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MEASUREMENT AND MODELING OF GAMMA-ABSORBED DOSES DUE TO ATMOSPHERIC RELEASES FROM LOS ALAMOS MESON PHYSICS FACILITY

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Funding Organization: Los Alamos National Laboratory

Introduction

Portable, high-pressure ionization chambers (HPICs) measure short-term gamma radiation levels caused by air activation products from the Los Alamos Meson Physics Facility's (LAMPF)

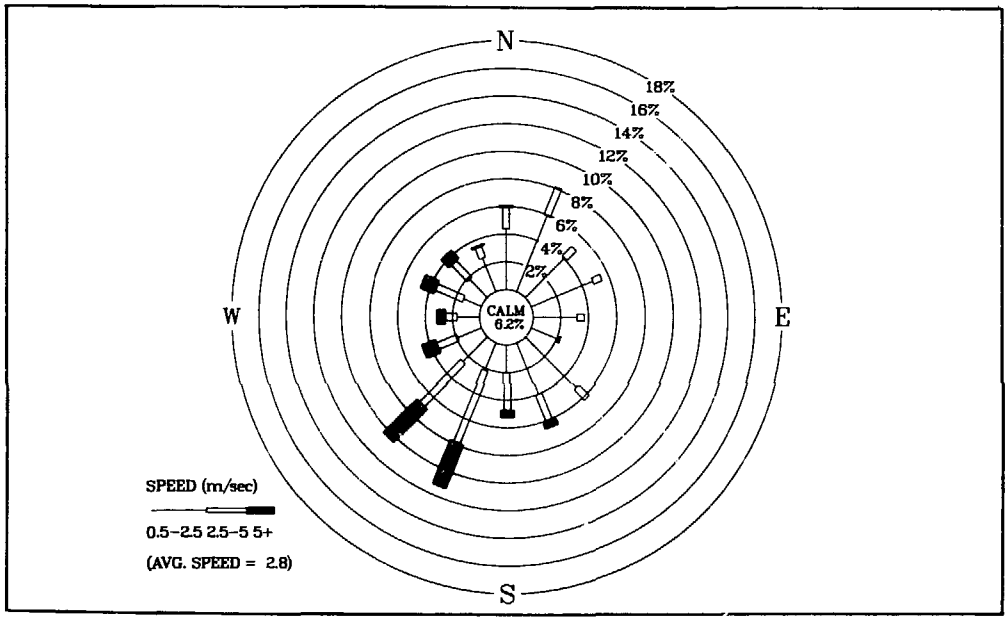

FIGURE 22.
Wind rose for nearest off-site location from Los Alamos Meson Physics Facility's 1983 operating cycles (January 1 to February 8 and September 8 to December 31).

emissions. The HPICs are situated at the nearest (~800 m) off-site location from LAMPF (designated Station 6, East Gate). These measurements are in addition to those made by the thermoluminescent dosimeter network that routinely measures long-term gamma radiation levels. A Gaussian-type atmospheric dispersion model, which accounts for gamma radiation from various radioisotopes in the LAMPF plume, is used to predict gamma-absorbed doses.

Short-term gamma-absorbed doses were measured by one HPIC at an azimuth of 12° from the LAMPF stack during the January 1 through February 8 operating cycle. Two HPICs were in the field during the September 8 through December 31 operating cycle, one north and the other north-northeast of the LAMPF stack, but they did not provide reliable data. Meterorological data were also measured at both East Gate and LAMPF. Airborne emission data were taken at the stack.

Results

The predominant winds are typically south-southwesterly and southwesterly over LAMPF. Figure 22 shows the wind rose for the periods in 1983 when LAMPF was operating. The high frequency of south–southwesterly and southwesterly winds is due in large part to the afternoon Rio Grande Valley upwind. These predominant winds blow toward East Gate.

Daily model predictions, based on the integration of modeled 15-min periods, were made for the first LAMPF operating cycle and were compared with the measured data. Figure 23 shows the comparison of the predicted and measured daily gamma doses due to LAMPF emissions. There is very good correlation between measured and predicted values. During 39-day operating cycles, the model predicted an absorbed dose of 10.3 mrad compared with the 8.8 mrad that was measured, an overprediction of 17%.

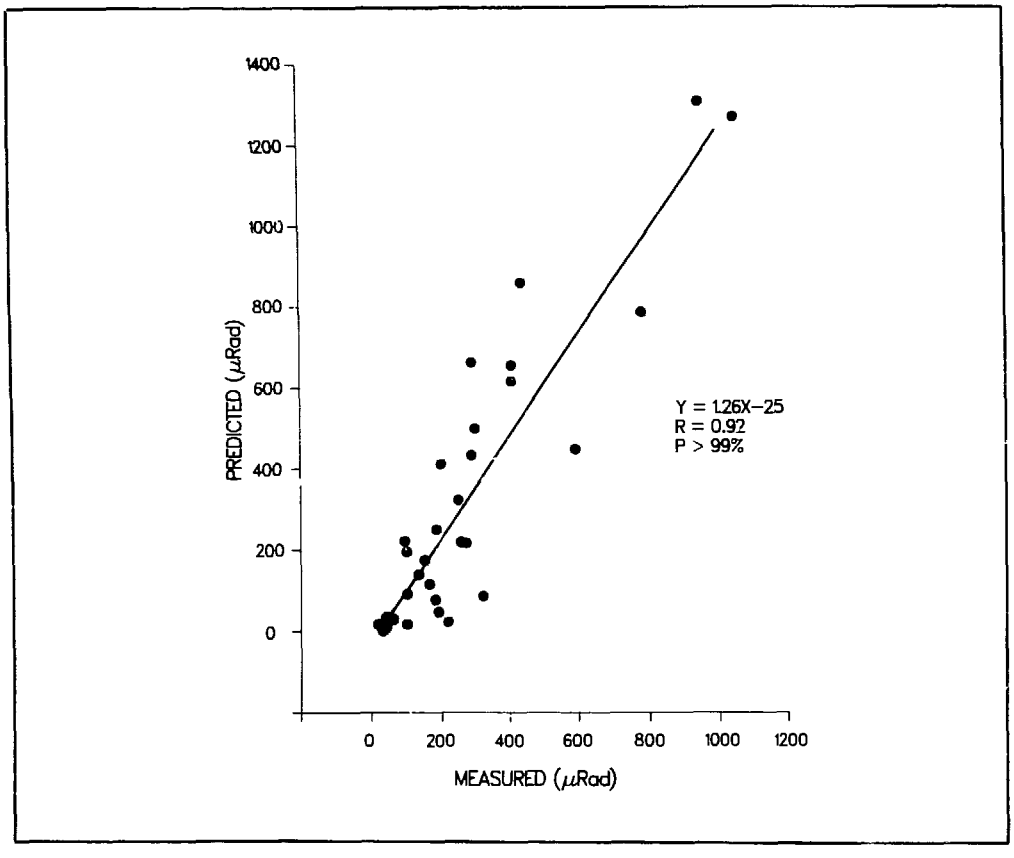

FIGURE 23.
Predicted versus measured daily gamma doses.

Further Study

Three portable HPICs will be used during the next LAMPF operating cycle. The instruments will be placed in the directional sectors of north, north-northwest, and northeast from the LAMPF stack toward East Gate. A TLD will also be placed by each HPIC. It is hoped that the dimensions of the plume can be better defined over short time periods. Also, the short-term model's accuracy and precision can be tested further. Finally, comparisons of HPIC data with TLD data of model predictions will be made.

DELTA COUNT-RATE MONITORING S`

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Detection of radioactive contaminants in the environment often requires surveying large areas. A need for a more effective way to rapidly search for gamma-ray contamination over large areas led to the design and construction of a very sensitive gamma detection system.[1] This system alerts the user to small changes in the count rate, or delta, which can locate areas of potential radioactive contamination.

Environmental surveys are frequently done in areas with rugged off-road conditions in adverse weather. For this reason, the delta count-rate monitoring system was installed in a four-wheel-drive van instrumented for environmental surveillance and accident response.

The system consists of four main sections: (1) two scintillation detectors, (2) high-voltage power supply amplifier and single-channel analyzer, (3) delta count-rate monitor, and (4) count-rate meter and recorder. The van's 6.5-kW generator powers the standard nuclear instrument modular design system. The two detectors are mounted in the rear corners of the van and can be run singly or jointly. A solid-state bar-graph count-rate meter mounted on the dashboard can be read easily by both the driver and passenger. Mounted just to the right of the driver is a solid-state strip chart recorder, which shows trends and provides a permanent record of the data. An audible alarm is sounded at the delta monitor and at the dashboard count-rate meter if a detected radiation level exceeds the set background level by a predetermined amount.

Reference

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SAMPLING AND INSTRUMENTATION REQUIREMENTS FOR LONG-RANGE D&D ACTIVITIES AT INEL

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Assistance was requested to help determine sampling and instrumentation requirements for the long-range decontamination and decommissioning activities at the Idaho National Engineering Laboratory. Through a combination of literature review, visits to other DOE contractors, and a