LINAC08 POSTER: THP038

A NEW SRF CAVITY SHAPE WITH MINIMIZED SURFACE ELECTRIC AND MAGNETIC FIELDS FOR THE ILC*

Zenghai Li and Chris Adolphsen

SLAC, Menlo Park, CA 94025, U.S.A.

*This work was supported by DOE contract No. DE-AC02-76SF00515.

THP038

ILC Cavity

Baseline & alternative designs

TESLA TDR: Es/Ea ↓ Bs/Ea ↑

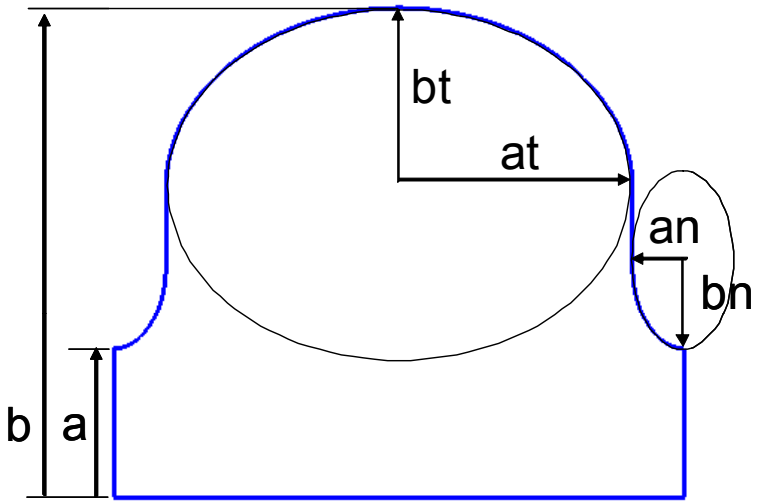
LL design: Es/Ea ↑ Bs/Ea ↓

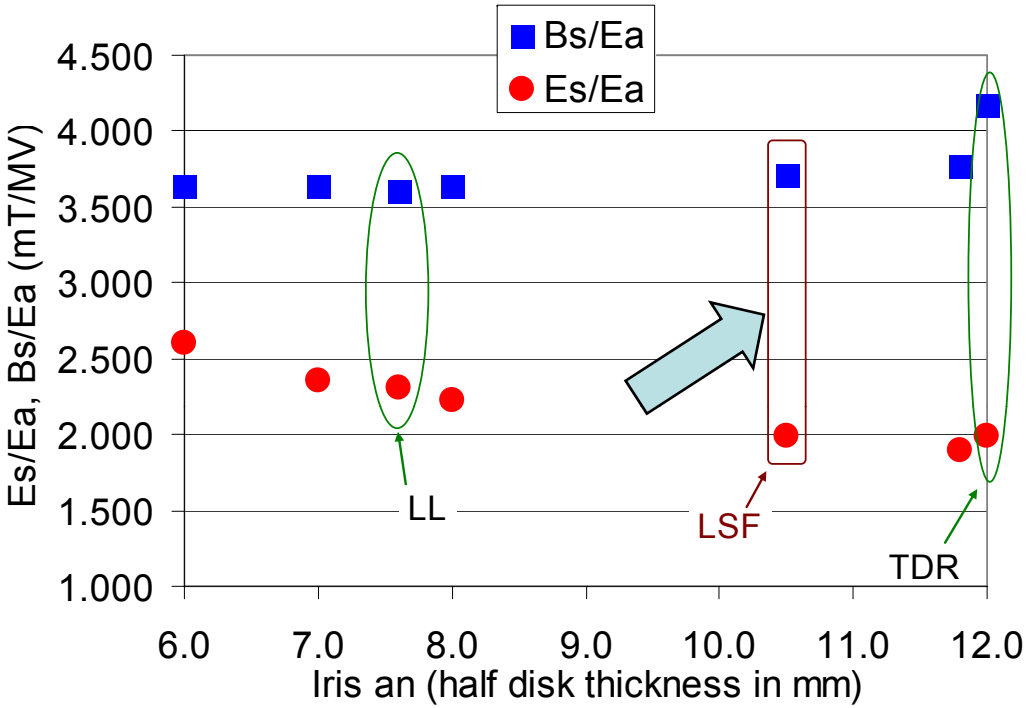
Goal of this work:

Es/Ea ↓ Bs/Ea ↓

Cell Shape Optimization

THP038

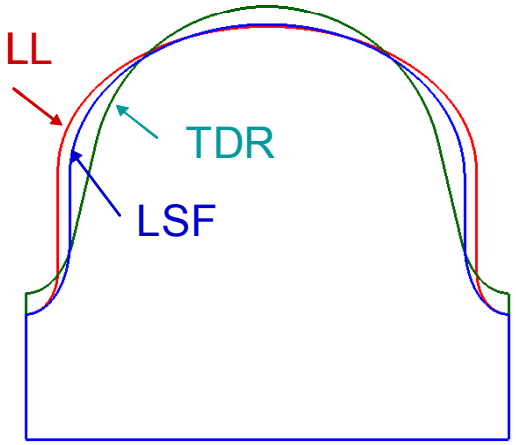


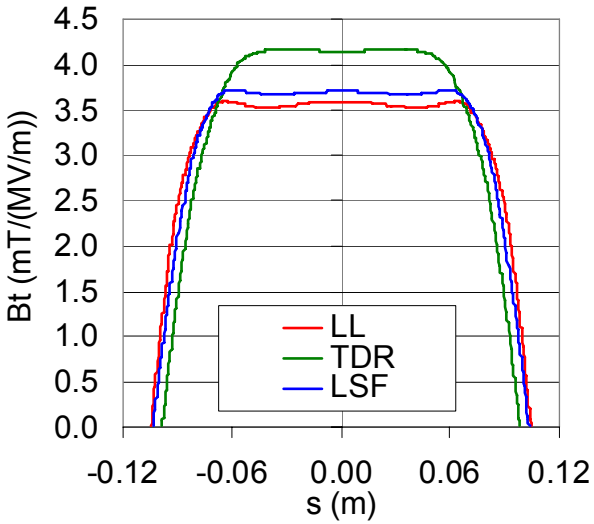


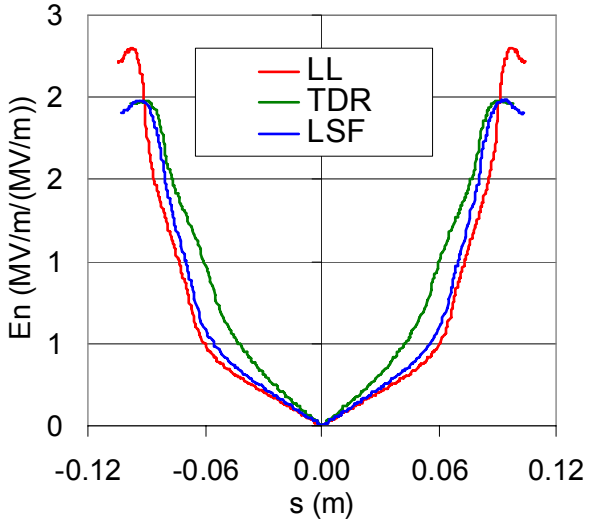
- **Cell contour: two ellipses connected with straight lines**
- **Given *an*, *bn* and *bt* optimized to minimize Es and Bs**
- **Low Surface Field (LSF) Design**
  - **Iris radius of 30-mm**
  - **an=10.5 mm**

LSF, TDR and LL Comparison

THP038

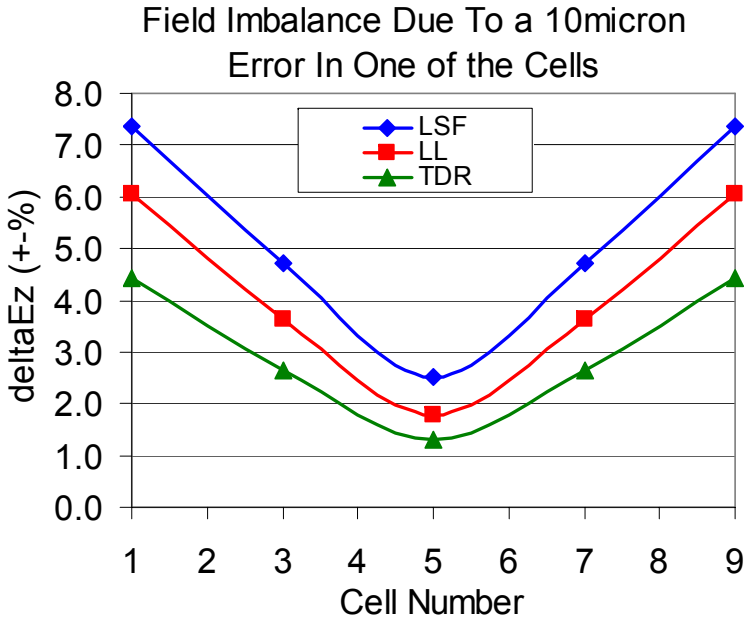






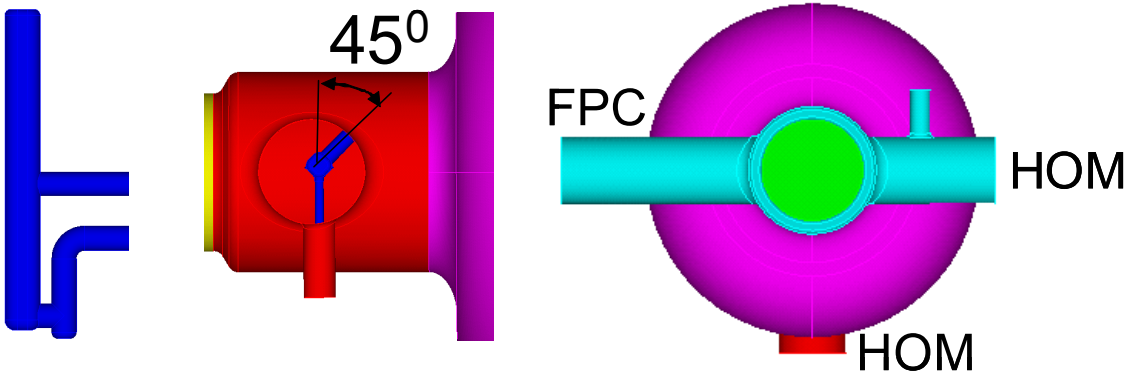
The Low Surface Field (LSF) Design

- 15% higher R/Q than TDR
- 11% lower Bs/Ea → 20% lower cryogenic heating
- 15% lower Es/Ea than LL design, same as TDR
- Field flatness 20% more sensitive to cell error than LL

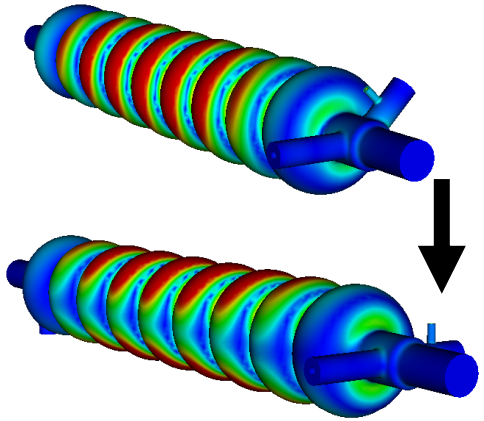


HOM Coupler Optimization

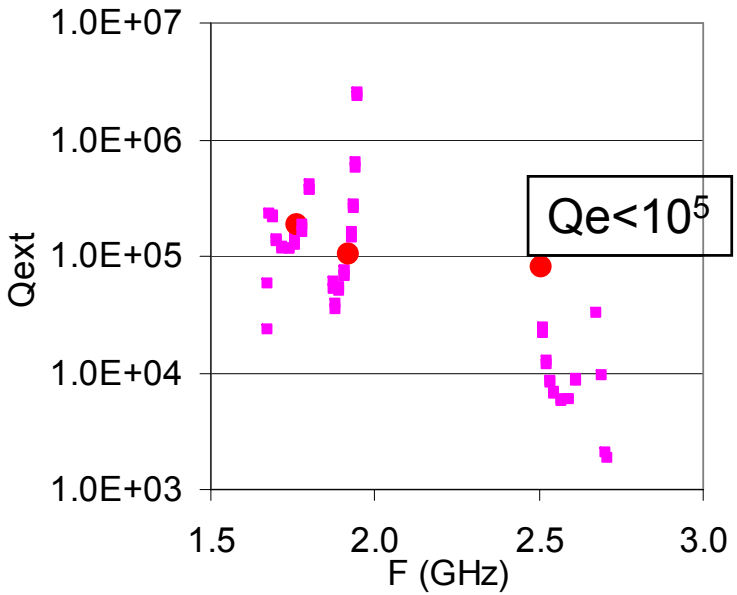
THP038

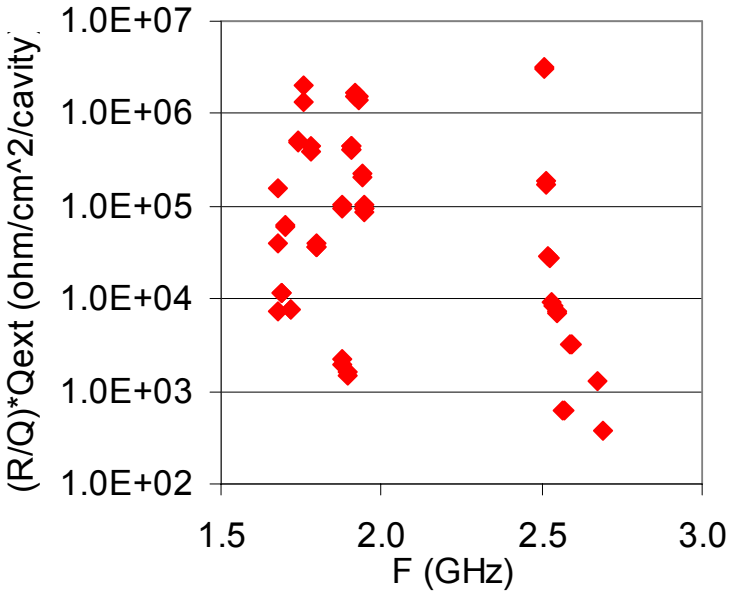


Improved coupling for high R/Q modes



New coupler orientation





Summary

THP038

- A Low Surface Field (LSF) cavity shape was optimized
  - Bs/Ea 11% lower than the TDR design, which would support a gradient about 10% higher and lowers the cryogenics power by about 20%
  - Es/Ea 15% lower than the original LL design, same as TDR
- HOM coupler optimized
  - to damp the dipole wakefields
  - Qext of the highest R/Q mode in 3rd band is below 10^5 and satisfies the ILC requirements