ID3000 Series

Picosecond Lasers

Compact, easy to use and versatile sources of telecom-band, NIR, visible and UV photons

ID 3000 Series is a cost-effective solution offering high-quality picosecond-pulsed laser light under long-term and maintenance-free operation. Both free space and fibre-coupled versions are available to handle virtually any optical application.

An ID3000 Series laser can be used with IDQ singlephoton detectors and Time Controller Series to enrich a range of high-speed and high-sensitivity time-correlated single-photon counting (TCSPC) applications, from quantum photonics and quantum information, superresolution microscopy, time-resolved spectroscopy, to the field-testing of optical fibres.

Use the ID 3000 Series Picosecond Laser to enhance your experiments today.

Key Applications

- **Optical pulses typically shorter than 30 ps (at least < 50 ps)**
- **Continuously tuneable repetition rate, from pulse-on-demand up to 40 MHz**
- **Ultra-low timing jitter < 4 ps rms**
- **Remote operation available via RS-232 or USB 2.0 connection**
- **Maintenance-free 24/7 operation**
- **Free space or fibre-coupled laser emission**
- **In-stock models:** 1550 nm and 1310 nm sources
- **Available wavelengths:** 375 nm to 1550 nm

Applications

- **QKD and quantum communication**
- **Quantum optics and computing**
- **Single-photon source characterization**
- **Fluorescence lifetime imaging**
- **Failure analysis of integrated circuits**
- **VIS, NIR and MIR spectroscopy**

New

- Even shorter laser pulses, on demand
- Available in a range of wavelengths, from UV to the telecom C-band

Picosecond pulses on demand

The ID3000 Series of compact, versatile and easy to use picosecond-pulsed lasers

These lasers are based on high-reliability semiconductor laser diodes operated in gain-switched mode, emitting laser pulses typically shorter than 30 ps across a broad segment of the electromagnetic spectrum (UV to telecom C-band, 375 nm to 1550 nm).

Each ID3000 laser source operates as a laser head working in tandem with a laser controller, where multiple laser heads can be interchanged with a single controller. The laser head is pre-tuned to a particular wavelength (see the laser wavelengths table on the next page), and can be operated out of the box within minutes through the controller's user-friendly interface.

The on-demand picosecond pulses of the laser head—combined with the ultra-low timing jitter of the ID3000's laser controller—allow for unparalleled precision and control in your experimental setup within such a compact device.

Versatile design

- Pulse-on-demand operation up to 40 MHz
- Remote operation: you can connect via RS-232 or USB 2.0 connection
- Robust design: functions maintenance-free under 24/7 industrial operation

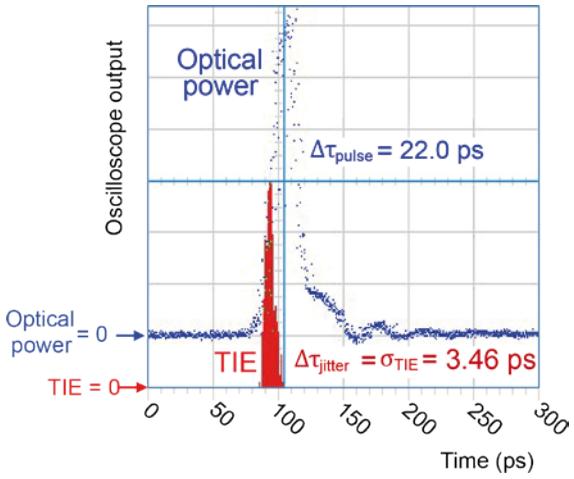
Ultra-low jitter

- The ID3000's timing jitter is ultra-low: typically lower than 4 ps rms
- This ultra-low measured jitter is only an upper limit of the timing jitter, as it includes jitter contributions from the measuring electronics
- Pulse-tuning mode minimizes the effects of after-pulsing

(Right) Optical pulse profile and timing interval error (TIE) from a 1550 nm ID 3000 laser. Pulse width $\Delta\tau_{pulse}$ is calculated as the FWHM of the optical pulse profile. Timing jitter $\Delta\tau_{jitter}$ is calculated as the standard deviation of fluctuations in the detected optical pulse arrival time (the TIE), at 50% amplitude of the pulse's leading edge.

Ultrafast laser pulses

The gain-switched operation of the semiconductor laser diode allows emission of ultrafast optical pulses from 20 to 110 ps pulse width with ultra-low timing jitter.

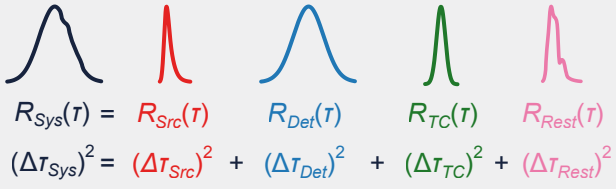


How to: TCSPC and the Instrument Response Function

The Instrument Response Function (IRF) describes the temporal response of your detection system against the 'true' dynamics of the system under investigation. The IRF takes into account all the detectors, measurement electronics, source precision, and any other instruments contributing to a non-instantaneous response in your experiments. Ultimately, the IRF tells you the best achievable timing precision of your detection system.

In the example to the right — typical for time-correlated single-photon counting (TCSPC) — the overall system response, RSys(T), is a linear combination of the component IRFs, where is the convolution operator.

The resulting uncertainty — the timing jitter $\Delta\tau_{Sys}$ — is thus the quadrature sum of all component timing jitters. Use this insight to find the best ways to improve your experimental precision.



(Above) : time delay between detection events, 'Src': photon source, 'Det': single-photon detector pair, 'TC': time correlator (e.g. ID1000), 'Rest': everything else in the detection system contributing to a finite timing response.

Picosecond pulses on demand

The ID3000 Series of compact, versatile and easy to use picosecond-pulsed lasers

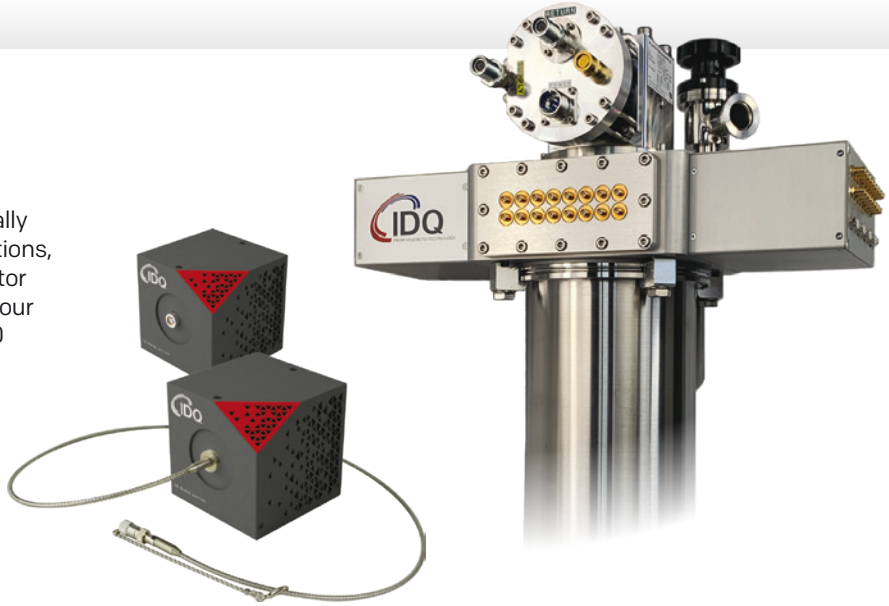
Type	Output	Wavelength	Spectral width	Pulse width	Peak power	Avg. Power
DFB	FC/APC	1550 ± 10 nm	< 0.5 nm	< 50 ps [a]	> 20 mW	> 0.02 mW
DFB	Free space	1550 ± 10 nm	< 0.5 nm	< 50 ps [a]	> 40 mW	> 0.04 mW
DFB	FC/APC	1310 ± 10 nm	< 0.5 nm	< 50 ps [a]	> 20 mW	> 0.02 mW
DFB	Free space	1310 ± 10 nm	< 0.5 nm	< 50 ps [a]	> 40 mW	> 0.04 mW
FP	FC/APC	1060 ± 20 nm	< 15 nm	< 50 ps	> 80 mW	> 0.2 mW
FP	Free space	1060 ± 20 nm	< 15 nm	< 50 ps	> 200 mW	> 0.5 mW
FP	FC/APC	940 ± 20 nm	< 15 nm	< 50 ps	> 80 mW	> 0.2 mW
FP	Free space	940 ± 20 nm	< 15 nm	< 50 ps	> 200 mW	> 0.5 mW
FP	FC/APC	850 ± 15 nm	< 10 nm	< 50 ps	> 80 mW	> 0.2 mW
FP	Free space	850 ± 15 nm	< 10 nm	< 50 ps	> 200 mW	> 0.5 mW
FP	FC/APC	690 ± 15 nm	< 7 nm	< 50 ps	> 80 mW	> 0.2 mW
FP	Free space	690 ± 15 nm	< 7 nm	< 50 ps	> 200 mW	> 0.6 mW
FP	FC/APC	665 ± 15 nm	< 7 nm	< 45 ps	> 80 mW	> 0.3 mW
FP	Free space	665 ± 15 nm	< 7 nm	< 45 ps	> 200 mW	> 0.6 mW
FP	FC/APC	635 ± 15 nm	< 7 nm	< 70 ps	> 80 mW	> 0.3 mW
FP	Free space	635 ± 15 nm	< 7 nm	< 70 ps	> 200 mW	> 0.8 mW
FP	FC/APC	510 ± 15 nm	< 10 nm	< 110 ps	> 40 mW	> 0.2 mW
FP	Free space	510 ± 15 nm	< 10 nm	< 110 ps	> 100 mW	> 0.6 mW
FP	FC/APC	480 ± 20 nm	< 10 nm	< 80 ps	> 60 mW	> 0.3 mW
FP	Free space	480 ± 20 nm	< 10 nm	< 80 ps	> 150 mW	> 0.8 mW
FP	FC/APC	440 ± 20 nm	< 5 nm	< 70 ps	> 100 mW	> 0.3 mW
FP	Free space	440 ± 20 nm	< 5 nm	< 70 ps	> 250 mW	> 0.7 mW
FP	FC/APC	405 ± 15 nm	< 5 nm	< 45 ps	> 160 mW	> 0.4 mW
FP	Free space	405 ± 15 nm	< 5 nm	< 45 ps	> 400 mW	> 1.0 mW
FP	FC/APC	375 ± 10 nm	< 5 nm	< 45 ps	> 160 mW	> 0.3 mW
FP	Free space	375 ± 10 nm	< 5 nm	< 45 ps	> 400 mW	> 0.6 mW

(Above) The available models and options for the ID 3000 Series Picosecond Lasers. Note that all lasers have a maximum repetition rate of 40 MHz.

(a) Pulse widths typically less than 30 ps

Make every photon count

The ID 3000 Series lasers are designed especially for IDQ's range of single-photon detection solutions, from our versatile and easy to use semiconductor SPADs, to the game-changing performance of our SNSPDs, and our ultrafast, ultra-precise ID1000 Time Controller.



Specifications

Optical		
Pulse repetition rate [1]	Pulse-on-demand (0 Hz to 40 MHz)	
Operating wavelength [2]	375, 405, 440, 510, 635, 665, 690, 850, 940, 1060, 1300, 1500 nm	
Frequency resolution	1 Hz @ 50 Hz	
Beam quality, TEM	$M^2 < 1.2$	
Polarization extinction ratio	> 20 dB (unpolarized fibre)	
Timing jitter, rms	< 4 ps	
Interface		
Trigger in [1]	TTL or ± 5 V @ 50 Ω (BNC)	
Trigger in delay	Free space: < 50 ns	Fibre: < 60 ns
Trigger out (synchronization)	+ 5 V @ 50 Ω (BNC)	
Interlock	2.5 mm mono TS (jack connector)	
External communication	USB 2.0 or RS-232	
Mechanical / Electrical / Environmental		
Laser output	Free-space or single-mode fibre	
Output fibre length	1 m FC/APC	
Warm-up time	< 10 minutes	
Operation temperature	15 – 35 °C	
Storage temperature	-15 – 60 °C	
On/off cycles	> 10,000	
Lifetime	> 10,000 hours	
Power supply requirements	12 VDC/3A or 100-264 VAC, 47-63 Hz	
Power consumption	< 30 W	
Laser head dimensions (W x H x L)	95 mm x 31 mm x 181 mm	
Laser head weight	0.45 kg	
Control unit dimensions (W x H x L)	326 mm x 88 mm x 235 mm	
Control unit weight	2.5 kg	

[1] *Pulse-on -demand with external trigger. Internal trigger >25 Hz.*

[2] *One wavelength selected per laser head.*

Warning

Class 1 laser product
Classified PER IEC 60825 60825-1, ED 3.0, 2014

IDQ an IonQ company

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