

PROPOSAL FOR EXPERIMENT AT RCNP

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TITLE:

Search for supernarrow dibaryons via the $p+d$ scattering
(extended proposal of R23)

SPOKESPERSON:

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RUNNING TIME:

Test running time for experiment 1 days
Data runs 6 days

BEAM LINE:

Ring : WS course

BEAM REQUIREMENTS:

Type of particle polarized p
Beam energy 295 MeV
Beam intensity 10 nA (stopped by the beam dump in the wall)
Any other requirements energy resolution: $\Delta E \leq 200$ keV
low horizontal emittance beam: $\Delta x=2\text{mm}$, $\Delta\theta_H=\pm 0.7$ mr

BUDGET:

Experimental expenses 850,000 yen
Travel planes 700,000 yen

**TITLE: Search for supernarrow dibaryons via the $p+d$ reaction
(extended proposal of R23)**

SPOKESPERSON: Atsushi Tamii

SUMMARY OF THE PROPOSAL

The possibility of existence of six-quark states, *i.e.* dibaryons, is one of interesting predictions of the QCD. A lot of works have been devoted to the search for dibaryons but none of the candidates has been established up to now. Among the many dibaryons, super-narrow dibaryons (SNDs) are of particular interest. The SNDs are prohibited into two nucleons by the Pauli principle and to decay into the $NN\pi$ system due to their small mass. Consequently the SNDs must decay through electromagnetic processes, and have very narrow decay width of less than 1 keV. Observation of the SNDs has a great impact on nuclear physics, and provides important data to the QCD calculations.

Recently three narrow peaks have been found in the missing mass spectra of the $pd \rightarrow pX$ reaction at the Institute for Nuclear Research (INR). The width of the resonances are equal to the missing mass resolution. They are reported as SND candidates. In order to study the property of one of the three candidates, an experiment has been carried out at the Research Center for Nuclear Physics (RCNP) under the program number R23 by employing two magnetic spectrometers. Although a good mass resolution and background-free condition have been achieved, the narrow peak could not be observed.

The reason of the inconsistency between the two results are considered as 1) the cross section of the data at the INR is overestimated, and 2) more than half of the produced dibaryons might have escaped from the detection in the setup at the RCNP due to the characteristic momentum distribution of the decay protons.

We propose to measure the $pd \rightarrow ppX$ and $pd \rightarrow pdX$ reaction as an extension of the R23 program. By using a cryogenic deuterium target we can achieve much higher statistics over a broader mass range of 1886–1959 MeV. A good mass resolution of 600 keV can be achieved by a careful tuning of the beam emittance, By the proposed experiment, we can obtain decisive conclusion on the existence of the narrow peaks, and if they really exist, we can obtain further information on cross sections, widths, analyzing power, and decay characteristics which is indispensable for revealing the property of the narrow resonances.