A detailed review of normal conducting linac cooling design was completed by M. Ross and a set of recommendations were tendered for implementation. In addition an overall review of drawing status and content was completed and a review of summary design text documents was completed.

Japanese and representative California site descriptions and status were described and discussed as well as next year's plans for further development of the LC conventional facilities.

Summary of the 7th MAC Meeting

Nobu Toge, KEK

The 7th NLC Machine Advisory Committee (MAC) meeting was held from June 23rd through 25th, the week after the ISG-X/NLC collaboration meeting. Twelve MAC members, led by the chairperson Satoshi Ozaki, participated in this review – D. Boussard, J.-D. Delahaye, J. Delayen, J. Galayda, D. Hartill, G. Kugler, K. Oide, S. Peggs, J. Strait, N. Toge and F. Willeke. In his opening remarks, Jonathan Dorfan, the SLAC director, reviewed the national and international activities related to linear collider development. Dorfan introduced the US efforts in examining both the warm (normal conducting) and cold (super conducting) technologies for the main linacs on the basis of comparable performance parameters. He also commented on the formation of the "Wise Persons' Committee" under ILCSC of ICFA, and the perceived timetable (summer, 2004) for an international decision on the technology base for the main linacs of the linear collider to be built by a global collaboration. Then, following Dorfan's remarks and David Burke's project overview, some twenty reports detailing ongoing research were presented, together with a tour of the NLCTA site.

The MAC-7 meeting spent most of its time continuing the discussions that took place at MAC-6 in November 2002, when a major redirection of the R&D efforts, a switch from DLDS to SLED-II, for the main linac microwave technology, was reported.

The Committee noted the steady progress being made toward acceptable NLC accelerator structures, both in the areas of high-gradient testing at SLAC as well as the manufacturing efforts that are intensifying at FNAL and KEK-SLAC. The Committee witnessed the vigorous efforts that are under way for the final stage preparation and assembly of components for the demonstration experiment of SLED-II at NLCTA. The Committee welcomed the new developments in the area of accelerator physics and injector development, including continued efforts on the DR-to-IR (from the damping ring to the interaction region) simulation, the steadily improving design of damping rings, simulation studies of and possible remedies for the "electron cloud" issues, and formation of an international collaboration to support the recently approved E166 experiment to study the feasibility of producing polarized positrons. Many of the Committee members were fascinated by the studies of accelerator system availability, in which simulations were performed of the expected maintenance and recovery processes over a time span of several years, with various assumptions on the component MTBF and MTTR, together with specific tunnel layout and accessibility assumptions. This work is the effort of a task force appointed by the US Linear Collider Steering Group.

The Committee members expressed concern over certain aspects of the ongoing research program. The work to demonstrate high power, high repetition rate PPM klystrons is falling behind due either to problems with the stable operation of waveguide and load systems in the setup (KEK-Toshiba klystron) or discharges suspected at one of the weld joints (NLC klystron). The highly "success-oriented" scheduling of the SLED-II demonstration, in the face of "hardware reality," has resulted in an apparent schedule delay of several months or more, when compared with the original projection that was presented at MAC-6. This is despite the outstanding efforts done by the manufacturing and installation crews. While the IGBT-based klystron modulator used for SLED-II testing can support operation at a repetition rate of 30 Hz, some issues remain in the area of high repetition rate operation with an improved efficiency as future homework. In addition, some members of the NLC group are being "drafted" on a part-time, temporary basis for strengthening both short- and long-term efforts in improving the performance of PEP-II, the present physics work-horse of SLAC.

Many Committee members noted, however, that none of these issues should be fundamental stumbling blocks in the sense that careful coordination and continuing sustained effort should be able to overcome them. Overall, the Committee-felt that there is a good chance that the critical R1 items, the high gradient operation of accelerator structures and the demonstration of high RF power with SLED-II will be accomplished within 2003 or by early 2004. The final report of the Committee is currently in editorial review.

Research Progress Note:

The 75-MW XP3-3 klystron was run on July 17 at 75 MW peak power out with 1.6 µs pulses and a repetition rate of 120 Hz, demonstrating that the gun, output circuit, windows and magnet of a PPM klystron can handle comfortably the performance required for NLC/GLC. At 80 MW power out, at 60 and 120 Hz, the tube also ran stably, although these runs were very short.

PAC03 Publications continued

"Cost Based Failure Modes and Effects Analysis (FMEA) for Systems of Accelerator Magnets," C.M. Spencer SLAC, S.J. Rhee Stanford University http://warrior.lbl.gov:7778/PAC_PUBLIC view_pac.display_abstract?this_id=3327, SLAC-PUB-9913

"Further Experience with the SLC Permanent Magnetic (PM) Multipoles,"J. Spencer SLAC, S. Mao, C.M. Spencer SLAChttp://warrior.lbl.gov:7778 PAC_PUBLICview_pac.display_abstract?this_id=5096.

"Permanent Magnets for Radiation Damage Studies," J. Spencer SLAC, J.T. Volk FNAL http:/warrior.lbl.gov:7778/PAC_PUBLIC/view_pac.display_abstract?this_id=5089

Calendar of Upcoming Events Conferences and Workshops of Interest

Lepton/Photon 2003, August 11-16, 2003, Fermi National Accelerator Laboratory, Batavia, Illinois, http://conferences.fnal.gov/lp2003/.

30th Advanced ICFA Beam Dynamics Workshop on High Luminsoity e+e- Collisions, October 13-16, 2003, Stanford, CA. http://www-conf.slac.stanford.edu/icfa03/

IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC 2003) October 19-24, 2003, Portland, Oregon, USA. http://www.nss-mic.org/.

International Conference on Linear Colliders (LCWS), 19-24 April 2004, Paris, France.

11th Advanced Accelerator Concepts Workshop (AAC 2004), 20-25 June 2004, Stony Brook, New York.

NLC News

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Director's Corner

David L. Burke

June was a busy month at SLAC with a combined ISG and NLC collaboration meeting at the Lab, where we learned that the regional Asian community has adopted Global Linear Collider (GLC) for the X-band machine, to acknowledge their commitment to an international project. The collaboration meeting was followed immediately by the NLC Machine Advisory Committee (MAC) meeting. This issue of the News contains several reports on these active working meetings.

Collaboration between Japanese and US scientists and engineers on the design and development of technology for the X-band collider continues to become more integrated and focused. The NLC and GLC groups have converged on a common X-band design over the past year, and combining the ISG-X (read "ISG-10") and NLC Collaboration meetings proved very successful. The technology R&D is being carried out jointly at the ATF at KEK and the NLCTA at SLAC with hardware and personnel from all participating laboratories. The combined meeting was an important opportunity to go over the latest designs and experimental results and to plan future work. Accelerator structures from KEK, Fermilab, SLAC, and CERN are being installed and tested at the NLCTA, klystrons from KEK and SLAC are being jointly tested, and new rf distribution components are being designed, fabricated, and tested on both sides of the Pacific. Work over the past year at the ATF has established emittances in the damping ring better than the X-band design needs, and new initiatives are underway to develop beam position monitors able to resolve beam motions as small as a nanometer. Such devices would be extremely useful in R&D on ground motion and component stabilization.

We met with the MAC for seventh time since its inception three years ago. These meetings have become very important and useful dialogs with this committee of experts, and the NLC Collaboration takes these opportunities very seriously. Issues this time around were largely continuations of those discussed at the last meeting in November, and the MAC broadly endorsed the plans and priorities of the Collaboration. The MAC noted and heartily approved the tighter alignment of the NLC and GLC efforts, and strongly supported the direction of effort by the Collaboration to the activities of the US and International Linear Collider Steering Groups. The X-band technology R&D is reaching a critical phase and the Committee reinforced the importance of successful completion of the planned demonstrations of SLED-II rf power and X-band structure gradient. These are the key ingredients that will go into the warm-cold technology down-select that will be taken by the international HEP community later next year. As summarized by the MAC Chair, Satoshi Ozaki, "Keep going, and work hard to keep on schedule." Message received and understood.

Report on ISG-X and Collaboration Plenary Sessions[1]

Cherrill M. Spencer

If you had attended all the plenary sessions of the joint tenth **I**nternational Linear Collider **S**tudy **G**roup (ISG-X) and the US NLC Collaboration meeting, you would have heard that the ACFA had decided to change the name JLC to GLC; that the H60VG3N-6C is the best H structure so far; that we need to focus on the R1 goals of the TRC, because if we don't meet these goals, the USLCSG will not be impressed; that the SLED lines are installed near the NLCTA; that in the distant future we will switch to XP4s but in the meantime when will we see decisive positive results on the PPMs; and that the best BBA process in the world won't yield an available linear collider if its components' MTBFs are too short. I'm sure a social scientist could tell us what a proliferation of acronyms means about the status of a project, and we have surely arrived there. An NLC/GLC glossary is called for, or else the accelerating structures won't be the only things having a spitfest!

The SLAC-KEK ISG was formed in 1998, based on a Memorandum of Understanding between SLAC and KEK on the development of a linear collider that utilizes room-temperature rf technologies for the main linacs. It was pleasing to hear, from SLAC's Director, Jonathan Dorfan, in his welcoming remarks, that the current KEK Director Dr. Yoji Totsuka had visited SLAC for the very first time just two weeks previously and affirmed the various joint ongoing projects between KEK and SLAC. Dorfan explained how the *International* Linear Collider Steering Committee (ILCSC), chaired by Maury Tigner, Cornell, was steering us towards an international organization charged with constructing a linear collider, but that the accelerating technology had first to be chosen. Dorfan expects that this choice between a superconducting or a room temperature accelerating structure will be made by a yet-to-be-convened "wise persons'" committee sometime in late 2004. Particle physicists from all over the world are already speaking to their respective government agencies about their need for a 1-TeV linear collider; informal discussions amongst these agencies need to start soon. The particle physics community is showing its support for a new linear collider through adding their signatures to a web-based document that currently has about 1200 signatures. The **US LC S**teering **G**roup (USLCSG), chaired by Dorfan, decided a few months ago that the US needed to look at a cold design that might be compared directly, on the basis of physics reach, to our warm design. A considerable effort is being expended by NLC collaborators on this cold LC design. Dorfan nevertheless indicated no additional resources would be available to us.

Nobu Toge, KEK assistant professor and spokesman for the GLC project, reported on linear collider activities in Asia, with an emphasis on what has happened since the last ISG meeting in December 2002. Improvements continue to be made to the KEK **A**ccelerator **T**est **F**acility (ATF), a new rf gun with multibunch capacity was installed last December, plus some new BPMs and improved laser wire monitors in the ATF damping rings are yielding better beam emittances. Toge explained that KEK had long-term plans to extend the ATF to include a short X-band linac that would be a test facility for X-band structures, such that KEK would build up expertise in X-band linac systems. Toge reported that the LC Globalization Committee, established by then DG Sugawara in September 2001 to examine how to realize a Japanese LC through a global-scale international collaboration, has issued its final report which can be found at http://lcdev.kek.jp/GLCC/. They examined the relations of an LC-lab (GLCC) with KEK, national and local governments, overseas labs, and agencies overseas. They decided an international LC needed the creation of a new international laboratory, whose governance would be based on treaties, rather like CERN's governing structure. What steps need to be taken now in order to arrive at such a new lab will be a topic of discussion for the next meeting of the ILCSC (at FNAL in August).

Footnote[1] The goals for this joint meeting of the International Study Groups collaboration between SLAC and KEK and the US NLC Collaboration, as well as the transparencies from many of the presentations, can be found on the web at http://www-project.slac.stanford.edu/lc/ilc/ISG_Meetings/ISG10/nlcisg10.htm

In the meantime, in order to inform the Asian physics and industrial community about the status of efforts towards realization of the GLC project, a LC Project Roadmap Rolloutwas held in Tsukuba in February 2003 with 315 participants (45 from overseas, 79 from industry), organized by the **A**sian **C**ommittee on **F**uture Accelerators, the Japanese HEP Committee and KEK. The resulting "Roadmap Report" can be viewed at http://lcdev.kek.jp/ProjReport/. The report contains a section on Conventional Facilities and site studies. Nine candidate sites have been identified, spread throughout the Japanese islands; each has geology adequate to provide sufficiently low ground motion. Toge explained that discussions with Japanese industry about the (newly renamed) Global Linear Collider (GLC) are being intensified, while discussions with Japanese funding agencies are just beginning. He concluded by saying he and his Asian colleagues are *most* interested in how their colleagues in North America and the European Union are pursuing their versions of LC proposals, and what sort of similarities / differences of opinions / situations / problems exist compared to theirs.

Gerry Dugan, from the Laboratory for Elementary Particle Physics at Cornell University presented a report on the activities of the various task forces set up in January 2003 by the USLCSG. The Accelerator Subcommittee of the USLCSG has been charged by the USLCSG Executive Committee with the preparation of options for the siting of an international linear collider in the US. The Accelerator Subcommittee decided that they would respond to the LC requirements as specified by the Physics/Detector Subcommittee by producing two different design options, a warm option, based on the design of the NLC Collaboration, and a cold option, similar to the TESLA design at DESY, but with the NLC energy reach desired by the HEP community. Both options would be developed in concert, using, as much as possible, similar approaches in technical design for similar accelerator systems, and a common approach to cost and schedule estimation methodology, and to risk/reliability assessments. To carry out the charge, the Accelerator Subcommittee has formed four task forces: (a) Accelerator physics and technology design, (b) Cost and schedule, (c) Civil construction and siting, and (d) Availability design. A fifth will be formed to provide risk assessment. They are all following guidelines to make the comparison between warm and cold machines simpler and more straightforward. The biggest difference between the cold option and the NLC2003 configuration is the former's use of an undulator-based positron source. The US cold option differs quite a lot from the TESLA design, including the use of 28 MV/m gradient structures and with two tunnels long enough to accommodate sufficient main linac elements to reach 1 TeV or above. The task forces are comprised principally of NLC collaborators who have been working on the details of these options since February. As their final reports are not due until September, we will not report any further details here from Dugan's brief descriptions. A progress report on the Availability Task Force was given by Tom Himel in another ISG-X plenary session and is described below.

Steffen Döbert of SLAC gave an overview talk on the status of the ongoing R&D into high gradient accelerating structures, this R&D work is being carried out by 37 people at SLAC, FNAL and KEK. To design, build and demonstrate a 65 MV/m gradient working with a breakdown rate below a certain threshold in an X-band accelerating structure is one of the two "R1" demonstrations that must be made to prove the technical feasibility of an x-band LC. We have not yet tested a structure that meets our full set of criteria; modifications are being made to the copper cells that comprise the main linac structures and to the way they are fabricated and processed in the effort to find a structure that works consistently at 65 MV/m. Since the last ISG meeting, seven different styles of structures made at SLAC and FNAL have been tested at the NLCTA. All of them have suffered from some level of breakdown, which means the gradient cannot be maintained and these breakdowns sometimes cause physical damage to the copper disks. When a cluster of breakdowns occur in one small area in a short space of time,we call it a "spitfest." Many experiments have been carried out to ascertain why the breakdowns tend to occur near the "front" of the long waveguide structures, and what values of certain parameters such as power input, maximum surface field, velocity of traveling wave, density and heat capacity of copper, lead to the existence of breakdowns. As Döbert reported, some "great results have been achieved, but they are not yet good enough." Additional structure variations will be tried out in the next few months, including a standing wave design and some with molybdenum or tungsten cell irises designed and built by CERN. Since Döbert's report, excellent results have been obtained on the third Fermilab prototype structure.

Dave Schultz of SLAC gave an overview talk on the status of the other "R1" demonstration required to prove the feasibility of a 1-TeV X-band linear collider: to prove we can generate and distribute the necessary amount of rf power to the accelerating structures. This project is called the "8 pack" project and apparatus is being designed and fabricated for a multimoded SLED II pulse compression system that can produce an rf pulse of 475 MW over 400 nanoseconds. We are using four 50 MW XL4 klystrons and a solid state modulator, which are ready, SLED tube lines, which are in place, and high-power rf system components which are at various stages of readiness. Of the critical items: the combiner, the cross potent, and splitter have been fabricated, the subassemblies brazed and cold tested, and are in the final brazing cycle. The couplers are completed. The SLED pump tees are nearing completion and the load trees are being assembled. Cold testing of the fully assembled rf system is planned for July and August with the goal of reaching the 475-MW pulse milestone in September 2003. The 8-Pack Project has a second phase, in which it addresses one of the "R2" requirements for an X-band LC. It is a 'A Linac subunit test.' The 8-Pack Phase-2 goal is to use the SLED II system for a full power demonstration of an rf feed to 4.8 meters of high gradient structures on the NLCTA beamline. We will install eight 60-cm-long high-gradient rf structures, then we will transmit the high power from the SLED II system to the beamline. We will split the high power to the high gradient rf structures and gain experience with an X-band LC RF feed at full power and full repetition rate. The exact layout of the SLED II waveguides feeding into the eight linac structures was a topic of discussion in the later 8-pack working group.

The Thursday afternoon plenary session, led by Nobu Toge, was an open discussion of the NLC-KEK collaboration plans for the next 9 months. Bearing in mind that the international technology selection process is expected to occur in 2004, the group affirmed that its priority lies with completing the R1 demonstrations, but that the R2 tasks need to be initiated and progress made on them as best as possible within the limits of our available resources.

The last plenary I will describe is the progress report by Tom Himel of SLAC on the work of the Availability Task Force mentioned above. The ultimate purpose of this task force's work is to create an availability budget for the major systems of a linear collider such that the complete accelerator meets a specified availability (which is a measure of actual uptime compared to a goal uptime) which is expected to be around 85%. The availability of a system with multiple components is the product of the components' availabilities , each of which is defined as Mean Time Between Failures [MTBF]/ (MTBF + Mean Time To Repair [MTTR]). If the components' MTBFs are too short or their MTTRs are too long, then the system availability will not reach its required value. This Task Force is attempting to simulate an accelerator's operation with a computer program that follows the behavior of tens of thousands of components, each category of which, such as, magnets, power supplies, pumps, klystrons and BPMs are represented by an MTBF and MTTR that have been determined empirically from existing accelerators' experience (such as SLC). Establishing empirical MTBF values is an enormous task itself, and this modeling project will identify those components whose MTBFs are having the most detrimental effect on the overall availability. This information will be sent to the design engineers with instructions to improve the MTBF or MTTR by a certain amount.

The simulation program reads an EXCEL spreadsheet with data on component counts and their MTBFs and MTTRs in the different regions of the accelerator (electron main linac, positron damping ring etc), it assumes that if all components are working a certain amount of luminosity at a certain center of mass energy is being produced. Another set of input data shows the effect of each component when it breaks: either the luminosity is diminished, or the beam energy is reduced, or nothing bad results. The average MTBF for N identical components is MTBF of one/ number of the component. The program models 5 years running of the accelerator and it calculates when a component will break by throwing a random number with an exponential distribution with the above average MTBF. It goes through all the components and keeps track of when the next magnet for example, is going to break; when that time comes, the effect of the breakage is imposed on the luminosity or energy. If that parameter is too far degraded, then the accelerator is declared to be down and the program simulates it being repaired using the provided MTTR and a restricted number of repair people. A realistic "good beam" recovery period is added to the repair time and then the beams are considered to be colliding again until the next component fails. The program has other "niceties" that model how a real accelerator runs and it assumes a 3-month-long shutdown every year for maintenance and postponed repairs. The modeling program is still being developed, and MTBFs and MTTRs are still being established. When it is ready, the Availability Task Force will use it to model the cold and warm LC machines specified by the USLCSG to find out if there is a large difference in their overall availabilities if we assume existing components' MTBFs, and how much more reliable the "worst" components would have to be. They will then estimate (with input from other task forces) how much it might cost to engineer the necessary improvements in the culpable MTBFs. All this information will assist the process of choosing the technology of the next linear collider.

NLC Collaboration Meeting: Structures Working Group Summary

Harry Carter

During the week-long ISG-X/NLC Collaboration meeting, Working Group 3, "Structures", was led by co-conveners Harry Carter (FNAL), Toshi Higo (KEK), and Juwen Wang (SLAC). The goals set for the group were: (1) Review of progress and experiences in design and fabrication, (2) Review of high gradient tests, (3) Plan and schedule toward meeting the TRC R1 demonstration requirements, (4) Plan and schedule toward meeting the TRC R2 demonstration requirements, and (5) Prepare for the international technology selection process for the X-Band collider.

After the opening plenary session, a joint session was held with the Rf Power Working Group (WG1) in which presentations were given and discussions held on the topics of power distribution, breakdown studies, and high power testing. The configuration for Phase II of the 8-Pack Project was discussed as well as staging options that might be considered iin order to maintain flexibility for testing of structures in NLCTA during the Phase II power distribution installation work in the NLCTA enclosure. Several issues remain to be resolved before a final configuration will be determined.

A joint session was held with the Accelerator Design Group in which presentations on the subjects of structure parameter optimization, fabrication tolerances, wakefield calculation, and structure fabrication at FNAL and KEK were given. During subsequent discussions of these topics, several important decisions were made: (1) In order to assure sufficient "overhead" between the nominal highest, damage resulting from breakdowns is more severe and is evidenced by a phase shift in the damaged area of the structure. The combination of lowered gradient and a reduced breakdown rate in the front end of the new design should result in little or no damage in this area. (2) KEK agreed to immediately produce cells for two structures of the new design, with a projected delivery date to SLAC for final assembly in September 2003. (3) Since they had already ordered cells for four FXC (H60VG3S18) structures, Fermilab will complete these structures before switching to the new design. Both the FXC and the SLAC/KEK structures will satisfy the TRC R1 requirements and will be used in Phase II of the 8-Pack Project.

In all, the participants felt that the sessions were very useful and that the important decisions that were made with respect to the next structure design will place us in the best possible position to meet the TRC R1 and ultimately R2 requirements prior to the linear collider technology decision in June 2004.

Accelerator Design Subgroup on Interaction Regions

Thomas W. Markiewicz

The Interaction Region (IR) subgroup of the Accelerator Design working group met for one three-hour session. Andrei Seryi and Fulvia Pilat presented talks on beam delivery optics to IR2 and the lattice for the US Cold LC, respectively. H. Yamaoka spoke about the final doublet vibration suppression R&D program at KEK while Josef Frisch and Eric Doyle updated the status of the inertial-sensor-based vibration suppression program at SLAC.

The second IR has always received less attention than the primary IR and luminosity at maximum design energy more attention than off-energy performance. Given the USLCSG's recent scope requirements of energy flexibility and two high-energy IRs, it was time to remedy this inequity. Andrei presented a detailed design of the transport system, collimation and final focus (FF) to IR2. While the design is still being improved, careful attention to the bending lattice and to the direction of bends in the FF result in luminosity at IR2 at 650 GeV c.m. that is only 10% less than that in IR1; at 1.3 TeV, this number modestly increases to a 25% deficit. Luminosity at the Z is only 30% less than the predicted geometric (1/E scaled) luminosity for Phase I (500 GeV nominal) running, independent of IR; once the beam delivery system is reconfigured for Phase II (1 TeV nominal) running, this loss increases to 60% or 80%, for IR1 and IR2, respectively.

The beam delivery optics of the US Cold LC design are identical to that of the NLC, with the addition of a matching section and a fast beam abort system. Fulvia reported on her and Brett Parker's studies to document its performance for the US LC cold parameter set.

The KEK group has long held that bridging the IP with a thin-walled (1 cm) carbon fiber support tube (of 80-cm diameter in the current design) and locking the final doublet magnets together would be the best approach to minimizing relative jitter between them. Yamaoka-san explained how measurement and simulation of simple mechanical models of independently supported and vibrated cantilevered beams, joined or not by thin plates, have evolved into a study of a 1/10-scale model of a cylindrical aluminum support tube. Finite element analysis of frequencies and amplitudes are supported by geophone measurements. Currently half the length has been built; plans call for the second half and the bridging carbon fiber middle section to be constructed in the near future.

Josef Frisch described the history of the inertial-sensor-based vibration program at SLAC, that began with tests of a single 30-cm aluminum cube equipped with commercial vibration sensors, and has developed to a full-scale mechanical prototype of a cantilevered support beam holding a girder with the same mechanical properties as a permanent magnet. Two prototype inertial sensors have been constructed that are compact in size and nonmagnetic, with much better noise versus frequency characteristics than the commercial sensors. While these are being tested against the industry standard, the bulky, magnetic Struckheisen STS-II, the large mechanical prototype is being equipped with the commercial sensors and algorithms are being developed to handle its extra internal degrees of freedom. Eric Doyle went into detail over the design and development of the sensor itself, concentrating on the improvements desired for the next iteration. Approximately ten of these devices will be manufactured and installed on the prototype by the end of the calendar year.

ISG-10 Conventional Facilities Activity Summary

Clay Corvin

Conventional facilities contributors for both normal and super conducting linear colliders met during theISG-X/Collaboration meeting, held from July 17 to 20th, 2003. The primary organizers were A. Enomoto, C. Corvin and V. Kuchler.

Considerable progress had been made on evaluating ground motion and vibration since ISG-9 so not surprisingly these topics were discussed in some detail. Contributors included T. Tauchi, T. Matsuda, A. Seryi, F. Asiri and F. LePimpec as well as several others.