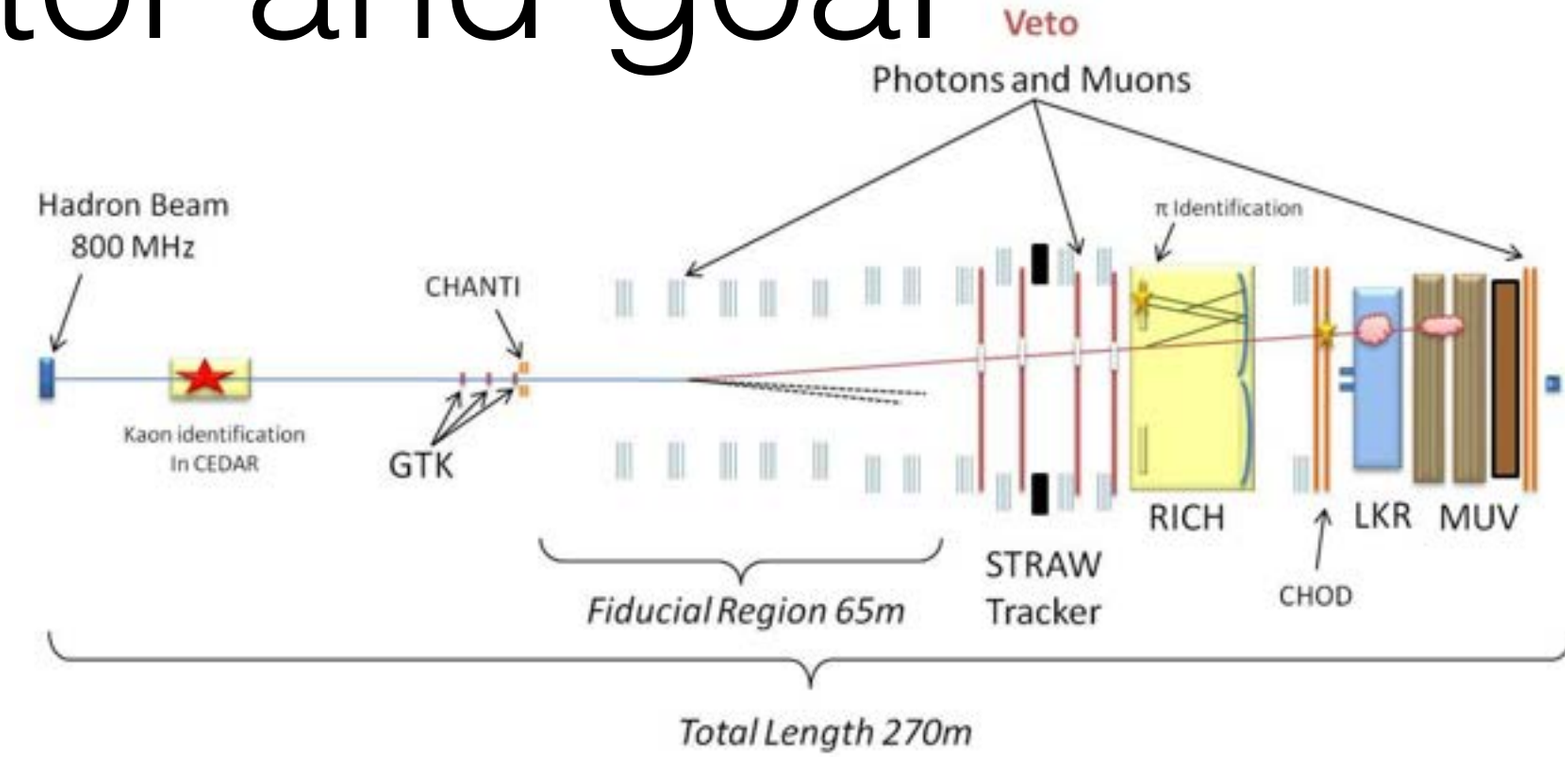
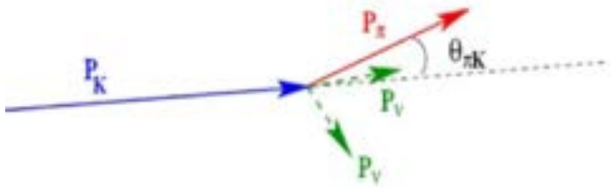
NA62
2014 commissioning run

Dario Soldi - Università degli Studi di Torino
on behalf of the NA62 collaboration

Moriond - EW Interactions and Unified Theories

Detector and goal





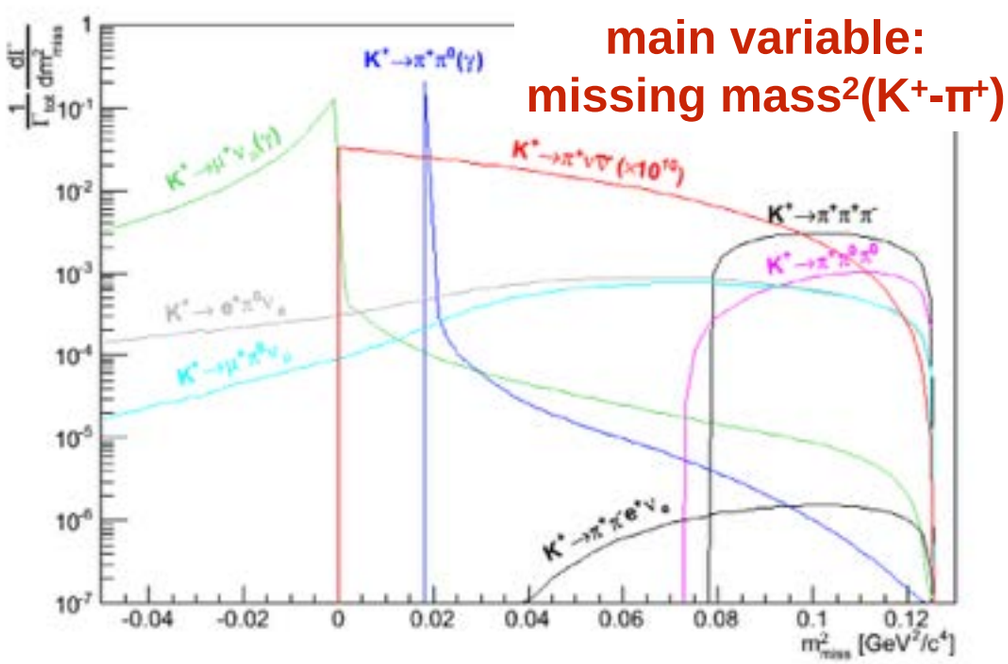
- Main goal: $K^+ \to \pi^+ \nu\bar{\nu}$
- 10^{13} K^+ decays in flight;
- expected 100 signal events S/B ~ 10;
- 92% of total BR(K^+) rejected using kinematics, 8% relies on vetoes, PID;

BRANCHING RATIO (10^{11}):

- Theory: $7.81^{+\,0.8}_{-\,0.71} \pm 0.29$
- Experiment: $17.3^{+\,11.5}_{-\,10.5}$

Joachim Brod, Martin Gorbahn, Emmanuel Stamou
Phys. Rev. D83, 034030 (2011)

A. V. Artamonov *et al.* (E949 Collaboration)
B. B. Phys.Rev.Lett.101, 191802, 2008.



Beam

Nominal

- Primary SPS 400 GeV/c protons to beryllium target;
- non-separated beam: 71% Pions, 23% Protons, **6% Kaons**;
- Total Rate: 750 MHz;
- 10 % K decays in fiducial region;
- 4.5×10^{12} K decays per year;

2014 run

- Beam optics completed;
- Intensity: from 5% up to 20% of nominal;
- Muon runs for calibration of detectors;

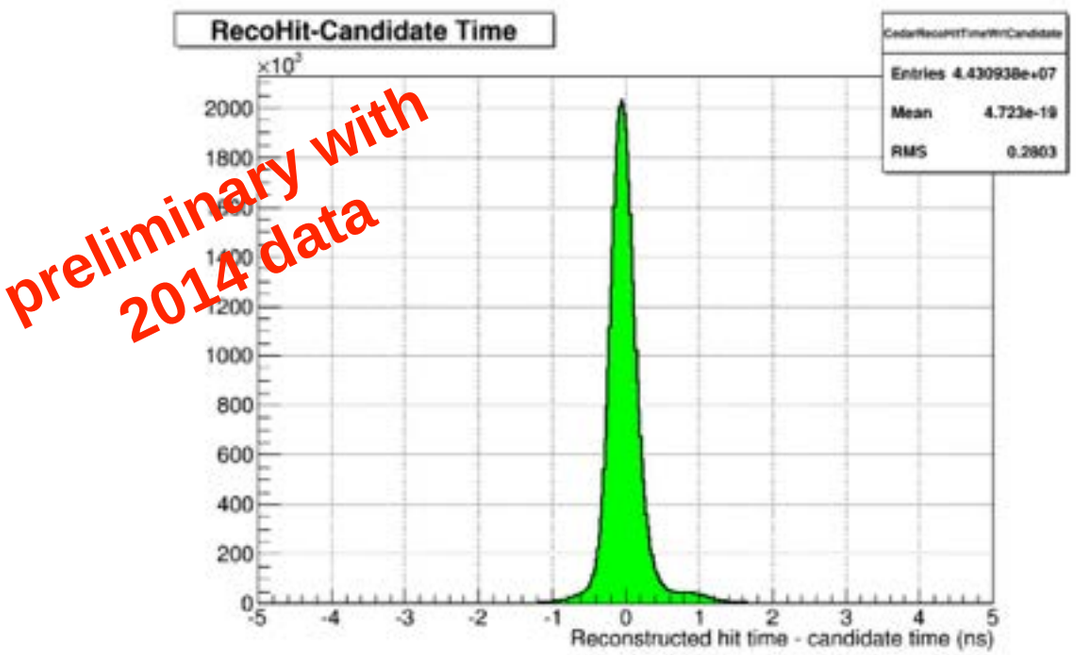
Kaon Tag

Nominal

- Differential Cherenkov counter (CEDAR, from SPS);
- Beam K+/π+ separation;
- 50 MHz kaon rate;
- Time resolution σ_T < 100 ps;
- < 1% pion mis-ID probability;
- > 95 % kaon tagging efficiency;
- Suppression of background from accidental tracks;

2014 run

Preliminary: single hit time resolution (~280 ps)

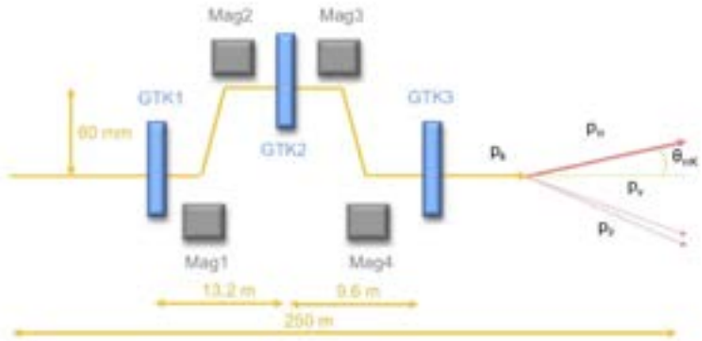


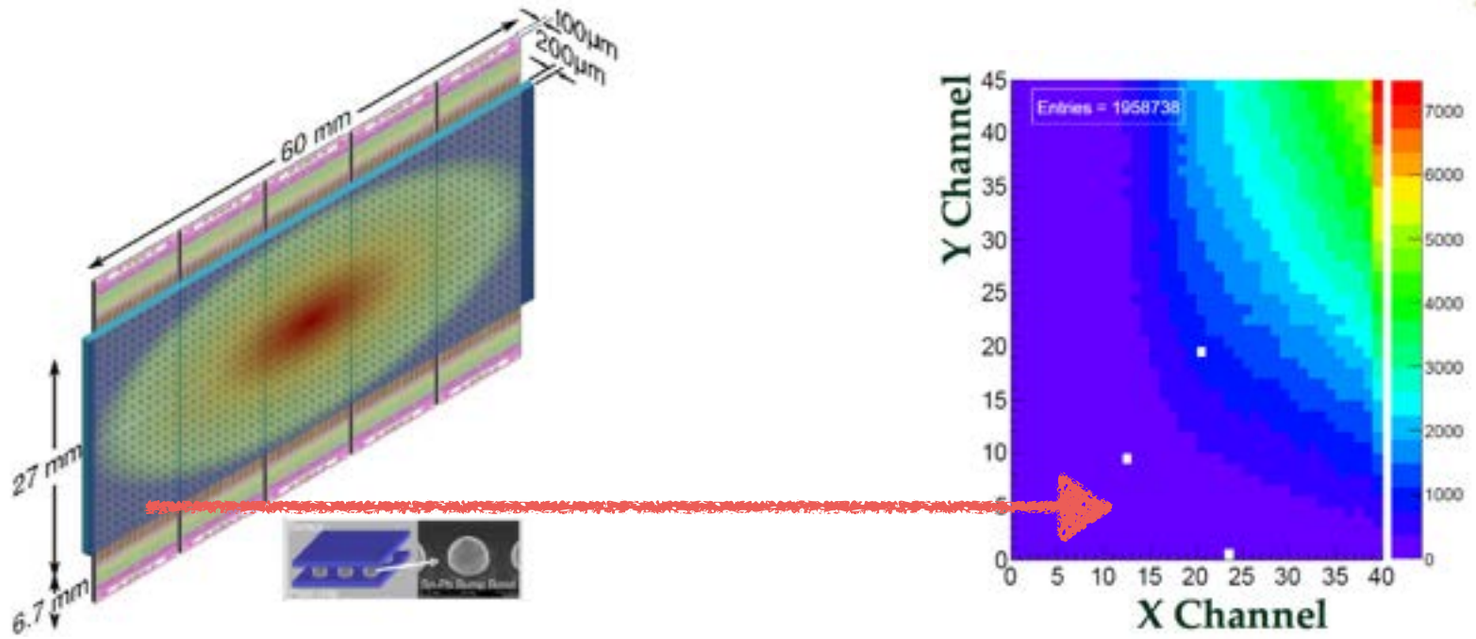
Spectrometers

- **Beam spectrometer:** 3 stations of Si-Pixel Detectors.

  - Installed, partially read out;

  - Time resolutions: expected to be 200 ps, σ(P)/P ~ 0.2%



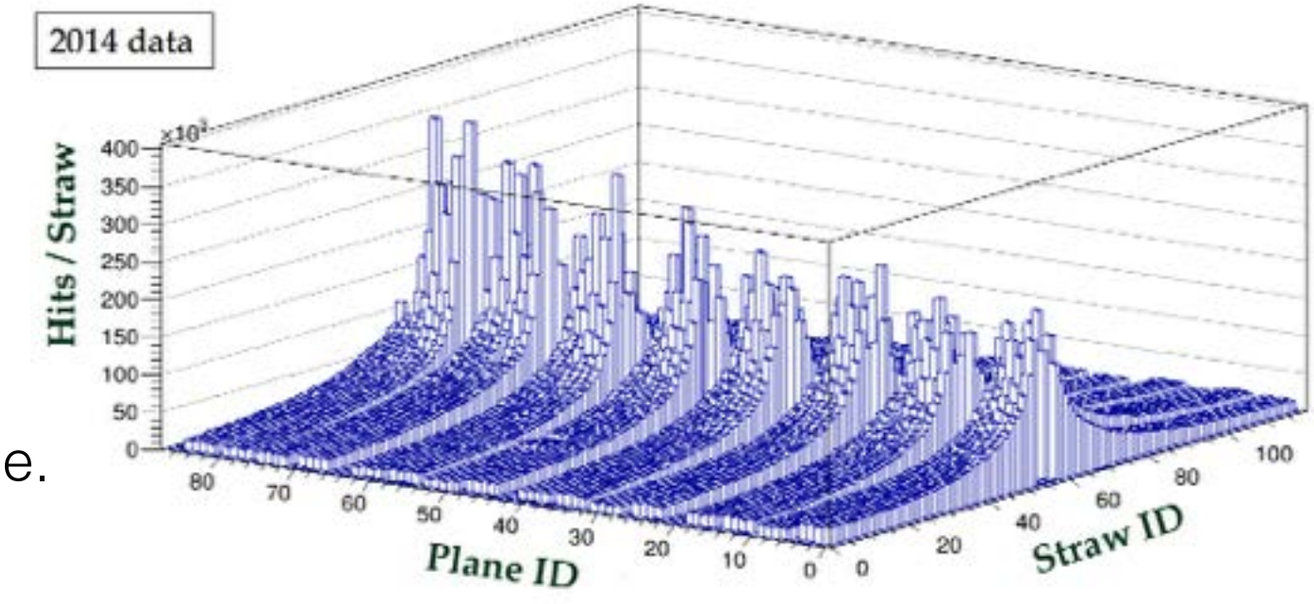


- **Straw chamber spectrometer:** 4 stations covering x,y,u,z plans.

  - Installed;

  - Triggerless data taking;

  - Matching with other detectors done offline.



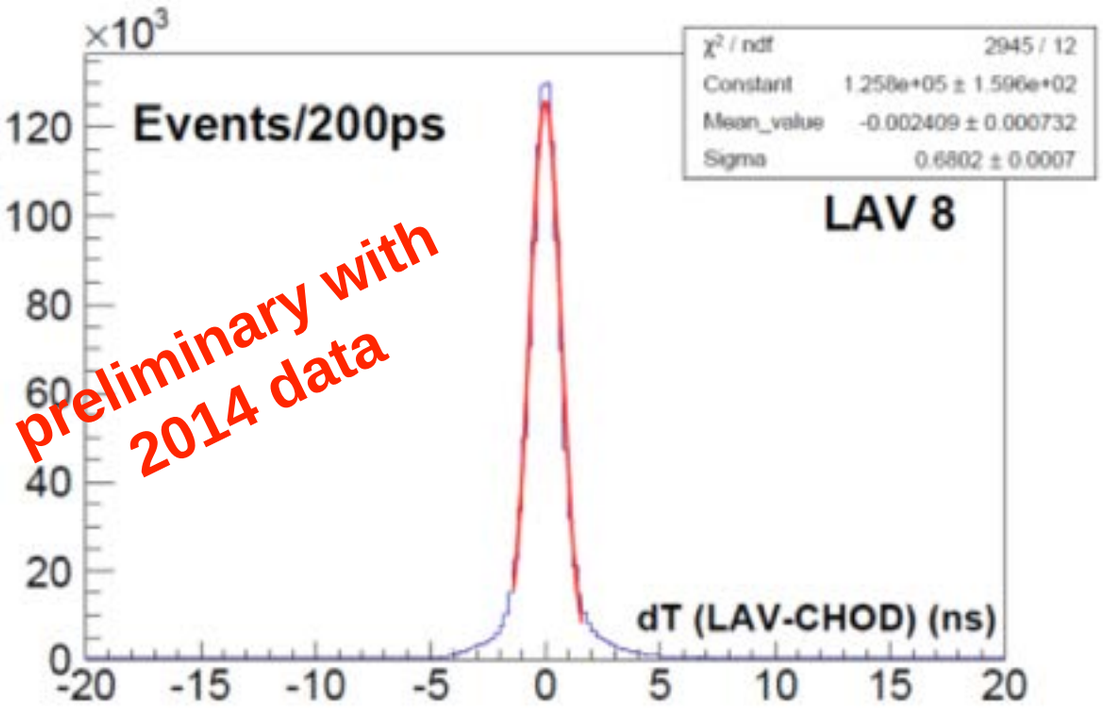
Photon Vetoes

- Suppression of photons from:
  - radiative decay;
  - $\pi^+ \pi^0$;
- Hermetic photon coverage up to 50 mrad;

Large Angle Vetoes

Lead glass blocks

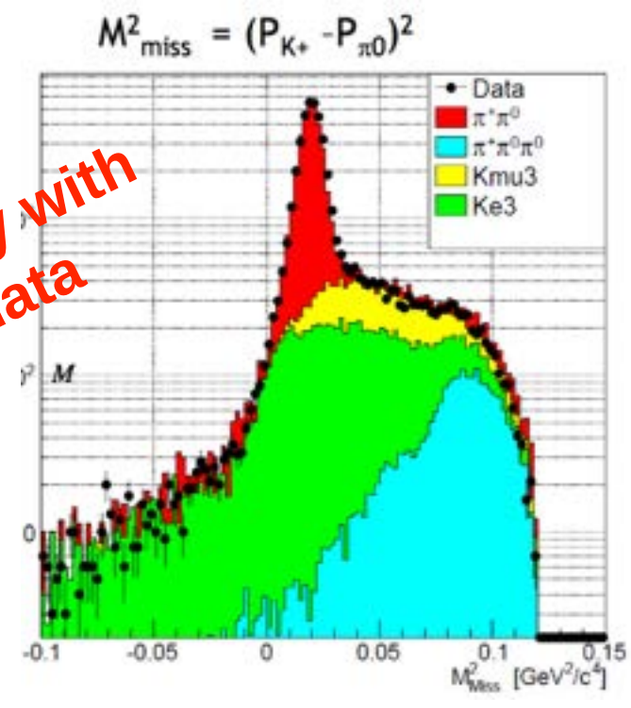
- 12 stations installed and read out;
- Time resolution measured in 2014 is < 1 ns



Liquid Krypton Calorimeter

NA48 electromagnetic calorimeter

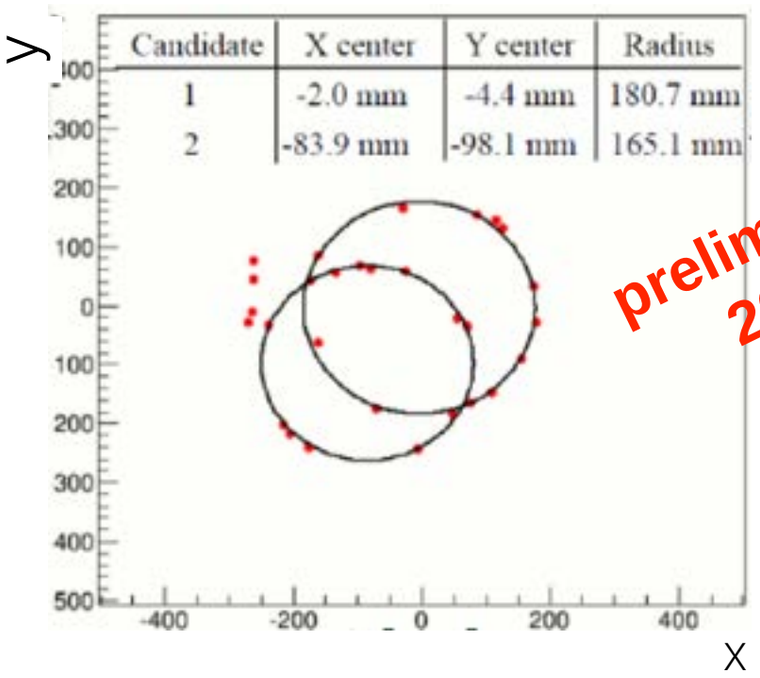
- New read out commissioned;
- Calibration;
- First measurement as MC prediction

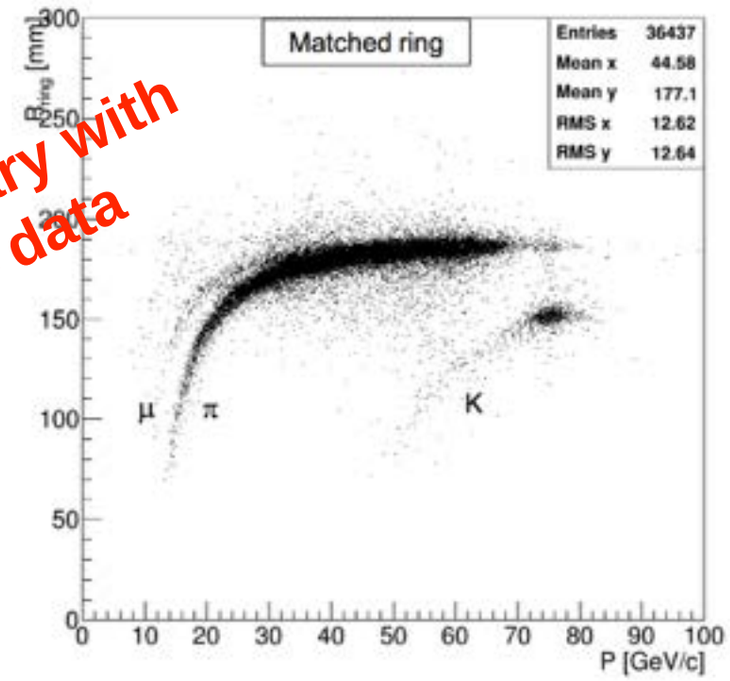


RICH counter and Muon Vetoes

RICH:

- Cherenkov light ring radius proportional to β of particle;
- Ne gas at 1 atm;
- mosaic of Cherenkov mirrors;
- High granularity γ detector (2000 PMTs);
- 17 m long;





preliminary with 2014 data

MUV1-2:

- Fe-scintillators calorimeter;
- hadr/mip cluster ID;
- distinguish between μ and π;

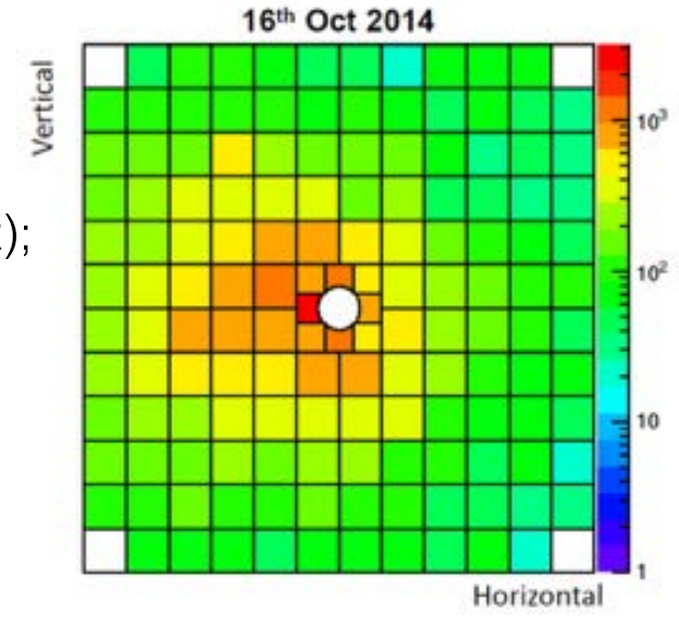
MUV2 - 2014 run:

Efficiency: 99.9%

Time resolution: 1.4 ns (preliminary)

MUV3:

- scintillation tiles array;
- detect muons (<1% ineff);
- used in L0 trigger as veto (10MHz);



Trigger and data acquisition

- Digital data stream from Front End to the Data Acquisition;
- common FPGA-based motherboard for trigger generation and data acquisition
- UDP-IP Ethernet Protocol from detectors to the L0 trigger processor;

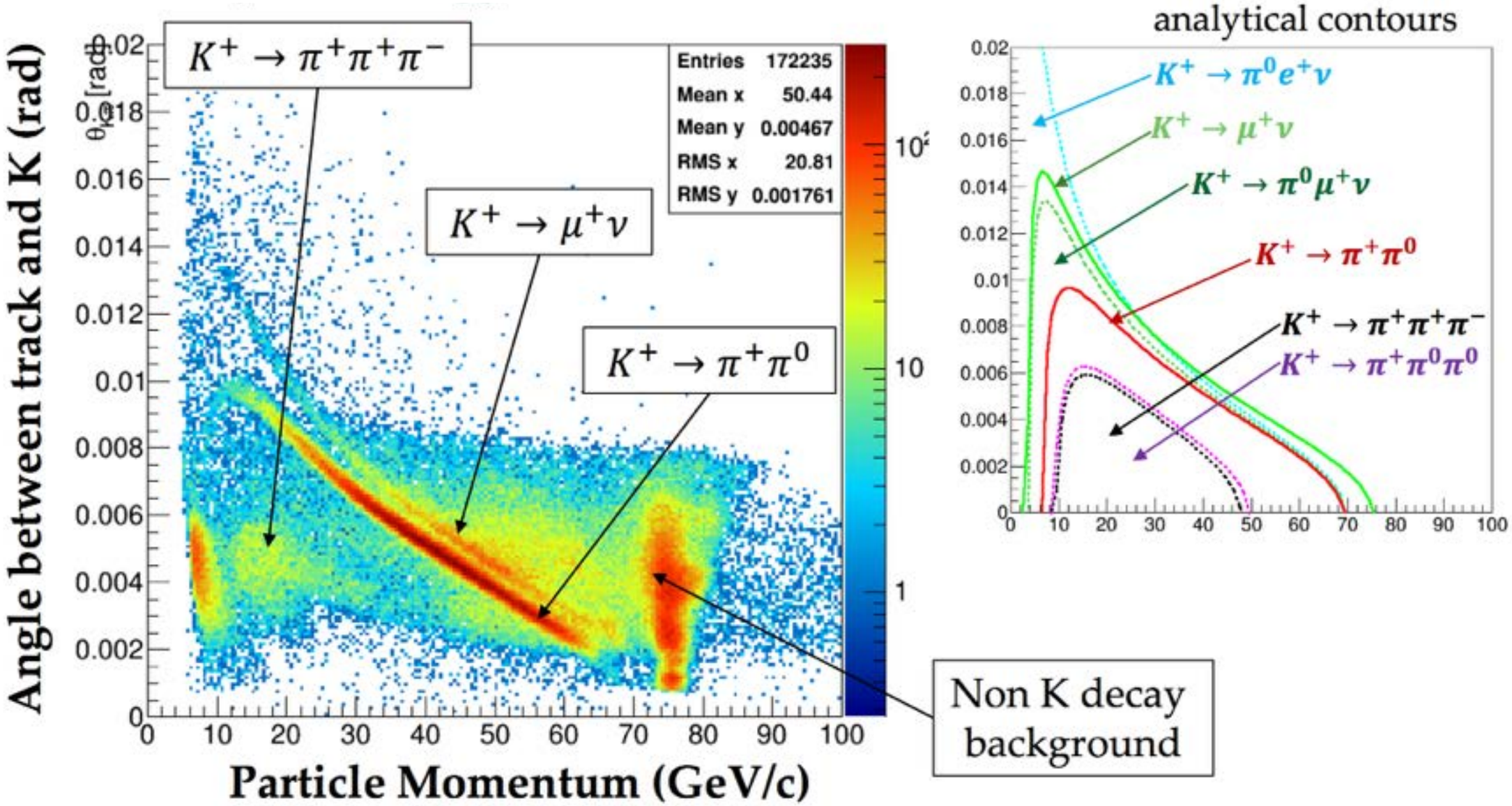
2014 Run

- 100% Trigger Electronics boards installed;
- System deeply tested;
- Two trigger processors under study, one based on FPGA data matching (used for 2014 run), the other based on online software data analysis

First look at 2014 data

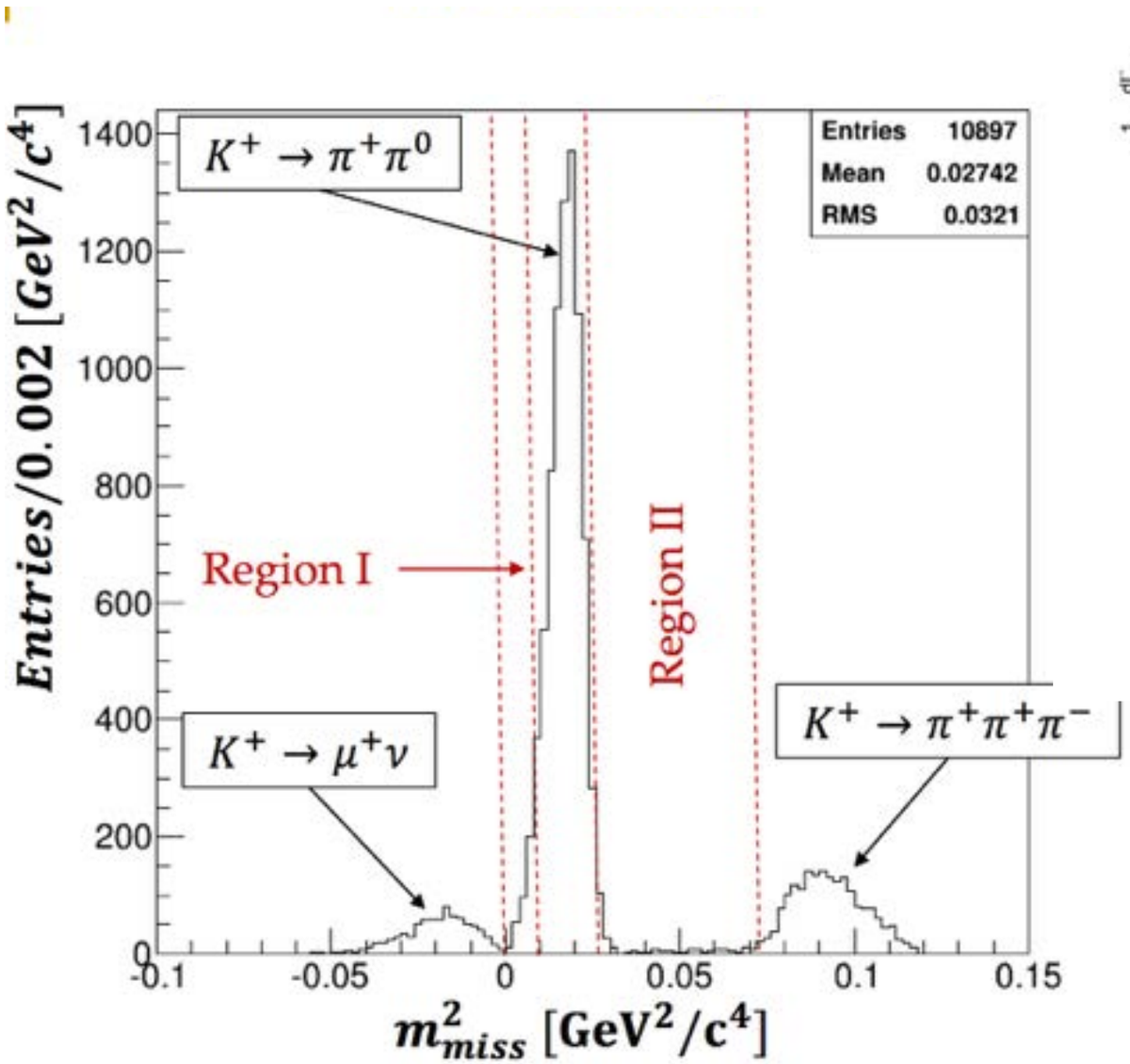
Events with only 1 track in the spectrometer reconstructed (40 ns time window).

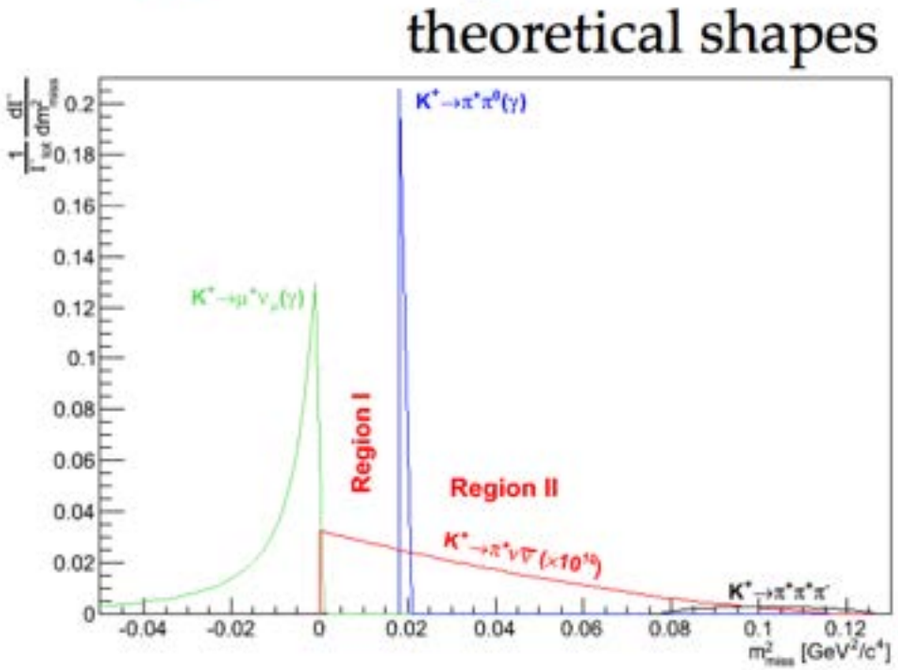
10^2 muon rejection at trigger level.



First look at 2014 data

- Apply KTAG for K ID;
- Decay vertices selection;
- Momentum < 35 GeV





Conclusions

- NA62 took data for the first time in 2014;
- Almost all subdetectors have been commissioned.
- Data analysis is in progress

NA62 marks CERN's return to the exploration of the Standard Model using high-intensity kaon beams.

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Thank you