FCC Test Report

Product Name	Verizon Receiver
Model No.	LV65
FCC ID	NKR-LVSK-65

Applicant	Wistron NeWeb Corporation
Address	20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan

Date of Receipt	Mar. 09, 2022
Issued Date	June 21, 2022
Report No.	2230313R-RFUSWW5V06-A
Report Version	V1.0

Testing Laboratory
3023

The test results relate only to the samples tested.
The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.
This report must not be used to claim product endorsement by TAF or any agency of the government.
The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Report

Issued Date: June 21, 2022
Report No.: 2230313R-RFUSWW5V06-A

Product Name	Verizon Receiver
Applicant	Wistron NeWeb Corporation
Address	20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan
Manufacturer	Wistron NeWeb Corporation
Model No.	LV65
FCC ID	NKR-LVSK-65
EUT Rated Voltage	AC 100-120V / 50-60Hz
EUT Test Voltage	AC 120V / 60Hz
Trade Name	Verizon
Applicable Standard	FCC 47 CFR Part 30
Test Result	Complied

Documented By : Genie Chang
(Senior Project Specialist / Genie Chang)

Tested By : Ivan Chuang
(Senior Engineer / Ivan Chuang)

Approved By : Alan Chen
(Senior Engineer / Alan Chen)

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Revision History

Report No.	Version	Description	Issued Date
2230313R-RFUSWW5V06-A	V1.0	Initial issue of report	2022-06-21

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Verizon Receiver
Trade Name	Verizon
Model No.	LV65
FCC ID	NKR-LVSK-65
Frequency Range	27.5 GHz – 28.35 GHz 37 GHz – 40 GHz
Type of Modulation	CP-OFDM: QPSK, 16QAM & 64QAM DFT-S-OFDM: Pi/2 BPSK,QPSK, 16QAM & 64QAM
Subcarrier Spacing (SCS)	120 kHz
Component Carrier (CC)	1CC, 2CC
Channel Bandwidth	1CC: 50 MHz, 100 MHz 2CC: 100 MHz+100 MHz
E.I.R.P. Power (dBm)	n260_SISO Beam: 47.6 dBm n260_MIMO Beam: 50.55 dBm
	n261_SISO Beam: 47.91 dBm n261_MIMO Beam: 51.01 dBm
Antenna Type	Patch array Antenna
Channel Control	FTM (Factory Test Mode) by test software
LAN Cable	Non-shielded, 3m
POE Adapter	MFR: DELTA, M/N: ADH-65BR H Input: AC 100-120V, 50-60Hz Output: 56V⎓1.161A , 65.02W

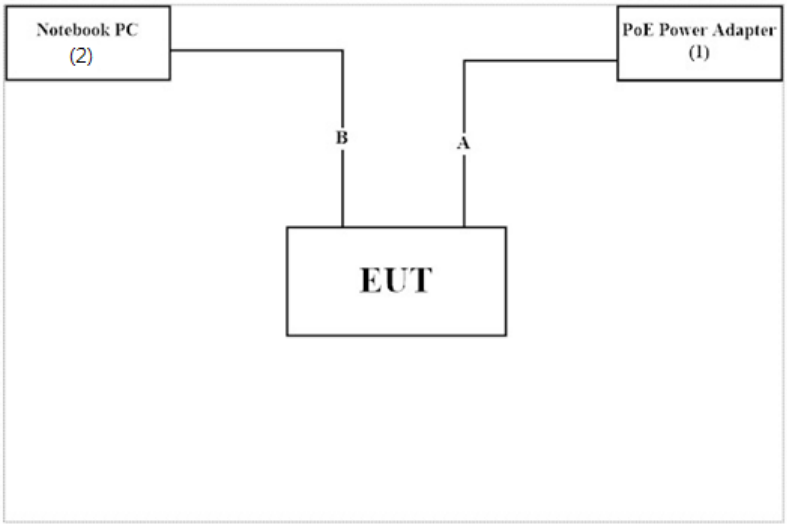
1.2. Test System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	PoE Power Adapter	DELTA	ADH-65BR H	N/A	N/A
2	Notebook PC	ACER	Travel Mate P246 series	NXVA9TA001439 1981E7600	N/A

Signal Cable Type		Signal cable Description
A.	LAN Cable	Non-shielded, 4.5m
B.	USB Cable	Non-shielded, 1m

1.3. Configuration of Test System



1.4. EUT Exercise Software

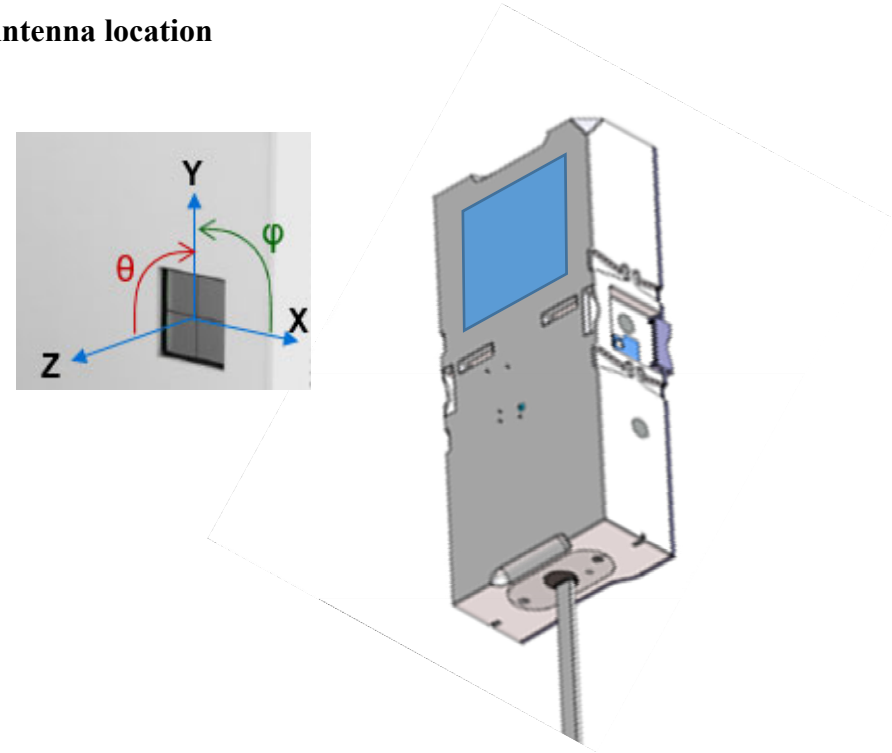
1. Setup the EUT as shown in Section 1.3.
2. Execute “QRCT V4.0 .exe” on the Notebook PC.
3. Configure the test mode, the test band, antenna beam, channel, RB, modulation and continuous Tx operation with maximum duty cycle.
4. Press “Tx control” to start the continuous Transmit at maximum uplink duty cycle of 100%
5. Verify that the EUT works properly.

1.5. EUT description

- ✓ Support n260/n261 (28/39 GHz)
- ✓ There are four QTM's 5G array antenna modules
- ✓ Support dual polarization transmitting

These four 5G arrays antenna modules can operate simultaneously, and support up to 64 element arrays to reach high gain performance. As for beam-steering/beam-forming mechanism, the wide beam-width on the best array, sweeps begin to improve link, and beam-width then reduces on best beam location.

1.5.1. Antenna location



1.5.2. Antenna information

There are four QTM's 5G array antenna modules, and each 5G array antenna module consists of two sub-arrays which means V+H beam pair beam for 2x2 UL MIMO. These 5G arrays antenna modules can operate simultaneously. As for beam-steering/beam-forming mechanism, the wide beam-width on the best array, sweeps begin to improve link, and beam-width then reduces on best beam location. The codebook of antenna array configuration can find 8-element and 64-element patch antenna combination beam, Vertical and Horizontal beam can operate at the same time.

1.5.3. Antenna Gain at the Band Edge

Test Band	Frequency (GHz)	Antenna Gain (dBi)
n260	37	19.8
	40	21.6
n261	27.5	19.9
	28.35	20.2

1.6. Test modes of EUT

The EUT was found the worst case, then used the below for final measurements.

n260-1CC

Test Items	BW (MHz)		Modulations				Ch.	RB			Beam ID		Axis (X,Y,Z)
	50	100	BPSK	QPSK	16 QAM	64 QAM		1	10/ 20	30/ 64	Single	MIMO	
Occupied Bandwidth	■	■	■	■	■	■	L,M,H	■	■	■	87, 343	87+343	Z
EIRP	■	■	■	■	■	■	L,M,H	■	■	■	87, 343	87+343	Z
Radiated Spurious Emission	■	■	□	■	□	□	L,M,H	□	■	□	87	87+343	Z
Band Edge	■	■	■	■	□	□	L,H	■	■	■	87, 343	87+343	Z
Frequency Stability	□	□	CW				M	□	□	□	343	--	Z

Note:

1. ■: Chosen for final testing
2. CC: Component Carrier
3. RB: 10RB: Bandwidth 50 MHz/20RB: Bandwidth 100 MHz;
   30RB: Bandwidth 50 MHz with All Modulations/64RB: Bandwidth 100 MHz with All Modulations.
4. In the pre-test results between CP-ODFM and DFT-s-OFDM, only the worst case (DFT-s-OFDM) is shown in the test report.

n260-2CC

Test Items	BW (MHz)		Modulations				Ch.	RB			Beam ID		Axis (X,Y,Z)
	50	100	BPSK	QPSK	16 QAM	64 QAM		1	10/ 20	30/ 64	Single	MIMO	
Occupied Bandwidth	■	■	■	■	■	■	L,M,H	■	■	■	87, 343	87+343	Z
EIRP	■	■	■	■	■	■	L,M,H	■	■	■	87, 343	87+343	Z
Radiated Spurious Emission	■	■	□	■	□	□	L,M,H	□	□	■	87	87+343	Z
Band Edge	■	■	■	■	□	□	L,H	■	■	■	87, 343	87+343	Z
Frequency Stability	□	□	CW				M	□	□	□	343	--	Z

Note:

1. ■: Chosen for final testing
2. CC: Component Carrier
3. RB: 10RB: Bandwidth 50 MHz/20RB: Bandwidth 100 MHz;
   30RB: Bandwidth 50 MHz with All Modulations/64RB: Bandwidth 100 MHz with All Modulations.
4. In the pre-test results between CP-ODFM and DFT-s-OFDM, only the worst case (DFT-s-OFDM) is shown in the test report.
5. 2CC Configuration only supports 100MHz+100MHz.

n261-1CC

Test Items	BW (MHz)		Modulations				Ch.	RB			Beam ID		Axis (X,Y,Z)
	50	100	BPSK	QPSK	16 QAM	64 QAM		1	10/ 20	30/ 64	Single	MIMO	
Occupied Bandwidth	■	■	■	■	■	■	L,M,H	■	■	■	87, 343	87+343	Z
EIRP	■	■	■	■	■	■	L,M,H	■	■	■	87, 343	87+343	Z
Radiated Spurious Emission	■	■	□	■	□	□	L,M,H	□	■	□	343	87+343	Z
Band Edge	■	■	■	■	□	□	L,H	■	■	■	87, 343	87+343	Z
Frequency Stability	□	□	CW				M	□	□	□	343	--	Z

Note:

1. ■: Chosen for final testing
2. CC: Component Carrier
3. RB: 10RB: Bandwidth 50 MHz/20RB: Bandwidth 100 MHz;
   30RB: Bandwidth 50 MHz with All Modulations/64RB: Bandwidth 100 MHz with All Modulations.
4. In the pre-test results between CP-ODFM and DFT-s-OFDM, only the worst case (DFT-s-OFDM) is shown in the test report.

n261-2CC

Test Items	BW (MHz)		Modulations				Ch.	RB			Beam ID		Axis (X,Y,Z)
	50	100	BPSK	QPSK	16 QAM	64 QAM		1	10/ 20	30/ 64	Single	MIMO	
Occupied Bandwidth	■	■	■	■	■	■	L,M,H	■	■	■	87, 343	87+343	Z
EIRP	■	■	■	■	■	■	L,M,H	■	■	■	87, 343	87+343	Z
Radiated Spurious Emission	■	■	□	■	□	□	L,M,H	□	□	■	343	87+343	Z
Band Edge	■	■	■	■	□	□	L,H	■	■	■	87, 343	87+343	Z
Frequency Stability	□	□	CW				M	□	□	□	343	--	Z

Note:

1. ■: Chosen for final testing
2. CC: Component Carrier
3. RB: 10RB: Bandwidth 50 MHz/20RB: Bandwidth 100 MHz;
   30RB: Bandwidth 50 MHz with All Modulations/64RB: Bandwidth 100 MHz with All Modulations.
4. In the pre-test results between CP-ODFM and DFT-s-OFDM, only the worst case (DFT-s-OFDM) is shown in the test report.
5. 2CC Configuration only supports 100MHz+100MHz.

1.7. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Radiated Emission	Temperature (°C)	10~40 °C	24.3 °C
	Humidity (%RH)	10~90 %	60.5 %
Conductive	Temperature (°C)	10~40 °C	25.6 °C
	Humidity (%RH)	10~90 %	60.5 %

USA : FCC Registration Number: TW0033

Canada : CAB Identifier Number: TW3023 / Company Number: 26930

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No. 5-22, Ruishukeng Linkou District, New Taipei City, 24451, Taiwan
Performed Location : No. 26, Huaya 1st Rd., Guishan Dist.,Taoyuan City 333411, Taiwan, R.O.C.
Phone number : +886-3-275-7255
Fax number : +866-3-327-8031
Email address : info.tw@dekra.com
Website : http://www.dekra.com.tw

1.8. List of Test Equipment

Test Site number: 966-2

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
X	Signal Analyzer	R&S	FSV3044	101115	2022/01/10	2023/01/09
X	Spectrum Analyzer	Keysight	N9030B	MY56320509	2021/08/06	2022/08/05
X	Horn Antenna	VDI	RCH015 (50-75GHz)	N/A	2020/11/02	2023/11/01
X	Horn Antenna	VDI	RCH010(75-110GHz)	N/A	2020/11/02	2023/11/01
X	Horn Antenna	VDI	RCH08(90-140GHz)	N/A	2020/11/02	2023/11/01
X	Horn Antenna	VDI	RCH05(140-220GHz)	N/A	2020/11/02	2023/11/01
	Horn Antenna	VDI	RCH03(220-325GHz)	N/A	2020/11/02	2023/11/01
X	Down Convertor(SAX093)	VDI	N9029AV15(AT0-55847)	US54250106	2020/11/02	2023/11/01
X	Down Convertor(SAX092)	VDI	N9029AV10(AT0-74929)	US53250010	2020/11/02	2023/11/01
X	Down Convertor(SAX091)	VDI	N9029AV08(AT0-59571)	US53250004	2020/11/02	2023/11/01
X	Down Convertor(SAX090)	VDI	N9029AV05(AT0-60029)	US53250004	2020/11/02	2023/11/01
	Down Convertor(SAX214)	VDI	N9029AV03(AT0-57775)	US53250006	2020/11/02	2023/11/01
	Loop Antenna	AMETEK	HLA6121	49611	2022/03/18	2023/03/17
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-675	2021/08/11	2022/08/10
X	Horn Antenna	ETS-Lindgren	3117	00203799	2021/12/27	2022/12/26
X	Horn Antenna	Com-Power	AH-840	101087	2021/06.16	2022/06/15
X	Pre-Amplifier	EMCI	EMC001330	980302	2021/07.06	2022/07/05
X	Pre-Amplifier	EMCI	EMC051835SE	980632	2021/09/07	2022/09/06
X	Pre-Amplifier	EMCI	EMC05820SE	980285	2021/07/02	2022/07/01
X	Pre-Amplifier	EMCI	EMC184045SE	980369	2021/04/27	2022/04/26
X	Coaxial Cable	EMCI	EMC102-KM-KM-600	1160314		
X	Coaxial Cable	EMCI	EMC102-KM-KM-7000	170242		
X	EMI Test Receiver	R&S	ESR	102793	2021/12/15	2022/12/14
X	Coaxial Cable	SGH	HA800	GD20110223-2	2022/03/17	2023/03/16
		SGH	HA800	GD20110222-4		
		SGH	SGH18	2021005-2		
		SGH	SGH18	202108-5		

Note:
1. The mm-Wave equipment (above 50GHz) is calibrated every three years, the other equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version: AUDIX e3 V9.

Test Site number: SH-3

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
X	Temperature Chamber	KSON	THS-D4T-100	A0606	2021/08/24	2022/08/23
	DC Power Supply	GW Instek	SPD-3606	GEQ820915	2021/07/09	2022/07/08
X	Spectrum Analyzer	Keysight	N9030B	MY56320509	2021/08/06	2022/08/05
X	Horn Antenna	Com-Power	AH-840	101087	2021/06/16	2022/06/15

Note:
1. The equipment are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.

1.9. Measurement Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Items	Measurement Uncertainty (MU)
Occupied Bandwidth	±9475.95Hz
Equivalent Isotopically Radiated Power	±3.73dB
Radiated Spurious Emission	9kHz~30MHz: ±3.89dB。 30MHz - 1GHz: ±4.05dB 1GHz - 18GHz: ±3.73dB 18GHz - 40GHz: ±3.73dB 40GHz - 50GHz: ±3.75dB 50GHz - 325GHz: ±4.39dB
Band Edge	±3.73dB
Frequency Tolerance	±9475.95Hz

1.10. Caculations

1.10.1. E.I.R.P. Caculation

The filed strength (dBuV/m) method have converted to E.I.R.P. test results by the section 5.8.4 of KDB 971168 D01.

Example:

E (dBuV/m) = Measurement amplitude level (dBm) + 107+ Cable Loss (dB) + Antenna Factor (dB/m)

E (dBuV/m) = EIRP (dBm) - 20 log D +104.8

EIRP (dBm) = Measurement result (dBm) + Fact (dB/m) + 107 + 20 log D-104.8

= -10 dBm + 48.13+ 107+ 20log (1m) - 104.8

= -10 dBm + 50.33 dB (50.33 dB= 48.14(Fact (dB/m)) + 107 - 104.8=Correction factor for 1m)

= 40.33dBm

1.10.2. MIMO Power Caculation

According to KDB 662911 D01 and D02, the cross-polarization the two field strengths must be combined as vectors with one oriented at a 90 degree angle with respect to the other. The combined field strength has a magnitude equal to the square root of the sum of the squares of the two field strengths, or, equivalently, the square of the combined field strength is equal to the sum of the squares of the two individual field strengths. Since EIRP and ERP are proportional to the square of the field strength, the combined EIRP or ERP is equal to the sum of the individual EIRPs or ERPs.

Example:

MIMO E.I.R.P = 10 log (linear Value-E.R.I.P $_{\text{H-polarization}}$ + linear E.I.R.P V $_{\text{V-polarization}}$)

= 10 log (100 mW+100 mW)

= 23 dBm

1.10.3. Minimum Measurement Distance Evaluation

According to KDB842590 D01, the all measurements of the fundamental emission, out of band, harmonics and spurious emissions shall be made in the far field of the measurement antenna. The far-field boundary for mmW antennas is greater than or equal to $2D^2/\lambda$ (with D being the largest dimension of the antenna, and λ the wavelength of the emission). When the selected far-field measurement distance is different than the distance at which the applicable limit is specified, a linear inverse distance attenuation factor (20 dB/decade of distance change for field strength) shall be applied.

For fundamental or out-of-band emissions the largest far-field distance of either the EUT antenna or measurement antenna shall be used. For spurious emissions the far-field distance will be based on the measurement antenna.

1. Fundamental & Band edge:

Measurement Frequency Range (GHz)	Antenna Dimension (EUT)			Far filed distance (m)	Measurement Distance (m)
	Length (mm)	Width (mm)	Thick (mm)		
27.5-40	34.1	34.1	3	0.212-0.308	3

2. Spurious emissions

Measurement Frequency Range (GHz)	Measurement Antenna Model	Antenna Dimension (Measurement Antenna)		Far filed distance (m)	Measurement Distance (m)
		Length (mm)	Width (mm)		
18-40	AH-1840	71	56	0.605-1.344	3
40-50	QWH-QPRR00	56.6	43.7	0.854-1.068	2
50-75	RCH015	25	25	0.208-0.313	1
75-110	RCH010	18	18	0.162-0.238	1
90-140	RCH08	14	14	0.118-0.183	1
140-220	RCH05	9	9	0.076-0.119	1

1.11. Overview of results

Requirement – Test item	Basic standard(s)	Result
Occupied Bandwidth	CFR47 CFR Part 2, Clause 2.1049	Pass
Equivalent Isotopically Radiated Power	FCC 47 CFR Part 30, clause 30.202	Pass
Radiated Spurious Emission	CFR47 CFR Part 2, Clause 2.1053 FCC 47 CFR Part 30, clause 30.203	Pass
Band Edge	CFR47 CFR Part 2, Clause 2.1053 FCC 47 CFR Part 30, clause 30.203	Pass
Frequency Tolerance	CFR47 CFR Part 2, Clause 2.1055	Pass

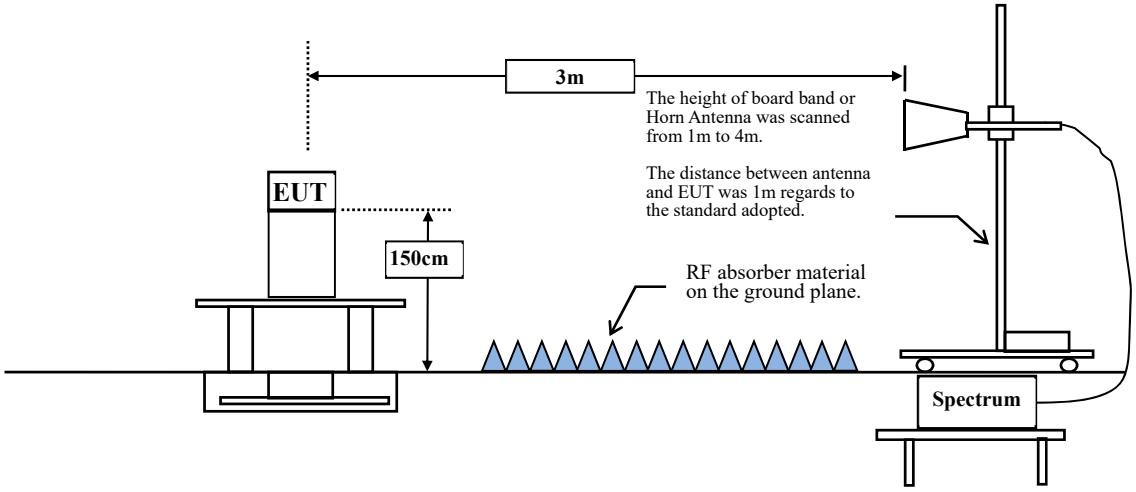
Supplementary information:

1) ANSI 63.26-2015
2) KDB 842590 D01 Upper Microwave Flexible Use Service v01r01
3) KDB 971168 D01 Power Meas License Digital System v03r01
4) KDB 662911 D01 Multiple Transmitter Output v02r01

KDB 662911 D02 MIMO with Cross Polarized Antenna v01

2. Occupied Bandwidth

2.1. Test Setup



2.2. Limits

N/A

2.3. Test Procedure

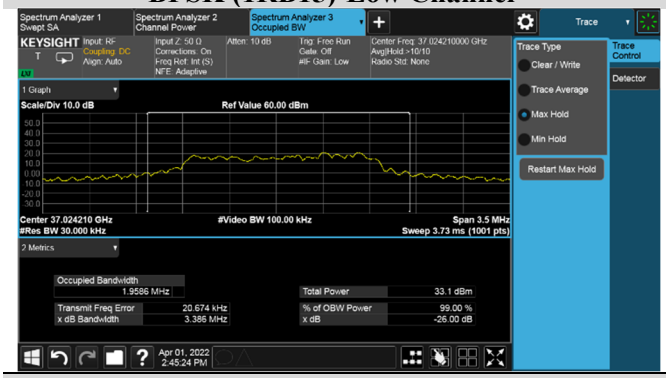
1. The spectrum analyzer center Frequency is set to the nominal EUT channel center Frequency. And the spectrum analyzer used the 99% OBW function for testing.
2. Set (IF filter 3dB) RBW = 1% to 5% of the OBW and the VBW shall be set ≥ 3 × RBW.
3. Set Detector = Peak
4. Set Trace = Max hold
5. Seep = auto couple
6. Set span >=1.5 x OBW
7. Repeat the step 2 to 6 until it would be within 1% to 5% of the 99% OBW

2.4. Test Results

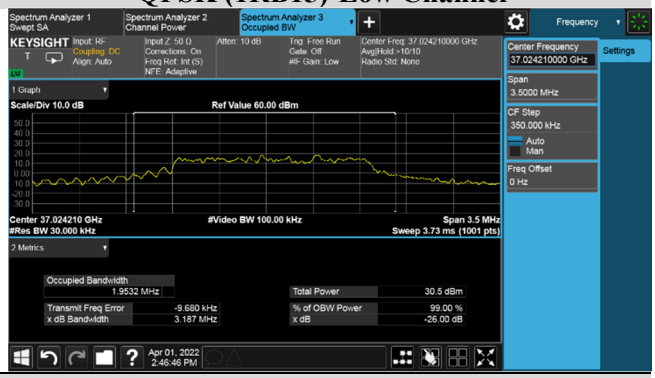
Test Band			n260			
Subcarrier spacing (SCS)			120 kHz			
Bandwidth (MHz)	Component carrier CC	Modulation	Resource block RB	OBW (MHz)		
				Low Channel	Middle Channel	High Channel
50	1	BPSK	1RB15	1.9586	1.9619	1.9629
			10RB11	14.301	14.368	14.411
			30RB0	43.087	43.135	43.018
		QPSK	1RB15	1.9532	1.9513	1.9298
			10RB11	14.406	14.331	14.36
			30RB0	42.886	42.982	43.041
		16QAM	1RB15	1.8496	1.8999	1.8426
			10RB11	14.41	14.374	14.356
			30RB0	43.066	43.262	43.139
		64QAM	1RB15	1.8951	1.9768	1.8136
			10RB11	14.369	14.312	14.329
			30RB0	42.752	42.997	43.159
100	1	BPSK	1RB15	1.9094	1.9644	1.999
			10RB11	28.719	28.738	28.49
			30RB0	91.424	91.302	91.139
		QPSK	1RB15	1.9627	1.9986	1.9331
			10RB11	28.687	28.775	28.698
			30RB0	91.477	91.131	91.377
		16QAM	1RB15	1.897	1.9091	1.9186
			10RB11	28.61	28.608	28.507
			30RB0	91.212	91.258	91.271
		64QAM	1RB15	1.9263	1.8956	1.9029
			10RB11	28.637	28.49	28.643
			30RB0	91.032	91.201	91.307
100	2	BPSK	1RB32	107.65	108.69	107.64
			20RB22	129.38	129.54	129.3
			64RB0	190.11	190.64	190.37
		QPSK	1RB32	107.43	107.94	107.38
			20RB22	129.66	129.65	129.49
			64RB0	190.52	190.53	190.46
		16QAM	1RB32	106.09	106.53	106.53
			20RB22	129.43	129.5	129.38
			64RB0	190.2	190.29	190.11
		64QAM	1RB32	106.65	106.65	106.69
			20RB22	129.49	129.69	129.59
			64RB0	190.38	190.44	189.79

n260-1CC (BW 50MHz)

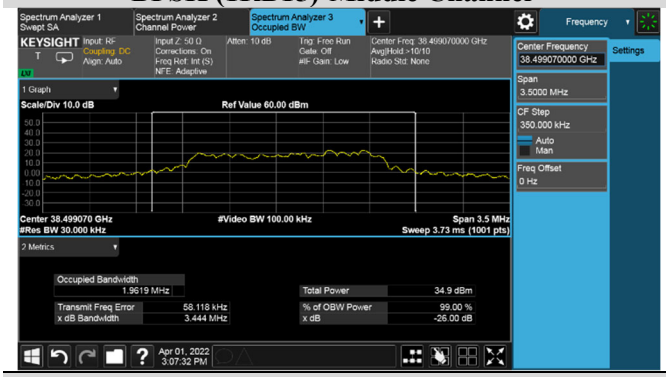
BPSK (1RB15)-Low Channel



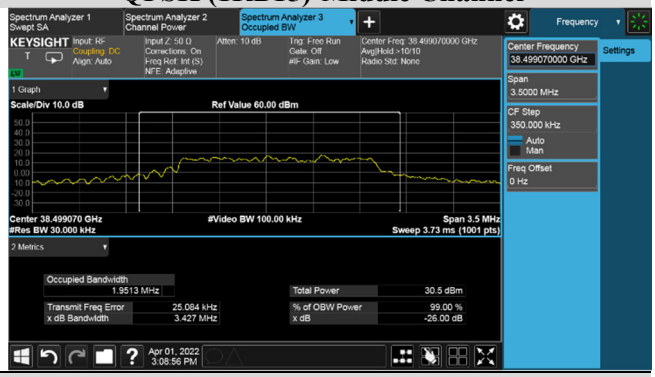
QPSK (1RB15)-Low Channel



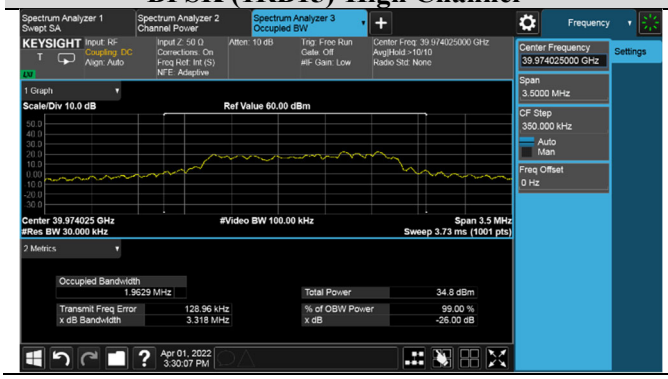
BPSK (1RB15)-Middle Channel



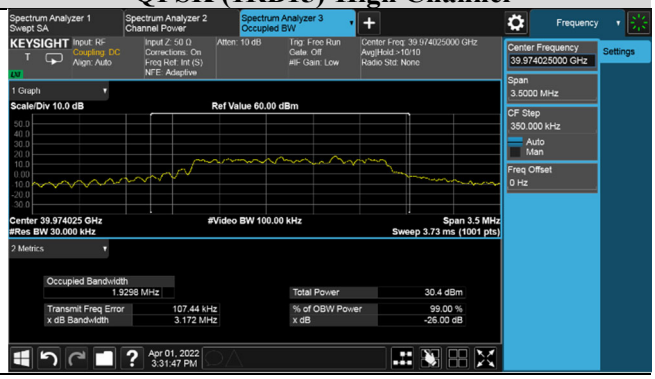
QPSK (1RB15)-Middle Channel



BPSK (1RB15)-High Channel

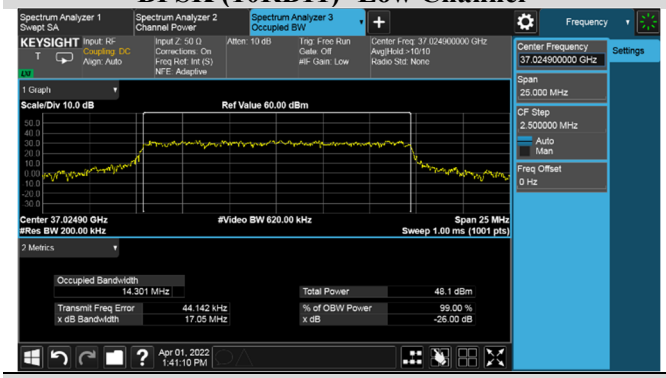


QPSK (1RB15)-High Channel

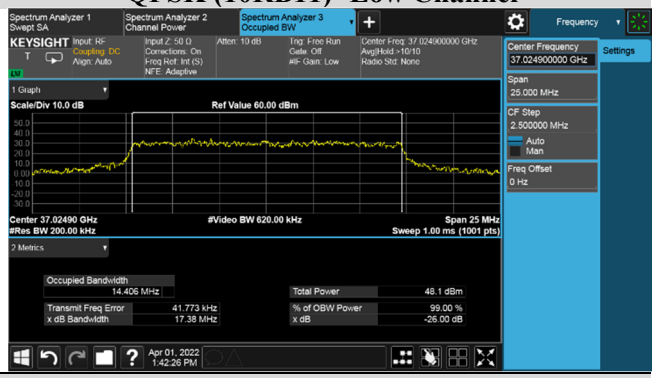


n260-1CC (BW 50MHz)

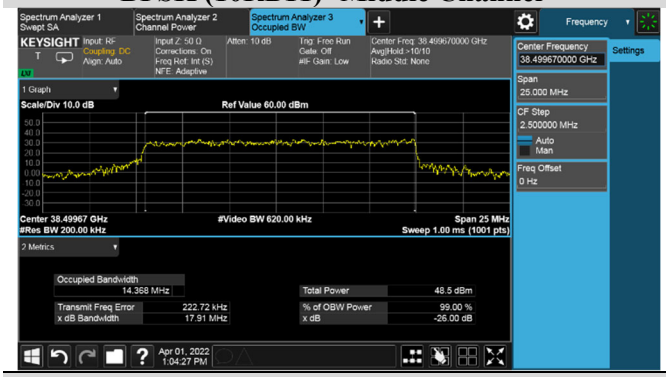
BPSK (10RB11) -Low Channel



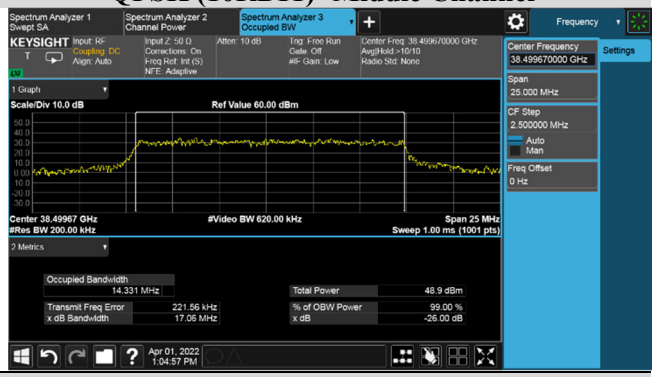
QPSK (10RB11) -Low Channel



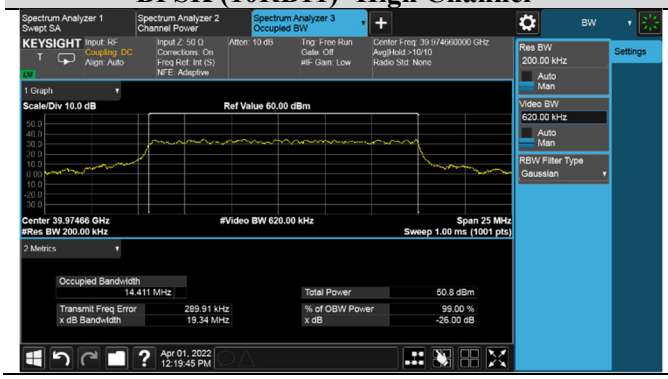
BPSK (10RB11) -Middle Channel



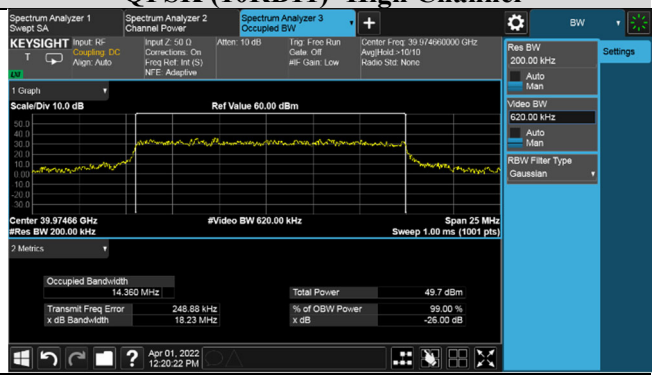
QPSK (10RB11) -Middle Channel



BPSK (10RB11) -High Channel

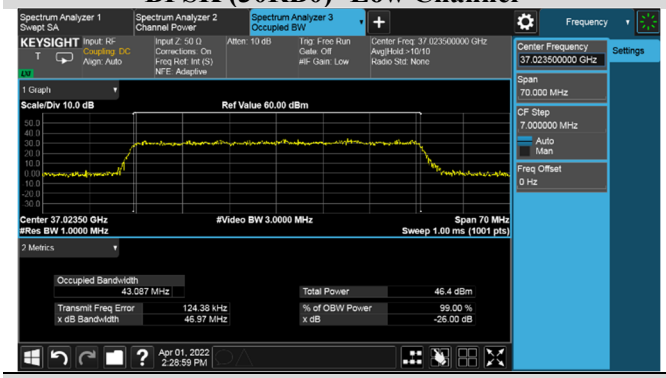


QPSK (10RB11) -High Channel

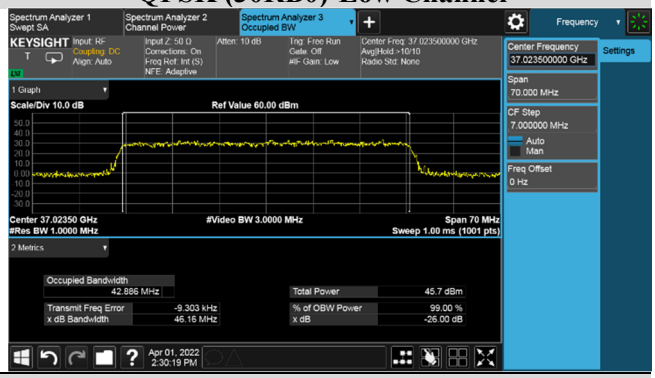


n260-1CC (BW 50MHz)

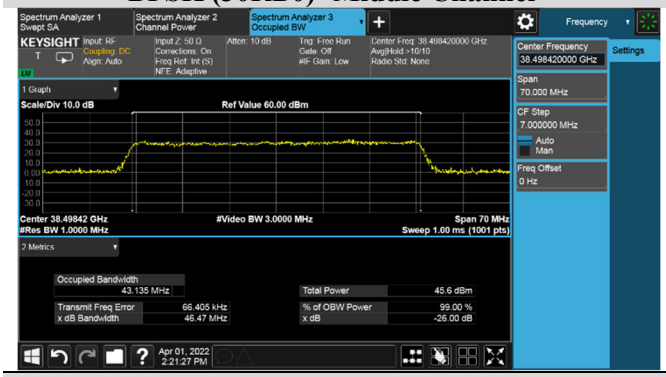
BPSK (30RB0) -Low Channel



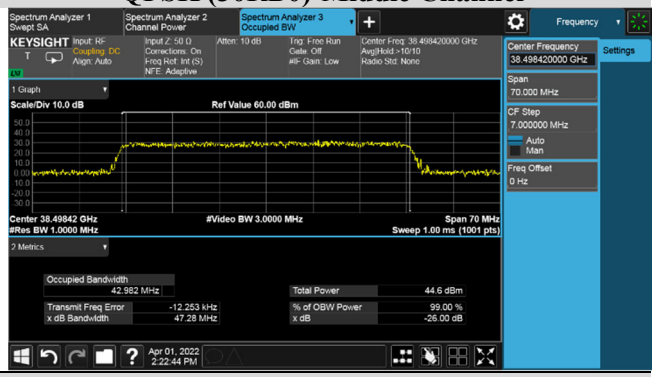
QPSK (30RB0)-Low Channel



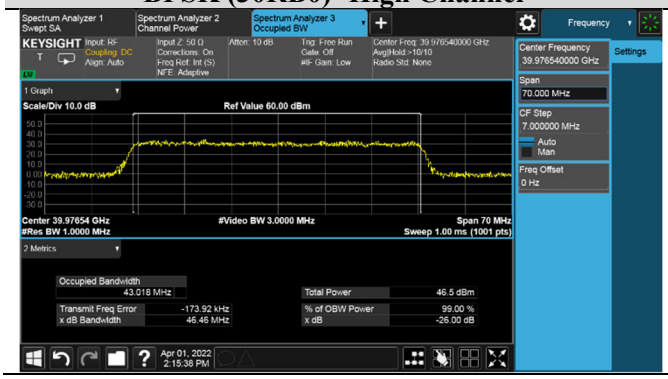
BPSK (30RB0) -Middle Channel



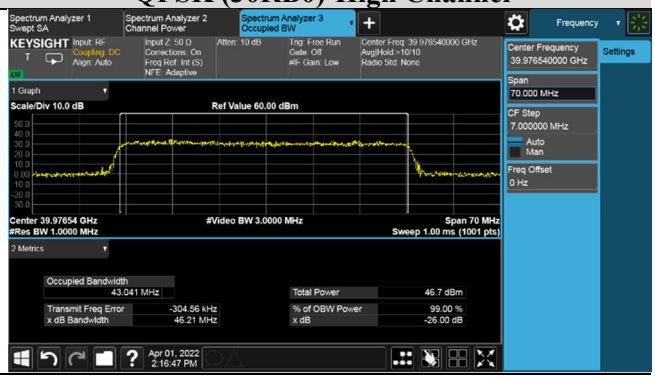
QPSK (30RB0)-Middle Channel



BPSK (30RB0) -High Channel

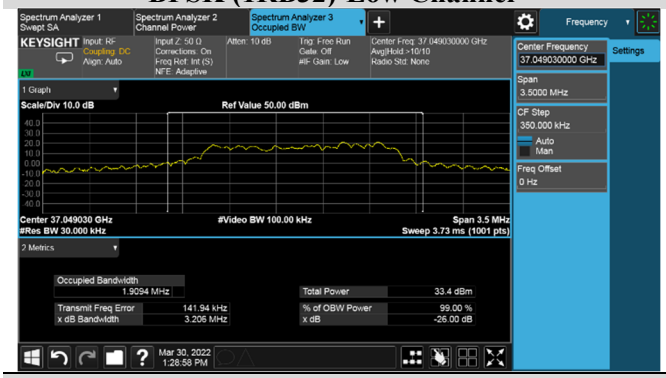


QPSK (30RB0)-High Channel

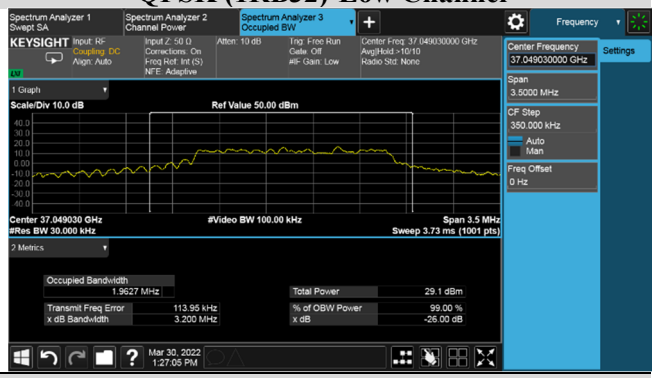


n260-1CC (BW 100MHz)

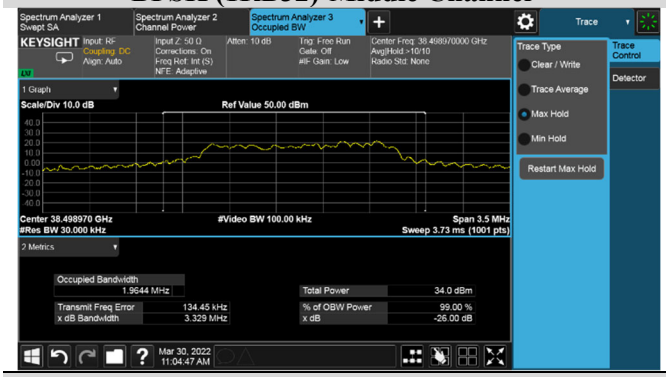
BPSK (1RB32)-Low Channel



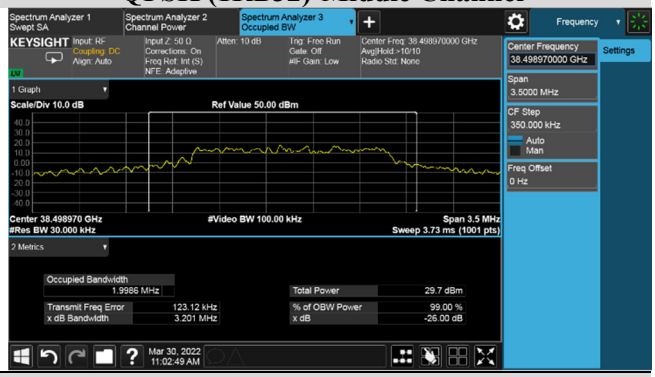
QPSK (1RB32)-Low Channel



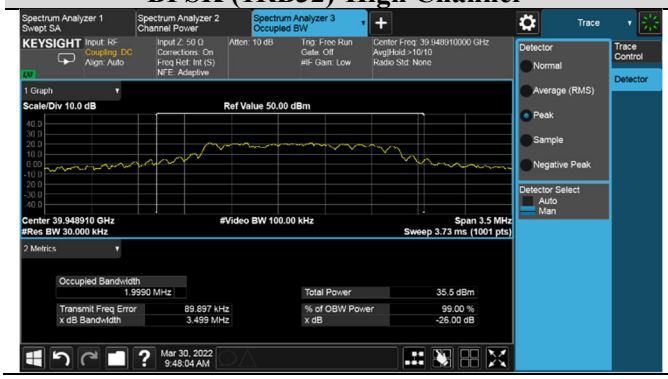
BPSK (1RB32)-Middle Channel



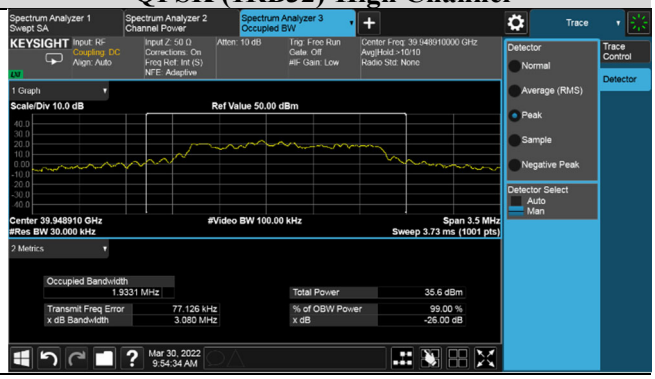
QPSK (1RB32)-Middle Channel



BPSK (1RB32)-High Channel

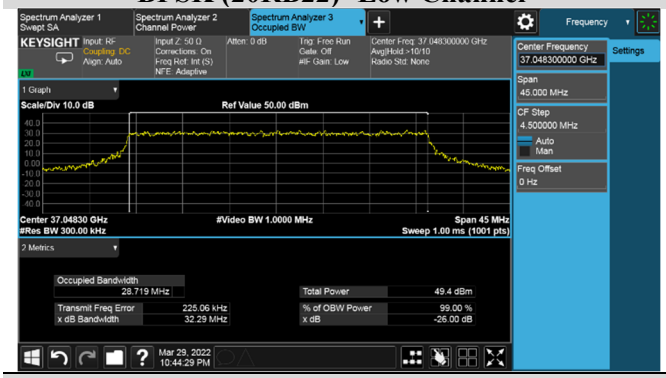


QPSK (1RB32)-High Channel

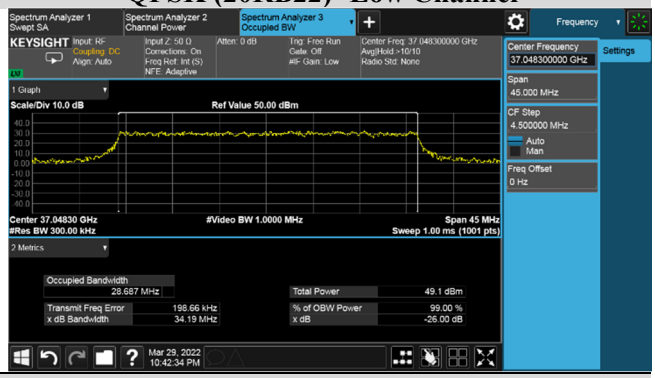


n260-1CC (BW 100MHz)

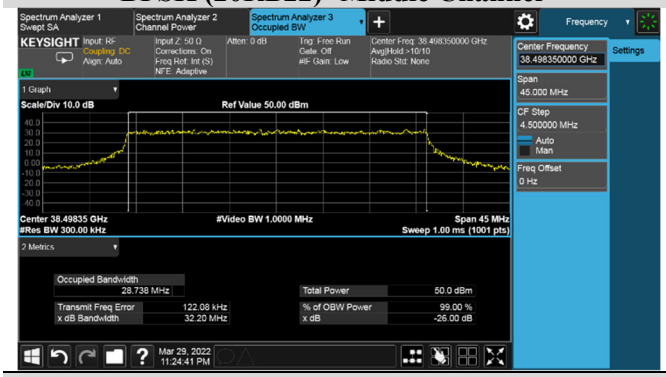
BPSK (20RB22) -Low Channel



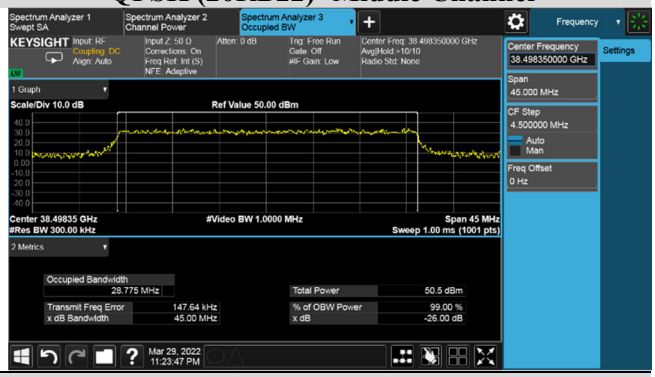
QPSK (20RB22) -Low Channel



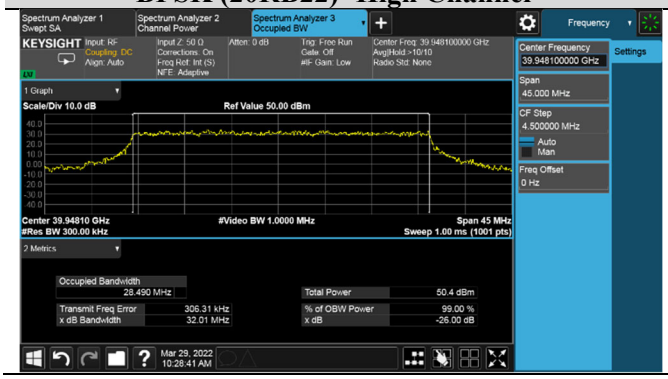
BPSK (20RB22) -Middle Channel



QPSK (20RB22) -Middle Channel



BPSK (20RB22) -High Channel



QPSK (20RB22) -High Channel