

# POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n25



XMH 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 XMM 2022.02.07.0

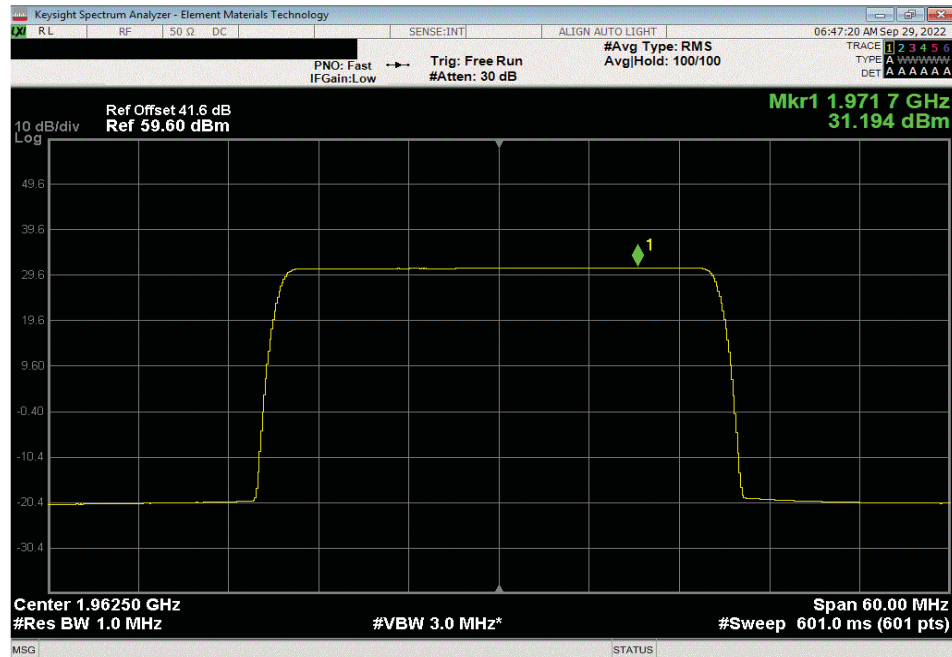
EUT: AHFIB		Work Order: NOKI0049				
Serial Number: K9181401111		Date: 30-Sep-22				
Customer: Nokia of America Corporation		Temperature: 21.8 °C				
Attendees: John Rattanavong		Humidity: 46.2% RH				
Project: None		Barometric Pres.: 1012 mbar				
Tested by: Marty Martin		Job Site: TX07				
Power: 54 VDC						
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 offset 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 multipoint (2x2 MIMO, 4x4 MIMO) operation was determined 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 <i>Marty Martin</i>				
		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

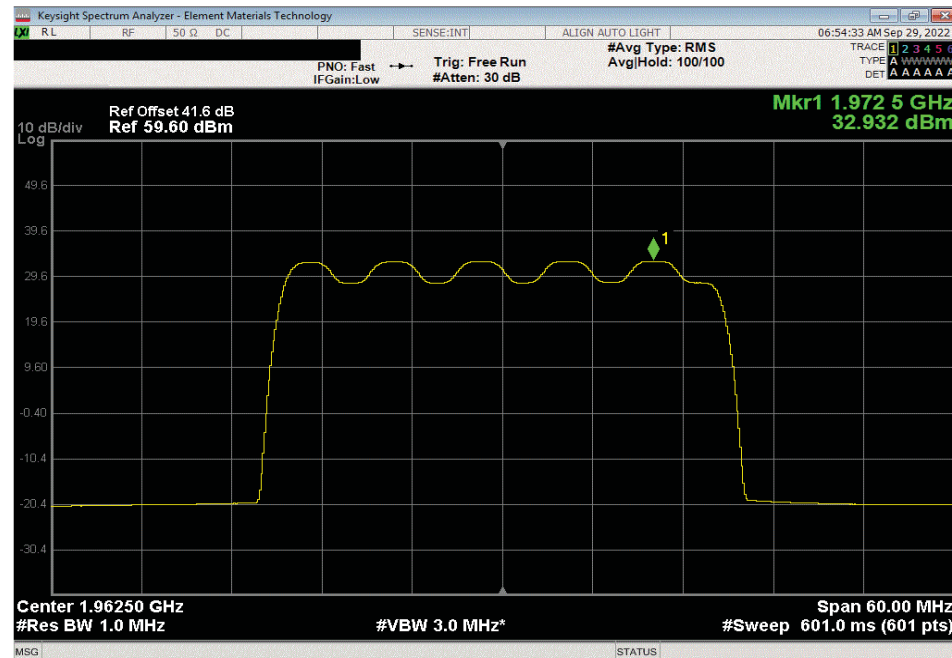


TMTX 2022.06.03.0 XMI 2022.02.07.0

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

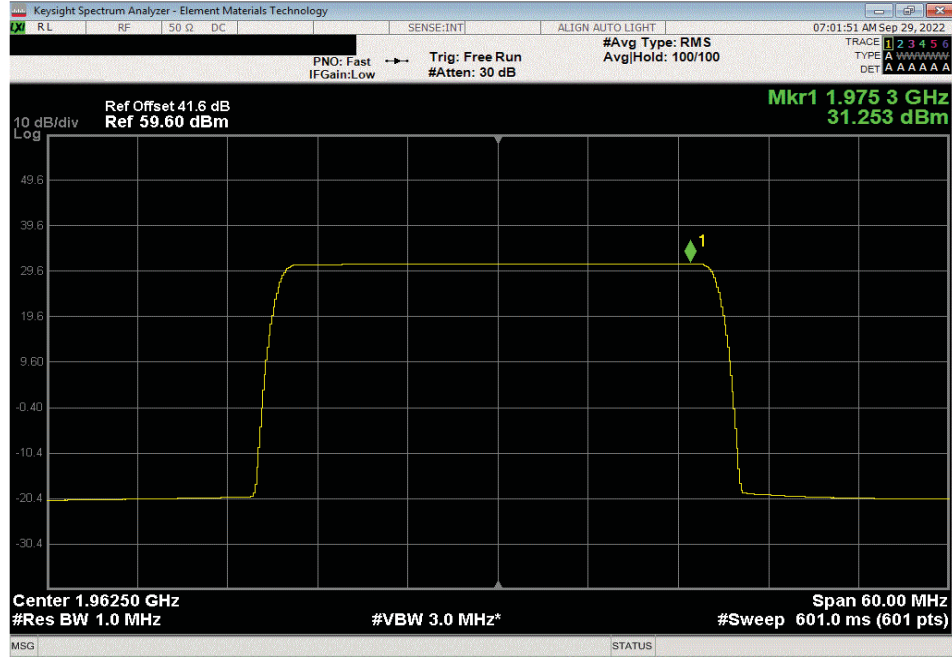


# POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n25

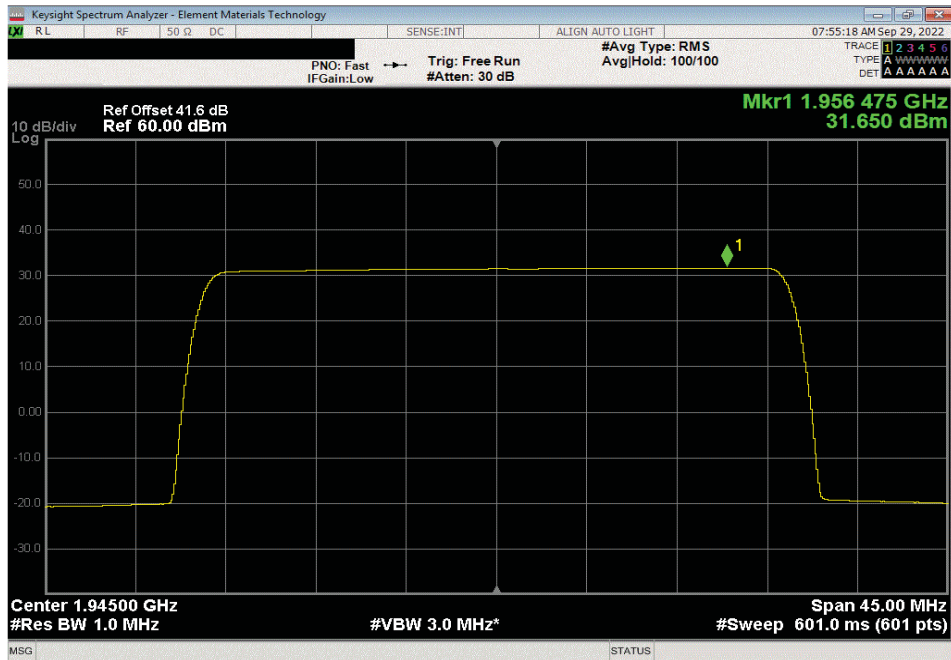


TMTx 2022.06.03.0 XMI 2022.02.07.0

Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 64QAM, Mid Channel, 1962.5 MHz						
	Initial Value	Duty Cycle	Single Port	Two Port (2x2 MIMO)	Four Port (4x4 MIMO)	
	dBm/MHz	Factor (dB)	dBm/MHz = PSD	dBm/MHz = PSD	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	Duty Cycle	Single Port	Two Port (2x2 MIMO)	Four Port (4x4 MIMO)	
	dBm/MHz	Factor (dB)	dBm/MHz = PSD	dBm/MHz = PSD	dBm/MHz = PSD	
	31.65	0	31.65	34.65	37.65	

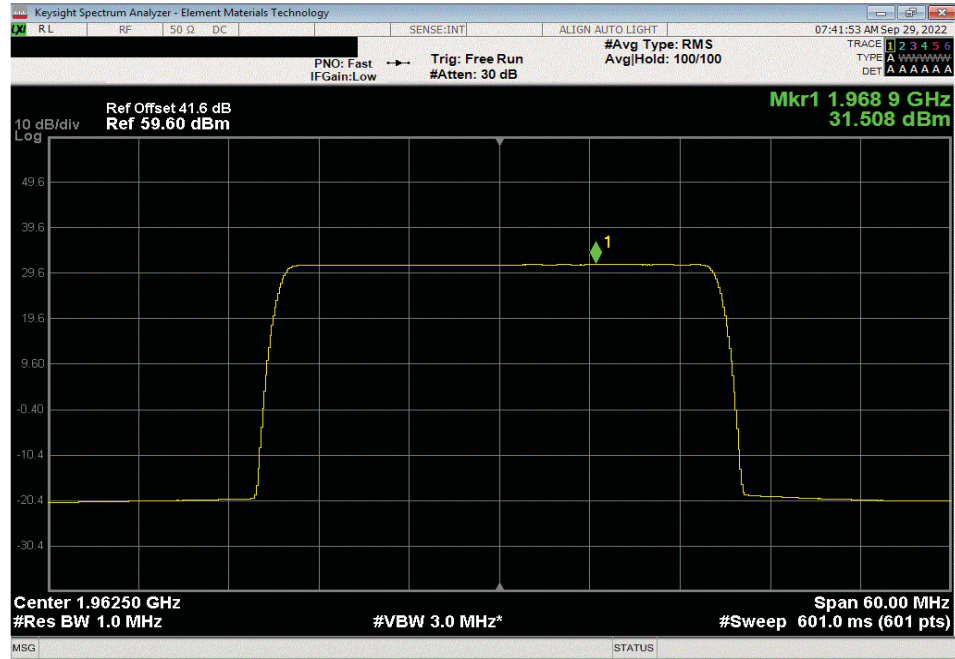


# POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n25

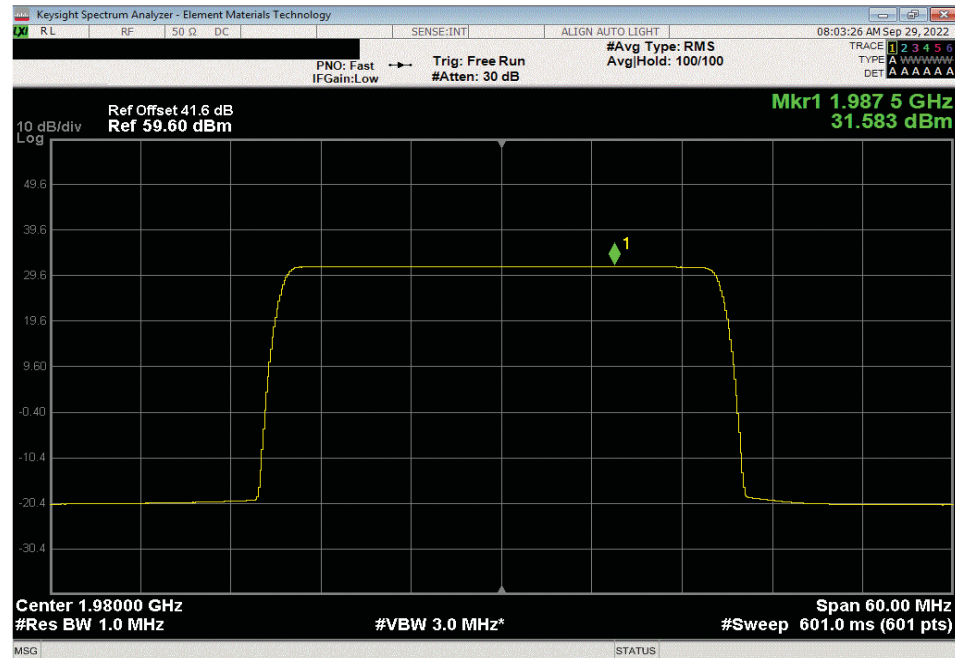


TXTX 2022.06.03.0 XMI 2022.02.07.0

Port 1, NR, Band n25, 1930 - 1995 MHz, 30 MHz, 256QAM, Mid Channel, 1962.5 MHz						
Initial Value	Duty Cycle	Single Port	Two Port (2x2 MIMO)	Four Port (4x4 MIMO)		
dBm/MHz	Factor (dB)	dBm/MHz = PSD	dBm/MHz = PSD	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	Duty Cycle	Single Port	Two Port (2x2 MIMO)	Four Port (4x4 MIMO)		
dBm/MHz	Factor (dB)	dBm/MHz = PSD	dBm/MHz = PSD	dBm/MHz = PSD		
31.583	0	31.58	34.58	37.58		



# POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n25



TXTX 2022.06.03.0 XMI 2022.02.07.0

## 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
<b>Worst Case PSD/Antenna Port</b>	32.9dBm/MHz
<b>Number of Ant Ports per Polarization</b>	2
<b>Total PSD per Polarization 10*Log (2) = +3</b>	35.9
<b>Cable Loss (site dependent)</b>	0 dB
<b>Dir Gain = Maximum Antenna Gain (GAnt) See Note 1</b>	17.9 dBi
<b>EIRP per Polarization</b>	53.8 dBm/MHz
<b>Number of Polarizations</b>	2
<b>EIRP Total = Y1 ±45° and Y2 ±45° See Note 2</b>	53.8 dBm/MHz
<b>Passing EIRP Limit</b>	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



TotTx 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 Rattanaovong	Humidity: 50.3% RH				
Project: None	Barometric Pres.: 1008 mbar				
Tested by: Marty Martin	Power: 54 VDC				
	Job Site: TX07				
<b>TEST SPECIFICATIONS</b>					
FCC 27:2022	ANSI C63.26:2015				
RSS-139 Issue 4: 2022	RSS-139 Issue 4: 2022				
<b>COMMENTS</b>					
All measurement path losses were accounted for in the reference level offset 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 determined 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)].					
<b>DEVIATIONS FROM TEST STANDARD</b>					
None					
Configuration #	2				
	Signature <i>Marty Martin</i>				
	Initial Value	Duty Cycle	Single Port	Two Port (2x2 MIMO)	Four Port (4x4 MIMO)
	dBm/MHz	Factor (dB)	dBm/MHz = PSD	dBm/MHz = PSD	dBm/MHz = PSD

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

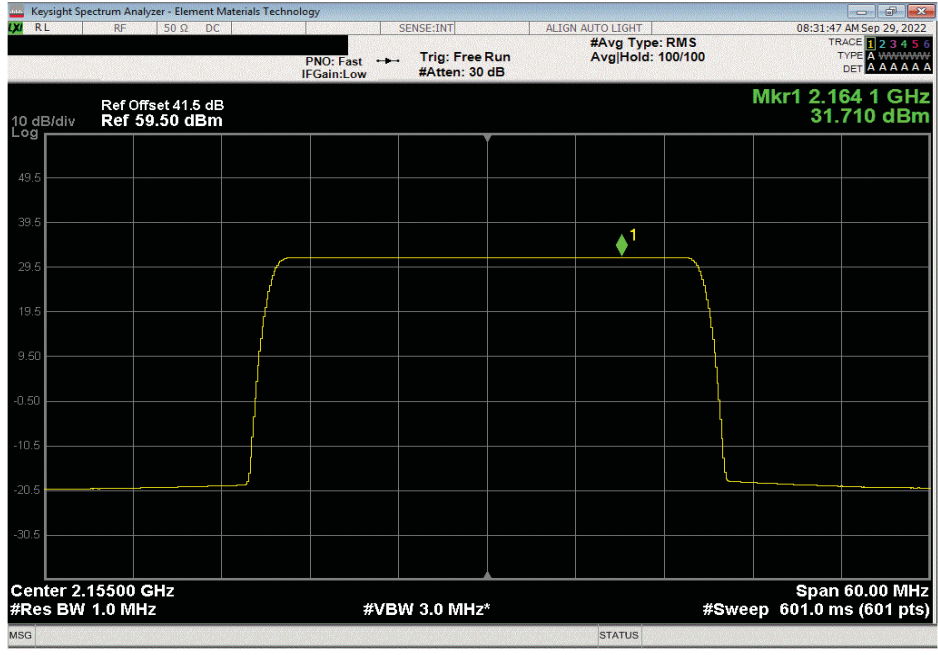


# POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n66

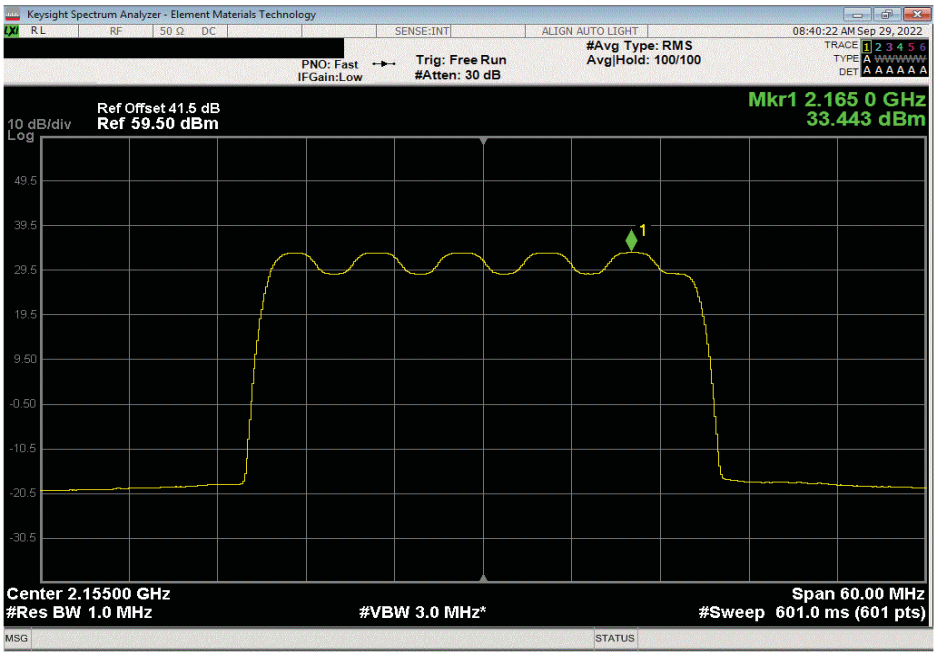


TbTx 2022.06.03.0 XMI 2022.02.07.0

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

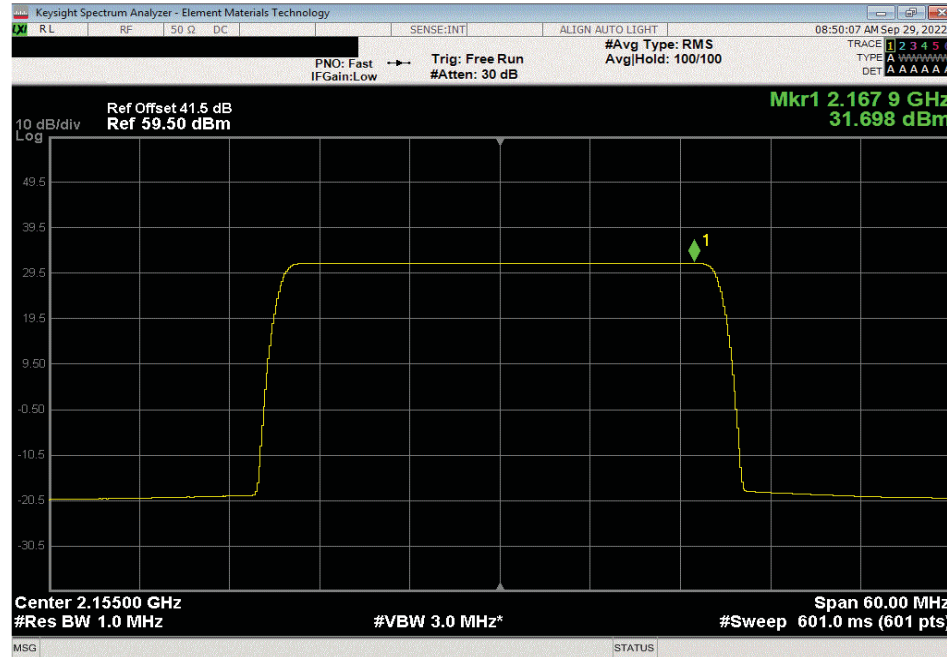


# POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n66

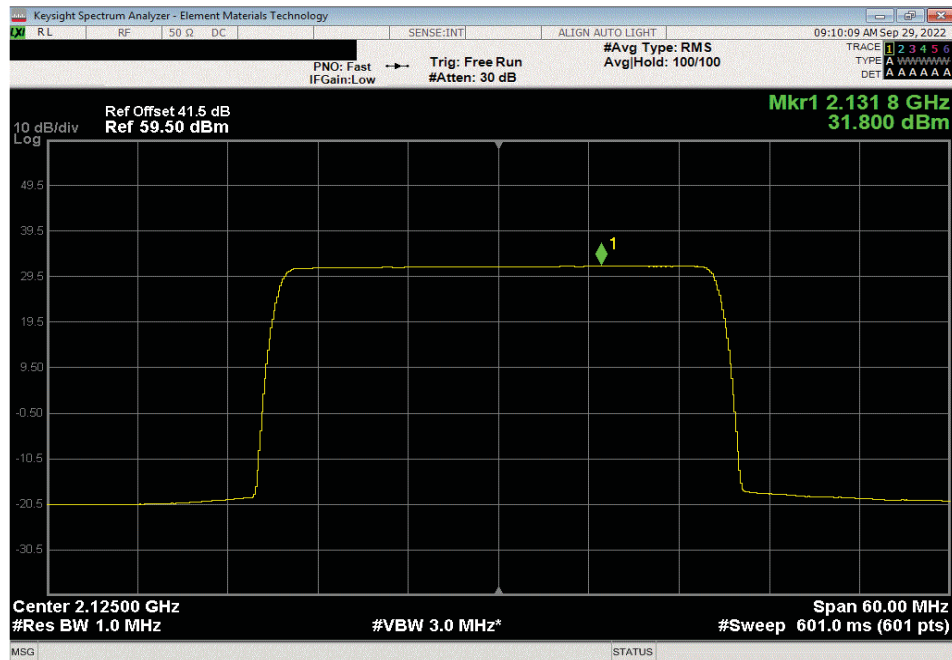


TbTx 2022.06.03.0 XMI 2022.02.07.0

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	

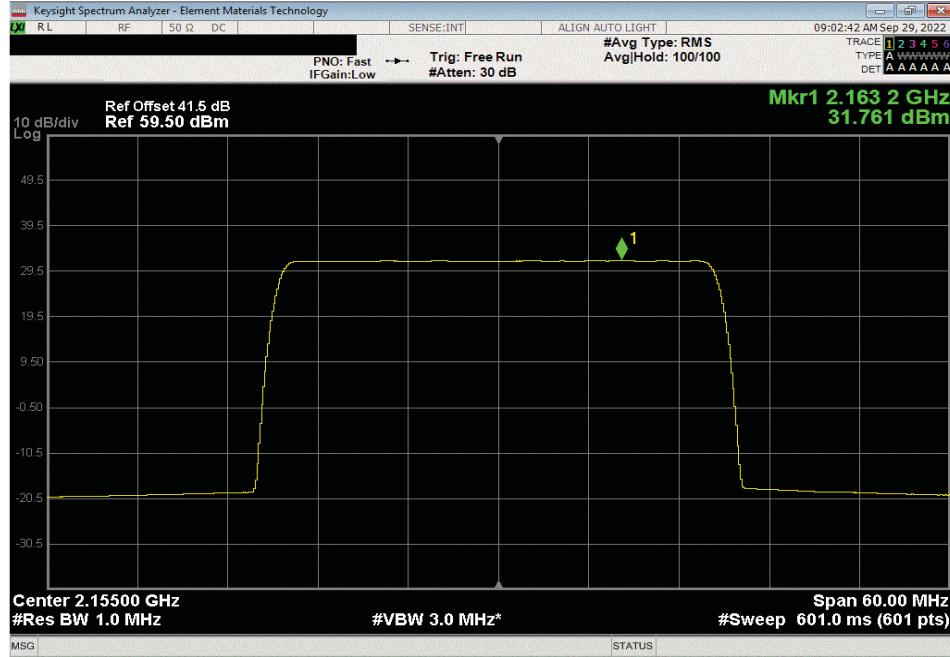


# POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n66

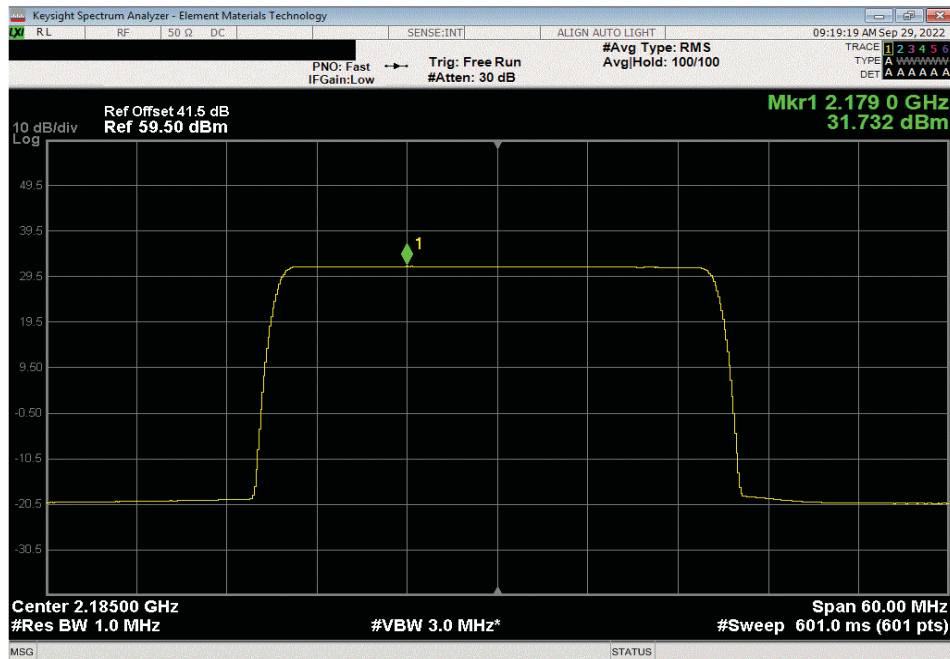


TXTX 2022.06.03.0 XMM 2022.02.07.0

Port 1, NR, Band n66, 2110 - 2200 MHz, 30 MHz, 256QAM, Mid Channel, 2155 MHz						
	Initial Value	Duty Cycle	Single Port	Two Port (2x2 MIMO)	Four Port (4x4 MIMO)	
	dBm/MHz	Factor (dB)	dBm/MHz = PSD	dBm/MHz = PSD	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	Duty Cycle	Single Port	Two Port (2x2 MIMO)	Four Port (4x4 MIMO)	
	dBm/MHz	Factor (dB)	dBm/MHz = PSD	dBm/MHz = PSD	dBm/MHz = PSD	
	31.732	0	31.73	34.73	37.73	



# POWER SPECTRAL DENSITY AND EIRP CALCULATIONS- BAND n66



TXTX 2022.06.03.0 XMI 2022.02.07.0

## 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
<b>Worst Case PSD/Antenna Port</b>	33.4dBm/MHz
<b>Number of Ant Ports per Polarization</b>	2
<b>Total PSD per Polarization <math>10^{\circ}\log(2) = +3</math></b>	36.4
<b>Cable Loss (site dependent)</b>	0 dB
<b>Dir Gain = Maximum Antenna Gain (G<sub>Ant</sub>) See Note 1</b>	18.2 dBi
<b>EIRP per Polarization</b>	54.6 dBm/MHz
<b>Number of Polarizations</b>	2
<b>EIRP Total = Y1 +45° and Y2 +45° See Note 2</b>	54.6 dBm/MHz
<b>Passing EIRP Limit</b>	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



XMI: 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				
FCC 24E:2022		Test Method: ANSI C63.26:2015		
RSS-133:2018		RSS-133:2018		
COMMENTS				
All measurement path losses were accounted for in the reference level offset 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 <i>Marty Martin</i>		
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

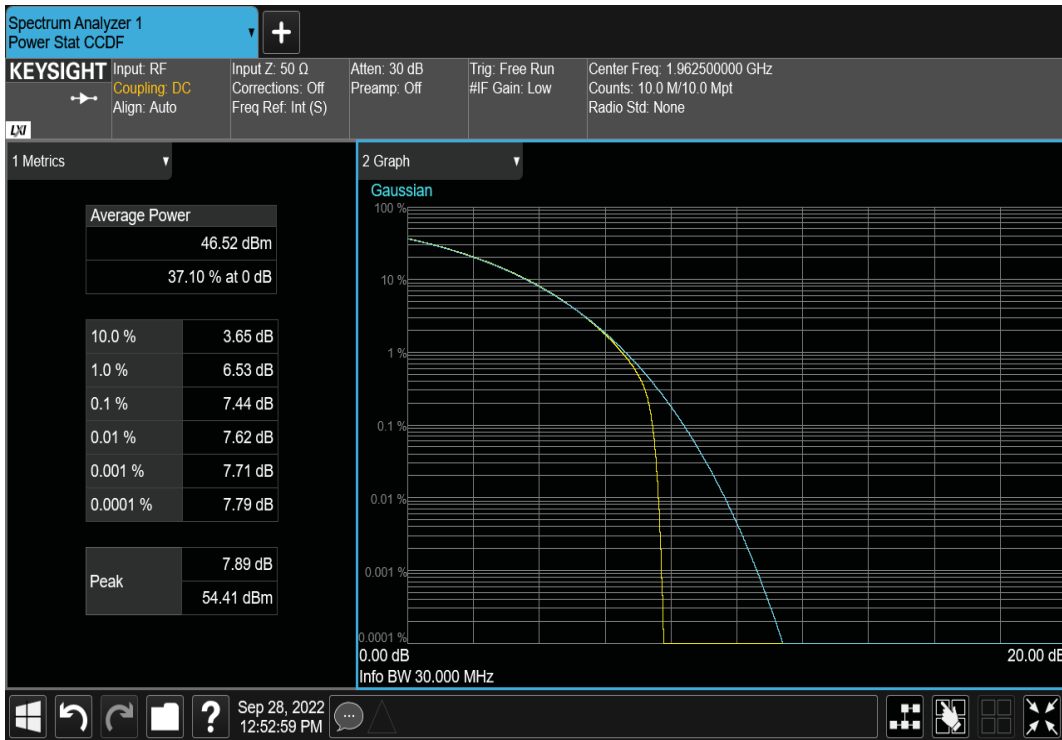
# PEAK TO AVERAGE POWER (CCDF) - BAND n25



XMI 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



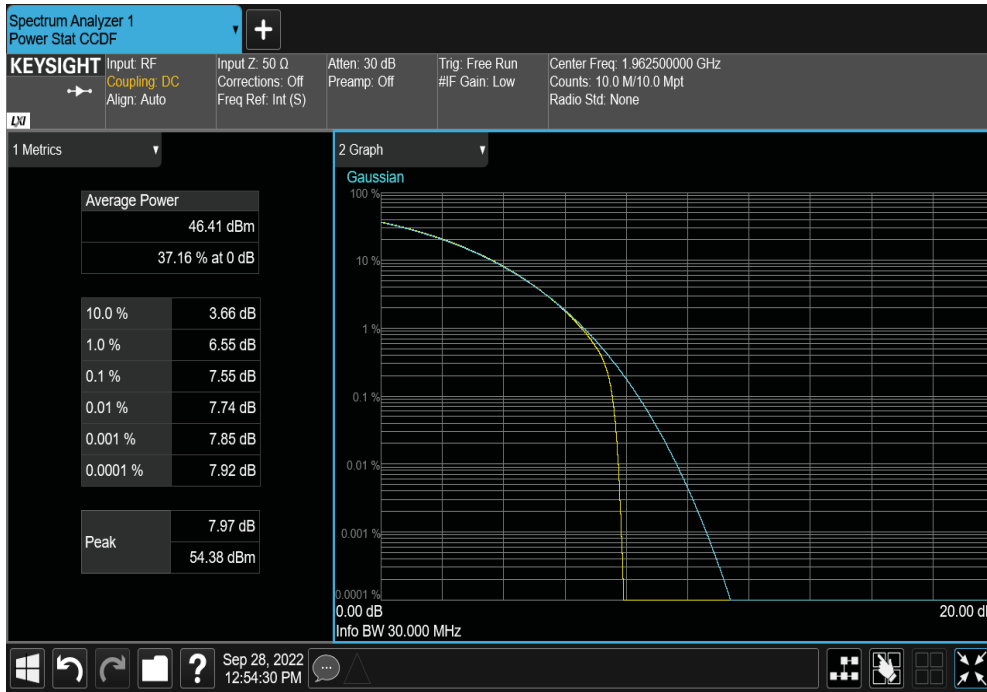
# PEAK TO AVERAGE POWER (CCDF) - BAND n25



XMI 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





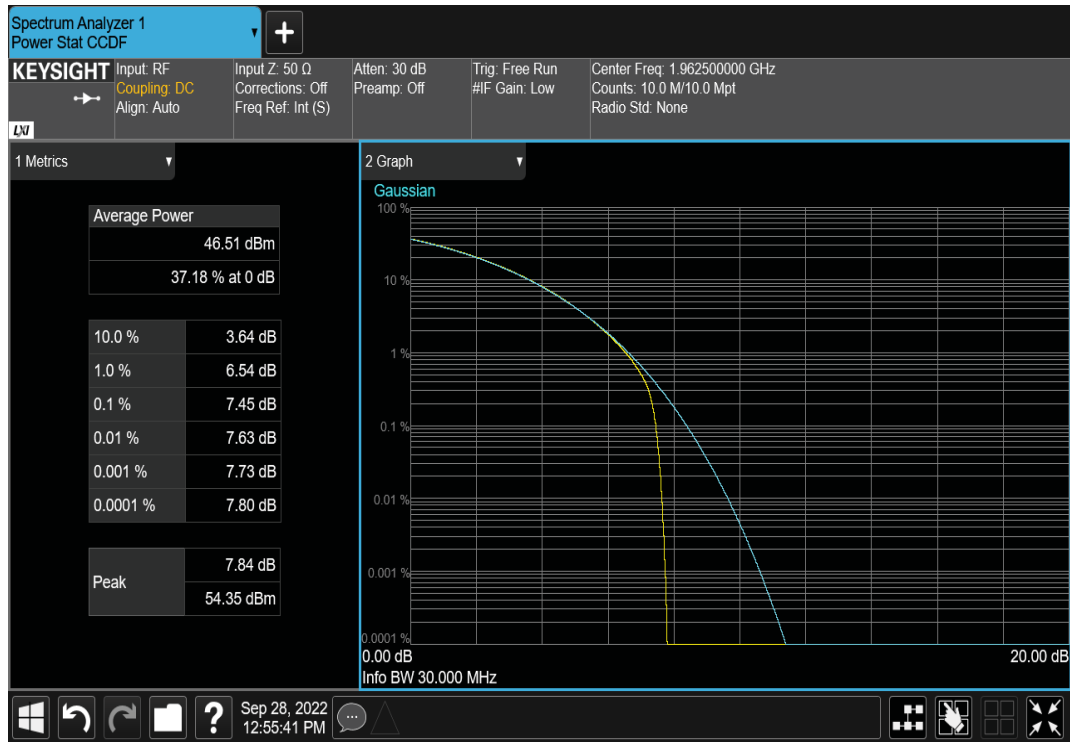
# PEAK TO AVERAGE POWER (CCDF) - BAND n25



XMI 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



XMI 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



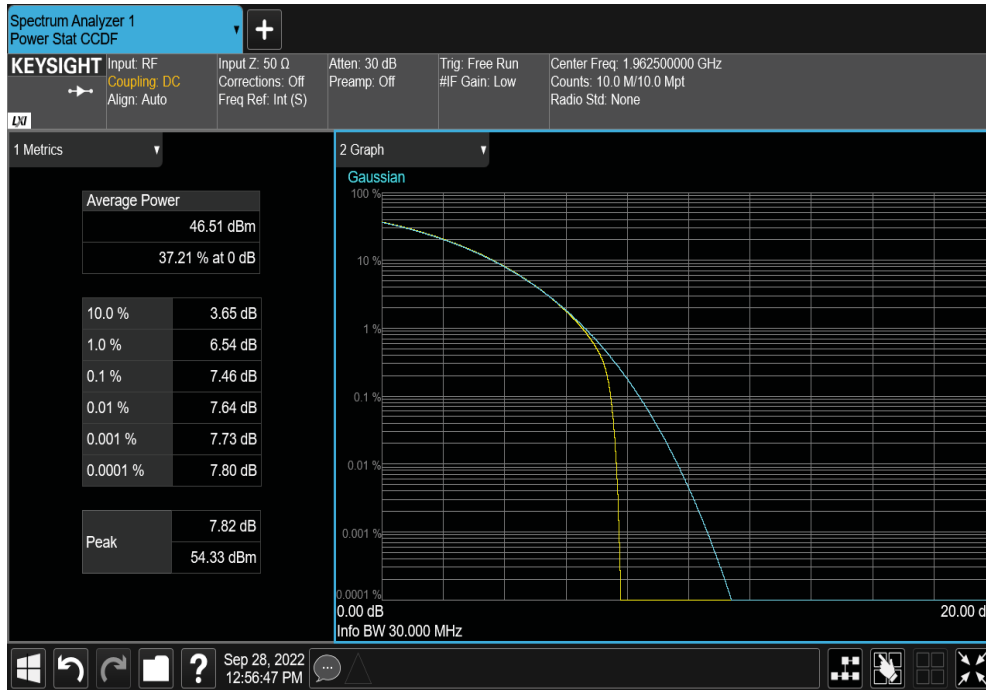
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XMI 2022.02.07.0

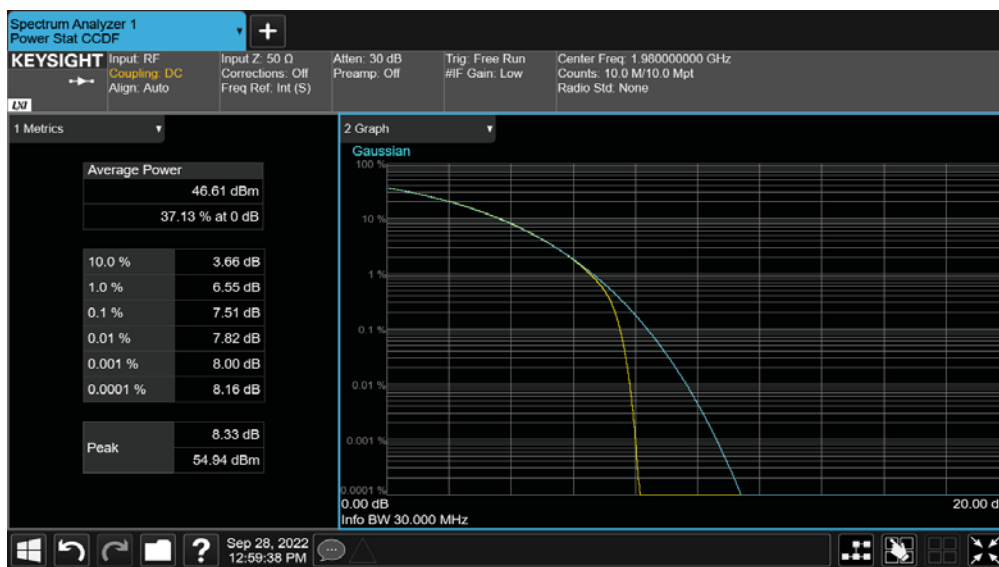
Port 1, NR, Band n25 1930 - 1995 MHz, 30 MHz Bandwidth, 256QAM, Mid Channel 1962.5 MHz

	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



element

XMIT 2022.02.07.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	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		
FCC 27:2022		Test Method
RSS-139 Issue 4: 2022		ANSI C63.26:2015
		RSS-139 Issue 4: 2022
COMMENTS		
All measurement path losses were accounted for in the reference level offset 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 <i>Marty Martin</i>
		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	Mid Channel 2155 MHz	
	Low Channel 2125 MHz	7.51      13      Pass
	Mid Channel 2155 MHz	7.43      13      Pass
	High Channel 2185 MHz	7.51      13      Pass

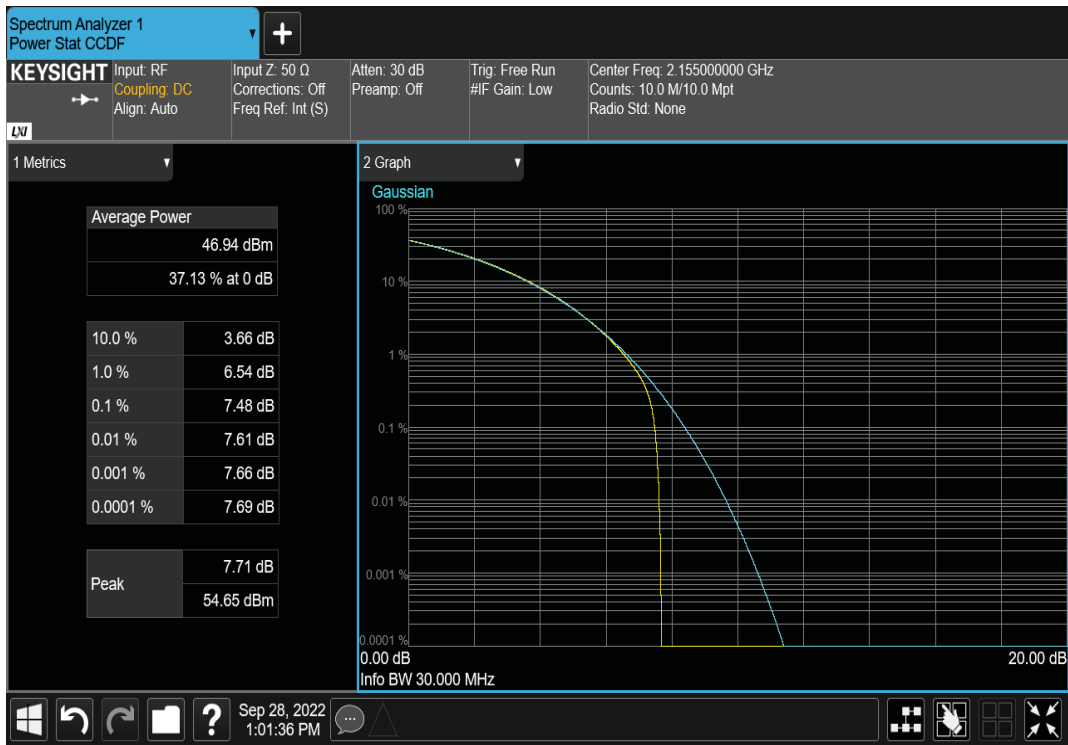
# PEAK TO AVERAGE POWER (CCDF) - BAND n66



XMI 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



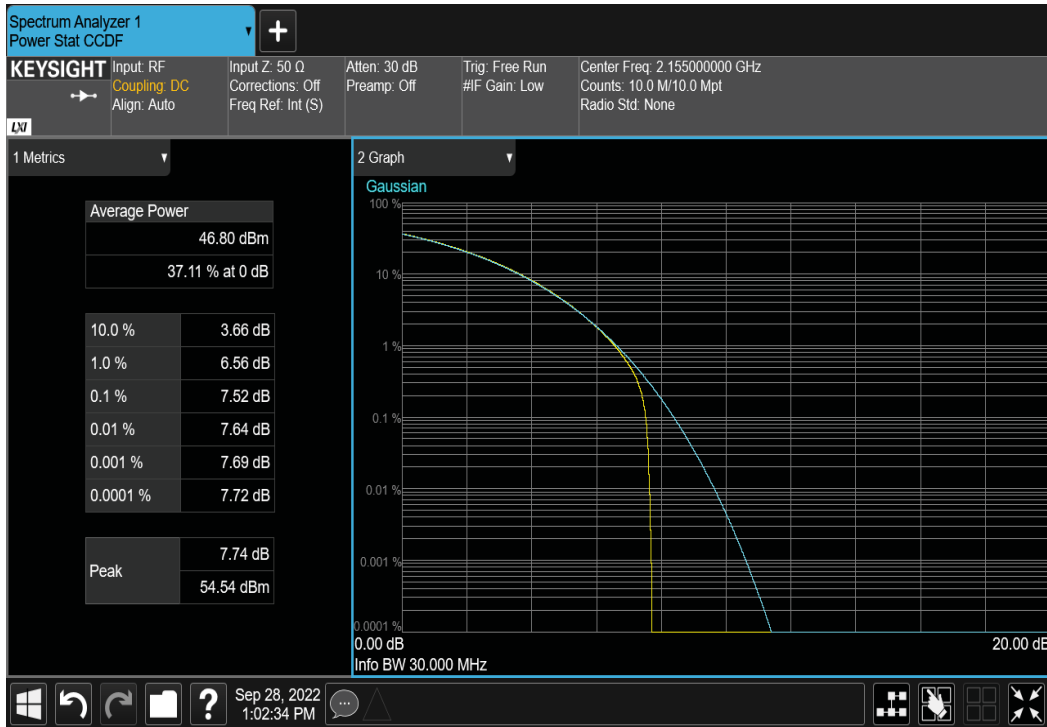
# PEAK TO AVERAGE POWER (CCDF) - BAND n66



XMM 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



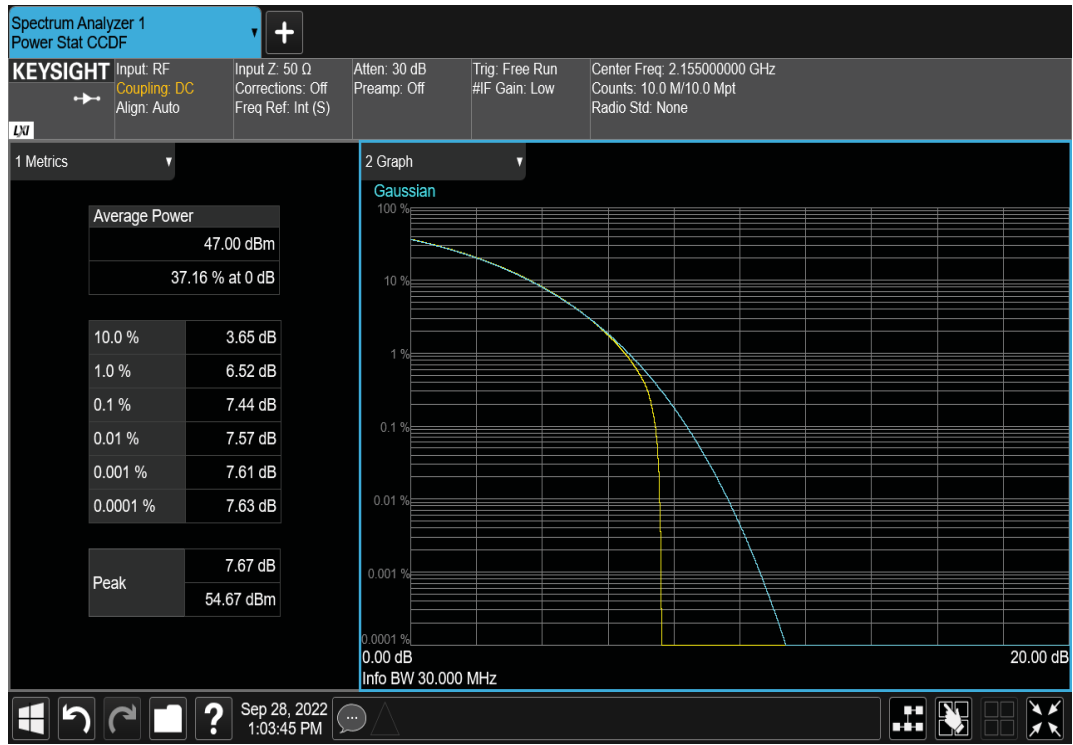
# PEAK TO AVERAGE POWER (CCDF) - BAND n66



XMI 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



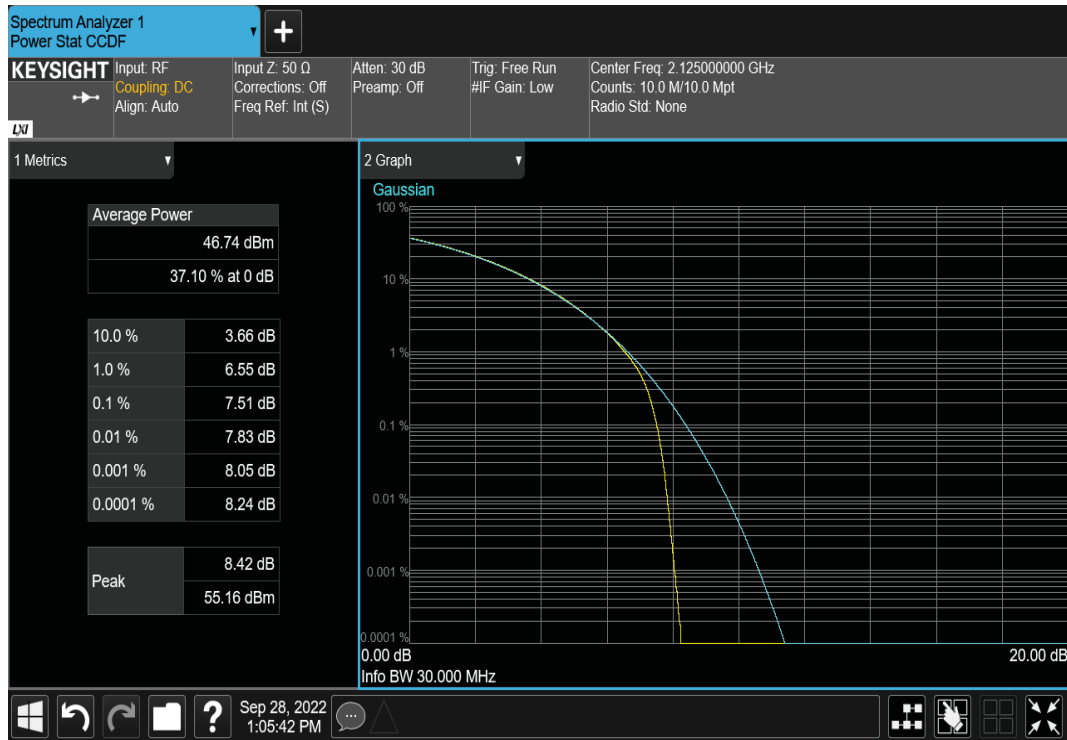


# PEAK TO AVERAGE POWER (CCDF) - BAND n66



XMtr 2022.02.07.0

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

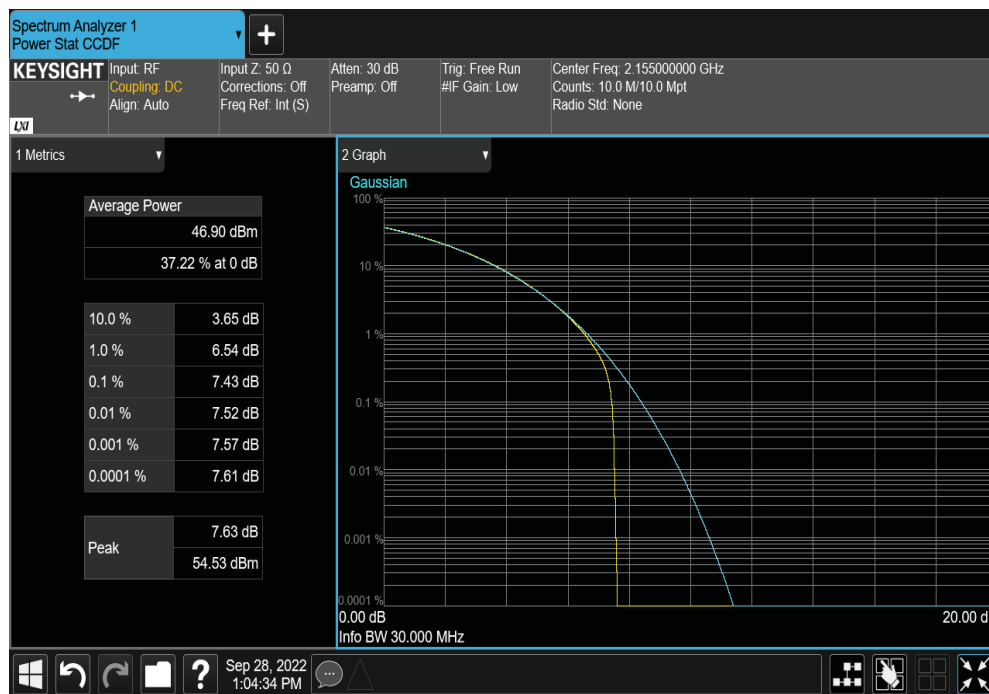


# PEAK TO AVERAGE POWER (CCDF) - BAND n66

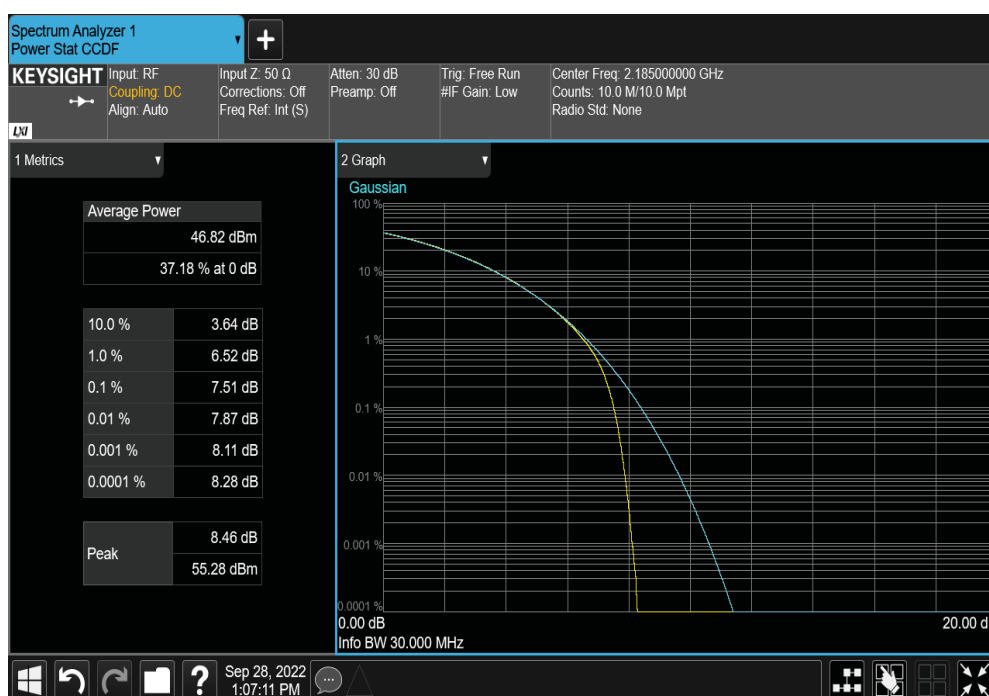


XMIT 2022.02.07.0

Port 1, NR, Band 66, 2110 - 2200 MHz 30 MHz Bandwidth , 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  $[-10 \cdot \log(4)]$  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  $[-13 \text{ dBm} - 10 \log(4)]$  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



Tel: 2022.06.03.0 XMI: 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	
TEST SPECIFICATIONS		Job Site: TX07	
FCC 24E:2022		Test Method	
RSS-133:2018		ANSI C63.26:2015	
COMMENTS		RSS-133:2018	
All measurement path losses were accounted for in the reference level offset 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 <i>Marty Martin</i>	

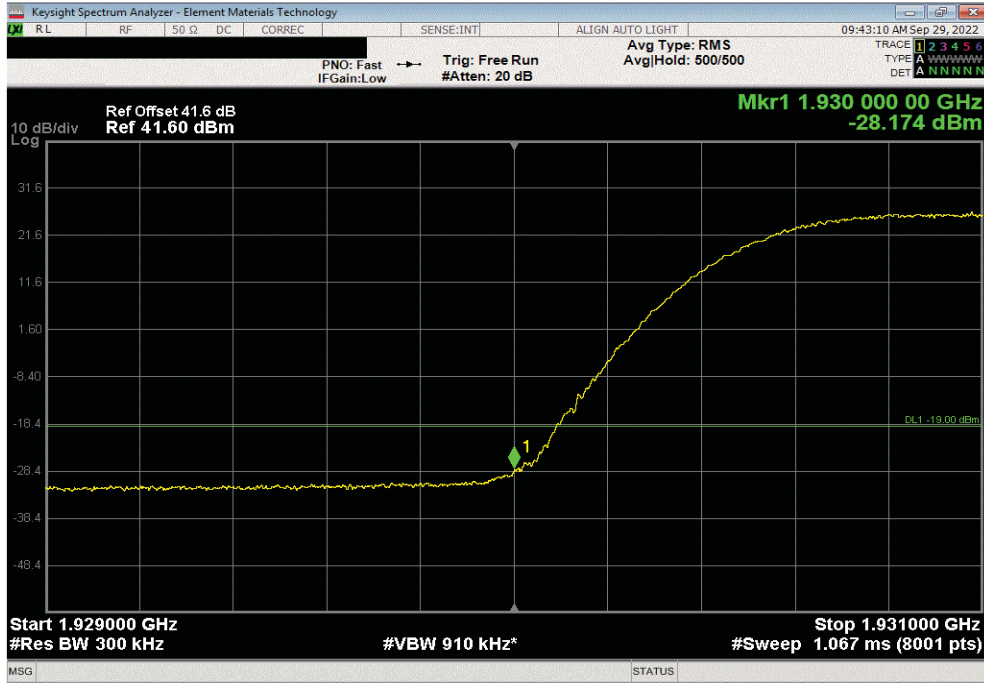
Port 1, NR, Band n25, 1930 - 1995 MHz	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
30 MHz					
QPSK					
Low Channel, 1945 MHz	1	1930	-28.17	-19	Pass
Low Channel, 1945 MHz	2	1928.5	-27.31	-19	Pass
Low Channel, 1945 MHz	3	1927.95	-27.37	-19	Pass
High Channel, 1980 MHz	1	1995	-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

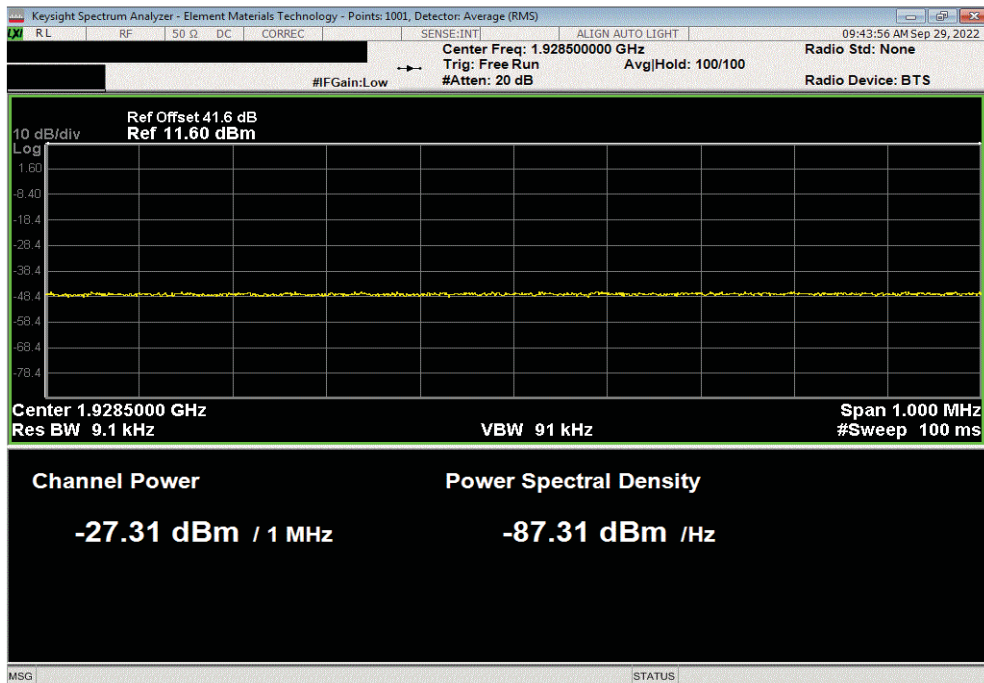


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

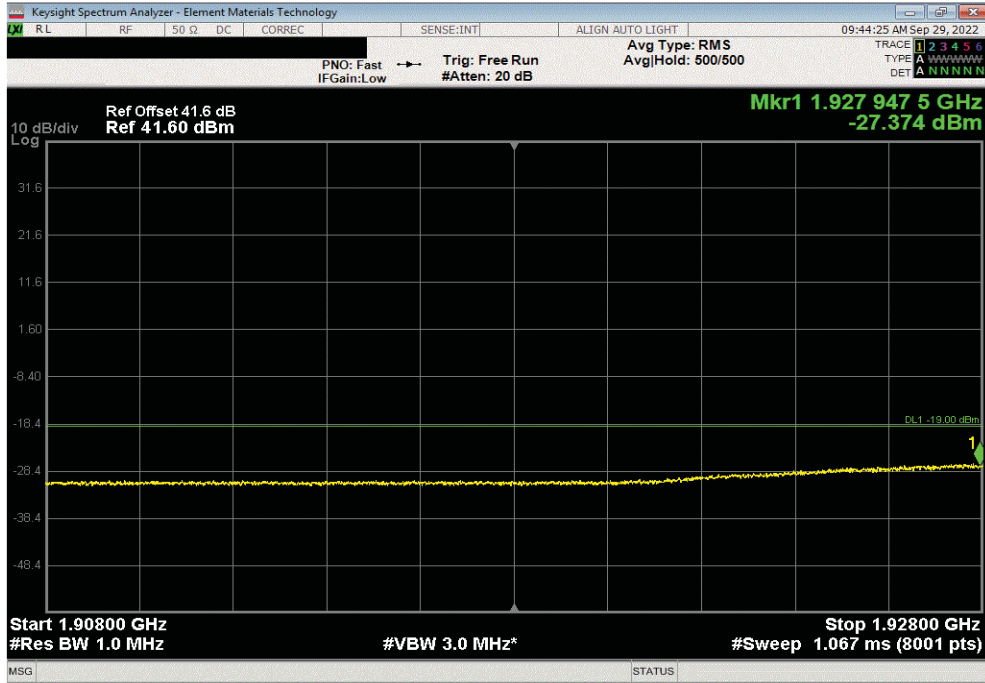


# BAND EDGE COMPLIANCE- BAND n25

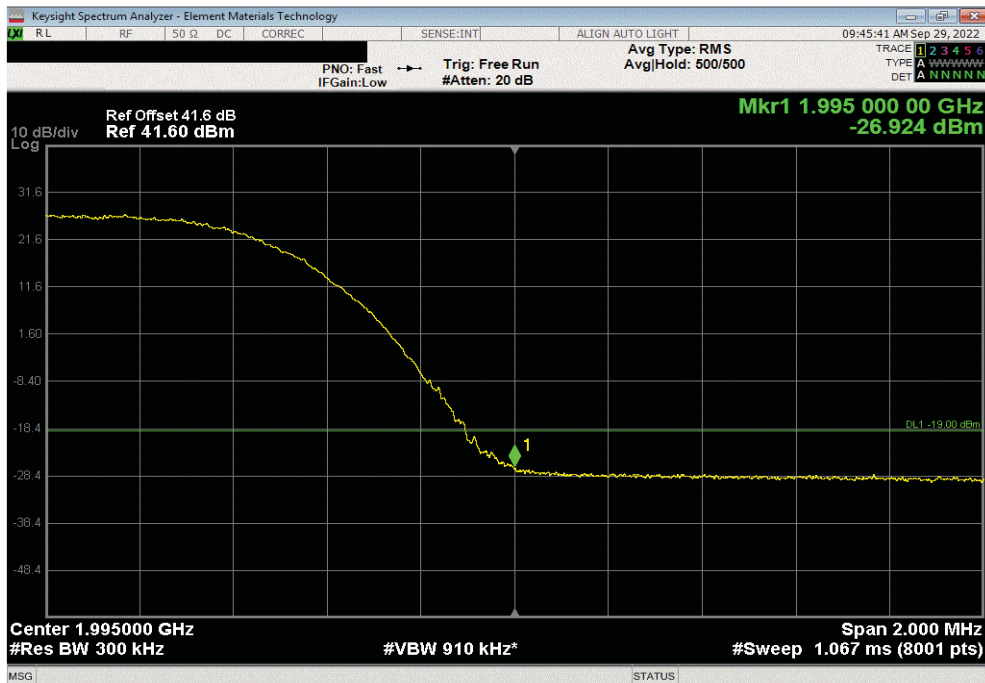


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

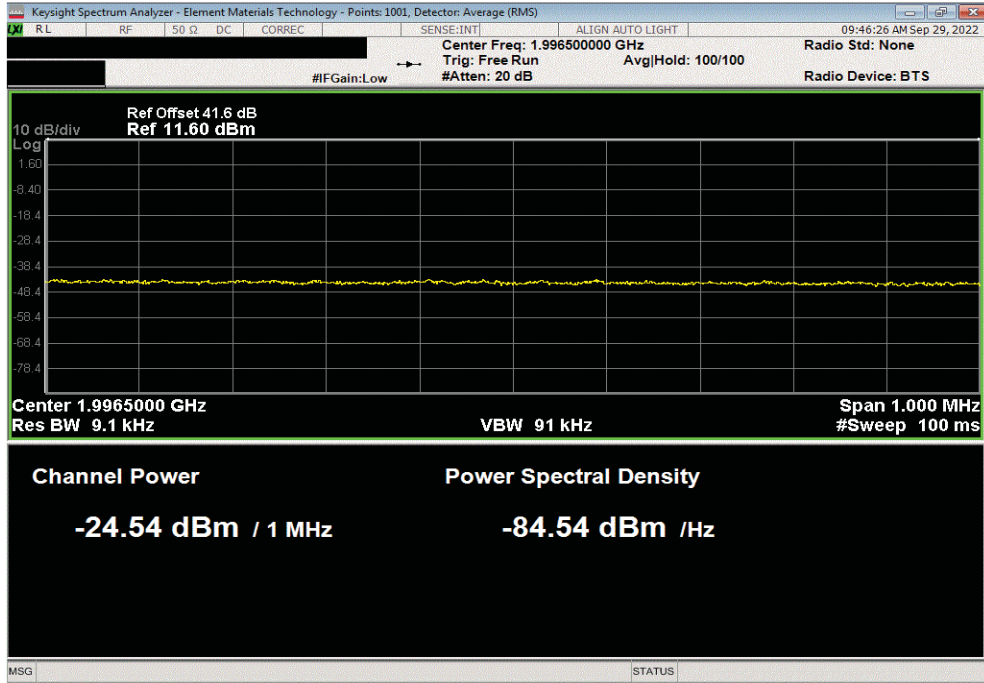


# BAND EDGE COMPLIANCE- BAND n25

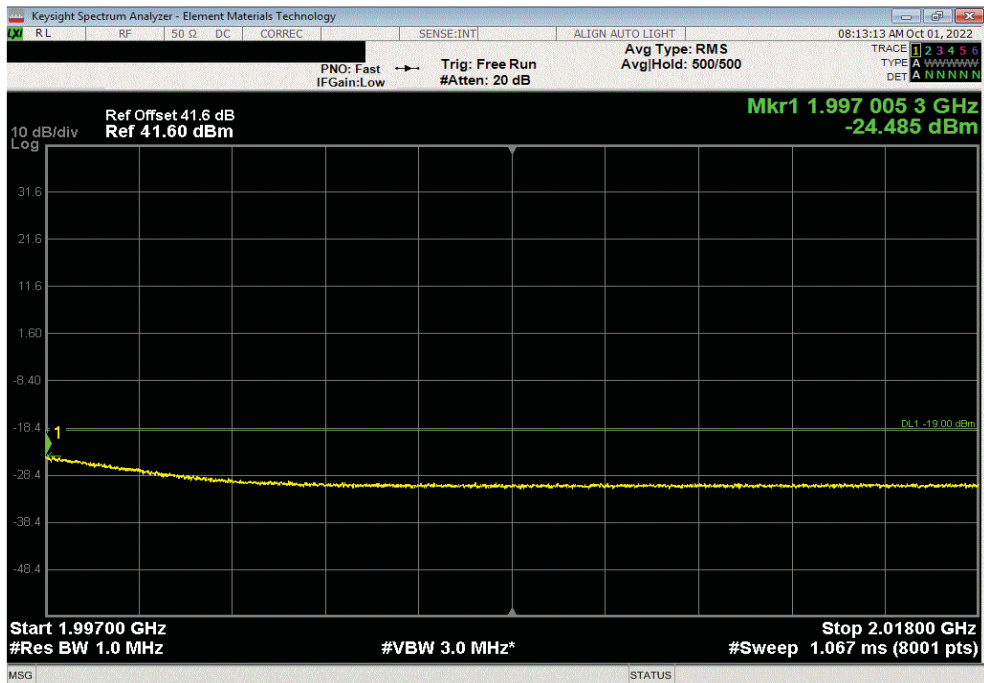


TbTx 2022.06.03.0 XMit 2022.02.07.0

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		

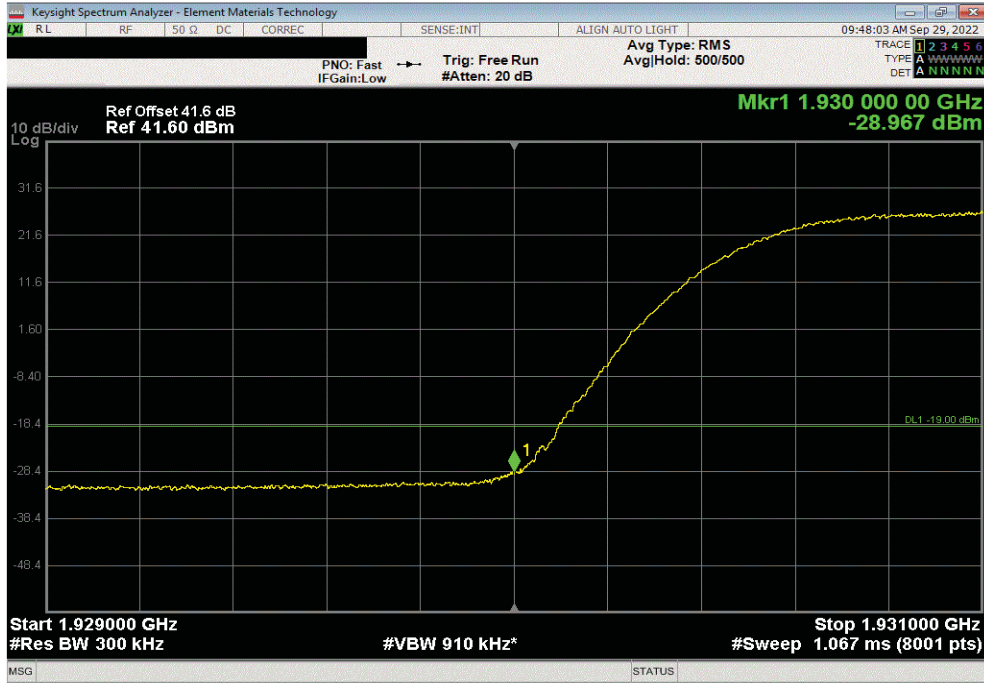


# BAND EDGE COMPLIANCE- BAND n25

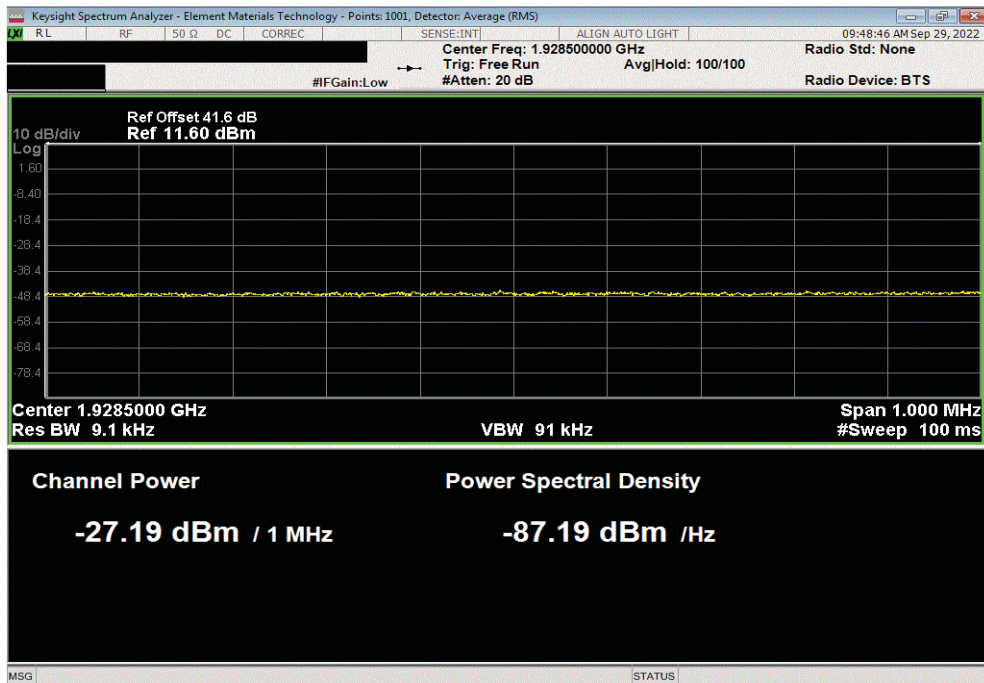


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		



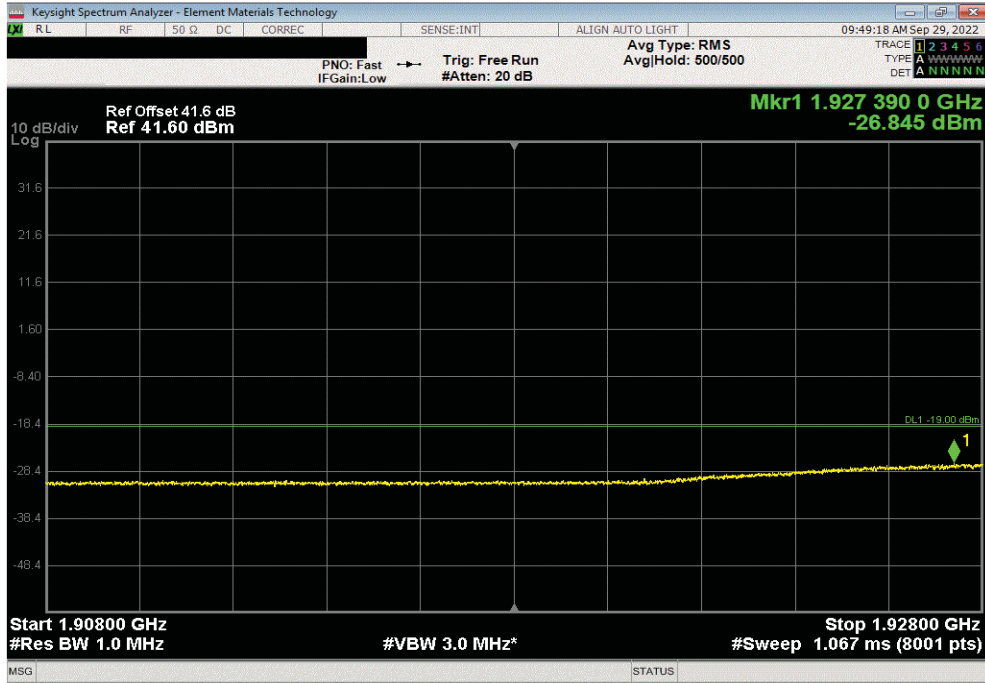


# BAND EDGE COMPLIANCE- BAND n25

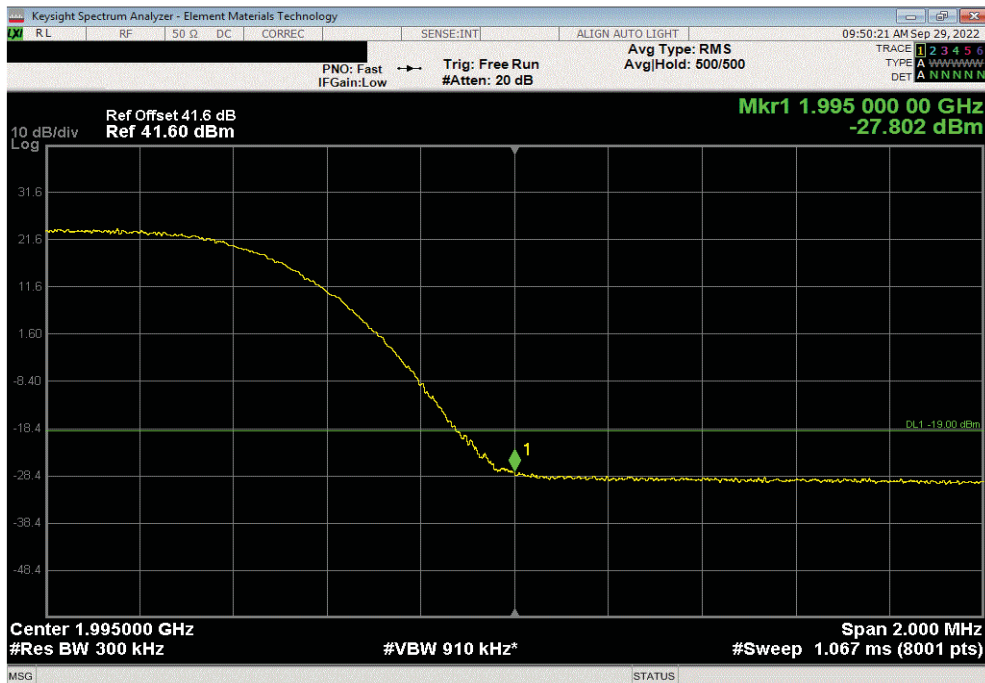


TbTx 2022.06.03.0 XMit 2022.02.07.0

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		

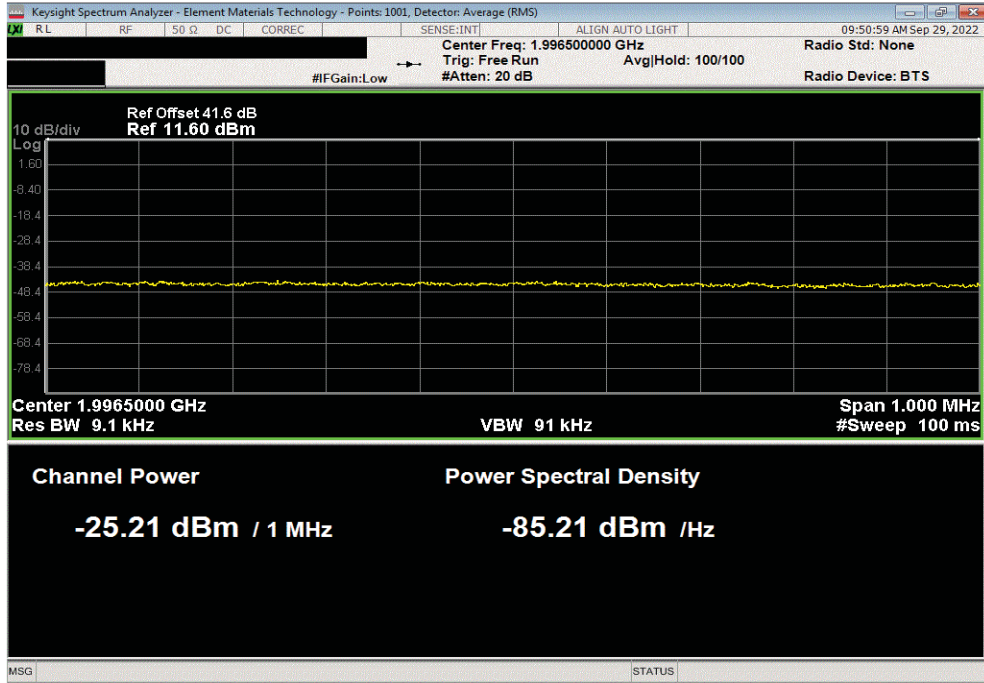


# BAND EDGE COMPLIANCE- BAND n25

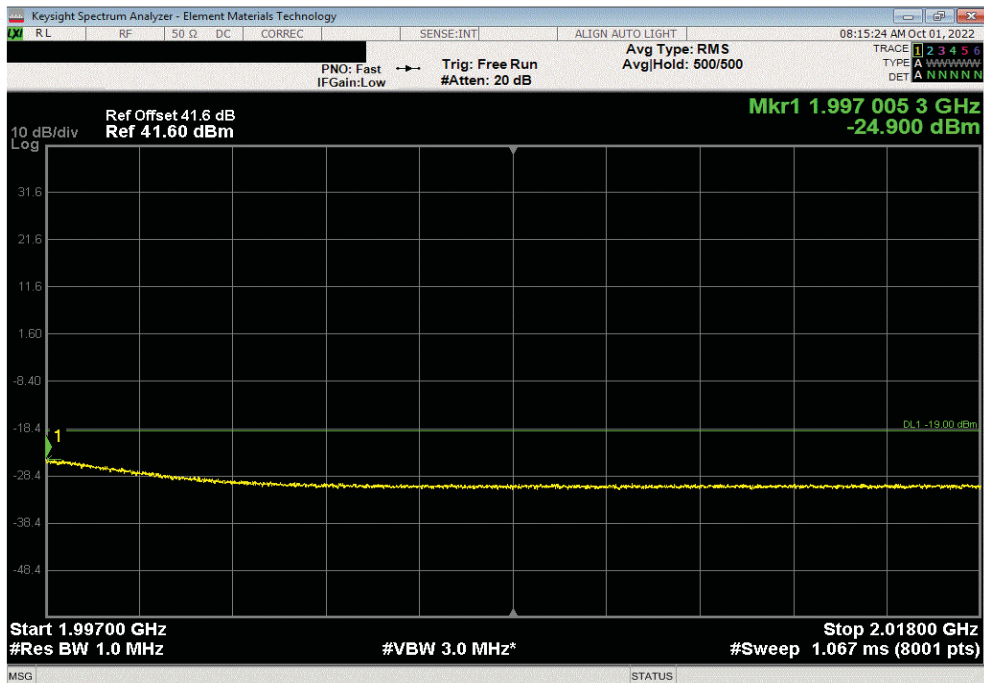


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

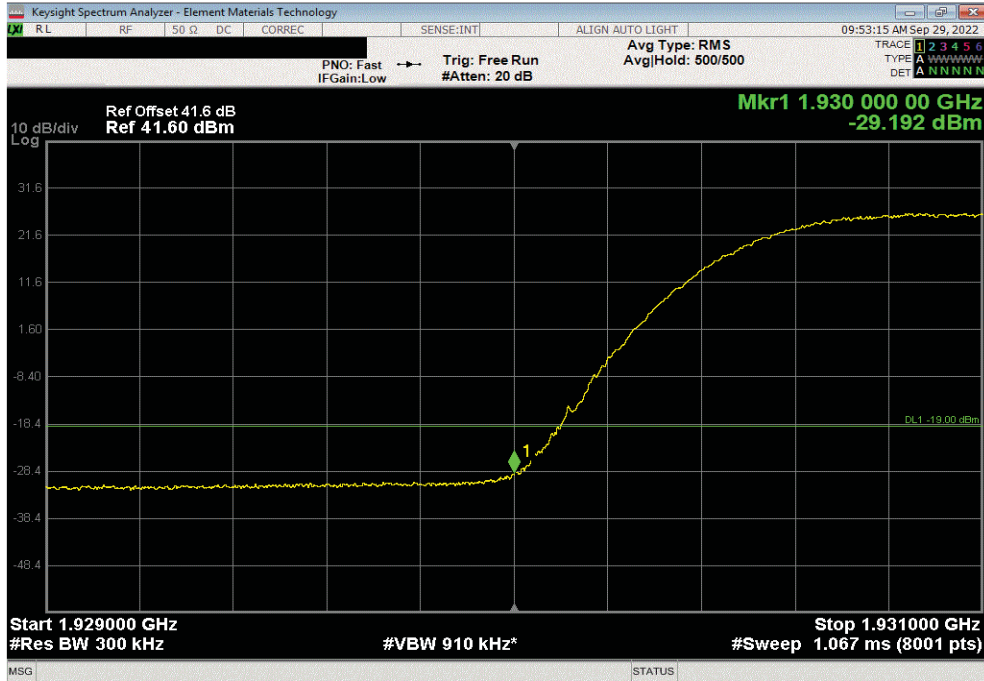


# BAND EDGE COMPLIANCE- BAND n25

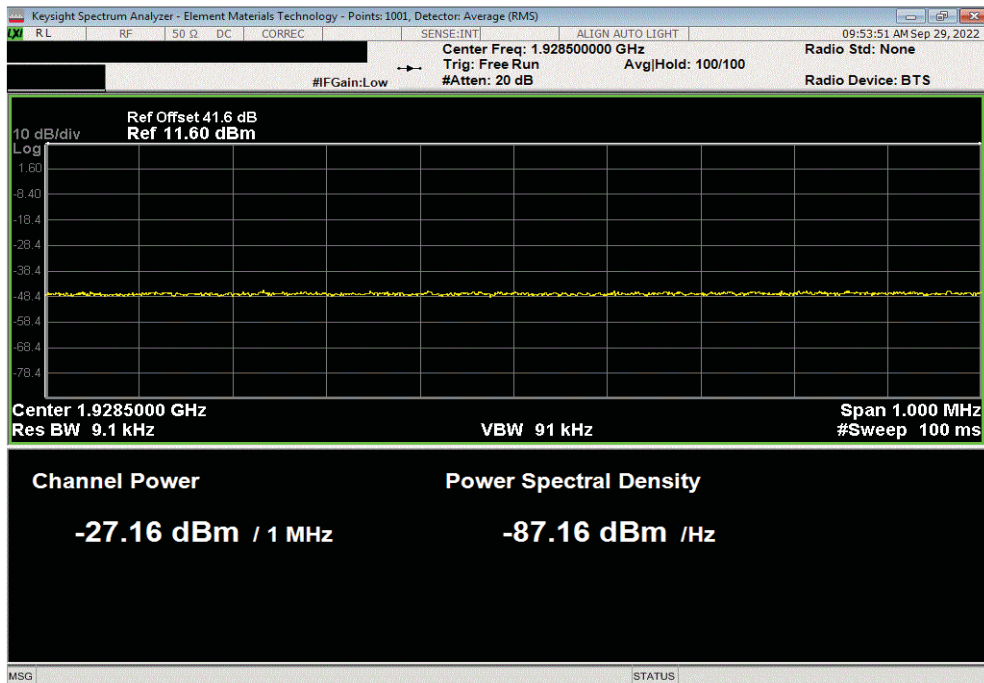


TbTx 2022.06.03.0 XMit 2022.02.07.0

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		

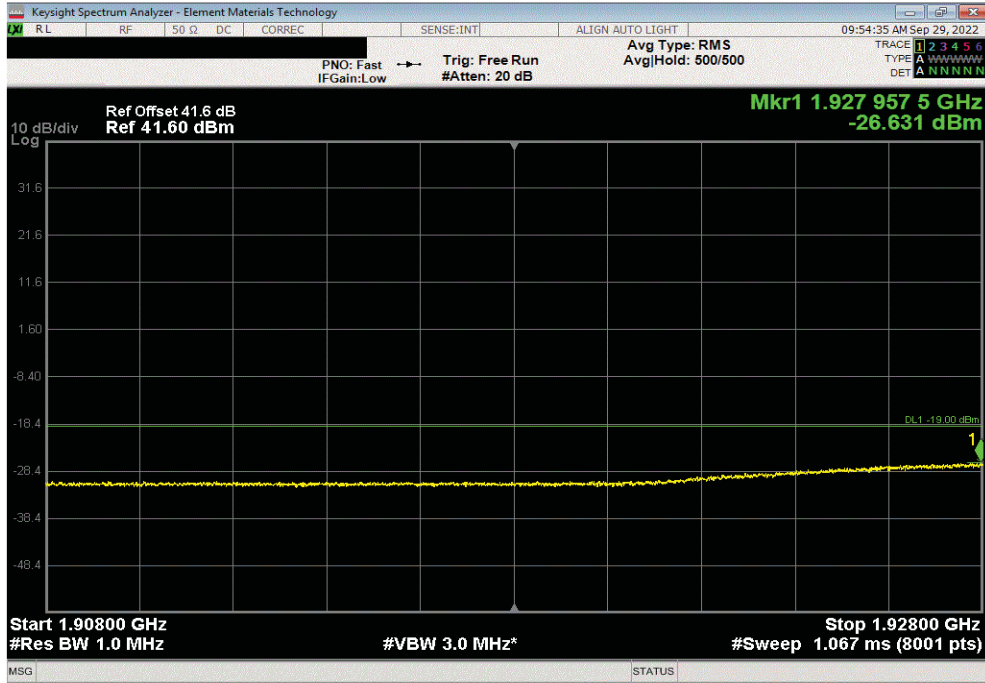


# BAND EDGE COMPLIANCE- BAND n25

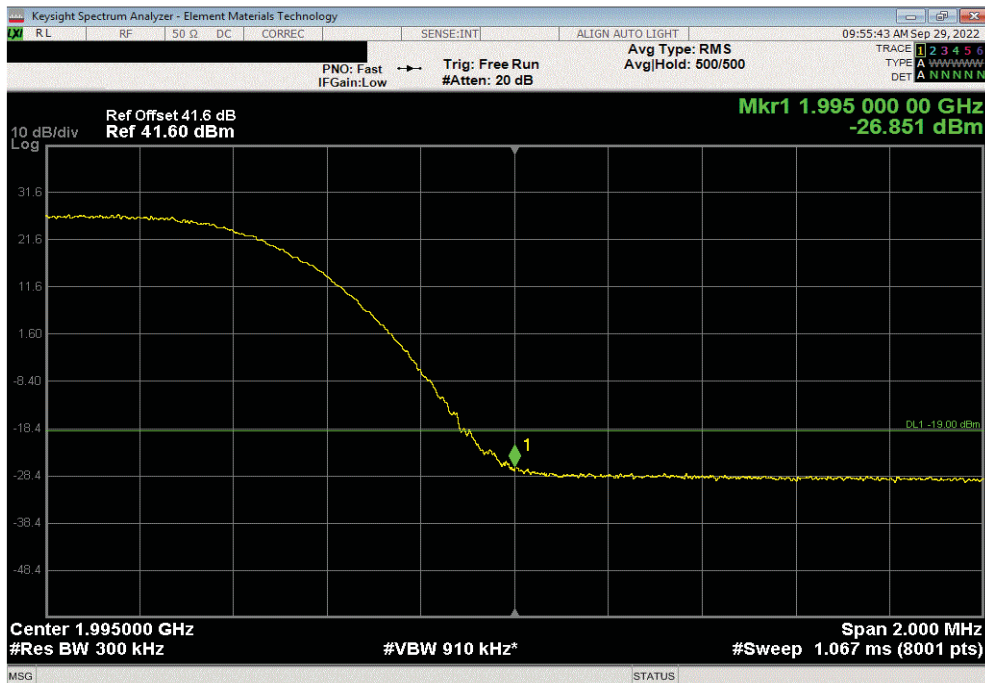


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

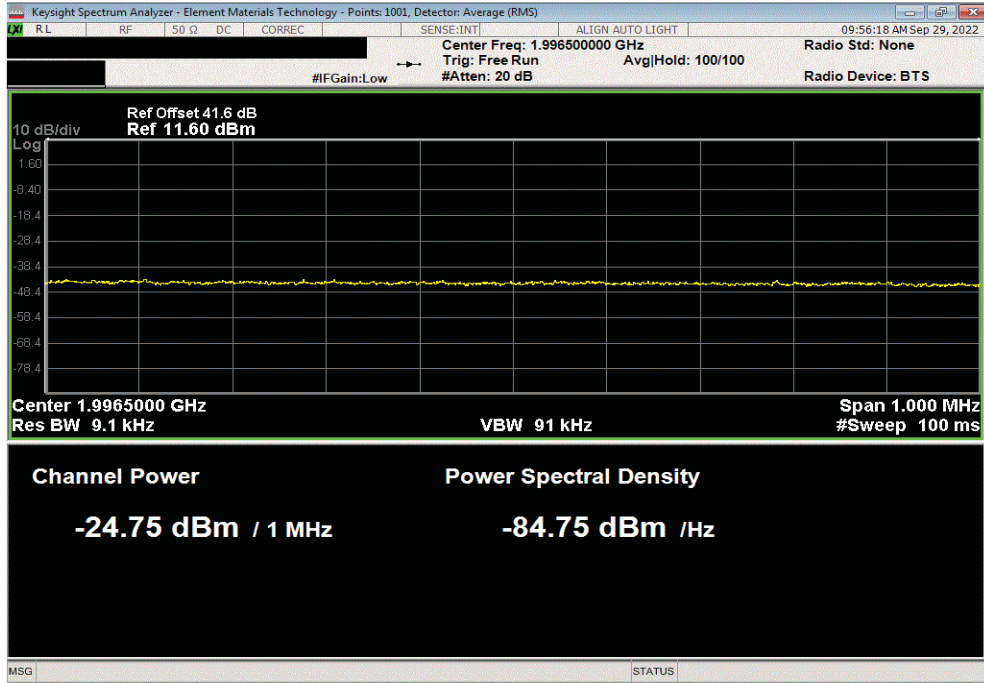


# BAND EDGE COMPLIANCE- BAND n25

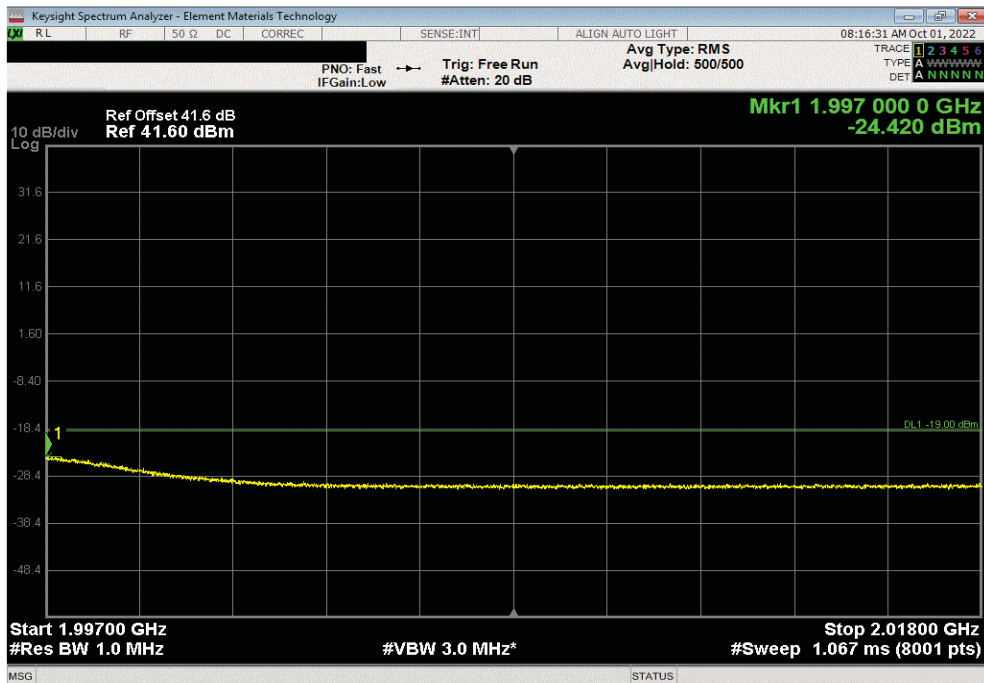


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

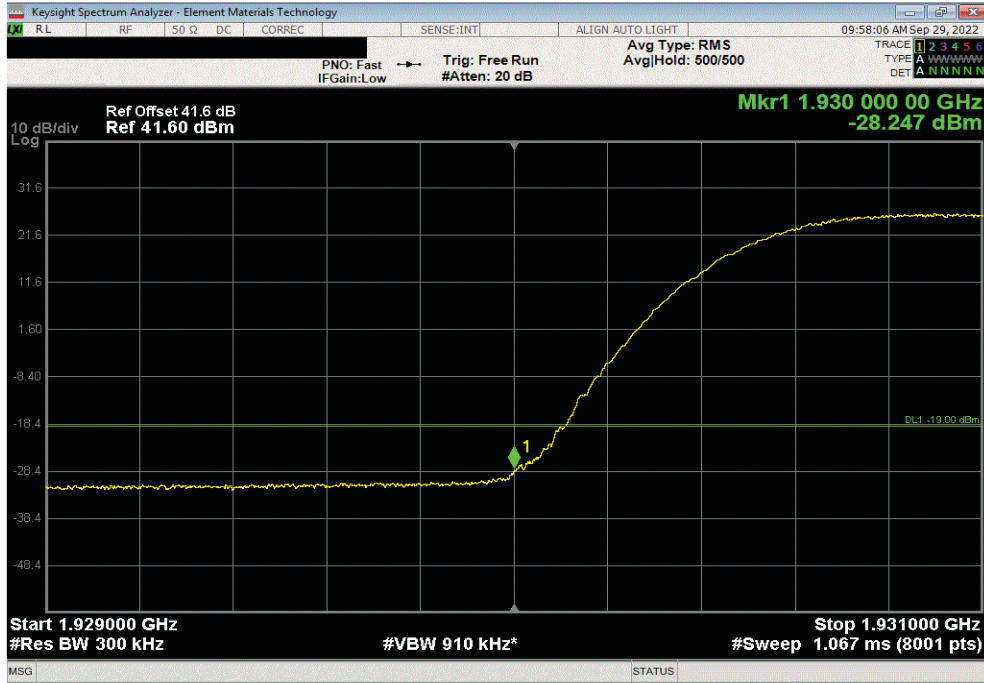


# BAND EDGE COMPLIANCE- BAND n25

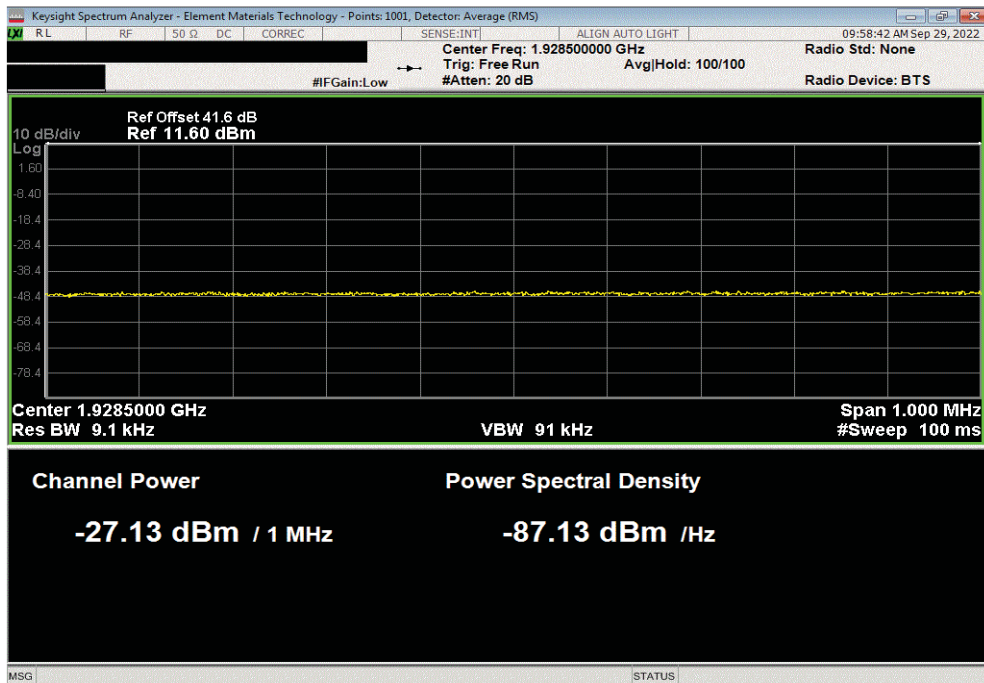


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

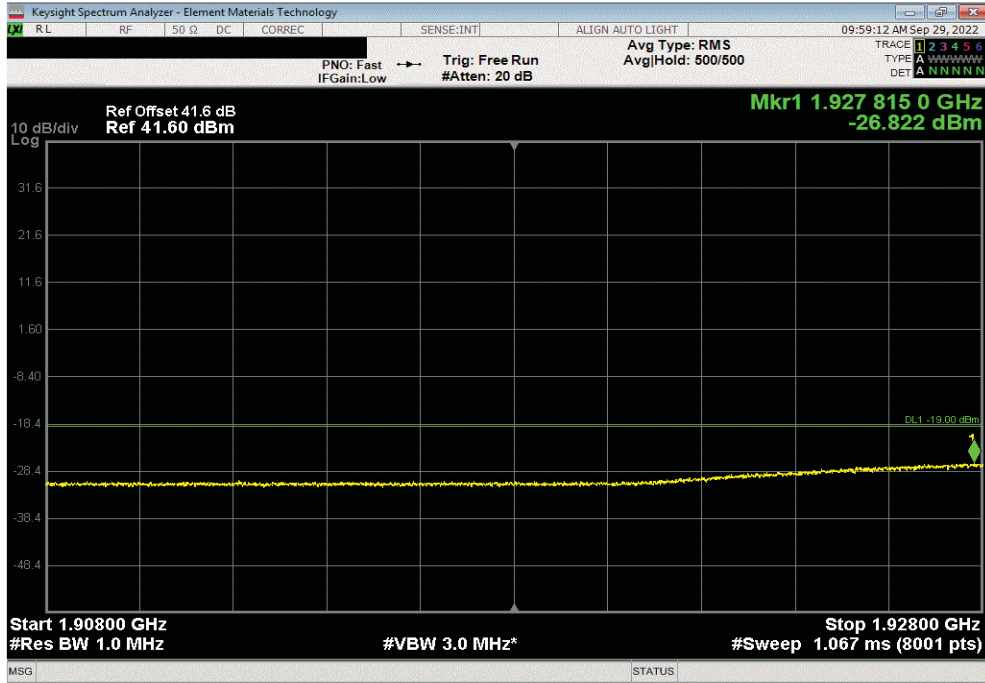


# BAND EDGE COMPLIANCE- BAND n25

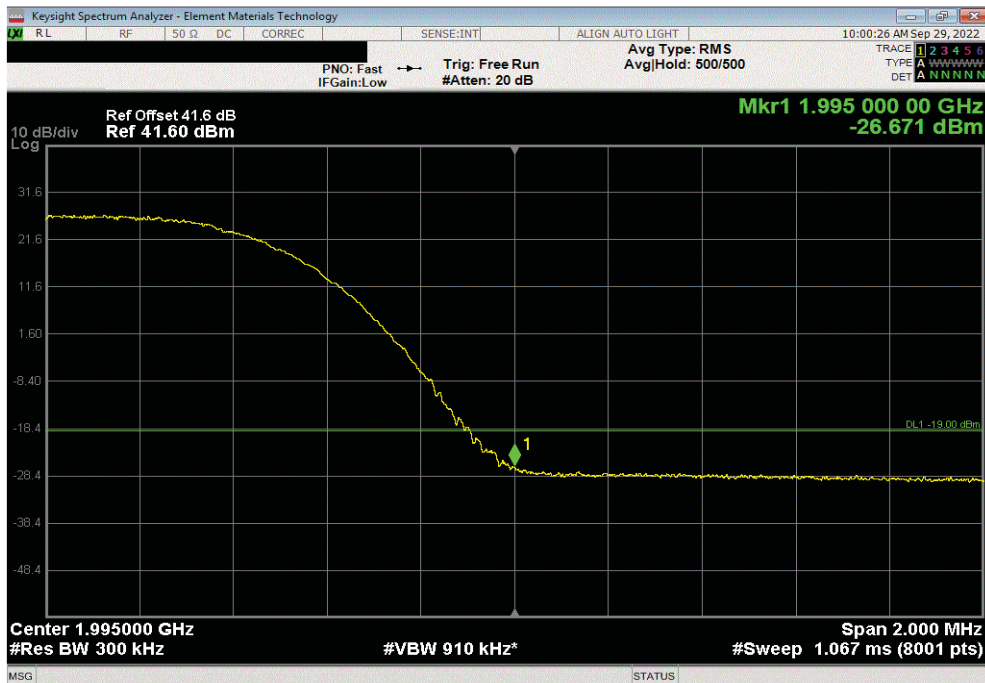


TbTx 2022.06.03.0 XMit 2022.02.07.0

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		

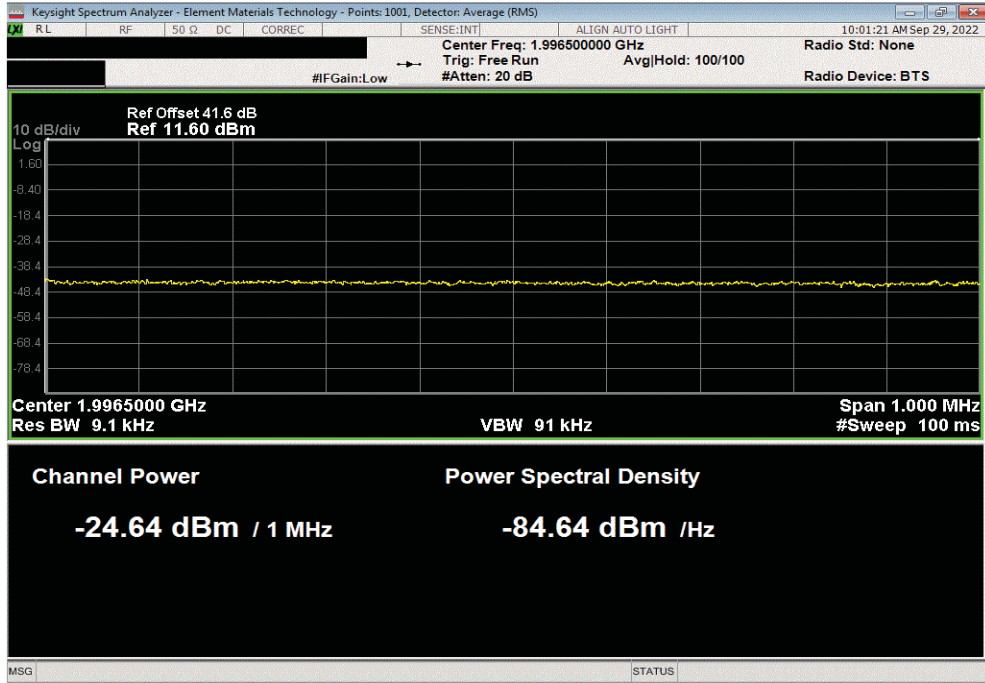


# BAND EDGE COMPLIANCE- BAND n25

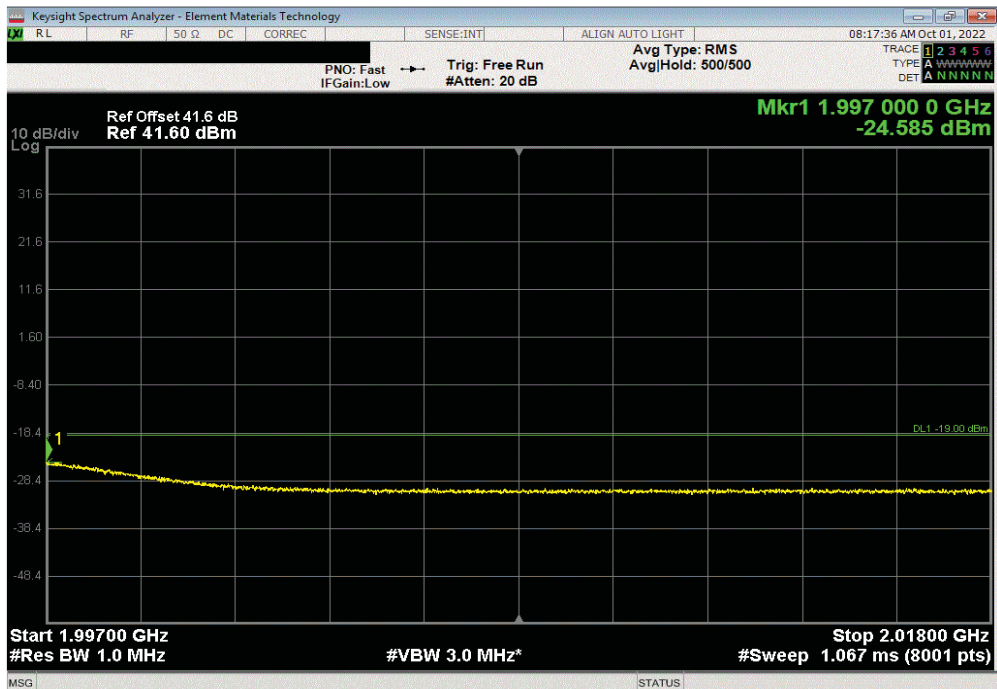


TbTx 2022.06.03.0 XMit 2022.02.07.0

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  $[-10 \cdot \log(4)]$  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  $[-13 \text{ dBm} - 10 \log(4)]$  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



TstTx 2022.06.03.0 XMI: 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 Method	
TEST SPECIFICATIONS		FCC 27:2022	
ANSI C63.26:2015		RSS-139 Issue 4:2022	
COMMENTS		All measurement path losses were accounted for in the reference level offset 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 <i>Marty Martin</i>	
		Frequency Range	Measured Freq (MHz)
		Max Value (dBm)	Limit (dBm)
			Result

Port 1, NR, Band n66, 2110 - 2200 MHz  
30 MHz

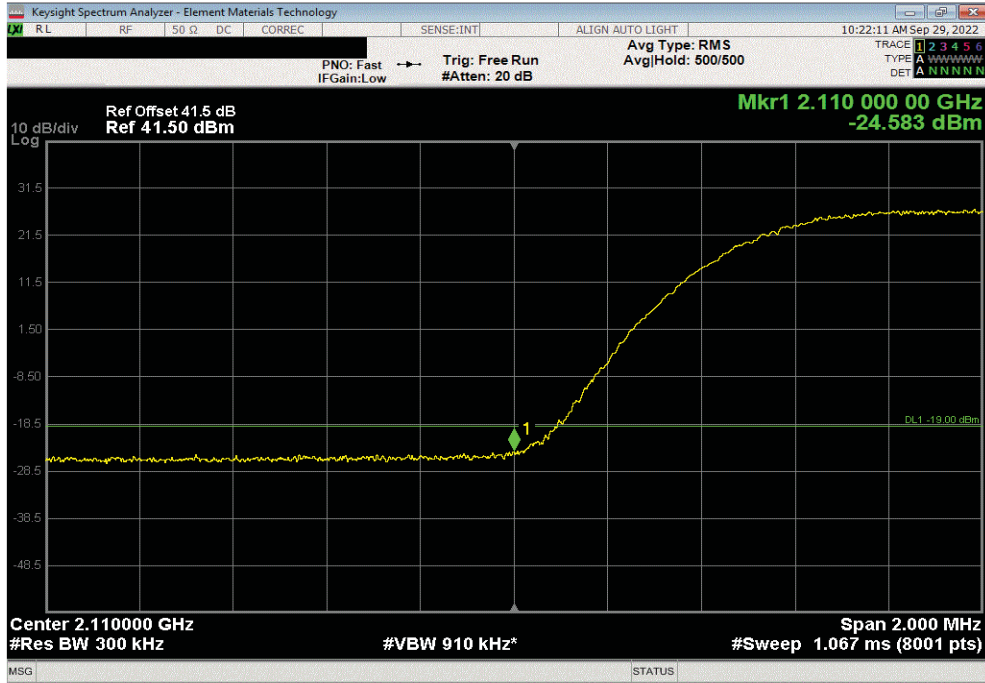
Modulation	Channel	Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit (dBm)	Result
QPSK	Low Channel, 2125 MHz	1	2110	-24.58	-19	Pass
	Low Channel, 2125 MHz	2	2108.5	-21.77	-19	Pass
	Low Channel, 2125 MHz	3	2107.89	-25.44	-19	Pass
	High Channel, 2185 MHz	1	2200	-25.9	-19	Pass
	High Channel, 2185 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

# BAND EDGE COMPLIANCE - BAND n66

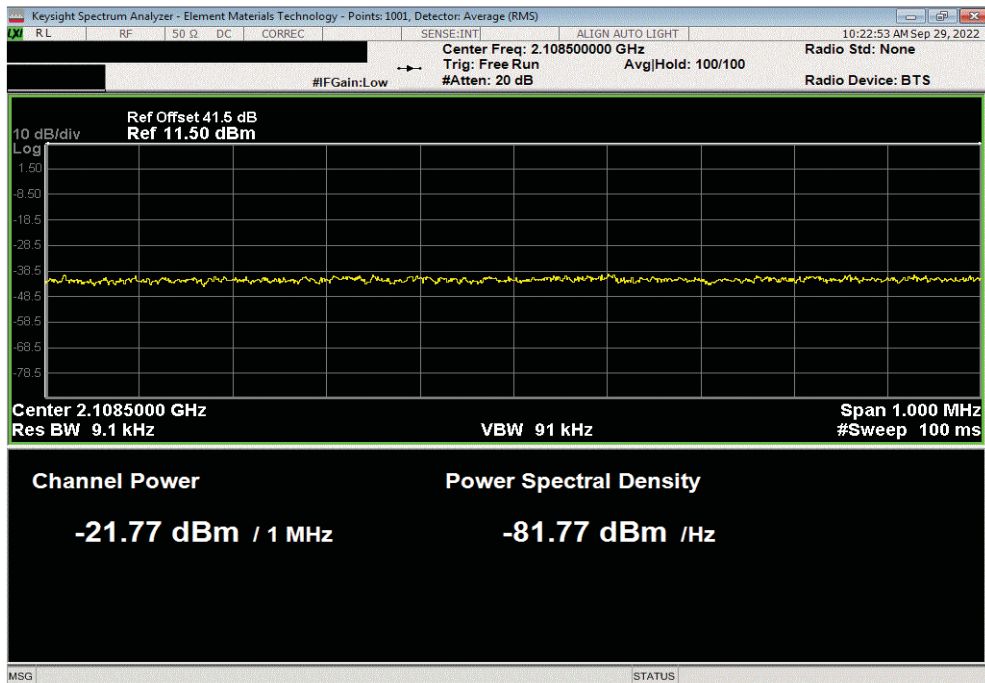


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

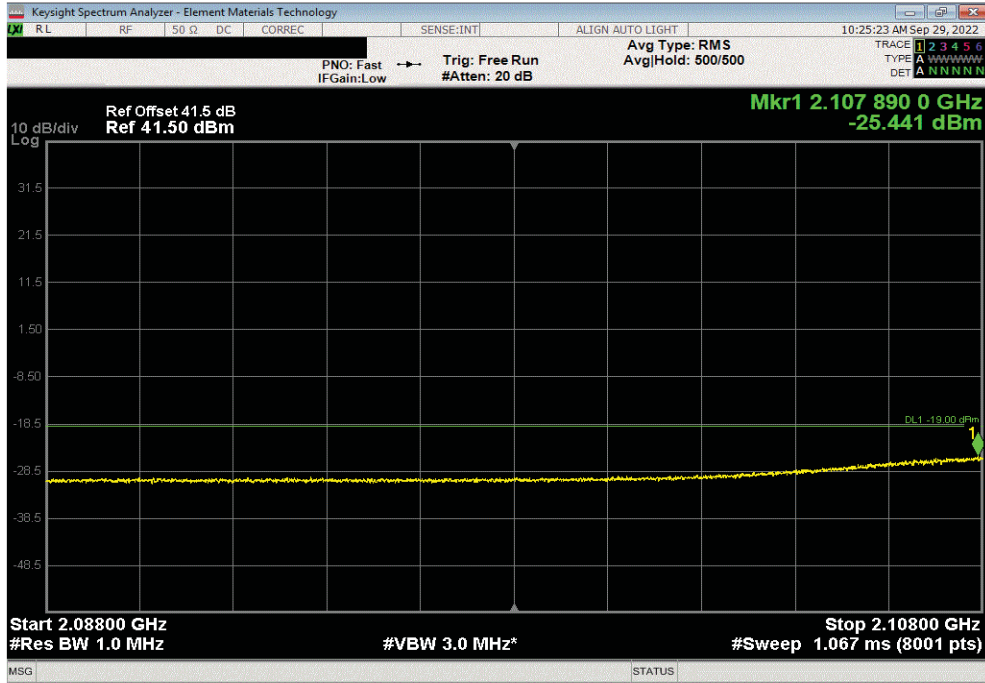


# BAND EDGE COMPLIANCE - BAND n66

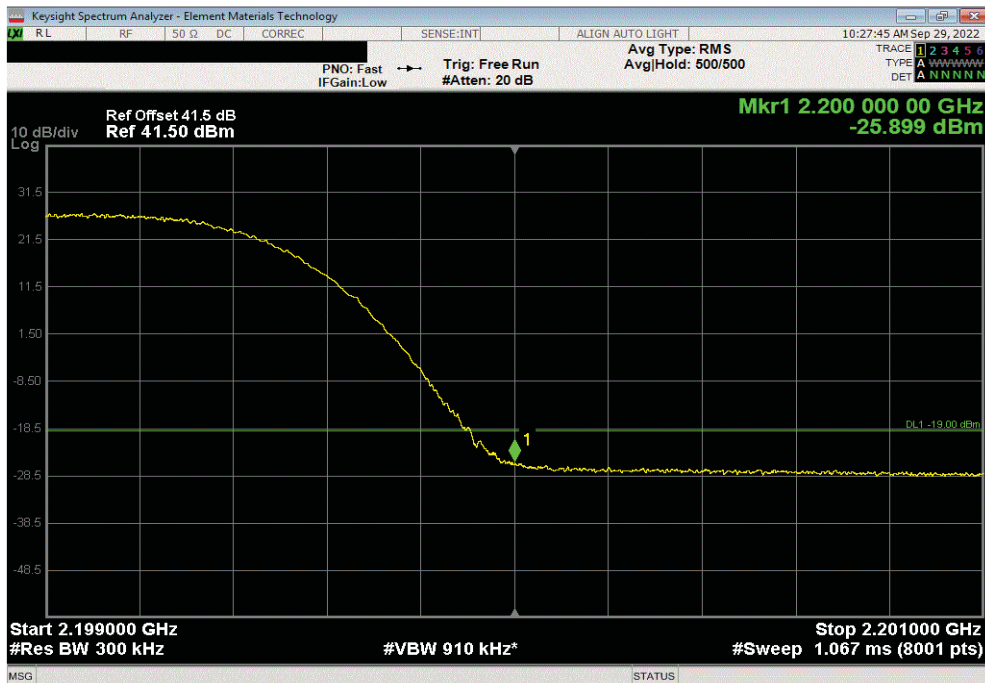


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

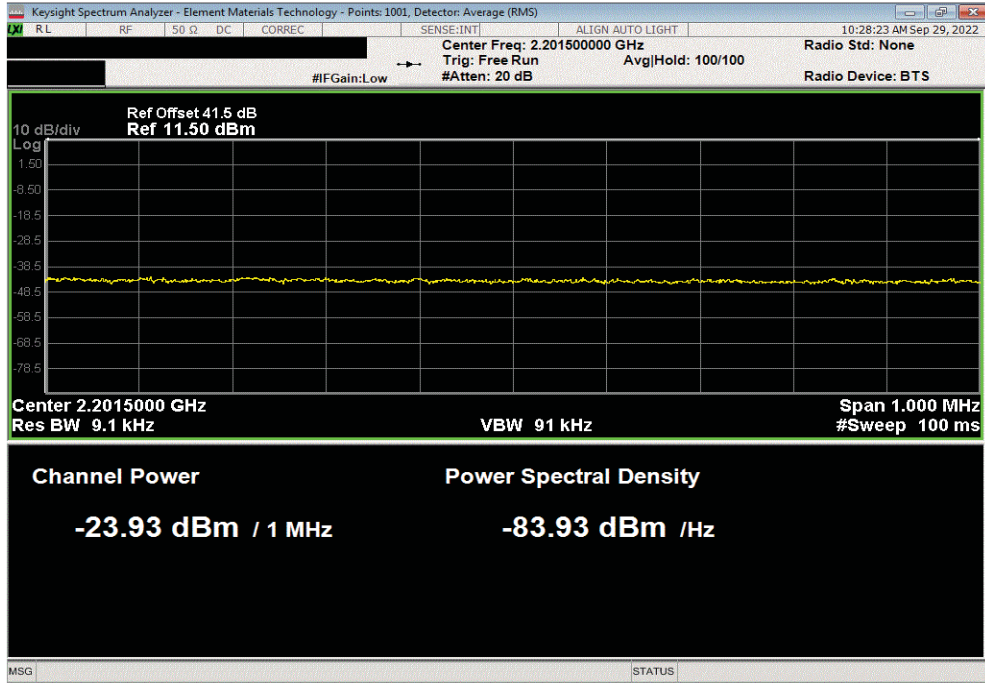


# BAND EDGE COMPLIANCE - BAND n66

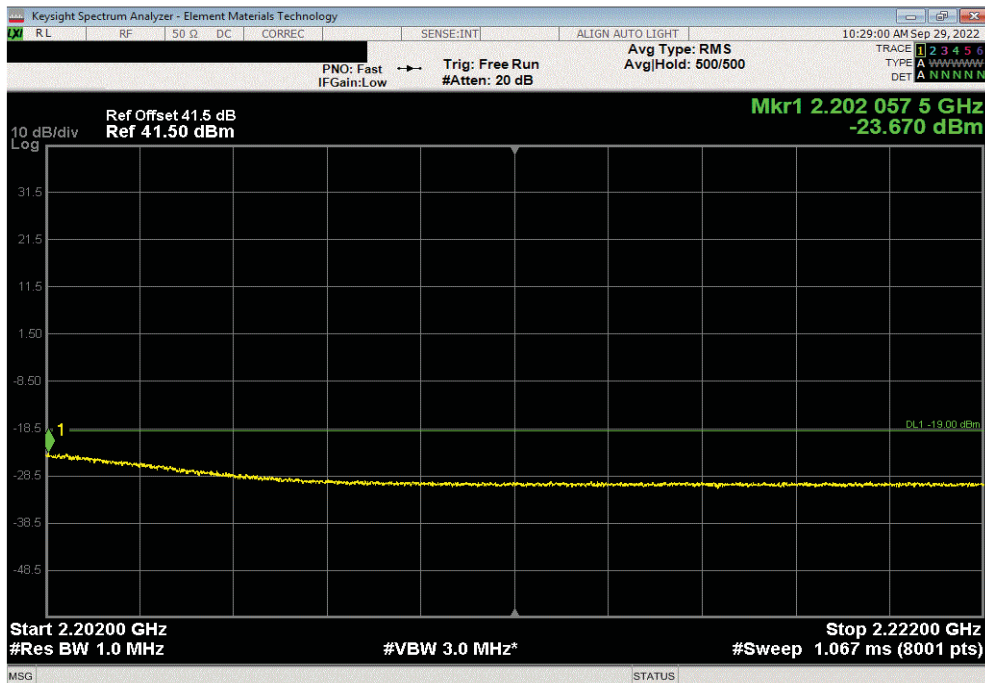


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

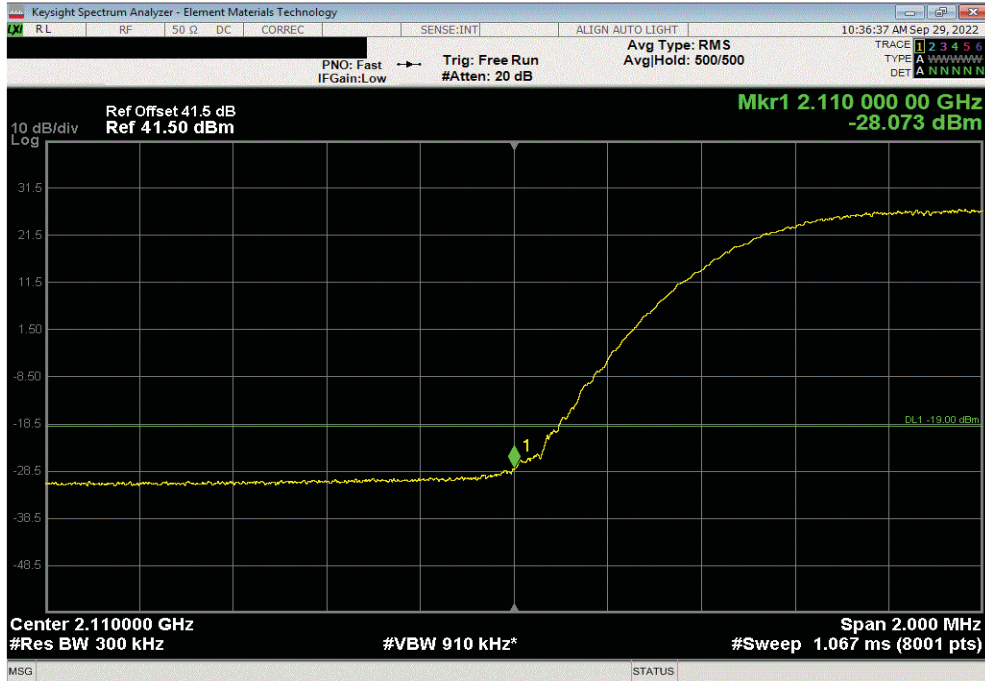


# BAND EDGE COMPLIANCE - BAND n66

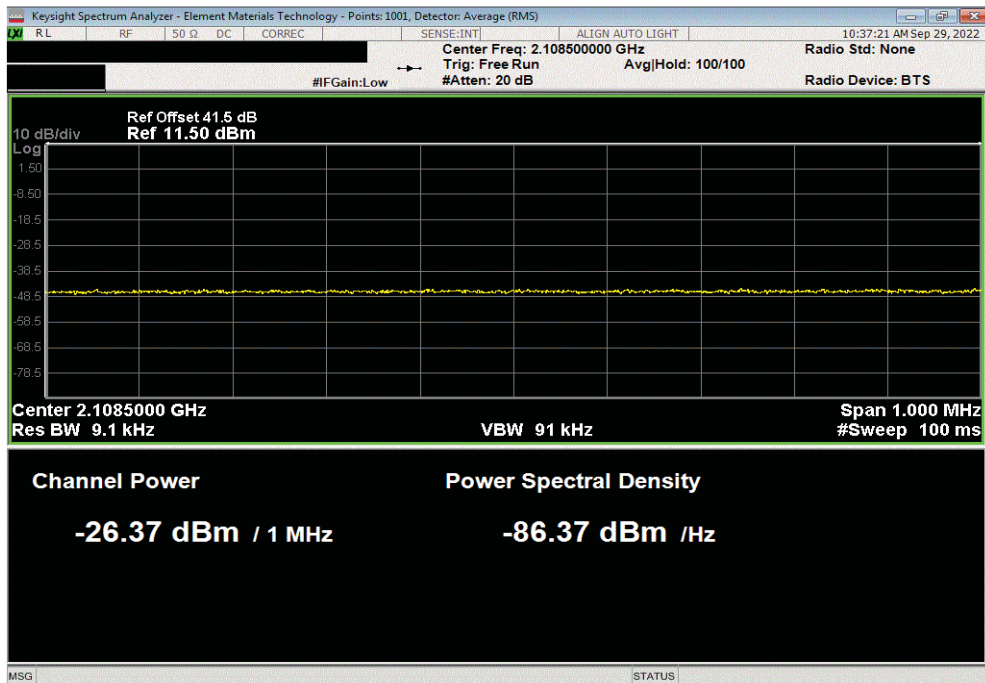


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

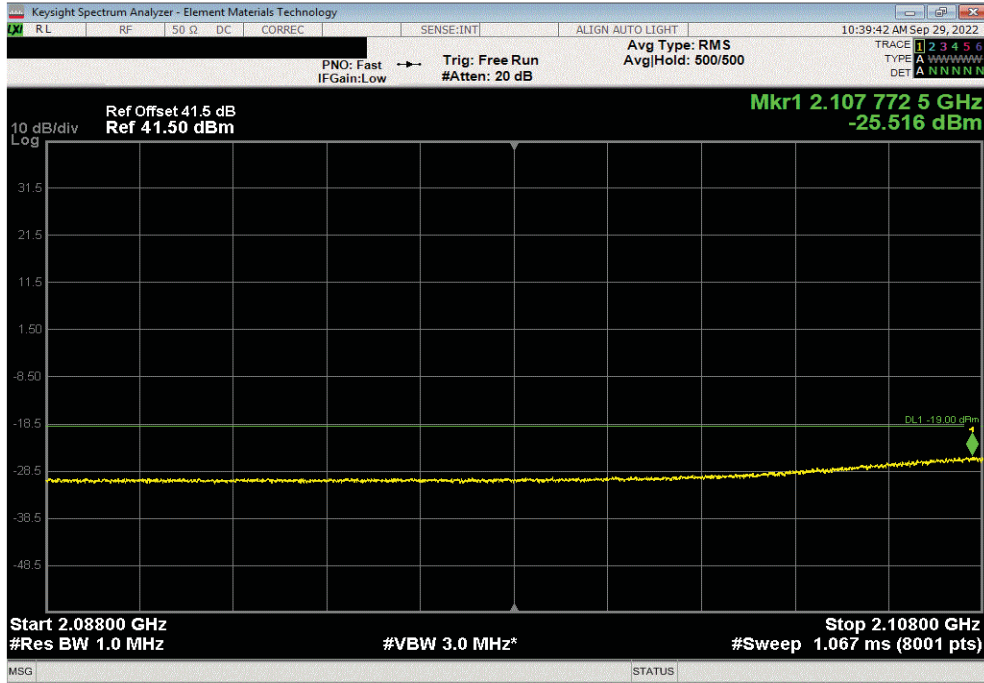


# BAND EDGE COMPLIANCE - BAND n66

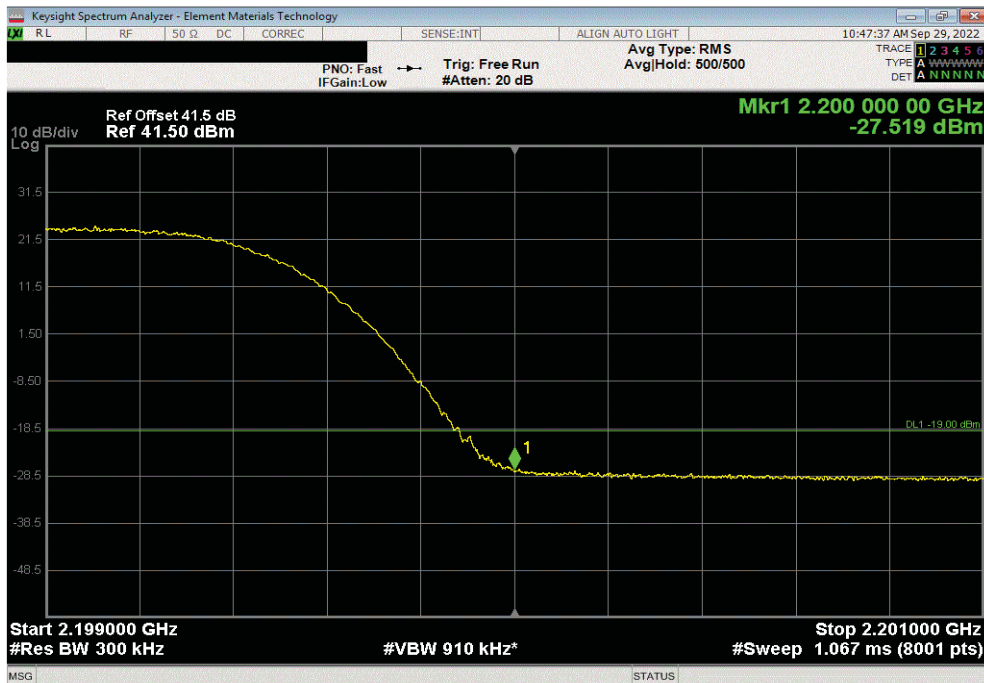


TbTx 2022.06.03.0 XMit 2022.02.07.0

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		

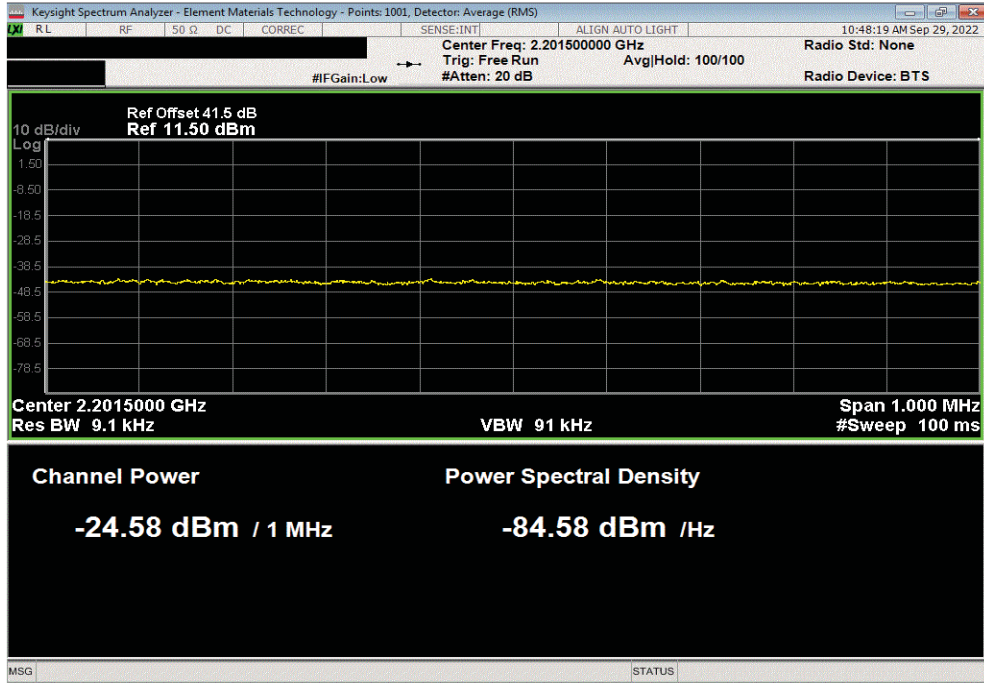


# BAND EDGE COMPLIANCE - BAND n66

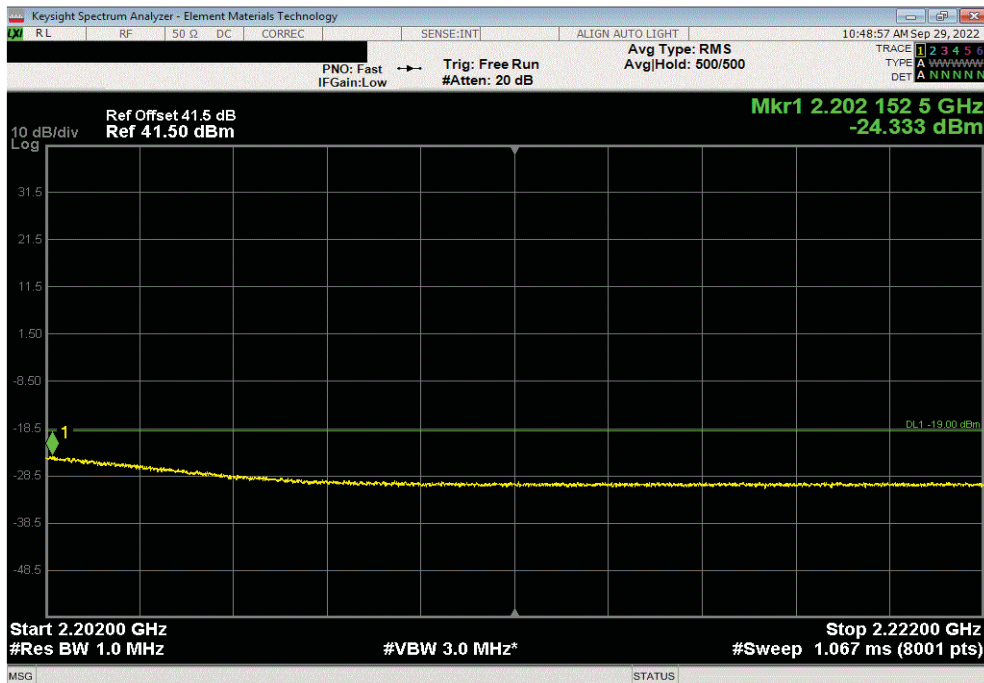


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		



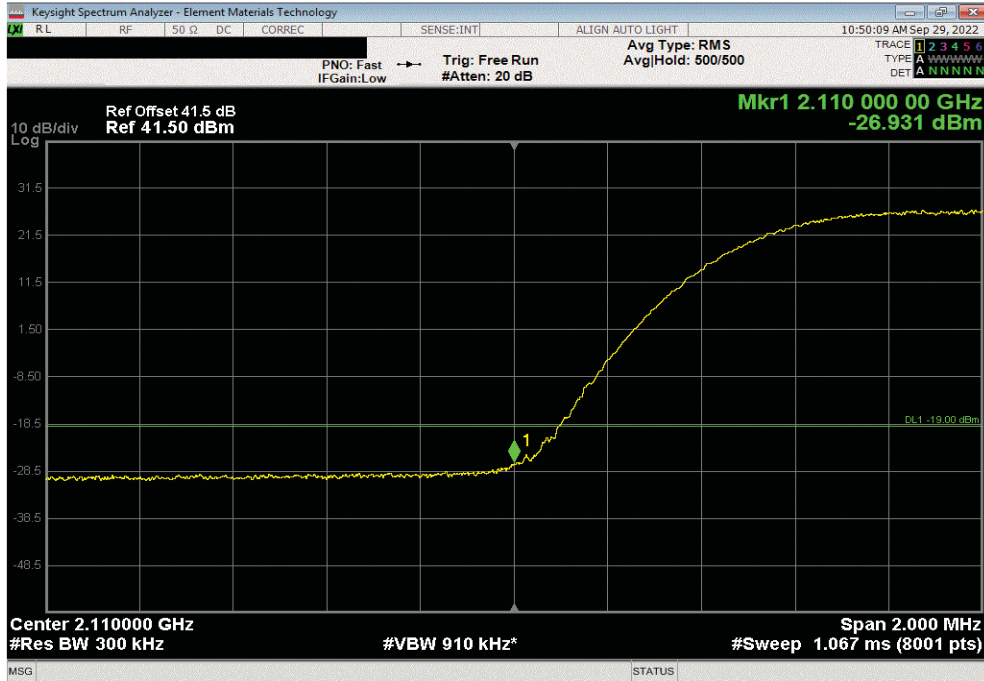


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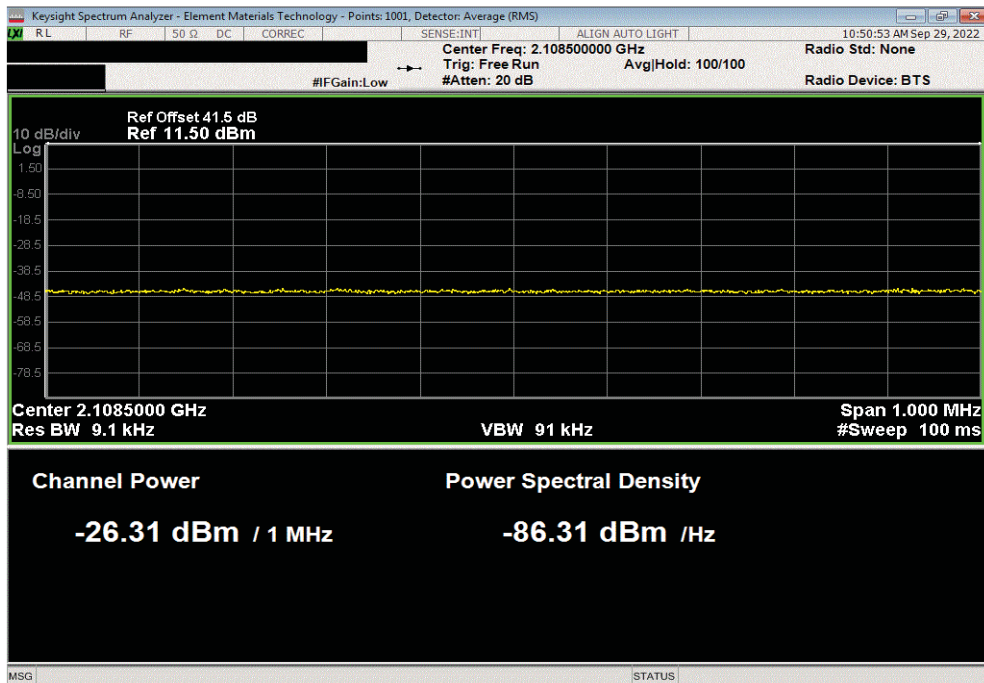


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

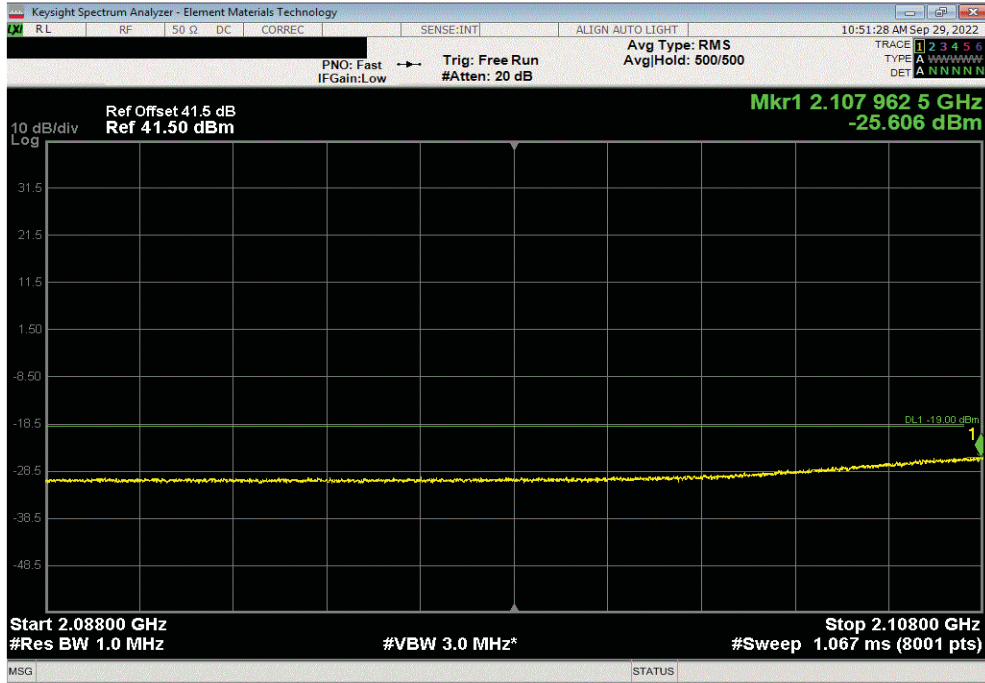


# BAND EDGE COMPLIANCE - BAND n66

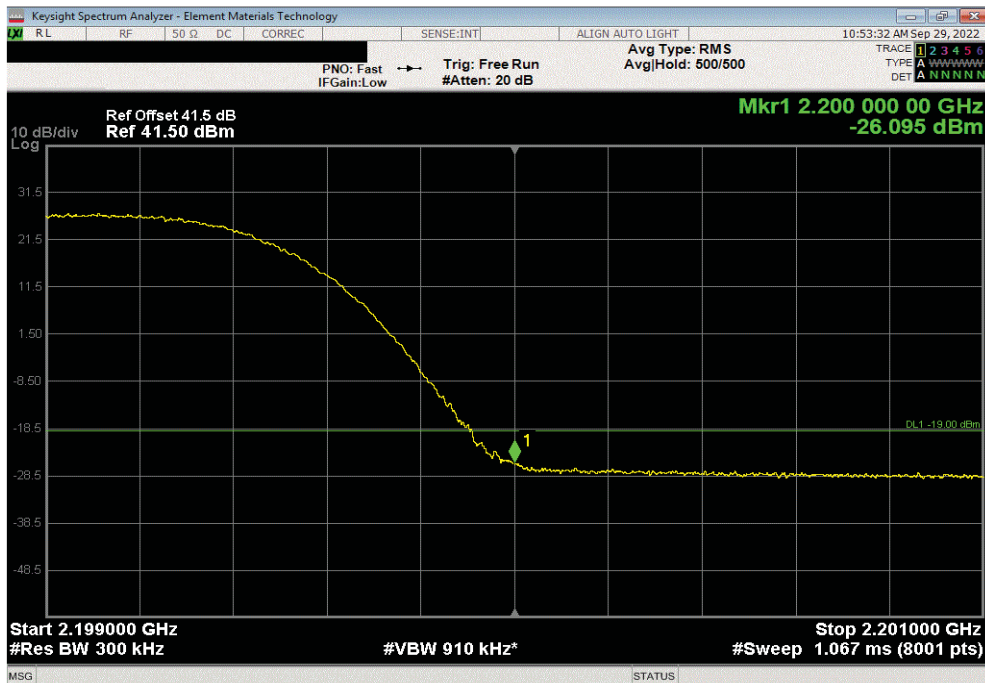


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

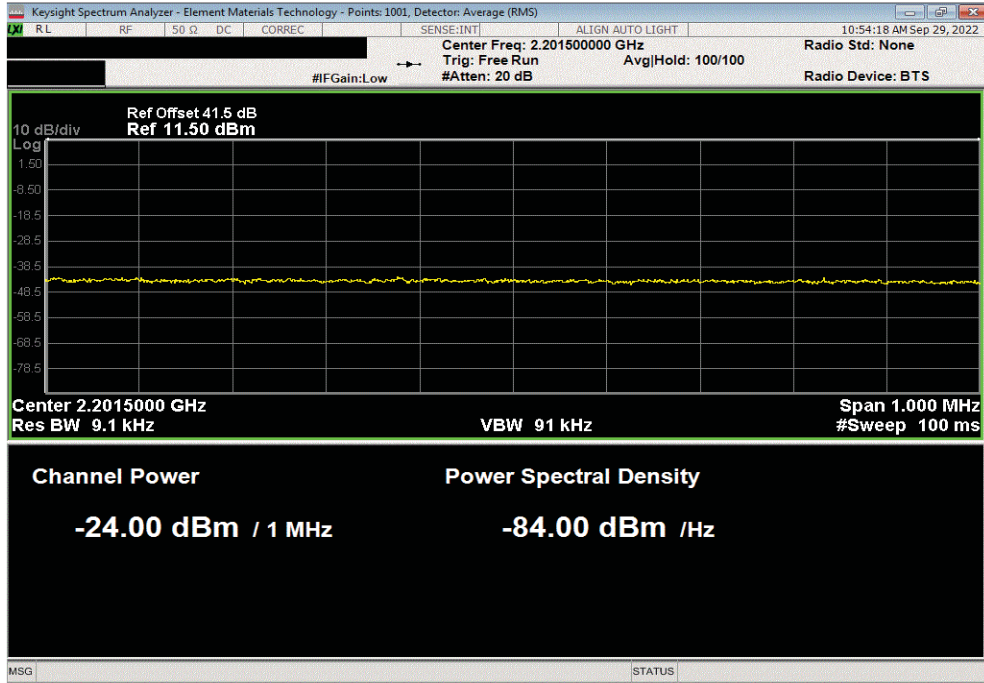


# BAND EDGE COMPLIANCE - BAND n66

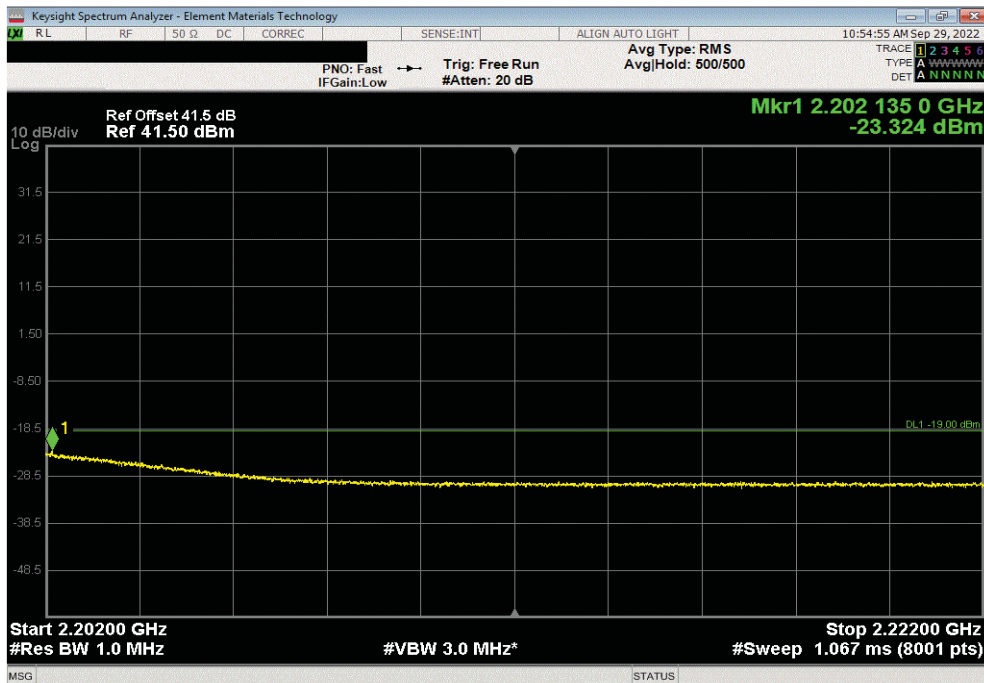


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

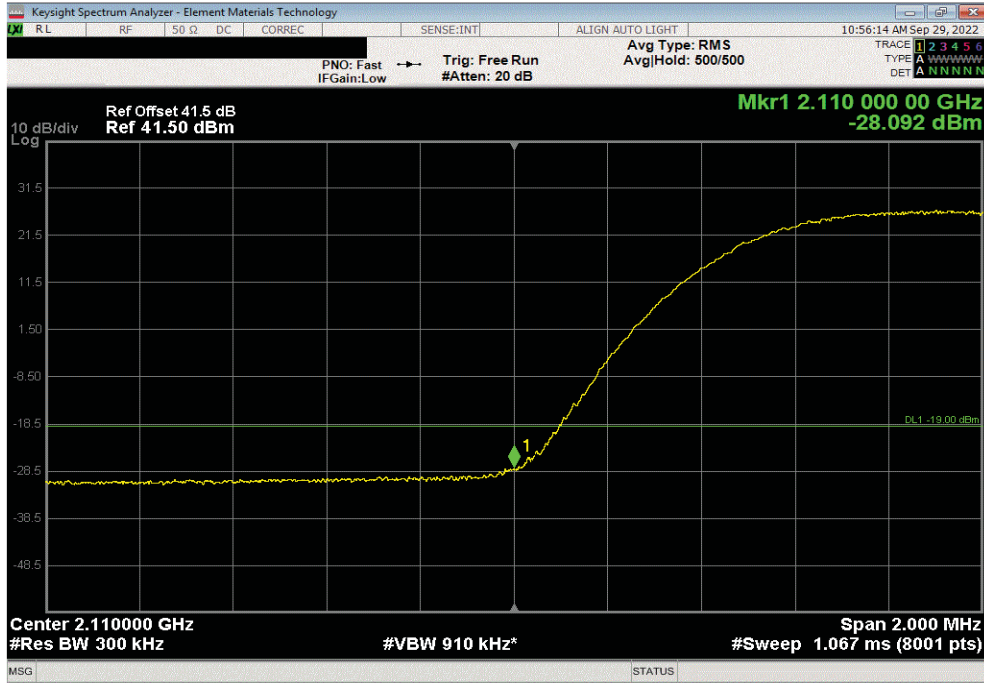


# BAND EDGE COMPLIANCE - BAND n66

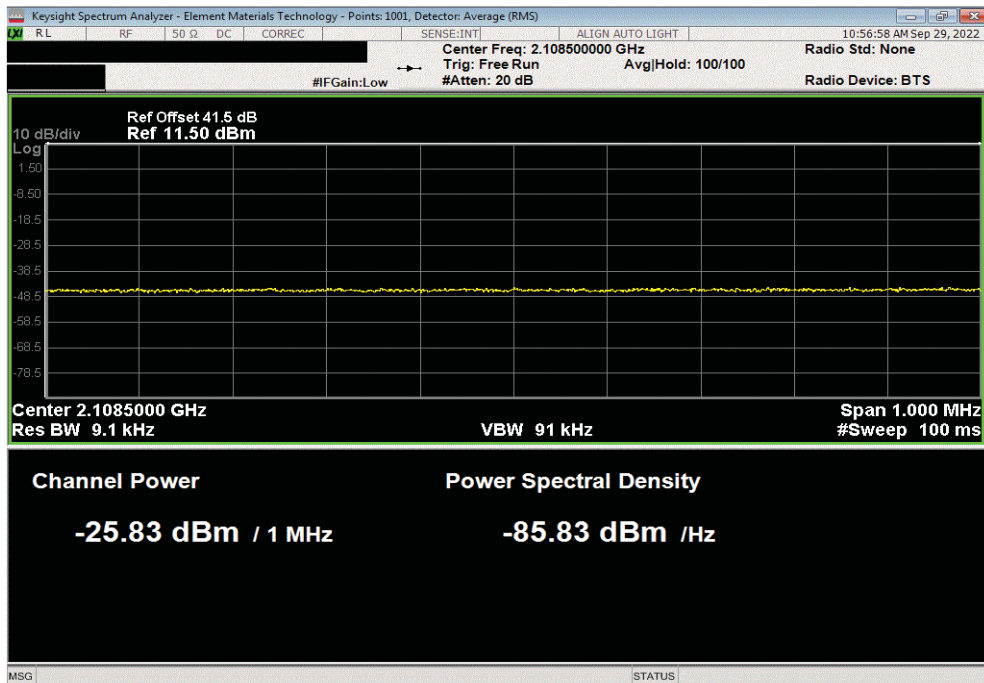


TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

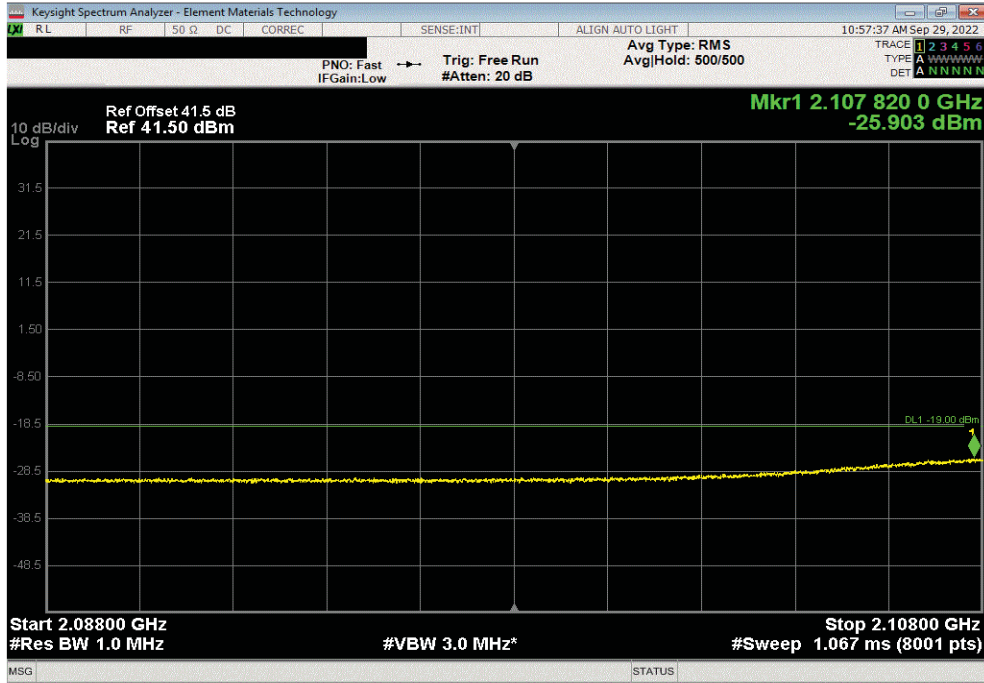


# BAND EDGE COMPLIANCE - BAND n66

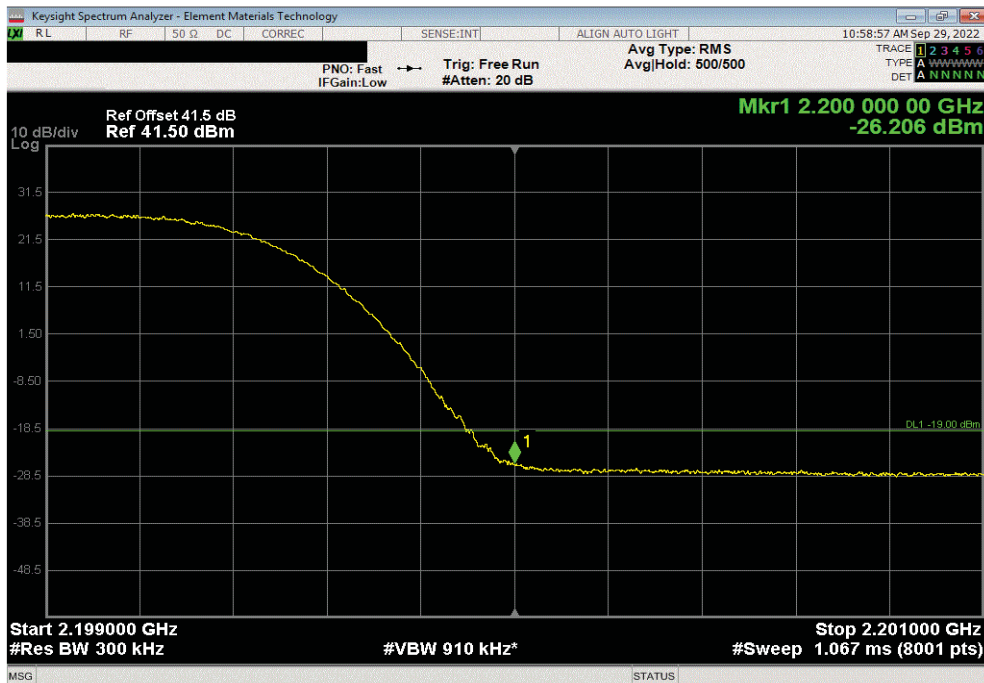


TbTx 2022.06.03.0 XMit 2022.02.07.0

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		

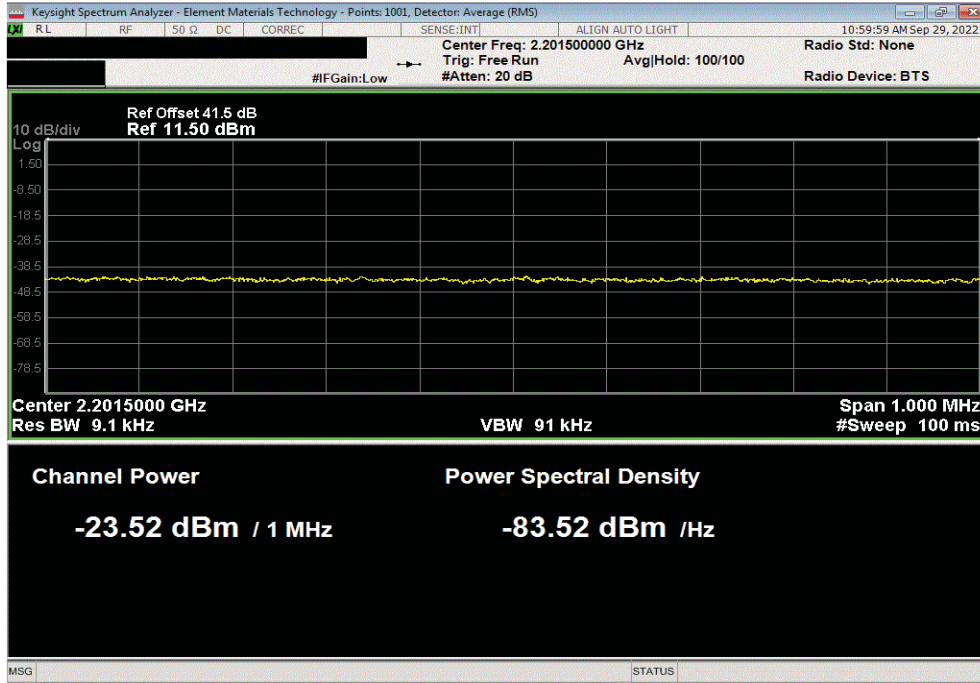


# BAND EDGE COMPLIANCE - BAND n66



TbTx 2022.06.03.0 XMI 2022.02.07.0

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		

