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Notes from a Telephone Conversation with John Elias:
Radiation Levels in the Tevatron Tunnel

1. Beam Storage

The counting rate that is seen in beam storage mode in the superconducting ring is consistent with beam-gas scattering. He finds that his counters are a very sensitive measure of the vacuum. In the acceleration from 150 GeV to 800 GeV he finds that the rate of rise of background is consistent with the variation in p-p cross-section, again verifying that the background is from beam-gas scattering.

He has data that indicate that a good rule-of-thumb is that 2 neutrons/GeV/particle are produced in the beam-gas collisions. These are produced isotropically. The resultant spectrum peaks at 6-8 MeV.

CDF will be installing scrapers at a high-beta point downstream of DØ to clean up the halo. It might be necessary to make more provisions for shielding protection in the vicinity of the scrapers than in the rest of the circumference.

The abort is absolutely clean. Elias sees nothing when it is fired.

2. Shielding and Damage Levels

The CDF has electronics right down to the beam pipes, so there is concern also about radiation from p-bar production using the Main Ring. Electronics die at 10^{12} minimum ionizing particles per cm^2, which translates to

$$\boxed{D \approx 10^5 \text{ rads}}$$

Elias sees up to 26K rad/wk along the Main Ring beam pipe when fast spill is striking it. In an open-ended alcove which views 5-6 feet of beam pipe he sees only 14 rads for 8.5×10^{16} protons. In another alcove that views 30' of pipe he sees 35 rads, so the alcoves seem quite effective. This radiation is due to the Main Ring, which is known to be quite dirty, particularly at 8 GeV injection. The amount of radiation produced by the Tevatron is almost non-existent.

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