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MEMORANDUM

To : SPS Committee

From : UA2 Collaboration

Subject : Request for SPS beam time for tests and calibrations for the upgraded UA2 detector in 1986 and 1987

In this memorandum we update our request for SPS beam time for tests and calibrations of the various detector elements for the upgraded UA2 experiment [1-3]. A total amount of 80 days in 1986 and 30 days as early as possible in 1987 are requested as main-user time in the H2 beam line. A very major fraction of this time will be needed for precise and systematic calibrations of all calorimeter components. These calibrations will be of vital importance for the upgraded UA2 experiment as has been demonstrated by the past UA2 Collider experience.

For the calibration of the calorimeters of the upgraded UA2 detector we intend to follow closely the procedure [4] used for the present UA2 central calorimeter which gave satisfactory results. The absolute energy scale of the electromagnetic calorimeter is presently known in UA2 with a systematic uncertainty estimated to be less than $\pm 1.6\%$ with a cell-to-cell rms spread of 2.5%. The corresponding values for hadronic energy depositions are $\pm 4\%$ and 8% respectively. As an illustration these uncertainties lead to the following values for the Intermediate Vector Boson masses $m_Z = 92.5 \pm 1.3 \pm 1.5$ GeV and $m_W = 81.2 \pm 1.1 \pm 1.3$ GeV where the first error is statistical and the second one reflecting the energy scale uncertainty.

We expect to decrease the systematic uncertainties on the energy scale for the upgraded UA2 experiment due to improvements in the calibration hardware [1, 3]. It is aimed to keep the uncertainty of the absolute energy scale over several years within $\pm 1\%$ ($\pm 2\%$) for the electromagnetic (hadronic) calorimeters with cell-to-cell rms spreads of less than 2% and 3% respectively. For this we intend to calibrate each calorimeter cell of all modules with electrons, pions and muons of a known energy. These measurements require a high quality of the electron beam, implying a vacuum beam pipe up to our test area. Furthermore, we will measure the response of each calorimeter type as a function of energy and beam impact position and angle.

The very tight installation schedule of the upgraded UA2 detector requires that we calibrate in 1986 all the modules of the central calorimeter and half (one side) of the end cap calorimeters. The second half of the end cap calorimeters has to be calibrated as early as possible in 1987. The beam time needed for the calibrations is well known for the central calorimeter from the previous calibration runs and can be estimated for the end cap modules from the recent full size prototype studies in the H2 beam. The requested beam time is 38 days in 1986 for the central calorimeter and for the end cap calorimeter 30 days in 1986 and 24 days in 1987.

Further tests and calibrations on all components of the upgraded UA2 central detector [2] and preshower detectors [2, 3] will take place in 1986 and 1987. In order to minimize the required beam time we foresee to combine these measurements as much as possible with the calorimeter measurements. For non-compatible tests we require in addition to the time covered by calorimeter runs 12 days of beam time in 1986 and 6 days in 1987.

In summary we require 80 days of main-user beam time in 1986 and 30 days in early 1987 for the complete calibration and testing of the upgraded UA2 detector.

References

- [1] Proposal to improve the performance of the UA2 detector; CERN/SPSC 84-30, SPSC/P 93/Add.2, May 15, 1984.
- [2] Proposal to improve the performance of the UA2 central detector; CERN/SPSC 84-95, SPSC/P 93 Add.3, December 1, 1984.
- [3] Status reports on the end cap tracking and preshower, and on the calorimeter end caps; CERN/SPSC 85-3, SPSC/M 399, January 10, 1985.
- [4] A. Beer et al., Nucl. Instr. Meth. 224 (1984) 360.