The 7th International Superconductivity Industry Summit
Grand Challenges for the 21st Century

Official Communique

International Industry Summit Hails Progress in Superconductivity

Large-scale product opportunities for 21st Century Identified for Electronic and Electrical Industries

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The 7th International Superconductivity Industry Summit (ISIS-7) was held October 11-13, 1998 in Washington, D.C. The meeting was attended by delegates from the United States, Japan and Europe representing the industry groups CSAC[1] (USA), which hosted the summit, CONECTUS[2] (Europe) and ISTEC[3] (Japan). Also in attendance were guests from the governments of the USA, Japan and Europe.

The focus of this Industry Summit was:

- Recognition and documentation of the achievements of the superconductor industry;
- Documentation of key, near-term developments in various market sectors; and
- Identification of the primary challenges to be overcome in order to rapidly grow the superconductor industry in the early part of the 21st century.

The delegates to ISIS-7 concluded:

- The superconductor industry has been built on a foundation of a need by high energy physics for large accelerator magnets. This led to the subsequent development of magnets for nuclear resonance spectroscopy (NMR) and magnetic resonance imaging (MRI´s). Together, MRI and NMR represent a worldwide market of approximately $2 billion.
- New technologies based on advances in low temperature superconductors (LTS), high temperature superconductors (HTS), and refrigeration 。・cryogenic systems have reached the stage of prototype demonstrations and new early products in:
- Health care
- Electric power
- Electronics and communications
- Process industries

High energy physics and material sciences.

These new technologies will have substantial payoffs in efficiency, productivity, wealth creation and the global environment.

Superconductor technology has achieved many of the technical performance goals identified a decade ago. Commercialization of HTS applications over the next several years will require further patient investment by industry, continuation of government R。D programs, and by a healthy global economy.

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[1]CSAC–Council on Superconductivity for American Competitiveness

[2]CONECTUS–Consortium Of European Companies Determined to Use Superconductivity

[3]ISTEC–International Superconductivity Technology Center

See Appendix for listing of members of ISIS–7 participating organizations.
October 13, 1998

The ISIS Challenge to World Governments

The ISIS–7 delegates recognized the potential for generating wealth and job creation, improved quality of life and positive impacts on the global environment through the application of superconductor technology to the health care, electric power, electronics and communications, transportation, process industry and research sectors. They strongly emphasized the need for patient investment both technology and market development in order to complete the process of wide–scale commercialization of superconductor applications for these vital world–wide societal needs:

A necessary condition for patient investment is positive economic climate. The ISIS–7 delegates call on their governments to aggressively address the global economic condition and assure a return to a healthy world economy. The delegates also call on their governments to continue vigorous funding of the development and demonstration of applications of superconductor technology. Examples of essential programs that the delegates strongly support include, but were not limited to, Japan´s MITI Sunshine Project, the U.S. Department of Energy´s Superconductivity Partnership Initiative and Superconductivity Program for Electric Power, and the European Commission supported programs. These programs provide good models for industry/government partnerships that are required to stimulate and support the transition of new technologies from the laboratory to the marketplace. The successful commercialization of medical MRI resulting from government–funded development of low temperature superconductors for high energy physics is an excellent example of the benefits from such investments.

The Grand Challenge to Industry-Growth on a Foundation of Success

Superconductivity, the ability of certain materials to conduct very high electric current with no resistance when cooled to sufficiently low temperatures, was discovered more than 80 years ago. Applications of superconductivity evolved in the 1970´s in the form of powerful electromagnets for high energy physics research and as just mentioned in the 1980´s as electromagnets for MRIs, the single largest commercial market for superconductors today. Not to be discounted is the pervasive use of laboratory-scale superconducting magnets in almost every field of physical science. More Nobel Prizes in Physics in the 20th Century have been awarded for the advancement of superconductivity itself and its use in unlocking the secrets of nature than for any other scientific discipline. The ISIS delegates urge that the basic principles and applications of superconductivity become a part of school science education worldwide.

In 1986, a new family of superconductors was discovered that exhibit superconductivity at temperatures at least 5 to 20 times higher than the previously known superconductors. This led to a tremendous level of new research in the development of applications that were not previously economical because of the high cost of cooling for the earlier materials. While the development of prototypes such as power transmission cables, motors and transformers, for the new HTS materials multiplied, the growth in applications of LTS materials continued to grow as well.

The pace of development of HTS wires and their application since the discovery of these new materials has exceeded the pace of development of nearly all comparable discoveries. A period of about 20 years between the discovery of anovel physical phenomenon and its commercial utilization is normal for many technologies. Commercially available current leads made from HTS wires have begun to be used to more efficiently supply power to commercial LTS electromagnets used in MRIs, magnetic separation, particle accelerators and equipment for industrial power quality applications.

Initial successful demonstrations of HTS power transmission cables and cable accessories have occurred in Japan, the USA and Europe, and the first installations and operation of HTS power transmission cables in the electrical networks of utilities is less than two years away. HTS power transformers have been demonstrated in Europe, Japan and the USA, and programs are currently underway to develop, manufacture and install HTS transformers in utility substations within three to four years. Prototype commercial-scale electric motors employing HTS coils are cueently being manufactured, and the development of fault current limiting equipment for utility networks is under development in many countries around the world. Demonstrations of HTS electromagnets in magnetic separation processing of soils and industrial processing of silicon have also been made.

In addition to electric power and high-field magnet applications, both the original development of LTS materials and the 1986 breakthrough to HTS have enabled important electronic device embodiments. These fall into three general categories:

1. Passive radio-frequency (RF) filters for wireless communication.

2. Sensitive magnetic field detectors called superconducting quantum interference devices (SQUIDs).

3. Digital switches and memories based on the Josephson effect.

Progress in all three areas has been substantial. The basic technology works and the first two applications are ready for commercial use awaiting appropriate market opportunities. The RF filters, will expand commercialization of personal communication systems. SQUIDs will be commercialized as biomagnetic diagnostic techniques, such as magnetoencephlography and magnetocardiography, begin to emerge alongside and complementary to their electrical counterparts. Already a number of pathologies have been identified that display unique magnetic signatures which will speed entry into the medical diagnostic equipment market. SQUID devices are also already impacting the field of non-destructive analysis, being studied for application as a quality control device for semiconductor circuit fabrication and the detection of below-the-surface micro-cracks due to aluminum fatigue in military and commercial aircraft. Further away is the deployment of active digital devices in computers, with petaflop[4] processing speeds believed achievable in the next five years using new RSFQ technology. Central to all superconducting electronic development is flexible companion refrigeration designed as an integral part of every system. The ISIS delegates urged that their governments assure funding of basic R。[illegible] efforts in existing superconducting electronics centers-of-excellence, especially digital devices, and encourage the incorporation of refrigeration development as an essential element of their program.

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[4]10**15 Floating point operations per second.

APPENDIX I
Background on ISIS

The discovery of HTS materials, and their promise to create many new products in the medical, electrical, electronics and communications, industrial processing and transportation spectors led to the creation of the industry groups known as CSAC, ISTEC and CONECTUS. The recognition of the potential huge impact on the world´s economy, job creation and the quality of life, led the three organizations to come together to organize the international forum known as ISIS. The objective of the ISIS process is to encourage international cooperation, exchange information fo scientific and technological advances, assess the prospects for the technologies and the foster the growth of the superconductor industry.

The first ISIS meeting was held in Washington, DC in 1992 (and 1995) and subsequent summits were held in Japan (1993 and 1996) and in Europe (1994 and 1997). ISIS-7 starts a new cycle of Summits at the world approaches the new Millennium.

ISIS-7 was attended by approximately 60 delegates from Japan, Europe (Germany, Italy, Denmark, Norway, Sweden and the United Kingdom) and the United States-representing roughly 65% of the world´s economies. This Summit focused on an international update of the development of practical technologies and products in demonstration around the world.

The delegates agreed that ISIS-8 is to be held in Japan during the autumn of 1999, hosted by ISTEC.

Participating countries and organizations:

Denmark	Nordic Superconductor Technologies
Germany	Accel Instruments GmbH
Germany	Conectus
Italy	Europa Metalli SpA
Italy	MASPEC-CNR
Italy	Pirelli Cables
Sweden	Ericsson Components AB
UK	Merck, Ltd.
UK	Oxford Instruments, NMR Instrument
UK	Oxford Magnet Technology
Japan	Sumitomo Electric Industry
Japan	AIST, MITI
Japan	ISTEC
Japan	KEK: High Energy Accelerator Research Organization
Japan	Nippon Steel Corporation
Japan	Railway Technical Research Institute
Japan	JETRO New York
Japan	New Energy 。・Industrial Tech. Dev. Organization
Japan	Toshiba America MRI, Inc.
USA	3 M Corporation
USA	ABB Power T。[illegible] Company, Inc.
USA	Air Products and Chemicals, Inc.
USA	American Superconductor Corporation
USA	BWX Technologies, Inc.
USA	Consolidated Edison Co. of New York
USA	CSAC
USA	DuPont Superconductivity

USA	EPRI
USA	EURUS Technologies, Inc.
USA	General Electric Co./Vantage Management
USA	IGC-APD Cryogenics, Inc.
USA	Intermagnetics General Corporation
USA	Los Alamos National Laboratory
USA	Lotepro Corporation
USA	National High Magnetic Field Laboratory
USA	Northwestern University
USA	Oxford Superconducting Technology
USA	Prelli Cables 。・Systems North America
USA	Superconductor Technologies, Inc.
USA	TRSenergy
USA	TX Ctr for Superconductivity
USA	U.S. Department of Energy