METHOD FOR DETECTION OF ILLEGAL CIGARETTE BOXES IN IRON ORE CARGO

M. FULOP
ABRS Ltd., Samorin, Slovakia

A. RUZICKA
Faculty of Mathematics, Physics and Informatics Comenius University in Bratislava, Bratislava, Slovakia

P. RAGAN
ABRS Ltd., Samorin, Slovakia

A. SAGATOVA
Slovak University of Technology in Bratislava, Faculty of Electrical Engineering and Information Technology, Institute of Nuclear and Physical Engineering, Bratislava, Slovakia

Braking radiation, obtained by converting electron beams accelerated by linear accelerators (hereinafter referred to as x-scanner) to energies of 5 to 9 MeV is used to detect illegal hiding of goods in container transport by the non-destructive method of X-radiography. These scanning systems can penetrate a load thickness equivalent to a layer of iron 30 to 40 cm thick. With larger cargo thicknesses, such as iron ore in shipping or rail, x-scanners are inefficient, and customs control of loads is often performed manually. Manual customs control of iron ore on railway wagons is a lengthy and physically demanding activity, so it is rarely applied to more than 20% of wagons. This problem of customs control with wagons loaded with iron ore is solved by a scanner, which is based on a neutron generator T (d, n).

In the proposed project the Monte Carlo code MCNPX was used for:

- Determination of the vertical neutron transition factor of the generator T(d, n)) through different layers of a selected type of iron ore loaded on a wagon.
- Optimization of irradiation geometry of iron ore cargo and neutron beam collimation.
- Design and verification of a neutron detection system after their passage through an iron ore cargo in order to detect the presence of cigarettes hidden in different positions of the iron ore cargo.
- Control of the influence of cosmic neutrons and muons on the determination of the neutron emission size of the generator T (d, n).
- Checking the efficiency of the neutron generator with regard to radiation protection of workers and protection of the environment

According to a survey carried out on the basis of a patent application, similar devices are not yet manufactured in Europe, the USA and China.