



# Physics at High Baryon Density Region

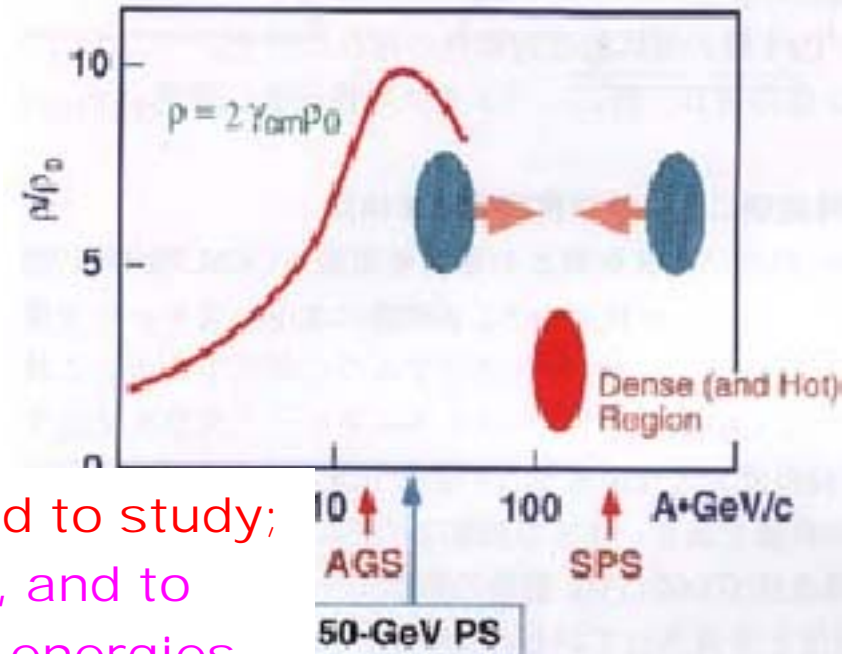
Where we are  
Physics at JHF  
Plan and R&D issue

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## Where we are?

“Flow dynamics at energies between 10 and 160 GeV/c” presented by *Yasuo Miake* (Tsukuba U.) at the last workshop in 2000. (KEK Report 2000 - 11)

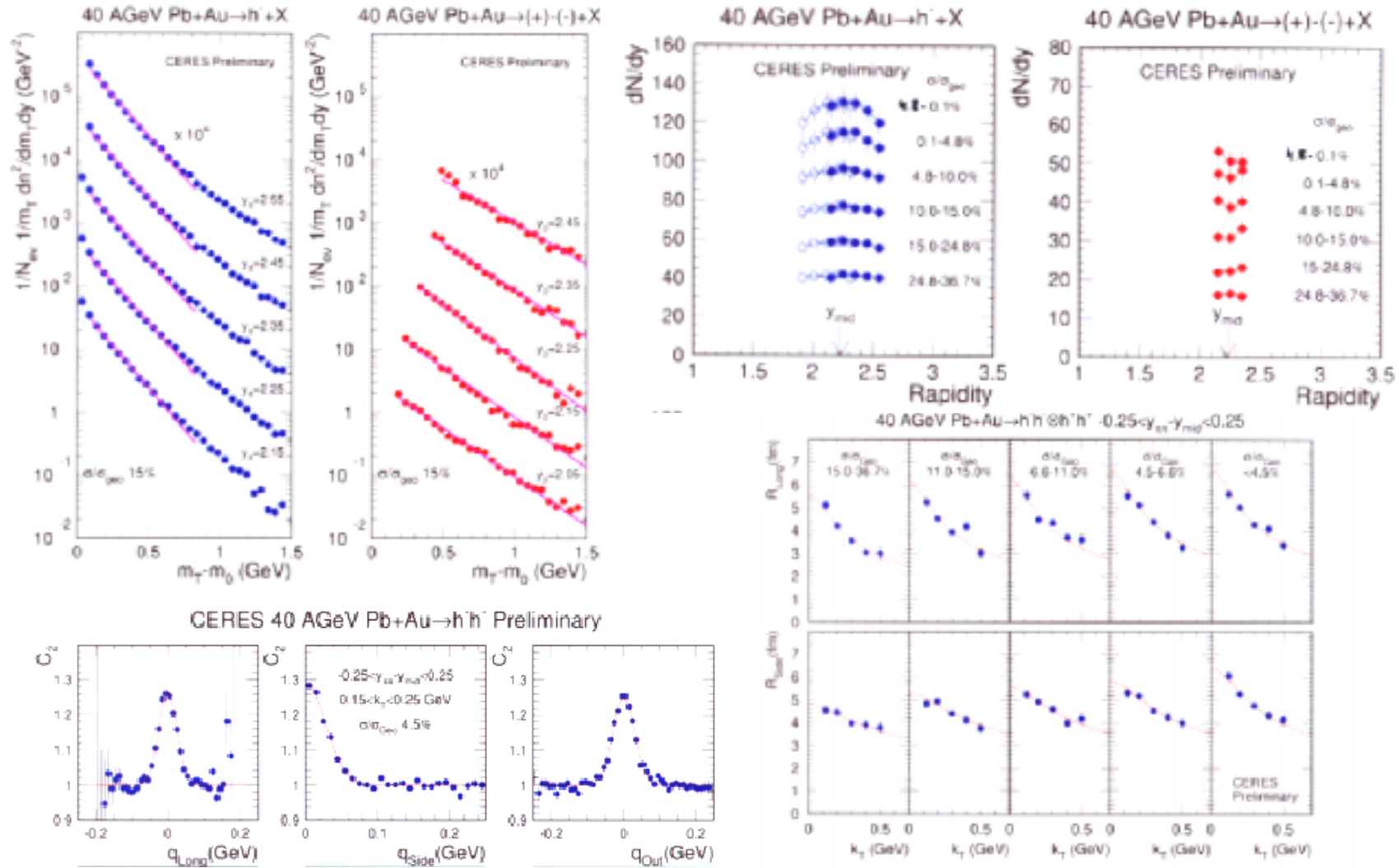


Heavy-Ion beam in JHF is demanded to study; properties of dense nuclear matter, and to link physics between AGS and SPS energies

Update the activities by Shin'Ichi Esumi (Tsukuba)

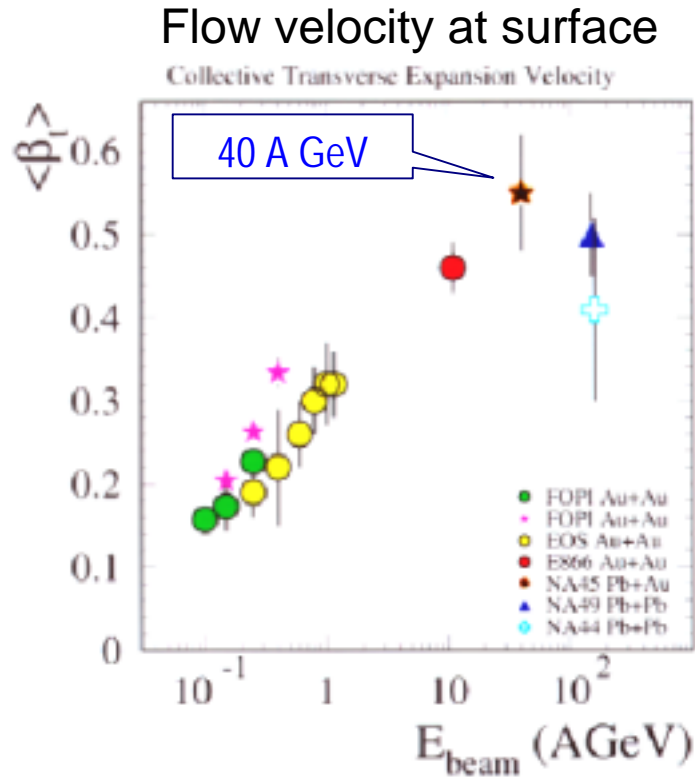
However, the energy gap getting narrower in these days; since the SPS went down to 80 A and 40 A GeV/c, and plans down to 30 A and even 20 A GeV/c.

# What has been studied by hadronic probes?



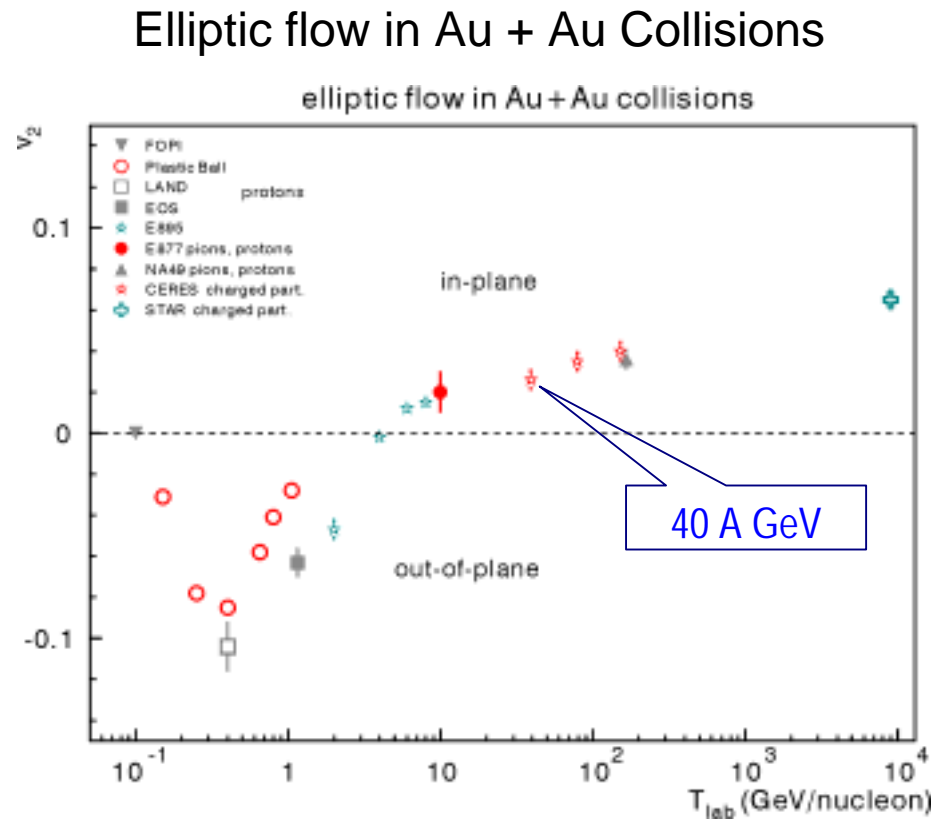
H.Appelhauser for CERES at QM2001

# Flow dynamics of dense nuclear matter at freeze-out



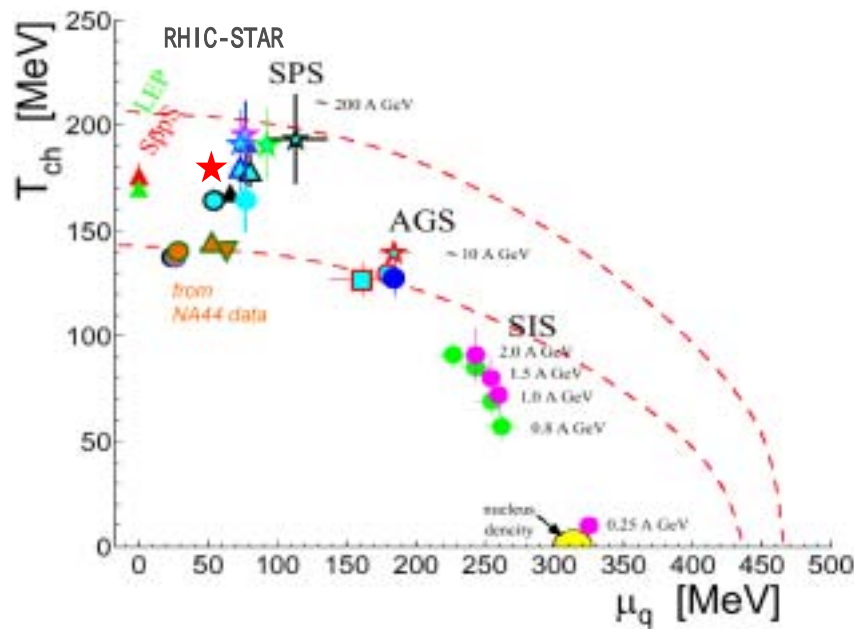
H.Appelshauer for CERES at QM2001

JHF heavy-ion beam may produce the densest nuclear matter.

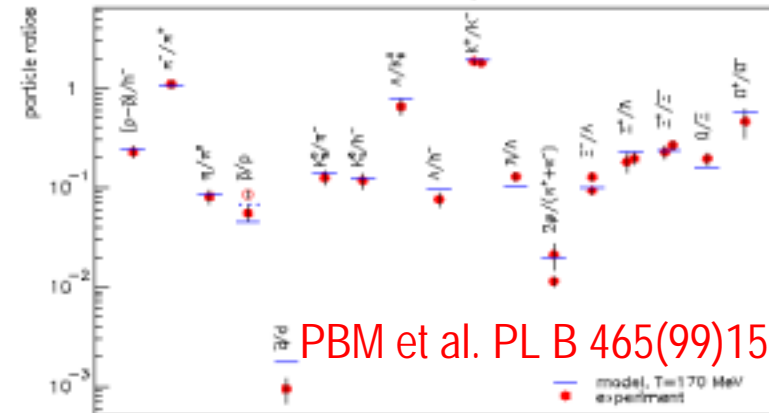


# Chemical properties of nuclear matter at freeze-out

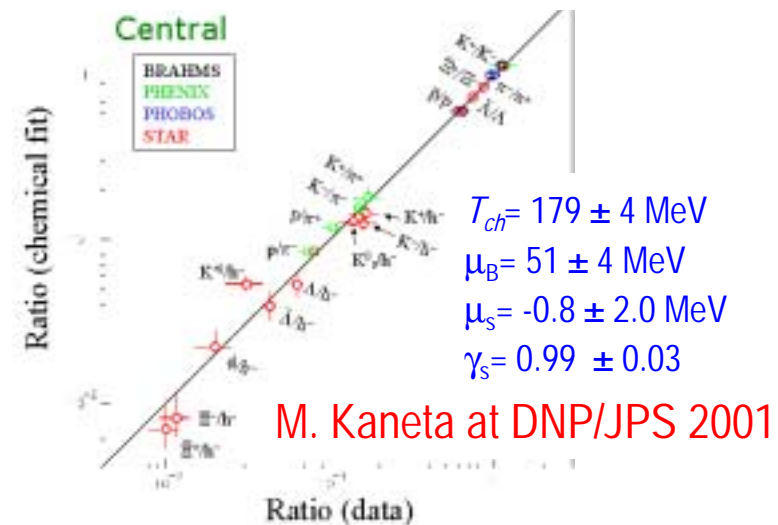
$$\rho = \gamma_s \frac{g}{2\pi^2} \int \frac{p^2 dp}{\exp[(E-\mu)/T_{\text{chemical}}] \pm 1}$$



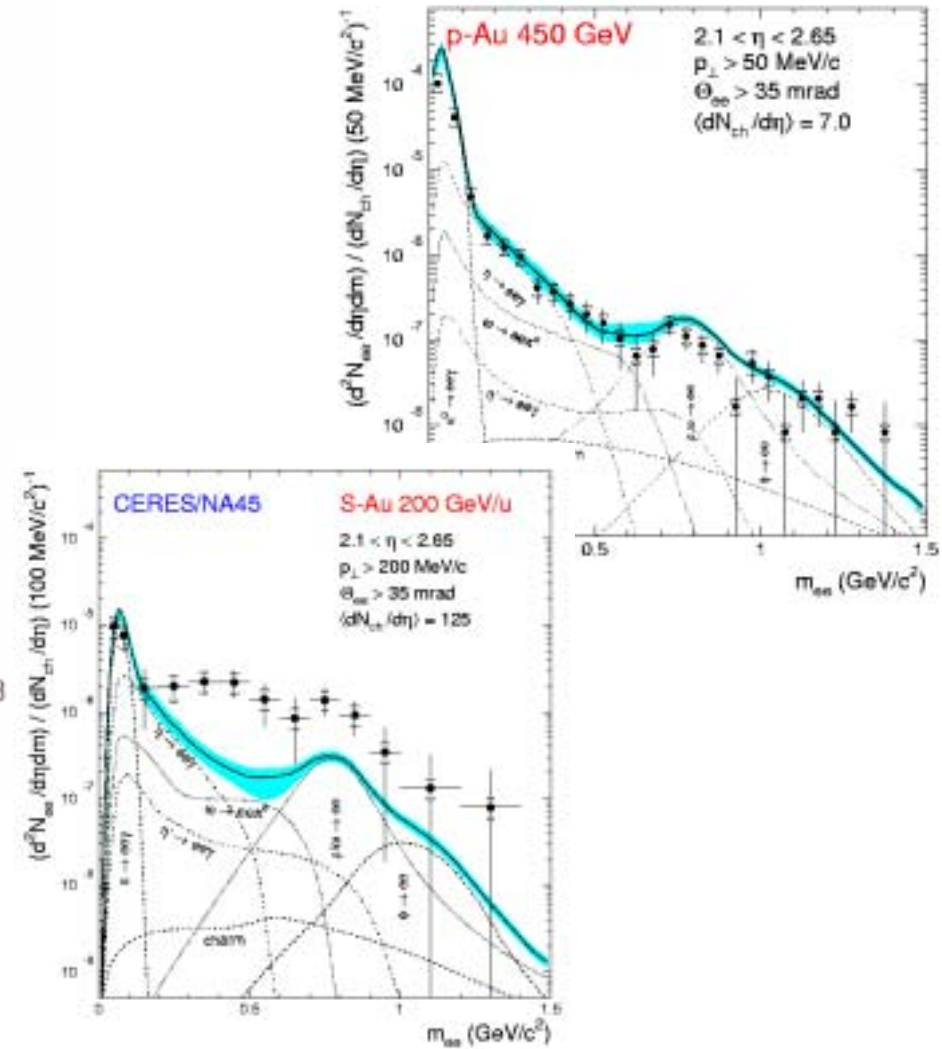
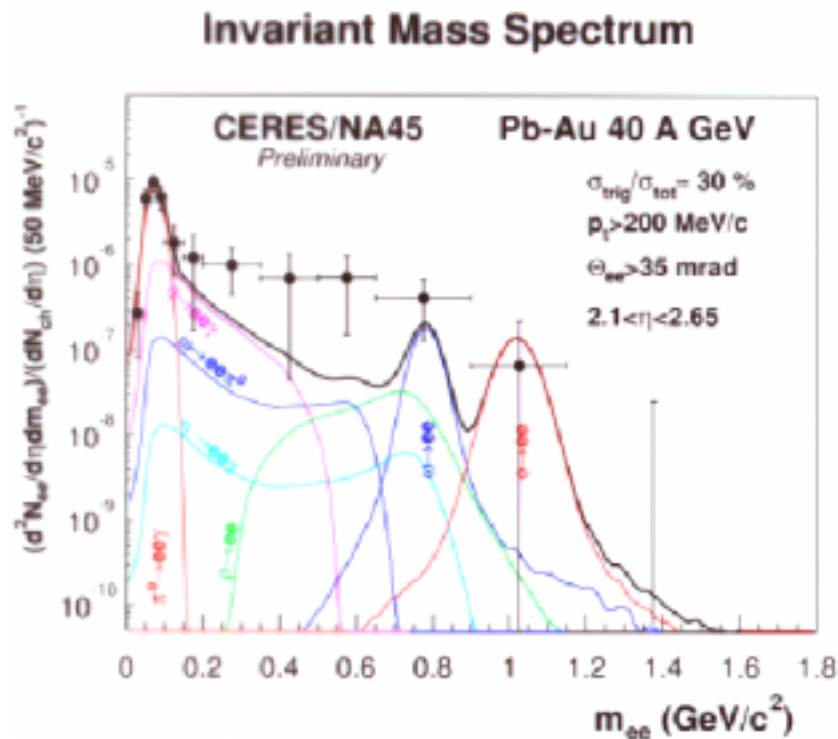
## Chemical fit results at SPS



## Chemical fit results at RHIC



# What has been studied by leptonic probes?



H.Appelshauer for CERES at QM2001

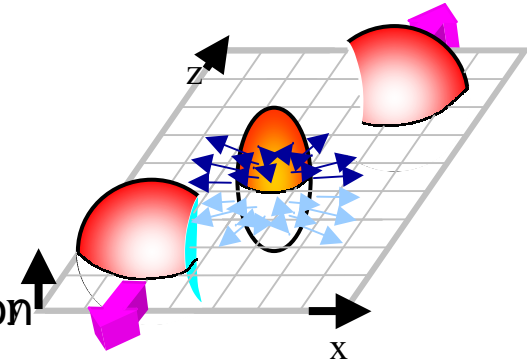
# Physics at the highest baryon density

## Hadronic probe physics (presented by Y.M.)

- Origin of collective force - Flow
- Properties of high dense nuclear matter

## Leptonic probe physics

- Low mass spectroscopy – Onset of mass modification
- Vector meson mass – Chiral symmetry





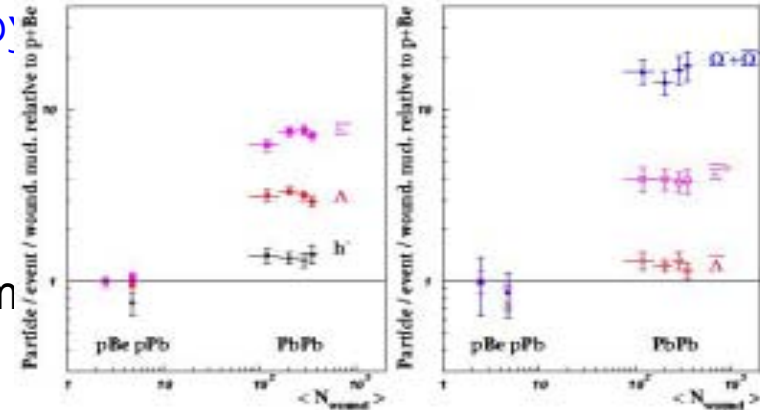
# Physics at the highest baryon density

## Hadronic probe physics (presented by)

- Origin of collective force - Flow
- Properties of high dense nuclear matter

## Leptonic probe physics

- Low mass spectroscopy – Onset of mass  $m$
- Vector meson mass – Chiral symmetry



## Production of multi-strangeness baryons

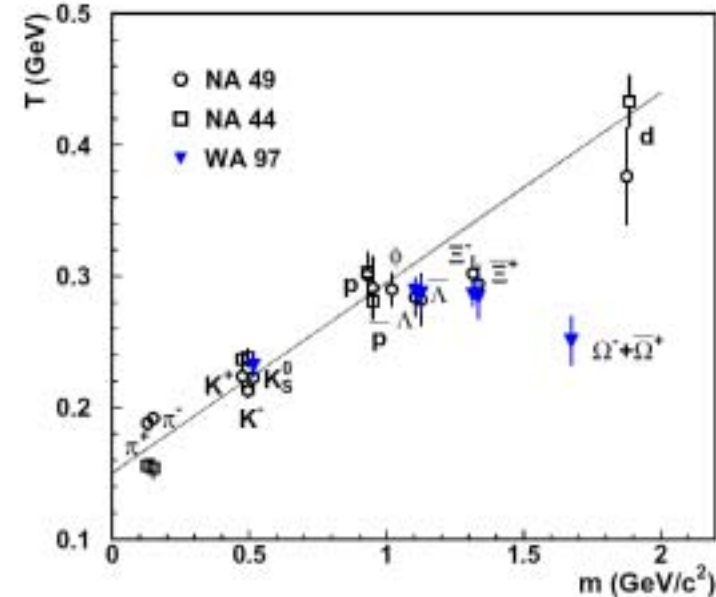
- Onset of strange quark enhancement
- Short-lived strange matter search

## Anti-nucleus production

- Anti-helium production
- Long-lived strange matter search

## Some Exotics (presented in '95)

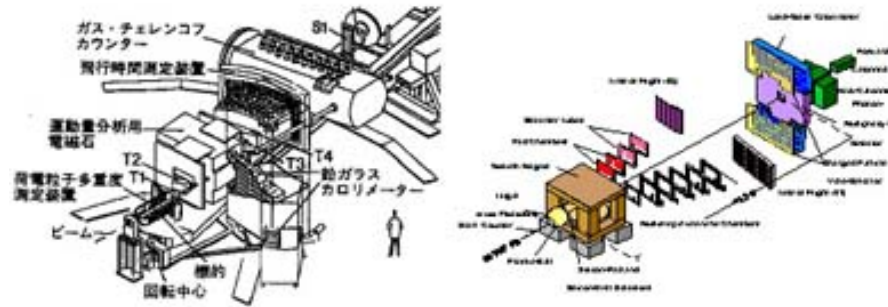
- HBT of direct  $\gamma$ 's
- Mass of unflavored meson  $\eta'(958)$



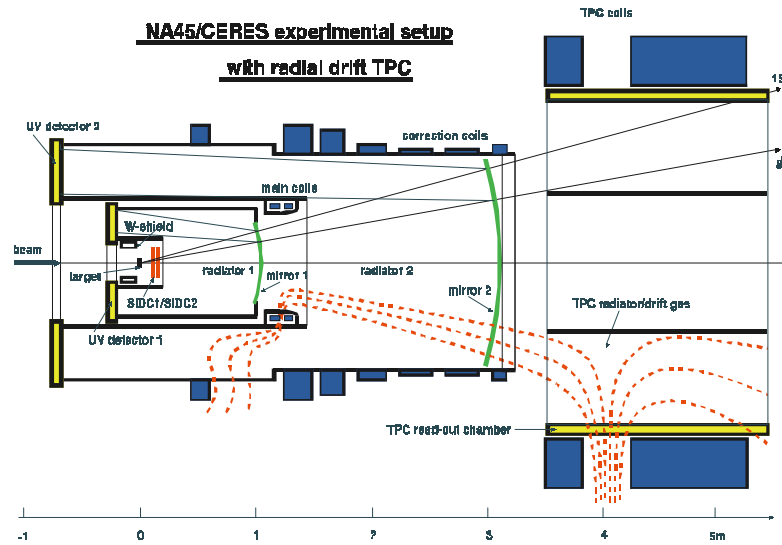
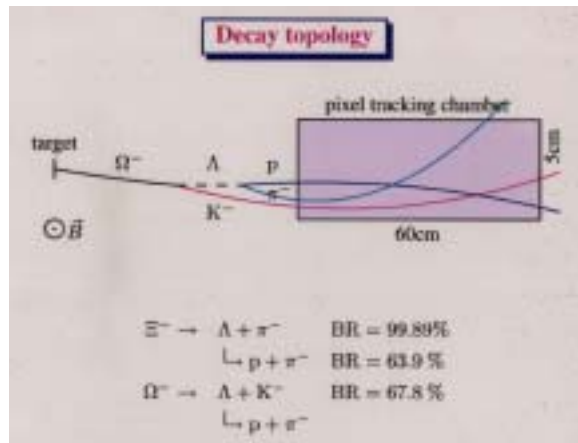


# Plan and R&D issue

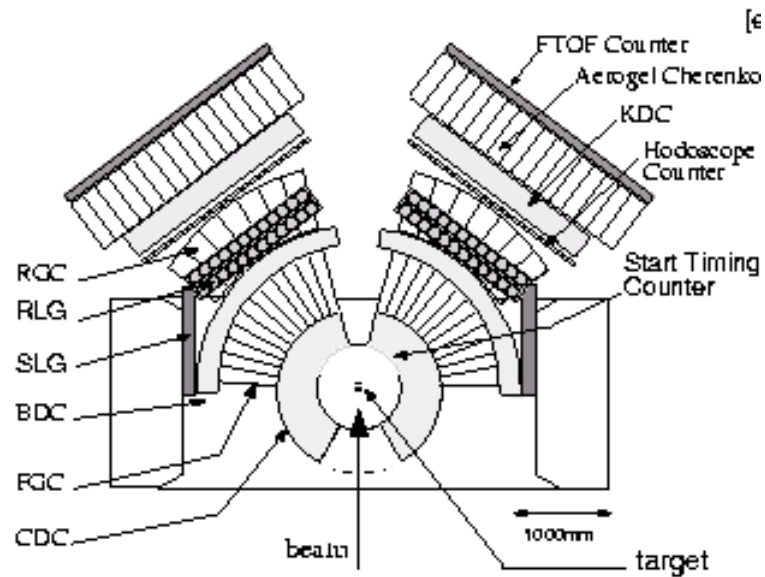
「反応面方位角測定器」+「スペクトロメーター」



# Plan and R&D issue



# Plan and R&D issue



Leptonic and hadronic spectrometer with  
functionality of reaction plane determination

R&D issue:

- Spectrometer design (rapidity coverage)
- Hadron PID and EMcal
- Reaction plane detector (aka plastic ball)