New Results from CERES

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- Experiment
- Electrons at 40 GeV
- Hadrons at 40,80 GeV
- Current activities and plans

Sources of e^+e^- pairs

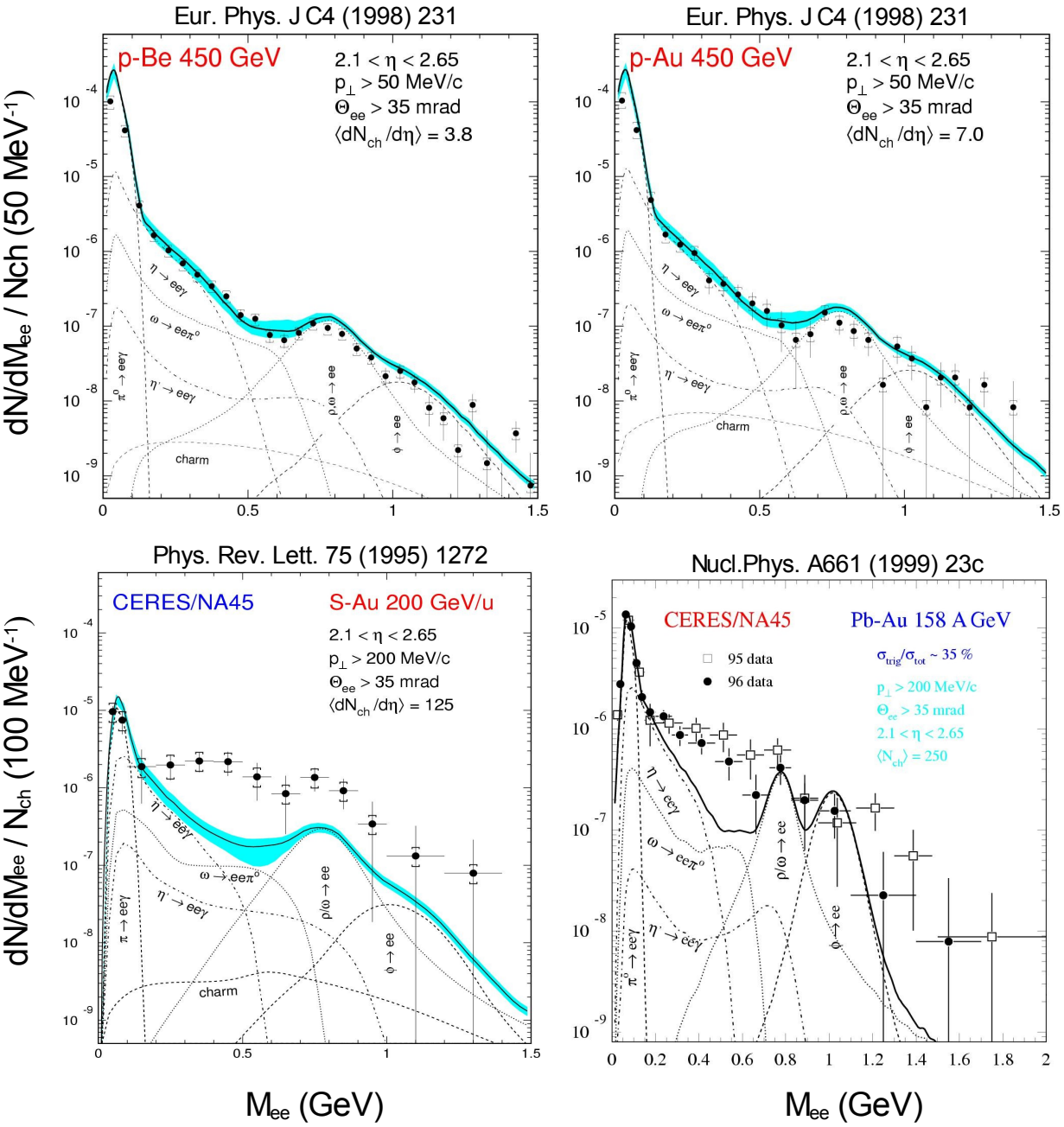
- $qq \rightarrow \gamma^* \rightarrow e^+e^-$ Drell-Yan
- $qg \rightarrow q\gamma^* \rightarrow qe^+e^-$
- $qqbar \rightarrow g\gamma^* \rightarrow ge^+e^-$

- $\rho,\omega,\varphi,\psi,Y \rightarrow e^+e^-$ vector meson decay
- $\pi\pi \rightarrow e^+e^-$ pion annihilation
- $qqbar \rightarrow \gamma^* \rightarrow e^+e^-$ QGP thermal radiation

- $\pi^o,\eta,\eta' \rightarrow e^+e^-\gamma$ Dalitz decay
  $\omega \rightarrow e^+e^-\pi^o$
- $D \rightarrow e^+X$ open charm production
  $Dbar \rightarrow e^-X$ and semileptonic decay

- $\gamma X \rightarrow e^+e^-X$ pair conversion

CERES results 92-96



→ excess of e^+e^- pairs in heavy ion collisions

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GENESIS

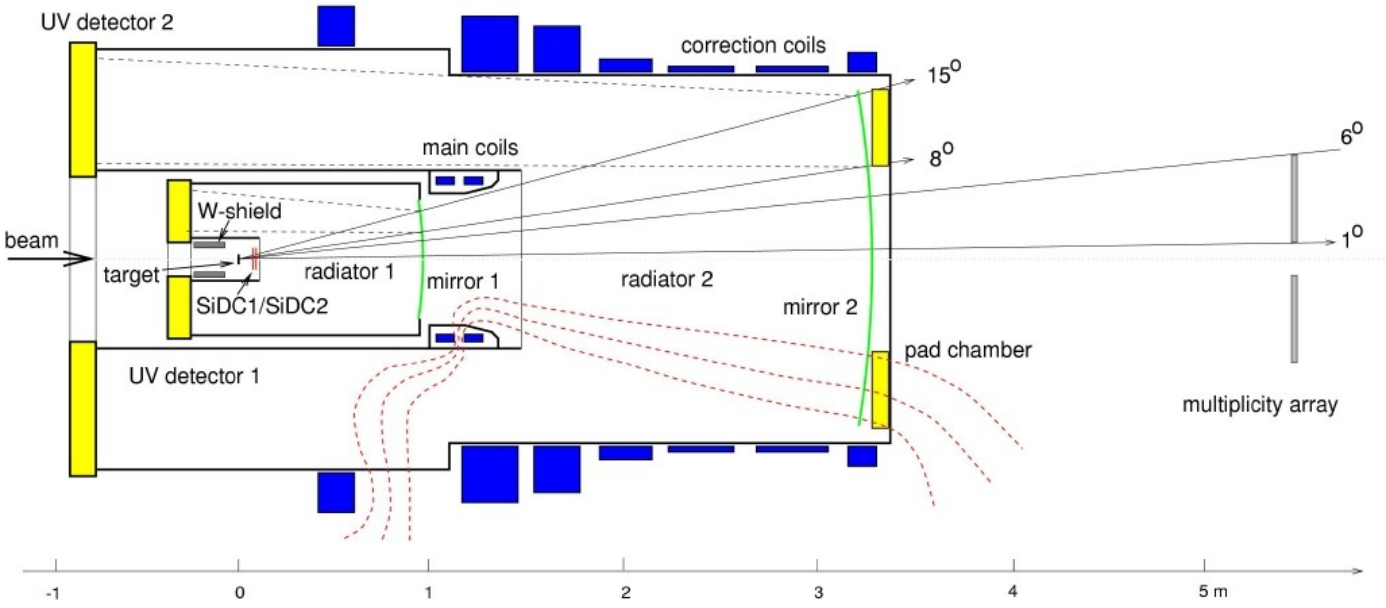
particle	relative abundance	decays
π^o	1.0	$\pi^o \rightarrow \gamma e^+e^-$
η	0.053	$\eta \rightarrow \gamma e^+e^-$
η'	0.009	$\eta' \rightarrow \gamma e^+e^-$
φ	0.0033	$\varphi \rightarrow e^+e^-$
ρ	0.065	$\rho \rightarrow e^+e^-$
ω	0.065	$\omega \rightarrow e^+e^-$ $\omega \rightarrow \gamma e^+e^-$

$$dN/dy \sim \cosh^{-2}[0.75/\sigma(y-yo)]$$
$$dN/dp_t \sim Ae^{-Bm_t} + C(1-0.0682\ m_t)^{7.9}/(1+m_t^2)^4$$

CERES run history

1990	installation	
1991	completed	
1992	200 GeV S+Au	4M central 3M pairs
1993	450 GeV p+Be 450 GeV p+Au	10M pairs 3M pairs
1995	160 GeV Pb+Au	10M central
1996	160 GeV Pb+Au	50M central
1997	TPC construction	
1998	TPC installation	
1999	40 GeV Pb+Au	10M central
2000	80 GeV Pb+Au 160 GeV Pb+Au	1M central 30M central

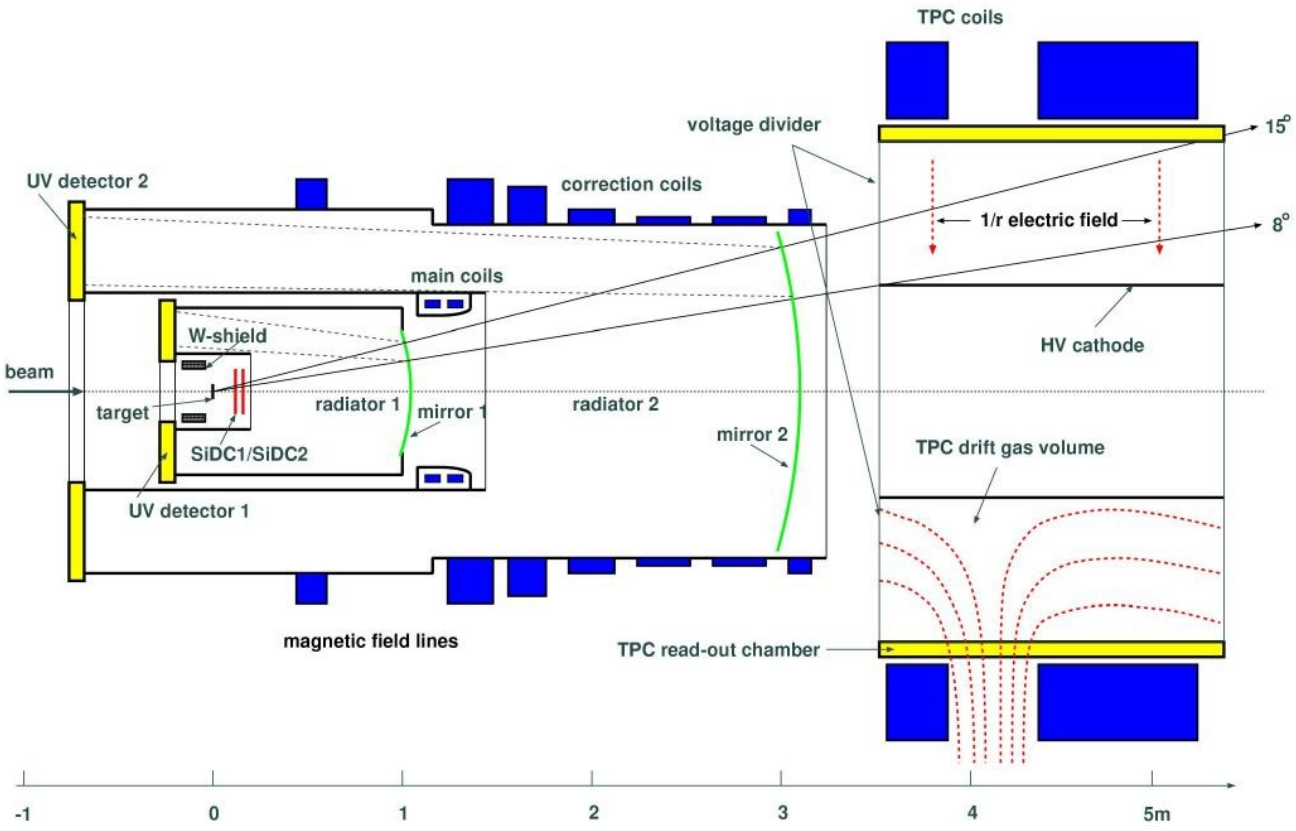
CERES setup in 1996



- cylindrical symmetry, $2.1<\eta<2.7$
- radial magnetic field, parallel to trajs. in RICH2
- UV detectors upstream of target
- gamma conversion minimized

- SD1,SD2 (charged particles) vertex, centrality, close pair rej.
- RICH1,RICH2 (electrons) PID, momentum determination
- PADC (charged particles) tracking

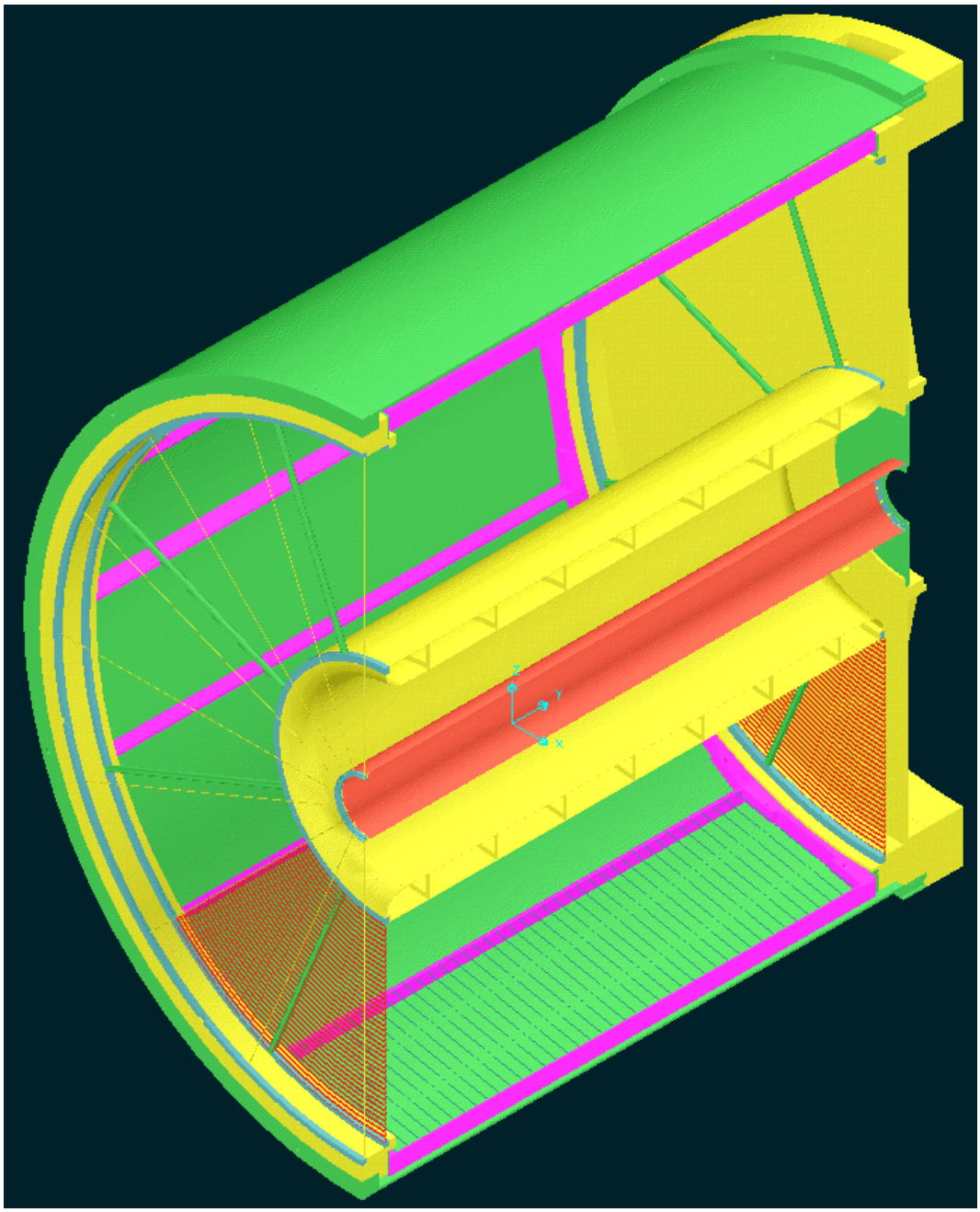
CERES setup 1999-2000



SD's: angle	RICH's: electron PID	TPC: momentum, dE/dx

- better mass resolution (2% at ω mass)
- better electron PID
- hadron measurement

CERES TPC



- cylinder Φ 2.6 m x 2 m
- gas Ne:CO_2 (80:20)
- radial E-field E_R~1/r with E=200-600 V/cm
- radial drift with v=0.7-2.4 cm/μs

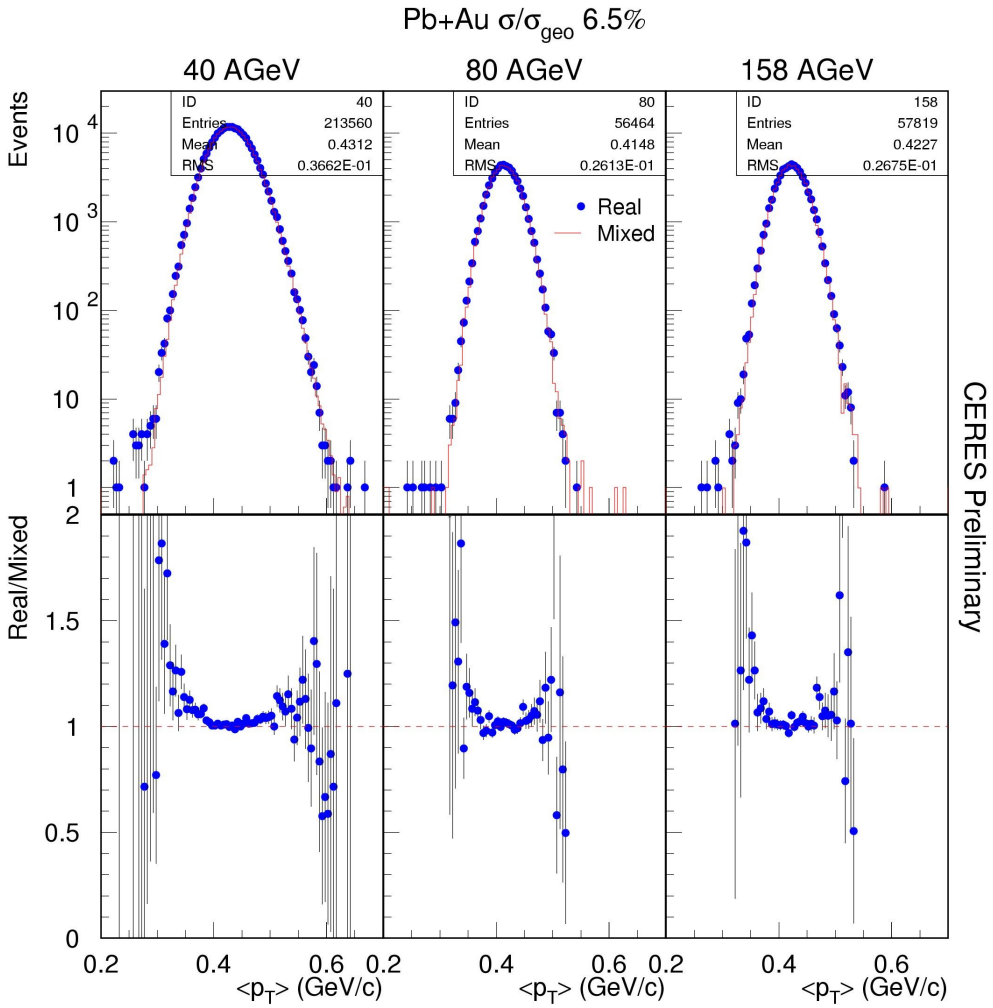
CERES 1999-2000 Pb+Au results

- 40 GeV e^+e^-
- 40 GeV h^- spectra
- 40 GeV h^+– h^- spectra
- 40 GeV h^-h^- HBT
- 40,80,160 GeV elliptic flow
- 40,80,160 GeV pt fluctuations
- 160 GeV high pt pion correlations

shown in QM2001 by Harry Appelshäuser

- 40 GeV λ
- 80 GeV h^-h^- HBT

Event by event mean pt



→ Non-zero event-by-event fluctuations

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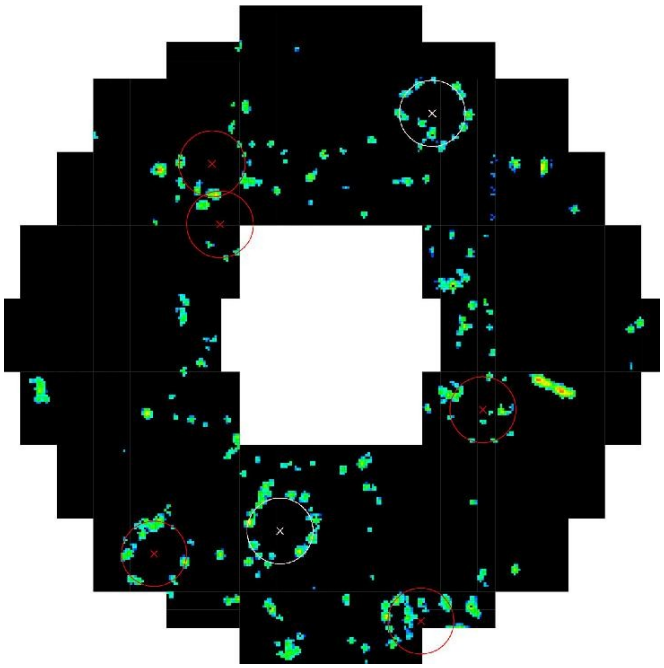
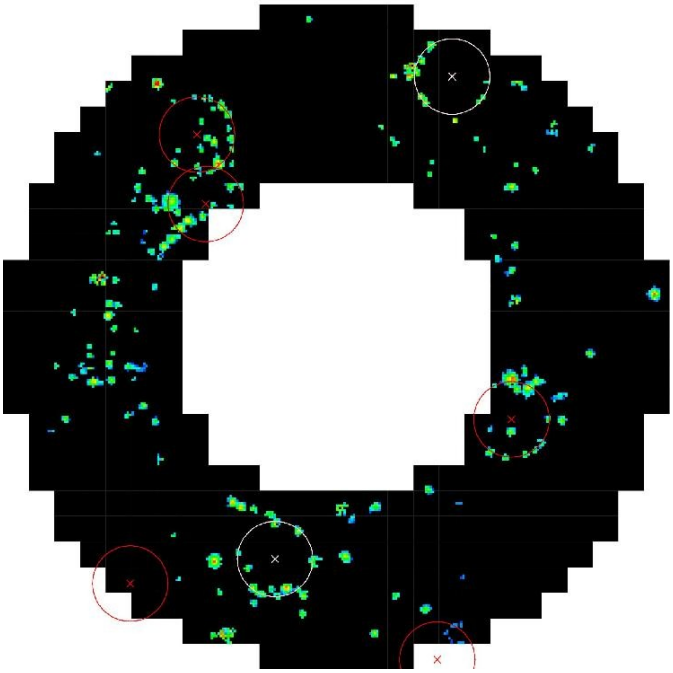
e^+e^- pairs from Pb+Au at 40 GeV/nucleon

Event in RICH



RICH 1

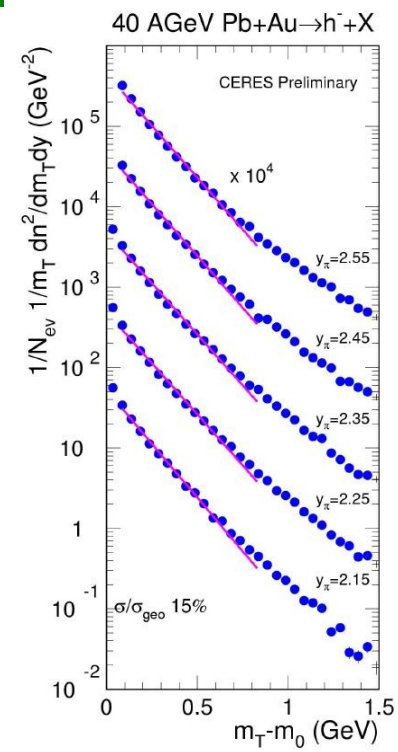


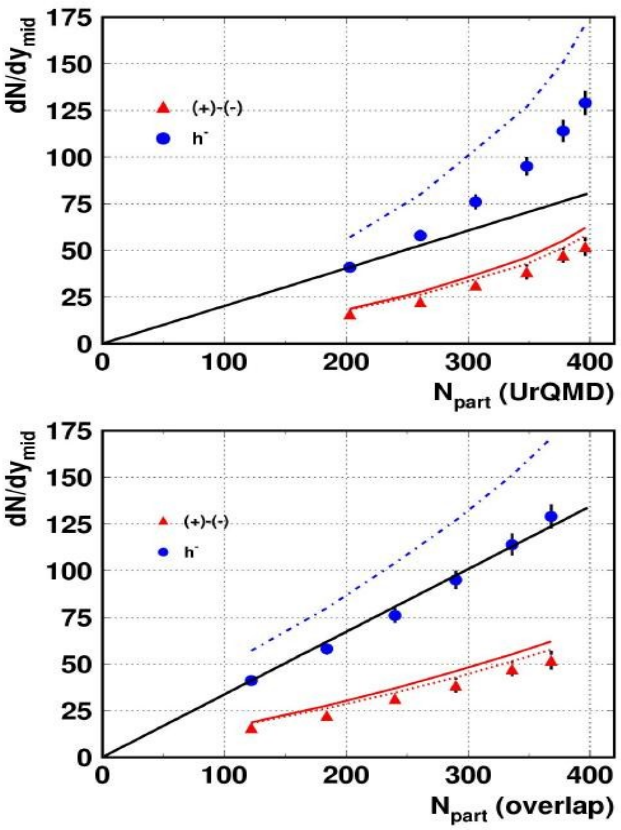
RICH 2

Hadrons from Pb+Au at 40 and 80 GeV/nucleon

40 GeV h^- spectra

Harry Appelshäuser





VERY PRELIMINARY

http://www.gsi.de/~misko/overlap

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Nuclear overlap via web

http://www.gsi.de/~misko/overlap

Web interface for a nuclear overlap calculation code

This nuclear overlap code will calculate the number of participants and the number of binary collisions in an nucleus-nucleus collision via the mass distribution within the two colliding nuclei. Please enter the input parameters below.

A: 208 (mass number of the projectile nucleus)

B: 208 (mass number of the target nucleus)

Which density profile do you want?

- sharp sphere
- Woods-Saxon

sigma: 42 (inelastic NN cross section in mb, recomended values are 30 for 10-200 GeV LAB, 37, 41, 42, 60 for s=56, 130, 200, 5500 GeV, respectively)

Statistics: 1000 (number of trials per integral, 1000 is good for a quick test)

Submit

A lead lead collision calculation takes typically 10 seconds per thousand trials.

Web interface by Jens Elgeti

Average number of participants and collisions

from: b= 0 fm or 0 centrality

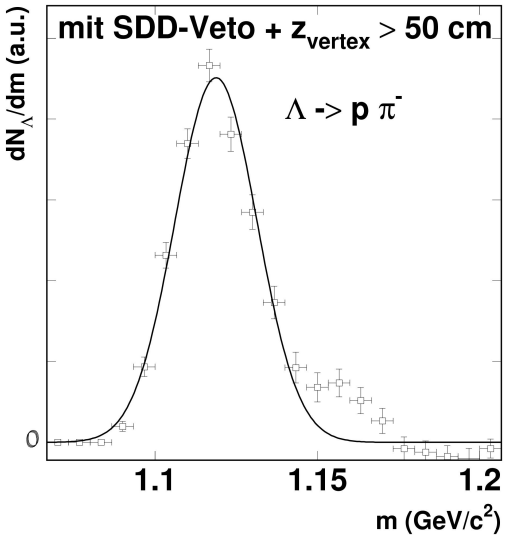
to: b= 4.8 fm or .10266 centrality

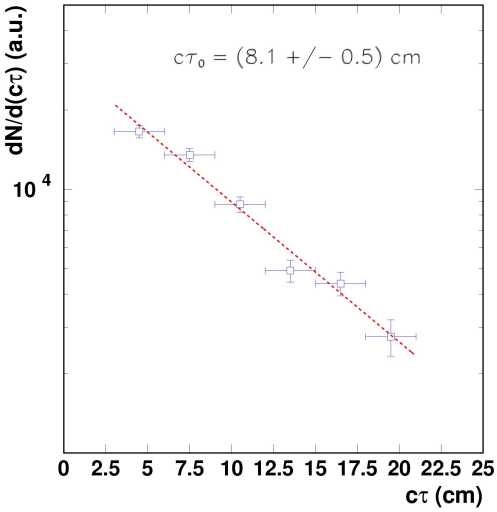
calculate

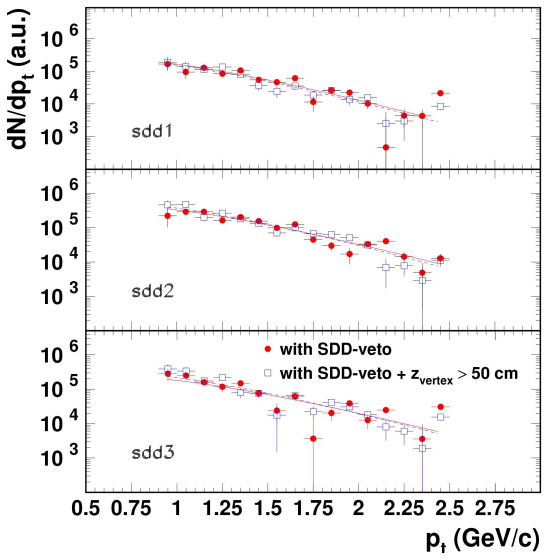
Number of participants: 324.4

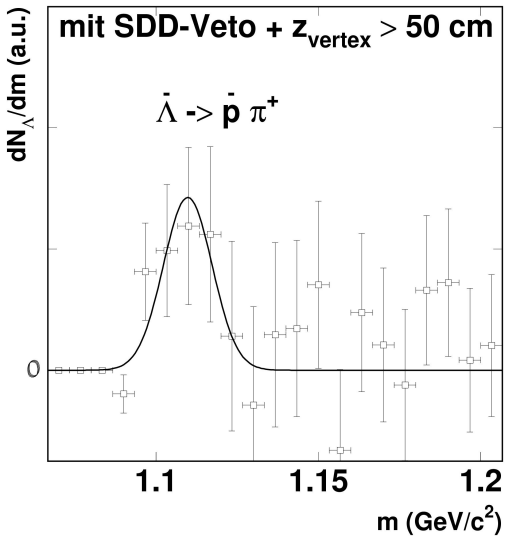
Number of collisions: 748.8

λ Production at 40 GeV









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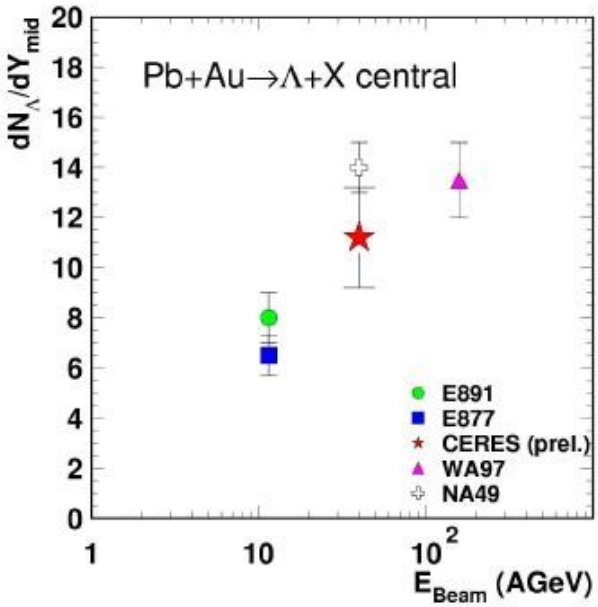
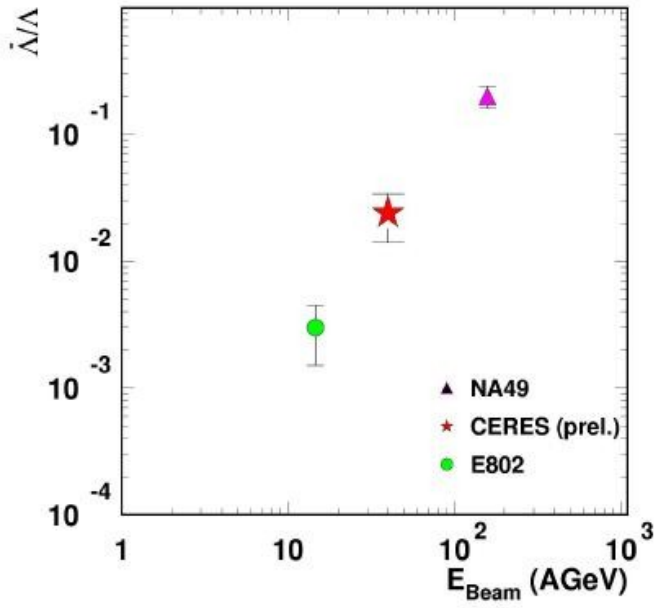
λ Production at 40 GeV





→ λ and anti-λ yields fit into the beam energy systematics

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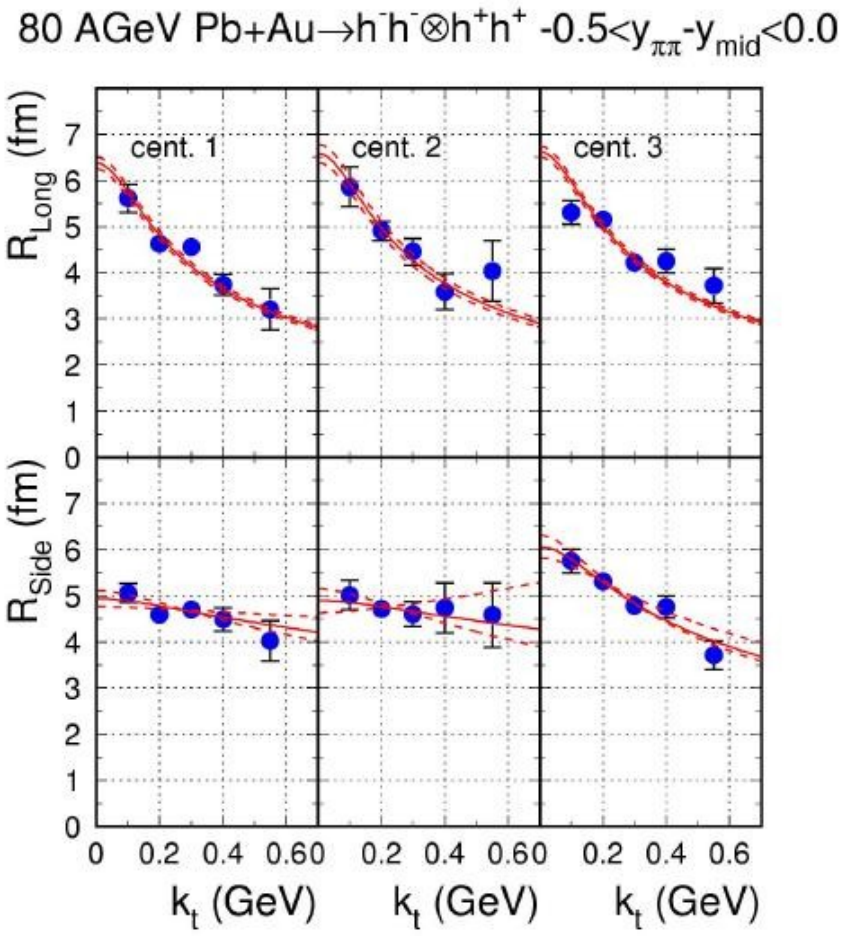
HBT in Pb+Au at 80 GeV

Harry Appelshäuser

VERY PRELIMINARY



$R_{Long}(k_t) = {}_o(T/m_t)^{1/2}$ → ${}_o$ = 7 fm/c

$R_{Side}^2(k_t) = R_{geo}^2/(1+m_t \beta_T^2/T)$ → β_T = 0.22-0.55

→ R_{geo} = 5-8 fm

→ similar to 40 GeV

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HBT in Pb+Au at 80 GeV

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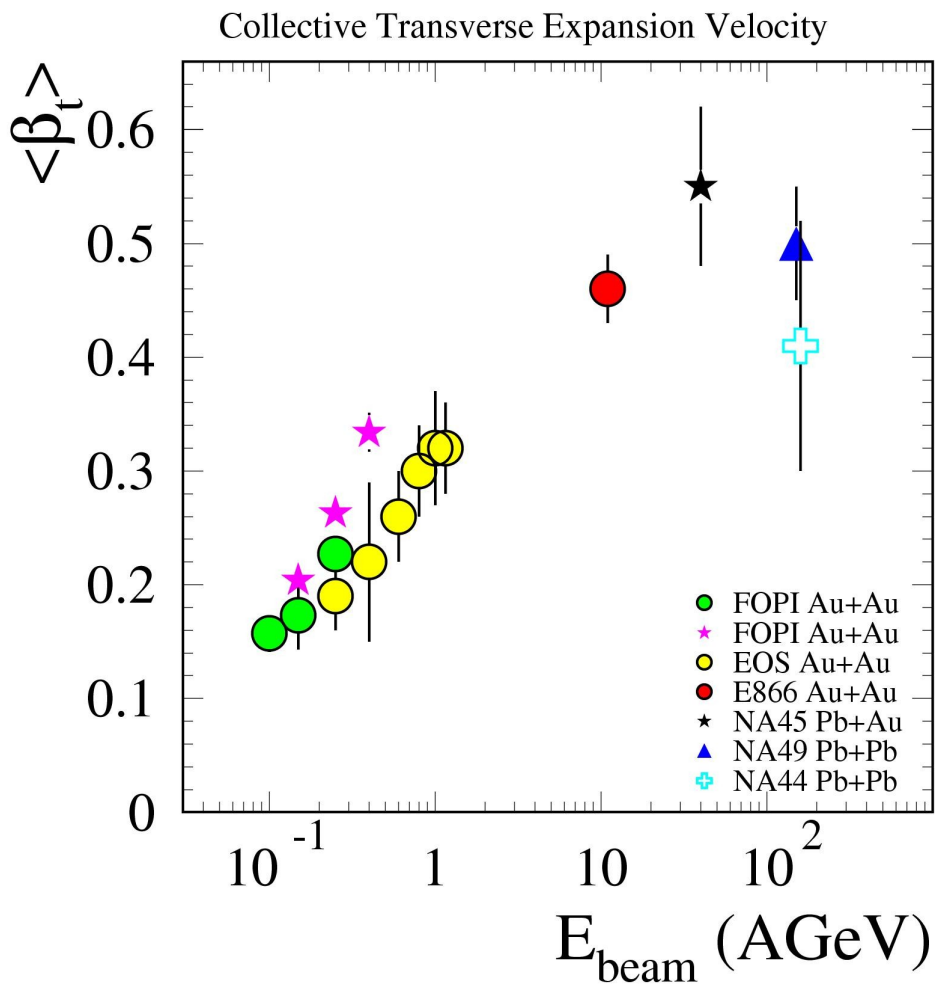

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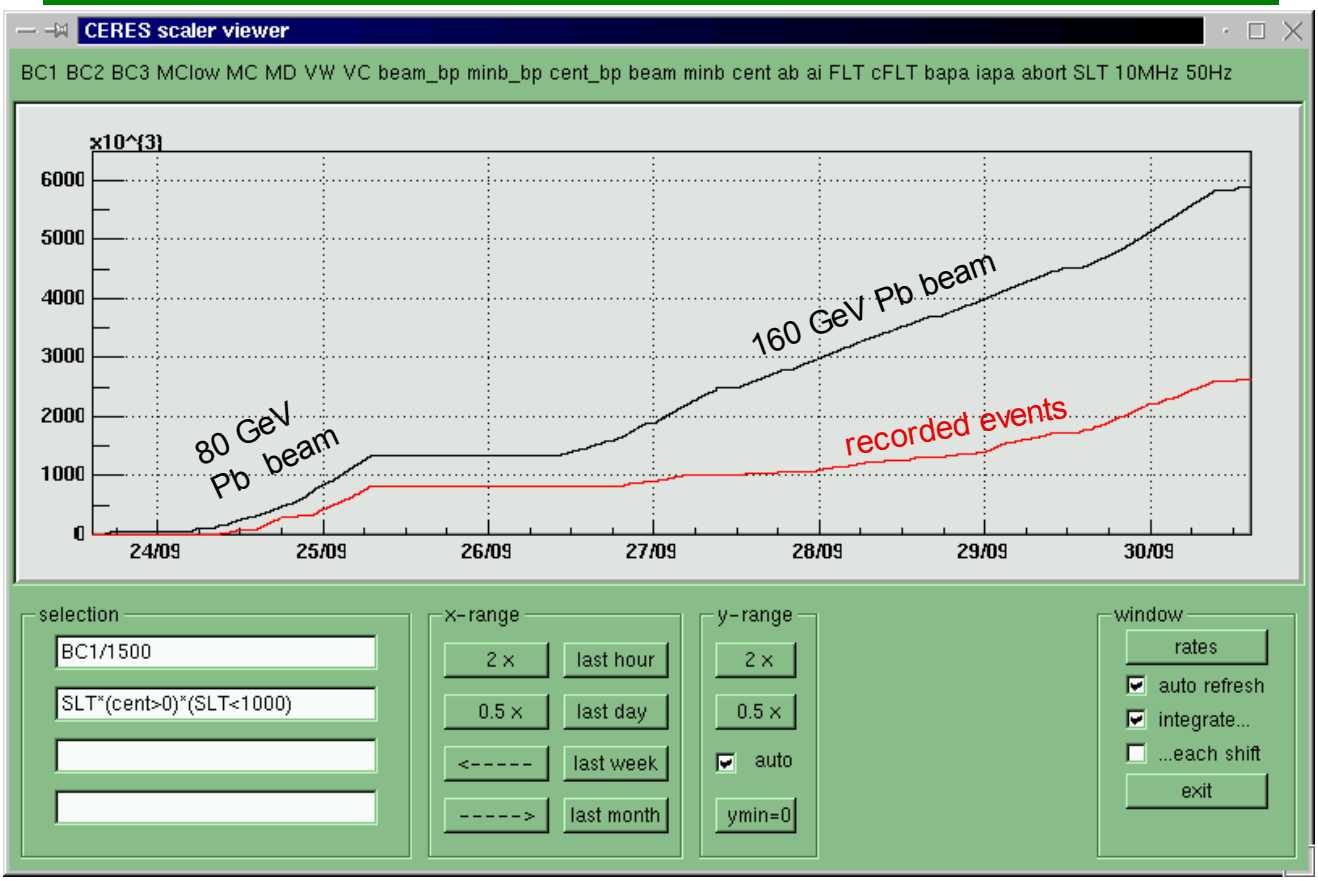
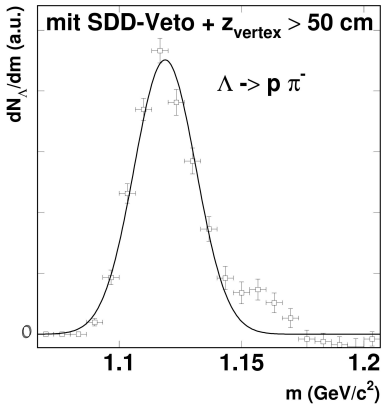
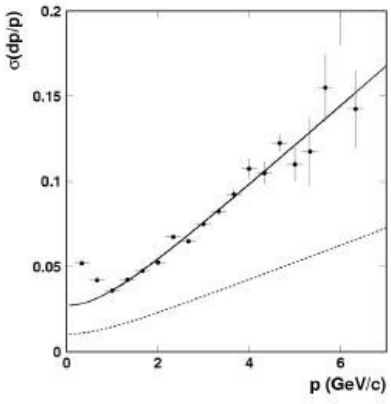
80 GeV/nucleon “run”



Current activities

λ at 40 GeV





λ peak too wide
→ Δp too high
→
better calibr-
ation needed

calibration of 2000 data

- TPC detailed calculation of E-field
- TPC detailed calculation of B-field
- TPC new hit finding algorithm
- TPC improved tracking algorithm
- RICH event by event monitoring
- SD careful drift velocity calibration
- new 3-d event display

Summary and outlook

- 40 GeV results close to final (dileptons, hadron spectra, λ)
- preliminary results for 80 GeV (hadrons)

- systematic calibration of the TPC to reach the design Δp in the 2000 data (160 GeV)
  results expected for QM2002

- 20,30 GeV run in 2002 under consideration