MIRION TECHNOLOGIES

TELESCOPES

Stack of Two or More HPGe Detectors

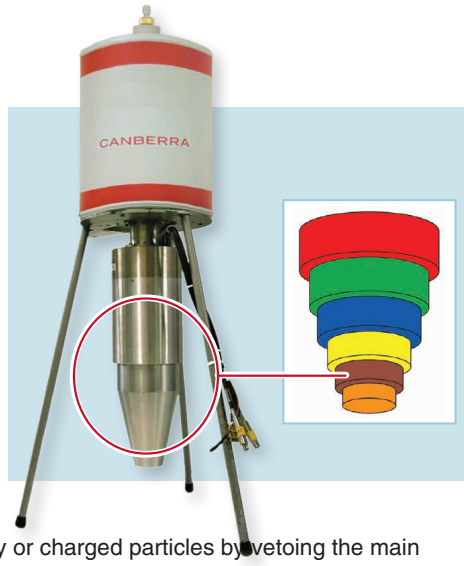
Features

- Multi-arrangement of planar, or planar and coaxial detectors (segmented or not), HPGe or Si(Li) or PIPS®
- Extended gamma-ray energy range or charged particle discrimination
- Background suppression by using coincidence timing between detectors
- No measurable crosstalk effects between channels
- Minimized dead areas between detector layers
- Stable thin window proprietary technology not affected by heat cycling or neutron annealings

Applications

- Waste barrel monitoring or whole body counting systems: Both applications need highest efficiency, wide energy range and lowest MDAs
- Space spectroscopy: background reduction by multiple site method (ß decay suppression)
- Compton cameras: telescope of double sided strip detectors (DSSDs)
- Nuclear physics: Doppler broadening correction by incidence angle measurements (segmented planar detector stack)
- High energy measurements of gamma rays with best achievable efficiency
- Background reduction by vetoing of charge particles
- High energy proton spectroscopy

Description



The purpose of a telescope arrangement of several planar and coaxial germanium detectors is to get wide energy range measurements with the best possible efficiency and background correction, like in cosmic gamma rays spectroscopy.

Stacks of planar and coaxial, pixel or strip segmented detectors can also be mounted or associated with Si(Li), PIPS detectors to best focus on X-ray or charged particles by vetoing the main signal, and remove any unwanted background.

Such arrangement increases the detector resolving power by discriminating gamma rays from the measured background, and also by reducing Doppler broadening effects.

The absorption efficiency of such detector is very high due to the larger germanium volume crossed by photons or particles.

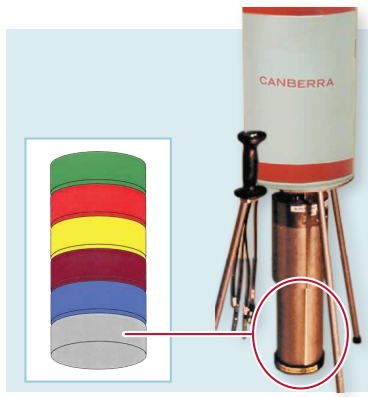
Moreover, special care has been taken to minimize dead areas within detector assemblies and stacks.

The thin contact technology is a main issue for charged particle detection.

Indeed, a stack of several crystals is a very interesting tool for high energy charged particles measurements.

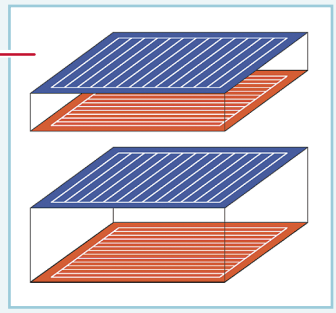
Stacks of planar and coaxial detectors and assemblies of stack in arrays in common cryostat are possible.

CANBERRA can offer a dedicated cryostat with special high cooling power LN_2 Dewars developed for array detectors (Clover detectors). LN_2 free solutions are possible as well with the latest electrical cooling technology. This is now a very mature cooling solution in case LN_2 has to be banned because of safety or security regulations; any room constraints (industrial applications) or accessibility (space applications).



TELESCOPES – Stack of Two or More HPGe Detectors

Samples of some delivered projects –



Germanium Thin Window Technology Telescope for Compton Camera Applications.

- X-Y 52 strips telescope: Two segmented crystals with 13 strips on each side.
- Pitch: 3 mm.

Courtesy of Pr Harada/JAEA

Neutron cross section telescope:

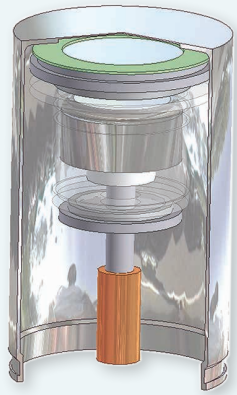
- Two coaxial N-type HPGe detectors of 70% relative efficiency achieving a total of 140 mm high energy stopping power in a close cryostat packing. The typical performance is of 0.1% FWHM at 30 MeV gamma photons.

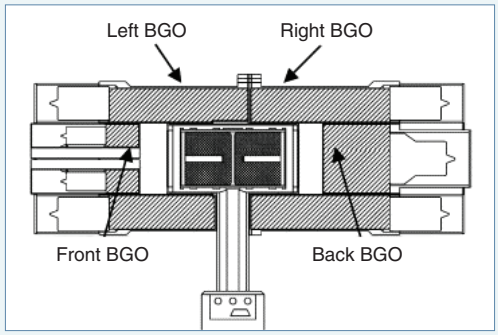
Application:

- Neutron cross section measurement and their relevance in transmutation of nuclear waste. See NIM A554 (2005) 306-313.

Internal view of anti beta telescope:

- Rear germanium detector and a front Si(Li) or,
- PIPS detector as an electron veto shield.





Array of three coaxial detectors in the same canister for double beta applications.

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