MEMORANDUM

To: Emulsion Experiment Committee


Re: Beam a° for Λ° experiment E 58

In this memorandum we set out our proposal for the a° beam. In it we have taken account of all the information we have been able to obtain concerning the physical limitations around the PS, and the availability of beam-transport-equipment and shielding materials. We have also taken into consideration the requirements of other experimental groups as far as we were able to obtain information about them.

The requirements we have taken into account are the following:

a) The 200-cm HBC must not be put out of action by a°. We interpret this to mean that there should not be any interference with the choice of beams for the 200-cm chamber when a° is off, and that at least one of the beams for the chamber should be usable with at least 9 bursts out of 10 when a° is running (note that the Λ° experiment cannot take more than 1 burst out of 10; the average consumption of bursts during testing and running time - see EmC 65/8 - is expected to be less than 7.5 %).

b) The large-angle pp-scattering experiment of the Cocconi-Wetherell group should be interfered with as little as possible.

c) The need for shielding should be kept down.

d) Other things being equal, it is preferable to have a design such that the overhead cranes can be used for installation.

In what follows we describe first the arrangement we consider to have the best combination of characteristics; other possibilities are discussed further below.

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The proposed beam arrangement

1) Lay-out

We propose to use fast ejection 58 in the following way (see attached drawing):

A deflection magnet type ME 150 (modified to allow it to be cycled) is installed down-stream from the existing hydrogen target (1 on drawing; 3 is the ME 150 magnet to be installed) of the large-angle scattering experiment. The target for the $m_6$ beam (2 on drawing) is placed into the undeflected proton beam line, as planned by TC at present, so that the $m_6$ beam can operate normally whenever the deflection magnet (3) is off.

The target for the $a_9$ beam (4 on the drawing) is placed on one side of the $m_6$ target, and the proton beam is deflected to it by turning on the magnet 3 for any burst in which $a_9$ is required to operate instead of $m_6$. As the ME 150 magnet (3) with rectifier power supply can be taken very rapidly through a complete off-on-off cycle (rise time 0.5 sec) it is possible with this arrangement to select single bursts for the $a_9$ target, whilst all other bursts go to $m_6$. There is, of course, no interference whatsoever with the protons for $m_6$, or $m_6$ itself, as long as the magnet (3) is off.

With this lay-out, the targets for $m_6$ and $a_9$ are close together so that they can share one shielding enclosure and one beam stopper. As far as economy of shielding material is concerned, this type of design is superior to any in which the two targets are widely separated and have to be provided with separate shielding and separate beam stoppers (one oscillating, one fixed).

On the drawing, the $a_9$ target (4) and beam are shown placed between the $m_6$ and $a_9$ beam lines. This arrangement has the advantage that most installation work can be done within the range of the overhead crane. On the other hand, the beam-stopper and shielding design will be complicated, and there will be rather little space around the experimental equipment. The alternative is to place the $a_9$ target in position 5, between $m_6$ and the wall of the experiment hall, and to let the beam pass through the wall to the outside. In that case most installation work would have to be done with mobile equipment, and a hut would have to be erected outside to provide shielding and accommodation for the experiment.

It should be noted that the proposed lay-out is such that $m_6$ is not affected if $a_9$ is dismantled partially or completely.
2) Interaction with other experiments

CHBC 200

Operation of $a_g$ is clearly compatible with that of $m_6$, both during setting up and running of the experiment, with $m_6$ always receiving at least 9 bursts in 10.

Like $m_6$ and the large-angle-scattering experiment, $a_g$ is incompatible with $a_3$ proper, but $a_g$ could still be operated from target 61 whilst $a_g$ (or any other beam requiring ejection 58) is running. The $a_g$ beam, as proposed here, cannot run at the same time as $a_3$.

Large-angle scattering

During setting-up of $a_g$ it is possible, or even preferable, to use long bursts. Setting-up can therefore be done when the large-angle-scattering experiment is running with slow ejection. During exposures, however, fast ejection is needed, so that the scattering experiment cannot run at those times.

We understand that the $m_6$ beam also can be set up with long bursts, but is incompatible with large-angle scattering during production runs.

Other experiments

As far as we know, Rubbia, Steinberger et al. are expected to move to slow ejection 62 ($a_3$) during the next shut-down, so that there will not be any interference with them.

Other Possibilities

1) Beam switching upstream of the $u_1$ target would, in principle, make $a_g$ compatible with $u_1$ and $m_6$. This possibility was investigated, but it was found that it would be extremely difficult to find space for the beam and the equipment in the area involved. In particular it appears that survey pillar 6 would have to be removed or modified.

2) If the large-angle pp-scattering experiment were to move to the $a_3$ beam, it would be possible to build $a_g$ from their present target position, with a flip-up target for $a_g$. In that case also there would have to be an oscillating beam stopper behind the $a_g$ target. Furthermore, the first bending magnet of $a_g$ would be part of the proton-beam transport for $m_6$.

Concluding Remarks

We believe that the proposed lay-out represents a workable solution. Disturbance to other users and experiments has been minimized, and it will be possible to operate the beam simultaneously with $m_6$ at all times, and simultaneously with the large-angle-scattering experiment during setting up.

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