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Laser frequency locking with low pump field saturated absorption spectroscopy

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Basic Principle

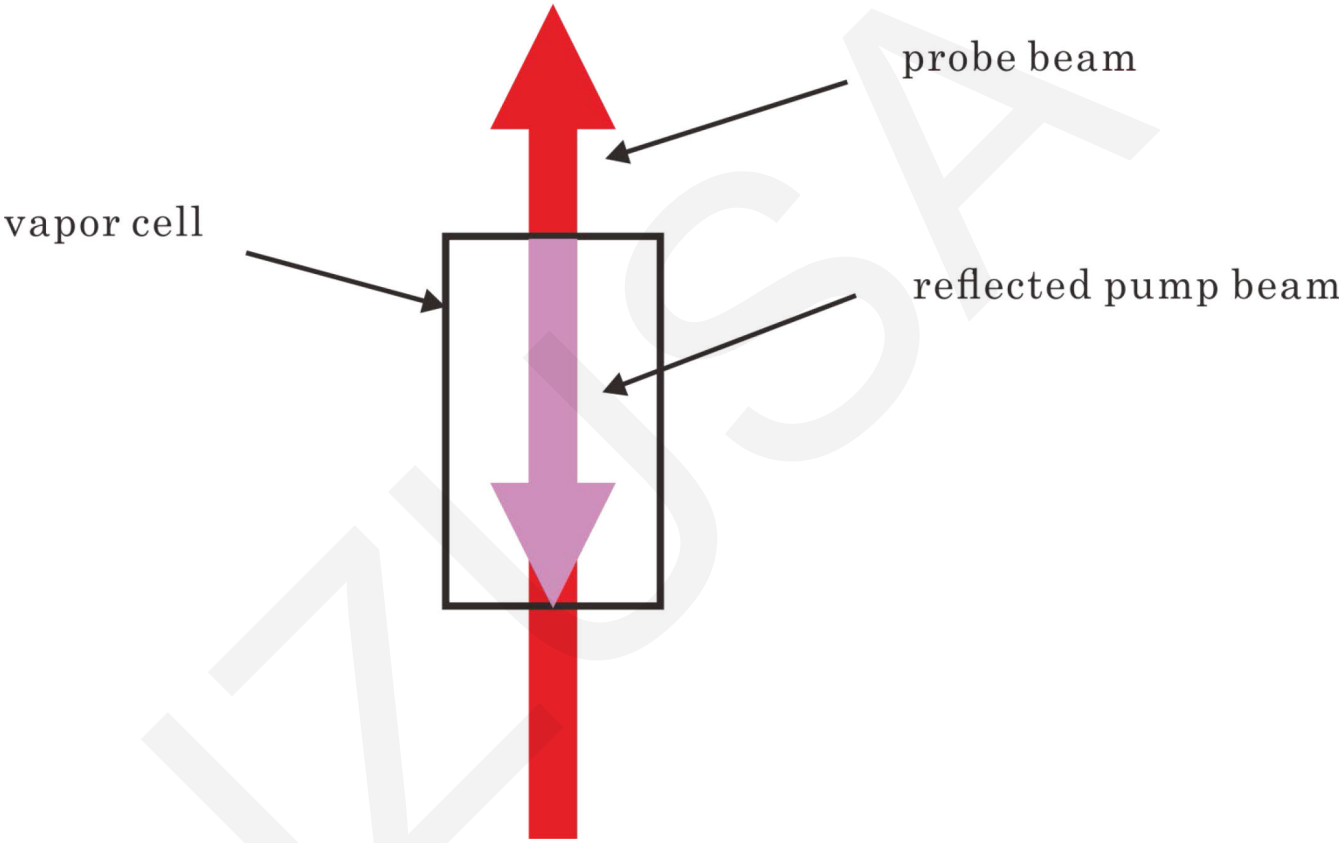


Fig.1 Low pump field saturated absorption spectros-copy scheme. The probe beam travels through the vapor cell and the reflected light from the inner surface is the pump field.

Experimental set-up

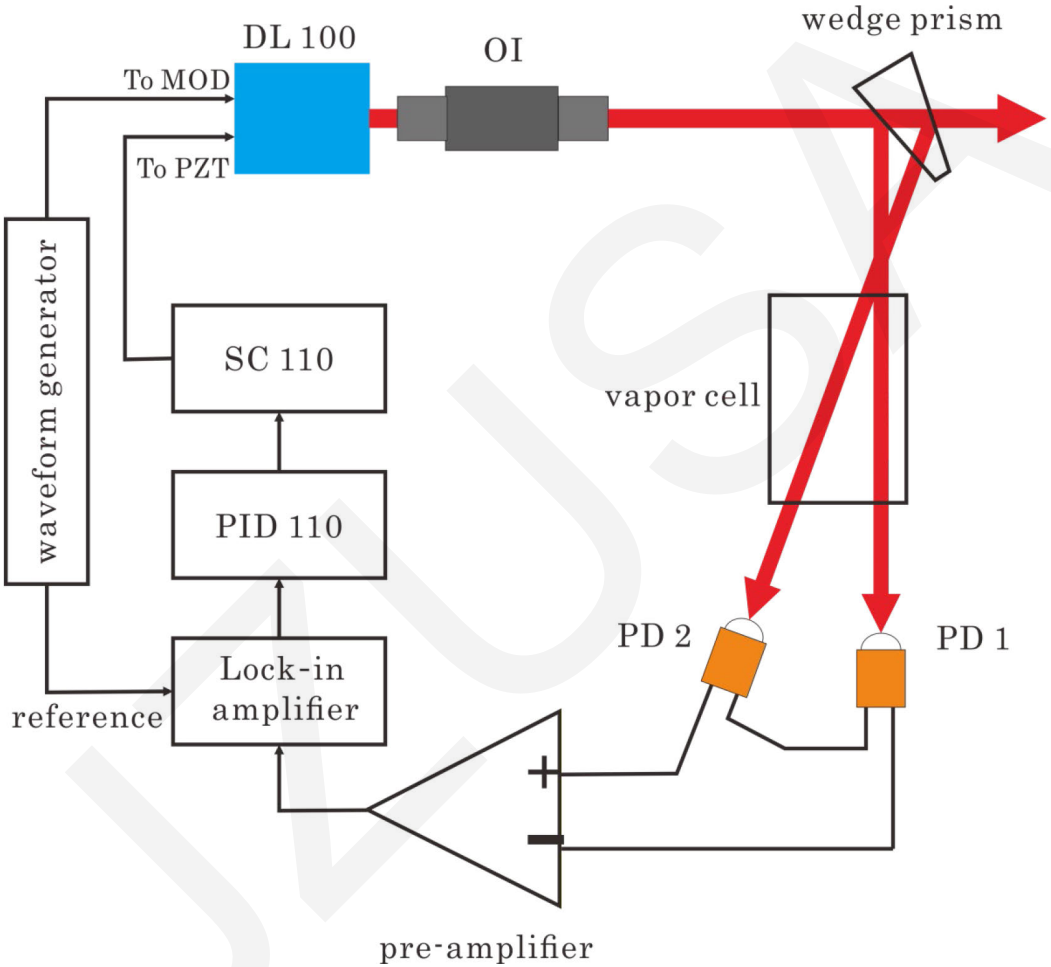


Fig.2 Experimental apparatus. OI: optical isolator; PD: photodiode detector; MOD: current modulation input in-terface; PZT: Piezoelectric ceramic.

Result and discussion

Incident angle and relative intensity

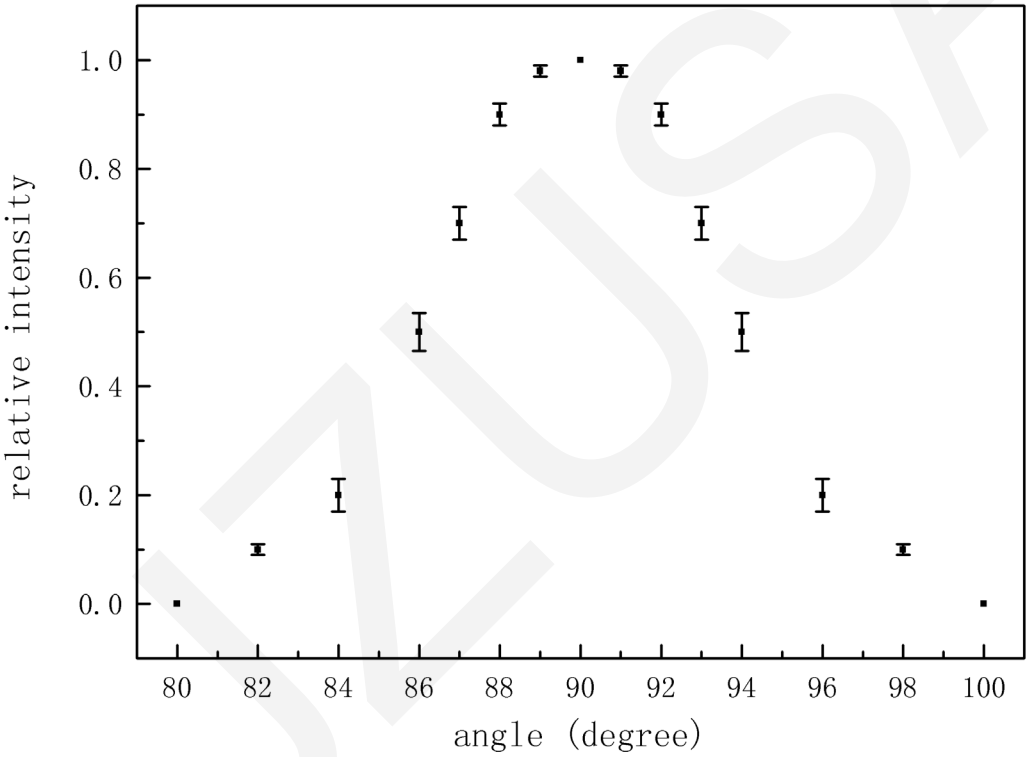


Fig.3 The relationship between incident angle of the probe beam and the relative intensity of the signal.

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Result and discussion

Lock-in effect

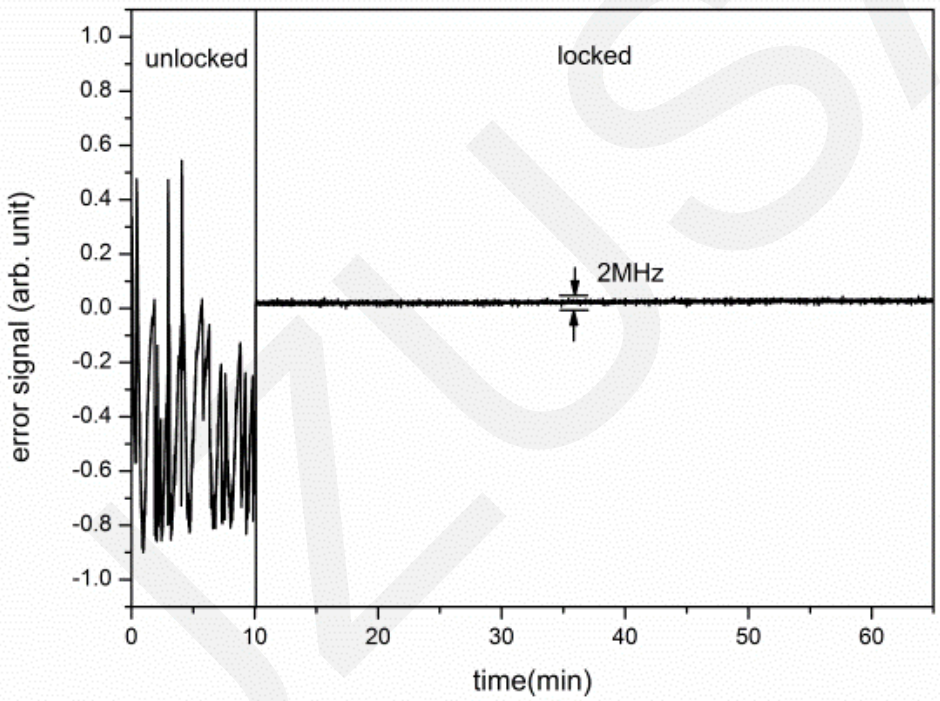


Fig.4 Error signals before and after the frequency of the laser is locked.

Conclusions

- We put forward and demonstrate experimentally a laser frequency locking method using low pump field saturated absorption spectroscopy. Compared with traditional high pump-low probe configuration, our low pump-high probe configuration is much simpler. There is no additional reflecting mirror in the scheme, and so it is less sensitive to vibration than the traditional scheme. It is a technique that can find application in precision measurement systems on moving platforms.

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