ORNL
INSTRUMENT EVALUATION SUMMARY

Eberline RO-20

Description: The RO-20 is a five-range portable instrument that utilizes a vented ion chamber to measure beta-gamma radiation. The ranges are 5 mR/hr (0 - 5 mR/hr), 50 mR/hr (0 - 50 mR/hr), 500 mR/hr (0 - 500 mR/hr), 5 R/hr (0 - 5 R/hr), and 50 R/hr (0 - 50 R/hr).

Summary Date: August 6, 1996

Ranges Evaluated: 5 and 50 mR/hr, and 5 R/hr (Environmental Factors Only)

General Comments:

NOTE: A group of 5 RO-20s were updated by Eberline out of which 4 were re-evaluated. This summary contains the results from the re-evaluation.

1. When originally evaluated, all instruments were extremely erratic on the 5 mR/hr range. The manufacturer was notified and indicated that there was not any damping on the meter movement. This has been revised and may be available on recently produced models.
2. Confidence intervals used to ascertain whether results are conclusive or inconclusive are
determined using the 0.95 quantile of the student's t distribution (95% confidence interval).
3. Unless indicated otherwise, the 5 R/hr range was only evaluated for "Environmental Factors."

INTERFERING RESPONSES TEST RESULTS

Radio Frequency/Microwave: Each RO-20 had acceptable results, on each range tested, when exposed to 140, 915, and 2450 MHz fields at 20 (+10,-0) volts/meter. No susceptibilities were observed during the scan from 100 kHz to 1000 MHz at 20 (+10,-0) volts/meter when operated on the 50 mR/hr range. When operated on the 5 mR/hr range, response abnormalities were observed at frequencies from 730 to 800 MHz. Three of the four evaluated went low during

exposure with the remaining RO-20 responding high during exposure.

Electric Fields: Each RO-20 had acceptable results, on each range tested, when exposed to an electrostatic field of 5000 volts/meter, and electric fields of 60 and 400 Hz at 40 volts/meter. Electric field tests were performed using the Gigahertz Transverse Electromagnetic Wave Cell.

Magnetic Fields: Each RO-20 had acceptable results, on each range tested, when exposed to 10 Gauss (10 Oersted) DC, and 60 Hz (1.26 Gauss) AC in two orientations.

ENVIRONMENTAL FACTORS

Temperature: All results were acceptable from the 5 and 50 mR/hr, and the 5 R/hr ranges at temperatures from -10 to 50 °C.

Temperature Shock: When tested on the 50 mR/hr and the 5 R/hr ranges, all RO-20s were acceptable when exposed to rapid temperature changes of 22 to -10, -10 to 22, 22 to 50, and 50 to 22 (° C). When tested using the 5 mR/hr range, three of the four RO-20s had out-of-tolerance low responses after being exposed to the rapid temperature change from 22 to -10 °C. One of the three had out-of-tolerance low readings 30 and 60 minutes after being exposed to the rapid temperature change from 22 to 50 °C. This same instrument went low after being exposed to the rapid temperature change from 50 to 22 °C. The remaining RO-20 had acceptable responses throughout the test. One inconclusive result was obtained at the first recording interval after being shocked from 22 to -10 °C. All mean responses were within the acceptance range.

Humidity: All instruments had acceptable results when operated on the 5 and 50 mR/hr, and the 5 R/hr ranges in humidities of 40 and 95% at 22 ± 2 °C.