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Radiation Levels Near the E-20 Catcher

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Subject Radiation Levels Near the E-20 Catcher

Objectives

Our goal was to measure the radiation levels in the area of the E-20 catcher to see if it is true that over half of the energy impinging on the catcher winds up in the nearby downstream magnets.

Procedure

The Health Physics group has a nice new meter which reads the residual activity in the ring, digitizes it and stores it for transfer to a PC. They made contact readings in the midplane at each foot along magnets E-18 to F-4. The data was taken only on the aisle side, and thus for the E magnets the meter saw the beam tube shielded only by the cover, while the F magnet readings were shielded by the magnet backlegs. The backleg shielding normally reduces the readings by about a factor of ten.

Results

The data are shown in Figure 1. Not shown are contact readings made at the extreme upstream and downstream ends of the catcher. These readings were 600 and 800 mr. The other readings may be viewed as having two components, radiation from the local source, the magnet, and radiation from a nearby very hot source, the catcher. Thus in the last half of E-20 the levels are climbing. We may attribute this to either the detector seeing the catcher itself or to a higher level of residual activity in the magnet from earlier backscattering from the catcher. Much more noticeably, the first three readings in F-1 are very high, which we can assume are due to the detector seeing the catcher itself. The last half of F-1 then looks very similar to F-2 through F-4. It is interesting to note that the upstream ends of a magnet are in general hotter than the downstream ends of the adjoining magnets. Presumably scattered beam is diverging from the upstream magnet and impinging on the face of the downstream magnet.

Two thick concrete slabs shield the aisle from the catcher. Readings along the outside of these shields show that they reduce the levels at the catcher by a factor of 20 to 30.

Analysis

If we assume the readings along the first half of F-1 are from the catcher, then we can conclude that F-1, F-2, and F-3 all read in the range of 20 to 30 mr. If we scale by a factor of ten, we can expect levels of several hundred mr around the beam tube. Since the catcher itself is around 700 mr, the total induced activity in the magnets is perhaps about equal to that in the catcher. This very crude estimate is thus in agreement with A. Stevens's calculation that the catcher is about 40% efficient.

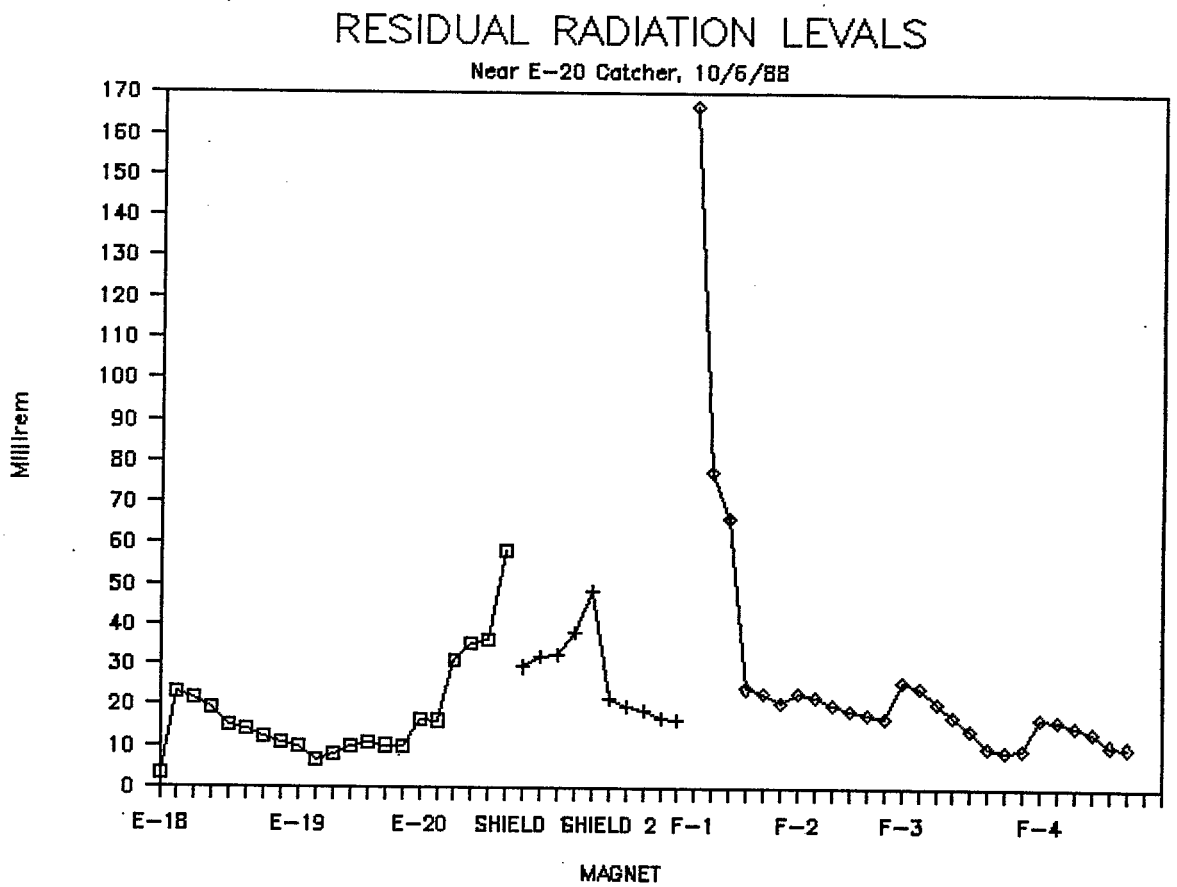

Figure 1.