



TEST REPORT

FCC ID: 2ADYY-T16RA

Product: Laptop Computer

Model No.: T16RA

Trade Mark: TECNO

Report No.: WSCT-A2LA-R&E240300010A-Wi-Fi2

Issued Date: 03 April 2024

Issued for:

TECNO MOBILE LIMITED
FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET
FOTAN NT HONGKONG

Issued By:

World Standardization Certification & Testing Group(Shenzhen) Co., Ltd.
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Note: The results contained in this report pertain only to the tested sample. This report shall not be reproduced, except in full, without written approval of World Standardization Certification & Testing Group(Shenzhen) Co., Ltd. This report must not be used by the client to claim product certification, approval, or any agency of the U.S. Government.





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Report No.: WSCT-A2LA-R&E240300010A-Wi-Fi2

1 Test Certification

Product:	Laptop Computer
Model No.:	T16RA
Trade Mark:	TECNO
Applicant:	TECNO MOBILE LIMITED
Address:	FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG
Manufacturer:	TECNO MOBILE LIMITED
Address:	FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG
Date of Test:	22 February 2024 to 02 April 2024
Applicable Standards:	FCC CFR Title 47 FCC Part 15 Subpart E

The above equipment has been tested by World Standardization Certification & Testing Group(Shenzhen)Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



(Wang Xiang)

Checked By:



(Mo Peiyun)

Approved By:



(Liu Fuxin)

Date:

03 April 2024



世标检测认证股份
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2 EUT Description

Product:	Laptop Computer
Model No.:	T16RA
Trade Mark:	TECNO
Operation Frequency:	Band 1: 5180-5240 MHz Band 2: 5260-5320 MHz Band 3: 5500-5700 MHz Band 4: 5745-5825 MHz
Modulation type:	IEEE 802.11a/n/ac: OFDM/OFDMA (BPSK/QPSK/16QAM/64QAM/256QAM)
Antenna Type:	Integral Antenna
Antenna Gain	MAIN ANT: 2.02dBi AUX ANT: 2.91 dBi
Rechargeable Li-Polymer Battery:	Model: 528282-3S1P Rated Voltage: 11.61V Rated Capacity: 6460mAh/75Wh Typical Capacity: 6550mAh/76.04Wh Limited Charge Voltage: 13.35V
Adapter:	Adapter: TCW-A61S-65W Input: 100-240V~50/60Hz 1.5A Max Output: PD:5V---3A 9V---3A 12V---3A 15V---3A 20V---3.25A PPS:3.3-11V---5A Max
Remark:	N/A.



3 TEST DESCRIPTION

3.1 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 3.2\text{dB}$
2	RF power, conducted	$\pm 0.16\text{dB}$
3	Spurious emissions, conducted	$\pm 0.21\text{dB}$
4	All emissions, radiated(<1GHz)	$\pm 4.7\text{dB}$
5	All emissions, radiated(>1GHz)	$\pm 4.7\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$



3.2 TEST ENVIRONMENT AND MODE

Operating Environment:

Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar

Test Mode:

Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 98.46%)
-------------------	--

The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. For the full battery state and The output power to the maximum state.

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test Mode	Description
Mode 1	802.11a
Mode 2	802.11n20
Mode 3	802.11n40
Mode 4	802.11ac20
Mode 5	802.11ac40
Mode 6	802.11ac80

Note:

- (1) The measurements are performed at the highest, lowest available channels.
- (2) The EUT use new battery.
- (3) Record the worst case of each test item in this report.

3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

Test program	DRTU								
Mode	Test Frequency (MHz)								
	NCB: 20MHz								
802.11a	5180 MHz	5240 MHz	5260 MHz	5320 MHz	5500 MHz	5700 MHz	5745 MHz	5825 MHz	
802.11n	5180 MHz	5240 MHz	5260 MHz	5320 MHz	5500 MHz	5700 MHz	5745 MHz	5825 MHz	
802.11ac	5180 MHz	5240 MHz	5260 MHz	5320 MHz	5500 MHz	5700 MHz	5745 MHz	5825 MHz	
	NCB: 40MHz								
802.11n	5190 MHz	5230 MHz	5270 MHz	5310 MHz	5510 MHz	5670 MHz	5755 MHz	5795 MHz	
802.11ac	5190 MHz	5230 MHz	5270 MHz	5310 MHz	5510 MHz	5670 MHz	5755 MHz	5795 MHz	
	NCB: 80MHz								
802.11ac	5210 MHz	5290 MHz	5530 MHz	5610 MHz	5775 MHz				

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.



3.4 CONFIGURATION OF SYSTEM UNDER TEST



(EUT: Laptop Computer)

3.5 DESCRIPTION OF SUPPORT UNITS (CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
Adapter	Adapter1	/	/	ADAPTER
Router	Archer AX6000	/	TE7AX6000	/

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.
- (4) The adapter supply by the applicant.

4 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 Subpart C&E			
Standard Section	Test Item	Judgment	Remark
2.1049 15.403(i)	26dB & 99% Bandwidth	PASS	Complies
15.407(e)	6dB Spectrum Bandwidth	PASS	Complies
15.407(a)	Maximum Conducted Output Power	PASS	Complies
15.407(a)	Power Spectral Density	PASS	Complies
15.407(b)	Unwanted Emissions	PASS	Complies
15.207	AC Conducted Emission	PASS	Complies
15.407(g)	Frequency Stability	PASS	Complies
15.407(c)	Automatically Discontinue Transmission	PASS	Complies
15.203 & 15.407(a)	Antenna Requirement	PASS	Complies
15.407(h)	Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS)	PASS	Complies

NOTE:

(1)" N/A" denotes test is not applicable in this test report.



5 MEASUREMENT INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	Calibration Date	Calibration Due.
Test software	--	EZ-EMC	CON-03A	-	-
Test software	--	MTS8310	-	-	-
EMI Test Receiver	R&S	ESCI	100005	11/05/2023	11/04/2024
LISN	AFJ	LS16	16010222119	11/05/2023	11/04/2024
LISN(EUT)	Mestec	AN3016	04/10040	11/05/2023	11/04/2024
Universal Radio Communication Tester	R&S	CMU 200	1100.0008.02	11/05/2023	11/04/2024
Coaxial cable	Megalon	LMR400	N/A	11/05/2023	11/04/2024
GPIO cable	Megalon	GPIO	N/A	11/05/2023	11/04/2024
Spectrum Analyzer	R&S	FSU	100114	11/05/2023	11/04/2024
Pre Amplifier	H.P.	HP8447E	2945A02715	11/05/2023	11/04/2024
Pre-Amplifier	CDSI	PAP-1G18-38	--	11/05/2023	11/04/2024
Bi-log Antenna	SUNOL Sciences	JB3	A021907	11/05/2023	11/04/2024
9*6*6 Anechoic	--	--	--	11/05/2023	11/04/2024
Horn Antenna	COMPLIANCE ENGINEERING	CE18000	--	11/05/2023	11/04/2024
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-631	11/05/2023	11/04/2024
Cable	TIME MICROWAVE	LMR-400	N-TYPE04	11/05/2023	11/04/2024
System-Controller	CCS	N/A	N/A	N.C.R	N.C.R
Turn Table	CCS	N/A	N/A	N.C.R	N.C.R
Antenna Tower	CCS	N/A	N/A	N.C.R	N.C.R
RF cable	Murata	MXHQ87WA3000	-	11/05/2023	11/04/2024
Loop Antenna	EMCO	6502	00042960	11/05/2023	11/04/2024
Horn Antenna	SCHWARZBECK	BBHA 9170	1123	11/05/2023	11/04/2024
Power meter	Anritsu	ML2487A	6K00003613	11/05/2023	11/04/2024
Power sensor	Anritsu	MX248XD	--	11/05/2023	11/04/2024
Spectrum Analyzer	Keysight	N9010B	MY60241089	11/05/2023	11/04/2024





6 Facilities and Accreditations

6.1 FACILITIES

All measurement facilities used to collect the measurement data are located at **Building A-B, Baoshi Science & Technology Park, Baoshi Road, Bao'an District, Shenzhen, Guangdong, China of the World Standardization Certification & Testing Group(Shenzhen) CO., LTD**

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 32. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2 ACCREDITATIONS

CNAS - Registration Number: L3732

China National Accreditation Service for Conformity Assessment, The test firm Registration Number: L3732

FCC - Designation Number: CN1303

World Standardization Certification & Testing Group(Shenzhen) CO., LTD. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Designation Number: CN1303.

A2LA - Certificate Number: 5768.01

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number: 5768.01





7 Test Results and Measurement Data

7.1 CONDUCTED EMISSION MEASUREMENT

POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz



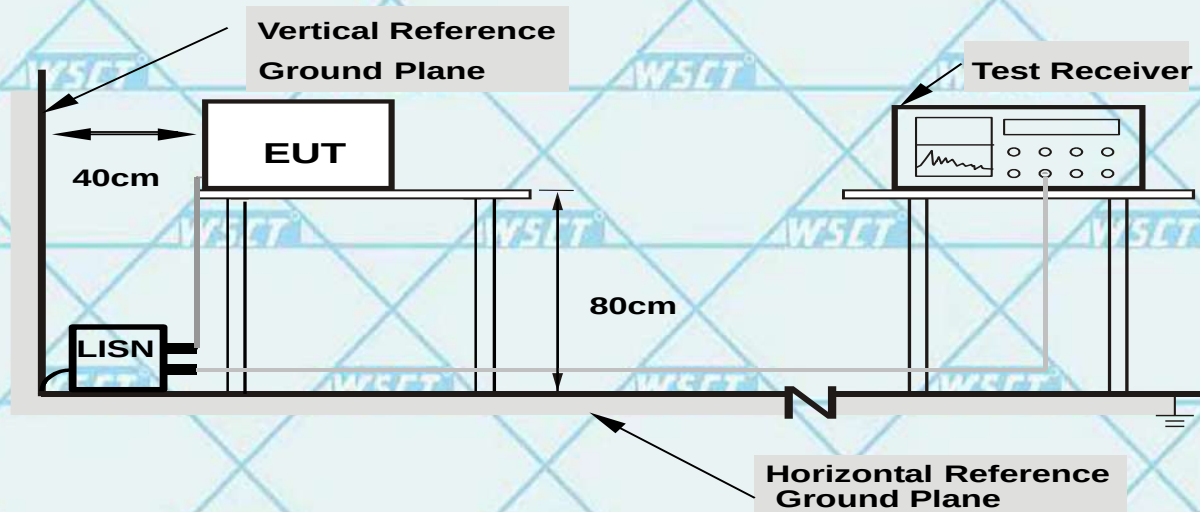
7.1.1 TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

7.1.2 DEVIATION FROM TEST STANDARD

No deviation

TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

7.1.3 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



Report No.: WSCT-A2LA-R&E240300010A-Wi-Fi2

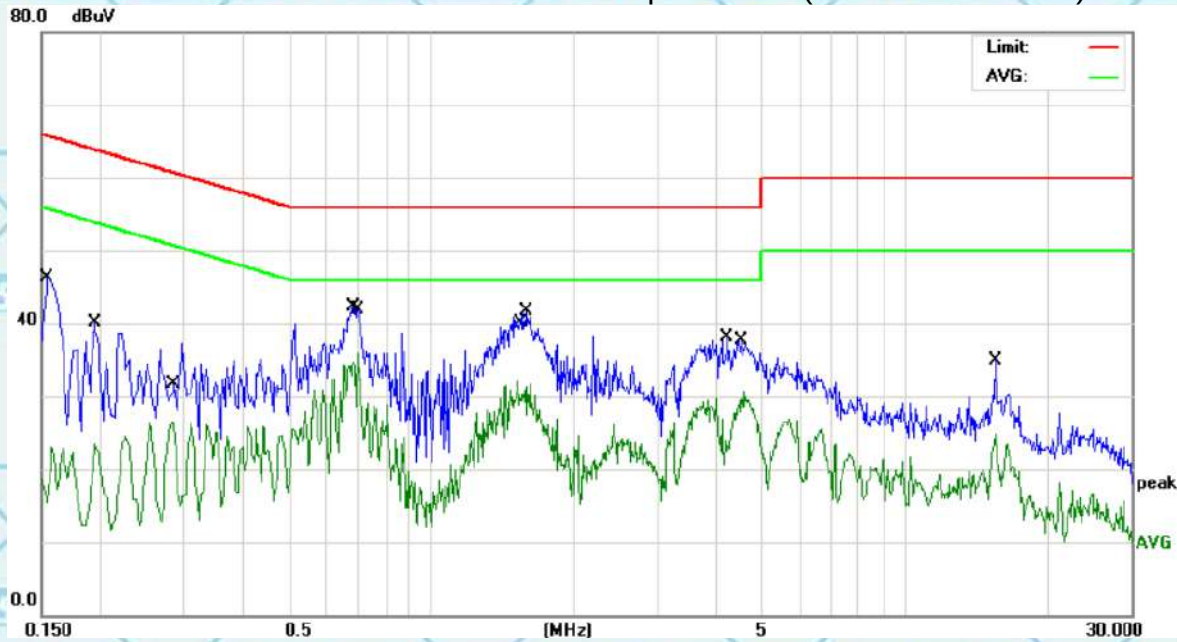
Certificate #5768.01

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7.1.4 TEST RESULTS

The worst mode is MIMO802.11n20

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)-worst



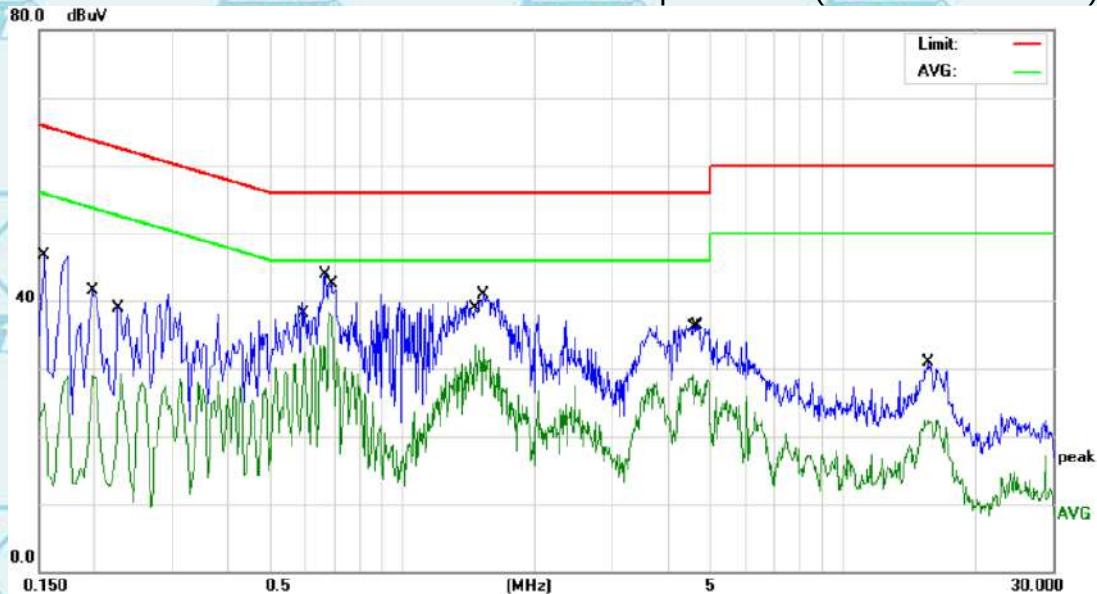
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1539	35.91	10.45	46.36	65.78	-19.42	QP
2		0.1940	29.69	10.45	40.14	63.86	-23.72	QP
3		0.2819	16.05	10.47	26.52	50.76	-24.24	AVG
4		0.6860	31.84	10.53	42.37	56.00	-13.63	QP
5	*	0.6980	25.34	10.53	35.87	46.00	-10.13	AVG
6		1.5220	21.51	10.63	32.14	46.00	-13.86	AVG
7		1.5859	31.13	10.64	41.77	56.00	-14.23	QP
8		4.2180	27.37	10.73	38.10	56.00	-17.90	QP
9		4.5540	19.88	10.74	30.62	46.00	-15.38	AVG
10		4.5540	19.88	10.74	30.62	46.00	-15.38	AVG
11		15.5340	23.81	11.18	34.99	60.00	-25.01	QP
12		15.5340	13.63	11.18	24.81	50.00	-25.19	AVG

Remark: All the modes have been investigated, and only worst mode is presented in this report.





Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1539	36.34	10.45	46.79	65.78	-18.99	QP
2		0.1980	31.08	10.45	41.53	63.69	-22.16	QP
3		0.2300	18.86	10.46	29.32	52.45	-23.13	AVG
4		0.6020	21.79	10.53	32.32	46.00	-13.68	AVG
5		0.6700	33.33	10.53	43.86	56.00	-12.14	QP
6	*	0.6860	27.67	10.53	38.20	46.00	-7.80	AVG
7		1.4660	22.80	10.62	33.42	46.00	-12.58	AVG
8		1.5339	30.23	10.64	40.87	56.00	-15.13	QP
9		4.5620	18.34	10.74	29.08	46.00	-16.92	AVG
10		4.6660	25.59	10.74	36.33	56.00	-19.67	QP
11		15.7020	19.70	11.18	30.88	60.00	-29.12	QP
12		15.7020	11.20	11.18	22.38	50.00	-27.62	AVG

Note1:

Freq. = Emission frequency in MHz

Reading level (dBuV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBuV) = Reading level (dBuV) + Corr. Factor (dB)

Limit (dBuV) = Limit stated in standard

Margin (dB) = Measurement (dBuV) - Limits (dBuV)

Q.P. = Quasi-Peak AVG = average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

7.2 RADIATED EMISSION MEASUREMENT

Radiated Emission Limits(Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micromvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 1Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP



7.2.1 TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

7.2.2 DEVIATION FROM TEST STANDARD

No deviation





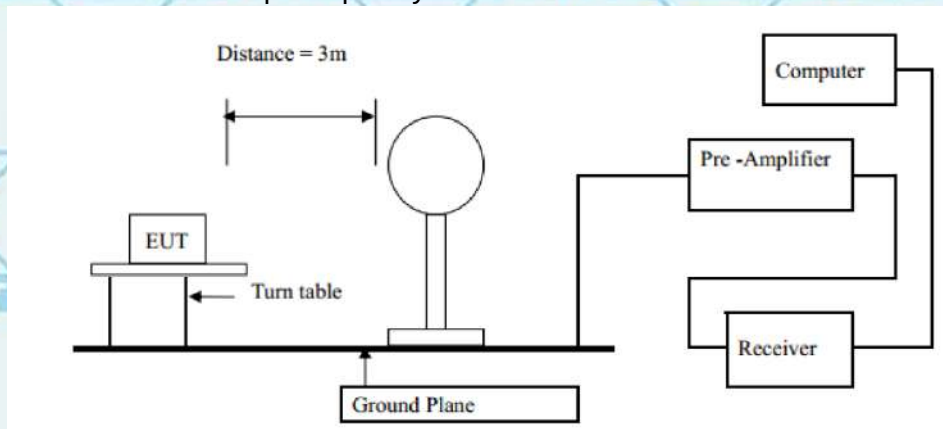
Report No.: WSCT-A2LA-R&E240300010A-Wi-Fi2

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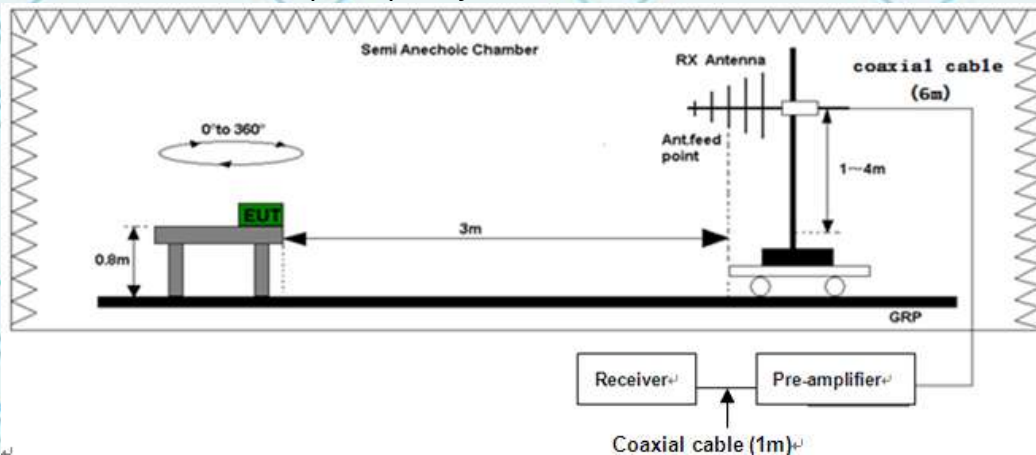
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7.2.3 TEST SETUP

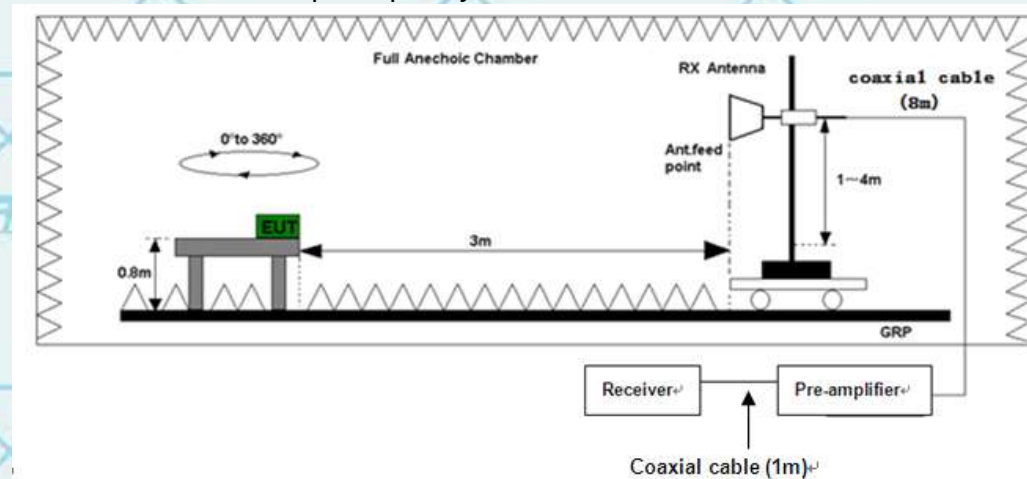
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz





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The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.2.5 RESULTS (BELOW 30 MHZ)

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

Note:

No result in this part for margin above 20dB.

Distance extrapolation factor = $20 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuV) + distance extrapolation factor.

All the x/y/z orientation has been investigated, and only worst case is presented in this report.





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7.2.6 TEST RESULTS (BETWEEN 30M – 1000 MHZ)

Please refer to following diagram for individual

Below 1GHz

The worst mode is MIMO802.11n20

Horizontal:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1	!	38.6160	34.15	-0.68	33.47	40.00	-6.53	QP
2	*	84.9993	41.14	-4.90	36.24	40.00	-3.76	QP
3		261.9753	35.78	-1.34	34.44	46.00	-11.56	QP
4		362.9844	32.64	1.71	34.35	46.00	-11.65	QP
5	!	668.1422	32.28	9.30	41.58	46.00	-4.42	QP
6	!	925.7563	27.49	13.51	41.00	46.00	-5.00	QP

Remark: All the modes have been investigated, and only worst mode is presented in this report.



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Vertical:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1	*	30.0000	37.22	-1.73	35.49	40.00	-4.51	QP
2	!	84.9993	39.14	-4.90	34.24	40.00	-5.76	QP
3		189.0742	35.95	-3.32	32.63	43.50	-10.87	QP
4		362.9844	30.14	1.71	31.85	46.00	-14.15	QP
5	!	668.1422	29.78	9.30	39.08	46.00	-6.92	QP
6	!	916.0687	26.81	13.36	40.17	46.00	-5.83	QP

Note1:

Freq. = Emission frequency in MHz

Reading level (dBuV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss - Amplifier factor.

Measurement (dBuV) = Reading level (dBuV) + Corr. Factor (dB)

Limit (dBuV) = Limit stated in standard

Margin (dB) = Measurement (dBuV) - Limits (dBuV)





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Note: All the mode have been tested, and only the worst case mode are in the report

802.11n20(the worst case)**Above 1GHz**

Freq. (MHz)	Low channel: 5180MHz						
	Ant.Pol	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
10360	V	60.13	39.08	74	54	-13.87	-14.92
15540	V	59.59	40.37	74	54	-14.41	-13.63
10360	H	59.75	39.34	74	54	-14.25	-14.66
15540	H	59.85	40.85	74	54	-14.15	-13.15

Freq. (MHz)	Low channel: 5260MHz						
	Ant.Pol	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
10,520	V	60.54	41.15	74	54	-13.46	-12.85
15,780	V	58.96	39.71	74	54	-15.04	-14.29
10,520	H	58.47	39.76	74	54	-15.53	-14.24
15,780	H	58.92	39.92	74	54	-15.08	-14.08

Freq. (MHz)	Low channel: 5500MHz						
	Ant.Pol	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
11,000	V	59.26	41.95	74	54	-14.74	-12.05
16,500	V	59.00	40.87	74	54	-15.00	-13.13
11,000	H	59.17	39.06	74	54	-14.83	-14.94
16,500	H	59.33	40.33	74	54	-14.67	-13.67

Freq. (MHz)	Low channel: 5745MHz						
	Ant.Pol	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
11,490	V	59.35	41.48	74	54	-14.65	-12.52
17,235	V	59.31	39.79	74	54	-14.69	-14.21
11,490	H	58.44	39.13	74	54	-15.56	-14.87
17,235	H	59.78	40.78	74	54	-14.22	-13.22

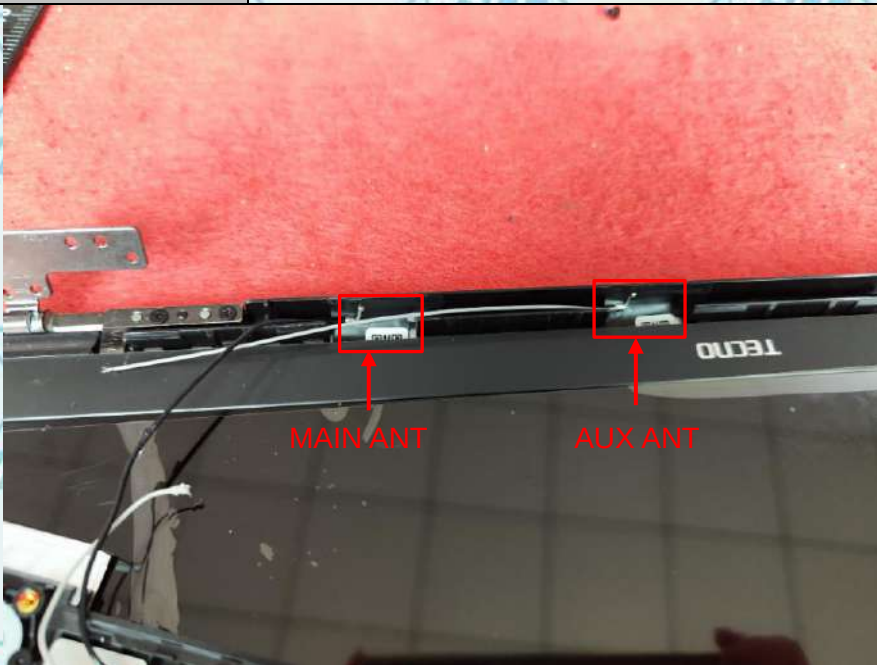
Note:

1. All emissions not reported were more than 20dB below the specified limit or in the noise floor.
2. Emission Level= Reading Level+ Probe Factor +Cable Loss.
3. Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.





7.3 ANTENNA REQUIREMENT

Standard requirement:	The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and FCC part 15C section 15.407.
FCC part 15C section 15.203 and FCC part 15C section 15.407 requirements: Systems operating in the 5150~5850MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
	

7.4 EMISSION BANDWIDTH

7.4.1 TEST EQUIPMENT

Please refer to Section 5 this report.

7.4.2 TEST PROCEDURE

-26dB Bandwidth and 99% Occupied Bandwidth:	
Test Method:	a)The transmitter was radiated to the spectrum analyzer in peak hold mode. b)Measure the maximum width of the emission that is 26 dB down from the peak of the emission Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
Test Equipment Setting – 26dB Bandwidth:	Test Equipment Setting – 99%% Bandwidth:
a)Attenuation: Auto b)Span Frequency: > 26dB Bandwidth c)RBW: Approximately 1% of the emission bandwidth d)VBW: VBW > RBW e)Detector: Peak f)Trace: Max Hold g)Sweep Time: Auto	a)Span: 1.5 times to 5.0 times the OBW b)RBW: 1 % to 5 % of the OBW c)VBW: $\geq 3 \times \text{RBW}$ d)Detector: Peak e)Trace: Max Hold
6 dB Bandwidth:	
Test Method:	a)The transmitter was radiated to the spectrum analyzer in peak hold mode. b)Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (C) Emission Bandwidth. c)Multiple antenna system was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band. d)Measured the spectrum width with power higher than 6dB below carrier.
Test Equipment Setting:	e)Detector: Peak f)Trace: Max Hold g)Sweep Time: Auto
a)Attenuation: Auto b)Span Frequency: > 6dB Bandwidth c)RBW: 100kHz d)VBW: $\geq 3 \times \text{RBW}$	
Maximum Conducted Output Power Measurement:	
Test Method:	a)The transmitter output (antenna port) was connected to the power meter. b)Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (E) Maximum conducted output power =>3. Measurement using a Power Meter (PM) =>b) Method PM-G (Measurement using a gated RF average power meter). c)Multiple antenna systems was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band. d)When measuring maximum conducted output power with multiple antenna systems, add every result of the values by mathematic formula.
Test Equipment Setting: Detector - Average	
Power Spectral Density:	
Test Method:	a)The transmitter output (antenna port) was connected RF switch to the spectrum analyzer. b)Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (F) Maximum Power Spectral Density (PSD). c)Multiple antenna systems was performed in accordance KDB662911 D01 v02r01 in-Band Power Spectral Density (PSD) Measurements (a) Measure and sum the spectra across the outputs. d)When measuring first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3 and so on up to the Nth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way. e)For 5.725~5.85 GHz, the measured result of PSD level must add $10\log(500\text{kHz}/\text{RBW})$

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and the final result should ≤ 30 dBm.	
Test Equipment Setting:	
a)Attenuation: Auto b)Span Frequency: Encompass the entire emissions bandwidth (EBW) of the signal c)RBW: 1000 kHz d)VBW: 3000 kHz	e)Detector: RMS f)Trace: AVERAGE g)Sweep Time: Auto h)Trace Average: 100 times
Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/\text{RBW})$ to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.	

Frequency Stability Measurement:

Test Method:	a)The transmitter output (antenna port) was connected to the spectrum analyzer. b)EUT have transmitted absence of modulation signal and fixed channelize. c)Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth. d)Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings. e)fc is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f_c \times 106$ ppm and the limit is less than ± 20 ppm (IEEE 802.11nspecification). f)The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value g)Extreme temperature is $0^{\circ}\text{C} \sim 40^{\circ}\text{C}$
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Test Equipment Setting:

a)Attenuation: Auto b)Span Frequency: Entire absence of modulation emissions bandwidth c)RBW: 10 kHz d)VBW: 10 kHz	e)Sweep Time: Auto
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7.4.3 CONFIGURATION OF THE EUT

Same as section 3.4 of this report

7.4.4 EUT OPERATING CONDITION

Same as section 3.5 of this report.



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-26dB Bandwidth and 99% Occupied Bandwidth:	
Limit:	No restriction limits.
-6 dB Bandwidth:	
Limit:	For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.
Test Equipment Setting:	
a)Attenuation: Auto	e)Detector: Peak
b)Span Frequency: > 6dB Bandwidth	f)Trace: Max Hold
c)RBW: 100kHz	g)Sweep Time: Auto
d)VBW: $\geq 3 \times$ RBW	
Maximum Conducted Output Power Measurement:	
☒ 5.15~5.25 GHz	
☐ Limit of Outdoor access point: The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).	☐ Limit of Indoor access point: The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
☐ Limit of Fixed point-to-point access points: The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.	☒ Limit of Mobile and portable client devices: The maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
☒ 5.25-5.35 GHz & ☒ 5.470-5.725 GHz	
The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
☒ 5.725~5.85 GHz	
The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.	
Power Spectral Density	
☒ 5.15~5.25 GHz	
☐ Limit of Outdoor access point: 17 dBm/MHz	☐ Limit of Indoor access point: 17 dBm/MHz
☐ Limit of Fixed point-to-point access points: 17 dBm/MHz	☒ Limit of Mobile and portable client devices: 11 dBm/MHz
☐ 5.25-5.35 GHz	11 dBm/MHz
☐ 5.470-5.725 GHz	11 dBm/MHz
☒ 5.725~5.85 GHz	30 dBm/500kHz
Frequency Stability Measurement:	
Limit:	In-band emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual. The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE

7.4.6 TEST RESULT

-26dB Bandwidth and 99% Occupied Bandwidth

Product	: EUT-Sample	Test Mode	: See section 3.4
Test Item	: -26dB Bandwidth/-6dB Bandwidth and 99% Occupied Bandwidth	Temperature	: 25 °C
Test Voltage	: DC 11.61V	Humidity	: 56%RH
Test Result	: PASS		

-26dB Bandwidth

Mode	Frequency (MHz)	-26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Verdict
a	5180	23.168	16.580	Pass
a	5240	23.478	16.627	Pass
a	5260	22.169	16.633	Pass
a	5320	22.786	16.624	Pass
a	5500	22.806	16.567	Pass
a	5700	22.369	16.611	Pass
n20	5180	22.552	17.722	Pass
n20	5240	23.536	17.757	Pass
n20	5260	23.529	17.718	Pass
n20	5320	23.01	17.741	Pass
n20	5500	22.913	17.704	Pass
n20	5700	22.746	17.701	Pass
n40	5190	42.519	35.943	Pass
n40	5230	41.578	35.983	Pass
n40	5270	42.482	35.962	Pass
n40	5310	42.205	35.926	Pass
n40	5510	43.048	35.984	Pass
n40	5670	42.679	35.991	Pass
ac20	5180	22.747	17.721	Pass
ac20	5240	23.095	17.771	Pass
ac20	5260	23.102	17.711	Pass
ac20	5320	23.049	17.716	Pass
ac20	5500	22.99	17.720	Pass
ac20	5700	22.997	17.717	Pass
ac40	5190	42.373	35.950	Pass
ac40	5230	43.686	35.988	Pass
ac40	5270	41.827	36.010	Pass
ac40	5310	42.374	35.970	Pass
ac40	5510	42.19	35.997	Pass
ac40	5670	42.515	35.952	Pass
ac80	5210	81.438	75.033	Pass
ac80	5290	86.524	75.041	Pass
ac80	5530	84.294	75.097	Pass
ac80	5610	83.233	75.175	Pass

-6dB Bandwidth

Mode	Frequency (MHz)	-6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Verdict
a	5745	11.246	16.420	Pass
a	5825	16.064	16.420	Pass
n20	5745	15.126	17.597	Pass
n20	5825	14.965	17.602	Pass
n40	5755	30.12	35.975	Pass
n40	5795	33.802	35.921	Pass
ac20	5745	13.875	17.604	Pass
ac20	5825	15	17.600	Pass
ac40	5755	35.045	35.966	Pass
ac40	5795	30.701	35.968	Pass
ac80	5775	73.861	75.032	Pass



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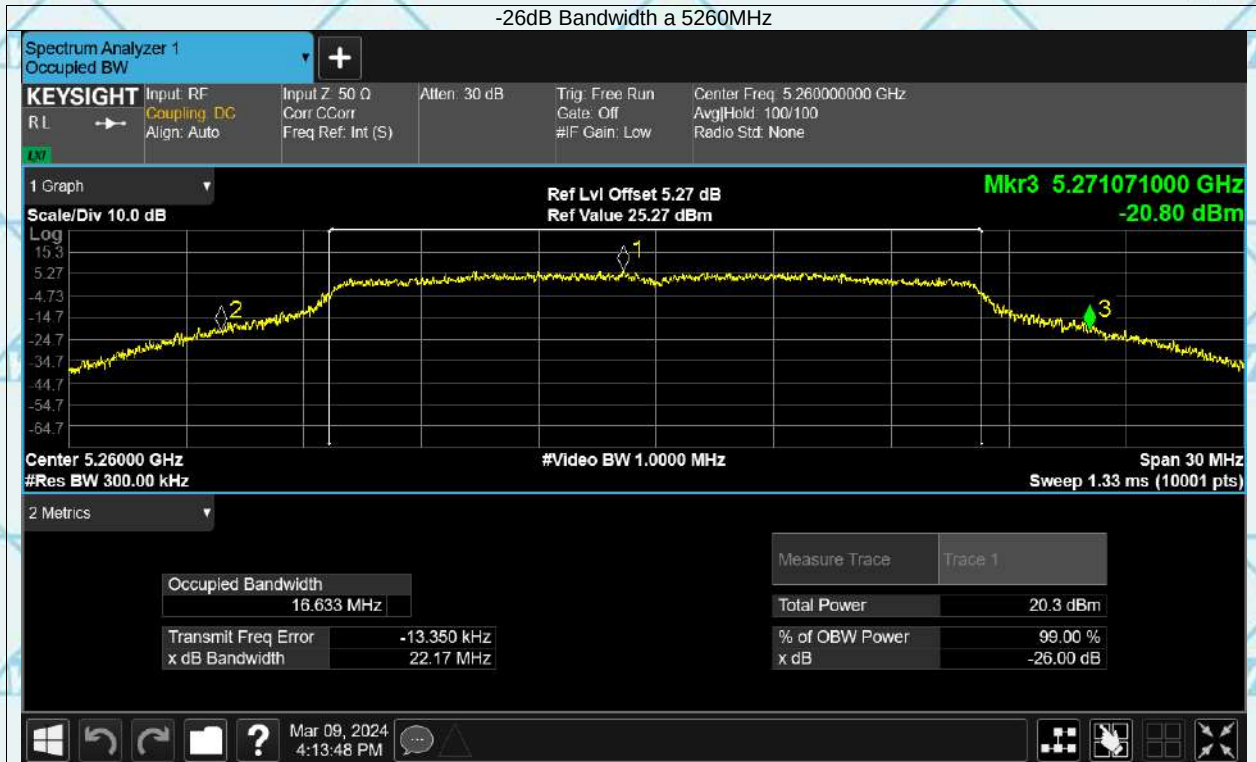
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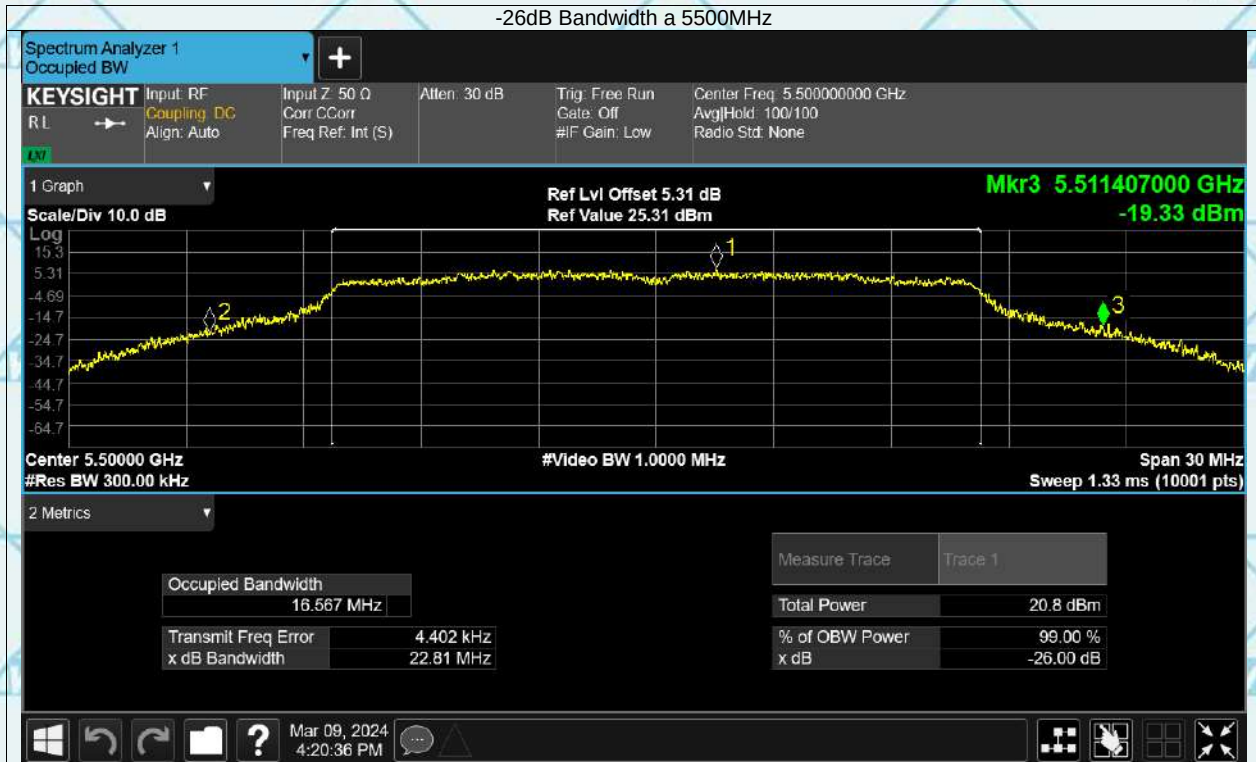
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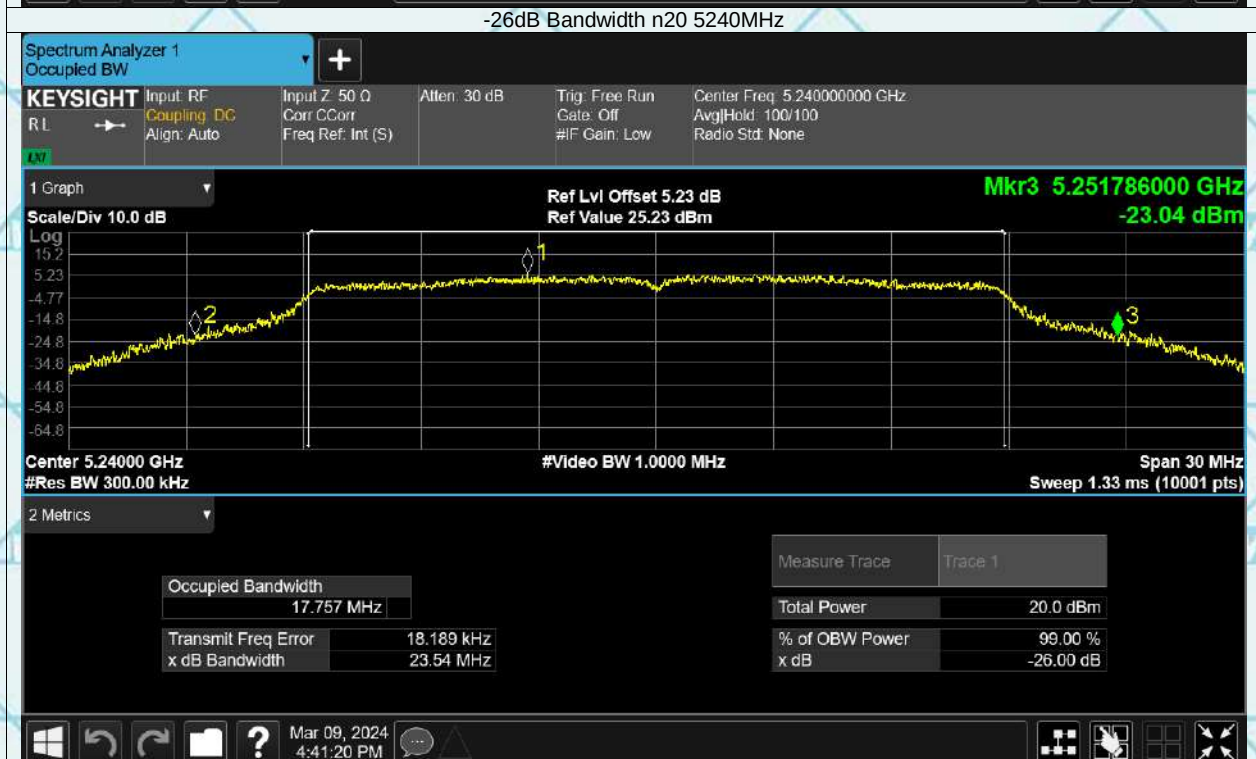
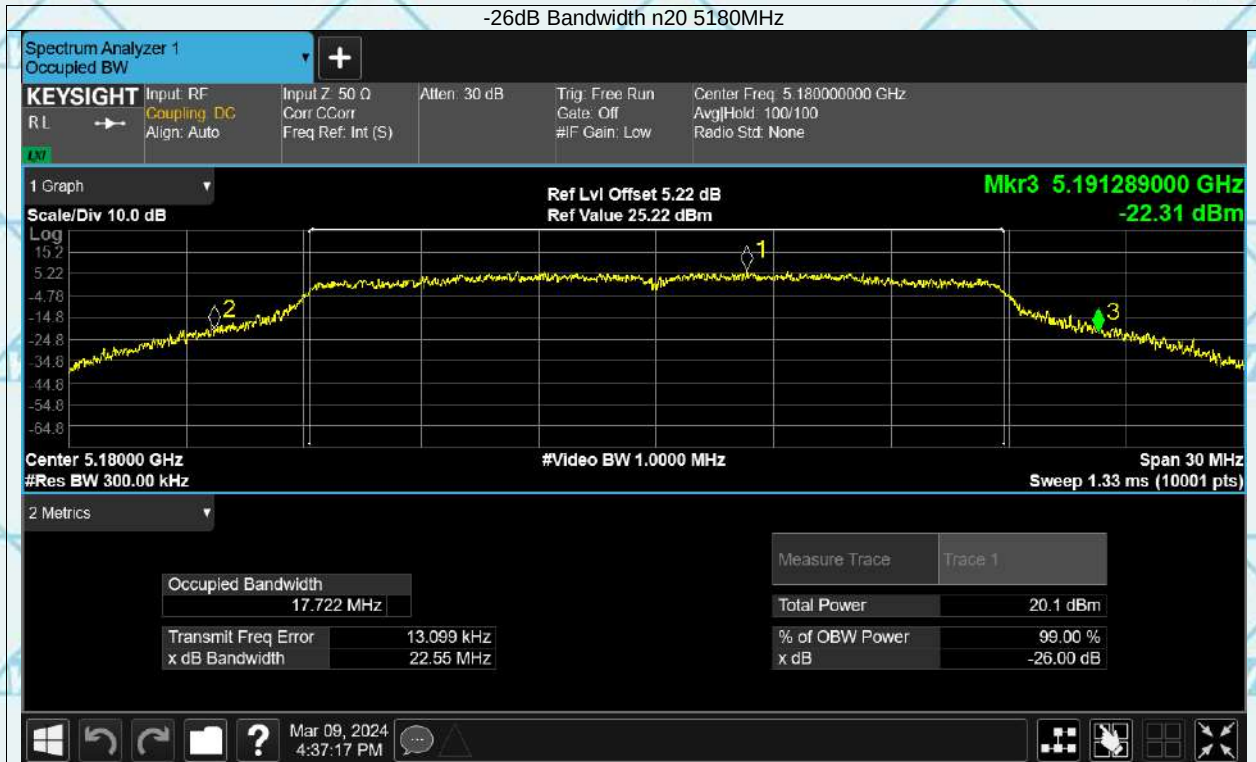
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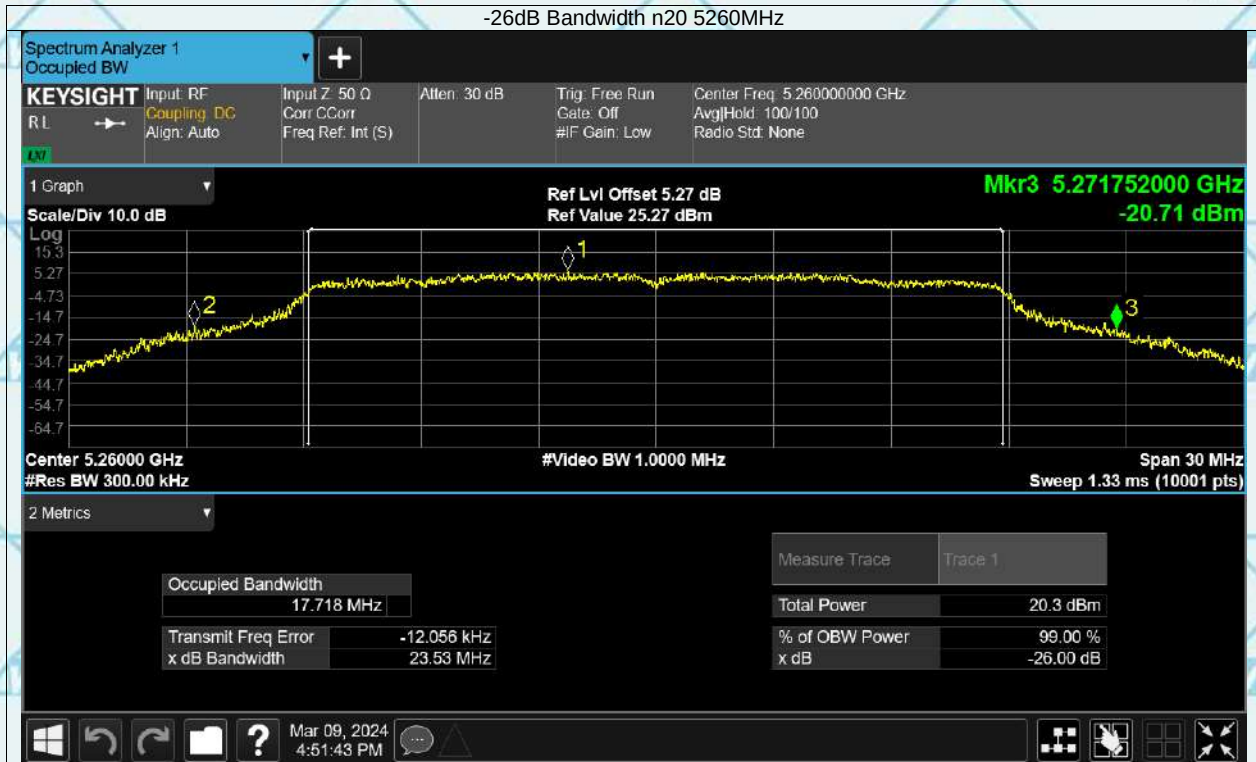
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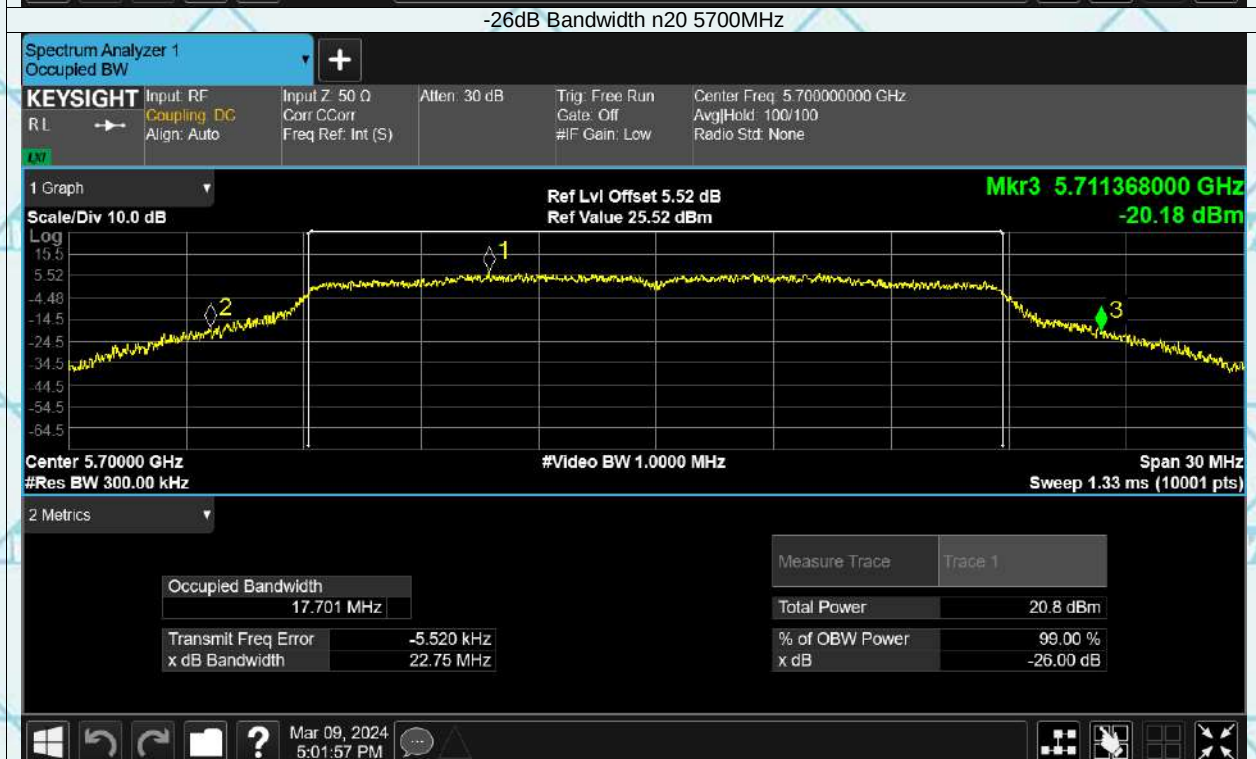
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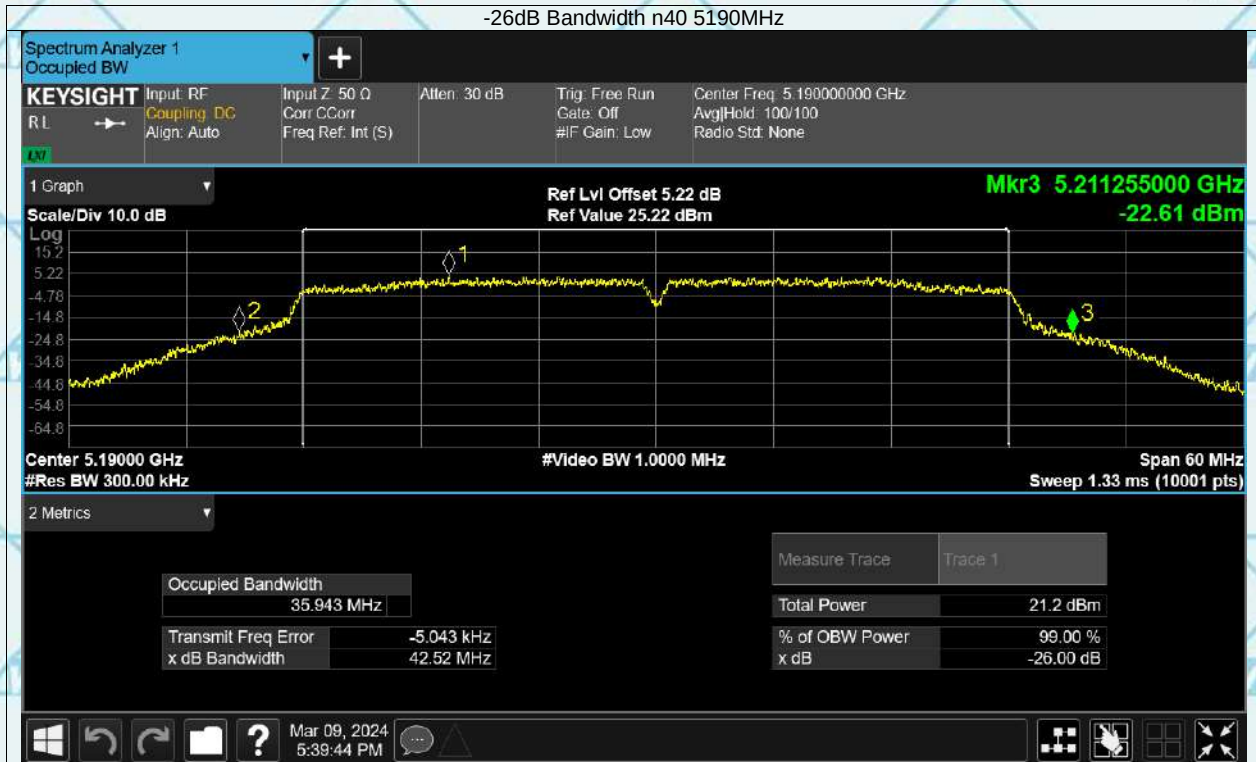
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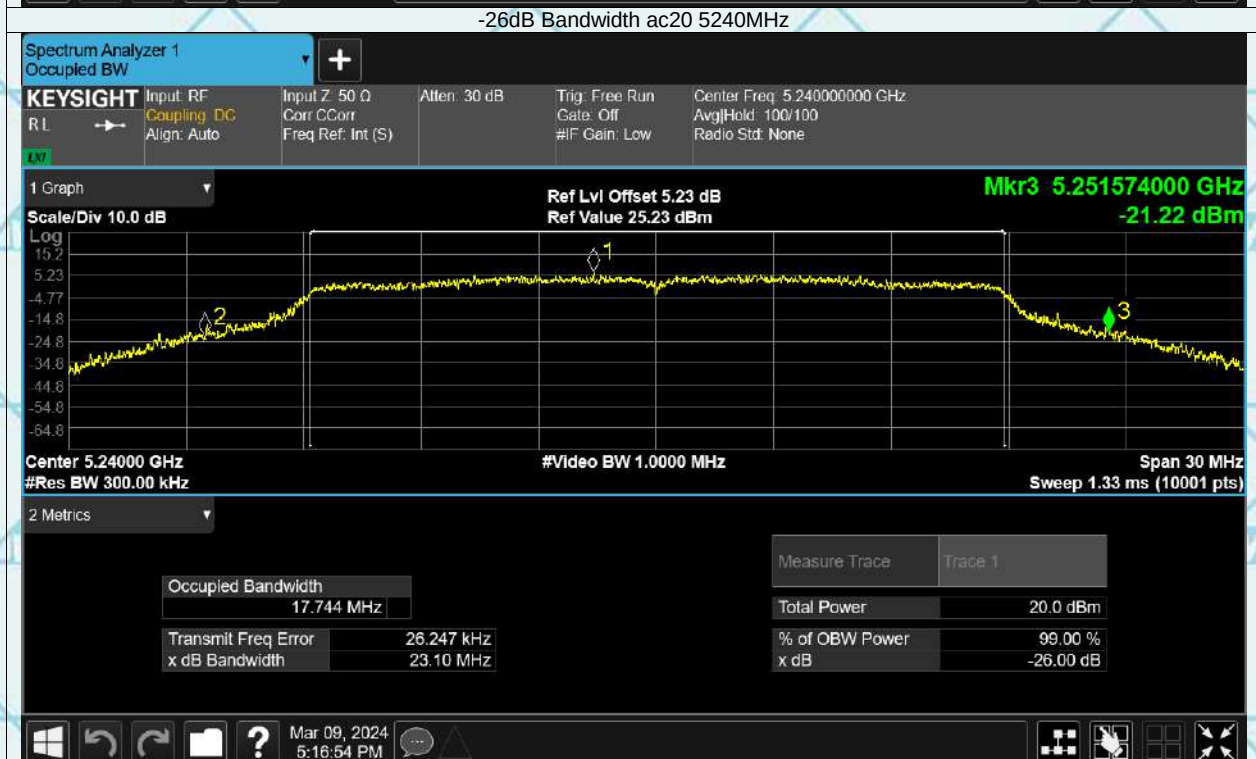
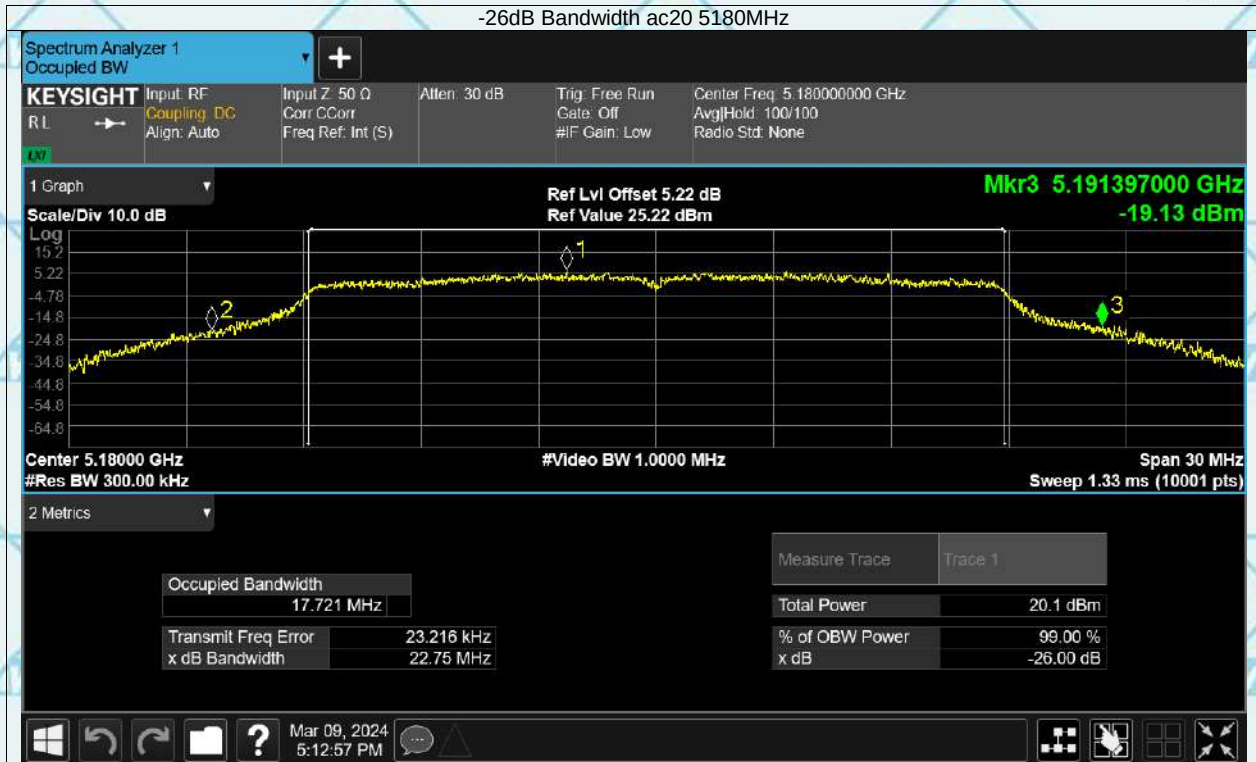
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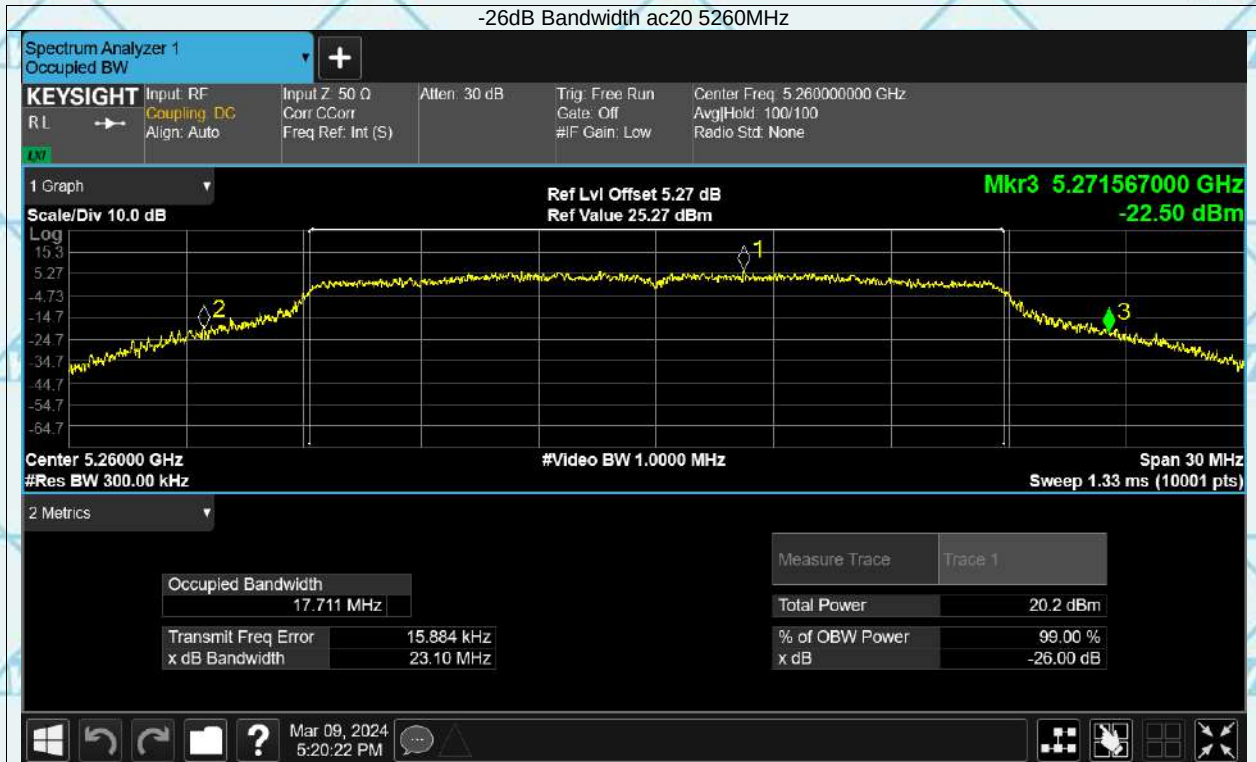
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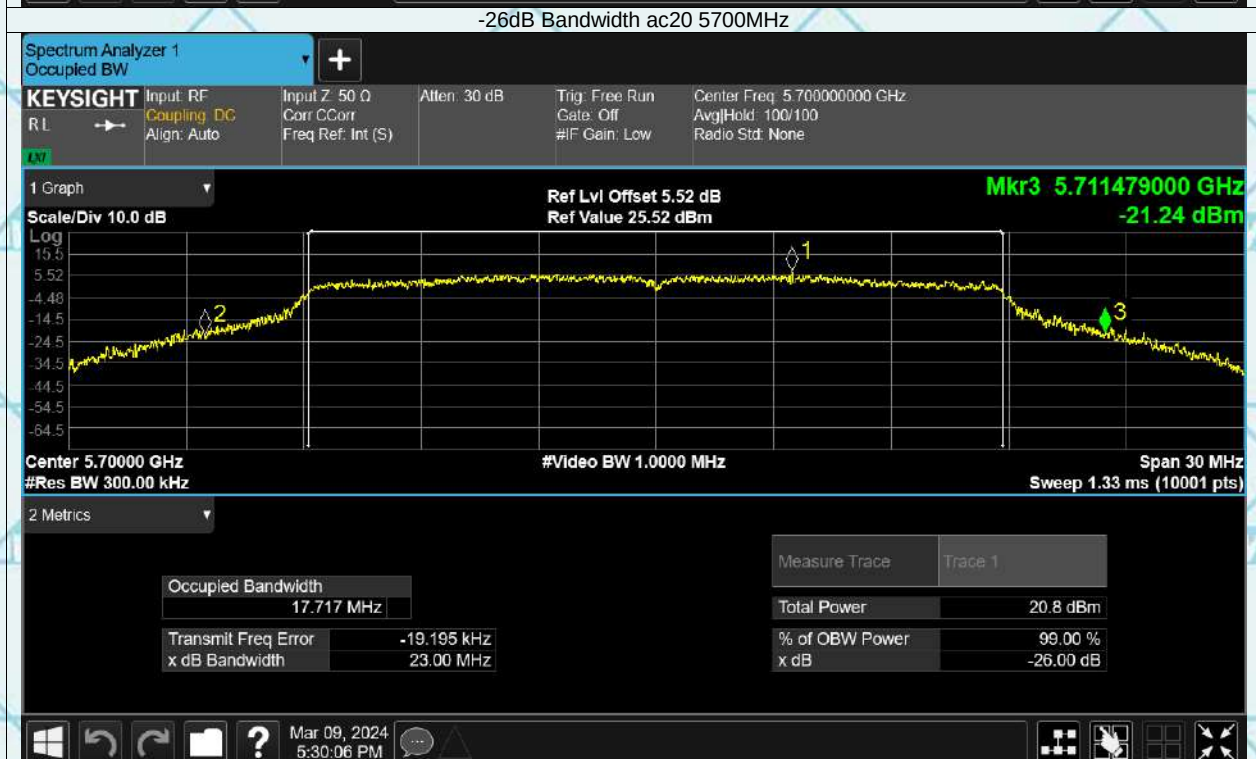
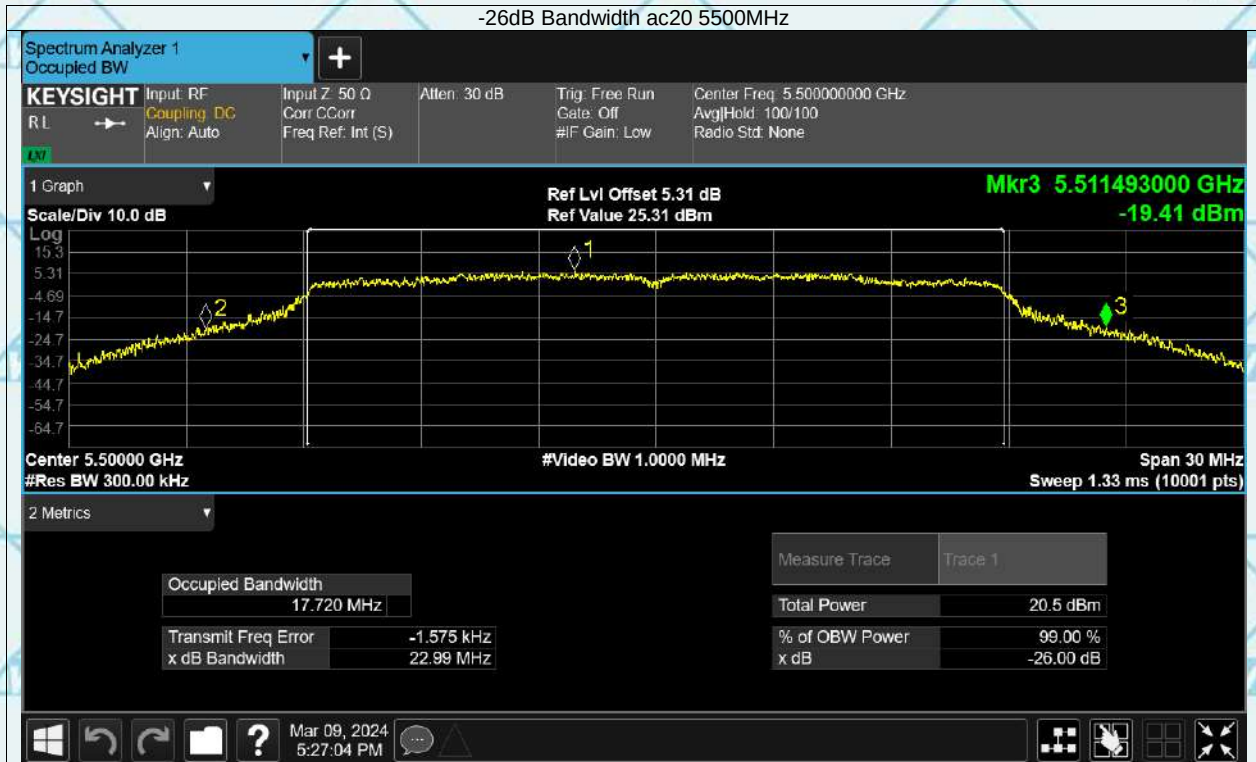
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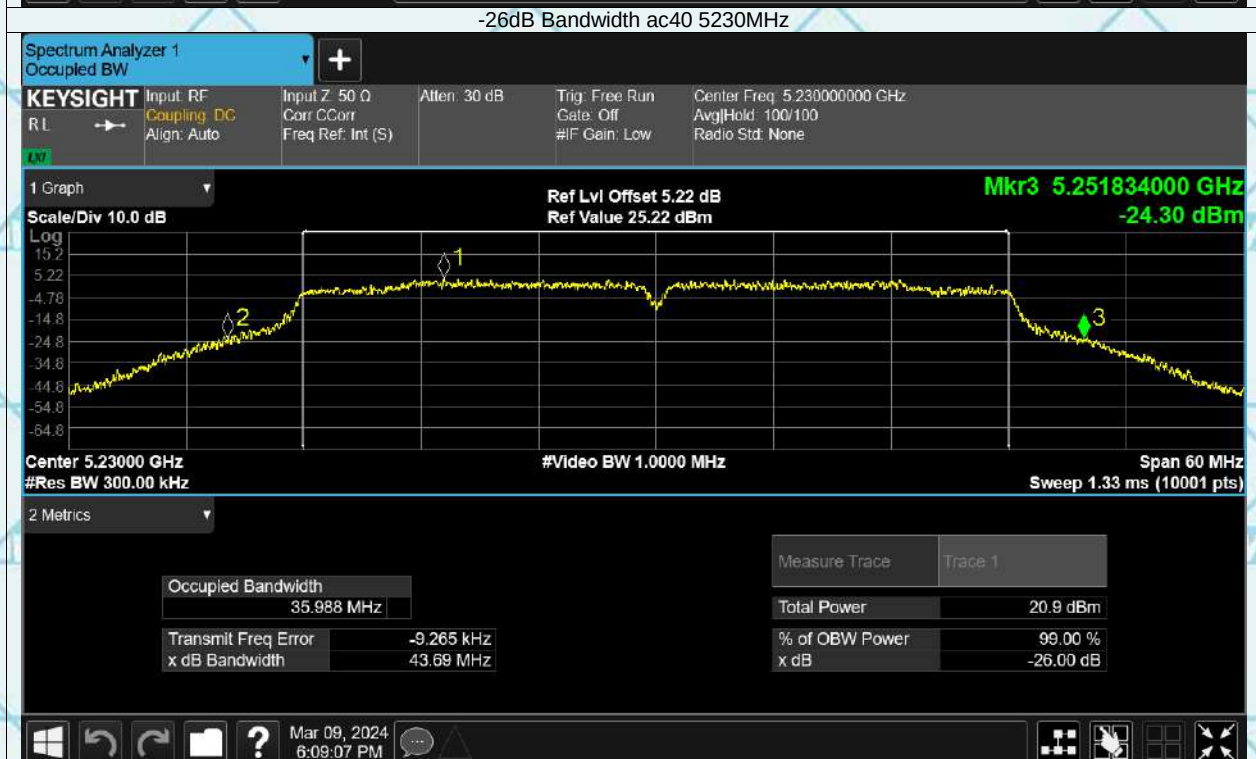
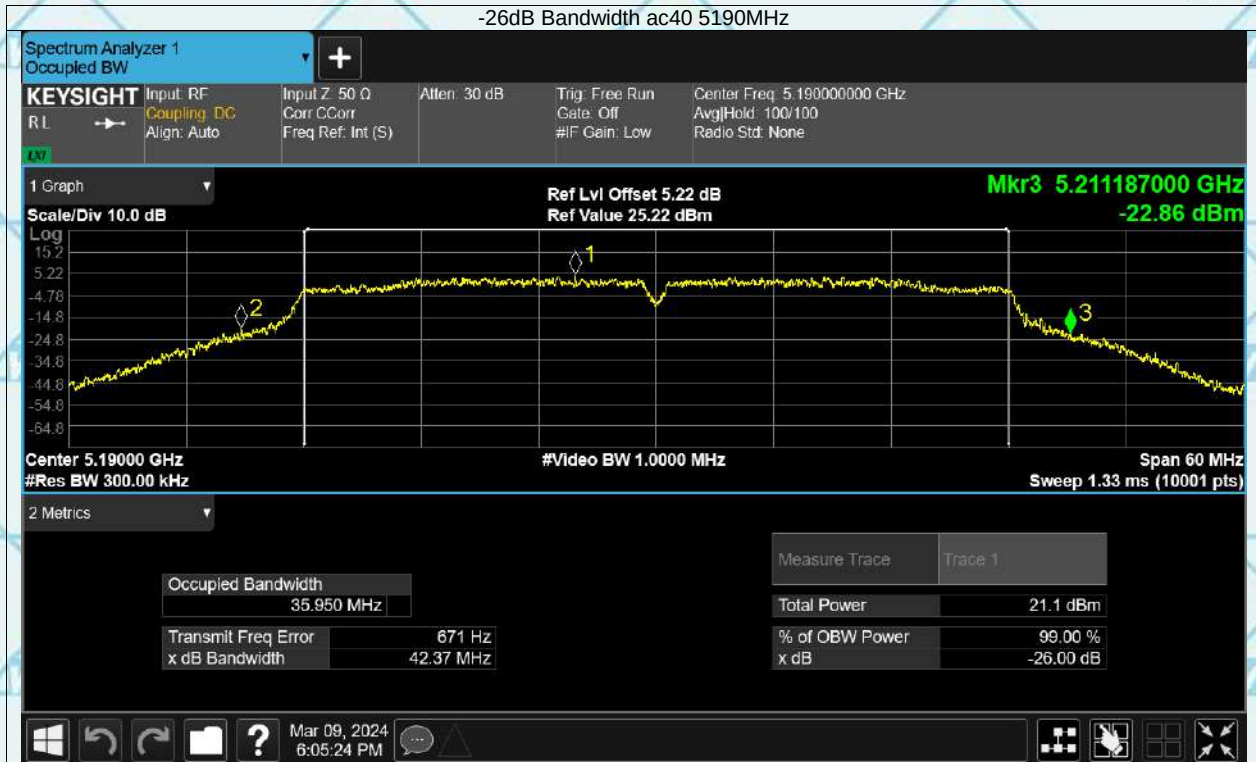
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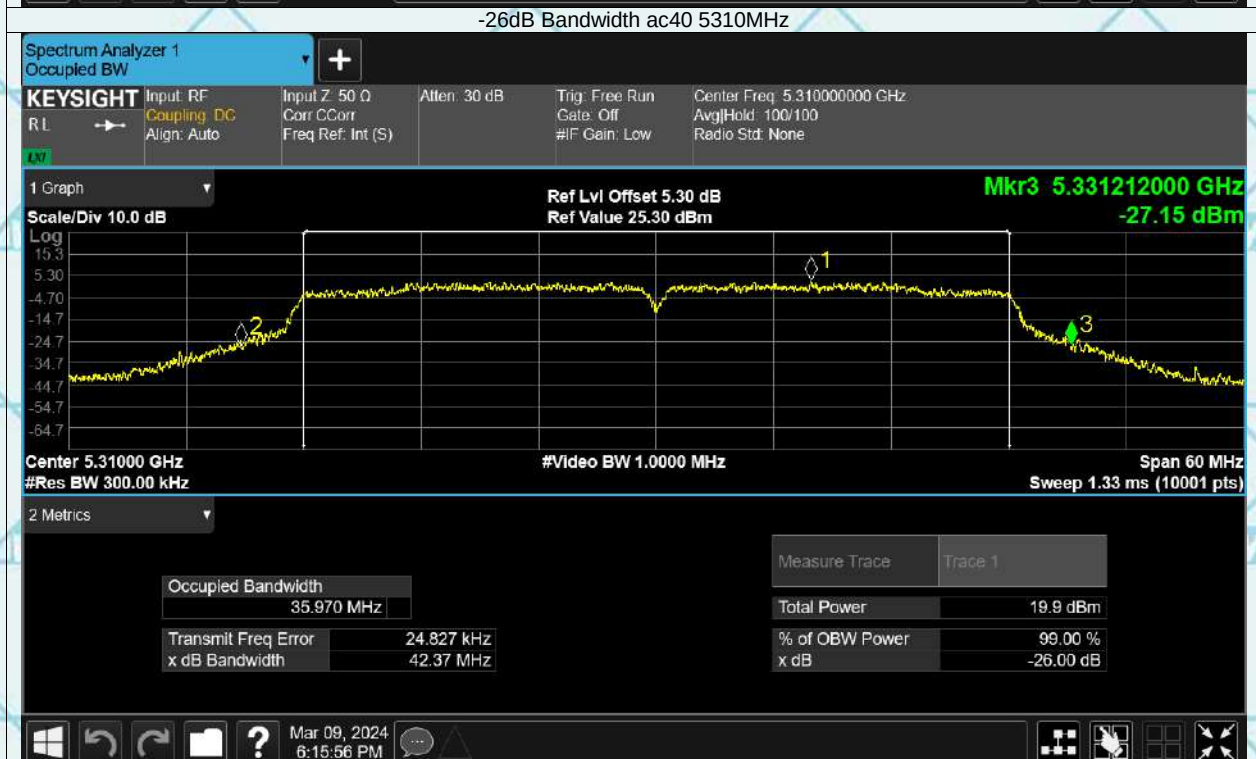
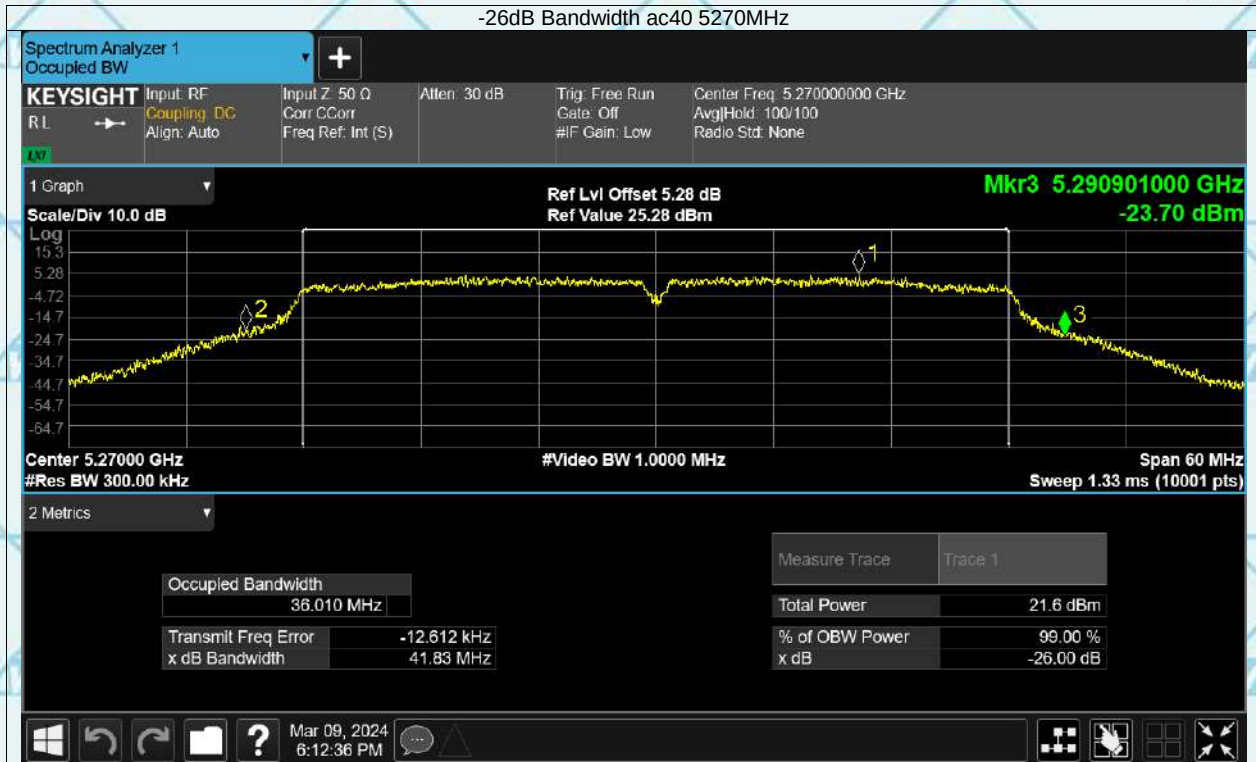
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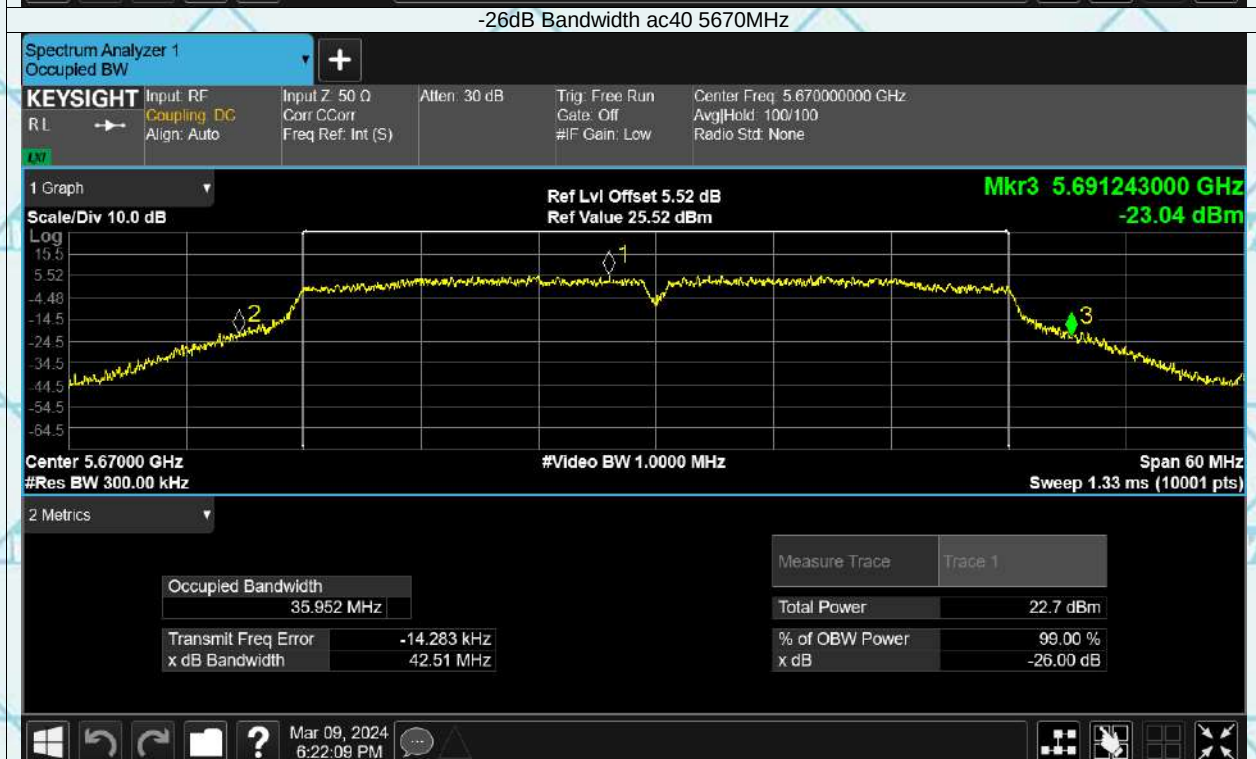
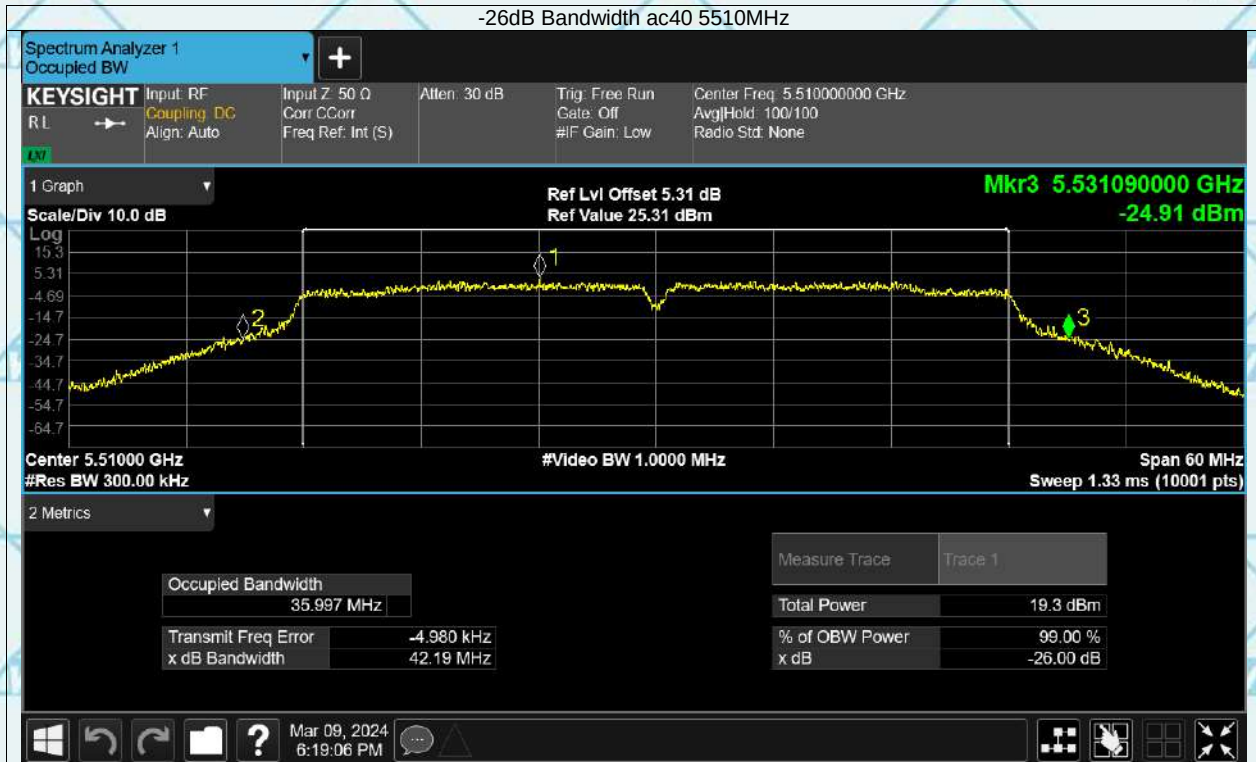
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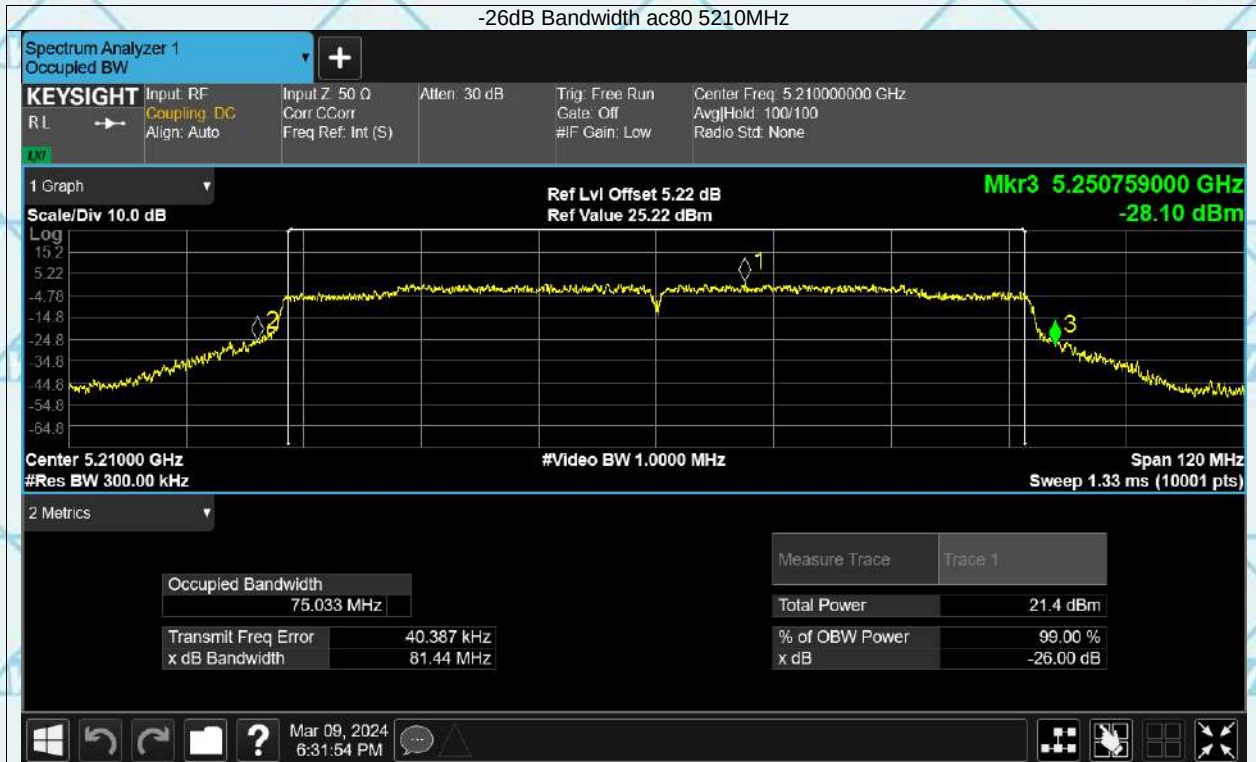
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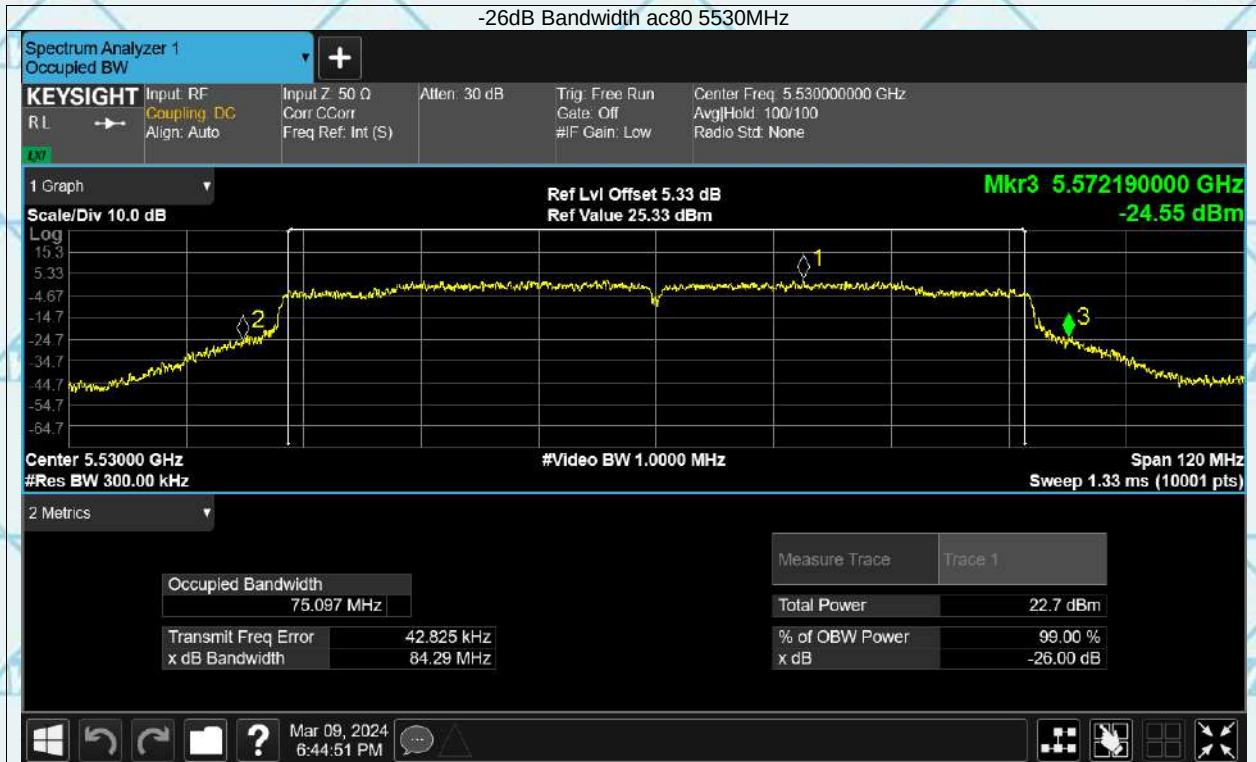
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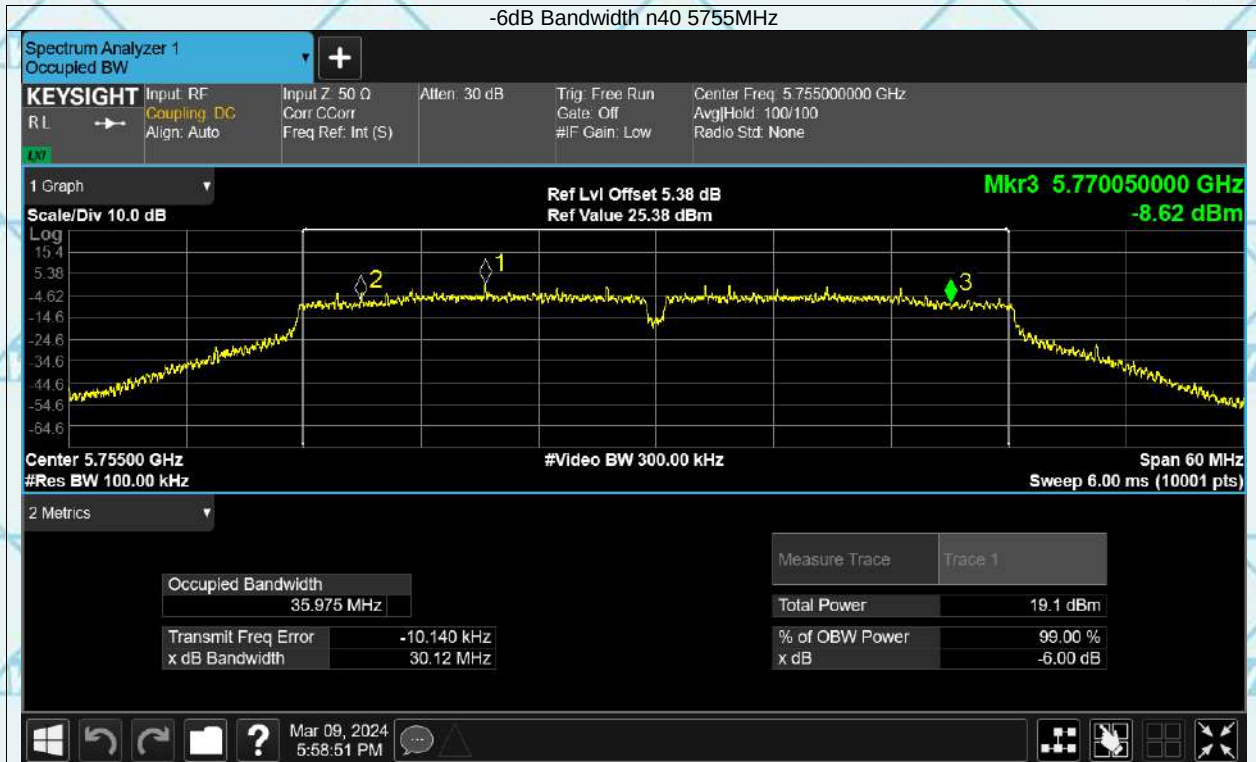
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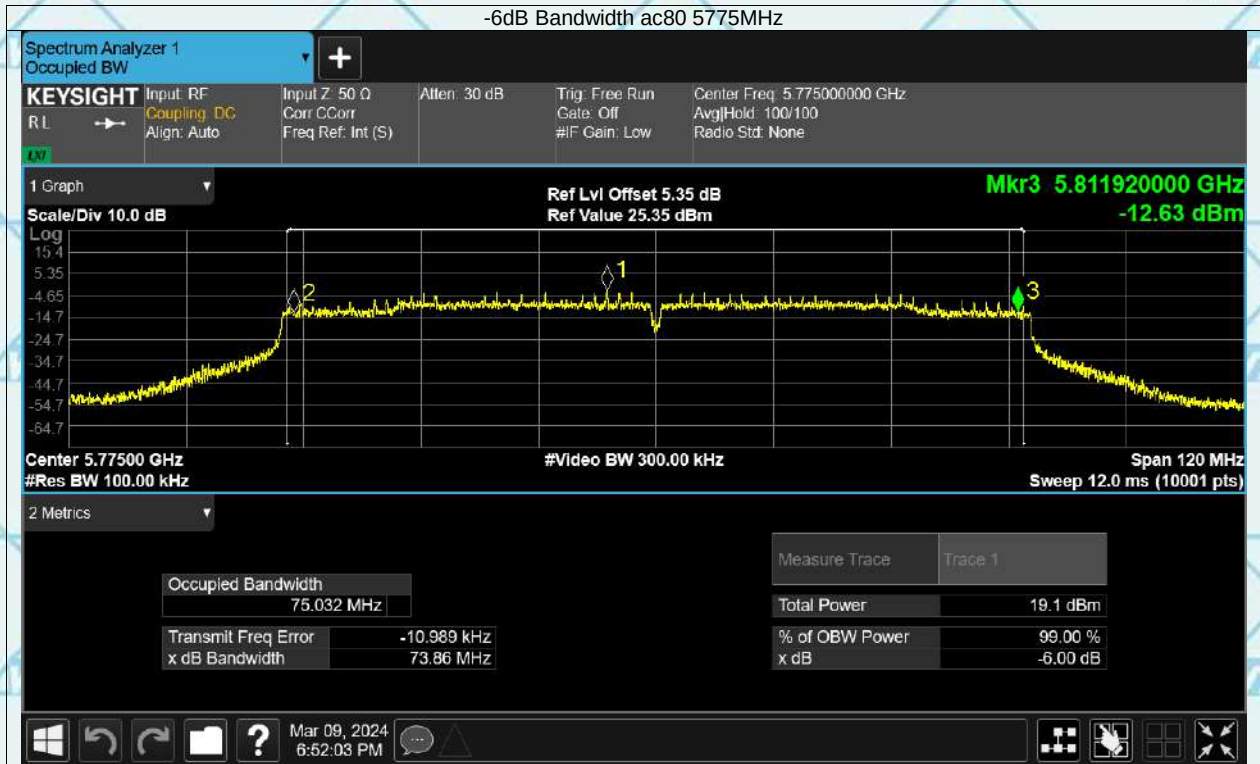
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7.5 MAXIMUM CONDUCTED OUTPUT POWER

- (i) If all antennas have the same gain, G_{ANT} :
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. (This formula can also be applied when antennas have different gains if the highest antenna gain is substituted for G_{ANT} .)
- (ii) If antenna gains are not equal and each transmit antenna is driven by only one spatial stream, directional gain may be calculated by either of the following two formulas.
- Directional gain = $G_{ANT\ MAX} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and $G_{ANT\ MAX}$ is the gain of the antenna having the highest gain (in dBi).

Or,

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k/20}$ if the k th antenna is being fed by spatial stream j , or zero if it is not;
 G_k is the gain in dBi of the k th antenna.

For power measurements on IEEE 802.11 devices, 1,2

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

Note: $N_{ANT}=2$, satisfy the condition $N_{ANT} \leq 4$, so Array gain=0dB, Directional gain= G_{ANT} +Array gain=2.91dBi+0dB=2.91dBi, not more than 6, so the power limit is unchanged.



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Product	: EUT-Sample	Test Mode	: See Section 3.4
Test Item	: Output Power	Temperature	: 25 °C
Test Voltage	: DC 11.61V	Humidity	: 56%RH
Test Result	: PASS		

MAIN

Mode	Frequency (MHz)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
a	5180	0.91	14.77	24	Pass
a	5240	0.91	14.14	24	Pass
a	5260	0.93	14.52	24	Pass
a	5320	0.91	14.33	24	Pass
a	5500	0.93	15.14	24	Pass
a	5700	0.93	16.08	24	Pass
a	5745	0.95	13.85	30	Pass
a	5825	0.93	13.72	30	Pass
n20	5180	0.85	14.71	24	Pass
n20	5240	0.85	14.36	24	Pass
n20	5260	0.85	14.75	24	Pass
n20	5320	0.85	14.17	24	Pass
n20	5500	0.85	14.88	24	Pass
n20	5700	0.85	15.84	24	Pass
n20	5745	0.85	13.61	30	Pass
n20	5825	0.85	13.39	30	Pass
n40	5190	0.91	14.88	24	Pass
n40	5230	0.87	14.25	24	Pass
n40	5270	0.9	14.99	24	Pass
n40	5310	0.9	13.51	24	Pass
n40	5510	0.91	13.11	24	Pass
n40	5670	0.87	16.09	24	Pass
n40	5755	0.9	13	30	Pass
n40	5795	0.88	11.75	30	Pass
ac20	5180	0.88	14.68	24	Pass
ac20	5240	0.88	14.44	24	Pass
ac20	5260	0.88	14.51	24	Pass
ac20	5320	0.88	13.94	24	Pass
ac20	5500	0.88	15.11	24	Pass
ac20	5700	0.88	15.72	24	Pass
ac20	5745	0.88	13.37	30	Pass
ac20	5825	0.88	13.25	30	Pass
ac40	5190	0.98	14.98	24	Pass
ac40	5230	0.96	14.6	24	Pass
ac40	5270	0.94	15.06	24	Pass
ac40	5310	0.98	13.66	24	Pass
ac40	5510	0.96	12.78	24	Pass
ac40	5670	0.96	16.32	24	Pass
ac40	5755	0.94	12.98	30	Pass
ac40	5795	0.96	12.58	30	Pass
ac80	5210	1	14.74	24	Pass
ac80	5290	1	13.43	24	Pass
ac80	5530	0.99	15.86	24	Pass
ac80	5610	0.99	16.62	24	Pass
ac80	5775	0.99	12.66	30	Pass





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AUX Ant2

Mode	Frequency (MHz)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
a	5180	0	13.61	24	Pass
a	5240	0	13.71	24	Pass
a	5260	0	13.58	24	Pass
a	5320	0	13.71	24	Pass
a	5500	0	13.93	24	Pass
a	5700	0	14.94	24	Pass
a	5745	0	12.83	30	Pass
a	5825	0	12.83	30	Pass
n20	5180	0	13.61	24	Pass
n20	5240	0	13.38	24	Pass
n20	5260	0	13.45	24	Pass
n20	5320	0	13.53	24	Pass
n20	5500	0	13.78	24	Pass
n20	5700	0	15.15	24	Pass
n20	5745	0	12.87	30	Pass
n20	5825	0	12.68	30	Pass
n40	5190	0	14.66	24	Pass
n40	5230	0	14.44	24	Pass
n40	5270	0	14.69	24	Pass
n40	5310	0	13.61	24	Pass
n40	5510	0	12.6	24	Pass
n40	5670	0	16.44	24	Pass
n40	5755	0	12.81	30	Pass
n40	5795	0	12.55	30	Pass
ac20	5180	0	13.83	24	Pass
ac20	5240	0	13.55	24	Pass
ac20	5260	0	13.49	24	Pass
ac20	5320	0	13.81	24	Pass
ac20	5500	0	13.72	24	Pass
ac20	5700	0	14.93	24	Pass
ac20	5745	0	12.71	30	Pass
ac20	5825	0	12.6	30	Pass
ac40	5190	0	14.52	24	Pass
ac40	5230	0	14.21	24	Pass
ac40	5270	0	14.7	24	Pass
ac40	5310	0	13.49	24	Pass
ac40	5510	0	12.45	24	Pass
ac40	5670	0	16.37	24	Pass
ac40	5755	0	12.8	30	Pass
ac40	5795	0	12.27	30	Pass
ac80	5210	0	14.4	24	Pass
ac80	5290	0	13.26	24	Pass
ac80	5530	0	14.78	24	Pass
ac80	5610	0	16.5	24	Pass
ac80	5775	0	12.46	30	Pass

MIMO Mode

Mode	Frequency (MHz)	Total Power (dBm)	Limit (dBm)	Verdict
n20	5180	17.21	24	Pass
n20	5240	16.91	24	Pass
n20	5260	17.16	24	Pass
n20	5320	16.87	24	Pass
n20	5500	17.38	24	Pass
n20	5700	18.52	24	Pass
n20	5745	16.27	30	Pass
n20	5825	16.06	30	Pass
n40	5190	17.78	24	Pass
n40	5230	17.36	24	Pass
n40	5270	17.85	24	Pass
n40	5310	16.57	24	Pass
n40	5510	15.87	24	Pass
n40	5670	19.28	24	Pass
n40	5755	15.92	30	Pass
n40	5795	15.18	30	Pass
ac20	5180	17.29	24	Pass
ac20	5240	17.03	24	Pass
ac20	5260	17.04	24	Pass
ac20	5320	16.89	24	Pass





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ac20	5500	17.48	24	Pass
ac20	5700	18.35	24	Pass
ac20	5745	16.06	30	Pass
ac20	5825	15.95	30	Pass
ac40	5190	17.77	24	Pass
ac40	5230	17.42	24	Pass
ac40	5270	17.89	24	Pass
ac40	5310	16.59	24	Pass
ac40	5510	15.63	24	Pass
ac40	5670	19.36	24	Pass
ac40	5755	15.9	30	Pass
ac40	5795	15.44	30	Pass
ac80	5210	17.58	24	Pass
ac80	5290	16.36	24	Pass
ac80	5530	18.36	24	Pass
ac80	5610	19.57	24	Pass
ac80	5775	15.57	30	Pass



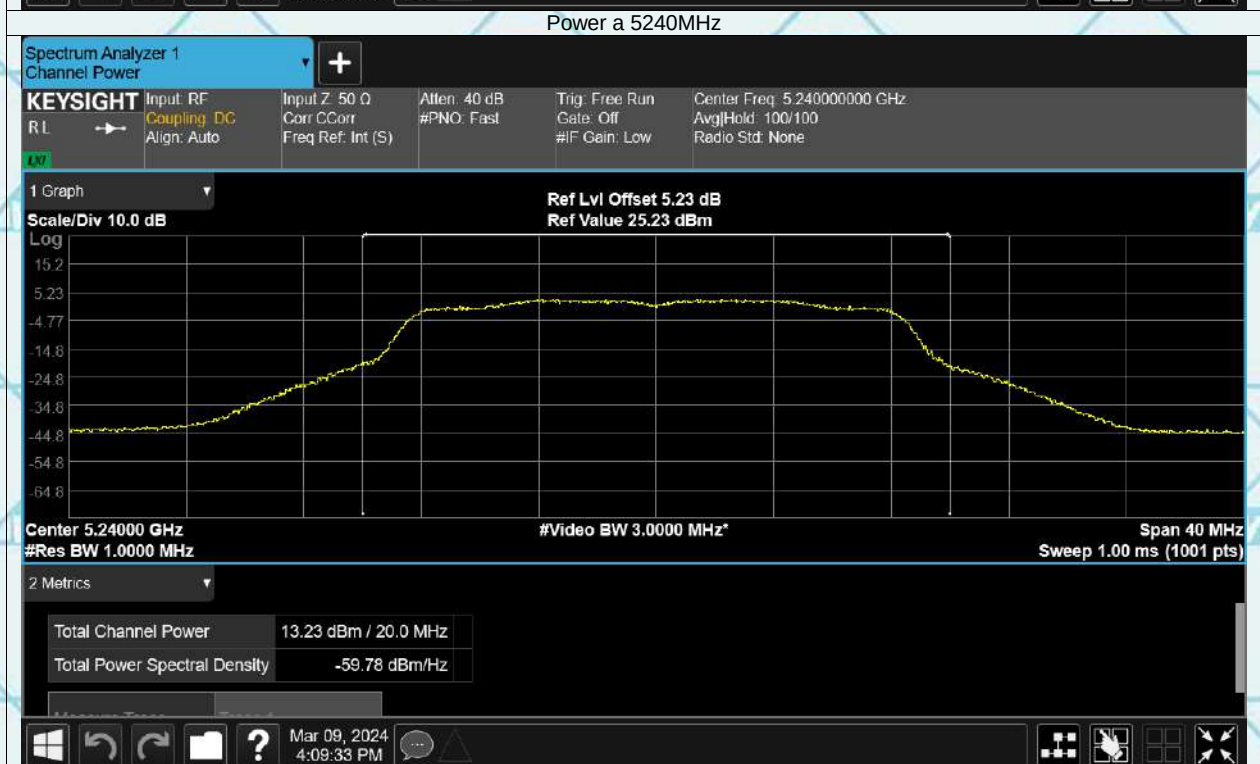
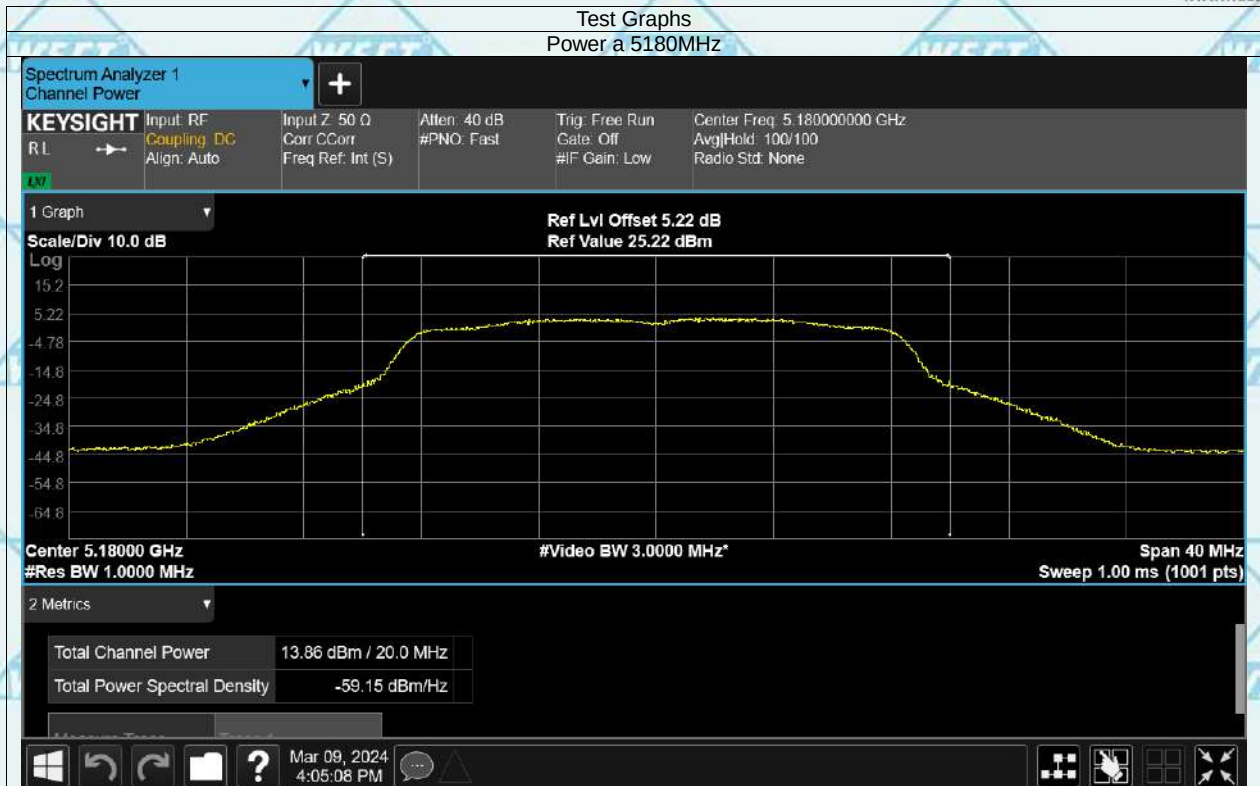


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MAIN

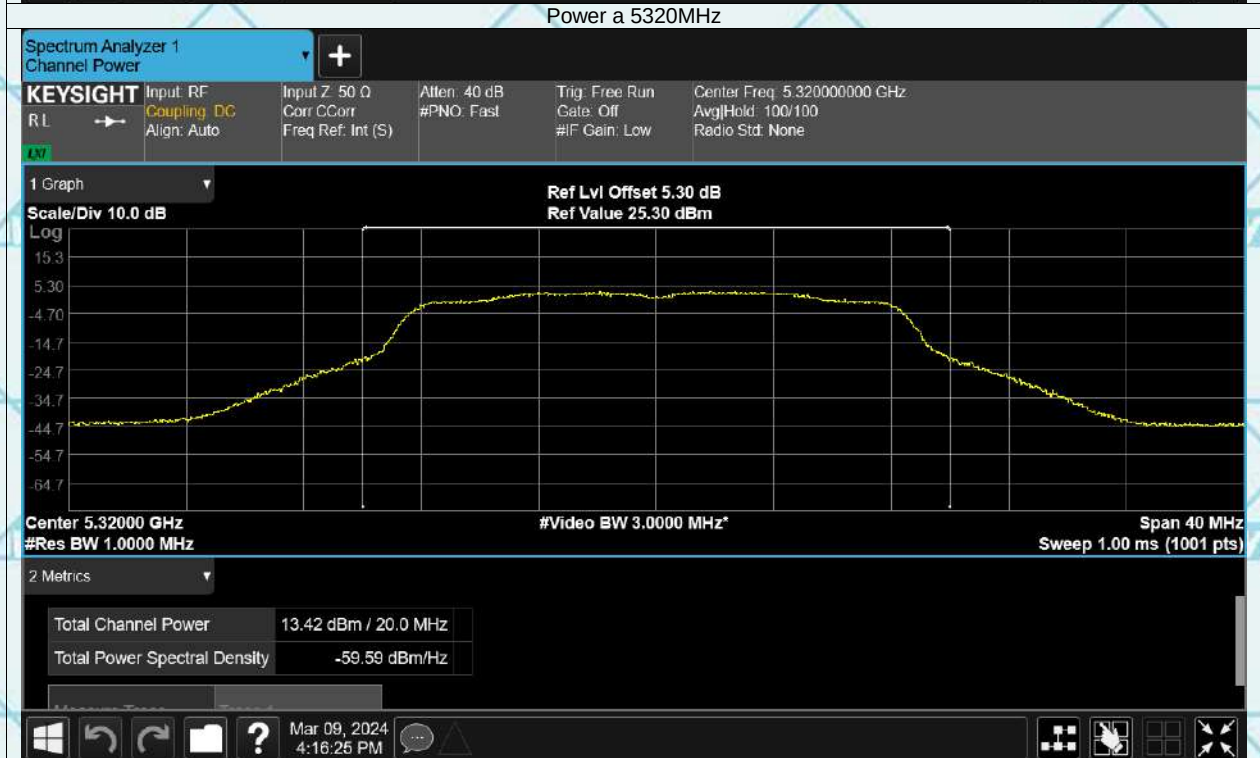
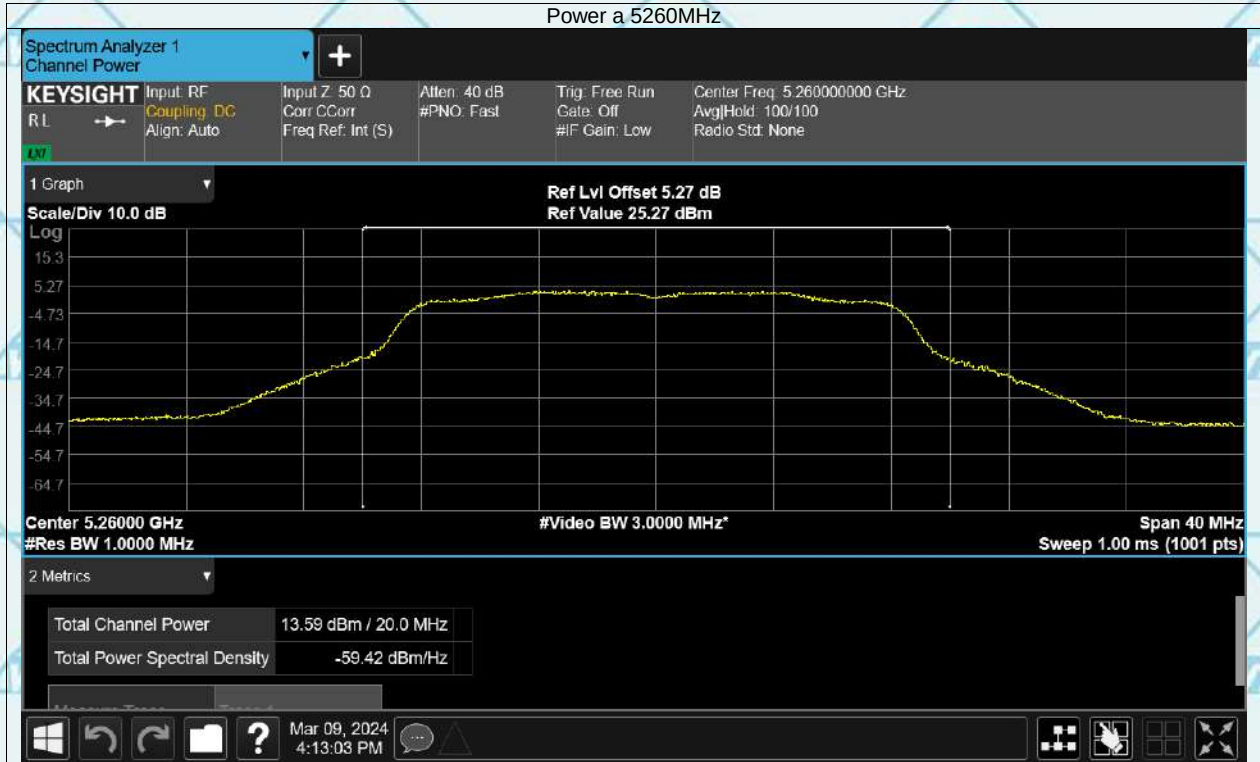




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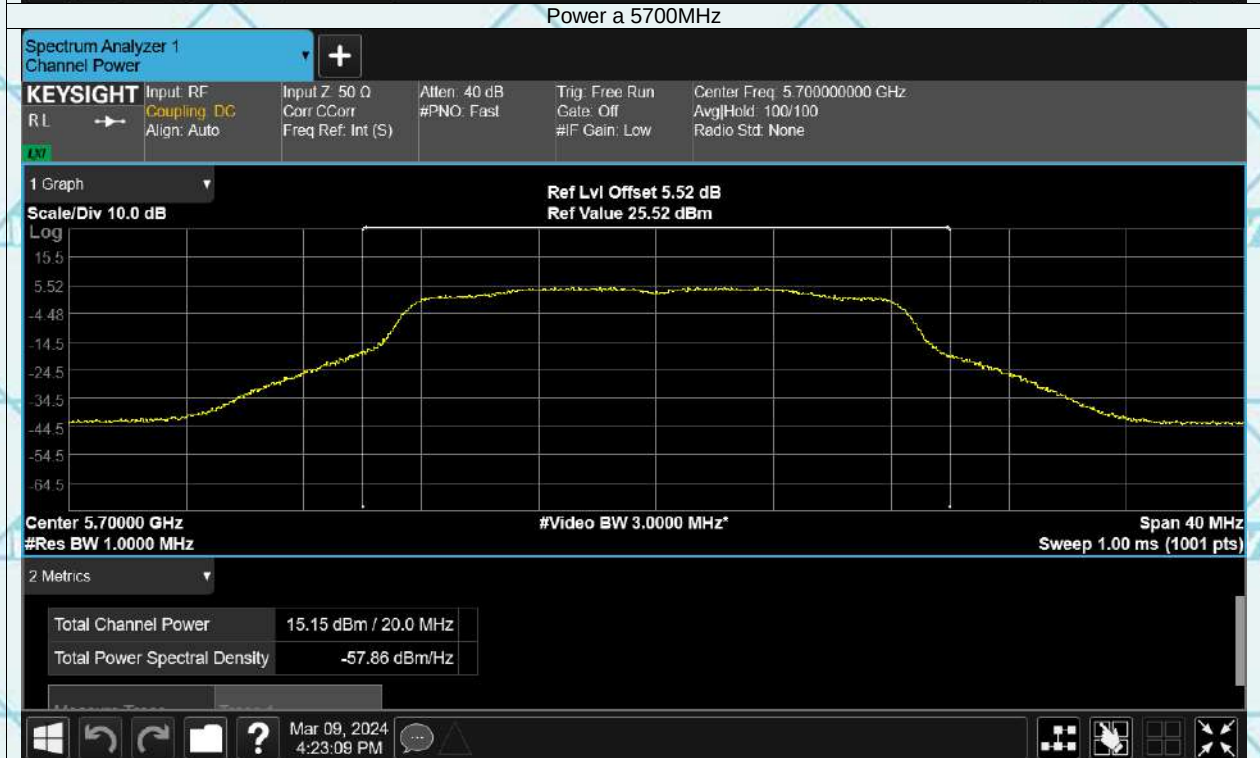
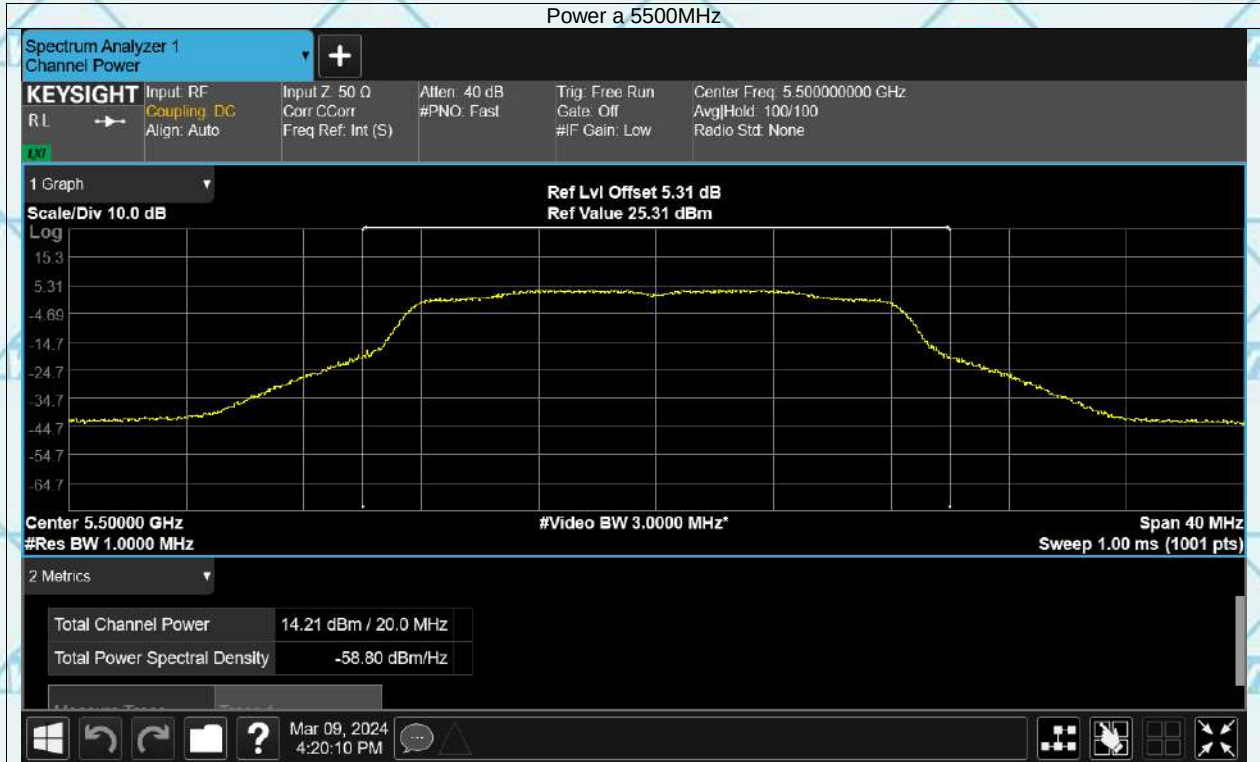




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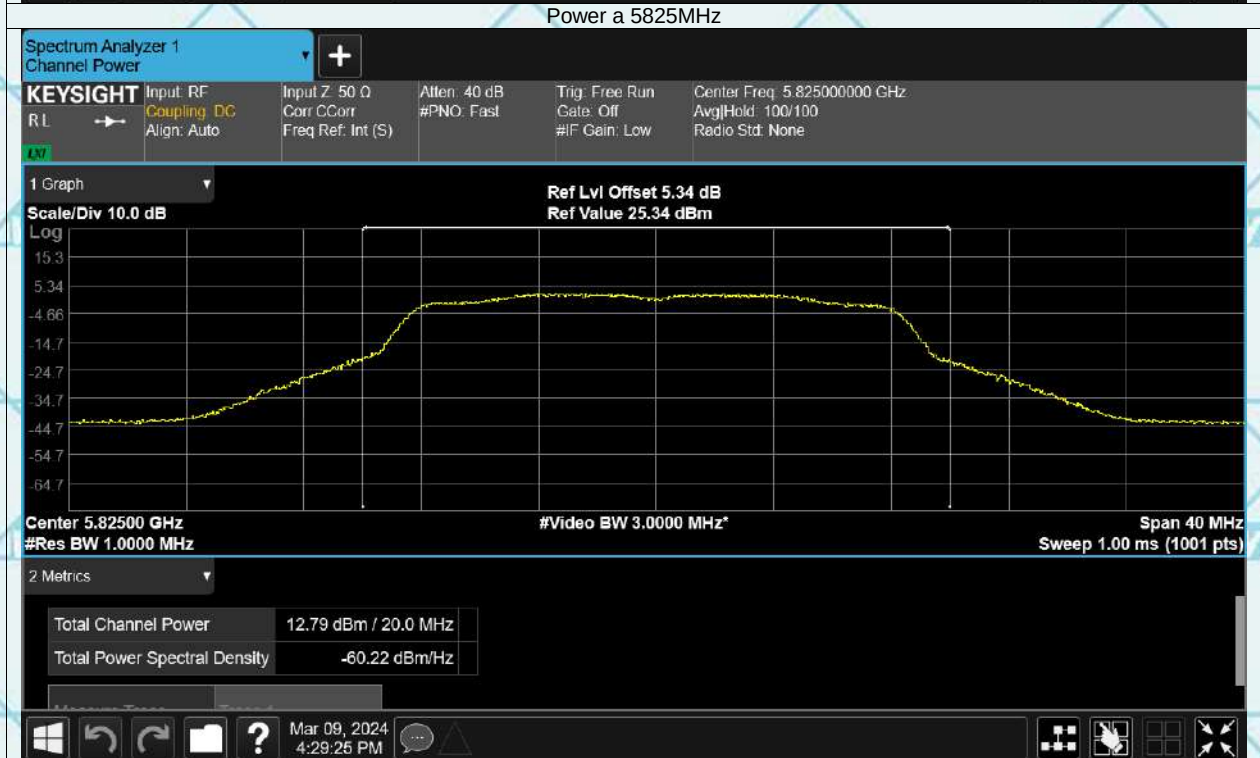
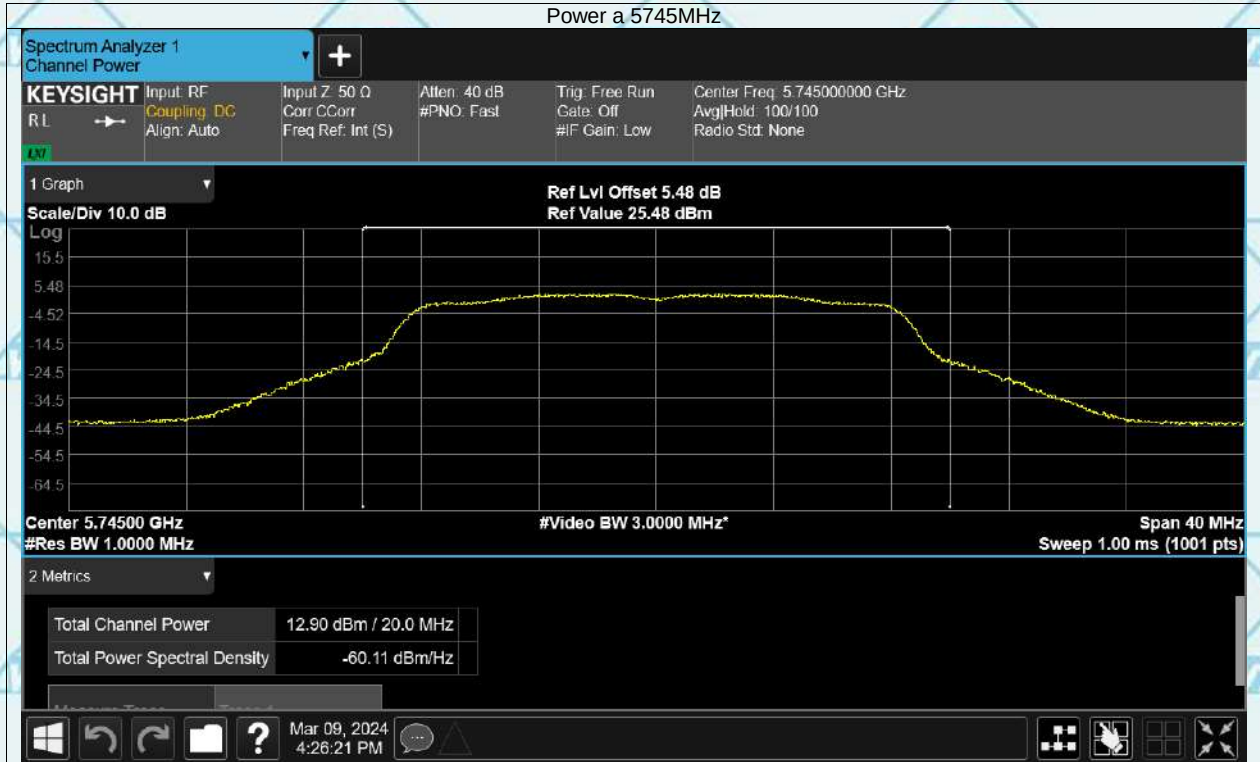




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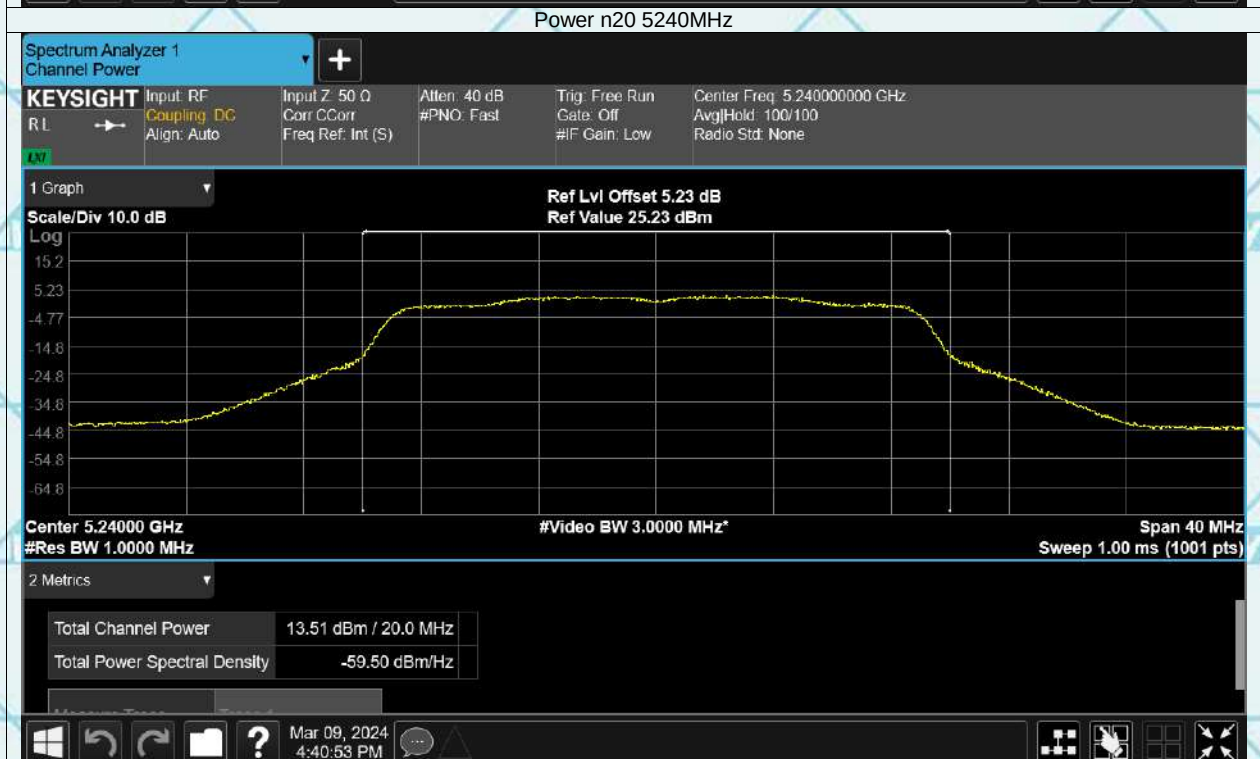
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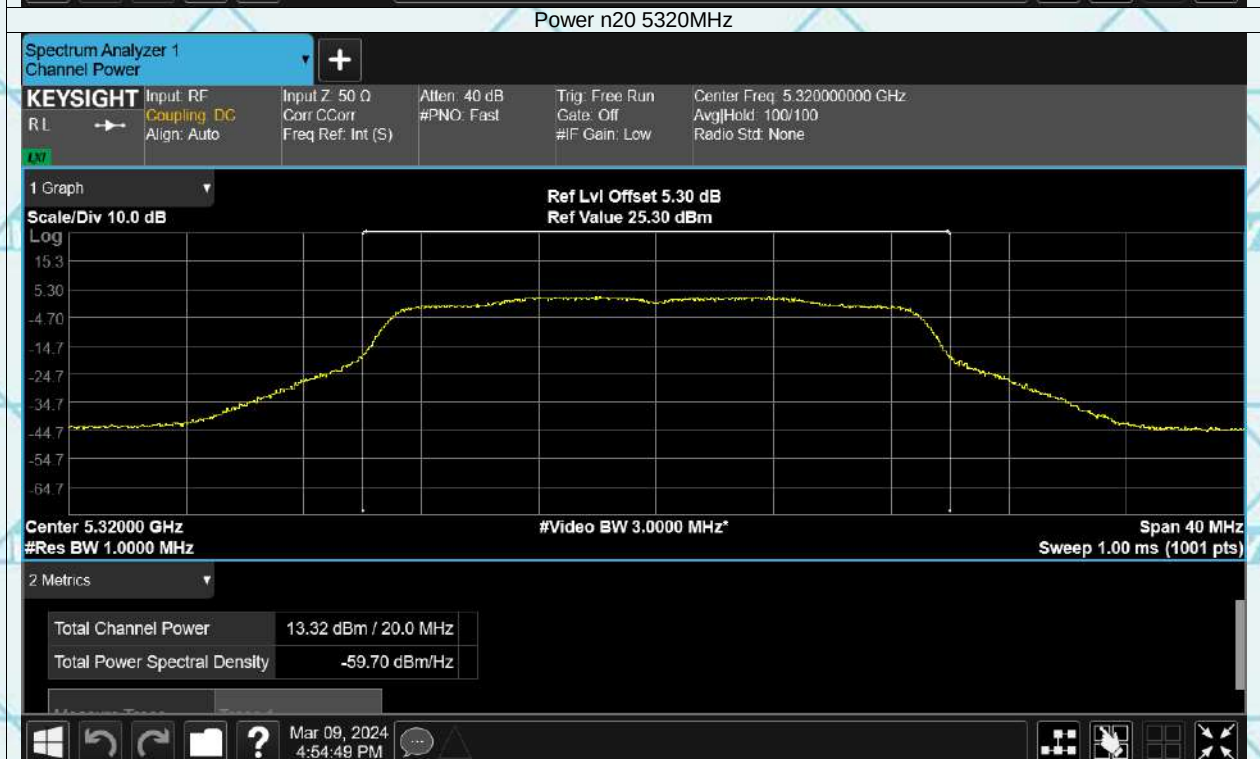
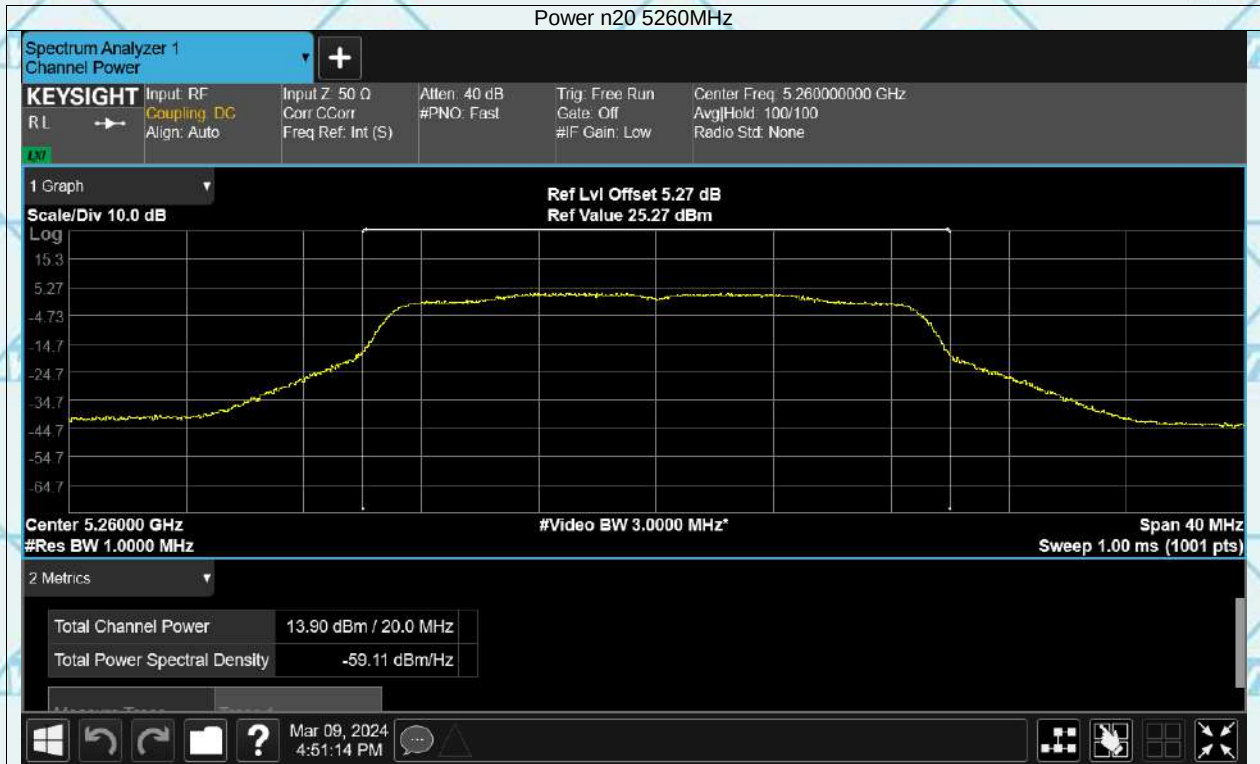
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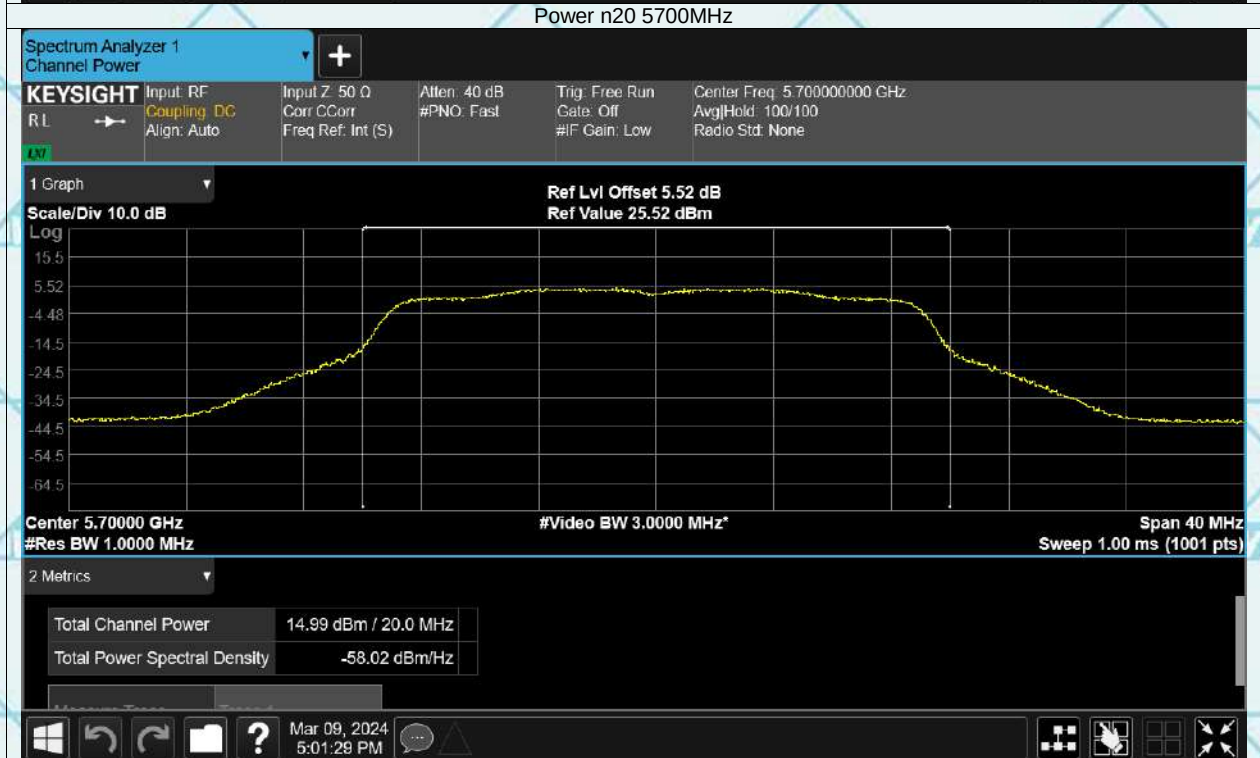
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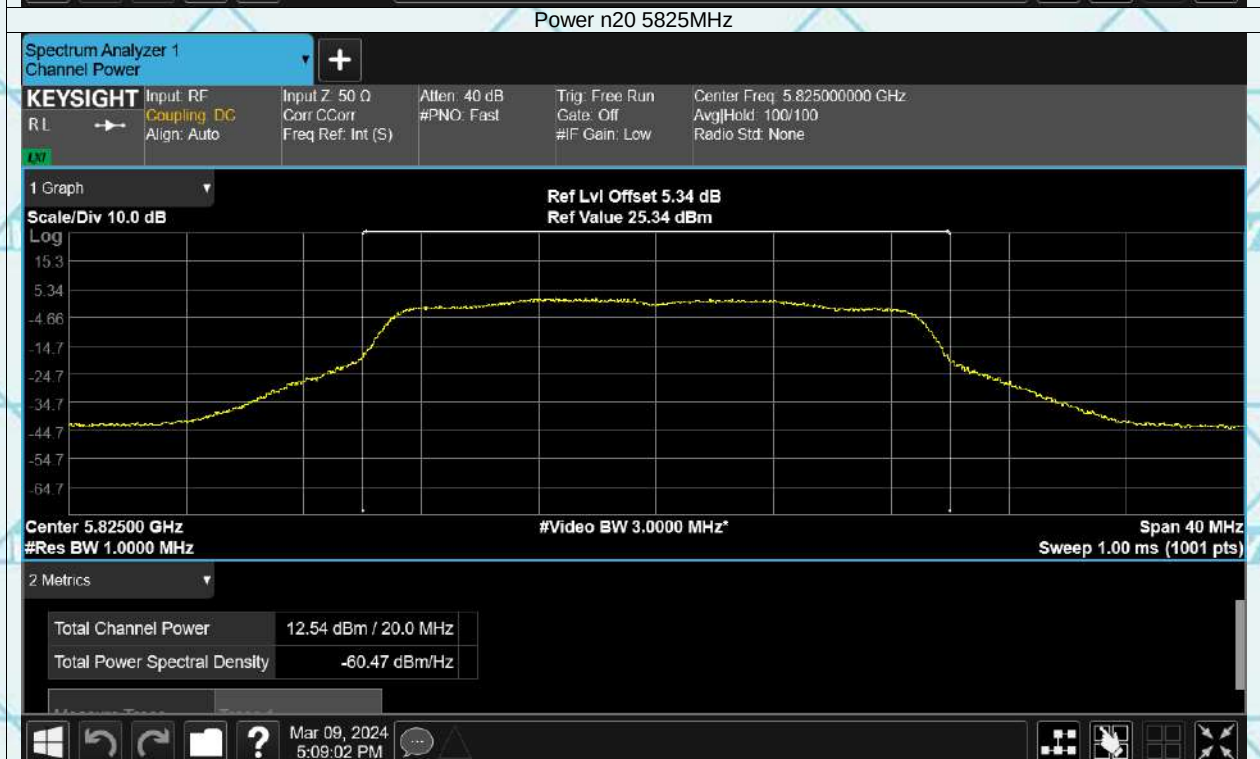
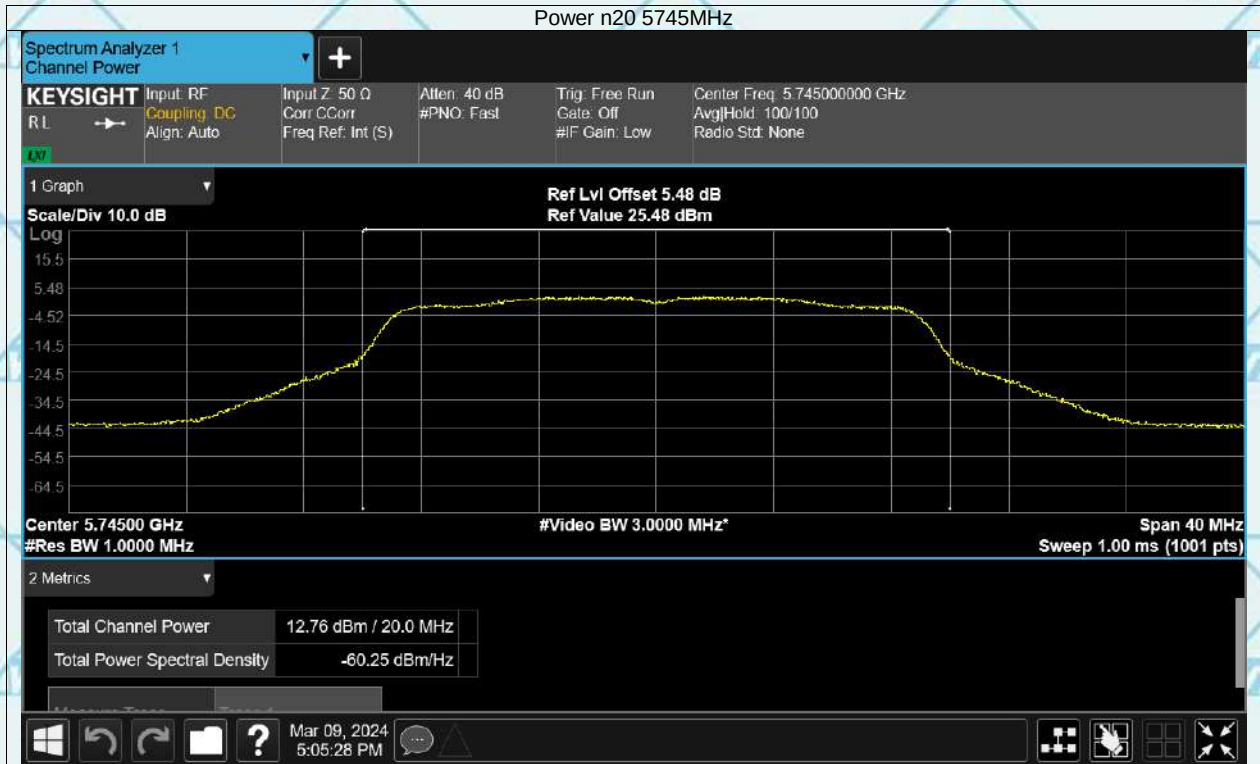
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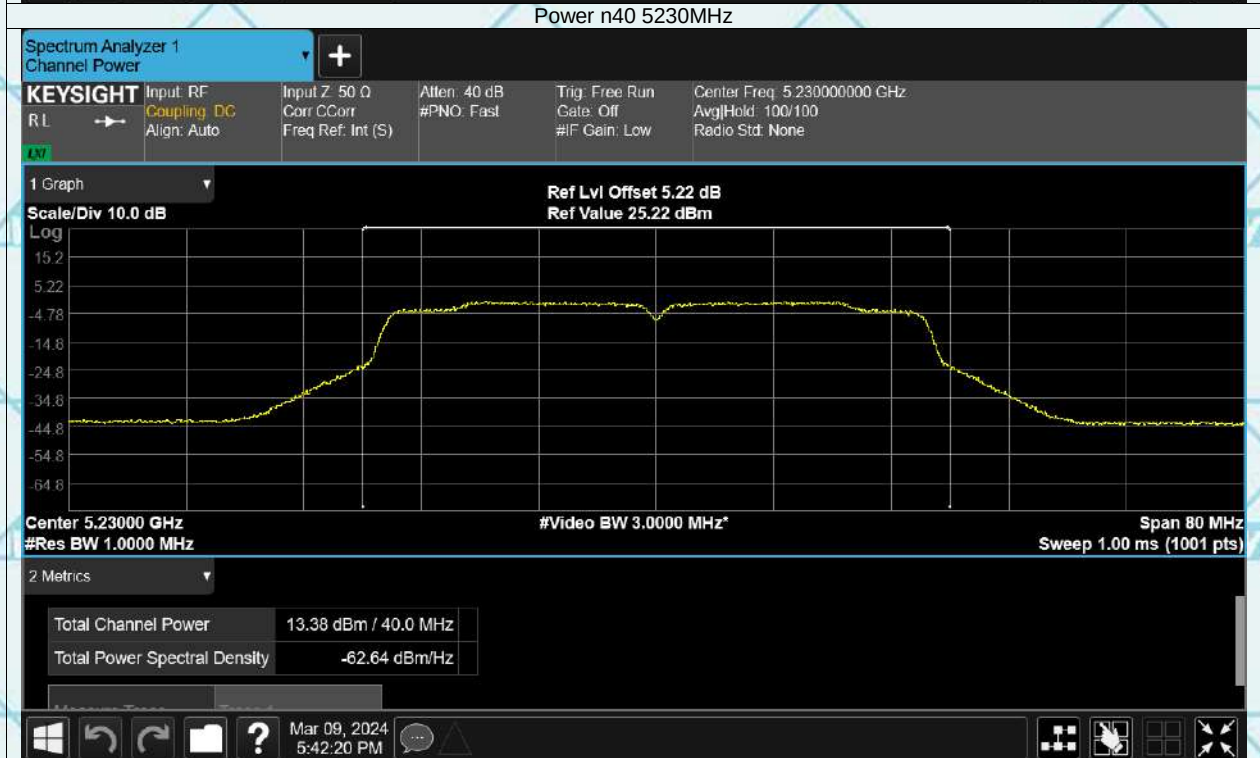
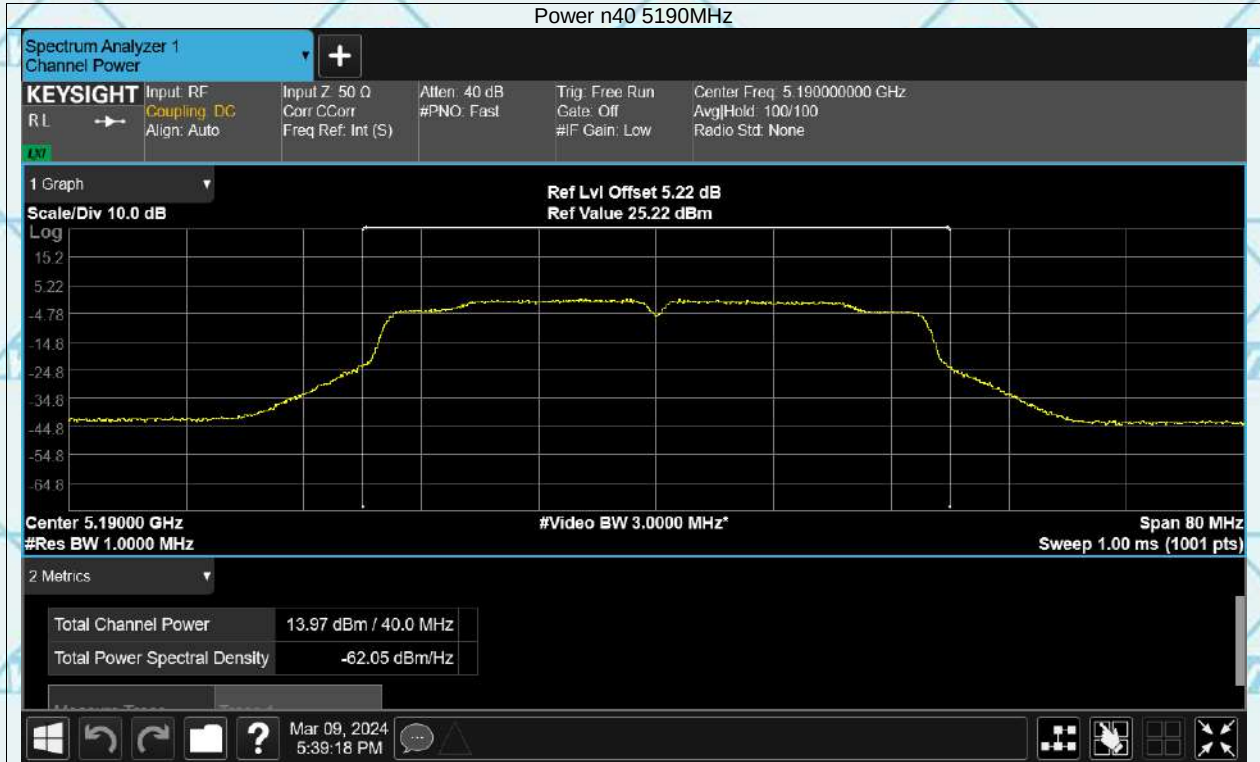
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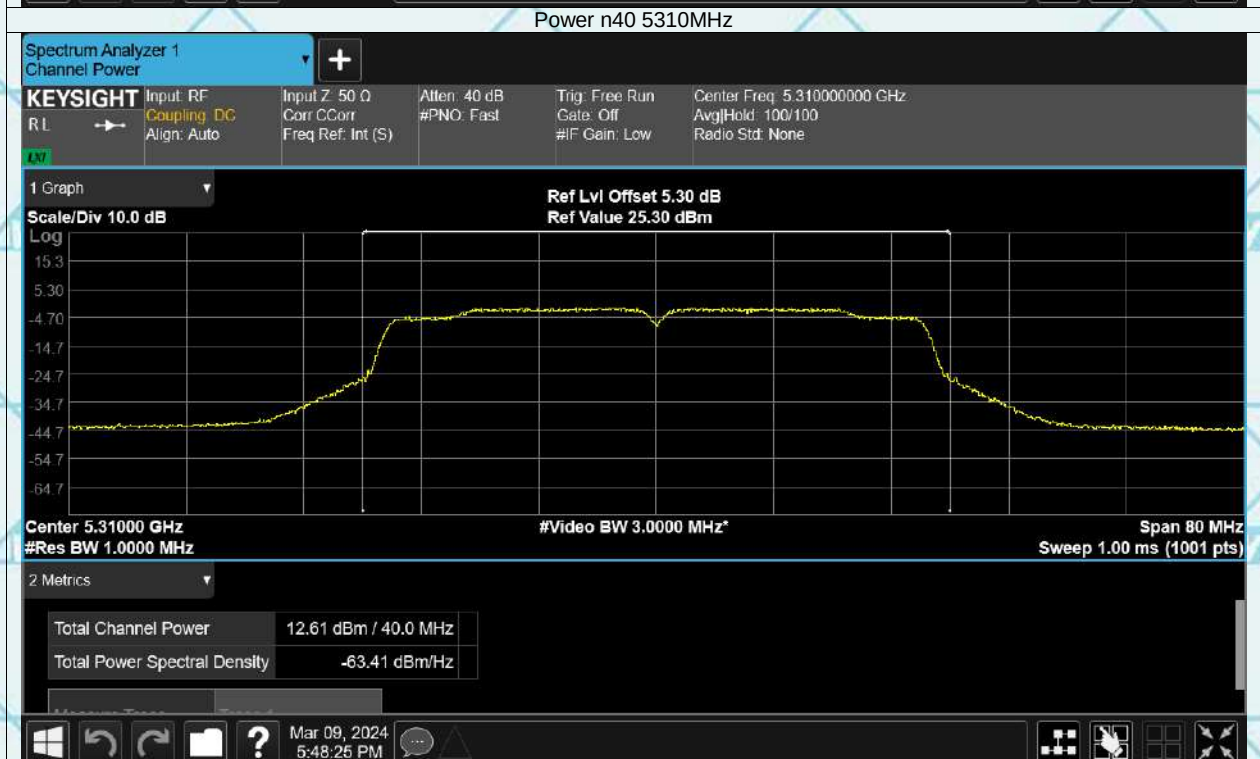
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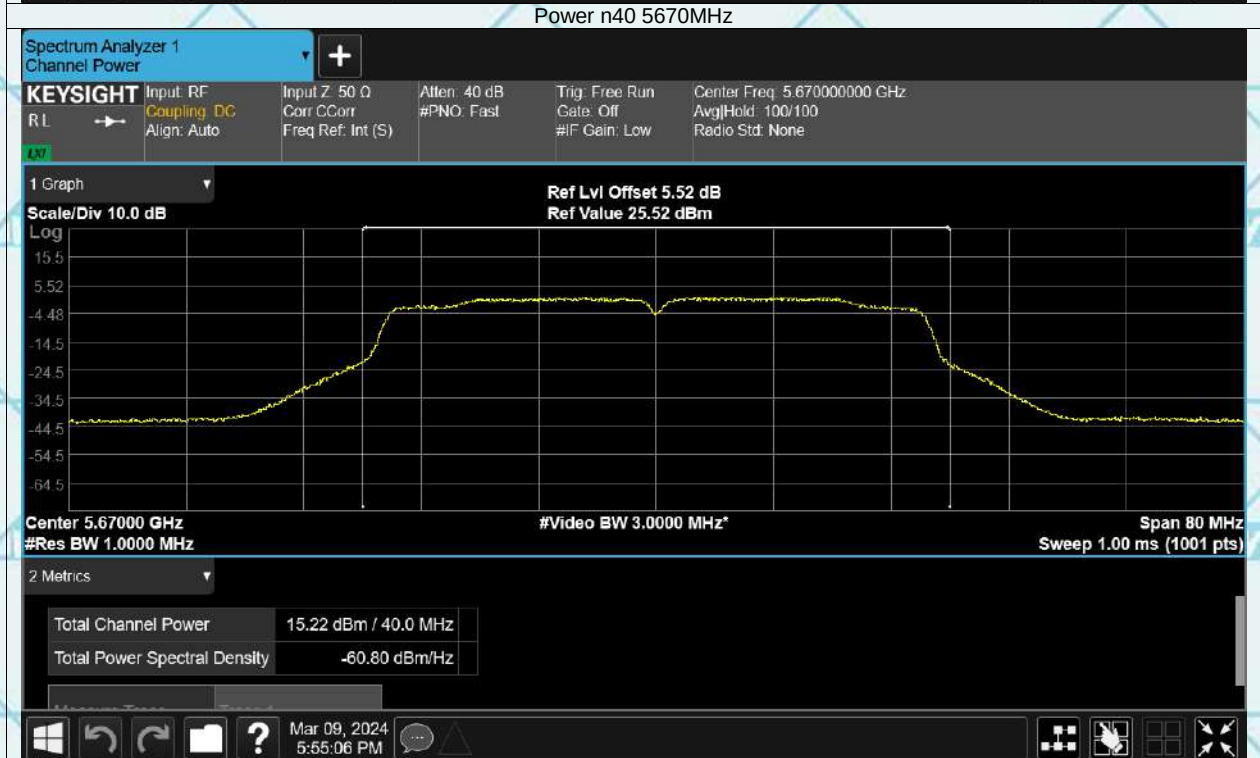
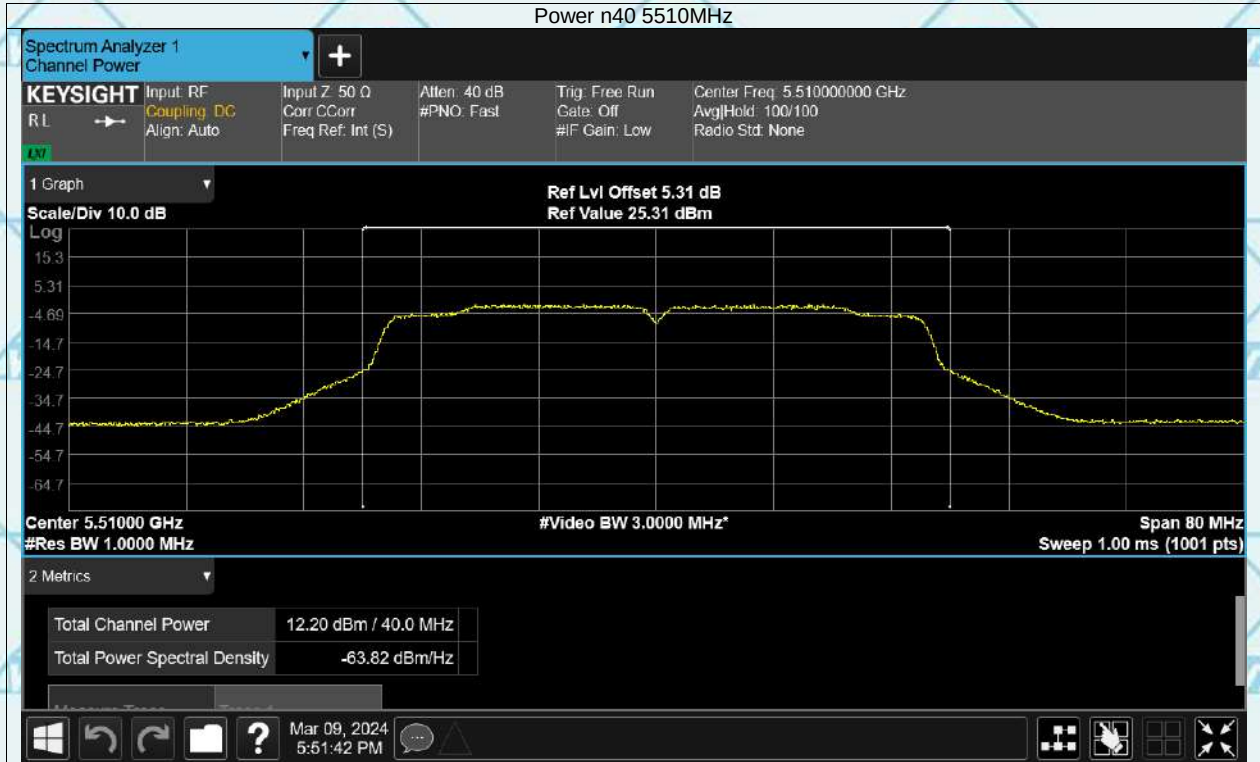
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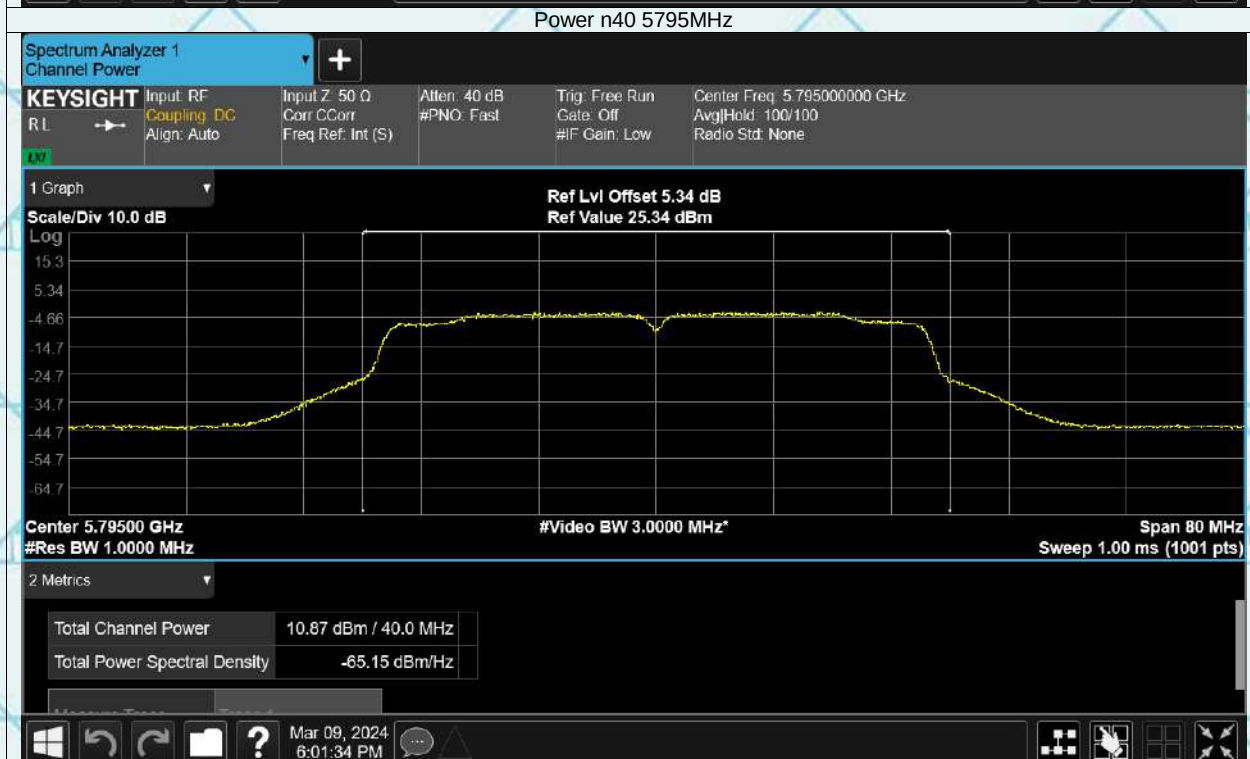
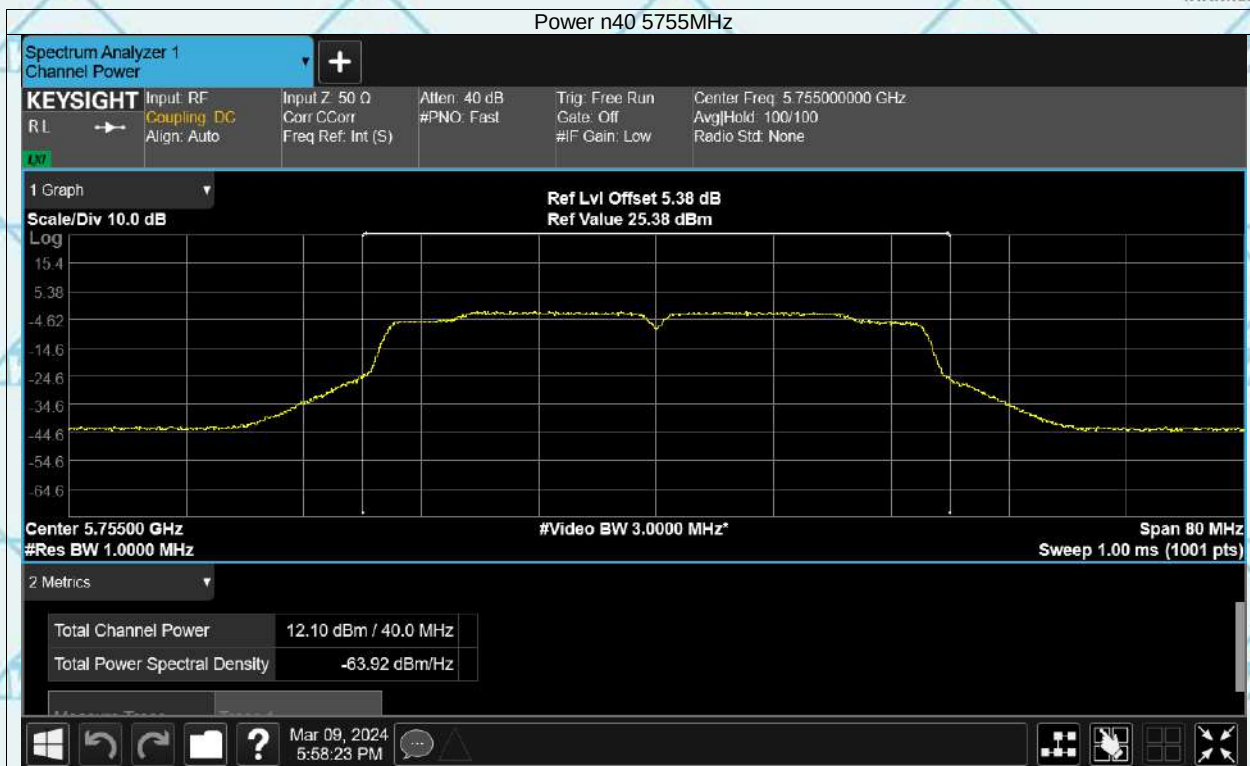
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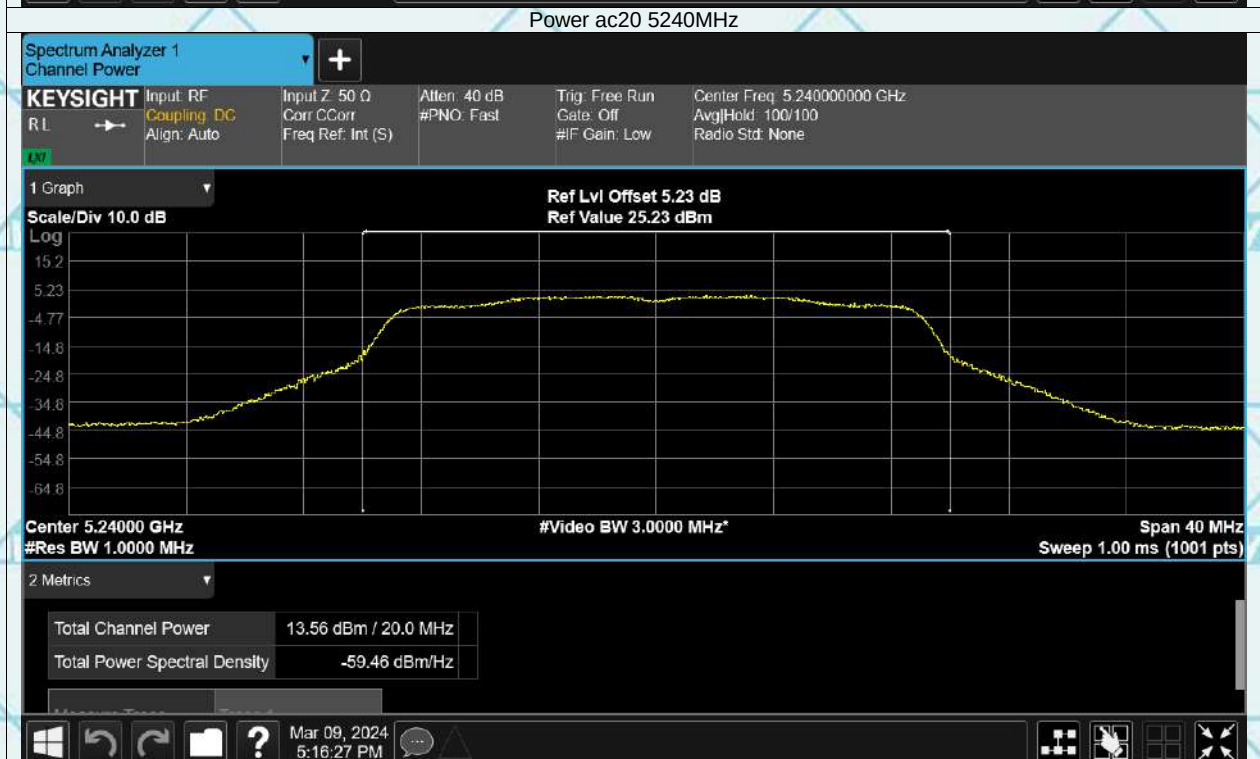
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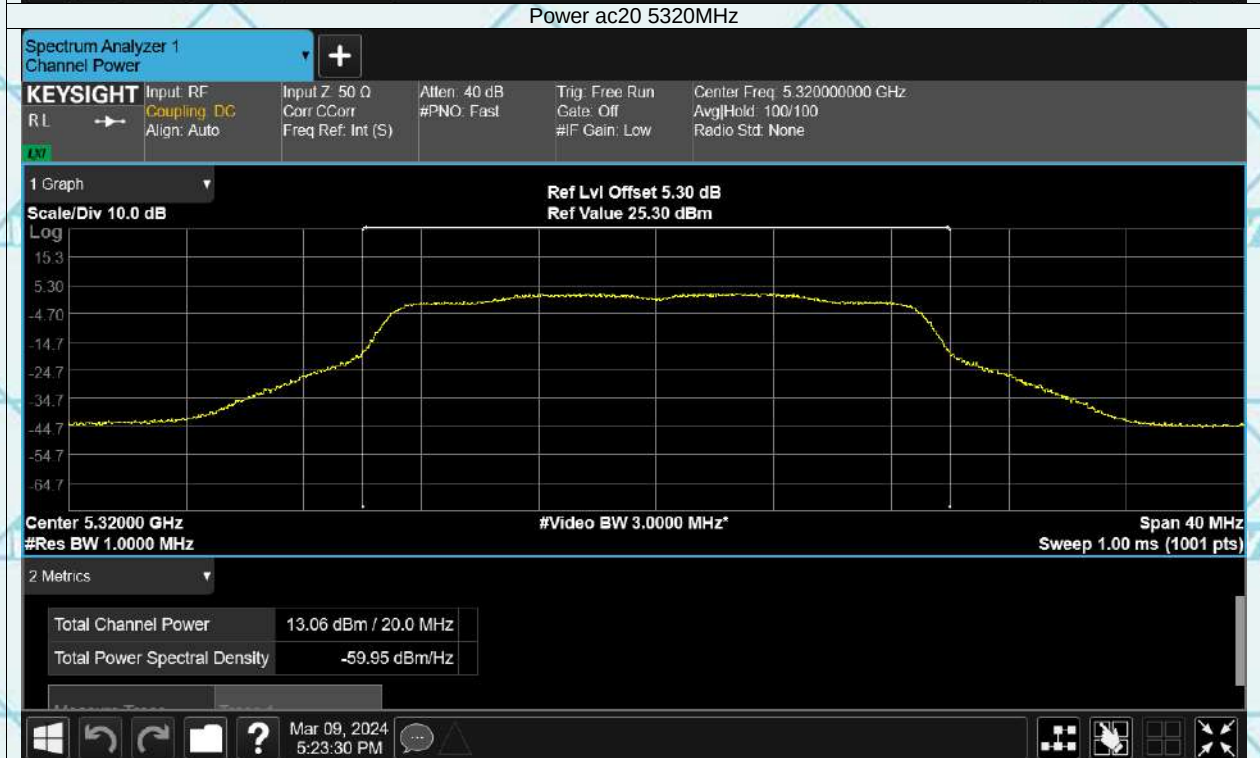
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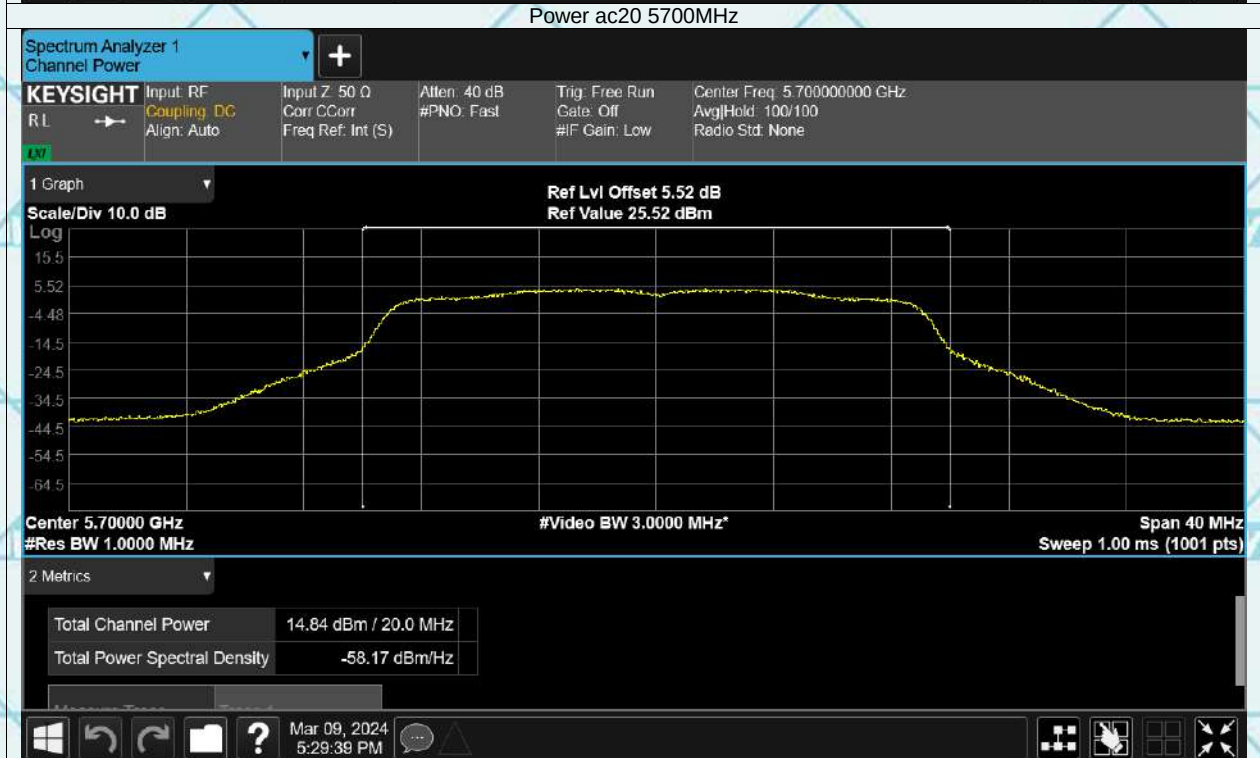
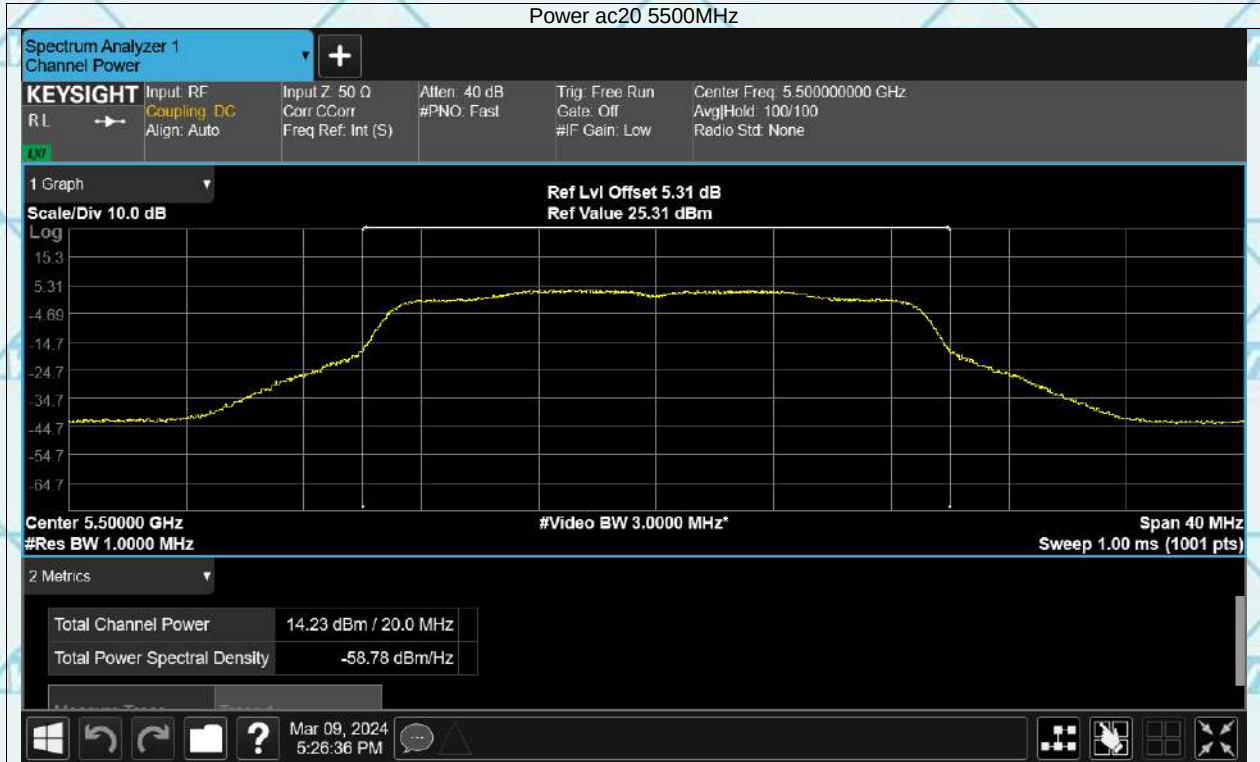




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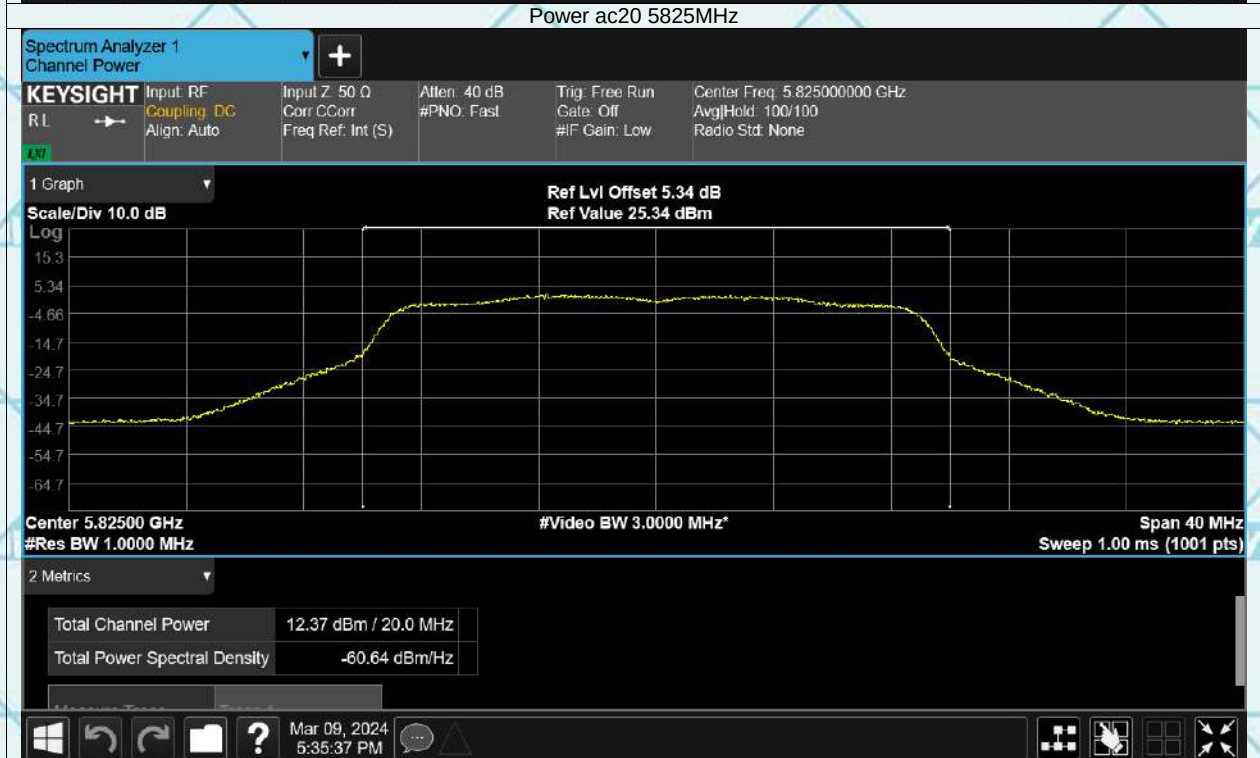
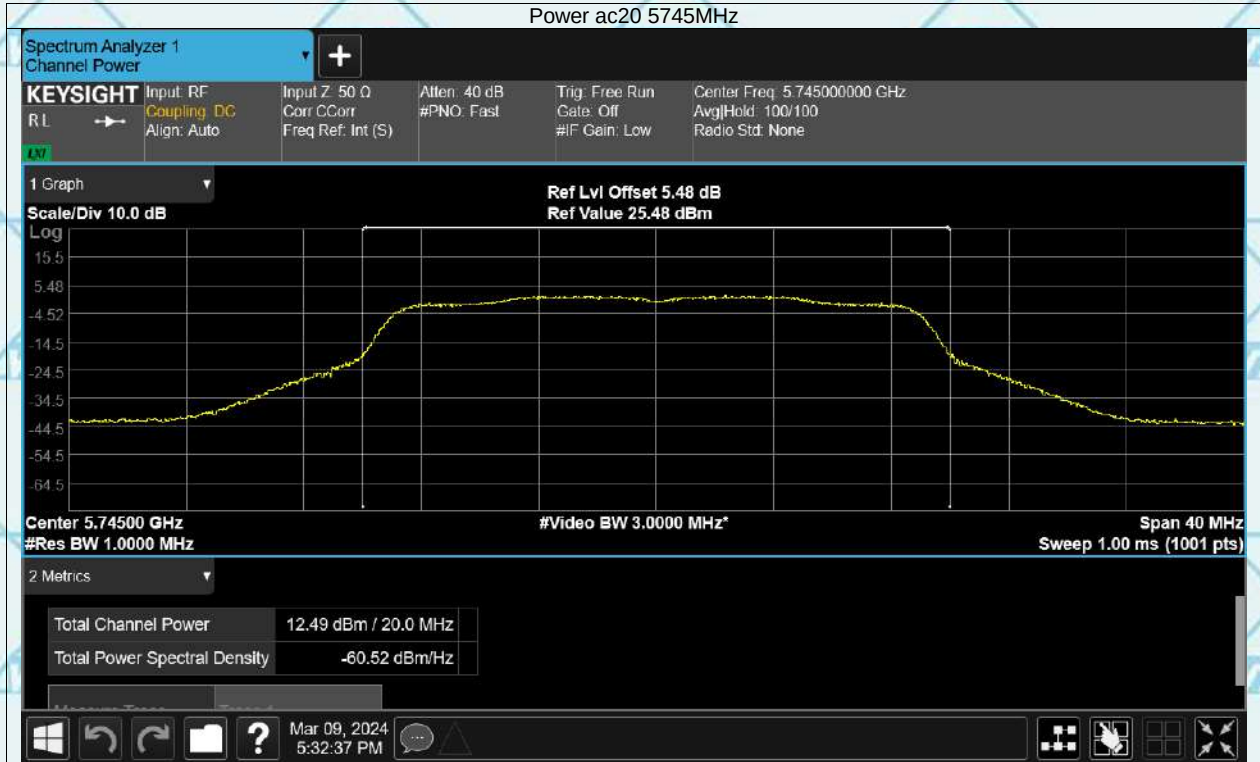




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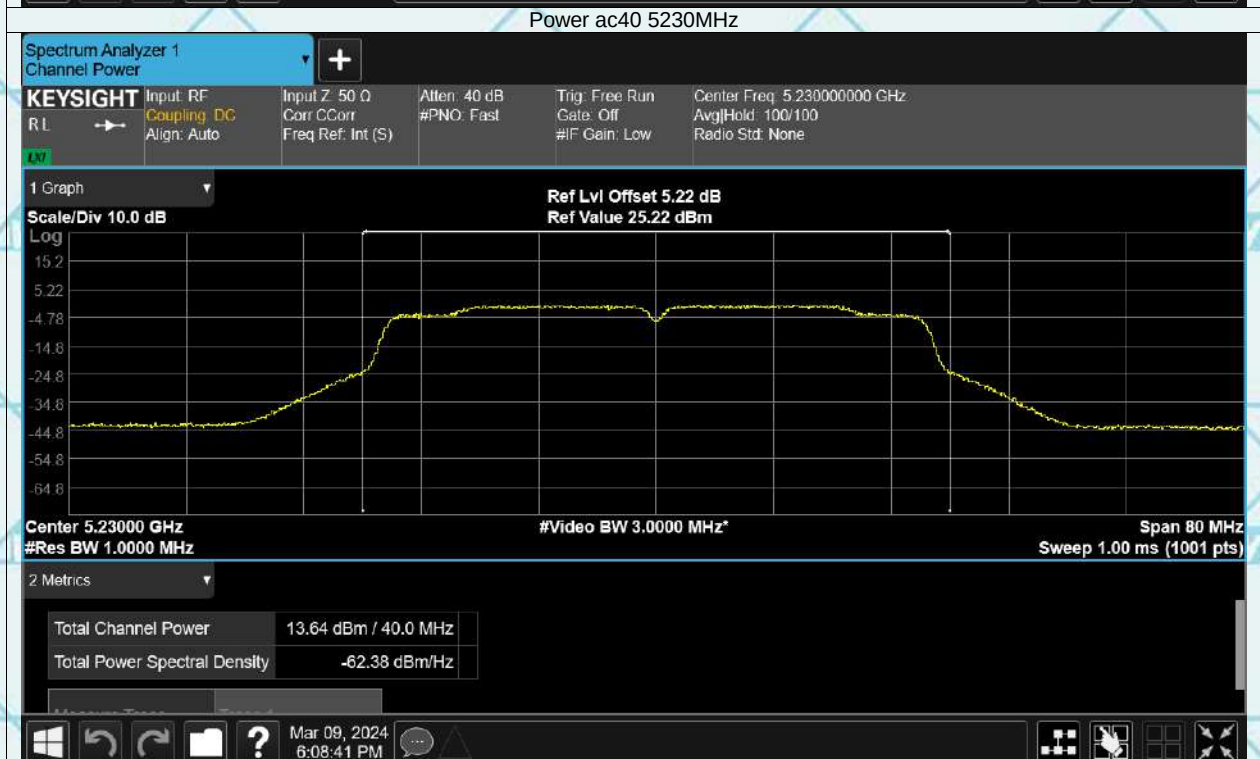
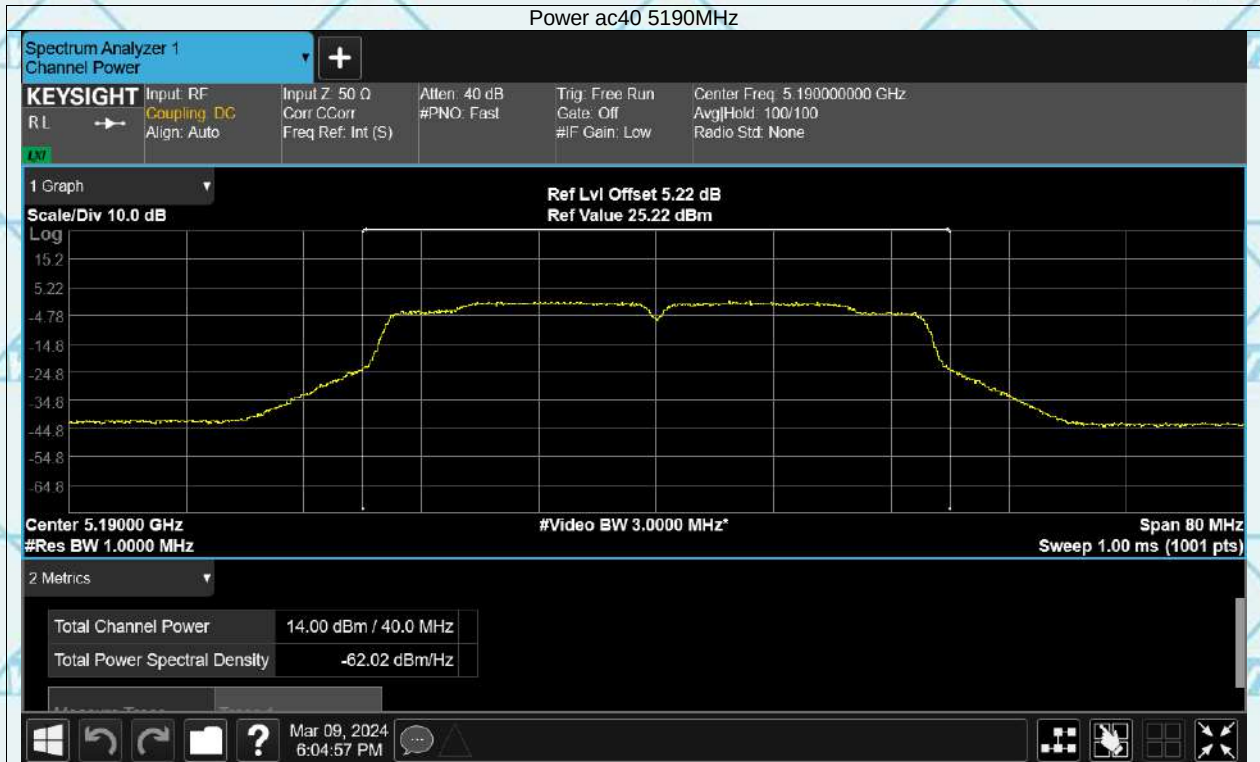
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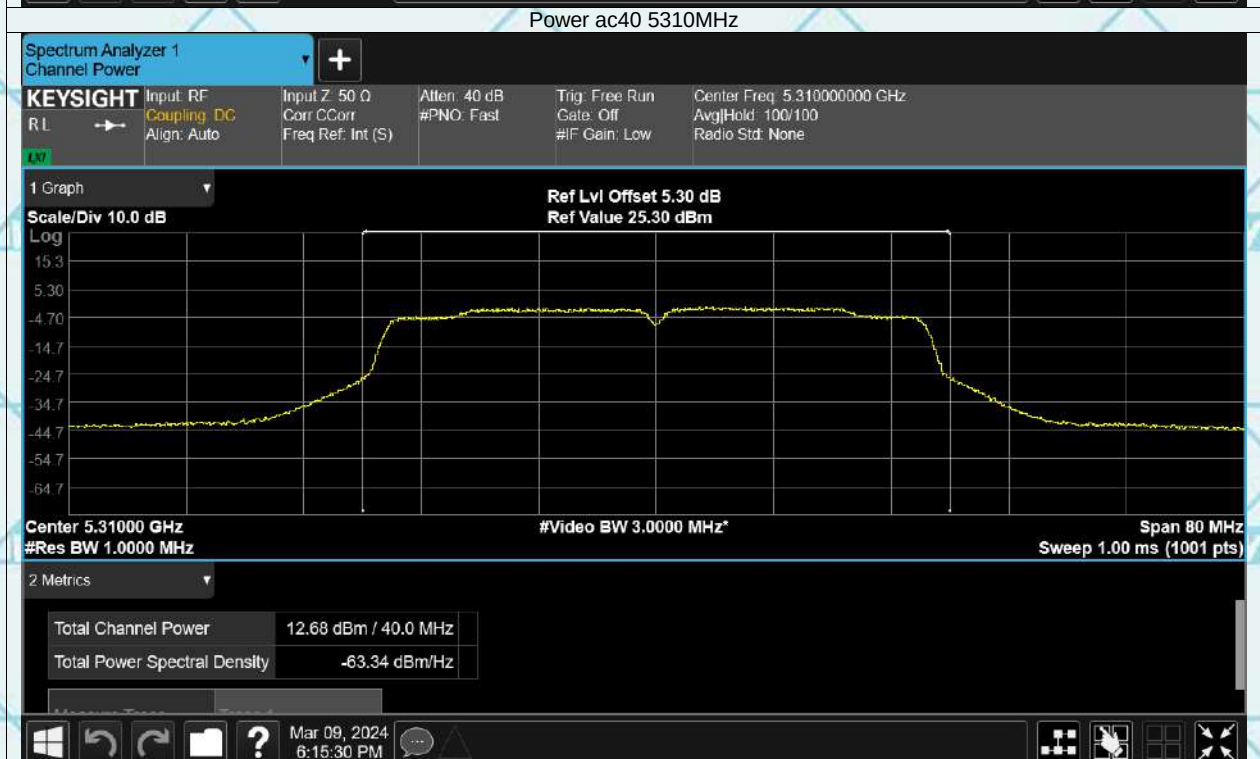
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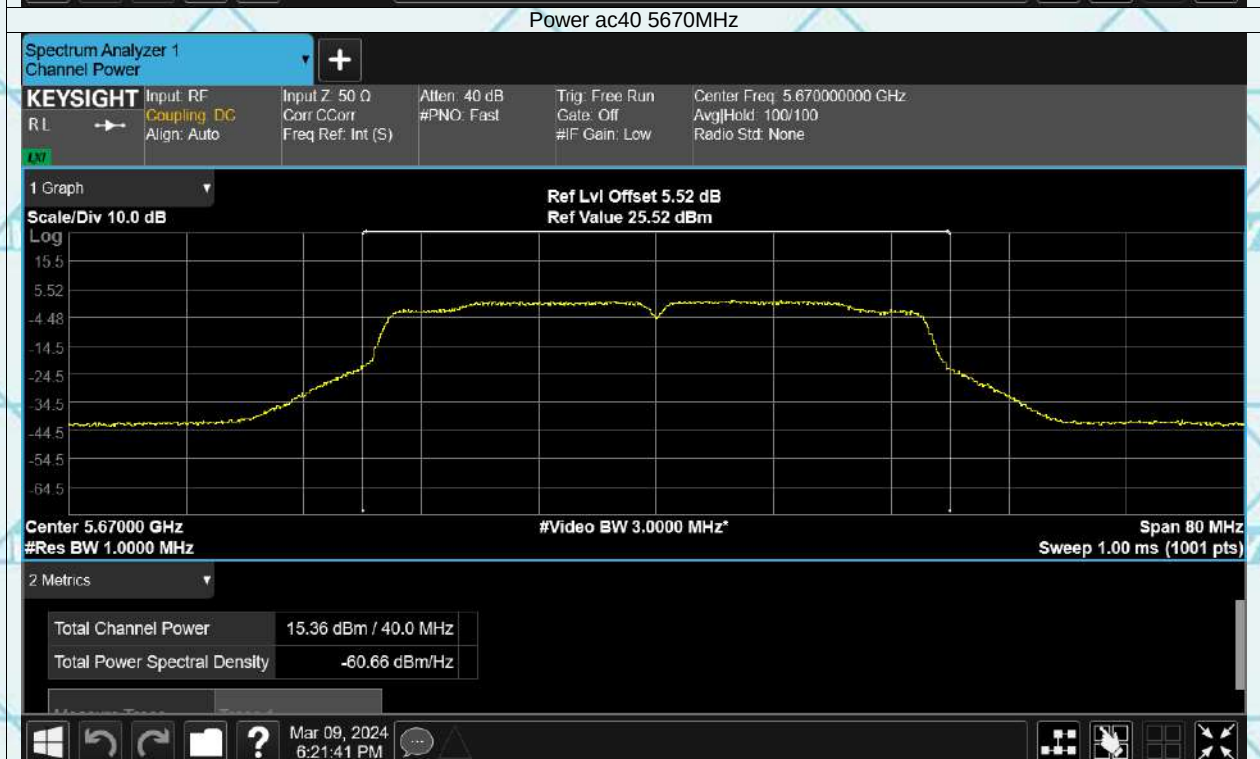
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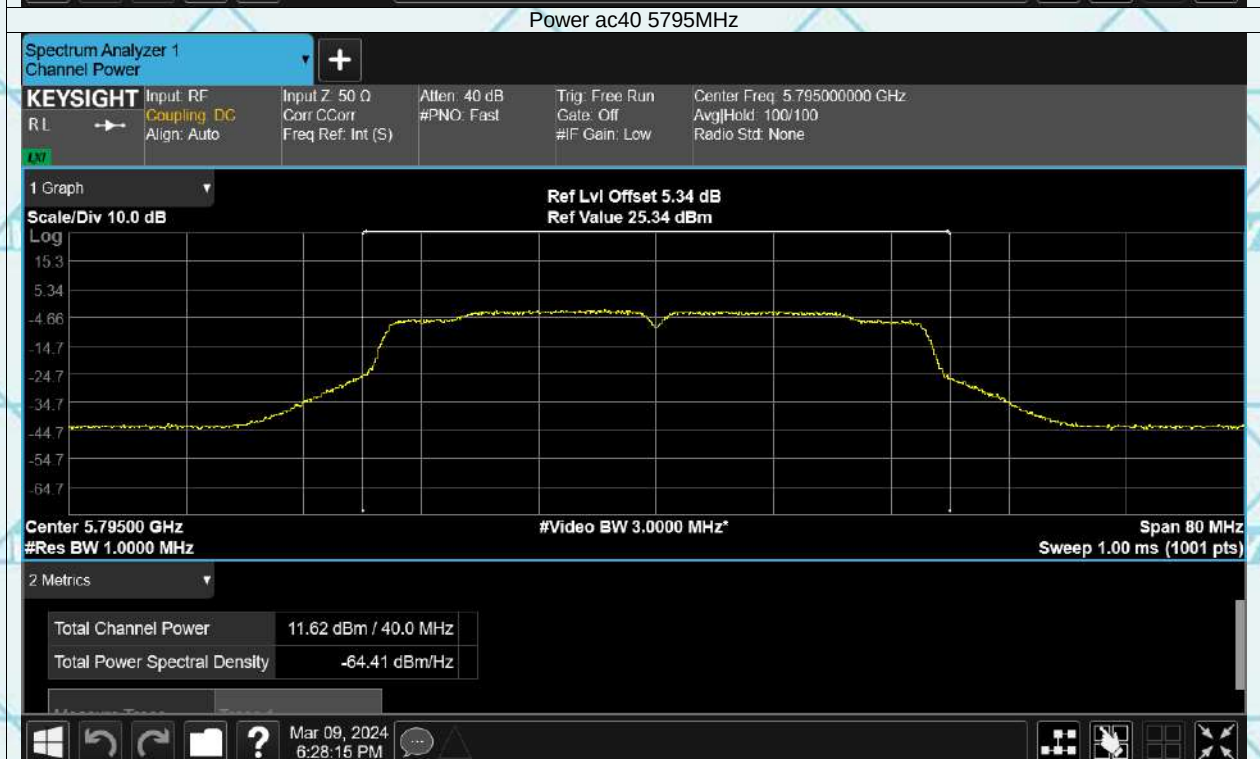
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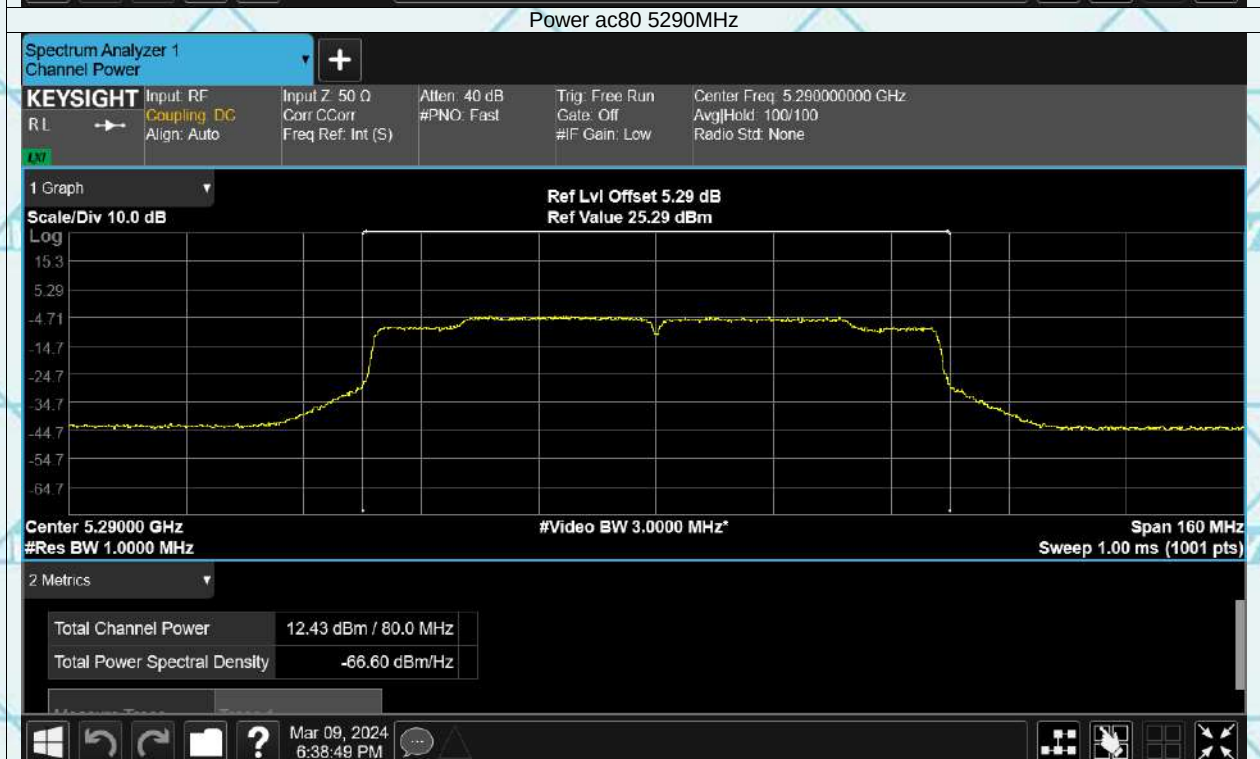
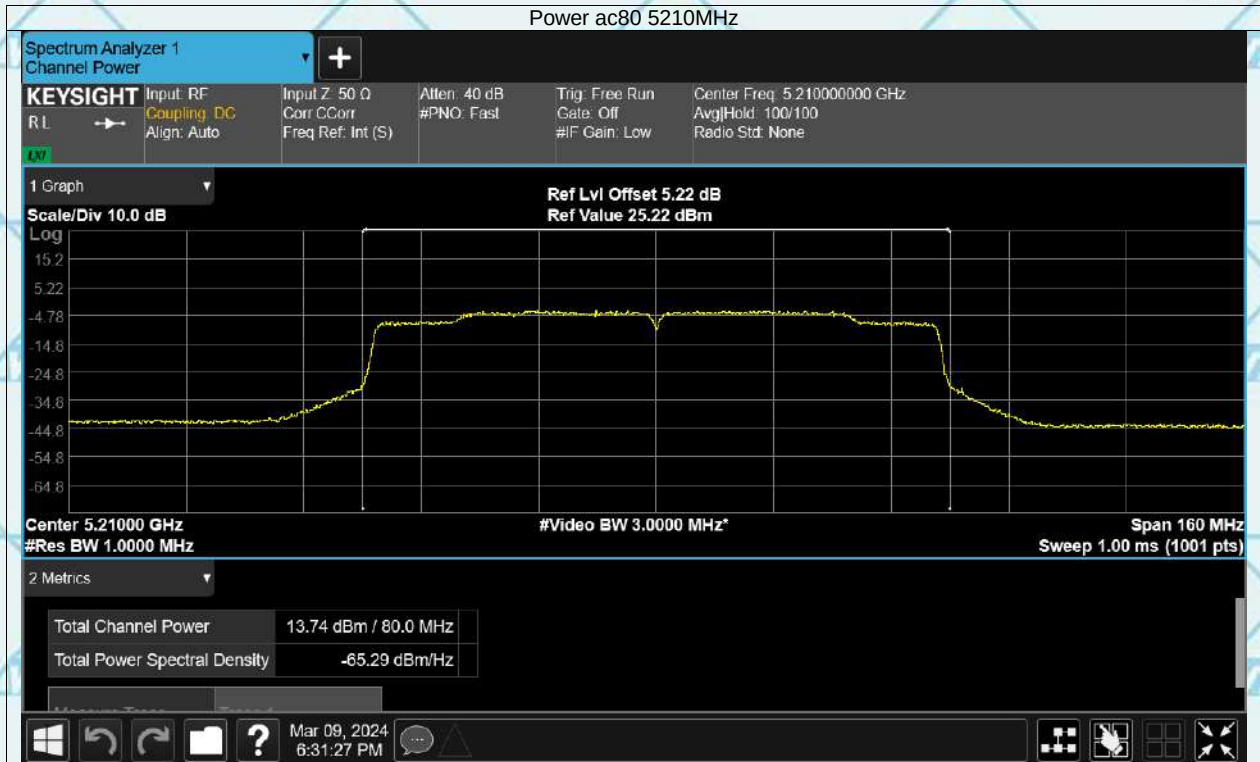
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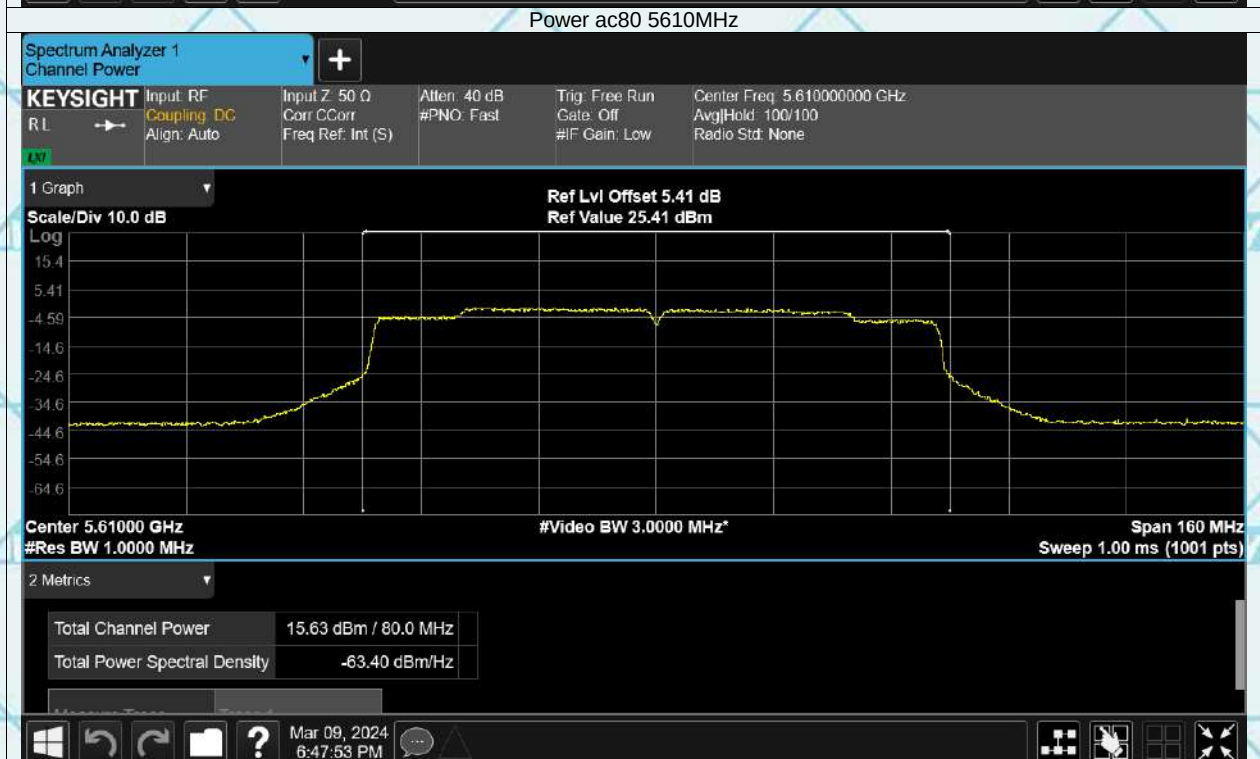
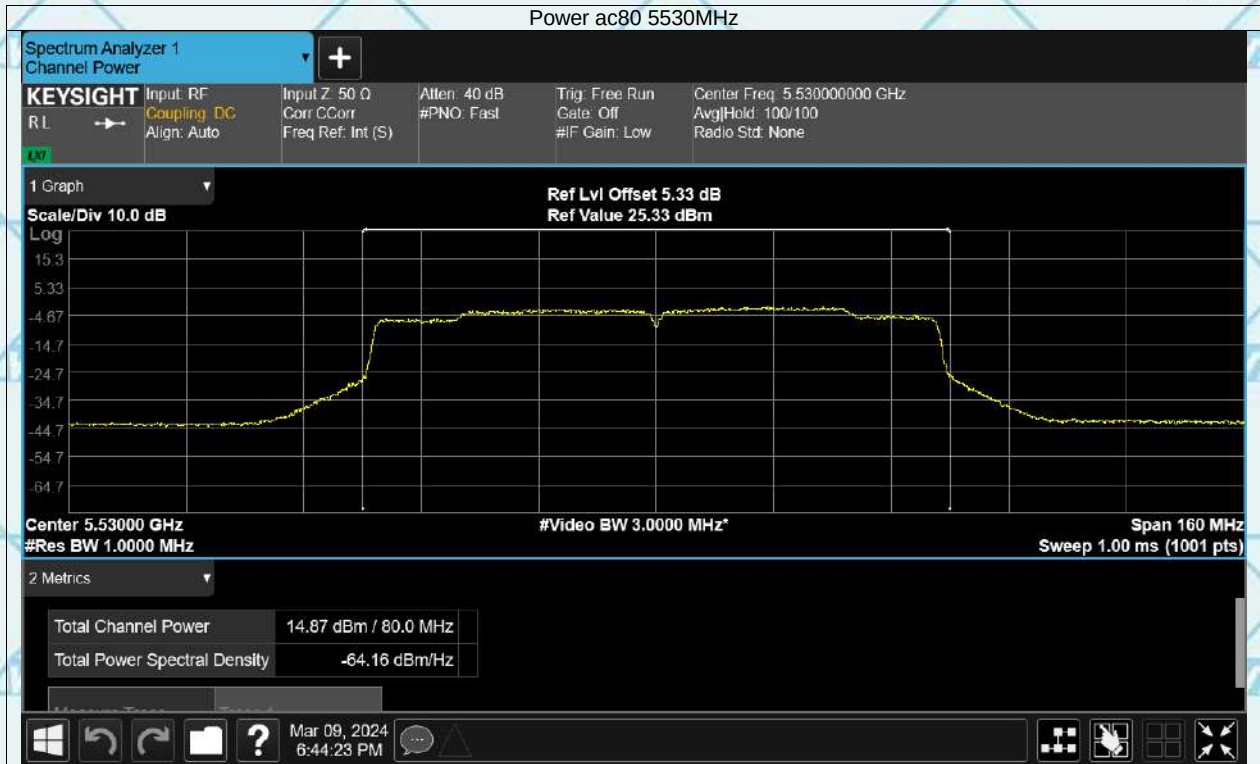
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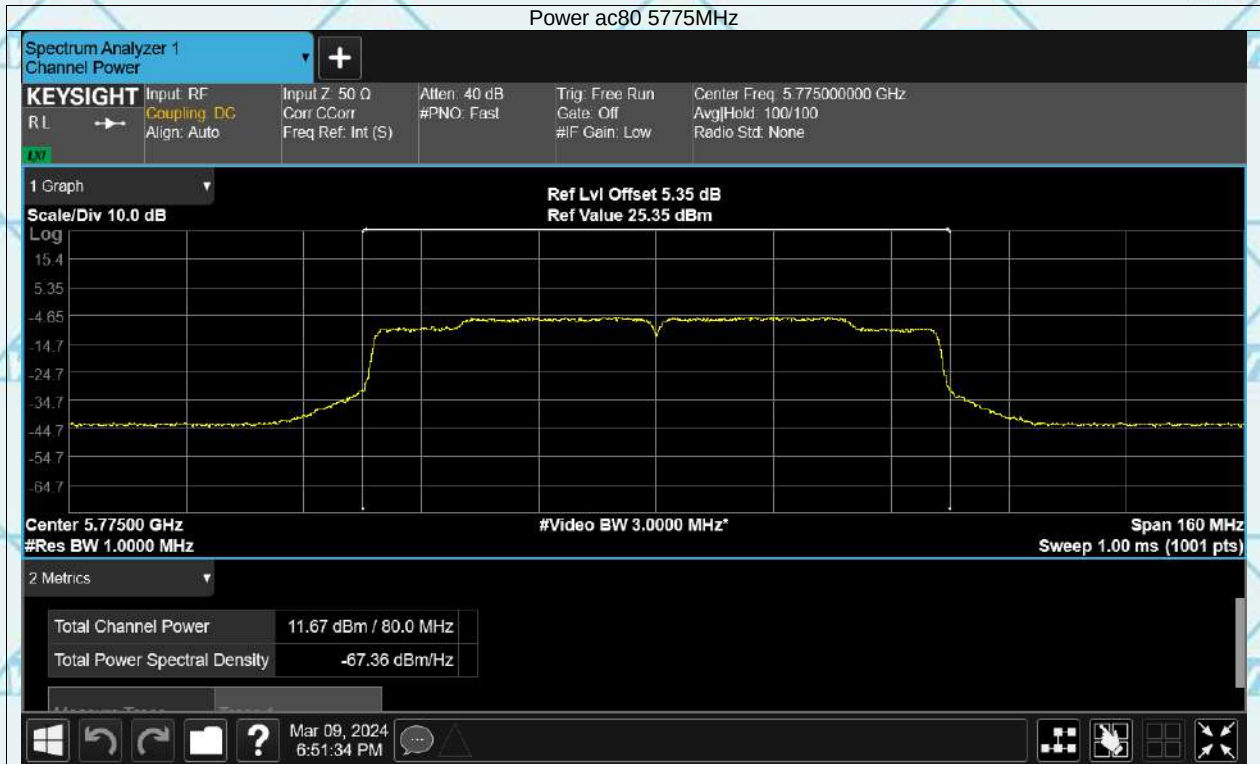
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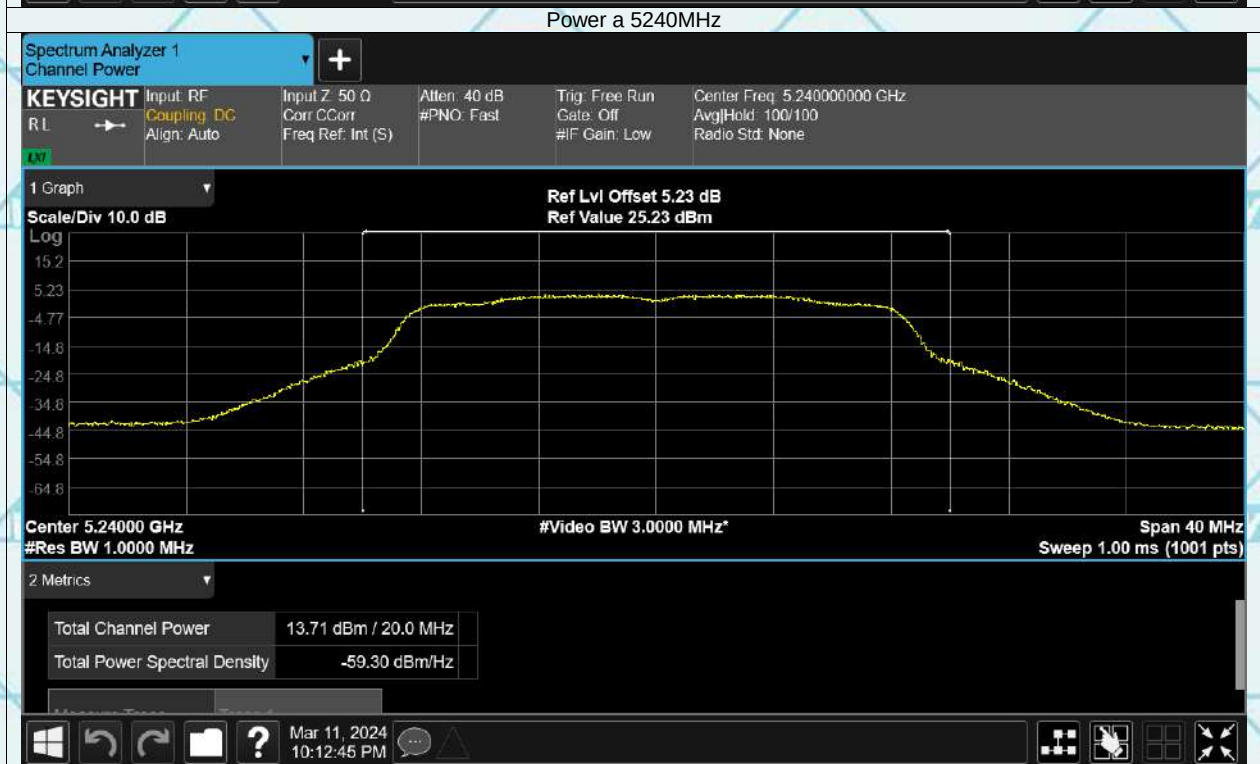
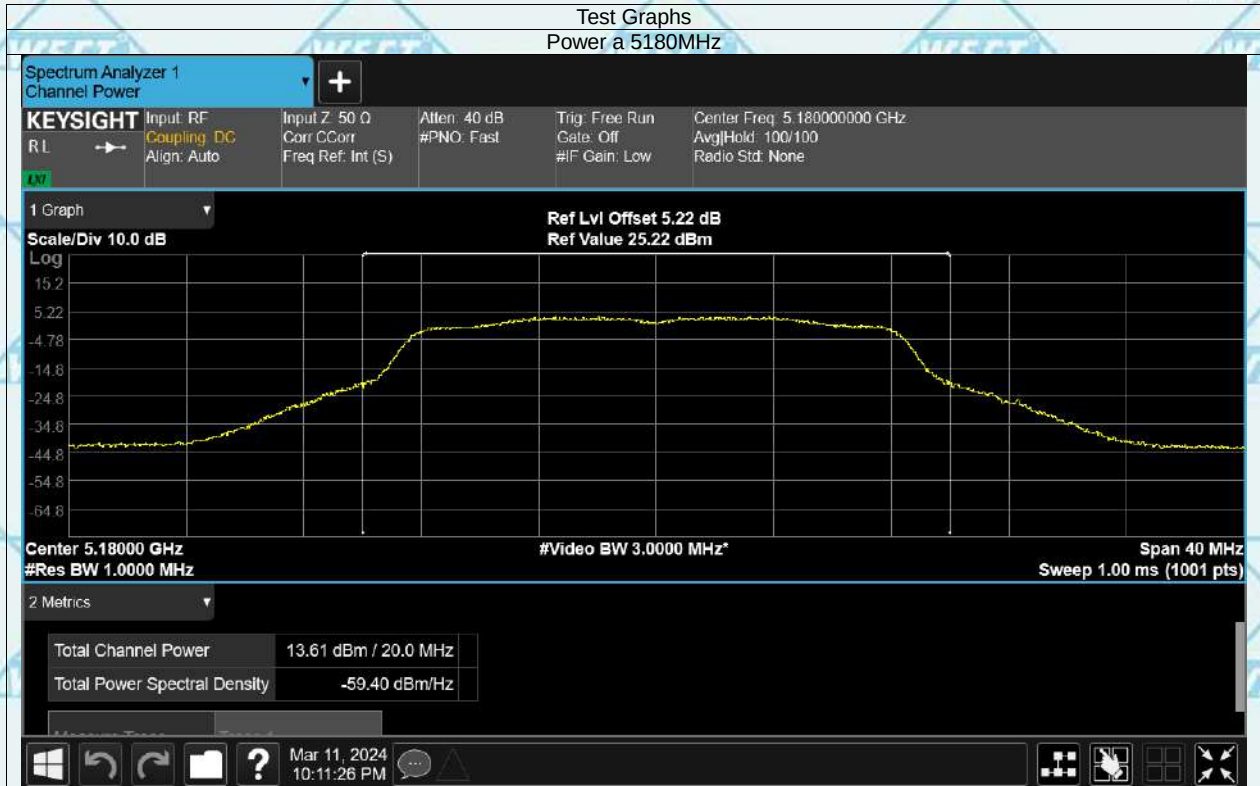


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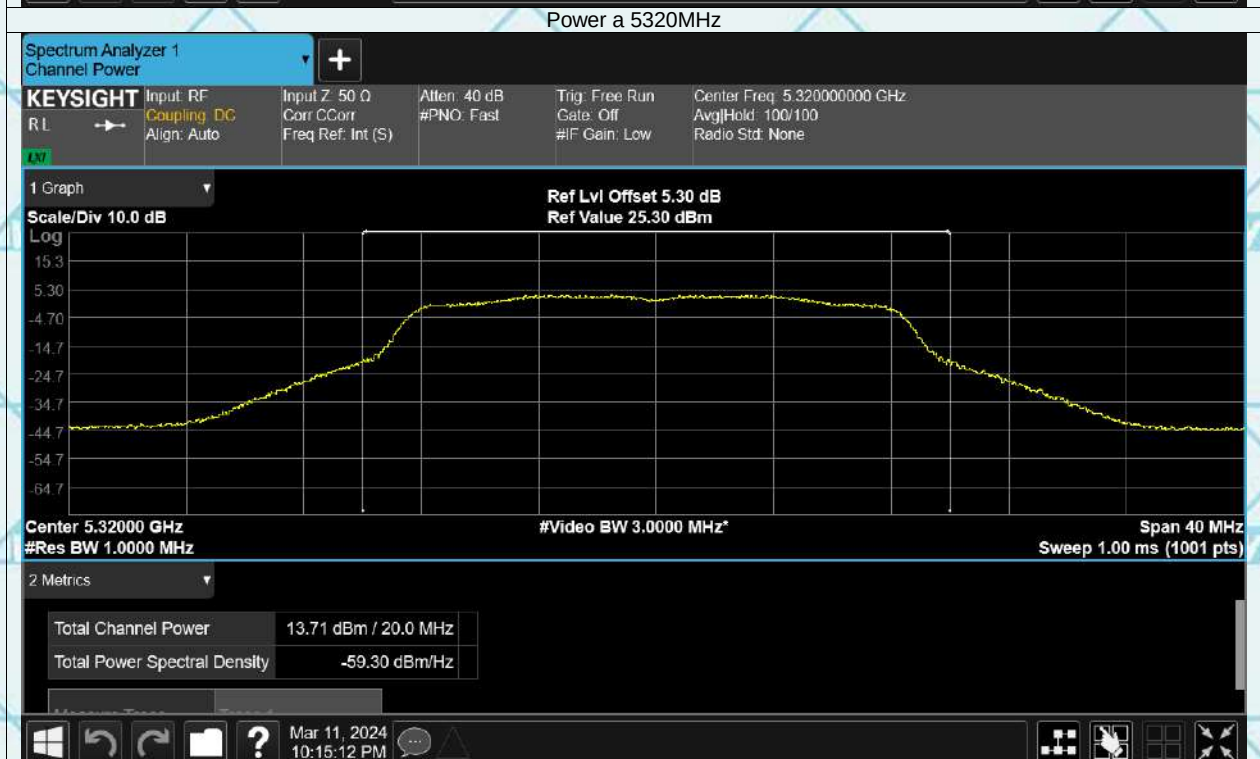
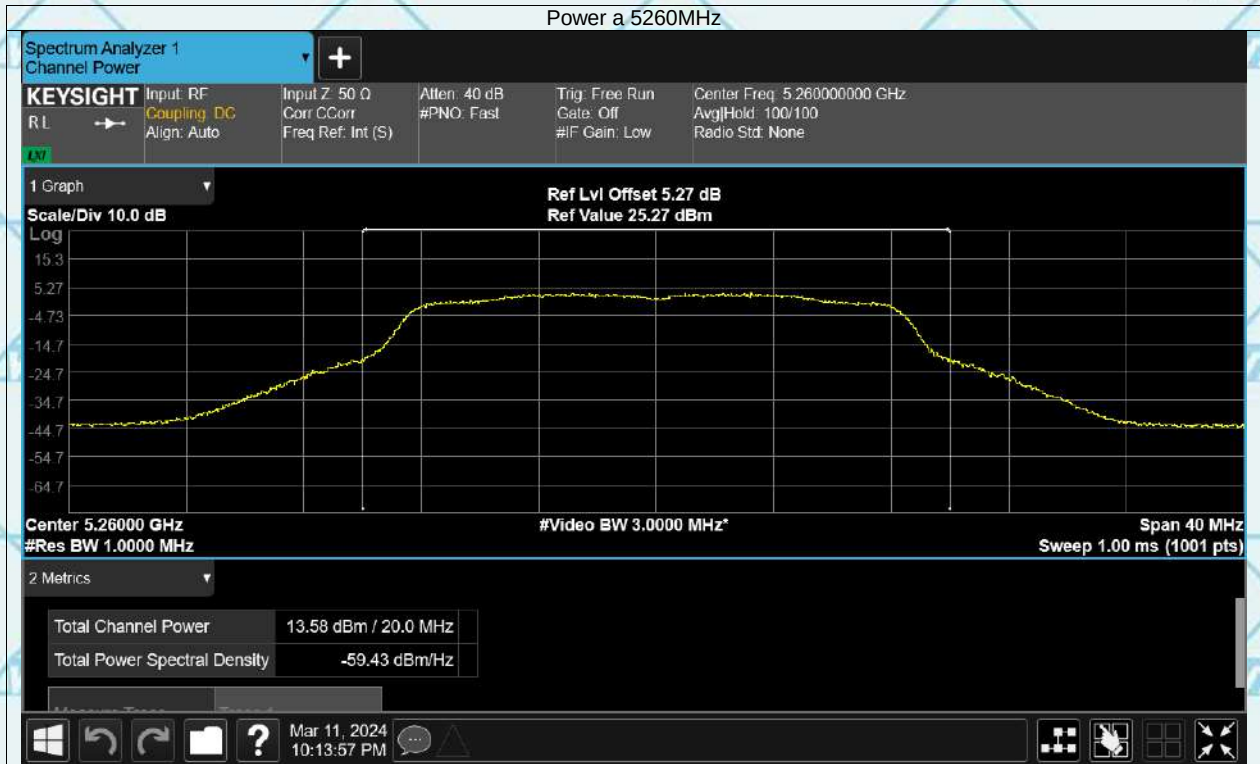
AUX Ant2





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