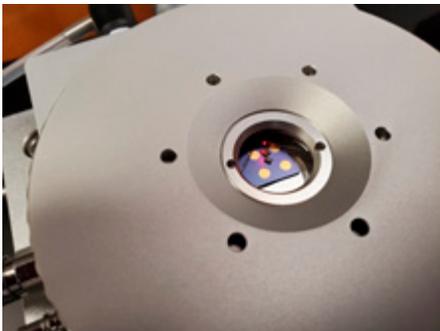


TESTING NON-LINEAR MATERIALS WITH A RADIANT TESTER AND TEMPERATURE STAGE

Radiant's Precision Test Systems interface with unique temperature-controlled stages for electrical testing of samples from -196°C up to 600°C . The temperature stage has four internal micromanipulator probes connected to BNC connectors on the side of the chamber.

The temperature stage stabilizes within 0.1°C of the assigned temperature but can change the sample temperature at a rate up to $150^{\circ}\text{C}/\text{minute}$ or 2.5°C per minute. This high rate of temperature change coupled with the internal electrical connections makes the temperature stage perfect for measuring the pyroelectric coefficient of a sample



The sample pedestal inside the temperature stage chamber accommodates devices up to 2 cm in diameter and is earth grounded. The chamber enclosure will also be earth grounded, making the chamber an efficient Faraday cage that shields the sample from ambient electrical noise. With the sample placed on a passive ceramic insulator atop the stage (supplied by Radiant), the test path is isolated from noise in the earth ground. The ceramic insulator coupled with the Faraday cage effect of the metal enclosure ensures quiet measurements down to very small capacitance values.

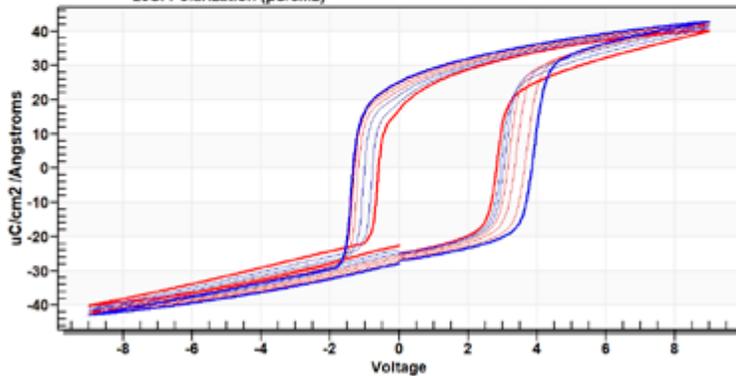
The BNC connectors handle up to 300 volts, making it possible to execute all of the electrical measurements of thin ferroelectric and piezoelectric film capacitors allowed by Radiant test instruments over the 600°C to -196°C temperature range. Bulk ceramic or single crystal capacitors may also be tested in this fixture up to 300 volts. This is enough voltage to generate full hysteresis loops on PMN-PT single crystal actuators and to test single layer or multilayer piezoelectric actuators over temperature*. Pyroelectric characterization of bulk devices is available over the entire temperature range for both thin-film and bulk devices.



Piezo vs Temperature 25C->200C

[Radiant Type AC BLUE in Linkam Chamber]

200C: Polarization ($\mu\text{C}/\text{cm}^2$) 170C: Polarization ($\mu\text{C}/\text{cm}^2$)
135C: Polarization ($\mu\text{C}/\text{cm}^2$) 105C: Polarization ($\mu\text{C}/\text{cm}^2$)
75C: Polarization ($\mu\text{C}/\text{cm}^2$) 45C: Polarization ($\mu\text{C}/\text{cm}^2$)
25C: Polarization ($\mu\text{C}/\text{cm}^2$)



**High voltage poling of bulk capacitors and piezoelectric actuators above 300 volts will not be allowed inside this chamber. For HV poling up to 650°C, please acquire a Radiant High Temperature Test Fixture (HTTF) for quartz tube furnaces or box furnaces.*

The temperature stage has a 12.5 millimeter window in its top surface which allows for displacement/ temperature measurements of the sample to be taken with Laser Doppler Vibrometer, Radiant Tester and Temperature Stage.

The temperature stage is already fully integrated with the powerful Vision test and data management system that operates Radiant's test instruments.

For more information about Radiant Technologies, Inc product line, see www.FerroDevices.com