

Cosmic Ray Background Test Stand

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CR Background Test: Purpose

- This is a way to measure the fake neutrino event rate for a detector on the surface without an overburden
 - The idea is to run > 90 % live for a few months with a small device to mimic the backgrounds in 50 kT where we will see 100 seconds of beam spill per year
- **An overburden is an expensive complication to the detector building**
 - The cost estimate includes a 75% contingency on the building because of this
- The Executive Council confirmed the priority of this test for FY04 R&D in the phone meeting held on April 12

The story of the last few months

- We had been heading down a path to use 29 BELLE RPCs in a particle board structure in Lab E.
- We believe we need a device with NOvA sampling in a cube about 3m on a side to do this test
 - Just event containment arguments
- Given our recent RPC consensus, there is no appetite in the CR Background Test group to continue with these RPCs
 - In fact, to continue would require building electronics (designed by Gary Drake for us and for LC Hadron Calorimeter work) for these RPCs
 - Cost is estimated at about \$ 25 K
 - Seems like a waste?
 - We explored using other existing electronics (FERA ADCs, CDF RABBIT), but none easily satisfies the high live time requirement for the test

So, now what?

- Scintillator?
 - This means we have no detectors and no electronics
- However, it is possible to think of using the MINOS spares as the electronics for the NOvA CR Background test
 - In principle the MINOS Far Detector and CalDet's 1440 channels were both supposed to operate together forever if need be
 - Jeff Nelson has done an inventory and it looks like most parts do exist
 - A few are in short supply and even MINOS is considering buying more
 - NOvA would probably have to buy some parts also
 - Jeff estimates it might take \$ 10 K from NOvA

Jeff's inventory

14-May-04

Cosmic Ray Stand

\$1,915

	Item	Needed	Spare Pool	\$	Comment	Looks OK?
Front end	Phototubes (M16)	90	>91	\$ -	1 at Soudan; 90+ Stored at Texis-Austin (Lang)	yes
	PMT bases	90	>106	\$ -	16 at Soudan + 90+ UTA spares	yes
	VFB (frontends)	30	84	\$ -	68 @ prep + 16 @ Soudan; another 15 being fixed	yes
	PMT boxes	30	34	\$ -	30 at FNAL and avail.; 4 at Soudan	yes
FEE-BEE connection	control cable	30	?	\$ 1,500.00	ones from caldet were dead; minos plans to buys spares; assume bought for now; WAG	no
	signal cable	30	?	\$ -	caldet ones somewhere?; questions asked	buy?
	power cable	30	?	\$ -	caldet ones somewhere?; questions asked	buy?
RACK infrastructure	LV power distribution box	1	3	\$ -	Stored at Soudan	yes
	6V supply	1	0	?	2 complete sets of guts stored at Soudan; Random 6V supply probably OK	buy
	MINOS VME crate	1	2	\$ -	Stored at Soudan; OK to borrow 1 for rapid return	yes
	Weiner power supply	1	3	\$ -	At Soudan	yes
	fan pack	1	1	?	ND spare or buy	buy/ND spare?
	fan power supply	1	1	?	ND spare or buy	buy/ND spare?
	Rack	1		\$ -	FNAL standard 19" rack	get from FNAL
	Ethernet cable	2		\$ 30.00	make/steal	get from FNAL
	Power Strip	1		\$ 25.00	buy	buy
	UPS	1		\$ 250.00	buy	buy
Serial cable	1		\$ 10.00	Custom hack	make	
HV	Lecroy mainframe	1	PREP	\$ -	Prep	yes
	HV cable	90	None to ship	?	Beg, borrow, steal	?
Back End	VMM	15	16	\$ -	An additional 9 in for repair	t until fixes done
	VARC (VME card)	3	6	\$ -	6 more in repair	yes
	RIO processor	1	?	?	RAL owns	?
DAQ	DAQ PC	1	?	\$ -	modest requirements; pick one up somewhere	yes
	Copper PVIC	2	?	?	RAL owns	?
	PVIC cable	1	?	?	RAL owns	?
Misc/ questionable	timing module	1	5	\$ -		yes
	Rack Protection	1	0	\$ -	more being ordered; could use a MIPP-type smoke detector/cutoff	make/buy
	EDAS box	1	0	\$ 100.00	Option if not using RPS (for HV control); if no RPS, use for HV control	
	Light injection	0	1	\$ -	Not needed; singles/muons OK for this device	
	LI cables	0	few	\$ -	Not needed; singles/muons OK for this device	

What about the scintillator?

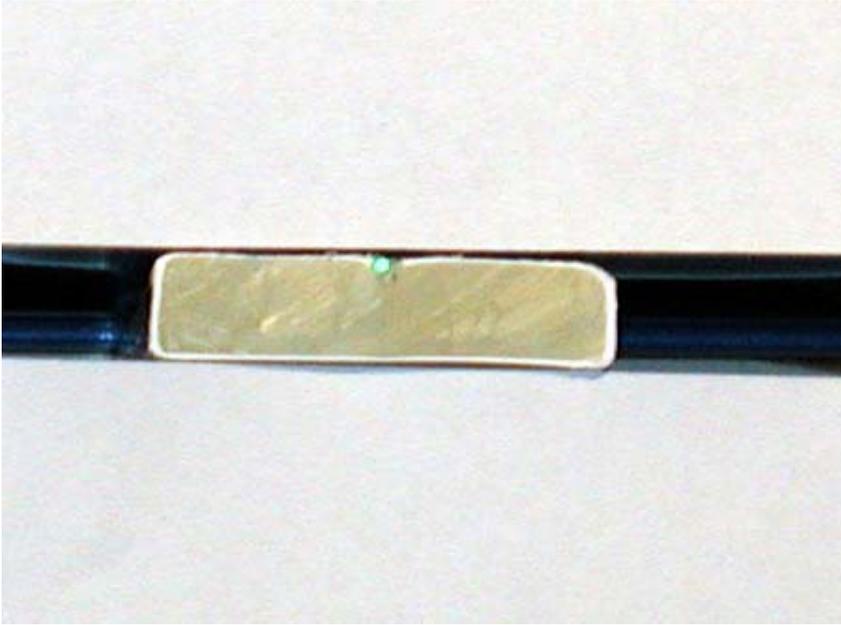
- The CalDet modules are not available
- New scintillator can be had in a few weeks for about \$ 12 K for 1500 10' strips
 - Another \$ 10 K for assembly, maybe ANL could do it
 - More costs for fiber, skins, manifolds
 - Maybe as high as \$ 45 K Total, more \$ than we have
- Another idea is to use the scintillator in the MINOS Four-Plane prototype.
 - We believe this is not needed by MINOS
 - Slightly inferior scintillator relative to final MINOS product, but if we shorten the 8 m modules to our desired 3 m, it should be enough light from a one end readout

The 4 plane prototype

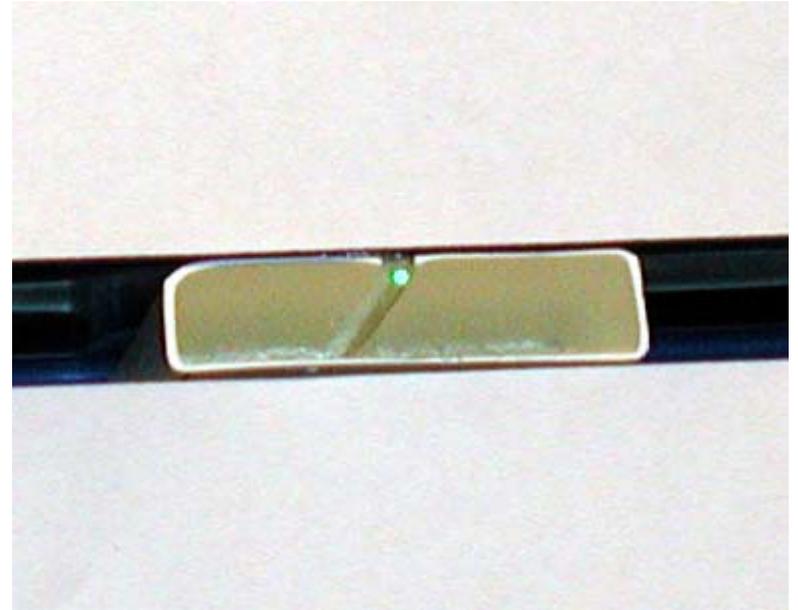
- 3 planes of scintillator
 - each with 192 strips in modules of 20 or 28 strips
 - Two of the modules are easily accessible, just bolted in place on the front face
 - each strip 6 - 8 m long.
- With appropriate approvals, one could contemplate cutting the existing strips into 2 parts, each with a readout at only one end
 - This would give about 1200 strips
 - Gives 16 planes each 3 m x 3 m for the NOvA Cosmic Background Test Stand
- Once the MINOS Near installation is complete, there are a few more short spares we might be able to add ?



Rich Talaga did a saw test



Saw cut with a hand saw !



Hand saw then fly cut with the ANL diamond bit machine

Fiber survived OK in both cases, looks like this could work

Why not Liquid?

- Implies we wait for Liquid R&D or
 - e.g. invent top manifolds and bottom seals in multiple places
 - Seems inefficient
 - Cost estimate for all liquid is about \$ 100 K
 - Estimate for T ASD version even higher since 6 times as many channels
- Could upgrade to Liquid later
 - or even just one plane at a time
 - Ken's R&D list included extrusions for 2 planes of Liquid Scintillator for the CR Background test @ \$ 4 K
- And we expect that the Solid strips might remain useful in any case
 - Fancier triggers, active shield test,...

So the CR Background Test group / bunch asks that:

- NOvA officially request the four plane prototype from the MINOS collaboration and the NuMI / MINOS Project with the understood intent to cut it up.
- NOvA officially request the use of MINOS Far Detector spare electronics with the understanding that they are “hot spares” subject to recall at any time (need MOU)
 - We would hope to agree on a specific list, then buy whatever is missing.
 - Estimate is < \$25 K + Fermilab effort.