

ADDENDUM-8 to PROPOSAL SPSLC/P264

**Additional Information Concerning the Future NA49 Programme on
Nucleus-Nucleus Collisions at Low SPS Energies**

The NA49 Collaboration

Abstract

This document provides further information relevant for the NA49 request (CERN/SPSC 2000-035) of Pb beam at 20 and 30 A·GeV .

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Based on the first results on Pb+Pb collisions at 40 A·GeV the NA49 Collaboration requested in August 2000 [1]

- 5 days of 80 A·GeV Pb beam in addition to the full energy heavy ion run in 2000 and
- 15 days of Pb beam split between 20 A·GeV and 30 A·GeV in year 2002.

Our request for 80 A·GeV Pb beam was granted and the 80 A·GeV beam was delivered to the experiment in the period September 20–25, before the official startup of the full energy heavy ion run. NA49 successfully accumulated 300k central Pb+Pb collisions. We gratefully acknowledge the special efforts of the accelerator group to make this possible.

After our request for low energy running in 2002 was submitted to the SPSC on August 18, 2000, the SPSC recommended an Indium beam period at full SPS energy in 2002 for the new experiment NA60. The aim of our request for Pb beam at 20 and 30 A·GeV is to complete the study of the energy dependence of the basic observables (like pion and strangeness yields) in the onset region of deconfinement in heavy ion collisions. The data on central Pb+Pb collisions at 40, 80 and 160 A·GeV have been obtained at the CERN SPS. Lower energy results on central Au+Au collisions at 2, 4, 6, 8 and 11 A·GeV are available from the Brookhaven AGS. For a meaningful and consistent comparison the data at 20 and 30 A·GeV should therefore also be taken for Pb+Pb collisions and not for In+In. According to information from the PS and SPS Divisions and the SPS Coordinator a change from full energy Indium to low energy Pb beam would take about 7 days.

The current full energy Pb run of NA49 is oriented towards the study of low cross section observables like open charm, resonance and light (anti)nuclei production. This physics programme requires high statistics of central Pb+Pb events. In order to increase the number of events per spill, two modifications were introduced in the NA49 data acquisition system. In order to overcome a bandwidth limitation in the NA49 DAQ system we introduced a loss-less compression algorithm. This reduces the raw data event size by about 40% for Pb+Pb collisions. In addition the number of time samples in the TPCs was reduced from 512 to 256 in order to overcome the limitation of the available event buffers in the DAQ system. The resolution of the TPC detectors is reduced somewhat by sampling the analog signals at only half the standard rate. So far the analysis of data taken under those conditions have not shown any deterioration of track quality. The total gain after both modifications is an increase of the event rate by a factor of 1.75.

Nevertheless, we request 15 days total at 20 and 30 A·GeV to allow for the required setup times. The beams at these low energies cannot be extracted at full efficiency into the external beam lines according to information provided by the SPS division. We may expect of the order of one quarter of the circulating intensity at the lowest energy. Since NA49 requires less than 200 000 particles per spill this will not present a real problem. We also discussed the feasibility of extracting a fraction of the intensity to NA49 during the acceleration ramp of the SPS in order to be compatible with runs of NA60 at full energy. It turned out that this is not possible for the North Area.

Clearly we would prefer to have the 15 days of low energy Pb-beam as soon as possible in order to confirm the onset energy of deconfinement.

References

- [1] S. V. Afanasiev et al. (NA49 Collab.), *Study of the Onset of Deconfinement in Nucleus–Nucleus Collisions at Low SPS Energies*, CERN/SPSC 2000–035.