1. Title
   Elucidation of heavy hadrons in B-factory by collaboration of experimentalists and theorists

2. List of participants

   - Yuji Kato, Assistant Professor, KMI, Nagoya University
   - Atsushi Hosaka, Professor, RCNP Osaka University
   - Hikari Hirata, Ph.D student, Nagoya University
   - Kenkichi Miyabayashi, Professor, Faculty Division of Natural Sciences, Nara Women's University
   - Kiyoshi Tanida, Principal researcher Advanced Science Research Center, Japan Atomic Energy Agency
   - Makoto Takizawa,Lecturer, PI,Showa Pharmaceutical University
   - Makoto Oka, Director General, Advanced Science Research Center, Japan Atomic Energy Agency
   - Masayuki Niiyama, Associate professor, Kyoto Sangyo University
   - Mizuki Sumihama, Associate professor, Department of education Gifu university/RCNP Osaka University
   - Shigehiro Yasui, Postdoc, Keio University
   - Tomoaki Hotta, Assistant Professor, RCNP
   - Yasuhiro Yamaguchi, Special Postdoctoral Researcher, Nishina Center, RIKEN

3. Period of research
   From September/2019 to March/2021

4. Main location of collaboration implementation
   Nagoya University

5. Publication list including any kinds of papers, talks and so on.
   Nothing.

6. Description of the outputs
   The purpose of this research is to make a comprehensive understanding of heavy hadrons by using Belle/Belle II experimental data with collaboration of experimentalists and theorists. B-factroy experiment opened new era in the hadron spectroscopy by discoverying huge number of hadrons containing heavy charm or bottom quarks which can not be explained by simple quark model. Also, many baryons which contain a charm or a strange quark are discovered. Such baryons are suitable to study 'di-quark' substructure.

   However, the nature of these hadrons are still not understood yet. To boost heavy flavor hadron spectroscopy, we launch a joint collaboration team to analyze experimental data with a help of theorists and to perform theoretical prediction which is feasible by experiments.

We had one meeting to determine the key observables to understand charmed baryons and a candidate of exotic hadron, X(3872). For the charmed baryon, we concluded that the double ratio of branching fractions $\mathcal{B}(\Xi_c^* \to \Lambda D)/\mathcal{B}(\Xi_c^* \to \Sigma_c K)$ and $\mathcal{B}(\Lambda_c^* \to pD)/\mathcal{B}(\Lambda_c^* \to \Sigma_c \pi)$ is very useful to identify the correspondence between Λ_c and Ξ_c and leads to the systematic understanding of all the charmed baryons. For $X(3872)$, we identified the search for isospin partner $J/\psi \to \pi^+\pi^0$ channel is very important to check if the $X(3872)$ is a threshold cusp of DD^* We started to work on these observables both theoretically and experimentally.