

Active RFID tags and sensors, in tandem with video cameras, watch over the king's golden sandals and other Egyptian antiquities on display at museums.

By Claire Swedberg

June 24, 2009—Traveling exhibits manager [Arts and Exhibition International](#) is using RFID technology to protect the treasure of King Tutankhamun's tomb as the artifacts are displayed at locations across the world. The system, provided by U.K. RFID technology company [Integrated Security Information Systems](#) (ISIS), is traveling with the "Tutankhamun: The Golden King and the Great Pharaohs" exhibit, currently being set up in Indianapolis. If display cases are tampered with while on display, video images from a CCTV system provided by [Bosch Security Systems](#) are instantly displayed in the museum's security office, museum staff members can receive alerts on their pagers and an audible alarm inside the gallery warns the perpetrator that the system has been triggered.

Starting in 1996, ISIS has provided RFID-based tracking systems for corporations, government departments, and, in 2000, for museums, galleries and private collectors to protect valuable artwork and artifacts. For the past nine years, the company has been using [Wavetrend](#) 433 MHz active RFID tags in a variety of form factors. The tags contain built-in vibration sensors and magnetic tamper switches to determine if an object has been touched or moved, and to detect if a display case has been opened. Its users include the National Gallery in London, Museum of Modern Art in New York and the Museum of Islamic Art in Doha, Qatar.

When Arts and Exhibition International, based in Aurora, Ohio, began organizing the second of two King Tut exhibits for the Egyptian government, the company met with ISIS for an RFID-based security system that would track 75 display cases with 130 Egyptian national treasures, including more than 50 items from Tutankhamun's tomb and more than 70 artifacts representing other pharaohs and notables, along with the latest scientific research about King Tut. The exhibit, which began in the Austrian city of Vienna, then traveled to Atlanta in the United States, would need to be protected in each of the multiple installations at a variety of different museums and galleries, says Jeffrey Wyatt, Arts and Exhibitions International's VP and project manager, in seven or eight cities over the course of five years. Currently the exhibit is being installed at the Children's Museum of Indianapolis, the exhibit's third stop. Arts and Exhibition International decided to use the ISIS system after looking at existing ISIS deployments in London.

"This is the first time we've worked with RFID," Wyatt says. The technology, he says, offers two advantages over traditional wired sensor systems: It can work in multiple countries (as opposed to dedicated security solutions specific to certain standards), and it gives him the ability to track data about the display's location and status at all times, and not only when something goes wrong. "With RFID we always know the location and status of a case or object. That's a more powerful way of monitoring precious items," he says.

In addition, the company wanted a system that could integrate with video monitoring, so Art and

Exhibitions International acquired a CCTV security system provided by [Bosch](#) that includes nearly 40 cameras, as well as software to translate data from those cameras. If an incident occurred, such as a display case being opened or jostled, ISIS' Aspects software would detect that, then issue a command to activate the relevant Bosch camera, says Rob Green, ISIS managing director. The software resides on an ISIS PC that travels with the exhibit and which is installed in the museum's security office. That PC stores RFID reader data, while another stores video footage from the cameras.

With each installation, a museum's staff electricians run standard Category 5 Ethernet cable to connect readers to the backend system as well as to connect CCTV Bosch cameras to their own server in the security room. The cabling can be done in advance of the arrival of the exhibit, says Wyatt, making the transition that much faster. Ten or fewer readers are installed on ceilings and walls to receive transmission from each tagged display case tag. The tags' unique ID numbers link with data about the display case's ID number and location as well as what is stored in that display case.

The 433 MHz tags, about the size of a domino, include a 3-volt lithium battery with a life expectancy of six years if the device beacons every 15 seconds. They have a read range of 100 meters in free space, but closer to 30 meters indoors, says Green.

The reader detects a signal from the tag, and then transfers that data via an Ethernet connection to the ISIS server, where the Aspects software translates and stores the data.

The "Current Alarm" feature in the Aspects system provides a window that remains open and cannot be closed in the event of an alarm. It flashes information, graphics and instructions about the alarm and its response. The tracking function monitors the movement of an RFID tag with CCTV video footage from the camera in closest vicinity of the tag. If a tag fails to beacon when it is expected to, an "Artwork Tag Missing" flag is displayed on the security room screen.

The security system can be moved easily from one museum to the next, Wyatt says. "There is different architecture at each location," he says, and each is also a different size; the Vienna location being 15,000 square feet, Atlanta was 25,000 square feet and Indianapolis is 12,000 square feet, while some are two stories, others are one story. However, the installations have been managed well, he says, with 10 interrogators being enough to capture all tag transmissions. With each move, Wyatt says, "We reconfigure the software and alarms," so that they represent the zones specific to that location (indicating, for example, that Case 12 is in Gallery 2).

"I'm very happy with how it's working," Wyatt says. "I think what I find most exciting is that you are collecting all this data and records of every vibration and background for that vibration." The company can then use that data to understand any changes in conditions the ancient artifacts are exposed to.