

DEVELOPMENT OF OCCUPATIONAL EXPOSURE RECOMMENDATIONS:  
OBSERVATIONS ON THE USES OF RF/MICROWAVE ENERGY



As a major part of the development of a criteria document to include a recommended occupational exposure standard for worker protection from radio-frequency (RF) and microwave fields, NIOSH has attempted to gather information on the uses of RF/microwave energy. The objective was to collect facts and data on workplace practices and engineering controls involved in the production and/or use of microwave energy, and to obtain information on recognized biological effects. The scope was limited to information relevant to the production and/or use of RF/microwave energy in the frequency range from 0.5 MHz to 300 GHz; any incidental information to be collected only when and where it aids comprehension of the data; current state-of-the-art to be emphasized.

More than 300 contact letters were mailed in July 1978 to manufacturers of RF/microwave equipment, and to potential Federal and industrial users of RF/microwave energy. Letters were also sent to trade associations, professional societies, and to selected labor unions. The letters included the October 28, 1977, FR notice (42 FR 56799), and were of two types: one for manufacturers and potential users of RF/microwave energy and equipment, the other for trade associations, professional societies, and labor unions. Both types of letters announced NIOSH's plans to develop a criteria document containing a recommendation for an occupational exposure standard for RF/microwave energy, and requested from the facility or organization receiving the letter information on: bioeffects studies, engineering controls, medical/biological monitoring of personnel exposed to RF/microwave fields, personal protective devices, measurement techniques and equipment for monitoring of RF/microwave fields, work practices, recordkeeping, and warning devices.

A detailed description of the types of responses received, and a tabular presentation of the outcome of the responses (i.e., plant site visit, etc.) will be discussed.

Visits were made to several plants and facilities where RF/microwave energy is used. On some of these visits measurements of electromagnetic fields were made and photographs were taken. Representative slides and results of these site visits will be presented.

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<sup>1</sup>National Institute for Occupational Safety and Health, Rockville, Maryland.

<sup>2</sup>Equitable Environmental Health, Inc., Rockville, Maryland.

As a major part of the development of a criteria document to include a recommended occupational exposure standard for worker protection from radio-frequency (RF) and microwave fields, NIOSH has attempted to gather information on the uses of RF/microwave energy. This was an essential early concern while the scope and coverage of the document was being discussed. Communication with industry, organized labor, academia, state and Federal agencies, trade associations, and professional societies was initiated during the development of the "Scope Report." Many of the individuals or organizations contacted were already aware of the NIOSH plan for a criteria document on RF/microwave energy, either by having read the Federal Register notices dated December 23, 1976 (41 FR 55941), and October 28, 1977 (42 FR 56799), or by having heard the announcement of such plans at the American Industrial Hygiene Conference (Los Angeles, May 1978), the International Microwave Power Institute Meeting (Ottawa, June 1978), or at the Electromagnetic Radiation Management Advisory Council Meeting (Washington, D.C., August 1978).

#### Authors Affiliation

1. National Institute for Occupational Safety and Health, Rockville, Maryland.
2. Equitable Environmental Health, Inc., Rockville, Maryland.

A "Preliminary Report of Plants and Processes," which was developed next, provided general information on the production and uses of RF/microwave energy, estimates of worker exposure, and information on the industries/processes/users/manufacturers/etc. involved. Identification of specific user groups/organizations/companies/etc. was made. Telephone contact was established to identify the production or plant manager, safety director, industrial hygienist, health physicist, etc., within each facility.

An "Outline for a Plant Visit" (copy attached) was prepared, defining the objective and the scope of our inquiry. As stated:

Objective - To collect facts and data on workplace practices and engineering controls involved in the production and/or use of microwave energy, and to obtain information on recognized biological effects (gained through medical surveillance program).

Scope - Limited to information relevant to the production and/or use of RF/microwave energy in the frequency range from 0.5 MHz to 300 GHz; any incidental information <sup>to</sup> will be collected only when and where it aids comprehension of the data; current state-of-the-art <sup>to</sup> will be emphasized.

This outline was sent to, or discussed with, representatives of facilities which seemed receptive to a visit. Plant visit data forms were also discussed with potential participants. The forms are of two types: a) for users of RF/microwave energy, and b) for manufacturers of RF/microwave equipment.

More than 300 formal contact letters were mailed in July 1978 to manufacturers of RF/microwave equipment, and to potential Federal and industrial users of RF/microwave energy. Letters were also sent to trade associations, professional societies, and to selected labor unions. The letters included the October 28, 1977, FR notice, were OMB-approved, and were of two types: one for manufacturers and potential users of RF/microwave energy and equipment, the other for trade associations, professional societies, and labor unions. Both types of letters announced NIOSH's plans to develop a criteria document containing a recommendation for an occupational exposure standard for RF/microwave energy, and requested from the facility or organization receiving the letter information on bioeffects studies, engineering controls, medical/biological monitoring of personnel exposed to RF/microwave fields, personal protective devices, measurement techniques and equipment for monitoring of RF/microwave fields, work practices, recordkeeping, and warning devices (including the posting of signs). The letter (copy attached) sent to the manufacturers and users also requested their consideration for the possibility of a visit by NIOSH representatives to their plant or facility to observe work practices, uses, engineering controls, etc. Whenever possible, the letters were sent to the individual within the organization who had previously been identified as having an interest in, and knowledge of, the use of RF/microwave energy. A detailed description of the types of responses received and a tabular presentation of the outcome of the responses (i.e., plant site visit, etc.) will be discussed.

Visits to plants/facilities (of the manufacturer and user group) were scheduled for 1 to 2 days each, and occurred during the period October 1978-February 1979. The attached table lists each organization, its geographic location, and the dates of the completed visit. In general (but not entirely), the visits evolved from (or were generated by) the contact letters and telephone follow-up. On some of the visits, measurements of the electromagnetic fields generated (i.e., E, H, or power density) were made, and photos were taken. Some representative slides will be shown, and the results and conclusions of the visits will be discussed. The visits were conducted in accordance with Section 20 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 669), as enumerated in "Occupational Safety and Health Investigations (Visits) to Places of Employment" (42 CFR Part 85a), (see 40 FR 26530, dated June 24, 1975). Actual occupational situations and a cross section of various usage situations were encountered in the visits.

A draft report of each visit was submitted (within 6 weeks of <sup>the</sup> ~~each~~ visit) to the plant management to be checked for accuracy, and to prevent inadvertent release of proprietary (or classified) material. Following approval by the facility or organization, a final report, the Plant Observation Report and Evaluation, was prepared for each facility visited.

The Summary Plant Observation Report and Evaluation was prepared during March 1979, and much of the information and many of the conclusions have been incorporated into the draft of the criteria document. The applicable chapters of this document are: IV. "Environmental Data and Engineering Controls," and V. "Work Practices."