

Ericsson AB

RF TEST REPORT

Report Type:

FCC Part 27 RF report

PRODUCT NAME:

Radio/AIR 4435 B41

REPORT NUMBER:

240100205SHA-001

ISSUE DATE:

January 5, 2024

DOCUMENT CONTROL NUMBER:

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TEST REPORT

Applicant: Ericsson AB
Isafjordsgatan 10 SE-164 80 Stockholm 16480 Sweden

Manufacturer: Ericsson AB
Isafjordsgatan 10 SE-164 80 Stockholm 16480 Sweden

FCC ID: TA8AKRC161925

SUMMARY:

The equipment is tested according to the following standard(s) or Specification:

FCC CFR 47 Part 27: MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

PREPARED BY:

REVIEWED BY:



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Reviewer
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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
240100205SHA-001	Rev. 01	Initial issue of report	January 5, 2024

Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
Max Output Power and Peak to Average Power Ratio and EIRP	27.50(h) 2.1046	Pass
Occupied Bandwidth	27.53(m) 2.1049	Pass
Unwanted Emissions at Band Edge	27.53(m) 2.1051	Pass
Conducted Unwanted Emission	27.53(m) 2.1051	Pass

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Description:	Remote Radio Unit
Product name:	Radio/AIR 4435 B41
Product number:	Radio 4435 B41: KRC 161 925/1 (AC), KRC 161 925/2 (DC) AIR 4435 B41: KRD 901 215/1 (AC, with antenna), KRD 901 215/2 (DC, with antenna), KRD 901 215/3 (AC, with RDNB board), KRD 901 215/4 (DC, with RDNB board)
Serial Number(s)	EA8A574155 for KRC 161 925/2
Rating:	-48V DC or 100-250V AC 50/60 Hz
Software Version:	PIS: CXP9013268/15_R97BE, UP: CXP9024418/15_R89A06
Hardware Version:	R1B
Sample received date:	December 27, 2023
Date of test:	December 27, 2023 ~ December 29, 2023

1.2 Technical Specification

Frequency Range:	TX/RX: 2496-2690 MHz
Number of Antenna ports:	4 TX/RX
Supported RAT:	SR/MR: LTE, NR
Max RF bandwidth (IBW):	160 MHz
Supported Number of Carriers:	Maximum 6 carriers per port
Supported modulation:	QPSK, 16QAM, 64QAM, 256QAM
Supported Channel Bandwidth:	LTE: 10, 15, 20 MHz NR: 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz
Declaration output power:	0.5W/MHz up to 20W per port

Note: Information in the 1.2 sheet declared by the manufacturer.

1.3 Description of Test Facility

Conducted testing:

Name:	Intertek Testing Services Shanghai
Address 1:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Address 2:	No. 5 Lize East Street, Ericsson Tower, Chaoyang District, Beijing 100102 P.R.C.
Telephone:	+86 21 61278200
Telefax:	+86 21 54262353
The test facility is recognized, certified, or accredited by these organizations:	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	A2LA Accreditation Lab Certificate Number: 3309.02

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2 TEST SPECIFICATIONS

2.1 Related documents

FCC Part 27 (2022)

FCC Part 2 (2022)

ANSI C63.26:2015

KDB 971168 D01 v03r01

KDB 662911 D01 v02r01

2.2 Product Information

The Equipment Under Test (EUT) Radio/AIR 4435 B41 is an Ericsson Radio Unit working in the wireless communication services 2496-2690 MHz band which provides communication connections to 2496-2690 MHz network. The Radio/AIR 4435 B41 operates from a -48V DC or 120VAC 60Hz.

Radio 4435 B41 has 2 variants. Their difference is listed as below, and others are same.

KRC 161 925/1 with AC input

KRC 161 925/2 with DC input

AIR 4435 B41 has 4 variants. Their difference is listed as below, and others are same.

KRD 901 215/1 with AC input and Antenna

KRD 901 215/2 with DC input and Antenna

KRD 901 215/3 with AC input and RDNB board for testing purpose

KRD 901 215/4 with DC input and RDNB board for testing purpose

Tests were performed on KRC 161 925/2.

The EUT includes 4 TX/RX ports. It can be configured to transmit in MIMO mode, and MIMO mode was used for measurements as the worst configuration. The complete testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.

A full technical description can be found in the Manufacturer's documentation.

2.3 Configuration Description

The following settings were used to represent all traffic scenarios. The output power was measured on the bottom, middle and top channel of all applicable antenna ports. By measuring the output power of QPSK, 16QAM, 64QAM and 256QAM on one of the antenna ports, it was determined that QPSK for NR was the worst case modulation schemes and were used for all testing.

Complete testing was carried out on the worst case antenna port which was established as being the highest output power from the 4 measured ports on worst case modulation scheme. This antenna port was Port A for all modes.

The settings below were used for all measurements unless otherwise noted:

Configuration	Carrier	NR Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
NR-1C	1	10	2501.01	2593.02	2685.00
		15	2503.50	2593.02	2682.51
NR-2C	2	10	-	2518.02+2668.02	-
		15	-	2520.51+2665.50	-
NR-6C	6	10	-	2518.02+2528.01+2538.00+2648.01+2658.00+2668.02	-
		15	-	2520.51+2535.51+2550.51+2635.50+2650.50+2665.50	-

Configuration	Carrier	NR Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
NR-1C-BE	1	10	2501.01	-	2685.00
		15	2503.50	-	2682.51
NR-2C-BE	2	10	2501.01+2511.00	-	2675.01+2685.00
		15	2503.50+2518.50	-	2667.51+2682.51
NR-6C-BE	6	10	2501.01+2511.00+2521.02+2531.01+2541.00+2551.02	-	2635.02+2645.01+2655.00+2665.02+2675.01+2685.00
		15	2503.50+2518.50+2533.50+2548.50+2563.50+2578.50	-	2607.51+2622.51+2637.51+2652.51+2667.51+2682.51

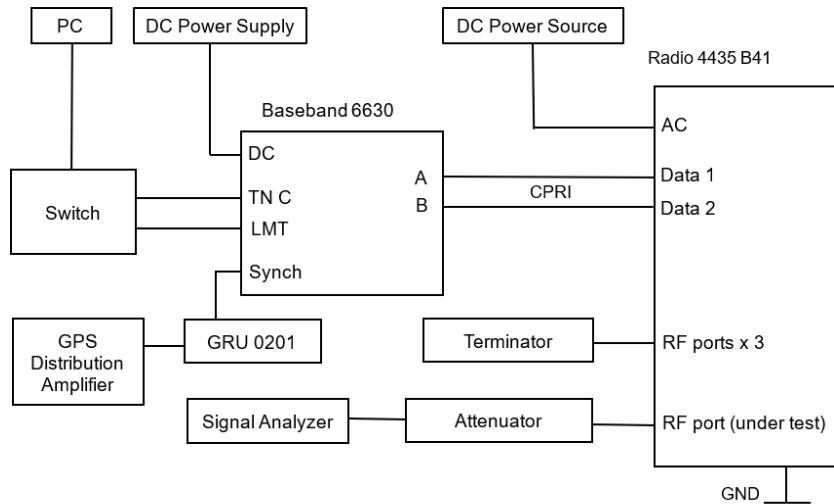
TEST REPORT

Configuration	Carrier	NR Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
NR-1C-UE	1	10	2501.01	2593.02	2685.00
		15	2503.50	2593.02	2682.51
NR-2C-UE	2	15	2503.50+2518.50	-	2667.51+2682.51
NR-6C-UE	6	10	2501.01+2511.00+ 2521.02+2531.01+ 2541.00+2551.02	-	2635.02+2645.01+ 2655.00+2665.02+ 2675.01+2685.00

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2.4 Test Setup

Conducted Measurement:



No.	Auxiliary Equipment	Product Number / Model Type	Version
1	PC	PowerEdge R230	-
2	DC Power Supply	N8737A	-
3	Baseband 6630	KDU 137 848/1	R2H
4	GRU 02 01	NCD 901 41/1	R1D
5	GPS Distribution Amplifier	58536A	-
6	Switch	LS-S5024E-CN	-
7	Terminator	TF150	-
8	40dB Attenuator	TDS200	-
9	20dB Attenuator	3.5TS100	-

Proper Attenuator will be chosen to use in relative test case. And the cable loss of specified Attenuator with connect cable will be calibrated before test for relative frequency range and the worst reading will be used as offset in the relative test case.

TEST REPORT**2.5 Test environment condition:**

Test items	Temperature	Humidity
Max Output Power and Peak to Average Power Ratio and EIRP	20°C to 24°C	45%RH to 55%RH
Occupied Bandwidth		
Unwanted Emissions at Band Edge		
Conducted Unwanted Emission		

2.6 Instrument list

Intertek Testing Services					
Used	Equipment	Manufacturer	Type	S/N	Due date
<input checked="" type="checkbox"/>	PXA Signal Analyzer	Keysight	N9030A	EC1046	2024.4.7
<input type="checkbox"/>	Signal Generator	R&S	SMU200A	EC1050	2024.4.2
<input checked="" type="checkbox"/>	Multi-meter	Fluke	117	EC1051	2024.2.5
<input type="checkbox"/>	Climatic Chamber	赛宝	CEEC-WR16H-50W	EC1052	2024.8.28
<input checked="" type="checkbox"/>	Humiture meter	托普	TPJ-20	EC1053	2024.2.21

TEST REPORT**2.7 Measurement uncertainty**

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum output power	0.73dB
Occupied Bandwidth	0.88%
Unwanted Emissions at Band Edge	3.03dB
Conducted Unwanted Emission	3.03dB

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3 Maximum Output Power and Peak to Average Power Ratio and EIRP

Test result: Pass

3.1 Limit

Output Power:

$$\text{EIRP} \leq 33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$$

X = actual channel bandwidth

Y = 5.5 or 6 MHz

Peak to Average Ratio: ≤ 13 dB

3.2 Measurement Procedure

The EUT was configured to transmit on maximum power and proper modulation. The transmitter power shall be measured in terms of a root-mean-square (RMS) average value.

A peak to average ratio measurement is performed at the conducted ports of the EUT for single carrier for single RAT mode. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) was used and 0.1% probability value recorded.

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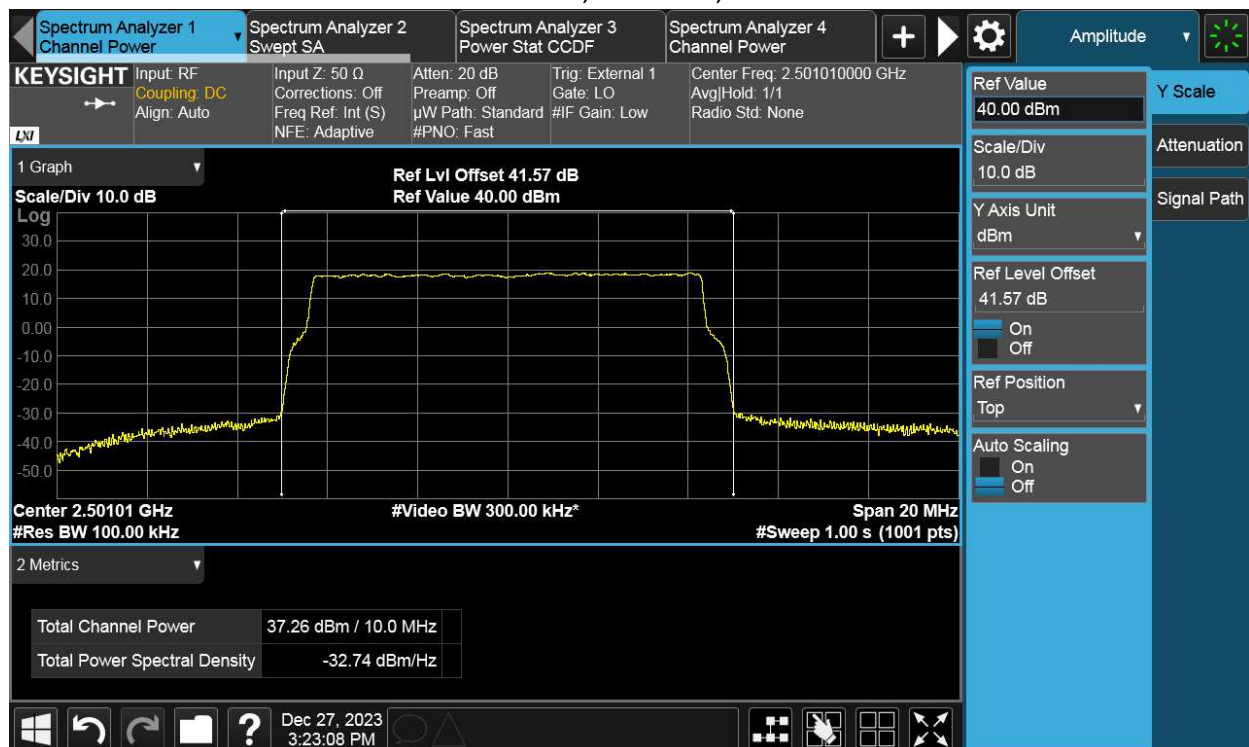
3.3 Measurement result

NR-1C:

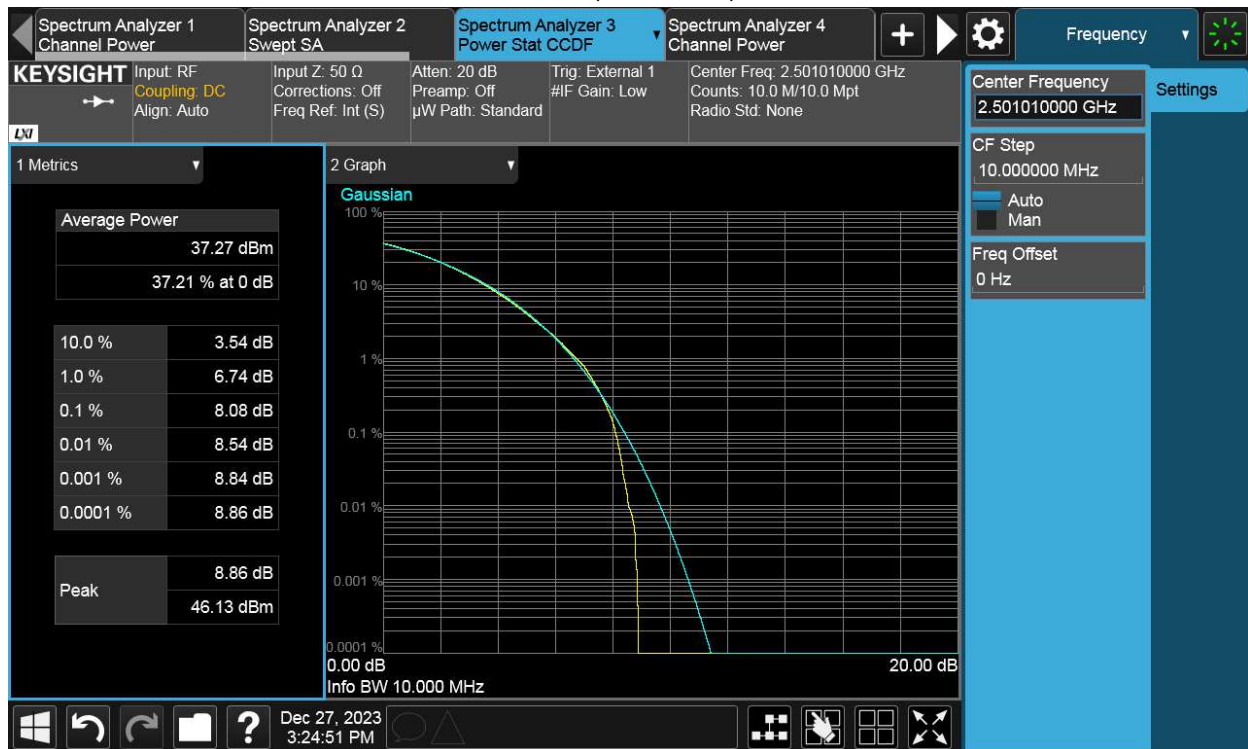
Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)								
			Channel position B			Channel position M			Channel position T		
			Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)
A	QPSK	10	37.26	28.47	8.08	37.06	28.14	7.99	36.81	28.13	8.00
B	QPSK	10	37.10	28.36	8.10	36.97	28.04	8.00	36.90	28.15	8.00
C	QPSK	10	37.04	28.28	8.08	36.89	27.96	7.99	36.87	28.08	7.99
D	QPSK	10	36.88	28.13	8.10	36.87	27.98	8.00	36.74	28.02	7.97
Total			43.09	34.33	-	42.97	34.05	-	42.85	34.12	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)								
			Channel position B			Channel position M			Channel position T		
			Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)
A	QPSK	15	39.09	28.32	8.15	39.04	28.26	8.16	38.96	28.42	8.19
B	QPSK	15	38.68	27.90	8.14	38.64	27.88	8.15	38.70	28.20	8.19
C	QPSK	15	38.64	27.77	8.14	38.43	27.70	8.16	38.75	28.22	8.19
D	QPSK	15	38.66	27.83	8.15	38.67	27.95	8.14	38.81	28.27	8.18
Total			44.79	33.98	-	44.72	33.97	-	44.83	34.30	-

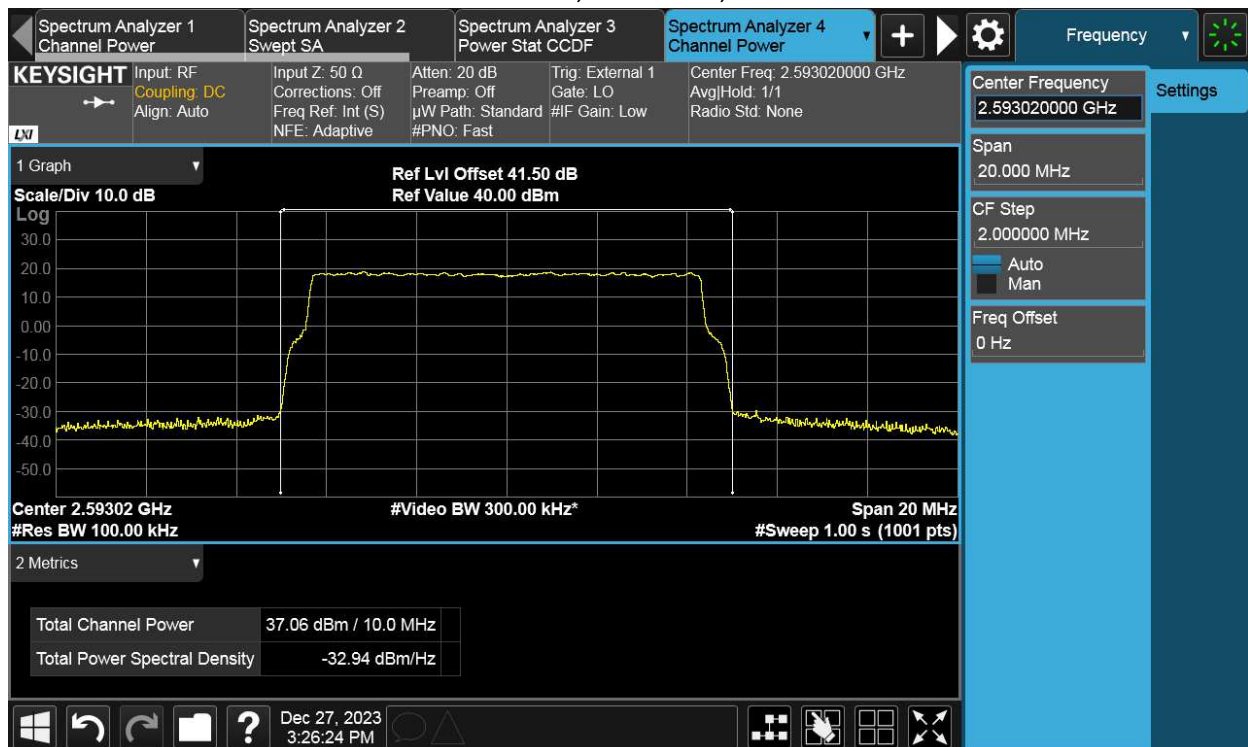
NR 10MHz, Channel B, Power



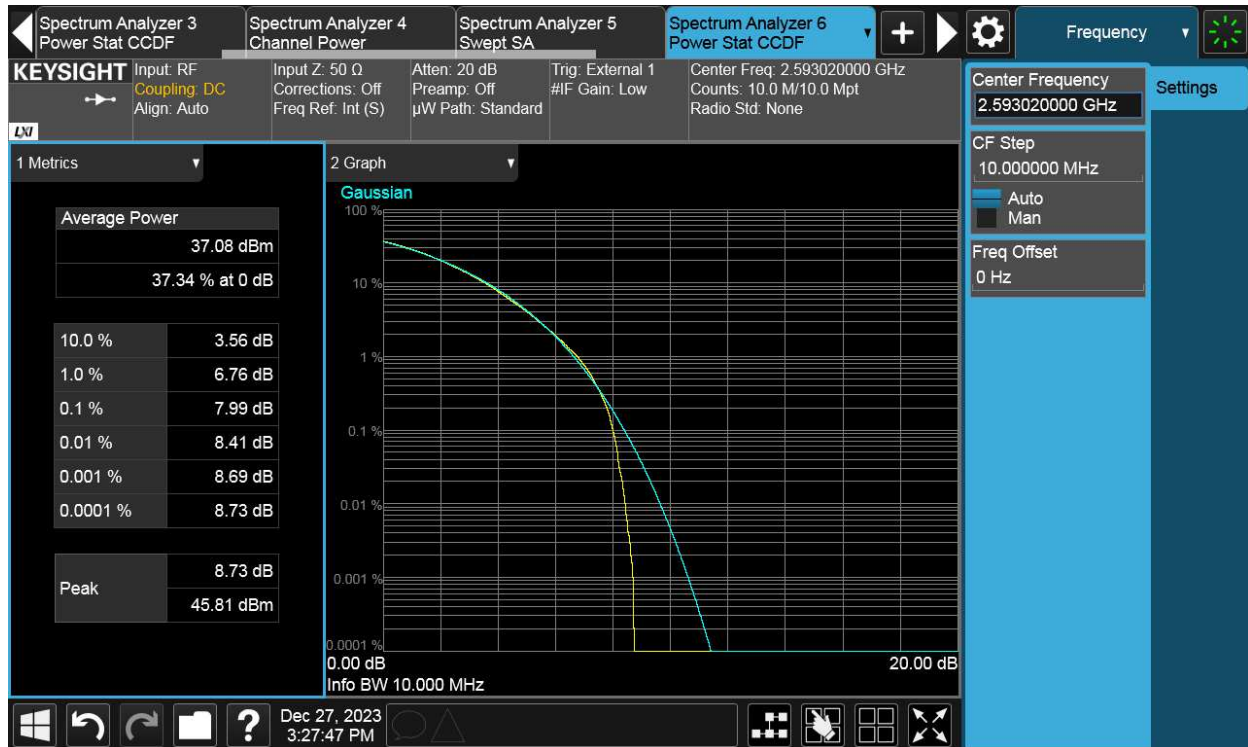
NR 10MHz, Channel B, PAR



NR 10MHz, Channel M, Power



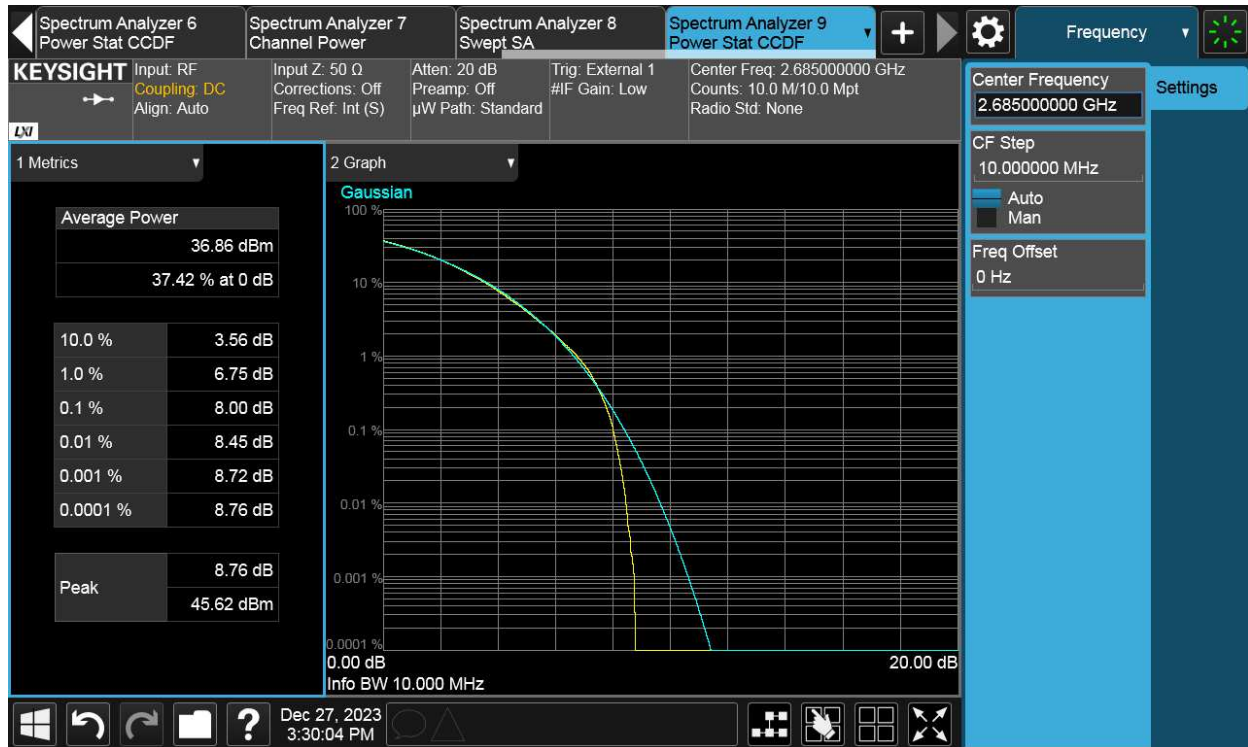
NR 10MHz, Channel M, PAR



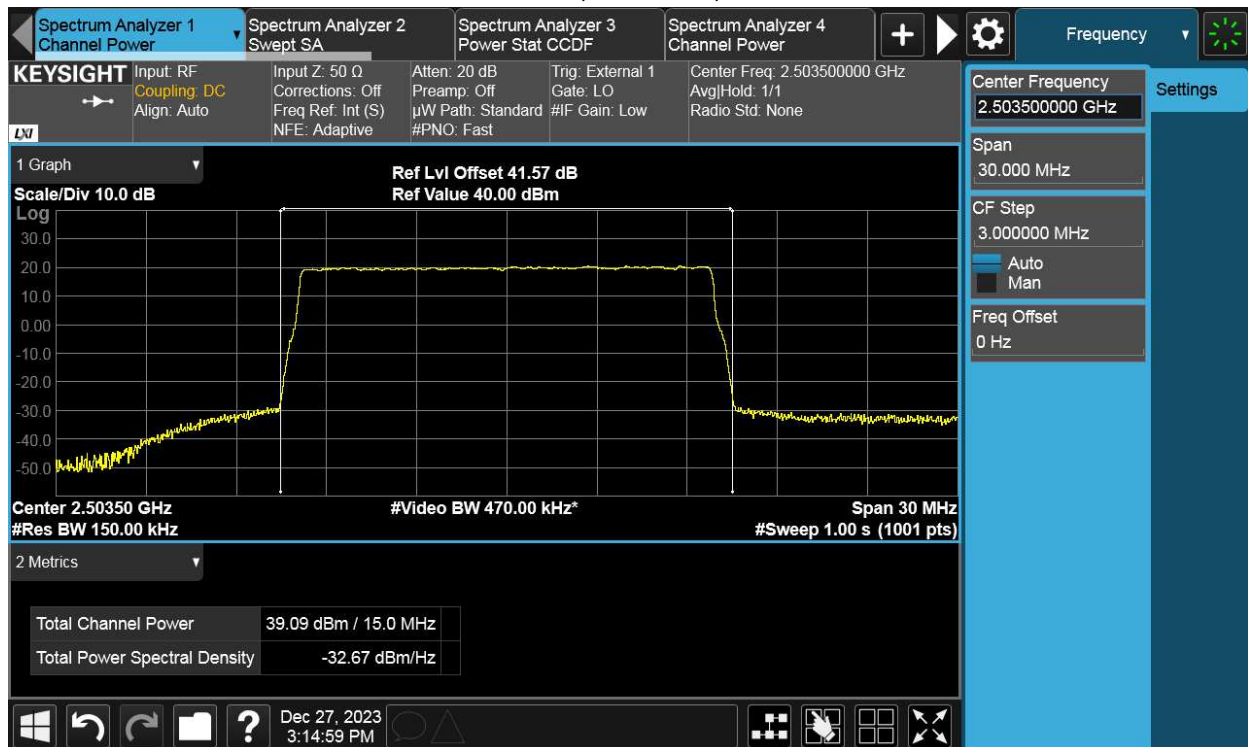
NR 10MHz, Channel T, Power



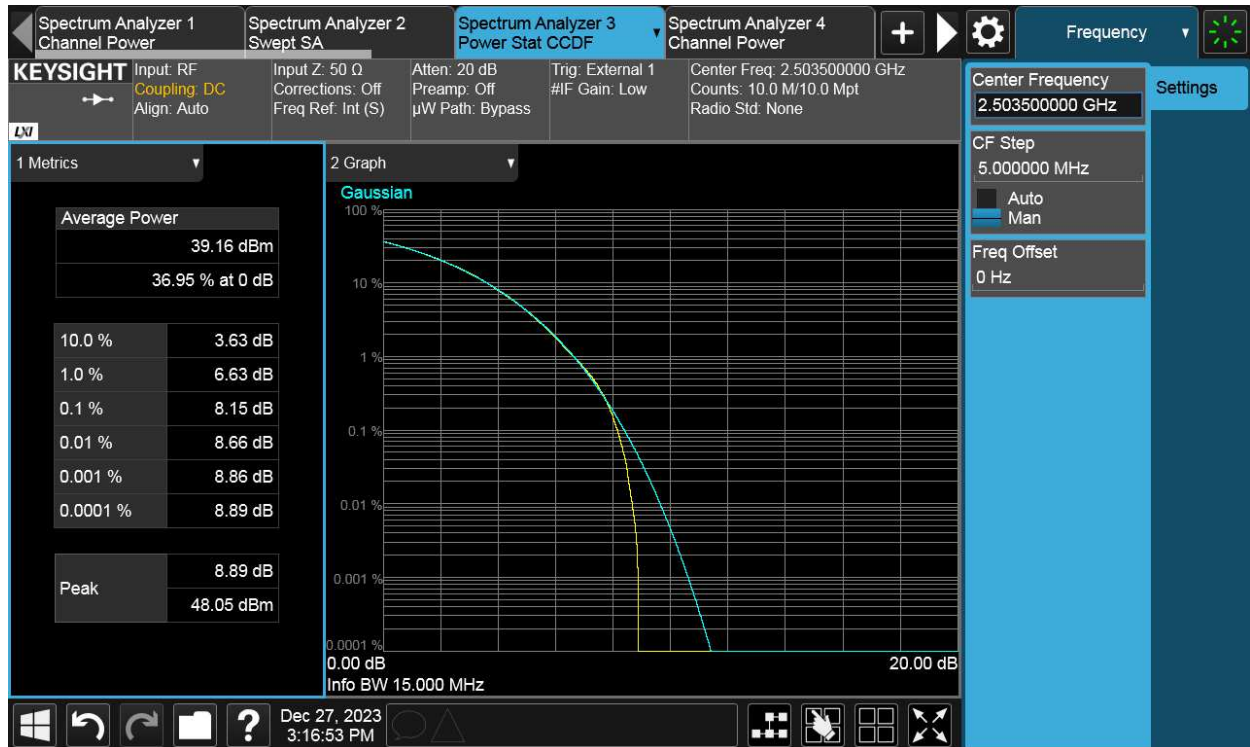
NR 10MHz, Channel T, PAR



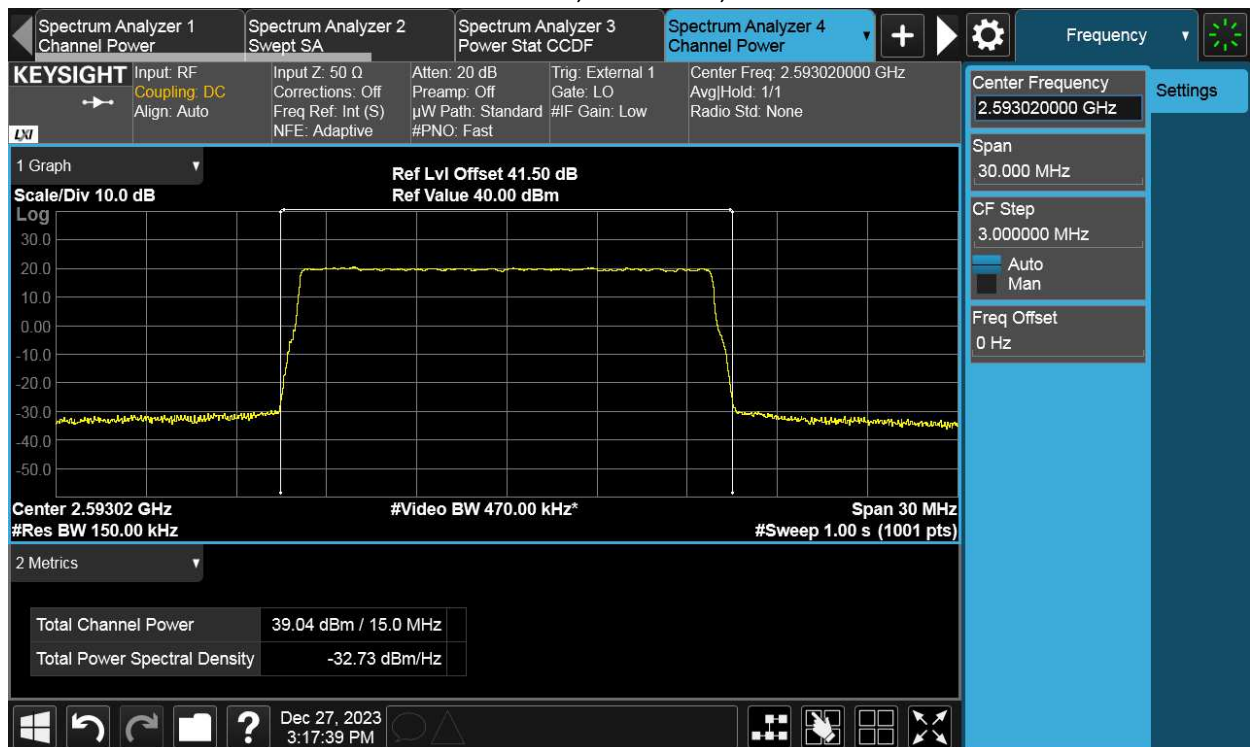
NR 15MHz, Channel B, Power



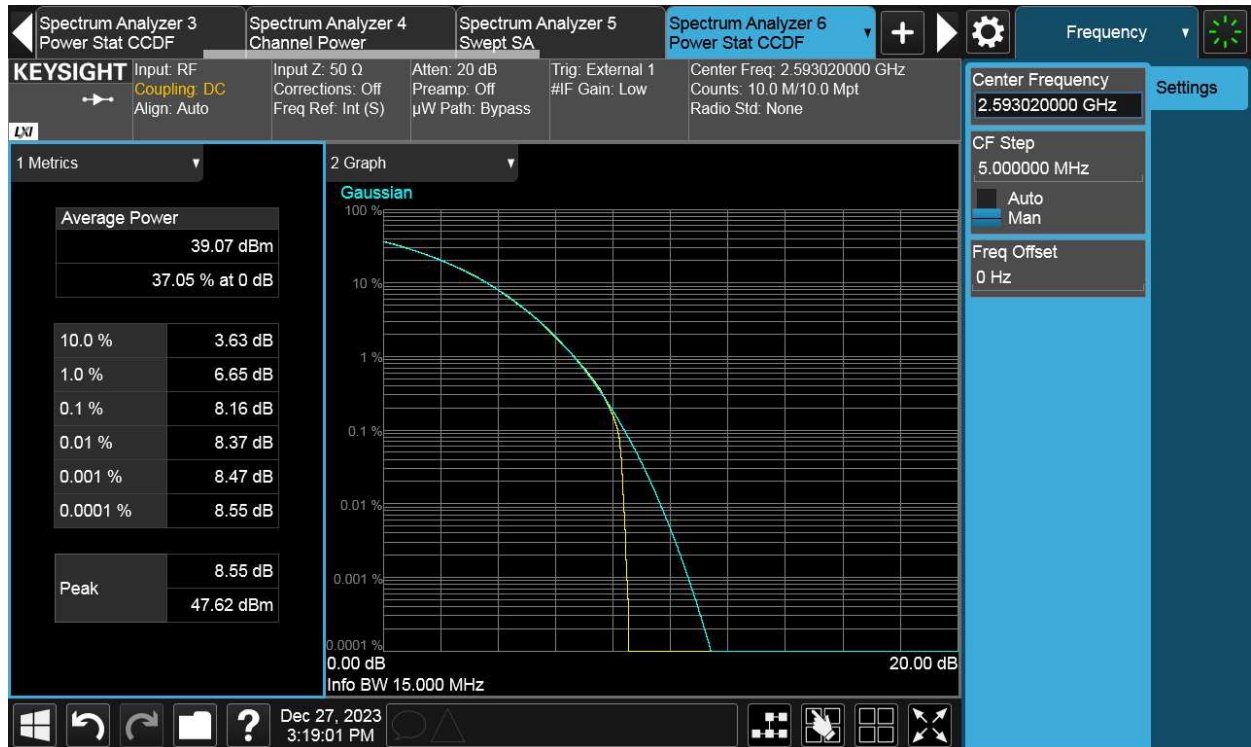
NR 15MHz, Channel B, PAR



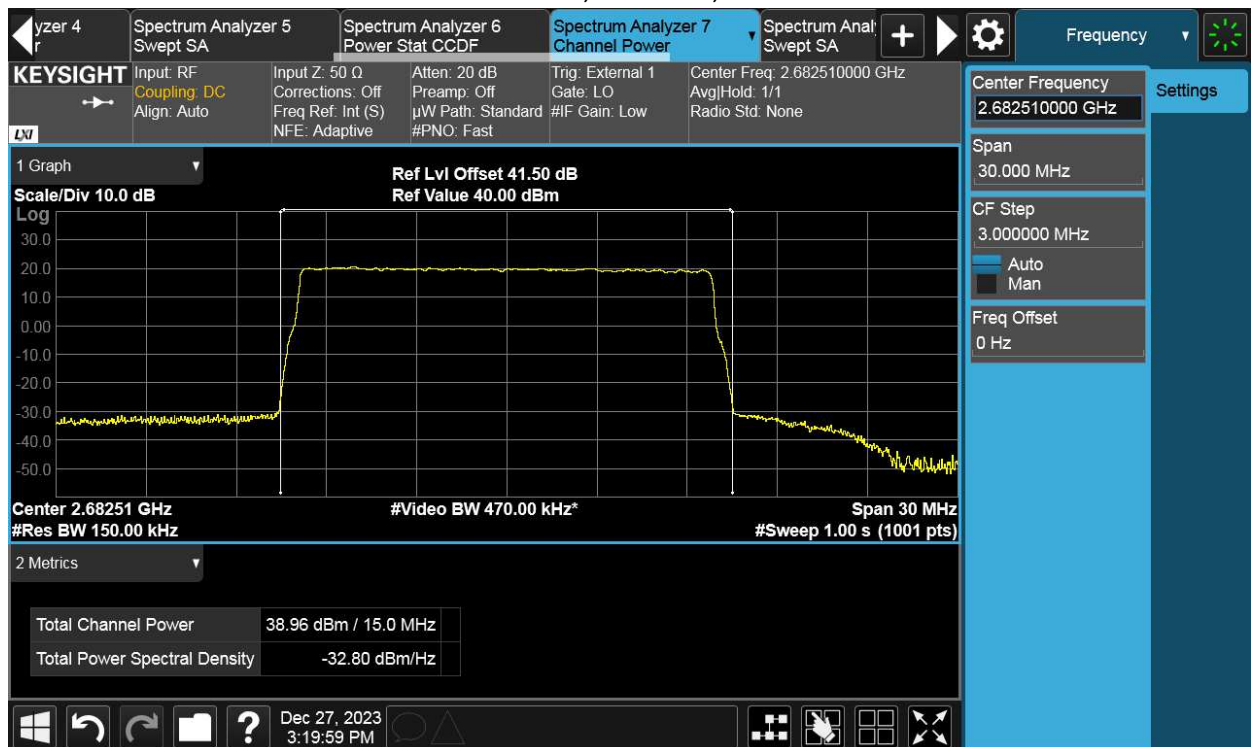
NR 15MHz, Channel M, Power



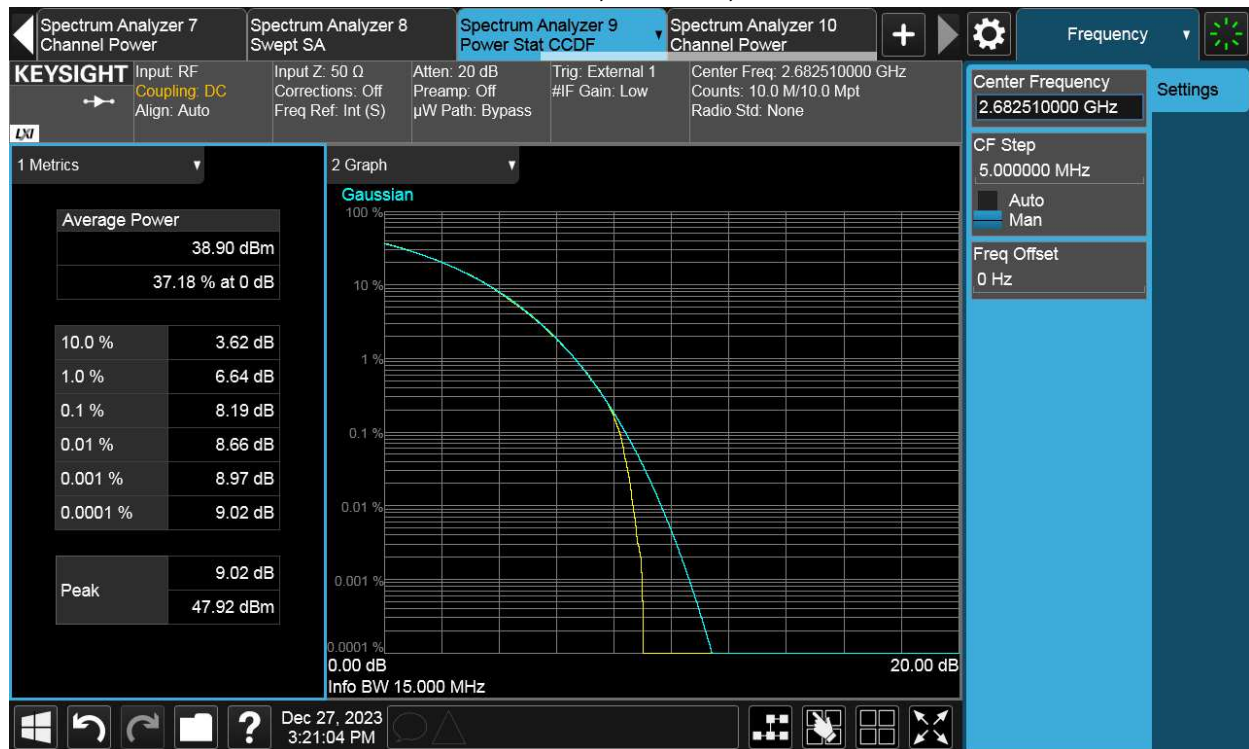
NR 15MHz, Channel M, PAR



NR 15MHz, Channel T, Power



NR 15MHz, Channel T, PAR

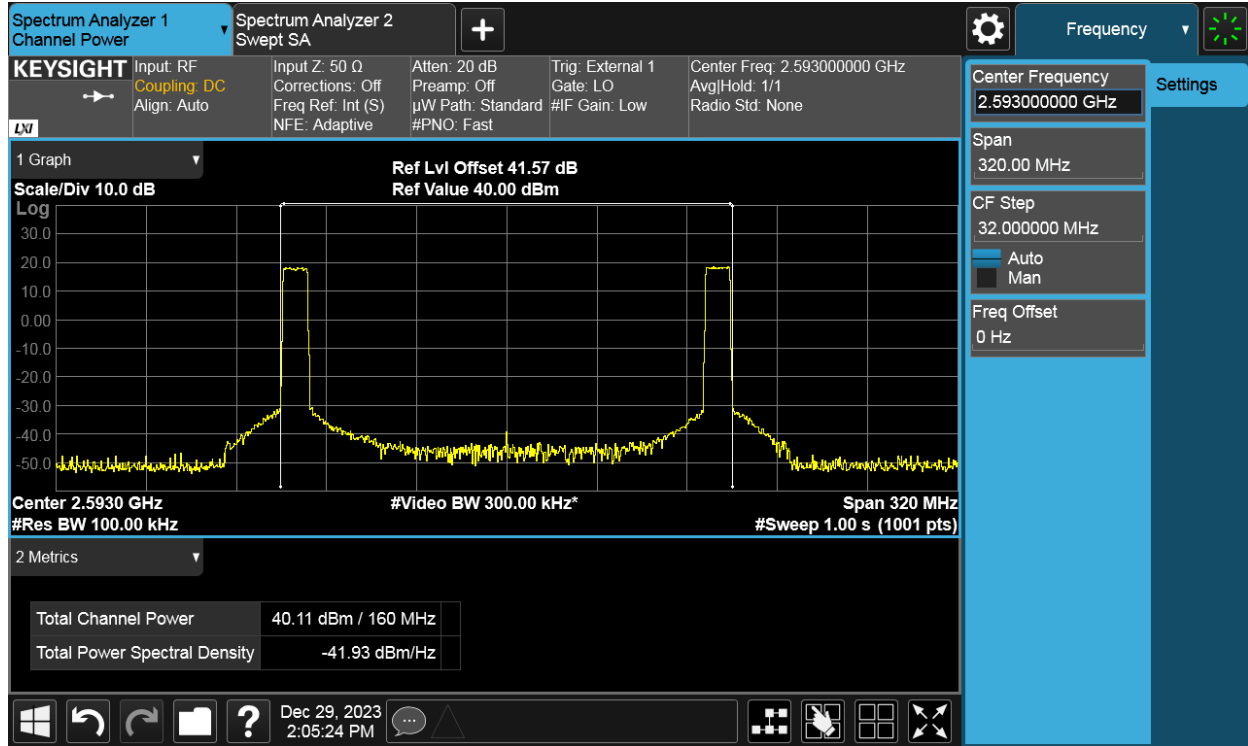


NR-2C:

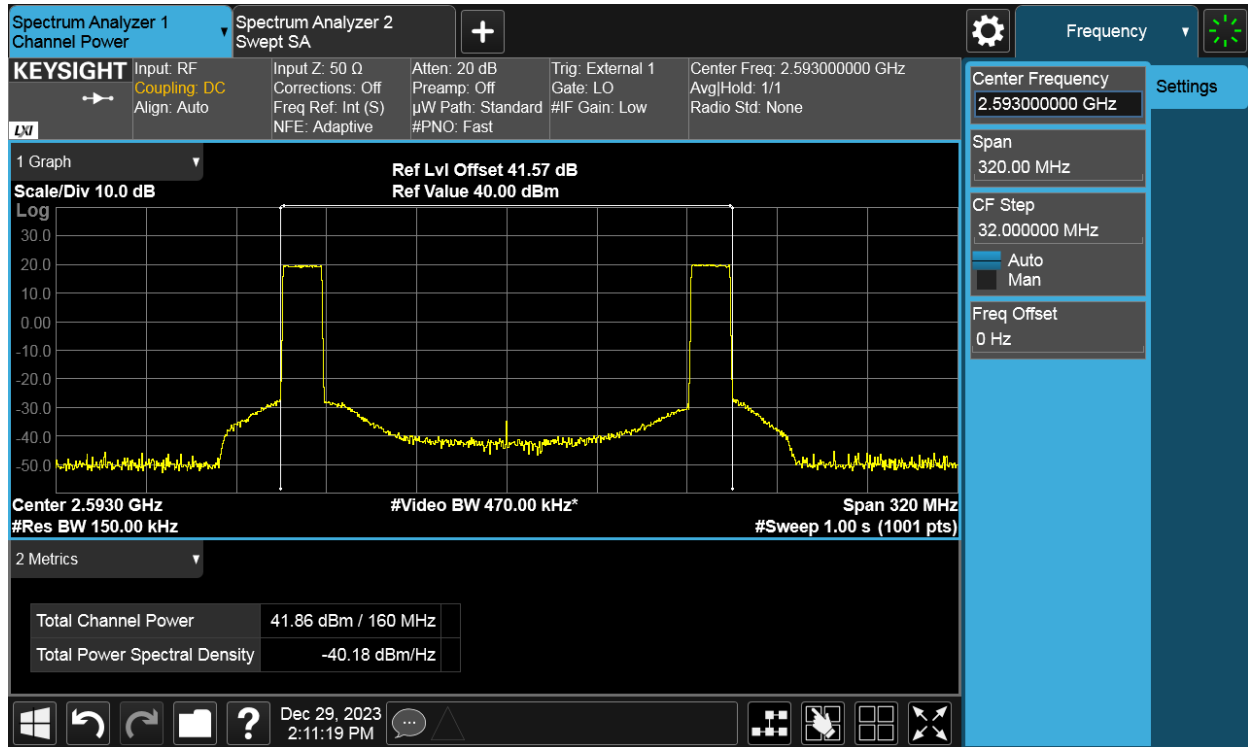
Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)								
			Channel position B			Channel position M			Channel position T		
			Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)
A	QPSK	10	-	-	-	40.11	28.24	-	-	-	-
B	QPSK	10	-	-	-	39.80	27.87	-	-	-	-
C	QPSK	10	-	-	-	39.70	27.69	-	-	-	-
D	QPSK	10	-	-	-	39.55	27.56	-	-	-	-
Total			-	-	-	45.82	33.87	-	-	-	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)								
			Channel position B			Channel position M			Channel position T		
			Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)
A	QPSK	15	-	-	-	41.86	28.06	-	-	-	-
B	QPSK	15	-	-	-	41.59	27.61	-	-	-	-
C	QPSK	15	-	-	-	41.39	27.41	-	-	-	-
D	QPSK	15	-	-	-	41.26	27.38	-	-	-	-
Total			-	-	-	47.55	33.64	-	-	-	-

NR 10MHz, Channel M, Power



NR 15MHz, Channel M, Power

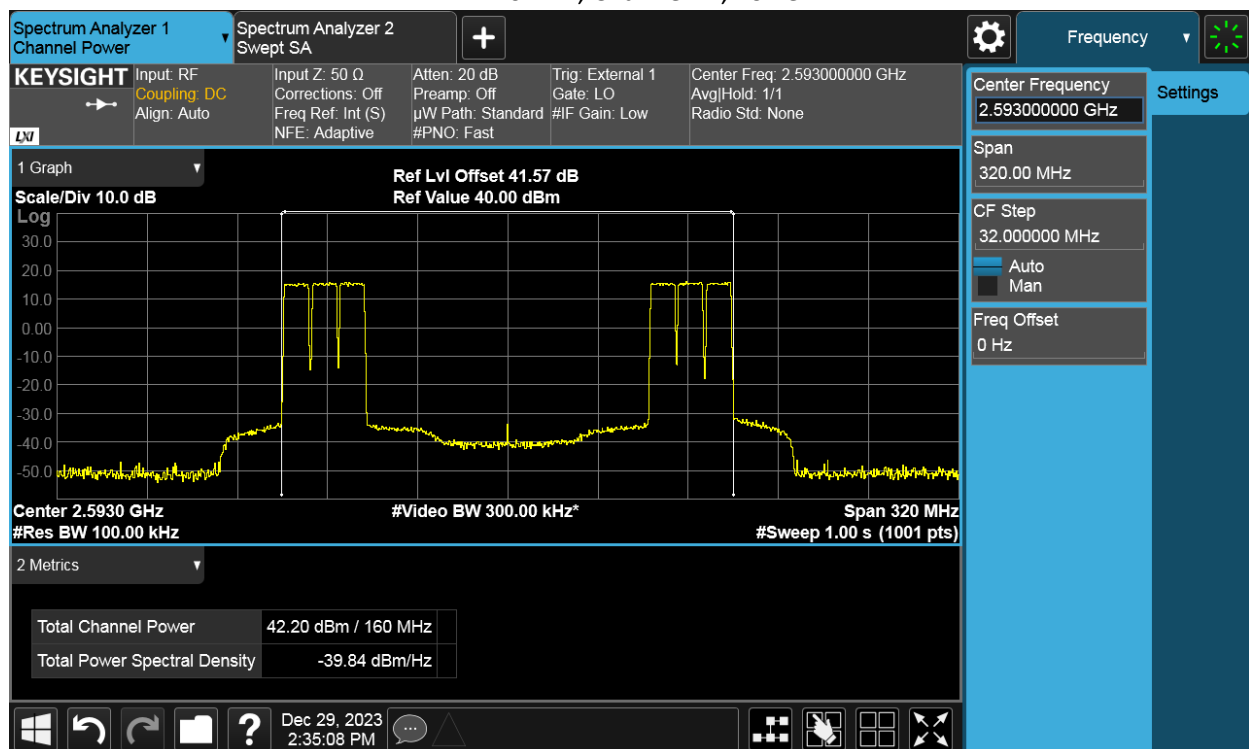


NR-6C:

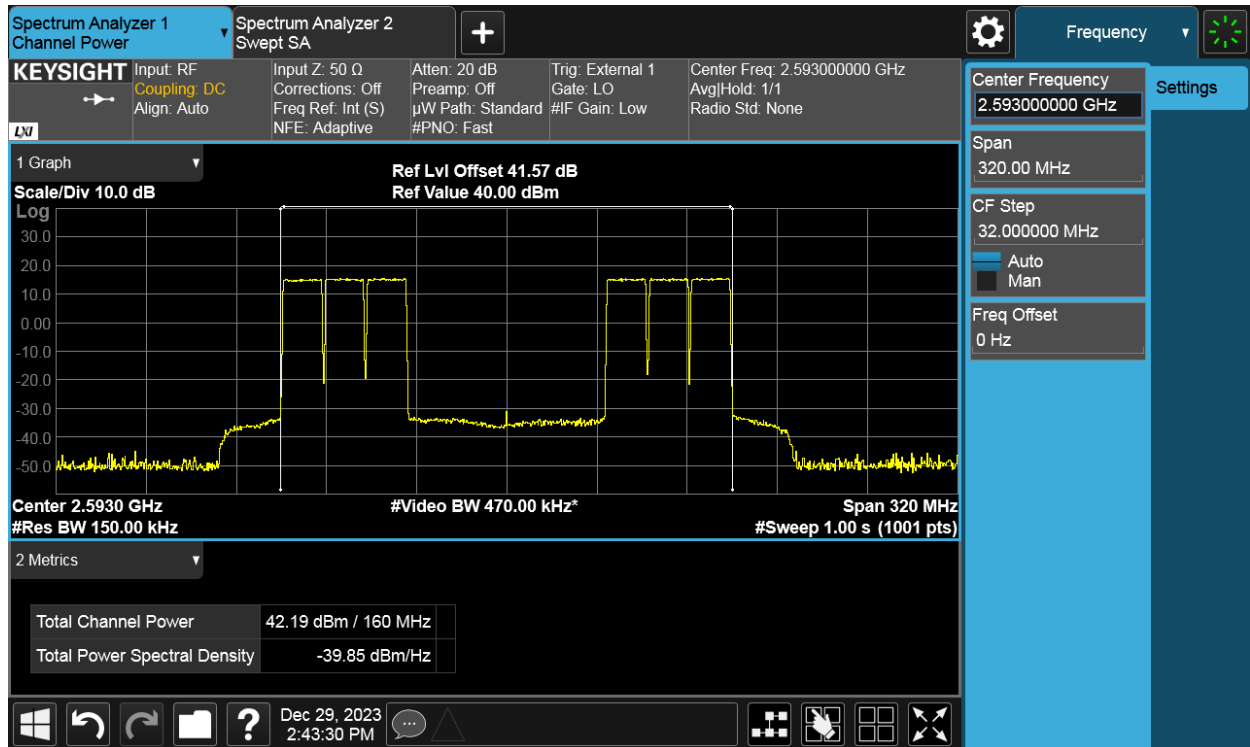
Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)								
			Channel position B			Channel position M			Channel position T		
			Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)
A	QPSK	10	-	-	-	42.20	25.60	-	-	-	-
B	QPSK	10	-	-	-	41.94	25.37	-	-	-	-
C	QPSK	10	-	-	-	41.73	25.24	-	-	-	-
D	QPSK	10	-	-	-	41.63	25.22	-	-	-	-
Total			-	-	-	47.90	31.38	-	-	-	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)								
			Channel position B			Channel position M			Channel position T		
			Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)	Power (dBm)	Power (dBm /MHz)	PAR (dB)
A	QPSK	15	-	-	-	42.19	23.64	-	-	-	-
B	QPSK	15	-	-	-	41.85	23.37	-	-	-	-
C	QPSK	15	-	-	-	41.67	23.19	-	-	-	-
D	QPSK	15	-	-	-	41.73	23.40	-	-	-	-
Total			-	-	-	47.89	29.42	-	-	-	-

NR 10MHz, Channel M, Power



NR 15MHz, Channel M, Power



TEST REPORT**4 Occupied Bandwidth****Test result: Pass****4.1 Measurement Procedure**

The EUT was set to transmit at maximum power and testing was carried out on bottom, middle and top channels. Using the Occupied Bandwidth measurement function in the spectrum analyzer, the 26dB bandwidth was measured in accordance with FCC KDB 971168 D01 Clause 4.2.

The measurement method is from KDB 971168 4.2:

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
- c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least $10\log(\text{OBW} / \text{RBW})$ below the reference level.
- d) Set the detection mode to peak, and the trace mode to max hold.
- e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

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4.2 Measurement result

NR- 1C

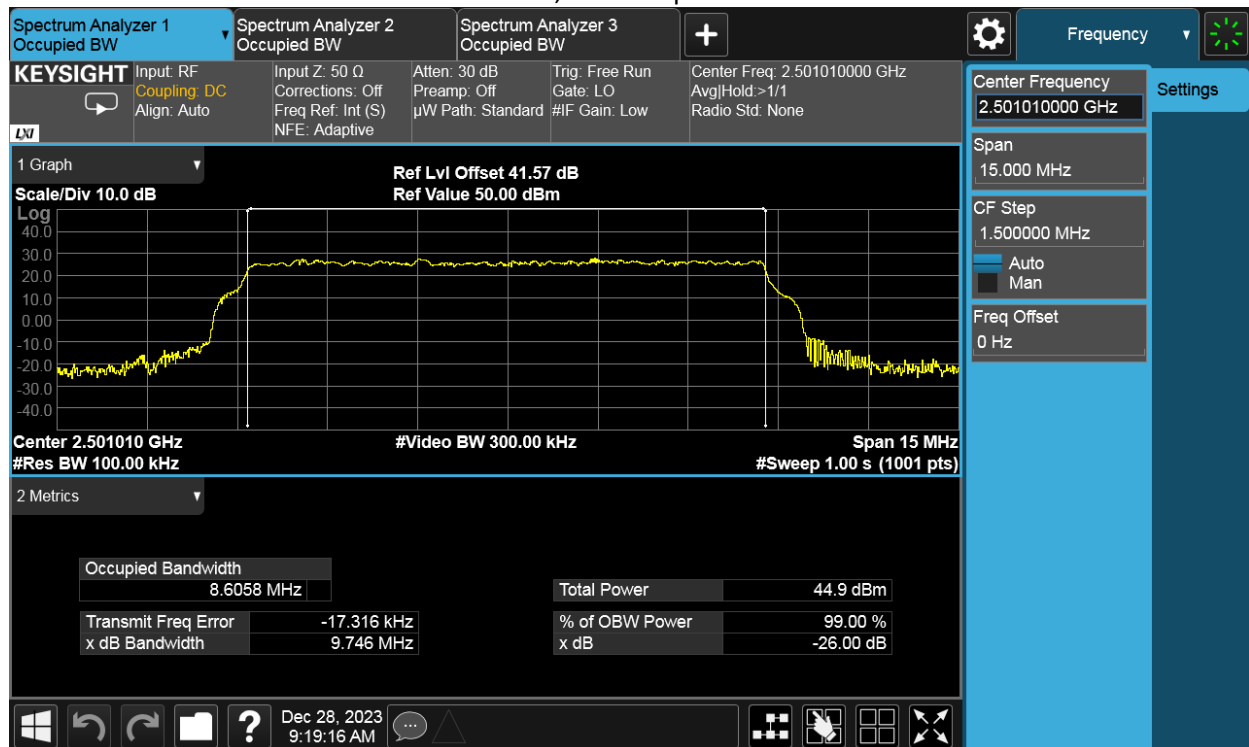
99% Occupied Bandwidth

Antenna Port	Modulation	Bandwidth	Occupied Bandwidth (MHz)		
			Channel Position B	Channel Position M	Channel Position T
A	QPSK	10MHz	8.6058	8.6300	8.6425
A	QPSK	15MHz	13.582	13.573	13.574

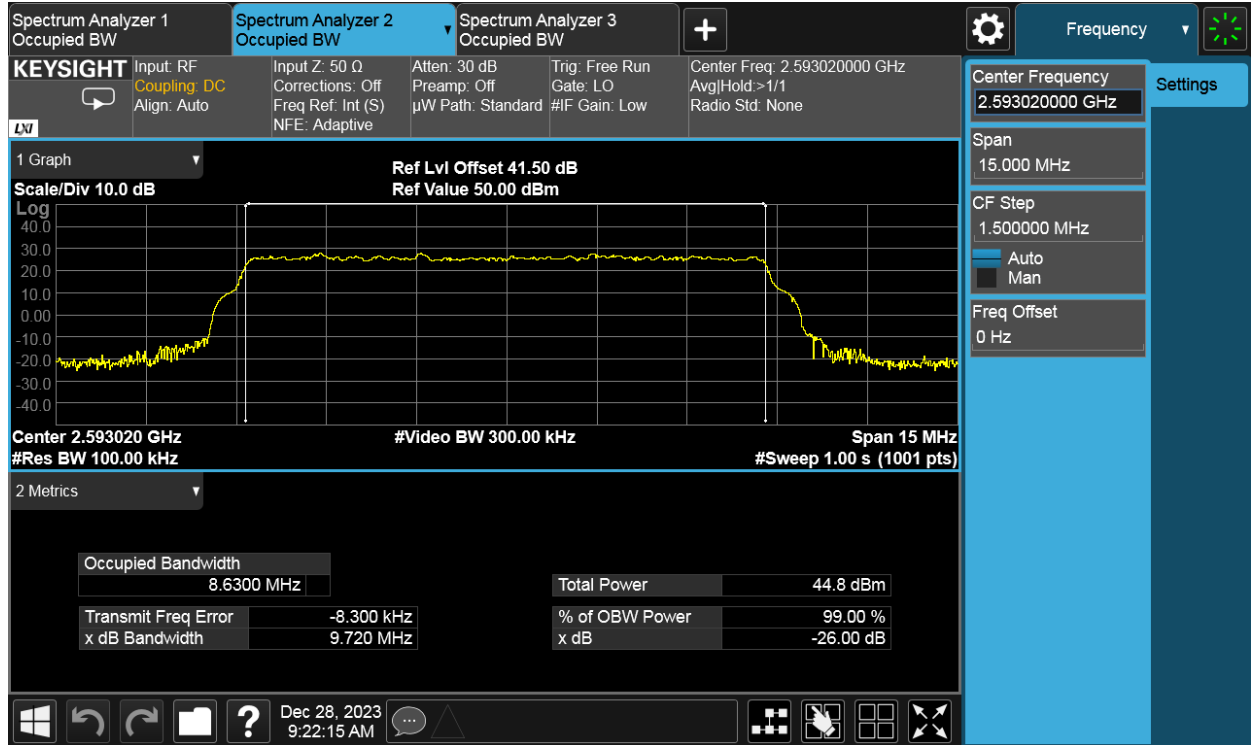
-26dBc Occupied Bandwidth

Antenna Port	Modulation	Bandwidth	Occupied Bandwidth (MHz)		
			Channel Position B	Channel Position M	Channel Position T
A	QPSK	10MHz	9.746	9.720	9.770
A	QPSK	15MHz	14.69	14.66	14.64

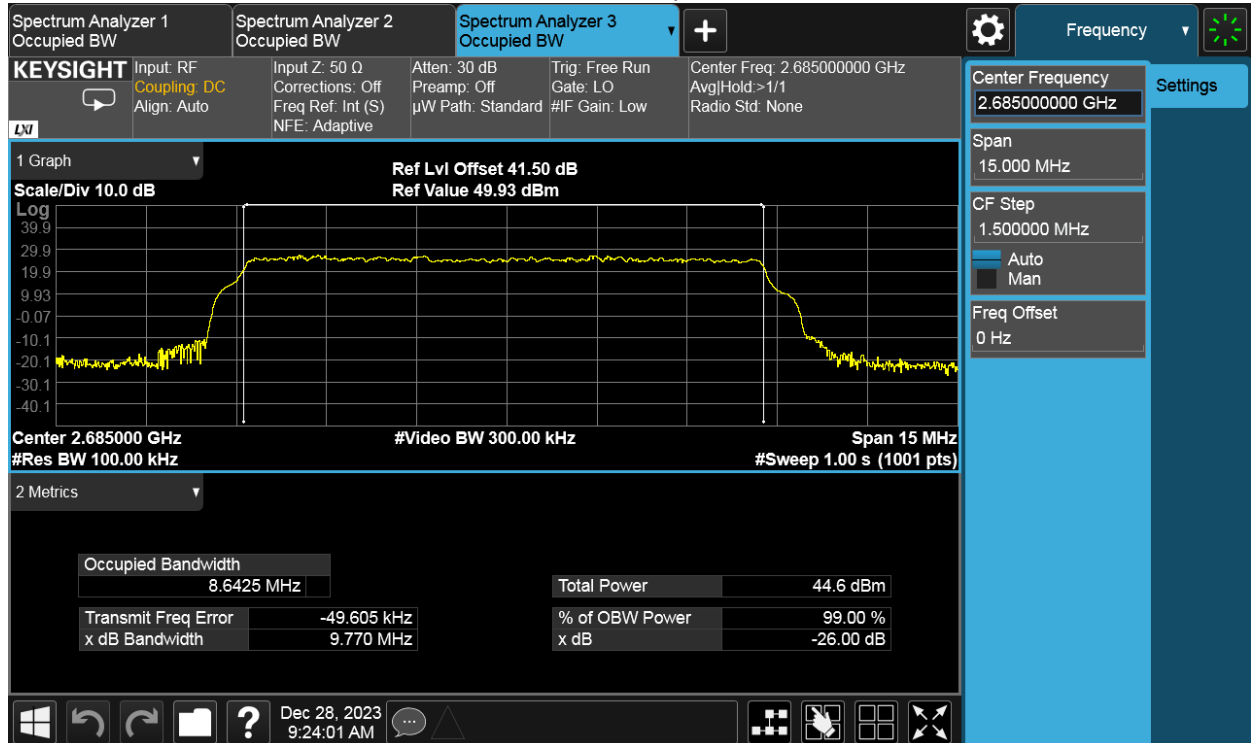
10MHz, Channel position B



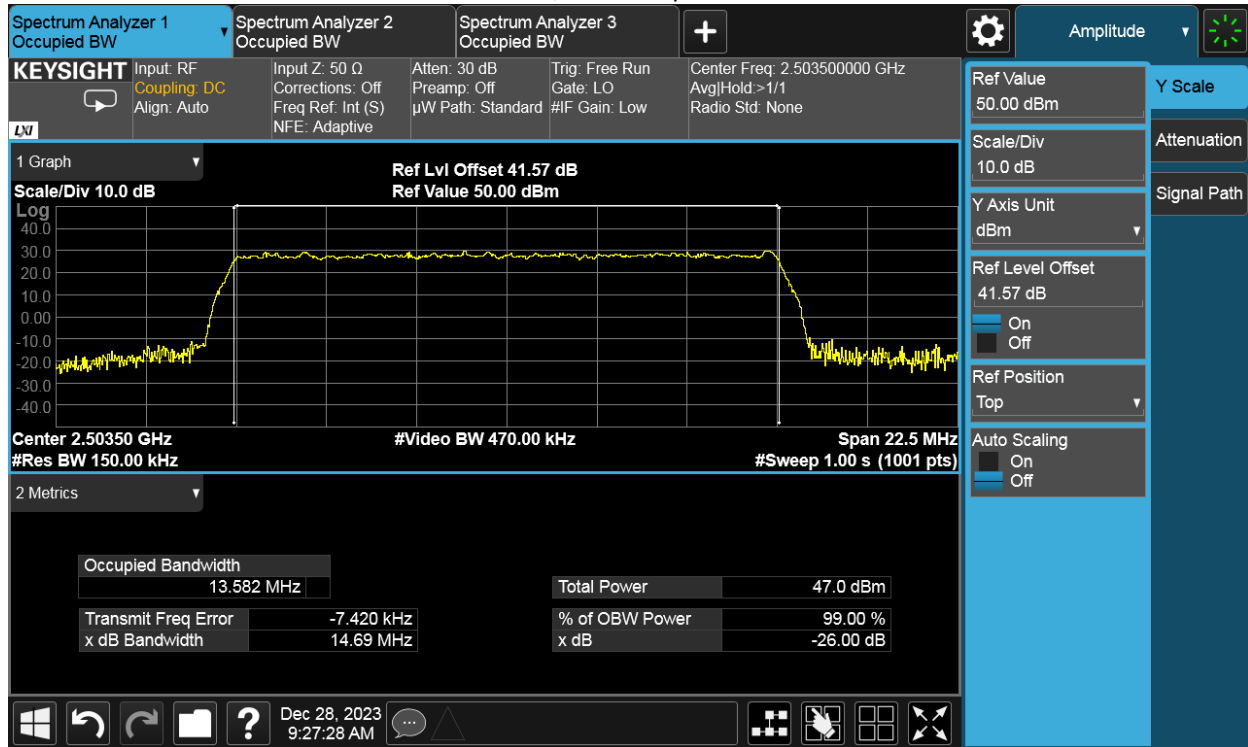
10MHz, Channel position M



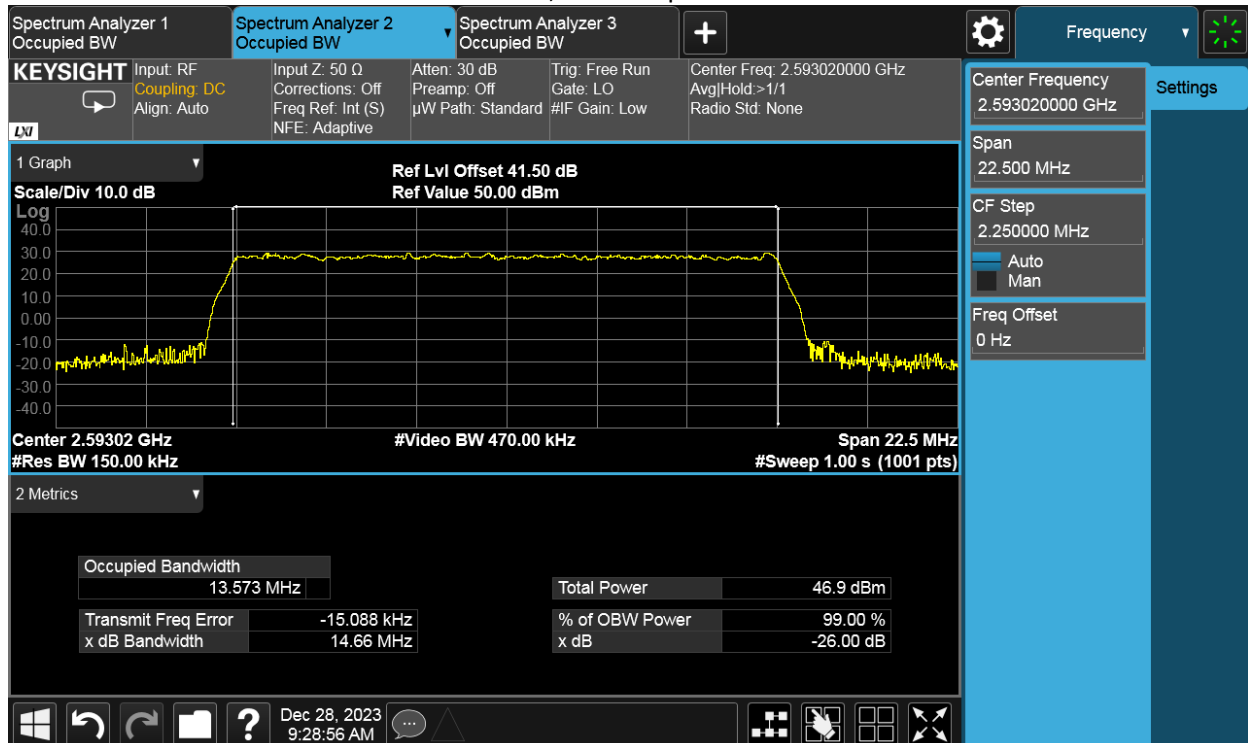
10MHz, Channel position T



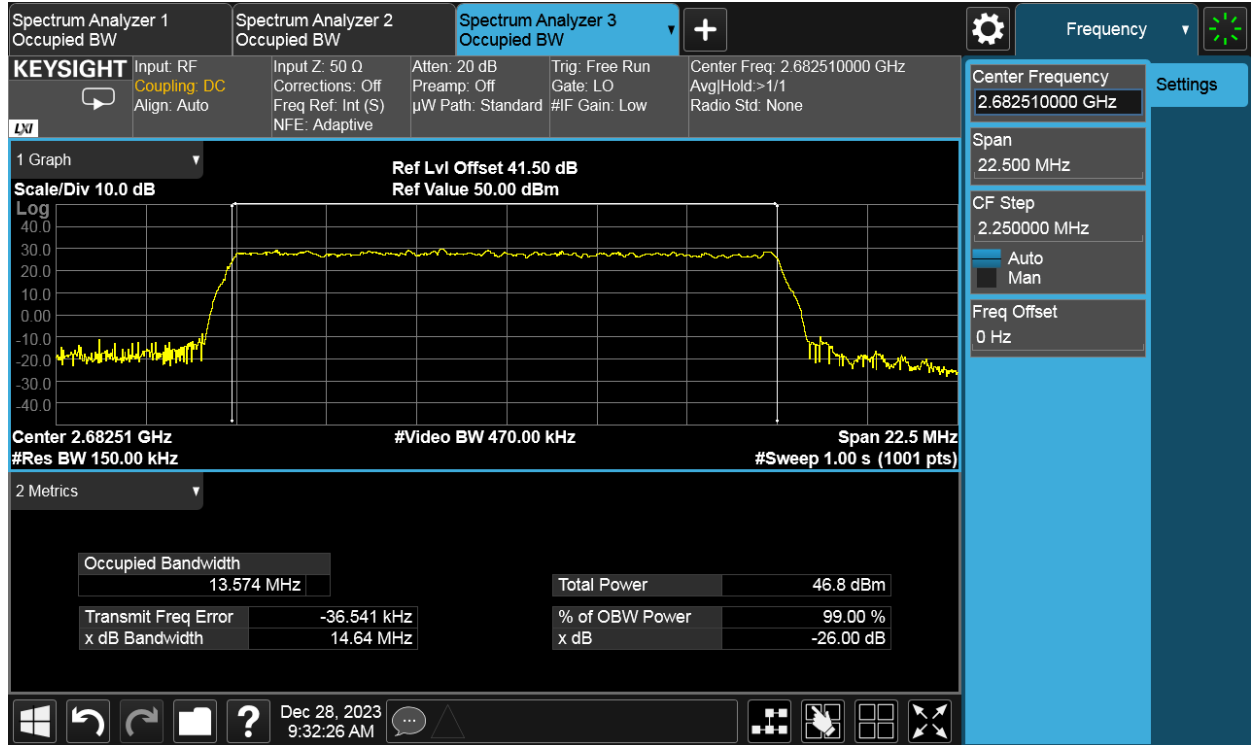
15MHz, Channel position B



15MHz, Channel position M



15MHz, Channel position T



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5 Unwanted Emissions at Band Edge

Test result: Pass

5.1 Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

5.2 Measurement Procedure

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For MIMO mode configurations, the limit was adjusted with a correction of -6.02dB [$10\log(1/4)$] by using the Measure and Add $10\log(N)$ dB technique according to KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from antenna ports . Then the limit was adjusted to -19.02dBm .

In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed and a RBW of 1MHz for measurements of emissions $> 1\text{MHz}$ away from the band edges.

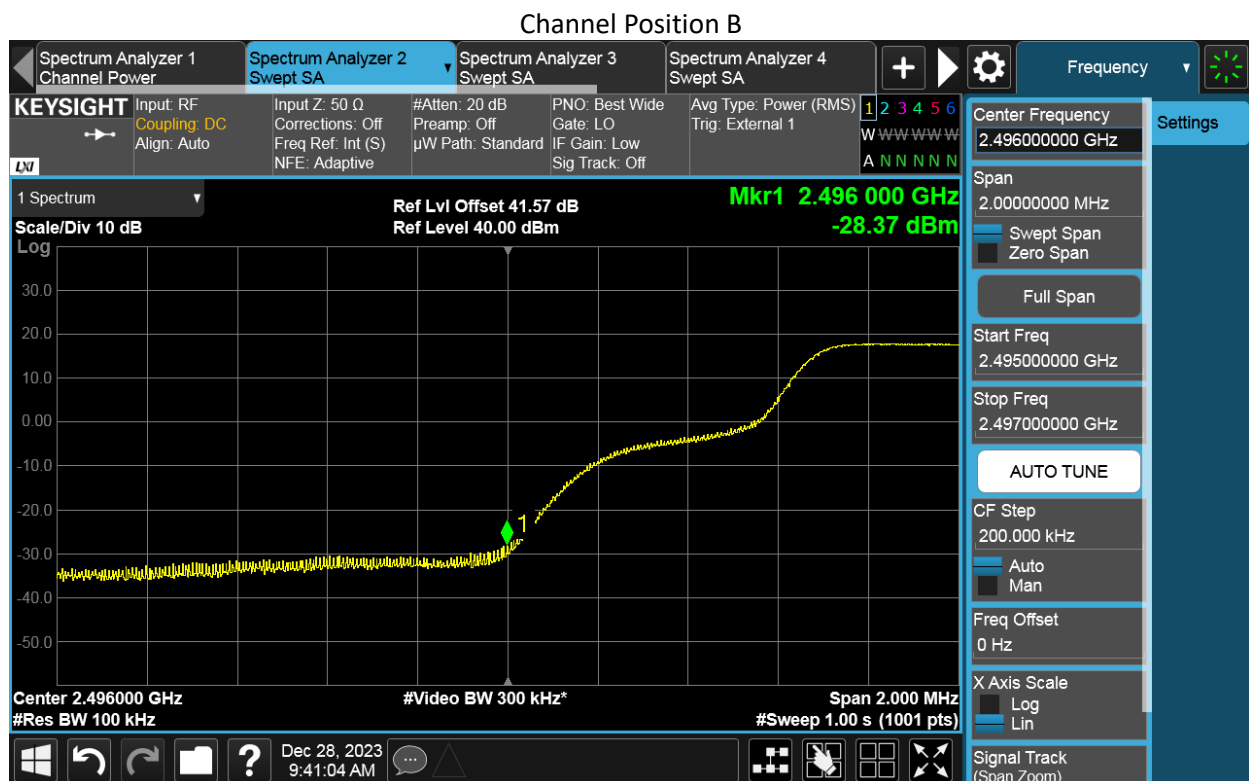
Spectrum analyzer detector was set as RMS.

TEST REPORT

5.3 Measurement result

NR-1C-BE:

Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
A	B	QPSK	10	100	-19.02
A	T	QPSK	10	100	-19.02

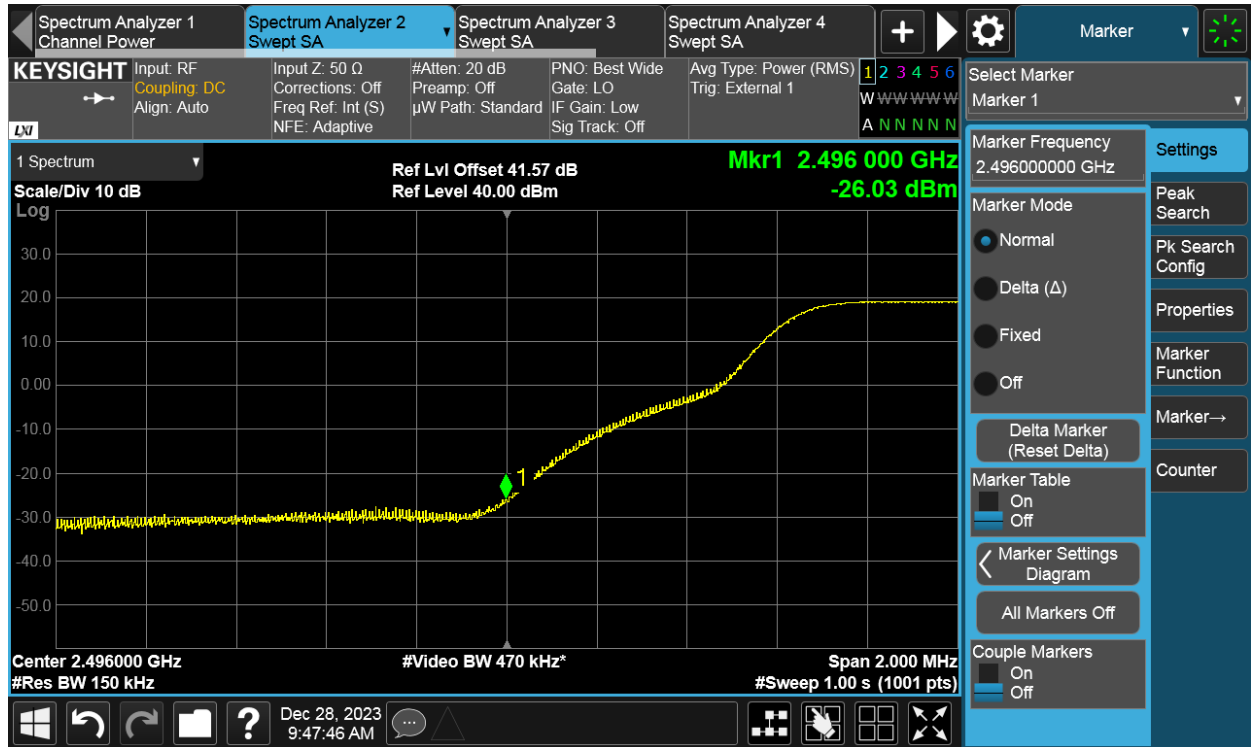


Channel Position T

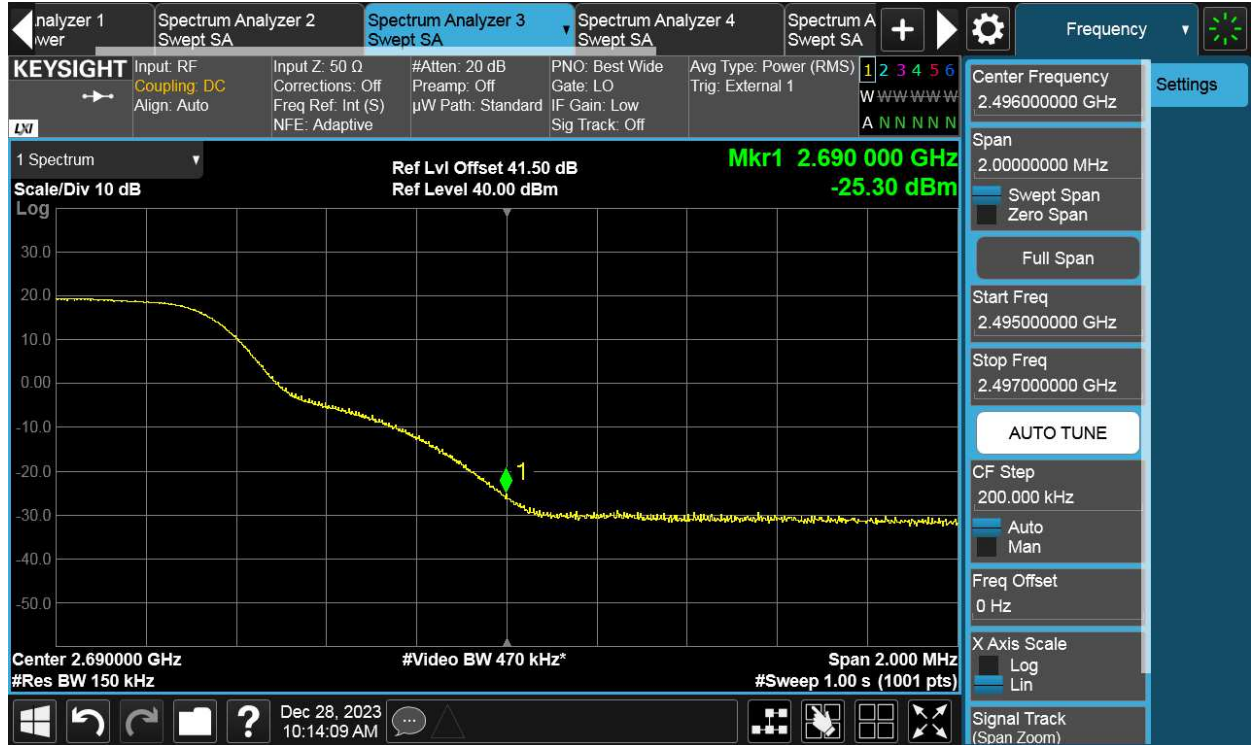


Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
A	B	QPSK	15	150	-19.02
A	T	QPSK	15	150	-19.02

Channel Position B



Channel Position T



NR-2C-BE:

Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
A	B	QPSK	10	100	-19.02
A	T	QPSK	10	100	-19.02

Channel Position B

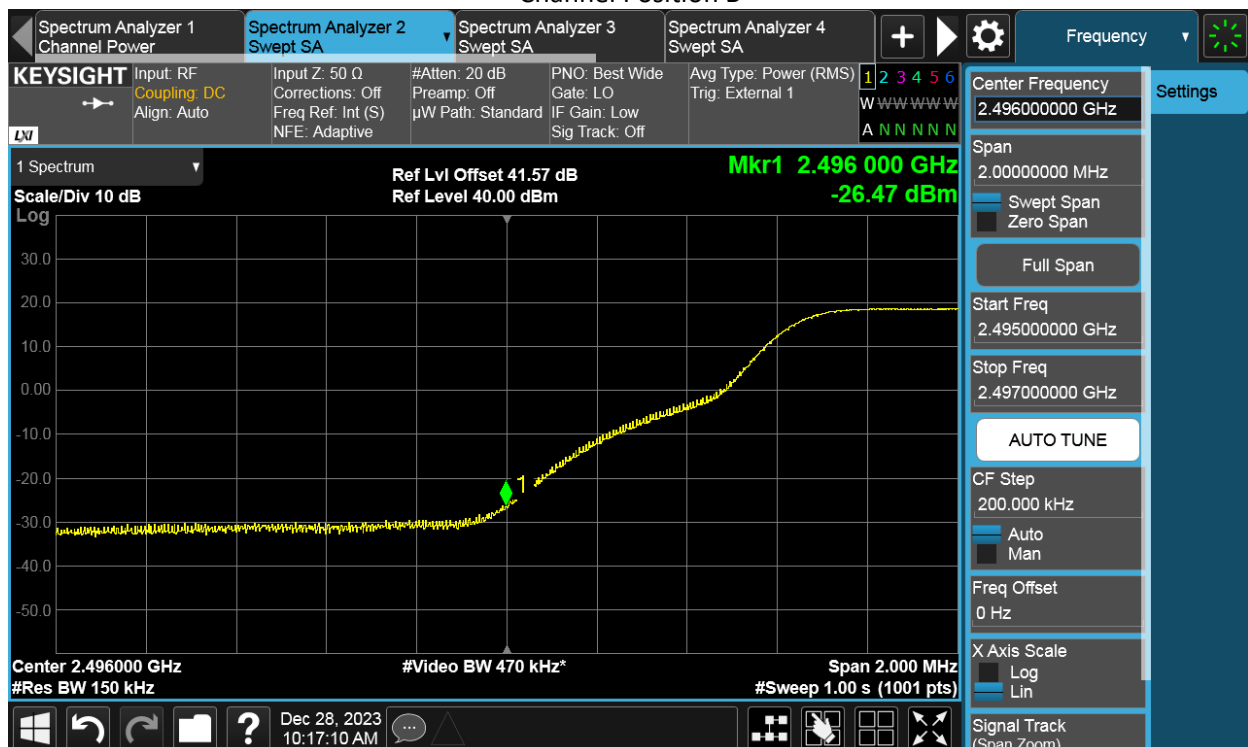


Channel Position T

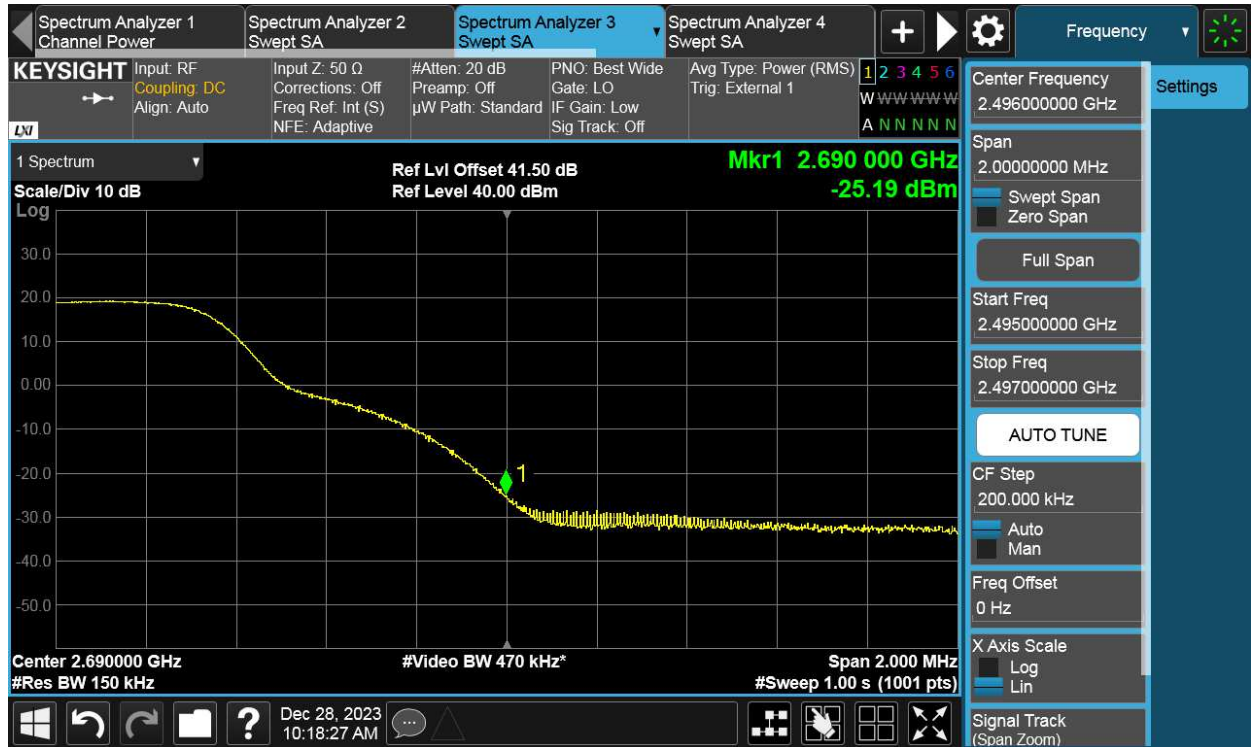


Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
A	B	QPSK	15	150	-19.02
A	T	QPSK	15	150	-19.02

Channel Position B



Channel Position T



NR-6C-BE:

Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
A	B	QPSK	10	100	-19.02
A	T	QPSK	10	100	-19.02

Channel Position B



Channel Position T



Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
A	B	QPSK	15	150	-19.02
A	T	QPSK	15	150	-19.02

Channel Position B



Channel Position T



TEST REPORT

6 Conducted Unwanted Emission

Test result: Pass

6.1 Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

6.2 Measurement Procedure

In accordance with FCC rules, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

The spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 27GHz. The resolution bandwidth of 1MHz was employed for frequency band 9kHz to 27GHz. The spectrum analyzer detector was set to RMS.

For MIMO mode configurations, the limit was adjusted with a correction of -6.02dB [$10\log(1/4)$] by using the Measure and Add $10\log(N)$ dB technique according to KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from antenna ports. Then the limit was adjusted to -19.02dBm .