# Quench Dynamics in Silver Coated YBCO Tapes

R. C. Duckworth and J. M. Pfotenhauer
University of Wisconsin-Madison

J.W. Lue, M.J. Gouge, D.F. Lee, and D.M. Kroeger
Oak Ridge National Laboratory

# Presentation Outline

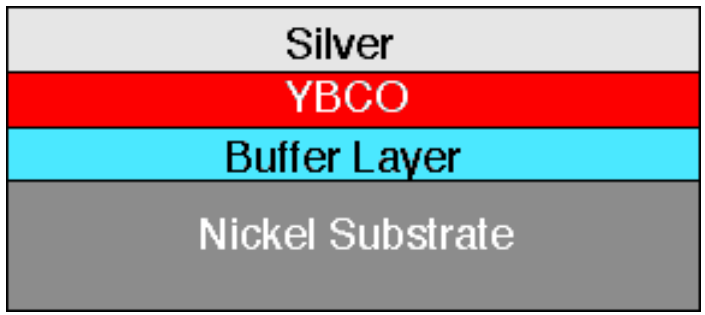
I. Background Information
II. Experimental Setup
III. Numerical Model
IV. Experimental Results
V. Comparison of Experiments to Model
VI. Conclusions and Recommendations

# I. Background information

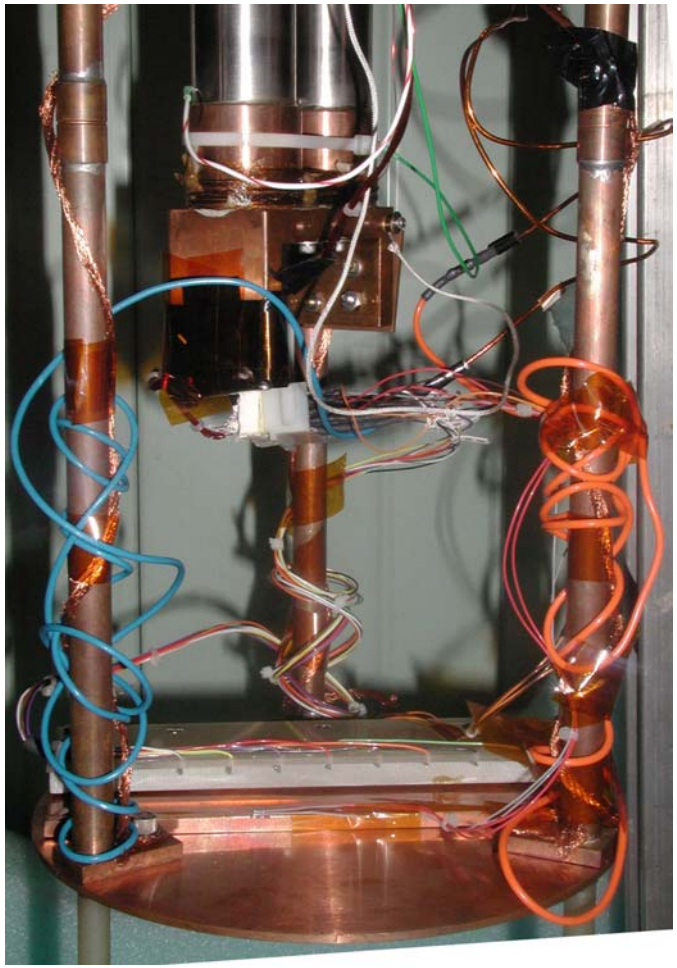
- Motivation
  - Previous HTS materials (Bi-2212 and Bi-2223) suggest a possible dependence of normal zone formation and propagation on sample composition and cooling conditions (i.e. conduction vs. convection).
  - With improvements in YBCO, knowledge of normal zone formation will prove essential to successful application to areas like wires, current limiters, and magnets.

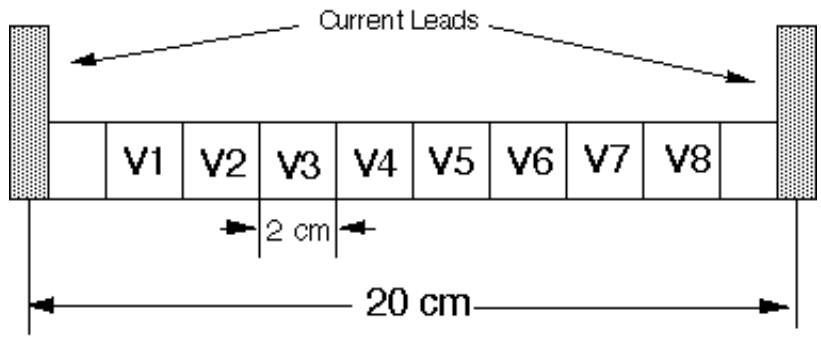
# I. Background information (cont'd)

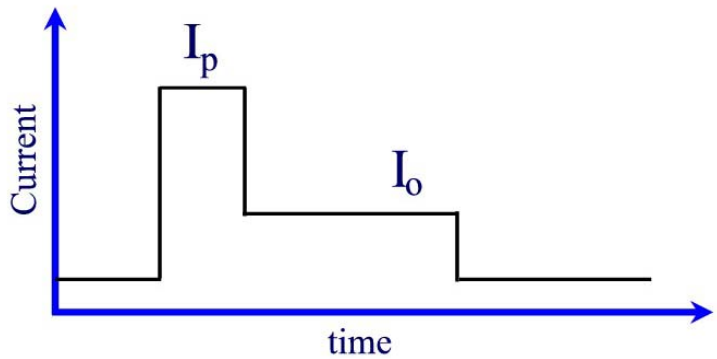
- Objective
  - To classify the formation of normal zones in Rolling Assisted BiAxially Textured Substrate (RABiTS) YBCO films with respect to silver thickness and pulse and operating currents



# II. Experimental Setup





# III. Numerical Model

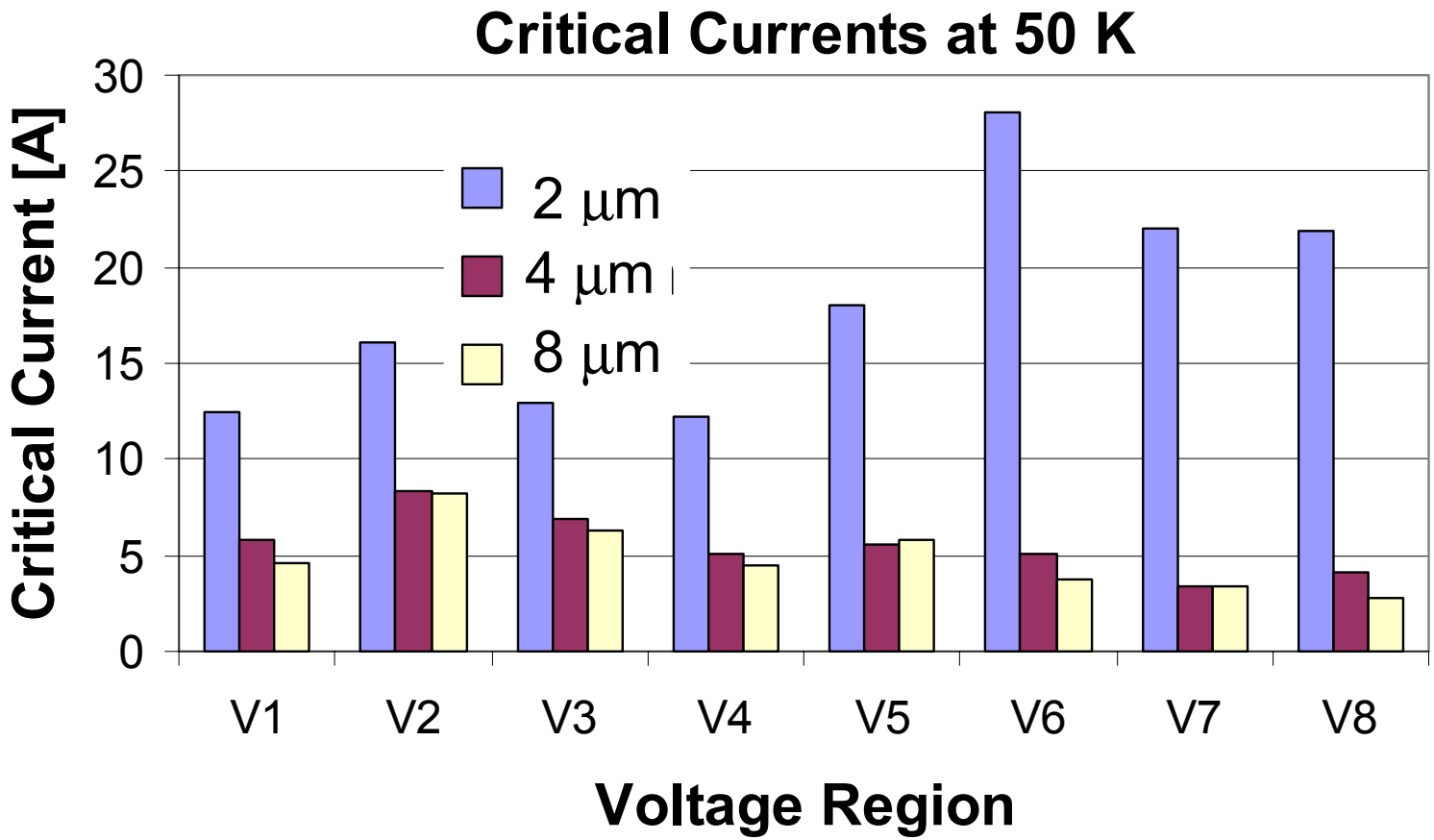
- Solve 1-D non-linear, heat equation

$$C(T)\frac{\partial T}{\partial t} = \frac{\partial}{\partial x}\left(k\frac{\partial T}{\partial x}\right) + Q_{gen}$$

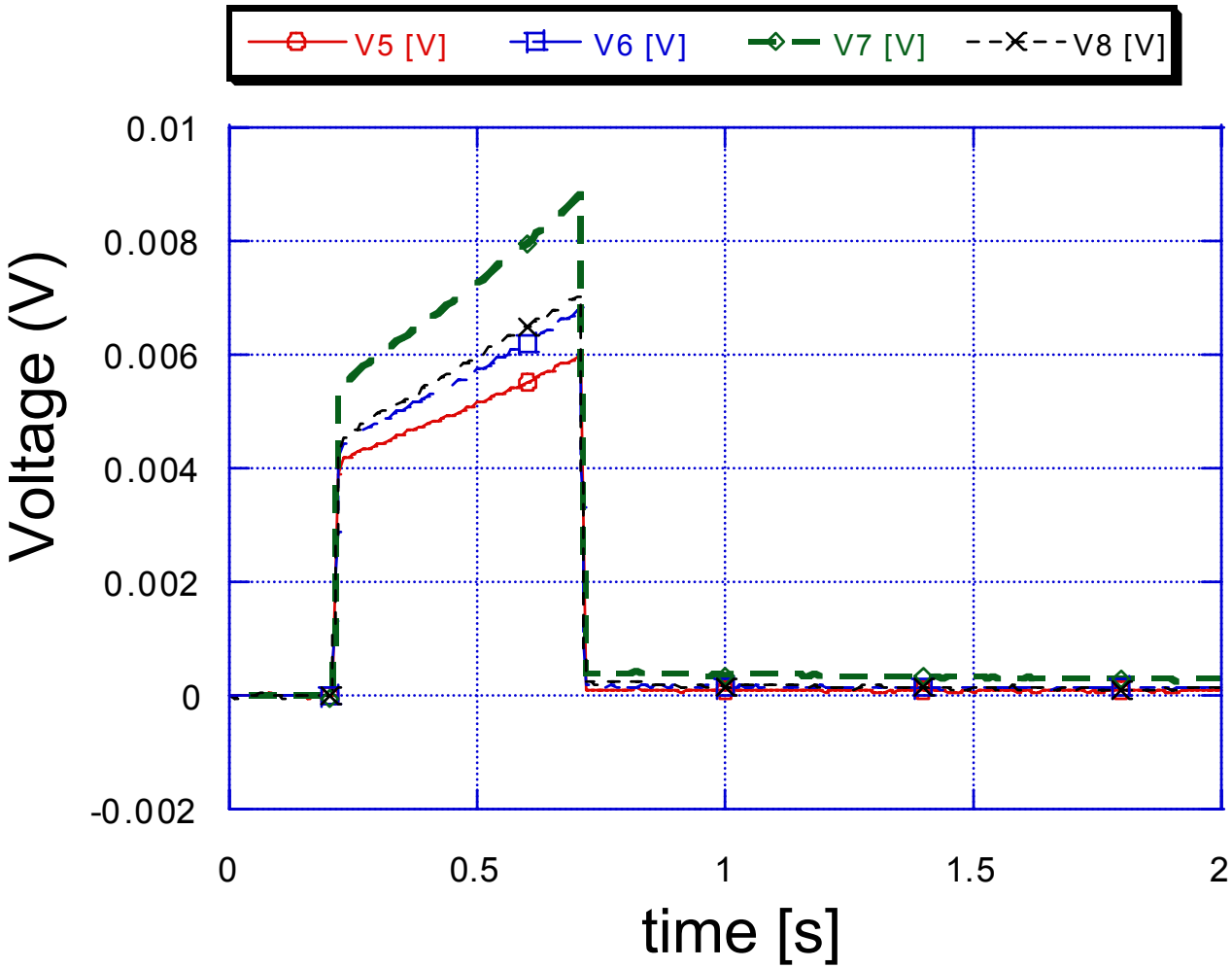
  - Where k and C are volumetrically averaged
  - The heat generation term can be presented as

$$Q = \begin{cases} 0 & I < I_c \\ \left(\frac{\rho}{A}\right)_m \frac{I}{A_t}\left(I - I_c(T)\right) & T < T_c, I > I_c \\ \left(\frac{\rho}{A}\right)_m \frac{I^2}{A_t} & T > T_c \end{cases}$$

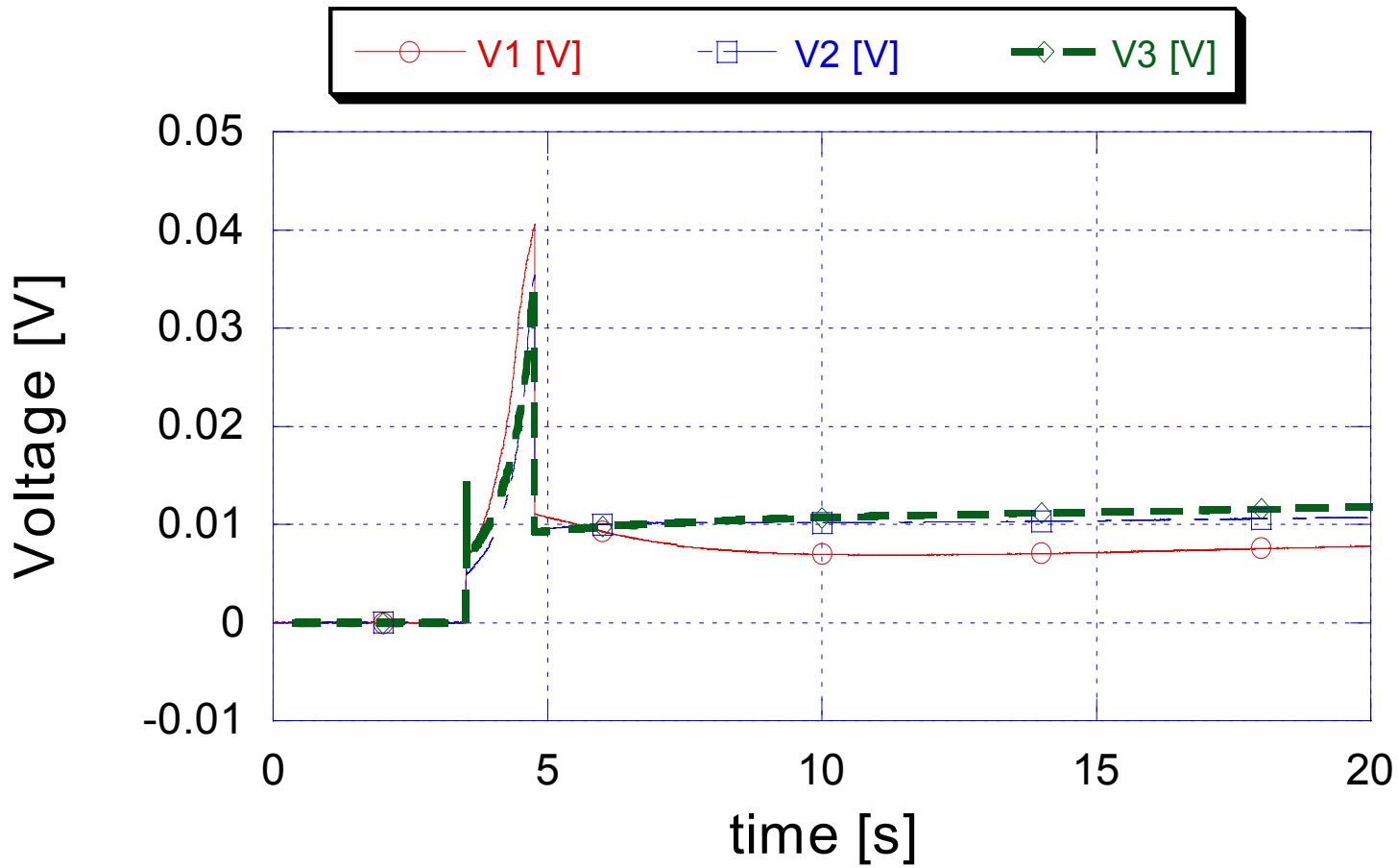
# IV. Experimental Results



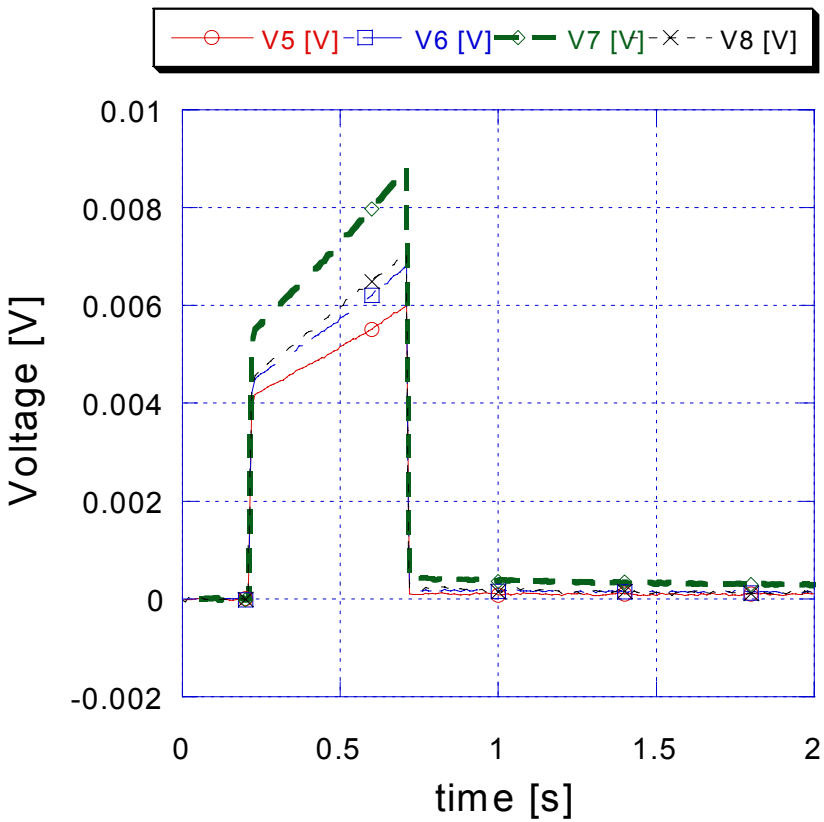
# IV. Experimental Results (cont'd)

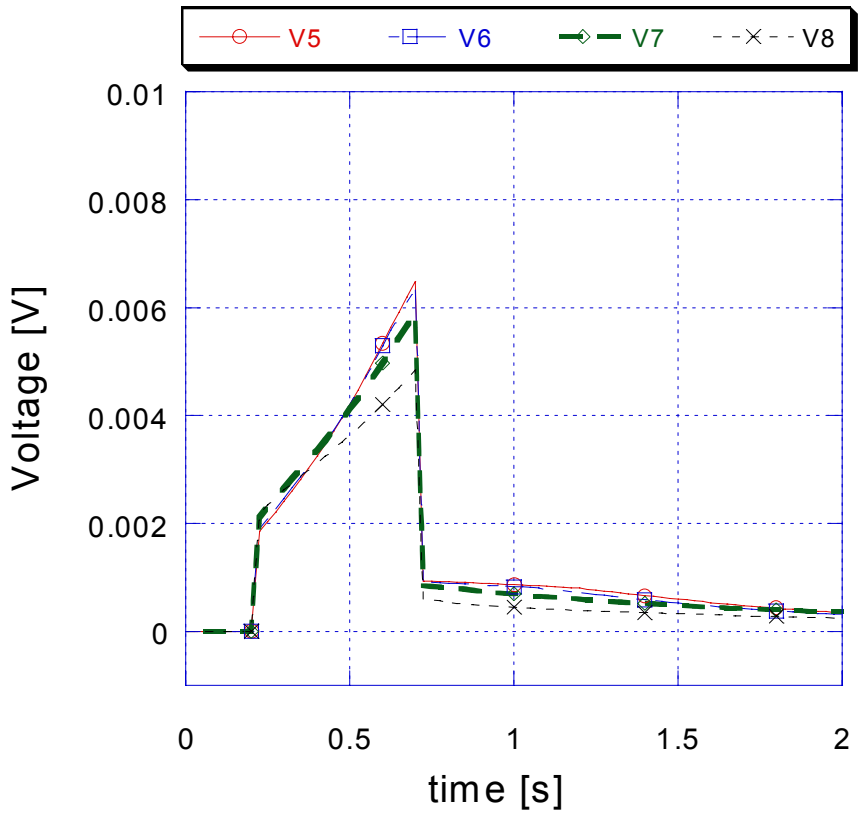


# IV. Experimental Results (cont'd)

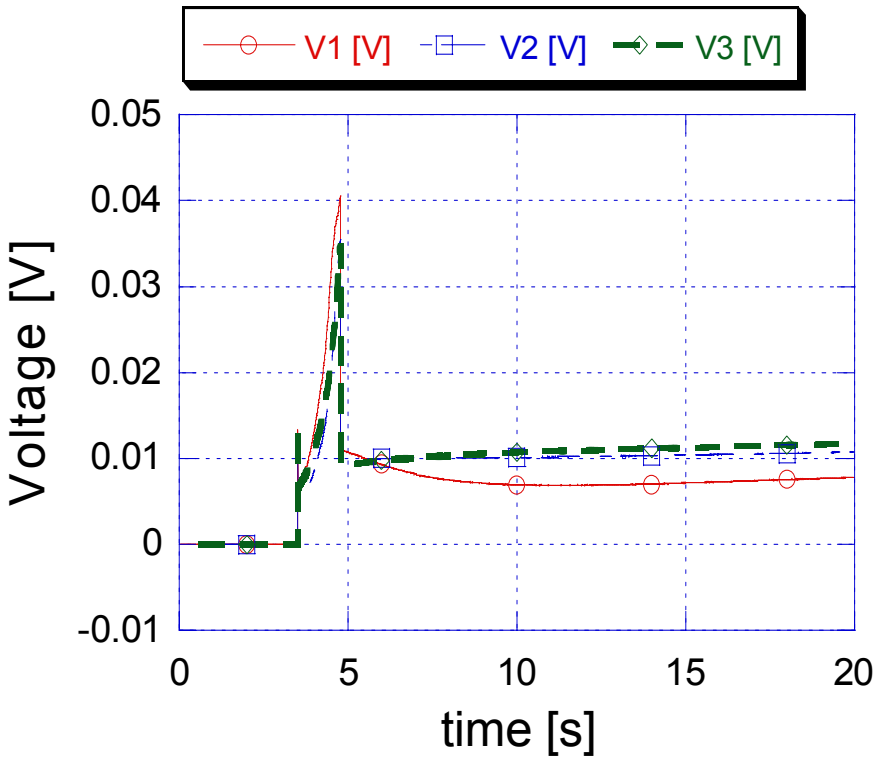


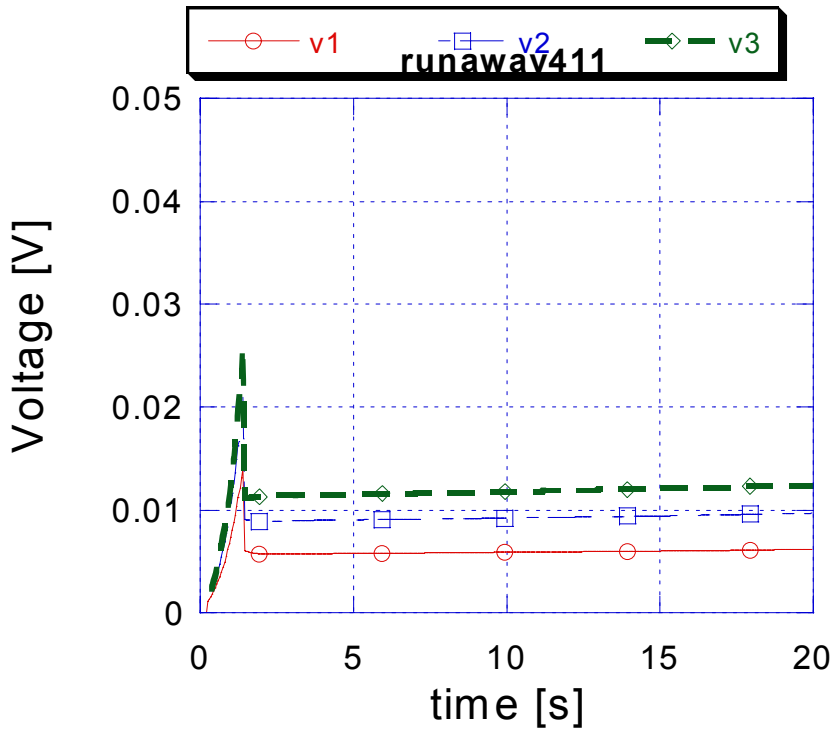
# V. Comparison of Experiments to Model



# V. Comparison of Experiments to Model (cont'd)



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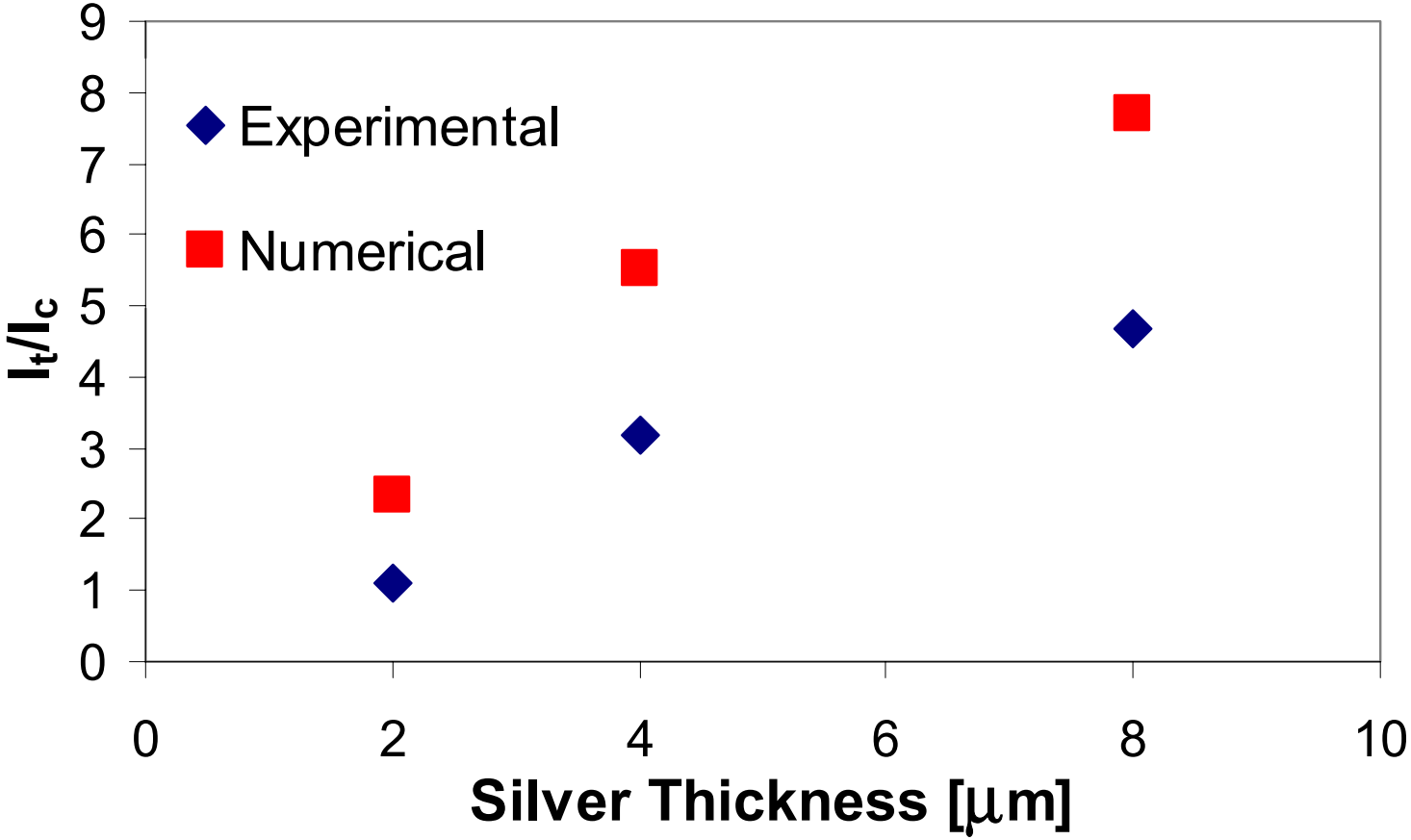

# VI. Conclusions and Recommendations

- Increases in silver thickness increase thermal runaway current.
- Thickness of nickel and silver thickness uniformity affect normal zone formation
- Examine alternative substrates that promote thermal stability (material, thickness, etc.)
- Study the influence of Ag/YBCO contact resistance on quench dynamics