



MICE CM20

Wrap-up

Thanks to Paul Kyberd and Debbie for organization and beautiful settings for collaboration dinner under the auspices of Henry the VIII

The International Muon Ionization Cooling Experiment



Outline:

1. Beam line project and beam line commissioning
2. Infrastructure project
3. DAQ, Controls, operations, safety, running MICE
4. Detectors CKOV, TOF0, TOF1, KL, Tracker TOF2
5. Spectrometer solenoids, spool piece,
6. Schedule issues Step I, II, III, III.1
7. Uncovered phase I items (SW, Beam Correction & Collimation System)
8. Software project and analysis
9. RF module, RF cavities, RF power
10. LH2 absorbers, LH2 Infrastructure, FC module
11. Schedule MICE STEP IV, V, VI
12. Other points: Exec. Board, Speakers Bureau etc..
13. Next MICE events: meetings, VCs, CMs

A wrap-up, so insist on highlights, issues, decisions and plan

Follow up will be assured by

- Hall meetings: local meeting for Hall and beam line work
- MICO meetings: MICE-wide phone meetings for monitoring progress of installation, commissioning, operations
- Video Conferences: MICE wide show and tell reports and communications
- Collaboration meeting



Infrastructure: A BIG PROJECT!

Under very good hands of W.Spensley, K. Long, R. Apsimon, A. Nichols and T.Hayler!
Major achievement with installation of DSA shielding, decay solenoid,
beam line magnets till Q6, water, electricity, power supplies etc.. Q1 PS missing

Still not completely powered up.
PPS review 15 February
to be done in May shutdown

Radiation survey at each step
Radiation monitors

Still to finish: decay solenoid!

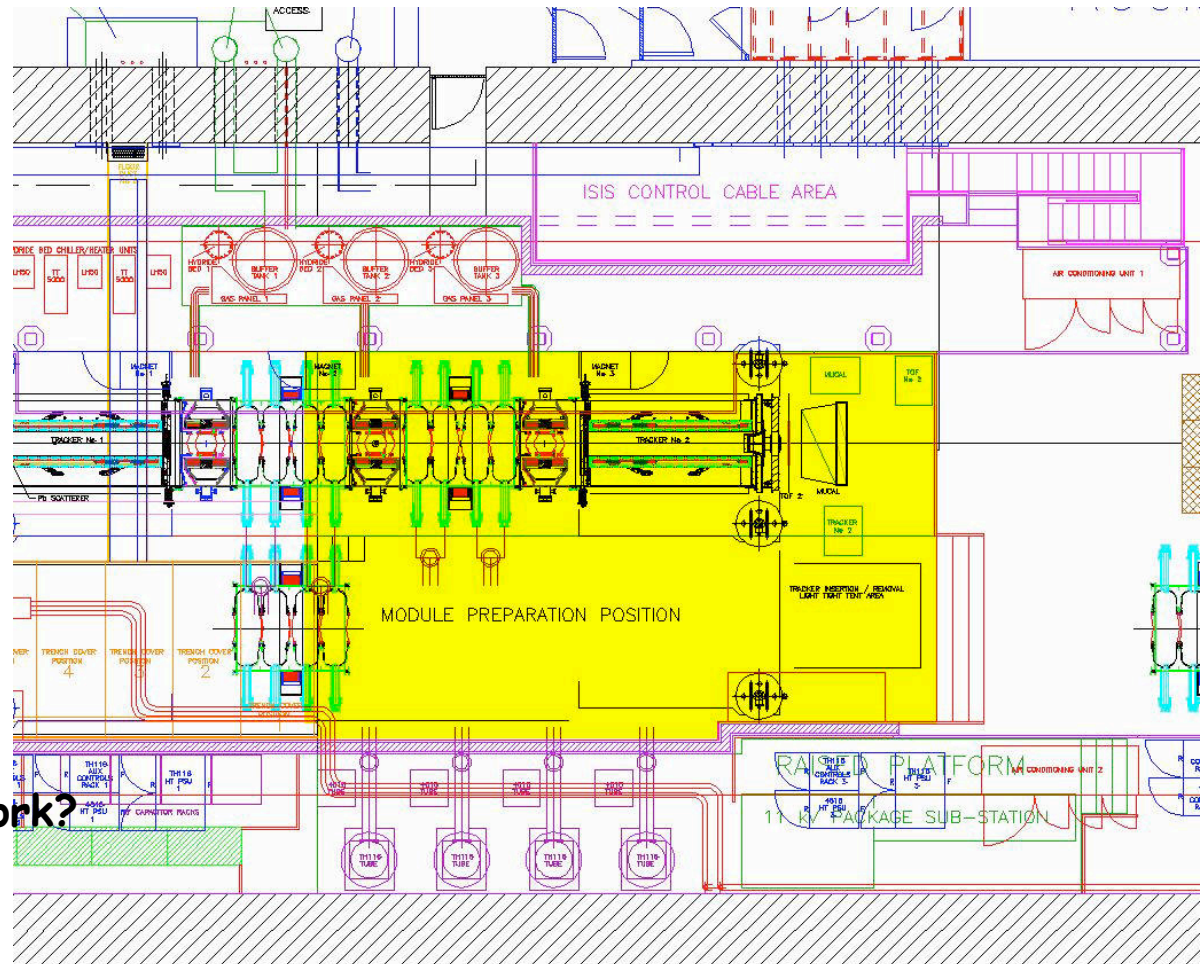
Q7-9 installation by March

False floor construction!
will require destruction of ramp
(18/02, 4 weeks, very messy)
Interference with Decay sol. Work?

Magnetic walls start 10 March
--> 4 July?

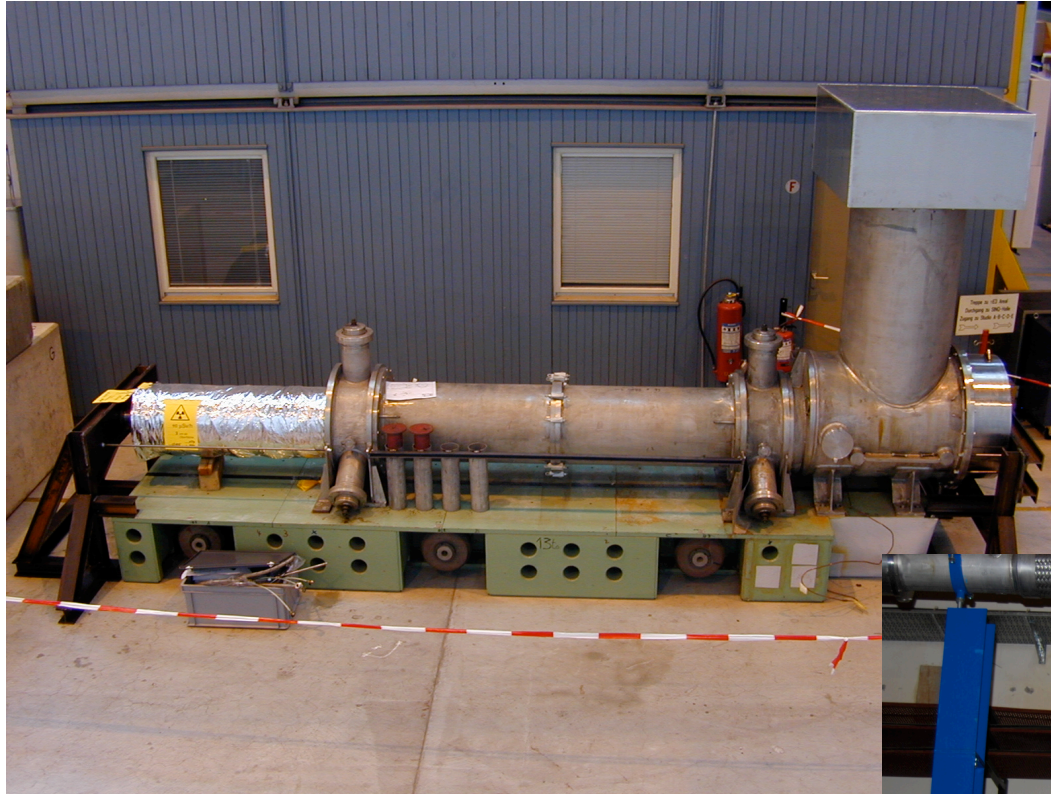
Too late!!!

Solution/staging being discussed





Decay solenoid



Installed but still not working.

- cryo needs fixing
 - magnet needs connecting
 - powering
 - testing + quench protection
- Hmmm. Still major risk involved





Beam line commissioning

GOAL of period 1: get beam to the end of the DSA

- Target operation (after target 2 has operated 500k times) (>20 Fev)
- + adjust beam loss monitors --> where can we be without irradiating ISIS?

- magnets must be operational (complete cabling, water, interlocks)

- DAQ + at least one detector must be available to record particles
 - ICL beam line monitors and GVA scintillators will count particles
 - TOFO (by pulse height) + and CKOV to provide e/(mu,pi)/proton separation
 - Stand will be ready when detectors are ready. Cabling?

- Logbook: B. Martlew proposed to implement logbook for trial. OK!

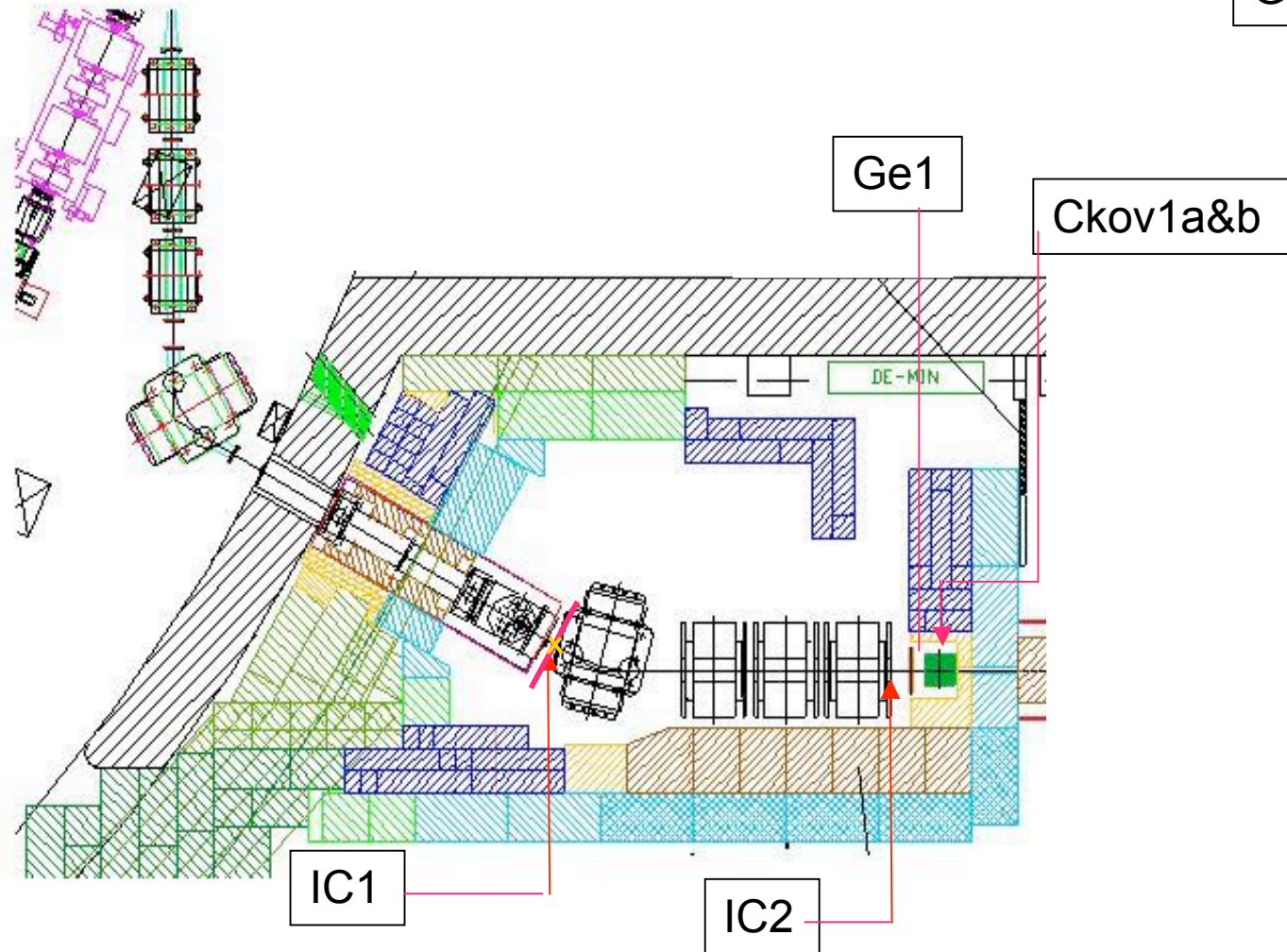
- all agree that TOFO is essential asap (we will pay for travel!)

- what level of PPS is needed for initial operation?
Suggest a video/web camera in the hall (Tortora)

- commissioning plan (Tilley et al,) developed
(i.e. operations to be performed and corresponding optics)

BL & Detectors - agreed startup layout.

Ge2 - tbd





DAQ controls and monitoring

Hardware is at RAL

There is a technical design for Trigger

DAQ Rack layout available, will need additional iteration

FEE electronics for TOF and EMCAL is ready

Cable path for TOF still to be minimized (impacts performance!)

Monitoring:

Talk to B. Martlew

B.G.Martlew@dl.ac.uk

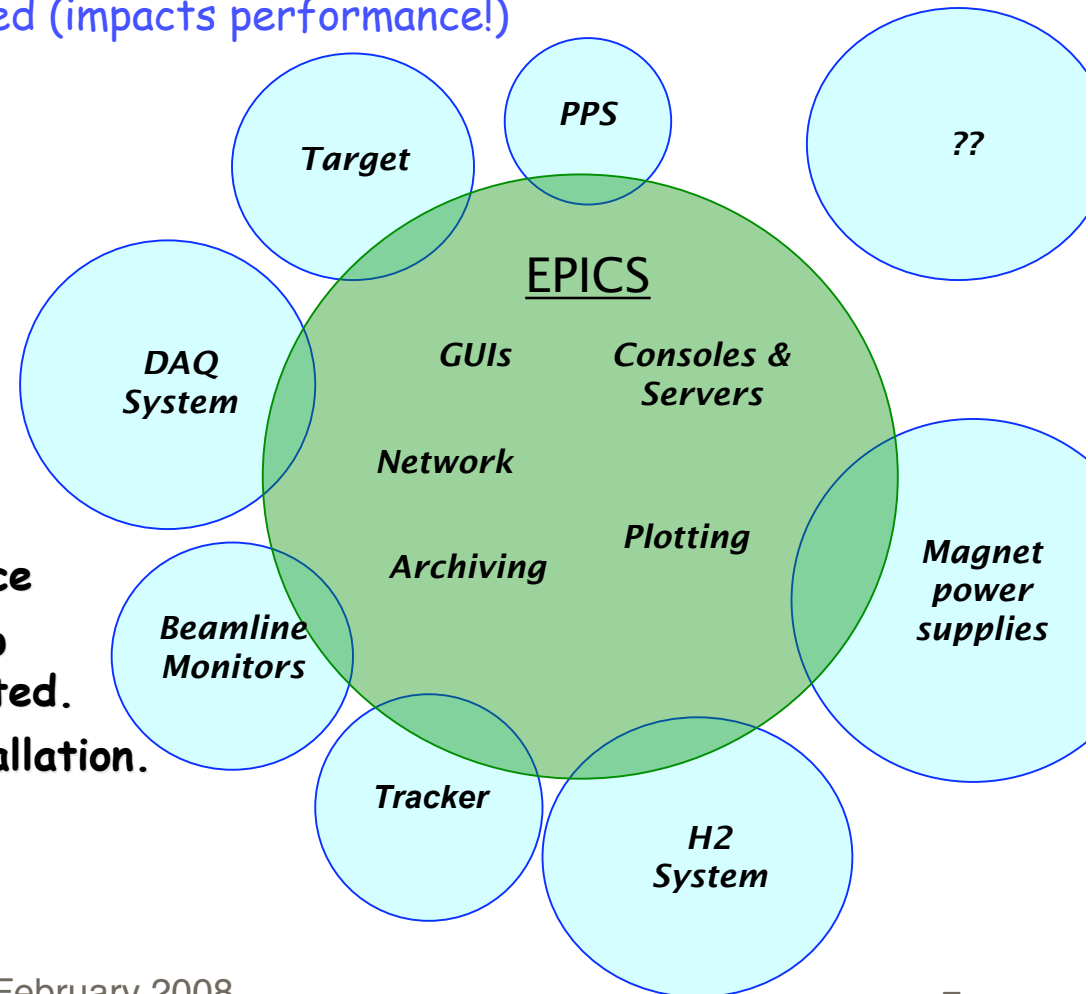
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EPICS framework is ready

Network:

- All network switches/routers in place
- Configuration by RAL network group but still not working. being investigated.
- Still waiting for network cable installation.

URGENT!





What to monitor? How?

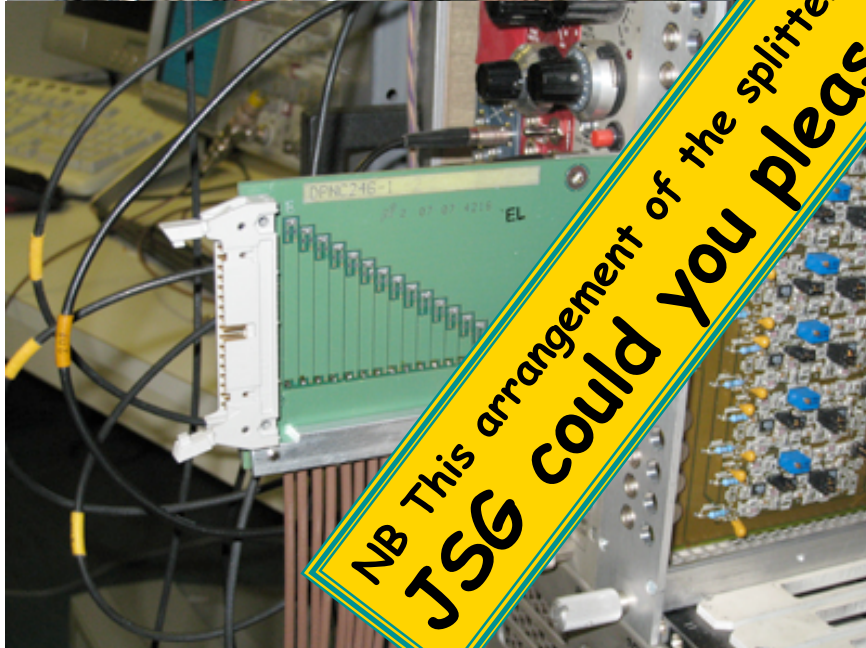
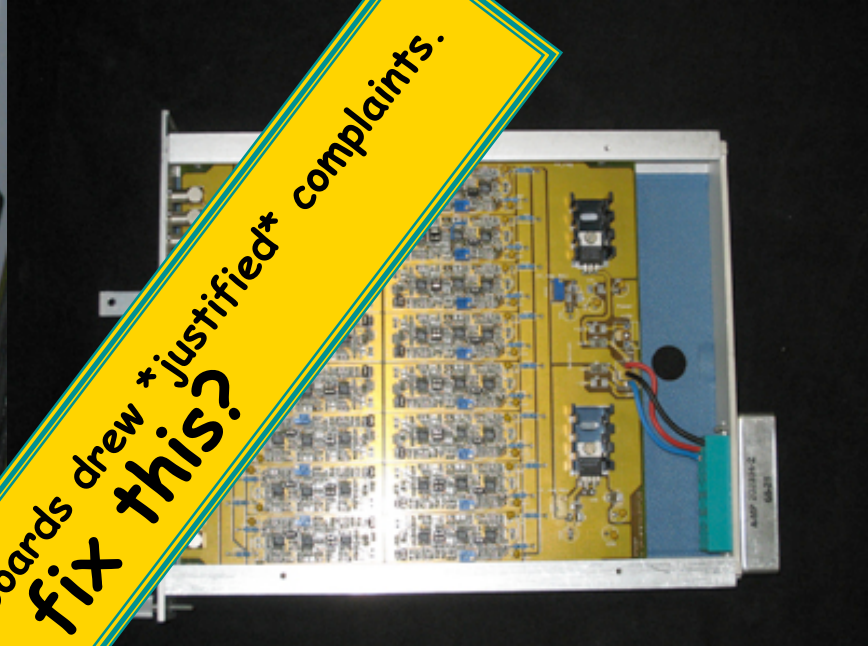
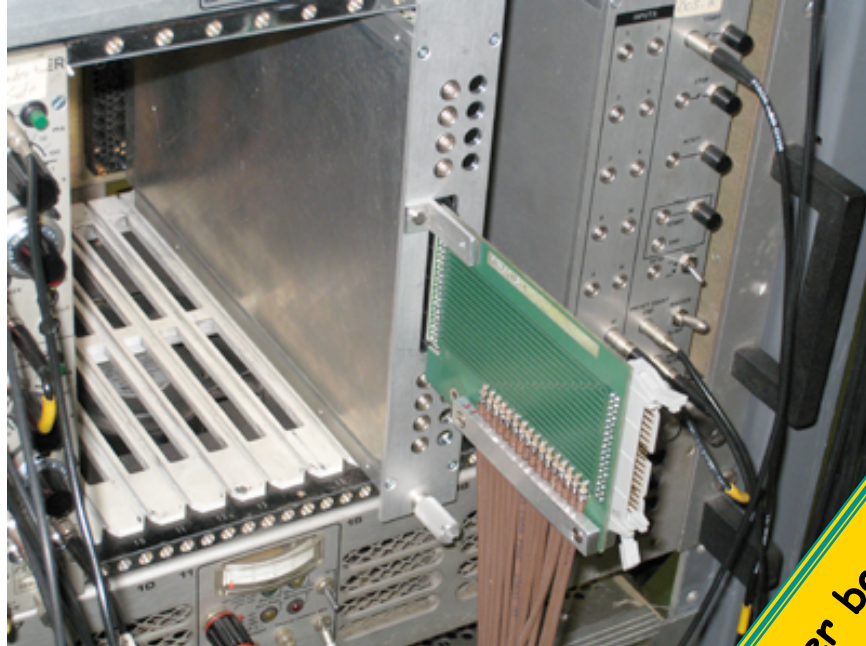
- Information can be stored in three different places
- EPICS data base
- online data base
- MICE data stream

Minimize possible blockage of reconstruction analysis by calls to unavailable data base

EPICS will keep record of info it monitors

Send data requested every run or spill to the DAQ.

DOCUMENTATION NEEDED.



NB This arrangement of the splitter boards drew *Justified* complaints.
JSG could you please fix this?

TOF & EMCAL FEE

- Splitters
 - 8 available (128 ch)
 - 1 at RAL
 - 4 being shipped
- Shapers
 - 10 units available (160 ch)
 - 1 at RAL from Sofia
 - 3 being shipped from Gva
- Patch panel
 - Collecting...



TRACKER

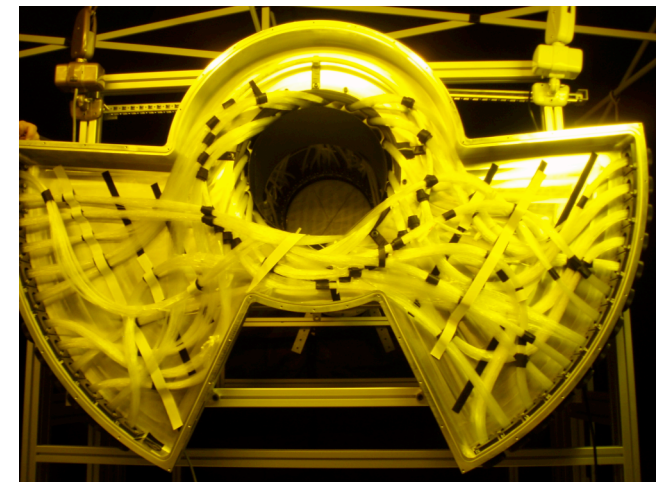
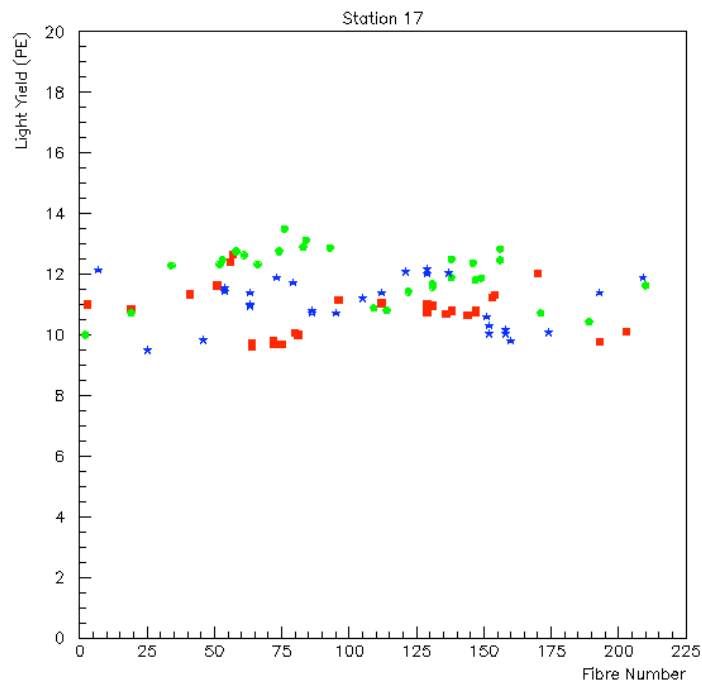
Tracker complete in R8

Superb quality of construction (1/5000 channels dead)

Unlucky with the cryostats!

Can go cosmic testing in peace or beam testing in the hall.

Once again the best is also the most dangerous!





CKOV , TOFO

CKOV has been at RAL since summer 2007 (Mississippi, Louvain, Trieste)
Now two ready to install
TOFO nearly complete and tested at Milano
We all agree tis should be moved to MICE asap.

Extremely precious device (segmentation, pulse eight, timing) for STEPI
Dont worry, stand will be ready when detector arrives!

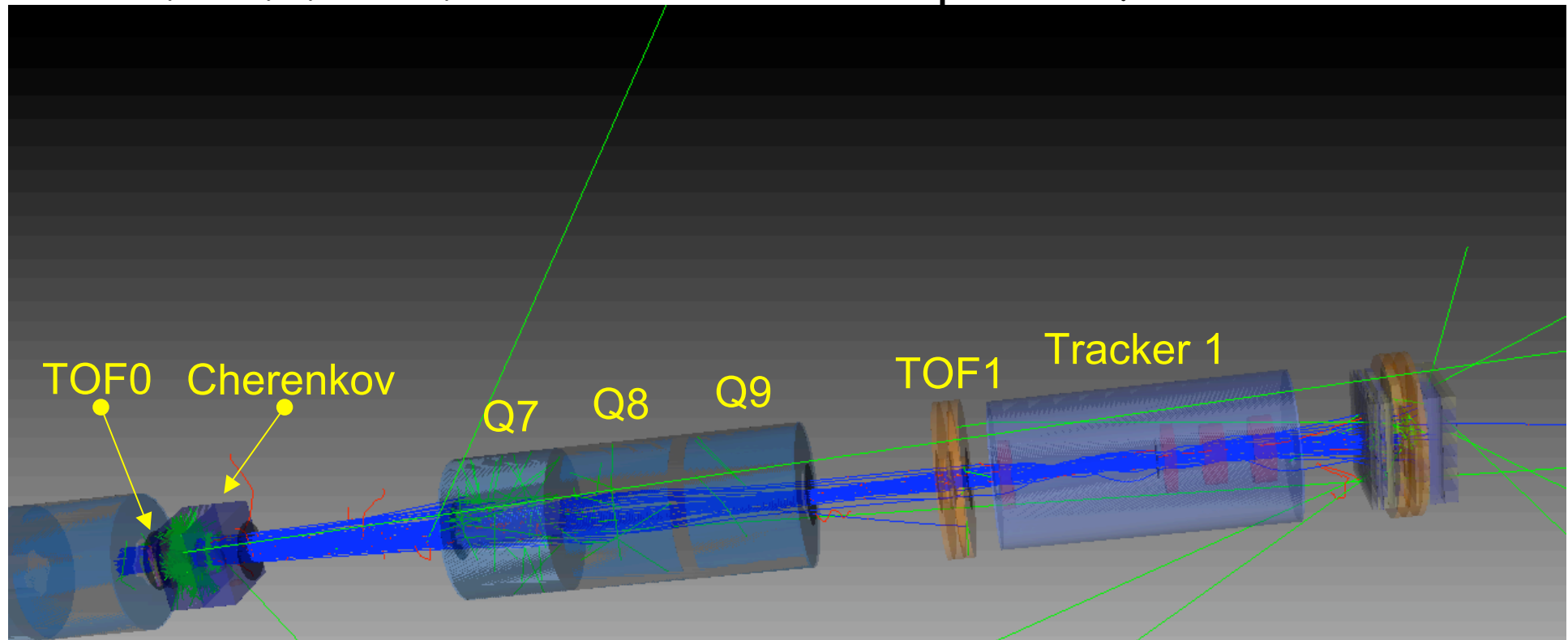
Cables issue was solved suring the meeting by diligence of MZ and Willie





Mark Reyner

Momentum measurement with TOF1-TOF0 has precision of 1% at 200 MeV/c



- 100 muons from Kevin's realistic TURTLE beam:
 - Blue - positively charged particles, mainly μ^+
 - Red - negatively charged particles, mainly e^-
 - Green - neutral particles, mainly photons



Alignment

Four lines of attack

1. **Measurement.** (Tilley) best done with tracker (x, x', y, y'); next best is FNAL Beam Monitors
2. **Calculate effect by MC** (D.Forrest) : suggested to reweight cloud of muons to decenter beam; and calculate effect on cooling
3. **Correct effect seen on data** : reweight measured muons to correct offsets and generate aligned beam by software
4. **Muons Inc will propose a corrector and collimator scheme for MICE** (also to create low emittance beam)



Spectrometer solenoids

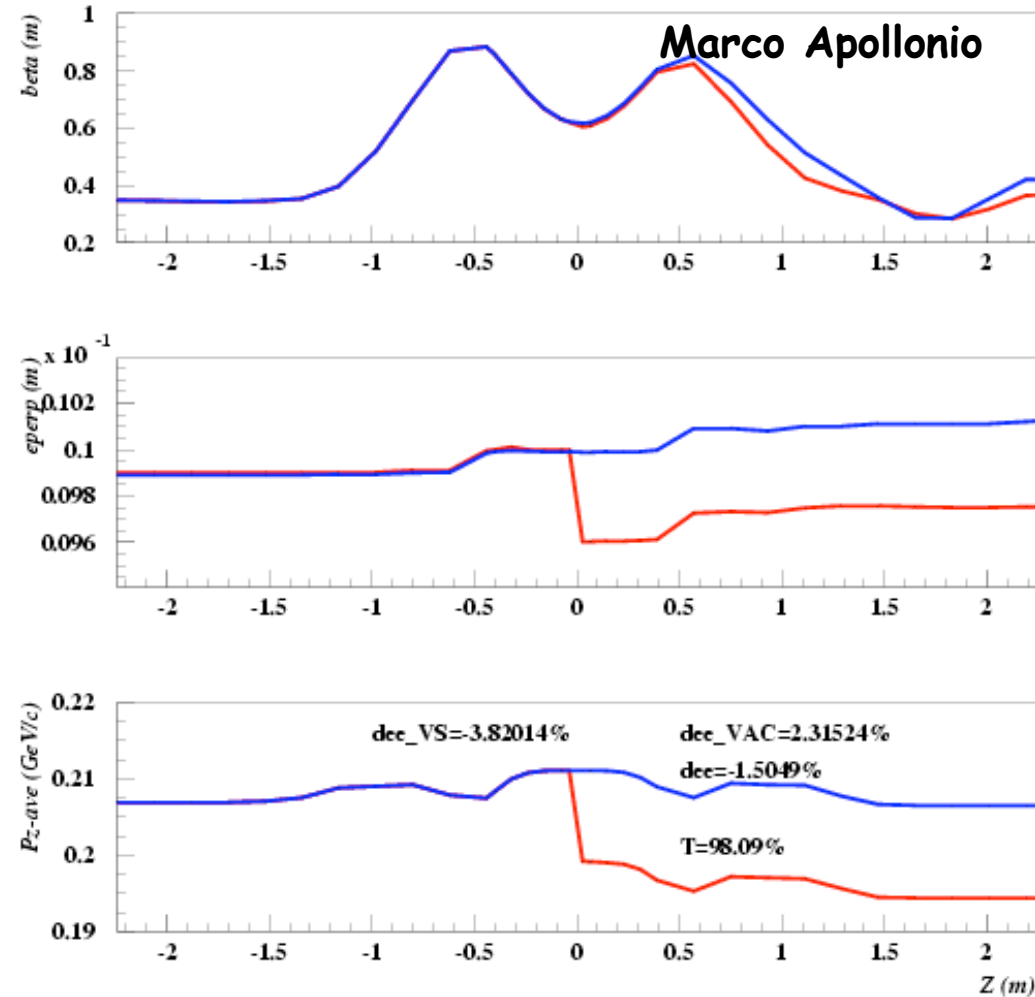


Procure Coil Formers, Leads, Instrumentation, etc.		Complete
Wind Coils on Coil Formers		Both magnets complete
Deliver 4 ea Cryocoolers to Wang (LBNL)		Complete
Buy Power Supplies & Send to Wang (LBNL, UCR)		4 ea 60 A 4 ea 300 A
Assemble and Leak Check He Shell		Complete This month
Fab System & Perform Cryocooler Tests		2nd tests now
Fab and Load Test Cold Mass Supports		Complete
Assemble Shield, Vac Vessel, Cold Mass Suppts		
In		
Le		
Pr		
Magnet Setup at FNAL		
Magnetic Measurements & Commissioning at FNAL		
Ship Magnets to RAL for Installation		

**Delay due to cold mass support issue
will arrive at RAL 15 May 08/ 31 Aug 08**



Spool piece and step III absorbers



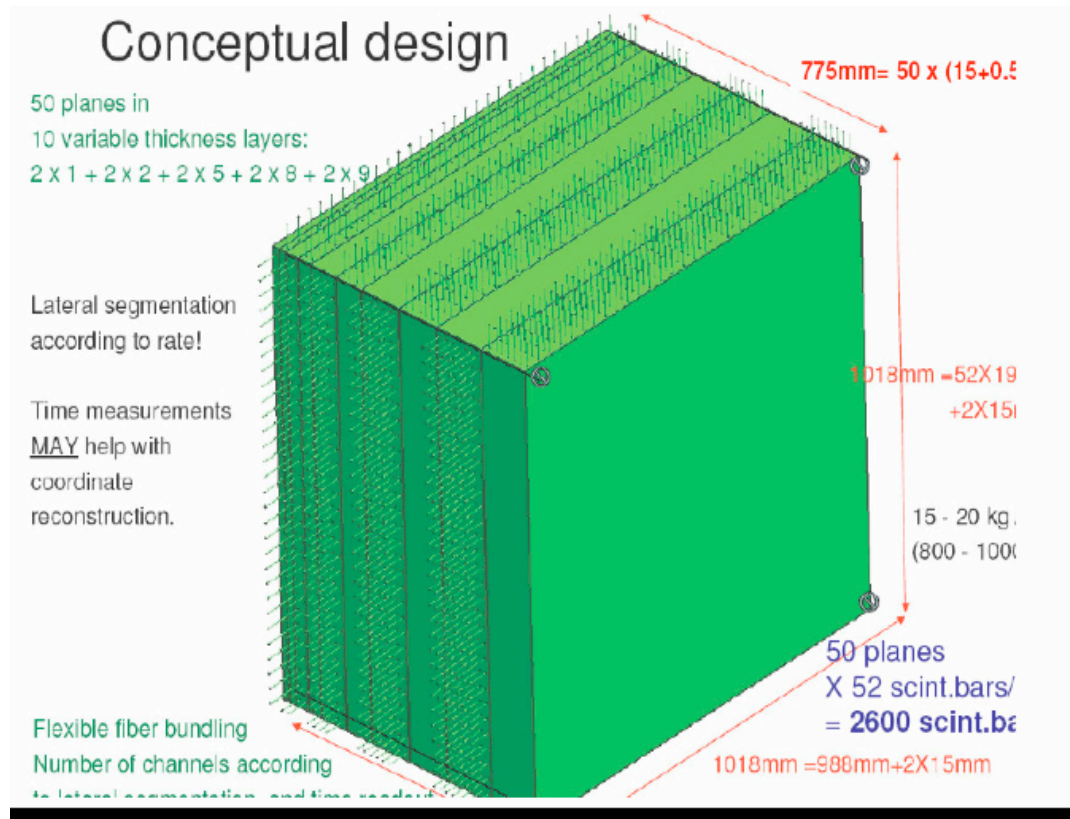
Spool piece principle above
(Nichols, Perrin)

Access slit to be widened by 4 cm in z (slide solenoid)
and lengthened to 52cm

Marco will check optics)



Sandwich calorimeter



Collaboration:
FNAL, scintillator, fibers
Trieste mechanical assembly, PMTs
UNIGE PMTs electronics

Funding bid prepared at UNIGE, according to "Sandstroem design"
Need a more detailed note of the project !!!
Many questions open: support, noise, readout scheme etc...

Expect this device in MICE in first half of 2009



Phase II

- RF power source
CERN -> will deliver assembly at RAL or DL in june 2008
Daresbury Lab refurbishment going on. Target date Q4 2008.
- RFCC module
MUCOOL R&D at FNAL -- ongoing
Coupling coil at Harbin: ongoing, first coil for MUCOOL R&D end 2008
("original target")
second one first half 2009

Cavities contracts to be signed from now on
==> 1st RFCC module by second half 2009
- first LH2 absorbers (KEK) ready to be built by Japanese firm.
20k\$ to be found + windows +we are not completely covered here
- Focus coils are the main issue (STFC funding!)
- uncovered item for step V: radiation shield



Phase II preparations

- FC module (Lau) needs to be ordered now. It has been in the fridge for >6 mo.
- Absorbers (Ishimoto)





RFCC module

Coupling coil

Construction in Harbin (Li Wang) -- full swing. Aim at delivery of first coil Oct09

RF cavities (D. LI)

Construction plan layed down. Review in may 2008

Expected delivery date of RFCC module : end 2009 (in line with Jan08 schedule)

RF power station

Refurbishment at CERN on going (Ramberger) --> june 2008

Refurbishment at DL ongoing (will visit it in june 2008!)



■ Layout for 350mm ID small coil testing



Cryo-test Hall

Provided by Liu,C.S.





Cooling tubing

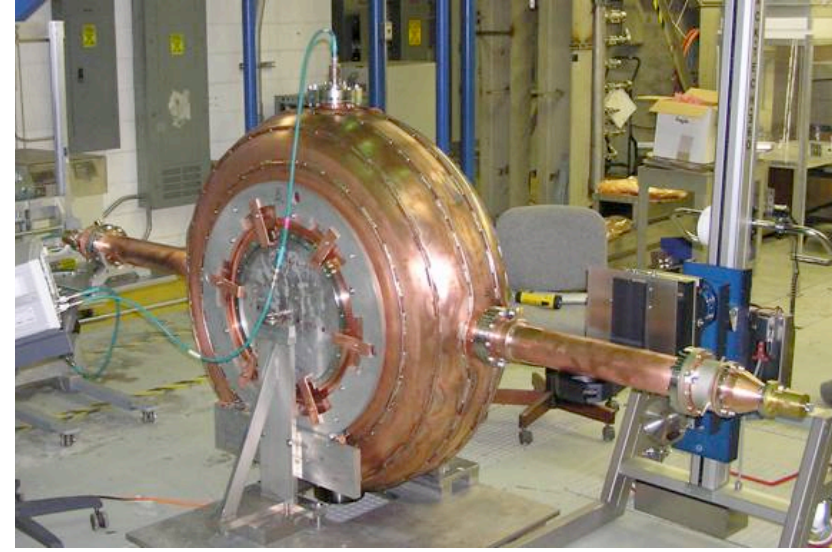
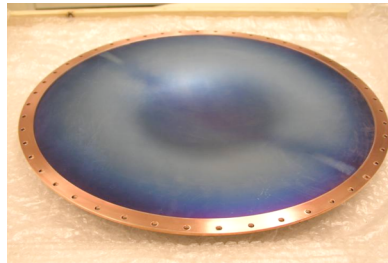
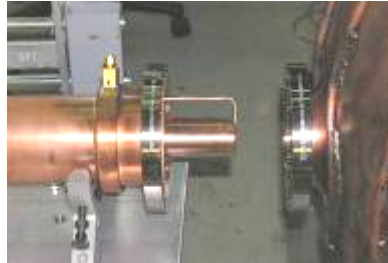


650A power leads





MUCOOL Cavity Review



- Design and engineering at LBNL
- Half shells spun at Acme in Minnesota
- Parts made in Univ. of Mississippi and LBNL
- E-beam welding & port-pulling, cleaning and EP at J-Lab, NASA
- Coupler tests at SNS, Oak Ridge National Lab
- Final assembly and high power tests at MTA, FNAL (March-2006) and reached 16-MV/m without external magnetic field

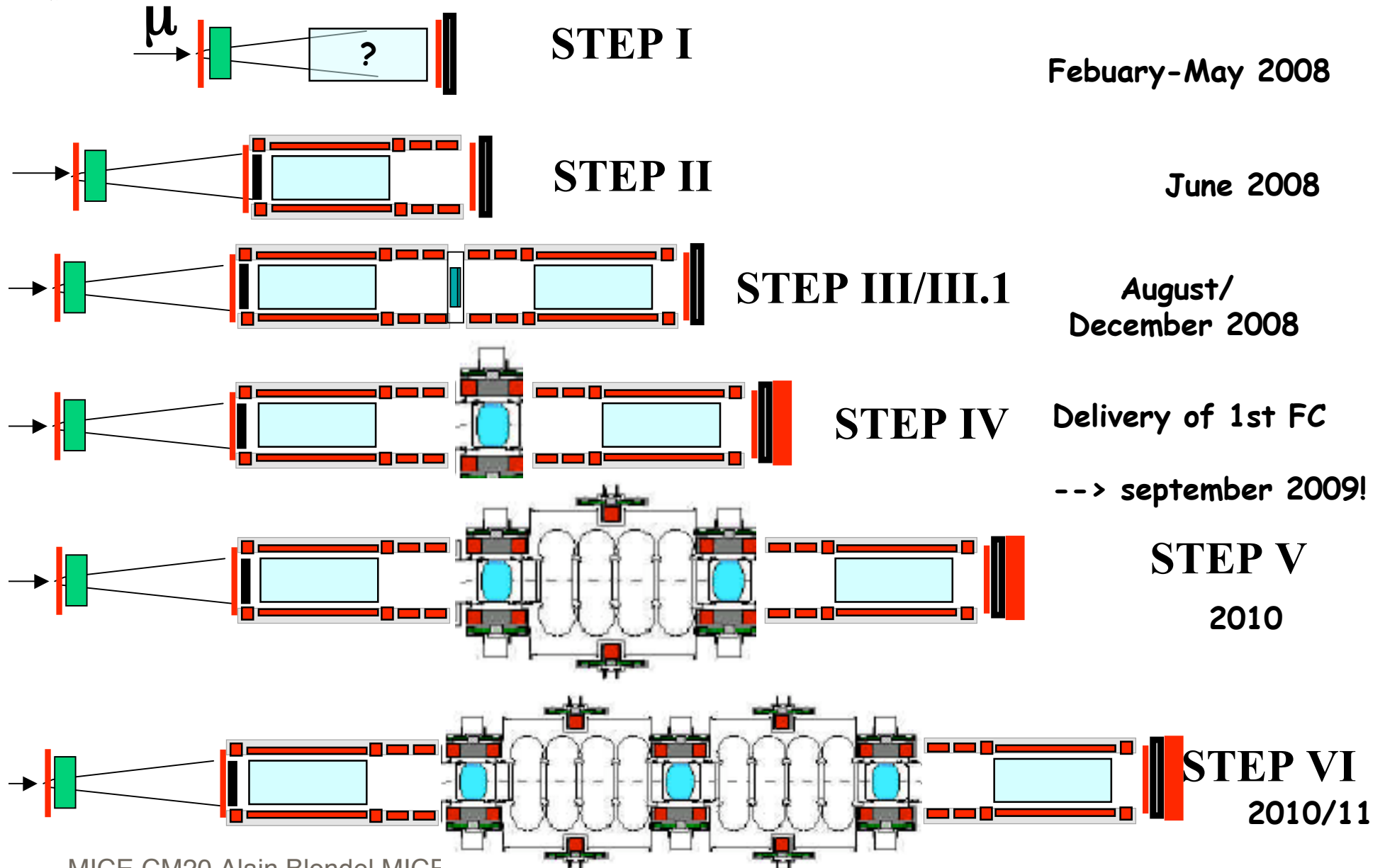


Noted decisions

1. Spool piece for step III.1
absorber size is 70 mm X 520 mm (250mm diameter)
solenoid 2 will be recessed by 4 cm.
Will lose some focusing possibility, gain in size of cooling effect to be measured
2. RF shield for step V,VI. Study made by Stephanie,
needs lab to take responsibility!
3. Effect of misalignments on emittance measurements should be studied
 - learn how to reweight!
 - measurement of momentum with TOF vs beam (vs spectrometer)(we will have three independent means with 1-2 % precision per particle)
(how well do we know the field integrals?)
4. Installation of TOF1 and KL in hall for running period 2:
need serious protection because of construction work in Hall.



Aspirational MICE Schedule as of February 2008





Next events:

MICO meeting: PC Monday 18 February 14h30 for one hour
Every Monday afterwards;

secretary badly needed! Action list to be posted on MICE web page

Hall Meetings 13:30 on wednesdays

MICE Video Conferences once a month on Thursdays 14:30

28 February

27 March

24 April

22 May



MICO -- Sample Agenda

- Action item and milestone summary [**Nichols**]
- ISIS issues [**Rogers**...as needed]
- Target 1 & 2 [**Booth**]
- Cryogenics (decay solenoid, Linde plant, LH₂) [**Courthold**]
- Hall infrastructure (mech., electr. & RF) [**Hayler**]
- PPS [**Alexander**]
- Controls [**Martlew/Oates**]
- DAQ [**Graulich**]
- Spectrometer Solenoids + RFCC magnets [**Proctor**]
- AFC module (incl. absorber) and integration [**Lau**]
- Detectors (beam line + **MICE**) [tbd]
- Commissioning needs [**MOM**]
- Agenda of next meeting.

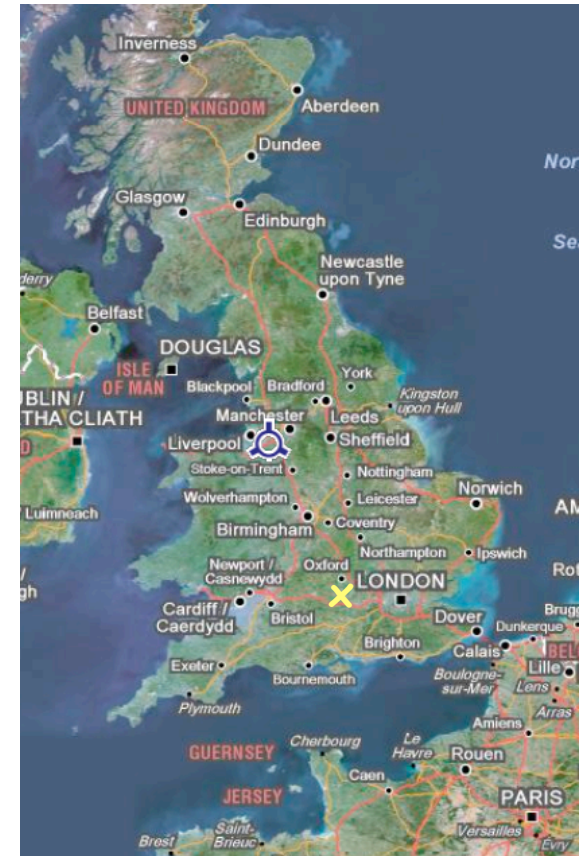
≤ 5 min. each; if nothing new to report, simply indicate so



GOALS TO CM21 June 4-7 in Daresbury Lab, UK (Becky Seviour, Andy Moss, X for program)

1. step I completed !

- Complete beam line, incl BLMs, PPS, radiation, etc..
(K.Long, W.Spencley)
- DAQ, Controls, logbook...running since mid-February
(JSG, B.Martlew)
- CKOV, TOFO installed before March 1
(Lau, Cremaldi, Bonesini)
- TOF1, KL installed before April 7 (")
- (Online) software reading data and providing beam
prarameters (M.Ellis)
- Determine misalignments and set of PS currents for
emittances/momenta matrix, beam composition and
intensity (K.Tilley, analysis team)
- **DOCUMENTATION FOR ALL THE ABOVE before
operating (Project managers and MOM to enforce!)**
- rehearse EPAC08 talks!



WE CAN DO IT!

Main concerns are
-- Target
-- Decay solenoid



2. Have run tracker on cosmics (K.Long et al)
3. Spectrometer solenoid completed, mapped (Bross) and arrived at RAL (S.Virostek) ready to install tracker and diffuser, Mag shield and TOF1 (TOF2, KL?)
4. Infrastructure:
Have mag. shielding to protect from Spectrometer Solenoids or more
False floor construction in MICE Hall
5. Have finalized plans for SW construction (G.Giannini)
6. Have a proposal for the MICE BL correctors and collimators (T.Roberts Muons Inc)
7. Have reviewed and launched RF cavity procurement plan (D.Li)
8. Have ordered FC modules (K.Long)
9. Have ordered absorber body (S.Ishimoto)
10. Have found a collaborator responsible for RF shield for step V,VI (AB)
- 11.... Please signal for omissions!



Conclusions

MICE team has gone through difficult times over the years
(PM resignation, CERN/INFN/STFC/... funding crises, marginalization...)

We are survivors

We know the route. We know where we are going.
We will demonstrate Ionization Cooling and study it precisely.

The road is full of potholes and traffic jams so we get impatient.
However we are making progress regularly...
... just consider what was done since we last met!

Must remain aware of quality required for 10^{-3} measurements

In a few weeks MICE will be a running experiment,
and by June we will have completed the first step.

Thank you all for the hard work and focus , we will make it!

***** THESE ARE EXCITING TIMES! *****