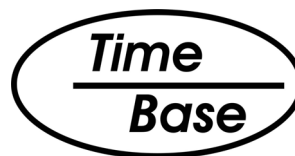


# *Tunable single-frequency diode-pumped Nd:YAG ring lasers at 1064/532 nm*

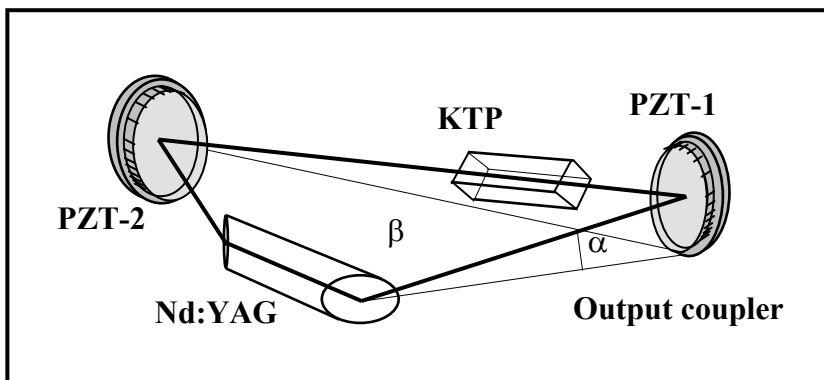


## Main features

- - *single-frequency operation*
- - *wide frequency tunability*
- - *simultaneous operation at 1064 nm and 532 nm*
- - *narrow linewidth*
- - *high output power*

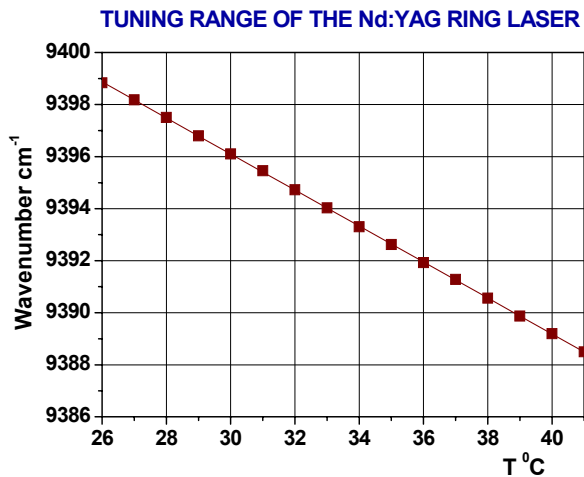
*TimeBase* offers a variety of the ultra-stable continuous wave diode-pumped *ring* Nd:YAG lasers with an *intracavity frequency doubling*, simultaneously emitting at 1064 nm and 532 nm. The main features of these lasers are *narrow linewidth* (several kHz at the acquisition time 0.1 – 1 s), *high output power* (up to 1.5 W at 1064 nm/up to 150 mW at 532 nm)\*, and a *wide frequency tunability* over the whole Nd:YAG gain profile. The *ring configuration* of the lasers ensures a low sensitivity to an optical feedback, thus making them an ideal tool for a wide range of applications including holography, interferometry and high-resolution spectroscopy.

The construction of the Nd:YAG lasers is presented in Fig.1.

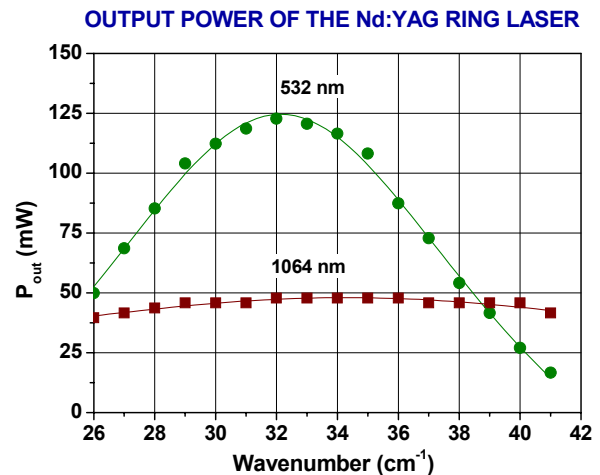


**Fig. 1** Schematic of the nonplanar ring Nd:YAG laser

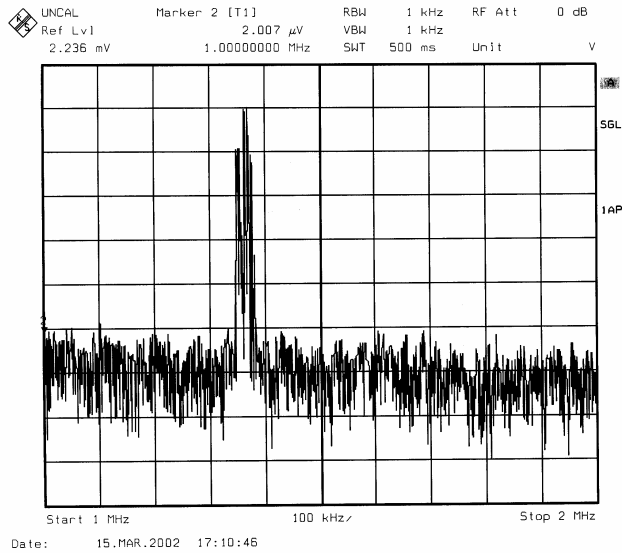
The nonplanar laser resonator is defined by two dielectric mirrors, a gain medium Nd:YAG prism, placed in a strong longitudinal magnetic field, and a birefringent nonlinear KTP crystal. The Faraday effect in the YAG crystal, combined with an out-of-plane coupler and the Brewster surface, form an optical diode for a stable unidirectional operation of the ring laser. The intracavity KTP crystal together with the Brewster surface of the Nd:YAG laser serve as a Lyot filter, providing the single-frequency operation of the laser as well as a wide frequency tunability. The latter is performed by a variation of the KTP crystal's temperature. The typical tuning characteristics of the laser are shown below. Both of the laser mirrors are mounted on the piezo-transducers (PZT) for a frequency correction of the laser frequency, e.g. for laser frequency stabilization. The detailed description of the laser is given in [1,2].



**Fig. 2** Frequency tuning range versus temperature



**Fig. 3** Output power within the tuning range



**Fig. 4** Typical beat signal between two ring Nd:YAG lasers.

## Standard models:

Model	Power at 1064 nm	Power at 532 nm	Tuning range 1064/532 nm
ILP 1064/532 – 30/100	> 30 mW	>100 mW	~ 350/700 GHz
ILP 1064/532 – 400/10	>400 mW	>10 mW	~ 200/400 GHz
ILP 1064/532 – 1000/10	>1000 mW	>10 mW	~ 200/400 GHz
ILP 1064–1500	>1500 mW	-	not tunable

## Nd:YAG laser characteristics

Output power at $\lambda=1064$ nm	up to 1.5 W
Output power $\lambda=532$ nm	up to 150 mW
Mode	TEM <sub>q00</sub>
Polarization at 1064 nm	Linear
Polarization at 532 nm	Linear, 45° to 1064 nm
Linewidth	~10 kHz
Free spectral range (FSR)	~ 2.4 GHz
Sensitivity of PZT-1	~ 1 MHz/V
Bandwidth of PZT-1	DC ... 30 kHz
Operating voltage	-50 ... +50 V
Sensitivity of PZT-2	~10 MHz/V
Bandwidth of PZT-2	DC ... 1 kHz
Operating voltage	-150 ... +250 V
Tuning range at 1064 nm/532 nm	~350/700 GHz
Frequency tuning rate	~ - 20 GHz/°C
Operating temperature range	+10 ... + 40 °C
Dimensions of the laser head	30x170x100 cm <sup>3</sup>
Weight	6.5 kg

\* The maximum output power is specified only for a particular wavelength and is a subject of a compromise between the 1064 nm and 532 nm radiations power.

**For more detailed information please contact:**

***TimeBase***

Birkenhof 26

40225 Düsseldorf

Germany

Fax: +49-(0)211-3160699

*info@time-base.de*

www.time-base.de

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**References**

1. *Tunable single-frequency diode-pumped Nd:YAG ring laser at 946 nm* M.V. Okhapkin, M.N. Skvortsov, M.N. Belkin, N.L. Kvashnin, S.N. Bagayev. *Opt. Comm.*, 194, 207-211 (2001)
  2. *Tunable single-frequency diode-pumped Nd:YAG ring laser at 1064/532 nm for optical frequency standard applications* M.V. Okhapkin, M.N. Skvortsov, M.N. Belkin, N.L. Kvashnin, S.N. Bagayev. *Opt. Comm.*, 203, 359-362 (2002)
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