

DigiPDH

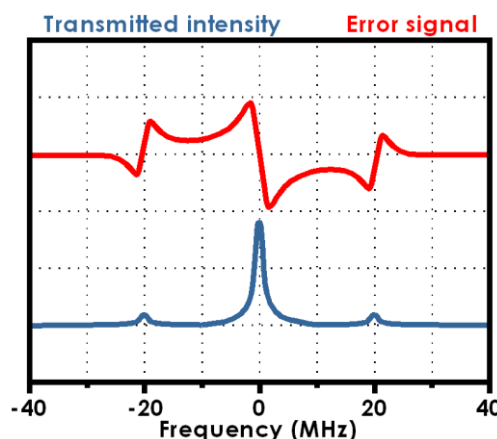


Overview

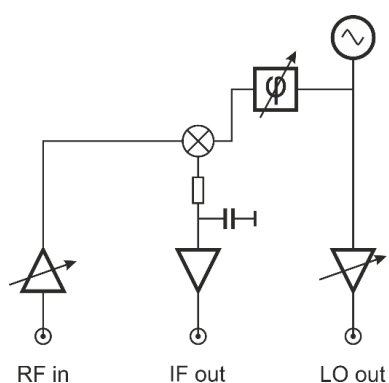
DigiPDH is the perfect tool for laser frequency stabilization based on the Pound-Drever-Hall principle.

It extends the modulation / demodulation capabilities of TEM's *LaseLock*® universal laser locking device into the radio frequency (RF) range.

DigiPDH comprises a digital sinusoid signal generator with adjustable frequency between 3 MHz and 120 MHz and a corresponding phase-sensitive RF receiver with up to 6 MHz IF (error signal) bandwidth.



Principle of Operation

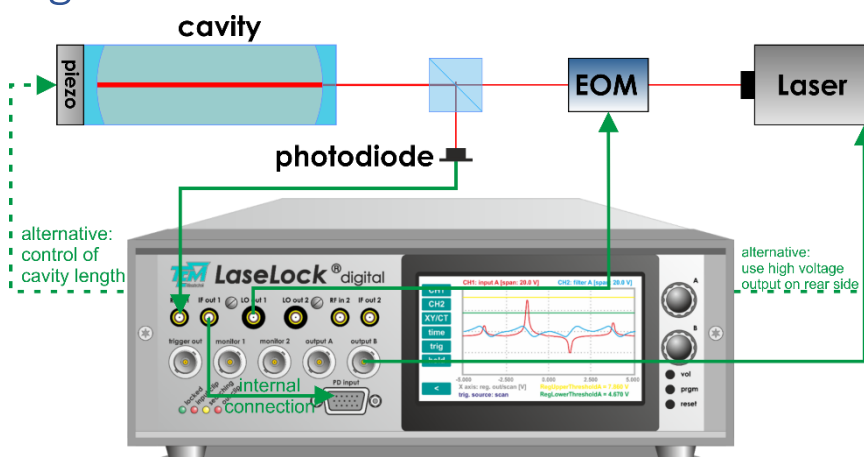


The *DigiPDH* receiver mixes the RF input signal (from a photodiode, e.g.) with the local oscillator, thus providing the error signal as a DC signal or at some user-selected intermediate frequency (IF). The conversion gain is adjustable from 0 to +20 dB. The generic IF bandwidth of 6 MHz is reduced to 1 MHz by default. In order to obtain the full bandwidth, the user can simply remove a socketed capacitor.

Within a Pound-Drever-Hall setup, the signal generator acts as local oscillator for laser phase or frequency modulation. Its adjustable output power of up to +10 dBm at 50 ohms suffices to drive resonant EOMs. It also features a return power measurement that helps to find the resonance frequency by minimizing the reflected power.

Integration with *LaseLock*®

DigiPDH neatly integrates into TEM Messtechnik's *LaseLock*® general laser stabilization system. The IF outputs provide the error signal for the control loop and are therefore internally connected to the *input "a"* or *"b"*, resp., of the *LaseLock* signal processor.



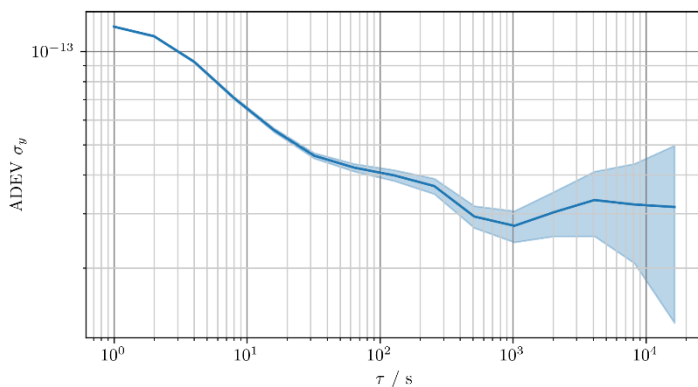
Versions, Options and Customization

DigiPDH is available as single-channel or dual-channel version. In the latter, the two LOs and RF receivers can be used independently or in a combined way, i. e. at the same frequency with fixed phase relation, for example for to stabilize two subsequent SHG stages.

The second channel could as well be used to drive an AOM as a chopper in a FM spectroscopy set-up.

TEM Messtechnik offers a variety of customizations for the DigiPDH. For example, the receiving mixers can be extended into I/Q receivers, i. e. providing the IF (error signal) as sine and cosine signals. In combination with the reflected power detection, the 2-channel DigiPDH can be transformed into a vector network analyzer.

Application example



TEM Messtechnik recently presented a very robust iodine FM spectroscopy unit. Using DigiPDH integrated in a LaseLock device, the system could lock a Coherent Prometheus diode-pumped Nd:YAG ring laser to the hyperfine spectrum of iodine.

The stability was ~ 8.5 Hz (Allan deviation at 1000s averaging time, measured versus the optical frequency comb generator at PTB).

Technical Data

- Oscillator frequency: adjustable 3 ... 120 MHz
- Phase detector sensitivity -20 dBm for 1 Vpp error signal
- Oscillator output return power / SWR measurement
- Phase adjustment range 0 ... 360°
- Oscillator output power -40 ... +10 dBm @ 50 Ω
- Error signal bandwidth 1 MHz (max. 6 MHz)
- Available as single channel or dual channel version
- optional: I/Q phase detection
- optional: reference frequency input

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