Spent Fuel Attribute Tester realisation and applications

I. Almási\textsuperscript{a}, Z. Hlavathy\textsuperscript{a}, L. Lakosi\textsuperscript{a}, C.T. Nguyen\textsuperscript{a}, N. Buglyó\textsuperscript{b}, M. Beier\textsuperscript{b}

\textsuperscript{a}Departement of Radiation Safety, Safeguards Group, Institute of Isotopes, Budapest, Hungary
\textsuperscript{b}Nuclear Power Plant, Paks, Hungary

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Portable SFAT (HU-SFAT)  
developed in the frame of the Hungarian support programme to IAEA safeguards

Detector house: watertight, pressurized by air for higher safety, 50mm lead shielding for side gammas

Detector: hemispherical 500 mm³ CdZnTe medium resolution detector, connected to a mini MCA, controlled by a laptop

Air collimator: modular design, 1 m long, ∅55 mm stainless steel tubes, available up to 8 pieces, neighbour effects minimized by collimator design

No fuel/object movement

Positioning stand is mounted on the railings of the refuelling machine, install and handle by two persons
Use of SFAT
Applications

- 5 min measurement time: 10% STD for the 662 keV peak of Cs-137 for normal BU, 6-7 y CT fuel; even in the presence of a second (upper) layer with short-cooled SFAs adjacent
- 662 keV peak identified even for extremely low BU (order of GWd/tU) fuel of 6-7 y CT
- Verification of Co-60 sources method for revealing undeclared irradiation.
- Test of tank without fuel (construction part of damaged fuel assemblies)
- Test of canisters with damaged fuel (type T28 for parts of fuel assemblies and T29 with baskets for pellets only)
- Limitation: 500mm thick water shields the gamma 662keV!
Spectrum of a Co-60 container measured with 4 collimator tubes and lead rings, Measurement time: 1000 s.
BG and canister T28 measured with 2 collimator tubes, Measurement time: 300 s.
Two canisters (T29) measured with 2 collimator tubes, Measurement time: 300 s.
Fuel assembly, 7 y CT measured with 2 collimator tubes, Measurement time: 300 s.
Fuel assemblies at different cooling times and burnups

CT=2/3 y

CT=2.7 y
BU=22.6

CT=3.7 y
BU=41

CT>14 y
Summary

- The SFAT device was designed and built in our Institute,

- SFAT was applied successfully in a series of problems where the measurement of the Cherenkov light would be problematic due to geometry, water quality, etc.
Thank You for Your attention!