



**The 1st CSIS International Symposium
on Spintronics-based VLSIs**

and

**The 7th RIEC International Workshop
on Spintronics**

Date: February 3rd and 4th, 2011

Venue: Laboratory for Nanoelectronics and Spintronics,
4th Floor, Conference Room, Tohoku University,
Sendai, Japan

<http://www.csis.tohoku.ac.jp/>

Symposium Registration

Registration: E-mail to CSIS Support Office (sien@csis.tohoku.ac.jp) by January 17th, 2011.

Symposium Fee: Free

Banquet Registration

Advance Registration: E-mail to CSIS Support Office (sien@csis.tohoku.ac.jp) by January 17th, 2011.

Banquet Fee: 5,000 JPY
Banquet Fee will be collected on site at the Symposium

Sponsors

The symposium and the workshop are sponsored and supported by:

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- Ministry of Education, Culture, Sports, Science & Technology, Japan
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- Tsukuba Innovation Arena for Nanotechnology
- Research Institute of Electrical Communication (RIEC), Tohoku University

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PROGRAM

Thursday February 3rd, 2011

- Materials and Devices -

Opening 9:00 -9:15		Opening Remarks and Announcements
Invited talk 9:15-9:50	T1	Magnetic tunnel junction based orthogonal spin transfer devices <u>Andrew D. Kent</u> ¹ , Huanlong Liu ¹ , Daniel Bedau ¹ , Jordan Katine ² and Juergen Langer ³ (¹ New York University, ² Hitachi-GST, ³ Singulus Technologies)
Invited talk 9:50-10:25	T2	Materials design and science of magnetic tunnel junctions with perpendicular anisotropy electrodes for VLSIs <u>Shoji Ikeda</u> ^{1,2} , M. Yamanouchi ² , H. Sato ² , K. Miura ^{3,2,1} , K. Mizunuma ¹ , H. Yamamoto ³ , R. Koizumi ¹ , H. D. Gan ² , M. Endo ¹ , S. Kanai ¹ , J. Hayakawa ³ , F. Matsukura ^{1,2} , H. Ohno ^{1,2} (^{1,2} Tohoku University, ³ Hitachi)
10:25-10:45		Coffee Break
Invited talk 10:45-11:20	T3	Multiscale modeling for spintronics <u>Claudia K. A. Mewes</u> , William H. Butler, Tim Mewes (University of Alabama)
Invited talk 11:20-11:55	T4	Self-consistent calculations of spin transport and magnetization dynamics <u>Kyung-Jin Lee</u> ¹ , Hyun-Woo Lee ² , Jung-Hwan Moon ¹ , Seo-Won Lee ¹ , Kyoung-Whan Kim ² (¹ Korea University, ² Pohang University of Science and Technology)
11:55-13:30		Lunch
Invited talk 13:30-14:05	T5	Observation of intrinsic pinning mechanism in current-induced domain wall motion T. Koyama ¹ , D. Chiba ¹ , K. Ueda ¹ , H. Tanigawa ² , S. Fukami ² , T. Suzuki ² , N. Ohshima ² , N. Ishiwata ² , Y. Nakatani ³ , and <u>Teruo Ono</u> ¹ (¹ Kyoto University, ² NEC, ³ University of Electro-communications)
Invited talk 14:05-14:40	T6	Rashba Spin-Orbit torques in ferromagnetic thin films <u>Gilles Gaudin</u> ¹ , I. M. Miron ^{1,2} , T. Moore ^{1,3} , H. Szabolcs ¹ , S. Auffret ¹ , B. Rodmacq ¹ , L. D. Buda-Prejbeanu ¹ , A. Schuhl ¹ , S. Pizzini ³ , J. Vogel ³ , M. Bonfim ⁴ , P. Gambardella ^{2,5} (¹ SPINTEC, ² ICN-CSIC, ³ CNRS/UJF, ⁴ Universidade Federal do Paraná, ⁵ ICREA)
Invited talk 14:40-15:15	T7	Universality between current- and field-driven domain wall motion in ferromagnetic metallic nanowires Jae-Chul Lee ^{1,2} , Kab-Jin Kim ¹ , Jisu Ryu ³ , Kyoung-Woong Moon ¹ , Sang-Jun Yun ¹ , Gi-Hong Gim ¹ , Kang-Soo Lee ¹ , Kyung-Ho Shin ² , <u>Hyun-Woo Lee</u> ³ , and Sug-Bong Choe ¹ (¹ Seoul National University, ² KIST, ³ Pohang University of Science and Technology)
15:15-15:35		Coffee Break

Invited talk 15:35-15:55	T8	Domain wall motion cell with perpendicularly magnetized Co/Ni wire for high-speed memory and logic <u>Shunsuke Fukami</u> and N. Ishiwata (NEC)
Invited talk 15:55-16:15	T9	Temperature dependence of domain patterns observed in demagnetized CoFeB/MgO films with perpendicular anisotropy <u>Michihiko Yamanouchi</u> ¹ , A. Jander ^{2,3} , P. Dhagat ^{2,3} , S. Ikeda ^{1,3} , F. Matsukura ^{1,3} , and H. Ohno ^{1,3} (¹ Tohoku University, ² Oregon State University)
Invited talk 16:15-16:50	T10	NRI Spintronics Research for Beyond CMOS Technology <u>Dejan Markovic</u> (UCLA)
16:55-18:25	POSTER SESSION See pages 5 and 6	
Banquet 18:30-20:30	<i>Katahira Sakura Hall, Tohoku University</i>	

Friday February 4th, 2011

Spintronics-based LSIs

Invited talk 9:00-9:35	F1	Nonvolatile computer systems and memory hierarchy transformation with STT RAM technology <u>Tetsuo Endoh</u> ^{1,2} , S. Ikeda ^{1,3} , T. Hanyu ^{1,4} , N.Kasai ¹ and H.Ohno ^{1,3} (^{1,2,3,4} Tohoku University.)
Invited talk 9:35-10:10	F2	How spintronics and STT-RAM can benefit future mobile applications <u>Nick Yu</u> (Qualcomm)
Invited talk 10:10-10:45	F3	Design considerations and challenges of STT MRAM products R. Beach ¹ , G. Jan ¹ , <u>Po Kang Wang</u> ¹ , D. Tang ¹ , C. Horng ¹ , W. Kula ¹ , T. Torng ¹ , D.C. Worledge ² , J.Z. Sun ² , G. Hu ² , M. C. Gaidis ² , and W. J. Gallagher ² (¹ MagIC Technologies, ² IBM)
10:45-11:05	Coffee Break	
Invited talk 11:05-11:40	F4	Advances in materials and structures for STT-RAM <u>Vladimir Nikitin</u> , Dmytro Apalkov, Steven Watts, Alexey Khvalkovskiy, Xueti Tang, Alexander Driskill-Smith, Kiseok Moon, Adrian Ong, Daniel Lottis, Eugene Chen, Mohamad Krounbi (Grandis)
Invited talk 11:40-12:15	F5	High efficient and back hopping free STT writing on perpendicular MTJs <u>Hiroaki Yoda</u> ¹ , N. Shimomura ¹ , T. Kai ¹ , T. Kishi ¹ , H. Aikawa ¹ , M. Yoshikawa ¹ , T. Nagase ¹ , K. Nishiyama ¹ , E. Kitagawa ¹ , T. Daibou ¹ , M. Amano ¹ , S. Takahashi ¹ , M. Nakayama ¹ , S. Ikegawa ¹ , M. Nagamine ¹ , J. Ozeki ¹ , S. Yuasa ² , S. Mizukami ⁶ , Y. Ando ³ , Y. Suzuki ⁴ , Y. Nakatani ⁵ , T. Miyazaki ⁶ , and K. Ando ² (¹ Toshiba, ² AIST, ^{3,6} Tohoku University, ⁴ Osaka University, ⁵ University of Electro-Communications)
12:15-14:00	Lunch	
Invited talk 14:00-14:35	F6	Can the STT-MRAM replace a DRAM ? <u>Kijoon H. P. Kim</u> (Samsung Electronics)
Invited talk 14:35-15:10	F7	Status and outlook of MRAM technology <u>Brad N. Engel</u> , J.M. Slaughter, N.D. Rizzo, F.B. Mancoff, R. Whig, J.J. Sun, K. Smith, K. Nagel, and D. Houssameddine (Everspin Technologies)
Invited talk 15:10-15:45	F8	MTJ-based nonvolatile logic-in-memory architecture and its applications <u>Takahiro Hanyu</u> ^{1,2} , S. Matsunaga ¹ , D. Suzuki ¹ , M. Natsui ^{1,2} , S. Ikeda ^{1,3} , T. Endoh ^{1,4} , and H. Ohno ^{1,3} (^{1,2,3,4} Tohoku University)
Closing 15:45-15:50		Closing Remarks

Thursday February 3rd, 2011

POSTER SESSION 16:55-18:25

P1	Band structure and magneto- transport properties in II-VI nanostructures semiconductors. Application to infrared detector superlattices Abdelhakim Nafidi (University Ibn Zohr)
P2	Dependence of the exchange bias direction on the cooling-field strength Jangyup Son, Soogil Lee, Sanghoon Kim, and Jongill Hong (Yonsei University)
P3	Spin-transfer-torque dependence on MgO tunnel barrier thickness in MTJs W. Skowroński ¹ , T. Stobiecki ¹ , J. Wrona ¹ , G. Reiss ² , K. Chalapat ³ , G. S. Paraoanu ³ , and S. van Dijken ⁴ (¹ AGH University of Science and Technology, ² Bielefeld University, ^{3,4} Aalto University)
P4	Development of reconfigurable spin logic block based on SpRAM for 3D-stacked reconfigurable spin processor R. Nakazawa, H. Kino, K. Kiyoyama, T. Tanaka, and M. Koyanagi (Tohoku University)
P5	A post oxidation process of Mg layer for MgO barrier magnetic tunnel junctions H. Yamamoto ¹ , K. Ono ¹ , T. Morita ¹ , S. Ikeda ² , and H. Ohno ² (¹ ULVAC, ² Tohoku University)
P6	Structural and magnetic properties of Fe- and Mn-doped Si thin films Jooyoung Suh ¹ , Sang Woo Pak ¹ , Kyung Su Lee ¹ , Eun Kyu Kim ^{1*} , and Yoon Shon ² (¹ Hanyang University, ² Dongguk University)
P7	Well-width dependence of spin relaxation in InGaAs quantum wells Y. Kunihashi ¹ , M. Kohda ^{1,2} , and J. Nitta ¹ (¹ Tohoku University, ² PRESTO JST)
P8	Fabrication of PbPd_{1-x}Co_xO₂ spin gapless semiconductor films and investigation of their magnetic and transport properties Y. F. Chiang ² , H. L. Su ^{1,3} , S. Y. Huang ¹ , and J. C. A. Huang ^{1,2} (^{1,2} National Cheng Kung University, ³ Hefei University of Technology)
P9	Electron wave packet dynamics in the spin torque transfer Mitsuhiro Arikawa ^{1,2} , Yasuhiro Hatsugai ³ , and Kenji Shiraishi ³ (^{1,3} University of Tsukuba, ² CREST)
P10	Exchange biased magnetic tunnel junctions with thin CoFeB electrodes for in-plane and out-of-plane magnetic field sensing P. Wiśniowski ¹ , J. Wrona ¹ , W. Skowroński ¹ , T. Stobiecki ¹ , S. Cardoso ² , and P. Freitas ² (¹ AGH University of Science and Technology, ² INESC-MN and IN-Institute of Nanoscience and Nanotechnology)
P11	Gilbert magnetic damping constant of Co-based Heusler alloy thin films M. Oogane ¹ , T. Kubota ¹ , Y. Kota ¹ , S. Mizukami ² , H. Naganuma ¹ , A. Sakuma ¹ and Y. Ando ¹ (^{1,2} Tohoku University)

P12	<p>MgO magnetic tunnel junctions with a synthetic free layer consisting of CoFeB/Ru/ perpendicular magnet</p> <p>Yeon Sub Lee^{1,3}, <u>Byoung-Chul Min</u>^{*1}, Gyung Min Choi¹, Jürgen Langer², Berthold Ocker², Wolfram Maass², Young Keun Kim³, and Kyung-Ho Shin¹ (¹KIST, ²Singulus Technologies, ³Korea University)</p>
P13	<p>Exchange bias of multiferroic BiFeO₃ epitaxial films</p> <p>Hiroshi Naganuma, Mikihiro Oogane, and Yasuo Ando (Tohoku University)</p>
P14	<p>Spin torque diode effect of magnetic tunnel junction with synthetic ferrimagnetic free layer</p> <p>Nobuhito Inami¹, Hiroshi Naganuma¹, Mikihiro Oogane¹, Yasuo Ando¹, Shoji Ikeda^{2,3}, and Hideo Ohno^{2,3} (^{1,2,3}Tohoku University)</p>
P15	<p>Current driven domain wall dynamics in perpendicularly magnetized ultrathin CoFeB nanowires</p> <p>Masamitsu Hayashi¹, Jaivardhan Sinha¹, Carsen Kline¹ and Seiji Mitani¹ Shunsuke Fukami², and Nobuyuki Ishiwata² (¹NIMS, ²NEC)</p>
P16	<p>Influences of Boron composition on tunnel magnetoresistance properties of double-MgO-barrier magnetic tunnel junctions</p> <p>H. D. Gan¹, S. Ikeda^{1,2}, M. Yamanochi¹, K. Mizunuma², K. Miura^{3,1,2}, F. Matsukura^{1,2}, and H. Ohno^{1,2} (^{1,2}Tohoku University)</p>
P17	<p>Annealing effect on perpendicular magnetic anisotropy of CoFeB/MgO structure</p> <p><u>H. Sato</u>¹, R. Koizumi², M. Yamanouchi¹, S. Ikeda^{1,2}, K. Miura^{1,2,3}, K. Mizunuma², H. D. Gan¹, F. Matsukura^{1,2} and H. Ohno^{1,2} (^{1,2}Tohoku University, ³Hitachi)</p>
P18	<p>Annealing stability for tunnel magnetoresistance in MgO-CoFeB based magnetic tunnel junctions with perpendicular anisotropy CoFe/Pd multilayers</p> <p>Kotaro Mizunuma¹, Michihiko Yamanouchi², Shoji Ikeda^{1,2}, Hideo Sato², Hiroyuki Yamamoto³, Hua-Dong Gan², Katsuya Miura^{3,1,2}, Jun Hayakawa³, Fumihiro Matsukura^{1,2}, and Hideo Ohno^{1,2}(^{1,2}Tohoku University, ³Hitachi)</p>
P19	<p>Modulation of magnetic anisotropy in Ta/Co₄₀Fe₄₀B₂₀/MgO by electric fields: thickness and annealing temperature dependences</p> <p>S. Kanai¹, M. Endo¹, S. Ikeda^{1,2}, F. Matsukura^{1,2}, H. Ohno^{1,2}(^{1,2}Tohoku University)</p>
P20	<p>Buffer layer dependence of magnetic domain wall creep in (Ga,Mn)As</p> <p>A. Suzuki¹, A.Kanda¹, F. Matsukura^{1,2}, H. Ohno^{1,2} (^{1,2}Tohoku University)</p>
P21	<p>MTJ edge deformation influence on switching current distribution for a shaped-varying MTJ switched with magnetic field</p> <p>H. Honjo S. Saito , R. Nebashi, N. Sakimura, S. Miura*, and T. Sugibayashi (NEC)</p>
P22	<p>Chemical modification of magnetic thin film during alcohol-based plasma etching</p> <p>Keizo Kinoshita, K. Suemitsu, N. Ohshima, N. Ishiwata, T. Sugibayashi (NEC)</p>