

2017.04
제35권 제1호

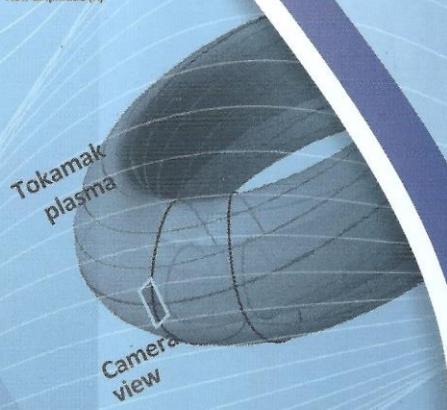
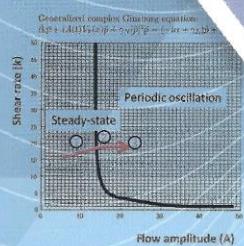


Bulletin of the
Korean Physical Society

한국 물리학회 회보

2017년 봄 학술논문발표회
및 제93회 정기총회
2017 KPS Spring Meeting

2017.4.19(수) – 21(금)
대전컨벤션센터



물리교육과)

F7.09 [17:36 - 17:48]

Installation and data analysis of Foucault's pendulum in Daegu National Science Museum / 김철희*, 정세훈 (국립대구과학관)

F7.10 [17:48 - 18:00]

HTML5 기반 동역학 시뮬레이션의 교육적 활용 / 오원근* (충북대학교 물리교육과)

F7.11 [18:00 - 18:12]

학생들이 생각하는 과학 실험과 지식의 역할: 단진자를 통한 중력 가속도 측정 실험을 중심으로 / 조현국* (단국대학교 교양학부)

[F8-co] **Pioneer: Topological Semiconductors / Magnetism IV**

2017. 4. 20 Thursday 16:00 - 17:48

좌장: 박 병 국 한국과학기술원
Chair: PARK Byong Guk (KAIST)

Room: #108

F8.01(초) [16:00 - 16:24]

Terahertz Electrodynamics of Topological Insulators / KIM Jae Hoon*, CHO Mann-Ho (Department of Physics, Yonsei University)

F8.02(초) [16:24 - 16:48]

Introducing Antiferromagnetic ordering in topological insulators by rare earth substitution / LEE Kyujoon*, KIM Jinsu², LEE Hyun Sung², TAKABATAKE Toshiro³, KIM Hanchul⁴, KIM Miyoung⁴, DOLINSEK Janez⁵, JUNG Myung-Hwa² (Institute for Physics Johannes Gutenberg University Mainz, ²Department of Physics Sogang University, ³Department of Quantum matter Hiroshima University, ⁴Department of Nano Physics, Sookmyung Women's University, ⁵J. Stefan Institute and University of Ljubljana)

F8.03(초) [16:48 - 17:12]

Magnetic easy axis and ground state of antiferromagnetic CeNMSb₂ (NM:Cu and Au) compounds / 장재경, 이주열* (성균관대학교 물리학과)

F8.04 [17:12 - 17:24]

X-ray magnetic circular dichroism study on La-Co substituted M-type Sr hexaferrites / 고윤영¹, 노우석¹, 박병규², 김재영^{*2} (마스플랑크 한국/포스텍 연구소, ²포항가속기연구소)

F8.05 [17:24 - 17:36]

Voltage effect on the spin-wave eigenmodes in disk-shaped CoFeB nanomagnet / CHO Jaehun*, MIWA Shinji^{1,3}, YAKUSHIJI Kay²

TAMARU Shingo², KUBOTA Hitoshi², FUKUSHIMA Akio², YUASA Shinji², YOUNG-YEOL⁴, SUZUKI Yoshishige^{1,2,3} (¹Graduate School of Engineering Science, Osaka University, Toyonaka, ²National Institute of Advanced Industrial Science and Technology (AIST), Spintronics Research Center, ³Center for Spintronics Research Network (CSRN), Osaka University, ⁴Department of Emerging Materials Science, DGIST)

F8.06 [17:36 - 17:48]

Evolution of Fermi surface in Gd-substituted Bi₂Se₃ single crystals by Shubnikov-de Haas oscillation / 김수환, 정명화* (서강대학교 물리학과)

[F9-or] **The physics festival and lecture for high-school students**

2017. 4. 20 Thursday 14:00 - 17:30

Room: #201

좌장: 이 신 범 대구경북과학기술원
Chair: LEE Shin Bum (DGIST)

F9.01 [14:10 - 16:00]

포스터 및 작품 발표(2층 복도)

F9.02 [16:00 - 17:00]

고교생 대상 강연: 스피트로닉스와 그 응용 / 김갑진 (KAIST)

F9.03 [17:00 - 17:15]

우수 발표에 대해 한국물리학회장상 시상

[F10-st] **Biological Physics**

2017. 4. 20 Thursday 16:00 - 17:24

Room: #202

좌장: 김 용 운 한국과학기술원
Chair: KIM Yong Woon (KAIST)

F10.01(초) [16:00 - 16:24]

Effects of molecular crowding and confinement on the spatial organization of a biopolymer / JUNG Youngkyun* (Supercomputing Center, KISTI)

F10.02 [16:24 - 16:36]

A new analog controller inspired by glucose homeostasis / 송태근, 조정호* (아태이뮨물리연구센터)

F10.03 [16:36 - 16:48]

Effect of Spike-Timing-Dependent Plasticity on Stochastic Spike Synchronization in A Small-World Neuronal Network / KIM Sang-Yoon, LIM Woochang* (Institute for Computational Neuroscience and

Department of Science Education, Daegu National University of Education)

F10.04 [16:48 - 17:00]

Effects of a sleep restriction on the pain perception: qEEG biomarkers / KIM JongWon*¹, LEE Jin-Seong² (¹Department of Healthcare IT, Inje University, ²Department of Psychiatry, Pusan National University Yangsan Hospital)

F10.05 [17:00 - 17:12]

Extinction behavior from coexistence of two types / 박해진*¹, TRAULSEN Arne (Theory department, Max Planck Institute for Evolutionary Biology)

F10.06 [17:12 - 17:24]

Distribution of number of local maxima in Fisher's Geometric Model / PARK Su-Chan* (The Catholic University of Korea)

[F11-bp] Molecular & Cellular biological physics II

2017. 4. 20 Thursday 16:00 - 17:48

Room: #204

좌장: 김 채 운 UNIST

Chair: KIM Chae Un (UNIST)

F11.01 [16:00 - 16:12]

NAP1L1 accelerates activation and discourages pausing to enhance nucleosome remodelling by CSB / LEE Ju Yeon¹, LAKE Robert J², KIRK Jaewon¹, BOHR Vilhelm A³, FAN Hua-Ying², HOHNG Sungchul*¹ (¹Department of Physics and Astronomy, Seoul National University, ²Epigenetics Program, Department of Biochemistry and Biophysics, Perelman School of Medicine, Univers, ³Laboratory of Molecular Gerontology, National Institute on Aging, National Institutes of Health, Bal)

F11.02* [16:12 - 16:24]

Enthalpic and entropic contributions in folding and unfolding kinetics of a single membrane protein with lipid bilayer conditions / CHOI Hyunkyu^{1,2}, MIN Duyoung³, BOWIE James U³, YOON Tae-Young*² (¹Department of Physics, Korea Advanced Institute of Science and Technology (KAIST), ²Department of Biological Sciences, Seoul National University (SNU), ³Department of Chemistry and Biochemistry, University of California-Los Angeles (UCLA))

F11.03* [16:24 - 16:36]

Research on HER2&HER3 signaling pathway using RTK dimer kinase assay / CHOI Byungsan¹, CHA Minkwon¹, PARK Sangwoo³, YOON Tae-Young*² (¹Department of Physics, Korea Advanced Institute of Science and Technology, ²School of Biological Sciences, Seoul National University, ³Proteina)

F11.04* [16:36 - 16:48]

Molecular Mechanism of NSF during SNARE disassembly / KIM Changwon¹, KIM Sung Hyun², RYU Je-Kyung³, YOON Tae-Young*² (¹Seoul National University, ²School of Biological Science, Seoul National University, ³Department of Bionanoscience, Kavli Institute of Nanoscience, Delft University of Technology)

F11.05* [16:48 - 17:00]

Observing dynamic membrane fluctuations of individual red blood cells from patients with diabetes mellitus employing 3-D quantitative phase imaging / LEE SangYun, PARK YongKeun* (Department of Physics, Korea Advanced Institute of Science and Technology)

F11.06* [17:00 - 17:12]

Mechanistic Studies of Intercellular Nanotubes / 장민혁, 오재호, 이종봉* (포항공과대학교 물리학과)

F11.07* [17:12 - 17:24]

Transcription-Translation coupling effects on transcriptional regulation / YANG Sora¹, KIM Seunghyeon¹, LEE Nam Ki*² (¹Department of Physics, POSTECH, ²Department of Chemistry, Seoul National University)

F11.08* [17:24 - 17:36]

Visualization of Chromatin Dynamics in Living Cells / CHAUDHARY Narendra^{1,2}, CHO Hayoon¹, GANTUMUR Narangerel¹, KIM Hajin*^{1,2} (¹Department of Biomedical Engineering, Ulsan National Institute of Science and Technology, ²Center for Genomic Integrity, Institute for Basic Science)

F11.09 [17:36 - 17:48]

Unconventional mechanical response of lipid-membrane compartments in living cells / KIM Jichul, YOON Tae-Young* (Center for Nanomedicine, Institute for Basic Science)

[F12-as] Toward multi-messenger astrophysics

2017. 4. 20 Thursday 16:00 - 17:36

Room: #205

좌장: 박 일 흥 성균관대학교

Chair: PARK IL Hung (Sungkyunkwan Univ.)

F12.01(초) [16:00 - 16:24]

Recent Progress in Cosmic Ray Observation and Effort for Multi-messenger Search / LEE Jik* (Department of Physics, Sungkyunkwan University)

F12.02(초) [16:24 - 16:48]

Gamm-ray bursts in the Multi-messenger era / JEONG Soomin* (SungKyunKwan University& IAA-CSIC)

2017년 봄 학술논문발표회 및 제93회 정기총회, 2017 KPS Spring Meeting
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F10.03

Effect of Spike-Timing-Dependent Plasticity on Stochastic Spike Synchronization in A Small-World Neuronal Network

KIM Sang-Yoon, LIM Woochang*

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Abstract:

We consider an excitatory population of subthreshold Izhikevich neurons which exhibit noise-induced spikings. This neuronal population has adaptive dynamic synaptic weights governed by the spike-timing-dependent plasticity (STDP); the synaptic weights vary via a Hebbian plasticity rule depending on the relative time difference between the pre- and the post-synaptic spike times. In the absence of STDP, stochastic spike synchronization (SSS) between noise-induced spikings of subthreshold neurons was previously found to occur over a large range of intermediate noise intensities through competition between the constructive and the destructive roles of noise. Here, we investigate the effect of additive STDP on the SSS for various values of the rewiring probability p in the Watts-Strogatz small-world neuronal network which interpolates between the regular lattice with high clustering ($p=0$) and the random graph with short average path length ($p=1$) via random uniform rewiring. A "Matthew effect" in synaptic plasticity is found to occur due to a positive feedback process. Good synchronization gets better via long-term potentiation (LTP) of synaptic weights, while bad synchronization gets worse via long-term depression (LTD). As a result, a step-like rapid transition to SSS occurs by varying the noise intensity, in contrast to the relatively smooth transition in the absence of STDP. Furthermore, a "plateau" of SSS with nearly same degree is formed within the range of the SSS. Emergence of LTP and LTD of synaptic weights are investigated in details through microscopic studies based on both the distributions of time delays between spike times of the pre- and the post-synaptic neurons and the pair-correlations between the pre- and the post-synaptic IISRs (instantaneous individual spike rates). Finally, a multiplicative STDP case depending on the synaptic weights is also studied and compared with the above additive STDP case (independent of the synaptic strengths).

Keywords:

Spike-Timing-Dependent Plasticity, Stochastic Spike Synchronization, Small-World Neuronal Network



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