

1911

EXTERNAL TRANSMITTAL AUTHORIZED

ORNL
MASTER COPY

~~For Internal Use Only~~

ORNL
CENTRAL FILES NUMBER

56-1-194

Copy No. 36

Oak Ridge National Laboratory

Health Physics Division

APPLIED HEALTH PHYSICS SEMI-ANNUAL REPORT

July 1955 - January 1956

DECLASSIFIED

Per Letter Instructions Of

E. J. Murphy 8-2-57
D. McKelvey

For: N. T. Bray, Supervisor
Laboratory Records Dept.
ORNL

Distribution:

- 1. H. A. Albee
- 2. T. E. Anderson
- 3. W. E. Arthur
- 4. E. E. Brown
- 5. T. J. Burnett
- 6. G. C. Cain
- 7. R. A. Charlie - A. M. Weinberg
- 8. R. L. Clark
- 9. H. R. Crafts
- 10. D. K. Davis
- 11. W. L. Cottrell
- 12. C. R. Guanz
- 13. E. D. Cupton
- 14. J. C. Hart
- 15. C. E. Haynes

- 16-19 Health Physics Shift Supervisors
- 20. G. E. Hurst
- 21. L. G. Johnson
- 22. E. J. Kuna
- 23. J. T. Ledbetter
- 24. K. Z. Morgan
- 25. H. L. Sharp
- 26. E. G. Struxness
- 27. P. D. Teague
- 28. A. D. Warden
- 29. H. P. Wokky
- 30-35. Laboratory Records
- 36. ORNL-RT
- 37. Div. Files
- 38-62. File #

This document has been approved for release to the public by:

David R. Hamrin 7/13/95
Technical Information Officer Date
ORNL Site

~~CONFIDENTIAL USE ONLY~~

SECTION I. AREA MONITORING

Part A. Salient and Non-Routine Items

Based on an average of samples collected by ten continuous air monitors, air activity was notably less than that experienced during the first half of 1955. The weekly average value for this period was 2.4×10^{-12} $\mu\text{c}/\text{cc}$ which is 67.6% less than that recorded during the last period. The highest average activity for a single week was 9.1×10^{-12} $\mu\text{c}/\text{cc}$ and occurred during the week ending January 3, 1956⁽¹⁾. The highest activity recorded by a single air monitor was 2.3×10^{-11} $\mu\text{c}/\text{cc}$ which is less than the maximum permissible level for beta-gamma activity by a factor of 44.

As shown by Fig. 1, the average radio-particulate count for the samples collected by the ten Continuous Air Monitors also decreased. The average count for the period was found to be 0.84 particles/1000 ft³ of air sampled. This value indicates that there were 56.7% less airborne radio-particulates this period than for the first half of 1955. The highest average count occurred during the week ending January 3, 1956 with an average particle count of 4.59 particles/1000 ft³. The highest weekly particle count for a single air monitor was 10.13 particles/1000 ft³ and occurred during the week ending July 25th.

The effluent discharged from White Oak Lake showed a decrease in beta activity of 4.7% from that of the first six months of 1955. The calculated probably average concentration in the Clinch River for the period was 1.22×10^{-7} $\mu\text{c}/\text{cc}$. The average above the 10^{-7} $\mu\text{c}/\text{cc}$ operating limit resulted from high activity releases near the end of the period, Fig. 2. These were caused by the flushing of activity from the mud following the draining of White Oak Lake and several accidental releases of sizable quantities of activity from the Laboratory during the month of December. In all, however, the operating limit was exceeded only 25% of the time this period, Fig. 3, as compared to 46% for the first half of 1955. The percent MPC based on radiochemical analysis of White Oak Lake effluent is shown in Fig. 4. The average for the period was 27.2%.

During the week of July 17th a major portion of the goldfish population (*Carrassius auratus*) died in White Oak Lake. It was estimated that 15,000 to 20,000 fish expired. An effort was made to remove the fish from the lake and dispose of them by burial. An investigation was made as to the cause of the incident. The best estimates concluded the cause to have been a combination release to White Oak Lake of sulfuric acid and an insecticide known as Chlordane.

(1) The "1955 Health Physics year" ended January 5, 1956.

White Oak Lake was completely drained during the month of October. For the remainder of the year White Oak Creek flowed directly into the Clinch River. Prior to draining, the fish in the lake were killed and removed to prevent their entry into the Clinch River. The draining was carried out: (1) to facilitate and improve control of activity releases after necessary maintenance work is performed on the dam facilities; (2) to provide additional safeguards by increasing the retention potential; (3) to permit modification of sections of the lake area for ecology studies; (4) to stabilize and control the silt deposits; and (5) to avoid attracting and harboring migratory wildfowl.

Area background measurements were taken monthly about the Laboratory and reported separately. The average monthly background was found to be 29.3% less than last half and 48% less than the average for last year.

Beginning with this period, the Area Monitoring Section assumed responsibility for checking "R" clothing. This necessitated the transfer of an employee from the Personnel Monitoring Section to Area Monitoring. Of the garments going to commercial laundries for cleaning, 3.6% were held out as exceeding the maximum permissible limit. Garments checked to go to commercial laundries totaled 53,687. The histogram on page 10, Fig. 5, shows the weekly fluctuations in per cent contaminated garments during the period.

Report No. MOA-130-55, "Particle Activity Determination by Autoradiography", was issued as Central Files Memo, CF-55-12-121.

Part B. Statistical Data

1. Air Activity

a. Constant Air Monitors

Average Long Lived Activity

<u>Station Number</u>	<u>Location</u>	<u>Wkly. Av. to Date This Year, Conc. x 10⁻¹³ µc/cc</u>	<u>Deviation From 1954 Weekly Av.</u>
HP-1	N 3550	147.69	+330.7%
HP-2	S 3001	55.08	- 98.6%
HP-3	S 1000	35.08	+178.6%
HP-4	W 3513	17.45	+175.2%
HP-5	E 2506	146.67	+111.4%
HP-6	SE 3012	20.93	- 97.0%
HP-7	W 7001	17.12	+113.5%
HP-8	Rock Quarry	8.04	+153.5%
HP-10	S 2007	28.87	+ 88.7%
Average		49.38	

Deviation of this year's average long lived activity to date from last year's average - 89.7%

2. Particulate Studies

a. CAM Filters

Number	Location*	Particle Distribution Weekly Average Number of Particles				Total	Weekly Av. To Date This Year Particles Per 1000 cu. ft.	Deviation of Wkly. Av. to Date This Year from Weekly Av. Last Year
		10^5	$10^5 - 10^6$	$10^6 - 10^7$	10^7			
*Activity Ranges - Dis/24 Hours								
HP-1	N 3550	81.85	3.41	0.02	0.00	85.28	1.83	+ 26.2%
HP-2	S 3001	65.98	2.88	0.13	0.02	69.01	1.36	+ 7.9%
HP-3	S 1000	12.60	0.68	0.06	0.00	13.34	0.98	+ 81.4%
HP-4	W 3513	11.08	0.64	0.00	0.00	11.72	0.69	+ 91.7%
HP-5	E 2506	51.21	1.26	0.00	0.00	52.47	3.50	+ 4.8%
HP-6	SE 3012	44.53	1.98	0.09	0.00	46.60	0.90	+ 34.3%
HP-7	W 7001	37.43	2.32	0.08	0.00	39.83	0.80	+ 81.8%
HP-8	Rock Quarry	51.64	1.49	0.02	0.00	53.15	1.05	+218.2%
HP-9	A-10 Site	57.28	1.85	0.11	0.00	59.24	1.22	+134.6%
HP-10	E 2074	64.45	1.60	0.02	0.00	66.07	1.44	+ 82.3%
Average							1.38	

Deviation of this year's weekly average to date from weekly average last year

+ 42.3%

3. Meteorological Data

a. Rainfall

Total this year	51.66 inches
Normal Yearly Rainfall	52.04 inches
Deviation from Normal Seasonal Rainfall	0.7%

4. Liquid Waste Disposal

a. Curies Discharged

	<u>Settling Basin Beta</u>	<u>White Oak Lake Beta</u>
Weekly Av. to date this year	4.14	8.24
Deviation from 1954 weekly average	-8.2%	+11.7%

~~CONFIDENTIAL~~

b. Submersion Data

	Settling Basin			White Oak Lake		
	Beta mrep/hr	Gamma mr/hr	Total mr(ep)hr	Beta mrep.hr	Gamma mr/hr	Total mr(ep)hr
Weekly Av. to Date this Year	0.038	0.262	0.570	0.038	0.022	0.060
Deviation From 1954 Weekly Average	-37.7%	-50.3%	-44.4%	+5.6%	-24.1%	-7.7%

c. Plutonium Discharged

	Settling Basin		White Oak Lake	
	Conc. x 10 ⁻⁹ µg/cc	Total mg. Plutonium	Conc. x 10 ⁻⁹ µg/cc	Total mg Plutonium
Weekly Av. to Date this Yr.	3875.9	58.145	286.8	74.982
Deviation from 1954 Weekly Average	+26.9%	+94.5%	+191.2%	+230.2%

d. Probable average concentration in Clinch River below White Oak Creek using as a dilution factor the ratio of White Oak Lake discharge to the flow of Clinch River.

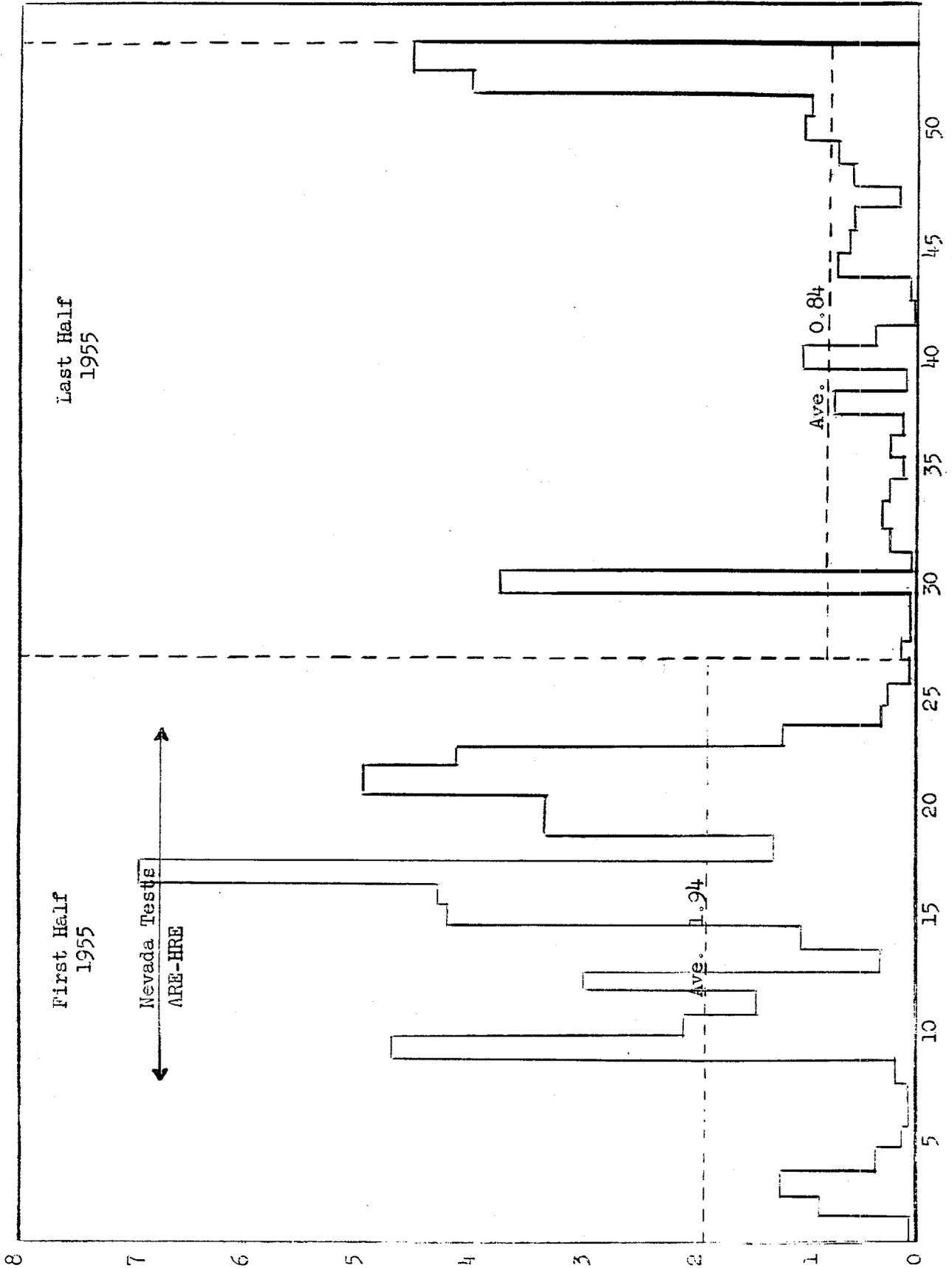
Weekly Average to Date This Year	1.25 x 10 ⁻⁷ µc/cc
Deviation from 1954 weekly Average	-25.2%

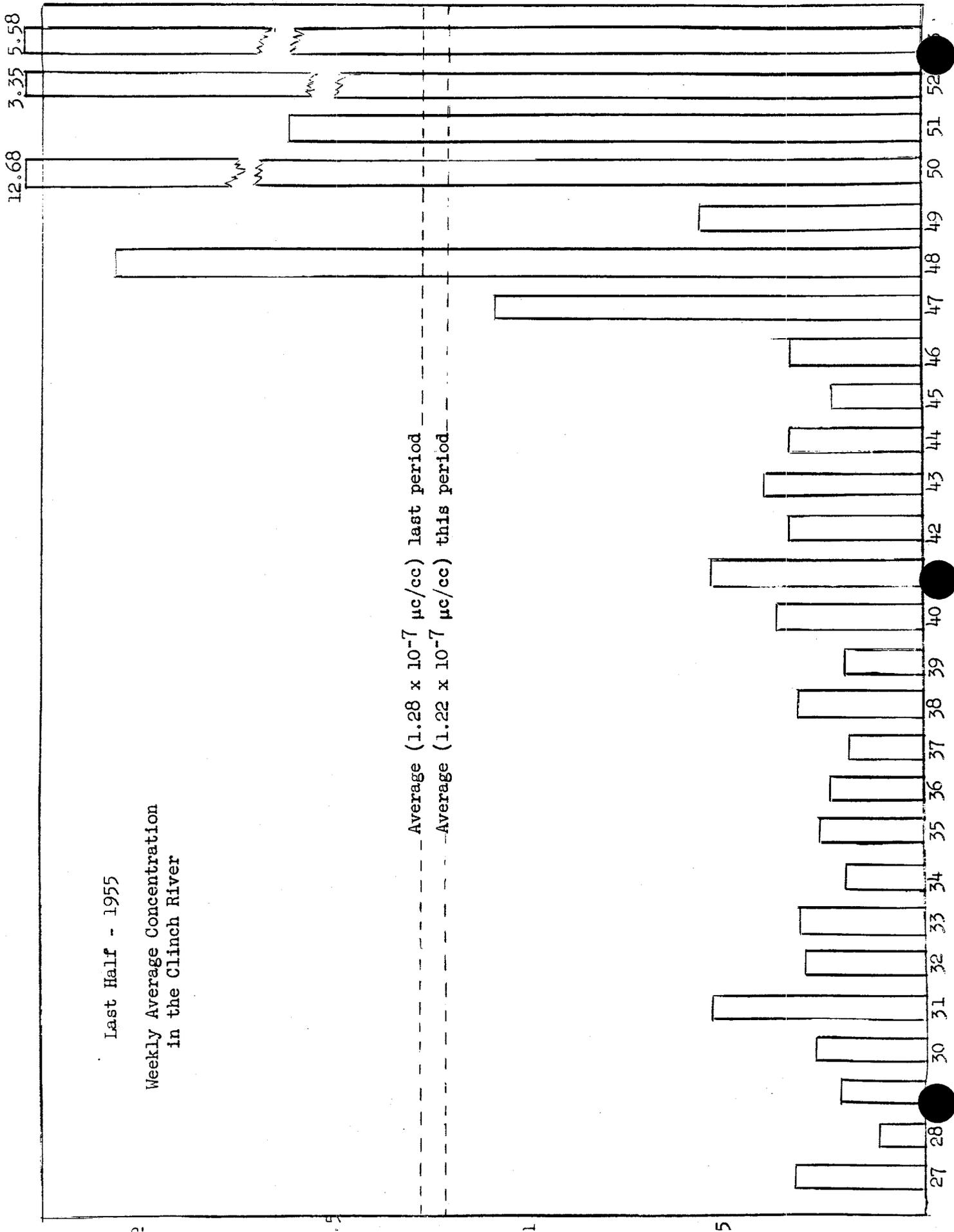
5. Laundry Decontamination Measurements

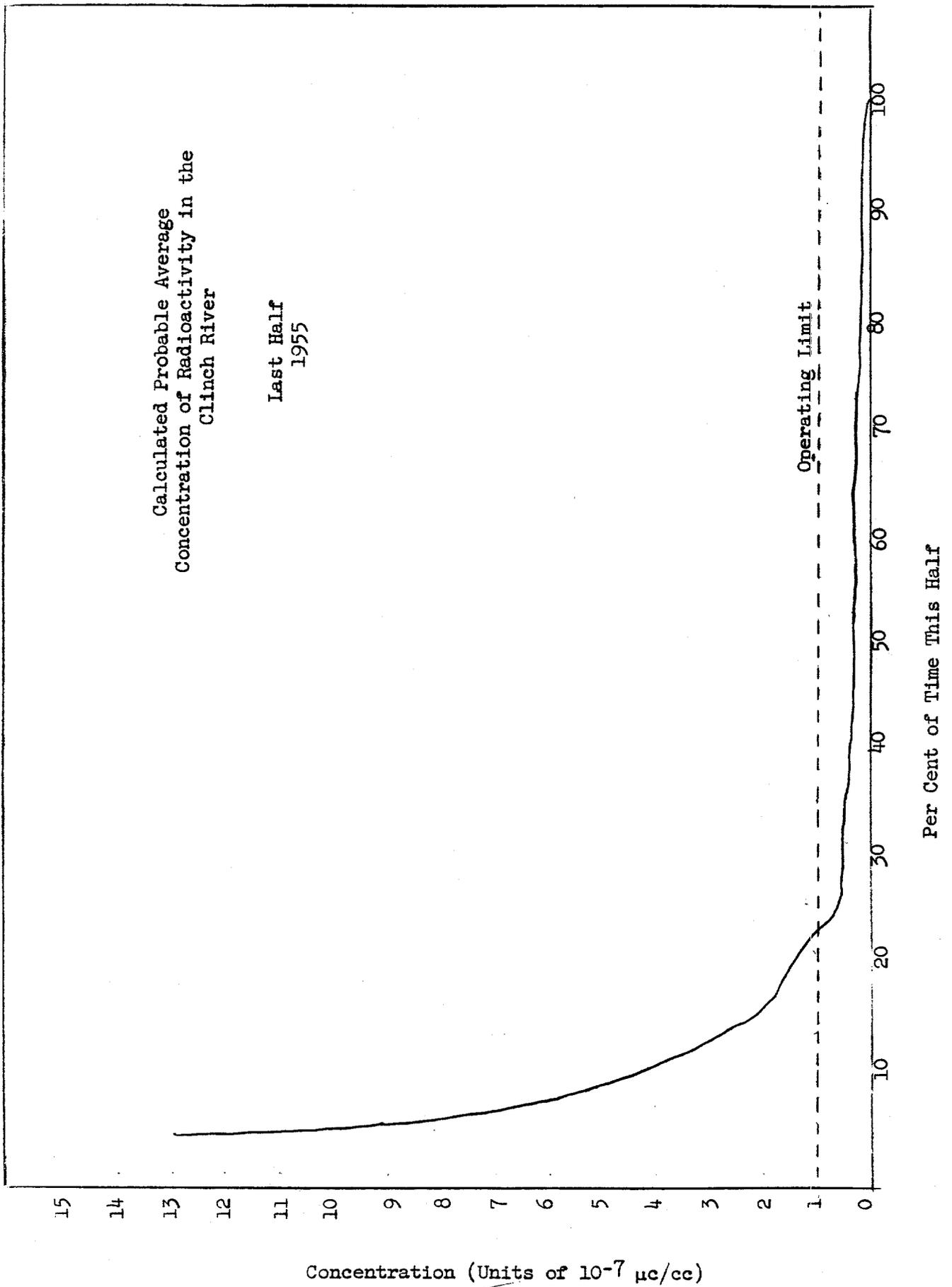
	Weekly Av. to Date This Year	Deviation of this Year's Weekly Av. from 1954 Wkly. Av.
a. Garments	3866	+ 2.1%
b. Special Items	2365	+94.7%

~~CONFIDENTIAL~~

Fig. 1
Air Particulate Activity
Average of 10 CAM's







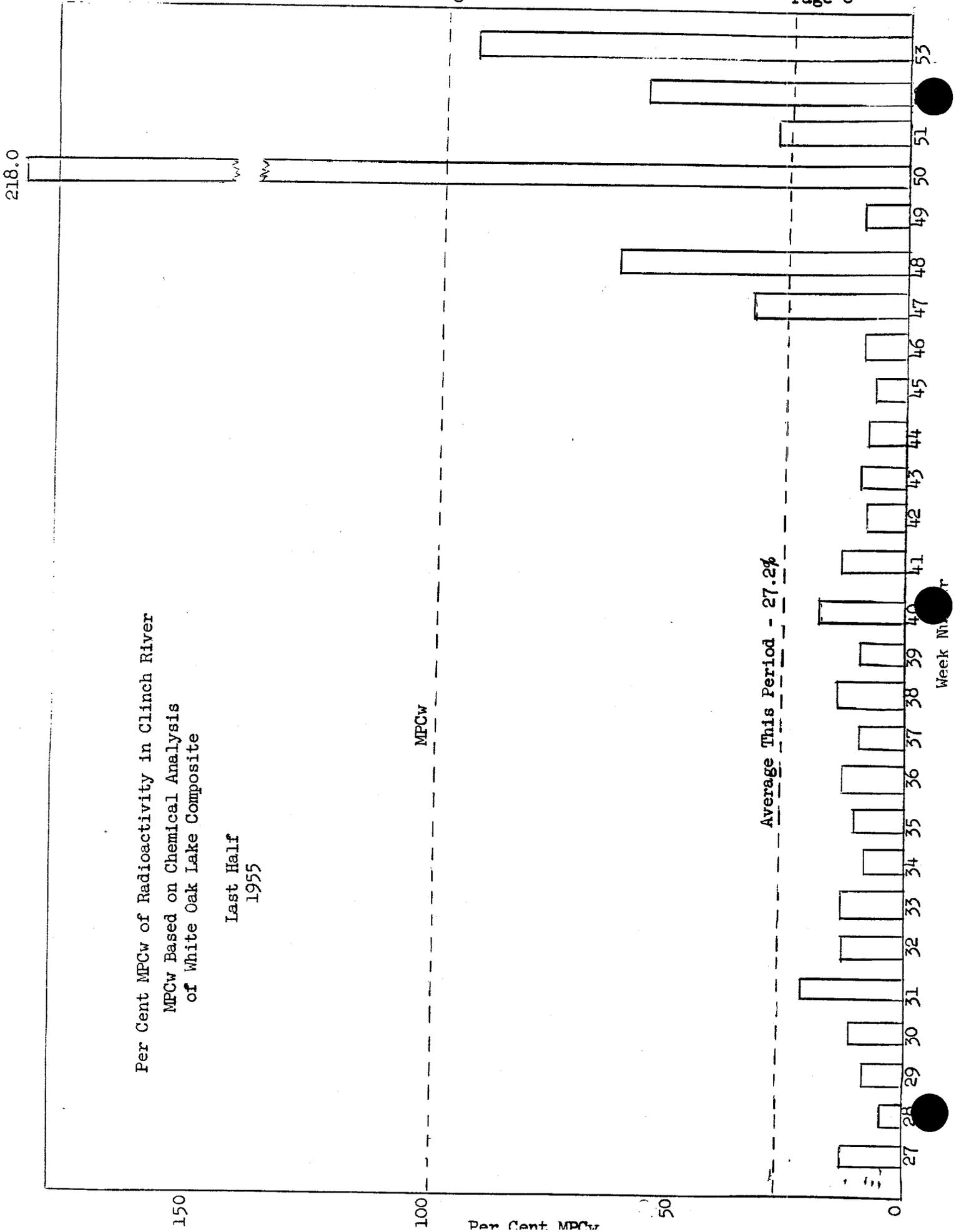


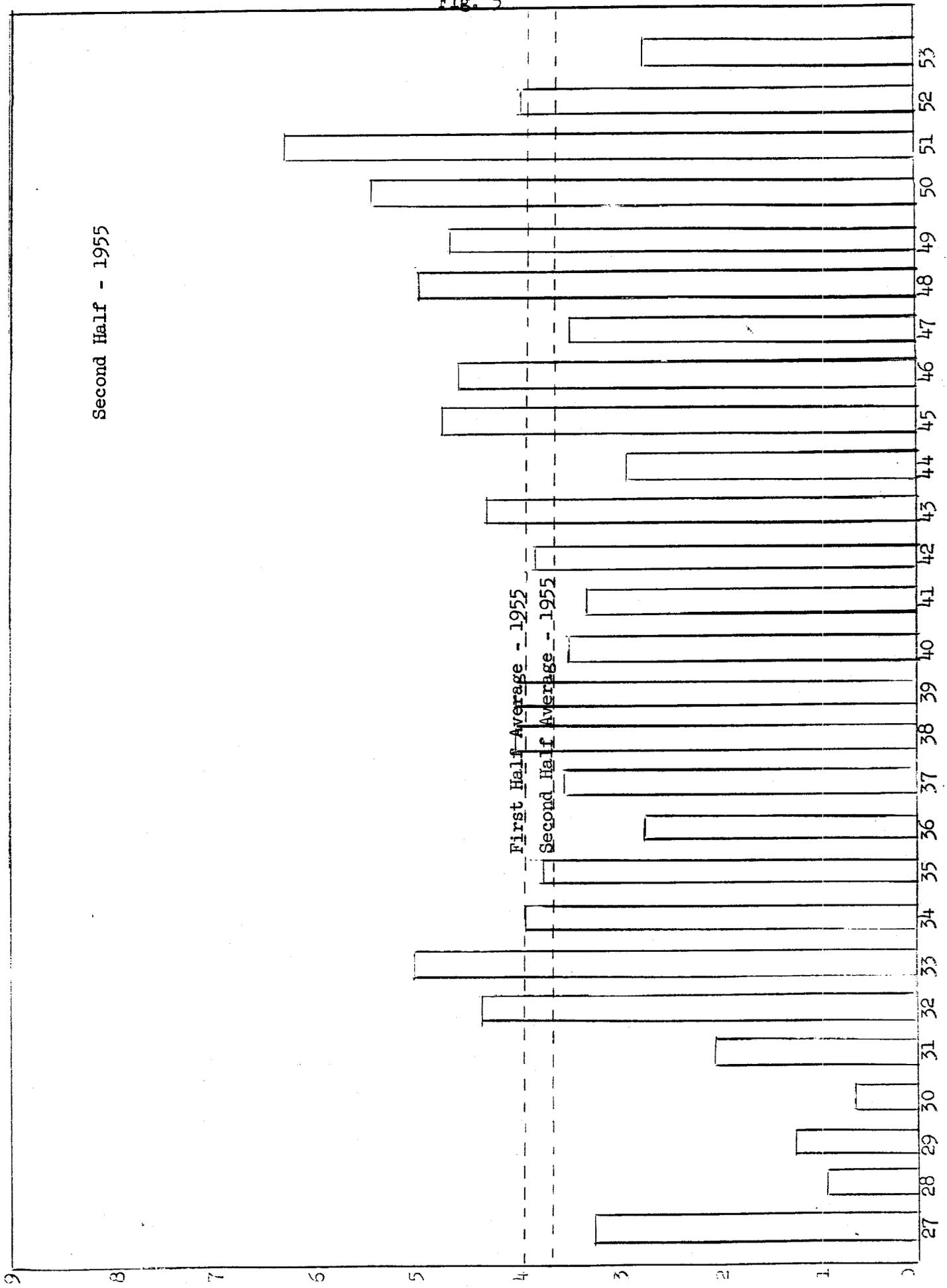
Fig. 5

Second Half - 1955

First Half Average - 1955

Second Half Average - 1955

Week Number



SECTION II. ASSAYS - INSTRUMENTS

Part A. Salient and Non-Routine Items

Urinalysis for tritium is now being done routinely by the Bio-Assays Unit. The equipment and techniques used are described in LA-1678.

Within recent months facilities have been provided for producing chemical dosimeters of the type and range described by Lt. Sigoloff of USAF and Dr. Taplin of UCLA. With the assistance of Lt. Sigoloff, the Standards Group of the Applied Health Physics Sections, under the direction of E. D. Gupton, has been able to produce, within limits, dosimeters as described in available reports.

Experiments were performed to determine the energy response of the modified plastic chamber as used on the ORNL Cutie Pie. The deviation in energy response was less than 10% through the energy range from 8 effective kilovolts to 1.2 mev.

The response data for the ORNL film badge meters were extended downward to 8 effective kilovolts. Previously, the energy response had extended to about 20 KVE.

Two smelting operations using uranium contaminated stainless steel and one operation using uranium contaminated copper were performed for test purposes.

The first test involved seven tons of contaminated stainless steel. The second test involved 70 tons of the same type of scrap material. The third test was concerned with the smelting of 100 tons of contaminated copper.

The three separate tests were made in order that potential hazards could be evaluated for the different phases in the preparation, handling, smelting, and disposal operations.

This section cooperated in the AEC Radiological Fellowship Training Program during July and August.

Part B. Statistical Data1. Assays and Measurements Unit

a. Counting Services - (Weekly Average)

<u>Type of Sample and Requestor</u>	<u>Calculations Required or Points Plotted</u>	<u>No. Counts Performed</u>		<u>Units Per Count*</u>	<u>Total Units</u>
		<u>Alpha</u>	<u>Beta</u>		
Smears		2363	2646	1	5006
Air Samples	178	234.4	222.1	3	1903.7
Area Monitoring		7.1	14.9	4	88.0
Environmental Studies			40.0	4	160.0
ERDL			7.6	4	30.4
Decay and Absorption Studies			97	4	38.8
Knoxville Iron Works Applied Radiobiology		7.1		4	28.8
Terrestrial Ecology			9.1	4	36.3
Sr. Mice Tissue Study			24.6	4	98.3
Urinalysis Research			20.0	4	80.0
Sanitary Engineering Field Investigations			19.6	4	78.4
Chemistry & Soils Studies			20.3	4	81.2
Average Units Per Week this Report					7978
Deviation of Weekly Average this Report from 1954 Weekly Average					8.1%
Total Units Handled to Date this Year					439841
Deviation of Weekly Average to Date This Year From 1954 Weekly Average					2.5%

* Unit = 2/3 min.

b. Chemical AnalysisWeekly Average

Pu	11.3
U	15.5
Sr	12.3
Gross Alpha	4.9
Ra	2.0

b. (Continued)

<u>Chemical Analysis</u>	<u>Weekly Average</u>
Lead (Urine)	3.0
(Blood)	.7
Average number of samples per week	56.4
Deviation of weekly average this report from 1954 weekly average	8.4%
Total samples handled to date this year	3288
Deviation of weekly average to date this year from 1954 weekly average	+ 2.9%

2. Environ

a. Air Activity Studies

<u>Type Sample</u>	<u>Av. No. of Samples Per Wk/Station</u>	<u>No. Stations</u>	<u>Total Samples For Period</u>
Water	2.6	4	68
Filter.	2.6	4	68
Gum Paper	28.31	4	736
TOTAL	33.51	TOTAL	872

3. Calibration Unit

a. Film Routine

Average number of films calibrated per week	234
Deviation of the weekly average this report from 1954 weekly average	- 18%
Total Films calibrated	6082
Deviation of weekly average to date this year from 1954 weekly average	- 26%

b. Instrument Routine

Average number of instruments calibrated per week	82
Deviation of the weekly average this report from 1954 weekly average	- 23%
Total instruments calibrated	2136
Deviation of weekly average to date this year from weekly average of 1954	- 16%

4. Portable Instruments Repaired

a. Average number of instruments repaired per week	48
b. Deviation of the weekly average this report for weekly average of 1954	+ 2%
c. Total instruments repaired to date this year	2599
d. Deviation of weekly average to date this year from weekly average of 1954	+ 6%

5. Operation of Fixed and Semi-Portable Instruments*

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
a. Constant Air Monitors	8255	1726	6529	83	79%	1.0%
b. Monitrons	9906	1068	8838	108	89%	1.1%

*Explanation for Column Headings:

1. Total number of "Instrument Days" where an "Instrument Day" is defined as the number of instruments times the number of work days in the quarter.
2. Number of "Instrument Days" for which operational reports were received.
3. Number of "Instrument Days" for which operations reports were not received.
4. "Instrument Days" instrument reported out of service.
5. Per cent of "Instrument Days" not reported.
6. Per cent of "Instrument Days" instrument reported out of service.

5. (Cont'd) Operation of Fixed and Semi-Portable Instruments

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
c. Hand & Foot Counters	1397	196	1201	19	86%	1.4%
d. AC Poppies (Alpha & Beta-Gamma)	2921	673	2248	10	77%	.34%
e. Scalers (Including alpha counters)	3556	845	2711	15	76%	.42%
f. Precipitrons	1778	450	1328	0	75%	0%
g. Friskers	1397	192	1205	20	86%	1.4%
h. Filtrons	1270	305	965	0	76%	0%
i. Disc Air Samplers	1905	584	1321	141	69%	7.4%

SECTION III. PERSONNEL MONITORINGPart A. Salient and Non-Routine Items

On December 3 and 4, 1955, Oak Ridge National Laboratory had its first Family Day. This group monitored 4,672 visitors, of which no significant exposures were observed.

During this period monitoring film was placed upon commercial aircraft crews of flights carrying active isotopes originating from McGhee-Tyson Airport, Knoxville, Tennessee. A total of 1,769 films were processed for this purpose. Data at this date is inconclusive and is being submitted to further analysis.

Figs. 6 and 7 are plots by Laboratory divisions of the number of significant exposures, the number of cases where weekly MPE was exceeded, the number of overage weeks, and the number of persons involved. No employee received more than permissible exposure for the period involved as defined by Bureau of Standards Handbook 59.

Part B. Statistical Data1. Personnel Metersa. Distribution and Performance of Pocket Meters

	<u>Weekly Av. To Date This Year</u>	<u>Deviation of This Year's Av. From 1954 Weekly Average</u>
Meters Distributed	4150	- 10.1%
Readable Meters	4146	- 10.2%
Non-Readable Meters	4	0
Non-Readable Pairs	0	-100.0%
Off-Scale Readings	13	- 18.8%
Off-Scale Pairs	1.42	- 13.9%

b. Expected Off-Scale

<u>Pocket Meter Pairs</u>	0	0
---------------------------	---	---

c. Distribution and Processing Data of Film Meters

West Portal	2067	15.9%
Y-12 Portal	0	0
East Portal	1244	- 24.3%
Visitors	741	60.7%
Ring Films, Pads, etc.	162	200.0%
Routine Neutron Films	248	16.4%
Special Neutron Films	105	- 35.1%
Calibrations	191	5.5%

c. (Cont'd) Distribution and Processing Data of Film Meters

	<u>Weekly Av. To Date This Year</u>	<u>Deviation of This Year's Av. From 1954 Weekly Average</u>
Correspondents	116	- 72.4%
Special X-ray Films	14	- 33.3%
Total Films Handled	4888	13.4%

d. Film Meter Data Loss

Badge Meters not serviced	68	44.7%
Films lost	0	0
Films damaged	0	0
Total	68	44.7%

2. Investigations Initiateda. From Pocket Meter Records

Significant total of 600 mr or more	.02	- 80.8%
Off Scale Pairs	1.40	- 15.1%
Non-Readable Pairs	.02	0
Total	1.44	- 18.6%

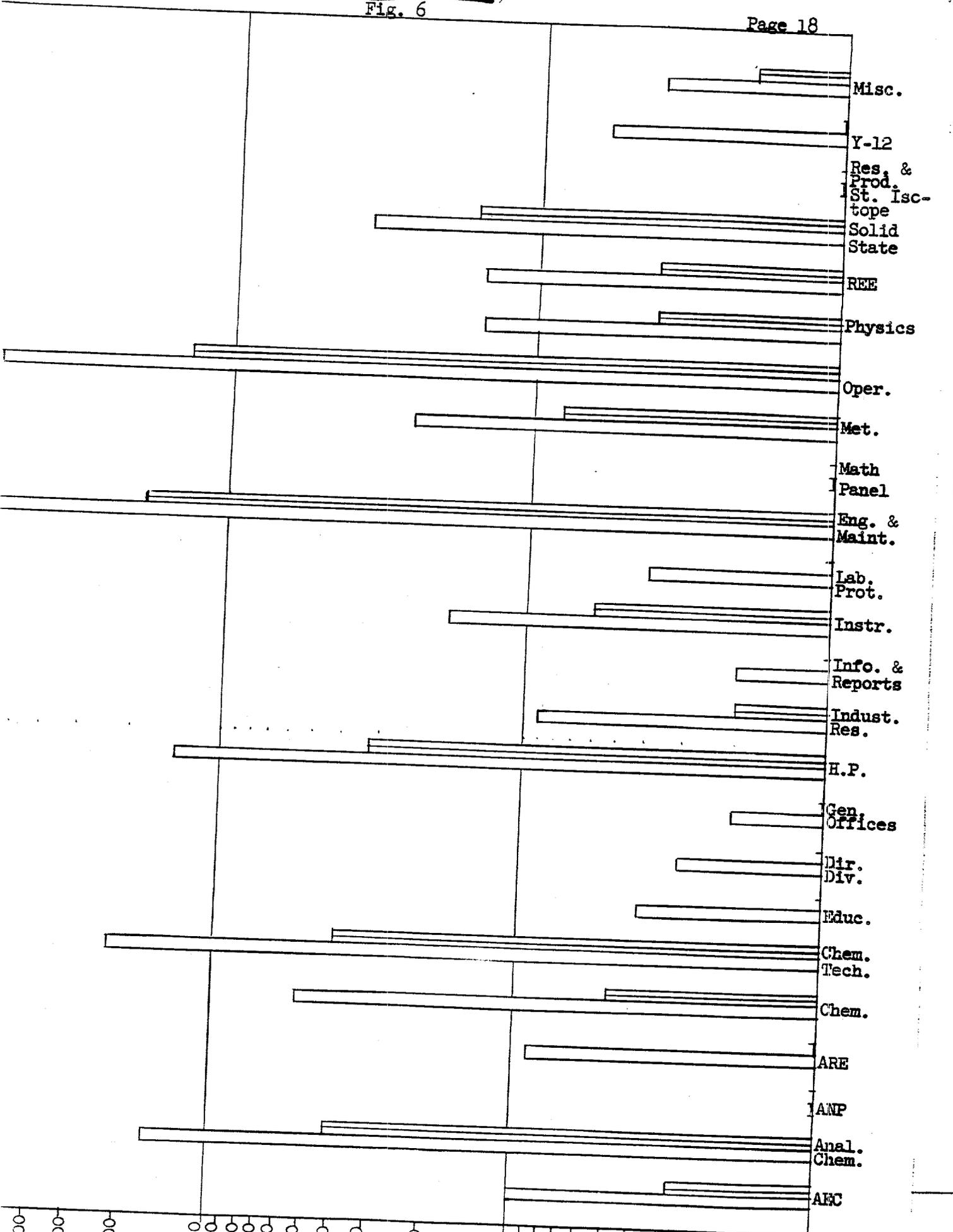
b. From Film Meter Records

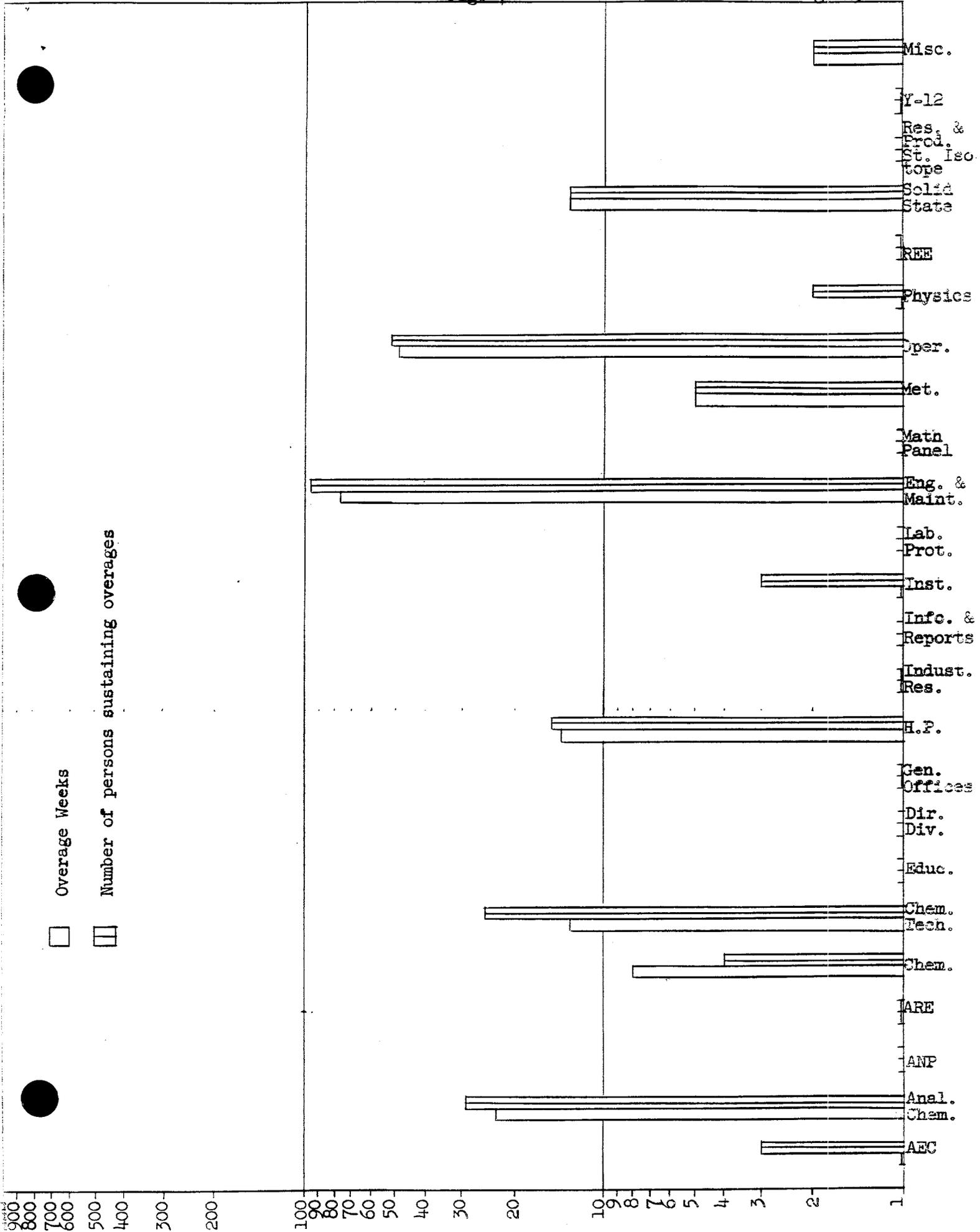
Weekly PTR of 1000 mrep or more, or shield of 600 mr or more	4	39.4%
Questionable PTR of 1000 or more	.60	- 13.1%
Lost or damaged films	.10	400.0%
Average 100% of MPE/wk.	5.88	104.8%
Total	10.44	128.9%

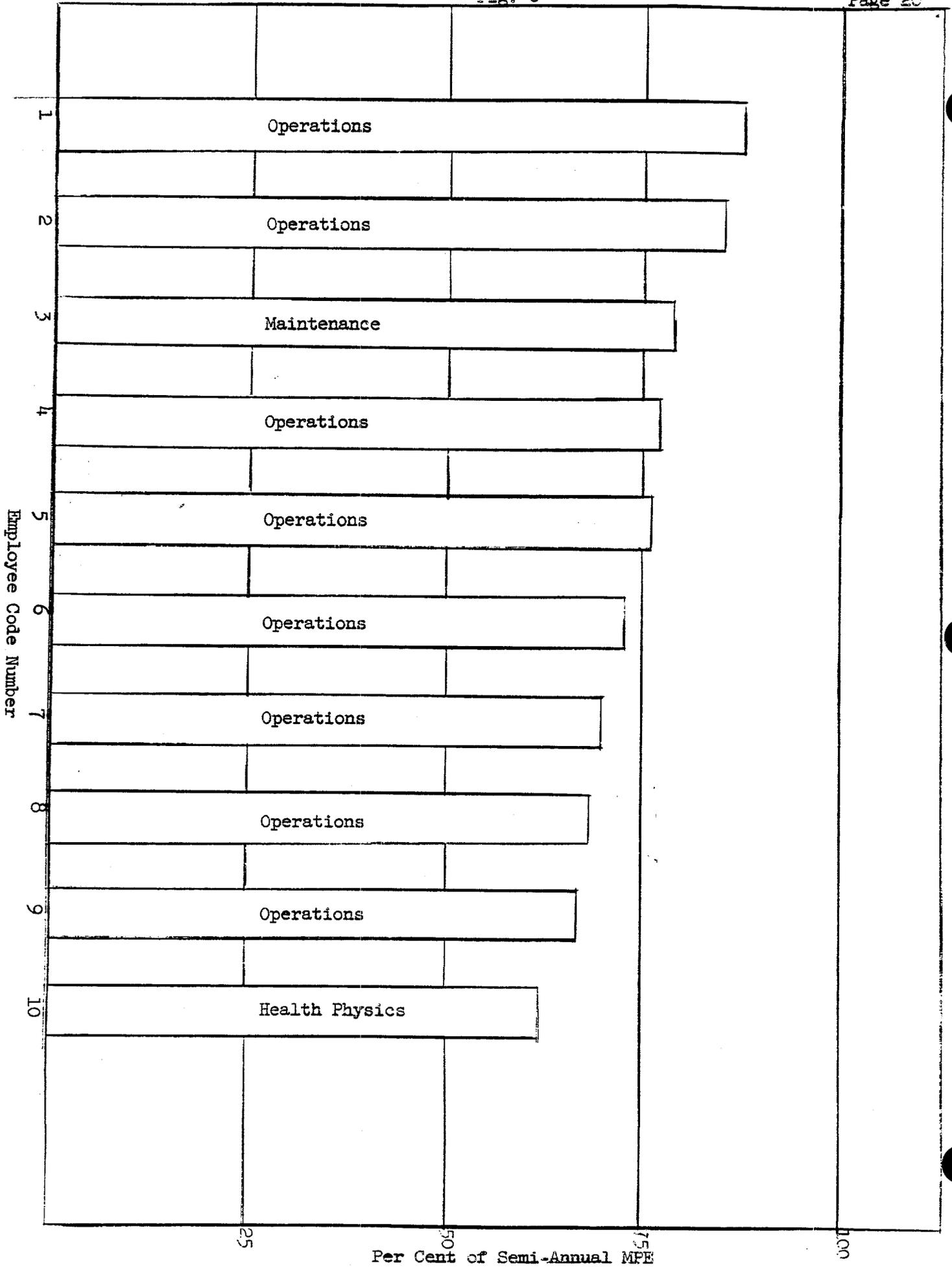
c. Investigation Results

	<u>Investigated to Date This Year</u>	<u>Confirmed to Date This Year</u>
Pocket Meters	72	45
Film Meters	613	223
Total	685	268

Paired off-scale pocket meters investigated to date this year	72
Legitimate number of off-scale pocket meter pairs to date this year	45
Statistical probability of spurious (paired off-scale) pocket meter readings to date this year	1.03







SECTION IV. RADIATION SURVEY

Part A. Salient and Non-Routine Items

General Research, Chemistry, and Operations Survey

The ARE catch tank was removed from Building 7503 to Cell 3, Building 3019, on July 18, 1955. ARE, Engineering and Maintenance, and Chemical Technology personnel cooperated in the well planned move and exposures were held to a minimum. Ref: "Removal of ARE Catch Tank", dated August 3, 1955.

On August 10, 1955 while a hole was being drilled into a line to the thorium process in Building 3019, the floor and two employees were contaminated. Successful decontamination proceedings were carried out on the employees and the floor area was decontaminated to 30 mr/hr. Ref: RS-119-55, dated August 15, 1955.

An incident occurred on August 26, 1955. Building 3019 in which one employee and a small surface area of the floor in the sampling room became contaminated. Ref: RS-122-55, dated September 7, 1955.

Reactors, Accelerators, and Related Physics Surveys

Airborne activity arose in the west room of the LITR when a sample container was disconnected from the in-pile loop in HB-4. The incident occurred on July 13, 1955 and is described in Activity Hazard Incident Report No. RS-117-55, dated July 26, 1955.

The semi-annual autoradiographic survey of the Graphite Reactor site was performed during July. Forty film were used in this study. No significant change in the particulate activity distribution could be detected.

On November 15, 1955 a fission gas incident required evacuation of the LITR. The incident resulted from removal of an experiment from HB-6. It was made more serious by the fact that a valve in a hot drain line in the last room was open when it should have been closed. Modifications of the drain system are presently underway. Ref: Activity Hazard Incident Report No. RS-126-55, dated November 15, 1955.

SECTION V. TECHNOLOGICAL STUDIES

During the second half of 1955, the effort of this Section was distributed as follows:

- | | |
|--|-----|
| 1. Problems of Environs Group
(Reported under Assays-Instruments) | 32% |
| 2. Special and Technical Problems | 68% |

Of the first category, particular mention should be made of two special endeavors:

1. Planning and participation in CAP's Operation Egghunt
2. Draining of White Oak Lake

which accounted for 44% of the effort applied.

The second category included:

1. Reactor problems and hazards.
2. Problems of legal regulations of radiation exposure.
3. Consultation by mail and with visitors.
4. AIHA Radiation Committee and Session arranging work.
5. Sundry technical problems of Health Physics.
6. Special problems and hazards at ORNL.

J. C. Hart
J. C. Hart, Chief
Applied Health Physics

Date Compiled by: A. D. Warden
D. M. Davis
J. C. Ledbetter
T. J. Burnett
H. H. Abee
et. al.

JCH:mfm