

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 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

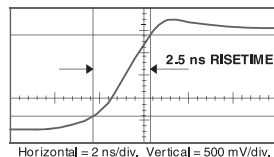
Noise: <100 e⁻ RMS (Room Temp.)

<20 e⁻ RMS (Cooled FET)

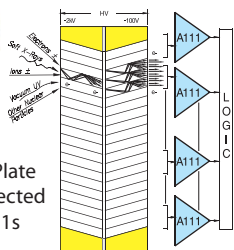
Gain-Bandwidth f_T > 1.5 GHz

Power: 19 mW typical

Slew rate: >475 V/ μ s

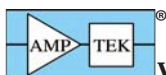


THE INDUSTRY STANDARD A111



A Microchannel Plate
(MCP) Array Connected
to Multiple A111s

AMPTEK - Your complete
source for high performance
preamplifiers and amplifiers



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AMETEK
MATERIALS ANALYSIS DIVISION

needs new ways to deal with the rapidly growing crises of climate change. The latest report of the Intergovernmental Panel on Climate Change (IPCC) concludes that previous reports erred in being too cautious: The time to stem the flow of greenhouse gases is shorter than had been estimated. We face the possibility of a runaway situation in which an increase in global temperature feeds back to accelerate global heating. Such a process would lead to a massive change in climate and a catastrophic elevation of sea level. We face a threat to civilization.

In the US today, support for basic research is dwindling. Opportunities for a career in basic research are decreasing, and our ability to attract excellent students from home and abroad is declining. When considered in the context of the most recent report of the IPCC, the neglect of basic research may be disastrous.

If our civilization succeeds in learning to live in harmony with the natural world, science will have played a crucial role in the transition. The immediate problem in the US is to convince Congress that the situation is urgent. Happily, the years of developing STEM education in the US are starting to pay off. The numbers of scientifically literate citizens and members of Congress are growing. Our representatives will listen if citizens—both scientists and nonscientists—speak up for science and particularly for the value of basic research.

Daniel Kleppner
(kleppner@mit.edu)

Massachusetts Institute of Technology
Cambridge

LETTERS

Rediscovering the roots of our work

Acknowledging the priority of ideas in the scientific literature can be difficult. One can hardly be faulted for not being aware of all papers on a topic. The problem is hard enough with the many foundational papers that get cited but rarely read; it is much worse with the masses of others that have faded into obscurity along with their precocious insights.

Charles Day's editorial "Crediting our predecessors" (PHYSICS TODAY, September 2018, page 8) and Ray Goldstein's article "Coffee stains, cell receptors, and time crystals: Lessons from the old literature" in the same issue (page 32) remind us of the pleasurable thrill (and for those who thought their ideas were original, the disappointment) of rediscovering those old gems.

My favorite example of the form is a not-so-obscure paper, "Gravitational machines," by Freeman Dyson.¹ That brilliant article, ostensibly about the limits of power generation by a spacefaring civilization, is occasionally cited for its insights into the gravitational-wave radiation of binary systems.

But Dyson's article made a series of other remarkable scientific leaps that are rarely cited. He offered what is apparently the first published speculation on the existence of tight binaries comprising two neutron stars; his comment predated the discovery of pulsars by five years. He also calculated the gravitational-wave signal strength of those binaries and identified them as an observable source of gravitational waves, even at intergalactic distances. He did not imagine that such binaries could form naturally, but he speculated that they could be the by-product of deliberate energy extraction and argued that the detection of a merger event would constitute evidence for alien technology.

Despite having presaged the discovery of gravity waves from the inspiral of binary neutron star GW170817 by more than 50 years, Dyson's work is not cited in that paper² or any other paper I can find on that topic, presumably because most people are unaware of that particular aspect of Dyson's publication. Many who cite his paper thus apparently do so without reading it, which is a shame because it is a model of clarity, simplicity, and brevity and is a joy to read.

References

1. F. Dyson, in *Interstellar Communication: A Collection of Reprints and Original Contributions*, A. G. W. Cameron, ed., W. A. Benjamin (1963), p. 115.
2. B. P. Abbott et al., *Astrophys. J. Lett.* **848**, L12 (2017).

Jason T. Wright

(astrowright@gmail.com)

Pennsylvania State University
University Park PA