



Designation: D 3085 – 75 (Reapproved 1983)

Standard Practice for MEASUREMENT OF LOW-LEVEL ACTIVITY IN WATER¹

This standard is issued under the fixed designation D 3085; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice describes the process necessary to obtain meaningful data from water samples that contain low levels (<10 pCi) of radioactivity.

2. Summary of Practice

2.1 The measurement of low level (up to 10 pCi) fission product or natural activities in environmental samples usually requires separation of the radioelement sought from the water sample. Normally, a measurement of the gross activity of a sample is non-specific and, therefore, of little value. Also, the sample size required to detect a given nuclide quantitatively makes gross counting impractical. An adequate separation of the nuclide sought from the bulk matrix can usually be effected using either carrier or carrier-free techniques.

2.2 It is convenient although not absolutely necessary to add a radioactive tracer to the sample prior to the chemical separation. The tracer is usually another isotope of the element sought and one that has a different mode of decay. For example, strontium-85, a gamma emitter, is commonly used to trace strontium-90, a beta emitter. The chemical recovery of each sample may then be easily and accurately determined by gamma counting the final product of the analysis and comparing this count with a known aliquot of the original tracer solution.

2.3 If the tracer interferes with the measurement of the nuclide sought, then other methods for determining recovery are necessary. One very common method is the gravimetric recovery of the carrier.

2.4 When investigating low levels of fission

products or natural activities in environmental samples, contamination of the sample may occur due to the presence of the nuclide of interest in reagents used in sample processing. Careful analyses of these reagents must be performed to determine the extent of this contamination, so that it may be subtracted from the final sample value. In some instances the extent of contamination of the reagents may dictate the chemical procedure selected for a particular analysis.

3. Significance and Use

3.1 This practice is suited to the gross measurement of alpha, beta and gamma radioactivity in environmental samples with activity levels less than 10 pCi.

4. Instrumentation

4.1 The counters used should be standardized periodically with sources prepared in a manner identical to that used for samples, but with a known amount of the nuclide present. In this way, sample count rates can be converted to disintegration rates. It is, however, impractical to prepare and count such sources each time samples are to be measured. A check source of a permanent nature must be counted whenever samples are measured, and daily, if at all possible, to ensure that the instrument is functioning properly. Control charts carefully maintained on the check source and instrument

¹ This practice is under the jurisdiction of ASTM Committee D-19 on Water and is the direct responsibility of Subcommittee D 19.04 on Methods of Radiochemical Analysis.

Current edition approved Oct. 31, 1975. Published December 1975. Originally published as D 3085 – 72 T. Last previous edition D 3085 – 75.