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FURTHER OBSERVATIONS OF THE POINT SOURCE OF COSMIC RAYS*

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ABSTRACT

A point source of cosmic rays at $\delta = 0°$, $\alpha = 5^h\ 30^m$, was reported at the Mexico Meeting of IUPAP in September 1955 (*Nature, Lond.* **177**, 35, 1956). The existence of the point source was verified by further observation. This phenomenon suggests the possibility of a direct method of exploring interplanetary space.

The authors [1, 2] reported the existence of a point source of cosmic rays at declination $\delta = 0°$, right ascension $\alpha = 5^h\ 30^m$, before entering into the geomagnetic field, observed with two Geiger–Müller counter telescopes until 18 August 1955. The observation was continued with the two telescopes, and the same point source was observed again as shown in Fig. 1. The count at the point source is $N = 2395$, while the average of the other seven positions is $N_0 = 2196{\cdot}1$. Therefore

$$N - N_0 = +0{\cdot}091\, N_0 = +4{\cdot}3 N_0^{\frac{1}{2}}. \quad (1)$$

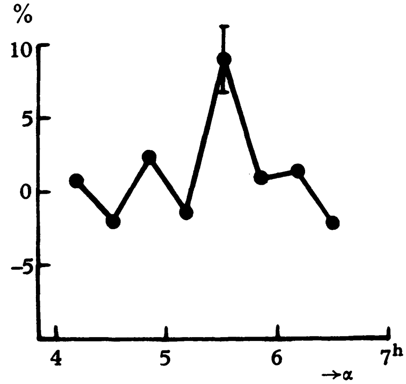

Fig. 1. Further observation of cosmic rays from the declination $\delta = 0°$. Telescope no. 1: 19 August 1955–March 1956. Telescope no. 2: 19 August 1955–June 1956.

Since April 1954, observations were done at the zenith distance $Z = 80°$, twice a day at two azimuths, $A = 85°$ and $A = 255°$, respectively. In Fig. 2, the results of the total observations (1954–6) were divided into four independent observations. Every curve shows the existence of the same point source. That is to say, the point source was observed four times, with two telescopes and at two azimuths, respectively. The total count at the

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point source is $N = 3688$, while the average of the other seven positions is $N_0 = 3322{\cdot}6 \pm 22$. Therefore

$$N - N_0 = +0{\cdot}110 N_0 = +6{\cdot}3 N_0^{\frac{1}{2}}. \tag{2}$$

In the previous report, the corresponding values were

$$N - N_0 = +0{\cdot}157 N_0 = +5{\cdot}2 N_0^{\frac{1}{2}}. \tag{3}$$

Therefore, the existence of the point source was confirmed with greater accuracy than in the previous report.

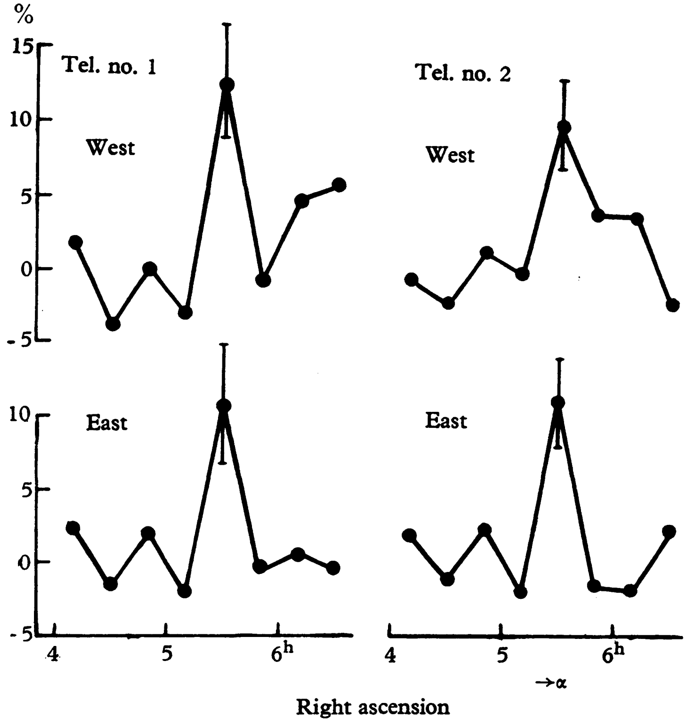

Fig. 2. Four independent observations of cosmic rays from the declination $\delta = 0°$. Telescope no. 1, April 1954–March 1956. Telescope no. 2, July 1955–June 1956. East: Azimuth $A = 85°$. West: $A = 255°$.

At the same declination and in a wider range of right ascension shown in Fig. 3, there are eighteen positions, though the time intervals of the observation of them are not strictly equal to each other. The expectation of the count at the point source, determined from the observation of the other seventeen positions is $\{N\} = 3365 \pm 15$, and

$$N - \{N\} = +0{\cdot}097\{N\} = +4{\cdot}9\sigma, \tag{4}$$

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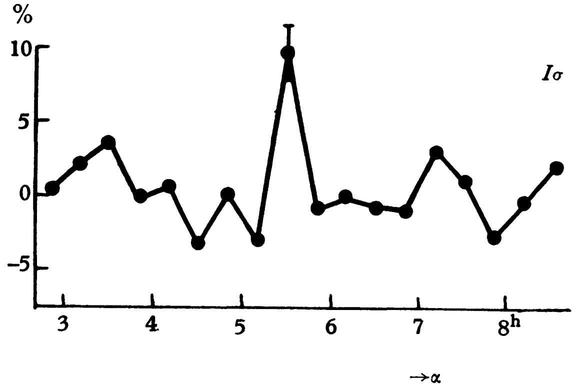
where σ is the standard deviation of the intensities determined from the seventeen positions. σ is 2·0 %, while that expected from simple Poisson distribution is 1·8 %. Therefore, there is not much difference between them. σ includes anisotropies of cosmic rays in the seventeen positions and the effect of geophysical and instrumental instabilities, even if they exist. Still, the above result shows that the existence of the point source is sufficiently significant compared with the standard deviation σ.



Right ascension

Fig. 3. Cosmic rays from the declination $\delta=0°$. Telescope no. 1: April 1954–March 1956. Telescope no. 2: July 1955–June 1956. σ: Standard deviation determined from 17 points, excepting the point source of cosmic rays at $\alpha=5^h\ 30^m$.

Fig. 4 shows the intensity distribution over a little larger part of the celestial sphere, observed with telescope no. 2, which can observe five adjacent declination bands at once. This figure shows that the above described point source is the most significant position in this part of the celestial sphere.

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REFERENCES

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[2] Sekido, Y., Yoshida, S. and Kamiya, Y. *Nature, Lond.* **177**, 35, 1956; Communication to Meeting of IUPAP Mexico, September 1955, p. 45.

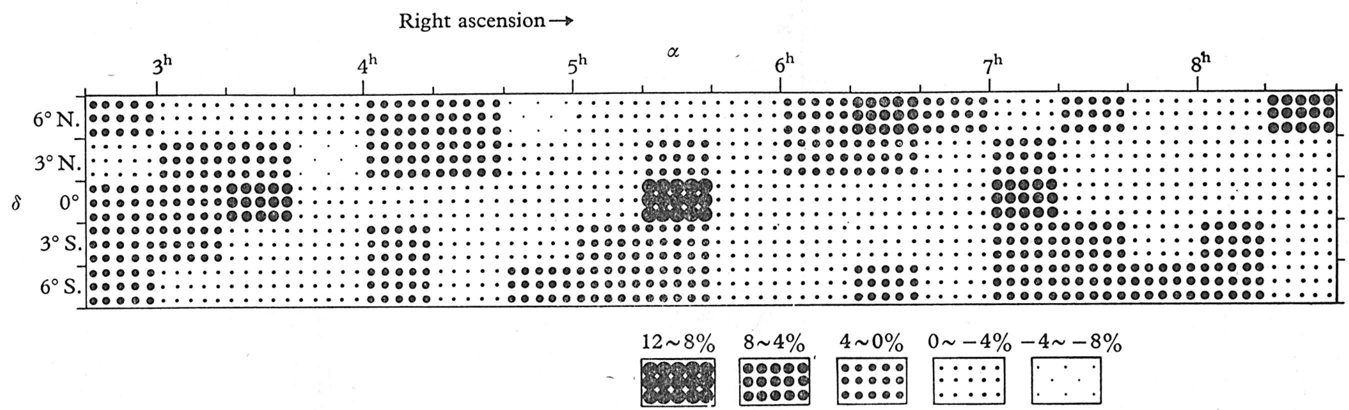

Fig. 4. Distribution of cosmic ray intensities in a part of the celestial sphere. Telescope no. 2, July 1955–June 1956. Graduation: +12%, +8%, +4%, 0%, −4%, −8%. The point source is at $\delta = 0°$, $\alpha = 5^h\ 30^m$.

Parker: What are the particle energies in the observations made?

Fujita: Nearly 3×10^{11} eV, I should suppose.

Parker: How are such particles observed?

Ehmert: An energy of 9 GeV is necessary for mesons to penetrate the lead shield between the counters of the telescope. The primary energies are extremely high.

Parker: Could someone give a rough order of magnitude of the energy the primaries might have to produce such particles?

Heidmann: At the Mexico conference the primary particles were assumed to have an energy of 200–300 GeV.