

Configure Rohde & Schwarz ZVA Series Network Analyzers for OML Millimeter Wave Frequency Extension Modules

OML millimeter wave frequency extension modules are designed to work with all manufacturers' millimeter wave configurable vector network analyzers. This paper describes Rohde & Schwarz ZVA series vector network analyzers "direct-connect" instrumentation configuration for OML frequency extension modules.

The 4-Port ZVA24 network analyzer used to develop this procedure has the following installed options with firmware version 4.01. Contact manufacturer for the latest minimum options and firmware version required to configure external millimeter converter.

711101 000

Software Option - ZVA-K8 Converter Control

Hardware Option

- ZVAB-B4	- ZVA24-B22
- ZVA24-B32	- ZVA24-B23
- ZVA24-B34	- ZVA24-B24
- ZVA24-B16	- ZVA24-B31
- ZVA24-B21	- ZVA24-B33

OML offers standalone DC power supplies to energize OML frequency extension modules (Contact OML for more details). Otherwise, any good DC power supplies such the ones below will satisfy the DC requirements:

• One +12VDC, 7A, DC power supply (E3632A)

Or

• Two +12VDC, 3A, DC power supplies (U8001A)

OML millimeter wave frequency extension modules are simply "plug 'n' play" after configuring the ZVA network analyzer for millimeter wave measurement.

Hardware Connection

Connect ZVA network analyzer and OML millimeter wave frequency extension modules and DC power supply as shown in Figure 1.





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Instrumentation Configuration

ZVA with firmware version 4.01 is used for capturing the screen displays in this procedure. Different firmware versions may have slightly different displays.

Selecting Frequency Extension Model

- 1. Press "SYSTEM CONFIG" hard key on the front panel under SYSTEM selection section and press "System Config" soft key to access the System Configuration setup table (Figure 2).
- 2. Click on the upper right-hand arrow on the "System Configuration" dialogue display with the mouse until "Frequency Converter" tab appears.

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3. Click on the "Frequency Converter" tab to activate frequency converter configuration setup.

System Configuration	s Frequency Converter	J	atrix Configuration	2 - = × - *
Type: ZVA-Z325	Number of Converters	CO Source	`	System
Converter Setup: ZVA/T SOURCE REF OUT 3,4 IN IN	REF MEAS PORT	Ext. Generator		Config Pasurement Wizard Print Internal Reference External Reference
Port Assignment:	роп 3, 4			GPIB Address
Port# Serial # of Converter Power Cont 1 Unknown • None 2 Unknown • None	rol			Service Function
		Clos	e Help	- More - 1/2



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- 4. Click on the "<u>Type</u>" pull down selection and highlight the frequency extender to be used in the setup with the mouse (Figure 3).
- 5. Click on the "<u>Number of Converters</u>" pull down selection and select the number of converter attached to the vector network analyzer, if different from two (2).
- 6. Click the "<u>Apply</u>" tab to activate configuration and the "<u>Close</u>" tab to close the system configuration dialogue display.

(Note: ZVA-Z110, ZVA-Z170, ZVA-Z220 & ZVA-Z90 use the same RF & LO multiplication factor as OML V10VNA2-T/R, V06VNA2-T/R, V05VNA2-T/R & V12VNA2R-T/R frequency extenders. There is no need to modify the "Port Configuration" setup for these four Bands. See "OML and ZVA Model Cross Reference Table" at the end of this paper.)



Figure 3 – System Configuration Table with Freq. Extender Model Numbers

Modify Factory Installed Model Multiplication Factors

Check "OML and ZVA Model Number Cross Reference Table" for OML models that require either LO and/or RF multiplication factor modification.

LO Multiplication Factor – WR15 Frequency Band Example

7. Press the "MODE" hard key on the front panel under CHANNEL selection section and press the "Port Config" soft key to access to the Port Configuration setup table (Figure 4).

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	- 47 - 37							Scalar Mixer Meas Harmonics •	
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		Port 1 Converter Port 1 Port 2 Converter Port 2 Port 3		1 / 6 · fb fb <u>1 / 6 · fb</u> fb 1 / 6 · fb - 1 / 6 · 279 MHz	··· ··· ···	8.33333333333 GHz 12.5 GHz 50 GHz 75 GHz 8.333333333 GHz 12.5 GHz 8.333333333 GHz 12.5 GHz 8.286833333 GHz 12.4535 GHz	VdBm + 7 dB Varies 0 dBm + 7 dB varies 0 dBm + 7 dB	7 dBm 279 M varies 7 dBm 279 M varies 7 dBm 279 M	
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Figure 4 – Port Configuration Table with Preset Multiplication Factors

8. Click on the cell under frequency column next to Port 3 with a check mark to change the LO multiplication factor 1/6 fb – 1/6 279MHz.

Release Date: 03-2021

9. Use the up/down arrow key or the **DATA ENTRY** key pad to change the multiplication factor from 6 to 5 in both cells. This will automatically change Port 4 Source Frequency multiplication factor (Figure 5).

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		Port 2		1/6·fb		8.333333333 GHz 12.5 GHz	0 dBm + 7 dB 🛄	7 dBm	279 M
		Converter Port 2		fb		50 GHz 75 GHz	varies	varies	
		Port 3		1 / 6 · fb - 1 / 6 · 279 MHz		8.286833333 GHz 12.4535 GHz	0 dBm + 7 dB 🛄	7 dBm	279 M
		Port 4		1 / 6 · fb - 1 / 6 · 279 MHz		8.286833333 GHz 12.4535 GHz	0 dBm + 7 dB 🛄	7 dBm	279 M
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	Displ	ayed Columns Stimulus		Balanced Ports and P	ort (e at ,	Groups Measure Source Receiver Free Source Free	Port Waves at equency uency	Freq Cor	i∨ Off
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Figure 5 – Modifying LO Port Multiplication Factor in Configuration Table

10.Press "<u>OK</u>" to accept the new LO multiplication factor for port 3 and port 4 (Figure 6).

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Figure 6 – New LO Port Multiplication Factor in Configuration Table



RF Multiplication Factor – WR15 Frequency Band Example

- 11.Click on the cell under frequency column next to Port 1 without a check mark to change the RF multiplication factor 1/6 fb (Figure 7).
- 12.Change the multiplication factor from 6 to 4 using the up/down arrow or use the **DATA ENTRY** keypad.

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			Port 2			1/6·fb			8.3333	33333 G	iHz 12.5 GHz	0 dBm + 7 dB		7 dBm	279 MHz
		Converter	Port 2			fb				50	GHz 75 GHz	varies		varies	fb
			Port 3		1/5·fb	p-1/5·27	9 MHz		9.94	42 GHz	14.9442 GHz	0 dBm + 7 dB		7 dBm	279 MHz
			Port 4		1/5·fb	o-1/5·27	9 MHz		9.94	42 GHz	14.9442 GHz	0 dBm + 7 dB		7 dBm	279 MHz
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Figure 7 – Configured RF Port 1 Multiplication Factor in Configuration Table

- 13.Press "<u>OK</u>" to accept the new RF multiplication factor for port 1.
- 14.Click on the cell under frequency column next to Port 2 without a check mark to change the RF multiplication factor 1/6 fb (Figure 8).
- 15.Change the multiplication factor from 6 to 4 using the up/down arrow or use the **DATA ENTRY** keypad.

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Figure 8 – Configured RF Port 2 Multiplication Factor in Configuration Table



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															Port Config
	- 55														Scalar Mixer Meas
	40														Harmonics)
P	ort Cor	figuration													
	Meas	Physical Port	Sour	се			N	Jow V	VR1	5 RF	' Po	rts Mi	ılti	nlicatio	n Respiresr
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		Port 4		1/5·fb)-1/5-2	279 MHz		9 ,9442 G	iHz 1	4.9442 GI	Hz O d	IBm + 7 dE	3	7 dBr	n 279 MHz 🛄
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16.Press "<u>OK</u>" to accept the new RF multiplication factor for port 2 (Figure 9).

Figure 9 – Completed Modification of RF & LO Multiplication Factor

17.Press "<u>OK</u>" to exit "<u>Port Configuration</u>" setup table.



Modify Factory Port 1, 2, 3 & 4 Output Power

ZVA series network analyzers default all four VNA ports output power to +7dBm in the millimeter wave "direct-connect" configuration. The procedure below shows the steps necessary to increase the port power to +10 dBm to insure adequate RF power level is delivered to OML RF & LO input power, if needed.

- 1. Press the "**MODE**" hard key on the front panel under <u>**CHANNEL**</u> selection section and press the "<u>Port Config</u>" soft key to access to the Port Configuration setup table.
- Click on the cell located along "Port 1" row and under "Power" column 0 dBm + 7 dB (Figure 10).

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	#	Ger	Frequency		Frequency Result Power Power Result Frequency
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	Converter Port 1		fb		50 GHz 75 GHz varies varies fb
7	Port 2		1 / 4 · fb		12.5 GHz 18.75 GHz 0 dBm + 7 dB 7 dBm 279 MHz
	Converter Port 2		fb		50 GHz 75 GHz varies varies fb
	Port 3		1 / 5 · fb - 1 / 5 · 279 MHz		9.9442 GHz 14.9442 GHz 0 dBm + 7 dB 7 dBm 279 MHz
	Port 4		1 / 5 · fb - 1 / 5 · 279 MHz		9.9442 GHz 14.9442 GHz 0 dBm + 7 dB 🔨 7 dBm 279 MHz
(5
					Measure Source Port Waves at
Displ	ayed Columns	J	Balanced Ports and P	ort (Groups
		η,	_		O Source Frequency
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- 3. Click on the "<u>Port Power Offset</u>" tab and change the <u>7 dB</u> to <u>10 dB</u> using either the up/down arrow or the **DATA ENTRY** keypad.
- 4. Press "<u>OK</u>" to accept the change to the port power.
- 5. Repeat steps 2, 3 and 4 for Port 2, Port 3 & Port 4 row and "Power" column 0 dBm + 7 dB (Figure 11).

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		Converter Port 1		fb			50 GHz 7	5 GHz	varies		varies	fb
		Port 2		1/4·fb		12.	5 GHz 18.7	5 GHz	0 dBm + 10 dB		10 dBm	279 MHz
		Converter Port 2		fb			50 GHz 7	5 GHz	varies		varies	fb
		Port 3		1/5·fb-1/5·2/9 MH	z	9.9442 (GHz 14.944	2 GHz	0 dBm + 10 dB		10 dBm	279 MHz
		Port 4		1/5-10-1/5-2/9 MH	z	9.9442 (äHz 14.944	2 GHz	0 dBm + 10 dB		10 dBm	279 MHz
	<											>
	Displayed Columns Balanced Ports and Port Groups Stimulus Same Connector Type at All Ports											
				Same Gender at All F	Ports			OI		Canc	el	Help

Figure 11 – Completed Port Power Configuration

6. Press "<u>OK</u>" to exit Port Power Configuration.



OML and ZVA Model Number Cross Reference

	RF	LO		RF	LO
OML Model #	xN	xN	R&S Model #	xN	xN
V10VNA2-T/R	<u>6</u>	8	ZVA-Z110	<u>6</u>	8
V08VNA2-T/R	8	8	ZVA-Z140	12	8
V06VNA2-T/R	<u>12</u>	<u>10</u>	ZVA-Z170	<u>12</u>	<u>10</u>
V05VNA2-T/R	<u>12</u>	<u>12</u>	ZVA-Z220	<u>12</u>	<u>12</u>
V03VNA2-T/R	<u>18</u>	18	ZVA-Z325	<u>18</u>	16
V02.2VNA2-T/R	<u>30</u>	28	ZVA-Z500	<u>30</u>	24
V15VNA2-T/R	4	5	711 775	6	6
V15VNA2R-T/R	4	<u>6</u>	L V A - L / J	0	<u>U</u>
V12VNA2-T/R	<u>6</u>	5	71/4 700	6	6
V12VNA2R-T/R	<u>6</u>	6	L v A-290	<u>U</u>	<u>U</u>

Table 1 – OML & ZVA Model Number Cross Reference Table

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