

Using the SabreBPM to Measure Radioactive Iodine in Air

1) *What is the SabreBPM?*

The Bladewerx SabreBPM™ Portable Alpha/Beta CAM is a lightweight, battery-powered, continuous air monitor that can be used for workplace monitoring, emergency-response assessments, fixed location monitoring, and for any other application requiring monitoring for radioactive particulates in air. It is designed to provide workers with an early warning of an airborne release of alpha or beta emitting particulates in the presence of normal radon backgrounds.



Using alpha spectrometry coupled with Bladewerx peak-fitting software for radon-background compensation provides sensitive and accurate workplace measurement/alarm indications for alpha and beta isotopes of interest. A self-contained pump, integral detector head, audible/visual alarm indicators, and internal battery, allow for portable operation of more than eight hours. The solid-state, ion-implanted, silicon detector and multichannel analyzer provide the input for an embedded processor board that performs beta detection and the alpha spectral analysis for radon background compensation.

2) *The SabreBPM's Sensitivity to Iodine-131*

The decay scheme of Iodine-131 (I-131) includes a 606 keV beta with an 89% abundance ratio, which the SabreBPM can readily detect. It also emits a 364 keV gamma with an 81% abundance ratio, but this gamma is not readily detected by the SabreBPM, which is primarily sensitive only to alpha and beta. The SabreBPM has a typical efficiency for Cl-36 (710 keV max beta energy) of 18% (4 pi) with a bare source and 15% with a 1.5 micron filter on top of source. The efficiency to I-131 can be expected to be similar to that of Cl-36.

3) *Configuring the SabreBPM for Iodine Monitoring*

The SabreBPM is made sensitive to Iodine in gaseous form by passing the gas through a carbon impregnated filter paper to absorb and retain I-131. Placing a carbon filter paper under the normally installed particulate filter paper provides the ability to monitor for I-131 in air while continuing to measure for alpha particulates (and to compensate for the betas emitted by



radon progeny). Both the carbon impregnated filter and a standard membrane type filter can be installed simultaneously in the SabreBPM radial entry head with no modifications to the head. In this configuration, any radioactive beta particulates other than radon progeny will be reported as I-131 (the SabreBPM background compensation algorithm automatically corrects the gross beta reading for radon based on a spectral analysis of the alpha spectrum).

- Standard PTFE membrane-type filters are available from Bladewerx, part number BSP-FILT-15B037, 37mm diameter 1.5 μ m Speclon filter. When used with an external pump where the flow rate is in excess of 20 LPM, a Speclon 5.0 (5 μ m pore) filter should be used. To ensure good alpha spectrums, PTFE membrane-type media should be used.
- Carbon impregnated filters (37mm diameter) are available from Bladewerx, part number BSP-FILT-CB037, or from Hi-Q Environmental Products Co., part number FPACI-37. For this media at 1 CFM, the Iodine retention efficiency is approximately 90%. At 2 CFM, it is approximately 85%.

If there is a concern that the air being sampled may contain beta particulates other than radon progeny, an additional SabreBPM can be installed up-stream of the Iodine SabreBPM (would require using the optional in-line head on the Iodine SabreBPM) to monitor for alpha and beta particulates and remove them from the sample stream. The particulates can also be removed from the sample stream by installing a particulate pre-filter on the SabreBPM (which also requires using the optional in-line head). When using dual SabreBPMs for particulate and Iodine measurements or if higher flow sample flow rates are desired, an external pump is recommended (this is a standard option). If ambient gamma levels are variable, the gamma background option for the SabreBPM (to compensate for gamma background that can occur in the beta channel) is recommended as well.