Steps towards physics from Run-II Muon Data - MJL - 1/26/02

* Alignment with p-p and Au-Au field off data
  - inter-station alignment using 2 stations to predict 3rd, correction of strip geometry
  - methods to input alignment corrections and place them in database
  - accuracy and masking widths for projection of muID roads to station-3 and then forward to other stations using bend-planes
  - residuals of stubs and full tracks through 3 stations
  - lineup with vertex and muID roads
  - Study raw data for any swapped cables as might be evidenced by discontinuities in hit or noise distributions versus strip number in a plane, etc.
* Verification and tuning of tracker with real data once alignment is adjusted correctly
  - start with p-p field off and on
    + resolution of cathode clusters in fits
    + chisq/df cuts for stubs and tracks
    + pointing to vertex cuts
* then Au-Au, where additional issues that come with higher-occupancy must be dealt with
    + ghost tracks
    + weeding out bad hits
    + effect of dead or missing planes

* Develop best way to get vertex, especially for p-p where beam-beam is inefficient (and NTC has effectively no vertex resolution)
  - event by event decision on what vertex source to use
  - new algorithm to optimize mass resolution when there is no vertex measurement, by using muon tracks alone and their distance of closest approach
* Optimization of algorithms to deal with dead FEM's and HV for the Run-II data and study of the resulting acceptance and efficiency losses
  - Fix algorithms for missing planes
* Make muon oriented data set list for p-p and Au-Au
  - for Au-Au start with Tatsuya's list
  - add e.g. muID trigger type, beam cleanliness, shielding status
  - add MMS field
  - add HV status of both muTr and muID
  - place "permanent" samples of each type of raw data (also MC & DST?) on disk for testing codes and studying algorithm changes
* Improve Web documentation
  - make one documentation area that anyone can contribute to (i.e. group writable in the phnxmutr account on rcf?)
  - put data set list there
  - appoint coordinator for this area
  - write document describing overall picture of tracking algorithms (i.e. put what I "lectured" about in a document + more)

* Cleanup of muID roads to
  - optional elimination of all ghosts to test with only golden roads
  - combination into groups that point to same tracking region
  - especially for higher occupancy Au-Au data
* Improving simulation to be more realistic especially in terms of occupancy
  - to make it a better tool for helping understand pattern recognition problems
  - to make it better for simulating backgrounds and for understanding acceptance and efficiency
  - retire camresp*.C macros and do response with preco
* Develop track embedding machinery to allow determination of efficiency dependence on centrality and other kinematic variables
* Develop machinery to group events in "classes" and mix events from same classes to describe random backgrounds. Classes would be events with about the same vertex, centrality, time data was taken, etc.

* Revisit cluster resolution and try to achieve 100 micron resolution
  - not necessary for Run-II data
  - determine whether more accurate cathode gain calibrations that also describe the higher amplitudes where gain gradually saturates are necessary and re-process calibration data if necessary
  - also consider declaring strips with flaky pedestals as dead strips
  - look for other sources for the present ~300 micron resolution, e.g. relative cathode plane alignment, ...
  - study charge matching between cathode cluster in same gap
* Use one event display to study pattern recognition performance as a tool for helping visualize best compromises and cuts, etc.
* Once J/Psi peak is seen study various issues versus J/Psi yield and resolution
  - systematics with region tracks go through as a way of checking for magnetic field deviations from maps, i.e. versus theta or phi
  - look for systematics versus run, magnet cycling, central-magnet field value
  - re-fit new 3d field map to extract bend-plane parameterizations (the ones being used now date from 3 or more years ago and used the old 2d map)

* Improve DST's and micro-DST's
  - make sure relevant things are in them (xF, pT, cos(theta-cs)...)
  - make re-tracking from DST work
  - is track embedding at DST level, if so make it work
* Housekeeping
  - make switches work on histogram and ntuple creation
  - wrapped tables..?
* More quantitative muID comparisons
  - correlations between muTr and muID momentum and depth, positions and angles, ...
  - compare muID shower profile and depth to expectations
  - image backgrounds
* Debug capability of tracker to run without seeding from muID
  - e.g. loop over a mask for each whole station-3 octant instead of a mask area around a muID projection?
* Prepare software for North arm data
  - check using North arm simulations
  - check (get?) North arm 3d field map and recalculate bend-plane parameterizations from it
  - North arm electronics->strip mapping and geometry