Laboratori Nazionali di Frascati

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G. Cavalleri, E. Gatti, R. Habel, E. Iarocci, T. Letardi and R. Visentin: ISOTROPIC MONOGAP CHAMBER PULSED WITH DAMPED OSCILLATION. -

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Isotropic Monogap Chamber Pulsed with Damped Oscillation.

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This chamber is a development of the « gas amplified scintillation chamber » realized at the C.I.S.E. laboratories by some of us (1). After the work of ref. (1) this kind of isotropic track visualizer was further developed by groups in URSS (2) and USA (3). They succeded, by using larger chambers and higher pulse voltage, in visualizing minimum ionization particles by allowing Townsend avalanches to grow up to initial streamers.

Both URSS (2) and USA (3) groups used unidirectional pulses to produce the limited streamers. We use instead, as in our previous works (1), a damped oscillating pulse with a frequency of 28 MHz, a decay time constant of 0.15 μs and amplitude of the first oscillation of 12 kV/cm.

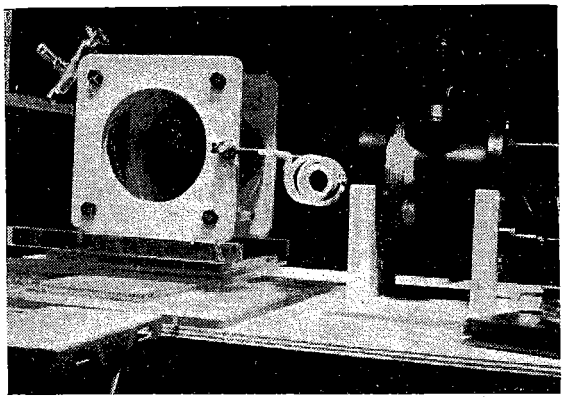

Fig. 1. – The chamber coupled to the Marx generator by the autotransformer.

The chamber (made of Pyrex glass) is cilindrical (15 cm in diameter and 10 cm height) with external electrodes one of which is a copper mesh with a transparency of 85% (v. Fig. 1).

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(1) G. CAVALLERI, E. GATTI, M. NASINI and G. REDAELLI: *Energia Nucleare*, **12**, 779 (1961); G. CAVALLERI, E. GATTI and G. REDAELLI: *Nuovo Cimento*, **25**, 1282 (1962); F. T. ARECCHI, G. CAVALLERI, P. PRINCIPI and G. REDAELLI: *Energia Nucleare*, **9**, 713 (1962).

(2) G. E. CHIKOVANI, V. A. MIKHAILOV and V. N. ROINISHVILI: *Phys. Lett.*, **6**, 254 (1963); G. E. CHIKOVANI, V. N. ROINISHVILI and V. A. MIKHAILOV: *Nucl. Instr. and Meth.*, **29**, 261 (1964); B. A. DOLGOSHEIN, B. U. RODIONOV and B. I. LUCHKOV: *Nucl. Instr. and Meth.*, **29**, 270 (1964).

(3) F. BULOS, A. BOYARSKI, R. DIEBOLD, B. RICHTER, A. ODIAN and F. VILLA: *Purdue Conference on Instrumentation for High-Energy Physics* (May 1965); *IEEE Trans. on Nuclear Science* NS-12, November 4 (1965); K. STRAUCH: *Innovation in Visual spark chamber techniques, IEEE Trans. on Nuclear Sciences*, NS-12, November 4 (1965).

The oscillating H.V. pulse is obtained with a Marx generator coupled to the chamber by an autotransformer (v. Fig. 1), the primary and secondary circuits being tuned on the same frequency. Cosmic rays tracks are shown in Fig. 2.

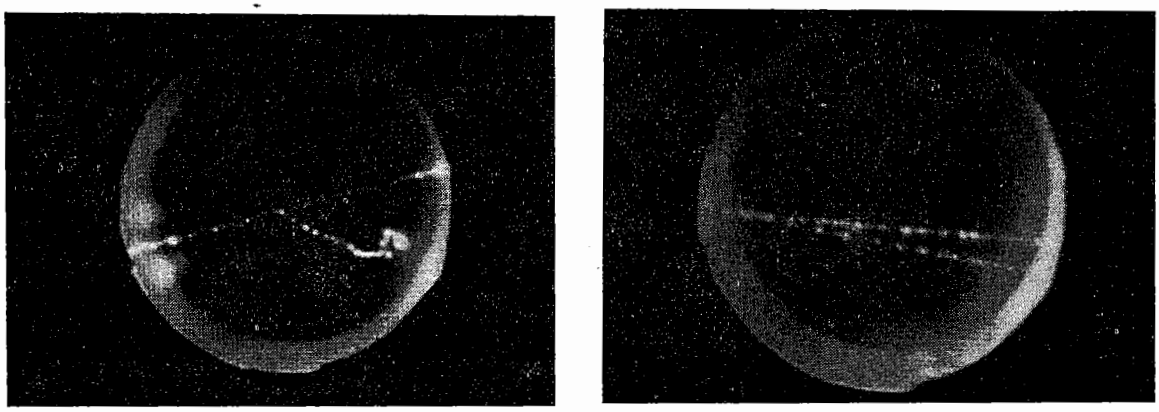

Fig. 2*a*. – Photographs of tracks viewed along the electric field direction.

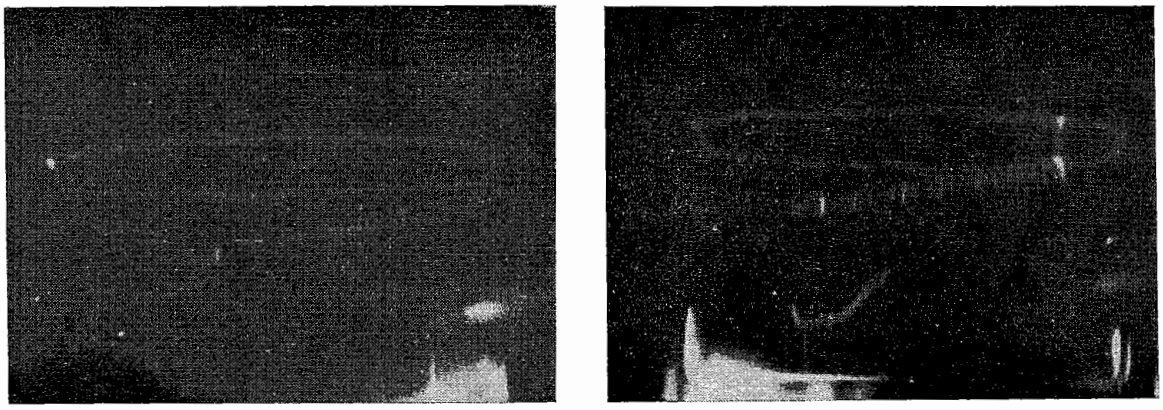

Fig. 2*b*. – Tracks photographed viewing normally to the electric field.

The photographs of Fig. 2*a* are taken, with a Nikkor lens $f/1.1$ and Kodak Tri-X-Film, along the direction of the electric field. The photographs of Fig. 2*b* are taken at right angle with the electric field. The tracks appear, in the front view, as bright spots $(1 \div 2)$ mm wide and in the side view as streaks $(4 \div 5)$ mm long.

With a lower electric field (8 kV/cm) the brightness of the tracks decreases and an image intensifier must be interposed between the isotropic chamber and the camera lens.

We used a three-stage image intensifier magnetically focused, with a total gain of about $5 \cdot 10^3$ at 50 kV d.c. supply, made in our laboratories [4].

The last two stages of the intensifier

[4] R. HABEL, T. LETARDI and G. MARANGONI: *Intensificatore di immagine a tre stadi a focalizzazione magnetica*, to be published in *Alta Frequenza*.

Fig. 3. – A track photographed, in the electric field direction, with the image intensifier.

were gated to avoid film darkening by the tube background.

The photographs of Fig. 3 are taken with the intensifier. The front lens aperture was $f/4.5$.

This preliminary work shows that it is possible to obtain, with the damped oscillation, a brightness and a spatial resolution of tracks comparable to or eventually better than those obtained, at relatively higher fields, employing rectangular pulses ([3]).