

What's New in the World of Superconductivity (January)

Power Applications

Intermagetics General Corporation (January 7, 2002)

IGC-SuperPower, LLC announced a major milestone for calendar year 2001: the continuous production of second-generation HTS tapes at their pilot-scale facilities in Schenectady, NY. Phillip J. Pelliagrino, Intermagetics' sector president of energy technology, stated that the "Demonstration of continuous, versus batch, production of second-generation HTS material is a critical stepping stone in SuperPower's goals of achieving longer lengths of high-performance second-generation HTS tapes and ultimately, routine, volume production of this high-performance material." The company's production goals for 2002 are a 100 amp-meter performance level in greater than one-meter lengths; the company is also in the process of establishing their 2003 target of a 1000 amp-meter performance level in greater than 10-meter lengths. Continuous production methods enable a substantial reduction in labor costs, helping to improve the cost-benefit ratio that is crucial to the commercial viability of HTS technology.

Source:

"Intermagetics Achieves Key Milestone in Continuous Production of Second-generation High-Temperature Superconducting Tape"
(Intermagetics General Corporation Press Release January 7, 2002)
<http://www.igc.com/>

Intermagetics General Corporation (January 8, 2002)

Intermagetics General Corporation (Nasdaq: IMGC) reported second-quarter earnings, increased 16 percent to \$3.6 million, or \$0.21 per diluted share, from \$3.1 million, or \$0.19 per diluted share, a year earlier. Net sales for the quarter ended November 25, 2001 climbed 20 percent to \$39.0 million from \$32.4 million. Reported net income was \$10.4 million, or \$0.60 per diluted share, which included a gain on the sale of the company's low-temperature superconductor (LTS) division and the write-down of investments.

Glenn H. Epstein, Intermagetics president and CEO, reported other news:

Strong MRI sales.

Three California facilities operated by IGC-Polycold Systems Inc. were being consolidated into a single, larger and more efficient facility.

In the Energy Technology segment investment was doubled in SuperPower to almost \$1.7 million this quarter.

Solid progress on operating goals enhanced in conjunction with the sale of the LTS business.

A favorable overall outlook.

Source:

"Intermagetics Q2 Net Income Increases 16% Before One-Time Items" (Intermagetics General Corporation Press Release January 8, 2002)
<http://www.igc.com>

American Superconductor Corporation (January 16, 2002)

American Superconductor Corporation announced that it has successfully completed load testing of the world's first 5,000-horsepower (hp) HTS prototype electric motor. The prototype was produced to confirm the company's design of the HTS rotor field winding, the high efficiency refrigeration system, and the fresh water-cooled stator technology. Technical results are available on American Superconductor's website

<http://www.amsuper.com/5000hpparameters.htm>

American Superconductor Corporation's patented, ultra-compact HTS electric motors are designed to reduce the size, weight, and cost of large industrial and ship propulsion motors, while simultaneously increasing their electrical efficiency. The company is proceeding with plans to design, manufacture, and test its first ship propulsion motor, which will have a much higher torque and lower motor speed than the 5,000-hp prototype motor. Conversion to electric ship propulsion is expected to increase the ship propulsion motor and generator market to US\$ 2-4 billion annually within the next ten years (current market value is estimated at US\$ 400 million). American Superconductor expects to have a commercial HTS ship propulsion motor available by 2004.

Source:

"American Superconductor Issues Results for 5,000-horsepower HTS Electric Motor Prototype"
(American Superconductor Corporation Press Release January 16, 2002)
<http://www.amsuper.com/>

American Superconductor Corporation (January 16, 2002)

American Superconductor Corporation announced that Pirelli Energy Cables and Systems has delayed the demonstration of the three HTS cables installed last summer in a Detroit Edison substation. The delay is the result of a problem with the vacuum system; the cable cryostats can only achieve a partial vacuum. Further testing of the cable system components will be necessary to determine what is preventing the cables from achieving full vacuum. Pirelli expects to announce a new timetable for the project in the second quarter of 2002. Tests on sections of the installed cables have indicated that the HTS wires in the cables meet all the performance requirements for rigorous field installations. Further information on the Detroit HTS Cable Demonstration project can be found at <http://www.detroitedison.com/htscable/index.html> or <http://www.amsuper.com/detroit.htm>.

Source:

"Delay Reported in Detroit HTS Cable Demonstration Project"

(American Superconductor Corporation Press Release January 16, 2002)

<http://www.amsuper.com/>

American Superconductor Corporation (January 24, 2002)

American Superconductor Corporation is making a technical presentation on HTS wire development available to the public. The presentation outlines recent developments in multifilament and coated conductor composite HTS wire architectures and examines the roadmap to the commercialization of HTS wire products. The report also outlines the ongoing manufacturing and application research in coated conductor composite and MgB₂, which may lead to future improvements in the price and performance of HTS wire. The full report can be found at <http://www.amsuper.com/doewireworkshop.htm>. This presentation was initially given at the Department of Energy's 2002 Wire Development Workshop (January 22, 2002).

Source:

"American Superconductor Updates HTS Wire Developments at Department of Energy's Wire Development Workshop"

(American Superconductor Corporation Press Release January 24, 2002)

http://www.amsuper.com

American Superconductor Corporation (January 29, 2002)

American Superconductor Corporation (AMSC) reported net revenues for the third quarter of fiscal 2002 were \$3.53 million compared with \$5.61 million for the third quarter of fiscal 2001. The net loss for the third quarter of fiscal 2002 was \$10.88 million, or \$0.53 per share, compared with a net loss of \$4.13 million or \$0.20 per share for the third quarter of fiscal 2001. In addition, net revenues for the first nine months of fiscal 2002 were \$8.45 million

compared with net revenues of \$14.25 million for the same fiscal period last year. The net loss for the first nine months of fiscal 2002 was \$29.04 million, or \$1.42 per share, compared with a net loss of \$13.63 million, or \$0.68 per share, for the same fiscal period in the previous year. Moreover, cash, cash equivalents and long-term investments were \$86.6 million on December 31, 2001 compared with \$106.4 million on September 30, 2001. Net cash used in the quarter was \$19.8 million, higher than planned, because of the timing of fixed asset additions and a lower rate of SMES sales.

Greg Yurek, CEO of American Superconductor said that sales this quarter of D-SMES grid reliability solutions did not meet his expectations because of additional delays by utilities in making their buying decisions. Yurek added that the company was continuing to work actively with both established and new customer prospects for D-SMES. AMSC is revising their SMES revenue guidance down from \$8 to \$10 million for the year to \$2 to \$6 million, due to uncertainty in the economy causing delays.

However the company reported excellent progress during the quarter in the development and manufacturing scale-up of its core product, high temperature superconductor (HTS) wires and during the quarter the company shipped two significant HTS wire orders to OEMs who are developing prototypes – one for power generation and the other for a transportation application.

The company also signed a distribution agreement with Korean-based Kiswire, one of the worlds largest industrial wire manufacturers, to sell its industry-leading HTS wire into the Korean market.

Source:

"American Superconductor Reports Fiscal 2002 Third Quarter Results" (American Superconductor Press Release, January 29, 2002)

<http://www.amsuper.com>

MRI

Intermagnetics General Corporation (January 8, 2002)

Intermagnetics General Corporation (Nasdaq: IMGCC) announced that it has signed an agreement to sell the helium-related portion of subsidiary IGC-APD Cryogenics' business to Sumitomo Heavy Industries (SHI) for about \$10 million.

The mixed-gas portion of APD Cryogenic's refrigeration systems business will be integrated into IGC-Polycold Systems' new facility in Petaluma, California. Sumitomo Heavy Industries and Intermagnetics also announced a strategic six-year supply agreement under which Intermagnetics will purchase shield coolers used in the production of its magnetic resonance imaging (MRI) magnet systems.

This sale was seen to be of mutual benefit to both parties. Glenn H. Epstein, president and CEO of Intermagnetics said that he believes that the sale of the helium-related business to SHI is a classic 'win-win' situation. He said, "Sumitomo will become the market leader in helium-based

shield coolers for MRI, which will allow it to continue to invest in maintaining and expanding a strong product line. The new arrangement will assure SHI of a long-term customer and assure Intermagnetics of dependable sources for our shield cooler requirements. Both SHI in Japan and its new subsidiary in Allentown will have the capability of producing all of the various designs we require." Sumitomo was also pleased with the deal. Osamu Sekiya, General Manager of SHI Cryogenics said, "Sumitomo Heavy Industries is focused on expanding its position in cryogenic technology and applications. The purchase of APD Cryogenics firmly establishes SHI as the premier provider and technology leader of helium based products for the MRI industry and other applications, and positions it well for growth within the cryopump segment of the semiconductor market. This acquisition will allow us to serve our customers with enhanced global sales and support while adding to our capability in the development of next generation cryogenic solutions."

Related news is that Intermagnetics announced that David E. Thielman has replaced David Dedman as vice president and general manager of Polycold Systems. Dedman will now assist Sumitomo in its integration of APD's helium operations.

Source: "Intermagnetics Signs Definitive Agreement to Sell Helium Refrigeration Equipment Business"
(Intermagnetics General Corporation Press Release. January 8, 2002)
<http://www.igc.com/>

Electronics

National Institute of Standards and Technology (January 29, 2002)

National Institute of Standards and Technology (NIST) researchers have demonstrated sine-wave synthesis in three superconducting integrated circuit chips using palladium-gold barrier junctions. The accomplishment represents a major step towards the development of a waveform synthesizer using Josephson junctions capable of providing precisely defined output voltages (up to 1 volt), frequencies (up to 1 GHz) and waveforms of any arbitrary shape. Possible practical applications of such a system include an AC voltage standard source for the calibration of high-performance test and measurement instruments.

Source:
"Josephson synthesizer circuit demonstrated"
(National Institute of Standards and Technology Press Release January 29, 2002)
http://www.nist.gov/public_affairs/update/upd020122.htm#Etechnology

Communication

ISCO International, Inc. (January 3, 2002)

In a bid to raise \$20 million, ISCO International, Inc. (ISCO) announced today that it has approved the

distribution of non-transferable subscription rights to holders of the Company's outstanding common stock to purchase additional shares of common stock. Holders of the Company's common stock as of Monday, January 7, 2002 will be entitled to purchase additional shares of common stock at the subscription price of \$0.50 per share. The Company will issue another press release to announce the commencement of the rights offering.

Source:
"ISCO International Announces Rights Offering"
(ISCO International, Inc. Press Release. January 3, 2002)
<http://www.iscointl.com>

Superconductor Technologies Inc. (January 10, 2002)

Superconductor Technologies announced the introduction of its IMT-2000 SuperFilter(R) Tower Top System, a cryogenic receiver front-end (CRFE) system designed for use in international markets adopting 3G wireless standards. The HTS technology employed by this system enables the performance of wireless base stations to be enhanced, extending the range, lowering the number of dropped and blocked calls, and increasing the capacity of the stations. The system will be unveiled at the 3G Mobile World Summit in Tokyo, Japan (Jan. 15-18, 2002). M. Peter Thomas, president and CEO of STI, stated that "This product introduction represents a key milestone for Superconductor Technologies as it establishes our international presence in terms of product development and marketing." The IMT-2000 SuperFilter Tower Top System has been designed to meet the stringent environmental specifications of Japanese carriers and will be sold in Japan by Matsushita Inter-Techno Co., Ltd., a division of Matsushita Electric Industrial Co., Ltd. (also known as National/Panasonic). In addition to Japanese operators, Superconductor Technologies intends to target other international wireless operators deploying 3G networks.

Source:
"Superconductor Technologies Inc. Introduces IMT-2000 SuperFilter(R) Tower Top System Designed Specifically for International 3G Development"
(Superconductor Technologies Inc. Press Release January 10, 2002)
<http://www.suptech.com/>

Superconductor Technologies Inc. (January 28, 2002)

Superconductor Technologies Inc. (SCON) (STI) expects net revenues to be in the range of \$28 million to \$33 million in 2002, with commercial product revenue contributing about 90 percent and government revenue contributing the remainder.

In the same period, R&D expense is expected to be around \$6 and a half million and selling, general and administrative expense is likely to be in the range of \$14.3 million to \$14.9 million. First quarter 2002 total revenues are expected to be between about \$4 million to \$4.5 million. Gross margins on product sales are expected to turn positive in the second quarter of 2002. With expected higher sales volumes and greater manufacturing efficiencies, STI plans to achieve at least 25 percent gross product margins in the fourth quarter of 2002.

M. Peter Thomas, STI's president and chief executive said, "We are entering 2002 with a solid baseline for revenue expectations and visibility". He added, "We recently announced a major follow-on purchase agreement for a minimum of 1,000 SuperFilter units, and customer interest in our solutions continues to build as our core product gains field experience and acceptance from wireless operators around the world. Our installed base of SuperFilter products is now over 1,000 units and our cumulative hours of operation exceeds 12 million. These positive developments as well as recent customer and industry activities afford the opportunity to update investors concerning our financial guidance for 2002."

The company expects gross commercial revenues will be about \$2.1 million for the fourth quarter 2001, compared to \$3.5 million in the same period in the previous year. Also, STI expects net commercial product revenues of approximately \$1.8 million for the fourth quarter of 2001, compared to \$2.4 million in the same period of the prior year. Total net revenues are expected to be approximately \$3.2 million for the fourth quarter of 2001 compared to \$3.7 million for the fourth quarter of 2000.

STI expects the loss for the fourth quarter ended December 31, 2001 will not exceed \$5.1 million, or a loss of \$0.31 to 0.32 per common share. The company ended the fourth quarter 2001 with approximately \$21 million in product backlog and approximately \$15.2 million in cash and equivalents.

In regards to the results for the year ended December 31, 2001. STI expects gross commercial revenues will be approximately \$9.9 million compared to \$7.6 million in the previous year. Also, STI expects net commercial product revenues of approximately \$7.6 million for 2001, as compared to \$5.3 million in the year 2000. Moreover, total net revenues are expected to be \$12.4 million for 2001 as compared to \$10.0 million for 2000. Finally, the company expects that the total loss for the year ended December 31, 2001 will be approximately \$17 million, or a loss of \$1.10 to \$1.11 per common share.

Source:

"Superconductor Technologies Inc. Anticipates 2002 Revenues Of \$28 Million to \$33 Million"

(Superconductor Technologies Inc. Press Release. January 28, 2002)

<http://www.suptech.com/>

Basic Research

Lawrence Berkeley National Laboratory and University of California at Berkeley (January 23, 2002)

Dr. J.C. Davis and his group at Lawrence Berkeley National Laboratory and the University of California at Berkeley have used scanning tunneling microscopy (STM) to produce nanometer-scale maps of "granular" superconductivity in a high-temperature superconductor. The group has verified their findings using a second innovative use of STM, in which individual nickel atoms

were used as probes to distinguish superconducting from nonsuperconducting regions in Bi-2212. Using an underdoped sample of Bi-2212, the researchers found nanoscale grains of apparent superconductivity embedded in an electronically distinct background that appears to be nonsuperconducting.

However, macroscopic superconductivity may still occur through Josephson tunneling. This finding is significant in that a major challenge to understanding the mechanism of high-temperature superconductivity has been explaining how superconducting, insulating, and other electronic states can exist in the same material at the same time. The concept of "granular" superconductivity, supported by the present results, suggests that regions of superconductivity can be spatially separated from each other, even in high-temperature superconductors with essentially perfect crystal structures. These results have been published in *Nature* (January 24, 2002 issue).

Source:

"Disorderly Superconductors Caught in the Act"

(Lawrence Berkeley National Laboratory News Release, January 23, 2002)

<http://www.lbl.gov/Science-Articles/Archive/MSD-granular-superconductor.html>

Max-Planck- Institute for Solid State Research (January 25, 2002)

Physicists at the Max-Planck-Institute for Solid State Research (Germany), the Centre d'Energie Atomique (France), and the Russian Academy of Sciences have shown that an unusual, fluctuating type of magnetic order plays a central role in the mechanism responsible for high-temperature superconductivity. Their results were published in the online edition of *Science* (*Science EXPRESS*, January 24, 2002). The researchers were interested in the mechanism responsible for the formation of Cooper pairs in high-temperature materials. They used neutron scattering experiments to examine a "mosaic" of several hundred small crystals of $Tl_2Ba_2CuO_6$ and obtained data suggesting that a magnetic mechanism is involved in the formation of Cooper pairs. The ordering pattern of electron spin appears to fluctuate in high-temperature superconductors, appearing and disappearing over short periods of time. The German-French-Russian researchers believe that pairs of electrons may be able to move more easily than single free electrons through a background of fluctuating electron spins, thereby saving magnetic energy. The scientists will next look for the presence of a fluctuating magnetic order in other high-temperature superconducting materials, particularly pure materials with high transition temperatures.

Source:

"Magnetic moments in a crystal mosaic"

(Max-Planck-Institute for Solid State Research Press Release January 25, 2002)

<http://www.mpg.de/news02/news0203.htm>

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