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# Commissioning runs of J-PARC E16 experiment performed in 2020-21

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Hadrons are elementary excitations of the QCD vacuum, and their properties reflect the state of the vacuum. The properties of the vacuum are theoretically suggested to be modified at finite density or temperature. Therefore, measuring hadrons under such an environment will lead to understanding of the property of QCD vacuum.
The J-PARC E16 experiment focuses on a measurement of the spectral modifications of vector mesons at nuclear density. In the experiment, 30 GeV primary proton beam is irradiated on carbon and copper targets to produce vector mesons, $\rho$, $\omega$ and $\phi$. We measure the spectra of these mesons at nuclear density from their dilepton decay.
In order to obtain large statistics, we constructed a new spectrometer having high rate capability to detect dileptons produced in pA reaction. The spectrometer consists of Silicon Strip Detectors (SSD), GEM TRackers (GTR) for tracking, and Hadron Blind Detectors (HBD) and Lead Glass calorimeters (LG) for electron identification. GTR is used to cope with the expected high particle rate 5 kHz/mm$^2$. The spectrometer is designed 5.8 MeV/$c^2$ mass resolution for $\phi$ mesons and 99.97 % pion rejection power.
The experiment has been successfully launched at a J-PARC high momentum beam line in 2020, and three commissioning runs have been carried out so far. The first physics run is planned in 2022-2023. In the physics run, we will obtain 15,000 $\phi$ mesons.
Preliminary results of the commissioning runs and the expected physics results will be presented in this talk.

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