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JAEA-ISCN Development Programs of Advanced Technologies of Nuclear Material

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JAEA-ISCN(Integrated Support Center for Nuclear nonproliferation and Nuclear Security) has been implementing basic development programs of the following NDA technologies.

- (1) NRF (Nuclear resonance fluorescence) NDA technology using laser Compton scattered (LCS) gamma-rays (intense mono-energetic gamma-rays).
- (2) Alternative to ^3He neutron detection technology using $\text{B}_2\text{O}_3/\text{ZnS}$ ceramic scintillator.
- (3) NRD (Neutron resonance densitometry) using NRTA (Neutron resonance transmission analysis) and NRCA (Neutron resonance capture analysis).

The technology (1) is for future NDA systems using NRF reaction for precise quantitative selective measurement of ^{239}Pu (and any actinide isotopes) in spent fuel assemblies, debris of melted fuel with using an LCS gamma-ray source based on a superconducting energy recovery linac (ERL). NRF NDA could be used for nuclear security (non-destructive detection of NM hidden behind very thick shielding material in containers) if the LCS gamma-ray source is achieved. Basic demonstrations of LCS gamma-ray generation are planned in the end of 2014JFY.

The technology (2) is for NDA systems (instead of current safeguards NDA systems with ^3He tubes) of neutrons from NMs. The present activities are developing $\text{ZnS}/\text{B}_2\text{O}_3$ ceramic scintillator and demo-NDA systems using $\text{ZnS}/\text{B}_2\text{O}_3$ ceramic scintillator detectors. Comparative measurements between the demo-NDA systems with the same kind of ^3He NDA system are planned.

The technology (3) is for a precise NDA system of nuclear material in particle-like debris (in a thin disk container) of melted fuel. NRTA is for determining Pu/U isotopic compositions. NRCA is for determining neutron absorbing elements such as ^{10}B in the target by analyzing gamma-rays specific to neutron absorbing elements. Demonstrations of NRD detectors at a beam line of GELINA of JRC- IRMM are planned in the end of 2014JFY.

Country or International Organization

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