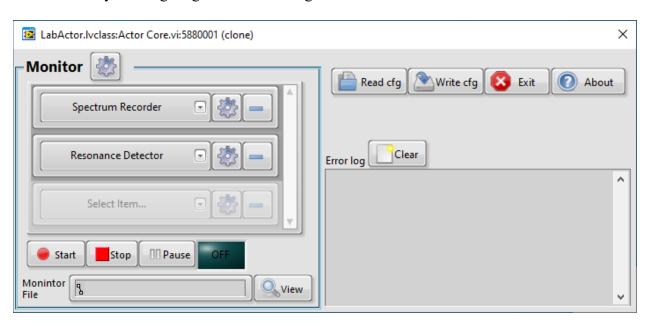
LabActor

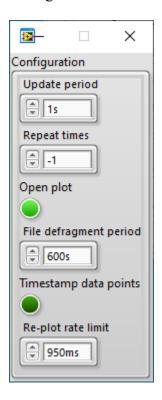
Main control module – select and access measurement modules, control measurements etc. Active modules are selected via "Select Item..." drop-down menu. Module configuration panels are accessed by clicking on gear icon to the right of the module name.



[abc] Monitor List of active measurement modules **III** Start Start measurement TFI Stop Stop measurement TEI Pause Pause measurement TFI View View Monitor data file TEI Read cfg Read application configuration from file Write application configuration to file **TFI** Write cfg **III** Monitor configuration Open Monitor configuration **TFI** Exit Exit application TF Clear log Clear error log **ITE** Monitor Running Measurement state **Monitor** File Latest Monitor data file name Error log Error messages

Monitor

Configure measurement flow



Configuration

DBL Update period Request data collection this often

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

Open plot Open new Monitor data plot on start

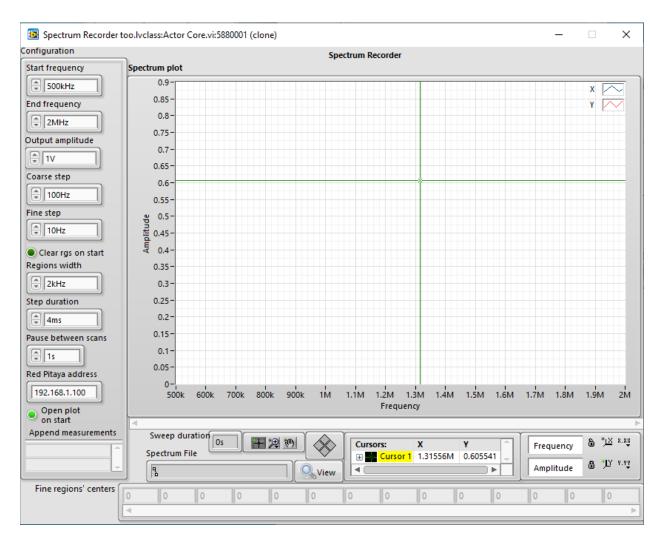
DBL File defragment period Defragment Monitor data file this often when running

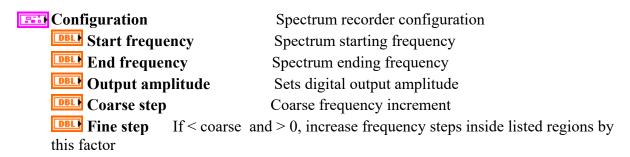
Timestamp data points

DBL Re-plot rate limit Limits update rate of plot windows

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





- Clear rgs on start Empties fine region's centers array at the start of the measurements
- **Regions width** Width of fine regions
- Step duration Interval between frequency increments
- Pause between scans Pause duration after each frequency scan before starting next scan
- Address Network address of Red Pitaya
- Open plot Open new spectrum plot window at the start of measurements
- Focus Focus region centers If not empty, increase frequency steps outside listed regions
- **Append measurements** Names of other modules which results will be added to spectrum files
- View View latest spectrum file
- Spectrum plot Latest spectrum
- Spectrum File Latest spectrum file
- Sweep duration Estimated duration of single spectrum recording, sec

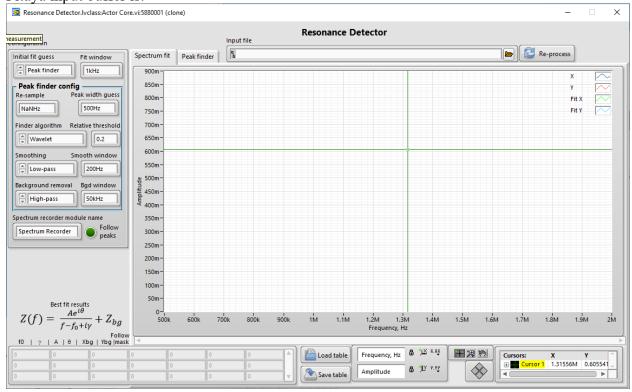
Resonance Detector

Resonance 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, φ 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, γ is resonance half-width, A is amplitude, θ 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 Resonance Detector processing run, which is stored 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 fo.

Resonance 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)

Essis Configuration

Line Detector configuration

Initial fit guess

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

DBL Fit window

Width of complex Lorentzian fit window around the peak

DBLI Re-sample

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

DBLY 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

DBLI Smooth window

Smoothing amount for peak finder

BLI Relative threshold

Smallest peak magnitude relative to spectrum maximum

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 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

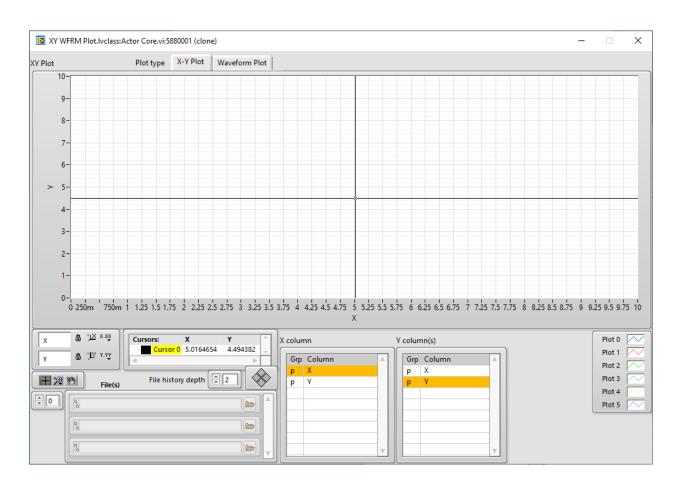
Filtered and smoothed magnitude with peaks found by Peak Finder, if Peak Finder is enabled

[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