

ARG-US RFID System for Management of High-Risk Materials (ANL-IN-08-046)

Proven, patented and commercially available, ARG-US—the “watchful guardian”—will safeguard the management of nuclear and radioactive materials, as well as that of other sensitive items in storage, transportation and disposition.

Background and Need

For years, radio frequency identification (RFID) technology has been used in a variety of applications, from passports to inventory tracking in retail environments. Homeland security concerns have heightened the need for sensitive, real-time tracking of thousands of radioactive and hazardous material packages to ensure accountability, safety, security, and worker and public health. Argonne scientists successfully developed ARG-US, a remote-sensing system for monitoring and tracking nuclear and other sensitive materials based on RFID technology.

The Invention

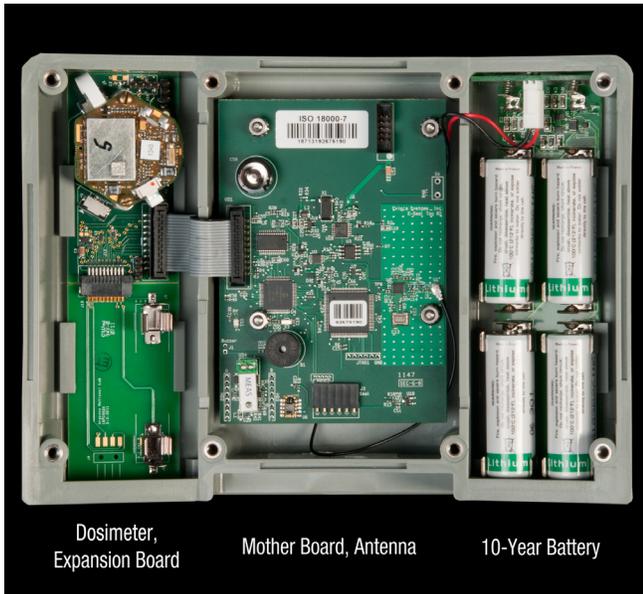
ARG-US uses battery-powered RFID tag sensors to remotely monitor the vital parameters of packages containing sensitive materials and has automatic alarm notification capabilities. The original goal in developing ARG-US RFID technology was to support the US Department of Energy (DOE) in modernizing the life-cycle management of nuclear materials and enhancing safety, security, safeguards and sustainability.



Argonne nuclear engineer Yung Liu examines data using the radio-frequency identification device developed at the laboratory. The technology allows users not only to track nuclear materials but also to remotely monitor environmental and physical conditions such as temperature and humidity.

The ARG-US system, developed for the DOE Packaging Certification Program, is the result of extensive hardware and software development.

The form factor of the RFID tag was designed to be broadly compatible with common material packaging and has undergone radiation endurance testing. The sensor suite includes seal integrity, radiation, temperature, humidity, and shock, and can be expanded to accommodate additional sensors. Sophisticated battery life management and monitoring extends battery life to 10 years or more. Two specialized software applications—ARG-US TransPort and ARG-US OnSite—were developed to provide a powerful, customizable platform for full life-cycle materials management during transport, storage and disposition. The system incorporates secure communications, databases, and web services, and includes integrated ARG-US and DOE TRANSCOM satellite communication systems.



Interior of ARG-US system

Together, these features significantly improve performance and reduce costs associated with nuclear material operations and aging management, while enhancing safety, security, safeguards and sustainability.

Since 2010, ARG-US RFID has been extensively tested under various operational environments at five DOE sites and in multiple transportation campaigns. Also in 2010, an RFID Command Center was established at Argonne National Laboratory to support the ongoing field testing and development of devices and applications for civilian nuclear fuel cycles and other high-risk materials. In April 2011, ARG-US was chosen by an industry panel to receive *RFID Journal's* prestigious "Most Innovative Use of RFID" Award. ARG-US was also selected as a finalist to present at the 2011 World's Best Technology Innovation Marketplace, a preeminent technology forum. And in February 2012, the system was featured in a case study in the U.S. for the *World Institute for Nuclear Security and the World Nuclear Transport Institute Joint International Best Practice Guide on Electronic Tracking for the Transport of Nuclear and Other Radioactive Materials, Revision 1.0*.



Drum with RFID tag attached

As a result of demonstrated performance, ongoing development, and industry recognition of the technology's value in the broader market, applications of ARG-US continue to expand beyond that original goal. In July 2012, Evigia Systems, Inc., an Ann Arbor, Michigan company, received exclusive license rights from Argonne National Laboratory to produce the ARG-US RFID system for the broader nuclear and non-nuclear marketplace. This agreement highlights the value of ARG-US RFID technology. And will facilitate technology transfer to the marketplace, one of the key goals of the DOE's national laboratories.

Features and Benefits

- ▶ **Security** – ARG-US can monitor thousands of drums 24/7 via secured RF/Ethernet links. The system can also track and monitor drums during transport. Any abnormal situation will trigger an alarm for immediate action. Alarm situations include seal tampering, unauthorized move, high temperature, humidity, shock and radiation. Drum information is stored in tags and archived in local and central servers.
- ▶ **Longevity** – Tags are resistant to radiation (≥ 30 kR) and have long battery life (≈ 10 yr)
- ▶ **Sensors** – Various types of data (Seal Integrity, temperature, humidity, shock, radiation, battery strength) provide instant alarms, environmental data and event logs.
- ▶ **Versatility** – Custom software modules (storage and transportation) are user-friendly and can be easily integrated into existing on-site databases. Drum information is stored in tags and archived in local and central servers.
- ▶ **Reduced cost**

Applications and Industries

Argonne's RFID system is useful in any industry or organization that uses or transports nuclear or other hazardous materials; for example

- ▶ Civilian nuclear fuel cycle industries
- ▶ Hospitals or other areas needing monitoring
- ▶ Oil, gas and hazardous chemicals industries
- ▶ International applications to enhance transparency, materials accountability, safety, security and safeguards

Availability

The technology was licensed exclusively to Evigia Systems, Inc. in July 2012 for commercial production of components and systems for nuclear and non-nuclear applications. Evigia Systems, Inc. is a leading manufacturer of ISO-18000 Part 7 RFID tags and readers and has been a steady supplier for the U.S. Department of Defense. Other fields-of-use are available for licensing.

Patent Information

United States Patent 8,013,744

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