AN INEXPENSIVE METHOD OF ACCURATELY MEASURING THE AVERAGE RADON CONCENTRATION IN A RADON TEST CHAMBER OR IN THE FIELD

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INTRODUCTION

The radon measurement industry is primarily interested in radon risk to inhabitants in homes and work places. Since health risk accumulates with time , longer term measurements are more important than instantaneous radon assays. Accurate measurements of the average radon concentration over days and years is complicated by the variation of radon concentration with time. Three mechanisms that most perturb the radon concentration are the well known diurnal radon concentration cycle, dilution by drafts, and normal radioactive decay.

Radon measurements are usually performed by three types of detectors. They are electronic instruments that continuously sample the radon concentration, record each value in memory, and calculate the average at the end of the exposure. Integrators such as E-perms, or alpha track devices, or semi-integrators such as activated charcoal detectors are more routinely used. For calibration purposes electronic continuous radon detectors are frequently used to precisely define the exposure fields that the other detectors are tested in. The quality of these test exposures depends on the calibration and stability of the continuous radon measuring device used to define the radon field. Good calibration facilities deploy more than one continuous monitors to confirm the results, and the devices must be calibrated at least annually.

A better type of continuous monitor should contain a radon source that could be used to standardize the instrument to eliminate short and long term errors. Some Lucas cells are made with internal radium sources such as the Pylon 3150A calibrator. Evacuated Lucas cells are frequently used for short term 'grab' samples to determine near instantaneous radon concentrations. If it were possible to accumulate an air sample composed of many smaller samples taken over time that were compensated for decay, one or more Lucas cells could be used to measure the average radon concentration over several days with accuracy and precision rivaling electronic instruments and exceeding continuous monitors by the ability to normalize to a radium doped Lucas cell. This purpose of this paper is to describe such a system.