

PT9 A 61-cm radius 180° double focussing thermal ion mass spectrometer

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TIMS, isotope-ratios, electrometers

PG-61 was first in the world to demonstrate static isotope ratio measurements in multiple cups.

The PG-61 is a non-uniform radial magnetic field spectrometer originally designed to study nuclear reactions with HV tandem accelerators. It was converted in the late 80's to a multi-cup thermal ion mass spectrometer for measurement of isotope ratios of elements from Mg to Fe from meteorites. It made use of Keithley-642 solid state electrometers to collect data in 3 channels without field switching. During mid-90's it was further modified to 5-cups and employed a unique data collection technique called charge-collection. The method enables over x1000 reduction in noise levels to cover the ion-beam intensity region between what is possible with resistive feed-back elements and electron multipliers. The measurement range extends down to below 10^{-15} ampere in multiple channels. The background noise is less than 60 ions/s. The instrument is mainly used for U-series dating. Keithley no longer manufacture the 642 electrometers. We have designed a replacement version that has better specifications. Current, novel conceptual designs aim to reduce background noise levels even further to better than a few ions/s by using capacitively coupled ac-mode electrometers.

[1] M.T. Esat, Nuclear Instruments & Methods in Physics Research B 1984, 233: 545-553.

[2] T.M. Esat, International Journal of Mass Spectrometry & Ion Processes 1995, 148:159-170.