Berkeley Nucleonics Corporation

FAQs for 945 SAM and SAMpack (SAM III instruments)

What is the dose rate range for the SAM III instruments?

The new upgraded SAMs have a dose rate range of
1 nSv/hr to 100 mSv/hr, resulting in a range of 100 million. The dose rate can also be shown in rem/hr (100 nrem/hr to10 rem/hr).

Why is dose rate given in Sv/hr (Sievert per hour) or rem/hr (roentgen equivalent man per hour)?

The Sievert (Sv) is the international system (SI) unit and is the preferred unit for measuring ionizing radiation specifically in human tissue. The dose rate in rem/hr can also be selected in the SAM for those who are more accustomed to using the older unit (100 rem is equal to
1Sievert).

Why do the new SAMs have an optional sigma trigger setting?

The new sigma trigger allows a low threshold for sensing a radioactive source while unaffected by false triggering due to changes in background (sigma indicates standard deviations over background). This provision automatically updates the current background which yields higher sensitivity while eliminating false triggers due to changing ambient background. This feature allows the user to survey a large area without needing to continuously stop and store a new and different background. A sigma setting of 4 is recommended.

How does the SAM III maintain a high degree of sensitivity since it no longer uses the QCC algorithm?

QCC in the previous SAM was used to enhance the statistics which gave a high degree of sensitivity in real time. This technique is called a transform and can be accomplished in less than 100 n seconds. The new SAM uses a different type of transform called a wavelet. The wavelet is equally as fast and has resulted in sensitivities many times greater than QCC (a factor of 4 improvement in sensitivity for Cs-137). The wavelet has another important advantage in that the energy axis is linear as opposed to logarithmic with QCC.

Why is smart phone technology employed in the SAM III instruments and what are the advantages?

The smart phone technology lends itself to spectroscopy with simplified and intuitive operation. The advantages are many fold:

1) Smart phone operation is wide spread allowing the user to quickly adapt to touch screen use and utilizing many cell phone features.
2) The device (PDA) is a quality product which gives the SAM III products reliable operation with many first-ever capabilities. The display has excellent linearity and resolution with color coded spectra and one-finger operation of the cursor. Many features are automated, for example, auto calibration and stabilization which are clearly displayed.
3) Detaching the PDA allows convenient control of the SAM III from a distance (bluetooth control). With the SAMpack this means monitoring can be a clandestine operation with or without earphones. In addition the SAM 945 can be carried on the shoulder for long distances with the PDA mounted on the SAM or hand held during surveillance.
4) When monitoring waste or highly active material the user can be at a safe distance (20 feet or more) and have complete control of the spectrometer which includes making measurements, taking multiple acquisitions, manipulating the spectrum, etc. Therefore, the ALARA safety practices are easily accomplished.

5) General cell phone features are incorporated into the operation of the SAM. For example, taking a picture and adding text or video describing details of the source being measured. This added information is included with the report and spectrum.

Is the SAM III protected/sealed to withstand heavy rain and spray?
The SAM III instruments are ruggedized and have an IP65 rubberized enclosure. This protective seal withstands water spray and heavy rain.

What is the battery life of the SAM III instruments?
The model 945 SAM and SAMpack have a highly upgraded power source with rechargeable lithium-ion batteries. These batteries give reliable operation up to 24 hours before requiring recharge.

What detectors are available with the SAM III instruments?
The SAM III instruments are supplied with a standard NaI 3x3 inch detector. Optional detectors are $CeBr_3$ and $LaBr_3$ high resolution detectors of several sizes.

What is the maximum count rate for the SAM III instruments?
The SAM III instruments have a maximum count rate of 100 k – 150 k cps depending on the amount of background.

What isotope libraries are supplied with the SAM III instruments?
The standard library is the NaI ANSI N.42. Additional libraries include a large medical library and an industrial library for NaI.
There is also an ANSI CeBr (or LaBr) library.

What is the sensitivity of the neutron detector?
The neutron detector has a sensitivity of ~3cps/nv. Using the standard neutron measurement of 20,000 n/sec at a distance of 25 cm, this source would yield about 30 cps. Realize that geometry and distance to the neutron detector will greatly affect the count rate.