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#9-299 Advanced strategies for ^{14}C measurement in environmental monitoring

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^{14}C measurements are essential in various fields, such as radiocarbon dating and environmental monitoring. While the level of carbon-14 in the environment remains relatively stable over time, detecting low concentrations of ^{14}C in environmental samples can still be challenging. To achieve the required sensitivity for low-level ^{14}C detection, specific sample preparation and efficient measurements are necessary. For example, at ASNR in France, different techniques are used depending on the samples and the requirements. Some samples are sent to external laboratories for analysis by accelerator mass spectrometry (AMS), but most measurements are carried out using liquid scintillation counting. As a result, the performance of liquid scintillation counters is crucial to meet the required sensitivity levels.

To reach the necessary sensitivity and minimize uncertainties, one of the strategies employed in the lab is the synthesis of benzene as sample preparation. The process involves synthesizing benzene molecules from the carbon in the sample. This method is particularly useful in environments where ^{14}C levels are very low, enabling highly accurate measurements in various samples. However, it is a complex process that requires time and careful handling of critical compounds.

To meet the required low-level, ^{14}C measurement standards for environmental monitoring, another approach is to focus on optimizing liquid scintillation counting techniques. To lower the detection limit and reduce uncertainties, measurements using the Aloka LB7 instrument have been optimized. Indeed, this instrument allowed the use of high volume of sample as measurement.

The presentation will begin with an overview of the different methods used at ASNR to measure ^{14}C and the detection limits achieved. Various methodologies will be discussed, and the presentation will conclude with perspectives and a focus on the new challenges faced by laboratories in environmental monitoring.

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