de Boer and van Dantzig Reply: Emulsion data reported by El-Nadi and Badawy[1] for e^+e^- pairs from relativistic heavy-ion reactions show[2] an indication for three phenomena, consistent with production and decay of light neutral bosons. These recent observations are remarkably similar to 35-year-old emulsion data from Anand[3] obtained by exposure to cosmic rays. In his Comment, Perkins[4] objects to our interpretation of the close e^+e^- pairs in both data sets, arguing that the observed numbers of such events are compatible with those expected for the Dalitz process $\pi^0 \rightarrow e^+e^-\gamma$. In our considerations, we apply for both data sets independent criteria: the distribution in vertex distance L, in energy partition y, and in opening angle ω.

First, the comparison of the L distribution for close pairs with the smoothed distribution for twice-minimum-ionizing single (proton) tracks coming directly from the vertex has led Anand to conclude that these did *not* emerge from the collision point, with a χ^2 probability of less than 0.1%. This amounts to a 3.3σ deviation, considerably beyond the 2σ effect mentioned by Perkins. It is unexplained why the π^0 lifetime of 5×10^{-15} s thus deduced by Anand is radically different from the present Particle Data Group value[5] 8.4×10^{-17} s. Second, the energy partition (y) distribution has a 6σ deviation from the flat spectrum expected.[6,7] Perkins argues that there is an observational bias against asymmetric close pairs. Anand stated explicitly though that no pairs with widely different energies and directions had been observed. He reported 20 "single" events of which he attributed ~ 10 low energetic ones to β decay, and ~ 10 to pairs with a large angular separation ω of which one of the members had not been recognized. For 26 pairs the energies of both members could be measured. These turned out to be strongly peaked at equipartition. Since no correlation is expected[8,9] between large y and large ω, it is unlikely that the 36 remaining pairs together with ~ 10 single events would *fully* complement the y distribution of the 26 events. Third, Anand divided the 62 direct-pair events in two equal groups, with different energy ranges. The approximate energies for the 36 incomplete events have been deduced from the opening angles using the relation $\omega = 4mc^2/E$, assuming equal energy partition. Conversely, the energy lower limits of the two groups (40 and 150 MeV) correspond to opening-angle upper limits of 2.9° and 0.8°, respectively. Allowing a margin of a factor 2 for asymmetric energy partition, we infer that all registered pairs from Anand have $\omega \leq 6°$. The Dalitz-decay ω distribution,[8,9] although peaked at a small value, extends over the whole angular range, with 75% of the events at $\omega > 6°$. From the Dalitz branching ratio (0.012) for Anand's 7000 produced π^0's, we expect ~ 84 Dalitz pairs. Correction for geometric efficiency leads to ~ 55 events spread over all angles, of which ~ 14 (25%) would have $\omega \leq 6°$, leaving ~ 48 unexplained. The above considerations, taken together, clearly illustrate that with present-day knowledge Anand's events cannot be *perfectly well* understood in terms of π^0 Dalitz decay.

In the data from El-Nadi and Badawy[1] we distinguished three clusters of pairs. Only clusters B ($m \sim 2.1$ MeV) and C ($m \sim 9.2$ MeV) contain close pairs ($L \leq 18$ μm). Assuming the same obscuration around the vertex as in Anand's emulsions, and taking a Poisson distribution for twice-minimum-ionizing particles, the probability that the L distribution matches the one for Dalitz pairs is 2×10^{-8}, representing a 5.6σ deviation. The probability that the y distribution for the 9 completely measured close pairs (peaked at $y=0$) arises from the Dalitz process is 6×10^{-4} (3.4σ effect). The estimated number of Dalitz pairs in the emulsion used by El-Nadi and Badawy, coming from 2300 collisions of α's at 3.5 GeV/nucleon (effectively) is ~ 16. Opening angles ω cover 0° to 9°; only 40% of the Dalitz pairs are in this range. Consequently, the expected number of Dalitz pairs is ~ 7, to be compared with 13 close pairs which appear to originate visually at some distance from the vertex.[10] Perkin's judgement that the *number* of close pairs observed is *quite compatible* with Dalitz decay is roughly (within 2σ) correct. However, when these events are considered with regard to their L, y, and ω distributions jointly ($> 7\sigma$ deviation), an explanation in terms of π^0 Dalitz decay appears statistically far fetched.

We therefore remain in favor of our interpretation according to which light neutral particles have possibly been observed in both discussed data sets.

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