Contribution ID: **10** Type: **Presentazione 12 minuti**

Multi-strange baryon production at mid-rapidity in Pb-Pb collisions at √sNN = 2.76 TeV with ALICE

Thursday, 12 April 2012 09:17 (10 minutes)

ALICE è un esperimento progettato per misurare le proprietà della materia fortemente interagente creata in collisioni tra ioni pesanti ad LHC. A partire dal 2010, l'esperimento ha raccolto dati da collisioni con energia nel centro di massa per coppia di nucleoni pari a 2.76 TeV, con un fattore 14 maggiore rispetto ai precedenti studi realizzati presso RHIC.
La misura di produzione di particelle con stranezza multipla è uno strumento fondamentale per studiare la materia in condizioni estreme di temperatura e densità di energia, creata nelle collisioni ultra-relativistiche tra nuclei: in particolare, una delle prime storiche segnature dell'avvenuta formazione di uno stato deconfinato è stata l'incremento nella produzione di particelle con contenuto di stranezza, ed in particolare gli anti-barioni a stranezza multipla, in tali collisioni rispetto a quanto misurato in interazioni adroniche ordinarie.
In questo contributo sono mostrati gli spettri in impulso trasverso, nella regione centrale di rapidità, dei barioni carichi Ξ e Ω nell'intero intervallo di centralità 0-90% così come in quattro sotto classi di centralità. Gli incrementi di stranezza rispetto a collisioni pp alla stessa energia nel centro di massa sono stati studiati in funzione del numero medio di nucleoni partecipanti. I risultati sono confrontati con quelli ottenuti nelle corrispondenti misure realizzate alle energie di SPS e RHIC.

Inserire un breve CV (solo per dottorandi che richiedono un contributo spese)

- Education -
  [2011-today]
  Ph. D. student in Experimental Physics, Department of Physics, Università degli Studi di Bari, Italy
  "Study of multi-strange baryon production in p-p and PbPb collisions with ALICE at the LHC"
  [2005-2010]
  Master's degree in Nuclear and Particles Physics, Department of Physics, Università degli Studi di Bari, Italy (110/110 with honors)
  "Coalescence of light nuclei at the LHC and their identification with ALICE"
  [2001-2005]
  Bachelor's degree in Physics, Department of Physics, Università degli Studi di Bari, Italy (99/110)
  "Signal shape techniques for γ-Neutron discrimination"
- Current research activity -
  My current research activity is being carried out within the "Soft Physics Working Group (PWG2)" (today become "Light Flavours PWG") of the ALICE Collaboration and is mainly devoted to the study of multi-strange baryon production in PbPb collisions at the LHC energies.
  Baryons with two or three units of strangeness (Ξ−, Ξ+, Ω− and Ω+, known also as "cascades") are identified by a topological method, looking for their weak decay products originating from secondary vertices well separated from the main interaction vertex. This is allowed by the excellent performance of the main tracking detectors in the ALICE's central barrel, the Time Projection Chamber (TPC) and the Inner Tracking System (ITS), in the challenging environment of the most central (head-on) PbPb collisions.
  As a first step of the analysis, I had to check the initial reconstruction where cascade candidates are selected using quite broad cuts and stored in the Event Summary Data (EDS) files: those loose cuts had

to be tighten with respect to the corresponding ones previously used for p-p collisions due to the much larger amount of tracks and combinations available in PbPb.
After this step, a total of about 20 M events with cascade candidates were selected for the final analysis: on this sample I had work out a set of tuned topological and kinematic cuts to enhance the signal-over-background ratio and allow a proper signal extraction. This tuning procedure has been guided and validated by a Quality Assurance (QA) procedure based on detailed comparison (for each of the topological variable used in the cuts) between data and Monte Carlo (MC), for both signal and background regions in the invariant mass spectra.
The next step was the signal extraction procedure. It is based on a fitting procedure on the cascade invariant mass spectra, made in transverse momentum (pt) and centrality bins, which uses a gaussian and a second order polynomial function for signal and background description respectively: this allowed to measure the first raw (uncorrected) pt spectra up to 10 (8) GeV/c and 8 (6) GeV/c for Ξ (Ω) in the 0-90% and 0-20% centrality respectively. These spectra were first shown by the ALICE Collaboration at the Quark Matter 2011 Conference in the last May.
Another relevant chapter of my analysis work in the past months concerned the computation of the efficiency and acceptance corrections for each cascade type. As usual, this is basically done using events from a MC generator, fully propagated through the detector by the transport code (GEANT3) and treated with the same analysis method used for the real data. A special trick had to be implemented for this particular analysis, due to the low yield of the multi-strange particles: we have used a special "injected-HIJING" dedicated MC production, where multi- strange particles are superimposed (in each event) to the "pure" HIJING event. In this way, with a few millions MC events we have been able to get a reasonable correction for the measured pt spectra, in 20% wide centrality bins.
The corrected pt spectra for the four cascade types have been described by a Blast-Wave model fit, to extract the particle yields in the full pt. The yields have been then compared with the corresponding ones in p-p at the same specific energy, preliminary using an interpolation between ALICE p-p data at 7 TeV and p-p data at lower energies. Multi-strange baryon yields in PbPb and enhancements with respect to p-p have been first shown by ALICE at the Strangeness in Quark Matter 2011 Conference, in the last September.
Today I'm also involved in the multi-stange analysis in p-p collision data at 2.76 TeV collected by ALICE in the last spring: a measurement of the multi-strange baryons on that data, at least for the Ξs, would be an important check of the interpolation values presently used in calculating the enhancements.

- Conferences -
  Italian Physical Society XCVII National Congress (SIF). (L'Aquila (IT)).
  "Multi-strange particle production in Pb-Pb collisions at the LHC with ALICE".

Si richiede un contributo spese? (solo per dottorandi)

Si

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