

Paper No. 6001 **DETECTING THE LOCATION OF MOBILE SOURCES
LOST OR STOLEN DURING TRANSPORT**

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Abstract

This paper describes a source control system for non-destructive gammagraphy devices that tracks and easily locates a device in the event of its theft during storage or transport; this system would also reduce the problems associated with orphan sources. During routine operations of storage and transport should a device be stolen from its store, a vehicle during transport or diverted from the route intended by the operator, these events significantly increase the radiation risks to those who steal the device, the public should the device be abandoned, and the potential of malevolent use. The system described in this paper would monitor and track the location of a device during storage and routine transport 24 hours each day. An RFID would be discretely located on the device and a transmitter located in the transport case of the device would confirm the presence of a device in its case. The vehicle used to transport the device would also be fitted with a transmitter enabling the location of the device and the vehicle to be constantly located including detection of the removal of the device from the vehicle. Immediate detection of unauthorised removal of the device from its store, vehicle or intended route would result in the immediate activation of recovery operations thereby reducing the potential risk of radiation exposure.

Summary

The safety and security of radiographic exposure devices during transport is an important enable the issue particularly when a device is 'lost' or stolen. This paper proposes a system that can track and locate these devices during storage and transport thereby providing a means to quickly return the device to regulatory control. Thousands of radiographic exposure devices are transported every day and there are examples where devices have been targeted for theft and where the vehicle carrying a device has been stolen, not for the device itself but for the vehicle in which cases the device is often discarded. Abandoning the device then leads to high risks for those who have secondary contact for example children or those attracted by its apparent intrinsic value. Also a lack of knowledge of the dangers involved has led some people in the past attempting and sometimes succeeding to open the device and remove the source. With other factors involved such as location, country and the intentions of those in possession of the device, it is important that the device is located quickly and recovery actions begin as soon as possible.

Introduction

The safety and security of radiographic exposure devices during storage and transport is an important issue particularly when a device is 'lost' or stolen. Thousands of radiographic exposure devices are transported every day and there are examples where devices have been targeted for theft, and instances where the vehicle carrying a device has been stolen, not for the device itself but for the vehicle in which cases the device is often discarded. Abandoning the device then leads to high risks for those who have secondary contact for example children or those attracted by its apparent intrinsic value. Also a lack of knowledge of the dangers involved has led some people in the past attempting and sometimes succeeding to open the device and remove the source. With other factors involved such as location, country and the intentions of those in possession of the device, it is important that the device is located quickly and recovery actions begin as soon as possible.

To improve the safety and security of devices during transport, the operator can implement three stages, namely:

Stage 1 is to ensure operators are trained in safety and security matters to enable them to take the necessary precautionary measures to minimise the radiation risks during transport (safety) and ensure security issues are also appropriately considered;

Stage 2 is to provide a means of knowing where the device is at all times and to be when the device is removed from its store or from the vehicle;

Stage 3 is to have a means of locating the device to enable recovery actions to take place in an efficient and effective way.

Overview of System

There are six elements to the device tracking system as shown in Figure 1.



Figure 1

1. A control room monitors the signals and alerts the registered owner if the device is moved during the silent hours defined by the registered owner. The control room will also provide real time tracking of the vehicle and the device 24 hours a day.

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This is important for small organisations that may not have an office staff. The operator can also have the location relayed to a smartphone / tablet.

2. RFID1 is discretely attached to each device and details such as source identification, isotope and source strength and registered owner details are stored in RFID1.
3. In the transport case used for the device, a transmitting device (TD1) is fitted which detects the presence of RFID1 and hence the device in the transport case. An alternative would be to have the tracking device (TD1) fitted directly on the device but this would require more work to modify the devices already in use.
4. During storage, TD1 would send a signal to locate the device to the control room, if the store is located underground or a tracking signal cannot be sent directly, then a signal relay device (SRD) would be fitted.
5. If necessary, an antenna is located elsewhere in the building to transmit the signal from the SRD.
6. Each vehicle would have a tracking device (TD2) fitted similar to those used in many countries by industry and private vehicle owners.

Advantages

- i. The operator would be immediately informed of the removal of a device from its store.
- ii. The device can be located 24 hours a day by a control room.
- iii. It provides immediate information to police / security enforcement to locate and recover the device.
- iv. It will detect and inform the control room when the device is removed from the vehicle during routine working hours.
- v. The system requires minimal modifications to the device (fitting of RFD1) and no maintenance.
- vi. The system uses existing technology with proven reliability.

Conclusions

This tracking system provides an effective solution to the issues that arise in the event of a device being stolen or diverted. The consequential radiation health issues for those who take the device or for those who discover an abandoned device would be significantly mitigated if the device was located and recovered in the time taken to reach the location of the device as indicated by its tracking system. The components of the system are proven technology and the costs are relatively small but the advantages are hugely significant.