RegA 9000/9050

Ti:Sapphire Regenerative Amplifier

The RegA™ is a cw-pumped, titanium:sapphire (Ti:S) regenerative amplifier providing ultrafast pulses capable of pumping multiple OPAs at repetition rates as high as 300 kHz.

When combined with either a Vitesse™ or Mira® 900 laser, the RegA 9000 is a compact amplifier package providing 160 fs pulses. For applications requiring shorter time resolution, the RegA 9050 uses a short-pulse Mira-SEED or Vitesse-SEED, combined with an external stretcher/compressor, to provide amplified pulses in the 60 fs regime.

CW-Pumping Technology

The cw-pumped Ti:S regenerative amplifier, cavity-dumped by an acousto-optic modulator (AOM), was first demonstrated in 1992[1]. The technique uses cw laser pumping, which takes advantage of the 3 µsec-long energy storage time of Ti:S to produce stable operation at very high repetition-rates. The pulse injection and ejection, into and out of the amplifier, is achieved by a fast, high-efficiency AOM. These pumping and switching techniques eliminate the rep-rate limitations associated with amplified systems based on pulsed pump-lasers and electro-optic Pockels cells. Currently, the RegA is the only commercial amplifier capable of such high repetition rates.

Compact, Stable, Solid-State System

Continuous-wave pumping allows a compact, completely solid-state amplifier system based on the Verdi® diode-pumped, solid-state green laser. The result is a stable, compact, easy-to-use system. When used with the Vitesse-Duo, an all-solid-state integrated Ti:S seed and Verdi pump source, the complete amplified system fits on a 4' by 6' optical table. Verdi's low-noise pumping and compact, solid-state design lead to excellent output stability. An electronic control box displays the system's operating conditions and provides complete timing control of pulse injection, dumping and gain-switching.

The RegA, which requires only a few mW of output power from the Vitesse or Mira 900 oscillators, amplifies this output over 1000 times to the µJ level. In the RegA 9000 system, inherent group velocity dispersion (GVD) in the amplifier broadens the pulse length to tens of picoseconds. After extraction, the pulse is recompressed to <200 fs by a simple, single-grating pulse-compression stage. In the RegA 9050 system, a separate grating expander/compressor is added to provide amplified pulses of <60 fs.

The µJ pulse energies from the RegA can be used directly, or can generate a stable, high-quality white-light continuum, or can pump one or more OPAs.[2,3,4]

High-Quality OPA Output with Wide Tunability

The excellent beam quality and µJ pulse energy from the RegA allows pumping of one or two OPAs at the optimum gain level, without the risk of damage seen with traditional mJ-level systems. This means the OPA beam quality is superior, due to its low pump threshold. Pumping multiple OPAs with the RegA allows for independently tunable, yet synchronized sources for many pump-probe experiments in the range from 480 nm to 2400 nm. When combined with Coherent's DFG 9400/9800, this tuning range is extended into the mid-IR range up to 10 µm or more.

1. T. D. Norris, Opt. Letts, 17, 1009 (1992)
2. M.K. Reed, et al., Opt. Letts, 19, 1855 (1994)
3. M.K. Reed, et al., Opt. Letts, 20, 605 (1995)
4. M.K. Reed, et al., IEEE JQE, 32, 1273 (1996)

FEATURES

- ***CW-pumped, ultrafast Ti:sapphire amplifier***
- ***Up to 300 kHz repetition rate***
- ***Ultrastable operation***
- ***Near-diffraction-limited beam***
- ***Multiple OPA pumping***

APPLICATIONS

- ***Multi-color pump-probe experiments***
- ***Femtosecond micromachining***
- ***Nonlinear optics***
- ***Upconversion***
- ***Four-wave mixing***

Layout of RegA 9000 Regenerative Amplifier with Vitesse Duo. The Vitesse Duo is a completely hands-off, solid-state, integrated seed and pump source for the RegA 9000.

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Specifications for Various RegA Set-ups

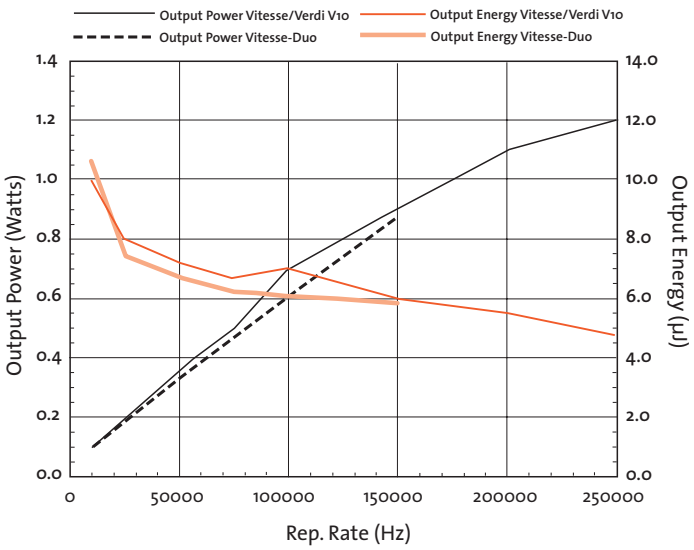
		Sabre[1]		V-10[2]		V-8[3]	Vitesse-Duo[4]
Power/Energy Specifications RegA 9000/9050	Repetition Rate (kHz)	100	250	100	250	100	100
	Pulse Energy (µJ)	4	3	4	3	3	3
	Average Power (W)	0.4	0.75	0.4	0.75	0.3	0.3
	Energy Stability[5]	<±2%	<±2%	<±1%	<±1%	<±1%	<±1%

		RegA 9000	RegA 9050
Time-Resolution Specifications RegA 9000/9050	Pulsewidth	<160 fs (<225 fs ac)	<60 fs (<80 fs ac)

Common Specifications for all Coherent RegA Set-ups	Polarization	linear, horizontal, >500:1
	Beam Diameter	3 mm nominal
	Average Power Drift	<±2% total in one hour
	Beam Quality M^2	<2.0
	Time-Bandwidth Product	<2x Gaussian

[1] Assumes >12W of argon ion power is used to pump RegA, regardless of seed set-up. [2] Assumes 10W of Verdi power is used to pump RegA. [3] Assumes 8W of Verdi pump power. [4] Special integrated seed-pump source for RegA. Contains internal 10W Verdi, split to pump Vitesse seed and RegA. Rep. Rate upper limit is 150 kHz. [5] Peak-to-peak 1 Hz to 100 kHz. [6] After one-hour warm-up, crystal temperature is controlled with supplied chiller; room temperature stable <+1°C.

All-Solid-State RegA Performance
Output Power/Energy Versus Rep. Rate



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Coherent follows a policy of continuous product improvement. Specifications are subject to change without notice.

Coherent's scientific and industrial lasers are certified to comply with the Federal Regulations (21 CFR Subchapter J) as administered by the Center for Devices and Radiological Health on all systems ordered for shipment after August 2, 1976.

Coherent offers a limited warranty for all RegA systems. Please refer to the latest version of the Coherent, Inc., Laser Group Price List for full details of this warranty coverage.

ISO 9002 REGISTERED

CE 93/42/EEC 0459

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