PID summary

J. Va'vra

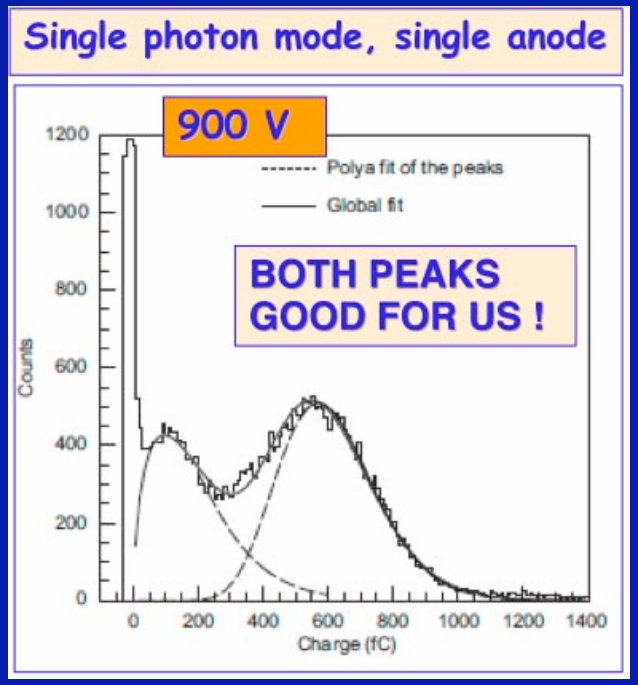
Speakers

- **Barrel FDIRC**
  - **Silvia Dalla Torre: Experience with MaPMTs at Compas**
  - **Jerry Va'vra: Barrel PID effort at SLAC and PID list of tasks & schedule**
  - **Massimo Benettoni: Mechanicals status and schedule (Fbox)**
  - **Nicola Mazziota: Mechanical work in Bari (Fbox support in CRT)**
  - **Francesco Giordano: PID activities in Bari**
  - **Flavio DAL Corso: SiPM characterization and irradiation status report**
  - **Alexey Drutskoy: Possible FDIRC option**
- **Forward PID presentations**
  - **Evgeni Kravchenko: FARICH status**
  - **Jerry Va'vra: LYSO as a TOF detector**
  - **Leonid Burmistrov: fTOF status**
- **Status of PID electronics**
  - **Vanessa Tocut: PID analog front end status**
  - **Christophe Beigbeder: Barrel electronics status**

Compas experience with MaPMTs

Silvia Dalla Torre

R7600-03-M16, 16 pixels, bi-alkali, UV extended glass



Be careful with a single pe spectra:

- First peak gain: 8 x 10^5
- Second peak gain: 4 x 10^6 !!! (Too high for me)
- Population of the 1-st peak ~30-40%
- Explanation: some photons convert on the 1-st dynode
- One can see this effect only at rather high gain !!

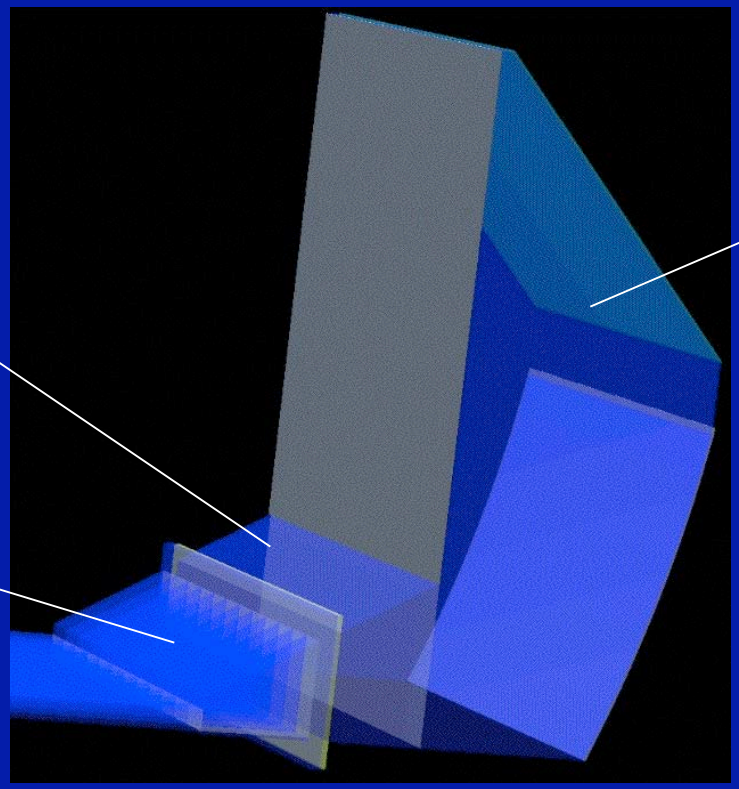
- Tube could run up to 5-6 MHz/pixel
- In the experiment they had typically ~0.5 MHz/pixel

- Tested 647 tubes
- Rejection rate during selection ~2.5%, usually due to a noisy pixel)
- After 5 years (running 6 months/year): 1 tube dead

- **Overall experience with MaPMTs: good**

FBLOCK and New Wedge optics

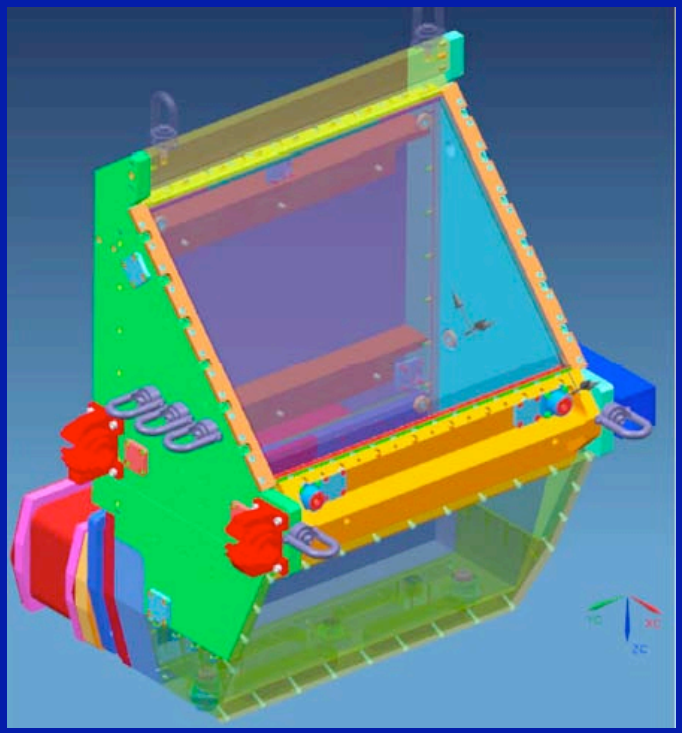
J. Va'vra



- **Cosmo optics is starting now.**
- **Expect the New Wedge delivery in May.**
- **Expect the FBLOCK delivery in late June.**

Fbox

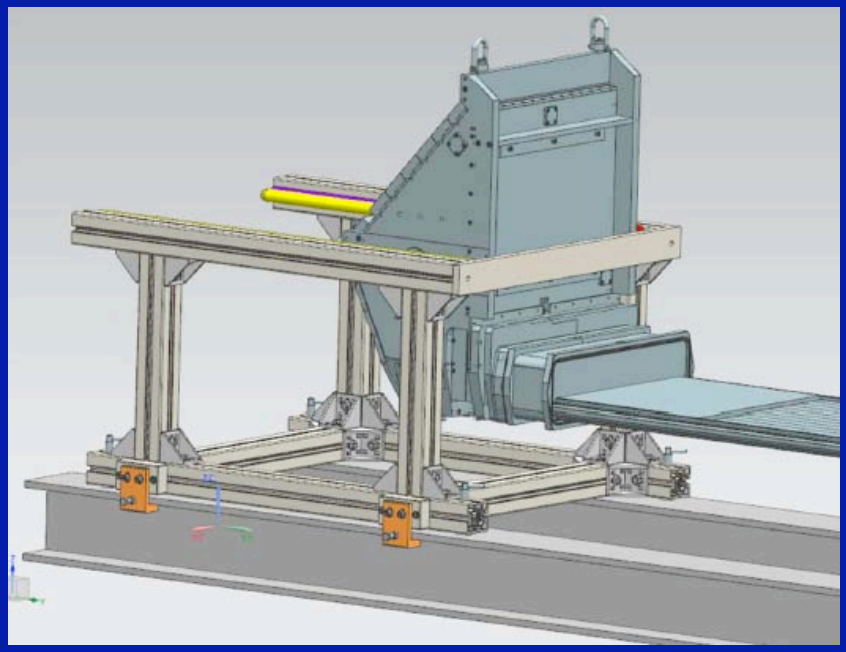
M. Benettoni



- **Model was finalized. Working on the production drawings.**
- **By April end all parts should be either in production or on order.**
- **Assembly test in Padova by mid June. Bari is working on dummy FBLOCK model to help the test assembly.**
- **Delivery to SLAC by the end of June.**

Fbox support in CRT

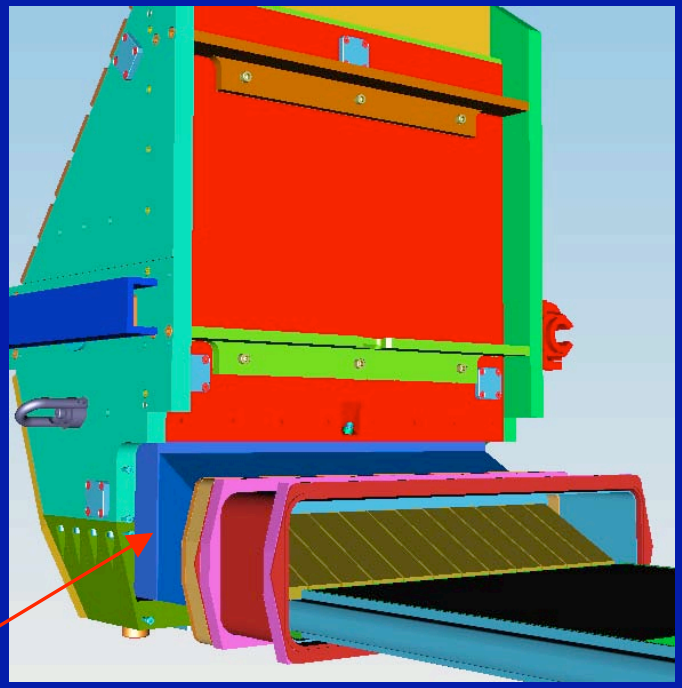
N. Mazziota and M. Benettoni



- **Model is close to be finalized. Working on detailed production drawings.**
- **Bari is also working on Dummy Fbox, which will be used as a mechanical gauge.**
- **Delivery to SLAC by the end of June.**
- **One issue is an earthquake protection. We all agree that we have to restraint both (a) bar box, and (b) Fbox, while allowing a small movement controlled by a spring to apply pressure on the RTV joint.**
- **Had a very useful discussion here in Frascati (Massimo, Nicola and Jerry).**

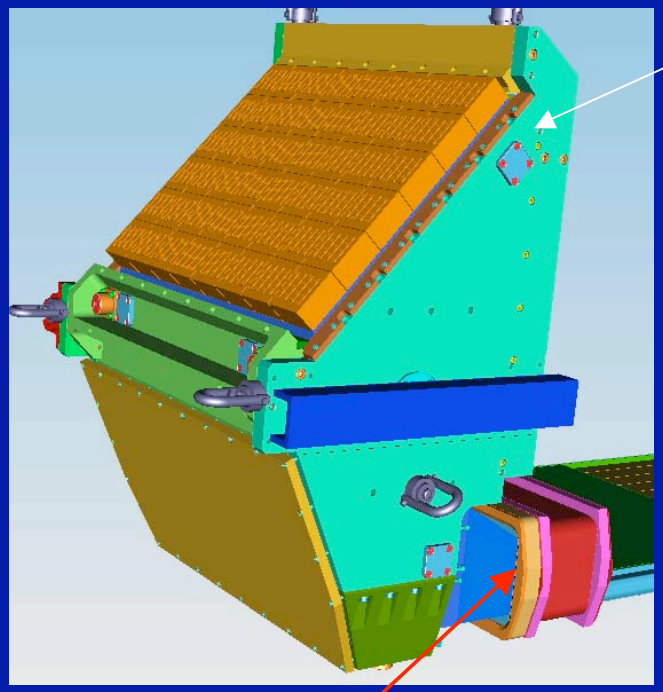
Optical coupling of large surfaces

M.McCulloch and J. Va'vra



RTV

Have to do this joint in situ. If we have to take things apart, we will cut it here. RTV coupling is less sensitive to alignment of two surfaces than the Epotek joint. Present aim is to have a glue thickness of 1 mm.



Massimo's Fbox design

Epotek-301-2

This joint will be done in the clean room first. We can do a better alignment there. We do not want to do an RTV joint here out of fear that the EPDM gasket will poison it. Also it would be very difficult to make a dam for RTV. Present aim is to have a glue thickness of ~1 mil.

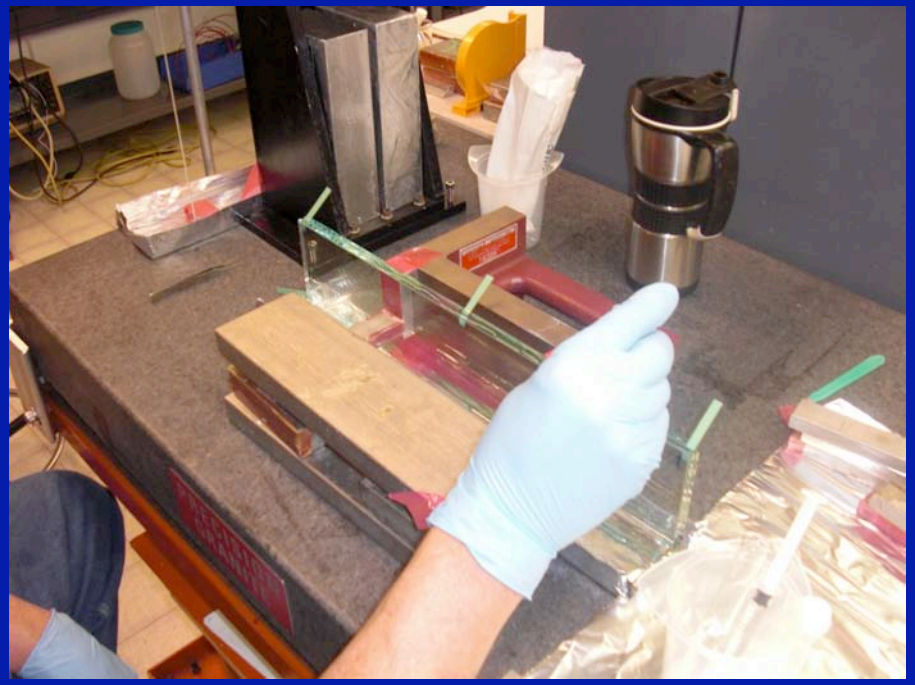
- **Present thinking is to make the bar box window-to-Wedge coupling using the Epotek-301-2 epoxy, and Wedge-to-FBLOCK coupling using an RTV.**

Optical coupling of large surfaces

M.McCulloch and J. Va'vra

Gluing test #7a:

Epotek-301-2, start with 3 mils engineered gap, vertical joint



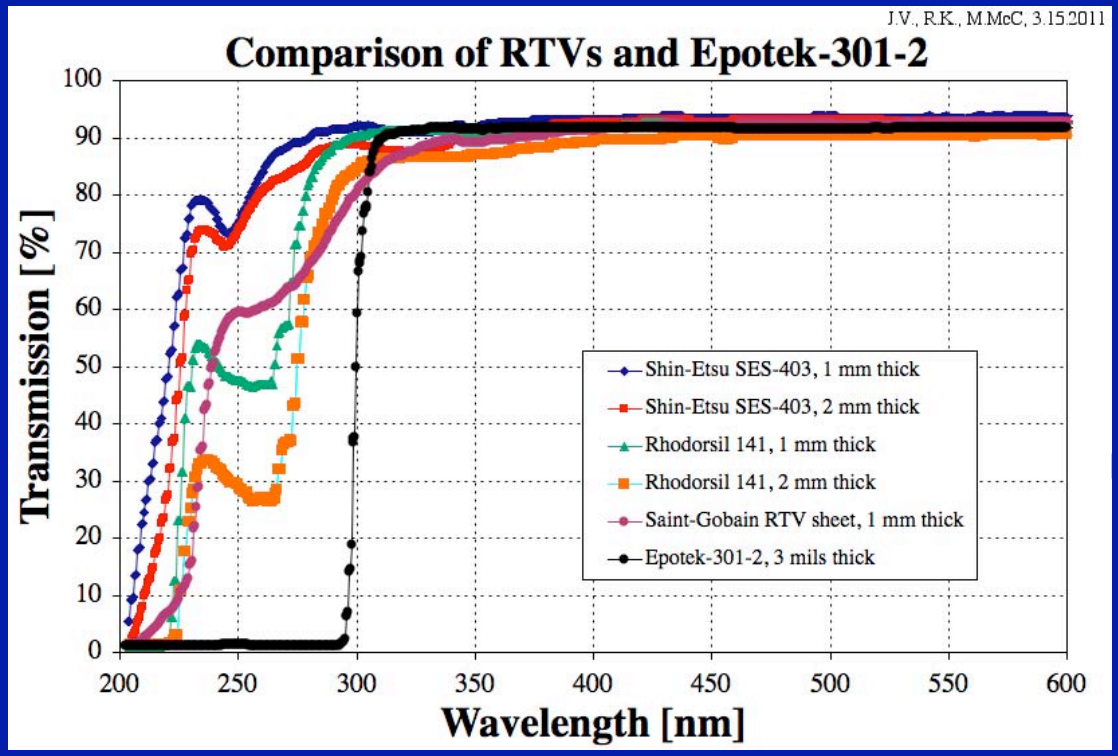
Gluing test #19:

Shin-Etsu SES-403 RTV, 1 mm, vertical inclined joint

- **The methodology with wet glues is being worked out.**
- **We think it is possible to make such large optical couplings.**

Transmission at incident angle of 90° for various optical glues

J. Va'vra, B. Kirby and M.McCulloch

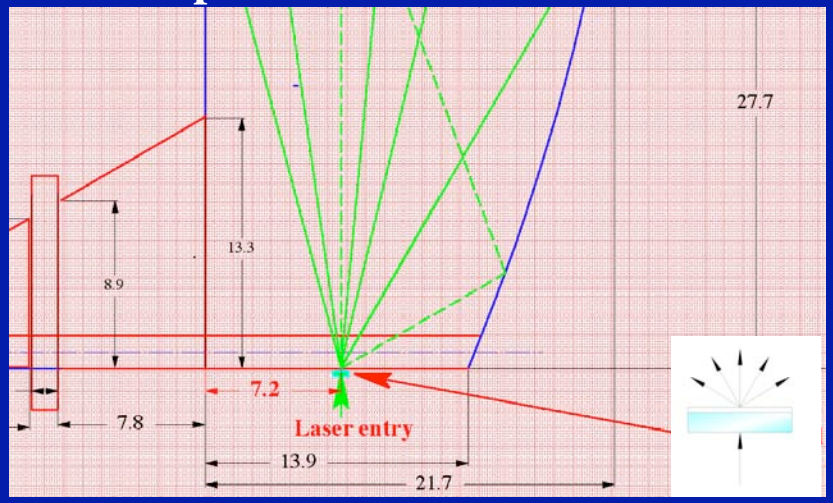


- **The Epotek-301-2 epoxy is our anchor reference.**
- **1mm-thick RTV samples (Rhodorsil 141 & Shin-Etsu SES-403) are very transparent. 2mm-thick RTV samples begin to have a slight problem.**
- **1mm-thick Saint-Gobain RTV sheet has some loss below ~350nm.**
- **Radiation and yellowing damage tests under way. Will be reported on in Elba.**

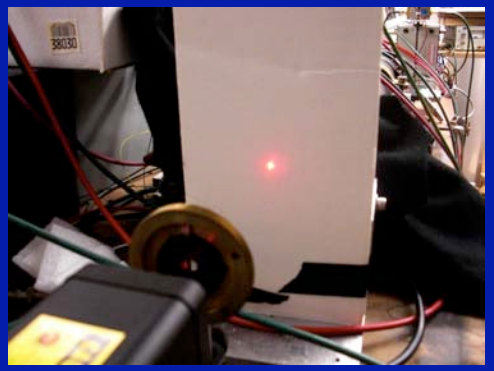
Fiber entry design

J. Va'vra with help of D. Roberts and M. Benettoni

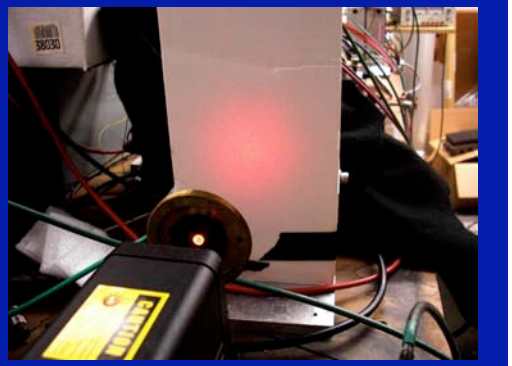
Diffuser position:



Laser spot with no diffuser:

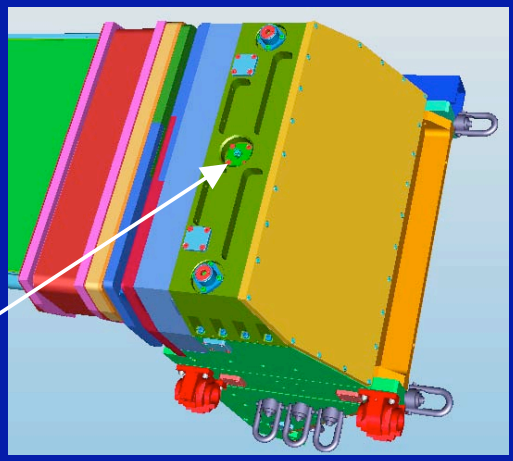


Laser spot with no diffuser:



(Screen is 13 cm away; ~3" dia. spot)

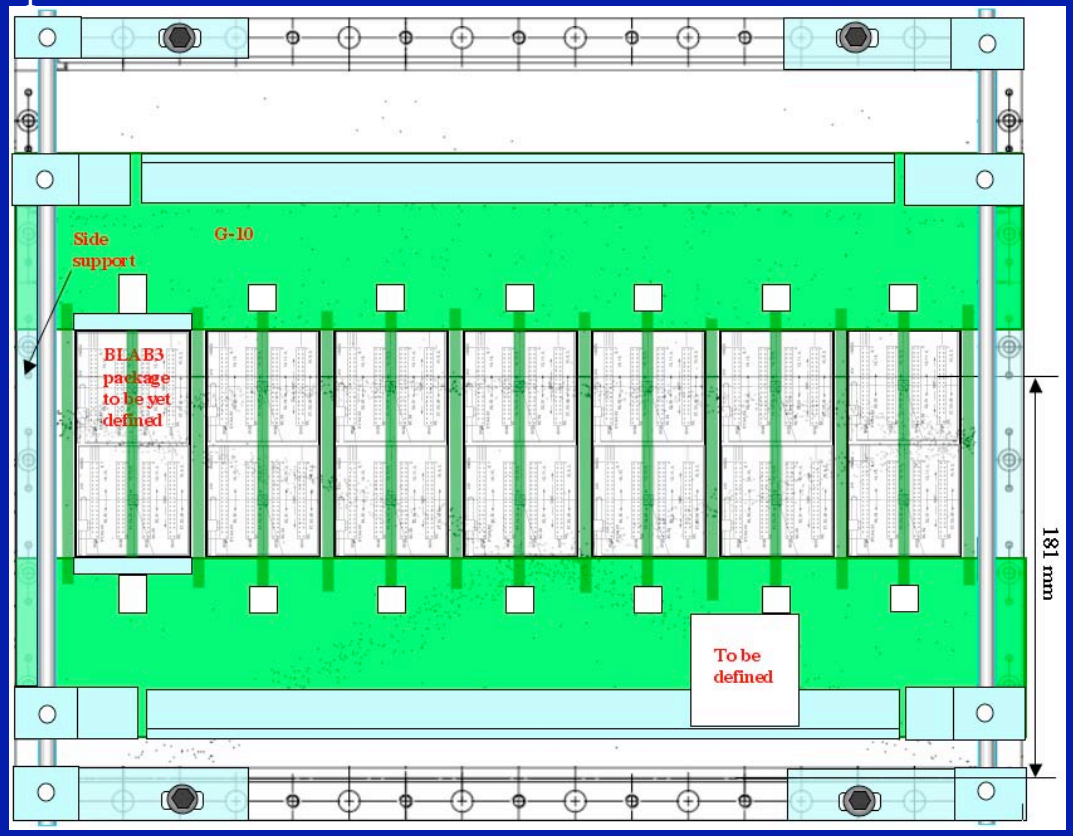
- **Will have a 5mm dia. glass diffuser at the bottom of FBLOCK. Need a very small footprint not to lose too many Cherenkov photons.**
- **MC simulation of the fiber calibration optics done by Doug.**
- **Massimo has made a mechanical design of the fiber entry.**



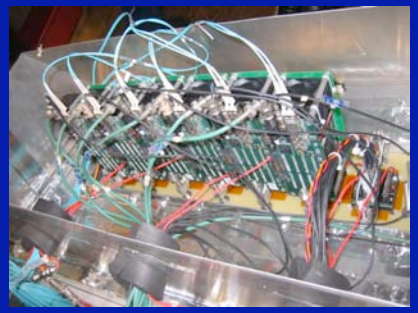
Initial detector layout for 2011-12 period

J.Va'vra with input from G. Varner, D. Roberts, M. Benettoni, M. McCulloch

Present plan:



We used a similar concept in the 1-st FDIRC prototype:



- **We start with seven BLAB3 double-packages.**
- **Will be replaced by LAL electronics in 2012.**
- **One empty extra slot for possible new detector ideas - to be yet defined.**

Detector scanning setups

Goal:

- Learn about the operation of both detector and electronics.
- Measurements of S/N, charge sharing, effective pixel widths, cross-talk, gain, pulse height spectra have to be done with a final electronics.
- In return, these setups will feed back the information to electronics engineers.

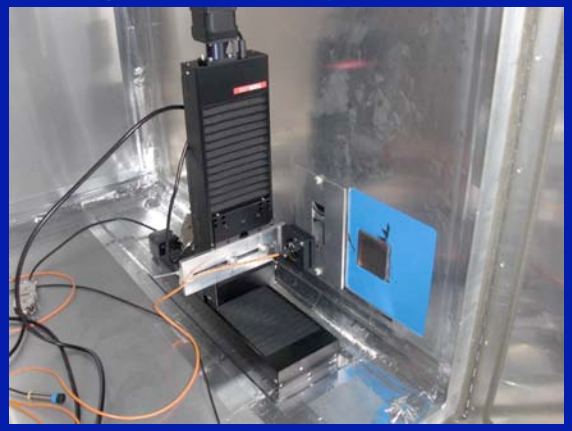
Comment:

- We have right now a working setup at SLAC. Planning to process 14 MaPMTs and determine a 2D efficiency map normalized to a Qantacon PMT.
- New systems are being developed at Maryland, Bari, LAL and possibly also in Trieste, if they join SuperB.
- That is all good, in principle, but all these setups have "wrong" electronics at present, and therefore we will not learn the "right" stuff from the present setups !
- We will need to have the French electronics to converge.
- This will provide the engineers the necessary feedback to fix errors.

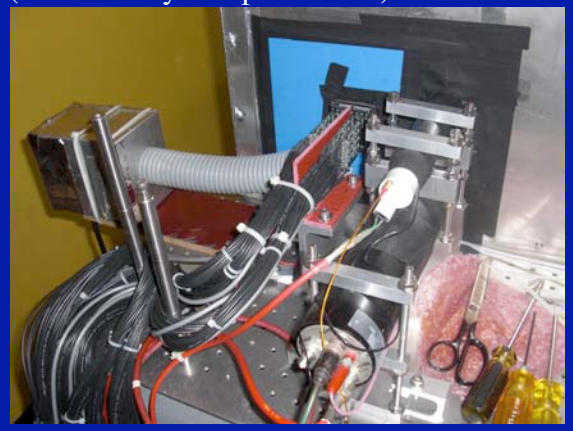
Restart of SLAC scanning setup

J. Benitez, K. Nishimura, D. Aston, J. Va'vra, M. McCulloch

New stage controlled by Windows:



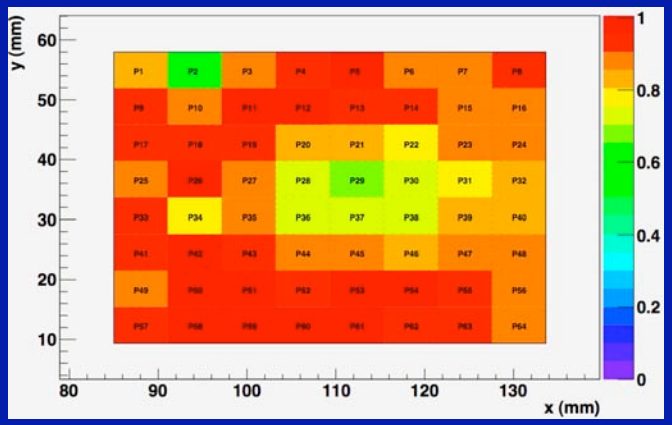
New amplifiers:
(SLAC/Maryland production)



PiLas laser (407nm):

The new UNIX μ-PCi computer:
(with fiber interface for BLAB3 electronics)

Scan of the 1-st H-8500 MaPMT:
(normalized to Photonis PMT's QE)



Plan for next month:

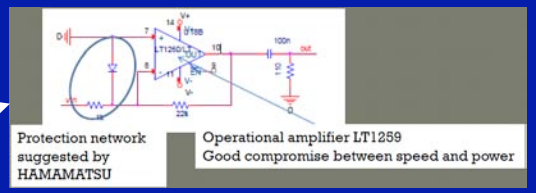
- Scan all 14 H-8500 tubes for FDIRC
(a single point per pixel)
- Electronics presently used:
(a) LeCroy Disc/ TDC 3377

Later on we may switch to:
(b) SLAC CFD/Phillips TDC 7186
(c) BLAB3 electronics
(d) Final LAL electronics in 2012

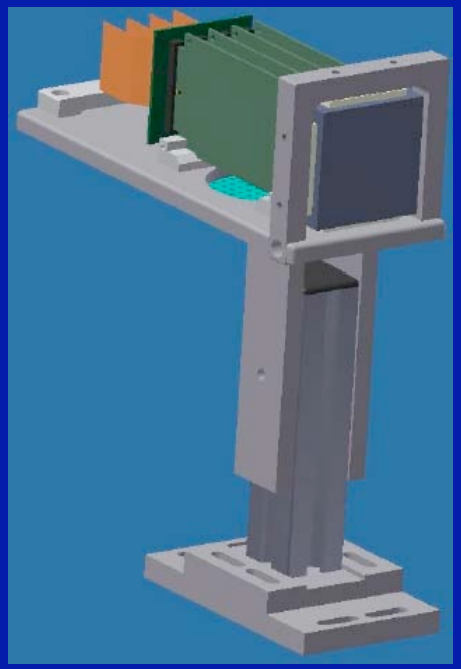
PID activities in Bari

F. Giordano

- **Mechanical work for FDIRC.**



- **Electronics for H-8500 tests.**
- **A development of the scanning setup.**



- **Starting to be involved in the FDIRC MC simulation.**
- **Starting to be involved in the CRT data analysis.**

Forward PID

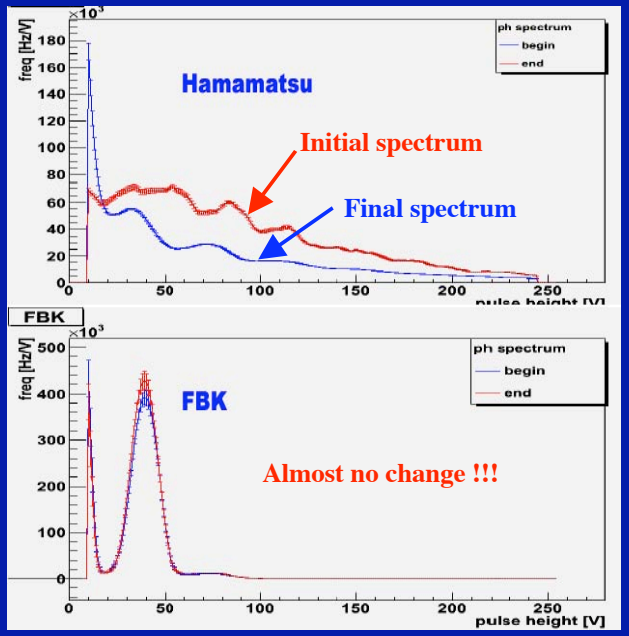
SLAC CRT setup:

- **J. Va'vra: LYSO + G-APD as a forward TOF**
  - **Results with small LYSO crystals yielded: σ ~110-160 ps.**
  - **However, a result with a full size disappointing: σ ~220 ps.**
  - **A reasonable result reached with a scintillator + G-APD: σ ~136 ps.**
  - **I am somewhat pessimistic that one can reach a resolution of σ ~100 ps.**
- **E. Kravchenko: FARICH**
  - **A lot of simulation of the performance done.**
  - **Prepared a test beam setup in Novosibirsk.**
  - **Have an array of G-APDs ready to evaluate the aerogel radiator.**
  - **Hope to get a result on resolution limits by Elba meeting.**
- **L. Burmistrov: fTOF data analysis from CRT**
  - **A huge data sample collected in the SLAC CRT (~ 400k events in total)**
  - **Established that one can achieve a 70ps resolution per pixel, with tails though.**
  - **They plan to add a calculation of $TOP_{expected}$ using a track information, and comparing it with $TOP_{measured}$. This would remove tails, I believe.**
  - **Analysis is still in progress.**

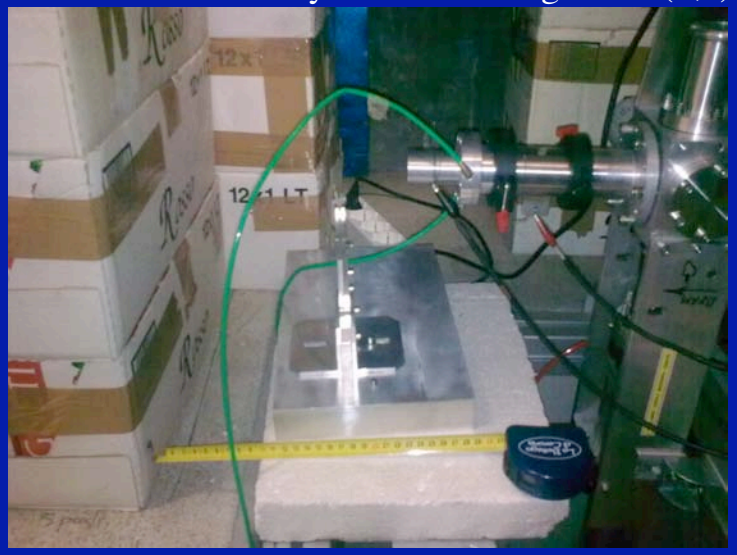
SiPMT (G-APD) characterization and irradiation status report

Flavio DAL Corso

Very preliminary results:



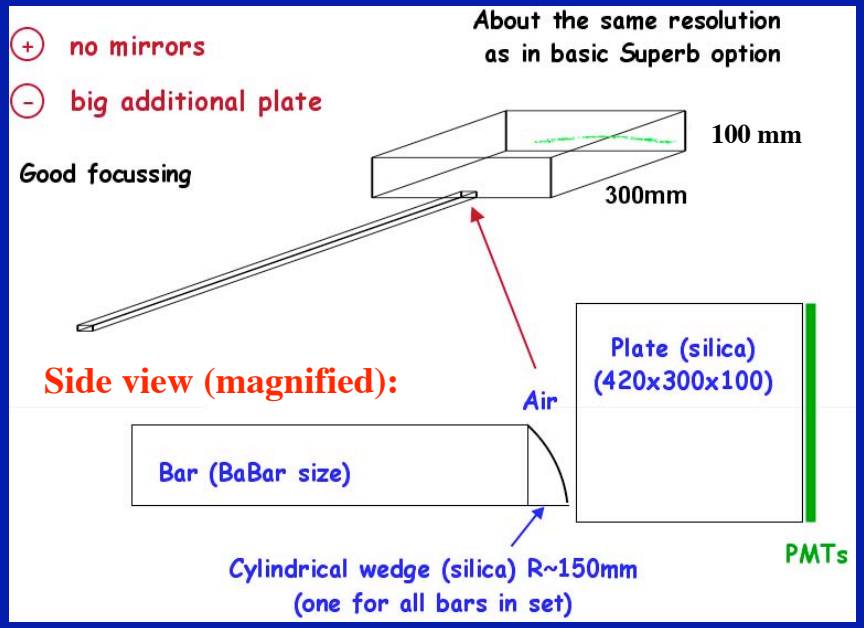
LNL facility:
Deuteron beam over beryllium thick-target: $^{9}Be(d,n)^{10}B$



- **A very useful facility to irradiate a sample by neutrons - good to know about it.**
- **Samples exposed to a flux of ~10^{10} neutrons.**
- **FBK SiPMTs (G-APD) see almost no change in the pulse height spectrum.**
- **More studies are needed to understand the lifetime result. I personally would like to see scope pictures of noise pulses before and after the irradiation.**

Possible FDIRC option

A. Drutskoy



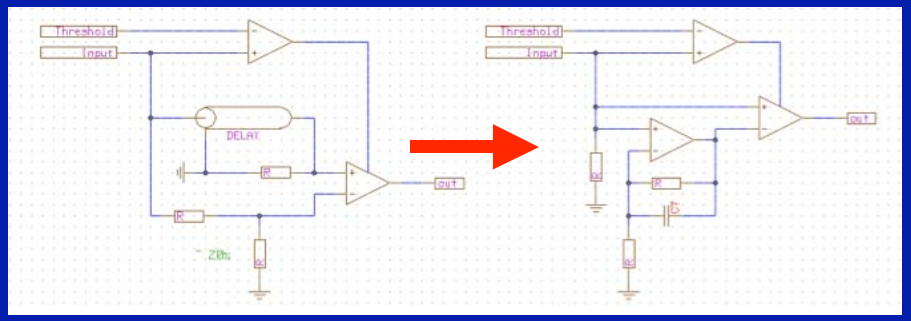
My comments:

- **<u>Photon losses ???:</u> Air interface means a loss of photons going at large angles. That is why DIRC has added a water interface. In addition, to increase a number of photons DIRC has a wedge to deflect photons into the active area.**
- **Not clear how this is going to work with the existing bar box geometry, which we do not intend to change. By this I mean wedges, window, window frame, etc.**
- **The present SuperB FDIRC performance was tested over the last 2 years. Many MC studies were done, and many experimental studies were done with the 1-st prototype. No performance plots were presented for the above design (due to Belle computers being down).**

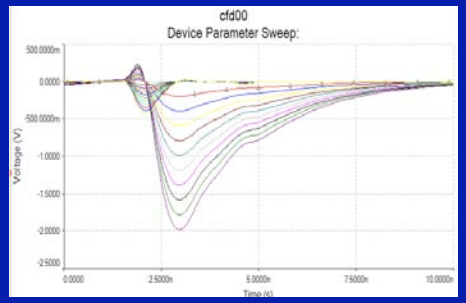
Status of PID electronics

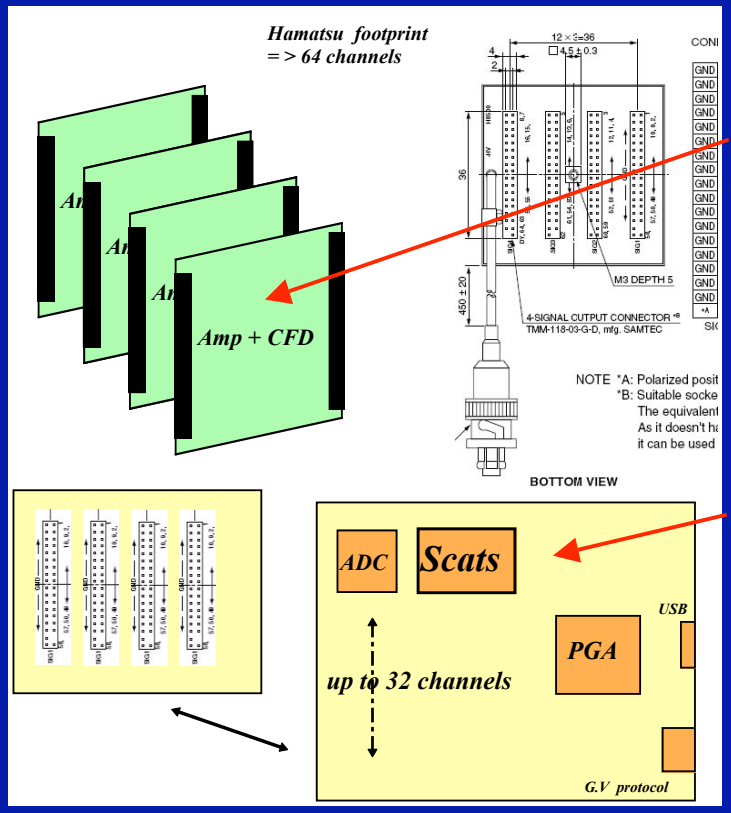
Vanessa Tocut and Christophe Beigbeder

Normal classical CFD: **Pseudo CFD on a PIF chip:**



Spice simulation:





Amp.+CFD interface board (initially discrete components, later on a PIF chip)

Motherboard (ADC, SCAT, USB and a Fiber GVbus protocol)

- **Asked for 130kEuro. If approved they will start SCAT chips in July.**
- **Will start with discrete components for Amp/CFD part; PIF chip will be available in 2012.**
- **Radiation hardness of similar circuit is being tested with Co^{60} source.**
- **My comment: we have 3-4 scanning setups & CRT !! We should unify the electronics.**

FDIRC tasks for 2011

	Tasks for FDIRC prototype test in CRT	Present list of institutions	People	Time to start	Time to finish	Range [days]	Comment	Critical items at present
2	I. FDIRC optics:							
3	**a) Mechanical support structures**							
4	Mechanical design of Fbox	Padova, SLAC, Bari	MB, JV, NM, MMcC	15-Jan-11	5-May-11	110	in progress	
5	Machining of Fbox parts			May-11	5-Jun-11	31		
6	Mechanical design of Fbox support in CRT			-Jan-11	5-May-11	110	in progress	
7	Machining of Fbox support for CRT			May-11	30-May-11	25		
8	3D dummy model of the New wedge & FBLOCK			-Mar-11	25-Apr-11	55	in progress	
9	Careful chemical cleaning (etching) of Fbox parts			-Jun-11	10-Jun-11	9		
10	Trial assembly of Fbox & 3D dummy, possible modifications, itterate			-Jun-11	15-Jun-11	5		
11	Sending Fbox, support and 3D dummy model to SLAC			-Jul-11	5-Jul-11	4		
12	Trial assembly of Fbox at SLAC, possible modification, itterate			5-Jul-11	15-Jul-11	10		
13	**b) Quartz optics (FBLOCK, New Wedge, coupons)**							
14	Optical design (ray tracing) and verification by MC				15-Jan-11		finished	
15	Raw quartz material procurement and delivery			-Oct-10	10-Jan-11	87	finished	
16	Quartz machining and polishing of FBLOCK & New Wedge			-Mar-11	25-Jun-11	92	in progress	
17	Delivery of the New Wedge to SLAC			May-11				
18	QC of New Wedge at SLAC; compare them with Cosmo data			May-11	25-May-11	10		
19	Delivery of FBLOCK to SLAC			-Jul-11				
20	Mechanical QC of FBLOCK at SLAC; compare them with Cosmo data			-Jul-11	15-Jul-11	14		
21	Simple optical tests of FBLOCK with a laser (look for lobes, etc.)			-Jul-11	15-Jul-11	1		
22	Optical coupling between bar box window and New Wedge (Epotek)			-Jun-11	25-Jun-11	5		
23	Measure the diffuser position with a laser and proper optical interfaces			-Jul-11	22-Jul-11	2		
24	Glue laser light diffuser to the bottom of the FBLOCK			-Jun-11	22-Jun-11	2		
25	Assembly of Fbox around FBLOCK & New Wedge			-Jul-11	1-Aug-11	12		
26	Installation of the laser lens and fiber connector			-Aug-11	20-Aug-11	5		
27	FBLOCK & Fbox assembly finished in the clean room			-Aug-11				
28	**c) Final integration in CRT**							
29	Removal of the present FDIRC prototype from CRT			May-10	17-May-10	2		
30	Installation of bar box support base for the new bar box			May-10	20-May-10	2		
31	QC the bar box base before bringing the bar box			May-10	30-May-10	10		
32	Install the bar box #0 on the CRT base			May-10	10-May-10	9		
33	Install the Fbox support to the CRT base			-Jul-10	15-Jul-10	14		
34	Trial fit of Fbox & dummy & bar box in CRT - adjust alignment			-Jun-11	30-Jun-11	10		
35	Bring Fbox with the real FBLOCK & New Wedge to CRT			-Aug-11	25-Aug-11	10		
36	Optical coupling between the FBLOCK & New Wedge (RTV ?)			5-Jul-11	31-Aug-11	37		
37	Gas sealing of Fbox and bar box, install the N2 boil-off gas flow			-Aug-11	5-Aug-11	4		
38	Install the N2 boil-off gas flow			-Sep-11	7-Sep-11	2		
39	Install the mechanical enclosure and establish the light seal			-Sep-11	12-Sep-11	2		
40	Install detectors with their initial electronics - see more later			-Sep-11	25-Sep-11	15		
41	**d) Other tests/actions which need to be done relatively soon**							
42	R&D on optical coupling between large area glass surfaces (Epotek & RT			-Jan-11	20-Mar-11	69	in progress	
43	Make a diffuser for the laser calibration, and test it			-Mar-11	1-Apr-11	7	ordered	
44	Order mirror coupons from the plating company			-Mar-11	24-Mar-11		finished	
45	Evaluation of mirror coupons for FBLOCK coating - hardness tests			-Mar-11	25-Jun-11			
46	Evaluation of mirror coupons for FBLOCK coating - radiation sensitivity	SLAC	JV	20-Feb-11	20-May-11	89		
47	Find a new place to do optical transmission tests	SLAC	JV		28-Feb-11		finished	
48	Create a glue test samples for "yellowing & radiation" tests	SLAC	MMcC, JV	15-Feb-11	25-Mar-11	38	finished	
49	UV light exposure of glue samples	SLAC	JV	15-Mar-11	15-Apr-11	31	in progress	
50	Radiation tests of glue samples	SLAC	JV	15-Mar-11	15-Apr-11	31	in progress	
51	Tests of optical coupling between detectors and FBLOCK (Grease ? RTV ?)	SLAC, Padova, Bari	MMcC, JV, MB, NM				later	
52	Measure refraction index of RTV used for coupling between Wedge & FBLOCK							
53	Optical distortions in RTV coupling between Wedge and FBLOCK							
54	Measure various distortions and errors in the FDIRC prototype	SLAC	alignment, MMcC, JV					
55