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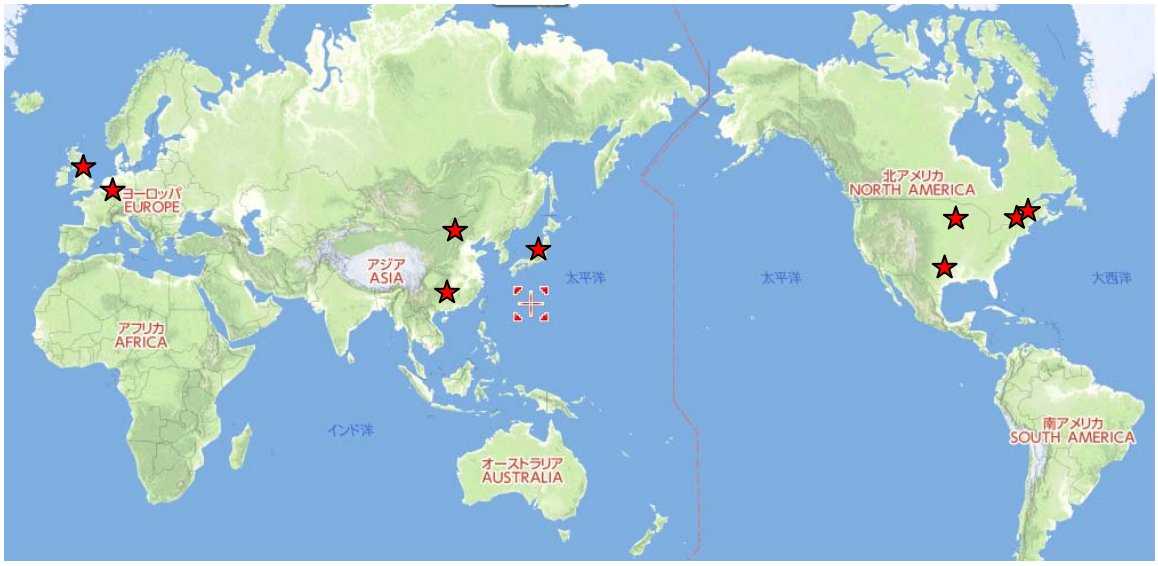
What's New in the World of Superconductivity (June, 2012)

초전도 뉴스 –세계의 동향–

超电导新闻 –世界的动向–

chāo diàn dǎo xīnwén - shìjiè de dòngxiàng-

Yutaka Yamada, Principal Research Fellow
Superconductivity Research Laboratory, ISTEC



★News sources and related areas in this issue

▶Accelerator 가속기 加速器 [jiāsùqì] • Basics 기초 基础 [jīchǔ]

Long-sought Higgs boson

CERN (July 4, 2012)

The ATLAS and CMS experiments have presented their latest preliminary results in the search for the Higgs boson, with both experiments observing a new particle in the mass region around 125-126 GeV; the observations have a reliability level of 5 sigma. While the results are regarded as preliminary, the findings are dramatic and indicate the discovery of the heaviest boson ever found. The presently reported findings

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are based on data collected in 2011 and 2012, and some data from 2012 is still being analyzed. Publication of the results is expected at the end of July, with a more complete picture emerging later this year after the LHC obtains more data. The next step will be to determine the precise nature of the particle and its significance to our understanding of the universe. CERN Director General Rolf Heuer commented, "We have reached a milestone in our understanding of nature. The discovery of a particle consistent with the Higgs boson opens the way to more detailed studies, requiring larger statistics, which will pin down the new particle's properties, and is likely to shed light on other mysteries of our universe."

Source: "CERN experiments observe particle consistent with long-sought Higgs boson"
CERN press release (June 13, 2012)
http://press.web.cern.ch/press/PressReleases/Releases2012/PR17.12E.html
Contact: CERN press office, Email: press.office@cern.ch

▶Power Application 전력응용 电力应用 [diànlì yìngyòng]

100th STATCOM Sale for Green Energy

AMSC (June 13, 2012)

AMSC has announced the sale of its 100th static synchronous compensator (STATCOM) solution. AMSC's D-VAR® STATCOM systems can be used for (1) the correction of voltage instability problems in transmission networks, (2) the provision of dynamic steady-state voltage and power factor control and regulation in transmission and distribution networks, (3) the protection of industrial facilities requiring premium power quality, and (4) the support of stable interconnections for distributed generation facilities and large-scale wind and solar farms. These solutions can help overcome the bottlenecks, grid disturbances, and stability problems that can occur between transmission systems and the point of actual power generation, enabling safe and efficient connections of renewable generation facilities to the power grid. When used in conjunction with the transmission or distribution systems of an electric utility, D-VAR systems can be used to monitor the power grid and provide automatic and instant voltage stabilization, enabling higher power and more reliable and efficient energy transfers through existing power lines. Finally, D-VAR STATCOM solutions installed in large industrial facilities can be used to correct voltage instability problems caused by the start-up of large drives, motors, and other equipment in addition to supporting and stabilizing voltages, thereby ensuring premium power quality.
The 100th STATCOM solution was purchased by Iberdrola Renewables, LLC, and will be used to connect a 48-MW wind farm in New Hampshire to the power grid; this wind farm will employ more than 150 construction personnel and, when operational will provide more than half of the annual municipal budget for the town of Groton, NH. Iberdrola Renewables is presently involved in more than 50 renewable energy projects in the United States.

Source: "AMSC Celebrates 100th STATCOM Sale"
AMSC press release (June 13, 2012)
http://www.amsc.com/about/news_events/press_releases.html

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Contact: Jason Fredette, Email: jason.fredette@amsc.com

▶Wire 선 재료 线材料 [xiàn cáiliào]

Fundamental HTS Patent

AMSC (June 5, 2012)

AMSC has acquired the exclusive rights to a fundamental HTS patent in the United States. The patent covers a broad range of second-generation (2G) and similar HTS materials, wire, and power-related applications including "smart" power cables, fault current limiters, wind turbine generators (particularly for high-power and offshore wind turbines), and ultra-compact motors. Additional information regarding the patent will be made available in the Form 10-K that AMSC plans to file with the U.S. Securities and Exchange Commission in late June. Daniel P. McGahn, President and CEO of AMSC, commented, "Along with our partners worldwide, we at AMSC have begun to deliver on [the promise of HTS materials] with industry-leading capacity, production and order rates. Underlying our market position is an unparalleled intellectual property portfolio. This new license further strengthens this position and our ability to serve the U.S. market's 2G needs for years to come."

Source: "AMSC Receives Exclusive Right to Fundamental HTS Patent"
AMSC press release (June 5, 2012)
http://www.amsc.com/about/news_events/press_releases.html
Contact: Jason Fredette, Email: jason.fredette@amsc.com

▶Management and Finance 경영정보 经营信息 [jīngyíng xìnxī]

2011 Financial Results

AMSC (June 6, 2012)

AMSC has reported its fourth quarter and full-year fiscal 2011 financial results for the period ending March 31, 2012. AMSC's revenues for the fourth quarter of fiscal 2011 were US $28.6 million, compared with $59.8 million for the same period in the previous fiscal year. This decline in revenue was mainly caused by the lack of revenue from AMSC's former customer, Sinovel Wind Group Co., Ltd. The company's revenue increased compared with its third quarter revenue ($18.1 million) mainly because of growth in the Wind and Grid reporting segments. The net loss for the fourth quarter was $21.2 million, compared with a net loss of $185.1 million for the same period in the previous fiscal year (which included a loss of $155.3 million in aggregate one-time asset write-downs, impairments, and accrued charges). The non-GAAP net loss for the fourth quarter was $15.1 million, compared with $26.1 million for the same period in the previous fiscal year. AMSC's revenues for the full fiscal year were $76.5 million, compared with $286.6 million for the same

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period in the previous fiscal year. Again, the decline in revenue was mainly caused by the lack of revenue from Sinovel. AMSC's net loss for fiscal year 2011 was $136.8 million, compared with a net loss of $186.3 million for the previous fiscal year. The non-GAAP net loss for the full fiscal year was $85.5 million, compared with $12.8 million for the previous fiscal year. As of March 31, 2012, AMSC's cash, cash equivalents, marketable securities, and restricted cash totaled $66.2 million and had a backlog of approximately $291 million.
On June 5, 2012, AMSC announced that it had received a $10 million loan and security agreement from Hercules Technology Growth Capital. The loan has an interest rate of 11%.
For the quarter ending June 30, 2012, AMSC anticipates revenues exceeding $26 million, with a net loss of less than $10 million (including a benefit of approximately $7 million for the settlement of adverse purchase commitments with certain vendors). The non-GAAP net loss for the first quarter of 2012 is expected to be less than $13 million. As of June 30, 2012, AMSC expects to have approximately $85 million in cash, cash equivalents, marketable securities, and restricted cash.

Source: "AMSC Reports Fourth Quarter and Fiscal Year 2011 Financial Results"
AMSC press release (June 6, 2012)
http://www.amsc.com/about/news_events/press_releases.html
Contact: Jason Fredette, Email: jason.fredette@amsc.com

▶Basics 기초 基础 [jīchǔ]

Nematicity and Superconductivity

Rice University (June 20, 2012)

Researchers from Rice University, Kyoto University, and the Japan Synchrotron Radiation Research Institute (JASRI) have reported intriguing similarities between the electronic properties of iron-based and copper-based HTS materials. The international group has found that the electronic properties of iron-based HTS materials differ in the horizontal and vertical directions, similar to the asymmetry observed in copper-based HTS materials. This asymmetry, also known as "nematicity", was observed across a wide range of temperatures, including those at which the material becomes superconducting. The asymmetry was also observed in materials with different "doping" formulae. The researchers used a parent compound of barium iron arsenide, which becomes superconducting when doped with phosphorous. By varying the amount of phosphorous and measuring the resulting electronic behavior across a range of temperatures, the group was able to probe the causes of high-temperature superconductivity. As HTS materials are cooled, they pass through a series of intermediate electronic phases before reaching the superconducting phase; these phase changes can be visualized using phase diagrams that show the particular phase an HTS material will occupy based on its temperature and chemical doping. The new evidence shows that nematicity exists all the way into the superconducting region, and not just in the vicinity of the magnetic phase, as previously thought. Intriguingly, the phase diagram for barium iron arsenide resembles that for copper-based HTS materials; specifically, the newly mapped region for nematic order in the iron-based material is a close match for the region known as the "pseudogap" in copper-based HTS materials. Andriy

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Nevidomskyy, an assistant professor of physics at Rice University, commented, “Physicists have long debated the origins and importance of the pseudogap as a possible precursor of high-temperature superconductivity. The new results offer the first hint of a potential analog for the pseudogap in an iron-based high-temperature superconductor." The group believes that their results could help physicists to determine whether electronic nematicity is essential for HTS. The group’s work has been published in *Nature*.

Source: “Asymmetry may provide clue to superconductivity”
Rice University press release (June 20, 2012)
http://news.rice.edu/2012/06/20/asymmetry-may-provide-clue-to-superconductivity/
Contact: Jade Boyd, Email:jadeboyd@rice.edu

Magnetism for Iron-based Superconductors

Ames Laboratory (June 25, 2012)

Researchers at the U.S. Department of Energy’s Ames Laboratory in collaboration with Kyoto University, the University of Illinois at Urbana-Champaign and the University of Bristol (U.K.) have found that magnetism may help or may even be responsible for the superconductivity observed in iron-based HTS materials. The group has been measuring the London penetration depth, or the depth to which a magnetic field penetrates a superconductor, to obtain basic information about these materials even while the materials are in a superconducting state. Ruslan Prozorov, an associate professor at Iowa State University and the lead investigator at Ames Lab, commented, “London penetration depth is one of the few quantities we can measure in a superconducting state to learn more about what's going on, so the technique we specialize in here at Ames Laboratory was particularly useful for this research project. In this collaboration, we studied a barium-iron-arsenic-phosphorus material at near zero Kelvin, and our London penetration depth measurements suggested that magnetism is responsible for superconductivity in iron-based superconductors. Typically, magnetism is detrimental to superconductivity, but when it is weakened enough, it might actually be helping." The group’s results have been published in *Science*.

Source: “Unraveling the mysteries of exotic superconductors”
Ames Laboratory press release (June 25, 2012)
http://www.external.ameslab.gov/news/news-releases/unraveling-mysteries-exotic-superconductors
Contact: Breehan Gerleman Lucchesi, Email:breehan@ameslab.gov

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