Term
Accuracy Definition: The degree of agreement of a measurement (X) with an accepted reference or true value (T); usually expressed as the difference between the two values (X - T), or the difference as a percentage of the reference or true value (100[X - T]/T), and sometimes expressed as a ratio (X/T).
Active radon/radon decay product measurement device Definition: A radon or radon decay product measurement system which uses a sampling device, detector, and measurement system integrated as a complete unit or as separate, but portable, components. Active devices include continuous radon monitors, continuous working level monitors, and grab radon gas and grab working level measurement systems, but does not include devices such as electret ion chamber devices, activated carbon or other adsorbent systems, or alpha track devices.
Alpha particle Definition: Two neutrons and two protons bound as a single particle that is emitted from the nucleus of certain radioactive isotopes in the process of decay.
Background count rate Definition: The counting rate obtained on a given instrument with a background counting sample. Typical reference background counting samples are: (1) Empty planchet: for G-M detectors, internal proportional counters, low background beta counters, alpha spectrometers. (2) Scintillation vial containing scintillant and sample known to contain no radioactivity: for liquid scintillation counters. (3) Container filled with distilled water: for gamma spectrometers.
Background measurements

Term
Definition: Measurements made with either active instruments exposed to a radon-free gas, such as aged air or nitrogen, or for passive detectors by analyzing unexposed detectors. Results are subtracted from the actual field measurements before calculating the reported concentration. Background levels may be due to electronic noise of the analysis system, leakage of radon into the detector, detector response to gamma radiation, or other causes.
Background radiation Definition: Radiation arising from radioactive material other than that under consideration. Background radiation due to cosmic rays and natural radioactivity is always present; background radiation may also be due to the presence of radioactive substances in building materials.
Bias Definition: A systematic (consistent) error in test results. Bias can exist between test results and the true value (absolute bias, or lack of accuracy), or between results from different sources (relative bias). For example, if different laboratories analyze a homogeneous and stable blind sample, the relative biases among the laboratories would be measured by the differences existing among the results from the different laboratories. However, if the true value of the blind sample were known, the absolute bias or lack of accuracy from the true value would be known for each laboratory. See Systematic error.
Blank sample Definition: A control sample in which the detector is unexposed and submitted for analysis. Often used to determine detector background values.
Blind spikes

Term
Definition: Detectors exposed to known radon or decay product concentrations and submitted for analysis without being labeled as such. Used to evaluate the accuracy of the measurement.
Calibrate Definition: To determine the response or reading of an instrument relative to a series of known values over the range of the instrument; results are used to develop correction or calibration factors.
Check source Definition: A radioactive source, not necessarily calibrated, which is used to confirm the continuing satisfactory operation of an instrument.
Coefficient of variation Definition: A measure of precision, calculated as the standard deviation (s or s) of a set of values divided by the average (Xave or μ), and usually multiplied by 100 to be expressed as a percentage. [COV = RSD = / x 100 for a sample] [COV' = RSD' = / x 100 for a population] See Relative percent difference. Acronym: COV
curie Definition: A standard measurement for radioactivity, specifically the rate of decay for a gram of radium - 37 billion decays per second. A unit of radioactivity equal to 3.7 x 10^{1} disintegrations per second. Acronym: Ci

Term
Duplicate measurements Definition: Two measurements made concurrently and in the same location, or side-by-side. Used to evaluate the precision of the measurement method.
Electron Definition: An elementary constituent of an atom that orbits the nucleus and has a negative charge. Beta decay is radioactive decay in which an electron is emitted from a nucleus.
Electron volt Definition: One eV is equivalent to the energy gained by an electron in passing through a potential difference of one volt. One unit of energy = 1.6 x 10^{12} ergs = 1.6 x 10^{1} joules; 1 MeV = 1 10 eV. Acronym: eV
Exposure time Definition: The length of time a specific mail-in device must be in contact with radon or radon decay products to get an accurate radon measurement. Also called exposure period, exposure parameters, or duration of exposure.
Gamma radiation Definition: Short-wavelength electromagnetic radiation of nuclear origin, with energies between 10 keV to 9 MeV.
Integrating device

Term
Definition: A device that measures a single average concentration value over a period of time. Also called a time integrating device.
Ion Definition: An electrically charged atom in which the number of electrons does not equal the number of protons.
Ionization Definition: The process whereby a neutral atom or molecule becomes negatively or positively charged by acquiring or losing an electron.
Ionizing radiation Definition: Any type of radiation capable of producing ionization in materials it contacts; includes high-energy charged particles such as alpha and beta rays, and non-particulate radiation such as gamma rays and X-rays. In contrast to wave radiation (e.g., visible light and radio waves) in which waves do not ionize adjacent atoms as they move.
Known exposure measurement Definition: See Spiked measurement
Lower limit of detection Definition: The smallest amount of sample activity which will yield a net count for which there is confidence at a predetermined level that activity is present. For a five percent probability of concluding falsely that activity is present, the LLD is approximately equal to 4.65 times the standard deviation of the background counts (assuming large numbers of counts where Gaussian statistics can be used [ANSI 1989, Pasternack and Harley 1971, U.S. DOE 1990]).

Term
Acronym: LLD
Passive radon/radon decay product measurement device Definition: A radon or radon decay product measurement system in which the sampling device, detector, and measurement system do not function as a complete, integrated unit. Passive devices include electret ion chamber devices, activated carbon or other adsorbent systems, or alpha track devices, but does not include continuous radon/radon decay product monitors, or grab radon/radon decay product measurement systems.
picocurie Definition: One pCi is one trillionth of a curie, 0.037 disintegrations per second, or 2.22 disintegrations per minute. Acronym: pCi
picocurie per liter Definition: A unit of radioactivity corresponding to one decay every 27 seconds in a volume of one liter, or 0.037 decays per second in every liter of air. Acronym: pCi/L
Pooled estimate of variance Definition: An estimate of precision derived from different sets of duplicates, calculated as follows: $S^2dp = S^2d1 (n - 1) + S^2ds (n - 1)/(n - 1) + (n - 1)$ Where: S^2dp = pooled variance; S^2d1 = variance observed with the first group of detectors or equipment; S^2d2 = variance observed with the second group of detectors or equipment; n = sample size of the first group of detectors or equipment; and n = sample size of the second group of detectors or equipment.

Term
Precision Definition: A measure of mutual agreement among individual measurements of the same property, usually under prescribed and similar conditions. Most desirably expressed in terms of the standard deviation, but can be expressed in terms of the variance, pooled estimate of variance, range, relative percent difference, or other statistic.
Quality assurance Definition: A complete program designed to produce results which are valid, scientifically defensible, and of known precision, bias, and accuracy. Includes planning, documentation, and quality control activities.
Quality control Definition: The system of activities to ensure a quality product, including measurements made to ensure and monitor data quality. Includes calibrations, duplicate, blank, and spiked measurements, interlaboratory comparisons, and audits.
Radioactive equilibrium Definition: A state in which the formation of atoms by decay of a parent radioactive isotope is equal to its rate of disintegration by radioactive decay.
Radioactive equilibrium ratio Definition: The total concentration of radon decay products (RDPs) present divided by the concentration that would exist if the RDPs were in radioactive equilibrium with the radon gas concentration which is present. At equilibrium (i.e., at an equilibrium ratio of 1.0), 1 WL of RDPs would be present when the radon concentration was 100 pCi/L. The ratio is never 1.0 in a house. Due to ventilation and

Term
plate-out, the RDPs never reach equilibrium in a house environment. A commonly assumed equilibrium ratio is 0.5 (i.e., the progeny are halfway toward equilibrium), in which case 1 WL corresponds to 200 pCi/L. However, equilibrium ratios vary with time and location, and ratios of 0.3 to 0.7 are commonly observed. Large buildings, including schools, often contain equilibrium ratios less than 0.5.
Radon Definition: A colorless, odorless, naturally occurring, radioactive, inert, gaseous element formed by radioactive decay of radium (Ra) atoms. The atomic number is 86. Although other isotopes of radon occur in nature, radon in indoor air is almost exclusively Rn-222. Acronym: Rn
Radon chamber Definition: An airtight enclosure in which operators can induce and control different levels of radon gas and radon decay products. Volume is such that samples can be taken without affecting the levels of either radon or its decay products within the chamber.
Random error Definition: Variations of repeated measurements that are random in nature and not predictable individually. The causes of random error are assumed to be indeterminate or non-assignable. The distribution of random errors is assumed generally to be normal (Gaussian).
Range Definition: The difference between the maximum and minimum values of a set of values. When the number of values is small (i.e., eight or less), the range is a relatively sensitive (efficient) measure of variability. As the number of values increases above eight, the

Term
efficiency of the range (as an estimator of the variability) decreases rapidly. The range, or difference between two paired values, is of particular importance in air pollution measurement, since in many situations duplicate measurements are performed as part of the quality assurance program.
Relative percent difference Definition: A measure of precision, calculated by: Rd% = [X - X]/Xave x 100 where: X = concentration observed with the first detector or equipment; X = concentration observed with the second detector, equipment, or absolute value; and Xave = average concentration = ((X + X) / 2) The relative percent difference (RPD) and coefficient of variation (COV) provide a measure of precision, but they are not equal. Below are example duplicate radon results and the corresponding values of relative percent difference and coefficient of variation. See also Coefficient of variation (COV) Acronym: RPD
Relative standard deviation Definition: See Coefficient of variation Acronym: RSD
Shewhart control chart Definition: A graphical chart with statistical control limits and plotted values (for some applications in chronological order) of some measured parameter for a series of samples. Use of the charts provides a visual display of the pattern of the data, enabling the early detection of time trends and shifts in level. For maximum usefulness in control, such charts should be plotted in a timely manner (i.e., as soon as the data are available).
Spiked measurements

Term
Definition: Quality control measurements in which the detector or instrument is exposed to a known concentration and submitted for analysis. Used to evaluate accuracy.
Standard deviation Definition: A measure of the scatter of several sample values around their average. For a sample, the standard deviation (s) is the positive square root of the sample variance. For a finite population, the standard deviation (s) is where μ is the true arithmetic mean of the population and N is the number of values in the population. The property of the standard deviation that makes it most practically meaningful is that it is in the same units as the observed variable X. For example, the upper 95% probability limit on differences between two values is 2.77 times the sample standard deviation. Acronym: s
Standard operating procedure Definition: A written document which details an operation, analysis, or action whose mechanisms are prescribed thoroughly and which is commonly accepted as the method for performing certain routine or repetitive tasks.
Statistical control chart Definition: A graphical chart with statistical control limits and plotted values (for some applications in chronological order) of some measured parameter for a series of samples. Use of the charts provides a visual display of the pattern of the data, enabling the early detection of time trends and shifts in level. For maximum usefulness in control, such charts should be plotted in a timely manner (i.e., as soon as the data are available).
Statistical control chart limits

Term
Definition: The limits on control charts that have been derived by statistical analysis and are used as criteria for action, or for judging whether a set of data does or does not indicate lack of control. On a means control chart, the warning level may be two standard deviations above and below the mean, and the control limit may be three standard deviations above and below the mean.
Systematic error Definition: The condition of a consistent deviation of the results of a measurement process from the reference or known level. The cause for the deviation, or bias, may be known or unknown, but is considered "assignable" (i.e., if the cause is unknown, it should be possible to determine the cause). See Bias.
Time integrated sampling Definition: Sampling conducted over a specific time period (e.g., from two days to a year or more) producing results representative of the average value for that period.
Uncertainty Definition: The estimated bounds of the deviation from the mean value, expressed generally as a percentage of the mean value. Taken ordinarily as the sum of (1) the random errors (errors of precision) at the 95% confidence level, and (2) the estimated upper bound of the systematic error (errors of accuracy).
Variance Definition: Mathematically, the sample variance is the sum of squares of the differences between the individual values of a set and the arithmetic average of the set, divided by one less than the number of values. For a finite population, the variance s^2 is the sum of

Term
squares of deviations from the arithmetic mean, divided by the number of values in the population where μ is the true arithmetic mean of the population.
Working level Definition: Any combination of short-lived radon decay products in one liter of air that will result in the ultimate emission of 1.3 x 10 MeV of potential alpha energy. This number was chosen because it is approximately the alpha energy released from the decay products in equilibrium with 100 pCi of Ra-222. Exposures are measured in working level months (WLM). Acronym: WL