

## On the Usability of Event Zero Time Determinations Using Xenon Isotopic Activity Ratios Given the Real Atmospheric Background Observations

One key parameter when IMS facilities of CTBTO detect radionuclides is the time origin of release. The activities of different isotopes reported in IMS measurements are usable for event time calculation. In theory, event dating works well under the assumption of a nuclear explosion scenario. For the radionuclides, the operational challenge is to understand results of event dating applied to the normal background. The routine IMS atmospheric background observations result from normal operational releases of nuclear facilities. The goal of this study is to estimate the usefulness of the timing equations in light of the real observations. It aims at characterizing conditions under which reasonable origin times can be determined and under which discrimination between nuclear test signatures and normal atmospheric background could work. The following two questions will be studied. (1) Can determination of the origin time for episodes of abnormal radionuclide background be utilized as a new way of background characterization? This will assume a range of realistic nuclear reactor sources. (2) Can event zero time determination be used for screening between nuclear tests and nuclear reactor sources? This will apply both reactor and explosion source scenarios and compare the results.

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**Track Classification:** 3. Advances in sensors, networks and processing