GEOANTINEUTRINO SPECTRUM AND SLOW NUCLEAR BURNING ON THE BOUNDARY OF THE LIQUID AND SOLID PHASES OF THE EARTH'S CORE

V. D. Rusov[1,2], V. N. Pavlovich[3], V. N. Vaschenko[4,5], V. A. Tarasov[1], T. N. Zelentsova[1,2], V. N. Bolshakov[1], D. A. Litvinov[1], S. I. Kosenko[1], O. A. Byegunova[2]

[1]Odessa National Polytechnic University, Odessa, Ukraine
[2]Bielefeld University, Bielefeld, Germany
[3] The Institute for Nuclear Researches of National Academy of Sciences of Ukraine, Kyiv, Ukraine
[4]Ukrainian National Antarctic Center, Kyiv, Ukraine
[5] National Taras Shevchenko University, Kyiv, Ukraine

The problem of the geoantineutrino deficit and the experimental results of the interaction of uranium dioxide and carbide with iron-nickel and silica-alumina melts at high pressure (5-10 GPa) and temperature (1600-2200^0 C) have motivated us to consider the possible consequences of the assumption made by V.Anisichkin and coauthors that there is an actinid shell on boundary of liquid and solid phases of the Earth's core. We have shown that the activation of a natural nuclear reactor operating as the solitary waves of nuclear burning in ^{238}U- and/or ^{232}Th-medium (in particular, the neutron-fission progressive wave of Feoktistov and/or Teller-Ishikawa-Wood) can be such a physical consequence. The simplified model of the kinetics of accumulation and burnup in U-Pu fuel cycle of Feoktistov is developed. The results of the numerical simulation of neutron-fission wave in two-phase UO_2/Fe medium on a surface of the Earth's solid core are presented. The georeactor model of ^{3}He origin and the ^{3}He/^{4}He-ratio distribution in the Earth's interior is offered. It is shown that the ^{3}He/^{4}He ratio distribution can be the natural quantitative criterion of georeactor thermal power. On the basis of O'Nions-Evensen-Hamilton geochemical model of mantle differentiation and the crust growth supplied by actinid shell on the boundary of liquid and solid phases of the Earth's core as a nuclear energy source (georeactor with power of 30 TW), the tentative estimation of geoantineutrino intensity and geoantineutrino spectrum on the Earth surface are given.

CONTRIBUTION OF THE EXCITED 1^+ STATES TO THE ^{116}CD $2\nu2\beta$-TRANSITION AMPLITUDE

S. V. Semenov[1], F. Šimkovic[2], R. Dvornicky[2]

[1]Russian Research Centre "Kurchatov Institute", Moscow, Russia
[2]Department of Nuclear Physics, Comenius University, Bratislava, Slovakia

The half-decay time and differential intensities of $2\nu2\beta$-transitions in ^{116}Cd have been calculated with the account for the contributions of two first excited 1^+ states of intermediate nucleus. The energy denominators of perturbation theory are treated exactly. It has been shown, that it is necessary to consider both modules and relative phases of matrix elements for three states estimation scheme. For ^{116}Cd the contributions of these two excited 1^+ states should have negative sign in order to obtain experimental value of $t_{1/2}^{2\nu2\beta}$. The theoretical single electron decay rate and angular correlation parameter can be compared with precise high statistics measurements with ^{116}Cd, which are now in progress in NEMO-3 experiment. This comparison can give possibility to test different hypothesis on nuclear mechanism of $2\nu2\beta$ transition in this isotope.

The work is supported by the JINR-Slovak Republic common project for 2006 and by the VEGA grant 1/3039/06.

RESULT ON DARK MATTER SEARCH OF KIMS

Sun Kee Kim

Seoul National University, Seoul, Korea