Some notes on the Beam Test

G. C. for the Beam Test Team

Outline

- Installation
 - Prototype
 - Other systems
- Detector Operation
- Running experience

The early days



Then we started mounting and testing the electronics and DAQ system in the hall of the facility.

Our office for the first day was the cafetería, where we fought the DHL for the delivery of the prototype.



The Meson Beam Test Facility



Detector installation



All the electronics located in a rack close to the detector.

PC for TDC acquisition placed near the rack and remotely controlled with VNC.

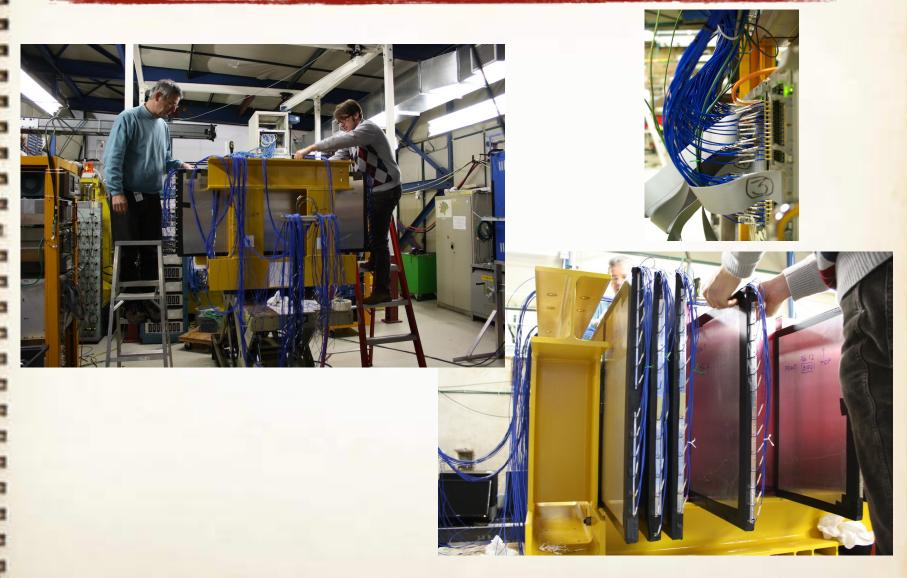
The detector installation was smooth.

The pízza boxes fitted just right in the gaps! Almost no clearance.

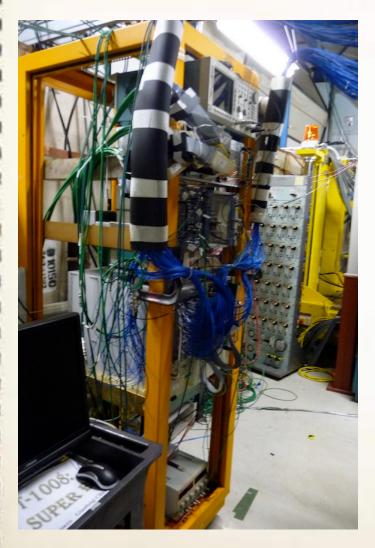


12/15/10

and cabling



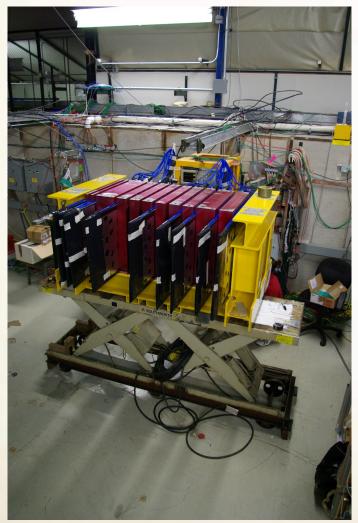
More píctures





Cabling and light insulation of the boxes

Ready to take data





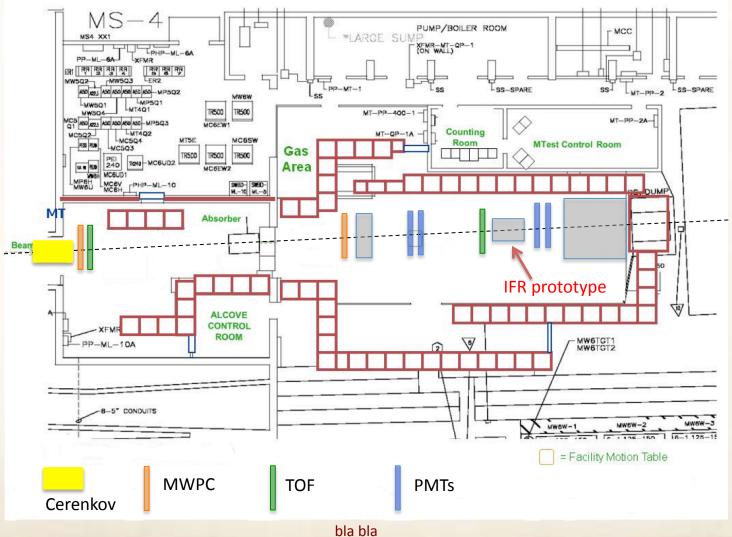
The first beam





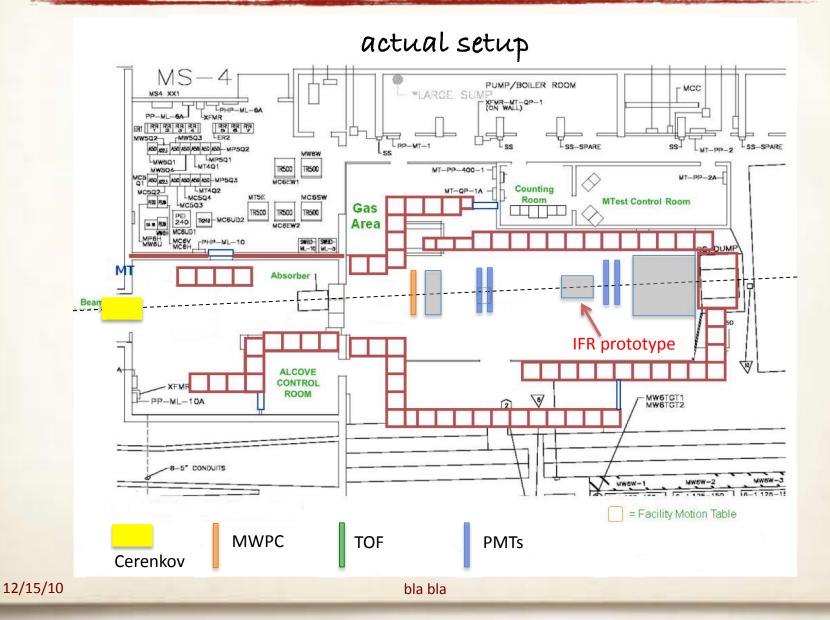
The setup

Initial idea



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The setup

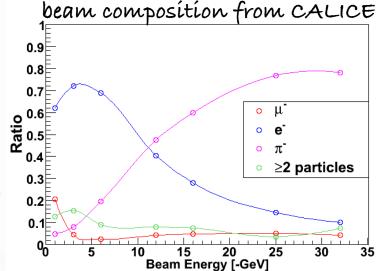


The beam

- We had beam a líttle later than expected: Wednesday at 10am ínstead of Tuesday afternoon.
- Despíte that we experienced few downtime and the beam was quite stable and usable.
- We obtained also a run extension up to 8pm for three days to compensate the downtime.

The trigger and particle rates

- Using two PMTs and two Cerenkov signals we made different trigger combinations.
 - not electron trigger (default)
 - Muon trigger
 - Píon trígger
 - Electron trigger
- We had some issues due to the reflection of the Cerenkov signals of the electron veto, producing large dead-time.



 We didn't see the expected rates, but the trigger worked fine, the busy logic as well and at the energy we ran we collected enough data.

Particle ID



- Except for the reflections in the signals the Cerenkov worked fine with Nitrogen (i.e. > 4 GeV).
- At lower momenta we tried to use the C4F80 but it was probably too cold outside and we couldn't operate the detector properly.
- We spent quite a lot of time doing pressure scans to find the right operating point to maximize the muon rate: experience for the next test.
- Due to lack of time we didn't explore the low energy region so we didn't installed the TOF.

The wire chambers

- We had one chamber installed but we couldn't use it to take date since it was causing huge dead-time.
- The expert wasn't there at the beginning of the run and when he came back we already decided to leave the chamber out for this test.
- This has no big impact on the test results.

The prototype

- Our prototype worked very well during all the data taking.
- The two stream (BIRO and TDC) were nicely synchronized.
- We had only a couple of dead channels in the electronics, that died during the installation when we didn't ramp up and down properly the bias voltage.
- Some issue with some TDC channels.
- No big issue of noise (actually we had less noise than in Ferrara).
- All in all a good running experience for our detector.

The online system

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	Vbias	Gain	ThrH	ThrL	RateA	Aeter	Save FEE Conf	ig
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yer 3	36.00 🗘	0.018	4.5	2.5	0	-1		Connect BIRO 1
yer 4	36.00	0.018	4.5	2.5	0			
yer 5	36.00	0.018	4.5	2.5	0	-1		Connect to TDC
yer 6	36.00 🗘	0.018	4.5	2.5				
ver 7	36.00 \$	0.018	4.5	2.5	0			ReadBackFEE
	36.00	0.018	4.5	2.5	0		RampUP	Load Last FEE Config
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Use Monitoring Offline

Stop

bla bla

Start

- DAQ and online worked properly (when no developers were around to test new "features").
- Thumb up also for the developers.

ontroi rantei	Configuration files fo	or this run			
Connect Comm Disconnect Comm DAQ Settings Connect Data Disconnect Data					
	Acquisition Thread	Acquisition Thread			
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Events to Acquire 0 C Preprocessing Start Run Stop		Acquired KBytes			
0 🗘 Run Number Elapsed time in this run	Preprocessing Threa	d			
	BIRO	TDC			
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	Preprocessed events	Preprocessed events			
	Actual frequency (ev/s)	Actual frequency (ev/s)			

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The test

Things to learn	they depend on (parameter to change)	and need (number of events)	
Detection performances (efficiency, dark count, occupancy)	SiPM settings (gain, thr)	Even 10 kevents per conf: very fast at high momentum	Completed including special modules
Tracking performances	Mainly SiPM settings	~50 kevents, we can	Completed
(time resolution, track		change parameters only	including
reconstruction, multiple		with high rate (i.e. high	special
tracks detection)		momentum)	modules
Particle ID (muon pion separation)	Mainly beam	~500 kevents distributed	Done only at
	momentum and	over the entire	high
	absorber configuration	momentum range (1GeV	momenta (≥
	but also on SiPM settings	– 5GeV)	4 GeV)

The test

Day	Conf	First shift	Beam energy	Second shift	Beam energy	After beam
Wed	CP1	Beam tuning and DAQ/ trigger test	8 GeV	Trigger setup	8 GeV	trigger installation and other maintenance
Thu	CP1	Cerenkov scan	8 GeV	Steady run	8 GeV	
Fri	CP1	Cerenkov scan	5 GeV	Steady run	5 GeV	Change gas in the Cerenkov
Sat	CP1	scan with C4F8O	3 and 4 GeV	Cerenkov scan (N)	4 GeV	
Sun	CP1	steady run	4 GeV	steady run	4 GeV	
Mon	CP1	steady run	5 GeV	steady run	6 GeV	insert special modules
Tue	CP1 special	steady run	8 GeV	steady run	8 GeV	dismount

My outlook 12/15/10 bla bla 20

What's now

- Take pure quality muons with cosmics run and compare with what we have in the data.
- Improve and optimize DAQ, monitoring and detector control. An online event display will help to check what we are acquiring.
- Develop offline code.
- Test MPPC module.
- Fully understand the operational feature and peculiarities of our prototype.
- Account more time for the next beam test and be sure to have more support from Fermilab.

Some questions to help making a plan

- Assemble new pízza boxes (?). Are we happy with the present layout? (SíPM, fibers, scintillators)
- What about a pízza box with irradiated SiPM?
- Do we have enough time and manpower to develop our own TDC?
- Can the double hit resolution of the TDC be an issue for the time readout?

Two thumbs up for the crew



