

Report of the RCNP Collaboration Research Network (RCNP-COREnet)					
COREnet034			PI: TAKEUCHI Sachiko		
1	Title of research		Quark rearrangements for light-flavored and unflavored exotic mesons — Quest for the origin of attractive force —		
2	List of Participants (Name and affiliation)		Sachiko Takeuchi (Japan College of Social Work)		
			Yasuhiro Yamaguchi (Nagoya University)		
			Makoto Takizawa (Shizuoka Pharmaceutical University, visiting lecturer, J-PARC branch, Theory Center, Institute of Particle and Nuclear Studies, KEK, Meson Science Laboratory, Cluster for Pioneering Research, RIKEN)		
			Atsushi Hosaka (Research Center for Nuclear Physics, Osaka University)		
			Noriyoshi Ishii (Research Center for Nuclear Physics, Osaka University)		
3	Period of research		From May 2022 to March 2024		
4	Main location of collaboration implementation		RCNP Osaka University (Hosaka, Ishii), KEK Tokai Campus (Takizawa), Japan College of Social Work(Takeuchi)		
5		Articles	Alessandro Giachino, Atsushi Hosaka, Elena Santopinto, Sachiko Takeuchi, Makoto Takizawa, Yasuhiro Yamaguchi, "Rich structure of the hidden-charm pentaquarks near threshold regions," Phys.Rev.D 108 (2023) 7, 074012 • e-Print: 2209.10413 [hep-ph]		
			Sachiko Takeuchi, "The impact of quark many-body effects on exotic hadrons," Proceedings to the 25th European Conf. on Few-Body Problems in Physics, to appear in Few-Body Systems		
		Publication list (Please include DOI if available)	Talks	Yasuhiro Yamaguchi, "Heavy hadron spectroscopy: exotic hadrons as molecular states near thresholds," (The 20th International Conference on Hadron Spectroscopy and Structure (HADRON 2023)@Genova, Italy, Jun. 7, 2023)	
				Yasuhiro Yamaguchi, "Exotic hadrons: Rich structure of multiparticle state near thresholds," (The 41st SPP Physics Conference and Annual Meeting@Siargao Island, Philippines, July 20, 2023)	
				Sachiko Takeuchi, "The impact of quark many-body effects on exotic hadrons," (25th European Conf. on Few-Body Problems in Physics@Mainz, Jul. 31, 2023)	
				竹内幸子, "Multiquark states by the quark-hadron hybrid model — S-factorに現れる クォーク自由度の効果 —," (多彩なハドロンの存在形態を探る理論と実験の最近の発展@RIKEN,Sep. 02, 2023)	
				山口康宏, "チャームエキゾチックなハドロン分子状態," (多彩なハドロンの存在形態を探る理論と実験の最近の発展@RIKEN,Sep. 02, 2023)	
				瀧澤誠, "理論と実験で探るハドロンの多彩な存在形態 —私のハドロン物理との関わり—," (多彩なハドロンの存在形態を探る理論と実験の最近の発展@RIKEN,Sep. 02, 2023)	
				Yasuhiro Yamaguchi, "Heavy exotic hadrons as a molecular state near thresholds," (第9回クラスター階層領域研究会@RIKEN, Sep. 22, 2023)	
				Yasuhiro Yamaguchi, "Exotic hadrons as a hadronic molecule," (Nagoya Workshop on Exotic Hadrons 2023@Nagoya University, Nov. 14, 2023)	
				Atsushi Hosaka, "Heavy exotic hadrons as hadronic molecules," (6th Joint Meeting of the APS Division of Nuclear Physics and the Physical Society of Japan@Hawaii,Nov 27,2023)	
				Sachiko Takeuchi, "On the Impact of the Quark Many-body Effects on Exotic Hadrons," (6th Joint Meeting of the APS Division of Nuclear Physics and the Physical Society of Japan@Hawaii,Nov 29,2023)	
				Makoto Takizawa, "Structure of the bottomonium counterpart of X(3872)," (6th Joint Meeting of the APS Division of Nuclear Physics and the Physical Society of Japan@Hawaii,Nov 29,2023)	
6	Description of the results and outputs		This project aims to understand the origin of the attraction that makes charged or strange heavy-exotic mesons. In F2023, we investigated how the quark exchange effect and the color-spin interaction between quarks affect the Tcc, d-Jpsi, X(3872), and their bottomonium counterparts. It is found that the Pauli-blocking and the quark spectroscopic factor (S-factor) effects on the quark kinetic term are strong and may give a bound state or a shape resonance by themselves. It provides a repulsion between the quark color-33bar pair in Tcc, where the color-spin interaction is strongly attractive. It can be the reason why T cc is such a shallowly bound state.		
7	Amount of budget implemented (for internal use only)		262,220 JPY		