

Line Tracker Instruction: Interactive Version

Rev. C, February 21, 2013



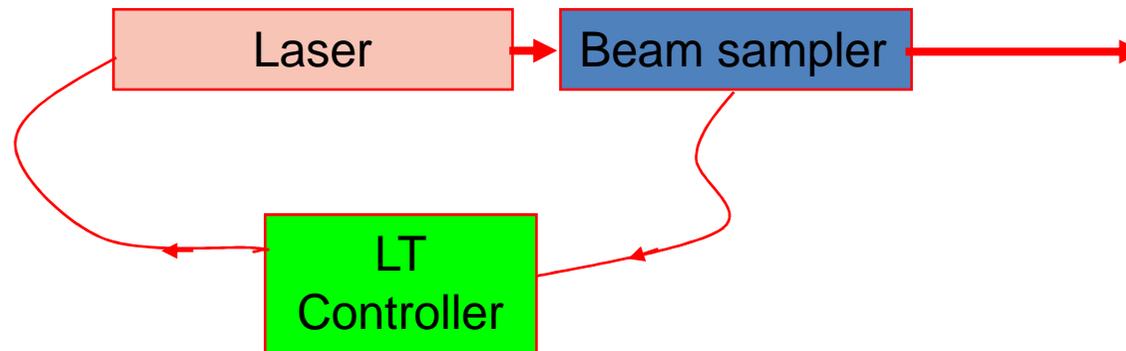
Access Laser Company

where innovation never stops

Main Features

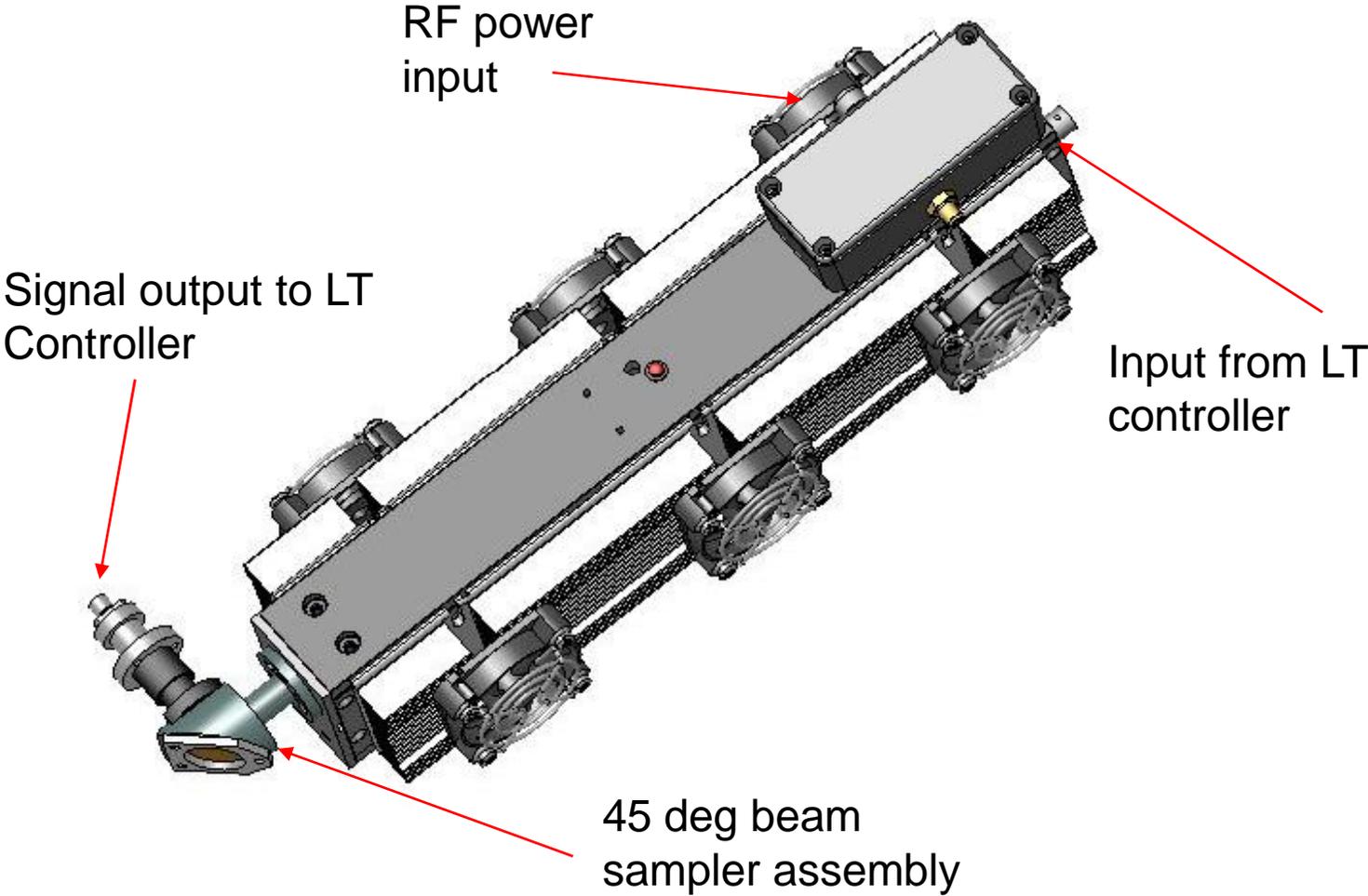
- Robust stabilization allows field applications where ambient environment changes.
- Stabilization without the side-effect of “chirping” inherent with the traditional dithering scheme.
- Power, spectrum, longitudinal mode and transverse modes are all stabilized at the same time.
- Maintains the stability of laser at any power level that is independently adjusted.

The Idea: Closed loop feedback control

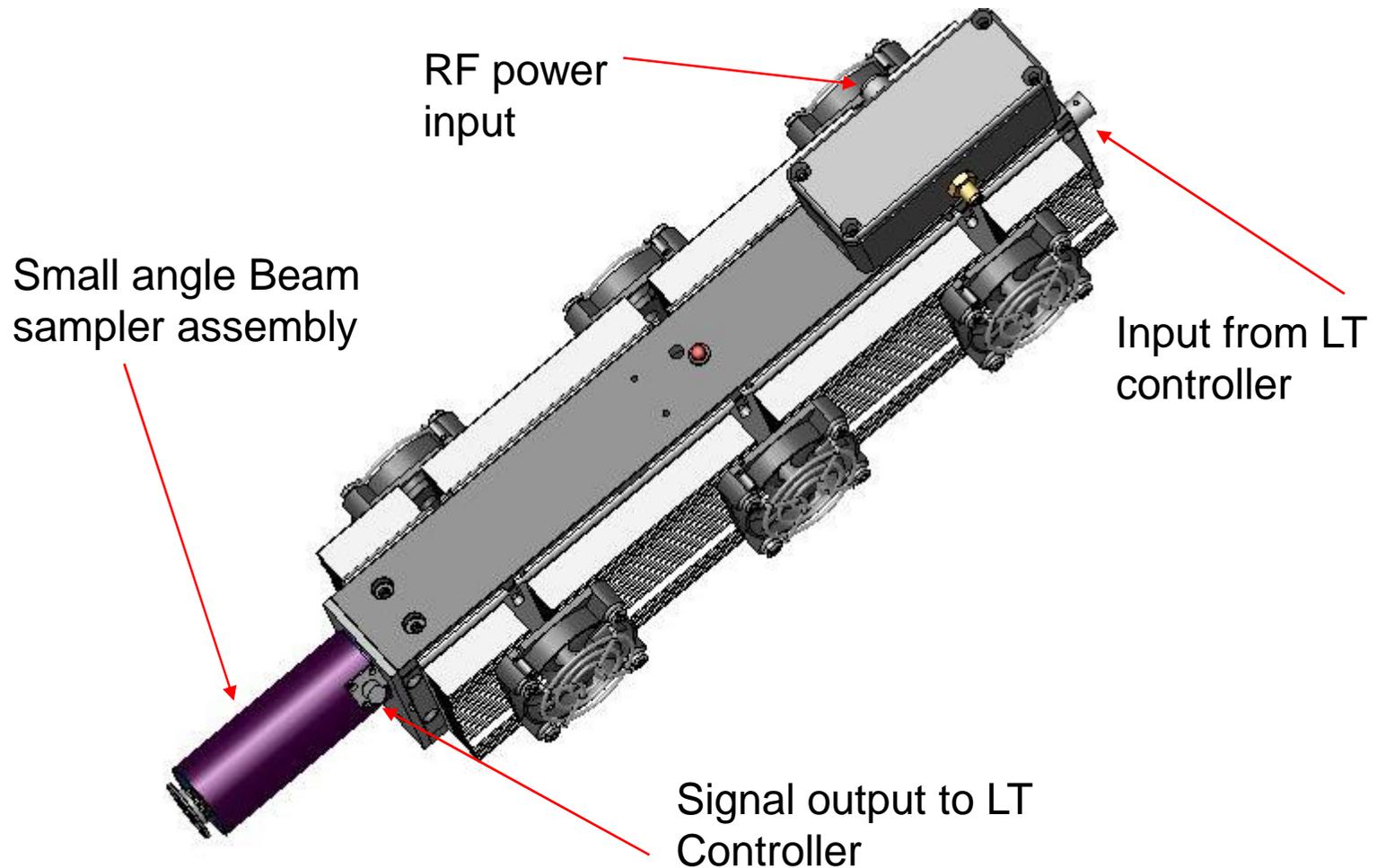


1. When laser rolls through a line its power goes through valley-peak-valley
2. Laser output power is sampled and turned into an electric signal
3. Signal is compared to the set value
4. Controller makes a decision whether to change the laser resonator
5. Command is sent to laser to compensate for the drift in laser resonator if necessary
6. Different from the traditional “dithering” approach: Piezo only moves to correct the residual drift of the well-stabilized resonator. There is no artificial frequency and power fluctuation introduced by the “dither.”

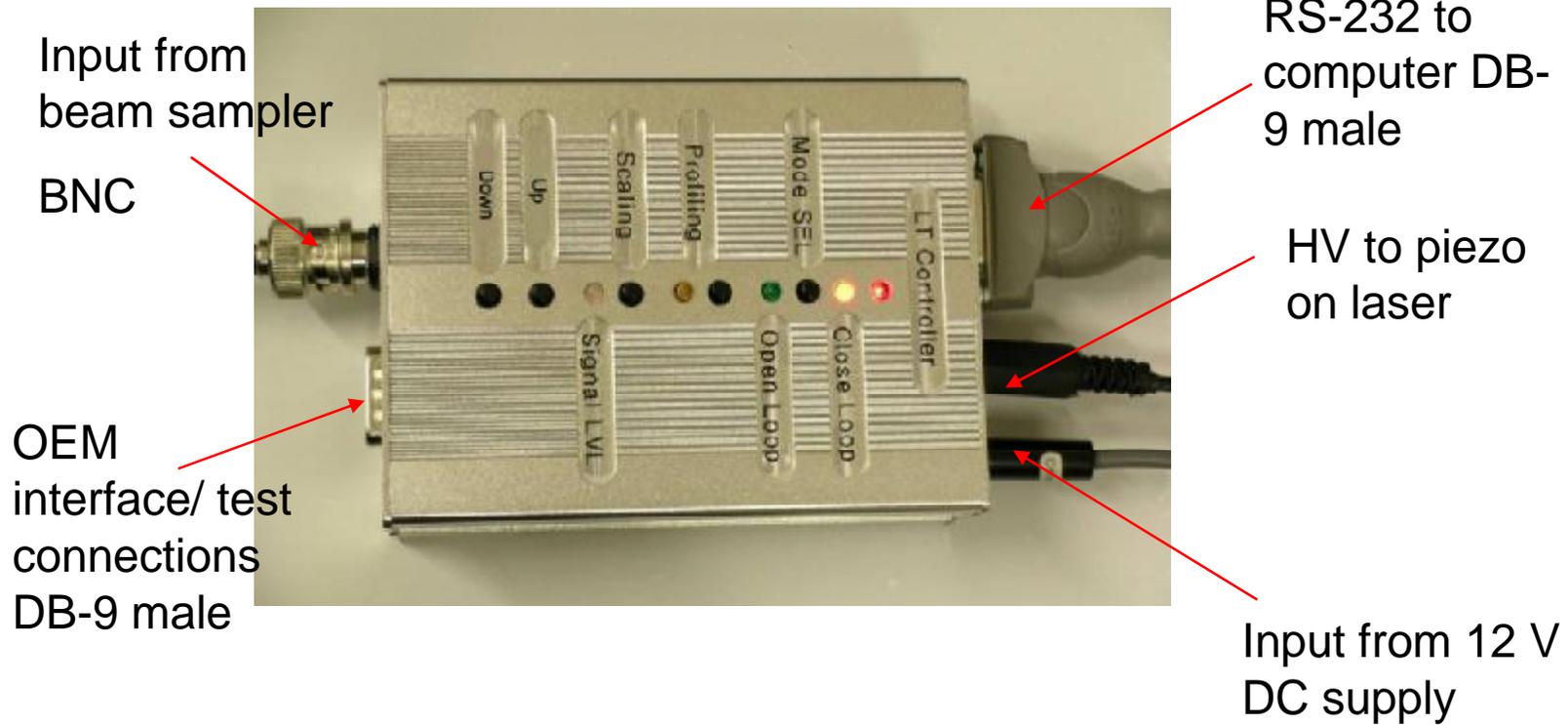
Line Tracker Sampling at 90-degrees



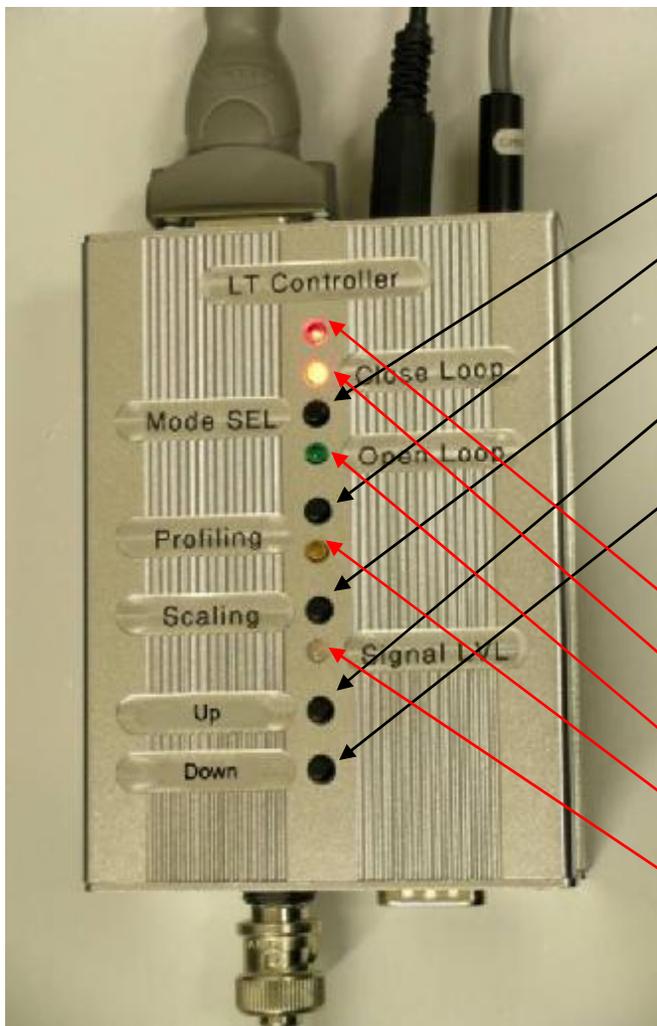
Line Tracker Sampling at Small Angle



LT Controller connections



Control Buttons and LEDs



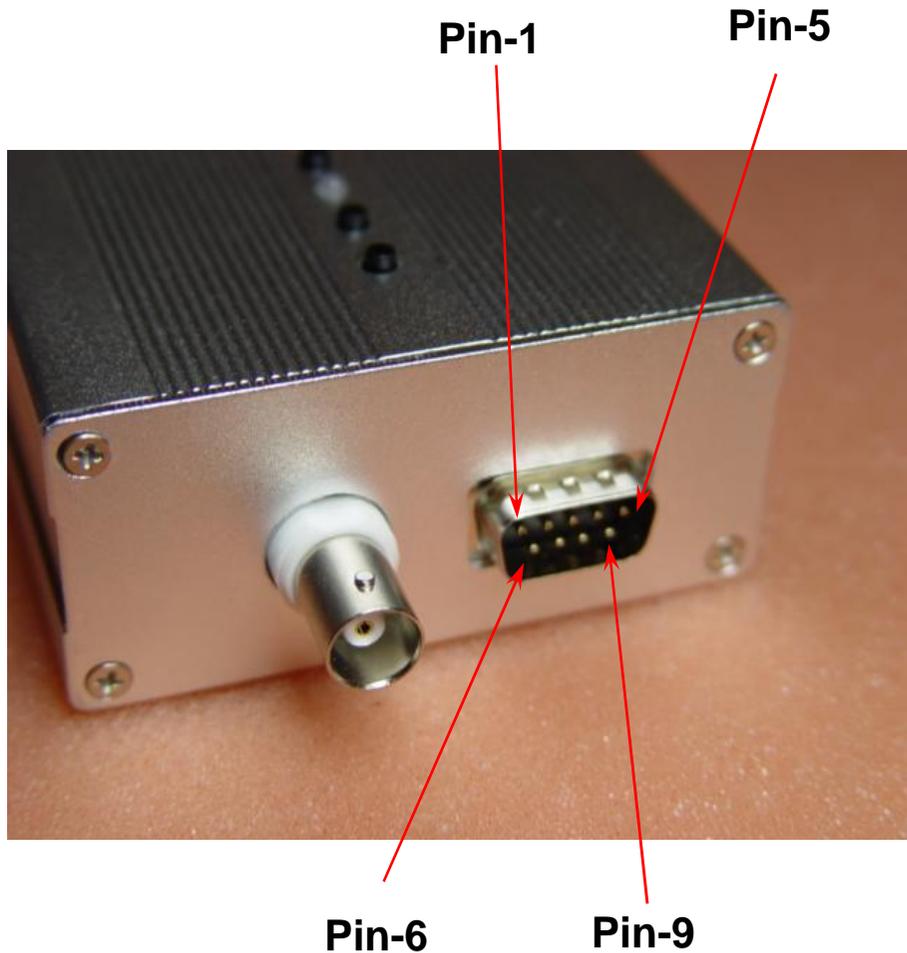
Push buttons (black):

- **Mode SEL:** Switch to open loop or close loop
- **Profiling:** scan for a profile of power pattern
- **Scaling:** Auto gain control
- **Up:** Open loop mode- manually increase driving voltage. Close loop mode-manually increase power.
- **Down:** Open loop mode-manually decrease driving voltage. Close loop mode- manually decrease power.

LED's

- Top red: Power indicator
- Closed Loop: Red-searching, Green-locked.
- Open Loop: Lights up in open loop mode
- Profiling: Blinks during profiling
- Signal LVL: fast blinks all the time. Green-power too low; Red- Power too high; Amber-Power OK

Signal Outputs for Status Monitoring



Pin-1: HV monitor (analog, proportional to high voltage applied to piezo actuator)

Pin-2: Signal-Too High (digital, same as signal lvl flashing red, signal too high)

Pin-3: Mode (digital, low open loop, high close loop)

Pin-4: Tracking (digital, in track when high)

Pin-5: Ground

Pin-6: Signal-Too Low (digital, same as signal lvl flashing green, signal too low)

Pin-7: Laser Power (Analog, proportional to laser power)

Pin-8: Profiling (digital, indicating profiling in process)

Pin-9: reserved

Note: All pins are output

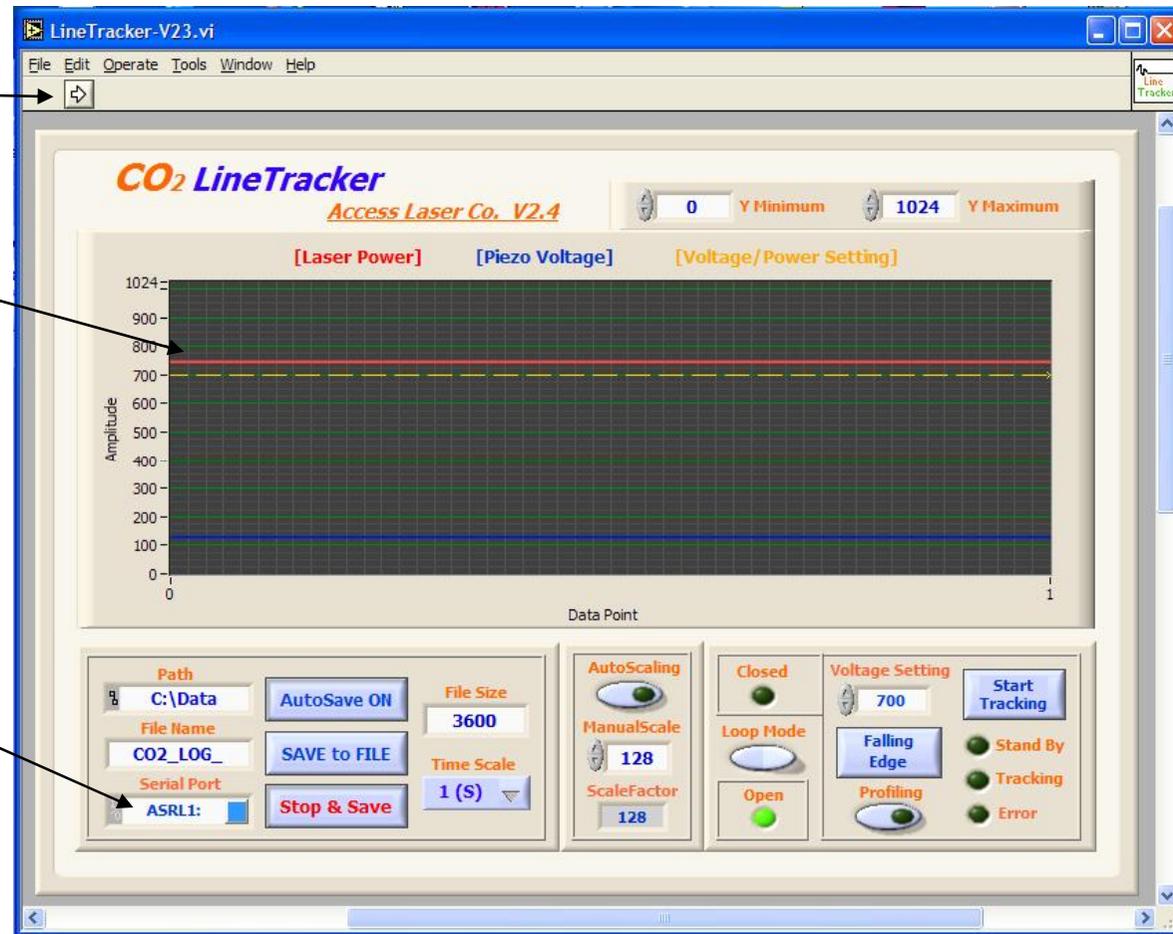
Computer interface: Line Tracker Software

Press this start arrow to activate the program after the appropriate serial port is selected

It is a good idea, when possible, to keep the power level at around 700 for best system resolution.

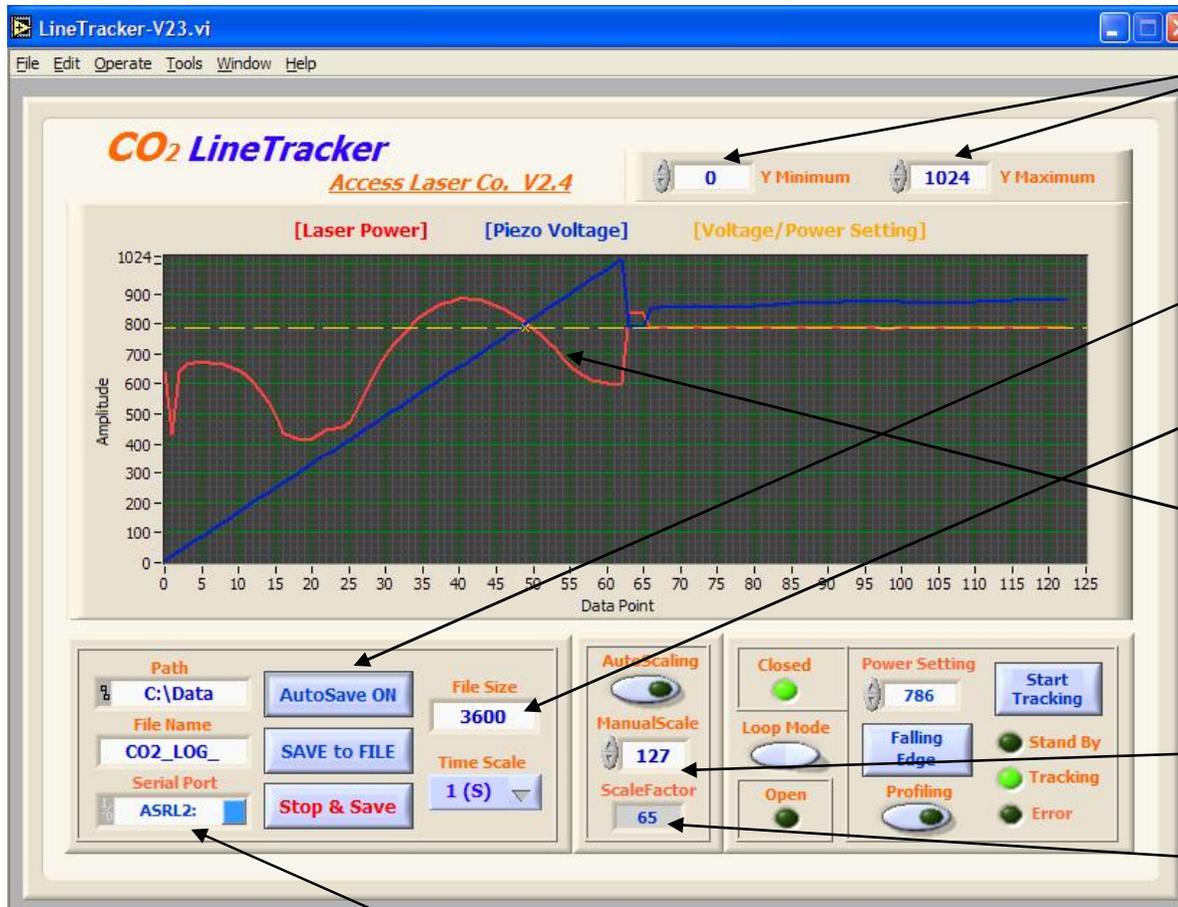
In a grating tuned laser this may not be achievable throughout the entire range.

Select the appropriate serial port before activating the program



NOTE: All functions of the LT controller are available here in the Line Tracker software. Some functions of the Line Tracker software are not available in the LT controller

Computer interface /data logging



Both power and voltage are set to a full range of 0 to 1024, arbitrary units.

When AutoSave is on files are saved as filled, with a time stamp in the file name. Data files are .csv format for easy importing into Excel.

File size indicates the number of data sets per file. Maximum 3600.

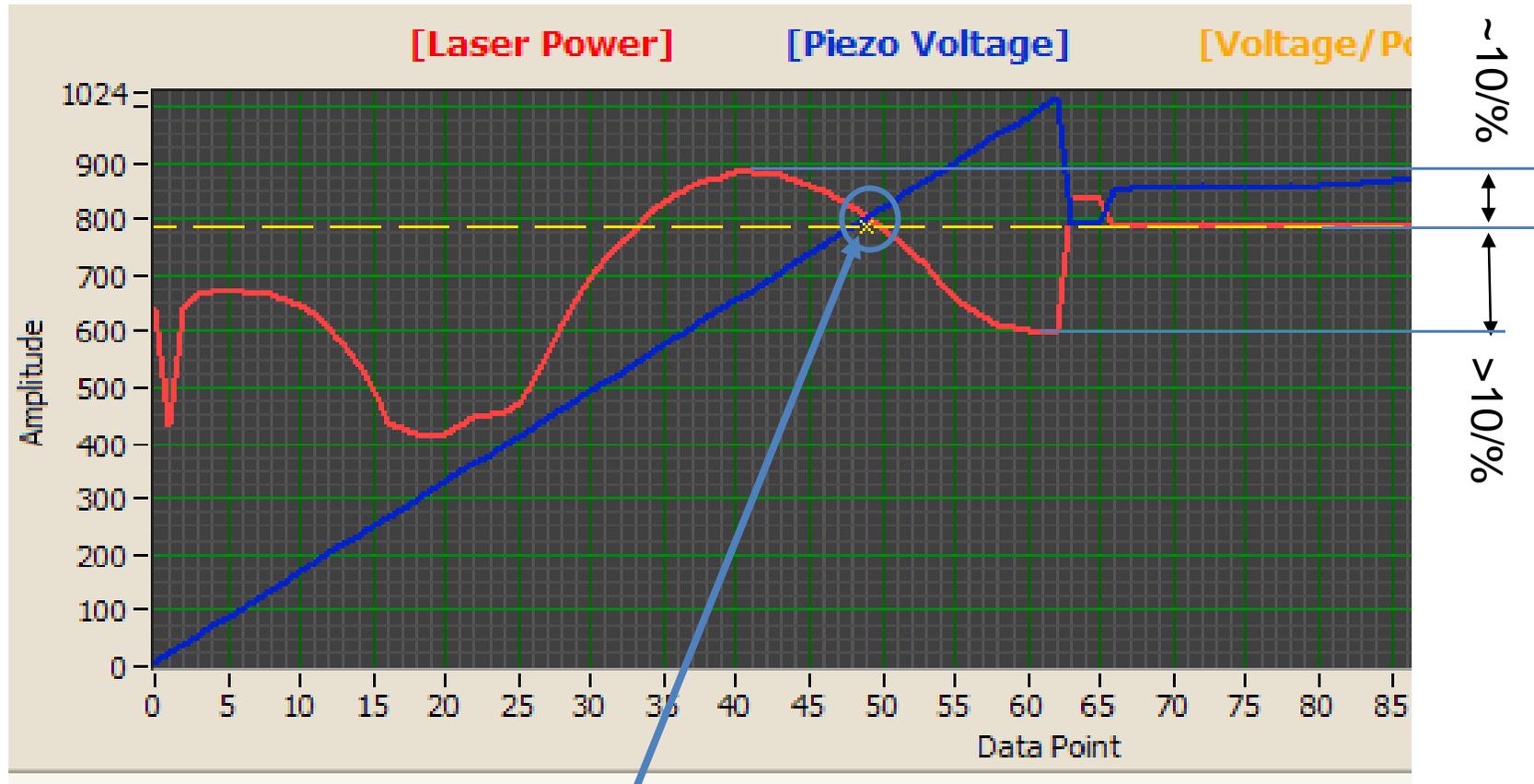
Laser is stabilized in the close-loop mode by moving the length of the resonator along the falling edge or the rising edge.

If manual setting is not entered by pressing the return key it will not take effect

Scale factor in effect

Make sure to select the appropriate serial port before starting operation

Find the Right Working Point - Grating Tuned Lasers



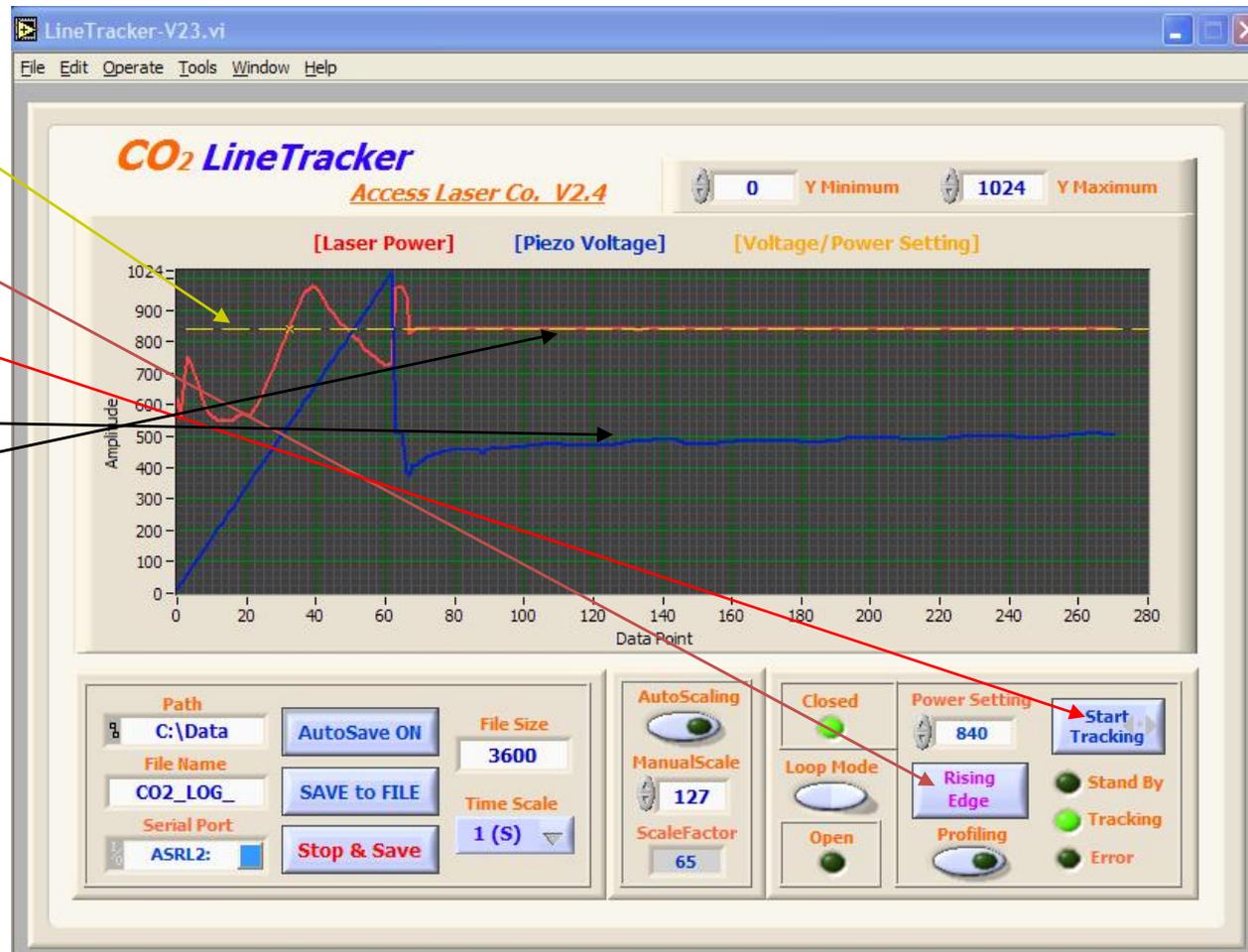
Piezo moves around the set point to compensate the length of resonator. The recommended working point is at about 10% below the peak and more than 10% above the valley, to provide enough room for correction.

Close loop operation

After profiling this yellow setting line becomes a cross.

Move the cross to approximately 10% below the desired peak on the power curve, select the appropriate edge, then press the "start tracking" button. The laser will start to be tracked and stabilized.

Notice that the piezo voltage (blue curve) moves up and down to keep the laser power (red curve) steady.



Operating Sequence

- Wait for the laser to settle down thermally, typically 30 minutes or so.
- Open the Line Tracker program in computer.
- Activate the program by clicking arrow in upper left corner.
- Click AutoScaling button while at highest power point to optimize the gain.
- Click Close-loop button to start close-loop mode. Laser will go into profile mode first to provide a minimum-to-maximum voltage scan on piezo.
- After the scan evaluate the smoothness of curve. Select the smooth portion of the curve. Then select “rising edge” or “falling edge” depending accordingly.
- At this time click the Start Tracking button. The laser should go into closed loop operation.
- If at any time the laser comes out of closed loop run the above process again. The curve may have moved due to thermal fluctuation, or you may want to pick a different spot to lock the laser in.

Upgrades to Software Version 1.25-2010

- Compatible with Windows 7
- Same functionality as the older version
- May require Administrator privileges to write the initialization file into the root directory (commonly C)
- Sample of initialization file included in this CD.
- Effective Aug 2011