Advantages of Quadratic Compression Conversion (QCC) patented technology of the SAM 935

1) The QCC algorithm is a transform. Transforms have been used for many years to enhance statistics – for example the FFT algorithm used to enhance x-ray imaging.
2) QCC is based on an algorithm related to the square root of the isotope's energy line(s). This optimizes the spectrum so that peaks are well separated at high, low, and all energies in between. In conventional spectroscopy you can optimize the low energy at the expense of the high energy and vise versa. All peaks in the QCC spectrum fall into eleven channels. This also makes processing easier.
3) The "apparent" MDA is greatly improved and increases with energy. It is true that one could utilize the capability of a high performance computer and an appropriate algorithm to optimize conventional spectroscopy without compression, however, greater error is likely in the one-second time domain. Even so there is much more to the algorithm as seen in 7) below.
4) The sensitivity arising from one-second data slices is greatly improved even down to background levels. For example ^{137}Cs at 10 microrem/h yields a sigma (standard deviation) above background of almost 20:1 in one second.
5) QCC allows isotopes with low branching intensities to be identified in real time. This is important when identifying uranium and weapons grade plutonium since these are best identified by their low abundant lines. Significant amounts of uranium and plutonium can be identified in real time (real time identification should always be followed by a longer acquisition for accurate analysis). Small quantities of plutonium (one gram or less) may take a minute or more to accurately identify but this is a short time compared to conventional NaI spectroscopy.
6) QCC provides improvements in compensating for the drift of NaI detectors. Since the compression is a function of energy the drift will be nearly compensated over a range of +/- 19 degrees F.
7) Because of QCC and the enhanced statistics in each one-second time slice, a number of important advantages result:
    a) Hysteresis is applied which compares the statistics in each time slice so that a higher statistical confidence can be achieved in a very short time period. For example, comparing the statistics in the first second with the following second will give a confidence level of over 97%. This greatly improves the real time response against false positives (ID in the first second and confirm in the next second).
    b) Real time response gives the opportunity to subtract background during every one-second update. This improves the sensitivity to reliably detect and identify isotopes in and below background levels. Significant levels of activity may produce very low intensities at short distances - because of the inverse square law. Therefore, the ability to detect and identify isotopes with low intensities in real time is important. For example, performing remediation in soil can be accomplished swiftly and still identify the areas that need accurate analysis in the low pCi/g concentrations. Quantitative analysis must always use an appropriate length of time for accumulating good statistics. The point is that the identified area for the analysis to take place can be quickly found. The same thing can be said about locating contraband in luggage, moving vehicles or personnel. For example medical isotopes can be distinguished from SNM in passengers walking through the security area. Another advantage of subtracting background in real time provides the ability to perform identification and analysis in high background environments.
    c) The ability to obtain meaningful real time data requires the subtraction of continuum and Compton during the one-second update. High energy isotopes like ^{137}Cs or ^{60}Co can easily make a low energy source like ^{241}Am hard to detect. The SAM can identify a weak ^{241}Am source in the presence of higher energy isotopes that are thousands of times more intense. Another example is the tooling out of Bremsstrahlung from x-ray imaging or the attempted masking of SNM with a beta source. Demonstrations have been performed to show that these masking attempts can be defeated.

Note: BNC does not claim that accurate analysis can be accomplished in one second. Accurate analysis is accomplished by using the Capture feature and running the MCA report. Real time identification does allow transient events to be located for further analysis. This is especially helpful for many applications in saving time and cost. In addition the sensitivity afforded in real time acquisition allows recognition of many events that would have gone undetected by other means.