Bubble Chambers Encyclopedia Article

Bubble Chambers

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Bubble Chambers

The bubble chamber is a device that allows physicists to see particle tracks directly in nuclear collision experiments. It was most widely used from the mid-1950s to the 1970s but is still useful because it helps scientists to visualize individual particle interactions.

In 1952, **Donald Glaser** invented the bubble chamber; he won the Nobel Prize for Physics for his invention in 1960. His prototype used xenon in its chamber, while later models used liquid hydrogen, propane, and freons (such as CFCl and CFBr) instead.

In an active bubble chamber, these liquids are superheated: heated to beyond their usual **boiling** point under high pressures, then quickly reduced to lower pressures. This leaves them extremely unstable, and bubbles will form anywhere a positive ion occurs. Researchers then shoot particle beams into the liquid chamber and take photographs, using the bubbles to track the paths of positive **ions**. Some bubble chambers can measure as large as 3.7 m in size and contain up to 30 m^3 of liquid.

The bubble chamber has several advantages in collision research. It has excellent resolution, is truly a three-dimensional detector, and can be used for long periods of **time**. Magnetic fields can easily be set up to run through the chamber, allowing physicists to consider electromagnetic properties of the particles. Experiments also can be repeated for thousands or millions of photographic images with very little **energy** and cost in resetting the observation chamber.

The bubble chamber does not enjoy the popularity it did in the 1970s, mostly because of one limitation: the liquid in the chamber is both the target and the observation device. Therefore, experiments are limited to targets which can clearly show bubble trails. Within this limitation, however, the bubble chamber is one of the most versatile tools of **nuclear physics**.