2 C.3

LA-3395-MS

DECLASSIFIED

LOS ALAMOS SCIENTIFIC LABORATORY
of the
University of California
LOS ALAMOS • NEW MEXICO

Radiation Measurements of the Effluent from the Kiwi TNT Experiment

UNITED STATES
ATOMIC ENERGY COMMISSION
CONTRACT W-7405-ENG. 36

All LA...MS reports are informal documents, usually prepared for a special purpose and primarily prepared for use within the Laboratory rather than for general distribution. This report has not been edited, reviewed, or verified for accuracy. All LA...MS reports express the views of the authors as of the time they were written and do not necessarily reflect the opinions of the Los Alamos Scientific Laboratory or the final opinion of the authors on the subject.

Printed in USA. Price $2.00. Available from the Clearinghouse for Federal Scientific and Technical Information, National Bureau of Standards, United States Department of Commerce, Springfield, Virginia

LA-3395-MS
UC-41, HEALTH AND SAFETY
TID-4500

LOS ALAMOS SCIENTIFIC LABORATORY
of the
University of California
LOS ALAMOS • NEW MEXICO

Report written: October 1965

Report distributed: April 7, 1966

Radiation Measurements of the Effluent from the Kiwi TNT Experiment

Work performed by:

C. L. Cuntz
R. V. Fultyn
R. W. Henderson
O. W. Larson

Report written by:

R. W. Henderson
R. V. Fultyn

APPROVED FOR PUBLIC RELEASE

APPROVED FOR PUBLIC RELEASE

ABSTRACT

This report includes a compilation of data resulting from the collection of samples of, and direct measurements of, the effluent cloud from the Kiwi Transient Nuclear Test experiment. Data are presented concerning the magnitude and isotopic composition of the airborne and ground deposited material at distances from 4,000 feet to 50 miles from the test point. Data from samples collected by cascade type impactors are given. Film dosimetry radiation measurements taken at the various stations are presented. A brief description of equipment and techniques used in the reduction is included.

An appendix gives the true distance and azimuth of each sampling station with regard to the TNT test point. For neatness and ease of tabulation, station locations used in this report are relative to Test Cell C.

ACKNOWLEDGMENTS

The Los Alamos Scientific Laboratory would like to acknowledge the assistance and excellent cooperation of the Radiological Sciences Department of the Reynolds Electrical and Engineering Company, Inc., in all phases of this operation.

APPROVED FOR PUBLIC RELEASE

CONTENTS

APPROVED FOR PUBLIC RELEASE

INTRODUCTION

The Kiwi Transient Nuclear Test (TNT) was conducted by the Los Alamos Scientific Laboratory (LASL) at the Nuclear Rocket Development Station (NRDS), Jackass Flats, Nevada, on January 12, 1965. The purpose of this nuclear destruction test of a prototype nuclear reactor engine was to furnish information for the Rover Flight Safety Program. A primary objective of the experiment was to determine the radiation environment resulting from such an excursion.

A slightly modified Kiwi B4 type reactor with no previous history was used for this test. The control mechanism was changed to allow abnormally rapid reactivity addition in order to produce a transient. The transient, resulting in $\sim 3 \times 10^{20}$ fissions, as anticipated, completely destroyed the reactor. About 60 to 70 per cent of the fission product activity was included in the effluent cloud which was carried by 15 to 20 knot winds away from the test point. This report discusses the radiation environment resulting from this effluent as documented by the LASL Field Studies Group (H-8) using extensive measurements of airborne and ground deposited fission product material.

Group H-8 brought to this experiment a backlog of procedures, techniques, and equipment developed in the course of work done during the previous testing programs in Project Rover.[1-3]

The highly mobile sampling capability made it possible to establish a concentrated array of samplers in the downwind direction. The trailer mounted units were placed in a sector between 180° and 280° on arcs 4,000, 8,000, 16,000, 32,000, 64,000, 128,000, and 256,000 feet from the test point.

Figures 1 and 2 show the location of H-8 sampling stations used for this test around Test Cell C. Because of the proximity of the TNT test point to Test Cell C (approximately 650 feet northwest), station placement beyond 4,000 feet was on the arcs previously established for the test cell. Figure 3 shows only those stations on the extended arcs which were used for this test. A total of 86 complete stations were established for the event. These stations consisted of an air sampling trailer, a pair of resin coated trays, and a film badge.

Each air sampling unit is equipped with a 3.5 kW generator, a high volume air sampler, and a radio receiver and decoder. This radio equipment allows complete remote operation of the generators and sampling equipment. A majority of the trailers were equipped with cascade impactors and a sequential sampler. Figures 4 and 5 show a fully equipped sampling trailer. Figure 6 shows the remote control unit for the radio system.

DESCRIPTION OF SAMPLING EQUIPMENT

High Volume Air Sampler (Figs. 7 and 8)

The high volume air sampler is a Staplex air sampler fitted with a transition piece to accommodate a 6 x 9 inch Whatman No. 41 filter paper. This particulate filter is backed up by a pair of organic vapor type respirator cartridges (activated charcoal) in parallel. This arrangement of sampling media allows for the gross separation of the airborne material into two distinct fractions. The material collected on the filter is assumed to be particulate and that on the charcoal cartridges is assumed to be gaseous at the time of collection. The sampling rate for this system is a nominal 1 M^3/minute.

Cascade Impactor (Fig. 9)

Figure 9 shows the cascade impactor being installed on the sampling trailer. The Unico* design has been selected by H-8 for field work, based on previous experience with several designs.[2] Nondrying resin coated plastic slides are used for the impaction stages and a millipore filter is used for the fifth and last stage. The unit provides an approximation to the size distribution of the airborne particulates as determined by their effective aerodynamic diameters.

Sequential Sampler

The sequential sampler as installed in a sampling trailer is shown in Figs. 4 and 5. The eight sampling heads collect particulate samples to assist in the estimation of relative cloud concentration as a function of time. The sampling sequence is initiated by radio command but is manually preset to sample during the total predicted time of cloud passage. Running times per sample vary from 5 minutes on the close-in arcs to 30 minutes on the distant arcs.

Resin Coated Trays (Fig. 10)

Samples of ground deposited activity were collected on paired 7 x 10-1/2 inch lucite trays coated with a clear nondrying resin. The trays were placed horizontally on stakes approximately 30 inches above grade, as shown in Fig. 10, at all trailer locations. Lucite trays were used to avoid previously encountered neutron activation[2] and to permit microscopic examination of the collected material.

Film Badges

DuPont type 544 film packets were used to measure the integral gamma doses at all stations. This packet contains a sensitive film

*Union Industrial Equipment Corporation

type 555 which indicates doses from 0.01 to 6 R and an insensitive film type 834 which measures doses from 2 to 10^3 R. A 40 mil lead strip surrounded the films so that gamma exposures could be distinguished in the presence of beta radiation. The film packet was contained in a protective plastic wrapper for placement in the field.

Counting Equipment (Figs. 11 and 12)

Because it is desirable to obtain gross beta and gamma counts from a large number of individual samples, including filter papers, charcoal cartridges, and resin coated trays, a system has been developed[2] to provide a simultaneous count of both beta and gamma activities. Beta counting is done by means of a 7 x 10-1/2 inch methane gas flow proportional counter located in the top of an iron counting shield. The gamma counting probe consists of a 10 inch diameter by 5 inch thick plastic phosphor (Nuclear Enterprises NE 102) coupled to five Dumont 6363 photomultiplier tubes. The probe output is fed into a standard single channel analyzer operating in the integral mode with the threshold set at approximately 100 keV. The mechanical arrangement of the components allows for variation of counting geometries inside the shield. The counting positions were calibrated prior to the operation, using Sr-Y-90 for the beta counter and Cs-137 for the gamma counter. Specially designed beta proportional counters (Fig. 13) were used to count samples collected by the cascade impactors and sequential samplers.

Quantitative isotopic information about selected samples was derived by use of multichannel gamma pulse height analysis. The basic component of the system is the Radiation Instrument Development Laboratory Model 34-12, 400 channel analyzer. The input for the system is from a Harshaw Integral-line 3 x 2 inch thalium activated sodium iodide crystal with a Dumont 6363 photomultiplier tube. Readout of the system is by a Mosley Autograf X-Y recorder and Computer Measurements Corporation Printer. Provision is made in the 3-1/2 inch thick steel shield for varying the counting geometry of the sample. This allows for the highest possible counting rate and at the same time avoids serious problems with shifts due to saturation of the photomultiplier or analyzer dead-time. Figure 14 shows the detector assembly for this system and Fig. 15 shows the entire system.

PROCEDURES AND RESULTS

Analysis Procedures

Samples were counted and selected for further analysis according to the procedures described in LA-3397-MS.[1] In the course of analysis it was found that the decay of the activity on the filter papers could best be analyzed by a method of curve matching in place of stripping. This procedure involved modifying the decay curve of gross fission products until the shape of the measured curve was matched. In general the gaseous fission product activities were subtracted from the gross fission product curve and those particulate daughters which would not have been present when the sample was collected. This analysis showed the material to be essentially unfractionated gross fission products.

The gaseous and deposited materials were analyzed using the curve stripping techniques described in Reference 1. This analysis indicated that the gaseous material was composed predominantly of iodines and was not greatly different from what would be expected from sampling a cloud of unfractionated fission products. The deposited activity was predominantly nonvolatile material. Iodine-135 was the only iodine identified in these samples.

Description of Tabulated Data

Table I shows the total dosages (μCi sec/M^3) and deposition concentrations (μCi/M^2) with the activity corrected to the time of cloud passage. Airborne particulate dosages are calculated from data generated by the analysis of filter papers, and the airborne gaseous dosages from an analysis of the charcoal cartridges. The deposited activity per unit area was determined by assuming that the ground deposition is the same in composition and magnitude as that collected on the resin coated tray.

Table II shows the measured deposition velocities at the stations where there was significant sample activity. Values are given for total airborne material and airborne particulate material. The reported values are of questionable significance since the deposited activity is highly fractionated, while the airborne material is not.

Table III shows the apparent zero time composition of the material collected by the charcoal cartridges and resin coated trays as determined by curve stripping techniques. The presence of Xe-135 on the cartridges is most likely due to in-growth from the I-135, but the point at which this growth begins is not known for certain. It probably is swept out of the cartridge during sampler operation and is free to diffuse readily from the cartridge before packaging for counting. Xenon-133 does not appear, because of the biasing of the count system at about 100 keV. The presence of the Ba-La-140 on the cartridges is not well understood, but this has been seen in other studies of fission products released to the atmosphere.

Table IV shows the results of the analysis of samples collected by the Unico impactors. These results were derived using the activity on the stages at count time and a calibration of the impactors for particulates with a specific gravity of 2.6. The stages of a single unit were counted one immediately after another with a maximum spread of about 10 minutes for an entire set. These data are presented as an approximation to the size characteristics of the airborne particulates and should not be considered as the final estimate of the particle size distribution of the effluent cloud. Detailed work on the particle size distribution of the reactor fragments was carried out by the LASL Health Division, Groups H-5 and H-8.[4,5]

Calculated Cloud Effects

Tables V and VI show the results of calculations based on the analysis of the samples collected from this experiment. The whole body dose due to cloud passage, shown in Table V, is calculated assuming that the station is in a semi-infinite cloud of uniform concentration equal to that measured at the station and extrapolated to time of cloud passage. It is recognized that this assumption is poor for stations within a few miles of the test point, but for the distant stations this assumption is reasonably valid. The integral dose measured by the film at each station is also included in Table V. This table also lists the adult inhalation thyroid dose. These data arise from the iodine exposure dosages measured at each station. The following thyroid dose factors for exposure to 1 Ci sec/M^3 were used to calculate the thyroid dose.

Isotope	Thyroid Dose (rad)
I-131	329.
I-132	12.4
I-133	92.3
I-134	5.6
I-135	25.3

Table VI presents the results of calculations based on the analysis of the resin coated trays. The ground deposition dose rate is calculated on the assumption that the station was located on an infinite plane with a uniform deposit of material of the same concentration as that measured on the resin coated tray extrapolated to time of cloud passage. The 1 year integrated deposition dose is calculated assuming a clean area before the arrival of the cloud and no recontamination during the integration period. The integration is done assuming only the physical decay of the isotopes. One year was selected as the integration period because of leaching and other removal processes.

Description of Figures

Figures 16 to 21 show isodosage and isoconcentration contours as measured by the high volume air samplers and resin coated trays. The cross section of the cloud is shown in Figs. 22 to 35. Shown are the exposure dosages and ground deposition and deposition velocities as a function of angle measured on each arc. The maximum exposure dosage measured on each arc, called the hot line, is shown in Fig. 36 as a function of distance. Figure 37 shows the ground deposition concentration and deposition velocity along the hot line. The whole body dose due to cloud passage is shown in Fig. 38, and the adult thyroid dose along the hot line is shown in Fig. 39. Figure 40 shows the maximum dose rate due to deposition for each arc.

REFERENCES

1. Henderson, R. W. and R. V. Fultyn, "Radiation Measurements of the Effluent from the Kiwi B4D-202 and B4E-301 Reactors," Los Alamos Scientific Laboratory Report LA-3397-MS (August 1965).
2. Ide, H. M. et al., "Radiation Measurements of the Effluent from the Kiwi B-1A, B-1B, and B-4A Reactors," Los Alamos Scientific Laboratory Report LAMS-2932 (April 1963).
3. Jordan, H. S., "Radiation Measurements of the Effluent from the Kiwi A Series of Reactors," Los Alamos Scientific Laboratory Report LAMS-2588 (October 1961).
4. Campbell, E. E. et al., "TNT Particle Study," Los Alamos Scientific Laboratory Report LA-3337-MS (August 1965). (Classified)
5. Boasso, C. J., "Kiwi Transient Nuclear Test Core Fragment Study," Los Alamos Scientific Laboratory Report LA-3445-MS (December 1965). (Classified)

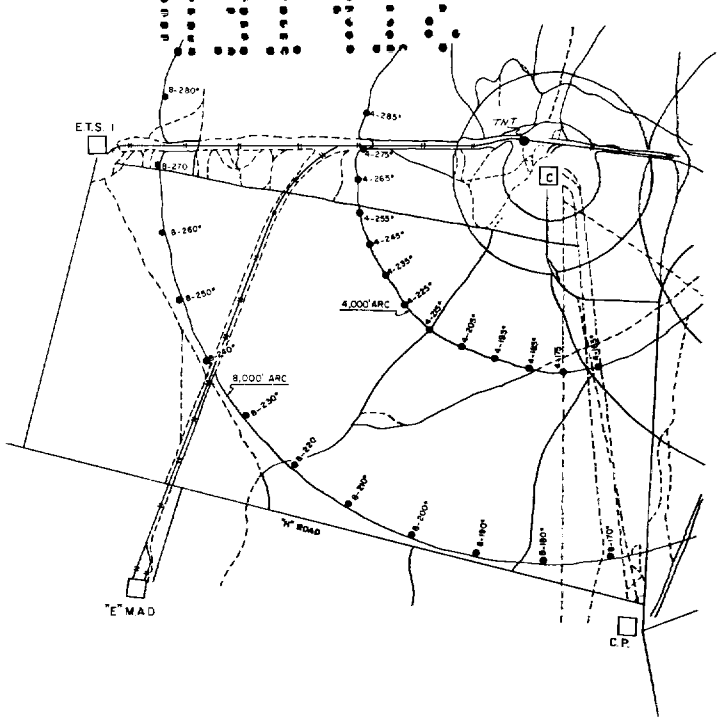


Fig. 1. Close-in placement map showing 4,000 and 8,000 foot arcs

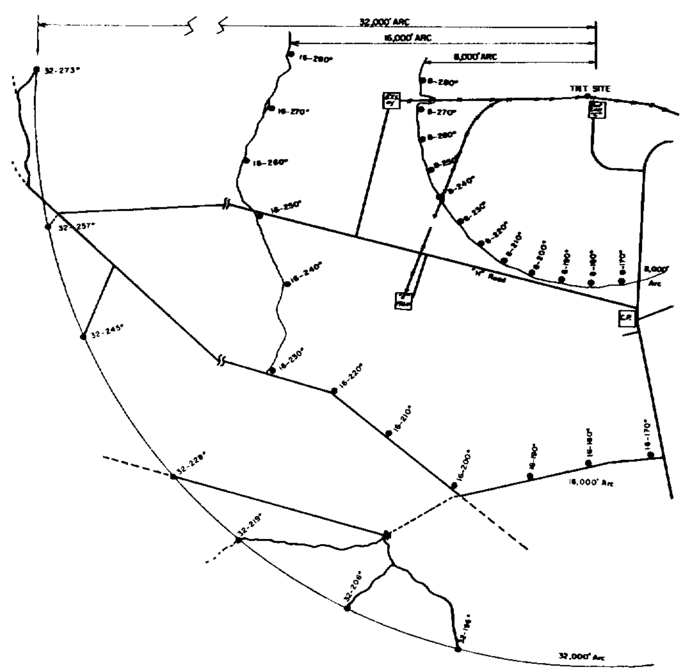


Fig. 2. Mid-distance placement map showing 8,000, 16,000, and 32,000 foot arcs

APPROVED FOR PUBLIC RELEASE

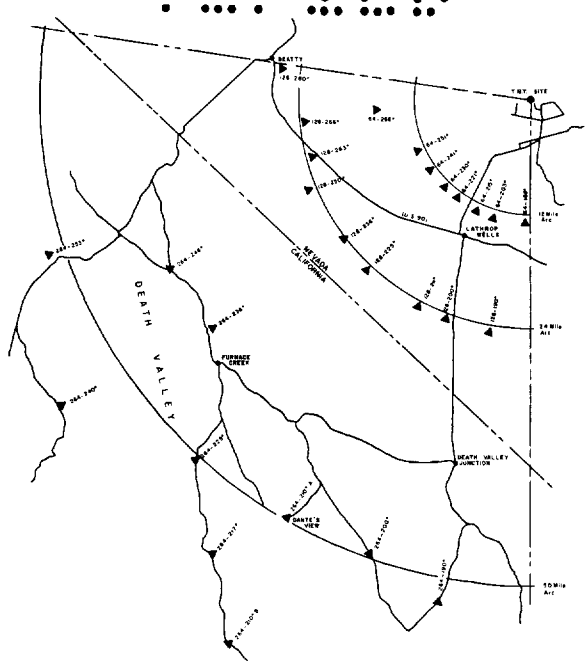


Fig. 3. Extended arc placement map showing 64,000, 128,000, and 256,000 foot arcs

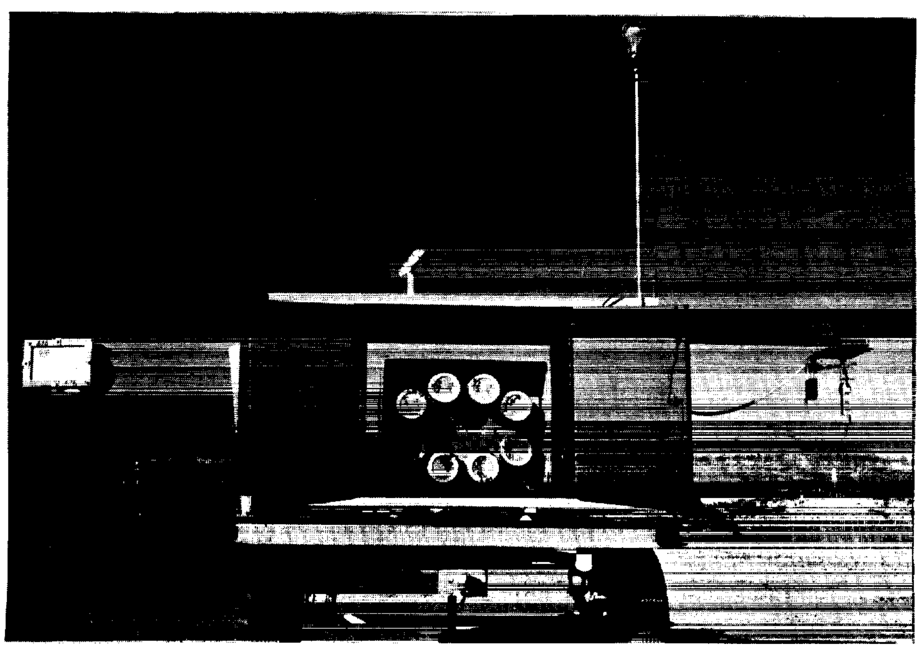


Fig. 4. Fully equipped air sampling trailer showing high volume air sampler, sequential sampler, and cascade impactor

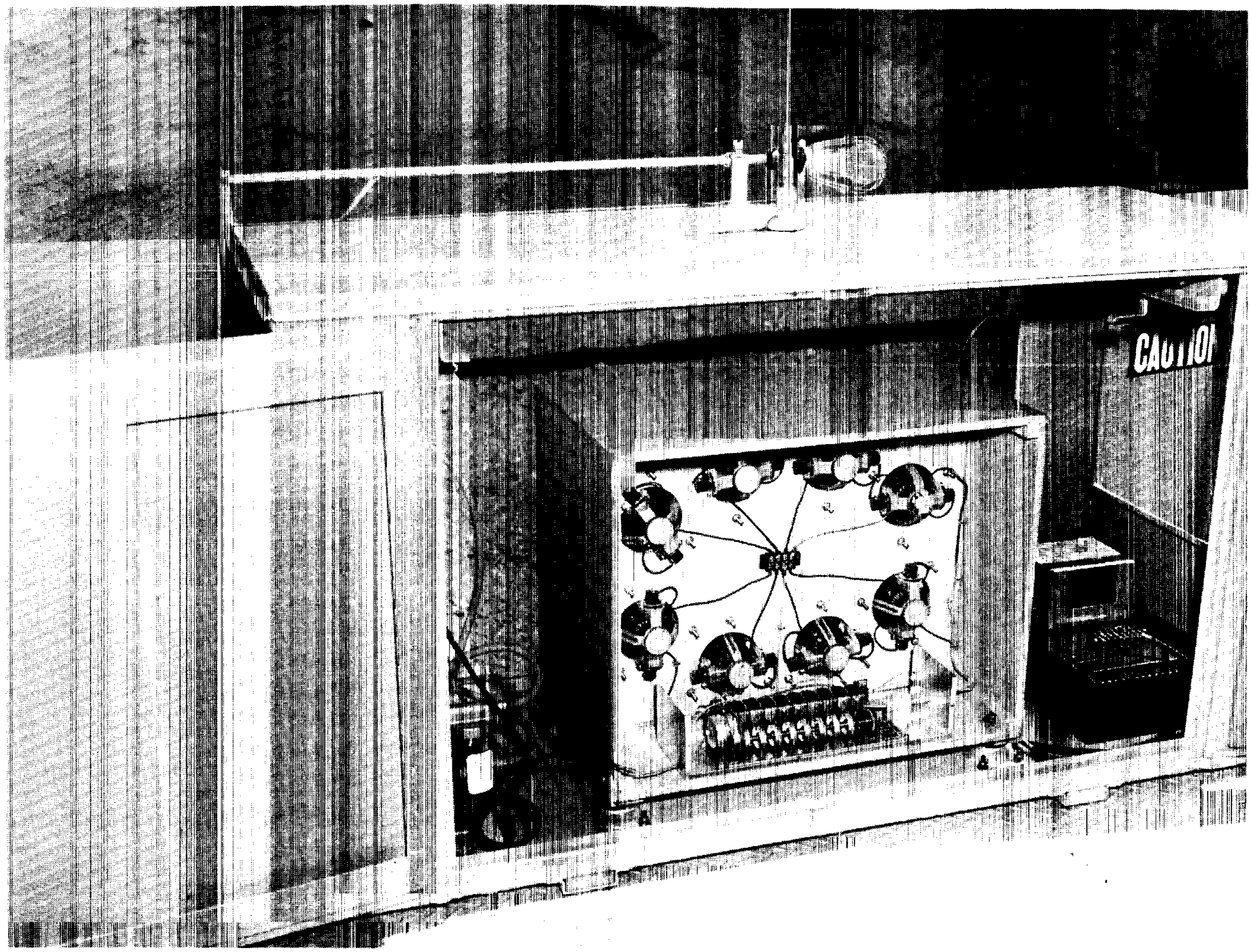


Fig. 5. Rear view of sampling trailer showing sequential sampler with timer and radio control unit

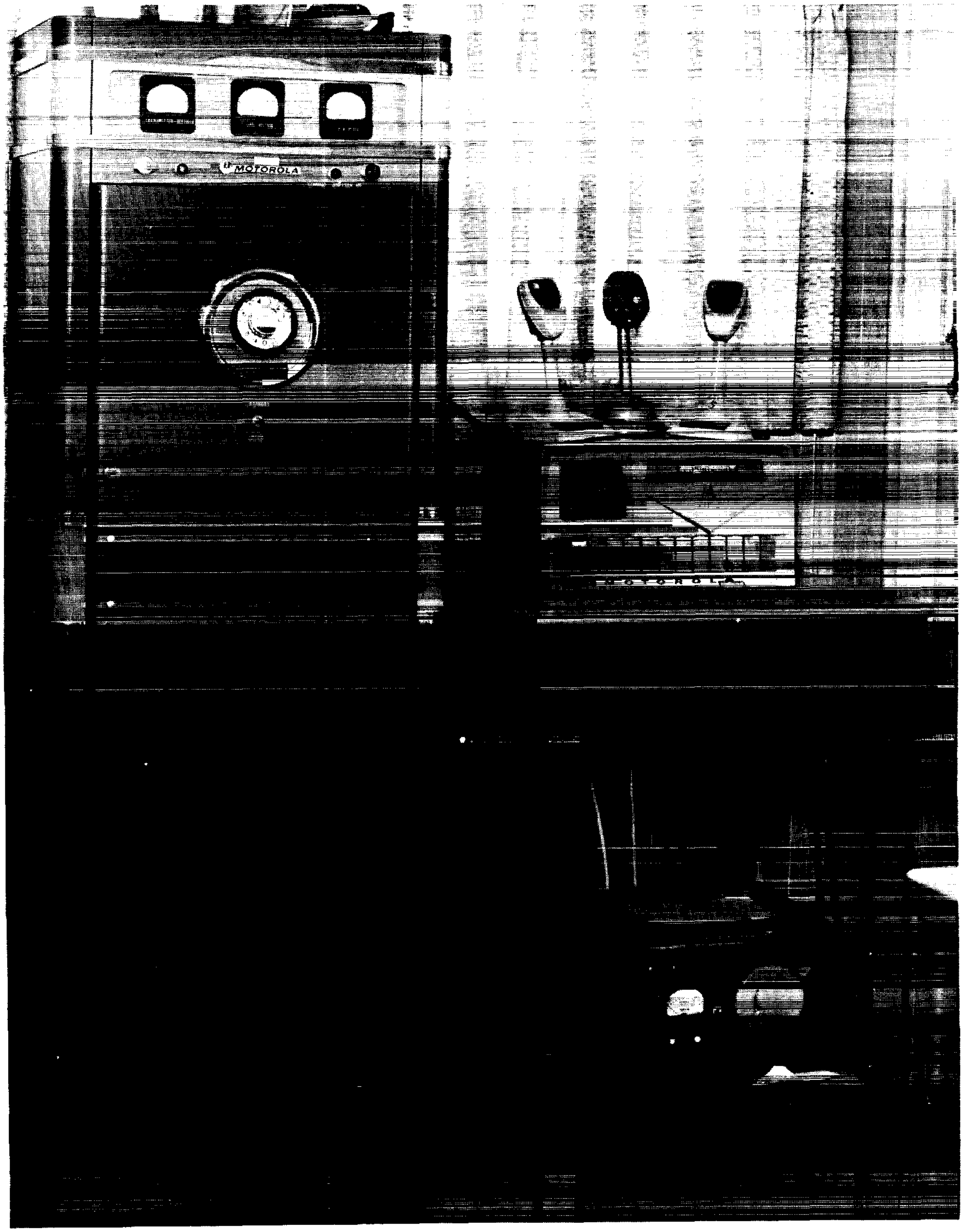


Fig. 6. Control unit for remote operation of sampling equipment

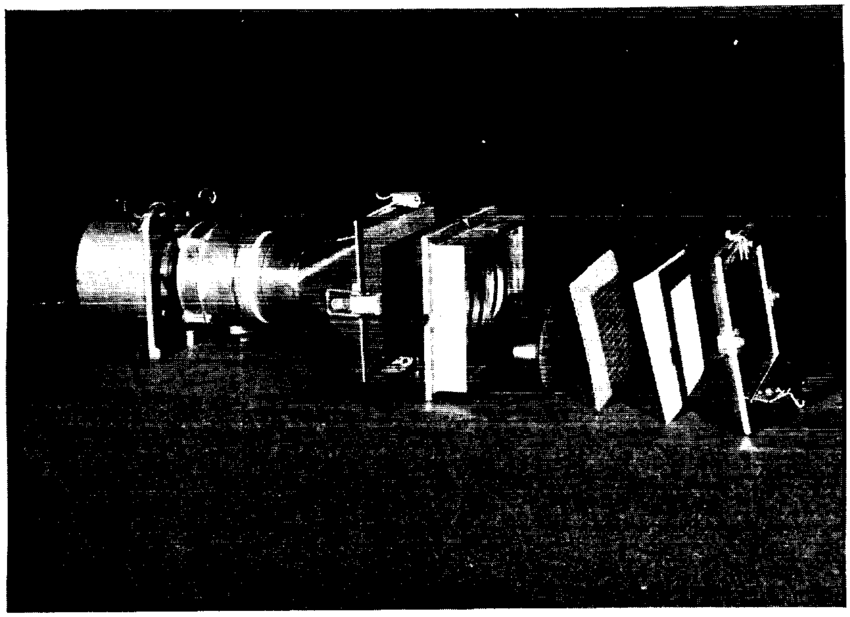


Fig. 7. Exploded view of high volume air sampler showing pump and transition piece, sampling head, charcoal cartridges, spacer screen, filter paper, and retainer frame

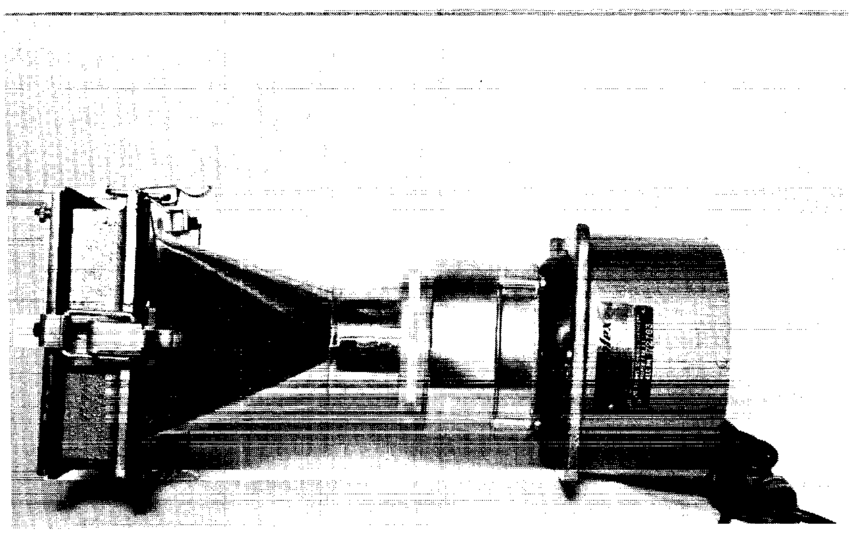


Fig. 8. Assembled view of high volume air sampler

APPROVED FOR PUBLIC RELEASE

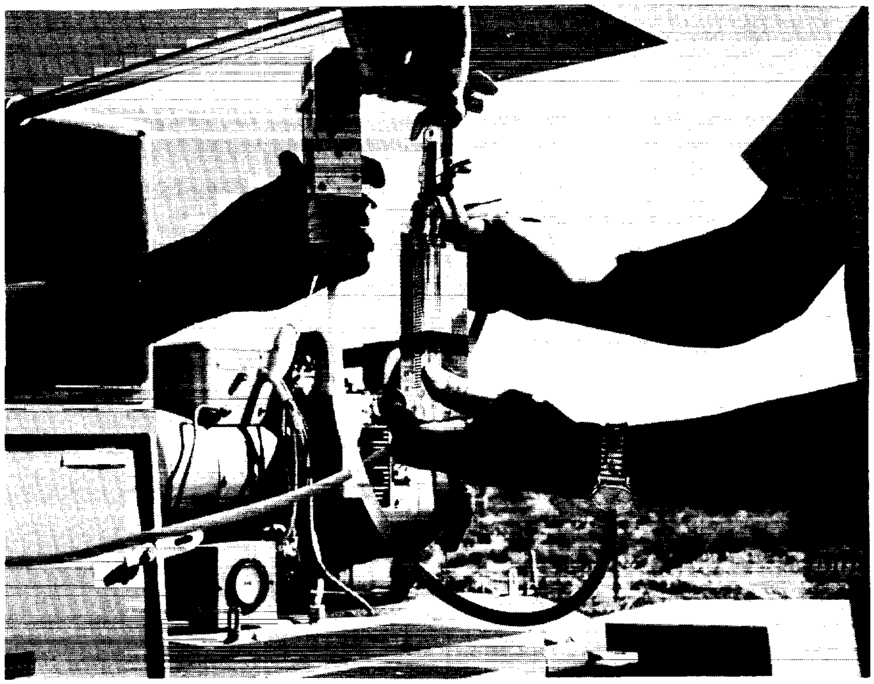


Fig. 9. Unico impactor and rotometer during installation

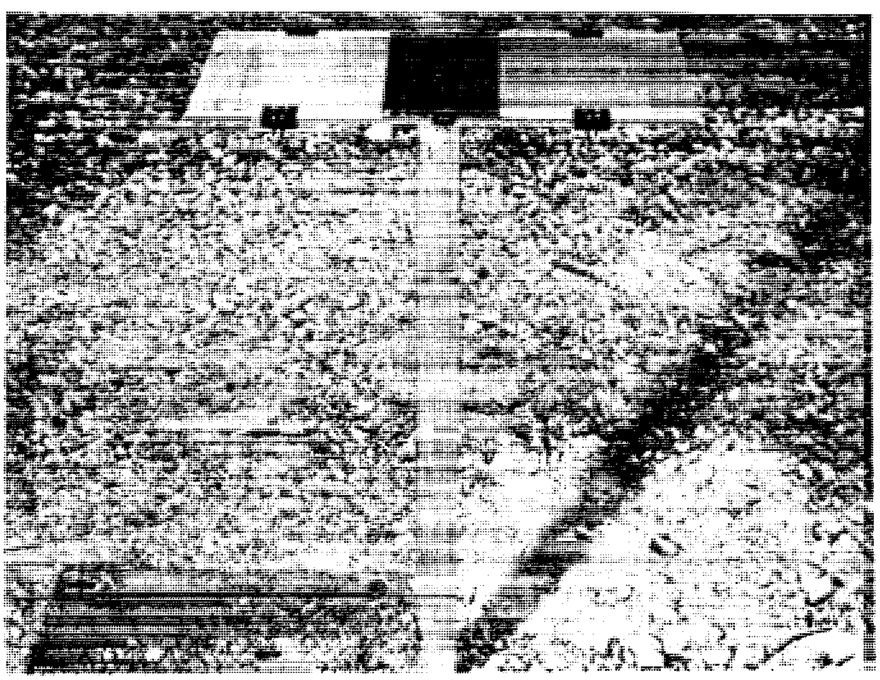


Fig. 10. Resin coated trays as placed in field

UNCLASSIFIED

APPROVED FOR PUBLIC RELEASE

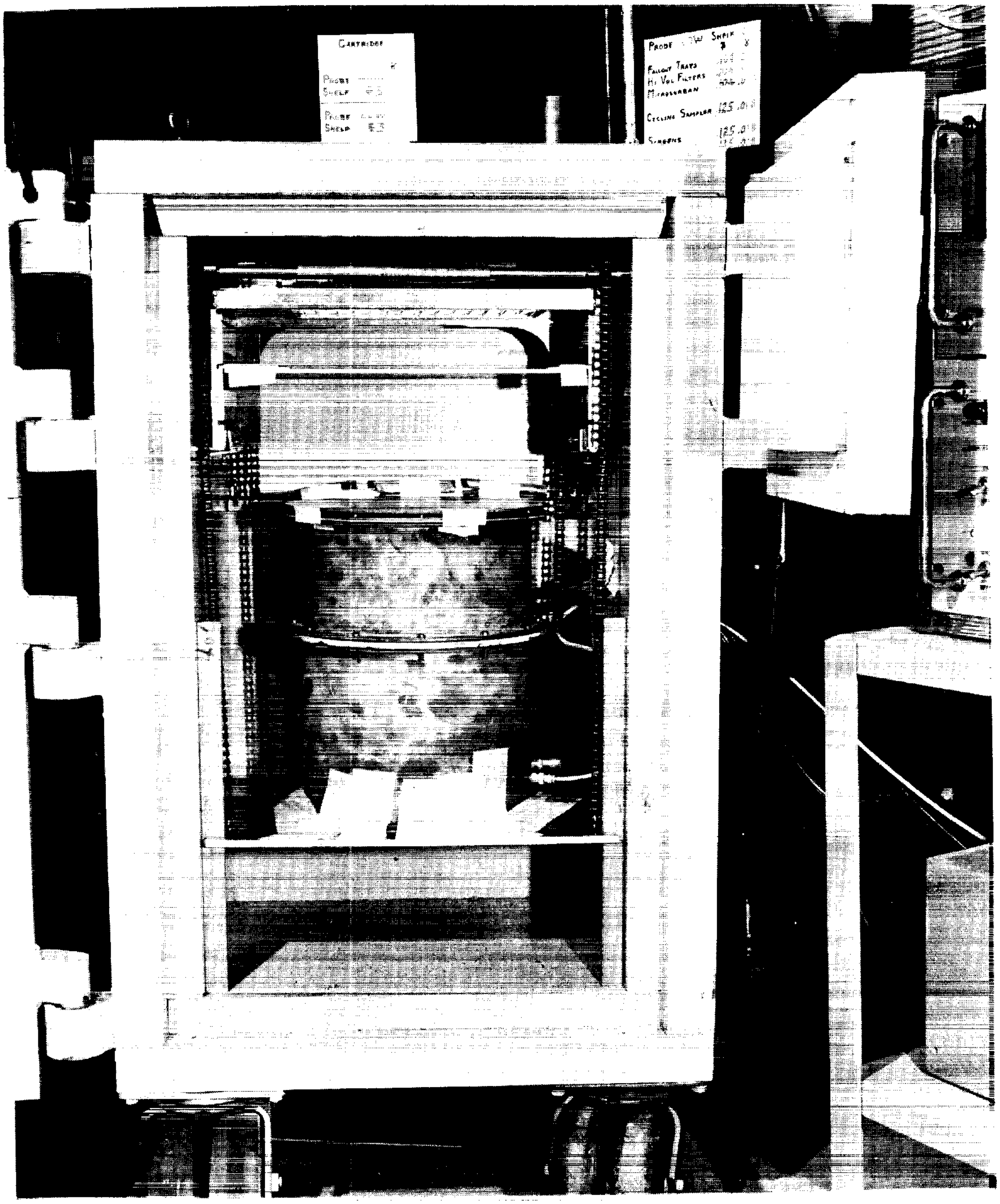


Fig. 11. Gross counting shield showing beta probe at top, sample holder, and gamma probe

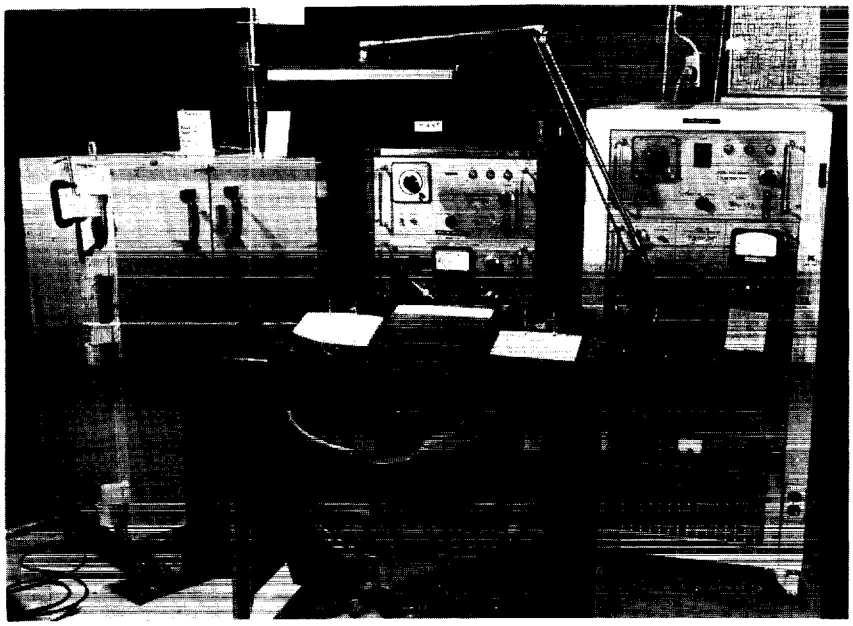


Fig. 12. Gross counting station showing shield, beta count electronics, and gamma count electronics

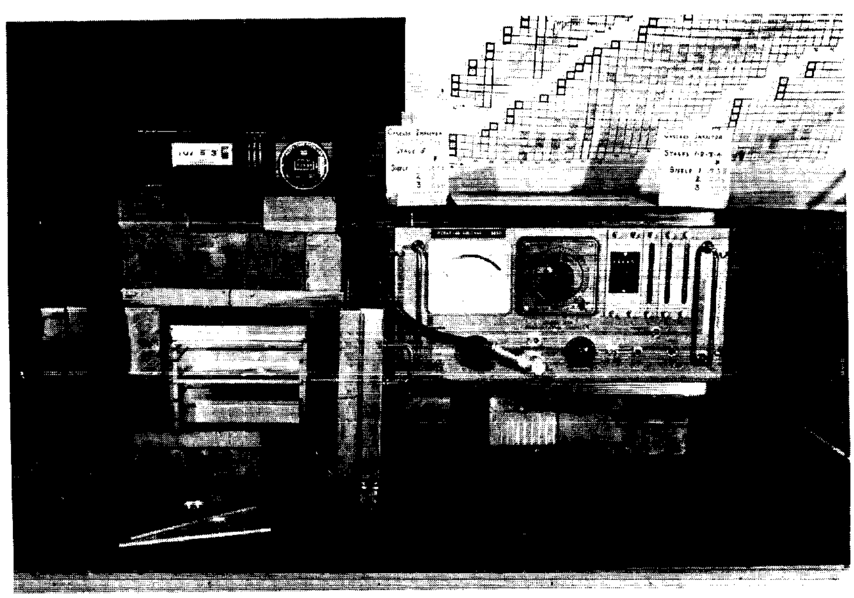


Fig. 13. Gross beta counter specially designed for Unico impactor samples

DECLASSIFIED

APPROVED FOR PUBLIC RELEASE

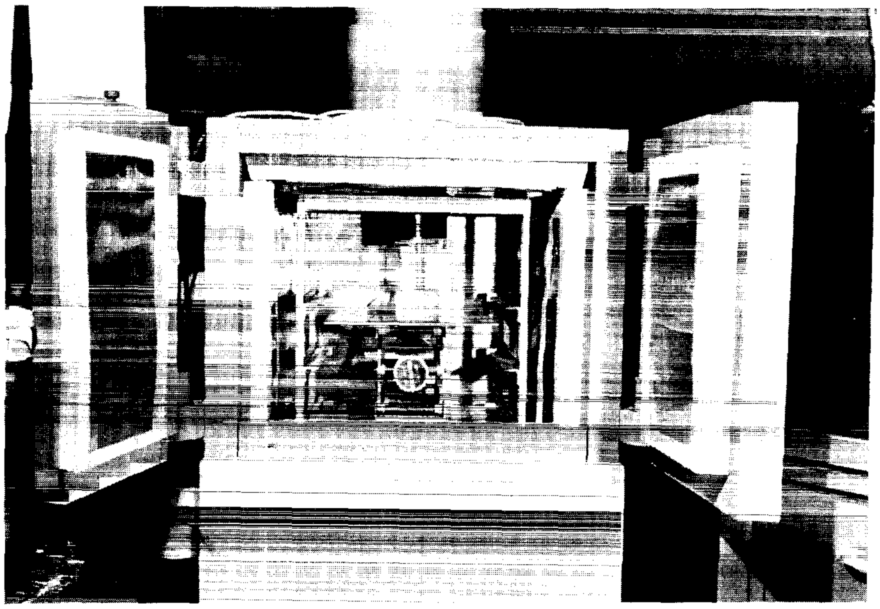


Fig. 14. Gamma pulse height analysis detector assembly showing shield, crystal, and sample positioning mechanism

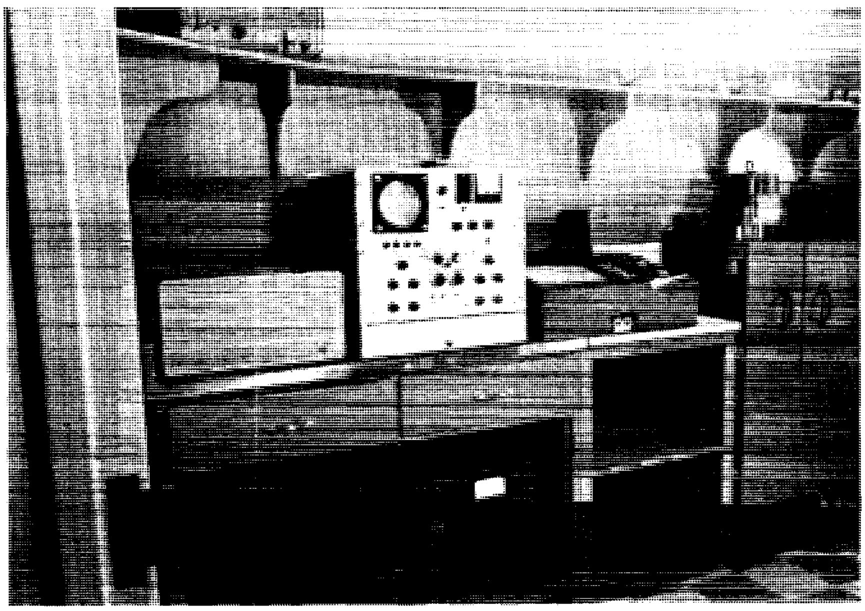


Fig. 15. Gamma pulse height analysis system showing printer, 400 channel analyzer, X-Y recorder, and detector shield

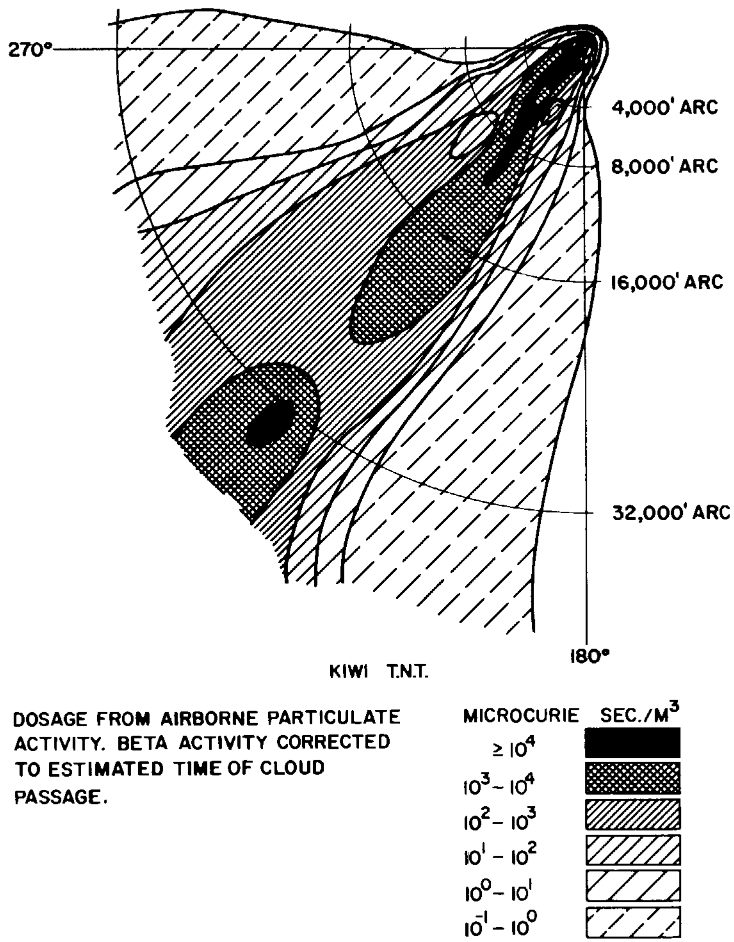

270°
4,000' ARC
8,000' ARC
16,000' ARC
32,000' ARC
180°
KIWI T.N.T.
DOSAGE FROM AIRBORNE PARTICULATE ACTIVITY. BETA ACTIVITY CORRECTED TO ESTIMATED TIME OF CLOUD PASSAGE.
MICROCURIE SEC./M^3
$\geq 10^4$
$10^3 - 10^4$
$10^2 - 10^3$
$10^1 - 10^2$
$10^0 - 10^1$
$10^{-1} - 10^0$

Fig. 16.

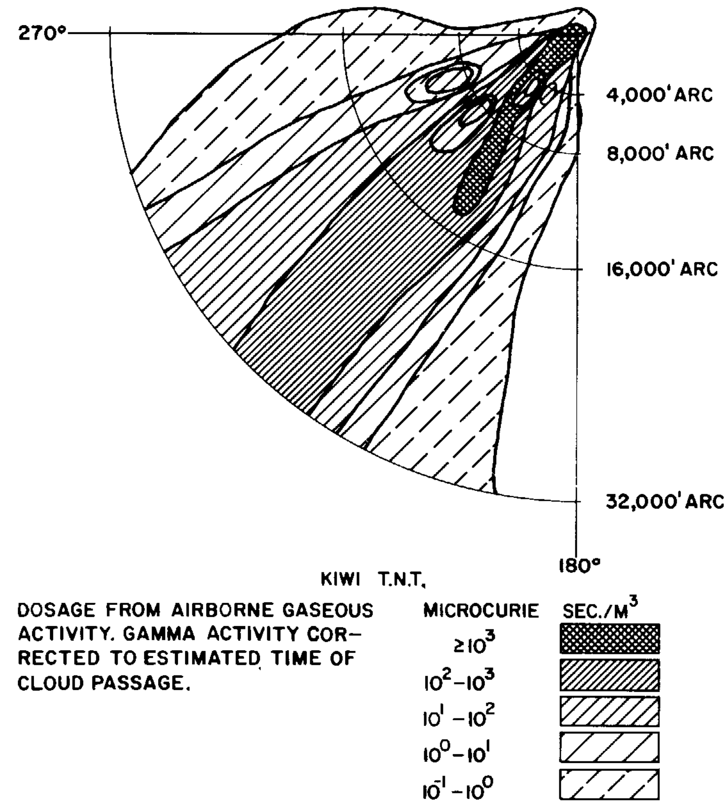

270°
4,000' ARC
8,000' ARC
16,000' ARC
32,000' ARC
180°
KIWI T.N.T.
DOSAGE FROM AIRBORNE GASEOUS ACTIVITY. GAMMA ACTIVITY CORRECTED TO ESTIMATED TIME OF CLOUD PASSAGE.
MICROCURIE SEC./M^3
$\geq 10^3$
$10^2 - 10^3$
$10^1 - 10^2$
$10^0 - 10^1$
$10^{-1} - 10^0$

Fig. 17.

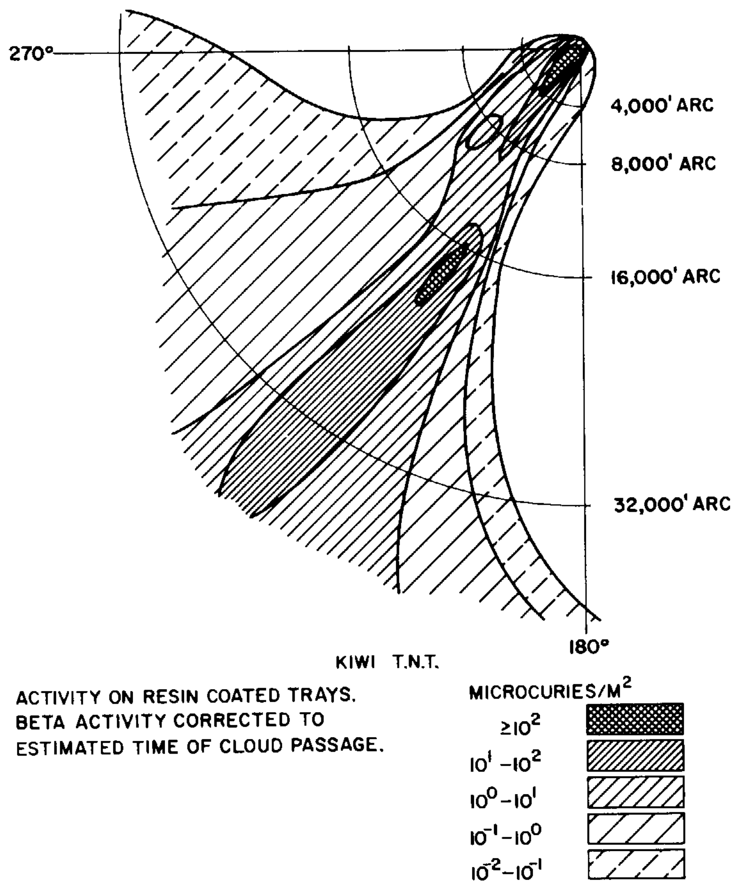

270°
4,000' ARC
8,000' ARC
16,000' ARC
32,000' ARC
180°
KIWI T.N.T.
ACTIVITY ON RESIN COATED TRAYS.
BETA ACTIVITY CORRECTED TO
ESTIMATED TIME OF CLOUD PASSAGE.
MICROCURIES/M^2
$\geq 10^2$
$10^1 - 10^2$
$10^0 - 10^1$
$10^{-1} - 10^0$
$10^{-2} - 10^{-1}$

Fig. 18.

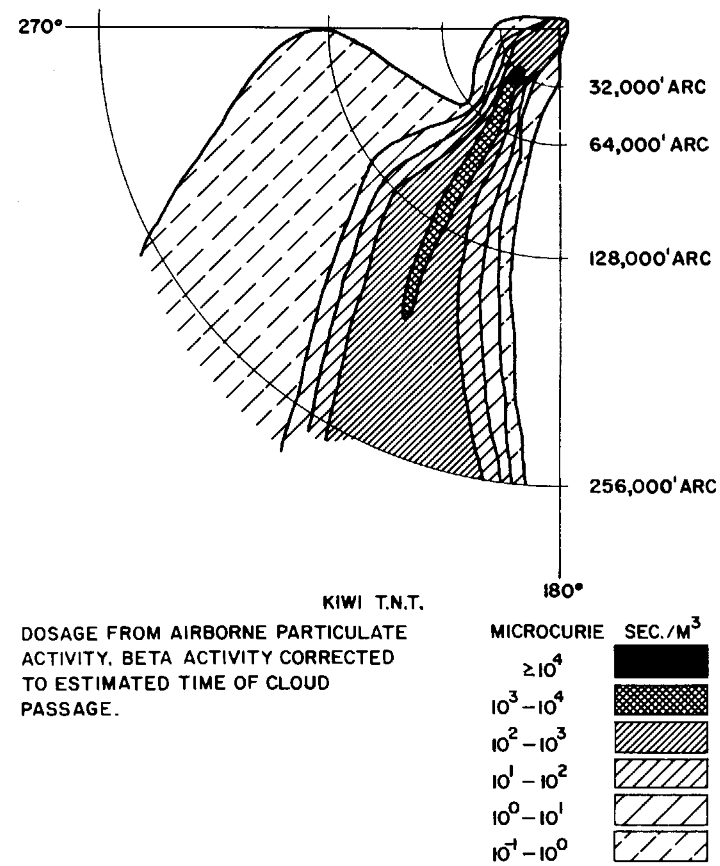
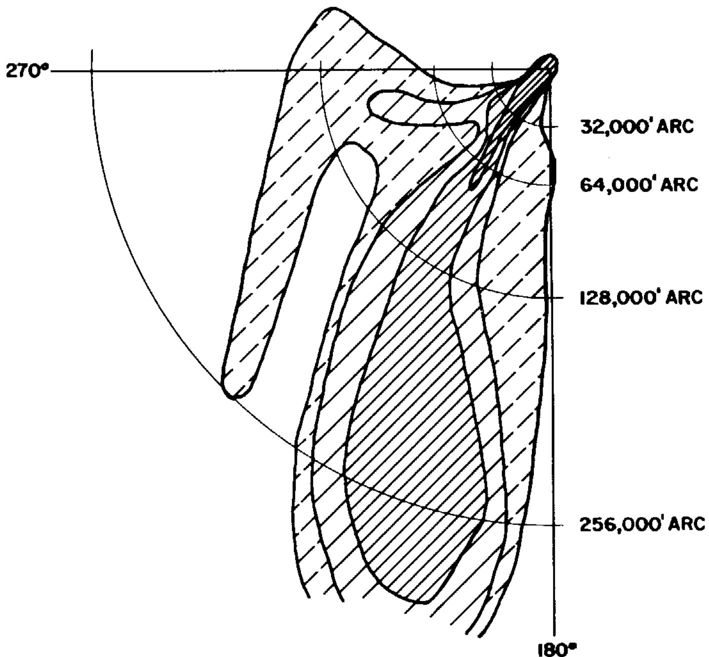

270°
32,000' ARC
64,000' ARC
128,000' ARC
256,000' ARC
180°
KIWI T.N.T.
DOSAGE FROM AIRBORNE PARTICULATE
ACTIVITY. BETA ACTIVITY CORRECTED
TO ESTIMATED TIME OF CLOUD
PASSAGE.
MICROCURIE SEC./M^3
$\geq 10^4$
$10^3 - 10^4$
$10^2 - 10^3$
$10^1 - 10^2$
$10^0 - 10^1$
$10^{-1} - 10^0$

Fig. 19.

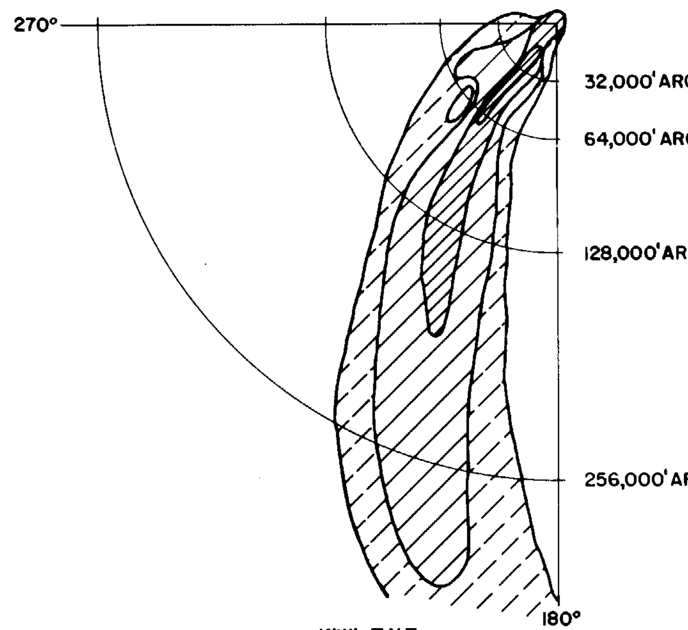


DOSAGE FROM AIRBORNE GASEOUS ACTIVITY. GAMMA ACTIVITY CORRECTED TO ESTIMATED TIME OF CLOUD PASSAGE.

MICROCURIE SEC./M^3

- $\geq 10^2$
- $10^1 - 10^2$
- $10^0 - 10^1$
- $10^{-1} - 10^0$

Fig. 20.



ACTIVITY ON RESIN COATED TRAYS. BETA ACTIVITY CORRECTED TO ESTIMATED TIME OF CLOUD PASSAGE.

MICROCURIES/M^2

- $10^1 - 10^2$
- $10^0 - 10^1$
- $10^{-1} - 10^0$
- $10^{-2} - 10^{-1}$

Fig. 21.

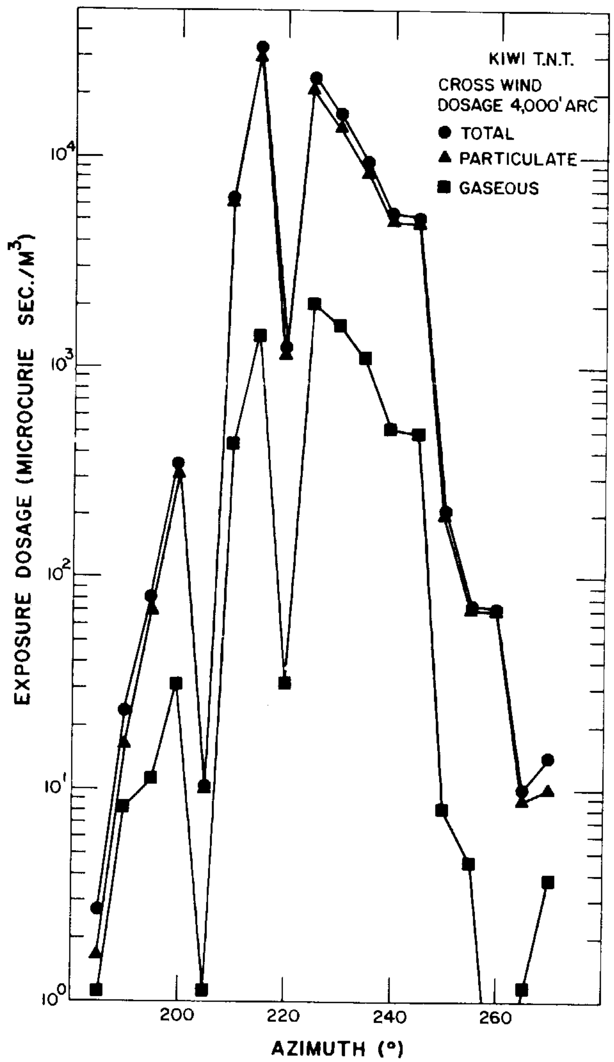

KIWI T.N.T.
CROSS WIND
DOSAGE 4,000' ARC
TOTAL
PARTICULATE
GASEOUS
EXPOSURE DOSAGE (MICROCURIE SEC./M^3)
AZIMUTH (°)

Fig. 22.

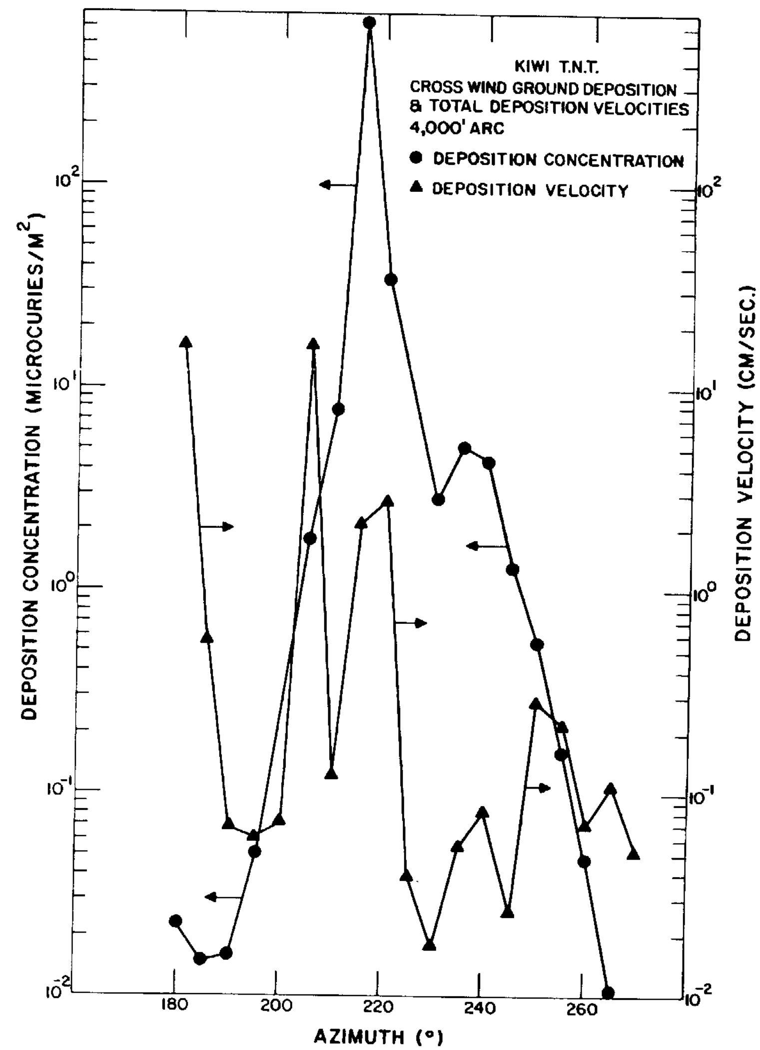

KIWI T.N.T.
CROSS WIND GROUND DEPOSITION
& TOTAL DEPOSITION VELOCITIES
4,000' ARC
DEPOSITION CONCENTRATION
DEPOSITION VELOCITY
DEPOSITION CONCENTRATION (MICROCURIES/M^2)
DEPOSITION VELOCITY (CM/SEC.)
AZIMUTH (°)

Fig. 23.

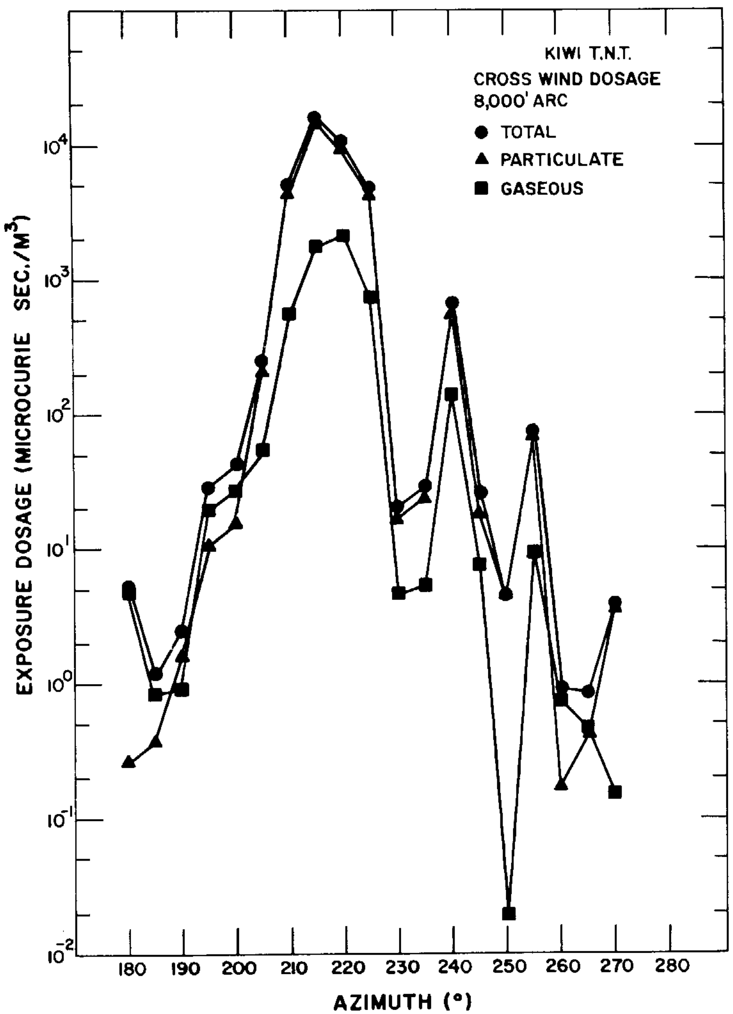

KIWI T.N.T.
CROSS WIND DOSAGE
8,000' ARC
TOTAL
PARTICULATE
GASEOUS
EXPOSURE DOSAGE (MICROCURIE SEC./M³)
AZIMUTH (°)

Fig. 24.

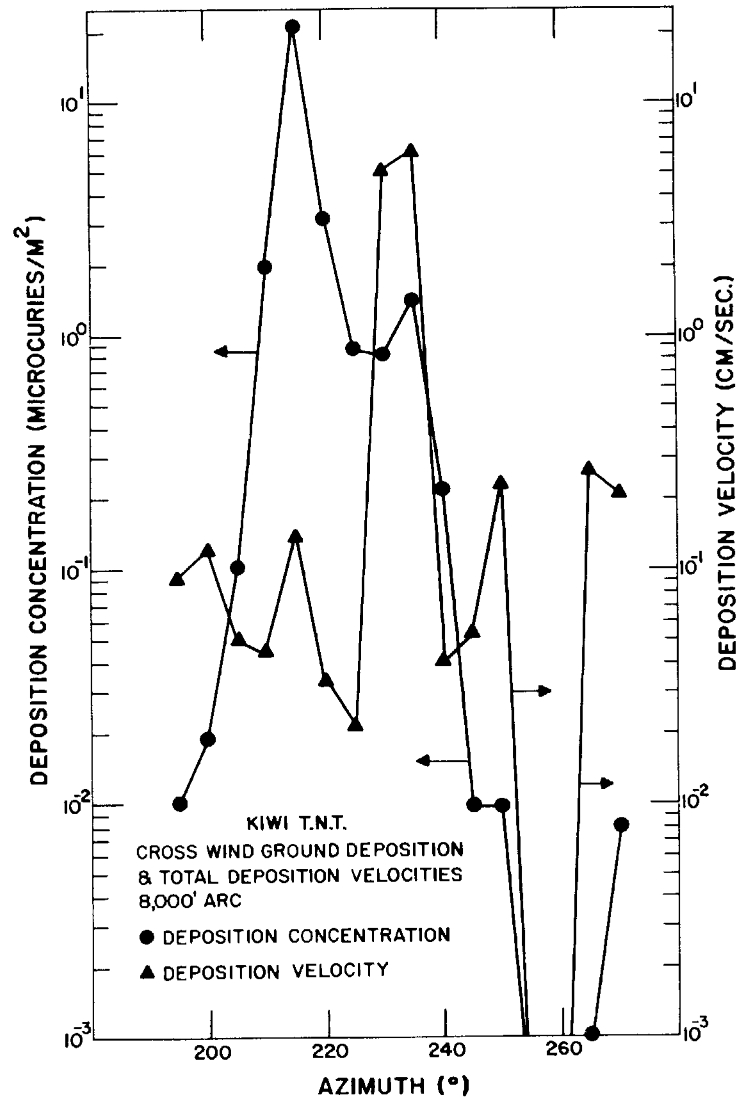

KIWI T.N.T.
CROSS WIND GROUND DEPOSITION
& TOTAL DEPOSITION VELOCITIES
8,000' ARC
DEPOSITION CONCENTRATION
DEPOSITION VELOCITY
DEPOSITION CONCENTRATION (MICROCURIES/M²)
DEPOSITION VELOCITY (CM/SEC.)
AZIMUTH (°)

Fig. 25.

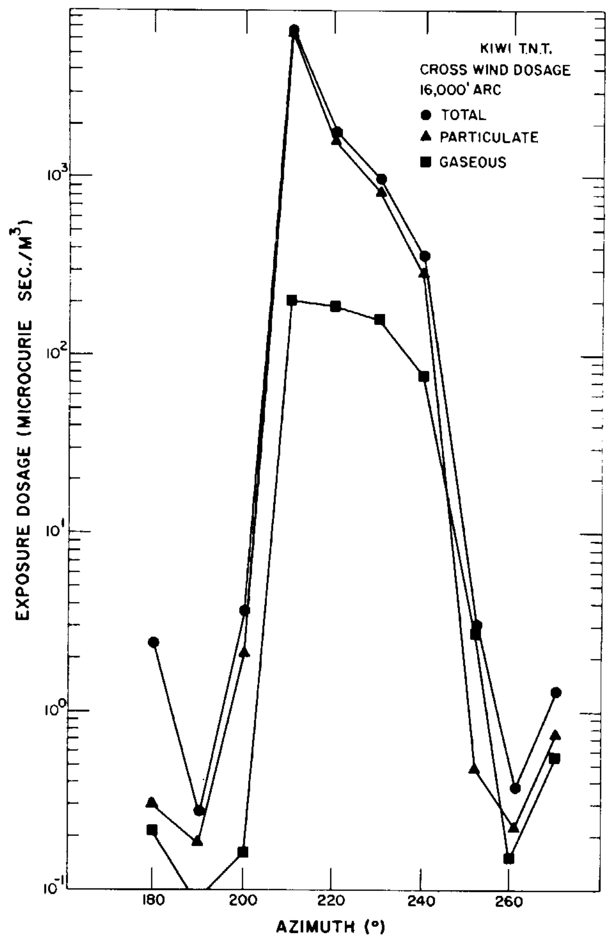

KIWI T.N.T.
CROSS WIND DOSAGE
16,000' ARC
TOTAL
PARTICULATE
GASEOUS
EXPOSURE DOSAGE (MICROCURIE SEC./M^3)
AZIMUTH (°)

Fig. 26.

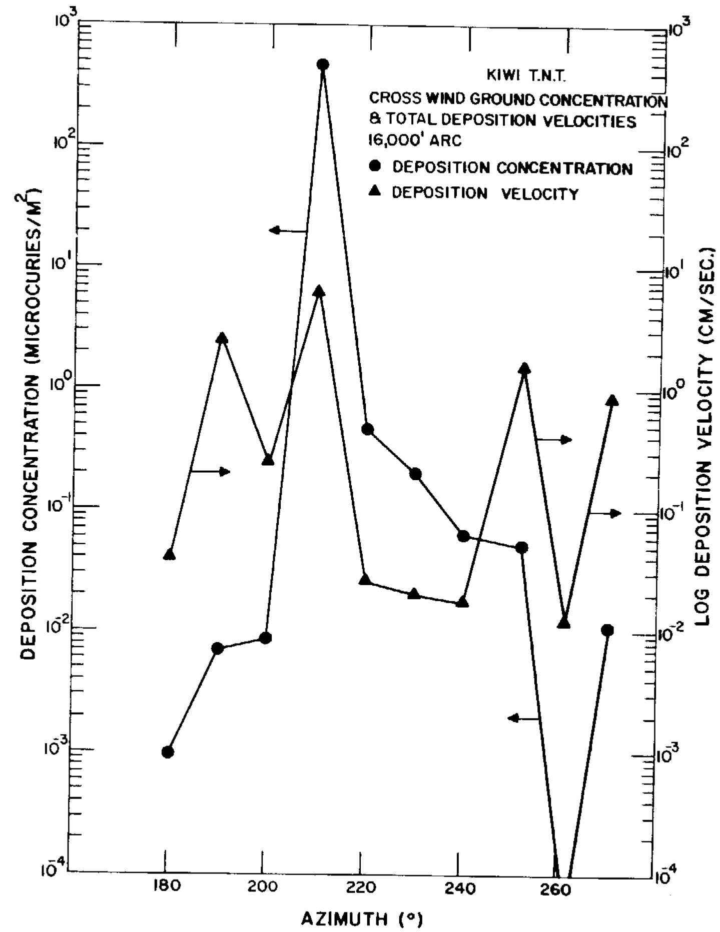

KIWI T.N.T.
CROSS WIND GROUND CONCENTRATION
& TOTAL DEPOSITION VELOCITIES
16,000' ARC
DEPOSITION CONCENTRATION
DEPOSITION VELOCITY
DEPOSITION CONCENTRATION (MICROCURIES/M^2)
LOG DEPOSITION VELOCITY (CM/SEC.)
AZIMUTH (°)

Fig. 27.

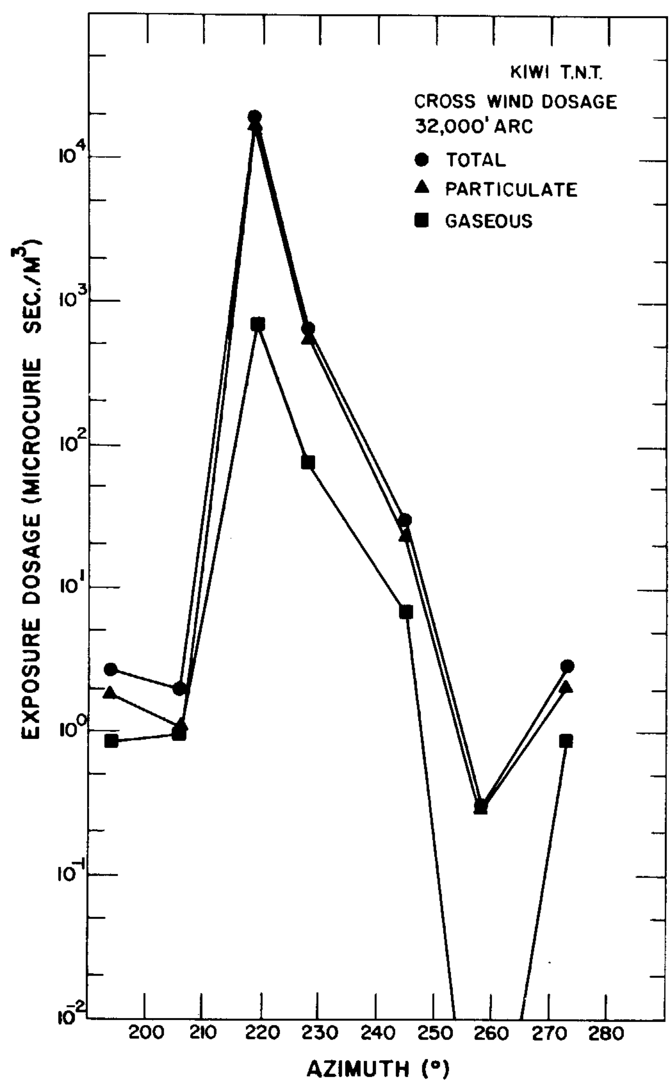

KIWI T.N.T.
CROSS WIND DOSAGE
32,000' ARC
TOTAL
PARTICULATE
GASEOUS
EXPOSURE DOSAGE (MICROCURIE SEC./M³)
AZIMUTH (°)
200 210 220 230 240 250 260 270 280

Fig. 28.

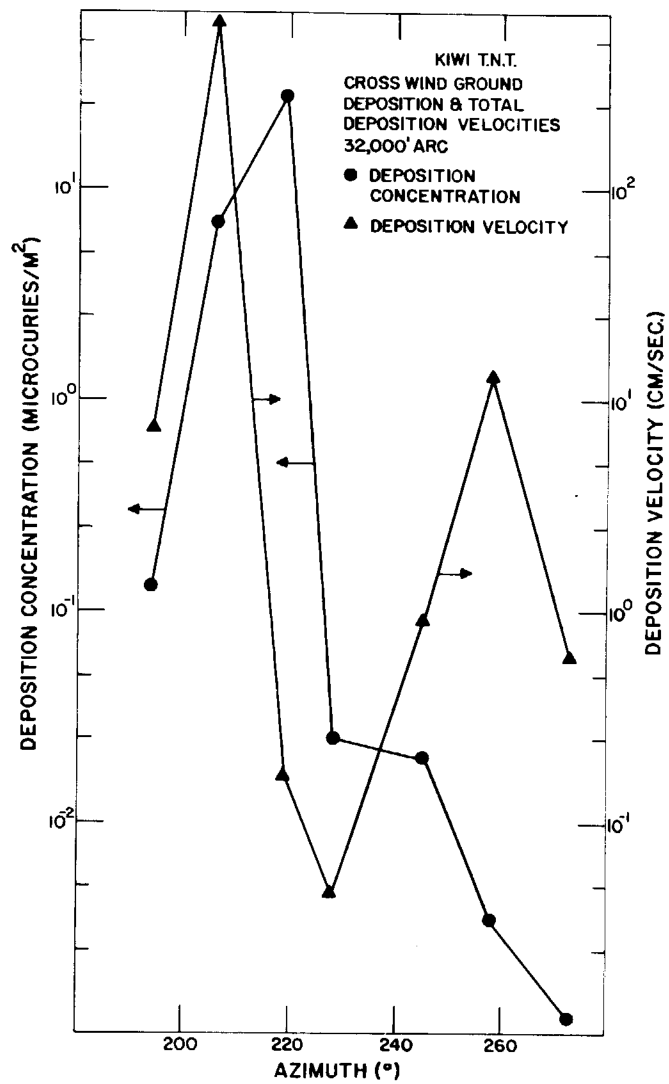

KIWI T.N.T.
CROSS WIND GROUND
DEPOSITION & TOTAL
DEPOSITION VELOCITIES
32,000' ARC
DEPOSITION CONCENTRATION
DEPOSITION VELOCITY
DEPOSITION CONCENTRATION (MICROCURIES/M²)
DEPOSITION VELOCITY (CM/SEC.)
AZIMUTH (°)
200 220 240 260

Fig. 29.

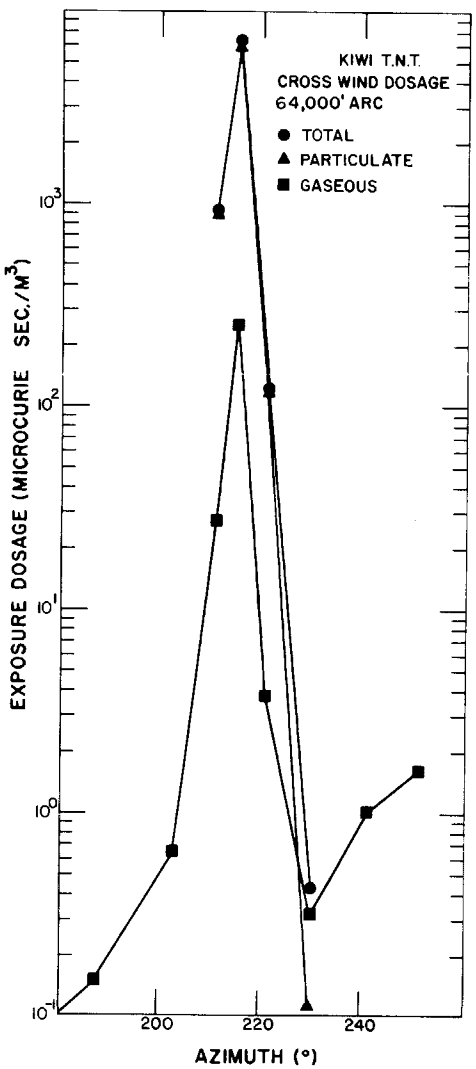

KIWI T.N.T.
CROSS WIND DOSAGE
64,000' ARC
TOTAL
PARTICULATE
GASEOUS
EXPOSURE DOSAGE (MICROCURIE SEC./M^3)
AZIMUTH (°)

Fig. 30.

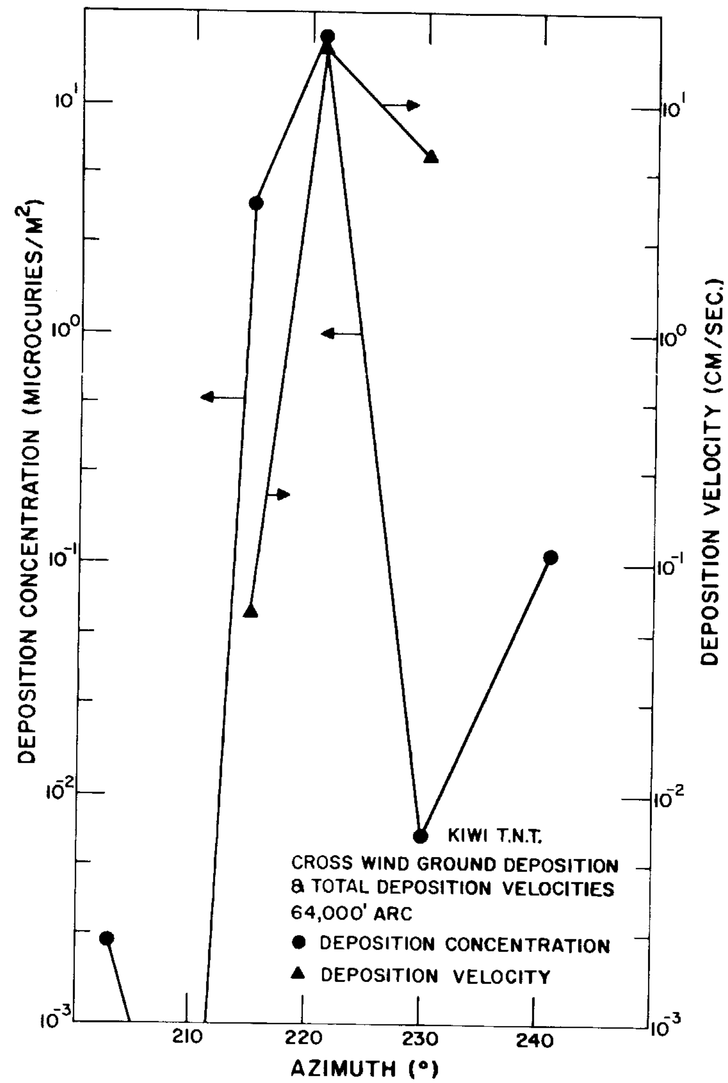

KIWI T.N.T.
CROSS WIND GROUND DEPOSITION
& TOTAL DEPOSITION VELOCITIES
64,000' ARC
DEPOSITION CONCENTRATION
DEPOSITION VELOCITY
DEPOSITION CONCENTRATION (MICROCURIES/M^2)
DEPOSITION VELOCITY (CM/SEC.)
AZIMUTH (°)

Fig. 31.

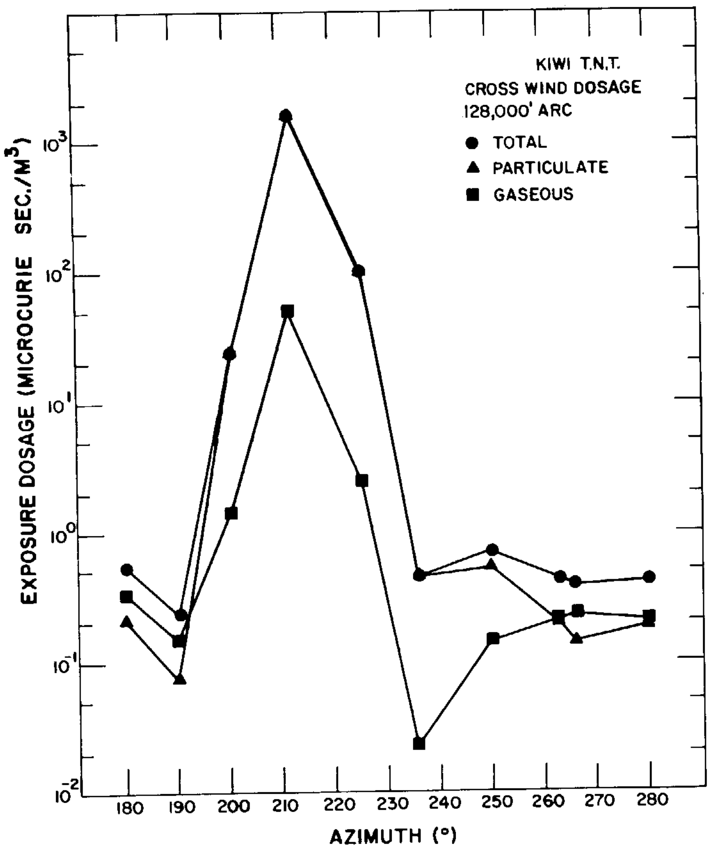

KIWI T.N.T.
CROSS WIND DOSAGE
128,000' ARC
TOTAL
PARTICULATE
GASEOUS
EXPOSURE DOSAGE (MICROCURIE SEC./M³)
AZIMUTH (°)

Fig. 32.

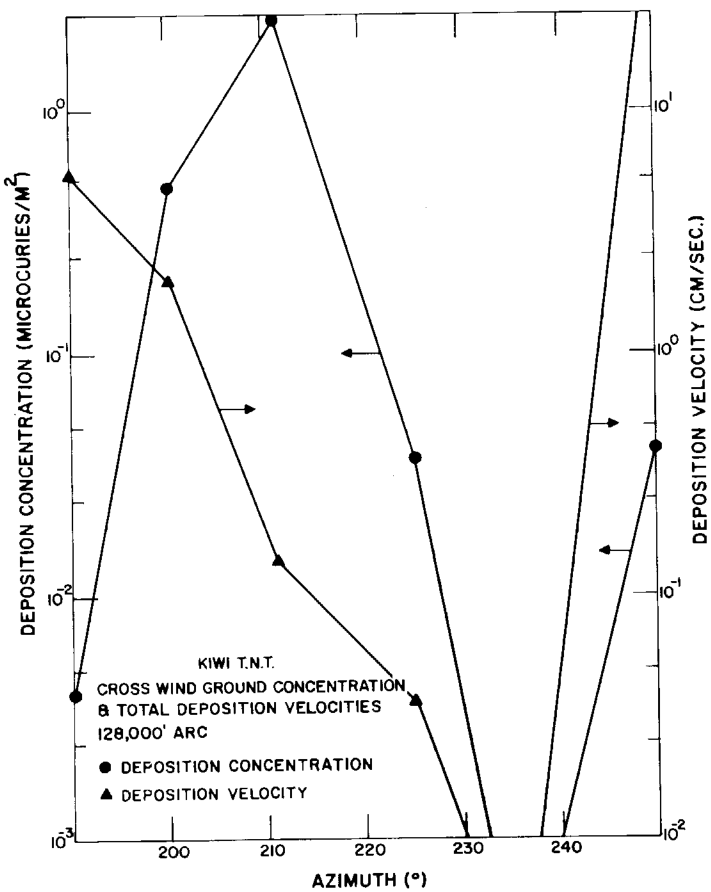

KIWI T.N.T.
CROSS WIND GROUND CONCENTRATION
& TOTAL DEPOSITION VELOCITIES
128,000' ARC
DEPOSITION CONCENTRATION
DEPOSITION VELOCITY
DEPOSITION CONCENTRATION (MICROCURIES/M²)
DEPOSITION VELOCITY (CM/SEC.)
AZIMUTH (°)

Fig. 33.

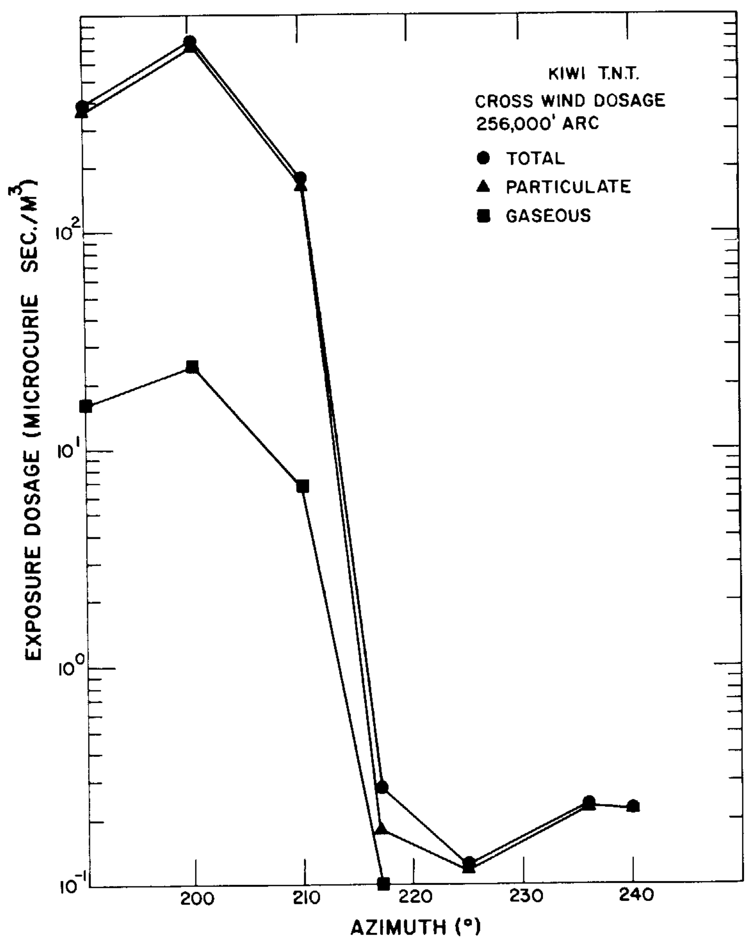

KIWI T.N.T.
CROSS WIND DOSAGE
256,000' ARC
TOTAL
PARTICULATE
GASEOUS
EXPOSURE DOSAGE (MICROCURIE SEC./M^3)
AZIMUTH (°)

Fig. 34.

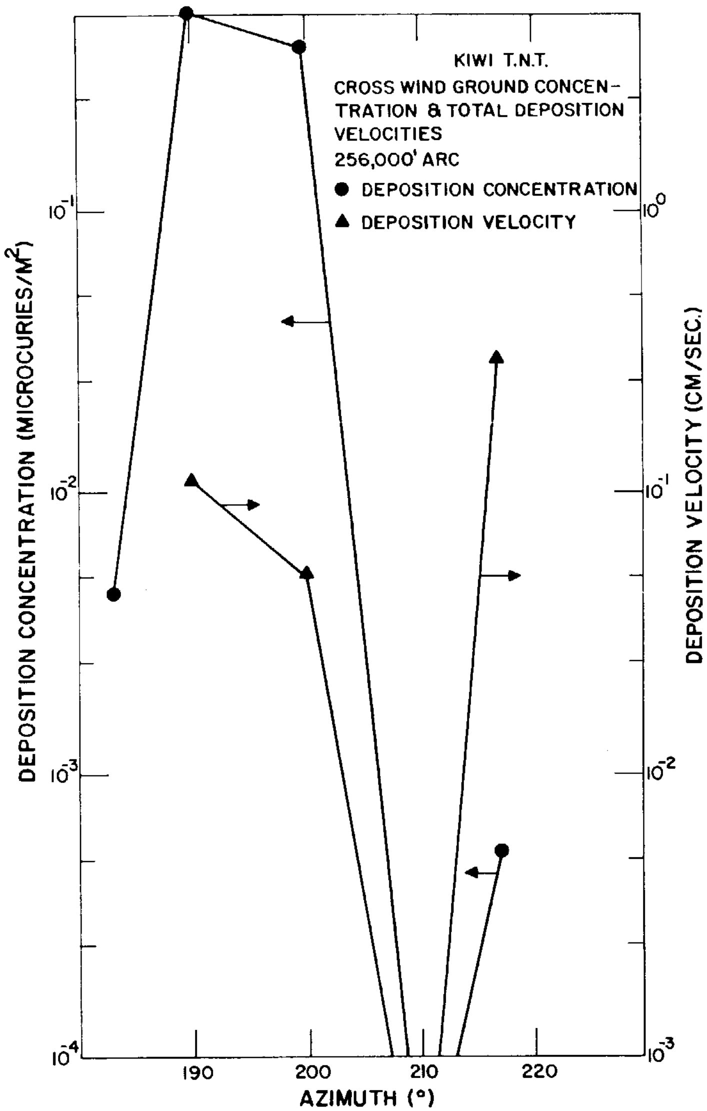

KIWI T.N.T.
CROSS WIND GROUND CONCENTRATION & TOTAL DEPOSITION VELOCITIES
256,000' ARC
DEPOSITION CONCENTRATION
DEPOSITION VELOCITY
DEPOSITION CONCENTRATION (MICROCURIES/M^2)
DEPOSITION VELOCITY (CM/SEC.)
AZIMUTH (°)

Fig. 35.

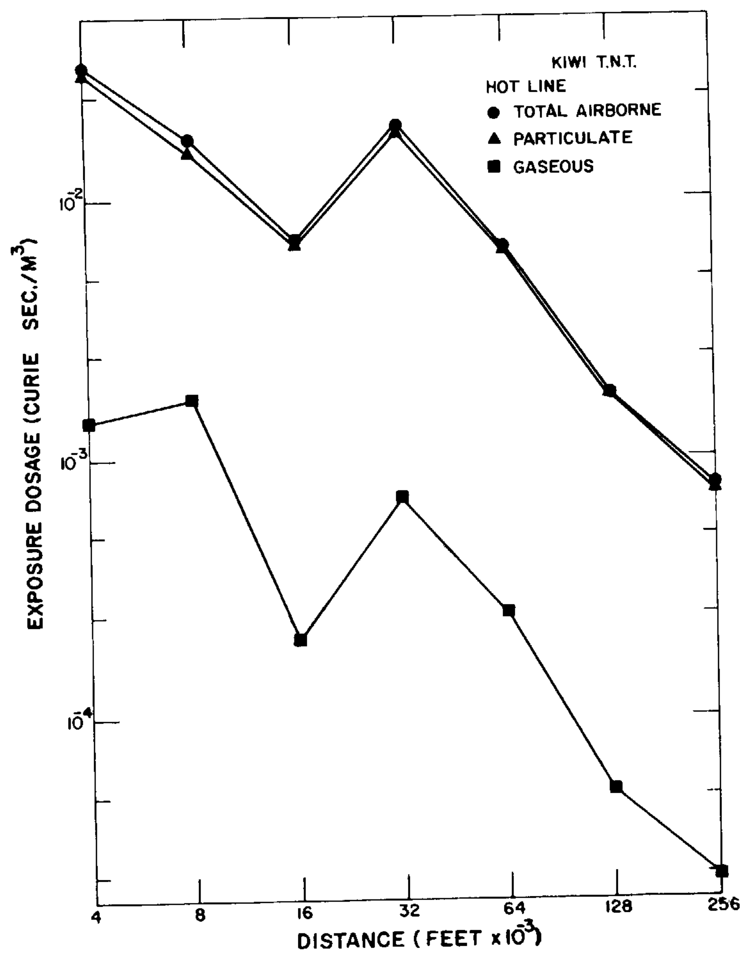

KIWI T.N.T.
HOT LINE
TOTAL AIRBORNE
PARTICULATE
GASEOUS
EXPOSURE DOSAGE (CURIE SEC./M^3)
10^{-2}
10^{-3}
10^{-4}
4
8
16
32
64
128
256
DISTANCE (FEET x 10^{-3})

Fig. 36.

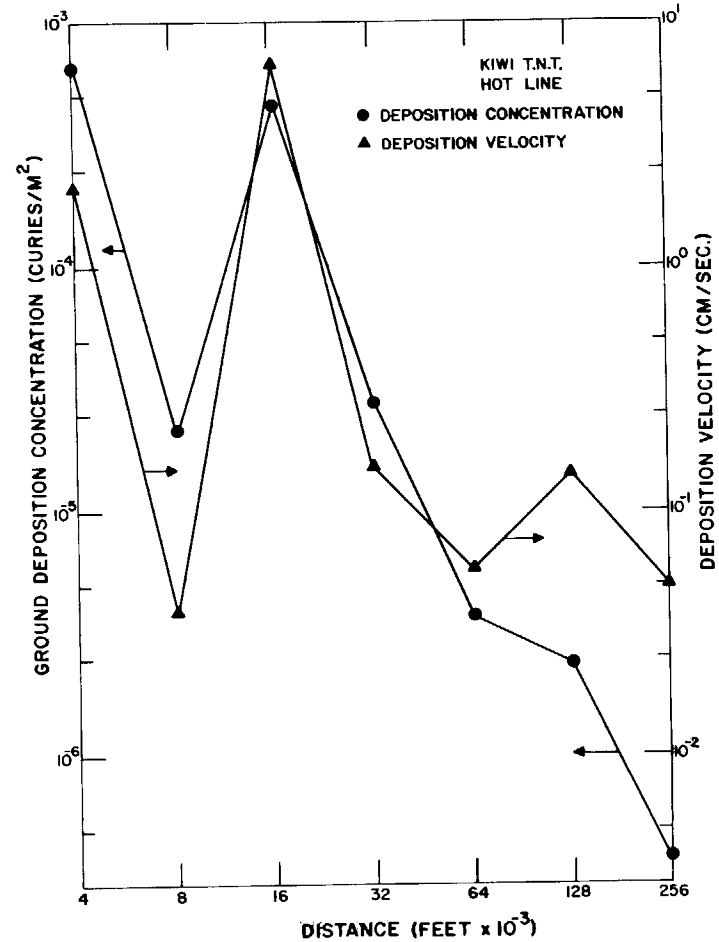

KIWI T.N.T.
HOT LINE
DEPOSITION CONCENTRATION
DEPOSITION VELOCITY
GROUND DEPOSITION CONCENTRATION (CURIES/M^2)
DEPOSITION VELOCITY (CM/SEC.)
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{1}
10^{0}
10^{-1}
10^{-2}
4
8
16
32
64
128
256
DISTANCE (FEET x 10^{-3})

Fig. 37.

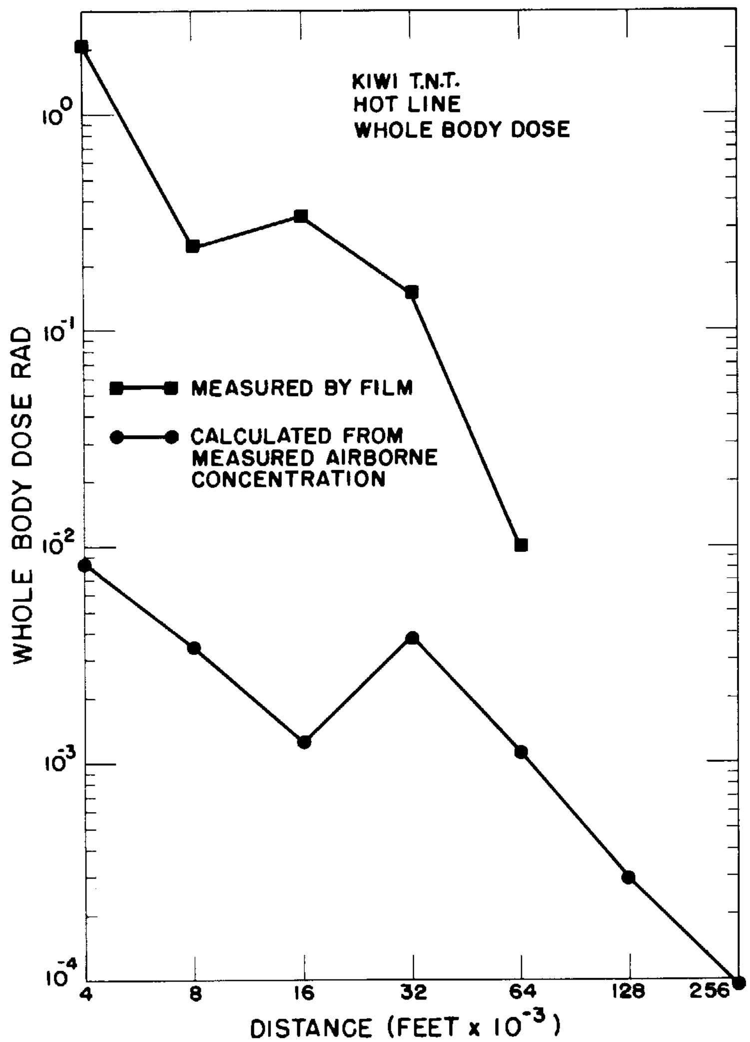

KIWI T.N.T.
HOT LINE
WHOLE BODY DOSE
MEASURED BY FILM
CALCULATED FROM MEASURED AIRBORNE CONCENTRATION
WHOLE BODY DOSE RAD
DISTANCE (FEET x 10^{-3})

Fig. 38.

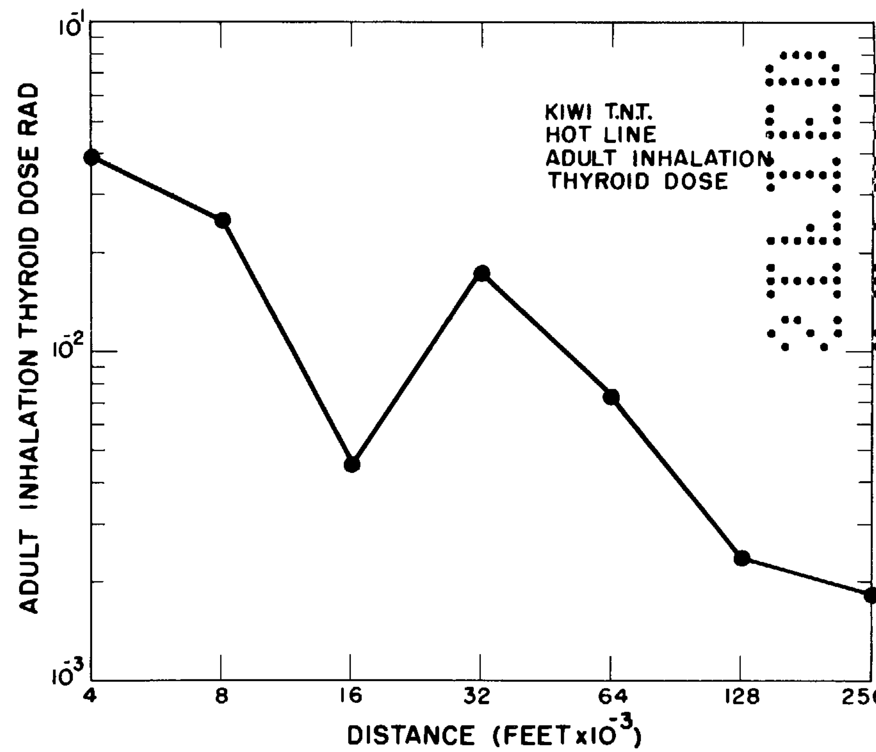

KIWI T.N.T.
HOT LINE
ADULT INHALATION
THYROID DOSE
ADULT INHALATION THYROID DOSE RAD
DISTANCE (FEET x 10^{-3})

Fig. 39.

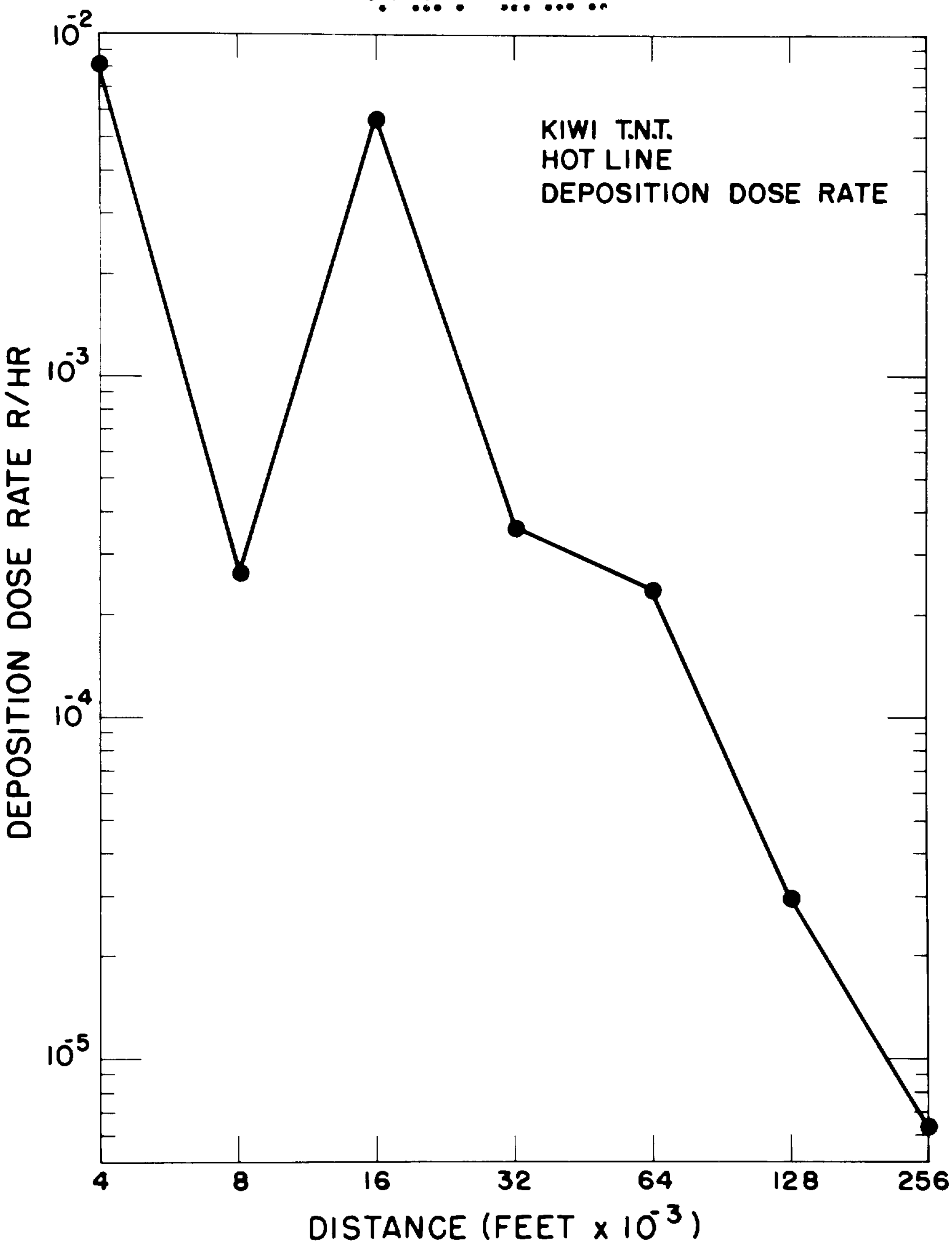

KIWI T.N.T.
HOT LINE
DEPOSITION DOSE RATE
DEPOSITION DOSE RATE R/HR
10^{-2}
10^{-3}
10^{-4}
10^{-5}
4
8
16
32
64
128
256
DISTANCE (FEET x 10^{-3})

Fig. 40.

TABLE I. MEASURED DOSAGES AND DEPOSITION CONCENTRATIONS

Station	Dosage (μCi sec/M^3) Airborne Particulate	Dosage (μCi sec/M^3) Airborne Gaseous	Total	Ground Deposition (μCi/M^2)
4,000 ft arc				
4-180	1.4×10^{-1}	Bkgd	1.4×10^{-1}	2.3×10^{-2}
4-185	1.6×10^{0}	1.1×10^{0}	2.7×10^{0}	1.5×10^{-2}
4-190	1.6×10^{1}	8.2×10^{0}	2.4×10^{1}	1.6×10^{-2}
4-195	7.1×10^{1}	1.1×10^{1}	8.1×10^{1}	4.9×10^{-2}
4-200	3.2×10^{2}	3.2×10^{1}	3.5×10^{2}	2.5×10^{-1}
4-205	1.0×10^{1}	1.1×10^{0}	1.1×10^{1}	1.8×10^{0}
4-210	6.0×10^{3}	4.3×10^{2}	6.4×10^{3}	7.8×10^{0}
4-215	3.1×10^{4}	1.4×10^{3}	3.2×10^{4}	6.6×10^{2}
4-220	1.2×10^{3}	3.1×10^{1}	1.2×10^{3}	3.4×10^{1}
4-225	2.2×10^{4}	2.0×10^{3}	2.4×10^{4}	9.3×10^{0}
4-230	1.4×10^{4}	1.6×10^{3}	1.6×10^{4}	2.8×10^{0}
4-235	8.3×10^{3}	1.1×10^{3}	9.4×10^{3}	5.2×10^{0}
4-240	4.8×10^{3}	5.0×10^{2}	5.3×10^{3}	4.4×10^{0}
4-245	4.6×10^{3}	4.6×10^{2}	5.0×10^{3}	1.3×10^{0}
4-250	1.9×10^{2}	7.8×10^{0}	2.0×10^{2}	5.6×10^{-1}
4-255	6.8×10^{1}	4.4×10^{0}	7.2×10^{1}	1.6×10^{-1}
4-260	7.1×10^{1}	2.8×10^{-1}	7.1×10^{1}	4.8×10^{-2}
4-265	8.7×10^{0}	1.1×10^{0}	9.8×10^{0}	1.1×10^{-2}
4-270	1.0×10^{1}	3.7×10^{0}	1.4×10^{1}	7.2×10^{-3}
8,000 ft arc				
8-180	2.6×10^{-1}	5.3×10^{0}	5.5×10^{0}	Bkgd
8-185	3.6×10^{-1}	8.1×10^{-1}	1.2×10^{0}	Bkgd
8-190	1.6×10^{0}	9.0×10^{-1}	2.5×10^{0}	Bkgd
8-195	1.1×10^{1}	1.8×10^{1}	2.9×10^{1}	1.0×10^{-2}
8-200	1.6×10^{1}	2.7×10^{1}	4.3×10^{1}	1.9×10^{-2}
8-205	2.0×10^{2}	5.2×10^{1}	2.5×10^{2}	1.0×10^{-1}
8-210	4.5×10^{3}	5.3×10^{2}	5.1×10^{3}	2.0×10^{0}
8-215	1.5×10^{4}	1.7×10^{3}	1.7×10^{4}	2.1×10^{1}
8-220	9.3×10^{3}	2.1×10^{3}	1.1×10^{4}	3.1×10^{0}
8-225	4.2×10^{3}	7.2×10^{2}	4.9×10^{3}	8.7×10^{-1}
8-230	1.6×10^{1}	4.5×10^{0}	2.0×10^{1}	8.2×10^{-1}
8-235	2.3×10^{1}	5.2×10^{0}	2.8×10^{1}	1.4×10^{0}
8-240	5.6×10^{2}	1.4×10^{2}	7.0×10^{2}	2.2×10^{-1}
8-245	1.8×10^{1}	7.4×10^{0}	2.6×10^{1}	9.6×10^{-3}
8-250	4.2×10^{0}	1.8×10^{-2}	4.2×10^{0}	9.7×10^{-3}
8-255	6.7×10^{1}	9.1×10^{0}	7.6×10^{1}	Bkgd
8-260	1.7×10^{-1}	7.1×10^{-1}	8.8×10^{-1}	Bkgd
8-265	3.9×10^{-1}	4.6×10^{-1}	8.5×10^{-1}	1.0×10^{-3}
8-270	3.8×10^{0}	[illegible]$.4 \times 10^{-1}$	3.9×10^{0}	7.9×10^{-3}
16,000 ft arc				
16-180	3.0×10^{-1}	2.1×10^{0}	2.4×10^{0}	9.6×10^{-4}
16-190	1.8×10^{-1}	8.5×10^{-2}	2.7×10^{-1}	6.9×10^{-3}
16-200	2.1×10^{0}	1.6×10^{0}	3.7×10^{0}	8.5×10^{-3}
16-210	6.7×10^{3}	2.0×10^{2}	6.9×10^{3}	4.6×10^{2}
16-220	1.6×10^{3}	1.9×10^{2}	1.8×10^{3}	4.7×10^{-1}
16-230	8.3×10^{2}	1.6×10^{2}	9.8×10^{2}	2.0×10^{-1}
16-240	2.9×10^{2}	7.6×10^{1}	3.6×10^{2}	6.2×10^{-2}
16-252	4.8×10^{-1}	2.7×10^{0}	3.1×10^{0}	5.0×10^{-2}
16-261	2.2×10^{-1}	1.5×10^{-1}	3.7×10^{-1}	4.3×10^{-5}
16-270	7.4×10^{-1}	5.5×10^{-1}	1.3×10^{0}	1.1×10^{-2}
32,000 ft arc				
32-194	1.8×10^{0}	8.4×10^{-1}	2.7×10^{0}	1.3×10^{-1}
32-206	1.1×10^{0}	9.0×10^{-1}	2.0×10^{0}	6.9×10^{0}
32-219	1.8×10^{4}	6.9×10^{2}	1.9×10^{4}	2.8×10^{1}
32-228	5.5×10^{2}	7.2×10^{1}	6.2×10^{2}	2.5×10^{-1}
32-245	2.2×10^{1}	6.6×10^{0}	2.8×10^{1}	2.0×10^{-1}
32-258	2.8×10^{-1}	Bkgd	2.8×10^{-1}	3.5×10^{-2}
32-273	2.0×10^{0}	8.1×10^{-1}	2.8×10^{0}	1.2×10^{-2}
64,000 ft arc				
64-172	Bkgd	7.3×10^{-2}	7.3×10^{-2}	Bkgd
64-188	Bkgd	1.5×10^{-1}	1.5×10^{-1}	Bkgd
64-203	Bkgd	6.4×10^{-1}	6.4×10^{-1}	2.3×10^{-2}
64-211	8.7×10^{2}	2.7×10^{1}	9.0×10^{2}	Bkgd
64-215	6.2×10^{3}	2.5×10^{2}	6.4×10^{3}	3.7×10^{0}
64-221	1.1×10^{2}	3.7×10^{0}	1.2×10^{2}	1.9×10^{1}
64-230	1.1×10^{-1}	3.1×10^{-1}	4.2×10^{-1}	6.5×10^{-3}
64-241	Bkgd	1.0×10^{0}	1.0×10^{0}	1.1×10^{-1}
64-251	Bkgd	1.6×10^{0}	1.6×10^{0}	Bkgd
128,000 ft arc				
128-180	2.1×10^{-1}	3.3×10^{-1}	5.3×10^{-1}	Bkgd
128-190	7.4×10^{-2}	1.5×10^{-1}	2.3×10^{-1}	4.0×10^{-3}
128-200	2.4×10^{1}	1.4×10^{0}	2.5×10^{1}	4.8×10^{-1}
128-211	1.7×10^{3}	5.2×10^{1}	1.7×10^{3}	2.4×10^{0}
128-225	1.0×10^{2}	2.5×10^{0}	1.1×10^{2}	3.7×10^{-2}
128-236	4.6×10^{-1}	2.3×10^{-2}	4.8×10^{-1}	Bkgd
128-250	5.6×10^{-1}	1.5×10^{-1}	7.1×10^{-1}	4.2×10^{-1}
128-263	2.1×10^{-1}	2.2×10^{-1}	4.3×10^{-1}	Bkgd
128-266	1.5×10^{-1}	2.4×10^{-1}	4.0×10^{-1}	Bkgd
128-280	2.0×10^{-1}	2.1×10^{-1}	4.1×10^{-1}	Bkgd
256,000 ft arc				
256-183	Bkgd	Bkgd	Bkgd	4.3×10^{-3}
256-190	4.8×10^{2}	1.6×10^{1}	4.9×10^{2}	5.1×10^{-1}
256-200	7.4×10^{2}	2.4×10^{1}	7.6×10^{2}	3.8×10^{-1}
256-210	1.7×10^{2}	6.7×10^{0}	1.8×10^{2}	Bkgd
256-217	1.8×10^{-1}	9.9×10^{-2}	2.8×10^{-1}	5.2×10^{-4}
256-225	1.2×10^{-1}	Bkgd	1.2×10^{-1}	Bkgd
256-236	2.3×10^{-1}	Bkgd	2.3×10^{-1}	Bkgd
256-240	2.2×10^{-1}	Bkgd	2.2×10^{-1}	Bkgd

TABLE II. DEPOSITION VELOCITIES IN CENTIMETERS PER SECOND - KIWI TNT

Station	Total Airborne Material (gaseous + particulate)	Particulate Material
4,000 ft arc		
4-180	16.	16.
4-185	0.56	0.94
4-190	0.067	0.10
4-195	0.060	0.069
4-200	0.071	0.078
4-205	16.	18.
4-210	0.12	0.13
4-215	2.1	2.1
4-220	2.8	2.8
4-225	0.039	0.042
4-230	0.018	0.020
4-235	0.055	0.063
4-240	0.083	0.092
4-245	0.026	0.028
4-250	0.28	0.29
4-255	0.22	0.24
4-260	0.068	0.068
4-265	0.11	0.13
4-270	0.051	0.072
8,000 ft arc		
8-195	0.034	0.091
8-200	0.044	0.12
8-205	0.040	0.050
8-210	0.039	0.044
8-215	0.12	0.14
8-220	0.028	0.033
8-225	0.018	0.021
8-230	4.1	5.1
8-235	5.0	6.1
8-240	0.031	0.039
8-245	0.037	0.053
8-250	0.23	0.23
8-255	-	-
8-260	-	-
8-265	0.12	0.26
8-270	0.20	0.21
16,000 ft arc		
16-180	0.040	0.32
16-190	2.6	3.8
16-200	0.23	0.40
16-210	6.7	6.9
16-220	0.026	0.029
16-230	0.020	0.024
16-240	0.017	0.021
16-252	1.6	10.
16-261	0.012	0.020
16-270	0.85	1.5
32,000 ft arc		
32-194	4.8	7.2
32-206	350.	630.
32-219	0.15	0.16
32-228	0.040	0.045
32-245	0.71	0.91
32-258	13.	13.
32-273	0.43	0.60
64,000 ft arc		
64-203	3.6	-
64-211	-	-
64-215	0.058	0.060
64-221	16.	17.
64-230	1.5	5.9
64-241	11.	-
128,000 ft arc		
128-190	1.7	5.4
128-200	1.9	2.0
128-211	0.14	0.14
128-225	0.034	0.037
128-236	-	-
128-250	59.	75.
256,000 ft arc		
256-190	0.10	0.11
256-200	0.05	0.051
256-210	-	-
256-217	0.19	0.29

APPROVED FOR PUBLIC RELEASE

TABLE III. DECAY CURVE DATA - KIWI TNT

Airborne Gaseous Material
4,000 ft arc

Isotope	% at Zero Time
I-134	48.2
I-132	1.50
I-135	44.8
Xe-135	3.64
I-133	1.78
Te I-132	0.0230
I-131	0.0392

Airborne Gaseous Material
8,000 ft arc

Isotope	% at Zero Time
I-134	81.1
I-135	10.6
Xe-135	7.38
I-133	0.923
Te I-132	0.0179
I-131	0.0340
Ba La-140	0.00640

Airborne Gaseous Material
16,000 to 256,000 ft arcs

Isotope	% at Zero Time
I-134	76.3
I-135	15.8
Xe-135	5.9
I-133	1.80
Te I-132	0.0288
I-131	0.0712
Ba La-140	0.0132

Deposited Activity
All Arcs

Isotope	% at Zero Time
I-135	59.9
Zr Nb-97	32.8
Mo-99	6.65
Ba La-140	0.554
Ru-103	0.0444
Zr Nb-95	0.0444

TABLE IV. AIRBORNE PARTICLE SIZE DATA, ACTIVITY ON UNICO IMPACTOR STAGES AT COUNT TIME (PICOCURIES) - KIWI TNT

Station	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Median Diameter (μ)	Geometric Standard Deviation	Comment
4,000 ft arc								
4-210	568	695	125	530	23,307			92% <1μ
4-215	134,172	200,034	14,537	114,340	126,641	3.8	5.4	
4-220	11,941	6,281	246	5,366	263			66% >5μ
4-225	1,286	2,851	329	2,972	47,641			86% <1μ
4-230	32,555	994	2,479	713	33,433			
4-235	6,424	3,051	1,577	6,040	85,704			84% <1μ
4-240	1,731	783	392	1,222	18,880			82% <1μ
4-245	1,585	226	299	2,649	24,069			88% <1μ
4-250	1,647	141	77	2,084	437	2.6	6.6	
8,000 ft arc								
8-210	3,270	1,253	220	1,471	22,984			80% <1μ
8-215	17,437	2,595	797	4,988	131,182			83% <1μ
8-220	3,173	2,153	275	4,965	4,726	1.6	7.2	
8-225	3,028	568	332	1,102	37,703			88% <1μ
16,000 ft arc								
16-210	27,978	1,306	193	988	0			95% >5μ
16-220	114	13	15	23	6			72% >5μ
16-230	107	48	37	145	2,417			89% <1μ
16-240	125	21	34	169	1,900			87% <1μ
32,000 ft arc								
32-219	161,930	8,230	53,915	23,940	23,892			62% >5μ
64,000 ft arc								
64-211	119	16	148	120	2,236			81% <1μ
64-215	353	7,730	694	1,515	31,910			69% <1μ
64-221	8,018	765	316	914	11			84% >5μ
128,000 ft arc								
128-211	81	262	64	219	7,515			91% <1μ
256,000 ft arc								
256-190	886	6,277	16	262	1,650	4.8	3.6	
256-200	1,897	536	271	1,413	4,191			55% <1μ

TABLE V. CLOUD PASSAGE EFFECTS - KIWI TNT

Station	Whole Body Dose due to Cloud Passage (rads)	Integral Gamma Dose (rads)	Adult Inhalation Thyroid Dose (rads)
4,000 ft arc			
4-180	3.16×10^{-8}	2.50×10^{-2}	4.03×10^{-8}
4-185	5.68×10^{-7}	2.00×10^{-2}	1.89×10^{-5}
4-190	4.90×10^{-6}	6.50×10^{-2}	1.36×10^{-4}
4-195	1.71×10^{-5}	1.15×10^{-1}	1.89×10^{-4}
4-200	7.77×10^{-5}	1.50×10^{-1}	5.99×10^{-4}
4-205	2.02×10^{-6}	1.90×10^{-1}	2.06×10^{-5}
4-210	1.22×10^{-3}	3.30×10^{-1}	8.41×10^{-3}
4-215	8.25×10^{-3}	2.08×10^{0}	3.31×10^{-2}
4-220	2.26×10^{-4}	3.95×10^{-1}	7.78×10^{-4}
4-225	5.42×10^{-3}	2.25×10^{-1}	3.89×10^{-2}
4-230	3.26×10^{-3}	2.10×10^{-1}	2.88×10^{-2}
4-235	1.91×10^{-3}	1.45×10^{-1}	1.92×10^{-2}
4-240	1.09×10^{-3}	7.00×10^{-2}	9.26×10^{-3}
4-245	9.13×10^{-4}	6.00×10^{-2}	8.43×10^{-3}
4-250	4.33×10^{-5}	1.30×10^{-1}	1.78×10^{-4}
4-255	1.66×10^{-5}	4.00×10^{-2}	9.10×10^{-5}
4-260	1.53×10^{-5}	3.00×10^{-2}	2.39×10^{-5}
4-265	2.16×10^{-6}	1.00×10^{-2}	2.07×10^{-5}
4-270	2.86×10^{-6}	$<1.00 \times 10^{-2}$	6.16×10^{-5}
8,000 ft arc			
8-180	9.96×10^{-7}	$<1.00 \times 10^{-2}$	5.49×10^{-5}
8-185	2.29×10^{-7}	$<1.00 \times 10^{-2}$	8.57×10^{-6}
8-190	5.14×10^{-7}	$<1.00 \times 10^{-2}$	9.82×10^{-6}
8-195	5.50×10^{-6}	$<1.00 \times 10^{-2}$	1.88×10^{-4}
8-200	8.28×10^{-6}	1.00×10^{-2}	2.90×10^{-4}
8-205	4.89×10^{-5}	3.00×10^{-2}	6.02×10^{-4}
8-210	9.51×10^{-4}	1.50×10^{-1}	6.88×10^{-3}
8-215	3.44×10^{-3}	2.45×10^{-1}	2.17×10^{-2}
8-220	2.30×10^{-3}	1.35×10^{-1}	2.50×10^{-2}
8-225	9.15×10^{-4}	5.00×10^{-2}	8.61×10^{-3}
8-230	4.26×10^{-6}	1.00×10^{-2}	5.22×10^{-5}
8-235	5.73×10^{-6}	$<1.00 \times 10^{-2}$	6.08×10^{-5}
8-240	1.36×10^{-4}	3.00×10^{-2}	1.62×10^{-3}
8-245	5.63×10^{-6}	$<1.00 \times 10^{-2}$	8.34×10^{-5}
8-250	8.93×10^{-7}	$<1.00 \times 10^{-2}$	1.45×10^{-6}
8-255	1.70×10^{-5}	$<1.00 \times 10^{-2}$	1.16×10^{-4}
8-260	1.64×10^{-7}	$<1.00 \times 10^{-2}$	7.42×10^{-6}
8-265	1.74×10^{-7}	-	4.95×10^{-6}
8-270	8.74×10^{-7}	$<1.00 \times 10^{-2}$	2.70×10^{-6}
16,000 ft arc			
16-180	4.40×10^{-7}	$<1.00 \times 10^{-2}$	2.57×10^{-5}
16-190	5.73×10^{-8}	$<1.00 \times 10^{-2}$	1.11×10^{-6}
16-200	7.64×10^{-7}	$<1.00 \times 10^{-2}$	2.01×10^{-5}
16-210	1.27×10^{-3}	3.35×10^{-1}	4.55×10^{-3}
16-220	3.26×10^{-4}	$<1.00 \times 10^{-2}$	2.78×10^{-3}
16-230	1.70×10^{-4}	$<1.00 \times 10^{-2}$	2.14×10^{-3}
16-240	7.93×10^{-5}	$<1.00 \times 10^{-2}$	1.04×10^{-3}
16-252	5.79×10^{-7}	$<1.00 \times 10^{-2}$	3.26×10^{-5}
16-261	7.84×10^{-8}	$<1.00 \times 10^{-2}$	1.91×10^{-6}
16-270	2.63×10^{-7}	$<1.00 \times 10^{-2}$	6.95×10^{-6}
32,000 ft arc			
32-194	4.80×10^{-7}	$<1.00 \times 10^{-2}$	1.13×10^{-5}
32-206	3.59×10^{-7}	$<1.00 \times 10^{-2}$	1.17×10^{-5}
32-219	3.79×10^{-3}	1.50×10^{-1}	1.72×10^{-2}
32-228	1.06×10^{-4}	$<1.00 \times 10^{-2}$	1.12×10^{-3}
32-245	5.07×10^{-6}	$<1.00 \times 10^{-2}$	9.11×10^{-5}
32-258	4.96×10^{-8}	-	1.14×10^{-7}
32-273	4.93×10^{-7}	-	1.09×10^{-5}
64,000 ft arc			
64-172	1.29×10^{-8}	$<1.00 \times 10^{-2}$	9.85×10^{-7}
64-188	2.63×10^{-8}	$<1.00 \times 10^{-2}$	2.01×10^{-6}
64-203	1.14×10^{-7}	$<1.00 \times 10^{-2}$	8.70×10^{-6}
64-211	1.34×10^{-4}	$<1.00 \times 10^{-2}$	8.47×10^{-4}
64-215	1.11×10^{-3}	$<1.00 \times 10^{-2}$	7.24×10^{-3}
64-221	1.82×10^{-5}	1.00×10^{-2}	1.14×10^{-4}
64-230	7.24×10^{-8}	$<1.00 \times 10^{-2}$	4.25×10^{-6}
64-241	1.81×10^{-7}	$<1.00 \times 10^{-2}$	1.39×10^{-5}
64-251	2.92×10^{-7}	$<1.00 \times 10^{-2}$	2.23×10^{-5}
128,000 ft arc			
128-180	8.58×10^{-8}	$<1.00 \times 10^{-2}$	5.24×10^{-6}
128-190	3.70×10^{-8}	$<1.00 \times 10^{-2}$	2.43×10^{-6}
128-200	3.55×10^{-6}	$<1.00 \times 10^{-2}$	4.48×10^{-5}
128-211	2.39×10^{-4}	$<1.00 \times 10^{-2}$	2.38×10^{-3}
128-225	1.45×10^{-5}	$<1.00 \times 10^{-2}$	1.36×10^{-4}
128-236	6.68×10^{-8}	$<1.00 \times 10^{-2}$	7.93×10^{-7}
128-250	1.03×10^{-7}	$<1.00 \times 10^{-2}$	2.81×10^{-6}
128-263	6.79×10^{-8}	$<1.00 \times 10^{-2}$	3.63×10^{-6}
128-266	6.38×10^{-8}	$<1.00 \times 10^{-2}$	3.92×10^{-6}
128-280	6.48×10^{-8}	$<1.00 \times 10^{-2}$	3.50×10^{-6}
256,000 ft arc			
256-190	6.08×10^{-5}	$<1.00 \times 10^{-2}$	1.19×10^{-3}
256-200	9.40×10^{-5}	$<1.00 \times 10^{-2}$	1.84×10^{-3}
256-210	2.20×10^{-5}	$<1.00 \times 10^{-2}$	4.47×10^{-4}
256-217	3.96×10^{-8}	$<1.00 \times 10^{-2}$	2.32×10^{-6}
256-225	1.51×10^{-8}	$<1.00 \times 10^{-2}$	2.27×10^{-7}
256-236	2.86×10^{-8}	$<1.00 \times 10^{-2}$	4.32×10^{-7}
256-240	2.63×10^{-8}	$<1.00 \times 10^{-2}$	3.97×10^{-7}

APPROVED FOR PUBLIC RELEASE

TABLE VI. GROUND DEPOSITION EFFECTS - KIWI TNT

Station	Deposition Dose Rate (R/hr)	1 Year Integrated Deposition Dose (rads)
4,000 ft arc		
4-180	2.85×10^{-7}	6.96×10^{-6}
4-185	1.91×10^{-7}	4.66×10^{-6}
4-190	2.03×10^{-7}	4.95×10^{-6}
4-195	6.07×10^{-7}	1.48×10^{-5}
4-200	3.10×10^{-6}	7.56×10^{-5}
4-205	2.23×10^{-5}	5.44×10^{-4}
4-210	9.79×10^{-5}	2.39×10^{-3}
4-215	8.15×10^{-3}	1.99×10^{-1}
4-220	4.26×10^{-4}	1.04×10^{-2}
4-225	1.16×10^{-4}	2.84×10^{-3}
4-230	3.53×10^{-5}	8.61×10^{-4}
4-235	6.48×10^{-5}	1.58×10^{-3}
4-240	5.45×10^{-5}	1.33×10^{-3}
4-245	1.63×10^{-5}	3.97×10^{-4}
4-250	6.96×10^{-6}	1.70×10^{-4}
4-255	2.00×10^{-6}	4.86×10^{-5}
4-260	5.95×10^{-7}	1.45×10^{-5}
4-265	1.40×10^{-7}	3.42×10^{-6}
4-270	9.01×10^{-8}	2.20×10^{-6}
8,000 ft arc		
8-195	1.28×10^{-7}	3.13×10^{-6}
8-200	2.42×10^{-7}	5.91×10^{-6}
8-205	1.27×10^{-6}	3.10×10^{-5}
8-210	2.57×10^{-5}	6.26×10^{-4}
8-215	2.63×10^{-4}	6.42×10^{-3}
8-220	3.94×10^{-5}	9.61×10^{-4}
8-225	1.09×10^{-5}	2.65×10^{-4}
8-230	1.03×10^{-5}	2.51×10^{-4}
8-235	1.75×10^{-5}	4.27×10^{-4}
8-240	2.79×10^{-6}	6.82×10^{-5}
8-245	1.21×10^{-7}	2.94×10^{-6}
8-250	1.21×10^{-7}	2.95×10^{-6}
8-255	-	-
8-260	-	-
8-265	1.26×10^{-8}	3.06×10^{-7}
8-270	9.92×10^{-8}	2.42×10^{-6}
16,000 ft arc		
16-180	1.19×10^{-8}	2.92×10^{-7}
16-190	8.69×10^{-8}	2.12×10^{-6}
16-200	1.06×10^{-7}	2.59×10^{-6}
16-210	5.71×10^{-3}	1.40×10^{-1}
16-220	5.85×10^{-6}	1.43×10^{-4}
16-230	2.49×10^{-6}	6.10×10^{-5}
16-240	7.79×10^{-7}	1.90×10^{-5}
16-252	6.22×10^{-7}	1.52×10^{-5}
16-261	5.36×10^{-10}	1.31×10^{-8}
16-270	1.38×10^{-7}	3.38×10^{-6}
32,000 ft arc		
32-194	1.68×10^{-6}	4.14×10^{-5}
32-206	8.56×10^{-5}	2.10×10^{-3}
32-219	3.55×10^{-4}	8.71×10^{-3}
32-228	3.08×10^{-6}	7.56×10^{-5}
32-245	2.52×10^{-6}	6.19×10^{-5}
32-258	4.35×10^{-7}	1.07×10^{-5}
32-273	1.54×10^{-7}	3.79×10^{-6}
64,000 ft arc		
64-203	2.87×10^{-7}	7.12×10^{-6}
64-211	-	-
64-215	4.64×10^{-5}	1.15×10^{-3}
64-221	2.33×10^{-4}	5.77×10^{-3}
64-230	8.07×10^{-8}	2.00×10^{-6}
64-241	1.33×10^{-6}	3.28×10^{-5}
64-251	-	-
128,000 ft arc		
128-190	5.01×10^{-8}	1.26×10^{-6}
128-200	5.97×10^{-6}	1.50×10^{-4}
128-211	2.96×10^{-5}	7.45×10^{-4}
128-225	4.58×10^{-7}	1.15×10^{-5}
128-236	-	-
128-250	5.26×10^{-1}	1.33×10^{1}
256,000 ft arc		
256-183	5.36×10^{-8}	1.40×10^{-6}
256-190	6.32×10^{-6}	1.65×10^{-4}
256-200	4.79×10^{-6}	1.25×10^{-4}
256-210	-	-
256-217	6.50×10^{-9}	1.69×10^{-7}

APPROVED FOR PUBLIC RELEASE

APPENDIX

STATION LOCATIONS

For neatness and ease of tabulation in the body of this report station locations have been given in reference to Test Cell C, for which they were established. The following table shows the location of the sampling stations on the 4, 000, 8, 000, and 16, 000 foot arcs in relation to the TNT test point. The test point was located N 28° W at 600 feet from Test Cell C. The location of the stations on the 32, 000 foot arc and beyond are not known precisely enough to make worthwhile any calculations of exact position in relation to the test point.

TABLE A-I. SAMPLER LOCATIONS - KIWI TNT

Test Cell C Location	TNT Location Distance (ft)	TNT Location Azimuth[a] (°)
4,000 ft arc		
4-180	4,540	176
4-185	4,520	181
4-190	4,490	186
4-195	4,460	190
4-200	4,420	194
4-205	4,390	199
4-210	4,350	203
4-215	4,310	208
4-220	4,260	212
4-225	4,220	217
4-230	4,170	222
4-235	4,120	226
4-240	4,060	231
4-245	4,010	236
4-250	3,960	241
4-255	3,910	246
4-260	3,860	251
4-265	3,800	256
4-270	3,760	262
8,000 ft arc		
8-180	8,530	178
8-185	8,510	183
8-190	8,480	188
8-195	8,450	192
8-200	8,410	198
8-205	8,370	202
8-210	8,330	207
8-215	8,290	212
8-220	8,240	216
8-225	8,200	222
8-230	8,150	226
8-235	8,100	231
8-240	8,040	236
8-245	7,980	241
8-250	7,940	246
8-255	7,890	251
8-260	7,840	256
8-265	7,790	261
8-270	7,740	266
16,000 ft arc		
16-180	16,500	179
16-190	17,800	188
16-200	18,800	198
16-210	18,000	209
16-220	17,700	219
16-230	19,100	228
16-240	16,000	237
16-252	15,900	249
16-261	16,800	258
16-270	14,400	267

(a) North = 0