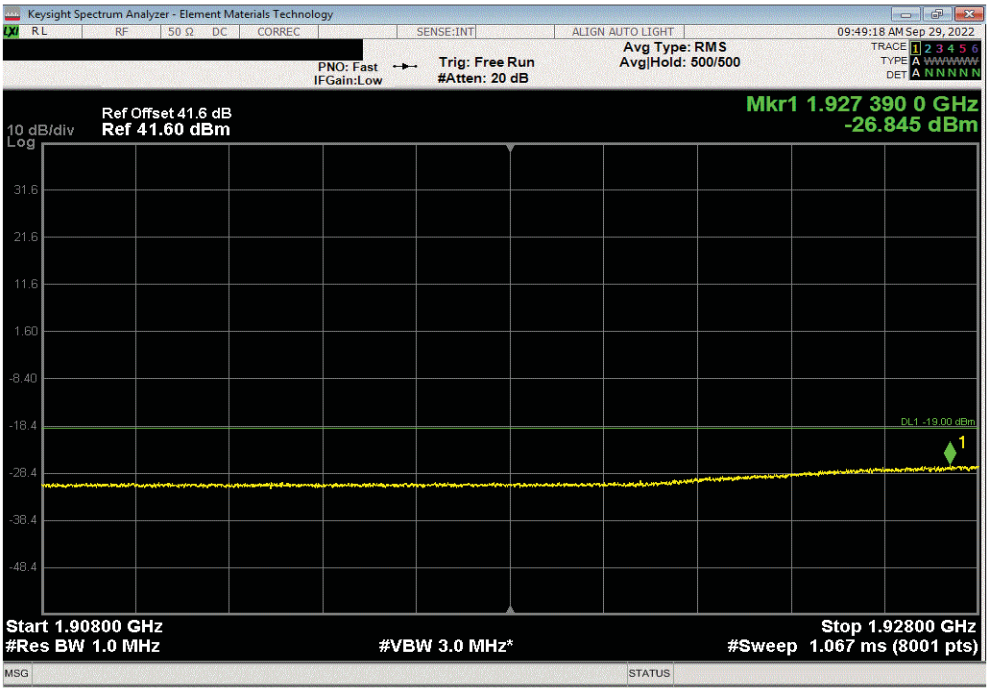
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 16QAM, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		1930	-28.97	-19	Pass



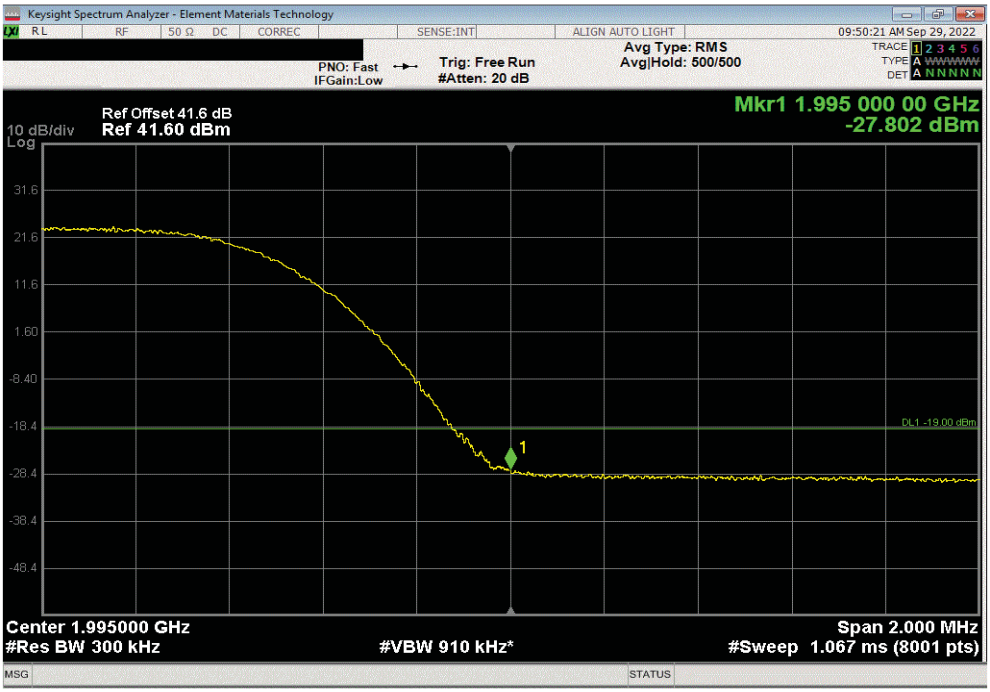
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 16QAM, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		1928.5	-27.19	-19	Pass



Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 16QAM, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		1927.39	-26.85	-19	Pass

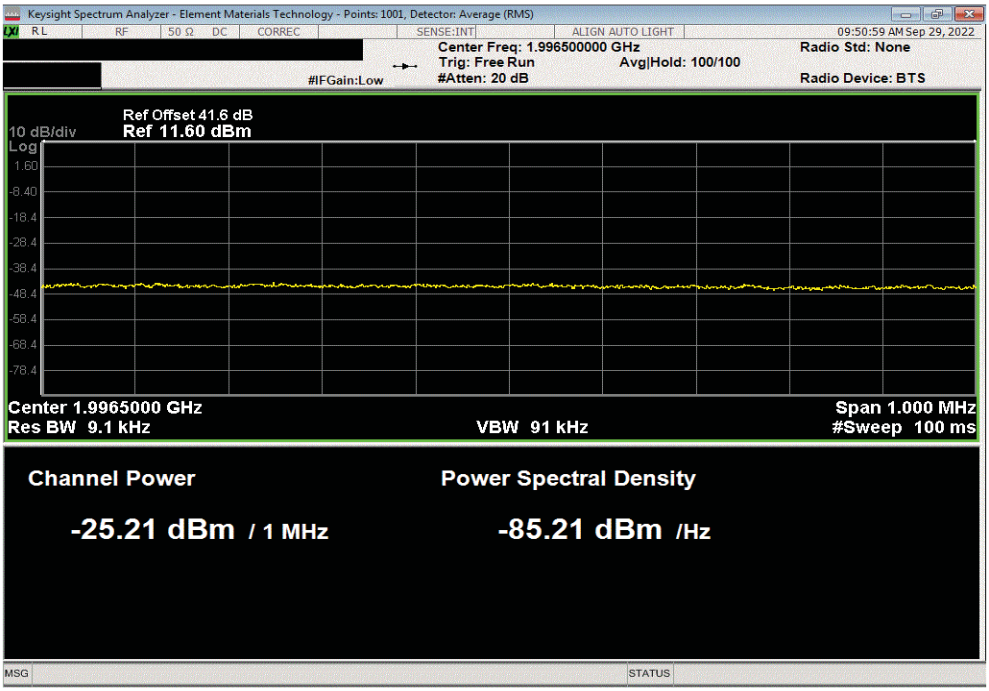


Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 16QAM, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		1995	-27.8	-19	Pass

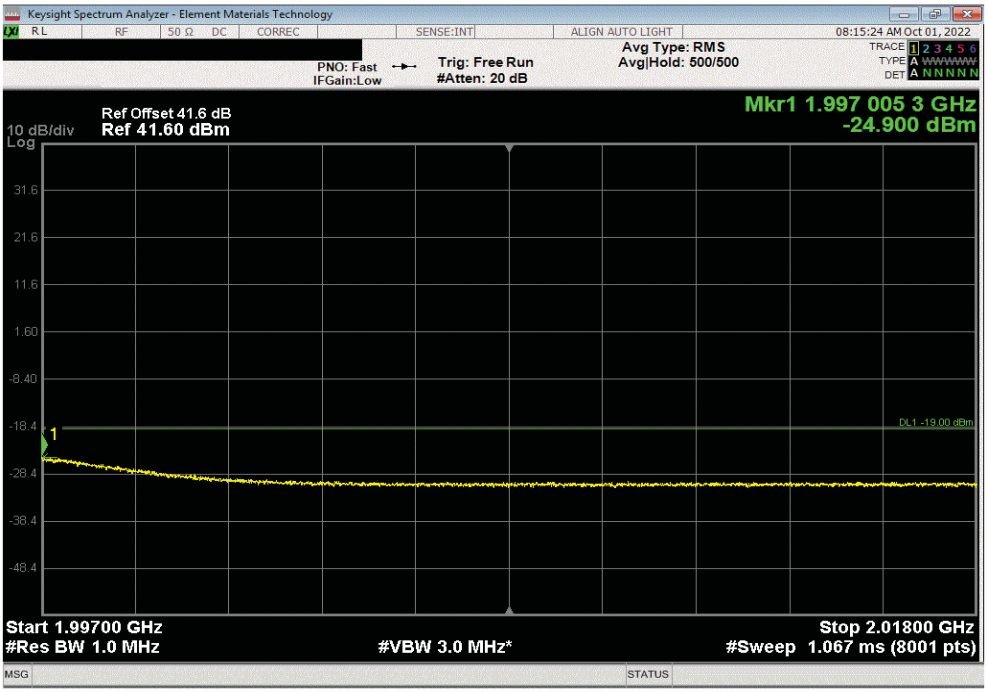


BAND EDGE COMPLIANCE- BAND n25

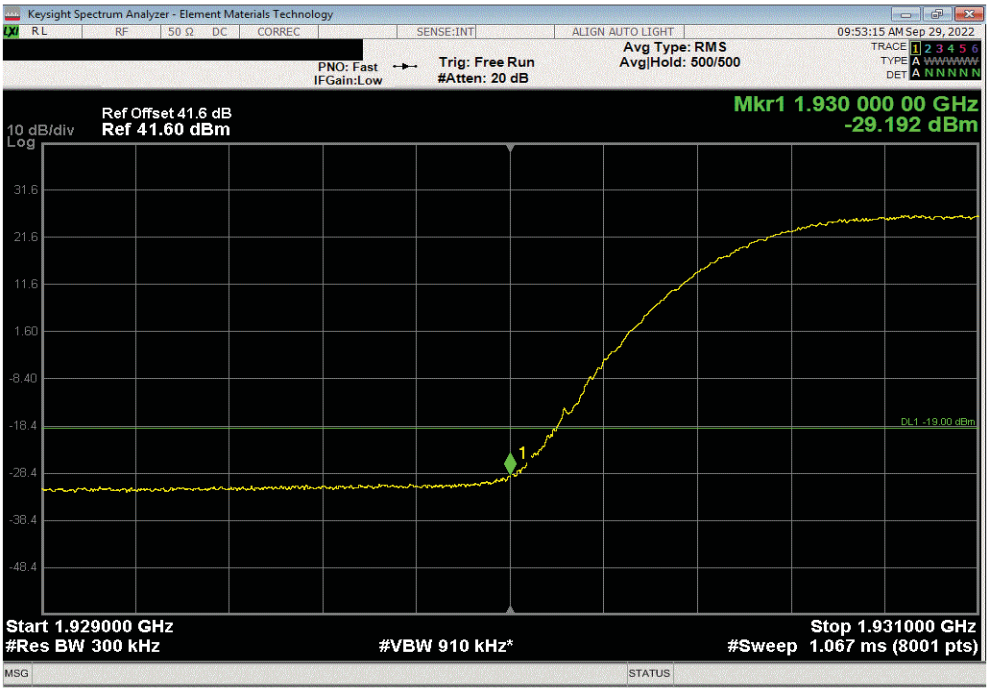
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 16QAM, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		1996.5	-25.21	-19	Pass



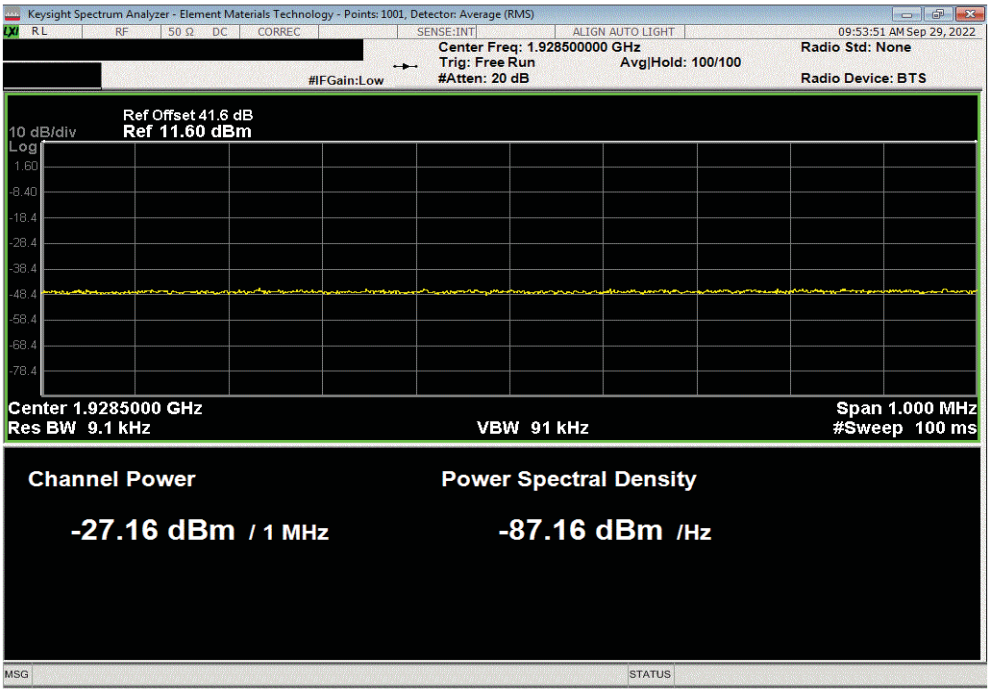
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 16QAM, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		1997	-24.9	-19	Pass



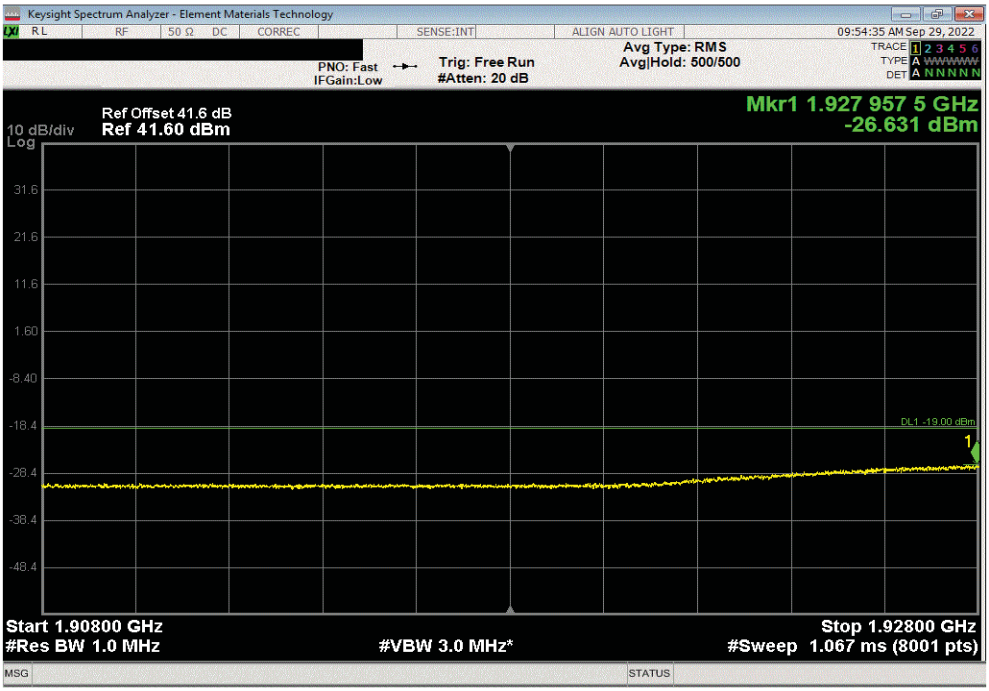
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 64QAM, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		1930	-29.19	-19	Pass



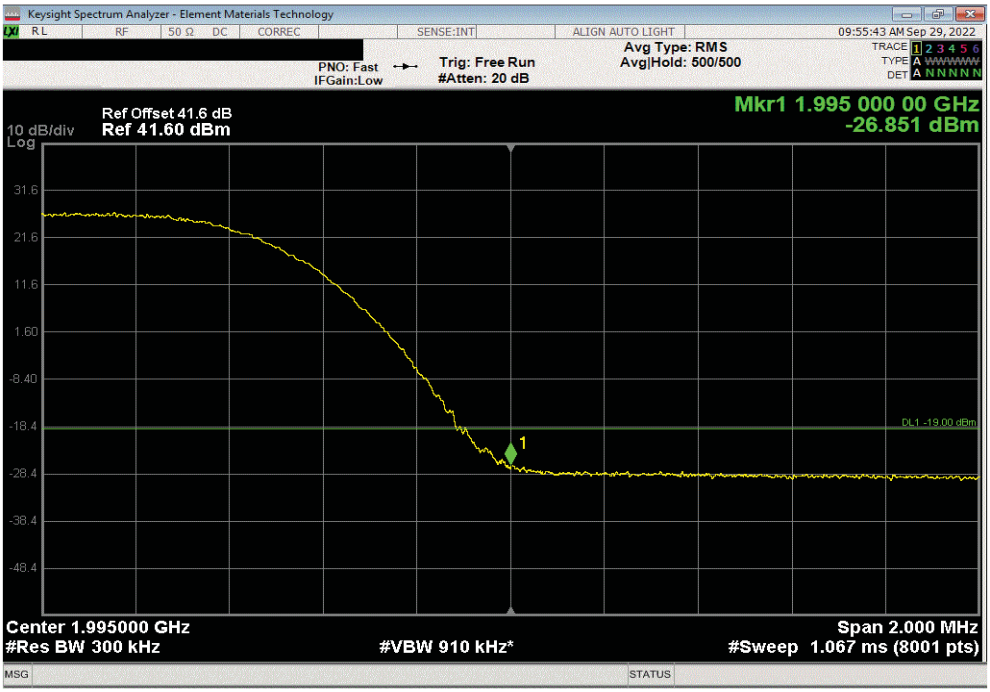
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 64QAM, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		1928.5	-27.16	-19	Pass



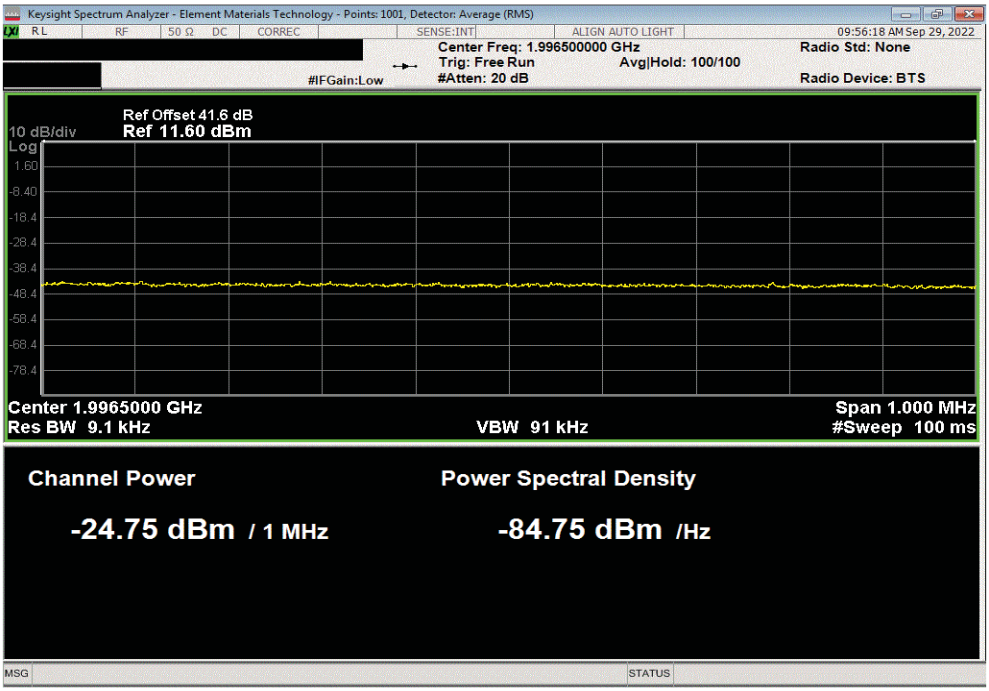
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 64QAM, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		1927.96	-26.63	-19	Pass



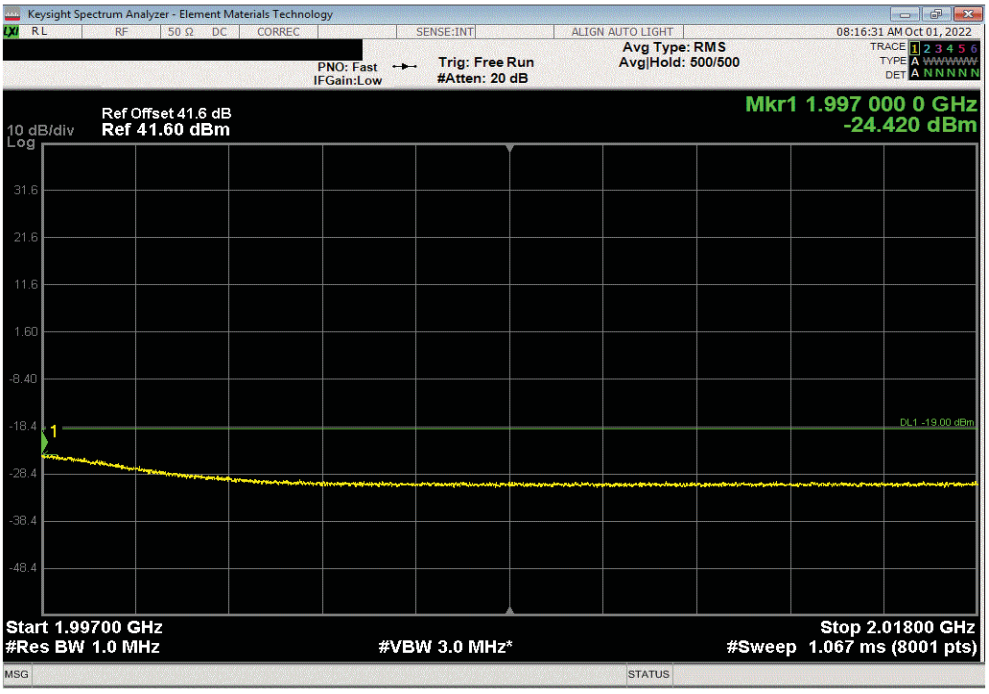
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 64QAM, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		1995	-26.85	-19	Pass



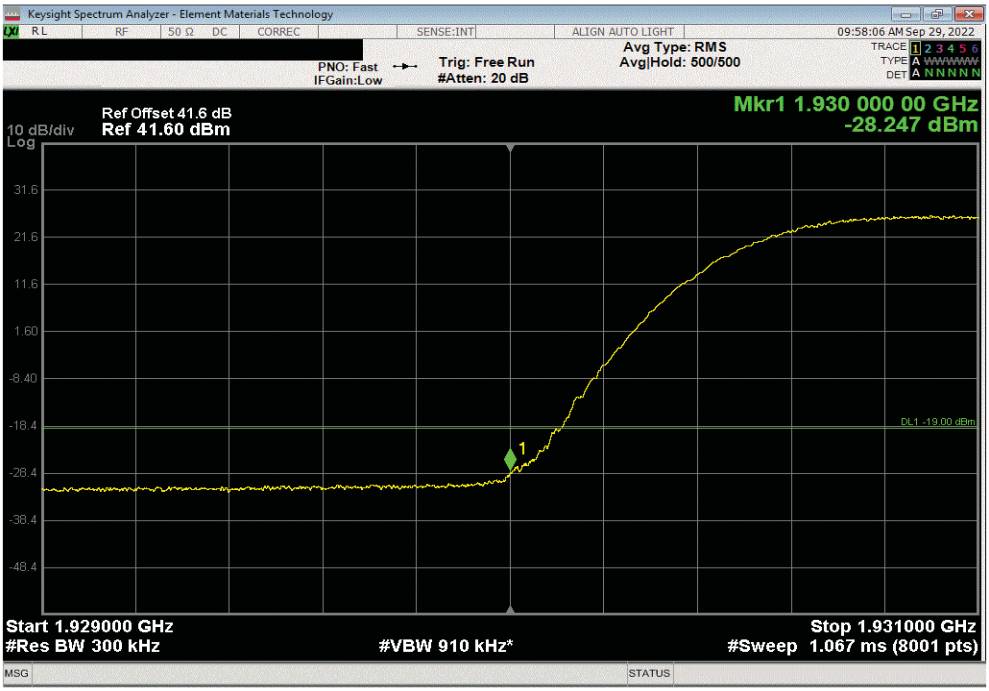
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 64QAM, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		1996.5	-24.75	-19	Pass



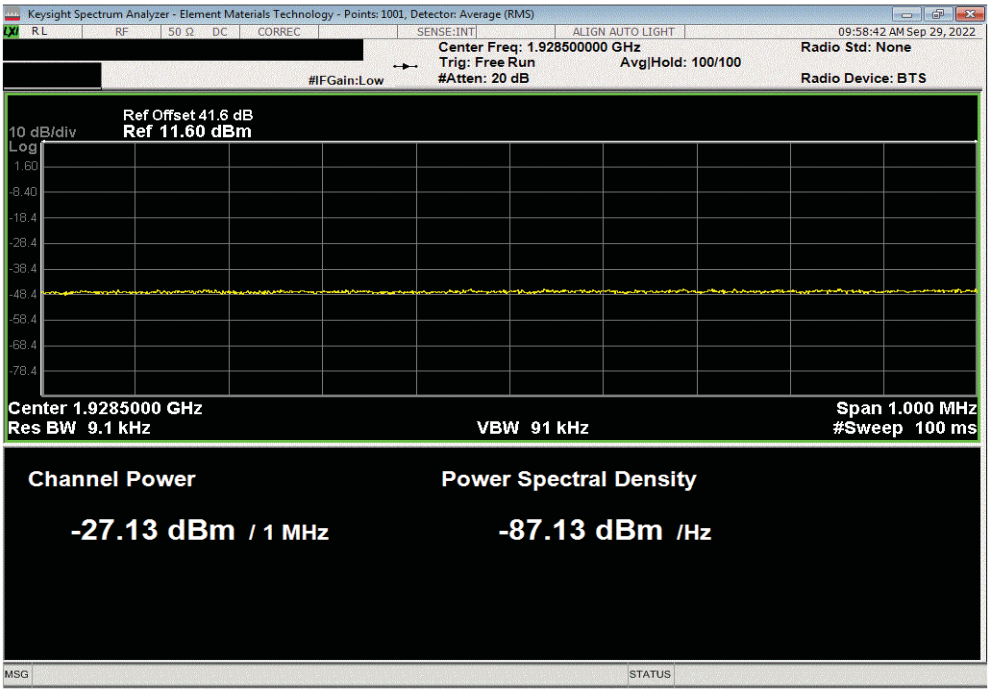
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 64QAM, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		1997	-24.42	-19	Pass



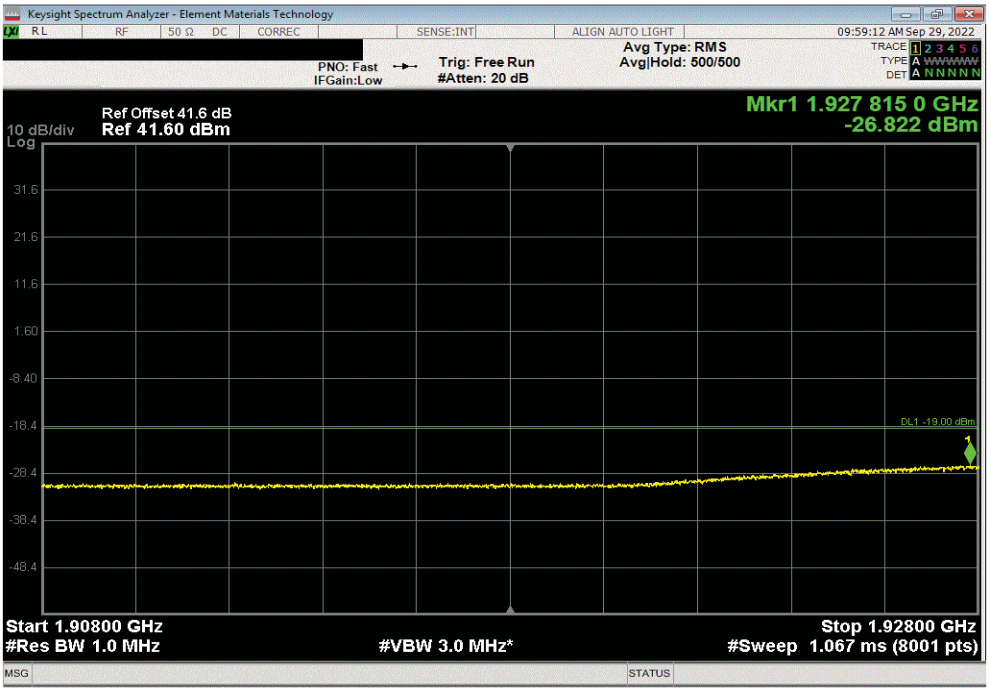
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		1930	-28.25	-19	Pass



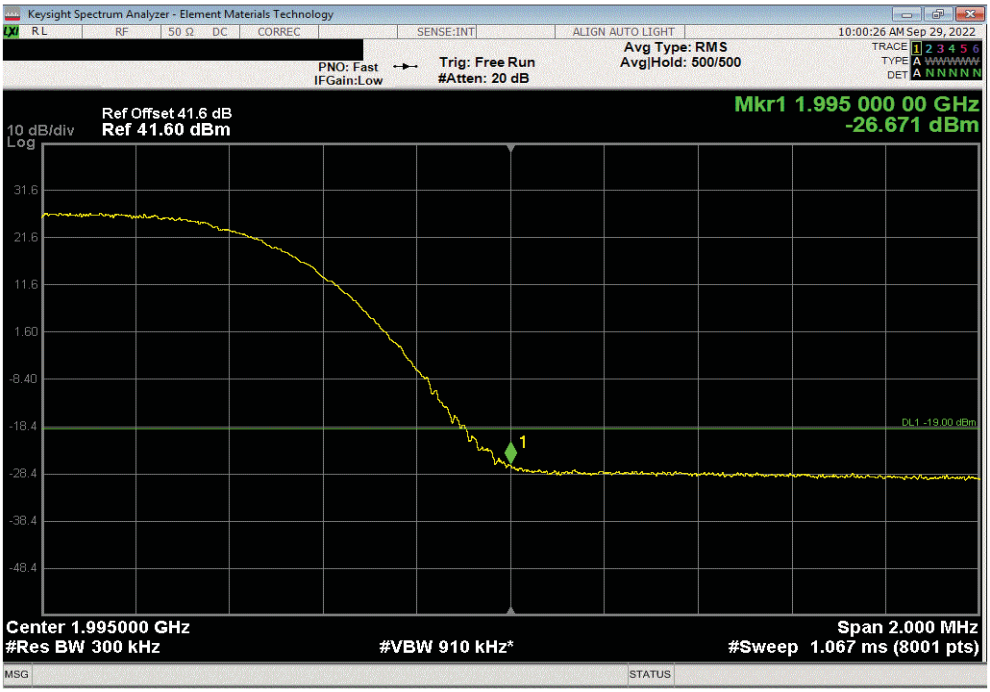
Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		1928.5	-27.13	-19	Pass



Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, Low Channel, 1945 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		1927.82	-26.82	-19	Pass

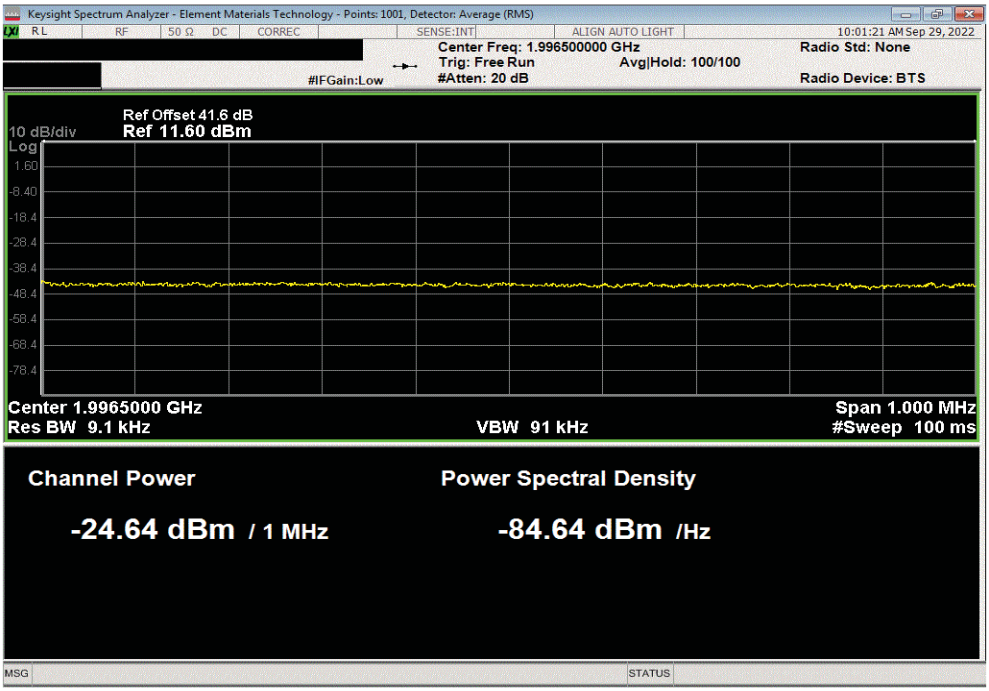


Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		1995	-26.67	-19	Pass

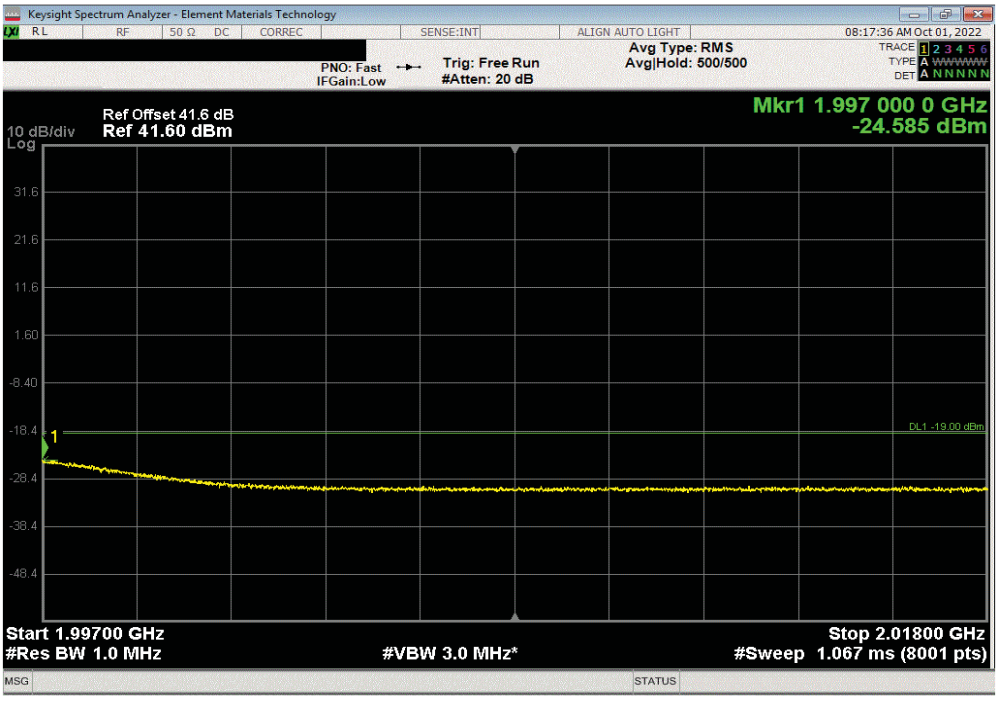


BAND EDGE COMPLIANCE- BAND n25

Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		1996.5	-24.64	-19	Pass



Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, High Channel, 1980 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		1997	-24.585	-19	Pass



BAND EDGE COMPLIANCE - BAND n66

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	SD3379	AMM	2022-09-09	2023-09-09
Block - DC	Fairview Microwave	SD3239	ANC	2022-03-02	2023-03-02
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-01-17	2023-01-17

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in the available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

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

RF conducted emissions was performed only on one port. The testing was performed on the same version of hardware (AHFIB) as the original certification test. The AHFIB antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in original 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.

All limits were adjusted by a factor of [-10*log(4)] dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911
Per section FCC 24.238(a), 27.53(h)(1), RSS 133 6.5 (i), RSS-139 section 5.6 - the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

The RBW to be used for these measurements are per FCC 24.238(b), 27.53(h)(3), RSS 133 6.5 (i), RSS-139 5.6. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified).The requirements for FCC/IC measurements are detailed in KDB971168 D01 v03r01 and ANSI 63.26.

BAND EDGE COMPLIANCE - BAND n66

TbtTx 2022.06.03.0 XMit 2022.02.07.0

EUT:	AHFIB			Work Order:	NOKI0049
Serial Number:	K9181401111			Date:	30-Sep-22
Customer:	Nokia of America Corporation			Temperature:	22 °C
Attendees:	John Rattanavong			Humidity:	48.6% RH
Project:	None			Barometric Pres.:	1008 mbar
Tested by:	Marty Martin	Power:	54 VDC	Job Site:	TX07

TEST SPECIFICATIONS	Test Method
FCC 27:2022	ANSI C63.26:2015
RSS-139 Issue 4:2022	RSS-139 Issue 4:2022

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 (40 watts/carrier).

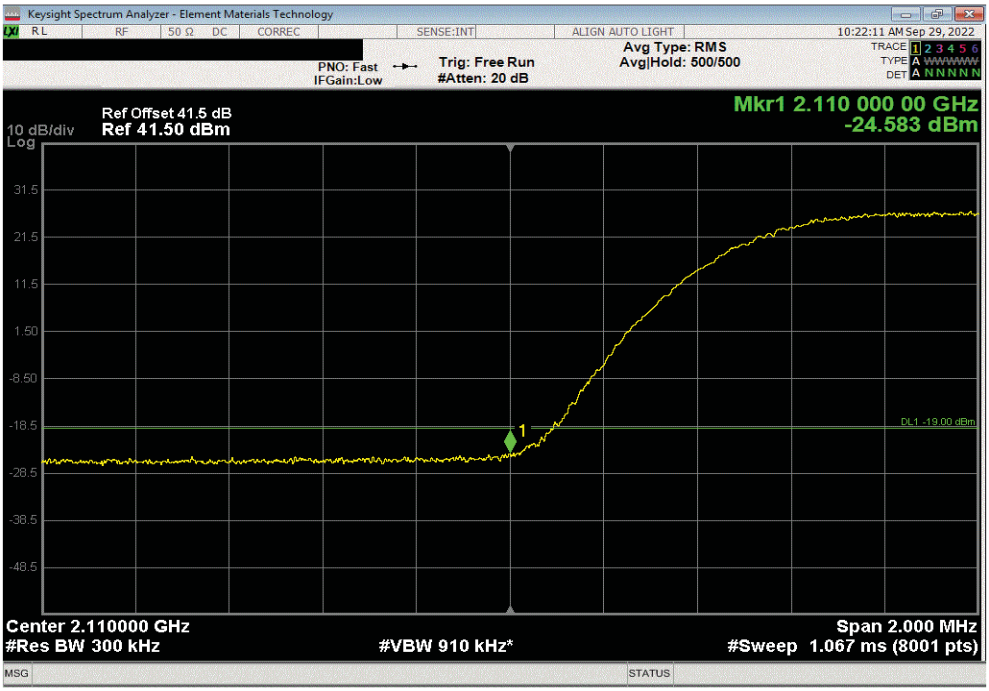
DEVIATIONS FROM TEST STANDARD

None

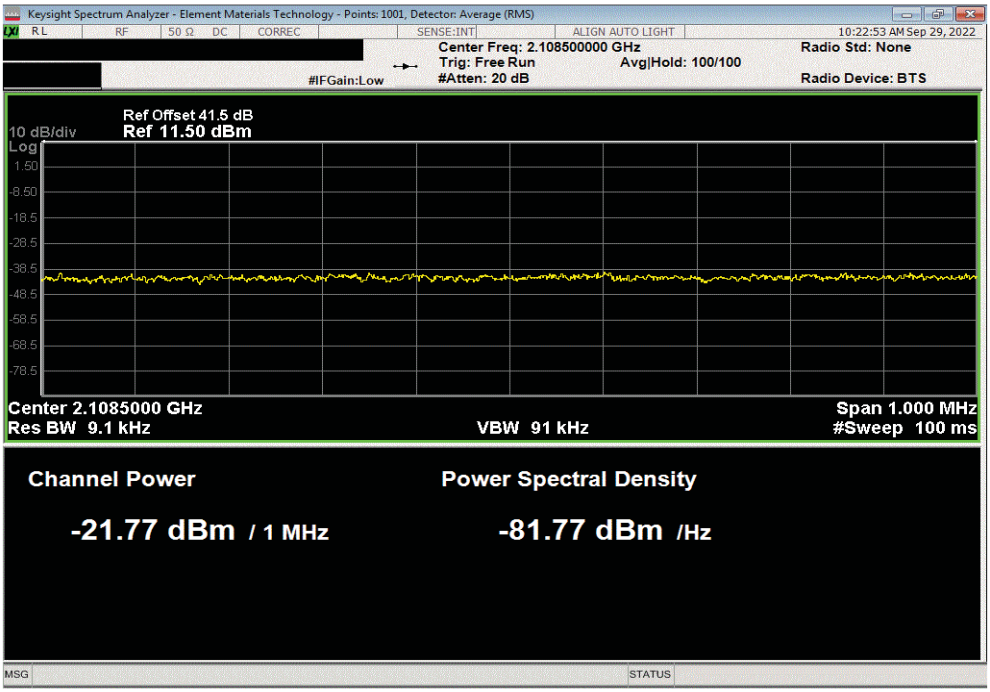
Configuration #	2	Signature

		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
Port 1, NR, Band n66, 2110 - 2200 MHz						
30 MHz						
QPSK						
	Low Channel, 2125 MHz	1	2110	-24.58	-19	Pass
	Low Channel, 2125 MHz	2	2108.5	-21.77	-19	Pass
	Low Channel, 2125 MHz	3	2107.89	-25.44	-19	Pass
	High Channel, 2185 MHz	1	2200	-25.9	-19	Pass
	High Channel, 2185 MHz	2	2201.5	-23.93	-19	Pass
	High Channel, 2185 MHz	3	2202.06	-23.67	-19	Pass
16QAM						
	Low Channel, 2125 MHz	1	2110	-28.07	-19	Pass
	Low Channel, 2125 MHz	2	2108.5	-26.37	-19	Pass
	Low Channel, 2125 MHz	3	2107.77	-25.52	-19	N/A
	High Channel, 2185 MHz	2	2200	-27.52	-19	Pass
	High Channel, 2185 MHz	2	2201.5	-24.58	-19	Pass
	High Channel, 2185 MHz	3	2202.15	-24.33	-19	Pass
64QAM						
	Low Channel, 2125 MHz	1	2110	-26.93	-19	Pass
	Low Channel, 2125 MHz	2	2108.5	-26.31	-19	Pass
	Low Channel, 2125 MHz	3	2107.96	-25.61	-19	Pass
	High Channel, 2185 MHz	1	2200	-26.1	-19	Pass
	High Channel, 2185 MHz	2	2201.5	-24	-19	Pass
	High Channel, 2185 MHz	3	2202.14	-23.32	-19	Pass
256QAM						
	Low Channel, 2125 MHz	1	2110	-28.09	-19	Pass
	Low Channel, 2125 MHz	2	2108.5	-25.83	-19	Pass
	Low Channel, 2125 MHz	3	2107.82	-25.9	-19	Pass
	High Channel, 2185 MHz	1	2200	-26.21	-19	Pass
	High Channel, 2185 MHz	2	2201.5	-23.52	-19	Pass
	High Channel, 2185 MHz	3	2202	-23.72	-19	Pass

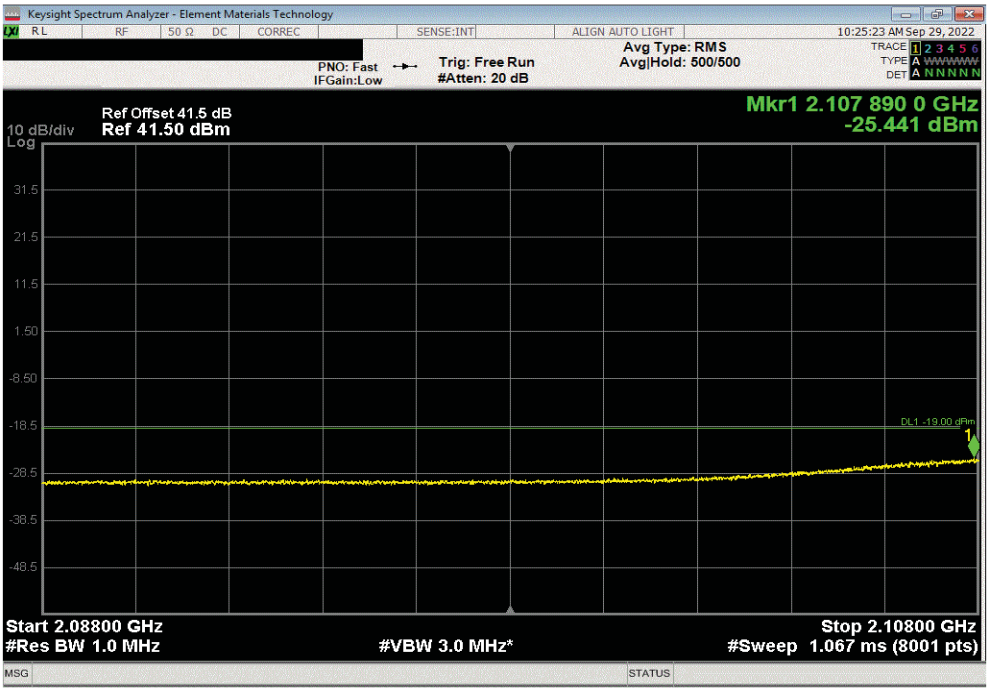
Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, QPSK, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		2110	-24.58	-19	Pass



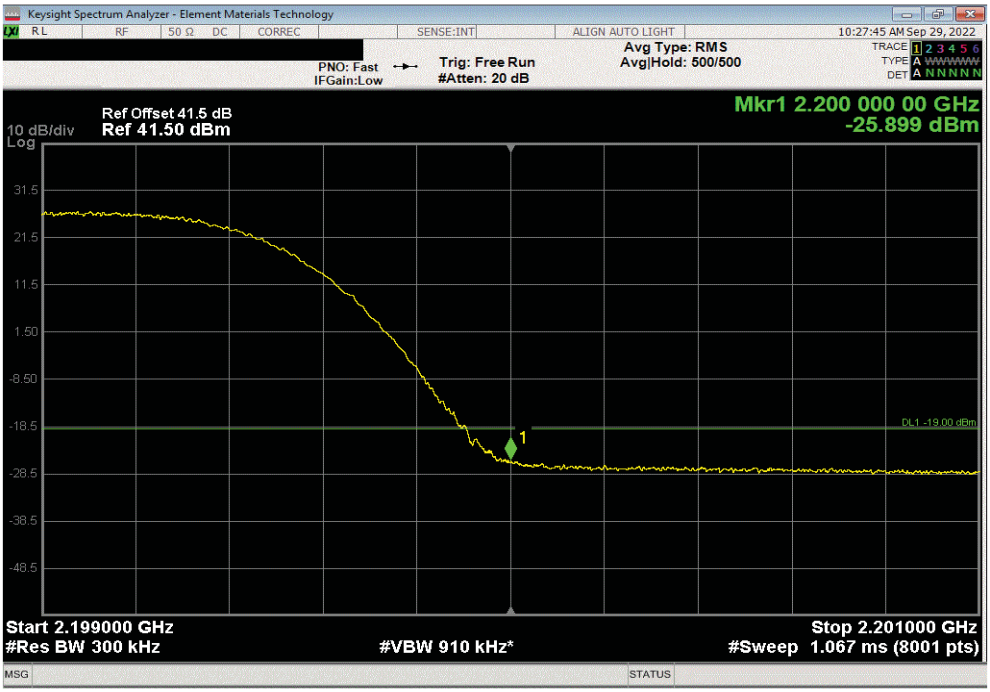
Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, QPSK, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		2108.5	-21.77	-19	Pass



Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, QPSK, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		2107.89	-25.44	-19	Pass

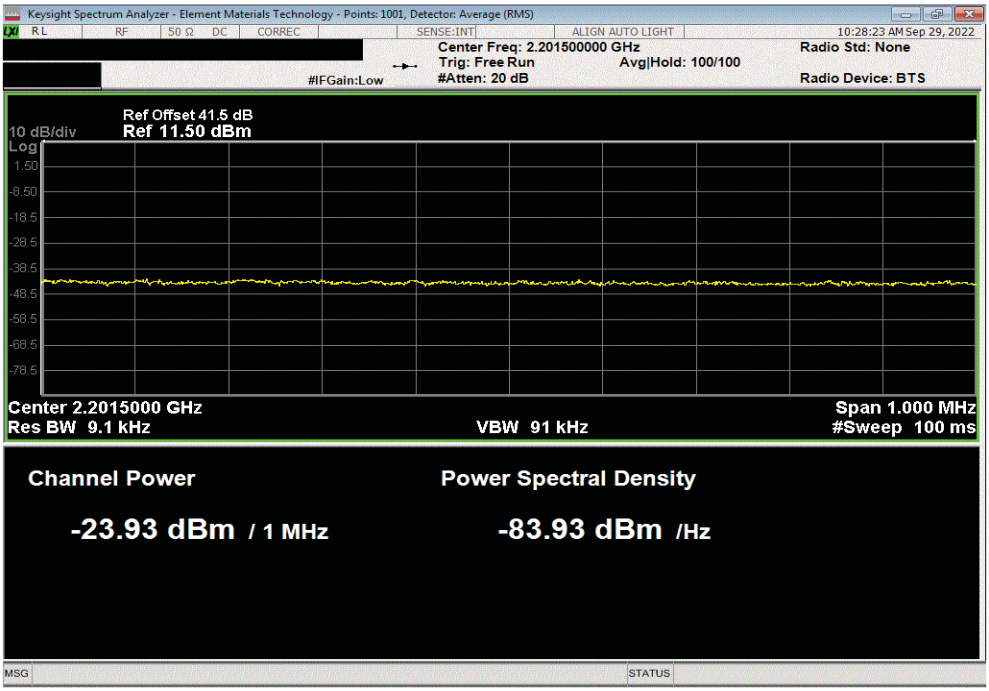


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, QPSK, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		2200	-25.9	-19	Pass

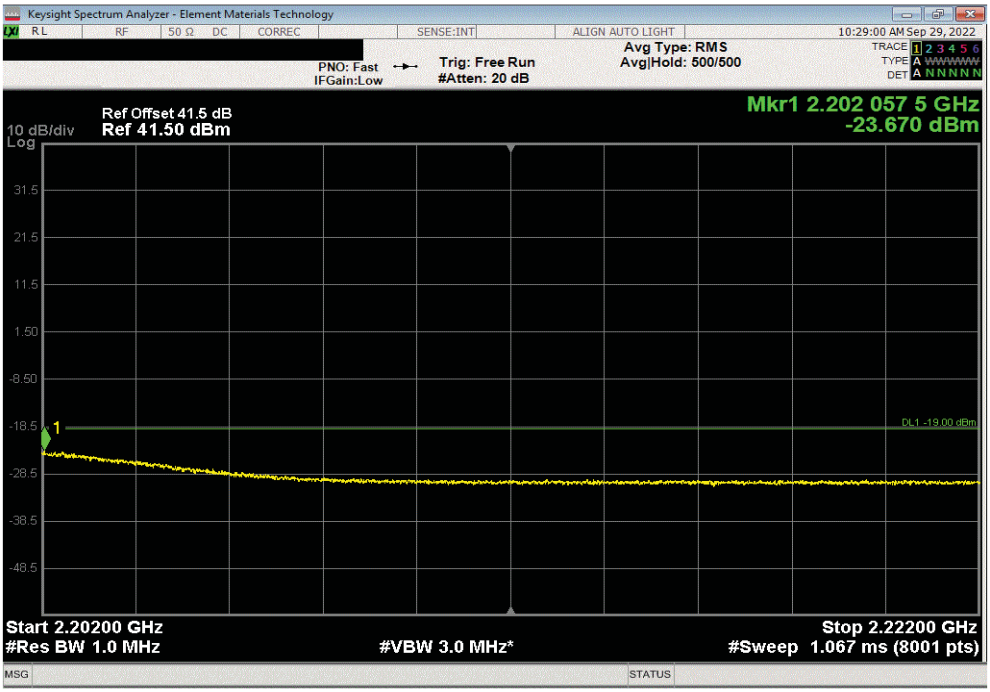


BAND EDGE COMPLIANCE - BAND n66

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, QPSK, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		2201.5	-23.93	-19	Pass

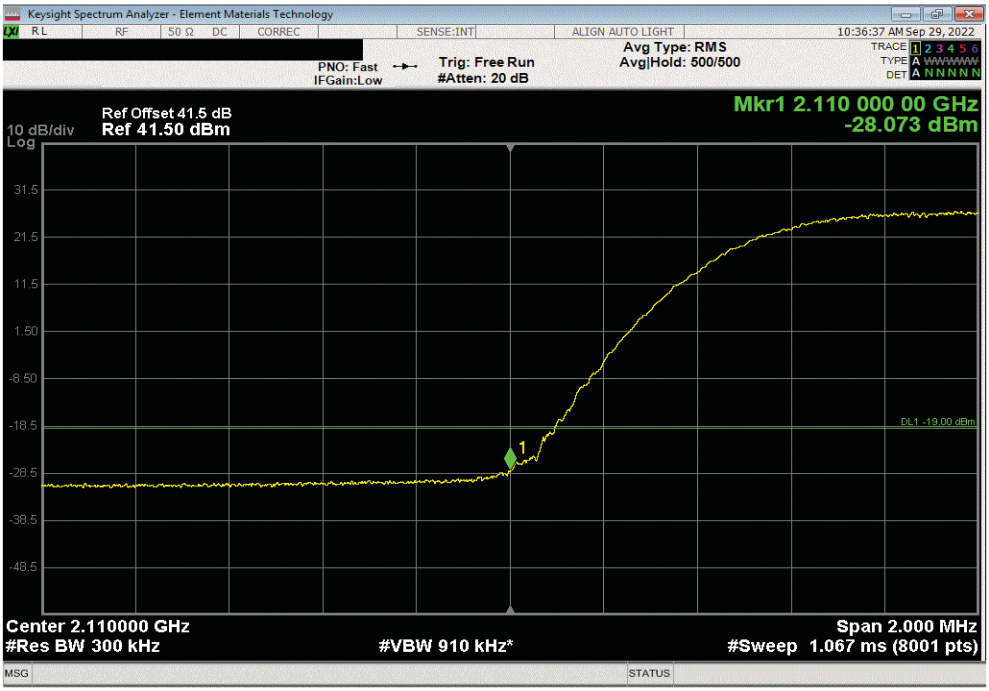


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, QPSK, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		2202.06	-23.67	-19	Pass

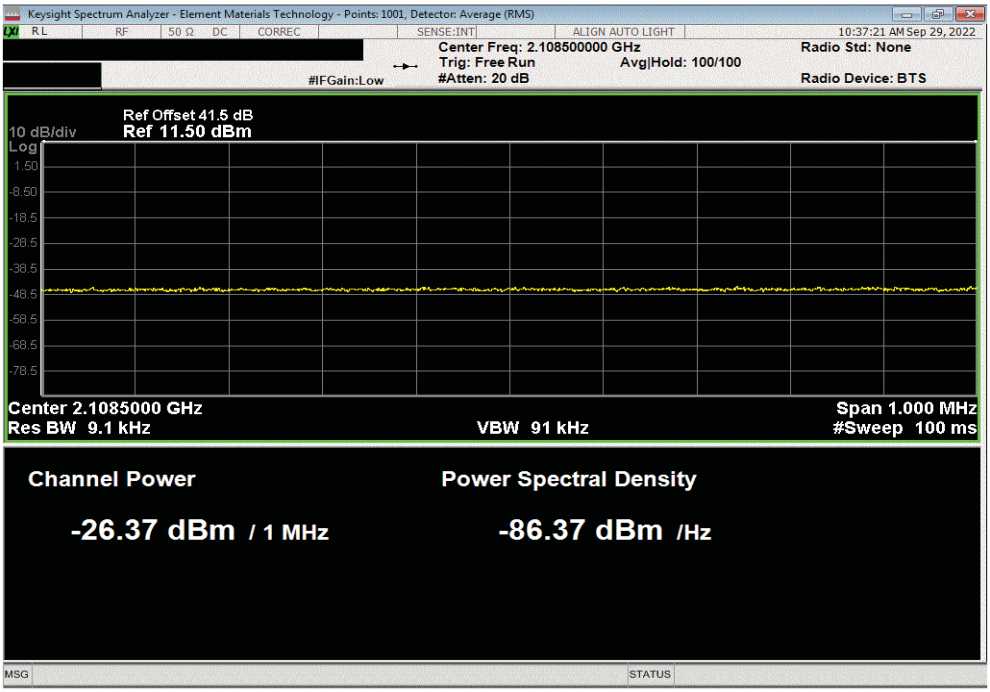


BAND EDGE COMPLIANCE - BAND n66

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 16QAM, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		2110	-28.07	-19	Pass

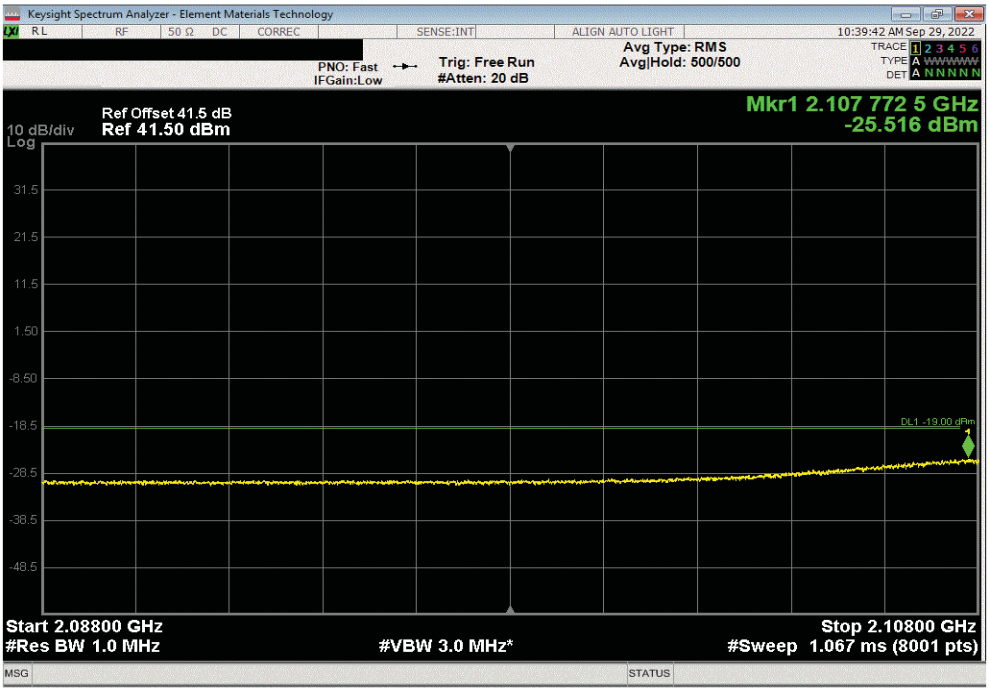


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 16QAM, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		2108.5	-26.37	-19	Pass

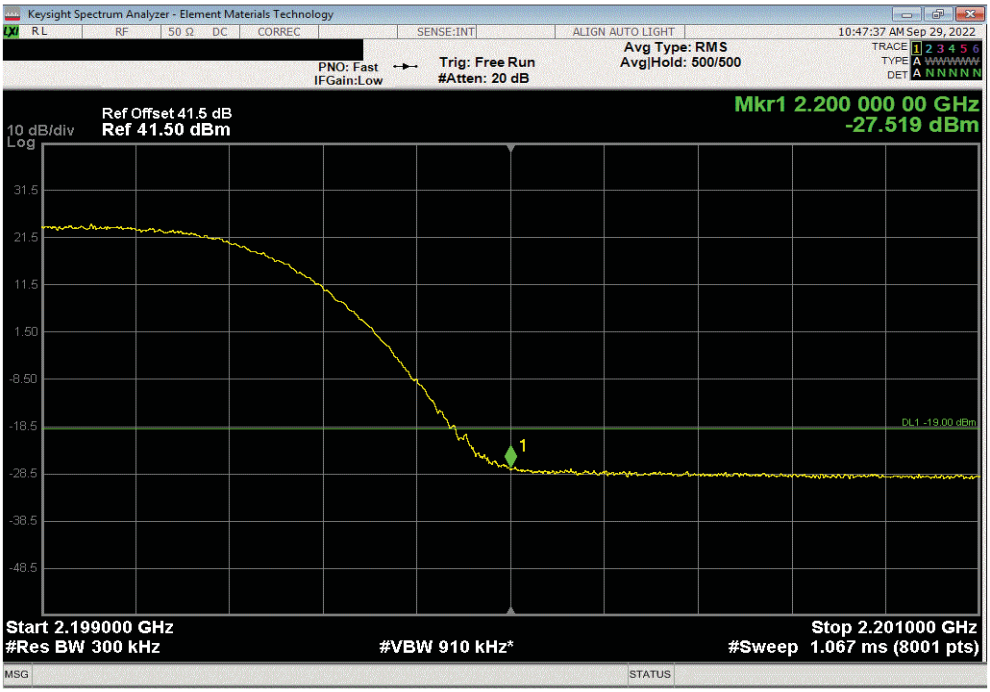


BAND EDGE COMPLIANCE - BAND n66

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 16QAM, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		2107.77	-25.52	-19	N/A

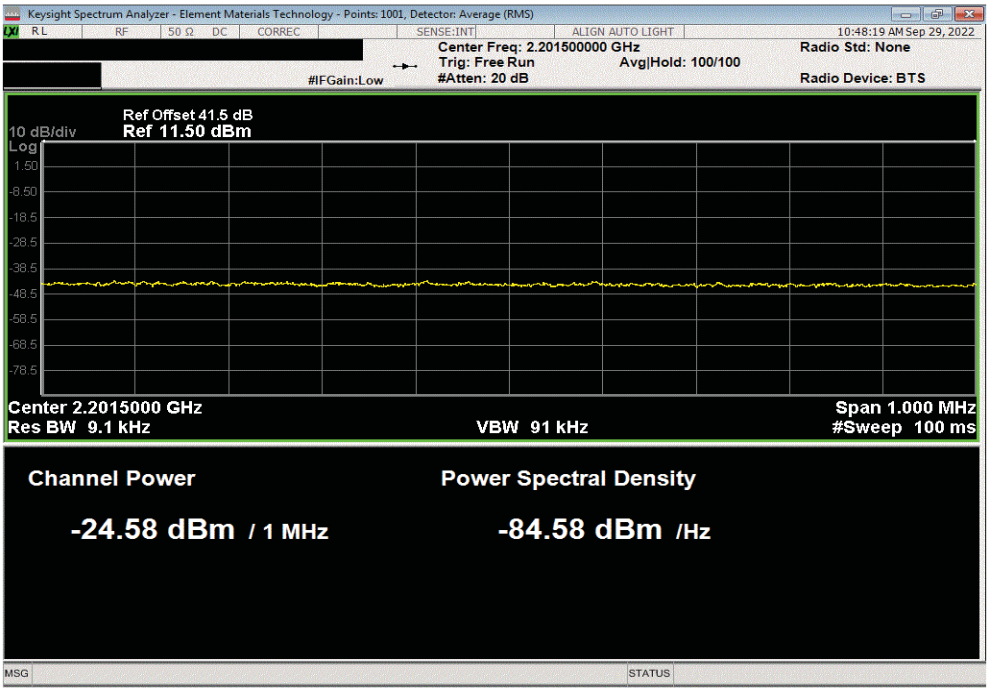


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 16QAM, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		2200	-27.52	-19	Pass

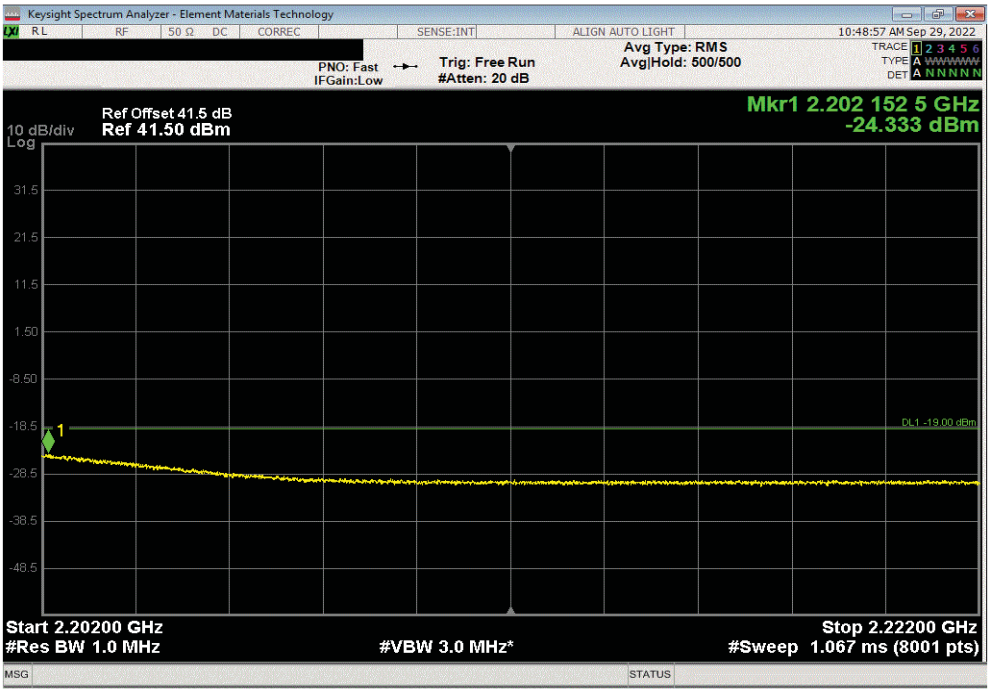


BAND EDGE COMPLIANCE - BAND n66

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 16QAM, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		2201.5	-24.58	-19	Pass

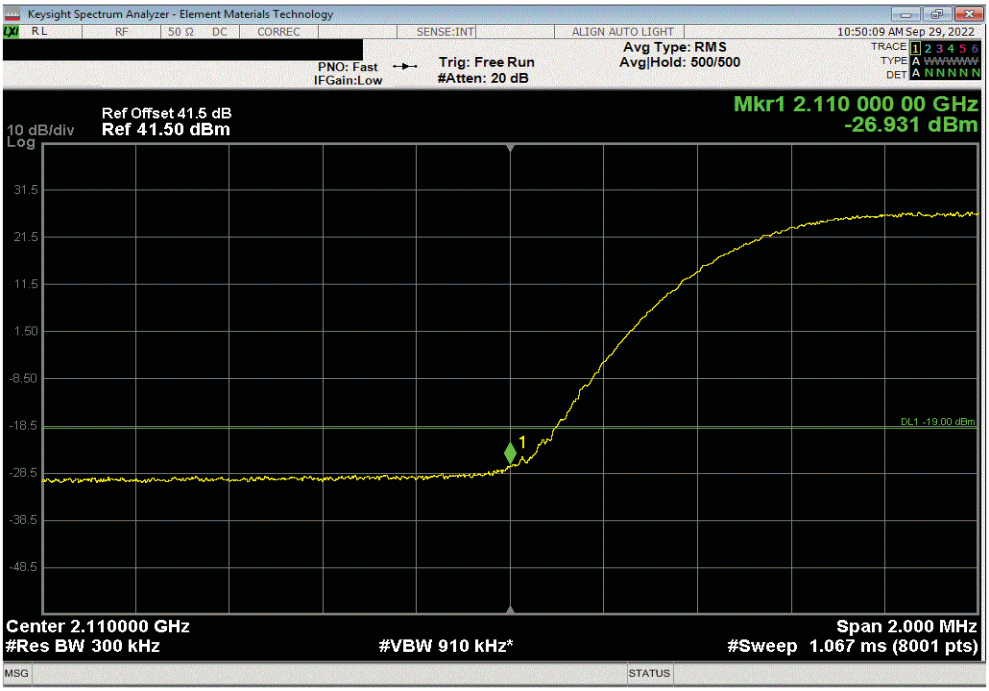


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 16QAM, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		2202.15	-24.33	-19	Pass

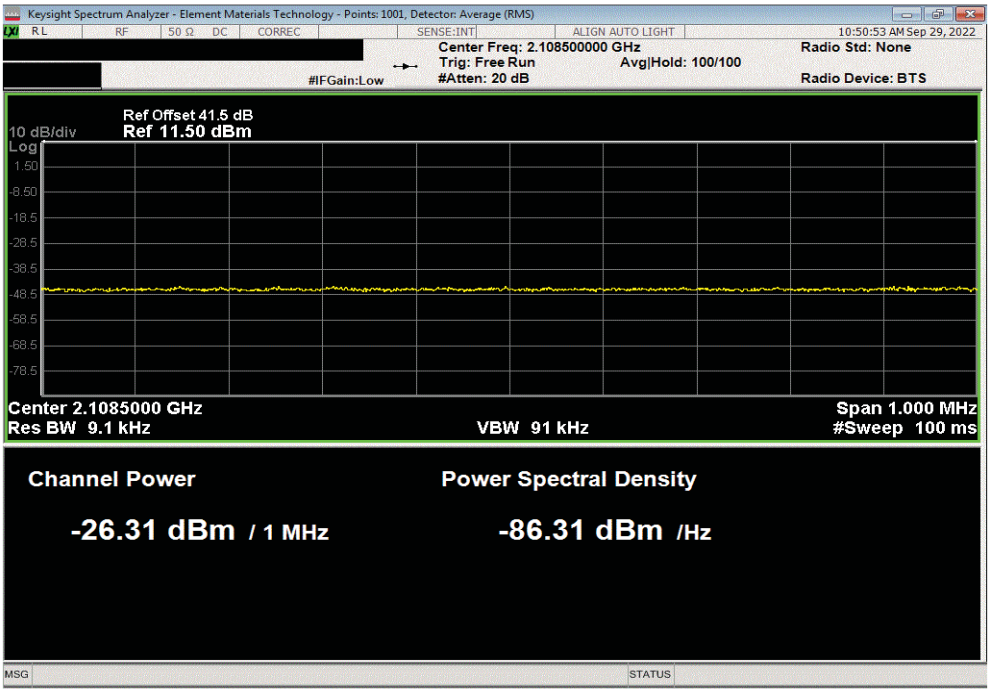


BAND EDGE COMPLIANCE - BAND n66

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 64QAM, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		2110	-26.93	-19	Pass

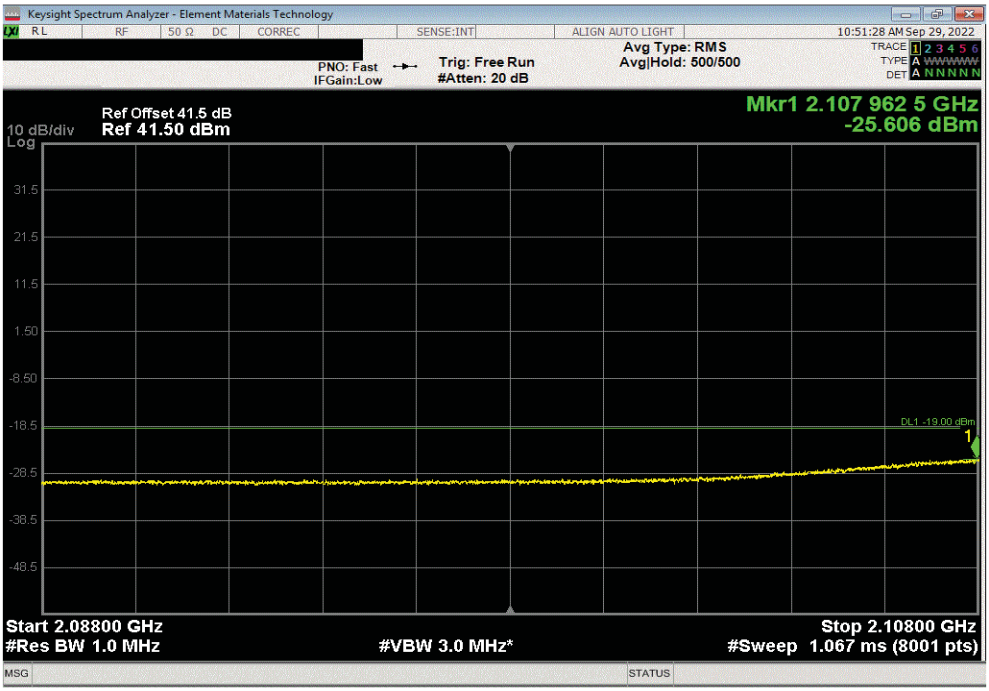


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 64QAM, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		2108.5	-26.31	-19	Pass

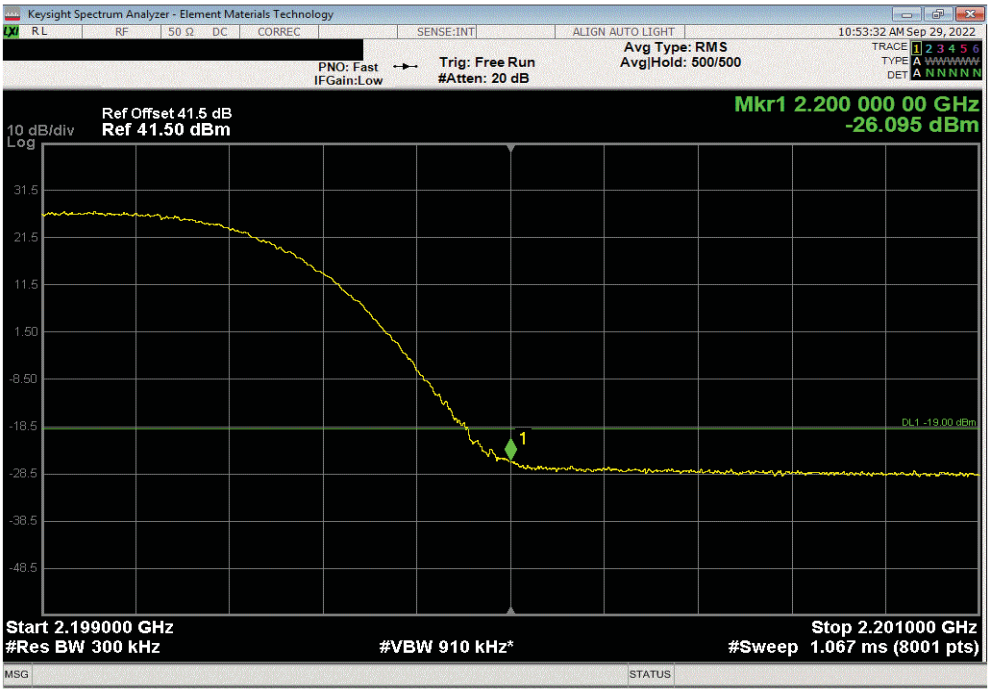


BAND EDGE COMPLIANCE - BAND n66

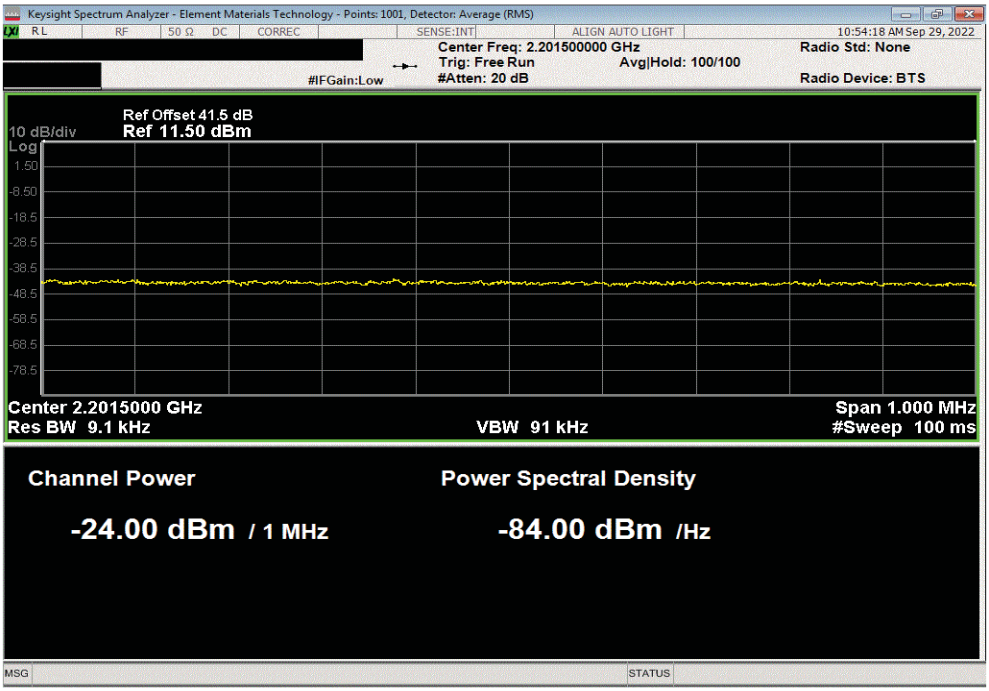
Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 64QAM, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		2107.96	-25.61	-19	Pass



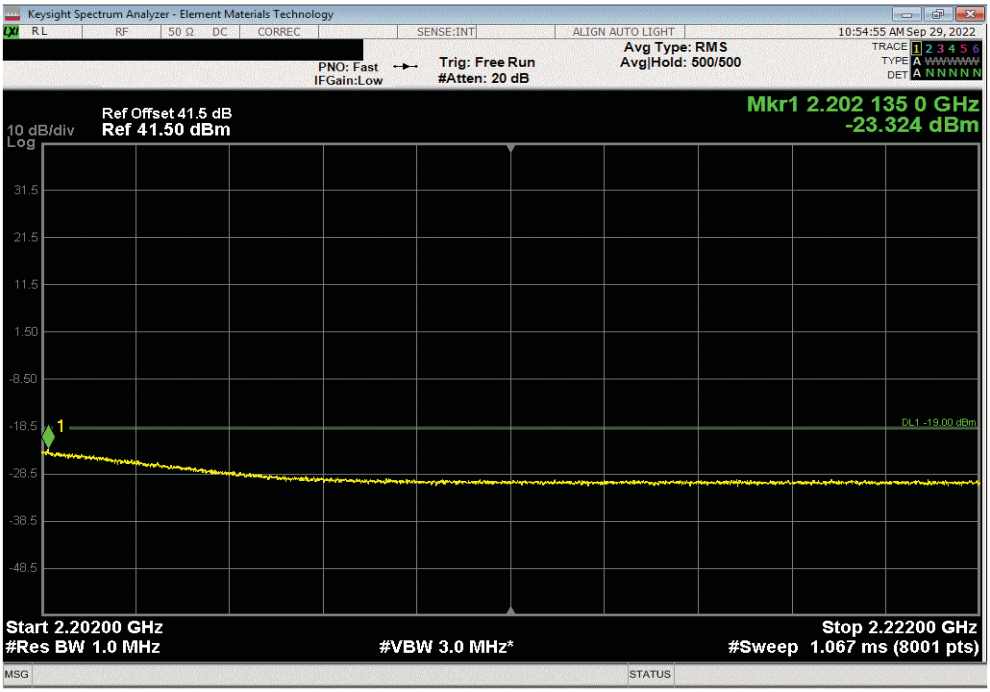
Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 64QAM, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		2200	-26.1	-19	Pass



Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 64QAM, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		2201.5	-24	-19	Pass

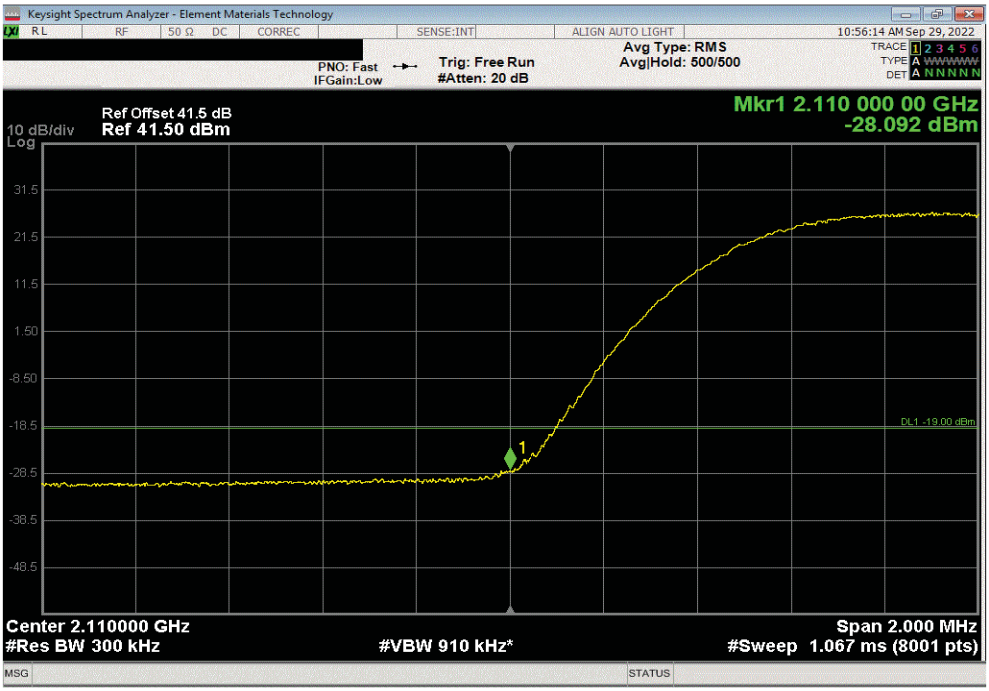


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 64QAM, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		2202.14	-23.32	-19	Pass

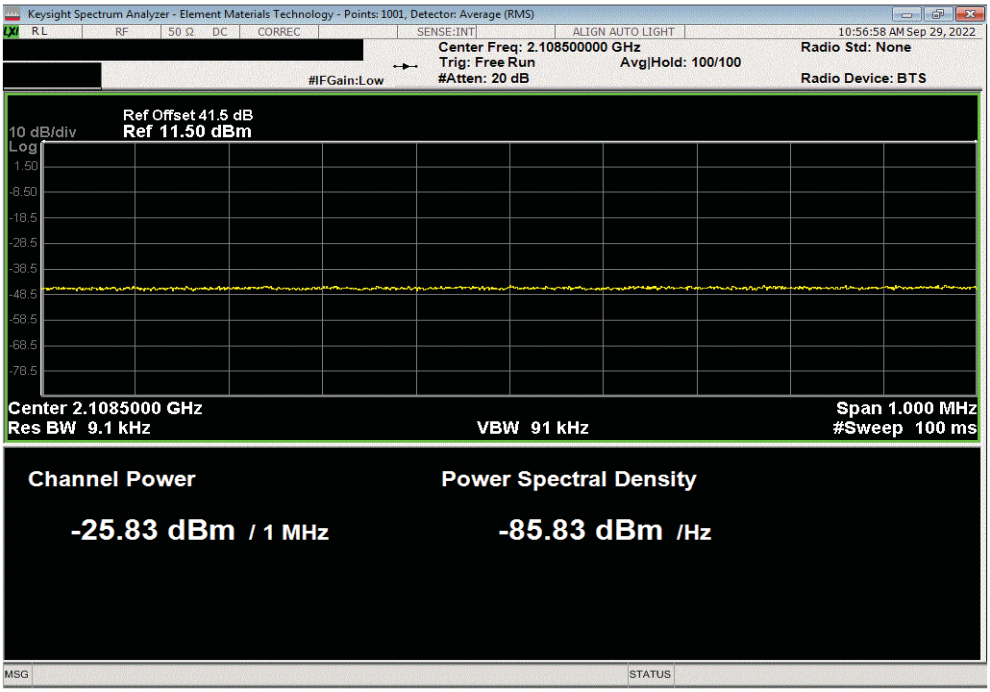


BAND EDGE COMPLIANCE - BAND n66

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		2110	-28.09	-19	Pass

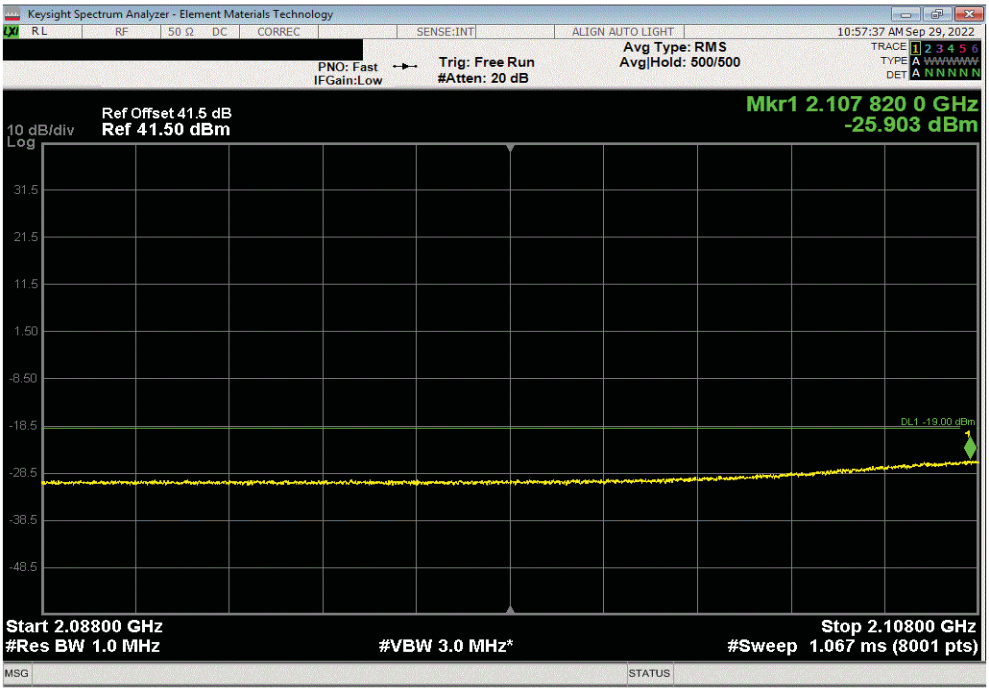


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		2108.5	-25.83	-19	Pass

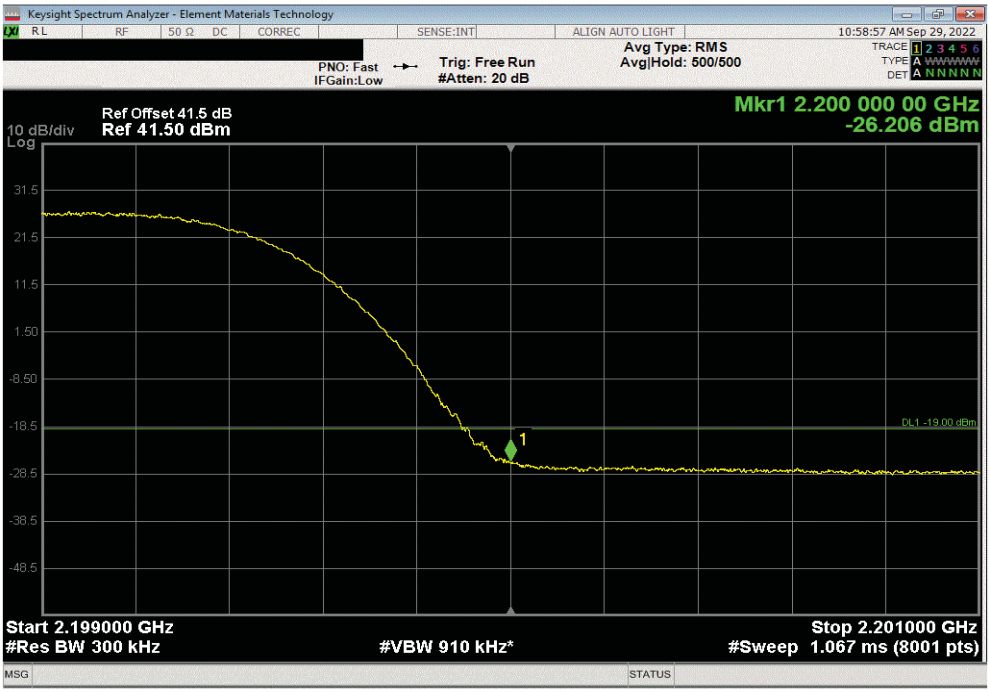


BAND EDGE COMPLIANCE - BAND n66

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, Low Channel, 2125 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		2107.82	-25.9	-19	Pass

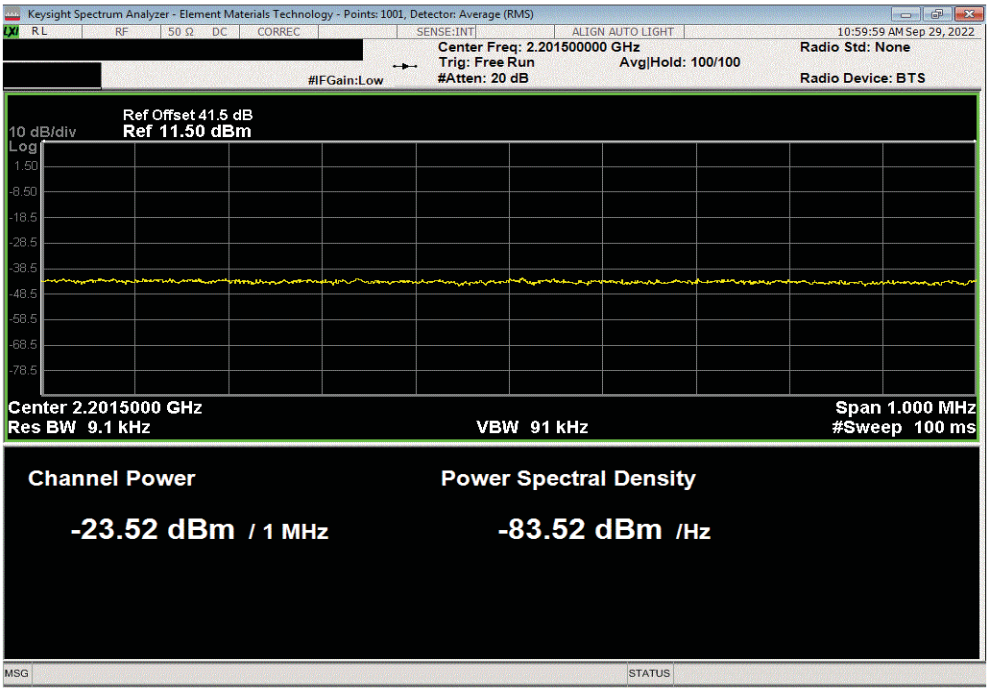


Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	1		2200	-26.21	-19	Pass



BAND EDGE COMPLIANCE - BAND n66

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	2		2201.5	-23.52	-19	Pass



Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, High Channel, 2185 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
	3		2202	-23.72	-19	Pass