

Report of the RCNP Collaboration Research Network (RCNP-COREnet)				
COREnet049		PI: FUJII Daisuke		
1	Title of research		Investigation of the relation between hadron's stability and stress distribution from gravitational form factors	
2	List of Participants (Name and affiliation)		Daisuke Fuji (Postdoctoral Fellow, ASRC, fuji.daisuke@jaea.go.jp)	
			Riku Kojima(M2 Student, RCNP, kojima@rcnp.osaka-u.ac.jp)	
			Akihiro Iwanaka (D3 Student, RCNP, Iwanaka@rcnp.osaka-u.ac.jp)	
			Masakiyo Kitazawa (Lecturer, YITP at Kyoto U., kitazawa@yukawa.kyoto-u.ac.jp)	
			Hyun-Chul Kim (Professor, Inha U. and Korea Inst. Advanced Study, Seoul, hchkim@inha.ac.kr)	
			Atsushi Hosaka (Professor, RCNP and ASRC, hosaka@rcnp.osaka-uac.jp)	
			Daiki Suenaga (Assistant professor, Nagoya U, suenaga@hken.phys)	
			Kei Suzuki (Scientist, ASRC, k.suzuki.2010@th.phys.titech.ac.jp)	
			Katsumasa Nakayama (Post Doctor, RIKEN AICS, katsumasa.nakayama@riken.jp)	
			Mitsuru Tanaka (D1 student, Nagoya U, tanaka@hken.phys)	
3	Period of research		2023.4~2024.3	
4	Main location of collaboration implementation		RCNP (Osaka U.), ASRC (JAEA), YITP (Kyoto U.)	
5	Publication list (Please include DOI if available)	Articles	[1] Daisuke Fujii, Katsumasa Nakayama, Kei Suzuki, "Dual chiral density wave induced oscillating Casimir effect" arXiv: 2402.17638 [hep-ph].	
			[2] Daisuke Fujii, Akihiro Iwanaka, Masakiyo Kitazawa, Daiki Suenaga, "Novel first-order phase transition and critical points in SU(3) Yang-Mills theory with spatial compactification", arXiv: 2404.07899 [hep-ph].	
		Talks	[1]"上のYang-Mills理論における非等方圧力と相構造", 藤井大輔, 岩中章紘 末永大輝, 北澤正清, KEK研究会「熱場の量子論とその応用」, (2023年8月29日), つくば.	
			[2]"ホログラフィックQCDからのハドロン形状因子", 藤井大輔, 岩中章紘, ELPH研究会(C035)「実験、反応・構造計算、格子QCDで解き明かすハドロン分光」, (2023年11月8日), 仙台.	
			[3]"The Dynamical properties of nucleon resonances by top down approach of holographic QCD", Daisuke Fujii, Akihiro Iwanaka, Atsushi Hosaka, The 2023 Fall Meeting of the Division of Nuclear Physics of the American Physical Society and Physical Society of Japan (Hawaii 2023); 6th Joint Meeting, (2023.11.29), Waikoloa.	
			[4]"Gravitational form factors for hadron from top-down holographic QCD", Daisuke Fujii, Akihiro Iwanaka, Seminar in Quark-Hadron Theory Group at Nagoya University, (2023.12.08), Nagoya.	
			[5]"非等方な境界条件下でのpure Yang-Mills理論における熱力学", 藤井大輔, 岩中章紘 末永大輝, 北澤正清, 基礎物理学研究所原子核グループセミナー, (2024年1月26日), 京都.	
			[6]"Gravitational form factors for vector mesons in the holographic QCD", Daisuke Fujii, Akihiro Iwanaka, Fourth International Workshop on Extension Project for the J-PARC Hadron Experimental Facility (HEF-ex 2024), (2024.02.21), Tokai.	
			[7]"非等方な境界条件下におけるpure Yang-Mills理論における圧力と相構造", 藤井大輔, 岩中章紘 末永大輝, 北澤正清, 日本物理学会2024春季大会, オンライン開催.	
			[8]"Dual chiral density wave中のカシミア効果", 藤井大輔, 中山勝政, 鈴木溪, 日本物理学会2024春季大会, オンライン開催.	
			[9]"MITバグモデルを用いた陽子内部の圧力の解析", 小島陸, 藤井大輔, 岩中章紘, 保坂淳, 日本物理学会2024春季大会, オンライン開催.	
			[10]"ホログラフィックQCDのトップダウンアプローチによるベクターメソンの重力形状因子", 藤井大輔, 岩中章紘, 日本物理学会2024春季大会, オンライン開催.	

[illegible]

6	Description of the results and outputs	Objective: To elucidate the mechanism how the stresses inside hadrons are produced by the fundamental theory of the hadrons. We aimed to reveal the above from the following four collaborations. Using four different QCD models, we investigated (1) stress inside nucleons, (2) stress inside mesons, (3) pressure produced by quarks in finite volume systems, and (4) pressure produced by gluons in finite volume and temperature systems. For (1) and (2), we obtained preliminary results and did several oral presentations. For (1), we succeeded in obtaining the stress distribution inside the nucleon and its resonance state, and are currently preparing a paper. As for (2), we have established a method to obtain the gravitational form factors of pions. Currently, we formulate the gravitational form factors of vector and axial vector mesons and study to obtain the stress distribution inside the meson. We have prepared and submitted papers about (3) and (4). In these studies, we have obtained many suggestions on the stress distribution inside hadrons from the investigation of the pressure produced by quarks and gluons, respectively.	
7	Amount of budget implemented (for internal use only)	71400 JPY	

