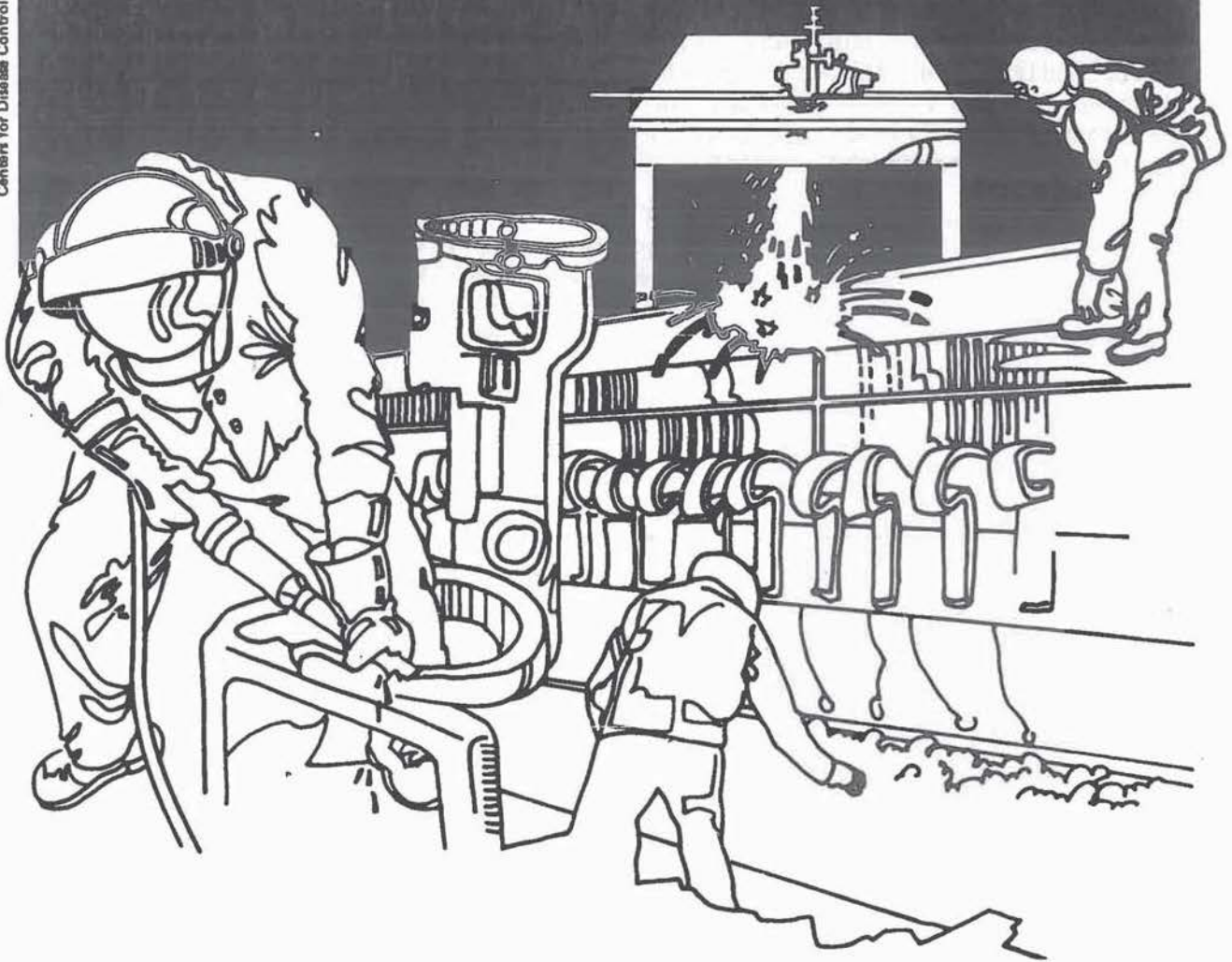


# NIOSH



## Health Hazard Evaluation Report

HETA 81-377-1214  
AT&T LONG LINES  
ATLANTA, GEORGIA

## PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HETA 81-377-1214  
November 1982  
AT&T Long Lines  
Atlanta, Georgia

NIOSH INVESTIGATORS:  
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## I. SUMMARY

On June 6, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from employees to conduct an evaluation at AT&T Long Lines, 51 Ivy Street, Atlanta, Georgia. The request was concerned with the leakage of radiofrequency/microwave (RF/MW) radiation from long distance telephone relay equipment.

Measurements of the RF/MW radiation were made on September 21, 1981 around the transmitters, the associated waveguide runs and at the base of the transmitting antenna. All measurements were of electric field strength, expressed as volts squared per meter squared ( $V^2/m^2$ ).

Although the relay systems are enclosed, some leakage was detected in a few cases, primarily around waveguide joints. The highest radiation measured was  $6 \times 10^2 V^2/m^2$  at the waveguide, much less than the OSHA standard of  $4 \times 10^4 V^2/m^2$ . At a distance of 5-10 cm from the waveguide there was no measureable radiation. The leakage radiation was not detectable after tightening the waveguide screws holding the RF interference shields on the transmitter output tubes. Because the measured radiation was low compared to the standard, no action was recommended.

NIOSH concludes that personnel working in and around the transmitters, waveguide runs and transmitting antenna at a microwave telephone relay station are not exposed to hazardous levels of radiofrequency and microwave radiation.

KEYWORDS: SIC (4811) Telephone communication (wire or radio)  
radiofrequency, microwave, telephone relay station, nonionizing radiation

## II. INTRODUCTION

On June 6, 1981, NIOSH received a request for a Health Hazard Evaluation (HETA 81-377) from employees of AT&T Long Lines, 51 Ivy Street, Atlanta, Georgia. In the request, the employees asked for an evaluation of the radiofrequency and microwave (RF/MW) radiation emitted by transmitting equipment used in the microwave telephone relay facility. The evaluation was conducted on September 21, 1981 by measuring the RF/MW radiation from the transmitters under actual use conditions.

## III. BACKGROUND

The AT&T Long Lines facility is part of a nationwide grid of microwave telephone relay stations. Through the stations, long distance telephone calls are transmitted from point to point by frequency modulated electromagnetic radiation. The relay antennas are usually located atop buildings since it is line of sight transmission.

The carrier frequency is 70 megahertz (MHz) which is frequency modulated with microwave frequencies ranging from 3730 to 4150 and from 5925.5 to 6093.5 MHz. The output power of the generators is either 0.5, 2, 5 or 10 watts (W). Incoming calls are received by the receiving antennas, sorted and routed through the waveguide systems, amplified and transmitted via the transmitting antenna to the next relay station.

## IV. METHODS

The transmitting equipment of interest to this request is located on the 9th, 12th and 14th floors of the AT&T building at 51 Ivy Street, Atlanta, Georgia. Measurements of the RF/MW radiation were made on these floors and on the roof of the building at the base of the transmitting antenna.

A Holaday Model HT-3002 meter (S/N 26092) was used to measure electric field strength with the electric field probe (S/N 186GR). Only electric field readings were taken because at these high frequencies, the measurements are made in the far field. The meter reads out in volts squared per meter squared ( $V^2/m^2$ ). The minimum detectable radiation limit is approximately  $500 V^2/m^2$  and the accuracy of the instrument is  $\pm 2.5$  dB, corresponding to  $+78$  and  $-44$  percent. For the electric field probe, the operational frequency range was 0.5 MHz to 6 GHz. The meter was calibrated on September 16, 1981 and the calibration verified upon returning from the survey.

Only technical personnel are present in the transmitter areas. Since the employee's position with respect to the microwave sources varies, all measurements of the sources and associated waveguide were made at a distance of 5 cm or at the closest possible distance. Thus, any worker's exposure would be far less than the measured values because workers are located farther from the source than the points at which radiation was measured, and the duration of any exposure would normally be for only a few minutes.

V. EVALUATION CRITERIA

For nonionizing radiation in the RF/MW range from 10 to 100,000 MHz, OSHA specifies a power density limit of 10 milliwatts per centimeter squared ( $\text{mW}/\text{cm}^2$ ) averaged over any 0.1 hour (6 minutes) period (29 CFR Part 1910.97). In the far field, this is equivalent to an electric field strength of  $4 \times 10^4 \text{ V}^2/\text{m}^2$ .

VI. RESULTS

Radiation measurements were made for RF/MW leakage from each transmitter on each floor (Tables 1-3). Radiation leakage was found at 6 locations, 2 on each floor. The highest radiation measured was  $6 \times 10^2 \text{ V}^2/\text{m}^2$ , immediately at the source, compared to the OSHA standard of  $4 \times 10^4 \text{ V}^2/\text{m}^2$ . No detectable radiation was found when the probe was moved to a distance of 5-10 cm from the source. In the 6 cases where leakage radiation was found, none was detectable after tightening the waveguide flange screws holding the RF interference shields on the transmitter output tubes.

VII. CONCLUSIONS

The maximum measured radiation is very low compared to the OSHA standard. In no instance was there any possibility of whole body exposure, although the OSHA standard does not differentiate between whole body and partial body exposure. Considering the exposure conditions and the probable exposure duration, it is concluded that there is no possibility in this situation of employee exposure to RF/MW radiation above the OSHA standard.

VIII. RECOMMENDATIONS

Corrective action is not needed because detectable radiation was found only in a few cases, the levels present were far below the OSHA standard and the probability of exposure was very low. Thus, although the radiation leakage could be reduced to nondetectable levels by tightening the waveguide screws as mentioned above, this action was not required because there was no radiation health hazard.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Technical Information Branch, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After ninety (90) days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

1. Requestor
2. AT&T Long Lines, 51 Ivy Street, Atlanta, Georgia.
3. Bell Laboratories, 600 Mountain Avenue, Murray Hill, New Jersey 07974
4. Georgia Department of Human Resources, 47 Trinity Avenue, Atlanta, Georgia 30334
5. U.S. Department of Labor, OSHA, Region IV
6. NIOSH, Region IV

For the purposes of informing the employees, of the results of this survey, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 days.

Table 1.

## Radiofrequency/Microwave Measurements on the 9th Floor

AT&T Long Lines  
 Atlanta Georgia  
 HETA 81-377  
 September 21, 1982

TD-2 Radio Bays

<u>Transmitter Number</u>	<u>Power(W)</u>	<u>Field Strength (V<sup>2</sup>/m<sup>2</sup>)</u>
929.1	2	ND
929.2	2	ND
929.3	2	ND
929.4	2	ND
929.5	2	6x10 <sup>2</sup>
929.6	2	ND
929.8	2	ND
929.9	2	ND
929.10	2	ND
929.11	2	ND
929.12	2	ND
929.13	2	ND
929.16	2	ND
929.17	2	ND
929.18	2	ND
929.19	2	ND
929.20	2	ND
927.13	5	ND
927.14	5	ND
927.15	5	ND
927.17	5	5x10 <sup>2</sup>
927.18	5	ND

3A FM Transmitters

926.1	2	ND
926.2	2	ND
926.3	2	ND
926.4	2	ND
926.5	2	ND
926.6	2	ND
927.1A	2	ND
927.1	2	ND
927.2	2	ND

Waveguide runs ND

Table 2.

## Radiofrequency/Microwave Measurements on the 12th Floor

AT&T Long Lines  
 Atlanta, Georgia  
 HETA 81-377  
 September 21, 1982

TD-2 Radio Bays

<u>Transmitter Number</u>	<u>Power(W)</u>	<u>Field Strength (V<sup>2</sup>/m<sup>2</sup>)</u>
1202.01	5	ND
1202.02	5	ND
1202.03	5	6x10 <sup>2</sup>
1202.07	5	ND
1202.08	5	ND
1202.09	5	ND
1202.10	5	ND
1202.11	2	ND
1202.12	2	ND
1203.16	2	ND
1203.17	2	ND
1203.18	2	ND
1209.02	2	ND
1209.03	2	ND
1209.04	2	ND
1209.05	2	ND
1209.06	2	ND
1210.01	2	5x10 <sup>2</sup>
1210.02	2	ND
1210.03	2	ND
1210.06	2	ND

Waveguide runs ND



Table 3.

## Radiofrequency/Microwave Measurements on the 14th Floor

AT&T Long Lines  
 Atlanta, Georgia  
 HETA 81-377  
 September 21, 1982

TH Radio Bays

<u>Transmitter Number</u>	<u>Power(W)</u>	<u>Field Strength (V<sup>2</sup>/m<sup>2</sup>)</u>
1458.1	5	ND
1458.3	5	ND
1457.1	5	ND
1457.3	5	ND
1457.5	5	ND
1457.8	5	ND
1430.01	5	ND
1430.09	5	ND
1430.10	5	ND
1430.18	0.5	ND
1430.19	0.5	ND
1430.20	10	ND
1430.22	10	ND
1413.01	10	6x10 <sup>2</sup>
1413.02	10	ND
1429.21		ND
1429.22		ND
1429.02		ND
1429.09		5x10 <sup>2</sup>
1429.10		ND
Waveguide runs		ND
Antenna base on roof		ND