

## ERRATA AND ADDENDA TO THE ARTICLE

"INTERACTION CROSS SECTIONS OF HIGH-ENERGY PARTICLES"<sup>1</sup>

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AFTER publication of reference 1, I received many letters from experimenters, who supplemented and refined their previously published data. I also received preprints containing new results. In this connection, the following errata and addenda must be made to reference 1:

1. The Geneva accelerator was used to measure<sup>2</sup> the total cross sections of the interactions of protons, antiprotons, K mesons, and pions with protons in the 3-10 Bev range. Within experimental accuracy,  $\sigma_{\text{tot}}(\pi^{\pm}p) = 28-30$  mb at these energies. The  $K^-p$  and  $K^+p$  interaction cross sections vary little with increasing energy, and their values, for the energy most thoroughly investigated in reference 2, are  $24.5 \pm 1.5$  and  $19.5 \pm 1$  mb.

The results obtained in Geneva are in good agreement with the  $K^+p$  interaction cross section measured<sup>3</sup> in Dubna at 3.25 and 4.3 Bev.

The cross section  $\sigma_{\text{tot}}(pp)$  decreasing with increasing energy, and when  $E = 9.8$  Bev it is merely  $12 \pm$  mb greater than  $\sigma_{\text{tot}}(pp)$ , which decreases slowly from  $43.15 \pm 1.5$  mb at 4.15 Bev to  $40.5 \pm 0.5$  mb at 9.8 Bev. It is reported<sup>2</sup> that Cocconi obtained  $\sigma_{\text{tot}} = 38.5 \pm 1.5$  mb at 26 Bev.

2. The cross section  $\sigma_{\text{inel}} = 21$  mb, mentioned in reference 4 for inelastic pp interactions, is merely an estimate, the accuracy of which is not better than 7 mb. It is therefore necessary to assume that  $\sigma_{\text{tot}} = \sigma_{\text{inel}} + \sigma_{\text{el}} = 31 \pm 10$  mb, which does not contradict within the limits of experimental error, the value  $\sigma_{\text{tot}} = 41 \pm 0.5$  mb cited in reference 2.

The statistical error in the value of the mean free path  $L$  of a 9-Bev proton in emulsion, previously cited in reference 4, should likewise be more than doubled (from data<sup>4</sup> on the number of stars). In addition, this reference does not state the systematic error due to possible omission of stars in the scanning of the emulsions. Consequently the value of  $\sigma_{\text{tot}}(pN)$ , determined in reference 1 from the experimental value of  $L$ , is underestimated.

Later data<sup>6</sup> yield  $L \leq 35.7 \pm 0.7$  cm, which corresponds to a cross section  $\sigma_{\text{tot}}(pN) \geq 33 \pm 2$  mb. Here, too, only the mean statistical error is indicated, but the inequality sign indicates that stars may have been omitted in the scanning.

3. Earlier values of the total  $\pi^{\pm}p$  interaction cross sections<sup>8</sup> have been revised in reference 7, which gives many new data. The values obtained at the maximum were  $\sigma_{\text{tot}}(\pi^-p) = 58.0 \pm 1.8$  mb at  $E = 890 \pm 9$  Mev

and  $\sigma_{\text{tot}}(\pi^+p) = 38.0 \pm 2$  mb at  $E = 1.330 \pm 0.030$  Bev.

The cross sections obtained in reference 7 differ noticeably from those of reference 9. The reason for this difference is still unclear.

4. In Alvarez' paper at the Ninth Annual High-Energy Physics Conference (Kiev) the values of  $\sigma_{\text{tot}}(K^-p)$  are given as a function of the K-meson momentum. The values 0.9, 1.17, 1.4, 1.7, and 2.8 Bev listed in Table X of reference 1 must therefore be replaced by 0.60, 0.74, 0.94, 1.23, and 2.35 Bev/c respectively. The values for  $E = 0.94$  and 1.23 Bev were taken furthermore from entry 59 of the bibliography of reference 1.

5. It is stated in the caption to Fig. 6 of reference 1 that the dotted curve shows the cross section  $\sigma_{\text{tot}}(\pi^0p)$ . The curve for this cross section has actually been left out of the figure, and can be obtained by plotting the half-sum of the curves of  $\sigma_{\text{tot}}(\pi^-p)$  and  $\sigma_{\text{tot}}(\pi^+p)$  in Fig. 2.

In conclusion, I take this opportunity to express my deep gratitude to all who communicated with me. All these data will be included in the revised and augmented translation of the review, which will be published in *Fortschritte der Physik*.

<sup>1</sup> V. S. Barashenkov, Usp. Fiz. Nauk **72**, 53 (1960), Soviet Phys.-Uspekhi **3**, 689 (1961).

<sup>2</sup> Von Dardel, Frisch, Mermod, Milburn, Pirone, Vivargent, Weber, and Winter, Proc. of Annual Conference on High-Energy Physics, Rochester, 1960.

<sup>3</sup> Lukhachev, Stavinskii, Chang, and Hsü, *ibid*.

<sup>4</sup> Bogachev, Bunyatov, Gramenitskii, Lyubimov, Merekov, Podgoretskii, Sidorov, and Tuvdendorzh, JETP **37**, 1225 (1959), Soviet Phys. JETP **10**, 872 (1960).

<sup>5</sup> Bogachev, Bunyatov, Merekov, and Sidorov, Doklady Akad. Nauk SSSR **121**, 617 (1958), Soviet Phys.-Doklady **3**, 785 (1959).

<sup>6</sup> Wang, Visky, Gramenitskii, Grishin, Dalkhazhav, Lebedev, Nomofilov, Podgoretskii, and Strel'tsov, preprint, Joint. Inst. Nuc. Res. 1960.

<sup>7</sup> Brisson, Detouef, Falk-Vaizant, Van Rossum, and Valadas, Preprint, Saclay, 1960.

<sup>8</sup> Brisson, Detouef, Falk-Vaizant, Van Rossum, Valladas, Luce, and Yian, Phys. Rev. Lett. **3**, 561 (1959).

<sup>9</sup> Burrowes, Caldwell, Frisch, Hill, Ritson, Schluter, and Wahlig, Phys. Rev. Lett. **2**, 119 (1959).

Translated by J. G. Adashko