Working Group 4
Performance Frontiers

TTC Meeting at Sacaly
06th of July 2016

Sarah Aull, Anna Grassellino and Kensei Umemori

WG 4: The Performance Frontier (S. Aull, A. Grassellino, K. Umemori)

Three working groups have been active under the TTC umbrella: High Q for cryogenic cost reduction for CW accelerators at medium gradients, High Gradients with Nb and Nb3Sn, and Thin film Nb-Cu for cost reduction. Please include on-going efforts on composite Nb-Cu. Explorations at these frontiers will benefit medium-term and far-term future accelerators under discussion. Co-chairs should encourage presentations that will lead to a summary of on-going efforts underway for the three active WGs. Breakthroughs in these areas should get special attention. In your final summary please make an assessment of the probability of success for improved understanding, and highlight results for high Q, gradients > 50 MV/m and successful elimination of the Q-slope in Nb-Cu. Please do not make your summary talk a collection of slides from the presentations in the WG, but rather organize your talk along the lines of accomplished advances and needed developments.

Organization of the Session

Today

Working Group 4 (S. Aull, A. Grassellino, K. Umemori)

Mrs. Sarah Aull, Dr. Anna Gr...

Thin films and new materials

Room 112 14:00 - 17:45

Thursday morning

Working Groups 3 & 4 (common session)

Mrs. Sarah Aull, Dr. Anna Grassellino, Dr. Kensei Umemo...

High gradient

Room 112

Beyond Bulk Niobium

- For future accelerators key challenges will be
  - high beam current (favors low frequencies)
  - high accelerating voltage (LINACS)
  - high cryogenic consumption (Circular machines)

- Nb/Cu and new materials may open the possibilities of
  - operation at 4.5 K (smaller cryo plant)
  - lower production cost (raw material, magnetic shielding)
  - higher accelerating gradient

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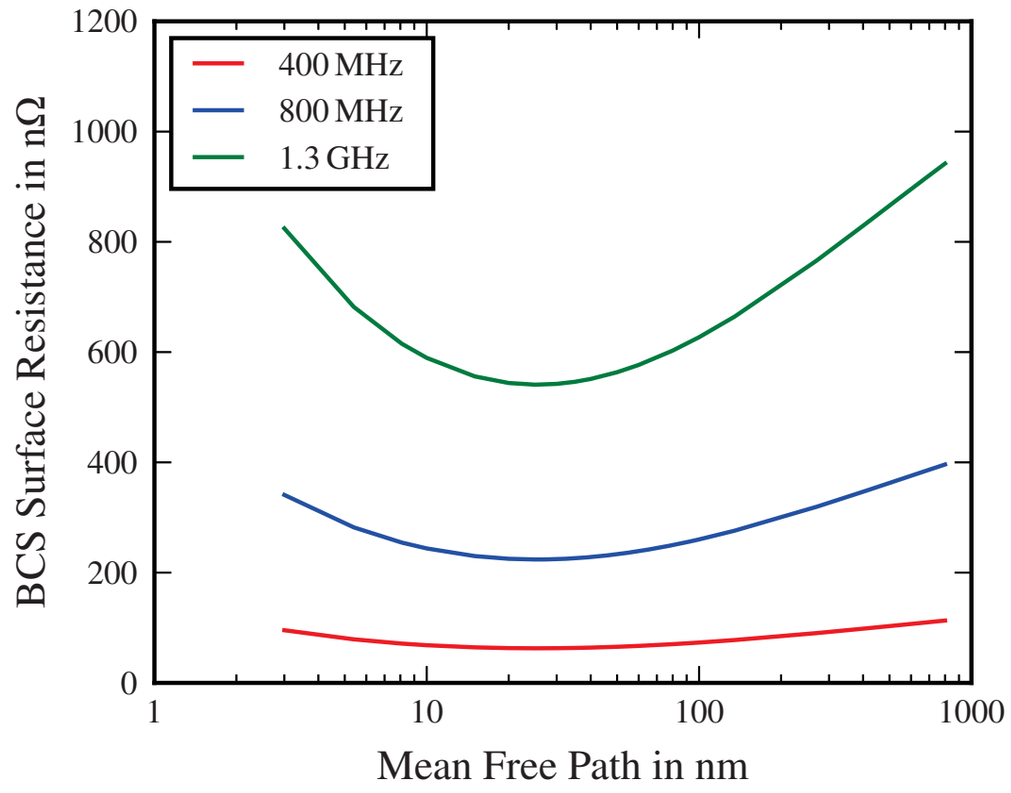
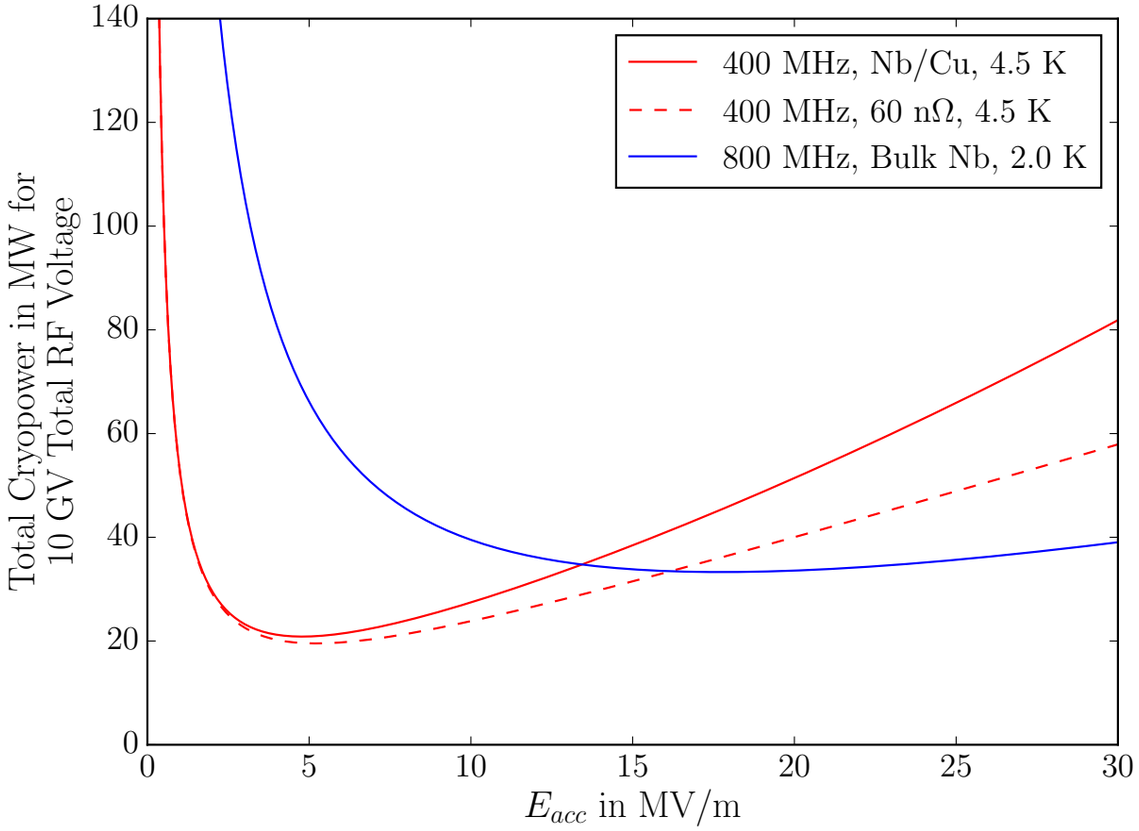
Advantages of a Copper Substrate

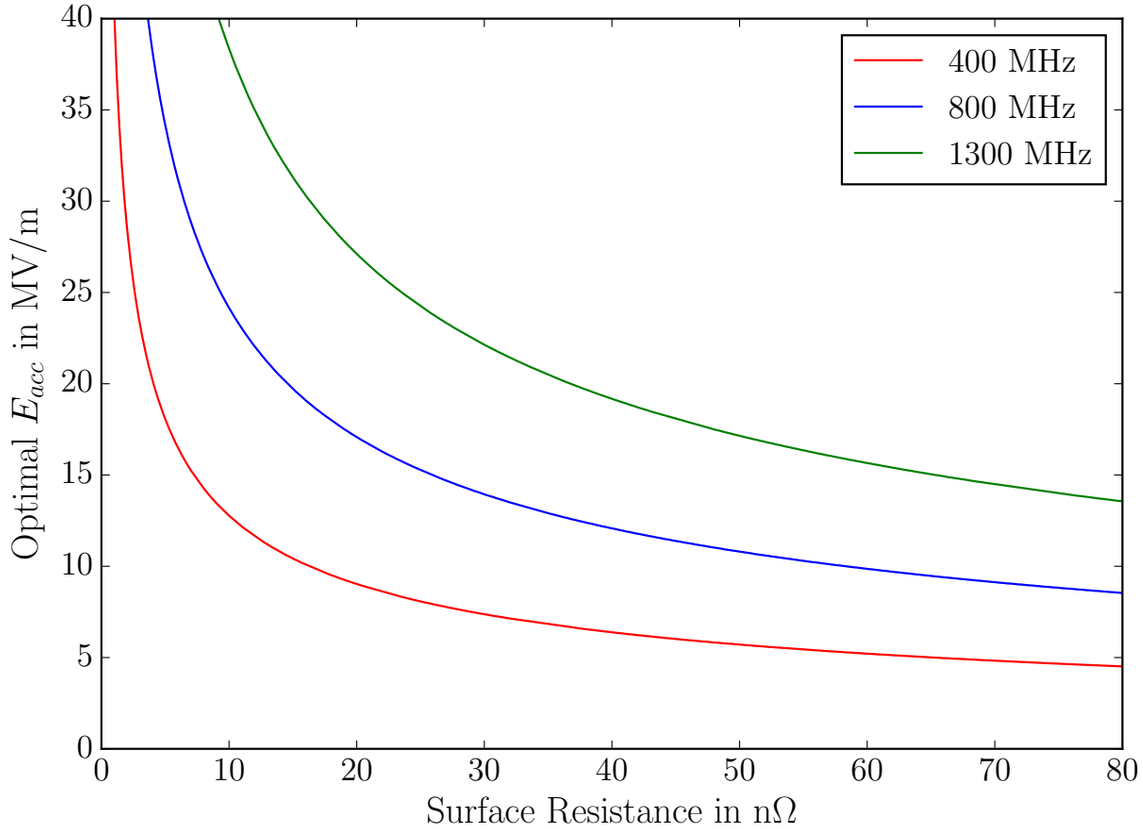
- High thermal conductivity allows
  - ensures thermal stability even in Helium-I
  - low RRR of the superconducting film
  - thicker cavity walls (reducing microphonics)



Cryogenic Losses

- Required cryo power (per dissipated W) is about 3.4 times less at 4.5 K compared to 2 K operation.
- A reduced Nb/Cu Q-slope can already compete with bulk Nb.





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Open Questions

- Which coating parameters have the biggest influence on the RF performance?
- Do all films have low trapped flux sensitivity? What about Nb3Sn?
- Is a thin film coating on normal conducting substrate potentially dangerous for machine operation? what if a field emitter blows up a crater and exposes normal conducting area underneath?
- (When) will we get a Q-slope free cavity/what will it take? Is there a unique cause for slope in films or many causes of different nature, varying form cavity to cavity?

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