A Dependence of the (pi+,pi+pi+-) Reaction near the 2mpi Threshold

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Intro.

2H,12C,40Ca,208Pb(pi+,pi+pi+-)反応をTpi+=282.7MeVにてしらべ、2mpi閾値付近までのMpi+pi+-分布を測定した。A=2に対しては、閾値付近での収量はほとんどゼロであったが、Aと共に急激に増加した。Phase analysisによると、pi+pi-のペアはJ=I=0から来ていることが分かった。Pi+pi-に関しては，閾値付近でAに依存してJ=0,I=2に対するわずかな増加が見られた。実験の結果はpi-piの相互作用がJ=I=0チャンネルにおいて大きな原子核効果を受けることが示唆している。

CHAOS Experiment

- TRIUMF M11 beam line
- 5X10^6 particles /s
- Beam monitor
  - Plastic scintillator
    - Four strips
    - T0 for drift chamber and PID telescope.
- Tracking
  - Four rings of cylindrical wire chambers
    - Inner two
      - Fast proportional wire chambers
      - Three in the dipole field of 0.5T
      - Two narrow sections directly traversed by the beam were switched off

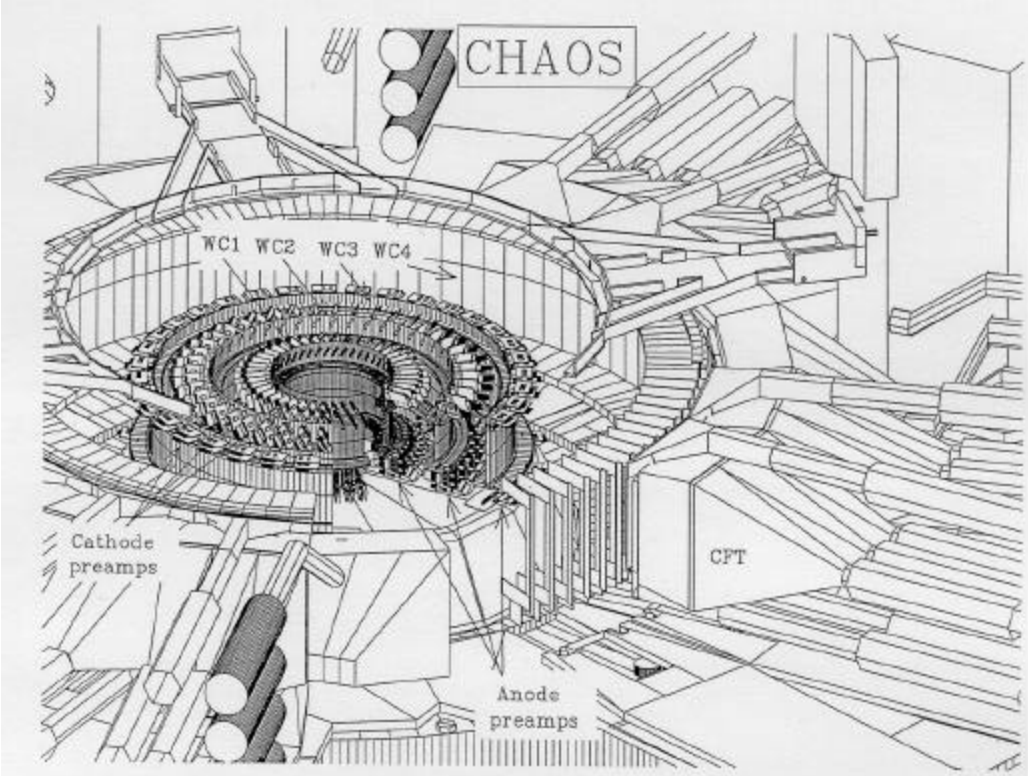

Fig. 1. Details of the central region of the CHAOS detector. The detector array is actually completely cylindrical; in this figure parts of each detector component are cut away for clarity. The individual components are discussed in the text.

CHOAS experiment

- PID telescope
  - 20 telescopes
  - 71cm from bertex
  - 3.2mm thickness first scintillator
  - Two were removed fo incident and outgoing beam.
  - NE110.
  - SF5 lead glass(5x0)

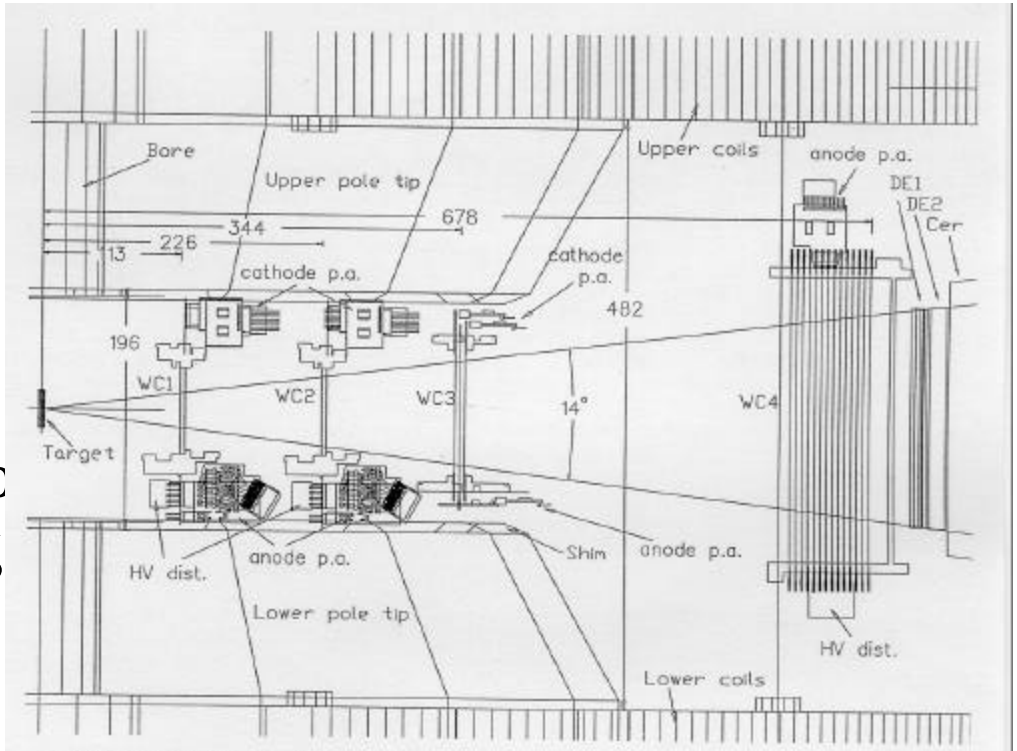

Fig. 2. This side view shows a section of all detector elements to illustrate the geometry and construction of the wire chambers. Units are in mm.

Particle ID

- by Delta-E and momentum.
  - Delta-E is determined by combining the energy released in the tree elements of a telescope.
  - PID efficiency was about 98%
  - >55MeV/c for pi
  - >185MeV/c for protons
- Trigger
  - First level
    - In-beam counter & two PID telescopes
  - Second level rejects
    - Missing wire chamber hits
    - Events not originating from the target region
    - BG by momentum sum
  - 97% after 1st trigger were rejected at 2nd trigger
- Momentum resolution
  - 2% = dp/p
  - 92% efficiency

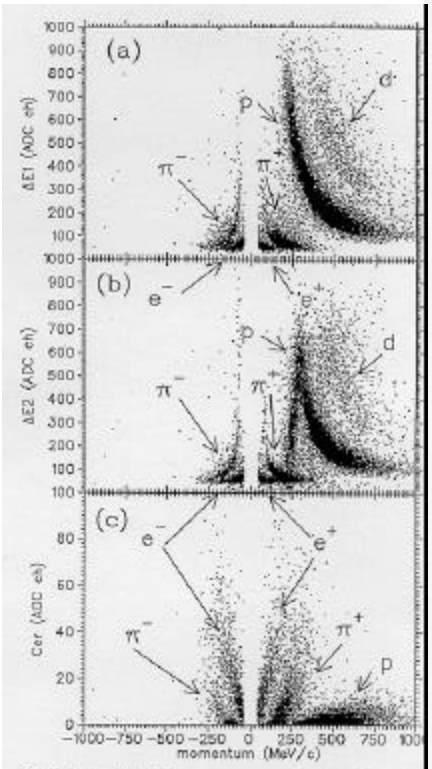

Fig. 5. A scatterplot of the momentum versus the pulse height in the ΔE_1 scintillation counter (a), ΔE_2 scintillation counter (b), or lead–glass Cherenkov counter (c) is shown to indicate the methods used to mainly identify pions, protons, and electrons/positrons.

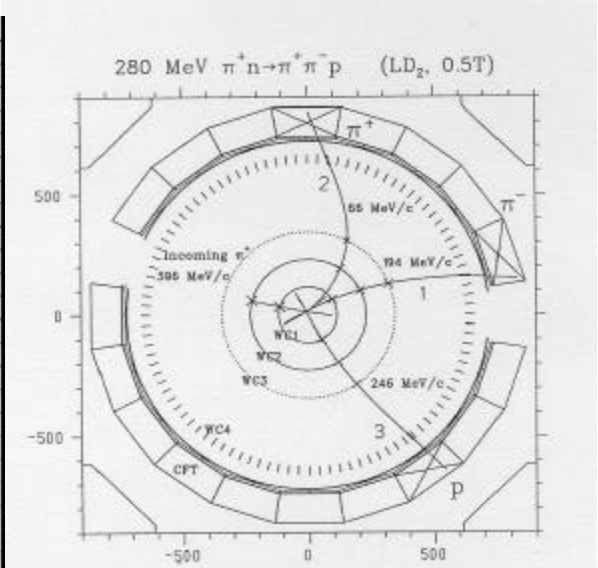

Fig. 4. A typical event recorded by the spectrometer. The axes are in mm. Struck anodes are indicated by a cross, as are the CFT blocks which contained signals for this event. The innermost two circles correspond to the 720 anodes per chamber of WC1 and WC2. The dotted circle represents the 144 anodes of WC3. The 100 radial line segments near an average radius of 640 mm correspond to the 100 cells of WC4, each of which has eight drift anodes. Outside WC4 are the 18 CFT blocks, each 18° wide and comprised of a 3 mm scintillator (ΔE_1), followed by a 13 mm scintillator (ΔE_2), followed by a 120 mm lead–glass Cherenkov detector. One CFT block is removed on the left (right) of the figure to let the incident beam into (out of) the spectrometer. The drift chambers (WC3 and WC4) are deadened in these regions as well.

Analysis

- Correction : GEANT Monte Carlo
  - Error includes statistical uncertainty of GEANT weight
  - The both of pi+pi+ and pi+pi- have same aceptance
  - Only the targets were change during the exp.
  - The comparison of both invariant mass for pi+pi+, pi+pi- indicates the minimum systematic error