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PRELIMINARY RESULT OF FRASCATI (ADONE) ON THE NATURE
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ABSTRACT

We report on the results at ADONE to study the properties of the newly found 3.1 GeV particle.

Soon after the news that a particle of 3.1 GeV with a width consistent with zero had been observed at Brookhaven by the MIT Group⁽¹⁾, it was immediately decided to push ADONE beyond its nominal limit of energy (2 x 1.5 GeV) to look for this particle. On the following day the information had reached us that this particle had also been observed at SPEAR at the energy exactly of 3.10 GeV with a narrow width < 1.3 MeV.

Three experiments⁽²⁾ (The Gamma-Gamma Group, the MEA Group, and the Baryon-Antibaryon Group) already prepared to systematically analyze the 1.5 to 3.0 GeV C. M. energy region started to analyze the energy interval between 3.08 and 3.12 GeV in 0.5 MeV steps. A striking increase in the total counting rate was observed soon afterwards in all three experiments, and the film analysis was immediately started. We report in the following preliminary results that had been obtained.

The results of the Gamma-Gamma Group: The apparatus, which covers a solid angle of approximately $0.75 \times 4\pi$, consists of optical spark chambers and wire chambers, is particularly suited to analyze the neutral and electromagnetic components (γ rays and electrons). The number of events in this reaction $e^+ + e^- \rightarrow > 3$ bodies (tracks or shower) is plotted in Fig. 1 in the region 3.090 to 3.112 GeV. The analysis of the events indicates an average charged multiplicity of 3.4 ± 0.5 , with a maximum 8. The presence of K, and a rather abundant photon component (average number of observed photon per events = 1.6 ± 0.1 with a maximum of 7) have been established. The experimental cross section at the top of the peak is found to be approximately 800 nb. The energy resolution of ADONE is approximately ± 1.5 MeV, this so far has prevented a direct measurement of the cross section at the peak.

The results of the MEA Group: This group has concentrated in studying the reaction $e^+ + e^- \rightarrow e^+ e^-, \mu^+ \mu^-,$ and hadrons. The experimental set up includes a large magnet with the field perpendicular to the beam direction and optical wide gap spark chambers and narrow gap shower spark chambers. The effective detection solid angle is $0.35 \times 4\pi$. The trigger requires at least two tracks particles of 120 MeV/c and 180 MeV/c respectively. The observed rate of multihadron events and the total production rate are given in Table I as a function of the total energy. The integrated luminosity, as measured by the

ADONE accelerator group with monitor based on small angle Bhabha scattering, is 0.6 nb^{-1} for each point. The multihadron event exhibit large multiplicity of both charged and neutral particles. Evidence for K production is also obtained.

The results of the Baryon-Antibaryon Group: This group has also seen a clear signal in the trigger of events with two relativistic colinear tracks. A six-fold coincidence between two opposite colinear telescopes viewing the intersection was used in the trigger. The cosmic ray background was rejected on line.

The observed cross section in this running condition, under the assumption that the resonance has spin 1 and that the decay width into ee pair is equal to the decay width into $\mu\mu$ pair, can be related to the ratio between the square of the partial width into e^+e^- pair and the total width. One can deduce the following result:

$$2 \frac{\Gamma_{ee}^2}{\Gamma_{\text{total}}} = (0.8 \pm 0.2) \text{ KeV.}$$

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REFERENCES

- (1) - Sau Lan Wu, private communication, November 11, 1974.
- (2) - Annual report, Laboratori Nazionali di Frascati, 1973.

TABLE I

Rate of events as a function of the total energy (MEA Group)

Total energy MeV	Total No. of events/ 0.6 nb^{-1} luminosity	Hadronic events (non-collinear events)
3090	2 ± 2	0
3092	4 ± 3	2 ± 2
3094.5	4 ± 2	0
3096.5	4 ± 2	3 ± 2
3098.5	4 ± 2	3 ± 2
3100.5	26 ± 5	20 ± 5
3102.5	23 ± 4	15 ± 3
3104.5	10 ± 3	6 ± 2
3106.5	4 ± 2	0
3108.5	5 ± 2	1 ± 1
3110.5	4 ± 2	2 ± 1
3112	4 ± 3	0

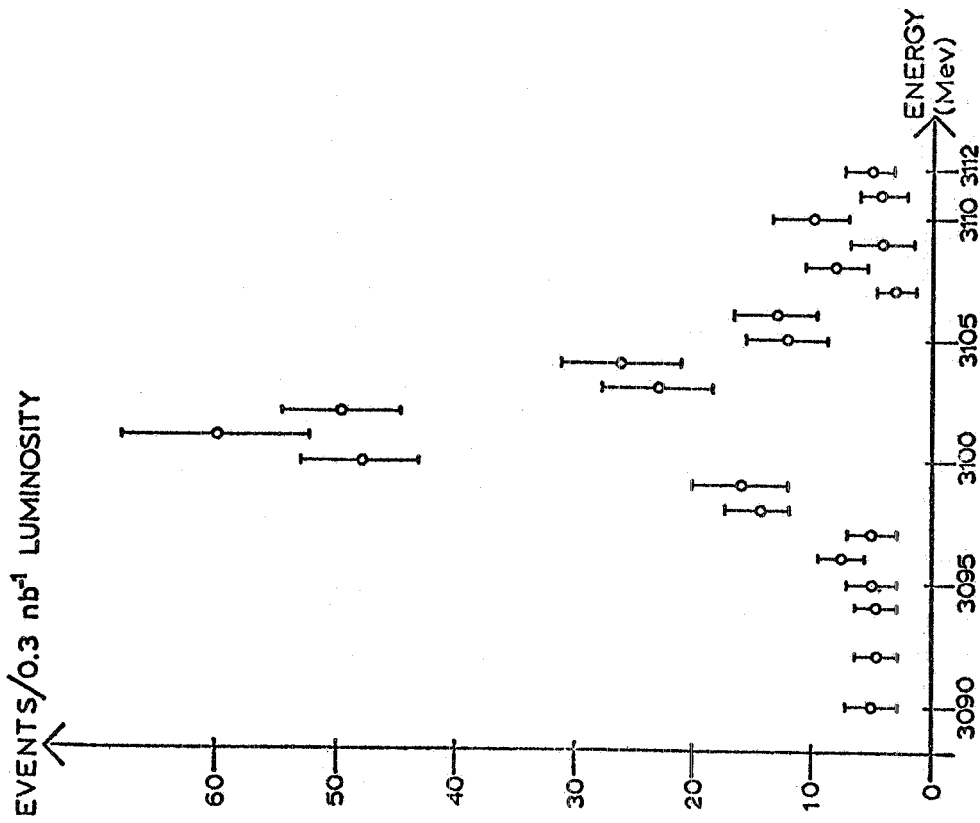


FIG. 1 - Shows the result from the Gamma-Gamma Group of total 446 events. The number of events per 0.3 nb^{-1} luminosity is plotted versus the total C. M. energy of the machine.