FLUX CALCULATION FOR THE SO-CALLED "HIGH-QUALITY LOW-COST BEAM"

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A. D. Krisch[1] has recently proposed a "HQLCB" but has unfortunately neglected to estimate the flux to be expected except to point out that it is of "somewhat less intensity than a 'steel-block' beam. . ."

We have calculated the neutrino spectrum to be expected from such a device in order to ascertain what the author means by "somewhat less intensity." The calculations were done under the following assumptions:

1. We used the Trilling production spectrum.
2. We assumed that all pions in the specified ranges (30 ± 8 GeV and 60 ± 15, separately) are collected and focussed into a pencil beam for the proposed decay length. The effects of the plug proposed by Krisch have not been taken into consideration, but it is clear that will tend to reduce the beam intensity.

We compare these results with those for iron block shields and earth shields from our report (B.1-68-82). The results are summarized in Table I.

We see no advantage in and no difference between the beam

proposed by Krisch and the narrow-band system discussed at length since 1964 by Keefe et al. and recently reviewed by Perkins.[2] It has long been known, as explicitly stated by Perkins, that "the wide-band system. . .offers integrated neutrino fluxes at least an order of magnitude greater than might be achieved with a narrow-band system." Other schemes to reduce the iron shield, as discussed in the report of U. Camerini and S. L. Meyer, would appear to offer considerably more flux in all energy bands than does the "HQLCB"--some perhaps lower in cost.

Apart from the "narrow band" aspects of this system, we feel obliged to comment on the sole reliance on magnetic deflection to remove the muon background. As we note in our own report, we personally believe that it will be possible to design a magnetic deflection system which will obviate a full muon range shield. However, as we point out in our recommendation that a design study be initiated for this purpose, detailed calculation of the myriad scattering possibilities and exotic routes (e.g. through magnet return yokes) available to muons is required to make this scheme convincing. As stressed by Jovanovitch, this argument does not yet exist. We, therefore, refrained from recommending reliance upon such a system before these calculations are made. We believe that this obligation is incumbent upon others as well as on ourselves.

REFERENCES

[1] A. D. Krisch, NAL Summer Study Report B.1-68-71, 1968.

[2] D. H. Perkins, CERN/ECFA 67/16, Vol. II, 1967, p. 1.

Table I. Number of neutrinos/10^2 interacting protons in various neutrino energy intervals.

	3-5 GeV	5-10	>10	>20	ALL
Krisch Report B.1-68-71 30±8 GeV	<0.01	0.11	0.55	<0.01	0.66
Contribution of kaons	<0.001	<0.001	0.029	0.029	0.029
"Iron block" beam--150 m Fe shield Report B.1-68-82, Table I	1.00	2.70	2.30	0.54	6.00
Earth shield--600 m earth (ibid, Table I)	<0.01	0.30	1.70	0.79	2.00
Krisch's Report B.1-68-71 60±15 GeV	<0.01	0.01	0.66	0.27	0.67
Pion cutoff beam--only 50 m Fe shield required Report B.1-68-82, Table II	3.50	3.10	1.40	0.39	8.00
Pion cutoff beam--only 50 m Fe shield required The flux/sec is twice these figures (ibid, Table III)	2.0	2.4	0.9	<0.01	5.2