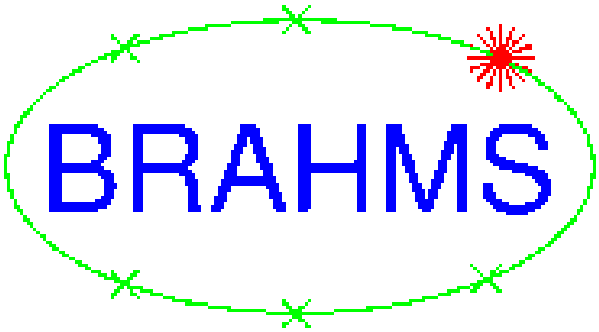

BRAHMS Day One Physics, current status March 24, 1999

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Overview of presentation

- Physics Goals of BRAHMS
- Detector overview
  - Overall layout
  - Status (and pictures)
- Year One Expectations
  - Examples of First Year Measurements
  - Outline of First Year Run Plan

BRAMS Physics Goals

Measurements

- p, K, π identified in wide range of rapidity, $0 < |y| < 4$ and $0.2 < p_t < \sim 3$GeV/c (central and fragmentation region).
- Measure semi-inclusive p_t spectra as function of centrality.
- Study this as function of collision system (Au, Si, p+A, and p+p)
- Capabilities for BE measurements.

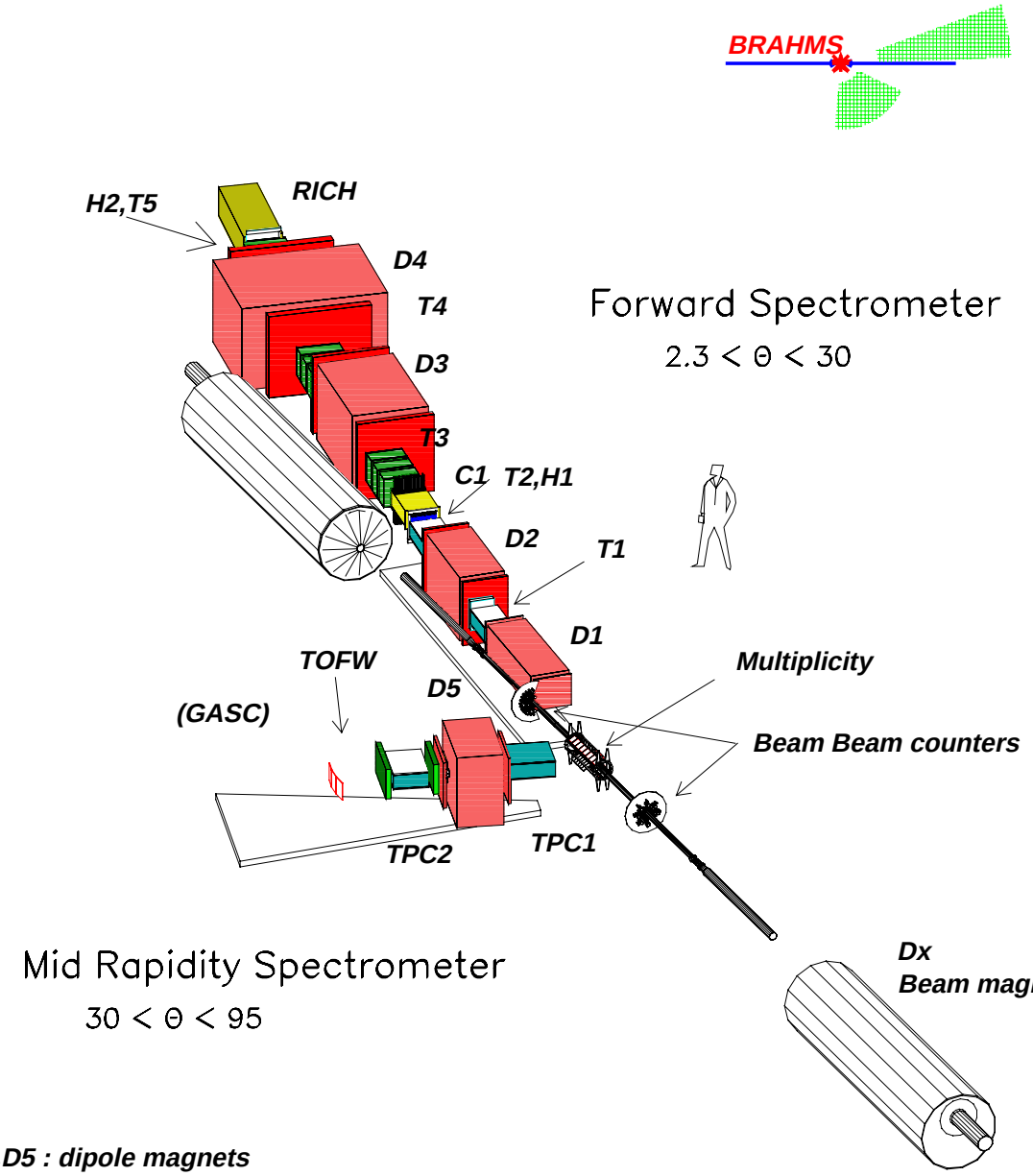
Results will address

- Reaction Dynamics. Stopping, chemical equilibrium, thermalization.
- p,p-bar production. Baryo-chemical potential
- K+,K-. Strangeness enhancement.
- $< p_t >$ vs dN/dy.
- Mini-jet production systematic; rapidity dependence ($p_t >$ 2 GeV/c p, K, π).

First Year Physics Goals (Au+Au)

- Stopping
  - Baryon number transfer in rapidity
    - Different mechanism in HI reactions like Gluon junction or di-quark breaking mechanism may result in higher transfer than simple extrapolations from pA will indicate.
  - Energy transfer from beam to central region.
    - A rapidity shift in baryon kinematically corresponds to an energy loss. This energy can show up as increased particle production at mid-rapidity , or carried by high rapidity particles.
  - Model prediction vary different. This meeting and QM99 is the last chance for unbiased predictions.
- Global measurements
  - multiplicity measurements, and correlations with forward neutrons
- Hadron rapidity distributions and pi, K, p yields for soft p_t region.

Perspective View of Spectrometer



D1,D2,D3,D4,D5 : dipole magnets
T1,T2,T3,T4,T5, TPC1 TPC2: tracking detectors
H1,H2,TOFW : Time-of-flight detectors
RICH, GASC : Cherenkov detectors

Tracking and PID

Forward Spectrometer

➡ $2.3^o < \Theta < 30^o$ Coverage

- Full Forward Spectrometer ($2.3^o < \Theta < 15^o$)

  High-momentum mode

  – sweeping D1,D2

  – tracking and momentum determination by T2-T5, D3,D4

  – PID: RICH (π/K/p) separation < 25 GeV/c) Tof-H2 (π /K < 5, K/p < 8.5 GeV/c with 4σ cut)

  Low-momentum mode

  – tracking and momentum determination by T1-T2, D2

  – PID: C1 (π/K) separation < 9 GeV/c) Tof-H1 (π /K < 3.3, K/p < 5.7 GeV/c with 4σ cut

- Front Forward Spectrometer ($15^o < \Theta < 30^o$)

  – Same as Low-momentum Mode

Momentum resolution σ**(dp/p)** ~ 1%

Mid-Rapidity Spectrometer

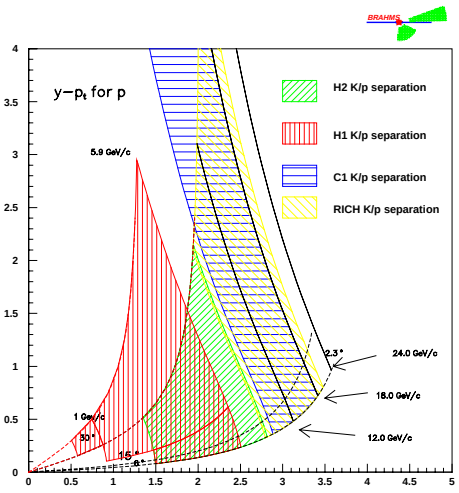
➡ $30^o < \Theta < 95^o$ Coverage

- Tracking and Momentum determination, MTP1,MTP2 and D5.
- PID TOFW (π /K < 2.2, K/p < 3.7 GeV/c with 4σ cut). Essentially one charge measurements.

Global Detectors

- Multiplicity Detector
  - Provide a measure of charged particle multiplicity in the central region
  - Sufficient segmentation to provide dN/deta
  - Provide triggering on central/ non central events in AuAu and SiSi reactions.
- Beam-Beam Counter
  - provide a start time and Level 0 trigger
  - ~50psec time resolution and vertex determination to ~2 cm.
  - Provide multiplicity information at high eta.
- Zero Degree Calorimeters (ZDC)
  - Luminosity Device for AuAu collisions
  - Indicator of forward going energy (neutrons)
  - Common centrality information for all RHIC experiments

Coverage of Spectrometers



BRAHMS Day-1 Configuration

The forward spectrometer is fully instrumented with its detectors, but is only capable of powering the magnets to about half field thus restricting the coverage in phase-space..

The Front Forward Spectrometer (FFS) consisting of 2 magnets D1 and D2, and associated detectors moveable.

The Back Forward Spectrometer (BFS) consisting of 2 magnets D3 and D4 and associated detectors

Mid Rapidity Spectrometer (MRS).

The Centrality detector consisting of an inner layer of Si-detectors and an outer layer of large scintillator.

The Beam-Beam counter array.

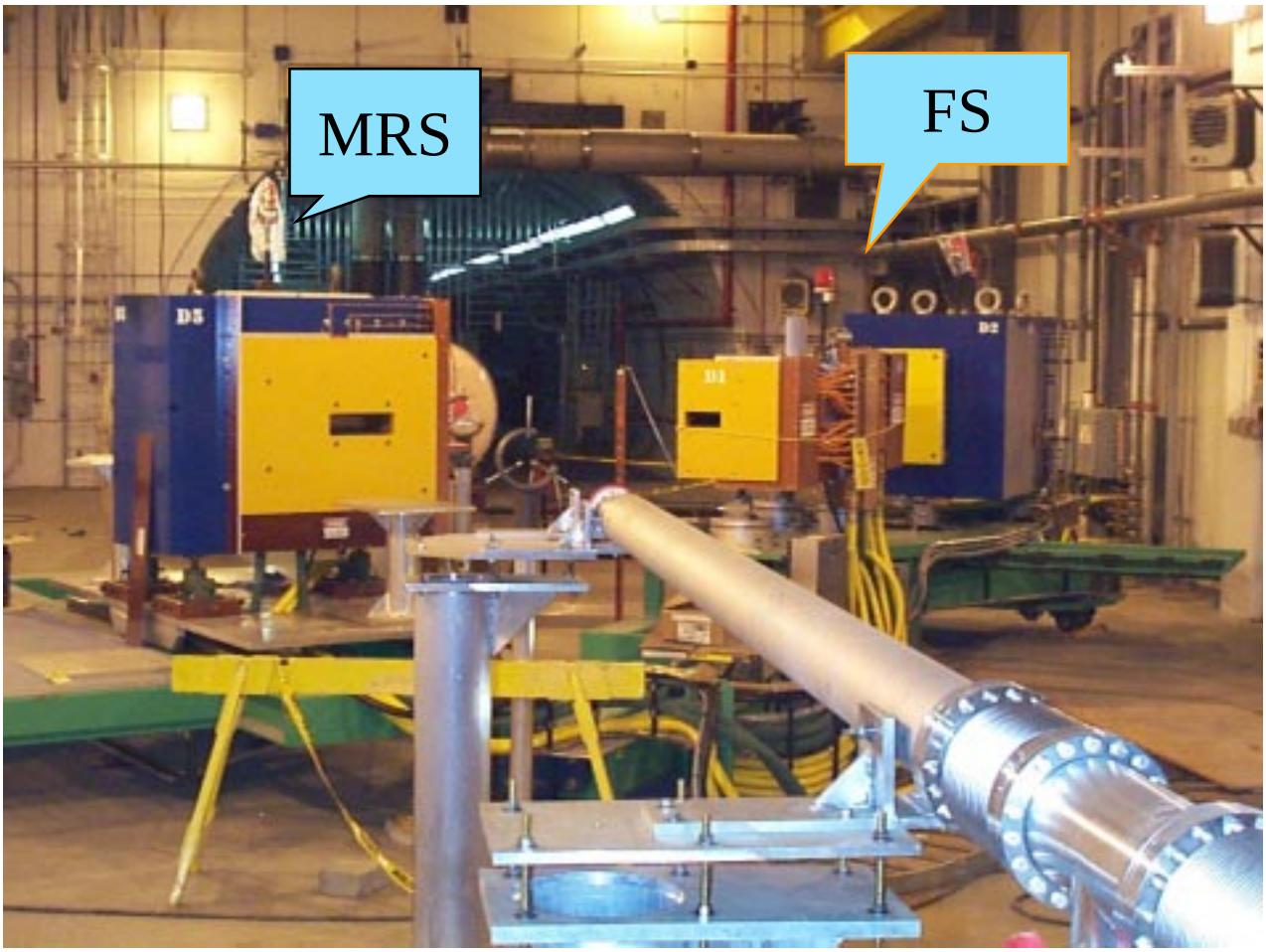
The Zero Degree Calorimeters (ZDC)

Engineering Run (July).

- Front Forward Spectrometer
- Mid-Rapidity Spectrometer
- ZDC, Beam-Beam and Multiplicity Tiles.

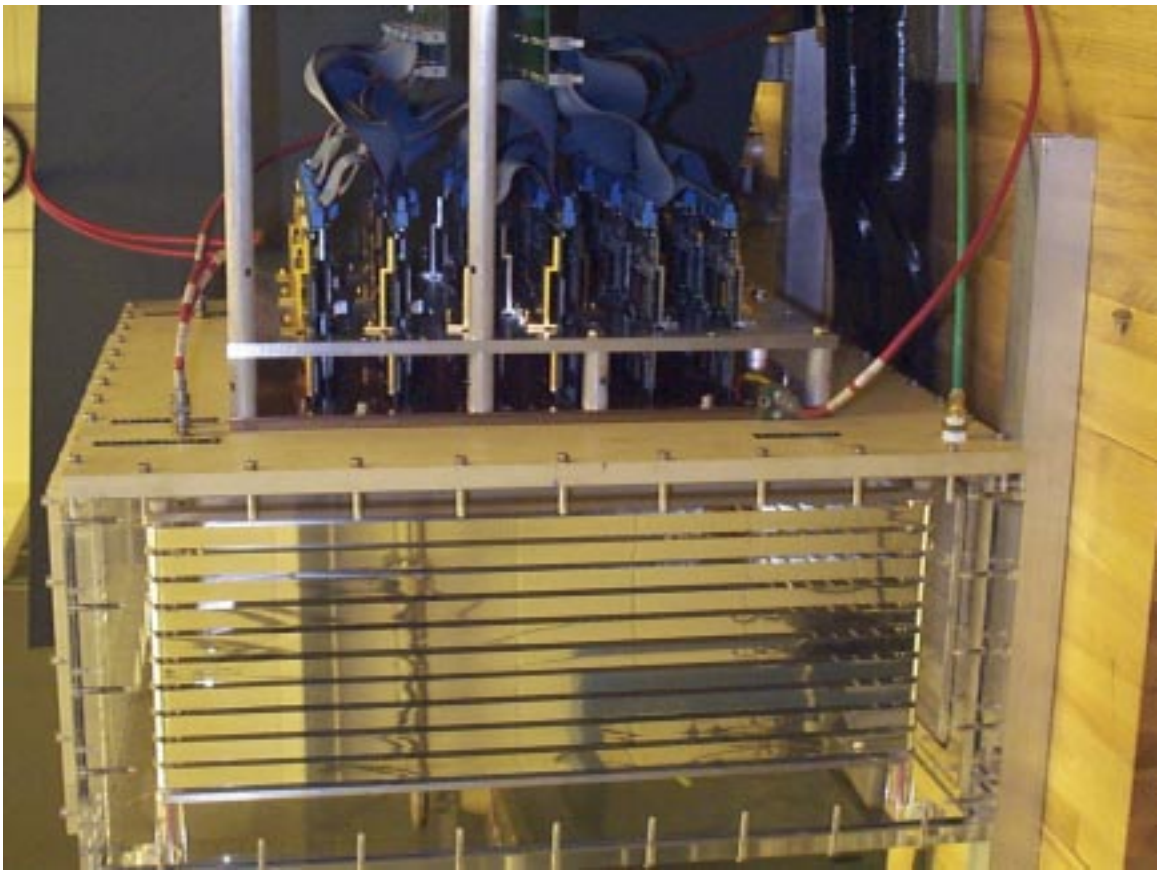
Spectrometer System

2 O'clock IR viewed from DX



TPCs

- The TPCs have a short drift using $ArCO_2$
- Each detector has about 1000 pads readout with STAR FEE electronics, and a BRAHMS VME receiver board

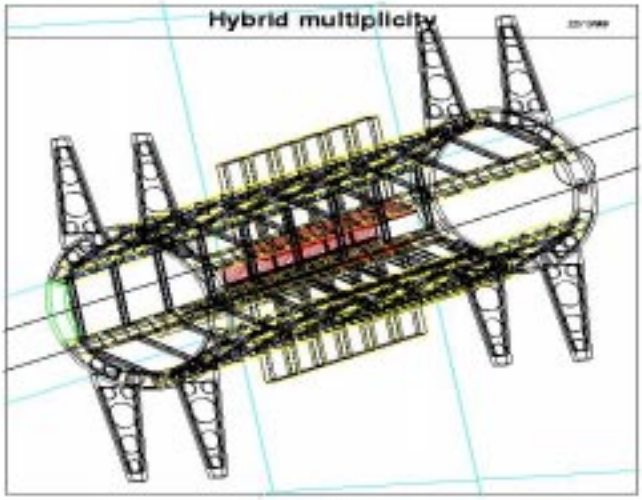


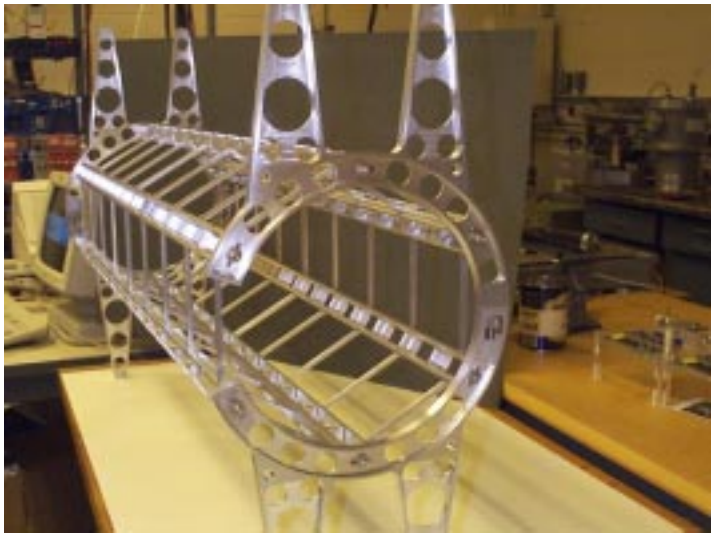
MTP1 for MRS in lab setup.

Multiplicity Measurement and Detector

Hybrid Detector consisting of two layers of

- 168 channels of Si-detector channels
- 40 segments of 12*12 cm scintillator tiles
- coverage -2.2 < e < 2.2





C1 Cherenkov Detector

- Threshold Segmented Cherenkov Detector using C_4F_{10} at 1.2 atm.
- 40 individual cones with H1161 PMTs.
- Gives pi/K separation up to 9 GeV/c

Detector in Lab Tested and ready

Radiator volume

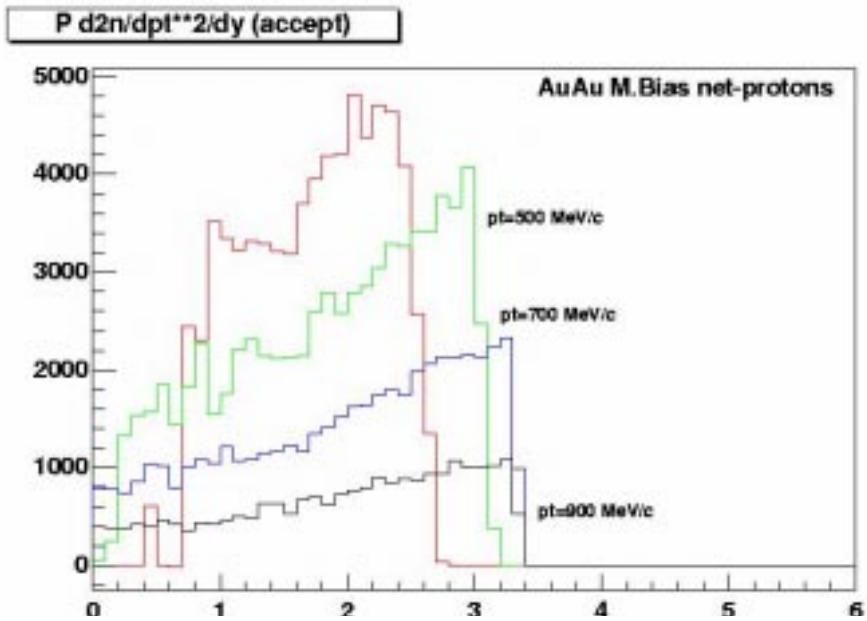
BRAHMS Goals for FY2000 Running Period

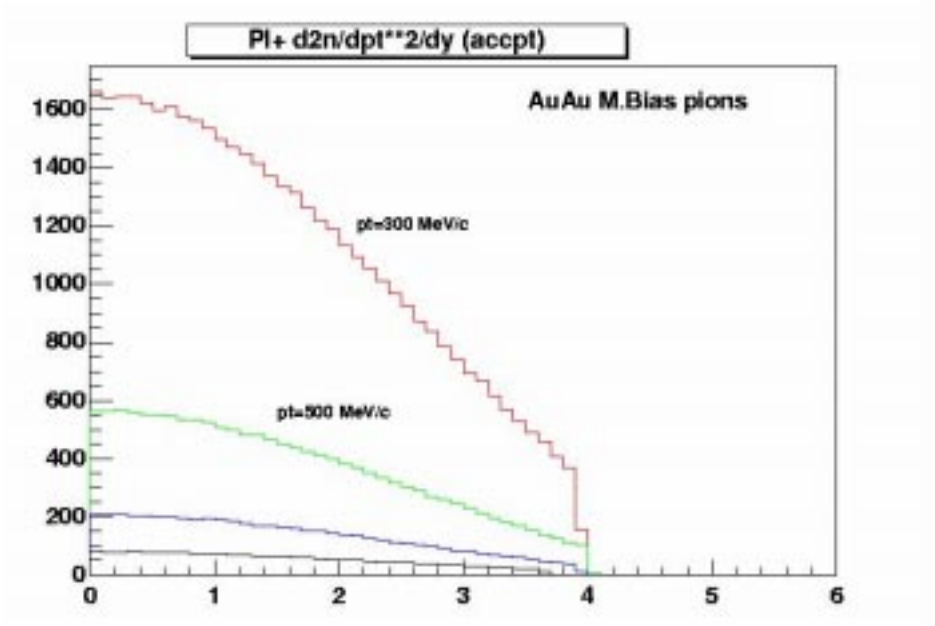
- Commissioning of full detector system, in particular the detectors on the BFS i.e. Drift Chambers, the H2 hodoscope and the RICH.
- Engineering. Before physics measurements can be performed it is necessary to understand the operations of detector system under stable beam conditions to study and evaluate
  - Beam collisions, beam gas background collisions
  - Detectors backgrounds at different spectrometer settings
  - Trigger (Beam-Beam counters and Multiplicity array).
- Global multiplicity distributions and correlation's with ZDC data.
- A first survey of AuAu rapidity distributions at a small number of selected transverse momenta at a small number of rapidities (e.g. 0, 1, , 2. , 3.) for pt=.4, .6 and .8 GeV/c.
- A set of higher statistics runs to obtain more complete pt-spectra and extending to higher pt. This will aim to get high statistics spectra of both central, min bias and peripheral collisions for protons, kaons in addition to pions at selected rapidities and pt up to about 1-1.2 GeV/c.

Some selected results

- Dn/dp_t mid-rapidity
- Dn/p_t at high rapidity
- Rapidity-distributions estimated from Fritiof 7.02 at given p_t values.
- An multiplicity example
- An HBT example

Min Bias Acceptance (fritiof 7.02)





Final Thoughts