

CURRICULUM VITAE

Ching-Ray Chang

Qualifications: B.S., National Taiwan University (1979)
Ph.D. in Physics, University of California, San Diego (1988)
Thesis Title: The reversal mechanism of uniaxial ferromagnetic
particular medium

Professional Appointments:

Current Appointment: Vice President of Administrative affairs, National Taiwan University
(from June 22nd, 2013)

- Dean of College of Sciences, National Taiwan University (from August 1st, 2011 to June 21st, 2013)
- Professor of Physics, Department of Physics, National Taiwan University (from August 1st 1994)
- General Director of International Cooperation Department, National Sciences Council (from Feb. 1st, 2008 to Jan. 31, 2011)
- Associated Professor, Department of Physics, National Taiwan University (from Feb. 1st, 1989)
- Chairman of Department of Physics, National Taiwan University (from August 1st 2001 to July 31, 2007)
- Research Scientist, Materials Research Lab. Industrial Technology Research Institute, Taiwan (from Sep. 10, 1988 to Feb. 1, 1989)

Honors and Distinctions:

1. **2012: NTU Distinguished Professor**
2. 2012: Corresponding Member of *Russian International Engineering Academy*
3. 2011: The 2011 Magnetic Technology Medal, Taiwan Association of Magnetic Technologies.
4. 2010: IEEE Fellow
5. 2009: Fellow of American Physics Society
6. 2008: 1st Prize of PhD thesis advisor for Lam research Inc. award
7. 2007: The award for special contribution of Physics Community of Taiwan Physics Society.
8. 2006: 1st Prize of the research advisor for TSMC materials PhD thesis.

9. 2005: The researching award of Taiwan Information Storage Association
10. 2004: The distinguished industrial contribution award in NTU.
11. 2004: The researching award of Taiwanese Magnetic Society.
12. 1989-2001: NSC researching awards(including 5 times excellent award before it was terminated at 1996)
13. 1999: The honorable teacher award in NTU University.
14. 1999: The best remote teaching site in NTU network teaching award.

SCHOLARLY AND PROFESSIONAL ACTIVITIES:

Professional Societies:

1. IEEE Fellow selection committee of Magnetic society, 2013-2014.
2. Vice Chair of of C9 : Magnetism: International Union of Pure and Applied Physics (IUPAP), (2012-2014).
3. President of Asian Union of Magnetics Societies, (2012-2013)
4. Vice President of Asian Union of Magnetics Societies, (2009-2011).
5. Administrative committee of IEEE Magnetic Society (2007-2009), (2011-2012)
6. Council member of C9 : Magnetism: International Union of Pure and Applied Physics (IUPAP) (2005-2008).(2009-2011).
7. Council member of AAPPS (2008-2010, 2011-2013)
8. Council members of Working Group of Woman in Physics, IUPAP, (2011-2016).
9. Chairperson of IEEE: Taiwan Magnetic Chapter (2005-2008)
10. IEEE Magnetic Society Technical Committee (2005-2006).(2007-2008).
11. President of Taiwan Association of Magnetic Technology, (2007-2008), (2009-2010).
12. Executive Secretary of Association of Asia Pacific Physical Society (AAPPS) (2005-2007)
13. President of Physical Society located in Taipei, ROC (2004-2005)

Academic Board and Officers:

1. International Advisor Board of NIMS(National Institute for Materials Research), Japan, (2011-2016).
2. Advisory Committee of the Conference on Magnetism and Magnetic Materials (MMM AdComm) AIT, USA (2012-2014).
3. Director for Center for Theoretical Physics, NTU (2005-2007).
4. Director for Physics North division of National Center for Theoretical Sciences, Taiwan (2005-2007).
5. Executive member, National Center for Theoretical Sciences, Taiwan (2005-2007).

International Journals:

1. Managing Editor : The journal of SPIN (2011-)
2. Editorial Board of Journal of Magnetism and Magnetic Materials : (2008-2010)
3. Deputy-Chief Editor of AAPPS Bulletin (2005-2007)(2008-2009)
4. Chief Guest editor for special issue of Journal of Magnetism and Magnetic Materials for ISAMT'99, ISAMT '03, ISAMT 05.
5. Referee for Physics Review B, Physics Review Letters, Applied Physics Letters, IEEE Transaction on Magnetics, Nanotechnology, Applied Physics D, Journal of Applied Physics, Journal of Magnetism and Magnetic Materials, Physics Materials and Chemistry, Chinese Journal Physics, Physics Letters A, Materials Science and Engineering B, Thin Solid Films, SPIN.

International Conferences:

1. Honorable Chair of 2nd IcAUMS, 2012, Nara, Japan.
2. General Chair of InterMag 2011, Taipei
3. Program Committee of InterMag 2009, USA.
4. Program Committee of ICM 2009, Germany
5. Program Committee of MMM 2007, USA,
6. Program committee of InterMag 2005 in Nagoya, Japan.
7. The Organizer of World Year of Physics 2005- Taiwan Activities (2005).
8. Chief organizer of World Year of Physics in Taiwan (2005).
9. Chairperson of 4th Magnetic Asian Forum in Yulin, (2007).
10. Session chairman and Program committee of International magnetism conferences , e.g., InterMag, MMM, ISAMT, etc.
11. Joint to sponsor local international conferences held by Taiwanese Magnetic Technology Society, e.g., ISAMT, ISPPM, etc.
12. The international Chair of “Young Physics Ambassador Symposium”, 2005 in Taipei.

Academic Service (National Taiwan University)

1. Chair: Department of Physics, NTU, 2001-2007
2. Chair: Audit committee, NTU (2005-2007), member (2003-2005)
3. University Congress member (1999-2007)
4. College congress member (199-2007)
5. Member of research and Development, NTU (2007-2008)
6. Entrance Exam committee,

Others:

1. The chief editor of the *Introduction to Physics Department* (1994, 1997).
2. The chief editor of the *Introduction to College of Sciences, NTU*(1998)
3. Panel for Physics division of National Science Council, ROC (1996-1998), (2000-2003)
4. Chief editor(1998) and consultant(1999) of Bimonthly Physics for Physics Society located at Taipei, ROC.
5. Executive Board of Physics Society located at Taipei, ROC(1999-2000)
6. Executive Board of National Center for Theoretical Sciences.(1999-2000)

Current Projects:

1. Three dimensional magnetic sensor for electric compass, MOEA, (2012-2014).
2. Spin polarized transport in two dimensional system (2012-2014).

Research Activities

I am currently involved in a highly successful research group carrying out computational and theoretical studies of magnetic materials within the Department of Physics, National Taiwan University. We have collaborated with a lot of experimental groups around the world in addition to our own departmental experimentalists. A very important and productive collaboration is with the experimental group in Institute of Physics, Academia Sinica. The interaction between theory and experiment generated by this collaboration makes a vital contribution to the development of both models and experimental techniques.

My current research activities are focused on the following topics:

- I. *Spin transport in two-dimensional electron system*, Prof. Chang and his coworkers found that both the Rashba and the Dresselhaus coupling terms of the spin Hamiltonian can be transformed into a free-electron like system, and this transformation consequently maps the complicated dynamic problem of spin transport in 2DEG onto the free electron system.
- II. *Dynamic Reversal of Mesoscopic Magnets*: To understand the inconsistency between the experimental data and reversal theory, we extend the linear theory to the nonlinear and chaotic regions. High frequency response shows that the magnetization reverses oscillatory and detailed analyses are still in progress.
- III. *Mechanism of Spin-dependence Transport*: Spin-dependent tunneling of electrons gives a very large magnetoresistance, we are now studying the possibility of spin-filter to enhance the magnetoresistance. Spin injection from ferromagnetic region into another ferromagnetic region or the semiconductor are also under intensive studies now.

- IV. *Mechanism of Exchange Bias in Spin-valve*: The origins of spin valve type multilayers are studied, especially, the topological effects on the magnetic surface anisotropy and antiferromagnetic states are emphasized. Now we are concentrated on the mechanism of exchange bias. Ultimate goal is to find the easy way to build a giant magnetoresistance, low coercivity spin valve.
- V. *Magnetic Recording Theory*: Physical processes of the magnetic recording and their associated noises are interested. We currently are concentrated on the thermal noise of bycrystal media.

Teaching Experience

I have experience of teaching at all levels,

Undergraduate:

General Physics, (1st and 2nd years), *Medical Physics*

Mechanics, Electromagnetics, Modern Physics, Mathematics for Physicists (2nd year),

Introduction to Solid States Physics

Postgraduate:

Magnetism, Special topics on Surface Sciences, Physics for Magnetic Recording, introduction of spintronics

Graduate Students: 12 Ph. D. and 9 master students graduated.

PUBLICATIONS and Patents

- 214 Chen, Kuo-Wei, Su, Yu-Hsin, Chen, Chien-Liang and Ching-Ray Chang, "Quantum interference and sharp spin polarization on a double quantum dot: Role of Rashba spin-orbit interaction", *Phys. Rev. B*, in print, 2013
- 213 Jian-Yuan Chang, Jih-Sheng Wu, Ching-Ray Chang, "Exact Hamiltonians with Rashba and Cubic-k Dresselhaus spin-orbit couplings in curved surface", *Phys. Rev. B*, in print, 2013
- 212 Son-Hsien Chen, Chien-Liang Chen, Ching-Ray Chang, Farzad Mahfouzi, "Spin-charge conversion in multiterminal Aharonov-Casher ring coupled to precessing ferromagnets: A charge-conserving Floquet-nonequilibrium Green function approach", *Phys. Rev. B*, vol. 87, 045402, (2013).
- 211 Jui-Hang Chang, HH Chen and Ching-Ray Chang, "Reduction of critical current density in a spin valve with perpendicular polarizer and planar biaxial free layer", *Journal of Physics D: Applied Physics*, 46, 035002, (2013).
- 210 Luo, G. Y., Song, M. Y., Hung, H. Y., Chiu, Y. C., Kwo, J., Lee, S. F., Chang, Ching-Ray, Lin, J. G., "Spin Pumping Induced Inverse Spin-Hall Effects in La_{0.7}Sr_{0.3}MnO₃/Platinum Bilayer Film", *IEEE TRANSACTIONS ON MAGNETICS*, vol.48, 3958-3960, (2012).
- 209 CL Chen, Ching-Ray Chang and B. Nikolic, "Quantum coherence versus dephasing effects on the spin Hall current and nonlocal voltage induced by magnetotransport through multiterminal graphene bars", *Phys. Rev. B* 85, 155414 (2012). *Virtual Journal of Nanoscale Science & Technology*, 2012.
- 208 Chen Chien-Liang; Su Yu-Hsin and Chang Ching-Ray, "Spin-orbit force in graphene with Rashba spin-orbit coupling", *J. Appl. Phys.* 111, 07B330 (2012) *Virtual Journal of Nanoscale Science & Technology*, 2011.
- 207 Lee Hsin-Han and Chang Ching-Ray, "Spin transport calculation for the branch-shaped zigzag graphene nano-ribbon", *J. Appl. Phys.* 111, 07C521 (2012).
- 206 Su Yu-Hsin; Chen Chien-Liang; Chen Kuo-Wei and Chang Ching-Ray, "Spin stability and magnetic screening of a magnetic impurity in four-terminal Landauer setup with Rashba spin-orbit coupling", *J. Appl. Phys.* 111, 07C324 (2012)
- 205 JH Chang, HH Chen and Ching-Ray Chang, "Multiple-Step Relaxing-Precessional Magnetization Switching", *IEEE Trans. Magn.*, Mag-47, 641-6444, (2011).

- 204 T.C. Cheng, J.Y. Chen and Ching-Ray Chang, “The Geometrical Effect on Non-Abelian Spin-orbital Gauge Field of a Curved Surface”, *Physical Review B*, Dec., B84, 214423 (2011).
- 203 M.Y. Song ,W.C. Chen , Daniel Hsu, Ching-Ray Chang, and J.G. Lin, “Modulated room temperature magnetoresistance in manganite superlattices”, *Appl Phys A*, 104, 811–813,(2011).
- 202 H.H. Chen, J.H. Chang and Ching-Ray Chang, “Synchronization of spin-torque nano-oscillators from an induced corrugated attractor”, *SPIN*, vol. 1, 1-20, (2011).
- 201 Chang,Jui-Hang, Chen,Hao-Hsuan,Chang,Ching-Ray and Yaowen Liu,” Phase locking of dynamical modes in a nanomagnetic oscillator with a circularly spin-polarized current”, *Phys. Rev. B* 84, 054457 (2011).
- 200 Ming-Hao Liu (劉明豪), Jih-Sheng Wu (吳致盛), Son-Hsien Chen (陳松賢), and Ching-Ray Chang (張慶瑞), “Spin and charge transport in U-shaped one-dimensional channels with spin-orbit couplings”, *Phys. Rev. B* 84, 085307 (2011). *Virtual Journal of Nanoscale Science & Technology*, 2011.
- 199 Hou Zhiwei; Liu Yaowen; Cardoso Susana; Freitas Paulo P.; Chen Haohsun and **Ching-Ray Chang**, “Dynamics of the reference layer driven by spin-transfer torque: Analytical versus simulation model”, *Journal of Applied Physics*;109(11):113914 - 113914-5 (2011).
- 198 Su Yu-Hsin; Chen Son-Hsien; Chen Kuo-Wei; Chen Chien-Liang and **Ching-Ray Chang**,”Spin flip of a single anisotropic magnetic impurity in four-terminal Landauer setup with Rashba spin-orbit coupling”, *Journal of Applied Physics*;109(7):07C721 - 07C721-3 (2011).
- 197 Chen Chien-Liang; Su Yu-Hsin; Chen Kuo-Wei; and **Ching-Ray Chang**, “Enhanced spin Hall accumulation with two charge current vortices in the Landauer setup with four terminals”,*J. Appl. Phys.* 109, 07C715 (2011). *Virtual Journal of Nanoscale Science & Technology*, 2011.
- 196 D. Cimpoesu, I. Klik, C. R. Chang, A. Stancu, L. Spinu, *Thermally activated transitions in a system of two single domain ferromagnetic particles*, *J. Appl. Phys.* **109**, 07D339 (2011)
- 195 Ivo Klik and Ching-Ray Chang, “Complex conjugate eigenvalues in the spectrum of an operator for resonant activation”, E83, 042101, **Physical Review E** (2011).
- 194 JS Yang, CM Lee, and **Ching-Ray Chang**,” Switching Behavior of Vortex Cores in Bilayer Nanodots by Uniform Magnetic Field Pulses”, *IEEE Trans. Magn.*, Mag-47, 641-6444, (2011).
- 193 J. H. Chang, H. H. Chen, and Ching-Ray Chang, “Instabilities of a spin-valve system with perpendicular polarizer and in-plane bias field”, **Physical Review B** B83, 54425, (2011)
- 192 Ming-Hao Liu (劉明豪) and **Ching-Ray Chang** (張慶瑞) 2010,”Anomalous spin Hall effects in Dresselhaus (110) quantum wells”, **Phys. Rev. B** **82**, 155327 (2010), **Virtual Journal of Nanoscale Science & Technology**, 2010.

- 191 Mahfouzi, Farzad, Nikolic, Branislav K., Chen, Son-Hsien, and **Ching-Ray Chang**, 2010, "Microwave-driven ferromagnet-topological-insulator heterostructures: The prospect for giant spin battery effect and quantized charge pump devices", *Physical Review B*, Vol. 82, 195440, 2010. **Virtual Journal of Nanoscale Science & Technology, 2010**
- 190 Chien-Liang Chen, Son-Hsien Chen, Ming-Hao Liu, and **Ching-Ray Chang**, 2010, "Spin transport in tubular 2DEG with Rashba spin-orbital coupling", *Journal of Applied Physics*, Vol. 108, 033715, 2010.
- 189 Son-Hsien Chen, I. Klik, and **Ching-Ray Chang**, 2010, "Spin Hall effect in a square 2DEG sample with a central defect", *J. Magn. Magn. Mater.*, Vol.322, 1452, 2010.
- 188 Son-Hsien Chen, Branislav K. Nikolic, and Ching-Ray Chang, 2010, "Inverse quantum spin Hall effect generated by spin pumping from precessing magnetization into a graphene-based two-dimensional topological insulator", *Physical Review B*, Vol. 81, 035428, 2010.
- 187 Son-Hsien Chen (陳松賢), Sadamichi Maekawa (前川禎通), Ming-Hao Liu (劉明豪), and **Ching-Ray Chang** (張慶瑞) 2010, "Magnetization and exchange of magnetic impurities mediated by Rashba electron gas in Landauer setup", *JOURNAL OF PHYSICS D-APPLIED PHYSICS*, vol. 43 Issue: 1, 015003, 2010.
- 186 Ming-Hao Liu (劉明豪) and Ching-Ray Chang (張慶瑞) 2009, "Upstanding Rashba spin in honeycomb lattices: Electrically reversible surface spin polarization", *Phys. Rev. B* 80, 241304(R) (2009), *Virtual Journal of Nanoscale Science & Technology, 2009*.
- 185 Cao, R., Moriyama, T., Wang, W. G., Fan, X., Kolodzey, J., Chen, S. H., Ching-Ray Chang, Tserkovnyak, Y., Nikolic, B. K., Xiao, J. Q., 2009, "Spin-Polarized Transport and Dynamics in Magnetic Tunneling Structures", *IEEE TRANS. MAG.*, Vol. 45, 10, 3434-3440, 2009.
- 184 Su, YH; Yang, JS; and Ching-Ray Chang, 2009, "Schwarz-Christoffel Transformation for Cladding Conducting Lines", *IEEE TRANS. MAG.*, Vol. 45, 10, 3800-3803, 2009.
- 183 Chen, SH; Klik, I; and Ching-Ray Chang, 2009, "Spin-Hall effect in a finite two-dimensional electron gas sample with a central defect", *J. APPL. PHYS.*, Vol. 105, 7, 07E908, 2009. *Virtual Journal of Nanoscale Science & Technology, 2009*.
- 182 Sui-Pin Chen and Ching-ray Chang, 2010, "Attenuated Oscillation of the Tunneling Magnetoresistance in a Ferromagnet-Metal-Insulator-Ferromagnet Tunneling Junction", *IEEE TRANS MAG*, Vol. 45, 6, 2410-2412, 2009.
- 181 Son-Hsien Chen, **Ching-Ray Chang**, JQ Xiao, and BK Nikolic 2009, "Spin and charge pumping in magnetic tunneling junctions with precession: A nonequilibrium Green function approach", *PHYSICAL REVIEW B*, Vol. 79, 5, 054424, 2009. *Virtual Journal of Nanoscale Science & Technology, 2009*.
- 180 Chen KW and **Ching-Ray Chang**, 2008, "Quantum interference and spin polarization on Rashba double quantum dots embedded in a ring", *PHYSICAL REVIEW B*, vol. 78, 235319-235326, 2008. *Virtual Journal of Nanoscale Science & Technology, 2008*
- 179 Chang, JH and **Ching-Ray Chang** 2008, "Influence of the Demagnetizing Field in Spin Dynamics With a Perpendicular-to-Plane Polarizer", *IEEE TRANSACTIONS ON MAGNETICS* Volume: 44 Issue: 11 Pages: 2508-2511, 2008.

- 178 Ming-Hao Liu (劉明豪), Son-Hsien Chen (陳松賢), and **Ching-Ray Chang** (張慶瑞)2008,” Nonequilibrium spin transport on Au(111) surfaces” , **PHYSICAL REVIEW B**, vol. 78, 195413-195417, 2008.
- 177 Ming-Hao Liu (劉明豪), Son-Hsien Chen (陳松賢), and **Ching-Ray Chang** (張慶瑞)2008, “Current-induced spin polarization in spin-orbit-coupled electron systems”, **PHYSICAL REVIEW B** Volume: **78,165316**, 2008. Virtual Journal of Nanoscale Science & Technology, 2008
- 176 Yang, JS; He, XG; Chen, SH, and **Ching-Ray Chang**, 2008, “Spin precession due to a non-Abelian spin-orbit gauge field”, **PHYSICAL REVIEW B** Volume: **78** Issue: **8** , **085312**, 2008. Virtual Journal of Nanoscale Science & Technology, 2008
- 175 **Ching-Ray Chang**, and Jhih-Shinn Yang, 2008, “Magnetization Configuration and Magnetization Reversal of Thin submicron Permalloy Ellipses with Structure Defects”, Journal of Nanosciences and Nanotechnology, Vol. 8, 1-4, 2008.
- 174 Wu, YC; Wang, LW; Lai, CH, and **Ching-Ray Chang**, 2008,” Control of microstructure in (001)-orientated FePt-SiO₂ granular films”, JOURNAL OF APPLIED PHYSICS, Volume: **103** Issue: **7**, **07E140**, 2008. .
- 173 Chen, Son-Hsien, and **Ching-Ray Chang**, 2008, “Spin accumulation oscillation and current vortex in the Laudauer setup with locally applied biases”, JOURNAL OF APPLIED PHYSICS, Volume: **103** Issue: **7**, **07B721**, 2008. .
- 172 Chen KW and **Ching-Ray Chang**, 2008, “Electron transport through quantum dots with indirect coupling parameters”, JOURNAL OF APPLIED PHYSICS, **103**, 07B708 (2008). Virtual Journal of Nanoscale Science & Technology -- February 4, 2008
- 171 Son-Hsien Chen, **Ching-Ray Chang**, 2008, “Non-Abelian spin-orbit gauge: Persistent spin helix and quantum square ring”, **PHYSICAL REVIEW B** Volume: **77**, **045324**, 2008. Virtual Journal of Nanoscale Science & Technology -- February 4, 2008
- 170 Chen, SP and **Ching-Ray Chang**, “Spin accumulation from the spin Hall effect and the anisotropic effect studied using the effective mean-free-path model”, **PHYSICA STATUS SOLIDI B-BASIC SOLID STATE PHYSICS** Volume: **244**, **4398-4402**, 2007
- 169 LK Lin, CY Kuo, JY Ou, CC Chang, **Ching-Ray Chang**, L Horng, JC Wu, 2007, “Observation of Multiple Transitions on Permalloy by Magnetic Force Microscopy” , Phys. Stat. Sol.(c), No. 12, 4360-4363, 2007.
- 168 Ming-Hao Liu, Gustav Bihlmayer, Stefan Blugel and **Ching-Ray Chang**, 2007, “Intrinsic spin-Hall accumulation in honeycomb lattices: Band structure effects” , Phys. Rev. B **76**, 121301 (2007) (2007). Selected for the Volume 16, Issue 12, Sep. issue of Virtual Journal of Nanoscale Science & Technology
- 167 Chen, Son-Hsien, Liu, Ming-Hao, and **Ching-Ray Chang** 2007, Local spin density in a two-dimensional electron gas with a hexagonal boundary, Phys. Rev. B **76**, 075322 (2007). Selected for the Volume 16, Issue 9, Aug. issue of Virtual Journal of Nanoscale Science & Technology
- 166 Chao, C. T., Lin, L. K., Wu, J. C., Wei, Zung-Hang, Lai, Mei-Feng, and **Chang, Ching-Ray** , 2007, “Short-circuiting effect on the magnetoresistance of microstructured permalloy rings”, JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 310 (2): 1986-1988 Part 3, MAR 2007.

- 165 Kuo, C. Y., Chung, W. S., Wu, J. C., Horng, Lance, Wei, Zung-Hang, Lai, Mei-Feng, and **Chang, Ching-Ray**, 2007, "Magnetoresistance of microstructured permalloy ellipses having multi-domain configurations", JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 310 (2): E672-E674 Part 3, MAR 2007.
- 164 Chen, Sui-Pin, **Chang, Ching-Ray**, Lai, Chih-Huang, 2007, "Influence on interfacial diffusive scatterings of the angle between the magnetizations of the two magnetic layers in a magnetic trilayer", JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 310 (2): E751-E752 Part 3, MAR 2007.
- 163 Liu MH, Chen KW, Chen SH, and **Ching-Ray Chang** 2007, Rashba spin interferometer, IEEE TRANSACTIONS ON MAGNETICS 43 (6): 2869-2871 JUN 2007
- 162 Chen KW, Liu MH, Chen SH, and **Ching-Ray Chang** 2007, Bipolar spin switch using Aharonov-Bohm ring with embedded double quantum dots, IEEE TRANSACTIONS ON MAGNETICS 43 (6): 2866-2868 JUN 2007
- 161 Lai MF, Wei ZH, Wu JC, and **Ching-Ray Chang** 2007, Field evolution of multivortex and cross-tie states in Permalloy thin films, JOURNAL OF APPLIED PHYSICS 101 (9): Art. No. 09N111 MAY 1 2007
- 160 Son-Hsien Chen, Ming-Hao Liu, Kuo-Wei Chen, **Ching-Ray Chang**, 2007, Broken spin Hall accumulation symmetry by magnetic field and coexist of Rashba and Dresselhaus interactions, JOURNAL OF APPLIED PHYSICS 101 (9): Art. No. 09D513 MAY 1 2007. Selected for the Volume 15, Issue 19, May issue of Virtual Journal of Nanoscale Science & Technology
- 159 JS Yang and **Ching-Ray Chang** 2007, "The Effect of Structural Defects on Magnetic Switching in Thin Ferromagnetic Patterned Films", IEEE TRANSACTIONS ON MAGNETICS 43 (2): 923-926 Part 2 Sp. Iss. SI FEB 2007.
- 158 Ming-Hao Liu, Kuo-Wei Chen, Son-Hsien Chen, **Ching-Ray Chang**, 2006 "Persistent spin helix in Rashba-Dresselhaus two-dimensional electron systems" , Phys. Rev. B74, 235322, Dec. (2006). Selected for the Volume 15, Issue 1, Jan. issue of Virtual Journal of Nanoscale Science & Technology
- 157 Ming-Hao Liu and **Ching-Ray Chang**, 2006, "Nonuniform Rashba-Dresselhaus spin precession along arbitrary paths" , Phys. Rev. B 74, 195374, Nov. (2006). Selected for the Nov. issue of Virtual Journal of Nanoscale Science & Technology
- 156 YC Chang, CC Chang, JC Wu, ZW Wei, MF Lai, and **Ching-Ray Chang**, 2006 " Probing the magnetization reversal microstructured permalloy cross by planar Hall measurement and magnetic force microscopy", IEEE TRANSACTIONS ON MAGNETICS, 42 (10): 2963-2965 OCT (2006).
- 155 Sui-Pin Chen, **Ching-Ray Chang**, Tzay-Ming Hong, and Chih-Huang Lai, 2006, "Spin accumulation from the spin Hall effect studied using the effective mean-free-path model" , IEEE TRANSACTIONS ON MAGNETICS, 42 (10): 2667-2669 OCT (2006).
- 154 Liu MH, **Ching-Ray Chang**, 2006, Spin precession in inversion-asymmetric two-dimensional systems, JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 304 (1): 97-101 SEP 1 2006

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- 152 SP Chen, and **Ching-Ray Chang**, 2006, "Induced interfacial diffusive scatterings from different mean free paths between adjacent materials", JOURNAL OF APPLIED PHYSICS 99 (8): Art. No. 08R502 APR 15 (2006).
- 151 Chang YC, Chang CC, Chang I, ZH Wei, MF Lai, **Ching-Ray Chang**, 2006, "Investigation of Permalloy cross structure using magnetic force microscope and magnetoresistance measurement", JOURNAL OF APPLIED PHYSICS 99 (8): Art. No. 08B710 APR 15 (2006).
- 150 MH Liu, SH Chen, **Ching-Ray Chang**, 2006, "Precessionless spin transport wire confined in quasi-two-dimensional electron systems," JOURNAL OF APPLIED PHYSICS 99, (8): Art. No. 08H707 APR 15 (2006). Selected for the May 8, 2006 issue of Virtual Journal of Nanoscale Science & Technology.
- 149 MH Liu, **Ching-Ray Chang**, 2006, "Datta-Das transistor: Significance of channel direction, size dependence of source contacts, and boundary effects", Phys. Rev. B 74, (2006), May. Selected for the May 8, 2006 issue of Virtual Journal of Nanoscale Science & Technology
- 148 S.T. Chui and **Ching-Ray Chang**, 2006, "Finite temperature simulation studies of spin-flop magnetic random access memory devices", PHYSICS LETTERS A 353 (4): 345-348 MAY 1 (2006).
- 147 SP Chen and **Ching-Ray Chang**, 2005, "Analytic solutions of Linear Boltzmann Transport equation for multilayered system", Phys. Rev. B, 72, 64445, Aug. , (2005). Selected in September 5, 2005 issue of Virtual Journal of Nanoscale Science & Technology.
- 146 Lin JG, Cheng SL, **Ching-Ray Chang**, et al., 2005, "Superconducting and transport properties of YBa₂Cu₃O₇/La_{0.7}Sr_{0.3}MnO₃ bilayers ", JOURNAL OF APPLIED PHYSICS 98 (2): Art. No. 023910 JUL 15 (2005) has been selected for the August 15, 2005 issue of Virtual Journal of Applications of Superconductivity.
- 145 J. Yang, J. Wang, Z. M. Zheng, D.Y. Xing and **Ching-Ray Chang**, 2005, "Quantum Oscillations of Tunneling magnetoresistance in Magnetic Tunneling junction", Phys. Rev. B, 71, 214434, July, (2005).
- 144 Lai JY, Lai MF, **Ching-Ray Chang**, et al. 2005, "Effects of interparticle dipole interaction on permalloy thin film arrays ", JOURNAL OF APPLIED PHYSICS 97 (10): Art. No. 10J504 Part 3 MAY 15, (2005) .
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"Superconductivity and magnetism of the R_6Ni_2Sn ($R = Y$ and rare earth)
compounds", PHYSICA B-CONDENSED MATTER 359: 211-213 APR 30 (2005).
- 140 MH Liu, **Ching-Ray Chang**, SH Chen, 2005, "Spin Precession due to spin-orbital
coupling in a two dimensional electron gas with spin injection via ideal quantum contact",
PHYSICAL REVIEW B 71 (15): 153305 APR (2005). Selected in "Virtual Journal of
Nanoscale Science & Technology"
- 139 Lai MF, Wei ZH, Wu JC, **Ching-Ray Chang** et al., 2005 "As-deposited magnetic states
in arrays of rectangular permalloy elements", IEEE TRANSACTIONS ON
MAGNETICS 41 (2): 944-946 FEB (2005).
- 138 Chang CC, Chang YC, Chung WS, **Ching-Ray Chang** et al. "Influences of the aspect
ratio and film thickness on switching properties of elliptical Permalloy elements", IEEE
TRANSACTIONS ON MAGNETICS 41 (2): 947-949 FEB (2005).
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networks", IEEE TRANSACTIONS ON MAGNETICS 41 (2): 953-955 FEB (2005).
- 136 Yang JS, **Ching-Ray Chang**, Lin WC, et al. 2005, "Spin dynamics of unit cells in
magnetic random access memory", IEEE TRANSACTIONS ON MAGNETICS 41 (2):
879-882 FEB (2005).
- 135 Yang JS, **Ching-Ray Chang**, 2005, "Fast switching in single-domain particles with
uniaxial quartic anisotropy", JOURNAL OF MAGNETISM AND MAGNETIC
MATERIALS 287: 303-307 Sp. Iss. SI FEB (2005)
- 134 Chan TS, Liu RS, Guo GY, **Ching-Ray Chang**, 2005, "Effects of B'-site transition metal
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15. A way to make core-shell composite nanoparticles, No. I 240009, Taiwan, 2005/09/21
16. Fabrication of theromowriting/magnetic reading media, No. 224305, Taiwan, 2004/11/21
17. Surface Plasma assisted writing of magneto-optical media, No. I224306, Taiwan, 2004/11/21

Pending:

1. Rapid Quench to make high density recording film, Hong Kong, No. HK1142057

2. Data storage instrument and their storage methods, Taiwan, 200947436,
3. Perpendicular Recording Media and the fabrication methods, Taiwan, 200926165
4. Perpendicular Recording thinfilm and the fabrications, Taiwan, 200917240
5. Data storage instrument and their storage methods, Hong Kong, HK1139501
6. Data storage instrument and their storage methods, China, CN1011609717

Invited speaker(Since 2006-):

1. STS, Kyoto, Oct. 2012.
2. ICAUMS, Nara, Oct. 2012.
3. WUN spintronics, Sydney, 2012.
4. Workshop on Standardisation of Chinese Physics Terminology, Singapore, Dec. 12-14, 2011.
5. Taiwan International conference of Spintronics, TICS2011, Puli, Taiwan, Dec. 2-4, 2011.
6. 17th Advanced Technologies and Applications, Kyungnam, Korea, Nov. 1-3, 2011.
7. Chinese Physics Society, Autumn meeting in HangChou, China, Sep. 15-18, 2011.
8. Moscow International Symposium on Magnetism (MISM), Moscow, Aug. 21-25, 2011.
9. 2011 "Frontier of Sciences and Technologies", Ulanbatta, Mongolia, 2011.
10. International Conference on Materials for Advanced Technologies(ICMAT), Singapore, Jun, 2011.
11. International Conference of Asia Union of Magnetic Societies (ICAUMS), Jeju island, Korea, Dec.,2010,
12. "spin Pumping in magnetic tunneling junctions", IUMRS Singapore, 2009.
13. "Spin Polarized transport and dynamics in magnetic tunneling structures", InterMag 2009, CA, USA.
14. Spin Polarized transport and dynamics in magnetic tunneling structures", InterMag 2009, CA, USA.
15. "Spin interferometer", Asia Magnetic Conference at Busan, Dec.10-12, 2008.
16. "Spin Precession in 2DEG", ISAMMA, Jeju island, Korea, 2007.
17. "Spin-orbital gauge influence of spin precession", Invited speaker at CN Yang's 85th birthday ceremony, Singapore, 2007
18. "Spin transport in 2DEG", Invited talk Overseas Chinese Physics Associations (OCPA), Taipei, 2006

