PRELIMINARY RESULTS FROM NA52
STRANGELET SEARCH IN Pb-Pb AT 160 GeV/NUCLEON

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We report on a Strangelet search in Pb-Pb interaction at 160 GeV/c per nucleon. Preliminary analysis shows the ability of NA52 to reach sensitivity down to 3.10^{-9} strangelet/interaction.

The discovery of strangelets has long been advertised as an ultimate signature for the quark gluon plasma (QGP) formation in ultrarelativistic heavy ion collisions. Strangelets could be formed from the QGP via the "strangeness distillation" process. Their discovery would have profound implications beyond the confirmation of QGP formation.

NA52 uses the H6 beam line in the North Experimental Area of the SPS at CERN as a spectrometer for secondary charged particles produced in Pb-Pb collisions at a beam momentum of 160 GeV/c per nucleon. The H6 beam line is a double-bend, double-focussing spectrometer with a total length of 524 m from the production target. The momentum acceptance is $\Delta p/p = 3\%$, with a solid angle of $\Delta\Omega = 2.3$ μsr at any rigidity in the range 5 GeV/c $\leq p/Z \leq$ 200 GeV/c. A 40 mm lead target was installed in the T4 target box for the strangelet search. A thin quartz Cerenkov counter detecting the incident beam ions is also used as a "time-zero" counter. Five time of flight scintillator hodoscopes, TOF1-TOF5, were positioned along the beam line to measure the particle velocity and charge. Each hodoscope is made of 8 vertical scintillator slabs. Multiwire proportional chambers just downstream of every TOF hodoscope measure the transverse coordinates of the traversing particles with a precision of ± 1.5 mm. This information is used for background and pile-up rejection. A segmented uranium-scintillator calorimeter with a total depth of 7.1 λ_{int} is located at the end of the spectrometer. The total energy information obtained with the calorimeter is somewhat redundant with the charge and momentum measurements described above, and is thus a useful instrument for background and pile-up rejection.

The ion beam intensity delivered to NA52 in 1994 varied between 2.10^7 and 6.10^7 Pb-ions/burst. We have searched for positively and negatively charged strangelets at spectrometer rigidities of ± 100 GeV/c and ± 200 GeV/c. Data from 2.10^{11} to 3.10^{11} Pb-ions were accumulated at each of these four settings. Preliminary data analysis was carried out with the calibration and reconstruction programs running in the data acquisition environment. At +100 GeV/c events registered only in the upstream part of the spectrometer, were found to be affected by pile-up ; when extending the TOF fit to include the timing information from the quartz Cerenkov counter, all such events, with $(m/Z)^2 > (5.3\ GeV/c^2)^2$, were removed. No background due to pile-up was found in the data collected at +200 GeV/c ; the trigger condition requiring each particle to travel down the full length of the spectrometer, makes the TOF analysis robust against pile-up effects, even in the presence of a higher particle flux. No particles with $(m/Z)^2 > (11\ GeV/c^2)^2$ were detected in our data sample. In 1994 the sensitivity reached for strangelet production is 3.10^{-9}/interaction. Further analysis will be able to exploit additional, as yet unused experimental information (multiple hits in the wire chambers, future/past registers of the TOF counters) to improve the recognition and elimination of pile-up effects.

With the data from the first, very successful Pb-ion run at CERN, the NA52 experiment is able to reach a sensitivity for the production of positively or negatively charged strangelets of 3.10^{-9}/interaction. The clean particle identification capability makes the NA52 apparatus well suited for particle production measurements.