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PROPOSAL TO STUDY THE TIME DEPENDENCE OF THE INTERFERENCE IN THE $K^0 \to 2\pi$ DECAY IN A BEAM OF K^0 MESONS

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We take note of the fact that our proposal to study the interference of K_1^0 and K_2^0 decay in the $\pi^+\pi^-$ mode, in a beam in which the K_1 is regenerated from K_2, was rejected, and point out that the same detector which is in a state of finished design (two months of work) and is in our opinion good, can be used to measure a complementary effect. If a target is struck by high-energy protons, K^0 and $\bar{K}^0$ will be among the products. The time dependence of the 2π decay mode, in the K^0 rest frame, will be of the form

$$P_t(2\pi) \propto e^{-t/\tau_1} + |\alpha|^2 + \left(\frac{I_{K^0} - I_{\bar{K}^0}}{I_{K^0} + I_{\bar{K}^0}} \right) \cdot 2|\alpha| \cos(\Phi + \Delta m t)\, e^{-t/2\tau_1} ,$$

where α is the ratio of the amplitudes of K_2 and K_1 decay into π^+ and π^-, $\alpha = |\alpha| e^{i\Phi}$, and I_{K^0} and $I_{\bar{K}^0}$ are the production intensities of K^0 and $\bar{K}^0$. The interference term will be important in the region $t = 12\tau_1$. This should be compared with the fact that in the regeneration experiment previously proposed, the time important for interference is of the order of 6τ, or less, depending on the amount of regeneration used.

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The experiment has the disadvantage with respect to the regeneration experiment that since one has to wait at least twice as long to see the interference, a given uncertainty in Δm will introduce an error in Φ at least twice as great as in the previous experiment. It has the two following advantages:

1. If the phase Φ were somehow known, it will offer a correspondingly greater precision in the knowledge of Δm.

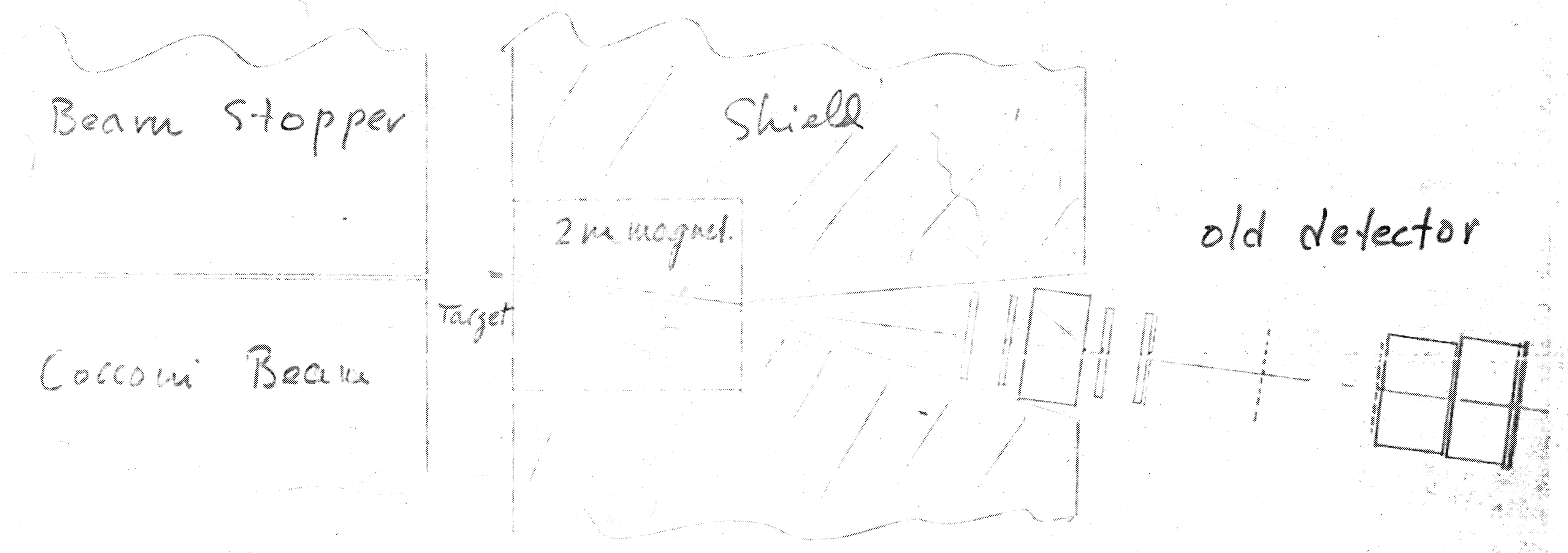
2. In the determination of Φ, although the uncertainty introduced by uncertainty in Δm is larger, no auxiliary arguments such as the determination of the regeneration phase are necessary.

We have looked into the feasibility of a start on this experiment in the coming running period. It seems possible to put a small channel into the beam stopper in the slow extracted proton beam being prepared for Cocconi et al. A hole $\sim$ 2 cm $\times$ 4 cm will pass $\sim 10^{10}$ protons. These will be allowed to strike a target and the neutral products are detected at 8° in a channel approximately 2 cm wide and 5 cm high imbedded in a two metre magnet which serves as shield and charged particle sweeper. Our old detector follows.

The set up of this magnet and the auxiliary shielding would be expected to be completed in the latter part of September, in time for the bulk of the two week total exposure approved for Cocconi.

This exposure time is inadequate to permit the expectation that our detector can be tuned in this time. We therefore propose to tune it in a 15° neutral beam available from the target used by Winter and Falk-Variant.

It should be possible in this running period to get a good start on the effect, and we would expect to stay with the same arrangement when the beam is set up again after this running period.


Beam Stopper
Shield
2m magnet.
old detector
Target
Cocconi Beam