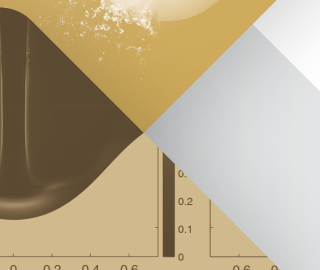
- 2021. 10 제39권 제2호
- Bulletin of the Korean Physical Society
- 한국물리학회 회보

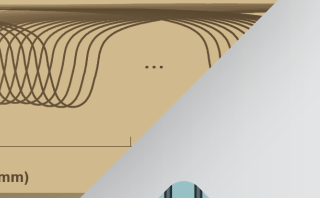
2021 KPS Fall Meeting

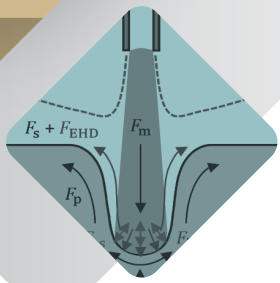
2021년 가을 학술논문발표회 및 임시총회

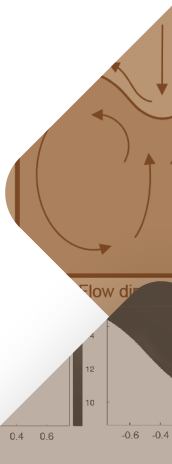
2021년
10월 20일(수)~22일(금)

Virtual Conference









KPS 한국물리학회 The Korean Physical Society

E12.03* [14:48 - 15:00]
Mixed-halide Zero-dimensional Perovskites Synthesized via Mechanochemistry for Visible Emission Over a Wide Color Spectrum / LIM Hyungbin[1], BAEK Kyeong-Yoon[1], KIM Jaeyoung[1], LEE Jonghoon[1], LEE Woocheol[1], AHN Heebeom[1], KIM Junwoo[1], KANG Keehoon*[2], LEE Takhee*[1] ([1]Dept. of Physics and Astronomy, Seoul National University, [2]Department of Materials Science and Engineering, Yonsei University)

E12.04 [15:00 - 15:12]
Blended Hole Transport Layer for Blue Perovskite Light Emitting Diodes / LEE Bo Ram*[1], YU Zhongkai[1], JEONG Woo Hyeon[2], WU Sang wook[1], CHOI Hyosung[2] ([1]Physics, Pukyong National University, [2]Chemistry, Hanyang University)

E12.05* [15:12 - 15:24]
Proton irradiation effect on organic-inorganic lead halide perovskites synthesized by mechanochmical synthesis and flash evaporation / LEE Takhee*[1], SHIN Jiwon[1], CHO Kyungjune[2], KANG Keehoon[3], BAEK Kyeong-Yoon[1], LEE Jonghoon[1], LEE Woocheol[1], KIM Jaeyoung[1], JANG Choontae[1], PARK Jaehyoung[1] ([1]Dept. of Physics and Astronomy, Seoul National University, [2]Soft Hybrid Materials Research Center, KIST, [3]Department of Materials Science & Engineering, Yonsei University)

[E13-st] Soft Matters and Biophysics
2021. 10. 21 Thursday 14:00~15:12
Room: 13
좌장 : **전재형** 포항공과대학교
Chair : JEON Jae-Hyung (POSTECH)

E13.01* [14:00 - 14:12]
네마틱 액정의 변형을 이용한 전기에너지 생성 / 이재훈[1], 이준용[1], 유정선[2], 김종현*[1,2] ([1]Physics, Chungnam National University, [2]Institute of Quantum Systems, Chungnam National University)

E13.02* [14:12 - 14:24]
Field-induced reconfiguration of double-twist director configuration of liquid crystal in cylindrical confinement / LEE Junghoon[1], JEONG Joonwoo*[1] ([1]Physics, UNIST)

E13.03 [14:24 - 14:36]
Accelerating Langevin Field-Theoretic Simulation of Polymers with Deep Learning / KIM Jaeup*[1], YONG Daeseong[1] ([1]Physics, UNIST)

E13.04 [14:36 - 14:48]
Disynaptic Effect of Hilar Cells on Pattern Separation in A Spiking Neural Network of

Hippocampal Dentate Gyrus / KIM Sang-Yoon[1], LIM Woochang*[1] ([1]Daegu National University Of Education)

E13.05 [14:48 - 15:00]
Orientational fluctuations and bimodality in semiflexible nunchucks / BENETATOS Panayotis*[1], RAZBIN Mohammadhosein[2] ([1]Dept. of Physics, Kyungpook National University, [2]Department of Energy Engineering and Physics, Amirkabir University of Technology, Tehran, Iran)

E13.06 [15:00 - 15:12]
Giant Charge Reconstruction in Lipid Vesicles : Optical Bottle Study / LEE Jaehee[1], GIM Bopil[1], PARK Seongmin[2], PARK Chang Young[3], JANG Hyunwoo[1], LEE Suho[1], JEONG Dae-Woong[1], OU-YANG H Daniel[4], KIM Mahn Won[2], KIM Joon Heon[5], KWON Suyong[6], HYEON Changbong[7], CHOI Myung Chul*[1] ([1]Department of Bio and Brain Engineering, KAIST, [2]Dept. of Physics, KAIST, [3]R&D Center, LG Hausys, [4]Dept. of Physics, Lehigh University, [5]Advanced Photonics Research Institute, GIST, [6]Division of Policy and Strategy, KRISS, [7]School of Computational Science, Korea InstiKorea Institute for Advanced Studytute for Advanced Study)

[E14] No session

[E15-pl] Focus: Review of Basic Plasma Studies
2021. 10. 21 Thursday 14:00~16:00
Room: 15
좌장 : 최수석 제주대학교
Chair : CHOI Sooseok (Jeju National University)

E15.01 [14:00 - 14:24]
플라즈마 이온에너지 분포의 특이 거동 해석 / 성인호[1], 이장재[1], 유신재*[1,2] ([1]Dept. of Physics, Chungnam National University, [2]Korea Research Institute of Standards and Science)

E15.02 [14:24 - 14:48]
반도체 산업의 플라즈마 시뮬레이션 방법론 (Plasma Simulation for Semiconductor Manufacturing) / SONG Sang-Heon*[1] ([1]SK Hynix)

E15.03 [14:48 - 15:12]
비충돌 Child-Langmuir 쉬스 형성에 이온 충돌이 미치는 영향 연구 (Investigation of Ion Collision Effect on Child-Langmuir Collisionless Sheath Formation) / 김곤호*[1], 김남균[1], 이하늘[1], 이명건[1] ([1]Plasma Application Laboratory, Department of Nulcear Engineering, Seoul National Univesity)

Abstract: E13.04 : Disynaptic Effect of Hilar Cells on Pattern Separation in A Spiking Neural Network of Hippocampal Dentate Gyrus

Presenter:
Lim Woochang
(, Daegu National University Of Education)

Author:
KIM Sang-Yoon [1], LIM Woochang [*1]
([1]Daegu National University Of Education)

We investigate the disynaptic effect of the hilar cells on pattern separation in a spiking neural network of the hippocampal dentate gyrus (DG). The principal granule cells (GCs) in the granular layer of the DG perform pattern separation, transforming similar input patterns into less-similar output patterns. In our DG network, the hilus consists of two types of hilar cells: excitatory mossy cells (MCs) and inhibitory HIPP (hilar perforant path-associated) cells. Here, we consider the disynaptic effects of the MCs and the HIPP cells on the GCs, mediated by the inhibitory basket cells (BCs) in the granular layer; MC $\rightarrow$ BC $\rightarrow$ GC and HIPP $\rightarrow$ BC $\rightarrow$ GC. Disynaptic inhibition of the MCs tends to decrease the firing activity of the GCs. On the other hand, the HIPP cells disinhibit the intermediate BCs, which leads to increasing the activity of the GCs. By changing the synaptic strength $K^{(\mathrm{BC,X})}$ [from the presynaptic X (= MC or HIPP) to the postsynaptic BC] from the default value $K^{(\mathrm{BC,X})*}$, we study the change in the pattern separation degree $\mathcal{S}_d$. When decreasing $K^{(\mathrm{BC,MC})}$ or independently increasing $K^{(\mathrm{BC,HIPP})}$ from their default values, $\mathcal{S}_d$ is found to decrease (i.e., pattern separation is reduced). On the other hand, as $K^{(\mathrm{BC,MC})}$ is increased or independently $K^{(\mathrm{BC,HIPP})}$ is decreased from their default values, pattern separation becomes enhanced (i.e., $\mathcal{S}_d$ increases). In this way, their disynaptic effects are opposite ones. Thus, when simultaneously varying both $K^{(\mathrm{BC,MC})}$ and $K^{(\mathrm{BC,HIPP})}$, as a result of the two competing disynaptic effects of the MCs and the HIPP cells, $\mathcal{S}_d$ forms a bell-shaped curve with an optimal maximum at their default values. In this case, the activation degree of the GCs, $D_a^{(\mathrm{GC})}$, forms a well-shaped curve with an optimal minimum at the default values. Moreover, we also investigate the population and the individual activities of sparsely synchronized rhythms of the GCs, the MCs, and the BCs in the GC-MC-BC loop, and find that their population and individual activity degrees, $\mathcal{A}_P$ and $\mathcal{A}_I$, are correlated with the pattern separation degree $\mathcal{S}_d$. Consequently, the larger the activity degree of the GC-MC-BC loop becomes, the more the pattern separation becomes enhanced.

Keyword:
Hippocampal Dentate Gyrus, Pattern Separation, Disynaptic Effect, Activity Degree of the GC-MC-BC Loop