CHAPTER IV

RESULTS AND CONCLUSION

4.1 Determination of the Absorption Curve of Cosmic Rays.

The G.M. tubes were set as shown in Fig.17, the distance between the upper and the lower G.M. tubes was 50 centimetres. The middle tubes can be set anywhere in between, but for this measurement it was exactly in the middle of the two pairs of tubes. Over the lower G.M. tubes were lead absorber. Then the triple coincidence was counted as a function of the lead thickness, and the atmospheric pressure and temperature were recorded. For correcting the intensity variation due to the diurnal variation, the data were collected at the same time each day. The count rates then were corrected for accidental counts*, pressure and temperature effect.

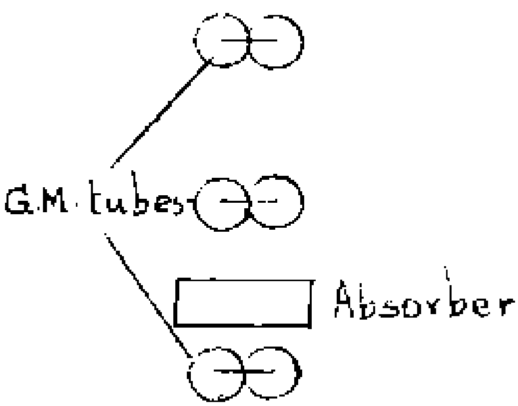

Fig. 17 Counter Arrangement for Absorption Curve Determination

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* It was found that the accidental counts with and without absorbers did not change very much.

The data and the graph of logarithmic scale on the relative intensity versus the thickness of the lead absorbers is shown in Table 4-1 and Fig. 18.

Table 4-1. The thickness and the intensity of cosmic rays.

T thickness in cm.	P pressure in mm.	Temp ^oC	C count rate in one hour	N cpm.	N/N_o
0	755.20	30.8	680.46	1.14 ± 0.44	1
5	757.35	30.7	578.03	0.96 ± 0.40	0.842 ± 0.471
10	755.60	30.0	525.04	0.88 ± 0.38	0.771 ± 0.454
15	755.05	30.5	521.23	0.87 ± 0.38	0.764 ± 0.444
20	756.10	30.5	490.34	0.82 ± 0.37	0.720 ± 0.442
25	755.30	30.3	450.08	0.75 ± 0.35	0.658 ± 0.394

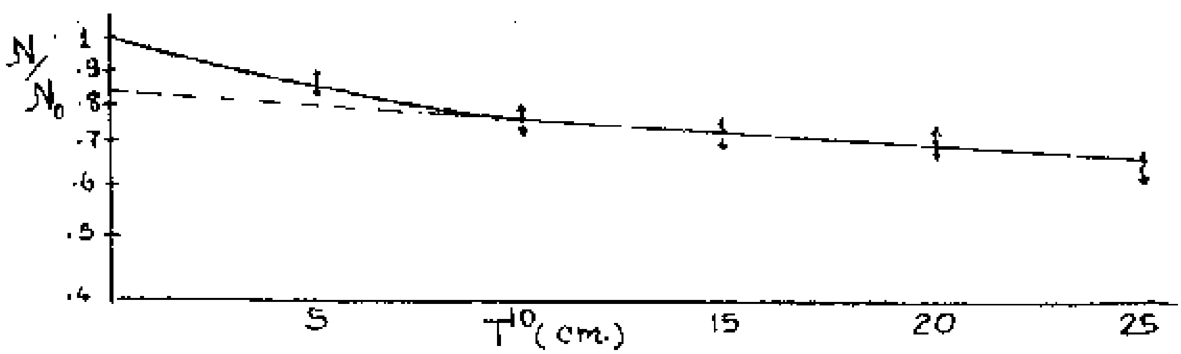

Fig. 18. Relative Intensity versus Thickness

From the curve it was found that the thickness for seperating the hard and soft component is about 10 centimetres of lead.

4.2 Determination of the Diurnal Variation of Hard Component of Cosmic Rays.

The G.M. tubes were arranged as shown in Fig.17 with 10 centimetres of lead over the central counters. The distance between the upper and lower counters was 80 centimetres. The triple and double coincidence count rates, local time, pressure and temperature were recorded. Then the intensity was corrected to the standard pressure and temperature. The system was run all day and night from July 16, 1963 to September 18, 1963. The distance between the upper and lower counters was then separated 105 centimetres apart. The same method was recorded during the period December 5, 1963 to December 25, 1963. The graph as shown in Fig. 19 is the diurnal variation of hard component of cosmic rays on November 8, 1963, which was a fine day, since there were no clouds during that day and night. From the graph it is seen that the intensity at night is lower than that at the day time because of the secondaries from neutron decay. It is known that most neutrons are sent out to the earth from the sun.

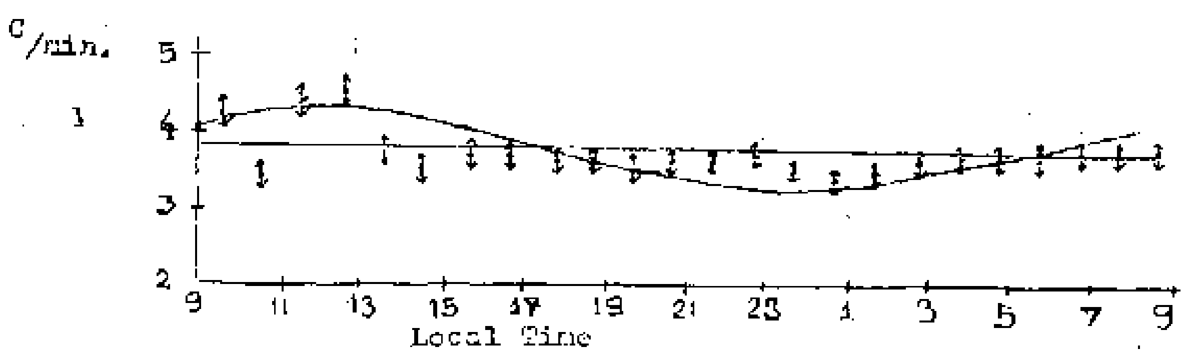

Fig. 19 The intensity of Hard Component versus the Local Time.

4.3 The Intensity of Cosmic Rays at Latitude 13°46' (N)

The total intensity of cosmic rays was found from the count rate with no absorber or with zero thickness as,

$$J = \frac{C.L^2}{A}$$

where J is the intensity,

L is the distance between the upper and lower counters,

A is the active area of the counter.

It was found that the total intensity J_t and the intensity of hard component J_h under the roof of the Physics Building are as follows:

$J_t = 0.460$ particles/min.-cm.^{2}-ster., for $L = 50$ cm.,

$J_n = 0.458$ particles/min.-cm.^{2}-ster., for $L = 80$ cm.,

and $J_h = 0.403$ particles/min.-cm.^{2}-ster., for $L = 80$ cm.,

$J_h = 0.380$ particles/min.-cm.^{2}-ster., for $L = 105$ cm.,

4.4 Conclusion.

From this investigation it was found that the sensitive diameter of each G.M. tube is the whole diameter of the tube. This effect can be interpreted as caused by secondary particles from the outer wall of the tube. The sensitive length is somewhat less than the length of the tube, because the inner glass tube is somewhat shorter than the outer brass wall. The experiment was done by measuring the three-fold coincidence count rate and two-fold coincidence count rates at the same time interval for correcting the diurnal variation, barometer, temperature effect, and the sun's activity. This result is the same as Street and Woodward (28). The total intensity of cosmic rays in the open air at Sanam Suapa during the Red Cross Fair 1963 is 0.473 particle per cm^2 per min. per ster.. The total intensity under the roof of the Physics Building is 0.459 particle per cm^2 per min. per ster.. The intensity of hard component at this station is 0.391 particle per cm^2 per min. per ster., which is the same as Nordheim's conclusion (31) that the hard component is about 70 percent of the total.

The absorption curve was found to be the same as that of Street, Woodward and Stevenson (17). The small differences may be caused by the thickness of the roof. The diurnal variation at the day time and at night is due to secondary cosmic rays from the decay of neutral particles coming from the sun. As stated previously, the charged particles will be trapped in the radiation belts. They can move to the earth only when they have high energies. Thus the intensity of charged particles is almost the same during the day and night. The low intensity of radiation also confirms the geomagnetic effect and the fact that the particles from the sun have low energies.

The efficiency of the experimental instrument is about 0.945, and it is almost constant all the time. Though it was operated all day and night for three months from July to September without closing down, the efficiency was checked to be almost the same all the time. It is found that the coincidence count rates decrease when the distance between the upper and the lower tubes increases, but the intensity measured in particle per cm^2 per min. per ster. is the same. The difference may be caused by the showers, and the variation of the time of the day.