

PROPOSAL FOR EXPERIMENT AT RCNP

October 23, 2017

TITLE:**Linear Polarization Measurement in ^{137}Pm , ^{137}Sm : Search for New Wobbling Candidates****SPOKESPERSON:**

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and CAGRA collaboration

RUNNING TIME:	Installation time without beam	4 days
	Test running time for experiment	0.5 day
	Data runs	5 days
BEAM LINE:		AVF: EN course
BEAM REQUIREMENTS:	Type of particle	^{40}Ca
	Reactions to be used	$^{101}\text{Ru} (^{40}\text{Ca}, 2p2n) ^{137}\text{Sm}$, $^{101}\text{Ru} (^{40}\text{Ca}, 3pn) ^{137}\text{Pm}$
	Beam energy	172 MeV
	Beam intensity	≤ 19 pA

TITLE:

Linear Polarization Measurement in ^{137}Pm , ^{137}Sm : Search for New Wobbling Candidates

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SUMMARY OF THE PROPOSAL

Research Background: We propose to utilize the CAGRA γ -ray clover array, which has high efficiency for high-fold γ -ray coincidence events and excellent applicability for linear polarization measurement, to search for new wobbling bands in ^{137}Pm and ^{137}Sm , and extend their level-schemes. Recently a transverse wobbling band has been identified in the odd proton nucleus ^{135}Pr , in which a proton particle is coupled to a triaxial core. This opened an intense debate on the understanding of the low-spin rotational excitations in nuclei, revealing that the wobbling motion may also exist in normal-deformed lanthanides. A similar wobbling band is expected to exist in ^{137}Pm , which has only two more protons than ^{135}Pr . Meanwhile, transverse wobbling may also exist in an odd-neutron nucleus, like ^{137}Sm , in which a neutron hole is coupled to a triaxial core. To find a non-yrast band and judge if it is a wobbling band, a high-efficiency array and a linear polarization measurement are both indispensable. CAGRA is an excellent choice since it can meet the two requirements at the same time.

Purpose: To search for new wobbling candidates in ^{137}Pm and ^{137}Sm and extend their level-schemes.

Methods: We propose an in-beam γ -ray spectroscopy experiment via the reaction of 172-MeV ^{40}Ca on thick ^{101}Ru target (with a thick gold backing). Three- and higher-fold γ -ray coincidence events will be recorded. The clover detectors perpendicular to the beam direction will be used to analyze the linear polarization. A CsI detector array will also be used to select different reaction channels.