ANALYSIS FORUM: Status & Outstanding Issues
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MICE Collaboration Meeting
Oct 10, 2006 - RAL
Action items from cm15

+ Run plan
  • Time of flight measurements and relation to trigger
  • Algorithm for rf voltage calibration
+ Effects of collimation, scraping in beamline
+ Downstream geometry (sizes of TOF2, EMCal, shields)
• Rf-induced background in TOF (and with different optics)
• Global PID performance (up/downstream) in different optics/momentum
+ Beam envelope interference with spectrometer cryostat
+ Effect of variations in window shape, absorber density, etc.
+ Scoping/beam envelope/acceptance through cooling channel and detectors
  • Weighting/virtual beam
  • Performance indicators (transmission, emittance, phase space density, ..)

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Progress since cm15

- Maintained almost bi-weekly phone meeting schedule
  - Jun 29, Jul 13, Aug 10, Sep 7, Sep 21
  - Average attendance: down to 4.6 mice

- Discussed
  - Data challenge (Ellis, YT)
  - Acceptance of channel, scraping and detector sizes (Apollonio, Cobb, Palladino, Rogers, Sandström)
  - Software tools (Ellis, Rogers)

- Also
  - MICE-Note-146 (Sandström) - sophisticated PID analysis
  - MICE-Note-147 (Graulich) - DAQ event model documentation

- Overall effort has not increased as needed. Key players busy with theses, etc.
  - Need more people to pay attention

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Background

- **Experimental configuration**
  - Has not fully converged
  - Hard to draw robust conclusions until we break the "conformal symmetry"

- **Software tools**
  - Conflicting pressures
    - Once the data starts flowing in, it will be impossible to improve the infrastructure
    - Need to clean up as much as possible now

BUT

- Physics results need to be reliable and stable long before the run and stay that way
- Need to clean up as much as possible now;

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Data Challenge Requirements/Status

• Inputs
  – Full beam tic-tac-toe at correct interface location
  – Run plan

• Monte Carlo Tools
  + Definition and simulation of trigger, event model
  ✓ Realistic electromagnetic model (rf maps, Fe shields)
  – Rf voltage/phase fluctuations?
  + Realistic collimation in beam simulations
  ✓ Ckov: build G4 model, incorporate into PID
  + TOF2 geometry
  + EMCal geometry
  ✓ Tracker geometry
  ✓ Rf background model
  ✓ Realistic materials/shapes in cooling channel modules
  ✓ User-friendly virtual detectors for what-went-where type studies
  – Misalignments
  + Realistic model of detector front ends (including dead/hot/mixed channels)
Data Challenge

- **Reconstruction Tools**
  - Track swimmer with realistic model
  - Full fitter using all detector digits

- **Analysis Tools**
  - Global PID algorithm/tuner
  - Data weighting/virtual beam algorithms
  - Performance indicators (transmission, emittance, phase space density, amplitude, moments, vector potential, etc.)
  - User-defined cuts/functions

- **Computing Resources**
  - Disk, CPU, personpower
  - Monte Carlo vs "data"?
Run Plan: General Considerations

MICE is complex, we have to control
- Beam settings: momentum, diffuser
- Detectors: pedestals, gains
- Cooling channel: magnets, absorbers, cavities

• We may want many special configurations for calibration, alignment, systematics

• Change-over to different settings involves many timescales, the loop is not completely clear
  - Beam (beamline magnets, collimators, diffuser)
  - Absorber change (full/empty, He/H, solid/liquid)
  - Optics (magnet currents)
  - Rf (on/off, phase/voltage)
  - Trigger (cosmic, empty, incoming-µ, good-µ, bad-µ, ...)

• Also various other operational constraints
  - Don’t want to warm up superconducting magnets
  - Safety
    - Search/secure after access, magnetic survey before power-up?

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## Example: Start-up

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Beamline</th>
<th>Diffuser</th>
<th>Absorbers</th>
<th>Tracker field</th>
<th>Cooling channel magnets</th>
<th>Trigger front end</th>
<th>DAQ + online rec.</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detector smoke test</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>1 day</td>
</tr>
<tr>
<td>Detector shakedown</td>
<td>On</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Cabled</td>
<td>Don’t care</td>
<td>1 day</td>
</tr>
<tr>
<td>DAQ shakedown</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Timed</td>
<td>Running</td>
<td>few days</td>
</tr>
<tr>
<td>Initial det. calibration</td>
<td>On</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>Don’t care</td>
<td>On</td>
<td>On</td>
<td>1 week</td>
</tr>
<tr>
<td>Beam tuning</td>
<td>On</td>
<td>Different settings</td>
<td>Don’t care</td>
<td>On</td>
<td>Don’t care</td>
<td>On</td>
<td>On</td>
<td></td>
</tr>
</tbody>
</table>

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**Miscellaneous**

- **Downstream apertures**
  - Process has not converged
    - attempt to update geometry uncovered various problems
    - will commit changes by end of cm16
    - can continue with the Blondel/Palladino plan afterward

- **Rf-induced background in detectors**
  - detailed simulation study on hold until sizes, etc. converge (although not strictly necessary)
  - Guesstimate of TOF/tracker rate ratio based on size, thickness, channel count implies this may be a problem in the “100xnominal” case; need to tackle soon
Outlook

- Downstream apertures still in flux but should be resolved “soon”
- Run plan under discussion with K. Long, draft to appear on the web “soon”
- Data Challenge to be launched in a few weeks
  - will help establish/debug standard analysis chain for MICE
  - analysis of the results will keep us busy until cm17
- Other problems on hold due to lack of analytical mice
  - my MICE-time substantially reduced
- We need
  - more people working on analysis issues
  - more participation in the analysis forum
- Things are getting interesting, don’t miss the fun!

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