

Charge Sensitive Preamplifiers

CoolFET®



Noise @ 0 pF: 670 eV FWHM (Si)
~76 electrons RMS

Noise Slope: 13 eV/pF with Low C_{iss} FET
11.5 eV/pF with high C_{iss} FET

Fast Rise Time: 2.5 ns

FEATURES

- Thermoelectrically Cooled FET
- 3 internal FETs to match detector
- Lowest Noise and Noise Slope
- AC or DC coupling to the detector
- Both Energy and Timing outputs
- Optional input protection
- Easy to use

STATE-OF-THE-ART

A250



External FET

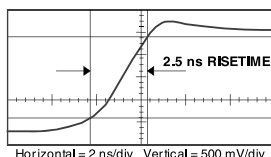
FET can be cooled

Noise: <100 e⁻ RMS (Room Temp.)
<20 e⁻ RMS (Cooled FET)

Gain-Bandwidth f_t > 1.5 GHz

Power: 19 mW typical

Slew rate: >475 V/ μ s

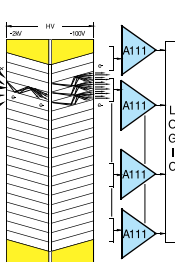


THE INDUSTRY STANDARD

A111



A Microchannel Plate
(MCP) Array Connected
to Multiple A111s



AMPTEK - Your complete
source for high performance
preamplifiers and amplifiers

Visit Us Now

www.amptek.com



AMPTEK INC.

sales@amptek.com www.amptek.com

depths required by surface waves, temperatures are hundreds of degrees hotter than shown.

► Ambient mantle, from midplate geophysical and petrological data, is 150–200 K hotter than assumed in thin-plate models.¹

► The global low-velocity zone contains 1–2% melt, on average.

► Thermodynamically consistent subplate geotherms are subadiabatic and 300 K colder at lower mantle depths than assumed; that makes plumes, if they exist, useless for providing excess temperatures.

The effects of compression, secular cooling and anisotropy, and properly scaled simulations eliminate mantle plumes as an observational fact or a viable physical theory.³ The physics-based and surface-wave-based plume alternative is simply this: Midplate volcanoes tap into a thick sheared anisotropic boundary layer that is sufficiently hot, fertile, large, and fixed, at depth, to explain volcanic chains; the layer is disrupted at ridges.^{3,4}

References

1. D. McKenzie, M. J. Bickle, *J. Petrol.* **29**, 625 (1988); M. A. Richard, R. A. Duncan, V. E. Courtillot, *Science* **246**, 103 (1989), and references therein. For physically realistic models see A. Maggi et al., *Geophys. J. Int.* **166**, 1384 (2006), and W. B. Moore, *J. Geophys. Res.* **113**, B11407 (2008).
2. A. M. Dziewonski, D. L. Anderson, *Phys. Earth Planet. Inter.* **25**, 297 (1981); H. Sato, I. S. Sacks, T. Murase, *J. Geophys. Res.* **94**, 5689 (1989); D. L. Anderson, *Theory of the Earth*, Blackwell Scientific, Boston (1989); D. L. Anderson, T. Tanimoto, Y.-S. Zhang, *Science* **256**, 1645 (1992); R. Jeanloz, S. Morris, *Geophys. Res. Lett.* **14**, 335 (1987).
3. For an overview of boundary layer physics, see <http://www.mantleplumes.org/ShearedBoundaryLayer.html> and <http://www.mantleplumes.org/CMBRevisited.html>.
4. For discussions of “modern” mantle plume theories, see <http://www.mantleplumes.org/TopPages/ShearDrivenUpwellingTop.html> and <http://www.mantleplumes.org/LLAMA.html>.
5. G. L. Pavlis et al., *Tectonophysics* **532–535**, 82 (2012); D. E. James et al., *Earth Planet. Sci. Lett.* **311**, 124 (2011); M. J. Fouch, *Geology* **40**, 479 (2012).
6. D. Zhao et al., *Chin. Sci. Bull.* **49**, 1401 (2004); M. J. R. Wortel, W. Spakman, *Proc. K. Ned. Akad. Wet.* **95**, 325 (1992); R. Meyer, G. R. Foulger, “The European Cenozoic Volcanic Province is not caused by mantle plumes,” <http://www.mantleplumes.org/Europe.html>. See also *Geological Society of America Special Papers*, vols. 388, 430, 470, <http://specialpapers.gsapubs.org/content/by/year>.

Don L. Anderson

(dla@gps.caltech.edu)

California Institute of Technology
Pasadena

Low-energy tools underlie high-energy physics

Charles Roos (PHYSICS TODAY, May 2012, page 10) has charged me with naiveté in claiming that high-energy particle physics has never produced jobs for anyone but HEP physicists (PHYSICS TODAY, September 2011, page 10). In support of his charge he cites several developments stemming from HEP research that have contributed significantly to the economy and to job growth.

However, Roos appears to have inadvertently made my case for me: None of the contributions he cites has anything to do with HEP physics itself. All are tools engineered from lower-energy electron-volt physics, or byproduct results, or spinoffs. High-field and superconducting magnets are pure eV physics. Money spent on the thousands of them in the Large Hadron Collider at CERN would have benefited the country and the world more if the funds had instead been spent on developing superconducting transmission lines to convey electricity efficiently from the remote solar and wind farms generating it to urban centers using it.

All R&D programs generate unexpected byproduct results or spinoffs. That is an excellent reason for public support of science: You always get lagniappe—more than you paid for. However, the unpredictability of those results means that the expectation of them cannot be the basis for choosing to support one program over another. For example, the development of integrated-circuit microprocessors was greatly speeded by NASA's need for extremely lightweight computers in triplicate for its space capsules. So the entire computer industry—for smartphones, cars, washing machines, and refrigerators—can be claimed to be a byproduct of the space program. Millions of jobs! (Memo to NASA: Ask for more money.)

All the jobs for which Roos credits HEP physics are applications of eV physics and result merely from the expenditure of vast sums of money, irrespective of the goal for which it was spent. They have nothing to do with HEP physics itself.

John F. Waymouth

(jfwaymouth@waymouth.org)
Marblehead, Massachusetts