NINTH INTERNATIONAL CONFERENCE ON RADIATION IN VARIOUS FIELDS OF RESEARCH

June 14 - 18, 2021 | Hunguest Hotel Sun Resort | Herceg Novi | Montenegro

BOOK OF ABSTRACTS

rad-conference.org

NINTH INTERNATIONAL
CONFERENCE ON RADIATION
IN VARIOUS FIELDS OF RESEARCH
June 14-18, 2021 | Herceg Novi | Montenegro
rad-conference.org | Book of Abstracts

Comparison of coincidence summing correction factors calculated by EFFTRAN and GESPECOR software

Mirjana Đurašević, Aleksandar Kandić, Igor Čeliković, Zorica Obradović, Tamara Milanović, Ivana Vukanac

Vinča Institute of Nuclear Sciences, National Institute of Republic of Serbia, University of Belgrade, Belgrade, Serbia

https://doi.org/10.21175/rad.abstr.book.2021.28.8

Gamma ray spectrometry with high purity germanium (HPGe) detector is one of the most widely used methods for environmental samples measurements. It is basically a non-destructive method and usually there is no need for the extensive sample preparation. True coincidence summing effect has a significant effect in gamma ray spectrometry analysis, especially in low source-to-detector geometry. Many authors have paid attention to this problem mainly by analyzing and determining coincidence summing correction factors for artificial radionuclides. However, the effect of true coincidence summing can significantly affect the result obtained by gamma ray spectrometry of environmental samples. Therefore, special attention should be paid to the determination of correction factors for coincidence summing of radionuclides from natural series (uranium, thorium and actinium series).

Coincidence summing correction factors can be determined in several manners. Application of appropriate software packages is one of the most common. Software packages EFFTRAN and GESPECOR are among the most used ones. These software are based on Monte Carlo simulation. EFFTRAN is efficiency transfer code with semiempirical approach, whereas GESPECOR is dedicated code specifically tailored to solve most of the problems concerning gamma spectrometric measurements. The values of the correction factors depend on the detector geometry as well as the relevant data related to analyzed sample. The geometry of the detector implies the parameters of the detector itself (crystal dimensions, thickness of the dead layer, the thickness of the detector window). On the other hand, the relevant data related to analyzed sample includes dimensions of the container in which the sample is packed, sample density, chemical composition.

The aim of this work is to compare coincidence summing factors obtained by using EFFTRAN and GESPEOR software in the case of p-type semiconductor HPGe detector with 30 % relative efficiency. All coincidence summing correction factors were calculated for soil sample in the cylindrical geometry and for radionuclides which are usually analyzed for environmental samples:

- for the uranium series: ^{214}Pb for energies 295.22 keV and 351.93 keV; ^{214}Bi for energies 609.32 keV, 1120.29 keV and 1764.54 keV;^{234m}Pa for energies 766.36 keV and 1001.03 keV.
- for the thorium series: ^{212}Pb for energies 238.63 keV and 300.09 keV; ^{208}Tl for energy 583.19 keV; ^{212}Bi for energy 727.33 keV; ^{228}Ac for energies 911.2 keV and 968.97 keV.
- for the actinium series: ^{235}U for energies 143.76 keV, 163.33 keV, 185.71 keV and 205.31 keV.

The obtained values of the correction factors for coincidence summing showed a good agreement between these two software packages. Mutual deviations between correction factors calculated by using EFFTRAN and GESPECOR software were within ± 3 %.

rad-conference.org