



“Day After” decommissioning di un acceleratore lineare ad alta energia: caratterizzazione della testata.

“Day After” High Energy Linear Accelerator decommissioning: characterization of the head of the accelerator

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Purpose: Italian laws are very restrictive in terms of release and exemption quantities in case of waste contaminated by radioactive isotopes. This study focuses on the characterization of a 18 MV Elekta Precise Linear Accelerator head that have been in clinical use since two days before its dismantling to make space to a new “state of the art” machine.

Methods and materials: Dismantling have been carried out by an Italian specialized company, each part of the machine have been first measured with a high efficiency α , β , γ contamination monitor equipped with ZnS:Ag detector and a portable γ -ray spectrometer (NaI(Tl)). Activated parts have been subsequently measured with a low background high definition high purity spectrometric chain with an electric cooled germanium detector (HPGe). Energy, FWHM and efficiency calibration have been performed with a multigamma Marinelli source in the range 59 keV (^{241}Am) – 1836 keV (^{88}Y). Efficiency curves for different geometries have been transferred from physical calibration source by ISOCS (Canberra) software.

Results: ^{57}Co , ^{58}Co , ^{60}Co , ^{54}Mn have been among the more frequent radioisotopes found. However short lived nuclides (eg. ^{122}Sb) were present as well.

Conclusion: Activation of long lived radionuclides was confirmed as previously reported in published paper; short lived radionuclides were detected as well. Waiting for full decay of short lived radioisotopes could allow to minimize the amount of radioactive waste.



Figure 1 X-Ray carousel in the low background HPGe

References:

[1] Brusa A, Cesana A, Stucchi C, Terrani M, Zanellati F. “Long-term activation in a 15 MeV radiotherapy accelerator”, Med Phys. 2008 Jul;35(7):3049-53.