Advanced Accelerator Concepts Workshop
June 23-28, 2002
Mandalay Beach Resort, CA

MILLIMETER-WAVE RF SOURCES FOR A FUTURE COLLIDER

A vision statement to guide the working group

The motivation for development of mm-wave rf sources for a future normal conducting collider arises from the anticipated scaling (in rough proportion to frequency) of the dark current limit for the maximum accelerating gradient that can be sustained by a copper accelerating structure. Thus NLC at 11.4 GHz is expected to operate with a gradient roughly four times that of SLC, while another factor-of-three or higher might be possible by operating at 30 GHz or above. The maximum gradient will be further constrained by rf breakdown and surface fatigue due to pulsed heating. In any case, experimental tests of accelerating gradient under a variety of conditions must be carried out before the absolute limits will be known. In this working group, new millimeter-wave rf sources will be described and examined for their potential long-term suitability as rf drivers for a future collider; and for their short-term suitability in high-power testing of rf components, accelerator structures, and rf pulse compressors. Parameters to be considered for a candidate mm-wave rf amplifier include peak output power, pulse width, average power, gain, frequency stability, efficiency, bandwidth, and ability to operate into a highly-reflecting resonant load without excitation of spurious modes. Few suitable high-power mm-wave rf components exist, so their development must go hand-in-hand with that of the sources, to allow evaluation of the sources and of their utility in driving accelerator structures. Likewise, rf pulse compressors must also be developed to generate the high-peak-power short rf pulses needed to excite the accelerator structures. Efforts to develop mm-wave sources should be carried out in light of recent experimental results for rf breakdown and accelerating gradient limits. Invited and contributed talks should respond to this vision, and round-table discussions will be organized to air all points-of-view on this challenging range of topics.

Topics that are appropriate for presentation and discussion in this working group include:

1. RF breakdown and surface fatigue limits to accelerating gradient in copper structures.
2. Millimeter-wave rf source concepts, designs, and experimental test results.
3. Millimeter-wave rf components with application to accelerator R&D.
4. Millimeter-wave rf pulse compressors, with application to accelerator R&D.
5. Millimeter-wave accelerator structures.

Queries and comments can be directed to the working group organizer:

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