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SUMMARY. -

We have searched for possible narrow resonances produced in the reaction $e^+e^- \longrightarrow$ hadrons, at Adone, in the mass interval 1.45÷1.92 GeV. Within the present statistic, no evidence has been found. We obtain an upper limit on the energy integrated resonant cross section of about 6% of the J/ψ(3.1) corresponding value.

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In this letter we present the results on a search for possible narrow resonances, that is with total width less than the energy spread of Adone, produced in the reaction $e^+e^- \longrightarrow$ hadrons, at Adone. These results are relative to the mass interval 1.45÷1.92 GeV. They follow a similar search[1,2], performed at higher energy (1.91÷3.09 GeV).

The experimental set-up (Fig. 1) has been described in detail elsewhere[2,3]. It consists of two large semicylindrical telescopes placed above and below the interaction region. These telescopes (shower detector) are a sandwich of scintillation counters, optical spark chambers and lead converters (total thickness 5.5 R.L.). The shower detector covers a solid angle, for a point-like source, of 0.41 x 4π sr for triggering and 0.66 x 4π sr for tracking. Outside the shower detector heavy plate optical spark chambers are used to observe the ranges and nuclear interactions of hadrons. A pair of circular side-telescopes containing spark chambers with magnetostrictive read-out, lead absorbers and scintillation counters, complete the detection system ($\Delta\Omega/4\pi$=0.15). The trigger logic requires a coincidence between the upper and lower telescopes of the shower detector. For only a charged particle in a telescope, this corresponds to a lower energy limit of T_π=120 MeV, T_k=190 MeV. If photons enter the telescope firing the trigger counters these limits could be as low as T_π= 35 MeV, T_k =60 MeV.

The total c.m.energy spread (FWHM) of the machine depends on the c.m. energy according to the formula $\Gamma_W(\mathrm{MeV})=0.32W^2(\mathrm{GeV}^2)$. Therefore in the presently explored energy region Γ_W ranges from 0.7 MeV to 1.2 MeV, allowing us to scan the total c.m. energy interval in 1 MeV steps. Luminosity of the machine was measured by wide angle Bhabha scattering in our apparatus and checked with small angle (3°÷6°) Bhabha scattering measured in a different interaction region of Adone. Each energy step corresponds to an integrated luminosity of 0,2 nb^{-1} except for some energy regions where higher statistics has been accumulated.

We have selected 2422 events from the reaction $e^+e^- \longrightarrow$ hadrons, by requiring at least two charged prongs plus anything in the optical spark chambers.

The relative yield of the events as a function of energy is reported in Fig. 2. The quoted errors are statistical only. No significant narrow peak is evident in the explored energy region.

Following our previous[1,2] analysis, we define the quantity

$$\Sigma = \int_{\Delta W} \left[\sigma(W) - \sigma_{NR}(W) \right] dW$$

where ΔW is an energy interval equal to the machine spread; $\sigma(W)$ is the measured hadronic cross section at c.m. energy W,; $\sigma_{NR}(W)$ is the non resonant part of $\sigma(W)$: it has been calculated from the experimental

yield averaged on an interval of ± 25 MeV around the considered W value. The detection efficiency has been calculated under the assumption that all the produced particles are pions, with an invariant phase space momentum distribution. The calculated efficiency turns out to be about 18% and is weakly dependent on the energy.

The maximum value for Σ obtained in the energy region 1.45÷1.92 GeV is used to estimate the upper limit, at 90% confidence level, on the energy integrated resonant cross section. This limit turns out to be 6% of the corresponding $J/\psi(3.1)$ value (9.6 ± 1.9 nb. GeV) measured in the same experimental set-up. Radiative corrections have been taken into account.

We would like to thank the Adone group for machine operation. A special appreciation is due to Mrs. M. A. Melorio for her very careful film analysis.

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1) C. Bacci et al.; Phys. Lett. 58B, 481 (1975).
2) C. Bacci at al.; Phys. Lett. 64B, 356 (1976).
3) R. Baldini Celio et al.; Lett. Nuovo Cimento 11, 711 (1974); C. Bacci et al.; Lett. Nuovo Cimento 12, 269 (1975).

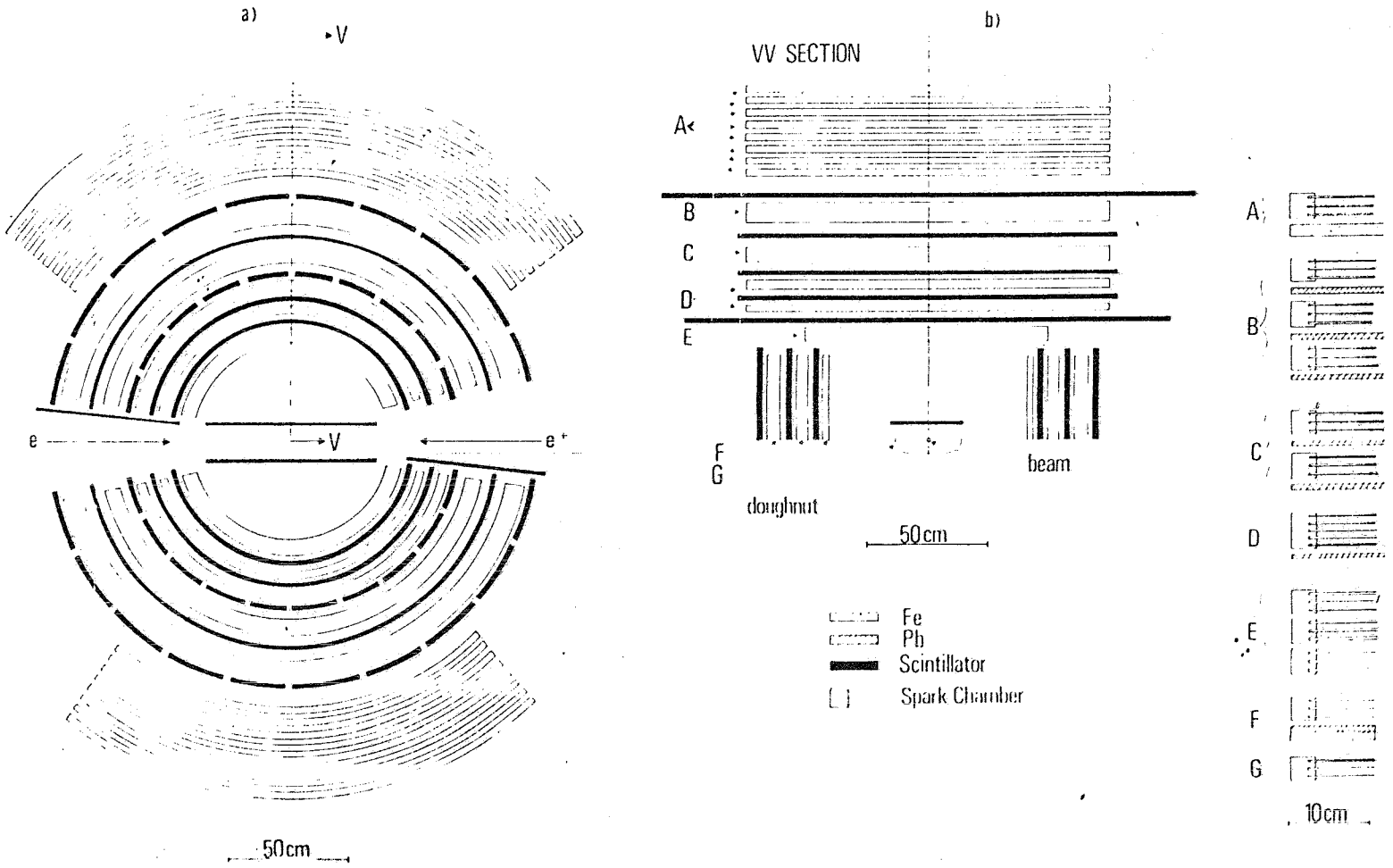

FIG. 1 - Experimental set-up.

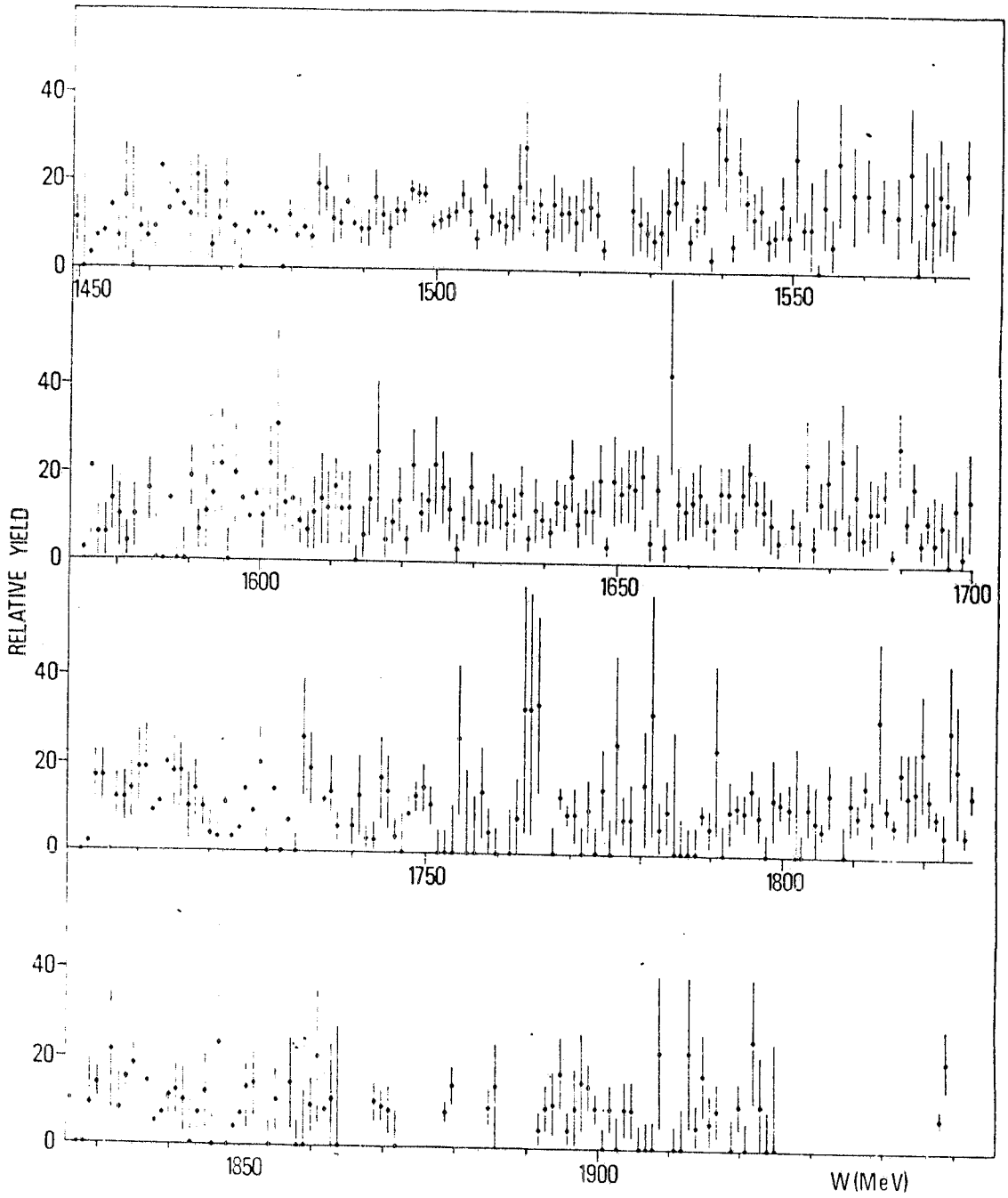

FIG. 2 - Relative yield for the reaction $e^+e^- \longrightarrow$ $\longrightarrow$ hadrons as a function of the total c. m. energy W.