

2.17. COMPLEXATION OF THREE OR MORE METHODS OF RADIANT SOURCES DETECTION

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In capacity of a necessary condition for implementation of the idea of three or more radiant sources (RS) detection methods complexation, an availability of preliminary baseline measurements per each detection method is required. All methods are considered as independent. Each measurement is expressed quantitatively i.e. in number of particles per a time unit.

For example, for three methods:

- On X-direction a mathematical expectation (ME) of baseline neutron number is precipitated, X^- ;
- On Y-direction – ME of baseline photon number, Y^- ;
- On Z-direction – ME of β -particles number, Z^- .

All distributions of registered particles are considered as Poisson. On the basis of baseline measurements an ellipsoid formula in Cartesian coordinate system is set up:

$$\frac{(X - X^-)^2}{A \cdot X^-} + \frac{(Y - Y^-)^2}{B \cdot Y^-} + \frac{(Z - Z^-)^2}{C \cdot Z^-} = 1$$

A, B, C coefficients are selected according to the a priori set false-alarm probability (). For this purpose three Poisson processes with ME X^-, Y^-, Z^- are computer simulated and a number X, Y, Z random values exceeding ranges of baseline ellipsoids with pre-determined A, B, C and P_{fs} are calculated. The first A, B, C iteration is accepted equal to 3. The simulation has shown that A, B, C coefficient values are equal to 15 with $P_{fs} = 10^{-3}$, $X^- = 30,000, Y^- = 9, Z^- = 100$.

A decision concerning the availability of RS is made in case if a result of measurements in X_i, Y_i, Z_i detection mode exceeds ranges of an ellipsoid. I.e. a substitution of these values into the ellipsoid baseline formula will result in a value more 1. If a result will be less than 1, a conclusion of RS non-availability is made. Increase of a number of methods leads to a significant decrease in a false RS detection possibility.