Title: AVNG – Annotated Bibliography

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Summary

The AVNG (Attribute Verification System with Information Barrier for Plutonium with Classified Characteristics utilizing Neutron Multiplicity Counting (NMC) and High-Resolution Gamma-ray (HpGe) Spectrometry) was an attribute measurement system jointly developed under the Trilateral Initiative. The United States, Russian Federation (RF), and IAEA all participated in the initial design. The final system was funded by the U.S. and built and demonstrated by VNIIEF in Russia.

Key References

Langer, D. et al. (2001). Attribute Verification Systems with Information Barriers for Classified Forms of Plutonium in the Trilateral Initiative. IAEA-SM-367/17/02 LA-UR-01-5567. *Symposium on International Safeguards: Verification and Nuclear Material Security*. Vienna, Austria: International Atomic Energy Agency.
Initial development of the AVNG came out of the Trilateral Initiative efforts. This paper was written before direct work on the AVNG was started and lays out the design requirements and recommended approaches. It also provides some of the context (prior systems and contemporary work) in which the AVNG was started as well as some of the underlying assumptions. The paper focuses on the technical issues, but it also provides some of the history of the Trilateral Initiative. This and the following paper frame the AVNG development process.

Razinkov, S. et al. (2010). The Design and Implementation of the AVNG. LA-UR-10-02623. *Proceedings of the 51st Annual Meeting of the Institute of Nuclear Materials Management*. Baltimore, Maryland, USA: Institute of Nuclear Material Management.
Following the demonstration of the AVNG at VNIIEF in 2009, several papers were presented at the INMM Annual meeting the following summer. This paper provides an overview the final system as built by VNIIEF in collaboration with LANL and LLNL. Three attributes, Pu presence, Pu isotopics (weapons grade or not), and Pu mass above a threshold were used as the basis for the design. Unlike previous US systems, the AVNG depended more on software for controlling information access. Also, the design of essentially a room for the detection equipment instead of boxes that served as Faraday cages as used in US designs was a novel approach.

Additional References

Razinkov, S. et al. (2010). AVNG System Objectives and Concept. LA-UR-10-02625. *Proceedings of the 51st Annual Meeting of the Institute of Nuclear Materials Management*. Baltimore, Maryland, USA: Institute of Nuclear Material Management.
Langner, 2001, defined the AVNG objectives and concept at the beginning of the process. In this paper, Sergei Razinkov captures the final objectives and design concept as built by VNIIEF. This paper is one of a set of papers presented at the 2010 INMM meeting that provide an overview of the AVNG system at the end of the project.

Smith, M.R. (2010). Introduction to the Attribute Verification--Neutron/Gamma (AVNG) Program. *Proceedings of the 51st Annual Meeting of the Institute of Nuclear Materials Management*. Baltimore, Maryland, USA: Institute of Nuclear Material Management.
Michele Smith was the federal lead for much of the AVNG program. Her paper provides an overview of the program and how thinking about the AVNG fits into United States Government thinking about technologies for treaty verification as well as how project enabled the U.S. to explore the advantages and disadvantages of joint design and joint development.

Kondratov, S. et al. (2010). Testing the AVNG. LA-UR-10-02626. *Proceedings of the 51st Annual Meeting of the Institute of Nuclear Materials Management*. Baltimore, Maryland, USA: Institute of Nuclear Material Management.
Acceptance testing of individual components and testing of the complete AVNG with Russian produced reference materials were an integral part of the AVNG system development. While much of the data shown is of the radiation detector measurements, the performance of the information protection elements is also discussed. This paper is one of a set of papers presented at the 2010 INMM meeting that provide an overview of the AVNG system at the end of the project.

In addition to the specific papers listed above, the 2010 INMM meeting had a full session entitled “Nonproliferation and Arms Control: The Russian AVNG Attribute Measurement System.” The other papers from that session are available in the meeting proceedings.