

東北大学 電気通信研究所  
**研究室外部評価 参考資料**  
(2013 年度-2018 年度)

**Research Laboratory Reference Data  
for External Review**

April 2013 – March 2019  
(FY. 2013–2018)

**Research Institute of Electrical Communication  
Tohoku University**

生体電磁情報研究室

Electromagnetic Bioinformation Engineering

分野や研究室の事情に合わせて、エビデンスとなる資料を下の例に従ってまとめてください。

## 1. 研究成果 / Research Achievements

### 1) 査読付学術論文 / Refereed journal papers

- 1) H. Kikuchi, J. Kumano, T. Nakai, Y. Onodera, S. Hashi, K. Ishiyama, "Effects of the Edge Shape of the Elements on the Properties of Stepped Giant Magnetoimpedance," *IEEE Transactions on Magnetics*, Vol. 49, No. 7, July, pp. 4044-4047 (2013).
- 2) S. H. Kim, K. S. Shin, S. Hashi, K. Ishiyama, "A Pushing Force Mechanism of Magnetic Spiral-Machine for Wireless Medical-Robots in Therapy and Diagnosis," *IEEE Transactions on Magnetics*, Vol. 49, No. 7, July, pp. 3488-3491 (2013).
- 3) J. W. Shin, S. H. Kim, S. Hashi, K. Ishiyama, "Dependence of the magnetic anisotropy on the ratio of the thicknesses of the magnetic and conductive layers," *Journal of the Korean Physical Society*, Vol. 63, No. 3, August, pp. 676-680 (2013).
- 4) T. Fukushi, S. H. Kim, S. Hashi, K. Ishiyama, "Magnetic Silicone Rubber: Fabrication and Analysis with Application," *Journal of the Korean Physical Society*, Vol. 63, No. 3, August, pp. 686-690 (2013).
- 5) S. H. Kim, S. Hashi, K. Ishiyama, Y. Shiraiishi, Y. Hayatus, M. Akiyama, Y. Saiki, T. Yambe, "Preliminary validation of a new magnetic wireless blood pump," *Artificial Organs*, Vol. 37, Issue 10, October, pp. 920-926 (2013).
- 6) H. Kikuchi, Y. Takahashi, K. Takahashi, T. Nakai, S. Hashi, K. Ishiyam, "Effects of the easy axis direction on magnetoimpedance properties of thin films with uniaxial anisotropy," *Journal of Applied Physics*, Vol. 115, No. 17, January, 17A303 (2014).
- 7) J. Shin, Y. Miwa, S. Kim, S. Hashi, K. Ishiyama, "Analysis of Thin-Film MI sensor using the Variations in Impedance and the Magnetic Domain Structure," *Journal of Applied Physics*, Vol. 115, No. 17, January, 17E507 (2014).
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- 9) T. Fukushi, S. H. Kim, S. Hashi, K. Ishiyama, "Preliminary validation of SmFeB-magnetic silicone rubber for a flexible magnetic actuator," *Smart Materials and Structures*, Vol. 23, No. 6, June, 067001, (2014).
- 10) J. Shin, Y. Miwa, K. H. Kim, S. Hashi, K. Ishiyama, "Observation of the magnetic properties according to changes in the shape of thin-film giant magnetoimpedance sensor," *IEEE Transactions on Magnetics*, Vol. 50, No. 11, November, p. 4005603 (2014).
- 11) H. Kikuchi, S. Kamata, K. Takahashi, T. Nakai, S. Hashi, K. Ishiyam, "Investigation of driving power dependence on GMI properties of thin film elements with uniaxial anisotropy," *IEEE Transactions on Magnetics*, Vol. 51, No. 1, p. 4001204, January (2015).

- 12) Y. Miwa, J. Shin, Y. Hayashi, S. Hashi, K. Ishiyama, "Basic study of fabricating high sensitive strain sensor using magnetostrictive thin film on Si wafer," *IEEE Transactions on Magnetics*, Vol. 51, No. 1, p. 2000604, January (2015).
- 13) S. Yabukami, K. Takahashi, T. Ozawa, O. Fujioka, T. Nagano, S. Hashi, H. Kanetaka, "Tracking system for magnetic wireless marker using field programmable gate array," *Journal of the Magnetics Society of Japan*, Vol. 39, No. 4, pp.156-160 (2015).
- 14) Y. Hayashi, S. Hashi, H. Kura, T. Yanai, T. Ogawa, K. Ishiyama, M. Nakano, H. Fukunaga, "Electrochemical fabrication of nanocomposite films containing magnetic metal nanoparticles," *Japanese Journal of Applied Physics*, Vol. 54, p. 075201, June (2015).
- 15) H. Kikuchi, S. Kamata, T. Nakai, S. Hashi, K. Ishiyama, "Influence of demagnetizing field on thin-film GMI magnetic sensor elements with uniaxial magnetic anisotropy," *Sensors and Actuators A: Physical*, Vol. 230, No. 7, July, pp. 142-149 (2015).
- 16) H. Kikuchi, S. Kamata, S. Oe, T. Nakai, S. Hashi, K. Ishiyama, "Improvement of Stepped Magnetoimpedance Properties by Controlling the Demagnetizing Effect," *IEEE Transactions on Magnetics*, Vol. 51, No. 1, November, 4004304 (2015).
- 17) J. Huang, T. Mori, K. Takashima, S. Hashi, Y. Kitamura, "IM6D: Magnetic Tracking System with 6-DOF Passive Markers for Dexterous 3D Interaction and Motion," *ACM Transactions on Graphics*, Vol. 34, No. 6, 217, November (2015).
- 18) H. Kikuchi, S. Oe, H. Uetake, S. Yabukami, T. Nakai, S. Hashi, K. Ishiyama, "Enhancement of Sensitivity on Miniaturized Thin-film Magnetoimpedance with Ellipsoidal Element," *Physics Procedia*, Vol. 75, pp. 1271-1278 (2015).
- 19) J. Huang, T. Mori, K. Takashima, S. Hashi, Y. Kitamura, "6-DOF computation and marker design for magnetic 3D dexterous motion-tracking system," *VRST '16 Proceedings of the 22nd ACM Conference on Virtual Reality Software and Technology*, pp. 211-217, November 02 - 04, (2016).
- 20) H. Kikuchi, S. Kamata, C. Sumida, T. Nakai, S. Hashi, K. Ishiyama, "Enhancement of impedance change at low frequency in a thin-film magnetoimpedance element," *Journal of Magnetism and Magnetic Materials*, Vol. 420, pp. 269-274, December 15 (2016).
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- 22) H. Kikuchi, C. Sumida, H. Uetake, S. Yabukami, S. Hashi, K. Ishiyama, "Analysis of thin-film magnetoimpedance behavior in low MHz regions based on domain wall equation and bias susceptibility theory," *AIP Advances*, Vol. 7, 056617, January 4 (2017).
- 23) Y. Osaki, S. Hashi, S. Yabukami, H. Kanetaka, K. Ishiyama, "Wireless magnetic position-detection system with four excitation coils," *IEEE Sensors Journal*, Vol. 17, No. 14, pp. 4412-4419 (2017).

- 24) H. Kikuchi, C. Sumida, T. Nakai, S. Hashi, K. Ishiyama, "Effects of dc bias current on behaviors and sensitivity of thin-film magnetoimpedance element," *IEEE Transactions on Magnetics*, Vol. 53, No. 11, 4003704 (2017).
- 25) J. Ma, S. Muroga, Y. Endo, S. Hashi, M. Naoe, H. Yokoyama, Y. Hayashi, K. Ishiyama, "Noise suppression and crosstalk analysis of on-chip magnetic film-type noise suppressor," *AIP Advances*, Vol. 8, 056613 (2018).
- 26) Yoshiaki Hayashi, Tomoyuki Ogawa, and Kazushi Ishiyama, "Preparation and characterization of SiO<sub>2</sub>-coated submicron-sized L10 Fe-Pt particles," *AIP Advances*, Vol. 8, 056416 (2018).
- 27) S. Fujieda, S. Asano, S. Hashi, K. Ishiyama, T. Fukuda, S. Suzuki, "Significant reduction in Young's modulus of Fe-Ga alloy single crystal by inverse magnetostrictive effect under tensile stress," *Journal of Applied Physics*, Vol. 124, 233901 (2018).
- 28) Y. Kubo, S. Hashi, H. Yokoi, K. Arai, K. Ishiyama, "Development of Strain and Vibration Sensor using Magnetostriction of Magnetic Thin Film," *IEEJ Transactions on Sensors and Micromachines*, Vol. 138, No. 4, pp. 153-158 (2018).
- 29) J. Ma, S. Muroga, Y. Endo, S. Hashi H. Yokoyama Y. Hayashi, K. Ishiyama, "Analysis of Magnetic Film-Type Noise Suppressor Integrated on Transmission Lines for On-Chip Crosstalk Evaluation," *IEEE Transactions on Magnetics*, Vol. 54, No. 6, 2800404 (2018).

2) 原著論文と同等に扱う査読付国際会議発表論文

Full papers in refereed conference proceedings equivalent to journal papers

- 1) J. Huang, K. Takashima, S. Hashi, Y. Kitamura, "IM3D: Magnetic Motion Tracking System for Dexterous 3D Interactions," *ACM SIGGRAPH2014, Emerging Technologies*, Article No. 12, (2014). August 10-14, Vancouver (Canada) (Demonstration category, Acceptance rate: 20%)

3) 査読付国際会議 / Papers in refereed conference proceedings

- 1) T. Fukushi, S. H. Kim, S. Hashi, K. Ishiyama, "Preliminary validation of SmFeN-magnetic silicone rubber for a magnetic wireless actuator," *ISAMMA2013, SF-10*, (2013).
- 2) J. W. Shin, S. H. Kim, S. Hashi, K. Ishiyama, "Fabrication of thin-film MI sensor using difference of thermal expansion coefficient in trilayer," *ISAMMA2013, EB-07*, (2013).
- 3) S. H. Kim, J. W. Shin, S. Hashi, K. Ishiyama, "Synchronous magnetic axial coupling and magnetic suspension for magnetic wireless blood pump," *ISAMMA2013, UE-07*, (2013).
- 4) Y. Murakami, S. Agatsuma, S. Hashi, K. Ishiyama, "Magnetic properties of non-oriented Si-Fe sheets under uniform in-plane stress," *SMM21, C1-12*, (2013).

- 5) S. Hashi, Y. Miwa, G. Kitazawa, J. W. Shin, S. Agatsuma, K. Ishiyama, "Arbitrary Anisotropy Control of Magnetostrictive Film Using Non Magnetic Laminated Layer," SMM21, F2-02, (2013).
- 6) H. Kikuchi, Y. Takahashi, K. Takahashi, T. Nakai, S. Hashi, K. Ishiyama, "Effects of the easy axis direction on magnetoimpedance properties of thin films with uniaxial anisotropy," 58th MMM, AR-06, (2013).
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- 8) Y. Hayashi, W. Goto, S. Hashi, K. Ishiyama, "Nanostructure of Composite Film Embedded Co-ferrite Nanoparticles Prepared by Combination of EPD and Electroplating," 58th MMM, DV-12, (2013).
- 9) T. Fukushi, S. Kim, S. Hashi, K. Ishiyama, "SmFeN-Magnetic Silicone Rubber for Artificial Muscle," 58th MMM, EW-10, (2013).
- 10) J. Shin, S. H. Kim, S. Hashi, K. Ishiyama, "Observation of the magnetic properties according to changes in the shape of thin-film MI sensor," INTERMAG2014, BU-17, (2014).
- 11) Y. Hayashi, S. Hashi, T. Yanai, K. Ishiyama, M. Nakano, H. Fukunaga, "Magnetic Properties of Composite Film Composed of Soft Magnetic Nanoparticles and L10FePt Film," INTERMAG2014, CF-8, (2014).
- 12) S. H. Kim, J. W. Shin, S. Hashi, K. Ishiyama, "Synchronous magnetic radial coupling for magnetic multiple-pump operation," INTERMAG2014, GP-8, (2014).
- 13) S. H. Kim, J. W. Shin, S. Hashi, K. Ishiyama, "Multi-scale spiral-type magnetic machine for fluid manipulation," INTERMAG2014, HS-15, (2014).
- 14) H. Kikuchi, S. Kamata, T. Nakai, S. Hashi, K. Ishiyama, "Dependence of sensing position on the MI properties of elements fabricated using thin-film with uniaxial anisotropy," INTERMAG2014, GW-05, (2014).
- 15) J. Shin, Y. Miwa, S. H. Kim, S. Hashi, K. Ishiyama, "A study of the influence of the magnetostriction constant on magnetic anisotropy of MI sensor using magnetostrictive film," EMSA2014, MP51, (2014).
- 16) Y. Miwa, J. Shin, Y. Hayashi, S. Hashi, K. Ishiyama, "Basic study of fabricating high sensitive strain sensor using magnetostrictive thin film on Si wafer," EMSA2014, MP52, (2014).
- 17) H. Kikuchi, S. Kamata, Y. Takahashi, T. Nakai, S. Hashi, K. Ishiyama, "Investigation of driving power dependence on MI properties of thin-film elements with uniaxial anisotropy," EMSA2014, TP17, (2014).
- 18) Y. Hayashi, S. Hashi, T. Yanai, K. Ishiyama, M. Nakano, H. Fukunaga "Study of post annealing conditions for having high corecivity of electrodeposited FePt thin film on Molybdenum underlayer," 59th MMM, AV-11, (2014).

- 19) S. Kamata, H. Kikuchi, T. Nakai, S. Hashi, K. Ishiyama, "Enhancement of impedance change in low frequency on thin-film magnetoimpedance element," 59th MMM, BR-03, (2014).
- 20) Y. Hayashi, S. Hashi, H. Kura, T. Yanai, T. Ogawa, K. Ishiyama, M. Nakano, H. Fukunaga "Fabrication and magnetic properties of composite film utilizing metal magnetic nanoparticles by electrochemical method," 59th MMM, FR-15, (2014).
- 21) S. Kim, S. Hashi, K. Ishiyama, "Application of bonded magnets: a tiny magnetic wireless pump for medical application," 59th MMM, HW-15, (2014).
- 22) H. Kikuchi, S. Kamata, S. Oe, T. Nakai, S. Hashi, K. Ishiyama, "Improvement of stepped magnetoimpedance properties by controlling demagnetizing effect," INTERMAG2015, FR-04, (2015).
- 23) Y. Hayashi, S. Hashi, H. Kura, T. Yanai, T. Ogawa, K. Ishiyama, M. Nakano, H. Fukunaga, "Fe-Pt / Fe-Co Nanocomposite films fabricated by electrochemical method," ICM2015, TU.H-P37, (2015).
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- 25) S. Kim, C. Yu, S. Hashi, K. Ishiyama, K. Kim, "Magnetic microrobot with dual-spiral mechanisms for stent transportation and installation," 13th Joint MMM-Intermag, ER-08, (2016).
- 26) S. Hashi, H. Yokoi, K. Ishiyama, "Stability of anisotropy of FeSiB magnetostrictive films induced by thermal stress," 13th Joint MMM-Intermag, FD-12, (2016).
- 27) C. Sumida, H. Kikuchi, H. Uetake, S. Yabukami, S. Hashi, K. Ishiyama "Analysis of thin-film magnetoimpedance behavior at low MHz region based on domain wall equation and bias susceptibility theory," 61th MMM, DU-03, (2016).
- 28) C. Sumida, H. Kikuchi, S. Hashi, K. Ishiyama, T. Nakai, "Effect of DC bias current on sensitivity of thin-film magnetoimpedance element," INTERMAG2017, FR-03, (2017).
- 29) S. Hashi, Y. Osaki, S. Yabukami, H. Kanetaka, K. Ishiyama, "Improvement of detection accuracy of magnetic marker of wireless magnetic motion capture system using multi-excitation method," INTERMAG2017, GP-10, (2017).
- 30) M. Jingyan, S. Muroga, Y. Endo, S. Hashi, Y. Hayashi, K. Ishiyama, "Crosstalk Analysis of On-chip Magnetic Film-type Noise Suppressor," 62th MMM, CI-14, (2017).
- 31) Y. Hayashi, K. Ishiyama, "Preparation and characterization of SiO<sub>2</sub>-coated submicron-sized L10 Fe-Pt particles," 62th MMM, GV-01, (2017).
- 32) Jingyan Ma, Sho Muroga, Yasushi Endo, Shuichiro Hashi, Yoshiaki Hayashi, Kazushi Ishiyama, "Characteristic Length Analysis of Magnetic Film-type Noise Suppressor Integrated on

Transmission Lines for On-chip Crosstalk Evaluation,” The 4th International Symposium on Advanced Magnetic Materials and Applications (ISAMMA 2017), MMA-O6, (2017).

- 33) S. Hashi, D. Sora, Y. Kubo, K. Arai, K. Ishiyama, “Anisotropy control of magnetostrictive film using thermal stress and its application for sensor device,” CW-07, INTERMAG2018, (2018).
- 34) H. Yokoyama, Y. Hayashi, K. Kusunoki, S. Hashi, K. Ishiyama, “Magneto-impedance properties of thin-film sensors using CoNbZr/SiO<sub>2</sub> multilayer films,” JEMS2018, P-C.030, (2018).

4) 査読なし国際会議・シンポジウム等 / Papers in conference proceedings

5) 総説・解説 / Review articles

6) 査読付国内会議 / Refereed proceedings in domestic conferences

- 1) Y. Kubo, S. Hashi, H. Yokoi, K. Arai, K. Ishiyama, "Development of Strain and Vibration Sensor using Magnetostriction of Magnetic Thin Film," IEEJ 34<sup>th</sup> SENSOR SYMPOSIUM on Sensors Micromachines and Applied Systems, 31p3-PS-60, Oct. 31, 2017.

7) 査読なし国内研究会・講演会 / Proceedings in domestic conferences

- 1) Y. Miwa, G. Kitazawa, J. W. Shin, S. Hashi, K. Ishiyama, “Study on magnetic anisotropy of magnetostrictive film by difference of thermal expansion coefficient,” The 37th Annual Conference on MAGNETICS in Japan (Hokkaido University), 3pA-10, p. ?, Sep. 3, 2013.
- 2) Y. Hayashi, W. Goto, S. Hashi, K. Ishiyama, “Study on fabrication of composite magnetic film utilizing metal nanoparticles,” The 37th Annual Conference on MAGNETICS in Japan (Hokkaido University), 6aD-4, p. ?, Sep. 6, 2013.
- 3) (9) T. Chiba, S. Yabukami, T. Ozawa, H. Kanetaka, Y. Shimizu, S. Hashi, “Position Sensing System of Wireless Magnetic Ribbon Type Marker,” The 37th Annual Conference on MAGNETICS in Japan (Hokkaido University), 5aF-3, p. ??, Sep. 5, 2013.
- 4) T. Fukushi, S.H.Kim, S. Hashi, K. Ishiyama, “Research and development of magnetic actuator using the magnetic silicone rubber,” Special Spinics meeting 2013 (Iwate University), 13-18-9, p. 20, Oct. 18, 2013.
- 5) Y. Miwa, G. Kitazawa, J. W. Shin, S. Hashi, K. Ishiyama, “Study on magnetic anisotropy of magnetostrictive film considering thermal expansion of the substrate,” Special Spinics meeting 2013 (Iwate University), 13-18-10, p. 21, Oct. 18 2013.
- 6) Y. Murakami, S. Agatsuma, S. Hashi, K. Ishiyama, “The variation in magnetic properties of non-oriented silicon steel sheets by isotropic in-plane stress,” The Papers of Technical Meeting on “Magnetics” IEE Japan (Tokyo), MAG-13-144, p. ??-??, Dec. 17, 2013.

- 7) S. Myou, H. Yamada, S. Hashi, K. Ishiyama, Y. Kitamura, T. Suzuki, "Magnetic properties of FeSiB ribbon under stress," The 2014 Annual Meeting of the Institute of Electrical Engineering of Japan (Ehime university), 2-130, March. 19, 2014.
- 8) M. Naoe, S. Ohnuma, N. Kobayashi, T. Iwasa, K. Arai, H. Masumoto, T. Yamakami, Y. Hashimoto, Y. Murakami, S. Hashi, K. Ishiyama, "Relationship between Magnetic Properties and Nano-Structure of Soft Magnetic CoPd-CaF<sub>2</sub> Nano-Granular Film," The 2014 Annual Meeting of the Institute of Electrical Engineering of Japan (Ehime university), 2-153, March. 20, 2014.
- 9) Y. Hayashi, H. Yokoi, S. Hashi, H. Kura, T. Yanai, T. Ogawa, K. Ishiyama, M. Nakano, H. Fukunaga, "Study on fabrication of composite film composed of FeCo nanoparticles and FePt electroplated film," The 38th Annual Conference on Magnetism in Japan, 2pE-13, p102, Sep. 2, 2014.
- 10) K. Takahashi, S. Yabukami, T. Ozawa, O. Fujioka, S. Hashi, H. Kanetaka, "Position Sensing System of Wireless Magnetic Marker using FPGA board," The 38th Annual Conference on Magnetism in Japan, 3pD-4, p. 173, Sep. 3, 2014.
- 11) S. Kamata, H. Kikuchi, T. Nakai, S. Hashi and K. Ishiyama, "Enhancement of sensitivity in low frequency region on High-Frequency Carrier-Type Thin-film Magnetic Field Sensor," The 38th Annual Conference on Magnetism in Japan, 5pD-2, p. 351, Sep. 5, 2014.
- 12) H. Yokoi, Y. Kubo, S. Hashi, K. Ishiyama, "Thin film strain sensor using inverse-magnetostriction effect on Si wafer," Special Spinics meeting 2015 (Shinsyu University), 15-5-19, p. 19, Nov. 20, 2015.
- 13) Akito Honda, Kazushi Ishiyama, Shuichiro Hashi, Hajime Yokoi, "AMR properties of magnetic thin film with induced magnetic anisotropy," The 2015 Joint Meeting of the Institute of Electrical Engineering of Japan Tohoku Branch (Iwate Prefectural University), 2E11, Aug. 28, 2015.
- 14) H. Yokoi, Y. Kubo, S. Hashi, K. Ishiyama, "Thin film strain sensor using inverse-magnetostriction effect on Si wafer," The 39th Annual Conference on MAGNETICS (Nagoya University), 08pD-6, p. 60, Sep. 8, 2015.
- 15) W. Goto, S. Hashi, K. Ishiyama, "An invention of the magnetically-bended guidewire by a low magnetic field," The 39th Annual Conference on MAGNETICS (Nagoya University), 08pE-15, p. 84, Sep. 8, 2015.
- 16) Y. Osaki, S. Hashi, S. Yabukami\*, H. Kanetaka, K. Ishiyama, "Motion capture system for tracking motion of hand work," The 39th Annual Conference on MAGNETICS (Nagoya University), 8pD-9, p. 63, Sep. 8, 2015.
- 17) S. Oe, H. Kikuchi, H. Uetake, S. Yabukami, T. Nakai, S. Hashi, K. Ishiyama, "Miniaturization of thin-film based magnetic field sensor with high sensitivity by controlling distribution of



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- 18) Akito Honda, Yokoi Hajime, Hashi Shuichiro, Ishiyama Kazushi, “The AMR film sensor with induced magnetic anisotropy,” 2-129, p. 153, Mar. 18, 2016.
  - 19) Gengjian Lou, Nobuyasu Adachi, Takeshi Kato, Satoshi Iwata, Yuto Matsumoto, Shuichiro Hashi, Kazushi Ishiyama, Takahashi Ishibashi, “FMR measurements of highly bismuth-substituted neodymium iron garnet thin films,” The 77th JSPS (The Japan Society of Applied Physics) Autumn Meeting (Niigata•Toki Messe), 13p-P8-24, p. ??, Sep. 13, 2016.
  - 20) S. Fujieda, S. Asano, S. Suzuki, S. Hashi, K. Ishiyama, T. Fukuda, The Japan Institute of Metals and Materials 2016 Fall (159th) Annual Meeting (Osaka Univ.), 401, p. X, Sep. 21, 2016.
  - 21) H. Yokoi, Y. Kubo, S. Hashi, K. Ishiyama, “Anisotropy control of thin film strain sensor using inverse-magnetostriction effect,” Special Spinics meeting 2016 (Tohoku Gakuin Univ.), 16-4-9, p. 9, Nov. 21, 2016.
  - 22) Y. Osaki, S. Hashi, H. Kanetaka, K. Ishiyama, S. Yabukami, “Study of excitation method for wireless position detecting system using LC resonant magnetic marker,” The Papers of Technical Meeting on “Magnetics” IEE Japan (Kyushu Univ.), MAG-16-237, pp. 88-92, Dec. 8, 2016.
  - 23) C. Sumida, H. Kikuchi, H. Uetake, S. Yabukami, S. Hashi, K. Ishiyama, “Possibility of thin-film magnetoimpedance by direct driven current at MHz region using magnetic domain resonance,” The 40th Annual Conference on MAGNETICS in Japan (Kanazawa Univ.), 06pB-9, p. 99, Sep. 6, 2016.
  - 24) Y. Matsumoto, S. Hashi, K. Ishiyama, “High frequency near magnetic field distribution measurement using burst modulated pulsed laser,” The Papers of Technical Meeting on “Magnetics” IEE Japan (Keio Univ.), MAG-16-216, pp. 17-20, Dec. 12, 2016.
  - 25) Y. Matsumoto, S. Hashi, K. Ishiyama, “AC magnetic field measurement using pulse laser burst modulation,” The 40<sup>th</sup> Annual Conference on MAGNETICS in Japan (Kanazawa Univ.), 06pB-8, p. 98, Sep. 6, 2016.
  - 26) Y. Osaki, S. Hashi, S. Yabukami, H. Kanetaka, K. Ishiyama, “Study for improvement of detection ability of position-detecting system using multi excitation coils,” The 40<sup>th</sup> Annual Conference on MAGNETICS in Japan (Kanazawa Univ.), 06pB-11, p. 101, Sep. 6, 2016.
  - 27) Gengjian Lou, Yuto Matsumoto, Shuichiro Hashi, Kazushi Ishiyama, Takeshi Kato, Satoshi Iwata, Nobuyasu Adachi, Tomoyasu Taniyama, Takayuki Ishibashi, “,” The 64th JSPS (The Japan Society of Applied Physics) Spring Meeting (Kanagawa•Pacifico Yokohama), 17a-501-10, p. ??, Mar. 17, 2017.
  - 28) (35) S. Fujieda, S. Asano, T. Kawamata, S. Suzuki, S. Hashi, K. Ishiyama, T. Fukuda, The Japan Institute of Metals and Materials 2017 Fall (161th) Annual Meeting (Hokkaido Univ.), 173, p. X, Sep. 8, 2017.

- 29) Y. Hayashi, K. Ishiyama, "Preparation of core/shell particles using sub-micron sized Fe-Pt particles," The 41<sup>st</sup> Annual Conference on MAGNETICS in Japan (Kyusyu Univ.), 20pB-1, p. 72, Sept. 20, 2017.
- 30) Y. Kubo, K. Arai, S. Hashi, K. Ishiyama, "Application of strain sensor using inverse-magnetostriction effect to vibration sensor," The 41<sup>st</sup> Annual Conference on MAGNETICS in Japan (Kyusyu Univ.), 21aD-7, p. 173, Sept. 21, 2017.
- 31) K. Kusunoki, H. Yokoyama, S. Hashi, Y. Hayashi, K. Ishiyama, "Study on Lamination Structured Magneto-Impedance Sensor Using Conductive Layer," The 41<sup>st</sup> Annual Conference on MAGNETICS in Japan (Kyusyu Univ.), 21aD-8, p. 174, Sept. 21, 2017.
- 32) Y. Matsumoto, D. Tatsuoka, K. Arai, Y. Hayashi, S. Hashi, K. Ishiyama, "Near magnetic field measurement of high frequency circuit element by pulsed laser burst modulation," The 41<sup>st</sup> Annual Conference on MAGNETICS in Japan (Kyusyu Univ.), 21pD-1, p. 179, Sept. 21, 2017.
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- 34) K. Kusunoki, H. Yokoyama, S. Hashi, Y. Hayashi, K. Ishiyama, "Sensitivity Improvement of Lamination Structured Magneto-Impedance Sensor Using Conductive Layer," Special Spinics meeting 2017 (Akita Univ.), 17-5-2, p. 2, Nov. 27, 2017.
- 35) S. Hayashi, K. Ishiyama, "Preparation of L1<sub>0</sub> Fe-Pt/SiO<sub>2</sub>-core/shell particles" Special Spinics meeting 2017 (Akita Univ.), 17-5-5, p. 5, Nov. 27, 2017.
- 36) Y. Matsumoto, D. Tatsuoka, K. Arai, Y. Hayashi, S. Hashi, K. Ishiyama, "Measurement of near magnetic field around high frequency circuit using burst modulated pulsed laser," Special Spinics meeting 2017 (Akita Univ.), 17-5-2, p. 27, Nov. 27, 2017.
- 37) Y. Hayashi, K. Ishiyama, "Fabrication of nanostructured magnetic materials using nanoparticles," The Papers of Technical Meeting on "Magnetics" IEE Japan (Tohoku Univ.), MAG-17-141, Nov. 16, 2017.
- 38) Gengjian Lou, Jion Yamakita, Masami Nishikawa, Yuto Matsumoto, Shuichiro Hashi, Kazushi Ishiyama, Nobuyasu Adachi, Takeshi Kato, Satoshi Iwata, Takayuki Ishibashi, "Characterization of magnetic anisotropy and high-frequency properties of Nd<sub>0.5</sub>Bi<sub>2.5</sub>Fe<sub>5-y</sub>Ga<sub>O<sub>12</sub></sub> thin films on glass substrates," The 65th JSPS (The Japan Society of Applied Physics) Spring Meeting (Waseda Univ.), 19p-D104-15, p. ??, Mar. 19, 2018.
- 39) S. Fujieda, S. Asano, T. Kawamata, S. Suzuki, R. Umetsu, S. Hashi, K. Ishiyama, T. Fukuda, The Japan Institute of Metals and Materials 2018 Spring (162th) Annual Meeting (Chiba Institute of Technology), 267, p. X, Mar. 20, 2018.
- 40) S. Fujieda, S. Asano, R. Simura, S. Hashi, K. Ishiyama, T. Fukuda, S. Suzuki, "Modulation of magnetic-domain structure of Fe-Ga alloy single crystal by applying tensile and compression

stresses parallel to a <100> direction,” The 42th Annual Conference on MAGNETICS in Japan (Nihon Univ.), 14aC-5, p. 249, Sept. 14, 2018.

- 41) S. Hashi, D. Sora, Y. Kubo, K. Arai, K. Ishiyama, “Anisotropy induce method using inverse magnetostrictive effect of amorphous magnetic film and their sensor application,” The Papers of Technical Meeting on “Magnetics” IEE Japan, MAG-18-186, pp. 13-16, Dec. 11 2018.
- 42) Y. Hayashi, K. Ishiyama, “Effect of annealing conditions on the structure and magnetic properties of SiO<sub>2</sub>-coated submicron-sized Fe-Pt particles,” The Papers of Technical Meeting on “Magnetics” IEE Japan (Tokyo), MAG-18-193, pp. ??-??, Dec. 17, 2018.
- 43) D. Sora, Y. Kubo, K. Arai, S. Hashi, K. Ishiyama, “Application of strain sensor using inverse-magnetostriction effect to vibration sensor,” Special Spinics meeting 2018 (Tohoku Univ.), 18-4-7, p. 7, Nov. 15, 2018.

## 8) 著書 / Books

- 1) 書名：「改訂 磁気工学の基礎と応用」, ISBN : 978-4-339-00856-2  
著者：電気学会マグネティックス技術委員会 編  
共著 Prof. K. Ishiyama, Assoc. Prof. S. Hashi, and others

## 9) 特許 / Patents

### i) Patents filed

- 1) 特開 2014-135876 モータ用制御装置、制御機能付きモータ、モータシステム及びポンプシステム（公開日：2014年7月24日）  
金性勲, 石山和志, 栢修一郎

### ii) Patents awarded

## 10) 招待講演 / Invited Talks

### Prof. K. Ishiyama:

- “Visualization of RF magnetic near-field,” International Association for the science of electrical, transport and optical properties of inhomogeneous media (ETOPIM11), (Kraków, Ukuraina, July 16-20, 2018)

### Assoc. Prof. S. Hashi:

- “Sensor application of inverse magnetostriction effect of soft magnetostrictive film” The 5th International Conference of Asian Union of Magnetics Societies (IcAUMS 2018), (Jeju, Korea, June 3-7, 2018)

## 2. 学会活動 / Activities in academic societies

### (1) 学会役員等の活動 / Activities on committees of academic societies

Prof. K. Ishiyama:

- 1) IEEJ (The Institute of Electrical Engineers of Japan) / Board Member, Apr. 2008-present, Organize the society
- 2) Magnetics Society of Japan /
- 3) IEEE Magnetics Society Sendai/Sapporo Joint Chapter / Chair, Jan. 2016-Dec. 2016

Assoc. Prof. S. Hashi:

- 1) IEEJ Tohoku branch / Treasurer, Apr. 2014-Mar. 2016, Organize the branch
  - 2) IEEE Magnetics Society Sendai/Sapporo Joint Chapter /  
Vice chair, Jan. 2013-Dec. 2013  
Secretary/Treasurer, Jan. 2017-Dec. 2017  
Treasurer, Jan. 2018-Jul. 2019
  - 3) IEEJ Technical meeting –Magnetics– member  
Jul. 2010-Jun. 2013 ナノスケール磁性材料の新機能性の評価と応用調査専門委員会  
Jul. 2013-Jun. 2016 ナノスケール磁性体の新物性と新機能性の応用調査専門委員会  
Jul. 2016-Jun. 2019 ナノスケール磁性体の構造・組織解析と創製調査専門委員会
- (2) 学術的国際会議の企画・運営  
Planning and organizing academic international conferences.

- (3) 学術論文誌の編集・査読 / Editor and reviewer for academic journals.

Prof. K. Ishiyama:

- 1) Editor: Magnetic Society of Japan (2008-present)
- 2)

Assoc. Prof. S. Hashi:

- 1) The Journal of the Institute of Electrical Engineers of Japan /  
Co-chief Editor, Apr. 2011-Mar. 2014, Management of editors, Editing & proposal of special issue & technical review articles  
Chief Editor, Apr. 2014-Mar. 2016, Management of editors, Editing & proposal of special issue & technical review articles
- 2) The Institute of Electrical Engineers of Japan (IEEJ) Sensors and Micromachines Society /  
Publishing committee, Apr. 2017-present, Reviewing contributed articles
- 3) 2016 Joint MMM-Intermag Conference Session Chairs
- 4) Referee: IEEE Trans. Magn., IEEE Magn. Lett., IEEE Sens. J, Chem. Mat., J. Magn. Soc. Jpn., etc.  
(Total: 10 manuscripts)

3. 社会貢献 / Contributions to society

- (1) 教育活動 / Educational activities outside university

(2) 産業界における指導・啓蒙 / Instruction and education for industry

(3) 国・地方自治体・公共団体における活動  
Activities for national and local governments, and public organizations

(4) アウトリーチ活動 / Outreach activities

1) On-site lecture:

Prof. K. Ishiyama:

Assoc. Prof. S. Hashi: Aizu Gakuho high school (2015), Shimotsuma 1st high school (2017)

2)

4. 競争的資金の獲得状況 / Research funds/grants received

(1) 科学研究費補助金 / Grant-in-Aid for Scientific Research (KAKENHI)

1) Challenging Exploratory Research 25630085, FY 2013-2014, Research title: “（磁気ビーズを能動的に分散させる新たな手法の提案と実証）,”

(K. Ishiyama, as a Principal Investigator, Total budget 3,000,000 Yen)

2) Grant-in-Aid for Scientific Research(B) 26289084, FY 2014-2016, Research title: “（逆磁歪を利用した異方性制御機構の解明とそれを利用した低損失モータ用電磁鋼板の開発）,”

(K. Ishiyama, as a Principal Investigator, Total budget 12,500,000 Yen)

3) Challenging Exploratory Research 17K18863, FY 2017-2018, Research title: “（低侵襲高周波磁界計測のための新たな計測方式）,”

(K. Ishiyama, as a Principal Investigator, Total budget 4,900,000 Yen)

4) Grant-in-Aid for Scientific Research(B) 18H03270, FY 2018-2020, Research title: “Development and application of wireless haptic interface using magnetics（磁場を用いたワイヤレスハプティックインタフェースの開発とその応用）,”

(S. Hashi, as a Principal Investigator, Total budget 13,100,000 Yen)

(2) 受託研究費 / Other grants and subsidies

Contracted research funds:

1) JST-SENTAN (Japan Science and Technology Agency, Development of advanced measurement and analysis systems) program, FY 2013-2016, Research title: “磁気 MEMS を利用した微小振動計測システムの開発,”

(K. Ishiyama, as a Principal Investigator, Total budget 82,880,525 Yen)

2) MIC (Ministry of Internal Affairs and Communications) project, FY 2015-2018, Research title: “Measurement and Countermeasure Methodologies to Deal with Broadening Unnecessary Radio Wave（不要電波の広帯域化に対応した電波環境改善技術の研究開発）,”

(K. Ishiyama, as a Principal Investigator, Total budget 104,316,369 Yen)

3) NEDO (New Energy and Industrial Technology Development Organization) project, FY 2016, Research title: “,”

(K. Ishiyama. as Co-Investigator, Total budget 8,800,000 Yen)

Subsidies:

- 4) The Murata Science Foundation (村田学術振興財団), FY 2014  
(S. Hashi, as a Principal Investigator, Total budget 1,500,000 Yen)
- 5) Power Academy (パワーアカデミー), FY 2017-2018  
(S. Hashi, as a Principal Investigator, Total budget 1,000,000 Yen)
- 6) CASIO Science Promotion Foundation (カシオ科学振興財団), FY 2016-2019  
(S. Hashi, as a Principal Investigator, Total budget 7,000,000 Yen)
- 7) The Iron and Steel Institute of Japan (日本鉄鋼協会), FY 2017-2018  
(S. Hashi, as a Principal Investigator, Total budget 2,000,000 Yen)

Joint research with companies:

- 8) YAZAKI Corp. K. Ishiyama, FY 2013-2018, 5,099,765 Yen
- 9) Nippon Aleph Corp. K. Ishiyama, FY 2013, 455,000 Yen
- 10) Denso Corp. K. Ishiyama, FY 2013-2014, 1,575,000 Yen
- 11) KRI Inc. K. Ishiyama, FY 2015-2016, 2,891,164 Yen
- 12) SHOWA DENKO K.K. K. Ishiyama, FY 2017-2018, 1,900,000 Yen
- 13) MITSUYA CO., LTD. K. Ishiyama, FY 2017, 180,000 Yen
- 14) Kobe Steel, Ltd. S. Hashi, FY 2017-2018, 1,818,180 Yen

5. 国際共同研究・連携研究・連携教育活動の実績

International joint research, collaborative research, and collaborative education

6. 共同利用・共同研究拠点活動の実績

Achievements of work done under the framework of Joint Usage/Research Center

- (H23A10) Project A: Principal investigator Assoc. prof. Hiroaki Kikuchi of Iwate university (FY 2011 - 2013)
- (H23B04) Project B: Principal investigator Prof. Kazushi Ishiyama of Tohoku University (FY 2011 - 2013)
- (H25B03) Project B: Principal investigator Assoc. prof. Takeshi Yanai of Nagasaki University (FY 2013 -2015)
- (H26A15) Project A: Principal investigator Dr. Tomoo Nakai of Miyagi Industrial technology institute (FY 2014 -2016)
- (H27B05) Project B: Principal investigator Prof. Masahiro Yamaguchi of Tohoku university (FY 2015 - 2017)
- (H28A17) Project A: Principal investigator Assoc. prof. Shuichiro Hashi of Tohoku university (FY 2016 -2018)
- (H28B02) Project B: Principal investigator Assoc. prof. Ken-ichi Yamamoto of University of the Ryukyus (FY 2016-2018)
- (H28B10) Project B: Principal investigator Prof. Kazushi Ishiyama of Tohoku university (FY 2016 - 2018)
- (H30A40) Project A: Principal investigator Assoc. prof. Sho Muroga of Akita university (FY 2018 - 2020)

- (H30B02) Project B: Principal investigator Prof. Kazushi Ishiyama of Tohoku university (FY 2018 - 2012)
- (H30B04) Project B: Principal investigator Prof. Akira Ando of Tohoku university (FY 2018-2020)
- (H30B03) Project B: Principal investigator Prof. Masahiro Yamaguchi of Tohoku university (FY 2018 - 2020)

## 7. 研究教育指導 / Research supervision

### (1) 担当講義リスト / List of lectures

#### Lectures in undergraduate schools

- Basic theory of Electrical circuit (2006-present), Prof. K. Ishiyama
- Exercises in Electrical circuit (2006-present), Prof. K. Ishiyama
- Electrical circuit I (2006-present), Prof. K. Ishiyama
- Exercises in Electrical circuit I (2006-present), Prof. K. Ishiyama
- Outline of Electronic Engineering (2009-present), Prof. K. Ishiyama
- Exercises in Calculus & Physics (2010-present), Assoc. Prof. S. Hashi

#### Lectures in graduate schools

- Magnetic device engineering (2006-present, alternate year), Prof. K. Ishiyama
- Special lecture on Spin-electronics (2010-present), Prof. K. Ishiyama
- Special lecture on Medical Engineering (2008-present), Prof. K. Ishiyama
- Special lecture on Bioinformation-systems (2012-present), Prof. K. Ishiyama
- Special lecture on Energy-devices engineering (2014-present, 1/8 period), Prof. K. Ishiyama
- Special lecture on Energy-devices engineering (2014-present, 1/8 period), Assoc. Prof. S. Hashi

#### Others

- Seminar in Creation engineering (2006-present), Prof. K. Ishiyama
- Basic Seminar (2006-present), Prof. K. Ishiyama
- Basic Seminar (2017), Assoc. Prof. S. Hashi

### (2) 学位取得者リスト

List of bachelor's, master's and doctoral degree students supervised

#### Doctoral degree program (Dr. Eng.)

Japanese students: 1 (JSPS Research Fellows: 1)

Foreign students: 2 (JSPS Research Fellows: 1,  
government-sponsored foreign students: 0)

Mature students: 1

- 1) Shin Jaewon, "Magnetic Anisotropy Control Methods in Soft Magnetic Thin Film and Magnetic Sensor Applications," 2015.
- 2) Yoshiyuki Hayashi, "Electrochemical Fabrication of Functional Nanostructured Composite Materials," 2016.  
林 禎彰, "電気化学的手法による機能性ナノ構造複合材料の形成に関する研究," 2016
- 3) Keiji Iwata, "Prediction of Three-Dimensional Magnetic Domain Structures Using Multivariable Optimization of Free Energy," 2016.  
岩田 圭司, "自由エネルギーの多変数最適化計算による三次元磁区構造予測に関する研究," 2016年

- 4) Jingyan Ma, “Study on Noise Suppression Mechanism of Magnetic Film for On-Chip Design,” 2018.

Doctoral degree program (Dr. Biomedical Eng.)

Japanese students: 0 (JSPS Research Fellows: 0)  
Foreign students: 0 (JSPS Research Fellows: 0,  
government-sponsored foreign students: 0)  
Mature students: 0

Master’s degree program (Master’s degree of Eng.)

Japanese students: 10  
Foreign students: 0 (government-sponsored foreign students: 0)  
Mature students: 0

- 1) Yukihiro Murakami, “A study on inverse magnetostrictive effect of non-oriented Si-Fe under uniform in-plane stress,” 2013.  
村上 祐貴彦, “面内一様応力下における無方向性珪素鋼板の逆磁歪効果に関する研究” 2013
- 2) Takanori FUKUSHI, “A Study about Magnetic Actuator using Flexible Magnets,” 2013.  
福士 恭基, “柔軟磁石を用いた磁気アクチュエータに関する研究” 2013
- 3) Yasuyuki Miwa, “Study on a strain sensor utilizing inverse-magnetostrictive effect,” 2014.  
三輪 泰之, “磁歪膜の逆磁歪効果を利用したひずみセンサに関する研究” 2014
- 4) Wagaru GOTO, “A development of the magnetically-bended guidewire by a low magnetic field,” 2015.  
後藤 渉, “低磁場で屈曲する磁気屈曲ガイドワイヤの開発” 2015
- 5) Yutaro OSAKI, “Study on the Excitation Method of the LC Resonant Magnetic Marker for Position-Detection System,” 2016.  
大崎 祐太郎, “位置検出用 LC 共振型磁気マーカの励磁手法に関する研究” 2016
- 6) Hajime Yokoi, “Study on a strain sensor utilizing inverse-magnetostrictive effect and application,” 2016.  
横井 甫, “逆磁歪効果を利用したひずみセンサとその応用に関する研究” 2016
- 7) Kosuke Kusunoki, “Study on sensitivity improvement of High Frequency Carrier-Type Magnetic Field Sensor,” 2017  
楠 洸介, “高周波キャリア型磁界センサの高感度化に関する研究” 2017
- 8) Yuito Kubo, “Study on a vibration sensor utilizing inverse-magnetostrictive effect,” 2017.  
久保 結人, “逆磁歪効果を利用した振動センサに関する研究” 2017
- 9) Yuto Matsumoto, “Study on minimally invasive near magnetic field measurement using magneto-optic effect,” 2017.  
松本 悠人, “磁気光学効果を利用した低侵襲近傍磁界計測に関する研究” 2017
- 10) Hiroo Yokoyama, “Study on design of high sensitivity thin film magnetic field sensor,” 2018.  
横山 広雄, “高感度薄膜磁界センサの設計に関する研究” 2018

Bachelor's degree program (Bachelor's degree of Eng.)

Japanese students: 12  
Foreign students: 0 (government-sponsored foreign students: 0)

8. 叙勲・受賞・表彰 / Honors, awards, and prizes

1) Ishiyama-Hashi Lab.:

Jury’s Special Award on Nikkei Electronics Japan Wireless Technology Award (May 31, 2013)



2) Assoc. Prof. S. Hashi:

M. Ishida Foundation Research Award 2013, (Nov. 8, 2013)

3) Yuto Matsumoto (second-year master's student):

MSJ Presentation Award for Student, The Magnetics Society of Japan, (Sep. 20, 2017)

4) Yuto Matsumoto (second-year master's student):

Best Student Presentation Award, Special Spinics meeting, 2017, (Nov. 28, 2017)

5) Yuichi Saito (first-year master's student):

President' Award of Tohoku University 2018, (Mar. 27, 2019)

## 9. その他 / Others