

University of Kentucky – VS 374 – Source Recovery
April 4-7, 2006
(Revised June 15, 2006)

Background

A Varian VariSource HDR unit is installed at the University of Kentucky Hospital. UK contacted Varian Service on the afternoon of April 4, 2006 to report a problem with the HDR unit. The event occurred during training on emergency procedures when two students turned the emergency manual retract handle instead of simulating “turning” the handle. When the emergency retract handle was turned, it forced the active wire from the tungsten shield and created a high radiation area. At the time of the event the active wire was approximately 7.5Ci.

The active wire, which contains the Ir-192 source, is attached to the emergency manual retract handle by a series of drive wheels and rollers. The emergency manual retract system is designed such that when turned it will immediately begin to reel the source wire into its parked and fully shielded position if the source wire is extended. Its use is one of several actions that offer redundancy to on-board systems that should be used in an actual radiation emergency when it is necessary to retract the source into its shielded position.

The emergency manual retract handle is not to be used if the active wire is parked and shielded. Customer bulletins have been sent to all users of the VariSource system stating that the emergency retract handle should never be turned when the source wire is parked. Additionally, a warning label is posted immediately next to the emergency retract handle and states that the emergency retract system is connected to the active wire.

Emergency training provided by Varian

University of Kentucky records that documented the training on the use of the emergency retract system were reviewed by Varian personnel at the time of the source recovery. These records were reviewed with the UK RSO.

The HDR unit was installed at UK during the first week of March 2005. Specific training on the use of the emergency retract system was provided on March 2, 2005 by the Varian service engineer that installed the unit. Approximately 20 employees that work with the HDR unit attended the training session. The training consisted of hands-on practice using the emergency manual retract system with a dummy wire installed in place of the active wire. The procedure states that, a dummy wire (not an active wire) must be installed when practicing turning the handle. The procedure (1) states that the manual retract system should never be turned when the active source wire is in its parked position. A copy of the procedure is attached to the attendance roster.

**Additional information added on June 15, 2006 – in the above paragraph, the procedure identified as “procedure (1)” is the Customer Technical Bulletin CTB-VS-366A wherein it is stated in four instances that turning the emergency retract hand wheel may cause the active wire to be dislodged from the shielding.

June 15, 2006

The event

Two of four students actually turned the handle rather than a simulation. This action forced the active wire from the tungsten shield. Radiation alarms sounded and the students quickly exited the room. Soon thereafter, the physicist called Varian. It is estimated that the handle was turned a total of 16 times, 8 rotations each by 2 students. The highest exposure to a student was approximately 40 mrem. (Please confirm this with the UK RSO).

Varian responded to the emergency that same day. The Field Service Engineer evaluated the event with the physicist and Varian's RSO was notified immediately. The RSO for UK and the RSO for VMS conferred later that day and discussed the event and made preliminary plans for the source recovery. The RSO for UK secured the HDR treatment room and it was maintained secure until Friday when the source recovery began.

Planning

On April 6, 2006, the RSO for Varian reviewed possible scenarios with Varian engineers in Charlottesville VA. Mock ups and trial runs were conducted using an HDR unit of the same make and model as the one at UK. The result of the mock up training provided the likely scenario of how to recover the wire and secure it in a shielded container.

Varian expedited a Type A shipping container to UK that would be used to store and ship the affected source wire to a licensed facility for evaluation and disposal.

Source recovery

On April 6, 2006, three Varian employees traveled to UK to recover the wire – two service engineers and the RSO. UK's RSO staged material at the HDR treatment room door the day before. Of particular importance were 1-inch portable lead shields. The UK RSO and two senior radiation safety technicians were of great assistance during the recovery.

The recovery commenced at 9:13 a.m. on April 7, 2006 and was completed at 10:15 a.m. Varian personnel made a total of 13 entries into the HDR treatment room. Total cumulative time was 159 seconds, and cumulative dose was 66.1 mrem. Whole body badges, extremity badges and electronic dosimeters were used throughout the evolution. At the end of the recovery, the source was safely packed in the emergency safe. The safe, in turn, was packed in the Type A container and it awaits shipment for evaluation and disposal. Shipment will occur when the source has decayed to a point that it can be shipped as a Yellow-II shipment, and not requiring an exclusive use vehicle.

No UK employees entered the room until the source was secured in the emergency safe.

Installation of a new Ir-192 source

After the wire was recovered, the service engineer inspected the HDR unit to ensure that it had not been damaged and that all systems were operating normally. A new wire (approx. 9.5Ci) was installed and the unit was placed back in service.

Follow up to the source recovery

The source wire recovery was a success. Proper planning and execution of the recovery resulted in very low personnel exposures and ALARA was clearly met. UK and Varian were in regular communication throughout the event. This was a key component to success. Every event has lessons learned, and Varian internal emergency response procedures are being revised based on the events at UK.

Analysis of the event

The HDR unit was in a normal and safe condition prior to the event. No patients were being treated and the Authorized Medical Physicist was present and supervising the emergency training.

Written and practical training sessions had taken place stating that the handle should not be turned when the active wire is parked.

- The March 2, 2005 training sessions, and the procedures attached to the roster, stated this instruction.
- A customer bulletin was sent to the site that states that the emergency handle should not be turned if the wire is parked.
- A warning plaque is mounted directly over the emergency retract handle stating that it is connected to the active wire.

The HDR unit did not operate unexpectedly or abnormally.