



# torus

## Single frequency CW lasers



- CW 532 nm up to 750 mW
- CW 660 nm up to 200 mW
- Extremely low noise
- TruLoQ™ Active mode lock technology



### Overview

The **torus** is the only actively locked single longitudinal mode laser commercially available. The **torus** is available at 532 nm (50 mW to 750 mW) and at 660 nm (50 mW to 200 mW), making it ideal for applications such as holography, Brillouin scattering and high resolution Raman spectroscopy. The pump diode MTF is manufacturer-specified as >100,000 hours at full power, but Laser Quantum de-rates the diode to further increase its lifetime, giving the **torus** itself industry leading lifetimes.

Despite the inherent single frequency operation of the **torus**, mode-drift and eventual mode-hop will occur if the laser cavity changes length due to ambient air temperature variation. To mitigate this, the digital power supply receives a signal from the laser which reports the exact position of the laser mode in frequency space. The power supply then feeds back a control signal which maintains the position of the mode. This active feedback control loop eliminates the risk of mode-hop and leads to a highly stable output. (Fig. 1 and 2).

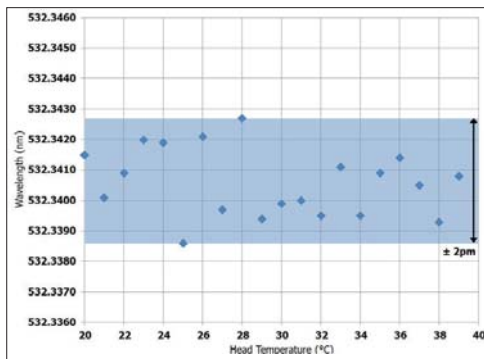


Fig. 1 Typical wavelength stability versus head temperature of **torus** laser.

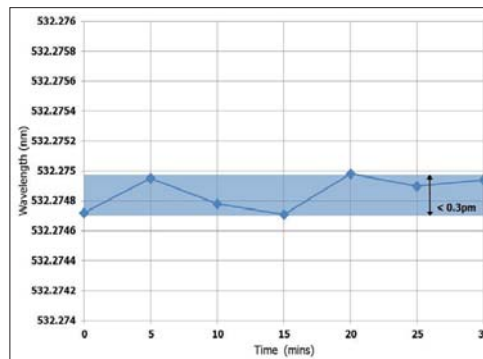


Fig. 2 Typical wavelength stability versus time of **torus** laser.

Using a Fabry-Perot interferometer (JRS Scientific Instruments) the **torus** laser typically shows high spectral purity with side bands <-110 dB compared with the central mode. (Fig. 3)\*.

See Laser Quantum whitepaper "**torus** spectral purity" for further information.

\* Measured by a customer and does not represent a Laser Quantum specification.

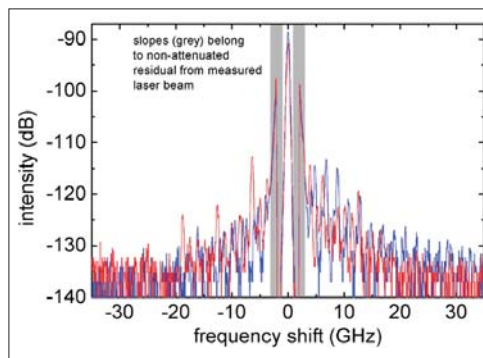


Fig. 3



Using TruLoQ™ technology, the effects of temperature change on the laser such as mode-drift and mode-hop are minimised.



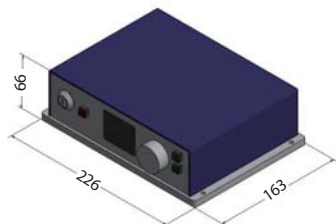
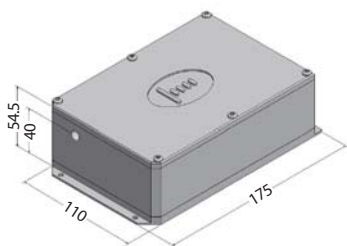
The **torus** can be controlled across the internet via the RemoteApp™ software that also allows connection to the Laser Quantum support team for monitoring laser performance, diagnosing opportunities for and carrying out laser optimisation.



Every **torus** laser has been subjected to a 1200 g drop-test to check that all components are correctly fitted prior to its extended 300 hour test period. This rigorous testing regime ensures long operational lifetimes.



## Dimensions (mm)



## Other information

- Umbilical length: 1.5 m
- Laser head weight: 1.2 kg
- Warm-up time: <30 minutes
- Cooling options available
- Horizontal polarisation on request
- Fibre coupling available
- LabView drivers available
- 2 years unlimited hours warranty for scientific users



Drawings are for illustrative purposes only, please contact Laser Quantum for complete engineer's drawings.

## Specifications\*

	torus 532	torus 660
Wavelength	532 nm	660 nm
Power	50 to 750 mW	50 to 200 mW
Beam diameter <sup>1</sup>	1.7 mm ± 0.2 mm	1.7 mm ± 0.2 mm
Spatial Mode	TEM00	TEM00
Ellipticity	<1:1.1	<1:1.1
Bandwidth	1 MHz	1 MHz
Divergence	≤0.4 mrad	≤0.4 mrad
M-Squared	<1.1	<1.1
Power stability (RMS) <sup>2</sup>	<1.0 %	<1.0 %
Noise (RMS)	<0.25 %	<0.5 %
Noise bandwidth	10 Hz to 100 MHz	10 Hz to 50 kHz
Pointing stability	<2 urad/°C	<2 urad/°C
Polarisation ratio	>100:1	>100:1
Polarisation direction <sup>3</sup>	vertical	vertical
Coherence length	>100 m	>100 m
Beam angle <sup>4</sup>	<1 mrad	<1 mrad
Operating temperature	15 to 35°C	15 to 35°C

\* Laser Quantum operates a continuous improvement programme which can result in specifications being improved without notice.

<sup>1</sup> Beam diameter defined as the average of major and minor 1/e<sup>2</sup> beam size measured at 25 cm from exit port, at specified power.

<sup>2</sup> Test duration >100 hrs at constant temperature.

<sup>3</sup> Horizontal polarisation is available upon request.

<sup>4</sup> Tolerance relative to head orientation.

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