

SKYSHINE MEASUREMENT IN KEK

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1. Introduction

In a facility of high-energy proton accelerator, stray radiation field produced at the outer surface of the shield is contributed mostly by fast and high-energy neutrons and the dose could be propagated to distant points by the effect of the so-called "skyshine".

In order to meet the recent requirement of keeping the environment surrounding radiation facilities destroyed as less as possible, behaviour of the radiation propagation by skyshine must be fully understood.

Upon completing the KEK-PS, radiation levels around the facility have been surveyed¹⁾ and the character of the dose propagation by skyshine has been examined^{1,2)}.

2. Instrumentation

A detection system of neutrons with very high sensitivity has been developed¹⁾. A 5.8"φ-BF₃ detector, APTEC BP-28, was used with moderator cover of polyethylene of 6.5 cm thickness. Similar system of 2"φ-BF₃ detector and another bare 2"φ-BF₃ detector were also used for the measurement at the points close to the accelerator. These systems were equipped in the radiation monitoring car.

3. Result

As a sample of the results obtained, variation of the neutron dose rate with the distance from the center of the accelerator in the direction of the Counter Experimental Hall is shown in Fig.1. Comparison is made with the principal results obtained in the foreign countries³⁾ and given in Fig.2. The behavior is well described with the Thomas' empirical equation by choosing the values of the parameters adequately. Attenuation length for the skyshine neutrons turned out to be 1300 meters or so which is the longest among the experimental values published so far.

4. References

- 1). M. Miyajima, et al. : KEK-77-17 (1977).
- 2). K. Katoh and H. Hirayama : "Skyshine at Proton Synchrotron" (in Japanese), *Hoshasen*, to be published.
- 3). A. Rindi and R.H. Thomas : "Skyshine - A Paper Tiger ?" *Particle Accelerators* 7, 23-39 (1975).

Ratio of Skyshine Neutron Dose Equivalent
to Cosmic Ray Neutron Dose Equivalent

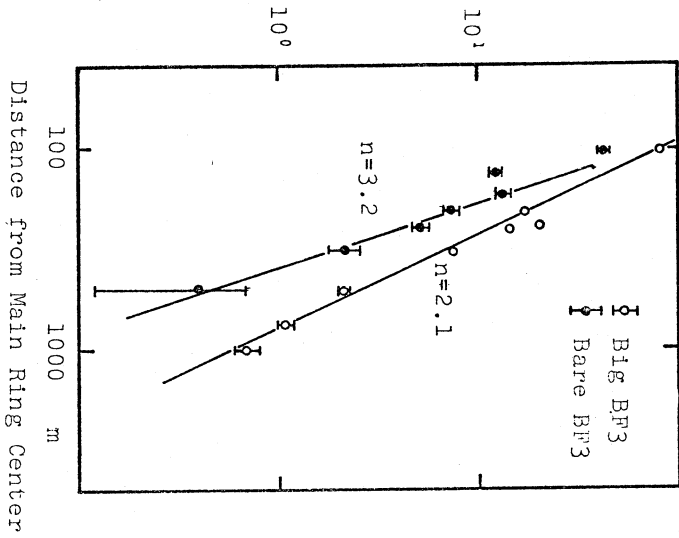


Fig. 1 Variation of Neutron Levels as a
Function of Distance from the
Center of the Accelerator

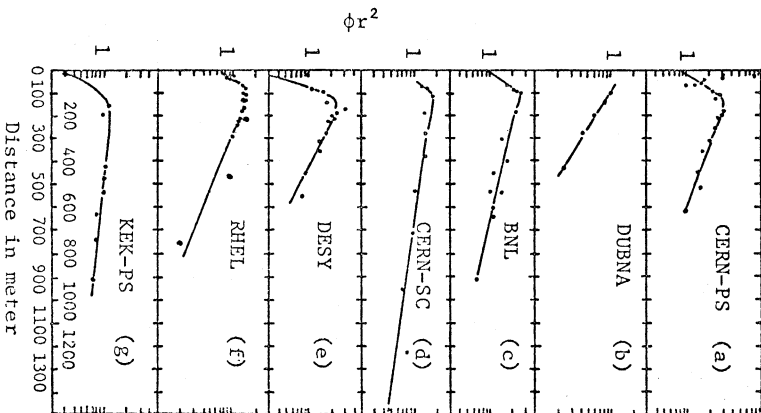


Fig. 2 Measurements Performed
around Different Accelerators