

# U.S. Workshop on High Gradient Research for Multi-TeV Linear Colliders

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# Motivation

- The ILC will reach  $\frac{1}{2}$  to 1 TeV cm energy.
- Advanced Accelerator research looking far beyond this, exploring laser and plasma acceleration
- Multi-TeV energy appears to be reachable with extension of normal conducting high gradient technology.
- The CLIC Two-Beam approach offers a power source which is not so frequency specific—from 11-30 GHz at least.
- After extensive development, NLC achieved reliable 65 MV/m for collider-ready structures (achieved much higher gradients in selected tests!).
- Multi-TeV colliders need higher gradient—CERN specifications have been 150 MV/m loaded.
- This collaboration should aspire to build the bridge to span this gap.

# Charge

- The US collaboration should:
  - Leverage past and ongoing research efforts towards high gradient acceleration and high power generation in order to develop the highest practical acceleration gradient and to establish a working accelerator frequency for a multi-TeV linear collider.
  - Collaborate with CERN and our other non US colleagues to leverage two beam accelerator development.
- Approach—understand the science:
  - Perform controlled experiments to address the key aspects of accelerator structures which affect the achievable gradient.
  - Develop an understanding of all the issues.
  - Use this information to design and then test high gradient structures.

# Process

- Bring the US community working on these issues together
  - Leverage substantial infrastructure
  - Scientists
  - Facilities
- Take stock of what we know regarding gradient limitations
- Form a Collaboration to address the questions.
- Collaborate with CERN to couple to two-beam power source development for the long term.

# What would success look like?

- In 2009-2011
  - Several accelerator structures operating at low breakdown rate.
  - Pulse lengths, wake fields compatible with LC application
  - Gradient substantially higher than the NLC baseline
    - Let's say well above 100 MV/m.
    - Perhaps up to 200 MV/m.
  - Frequency accessible for two-beam power source
    - Probably  $11.4 \text{ GHz} \leq \text{frf} \leq 30 \text{ GHz}$ .

# This Workshop

- Today we are examining what we know, and what the attendees have to offer to address this problem.
- We need to develop a common understanding of where we are going.
- We need to begin to organize ourselves to address how we will get there.

# Workshop overview

- Begin with experience at SLAC and CERN
- Full schedule hearing about work around the US from participants
  - We have allowed time for questions
  - Very full schedule, please watch your time.
- Conclude with discussion of organization, collaboration governance and future meetings

# Workshop Misc.

- Please examine the schedule for minor changes
- Please sign up for meal tonight prior to lunch.
  - Hunan Garden Restaurant, 7 pm
  - ~\$25 + drinks
- Chris Nantista is acting as Scientific Sec. for the workshop.
  - Please get a soft copy of your talk and additional material to him.
- Joan Valine is the workshop admin.
  - She will be here at breaks—926-2068