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A New Experimental Programme with Nuclei and Proton Beams at the CERN SPS

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Exciting results on the deconfinement phase transition in nucleus-nucleus collisions and production of pentaquarks in proton-proton interactions have been obtained recently by the NA49 Collaboration at the CERN SPS. In parallel experiments at RHIC measured a strong suppression of hadron production at high transverse momenta and observed a mono-jet structure in central Au+Au collisions at very high energies.

These results have significant impact on our current understanding of strong interactions and at the same time raise numerous questions and ask for new directions of further experimental and theoretical efforts. In particular further measurements at the CERN SPS using the upgraded NA49 apparatus are urgently needed. **We express a strong interest in performing necessary measurements as soon as possible.** The main subjects proposed by us for future study at the SPS are:

1. Measurements of the energy dependence (10–200 A·GeV) of hadron production in central collisions of light nuclei (C+C and Si+Si) as well as hadron–proton and hadron–nucleus interactions. Measurements with ions are needed to understand the role of the volume of strongly interacting matter in determining the onset of the deconfinement phase transition. Measurements with hadron beams are necessary to constrain alternative models of the collision process, and in particular to study the role of isospin and multiple collisions. backward center-of-mass hemisphere.

2. Measurements of the production of high mass hadrons and hadronic resonances in p+p interactions. In particular study of the properties of the newly discovered pentaquark states and a search for new states of this exotic family of hadrons.

3. Measurement of forward hadron production in minimum bias p+C, He+C, and C+C collisions. These data are required for the accurate interpretation of extensive air shower measurements and cosmic ray muon as well as neutrino flux data.

4. Study of identified hadron (π^0, K^0_S, Λ) production at high transverse momenta in proton–nucleus and light nucleus–nucleus collisions at the top SPS energy. These data are needed to establish the energy dependence of the effects observed recently at RHIC.

We would like to present a detailed programme of the new measurements, their physics justifications and the necessary spectrometer upgrades during Villars meeting in 2004.

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