Pushing the Limits of RF Superconductivity Workshop

Abstract Submission Form for Contributed Talks

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Session: (choose one)

_X__ Ultimate Field Limits, New Materials, New Geometries

___ High Q, Field Emission, Q-Slopes

___ Future Research Paths to Ultimate Performance

ABSTRACT:

Title: Measuring critical RF fields of superconductors using high power short pulses in X band

The technique developed at SLAC in the early 80's to measure critical RF fields in superconductors using short pulses is being revived and extended. The original measurements were made on full TM010 cavities at 2856 MHz with a few MW peak power available over 1 microsecond pulses. Field emission limited the possibility of reaching extremely high gradients at low temperature. The new superconductor testing program is based on a copper TE011 cavity at 11.424 GHz, previously used by Pritzkau and Siemann to determine pulse heating effects on copper surfaces. The cavity will be fitted with an end plate of 4.4 cm diameter, made out of superconducting materials and powered with pulses as high as over 100 MW. This excess peak power will allow exploring short pulse regimes in the tens of nanoseconds and determining short time scale heating effects. The cavity can be operated at any temperature from 2 K to room temperature, so that critical fields can be tracked all the way to the critical temperature of any superconductor. The simple end plate geometry is particularly suited for tests of superconducting films and high temperature superconductors, for which small planar samples can be manufactured. With this method and apparatus, many materials can be tested in a short time, allowing a rapid selection of potentially promising materials that can sustain large RF fields. Basic physics of superconductivity can also be carried out with this system. Preliminary setup tests will begin in the fall of 2004.