The 3rd harmonic Structure

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Limitation by Physics

According to BCS theory the surface resistance is approximately

$$R_{BCS} = A\frac{f^2}{T}\exp\left(\frac{-\Delta}{k_B T}\right)$$

This limits the ultimate gradient which can be reached,

At 1.3 GHz this number is 1 nΩ at 2 K,
at 3.9 GHz it is 9 nΩ.

The limit scales from 50 MV/m to 17 MV/m

Limitation cntd

- Limit at 3 GHz ~ 25 MV/m
- At Cornell 25 MV/m was reached (1400°C treatment)
- For 3.9 GHz this translates to

Reschke 94

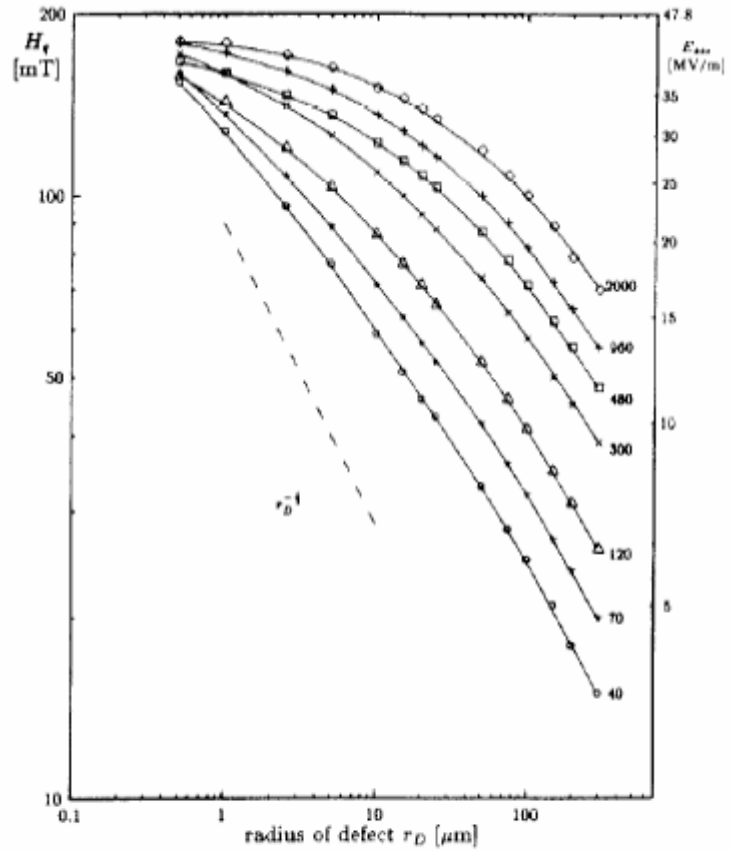


Figure 1: Expected breakdown limit for different defect sizes. The parameter is the RRR (see Fig.3). $\frac{H_q}{E_{acc}} = 4.18\,\frac{\mathrm{mT}}{\mathrm{MV/m}}$ corresponds to the S-band S-DALINAC cavities [3]. ($T_B < 2.1\,\mathrm{K}$, $f = 3\,\mathrm{GHz}$, $R_D = 8\,\mathrm{m\Omega}$, $R_{res}^{hom} = 0\,\Omega$, $D = 2\,\mathrm{mm}$).

Padamsee 93

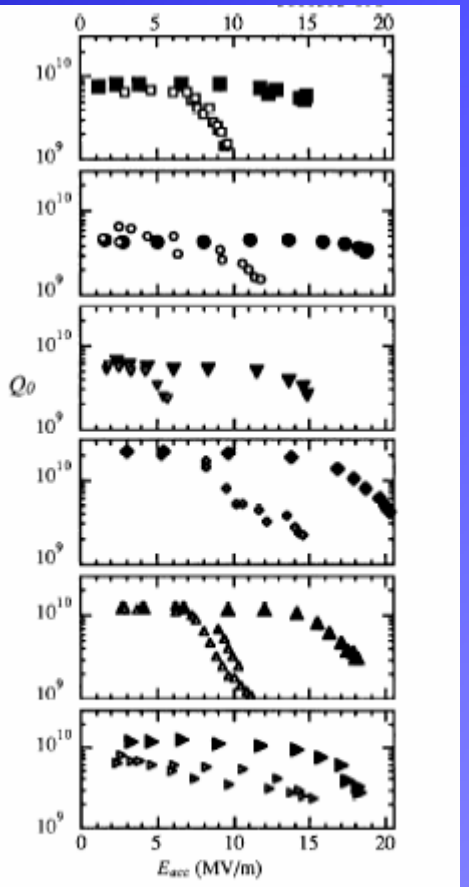
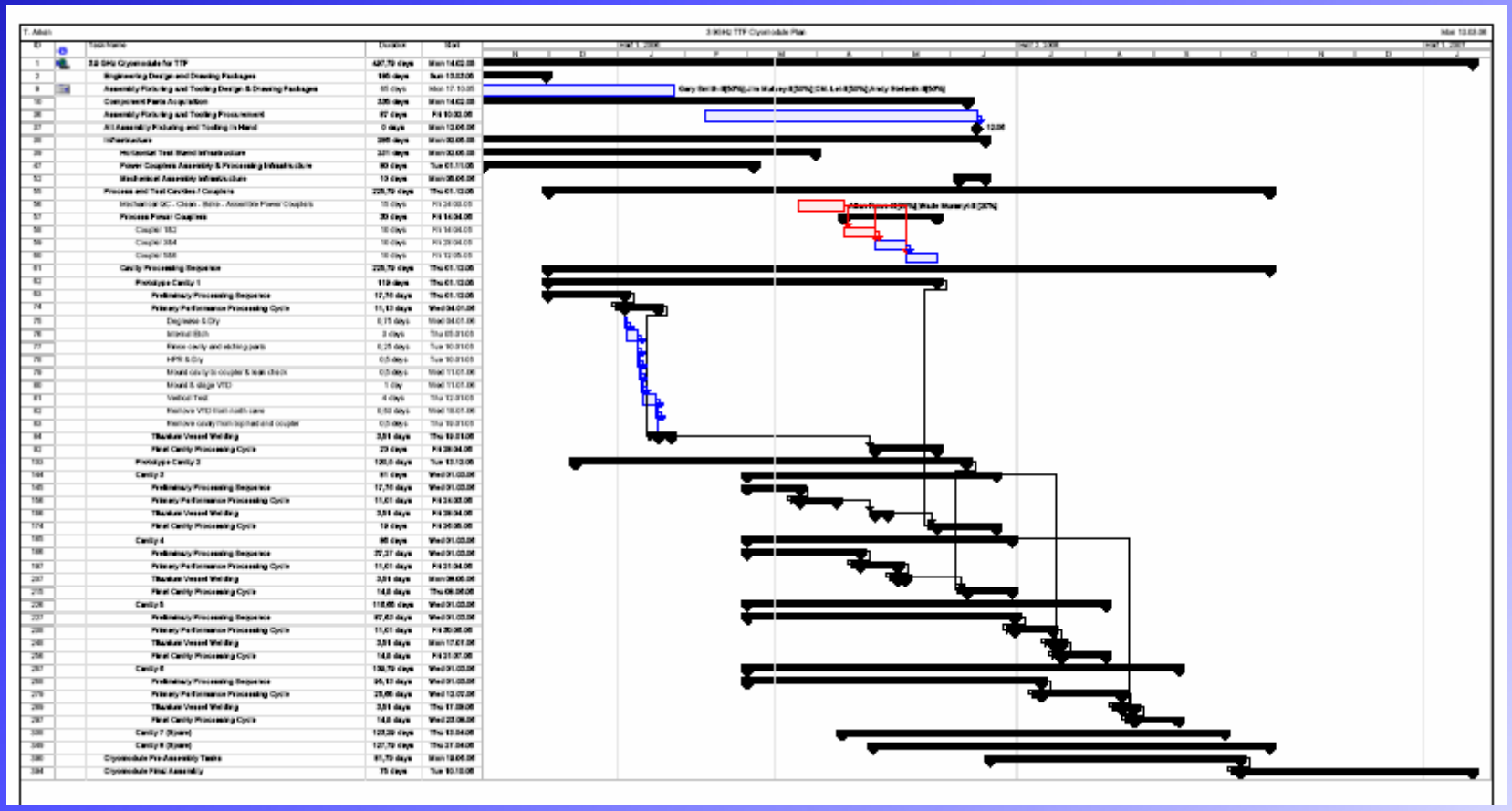


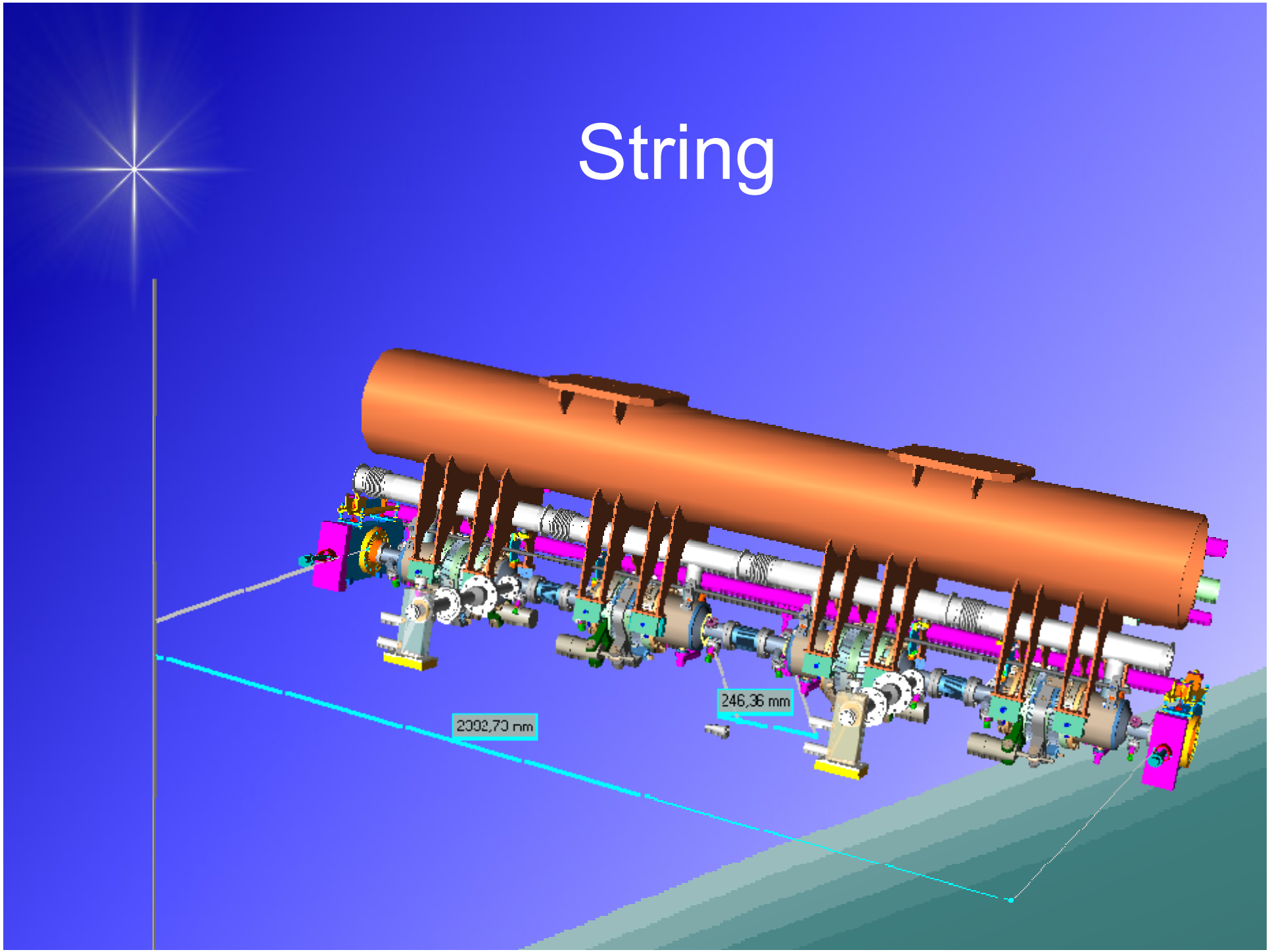
Figure 3. Composite Q_0 vs E_{acc} plots of the six best tests of nine cell cavities. Open symbols show cavity behavior before processing; closed symbols are for after HPP.

Status at Fermilab

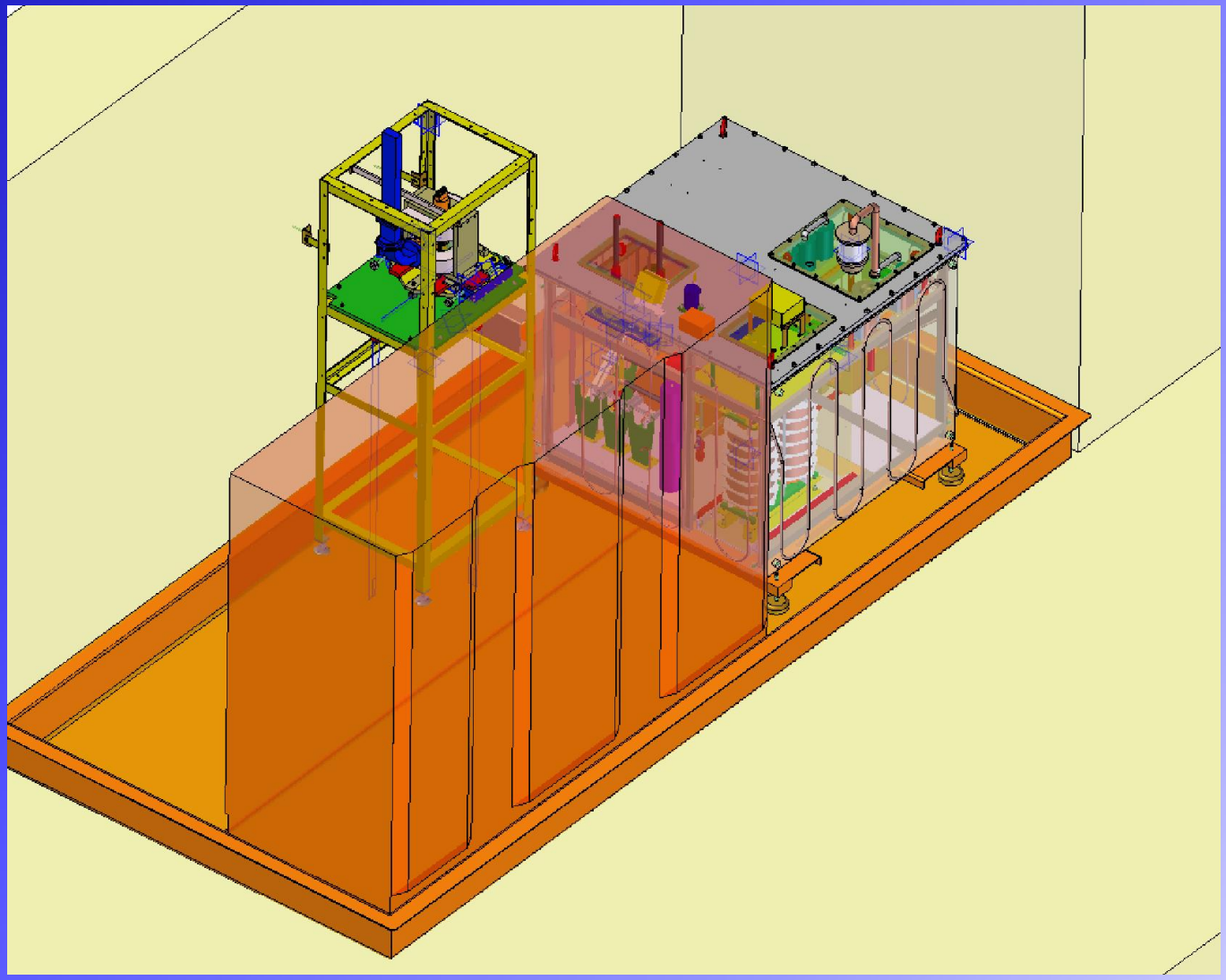



Fermilab
SCRF 3.9 GHz

String



Status at DESY



Status at DESY

- Modulator being modified (parts available)
- Klystron expected in July
- Circulators overdue (Feb)
- Waveguides on the way