

High Electric Fields in rf Cavities

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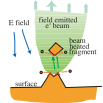
P. Bauer,
Fermilab

D. N. Seidman, J. Sebastian, K. Yoon,
Material Science and Engineering Dept., Northwestern Univ.

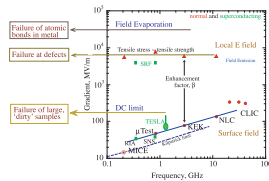
The Model

A model of breakdown triggers

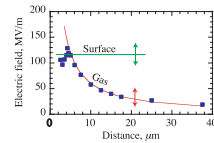
Fields tear off fragment or cluster
FE beams ionize fragment
Lossy plasma produced near wall
EM energy heats wall



Frequency dependence

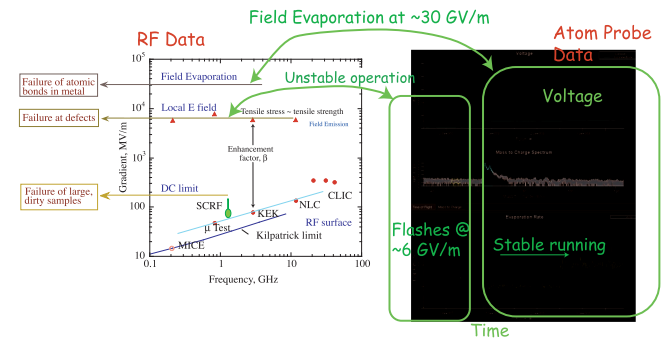


$10^{-11} - 10^5$ Torr

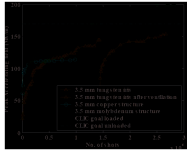


Espartero and Hobbs, 1990 - 1999

Future R&D

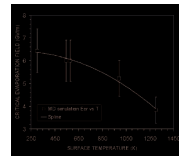


Materials

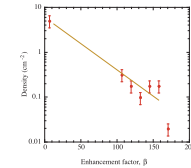


CEM Data, 2003

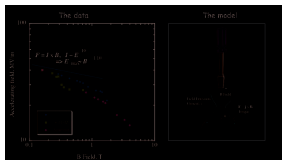
Temperature



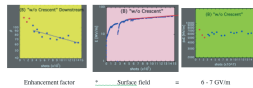
Secondary Emitters



Strong Magnetic fields

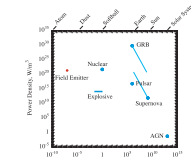


Cavity Conditioning

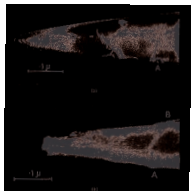


KEK Cooper Garity, 2003

Rapid evolution of spark

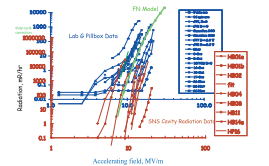


Atom Probe data



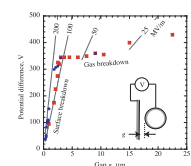
Bridgman and Smith, 1970

Superconducting rf

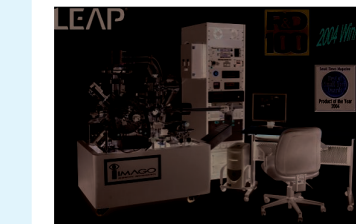


SLAC Garity and Lab G. data

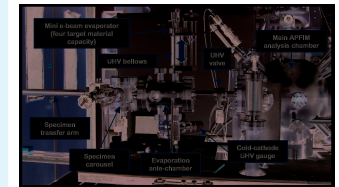
Light and power switching



Espartero and Hobbs, 1990 - 1999



Coating facility



X rays from cavities imply E fields that can damage surfaces.

Little is known about these processes.

No systematic data on high fields and surfaces.
No detailed model of breakdown.

We have a program to try to understand them.
RF experiments in warm cavities.
Modeling of high field effects.
Atom Probe Tomography.

Atom Probe Tomography is an excellent technique
Straightforward, systematic studies are possible.
Completely covers required experimental range.
however . .

There is much less experience with surface studies

