Planned Breakdown Test of SW Accelerator Cavity with Shaped Iris

J.M Neilson, V. Dolgashev and S. Tantawi

SLAC National Accelerator Laboratory

IWLC 2010

Geneva

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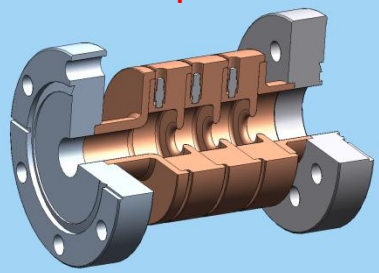
Outline

- Previous breakdown results for elliptical and rounded iris
- Calculations for shaped iris geometry

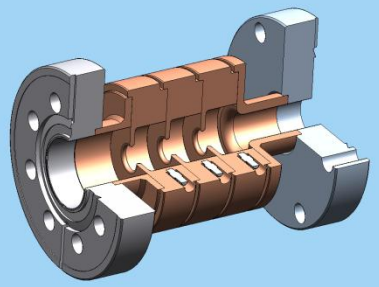
Two Single-Cell-SW Structures with same magnetic but different electric fields

Thick elliptical iris

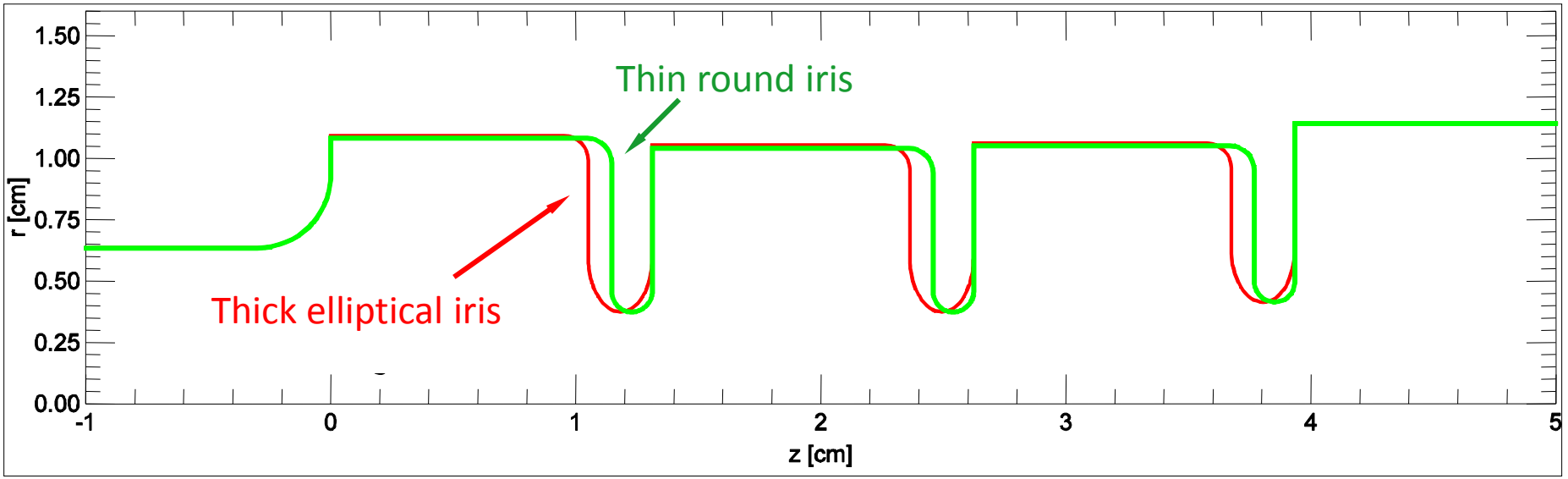


1C-SW-A3.75-T2.0-Cu

Thin round iris



1C-SW-A3.75-T1.66-Cu



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Parameter Values for Simple Iris (Field Normalized for 100MeV/m Gradient)

Parameter	T=1.66 Round Iris	T=2.6mm Elliptical Iris
Stored Energy [J]	0.189	0.189
Q-value	8820	8560
Shunt Impedance [MOhm/m]	85.2	82.6
Max. Mag. Field [KA/m]	314	325
Max. Electric Field [MV/m]	**266**	**203**
Losses in one cell [MW]	1.54	1.59
Hmax*Z0/Eacc	1.18	1.22
Max. Im{E x H*} W/μm²	42.8	44.4
Max. Im{E x H*}/H²	417	407

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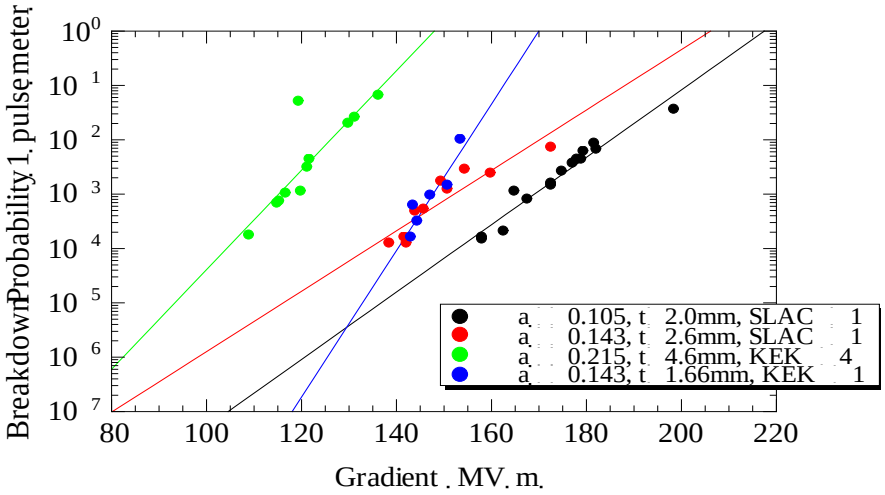
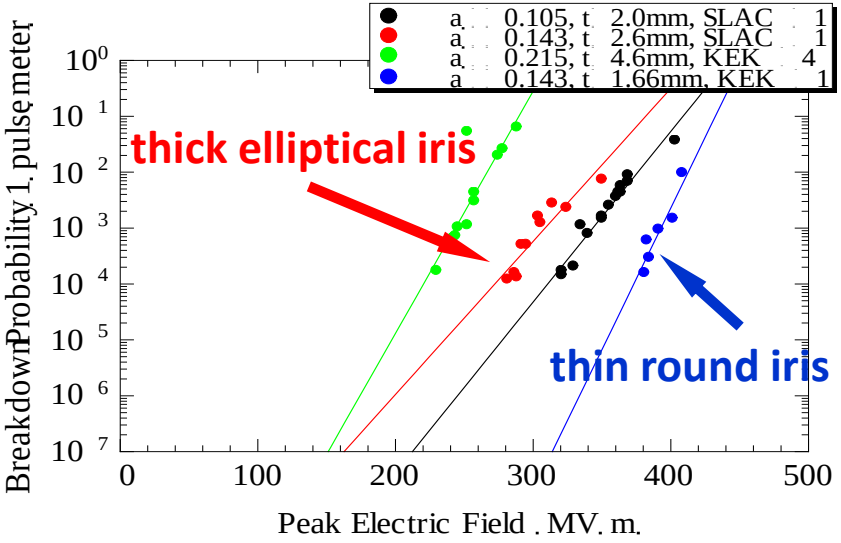
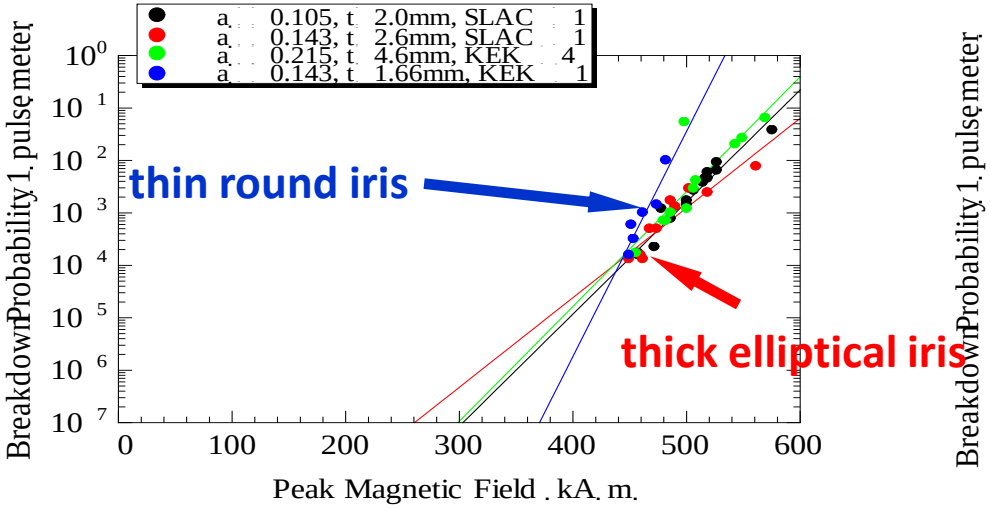
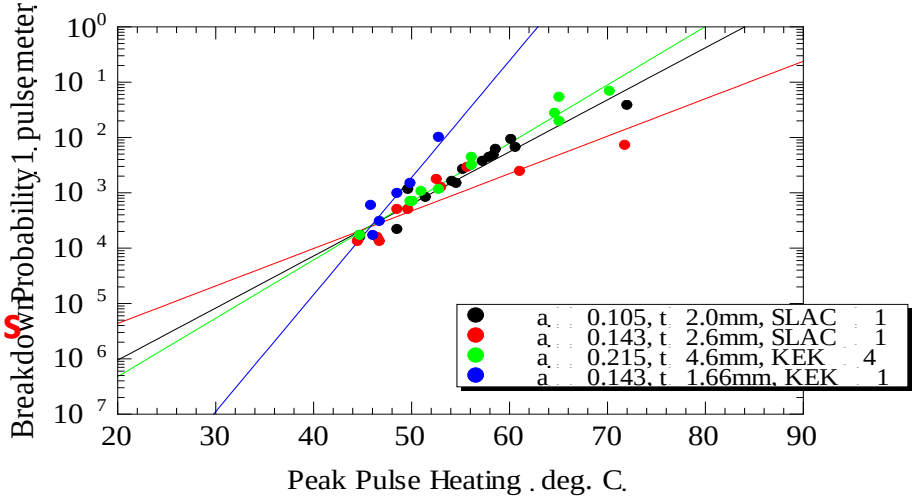
Breakdown Dependence









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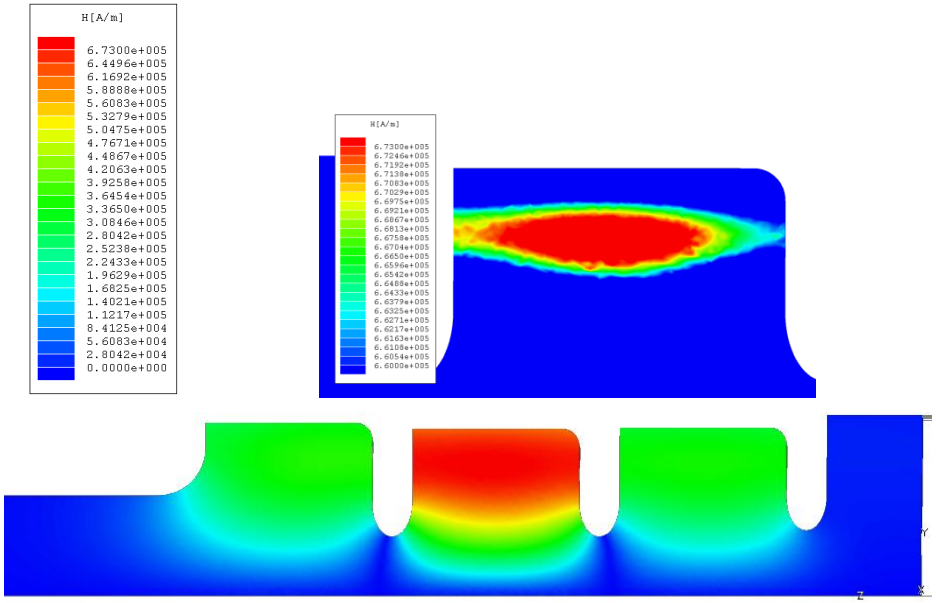
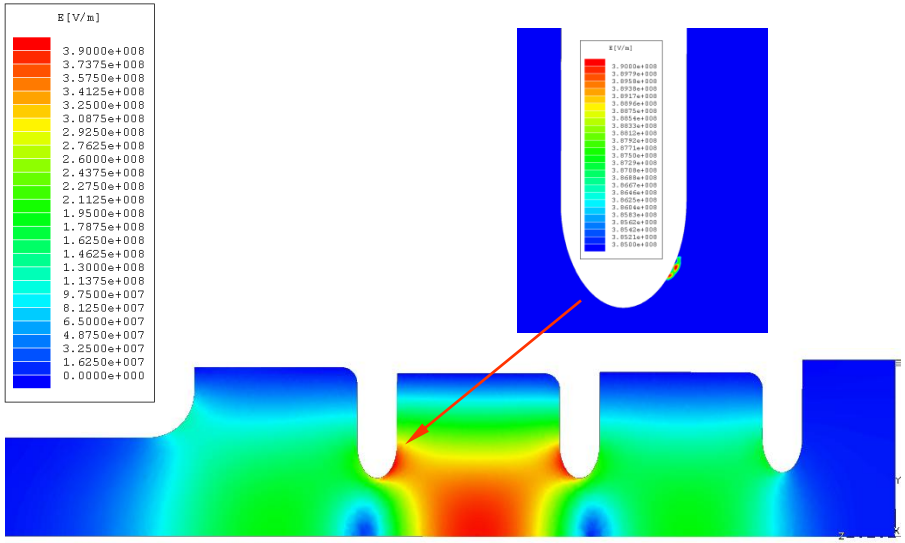
1C-SW-A3.75-T2.6-Cu
10 MW input



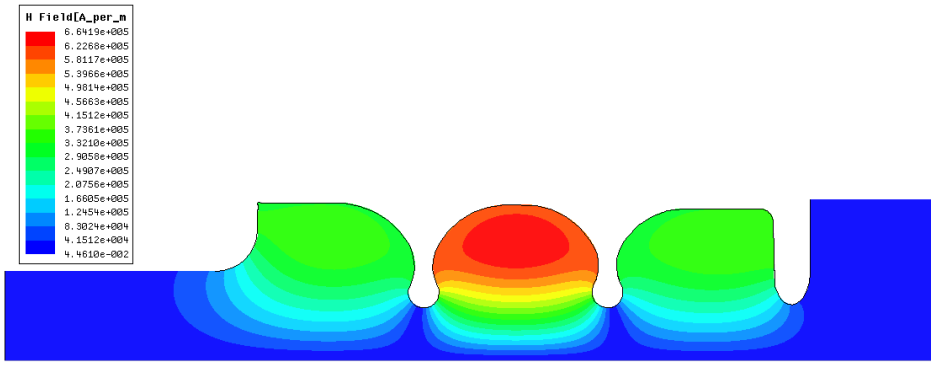
Maximum magnetic field 672 kA/m

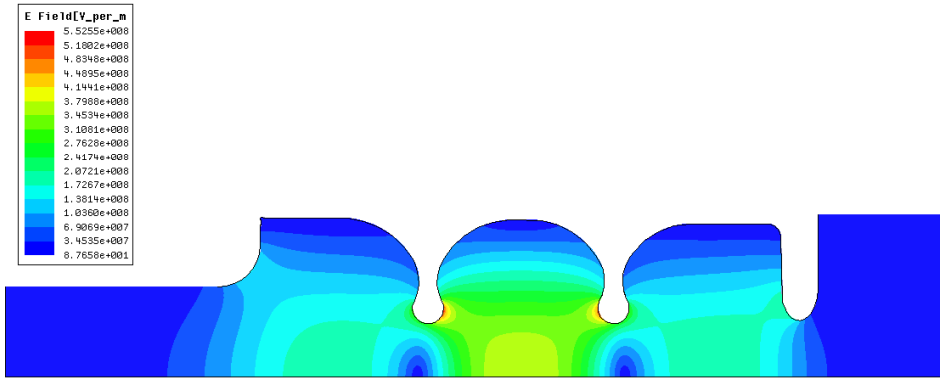


Maximum magnetic field 390 MV/m

Resonance at 11.4212 GHz $\beta = 0.988$

1C-SW-A3.75-T2.2-Cu
10 MW input





Resonance at 11.424 GHz $\beta = 1.007$

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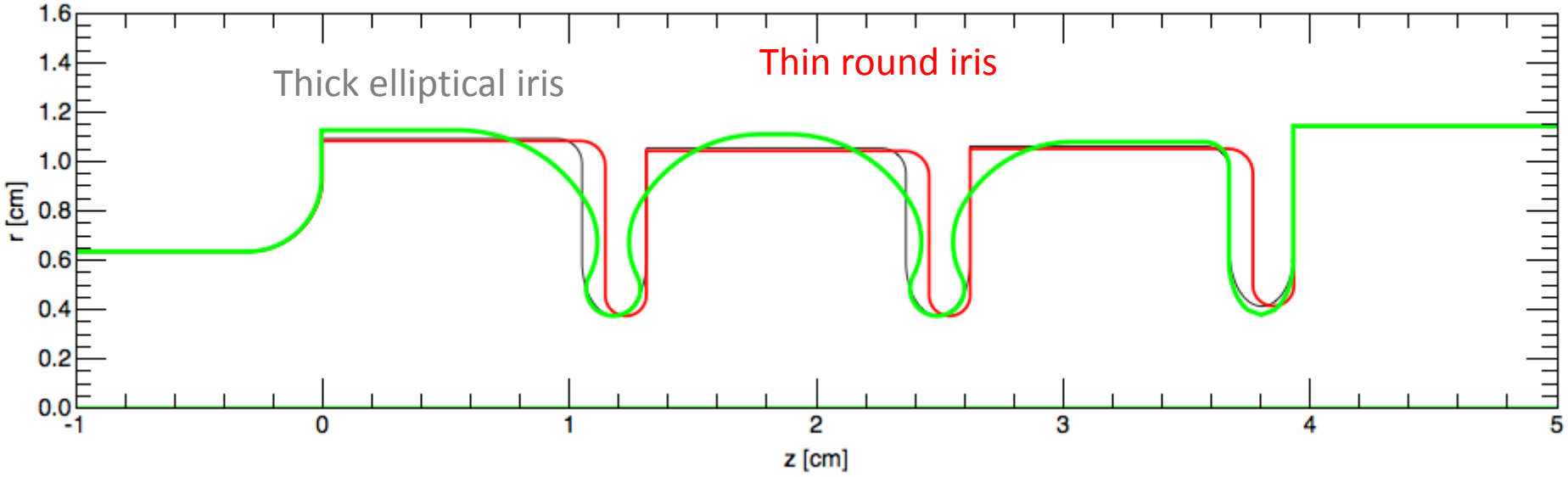
Shaped Iris



- Iris profile designed to maximize shunt impedance, minimize peak surface magnetic field

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SW Cells a/λ =0.143, π Phase Shift Field Normalized for 100MeV/m Acceleration

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Stored Energy [J]	0.189	0.189	0.186
Q-value	8820	8560	10090
Shunt Impedance [MOhm/m]	**85.2**	**82.6**	**99.2**
Max. Mag. Field [KA/m]	**314**	**325**	**294**
Max. Electric Field [MV/m]	266	203	268
Losses in one cell [MW]	1.54	1.59	1.32
Hmax*Z0/Eacc	1.18	1.22	1.11
Max. Im{E x H*} W/μm²	**42.8**	**44.4**	**56.5**
Max. Im{E x H*}/H²	417	407	650

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Summary

- New structure designed with lower magnetic field
- However local Poynting vector significantly increased compared to other structure