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# Application of the Direct Matrices Multiplication method in gamma ray spectrometry

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The Direct Matrices Multiplication (DMM) method was developed by D. Novković as theoretical model for coincidence summing of X-and gamma rays of radionuclides with complex decays schemes. This method enables: a) identification of all possible decay paths and decay paths outcomes; b) calculation of particular path outcome, probabilities and corresponding energy deposited in the detector; c) determination of theoretical expressions for count rates of single and summing peaks as well as for total count rate, where the unknown quantities are the total and peak detection efficiencies. This method can be applied to the point sources and for small source-to-detector distances. It was successfully applied to the decay of 139Ce, 57Co, 133Ba, and 75Se. The DMM method was tested on the equivalence with other methods for calculation of coincidence summing corrections by G. Kanisch, T. Vidmar and O. Sima and a good agreement with the GESPRECOR program was confirmed for point sources of 133Ba, 134Cs and, 152Eu. In the case of the volume sources, calculations of coincidence summing corrections, peak and total efficiencies are more complex than for point sources. Laboratory for Nuclear and Plasma Physics participated in the intercomparison, organized by the Gamma-ray Spectrometry working group of the International Committee for Radionuclide Metrology (ICRM). Volume sources filled by radioactive solution (152Eu, 134Cs) and with different absorbers have been considered. Results obtained by DMM method showed satisfactory agreement with the mean values.

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