Laser Locking Controller: Preci-Lock

The product description

A fully functional laser locking controller (Preci-Lock) developed by Erbium group can be used for frequency locking in different application scenarios. Preci-Lock integrating modulation and demodulation module, PID module and high voltage amplifier module. It integrates the functions of error signal generation, PID servo and PZT drive. Preci-Lock can been used as locking controller for a variety of common frequency stabilization techniques, such as absorption spectrum, saturated absorption spectrum, modulation spectrum, modulation transfer spectrum and PDH technology.

◆Features The Preci-Lock controller mainly includes the modulation and the demodulation module, the PID module and the high voltage amplifier module. In addition, it also includes a RS422 protocol communication interface and a ±12V power supply interface. The precilock can be satisfied for most common requirements of laser frequency stabilization.

Modulation & Demodulation Module

Parameters	Indexes
Modulation Power Range	0-1023(Max. 10dBm)
Modulation Output Frequency	20MHz/3MHz/10kHz
Phase Regulation Range	0-360°
PD Signal Input Range	<1Vpp
PD Signal Input Coupling	AC Coupling
PD Signal Input Coupling Impedance	50 Ω
The modulation and demodulation module modulate the laser, and demodulate the spectral signal detecte by the detector to produce error signal. The modulation frequency can be customized according t customer.	

PID Module

Parameters		Indexes
Fast Output PID		Single- Channel PIDP
Fast Output PID		PIDP+ PI Tandem
PIDP Integral Folding Frequency		(3.4 kHz-34 kHz) , (1 kHz-10 kHz) , (330 Hz-3.3 kHz) , (100 Hz-1 kHz) , (33 Hz- 330 Hz) , (10 Hz-100 Hz) , (3.3 Hz-33 Hz) , (1 Hz-10 Hz)
PIDP Differential Folding Frequency		16 kHz , 34 kHz , 59 kHz , 133 kHz , 284 kHz , 483 kHz , 724 kHz
PI Integral Folding Frequency		33 kHz , 10 kHz , 3.3 kHz , 1 kHz , 330 Hz , 100 Hz , 33 Hz
Fast Output	Output Bandwidth	500 kHz
	Output Range	-9 V-9 V
	Bias tuning Range	0-9 V
	Gain tuning Range	0.0005-25

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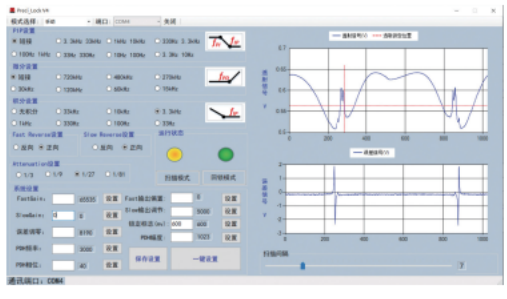
	Outputreverse function	Inclusion
Slow Output	Output Bandwidth	500 kHz
	Output Range	-9 V-9 V
	Bias tuning Range	0-9 V
	Gain tuning Range	0.0003-20
	Outputreverse function	Inclusion
	Scanning frequency	2 Hz
	Scanning waveform	Triangular Wave
	Maximum Scanning Range	0-9 V
Error signal bias adjustment	Range	-2 V- 2 V
	Accuracy	0.25 mV
Error Signal Input	Unsaturated range	-0.5 V-0.5 V
	InputImpedance	510 Ω
Lock Reference Input	Input Range	-9 V-9 V
	InputImpedance	MΩ
The frequency of the laser can be controlled by PID module through feedback signal according to the error signal. PID module in Preci-lock is in series PID structure, including two PI, and offering two output ports,the parameters of the module can be adjusted with high precision.		

High voltage amplifier module

	Parameters	Indexes
Some lasers or devices require high dc voltage to drive the PZT Preci-lock's built-in high dc voltage amplifier module can output a voltage signal of up to 110V with its 15 times amplification.	magnification	15
	Output Range	0-110 V
	Bandwith	High resistance load bandwidth 50 kHz
		Capacitive load bandwidth (small signal output (0.1 u load) 20 kHz
	Drive Capability(Max. Output Current)	50 mA

Control Software



Preci-Lock interface

For a better laser frequency control, Preci-Lock abandons the physical knobs and buttons. And all parameter changes and locking control are realized by the PC software. Preci-lock software includes the functions of communication control, reference and error signal display, PID module parameters adjustment, locking control and so on. Except the necessaryphysical connection, the laser locking control can be fully realized by PreciLock software. A pure digital operation is more convenient for user. Another feature of Preci-Lock software is the automatic locking function, which can realize the automatic locking of laser frequency under reasonable parameter settings. In automatic locking mode, Preci-Lock can realize auto locking, unlock

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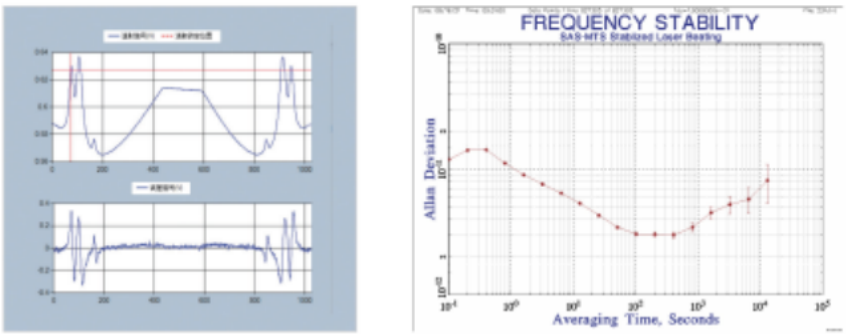
judging and re-locking of the laser frequency. This mode can realize the long-term stable locking of laser frequency, especially suitable for the cold atom physics experiment that requires long-term continuous measurement.

Example

As a fully functional locking control module, Preci-Lock can meet the most demands of frequency locking. The frequency locking can be divided into internal modulation and external modulation frequency locking according to the different modulation. The two frequency locking methods are different in principle while the physical connecting of Preci-Lock is also different for them.

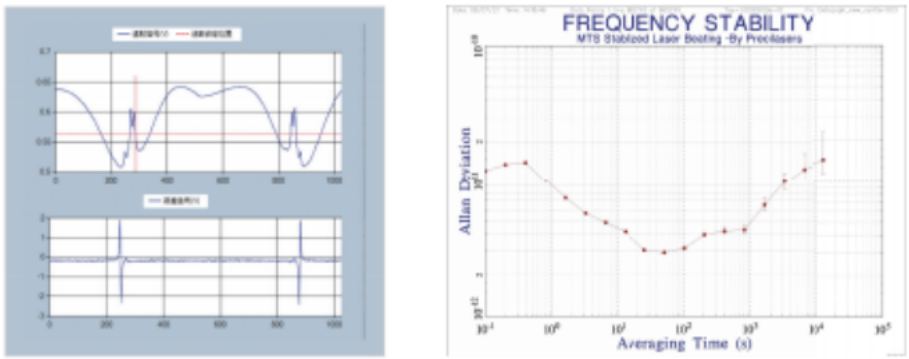


Rubidium atom saturation absorption spectrum and corresponding error signal (left);

Internal modulation frequency stabilization results (right).

◆ **Stabilization Internal Modulation Frequency**

For internal modulation, the modulation signal and feedback signal feedback together to the laser through an adder. The frequency lock point corresponding to the wave peak and wave trough of the spectra. Typical internal frequency stabilization modulation is adopted in lock-in saturation absorption spectrum or absorption spectrum
frequency stabilization.



Rubidium atom modulation transfer spectrum and corresponding error signal (left);

External modulation frequency stabilization results (right).

◆ **Stabilization External Modulation Frequency**

For external modulation, the modulation signal and feedback signal are divided and the external modulation signal is applied to an external independent modulator. The frequency lock point corresponding to the zero point of the spectra. Typical external frequency stabilization modulation is adopted in modulation transfer spectrum or PDH frequency stabilization.

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