fications system is not functioning and we therefore cannot separate muons from strongly interacting particles. However, outside the peak the data are consistent with our previously measured μ-pair cross section. Since a large $\pi\pi$ or KK branching ratio would be unexpected for a resonance this massive, the two-body enhancement observed is *probably* but not *conclusively* in the μ-pair channel.

The $e^+e^- \to$ hadron cross section is presumed to go through the one-photon intermediate state with angular momentum, parity, and charge conjugation quantum numbers $J^{PC}=1^{--}$. It is difficult to understand how, without involving new quantum numbers or selection rules, a resonance in this state which decays to hadrons could be so narrow.

We wish to thank the SPEAR operations staff for providing the stable conditions of machine performance necessary for this experiment. Special monitoring and control techniques were developed on very short notice and performed excellently.

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[1]The apparatus is described by J.-E. Augustin *et al.*, to be published.

[2]The detection-efficiency determination will be described in a future publication.

[3]While preparing this manuscript we were informed that the Massachusetts Institute of Technology group studying the reaction $pp \to e^+e^- + x$ at Brookhaven National Laboratory has observed an enhancement in the e^+e^- mass distribution at about 3100 MeV. J. J. Aubert *et al.*, preceding Letter [Phys. Rev. Lett. 33, 1402 (1974)].

[4]G. Bonneau and F. Martin, Nucl. Phys. B27, 381 (1971).

Preliminary Result of Frascati (ADONE) on the Nature of a New 3.1-GeV Particle Produced in e^+e^- Annihilation*

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

Soon after the news that a particle of 3.1 GeV with a width consistent with zero had been observed at Brookhaven National Laboratory by the Massachusetts Institute of Technology group,[1] it was immediately decided to push ADONE beyond its nominal limit of energy (2×1.5 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 of exactly 3.10 GeV with a narrow width, <1.3 MeV.[2]

Three experiments[3] [the Gamma-Gamma Group, the Magnet Experimental Group for ADONE

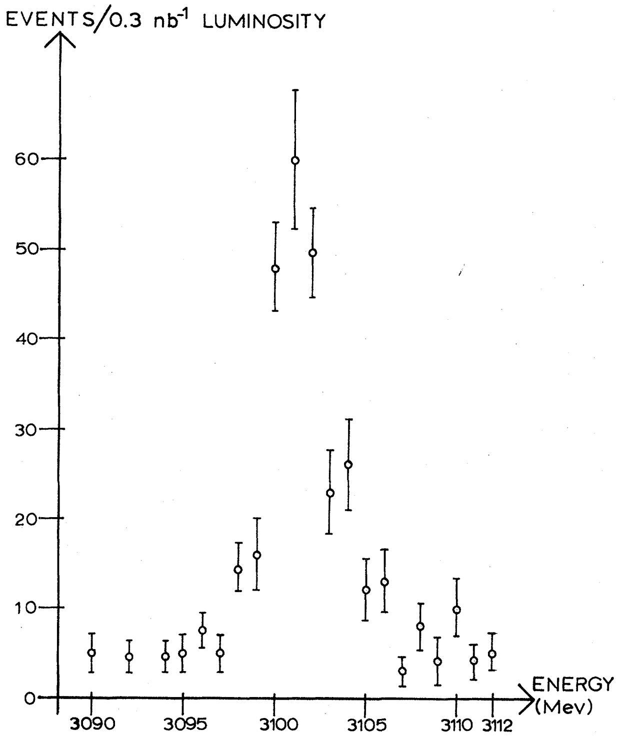

FIG. 1. Result from the Gamma-Gamma Group, total of 446 events. The number of events per 0.3 nb^{-1} luminosity is plotted versus the total c.m. energy of the machine.

(MEA), and the Baryon-Antibaryon Group], already prepared to analyze systematically 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 the preliminary results that have been obtained.

Results of the Gamma-Gamma Group.—The apparatus, which covers a solid angle of approximately $0.75\times4\pi$, consists of optical spark chambers and wire chambers and 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 showers), 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 of 8. The presence of K and a rather abundant photon component (average number of observed photons per event is 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 has so far prevented a direct measurement of the cross section at the peak.

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 (noncollinear 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

Results of the MEA Group.—This group has concentrated on studying the reaction $e^++e^-\rightarrow e^+e^-$, $\mu^+\mu^-$, and hadrons. The experimental setup 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 $0.35\times4\pi$. The trigger requires at least two tracks of particles of 120 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 has been measured by the ADONE accelerator group with a monitor based on small-angle Bhabha scattering and is 0.6 nb^{-1} for each point. The multihadron events exhibit large multiplicity of both charged and neutral particles. Evidence for K production is also obtained.

Results of the Baryon-Antibaryon Group.—This group has also seen a clear signal in the trigger of events with two relativistic collinear tracks; a sixfold coincidence between two opposite collinear 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 can be related, under the assumption that the resonance has spin 1 and that the decay width for ee pairs is equal to the decay width for $\mu\mu$

pairs, to the ratio between the square of the partial width into e^+e^- pair and the total width. One can deduce the following result:

$$\Gamma_{\mu\mu}^2/\Gamma_{\text{total}} = 0.8 \pm 0.2 \text{ keV}.$$

We are grateful to Dr. San Lan Wu for providing us with the Massachusetts Institute of Technology results before publication. We thank the ADONE machine group for the excellent performance of the machine and we thank N. Cabibbo, A. Grillo, L. Maiani, G. Parisi, and R. Petronzio for interesting discussions.

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[1]S. L. Wu, private communication. See J. J. Aubert *et al.*, second preceding Letter [Phys. Rev. Lett. 33, 1402 (1974)].

[2]J.-E. Augustin *et al.*, preceding Letter [Phys. Rev. Lett. 33, 1404 (1974)].

[3]Annual report, Laboratori Nazionali di Frascati, 1973 (unpublished).

COMMENTS

Comment on "Superfluid Flow in Restricted Geometries"*

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It is argued that experiments on superflow in pores, films, and channels can be interpreted without the introduction of a superfluid healing length.

Interest in the properties of helium in restricted geometries has not abated since the publication of the Letter[1] referred to in the title of this note. Here we would like to draw attention to some important consequences of the theory developed in this earlier Letter[1] regarding the interpretation of superflow experiments in terms of a superfluid healing length.

Experiments[2-6] have shown that when helium flows through very fine pores or channels, there is an apparent increase in the normal-fluid mass over what one would expect for an equivalent volume of bulk helium at the same temperature. These experiments have been conventionally interpreted in terms of a local superfluid density ρ_s which is supposed to vanish near a boundary but which takes on the bulk helium value at distances from the boundary large compared to a certain "healing length" ξ_s, defined by

$$\xi_s = \int_0^\infty [1 - \rho_s(x)/\rho_s(\infty)]\,dx, \quad (1)$$

where $x = 0$ denotes the boundary surface and x is the coordinate direction normal to the boundary.[3] The experiments, when interpreted in terms of the local two-fluid model, measure ξ_s directly. We would argue that such an interpretation should be avoided if possible since $\rho_s(x)$ is not presently experimentally accessible.

A locally varying ρ_s is a familiar feature of the usual two-fluid model, but in that case ρ_s depends only on a local T, P, and $\vec{v}_s - \vec{v}_n$, not on the presence of boundaries *per se*. Also the scale of the variations must be large enough (much larger than ξ_s in general) to permit local thermodynamic averaging. The principal theoretical motivation for the introduction of healing behavior is the Ginzburg-Pitaevskii mean-field theory[7] for $T \approx T_\lambda$ in which $\rho_s = |\Psi|^2$ and where Ψ is a complex order parameter. The difficulties here are that the singular temperature dependence of Ψ must be introduced in an *ad hoc* way,[8] and that the correct boundary conditions on Ψ are uncertain. The former difficulty can be avoided by introducing the "helicity modulus" and appealing to scaling arguments.[9]

There exists therefore no compelling theoretical reason for the introduction of a superfluid healing length. The question now is: Can we in-