

# Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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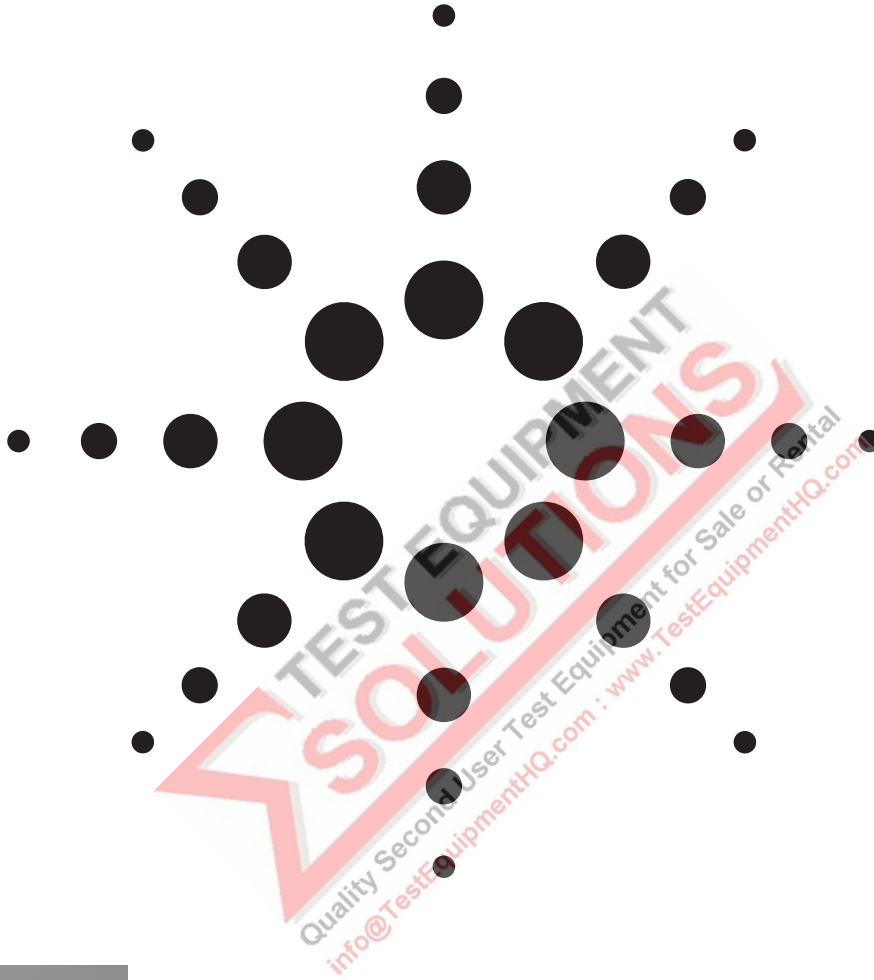
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# Agilent 81689A / 81689B / 81649A Compact Tunable Laser Modules Technical Specifications

February 2002



The 81689A, 81689B, 81649A compact tunable laser modules offer superior performance now also in the compact module class. As they are tunable with continuous output power, they are the most flexible stimulus for the test of optical amplifiers, DWDM components as well as for the test of complete DWDM systems.



**Agilent Technologies**

## Compact tunable lasers for C- and L-band

The Agilent 81689A and 81689B modules operate in the C-band from 1525 nm to 1575 nm, whereas the Agilent 81649A covers the L-band from 1570 nm to 1620 nm.

## Test of optical amplifiers

A variable amount of the compact, yet fully remote controlled Agilent 81689A, 81689B and 81649A tunable laser modules, in combination with the 81682A and 81642A high power Tunable Laser, is the ideal solution to characterize optical amplifiers for use in DWDM applications. The 81689A, 81689B and 81649A compact tunable laser modules provide the high stimulus power needed to test today's optical amplifiers. Together with the 81651A optical attenuator module, an output power dynamic range of more than 60 dB can be achieved. Even without the attenuator module the power can be attenuated by 9dB (10dB for 81689B) e.g. to equalize power levels of several sources.

## Polarization Maintaining Fiber for the test of integrated optical devices

The 81689A, 81689B and 81649A modules are ideally constructed to characterize integrated optical devices. Their optional Panda PMF output ports provide a well defined state of polarization to ensure constant

measurement conditions on waveguide devices. A PMF cable easily connects an external optical modulator. The 81689A, 81689B and 81649A is available with both, standard single-mode fiber and Panda type PMF.

## Compact module for DWDM multi-channel test

The 81689A, 81689B and 81489A allow a realistic multi-channel test bed for DWDM transmission systems to be set up. Their flexibility make them the preferred choice for tests of DWDM transmission system during installation and maintenance phases.

## Compact spare for DFB modules in ITU grids

The 81689B for the first time solves the sparing nightmare for users of DWDM combs. In combination with a comb of 81662A DFB lasers the 81689B can replace any DFB between 1525nm and 1575nm without power penalty.

## Remote control & PnP software drivers for easy process automation

Its continuous, mode-hop free tuning makes it quick and easy to set even the most complex configurations to the target wavelengths and power levels, just by dialing or using the vernier keys.

A 8163B mainframe can host 2 compact tunable laser modules. This allows for the most compact C- and L-band stimulus solution available today.

Each 8164B mainframe can host up to four units of the 81689A, 81689B or 81649A in its upper slots.

The 8166B is most interesting for high channel count solutions. Up to 17 compact tunable laser modules can be hosted here.

The 81649A, 81689A and 81689B are produced to ISO 9001 international quality system standard as part of Agilent's commitment to continually increasing customer satisfaction through improved quality control.

Specifications describe the instrument's warranted performance. They are verified at the end of a 2 m long patchcord and are valid after warm-up and for the stated output power and wavelength ranges.

Each specification is assured by thoroughly analyzing all measurement uncertainties. Supplementary performance characteristics describe the instrument's non-warranted typical performance.

Every instrument is delivered with a commercial certificate of calibration and a detailed test report.

For further details on specifications, see the Definition of Terms in Appendix C of the Compact Tunable Laser User's Guide.

## 81689A, 81689B, 81649A Compact Tunable Laser for Multi-channel test applications

	Agilent 81689A	Agilent 81689B	Agilent 81649A
Wavelength range	1525 nm to 1575 nm	1525 nm to 1575 nm	1570 nm to 1620 nm
Wavelength resolution	0.01 nm, 1.25 GHz at 1550 nm	0.01 nm, 1.25 GHz at 1550 nm	0.01 nm, 1.17 GHz at 1595 nm
Absolute wavelength accuracy (typ.) <sup>[1]</sup>	±0.3 nm	±0.3 nm	±0.3 nm
Relative wavelength accuracy <sup>[1]</sup>	±0.3 nm	±0.15 nm	±0.15 nm
Wavelength repeatability <sup>[1]</sup>	±0.05 nm	±0.05 nm	±0.05 nm
Wavelength stability (typ., over 24 h at constant temperature) <sup>[1]</sup> (typ., over 1 h at constant temperature) <sup>[1]</sup>	±0.02 nm	±0.01 nm ±0.005 nm	±0.01 nm ±0.005 nm
Tuning speed (typ.)	< 10 sec/ 50 nm	< 10 sec/ 50 nm	< 10 sec/ 50 nm
Linewidth (typ.) <sup>[2]</sup> with Coherence Control ON (typ.) <sup>[2]</sup>	20 MHz ---	< 20MHz > 100MHz	< 20MHz > 100MHz
Output power (continuous power on during tuning)	≥ 6 dBm (1525 –1575nm)	≥ 10 dBm (1525 –1575nm)	≥ 6 dBm (1570 –1620nm)
Minimum output power	-3 dBm	0 dBm	-3 dBm
Power stability (at constant temperature) <sup>[3]</sup>	±0.03 dB over 1 hour, typ. ±0.06 dB over 24 hours	±0.015 dB over 1 hour, typ. ±0.0075 dB over 1 hour, typ. ±0.05 dB over 24 hours	±0.015 dB over 1 hour, typ. ±0.0075 dB over 1 hour, typ. ±0.05 dB over 24 hours
Power repeatability (typ.) <sup>[3]</sup>	±0.02 dB	±0.02 dB	±0.02 dB
Power linearity	±0.1dB	±0.1dB	±0.1dB
Power flatness versus wavelength	±0.3 dB	±0.2 dB	±0.2 dB
Side-mode suppression ratio (typ.) <sup>[2]</sup>	> 40 dB (1525 – 1575 nm at 0 dBm)	> 45 dB (1525 – 1575 nm at ≥ 3 dBm)	> 45 dB (1570 – 1620 nm at ≥ 0 dBm)
Signal to source spontaneous emission ratio (typ.) <sup>[4]</sup>	≥ 39 dB/ nm (1525 –1575 nm at 6 dBm)	≥ 44 dB/ nm (1525 –1575 nm at 10 dBm)	≥ 42 dB/ nm (1570 – 1620 nm at 6 dBm)
Relative intensity noise (RIN, typ.)	< -137 dB/Hz (100 MHz – 2.5 GHz, at +3 dBm)	< -137 dB/Hz (100 MHz – 2.5 GHz, at +7 dBm)	< -137 dB/Hz (100 MHz – 2.5 GHz, at +3 dBm)
Dimensions	75 mm H, 32 mm W, 335 mm D (2.8" x 1.3" x 13.2")	75 mm H, 32 mm W, 335 mm D (2.8" x 1.3" x 13.2")	75 mm H, 32 mm W, 335 mm D (2.8" x 1.3" x 13.2")
Weight	1 kg	1 kg	1 kg

<sup>[1]</sup> At CW operation. Measured with wavelength meter based on wavelength in vacuum.

<sup>[2]</sup> Measured by heterodyning method.

<sup>[3]</sup> 500 ms after changing power.

<sup>[4]</sup> Measured with optical spectrum analyzer at 1 nm resolution bandwidth.

### Listed options

**Option 021:** standard single mode fiber,  
straight contact output connector

**Option 022:** standard single mode fiber,  
angled contact output connector

**Option 071:** polarization maintaining  
fiber, straight contact output connector

**Option 072:** polarization maintaining  
fiber, angled contact output connector

## Supplementary performance characteristics

### Modulation

#### Internal digital modulation

50% duty cycle, 200 Hz to 300 kHz.  
> 45% duty cycle, 300 kHz to 1 MHz.  
Modulation output (via Mainframe):  
TTL reference signal.

#### External digital modulation

> 45% duty cycle, fall time  
< 300 ns, 200 Hz to 1 MHz.  
Modulation input (via Mainframe):  
TTL signal.

#### External analog modulation

$\geq \pm 15\%$  modulation depth,  
5 kHz to 1 MHz.  
Modulation input: 5 Vp-p

#### Coherence control

(81649A/81689B)

For measurements on components with 2 m long patchcords and connectors with 14 dB return loss, the effective linewidth results in a typical power stability of  $< \pm 0.025$  dB over 1 minute by reducing interference effects in the test setup.

## General

#### Output isolation (typ.):

38 dB

#### Return loss (typ.):

55 dB (options 022, 072)  
40 dB (options 021, 071)

#### Polarization maintaining fiber (Options 071, 072)

Fiber type: Panda.  
Orientation: TE mode in slow axis,  
in line with connector key.  
Extinction ratio: 16 dB typ.

#### Laser class:

Class IIIb according to FDA 21 CFR 1040.10, Class 3A according to IEC 825 - 1; 1993.

#### Recommended re-calibration period:

2 years.

#### Warm-up time:

< 40 min,  
immediate operation after boot-up.

## Environmental

#### Storage temperature:

-20 °C to +70 °C (81689A)  
-40 °C to +70 °C (81689B, 81649A)

#### Operating temperature:

15 °C to 35 °C

#### Humidity:

< 80 % R.H. at 15 °C to 35 °C

Specifications are valid in non-condensing conditions.

## Laser Safety Information

All laser sources specified by this data sheet are classified as Class 1M according to IEC 60825-1 (2001). All laser sources comply with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated 2001-July-26

INVISIBLE LASER RADIATION  
DO NOT VIEW DIRECTLY WITH  
OPTICAL INSTRUMENTS  
CLASS 1M LASER PRODUCT  
(IEC 60825-1 / 2001)

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## Agilent Technologies' Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

### Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

### Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

**By internet, phone, or fax, get assistance with all your test & measurement needs**

### Online assistance:

**[www.agilent.com/coms/lightwave](http://www.agilent.com/coms/lightwave)**

Phone or Fax  
United States:  
(tel) 1 800 452 4844

Canada:  
(tel) 1 877 894 4414  
(fax) (905) 206 4120

Europe:  
(tel) (31 20) 547 2323  
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(tel) (81) 426 56 7832  
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Latin America:  
(tel) (305) 269 7500  
(fax) (305) 269 7599

Australia:  
(tel) 1 800 629 485  
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New Zealand:  
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(fax) 64 4 495 8950

Asia Pacific:  
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Product specifications and descriptions in this document subject to change without notice.

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### Related Agilent Literature:

Agilent 8163A Lightwave Multimeter  
Agilent 8164A Lightwave Measurement System  
Agilent 8166A Lightwave Multichannel System  
Technical Specifications  
p/n 5988-1568EN

Agilent 81662A DFB Laser  
Agilent 81663A DFB Laser  
Agilent Fabry Perot Laser  
Technical Specifications  
p/n 5988-1570EN

Agilent Power Sensor Modules  
Agilent Optical Heads  
Agilent Return Loss Modules  
Technical Specifications  
p/n 5988-1569EN

Agilent 8163A/B Lightwave Multimeter  
Agilent 8164A/B Lightwave Measurement System  
Agilent 8166A/B Lightwave Multichannel System  
Configuration Guide  
p/n 5988-1571EN

Agilent 8163B Lightwave Multimeter  
Agilent 8164B Lightwave Measurement System  
Agilent 8166B Lightwave Multichannel System  
Technical Specifications  
p/n 5988-3924EN



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