



## Component Spectrum Analyzer<sup>®</sup> (CSA) Quick-Start Guide

This Quick-Start Guide will enable you to make basic measurements with the dBm Optics Component Spectrum Analyzer<sup>®</sup> (CSA). This Quick-Start Guide is not meant to replace the in-depth information contained in the full Component Spectrum Analyzer<sup>®</sup> (CSA) manual. There are many functions and features that are completely ignored 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 CSA that will greatly enhance the analysis of a device's performance; tools such as additional traces, markers functions, applications and display options to name a few. These are explained in the full operating manual. Review the complete manual in detail to understand not only the procedural steps necessary to perform the various measurements, but to understand the applications and theories behind the measurements as well.

If you have additional questions, please contact Applications Engineering at 303-464-1919 or by email at [applications@dbmoptics.com](mailto:applications@dbmoptics.com).

## Using the CSA to Measure IL, PDL and ORL

	<b>CSA with Internal Polarization Controller and GPIB-connected TLS</b>	<b>CSA with 8169A External Polarization Controller and GPIB-connected TLS</b>
<b>Connections</b>	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).	
<b>1) Electrical Connections</b>	<ul style="list-style-type: none"> <li><b>A)</b> Power to all instruments</li> <li><b>B)</b> Trigger cable from TLS trigger out to CSA measurement start</li> <li><b>C)</b> GPIB cable from the rear panel of the CSA's <b>GPIB EXT. DEVICE CONTROLLER</b> to TLS</li> </ul>	<ul style="list-style-type: none"> <li><b>A)</b> Power to all instruments</li> <li><b>B)</b> Trigger cable from TLS trigger out to CSA measurement start</li> <li><b>C)</b> GPIB cable from the rear panel of the CSA's <b>GPIB EXT. DEVICE CONTROLLER</b> to TLS and to polarization controller</li> </ul>
<b>2) Optical Connections</b>	<ul style="list-style-type: none"> <li><b>A)</b> TLS to <b>TLS IN</b> on CSA using slow axis aligned PM fiber</li> <li><b>B)</b> SM patch cord from Pref to Channel 5 on CSA</li> <li><b>C)</b> (If using WaveRef I Model 401) SM patch cord to Wavelength Reference on CSA</li> <li><b>D)</b> SM patch cord from <b>TO DUT</b> to Channel 1</li> </ul>	<ul style="list-style-type: none"> <li><b>A)</b> TLS to polarization controller</li> <li><b>B)</b> Polarization controller to <b>TLS IN</b> on CSA</li> <li><b>C)</b> SM patch cord to Pref on CSA</li> <li><b>D)</b> SM patch cord to wavelength reference on CSA</li> <li><b>E)</b> SM patch cord from <b>TO DUT</b> to Channel 1</li> </ul>

	CSA with Internal Polarization Controller and GPIB-connected TLS	CSA with 8169A External Polarization Controller and GPIB-connected TLS
<b>Prior to Measurement</b>		
<b>1) Set TLS</b>	<p>A) Press the <b>SWEEP</b> button</p> <p>B) Verify that <b>CONTINUOUS</b> is selected under <b>SWEEP MODE</b></p> <p>C) Press <b>MORE...</b></p> <p>D) Press <b>TLS SETUP</b></p> <p>E) Press <b>TLS A SETUP...</b>; set GPIB address to match TLS</p> <p>F) Press <b>SELECT TLS A</b>. The CSA 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>	
<b>2) Set Sweep Parameters</b>	<p>A) Press the <b>SWEEP</b> button</p> <p>B) Enter <b>START WAVELENGTH</b> (1525 nm typical)</p> <p>C) Enter <b>STOP WAVELENGTH</b> (1620 nm typical)</p> <p>D) Enter <b>SWEEP RATE</b> (New Focus or dBm Optics TLS to 100 nm/second; Agilent TLS to fastest valid sweep rate)</p> <p>E) Enter <b>READING SPACING</b> (0.010 nm typical)</p> <p>F) Toggle the <b>START</b> option to <b>TRIGGER</b></p> <p>G) All other settings to default</p>	
<b>3) Set Measurement Ranges</b>	<p>A) Press the <b>CHANNELS</b> button</p> <p>B) Press <b>EDIT CHANNELS...</b> and look at the measurement ranges to verify that the desired ranges are selected for each channel. If you are not sure of the appropriate ranges to use:</p> <p>i) Press <b>SELECT/DESELECT ALL CHANNELS</b></p> <p>ii) Press <b>AUTO-SET SELECTED CHANNELS MEASUREMENT RANGE</b></p> <p>C) Run a sweep by pressing the <b>START/STOP</b> button. Ensure data looks appropriate.</p>	
<b>4) Perform Dark Current Calibration</b>	<p>A) Press the <b>CHANNELS</b> button</p> <p>B) Press <b>DO DARK CURRENT ZERO</b></p>	
<b>5) Specify Polarization Controller</b>	<p>A) Press the <b>APPS</b> button</p> <p>B) Press <b>PDL MEASUREMENT SETUP...</b></p> <p>C) Press <b>SETUP...</b></p> <p>D) Toggle <b>CONTROL MODE</b> until <b>INTERNAL</b> is selected</p>	<p>A) Press the <b>APPS</b> button</p> <p>B) Press <b>PDL MEASUREMENT SETUP...</b></p> <p>C) Press <b>SETUP...</b></p> <p>D) Toggle <b>CONTROL MODE</b> until <b>8169A</b> is selected</p>
<b>6) Verify CSA Communicates with Polarization Controller</b>	N/A	<p>A) Press the <b>APPS</b> button</p> <p>B) Press <b>PDL MEASUREMENT SETUP...</b></p> <p>C) Press <b>MAXIMIZE POWER THROUGH POLARIZER</b>. If polarization controller does not respond, check GPIB address (steps below) and try again.</p> <p>i) Press the <b>SYSTEM</b> button</p> <p>ii) Press <b>COMMUNICATIONS SETUP...</b></p> <p>iii) Press <b>GPIB CONTROL SETUP...</b></p> <p>iv) Enter value in <b>POL. CONTROLLER GPIB ADDRESS</b></p>

	<b>CSA with Internal Polarization Controller and GPIB-connected TLS</b>	<b>CSA with 8169A External Polarization Controller and GPIB-connected TLS</b>
<b>Measurements</b>		
<b>1. Measure IL</b>	<p><b>A)</b> Optically connect <b>TO DUT</b> to the device under test and connect output of DUT to Channel 1 through Channel N.</p> <p><b>B)</b> Specify dB mode by pressing the <b>CHANNELS</b> button and selecting <b>dB</b> under <b>POWER MODE</b>.</p> <p><b>C)</b> Press the <b>START/STOP</b> button to initiate sweep. Accurate IL data should now be displayed.</p>	
<b>2. Measure IL and PDL</b>	<p><b>A)</b> Perform all steps under 1 above.</p> <p><b>B)</b> Make sure that a PDL trace is added for each channel on which you want to measure PDL. To do this:</p> <ul style="list-style-type: none"> <li><b>i)</b> Press the <b>CHANNELS</b> button</li> <li><b>ii)</b> Press <b>EDIT CHANNELS...</b></li> <li><b>iii)</b> Press <b>MORE...</b></li> <li><b>iv)</b> Press <b>PDL TRACES...(&amp; PDBW, PDBW)</b></li> <li><b>v)</b> Press <b>SELECT NEXT TRACE</b></li> <li><b>vi)</b> Toggle <b>PDL TRACE ON/OFF</b> until desired setup is attained</li> </ul> <p><b>C)</b> Press the <b>START/STOP</b> button to initiate sweep. Accurate IL and PDL data should now be displayed.</p>	
<b>3. Measure IL, PDL, and ORL</b>	<p><b>A)</b> Perform all step under 1 above.</p> <p><b>B)</b> Perform all steps under 2 above.</p> <p><b>C)</b> Connect patch cable from ORL output to Channel 4.</p> <p><b>D)</b> Turn on ORL Option:</p> <ul style="list-style-type: none"> <li><b>i)</b> Press the <b>APPS</b> button</li> <li><b>ii)</b> Press <b>ORL...</b></li> <li><b>iii)</b> Toggle the <b>ORL</b> softkey until <b>ON</b> is selected</li> </ul> <p>(If this option is not available, you will need to recalibrate ORL reference data—see below.)</p> <p><b>E)</b> Press the <b>START/STOP</b> button to initiate sweep. Accurate IL, PDL and ORL data should now be displayed. You may need to perform an ORL calibration (see next page).</p>	

	CSA with Internal Polarization Controller and GPIB-connected TLS	CSA with 8169A External Polarization Controller and GPIB-connected TLS
<b>Additional Corrections</b>		
<b>Splitter Cal (SplitCal)</b>	<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.</p> <p>To perform a new Splitter Cal (SplitCal):</p> <ol style="list-style-type: none"> <li>1) Set up a continuous wavelength sweep using the maximum wavelength range that will be used (see #2 under "Prior to Measurement" in this guide)</li> <li>2) Press the <b>CHANNELS</b> button</li> <li>3) Press <b>POWER MODE SETUP &amp; CAL...</b></li> <li>4) Press <b>SPLITCAL SETUP...</b></li> <li>5) Press <b>CLEAR CHANNEL SPLITCAL DATA</b></li> <li>6) Connect a patch cord from <b>TO DUT</b> to the first channel</li> <li>7) Press <b>ADD SCAN</b></li> <li>8) Press <b>ACQUIRE NOW</b>. Confirm that SplitCal values are reasonable; typically between 0-2 dB.</li> <li>9) Initiate a sweep by pressing the <b>START/STOP</b> button</li> <li>10) Ensure that the readings are very stable and flat across wavelength. Typical variation should be in the range of milli-dBs.</li> </ol> <p>If very high accuracy is required on multiple channels, repeat these steps for each of the other channels. Repeat the previous steps while setting the <b>SELECTED CHANNEL</b> (in the Add Scan section) to each channel in sequence and setting <b>DEFAULT SPLITCAL</b> to <b>DISABLED</b>.</p>	
<b>PDL Reference Set: Using 4-sweep Vector Reference for PDL</b>	<p>Perform a PDL Reference Set if you are trying to measure very low values of PDL, very high accuracies of PDL (&lt; 0.05 dB), or if you are using additional optics to deliver light from the <b>TO DUT</b> output to the DUT that have significant PDL values that need to be corrected for. Follow these steps to perform a PDL Reference Set:</p> <ol style="list-style-type: none"> <li>1) Connect patch cable from <b>TO DUT</b> output to <b>CH 1</b>. Use all optics that will be in path for actual measurement. Everything upstream of the DUT that is in the optical path for the calibration will be calibrated out.</li> <li>2) Make sure that the sweep settings are set to desired wavelength and sweep rate for upcoming IL/PDL trace. Also make sure that the PDL trace is turned on for the desired measurement channel(s).</li> <li>3) Press the <b>APPS</b> button</li> <li>4) Press <b>PDL MEASUREMENT SETUP...</b></li> <li>5) Press <b>START MEASURE PDL REF SET</b></li> <li>6) Press <b>BACK...</b></li> <li>7) Press <b>PDL MEASUREMENT SETUP...</b></li> <li>8) Toggle <b>PDL REF SET</b> until <b>USE</b> is selected</li> </ol>	

	CSA with Internal Polarization Controller and GPIB-connected TLS	CSA with 8169A External Polarization Controller and GPIB-connected TLS
<p><b>Using Both SplitCal and PDL Reference Set</b></p>	<p>1) Perform PDL Ref set first on Channel 1  2) Perform Splitter Cal on each subsequent channel. Make sure measurements are using PDL Ref Set.</p> <p><b>NOTE:</b> No SplitCal for Channel 1. The PDL Ref set will act as the SplitCal for Channel 1.</p>	
<p><b>Recalibrate and Use ORL Reference Data</b></p>	<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.</p> <p><b>NOTE:</b> 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><b>NOTE:</b> Depending on software version, power mode may need to be set to dB. To do this, press the <b>CHANNELS</b> button and then toggle the <b>POWER MODE</b> softkey to select <b>dB</b>.</p> <p><b>1) <u>Step 1: Calibrate Zero Light Level Data</u></b></p> <p><b>A)</b> Press the <b>APPS</b> button  <b>B)</b> Press <b>ORL...</b>  <b>C)</b> Press <b>EDIT/VIEW ORL ZERO REF DATA...</b>  <b>D)</b> Press <b>CLEAR ORL REF DATA</b> (If <b>CLEAR ORL REF DATA</b> is grayed out, there is no ORL ref data stored to be cleared)  <b>E)</b> Attach calibration fiber (simple FC-PC terminated patch cable connected to the output of the CSA). Mandrel-wrap the output fiber so that no light is getting to output connector. This is the zero ORL known state.  <b>F)</b> Run a measurement (by pressing the <b>START/STOP</b> button) to get valid data on screen for this state.  <b>G)</b> Press <b>SAVE ORL ZERO REF SWEEP DATA TO FILE</b></p> <p><b>2) <u>Step 2: Calibrate Gain Data</u></b></p> <p><b>A)</b> Unwrap the fiber so that light is getting to the connector (PC connector). This is now the -14.7 dB ORL known state.  <b>B)</b> Run a measurement (by pressing the <b>START/STOP</b> button) with the fiber in this state  <b>C)</b> Press <b>BACK...</b>  <b>D)</b> Press <b>EDIT/VIEW ORL GAIN REF DATA...</b>  <b>E)</b> Press <b>COMPUTE &amp; SAVE ORL GAIN REF SWEEP DATA TO FILE</b>  <b>F)</b> Press the <b>APPS</b> button  <b>G)</b> Press <b>ORL...</b>  <b>H)</b> Toggle <b>ORL</b> to <b>ON</b>. The CSA is now ready to measure accurate ORL sweeps.  <b>I)</b> Verify this calibration. With the calibration fiber still attached, press the <b>START/STOP</b> button. ORL sweep should yield a sweep that is very close to -14.7 dB.</p>	

	<b>CSA with Internal Polarization Controller and GPIB-connected TLS</b>	<b>CSA with 8169A External Polarization Controller and GPIB-connected TLS</b>
<b>Maximize Power Through Polarizer</b>	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, Channel 5. If the power on Channel 5 is more than 8 dB below the TLS output, perform a new maximize. To maximize power through the polarizer:</p> <ol style="list-style-type: none"> <li>1) Press the <b>APPS</b> button</li> <li>2) Press <b>PDL MEASUREMENT SETUP...</b></li> <li>3) Press <b>MAXIMIZE POWER THROUGH POLARIZER</b></li> </ol>
<b>Dark Current Calibration</b>	<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, press the <b>CHANNELS</b> button and then press <b>DO DARK CURRENT ZERO</b>.</p>	
<b>Viewing Tips</b>	<ol style="list-style-type: none"> <li>1) Select 1, 2 or 3 graphs to be shown simultaneously by using the view buttons located beneath the screen. Typically, a two-graph setup is desired for the simultaneous measurement of IL, PDL and ORL (IL and ORL in one graph and PDL in the other).</li> <li>2) Keeping the auto reference level turn on will keep the data selected in the viewable area of the screen. To set the auto reference: <ol style="list-style-type: none"> <li>A) Press <b>AMPLITUDE</b></li> <li>B) <b>AUTO REFERENCE LEVEL</b> (set to <b>MAX</b>, <b>AVERAGE</b> or <b>OFF</b>)</li> </ol> </li> <li>3) A certain trace type can be selected to be displayed on screen (IL only, PDL only, All, etc.). To do this: <ol style="list-style-type: none"> <li>A) Press the <b>AMPLITUDE</b> button</li> <li>B) Press <b>NEXT TRACE TYPE</b></li> </ol> </li> <li>4) The traces function is very helpful in reading and understanding data. <ol style="list-style-type: none"> <li>A) Press the <b>TRACES</b> button</li> <li>B) Press <b>SELECT NEXT TRACE</b></li> <li>C) The selected trace turns white and the flag on the top of the screen shows statistical information about this trace.</li> </ol> </li> </ol>	



Version 2.1

dBm Optics, Inc.  
300 S. Public Road  
Lafayette, CO 80026  
U.S.A.

[www.dbmoptics.com](http://www.dbmoptics.com)  
[info@dbmoptics.com](mailto:info@dbmoptics.com)  
303-464-1919

Copyright 2007, dBm Optics, Inc. All rights reserved. dBm Optics, Component Spectrum Analyzer<sup>®</sup>, Swept Spectrometer<sup>®</sup>,  $\mu$ -Fine, Real-Time Reference and Beam-Block Shutter and all other dBm Optics product names are trademarks or registered trademarks in the U.S.A. or other countries. All other trademarks mentioned herein are the property of their respective companies. Products described in this catalog may be covered by one or more patents in the U.S.A. and in other countries. Information in this catalog is subject to change without notice.