



Summer Research for Community College Students – 2012

Temperature Mapping Software for Single-Cell Superconducting Cavities

I. Abstract

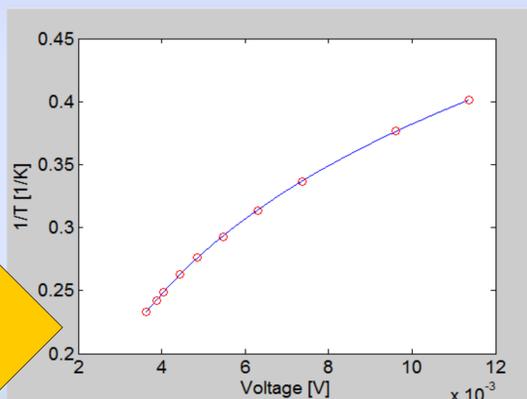
Superconducting niobium cavities are routinely manufactured at Cornell University. In order to understand the various properties of these cavities, several tests are performed. One such examination is the Temperature Map (T-Map). A temperature mapping system is a setup that measures the temperature profile across an entire cavity.

II. Apparatus



Single-cell cavity surrounded by T-Map sensors.

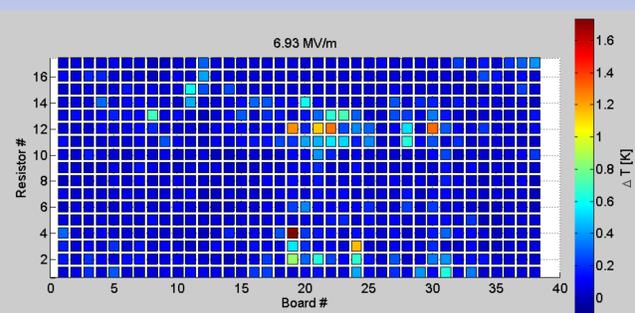
- A series of 38 boards having 17 Allen & Bradley resistors each are stationed around a cavity.
- These resistors are temperature sensitive; therefore, as the temperature changes locally, the voltage registered across the resistor changes.



The resistor voltages are calibrated to different temperatures according to this fit. The better the fit, the more we can trust our data.

III. The Old System

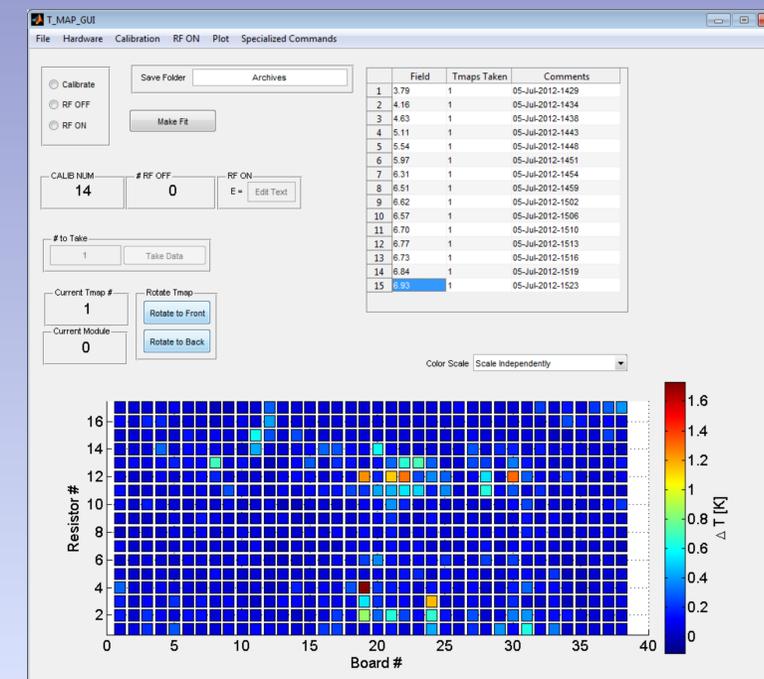
- One can create a graphical readout of the temperature across the entire surface of the cavity.



IV. A New System

- Data collection and analysis accomplished with command line Matlab functions
- This proved to be a cumbersome form of data acquisition

V. The Solution



Features

- Takes data for...**
 - Temperature Sensor Calibration
 - RF Off Mapping
 - RF On Mapping
- Drop-down menus for...**
 - Broken Resistors
 - Removing bad calibration points
 - Options for plotting externally to save in notebook
 - Saving and loading data
 - Making a movie of heating over increasing fields
- T-Map Table Contains...**
 - Field magnitudes
 - Number of T-Maps taken at a given field
 - Sections for comments
 - Maps easily accessible by cursor selection
- Plotting Area**
 - Plots current T-Map internally
 - Able to plot all T-Maps on equal scaling
 - Able to rotate for different views