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Steering and Tuning with new Optics in LEBT

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LINAC STUDIES. (JULY 1ST THRU 10TH 1974)

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Object of the study was to steer the beam in the Low Energy Beam Transport system so that it enters the linac on axis. Also test of a new quadrupole arrangement omitting three triplets from the Low Energy Beam Transport system was planned. New diagnostic (wire grass wires) for measuring beam in this system was also to be tested.

Results were as follows:-

1/ The beam was steered successfully with the use of steering in the first and third triplets in the Low Energy Beam Transport system (the second triplet was turned off as per calculations made prior to the test)

2/ The program to eliminate the three triplets was successful in that beam transmission through the Low Energy Beam Transport system was equal to that obtained with all triplets energized prior to the shutdown. Furthermore the emittance areas in both radial planes at the entrance to Tank #1 were the same as those measured prior to the shutdown. The quadrupole currents were as per program in all but the first triplet after the calculations which required a charge of ~20 Amperes in 240 Amperes from that calculated in the program. This difference may be due either to lack of precision in measuring the beam orientation at viewing foil #1 which is situated immediately following the first triplet. measurements made in VB#1 show that there are two protons and one H^{++} beam present, one of the proton beams being very asymmetric.

3/ The new position monitor wires are useful in centering the beam but suffer some problems due to the asymmetry in the beam which is seen in emittance measurement taken at three points in the line

4/ The emittance measurements at 10 MeV showed the beam to be well centered and have the normal emittance values for a 60 mA beam current

5/ Beam position and profile measurements made using the S.C.H.S. between Tanks and in HEBT, indicated that in spite of good front-end alignment the beam oscillated in amplitude by as much as 2 cm in both horizontal and vertical planes. It was necessary to introduce maximum steering in the dipoles situated in Tanks 2 3 and 9 plus an extra dipole in HEBT (immediately following the first HEBT quadrupole) in order to reduce the oscillation amplitude to ~2 mm horizontally & 5 mm vertically. The indication of a bad quadrupole element somewhere in Tank #2 are still to be further investigated.