Contribution ID: **71** Type: **Poster**

Application of 3D radiation visualization technique in calculation of Radioactive Waste Storage Drums

In recent decades, China's nuclear power industry has developed rapidly, but the increase in the number of workers has also posed a serious challenge to radiation protection. The visualization and simulation technology of 3D radiation field can construct the radiation field through the measurement data, and carry out 3D visualization of the radiation field, which is an important means of field monitoring and management. This method can make the staff more intuitive to understand the field radiation situation, provide a basis for shielding and protection, so as to effectively reduce the occupational radiation dose level of the staff, to achieve the purpose of radiation protection optimization.

3D radiation field visualization simulation technology is based on the field measurement data, inverse calculation of radiation source term activity, construction of the radiation field, and finally display the radiation field. The most important step is to use the inversion algorithm to calculate the activity of the source term. According to the calculation formula between radiation source and dose rate, the activity of each radiation source item can be calculated from the measured value of radiation field dose rate, which can be transformed into the problem of solving linear equations, so that it can be solved by mathematical method. The Maximum-Likelihood Expectation-Maximization (ML-EM) iterative method was used in this calculation.

A radioactive waste storage tank is selected as an example, and the radioactive waste is divided into four parts, assuming that each part is a uniformly distributed radioactive source. The nuclide of the radiation source is 137Cs. By measuring the dose rate around the storage drums of radioactive waste, part of the measured values are randomly selected for inversion calculation, and the activity of the four parts of the radiation source is obtained as 4.27E9Bq, 4.34E9 Bq, 4.50E9 Bq, and 5.14E9 Bq. At the same time, 60 measurement points were selected to compare the measured value of dose rate with the calculated value, and the results showed that the error of 59 points was less than 20%. The mean margin of error was 10.4%.

Through the calculation of the above example, it can be known that it is feasible to use ML-EM iterative method for source term inversion calculation, and the radiation sources in the radioactive waste storage tank are basically evenly distributed.

Speakers email

1157759266@qq.com

Speakers affiliation

China Institute for Radiation Protection

Name of Member State/Organization

CHINA

Primary author: Mr WEI, Jiafu

Presenter: Mr WEI, Jiafu

Session Classification: Session 6. Occupational radiation protection in nuclear power plants and nuclear fuel cycle facilities

Track Classification: 7. Occupational radiation protection in nuclear power plants and nuclear fuel cycle facilities