were turned off, the lights flashed and a photograph taken. During one such run, twelve flashes produced 10 pictures with cosmic ray tracks passing through the chamber.

The light pulses observed from the bubble chamber have the right intensity expected from a liquid scintillator. However, further tests with very non-relativistic particles passing into the chamber are being made to exclude definitely the possibility of the light being due to Cherenkov radiation. Such a chamber should prove useful in a number of experiments.

STABILIZATION AND CONTROL OF BUBBLE CHAMBER SENSITIVITY (*)

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(presented by B. Hahn)

In order to make bubble counting a useful tool for particle velocity measurements, a bubble chamber should have a constant radiation sensitivity (constant bubble density for e.g. minimum ionizing particles) over a time period, which is several times longer than the particle beam pulse duration including time jitter. Furthermore the radiation sensitivity should be the same at each expansion, and should be quickly adjustable in a reproducible way.

The bubble density of a bubble track is known to depend strongly on the liquid temperature and on the pressure drop (equilibrium vapour pressure minus final pressure reached during expansion). Experimental curves for $CBrF_3$ and for minimum ionizing electrons demonstrating this dependence are shown in Fig. 1. In order to obtain constant bubble density to within $\pm 5\%$, the temperature should be stabilized to $\pm 0.1°C$, and the final pressure to ± 0.05 atm.

While temperature stabilization has been a common enough practice, stabilization of the final pressure has received only little attention. For most of the existing bubble chambers the final pressure depends in a somewhat unreliable way on the production rate of " corner bubbles " (bubbles formed at corners, walls, gaskets, etc.), and on the speed of expansion. For such chamber operation, accurate bubble counting will not be possible without reference tracks of known ionizing power in each picture.

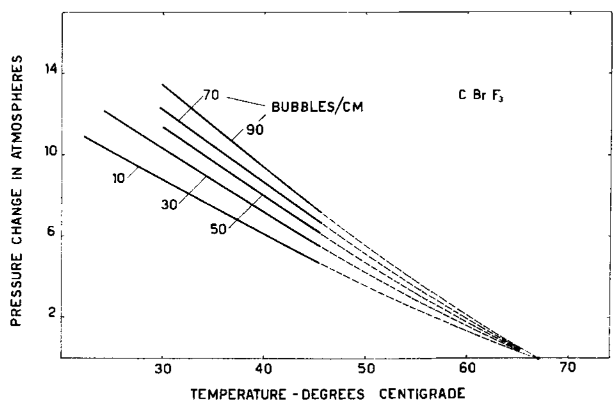

Fig. 1 Number of bubbles per centimeter produced by minimum ionizing electrons in $CBrF_3$ as a function of liquid temperature and pressure drop.

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Attempts at stabilization of final pressure have been made by Blinov et al [1], and by Bassi et al [2], however no constant radiation sensitivity has been reported.

Similar to the arrangement of Blinov et al, we have achieved pressure stabilization by providing pressure communication of the chamber liquid with a reference pressure through flexible membranes. The pressure reference is simply an air filled reservoir, whose pressure quickly can be adjusted in order to yield the desired chamber sensitivity.

Fig. 2 shows schematically a set of flat bottomed pressure pulses obtained with our pressure stabilized 16 cm bubble chamber, 2 liter in volume, filled with $CBrF_3$. The numbers attached to the pressure curves indicate the corresponding bubble densities measured for 30 MeV electrons. The true pressure pulses are identical to those presented in Fig. 2, except for small oscillations with amplitudes of approximately 0.05 atm and a period of several ms.

Sudden pressure stabilization of a fast expanding liquid of high compressibility involves a rather abrupt momentum change, resulting in serious pressure oscillations. The oscillations can be minimized by choosing proper chamber geometry (wide chamber neck), and by eliminating sudden pressure changes during expansion.

The bubble density throughout the flat part of the pressure pulses was always found to be constant within the error of bubble statistics of $\pm 5\%$. A typical bubble density plateau together with the corresponding pressure pulse is shown in Fig. 3.

A more extensive paper on pressure stabilization of bubble chambers will appear elsewhere.

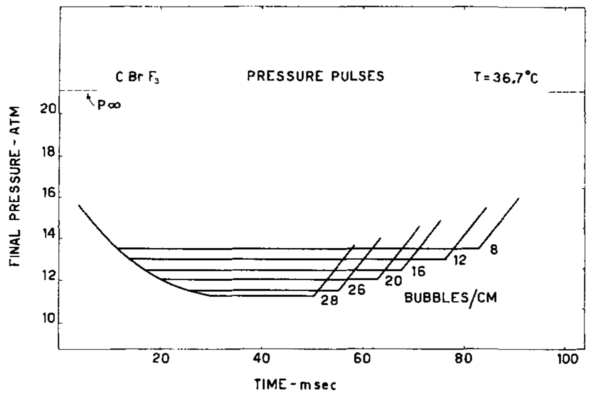

Fig. 2 Flat bottomed pressure pulses and corresponding number of bubbles per centimeter produced by minimum ionizing electrons in $CBrF_3$ at 36.7°C.

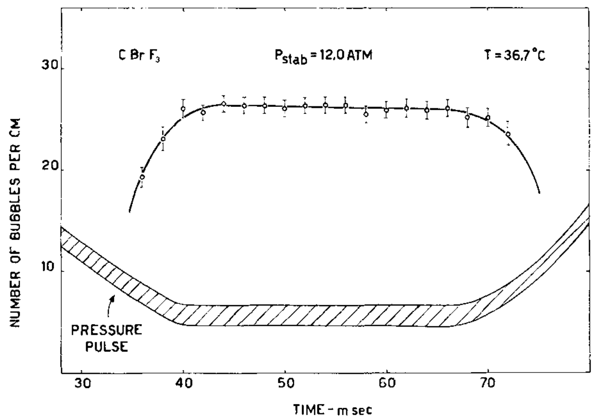

Fig. 3 Bubble density plateau and corresponding pressure pulse, obtained with minimum ionizing electrons in $CBrF_3$ at 36.7°C.

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