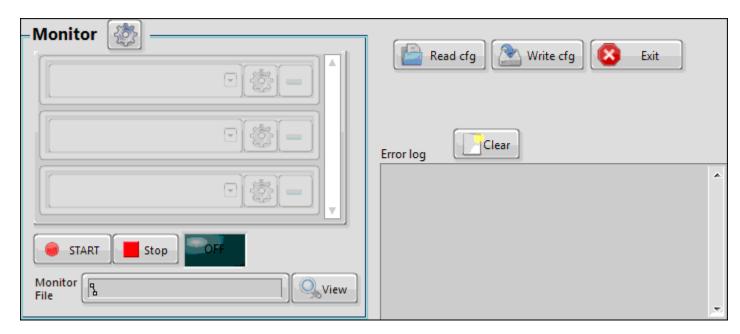
# LabActor

Main control module – select and access measurement modules, control measurements etc.



# [abc] Monitor

List of active measurement modules

**III** Start

Start measurement

**TFI** Stop

Stop measurement

**TFI** View

View Monitor data file

**TFI** Read cfg

Read application configuration from file

**TFI** Write cfg

Write application configuration to file

**III** Monitor configuration

Open Monitor configuration

**TFI** Exit

Exit application

**TFI** Clear log

Clear error log

**Monitor Running** 

Measurement state

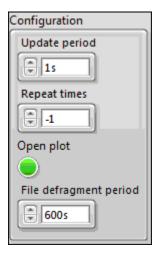
**Monitor File** 

Latest Monitor data file

Error log

# Monitor

Configure measurement flow



# **Configuration**

Monitor configuration

**DBLI** Update period

Request data collection this often

**1321** Repeat times

Complete this many measurements then stop (or keep going if <0)

**TFI** Open plot

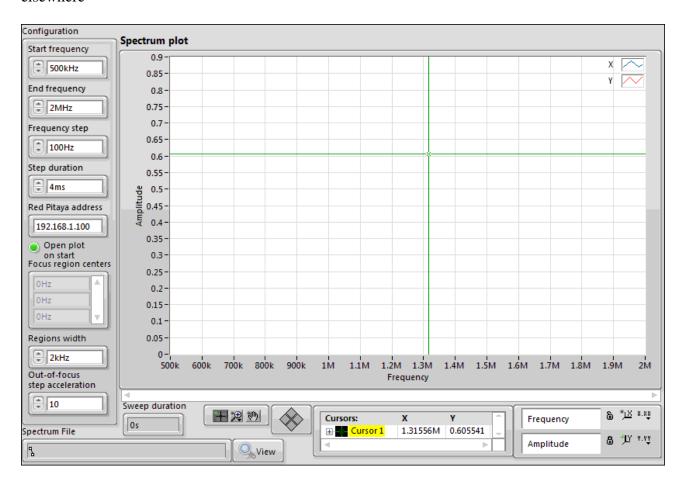
Open new Monitor data plot on start

File defragment period

Defragment Monitor data file this often when running

# **Spectrum Recorder**

Spectrum Recorder module sweeps frequency and records complex response using Red Pitaya. The sweep frequency increment is either uniform and equal to Frequency step, or equal to Frequency step only inside defined focus regions and Frequency step\*acceleration factor elsewhere



# **E**Configuration

Spectrum recorder configuration

**DBL** Start frequency

Spectrum starting frequency

**DBLI** End frequency

Spectrum ending frequency

**IBLI** Frequency step

Minimal frequency increment

**DBLI** Point interval

Interval between frequency increments

Address

Network address of Red Pitaya

**III** Open plot

Open new spectrum plot window at the start of measurements

**[DBL]** Focus region centers

If not empty, increase frequency steps outside listed regions

**DBLI** Regions width

Width of focus regions

Out-of-focus step acceleration

If > 1, increase frequency steps outside listed regions by this factor

**TIP** View XY Plot

View latest spectrum file

Spectrum plot

Latest spectrum

**Spectrum** File

Latest spectrum file

**Sweep duration** 

Estimated duration of single spectrum recording, sec

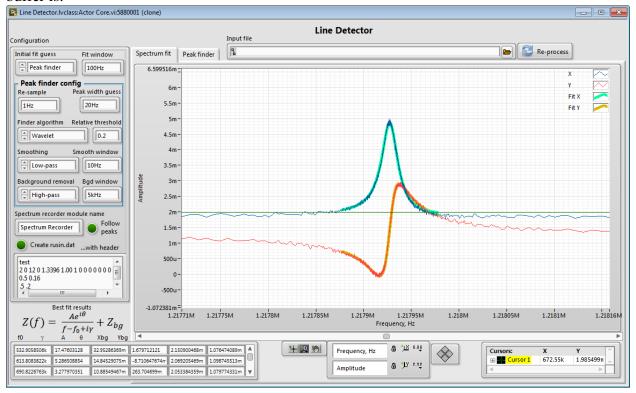
# **Line Detector**

Line Detector module finds amplitude peaks in spectrum file and fits complex Lorentzian around peaks

Each individual resonance parameters are determined via non-linear curve fit of the signal data in complex representation  $Z(f) = X(f) + iY(f) = M(f)e^{i\varphi(f)}$ , where're X is "Signal X", Y is "Signal Y", M is magnitude,  $\varphi$  is phase, and f is frequency. The resonance fit model is  $Z(f) = \frac{Ae^{i\theta}}{f - f_0 + i\gamma} + Z_{bg}$ , with fit parameters as follows:  $f_0$  is center frequency,  $\gamma$  is resonance half-width, A is amplitude,  $\theta$  is phase, and  $Z_{bg}$  is background signal.

The initial guess for fit parameters can be provided by either a Peak finder or by last fit results obtained in preceding Line Detector processing run shown in Best fit results control. The Best fit results array can be manually edited by overwriting the values or inserting or deleting rows via right-click pop-up menu. Each separate resonance is fitted within a frequency Fit window centered on its guessed  $f_0$ .

Line Detector can optionally send the updated the list of focus regions ( $f_0$ ) to Spectrum Recorder, in other words to follow peaks. The update is delayed depending on how full Red Pitaya input buffer is.



# Input file

Spectrum file to process (auto-updates when monitor is running)

### **Configuration**

Line Detector configuration

# **Initial fit guess**

Run peak finder to guess fit parameter or use Best fit results values

## **IDEL!** Fit window

Width of complex Lorentzian fit window around the peak

## **DBLI** Re-sample

If > 0, re-sample signal to this frequency step

#### **DBLI** Peak width guess

Guess width for peak finder

# **Tinder** algorithm

Peak finder type

## Background removal

Background removal type for peak finder

#### **Smoothing**

Smoothing type for peak finder

#### **DBL** Smooth window

Smoothing amount for peak finder

#### **BLI** Relative threshold

Smallest peak magnitude relative to spectrum maximum

#### **Belling** Bgd window

Background removal width for peak finder

#### **Spectrum recorder name**

Name of the spectrum recorder module to watch

### **TFI** Follow peaks

Auto-update Spectrum Recorder focus regions with best fit results

#### TFI Create rusin.dat

Auto-create rusin.dat

#### шы ...with header

Prepend rusin.dat with this header

## **TFI** Re-process

Re-process spectrum file selected in the Input file window

### Spectrum plot

Spectrum data (thin lines) with complex Lorentzian fit results (thick lines)

#### Peak Plot

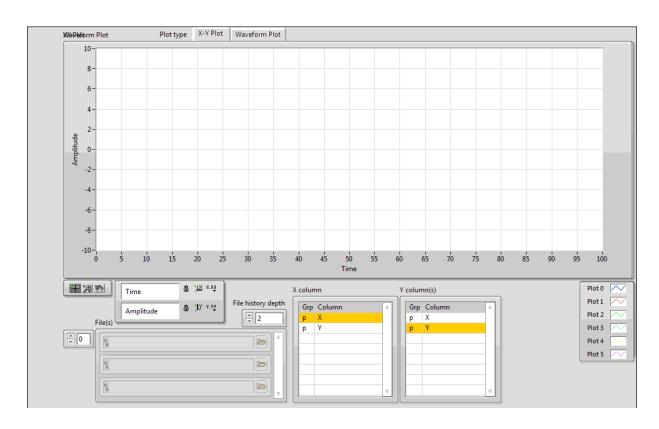
Filtered and smoothed magnitude with peaks found by Peak Finder, if Peak Finder is enabled

#### [DBL] Best fit results

Latest complex Lorentzian fit results. Manual edits allowed when used with "Last fit" guess mode

# **Data Plot Module**

Plots listed TDMS data files



- File(s)
  - List of files to plot. Click browse buttons on the right to add/replace
- X column

Selects X-axis channel name. Avaliable names determined by top file on the lsit.

Y column(s)

Selects Y-axis channel name(s). Hold Ctrl or Shift for multi-channel selection. Avaliable names determined by top file on the lsit.

Plot type

Switch between X-Y and Waveform style plots

File history depth

Keep up to this many previous files in the list when new measurement file arrives