THESIS

GROSS COUNT MULTI-SPECTRA ANALYSIS OF WEAK ACTIVITY SOURCES AMID ELEVATED BACKGROUND AND VARIOUS SHIELDED CONDITIONS

Submitted by

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ABSTRACT

GROSS COUNT MULTI-SPECTRA ANALYSIS OF WEAK ACTIVITY SOURCES AMID ELEVATED BACKGROUND AND VARIOUS SHIELDED CONDITIONS

Current methods to detect low activity radiological sources in areas with elevated or changing background may be insufficient for assessing real-time events. Background radiation fluctuates throughout the day, which thwarts the effectiveness of decision thresholds (y^*) extrapolated from long background count times. However, decision thresholds calculated from a string of spectral measurements can be used to optimize the decision threshold (y^*) at which count rates statistically exceed background. The goal of this project is to apply a frequentist string data analysis tool to real-time gross count sodium iodide (NaI) spectra under varying background radiation and shielding conditions. A sodium iodide scintillator is utilized with the ProSpect acquisition software to acquire gross count data for analysis of the source detection efficiency under varying background and shielding conditions. A series of measurements is taken using short count times, and assessed using Receiver Operating Characteristics (ROC) curves. The best combination of N measurements, with n events individually exceeding a discriminator threshold, is determined using true positive rates from the generated ROC curves. Ideally, the optimized combination of n exceedances of the discriminator threshold in N measurements discerns weak signals from elevated background, while minimizing false positive events.

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Chapter 1

Introduction

A stable energy state is sought by all matter. At the atomic level, a nucleus' quest to achieve stability results in the emission of energy in the form of particulate or electromagnetic radiation, called radioactive decay. An atom can undergo multiple decay events in order for the nucleus to reach stability [1]. There are four common types of emissions from the nucleus: alpha decay (two protons and two neutrons emitted from a heavy nucleus), beta (+/-) emission (negatively charged electrons and positively charged positrons emitted due to neutron and proton rich nuclei, respectively, gamma emission (electromagnetic wave emitted from nucleus due to an isomeric transition), and neutron emission [1 , 2]. The work of this thesis focuses on the importance and application of establishing a decision threshold for low activity/shielded sources in different elevated background environments. In order to discern how the conclusions contained herein were drawn, an understanding of the statistics involved is important. Accordingly, each applicable equation is provided.

Radioactivity is an inherent part of the universe. Although this characteristic can be measured, observed, and differentiated, the actual time for any individual atom to decay cannot be determined [2]. However, the decay of a population of atoms can be observed/measured, and the time it takes for half of the population to remain, called half-life, can be assessed. The half-life, unique to each type of nuclei and independent of their physical/chemical state, can then be used to estimate the remaining atoms or activity (decays per unit time) in a population after some time t (or, estimate the original amount given time, t) [1]. The activity A and number of atoms N are related by Equation 1.1, where λ is the average decay per nucleus per unit time described by Equation 1.2.

$$A = N\lambda \tag{1.1}$$

$$\frac{A}{n} = \lambda \tag{1.2}$$

The remaining amount of the sample or the population of atoms within that sample, after some time t, can then be calculated from the original amount N_o using Equation 1.3

$$N = N_o e^{-\lambda t} \tag{1.3}$$

The half-life, type of particle emission (i.e., alpha, beta, gamma), and decay energy can act as a fingerprint for nuclide identification.

The ability to identify, quantify, and assess specific radioactive nuclides within a sample requires the proper detector and statistical tools. However, external sources of radiation can thwart the effectiveness of a given measurement. As shown in Figure 1.1, outside sources include, but are not limited to medical procedures utilizing radioactive material or other sources of ionizing radiation and background radiation.

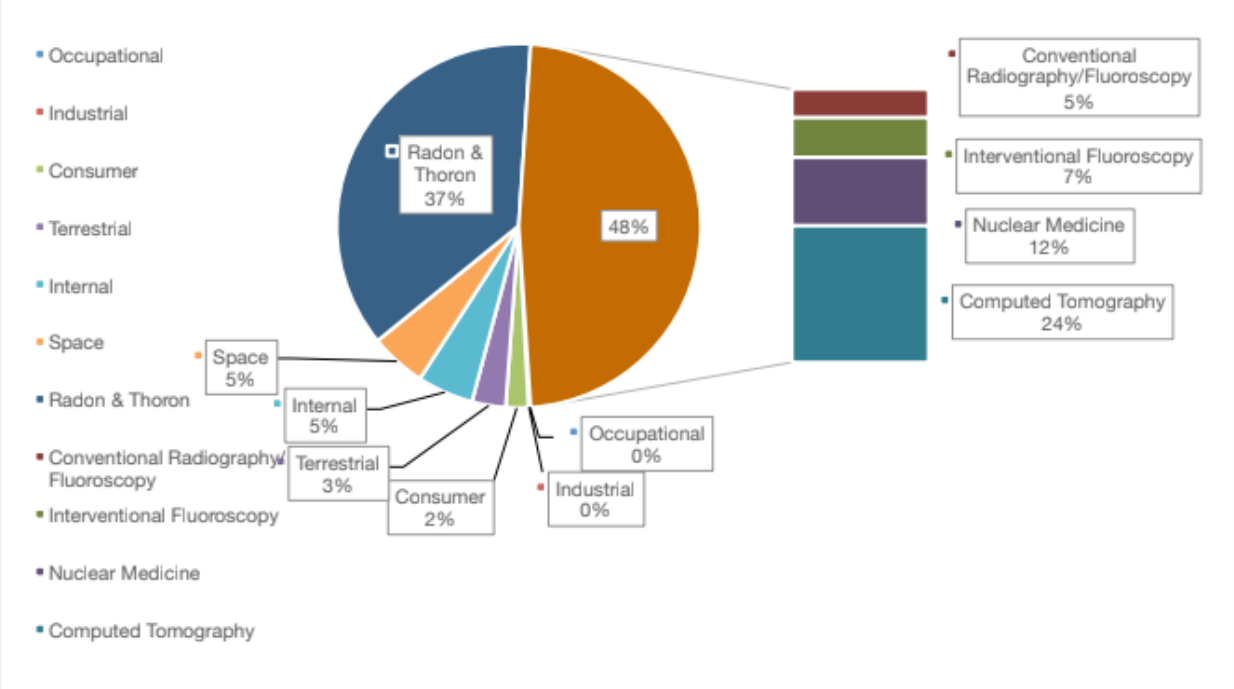

Figure 1.1: Sources of Ionizing Radiation Exposure

According to the Environmental Protection Agency (EPA) and the National Council on Radiation Protection and Measurements (NCRP), 37% of background radiation comes from the decay of

thoron and radon, and 15% comes from primordial/cosmic radiation [3]. Primordial radionuclides are radioactive nuclides with long half-lives (typically on the order of approximately 10^8 years) that were formed prior to the creation of the earth [1]. Cosmic radiation comes from outer space, the majority of which is deflected by the earth's magnetic field, and attenuated by the atmosphere. Cosmic radiation levels increase with increasing altitude as well as increasing longitude as they are attenuated and deflected less by the atmosphere and the magnetic field, respectively [2].

Levels of background radiation differ by location and time of day due to variable mineral/rock composition within the earth, temperature/pressure changes, longitude, and altitude [1]. The main "background influencing" primordial radionuclides are the nuclides of the uranium and thorium series. During the decay series of uranium and thorium to lead, radon (a naturally occurring radioactive noble gas) is produced. This gas diffuses through the ground to the surface, and contributes to the daily radiation exposure. Because temperature and pressure changes occur throughout the day as the earth's surface is heated and cooled, concentrations of radon gas will fluctuate. This fluctuation can influence and thwart accurate radiation detection.

Chapter 2

Radiation Detection

A wide variety of radiation detectors specific for type of decay, decay energy, and sample measurement time is available. For the purpose of this experiment, a sodium iodide scintillation detector system was used. The detection system is comprised of several main components, which can be displayed as a "signal processing chain" shown in Figure 2.1.

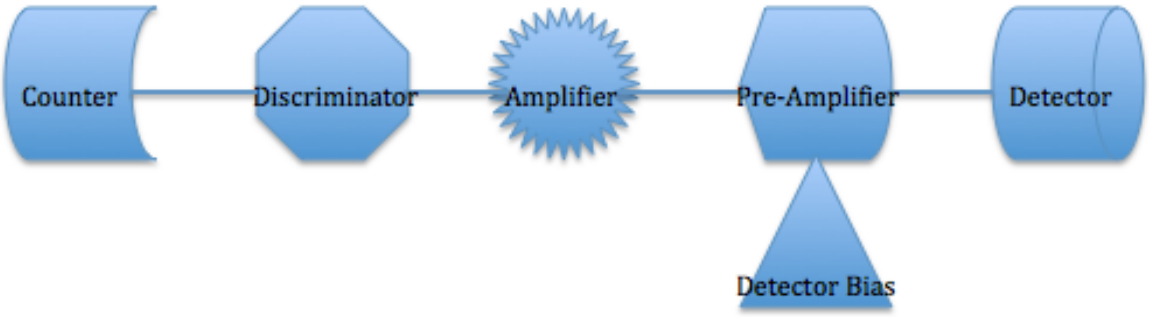

Figure 2.1: Signal Processing Chain

All measurements first require a background measurement with which a sample can be compared. For any given detection system, the background is broken up into two parts: the noise from the detector and background radiation. Radiation incident on the detector is converted into a signal that is then processed by the detection system. The signal is then passed through the pre-amplifier where the signal is shaped and the signal-to-noise ratio is maximized for the amplifier. The amplifier then further amplifies and shapes the signal from the preamplifier and passes the signal through the discriminator that applies a cutoff for upper and lower bounds. The cutoff effectively removes the majority of noise from the detector, and yields a logic pulse that is then measured by the counter [4].

A sodium iodide scintillation detection system utilizes a sodium iodide crystal medium to capture and convert incident gamma and x-ray radiation to light within the visible spectrum. The

crystal is delicate and housed in a vacuum-sealed housing to prevent moisture, external light, beta particles, and alpha particles from entering and thus disrupting the crystal structure. The gamma radiation is converted to visible light by exciting electrons within the crystal structure. As electrons de-excite, light (photons) are produced and then captured by the photomultiplier tube. The signal is then amplified by the photomultiplier to a signal proportional to the energy of the incident radiation. Although this proportionality allows for energy discrimination between different radionuclides, it does not ensure identification of radionuclides in measured samples. The detector's capabilities are unique to the energy and type of incident radiation [4].

The use of counting statistics to assess decay events is necessary to describe the innately random process. Variability between measurements is due to the stochastic nature of radioactive decay. The type of statistical assessment used for a given random process is related to the two types of random variables continuous and discrete, each having important probability distributions to describe the random events.

A probabilistic binomial process can describe certain random processes, such as radioactive decay. The half-life of radioactive nuclides provides information about the frequency of decay within a population of atoms, with no indication of the time it takes for the decay of any individual atom. Therefore, only two discrete outcomes can take place: either the nucleus underwent decay, or the nucleus did not.

Chapter 3

Types of Random Variables

A discrete random variable Y is discrete only if the values it can assume are finite or countably infinite [5]. A discrete random variable will therefore have a quantifiable set of possible outcomes, with a cumulative probability over all outcomes equal to one. Uppercase Y represents a random variable, and a lowercase y denotes some value or outcome the random variable can take on. The probability for a discrete random variable Y taking on a specific value or outcome y, is denoted as $P(Y = y)$. For each outcome y, there is an associated probability of the event occurring called the probability mass function $p(y)$. This is defined in Equations 3.1 and 3.2 below.

$$\sum_{y}(p(y) = y_1, y_2, ..., y_n)) = 1 \tag{3.1}$$

The summation must be over all values of y that have non-zero probabilities.

$$0 \leq p(y) \leq 1 \; \forall \; y \tag{3.2}$$

To assess the probability that any given selection of random variable Y produces a value less than y, a cumulative distribution function $F(y)$ is used to describe the events with the following characteristics.

$$F(-\infty) \equiv \lim_{y \to \infty} F(y) = 0 \tag{3.3}$$

$$F(\infty) \equiv \lim_{y \to \infty} F(y) = 1 \tag{3.4}$$

$$F(y) \; is \; a \; non\text{-}decreasing \; function \; of \; y \tag{3.5}$$

The expectation value $E(Y)$ for a discrete random variable Y with a probability mass function $p(y)$ is given by Equation 3.6, and only exists given absolute cumulative convergence in Equation 3.7.

$$E(Y) = \sum_{y} yp(y) \tag{3.6}$$

$$\sum_{y} |y|p(y) < \infty \tag{3.7}$$

The expectation value $E(Y)$ estimates the population mean μ, and is a parameter for the probability distribution only if $p(y)$ is an accurate characterization of the population frequency distribution [5]. The variance and standard deviation of a set of measurements or events are related to the expectation value as a difference between the measured/observed values with respect to their mean given by the following relationship.

$$If: \ Y \ is \ a \ random \ variable \ with \ mean \ E(Y) = \mu \tag{3.8}$$

$$Then: \ V(Y) = E[(Y - \mu)^2] \tag{3.9}$$

$$And: \ \sigma^2 = V(Y) = E(Y^2)[E(Y)]^2 \tag{3.10}$$

The discrete distributions that are important for counting statistics and radiation measurement assessment are the binomial and Poisson distributions, which will be discussed in the Statistical Distributions section.

A continuous random variable is defined as a random variable that can assume any value in a given interval [5]. Continuous random variables differ from discrete random variables by the way probabilities can be assigned. Since a continuous random variable can take on any value in a given interval, it is impossible to add an infinite amount of non-zero probabilities equal to one

[5]. Therefore, the probability distribution function for a continuous random variable uses the cumulative distribution function with characteristics denoted by Equations 3.3-3.5. The random variable Y is said to be continuous if it follows Equation 3.11 [5]. $F(y)$ is a distribution function of Y such that:

$$F(y) = P(Y \leq y) \; for \; -\infty < y < \infty \tag{3.11}$$

The cumulative distribution function $F(y)$ for continuous random variables describes the probability that the selection of a random variable Y is less than or equal to some value y, $P(Y \leq y)$. Consequently, for a random variable to be continuous, the probability that a random variable Y takes on the value y, $(P(Y = y))$ is zero. Continuous random variables are, however, defined by a probability density function $f(y)$. Probability density functions have the following properties [5]:

$$f(y) \geq 0 \; \forall \; y, \; -\infty < y < \infty \tag{3.12}$$

$$\int_{-\infty}^{\infty} f(y)dy = 1 \tag{3.13}$$

The probability density function $f(y)$ of a continuous random variable is related to the cumulative distribution function $F(Y)$ for a continuous random variable Y by Equations 3.14 and 3.15.

$$f(y) = \frac{dF(y)}{dy} = F'(y) \tag{3.14}$$

$$F(y) = \int_{-\infty}^{y} f(t)dt \tag{3.15}$$

The probability density function essentially acts as a model for the frequency distribution of a population of measurements [5]. However, Equation 3.15 only describes the probability of a continuous random variable taking on a value less than or equal to some value y. Equations 3.16 and 3.17 are used to describe and relate the probability of a continuous random variable Y taking on a value between two discrete values (a, b) on a given interval.

$$P(a < Y \leq b) = P(Y \leq b) - P(Y \leq a) = F(b) - F(a) \tag{3.16}$$

$$F(b) - F(a) = \int_a^b f(y)dy \tag{3.17}$$

The expectation value for a continuous random variable is given by Equation 3.18, only if the interval in question exists as defined by Equation 3.19.

$$E(Y) = \int_{-\infty}^{\infty} yf(y)dy \tag{3.18}$$

$$\int_{-\infty}^{\infty} |y|f(y)dy < \infty \tag{3.19}$$

The variance and standard deviation for continuous distributions follow the same mathematical relationships as in Equations 3.8-3.10 [5]. The continuous distribution that is important to gross count spectrum analysis is the Gaussian or normal distribution, which is derived using continuous random variables.

Chapter 4

Statistical Distributions

4.1 Binomial Distribution

A binomial distribution is used to describe the observation of a series of identical but independent trials with only two possible outcomes: success or failure. For an experiment to be deemed "binomial" it must have the following characteristics [5]:

- "N" number of trials is fixed
- Any trial must conclude with either success "s" or failure, "f"
- The probability of Success has a discrete value p
- The probability of Failure has a discrete value q related to the probability of Success by Equation 4.1:

$$q = 1 - p \tag{4.1}$$

- All "N" trials are independent
- "n" is the independent random variable number of successes in "N" trials.

The probability of "n" successes in a binomially distributed experiment for "N" trials and individual success probability p is given by Equations 4.2 and 4.3.

$$p(n) = \binom{N}{n} p^n q^{N-n} \; where \; n = 0, 1, 2, , N; \; 0 \leq p \leq 1 \tag{4.2}$$

$$\binom{N}{n} = \frac{N!}{n!(n-N)!} \tag{4.3}$$

Because the binomial distribution defines success/failure events, it can be used to describe radioactive decay events in which a nucleus either decays (success) or does not decay (failure). The

probability that a nucleus successfully decays, "p", in time "t" is given by incorporating the probability of failure "q" (the atom does not decay) to Equation 1.3, described in Equations 4.4 and 4.5 [6].

$$If:\ q = e - \lambda t \tag{4.4}$$

Then

$$Then:\ p = 1 - q = 1 - e^{-\lambda t} \tag{4.5}$$

Equations 4.6 and 4.7 give the expectation value and variance of the binomial distribution with respect to radioactive decay.

$$E(Y) = \mu = Np \tag{4.6}$$

$$V(Y) = Npq = Np(1-p) \tag{4.7}$$

Therefore, using the binomial distribution, the probability of n decays in a population of atoms over a given number of N trials during time t is given by Equation 4.8, with the mean number of decays calculated in Equation 4.9 using Equations 4.5 and 4.6.

$$p(n) = \frac{N}{n}(1 - e^{-\lambda t})^n (e^{-\lambda t})^{N-n} \tag{4.8}$$

$$E(Y) = N(1 - e^{-\lambda t}) \tag{4.9}$$

Although the binomial distribution can be used to describe radioactive decay, the binomial coefficient $\binom{N}{n}$, which accounts for unordered N objects, contains protracted factorials which cannot evaluated computationally for large N. Binomial approximations are therefore drawn using Poisson and Gaussian distributions [2, 5, 6].

4.2 Poisson Distribution

The binomial distribution converges to the Poisson distribution when the population size N is large, and the probability of success p is small (<0.05) [5]. The Poisson distribution has the same

distribution mean μ as the binomial distribution described in Equation 4.9 [5]. By taking the limit of the binomial probability distribution described in Equation 4.2, the resulting probability mass function is shown in Equation 4.10.

$$\lim_{N\to\infty}(\frac{N}{n})p^n(1-p)^{N-n} = p(n) = \frac{\mu^n}{n!}e^{-\mu}; n = 0, 1, 2, ..., \mu > 0 \tag{4.10}$$

The variance and expectation value of the Poisson distribution are equal to the mean μ of the population sample, and the standard deviation is therefore the square root of the mean, as shown in Equations 4.11-4.13 below.

$$E(Y) = \mu \tag{4.11}$$

$$V(Y) = \mu \tag{4.12}$$

$$\sigma^2 = V(Y) = \mu \tag{4.13}$$

The Poisson distribution is useful for assessing decay events where the sample measurement time is small, relative to the low probability that nuclei within the sample will decay, meaning the probability of a decay event happening in the same time interval the measurement took place, is very small.

4.3 Gaussian/Normal Distribution

The Gaussian, or normal distribution, which is the distribution most pertinent to the statistical analysis of gross count measurements in this thesis, is the most commonly used continuous probability distribution [5]. The probability density function for Gaussian distributions, given by Equation 4.14, assumes that the function is localized around the mean for $|N - \mu| \ll \mu$ [2].

$$f(y) = \frac{1}{\sigma\sqrt{2\pi}}e^{\frac{-(y-\mu)^2}{2\sigma^2}},\ -\infty < y < \infty \tag{4.14}$$

The Normal distribution has an expectation value and a variance given by Equations 4.15 and 4.16, respectively.

$$E(Y) = \mu \tag{4.15}$$

$$V(Y) = \sigma^2 \tag{4.16}$$

To determine the area under the normal probability density function for a given random variable Y between two points a and b, $P(a \leq Y \leq b)$, requires the calculation of the integral given in Equation 4.17.

$$\int_a^b \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(y-\mu)^2}{2\sigma^2}} dy \tag{4.17}$$

However, since a closed-form of this integral does not exist, computation requires numerical integration techniques [5]. The random variable Y, can, however, be transformed to a standard normal random variable Z by Equation 4.18.

$$Z = \frac{Y - \mu}{\sigma} \tag{4.18}$$

The transformation to the standard normal random variable Z designates a point measured from the mean of the normal random variable Y. The Z value is designated in units of standard deviation of the normal random variable, with mean value of Z equal to zero, and standard deviation equal to one [5].

Chapter 5

Evaluation of Radiation Detection

All measured samples first require a background measurement with which they are compared. ISO 11929 designates the three evaluation characteristics for radiation detection: the limits of the confidence interval, the detection limit, and the decision threshold [7]. The Neyman-Pearson lemma is the traditional hypothesis test between two simple hypotheses: $P(reject\ H_o|H_o\ is\ true) = \alpha$. When applied to radiation detection, H_o has two assumptions: only background radiation has been measured and the background measurement takes form of a known distribution. The α, or false positive probability, is established prior to measurement. Traditional radiation detection uses the Neyman-Pearson lemma re-written as $P(y > y^*|H_o\ is\ true) = \alpha$. The assumption of H_o is rejected when a measurement y exceeds an established decision threshold y^*. The decision threshold is the point at which a measurement value is determined to be above background and statistically significant. It is contingent upon error of the first kind, traditionally denoted as α.

There are two types of errors resultant of establishing a decision threshold, y^*, shown in Figure 5.1: false positive, α error, and false negative, β error, also called Type I and Type II errors, respectively.

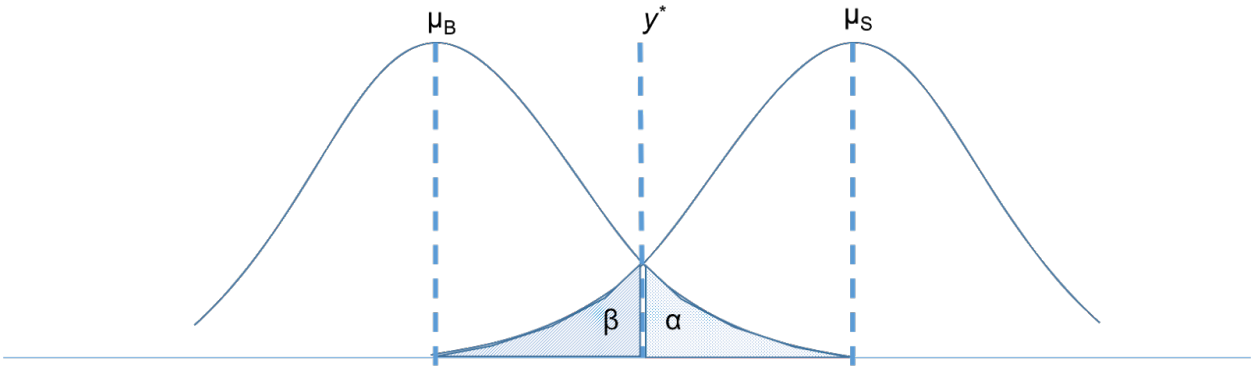

Figure 5.1: Type I and Type II (α and β) error for Signal-to-Background Distributions

A false positive (Type I or α error) occurs when a measurement registers above the decision threshold y^*, and is deemed statistically above background when no radioactivity is present. A missed detection (Type II or β error) occurs when a sample that is radioactive is measured below the decision threshold y^*, and thus deemed background. The decision threshold provides no information regarding whether or not a sample is radioactive.

A decision threshold is calculated using only "background" information. When a sample measurement falls above the decision threshold, it does not guarantee that the sample contains radioactivity, rather, that the sample statistically exceeded the decision threshold for background. Exceeding a decision threshold when radioactivity is not present is a false positive event, with rate established by a pre-determined α. Therefore, a measurement deemed "above background" requires further investigation to determine whether or not radioactivity is actually present in the sample. It is important to note that further investigation assumes an immediate indubitable decision is not required.

Instruments to detect radiation do not typically retain information about previous measurements. Therefore, each measurement is considered to be independent of previous and future measurements. However, if an instrument could store consecutive measurements, information from previous and future measurements (set) could be used in determining a detection event. The use of a set of individual measurements in determining a detection event will be referred to as multiple measurement assessment.

There are various ways multiple measurement assessment could be most effective for radioactivity determination. Environmental sampling could apply this method while surveying areas that have suspected radiation contamination. By utilizing a multiple measurement assessment, the overall number of false positive events that could otherwise trigger remediation or decontamination protocols would be greatly reduced. A reduction in false positive events would be observed because a discriminator threshold for each one of n measurements in a set of N measurements would need to be exceeded for a detection event to occur. Therefore, for a false positive event to happen, consecutive multiple independent measurements would have to yield an error of the first

kind (α). Further application of this method could be used for terrorism threat reduction. The ability to smuggle clandestine nuclear material across borders or through ports of entry would be essential for a radiological attack on U.S. soil. Due to the sheer volume of cars, trucks, shipping containers, and other means to transport clandestine nuclear material into the country, high false positive events that would halt operation and require investigation are not economically acceptable. Similarly, a missed detection event where clandestine nuclear material is successfully brought into the country could have catastrophic consequences. For the best application of this method to terrorism threat reduction, an indubitable decision would have to be made based on the n events exceeding a discriminator threshold, given N measurements. Therefore, if the pre-determined number of n measurements exceed the discriminator threshold for a given set of N measurements, radioactivity is said to be present.

Chapter 6

Purpose and Hypothesis

The purpose of this thesis is to further improve and advance detection capabilities of shielded and unshielded radioactive sources in elevated background environments using a string or series of measurements.

Traditionally, only a single measurement is compared to a decision threshold to determine whether or not activity is present within the sample. In areas where background radiation is elevated or fluctuates throughout the day, single measurement assessment for radioactivity determination may be insufficient. This research aims to improve detection capabilities by applying decision thresholds based on multispectral analysis, or a string of measurements, rather than a single measurement assessment for shielded sources and elevated background environments. The performance of single versus multiple measurements will then be compared using Receiver Operator Characteristic curves (R.O.C.) to assess true positive (decision threshold exceeded when source is present) versus false positive (decision threshold exceeded when source is not present) events. The highest true positive rates for the corresponding $\binom{N}{n}$ pairings will be extracted from the ROC curves and applied to the shielded and elevated background conditions.

Chapter 7

Materials and Methods

The materials and methods are divided into the following areas: the detection system, measurement conditions, and the evaluated criteria.

7.1 Detection System/Mathematical Tool

All measurements were taken using a sodium iodide Model 802-2×2 Scintillation detector (Model 802, Canberra Industries Inc., Meriden, CT). The photomultiplier tube (Model 2007P, Canberra Industries Inc., Meriden, CT) was connected to the detector and corresponding pre-amplifier. The Lynx Digital Signal Processor (Canberra Industries Inc., Meriden, CT) acts as the amplifier and discriminator, and converts the signal from the detector to counts that are displayed using the ProSpect acquisition software. Measurements were taken in one-second acquisition increments. Therefore, the data acquisition mode utilized was multispectral scaling mode (MSS) for continuous pulse height analysis (PHA). The data are converted to an Excel file and displayed as "Raw Counts" as a function of both Energy and Channels. The "raw-count" files were then parsed using Excel's built-in VBA software [8]. The parsed files could then be implemented in another Excel VBA coded sheet where the background/source counts were statistically analyzed, and results displayed in both tabulated and graphical form. The source used was a Cesium-137 five microcurie source (decay corrected using Equations 1.1-1.3) that emits a 662 keV gamma ray. The scintillator detector was calibrated and has a resolution of 8.5% for the Cs-137 662 keV peak.

7.2 Measurement Conditions

Background radiation varies throughout the day as concentrations in radon fluctuate with temperature and pressure changes. Previous research showed a time-window mid-day in which variations between gross count measurements for the background were minimal [6]. A twenty-four hour assessment of background radiation was taken using fifteen-minute measurement time increments,

and was evaluated for variations. The results confirmed earlier findings that there was less deviation in background during the mid-day window. This window (between 10 am - 3 pm) was utilized to ensure changes in background were minimal during data acquisition. All measurements were performed in room 312 in the MRB building at Colorado State University to ensure the geometry was consistent throughout experimentation. The experimental setup is shown in Figure 7.1.

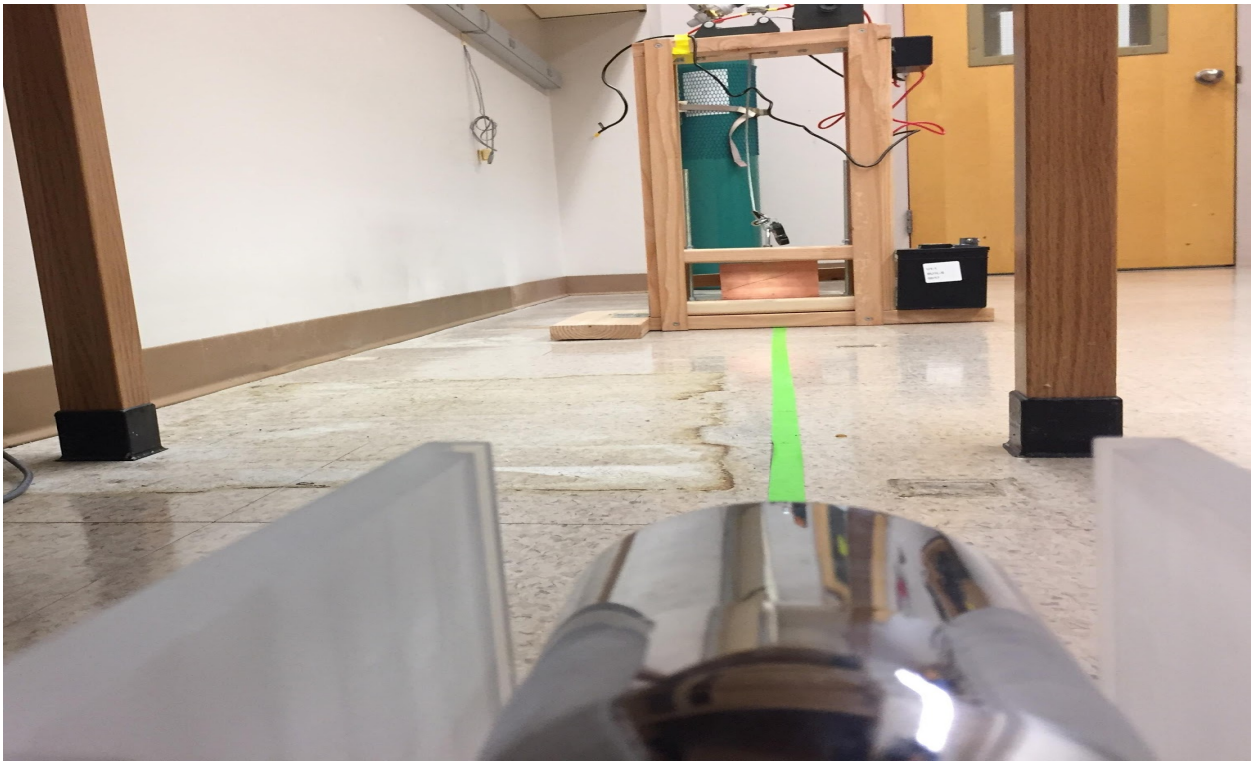

Figure 7.1: Experimental Setup view from NaI detector to shielded source

Four experimental conditions were tested to evaluate the effectiveness of the detection algorithm: normal background with cesium source, elevated background with cesium source, elevated background while shielding a cesium source with copper, lead, and aluminum, and a cesium source elevated background with cesium source.

In the first elevated background condition, count rates were elevated using Naturally Occurring Radioactive Materials (NORM) rocks containing thorium and uranium. The rocks were placed in proximity to the detector until the observed count-rate (approximately 1200 counts per second)

was twice the normal background count rate (approximately 600 counts per second). The source was then placed at varying distances (100 cm, 200 cm, 300 cm, 350 cm, and 400 cm) to affect the source strength according to the $\frac{1}{r^2}$ law. For an isotropic point source, increases/decreases in distance to the detector or measured point affect the source strength by a factor of $\frac{1}{r^2}$ where r is the distance from the point of interest [1].

The Shielded Source scenario utilized the same elevated background from the rocks containing thorium/uranium, and varied with the type of shield used to "hide" the source. Aluminum, copper, and lead shielding of thickness equal to one mean free path, μx, was calculated using Equation 7.1 and their corresponding linear attenuation coefficients. The thickness x is dependent on the shielding material density, ρ, and the desired source strength reduction for a given photon energy. The linear attenuation coefficient ρ for each material provides the fraction of photons absorbed or scattered per unit thickness. For one mean free path, the probability of interaction of the uncollided "beam" from the cesium source with the detector is reduced by a factor of $\frac{1}{e}$ or approximately 37%. Values for the calculated thicknesses are provided in Table 7.1.

Table 7.1: One mean free path shield thickness

600 keV Photons	Linear Attenuation Coefficient [μ/ ρ] (cm^2/g)	Density [ρ] (g/cm^3)	Shield Thickness [x] (cm)
Aluminum (Al)	7.802×10^{-2}	2.70	4.75
Copper (Cu)	7.625×10^{-2}	8.96	1.46
Lead (Pb)	1.248×10^{-9}	11.34	0.71

$$1 = \mu x \rightarrow \frac{1}{\frac{u}{\rho}\rho} = x \tag{7.1}$$

The cesium elevated background conditions were established by placing a cesium check source in proximity to the detector such that 200 cps above normal background (approximately 800 cps)

were observed. This condition was primarily used for analysis of variations in counts for the cesium peak in other research; however, gross count analysis was also performed.

Gross count spectra are analyzed with the assumption that background counts are normally distributed. The discriminator threshold y^*_{new} can be calculated using Equation 7.2, where μ_b is the mean of the counts and $Z_{\alpha-new}\sigma_b$ is a function of the α_{new}, which represents the probability that an individual measurement exceeds its discriminator threshold level such that Equation 7.5 is satisfied.

$$y^*_{new} = \mu_b + Z_{\alpha-new}\sigma_b \tag{7.2}$$

False positive values, α, for single radiation measurement assessment are typically set at 0.05 [1,4]. This means 5% of the time a measurement is above the decision threshold y^* when no source is present. When single measurement assessment (traditional method to radiation detection) is re-written for multiple measurement assessment, Equation 4.12 takes on the form of Equation 7.3.

$$FalsePositive = \binom{1}{1} 0.05^1 (1 - 0.05)^{1-1} = 0.05 \tag{7.3}$$

The single measurement assessment, re-written for multiple measurement assessment, has a total probability of a false positive event equal to the probability of success (α), 0.05. Since radiation detection scenarios typically involve multiple and/or consecutive measurements, treating each measurement irrespective of prior or future measurements could exclude valuable information pertinent for accurate radiation detection.

The probability for an individual measurement to exceed its discriminator threshold level, α_{new}, can, however, be calculated for multiple measurement assessment (i.e., looking at multiple measurements exceeding y^*_{new} for a given number of measurements) with the total false positive rate α held constant at 0.05 for "exact" and "at least" conditions shown in Equations 7.4 and 7.5.

$$\alpha = \binom{N}{n} \alpha^n_{new} (1 - \alpha_{new})^{N-n} \tag{7.4}$$

$$\alpha = \sum_{k=n}^{N} \binom{N}{k} \alpha_{new}^{k} (1 - \alpha_{new})^{N-k} \tag{7.5}$$

The "at least" condition for a source detection decision requires the analysis to decide that a radiological source is present when n or more individual measurements exceed the discriminator threshold in a set of N measurements. For example, if a source is deemed present in ten measurements when five of them exceed the discriminator threshold, then any pairing of five or more measurements that individually exceed the discriminator threshold will trigger a detection event (i.e., 6 out of 10, 7 out of 10, 8 out of 10, 9 out of 10, or 10 out of 10). For the "exact" condition to be satisfied, exactly n individual measurements in a set of N measurements would need to exceed their discriminator threshold. Using the previous example, exactly five out of ten measurements exceeding a discriminator threshold would trigger a detection event. If six or more out of ten measurements exceeded the discriminator threshold in that example, a detection event based on "exact" conditions would not occur. The calculated α_{new} are used to extrapolate the corresponding $Z_{\alpha-new}$ value for the discriminator threshold y^*_{new} calculation.

An analysis tool developed using Excel's built in VBA software uses the relationship between Equations 7.4 and 7.5 to calculate the discriminator threshold for each combination of n and N, and graphs the true positive vs. false positive events, given the "at least" or "exact" conditions [8].

Chapter 8

Results and Discussion

Optimization of the true positive detection rate required a quantitative assessment and comparison of false positive and true positive events under the varying experimental conditions. Graphical and tabulated data of these events are both used to determine the best analysis method for n and N, n being the number of measurements exceeding the discriminator threshold out of N total measurements. The graphical form is the ROC curve that takes shape by plotting the true positive detection rate against the false positive detection rate. Tabulated data consist of taking the highest true detection rates n for each condition, and comparing that n to the other scenarios. This will show the effectiveness of a particular n when compared to varying source strengths, shielding conditions, and background conditions. The $\frac{1}{r^2}$ law is utilized to vary the source strength. For N=10, 200 cm, 300 cm, and 400 cm distances were used which affects source strength by $\frac{1}{4}$, $\frac{1}{9}$, and $\frac{1}{16}$, respectively. The 100 cm distance which corresponds to a source strength of one was not used for multiple measurement assessment at N=10 because the true positive detection rate was 100% for all points on the ROC curve (with the exception of the traditional method), as seen in Table 8.1. The first number is the measured false positive rate and the second is the measured true positive rate, with the left most column being the expected false positive rate used to calculate the discriminator threshold for that particular ordered pair. For all tabulated data, the color and letter combinations correspond to the following: red represents highest true positive detection rate (denoted A), pink represents lowest true detection rate (denoted D), purple represents lowest false positive detection rate (denoted B), and tan represents highest false positive detection rate (denoted C).

Table 8.1: Normal background conditions, 100 cm false positive and true positive rates for n=1...10

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	1	0	1	0	1	0	1	0	1	0.0027	1	0.000909	1	0.0009	1	0	1	0	1	0.0005	0.8555
0.002	0	1	0.0059	1	0	1	0	1	0.0014	1	0.0036	1	0.002273	1	0.0032	1	0	1	0.0005	1	0.0018	0.8918
0.003	0	1	0.0095	1	0.0014	1	0.0014	1	0.0036	1	0.0036	1	0.002273	1	0.0045	1	0	1	0.0023	1	0.0036	0.9191
0.004	0.0045	1	0.0095	1	0.0014	1	0.0014	1	0.0041	1	0.0064	1	0.005	1	0.005	1	0	1	0.0023	1	0.0041	0.9291
0.005	0.0045	1	0.0095	1	0.0014	1	0.0014	1	0.0068	1	0.0077	1	0.005455	1	0.005	1	0	1	0.0027	1	0.0045	0.9423
0.006	0.0045	1	0.0095	1	0.0014	1	0.0014	1	0.0109	1	0.0077	1	0.007273	1	0.0091	1	0.0005	1	0.0027	1	0.0068	0.9505
0.007	0.0045	1	0.0095	1	0.0036	1	0.0027	1	0.0109	1	0.0091	1	0.007273	1	0.0105	1	0.0005	1	0.0027	1	0.0068	0.955
0.008	0.0045	1	0.0095	1	0.0036	1	0.0027	1	0.0123	1	0.0091	1	0.010455	1	0.0105	1	0.0018	1	0.0045	1	0.0077	0.9582
0.009	0.0045	1	0.0095	1	0.005	1	0.0045	1	0.0123	1	0.01	1	0.010455	1	0.0105	1	0.0018	1	0.0045	1	0.01	0.9605
0.01	0.0045	1	0.0132	1	0.005	1	0.0045	1	0.0123	1	0.01	1	0.010455	1	0.0109	1	0.0027	1	0.0055	1	0.0109	0.9623
0.02	0.0182	1	0.0341	1	0.0164	1	0.0227	1	0.0195	1	0.0205	1	0.023636	1	0.0159	1	0.0159	1	0.0123	1	0.0209	0.9805
0.025	0.0273	1	0.0345	1	0.025	1	0.0295	1	0.0227	1	0.0255	1	0.025909	1	0.0159	1	0.02	1	0.0168	1	0.0282	0.9855
0.03	0.0364	1	0.0345	1	0.0309	1	0.0332	1	0.0309	1	0.0373	1	0.031818	1	0.0195	1	0.02	1	0.0173	1	0.0318	0.9873
0.04	0.0409	1	0.0477	1	0.0445	1	0.0418	1	0.0359	1	0.0445	1	0.038182	1	0.0345	1	0.0332	1	0.0218	1	0.0418	0.9909
0.05	0.0455	1	0.0495	1	0.0527	1	0.0632	1	0.0555	1	0.0527	1	0.044545	1	0.0455	1	0.0405	1	0.0477	1	0.0509	0.9936
0.06	0.0623	1	0.0564	1	0.0641	1	0.0632	1	0.0555	1	0.0614	1	0.050909	1	0.0609	1	0.0545	1	0.0632	1	0.0609	0.9955
0.07	0.0623	1	0.0623	1	0.0773	1	0.0773	1	0.0732	1	0.0745	1	0.063636	1	0.0609	1	0.0636	1	0.0741	1	0.0691	0.9964
0.08	0.0905	1	0.0755	1	0.0868	1	0.1023	1	0.0914	1	0.0745	1	0.074091	1	0.0755	1	0.0795	1	0.0845	1	0.0809	0.9973
0.09	0.0995	1	0.0823	1	0.0959	1	0.1214	1	0.1109	1	0.0882	1	0.074091	1	0.0945	1	0.0795	1	0.0845	1	0.095	0.9977
0.1	0.1086	1	0.1014	1	0.0959	1	0.1214	1	0.1109	1	0.105	1	0.085909	1	0.0945	1	0.0914	1	0.1091	1	0.1023	0.9977
0.25	0.27	1	0.2795	1	0.265	1	0.2782	1	0.23	1	0.2436	1	0.245455	1	0.2464	1	0.2732	1	0.2627	1	0.2545	0.9995
0.5	0.5132	1	0.5127	1	0.5032	1	0.5245	1	0.4773	1	0.4768	1	0.505	1	0.5136	1	0.4709	1	0.5145	1	0.4918	1
0.75	0.7423	1	0.7623	1	0.7618	1	0.7268	1	0.7441	1	0.7373	1	0.749091	1	0.7427	1	0.7491	1	0.7818	1	0.7423	1

8.1 N=10 Varying Background Assessment

The first conditions analyzed were the false positive/true positive detection rates using normal background conditions, cesium elevated background conditions, and thorium/uranium elevated background conditions for α=0.05 and α=0.1. Only the examples from the 400 cm measurements will be shown in Table 8.2, and the remaining "meaningful" measurements for 200 cm, 300 cm, 350 cm, and 400 cm have been extracted and arranged in a table to be more easily assessed.

Table 8.2: Normal background conditions 400 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0045	0	0.0005	0.0009	0.0041	0	0.0055	0	0.0055	0.0005	0.0059	0.000455	0.019	0.0005	0.0141	0	0.0086	0	0.0123	0.0014	0.0018
0.002	0	0.0045	0	0.0045	0.0009	0.0082	0	0.0059	0.0005	0.01	0.0027	0.0118	0.001818	0.025	0.0009	0.0205	0	0.0173	0	0.0164	0.0027	0.0059
0.003	0.0045	0.0091	0.0009	0.0109	0.0032	0.0114	0.0018	0.0077	0.0014	0.0186	0.0036	0.0268	0.001818	0.03	0.0009	0.0232	0	0.0191	0	0.0245	0.0032	0.0073
0.004	0.0045	0.0182	0.0009	0.0241	0.0036	0.0145	0.0018	0.0095	0.0027	0.0227	0.0036	0.0345	0.001818	0.033	0.0014	0.0364	0	0.0205	0	0.0282	0.0045	0.01
0.005	0.0045	0.0182	0.0009	0.0268	0.0036	0.0223	0.0023	0.0164	0.0055	0.0273	0.0036	0.0345	0.003636	0.044	0.0032	0.0395	0.0009	0.0227	0	0.0282	0.0055	0.0127
0.006	0.0045	0.0182	0.0014	0.0295	0.0045	0.0273	0.0064	0.0268	0.0055	0.0273	0.0064	0.0495	0.003636	0.044	0.0032	0.0473	0.0009	0.0227	0.0005	0.0427	0.0059	0.0141
0.007	0.0045	0.0182	0.0118	0.0295	0.0045	0.0273	0.0064	0.0268	0.0064	0.0359	0.0064	0.0495	0.003636	0.05	0.0032	0.0473	0.0018	0.0368	0.0014	0.0486	0.0068	0.0182
0.008	0.0091	0.0182	0.0118	0.0295	0.0045	0.0364	0.0064	0.0377	0.0064	0.0359	0.0095	0.0586	0.003636	0.05	0.0032	0.0532	0.0036	0.0468	0.0014	0.0486	0.0073	0.0191
0.009	0.0091	0.0182	0.0141	0.0323	0.0045	0.0364	0.0064	0.0377	0.0086	0.0518	0.0095	0.0586	0.005909	0.061	0.0032	0.0532	0.0036	0.0468	0.0082	0.0609	0.0077	0.0218
0.01	0.0136	0.0182	0.0141	0.0323	0.0045	0.045	0.01	0.0473	0.0086	0.0518	0.0095	0.0673	0.005909	0.061	0.0032	0.0532	0.0036	0.0468	0.0082	0.0609	0.0095	0.0255
0.02	0.0273	0.0591	0.0264	0.0614	0.0118	0.0723	0.0155	0.0986	0.0214	0.0914	0.0191	0.0923	0.021364	0.112	0.0141	0.0836	0.0155	0.0968	0.0136	0.0905	0.0218	0.0436
0.025	0.0318	0.0727	0.0355	0.095	0.0218	0.0918	0.0264	0.1182	0.0236	0.1127	0.0236	0.1091	0.027273	0.129	0.02	0.1005	0.0195	0.1127	0.0191	0.0991	0.0264	0.05
0.03	0.0318	0.0727	0.0386	0.1073	0.025	0.1014	0.0345	0.1295	0.0377	0.1355	0.03	0.1377	0.027273	0.129	0.0236	0.1264	0.0255	0.1223	0.0232	0.1236	0.0318	0.0595
0.04	0.0455	0.0995	0.0395	0.1164	0.0414	0.1477	0.0427	0.1545	0.0445	0.1564	0.035	0.1518	0.039545	0.188	0.035	0.1564	0.0318	0.1523	0.0382	0.1568	0.045	0.0791
0.05	0.0545	0.1268	0.0605	0.1573	0.0518	0.175	0.0486	0.1832	0.0509	0.1777	0.0532	0.2073	0.050909	0.207	0.05	0.1786	0.0518	0.2009	0.0459	0.1786	0.0536	0.1009
0.06	0.0636	0.1545	0.0764	0.175	0.0623	0.2059	0.0577	0.2164	0.0641	0.2123	0.0532	0.2073	0.064545	0.231	0.06	0.2045	0.0709	0.2345	0.0509	0.1891	0.0618	0.1159
0.07	0.0673	0.1732	0.0823	0.2109	0.0709	0.2414	0.075	0.2509	0.0814	0.25	0.0609	0.2564	0.064545	0.231	0.0727	0.2368	0.0709	0.2345	0.0573	0.2282	0.0723	0.1282
0.08	0.0718	0.18	0.0923	0.2268	0.0909	0.2664	0.0959	0.2905	0.1027	0.2959	0.0823	0.3059	0.082273	0.264	0.0941	0.2791	0.075	0.2473	0.0755	0.2486	0.0841	0.1459
0.09	0.0764	0.1995	0.1027	0.2686	0.0909	0.2664	0.0959	0.2905	0.1027	0.2959	0.1091	0.3455	0.102273	0.299	0.0941	0.2791	0.0855	0.28	0.0918	0.2555	0.0877	0.1564
0.1	0.1082	0.2505	0.1145	0.3	0.1064	0.3027	0.1114	0.3309	0.1177	0.3395	0.1091	0.3455	0.102273	0.299	0.1141	0.3036	0.0855	0.28	0.1009	0.2723	0.1023	0.1777
0.25	0.2786	0.4768	0.2495	0.5427	0.2627	0.5977	0.2409	0.5568	0.29	0.6118	0.2568	0.5673	0.247727	0.554	0.2445	0.5268	0.2314	0.5195	0.2464	0.4691	0.2423	0.3564
0.5	0.5023	0.7568	0.4732	0.7886	0.4745	0.7895	0.5291	0.8264	0.5045	0.8277	0.4895	0.7905	0.483182	0.776	0.4968	0.76	0.4782	0.755	0.495	0.6818	0.4982	0.6305
0.75	0.7518	0.9323	0.7223	0.9118	0.7418	0.9509	0.7309	0.95	0.7105	0.9336	0.7677	0.92	0.765455	0.911	0.775	0.9159	0.7486	0.9059	0.7541	0.8732	0.7495	0.8382

A graphical representation of the data is shown in Figure 8.1 as an ROC curve.

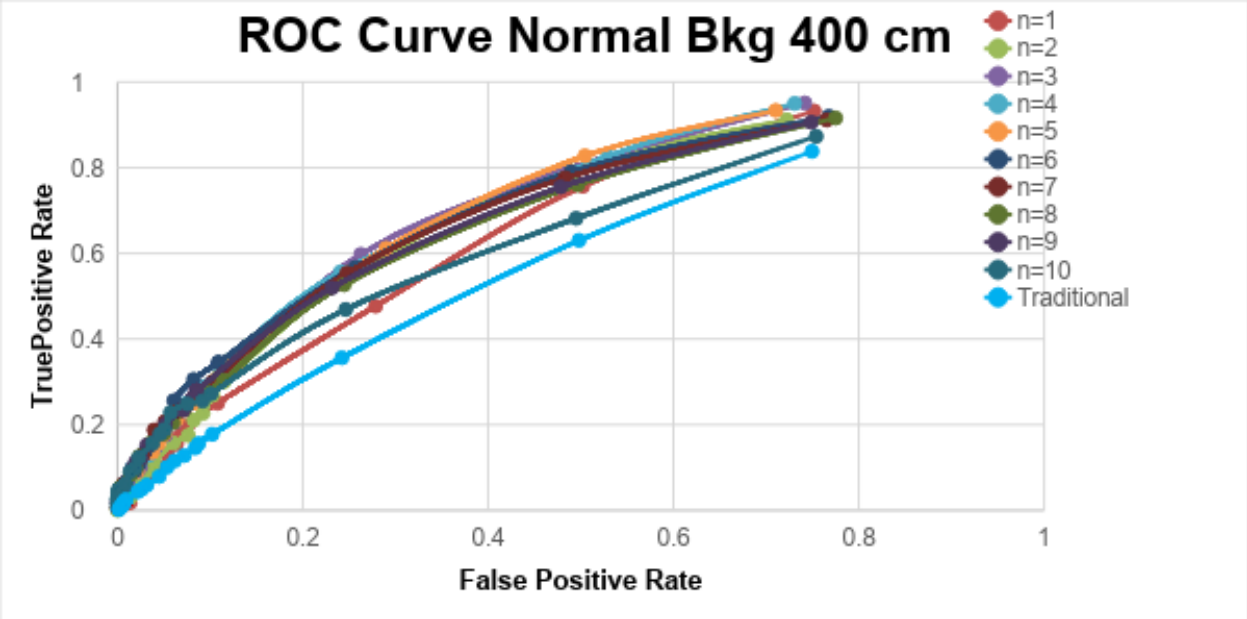

Figure 8.1: Normal background conditions at 400 cm, true positive vs. false positive detection rates for n=1...10

Since the points on the graph represent true positive detection rates at a given false positive rate, a greater upward concavity of a line on the graph corresponds to a better performing n number of measurements exceeding the discriminator threshold given N total measurements. It can be clearly seen that the traditional method to source detection is outperformed by all other multiple measurement assessments. The number of n measurements that had the highest true positive identification rate was therefore extracted, and used in the analysis of the varying background conditions. The points in Figure 8.1 generate a curve. Since these curves are not linear, the upward concavity of a curve indicates a better true positive detection per each false positive detection. A line of slope of 1 would indicate that the false detections are as frequent as true detections, meaning the algorithm had statistically failed to discern a source from background. The best n number of measurements for normal background conditions, applied to the varying background conditions is shown in Table 8.3.

Table 8.3: True positive identification rates - Best n number of measurements for normal background conditions, compared with varying background conditions

Normal Background N=10	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Normal Bkg**		**Th/U Elevated**		**Cs-Elevated**	
400 cm	n=6	n=6	**0.2073**	**0.3455**	0.1468	0.2655 (A)	0.1573	0.2632
350 cm	n= 6	n=6	**0.3423**	**0.5118**	0.1777 (B)	0.3055 (A)	0.2527 (A)	0.3432
300 cm	n=7	n=6	**0.412**	**0.5382**	0.216	0.3491 (A)	0.366 (B)	0.5264 (A)
200 cm	n=5	n=4	**0.9109**	**0.9505**	0.7695 (A)	0.8377	0.865 (C)	0.9227 (C)

The number of n measurements that produced the highest true positive identification rate under normal background conditions also produced the highest true positive identification rates at α=0.1 for the thorium/uranium elevated background at distances of 400 cm, 350 cm, and 300 cm.

However, when that n was applied to the cesium elevated background, the highest false positive detection rates were observed at 200 cm.

The best n number of measurements for the thorium/uranium elevated background conditions, applied to the other background conditions, was then assessed and the results are shown in Table 8.4.

Table 8.4: True positive identification rates - Best n number of measurements for thorium/uranium elevated background conditions, compared with varying background conditions.

Th/U Background N=10	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Normal Bkg**		**Th/U Elevated**		**Cs-Elevated**	
400 cm	n=7	n=6	0.2070	0.3455 (A)	**0.1710**	**0.2655**	0.1690 (A)	0.2632 (A)
350 cm	n= 7	n=6	0.320	0.5118 (A)	**0.1820**	**0.3055**	0.217 (B)	0.3432 (B)
300 cm	n=4	n=6	0.3482	0.5382 (A)	**0.2282**	**0.3491**	0.3764 (A)	0.5264 (A)
200 cm	n=5	n=5	0.884 (B)	0.9491	**0.670**	**0.8791**	0.865 (A,C)	0.9345 (A)

The number of n measurements that produced the highest true positive identification rate under thorium/uranium elevated background conditions at an α=0.1 also had the highest true positive identification rate for normal background conditions at 400 cm, 350 cm, and 300 cm, as well as 400 cm, 300 cm, and 200 cm for the cesium elevated background. For the 350 cm measurement, the n applied to the cesium elevated background was observed to have the lowest false positive identification rate. At α=0.05, the cesium elevated background had the highest true positive identification rate at 400 cm, 300 cm, and 200 cm, with the lowest false positive rate at 350 cm, however the highest false positive rate was also observed at 200 cm.

The best n number of measurements for the cesium elevated background conditions was then assessed, as shown in Table 8.5.

Table 8.5: True positive identification rates - Best n number of measurements for cesium elevated background conditions, compared with varying background conditions.

Cesium Background N=10	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Normal Bkg**		**Th/U Elevated**		**Cs-Elevated**	
400 cm	n=7	n=6	0.207	0.3455 (A)	0.171 (A)	0.2655 (A)	**0.169**	**0.2632**
350 cm	n= 6	n=4	0.3423 (A)	0.46	0.1777 (B)	0.2459	**0.2527**	**0.3486**
300 cm	n=4	n=6	0.3482	0.5382 (A)	0.2282	0.3491 (A)	**0.3764**	**0.5264**
200 cm	n=7	n=5	0.884 (B)	0.9491	0.67	0.8791 (A)	**0.867**	**0.9345**

The n number of measurements that produced the highest true positive identification rates for the cesium elevated background also produced the highest true positive identification rates for normal background at α =0.1 for 400 cm and 300 cm, α=0.05 for 350 cm, and had the lowest false positive identification rate at α=0.05 for 200 cm. For the thorium/uranium elevated background conditions at α=0.1, it produced the highest true positive identification rate at 400 cm, 300 cm, and 200 cm. At α=0.05, the highest true positive identification rate was observed for 400 cm, and the lowest false positive identification rate at 350 cm.

The expected outcome was that the higher background should decrease the counting efficiency, meaning the normal background conditions should have yielded the best n number of measurements. Since this was not observed, further investigation required looking at the percent difference, which was calculated using Equation 8.1.

$$\frac{Elevated/Shielded\ True\ positive\ rate - Standard\ Condition\ True\ positive\ rate}{Standard\ Condition\ True\ positive\ rate} \tag{8.1}$$

The percent differences were calculated and shown in Table 8.6.

Table 8.6: Percent difference for varying background conditions

N=10	Thorium/Uranium Elevated		Cesium Elevated	
Background Comparison	**α=0.05**	**α=0.1**	**α=0.05**	**α=0.1**
400 cm	-0.2918	-0.2315	-0.2412	-0.2382
350 cm	-0.4809	-0.4031	-0.2618	-0.3294
300 cm	-0.4757	-0.3513	-0.1117	-0.0219
200 cm	-0.1552	-0.1187	-0.0503	-0.0292

The negative percent difference represents a decrease in the overall true positive identification rate. This overall decrease in true positive rate was expected because higher gross counts add additional variability between the measurements, thereby decreasing counting efficiency. At 400 cm (weakest source strength), the optimal n number of measurements for various background conditions given a set of ten measurements and α=0.05 and α=0.1, were 6 and 7, respectively. This supports previous research that the optimal n number of measurements for multiple measurement assessment for variable background conditions is $n \geq \frac{N}{2}$ [6].

8.2 N=10 Varying Shielding Conditions

To represent an advanced application of using frequentist statistics for radiological source detection, several shielding materials were used in a simulated elevated background environment. The highest true detection rate for these varying conditions was assessed and compared to each scenario in order to find the optimal number of n measurements that would produce the best results across every condition. The shields used were lead, copper, and aluminum, standardized to one mean-free-path (MFP). The thorium/uranium elevated background used in the *Varying Background Conditions* section was the same for each shielded test.

For the lead shielded source, the number of n measurements that produced the highest true-positive identification rate also produced the highest true positive identification rate at 400 cm and α=0.05 for the aluminum, copper, and unshielded source, seen in Table 8.7. However, the highest false positive rates were also observed at distances of 300 cm and 200 cm for the aluminum, copper, and unshielded source at α=0.1 using lead's highest true positive rate for n measurements. The value for the true positive identification rate for each scenario was also higher than the lead shielded scenario at every distance and α-value.

Table 8.7: True positive identification rates - Best n number of measurements for lead shielded source, compared with each shielded condition

Lead 1-MFP N=10	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Pb-1mfp**		**Al-1mfp**		**Cu-1mfp**		**No Shield**	
400 cm	n=7	n=5	**0.1220**	**0.2105**	0.2150 (A)	0.2832	0.195 (A)	0.2834	0.171 (A)	0.2364 (B)
350 cm	n= 4	n=9	**0.1309**	**0.2264**	0.1918	0.2632	0.2995	0.4377	0.1473	0.2418
300 cm	n=5	n=5	**0.1564**	**0.275**	0.2191	0.3855 (A,C)	0.3459	0.4691 (C)	0.2205	0.3714 (C)
200 cm	n=4	n=5	**0.4377**	**0.5723**	0.6359	0.7845 (A,C)	0.71	0.8227 (A,C)	0.7264	0.8364 (C)

For the aluminum shielded source, the number of n measurements that produced the highest true positive identification rate also produced the highest true positive identification rate at 400 cm and α=0.05 for all scenarios shown in Table 8.8.

Table 8.8: True positive identification rates - Best n number of measurements for aluminum shielded source, compared with each shielded condition

Aluminum 1-MFP N=10	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Pb-1mfp**		**Al-1mfp**		**Cu-1mfp**		**No Shield**	
400 cm	n=7	n=4	0.122 (A)	0.2023	**0.215**	**0.3077**	0.195 (A)	0.2945	0.171 (A)	0.2332
350 cm	n= 5	n=5	0.1218	0.2073	**0.2164**	**0.3264**	0.3386	0.4605 (B)	0.1559	0.2618 (B)
300 cm	n=7	n=5	0.151	0.2718 (C)	**0.24**	**0.3855**	0.321	0.4691 (C)	0.216	0.3714 (C)
200 cm	n= 6	n=6	0.4295 (C)	0.5723 (A,C)	**0.6755**	**0.7845**	0.7109 (C)	0.8227 (A,C)	0.7541 (C)	0.8364 (C)

When the best n number of measurements are compared to each scenario at 300 cm and 200 cm and α=0.1, the highest false positive rates for each shielded condition were also observed. For the copper shielded source, the best n number of measurements that produced the highest true positive identification rate also produced the highest true positive identification rate at 400 cm and α=0.05 as shown in Table 8.9.

Table 8.9: True positive identification rates - Best n number of measurements for copper shielded source, compared with each shielded condition

Copper 1-MFP N=10	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Pb-1mfp**		**Al-1mfp**		**Cu-1mfp**		**No Shield**	
400 cm	n= 7	n=7	0.122 (A)	0.2	0.215 (A)	0.304	**0.195**	**0.308**	0.171	0.227
350 cm	n= 8	n=7	0.1155	0.195	0.1832	0.311	**0.3564**	**0.53**	0.1545	0.266
300 cm	n=9	n=7	0.1518 (B)	0.258	0.2409 (A,B)	0.366	**0.3423**	**0.482**	0.1959 (B)	0.314
200 cm	n=5	n=6	0.4277	0.5723 (A,C)	0.6514	0.7845 (A,C)	**0.7164**	**0.8227**	0.7695 (A)	0.8364 (C)

Highest false positive rates for the aluminum, lead, and unshielded conditions using the best n number of measurements were only observed at a distance of 200 cm and α=0.1. For the unshielded source, the number of n measurements that produced the highest true positive identification rate also produced the highest true positive identification rate at a distance of 400 cm and α=0.05 as shown in Table 8.10 for all shielded conditions.

Table 8.10: True positive identification rates - Best n number of measurements for unshielded source, compared with each shielded condition

No Shield (Th/U) N=10	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Pb-1mfp**		**Al-1mfp**		**Cu-1mfp**		**No Shield**	
400 cm	n=7	n=6	0.122 (A)	0.2 (B)	0.215 (A)	0.2918 (B)	0.195 (A)	0.2877 (B)	**0.171**	**0.2655**
350 cm	n= 7	n=6	0.096	0.1991	0.175	0.3009	0.328	0.5114	**0.182**	**0.3055**
300 cm	n=4	n=6	0.1518	0.275 (A)	0.2141	0.3782	0.3323	0.4709	**0.2282**	**0.3491**
200 cm	n=5	n=5	0.4277	0.5595	0.6514	0.7818	0.7164 (A)	0.8141	**0.7695**	**0.8791**

Lead and copper shielded sources also had the highest true positive identification at 300 cm with α=0.1, and 200 cm with α=0.05, respectively. At α=0.1 and 400 cm, the best number of n measurements also produced the lowest false positive rates for each condition. Although the best n number of measurements did not produce the highest observed true positive rates at all distances and shielded conditions, highest false positive rates were also not observed.

The unshielded source yielded the best n number of measurements when compared to all other shielded scenarios. This is interesting because it suggests that the best n number of measurements that will yield the highest true positive identification rates are independent of the shield, regardless of the material. Therefore, the percent difference for the unshielded compared to the shielded was calculated, and shown in Table 8.11.

Table 8.11: Percent difference for shielded conditions

N=10	Lead		Aluminum		Copper	
No Shield Comparison	**α=0.05**	**α=0.1**	**α=0.05**	**α=0.1**	**α=0.05**	**α=0.1**
400 cm	-0.2865	-0.2467	0.2573	0.0991	0.1404	0.0836
350 cm	-0.4725	-0.3483	-0.0385	-0.0151	0.8022	0.6740
300 cm	-0.3348	-0.2123	-0.0662	0.0834	0.4562	0.3489
200 cm	-0.4442	-0.3636	-0.1535	-0.1107	-0.0690	-0.0739

The highlighted regions show a positive increase in true positive identification rates. This was unexpected. The expected result for a shielded condition should have yielded a negative percent difference because of photopeak attenuation. Within the shielding, the 662 keV photons from the cesium source contribute to signal. When they are attenuated, one of two phenomena results, photoelectric effect and Compton scattering. The photoelectric effect transfers the energy from the gammas to an electron, which the detector will not detect (signal is lost). With Compton scattering, the gamma rays are still present at lower energies (signal is not lost). Photons interact with the shielding material, and secondary, Compton scattered photons may have a larger detection efficiency in the detector and may be scattered towards the detector from trajectories which otherwise would not have been in the direction of the detector. This is hypothesized to be a reason for the increased percent difference observed with the aluminum and copper shields. Any reduction in signal is due to the photoelectric effect. The photoelectric effect dominates with higher Z material, which could explain the negative percent difference with lead. However, since the shielding for each material is normalized to one mean free path, no difference had been predicted. Differences were hypothesized to be due to counting uncertainty. At 400 cm (weakest source strength), the optimal n number of measurements for various shielding conditions given a set (N=10) of ten measurements and α=0.05 and α=0.1, were 6 and 7, respectively. This further supports previous research that the optimal n number of measurements for multiple measurement assessment of

gross counts for variable background conditions is $n \geq \frac{N}{2}$ [6]. It is important to note that the best n number of measurements was independent of shielding.

8.3 N=7 Background Assessment

Further investigation to determine the optimal number of total measurements to be assessed tested N=7. The source strengths tested were at a distance of 100 cm, 200 cm, and 400 cm. The highest true positive rates were then extracted from the points generated for an ROC curve, and tabulated.

The best n number of measurements for normal background, applied to varying background conditions is shown in Table 8.12.

Table 8.12: True positive identification rates - Best n number of measurements for normal background conditions, compared with varying background conditions

Normal Background N=7	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Normal Bkg**		**Th/U Elevated**		**Cs-Elevated**	
400 cm	n=5	n=3	**0.1735**	**0.2818**	0.1186 (B)	0.2109	0.1332 (B)	0.2286 (A)
200 cm	n=4	n=4	**0.8209**	**0.8918**	0.6309 (A)	0.7695 (A,C)	0.7495 (A,C)	0.8527 (A)
100 cm	n=1..7	n=1..7	**1.0**	**1.0**	0.997	1.0	1.0	1.0

At 100 cm, true detection rates were 100% except at n=7 for the thorium/uranium elevated background. When the n number of measurements for the highest true positive detection rates under normal background conditions were compared to the thorium/uranium elevated background and cesium elevated background, highest false positive events were seen at 200 cm for α=0.1 and α=0.05, respectively.

The best n number of measurements under thorium/uranium elevated background and cesium elevated background conditions are shown in Tables 8.13 and 8.14, respectively.

Table 8.13: True positive identification rates - Best n number of measurements for thorium/uranium elevated background conditions, compared with varying background conditions

(Th/U) Elevated Background N=7	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Normal Bkg**		**Th/U Elevated**		**Cs-Elevated**	
400 cm	n=4	n=5	0.155	0.2623 (B)	**0.1273**	**0.2232**	0.125 (A)	0.2195 (A)
200 cm	n=4	n=4	0.8209 (A)	0.8918 (A)	**0.6309**	**0.7695**	0.7495 (A,C)	0.8527 (A)
100 cm	n=1..7	n=1..7	1.0	1.0	**0.997**	**1.0**	1.0	1.0

Table 8.14: True positive identification rates - Best n number of measurements for cesium elevated background conditions, compared with varying background conditions

Cs-Elevated Background N=7	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Normal Bkg**		**Th/U Elevated**		**Cs-Elevated**	
400 cm	n=4	n=4	0.155	0.2818 (A)	0.1273 (A)	0.2109	**0.125**	**0.2268**
200 cm	n=4	n=4	0.8209 (A)	0.8918 (A)	0.6309 (A)	0.7695 (A,C)	**0.7495**	**0.8527**
100 cm	n=1..7	n=1..7	1.0	1.0	0.997	1.0	**1.0**	**1.0**

The n number of measurements that produced the highest true positive events and the minimum highest false positive events were those applied from the cesium elevated background. The normal background conditions were expected to yield the most true positive events. This is because a higher background and overall increased gross counts should decrease counting efficiency. Further investigation required observation of the relative increase or decrease in the true positive rate, compared to normal background conditions. This was done using Equation 8.1, and the results are shown in Table 8.15.

Table 8.15: Percent difference for elevated background conditions

N=7	Thorium/Uranium Elevated		Cesium Elevated	
Background Comparison	**α=0.05**	**α=0.1**	**α=0.05**	**α=0.1**
400 cm	-0.3164	-0.2516	-0.2323	-0.1888
200 cm	-0.2315	-0.1371	-0.0870	-0.0438
100 cm	-0.0030	0	0	0

The relative decrease in true positive rates for normal background compared to the elevated conditions was observed. This means that even with the best n number of measurements for the set of N measurements (cesium elevated background), the overall true detection rate decreased relative to the normal background measurements, which was expected. At 400 cm (weakest source strength), the optimal n number of measurements for various background conditions given a set of seven measurements (N=7) and α=0.05 and α=0.1, were 4 and 5, respectively. This further supports previous research that the optimal n number of measurements for multiple measurement assessment for variable background conditions is $n \geq \frac{N}{2}$ [6].

8.4 N=7 Varying Shielding Conditions

True positive rates under varying shielding conditions were assessed with an N=7 sample size. The best n number of measurements for each individual shield was compared to the other shields, and the results are displayed in Tables 8.16-8.19. The n number of measurements that produced the highest true positive identification rate was for the unshielded scenario. This was unexpected, and further investigation was required.

Table 8.16: True positive identification rates - Best n number of measurements for lead shielded source, compared with each shielded condition

Lead 1-MFP N=7	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Pb-1mfp**		**Al-1mfp**		**Cu-1mfp**		**No Shield**	
400 cm	n=4	n=4	**0.1045**	**0.1864**	0.1536	0.2436	0.1723	0.2577	0.1273 (A)	0.2109
200 cm	n=4	n=4 (C)	**0.3505**	**0.4886**	0.5332 (A)	0.6714 (A,C)	0.5909 (A)	0.7027 (C)	0.6309 (A)	0.7695 (A,C)
100 cm	n=4 (B)	n=3 (B)	**0.9673**	**0.9855**	1.0 (A,B)	0.9995 (B)	0.9986 (B)	0.9991 (B)	1.0 (A,B)	1.0 (A,B)

Table 8.17: True positive identification rates - Best n number of measurements for aluminum shielded source, compared with each shielded condition

Aluminum 1-MFP N=7	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Pb-1mfp**		**Al-1mfp**		**Cu-1mfp**		**No Shield**	
400 cm	n=6	n=5	0.0959	0.1791	**0.1618**	**0.2709**	0.1532	0.2686 (A)	0.1218	0.2232 (A)
200 cm	n=4	n=4	0.3505 (A)	0.4486 (A,C)	**0.5332**	**0.6714**	0.5909 (A)	0.7027 (C)	0.6309 (A)	0.7695 (A,C)
100 cm	n=4 (B)	n=3 (B)	0.9673 (A,B)	0.9855 (A,B)	**1.0**	**1.0**	0.9986 (B)	0.9991 (B)	1.0 (A,B)	1.0 (A,B)

Table 8.18: True positive identification rates - Best n number of measurements for copper shielded source, compared with each shielded condition

Copper 1-MFP N=7	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Pb-1mfp**		**Al-1mfp**		**Cu-1mfp**		**No Shield**	
400 cm	n=4	n=5	0.1045 (A)	0.1791	0.1536	0.2709 (A)	**0.1723**	**0.2686**	0.1273 (A)	0.2232 (A)
200 cm	n=4	n=3	0.3505 (A)	0.4873	0.5332 (A)	0.6545	**0.5909**	**0.7186**	0.6309	0.7318
100 cm	n=5	n=4	0.9595	0.9832	1.0 (A)	1.0 (A)	**1.0**	**1.0**	1.0 (A)	1.0 (A)

Table 8.19: True positive identification rates - Best n number of measurements for unshielded source, compared with each shielded condition

No Shield (Th/U) N=7	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1	α=0.05	α=0.1
Distance	**n-value**		**Pb-1mfp**		**Al-1mfp**		**Cu-1mfp**		**No Shield**	
400 cm	n=4	n=5	0.1045 (A)	0.1791	0.1536	0.2709 (A)	0.1723 (A)	0.2686 (A)	**0.1273**	**0.2232**
200 cm	n=4	n=4 (C)	0.3505 (A)	0.4886 (A,C)	0.5332 (A)	0.6714 (A,C)	0.5909 (A)	0.7027 (C)	**0.6309**	**0.7695**
100 cm	n=4 (B)	n=3 (B)	0.9673 (A,B)	0.9855 (A,B)	1.0 (A,B)	0.9995 (B)	0.9986 (B)	0.9991 (B)	**1.0**	**1.0**

Further investigation required observation of the relative increase or decrease in percent difference for the unshielded compared to the shielded source. The expectation is that the shielding should yield negative percent differences because of photopeak attenuation, which reduces signal. The calculated percent differences compared to unshielded conditions are seen in Table 8.20.

Table 8.20: Percent difference for shielded conditions

N=7	Lead		Aluminum		Copper	
No Shield Comparison	**α=0.05**	**α=0.1**	**α=0.05**	**α=0.1**	**α=0.05**	**α=0.1**
400 cm	-0.1791	-0.1976	0.2066	0.2137	0.3535	0.2034
200 cm	-0.4444	-0.3650	-0.1549	-0.1275	-0.0634	-0.0868
100 cm	-0.0327	-0.0145	0	-0.0005	-0.0014	-0.0009

The highlighted regions show an increase in percent difference for the copper and aluminum shielded scenarios. This was unexpected, but confirmed similar results of the N=10 test. The percent differences were similar to that of the N=10 tests, but with decreased true positive rates. This was expected because there was a decreased sample size, and confirms that increasing the sample size increases the true detection rate. For the various distances, the optimal n number of measurements for the different shielded source conditions given a set of seven measurements and α=0.05 and α=0.1, was 4. This supports previous research that the optimal n number of measurements for multiple measurement assessment for variable background conditions is $n \geq \frac{N}{2}$.

Chapter 9

Conclusion

The current statistical approach to radiological source detection uses a single background count measurement to generate a decision threshold y^*. In areas with elevated or variable background, this process could decrease the overall true positive detection rate. This research has confirmed that an approach that uses multi-spectral or continuous measurements greatly increases accurate source detection. Practical applications of this method could include environmental monitoring, radiation contamination monitoring, and terrorism threat reduction for radiological dispersal devices.

There were several radiological source criteria investigated and confirmed with this research. The optimal number of N measurements with n number of measurements exceeding the discriminator threshold confirmed previous research that $n \geq \frac{N}{2}$ for elevated background environments performs the best. For shielded radiological sources in elevated background conditions, this research showed that shielding does not seem to change the optimal n number of measurements exceeding the discriminator threshold given N measurements. This means that the algorithm performs independently of a shielded source. The optimal number of N measurements for a given number of n measurements exceeding the discriminator threshold proved that N=10 outperforms lower N values. Statistically, this was expected because it allows more data points to be interpreted. For various background conditions, there was a difference in the optimal n number of measurements exceeding the discriminator threshold given N measurements for each background condition, and this difference suggests that it is not independent of background. Furthermore, a higher n number of measurements performed better under elevated background conditions (i.e., higher count rates), and a lower n number of measurements exceeding the discriminator threshold performed better for lower count rates.

It is important to note that the previously stated findings assume a set standard condition, i.e., a source is present during all source measurements. Further experimentation is recommended to explore the implementation of this method to a moving radiological source under various background

and variable shielding conditions. This would vary the number of individual measurements where a source is present during a set of N measurements. These conditions would simulate a "drive-by" detection system where detection capabilities are hindered through variable shielding from the vehicle or surrounding landscape.

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Appendix A

N=10

Table A.1: N=10: Normal Background Conditions, 100 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	1	0	1	0	1	0	1	0	1	0.0027	1	0.000909	1	0.0009	1	0	1	0	1	0.0005	0.8555
0.002	0	1	0.0059	1	0	1	0	1	0.0014	1	0.0036	1	0.002273	1	0.0032	1	0	1	0.0005	1	0.0018	0.8918
0.003	0	1	0.0095	1	0.0014	1	0.0014	1	0.0036	1	0.0036	1	0.002273	1	0.0045	1	0	1	0.0023	1	0.0036	0.9191
0.004	0.0045	1	0.0095	1	0.0014	1	0.0014	1	0.0041	1	0.0064	1	0.005	1	0.005	1	0	1	0.0023	1	0.0041	0.9291
0.005	0.0045	1	0.0095	1	0.0014	1	0.0014	1	0.0068	1	0.0077	1	0.005455	1	0.005	1	0	1	0.0027	1	0.0045	0.9423
0.006	0.0045	1	0.0095	1	0.0014	1	0.0014	1	0.0109	1	0.0077	1	0.007273	1	0.0091	1	0.0005	1	0.0027	1	0.0068	0.9505
0.007	0.0045	1	0.0095	1	0.0036	1	0.0027	1	0.0109	1	0.0091	1	0.007273	1	0.0105	1	0.0005	1	0.0027	1	0.0068	0.955
0.008	0.0045	1	0.0095	1	0.0036	1	0.0027	1	0.0123	1	0.0091	1	0.010455	1	0.0105	1	0.0018	1	0.0045	1	0.0077	0.9582
0.009	0.0045	1	0.0095	1	0.005	1	0.0045	1	0.0123	1	0.01	1	0.010455	1	0.0105	1	0.0018	1	0.0045	1	0.01	0.9605
0.01	0.0045	1	0.0132	1	0.005	1	0.0045	1	0.0123	1	0.01	1	0.010455	1	0.0109	1	0.0027	1	0.0055	1	0.0109	0.9623
0.02	0.0182	1	0.0341	1	0.0164	1	0.0227	1	0.0195	1	0.0205	1	0.023636	1	0.0159	1	0.0159	1	0.0123	1	0.0209	0.9805
0.025	0.0273	1	0.0345	1	0.025	1	0.0295	1	0.0227	1	0.0255	1	0.025909	1	0.0159	1	0.02	1	0.0168	1	0.0282	0.9855
0.03	0.0364	1	0.0345	1	0.0309	1	0.0332	1	0.0309	1	0.0373	1	0.031818	1	0.0195	1	0.02	1	0.0173	1	0.0318	0.9873
0.04	0.0409	1	0.0477	1	0.0445	1	0.0418	1	0.0359	1	0.0445	1	0.038182	1	0.0345	1	0.0332	1	0.0218	1	0.0418	0.9909
0.05	0.0455	1	0.0495	1	0.0527	1	0.0632	1	0.0555	1	0.0527	1	0.044545	1	0.0455	1	0.0405	1	0.0477	1	0.0509	0.9936
0.06	0.0623	1	0.0564	1	0.0641	1	0.0632	1	0.0555	1	0.0614	1	0.050909	1	0.0609	1	0.0545	1	0.0632	1	0.0609	0.9955
0.07	0.0623	1	0.0623	1	0.0773	1	0.0773	1	0.0732	1	0.0745	1	0.063636	1	0.0609	1	0.0636	1	0.0741	1	0.0691	0.9964
0.08	0.0905	1	0.0755	1	0.0868	1	0.1023	1	0.0914	1	0.0745	1	0.074091	1	0.0755	1	0.0795	1	0.0845	1	0.0809	0.9973
0.09	0.0995	1	0.0823	1	0.0959	1	0.1214	1	0.1109	1	0.0882	1	0.074091	1	0.0945	1	0.0795	1	0.0845	1	0.095	0.9977
0.1	0.1086	1	0.1014	1	0.0959	1	0.1214	1	0.1109	1	0.105	1	0.085909	1	0.0945	1	0.0914	1	0.1091	1	0.1023	0.9977
0.25	0.27	1	0.2795	1	0.265	1	0.2782	1	0.23	1	0.2436	1	0.245455	1	0.2464	1	0.2732	1	0.2627	1	0.2545	0.9995
0.5	0.5132	1	0.5127	1	0.5032	1	0.5245	1	0.4773	1	0.4768	1	0.505	1	0.5136	1	0.4709	1	0.5145	1	0.4918	1
0.75	0.7423	1	0.7623	1	0.7618	1	0.7268	1	0.7441	1	0.7373	1	0.749091	1	0.7427	1	0.7491	1	0.7818	1	0.7423	1

Table A.2: N=10: Normal Background Conditions, 200 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0.0609	0	0.1714	0	0.3	0	0.3505	0	0.4168	0.0014	0.4759	0	0.491	0	0.4532	0	0.3736	0	0.2673	0.0018	0.03
0.002	0.0045	0.0718	0.0027	0.2418	0.0009	0.3859	0	0.47	0.0014	0.5055	0.0014	0.5318	0.000909	0.566	0.0009	0.5145	0	0.465	0.0018	0.3595	0.0027	0.0482
0.003	0.0045	0.12	0.0027	0.2868	0.0014	0.405	0.0018	0.5132	0.0014	0.5932	0.0041	0.6045	0.001364	0.591	0.0009	0.5859	0.0005	0.54	0.0023	0.3805	0.0036	0.0591
0.004	0.0091	0.1614	0.0032	0.31	0.0014	0.4995	0.0041	0.5573	0.0018	0.6195	0.0041	0.6445	0.001818	0.619	0.0018	0.6127	0.0014	0.5645	0.0023	0.4077	0.0041	0.0718
0.005	0.0091	0.1791	0.0073	0.3473	0.005	0.5223	0.0077	0.5909	0.0018	0.6595	0.0041	0.6445	0.002727	0.658	0.0018	0.6127	0.0014	0.5645	0.0045	0.4255	0.0045	0.0809
0.006	0.0136	0.1836	0.0073	0.3723	0.005	0.5223	0.0077	0.6359	0.0018	0.6595	0.0041	0.6773	0.002727	0.698	0.0018	0.6523	0.0027	0.5927	0.0055	0.4514	0.0055	0.0886
0.007	0.0136	0.2282	0.0073	0.4159	0.005	0.5577	0.0077	0.6359	0.0059	0.6955	0.0041	0.7141	0.002727	0.698	0.0023	0.6755	0.0032	0.6118	0.0055	0.4782	0.0082	0.0959
0.008	0.0136	0.2505	0.0095	0.4632	0.0059	0.5827	0.0077	0.6755	0.0059	0.6955	0.0041	0.7141	0.002727	0.726	0.0023	0.6755	0.0032	0.6118	0.0055	0.4782	0.0082	0.1023
0.009	0.0182	0.2641	0.0095	0.4632	0.0059	0.5827	0.0077	0.6755	0.0059	0.7232	0.0073	0.7532	0.002727	0.726	0.0032	0.715	0.0032	0.6468	0.0064	0.4918	0.01	0.1086
0.01	0.0182	0.2641	0.0127	0.4932	0.0059	0.6145	0.0114	0.7118	0.0059	0.7232	0.0073	0.7532	0.002727	0.726	0.0032	0.715	0.0032	0.6468	0.0064	0.4918	0.0114	0.1132
0.02	0.0273	0.3836	0.0223	0.6359	0.0068	0.7264	0.0168	0.7964	0.0105	0.8177	0.0136	0.8227	0.008182	0.802	0.0114	0.8041	0.0095	0.7145	0.0118	0.5655	0.0259	0.1927
0.025	0.0364	0.4214	0.0245	0.6655	0.0123	0.7623	0.0191	0.8123	0.0123	0.8418	0.0209	0.8518	0.014091	0.82	0.0182	0.8214	0.0168	0.7395	0.0223	0.6336	0.03	0.2141
0.03	0.0364	0.4536	0.0268	0.6927	0.0259	0.7882	0.0291	0.8345	0.0182	0.8636	0.0209	0.8741	0.017727	0.843	0.0205	0.8482	0.0186	0.7714	0.0223	0.6336	0.0341	0.2309
0.04	0.0409	0.5205	0.0341	0.7386	0.0464	0.8614	0.0364	0.8714	0.0227	0.8891	0.0245	0.8868	0.023636	0.858	0.0264	0.8582	0.0245	0.7859	0.0382	0.6805	0.0414	0.2695
0.05	0.0455	0.5645	0.0427	0.7632	0.06	0.8823	0.0459	0.8905	0.0314	0.9109	0.0282	0.9041	0.030455	0.884	0.0314	0.8795	0.0295	0.8105	0.0459	0.7018	0.0495	0.3036
0.06	0.07	0.6123	0.0582	0.8064	0.0632	0.8977	0.0532	0.9073	0.0423	0.9205	0.0455	0.9227	0.034091	0.896	0.04	0.9032	0.0341	0.8318	0.0641	0.7359	0.0609	0.3495
0.07	0.0791	0.63	0.0668	0.8336	0.0745	0.9109	0.0568	0.9195	0.0568	0.93	0.0623	0.9264	0.041364	0.907	0.05	0.9136	0.0445	0.8518	0.0805	0.7359	0.0745	0.3791
0.08	0.0973	0.6732	0.07	0.8514	0.0855	0.9227	0.0723	0.9386	0.0755	0.9423	0.0623	0.9264	0.055909	0.927	0.05	0.9136	0.0559	0.8618	0.0805	0.7359	0.0864	0.4123
0.09	0.1105	0.6877	0.0805	0.8732	0.0855	0.9227	0.0723	0.9386	0.0873	0.9491	0.0764	0.9373	0.055909	0.927	0.0595	0.9227	0.0736	0.8818	0.1014	0.7723	0.0941	0.425
0.1	0.1109	0.7095	0.0805	0.8732	0.0991	0.9323	0.0845	0.9505	0.0873	0.9491	0.0914	0.9491	0.069545	0.939	0.0827	0.935	0.0736	0.8818	0.1114	0.8068	0.1036	0.4568
0.25	0.2905	0.9209	0.2468	0.9718	0.2423	0.9791	0.2591	0.985	0.2241	0.9882	0.225	0.9882	0.208182	0.982	0.2182	0.9764	0.2382	0.9605	0.2414	0.8918	0.2559	0.6905
0.5	0.5168	0.9877	0.51	0.9945	0.5073	0.9973	0.5232	0.9986	0.4868	0.9995	0.4855	0.9982	0.484091	0.996	0.4605	0.9968	0.5082	0.9991	0.53	0.9682	0.4882	0.8755
0.75	0.7723	0.9977	0.7168	1	0.7855	1	0.7877	1	0.7318	1	0.7105	1	0.728182	1	0.7677	1	0.7641	0.9991	0.7659	0.9864	0.745	0.9677

Table A.3: N=10: Normal Background Conditions, 300 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0091	0	0.0227	0.0009	0.0286	0	0.0455	0	0.0495	0.0005	0.0491	0.000455	0.056	0.0005	0.0414	0	0.0486	0	0.0373	0.0014	0.0091
0.002	0	0.0273	0	0.0336	0.0009	0.0618	0	0.0664	0.0005	0.0705	0.0027	0.07	0.001818	0.071	0.0009	0.0641	0	0.0645	0	0.0491	0.0027	0.0136
0.003	0.0045	0.0318	0.0009	0.0473	0.0032	0.08	0.0018	0.0795	0.0014	0.0886	0.0036	0.1	0.001818	0.085	0.0009	0.0745	0	0.0777	0	0.0709	0.0032	0.0168
0.004	0.0045	0.0318	0.0009	0.0659	0.0036	0.0964	0.0018	0.0877	0.0027	0.0955	0.0036	0.1123	0.001818	0.104	0.0014	0.095	0	0.0914	0	0.0814	0.0045	0.0236
0.005	0.0045	0.0318	0.0009	0.0664	0.0036	0.1068	0.0023	0.0977	0.0055	0.1095	0.0036	0.1123	0.003636	0.127	0.0032	0.1159	0.0009	0.1064	0	0.0814	0.0055	0.0286
0.006	0.0045	0.05	0.0014	0.0768	0.0045	0.115	0.0064	0.1064	0.0055	0.1095	0.0064	0.1336	0.003636	0.127	0.0032	0.1409	0.0009	0.1064	0.0005	0.0923	0.0059	0.03
0.007	0.0045	0.0632	0.0118	0.0809	0.0045	0.115	0.0064	0.1064	0.0064	0.1355	0.0064	0.1336	0.003636	0.148	0.0032	0.1409	0.0018	0.1245	0.0014	0.1027	0.0068	0.0355
0.008	0.0091	0.0723	0.0118	0.0809	0.0045	0.1259	0.0064	0.1295	0.0064	0.1355	0.0095	0.1655	0.003636	0.148	0.0032	0.1664	0.0036	0.1477	0.0014	0.1027	0.0073	0.0373
0.009	0.0091	0.0814	0.0141	0.1073	0.0045	0.1259	0.0064	0.1295	0.0086	0.1541	0.0095	0.1655	0.005909	0.17	0.0032	0.1664	0.0036	0.1477	0.0082	0.1245	0.0077	0.0405
0.01	0.0136	0.0905	0.0141	0.1073	0.0045	0.1341	0.01	0.1509	0.0086	0.1541	0.0095	0.185	0.005909	0.17	0.0032	0.1664	0.0036	0.1477	0.0082	0.1245	0.0095	0.045
0.02	0.0273	0.1345	0.0264	0.1805	0.0118	0.1932	0.0155	0.225	0.0214	0.2505	0.0191	0.2359	0.021364	0.247	0.0141	0.2473	0.0155	0.2009	0.0136	0.1736	0.0218	0.0732
0.025	0.0318	0.1477	0.0355	0.2195	0.0218	0.22	0.0264	0.2395	0.0236	0.2814	0.0236	0.275	0.027273	0.294	0.02	0.2718	0.0195	0.2277	0.0191	0.1982	0.0264	0.0864
0.03	0.0318	0.1614	0.0386	0.2514	0.025	0.2373	0.0345	0.2705	0.0377	0.3191	0.03	0.3077	0.027273	0.294	0.0236	0.2991	0.0255	0.2577	0.0232	0.2141	0.0318	0.0977
0.04	0.0455	0.2223	0.0395	0.2668	0.0414	0.2845	0.0427	0.3105	0.0445	0.3523	0.035	0.34	0.039545	0.366	0.035	0.3214	0.0318	0.2927	0.0382	0.2609	0.045	0.1205
0.05	0.0545	0.2577	0.0605	0.32	0.0518	0.3218	0.0486	0.3482	0.0509	0.3768	0.0532	0.385	0.050909	0.412	0.05	0.36	0.0518	0.3541	0.0459	0.2759	0.0536	0.1391
0.06	0.0636	0.2868	0.0764	0.3377	0.0623	0.3786	0.0577	0.4055	0.0641	0.4064	0.0532	0.385	0.064545	0.456	0.06	0.3886	0.0709	0.3805	0.0509	0.305	0.0618	0.155
0.07	0.0673	0.31	0.0823	0.3595	0.0709	0.4132	0.075	0.4505	0.0814	0.4441	0.0609	0.4305	0.064545	0.456	0.0727	0.4232	0.0709	0.3805	0.0573	0.3423	0.0723	0.1741
0.08	0.0718	0.3218	0.0923	0.4	0.0909	0.4464	0.0959	0.4823	0.1027	0.4841	0.0823	0.4782	0.082273	0.485	0.0941	0.4573	0.075	0.4155	0.0755	0.3927	0.0841	0.19
0.09	0.0764	0.3445	0.1027	0.4173	0.0909	0.4464	0.0959	0.4823	0.1027	0.4841	0.1091	0.5382	0.102273	0.51	0.0941	0.4573	0.0855	0.455	0.0918	0.4177	0.0877	0.2032
0.1	0.1082	0.3936	0.1145	0.4468	0.1064	0.4864	0.1114	0.5191	0.1177	0.5241	0.1091	0.5382	0.102273	0.51	0.1141	0.4982	0.0855	0.455	0.1009	0.4336	0.1023	0.2327
0.25	0.2786	0.6341	0.2495	0.6791	0.2627	0.7268	0.2409	0.7159	0.29	0.7682	0.2568	0.7314	0.247727	0.715	0.2445	0.7009	0.2314	0.6555	0.2464	0.6077	0.2423	0.4282
0.5	0.5023	0.8223	0.4732	0.8695	0.4745	0.8727	0.5291	0.9036	0.5045	0.9027	0.4895	0.9109	0.483182	0.897	0.4968	0.8786	0.4782	0.8777	0.495	0.7977	0.4982	0.7009
0.75	0.7518	0.9559	0.7223	0.9627	0.7418	0.9677	0.7309	0.9641	0.7105	0.9714	0.7677	0.9773	0.765455	0.973	0.775	0.975	0.7486	0.9595	0.7541	0.9136	0.7495	0.8823

Table A.4: N=10: Normal Background Conditions, 350 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0.0136	0.0036	0.0095	0	0.0323	0.0032	0.0286	0.0023	0.0227	0.0014	0.0336	0.002273	0.035	0	0.0286	0.0027	0.025	0.0041	0.0314	0.0018	0.0041
0.002	0.0045	0.0227	0.0077	0.0173	0.0009	0.05	0.0032	0.0377	0.0023	0.0305	0.0014	0.0509	0.003182	0.06	0	0.0409	0.0032	0.0523	0.0045	0.0418	0.0027	0.0086
0.003	0.0045	0.0273	0.0077	0.025	0.0036	0.0664	0.0032	0.0482	0.0032	0.0632	0.0045	0.0664	0.003182	0.067	0.0005	0.0636	0.0059	0.0741	0.0068	0.0459	0.0041	0.0114
0.004	0.0091	0.0273	0.0155	0.0391	0.0036	0.0727	0.0045	0.0568	0.0032	0.0732	0.005	0.0723	0.003182	0.082	0.0036	0.0841	0.0077	0.0905	0.0077	0.0523	0.0045	0.0136
0.005	0.0091	0.0318	0.0155	0.0423	0.0068	0.0805	0.0059	0.0759	0.0045	0.09	0.005	0.0723	0.004091	0.092	0.0036	0.0841	0.0095	0.1032	0.0077	0.0523	0.0055	0.0159
0.006	0.0091	0.0364	0.0155	0.0491	0.0068	0.09	0.0059	0.0814	0.0045	0.09	0.0073	0.0991	0.004091	0.115	0.0068	0.1027	0.0095	0.1032	0.0082	0.0595	0.0068	0.0232
0.007	0.0091	0.0409	0.0155	0.0582	0.0068	0.105	0.0059	0.0814	0.0045	0.1105	0.0073	0.1168	0.004091	0.115	0.0082	0.1232	0.0109	0.1136	0.0086	0.0845	0.0105	0.0273
0.008	0.0136	0.0409	0.0155	0.0582	0.0068	0.105	0.0091	0.1	0.0045	0.1105	0.0073	0.1168	0.005	0.139	0.0082	0.1232	0.0109	0.1136	0.0086	0.0845	0.0109	0.0282
0.009	0.0136	0.0409	0.0195	0.0714	0.0068	0.115	0.0091	0.1	0.0045	0.13	0.0091	0.1268	0.005	0.139	0.0114	0.14	0.0127	0.13	0.0091	0.0986	0.0114	0.0327
0.01	0.0182	0.0409	0.0195	0.0773	0.0068	0.115	0.0095	0.1095	0.0045	0.13	0.0091	0.1268	0.005	0.139	0.0114	0.14	0.0127	0.13	0.0091	0.0986	0.0132	0.0355
0.02	0.0273	0.0945	0.0314	0.1477	0.0159	0.1855	0.0123	0.1823	0.0114	0.1873	0.0164	0.2168	0.021364	0.207	0.0205	0.2082	0.0168	0.1814	0.0227	0.1777	0.0223	0.0595
0.025	0.0273	0.1018	0.0359	0.16	0.0209	0.2055	0.0127	0.215	0.0145	0.215	0.0214	0.2327	0.027273	0.238	0.0264	0.2277	0.0205	0.205	0.0241	0.2027	0.0291	0.0723
0.03	0.0373	0.1064	0.0368	0.1873	0.0227	0.2282	0.0164	0.2432	0.0255	0.2459	0.0255	0.2741	0.033636	0.262	0.0336	0.2627	0.03	0.2214	0.0295	0.2205	0.0355	0.0873
0.04	0.0464	0.14	0.0477	0.2441	0.0309	0.2464	0.025	0.2827	0.0286	0.275	0.0295	0.3173	0.041818	0.293	0.0382	0.2891	0.0405	0.2414	0.0373	0.2423	0.0427	0.1073
0.05	0.06	0.1732	0.0518	0.2577	0.0545	0.2977	0.0314	0.3141	0.0336	0.2964	0.0359	0.3423	0.05	0.32	0.0445	0.3127	0.0523	0.3127	0.0568	0.2932	0.0527	0.1277
0.06	0.0645	0.2127	0.0586	0.3018	0.0614	0.3341	0.0409	0.3495	0.0482	0.3486	0.0468	0.3786	0.054545	0.355	0.0509	0.3459	0.0609	0.3514	0.0609	0.3295	0.0609	0.1455
0.07	0.0968	0.2445	0.0795	0.3427	0.0682	0.3682	0.0568	0.3895	0.0532	0.3986	0.0632	0.4264	0.067273	0.393	0.0655	0.3986	0.0609	0.3514	0.0682	0.3459	0.0736	0.1641
0.08	0.1014	0.25	0.0995	0.3786	0.0682	0.3682	0.0759	0.4218	0.0609	0.44	0.0632	0.4264	0.075455	0.432	0.0859	0.4264	0.0745	0.3695	0.0809	0.3659	0.0791	0.175
0.09	0.1059	0.2855	0.0995	0.3786	0.0732	0.4082	0.0759	0.4218	0.0836	0.475	0.0773	0.4714	0.075455	0.432	0.0859	0.4264	0.08	0.4105	0.0809	0.3659	0.0932	0.1941
0.1	0.1209	0.3282	0.1118	0.4068	0.0859	0.4455	0.0877	0.46	0.0836	0.475	0.0968	0.5118	0.09	0.47	0.095	0.4727	0.1014	0.4314	0.105	0.3873	0.1018	0.2164
0.25	0.2668	0.5423	0.235	0.6736	0.26	0.68	0.2386	0.7205	0.2141	0.7359	0.2427	0.7359	0.232273	0.696	0.2205	0.6795	0.2641	0.6732	0.2523	0.6114	0.2491	0.4295
0.5	0.5209	0.8209	0.5218	0.86	0.4709	0.8764	0.4827	0.9436	0.4732	0.9082	0.5041	0.9182	0.477273	0.894	0.5136	0.8986	0.5273	0.8618	0.5377	0.8141	0.4991	0.6977
0.75	0.7755	0.9536	0.7514	0.9668	0.745	0.9927	0.7514	0.9823	0.7518	0.9809	0.7486	0.9805	0.740909	0.973	0.7477	0.9655	0.7582	0.9695	0.7877	0.9123	0.7482	0.8814

Table A.5: N=10: Normal Background Conditions, 400 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0045	0	0.0005	0.0009	0.0041	0	0.0055	0	0.0055	0.0005	0.0059	0.000455	0.019	0.0005	0.0141	0	0.0086	0	0.0123	0.0014	0.0018
0.002	0	0.0045	0	0.0045	0.0009	0.0082	0	0.0059	0.0005	0.01	0.0027	0.0118	0.001818	0.025	0.0009	0.0205	0	0.0173	0	0.0164	0.0027	0.0059
0.003	0.0045	0.0091	0.0009	0.0109	0.0032	0.0114	0.0018	0.0077	0.0014	0.0186	0.0036	0.0268	0.001818	0.03	0.0009	0.0232	0	0.0191	0	0.0245	0.0032	0.0073
0.004	0.0045	0.0182	0.0009	0.0241	0.0036	0.0145	0.0018	0.0095	0.0027	0.0227	0.0036	0.0345	0.001818	0.033	0.0014	0.0364	0	0.0205	0	0.0282	0.0045	0.01
0.005	0.0045	0.0182	0.0009	0.0268	0.0036	0.0223	0.0023	0.0164	0.0055	0.0273	0.0036	0.0345	0.003636	0.044	0.0032	0.0395	0.0009	0.0227	0	0.0282	0.0055	0.0127
0.006	0.0045	0.0182	0.0014	0.0295	0.0045	0.0273	0.0064	0.0268	0.0055	0.0273	0.0064	0.0495	0.003636	0.044	0.0032	0.0473	0.0009	0.0227	0.0005	0.0427	0.0059	0.0141
0.007	0.0045	0.0182	0.0118	0.0295	0.0045	0.0273	0.0064	0.0268	0.0064	0.0359	0.0064	0.0495	0.003636	0.05	0.0032	0.0473	0.0018	0.0368	0.0014	0.0486	0.0068	0.0182
0.008	0.0091	0.0182	0.0118	0.0295	0.0045	0.0364	0.0064	0.0377	0.0064	0.0359	0.0095	0.0586	0.003636	0.05	0.0032	0.0532	0.0036	0.0468	0.0014	0.0486	0.0073	0.0191
0.009	0.0091	0.0182	0.0141	0.0323	0.0045	0.0364	0.0064	0.0377	0.0086	0.0518	0.0095	0.0586	0.005909	0.061	0.0032	0.0532	0.0036	0.0468	0.0082	0.0609	0.0077	0.0218
0.01	0.0136	0.0182	0.0141	0.0323	0.0045	0.045	0.01	0.0473	0.0086	0.0518	0.0095	0.0673	0.005909	0.061	0.0032	0.0532	0.0036	0.0468	0.0082	0.0609	0.0095	0.0255
0.02	0.0273	0.0591	0.0264	0.0614	0.0118	0.0723	0.0155	0.0986	0.0214	0.0914	0.0191	0.0923	0.021364	0.112	0.0141	0.0836	0.0155	0.0968	0.0136	0.0905	0.0218	0.0436
0.025	0.0318	0.0727	0.0355	0.095	0.0218	0.0918	0.0264	0.1182	0.0236	0.1127	0.0236	0.1091	0.027273	0.129	0.02	0.1005	0.0195	0.1127	0.0191	0.0991	0.0264	0.05
0.03	0.0318	0.0727	0.0386	0.1073	0.025	0.1014	0.0345	0.1295	0.0377	0.1355	0.03	0.1377	0.027273	0.129	0.0236	0.1264	0.0255	0.1223	0.0232	0.1236	0.0318	0.0595
0.04	0.0455	0.0995	0.0395	0.1164	0.0414	0.1477	0.0427	0.1545	0.0445	0.1564	0.035	0.1518	0.039545	0.188	0.035	0.1564	0.0318	0.1523	0.0382	0.1568	0.045	0.0791
0.05	0.0545	0.1268	0.0605	0.1573	0.0518	0.175	0.0486	0.1832	0.0509	0.1777	0.0532	0.2073	0.050909	0.207	0.05	0.1786	0.0518	0.2009	0.0459	0.1786	0.0536	0.1009
0.06	0.0636	0.1545	0.0764	0.175	0.0623	0.2059	0.0577	0.2164	0.0641	0.2123	0.0532	0.2073	0.064545	0.231	0.06	0.2045	0.0709	0.2345	0.0509	0.1891	0.0618	0.1159
0.07	0.0673	0.1732	0.0823	0.2109	0.0709	0.2414	0.075	0.2509	0.0814	0.25	0.0609	0.2564	0.064545	0.231	0.0727	0.2368	0.0709	0.2345	0.0573	0.2282	0.0723	0.1282
0.08	0.0718	0.18	0.0923	0.2268	0.0909	0.2664	0.0959	0.2905	0.1027	0.2959	0.0823	0.3059	0.082273	0.264	0.0941	0.2791	0.075	0.2473	0.0755	0.2486	0.0841	0.1459
0.09	0.0764	0.1995	0.1027	0.2686	0.0909	0.2664	0.0959	0.2905	0.1027	0.2959	0.1091	0.3455	0.102273	0.299	0.0941	0.2791	0.0855	0.28	0.0918	0.2555	0.0877	0.1564
0.1	0.1082	0.2505	0.1145	0.3	0.1064	0.3027	0.1114	0.3309	0.1177	0.3395	0.1091	0.3455	0.102273	0.299	0.1141	0.3036	0.0855	0.28	0.1009	0.2723	0.1023	0.1777
0.25	0.2786	0.4768	0.2495	0.5427	0.2627	0.5977	0.2409	0.5568	0.29	0.6118	0.2568	0.5673	0.247727	0.554	0.2445	0.5268	0.2314	0.5195	0.2464	0.4691	0.2423	0.3564
0.5	0.5023	0.7568	0.4732	0.7886	0.4745	0.7895	0.5291	0.8264	0.5045	0.8277	0.4895	0.7905	0.483182	0.776	0.4968	0.76	0.4782	0.755	0.495	0.6818	0.4982	0.6305
0.75	0.7518	0.9323	0.7223	0.9118	0.7418	0.9509	0.7309	0.95	0.7105	0.9336	0.7677	0.92	0.765455	0.911	0.775	0.9159	0.7486	0.9059	0.7541	0.8732	0.7495	0.8382

Table A.6: N=10: Th/U Elevated Background, 100 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0.9455	0	0.9995	0.0023	1	0	1	0	1	0	1	0.00227	1	0.0014	1	0	1	0	0.9818	0.0018	0.4791
0.002	0.0045	0.98	0.0036	1	0.0036	1	0.0014	1	0	1	0	1	0.00318	1	0.0018	1	0.0014	1	0	0.9818	0.0027	0.5614
0.003	0.0091	0.9909	0.0036	1	0.005	1	0.0014	1	0	1	0.0032	1	0.00455	1	0.0027	1	0.005	1	0	0.9864	0.0045	0.61
0.004	0.0091	0.9914	0.0036	1	0.0091	1	0.0018	1	0	1	0.0032	1	0.005	1	0.0027	1	0.005	1	0	0.9864	0.005	0.6414
0.005	0.0091	0.9932	0.0036	1	0.0091	1	0.0018	1	0	1	0.0032	1	0.005	1	0.0041	1	0.005	1	0	0.9864	0.0055	0.6655
0.006	0.0091	0.9964	0.0036	1	0.0105	1	0.0032	1	0.0023	1	0.0032	1	0.00545	1	0.0045	1	0.0059	1	0.0036	0.9909	0.0055	0.685
0.007	0.0091	0.9973	0.0068	1	0.0105	1	0.0032	1	0.0023	1	0.0059	1	0.00818	1	0.0055	1	0.0064	1	0.0041	0.9955	0.0059	0.7009
0.008	0.0182	0.9973	0.01	1	0.0105	1	0.0032	1	0.0023	1	0.0068	1	0.00818	1	0.0055	1	0.0064	1	0.0059	0.9955	0.0068	0.7209
0.009	0.0182	0.9973	0.01	1	0.0105	1	0.0032	1	0.0023	1	0.0068	1	0.00818	1	0.0055	1	0.0068	1	0.0064	0.9955	0.0082	0.7418
0.01	0.0182	0.9973	0.01	1	0.0105	1	0.0032	1	0.0023	1	0.0073	1	0.01227	1	0.0136	1	0.0095	1	0.0064	0.9955	0.0086	0.7495
0.02	0.0273	1	0.0209	1	0.015	1	0.0118	1	0.0095	1	0.015	1	0.01682	1	0.0273	1	0.0186	1	0.02	0.9955	0.02	0.8214
0.025	0.0364	1	0.0327	1	0.015	1	0.0132	1	0.015	1	0.0177	1	0.02136	1	0.0295	1	0.0205	1	0.0236	0.9955	0.0255	0.8482
0.03	0.0455	1	0.0418	1	0.0259	1	0.015	1	0.0155	1	0.0223	1	0.02682	1	0.0359	1	0.0227	1	0.0295	1	0.0323	0.8641
0.04	0.0545	1	0.0468	1	0.0336	1	0.0255	1	0.0277	1	0.0323	1	0.03227	1	0.0518	1	0.0291	1	0.0445	1	0.0418	0.8864
0.05	0.0545	1	0.0568	1	0.0409	1	0.0314	1	0.0318	1	0.0377	1	0.05	1	0.055	1	0.0418	1	0.0518	1	0.0518	0.9032
0.06	0.0545	1	0.0768	1	0.0536	1	0.0464	1	0.0441	1	0.0568	1	0.06864	1	0.0682	1	0.0482	1	0.055	1	0.0577	0.9173
0.07	0.0645	1	0.0805	1	0.0645	1	0.0518	1	0.0577	1	0.0709	1	0.07591	1	0.0709	1	0.0605	1	0.0755	1	0.0673	0.9273
0.08	0.0736	1	0.0845	1	0.0809	1	0.0623	1	0.0695	1	0.0741	1	0.08955	1	0.0832	1	0.0786	1	0.0791	1	0.0773	0.9386
0.09	0.0782	1	0.0973	1	0.095	1	0.0705	1	0.0768	1	0.0855	1	0.10136	1	0.0882	1	0.0873	1	0.0864	1	0.0845	0.9468
0.1	0.0873	1	0.1077	1	0.095	1	0.0732	1	0.0768	1	0.0855	1	0.10136	1	0.0959	1	0.0873	1	0.0905	1	0.0968	0.9527
0.25	0.2636	1	0.2518	1	0.2432	1	0.2436	1	0.2205	1	0.2514	1	0.24227	1	0.2645	1	0.2445	1	0.2241	1	0.2527	0.9845
0.5	0.4859	1	0.4618	1	0.4859	1	0.5109	1	0.52	1	0.52	1	0.52636	1	0.5123	1	0.5241	1	0.4741	1	0.5032	0.9982
0.75	0.7673	1	0.7459	1	0.7827	1	0.7582	1	0.7573	1	0.7741	1	0.75455	1	0.7905	1	0.7523	1	0.7155	1	0.7536	1

Table A.7: N=10: Th/U Elevated Background, 200 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0491	0	0.0768	0	0.1173	0.0009	0.1755	0.0036	0.1827	0.0023	0.2118	0.000455	0.197	0	0.1855	0.0036	0.1327	0.0036	0.0777	0.0005	0.0182
0.002	0	0.0645	0.0036	0.1155	0	0.1864	0.0009	0.2355	0.0041	0.2659	0.0023	0.2764	0.000455	0.26	0.0023	0.2336	0.0082	0.1627	0.0036	0.1027	0.0027	0.0318
0.003	0.0045	0.0841	0.0036	0.14	0	0.2341	0.0045	0.2805	0.0041	0.3123	0.0032	0.3318	0.002273	0.323	0.0023	0.2682	0.0086	0.2041	0.0041	0.1377	0.0032	0.0386
0.004	0.0045	0.1068	0.0036	0.17	0.0009	0.2845	0.005	0.3309	0.0073	0.3309	0.0041	0.395	0.002727	0.347	0.005	0.2914	0.0091	0.2327	0.0055	0.1627	0.0041	0.0432
0.005	0.0045	0.1114	0.0041	0.2005	0.0041	0.3064	0.0059	0.3482	0.0073	0.3486	0.0055	0.4223	0.005909	0.373	0.0073	0.3109	0.0123	0.2505	0.0055	0.1723	0.005	0.0523
0.006	0.0045	0.1286	0.0041	0.2155	0.0041	0.3232	0.0073	0.3709	0.0073	0.3932	0.0059	0.4455	0.006364	0.413	0.0077	0.3273	0.0132	0.2645	0.0055	0.175	0.0064	0.0555
0.007	0.0045	0.1459	0.0041	0.2241	0.0068	0.3595	0.0073	0.3923	0.0073	0.42	0.0059	0.4455	0.006364	0.44	0.0082	0.3427	0.0168	0.2918	0.0073	0.1864	0.0073	0.0609
0.008	0.0045	0.1505	0.0041	0.2441	0.0114	0.3845	0.0073	0.3923	0.0082	0.4423	0.0082	0.4645	0.01	0.458	0.0095	0.365	0.0168	0.2918	0.0086	0.205	0.0091	0.0668
0.009	0.0045	0.1505	0.0041	0.2568	0.0114	0.4018	0.0082	0.415	0.0082	0.4423	0.01	0.4936	0.01	0.458	0.0095	0.365	0.0168	0.3036	0.0086	0.205	0.0095	0.0723
0.01	0.0045	0.1595	0.0059	0.2873	0.0114	0.4018	0.0086	0.4486	0.0123	0.4773	0.01	0.4936	0.013636	0.489	0.0141	0.3855	0.0168	0.3173	0.01	0.2286	0.0105	0.0786
0.02	0.0273	0.2655	0.0155	0.3855	0.0173	0.5432	0.0214	0.5682	0.0195	0.6082	0.0264	0.61	0.026364	0.575	0.0209	0.5195	0.025	0.4282	0.0241	0.2914	0.0218	0.1218
0.025	0.0273	0.2795	0.0214	0.4291	0.0227	0.5709	0.0255	0.5918	0.0291	0.6436	0.0295	0.6518	0.028636	0.6	0.0241	0.5564	0.0259	0.4482	0.03	0.3182	0.0264	0.1427
0.03	0.0318	0.3123	0.0332	0.4791	0.0268	0.6173	0.0277	0.61	0.0345	0.6686	0.0368	0.6791	0.033182	0.619	0.0336	0.59	0.0345	0.4645	0.03	0.3477	0.0341	0.1691
0.04	0.0409	0.3477	0.0468	0.5505	0.0332	0.6645	0.0282	0.6732	0.045	0.7223	0.0505	0.7209	0.038636	0.651	0.0436	0.63	0.0382	0.5118	0.0323	0.3809	0.0427	0.1995
0.05	0.05	0.4114	0.0564	0.6014	0.0359	0.6905	0.0468	0.7264	0.0614	0.7695	0.065	0.7541	0.050909	0.67	0.0495	0.65	0.0541	0.5482	0.0418	0.4241	0.0541	0.2282
0.06	0.0636	0.4332	0.0623	0.6527	0.0564	0.7236	0.0523	0.7468	0.0695	0.7986	0.0709	0.7577	0.065	0.737	0.0618	0.6877	0.0655	0.5973	0.0555	0.4736	0.0618	0.2555
0.07	0.0691	0.4664	0.0659	0.6659	0.0695	0.7486	0.0582	0.7705	0.0782	0.8136	0.0841	0.785	0.073182	0.756	0.07	0.7068	0.0732	0.6377	0.0632	0.4868	0.0745	0.2832
0.08	0.0873	0.4977	0.0709	0.6741	0.0791	0.7764	0.0655	0.7886	0.0864	0.8332	0.0927	0.8077	0.084091	0.783	0.0768	0.7268	0.0836	0.6505	0.0695	0.5127	0.0845	0.3095
0.09	0.0964	0.5368	0.0855	0.7095	0.0886	0.7891	0.0714	0.81	0.0986	0.8595	0.1055	0.8255	0.093636	0.82	0.0832	0.75	0.0986	0.6868	0.0814	0.5191	0.095	0.3268
0.1	0.1005	0.555	0.0991	0.7509	0.0955	0.8059	0.0959	0.8377	0.1127	0.8791	0.1141	0.8364	0.093636	0.82	0.0945	0.7573	0.1036	0.6964	0.0873	0.5295	0.1041	0.3477
0.25	0.2641	0.8455	0.2509	0.9055	0.2341	0.9355	0.2609	0.9445	0.2573	0.9455	0.2664	0.9532	0.222727	0.929	0.2282	0.8873	0.2236	0.8364	0.2382	0.74	0.2545	0.5845
0.5	0.5459	0.9668	0.5095	0.9718	0.505	0.9859	0.5114	0.9905	0.5095	0.9918	0.4882	0.9886	0.448636	0.98	0.4614	0.965	0.5036	0.95	0.5164	0.8795	0.4941	0.7923
0.75	0.7777	0.9955	0.77	0.9945	0.7405	0.9986	0.74	0.9991	0.7509	0.9973	0.75	0.9986	0.728182	0.996	0.6982	0.9945	0.7491	0.9841	0.7823	0.955	0.7409	0.925

Table A.8: N=10: Th/U Elevated Background, 300 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0091	0	0.0086	0.0036	0.0064	0.0018	0.0164	0.0018	0.0159	0.0018	0.025	0.001818	0.015	0.0018	0.0241	0.0027	0.0114	0.0009	0.0086	0.0005	0.0064
0.002	0	0.0136	0.0018	0.0114	0.0036	0.0127	0.0041	0.0214	0.0059	0.0327	0.0032	0.0395	0.005909	0.028	0.0045	0.0355	0.0036	0.0177	0.0036	0.0268	0.0023	0.0086
0.003	0.0045	0.0273	0.0018	0.0114	0.0059	0.0173	0.0041	0.0232	0.0059	0.0391	0.0045	0.0427	0.005909	0.035	0.0082	0.0409	0.0036	0.0218	0.0036	0.0291	0.0032	0.0118
0.004	0.0045	0.0364	0.0018	0.0214	0.0059	0.0236	0.0064	0.0323	0.0064	0.0541	0.0045	0.0468	0.006364	0.042	0.0082	0.0477	0.0036	0.0277	0.0036	0.0332	0.0041	0.0132
0.005	0.0045	0.0364	0.0045	0.0214	0.0059	0.0359	0.0064	0.0355	0.0064	0.0664	0.0045	0.0518	0.006818	0.048	0.0082	0.0536	0.0055	0.0277	0.0036	0.0373	0.005	0.0141
0.006	0.0045	0.0364	0.0045	0.0214	0.0064	0.0414	0.0073	0.0395	0.0068	0.0741	0.0045	0.0618	0.006818	0.06	0.0082	0.0623	0.0064	0.03	0.0036	0.0405	0.0059	0.015
0.007	0.0045	0.0409	0.0068	0.0268	0.0082	0.0486	0.0073	0.055	0.0068	0.0741	0.0059	0.0673	0.007727	0.069	0.0105	0.0723	0.0064	0.0355	0.0036	0.0405	0.0064	0.0186
0.008	0.0045	0.0514	0.0082	0.0327	0.0086	0.0559	0.0082	0.0714	0.0068	0.0859	0.0091	0.0727	0.009545	0.073	0.0109	0.0773	0.0077	0.0468	0.0045	0.0473	0.0086	0.0205
0.009	0.0045	0.0536	0.0082	0.0327	0.0086	0.0559	0.0082	0.0714	0.01	0.0955	0.0091	0.0727	0.009545	0.073	0.0109	0.0773	0.0077	0.0468	0.005	0.0495	0.0095	0.0227
0.01	0.0045	0.0577	0.0082	0.035	0.0086	0.0664	0.0109	0.0823	0.01	0.0955	0.0091	0.0768	0.015	0.084	0.0132	0.0864	0.0082	0.0577	0.0077	0.0536	0.01	0.0245
0.02	0.0227	0.0805	0.0177	0.07	0.0168	0.0991	0.0205	0.1309	0.0173	0.1318	0.0195	0.1341	0.025455	0.14	0.0218	0.1214	0.0205	0.1109	0.0159	0.0868	0.0177	0.0395
0.025	0.0227	0.0895	0.0177	0.0814	0.0191	0.1036	0.0232	0.1659	0.0214	0.16	0.0223	0.1445	0.025455	0.151	0.0223	0.1364	0.0205	0.1159	0.0209	0.1005	0.02	0.0477
0.03	0.0318	0.1123	0.0277	0.0891	0.025	0.1305	0.0232	0.1836	0.0268	0.1718	0.0268	0.1668	0.030909	0.164	0.0264	0.1418	0.0259	0.1436	0.0245	0.1041	0.0264	0.0545
0.04	0.0409	0.1245	0.0309	0.1268	0.0332	0.1659	0.0309	0.22	0.0382	0.2055	0.0368	0.2036	0.041364	0.198	0.0341	0.1673	0.0309	0.1759	0.0318	0.1195	0.0364	0.0755
0.05	0.05	0.1323	0.0405	0.1436	0.0495	0.2041	0.0382	0.2282	0.0441	0.2205	0.0414	0.2141	0.045	0.216	0.0418	0.2095	0.0345	0.1959	0.0368	0.14	0.0477	0.0918
0.06	0.0618	0.1523	0.0468	0.1614	0.0532	0.2186	0.0536	0.2636	0.0582	0.2645	0.0564	0.2468	0.063636	0.238	0.05	0.2382	0.0464	0.2305	0.0523	0.1809	0.0559	0.1068
0.07	0.0755	0.175	0.0591	0.185	0.0673	0.2395	0.0641	0.2786	0.0714	0.2855	0.0641	0.2882	0.072727	0.26	0.0564	0.2586	0.0577	0.2605	0.06	0.2005	0.0641	0.1214
0.08	0.0845	0.1932	0.0618	0.21	0.0745	0.2636	0.0677	0.2955	0.0805	0.3109	0.0764	0.3159	0.081818	0.283	0.0645	0.2745	0.0668	0.2773	0.0641	0.2123	0.0764	0.1391
0.09	0.0936	0.21	0.0718	0.2232	0.0873	0.2877	0.0814	0.3214	0.1018	0.3373	0.0882	0.3255	0.085	0.302	0.0755	0.2914	0.0718	0.2968	0.0714	0.2245	0.0877	0.1568
0.1	0.1027	0.2282	0.0845	0.2595	0.0918	0.3164	0.0927	0.3473	0.1177	0.3714	0.0973	0.3491	0.097273	0.314	0.085	0.3136	0.085	0.3027	0.0741	0.2545	0.0964	0.1714
0.25	0.205	0.4191	0.2436	0.5127	0.24	0.535	0.2791	0.5855	0.2445	0.5423	0.2377	0.55	0.228636	0.555	0.2273	0.5555	0.2236	0.5168	0.2455	0.51	0.2614	0.3732
0.5	0.4768	0.7164	0.4995	0.7364	0.545	0.7895	0.5323	0.7836	0.5341	0.7932	0.5159	0.7864	0.487727	0.815	0.4659	0.7982	0.4627	0.7455	0.4777	0.6859	0.5064	0.6182
0.75	0.7577	0.9014	0.77	0.9036	0.8032	0.9264	0.7868	0.9218	0.7609	0.9123	0.7455	0.9377	0.747727	0.946	0.7345	0.9341	0.7536	0.8827	0.7264	0.8486	0.745	0.8445

Table A.9: N=10: Th/U Elevated Background, 350 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0045	0	0.0086	0.0036	0.0082	0.0027	0.0059	0.0018	0.0027	0.0018	0.0041	0.001364	0.009	0	0.0118	0.0018	0.0109	0.0023	0.0114	0	0.0023
0.002	0	0.0045	0.0014	0.0086	0.0055	0.0141	0.0045	0.0068	0.0027	0.0123	0.0018	0.0073	0.001818	0.016	0.0014	0.0195	0.0023	0.0164	0.0023	0.0182	0.0009	0.0073
0.003	0	0.0045	0.0014	0.0214	0.0059	0.0177	0.0064	0.0123	0.0027	0.0177	0.0018	0.0105	0.001818	0.024	0.0023	0.0305	0.0032	0.0205	0.0023	0.0209	0.0018	0.0118
0.004	0	0.0045	0.0027	0.0295	0.0059	0.0209	0.0073	0.0232	0.0068	0.025	0.0023	0.0214	0.001818	0.026	0.0023	0.0345	0.0041	0.0214	0.0036	0.025	0.0023	0.0127
0.005	0	0.0091	0.0059	0.0295	0.0059	0.0273	0.0073	0.0255	0.0095	0.0286	0.0023	0.0236	0.001818	0.037	0.0041	0.0373	0.0041	0.0255	0.0036	0.0323	0.0036	0.0136
0.006	0	0.0091	0.0059	0.0332	0.0059	0.0273	0.0073	0.0264	0.0095	0.0336	0.0036	0.0291	0.001818	0.044	0.0059	0.0427	0.0059	0.0318	0.0041	0.0327	0.005	0.0145
0.007	0	0.0091	0.0091	0.0364	0.0082	0.0305	0.0073	0.0295	0.0095	0.0386	0.0036	0.035	0.003182	0.051	0.0077	0.0486	0.0073	0.0341	0.0041	0.0382	0.0064	0.015
0.008	0	0.0136	0.0091	0.0391	0.0082	0.0345	0.0073	0.0323	0.0095	0.0405	0.0036	0.035	0.003182	0.051	0.0086	0.0577	0.0086	0.0364	0.0077	0.0414	0.0068	0.0177
0.009	0	0.0227	0.0091	0.0409	0.0082	0.0345	0.0073	0.0323	0.0095	0.0405	0.0036	0.0482	0.006818	0.059	0.0086	0.0577	0.01	0.0423	0.0077	0.0414	0.0109	0.0209
0.01	0	0.0227	0.01	0.0409	0.0082	0.0386	0.0073	0.0432	0.0095	0.0405	0.0036	0.0482	0.007273	0.067	0.0086	0.0636	0.01	0.0423	0.0077	0.0477	0.0118	0.0223
0.02	0.0091	0.0727	0.0173	0.0645	0.0186	0.0755	0.0173	0.0686	0.0168	0.0795	0.01	0.0823	0.018182	0.122	0.0136	0.0959	0.0191	0.0864	0.0173	0.0736	0.0214	0.0364
0.025	0.0136	0.0805	0.0295	0.0755	0.02	0.0777	0.0286	0.0945	0.0195	0.0873	0.0132	0.1136	0.025909	0.129	0.0191	0.0991	0.0223	0.11	0.0195	0.0859	0.0277	0.0436
0.03	0.0182	0.1095	0.0373	0.0927	0.0291	0.0945	0.0314	0.1045	0.0214	0.0936	0.0182	0.1264	0.03	0.143	0.0295	0.1032	0.0273	0.1132	0.0273	0.1027	0.0332	0.0555
0.04	0.0227	0.1186	0.0427	0.1123	0.035	0.1205	0.0414	0.1273	0.0305	0.1286	0.0268	0.1545	0.039545	0.161	0.0341	0.1291	0.0364	0.1364	0.0355	0.1241	0.04	0.07
0.05	0.0364	0.1277	0.05	0.1336	0.0455	0.1382	0.0491	0.1473	0.0345	0.1559	0.03	0.1777	0.042273	0.182	0.0491	0.1545	0.0473	0.1541	0.0582	0.1423	0.0505	0.0827
0.06	0.0532	0.1368	0.0573	0.1436	0.0486	0.1545	0.0532	0.1695	0.0405	0.1736	0.0555	0.2295	0.056364	0.204	0.055	0.1818	0.0536	0.1736	0.065	0.1482	0.0609	0.0959
0.07	0.0668	0.1486	0.06	0.1795	0.0605	0.1732	0.0605	0.185	0.0473	0.1859	0.0618	0.2473	0.065455	0.217	0.0591	0.21	0.0609	0.1886	0.0791	0.1682	0.0727	0.1095
0.08	0.0986	0.1741	0.0614	0.1905	0.0682	0.2005	0.0668	0.2032	0.0568	0.2173	0.0668	0.2718	0.073182	0.241	0.0709	0.2527	0.0764	0.2005	0.0945	0.1927	0.0827	0.1268
0.09	0.1077	0.1841	0.0755	0.1959	0.0732	0.2186	0.0777	0.2286	0.0623	0.2418	0.0827	0.2927	0.082727	0.254	0.0709	0.2527	0.0914	0.2114	0.1041	0.2073	0.0909	0.1373
0.1	0.1214	0.1927	0.1023	0.2332	0.0805	0.2455	0.0895	0.2459	0.0709	0.2618	0.0918	0.3055	0.101364	0.266	0.0841	0.2691	0.0982	0.2418	0.1214	0.2118	0.1032	0.1536
0.25	0.2677	0.3991	0.2455	0.4409	0.2718	0.5	0.2559	0.505	0.2191	0.5073	0.2286	0.5	0.245455	0.5	0.2314	0.4736	0.2564	0.465	0.2727	0.4241	0.2491	0.3391
0.5	0.5395	0.6764	0.5227	0.7305	0.4991	0.7518	0.4877	0.7659	0.4995	0.7605	0.495	0.7577	0.503182	0.752	0.5059	0.7509	0.4877	0.7218	0.5432	0.6668	0.5023	0.6136
0.75	0.7732	0.9059	0.7673	0.9159	0.7536	0.9245	0.7577	0.9295	0.7545	0.9309	0.7468	0.9255	0.748636	0.93	0.74	0.9023	0.6886	0.895	0.7709	0.855	0.7536	0.8305

Table A.10: N=10: Th/U Elevated Background, 400 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0	0	0	0	0.0018	0.0014	0.0045	0	0.0032	0	0.0082	0	0.015	0.0005	0.0059	0	0.0036	0.0005	0.0027	0.0005	0.0009
0.002	0.0045	0	0	0	0	0.0064	0.0014	0.0073	0	0.0073	0	0.02	0	0.019	0.0009	0.0091	0.0009	0.0064	0.0005	0.0041	0.0018	0.0027
0.003	0.0045	0.0045	0	0.0023	0	0.0105	0.0023	0.0127	0	0.0136	0	0.0286	0.001364	0.021	0.0023	0.0145	0.0009	0.0064	0.0032	0.0132	0.0027	0.005
0.004	0.0045	0.0045	0.0055	0.0073	0	0.0173	0.0023	0.015	0	0.0164	0	0.0332	0.003636	0.025	0.0027	0.0177	0.0032	0.0086	0.0045	0.0214	0.0064	0.0059
0.005	0.0045	0.0045	0.0091	0.01	0.0023	0.0182	0.0036	0.0164	0	0.02	0	0.0391	0.003636	0.028	0.0027	0.0255	0.0041	0.0164	0.0055	0.0223	0.0082	0.0086
0.006	0.0045	0.0045	0.0132	0.0164	0.0041	0.0205	0.0036	0.0191	0.0005	0.0273	0	0.0455	0.003636	0.032	0.0027	0.0255	0.0045	0.025	0.0073	0.0241	0.0082	0.0091
0.007	0.0045	0.0045	0.0132	0.0173	0.0055	0.0218	0.0036	0.0195	0.0005	0.0295	0.0009	0.0491	0.005455	0.039	0.0027	0.0327	0.0045	0.025	0.0073	0.0245	0.0105	0.01
0.008	0.0045	0.0045	0.0132	0.0173	0.0082	0.0245	0.0036	0.0245	0.0005	0.0323	0.0009	0.0491	0.006364	0.046	0.0036	0.035	0.0068	0.0277	0.0073	0.0264	0.0109	0.0123
0.009	0.0045	0.0045	0.0132	0.0173	0.0091	0.0305	0.0041	0.0264	0.0005	0.0359	0.0014	0.0505	0.006364	0.046	0.0036	0.0395	0.0091	0.0295	0.0095	0.0305	0.0114	0.0136
0.01	0.0045	0.0091	0.0132	0.02	0.0091	0.0305	0.0041	0.0264	0.0005	0.0359	0.0018	0.0573	0.008182	0.047	0.0036	0.0395	0.0091	0.0295	0.0095	0.0305	0.0127	0.0155
0.02	0.0182	0.0273	0.0173	0.0395	0.0136	0.0518	0.0064	0.0641	0.0064	0.0732	0.0123	0.0841	0.014545	0.081	0.0145	0.0609	0.0164	0.065	0.0182	0.0509	0.0259	0.0273
0.025	0.0182	0.0455	0.025	0.0486	0.0205	0.0623	0.0086	0.0705	0.0159	0.0991	0.0132	0.0882	0.018182	0.092	0.0191	0.0664	0.0291	0.0836	0.0186	0.0536	0.0314	0.0355
0.03	0.0273	0.05	0.0323	0.0532	0.0268	0.0732	0.0164	0.0832	0.0159	0.1068	0.0145	0.0964	0.019545	0.111	0.0318	0.0832	0.03	0.0909	0.0232	0.0686	0.0341	0.0427
0.04	0.0636	0.0591	0.0505	0.0736	0.0386	0.0923	0.0227	0.1036	0.0268	0.1223	0.0309	0.1205	0.024545	0.136	0.0418	0.125	0.0405	0.1155	0.0273	0.0973	0.0455	0.0536
0.05	0.0818	0.0864	0.0595	0.0845	0.0414	0.1082	0.0341	0.1223	0.0305	0.1314	0.0359	0.1468	0.035909	0.171	0.0477	0.1427	0.0491	0.145	0.0405	0.1195	0.0545	0.0664
0.06	0.0818	0.0909	0.0745	0.1091	0.0568	0.1327	0.0409	0.1409	0.0405	0.1618	0.04	0.1686	0.046364	0.179	0.0536	0.16	0.0532	0.1586	0.0473	0.13	0.0645	0.0814
0.07	0.1045	0.1	0.0809	0.1168	0.0614	0.15	0.0564	0.1686	0.05	0.1759	0.0459	0.1941	0.058636	0.194	0.0673	0.2064	0.0609	0.1705	0.065	0.1536	0.0755	0.0927
0.08	0.1091	0.1205	0.1009	0.1436	0.0659	0.1586	0.0686	0.1827	0.0618	0.2041	0.0491	0.2145	0.068182	0.204	0.0768	0.2277	0.0764	0.1814	0.0764	0.1705	0.085	0.1018
0.09	0.1218	0.1382	0.1127	0.1609	0.0777	0.1777	0.0864	0.2027	0.0664	0.2159	0.0627	0.2341	0.085	0.218	0.0986	0.2427	0.0914	0.2191	0.0982	0.1827	0.0959	0.1182
0.1	0.1227	0.1582	0.1227	0.1777	0.0841	0.1986	0.1032	0.2332	0.0745	0.2364	0.0668	0.2655	0.095455	0.227	0.0986	0.2427	0.0914	0.2191	0.1068	0.1927	0.1018	0.1305
0.25	0.3027	0.3377	0.265	0.3677	0.255	0.4109	0.2309	0.4082	0.2014	0.4364	0.2273	0.4623	0.255455	0.477	0.2614	0.4418	0.2482	0.4218	0.2741	0.4045	0.2509	0.3186
0.5	0.5459	0.5695	0.5573	0.665	0.5155	0.6509	0.4795	0.6891	0.4636	0.6941	0.4645	0.7	0.501364	0.68	0.4777	0.6627	0.4873	0.6695	0.5305	0.6227	0.495	0.5859
0.75	0.7805	0.8432	0.7664	0.8445	0.755	0.8645	0.7436	0.8718	0.7114	0.8795	0.725	0.8759	0.749091	0.855	0.7336	0.8509	0.7609	0.8345	0.7614	0.8505	0.7473	0.8041

Table A.11: N=10: Cesium Elevated Background, 100 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	1	0	1	0.0023	1	0	1	0	1	0	1	0	1	0.0009	1	0	1	0.0005	1	0.0018	0.89
0.002	0.0045	1	0	1	0.0023	1	0.0009	1	0.0005	1	0.0009	1	0	1	0.0009	1	0.0023	1	0.0032	1	0.0032	0.9223
0.003	0.0045	1	0	1	0.0041	1	0.0009	1	0.0045	1	0.0009	1	0.001364	1	0.0009	1	0.0032	1	0.005	1	0.0032	0.9359
0.004	0.0091	1	0	1	0.0041	1	0.0009	1	0.0045	1	0.0023	1	0.002273	1	0.0018	1	0.0032	1	0.0064	1	0.0041	0.9459
0.005	0.0091	1	0	1	0.0064	1	0.0009	1	0.0059	1	0.0032	1	0.003636	1	0.0027	1	0.0059	1	0.0082	1	0.0041	0.9536
0.006	0.0091	1	0	1	0.0077	1	0.0009	1	0.0059	1	0.0032	1	0.003636	1	0.0027	1	0.0068	1	0.0118	1	0.0055	0.9568
0.007	0.0091	1	0.0027	1	0.0082	1	0.0009	1	0.0059	1	0.0032	1	0.005455	1	0.0027	1	0.0068	1	0.0118	1	0.0077	0.9627
0.008	0.0091	1	0.0082	1	0.0082	1	0.005	1	0.0064	1	0.0032	1	0.006818	1	0.0027	1	0.0068	1	0.0118	1	0.0082	0.9664
0.009	0.0091	1	0.0123	1	0.0086	1	0.005	1	0.0064	1	0.0032	1	0.006818	1	0.0041	1	0.0068	1	0.0118	1	0.0095	0.9682
0.01	0.0182	1	0.0123	1	0.0086	1	0.0068	1	0.0077	1	0.0032	1	0.006818	1	0.0041	1	0.0091	1	0.0118	1	0.0127	0.9755
0.02	0.0318	1	0.0255	1	0.0177	1	0.0164	1	0.015	1	0.0136	1	0.012727	1	0.0186	1	0.0186	1	0.0227	1	0.0264	0.9845
0.025	0.0318	1	0.0432	1	0.0214	1	0.0177	1	0.0186	1	0.0214	1	0.015	1	0.0232	1	0.0264	1	0.0305	1	0.0336	0.9886
0.03	0.0318	1	0.0486	1	0.0223	1	0.0209	1	0.025	1	0.0214	1	0.023182	1	0.0268	1	0.0323	1	0.0382	1	0.0373	0.9905
0.04	0.0409	1	0.0532	1	0.0291	1	0.0327	1	0.0277	1	0.0323	1	0.025	1	0.0318	1	0.04	1	0.0477	1	0.0445	0.9932
0.05	0.0409	1	0.0618	1	0.0445	1	0.0432	1	0.0318	1	0.0427	1	0.044545	1	0.0373	1	0.0505	1	0.0577	1	0.05	0.9941
0.06	0.0591	1	0.0736	1	0.0514	1	0.0514	1	0.0382	1	0.0555	1	0.056818	1	0.0609	1	0.0568	1	0.0609	1	0.0632	0.9968
0.07	0.0773	1	0.0868	1	0.0668	1	0.0609	1	0.0486	1	0.0632	1	0.056818	1	0.0668	1	0.0691	1	0.0718	1	0.07	0.9973
0.08	0.0955	1	0.0882	1	0.0805	1	0.0609	1	0.0705	1	0.0632	1	0.075455	1	0.0818	1	0.0886	1	0.0741	1	0.0795	0.9982
0.09	0.1091	1	0.0882	1	0.0923	1	0.0745	1	0.0705	1	0.0777	1	0.087727	1	0.0991	1	0.0977	1	0.0832	1	0.0855	0.9986
0.1	0.1273	1	0.1082	1	0.0923	1	0.0918	1	0.0909	1	0.0955	1	0.087727	1	0.0991	1	0.0977	1	0.0832	1	0.0973	0.9986
0.25	0.3064	1	0.2359	1	0.245	1	0.2309	1	0.2223	1	0.225	1	0.250909	1	0.2673	1	0.2523	1	0.275	1	0.2505	1
0.5	0.4964	1	0.4659	1	0.4868	1	0.4859	1	0.4877	1	0.4686	1	0.517273	1	0.515	1	0.5218	1	0.4941	1	0.4982	1
0.75	0.7491	1	0.7164	1	0.7473	1	0.7386	1	0.765	1	0.7595	1	0.769545	1	0.7418	1	0.7673	1	0.7055	1	0.7527	1

Table A.12: N=10: Cesium Elevated Background, 200 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0741	0.0009	0.2032	0.0023	0.2923	0	0.3568	0.0005	0.395	0.0014	0.4405	0.002273	0.387	0	0.3695	0.0014	0.3105	0.0023	0.2173	0.0005	0.0345
0.002	0	0.1255	0.0009	0.2859	0.0023	0.3723	0.0023	0.4109	0.0023	0.4845	0.0023	0.4964	0.003182	0.483	0.0005	0.4423	0.0036	0.3923	0.0041	0.2509	0.0027	0.0473
0.003	0	0.1518	0.0009	0.34	0.0023	0.4409	0.0041	0.4986	0.0036	0.5291	0.0036	0.5309	0.003636	0.508	0.0041	0.5168	0.0036	0.4582	0.0059	0.3205	0.0036	0.0609
0.004	0	0.1736	0.0009	0.3736	0.0023	0.4573	0.0055	0.5295	0.0036	0.565	0.005	0.5677	0.004091	0.54	0.0059	0.5345	0.0068	0.4941	0.0073	0.3418	0.005	0.075
0.005	0	0.1895	0.0036	0.3755	0.0023	0.4991	0.0123	0.5664	0.0041	0.6018	0.0059	0.5877	0.004091	0.574	0.0073	0.5755	0.0068	0.5177	0.0105	0.3827	0.005	0.09
0.006	0.0045	0.2232	0.0036	0.4118	0.0027	0.5241	0.015	0.6127	0.0059	0.6368	0.0095	0.6236	0.004091	0.574	0.0073	0.5755	0.0114	0.5509	0.0114	0.4218	0.0055	0.0959
0.007	0.0045	0.235	0.0036	0.4382	0.0064	0.5445	0.015	0.6127	0.0059	0.6368	0.0095	0.6236	0.008636	0.602	0.01	0.6045	0.0114	0.5509	0.0114	0.4218	0.0064	0.1064
0.008	0.0045	0.2595	0.0036	0.4668	0.0064	0.5445	0.015	0.6359	0.0095	0.6641	0.0173	0.65	0.009545	0.648	0.01	0.6045	0.0127	0.5695	0.0141	0.4445	0.0073	0.1114
0.009	0.0045	0.2859	0.0045	0.4877	0.0064	0.5768	0.015	0.6359	0.0095	0.6641	0.0173	0.65	0.009545	0.648	0.0127	0.6282	0.0127	0.5695	0.0168	0.4727	0.0086	0.1205
0.01	0.0045	0.3	0.0045	0.4877	0.0064	0.5768	0.0177	0.6545	0.0123	0.6873	0.0236	0.68	0.009545	0.648	0.0127	0.6282	0.015	0.6086	0.0168	0.4727	0.0095	0.1282
0.02	0.0273	0.3791	0.0218	0.6173	0.0218	0.7159	0.0295	0.7364	0.0277	0.7682	0.0318	0.7641	0.023636	0.738	0.0223	0.7464	0.03	0.7041	0.0218	0.5509	0.02	0.1895
0.025	0.0318	0.3982	0.0341	0.665	0.0218	0.7405	0.0327	0.7605	0.0364	0.7914	0.035	0.7905	0.03	0.765	0.0273	0.7582	0.0355	0.7382	0.0309	0.5945	0.0236	0.2077
0.03	0.0364	0.4509	0.0382	0.6959	0.0295	0.7668	0.0395	0.7982	0.0445	0.82	0.035	0.7905	0.037727	0.798	0.03	0.7891	0.0427	0.7445	0.0323	0.6195	0.03	0.2405
0.04	0.0491	0.5314	0.0459	0.7477	0.0545	0.8168	0.0468	0.8314	0.0618	0.8414	0.0495	0.8423	0.041818	0.82	0.0441	0.815	0.0527	0.7618	0.0359	0.6491	0.0405	0.2705
0.05	0.0491	0.6177	0.0555	0.7886	0.0609	0.8368	0.0659	0.8609	0.0705	0.865	0.0564	0.8645	0.062273	0.867	0.0505	0.8273	0.0614	0.7991	0.0673	0.6864	0.05	0.2959
0.06	0.0582	0.6709	0.0664	0.7986	0.0641	0.855	0.0741	0.8805	0.08	0.8764	0.0645	0.8818	0.062273	0.867	0.0627	0.8482	0.0705	0.82	0.0773	0.7036	0.0609	0.3386
0.07	0.0627	0.6868	0.0841	0.8268	0.0786	0.8709	0.0809	0.8955	0.0891	0.8918	0.0827	0.8995	0.075	0.885	0.0777	0.86	0.0809	0.8236	0.0868	0.7205	0.0718	0.365
0.08	0.0855	0.73	0.0841	0.8268	0.0932	0.8823	0.0809	0.8955	0.1064	0.9123	0.0827	0.8995	0.084545	0.906	0.0964	0.8855	0.0973	0.8555	0.0991	0.7477	0.0859	0.3959
0.09	0.0945	0.7455	0.0905	0.8391	0.1091	0.8973	0.0991	0.9077	0.1064	0.9123	0.1014	0.9136	0.098182	0.91	0.1177	0.91	0.1064	0.8677	0.1168	0.7718	0.0909	0.4077
0.1	0.1009	0.7555	0.1105	0.8632	0.1091	0.8973	0.1218	0.9227	0.1168	0.9345	0.1141	0.9255	0.098182	0.91	0.1177	0.91	0.1064	0.8677	0.1168	0.7718	0.1027	0.4295
0.25	0.2414	0.9132	0.2605	0.9673	0.2395	0.9814	0.2691	0.9855	0.2423	0.9773	0.2282	0.9709	0.263182	0.978	0.2618	0.9682	0.2586	0.9495	0.2591	0.8736	0.2623	0.6655
0.5	0.4936	0.9814	0.4823	0.9986	0.5	0.9991	0.5041	0.9945	0.5086	0.995	0.4777	0.9968	0.481818	0.994	0.4941	0.9914	0.5045	0.9786	0.4823	0.9209	0.5027	0.8609
0.75	0.7359	1	0.7314	1	0.7505	0.9991	0.7541	1	0.7473	0.9982	0.7282	0.9973	0.710455	0.999	0.7259	0.9991	0.7491	0.9932	0.7641	0.9818	0.7386	0.9623

Table A.13: N=10: Cesium Elevated Background, 300 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0091	0.0005	0.0036	0	0.0191	0.0023	0.0323	0.0036	0.0341	0.0032	0.0309	0.002727	0.04	0	0.0323	0.0059	0.0245	0.0018	0.0323	0.0009	0.0055
0.002	0	0.0227	0.0005	0.0068	0.0018	0.0345	0.005	0.0527	0.0036	0.0573	0.0073	0.0459	0.002727	0.055	0.0014	0.0459	0.0059	0.0395	0.0045	0.0459	0.0027	0.0095
0.003	0	0.0273	0.0005	0.0186	0.0018	0.0564	0.005	0.0686	0.005	0.0677	0.0082	0.0691	0.002727	0.064	0.0014	0.0577	0.0077	0.0564	0.0059	0.065	0.0045	0.0109
0.004	0	0.0318	0.0036	0.02	0.0027	0.0605	0.005	0.075	0.0064	0.08	0.0082	0.0886	0.002727	0.072	0.0068	0.0782	0.0077	0.0768	0.0059	0.0695	0.0055	0.0127
0.005	0.0045	0.0318	0.0068	0.0205	0.0032	0.0714	0.0077	0.0864	0.0073	0.0973	0.0082	0.0886	0.003182	0.085	0.0109	0.0845	0.0095	0.09	0.0064	0.0786	0.0059	0.0145
0.006	0.0045	0.0364	0.01	0.0341	0.0032	0.0773	0.0095	0.1086	0.0082	0.1095	0.0105	0.1109	0.004091	0.1	0.0141	0.1055	0.0095	0.09	0.0118	0.0918	0.0068	0.0168
0.007	0.0045	0.0364	0.01	0.0445	0.0132	0.0864	0.0095	0.1086	0.0132	0.1305	0.0118	0.1418	0.004091	0.1	0.0141	0.1055	0.01	0.1045	0.0118	0.0918	0.0086	0.0205
0.008	0.0045	0.0455	0.0155	0.0595	0.0132	0.0864	0.0123	0.1277	0.0132	0.1305	0.0118	0.1418	0.007727	0.12	0.0168	0.1186	0.01	0.1045	0.0136	0.1032	0.0091	0.0227
0.009	0.0045	0.05	0.0155	0.0595	0.0191	0.1095	0.0123	0.1327	0.015	0.1532	0.0127	0.1618	0.007727	0.12	0.0168	0.1186	0.01	0.1223	0.0136	0.1032	0.01	0.0245
0.01	0.0091	0.0545	0.0195	0.0595	0.0191	0.1095	0.0123	0.1327	0.015	0.1532	0.0127	0.1618	0.009545	0.146	0.0168	0.1405	0.01	0.1223	0.0177	0.1127	0.0109	0.0259
0.02	0.0273	0.0955	0.0291	0.1118	0.03	0.1795	0.0164	0.1923	0.0264	0.2232	0.025	0.2182	0.020909	0.233	0.0232	0.2409	0.0286	0.1877	0.0323	0.1677	0.0214	0.0568
0.025	0.0364	0.1045	0.0318	0.1291	0.0327	0.1914	0.0214	0.2268	0.0282	0.2514	0.0264	0.2455	0.026364	0.259	0.0255	0.2705	0.035	0.2155	0.0327	0.1864	0.025	0.0636
0.03	0.0455	0.1091	0.0482	0.1664	0.0373	0.2191	0.0236	0.2586	0.03	0.2882	0.0291	0.2773	0.031818	0.297	0.0373	0.2932	0.0364	0.2395	0.0418	0.2091	0.0336	0.0791
0.04	0.0545	0.1268	0.0609	0.2109	0.0432	0.2859	0.0491	0.3255	0.0409	0.3173	0.0355	0.3173	0.041364	0.325	0.0436	0.3259	0.0455	0.2991	0.0559	0.245	0.0423	0.0982
0.05	0.0632	0.1568	0.0655	0.2509	0.0473	0.325	0.0595	0.3764	0.0455	0.3455	0.0473	0.3659	0.043636	0.366	0.0541	0.3464	0.0582	0.3236	0.0632	0.2695	0.0532	0.1236
0.06	0.0677	0.1614	0.075	0.2655	0.0532	0.3432	0.0659	0.4064	0.0568	0.3755	0.0568	0.4136	0.051818	0.408	0.0759	0.3755	0.0723	0.3486	0.0745	0.3295	0.0627	0.1491
0.07	0.0859	0.1909	0.0905	0.3482	0.0605	0.3755	0.0755	0.4373	0.0686	0.4095	0.0664	0.4518	0.066818	0.451	0.0886	0.4141	0.0859	0.3764	0.0864	0.3591	0.0705	0.1695
0.08	0.0905	0.2086	0.0973	0.3686	0.0668	0.4091	0.0836	0.4673	0.0782	0.4468	0.085	0.4891	0.077273	0.495	0.1045	0.4518	0.0995	0.4109	0.1023	0.3791	0.0773	0.1895
0.09	0.1055	0.2373	0.0973	0.3686	0.0845	0.44	0.0836	0.4673	0.0886	0.4864	0.0973	0.5264	0.077273	0.495	0.1045	0.4518	0.12	0.4395	0.105	0.4023	0.0827	0.2
0.1	0.1114	0.2505	0.1045	0.41	0.0845	0.44	0.1027	0.4895	0.0886	0.4864	0.0973	0.5264	0.09	0.526	0.1305	0.4859	0.12	0.4395	0.105	0.4023	0.095	0.2136
0.25	0.2409	0.5159	0.2136	0.6591	0.2305	0.7145	0.23	0.7318	0.2455	0.7609	0.2505	0.7664	0.289545	0.755	0.2786	0.7177	0.2332	0.6741	0.2877	0.6523	0.2464	0.43
0.5	0.4914	0.8155	0.47	0.8705	0.4855	0.9014	0.4755	0.9141	0.4845	0.9232	0.5168	0.9245	0.49	0.913	0.5005	0.9	0.5086	0.8677	0.5118	0.7973	0.5127	0.7032
0.75	0.7364	0.95	0.7527	0.9723	0.7377	0.9764	0.7782	0.9868	0.7432	0.98	0.7423	0.9827	0.711818	0.98	0.7227	0.97	0.7727	0.9468	0.7373	0.9495	0.7427	0.8864

Table A.14: N=10: Cesium Elevated Background, 350 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0045	0	0.0182	0.0018	0.015	0.0041	0.0136	0.0032	0.0186	0.0009	0.0223	0.001818	0.011	0.0009	0.0077	0.0005	0.0136	0	0.0018	0.0018	0.0045
0.002	0.0045	0.0045	0	0.0295	0.0045	0.0168	0.0041	0.0205	0.0032	0.0305	0.0018	0.0395	0.002273	0.026	0.0009	0.0168	0.0018	0.0186	0.0009	0.0045	0.0032	0.0091
0.003	0.0091	0.0091	0	0.0314	0.0073	0.025	0.0041	0.0268	0.0032	0.0377	0.0027	0.0409	0.003636	0.034	0.0009	0.0232	0.0018	0.0195	0.0009	0.0045	0.0036	0.0114
0.004	0.0091	0.0182	0	0.0377	0.0091	0.0295	0.0041	0.0341	0.0041	0.0459	0.005	0.0518	0.003636	0.042	0.0014	0.0341	0.0018	0.0295	0.0009	0.0055	0.0055	0.0155
0.005	0.0182	0.0273	0.0027	0.0432	0.0091	0.0386	0.0041	0.0395	0.0041	0.0605	0.0059	0.0568	0.003636	0.042	0.0041	0.0409	0.0023	0.0332	0.0014	0.0073	0.0055	0.0182
0.006	0.0182	0.0273	0.0027	0.0486	0.01	0.0473	0.0055	0.0473	0.0059	0.0686	0.0064	0.0632	0.006364	0.053	0.0045	0.05	0.0032	0.0391	0.0027	0.0123	0.0055	0.0195
0.007	0.0182	0.0314	0.0068	0.0486	0.01	0.0473	0.0086	0.065	0.0059	0.0686	0.0064	0.0632	0.006818	0.067	0.0045	0.05	0.0032	0.0391	0.0027	0.0123	0.0068	0.0227
0.008	0.0182	0.0359	0.0105	0.0509	0.0141	0.0559	0.0086	0.065	0.0086	0.0877	0.0068	0.0809	0.006818	0.067	0.0045	0.0614	0.005	0.0441	0.0064	0.0223	0.0073	0.0232
0.009	0.0182	0.0405	0.0105	0.0509	0.0141	0.0559	0.0095	0.0668	0.0086	0.0877	0.0068	0.0809	0.006818	0.085	0.0045	0.0614	0.005	0.0441	0.0064	0.0227	0.0086	0.0241
0.01	0.0182	0.045	0.015	0.0509	0.0141	0.0723	0.0095	0.0668	0.0114	0.1	0.01	0.095	0.006818	0.085	0.0073	0.0668	0.0064	0.0527	0.0064	0.0227	0.01	0.0268
0.02	0.0318	0.0873	0.0255	0.09	0.015	0.1091	0.0136	0.1141	0.0277	0.1468	0.0168	0.1255	0.011818	0.133	0.01	0.0959	0.0118	0.0809	0.0105	0.05	0.0273	0.0495
0.025	0.0318	0.0982	0.0341	0.0982	0.015	0.1391	0.0191	0.1359	0.0323	0.1577	0.0182	0.1468	0.015	0.156	0.0118	0.1177	0.0168	0.0855	0.02	0.0532	0.0336	0.0545
0.03	0.0364	0.1073	0.0368	0.1155	0.0168	0.155	0.0214	0.1664	0.0323	0.1577	0.0232	0.1791	0.022727	0.175	0.0159	0.135	0.0209	0.0991	0.0214	0.0686	0.0373	0.0614
0.04	0.0545	0.1364	0.045	0.1395	0.0305	0.1764	0.0259	0.1805	0.0518	0.1991	0.0295	0.2059	0.024091	0.193	0.0295	0.175	0.03	0.1173	0.0382	0.0945	0.0459	0.0845
0.05	0.0545	0.16	0.0505	0.1868	0.0405	0.2009	0.0464	0.2309	0.0673	0.2195	0.0414	0.2527	0.03	0.217	0.0409	0.1945	0.0391	0.1364	0.0536	0.1009	0.0545	0.0955
0.06	0.0591	0.1914	0.0605	0.2018	0.0459	0.215	0.0586	0.2673	0.0718	0.2427	0.0414	0.2527	0.039545	0.242	0.0477	0.2255	0.0464	0.1655	0.0659	0.1127	0.0632	0.1164
0.07	0.0682	0.1977	0.0673	0.2241	0.0495	0.2364	0.0768	0.2845	0.0864	0.2836	0.0455	0.2827	0.046364	0.28	0.0477	0.2255	0.055	0.19	0.0741	0.1309	0.0727	0.1309
0.08	0.0864	0.2095	0.0832	0.2482	0.0655	0.2636	0.0768	0.2845	0.0864	0.2836	0.0568	0.3068	0.046364	0.28	0.0664	0.2436	0.0641	0.2177	0.0873	0.1505	0.0823	0.1436
0.09	0.1	0.2305	0.0886	0.2768	0.0823	0.3032	0.0941	0.3159	0.1023	0.3364	0.0682	0.3432	0.060909	0.305	0.0777	0.2845	0.075	0.2427	0.0968	0.1727	0.0918	0.1586
0.1	0.12	0.27	0.0895	0.2955	0.0823	0.3032	0.1132	0.3486	0.125	0.3723	0.0682	0.3432	0.077273	0.338	0.095	0.2995	0.075	0.2427	0.1105	0.1914	0.0955	0.1686
0.25	0.3259	0.4686	0.2368	0.5009	0.2082	0.5377	0.2468	0.5986	0.2336	0.595	0.2141	0.5518	0.245	0.536	0.2227	0.5032	0.2155	0.4391	0.2786	0.3982	0.2445	0.3723
0.5	0.5382	0.7309	0.5	0.7768	0.4655	0.8195	0.4773	0.8068	0.5	0.8141	0.5	0.7577	0.488636	0.763	0.4605	0.6941	0.5227	0.7127	0.5391	0.6673	0.4941	0.6164
0.75	0.7523	0.8936	0.7323	0.9368	0.7368	0.9395	0.7245	0.9286	0.76	0.9223	0.7282	0.9195	0.732727	0.904	0.73	0.9105	0.7623	0.9132	0.7932	0.8782	0.74	0.8191

Table A.15: N=10: Cesium Elevated Background, 400 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0	0	0	0.0009	0	0.0018	0.005	0	0.0055	0.0009	0.0109	0	0.013	0.0005	0.0068	0.0005	0.0064	0.0009	0.0041	0.0009	0.0023
0.002	0.0045	0	0	0	0.0027	0.0041	0.0018	0.0095	0	0.0095	0.0009	0.0218	0.000909	0.02	0.0018	0.0095	0.0005	0.0123	0.0023	0.0086	0.0009	0.0036
0.003	0.0045	0	0	0.0041	0.0027	0.0068	0.0018	0.0141	0.0014	0.0159	0.0009	0.0236	0.004091	0.024	0.0023	0.0132	0.0005	0.0145	0.0023	0.0123	0.0027	0.005
0.004	0.0045	0.0045	0.0014	0.0041	0.0027	0.0118	0.0018	0.0159	0.0018	0.0182	0.0009	0.0286	0.005	0.028	0.0023	0.0186	0.0005	0.0186	0.0027	0.0141	0.0045	0.0068
0.005	0.0045	0.0091	0.0014	0.0082	0.0027	0.0118	0.0027	0.0186	0.0027	0.0295	0.0023	0.0355	0.005455	0.035	0.0041	0.0305	0.0005	0.0223	0.0032	0.0168	0.0064	0.0077
0.006	0.0045	0.0091	0.0014	0.0177	0.0027	0.0177	0.0027	0.0223	0.0027	0.0295	0.0023	0.0355	0.005455	0.035	0.0041	0.0305	0.005	0.0223	0.0045	0.0182	0.0077	0.0095
0.007	0.0045	0.0091	0.005	0.02	0.0055	0.0177	0.0027	0.0236	0.005	0.0305	0.0023	0.0368	0.005455	0.044	0.0055	0.0377	0.005	0.0223	0.0055	0.0255	0.0095	0.0114
0.008	0.0045	0.0136	0.0055	0.0218	0.0086	0.0273	0.0027	0.0236	0.005	0.0305	0.0064	0.0432	0.005455	0.044	0.0055	0.0377	0.0064	0.0245	0.0055	0.0255	0.0109	0.0123
0.009	0.0045	0.0136	0.0055	0.0255	0.0086	0.0273	0.0032	0.025	0.0059	0.035	0.0064	0.0432	0.008182	0.047	0.0068	0.0445	0.0064	0.0245	0.01	0.0332	0.0123	0.0132
0.01	0.0091	0.0227	0.0055	0.0255	0.0091	0.0368	0.0032	0.025	0.0059	0.035	0.0064	0.0432	0.008182	0.047	0.0068	0.0445	0.0118	0.035	0.01	0.0332	0.0141	0.0132
0.02	0.0091	0.0364	0.0114	0.0473	0.0132	0.0568	0.0114	0.0541	0.0109	0.0645	0.0145	0.065	0.014091	0.076	0.0159	0.0759	0.0236	0.0614	0.0245	0.0691	0.0209	0.03
0.025	0.0136	0.0455	0.0259	0.0618	0.02	0.0614	0.0164	0.0618	0.0109	0.0795	0.0209	0.0832	0.016818	0.085	0.0214	0.0873	0.0341	0.0814	0.0264	0.0827	0.0291	0.04
0.03	0.0273	0.05	0.0323	0.0732	0.02	0.0686	0.025	0.0791	0.02	0.0986	0.0241	0.0959	0.023636	0.105	0.0241	0.0995	0.045	0.1064	0.0291	0.0882	0.0332	0.0441
0.04	0.0455	0.0682	0.0382	0.0845	0.0232	0.0932	0.0341	0.0827	0.0291	0.1218	0.0414	0.1427	0.034545	0.122	0.0373	0.1041	0.0505	0.115	0.0418	0.11	0.0377	0.0541
0.05	0.0682	0.0909	0.0441	0.0859	0.0336	0.1082	0.0405	0.1027	0.0414	0.1455	0.0468	0.1573	0.043182	0.169	0.0714	0.1327	0.0668	0.1495	0.0509	0.1159	0.0486	0.0691
0.06	0.0773	0.0955	0.0555	0.1095	0.0418	0.1255	0.0473	0.1355	0.0464	0.1668	0.0532	0.1759	0.054091	0.195	0.0864	0.1445	0.0818	0.1605	0.0564	0.1255	0.0609	0.0877
0.07	0.0955	0.1136	0.0618	0.1241	0.055	0.1482	0.0555	0.1573	0.0632	0.1923	0.0618	0.2009	0.054091	0.195	0.0959	0.1691	0.0923	0.1814	0.0664	0.1509	0.0673	0.1014
0.08	0.1091	0.1227	0.0764	0.1423	0.0695	0.1645	0.0691	0.1818	0.0632	0.1923	0.0618	0.2009	0.072727	0.214	0.0959	0.1691	0.0923	0.1814	0.0809	0.1577	0.0755	0.1155
0.09	0.1395	0.1277	0.0982	0.1514	0.08	0.1964	0.0795	0.2032	0.0818	0.2277	0.0786	0.2259	0.080909	0.24	0.105	0.1945	0.1018	0.2068	0.0986	0.1705	0.0859	0.1259
0.1	0.1441	0.1464	0.105	0.1845	0.0918	0.2114	0.0795	0.2032	0.0964	0.2536	0.0977	0.2632	0.101818	0.262	0.1295	0.2432	0.1155	0.2318	0.11	0.1814	0.0895	0.1382
0.25	0.2786	0.34	0.2209	0.3964	0.2323	0.3968	0.2286	0.4495	0.2141	0.4514	0.2368	0.4727	0.260455	0.434	0.2523	0.38	0.2509	0.3627	0.2718	0.4132	0.2414	0.3245
0.5	0.4882	0.6414	0.4955	0.6759	0.4836	0.7259	0.4805	0.7259	0.4941	0.7382	0.5318	0.7282	0.506364	0.664	0.5173	0.6295	0.5041	0.645	0.485	0.6518	0.5045	0.5823
0.75	0.7268	0.8605	0.7341	0.9	0.7486	0.9	0.7277	0.8982	0.7459	0.8841	0.7845	0.8873	0.784091	0.861	0.7695	0.8464	0.7545	0.845	0.715	0.8686	0.76	0.7995

Table A.16: N=10: Lead, Shielded 1-MFP Th/U Elevated Background 100 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0.1559	0	0.4741	0.0023	0.6759	0	0.7441	0	0.7791	0	0.8173	0.002273	0.812	0.0014	0.7609	0	0.705	0	0.5559	0.0018	0.0723
0.002	0.0045	0.2586	0.0036	0.5909	0.0036	0.7541	0.0014	0.795	0	0.8495	0	0.8755	0.003182	0.857	0.0018	0.8264	0.0014	0.7659	0	0.6141	0.0027	0.1055
0.003	0.0091	0.2827	0.0036	0.6514	0.005	0.8023	0.0014	0.8232	0	0.8818	0.0032	0.905	0.004545	0.89	0.0027	0.8573	0.005	0.7773	0	0.65	0.0045	0.1309
0.004	0.0091	0.3464	0.0036	0.6868	0.0091	0.835	0.0018	0.8577	0	0.9168	0.0032	0.9177	0.005	0.9	0.0027	0.8836	0.005	0.7927	0	0.6555	0.005	0.1464
0.005	0.0091	0.3955	0.0036	0.6991	0.0091	0.8536	0.0018	0.8805	0	0.9359	0.0032	0.9286	0.005	0.915	0.0041	0.8909	0.005	0.8082	0	0.6677	0.0055	0.1632
0.006	0.0091	0.4318	0.0036	0.76	0.0105	0.8677	0.0032	0.8955	0.0023	0.9464	0.0032	0.9373	0.005455	0.924	0.0045	0.9073	0.0059	0.8241	0.0036	0.6918	0.0055	0.1768
0.007	0.0091	0.4718	0.0068	0.7827	0.0105	0.8791	0.0032	0.9077	0.0023	0.9464	0.0059	0.9509	0.008182	0.93	0.0055	0.9109	0.0064	0.8318	0.0041	0.7064	0.0059	0.1914
0.008	0.0182	0.4923	0.01	0.8027	0.0105	0.8945	0.0032	0.9205	0.0023	0.9536	0.0068	0.9523	0.008182	0.947	0.0055	0.9186	0.0064	0.8318	0.0059	0.7155	0.0068	0.2036
0.009	0.0182	0.5095	0.01	0.815	0.0105	0.9014	0.0032	0.9205	0.0023	0.9614	0.0068	0.9523	0.008182	0.947	0.0055	0.9186	0.0068	0.8468	0.0064	0.7273	0.0082	0.2205
0.01	0.0182	0.5241	0.01	0.815	0.0105	0.9014	0.0032	0.9355	0.0023	0.9614	0.0073	0.9568	0.012273	0.953	0.0136	0.9327	0.0095	0.8541	0.0064	0.7273	0.0086	0.2264
0.02	0.0273	0.6577	0.0209	0.8905	0.015	0.9405	0.0118	0.9691	0.0095	0.9759	0.015	0.9809	0.016818	0.969	0.0273	0.9459	0.0186	0.9064	0.02	0.8059	0.02	0.3127
0.025	0.0364	0.7259	0.0327	0.9132	0.015	0.9477	0.0132	0.9814	0.015	0.9873	0.0177	0.9832	0.021364	0.981	0.0295	0.9545	0.0205	0.9132	0.0236	0.8105	0.0255	0.3509
0.03	0.0455	0.7414	0.0418	0.9168	0.0259	0.9614	0.015	0.9882	0.0155	0.99	0.0223	0.9855	0.026818	0.984	0.0359	0.9618	0.0227	0.9223	0.0295	0.8305	0.0323	0.3818
0.04	0.0545	0.7759	0.0468	0.9418	0.0336	0.9773	0.0255	0.9923	0.0277	0.9927	0.0323	0.9873	0.032273	0.985	0.0518	0.9727	0.0291	0.9405	0.0445	0.8491	0.0418	0.4209
0.05	0.0545	0.8086	0.0568	0.9577	0.0409	0.9823	0.0314	0.9941	0.0318	0.9932	0.0377	0.9914	0.05	0.99	0.055	0.9755	0.0418	0.9595	0.0518	0.8827	0.0518	0.4623
0.06	0.0545	0.8518	0.0768	0.9686	0.0536	0.9873	0.0464	0.995	0.0441	0.9932	0.0568	0.9964	0.068636	0.995	0.0682	0.9773	0.0482	0.9595	0.055	0.8918	0.0577	0.4882
0.07	0.0645	0.8668	0.0805	0.9755	0.0645	0.9873	0.0518	0.995	0.0577	0.9982	0.0709	0.9968	0.075909	0.995	0.0709	0.9791	0.0605	0.9614	0.0755	0.91	0.0673	0.52
0.08	0.0736	0.8855	0.0845	0.9773	0.0809	0.9923	0.0623	0.995	0.0695	0.9986	0.0741	0.9973	0.089545	0.997	0.0832	0.9832	0.0786	0.9664	0.0791	0.9145	0.0773	0.5523
0.09	0.0782	0.8968	0.0973	0.9864	0.095	0.9941	0.0705	0.9959	0.0768	0.9991	0.0855	0.9973	0.101364	0.999	0.0882	0.9841	0.0873	0.9736	0.0864	0.9236	0.0845	0.5732
0.1	0.0873	0.9191	0.1077	0.9891	0.095	0.9941	0.0732	0.9982	0.0768	0.9991	0.0855	0.9973	0.101364	0.999	0.0959	0.9841	0.0873	0.9736	0.0905	0.9282	0.0968	0.5991
0.25	0.2636	0.9895	0.2518	0.9991	0.2432	0.9995	0.2436	1	0.2205	1	0.2514	1	0.242273	1	0.2645	0.9977	0.2445	0.9945	0.2241	0.9727	0.2527	0.8077
0.5	0.4859	1	0.4618	1	0.4859	1	0.5109	1	0.52	1	0.52	1	0.526364	1	0.5123	1	0.5241	1	0.4741	0.9909	0.5032	0.9386
0.75	0.7673	1	0.7459	1	0.7827	1	0.7582	1	0.7573	1	0.7741	1	0.754545	1	0.7905	1	0.7523	1	0.7155	1	0.7536	0.9886

Table A.17: N=10: Lead, Shielded 1-MFP Th/U Elevated Background, 200 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0136	0	0.0395	0	0.0477	0.0009	0.0545	0.0036	0.045	0.0023	0.0677	0.000455	0.049	0	0.0445	0.0036	0.0341	0.0036	0.0309	0.0005	0.0095
0.002	0	0.0273	0.0036	0.0777	0	0.0755	0.0009	0.0673	0.0041	0.0727	0.0023	0.09	0.000455	0.074	0.0023	0.0605	0.0082	0.0441	0.0036	0.045	0.0027	0.0177
0.003	0.0045	0.0364	0.0036	0.0895	0	0.0859	0.0045	0.0877	0.0041	0.0936	0.0032	0.1073	0.002273	0.1	0.0023	0.0836	0.0086	0.0618	0.0041	0.06	0.0032	0.0255
0.004	0.0045	0.0455	0.0036	0.1123	0.0009	0.1045	0.005	0.1077	0.0073	0.1105	0.0041	0.1423	0.002727	0.121	0.005	0.0918	0.0091	0.0686	0.0055	0.0691	0.0041	0.0291
0.005	0.0045	0.0455	0.0041	0.1318	0.0041	0.1245	0.0059	0.1191	0.0073	0.1323	0.0055	0.1495	0.005909	0.13	0.0073	0.1	0.0123	0.0809	0.0055	0.08	0.005	0.0341
0.006	0.0045	0.0455	0.0041	0.1427	0.0041	0.1418	0.0073	0.1255	0.0073	0.1555	0.0059	0.1741	0.006364	0.152	0.0077	0.1132	0.0132	0.1005	0.0055	0.0814	0.0064	0.04
0.007	0.0045	0.0591	0.0041	0.155	0.0068	0.1545	0.0073	0.1427	0.0073	0.1777	0.0059	0.1741	0.006364	0.163	0.0082	0.1195	0.0168	0.1182	0.0073	0.0995	0.0073	0.0436
0.008	0.0045	0.0759	0.0041	0.1632	0.0114	0.1718	0.0073	0.1427	0.0082	0.1968	0.0082	0.1859	0.01	0.175	0.0095	0.1282	0.0168	0.1182	0.0086	0.1186	0.0091	0.0491
0.009	0.0045	0.0836	0.0041	0.1759	0.0114	0.1823	0.0082	0.1623	0.0082	0.1968	0.01	0.2	0.01	0.175	0.0095	0.1282	0.0168	0.1277	0.0086	0.1186	0.0095	0.0509
0.01	0.0045	0.0886	0.0059	0.1827	0.0114	0.1823	0.0086	0.1841	0.0123	0.22	0.01	0.2	0.013636	0.191	0.0141	0.1445	0.0168	0.1495	0.01	0.1268	0.0105	0.0577
0.02	0.0273	0.1605	0.0155	0.2359	0.0173	0.2673	0.0214	0.2691	0.0195	0.2941	0.0264	0.2841	0.026364	0.278	0.0209	0.2168	0.025	0.2186	0.0241	0.1809	0.0218	0.0882
0.025	0.0273	0.1877	0.0214	0.2682	0.0227	0.2936	0.0255	0.3064	0.0291	0.3227	0.0295	0.305	0.028636	0.293	0.0241	0.2355	0.0259	0.2359	0.03	0.2036	0.0264	0.1032
0.03	0.0318	0.2282	0.0332	0.2836	0.0268	0.3332	0.0277	0.3364	0.0345	0.3427	0.0368	0.3377	0.033182	0.314	0.0336	0.2605	0.0345	0.2623	0.03	0.2214	0.0341	0.1155
0.04	0.0409	0.2536	0.0468	0.3473	0.0332	0.3668	0.0282	0.3877	0.045	0.395	0.0505	0.3773	0.038636	0.345	0.0436	0.3259	0.0382	0.3159	0.0323	0.2664	0.0427	0.1377
0.05	0.05	0.29	0.0564	0.3832	0.0359	0.3845	0.0468	0.4377	0.0614	0.4277	0.065	0.4295	0.050909	0.364	0.0495	0.3486	0.0541	0.3527	0.0418	0.3073	0.0541	0.1568
0.06	0.0636	0.3282	0.0623	0.4159	0.0564	0.4436	0.0523	0.4668	0.0695	0.4605	0.0709	0.4655	0.065	0.427	0.0618	0.4086	0.0655	0.3845	0.0555	0.3364	0.0618	0.1759
0.07	0.0691	0.3505	0.0659	0.4377	0.0695	0.4659	0.0582	0.4936	0.0782	0.4814	0.0841	0.5005	0.073182	0.445	0.07	0.4355	0.0732	0.4114	0.0632	0.34	0.0745	0.1964
0.08	0.0873	0.3918	0.0709	0.4618	0.0791	0.4855	0.0655	0.5173	0.0864	0.5045	0.0927	0.5209	0.084091	0.484	0.0768	0.4577	0.0836	0.4432	0.0695	0.3605	0.0845	0.2114
0.09	0.0964	0.4159	0.0855	0.5086	0.0886	0.5159	0.0714	0.5309	0.0986	0.5295	0.1055	0.5509	0.093636	0.507	0.0832	0.4982	0.0986	0.47	0.0814	0.375	0.095	0.2286
0.1	0.1005	0.4373	0.0991	0.54	0.0955	0.5459	0.0959	0.5641	0.1127	0.5595	0.1141	0.5723	0.093636	0.507	0.0945	0.5282	0.1036	0.4945	0.0873	0.395	0.1041	0.2418
0.25	0.2641	0.7109	0.2509	0.7236	0.2341	0.7559	0.2609	0.7527	0.2573	0.7764	0.2664	0.7668	0.222727	0.77	0.2282	0.725	0.2236	0.7014	0.2382	0.5868	0.2545	0.4564
0.5	0.5459	0.8836	0.5095	0.8986	0.505	0.9232	0.5114	0.93	0.5095	0.93	0.4882	0.915	0.448636	0.91	0.4614	0.9186	0.5036	0.8682	0.5164	0.8155	0.4941	0.7032
0.75	0.7777	0.9786	0.77	0.9809	0.7405	0.9841	0.74	0.9882	0.7509	0.9868	0.75	0.9814	0.728182	0.992	0.6982	0.99	0.7491	0.9695	0.7823	0.9364	0.7409	0.8941

Table A.18: N=10: Lead, Shielded 1-MFP Th/U Elevated Background, 300 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0045	0	0.0064	0.0036	0.0136	0.0018	0.0082	0.0018	0.0032	0.0018	0.0059	0.001818	0.005	0.0018	0.0032	0.0027	0.0055	0.0009	0.0086	0.0005	0.0018
0.002	0	0.0045	0.0018	0.0145	0.0036	0.0209	0.0041	0.01	0.0059	0.0064	0.0032	0.0091	0.005909	0.007	0.0045	0.0077	0.0036	0.0059	0.0036	0.0191	0.0023	0.0036
0.003	0.0045	0.0091	0.0018	0.0164	0.0059	0.0227	0.0041	0.0127	0.0059	0.0105	0.0045	0.0173	0.005909	0.008	0.0082	0.0114	0.0036	0.0205	0.0036	0.0205	0.0032	0.0059
0.004	0.0045	0.0136	0.0018	0.0164	0.0059	0.0236	0.0064	0.015	0.0064	0.0136	0.0045	0.0227	0.006364	0.016	0.0082	0.0168	0.0036	0.0227	0.0036	0.0218	0.0041	0.0077
0.005	0.0045	0.0136	0.0045	0.0164	0.0059	0.0373	0.0064	0.0223	0.0064	0.0191	0.0045	0.0236	0.006818	0.018	0.0082	0.0218	0.0055	0.0286	0.0036	0.0309	0.005	0.0095
0.006	0.0045	0.0136	0.0045	0.0164	0.0064	0.0386	0.0073	0.0241	0.0068	0.0195	0.0045	0.0286	0.006818	0.024	0.0082	0.0273	0.0064	0.0286	0.0036	0.0309	0.0059	0.0105
0.007	0.0045	0.0136	0.0068	0.02	0.0082	0.0391	0.0073	0.0286	0.0068	0.0195	0.0059	0.0327	0.007727	0.028	0.0105	0.0295	0.0064	0.0327	0.0036	0.0309	0.0064	0.0136
0.008	0.0045	0.0136	0.0082	0.0282	0.0086	0.0477	0.0082	0.0318	0.0068	0.0282	0.0091	0.0395	0.009545	0.034	0.0109	0.0377	0.0077	0.0336	0.0045	0.0386	0.0086	0.0141
0.009	0.0045	0.0136	0.0082	0.0282	0.0086	0.0477	0.0082	0.0318	0.01	0.0318	0.0091	0.0395	0.009545	0.034	0.0109	0.0377	0.0077	0.0336	0.005	0.0395	0.0095	0.0159
0.01	0.0045	0.0182	0.0082	0.0395	0.0086	0.0495	0.0109	0.0409	0.01	0.0318	0.0091	0.0455	0.015	0.037	0.0132	0.04	0.0082	0.0382	0.0077	0.0459	0.01	0.0164
0.02	0.0227	0.0364	0.0177	0.0864	0.0168	0.075	0.0205	0.0609	0.0173	0.0827	0.0195	0.075	0.025455	0.083	0.0218	0.0695	0.0205	0.0855	0.0159	0.0627	0.0177	0.0386
0.025	0.0227	0.0414	0.0177	0.0955	0.0191	0.0786	0.0232	0.0814	0.0214	0.0945	0.0223	0.0918	0.025455	0.1	0.0223	0.0814	0.0205	0.0945	0.0209	0.0791	0.02	0.0473
0.03	0.0318	0.0527	0.0277	0.1073	0.025	0.095	0.0232	0.0927	0.0268	0.1105	0.0268	0.1014	0.030909	0.113	0.0264	0.0973	0.0259	0.1086	0.0245	0.0836	0.0264	0.055
0.04	0.0409	0.0709	0.0309	0.1305	0.0332	0.1241	0.0309	0.1286	0.0382	0.1427	0.0368	0.1214	0.041364	0.141	0.0341	0.1173	0.0309	0.1436	0.0318	0.0914	0.0364	0.0741
0.05	0.05	0.0891	0.0405	0.1482	0.0495	0.1514	0.0382	0.1518	0.0441	0.1564	0.0414	0.1327	0.045	0.151	0.0418	0.1427	0.0345	0.1518	0.0368	0.105	0.0477	0.0864
0.06	0.0618	0.1136	0.0468	0.1645	0.0532	0.1705	0.0536	0.1882	0.0582	0.1909	0.0564	0.1741	0.063636	0.176	0.05	0.1668	0.0464	0.1691	0.0523	0.135	0.0559	0.1005
0.07	0.0755	0.1195	0.0591	0.1836	0.0673	0.1855	0.0641	0.2045	0.0714	0.2018	0.0641	0.1973	0.072727	0.2	0.0564	0.19	0.0577	0.1855	0.06	0.1409	0.0641	0.11
0.08	0.0845	0.1223	0.0618	0.1964	0.0745	0.2005	0.0677	0.2305	0.0805	0.2245	0.0764	0.2245	0.081818	0.215	0.0645	0.2077	0.0668	0.1977	0.0641	0.1655	0.0764	0.1264
0.09	0.0936	0.1405	0.0718	0.2164	0.0873	0.2045	0.0814	0.2527	0.1018	0.2486	0.0882	0.2455	0.085	0.24	0.0755	0.2336	0.0718	0.215	0.0714	0.1823	0.0877	0.1391
0.1	0.1027	0.1632	0.0845	0.2459	0.0918	0.2136	0.0927	0.2641	0.1177	0.2718	0.0973	0.275	0.097273	0.258	0.085	0.2605	0.085	0.2332	0.0741	0.2018	0.0964	0.1527
0.25	0.205	0.3882	0.2436	0.4941	0.24	0.4764	0.2791	0.4941	0.2445	0.4823	0.2377	0.4786	0.228636	0.478	0.2273	0.4323	0.2236	0.4055	0.2455	0.4164	0.2614	0.3427
0.5	0.4768	0.6623	0.4995	0.7409	0.545	0.7614	0.5323	0.7695	0.5341	0.735	0.5159	0.76	0.487727	0.709	0.4659	0.6809	0.4627	0.6455	0.4777	0.6395	0.5064	0.6014
0.75	0.7577	0.8932	0.77	0.9041	0.8032	0.9291	0.7868	0.9168	0.7609	0.915	0.7455	0.8691	0.747727	0.882	0.7345	0.8855	0.7536	0.8714	0.7264	0.8427	0.745	0.8095

Table A.19: N=10: Lead, Shielded 1-MFP Th/U Elevated Background, 350 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0	0	0.0073	0.0036	0.0036	0.0027	0.0018	0.0018	0	0.0018	0.005	0.001364	0.004	0	0.0014	0.0018	0.0009	0.0023	0.0032	0	0.0014
0.002	0	0.0045	0.0014	0.0073	0.0055	0.0095	0.0045	0.0018	0.0027	0.0127	0.0018	0.01	0.001818	0.005	0.0014	0.0027	0.0023	0.0041	0.0023	0.0059	0.0009	0.0032
0.003	0	0.0045	0.0014	0.0073	0.0059	0.0114	0.0064	0.0086	0.0027	0.0141	0.0018	0.0109	0.001818	0.011	0.0023	0.0059	0.0032	0.0077	0.0023	0.0118	0.0018	0.0068
0.004	0	0.0091	0.0027	0.0091	0.0059	0.0141	0.0073	0.0155	0.0068	0.0186	0.0023	0.0136	0.001818	0.013	0.0023	0.0059	0.0041	0.0086	0.0036	0.015	0.0023	0.0086
0.005	0	0.0091	0.0059	0.0091	0.0059	0.0182	0.0073	0.0214	0.0095	0.02	0.0023	0.0155	0.001818	0.016	0.0041	0.0127	0.0041	0.0109	0.0036	0.015	0.0036	0.0105
0.006	0	0.0136	0.0059	0.0095	0.0059	0.0191	0.0073	0.0241	0.0095	0.0223	0.0036	0.0205	0.001818	0.021	0.0059	0.015	0.0059	0.0123	0.0041	0.0168	0.005	0.0114
0.007	0	0.0136	0.0091	0.0095	0.0082	0.0259	0.0073	0.025	0.0095	0.0264	0.0036	0.03	0.003182	0.023	0.0077	0.0164	0.0073	0.02	0.0041	0.0177	0.0064	0.0136
0.008	0	0.0136	0.0091	0.0132	0.0082	0.0277	0.0073	0.0268	0.0095	0.0355	0.0036	0.03	0.003182	0.023	0.0086	0.02	0.0086	0.0255	0.0077	0.0214	0.0068	0.0141
0.009	0	0.0136	0.0091	0.0136	0.0082	0.0277	0.0073	0.0268	0.0095	0.0355	0.0036	0.0341	0.006818	0.028	0.0086	0.02	0.01	0.0295	0.0077	0.0214	0.0109	0.0155
0.01	0	0.0136	0.01	0.0182	0.0082	0.0314	0.0073	0.0309	0.0095	0.04	0.0036	0.0341	0.007273	0.033	0.0086	0.0218	0.01	0.0295	0.0077	0.0255	0.0118	0.0159
0.02	0.0091	0.0318	0.0173	0.0418	0.0186	0.0423	0.0173	0.0518	0.0168	0.0682	0.01	0.0568	0.018182	0.05	0.0136	0.0555	0.0191	0.0473	0.0173	0.0486	0.0214	0.0309
0.025	0.0136	0.0318	0.0295	0.0518	0.02	0.05	0.0286	0.0677	0.0195	0.0809	0.0132	0.0695	0.025909	0.062	0.0191	0.0664	0.0223	0.0741	0.0195	0.0577	0.0277	0.0373
0.03	0.0182	0.0627	0.0373	0.0582	0.0291	0.0745	0.0314	0.0791	0.0214	0.0841	0.0182	0.0773	0.03	0.072	0.0295	0.07	0.0273	0.0814	0.0273	0.0809	0.0332	0.045
0.04	0.0227	0.0764	0.0427	0.0859	0.035	0.0936	0.0414	0.1032	0.0305	0.1041	0.0268	0.0968	0.039545	0.091	0.0341	0.0918	0.0364	0.0918	0.0355	0.1059	0.04	0.06
0.05	0.0364	0.0945	0.05	0.1223	0.0455	0.1041	0.0491	0.1309	0.0345	0.1218	0.03	0.1073	0.042273	0.096	0.0491	0.1155	0.0473	0.1155	0.0582	0.1332	0.0505	0.0732
0.06	0.0532	0.1218	0.0573	0.1259	0.0486	0.1091	0.0532	0.1414	0.0405	0.1368	0.0555	0.13	0.056364	0.131	0.055	0.1323	0.0536	0.1273	0.065	0.1427	0.0609	0.0841
0.07	0.0668	0.1264	0.06	0.1386	0.0605	0.1386	0.0605	0.1532	0.0473	0.1523	0.0618	0.145	0.065455	0.145	0.0591	0.1395	0.0609	0.1491	0.0791	0.1564	0.0727	0.1014
0.08	0.0986	0.1309	0.0614	0.1491	0.0682	0.1577	0.0668	0.1623	0.0568	0.1682	0.0668	0.1568	0.073182	0.155	0.0709	0.1736	0.0764	0.1764	0.0945	0.1759	0.0827	0.1168
0.09	0.1077	0.1436	0.0755	0.1627	0.0732	0.1795	0.0777	0.1877	0.0623	0.1832	0.0827	0.1759	0.082727	0.181	0.0709	0.1736	0.0914	0.1955	0.1041	0.1927	0.0909	0.125
0.1	0.1214	0.1518	0.1023	0.1882	0.0805	0.2045	0.0895	0.2073	0.0709	0.2009	0.0918	0.1991	0.101364	0.195	0.0841	0.1986	0.0982	0.2264	0.1214	0.2191	0.1032	0.1423
0.25	0.2677	0.355	0.2455	0.4059	0.2718	0.4036	0.2559	0.4255	0.2191	0.41	0.2286	0.3755	0.245455	0.416	0.2314	0.4277	0.2564	0.4382	0.2727	0.3936	0.2491	0.31
0.5	0.5395	0.6459	0.5227	0.6505	0.4991	0.6618	0.4877	0.6932	0.4995	0.6727	0.495	0.6723	0.503182	0.699	0.5059	0.6995	0.4877	0.6659	0.5432	0.6486	0.5023	0.5777
0.75	0.7732	0.8564	0.7673	0.8673	0.7536	0.8818	0.7577	0.8841	0.7545	0.8923	0.7468	0.8909	0.748636	0.89	0.74	0.8714	0.6886	0.8632	0.7709	0.8282	0.7536	0.8186

Table A.20: N=10: Lead, Shielded 1-MFP Th/U Elevated Background, 400 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0	0	0	0	0.0041	0.0014	0.005	0	0.0064	0	0.0023	0	0.004	0.0005	0.0036	0	0.0018	0.0005	0.0009	0.0005	0.0005
0.002	0.0045	0	0	0	0	0.0105	0.0014	0.0091	0	0.0068	0	0.0082	0	0.008	0.0009	0.005	0.0009	0.0018	0.0005	0.0059	0.0018	0.0018
0.003	0.0045	0	0	0	0	0.0127	0.0023	0.0132	0	0.0068	0	0.0105	0.001364	0.01	0.0023	0.0105	0.0009	0.0023	0.0032	0.0086	0.0027	0.0032
0.004	0.0045	0	0.0055	0.0018	0	0.0132	0.0023	0.0155	0	0.0068	0	0.0114	0.003636	0.011	0.0027	0.0114	0.0032	0.0032	0.0045	0.0109	0.0064	0.0045
0.005	0.0045	0	0.0091	0.0018	0.0023	0.0155	0.0036	0.0186	0	0.01	0	0.0127	0.003636	0.014	0.0027	0.0132	0.0041	0.0045	0.0055	0.015	0.0082	0.0059
0.006	0.0045	0	0.0132	0.0018	0.0041	0.0155	0.0036	0.02	0.0005	0.0141	0	0.0136	0.003636	0.014	0.0027	0.0132	0.0045	0.0109	0.0073	0.0186	0.0082	0.0068
0.007	0.0045	0	0.0132	0.0055	0.0055	0.0209	0.0036	0.0214	0.0005	0.0186	0.0009	0.0232	0.005455	0.016	0.0027	0.0173	0.0045	0.0109	0.0073	0.0214	0.0105	0.0086
0.008	0.0045	0	0.0132	0.0109	0.0082	0.0245	0.0036	0.0232	0.0005	0.0209	0.0009	0.0232	0.006364	0.019	0.0036	0.0195	0.0068	0.0159	0.0073	0.0241	0.0109	0.0109
0.009	0.0045	0.0045	0.0132	0.0109	0.0091	0.0305	0.0041	0.0277	0.0005	0.0223	0.0014	0.0245	0.006364	0.019	0.0036	0.0205	0.0091	0.0173	0.0095	0.025	0.0114	0.0123
0.01	0.0045	0.0045	0.0132	0.0182	0.0091	0.0305	0.0041	0.0277	0.0005	0.0223	0.0018	0.0277	0.008182	0.024	0.0036	0.0205	0.0091	0.0173	0.0095	0.025	0.0127	0.0141
0.02	0.0182	0.0182	0.0173	0.0477	0.0136	0.0455	0.0064	0.0477	0.0064	0.0427	0.0123	0.0536	0.014545	0.051	0.0145	0.0464	0.0164	0.0336	0.0182	0.05	0.0259	0.0318
0.025	0.0182	0.0318	0.025	0.0582	0.0205	0.0605	0.0086	0.0532	0.0159	0.0582	0.0132	0.0645	0.018182	0.056	0.0191	0.0532	0.0291	0.0509	0.0186	0.0532	0.0314	0.0414
0.03	0.0273	0.0318	0.0323	0.0741	0.0268	0.0645	0.0164	0.0668	0.0159	0.0609	0.0145	0.075	0.019545	0.067	0.0318	0.07	0.03	0.0568	0.0232	0.0623	0.0341	0.0495
0.04	0.0636	0.0455	0.0505	0.0873	0.0386	0.0859	0.0227	0.0823	0.0268	0.085	0.0309	0.0959	0.024545	0.091	0.0418	0.0968	0.0405	0.0809	0.0273	0.0732	0.0455	0.0595
0.05	0.0818	0.0591	0.0595	0.1136	0.0414	0.1077	0.0341	0.0991	0.0305	0.0995	0.0359	0.1214	0.035909	0.122	0.0477	0.1086	0.0491	0.1073	0.0405	0.0891	0.0545	0.0764
0.06	0.0818	0.0682	0.0745	0.1214	0.0568	0.1323	0.0409	0.1127	0.0405	0.1377	0.04	0.1277	0.046364	0.13	0.0536	0.1209	0.0532	0.1268	0.0473	0.0955	0.0645	0.0882
0.07	0.1045	0.0864	0.0809	0.1345	0.0614	0.1518	0.0564	0.1464	0.05	0.1486	0.0459	0.1495	0.058636	0.143	0.0673	0.1427	0.0609	0.1386	0.065	0.115	0.0755	0.1005
0.08	0.1091	0.1091	0.1009	0.165	0.0659	0.1632	0.0686	0.1609	0.0618	0.1636	0.0491	0.1623	0.068182	0.159	0.0768	0.1618	0.0764	0.1459	0.0764	0.1268	0.085	0.1141
0.09	0.1218	0.1345	0.1127	0.1718	0.0777	0.1632	0.0864	0.1805	0.0664	0.1895	0.0627	0.1818	0.085	0.178	0.0986	0.1818	0.0914	0.1714	0.0982	0.1391	0.0959	0.1255
0.1	0.1227	0.1436	0.1227	0.1841	0.0841	0.1877	0.1032	0.2023	0.0745	0.2105	0.0668	0.2	0.095455	0.2	0.0986	0.1818	0.0914	0.1714	0.1068	0.15	0.1018	0.14
0.25	0.3027	0.3791	0.265	0.3841	0.255	0.3918	0.2309	0.4164	0.2014	0.39	0.2273	0.4186	0.255455	0.407	0.2614	0.395	0.2482	0.3518	0.2741	0.3241	0.2509	0.3123
0.5	0.5459	0.6532	0.5573	0.6445	0.5155	0.6841	0.4795	0.665	0.4636	0.6536	0.4645	0.6514	0.501364	0.67	0.4777	0.6282	0.4873	0.6127	0.5305	0.6259	0.495	0.5686
0.75	0.7805	0.8623	0.7664	0.8573	0.755	0.8795	0.7436	0.8718	0.7114	0.8455	0.725	0.8477	0.749091	0.857	0.7336	0.8523	0.7609	0.8277	0.7614	0.8177	0.7473	0.795

Table A.21: N=10: Aluminum, Shielded 1-MFP Th/U Elevated Background, 100 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0.6118	0	0.9345	0.0023	0.9859	0	0.9932	0	0.9959	0	0.9959	0.002273	0.997	0.0014	0.9914	0	0.9645	0	0.8795	0.0018	0.2114
0.002	0.0045	0.7032	0.0036	0.9741	0.0036	0.9932	0.0014	0.9973	0	0.9986	0	0.9964	0.003182	0.998	0.0018	0.9936	0.0014	0.9741	0	0.9145	0.0027	0.2859
0.003	0.0091	0.7714	0.0036	0.9823	0.005	0.9964	0.0014	0.9995	0	0.9986	0.0032	0.9977	0.004545	1	0.0027	0.9936	0.005	0.9764	0	0.9236	0.0045	0.3318
0.004	0.0091	0.8068	0.0036	0.9873	0.0091	0.9986	0.0018	0.9995	0	0.9991	0.0032	0.9982	0.005	1	0.0027	0.9955	0.005	0.9777	0	0.9386	0.005	0.3568
0.005	0.0091	0.8423	0.0036	0.9877	0.0091	0.9986	0.0018	0.9995	0	0.9995	0.0032	0.9982	0.005	1	0.0041	0.9955	0.005	0.9777	0	0.9432	0.0055	0.3895
0.006	0.0091	0.8568	0.0036	0.9895	0.0105	0.9986	0.0032	0.9995	0.0023	1	0.0032	1	0.005455	1	0.0045	0.9955	0.0059	0.9818	0.0036	0.9432	0.0055	0.41
0.007	0.0091	0.8736	0.0068	0.9909	0.0105	0.9986	0.0032	0.9995	0.0023	1	0.0059	1	0.008182	1	0.0055	0.9955	0.0064	0.985	0.0041	0.9477	0.0059	0.4282
0.008	0.0182	0.8823	0.01	0.9927	0.0105	0.9991	0.0032	0.9995	0.0023	1	0.0068	1	0.008182	1	0.0055	0.9982	0.0064	0.985	0.0059	0.9568	0.0068	0.45
0.009	0.0182	0.8909	0.01	0.9941	0.0105	0.9991	0.0032	0.9995	0.0023	1	0.0068	1	0.008182	1	0.0055	0.9982	0.0068	0.985	0.0064	0.9568	0.0082	0.4782
0.01	0.0182	0.9005	0.01	0.9941	0.0105	0.9991	0.0032	1	0.0023	1	0.0073	1	0.012273	1	0.0136	0.9982	0.0095	0.9886	0.0064	0.9568	0.0086	0.4895
0.02	0.0273	0.9609	0.0209	0.9973	0.015	1	0.0118	1	0.0095	1	0.015	1	0.016818	1	0.0273	1	0.0186	0.9945	0.02	0.9682	0.02	0.5905
0.025	0.0364	0.9705	0.0327	0.9973	0.015	1	0.0132	1	0.015	1	0.0177	1	0.021364	1	0.0295	1	0.0205	0.9945	0.0236	0.9773	0.0255	0.6245
0.03	0.0455	0.9741	0.0418	0.9977	0.0259	1	0.015	1	0.0155	1	0.0223	1	0.026818	1	0.0359	1	0.0227	0.9945	0.0295	0.9818	0.0323	0.6623
0.04	0.0545	0.9877	0.0468	1	0.0336	1	0.0255	1	0.0277	1	0.0323	1	0.032273	1	0.0518	1	0.0291	0.9977	0.0445	0.9864	0.0418	0.7014
0.05	0.0545	0.9909	0.0568	1	0.0409	1	0.0314	1	0.0318	1	0.0377	1	0.05	1	0.055	1	0.0418	0.9977	0.0518	0.9909	0.0518	0.74
0.06	0.0545	0.9964	0.0768	1	0.0536	1	0.0464	1	0.0441	1	0.0568	1	0.068636	1	0.0682	1	0.0482	0.9977	0.055	0.9909	0.0577	0.7655
0.07	0.0645	1	0.0805	1	0.0645	1	0.0518	1	0.0577	1	0.0709	1	0.075909	1	0.0709	1	0.0605	0.9977	0.0755	0.9909	0.0673	0.7868
0.08	0.0736	1	0.0845	1	0.0809	1	0.0623	1	0.0695	1	0.0741	1	0.089545	1	0.0832	1	0.0786	0.9977	0.0791	0.9909	0.0773	0.8
0.09	0.0782	1	0.0973	1	0.095	1	0.0705	1	0.0768	1	0.0855	1	0.101364	1	0.0882	1	0.0873	0.9977	0.0864	0.9909	0.0845	0.8136
0.1	0.0873	1	0.1077	1	0.095	1	0.0732	1	0.0768	1	0.0855	1	0.101364	1	0.0959	1	0.0873	0.9977	0.0905	0.9909	0.0968	0.8268
0.25	0.2636	1	0.2518	1	0.2432	1	0.2436	1	0.2205	1	0.2514	1	0.242273	1	0.2645	1	0.2445	1	0.2241	0.9955	0.2527	0.9423
0.5	0.4859	1	0.4618	1	0.4859	1	0.5109	1	0.52	1	0.52	1	0.526364	1	0.5123	1	0.5241	1	0.4741	0.9955	0.5032	0.9868
0.75	0.7673	1	0.7459	1	0.7827	1	0.7582	1	0.7573	1	0.7741	1	0.754545	1	0.7905	1	0.7523	1	0.7155	1	0.7536	0.9991

Table A.22: N=10: Aluminum, Shielded 1-MFP Th/U Elevated Background, 200 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0227	0	0.0618	0	0.0959	0.0009	0.1223	0.0036	0.1445	0.0023	0.1805	0.000455	0.144	0	0.1395	0.0036	0.1186	0.0036	0.1023	0.0005	0.0123
0.002	0	0.0455	0.0036	0.0959	0	0.1386	0.0009	0.1482	0.0041	0.1868	0.0023	0.2214	0.000455	0.205	0.0023	0.19	0.0082	0.1632	0.0036	0.1223	0.0027	0.02
0.003	0.0045	0.0591	0.0036	0.1127	0	0.1609	0.0045	0.1814	0.0041	0.2332	0.0032	0.2627	0.002273	0.245	0.0023	0.2386	0.0086	0.1995	0.0041	0.1477	0.0032	0.0314
0.004	0.0045	0.0745	0.0036	0.1268	0.0009	0.1977	0.005	0.2268	0.0073	0.2618	0.0041	0.2982	0.002727	0.266	0.005	0.2505	0.0091	0.2268	0.0055	0.1723	0.0041	0.0345
0.005	0.0045	0.0882	0.0041	0.1441	0.0041	0.2164	0.0059	0.2486	0.0073	0.2809	0.0055	0.33	0.005909	0.286	0.0073	0.2859	0.0123	0.2409	0.0055	0.1895	0.005	0.0414
0.006	0.0045	0.1018	0.0041	0.165	0.0041	0.2327	0.0073	0.2768	0.0073	0.3236	0.0059	0.36	0.006364	0.311	0.0077	0.3023	0.0132	0.26	0.0055	0.2045	0.0064	0.0464
0.007	0.0045	0.1045	0.0041	0.1859	0.0068	0.2491	0.0073	0.3018	0.0073	0.3591	0.0059	0.36	0.006364	0.333	0.0082	0.3145	0.0168	0.2818	0.0073	0.2136	0.0073	0.0509
0.008	0.0045	0.1045	0.0041	0.2041	0.0114	0.2636	0.0073	0.3018	0.0082	0.3886	0.0082	0.3905	0.01	0.352	0.0095	0.3309	0.0168	0.2818	0.0086	0.2186	0.0091	0.0559
0.009	0.0045	0.1077	0.0041	0.2232	0.0114	0.2805	0.0082	0.3277	0.0082	0.3886	0.01	0.4164	0.01	0.352	0.0095	0.3309	0.0168	0.315	0.0086	0.2186	0.0095	0.0586
0.01	0.0045	0.1123	0.0059	0.235	0.0114	0.2805	0.0086	0.3555	0.0123	0.4077	0.01	0.4164	0.013636	0.379	0.0141	0.3532	0.0168	0.3359	0.01	0.2391	0.0105	0.0618
0.02	0.0273	0.1773	0.0155	0.3255	0.0173	0.3932	0.0214	0.4777	0.0195	0.5186	0.0264	0.5164	0.026364	0.49	0.0209	0.47	0.025	0.4245	0.0241	0.3118	0.0218	0.1023
0.025	0.0273	0.2032	0.0214	0.37	0.0227	0.4177	0.0255	0.5095	0.0291	0.5327	0.0295	0.5336	0.028636	0.519	0.0241	0.4991	0.0259	0.435	0.03	0.3482	0.0264	0.1268
0.03	0.0318	0.2677	0.0332	0.3909	0.0268	0.4736	0.0277	0.5318	0.0345	0.565	0.0368	0.5614	0.033182	0.546	0.0336	0.5214	0.0345	0.4723	0.03	0.3709	0.0341	0.1436
0.04	0.0409	0.295	0.0468	0.4409	0.0332	0.54	0.0282	0.5909	0.045	0.6136	0.0505	0.6086	0.038636	0.594	0.0436	0.5755	0.0382	0.5341	0.0323	0.4109	0.0427	0.1673
0.05	0.05	0.3405	0.0564	0.4845	0.0359	0.5745	0.0468	0.6359	0.0614	0.6514	0.065	0.6755	0.050909	0.617	0.0495	0.6027	0.0541	0.5691	0.0418	0.4468	0.0541	0.1977
0.06	0.0636	0.3718	0.0623	0.5432	0.0564	0.6282	0.0523	0.6609	0.0695	0.6736	0.0709	0.7027	0.065	0.682	0.0618	0.6368	0.0655	0.5859	0.0555	0.4923	0.0618	0.2191
0.07	0.0691	0.4041	0.0659	0.5736	0.0695	0.6568	0.0582	0.685	0.0782	0.7145	0.0841	0.7232	0.073182	0.711	0.07	0.6545	0.0732	0.6118	0.0632	0.5177	0.0745	0.2423
0.08	0.0873	0.4332	0.0709	0.5905	0.0791	0.6836	0.0655	0.7018	0.0864	0.7355	0.0927	0.7345	0.084091	0.727	0.0768	0.6859	0.0836	0.6327	0.0695	0.5332	0.0845	0.2718
0.09	0.0964	0.4627	0.0855	0.6391	0.0886	0.7082	0.0714	0.7164	0.0986	0.7591	0.1055	0.7595	0.093636	0.757	0.0832	0.7073	0.0986	0.6441	0.0814	0.5491	0.095	0.2927
0.1	0.1005	0.4636	0.0991	0.6591	0.0955	0.7268	0.0959	0.7291	0.1127	0.7818	0.1141	0.7845	0.093636	0.757	0.0945	0.7205	0.1036	0.6705	0.0873	0.575	0.1041	0.3141
0.25	0.2641	0.7877	0.2509	0.8373	0.2341	0.88	0.2609	0.9073	0.2573	0.9168	0.2664	0.9177	0.222727	0.906	0.2282	0.8655	0.2236	0.8214	0.2382	0.7095	0.2545	0.5505
0.5	0.5459	0.94	0.5095	0.9695	0.505	0.9745	0.5114	0.9777	0.5095	0.9736	0.4882	0.975	0.448636	0.964	0.4614	0.9491	0.5036	0.9241	0.5164	0.9	0.4941	0.7859
0.75	0.7777	0.9959	0.77	0.9995	0.7405	0.9991	0.74	0.9964	0.7509	0.9909	0.75	0.9986	0.728182	0.988	0.6982	0.9768	0.7491	0.975	0.7823	0.9727	0.7409	0.9241

Table A.23: N=10: Aluminum, Shielded 1-MFP Th/U Elevated Background, 300 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0	0	0.0023	0.0036	0.0073	0.0018	0.0055	0.0018	0.0073	0.0018	0.0091	0.001818	0.007	0.0018	0.0105	0.0027	0.0082	0.0009	0.01	0.0005	0.0041
0.002	0	0.0091	0.0018	0.0059	0.0036	0.0114	0.0041	0.0132	0.0059	0.0191	0.0032	0.0177	0.005909	0.014	0.0045	0.0232	0.0036	0.0259	0.0036	0.0155	0.0023	0.0059
0.003	0.0045	0.0182	0.0018	0.0082	0.0059	0.0127	0.0041	0.0182	0.0059	0.0245	0.0045	0.0241	0.005909	0.025	0.0082	0.0332	0.0036	0.0414	0.0036	0.0255	0.0032	0.0091
0.004	0.0045	0.0182	0.0018	0.0095	0.0059	0.0159	0.0064	0.0282	0.0064	0.0359	0.0045	0.0268	0.006364	0.031	0.0082	0.0373	0.0036	0.0423	0.0036	0.03	0.0041	0.0109
0.005	0.0045	0.0227	0.0045	0.0118	0.0059	0.0241	0.0064	0.0318	0.0064	0.0368	0.0045	0.0332	0.006818	0.04	0.0082	0.0455	0.0055	0.0477	0.0036	0.0423	0.005	0.0132
0.006	0.0045	0.0273	0.0045	0.0141	0.0064	0.0309	0.0073	0.0368	0.0068	0.0436	0.0045	0.0391	0.006818	0.05	0.0082	0.0509	0.0064	0.0591	0.0036	0.0505	0.0059	0.0141
0.007	0.0045	0.0318	0.0068	0.0141	0.0082	0.0345	0.0073	0.0423	0.0068	0.0436	0.0059	0.0477	0.007727	0.064	0.0105	0.0614	0.0064	0.0664	0.0036	0.0505	0.0064	0.015
0.008	0.0045	0.0364	0.0082	0.0141	0.0086	0.0409	0.0082	0.0627	0.0068	0.0545	0.0091	0.0541	0.009545	0.067	0.0109	0.0759	0.0077	0.075	0.0045	0.0536	0.0086	0.0168
0.009	0.0045	0.0409	0.0082	0.0141	0.0086	0.0409	0.0082	0.0627	0.01	0.0655	0.0091	0.0541	0.009545	0.067	0.0109	0.0759	0.0077	0.075	0.005	0.0623	0.0095	0.0186
0.01	0.0045	0.0409	0.0082	0.0195	0.0086	0.0614	0.0109	0.075	0.01	0.0655	0.0091	0.0664	0.015	0.082	0.0132	0.0936	0.0082	0.08	0.0077	0.0668	0.01	0.02
0.02	0.0227	0.0591	0.0177	0.0545	0.0168	0.0945	0.0205	0.1168	0.0173	0.1182	0.0195	0.1173	0.025455	0.151	0.0218	0.1532	0.0205	0.1191	0.0159	0.0959	0.0177	0.0386
0.025	0.0227	0.0773	0.0177	0.0632	0.0191	0.105	0.0232	0.145	0.0214	0.1532	0.0223	0.1359	0.025455	0.165	0.0223	0.1609	0.0205	0.1318	0.0209	0.1373	0.02	0.0464
0.03	0.0318	0.0886	0.0277	0.0736	0.025	0.1423	0.0232	0.1568	0.0268	0.1659	0.0268	0.1609	0.030909	0.178	0.0264	0.175	0.0259	0.1782	0.0245	0.1559	0.0264	0.0564
0.04	0.0409	0.1068	0.0309	0.1145	0.0332	0.1627	0.0309	0.195	0.0382	0.2059	0.0368	0.2045	0.041364	0.209	0.0341	0.1955	0.0309	0.2159	0.0318	0.1914	0.0364	0.0782
0.05	0.05	0.1295	0.0405	0.1532	0.0495	0.205	0.0382	0.2141	0.0441	0.2191	0.0414	0.2282	0.045	0.24	0.0418	0.2245	0.0345	0.2409	0.0368	0.2018	0.0477	0.0982
0.06	0.0618	0.1395	0.0468	0.1741	0.0532	0.2382	0.0536	0.2627	0.0582	0.2686	0.0564	0.2905	0.063636	0.28	0.05	0.2518	0.0464	0.2859	0.0523	0.2364	0.0559	0.1095
0.07	0.0755	0.1473	0.0591	0.2109	0.0673	0.2555	0.0641	0.2786	0.0714	0.2955	0.0641	0.31	0.072727	0.308	0.0564	0.2664	0.0577	0.3045	0.06	0.2491	0.0641	0.1259
0.08	0.0845	0.16	0.0618	0.2436	0.0745	0.2791	0.0677	0.3005	0.0805	0.32	0.0764	0.3359	0.081818	0.323	0.0645	0.2859	0.0668	0.3145	0.0641	0.2623	0.0764	0.1418
0.09	0.0936	0.1782	0.0718	0.2555	0.0873	0.3064	0.0814	0.3205	0.1018	0.3536	0.0882	0.3641	0.085	0.34	0.0755	0.3241	0.0718	0.335	0.0714	0.2827	0.0877	0.1582
0.1	0.1027	0.1927	0.0845	0.2986	0.0918	0.3332	0.0927	0.3514	0.1177	0.3855	0.0973	0.3782	0.097273	0.366	0.085	0.3514	0.085	0.3468	0.0741	0.2964	0.0964	0.1755
0.25	0.205	0.4286	0.2436	0.5518	0.24	0.5573	0.2791	0.6027	0.2445	0.61	0.2377	0.6023	0.228636	0.594	0.2273	0.5905	0.2236	0.5368	0.2455	0.5105	0.2614	0.3741
0.5	0.4768	0.7218	0.4995	0.7632	0.545	0.8045	0.5323	0.8159	0.5341	0.8191	0.5159	0.8327	0.487727	0.821	0.4659	0.7764	0.4627	0.7645	0.4777	0.7309	0.5064	0.6368
0.75	0.7577	0.9114	0.77	0.9182	0.8032	0.9405	0.7868	0.93	0.7609	0.9368	0.7455	0.9373	0.747727	0.928	0.7345	0.9114	0.7536	0.9064	0.7264	0.8755	0.745	0.8459

Table A.24: N=10: Aluminum, Shielded 1-MFP Th/U Elevated Background, 350 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0091	0	0	0.0036	0.0027	0.0027	0.0032	0.0018	0.0032	0.0018	0.0136	0.001364	0.01	0	0.0086	0.0018	0.0091	0.0023	0.0123	0	0.0036
0.002	0	0.0091	0.0014	0.0027	0.0055	0.005	0.0045	0.0068	0.0027	0.0195	0.0018	0.0236	0.001818	0.022	0.0014	0.0136	0.0023	0.0159	0.0023	0.0177	0.0009	0.0045
0.003	0	0.0091	0.0014	0.0041	0.0059	0.0073	0.0064	0.0145	0.0027	0.0223	0.0018	0.03	0.001818	0.034	0.0023	0.0186	0.0032	0.0236	0.0023	0.0227	0.0018	0.0068
0.004	0	0.0136	0.0027	0.0095	0.0059	0.0109	0.0073	0.015	0.0068	0.0318	0.0023	0.0382	0.001818	0.036	0.0023	0.0259	0.0041	0.0273	0.0036	0.0236	0.0023	0.0077
0.005	0	0.0136	0.0059	0.0168	0.0059	0.0136	0.0073	0.0195	0.0095	0.0377	0.0023	0.0414	0.001818	0.039	0.0041	0.0295	0.0041	0.0323	0.0036	0.0255	0.0036	0.0109
0.006	0	0.0227	0.0059	0.02	0.0059	0.0214	0.0073	0.0273	0.0095	0.045	0.0036	0.0541	0.001818	0.046	0.0059	0.035	0.0059	0.0395	0.0041	0.0291	0.005	0.0123
0.007	0	0.0227	0.0091	0.0241	0.0082	0.0214	0.0073	0.0323	0.0095	0.0486	0.0036	0.0573	0.003182	0.051	0.0077	0.0391	0.0073	0.0482	0.0041	0.0314	0.0064	0.0136
0.008	0	0.0273	0.0091	0.0282	0.0082	0.0318	0.0073	0.0391	0.0095	0.0568	0.0036	0.0573	0.003182	0.051	0.0086	0.0436	0.0086	0.0514	0.0077	0.0386	0.0068	0.0145
0.009	0	0.0318	0.0091	0.0282	0.0082	0.0318	0.0073	0.0391	0.0095	0.0568	0.0036	0.0618	0.006818	0.056	0.0086	0.0436	0.01	0.0541	0.0077	0.0386	0.0109	0.0168
0.01	0	0.0364	0.01	0.0286	0.0082	0.035	0.0073	0.0545	0.0095	0.0636	0.0036	0.0618	0.007273	0.065	0.0086	0.0541	0.01	0.0541	0.0077	0.0423	0.0118	0.0191
0.02	0.0091	0.0455	0.0173	0.0509	0.0186	0.0914	0.0173	0.0909	0.0168	0.1168	0.01	0.105	0.018182	0.099	0.0136	0.0991	0.0191	0.0923	0.0173	0.0732	0.0214	0.0386
0.025	0.0136	0.0591	0.0295	0.0732	0.02	0.0973	0.0286	0.1214	0.0195	0.1309	0.0132	0.1364	0.025909	0.112	0.0191	0.1105	0.0223	0.1086	0.0195	0.0791	0.0277	0.0486
0.03	0.0182	0.0682	0.0373	0.0836	0.0291	0.1059	0.0314	0.1309	0.0214	0.14	0.0182	0.1545	0.03	0.125	0.0295	0.1291	0.0273	0.1132	0.0273	0.0936	0.0332	0.055
0.04	0.0227	0.0773	0.0427	0.0945	0.035	0.1341	0.0414	0.155	0.0305	0.1782	0.0268	0.1777	0.039545	0.149	0.0341	0.1541	0.0364	0.1309	0.0355	0.1118	0.04	0.075
0.05	0.0364	0.1091	0.05	0.1477	0.0455	0.1632	0.0491	0.1918	0.0345	0.2164	0.03	0.1932	0.042273	0.175	0.0491	0.1832	0.0473	0.1564	0.0582	0.1382	0.0505	0.0882
0.06	0.0532	0.1245	0.0573	0.1641	0.0486	0.1964	0.0532	0.2159	0.0405	0.2409	0.0555	0.2341	0.056364	0.21	0.055	0.205	0.0536	0.1873	0.065	0.1455	0.0609	0.1027
0.07	0.0668	0.1368	0.06	0.1936	0.0605	0.2291	0.0605	0.2455	0.0473	0.2568	0.0618	0.2532	0.065455	0.245	0.0591	0.225	0.0609	0.2027	0.0791	0.1695	0.0727	0.1177
0.08	0.0986	0.1505	0.0614	0.2041	0.0682	0.2514	0.0668	0.2609	0.0568	0.2691	0.0668	0.2636	0.073182	0.265	0.0709	0.2573	0.0764	0.2164	0.0945	0.1845	0.0827	0.1318
0.09	0.1077	0.16	0.0755	0.2227	0.0732	0.2745	0.0777	0.2936	0.0623	0.3041	0.0827	0.2764	0.082727	0.289	0.0709	0.2573	0.0914	0.2386	0.1041	0.2	0.0909	0.1436
0.1	0.1214	0.195	0.1023	0.2623	0.0805	0.3059	0.0895	0.3182	0.0709	0.3264	0.0918	0.3009	0.101364	0.311	0.0841	0.2859	0.0982	0.2632	0.1214	0.2245	0.1032	0.1677
0.25	0.2677	0.4477	0.2455	0.4923	0.2718	0.5595	0.2559	0.5736	0.2191	0.5214	0.2286	0.5232	0.245455	0.533	0.2314	0.5045	0.2564	0.4827	0.2727	0.4473	0.2491	0.3618
0.5	0.5395	0.7036	0.5227	0.7968	0.4991	0.7932	0.4877	0.7727	0.4995	0.755	0.495	0.7505	0.503182	0.753	0.5059	0.7505	0.4877	0.7264	0.5432	0.7059	0.5023	0.6109
0.75	0.7732	0.8995	0.7673	0.9273	0.7536	0.9164	0.7577	0.9018	0.7545	0.9127	0.7468	0.9159	0.748636	0.909	0.74	0.905	0.6886	0.8755	0.7709	0.8764	0.7536	0.8295

Table A.25: N=10: Aluminum, Shielded 1-MFP Th/U Elevated Background, 400 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0	0	0.0036	0	0.0041	0.0014	0.0095	0	0.0064	0	0.0073	0	0.012	0.0005	0.0114	0	0.0095	0.0005	0.0036	0.0005	0.0023
0.002	0.0045	0.0045	0	0.0109	0	0.0068	0.0014	0.0155	0	0.0145	0	0.0255	0	0.021	0.0009	0.0159	0.0009	0.0214	0.0005	0.0077	0.0018	0.0045
0.003	0.0045	0.0136	0	0.0159	0	0.01	0.0023	0.0186	0	0.0191	0	0.0327	0.001364	0.026	0.0023	0.0227	0.0009	0.0318	0.0032	0.0118	0.0027	0.0055
0.004	0.0045	0.0136	0.0055	0.0159	0	0.0136	0.0023	0.0227	0	0.0245	0	0.0405	0.003636	0.03	0.0027	0.0264	0.0032	0.0323	0.0045	0.0186	0.0064	0.0073
0.005	0.0045	0.0182	0.0091	0.0209	0.0023	0.0173	0.0036	0.0259	0	0.0268	0	0.0414	0.003636	0.038	0.0027	0.0359	0.0041	0.045	0.0055	0.0282	0.0082	0.0127
0.006	0.0045	0.0182	0.0132	0.0218	0.0041	0.0177	0.0036	0.0277	0.0005	0.0305	0	0.0432	0.003636	0.041	0.0027	0.0359	0.0045	0.0473	0.0073	0.0309	0.0082	0.0132
0.007	0.0045	0.0182	0.0132	0.0314	0.0055	0.0241	0.0036	0.0327	0.0005	0.0441	0.0009	0.05	0.005455	0.043	0.0027	0.0432	0.0045	0.0473	0.0073	0.0368	0.0105	0.0141
0.008	0.0045	0.0227	0.0132	0.0377	0.0082	0.0323	0.0036	0.0414	0.0005	0.055	0.0009	0.05	0.006364	0.047	0.0036	0.055	0.0068	0.05	0.0073	0.0368	0.0109	0.0159
0.009	0.0045	0.0227	0.0132	0.0377	0.0091	0.04	0.0041	0.0473	0.0005	0.0627	0.0014	0.0527	0.006364	0.047	0.0036	0.0668	0.0091	0.055	0.0095	0.0414	0.0114	0.0173
0.01	0.0045	0.0227	0.0132	0.0395	0.0091	0.04	0.0041	0.0473	0.0005	0.0627	0.0018	0.065	0.008182	0.052	0.0036	0.0668	0.0091	0.055	0.0095	0.0414	0.0127	0.0186
0.02	0.0182	0.0455	0.0173	0.0714	0.0136	0.0773	0.0064	0.0936	0.0064	0.0991	0.0123	0.0977	0.014545	0.092	0.0145	0.11	0.0164	0.0832	0.0182	0.0709	0.0259	0.0405
0.025	0.0182	0.05	0.025	0.0936	0.0205	0.0882	0.0086	0.1064	0.0159	0.1177	0.0132	0.1036	0.018182	0.11	0.0191	0.1159	0.0291	0.0995	0.0186	0.0827	0.0314	0.0495
0.03	0.0273	0.0545	0.0323	0.0977	0.0268	0.0941	0.0164	0.12	0.0159	0.1214	0.0145	0.1114	0.019545	0.122	0.0318	0.1468	0.03	0.1118	0.0232	0.105	0.0341	0.055
0.04	0.0636	0.0727	0.0505	0.1191	0.0386	0.1223	0.0227	0.1468	0.0268	0.1436	0.0309	0.1391	0.024545	0.167	0.0418	0.1718	0.0405	0.1355	0.0273	0.1345	0.0455	0.0655
0.05	0.0818	0.1205	0.0595	0.1341	0.0414	0.1568	0.0341	0.1864	0.0305	0.1641	0.0359	0.1736	0.035909	0.215	0.0477	0.1773	0.0491	0.1732	0.0405	0.1659	0.0545	0.085
0.06	0.0818	0.125	0.0745	0.1682	0.0568	0.1741	0.0409	0.2136	0.0405	0.2	0.04	0.1936	0.046364	0.223	0.0536	0.1991	0.0532	0.1791	0.0473	0.1855	0.0645	0.0991
0.07	0.1045	0.13	0.0809	0.1873	0.0614	0.1864	0.0564	0.2441	0.05	0.2214	0.0459	0.2191	0.058636	0.236	0.0673	0.2473	0.0609	0.1941	0.065	0.2236	0.0755	0.1164
0.08	0.1091	0.1432	0.1009	0.2223	0.0659	0.2073	0.0686	0.2609	0.0618	0.2455	0.0491	0.24	0.068182	0.262	0.0768	0.2664	0.0764	0.2218	0.0764	0.2459	0.085	0.1286
0.09	0.1218	0.1568	0.1127	0.2309	0.0777	0.215	0.0864	0.295	0.0664	0.2564	0.0627	0.2686	0.085	0.278	0.0986	0.2877	0.0914	0.255	0.0982	0.2705	0.0959	0.1468
0.1	0.1227	0.1973	0.1227	0.2341	0.0841	0.2282	0.1032	0.3077	0.0745	0.2832	0.0668	0.2918	0.095455	0.304	0.0986	0.2877	0.0914	0.255	0.1068	0.2773	0.1018	0.1559
0.25	0.3027	0.4186	0.265	0.46	0.255	0.5091	0.2309	0.5241	0.2014	0.515	0.2273	0.555	0.255455	0.538	0.2614	0.5327	0.2482	0.5018	0.2741	0.4677	0.2509	0.355
0.5	0.5459	0.7009	0.5573	0.7532	0.5155	0.7818	0.4795	0.7809	0.4636	0.7877	0.4645	0.7727	0.501364	0.767	0.4777	0.7609	0.4873	0.6977	0.5305	0.7168	0.495	0.6209
0.75	0.7805	0.895	0.7664	0.9155	0.755	0.9241	0.7436	0.9295	0.7114	0.9268	0.725	0.9005	0.749091	0.925	0.7336	0.9191	0.7609	0.8918	0.7614	0.8945	0.7473	0.8386

Table A.26: N=10: Copper, Shielded 1-MFP Th/U Elevated Background, 100 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0.59	0	0.9473	0.0023	0.9841	0	0.9891	0	0.9877	0	0.9932	0.002273	0.988	0.0014	0.9886	0	0.9732	0	0.8468	0.0018	0.2109
0.002	0.0045	0.6968	0.0036	0.9695	0.0036	0.9927	0.0014	0.9918	0	0.9941	0	0.995	0.003182	0.992	0.0018	0.9923	0.0014	0.9895	0	0.8764	0.0027	0.2809
0.003	0.0091	0.7745	0.0036	0.9805	0.005	0.9932	0.0014	0.9936	0	0.9964	0.0032	0.9959	0.004545	0.995	0.0027	0.9977	0.005	0.9895	0	0.8932	0.0045	0.3277
0.004	0.0091	0.8118	0.0036	0.9859	0.0091	0.995	0.0018	0.995	0	0.9991	0.0032	0.9959	0.005	0.995	0.0027	0.9977	0.005	0.9914	0	0.9064	0.005	0.3618
0.005	0.0091	0.8486	0.0036	0.9859	0.0091	0.9982	0.0018	0.9959	0	0.9991	0.0032	0.9959	0.005	0.999	0.0041	0.9977	0.005	0.9936	0	0.92	0.0055	0.3941
0.006	0.0091	0.8664	0.0036	0.9891	0.0105	0.9982	0.0032	0.9977	0.0023	0.9991	0.0032	0.9959	0.005455	0.999	0.0045	0.9986	0.0059	0.9936	0.0036	0.9336	0.0055	0.4118
0.007	0.0091	0.8923	0.0068	0.9895	0.0105	0.9982	0.0032	0.9977	0.0023	0.9991	0.0059	0.9959	0.008182	0.999	0.0055	0.9986	0.0064	0.9941	0.0041	0.9382	0.0059	0.4305
0.008	0.0182	0.9041	0.01	0.9918	0.0105	0.9982	0.0032	0.9977	0.0023	0.9991	0.0068	0.9991	0.008182	0.999	0.0055	1	0.0064	0.9941	0.0059	0.9427	0.0068	0.4527
0.009	0.0182	0.9068	0.01	0.9945	0.0105	0.9982	0.0032	0.9977	0.0023	0.9991	0.0068	0.9991	0.008182	0.999	0.0055	1	0.0068	0.9941	0.0064	0.9427	0.0082	0.4755
0.01	0.0182	0.9123	0.01	0.9945	0.0105	0.9982	0.0032	0.9977	0.0023	0.9991	0.0073	0.9991	0.012273	0.999	0.0136	1	0.0095	0.9941	0.0064	0.9427	0.0086	0.4818
0.02	0.0273	0.9664	0.0209	0.9977	0.015	1	0.0118	1	0.0095	0.9995	0.015	0.9995	0.016818	1	0.0273	1	0.0186	0.9964	0.02	0.9564	0.02	0.5718
0.025	0.0364	0.9709	0.0327	0.9977	0.015	1	0.0132	1	0.015	0.9995	0.0177	1	0.021364	1	0.0295	1	0.0205	0.9977	0.0236	0.9564	0.0255	0.6155
0.03	0.0455	0.9823	0.0418	0.9986	0.0259	1	0.015	1	0.0155	0.9995	0.0223	1	0.026818	1	0.0359	1	0.0227	0.9977	0.0295	0.9609	0.0323	0.6468
0.04	0.0545	0.9864	0.0468	1	0.0336	1	0.0255	1	0.0277	1	0.0323	1	0.032273	1	0.0518	1	0.0291	0.9982	0.0445	0.9695	0.0418	0.6891
0.05	0.0545	0.9886	0.0568	1	0.0409	1	0.0314	1	0.0318	1	0.0377	1	0.05	1	0.055	1	0.0418	0.9982	0.0518	0.9695	0.0518	0.7123
0.06	0.0545	0.9936	0.0768	1	0.0536	1	0.0464	1	0.0441	1	0.0568	1	0.068636	1	0.0682	1	0.0482	0.9982	0.055	0.9727	0.0577	0.7445
0.07	0.0645	0.9945	0.0805	1	0.0645	1	0.0518	1	0.0577	1	0.0709	1	0.075909	1	0.0709	1	0.0605	0.9982	0.0755	0.9773	0.0673	0.7682
0.08	0.0736	0.9982	0.0845	1	0.0809	1	0.0623	1	0.0695	1	0.0741	1	0.089545	1	0.0832	1	0.0786	0.9982	0.0791	0.9773	0.0773	0.7936
0.09	0.0782	0.9982	0.0973	1	0.095	1	0.0705	1	0.0768	1	0.0855	1	0.101364	1	0.0882	1	0.0873	0.9982	0.0864	0.9773	0.0845	0.8091
0.1	0.0873	0.9982	0.1077	1	0.095	1	0.0732	1	0.0768	1	0.0855	1	0.101364	1	0.0959	1	0.0873	0.9982	0.0905	0.9773	0.0968	0.8232
0.25	0.2636	1	0.2518	1	0.2432	1	0.2436	1	0.2205	1	0.2514	1	0.242273	1	0.2645	1	0.2445	1	0.2241	0.9864	0.2527	0.9345
0.5	0.4859	1	0.4618	1	0.4859	1	0.5109	1	0.52	1	0.52	1	0.526364	1	0.5123	1	0.5241	1	0.4741	1	0.5032	0.9841
0.75	0.7673	1	0.7459	1	0.7827	1	0.7582	1	0.7573	1	0.7741	1	0.754545	1	0.7905	1	0.7523	1	0.7155	1	0.7536	0.9973

Table A.27: N=10: Copper, Shielded 1-MFP Th/U Elevated Background, 200 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0291	0	0.1077	0	0.1618	0.0009	0.2123	0.0036	0.1968	0.0023	0.1986	0.000455	0.175	0	0.1973	0.0036	0.1673	0.0036	0.0927	0.0005	0.0155
0.002	0	0.0564	0.0036	0.1795	0	0.2259	0.0009	0.2736	0.0041	0.2564	0.0023	0.2286	0.000455	0.255	0.0023	0.2473	0.0082	0.2123	0.0036	0.1314	0.0027	0.0318
0.003	0.0045	0.0745	0.0036	0.2009	0	0.2636	0.0045	0.3027	0.0041	0.3036	0.0032	0.2927	0.002273	0.297	0.0023	0.3141	0.0086	0.2445	0.0041	0.1577	0.0032	0.04
0.004	0.0045	0.0882	0.0036	0.2341	0.0009	0.3168	0.005	0.3377	0.0073	0.3259	0.0041	0.3545	0.002727	0.32	0.005	0.3305	0.0091	0.2605	0.0055	0.1814	0.0041	0.0464
0.005	0.0045	0.1018	0.0041	0.2614	0.0041	0.3355	0.0059	0.3523	0.0073	0.3595	0.0055	0.3741	0.005909	0.352	0.0073	0.3468	0.0123	0.2795	0.0055	0.1882	0.005	0.0586
0.006	0.0045	0.1127	0.0041	0.2805	0.0041	0.36	0.0073	0.3723	0.0073	0.3859	0.0059	0.4027	0.006364	0.366	0.0077	0.3668	0.0132	0.3132	0.0055	0.1982	0.0064	0.0641
0.007	0.0045	0.1218	0.0041	0.3023	0.0068	0.3791	0.0073	0.3968	0.0073	0.4205	0.0059	0.4027	0.006364	0.389	0.0082	0.3895	0.0168	0.3427	0.0073	0.2218	0.0073	0.0736
0.008	0.0045	0.135	0.0041	0.3105	0.0114	0.4027	0.0073	0.3968	0.0082	0.4318	0.0082	0.4314	0.01	0.412	0.0095	0.4191	0.0168	0.3427	0.0086	0.2395	0.0091	0.0832
0.009	0.0045	0.1423	0.0041	0.3405	0.0114	0.435	0.0082	0.4173	0.0082	0.4318	0.01	0.455	0.01	0.412	0.0095	0.4191	0.0168	0.3586	0.0086	0.2395	0.0095	0.0864
0.01	0.0045	0.1468	0.0059	0.3427	0.0114	0.435	0.0086	0.4323	0.0123	0.4582	0.01	0.455	0.013636	0.448	0.0141	0.4336	0.0168	0.3841	0.01	0.2486	0.0105	0.0973
0.02	0.0273	0.2764	0.0155	0.4364	0.0173	0.5145	0.0214	0.5477	0.0195	0.58	0.0264	0.5532	0.026364	0.567	0.0209	0.5109	0.025	0.4764	0.0241	0.325	0.0218	0.1377
0.025	0.0273	0.2941	0.0214	0.4745	0.0227	0.5318	0.0255	0.5814	0.0291	0.6036	0.0295	0.59	0.028636	0.593	0.0241	0.5418	0.0259	0.5045	0.03	0.3523	0.0264	0.1582
0.03	0.0318	0.3359	0.0332	0.4923	0.0268	0.5655	0.0277	0.6118	0.0345	0.6295	0.0368	0.6073	0.033182	0.627	0.0336	0.5714	0.0345	0.5159	0.03	0.36	0.0341	0.1759
0.04	0.0409	0.3732	0.0468	0.5509	0.0332	0.6114	0.0282	0.665	0.045	0.6786	0.0505	0.6559	0.038636	0.665	0.0436	0.6377	0.0382	0.5686	0.0323	0.4114	0.0427	0.2041
0.05	0.05	0.4414	0.0564	0.6018	0.0359	0.6427	0.0468	0.71	0.0614	0.7164	0.065	0.7109	0.050909	0.686	0.0495	0.6627	0.0541	0.6223	0.0418	0.4505	0.0541	0.2345
0.06	0.0636	0.4691	0.0623	0.6295	0.0564	0.6859	0.0523	0.7273	0.0695	0.7395	0.0709	0.7332	0.065	0.718	0.0618	0.7123	0.0655	0.6359	0.0555	0.4864	0.0618	0.26
0.07	0.0691	0.5105	0.0659	0.655	0.0695	0.7068	0.0582	0.7527	0.0782	0.7614	0.0841	0.7555	0.073182	0.74	0.07	0.73	0.0732	0.6545	0.0632	0.5086	0.0745	0.2823
0.08	0.0873	0.5586	0.0709	0.6691	0.0791	0.7345	0.0655	0.7718	0.0864	0.7805	0.0927	0.785	0.084091	0.763	0.0768	0.7582	0.0836	0.6745	0.0695	0.525	0.0845	0.3032
0.09	0.0964	0.6036	0.0855	0.7141	0.0886	0.7623	0.0714	0.7859	0.0986	0.7977	0.1055	0.8009	0.093636	0.793	0.0832	0.7718	0.0986	0.69	0.0814	0.5355	0.095	0.3227
0.1	0.1005	0.6309	0.0991	0.7314	0.0955	0.7768	0.0959	0.8109	0.1127	0.8141	0.1141	0.8227	0.093636	0.793	0.0945	0.7918	0.1036	0.705	0.0873	0.5573	0.1041	0.3414
0.25	0.2641	0.8341	0.2509	0.8973	0.2341	0.9341	0.2609	0.93	0.2573	0.9332	0.2664	0.9286	0.222727	0.927	0.2282	0.9241	0.2236	0.8605	0.2382	0.7664	0.2545	0.5732
0.5	0.5459	0.96	0.5095	0.9864	0.505	0.9868	0.5114	0.9895	0.5095	0.9882	0.4882	0.9805	0.448636	0.98	0.4614	0.9827	0.5036	0.9623	0.5164	0.9045	0.4941	0.8018
0.75	0.7777	0.9964	0.77	0.9995	0.7405	0.9995	0.74	0.9986	0.7509	0.9986	0.75	1	0.728182	0.997	0.6982	0.9973	0.7491	0.9927	0.7823	0.9773	0.7409	0.9314

Table A.28: N=10: Copper, Shielded 1-MFP Th/U Elevated Background, 300 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0091	0	0.0277	0.0036	0.0182	0.0018	0.0364	0.0018	0.03	0.0018	0.0432	0.001818	0.031	0.0018	0.0386	0.0027	0.025	0.0009	0.0295	0.0005	0.0064
0.002	0	0.0182	0.0018	0.0386	0.0036	0.0427	0.0041	0.0486	0.0059	0.0486	0.0032	0.065	0.005909	0.06	0.0045	0.0609	0.0036	0.0382	0.0036	0.0486	0.0023	0.0127
0.003	0.0045	0.0227	0.0018	0.0409	0.0059	0.0645	0.0041	0.0718	0.0059	0.0677	0.0045	0.0795	0.005909	0.074	0.0082	0.0718	0.0036	0.0536	0.0036	0.0577	0.0032	0.0177
0.004	0.0045	0.0273	0.0018	0.0468	0.0059	0.0723	0.0064	0.0855	0.0064	0.0932	0.0045	0.0873	0.006364	0.086	0.0082	0.0745	0.0036	0.0595	0.0036	0.0591	0.0041	0.0218
0.005	0.0045	0.0273	0.0045	0.0495	0.0059	0.095	0.0064	0.0986	0.0064	0.1118	0.0045	0.1045	0.006818	0.095	0.0082	0.0782	0.0055	0.075	0.0036	0.0809	0.005	0.0255
0.006	0.0045	0.0318	0.0045	0.05	0.0064	0.1095	0.0073	0.1082	0.0068	0.1214	0.0045	0.1168	0.006818	0.107	0.0082	0.0895	0.0064	0.0905	0.0036	0.0918	0.0059	0.0282
0.007	0.0045	0.0318	0.0068	0.0741	0.0082	0.1223	0.0073	0.1182	0.0068	0.1214	0.0059	0.1291	0.007727	0.124	0.0105	0.0986	0.0064	0.0982	0.0036	0.0918	0.0064	0.0305
0.008	0.0045	0.0455	0.0082	0.0786	0.0086	0.1273	0.0082	0.1295	0.0068	0.1405	0.0091	0.1491	0.009545	0.133	0.0109	0.1091	0.0077	0.1164	0.0045	0.1005	0.0086	0.0323
0.009	0.0045	0.05	0.0082	0.0786	0.0086	0.1273	0.0082	0.1295	0.01	0.1509	0.0091	0.1491	0.009545	0.133	0.0109	0.1091	0.0077	0.1164	0.005	0.1068	0.0095	0.0368
0.01	0.0045	0.0614	0.0082	0.0873	0.0086	0.1386	0.0109	0.1409	0.01	0.1509	0.0091	0.1632	0.015	0.152	0.0132	0.1245	0.0082	0.1245	0.0077	0.1123	0.01	0.0386
0.02	0.0227	0.125	0.0177	0.16	0.0168	0.205	0.0205	0.1991	0.0173	0.2045	0.0195	0.2255	0.025455	0.217	0.0218	0.1859	0.0205	0.195	0.0159	0.1536	0.0177	0.0695
0.025	0.0227	0.1436	0.0177	0.2009	0.0191	0.2155	0.0232	0.2536	0.0214	0.2441	0.0223	0.2405	0.025455	0.235	0.0223	0.2005	0.0205	0.2068	0.0209	0.17	0.02	0.0805
0.03	0.0318	0.1664	0.0277	0.215	0.025	0.26	0.0232	0.2895	0.0268	0.2668	0.0268	0.2618	0.030909	0.251	0.0264	0.2323	0.0259	0.25	0.0245	0.1818	0.0264	0.0932
0.04	0.0409	0.1959	0.0309	0.2682	0.0332	0.3	0.0309	0.3191	0.0382	0.3264	0.0368	0.2964	0.041364	0.299	0.0341	0.2741	0.0309	0.3114	0.0318	0.2123	0.0364	0.1186
0.05	0.05	0.2241	0.0405	0.3123	0.0495	0.3323	0.0382	0.3323	0.0441	0.3459	0.0414	0.3236	0.045	0.321	0.0418	0.3386	0.0345	0.3423	0.0368	0.2664	0.0477	0.1359
0.06	0.0618	0.2514	0.0468	0.3341	0.0532	0.3559	0.0536	0.3759	0.0582	0.3764	0.0564	0.3795	0.063636	0.37	0.05	0.3695	0.0464	0.3827	0.0523	0.2941	0.0559	0.1509
0.07	0.0755	0.2745	0.0591	0.3686	0.0673	0.3759	0.0641	0.3886	0.0714	0.3886	0.0641	0.3986	0.072727	0.402	0.0564	0.3932	0.0577	0.3995	0.06	0.315	0.0641	0.1695
0.08	0.0845	0.2791	0.0618	0.385	0.0745	0.4005	0.0677	0.4123	0.0805	0.4191	0.0764	0.4259	0.081818	0.426	0.0645	0.4132	0.0668	0.4109	0.0641	0.3295	0.0764	0.1923
0.09	0.0936	0.3241	0.0718	0.4023	0.0873	0.4232	0.0814	0.4373	0.1018	0.4432	0.0882	0.4509	0.085	0.445	0.0755	0.4414	0.0718	0.4455	0.0714	0.3518	0.0877	0.2032
0.1	0.1027	0.3591	0.0845	0.43	0.0918	0.4477	0.0927	0.4568	0.1177	0.4691	0.0973	0.4709	0.097273	0.482	0.085	0.46	0.085	0.4705	0.0741	0.3818	0.0964	0.2164
0.25	0.205	0.6145	0.2436	0.6759	0.24	0.6805	0.2791	0.6636	0.2445	0.6873	0.2377	0.6923	0.228636	0.714	0.2273	0.6905	0.2236	0.6836	0.2455	0.5664	0.2614	0.4241
0.5	0.4768	0.8291	0.4995	0.8559	0.545	0.8695	0.5323	0.8673	0.5341	0.8745	0.5159	0.8905	0.487727	0.894	0.4659	0.9023	0.4627	0.8641	0.4777	0.7982	0.5064	0.6827
0.75	0.7577	0.945	0.77	0.9655	0.8032	0.9582	0.7868	0.96	0.7609	0.9614	0.7455	0.9732	0.747727	0.977	0.7345	0.9709	0.7536	0.9477	0.7264	0.9336	0.745	0.8841

Table A.29: N=10: Copper, Shielded 1-MFP Th/U Elevated Background, 350 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0	0	0.0064	0.0036	0.0191	0.0027	0.0336	0.0018	0.0391	0.0018	0.0309	0.001364	0.03	0	0.0395	0.0018	0.0327	0.0023	0.0186	0	0.0036
0.002	0	0.0045	0.0014	0.0245	0.0055	0.0268	0.0045	0.0618	0.0027	0.0645	0.0018	0.0464	0.001818	0.049	0.0014	0.07	0.0023	0.045	0.0023	0.0368	0.0009	0.0077
0.003	0	0.0045	0.0014	0.0336	0.0059	0.0382	0.0064	0.0668	0.0027	0.0732	0.0018	0.0623	0.001818	0.078	0.0023	0.0855	0.0032	0.0536	0.0023	0.0432	0.0018	0.0114
0.004	0	0.0045	0.0027	0.0341	0.0059	0.0555	0.0073	0.0741	0.0068	0.0791	0.0023	0.0777	0.001818	0.083	0.0023	0.09	0.0041	0.0609	0.0036	0.0641	0.0023	0.0141
0.005	0	0.0091	0.0059	0.0364	0.0059	0.0714	0.0073	0.0805	0.0095	0.0895	0.0023	0.0868	0.001818	0.093	0.0041	0.0927	0.0041	0.0705	0.0036	0.0668	0.0036	0.0168
0.006	0	0.0227	0.0059	0.0459	0.0059	0.0827	0.0073	0.0859	0.0095	0.0986	0.0036	0.0995	0.001818	0.111	0.0059	0.1032	0.0059	0.0841	0.0041	0.0745	0.005	0.0218
0.007	0	0.0273	0.0091	0.0495	0.0082	0.0895	0.0073	0.1014	0.0095	0.1114	0.0036	0.1127	0.003182	0.124	0.0077	0.1182	0.0073	0.0945	0.0041	0.0777	0.0064	0.0232
0.008	0	0.0273	0.0091	0.0668	0.0082	0.0982	0.0073	0.1182	0.0095	0.1214	0.0036	0.1127	0.003182	0.124	0.0086	0.1277	0.0086	0.1073	0.0077	0.0836	0.0068	0.0264
0.009	0	0.0364	0.0091	0.0791	0.0082	0.0982	0.0073	0.1182	0.0095	0.1214	0.0036	0.1286	0.006818	0.142	0.0086	0.1277	0.01	0.1191	0.0077	0.0836	0.0109	0.0291
0.01	0	0.0364	0.01	0.09	0.0082	0.1168	0.0073	0.1259	0.0095	0.1295	0.0036	0.1286	0.007273	0.158	0.0086	0.1386	0.01	0.1191	0.0077	0.0959	0.0118	0.03
0.02	0.0091	0.0773	0.0173	0.1341	0.0186	0.1886	0.0173	0.1918	0.0168	0.1973	0.01	0.2105	0.018182	0.225	0.0136	0.2086	0.0191	0.1905	0.0173	0.1545	0.0214	0.0595
0.025	0.0136	0.0864	0.0295	0.1427	0.02	0.1959	0.0286	0.2168	0.0195	0.2223	0.0132	0.2359	0.025909	0.235	0.0191	0.235	0.0223	0.2327	0.0195	0.1723	0.0277	0.0673
0.03	0.0182	0.1082	0.0373	0.1586	0.0291	0.2177	0.0314	0.2364	0.0214	0.2318	0.0182	0.2682	0.03	0.255	0.0295	0.2559	0.0273	0.2577	0.0273	0.1991	0.0332	0.0786
0.04	0.0227	0.1332	0.0427	0.1968	0.035	0.2473	0.0414	0.2723	0.0305	0.2977	0.0268	0.3136	0.039545	0.305	0.0341	0.3009	0.0364	0.2905	0.0355	0.2368	0.04	0.1032
0.05	0.0364	0.1605	0.05	0.2486	0.0455	0.3036	0.0491	0.2995	0.0345	0.3386	0.03	0.3509	0.042273	0.328	0.0491	0.3564	0.0473	0.325	0.0582	0.2582	0.0505	0.125
0.06	0.0532	0.2059	0.0573	0.2714	0.0486	0.3214	0.0532	0.3227	0.0405	0.3582	0.0555	0.3877	0.056364	0.393	0.055	0.3727	0.0536	0.3473	0.065	0.2732	0.0609	0.1432
0.07	0.0668	0.2191	0.06	0.3232	0.0605	0.3732	0.0605	0.3564	0.0473	0.3827	0.0618	0.4282	0.065455	0.422	0.0591	0.4068	0.0609	0.3645	0.0791	0.3041	0.0727	0.1582
0.08	0.0986	0.2423	0.0614	0.345	0.0682	0.3968	0.0668	0.3695	0.0568	0.4086	0.0668	0.4545	0.073182	0.452	0.0709	0.4573	0.0764	0.3891	0.0945	0.3136	0.0827	0.1777
0.09	0.1077	0.2559	0.0755	0.3718	0.0732	0.4168	0.0777	0.3936	0.0623	0.4282	0.0827	0.4755	0.082727	0.496	0.0709	0.4573	0.0914	0.4077	0.1041	0.3305	0.0909	0.1955
0.1	0.1214	0.2691	0.1023	0.4045	0.0805	0.4332	0.0895	0.4382	0.0709	0.4605	0.0918	0.5114	0.101364	0.53	0.0841	0.4773	0.0982	0.4377	0.1214	0.3541	0.1032	0.2185
0.25	0.2677	0.5332	0.2455	0.645	0.2718	0.6691	0.2559	0.7	0.2191	0.7155	0.2286	0.7364	0.245455	0.731	0.2314	0.6641	0.2564	0.63	0.2727	0.5768	0.2491	0.4155
0.5	0.5395	0.7918	0.5227	0.8673	0.4991	0.8709	0.4877	0.9055	0.4995	0.8927	0.495	0.8991	0.503182	0.89	0.5059	0.8741	0.4877	0.8614	0.5432	0.815	0.5023	0.6923
0.75	0.7732	0.9459	0.7673	0.9641	0.7536	0.9723	0.7577	0.9759	0.7545	0.9755	0.7468	0.9814	0.748636	0.976	0.74	0.9673	0.6886	0.9541	0.7709	0.9168	0.7536	0.8764

Table A.30: N=10: Copper, Shielded 1-MFP Th/U Elevated Background, 400 cm, false positive and true positive detection rates for n=1...10

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0045	0	0	0	0	0.0032	0.0014	0.0059	0	0.0136	0	0.0155	0	0.016	0.0005	0.0132	0	0.0105	0.0005	0.0059	0.0005	0.0018
0.002	0.0045	0.0045	0	0.0073	0	0.0059	0.0014	0.0127	0	0.0245	0	0.0227	0	0.027	0.0009	0.0209	0.0009	0.0182	0.0005	0.0145	0.0018	0.0032
0.003	0.0045	0.0091	0	0.0109	0	0.0095	0.0023	0.0223	0	0.0359	0	0.0327	0.001364	0.031	0.0023	0.0286	0.0009	0.0245	0.0032	0.0236	0.0027	0.0036
0.004	0.0045	0.0091	0.0055	0.015	0	0.0095	0.0023	0.0291	0	0.0382	0	0.0355	0.003636	0.033	0.0027	0.0309	0.0032	0.0286	0.0045	0.0364	0.0064	0.005
0.005	0.0045	0.0091	0.0091	0.0182	0.0023	0.0109	0.0036	0.0332	0	0.0436	0	0.0414	0.003636	0.037	0.0027	0.0423	0.0041	0.035	0.0055	0.0436	0.0082	0.0073
0.006	0.0045	0.0182	0.0132	0.0209	0.0041	0.0109	0.0036	0.0391	0.0005	0.0468	0	0.0523	0.003636	0.04	0.0027	0.0423	0.0045	0.0386	0.0073	0.0491	0.0082	0.0095
0.007	0.0045	0.0182	0.0132	0.0209	0.0055	0.0145	0.0036	0.0423	0.0005	0.0514	0.0009	0.0686	0.005455	0.049	0.0027	0.0459	0.0045	0.0386	0.0073	0.0541	0.0105	0.0109
0.008	0.0045	0.0182	0.0132	0.0236	0.0082	0.0282	0.0036	0.0495	0.0005	0.0555	0.0009	0.0686	0.006364	0.061	0.0036	0.0486	0.0068	0.0414	0.0073	0.0573	0.0109	0.0168
0.009	0.0045	0.0182	0.0132	0.0236	0.0091	0.0441	0.0041	0.055	0.0005	0.0632	0.0014	0.0786	0.006364	0.061	0.0036	0.0645	0.0091	0.0514	0.0095	0.0632	0.0114	0.0173
0.01	0.0045	0.0182	0.0132	0.0327	0.0091	0.0441	0.0041	0.055	0.0005	0.0632	0.0018	0.0818	0.008182	0.064	0.0036	0.0645	0.0091	0.0514	0.0095	0.0632	0.0127	0.0191
0.02	0.0182	0.0318	0.0173	0.0591	0.0136	0.0873	0.0064	0.1009	0.0064	0.1091	0.0123	0.1114	0.014545	0.106	0.0145	0.1005	0.0164	0.0823	0.0182	0.0959	0.0259	0.0341
0.025	0.0182	0.0364	0.025	0.0695	0.0205	0.1027	0.0086	0.1168	0.0159	0.1205	0.0132	0.1218	0.018182	0.12	0.0191	0.1155	0.0291	0.1105	0.0186	0.0995	0.0314	0.0423
0.03	0.0273	0.0364	0.0323	0.0809	0.0268	0.1223	0.0164	0.1386	0.0159	0.1414	0.0145	0.1345	0.019545	0.132	0.0318	0.1368	0.03	0.135	0.0232	0.1195	0.0341	0.0527
0.04	0.0636	0.05	0.0505	0.1077	0.0386	0.1482	0.0227	0.1541	0.0268	0.1795	0.0309	0.1636	0.024545	0.155	0.0418	0.1618	0.0405	0.165	0.0273	0.1355	0.0455	0.0645
0.05	0.0818	0.07	0.0595	0.1227	0.0414	0.1655	0.0341	0.1818	0.0305	0.1932	0.0359	0.1914	0.035909	0.195	0.0477	0.1782	0.0491	0.1859	0.0405	0.1514	0.0545	0.0882
0.06	0.0818	0.09	0.0745	0.1464	0.0568	0.1914	0.0409	0.2	0.0405	0.2227	0.04	0.2155	0.046364	0.21	0.0536	0.1955	0.0532	0.2077	0.0473	0.1673	0.0645	0.1064
0.07	0.1045	0.1018	0.0809	0.1723	0.0614	0.2095	0.0564	0.2395	0.05	0.2309	0.0459	0.2291	0.058636	0.24	0.0673	0.2464	0.0609	0.2241	0.065	0.2059	0.0755	0.1227
0.08	0.1091	0.1573	0.1009	0.2345	0.0659	0.2295	0.0686	0.2568	0.0618	0.2532	0.0491	0.2491	0.068182	0.263	0.0768	0.2641	0.0764	0.2468	0.0764	0.2277	0.085	0.1332
0.09	0.1218	0.1668	0.1127	0.2473	0.0777	0.2536	0.0864	0.2727	0.0664	0.2714	0.0627	0.2705	0.085	0.281	0.0986	0.2905	0.0914	0.2995	0.0982	0.2532	0.0959	0.1505
0.1	0.1227	0.1832	0.1227	0.2718	0.0841	0.2723	0.1032	0.2945	0.0745	0.2823	0.0668	0.2877	0.095455	0.308	0.0986	0.2905	0.0914	0.2995	0.1068	0.2705	0.1018	0.16
0.25	0.3027	0.3918	0.265	0.4614	0.255	0.4927	0.2309	0.5023	0.2014	0.5068	0.2273	0.5527	0.255455	0.543	0.2614	0.5432	0.2482	0.5045	0.2741	0.4664	0.2509	0.3509
0.5	0.5459	0.7005	0.5573	0.7245	0.5155	0.7327	0.4795	0.7705	0.4636	0.7723	0.4645	0.79	0.501364	0.806	0.4777	0.7991	0.4873	0.7677	0.5305	0.7423	0.495	0.62
0.75	0.7805	0.8855	0.7664	0.8968	0.755	0.9268	0.7436	0.9241	0.7114	0.9309	0.725	0.9336	0.749091	0.941	0.7336	0.9341	0.7609	0.9205	0.7614	0.9023	0.7473	0.8441

Appendix B

N=7

Table B.1: N=7: Normal Background Conditions, 100 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.9995	0.0032	1	0	1	0	1	0.0014	1	0.0009	1	0	1							0.0005	0.8555
0.002	0	1	0.0055	1	0	1	0.0005	1	0.0023	1	0.0027	1	0	1							0.0018	0.8918
0.003	0.0032	1	0.0055	1	0.0009	1	0.0055	1	0.0027	1	0.0032	1	0	1							0.0036	0.9191
0.004	0.0032	1	0.0055	1	0.0018	1	0.0073	1	0.0032	1	0.0036	1	0.000909	1							0.0041	0.9291
0.005	0.0032	1	0.0077	1	0.0027	1	0.0091	1	0.0041	1	0.0045	1	0.001364	1							0.0045	0.9423
0.006	0.0032	1	0.0077	1	0.0027	1	0.0091	1	0.0055	1	0.0055	1	0.001818	1							0.0068	0.9505
0.007	0.0032	1	0.0114	1	0.0055	1	0.0109	1	0.0055	1	0.0055	1	0.001818	1							0.0068	0.955
0.008	0.0032	1	0.0114	1	0.0055	1	0.0145	1	0.0064	1	0.0064	1	0.001818	1							0.0077	0.9582
0.009	0.0064	1	0.0114	1	0.0086	1	0.0145	1	0.0064	1	0.0064	1	0.004091	1							0.01	0.9605
0.01	0.0064	1	0.0191	1	0.0086	1	0.0177	1	0.0091	1	0.0109	1	0.004091	1							0.0109	0.9623
0.02	0.0223	1	0.0255	1	0.0255	1	0.0282	1	0.0232	1	0.0155	1	0.014545	1							0.0209	0.9805
0.025	0.0255	1	0.0259	1	0.0309	1	0.0341	1	0.0273	1	0.0182	1	0.018182	1							0.0282	0.9855
0.03	0.0318	1	0.0286	1	0.035	1	0.0382	1	0.035	1	0.0223	1	0.02	1							0.0318	0.9873
0.04	0.0414	1	0.0395	1	0.0486	1	0.0482	1	0.0386	1	0.0327	1	0.030909	1							0.0418	0.9909
0.05	0.0445	1	0.0532	1	0.0536	1	0.0591	1	0.0505	1	0.0414	1	0.036364	1							0.0509	0.9936
0.06	0.0645	1	0.0636	1	0.0664	1	0.0705	1	0.0586	1	0.05	1	0.040909	1							0.0609	0.9955
0.07	0.0773	1	0.0727	1	0.08	1	0.0805	1	0.0705	1	0.0659	1	0.054545	1							0.0691	0.9964
0.08	0.0836	1	0.0841	1	0.09	1	0.0932	1	0.0705	1	0.0773	1	0.065	1							0.0809	0.9973
0.09	0.0932	1	0.0964	1	0.1059	1	0.0932	1	0.0818	1	0.0773	1	0.070909	1							0.095	0.9977
0.1	0.0995	1	0.1068	1	0.125	1	0.1073	1	0.095	1	0.095	1	0.080909	1							0.1023	0.9977
0.25	0.2641	1	0.2495	1	0.2591	1	0.2345	1	0.24	1	0.2527	1	0.280909	1							0.2545	0.9995
0.5	0.4955	1	0.515	1	0.4986	1	0.4786	1	0.4868	1	0.4918	1	0.515	1							0.4918	1
0.75	0.7595	1	0.7595	1	0.745	1	0.7359	1	0.7405	1	0.7273	1	0.762727	1							0.7423	1

Table B.2: N=7: Normal Background Conditions, 200 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0.0495	0.0014	0.1373	0	0.2441	0.0023	0.2814	0.0009	0.2932	0.0005	0.2905	0.000909	0.216							0.0018	0.03
0.002	0.0032	0.0859	0.0014	0.1777	0.0009	0.2955	0.0032	0.3786	0.0018	0.3827	0.0005	0.3364	0.000909	0.279							0.0027	0.0482
0.003	0.0064	0.1259	0.0041	0.2218	0.0009	0.3405	0.0032	0.4132	0.0032	0.4518	0.0005	0.4036	0.000909	0.304							0.0036	0.0591
0.004	0.0095	0.1332	0.0041	0.2927	0.0009	0.3809	0.0032	0.4564	0.0036	0.4855	0.0018	0.4345	0.001364	0.318							0.0041	0.0718
0.005	0.0095	0.165	0.0059	0.3159	0.0009	0.4118	0.0045	0.4905	0.0036	0.5168	0.0027	0.4605	0.002727	0.343							0.0045	0.0809
0.006	0.0095	0.1832	0.0059	0.3441	0.0009	0.4118	0.0055	0.5168	0.0036	0.5168	0.0027	0.485	0.003182	0.362							0.0055	0.0886
0.007	0.0127	0.1927	0.0073	0.3809	0.0009	0.4541	0.0077	0.5518	0.0045	0.5536	0.0027	0.485	0.003182	0.396							0.0082	0.0959
0.008	0.0127	0.205	0.0086	0.41	0.0023	0.4936	0.0077	0.5518	0.0055	0.5791	0.0059	0.5145	0.003636	0.431							0.0082	0.1023
0.009	0.0127	0.2114	0.0086	0.41	0.0023	0.4936	0.0109	0.585	0.0055	0.5791	0.0059	0.5145	0.003636	0.431							0.01	0.1086
0.01	0.0127	0.2245	0.0086	0.4414	0.0059	0.5264	0.0109	0.585	0.0077	0.6045	0.0073	0.5455	0.003636	0.459							0.0114	0.1132
0.02	0.0255	0.3423	0.0141	0.5432	0.02	0.6409	0.0182	0.6891	0.0132	0.7014	0.01	0.6486	0.010909	0.524							0.0259	0.1927
0.025	0.0255	0.3786	0.0173	0.5741	0.0273	0.7005	0.0186	0.725	0.0145	0.7227	0.0123	0.6795	0.015	0.54							0.03	0.2141
0.03	0.0286	0.4041	0.0282	0.6218	0.0291	0.7245	0.0241	0.7482	0.0182	0.7436	0.0159	0.7064	0.016818	0.564							0.0341	0.2309
0.04	0.0368	0.465	0.0355	0.6718	0.0336	0.7495	0.0277	0.7759	0.0264	0.7664	0.0291	0.7477	0.022273	0.605							0.0414	0.2695
0.05	0.0559	0.5009	0.0386	0.6968	0.0459	0.7877	0.0441	0.8209	0.0432	0.8077	0.0355	0.7609	0.038636	0.65							0.0495	0.3036
0.06	0.0686	0.5436	0.0405	0.7305	0.0564	0.8182	0.0545	0.8382	0.0482	0.8309	0.0414	0.7836	0.041818	0.669							0.0609	0.3495
0.07	0.0786	0.5832	0.0659	0.7882	0.0664	0.8355	0.0664	0.8568	0.0564	0.8432	0.0491	0.805	0.061818	0.704							0.0745	0.3791
0.08	0.0914	0.6214	0.0914	0.8127	0.0745	0.8532	0.075	0.8764	0.0677	0.8664	0.0564	0.8159	0.069545	0.725							0.0864	0.4123
0.09	0.1009	0.6505	0.0914	0.8127	0.0786	0.8709	0.075	0.8764	0.0677	0.8664	0.0664	0.8327	0.077727	0.743							0.0941	0.425
0.1	0.1136	0.6877	0.1077	0.8368	0.0786	0.8709	0.0791	0.8918	0.0768	0.8827	0.09	0.8505	0.096818	0.763							0.1036	0.4568
0.25	0.2764	0.8868	0.2455	0.9505	0.2559	0.9614	0.2259	0.9568	0.2141	0.9636	0.2168	0.9391	0.245	0.877							0.2559	0.6905
0.5	0.5282	0.9809	0.5045	0.9895	0.4936	0.9918	0.4664	0.9941	0.5059	0.9936	0.4764	0.9827	0.502727	0.955							0.4882	0.8755
0.75	0.755	0.9973	0.7727	0.9995	0.7464	1	0.7577	0.9995	0.7432	0.9995	0.7559	1	0.76	0.978							0.745	0.9677

Table B.3: N=7: Normal Background Conditions, 400 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0032	0	0.0041	0.0009	0.0018	0	0.0045	0.0005	0.0027	0.0005	0.0077	0.000455	0.007							0.0014	0.0018
0.002	0.0032	0.0064	0	0.0118	0.0009	0.0059	0.0023	0.0095	0.0018	0.01	0.0014	0.0159	0.000909	0.013							0.0027	0.0059
0.003	0.0032	0.0127	0	0.0141	0.0009	0.0136	0.0023	0.015	0.0018	0.0123	0.0014	0.0173	0.001818	0.014							0.0032	0.0073
0.004	0.0032	0.0127	0.0064	0.0141	0.0018	0.0145	0.0023	0.0168	0.0045	0.0314	0.0014	0.0209	0.003182	0.016							0.0045	0.01
0.005	0.0032	0.0127	0.0073	0.0168	0.0018	0.0164	0.0023	0.0218	0.0045	0.0314	0.0027	0.0227	0.005455	0.023							0.0055	0.0127
0.006	0.0064	0.0127	0.0073	0.0182	0.0032	0.0182	0.0045	0.0245	0.0045	0.0345	0.0036	0.0273	0.005455	0.023							0.0059	0.0141
0.007	0.0095	0.0127	0.0073	0.0182	0.0032	0.0182	0.0059	0.0282	0.0055	0.0405	0.005	0.0395	0.006364	0.026							0.0068	0.0182
0.008	0.0095	0.0127	0.0073	0.0236	0.0068	0.0218	0.0059	0.0282	0.0055	0.0405	0.005	0.0395	0.006364	0.032							0.0073	0.0191
0.009	0.0095	0.0127	0.0118	0.03	0.0077	0.025	0.0073	0.0359	0.0095	0.0455	0.0077	0.0436	0.006364	0.032							0.0077	0.0218
0.01	0.0127	0.0191	0.0118	0.03	0.0077	0.025	0.0073	0.0359	0.0095	0.0455	0.0077	0.0436	0.007727	0.041							0.0095	0.0255
0.02	0.0223	0.0509	0.0191	0.0586	0.02	0.0714	0.0205	0.0864	0.0159	0.0823	0.0159	0.0605	0.018636	0.065							0.0218	0.0436
0.025	0.0286	0.0605	0.0286	0.0836	0.0214	0.0895	0.0236	0.1036	0.0223	0.1127	0.0218	0.0836	0.023636	0.097							0.0264	0.05
0.03	0.0318	0.07	0.0368	0.0936	0.0268	0.1045	0.0309	0.12	0.0223	0.1127	0.0318	0.0959	0.027727	0.113							0.0318	0.0595
0.04	0.0414	0.0973	0.0459	0.1259	0.0291	0.1273	0.0414	0.1391	0.0364	0.1468	0.035	0.1118	0.039091	0.134							0.045	0.0791
0.05	0.0477	0.1232	0.0509	0.145	0.0532	0.1655	0.0459	0.155	0.0477	0.1736	0.0445	0.1359	0.046818	0.155							0.0536	0.1009
0.06	0.0541	0.1436	0.0636	0.1905	0.0636	0.1891	0.0577	0.1755	0.06	0.1909	0.0609	0.1614	0.053182	0.178							0.0618	0.1159
0.07	0.0668	0.1664	0.0795	0.2123	0.075	0.2227	0.0705	0.205	0.0664	0.2095	0.0736	0.1864	0.061364	0.195							0.0723	0.1282
0.08	0.0986	0.1991	0.0918	0.2277	0.0845	0.2518	0.0859	0.2309	0.0759	0.2445	0.0859	0.2145	0.070909	0.225							0.0841	0.1459
0.09	0.105	0.2086	0.1009	0.2509	0.0845	0.2518	0.0982	0.2573	0.0909	0.2623	0.1009	0.2441	0.081364	0.246							0.0877	0.1564
0.1	0.1209	0.2214	0.1009	0.2509	0.0995	0.2818	0.1123	0.2818	0.0909	0.2623	0.1091	0.2655	0.099545	0.27							0.1023	0.1777
0.25	0.2773	0.4536	0.2677	0.5182	0.2614	0.5236	0.2732	0.5473	0.2623	0.5305	0.2405	0.4741	0.243182	0.45							0.2423	0.3564
0.5	0.495	0.7436	0.5	0.7655	0.5218	0.7918	0.4841	0.7773	0.5041	0.7591	0.4909	0.7386	0.490455	0.681							0.4982	0.6305
0.75	0.7264	0.9036	0.7468	0.9291	0.7509	0.9291	0.7664	0.9159	0.7555	0.9018	0.7673	0.9127	0.756818	0.855							0.7495	0.8382

Table B.4: N=7: Th/U Elevated Background, 100 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0.91	0.0023	0.9964	0.0009	0.9991	0	0.9995	0	0.9991	0.0014	0.9927	0	0.959							0.0018	0.4791
0.002	0.0064	0.9586	0.0023	0.9995	0.0023	1	0	1	0	0.9991	0.0023	0.9977	0.001364	0.965							0.0027	0.5614
0.003	0.0064	0.9709	0.0023	1	0.0023	1	0	1	0.0027	1	0.0032	0.9991	0.001818	0.975							0.0045	0.61
0.004	0.0064	0.9782	0.005	1	0.0023	1	0.0014	1	0.0036	1	0.005	0.9991	0.002273	0.975							0.005	0.6414
0.005	0.0064	0.985	0.005	1	0.0023	1	0.0014	1	0.0041	1	0.0064	0.9991	0.002273	0.978							0.0055	0.6655
0.006	0.0127	0.9868	0.0055	1	0.005	1	0.0014	1	0.005	1	0.0064	0.9991	0.002273	0.981							0.0055	0.685
0.007	0.0127	0.9877	0.0077	1	0.005	1	0.0014	1	0.005	1	0.0064	0.9991	0.002273	0.987							0.0059	0.7009
0.008	0.0127	0.9909	0.01	1	0.005	1	0.0032	1	0.005	1	0.0064	0.9991	0.002273	0.987							0.0068	0.7209
0.009	0.0159	0.9909	0.01	1	0.0082	1	0.0032	1	0.005	1	0.0068	0.9991	0.004545	0.987							0.0082	0.7418
0.01	0.0191	0.9945	0.0109	1	0.0082	1	0.0032	1	0.0064	1	0.0082	0.9991	0.004545	0.987							0.0086	0.7495
0.02	0.0286	0.9968	0.0259	1	0.0127	1	0.0127	1	0.0159	1	0.0164	1	0.008182	0.99							0.02	0.8214
0.025	0.0318	0.9982	0.0327	1	0.0205	1	0.0164	1	0.0218	1	0.0273	1	0.010455	0.99							0.0255	0.8482
0.03	0.0382	0.9982	0.04	1	0.0291	1	0.0182	1	0.025	1	0.0314	1	0.018636	0.997							0.0323	0.8641
0.04	0.0382	1	0.0486	1	0.0332	1	0.0291	1	0.0364	1	0.0405	1	0.031818	0.997							0.0418	0.8864
0.05	0.0455	1	0.055	1	0.0377	1	0.0359	1	0.0455	1	0.0509	1	0.045	0.997							0.0518	0.9032
0.06	0.055	1	0.0623	1	0.0464	1	0.0427	1	0.0573	1	0.0623	1	0.051364	0.997							0.0577	0.9173
0.07	0.0614	1	0.0695	1	0.0559	1	0.0523	1	0.0682	1	0.0714	1	0.075455	0.997							0.0673	0.9273
0.08	0.0645	1	0.0777	1	0.0632	1	0.0677	1	0.0727	1	0.0736	1	0.080455	1							0.0773	0.9386
0.09	0.0659	1	0.0873	1	0.0705	1	0.0745	1	0.0891	1	0.0836	1	0.090455	1							0.0845	0.9468
0.1	0.0873	1	0.1018	1	0.075	1	0.0868	1	0.0964	1	0.0886	1	0.108182	1							0.0968	0.9527
0.25	0.2505	1	0.2282	1	0.2255	1	0.2368	1	0.2518	1	0.2341	1	0.245909	1							0.2527	0.9845
0.5	0.4905	1	0.4836	1	0.4864	1	0.5009	1	0.5223	1	0.4936	1	0.472273	1							0.5032	0.9982
0.75	0.7586	1	0.7732	1	0.7682	1	0.7559	1	0.7523	1	0.7641	1	0.747727	1							0.7536	1

Table B.5: N=7: Th/U Elevated Background, 200 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0	0	0	0	0.0014	0	0.0036	0	0.0041	0	0.0082	0.000455	0.005							0.0005	0.0009
0.002	0.0032	0.0032	0.0018	0.0041	0.0009	0.0055	0	0.0064	0	0.0118	0.0009	0.0091	0.001364	0.005							0.0018	0.0027
0.003	0.0032	0.0032	0.0068	0.0064	0.0027	0.01	0	0.0082	0	0.0177	0.0014	0.0123	0.003636	0.008							0.0027	0.005
0.004	0.0032	0.0032	0.0068	0.0064	0.0027	0.0132	0	0.0136	0	0.0209	0.0018	0.0123	0.004545	0.009							0.0064	0.0059
0.005	0.0032	0.0032	0.0068	0.0077	0.0027	0.0132	0	0.0159	0.0005	0.0273	0.0018	0.0168	0.006364	0.015							0.0082	0.0086
0.006	0.0032	0.0032	0.0068	0.0095	0.0027	0.0136	0.0023	0.0227	0.0005	0.0291	0.0032	0.0209	0.006364	0.015							0.0082	0.0091
0.007	0.0032	0.0064	0.0077	0.0095	0.0041	0.0159	0.0023	0.0227	0.0005	0.0314	0.0036	0.0245	0.007727	0.017							0.0105	0.01
0.008	0.0095	0.0095	0.0082	0.0095	0.0055	0.0182	0.0023	0.0268	0.0014	0.0345	0.005	0.0286	0.007727	0.022							0.0109	0.0123
0.009	0.0095	0.0127	0.0082	0.0132	0.0068	0.02	0.0023	0.0305	0.0014	0.0345	0.005	0.0286	0.009545	0.025							0.0114	0.0136
0.01	0.0127	0.0159	0.0082	0.0182	0.0082	0.0241	0.0032	0.0327	0.0014	0.0391	0.0059	0.0327	0.009545	0.025							0.0127	0.0155
0.02	0.0191	0.035	0.0218	0.04	0.015	0.0409	0.0059	0.0586	0.0136	0.0591	0.0155	0.0586	0.020909	0.054							0.0259	0.0273
0.025	0.0318	0.035	0.0255	0.0477	0.0191	0.0627	0.0136	0.0791	0.0182	0.0677	0.0182	0.0641	0.025455	0.064							0.0314	0.0355
0.03	0.0509	0.0445	0.0336	0.0609	0.0195	0.0668	0.0173	0.09	0.0205	0.07	0.0295	0.0714	0.029545	0.077							0.0341	0.0427
0.04	0.0573	0.0636	0.0445	0.0714	0.0273	0.0977	0.0282	0.1068	0.0305	0.1073	0.0418	0.0827	0.034545	0.091							0.0455	0.0536
0.05	0.0732	0.0818	0.0559	0.0982	0.035	0.1082	0.0355	0.1273	0.0309	0.1186	0.0518	0.1218	0.046818	0.101							0.0545	0.0664
0.06	0.0795	0.0945	0.0568	0.1082	0.0468	0.125	0.0414	0.1432	0.0409	0.1509	0.0582	0.1336	0.055	0.117							0.0645	0.0814
0.07	0.0873	0.1041	0.07	0.1282	0.0618	0.1473	0.0486	0.1523	0.0477	0.1686	0.0668	0.1718	0.060455	0.135							0.0755	0.0927
0.08	0.095	0.1177	0.0732	0.1368	0.0705	0.1682	0.0623	0.1759	0.0627	0.1927	0.0795	0.1864	0.066364	0.143							0.085	0.1018
0.09	0.1077	0.1273	0.095	0.1618	0.0841	0.1827	0.0709	0.1955	0.0736	0.2123	0.0868	0.2009	0.069545	0.16							0.0959	0.1182
0.1	0.1205	0.1514	0.1055	0.1741	0.09	0.2009	0.0805	0.2109	0.0832	0.2232	0.1018	0.2168	0.078182	0.187							0.1018	0.1305
0.25	0.295	0.3309	0.2686	0.3709	0.2436	0.3936	0.2091	0.4327	0.2241	0.4264	0.2395	0.4027	0.259091	0.405							0.2509	0.3186
0.5	0.5336	0.5836	0.5182	0.6223	0.4968	0.6655	0.4891	0.6786	0.5023	0.6655	0.47	0.6414	0.517273	0.626							0.495	0.5859
0.75	0.7673	0.8359	0.7514	0.85	0.7364	0.8495	0.7159	0.8555	0.7486	0.8436	0.7595	0.8409	0.752273	0.854							0.7473	0.8041

Table B.6: N=7: Th/U Elevated Background, 400 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0	0	0	0	0.0014	0	0.0036	0	0.0041	0	0.0082	0.000455	0.005							0.0005	0.0009
0.002	0.0032	0.0032	0.0018	0.0041	0.0009	0.0055	0	0.0064	0	0.0118	0.0009	0.0091	0.001364	0.005							0.0018	0.0027
0.003	0.0032	0.0032	0.0068	0.0064	0.0027	0.01	0	0.0082	0	0.0177	0.0014	0.0123	0.003636	0.008							0.0027	0.005
0.004	0.0032	0.0032	0.0068	0.0064	0.0027	0.0132	0	0.0136	0	0.0209	0.0018	0.0123	0.004545	0.009							0.0064	0.0059
0.005	0.0032	0.0032	0.0068	0.0077	0.0027	0.0132	0	0.0159	0.0005	0.0273	0.0018	0.0168	0.006364	0.015							0.0082	0.0086
0.006	0.0032	0.0032	0.0068	0.0095	0.0027	0.0136	0.0023	0.0227	0.0005	0.0291	0.0032	0.0209	0.006364	0.015							0.0082	0.0091
0.007	0.0032	0.0064	0.0077	0.0095	0.0041	0.0159	0.0023	0.0227	0.0005	0.0314	0.0036	0.0245	0.007727	0.017							0.0105	0.01
0.008	0.0095	0.0095	0.0082	0.0095	0.0055	0.0182	0.0023	0.0268	0.0014	0.0345	0.005	0.0286	0.007727	0.022							0.0109	0.0123
0.009	0.0095	0.0127	0.0082	0.0132	0.0068	0.02	0.0023	0.0305	0.0014	0.0345	0.005	0.0286	0.009545	0.025							0.0114	0.0136
0.01	0.0127	0.0159	0.0082	0.0182	0.0082	0.0241	0.0032	0.0327	0.0014	0.0391	0.0059	0.0327	0.009545	0.025							0.0127	0.0155
0.02	0.0191	0.035	0.0218	0.04	0.015	0.0409	0.0059	0.0586	0.0136	0.0591	0.0155	0.0586	0.020909	0.054							0.0259	0.0273
0.025	0.0318	0.035	0.0255	0.0477	0.0191	0.0627	0.0136	0.0791	0.0182	0.0677	0.0182	0.0641	0.025455	0.064							0.0314	0.0355
0.03	0.0509	0.0445	0.0336	0.0609	0.0195	0.0668	0.0173	0.09	0.0205	0.07	0.0295	0.0714	0.029545	0.077							0.0341	0.0427
0.04	0.0573	0.0636	0.0445	0.0714	0.0273	0.0977	0.0282	0.1068	0.0305	0.1073	0.0418	0.0827	0.034545	0.091							0.0455	0.0536
0.05	0.0732	0.0818	0.0559	0.0982	0.035	0.1082	0.0355	0.1273	0.0309	0.1186	0.0518	0.1218	0.046818	0.101							0.0545	0.0664
0.06	0.0795	0.0945	0.0568	0.1082	0.0468	0.125	0.0414	0.1432	0.0409	0.1509	0.0582	0.1336	0.055	0.117							0.0645	0.0814
0.07	0.0873	0.1041	0.07	0.1282	0.0618	0.1473	0.0486	0.1523	0.0477	0.1686	0.0668	0.1718	0.060455	0.135							0.0755	0.0927
0.08	0.095	0.1177	0.0732	0.1368	0.0705	0.1682	0.0623	0.1759	0.0627	0.1927	0.0795	0.1864	0.066364	0.143							0.085	0.1018
0.09	0.1077	0.1273	0.095	0.1618	0.0841	0.1827	0.0709	0.1955	0.0736	0.2123	0.0868	0.2009	0.069545	0.16							0.0959	0.1182
0.1	0.1205	0.1514	0.1055	0.1741	0.09	0.2009	0.0805	0.2109	0.0832	0.2232	0.1018	0.2168	0.078182	0.187							0.1018	0.1305
0.25	0.295	0.3309	0.2686	0.3709	0.2436	0.3936	0.2091	0.4327	0.2241	0.4264	0.2395	0.4027	0.259091	0.405							0.2509	0.3186
0.5	0.5336	0.5836	0.5182	0.6223	0.4968	0.6655	0.4891	0.6786	0.5023	0.6655	0.47	0.6414	0.517273	0.626							0.495	0.5859
0.75	0.7673	0.8359	0.7514	0.85	0.7364	0.8495	0.7159	0.8555	0.7486	0.8436	0.7595	0.8409	0.752273	0.854							0.7473	0.8041

Table B.7: N=7: Cesium Elevated Background, 100 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	1	0	1	0.0014	1	0	1	0	1	0	1	0	1							0.0018	0.89
0.002	0.0032	1	0	1	0.0023	1	0.0005	1	0	1	0.0023	1	0.002273	1							0.0032	0.9223
0.003	0.0064	1	0.0009	1	0.0023	1	0.0005	1	0.0018	1	0.0023	1	0.004545	1							0.0032	0.9359
0.004	0.0064	1	0.0036	1	0.0023	1	0.0045	1	0.0027	1	0.0032	1	0.005	1							0.0041	0.9459
0.005	0.0064	1	0.0055	1	0.0036	1	0.0045	1	0.0027	1	0.0032	1	0.005909	1							0.0041	0.9536
0.006	0.0064	1	0.0091	1	0.0045	1	0.0045	1	0.0027	1	0.0036	1	0.005909	1							0.0055	0.9568
0.007	0.0127	1	0.0114	1	0.0045	1	0.0055	1	0.0027	1	0.0036	1	0.005909	1							0.0077	0.9627
0.008	0.0127	1	0.0123	1	0.0055	1	0.0059	1	0.0027	1	0.0045	1	0.007727	1							0.0082	0.9664
0.009	0.0127	1	0.0123	1	0.0055	1	0.0059	1	0.0027	1	0.0045	1	0.008182	1							0.0095	0.9682
0.01	0.0127	1	0.0123	1	0.0055	1	0.0064	1	0.0027	1	0.005	1	0.008182	1							0.0127	0.9755
0.02	0.0223	1	0.0255	1	0.0186	1	0.0118	1	0.0159	1	0.0109	1	0.024545	1							0.0264	0.9845
0.025	0.0255	1	0.0309	1	0.025	1	0.015	1	0.0186	1	0.0205	1	0.032727	1							0.0336	0.9886
0.03	0.0286	1	0.0382	1	0.0295	1	0.0186	1	0.0241	1	0.0259	1	0.039091	1							0.0373	0.9905
0.04	0.0382	1	0.0445	1	0.0386	1	0.0268	1	0.0282	1	0.0314	1	0.045909	1							0.0445	0.9932
0.05	0.0541	1	0.0559	1	0.0427	1	0.0305	1	0.0391	1	0.0445	1	0.060455	1							0.05	0.9941
0.06	0.0668	1	0.0659	1	0.0477	1	0.0455	1	0.0527	1	0.0632	1	0.071818	1							0.0632	0.9968
0.07	0.0891	1	0.0777	1	0.0582	1	0.0627	1	0.0586	1	0.0723	1	0.075	1							0.07	0.9973
0.08	0.0986	1	0.085	1	0.0709	1	0.0627	1	0.0709	1	0.0836	1	0.085	1							0.0795	0.9982
0.09	0.1205	1	0.0918	1	0.0845	1	0.08	1	0.0841	1	0.0836	1	0.095	1							0.0855	0.9986
0.1	0.1282	1	0.0918	1	0.0895	1	0.09	1	0.0841	1	0.0973	1	0.111364	1							0.0973	0.9986
0.25	0.2714	1	0.23	1	0.2509	1	0.2455	1	0.2455	1	0.26	1	0.233636	1							0.2505	1
0.5	0.4832	1	0.4882	1	0.475	1	0.4814	1	0.495	1	0.4891	1	0.515455	1							0.4982	1
0.75	0.7364	1	0.7355	1	0.7468	1	0.7559	1	0.7718	1	0.7873	1	0.752727	1							0.7527	1

Table B.8: N=7: Cesium Elevated Background, 200 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0791	0	0.1573	0.0009	0.2223	0.0045	0.2386	0.0009	0.27	0.0018	0.2314	0.000455	0.175							0.0005	0.0345
0.002	0	0.1077	0	0.2236	0.0009	0.285	0.0068	0.3164	0.0027	0.3341	0.0018	0.2914	0.002273	0.222							0.0027	0.0473
0.003	0	0.1305	0.0014	0.2673	0.0027	0.3314	0.0073	0.3432	0.0036	0.37	0.0023	0.3591	0.006364	0.279							0.0036	0.0609
0.004	0	0.1509	0.0014	0.2914	0.0036	0.3482	0.0086	0.4255	0.0045	0.3918	0.0032	0.3818	0.006364	0.295							0.005	0.075
0.005	0.0032	0.1714	0.0014	0.3068	0.0064	0.3641	0.0086	0.4568	0.0055	0.4232	0.0045	0.4027	0.008182	0.315							0.005	0.08
0.006	0.0032	0.1891	0.0032	0.3473	0.0082	0.3977	0.0086	0.4568	0.0095	0.4555	0.0086	0.4395	0.008636	0.326							0.0055	0.0959
0.007	0.0032	0.2186	0.0055	0.3645	0.01	0.4514	0.01	0.4973	0.0123	0.4764	0.0086	0.4395	0.008636	0.326							0.0064	0.1064
0.008	0.0032	0.23	0.0064	0.4009	0.01	0.4773	0.0114	0.5295	0.0123	0.4764	0.0118	0.4536	0.009091	0.347							0.0073	0.1114
0.009	0.0032	0.25	0.0105	0.4214	0.01	0.4773	0.0114	0.5295	0.0132	0.5018	0.0118	0.4536	0.011364	0.365							0.0086	0.1205
0.01	0.0032	0.25	0.0105	0.4214	0.0136	0.51	0.0141	0.5536	0.0132	0.5018	0.0127	0.4805	0.011364	0.365							0.0095	0.1282
0.02	0.0255	0.3464	0.0236	0.5605	0.025	0.62	0.0205	0.6273	0.0241	0.6155	0.0223	0.5668	0.025455	0.469							0.02	0.1895
0.025	0.0318	0.3959	0.0273	0.6027	0.0295	0.6391	0.0259	0.6559	0.0264	0.6555	0.03	0.6486	0.034091	0.506							0.0236	0.2077
0.03	0.035	0.415	0.0332	0.6186	0.0336	0.6636	0.0318	0.6745	0.0314	0.6795	0.0355	0.6723	0.037727	0.546							0.03	0.2405
0.04	0.0382	0.5114	0.0409	0.6614	0.0473	0.7173	0.05	0.725	0.0359	0.7036	0.04	0.6945	0.046818	0.591							0.0405	0.2705
0.05	0.0445	0.5555	0.0582	0.6927	0.0518	0.7459	0.0595	0.7495	0.0582	0.755	0.0595	0.7341	0.054545	0.639							0.05	0.2958
0.06	0.0605	0.6009	0.0632	0.7227	0.0609	0.7736	0.0677	0.7632	0.0668	0.7868	0.0677	0.7636	0.061364	0.659							0.0609	0.3386
0.07	0.0718	0.6273	0.0691	0.7636	0.075	0.7973	0.0755	0.7845	0.075	0.8032	0.0809	0.7805	0.072273	0.675							0.0718	0.365
0.08	0.075	0.6518	0.0877	0.795	0.0859	0.8073	0.0882	0.81	0.0832	0.8277	0.1014	0.8055	0.075909	0.693							0.0859	0.3959
0.09	0.0909	0.6841	0.1086	0.8091	0.1023	0.8277	0.0964	0.8364	0.0982	0.8468	0.1014	0.8055	0.085	0.714							0.0909	0.4077
0.1	0.1005	0.7009	0.1086	0.8091	0.1082	0.8477	0.1059	0.8527	0.0982	0.8468	0.1159	0.8318	0.095455	0.737							0.1027	0.4295
0.25	0.2491	0.8786	0.2527	0.9336	0.2823	0.9495	0.2477	0.9486	0.2582	0.9386	0.2586	0.9295	0.259091	0.856							0.2623	0.6655
0.5	0.4886	0.9777	0.5041	0.99	0.4868	0.9845	0.505	0.9832	0.4782	0.9823	0.4673	0.9732	0.496818	0.926							0.5027	0.8609
0.75	0.7273	0.9995	0.7673	0.9977	0.7568	0.9977	0.7255	0.9959	0.7345	0.9968	0.745	0.9941	0.779545	0.975							0.7386	0.9623

Table B.9: N=7: Cesium Elevated Background, 400 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0	0	0	0.0005	0.0018	0.0005	0.0041	0.0005	0.0123	0.0005	0.0082	0.000455	0.006							0.0009	0.0023
0.002	0.0032	0	0	0.0027	0.0005	0.0077	0.0005	0.0064	0.0005	0.0155	0.0027	0.0109	0.000455	0.011							0.0009	0.0036
0.003	0.0032	0.0032	0	0.01	0.0036	0.0118	0.0005	0.0091	0.0009	0.0195	0.0045	0.0145	0.002273	0.015							0.0027	0.005
0.004	0.0032	0.0064	0.0023	0.0114	0.0036	0.02	0.0005	0.0118	0.0023	0.0236	0.0059	0.0173	0.002727	0.015							0.0045	0.0068
0.005	0.0032	0.0064	0.0023	0.0123	0.0036	0.0232	0.0027	0.0145	0.0023	0.0241	0.0064	0.0209	0.005	0.016							0.0064	0.0077
0.006	0.0032	0.0095	0.0027	0.015	0.0045	0.0236	0.0027	0.0173	0.0045	0.0282	0.0068	0.0227	0.006364	0.019							0.0077	0.0095
0.007	0.0064	0.0159	0.0027	0.015	0.0045	0.0236	0.0059	0.0264	0.0045	0.0282	0.0068	0.0227	0.007273	0.024							0.0095	0.0114
0.008	0.0064	0.0159	0.0055	0.0205	0.0068	0.025	0.0059	0.0264	0.0068	0.035	0.0073	0.0264	0.007273	0.024							0.0109	0.0123
0.009	0.0064	0.0191	0.0055	0.0218	0.0068	0.0277	0.0086	0.0268	0.0086	0.035	0.0073	0.0264	0.01	0.026							0.0123	0.0132
0.01	0.0064	0.0191	0.0055	0.0218	0.0068	0.0277	0.0086	0.0268	0.0086	0.035	0.0095	0.0373	0.01	0.026							0.0141	0.0132
0.02	0.0127	0.0318	0.0182	0.0427	0.0136	0.0495	0.0168	0.0618	0.025	0.0745	0.0159	0.0577	0.025455	0.053							0.0209	0.03
0.025	0.0223	0.0414	0.0214	0.0427	0.0191	0.065	0.0186	0.0714	0.0295	0.0841	0.0241	0.0777	0.028636	0.057							0.0291	0.04
0.03	0.0318	0.0477	0.0273	0.0545	0.025	0.0727	0.0241	0.0882	0.0309	0.0932	0.0286	0.0905	0.035	0.079							0.0332	0.0441
0.04	0.0541	0.0668	0.0364	0.075	0.0318	0.0955	0.035	0.1082	0.0345	0.1027	0.0341	0.1023	0.044545	0.089							0.0377	0.0541
0.05	0.0668	0.0795	0.0473	0.08	0.045	0.1155	0.0473	0.125	0.045	0.1332	0.0595	0.12	0.057273	0.124							0.0486	0.0691
0.06	0.0859	0.0895	0.0595	0.1141	0.0518	0.1209	0.0536	0.1395	0.0559	0.1559	0.0768	0.1345	0.065455	0.135							0.0609	0.0877
0.07	0.1018	0.1036	0.0686	0.1286	0.0614	0.1409	0.0645	0.1559	0.0718	0.1773	0.0864	0.1473	0.074091	0.148							0.0673	0.1014
0.08	0.1082	0.1077	0.0691	0.1418	0.0727	0.1709	0.0773	0.1777	0.0773	0.1955	0.0959	0.1645	0.079091	0.166							0.0755	0.1155
0.09	0.1091	0.1132	0.0764	0.155	0.0845	0.1909	0.0886	0.2	0.0836	0.2195	0.1064	0.1882	0.087273	0.174							0.0859	0.1259
0.1	0.125	0.1436	0.0845	0.1841	0.0945	0.2045	0.1036	0.2268	0.0836	0.2195	0.1064	0.1882	0.096364	0.187							0.0895	0.1382
0.25	0.24	0.3205	0.2477	0.3682	0.2405	0.4395	0.2573	0.4736	0.2695	0.4018	0.2782	0.4009	0.265909	0.358							0.2414	0.3245
0.5	0.4923	0.6527	0.475	0.6582	0.4714	0.6705	0.5086	0.6745	0.525	0.6464	0.5186	0.6086	0.499545	0.639							0.5045	0.5823
0.75	0.7605	0.8514	0.7377	0.8973	0.7368	0.8736	0.7677	0.8791	0.7759	0.8409	0.74	0.8259	0.734545	0.848							0.76	0.7995

Table B.10: Lead, Shielded 1-MFP Th/U Elevated Background, 100 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0.1386	0.0023	0.4014	0.0009	0.5436	0	0.5973	0	0.5686	0.0014	0.5609	0	0.469							0.0018	0.0723
0.002	0.0064	0.2086	0.0023	0.4914	0.0023	0.6141	0	0.6868	0	0.6668	0.0023	0.6386	0.001364	0.535							0.0027	0.1055
0.003	0.0064	0.2782	0.0023	0.5627	0.0023	0.6764	0	0.7345	0.0027	0.7164	0.0032	0.6732	0.001818	0.556							0.0045	0.1309
0.004	0.0064	0.3155	0.005	0.6082	0.0023	0.7009	0.0014	0.7686	0.0036	0.7595	0.005	0.6936	0.002273	0.591							0.005	0.1464
0.005	0.0064	0.3582	0.005	0.6377	0.0023	0.7218	0.0014	0.7977	0.0041	0.7777	0.0064	0.7405	0.002273	0.603							0.0055	0.1632
0.006	0.0127	0.3905	0.0055	0.6532	0.005	0.7405	0.0014	0.8145	0.005	0.7882	0.0064	0.7559	0.002273	0.619							0.0055	0.1768
0.007	0.0127	0.4009	0.0077	0.6695	0.005	0.76	0.0014	0.8323	0.005	0.8073	0.0064	0.78	0.002273	0.637							0.0059	0.1914
0.008	0.0127	0.43	0.01	0.6914	0.005	0.7736	0.0032	0.8468	0.005	0.8268	0.0064	0.78	0.002273	0.653							0.0068	0.2036
0.009	0.0159	0.4559	0.01	0.7114	0.0082	0.7882	0.0032	0.8468	0.005	0.8268	0.0068	0.7891	0.004545	0.664							0.0082	0.2205
0.01	0.0191	0.4736	0.0109	0.7245	0.0082	0.7882	0.0032	0.8586	0.0064	0.8336	0.0082	0.8132	0.004545	0.675							0.0086	0.2264
0.02	0.0286	0.5991	0.0259	0.82	0.0127	0.8659	0.0127	0.9182	0.0159	0.8941	0.0164	0.8595	0.008182	0.74							0.02	0.3127
0.025	0.0318	0.6309	0.0327	0.8491	0.0205	0.8959	0.0164	0.9286	0.0218	0.9159	0.0273	0.8736	0.010455	0.75							0.0255	0.3509
0.03	0.0382	0.6477	0.04	0.86	0.0291	0.9241	0.0182	0.9468	0.025	0.9245	0.0314	0.875	0.018636	0.782							0.0323	0.3818
0.04	0.0382	0.7195	0.0486	0.8955	0.0332	0.9468	0.0291	0.9614	0.0364	0.9364	0.0405	0.8932	0.031818	0.797							0.0418	0.4209
0.05	0.0455	0.7577	0.055	0.9086	0.0377	0.965	0.0359	0.9673	0.0455	0.9595	0.0509	0.9068	0.045	0.827							0.0518	0.4623
0.06	0.055	0.8032	0.0623	0.92	0.0464	0.9709	0.0427	0.9691	0.0573	0.965	0.0623	0.9232	0.051364	0.853							0.0577	0.4882
0.07	0.0614	0.8286	0.0695	0.9364	0.0559	0.9795	0.0523	0.9768	0.0682	0.9655	0.0714	0.9314	0.075455	0.861							0.0673	0.52
0.08	0.0645	0.8655	0.0777	0.9436	0.0632	0.9823	0.0677	0.9818	0.0727	0.9686	0.0736	0.94	0.080455	0.868							0.0773	0.5523
0.09	0.0659	0.8745	0.0873	0.9527	0.0705	0.9832	0.0745	0.9827	0.0891	0.9745	0.0836	0.9482	0.090455	0.877							0.0845	0.5732
0.1	0.0873	0.8955	0.1018	0.9664	0.075	0.9855	0.0868	0.9832	0.0964	0.9768	0.0886	0.9532	0.108182	0.887							0.0968	0.5991
0.25	0.2505	0.9782	0.2282	0.9968	0.2255	0.9986	0.2368	0.9995	0.2518	0.9941	0.2341	0.9886	0.245909	0.962							0.2527	0.8077
0.5	0.4905	0.9991	0.4836	0.9986	0.4864	1	0.5009	1	0.5223	0.9991	0.4936	0.9991	0.472273	0.987							0.5032	0.9386
0.75	0.7586	1	0.7732	1	0.7682	1	0.7559	1	0.7523	1	0.7641	1	0.747727	0.997							0.7536	0.9886

Table B.11: Lead, Shielded 1-MFP Th/U Elevated Background, 200 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0095	0.0023	0.0423	0	0.035	0.0023	0.0291	0.0018	0.0459	0.0005	0.0327	0	0.013							0.0005	0.0095
0.002	0.0032	0.0255	0.0023	0.0673	0.0018	0.0609	0.0032	0.045	0.0018	0.0586	0.0023	0.0545	0.002727	0.023							0.0027	0.0177
0.003	0.0032	0.0318	0.0023	0.0777	0.0055	0.075	0.0036	0.0673	0.0027	0.0655	0.0036	0.0618	0.002727	0.039							0.0032	0.0255
0.004	0.0032	0.0318	0.0023	0.0895	0.0055	0.0768	0.0045	0.0768	0.0055	0.0818	0.0059	0.075	0.007273	0.049							0.0041	0.0291
0.005	0.0032	0.0414	0.0027	0.1023	0.0055	0.0873	0.0055	0.0886	0.0055	0.0959	0.0059	0.0786	0.008182	0.057							0.005	0.0341
0.006	0.0032	0.0605	0.0041	0.1091	0.0055	0.0955	0.0082	0.1177	0.0055	0.1027	0.0059	0.0918	0.011818	0.065							0.0064	0.04
0.007	0.0032	0.0641	0.0082	0.1241	0.0082	0.1118	0.0082	0.1177	0.0064	0.1082	0.0073	0.0986	0.011818	0.072							0.0073	0.0436
0.008	0.0032	0.0705	0.0082	0.1323	0.0105	0.1245	0.0082	0.1327	0.0077	0.1223	0.0073	0.0986	0.011818	0.09							0.0091	0.0491
0.009	0.0032	0.08	0.0082	0.1323	0.0105	0.1364	0.0082	0.15	0.0127	0.1391	0.01	0.1068	0.014091	0.102							0.0095	0.0509
0.01	0.0032	0.0895	0.0082	0.1327	0.0105	0.1364	0.0091	0.1668	0.0127	0.1391	0.0109	0.12	0.015909	0.11							0.0105	0.0577
0.02	0.0223	0.1591	0.0232	0.2073	0.0182	0.1982	0.0168	0.2277	0.0209	0.215	0.0232	0.1527	0.022727	0.157							0.0218	0.0882
0.025	0.0255	0.1786	0.0295	0.2323	0.0259	0.2309	0.0273	0.2595	0.0245	0.2232	0.03	0.1836	0.023636	0.176							0.0264	0.1032
0.03	0.0286	0.2	0.0295	0.2482	0.0295	0.2468	0.0323	0.2741	0.0345	0.255	0.0336	0.2005	0.030909	0.2							0.0341	0.1155
0.04	0.0445	0.2432	0.0359	0.2918	0.0432	0.31	0.0445	0.3118	0.045	0.3105	0.0464	0.2391	0.037727	0.24							0.0427	0.1377
0.05	0.0486	0.2614	0.0427	0.3264	0.0464	0.3305	0.055	0.3505	0.0509	0.3268	0.0527	0.2923	0.055455	0.276							0.0541	0.1568
0.06	0.0645	0.3005	0.0518	0.3686	0.05	0.3773	0.0627	0.3705	0.0636	0.3614	0.0609	0.335	0.061364	0.309							0.0618	0.1759
0.07	0.0709	0.3327	0.0682	0.4114	0.0586	0.4027	0.0768	0.4118	0.0659	0.3777	0.0695	0.3582	0.065	0.327							0.0745	0.1964
0.08	0.0773	0.3664	0.0755	0.4241	0.0795	0.4459	0.085	0.4314	0.0714	0.3909	0.0777	0.3732	0.072273	0.355							0.0845	0.2114
0.09	0.09	0.4036	0.08	0.4373	0.0864	0.4723	0.0977	0.4595	0.0868	0.4095	0.0855	0.3968	0.075455	0.384							0.095	0.2286
0.1	0.1027	0.415	0.0886	0.4514	0.0973	0.4873	0.1073	0.4886	0.0914	0.435	0.0927	0.4291	0.079545	0.396							0.1041	0.2418
0.25	0.2677	0.6445	0.2514	0.6782	0.2573	0.6732	0.2586	0.7077	0.2145	0.665	0.2482	0.6695	0.249091	0.593							0.2545	0.4564
0.5	0.5355	0.8405	0.4914	0.8727	0.5073	0.8891	0.4914	0.8773	0.4632	0.8573	0.495	0.86	0.488636	0.787							0.4941	0.7032
0.75	0.7427	0.9614	0.7414	0.975	0.7441	0.975	0.7459	0.9755	0.7336	0.9809	0.7209	0.9627	0.772727	0.942							0.7409	0.8941

Table B.12: Lead, Shielded 1-MFP Th/U Elevated Background, 400 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0	0	0	0	0.0032	0	0.0055	0	0.0014	0	0.0027	0.000455	0.002							0.0005	0.0005
0.002	0.0032	0	0.0018	0	0.0009	0.0045	0	0.0064	0	0.005	0.0009	0.0055	0.001364	0.002							0.0018	0.0018
0.003	0.0032	0	0.0068	0	0.0027	0.01	0	0.0073	0	0.0068	0.0014	0.0068	0.003636	0.003							0.0027	0.0032
0.004	0.0032	0	0.0068	0.005	0.0027	0.0127	0	0.0091	0	0.0068	0.0018	0.0091	0.004545	0.003							0.0064	0.0045
0.005	0.0032	0	0.0068	0.0082	0.0027	0.0127	0	0.01	0.0005	0.0136	0.0018	0.01	0.006364	0.007							0.0082	0.0059
0.006	0.0032	0.0032	0.0068	0.0082	0.0027	0.0136	0.0023	0.015	0.0005	0.0136	0.0032	0.0141	0.006364	0.01							0.0082	0.0068
0.007	0.0032	0.0032	0.0077	0.0127	0.0041	0.0168	0.0023	0.015	0.0005	0.0164	0.0036	0.0168	0.007727	0.01							0.0105	0.0086
0.008	0.0095	0.0064	0.0082	0.0168	0.0055	0.0177	0.0023	0.0177	0.0014	0.0227	0.005	0.0173	0.007727	0.013							0.0109	0.0109
0.009	0.0095	0.0064	0.0082	0.02	0.0068	0.0236	0.0023	0.0205	0.0014	0.0227	0.005	0.0173	0.009545	0.015							0.0114	0.0123
0.01	0.0127	0.0095	0.0082	0.0255	0.0082	0.0259	0.0032	0.025	0.0014	0.0259	0.0059	0.0195	0.009545	0.015							0.0127	0.0141
0.02	0.0191	0.0223	0.0218	0.0464	0.015	0.0464	0.0059	0.035	0.0136	0.045	0.0155	0.0341	0.020909	0.041							0.0259	0.0318
0.025	0.0318	0.0255	0.0255	0.0595	0.0191	0.0573	0.0136	0.0482	0.0182	0.0509	0.0182	0.04	0.025455	0.052							0.0314	0.0414
0.03	0.0509	0.0318	0.0336	0.065	0.0195	0.0614	0.0173	0.0541	0.0205	0.0623	0.0295	0.0541	0.029545	0.066							0.0341	0.0495
0.04	0.0573	0.0477	0.0445	0.0773	0.0273	0.0755	0.0282	0.0777	0.0305	0.0841	0.0418	0.0673	0.034545	0.074							0.0455	0.0595
0.05	0.0732	0.07	0.0559	0.0973	0.035	0.0845	0.0355	0.1045	0.0309	0.0918	0.0518	0.0959	0.046818	0.085							0.0545	0.0764
0.06	0.0795	0.0859	0.0568	0.1059	0.0468	0.1	0.0414	0.1145	0.0409	0.1091	0.0582	0.1059	0.055	0.105							0.0645	0.0882
0.07	0.0873	0.0986	0.07	0.1182	0.0618	0.1164	0.0486	0.1241	0.0477	0.125	0.0668	0.1286	0.060455	0.126							0.0755	0.1005
0.08	0.095	0.1082	0.0732	0.1305	0.0705	0.1268	0.0623	0.155	0.0627	0.1523	0.0795	0.1373	0.066364	0.13							0.085	0.1141
0.09	0.1077	0.1282	0.095	0.16	0.0841	0.1445	0.0709	0.1677	0.0736	0.165	0.0868	0.1459	0.069545	0.14							0.0959	0.1255
0.1	0.1205	0.1509	0.1055	0.1723	0.09	0.1714	0.0805	0.1864	0.0832	0.1791	0.1018	0.1618	0.078182	0.151							0.1018	0.14
0.25	0.295	0.3782	0.2686	0.3655	0.2436	0.3836	0.2091	0.3741	0.2241	0.37	0.2395	0.3573	0.259091	0.32							0.2509	0.3123
0.5	0.5336	0.6409	0.5182	0.6436	0.4968	0.6568	0.4891	0.6464	0.5023	0.6305	0.47	0.5968	0.517273	0.58							0.495	0.5686
0.75	0.7673	0.8514	0.7514	0.8559	0.7364	0.8455	0.7159	0.8418	0.7486	0.8523	0.7595	0.8459	0.752273	0.819							0.7473	0.795

Table B.13: N=7: Aluminum, Shielded 1-MFP Th/U Elevated Background, 100 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0.5277	0.0023	0.8832	0.0009	0.9541	0	0.9664	0	0.9595	0.0014	0.9323	0	0.819							0.0018	0.2114
0.002	0.0064	0.635	0.0023	0.9277	0.0023	0.9682	0	0.9768	0	0.9764	0.0023	0.9559	0.001364	0.862							0.0027	0.2859
0.003	0.0064	0.69	0.0023	0.9468	0.0023	0.975	0	0.9832	0.0027	0.9818	0.0032	0.9582	0.001818	0.882							0.0045	0.3318
0.004	0.0064	0.7223	0.005	0.9618	0.0023	0.9786	0.0014	0.9855	0.0036	0.9918	0.005	0.9645	0.002273	0.895							0.005	0.3568
0.005	0.0064	0.7586	0.005	0.9709	0.0023	0.98	0.0014	0.9882	0.0041	0.9941	0.0064	0.9705	0.002273	0.899							0.0055	0.3895
0.006	0.0127	0.785	0.0055	0.9709	0.005	0.985	0.0014	0.9909	0.005	0.9941	0.0064	0.9759	0.002273	0.903							0.0055	0.41
0.007	0.0127	0.7977	0.0077	0.9745	0.005	0.9905	0.0014	0.9914	0.005	0.9941	0.0064	0.9764	0.002273	0.91							0.0059	0.4282
0.008	0.0127	0.82	0.01	0.9786	0.005	0.9936	0.0032	0.9918	0.005	0.9945	0.0064	0.9764	0.002273	0.914							0.0068	0.45
0.009	0.0159	0.8295	0.01	0.9818	0.0082	0.995	0.0032	0.9918	0.005	0.9945	0.0068	0.9764	0.004545	0.92							0.0082	0.4782
0.01	0.0191	0.8409	0.0109	0.9845	0.0082	0.995	0.0032	0.995	0.0064	0.9945	0.0082	0.9773	0.004545	0.923							0.0086	0.4895
0.02	0.0286	0.92	0.0259	0.9941	0.0127	0.9959	0.0127	0.9977	0.0159	0.9991	0.0164	0.985	0.008182	0.956							0.02	0.5905
0.025	0.0318	0.9414	0.0327	0.9945	0.0205	0.9977	0.0164	0.9977	0.0218	0.9991	0.0273	0.9855	0.010455	0.96							0.0255	0.6245
0.03	0.0382	0.9514	0.04	0.9945	0.0291	0.9977	0.0182	1	0.025	0.9991	0.0314	0.9873	0.018636	0.963							0.0323	0.6623
0.04	0.0382	0.9732	0.0486	0.9964	0.0332	0.9982	0.0291	1	0.0364	0.9995	0.0405	0.9873	0.031818	0.969							0.0418	0.7014
0.05	0.0455	0.9873	0.055	0.9968	0.0377	0.9995	0.0359	1	0.0455	1	0.0509	0.9918	0.045	0.972							0.0518	0.74
0.06	0.055	0.9895	0.0623	0.9991	0.0464	0.9995	0.0427	1	0.0573	1	0.0623	0.9941	0.051364	0.975							0.0577	0.7655
0.07	0.0614	0.9923	0.0695	1	0.0559	0.9995	0.0523	1	0.0682	1	0.0714	0.9941	0.075455	0.984							0.0673	0.7868
0.08	0.0645	0.9936	0.0777	1	0.0632	0.9995	0.0677	1	0.0727	1	0.0736	0.9941	0.080455	0.987							0.0773	0.8
0.09	0.0659	0.995	0.0873	1	0.0705	0.9995	0.0745	1	0.0891	1	0.0836	0.9973	0.090455	0.987							0.0845	0.8136
0.1	0.0873	0.9977	0.1018	1	0.075	0.9995	0.0868	1	0.0964	1	0.0886	0.9973	0.108182	0.987							0.0968	0.8268
0.25	0.2505	1	0.2282	1	0.2255	1	0.2368	1	0.2518	1	0.2341	0.9991	0.245909	0.997							0.2527	0.9423
0.5	0.4905	1	0.4836	1	0.4864	1	0.5009	1	0.5223	1	0.4936	1	0.472273	0.997							0.5032	0.9868
0.75	0.7586	1	0.7732	1	0.7682	1	0.7559	1	0.7523	1	0.7641	1	0.747727	1							0.7536	0.9991

Table B.14: N=7: Aluminum, Shielded 1-MFP Th/U Elevated Background, 200 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																						
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0223	0.0023	0.0491	0	0.0664	0.0023	0.0786	0.0018	0.1027	0.0005	0.0786	0	0.06							0.0005	0.0123
0.002	0.0032	0.0414	0.0023	0.0686	0.0018	0.1036	0.0032	0.115	0.0018	0.1355	0.0023	0.1273	0.002727	0.096							0.0027	0.02
0.003	0.0032	0.0623	0.0023	0.0873	0.0055	0.1245	0.0036	0.1518	0.0027	0.1641	0.0036	0.1523	0.002727	0.115							0.0032	0.0314
0.004	0.0032	0.0686	0.0023	0.1123	0.0055	0.1427	0.0045	0.1614	0.0055	0.1945	0.0059	0.1823	0.007273	0.143							0.0041	0.0345
0.005	0.0032	0.0745	0.0027	0.1332	0.0055	0.1677	0.0055	0.1845	0.0055	0.2114	0.0059	0.1977	0.008182	0.152							0.005	0.0414
0.006	0.0032	0.0777	0.0041	0.1409	0.0055	0.18	0.0082	0.2245	0.0055	0.2409	0.0059	0.2168	0.011818	0.162							0.0064	0.0464
0.007	0.0032	0.0809	0.0082	0.1582	0.0082	0.1986	0.0082	0.2245	0.0064	0.2573	0.0073	0.2268	0.011818	0.179							0.0073	0.0509
0.008	0.0032	0.0841	0.0082	0.1718	0.0105	0.2132	0.0082	0.2545	0.0077	0.2705	0.0073	0.2268	0.011818	0.189							0.0091	0.0559
0.009	0.0032	0.0936	0.0082	0.1718	0.0105	0.23	0.0082	0.2823	0.0127	0.2814	0.01	0.2545	0.014091	0.199							0.0095	0.0586
0.01	0.0032	0.0968	0.0082	0.1859	0.0105	0.23	0.0091	0.3064	0.0127	0.2814	0.0109	0.2695	0.015909	0.205							0.0105	0.0618
0.02	0.0223	0.1791	0.0232	0.2755	0.0182	0.3505	0.0168	0.3905	0.0209	0.3764	0.0232	0.3327	0.022727	0.29							0.0218	0.1023
0.025	0.0255	0.2145	0.0295	0.3086	0.0259	0.3973	0.0273	0.4259	0.0245	0.3941	0.03	0.3864	0.023636	0.311							0.0264	0.1268
0.03	0.0286	0.2286	0.0295	0.3291	0.0295	0.4168	0.0323	0.4518	0.0345	0.4518	0.0336	0.4068	0.030909	0.339							0.0341	0.1436
0.04	0.0445	0.2814	0.0359	0.3918	0.0432	0.4905	0.0445	0.4964	0.045	0.5009	0.0464	0.4518	0.037727	0.369							0.0427	0.1673
0.05	0.0486	0.3055	0.0427	0.4327	0.0464	0.5109	0.055	0.5332	0.0509	0.5191	0.0527	0.4982	0.055455	0.405							0.0541	0.1977
0.06	0.0645	0.3445	0.0518	0.4677	0.05	0.5614	0.0627	0.5491	0.0636	0.5709	0.0609	0.5445	0.061364	0.44							0.0618	0.2191
0.07	0.0709	0.3555	0.0682	0.5095	0.0586	0.5777	0.0768	0.6145	0.0659	0.5882	0.0695	0.5568	0.065	0.462							0.0745	0.2423
0.08	0.0773	0.3941	0.0755	0.5368	0.0795	0.6173	0.085	0.63	0.0714	0.6064	0.0777	0.5714	0.072273	0.493							0.0845	0.2718
0.09	0.09	0.4445	0.08	0.5523	0.0864	0.64	0.0977	0.6523	0.0868	0.625	0.0855	0.5945	0.075455	0.51							0.095	0.2927
0.1	0.1027	0.4673	0.0886	0.5809	0.0973	0.6545	0.1073	0.6714	0.0914	0.6491	0.0927	0.6186	0.079545	0.529							0.1041	0.3141
0.25	0.2677	0.7214	0.2514	0.8227	0.2573	0.8423	0.2586	0.8468	0.2145	0.8364	0.2482	0.8	0.249091	0.707							0.2545	0.5505
0.5	0.5355	0.9155	0.4914	0.9468	0.5073	0.955	0.4914	0.9564	0.4632	0.9427	0.495	0.9209	0.488636	0.856							0.4941	0.7859
0.75	0.7427	0.985	0.7414	0.9936	0.7441	0.9886	0.7459	0.9877	0.7336	0.9841	0.7209	0.97	0.772727	0.971							0.7409	0.9241

Table B.15: N=7: Aluminum, Shielded 1-MFP Th/U Elevated Background, 400 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0	0	0.0059	0	0.0023	0	0.0055	0	0.0068	0	0.0082	0.000455	0.006							0.0005	0.0023
0.002	0.0032	0.0095	0.0018	0.0082	0.0009	0.0059	0	0.0109	0	0.0191	0.0009	0.0159	0.001364	0.011							0.0018	0.0045
0.003	0.0032	0.0095	0.0068	0.0118	0.0027	0.0136	0	0.0155	0	0.0259	0.0014	0.0191	0.003636	0.016							0.0027	0.0055
0.004	0.0032	0.0127	0.0068	0.0159	0.0027	0.0191	0	0.02	0	0.0268	0.0018	0.0191	0.004545	0.018							0.0064	0.0073
0.005	0.0032	0.0127	0.0068	0.02	0.0027	0.0236	0	0.0218	0.0005	0.0314	0.0018	0.0218	0.006364	0.025							0.0082	0.0127
0.006	0.0032	0.0159	0.0068	0.0205	0.0027	0.0291	0.0023	0.0259	0.0005	0.0327	0.0032	0.0282	0.006364	0.026							0.0082	0.0132
0.007	0.0032	0.0159	0.0077	0.0218	0.0041	0.0309	0.0023	0.0259	0.0005	0.0423	0.0036	0.0332	0.007727	0.027							0.0105	0.0141
0.008	0.0095	0.0191	0.0082	0.025	0.0055	0.0309	0.0023	0.0286	0.0014	0.0473	0.005	0.0405	0.007727	0.03							0.0109	0.0159
0.009	0.0095	0.0223	0.0082	0.0305	0.0068	0.0336	0.0023	0.0373	0.0014	0.0473	0.005	0.0405	0.009545	0.032							0.0114	0.0173
0.01	0.0127	0.0223	0.0082	0.0336	0.0082	0.0368	0.0032	0.0468	0.0014	0.0509	0.0059	0.0432	0.009545	0.032							0.0127	0.0186
0.02	0.0191	0.0382	0.0218	0.0627	0.015	0.065	0.0059	0.0818	0.0136	0.075	0.0155	0.0941	0.020909	0.057							0.0259	0.0405
0.025	0.0318	0.0414	0.0255	0.0718	0.0191	0.0805	0.0136	0.1023	0.0182	0.0832	0.0182	0.1005	0.025455	0.075							0.0314	0.0495
0.03	0.0509	0.0645	0.0336	0.0932	0.0195	0.0886	0.0173	0.1064	0.0205	0.0936	0.0295	0.1173	0.029545	0.095							0.0341	0.055
0.04	0.0573	0.0891	0.0445	0.1136	0.0273	0.1168	0.0282	0.1268	0.0305	0.1364	0.0418	0.145	0.034545	0.104							0.0455	0.0655
0.05	0.0732	0.1018	0.0559	0.14	0.035	0.1368	0.0355	0.1536	0.0309	0.1464	0.0518	0.1618	0.046818	0.12							0.0545	0.085
0.06	0.0795	0.1127	0.0568	0.15	0.0468	0.1718	0.0414	0.1668	0.0409	0.1768	0.0582	0.1686	0.055	0.144							0.0645	0.0991
0.07	0.0873	0.1223	0.07	0.1677	0.0618	0.2023	0.0486	0.1832	0.0477	0.1932	0.0668	0.1982	0.060455	0.169							0.0755	0.1164
0.08	0.095	0.1536	0.0732	0.1836	0.0705	0.2264	0.0623	0.2073	0.0627	0.2377	0.0795	0.2214	0.066364	0.177							0.085	0.1286
0.09	0.1077	0.1818	0.095	0.2114	0.0841	0.2459	0.0709	0.2273	0.0736	0.2595	0.0868	0.2332	0.069545	0.2							0.0959	0.1468
0.1	0.1205	0.205	0.1055	0.2355	0.09	0.2609	0.0805	0.2436	0.0832	0.2709	0.1018	0.2505	0.078182	0.227							0.1018	0.1559
0.25	0.295	0.395	0.2686	0.4568	0.2436	0.4782	0.2091	0.475	0.2241	0.4832	0.2395	0.4632	0.259091	0.448							0.2509	0.355
0.5	0.5336	0.6736	0.5182	0.7182	0.4968	0.7473	0.4891	0.7632	0.5023	0.7423	0.47	0.7141	0.517273	0.704							0.495	0.6209
0.75	0.7673	0.8914	0.7514	0.9073	0.7364	0.9105	0.7159	0.8868	0.7486	0.9095	0.7595	0.8768	0.752273	0.878							0.7473	0.8386

Table B.16: N=7: Copper, Shielded 1-MFP Th/U Elevated Background, 100 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0.5114	0.0023	0.8855	0.0009	0.9382	0	0.9495	0	0.9473	0.0014	0.9259	0	0.779							0.0018	0.2109
0.002	0.0064	0.6386	0.0023	0.9273	0.0023	0.9559	0	0.9655	0	0.9745	0.0023	0.9577	0.001364	0.816							0.0027	0.2809
0.003	0.0064	0.6941	0.0023	0.9445	0.0023	0.965	0	0.9705	0.0027	0.9777	0.0032	0.9636	0.001818	0.826							0.0045	0.3277
0.004	0.0064	0.7327	0.005	0.9536	0.0023	0.9686	0.0014	0.9777	0.0036	0.9827	0.005	0.9664	0.002273	0.854							0.005	0.3618
0.005	0.0064	0.7777	0.005	0.9614	0.0023	0.975	0.0014	0.9809	0.0041	0.9827	0.0064	0.9718	0.002273	0.863							0.0055	0.3941
0.006	0.0127	0.8023	0.0055	0.9682	0.005	0.9759	0.0014	0.9836	0.005	0.9855	0.0064	0.9745	0.002273	0.87							0.0055	0.4118
0.007	0.0127	0.8177	0.0077	0.9705	0.005	0.9814	0.0014	0.985	0.005	0.9868	0.0064	0.9782	0.002273	0.873							0.0059	0.4305
0.008	0.0127	0.8405	0.01	0.975	0.005	0.9823	0.0032	0.9877	0.005	0.9905	0.0064	0.9782	0.002273	0.889							0.0068	0.4527
0.009	0.0159	0.8505	0.01	0.9786	0.0082	0.9836	0.0032	0.9877	0.005	0.9905	0.0068	0.9805	0.004545	0.892							0.0082	0.4755
0.01	0.0191	0.8695	0.0109	0.98	0.0082	0.9836	0.0032	0.9891	0.0064	0.9918	0.0082	0.9845	0.004545	0.901							0.0086	0.4818
0.02	0.0286	0.9395	0.0259	0.9914	0.0127	0.9905	0.0127	0.9968	0.0159	0.9973	0.0164	0.9977	0.008182	0.933							0.02	0.5718
0.025	0.0318	0.9486	0.0327	0.9959	0.0205	0.9923	0.0164	0.9968	0.0218	0.9973	0.0273	0.9991	0.010455	0.943							0.0255	0.6155
0.03	0.0382	0.9614	0.04	0.9964	0.0291	0.9936	0.0182	0.9973	0.025	0.9973	0.0314	0.9991	0.018636	0.955							0.0323	0.6468
0.04	0.0382	0.9795	0.0486	0.9973	0.0332	0.9964	0.0291	0.9986	0.0364	0.9982	0.0405	1	0.031818	0.959							0.0418	0.6891
0.05	0.0455	0.9823	0.055	0.9973	0.0377	0.9982	0.0359	0.9986	0.0455	1	0.0509	1	0.045	0.965							0.0518	0.7123
0.06	0.055	0.9905	0.0623	0.9986	0.0464	0.9982	0.0427	0.9986	0.0573	1	0.0623	1	0.051364	0.968							0.0577	0.7445
0.07	0.0614	0.9905	0.0695	0.9991	0.0559	0.9986	0.0523	0.9995	0.0682	1	0.0714	1	0.075455	0.968							0.0673	0.7682
0.08	0.0645	0.9923	0.0777	0.9995	0.0632	0.9991	0.0677	1	0.0727	1	0.0736	1	0.080455	0.971							0.0773	0.7936
0.09	0.0659	0.9923	0.0873	0.9995	0.0705	0.9991	0.0745	1	0.0891	1	0.0836	1	0.090455	0.971							0.0845	0.8091
0.1	0.0873	0.9959	0.1018	0.9995	0.075	0.9991	0.0868	1	0.0964	1	0.0886	1	0.108182	0.971							0.0968	0.8232
0.25	0.2505	1	0.2282	1	0.2255	1	0.2368	1	0.2518	1	0.2341	1	0.245909	0.987							0.2527	0.9345
0.5	0.4905	1	0.4836	1	0.4864	1	0.5009	1	0.5223	1	0.4936	1	0.472273	0.997							0.5032	0.9841
0.75	0.7586	1	0.7732	1	0.7682	1	0.7559	1	0.7523	1	0.7641	1	0.747727	1							0.7536	0.9973

Table B.17: N=7: Copper, Shielded 1-MFP Th/U Elevated Background, 200 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0	0.0273	0.0023	0.0986	0	0.1236	0.0023	0.125	0.0018	0.1136	0.0005	0.1059	0	0.082							0.0005	0.0155
0.002	0.0032	0.0527	0.0023	0.1391	0.0018	0.1827	0.0032	0.1568	0.0018	0.1545	0.0023	0.1682	0.002727	0.116							0.0027	0.0318
0.003	0.0032	0.0655	0.0023	0.1614	0.0055	0.2295	0.0036	0.2009	0.0027	0.1964	0.0036	0.1914	0.002727	0.137							0.0032	0.04
0.004	0.0032	0.075	0.0023	0.1814	0.0055	0.2395	0.0045	0.2145	0.0055	0.2259	0.0059	0.2236	0.007273	0.145							0.0041	0.0464
0.005	0.0032	0.0864	0.0027	0.2064	0.0055	0.2691	0.0055	0.2345	0.0055	0.2436	0.0059	0.2532	0.008182	0.162							0.005	0.0586
0.006	0.0032	0.1018	0.0041	0.2168	0.0055	0.2868	0.0082	0.28	0.0055	0.2645	0.0059	0.2768	0.011818	0.173							0.0064	0.0641
0.007	0.0032	0.105	0.0082	0.2491	0.0082	0.295	0.0082	0.28	0.0064	0.2845	0.0073	0.2895	0.011818	0.18							0.0073	0.0736
0.008	0.0032	0.1291	0.0082	0.2541	0.0105	0.3086	0.0082	0.3005	0.0077	0.3036	0.0073	0.2895	0.011818	0.2							0.0091	0.0832
0.009	0.0032	0.1382	0.0082	0.2541	0.0105	0.3177	0.0082	0.3268	0.0127	0.3259	0.01	0.3045	0.014091	0.221							0.0095	0.0864
0.01	0.0032	0.1595	0.0082	0.2764	0.0105	0.3177	0.0091	0.3409	0.0127	0.3259	0.0109	0.32	0.015909	0.234							0.0105	0.0973
0.02	0.0223	0.2395	0.0232	0.3773	0.0182	0.4086	0.0168	0.4327	0.0209	0.4373	0.0232	0.3895	0.022727	0.308							0.0218	0.1377
0.025	0.0255	0.2745	0.0295	0.4191	0.0259	0.4491	0.0273	0.4827	0.0245	0.4523	0.03	0.4245	0.023636	0.319							0.0264	0.1582
0.03	0.0286	0.2982	0.0295	0.4377	0.0295	0.4805	0.0323	0.5018	0.0345	0.5118	0.0336	0.4427	0.030909	0.358							0.0341	0.1759
0.04	0.0445	0.3623	0.0359	0.4941	0.0432	0.5527	0.0445	0.55	0.045	0.5609	0.0464	0.4936	0.037727	0.385							0.0427	0.2041
0.05	0.0486	0.4018	0.0427	0.5268	0.0464	0.5805	0.055	0.5909	0.0509	0.5836	0.0527	0.5527	0.055455	0.427							0.0541	0.2345
0.06	0.0645	0.4568	0.0518	0.5632	0.05	0.6255	0.0627	0.6114	0.0636	0.6277	0.0609	0.5945	0.061364	0.459							0.0618	0.26
0.07	0.0709	0.5068	0.0682	0.5955	0.0586	0.6368	0.0768	0.6486	0.0659	0.6509	0.0695	0.6141	0.065	0.474							0.0745	0.2823
0.08	0.0773	0.5295	0.0755	0.6145	0.0795	0.6741	0.085	0.6709	0.0714	0.6641	0.0777	0.6305	0.072273	0.498							0.0845	0.3032
0.09	0.09	0.5605	0.08	0.6277	0.0864	0.6955	0.0977	0.6836	0.0868	0.6818	0.0855	0.6536	0.075455	0.515							0.095	0.3227
0.1	0.1027	0.5832	0.0886	0.6445	0.0973	0.7186	0.1073	0.7027	0.0914	0.6941	0.0927	0.6655	0.079545	0.544							0.1041	0.3414
0.25	0.2677	0.7655	0.2514	0.8609	0.2573	0.8691	0.2586	0.8677	0.2145	0.8668	0.2482	0.8364	0.249091	0.734							0.2545	0.5732
0.5	0.5355	0.9477	0.4914	0.9664	0.5073	0.9682	0.4914	0.9664	0.4632	0.9664	0.495	0.9414	0.488636	0.903							0.4941	0.8018
0.75	0.7427	0.9918	0.7414	0.9941	0.7441	0.9927	0.7459	0.9859	0.7336	0.995	0.7209	0.9918	0.772727	0.965							0.7409	0.9314

Table B.18: N=7: Copper, Shielded 1-MFP Th/U Elevated Background, 400 cm, false positive and true positive detection rates for n=1...7

CALCULATION TABLE																								
α	n=1		n=2		n=3		n=4		n=5		n=6		n=7		n=8		n=9		n=10		Traditional	
0.001	0.0032	0	0	0.0032	0	0.0027	0	0.01	0	0.0095	0	0.0077	0.000455	0.009							0.0005	0.0018
0.002	0.0032	0.0064	0.0018	0.0082	0.0009	0.0027	0	0.0132	0	0.0195	0.0009	0.0127	0.001364	0.011							0.0018	0.0032
0.003	0.0032	0.0064	0.0068	0.01	0.0027	0.0182	0	0.0205	0	0.0223	0.0014	0.0232	0.003636	0.015							0.0027	0.0036
0.004	0.0032	0.0095	0.0068	0.0114	0.0027	0.0241	0	0.0295	0	0.0259	0.0018	0.0236	0.004545	0.018							0.0064	0.005
0.005	0.0032	0.0127	0.0068	0.0164	0.0027	0.0268	0	0.0327	0.0005	0.0359	0.0018	0.0332	0.006364	0.021							0.0082	0.0073
0.006	0.0032	0.0127	0.0068	0.0177	0.0027	0.0268	0.0023	0.0436	0.0005	0.04	0.0032	0.0359	0.006364	0.023							0.0082	0.0095
0.007	0.0032	0.0127	0.0077	0.02	0.0041	0.0323	0.0023	0.0436	0.0005	0.0409	0.0036	0.0405	0.007727	0.028							0.0105	0.0109
0.008	0.0095	0.0159	0.0082	0.025	0.0055	0.0345	0.0023	0.0436	0.0014	0.0486	0.005	0.0468	0.007727	0.03							0.0109	0.0168
0.009	0.0095	0.0159	0.0082	0.025	0.0068	0.0423	0.0023	0.0464	0.0014	0.0486	0.005	0.0468	0.009545	0.034							0.0114	0.0173
0.01	0.0127	0.0191	0.0082	0.0305	0.0082	0.0482	0.0032	0.05	0.0014	0.0518	0.0059	0.0509	0.009545	0.034							0.0127	0.0191
0.02	0.0191	0.0255	0.0218	0.0518	0.015	0.0836	0.0059	0.0782	0.0136	0.0818	0.0155	0.0791	0.020909	0.077							0.0259	0.0341
0.025	0.0318	0.0318	0.0255	0.0586	0.0191	0.0959	0.0136	0.0936	0.0182	0.0909	0.0182	0.0855	0.025455	0.095							0.0314	0.0423
0.03	0.0509	0.0382	0.0336	0.0705	0.0195	0.1059	0.0173	0.1023	0.0205	0.0945	0.0295	0.115	0.029545	0.112							0.0341	0.0527
0.04	0.0573	0.0641	0.0445	0.105	0.0273	0.1386	0.0282	0.1536	0.0305	0.1323	0.0418	0.1327	0.034545	0.131							0.0455	0.0645
0.05	0.0732	0.0923	0.0559	0.1555	0.035	0.155	0.0355	0.1723	0.0309	0.1423	0.0518	0.1532	0.046818	0.152							0.0545	0.0882
0.06	0.0795	0.1141	0.0568	0.1627	0.0468	0.1736	0.0414	0.19	0.0409	0.17	0.0582	0.1641	0.055	0.178							0.0645	0.1064
0.07	0.0873	0.1255	0.07	0.1827	0.0618	0.2045	0.0486	0.1941	0.0477	0.185	0.0668	0.1982	0.060455	0.196							0.0755	0.1227
0.08	0.095	0.1441	0.0732	0.1982	0.0705	0.2195	0.0623	0.2218	0.0627	0.2277	0.0795	0.2136	0.066364	0.208							0.085	0.1332
0.09	0.1077	0.1536	0.095	0.2286	0.0841	0.2432	0.0709	0.2341	0.0736	0.2473	0.0868	0.2282	0.069545	0.224							0.0959	0.1505
0.1	0.1205	0.1768	0.1055	0.2445	0.09	0.2532	0.0805	0.2577	0.0832	0.2686	0.1018	0.2536	0.078182	0.233							0.1018	0.16
0.25	0.295	0.41	0.2686	0.4623	0.2436	0.4659	0.2091	0.4814	0.2241	0.505	0.2395	0.5027	0.259091	0.45							0.2509	0.3509
0.5	0.5336	0.6814	0.5182	0.715	0.4968	0.7377	0.4891	0.7605	0.5023	0.7605	0.47	0.7418	0.517273	0.715							0.495	0.62
0.75	0.7673	0.8859	0.7514	0.8927	0.7364	0.9045	0.7159	0.9195	0.7486	0.9332	0.7595	0.9182	0.752273	0.893							0.7473	0.8441