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Matrix operation of the net count calculation method for beta-gamma coincidence spectrum analysis of IMS noble gas samples

Activity concentrations of CTBT relevant radioxenon isotopes are determined by using liner equations of the net count calculation (NCC) method based on a number of Region of Interest (ROI) and interference ratios between isotopes and ROIs for noble gas samples from IMS beta/gamma coincidence systems. Regarding the coincidence counts in X-rays region, different analysis algorithms were developed by introducing ROI-4 to -10. The interference ratios between ROI-3 to ROIs of 4 to 10 could be different between algorithms like 7-ROI and 10-ROI approaches. That is dependent on whether the coincidence counts of X-rays and electrons from Xe-133 is processed as the independent measurement of ROI-4 or the interferences of ROI-3 to ROI-4 and metastable xenon ROI-5/6. The definition of the interference ratio with respect to calculation algorithms was discussed in this presentation. The NCC equations can be resolved concisely by using matrix operation. Calculation procedures of the net counts, their uncertainties and critical limits were investigated, and the configurations were optimized for samples from noble gas systems of SAUNA II/III, Xenon International and SPALAX NG. It is flexible to compose the interference matrix according to specified analysis algorithm and configurations, and to add additional interference corrections.

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