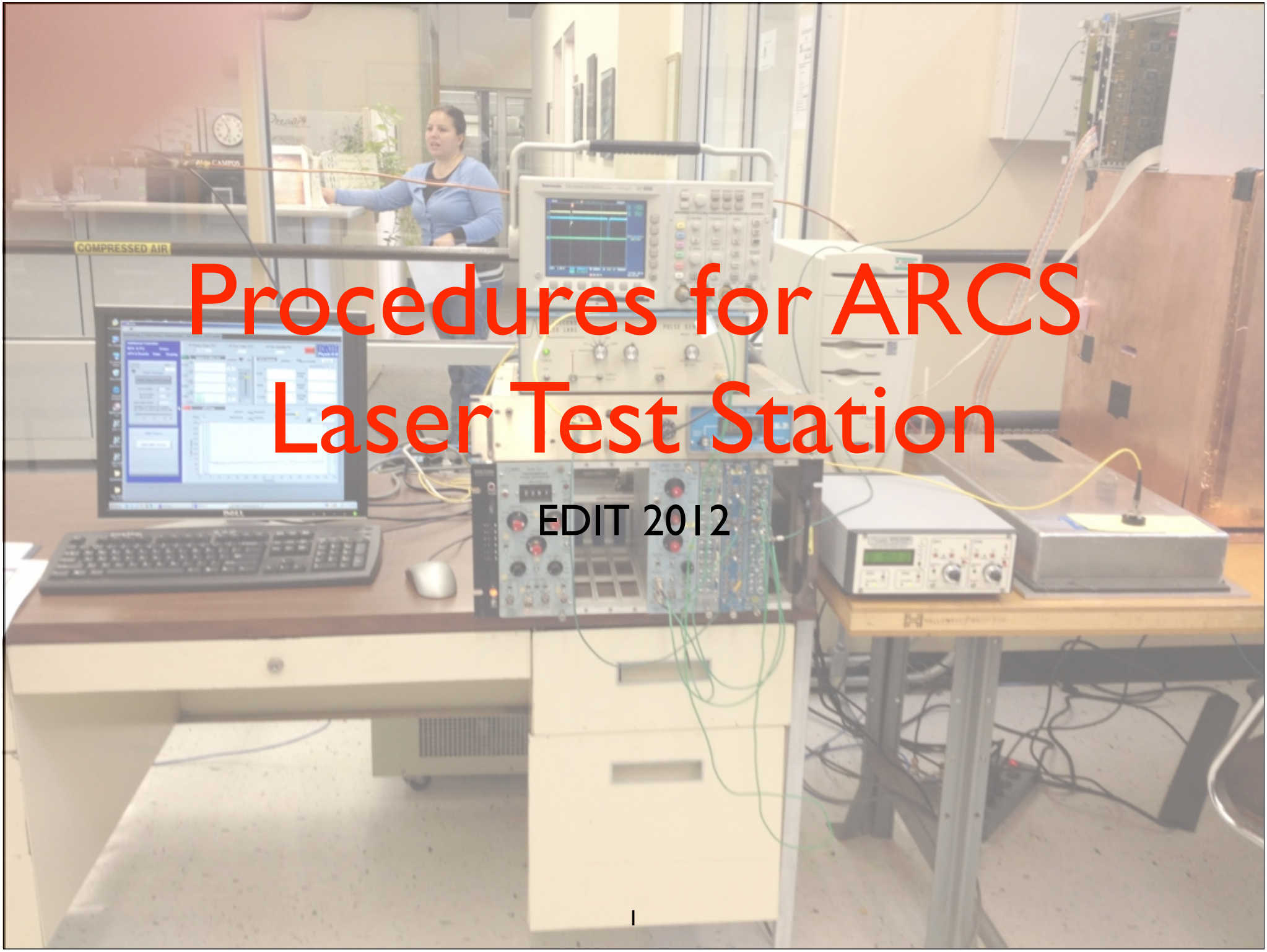
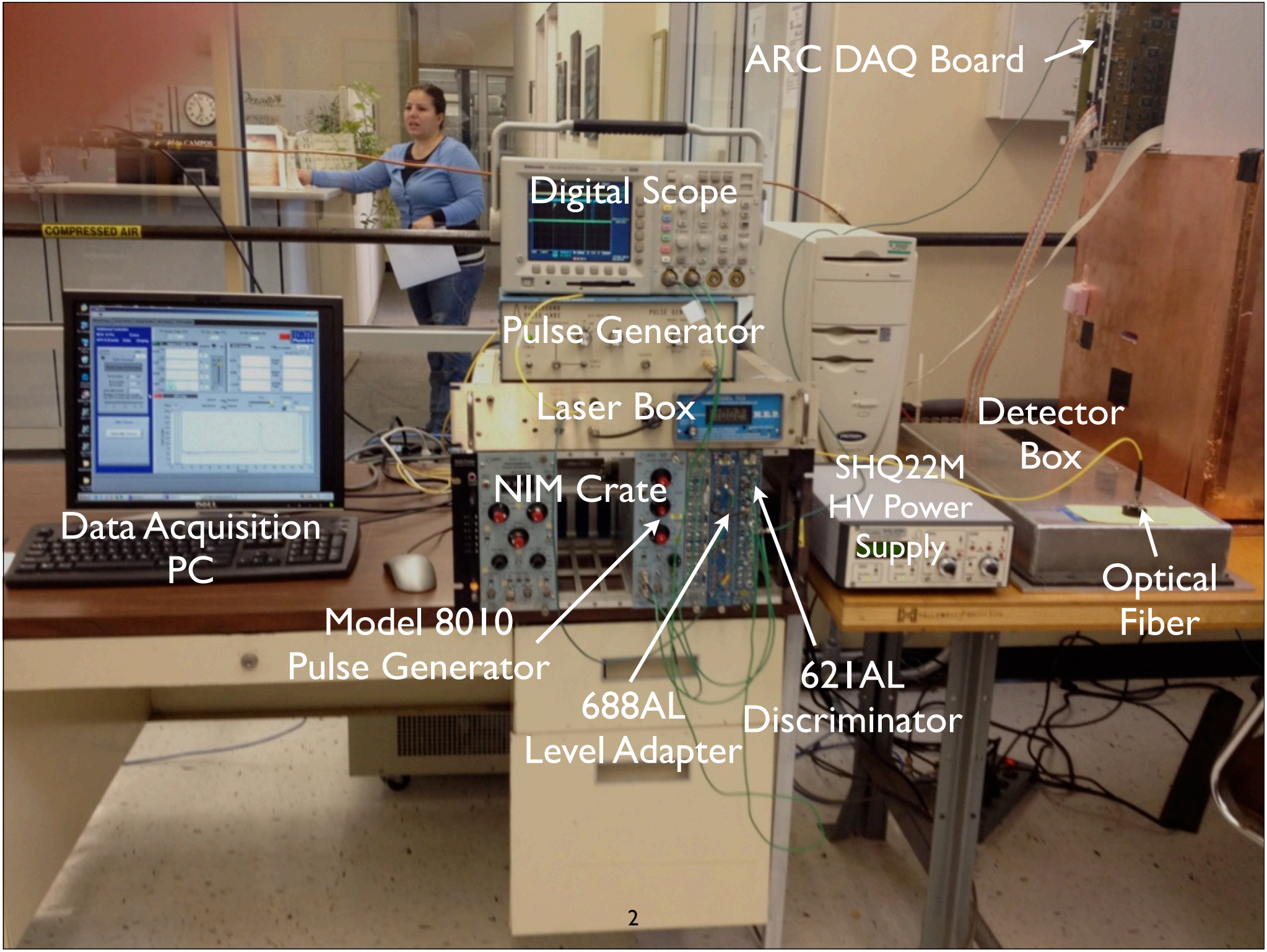
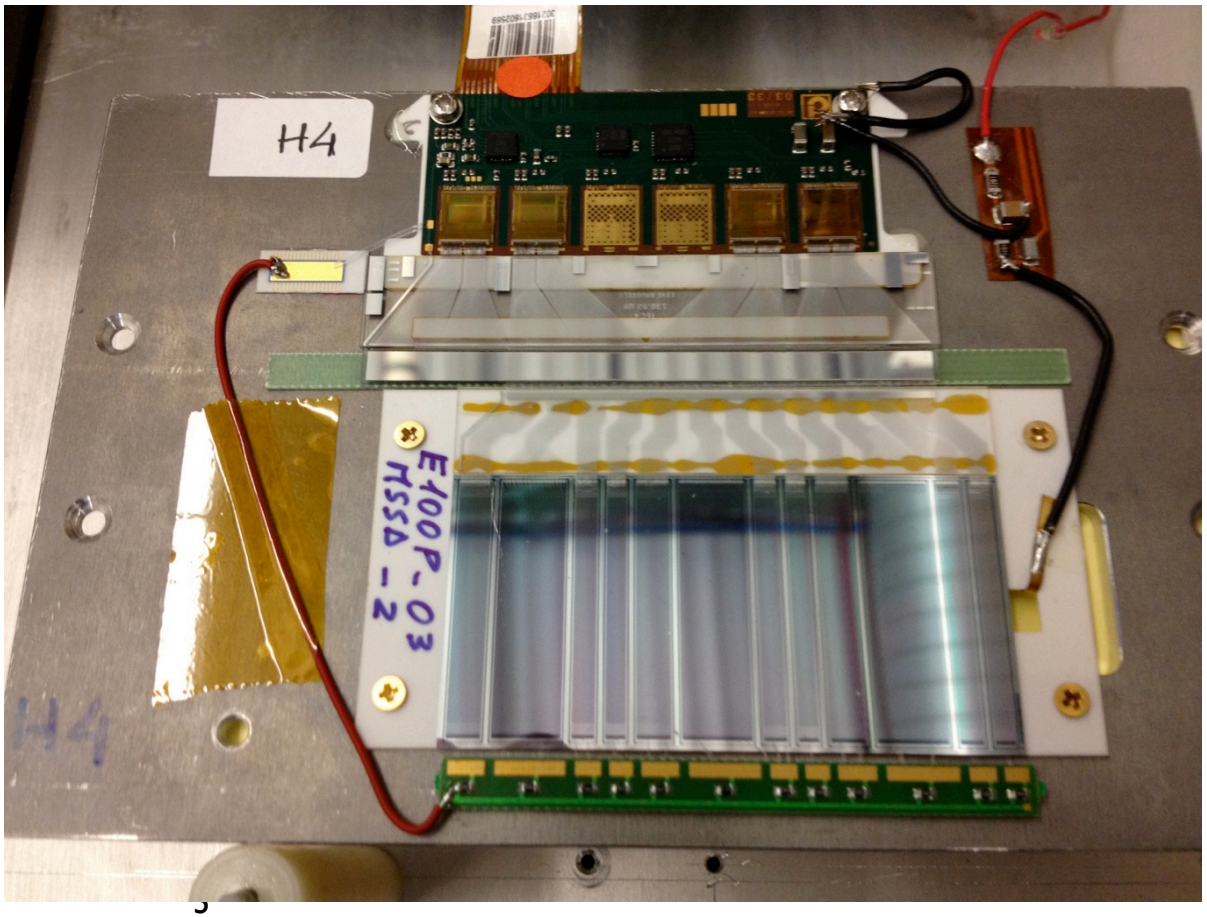


Procedures for ARCS Laser Test Station

EDIT 2012


ARC DAQ Board
Digital Scope
Pulse Generator
Laser Box
Detector Box
SHQ22M HV Power Supply
NIM Crate
Data Acquisition PC
Model 8010 Pulse Generator
688AL Level Adapter
621AL Discriminator
Optical Fiber
COMPRESSED AIR

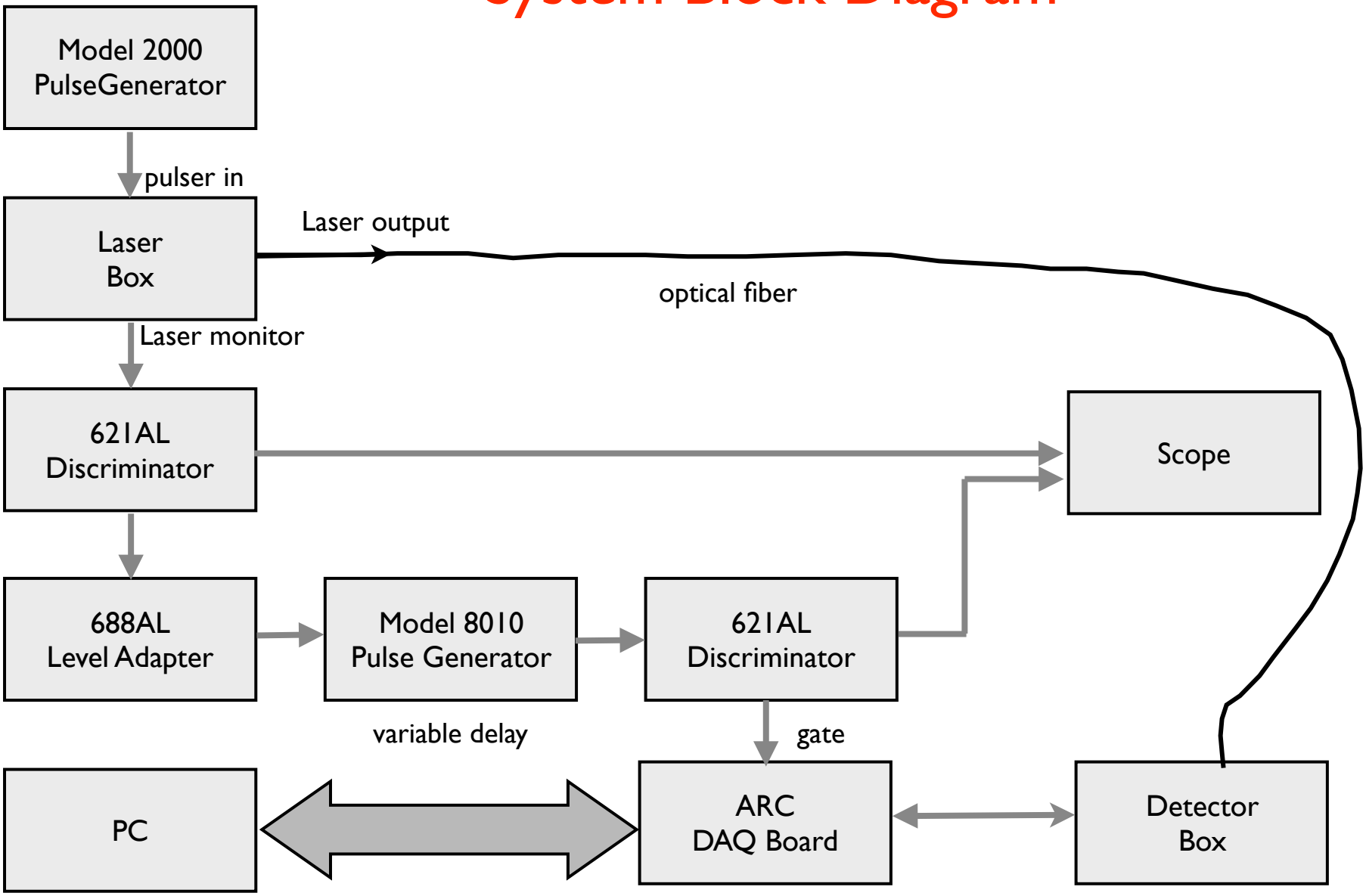
What's Inside the Detector Box ?



Main Goals

- Shine light pulses from an infrared Laser on a silicon microstrip detector and detect the resulting electrical signals
- Record on disk data taken with the Laser off (pedestals) and on (signal) in different operating conditions
- Analyze the data and study the dependence of the amplitude of the signal on bias voltage and gate delay

System Block Diagram



System Start-up

Turn on the two low voltage power supplies

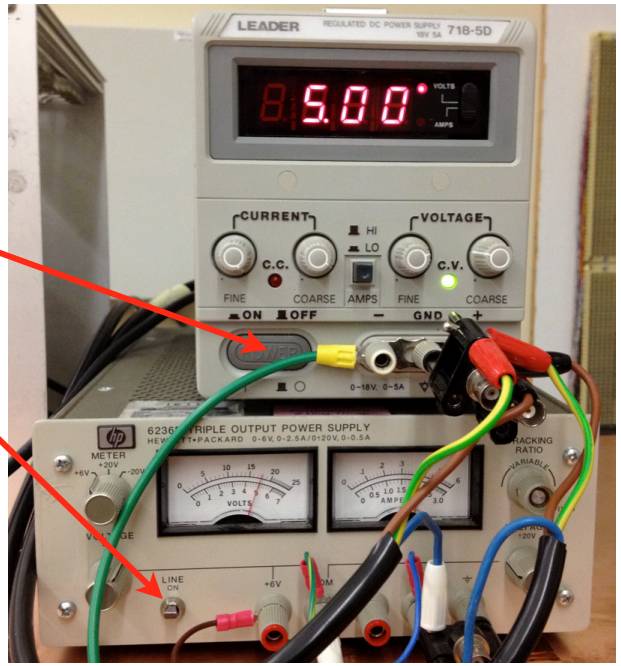
Turn on power to the NIM crate

Turn on power to the Digital Scope. You will see two pulses on the scope: one from the Laser monitor and one for the delayed signal for ARCS trigger.

Turn on the Model 2000 Pulse Generator

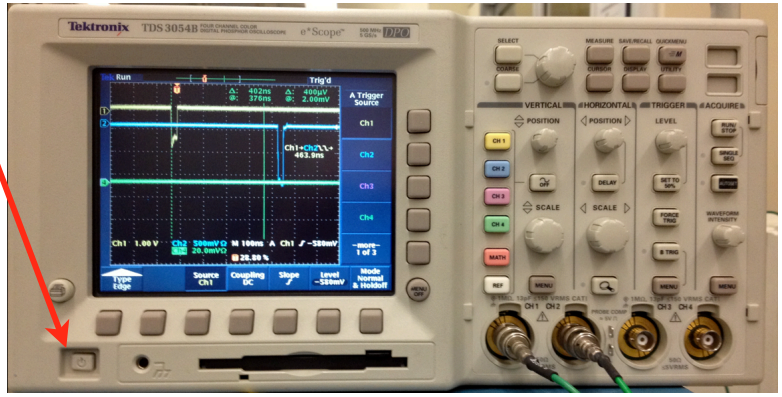
Turn on the SHQ22M high voltage power supply (switch is on the back of unit) with the High Voltage switch set to the Off position.

Low Voltage Power Supplies



NIM Crate

High Voltage Power Supply

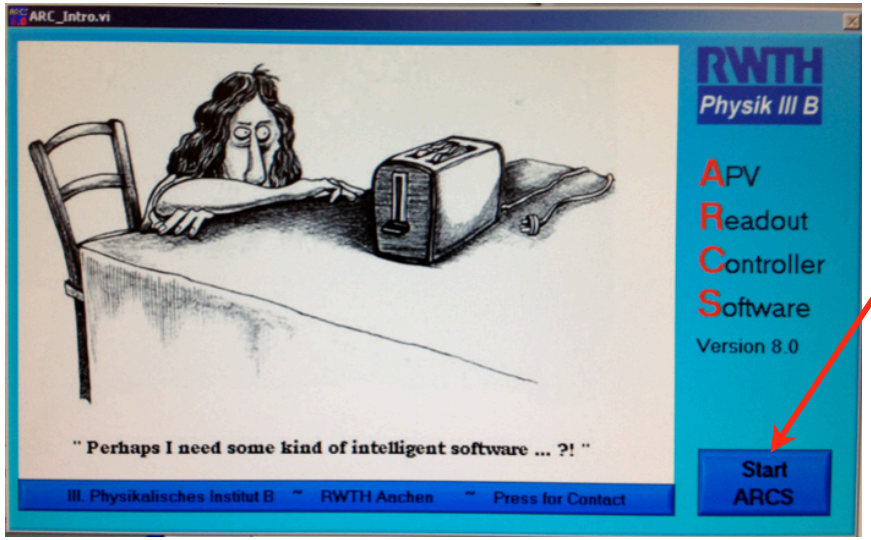


Digital Scope

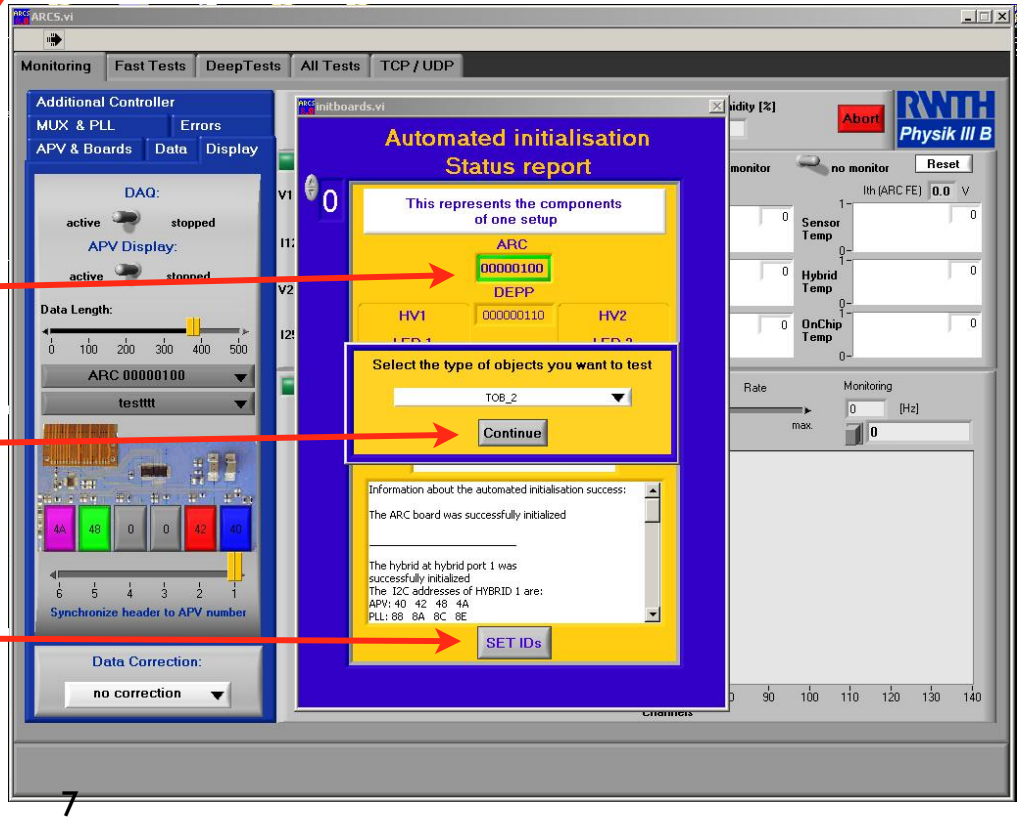
On the PC:

Login (if not already)
Username: xdaq
Password : Taiu4than.

Double click Shortcut Arcs8_0.exe on Desktop to start ARCS.vi program



On ARCS.vi program:
Hit Start on the blue window



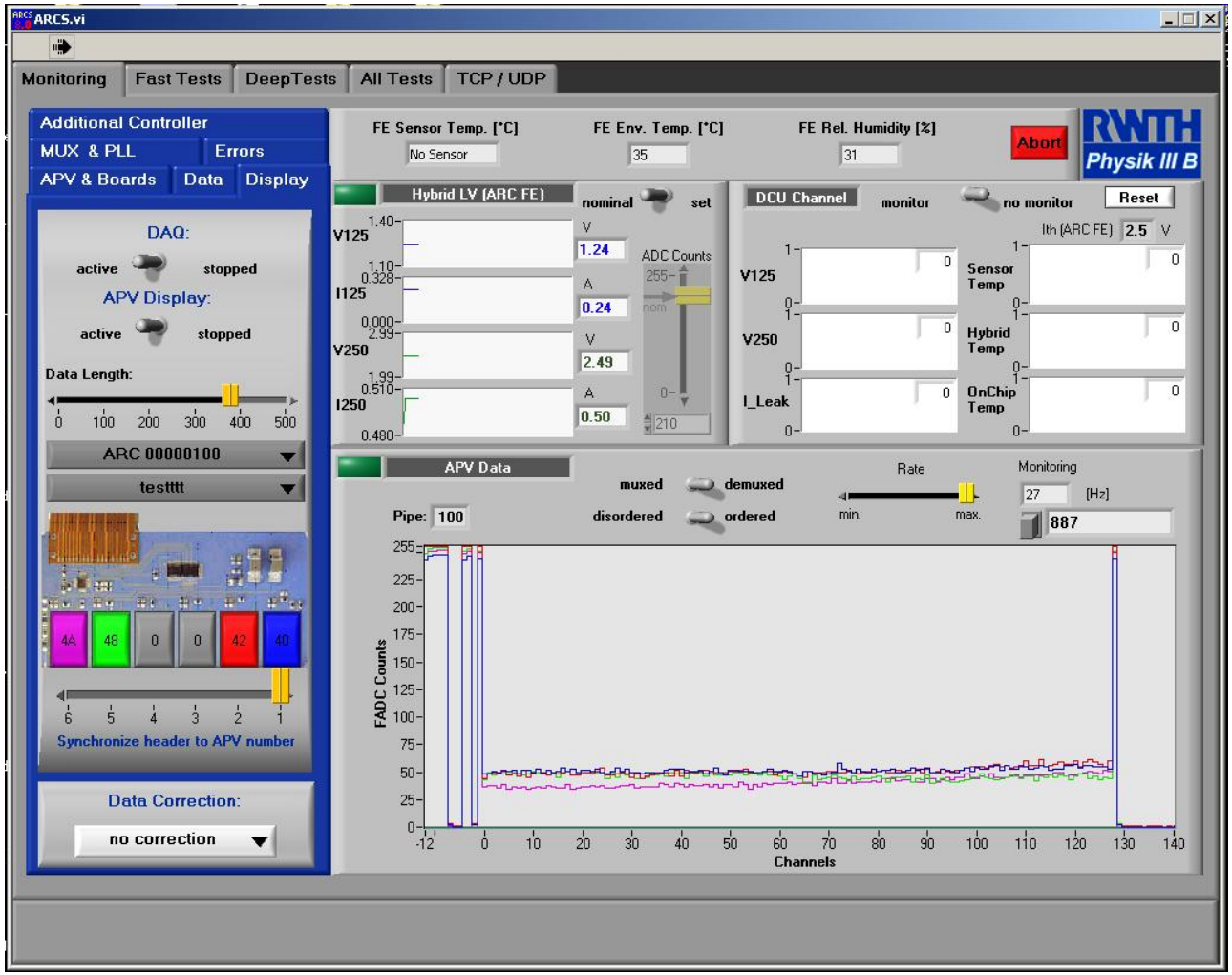
You will see green frame around 00000100 once the initialization is complete. If the frame is red start over. If the red persists ask for help.

Hit “Continue” to see “Hybrid 1 ID” circle is green

Type a meaningful string in the text box like, for example “LaserTest”

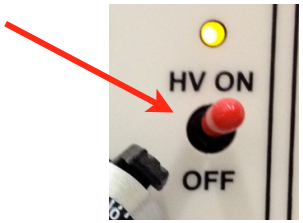
Hit “Set ID” box.

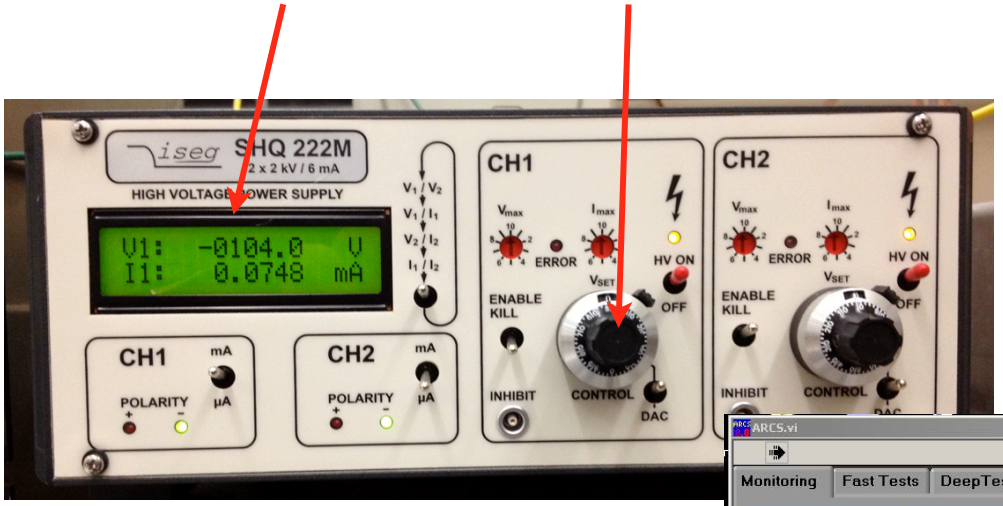
Now you have program running and you see:



Set the High Voltage switch on the SHQ22M to the On position.

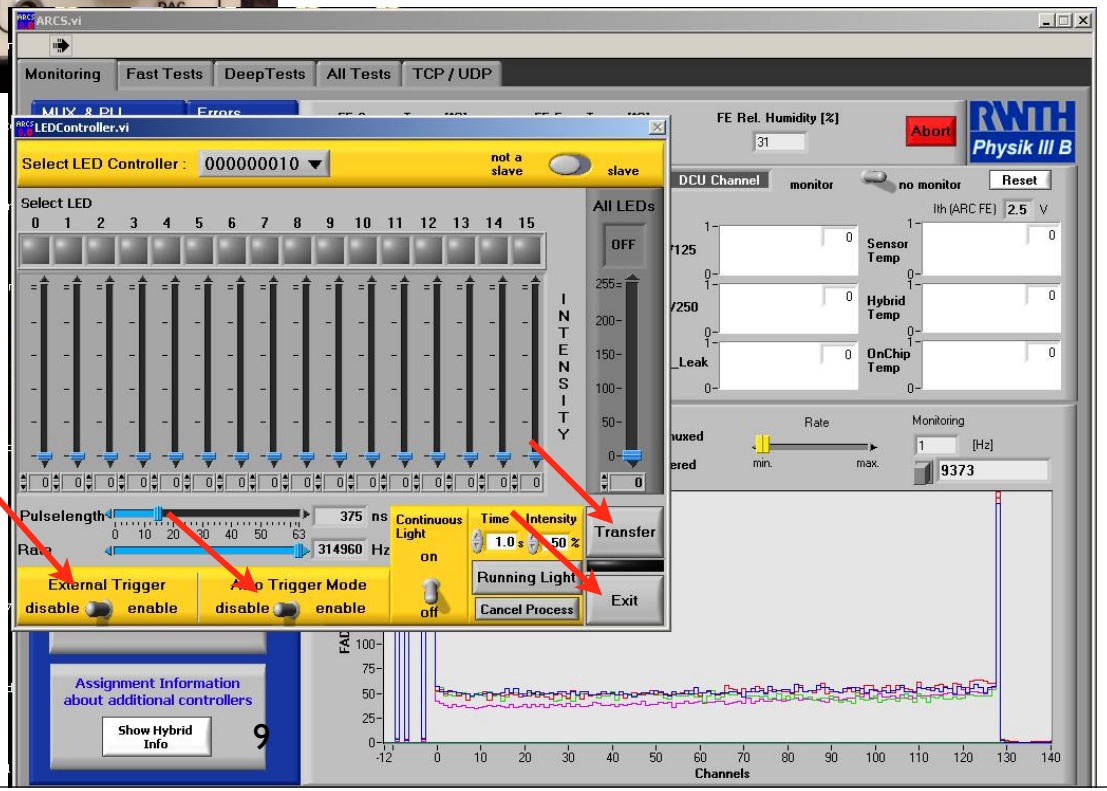
Set the voltage to the desired level using the control knob. Polarity must be negative. If you do not know yet what voltage you want, just set it to – 50V.



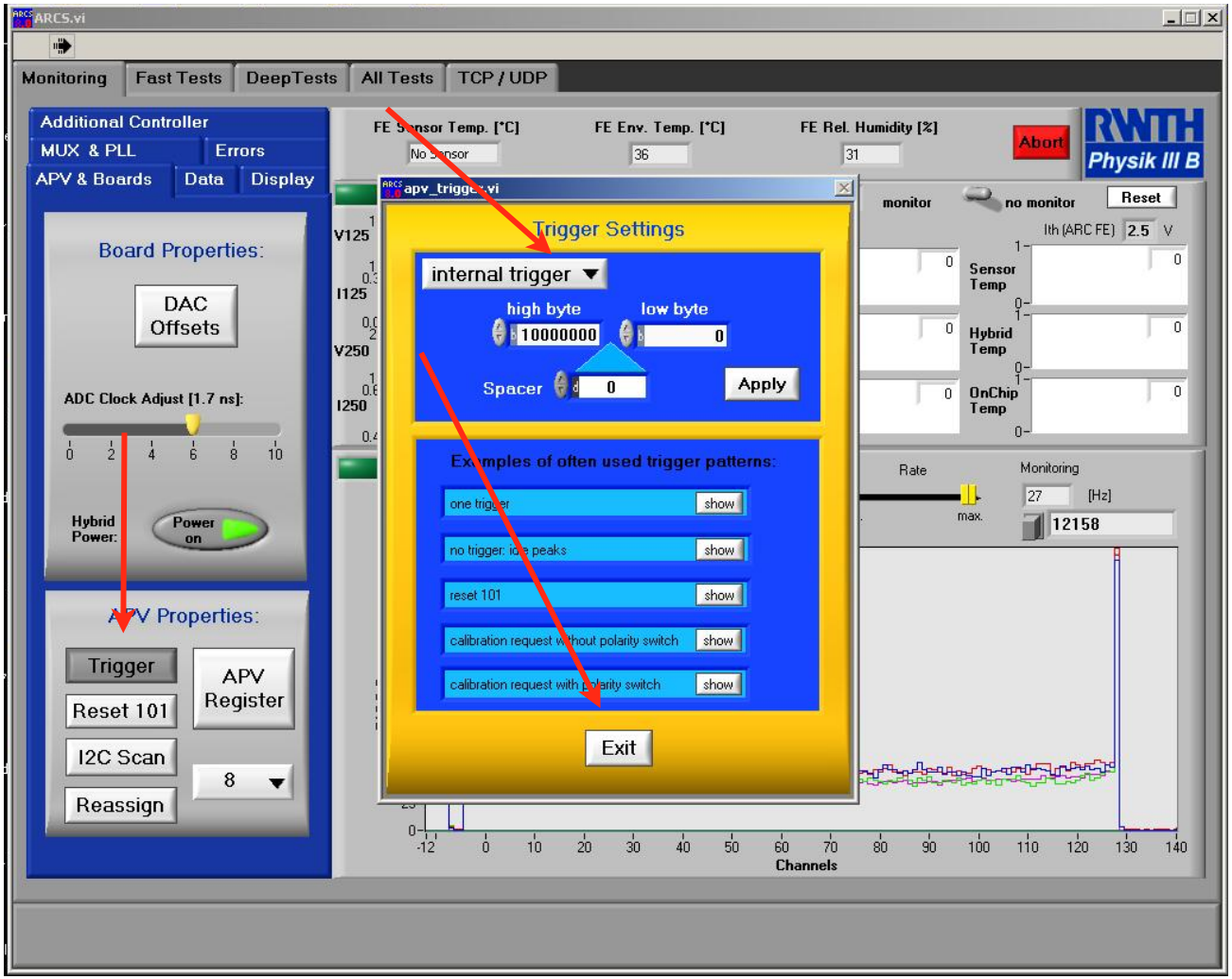


On ARCS.vi program's "Monitoring" tab, go to "Additional Controller" tab:

- Hit LED Button
- Then disable "Auto Trigger mode"
- Enable "External Trigger"
- Hit Transfer
- Hit Exit



On ARCS.vi program's "Monitoring" tab, go to "APV & Boards" tab
Hit Trigger button, toggle to "external trigger"
Hit Apply then Exit

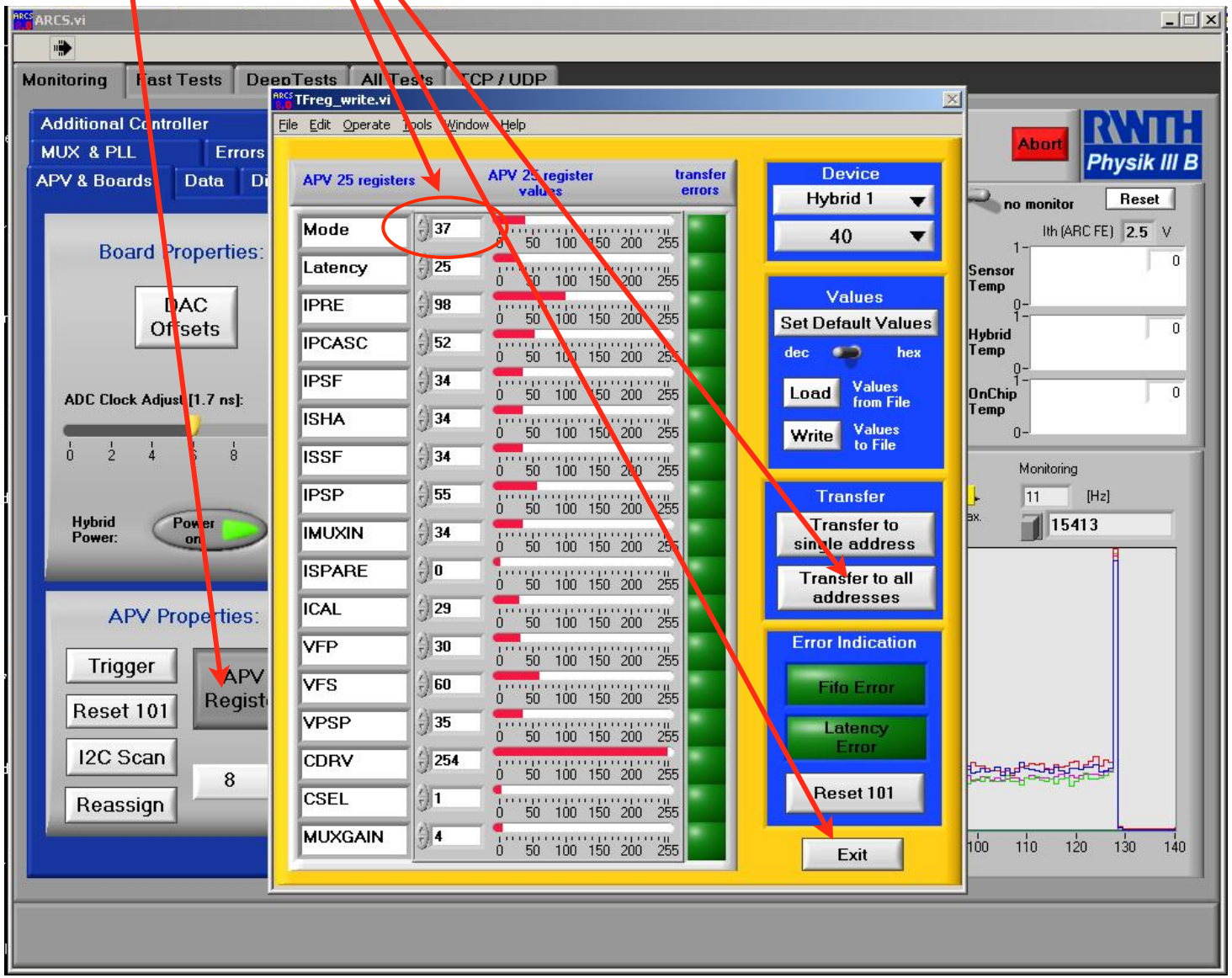


On ARCS.vi Program's "APV & Boards" tab, click "APV Register"

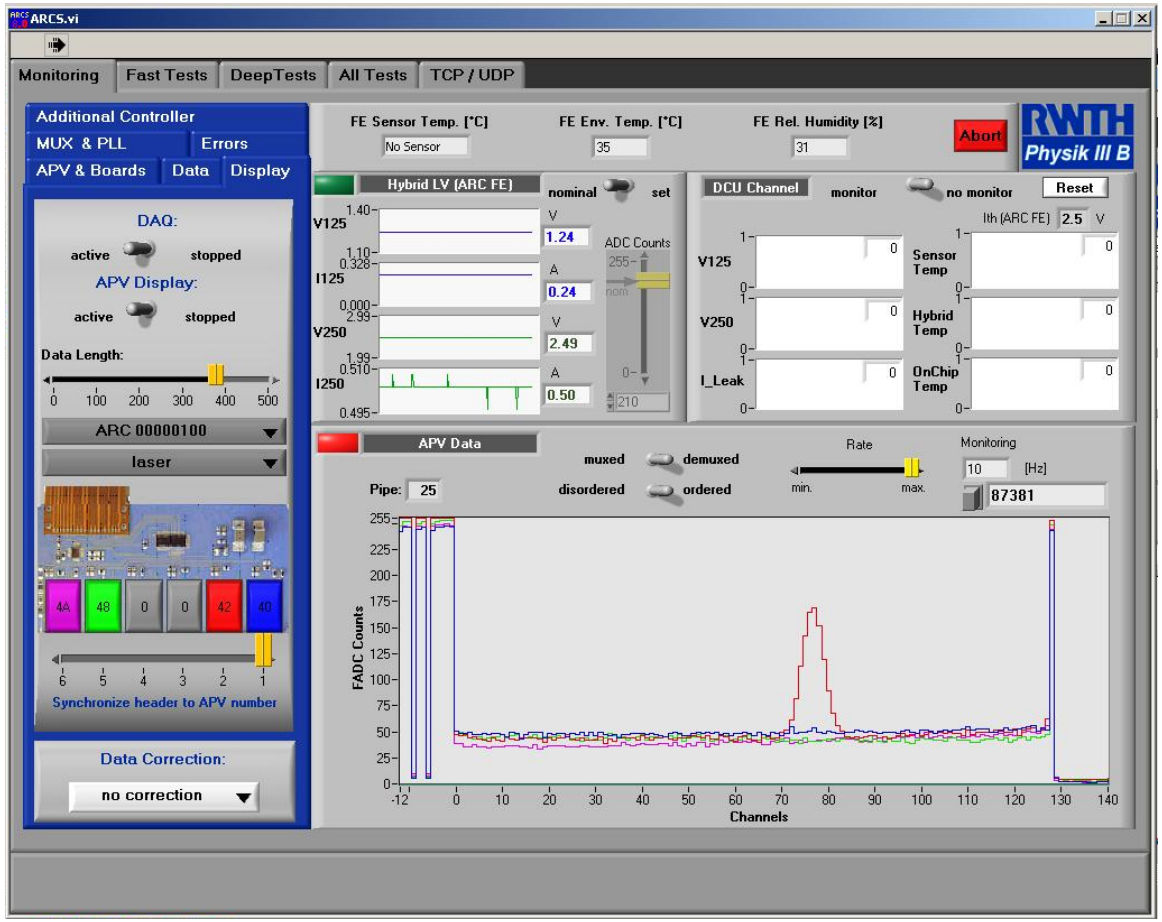
Set Mode = 13 (change from 37)

Hit "Transfer to All addresses"

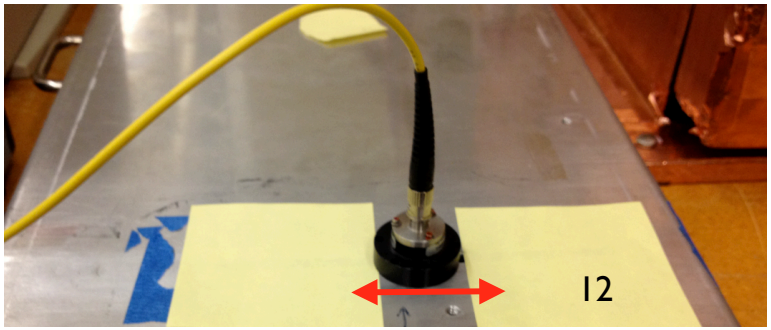
Hit Exit



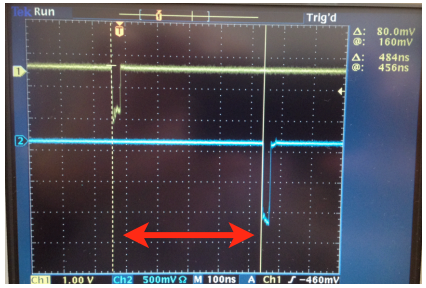
You are now ready to take data.
If you have the optical fiber positioned on top of the detector, you should see something similar to the picture below:



Try to move the optical fiber slightly right or left and you should see the peak move accordingly.



If you do not see the Laser signal, change the gate delay slowly back and forth (center red knob) until you see something. Try to find the position that maximizes the signal. The delay between the Laser and the gate on the scope screen should be close to 485 ns

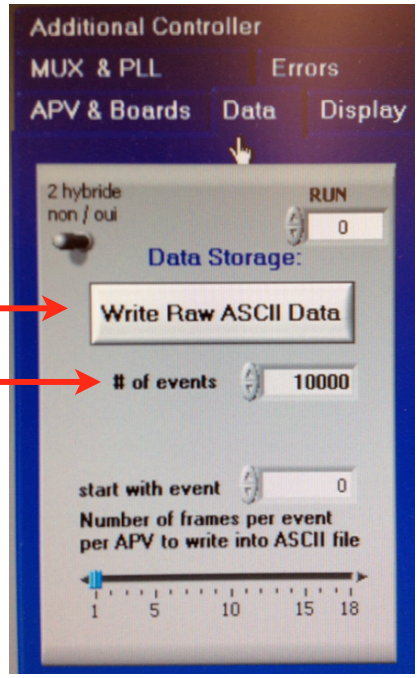


~ 485 ns

The black knob on the Laser box controls the brightness of the Laser pulse. Try to dial up and down one notch and you should see the height of the peak change accordingly.

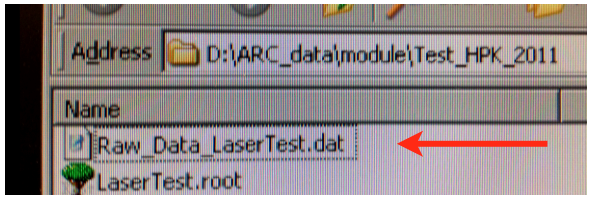
Data Taking

To record the data, either for Pedestal or Source run:
On ARCS.vi Program' "Monitoring" tab, go to "Data" tab
Set # events to 1000 (or the number of pulses you wish to record)
Hit Return
Hit "Write Raw ASCII data"



Observe the number of events being recorded: recording will stop automatically once the preset count is reached

A data file will be written on D: \ARC_data\module\test_HPK_2011\ with name:
Raw_Data_LaserTest.dat
(in blue is the string you typed during startup)



When done, before starting another run, rename this file to some other name meaningful to you. Otherwise the file will be overwritten.

At this point, if you wish, you can move the fiber, change the voltage or do whatever you need to do and start a new run just by hitting "Write Raw ASCII data" again

Data Analysis

You are provided with two Root macros to convert the raw data into appropriate .root files. Both macros need to be edited with the correct data file name to work properly.

Run “dat_to_root_bkg.C” on pedestal data (data taken with Laser off). It produces a .root file with the name as the pedestal data file.

dat_to_root_bkg.C

```
//=============================================================
// Change the inputs
//=============================================================

TString fileName = "Raw_Data_LaserTest_pedestal";
int nAPVs = 4;
int nEvents = -1; // -1 means all
```

edit this file name

Run “dat_to_root.C” on signal data (data taken with Laser on). It produces a .root file with the name as the signal data file.

dat_to_root.C

```
//=============================================================
// Change the inputs
//=============================================================

TString fileName = "Raw_Data_LaserTest_signal";
int nAPVs = 4;
int nEvents = -1; // -1 means all
```

edit this file name

You are also provided with the macro LaserAnalysis.C as a very simple example of how to read the .root files, perform pedestal subtraction and create a few simple histograms. We suggest that you start from there and develop your own code to do what you want to do.

Some examples of measurements