

## NATURAL GAMMA-SPECTRA ANALYSIS OF LARGE SAMPLES <sup>+</sup>)

A.H. Kukoč,

Inst. of Nucl. Sci. "B. Kidrič", Belgrade P.O. Box 522

Ordinary natural samples (soil, sand, limestone, clay, mud..) usually have  $n \cdot 10^{-6}$  g/g concentrations of Th and U and  $n \cdot 10^{-3}$  -  $n \cdot 10^{-2}$  g/g of K. Gamma spectrum of large (1-1,5 kg) sample, taken with low-background Ge(Li) spectrometer ( $N_B(E \ 30 \text{ keV}) = 0,88 \pm 0,01$  c.p.s.; 5,4% efficiency; 2,5 keV resolution<sup>1)</sup>), measured from 100 to 200 ks contains from 50 - 80 spectral lines (out of several hundred "seen" in samples with higher concentration of U and Th with more efficient spectrometer).

The determination of U usually relies upon gamma spectrometry of 226 Ra daughters, and assumes 238 U - 226 Ra equilibrium. Testing of this equilibrium, in large samples, can be performed by the determination of uranium isotopic ratio through intensity measurement of close doublet at 186 keV (185,7 keV 235 U; 186,1 keV 226 Ra).

In the case of nonequilibrium, U can be determined only from 185,7 keV gamma line. (In connection with this, the determination of Th will be discussed).

All above mentioned measurements assume an absolute efficiency curve determination for the particular specimen measured, therefore in the second part we will discuss some relative measurements in the case where both Th and U are presented in the sample. (Determination of Th/U ratio; determination of U isotopic ratio; Th/U - K correlation determination).

1. A.H. Kukoč: Background Studies with 3l ccm Ge(Li) spectrometer, (in Serbo-Croatian)., Belgrade, 1977 unpublished.

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<sup>+</sup>) Some parts of this work will be published elsewhere.