

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



Applicant: FIH CO., LTD.
No.4, Minsheng St., Tu-Cheng Dist., New Taipei City 23679,
Taiwan

Manufacturer: FIH CO., LTD.
No.4, Minsheng St., Tu-Cheng Dist., New Taipei City 23679,
Taiwan

Product Name: Internet Gateway

Brand Name: FIH

Model No.: FSNO21VA

Model Difference: N/A

Report Number: ER/2022/30097

FCC ID RYQFSNO21VA

Issue Date: May 30, 2022

Date of Test: April 6, 2022 ~ May 13, 2022

Date of EUT Received: March 30, 2022

Approved By

Blue Yang

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.26-2015 and the energy emitted by the sample EUT comply with FCC rule part 2, § 96.

The results of this report relate only to the sample identified in this report.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
ER/2022/30097	00	Original	May 30, 2022	Yuri Tsai	

Note:

- 1、The remark "***" indicates modification of the report upon requests from certification body.

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1 GENERAL PRODUCT INFORMATION

1.1 Product Description

Product Name:	Internet Gateway
Brand Name:	FIH
Model No.:	FSNO21VA
Model Difference:	N/A
Hardware Version:	1.0
Firmware Version:	V0.15A_1KUS
EUT Series No.:	356405430000400, 356405430005042
Power Supply:	12Vdc from AC/DC Adapter
Test Software (Name/Version)	Default

1.2 Antenna Designation

Antenna Type	Antenna No.
Monopole	Ant4
Dipole	Ant5
Note: Transmission frequencies in this test report are only available by the above antenna(s).	

Modulation	Frequency (MHz)	Peak Antenna Gain (dBi)	
		Ant4	Ant5
LTE-Band 48	3550 ~ 3700	-0.85709	-1.868

Note: Antenna information is provided by the applicant.

1.3 Operation Frequencies

NR Band 48			
BW (MHz)	Operation Frequency (MHz)		
10	3555.0	-	3695.0
20	3560.0	-	3690.0
30	3565.0	-	3685.0
40	3570.0	-	3680.0

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1.4 Maximum ERP/EIRP

5G NR Band n48_Part96_Uplink frequency band : 3550 to 3700 MHz									
Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
10	3555	3694.98	DFT-s PI/2 BPSK	23.02	21.152	0.130	8.6128	8612.8	8M61G7W
			DFT-s QPSK	23.04	21.172	0.131	8.6176	8617.6	8M62G7W
			DFT-s QAM	22.24	20.372	0.109	8.6233	8623.3	8M62D7W
			CP QPSK	21.55	19.682	0.093	8.6176	8617.6	8M62G7W
			CP QAM	21.49	19.622	0.092	8.6233	8623.3	8M62D7W
20	3560.01	3690	DFT-s PI/2 BPSK	23.19	21.322	0.136	17.814	17814.0	17M8G7W
			DFT-s QPSK	23.17	21.302	0.135	17.85	17850.0	17M9G7W
			DFT-s QAM	22.38	20.512	0.113	17.884	17884.0	17M9D7W
			CP QPSK	21.69	19.822	0.096	17.85	17850.0	17M9G7W
			CP QAM	20.95	19.082	0.081	17.884	17884.0	17M9D7W
30	3565.02	3684.99	DFT-s PI/2 BPSK	23.3	21.432	0.139	26.823	26823.0	26M8G7W
			DFT-s QPSK	23.22	21.352	0.137	26.825	26825.0	26M8G7W
			DFT-s QAM	22.51	20.642	0.116	26.853	26853.0	26M9D7W
			CP QPSK	21.77	19.902	0.098	26.825	26825.0	26M8G7W
			CP QAM	21.2	19.332	0.086	26.853	26853.0	26M9D7W
40	3570	3679.98	DFT-s PI/2 BPSK	23.32	21.452	0.140	35.697	35697.0	35M7G7W
			DFT-s QPSK	23.3	21.432	0.139	35.844	35844.0	35M8G7W
			DFT-s QAM	22.49	20.622	0.115	35.849	35849.0	35M8D7W
			CP QPSK	21.87	20.002	0.100	35.844	35844.0	35M8G7W
			CP QAM	21.25	19.382	0.087	35.849	35849.0	35M8D7W

MIMO

5G NR Band n48_Part96_Uplink frequency band : 3550 to 3700 MHz									
Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
10	3555	3694.98	CP QPSK	21.2940291	19.4260291	0.088	8.5907	8590.7	8M59G7W
			CP QAM	21.1932383	19.3252383	0.086	8.6071	8607.1	8M61D7W
20	3560.01	3690	CP QPSK	21.2768224	19.4088224	0.087	18.235	18235.0	18M2G7W
			CP QAM	21.0599751	19.1919751	0.083	18.307	18307.0	18M3D7W
30	3565.02	3684.99	CP QPSK	21.2910367	19.4230367	0.088	27.865	27865.0	27M9G7W
			CP QAM	21.0110367	19.1430367	0.082	27.86	27860.0	27M9D7W
40	3570	3679.98	CP QPSK	21.3153719	19.4473719	0.088	37.902	37902.0	37M9G7W
			CP QAM	21.0016929	19.1336929	0.082	37.862	37862.0	37M9D7W

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1.5 Test Methodology of Applied Standards

FCC 47 CFR Part 2, Part 96E

ANSI C63.26-2015

ANSI/ITA C603-E.2016

KDB 971168 D01 Power Meas license Digital System v03r01

KDB 940660 D01 Part 96 CBRS Eqpt v02

KDB 412172 D01 Determining ERP and EIRP V01r01

KDB 662911 D01 Multiple Transmitter Output v02r01

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1.6 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		

Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.

1.7 Special Accessories

No special accessories were used during testing.

1.8 Equipment Modifications

There was no modifications incorporated into the EUT.

1.9 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Measurement at Antenna Port

The EUT is placed on a table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

2.3.2 Radiated Emissions (ERP/EIRP)

The EUT is placed on a turn table, for emission measurements below 1 GHz is 0.8 m above ground plane, for emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note: The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Following shows an offset computation in physical test.

Frequency	RF cable loss (dB)	Attenuation (dB)	offset(dB)
High Band (Above 1 GHz)	4.72	10	14.72

MIMO

Frequency	RF cable loss (dB)	Attenuation (dB)	offset(dB)
High Band (Above 1 GHz)	4.25	10	14.25

2.5 Final Amplifier Voltage and Current Information:

5G NR BAND n48		
CP-OFDM_SCS 30 kHz		
Test mode	AC voltage (V)	AC current (mA)
Bandwidth:10MHz Mod:256QAM	120	36
Bandwidth:20MHz Mod:256QAM	120	34
Bandwidth:30MHz Mod:256QAM	120	35
Bandwidth:40MHz Mod:256QAM	120	33

MIMO

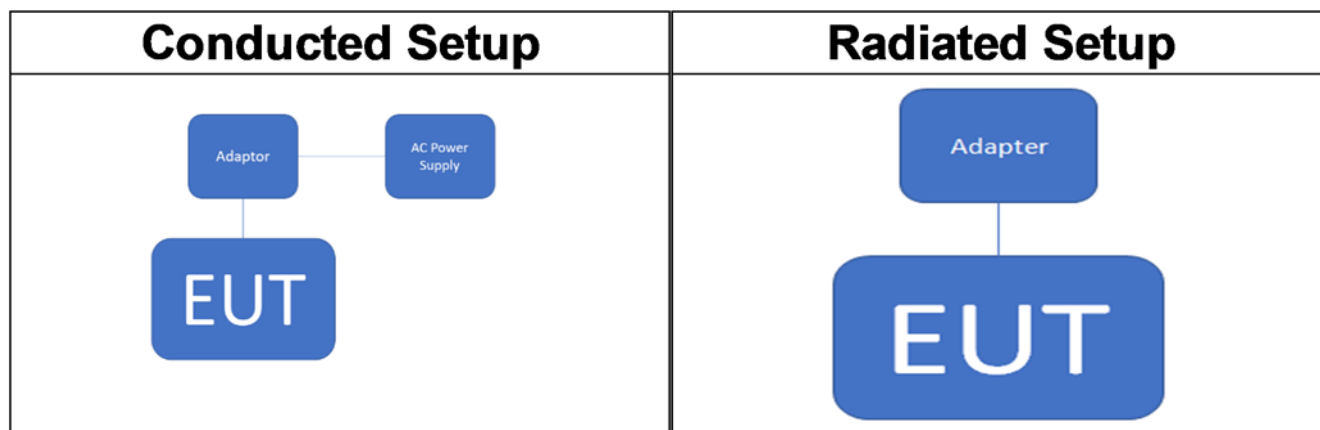
5G NR BAND n48		
CP-OFDM_SCS 30 kHz		
Test mode	AC voltage (V)	AC current (mA)
Bandwidth:10MHz Mod:256QAM	120	33
Bandwidth:20MHz Mod:256QAM	120	32
Bandwidth:30MHz Mod:256QAM	120	34
Bandwidth:40MHz Mod:256QAM	120	33

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2.6 Test Configuration



Note: Radio Communication Analyzer is placed in remote side for radiated test.

2.7 Control Unit(s)

Conducted Emission Test Site: Conducted 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Software	SGS	Radio Test Software	Ver. 21	N.C.R	N.C.R
Switching Adapter	Jiangxi Jian Aohai Technology	A929-120300W-US1	N/A	N/A	N/A
Radiated Emission Test Site: SAC 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
SWITCHING ADAPTER	Jiangxi JianAohai Technology Co.,Ltd	A929-120300W-US1	N/A	N/A	N/A
Test Software	Audix	e3	Ver. 9.210322	N.C.R	N.C.R

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a) §96.41(b)	Maximum Power Output	Compliant
§2.1046, §96.41(b)	Maximum Power Density	Compliant
§2.1053, §96.41(e)	FIELD STRENGTH OF SPURIOUS RADIATION	Compliant
§2.1051 §96.41(e)	OUT OF BAND EMISSION AT AN-TENNA	Compliant
§2.1049,(h)	OCCUPIED BANDWIDTH	Compliant
§2.1055(a)	Frequency Stability	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Pre-Scan has been conducted to determine the worst-case scenario from all possible combinations among available modulations, data rates and antenna ports, the worst case configurations listed below for the final test.
3. The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.

4.2 Measurement Configuration

LTE Band 48 MODE

Test Items	Band	Test Channel			Bandwidth (MHz)										Modulation DFT-s-OFDM					Modulation CP-OFDM				RB #					
		L	M	H	5	10	15	20	30	40	60	80	100	BPSK	QPSK	16 QAM	64 QAM	256 QAM	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full	
Conducted Power	48 (part96)	v	v	v		v		v	v	v			v	v	v	v	v	v	v	v	v	v			v	v	v	v	
Frequency Stability			v								v								v									v	
Occupied Bandwidth		v	v	v		v		v	v	v				v	v	v	v	v										v	
Mask		v	v	v										v					v				v	v				v	
Conducted Emission		v	v	v		v		v	v	v				v											v				
CCDF		v	v	v		v		v	v	v								v										v	
Radiated Emission		v	v	v						v				v											v				

MIMO

Test Items	Band	Test Channel			Bandwidth (MHz)										Modulation CP-OFDM				RB #					
		L	M	H	5	10	15	20	30	40	60	80	100	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full	
Conducted Power	48 (part96)	v	v	v		v		v	v	v				v	v	v	v			v	v	v	v	
Frequency Stability			v							v				v									v	
Occupied Bandwidth		v	v	v		v		v	v	v													v	
Mask		v	v	v										v				v	v				v	
Conducted Emission		v	v	v		v		v	v	v										v				
CCDF		v	v	v		v		v	v	v													v	
Radiated Emission		v	v	v						v				v						v				

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
Output Power measurement	+/- 1 dB
ERP/ EIRP measurement	+/- 3 dB
	+/- 3 dB
Emission Bandwidth	+/- 1.53 Hz
Undesignable radiated emission measurement	+/- 1.68 dB
Peak to Average Ratio	+/- 1 dB
Frequency Stability vs. Temperature	+/- 1.53 Hz
Frequency Stability vs. Voltage	+/- 1.53 Hz
Temperature	+/- 0.4 °C
Humidity	+/- 3.5 %
DC / AC Power Source	+/- 1 %

Radiated Spurious Emission Measurement Uncertainty			
Polarization: Vertical	+/- 2.57 dB	9kHz~30MHz	
	+/- 4.85 dB	30MHz - 1000MHz	
	+/- 4.45 dB	1GHz - 18GHz	
	+/- 4.24 dB	18GHz - 40GHz	
Polarization: Horizontal	+/- 2.57 dB	9kHz~30MHz	
	+/- 4.37 dB	30MHz - 1000MHz	
	+/- 4.45 dB	1GHz - 18GHz	
	+/- 4.24 dB	18GHz - 40GHz	

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

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6 MEASUREMENT EQUIPMENT USED

6.1 Conducted Measurement

Conducted Emission Test Site: Conducted 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/27/2021	04/26/2022
EXA Spectrum Analyzer	Agilent	N9010A	MY53400256	11/12/2021	11/11/2022
Radio Communication Analyzer	KEYSIGHT	E7515B	MY60191250	01/14/2022	01/13/2023
AC Power Source	Gwinstek	APS-7050E	GEV171679	09/28/2021	09/27/2022
Attenuator	Mini-Circuit	BW-S10W2+	4	12/14/2021	12/13/2022
DC Block	Mini-Circuits	BLK-18-S+	1	12/14/2021	12/13/2022
Power Divider	RF-LAMBDA	RFLT2W1G18G	11-JSPF412-017	12/14/2021	12/13/2022

6.2 Radiated Measurement

Radiated Emission Test Site: SAC 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWARZBECK	VULB9168	300	10/19/2021	10/18/2022
Horn Antenna	SCHWARZBECK	BBHA9120D	D803	12/20/2021	12/19/2022
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	01/03/2022	01/02/2023
Horn Antenna	SCHWARZBECK	BBHA9120D	603	05/18/2021	05/17/2022
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/16/2021	12/15/2022
Horn Antenna	SCHWARZBECK	BBHA9170	185	08/06/2021	08/05/2022
Site Cal	SGS	SAC I chamber	N/A	01/01/2022	12/31/2022
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY59071541	07/14/2021	07/13/2022
Signal Generator	R&S	SMBV100A	263084	01/11/2022	01/10/2023
Radio Communication Analyzer	KEYSIGHT	E7515B	MY60191250	01/14/2022	01/13/2023
Pre-Amplifier	EMC Instruments	EMC184045B	980135	10/27/2021	10/26/2022
Pre-Amplifier	HP	8449B	3008A01973	12/16/2021	12/15/2022
Pre-Amplifier	HP	8447D	2944A09469	12/16/2021	12/15/2022
Bandreject Filter 3300-3800	Micro-Tronics	WI	1	12/14/2021	12/13/2022
4GHz High Pass Filter	WI	WHKX4.0/18G-10SS	22	12/14/2021	12/13/2022
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	EMC 104-SM-SM-2000	160123	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	SUCOFLEX 104	160125	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	SUCOFLEX 106	76096/6	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2630/2	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY22962/2	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	SUCOFLEX 102	SN 520430/2	12/16/2021	12/15/2022

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7 MAXIMUM OUTPUT POWER MEASUREMENT

7.1 Standard Applicable

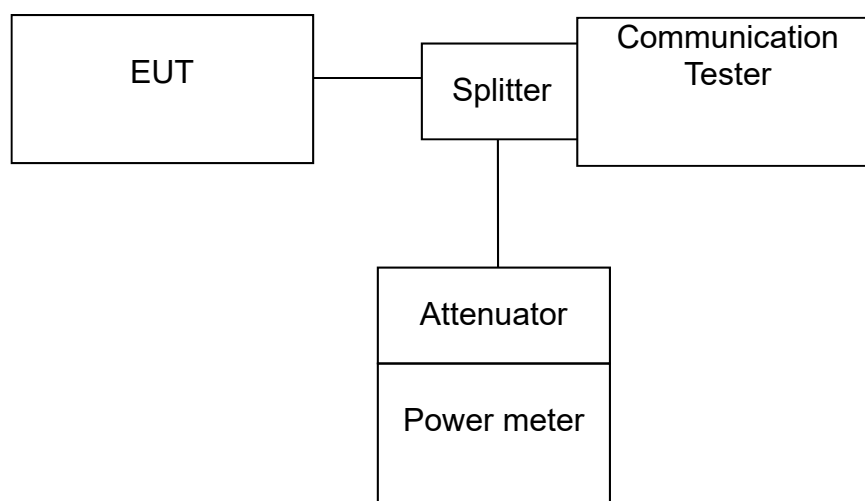
FCC §2.1046 & 96.41

- (a) FCC 96.41(a) Digital modulation. Systems operating in the Citizens Broadband Radio Service must use digital modulation techniques.
- (b) FCC 96.41(b) Power limits. Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) of any CBSD and End User Device must comply with the limits shown in the table in this paragraph (b):

Device	Maximum EIRP (dBm/10 MHz)
End User Device	23
Category A CBSD	30
Category B CBSD ¹	47

Category B CBSDs will only be authorized for use after an ESC is approved and commercially deployed consistent with §§96.15 and 96.67.

7.2 Test Set-up



Note: Measurement setup for testing on Antenna connector

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7.3 Measurement Procedure

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading.

Determining ERP and/or EIRP from conducted RF output power measurements

$$\text{ERP/EIRP} = \text{PMeas} + \text{GT-LC}$$

Where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);

PMeas = measured transmitter output power or PSD, in dBm or dBW;

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

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7.4 Measurement Result:

5G NR Band n48_part96: 3550 to 3700 MHz					Conducted Average (dBm)			EIRP (dBm)		
Antenna Gain(dBi)			-1.868		Channel (ARFCH)/ Frequency(MHz)			Channel (ARFCH)/ Frequency(MHz)		
EIRP Limit (dBm)			23dBm/10MHz		Low	Mid	High	Low	Mid	High
BW (MHz)	SCS (kHz)	Modulation	RB Allocation	RB Offset	637000	641666	646332	637000	641666	646332
					3555	3624.99	3694.98	3555	3624.99	3694.98
10	30	DFT-s PI/2 BPSK	1	1	22.93	22.92	23.02	21.06	21.05	21.15
			1	22	22.82	22.81	23.01	20.95	20.94	21.14
			12	6	22.83	22.87	23.00	20.96	21.00	21.13
			24	0	22.37	22.38	22.52	20.50	20.51	20.65
		DFT-s QPSK	1	1	22.89	22.85	23.04	21.02	20.98	21.17
			1	22	22.80	22.80	22.95	20.93	20.93	21.08
			12	6	22.85	22.82	22.99	20.98	20.95	21.12
			24	0	21.87	21.85	22.02	20.00	19.98	20.15
		DFT-s 16QAM	1	1	21.91	22.14	22.24	20.04	20.27	20.37
		DFT-s 64QAM	1	1	20.52	20.89	20.95	18.65	19.02	19.08
		DFT-s 256QAM	1	1	18.23	18.37	18.34	16.36	16.50	16.47
		CP QPSK	1	1	21.33	21.45	21.55	19.46	19.58	19.68
		CP 16QAM	1	1	20.79	21.35	21.49	18.92	19.48	19.62
		CP 64QAM	1	1	19.57	19.68	19.78	17.70	17.81	17.91
		CP 256QAM	1	1	16.64	16.67	16.75	14.77	14.80	14.88

5G NR Band n48_part96: 3550 to 3700 MHz					Conducted Average (dBm)			EIRP (dBm)		
Antenna Gain(dBi)			-1.868		Channel (ARFCH)/ Frequency(MHz)			Channel (ARFCH)/ Frequency(MHz)		
EIRP Limit (dBm)			23dBm/10MHz		Low	Mid	High	Low	Mid	High
BW (MHz)	SCS (kHz)	Modulation	RB Allocation	RB Offset	637334	641666	646000	637334	641666	646000
					3560.01	3624.99	3690	3560.01	3624.99	3690
20	30	DFT-s PI/2 BPSK	1	1	23.14	23.18	23.19	21.27	21.31	21.32
			1	49	23.05	22.93	23.01	21.18	21.06	21.14
			25	12	23.10	23.03	23.09	21.23	21.16	21.22
			50	0	22.72	22.55	22.62	20.85	20.68	20.75
		DFT-s QPSK	1	1	23.13	23.13	23.17	21.26	21.26	21.30
			1	49	23.07	22.92	23.01	21.20	21.05	21.14
			25	12	23.13	23.02	23.04	21.26	21.15	21.17
			50	0	22.19	22.00	22.06	20.32	20.13	20.19
		DFT-s 16QAM	1	1	22.38	22.27	22.17	20.51	20.40	20.30
		DFT-s 64QAM	1	1	21.10	21.02	20.92	19.23	19.15	19.05
		DFT-s 256QAM	1	1	18.47	18.57	18.53	16.60	16.70	16.66
		CP QPSK	1	1	21.53	21.69	21.55	19.66	19.82	19.68
		CP 16QAM	1	1	20.95	20.95	20.80	19.08	19.08	18.93
		CP 64QAM	1	1	19.99	19.97	19.86	18.12	18.10	17.99
		CP 256QAM	1	1	16.96	17.11	16.87	15.09	15.24	15.00

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5G NR Band n48_part96: 3550 to 3700 MHz					Conducted Average (dBm)			EIRP (dBm)		
Antenna Gain(dBi)			-1.868		Channel (ARFCH)/ Frequency(MHz)			Channel (ARFCH)/ Frequency(MHz)		
EIRP Limit (dBm)			23dBm/10MHz		Low	Mid	High	Low	Mid	High
BW (MHz)	SCS (kHz)	Modulation	RB Allocation	RB Offset	637668	641666	645666	637668	641666	645666
					3565.02	3624.99	3684.99	3565.02	3624.99	3684.99
30	30	DFT-s PI/2 BPSK	1	1	23.30	23.27	23.17	21.43	21.40	21.30
			1	76	23.22	23.03	23.04	21.35	21.16	21.17
			36	18	23.02	23.17	23.12	21.15	21.30	21.25
			75	0	22.57	22.64	22.87	20.70	20.77	21.00
		DFT-s QPSK	1	1	23.10	23.20	23.12	21.23	21.33	21.25
			1	76	23.09	22.95	23.11	21.22	21.08	21.24
			36	18	23.22	23.13	23.14	21.35	21.26	21.27
			75	0	22.21	22.15	22.16	20.34	20.28	20.29
		DFT-s 16QAM	1	1	22.39	22.51	22.29	20.52	20.64	20.42
		DFT-s 64QAM	1	1	21.13	21.19	21.04	19.26	19.32	19.17
		DFT-s 256QAM	1	1	18.54	18.59	18.50	16.67	16.72	16.63
		CP QPSK	1	1	21.59	21.77	21.61	19.72	19.90	19.74
		CP 16QAM	1	1	21.06	21.20	21.10	19.19	19.33	19.23
		CP 64QAM	1	1	19.72	19.85	19.71	17.85	17.98	17.84
		CP 256QAM	1	1	17.06	17.14	17.06	15.19	15.27	15.19
5G NR Band n48_part96: 3550 to 3700 MHz					Conducted Average (dBm)			EIRP (dBm)		
Antenna Gain(dBi)			-1.868		Channel (ARFCH)/ Frequency(MHz)			Channel (ARFCH)/ Frequency(MHz)		
EIRP Limit (dBm)			23dBm/10MHz		Low	Mid	High	Low	Mid	High
BW (MHz)	SCS (kHz)	Modulation	RB Allocation	RB Offset	638000	641666	645332	638000	641666	645332
					3570	3624.99	3679.98	3570	3624.99	3679.98
40	30	DFT-s PI/2 BPSK	1	1	23.30	23.29	23.32	21.43	21.42	21.45
			1	104	23.05	23.12	23.30	21.18	21.25	21.43
			50	25	23.06	23.15	23.13	21.19	21.28	21.26
			100	0	22.59	22.62	22.65	20.72	20.75	20.78
		DFT-s QPSK	1	1	23.27	23.22	23.29	21.40	21.35	21.42
			1	104	22.98	23.12	23.30	21.11	21.25	21.43
			50	25	23.05	23.10	23.14	21.18	21.23	21.27
			100	0	22.07	22.10	22.17	20.20	20.23	20.30
		DFT-s 16QAM	1	1	22.36	22.49	22.31	20.49	20.62	20.44
		DFT-s 64QAM	1	1	20.72	20.98	20.72	18.85	19.11	18.85
		DFT-s 256QAM	1	1	18.54	18.74	18.57	16.67	16.87	16.70
		CP QPSK	1	1	21.58	21.63	21.87	19.71	19.76	20.00
		CP 16QAM	1	1	20.93	21.02	21.25	19.06	19.15	19.38
		CP 64QAM	1	1	19.98	19.74	19.90	18.11	17.87	18.03
		CP 256QAM	1	1	16.99	17.09	16.85	15.12	15.22	14.98

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MIMO

5G NR Band n48_part96: 3550 to 3700 MHz					Conducted Average (dBm)			EIRP (dBm)		
Antenna Gain(dBi)		1.677			Channel (ARFCH)/ Frequency(MHz)			Channel (ARFCH)/ Frequency(MHz)		
EIRP Limit (dBm)		23dBm/10MHz			Low	Mid	High	Low	Mid	High
BW (MHz)	SCS (kHz)	Modulation	RB Allocation	RB Offset	637000	641666	646332	637000	641666	646332
					3555	3624.99	3694.98	3555	3624.99	3694.98
10	30	CP QPSK	1	1	21.29	21.24	21.24	22.97	22.91	22.91
			1	22	21.23	21.12	21.06	22.91	22.79	22.73
			12	6	21.26	21.04	21.13	22.94	22.71	22.81
			24	0	19.83	19.49	19.63	21.51	21.16	21.30
		CP 16QAM	1	1	20.90	21.19	20.78	22.57	22.87	22.45
		CP 64QAM	1	1	18.93	18.96	19.16	20.61	20.64	20.83
		CP 256QAM	1	1	16.47	16.31	16.24	18.14	17.99	17.91

5G NR Band n48_part96: 3550 to 3700 MHz					Conducted Average (dBm)			EIRP (dBm)		
Antenna Gain(dBi)		1.677			Channel (ARFCH)/ Frequency(MHz)			Channel (ARFCH)/ Frequency(MHz)		
EIRP Limit (dBm)		23dBm/10MHz			Low	Mid	High	Low	Mid	High
BW (MHz)	SCS (kHz)	Modulation	RB Allocation	RB Offset	637334	641666	646000	637334	641666	646000
					3560.01	3624.99	3690	3560.01	3624.99	3690
20	30	CP QPSK	1	1	21.28	21.24	21.27	22.95	22.92	22.95
			1	49	21.25	21.12	21.14	22.93	22.80	22.81
			25	12	21.27	21.17	21.19	22.94	22.84	22.87
			51	0	19.93	19.65	19.70	21.61	21.33	21.37
		CP 16QAM	1	1	21.06	20.78	20.90	22.74	22.46	22.58
		CP 64QAM	1	1	19.33	19.10	19.25	21.00	20.78	20.93
		CP 256QAM	1	1	16.61	16.39	16.43	18.29	18.07	18.10

5G NR Band n48_part96: 3550 to 3700 MHz					Conducted Average (dBm)			EIRP (dBm)		
Antenna Gain(dBi)		1.677			Channel (ARFCH)/ Frequency(MHz)			Channel (ARFCH)/ Frequency(MHz)		
EIRP Limit (dBm)		23dBm/10MHz			Low	Mid	High	Low	Mid	High
BW (MHz)	SCS (kHz)	Modulation	RB Allocation	RB Offset	637668	641666	645666	637668	641666	645666
					3565.02	3624.99	3684.99	3565.02	3624.99	3684.99
30	30	CP QPSK	1	1	21.29	21.29	21.28	22.96	22.97	22.96
			1	76	21.25	21.13	21.24	22.92	22.81	22.92
			39	19	21.25	21.15	21.18	22.92	22.83	22.86
			78	0	19.98	19.74	19.76	21.65	21.41	21.44
		CP 16QAM	1	1	21.01	20.92	20.80	22.69	22.59	22.48
		CP 64QAM	1	1	19.39	19.03	18.92	21.07	20.70	20.60
		CP 256QAM	1	1	16.67	16.71	16.50	18.35	18.39	18.17

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5G NR Band n48_part96: 3550 to 3700 MHz					Conducted Average (dBm)			EIRP (dBm)		
Antenna Gain(dBi)		1.677			Channel (ARFCH)/ Frequency(MHz)			Channel (ARFCH)/ Frequency(MHz)		
EIRP Limit (dBm)		23dBm/10MHz			Low	Mid	High	Low	Mid	High
BW (MHz)	SCS (kHz)	Modulation	RB Allocation	RB Offset	638000	641666	645332	638000	641666	645332
					3570	3624.99	3679.98	3570	3624.99	3679.98
40	30	CP QPSK	1	1	21.32	21.24	21.30	22.99	22.92	22.98
			1	104	21.21	21.09	21.04	22.88	22.77	22.72
			53	26	21.25	21.17	21.17	22.92	22.84	22.84
			106	0	20.04	19.78	19.83	21.72	21.46	21.51
		CP 16QAM	1	1	21.00	21.00	20.84	22.67	22.68	22.51
		CP 64QAM	1	1	19.36	19.37	19.18	21.04	21.05	20.86
		CP 256QAM	1	1	16.74	16.68	16.51	18.41	18.36	18.19

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8 MAXIMUM POWER DENSITY MEASUREMENT

8.1 Standard Applicable

FCC §2.1046 & 96.41

- (a) FCC 96.41(a) Digital modulation. Systems operating in the Citizens Broadband Radio Service must use digital modulation techniques.
- (b) FCC 96.41(b) Power limits. Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) of any CBSD and End User Device must comply with the limits shown in the table in this paragraph (b):

Device	Maximum PSD (dBm/MHz)
End User Device	n/a
Category A CBSD	20
Category B CBSD ¹	37

Category B CBSDs will only be authorized for use after an ESC is approved and commercially deployed consistent with §§96.15 and 96.67.

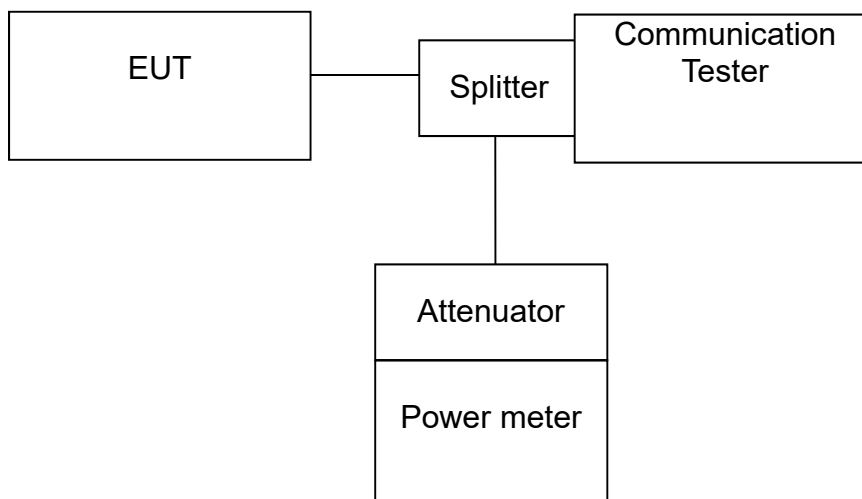
- (c) Power management. CBSDs and End User Devices shall limit their operating power to the minimum necessary for successful operations
- (1) CBSDs must support transmit power control capability and the capability to limit their maximum EIRP and the maximum EIRP of associated End User Devices in response to instructions from an SAS.
- (2) End User Devices shall include transmit power control capability and the capability to limit their maximum EIRP in response to instructions from their associated CBSDs.

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8.2 Test Set-up



Note: Measurement setup for testing on Antenna connector

8.3 Measurement Procedure

1. Set instrument center frequency to OBW center frequency.
2. Set span to at least 1.5 times the OBW.
3. Set the RBW to the specified reference bandwidth (often 1 MHz).
4. Set VBW $\geq 3 \times$ RBW.
5. Detector = RMS (power averaging).
6. Ensure that the number of measurement points in the sweep $\geq 2 \times$ span/RBW.
7. Sweep time = auto couple.
8. Employ trace averaging (RMS) mode over a minimum of 100 traces.
9. Use the peak marker function to determine the maximum amplitude level within the reference bandwidth (PSD).
10. Determine the EIRP by adding the effective antenna gain to the adjusted power level.

8.4 Measurement Result

Peak Power Density Results:

N/A, this is an End user device.

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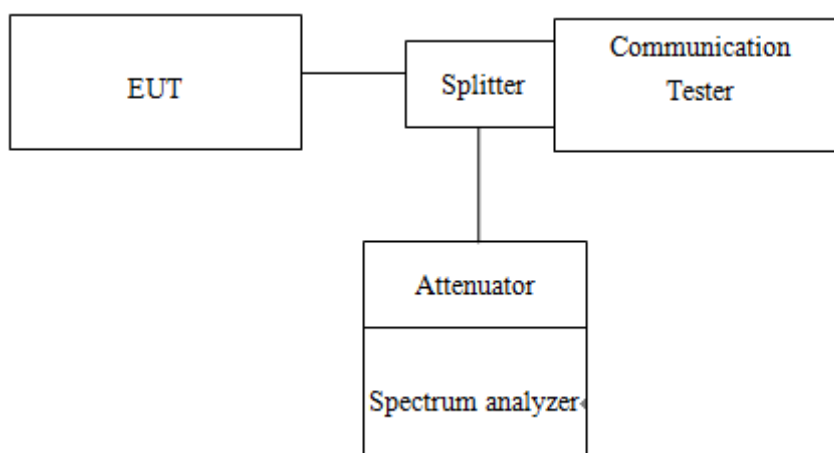
9 OCCUPIED BANDWIDTH MEASUREMENT

9.1 Standard Applicable

FCC Part 2.1049(h)

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power.

9.2 Test Set-up



9.3 Measurement Procedure

99% & 26dB Bandwidth with detector peak

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -26dBc display line was placed on the screen (or 26dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 RBW, with span > 2 * Signal BW, set % Power = 99%.

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9.4 Measurement Result

5G NR BAND n48_Part96 Channel bandwidth: 10MHz(3550 to 3700 MHz)											
DFT-S-OFDM_SCS 30 kHz											
Freq. (MHz)	CH	99% BW (MHz)					26 dB BW (MHz)				
		BPSK	QPSK	16QAM	64QAM	256QAM	BPSK	QPSK	16QAM	64QAM	256QAM
3555	637000	8.6128	8.6176	8.6233	8.5840	8.5963	9.8320	9.8680	9.7920	9.6130	9.6250
3624.99	641666	8.5655	8.5637	8.6153	8.5672	8.5392	9.5630	9.7850	9.5610	9.4760	9.4340
3694.98	646332	8.5709	8.5261	8.6212	8.5589	8.5007	9.4330	9.6300	9.6740	9.3350	9.5010
5G NR BAND n48_Part96 Channel bandwidth: 20MHz(3550 to 3700 MHz)											
DFT-S-OFDM_SCS 30 kHz											
Freq. (MHz)	CH	99% BW (MHz)					26 dB BW (MHz)				
		BPSK	QPSK	16QAM	64QAM	256QAM	BPSK	QPSK	16QAM	64QAM	256QAM
3560.0	637334	17.8090	17.8500	17.8840	17.8590	17.8420	19.1700	19.1500	19.2900	19.3900	19.2100
3625.0	641666	17.8140	17.8420	17.7350	17.7950	17.7320	19.0200	18.5900	18.7200	18.9800	18.6600
3690.0	646000	17.7960	17.8500	17.8510	17.8450	17.7950	19.1000	18.8500	18.6500	18.7000	18.6600
5G NR BAND n48_Part96 Channel bandwidth: 30MHz(3550 to 3700 MHz)											
DFT-S-OFDM_SCS 30 kHz											
Freq. (MHz)	CH	99% BW (MHz)					26 dB BW (MHz)				
		BPSK	QPSK	16QAM	64QAM	256QAM	BPSK	QPSK	16QAM	64QAM	256QAM
3565.0	637668	26.8230	26.7880	26.8530	26.7930	26.8420	28.6400	28.5900	28.4200	28.6000	28.3200
3625.0	641666	26.5930	26.8250	26.8170	26.8370	26.5490	27.8000	27.9100	27.6100	27.8000	28.0600
3685.0	645666	26.7340	26.7940	26.7760	26.8300	26.6810	28.5100	27.8300	27.8000	27.6500	28.7700
5G NR BAND n48_Part96 Channel bandwidth: 40MHz(3550 to 3700 MHz)											
DFT-S-OFDM_SCS 30 kHz											
Freq. (MHz)	CH	99% BW (MHz)					26 dB BW (MHz)				
		BPSK	QPSK	16QAM	64QAM	256QAM	BPSK	QPSK	16QAM	64QAM	256QAM
3570.0	638000	35.6970	35.7670	35.7280	35.7210	35.7070	37.7500	37.7300	37.7200	37.6800	37.5200
3625.0	641666	35.6470	35.8440	35.7260	35.6360	35.8490	37.3400	37.3400	37.8200	36.9100	37.2100
3680.0	645332	35.6480	35.8010	35.5310	35.5590	35.8120	37.7100	36.8600	37.3100	36.9700	36.9300

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MIMO

5G NR BAND n48_Part96 Channel bandwidth: 10MHz(3550 to 3700 MHz)									
DFT-S-OFDM_SCS 30 kHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3555	637000	8.5808	8.5892	8.5933	8.5728	9.5840	9.8070	9.6730	9.4280
3624.99	641666	8.5851	8.5959	8.5618	8.5445	9.5250	9.3960	9.3480	9.1550
3694.98	646332	8.5907	8.5556	8.6071	8.5294	9.3640	9.7660	9.2520	9.2880

5G NR BAND n48_Part96 Channel bandwidth: 20MHz(3550 to 3700 MHz)									
DFT-S-OFDM_SCS 30 kHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3560.0	637334	18.2350	18.2460	18.2370	18.2470	20.0000	19.6900	20.0100	19.8700
3625.0	641666	18.1430	18.1620	18.2090	18.2920	18.8700	19.7200	19.0800	19.3700
3690.0	646000	18.1930	18.2500	18.3070	18.1090	19.7100	19.1000	19.1000	19.5100

5G NR BAND n48_Part96 Channel bandwidth: 30MHz(3550 to 3700 MHz)									
DFT-S-OFDM_SCS 30 kHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3565.0	637668	27.8210	27.8360	27.8380	27.8600	29.6600	29.7500	29.6100	29.2900
3625.0	641666	27.8650	27.7860	27.7770	27.8370	28.6900	28.8900	28.6700	28.7100
3685.0	645666	27.7100	27.8350	27.8340	27.7460	28.7000	28.9000	28.7800	28.9900

5G NR BAND n48_Part96 Channel bandwidth: 40MHz(3550 to 3700 MHz)									
DFT-S-OFDM_SCS 30 kHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3570.0	638000	37.7550	37.8440	37.8030	37.8350	39.5400	39.9600	39.9200	39.9900
3625.0	641666	37.7410	37.6390	37.8620	37.6610	39.2100	39.1400	39.6000	39.3000
3680.0	645332	37.9020	37.7340	37.6300	37.7610	39.0900	39.1300	39.7000	39.0500

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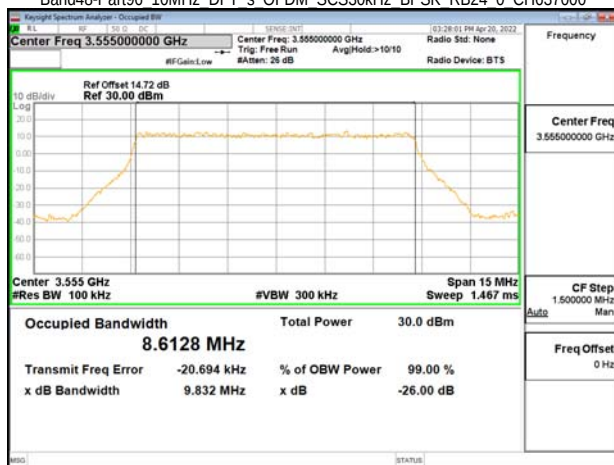
5G NR BAND n48_Part96 Channel bandwidth: 10MHz(3550 to 3700 MHz)									
DFT-S-OFDM_SCS 30 kHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3555	637000	8.5893	8.5994	8.6004	8.5809	9.7450	9.8640	9.6800	9.8060
3624.99	641666	8.6104	8.5195	8.5178	8.4945	9.5620	9.2220	8.8150	9.0730
3694.98	646332	8.5577	8.6106	8.5242	8.5825	9.5110	9.1960	9.1690	8.9510
5G NR BAND n48_Part96 Channel bandwidth: 20MHz(3550 to 3700 MHz)									
DFT-S-OFDM_SCS 30 kHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3560.0	637334	18.2190	18.2230	18.2130	18.1960	19.7600	19.5800	19.7400	19.7800
3625.0	641666	18.1910	18.1690	18.2800	18.2590	18.8200	18.9100	18.9400	19.3300
3690.0	646000	18.1880	18.2170	18.2300	18.1880	19.3800	18.7100	18.8000	18.9800
5G NR BAND n48_Part96 Channel bandwidth: 30MHz(3550 to 3700 MHz)									
DFT-S-OFDM_SCS 30 kHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3565.0	637668	27.8290	27.8230	27.8440	27.7960	29.5800	29.6400	29.5900	29.6900
3625.0	641666	27.6810	27.9090	27.7500	27.8100	28.5100	28.9700	28.6700	28.7200
3685.0	645666	27.8270	27.1970	27.7340	27.8480	29.4700	28.0500	28.9000	28.9900
5G NR BAND n48_Part96 Channel bandwidth: 40MHz(3550 to 3700 MHz)									
DFT-S-OFDM_SCS 30 kHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3570.0	638000	37.8120	37.7700	37.7710	37.8080	39.7300	39.9100	39.9000	39.7900
3625.0	641666	37.8730	37.7840	37.6640	37.8760	39.1500	39.2900	39.1400	39.1900
3680.0	645332	37.9670	37.7990	37.8210	37.7810	39.0600	39.1800	39.4000	39.0000

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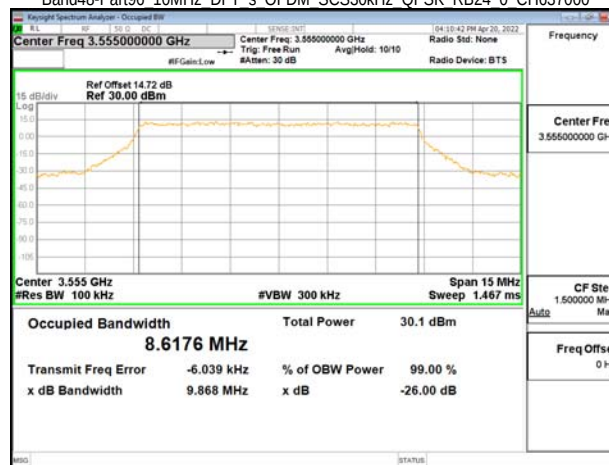
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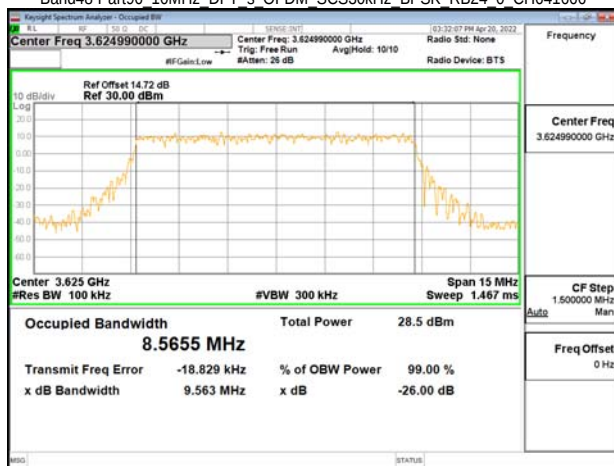
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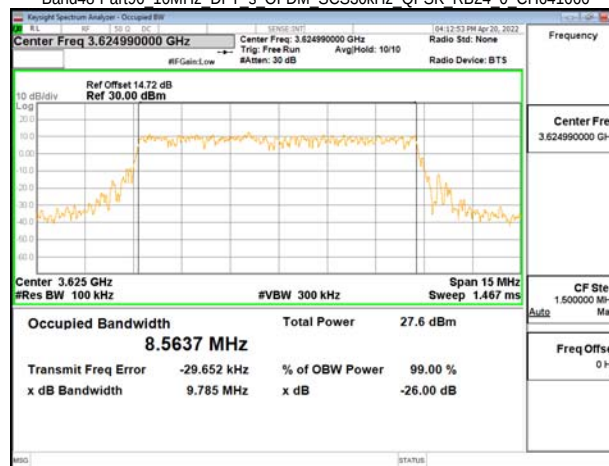
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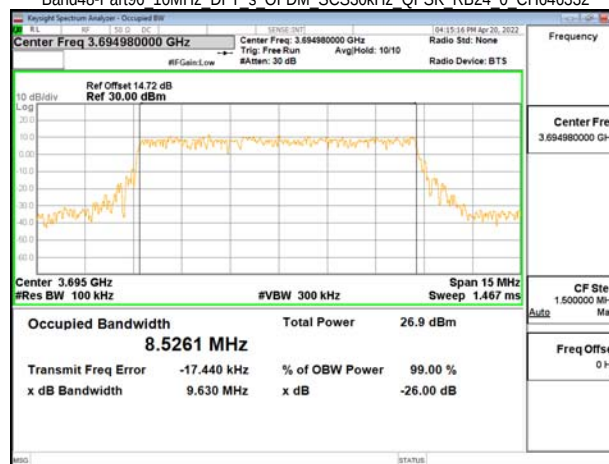
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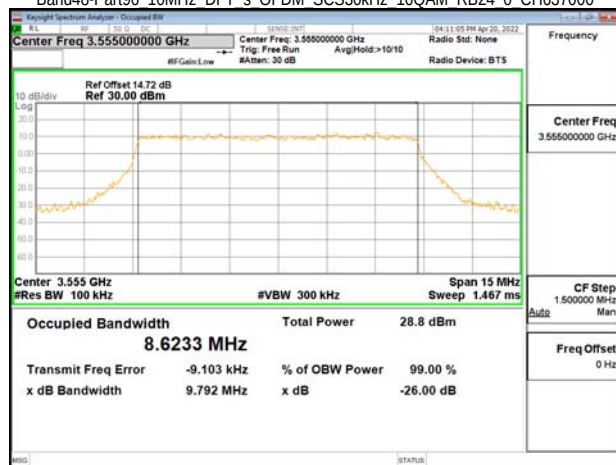


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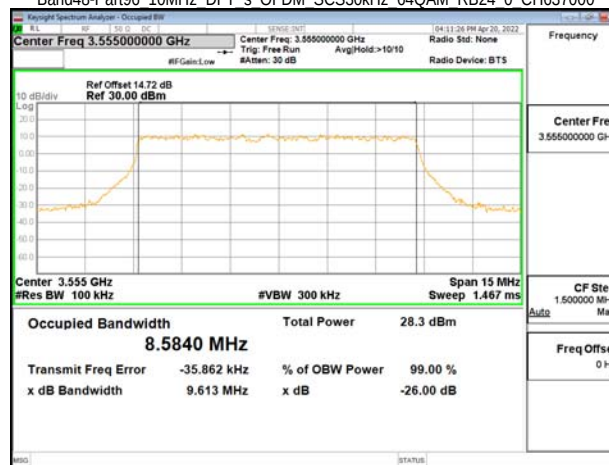
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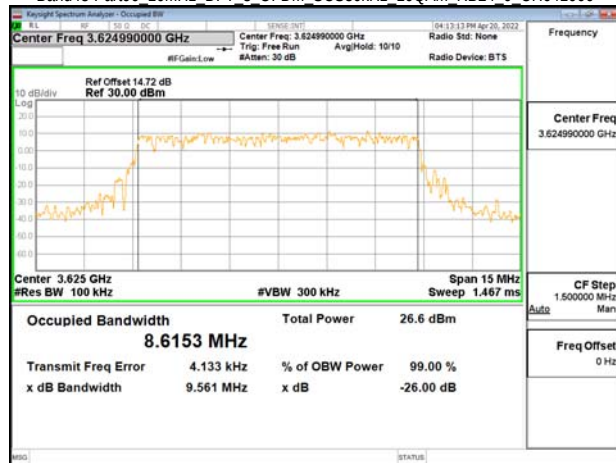
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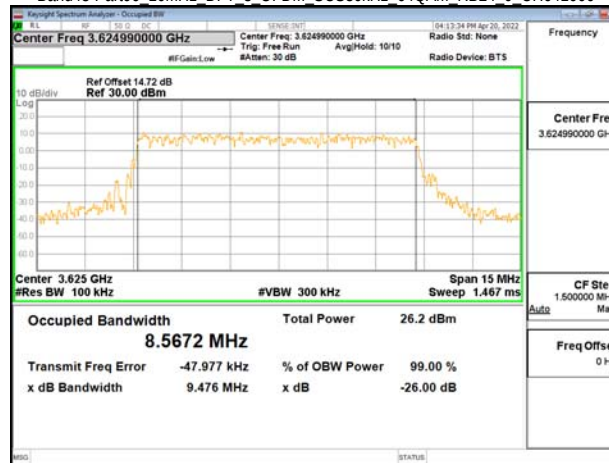
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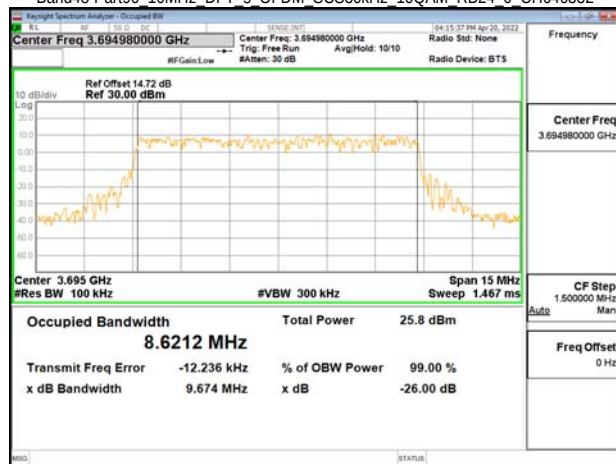
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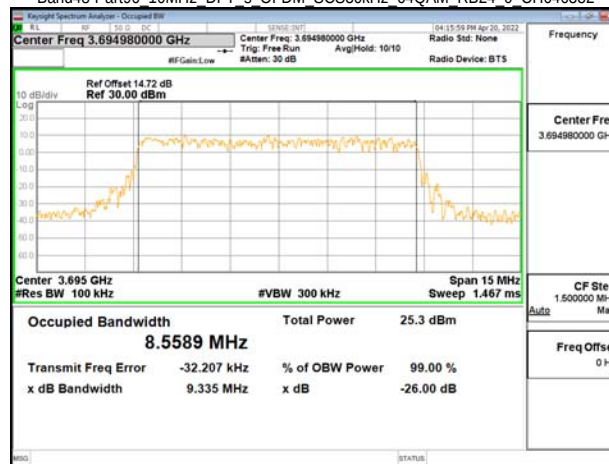
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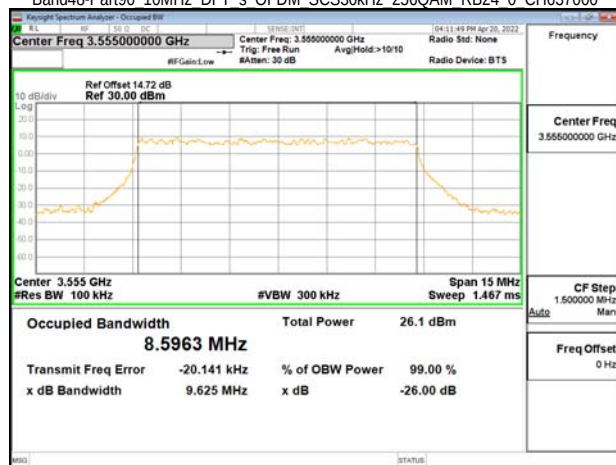


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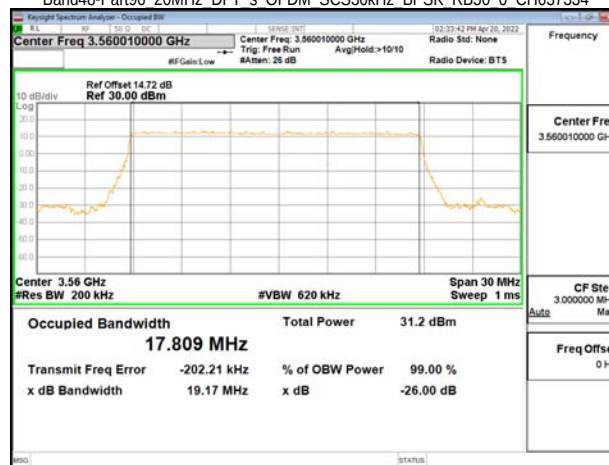
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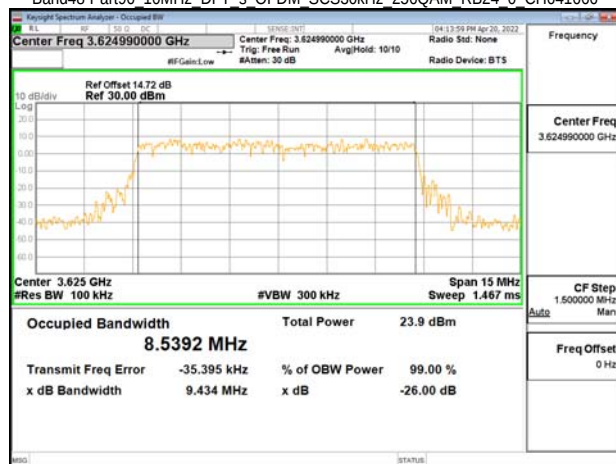
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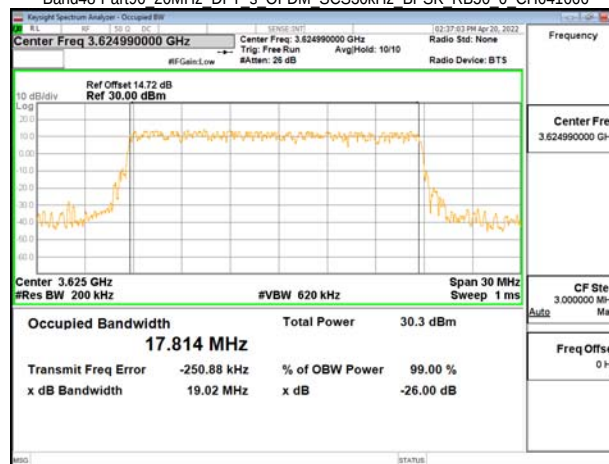
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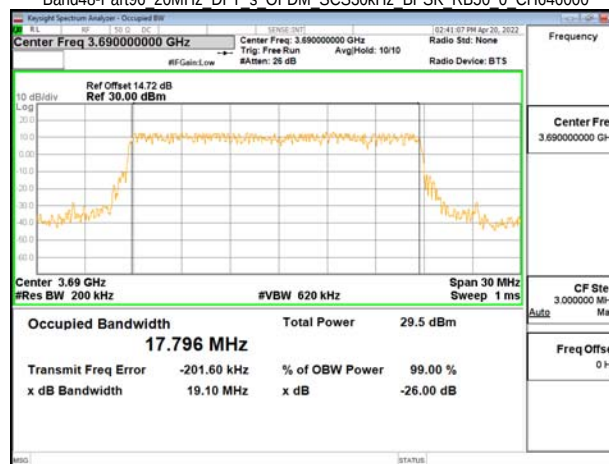
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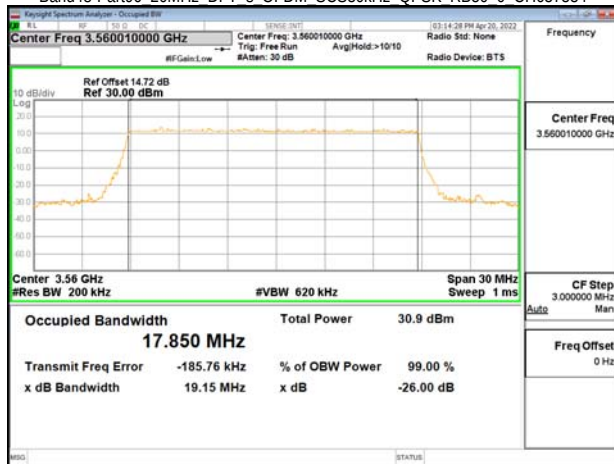


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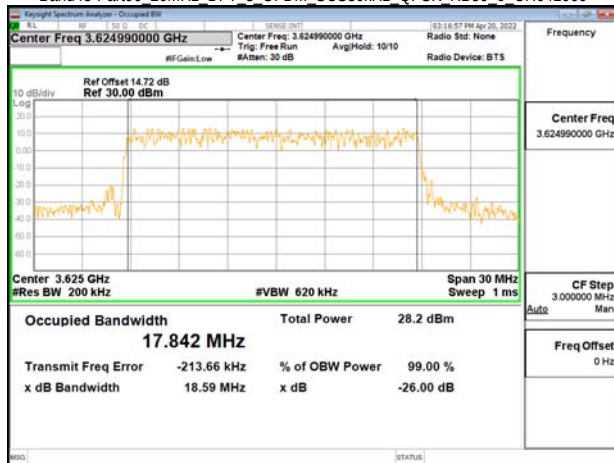
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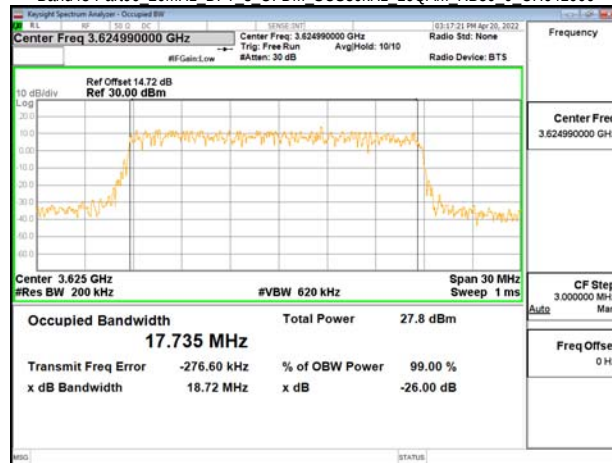
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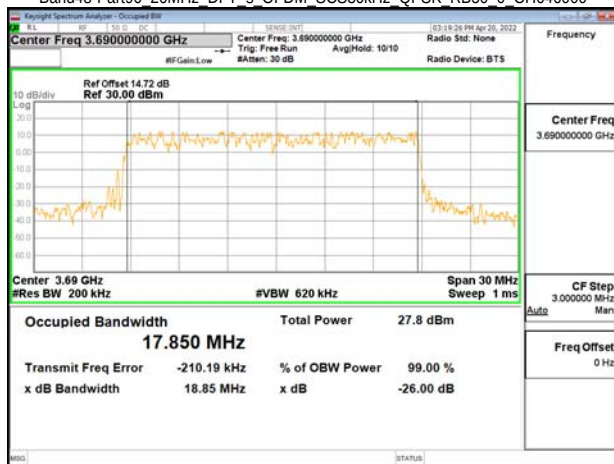
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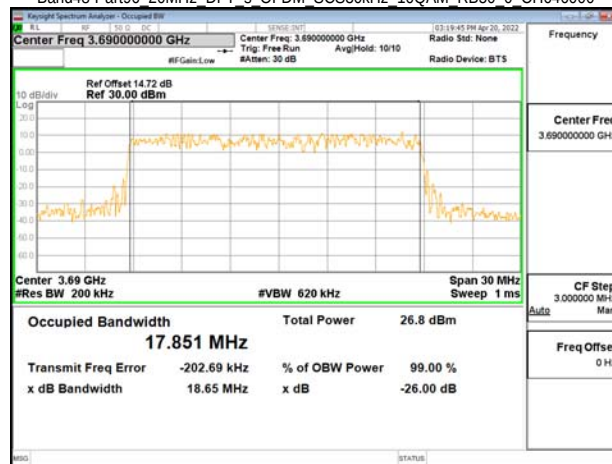
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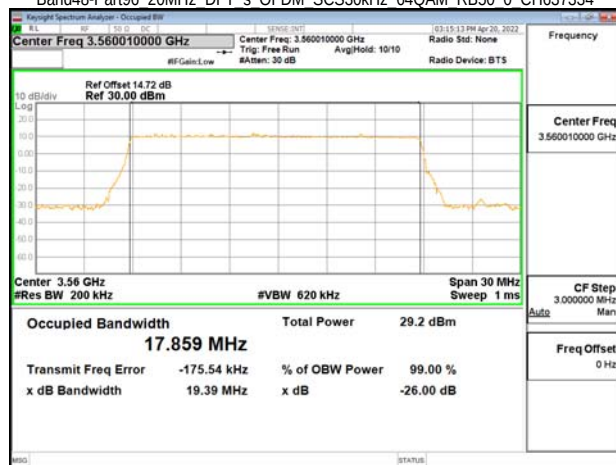


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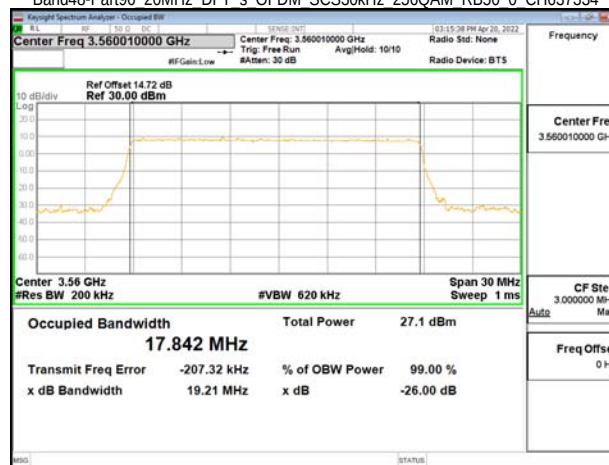
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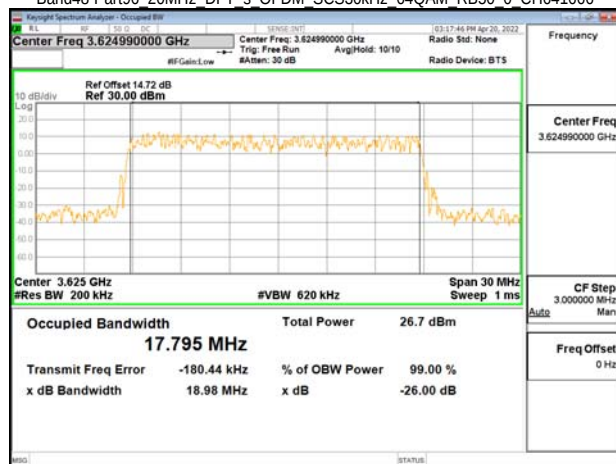
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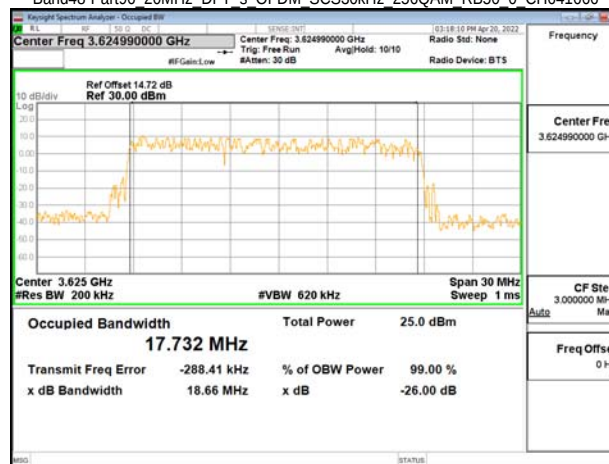
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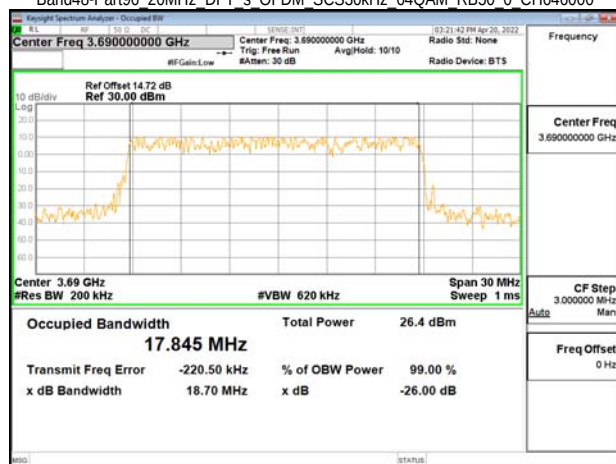
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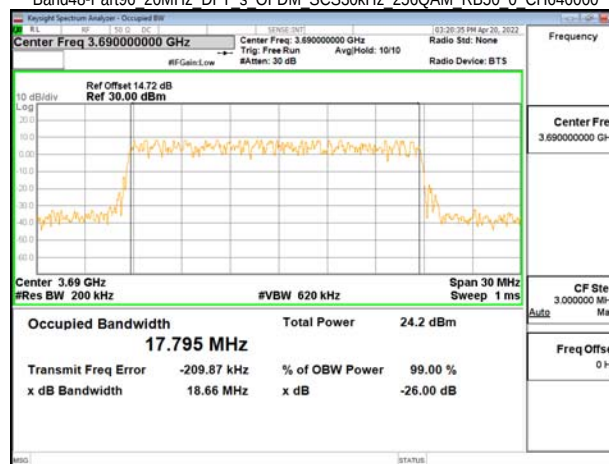
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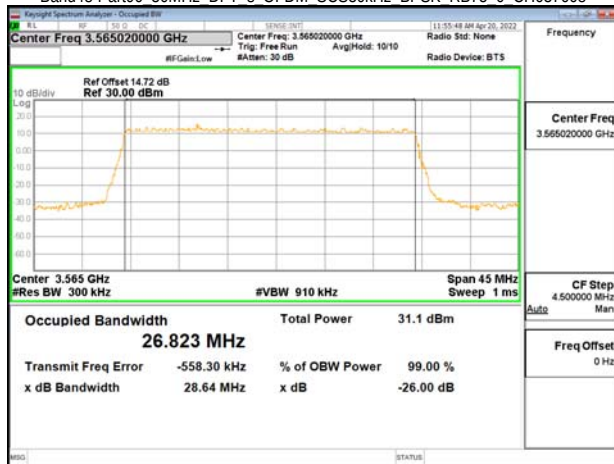


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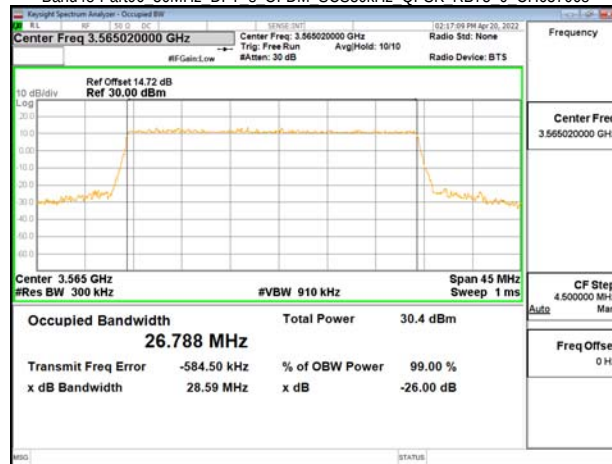
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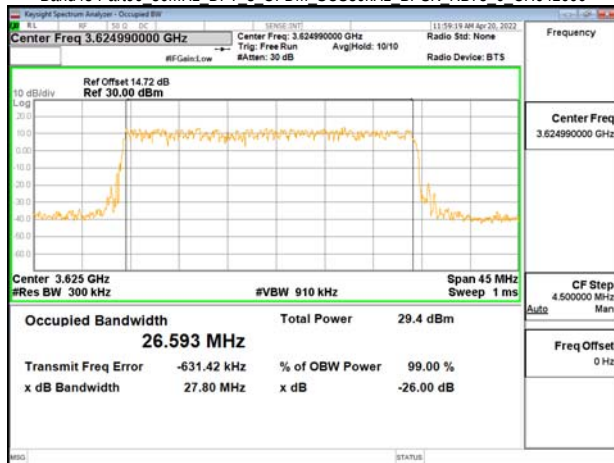
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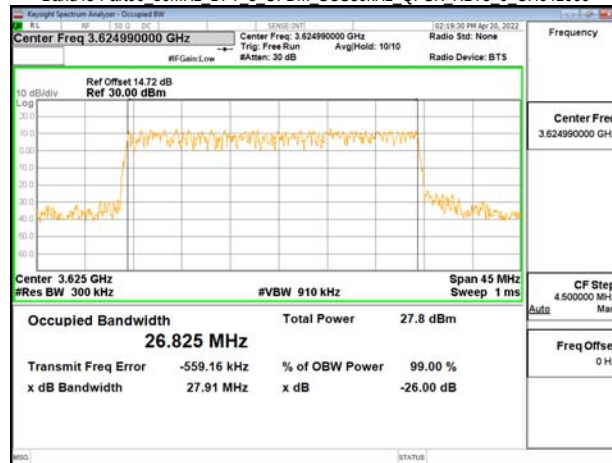
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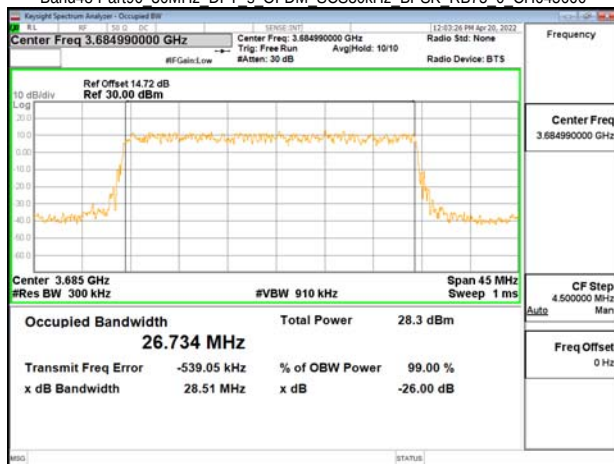
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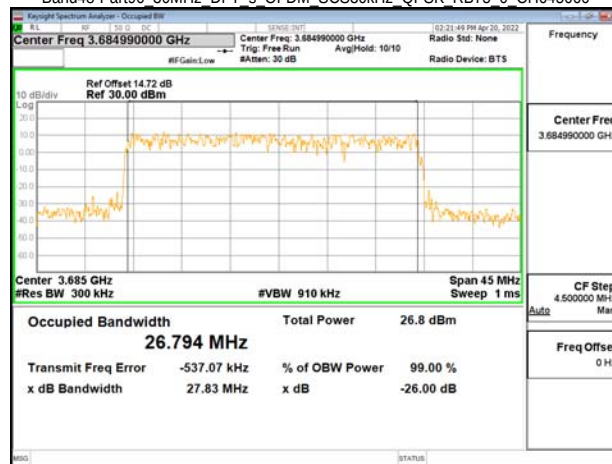
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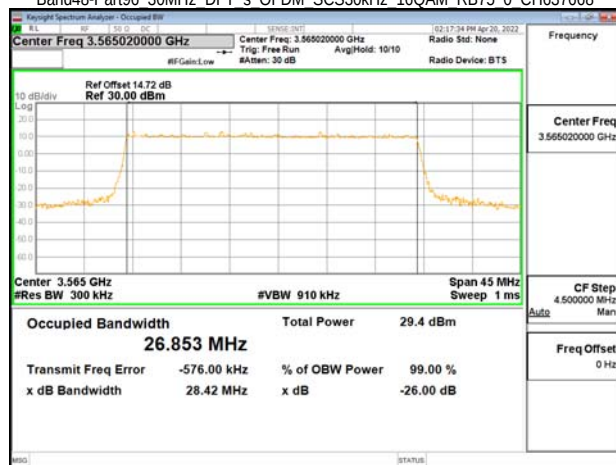


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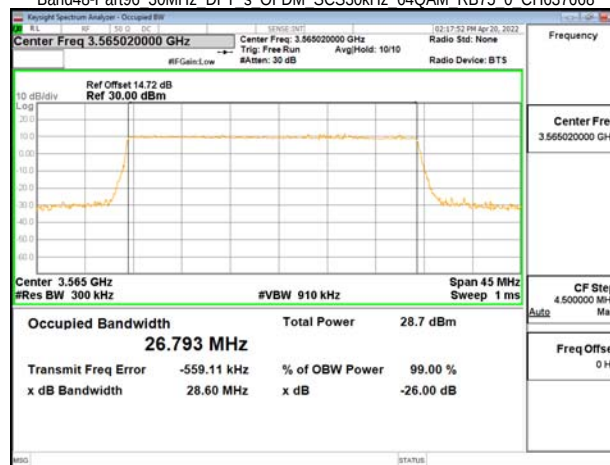
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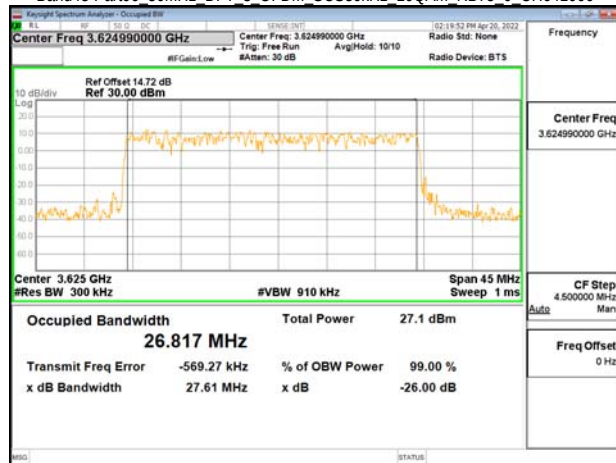
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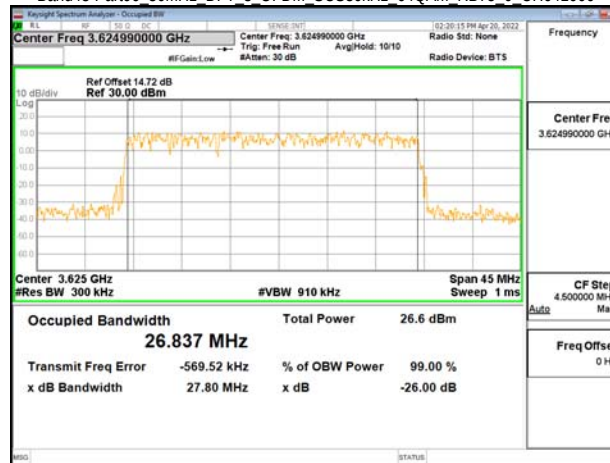
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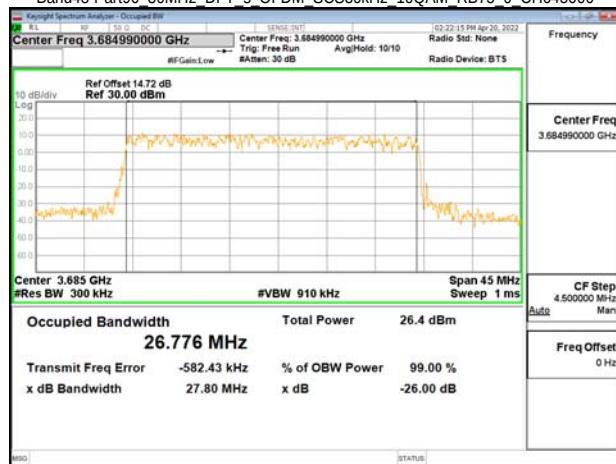
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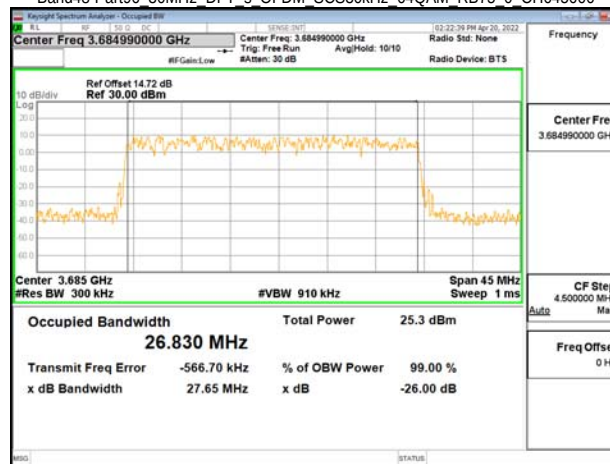
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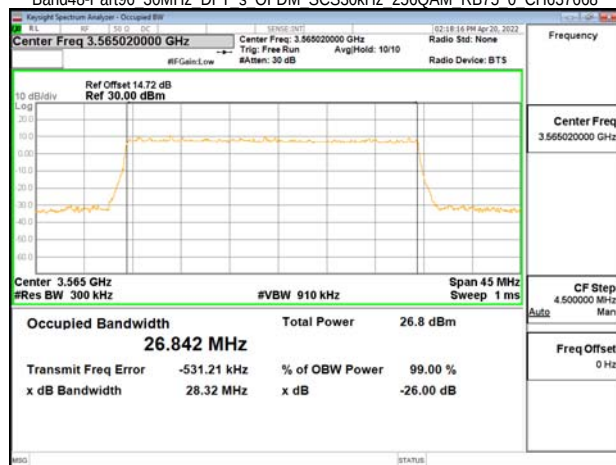


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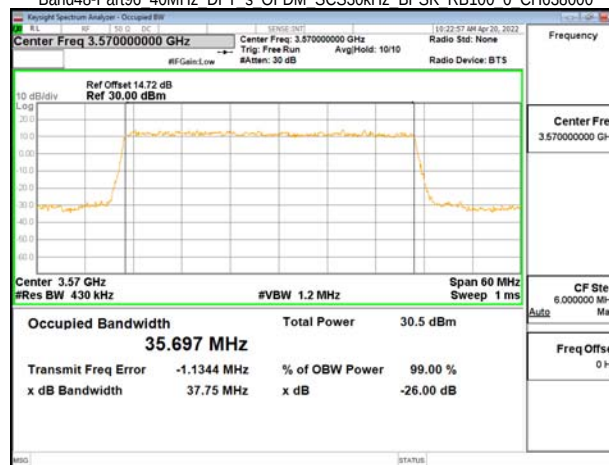
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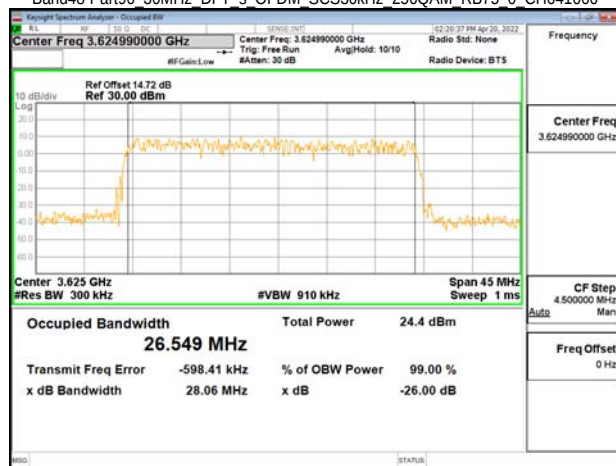
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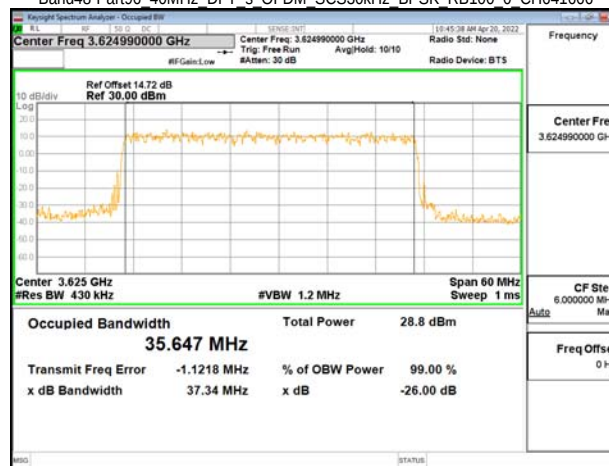
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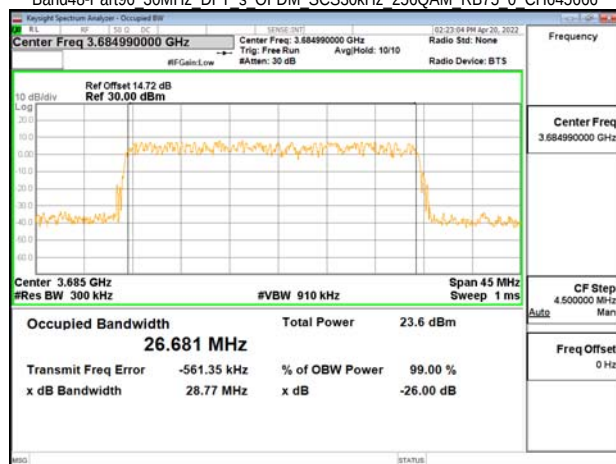
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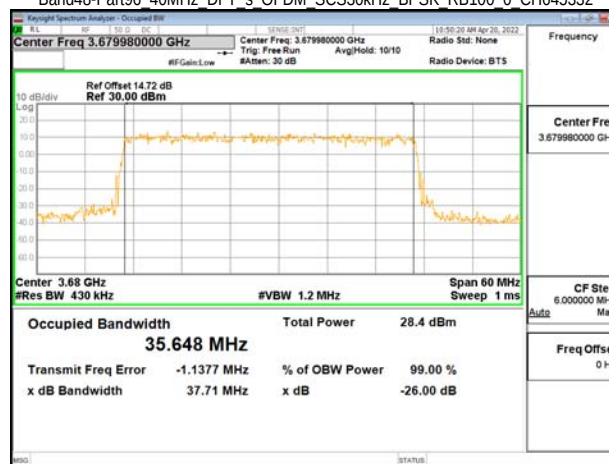
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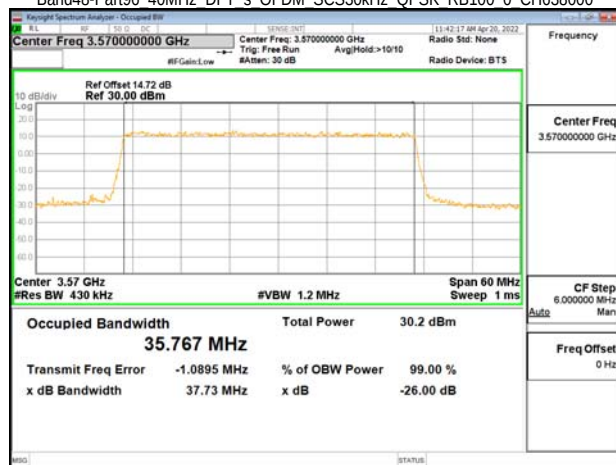


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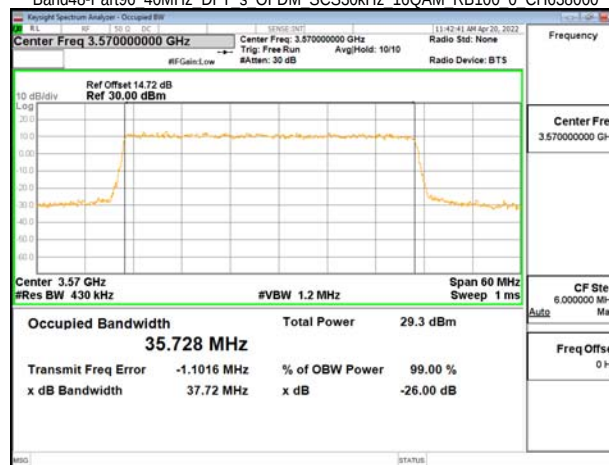
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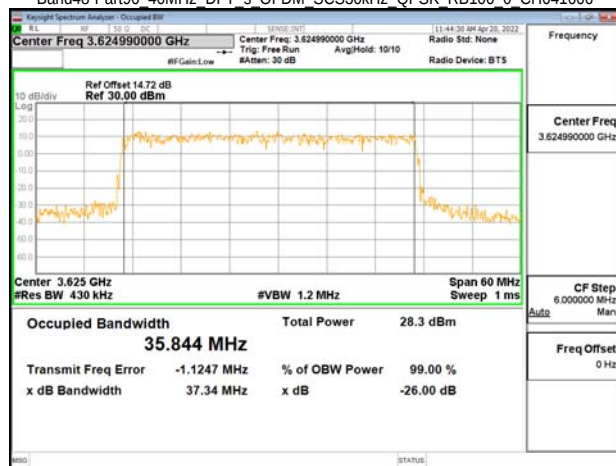
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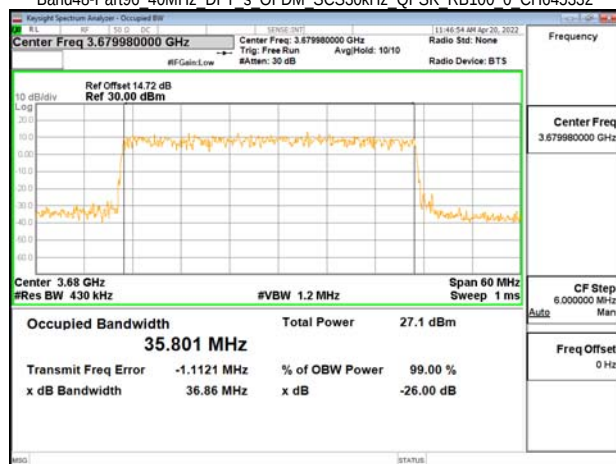
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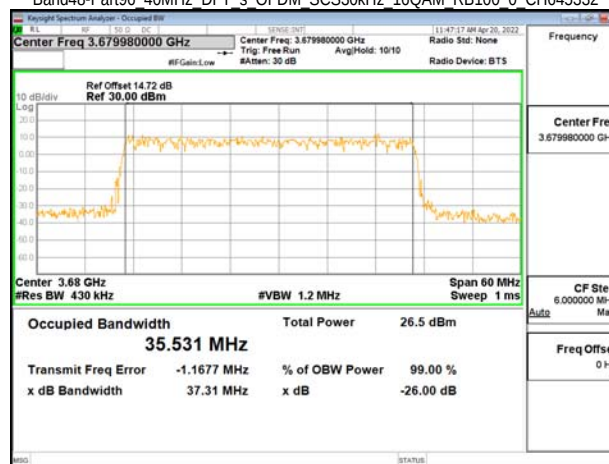
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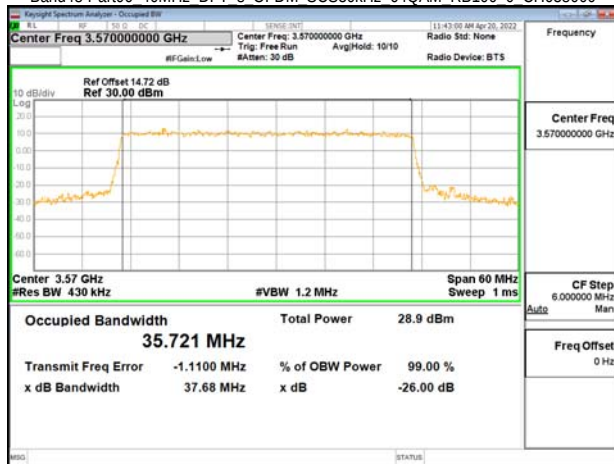


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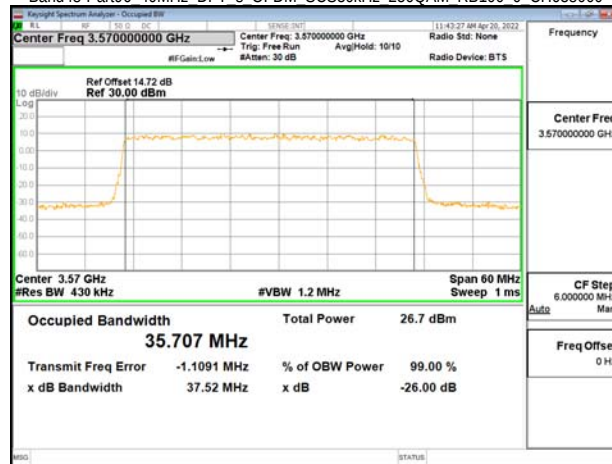
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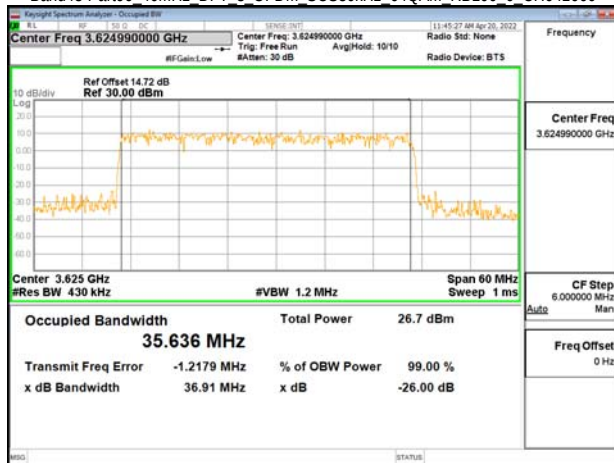
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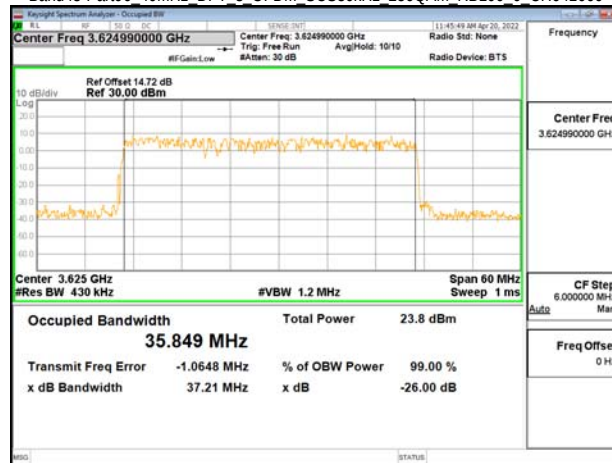
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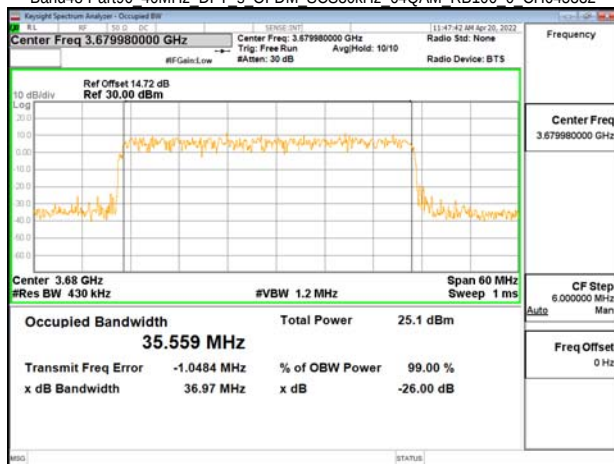
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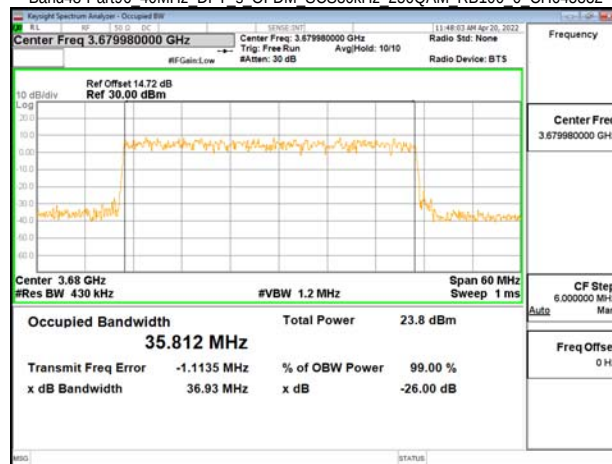
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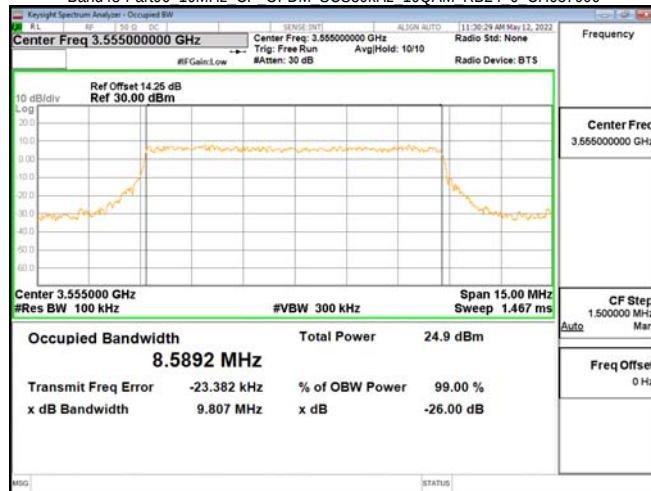
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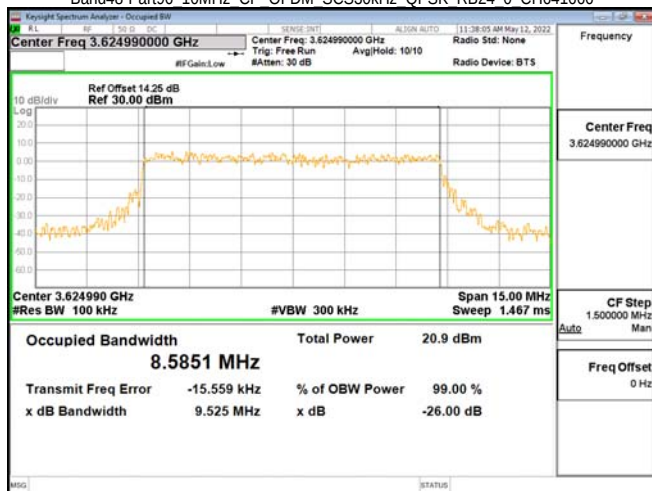
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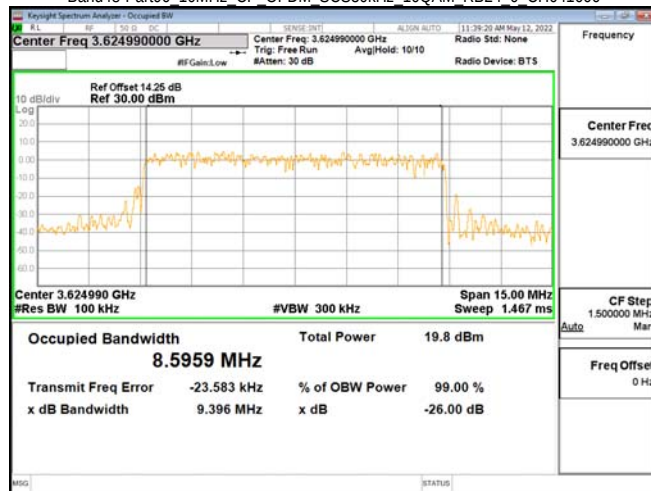
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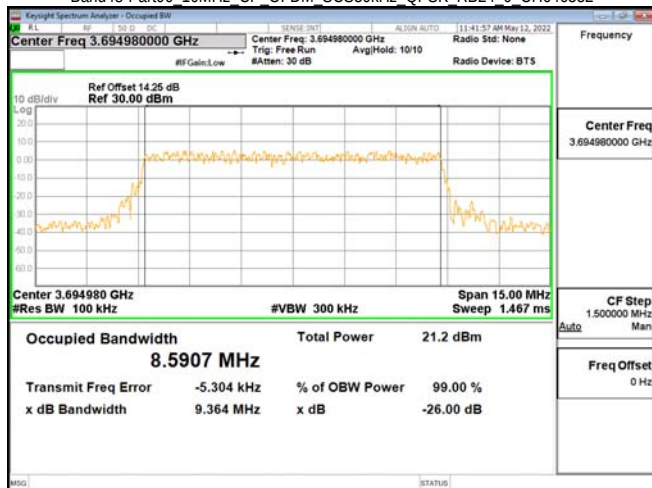
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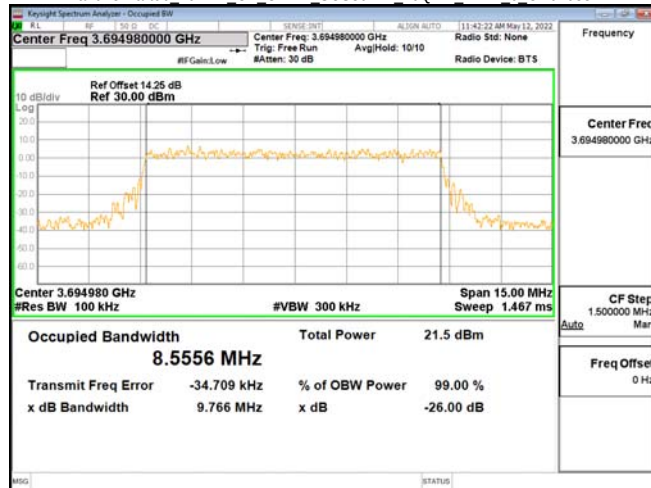
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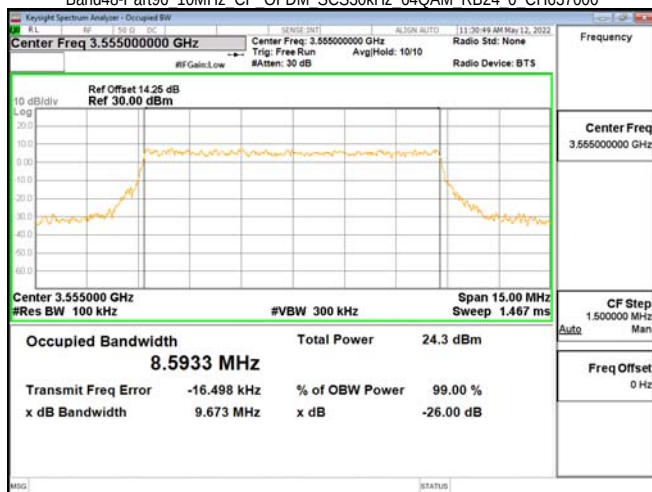


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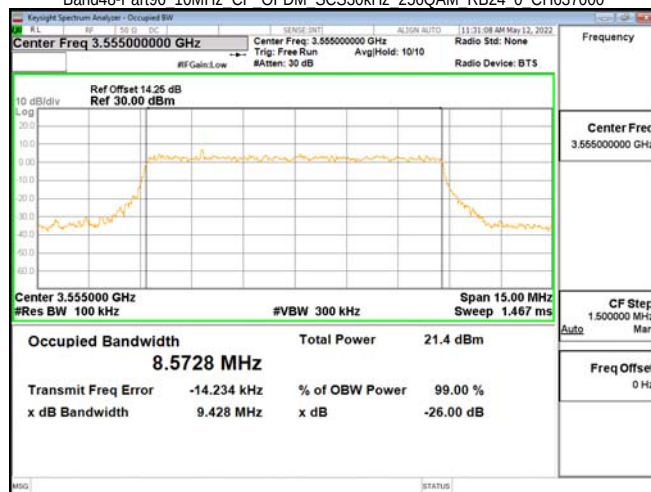
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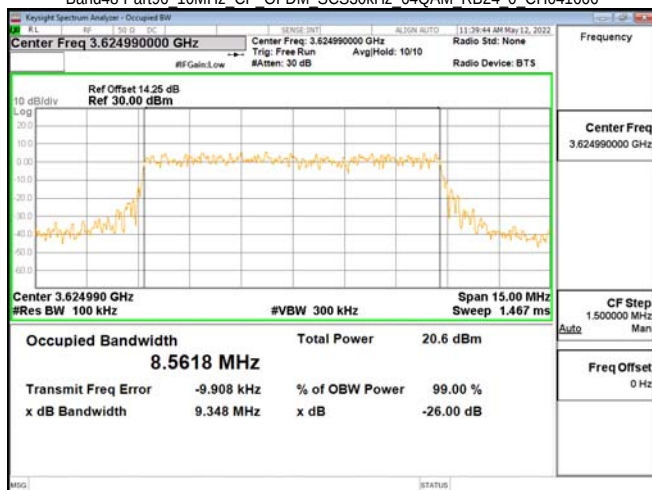
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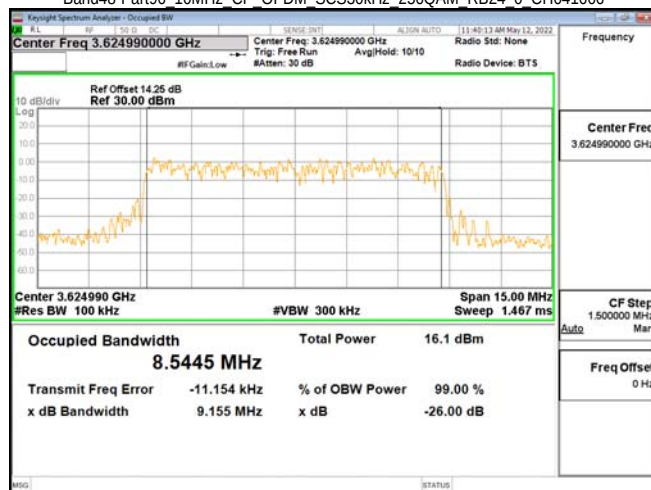
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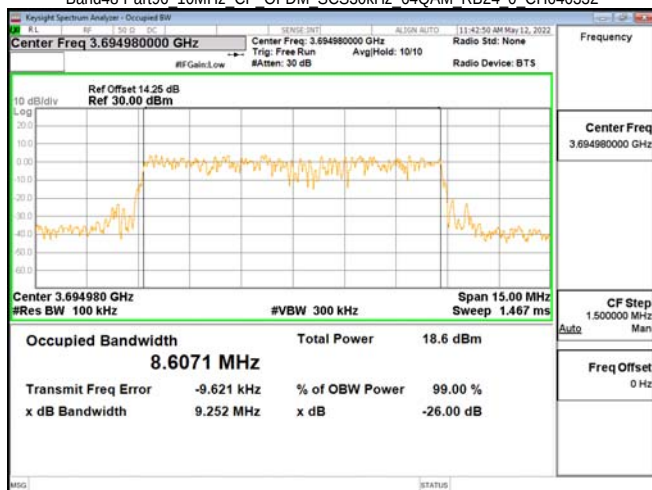
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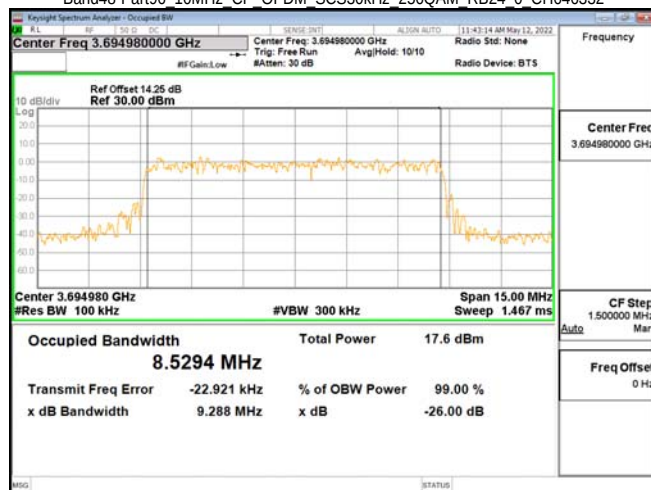
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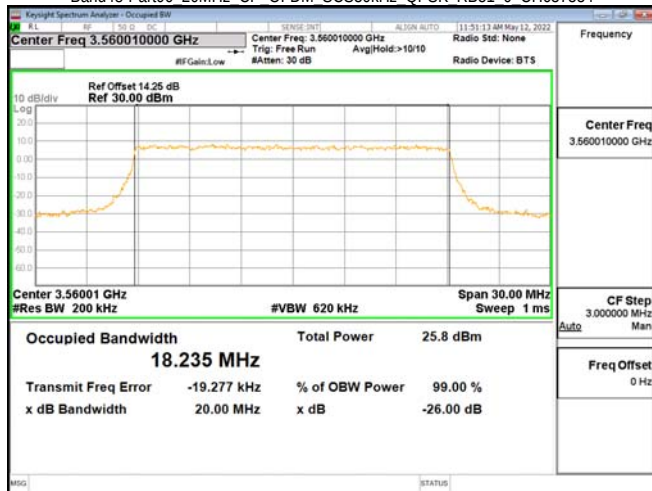


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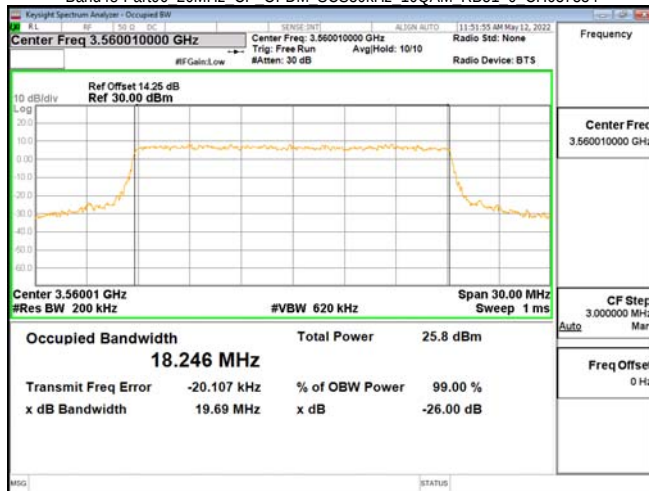
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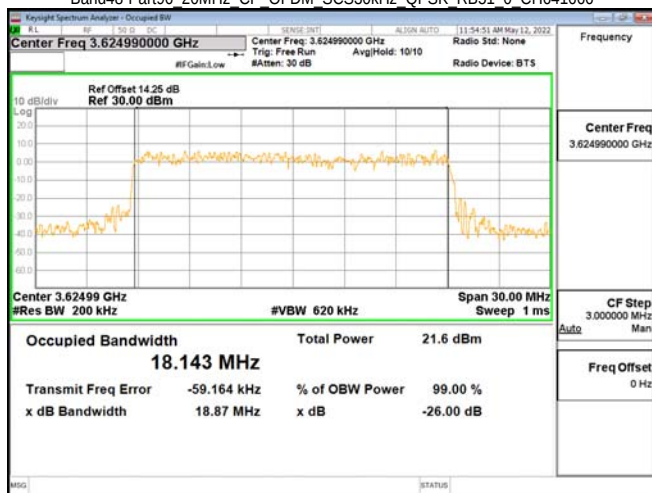
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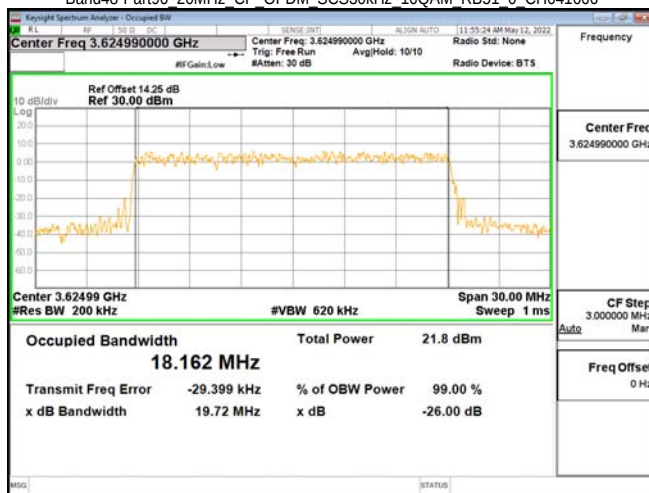
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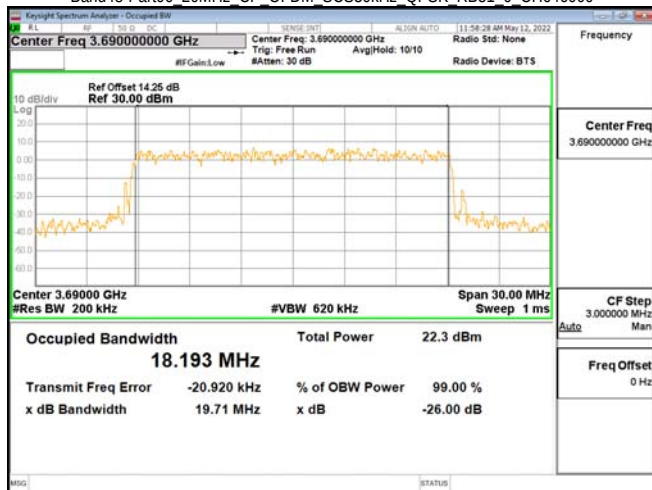
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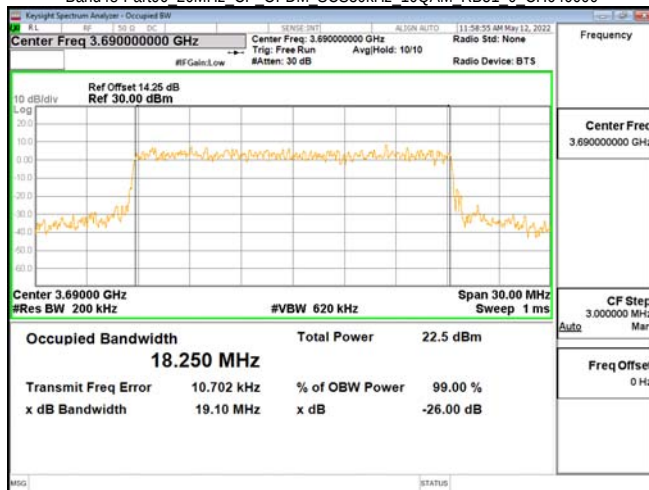
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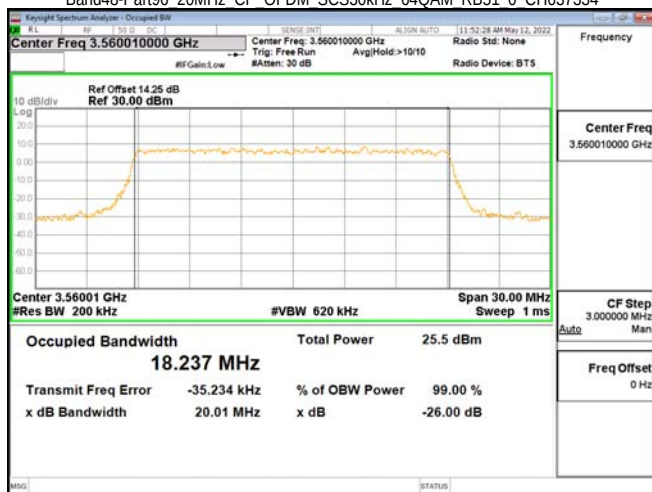


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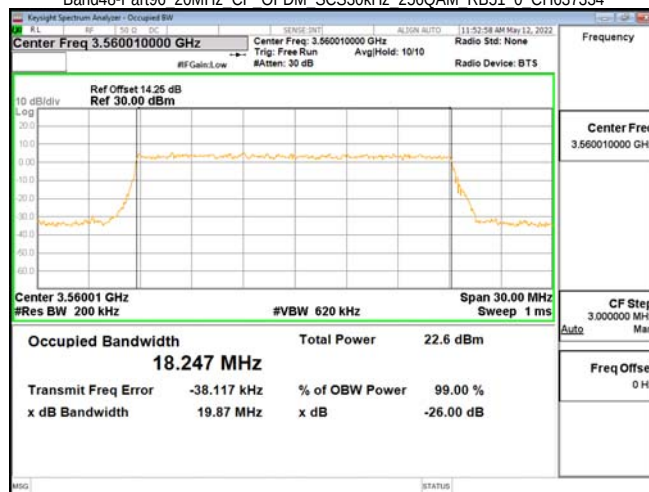
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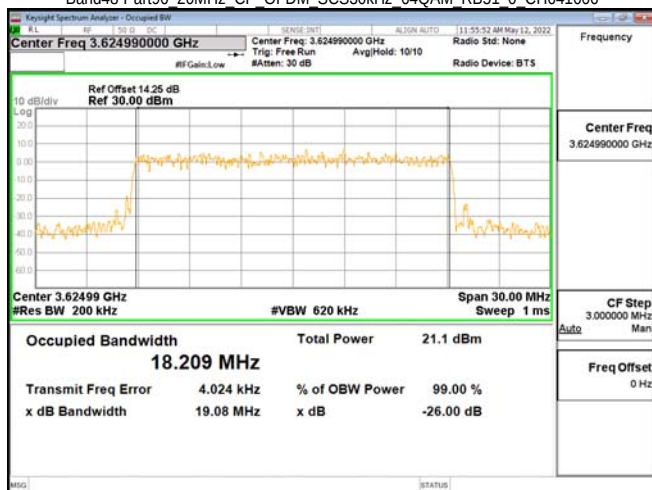
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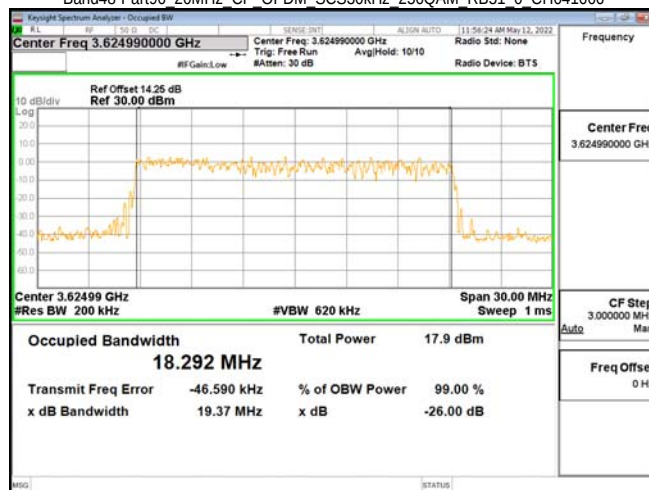
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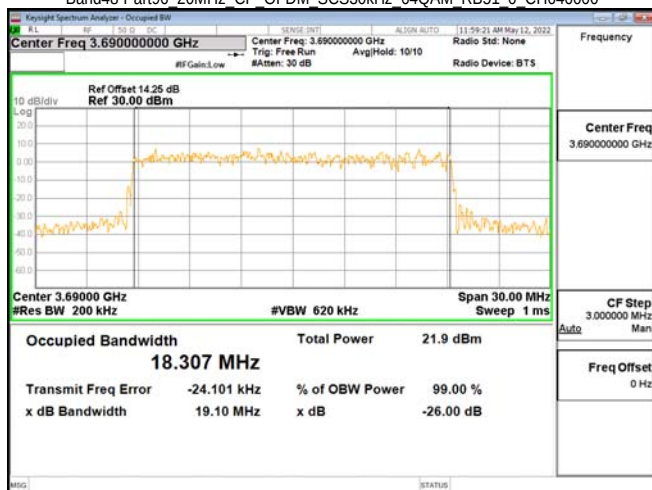
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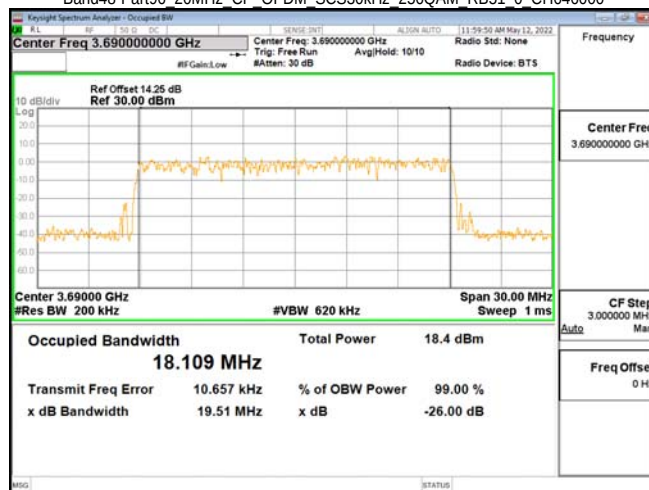
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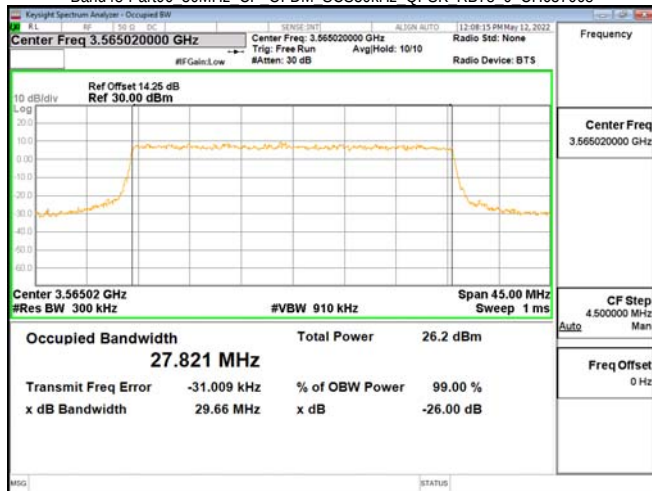


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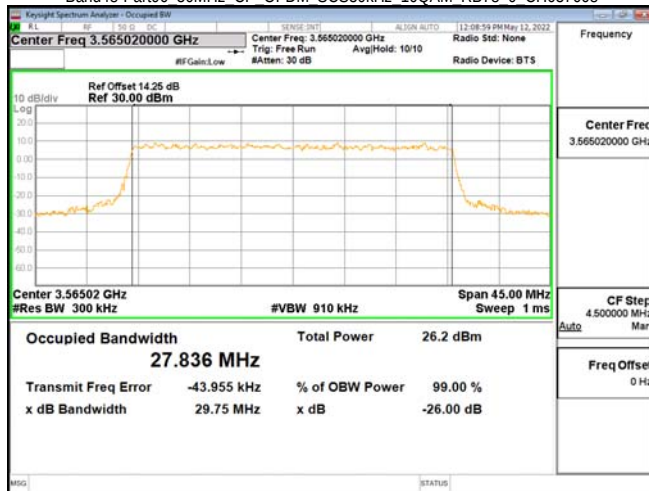
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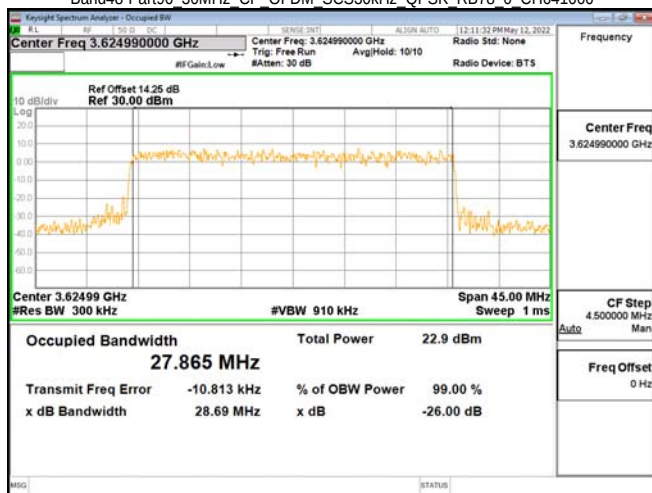
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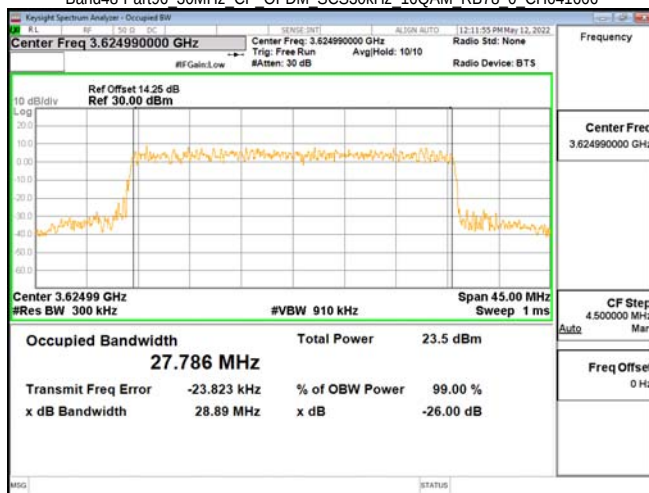
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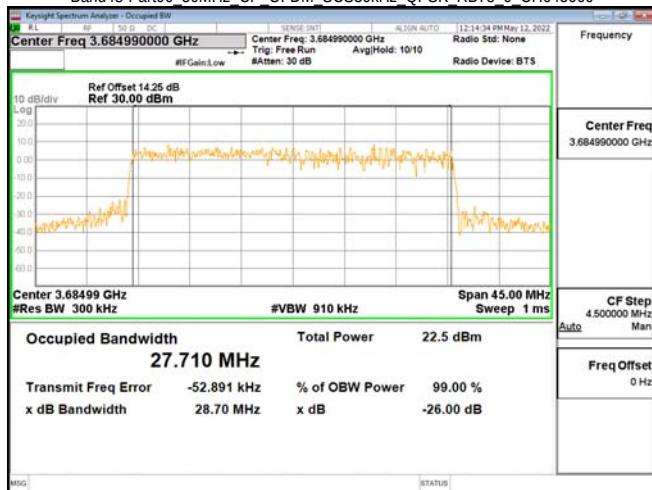
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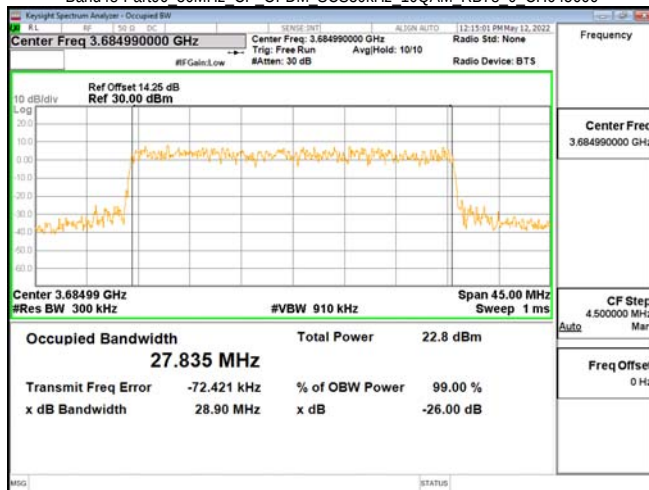
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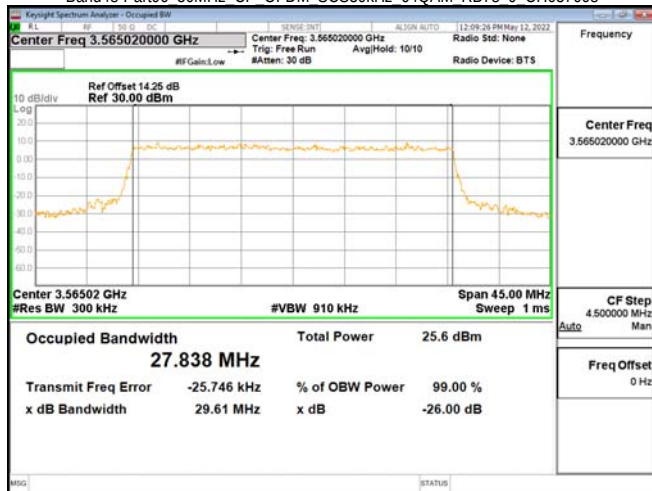


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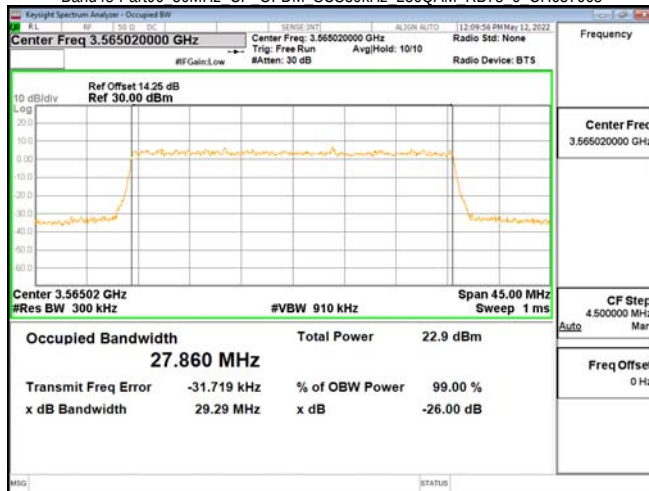
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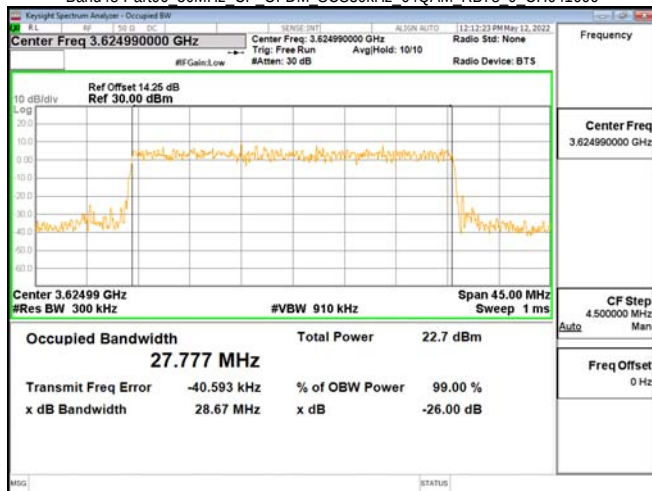
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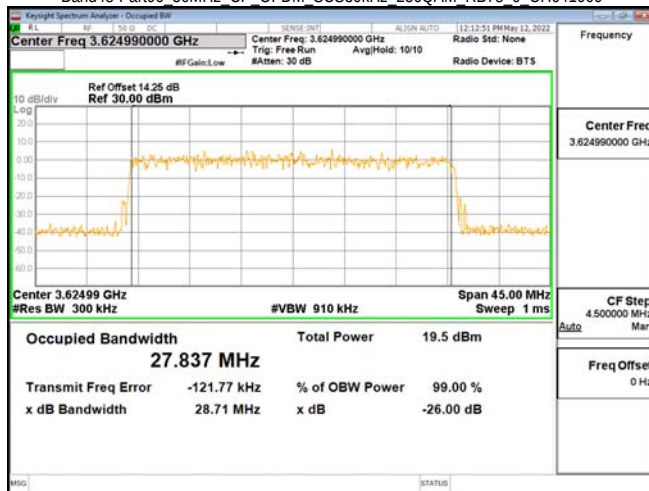
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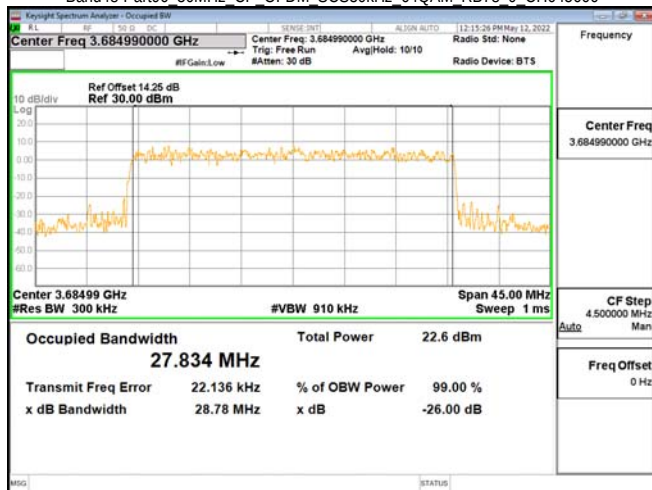
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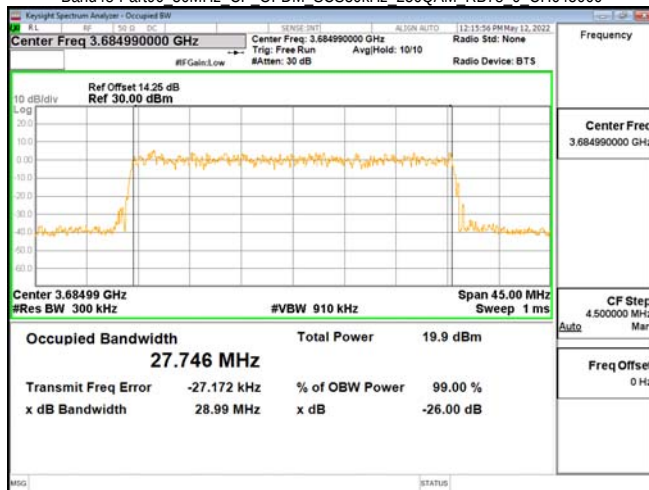
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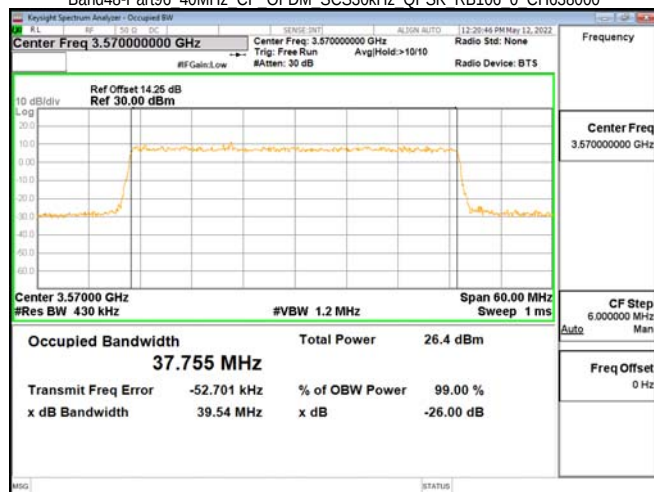


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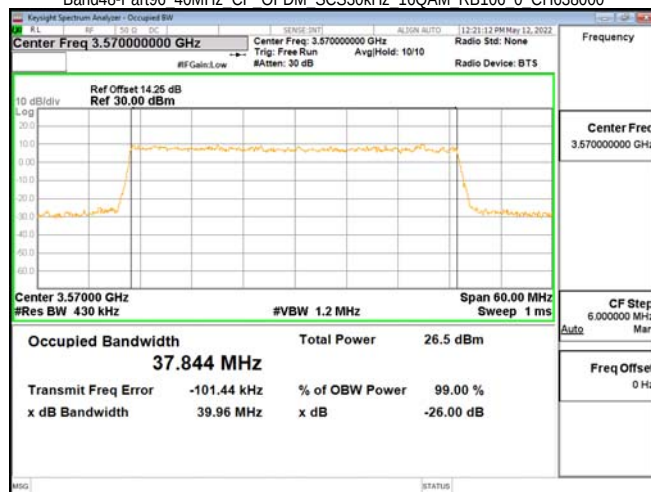
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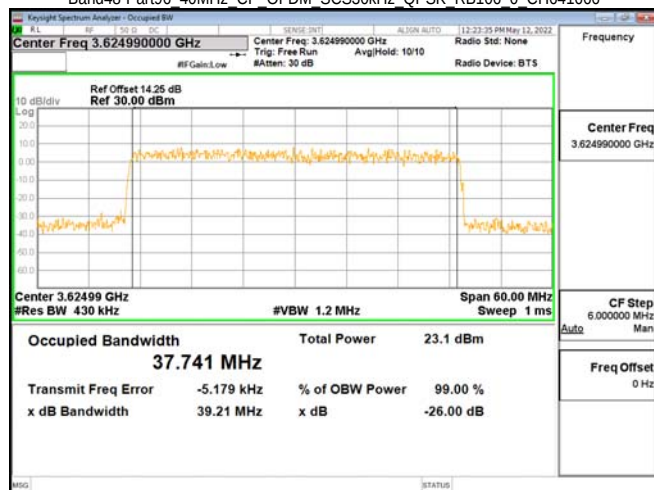
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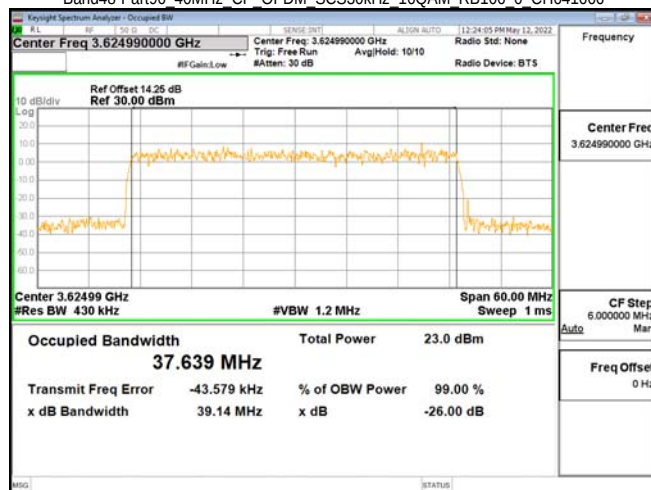
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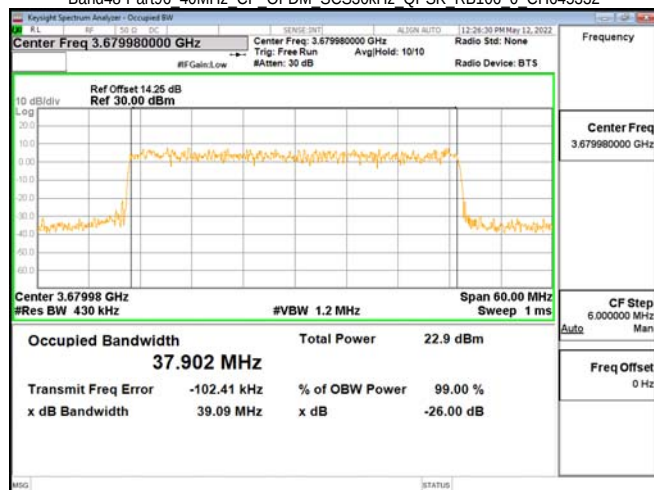
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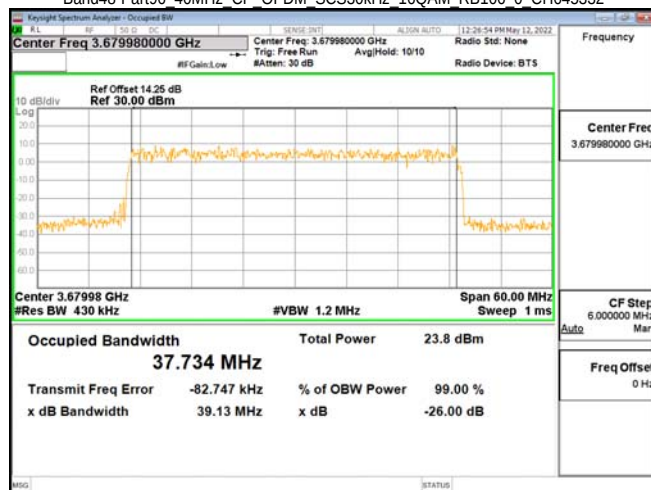
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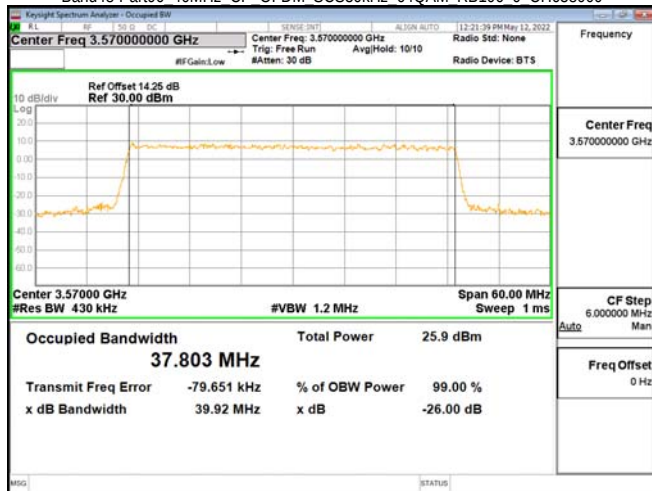


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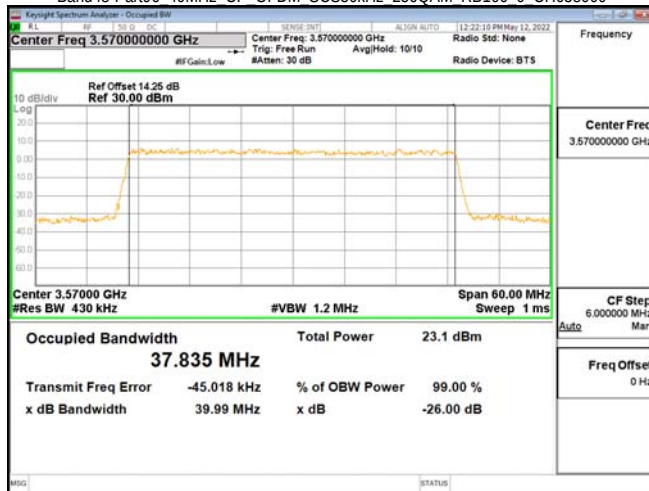
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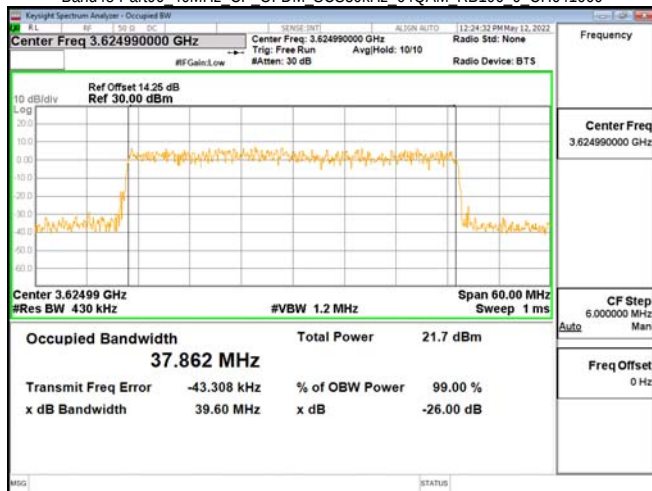
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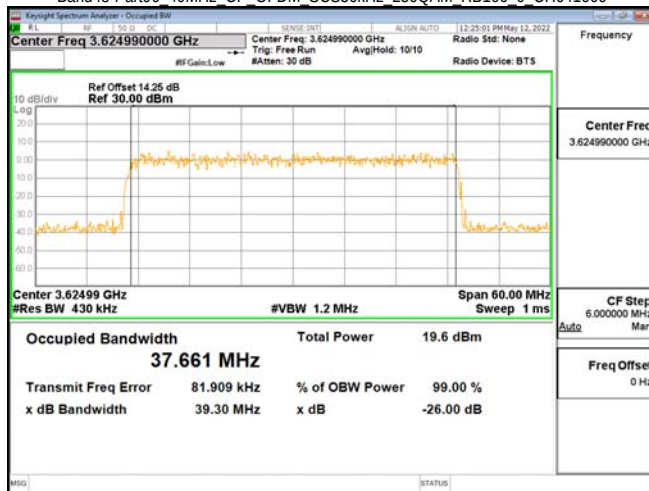
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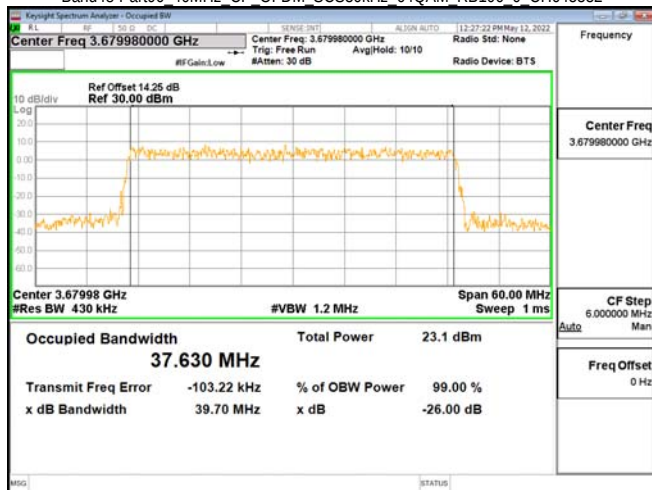
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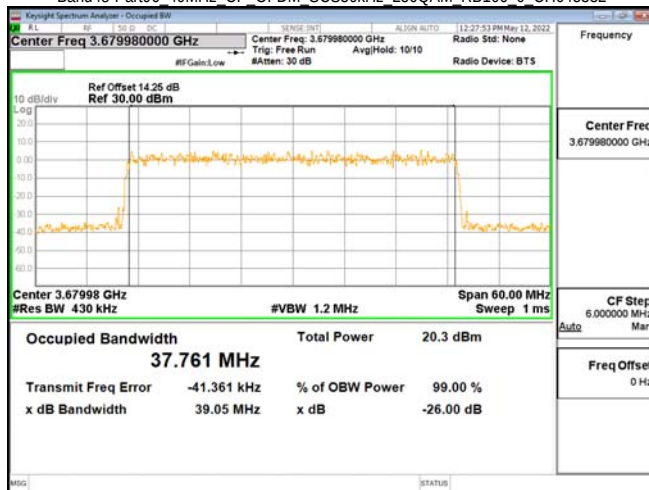
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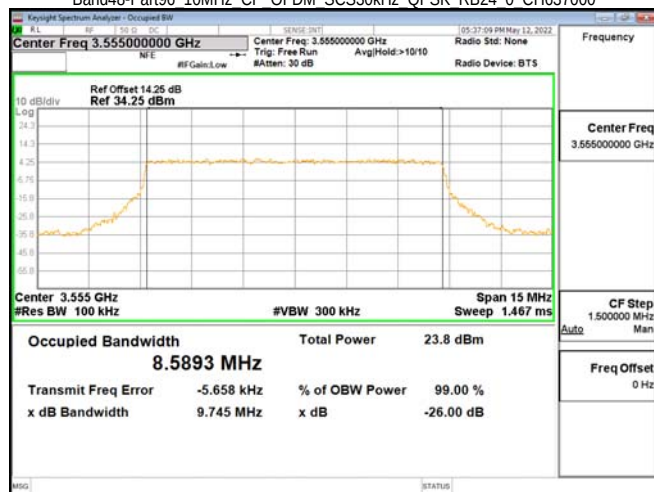


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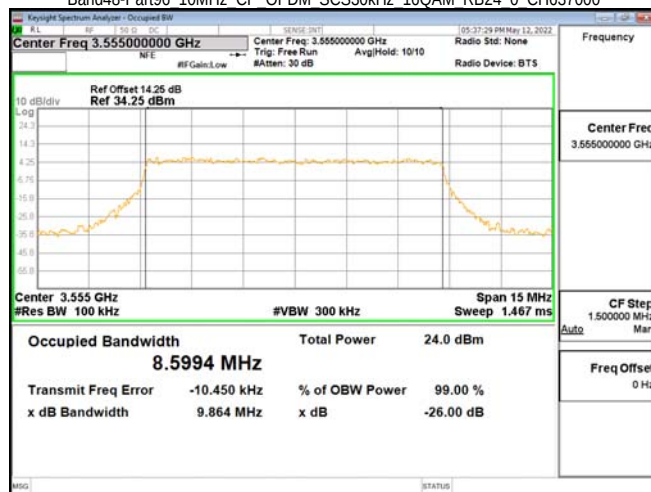
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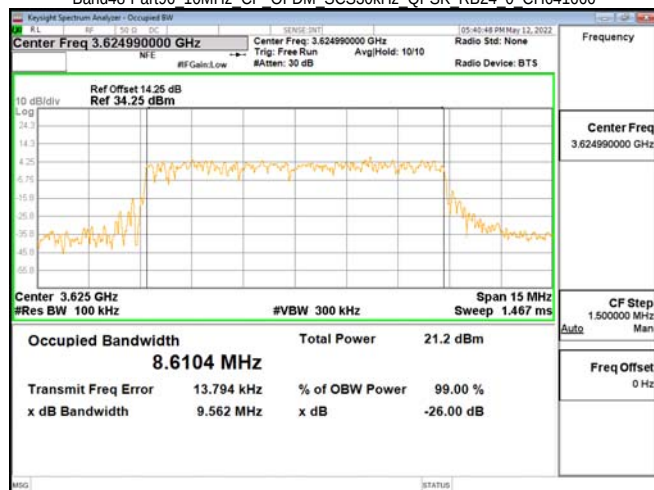
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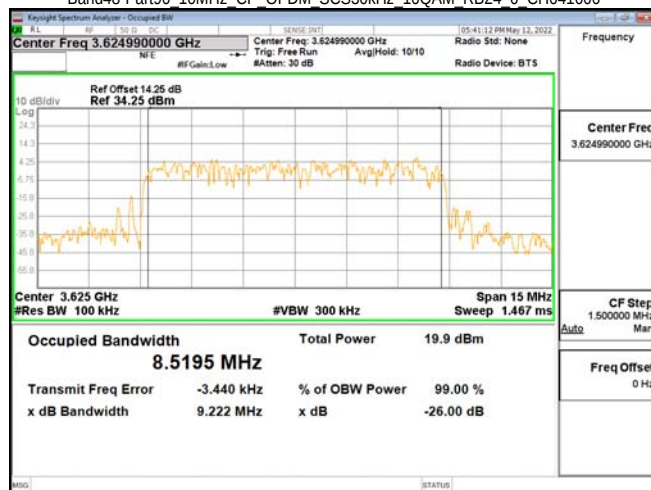
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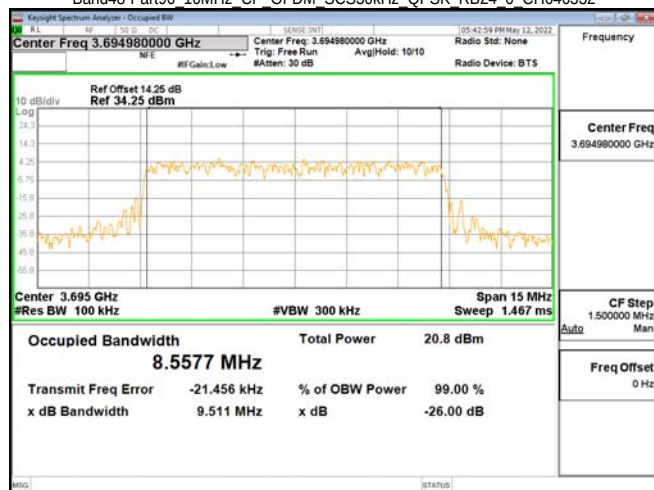
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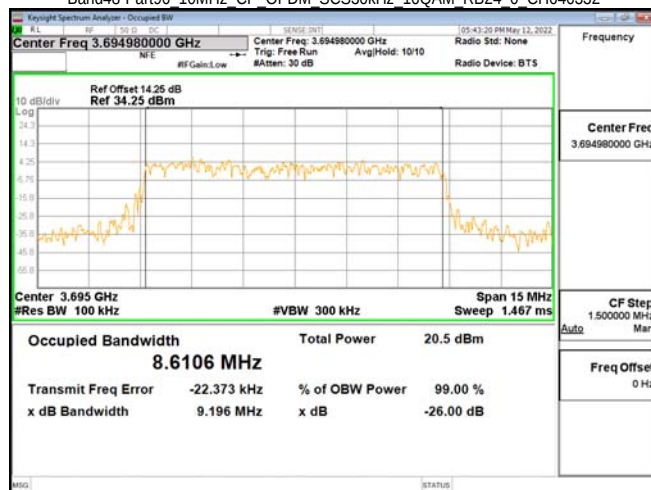
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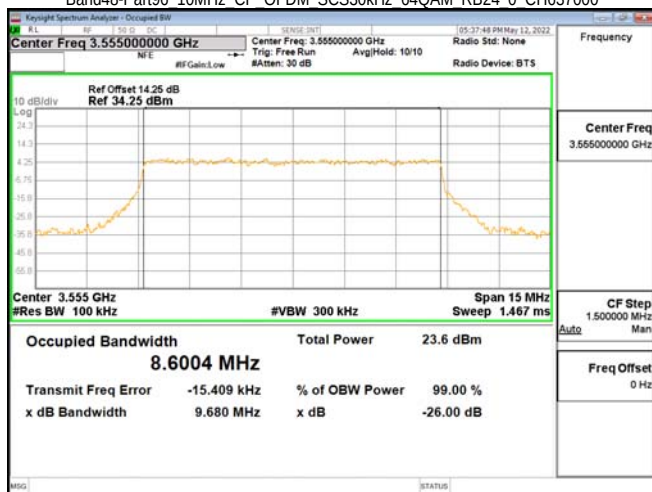


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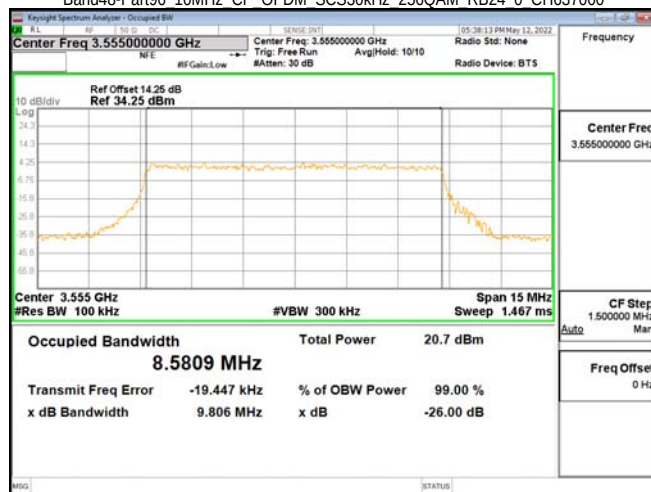
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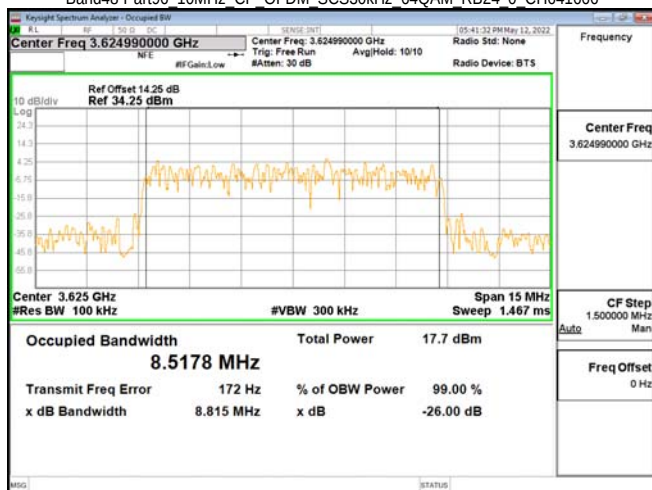
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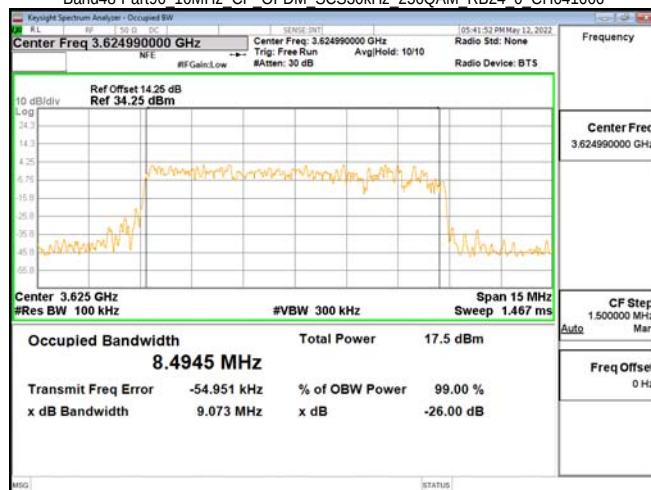
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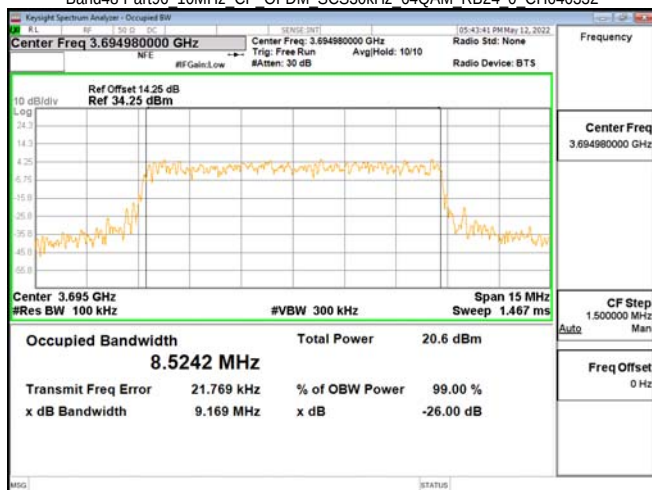
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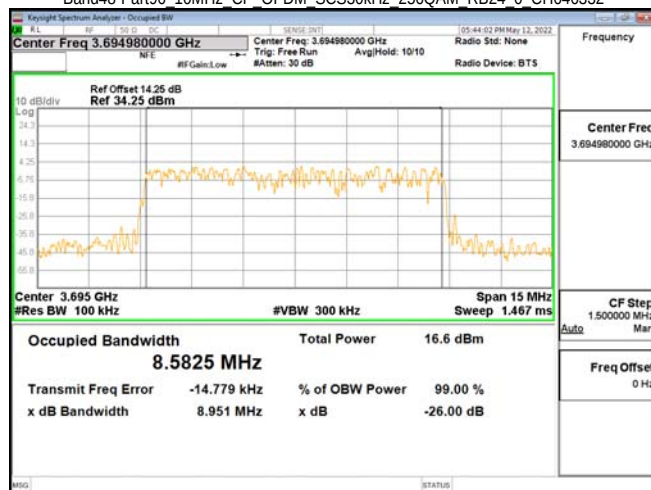
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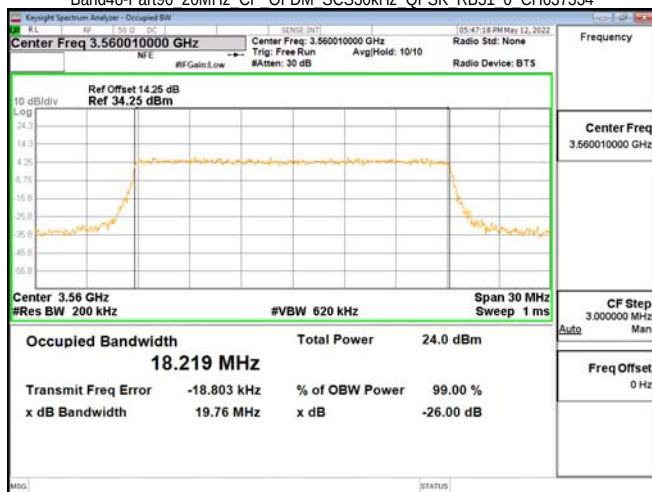


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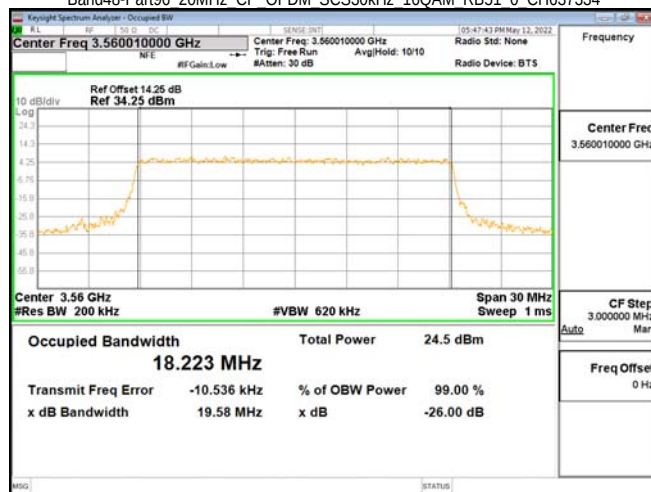
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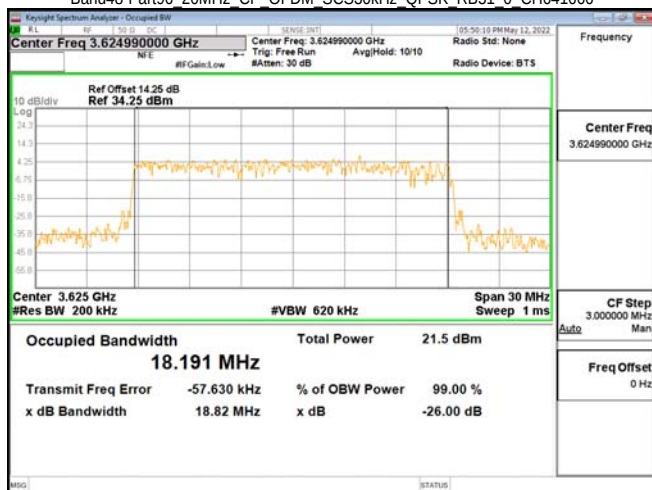
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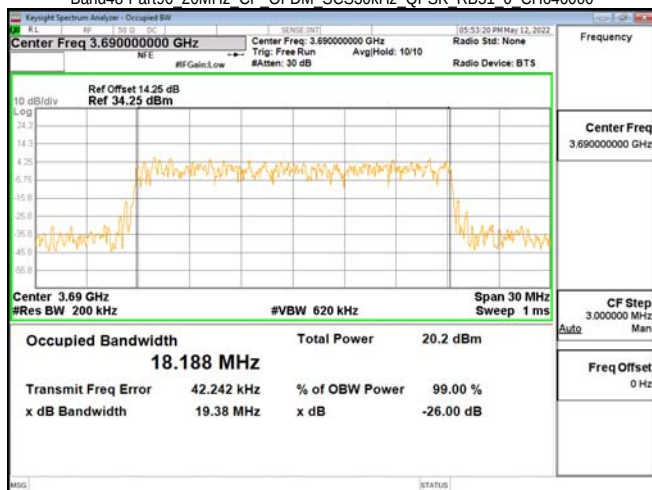
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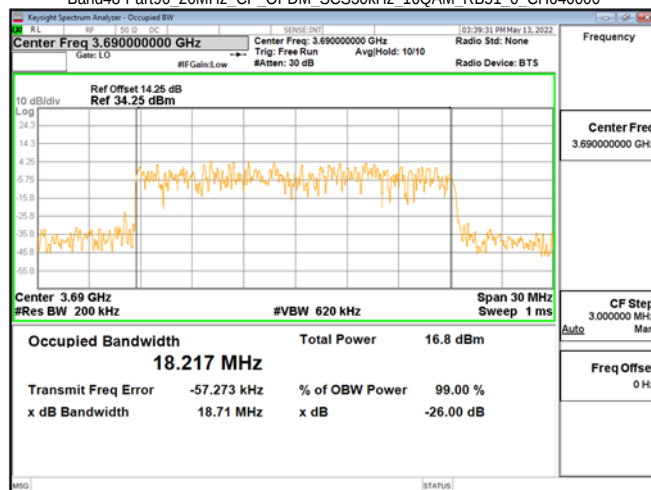
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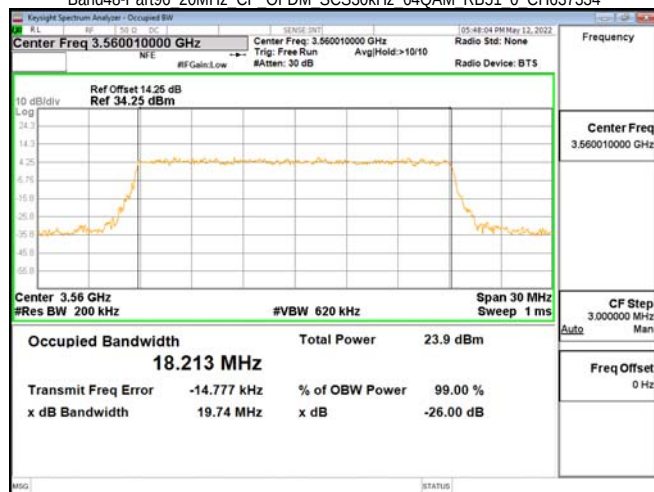


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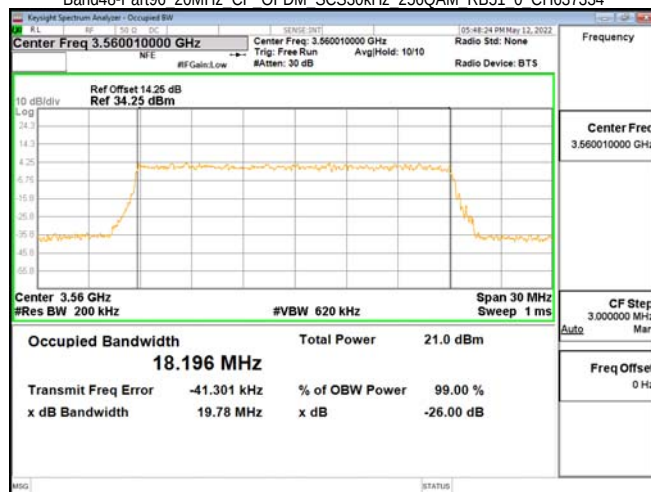
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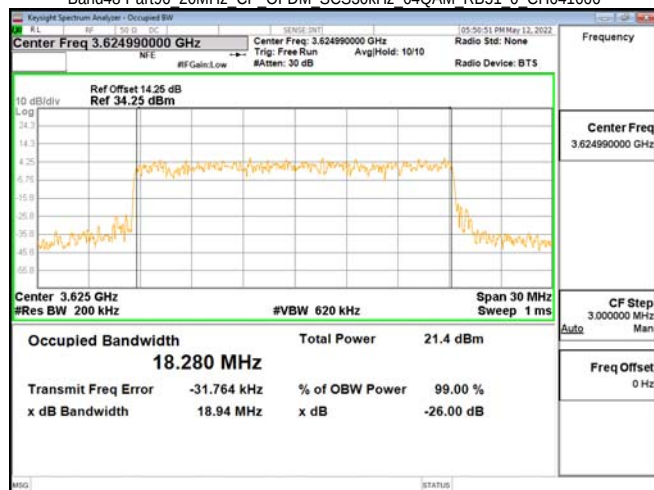
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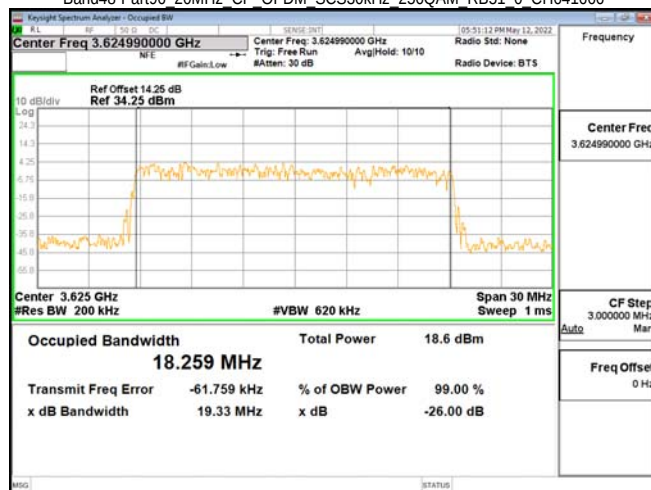
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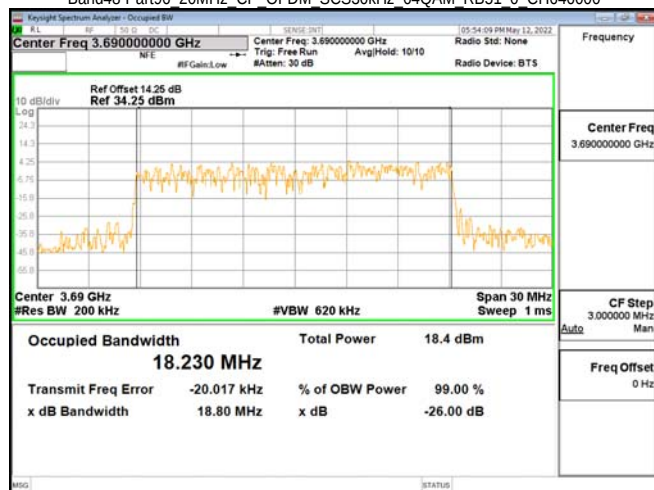
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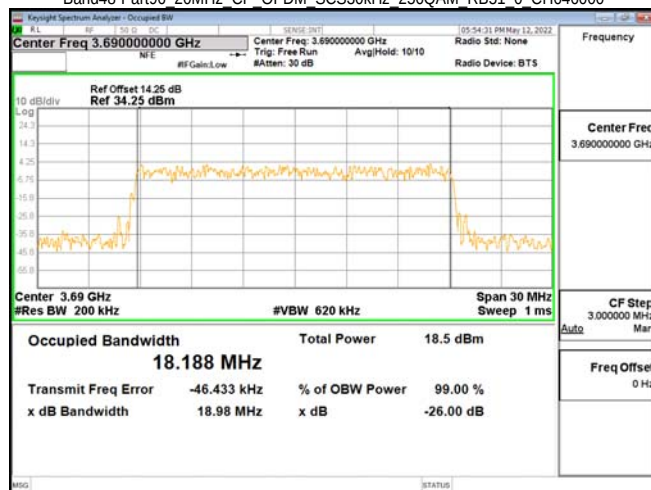
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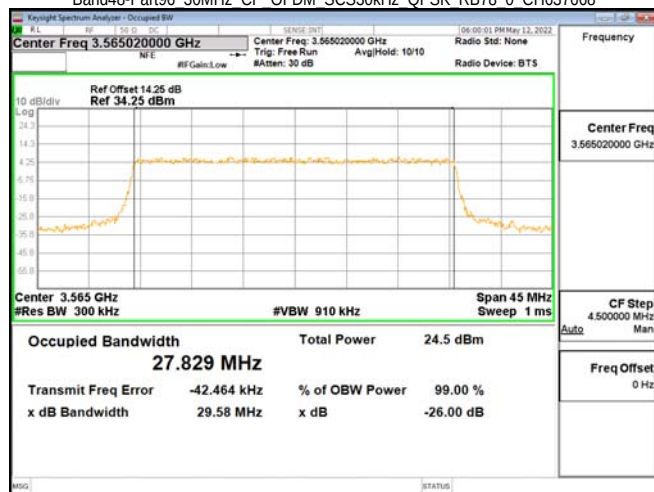


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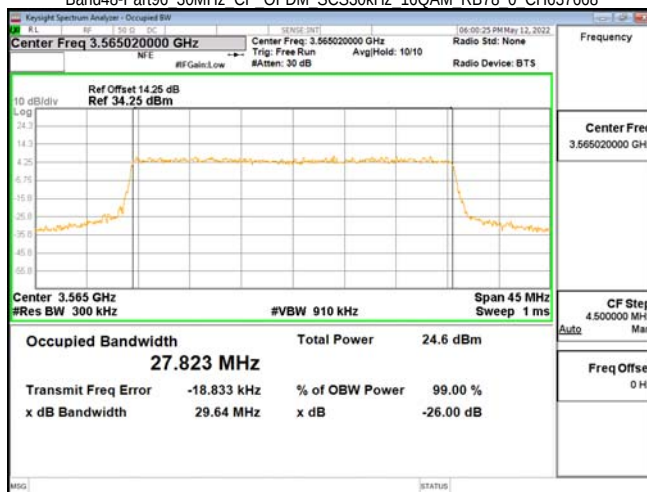
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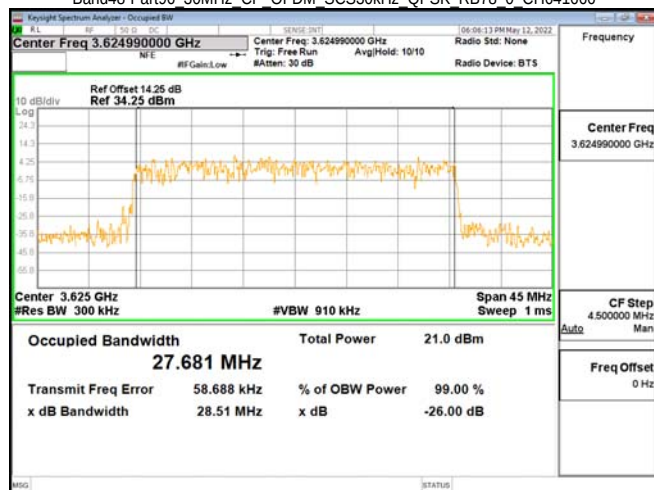
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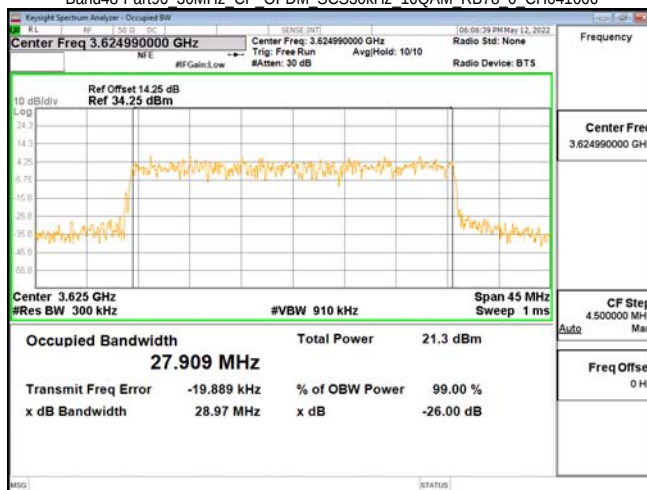
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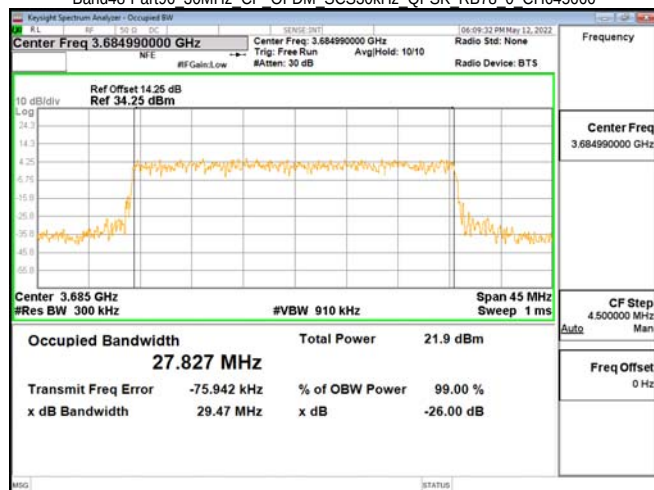
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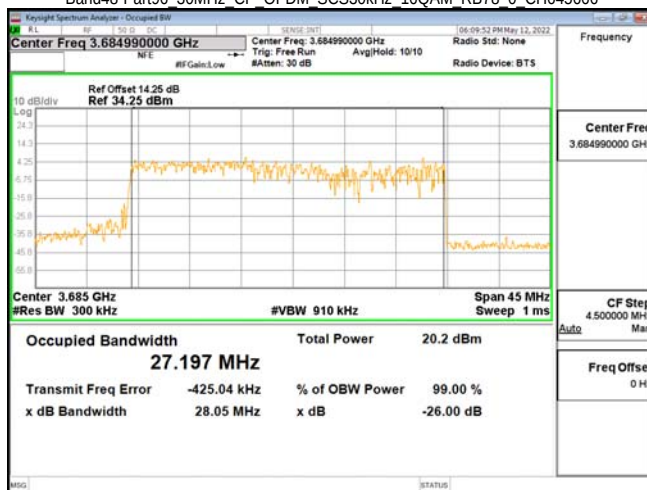
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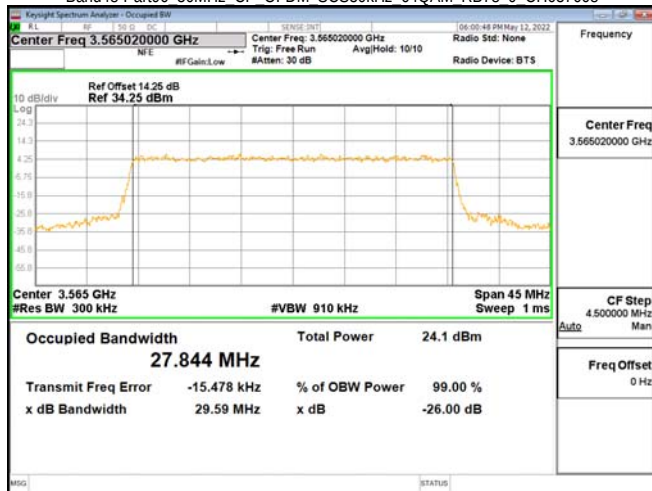
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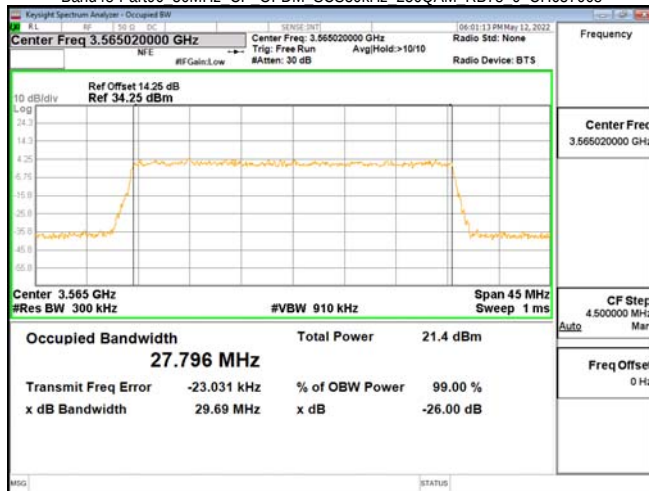
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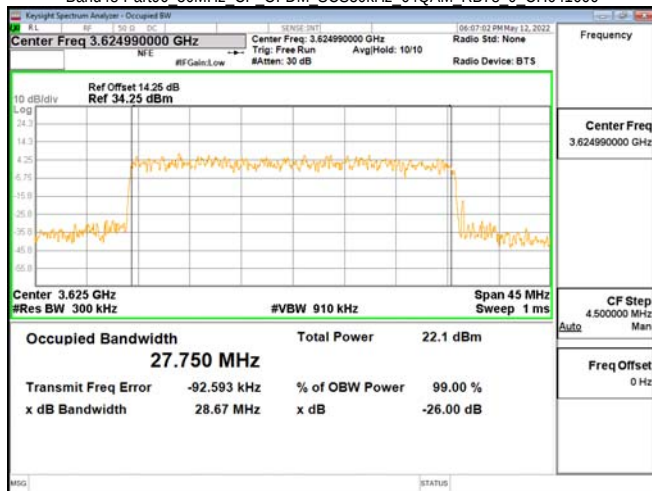
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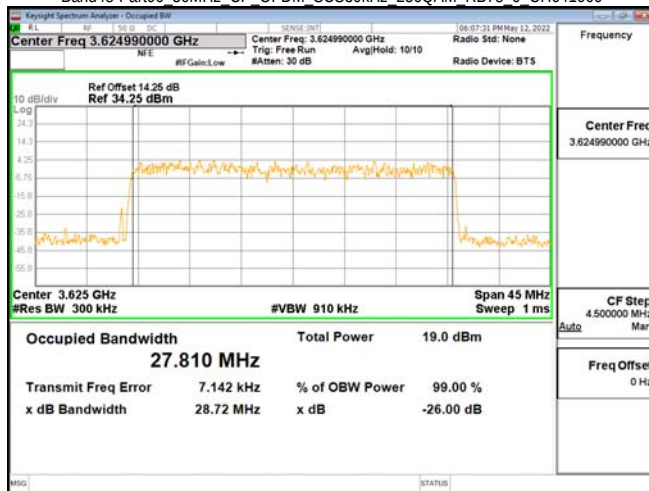
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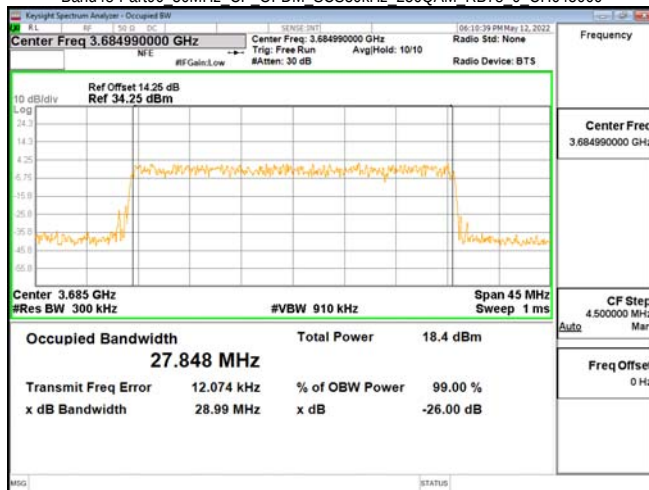
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