Radiant Technologies, Inc.
2835D Pan American Freeway NE
Albuquerque, NM 87107
Tel: 505-842-8007
Fax: 505-842-0366
e-mail: radiant@ferrodevices.com

Application Note
Radiant High Voltage Test Fixture
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Introduction:
Radiant Technologies, Inc. offers four types of high voltage test fixtures. One, the High Voltage Test Fixture (HVTF), has been very popular due to its ease of use and its safety features when working with high voltage ceramic samples.

Construction:
The HVTF is made of high-temperature Teflon and is able to withstand exposures of up to 230°C, making it ideal for both high-voltage and high-temperature testing. The HVTF breaks into two parts. The sample is placed in a chamber in bottom half of the fixture. A copper electrode fixed in the bottom of the chamber contacts the electrode on the bottom of the sample. A 25KV cable connects the copper contact to an external 25KV electrical connector. The bottom chamber is sealed so it may be filled with insulating oil to protect the sample from the arcing that may occur in "open air". The top half of the fixture fits over the bottom half, sealing the chamber. The top half of the fixture has an unclamped copper electrode that is held in place against the top sample electrode by gravity. This contact is free to move up or down to allow for varying thicknesses of sample. It will also move vertically when the sample changes size piezoelectrically. The top electrode has its own external connector. The test fixture is attached to the Precision High Voltage Interface (HVI) DRIVE and RETURN connectors. When the chamber is closed the sample is fixed and completely isolated from the external world giving a high degree of high-voltage protection to other equipment and operators. Note that when the HVTF is used in high-temperature testing, sufficient time should be allowed at the test temperature in the oven to ensure that the sample, within the chamber, has reached that same temperature as the oven.

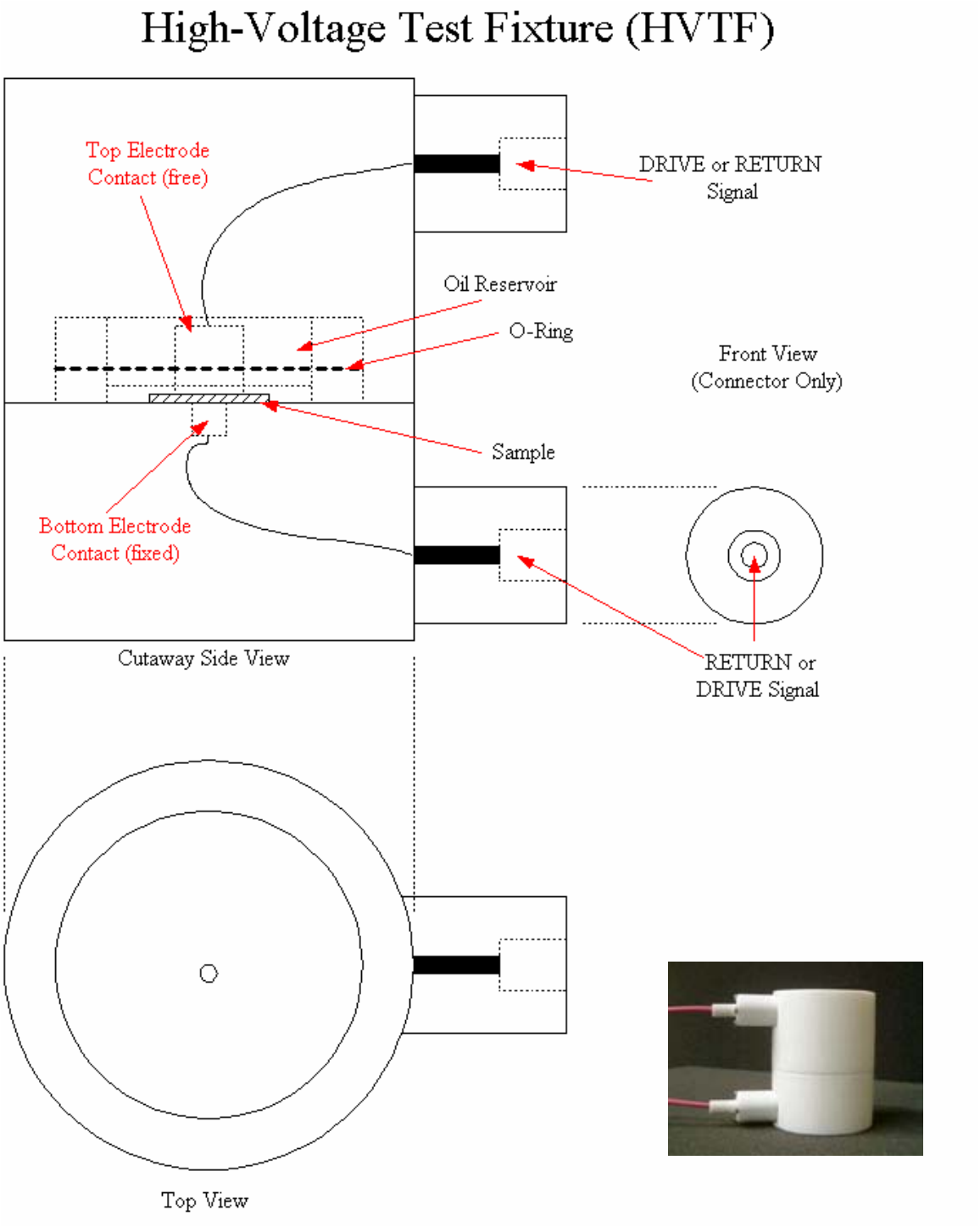

Figure 1
High Voltage Test Fixture

Using the fixturing shown in Figure 1 above, I measured a 300µ thick, hot-pressed 2/65/35 PNZT ceramic sample. The sample had an area of 3.8cm^2. The hysteresis of the sample is shown in Figure 2.

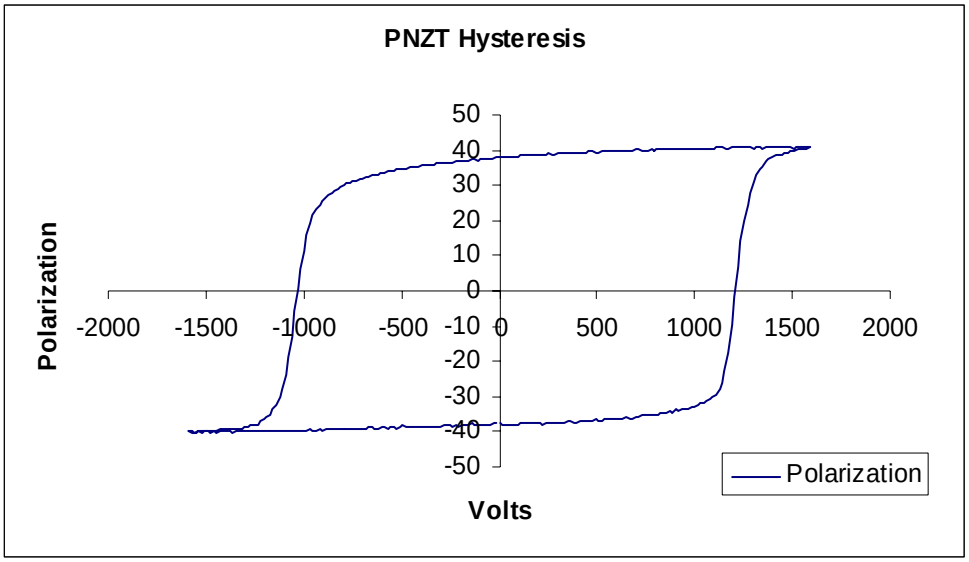

Figure 2
Hysteresis loop of the sample at 1600V

To verify that none of the polarization results originated from parasitics in the HVDM, I created a "capacitor" consisting of 1.3mm of 3M Sticky Pad papers. It had no electrodes. I placed the sticky pad between the electrodes of the HVTF and made a 2000-volt measurement for polarization. They are shown together in Figure 3.

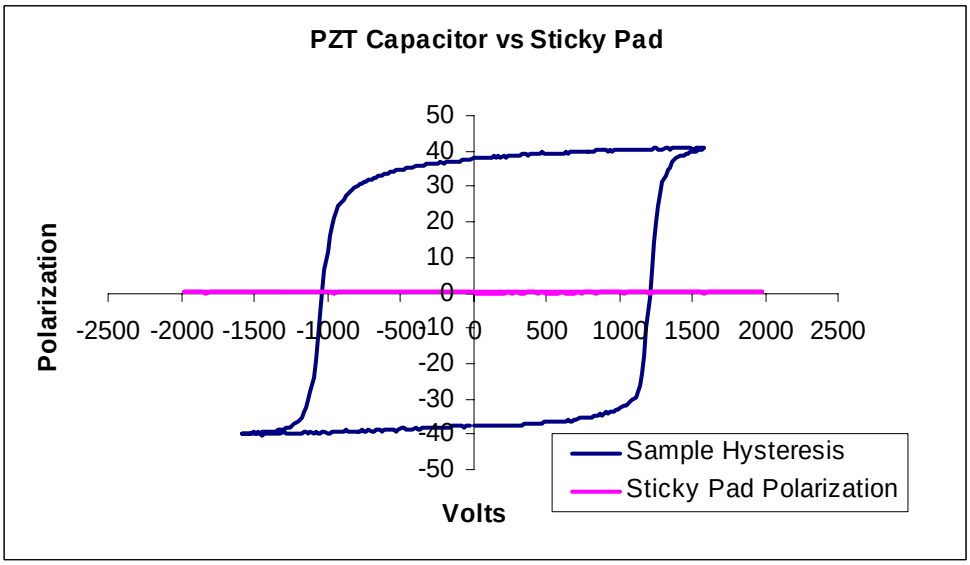

Figure 3
Polarization of a PNZT Ceramic vs a Null Capacitor

The HVTF adds almost no parasitics to the measurement of a typical ceramic sample.

Specifications

Height:	121mm (4.75 inches)
Diameter:	106mm (4.2 inches)
Maximum Horizontal Length: (Including high voltage socket)	114mm (4.45 inches)
Maximum temperature:	230°C
Maximum voltage:	10KV
Bottom electrode diameter:	6.3mm (0.25 inches)
Top electrode diameter:	12.6mm (0.5 inches)

Conclusion

The Radiant HVTF High Voltage Test Fixture provides a stable and convenient platform for measurements of ceramic capacitors. The HVTF is constructed of thick Teflon to provide excellent safety protection for the researcher even up to voltages as high as 10KV.