



Quick-Start Guide Swept Spectrometer[®] Model 4650

Measure IL, PDL and ORL with the Model 4650 and an External Laser

This Quick-Start Guide will enable you to make basic measurements with the dBm Optics Swept Spectrometer[®] (Model 4650). This Quick-Start Guide is not meant to replace the in-depth information contained in the full manual. There are many functions and features that are not covered in this Quick-Start Guide. For example, in the full manual you will find information for analog and digital filtering, ranges and averaging—all of which can improve measurement quality. In addition, there are many useful tools available on the Swept Spectrometer[®] that will greatly enhance the analysis of a device's performance; tools such as additional traces and display options. These are explained in the full operating manual.

We have written this guide based on a relatively complex system with an external laser. If your system is configured with an internal laser, much of the set up will be simpler. If your system is configured with an internal laser, please recognize that some of the instructions may not apply to your system.

If you have additional questions, please contact Applications Engineering at 303-464-1919 or by email at applications@dbmoptics.com.

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Connections

	Model 4650 with Internal Polarization Controller and GPIB-connected TLS	Model 4650 with 8169A External Polarization Controller and GPIB-connected TLS
	<p>For accurate IL and PDL measurements, it is critical for the optical connections to be clean. To ensure clean connections, visually inspect every connector before connection. For example, dirty or scratched optical connectors can easily add 0.2 dB IL and 0.08 dB PDL (or more).</p>	
1) Electrical Connections	<ul style="list-style-type: none"> A) Power to all instruments B) Trigger cable from TLS trigger out to Model 4650 IN 1 C) GPIB cable from the rear panel of the Model 4650's GPIB EXT. DEVICE CONTROLLER to TLS 	<ul style="list-style-type: none"> A) Power to all instruments B) Trigger cable from TLS trigger out to Model 4650 IN 1 C) GPIB cable from the rear panel of the Model 4650's GPIB EXT. DEVICE CONTROLLER to TLS and to polarization controller
2) Optical Connections	<ul style="list-style-type: none"> A) TLS to TLS IN on Model 4650 using slow axis aligned PM fiber B) SM patch cord from TO DUT to Channel 1 	<ul style="list-style-type: none"> A) SM patch cord from TLS to polarization controller B) SM patch cord from polarization controller to TLS IN C) SM patch cord from TO DUT to Channel 1

Prior to Measurement	Model 4650 with Internal Polarization Controller and GPIB-connected TLS	Model 4650 with 8169A External Polarization Controller and GPIB-connected TLS
1) Set TLS	<p>A) Press the MENU button until the Main Menu is displayed</p> <p>B) Press the SWEEP SETTINGS touchscreen button</p> <p>C) Press the TLS A SETUP touchscreen button</p> <p>D) Press the TLS WIZARD touchscreen button</p> <p>E) Select the radio button next to the appropriate manufacturer or next to AUTO DETECT</p> <p>F) Press the NEXT touchscreen button</p> <p>G) Enter the laser's GPIB address</p> <p>H) Press the NEXT touchscreen button</p> <p>I) The Model 4650 will find the TLS, display the model, and set minimum and maximum wavelengths. Set TLS output on and power as desired (often at maximum).</p> <p>J) Toggle TLS output to on (the first time you turn on the laser it will ask you for a password)</p> <p>K) Enter the password (the default password is 1234)</p> <p>L) Toggle TLS output to on if necessary</p>	
2) Set Sweep Parameters	<p>A) Press the MENU button until the Main Menu is displayed</p> <p>B) Press the SWEEP SETTINGS touchscreen button</p> <p>C) Press WL SWEEP MODE touchscreen button</p> <p>D) Enter START WAVELENGTH (1525 nm typical)</p> <p>E) Enter STOP WAVELENGTH (1620 nm typical)</p> <p>F) Enter SWEEP RATE (40 nm/second works for most lasers)</p> <p>G) Enter READING SPACING (0.010 nm typical)</p> <p>H) Toggle the START TRIGGER touchscreen button until EXTTRIG is selected</p> <p>I) All other settings to default</p>	
3) Set Measurement Ranges	<p>A) Press the MENU button until the Main Menu is displayed</p> <p>B) Press the CONFIGURE CHANNELS touchscreen button</p> <p>C) Select traces, options, filtering and ranges by making the appropriate selections. Use the slider bar to see all available options.</p>	
4) Perform Dark Current Calibration	<p>A) Press the MENU button until the Main Menu is displayed</p> <p>B) Press the REL/ZERO & UNITS SETTINGS touchscreen button</p> <p>C) Press DO DARK CALIBRATION TOUCHSCREEN BUTTON</p>	
5) Specify Polarization Controller	<p>A) Press the MENU button until the Main Menu is displayed</p> <p>B) Press the SPECIAL MEASUREMENT SETUP touchscreen button</p> <p>C) Press the PDL MEASUREMENT touchscreen button</p> <p>D) Toggle the PDL CONTROL touchscreen button until INTERNAL is selected</p>	<p>A) Press the MENU button until the Main Menu is displayed</p> <p>B) Press the SPECIAL MEASUREMENT SETUP touchscreen button</p> <p>C) Press the PDL MEASUREMENT touchscreen button</p> <p>D) Toggle the PDL CONTROL touchscreen button until 8169 is selected</p> <p>E) Make sure the Pol Controller GPIB address is correct</p> <p>F) Press the MAXIMUM POWER THROUGH POLARIZER touchscreen button</p>

Measurements

	Model 4650 with Internal Polarization Controller and GPIB-connected TLS	Model 4650 with 8169A External Polarization Controller and GPIB-connected TLS
1. Measure IL	<p>A) Optically connect TO DUT to the device under test and connect output of DUT to Channel 1 and/or Channel 2</p> <p>B) Specify dB mode by pressing the MENU button until the Main Menu appears; press the REL/ZERO & UNITS SETTING touchscreen button; toggle the UNITS touchscreen button until dB is displayed</p> <p>C) Press the SWEEP START/STOP button to initiate sweep. Accurate IL data should now be displayed.</p>	
2. Measure IL and PDL	<p>A) Perform all steps under 1 above</p> <p>B) Make sure that a PDL trace is added for each channel on which you want to measure PDL. To do this, press the MENU button until the Main Menu is displayed, then:</p> <ol style="list-style-type: none"> 1) Press the CONFIGURE CHANNELS touchscreen button 2) Use the slider bar to position the options so you can see PDL TRACE 3) Select ON or OFF in the PDL TRACE row under each channel 4) Set the supplemental traces to the desired settings. Supplemental traces are listed below the PDL TRACE row and include PDCW, PDBW and TETM <p>C) Press the START/STOP button to initiate sweep. Accurate IL and PDL data should now be displayed.</p>	
3. Measure IL, PDL, and ORL	<p>A) Perform all steps under 1 above</p> <p>B) Perform all steps under 2 above</p> <p>C) Turn on ORL Option:</p> <ol style="list-style-type: none"> 1) Press the MENU button until the Main Menu is displayed 2) Press the SPECIAL MEASURE SETUP touchscreen button 3) Press the ORL MEASUREMENT touchscreen button 4) Toggle the ORL touchscreen button until ON is selected <p>D) Press the START/STOP button to initiate sweep. Accurate IL, PDL and ORL data should now be displayed. An ORL calibration may need to be performed (see next page).</p>	

Additional Corrections	Model 4650 with Internal Polarization Controller and GPIB-connected TLS	Model 4650 with 8169A External Polarization Controller and GPIB-connected TLS
<p>Splitter Cal (SplitCal)</p>	<p>Perform a new Splitter Cal reference (SplitCal) if you use a different set of patch cords to connect the DUT to the instrument and/or it has been some time since the last SplitCal. We have developed a Wizard to step you through this process. You only need to configure the measurement prior to starting the Wizard.</p> <p>To perform a new Splitter Cal (SplitCal):</p> <ol style="list-style-type: none"> A) Set up a continuous wavelength sweep using the maximum wavelength range that will be used (see #2 under “Prior to Measurement” in this guide) B) Press the MENU button until the Main Menu is displayed C) Press the REL/ZERO & UNITS SETTINGS touchscreen button D) Press the PERFORM ”SPLITTER CAL” SCALAR CALIBRATION touchscreen button E) Clear channel SplitCal data. This can be accomplished two ways. <ol style="list-style-type: none"> 1) To clear an individual channel: <ol style="list-style-type: none"> i) Verify that the used channel for the SplitCal is the channel you want to clear ii) Press clear active channel split cal data 2) Clear all the channels by pressing the CLEAR ALL SPLITCAL DATA touchscreen button 3) Start the Wizard by pressing the ADD SPLITCAL SCAN touchscreen button 4) Follow the instructions on the screen. <p>If very high accuracy is required on channel 2, repeat these steps.</p>	
<p>PDL Reference Set: Using 4- or 6-state Vector Reference for PDL</p>	<p>Perform a PDL Reference Set if you are trying to measure very low values of PDL, very high accuracies of PDL (< 0.05 dB), or if you are using additional optics to deliver light from the TO DUT output to the DUT that have significant PDL values that need to be corrected for. We have developed a Wizard to step you through this process. You only need to configure the measurement prior to starting the Wizard. Follow these steps to perform a PDL Reference Set:</p> <ol style="list-style-type: none"> A) To configure the measurement, select the number of pol states that you require. <ol style="list-style-type: none"> 1) Press the MENU button until the Main Menu is displayed 2) Press the SPECIAL MEASURE SETUP touchscreen button 3) Press the PDL MEASUREMENT touchscreen button 4) Toggle the NUMBER OF STATES touchscreen button to 4 or 6 B) Start the Wizard <ol style="list-style-type: none"> 1) Press the MENU button until the Main Menu is displayed 2) Press the REL/ZERO & UNITS SETTING touchscreen button 3) Press the PERFORM ”PDL REF SET” VECTOR CALIBRATION touchscreen button 4) Follow the instructions on the screen 	

Additional Corrections	Model 4650 with Internal Polarization Controller and GPIB-connected TLS	Model 4650 with 8169A External Polarization Controller and GPIB-connected TLS
Using Both SplitCal and PDL Reference Set	<p>A) Perform PDL Ref set first on Channel 1</p> <p>B) Perform Splitter Cal on Channel 2. Make sure measurements are using PDL Ref Set.</p> <p>NOTE: No SplitCal for Channel 1. The PDL Ref set will act as the SplitCal for Channel 1.</p>	
Recalibrate and Use ORL Reference Data	<p>Perform this step if the ORL option is not available or if the ORL reference data obtained is not accurate. There are two steps to recalibrating ORL reference data: 1) calibrating zero light level data and 2) calibrating gain data. We have developed a Wizard to step you through the process.</p> <p>NOTE: Make sure that the sweep settings are set to desired wavelength and speed for upcoming ORL trace. Make sure that the measurement range is set to the appropriate level for ORL (usually -30 to -84 dBm).</p> <p>NOTE: Depending on software version, power mode may need to be set to dB. To do this, press the menu; press Rel/Zero & Units Setting; toggle units to select dB.</p> <p>A) <u>Step 1: Calibrate Zero Light Level Data</u></p> <ol style="list-style-type: none"> 1) Press the MENU button until the Main Menu is displayed 2) Press the SPECIAL MEASURE SETUP touchscreen button 3) Press the ORL MEASUREMENT touchscreen button 4) Press the EDIT/VIEW ORL ZERO REF DATA touchscreen button 5) Follow the instructions on the screen <p>B) <u>Step 2: Calibrate Gain Data</u></p> <ol style="list-style-type: none"> 1) Press the EDIT/VIEW ORL ZERO REF DATA touchscreen button 2) Follow the instructions on the screen 	

Additional Corrections	Model 4650 with Internal Polarization Controller and GPIB-connected TLS	Model 4650 with 8169A External Polarization Controller and GPIB-connected TLS
Maximize Power Through Polarizer	N/A	<p>Maximize power through polarizer if power through the polarization controller is low. To determine if power is low, look at the power on the reference channel (Pref). If the power on Pref is more than 8 dB below the TLS output, perform a new maximize. To maximize power through the polarizer:</p> <ul style="list-style-type: none"> A) Press the MENU button B) Press SPECIAL MEASUREMENT SETUP C) PRESS PDL MEASUREMENT D) Press MAXIMIZE POWER THROUGH POLARIZER
Dark Current Calibration	<p>Dark current calibration should be performed if dynamic range is being limited by noise floor on channel cards. Dark current calibration should be performed regularly if deep measurements are being made or if values of ORL greater than 40-50 dB are being measured. To perform dark current calibration:</p> <ul style="list-style-type: none"> A) Press the MENU button until the Main Menu appears B) Press REL/ZERO & UNITS SETTINGS C) Press DO DARK CALIBRATION 	



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