

MEMORANDUM

CERN LIBRARIES, GENEVA

To: Members of the SPSC  
 From: CHARM Collaboration  
 Subject: WBB operation in 1983



CM-P00045154

Since our last memorandum on the above subject (CERN-SPSC/83-33; SPSC/M 355) we have evaluated quantitatively the effect of the possible modes of collimation of the parent hadron beam on the yield of  $\bar{\nu}_\mu$  and on the possible  $\bar{\nu}_e$  background affecting the CHARM programme of  $\bar{\nu}_\mu e$  scattering. In addition, equivalent calculations have been carried out by A. Ball which are in approximate agreement with ours (see EF/BEAM/83-1).

Both of these sets of calculations have evaluated the event rates using two possible collimators of internal diameters 110 mm and 160 mm (referred to as "small" and "large" collimators in the note of A. Ball). One of these two collimators must be chosen before the run starts and cannot thereafter be changed. The longitudinal position of the collimator can, however, be changed within a limited range thus varying the acceptance of the beam. The position farthest from the target is referred to as the "closed" position, whereas the position closest to the target is deemed to be the "open" position.

The following table shows the effect of the two different collimators in their two extreme positions on the event rates of  $\nu_\mu$  and  $\bar{\nu}_\mu$  interactions produced by 450 GeV protons on target in the form of ratios to the event rates for the same number of 400 GeV protons on target when the large collimator is used in its "open" position (i.e. the event rates which pertained to the previous WBB operation except for the loss of repetition rate due to 450 GeV SPS operation). The data are taken from the note of A. Ball.

	Collimator $\phi = 160$ mm		Collimator $\phi = 110$ mm	
	Near	Far	Near	Far
$\nu_\mu$ ; All events	1.182	1.116	1.034	0.837
$\nu_\mu$ ; $E_\nu < 75$ GeV	1.147	1.059	0.954	0.732
$\bar{\nu}_\mu$ ; All events	1.279	1.153	1.029	0.729
$\bar{\nu}_\mu$ ; $E_\nu < 75$ GeV	1.254	1.110	0.976	0.667

Event rates: Ratio of yield at 450 GeV to that at 400 GeV

From this table, it is apparent that if the WBB is to be operated with 450 GeV protons, and the resulting higher muon background makes collimation necessary, then the use of a collimator of diameter 110 mm would reduce the yield of events in the energy region below 75 GeV to less than that obtainable with 400 GeV protons where we know that collimation is unnecessary. The use of a collimator of 160 mm diameter could be envisaged and, if absolutely necessary, its position could be adjusted to reduce possible muon background.

We have now checked that, with the use of appropriate energy cuts on the data, the  $\bar{\nu}_e$  background in the  $\bar{\nu}_\mu$ -e scattering experiment will not be significantly increased by the use of 450 GeV protons. However, we request that if the WBB run is scheduled for 450 GeV, then only the large collimator be installed thus allowing the potential benefit of the  $\sim 20\%$  higher yield of events per interacting proton. If the muon background is intolerably high even with the collimator in the far (closed) position, then the operating energy should be reduced, perhaps to a value intermediate between 400 and 450 GeV, to restore acceptable operating conditions without reducing the yield of neutrino events below that anyway obtainable with 400 GeV protons on target.