

SECTION 1

INTRODUCTION

1.1 EMF RAPID Engineering Projects

This report describes the performance and reports the results of Phase II of the survey of personal magnetic field exposure of the general population of the United States. The results of Phase I were described in the report: "Survey Of Personal Magnetic Field Exposure. Phase I : Pilot Study and Design of Phase II" [1]. Phase I and Phase II form Engineering Project 6 of the EMF RAPID Program, which is briefly described below.

Increasing public concern about the question of possible harmful health effects from exposure to power frequency electric and magnetic fields (EMF) led the U.S. Congress to address this issue in the Energy Policy Act of 1992 (P.L. 102-486). Specifically, Section 2118, under Subtitle B, Title XXI, (42 USC 13478) authorizes the Secretary of Energy to establish a jointly funded (Federal and non-Federal sources) comprehensive program to:

- determine if exposure to electric and magnetic fields produced by the generation, transmission, and use of electric energy affects human health;
- carry out research, development, and demonstration of technologies to mitigate any adverse human health effects; and
- provide for the dissemination of EMF information to the public

In order to fulfill these legislated responsibilities, the EMF Research and Public Information Dissemination Program (RAPID) was established.

The RAPID program includes engineering research focused on exposure assessment and source characterization. The engineering research of the RAPID program started in 1995 and includes the following eight projects:

1. Development of recommendation for guidelines for field source measurement
2. Development of recommendations for guidelines for environment-specific field measurement
3. Environmental field surveys
4. Development of recommendations for guidelines for personal exposure measurement
5. Development of an EMF measurement database
6. Survey of personal magnetic field exposure
7. Development of field exposure models
8. Evaluation of field reduction technologies

1.2 RAPID Engineering Project #6: Survey of Personal Magnetic Field Exposure

This report describes the performance of the second phase of the sixth project of the EMF RAPID engineering research in the area of exposure assessment and source characterization. The goal of the project is to obtain accurate information on the distribution of exposures of the general population of the United States. The project was conducted in two phases. In Phase I, conducted from October 1996 to September 1997, survey methodologies were developed and a small scale survey was conducted. Phase II, consisting of a large scale survey using the methodology developed in Phase I, started in October 1997 and was completed in April 1998.

Knowledge of individual exposures is important to successfully address EMF health effect issues. As hypotheses for interaction mechanisms are developed, detailed personal exposure characterization will be valuable for evaluating epidemiological studies. Detailed knowledge of personal exposures will be essential to develop risk assessment for the population at large.

Many studies have been conducted to obtain EMF exposure data, such as occupational field exposure studies, residential field exposure studies, school environmental field studies, transportation environmental field studies, and some personal exposure field studies (mostly connected with epidemiological studies). However, much less information is available on personal field exposure than environmental fields. No systematic study of personal field exposure has been conducted and it is difficult to integrate personal field exposure data obtained through epidemiological studies. It is necessary to develop exposure data on a large population sample using a consistent protocol, including as many different types of people as required for statistical representation, and using as many exposure metrics as feasible and practical.

The goal of Phase I was to obtain the information necessary for the planning of an extensive personal exposure survey. To achieve this goal, Phase I included two separate tasks: (1) a pilot survey of personal magnetic field exposure on a sample of 200 randomly chosen adult individuals in the United States (“200-person statistical sample”), and (2) the development and testing of the protocol for Phase II including selection of instrumentation and exposure metrics, assessment of methods of recruitment of the participants to the survey, and assessment of cost and quality of the data that would be obtained using various protocols.

The results of Phase I included recommendations for Phase II. These recommendations were the results of the analysis of the results of the pilot survey, the experience gained in conducting the survey, and the work performed to develop the protocol.

1.3 Recommendations for Phase II

During Phase I different sampling strategies and survey methods were investigated and compared. It was found that the choice of the most cost effective method is a function of the number of persons that would be included in the survey. The number of persons to be surveyed was fixed at 1000. This choice was dictated by the financial and time limitations of the RAPID engineering projects. These 1000 persons should be a random sample of the United States population and should include infants, toddlers, school age children, and adults of any age. For this number of people to be surveyed, it was determined that the best sampling strategy is a list assisted random digit dialing, with recruitment of the participants by phone. It was also found that the most cost effective survey method consists of mailing an exposure meter to the participants for a 24-hour exposure measurement period and of having the participant return the meter also by mail. The exposure meter needed to be small, easy to wear, simple to use, and capable of measuring and recording all the statistical quantities related to a time series of r.m.s. magnetic field values.