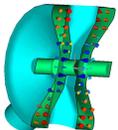

Multipacting Simulations for Spoke Resonators

Frank Krawczyk
LANL

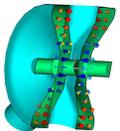
Workshop on the Advanced
Design of Spoke Resonators

Los Alamos, NM, USA
October 7 and 8, 2002



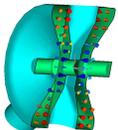
Introduction

- Motivation
- Simulations Approach
- Method Overview
- Existing simulation result
- Outlook



Motivation

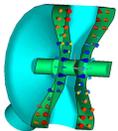
- Spoke resonators show multipacting
- The effect is no show stopper but annoying for operation/start-up
- Established multipacting simulation software exists mostly in 2D
- 3D simulators or coming up (XING, Cornell for wave-guides, MULTP for general geometries)
- We need simulations to understand locations of multipacting (flat part of spoke/outside wall 90° from spoke base/ other ??)
- Can we get rid of multipacting by reshaping the problem spots?



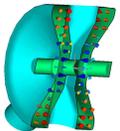
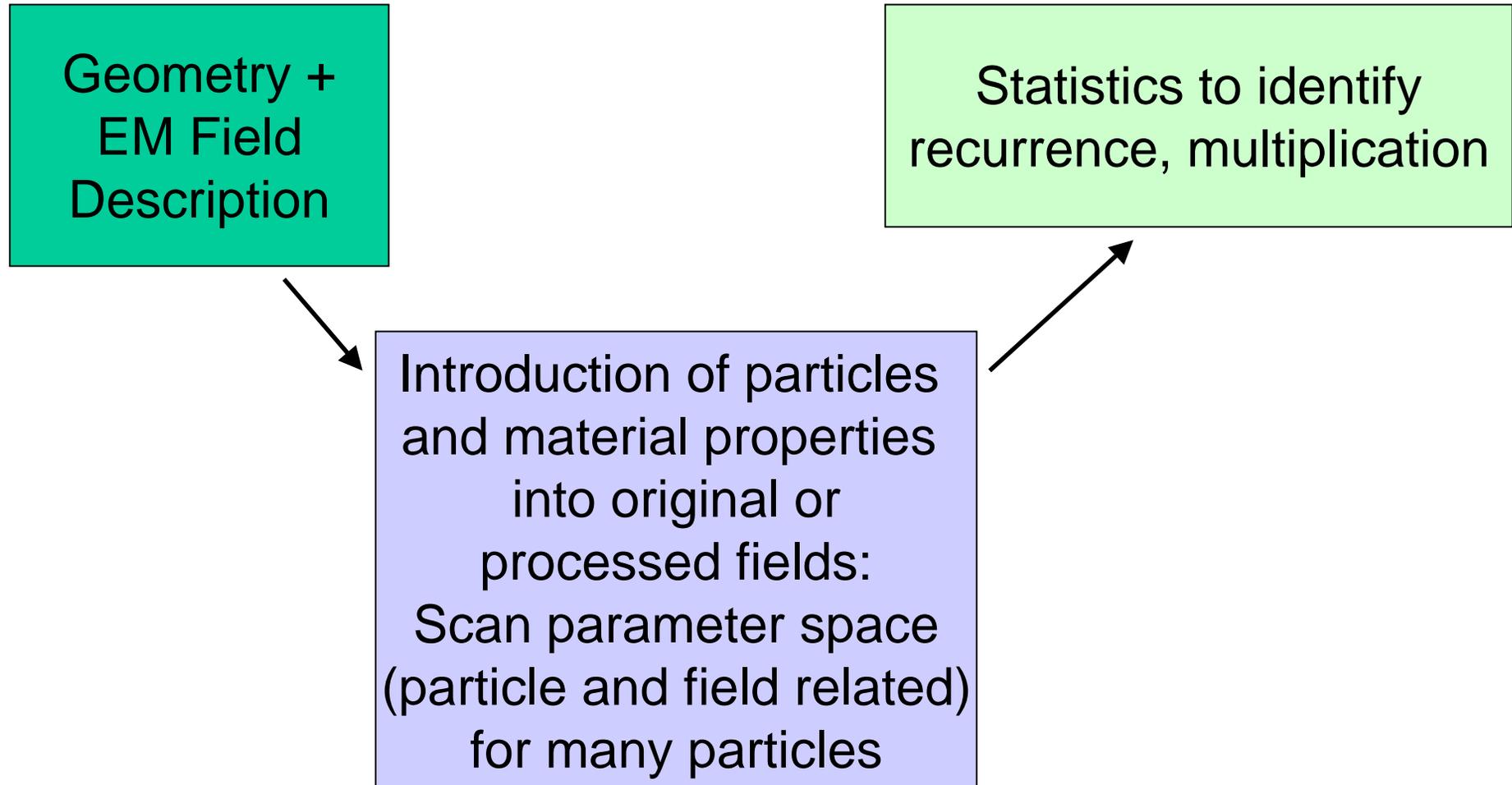
Simulations Approach to Multipacting

Common approach by all simulation software:

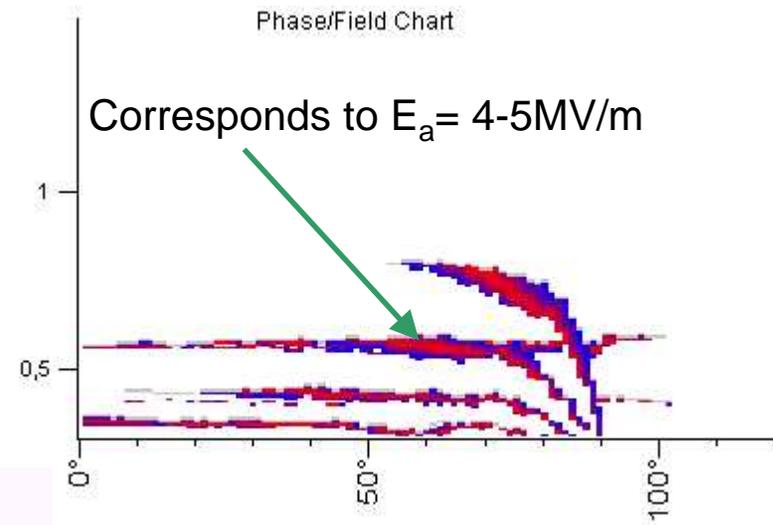
- Geometry description
- EM-field description (quality of surface field)
- Surface property description (SEY)(accurate knowledge)
- Particle description: location, energy, (re-)emission
- Scanning of parameter space (field levels, particle energies, rf -phases, emission angles)
- Statistics to identify recurrence patterns



Method Overview



MULTP Results for ANL Spoke



Suspicious Location

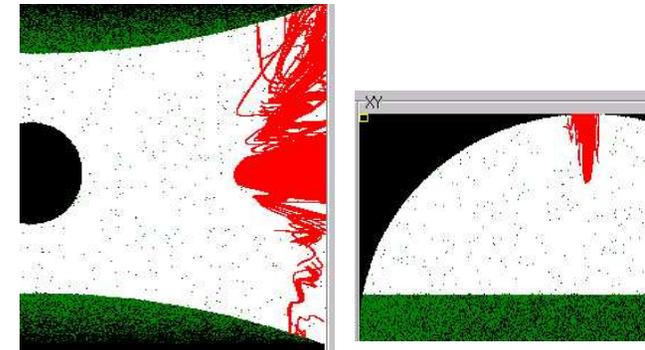
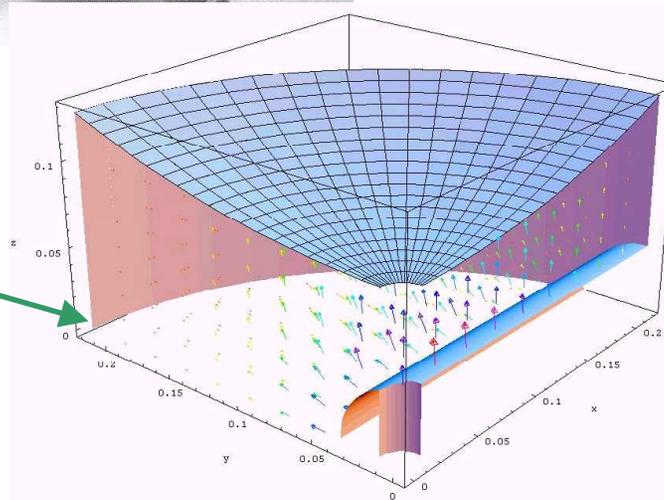
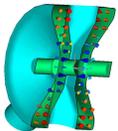
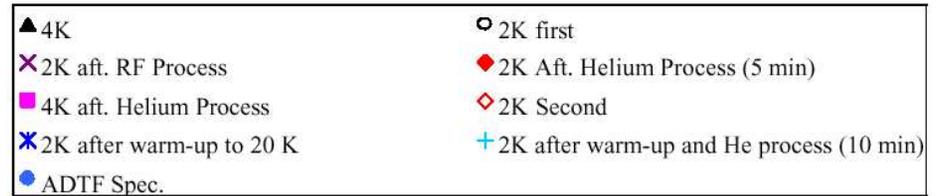


Fig.12a. The electron trajectories of the resonant multipaction.

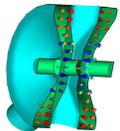
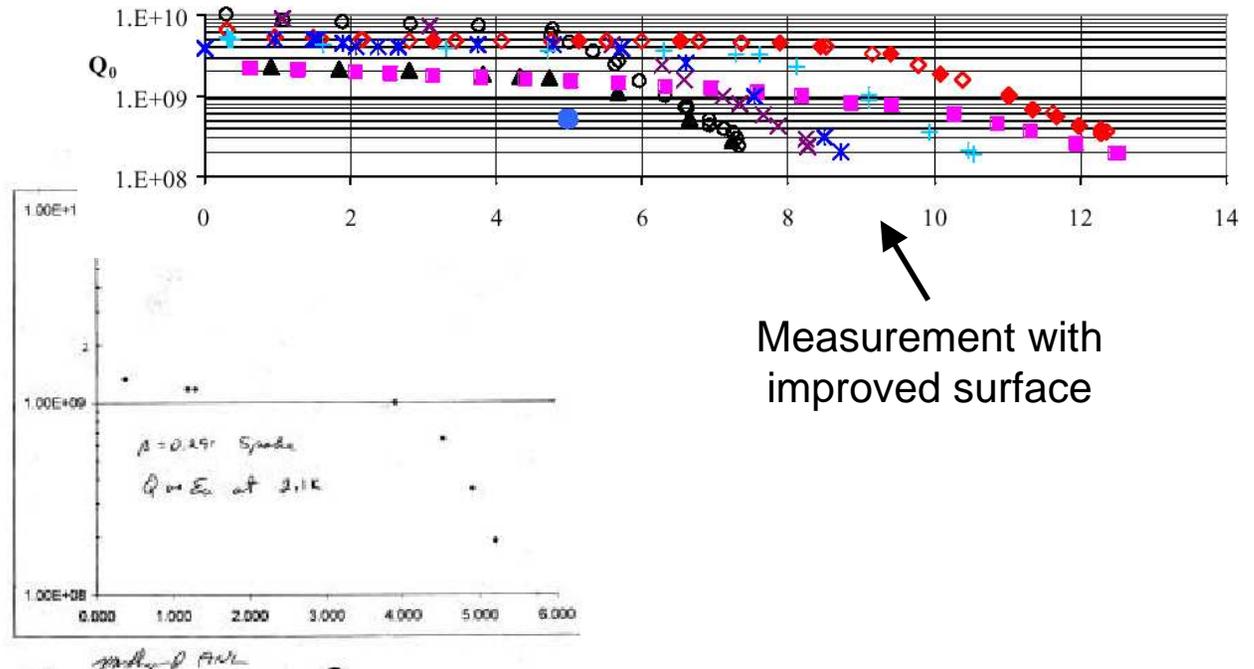
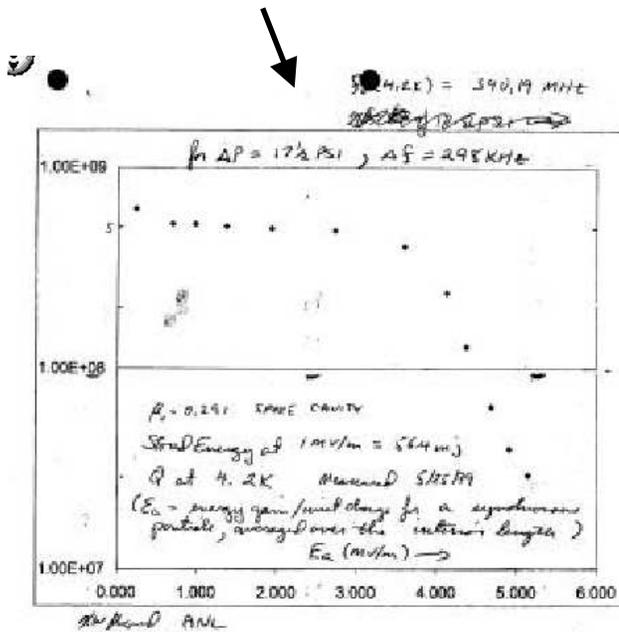


MULTP Results for ANL Spoke

ANL beta=0.3 spoke cavity Q vs. Eacc (3/29-4/4, 2001)



Original Measurement



Outlook

Things needed to improve the understanding:

- Evaluate existing 3D software and compare with measurements
- Identify multipacting locations
- Evaluate geometry modifications

