

AbstractID: 1680 Title: Calibration results and operational experience with a system for monitoring exposures and emissions from a medical cyclotron for the production of PET isotopes

A commercial monitoring system (RADACS™, Canberra Corporation, Meriden, CN) was installed to monitor air flows, exposure rates, and emissions in a building housing a medical cyclotron, chemistry facilities and PET scanner for the production, labeling and imaging of the principal positron emitters. Factory calibrations were verified and additional measurements performed to validate a system for the quantification of emissions and exposures to personnel.

The system measures exposure levels within the cyclotron vault and at strategic points within the facility and count rates from radioactive effluent released to the atmosphere. Integration of the count rate data yields total activity released. Two systems located at the release point were calibrated: a VGM-100™ sodium iodide detector placed within the main vent and a CAM-200™ sampler/detector. Both were calibrated using the general relationship:

$$\text{Release Peak Area} = \text{constant} \times \text{released activity}$$

Measured amounts of C-11 carbon dioxide gas were released into the exhaust vent.

The constant for each monitor was determined from a linear fit to the above using calibrated activities and peak area measurements from each detector:

VGM-100=  $1.95 \times 10^{-6}$   $\mu\text{Ci}/\text{cc-min}/\text{mCi}$  and CAM-200=  $2.61 \times 10^{-6}$   $\mu\text{Ci}/\text{cc-min}/\text{mCi}$ .

Conclusions: (1) Linearity and sensitivity of VGM-100 and CAM-200 systems were sufficient to measure gaseous radioactive effluent concentrations for verification of limits. (2) Regulatory compliance with emissions was verified with both systems.

(3) Supplemental field measurements were performed to verify cyclotron and PET scanner shielding.