

The probability of error appearance with the value from $\Delta^{\circ}X_1$ to $\Delta^{\circ}X_2$ determined by the total area of the hatched area (see fig.1) and is calculated as the

definite integral of the form
$$P = \int_{\Delta^{\circ}X_1}^{\Delta^{\circ}X_2} P(\Delta^{\circ}X) d\Delta^{\circ}X = \frac{1}{\sigma\sqrt{2\pi}} \int_{\Delta^{\circ}X_1}^{\Delta^{\circ}X_2} e^{-\frac{(\Delta^{\circ}X)^2}{2\sigma^2}} d\Delta^{\circ}X .$$

The values of this integral, calculated for the range varieties (intervals of $\Delta^{\circ}X$), are summarized and given in mathematical reference books.

If it is assumed that $\pm \Delta^{\circ}X = \pm\infty$, then $P(\Delta^{\circ}X) = 1$. Thus, the occurrence of random errors in the range from $-\infty$ to $+\infty$ has probability equal to one. This is quite natural, since all the errors have a finite value.

As already noted, the arithmetic mean of a number of measurements is the most likely value of the quantity which is measured. Accuracy of the determination of $X_{ev}(\bar{X})$ is estimated by the standard deviation and by probability. If we assume a normal distribution of random errors $\Delta^{\circ}X$, the root-mean-square error of the arithmetical mean value is equal to
$$\sigma(\bar{X}) = \sqrt{\frac{1}{n(n-1)} \sum_{k=1}^n \rho_k^2} = \frac{\sigma}{\sqrt{n}} .$$
 The analysis of

the expression for $\sigma(\bar{X})$ shows that increasing the number of repeated measurements "n" leads to a decrease in the mean square error.

When the law of distribution of random errors is already known, we can determine the probability of occurrence of errors $\Delta^{\circ}X$, which does not go beyond certain adopted boundaries. The boundaries between which the error values $\Delta^{\circ}X$ are situated are called the confidence boundaries, and the interval between them is the confidence interval. Confidence interval is characterized as confidence probability.

Thus, for accounting random error in the repeated results of measurement the most effective method is a probabilistic calculation method.