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Onset of deconfinement and search for the critical point of strongly interacting matter at CERN SPS energies

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The exploration of the QCD phase diagram and particularly the search
for a phase transition from hadronic to partonic degrees of freedom and possibly a critical endpoint, is one of the most challenging tasks in present heavy-ion physics.
As observed by the NA49 experiment, several hadronic observables in central Pb+Pb collisions at the CERN SPS show qualitative changes in their energy dependence. These features are not observed in elementary interactions and indicate the onset of a phase transition in the SPS energy range [1,2].

Further information about the existence and nature of a phase transition in the SPS energy range can be gained from the studies of event-by-event fluctuations of final state hadron distributions and yields performed by the NA61/SHINE [3], a successor of the NA49 experiment.

New results on p+p interactions at 20, 31, 40, 80 and 158 GeV/c will be shown. They will include:
- inclusive spectra of pi+, pi-, K-, and protons as a function
of transverse momentum/mass and rapidity,
- event-by-event fluctuations of transverse momentum, azimuthal
angle and chemical composition.

The new NA61 data will be compared with the corresponding results of
NA49 on central Pb+Pb collisions as well as with the predictions of Monte Carlo models.

The NA61/SHINE future plans will be presented.

[1] C. Alt et al., Phys. Rev. C 77 (2008) 024903
[2] M. Gazdzicki et al., J. Phys. G 30 (2004) S701
[3] N.Antoniou et al. [NA61/SHINE Collaboration],
CERN SPSC-2007-019, (2007).

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