RCNP EXPERIMENT E213

PROPOSAL OF EXPERIMENT AT RCNP

15 Jan. 2002

TITLE :

Measurement of particle production cross sections induced by 400-MeV protons on Gd, Ta and W

SPOKESPERSONS:

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David MZAVIA, Professor, JINR Dubna

RUNNING TIME :	Beam preparation and beam tuning	1.0 days
	Data runs	2.0 days

BEAM LINE : ES course

BEAM REQUIREMENTS :	Type of particle	p
	Beam energy	392 MeV
	Beam intensity	1 nA

BUDGET : Travel Expenses 400,000 yen

SCHEDULE : June 2002

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SPOKESPERSONS : Yusuke UOZUMI

SUMMARY OF THE PROPOSAL

We propose measurements of double-differential cross sections for the production of protons and deuterons in proton-induced reactions on Gd, Ta and W. Although they are the first priority elements for applications in new technologies, such as accelerator-driven systems (ADS), few data are available in an intermediate energy range. It is urgently required to obtain systematic cross section data for this aim. In our previous works, proton and deuteron-production cross sections were measured for 300 and 392-MeV proton reactions on several target nuclei, such as ^{12}C, ^{27}Al, ^{91}Nb, ^{197}Au, ^{208}Pb and ^{209}Bi. The data have been utilized to facilitate a testing and improvement of nuclear model calculations. As a result, it was demonstrated that the quantum molecular dynamics (QMD), one of the most typical nuclear reaction model used for nuclear data evaluations ranging from 200 MeV to 3 GeV, gives satisfactory accounts for proton spectra from the three lighter nuclei, but poor accounts for those from the heavier nuclei.

In this proposed research, we will conduct measurements with three target nuclei, ^{158}Gd, ^{181}Ta and ^{184}W with a 392-MeV proton beam. These nuclei are marked as first priority elements as coolant and/or target materials in ADS's. It should be added that they are in a mass range between ^{91}Nb and ^{197}Au, where the validity of the QMD is not clear. Therefore, the obtained data are of great importance in nuclear data studies for applications.