N7742C and N7743C Optical Power Meters

Two and four-channel power meters with linear or logarithmic analog outputs

Introduction

With the new N7742C and N7743C, Keysight extends the functionality of the popular N774-C optical power meter family. These new instruments offer models for wider wavelength range, higher power levels, analog feedback, and finer granularity of port count, while keeping the speed and logging performance of the well-established N7744C and N7745C.

Analog output power perfect for automated alignment

All N7742C and N7743C optical power meters provide an analog voltage output that can be used as feedback for automated alignment applications. The voltage on each channel's analog output port is configurable to be linearly or logarithmically proportional to the optical power level. The new logarithmic mode is very helpful for tracking the signal level over a wide dynamic range, like during probe adjustment.

Web user interface but no LAN?

Connect instrument and PC via USB. The instrument shows up as a new drive: double-click the shortcut on that drive. This lets any modern browser open a connection to the instrument: the graphical user interface appears. It's as simple as that!

KEYSIGHT

N7743C High-Power Optical Power Meter

For measuring optical power levels above +10 dBm, the N7743C is a good fit to devices like transmitter lasers, with +20 dBm maximum input power. The dark noise level is less than 30 pW, providing over 90 dB dynamic range. This provides an intermediate performance alternative to the remote heads, like the 81626C or 81628C that cover still higher power levels.

Optional extended wavelength range

In addition to the standard operating wavelength range of 1250 nm to 1650 nm for both N7742C and N7743C (options #200, #400), this can be extended down to 800 nm with options #210 and #410.

Two and four port with user-exchangeable connector receptacles

Both, N7742C and N7743C are available with two (option #200, #210) or four power sensor channels (option #400, #410). The connector style can be configured individually for each port by choosing from a range of user-exchangeable N7742-I connector interfaces.

Figure 1. N7742FI (FC), N7742KI (SC), N7742LI (LC) and N7742VI (ST) connector interfaces

Members of a growing family

The N7742C and N7743C benefit from the N77-C's family-wide, common trigger concept, and a modern, browser-accessible user interface, that makes it convenient to configure the instrument's functionality. High-speed measurement data acquisition, faster data interfaces, the use of dual-ported RAM for uninterrupted simultaneous measurement and readout, and fast power range switching help avoid unnecessary delays in the measurement process as well as in post-processing.

Key Benefits

High-speed measurement data acquisition for swept-wavelength and transient measurements

- Short minimum averaging time of 1 µs and up to 250 kHz bandwidth
- Data acquisition with up to 1 million samples per second and per port
- Memory for 1 M samples/port plus 1 M/port buffer for continuous logging with up to 3x faster data transfer, compared to the N7744A generation
- Frequency response matched to averaging time and stable dark-current zeroing provide high dynamic range without distorting filter shapes at high sweep speed

Ideal for automated and semi-automated alignment applications

- Analog output port with linear or logarithmic feedback signal
- Standard BNC connector with 0 V to 2 V output

Flexibility

- Connector adapters support FC, SC, LC, and ST connectors and are individually configurable
- The instrument can be controlled via LAN and USB
- The comprehensive hardware and trigger concept along with its large memory storage gives the flexibility to adapt the power meter to many test needs
- Then instrument programming code is compatible to the Lightwave measurement solution platform

Fast swept-wavelength measurements with high dynamic range

For lower port counts, the new N7742C and N7743C are alternatives to the N7744C and N7745C multiport power meters in swept-wavelength applications: Controlled by the photonic application software suite they can perform spectral measurements of insertion loss and polarization dependent loss when combined with Keysight tunable lasers and a polarization synthesizer. Accelerated concurrent power ranging and bi-directional wavelength sweeping enable high-throughput testing and fast update rates in alignment and adjustment processes. The photonic application suite has the Lambda Scan engine for IL and PDL that can combine the sweeps of up to 3 tunable laser wavelength ranges. See the photonic application software suite brochure for details. https://www.keysight.com/find/n7700.

Definitions

Generally, all specifications are valid at the stated operating and measurement conditions and settings, with uninterrupted line voltage.

Specifications (guaranteed)

Describes warranted product performance that is valid under the specified conditions. Specifications include guard bands to account for the expected statistical performance distribution, measurement uncertainties changes in performance due to environmental changes and aging of components.

Typical values (characteristics)

Characteristics describe the product performance that is usually met but not guaranteed. Typical values are based on data from a representative set of instruments.

General characteristics

Give additional information for using the instrument. These are general descriptive terms that do not imply a level of performance.

Optical power meter types with linear or logarithmic analog outputs

Model	Function	Description
N7742C Optical Power Meter 	Two or four channel optical power meter with user-exchangeable connector receptacles.	• InGaAs sensor • –80 dBm to +10 dBm power range • 1250 nm to 1650 nm (Options 200, 400) • 800 nm to 1650 nm (Options 210, 410)
N7743C Optical Power Meter 	Two or four channel optical power meter with user-exchangeable connector receptacles.	• InGaAs sensor • –70 dBm to +20 dBm power range • 1250 nm to 1650 nm (Options 200, 400) • 800 nm to 1650 nm (Options 210, 410)

Technical Specifications

	N7742C	N7743C
Sensor element	InGaAs	
Number of ports	2 (Options 200, 210) 4 (Options 400, 410)	
Maximum safe input power	+16 dBm	+23 dBm
Power range	–80 dBm to +10 dBm	–70 dBm to +20 dBm
Analog output	0 V to 2 V in to open, 600 Ω typical output impedance, max input voltage ±10 V, 15 kHz typical max. bandwidth	
Data logging capability	2 buffers per port, each with capacity for 1 M measurement points	
Averaging time	1 µs to 10 s	
Applicable fiber type	Standard SM and MM ≤ 62.5 µm core diameter, NA ≤ 0.24	

N7742C, N7743C	Options 200, 400	Options 210, 410
Operating wavelength range	1250 nm to 1650 nm	800 nm to 1650 nm
Specification wavelength range (if not stated differently)	1250 nm to 1625 nm	1250 nm to 1625 nm 808 nm ± 10 nm 852 nm ± 10 nm 940 nm ± 10 nm 1064 nm ± 10 nm
Uncertainty at reference conditions [1, 3]	± 2.5%	± 2.5% (1250 nm to 1625 nm) typical ± 2.5% (852/ 940/ 1064 nm) typical ± 3.0% (808 nm)
Total uncertainty [2, 5, 6]	± 4.5%	± 4.5% (1250 nm to 1625 nm) typical ± 4.5% (852/ 940/ 1064 nm) typical ± 5.0% (808 nm)
Polarization dependent responsivity [3, 7]	< ± 0.015 dB (1520 nm to 1580 nm) Typical < ± 0.01 dB (1250 nm to 1580 nm)	< ± 0.015 dB (1520 nm to 1580 nm) typical < ± 0.01 dB (1250 nm to 1580 nm) typical < ± 0.015 dB (1064 nm) typical < ± 0.025 dB (940 nm) typical < ± 0.04 dB (852 nm)
Spectral ripple (due to interference) [9]	< ± 0.01 dB (1520 nm to 1625 nm) typical < ± 0.01 dB (1250 nm to 1520 nm)	< ± 0.01 dB (1520 nm to 1625 nm) typical < ± 0.01 dB (1250 nm to 1520 nm) typical < ± 0.015 dBm (1064 nm) typical < ± 0.015 dB (940 nm) typical < ± 0.020 dB (852 nm)
Relative port to port uncertainty [1, 3, 4, 10]	Typical ± 0.05 dB	
Return Loss [8]	> 50 dB (1520 nm to 1580 nm) Typical > 57 dB (1280 nm to 1580 nm)	

1. Reference conditions:
   Single mode fiber SMF 9 µm.
   Power level: –20 dBm to 0 dBm.
   On day of calibration (add ± 0.3% for aging over one year; add ± 0.6% for aging over two years).
   Spectral width of source < 10 nm full width half maximum (FWHM).
   Wavelength setting of power sensor corresponds to source wavelength ± 0.4 nm.
2. Operating conditions:
   Single mode fiber SMF. For multimode fiber, typical.
   Within one year of calibration; add ± 0.3% for second year.
   Spectral width < 10 nm FWHM.
   Wavelength setting of power sensor corresponds to source wavelength ± 0.4 nm.
3. Ambient temperature (23 ± 5) °C.
4. Temperature constant within ± 1 K after zeroing. Relative humidity ≤ 60%.
5. Excluding noise and offset drift.
6. Power range –60 dBm to +10 dBm for N7742C, –50 dBm to +20 dBm for N7743C.
7. Straight connector, SMF.
8. Connector 8° angled, ceramic ferrule, SMF.
9. For constant state of polarization, source linewidth < 100 MHz, angled connector 8°. Add ± 0.01 dB typical within specification wavelength range for straight connector with ceramic ferrule.
10. Same 2-detector block, same wavelength.

	N7742C		
Power range	–80 dBm to +10 dBm		
Maximum safe input power	+16 dBm		
Linearity [3, 4]	± 0.02 dB ± 3 pW at (23 ± 5) °C ± 0.04 dB ± 5 pW over operating temperature range		
Drift [2]	± 3.5 pW		
Noise peak-to-peak (dark) [1, 2]	< 3 pW (1 s averaging time, 300 s observation time)		
Averaging time	**1 µs**	**25 µs**	**1 ms**
Noise 2σ (100,000 samples) [1]	Typical	Typical	Typical
PM range			
–30 dBm	< 0.1 nW	< 0.025 nW	< 0.005 nW
–20 dBm	< 1.5 nW	< 0.15 nW	< 0.02 nW
–10 dBm	< 6 nW	< 0.5 nW	< 0.08 nW
0 dBm	< 60 nW	< 4 nW	< 0.8 nW
+10 dBm	< 600 nW	< 40 nW	< 8 nW
Dynamic range (logging mode) [1, 2]	Typical	Typical	Typical
PM range			
–30 dBm	> 43 dB	> 48 dB	> 56 dB
–20 dBm	> 43 dB	> 53 dB	> 61 dB
–10 dBm	> 46 dB	> 57 dB	> 62 dB
0 dBm	> 46 dB	> 57 dB	> 63 dB
+10 dBm	> 43 dB	> 54 dB	> 59 dB
Port separation [2, 3]	> 85 dB (CW, one neighbor port with 0 dBm)		
Port separation, dynamic [2, 3, 5]	Typical > 70 dB (one neighbor port with 0 dBm in 0 dBm power meter range)		
Frequency response	3 dB cutoff frequency at 1 µs averaging time, typical		
–30 dBm range	10 kHz		
–20 dBm range	130 kHz		
–10 dBm to +10 dBm range	250 kHz		
Analog output max. bandwidth	Typical 15 kHz		

1. Ambient temperature (23 ± 5) °C.
2. Temperature constant within ± 1 K after zeroing. Relative humidity ≤ 60%.
3. Excluding noise and offset drift.
4. Power range –60 dBm to +10 dBm.
5. With analog output turned off.

	N7743C		
Power range	–70 dBm to +20 dBm		
Maximum safe input power	+23 dBm		
Linearity [3, 4, 5]	± 0.04 dB ± 30 pW at (23 ± 5) °C ± 0.15 dB ± 50 pW over operating temperature range		
Drift [2]	± 45 pW		
Noise peak-to-peak (dark) [1, 2]	< 30 pW (1 s averaging time, 300 s observation time)		
Averaging time	**1 µs**	**25 µs**	**1 ms**
Noise 2σ (100,000 samples) [1]	Typical	Typical	Typical
PM range			
–20 dBm	< 1.2 nW	< 0.3 nW	< 0.05 nW
–10 dBm	< 15 nW	< 1.5 nW	< 0.2 nW
0 dBm	< 60 nW	< 5 nW	< 0.8 nW
+10 dBm	< 600 nW	< 40 nW	< 8 nW
+20 dBm	< 6000 nW	< 400 nW	< 80 nW
Dynamic range (logging mode) [1, 2]	Typical	Typical	Typical
PM range			
–20 dBm	> 41 dB	> 47 dB	> 55 dB
–10 dBm	> 42 dB	> 52 dB	> 60 dB
0 dBm	> 46 dB	> 56 dB	> 62 dB
+10 dBm	> 47 dB	> 57 dB	> 63 dB
+20 dBm	> 44 dB	> 55 dB	> 60 dB
Port separation [2, 3]	> 85 dB (CW, one neighbor port with 0 dBm)		
Port separation, dynamic [2, 3, 6]	Typical > 70 dB (one neighbor port with 0 dBm in 0 dBm power meter range)		
Frequency response	3 dB cutoff frequency at 1 µs averaging time, typical		
–20 dBm range	10 kHz		
–10 dBm range	130 kHz		
0 dBm to +20 dBm range	250 kHz		
Analog output max. bandwidth	Typical 15 kHz		

1. Ambient temperature (23 ± 5) °C.
2. Temperature constant within ± 1 K after zeroing. Relative humidity ≤ 60%.
3. Excluding noise and offset drift.
4. Power range –60 dBm to +10 dBm.
5. For input power >10 mW: add typical ± 0.0016 dB/mW. In case of decreasing power, allow time for stabilization of the reading (about 5 s per dB change). In case of decreasing power by more than 50 dB, allow recovery time of 3 minutes.
6. With analog output turned off.

General Specifications

	N7742C, N7743C
Line power	AC 100 V to 240 V ± 10%, 50/60 Hz, 60 VA max.
Operating temperature	+5 °C to +40 °C
Operating humidity	≤ 80%, non-condensing
Storage temperature	–40 °C to +70 °C
Max. operating altitude	2000 m
Warm-up time	20 minutes
Recommended recalibration period	2 years
Dimensions	420 mm × 212 mm × 43 mm (excluding front and back rubber cushions and connectors)
Weight	3 kg (6 lbs)
User Interface	**N7742C, N7743C**
LAN Access (1 Gbit/s): HTTP Telnet VXI-11 SCPI-telnet SCPI-raw HISLIP	IPv4 and IPv6 Socket connection: http://<ip_address> or http://<host_name> port 23 port 111 (IPv4 only) port 5024 port 5025 port 4880
USB Access (USB 2.0)	Remote NDIS (virtual Ethernet link over USB); USB Mass Storage functions (read-only) USBTMC

Ordering Information

Product/option	Description
N7742C-200	Optical Multiport Power Meter, 2 channels, standard wavelength range
N7742C-210	Optical Multiport Power Meter, 2 channels, extended wavelength range
N7742C-400	Optical Multiport Power Meter, 4 channels, standard wavelength range
N7742C-410	Optical Multiport Power Meter, 4 channels, extended wavelength range
N7743C-200	Optical Multiport Power Meter, high power, 2 channels, standard wavelength range
N7743C-210	Optical Multiport Power Meter, high power, 2 channels, extended wavelength range
N7743C-400	Optical Multiport Power Meter, high power, 4 channels, standard wavelength range
N7743C-410	Optical Multiport Power Meter, high power, 4 channels, extended wavelength range
Product	**Connector interfaces (one required for each power meter port)**
N7742FI	Connector interface FC
N7742KI	Connector interface SC
N7742LI	Connector interface LC
N7742VI	Connector interface ST
Product/option	**Recommended accessories**
N7799C-1CM	Rack Mount Kit for 2 half-width instruments, 1 Rack Height Unit. Includes low profile rails, fitted to Keysight System II racks with 24-inch-spaced mounts. Requires Filler Kit N7799C-0CM for mounting single instrument
N7799C-0CM	Filler Kit for N7799C-1CM. Required for single half-width instrument; includes front panel and base plate
N7799C-DOC	Documentation of N77-C Platform, Physical Medium

User interface screen captures

The N774-C power meters' graphical user interface provides detailed information about the measured optical power level, as well as about relevant settings like power offsets, the power meter's averaging time, power range or the set wavelength. Also, the linear and log bar graph display makes manual adjustments, i.e., for maximum power, much easier. Responsive design ensures that the display adjusts to the browser window and the chosen zoom factor, allowing to comfortably arrange multiple instrument views on one screen. In continuous measurement mode, an oscilloscope-like trace of power levels with optional markers is available, a convenient feature for stability measurements, sparing time and effort to write control software.

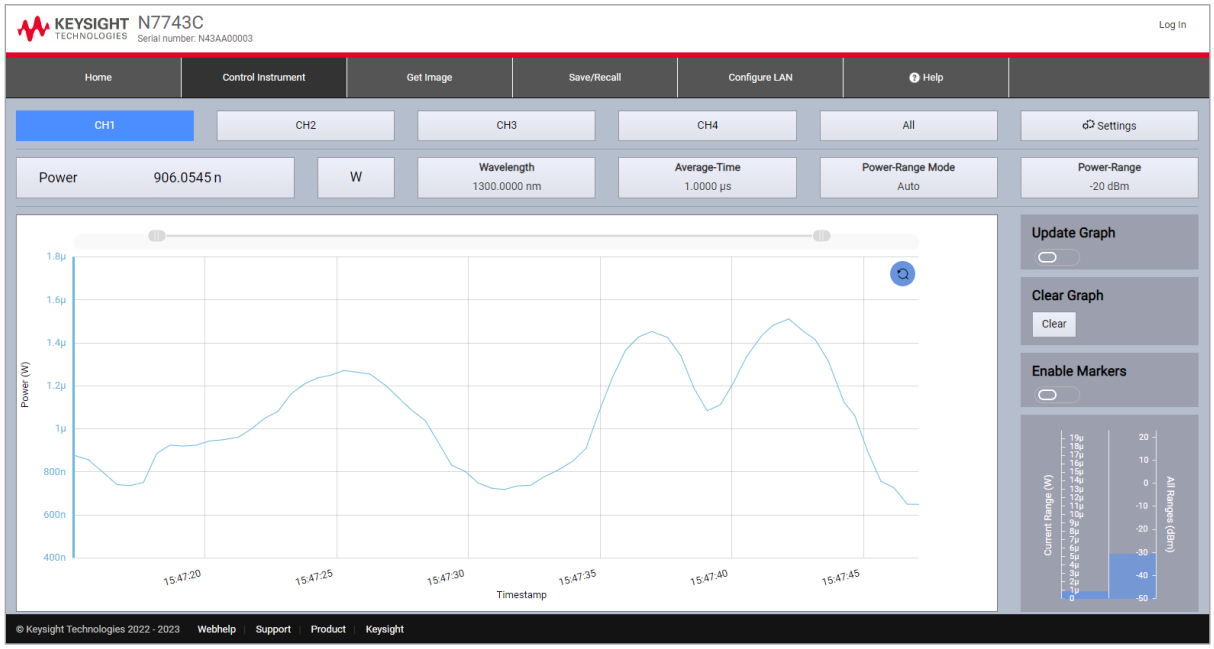

Figure 2. Continuous power measurement

Figure 3. Linear and log bar graph display

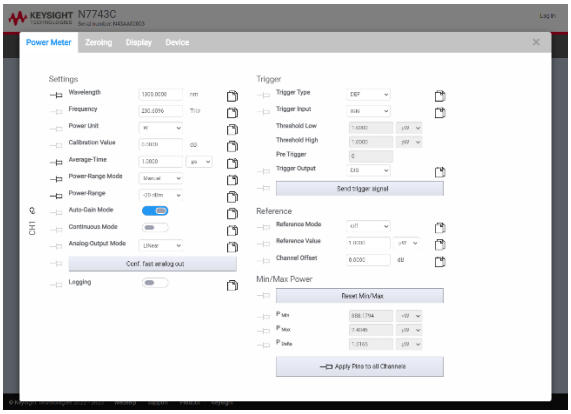

Figure 4. Power meter settings

For more information

To find more optical test instruments, check the following links:

Optical test instruments: www.keysight.com/find/oct

Optical signal conditioning products: www.keysight.com/find/voa

Optical multiport power meters: www.keysight.com/find/MPPM

Polarization solutions: www.keysight.com/find/pol

Tunable laser sources: www.keysight.com/find/tls

Keysight photonic discussion forum: community.keysight.com