

Report of the RCNP Collaboration Research Network (RCNP-COREnet)

COREnet050		PI: FUKUI Tokuro	
1	Title of research		Exploring Nuclear Giants: Structures and Reactions of Extremely Large Nuclei
2	List of Participants (Name and affiliation)		Tokuro Fukui Assistant Professor, Faculty of Arts and Science, Kyushu University tokuro.fukui@artsci.kyushu-u.ac.jp
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3	Period of research		July/2023–March/2025
4	Main location of collaboration implementation		Research Center for Nuclear Physics, Osaka University
5	Publication list (Please include DOI if available)	Articles	"Efimov states in excited nuclear halos" Shimpei Endo, Junki Tanaka arXiv:2309.04131 (2023)
			"Three-body forces and Efimov physics in nuclei and atoms" Shimpei Endo, Evgeny Epelbaum, Pascal Naidon, Yusuke Nishida, Kimiko Sekiguchi, Yoshiro Takahashi Eur. Phys. J. A 61, 9 (2025)
	Talks		遠藤晋平 "Efimov physics in the sub-threshold excited nucle" RIBF Users Meeting 2023, RIKEN、2023年9月7日
			遠藤晋平 "Exciting nuclei for the Efimov physics" クラスター領域研究会、RIKEN、2023年9月22日
			遠藤晋平 "Surprisingly large s-wave scattering length and Efimov states in the excited nuclei" RCNP Colloquium, Osaka Univ. RCNP、2024年2月29日
			遠藤晋平、田中純貴 "原子核励起状態におけるエフィモフ状態" 日本物理学会春季大会、オンライン、2024年3月20日
			Shimpei Endo 「Universality of Efimov states in cold atoms and nuclear physics」 UEC-SAARC Symposium on Emerging Technologies (USSET)、Uiv Electro-Communications、2023年12月7日
			Shimpei Endo "Efimov states in the highly excited nuclei " Advancing physics at next RI Beam Factory (ADRI25), RIKEN、2025年1月22日
			Shimpei Endo "Efimov states in highly excited nuclear halos" 4th Franco-Japanese workshop on Few-body Problems in Physics from Atoms to Quarks、LPC-Caen、France、2025年3月4日
			Shimpei Endo "相互作用の強い量子少数～多体系の普遍的挙動" 先端基礎研究センターセミナー、原子力研究開発機構、2024年5月20日
			中西勇貴(大阪大学理学部3回生)、田中純貴 "巨大原子核の発見に向けた高エネルギー分解能測定" オナーセミナー自主研究発表会、2025年3月28日
6	Description of the results and outputs		We study structure and reaction of a two-neutron halo state which may appear around the two-neutron separation threshold of exited nuclei. With a three-body calculation, we show that Efimov states may appear in the excited states of Gd and Zr nuclei. We present these results in domestic and international conferences, and the paper summarizing the results is under review process. Experimentally we conducted a (d, p) measurement on a gold target during the 2024 Osaka University Honors Seminar as a proof-of-principle. The experiment achieved sub-20 keV resolution and demonstrated the potential of (d, p) reactions for studying neutron halo states in heavy nuclei, with future application to gadolinium isotopes.
7	Amount of budget implemented (for internal use only)		268,496 YEN