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# The JPARC Heavy Ion Project

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Study of nuclear matter attracts wide interests in the field of hadron physics research. A project to study high-density nuclear matter using heavy ion collisions in a beam energy range of few GeV is being prepared at J-PARC. According to past experiments and model calculations, such heavy ion collisions can produce a high-baryon density matter, which has few times larger density than a normal nuclear matter. We can study properties of hadrons in a high-density matter and properties of matter itself directly.

We have designed a heavy-ion acceleration scheme and spectrometer for the experiment. We can achieve beam energies of 1-12 AGeV/$c$ and the collision rates of $10^{11}$ Hz. One the main purpose of the experiment is to explore the phase structures of the QCD phase diagram in a high-baryon density regime such as the first-order phase boundary and the QCD critical point, and search for color-superconducting phase. We will also measure various strange particles/nuclei and study their correlations to unveil the EOS of the matter. In addition, we also measure hadron properties, such as interactions, mass, width and decay rates, in a dese medium. Such measurements will give a bright experimental information on hadron physics in a high-density region.

In this presentation, we will show details of the project. The project is planned using a staging approach to realize the experiment as soon as possible, As the first phase of the project, we will perform the experiment with upgrades of the existing J-PARC E16 spectrometer with $10^8$ Hz beams. The E16 experiment is an ongoing experiment at J-PARC and aims to measure properties of vector mesons in a nucleus. We will introduce details of measurements at the first phase.

Also, relations with the current activities on hadron physics studies at J-PARC will be shown.

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