



# Radiochemistry – Gross Alpha and Gross Beta

Method 900.0 is designed for the screening of water samples for alpha ( $\alpha$ ) and/or beta ( $\beta$ ) particles to help determine if further analysis is needed. This method utilizes an alpha/beta counter to measure the activity level of the solid material left after the water is evaporated from the subsample. Samples with high dissolved solids can create matrix interference and may affect the results. Generally, most water samples are counted simultaneously for gross alpha and, if required, gross beta. Analysis is based upon measuring the rate of decay of the particles to determine the activity of the sample<sup>1</sup>.

## EPA 900.0 vs. NJ ECLS-R-GA: What Is The Difference?

The State of New Jersey developed an in-state-use only method for analysis of water samples. The New Jersey Rapid Gross Alpha (ECLS-R-GA R8) method utilizes a tighter window for counting that requires the sample to be analyzed within 36-48 hours from the date of collection. Analysis and prep are similar between the EPA 900.0 method and the New Jersey method. The main factor is the time allotted between collection and analysis. Radium-224 has a short half-life of only 3.5 days, so the narrow analysis window will likely capture this isotope before it decays<sup>2</sup>.

## What Is an Adjusted Gross Alpha Result?

With the combination of gross alpha and uranium (U) analysis on the same sample, a calculation can be made to adjust the initial result of the gross alpha. If you take the gross alpha result and subtract the uranium result, you can then use an adjusted gross alpha result in your final report to compare to the EPA drinking water standards.

$$\text{Gross Alpha} - \text{Uranium} = \text{Adjusted Gross Alpha}$$

The analysis is reported in a standard unit of picocuries per liter (pCi/L) or micrograms per liter ( $\mu\text{g/L}$ ).

### Water Sampling Container

- Sampling Bottle: 500 mL
- EMSL Product ID: 8714205
- Preservative: 5 mL of nitric acid
- Shipping Requirements: No ice needed
- Hold-Time, EPA 900.0: 6 months from collection
- Hold-Time, NJ ECLS-R-GA R8: 48 hours from collection
- Gross Alpha EPA 900.0 Detection Limit: 3 pCi/L
- Gross Beta EPA 900.0 Detection Limit: 4 pCi/L





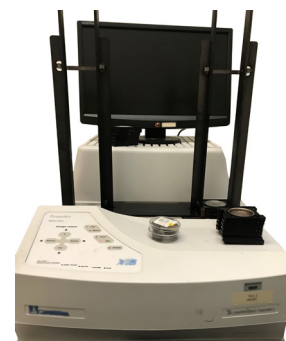
## Radiological Testing Guidelines

Gross Alpha/Beta Results	Potential Contamination	Recommended Additional Test(s)
< 5 pCi/L	Background Levels	None
5-15 pCi/L	Possible Radium	Radium 226 and 228
> 15 pCi/L	Possible Radium and Uranium	Radium 226, 228, and Uranium
<b>Treatment Recommended If:</b>		
Radium-226 + Radium-228 > 5 pCi/L OR Gross Alpha – Uranium > 15 pCi/L OR Uranium > 30 µg/L		

Safe Water Drinking Act (SDWA) Standards <sup>3,4</sup>	Maximum Contaminant Limit (MCL)
Gross Alpha	15 pCi/L
Gross Beta	50 pCi/L <sup>5</sup>



Alpha/Beta Counter



Alpha/Beta Counter

<sup>1</sup>(Gross Alpha) – <https://www.epa.gov/sites/production/files/2015-06/documents/epa-900.0.pdf>

<sup>2</sup>(New Jersey Rapid Gross Alpha) – [https://www.nj.gov/dep/watersupply/pdf/radium\\_bb\\_5\\_20\\_02.pdf](https://www.nj.gov/dep/watersupply/pdf/radium_bb_5_20_02.pdf)

<sup>3</sup>(Radionuclides)– <https://www.epa.gov/dwreginfo/radionuclides-rule>

<sup>4</sup>(Radionuclides) – <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=30006644.txt>

<sup>5</sup>(Radionuclides, Beta/Photon Applicability) – <https://www.epa.gov/sites/production/files/2015-09/roduction/files/2015-06/documents/epa-900.0.pdf>

### CAUTION:

Sampling bottles contain nitric acid as a preservative which can easily burn your skin and clothes. Please use gloves when handling bottles, avoid overfilling the bottles, and splashing the contents on you.

### What is an isotope?

Any of two or more species of atoms of a chemical element with the same atomic number and nearly identical chemical behavior but with differing atomic mass or mass number and different physical properties.

### What is a half-life?

The time required for a radioactive substance to lose 50 percent of its radioactivity by decay is known as the half-life.





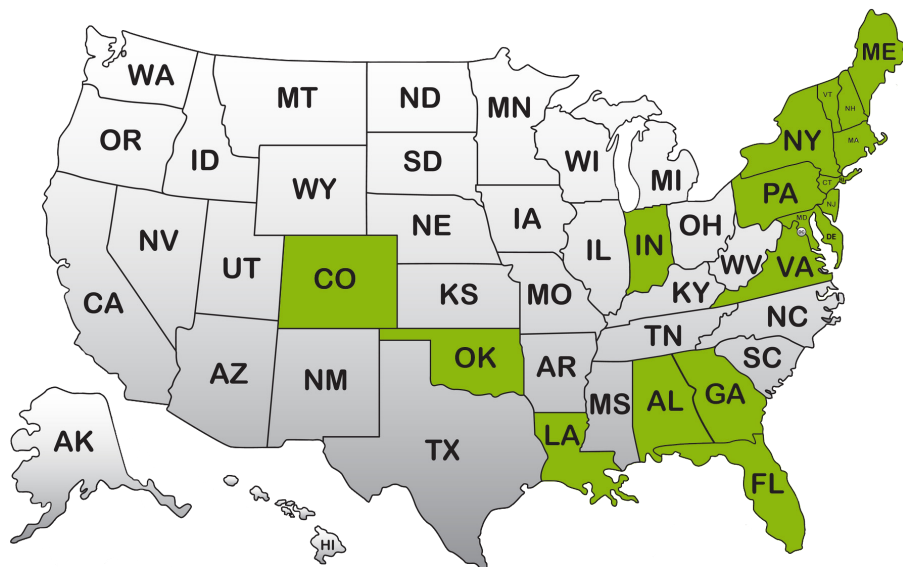
## State of Origin

As of 03/12/2020, we **can** accept samples from:

Alabama	Indiana	New York
Colorado	Louisiana	Oklahoma
Connecticut	Maine	Pennsylvania
Delaware	Maryland	Rhode Island
District of Columbia	Massachusetts	Vermont
Florida	New Hampshire	Virginia
Georgia	New Jersey	

As of 03/12/2020, we **cannot** accept samples from:

Alaska	Minnesota	Oregon
Arizona	Missouri	South Carolina
Arkansas	Mississippi	South Dakota
California	Montana	Tennessee
Hawaii	Nebraska	Texas
Idaho	Nevada	Utah
Illinois	New Mexico	Washington
Iowa	North Carolina	West Virginia
Kansas	North Dakota	Wisconsin
Kentucky	Ohio	Wyoming
Michigan		



 = Accepting samples as of 3/12/2020

