Satoshi FUKUI, Dr. Eng.

Professor
Program: Electrical and Information Engineering
Area: Electrical and Electronic Engineering
Undergraduate: Dept. of Electrical and Electronic Engineering

Professional Expertise

His professional expertise encompasses applications of high temperature superconductors (HTS) to power apparatuses and industrial devices, such as power transmission cables, rotational machines, energy strage devices, magnetic levitation devices, and electro-magnetic phenomena in superconductors, such as AC losses and stability against over current, when those are applied to these devices. He and his group have developed some essential techniques of AC loss measurement and numerical codes for AC loss analysis. His group also has developed a method to effectively reduce AC losses in superconducting windings for power apparatuses. For industrial applications, his group is developing non-contact spin processors for semiconductor device production system utilizing HTS magnetic levitation. All kinds of power and industrial applications of superconductors and their electromagnetic phenomena are major topics in his laboratory.

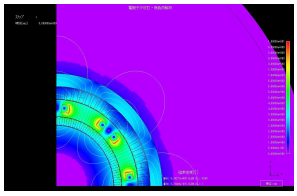
Research Fields of Interest

AC loss and electro-magnetics in high temperature superconductor for power application

- Measurement, numerical analysis and investigation of reduction methods of AC losses in HTS power devices, such as
  - power transmission cable
  - rotational machines
  - superconducting magnetic energy strage (SMES)

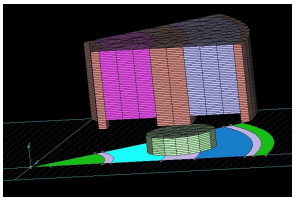
HTS power apparatuses

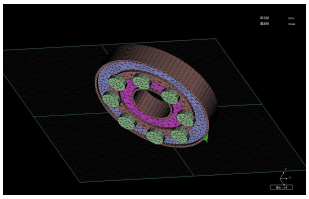
- Optimal design method of HTS power transmission cable based on AC loss minimization
- Electromagnetic design of HTS rotational machines



Novel applications for industrial and medical devices

- Non-contact spin processor for semiconductor device production system
- Magnetic drug delivery system
- Magnetic chromatography





Education

1997: Doctor Eng. Degree, Yokohama National University, Japan

1994: Master Eng. degree, Yokohama National University, Japan

Awards

1. Excellent Paper Presentation Award, IEEJ, 1997

Major Publications

Book chapters

[1] A. Ishiyama, H. Ohsaki, Y. Shirai, T. Takao, T. Nitta, S. Fukui, S. Fuchino, K. Funaki, K. Matsumoto, Superconducting Energy Engineering, chapter 6, Ohm-sha, 2006.

Papers

[1] S. Fukui, H. Tonsho, M. Toyoda, J. Ogawa, M. Yamaguchi, T. Sato, M. Furuse, H. Tanaka, K. Arai, M. Umeda, T. Takao, "Analysis of AC Loss Characteristics of High Temperature Superconducting Coil", IEEE Trans. Appl. Supercond., Vol.15, 1566-1569, 2005.

[2] S. Abe, T. Nishijyo, S. Fukui, J. Ogawa, M. Yamaguchi, T. Sato, M. Furuse, H. Tanaka, K. Arai, M. Umeda, T. Takao, "Analysis of AC Loss Characteristics of HTS Coils with Various Cross Sections", Physica C, Vol.426-431, 1316-1321, 2005.

[3] S. Fukui, T. Noguchi, J. Ogawa, M. Yamaguchi, T. Sato, O. Tsukamoto, "Analysis of AC Loss and Current Distribution in Multi-layer Tri-axial Three-phase HTS Cable", Physica C, Vol.426-431, 1374-1379, 2005.

[4] S. Fukui, T. Noguchi, J. Ogawa, M. Yamaguchi, T. Sato, O. Tsukamoto, “Analysis of AC Loss and Current Distribution Characteristics of Multi-Layer Triaxial HTS Cable for 3-Phase AC Power Transmission”, IEEE Trans. Appl. Supercond., Vol.16, 135-138, 2006.

[5] S. Fukui, T. Nishijyo, S. Abe, J. Ogawa, M. Yamaguchi, T. Sato, M. Furuse, H. Tanaka, K. Arai, M. Umeda, T. Takao, “Numerical Study on AC Loss Characteristics of HTS Coils With Various Cross Sections and Methods of AC Loss Reduction”, IEEE Trans. Appl. Supercond., Vol.16, 139-142, 2006.

[6] S. Fukui, R. Kojima, J. Ogawa, M. Yamaguchi, T. Sato, O. Tsukamoto, “Numerical Analysis of AC Loss Characteristics of Cable Conductor Assembled by HTS Tapes in Polygonal Arrangement”, IEEE Trans. Appl. Supercond., Vol.16, 143-146, 2006.

[7] M. Takahashi, S. Fukui, Y. Takahashi, R. Abe, J. Ogawa, M. Yamaguchi, T. Sato, H. Imaizumi, T. Ohara, “Numerical Study on Magnetic Chromatography Using Quadrupole Magnetic Field”, IEEE Trans. Appl. Supercond., Vol.16, 1116-1119, 2006.

[8] S. Fukui, S. Watanabe, J. Ogawa, M. Yamaguchi, T. Sato, O. Tsukamoto, “Numerical Study on AC Transport Current Loss Measurement of HTS Assembled Conductor by Pick-up Loop without Electrical Contacts”, IEEE Trans. Appl. Supercond., Vol.17, 1704-1707, 2007.

[9] S. Fukui, T. Noguchi, J. Ogawa, M. Yamaguchi, T. Sato, O. Tsukamoto, T. Takao, “Numerical Study on AC Loss Minimization of Multi-Layer Tri-Axial HTS Cable for 3-Phase AC Power Transmission”, IEEE Trans. Appl. Supercond., Vol.17, 1700-1703, 2007.

[10] S. Fukui, R. Abe, J. Ogawa, T. Oka, M. Yamaguchi, T. Sato, H. Imaizumi, “Study on optimization design of superconducting magnet for magnetic force assisted drug delivery system”, Physica C, Vol.463-465, 1315-1318, 2007.

[11] S. Fukui, R. Sato, J. Ogawa, T. Oka, M. Yamaguchi, T. Sato, S. Miyazaki, T. Sasahara, T. Tamaki, S. Nishiwaki, Y. Yuki, “Study on application of magnetic levitation utilizing HTS bulks to spin processors for photo mask production”, Physica C, Vol.463-465, 1289-1292, 2007.

[12] S. Fukui, K. Ohsugi, T. Nishijyo, J. Ogawa, T. Oka, M. Yamaguchi, T. Sato, M. Furuse, T. Takao, O. Tsukamoto, “Study on Optimal Design of High Temperature Superconducting Coil Based on AC Loss Minimization”, IEEE Trans. Appl. Supercond., Vol.18, 1366-1369, 2008.

[13] S. Fukui, Y. Shoji, R. Abe, J. Ogawa, M. Yamaguchi, T. Sato, H. Imaizumi, T. Ohara, “Numerical Simulation of Flow Fractionation Characteristics of Magnetic Chromatography Using an HTS Bulk Magnet”, IEEE Trans. Appl. Supercond., Vol.18, 828-831, 2008.

[14] S. Fukui, J. Ogawa, N. Suzuki, T. Oka, T. Sato, O. Tsukamoto, T. Takao, “Numerical Analysis of AC Loss Characteristics of Multi-Layer HTS Cable Assembled by Coated Conductors”, IEEE Trans. Appl. Supercond., Vol.19, 1714-1717, 2009.

[15] S. Fukui, N. Suzuki, J. Ogawa, T. Oka, T. Sato and O. Tsukamoto, “Numerical Analysis of Relation between AC Loss Characteristics and Geometrical Parameters of Multi-layer Polygonal Conductor Assembled by HTS Coated Conductor”, IEEE Trans. Appl. Supercond., Vol.20, pp. 2138-2141, 2010.

[16] S. Fukui, M. Takahashi, J. Ogawa, T. Oka, T. Sato, M. Yamaguchi and T. Takao, “Numerical Study on AC Loss Reduction of Multi-pole HTS Coil by Optimal Design of Winding Cross Section of Element Coil”, IEEE Trans. Appl. Supercond., Vol.20, pp. 2150-2153, 2010.

[17] S. Fukui, J. Ogawa, T. Sato, O. Tsukamoto, N. Kashima, S. Nagaya, “Study of 10 MW-Class Wind Turbine Synchronous Generators With HTS Field Windings”, IEEE Trans. Appl. Supercond., Vol.21, pp. 1151-1154, 2011.

[18] S. Fukui, T. Kawai, M. Takahashi, J. Ogawa, T. Oka, T. Sato, O. Tsukamoto, "Numerical Study of Optimization Design of High Temperature Superconducting Field Winding in 20 MW Synchronous Motor for Ship Propulsion", IEEE Trans. Appl. Supercond., Vol.22, pp.5200504, 2012.

[19] S. Fukui, M. Shibayama, J. Ogawa, T. Oka, T. Sato, T. Takao, O. Tsukamoto, "Measurement and Numerical Analysis of AC Loss in High Temperature Superconducting Coil", IEEE Trans. Appl. Supercond., Vol.22, pp.4704904, 2012.

[20] S. Fukui, S. Hatakeyama, J. Nanayama, A. Maruko, J. Ogawa, T. Sato, T. Oka and O. Tsukamoto, "Measurement and numerical analysis of dependence of AC loss in polygonal conductor assembled by YBCO tapes on gap length between neighboring tapes", IEEE Trans. Appl. Supercond.,Vol. 23, pp.5900105, 2013.