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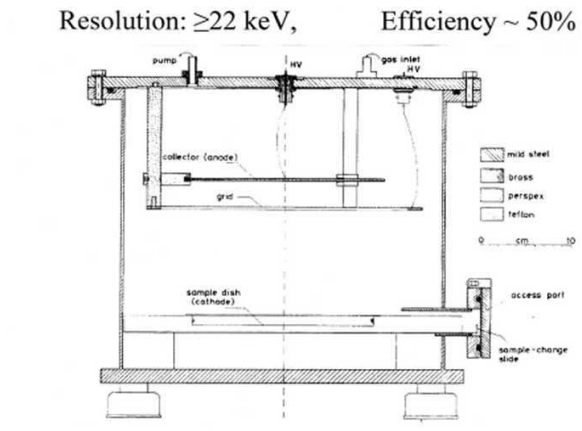
Alpha Spectrometry Hardware - Frisch Grid Ionization Chamber

Large volume Frisch Grid Ionization Chambers (GIC) can be used for alpha particle spectrometry of very large samples and therefore from large sample masses.

Photo: ORDELA, Inc.

The chamber shown here is available for samples having 8" or even 10" diameter. The chamber weighing 30 kg or 50 kg is operated with P10 counting gas (Ar + 10% methane) at a working pressure of 200 kPa (2 bar). Alphas are registered with approx. 45% efficiency and the resolution of the chamber is around 50 to 60 keV (FWHM).

The working principle of a GIC is illustrated in the drawing below. Normally the preamplifier is attached directly to the chamber in order to keep the cable from the anode to the first FET very short. High voltage supply up to 3 kV, linear amplifier, Analog-to-Digital Converter and multichannel analyzer have also to be supplied in order to operate the chamber.



The resolution of the chamber (FWHM of peaks) quoted by different sources is very variable, ranging from 22 keV to over 60 keV for very thin samples. There are various factors that influence the resolution very strongly such as:

- Purity of the P10 gas, especially its dryness
- Hyper-cleanness of the inner chamber walls
- Vibration-free environment
- Selected components in the preamplifier (the extinct Tennelec preamplifiers were unbeatably the best)

We have actually measured spectra with a GIC that have a resolution of 25 keV.

Photo: MAB Solutions GmbH

This GIC for samples having up to 20 cm diameter is operated with P10 counting gas at 10 to 50 mbar pressure (1 to 5 kPa). The chamber weighing around 50 kg has approx. 40% counting efficiency and a background of less than 13 counts per hour (integral).