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Quad-PID feedback loop with PLL capability

Zurich instruments just added the MF-PID option with 4 independent PID (proportional - integral - derivative) controllers to their MFLI, a 500 kHz/5 MHz lock-in amplifier. The MF-PID option builds on class-leading specifications of the MFLI such as low input noise of 2.5 nV/√Hz and a high dynamic reserve of 120 dB. Each controller is seamlessly integrated with the lock-in amplifier, using inputs from a multitude of internal measurement data and analog input signals. The maximum control loop bandwidth is 50 kHz.

When setting up a new control loop, the user is well supported by the LabOne PID-Advisor which offers a selection of models that can be picked and adjusted to have a close match with different applications. After defining the target bandwidth, the PID-Advisor suggests a set of parameters and graphically displays the corresponding transfer-function and step-response. Once the feedback loop is running, the auto-tune function optimizes the parameters to minimize the residual PID error. The software toolset included in LabOne also offers a parametric sweeper, oscilloscope and spectrum analyzer. These tools can be used to efficiently analyze the performance of the loop and compare to the selected model. In phase-locked-loop (PLL) mode, phase unwrapping extends the input range to ±1024π, meaning a reliable feedback at start-up and robust operation throughout.

The MF-PID option can be used in many applications, including frequency combs, frequency-transfer-locks, optical fibre noise-cancellation, atomic force microscopy (AFM), scanning tunneling microscopy (STM), scanning near-field optical microscopy (SNOM), MEMS resonators and gyroscopes.

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