

Introduction to the Radiant EDU

Radiant Technologies, Inc., Albuquerque, NM USA

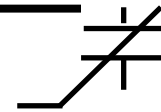
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Rev C

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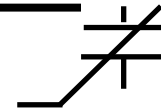
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Summary

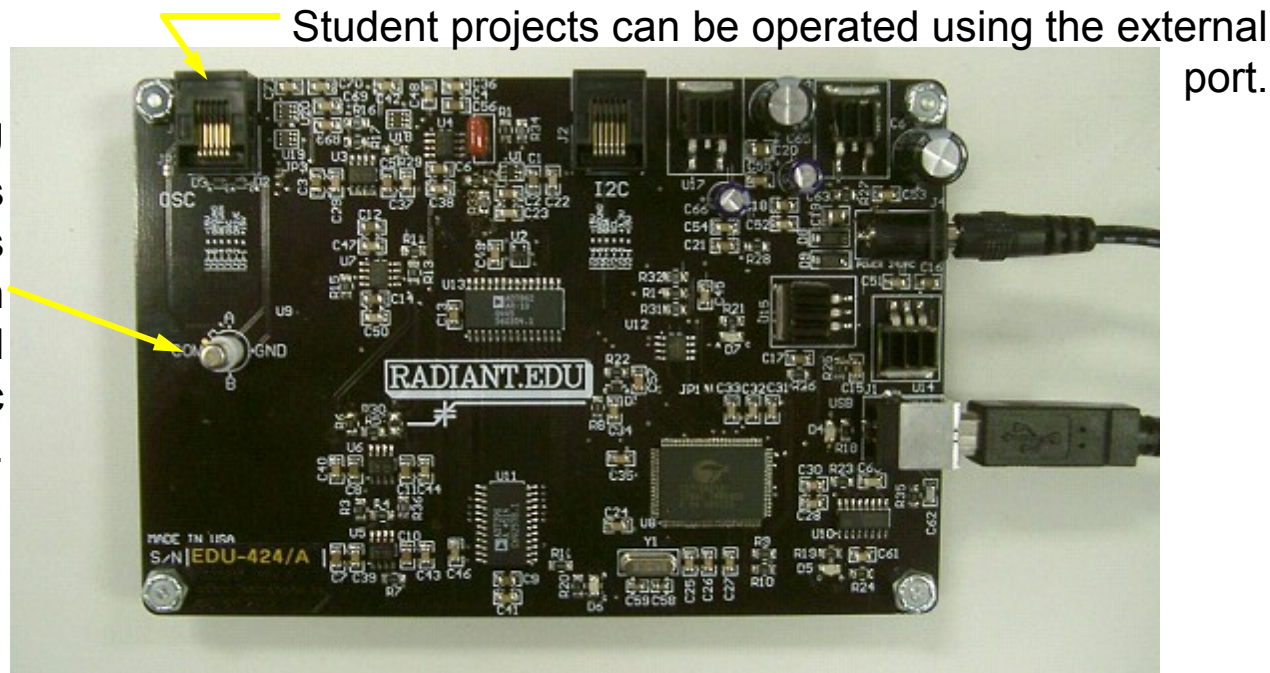
Radiant Technologies has created the Radiant EDU, a low-cost, simple laboratory instrument with matching ferroelectric capacitor samples, specifically for the purpose of introducing electroceramics to science and engineering students. The unit is designed to study ferroelectric devices as well as sensors and memories made from these components.

The EDU



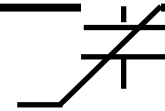
The Radiant EDU consists of an arbitrary waveform generator (AWFG), an electrometer, and an oscilloscope integrated into a single unit controlled by an on-board microprocessor that receives requests from the host computer via USB communications.

The EDU measures hysteresis curves on packaged ferroelectric capacitors.

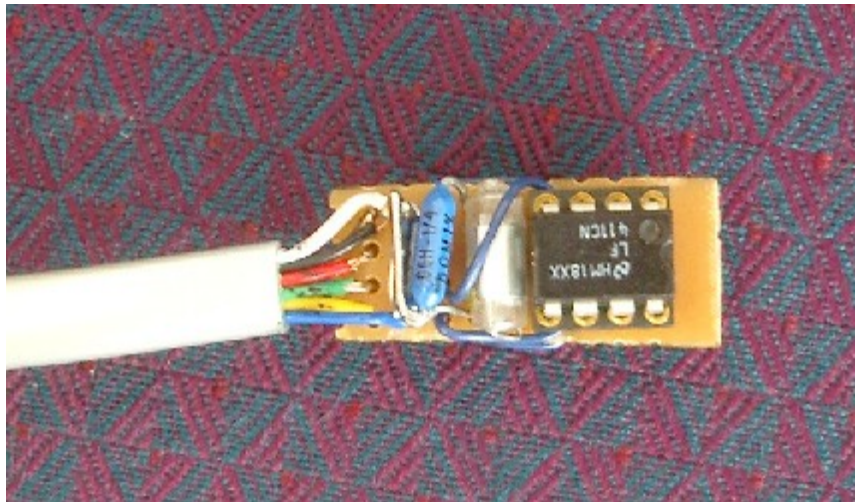


The EDU does not have an enclosure in order to avoid the perception by students that it is a “black box”.

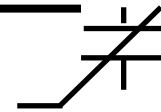
System Functionality



The external port containing the AWFG stimulus signal, the electrometer input, and the oscilloscope input allows students to fabricate their own experiments or design and test their own sensors.



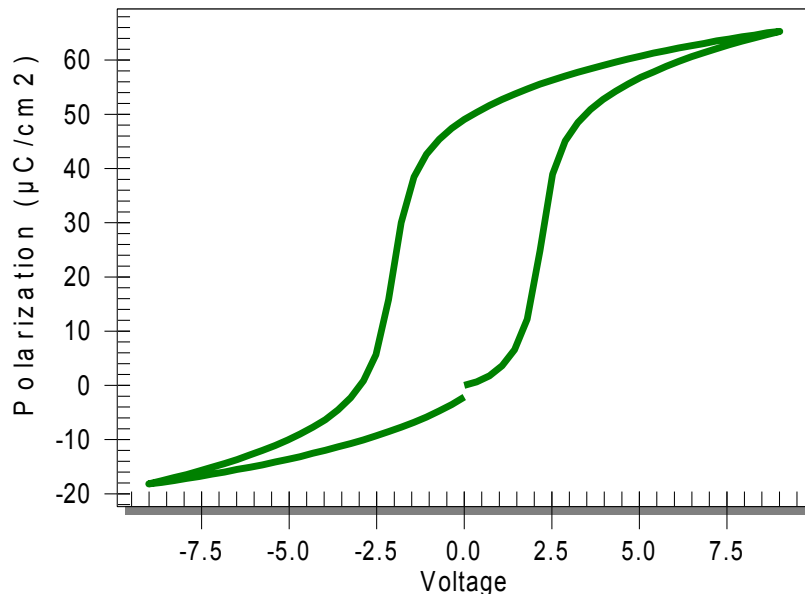
A homemade force sensor for the EDU built at Radiant.



Ferroelectricity

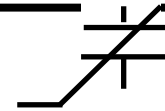
Ferroelectric materials, like Lead Zirconate Titanate (PZT) or Barium Titanate, are complex oxides with highly non-linear properties. They exhibit polarization hysteresis and sensitivity to force, displacement, and temperature changes. They are useful as memory materials and as sensors.

Classic Polarization Hysteresis
(0.25u thick PZT]

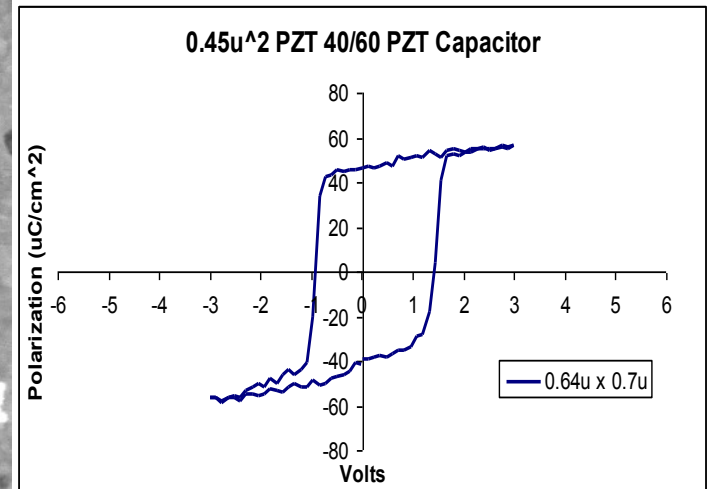
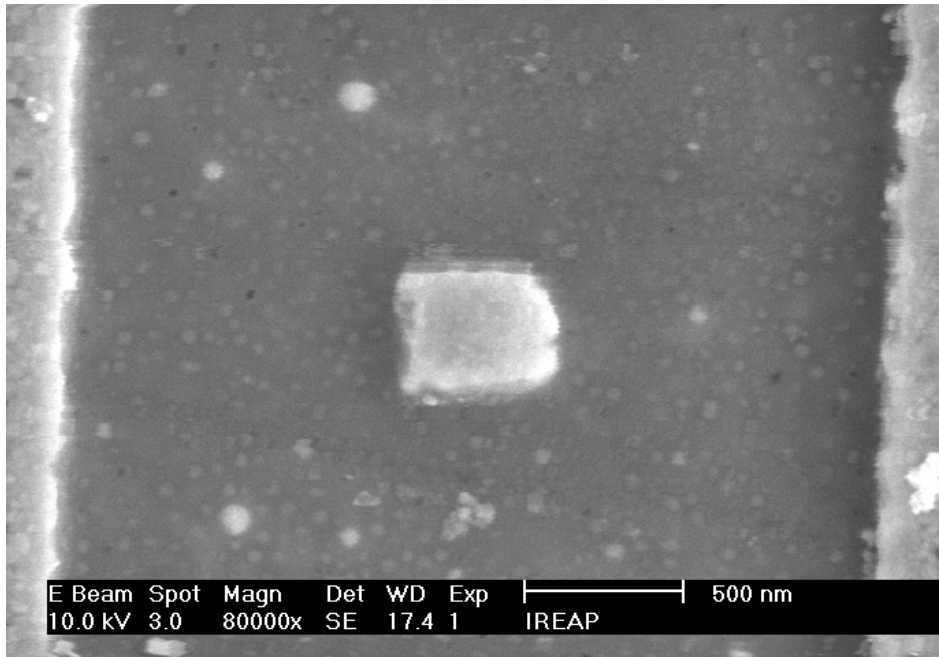


With packaged PZT capacitors supplied by Radiant, you can explore the principles of capacitance, the electrical properties of materials, the meaning of memory, and sensors.

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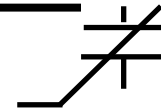


Radiant Technologies, Inc. is the world's leading manufacturer of test equipment for electro-ceramics. Our test systems can actuate 10KV devices or measure the hysteresis of a thin ferroelectric film capacitor with dimensions less than a square micrometer.



A submicron PZT capacitor courtesy of the University of Maryland.

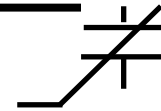
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Philosophy

Non-linear capacitors are an exciting technology, used in almost every aspect of society today. Civilization would not function without them. Sonar, medical ultrasound, fire detectors, infrared cameras, accelerometers, medical sensors, mechanical actuators, microphones, and intrusion detectors are just a few of the devices using non-linear capacitors as the critical operating element. Yet, these very special capacitors are practically unknown by engineers or even physicists and chemists.

Radiant Technologies created the EDU to make the technology accessible to university students and encourage them to pursue careers studying non-linear capacitors or building useful circuits with these unique devices.



Read More!

For a narrative on the EDU and its applications, there are four more application notes. Be sure to read each one.

You may contact us with questions or recommendations for the EDU and/or new ferroelectric-based components.

- Sales information: Michelle Bell
- Technical assistance: Joe Evans, Bob Howard, Spencer Smith, or Scott Chapman
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