Spectroscopic study of S=−2 hypernuclei with a new spectrometer S–2S

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The study of S=−2 hypernuclei is important for understanding baryon-baryon interaction and strange nuclear matter. However, the experimental data of S=−2 systems are very limited. We will obtain spectroscopic information of S=−2 hypernuclei using the ^{12}C(K^-,K^+) reaction, first (J-PARC E05 [1]). Following this measurement, we plan to carry out further spectroscopic studies on Ξ- and double Λ-hypernuclei with various targets.

For these experiments, we will utilize the high intensity K^- beam at J-PARC K1.8 beam line. The momentum of incident K^- is analysed by a beam line spectrometer with a good momentum resolution, which is already in operation for other experiments.

We are now constructing a new spectrometer "S−2S" (Strangeness −2 Spectrometer) for scattered K^+ to achieve both a large acceptance and a good resolution. It consists of a QQD-type configuration, and is designed to have a momentum resolution of better than 5×10^{-4} (FWHM), which corresponds to missing mass resolution of 1.5 MeV, 10 times better than in the case of a previous experiment at BNL [2]. We can explore the S=−2 world with S−2S.

The construction of Q1 and Q2 has already been finished. We measured magnetic field of Q1, and obtained a field gradient of 8.7 T/m enough to achieve an acceptance of 60 msr. The results are well understood by the field calculations using TOSCA simulation including its distribution. We are also developing detectors, especially a water Cherenkov counter for on-line *K*/*p* separation. We carried out performance tests of a prototype, and actual version is under design. The magnets and the detectors will be ready for installation in the next year.

References

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