Working with the FROG

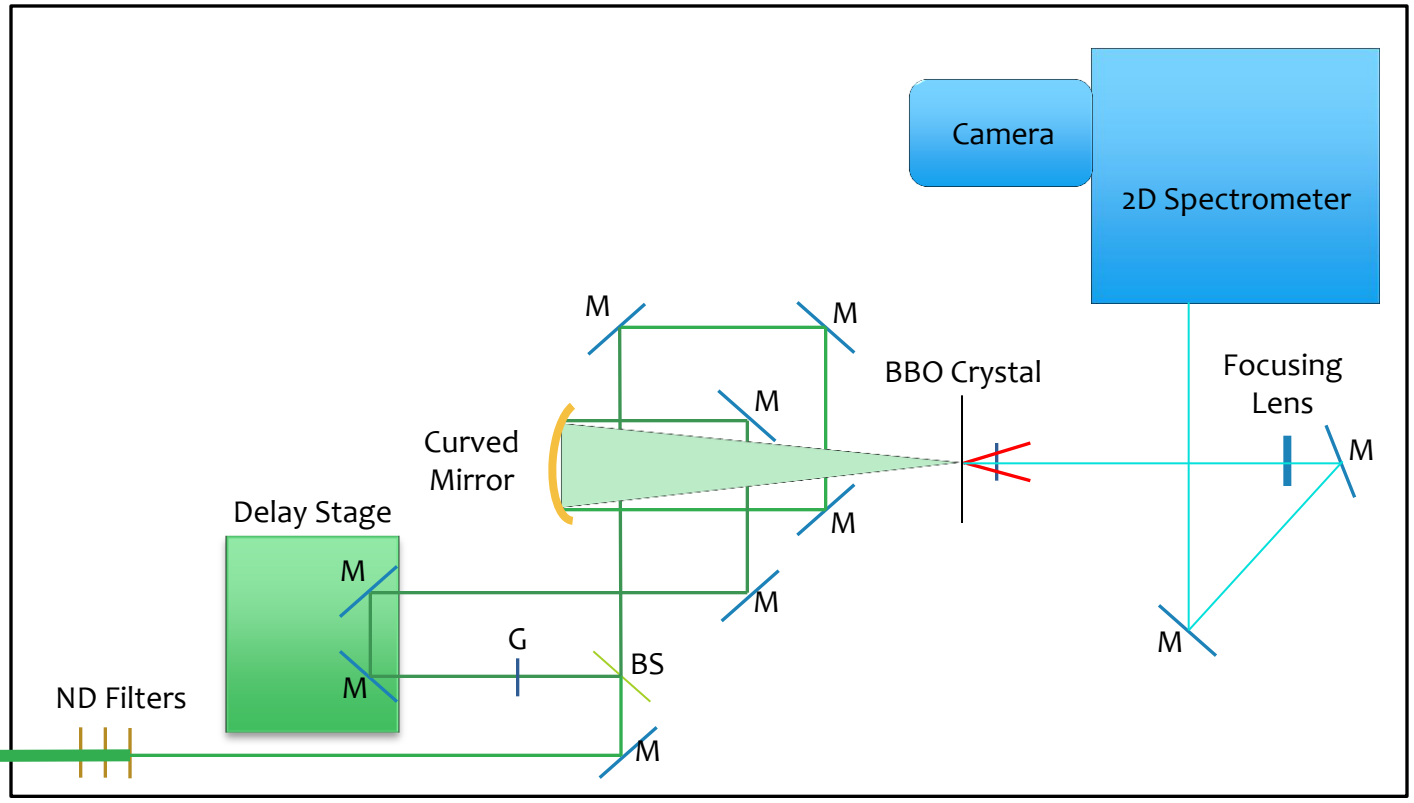
By Alex Brancale

Frequency-Resolved Optical-Gating (FROG)

GOALS

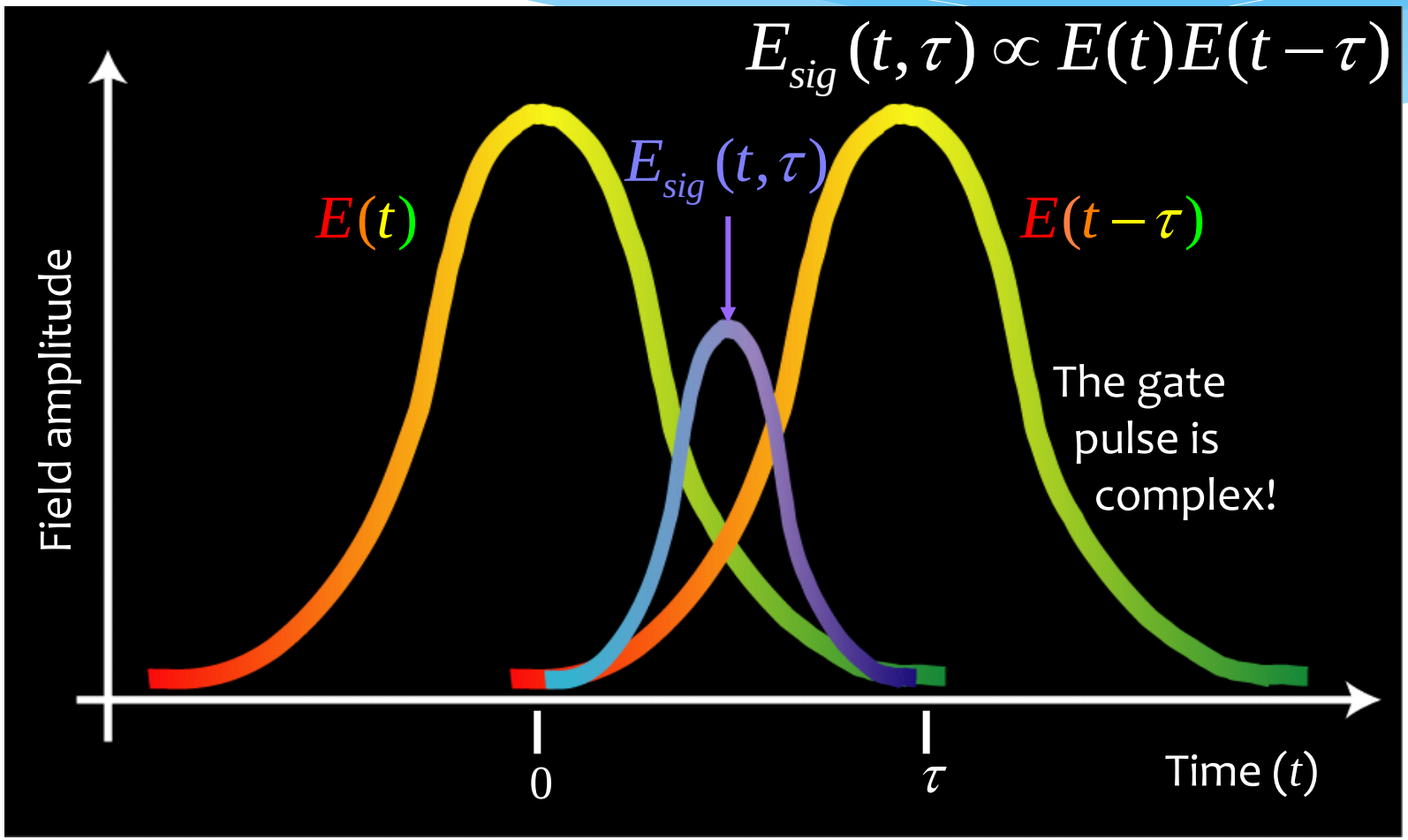
* Align the FROG
* Produce Second Harmonic Generation (SHG)
  * Blue light
* Record Pulse Characteristics
* Optimize LabView Program
* Trigger the Camera Shutter
* Understand Shutter Controls
* Expand the FROG to other Wavelengths

FROG Set-Up


Camera
2D Spectrometer
M
M
M
BBO Crystal
Focusing
Lens
M
Curved
Mirror
M
Delay Stage
M
M
G
BS
M
ND Filters
M
M

FROG Set-Up

What happens in the FROG



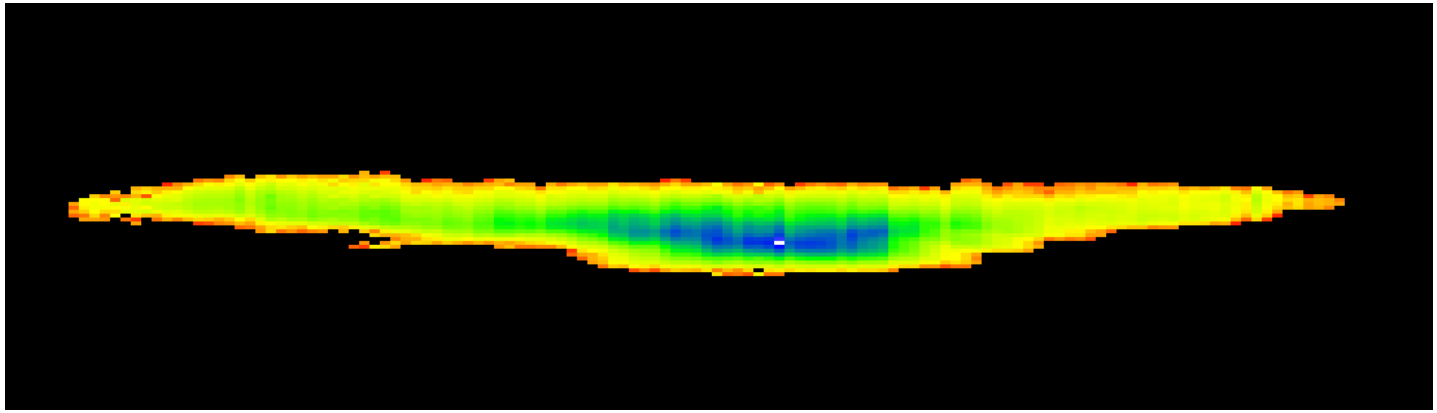
From Rick Trebino Ultra-Fast Optics Course

Blue Light

* Overlap in BBO crystal
  * Space
  * Time

How to get Pulse Characteristics

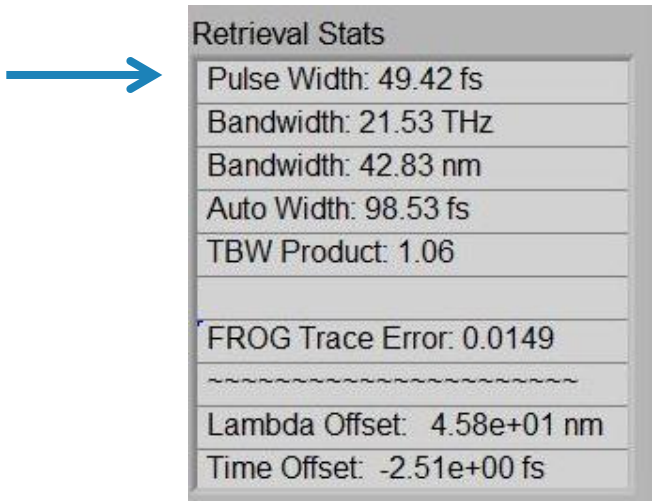
* Run a scan with LabView program
* Put scan data into FROG Reconstruction program



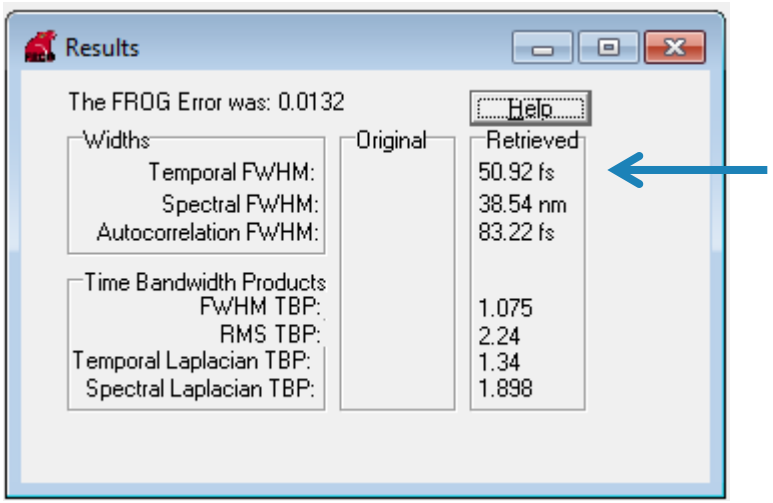
What we found with the FROG

* We have a functioning Single-Shot and Scanning FROG and FROG Software

PULSAR FROG

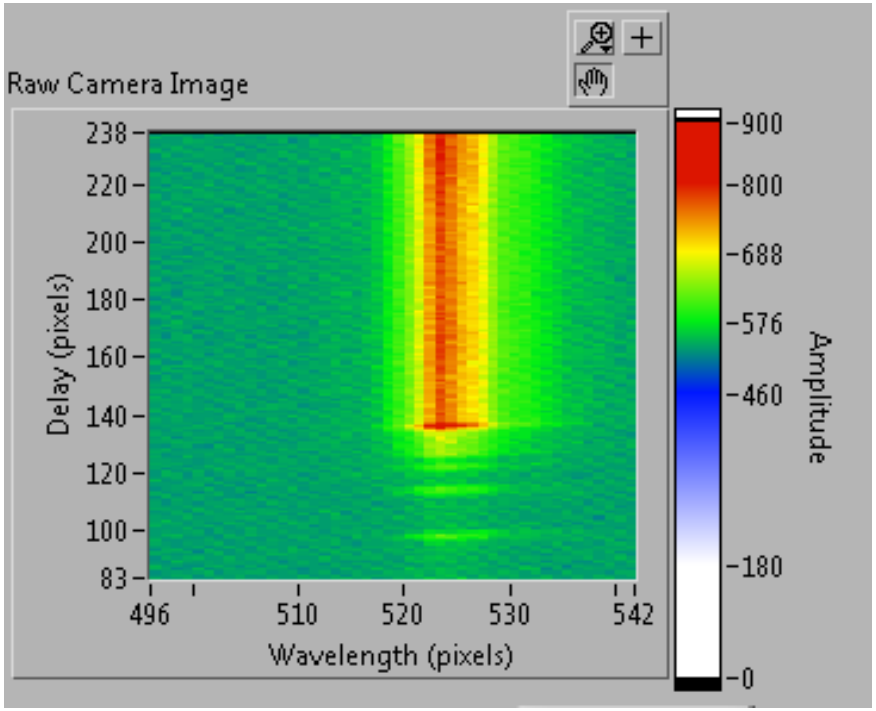


HITS FROG

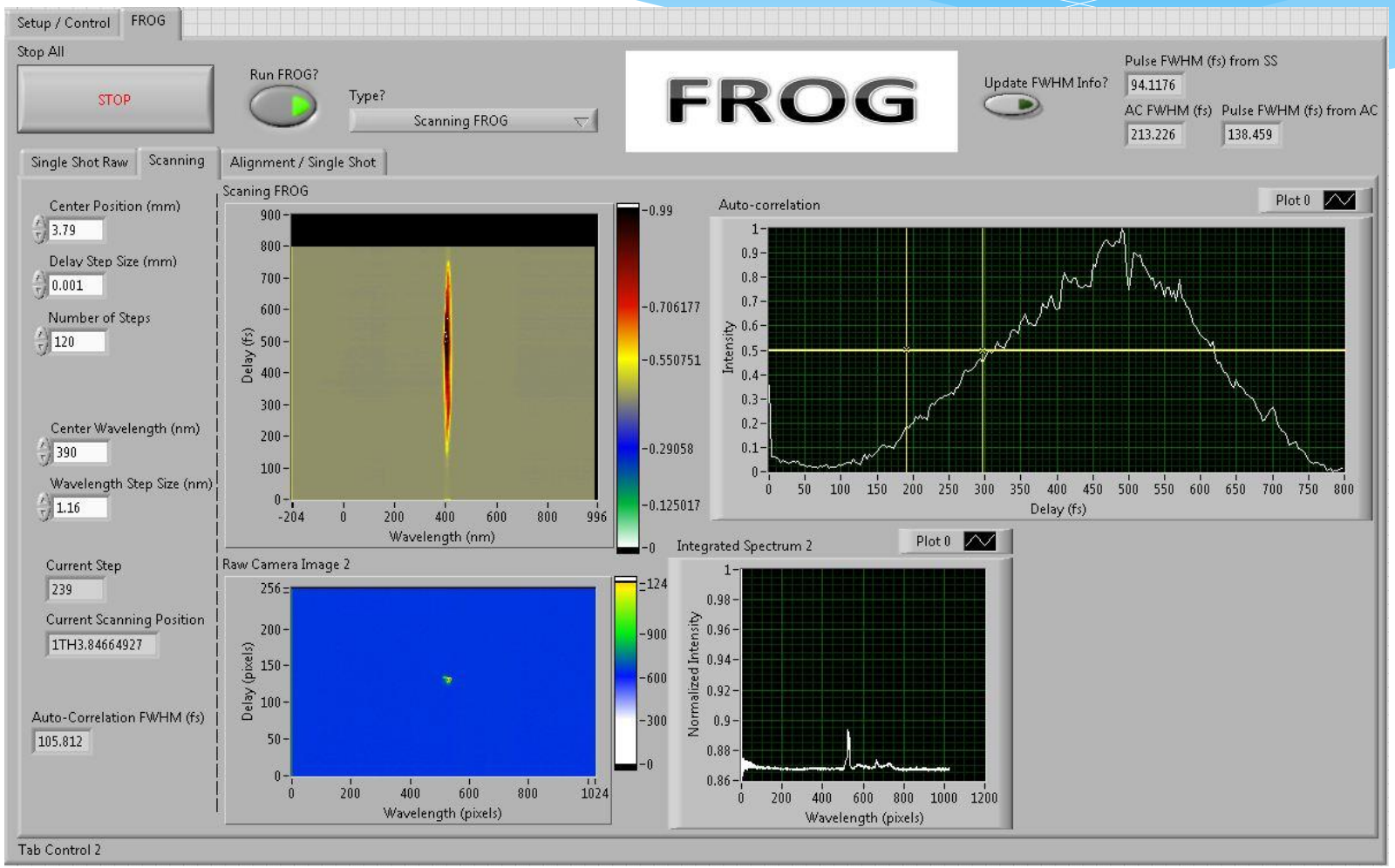


What we found with the FROG

* Smearing has been diminished in Single Shot mode
  * Shutter Issue

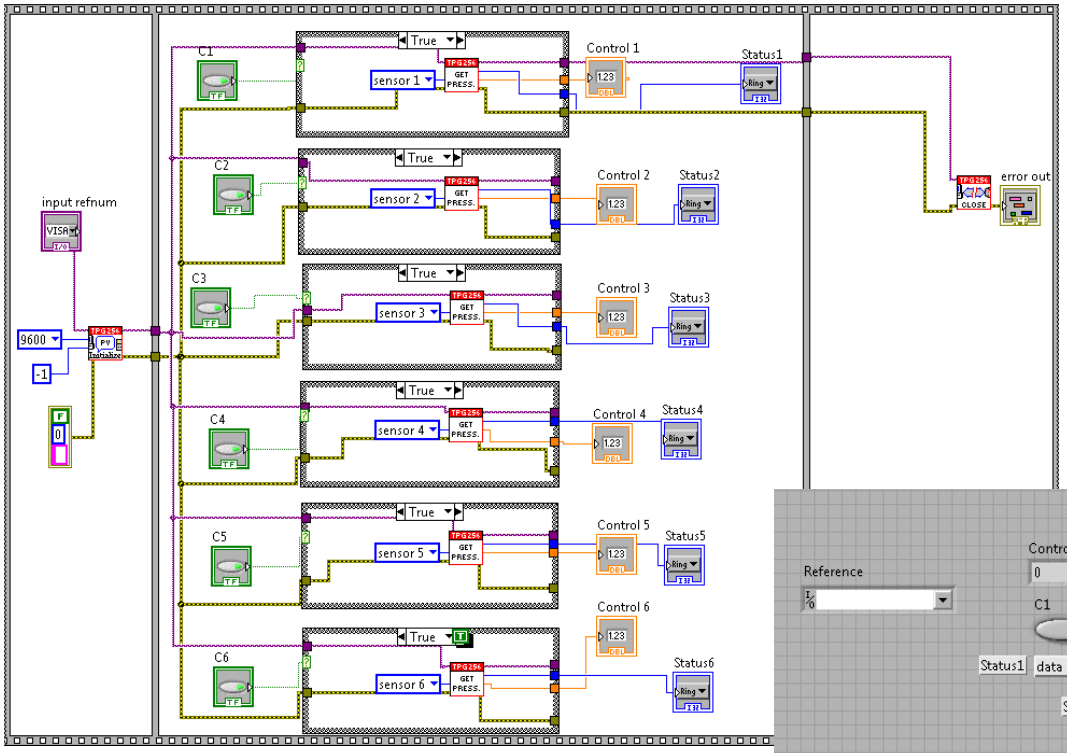


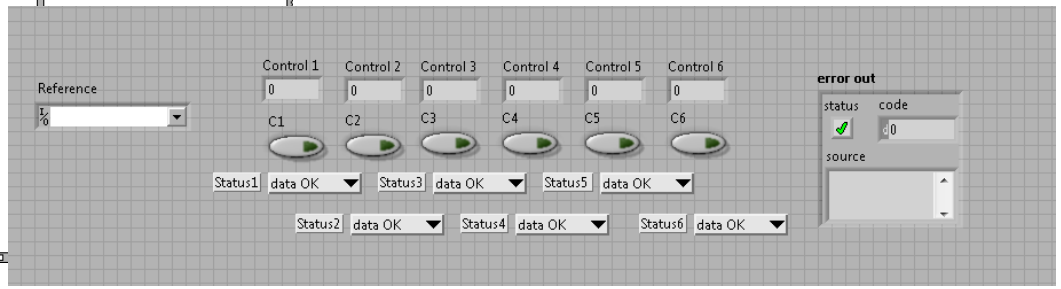
FROG Program Front Panel



Automation of the High Intensity Tunable Source (HITS) Lab

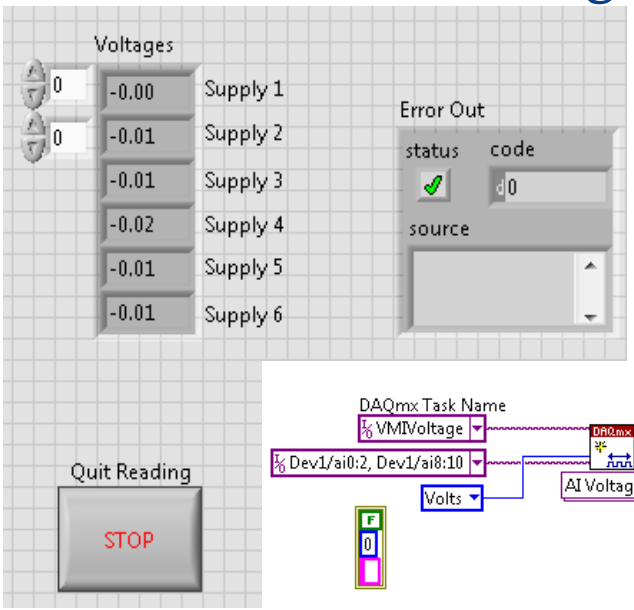
* Monitor Pressure gauge
  * All vacuum chambers in Lab

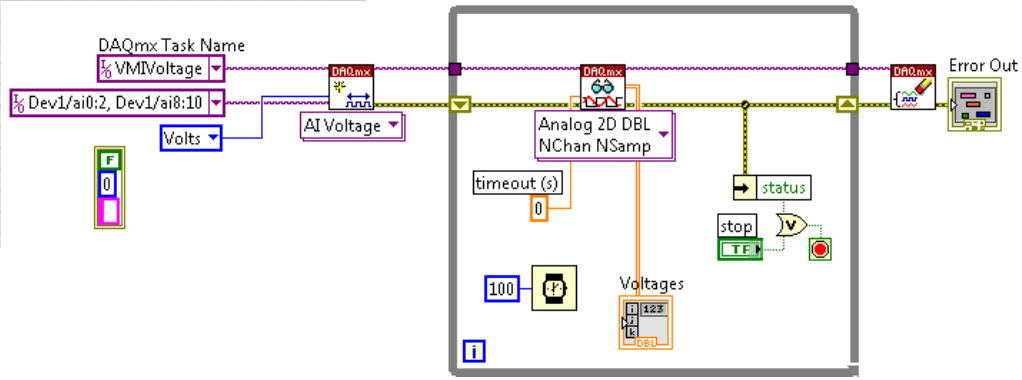




Automation of the High Intensity Tunable Source (HITS) Lab

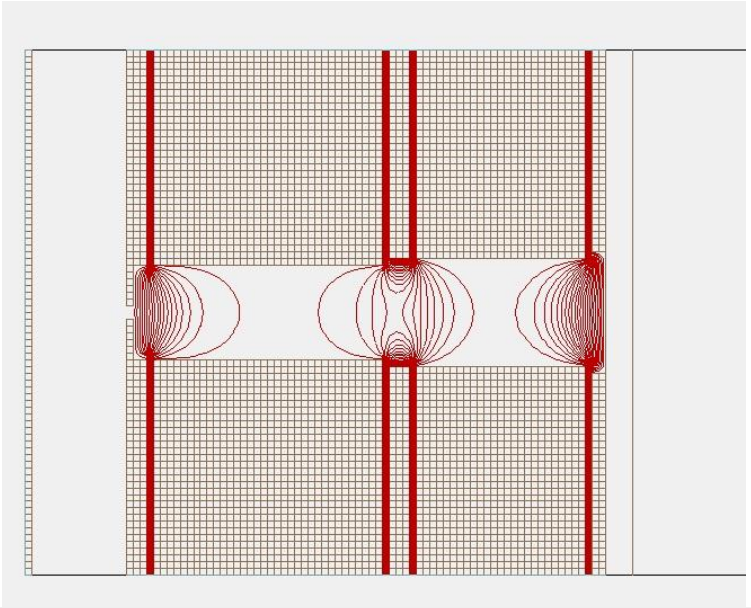
* Data Acquisition Box
  * Digital Analog Converter and Analog Digital Converter
  * Works with all High Voltage Power Supplies

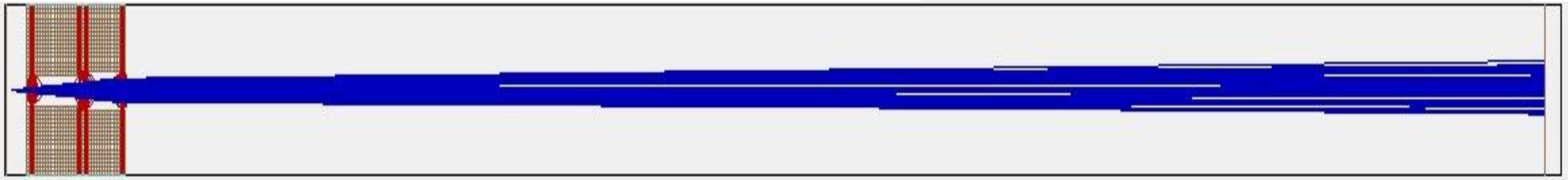




Automation of the High Intensity Tunable Source (HITS) Lab

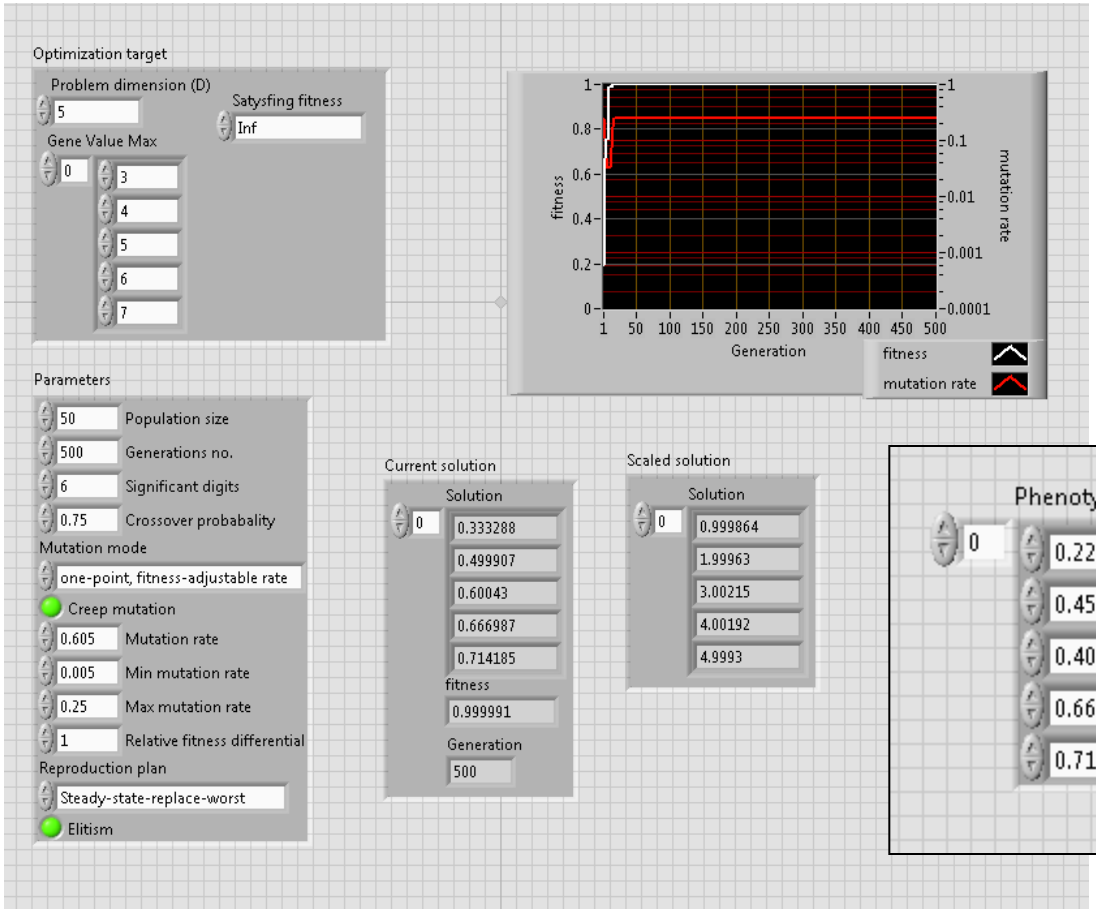
* Genetic algorithm
  * Electron Time of Flight Experiment
    * Optimizing Electron yield on the MCP
    * Control Voltages on Einzel lenses
    * Fitness - Optimize electron yield for certain energy ranges

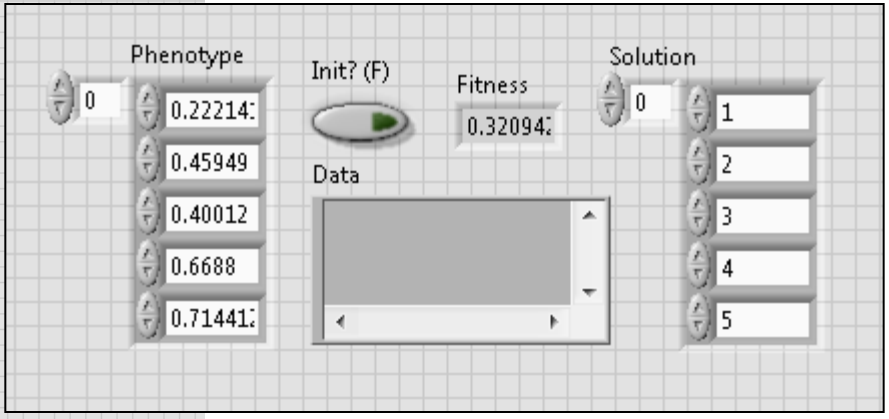




Automation of the High Intensity Tunable Source (HITS) Lab

* Implemented Genetic Algorithm LabView Front Panel





What's Next?

* Understand Shutter Controls better
  * Test without laser
* Implement background reading process
  * Take pre-laser image to be subtracted from all raw data
* Take more traces with the FROG
* Apply my Genetic Algorithm VI to the Experiment
  * Power Supplies and Pico-oscope

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NSF