01.03.2021

Department of Electrical Engineering

Corrigendum-1

Tender Reference no: EE/DEEP/044/2021/PDH LOCKING

Name of the Item: **LASER AND FEEDBACK CONTROL SYSTEM FOR PDH LOCKING**

Corrigendum details: **Changes in technical specification**

Technical Specifications for LASER AND FEEDBACK CONTROL SYSTEM FOR PDH LOCKING

We intend to purchase a complete laser locking and stabilisation system based on Pound-Drever-Hall (PDH) locking. The laser is to be stabilised against a standard reference cavity in PDH locking. The key elements required forthislockingarelistedbelowandshowninFig.1.

- **Stable reference cavity**

  This reference cavity acts as the frequency discriminator and any deviation from these frequency will result in generation of non-zero error signal.

- **Frequency stabilisation -electronics**

  The necessary components required for the feedback are Local Oscillator, Phase adjuster, Mixer, Low Pass Filter and also a PID. This components works as a system to generate the error signal which should be fed into the laser driver. The phase modulator creates the necessary sidebands for generating the PDH error signal.

- **Laser Driver**

  The generated error signal is fed into the laser driver, which has the current, temperature and piezo controls to stabilise the laser center frequency.
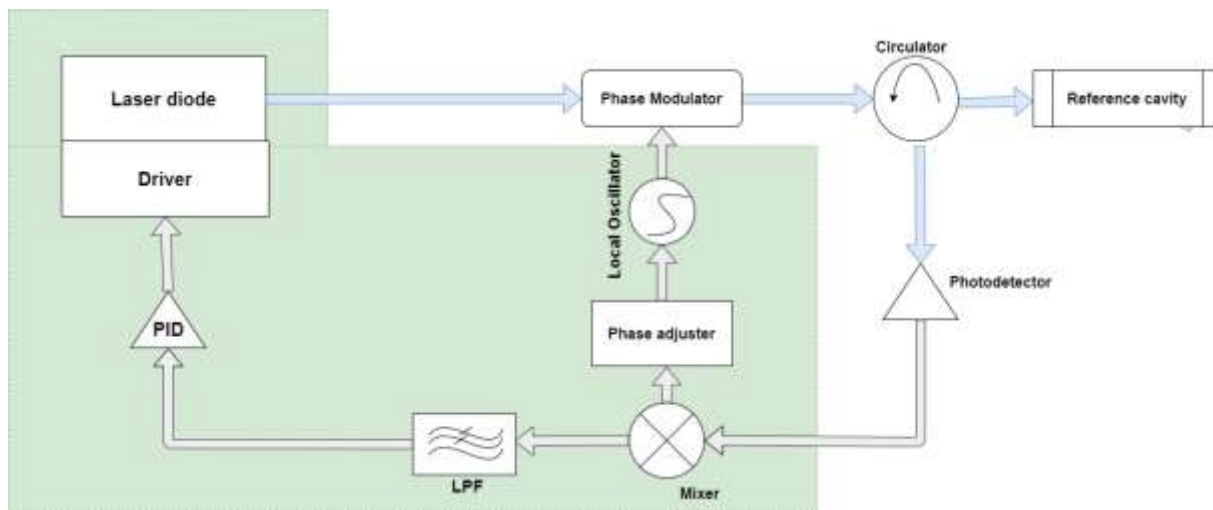

Figure 1: Essential Components required for PDH

locking The components highlighted in green are to be tendered and

purchased.

1 Requiredspecifications

Laserdriver

The required specifications for the laser driver is

Current Control - Parameter	values
Laser current	At least upto 500 mA
Laser voltage	At least upto 5 V @ 500 mA
Current step resolution	At least 1000 μA
RMS Current noise density	≤ 1μA over 1 kHz bandwidth
External modulation	≥ 7 kHz; larger the better

Table 1: Current control

requirements

TEC - Parameter	values
TEC current	≥ ±2 A
Set-Temperature step	≤ 0.1 degrees

Table 2: Temperature

controller requirements

Piezo control - Parameter	values
Piezo voltage	Min ≤ -1V and Max ≥ +12 V ; larger the better
Peizo Voltage adjustment step	At least 1 mV

Table 3: Piezo control

requirements

- The Driver should be compatible with the ECDL below.

- The driver should be able to drive third party diodes.

- There should be ability to provide the error signal at the input to the current control (modulation input), temperature control and peizo control independently.

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1.2 ECDL - Laser head

Compatible with the driver above.

Parameter	Value
Wavelength	1550 nm
Output power	at least 30 mW
Linewidth	better than 300 kHz (5 μs integration time)
Mode-hop free tuning range	$\geq$ 20 GHz
Output beam polarisation	Linear, > 100:1
ASE background, typical	< -40 dB
long term frequency stability @ room temperature	$<<$ 100 MHz/K
PC interface	Ethernet, USB, analog control
Output	Polarisation maintaining Fiber Coupled with APC connectors

Table 4: 1550 nm Laser parameters

1.3 Feedback control electronics

The feedback electronics should have the capability to generate a top-of-fringe locking error signal. This should include the modulator demodulator and the servo. The essential parameters necessary for that are given in the table. This should be compatible to the driver and laser diodes.

Parameter	Values
Modulation frequency	$\geq$ 25 MHz
Phase adjustment	0 to 360^0
Low pass filter bandwidth	upto 1 MHz
Output Compatibility	Modulation input of laser head
Input Compatibility	compatible to laser driver

Table 5: Parameters for feedback electronics

The servo and modulator/demodulator should be quoted separately.

1.4 Other Conditions

1. Installation of laser diode, driver and locking electronics should be carried out onsite.

2. The ordered solution should be modular. There should be options of including third party laser diodes for simple current driving and temperature control.

1. The ordered solution should have the ability to include the external error signal into the laser driver.

2. Output of the feedback control system should be accessible independently.

3. Vendor must show the evidence of installation of at least one similar laser locking system in India.

4. Installation and local support must be provided.

5. Should provide three years warranty.

6. Technical support for PDH control should be provided.

The price for each item should be quoted separately - Laser driver for ECDL, ECDL diode laser, Servo and the phase modulator/demodulator

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