Purpose:
Because of the delivery of large doses in a few fractions, any deviation generally results in a medical event for HDR brachytherapy. NRC Section §35.633 on full calibration measurements requires among others, the determination of (a) source positioning accuracy, (b) length of transfer tubes, (c) length of applicators, and (d) function of the transfer tubes, applicators, and transfer tube - applicator interface. While the determination of the individual parameters may be acceptable, the use as an integrated system may fail resulting in medical events reported to NRC.

Methods:
A treatment plan was designed to check the integrity of the integrated system consisting of the applicator connected to the HDR remote afterloader unit via designated transfer tubes. In this fashion, data entry of both the length of the applicator and the dwell positions must be entered into the treatment planning system. The first dwell position was set at the extreme end of the applicator. A series of dwell positions of equal or unequal spacing was set to track the pathway of the applicator. During dose delivery, the applicator was placed over a film or digital radiograph.

Results:
The successful completion of the dose delivery assures that there are no obstructions and confirms the integrity of the interconnectivity of the HDR unit, transfer tubes, and applicator. The radiograph allowed an evaluation of the maximum extent of the travel of the source relative to the applicator and thereby validating the data entry on the length of the applicator, dwell positions, and dwell spacing. In addition, the radiograph also revealed the travel of the source within the applicator.

Conclusions:
Commissioning using end-to-end testing of an integrated system should be applied to HDR brachytherapy. This process would have eliminated a number of medical events recently reported.