

APAC

apace -

first Asian Particle Accelerator Conference

quality. They consist of a large number of accelerator units, each unit being a combination of RF power sources (klystrons), a power distribution system and accelerating structures.

A series of prototype tests and the latest simulation study indicate good prospects for a rapid payoff in powerful klystrons. New schemes have been developed for efficient RF power distribution. High-precision machining and fabrication techniques for the accelerating structure have been considerably improved in recent years. Prototypes can sustain a high enough acceleration field and, at the same time, minimize adverse effects of wake fields from beam bunches. Improved versions will soon be tested with beam. All these developments in main-linac technology have the mass-production phase in mind.

In addition to these activities in Japan, collaboration with overseas laboratories is one of the pillars of

KEK research. This includes the US/Japan collaboration programme in particle and nuclear physics experiments, as well as the development of accelerator technologies, the UK/Japan programme in neutron research, and collaborations in Europe represented by ATLAS/LHC and HERA.

With this ambitious and wide-ranging programme, KEK is a major player in world physics, with facilities in Japan attracting many scientists from overseas, while Japanese specialists have major roles in important projects, particularly in the US and in Europe.

The Japan Hadron Facility (JHF) project. The tunnels for the 200 MeV linac and 50 GeV main ring are to be excavated respectively near the existing 12 GeV tunnel and inside the KEKB tunnel while the 3 GeV booster ring is to be built in the present 12 GeV PS tunnel. Other infrastructure of the 12 GeV PS is also fully utilized. The main ring will also supply a 50 GeV proton beam to the neutrino line under construction for the K2K experiment.

It was a milestone event in the history of Asian accelerator science when four hundred specialists from all over Asia assembled at the Japanese KEK laboratory in Tsukuba from 23 - 27 March for the First Asian Particle Accelerator Conference - APAC98.

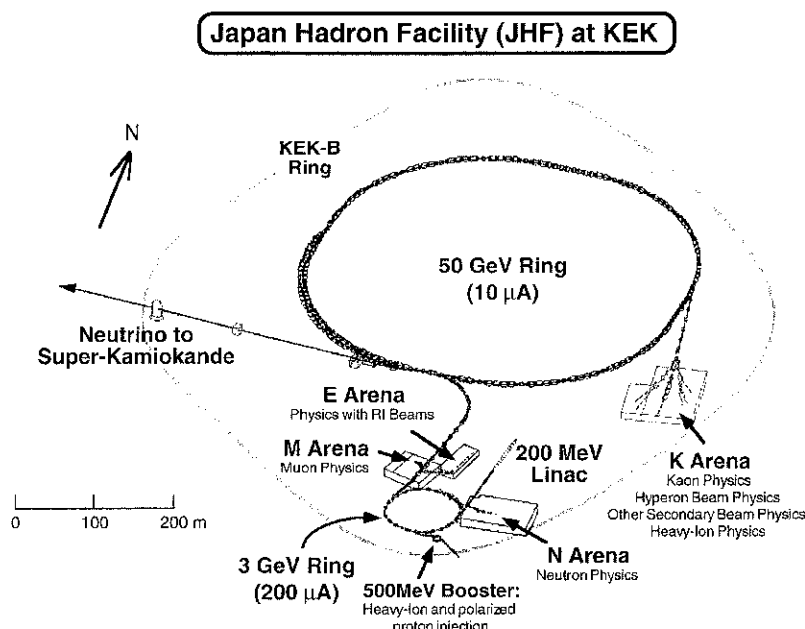
Although it was the first such conference, accelerator science and technology is not new in Asia. Low energy accelerators - high-voltage generators, electron linear accelerators and cyclotrons - have been quite common in many countries. However the profile of the Asian accelerator community has greatly changed since the 1980s, when synchrotron radiation achieved popularity.

Providing very bright sources from ultra-violet to x-rays, synchrotron radiation has attracted scientists in many fields - physics, chemistry, biology, and medicine. Many light sources have been constructed and more are still being planned in Asia.

Responding to this interest, the Asian Committee for Future Accelerators (ACFA) was formed in April 1996. Reflecting the rapid growth in accelerator-based science in Asia, ACFA's stated objective is to promote mutual understanding of activities, and to strengthen international collaboration among Asian countries.

The first meeting of ACFA was held in Pohang, Korea, home of the Pohang Light Source. At the meeting, ACFA decided to hold a regular Asian Particle Accelerator Conference (APAC), the first venue being Tsukuba.

In his APAC98 opening address, H. Sugawara, chairman of ACFA and Director-General of KEK, explained the motivation of ACFA and its role, and stressed the importance of close



Four hundred accelerator scientists from all over Asia participated in the first Asian Particle Accelerator Conference, held at the Japanese KEK laboratory.



Chitlada Settakorn from Thailand, currently studying at Stanford, reports on work on infrared radiation from sub-picosecond electron bunches.



collaboration among Asian countries in the field of accelerator science.

In individual country reports presented on the first day of the conference, representatives gave an overview on the activity in their respective nations. The speakers were Shuxian Fang (China), S. S. Kapoor (India), A. Djaloëis (Indonesia), M. Inoue (Japan), Won Namkung (Korea), Swee-Ping Chia (Malaysia), Richard Sah (Taiwan), Weerapong Pairuswan (Thailand) and Van-Do Nguyen (Vietnam). An invited talk from Novosibirsk was given by I. Chatounov in place of A. N. Skrinsky.

The area of high energy physics included the activities of the Beijing Electron-Positron Collider (BEPC) and the KEK B-factory. Shin-ichi Kurokawa, reporting on KEKB, impressed his audience by declaring "It is now in the final stage of construction and the commissioning starts this autumn."

Among the next generation high energy accelerator concepts, linear colliders are the most serious contenders, producing head-on collisions of energetic electron and positron beams supplied by very long linear accelerators. A linear

accelerator of the order of 20 kilometres is technically very challenging, and R&D has been pushed for many years at major world high energy accelerator laboratories. At the conference, status reports were presented by KEK, SLAC (Stanford), DESY (Hamburg), and BINP (Novosibirsk/Protvino).

Asian interest in high intensity proton accelerators has developed for various reasons - the production of high intensity neutrons for basic materials research as well as the development of advanced nuclear power technologies for nuclear waste transmutation and power production.

These objectives require proton accelerators with enormous beam power, more than ten times that of the most powerful accelerator in existence. At the conference, three proposals were presented; the Neutron Science Project (NSP) by the Japan Atomic Energy Research Institute (JAERI), the Japan Hadron Facility (JHF) by KEK, and the Korean Multipurpose Accelerator Complex (KOMAC) by Korean Atomic Energy Research Institute (KAERI).

All are multipurpose machines and are very challenging in terms of their

accelerator technology. C.K. Park of KAERI declared "The KOMAC is a nuclear green project." Both NSP and KOMAC designs incorporate a superconducting linear accelerator of energy around 1 GeV, a very novel technology. The technical innovation for these high-intensity accelerators attracts accelerator scientists and engineers.

Cyclotrons are the accelerators with longest history. Since the invention of the technique in 1931, innumerable cyclotrons have been constructed, first for nuclear physics, and more recently for medical applications.

A noticeable cyclotron advance is the construction of radioactive ion (RI) beam factories. Their beams of unstable nuclei are useful not only for nuclear physics but also for materials science and even for medical applications.

In Asia, two RI beam facilities are already operating - at the Institute of Modern Physics in China and at RIKEN in Japan. Welcome news at the meeting came from Y. Yano of RIKEN, who announced that a new

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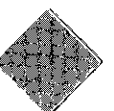
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At the conference banquet, V. Balakin from the Russian Budker Institute for Nuclear Physics, Protvino, hands a suitably-sized bottle of vodka to conference chairman Motohiro Kihara of KEK.



RIKEN RIB Factory had been approved by the funding agency. According to the plan, two ring cyclotrons will be constructed to boost the radioactive beam energy from the existing facility. When constructed, it will be the most powerful such factory in the world. As mentioned earlier, synchrotron radiation and free electron lasers are a major focus of attention. Many light sources exist in Asia: counting only user facilities, there are two in China, one in India, three in Japan, one in Korea, and one in Taiwan. The Siam Photon project in Thailand has

already been approved, and Hongjie Xu from the Shanghai Synchrotron Radiation Facility Project reported that they had completed their R&D programme and were awaiting final approval.

In view of their importance to the Asian accelerator community, low- or medium-energy accelerators and their applications figured prominently at APAC. One major application area is the medical sector, for cancer therapy and isotope production. Radiotherapy with electron linear accelerators has been widely used for many years. Recently, proton or heavy-ion therapy has been developed, and several such facilities constructed at Japanese hospitals. Plans for such facilities have also been drawn up in China, Korea and Taiwan.

Material microanalysis is another classic application. An interesting development is for environmental monitoring, where accelerator mass spectrometry has been widely applied for the detection of extremely small amounts of trace elements. Yuzeng Lin from the Tsinghua University of China reported on a

very compact electron linear accelerator with a very high microwave frequency, developed for baggage inspection at airports.

Besides the invited talks, the conference programme included 24 oral and 200 poster presentations. At KEK, participants were able to inspect the construction site of the B factory, the upgraded electron linear accelerator, the Accelerator Test Facility (ATF) for the development of linear collider technology, and the test stand for the JHF linear accelerator.

The conference was an exciting event for younger participants in particular, and was judged a major success.

On March 25, the third meeting of ACFA, held in parallel, elected Zhipeng Zheng of IHEP (China) and Won Namkung of POSTECH (Korea) as next chairman and vice-chairman, respectively. The second APAC is provisionally scheduled to be in China in 2001. The conference closed with an address by the ACFA chairman-designate and a symbolic handshake between the present chairman and his successor.



The chairman's baton of the Asian Committee for Future Accelerators (ACFA) was handed from Hirotaka Sugawara (left) of KEK, Japan, to Zhipeng Zheng of IHEP, China.