

Accepted Manuscript

Auto-HPGe, an autosampler for gamma-ray spectroscopy using high-purity germanium (HPGe) detectors and heavy shields

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PII: S2468-0672(18)30049-X
DOI: <https://doi.org/10.1016/j.ohx.2018.e00040>
Article Number: e00040
Reference: OHX 40

To appear in: *HardwareX*

Received Date: 22 June 2018
Revised Date: 20 August 2018
Accepted Date: 21 August 2018

Please cite this article as: M.C. Carvalho, C.J. Sanders, C. Holloway, Auto-HPGe, an autosampler for gamma-ray spectroscopy using high-purity germanium (HPGe) detectors and heavy shields, *HardwareX* (2018), doi: <https://doi.org/10.1016/j.ohx.2018.e00040>

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Title: Auto-HPGe, an autosampler for gamma-ray spectroscopy using high-purity germanium (HPGe) detectors and heavy shields

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Abstract: Radionuclide measurements have proven to be essential for determining processes related to pressing environmental issues as well as reconstructing historical events related to natural and anthropogenic activities. The detection of radionuclide tracers in environmental and geological samples provides unique and essential insights into specific sources and sinks. Despite its usefulness in measuring natural and anthropogenic radioisotopes, high-purity germanium (HPGe) gamma ray detectors are rarely automated as a result of the heavy shielding required to use this equipment. Consequently, the commonly available autosamplers for this kind of analysis can be very expensive, exceeding AU\$400,000. Here we present auto-HPGe, an autosampler for gamma ray detection in heavy shields that costs about AU\$1,100 to build. Auto-HPGe has potential to make HPGe analysis more attractive to scientists, especially when the equipment is located in remote locations or when the ability to change samples at odd hours is limited.

Keywords: 3D printing; Autosampler; Arduino; AutoIt; gamma detectors; laboratory automation; lead shields; OpenSCAD; radioisotopes; sampling

Specifications table

Hardware name	Auto-HPGe
Subject area	<ul style="list-style-type: none"> • Chemistry and Biochemistry • Environmental, Planetary and Agricultural Sciences • Palaeoclimatology, Palaeoecology, Palaeoceanography • Physics • Medicine
Hardware type	<ul style="list-style-type: none"> • Environmental sample handling
Open Source License	GNU General Public License (GPL) 3.0
Cost of Hardware	AU\$1,100
Source File Repository	https://osf.io/ja8tg/

1. Hardware in context

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