

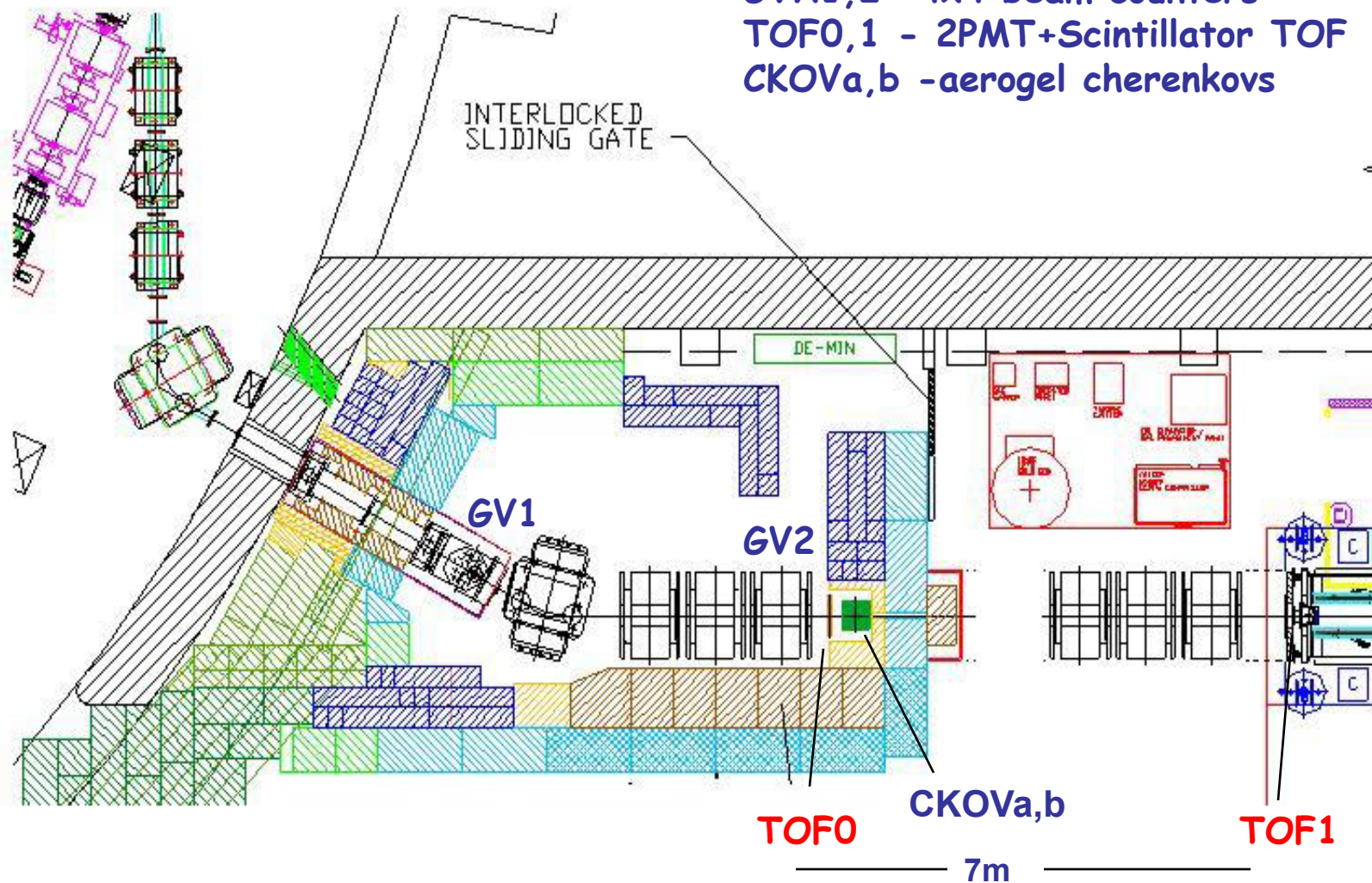


- MICE Particle ID important to insure high muon purity for muon cooling measurement.
- TOF System TOF0, TOF1, TOF2. - INFN Milano  
<100ps TOF resolution for excellent e, mu, pi, K, p id.  
Can provide secondary momentum measurement.
- 2 Threshold Cherenkov Beam Counters used for pi-mu ID in the beamline. -Louvain/UMiss/UIT/UIA
- KL/SW(mu ranger) provide final e/mu tag.  
Trieste/RomaIII/Fnal/Geneva
- GV1/2 tof counters. U Geneva (beam commissioning)

# MICE Beamline- Phase1/2 Startup



GVA1,2 -4x4 beam counters  
TOF0,1 - 2PMT+Scintillator TOF  
CKOVa,b -aerogel cherenkovs



# TOF Particle ID



$$\Delta T = \frac{L}{c} \sqrt{1 + \left(\frac{m}{p}\right)^2}$$

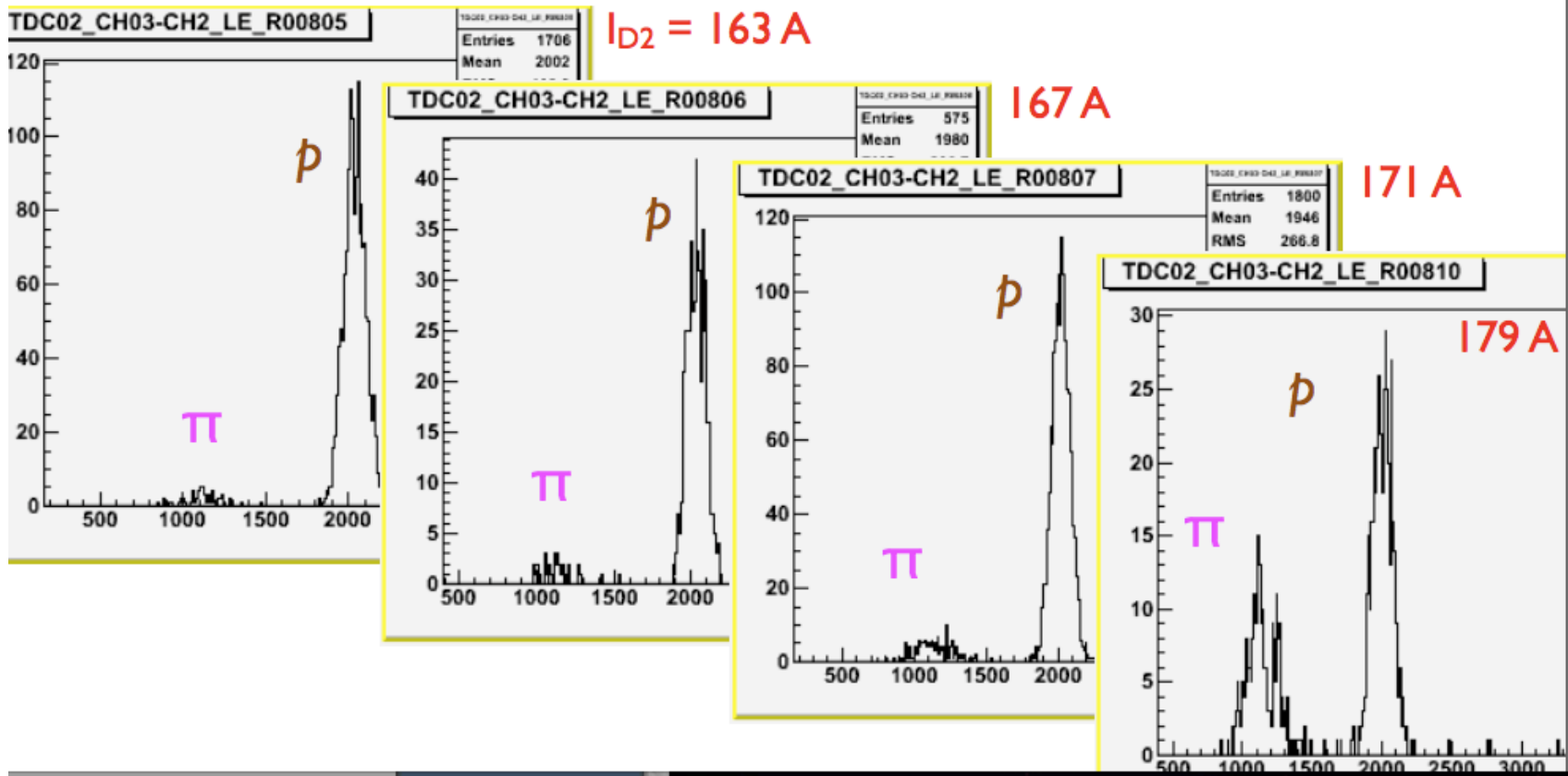
<b>P(GeV/c)</b>	<b>dt-electron</b>	<b>dt-muon</b>	<b>dt-pion</b>	<b>dt-kaon</b>	<b>dt-proton</b>
	<b>ns</b>	<b>ns</b>	<b>ns</b>	<b>ns</b>	<b>ns</b>
0.1	0.0003	12.19	19.00	107.74	225.15
0.15	0.0002	5.99	9.69	65.11	142.38
0.2	0.0001	3.51	5.81	44.39	101.34
0.25	0.0001	2.30	3.84	32.39	76.98
0.3	0.0000	1.62	2.72	24.71	60.96
0.35	0.0000	1.20	2.03	19.46	49.68
0.4	0.0000	0.92	1.56	15.71	41.38
0.45	0.0000	0.73	1.24	12.93	35.04
0.5	0.0000	0.59	1.01	10.82	30.07
0.55	0.0000	0.49	0.84	9.18	26.10
0.417	0.0000	0.85	1.44	14.67	39.04

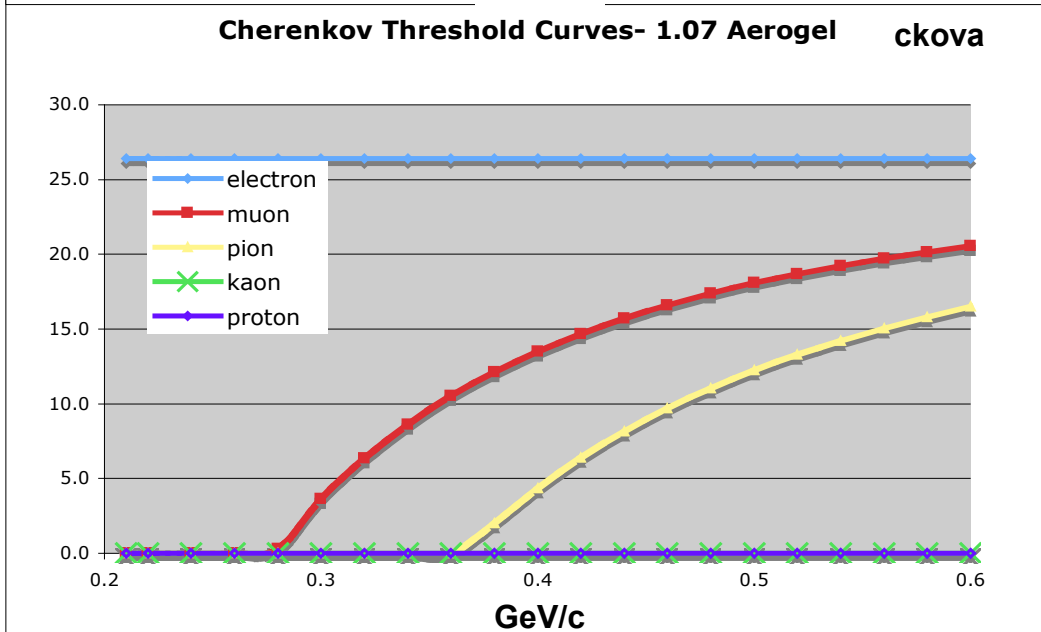
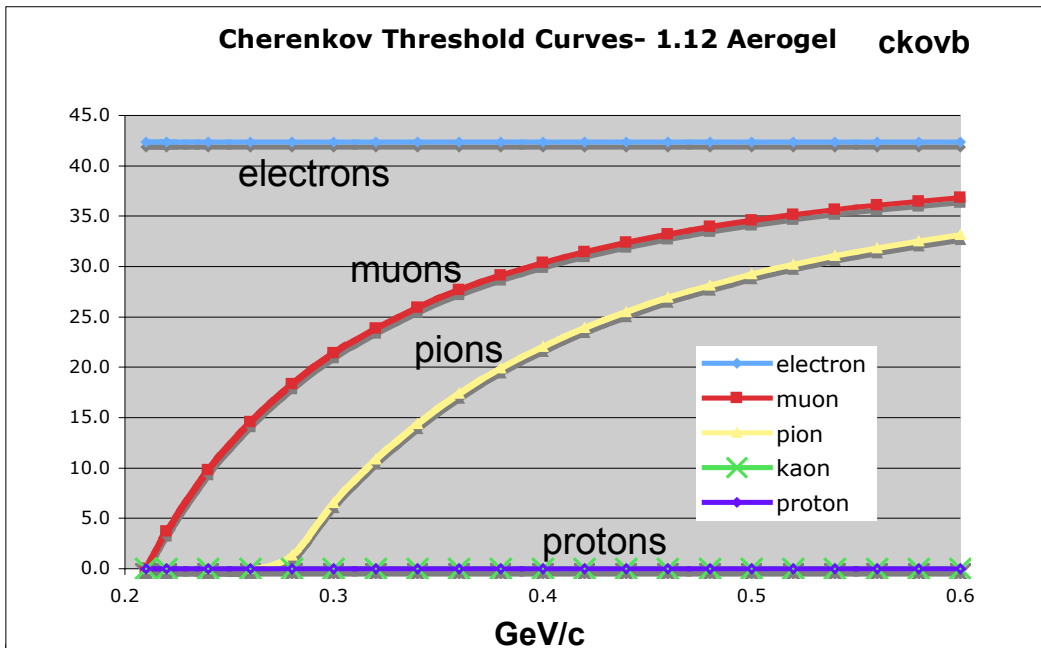
- TOF0/1 ~7 meters requires 100ps time resolutions.
- CKOVa/b provides second foil proof system ranges to higher momentum.
- Electron converter + muon ranger for e-mu on exit.



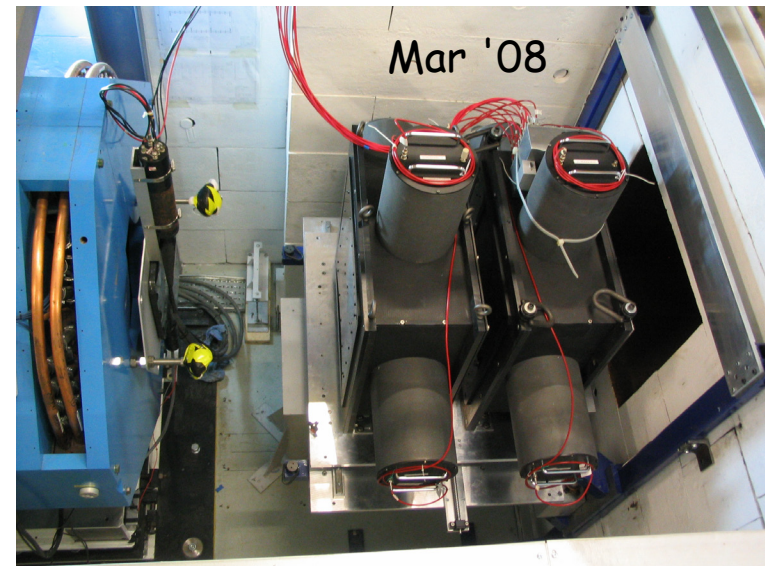
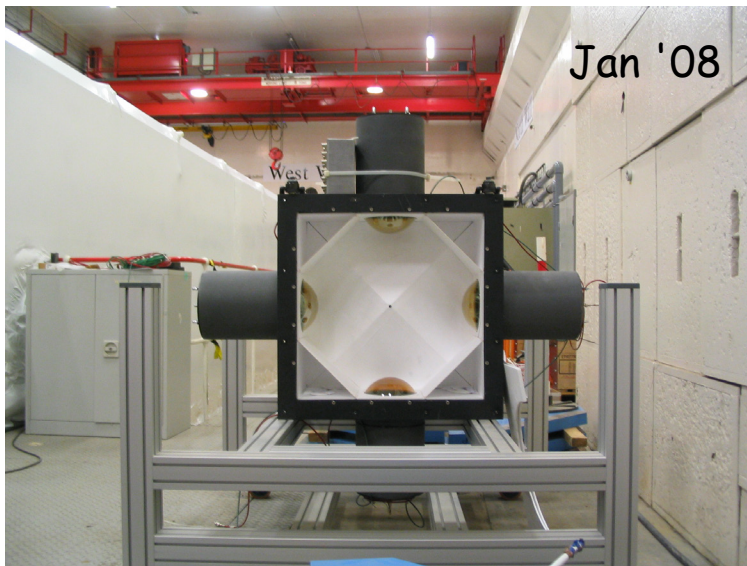
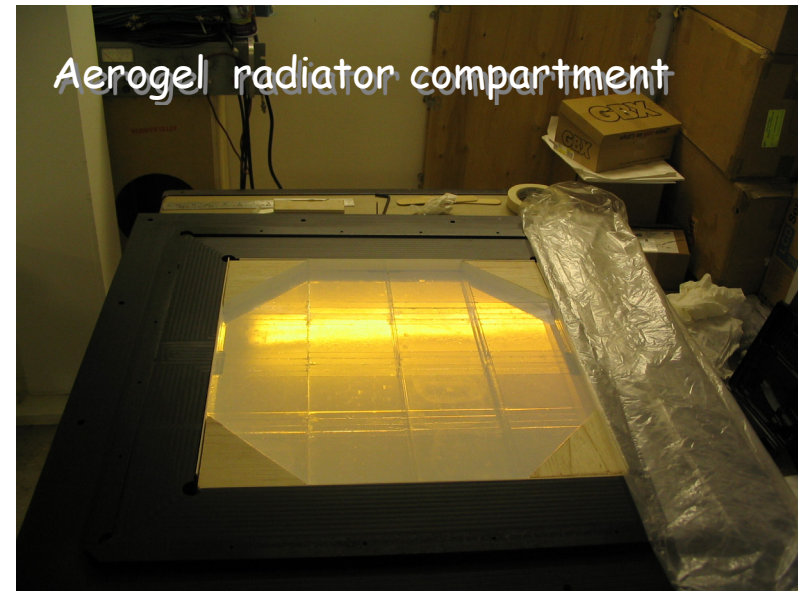
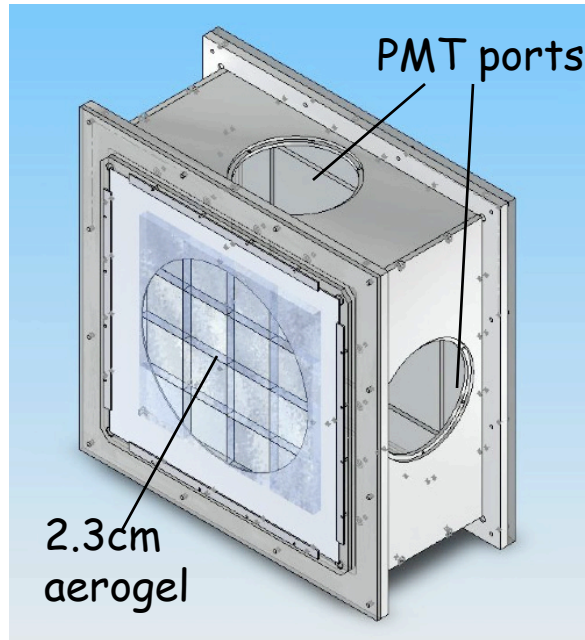
## Momentum Scans

- Example @ 460 MeV/c (on-line histograms):

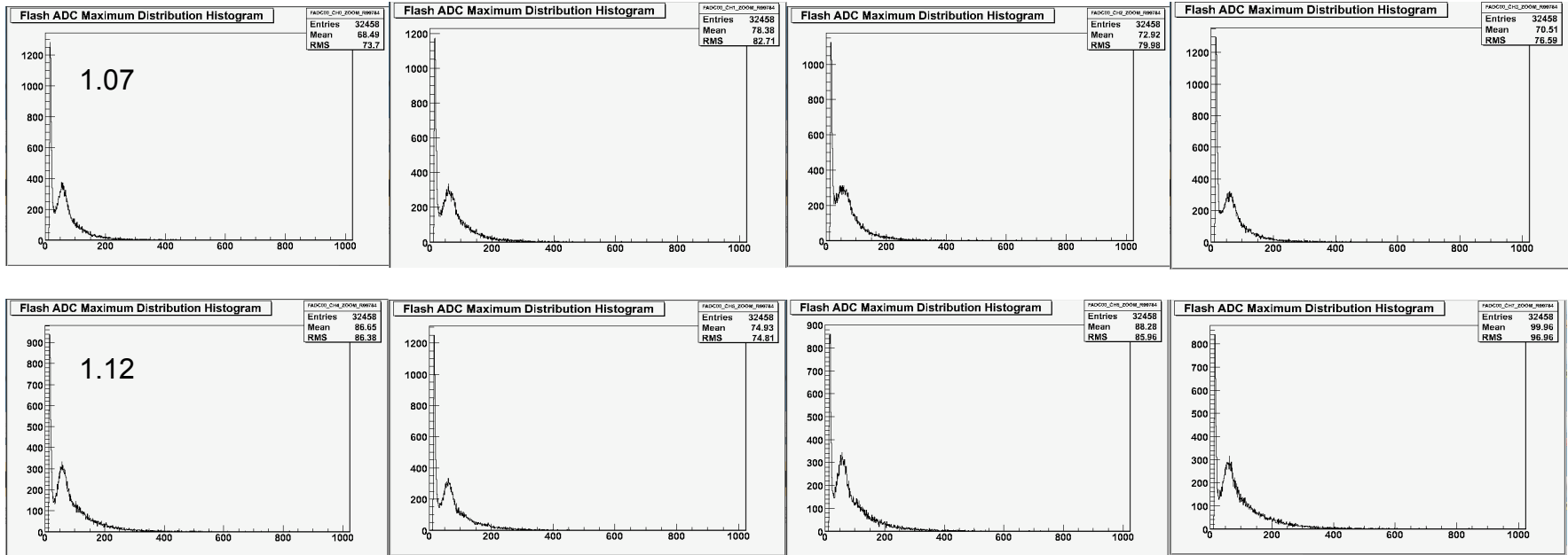




# Aerogel Cherenkovs



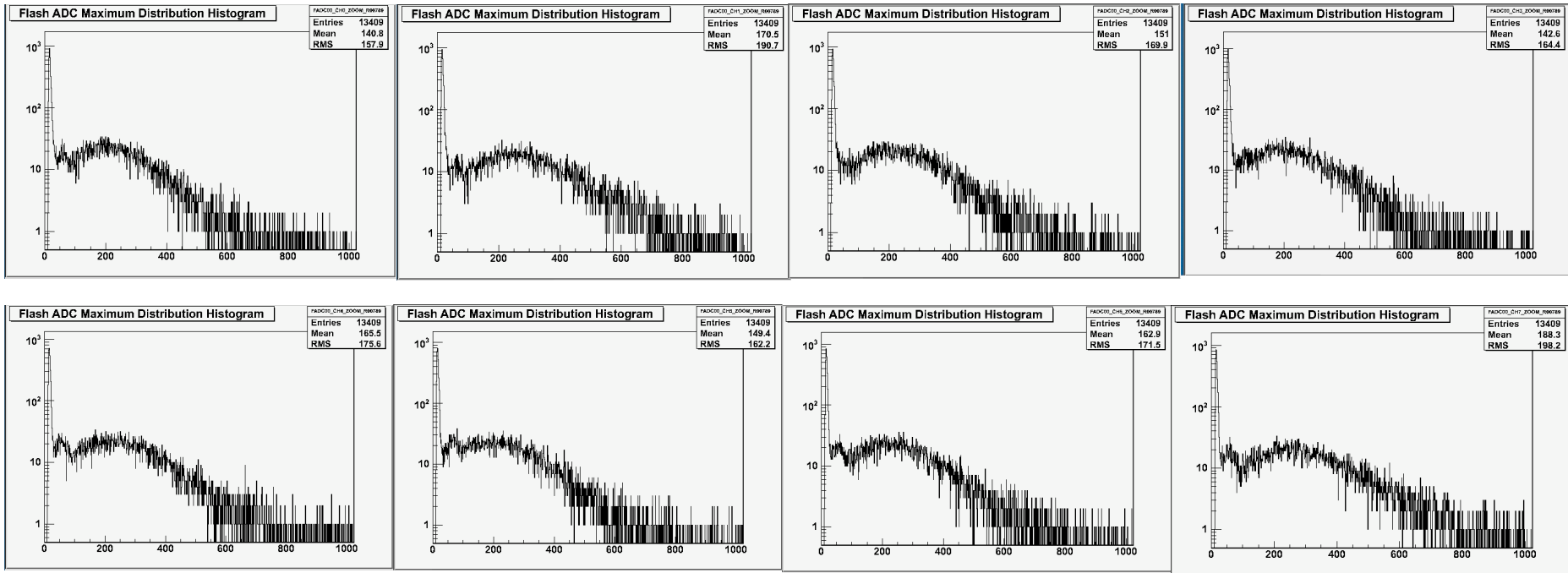
# CKOV - 300 MeV/c Pions Run 784



Channel	PED	1-pe
0	13.6	55.9
1	13.6	61.4
2	13.6	52.2
3	13.6	57.7
4	13.6	57.7
5	13.6	59.6
6	13.6	55.9
7	13.6	59.6

- beam or pulser runs can be used to set the 1PE gains.

# CKOV - 100 MeV/c Positrons Run 789



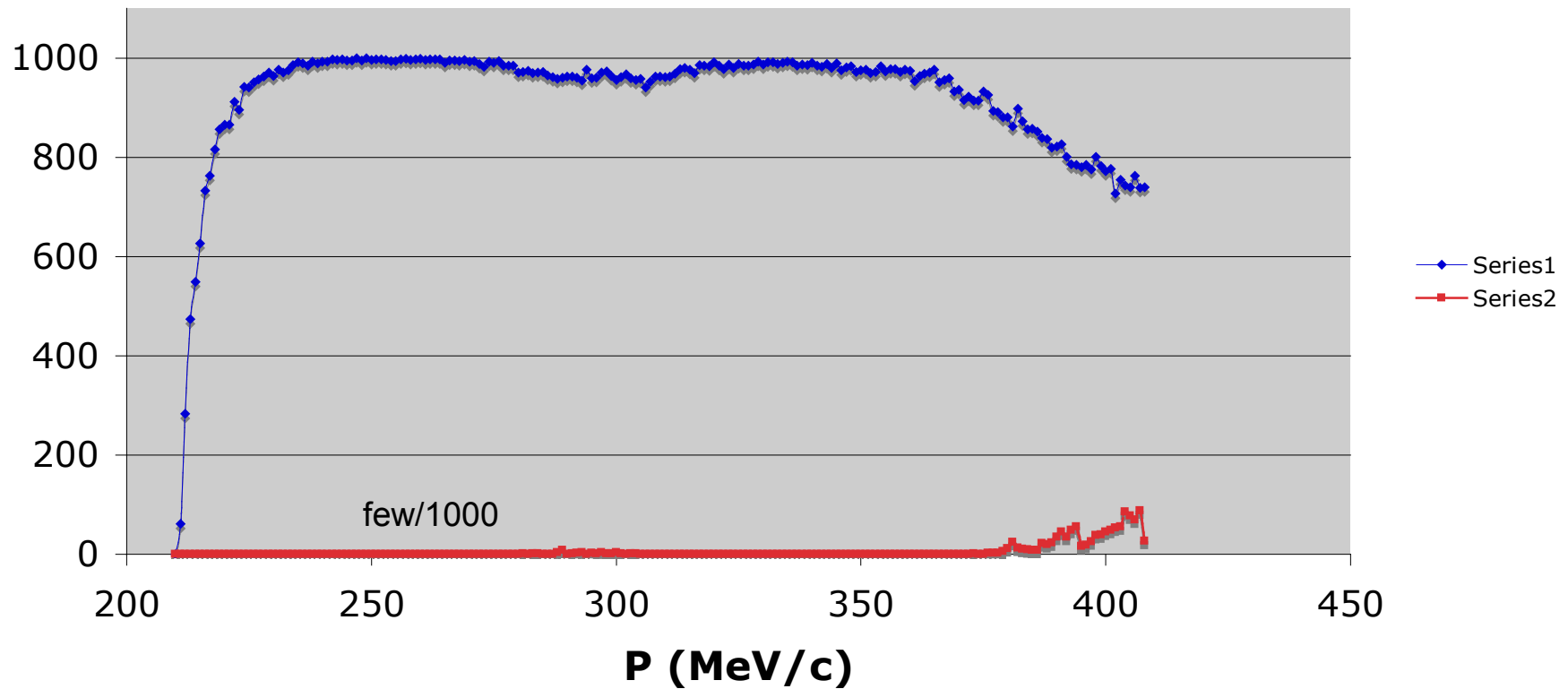
Channel	PED	1-pe	Signal-peak	npe	N-total	N-pred
0	13.6	55.9	207	4.57		90 (1-1/n^2)2.3cm
1	13.6	61.4	213	4.17		
2	13.6	52.2	214	5.19		
3	13.6	57.7	210	4.45	<b>18.39</b>	<b>26.20</b>
4	13.6	57.7	239	5.11		
5	13.6	63	216	4.10		
6	13.6	54	239	5.58		
7	13.6	54	261	6.12	<b>20.91</b>	<b>41.98</b>



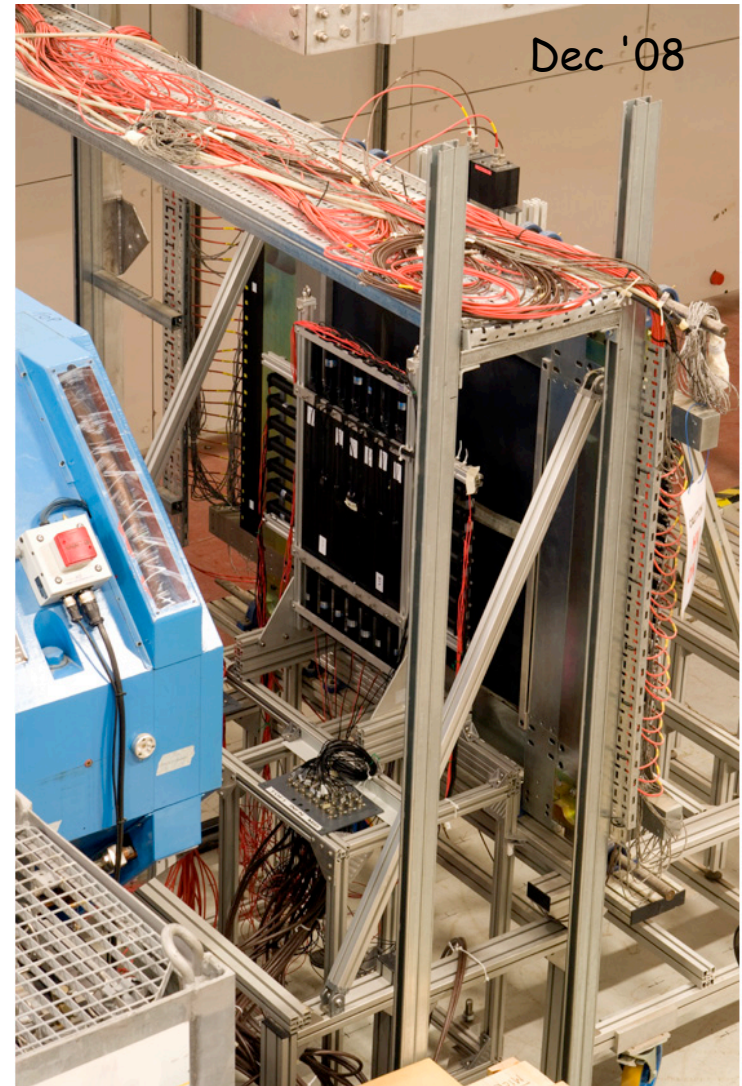
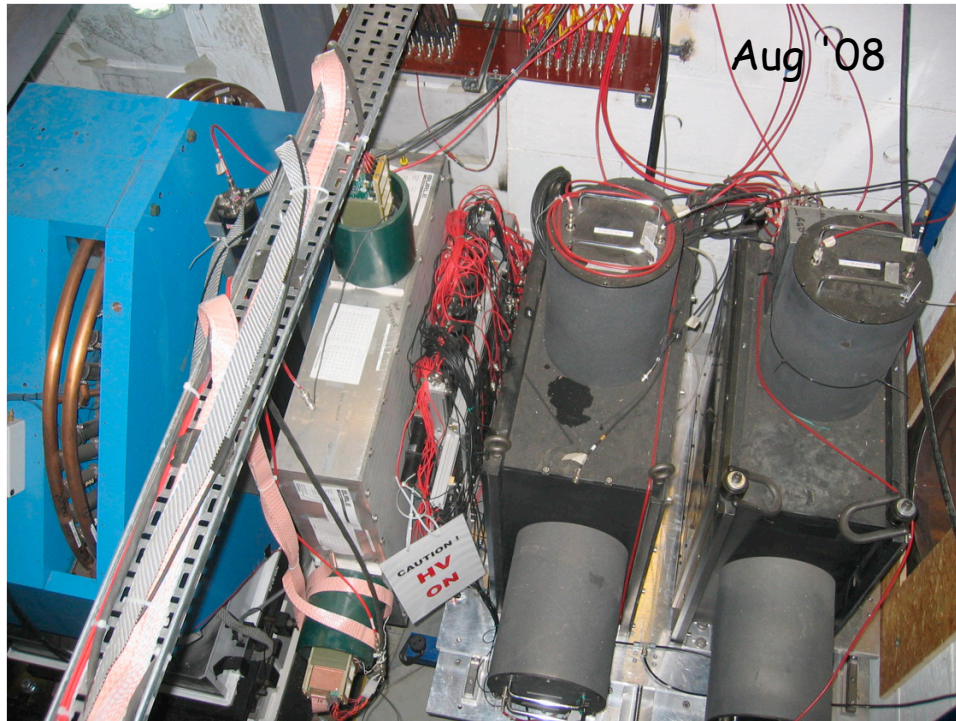
# CKOV Projected Eff vs Momentum



## Projected CKOV Muon Efficiency vs Momentum Pion MisID



# Tof0/1 Installation in July/Dec 08



$$\Delta T_{01} = \frac{(TOX_L + TOX_R) + (TOY_L + TOY_R)}{2} - \frac{(T1X_L + T1X_R) + (T1Y_L + T1Y_R)}{2}$$

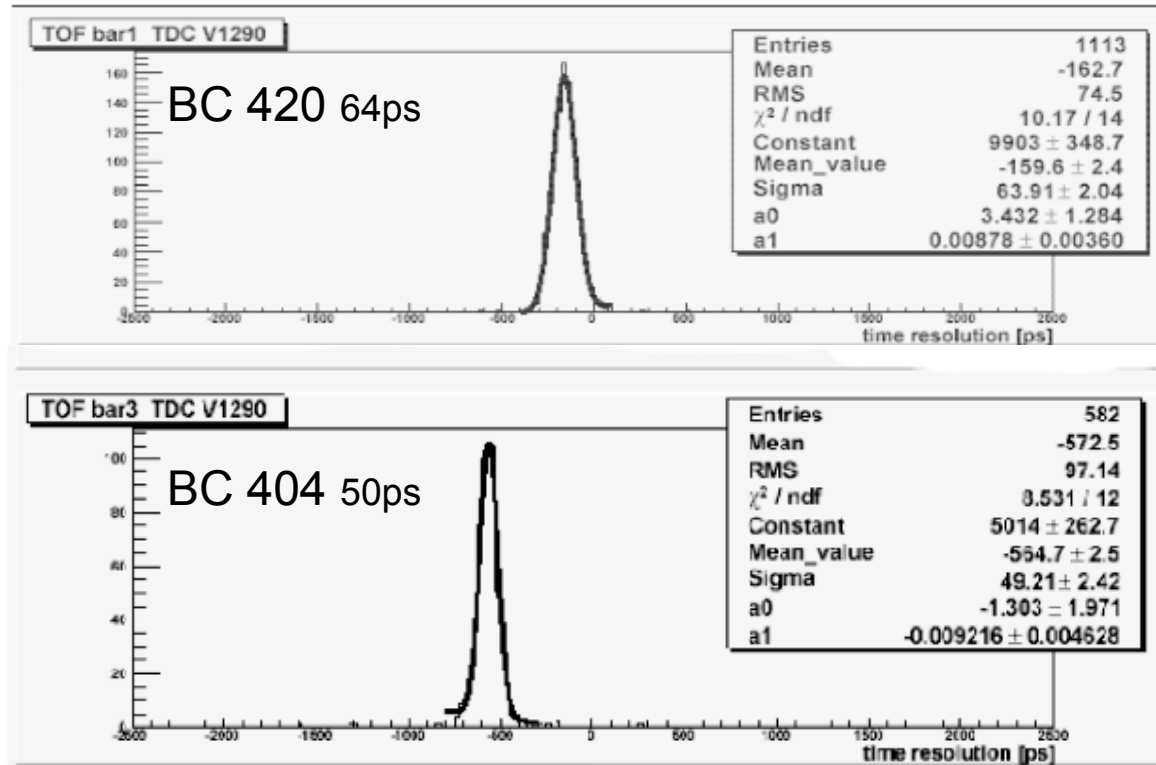
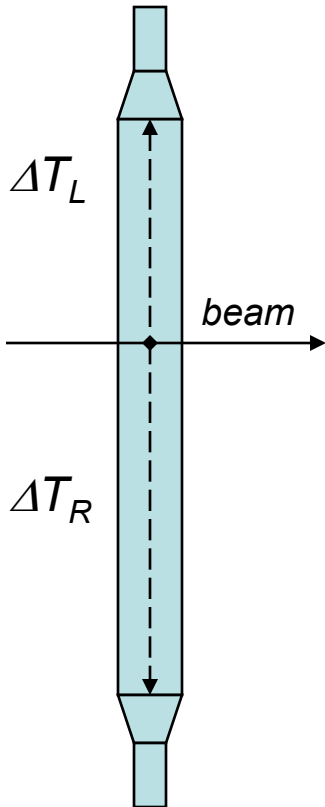
$$\delta \Delta T_{01} < 2\sqrt{2} \sigma_t \oplus \sigma_{cable} \oplus \sigma_{Xtalk} \oplus \sigma_{Twalk}$$

# TOF Intrinsic Timing Resolution



- TOF timing resolution was compatible with what obtained at the BTF testbeam.

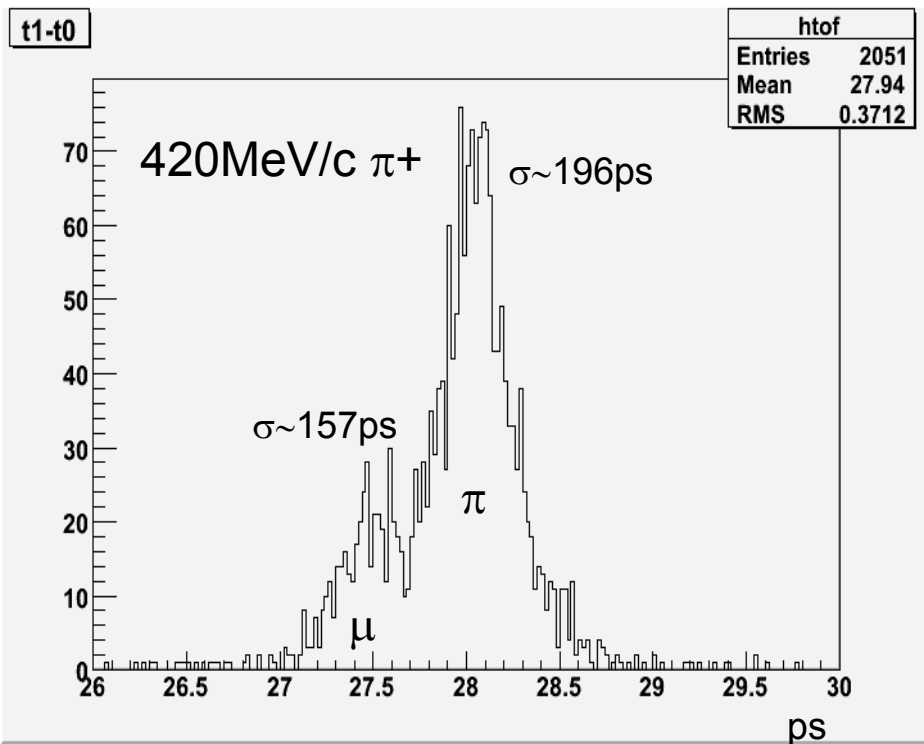
$$\sigma_t = \frac{\Delta T_L - \Delta T_R}{2}$$



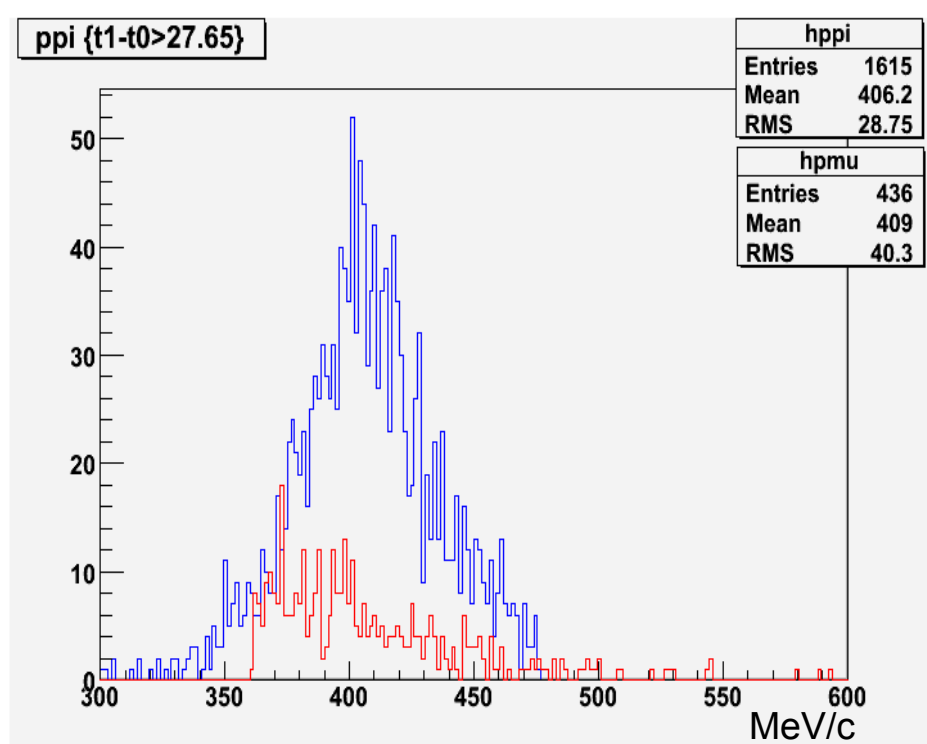
# TOF0/1 - 420 MeV/c Pions



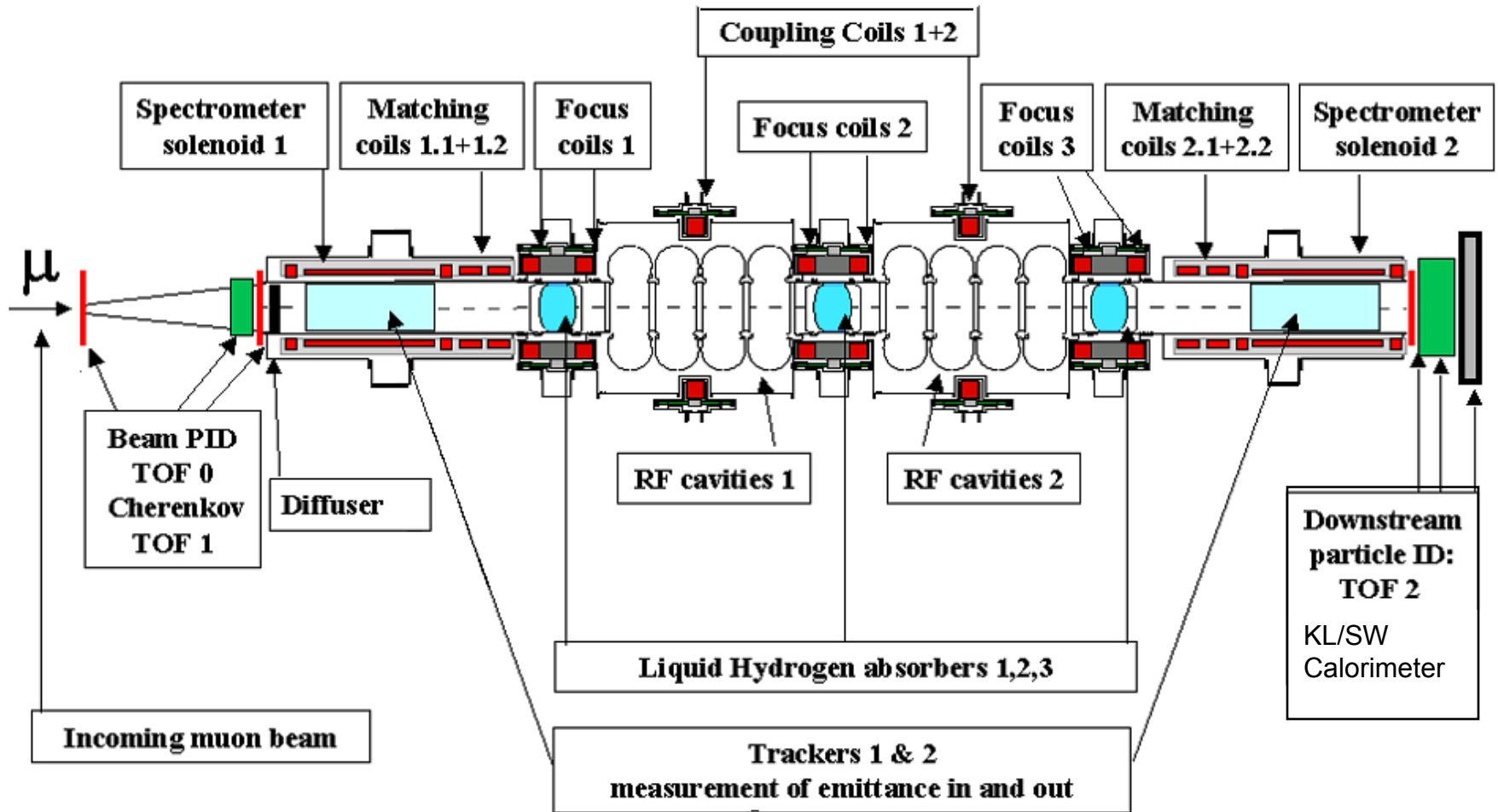
## TOF0—TOF1



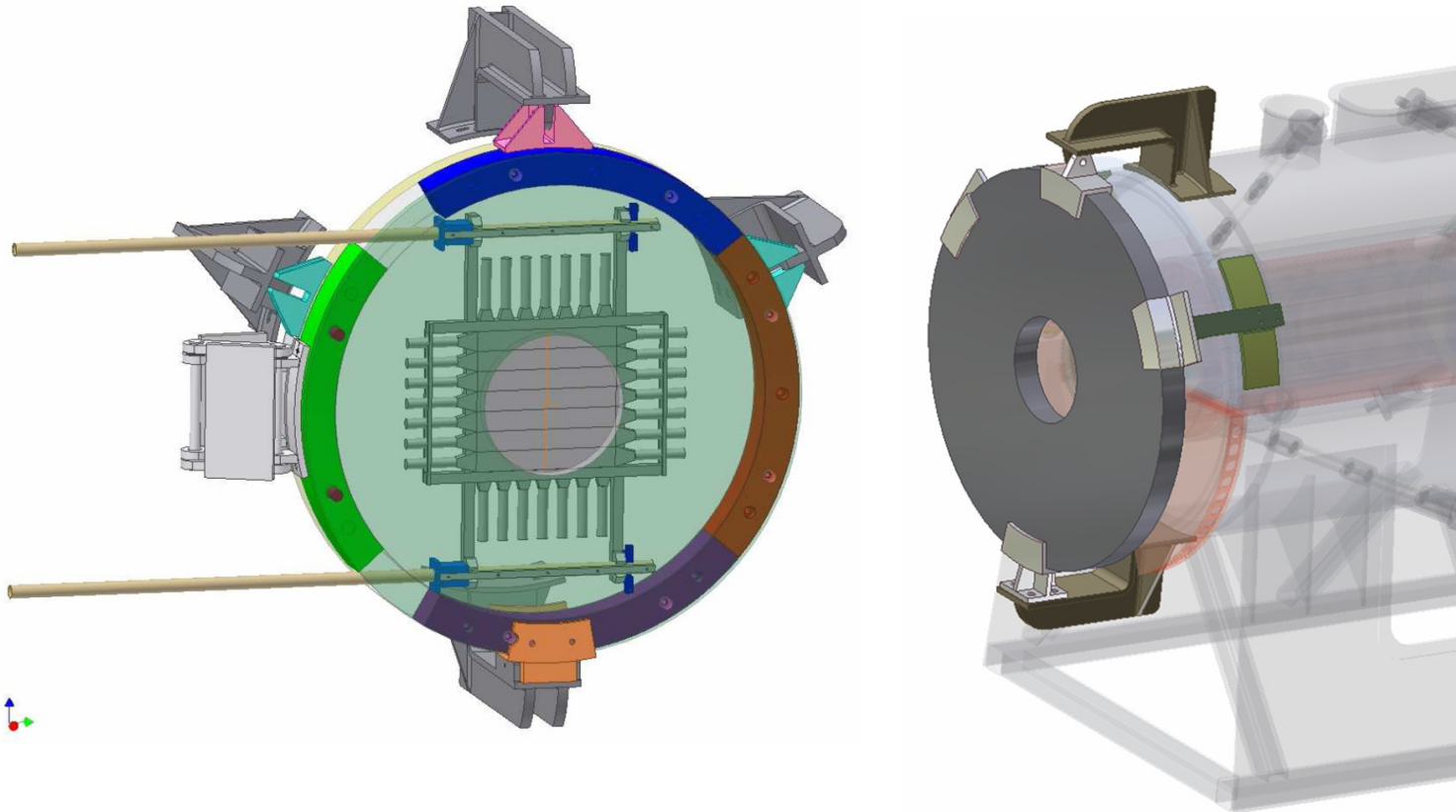
## Momentum



# MICE Layout



# TOF1 - Virostek Shield



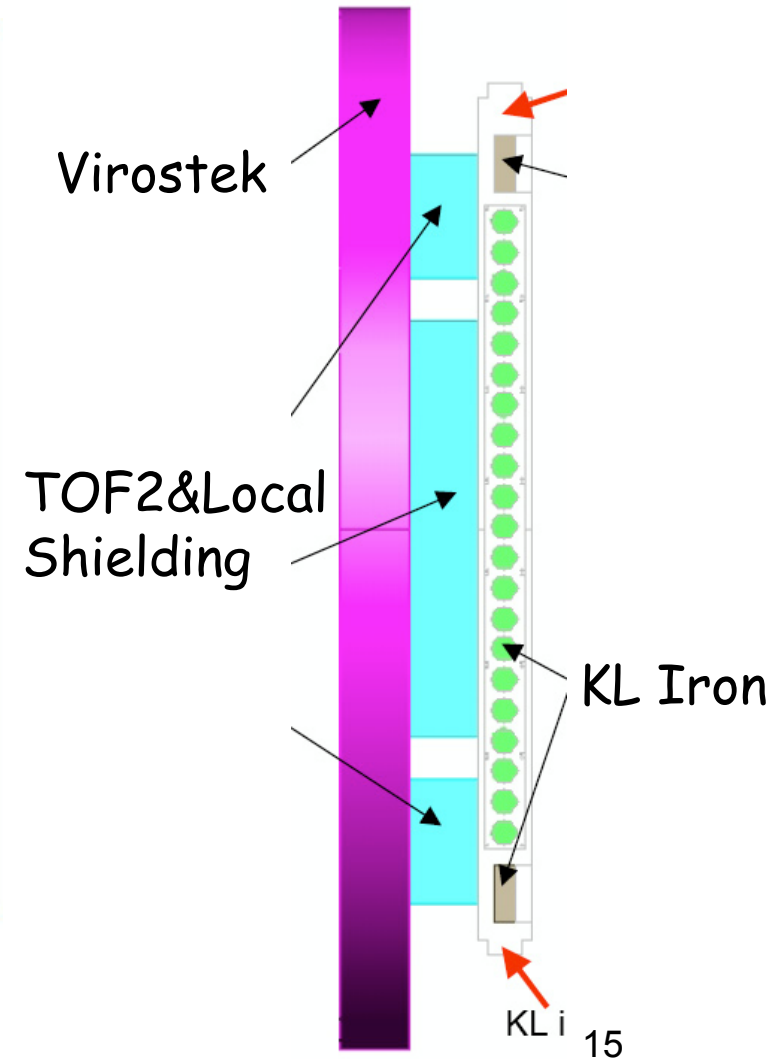
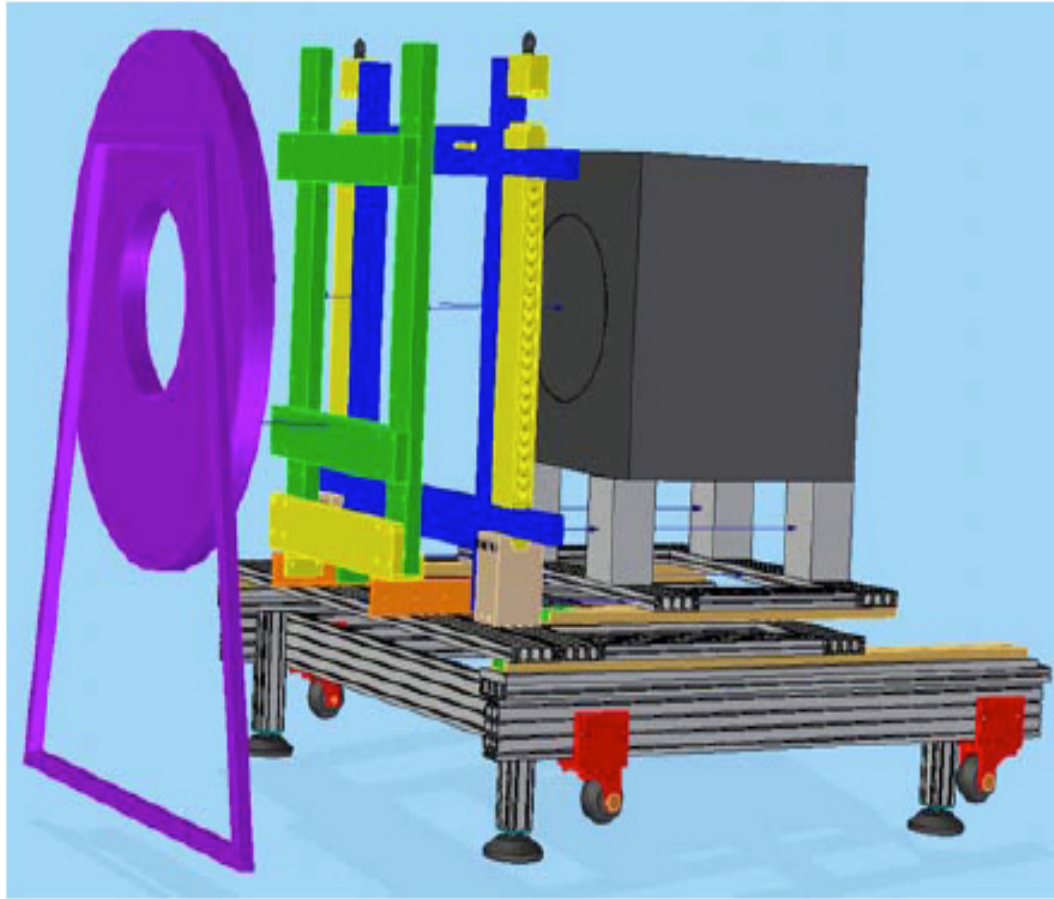
- TOF1 PMTs need magnetic shielding. S. Virostek design.
- Counter and shield fabrication in progress.

# Downstream Stand and Assembly - RomaIII



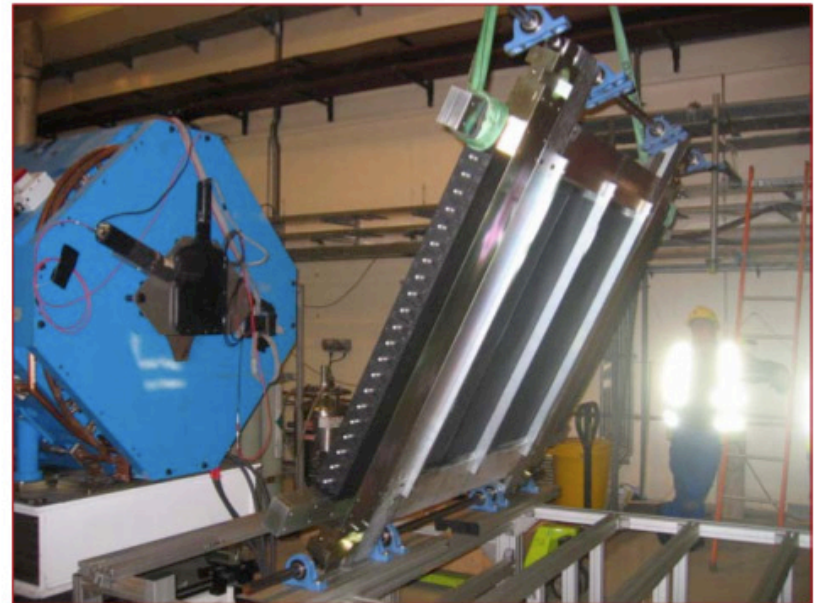
V-Shield TOF2/KL SW(50 plane SiFib)

TOF2/KL Shield Overlap.



## KL Test at Roma III and Installation at RAL

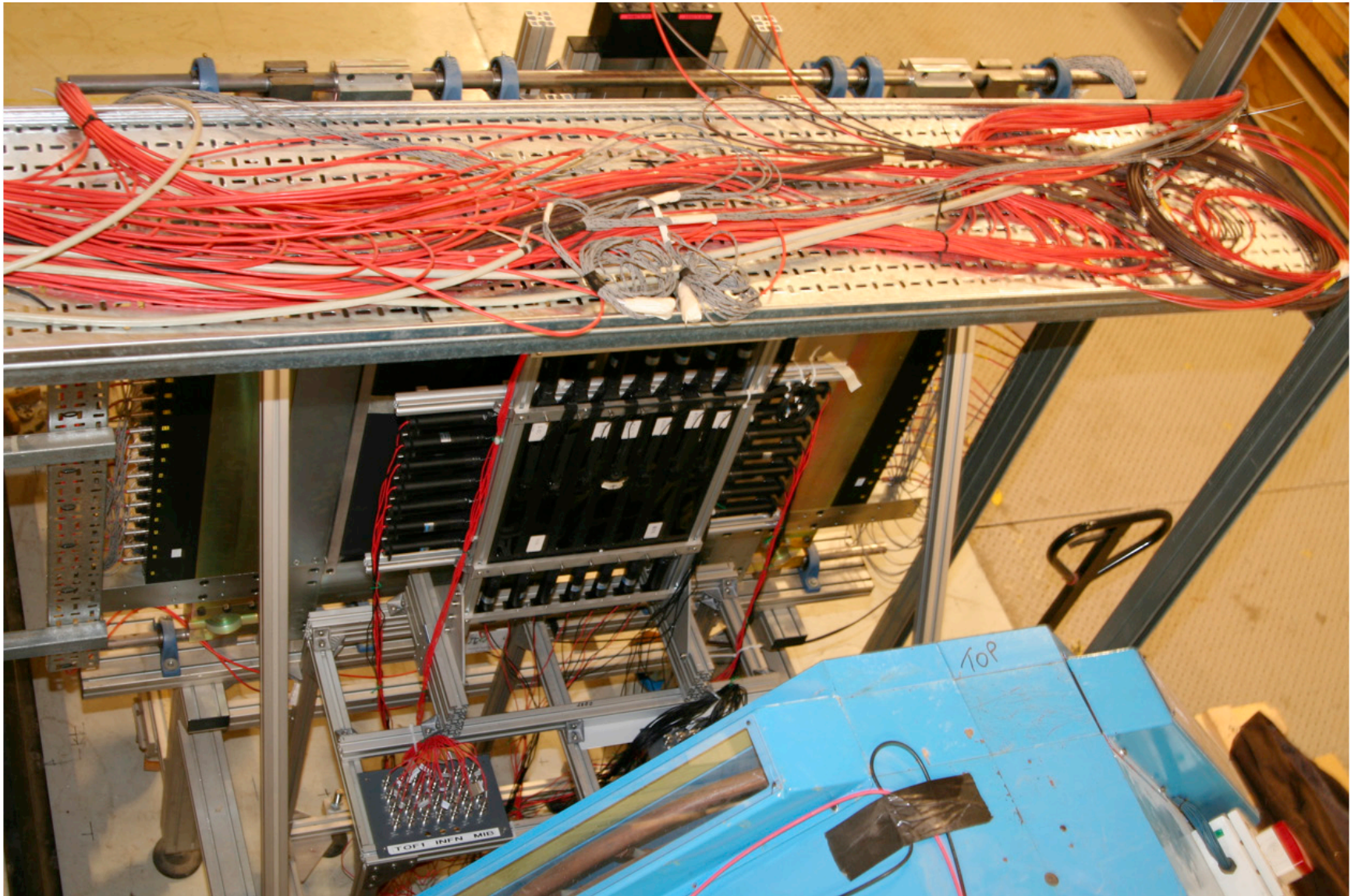
At the beginning of 2008 the detector has been tested and calibrated at Roma III laboratory and it has been sent to RAL in June for the installation in a provisional position of the MICE Hall in preparation.



The pictures show KL detector under test at Roma III and under installation in the MICE Hall at RAL

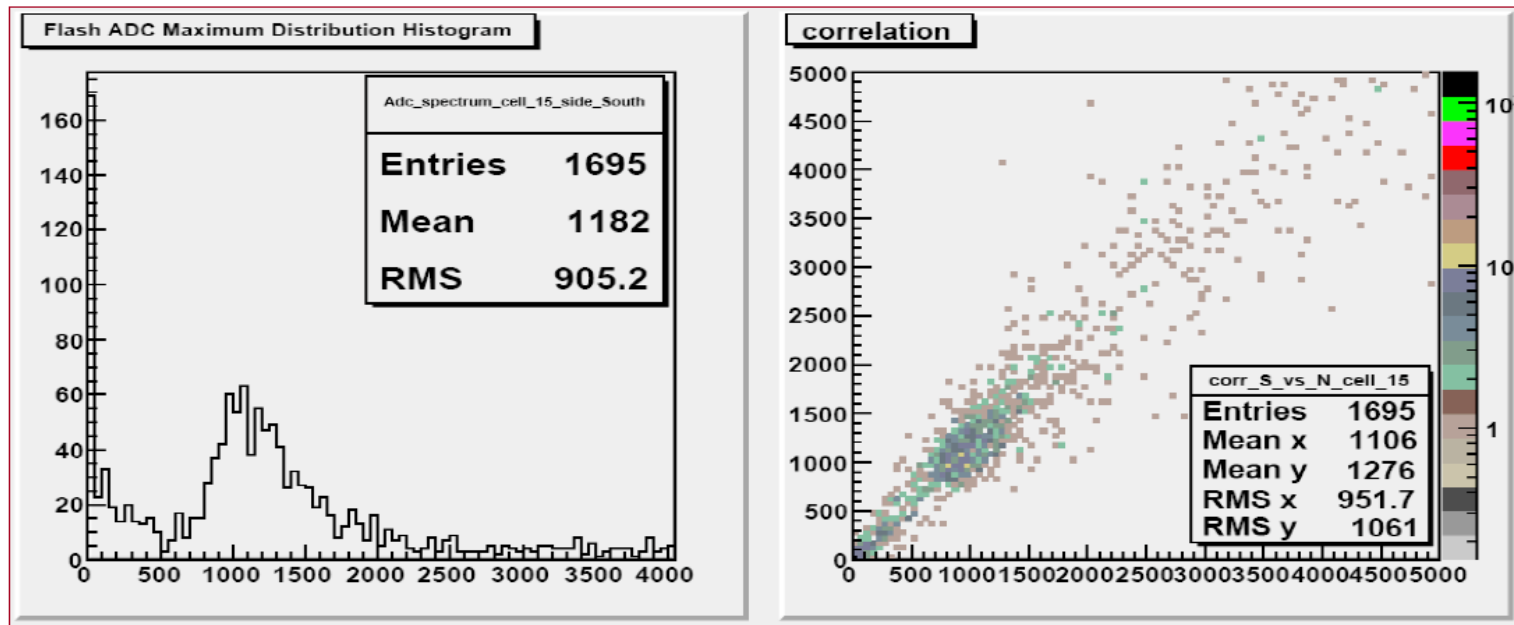


# TOF1 and KL in MICE Hall



## KL commissioning (RC)

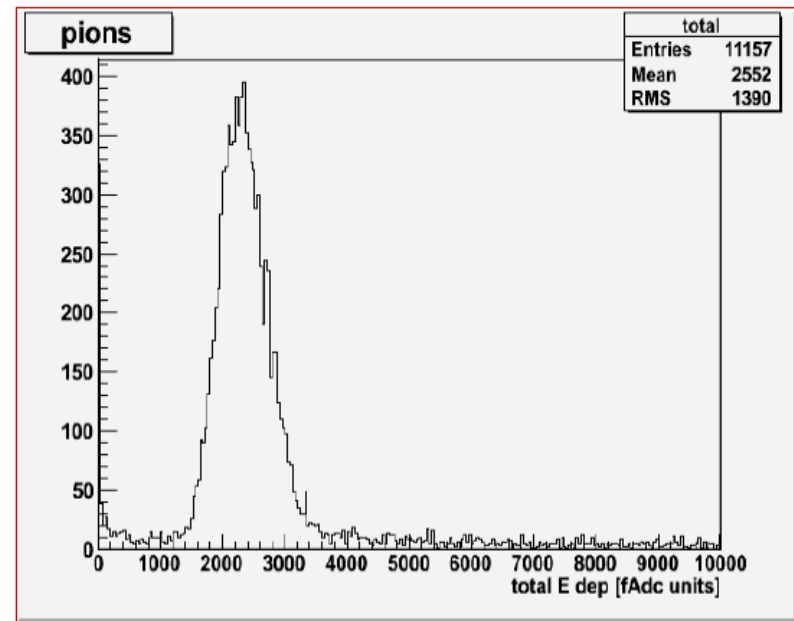
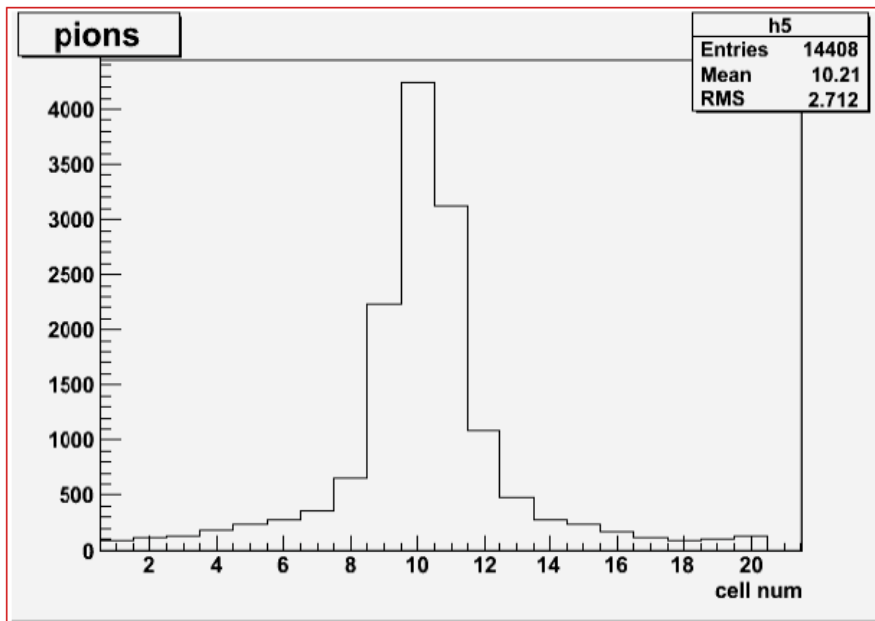
The installation in the provisional position, upstream with respect to the final one, and the commissioning work by means of cosmic rays has been completed at the beginning of July



MIP distribution and the correlation left-right of the PMT's signals.  
See as reference for details at <https://micelog.dl.ac.uk/MICE+Log/151>

# KL commissioning ( $\pi^+$ )

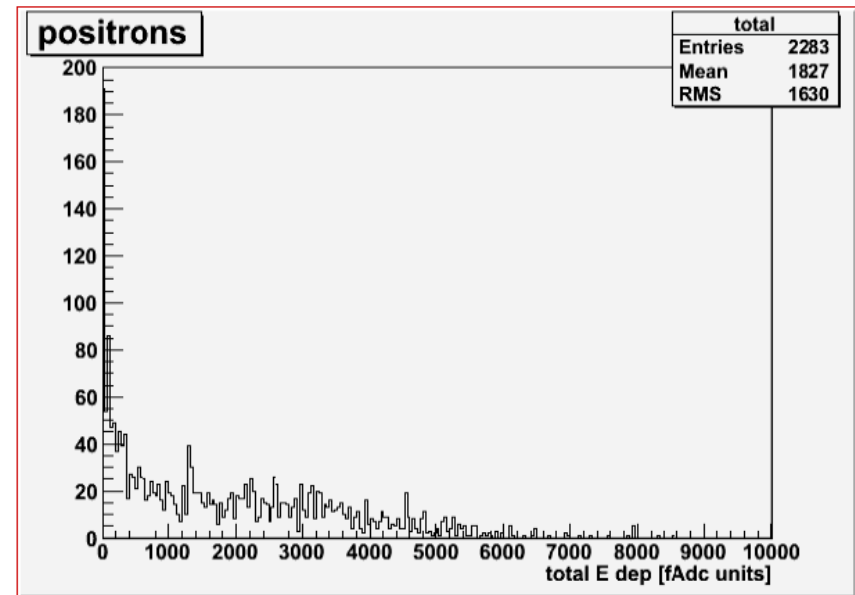
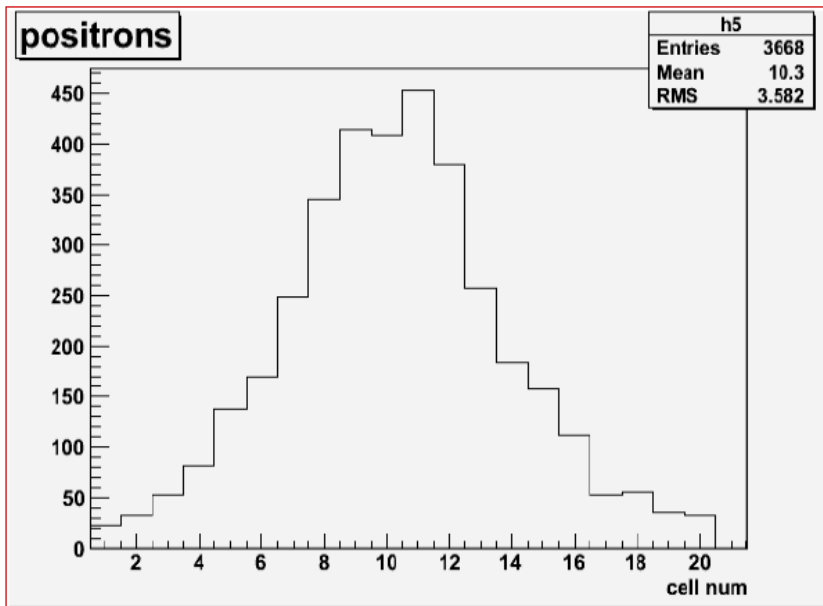
At the beginning of November the KL detector has been exposed for the first time to the pion (300 MeV)



Results of FADCs analysis show the beam's profile and the energy reconstruction in agreement with the expected resolution

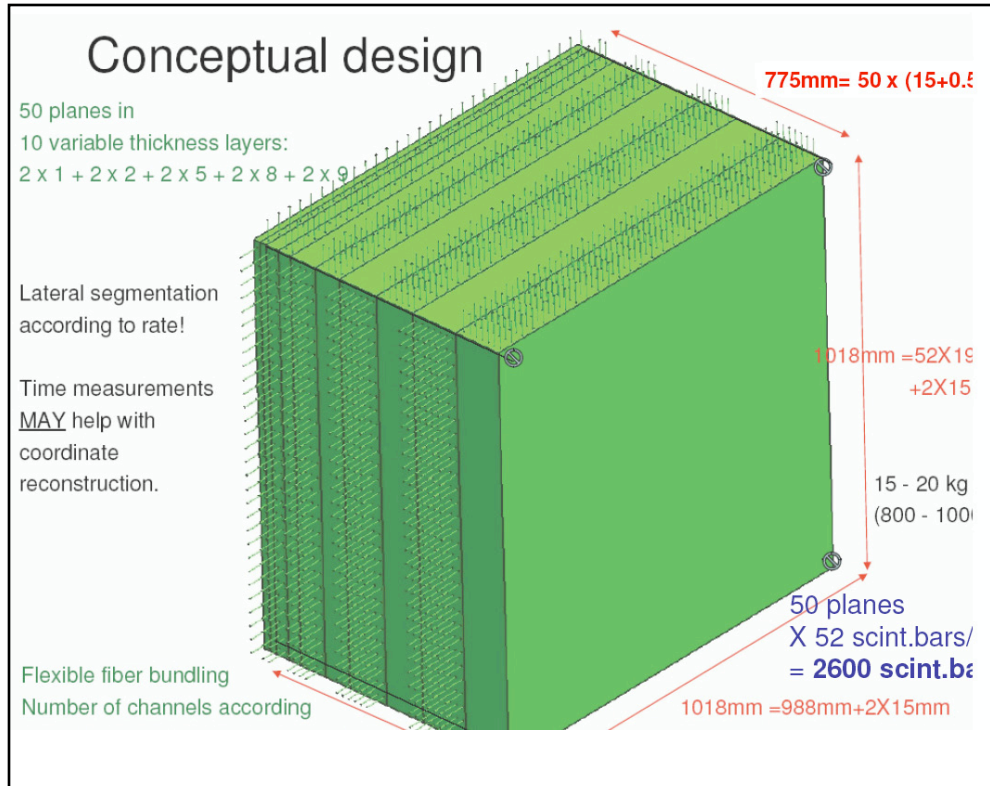
## KL commissioning ( $e^+$ )

Last November the KL detector has been exposed also to the positrons (100 MeV)



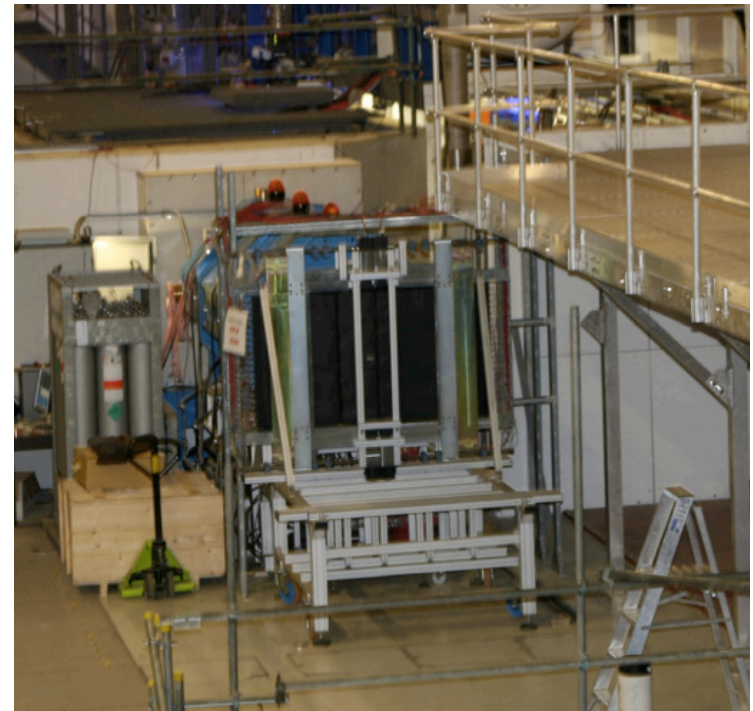
Results of FADCs analysis show the beam's profile (broader than  $\pi^+$ ) and the energy reconstruction indicating that the positron beam is significantly degraded before reaching KL

# SW - Fiber Calorimeter

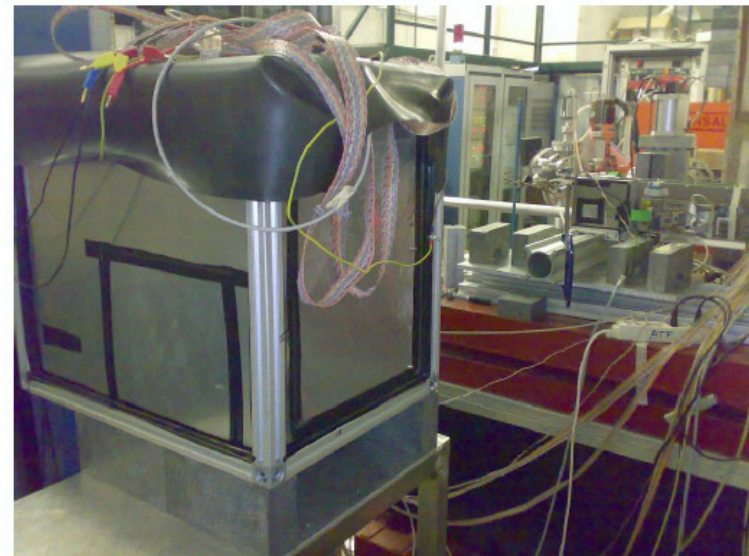


## Sci/Fi Calorimeter

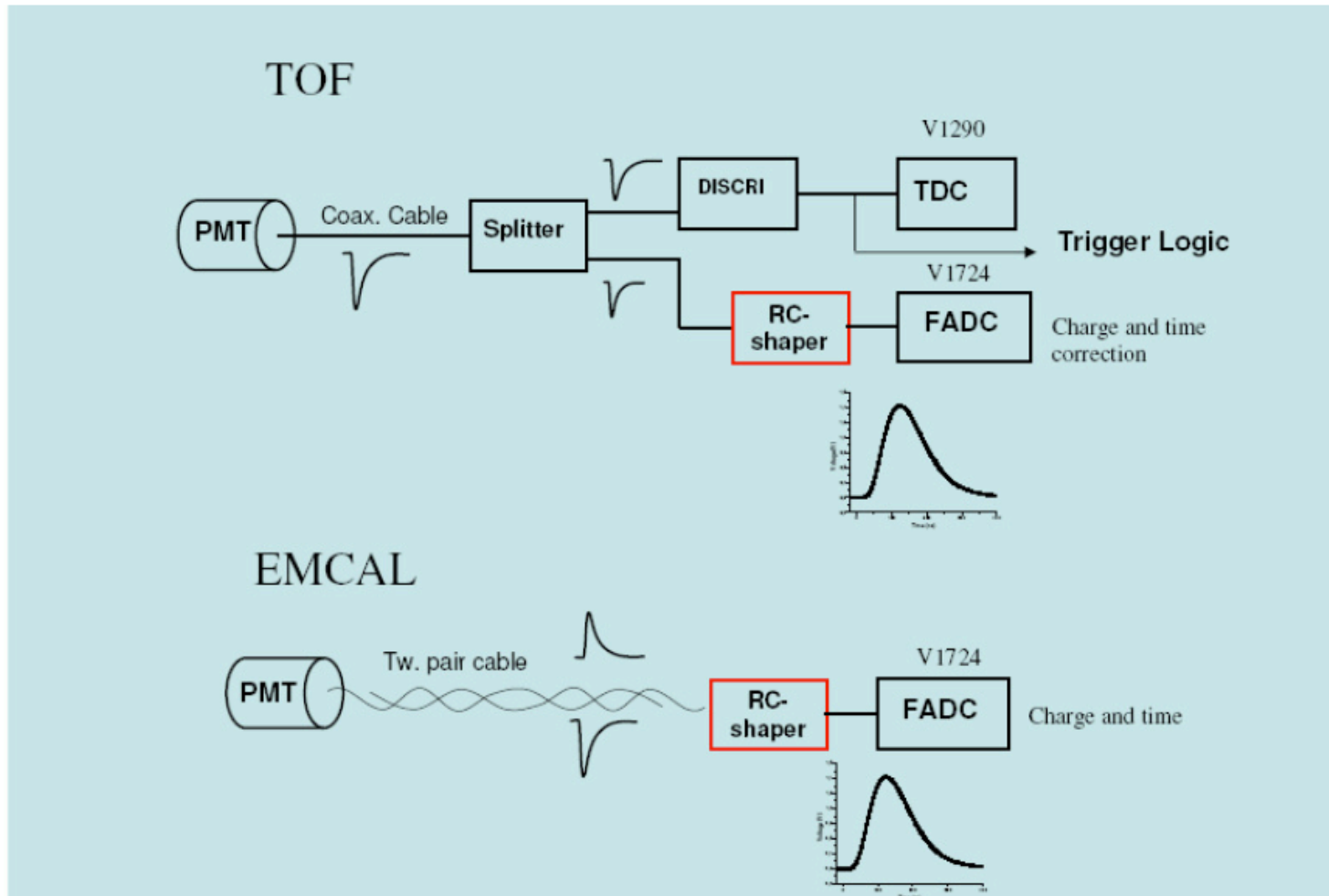
- Trieste- PMTs, Mech
- Roma III
- Fermilab- Sci/fibers
- Geneva- Electronics
- expected 2009



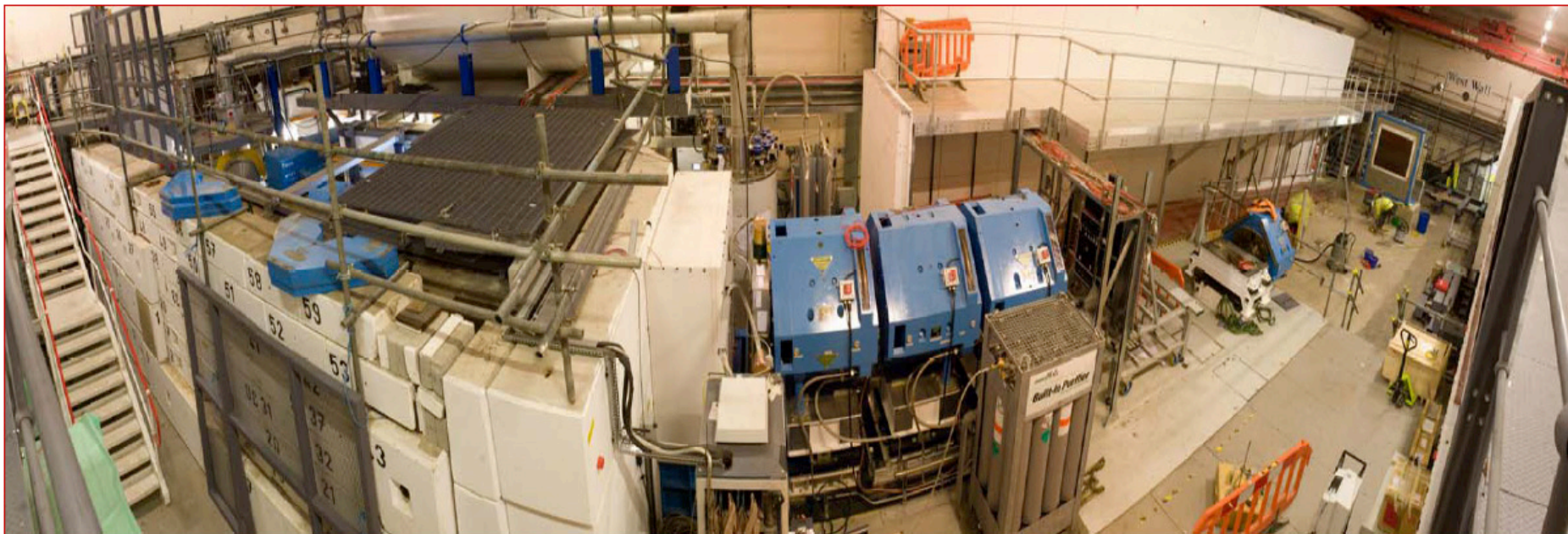
# SW Development- Trieste/RomaIII



## PID ADC Shaper for TOFs/KL and eventually SW (Ilko Rusinov)



# MICE Fisheye View



Malcomb Ellis

<http://www.mice.iit.edu/mico/webcams/>



# PID Summary



- Major progress on PI Systems in 2008.
- TOF 0/1/KL installed in MICE Hall and commissioned with beam .
- TOF1/2 shield plates and stands being fabricated.
- TOF2 delivery in 2009. **SW in progress.**
- TOF/CKOV/KL/SW Electronics near completion.

