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Contents:

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Top of Superconductivity Web21

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What's New in the World of Superconductivity

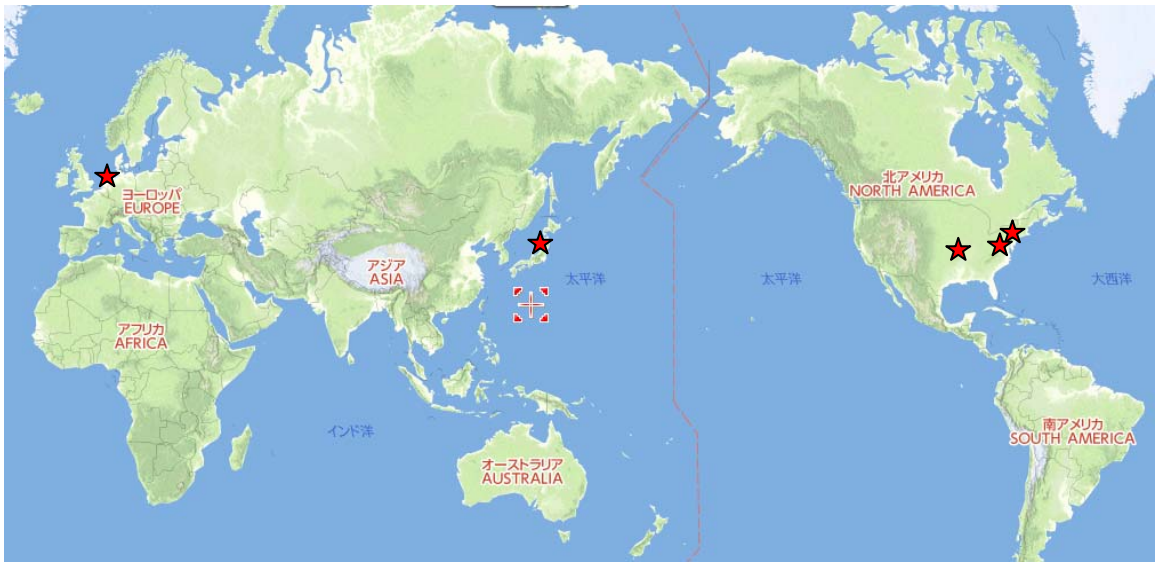
(Jan., 2016)

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
(Contact (now and after April 1, 2015): yutakayamadahts@gmail.com



★News sources and related areas in this issue

▸Power Applications

Funding for Resilient Grid System

AMSC (3 November, 2015)

AMSC has been awarded a contract modification worth up to $3.7 million from the U.S. Department of Homeland Security (DHS) Science and Technology (S&T) Directorate, which now totals $5.2 million. This project forms part of the work of the S&T Directorate at DHS to secure the nation's electric power grids and

improve resiliency against extreme weather, acts of terrorism, or other catastrophic events. AMSC's Resilient Electric Grid system offers resiliency in the event that parts of the grid go down for any number of reasons. AMSC and ComEd are working towards a deployment plan to permanently install this system in downtown Chicago. This funding will allow AMSC start to purchase and qualify key subcomponents of the system and undertake important engineering tasks to ensure optimal system performance. The phase of the program under the contract modification is expected to end in May 2017.

Source: "AMSC Resilient Electric Grid System Program Moves Forward With New Funding Authorization" (3 Nov, 2015) Press Releases
http://ir.amsc.com/releases.cfm
Contact: Brion D. Tanous, brion.tanous@amsc.com

▸Maglev

US Maglev Train

Federal Railroad Administration (6 November, 2015)

The Federal Railroad Administration (FRA) awarded a $27.8 million grant to the State of Maryland for preconstruction and planning costs for the potential development of a magnetic levitation (maglev) train between Washington, DC and Baltimore, Md. The funding specifically applies to preconstruction planning, engineering analysis, and other capital costs for fixed guideway infrastructure.

Maglev trains in Japan typically realize speeds in excess of 300mph, but have also been tested at speeds approaching 400mph. The FRA will assess the practicality of this maglev project to meet high safety standards as well as assessing the potential of this technology for future transportation.

For more information, please see the 2015 Notice of Funding Availability: https://www.fra.dot.gov/eLib/Details/L16260.

Source: "FRA Awards $27.8 Million to the State of Maryland for Baltimore-DC Magnetic Levitation Railroad" (6 Nov, 2015) Press Releases
https://www.fra.dot.gov/eLib/details/L17207#p1_z10_gD_lPR
Contact: frapa@dot.gov

▸Wire

Supply of HTS Wires

Superconductor Technologies Inc (10 November, 2015)

Superconductor Technologies Inc. (STI) reported results for the quarter ended Sept. 26, 2015. Jeff Quiram,

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STI's president and chief executive officer, stated that shipments of Conductus® wire increased this quarter and the forecasted demand for projects in 2016 and beyond far exceeds their existing manufacturing capacity. The company remains focused of supplying wires for superconducting fault current limiters (SFCL), magnets and power transmission cables.

With successful partnership with the Robinson Research Institute, STI has shipped wires to two new magnet customers - one during the third quarter and one in October. STI expanded their market reach by entering a distribution agreement with TING Corporation to supply the India market with Conductus wire. Since 2013, TING has sold 2G HTS wire to the Indian market for multiple customers and applications.

Source: " Reports 2015 Third Quarter Results"
(10 Nov, 2015) News
http://phx.corporate-ir.net/phoenix.zhtml?c=70847&p=irol-newsArticle&ID=211085
Contact: Investor Relations Contact, Cathy Mattison invest@suptech.com

▸Basics

High T_c FeSe film

Tohoku University (4 November, 2015)

Researchers at Tohoku University's Institute for Materials Research (IMR) has realized layer-by-layer etching in superconducting FeSe films down to approximately one-monolayer about 0.6nm. As the thickness of the film is reduced, the superconducting transition temperature (T_c) increases to around 40 K. In addition, the research group reveals that by combining with an electrostatic charging effect, the high-T_c transition can be induced in 10-nm thick condition (20 monolayers), which has currently been limited in one/two-monolayers. The development of this etching technique will allow for the exploration of nontrivial physical phenomena in atomically thin two-dimensional films. Their research outcome was published in Nature Physics online on Nov 2, 2015.

Source: "Electrochemical etching down to one-monolayer towards high-Tc superconductivity"
(4 Nov, 2015) News
http://www.tohoku.ac.jp/en/news/research/news20151104.html
Contact: Junichi Shiogai, junichi.shiogai@imr.tohoku.ac.jp

High Hc_2 MoS_2

Radboud University (12 November, 2015)

Experiments conducted at the High Field Magnet Laboratory (HFML) in Nijmegen and jointly operated by Radboud University and the FOM foundation, have discovered that transistors fabricated from MoS2 are not only superconducting at low temperatures but also stay superconducting in a high magnetic field, measured up to 37 Tesla.

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Electron pairing in conventional superconductors is easily broken when exposed to magnetic fields, but in MoS2 the paired electrons are intrinsically associated with an internal high magnetic field which can reach nearly one hundred Tesla and is much higher than the 37.5 Tesla measured at HFML, behaving in a way that contradicts a law in physics, the so called Pauli paramagnetic limit. Their findings are published in *Science,* November 12.

Source: ” Superconductor survives ultra high magnetic field”
(12 Nov, 2015) News
http://www.ru.nl/english/news-agenda/vm/physics/2015/superconductor-magnet/
Contact: Uli Zeitler, u.zeitler@science.ru.nl

Top of Superconductivity Web21

January 2016 Date of Issue: January 18, 2016
Superconductivity Web21
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Feature Article: Reporting on ISS2015 Sessions

-Physics and Chemistry/Vortex Physics

Tsuyoshi Tamegai, Associate Professor
Graduate School of Engineering
The University of Tokyo

Around 100 presentations made up of both orals and posters were presented at the sessions of the Physics and Chemistry/Vortex Physics. At the special plenary session held on the first day, Dr. Uchida introduced recent findings of high temperature superconductivity in hydrogen sulfide, single-layer FeSe, and cuprate superconductors. Regarding high temperature superconductivity in hydrogen sulfide, Dr. Eremets reported details of experiments performed at high pressure at his plenary lecture, whilst Dr. Akashi and Dr. Sano reported on the related theory during the oral session.

On the second day of the sessions the evaluation and fabrication methods of various types of bulk high temperature superconductors were introduced. With regards to bulk cuprate high temperature superconductors, Dr. Yao highlighted the recent developments in fabrication methods and Dr. Pinmangkorn and Dr. Diko provided details on the fabrication methods. Dr. Tamegai reported on bulk magnet employing coated conductors. Dr. Miryala and Dr. Kim presented the characteristics and fabrication methods of bulk MgB_2 superconductors. Dr. Uwatoko provided details of MnP, the first Mn-based superconductor discovered, highlighting the phase diagram under pressure. Dr. Mizoguchi and Dr. Kase presented the BiCh2-based superconductor, providing the relationship between the structure and superconductivity, and the symmetry of superconductivity, respectively. Regarding FeSe iron-based superconductor, Dr. Yamashita highlighted inducing superconductivity using an electrochemical reaction. Dr. Imai presented the fabrication details of Fe(Te,Se) thin-films, which are difficult to fabricate in bulk form; Dr. Nabeshima, on the transport properties of FeSe/FeTe thin films, and Dr. Sawada on the magnetic and transport properties of Fe(Te, Se) thin films. Dr. Koike reported on the growth of their new superconductors with high T_c characteristics, successfully synthesized via the intercalation of alkali metals and organic molecules into FeSe. Other reports related to iron-based superconductors include that from Dr. Kobayashi on the optical properties of transition-metal substituted $BaFe_2As_2$ compounds, Dr. Fujii on thermopower anisotropy, and Dr. Mu on large-scale CaFeAsF single crystal growth. Dr. Yamamoto reported on a photo-induced organic FET, which can reversibly switch between a superconducting and insulating state. Dr Miyawaki reported a phase diagram of the time-reversal symmetry-breaking state in a quasi-one-dimensional p-wave superconductor. Dr. Ishiguri reported on the possibility of new superconductivity in a semiconductor. Regarding the cuprate superconductors, Dr. Ikeda reported on the oxygen concentration dependence of superconductivity in the $Pr_{1.85}Ce_{0.15}CuO_4$, whilst Dr. Kurashima reported on ferromagnetic fluctuations in heavily overdoped Bi2201. Dr. Nomura reported on the second switch in Bi2201 intrinsic Josephson junctions. Dr. Ishizuka reported on the detailed observation of topologically protected surface states in β-PdBi2 superconductors by using photoemission spectroscopy.

On the third day of Vortex Physics session, Dr. Reichhardt discussed the dynamics of Skyrmion lattices comparing it with vortex dynamics. Dr. Ichioka reported on the transverse component of the structure factor

of flux line lattices, whilst Dr. Fukui discussed the vortex states in a chiral helimagnet superconductor. Dr. Sun highlighted the vortex dynamics in irradiated FeSe single crystal. Dr. Wimbush reported on in-plane field angle dependence of J_c in RBCO wires. Detailed experimental results for low-temperature superconductors utilizing STM were presented by Dr. Roditchev on superconducting Pb islands, and by Dr. Yonezawa on In thin films. Dr. Kokubo and Dr. Huy reported on the vortex states in MoGe thin films having different geometric shapes. Dr. Kato reported on an electromagnetic simulation study of vortex dynamics including thermal effects.

Finally, I would like to note that the invited speaker Dr. Roditchev made a wonderful summary talk at the closing session.

Top of Superconductivity Web21

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Feature Article: Reporting on ISS2015 Sessions

-Films & Junctions/Electronic Devices

Keiichi Tanabe, Director General
SRL/ISTEC

Presentations pertaining to FD (Films, Junctions, and Electronic Devices) totaled 39 of which 18 were lectures and 21 were posters. The lectures comprised of four sessions with a focus on films and junctions, SQUID applications, detectors, and signal processing. Amongst these sessions the main topics are introduced herewith.

Two lecture presentations on Fe-based superconducting thin films were given during the films and junctions session. Dr. Iida (Nagoya University, KIT, Germany) reported the effect of strain on the superconducting properties of PLD-fabricated Co-doped Ba122 thin films. An epitaxial thin film fabricated on an MgO substrate develops tensile stresses resulting in a shift of the superconducting dome-shaped relation towards the under-doped region. On the other hand, thin films fabricated on CaF_2 substrate develop compressive stresses, which results in a shift of the superconducting dome towards the over-doped region thereby realizing higher T_c. Dr. Sakoda (Tokyo University of Agriculture and Technology) reported on F-doped Sm1111 thin films fabricated by MBE. Using FeF_2 as the F source successfully produced thin films with a T_c close to 55 K with zero resistance, slightly lower than compared to a two-step method employing an SmF_3 overlayer. Dr. Elarabi (Kyoto University) reported on elliptically-polarized Terahertz wave emission observed for the first time in single crystal Bi2212 intrinsic Josephson junctions with a rectangular mesa structure. Dr. Sugimoto (TOYOTA Central R&D Labs) reported on the potential of a compact SMES consisting of multilayered superconducting films formed within a spiral groove and fabricated on a Si wafer. According to calculations, it is possible to realize high-energy volume storage densities surpassing those of Li-Ion batteries by employing high temperature superconducting films. However, there is an issue with regards to thin film growth within a groove as demonstrated by the prototype developed using NbN low-temperature superconducting films.

At the SQUID applications session, Dr. Stolz (IPHT-Jena, Germany), an invited speaker, presented the development of a SQUID-based full-tensor magnetic gradiometer system designed for airborne mineral exploration using low-temperature SQUIDs. The sensor comprises five planar gradiometers and three magnetometers required to adjust the balance. Compared to conventional airborne magnetic systems used to determine the Earth's magnetic field, the system has advantages that include greater spatial resolutions, superior terrain depiction, and the ability to differentiate between the residual and induced magnetism. Dr. Tsukada (Okayama University) reported on the outline of JST-SIP project launched last autumn, highlighting the development of a non-destructive detection system employing highly sensitive magnetic sensors such as MR sensors and SQUIDs utilized for social infrastructures. The highly sensitive performance characteristics at low frequencies are expected to offer defect detection located deep inside and the backside of component parts. Also, Dr. Kawagoe (Toyohashi University of Technology) reported on the development of an ultra-low field MRI food inspection system using HTS-SQUID. The modifications made to the interface around the RF-SQUID and the compact magnetic shield box has successfully

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reduced system noise and has realized a 2-dimensional image of several water-encapsulated cells. Dr. Adachi (ISTEC) reported on the barrier structure of a ramp-edge type Josephson junction in a multilayer thin film HTS-SQUID examined using TEM. At the junction interface, about 1.5 nm thick disordered domains with Cu deficiency and excessive rare earth elements compared to the superconducting phase were homogeneously observed. It seems that this works as a barrier.

At the Detector session, Dr. You (SIMIT, CAS, China) reported on China's recent progress in the development of a superconducting nanowire single photon detector (SNSPD) for quantum information. Dr. You and his research group has successfully realized around 80 % of the quantum detection efficiency for not only 1550 nm wavelengths for optical communications but also visible and near infrared portions by coupling a dielectric mirror under NbN nanowire. Regarding SNSPD, there is already an emerging small market counting five venture companies, including the SNSPD research development led by Dr. You. Dr. Mitsuda (JAXA) reported the development of Transition Edge Sensor (TES) for X-ray astronomy and material analysis. A 64-pixel sensor array has been developed for TES electron microscope for material analysis to enhance the counting rate and reduce the measurement times. The plan now is to install this in a scanning TEM next year. The greater requirement for pixels in astronomy has led to the development of frequency division multiplexing techniques. In Japan, such techniques will be employed in satellite missions from 2020 onwards. Other presentations included Dr. Kim (KRISS, Korea) on TES for underground dark matter investigation and neutrino studies planned in Korea; Dr. Yamamori (AIST) on the fabrication of a microwave kinetic inductance detector (MKID) utilizing epitaxial NbN thin films; and Dr. Noda (RIKEN) on the simulations of TES performance characteristics.

At the signal processing session, Dr. Oliver (MIT Lincoln Lab., USA) reported on the development of superconducting devices for quantum computers and high performance "classic" computers. Two approaches for quantum computers include either the utilization of a quantum bit gate or quantum annealing, each having specific advantages. With regards to the latter, Dr. Lanting (D-Wave, Canada) highlighted the significant progress in recent prototype development at his plenary lecture. One of the biggest issues relating to quantum bits was coherence time. Now, by modifying the material and gate structure has led to the improvement in the coherence time to several 10-100 micro secs, five orders of magnitude improvement over the past 15 years. This implies that the development has remarkably advanced to the stage just before the practical realization of a highly efficient program architecture. Also, MIT has constructed an 8-layer Nb SFQ integrated circuit process, contributing to the successful demonstration of SFQ circuit comprising a maximum of 70,000 junctions. The development of a 3-dimensional integrated circuit technology has also commenced, involving the stacking two flip-chips for the quantum bit chip and the read-out SFQ circuit chip. Dr. Miyajima (Osaka Prefecture University) reported on the development of a neutron imager based on SFQ readout circuits and an array of kinetic inductance detectors of Nb nanowires with a B converter layer. With regards to the detector, experiments using neutron pulses were conducted at J-PARK facilities and results equivalent to simulation studies were realized. Other presentations include; Dr Yamazaki (RIKEN) on the development of a novel nano-structure converter device aimed towards the coherent conversion of microwave and light; and Dr. Sato (Nagoya University) on the development of high-speed shift register memory for bit-serial type SFQ microprocessor. Dr. Sato highlighted that design optimization successfully led to the reduction of footprint and a lower power consumption.

Top of Superconductivity Web21

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Feature Article: Reporting on ISS2015 Sessions

-Wires, Tapes & Characterization

Teruo Izumi, Director
HTS Conductor Processing & Power Applications Division
Superconductivity Research Laboratory, ISTEC

A total of 32 lectures of which 17 were invited lectures, including plenary lectures, together with 27 posters were presented in the Wires, Tapes & Characterization session.

At the special plenary lecture, Dr. Moon of SuNAM introduced the history and recent trends in the development of coated conductors (CCs) in Korea. The DAPAS Project has ended the development of Bi-based wires, but instead, has focused efforts on the IBAD/RCE-DR process for CCs. With the establishment of SuNAM, a remarkable enhancement in wire performance has been realized. SuNAM currently has production capacities of 600 km/month (100 A/4 mm-width @ 77 K, s.f.). The aim is towards a low cost process by taking advantage of the RCE-DR process, which characteristically exhibits high-rate deposition (100 nm/s).

Dr. Holzapfel from KIT introduced the recent developments of the European coated conductors, specifically EUROTAPE. This project, currently in progress involves the joint collaboration of 21 research institutions in Europe. The CCs development projects conducted between 2012 to 2017 are targeting 500 m-100 €/kAm-400 A@77 K,s.f.-1000 A@5 K,15 T. During the current project year, the remaining time periods specifically are planned to focus on the long tape process. However, Dr. Holzapfel stated that in its place two topics, specifically; 1) ABAD-PLD (BRUKER) or CSD (OXLUTIA) and 2) RABiTS-MOD(D-nano) were selected instead.

Dr. Iijima of Fujikura reported on the recent trends seen in Japan highlighting reliable manufacturing technology development and the introduction of artificial pinning centers in IBAD-PLD CCs. Manufacturing reliabilities have advanced producing homogeneities with standard deviations of only 2 % for I_c of 500 m-class CCs. Regarding artificial pinning center technology, the introduction of BZO (5 %) doping into 50 m long tape has realized 1700 A/cmw@30 K, 2 T. The introduction of BHO has also led to 543 A/cmw@20 K 15 T for short tape. Dr. Fukushima of SuperPower introduced trends in artificial pinning center technology for MOCVD commercial CCs. The “Enhanced AP Wire” technique has successfully realized 500 A@30 K, 2 T for I_{cmin} in 7.5 % Zr doped 500 m long wires.

There were many presentations relating to the challenges in the technological development required in order to improve in-field characteristics. ISTEC reported a high level of in-field characteristic of 141 A/cmw@77 K, 3 T (411 A/cmw@65 K, 3 T) for I_{cmin} of PLD-fabricated thick film with the introduction of BHO artificial pinning into the EuBCO superconducting phase. Prof. Selvamanickam from the University of Houston, reported on heavily doped 25 % MOCVD-tapes having excellent performance characteristics of 20 MA/cm^2@30 K, 3 T. ISTEC also reported on the novel method to form BZO nanoparticle dispersions for MOD artificial pinning introduction, successfully realizing an in-field J_c characteristic equivalent to that of the

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vapor phase process by having to control the layer deposition thickness for each coating. Regarding MOD films, Dr. Malozemoff (AMSC) and Dr. Li (Brookhaven National Laboratory) reported on the introduction of novel artificial pinning by employing an ion irradiation process, and also on the developmental status of its roll-to-roll process. An Au ion irradiation roll-to-roll process confirmed the enhanced performance characteristics equivalent to that of stationary technique.

Additionally, regarding joint technology, Andong National University in Korea reported on low specific resistance of ～50 nΩ using ultrasonic welding methods. ISTEC also reported on joint technology using Ag nanoparticles, which produced ultra-low resistances of 6 nΩ by connecting at 150 °C for 1 h in air.

Top of Superconductivity Web21

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Feature Article: Reporting on ISS2015 Sessions

-Large Scale System Applications

Tomoo Mimura
Superconductivity Technology Group
R&D Department
TEPCO Research Institute
Tokyo Electric Power Company

The Large Scale System Applications session had over 20 presentations. The presentations during the SA-1~4, chaired by Dr. Hwang and I was mainly focused on AC Power Cable topics. The first presentation made by Dr. Hwang highlighted the overall superconducting projects recently conducted in Korea. During the DAPAS project in Korea which has already finished, the various performance tests including a long term test has been done by 22kV superconducting cable . This presentation gave me a Korea's aggressive stance to the study for HTS cable, because of the on-going development of 154 kV cables and DC cables (at Jeju island) after the DAPAS project. Dr. Lee from LS Cable introduced a detailed developmental status of 154 kV cables. With the present world-record level specification, so-called 154 kV 600 MVA 100 m, it was reported that the Type Test adhering to a technical report by CIGRE was done and confirmed favorable results. Dr. Bang of Yonsei University reported on modeling and simulation studies using the electric constant of superconducting cables. This analysis is very important for practical use for real grid from the viewpoints of safety and analysis taken when accidents occur. Finally, I reported the present status of Japan's superconducting cable project. An outline of current on-going national projects was presented followed by the ISTEC-MPACC project and ASAHI S/S Yokohama project. There are two main targets set in the project. One is to verify the safety characteristics should a grid accident occur, and the other is to demonstrate the enhancement in efficiency offered by the cooling system, which was the issue raised by the previous project. I reported that each project objective is now on going, and the scenarios expected of actual grid connections after the completion of the project.

While this presentation session did not include Europe and USA, however there are ongoing projects in Essen, Germany, also the research and development in China is also in progress. Further progress in Japan's research is expected and at the same time observing the future developmental status of each country.

Top of Superconductivity Web21

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Feature Article: Reporting on IEA-ISS Joint Session

Yutaka Yamada, Principal Research Fellow
Superconductivity Research Laboratory, ISTEC

On 17th November, the second day of the ISS conference, the IEA-ISS Joint Special Session, entitled Superconducting Applications and Future Energy Perspective, was held in the banquette room (Photo 1). The High Temperature Superconductivity-International Agreement (HTS-IA) of International Energy Agency (IEA) hosts this session, aiming to nurture young researchers. Last year, young researchers, aged 35 and below, made presentations on future energy. This year, the session was not being limited to only young researchers. The presentations were on topics relating to superconductivity and future energy. Eight researchers made presentations as set out in the table below. Candidates selected for the Young Generation Award were the three presenters highlighted in blue in the table who were from Japan, China, and UK.

Photo 1 A snapshot of the sessions

Table Presenters and lecture titles

No.	Presentors	Affiliation	Title
1	Luciano Martini	RSE, Italy. Chairman of IEA-HTS-IA	Introductory talk (European energy perspective) (tentative)
2	Y. Yamada/ L. Martini	ISTEC, Japan	IEA-HTS-IA HTS Road Map Results for Power Applications
3	T. Okazaki	ISTEC, Japan	Wind-powered thermal energy system with superconductor
4	N. Chikumoto	Chubu Univ., Japan	DC HTS cable in Ishikari and future energy (tentative)
5	Y. Ogasawara	NEDO, Japan	The Important Future Research and Development Direction for Promoting the Commercialization of High Temperature Superconductivity
6	Y. F. Wu (YG)	NINMR, China	My research work and Prospect of Future Energy
7	D. Kumagai (YG)	Tokyo Univ., Japan	Innovative superconducting technology for next generation railway systems
8	M. Ainslie (YG)	Cambridge Univ., England	Practical, high field magnetization of bulk superconductor for engineering applications

First of all, Dr. Martini, chair of IEA-HTS-IA, made an address and explained the significance of the IEA-HTS-IA and this session.

The author (YY) introduced the results of a questionnaire regarding the practical application of high temperature superconductors for power application, which was undertaken at the IEA-HTS-IA. In particular, low cost wires are an important issue with a specific target of 10 US$/kAm in 2030, for Y-based wires aimed

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by both wire manufacturers and equipment application companies. Regarding equipment, fault current limiters and cables are most promising and their commercialization is aimed between 2025-2030.

Dr. Okazaki from ISTEC introduced a new wind heat power technology to transform the energy derived from wind power directly to heat. The present power generator employing a rotary wind turbine can instead, be replaced by a superconducting power generator (Electromagnetic induced heating effect by a magnetic field generated at the coil). Superconductor technology is therefore promising to realize a highly efficient wind heat power generator.

Prof. Chikumoto of Chubu University presented demonstration studies of high temperature superconducting DC power transmission systems currently undergoing the national project in Ishikari, Hokkaido. The project is aiming for highly efficient power transmission, employing Bi2223 wires connecting a solar power plant and a data center. This summer, this 500 m-long cable (capacity 5 kA, 50 MVA) successfully achieved a high capacity loading, confirming low loss of the cable (~1.5 W/m).

Dr. Ogasawara of Technology Strategy Center, NEDO, presented recent technology surveys pertaining to superconductivity. In particular, the surveys highlighted important issues that presently includes device application and its practical demonstration, which is extended from the development of superconducting wires. She also added the future major objectives of NEDO's high temperature superconductor development, including railways as device application, in-grid cables, and medical industry applications such as NMR and MRI (Photo 2).

Photo 2 A snapshot of the presentations (Dr. Ogasawara)

The three candidates selected for the Young Generation Awards are; Dr. Wu of Northwest Institute for Non-ferrous Metal Research who presented the development of MgB_2 and Bi2212 wires and Li-battery materials; Dr Kumagai from the University of Tokyo who presented how high temperature superconducting cables utilized for trains can contribute to energy savings in urban cities and efficiency of railway operation; and Dr Ainslie from the University of Cambridge who presented how the studies of bulk superconductors can be useful for motors and power generators. Each presenter highlighted an effective superconducting application towards future energy for mankind.

Photo 3 Recipients of Young Generation Award with their certificates (Drs. Wu, Kumagai, and Ainslie in the center) and Dr. Watanabe (right) of ISTEC and IEA-HTS-IA OA, and Dr. Martini (left) of the IEA-HTS-IA chair

After the session there was a social gathering that included the presenters and people associated with encouraging young researchers (Photo3 & 4). The participation of Dr. Kusunose/NEDO as Japan reprehensive of IEA, Dr. Kinoshita/NEDO, Prof. Amemiya of Kyoto University and Prof.

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Kiss of Kyushu University (ex-Chair and present –chair of International Committee of Cryogenics and Superconductivity Society of Japan) acted as motivation to encourage young researchers.

Photo 4 With award recipients. From the right in the first row: Amemiya, Ainslie, Ogasawara, Martini, Wu, Chikumoto, and Kumagai. From the right in the back row: Okazaki, Kiss, Kinoshita, Watanabe, Kusunose, and Yamada.

Top of Superconductivity Web21

