FDIRC update

J. Va'vra, SLAC

SuperB Workshop at Pisa, 2012

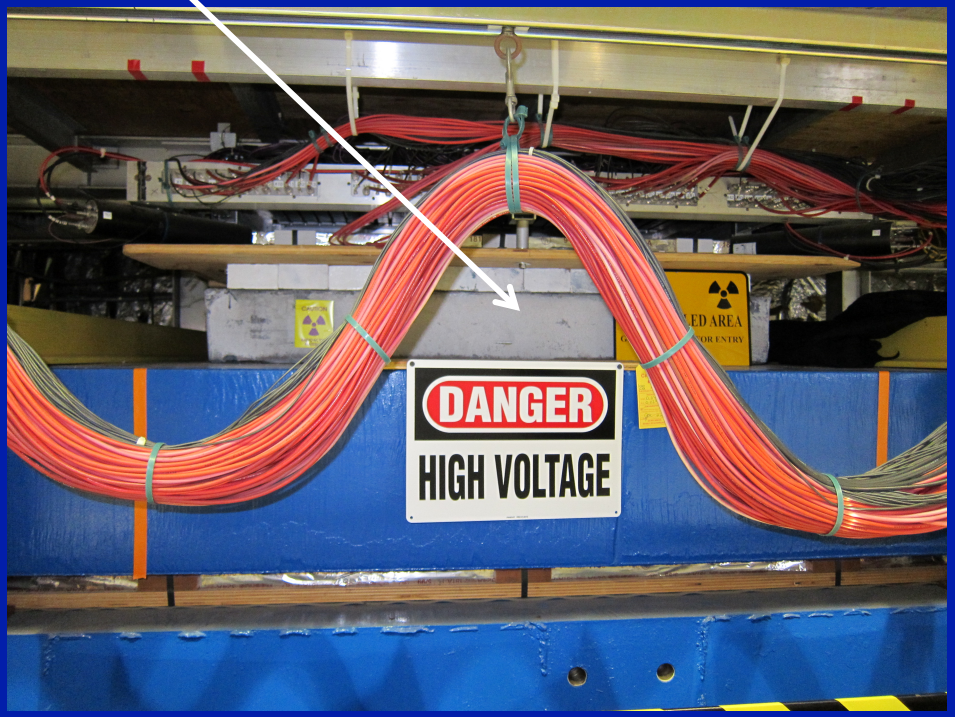
Main points of this talk

- CRT telescope absorber thickness upgraded.
- FDIRC detector alignment done.
- Boil-off N_2 gas flow through bar box & Fbox finished.
- The scanning setup has the IRS-2 electronics.
- FDIRC in CRT has 4 IRS-2 electronics packages.
- Measured the SES-403 RTV refraction index.
- What next ?

Increase the thickness of the CRT muon absorber

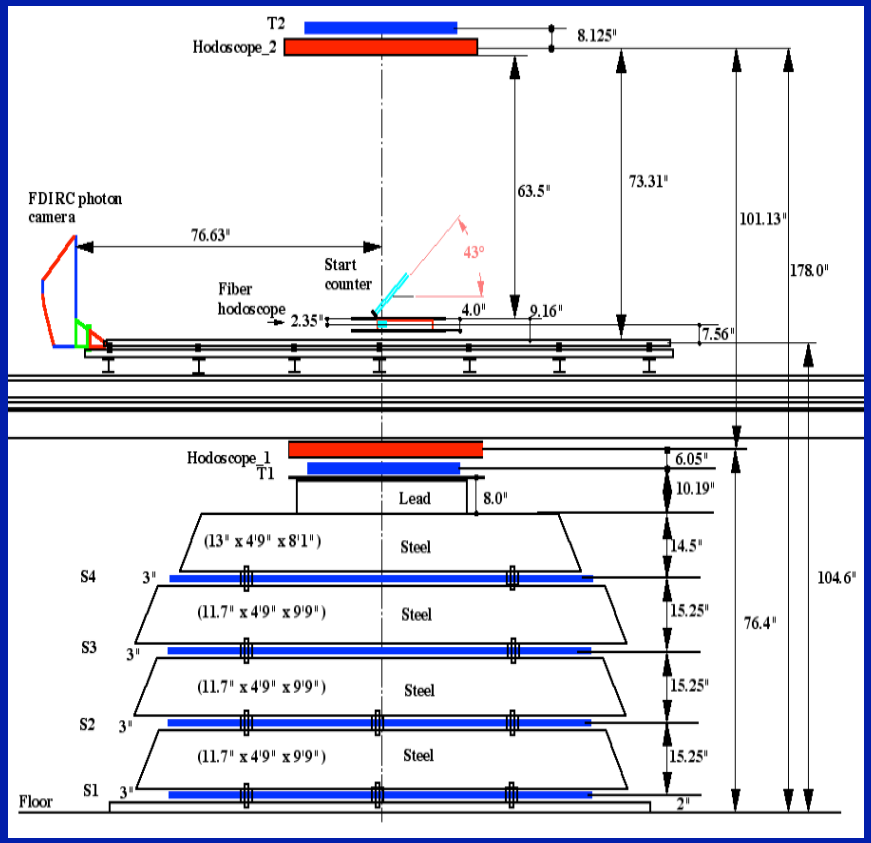
SLAC riggers, M. McCulloch, J. Va'vra

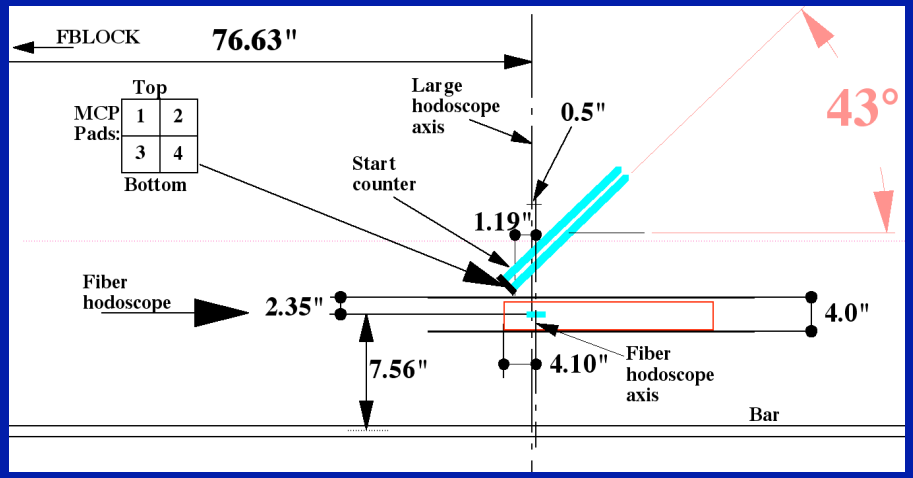
Add 8" of lead:



- **Added 8" of lead.**
- **This modification will increase the muon energy cutoff to ~ 2 GeV.**

New CRT configuration



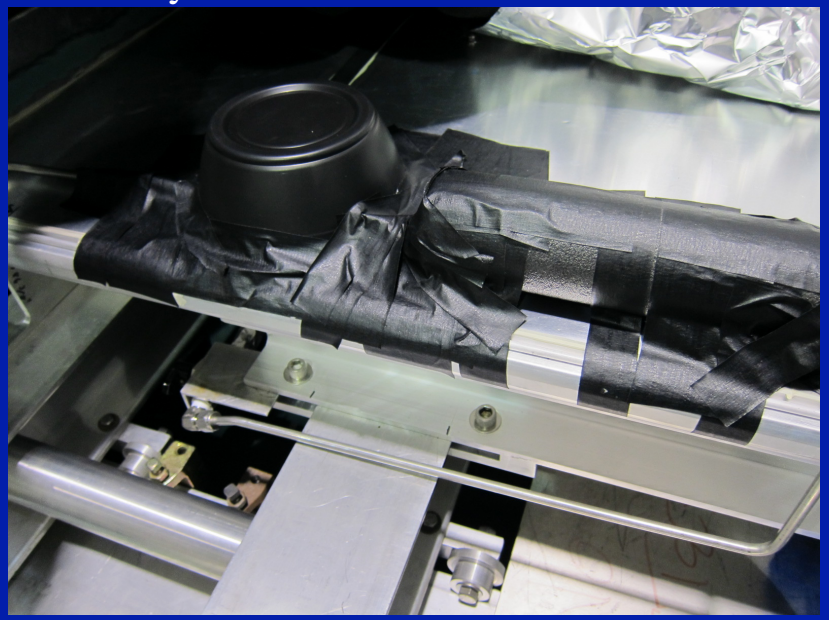


- **Add 8” of lead.**
- **Add fiber hodoscope (1mm x 1mm fibers).**

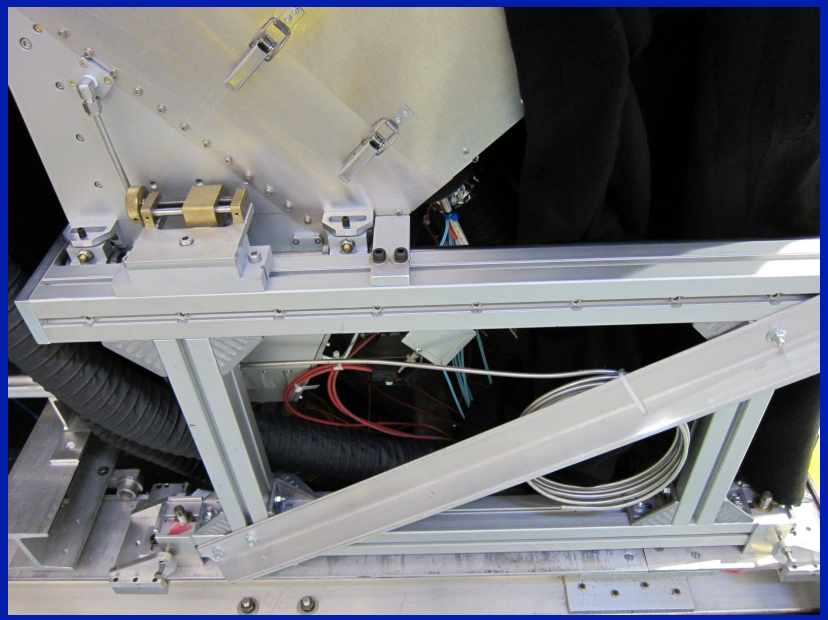
Boil-off N_2 gas flow established

M. McCulloch, J. Va'vra

Gas entry into the bar box:



Gas exit:



- **Flow boil-off N_2 through bar box and Fbox.**
- **Leak rate in the bar box: < 0.5 cf/hour.**
- **Leak rate in Fbox is large because of the detector O-ring: < 3.5-4 cf/hour.**
- **Total flow presently: ~5 cf/hour.**

A final detector position measurement

SLAC alignment group, J. Va'vra

- **Done when the detector plane with all detectors was clamped.**
- **Touch detector sides with the FERO digital arm.**
- **All alignment constants are:**

  http://www.slac.stanford.edu/~jjv/activity/fdirc/Critical_dimensions_v9.pdf

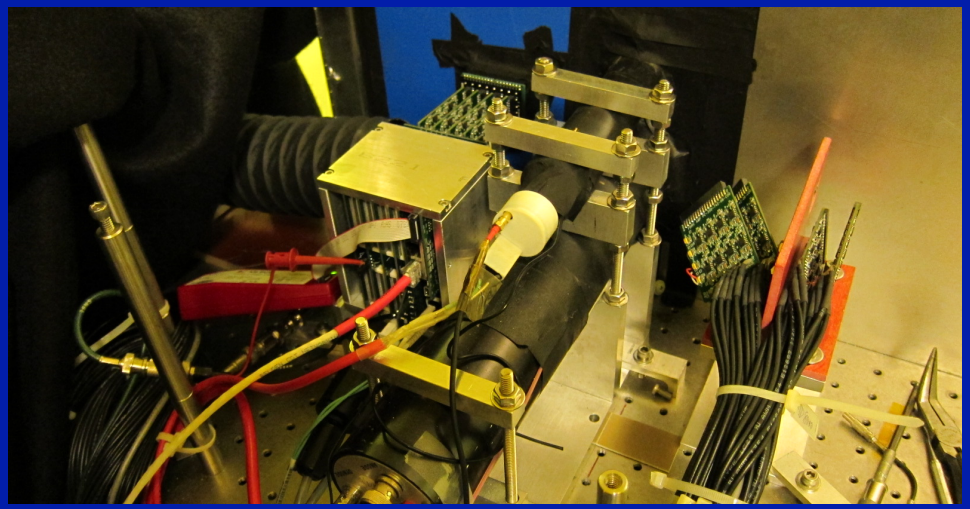
Many problems, which caused delays

- A great effort to remove both hardware and software problems to even start taking some data.
- At the end we ended up with one package ready for studies in the scanning setup and four in the FDIRC prototype in CRT.
- There are still many “things” to be tuned though.

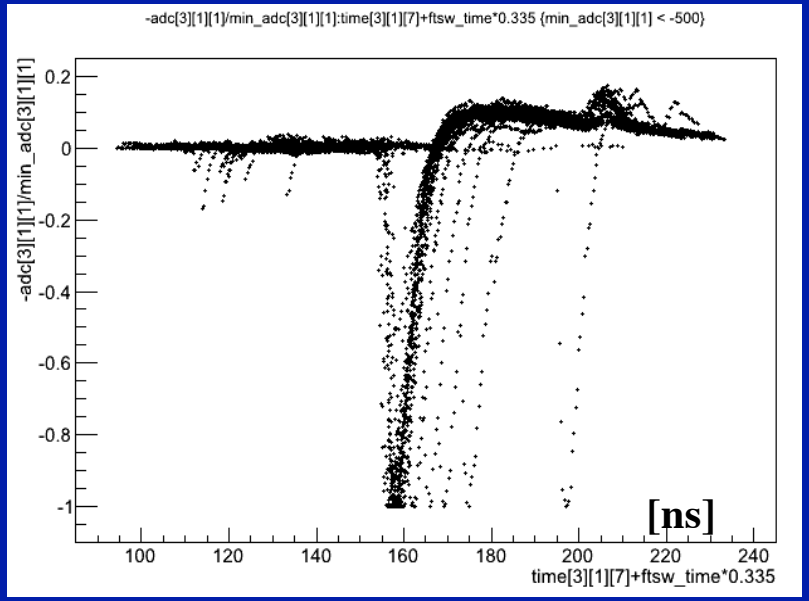
IRS-2 electronics – first pulses from H-8500 in the scanning setup

Kurtis Nishimura, Matt Andrew and J. Va'vra

IRS-2 electronics with SLAC amplifier:



Example of single electron pulses:

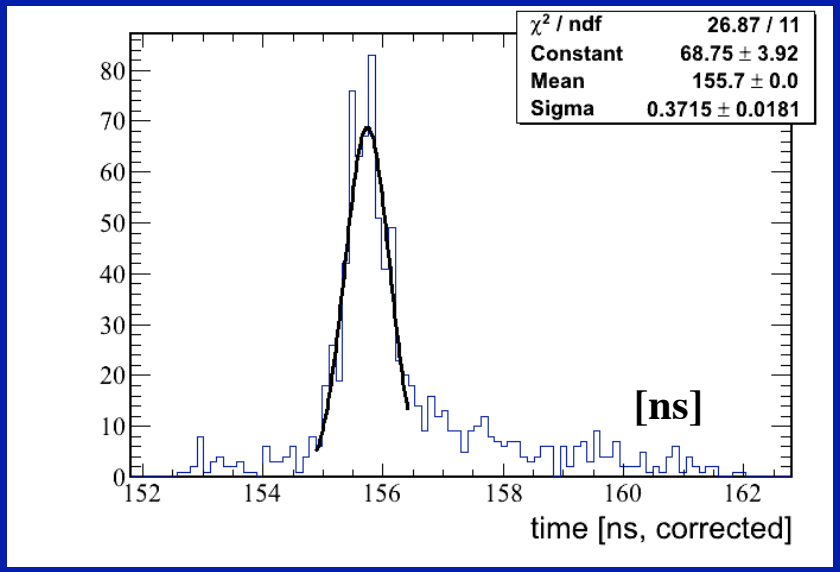


- **Observe good single pe pulses from the IRS-2 electronics.**
- **IRS-2: 2.7 GSa/s, which is a sample every 370 ps.**
- **SLAC amplifier works well. Good match to IRS-2 digitizer.**
- **IRS-2 timing resolution corrections not yet tuned, so we do not yet obtain the expected TTS resolution for the H-8500 tube.**

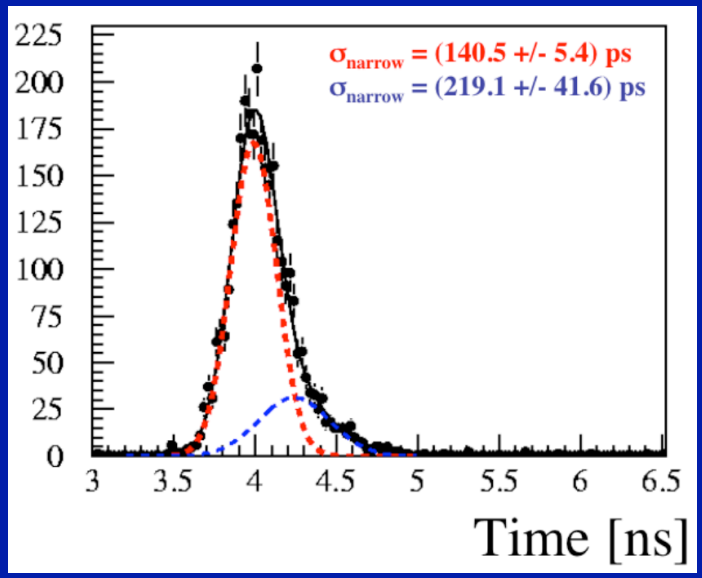
IRS-2 electronics – Does it work ?

Kurtis Nishimura

IRS-2 electronics with SLAC amplifier:



J.V.'s measurement with CFD (in TDR):

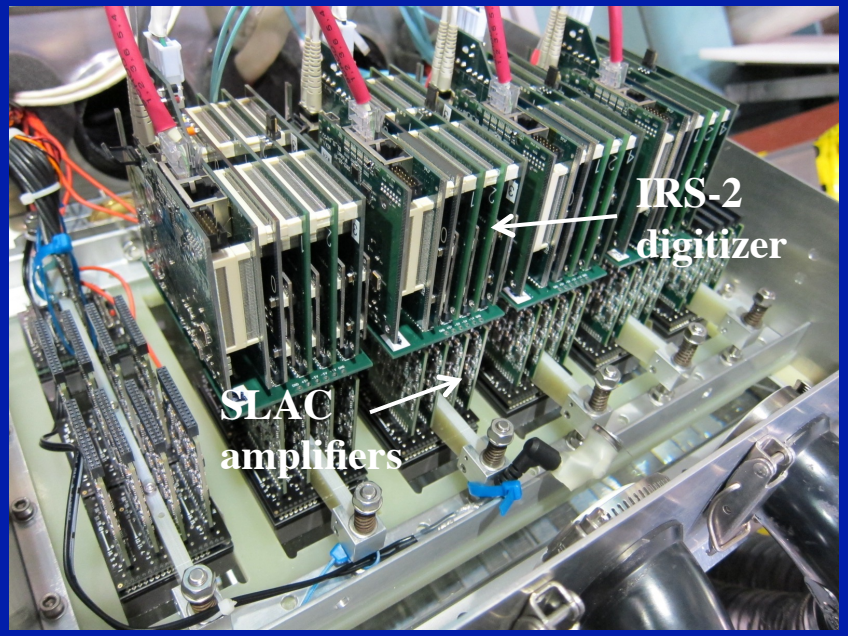


- **σ_{TTS} ~ 370 ps and a lot of tail. Very preliminary, as several corrections not yet applied. Use the software CFD timing algorithm.**
- **Using the hardware CFD we obtained narrower TTS distribution.**
- **For SL-10 tube: Kurtis obtained σ_{TTS} ~ 100 ps (Hamamatsu: ~ 30 ps).**
- **Martino Bursato is also looking into this.**
- **More work to do.**

FDIRC electronics in CRT

Kurtis Nishimura, Matt Andrew and J. Va'vra

FDIRC in CRT setup:



Clock distribution box:

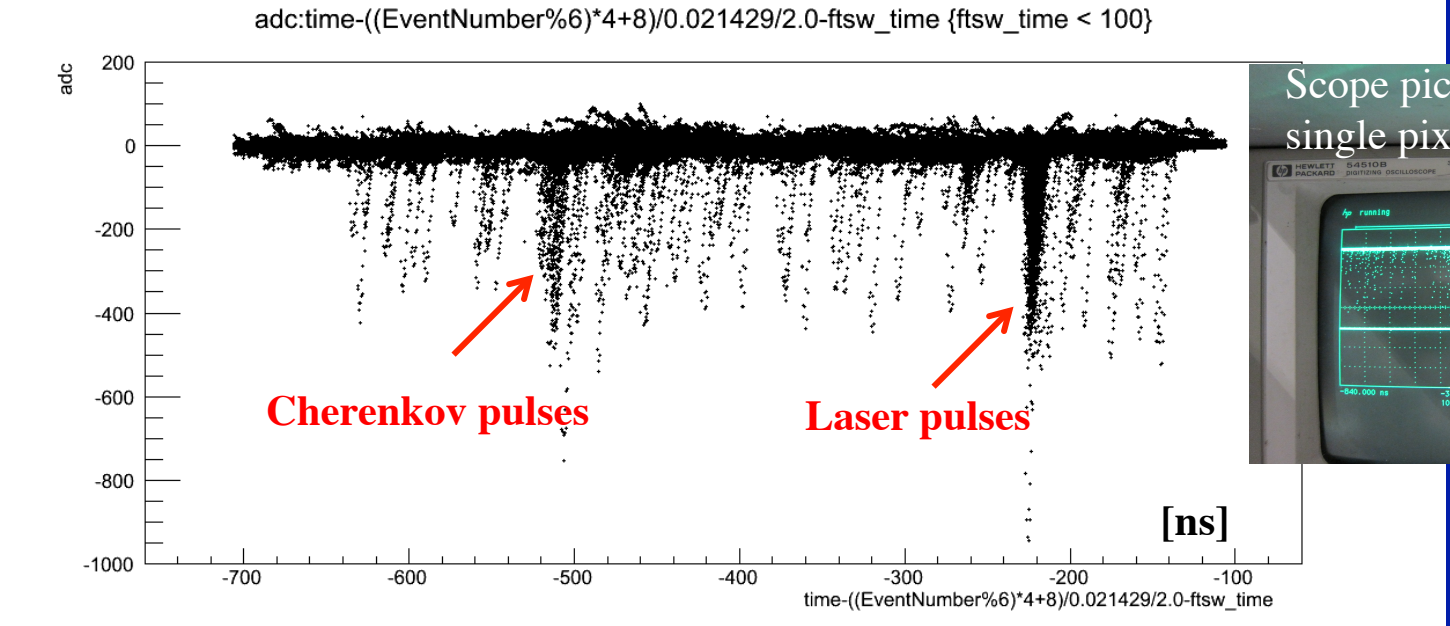
LV PS:

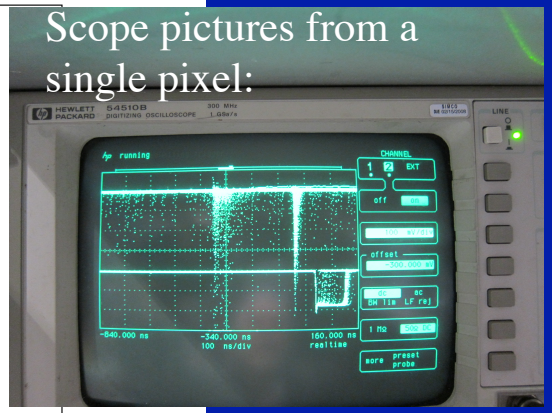
- **This means that we are reading out 512 pixels.**
- **Based on threshold scans, about 96% of channels are working acceptably.**
- **The last two packages will be ready in 2-3 weeks, I am told.**

First data from IRS-2 electronics

Kurtis Nishimura

Reconstructed IRS-2 pulses from the new FDIRC:





- **See both Cherenkov and laser pulses.**
- **See more random pulses than in the old single-bar FDIRC prototype, because we have now 12 bars, and the bar box has a tiny light leak.**
- **First trial dst produced, and I can read it with my program. However, we still do not have FDIRC variables conversion, so I do not have any results yet.**

Alignment of FBLOCK before gluing

M. McCulloch and J. Va'vra

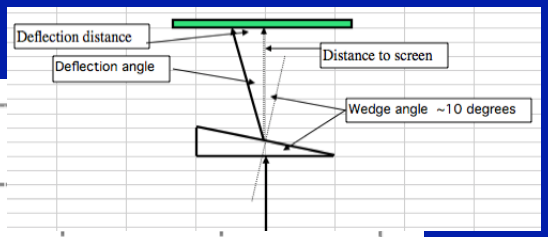
- **RTV glue thickness: 1.17 mm:**

  http://www.slac.stanford.edu/~jjv/activity/fdirc/Critical_dimensions_v9.pdf

- **What is the refraction index of SES-403 RTV ?**

Measurement of the RTV SES-403 refraction index

J. Va'vra



- **Measurements done at two wavelengths: 543 and 633 nm.**
- **An average 0.5*(n_{water} + $n_{fused\ silica}$) is a good approximation for n_{RTV}.**

What next ?

- Clean all bugs from running CRT.
- Install two more IRS-2 packages (within a 2-3 weeks ?).
- Verify the first dst file.
- Update analysis code for new information.
- Tune firmware and non-linear corrections.
- Fix a few PMTs in CRT.
- Put a thermal blanket around the bar box.
- Get MC pixel constants from Biplab.
- Attempt to reconstruct the Cherenkov angle resolution.
- Start a real CRT run lasting 2-3 months.
- Learn how to introduce the photon background – hardware bought. Measure θ_c-resolution = f(rate).