Can we predict performance of 650MHz cavity?

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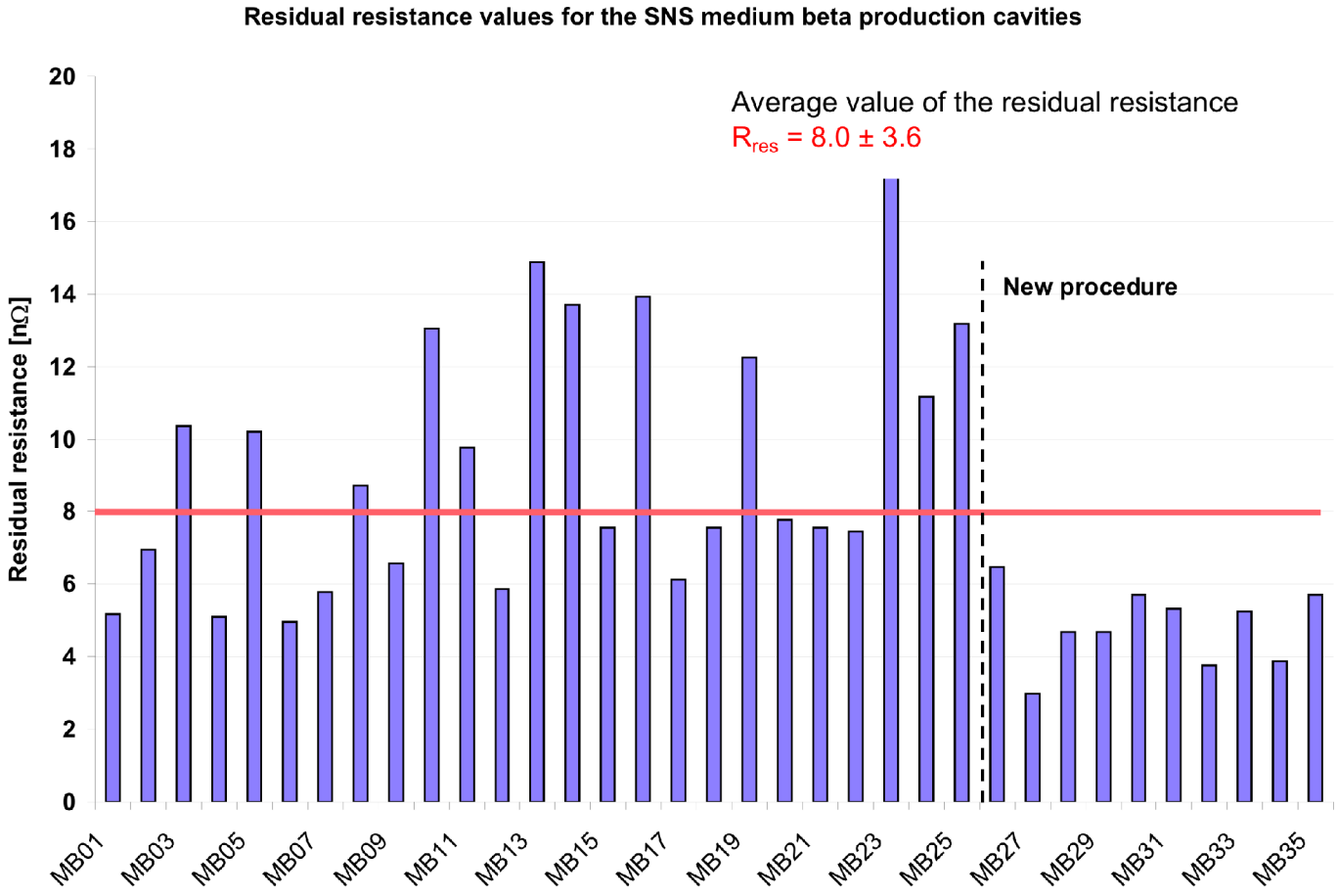
Intro: 650 MHz requirements

- CW machine – need to lower RF losses.
- => Paradigm shift: was “Get 35 MV/m” -> “Get 5 (8?) nOhm surface resistance”
  - “Going from 7.2 to 5 nOhm reduces cost of cryoplant by 20%”
- => Is it “5” or is it “8”? What can we expect? What can we deliver?

(Un)-Knowns

- $R_s \approx R_{BCS} + (R_{mag} + R_{res})$
  - $R_{BCS} = (A/T) \cdot f^2 \cdot \exp\{-B/T\}$
    - A = ?; B = ?
    - What helps: Operate machine at 1.8K
  - $R_{mag} = C \cdot B$; (B – residual magnetic field)
    - C = ? ; B = ?
  - R_{res} = ?

R_{res}



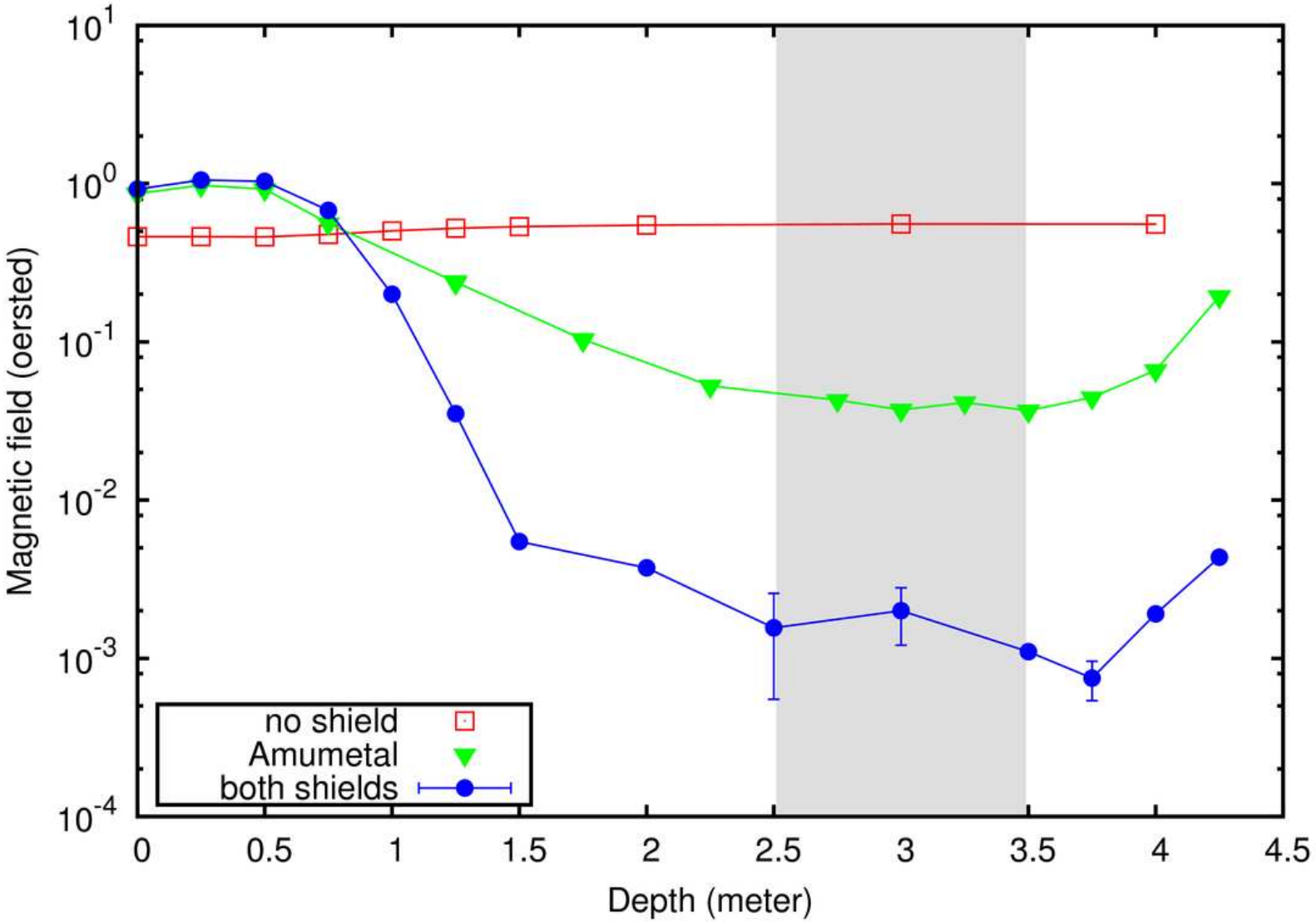
Jlab report by G. Ciovatti as presented by Padamsee on Fermilab colloq. (Nov. 2009)

But what about residual magnetic fields?

Magnetic fields

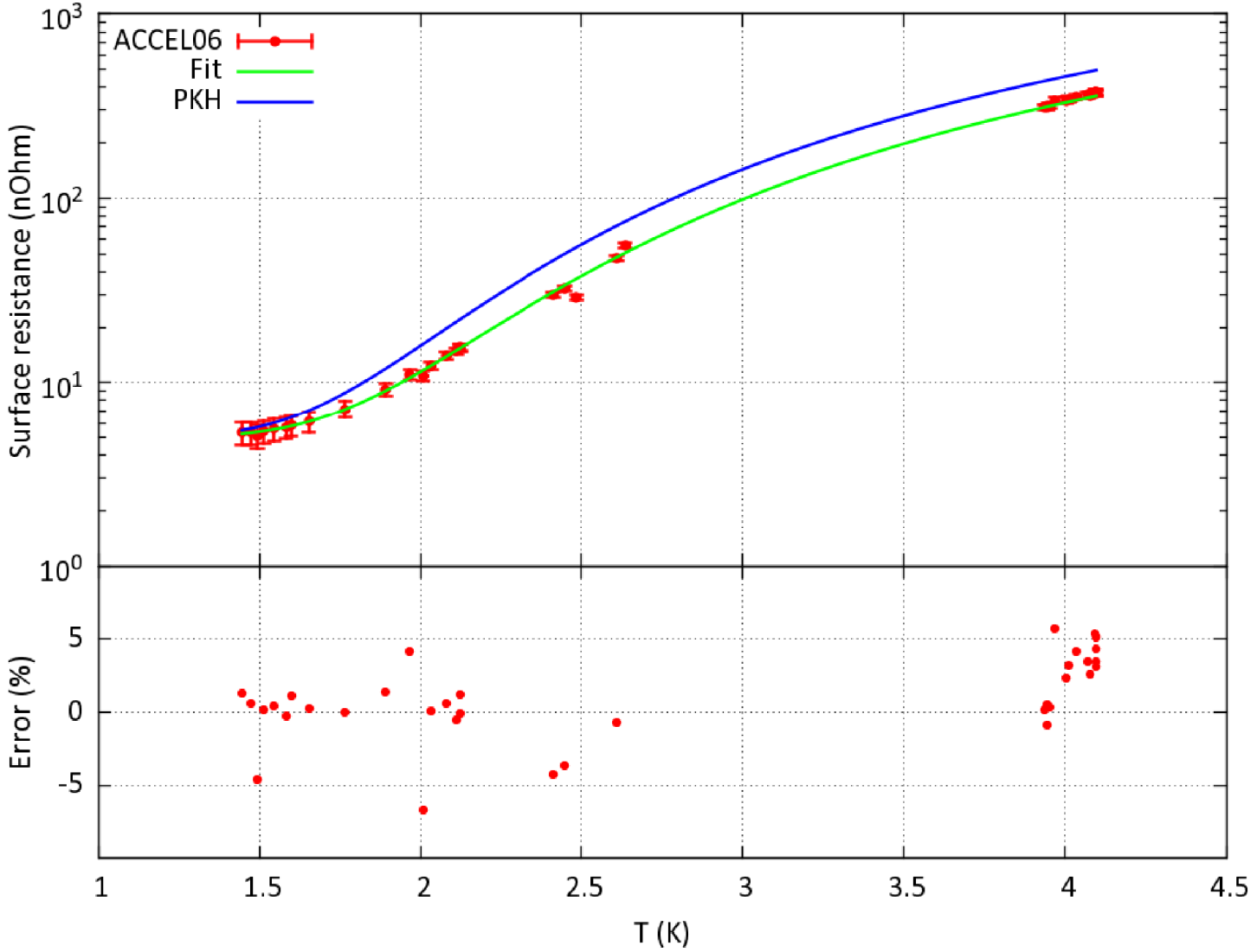
- What else determines "C"?
  - Mag field "form factor" (uniform or not; orientation)?
  - Material properties besides RRR (small/large grain)?
- How well do we know magnetic field around cavities?

Magnetic fields – VTS at Fermilab



Room T measurements. See: Ginsburg,Reid, Sergatskov IEEE Transactions on Applied Superconductivity, vol. 19, issue 3, pp. 1419-1422

R_{BCS}



Fit parameters: A=7073.0, B=18.4, C=4.97

R_s

- At Fermilab R_{res} consistent 5nOhm +/- 0.5nOhm (1.3GHz Tesla as well as 335MHz SSR1 spoke resonators)
  - SSR1 resonator – BCP + ultrasound +“crude” HPR
  - Double mag shield (mumetal + cryoperm) helps?
- Need more and better data (2.17 to 1.4K range)
- **How is it all relevant to operation at high E?**
  - What E can we commit to?