PROPOSAL FOR EXPERIMENT AT RCNP

9 February 2017

TITLE:
Study of the ^{7}Li(p, d) reaction near the π emission threshold

SPOKESPERSON:

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EXPERIMENTAL GROUP:

Full Name	Institution	Title or Position
Hiroyuki Fujioka	Department of Physics, Kyoto University	Assistant Professor
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Miho Tsumura	Department of Physics, Kyoto University	Graduate Student (D3)
Motoki Murata	Department of Physics, Kyoto University	Graduate Student (D2)
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Takahiro Nishi	RIKEN Nishina Center	Postdoc
Atsushi Tamii	RCNP, Osaka University	Associate Professor
Nobuyuki Kobayashi	RCNP, Osaka University	Assistant Professor
Johann Isaak	RCNP, Osaka University	Assistant Professor
Satoshi Adachi	RCNP, Osaka University	Researcher
Azusa Inoue	RCNP, Osaka University	Graduate Student (D1)
Takashi Hashimoto	Institute for Basic Science	Research Fellow
Yoshiki K. Tanaka	GSI	Postdoc

RUNNING TIME:	Installation time without beam	1 day
	Beam commissioning	0.3 days
	Calibration measurements	0.2 days
	Production run	0.5 days
BEAM LINE:		Ring : WS course
BEAM REQUIREMENTS:	Type of particle	p
	Beam energy	350 MeV or 392 MeV
	Beam intensity	$\lesssim$ 10 nA
	Other requirements	energy resolution $\lesssim$ 200 keV halo-free, small emittance
BUDGET:	LiF target	200 kyen
	Travel expenses	200 kyen

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SUMMARY OF THE PROPOSAL

Due to an attractive interaction between $I = 1/2$ pion-nucleon pairs, a four-body system, πNNα, with the isospin 0 and the spin-parity 0^-, may manifest itself as a resonance near the ^{6}Li$^*(3.563; 0^+) + \pi^0$ threshold. We propose a measurement of the ^{7}Li(p, d) reaction at the incident energy of 350 MeV or 392 MeV, in search of a possible signature of such a resonant state. Despite the absence of theoretical predictions at present except for the πNN "subsystem", we envisage the observation of quasi-free π production above the π emission threshold and a narrow peak structure corresponding to the πNNα state under somewhat optimistic assumptions.