High Gradient, Normal Conducting Accelerator Structures

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Where we are.

- Tremendous amount of progress in recent times.
- A lot of ‘water under the bridge’.
- Congratulations to the Team.
- Recent appreciation of role of pulsed heating in normal conducting, high gradient tests.
- Probably has always been a factor, even in high gradient S-band tests.
- Need to reinvent the structures to eliminate enhancement of pulsed heating or reduce the enhancement to acceptable levels.
- Keep an open mind as designs evolve.
Damping and Detuning

• Coupler pulsed heating problem can and will be solved.
• Detuning is a wakefield reduction ‘for free’, must use it.
• Damping slots/manifolds may be a problem.
• Need to consider other alternatives:
  – Cylindrical Symmetric HOM couplers, i.e.
  – “Choke Mode” type damping couplers
Standing or Traveling Wave?

• Need to explore both options.
• Standing Wave
  – Peak Gradient = loaded gradient
  – 50% more couplers
  – Use about three choke mode dampers/structure
• Traveling Wave
  – Peak Gradient > loaded gradient
  – Use classic slots to waveguide,
  – Or use choke mode dampers where needed.
SLAC- 40 years old this year

- SLAC began life at around 20 BeV
- Gradient around 7 MV/m
- Overhead in gradient (up to 20 MV/m) has given long life to the facility.
- The future linear collider will need a long life also.
- The pressure is on the structure to support even higher gradients.
- The Skrinsky Challenge: 100 MV/m Loaded
Is a loaded gradient of 100 MV/m possible?

- **Pulsed heating in normal cylindrical cell.**
- **Maximum RF pulse heating temperature vs. cell iris size**
  - 11.424 GHz $\pi$ standing wave structure
  - 100 MV/m loaded gradient
  - 400 ns pulse width
- **Traveling wave pulsed heating is higher by about a factor of two.**
- **Is this too much??**
Processing SW565 standing wave structures, 19-21 June 2002, Pulsed heating estimate for Input coupler iris.

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