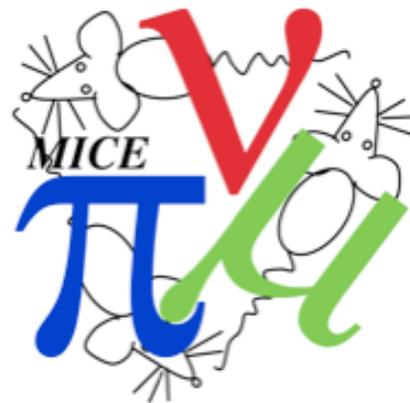
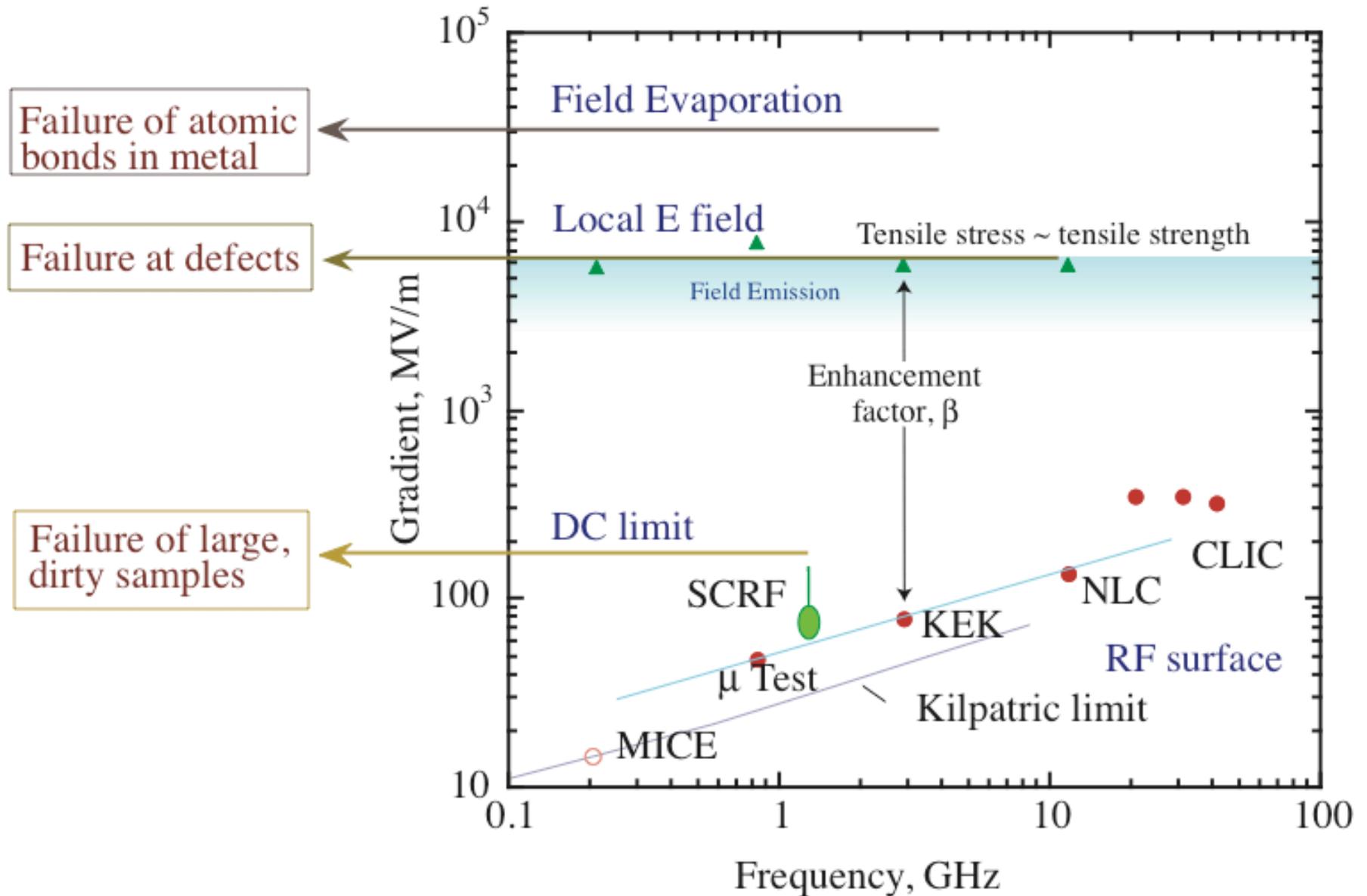


Recent Developments in RF Studies

J. Norem, Argonne
Muon Mtg.
6/3/5



High Gradients in Cavities - the Big picture



Recent Developments

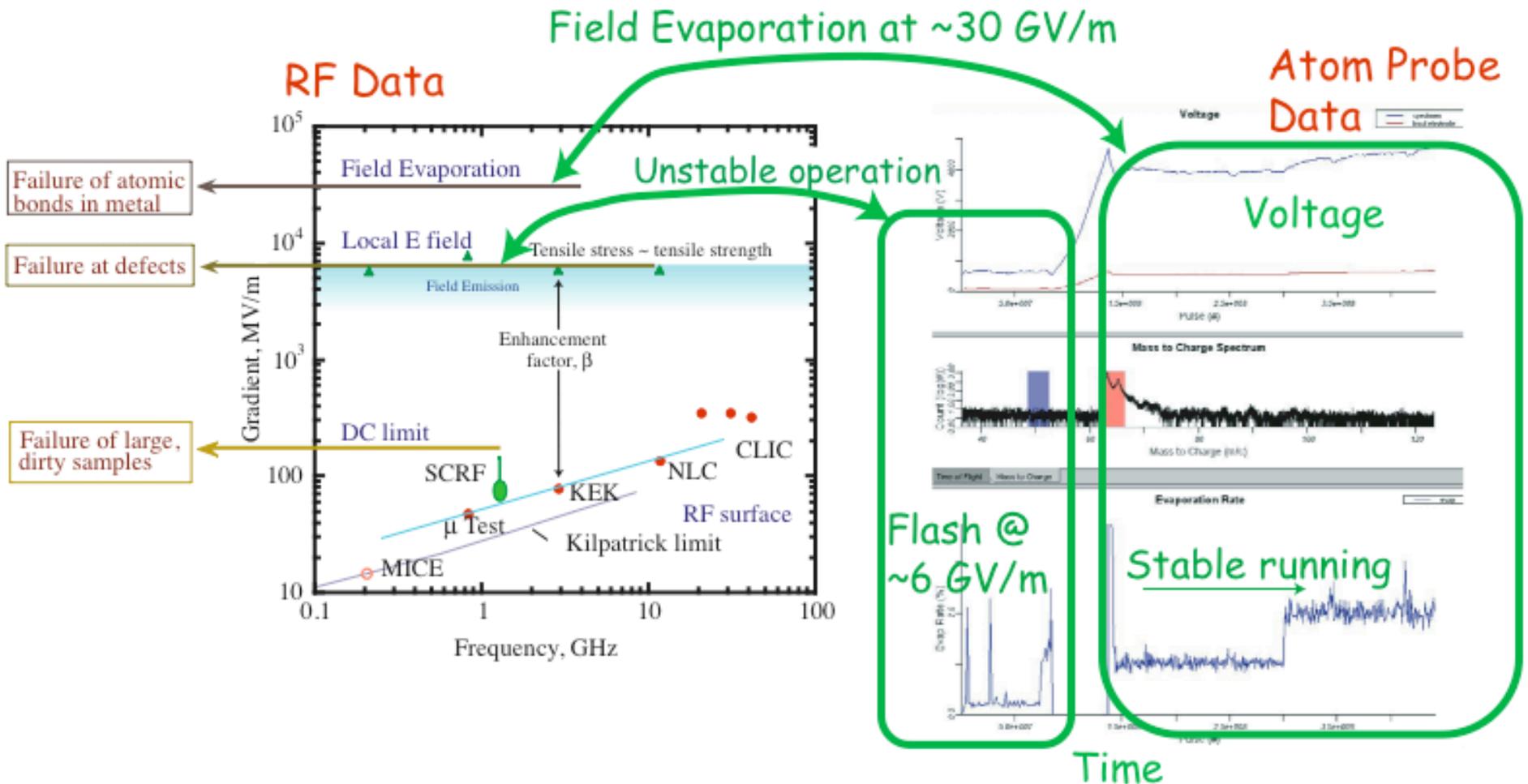
- We made the argument that we see "breakdown triggers" in the LEAP, at PAC05.
- Bob Rimmer sent data on SNS radiation and $Q(E)$ measurements. The data show radiation levels like the 805 MHz pillbox.
- We will argue at SRF 2005 that our models, data and R&D program are relevant to superconducting rf cavities.
- Ron Ruth is organizing a meeting to look at high gradient rf (11.4 - 30 GHz). The purpose is to support CLIC
The MuCool/MICE rf program work is relevant.
SCRF is also relevant.

The breakdown model seems generally consistent with data.

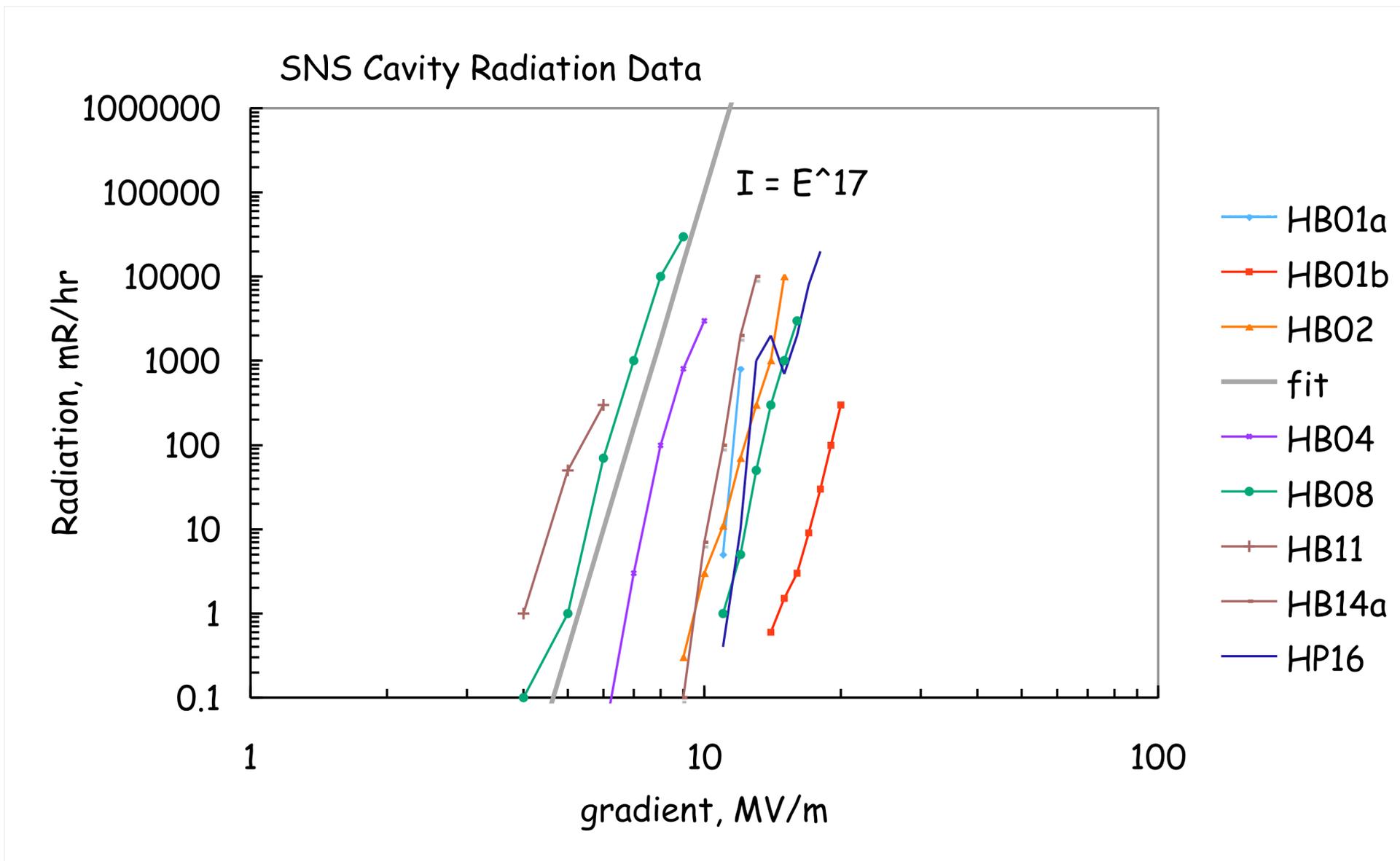
- **DC to 30 GHz** - breakdown occurs when tensile stress \sim tensile strength.
- **10^{-11} to 10^5 Torr** - weak pressure dependence.
- **Different materials** - harder materials better (oxides may matter - not neat)
- **Temperature dependence** - weak dependence is predicted
- **Secondary emitters** - may determine operating fields - we have new data
- **Strong magnetic fields** - torques within emitters seem to dominate.
- **Cavity conditioning** - occurs at constant local electric fields.
- **Atom probe data** - at 5 - 10 GV/m, surface layers belch and pop.

"rf breakdown triggers" in LEAP (?)

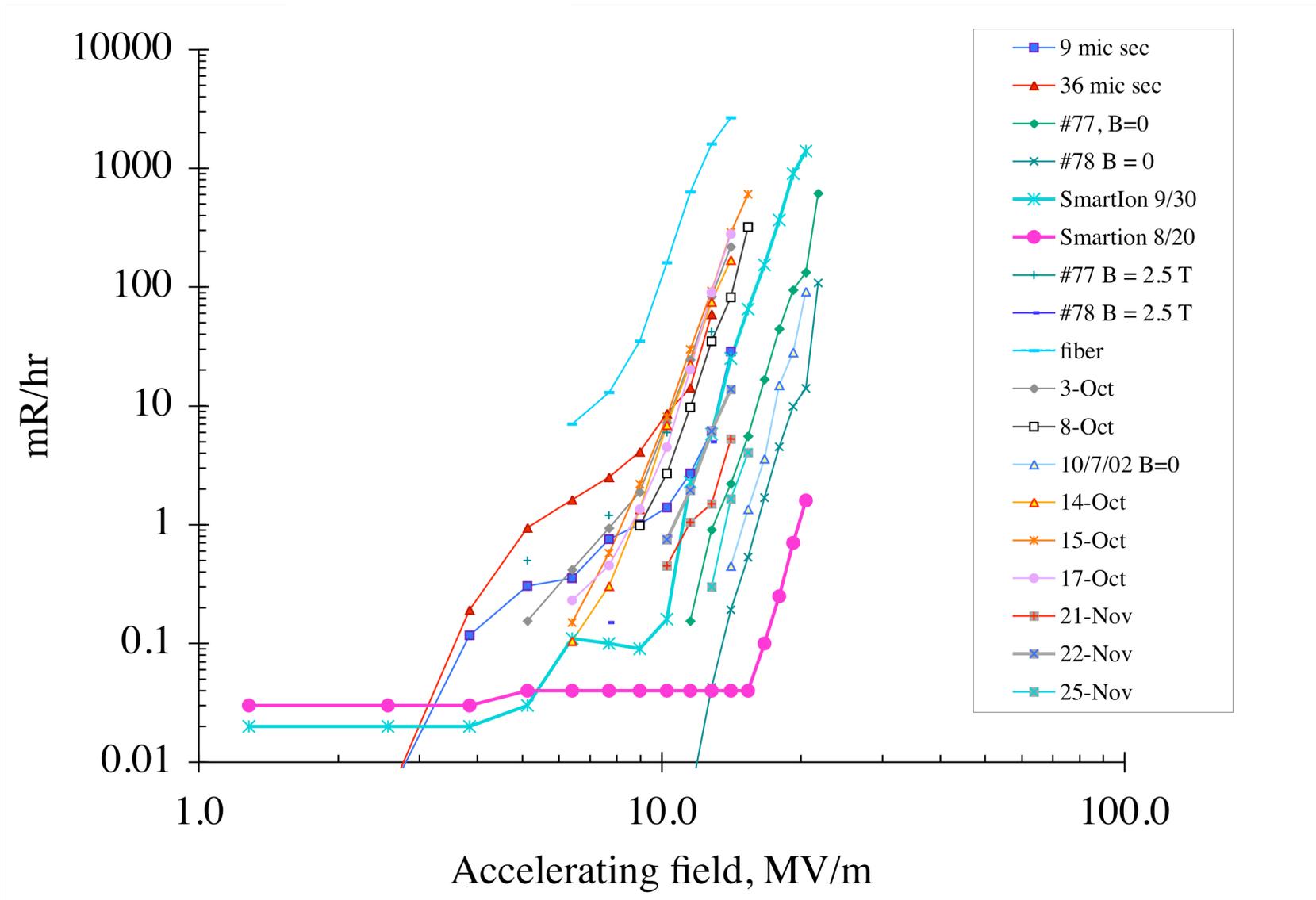
- LEAP data correlates with rf data. LEAP turn-on is unstable.
- Problems occur at about the right fields. (Oxide layers ?)



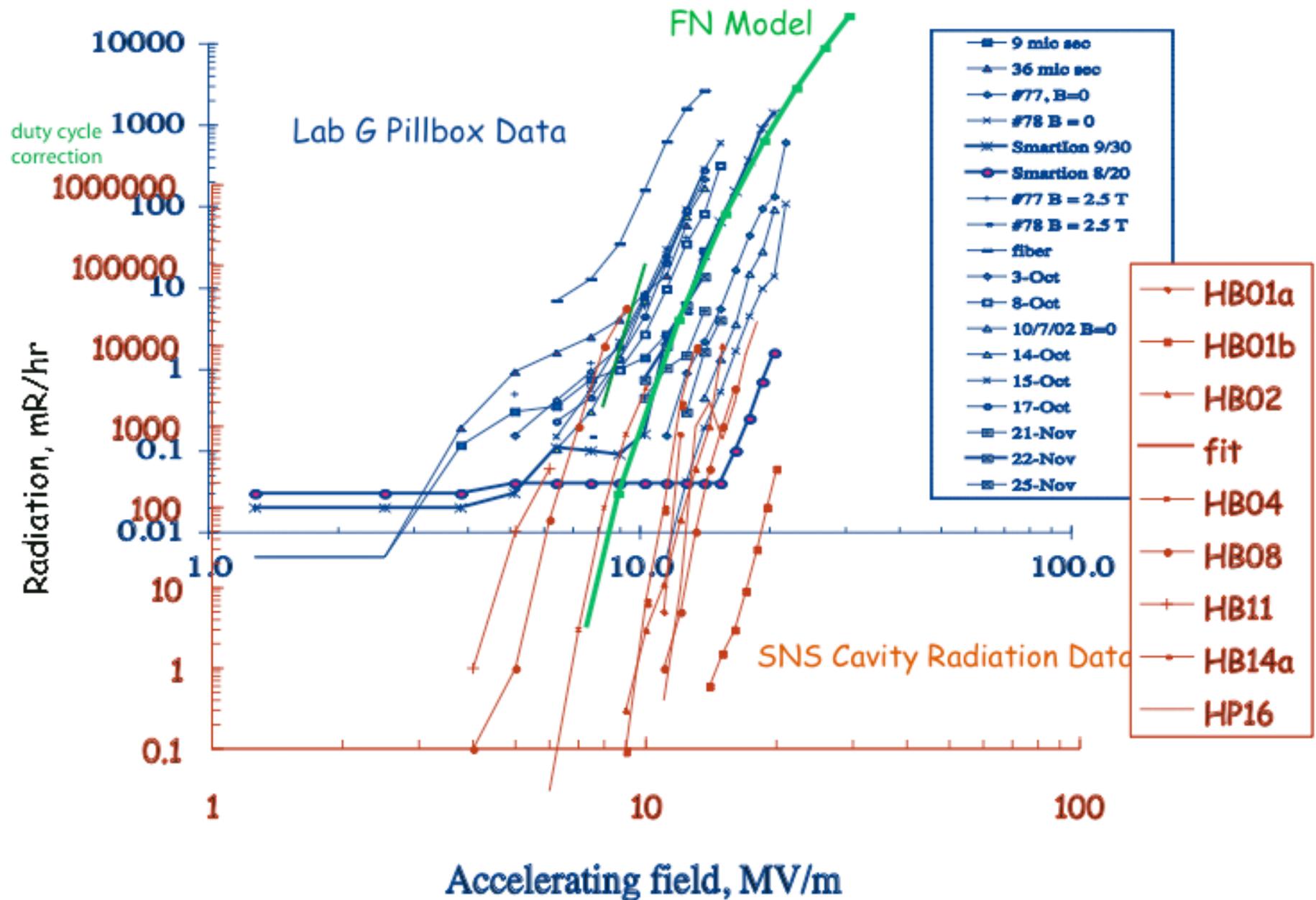
X ray data from SNS cavities.



LBL Pillbox cavity data from 9/02 - 12/02



Comparing Lab G Pillbox with SNS cavities.



Summary

- High Gradient rf is looking more like one field.
 - X-rays imply fields can be high enough to damage surfaces.
 - The same effects seem to limit us, CLIC and SCRF.
- Nevertheless, SCRF, CLIC and Muon efforts are not united.
 - SCRF and CLIC meeting 3000 miles apart on the same day.
- Atom Probe Tomography and MTA experiments may be crucial.
 - Systematic studies of surfaces and coatings.
 - Measurements of local fields as a function of B field, pulse length, etc.