MEMORANDUM

To: SPS Committee
Subject: UA8 comments on the proposed luminosity upgrade
From: Peter Schlein (UA8)

We understand that a luminosity upgrade is under discussion for the SPS collider. We would like to point out that in its planned form, the modification of the collider optics would make further running of UA8 impossible, and would thus jeopardize a large part of the UA8 physics program. To date we have had only one good run at the collider. Even this run was marred by a failure of the positioning mechanism of one set of Roman pots. In the current (spring 1989) run of the collider we hope to improve greatly our statistics thanks in part to a recent agreement with UA2 which will allow us a greater trigger rate, and to expected improvements in SPS operation techniques. Nevertheless, it will be difficult to amass sufficient statistics to complete our physics program. In order to minimize the effects of UA8 on UA2 we are limited to a fixed data taking rate (0.2 Hz) independent of the luminosity. Our statistics therefore depend only on running time.

With this in mind we would like to review the physics topics currently under study by UA8.

A) The Pomeron Structure Function.

UA8 has already published a letter on the results of measurements of the Pomeron structure function. Using small amounts of data we were able to show that the Pomeron structure function was quite soft. For a more quantitative evaluation of this structure function, we will need a much larger data sample with which we could measure accurately the shape of the jet angular distribution. In addition to this, we would like to repeat the measurement in a higher |t| range. It is expected that as the momentum transfer increases, the pomeron will become much more well defined by perturbative QCD. Investigation of this "Perturbative Pomeron" can then provide a link between the great success of QCD in describing the high p_T regime, and the less well understood region of soft physics.

B) Events with leading Lambda's

We have recently demonstrated that it is possible to locate and identify \Lambda^0 baryons which decay in the quadrupole apertures before the Roman pots. Because the \Lambda^0 is missing one of the quarks from the beam proton, it provides a signature to an entirely different sort of production mechanism. The comparison of events containing a leading \Lambda^0 with those containing a proton would be a natural extension to the UA8 physics program.

Several inclusive measurements of \Lambda^0 production dynamics, and polarization can also be made. Although they are of fundamental significance, these measurements can not be made by the two large collider experiments because of the absence of tracking in the far forward direction.

C) Multi Jet Events

Jet production at collider energies now seems to be dominated by QCD 2→2 interactions (e.g. qQ→qQ, gg→gg, etc...). This has been amply demonstrated by UA2 from studies of multi-jet events. It would be interesting to show that this is also the case in the diffractive interactions under study by UA8.

Each of these topics will require a large amount of data for which the statistics expected from the spring 1989 run will be at best marginally sufficient.

Also, we must have large samples of events of other types (elastic, minimum bias, low mass diffractive, etc...) to maintain the calibration of our apparatus and to use in characterizing the background to high mass diffraction (especially that due to pile-up).