

PIPS[®] Detector Instruction Sheet

Introduction

PIPS[®] detectors come in five standard series as well as special and custom design types. The standard series are Partially Depleted (PD), Fully Depleted (FD), Alpha (A), Beta (B) and CAM (Continuous Air Monitor). PIPS[®] detectors have an ion implanted entrance window of about 500 Å thickness. The CAM PIPS[®] have additional layers of aluminium and varnish and a total entrance window thickness of about 2 microns equivalent silicon.

Detector specifications as well as test data are provided overleaf or on a separate sheet.

Handling and Storage

The PIPS[®] detector should be handled with care. The implanted face contact, while not nearly as fragile as the gold or aluminium contacts on SSB detectors, is nevertheless very thin as it must be in order to achieve high efficiency and good resolution for alpha particles. Do not touch the surface with anything that might cause scratches or abrasion. Use the plastic cover when installing detectors in, or removing them from, alpha spectrometers. Store PIPS[®] detectors in their original plastic containers if they are removed from service.

Checkout and Operation

Before installing or operating a PIPS[®] detector, set the bias supply for the correct polarity as indicated on the test data sheet. When first operating a PIPS[®] detector in an Alpha Spectrometer, it is a good idea to evacuate the chamber for 10 to 15 minutes before applying bias. This will remove excess surface moisture if the detector has been exposed to high humidity in transit or storage.

Adjust the bias voltage to the recommended value. At this time you can choose one or more of several methods to confirm proper detector operation:

1. Measure Leakage Current

This is easy using Canberra 7401, 7404 or Alpha Analyst. Remember that leakage current doubles for about 5° C rise in temperature and take this into account when you compare your measurement to that of the factory.

2. Measure Pulser Line Width

Pulser line width should be about 5 keV (FWHM) narrower than Alpha Resolution except for CAM detectors, which have a thicker window. Pulser line width and beta resolution are synonymous. For beta detectors an adjustable calibrated pulser can be used to determine the noise level which is approximately 3 times the pulser line width (FWHM).

3. Measure Alpha Resolution

The ultimate test of system performance, this test must be performed using a good quality alpha source. Alpha sources do not emit monoenergetic alphas but have an intrinsic line width (due to scatter) that contributes to system resolution. Poor quality sources will not give good resolution and may lead to detector contamination. Alpha PIPS[®] detectors are deliberately not tested with an alpha source to avoid risk of contamination and background cannot be guaranteed after exposure to an alpha source.

Alpha resolution measurements should be made with a detector source spacing equal to 1.5 to 2 times the detector diameter and under good vacuum (≤ 100 microns HG or 10 Pa).

Cleaning

The PIPS[®] detector can be cleaned to remove oil film, fingerprints or dust particles on the surface. Some recoil contamination can be removed by cleaning as well, but recoil particles are often imbedded in the surface and cannot be entirely removed. Canberra Alpha Spectrometers can be equipped to reduce recoil contamination. Consult Canberra for more information on this subject.

To clean standard PIPS[®] detectors first blow dry air or N₂ gas on the surface to remove particles that might cause scratches in the subsequent cleaning step. Then use a cotton ball dampened with a mos quality isopropyl alcohol; Do not use methyl alcohol. Avoid excess wetting of the detector assembly, but repeat the cleaning treatment with fresh cotton balls to eliminate traces of contamination. Blow dry with dry air or N₂ gas and put under vacuum for 15 minutes or heat to 50° C for an hour to remove residual moisture before applying bias.

Note: cleaning is generally not effective in curing problems of leakage current, radiation damage or excess (condensing) water vapour. Neither will it repair physical damage to the junction(s). Suspect detectors should be checked carefully for physical damage to the surface(s) before other actions are taken.

Warranty

Terms

Unless otherwise specified, PIPS[®] detectors are warranted against defects in materials and workmanship for one year from the date of shipment.

U.S. domestic customers should contact the Detector Products Division to report problem(s) and to receive an Return Authorized Number (RAN) for any units to be returned. All other customers should contact their local Canberra distributor. Detectors should be returned to the factory freight prepaid and will be returned to the customer freight prepaid.

Limitations

This is the only warranty provided by Canberra; there are no other warranties, expressed or implied. All warranties of merchantability and fitness for an intended purpose are excluded. Canberra shall have no liability for any special, indirect or consequential damages caused by failure of any PIPS[®] detector.

Exclusions

This warranty does not cover detectors which have been modified without Canberra's written permissions or which have been subjected to unusual physical or electrical stress as determined by Canberra's service personnel.

This warranty does not cover damage due to high radiation doses from photon, neutrons, or charged particles. Detectors contaminated by radioactive materials cannot be returned for service or replacement. Canberra is not responsible for damage sustained in shipment. Examine detectors carefully when you receive them for evidence of damage caused in shipment. If damage is found notify the carrier and Canberra or your local distributor immediately. Keep all packaging materials and documents for use in claiming damages.