

Alpha Spectrometry Hardware - NIM Chambers and Systems

In the picture below a variety of NIM-based alpha spectrometer chambers is shown, some of which are still on the market but unfortunately not produced any more.



- All NIM chambers contain an easily decontaminated chamber with sample holder and Microdot connector for a room-temperature semiconductor detector. The chamber is evacuated to 1 mbar or below by an external pump; a three-way manifold allows for selective disconnection of a chamber from extended (branching) vacuum systems.

- In all chambers the detector is directly connected to a preamplifier and linear amplifier which in some chambers is followed by a biased amplifier for selection of certain energy windows to be measured. (Actually, it would be sufficient to provide two energy windows: the full window covers the Beta + Alpha energy range from 100 keV to 11.5 MeV and the alpha window covers 3 MeV to 11.5 MeV. However, no such chamber is on the market).

- All chambers provide regulated bias voltage for the detector which is typically around 35 to 40 Volts but which can be up to 100 Volts for special detectors.

- Some chambers contain a calibration pulse generator whose dial setting is an equivalent to apparent alpha particle energy. Example: when the dial is at 5.67 then a pulser peak is measured very close to an alpha energy of 5.67 MeV. This feature may work very well shortly after factory setting.
- Some chambers contain gadgets such as detector voltage and/or current indicator, vacuum indicator or time display. There may even be a vacuum control which allows application of detector bias only when pressure in the chamber is below a pre-set value.
- In some older chambers the vacuum connection is via Swagelock with 1/4" tube whereas other chambers provide NW-10 or similar normed vacuum flanges.

As measuring times in alpha spectrometry may be very long (a week is not unusual!) one may need several alpha chambers for routine measurements. Producers have therefore developed stacking crates in which several chambers can be stacked together, operated with a common vacuum pump and controlled from one emulator program in the operating PC.



Photo: ORTEC

Up to four Dual-Chamber systems can be operated together in this chassis. Each chamber has all electronics needed for alpha spectrometry, including a digital MCA and spectrum storage. Units are connected via USB to the control PC.

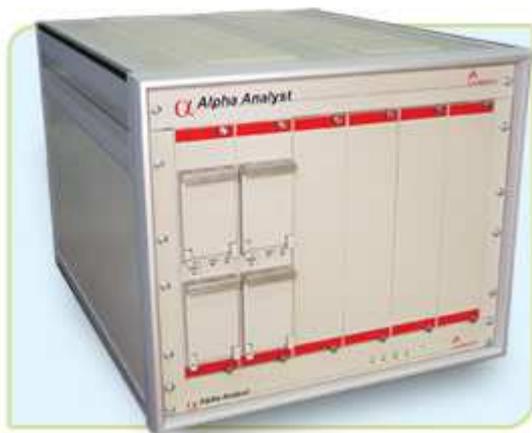


Photo: CANBERRA Industries, Inc.

A total of six dual alpha chambers can be accommodated in this chassis and up to four such units can be stacked in a large 19" rack. Each dual chamber provides one bias supply for both chambers and each chassis has linear electronics and a single (routing) ADC.

Some units intrinsically have or can be equipped with recoil contamination suppression via application of a small positive voltage to the detector and a controlled elevated air pressure in the chamber in order to slow down the ~100 keV recoils.