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M E M O R A N D U M

To: Professor G. Puppi, Chairman of the EEC
 From: A. Buhler, G. Fortunato, T. Massam, D. Manaresi
 and A. Zichichi,
 Re: Search for quarks.

1. Our previous experiment (Nuovo Cimento 40, 589 (1965)), based on simultaneous pulse-height analysis of six plastic scintillator counters, had a total (surface x solid angle) = $65 \text{ cm}^2 \text{ sterd.}$, and had been mounted using available counters and electronics. The total running time was dictated by the availability of an oscilloscope during our simultaneous PS runs, and amounted to 226 hours. The results of this experiment gave the following upper limit for $(2/3)$ quarks (90% confidence):

$$5 \times 10^{-8} \text{ cm}^{-2} \text{ sterd.}^{-1} \text{ sec}^{-1}$$

2. If we assume that Adair is observing only background, the level is $\approx 5 \times 10^{-9} \text{ cm}^{-2} \text{ ster.}^{-1} \text{ sec.}^{-1}$, both for $(2/3)$ and $(1/3)$ charges. The optimistic interpretation of Adair's results is that he observes quarks, above a background level, which can be roughly estimated from the data. In this case the quark-rates are:

for $(2/3)$	(0.8 \pm 0.4)	$10^{-9} \text{ cm}^{-2} \text{ sterd}^{-1} \text{ sec}^{-1}$
for $(1/3)$	" " " "	" " " "

3. Having available from our Papele experiment some larger counters and spark chambers, we have mounted a set-up which has the following total (surface x solid - angle) = $900 \text{ cm}^2 \text{ sterd.}$

In order to reach the Adair level, i.e. $0.5 \times 10^{-9} \text{ cm}^{-2} \text{ sterd}^{-1} \text{ sec}^{-1}$ we need to run with the present set-up for 64 days. Apart from the larger acceptance the present set-up has, with respect to the old one, two further advantages: (i) two spark chambers (top and bottom) whose main function is to allow us to resolve charge $(4/3)$ events from a pair of charge-one particles; moreover these spark chambers will allow us to correct for inclination and position of traversal of each particle: (ii) a time of flight measurement associated with the 6-fold pulse-height analysis, in order to extend the energy range accepted by our telescope.

4. Our experience with this type of set-up shows that it is possible to construct an analogous system having ten times the present acceptance. A set-up of this type has been studied in collaboration with Bologna University, and we need official approval for this collaboration to continue.