Development of nondestructive measuring technique of environmental radioactive strontium

S. Saiba, T. Okamiya, S. Tanaka, R. Tanuma, Y. Totsuka, T. Yoshida and J. Murata

Department of Physics, Rikkyo University, Tokyo 171-8501, Japan

saiba@rikkyo.ac.jp

This project is motivated to contribute on a social restoration from the Fukushima nuclear power plant accident triggered by the big earthquake in 2011, by establishing a new quick way to measure environmental radioactivity utilizing nuclear physics instruments. The main radioactivity concerned after the accident are from I-131, Cs-134 and 137, Sr-89 and 90. Sr-90 is difficult to be measured in a gamma-spectroscopy because of its tiny gamma-decay branching ratio of about 0.01%. Therefore, only small numbers of food or soil samples were measured during surveying projects by applying the standard chemical separation procedure which requires about two weeks to wait Sr-Y radio-equilibrium. In addition, according to a large-scale environmental soil surveying project leaded by MEXT, relative abundance of Cs-134 to Cs-137 is confirmed to be almost constant, however, that of Sr-90 to Cs-137 is widely spread from about 0.01% to 10% [1]. Therefore, reliable estimation of Sr-90 using Cs-137 activity is not possible.

In this project, we are aiming to establish a new detection technique which enables us to realize quantitative evaluation of the strontium radioactivity by means of a nondestructive measurement without chemical separation processing. Present project is going to measure Sr-90 radioactivity by performing a physical beta-spectroscopy utilizing the relatively large Q_beta of Y-90 (64 hours, 2.3MeV). We are trying to separate the Sr-90 contribution as a high energy tail using a high energy resolution detector, together with a statistical analysis to extract its contribution. The project background around the power plant accident, status, technical aspects of our device and their results will be presented at the conference.
