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ALGORITHMS DEVELOPMENT FOR LOW LEVEL RADIOXENON SPECTRUM ANALYSIS

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Underground or underwater nuclear tests can eventually lead to radioxenon releases in the atmosphere. In this scope, the verification regime of the Comprehensive nuclear Test Ban Treaty installed dedicated noble gas systems for the detection of low-level radioxenon activity in the air.
Recent development of these noble gas systems included new detector technologies. They exhibits very low background count rates. In this case, radioxenon signal as low as a few counts per 12h are expected. Therefore, for such low count measurement, classical Currie law estimation for measurement detection threshold and detection limits are not precise enough. To deal with this issue, the CEA/DAM implemented several algorithms (matrix inversion, iterative process, spectral unmixing).
Also, as it is not convenient to test and compare these algorithms on measured low level spectra of radioxenon, a Monte-Carlo simulated database of spectra was generated, for several detection configuration (high resolution beta/gamma spectra, low resolution gamma/high resolution beta spectra, and low resolution beta/gamma spectra).
This work will be presented, and algorithms key performance indicators for each detector configuration will be compared.

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