

Introduction

Hatfield & Dawson is a Washington State consulting engineering firm with a practice limited to telecommunications and electromagnetic engineering. The firm has been in operation since 1973 and is the successor to the practice of J. B. Hatfield (Sr.) Dating from 1945.

The principals and associates of the firm have extensive experience in all aspects of these specialized fields. We do design work, government agency and license application engineering, and preparation of specifications.

We also preform construction supervision, propagation analysis, measurements, testing, and operation review of :

- Communications and Radio Systems for FM and AM Broadcast
- Microwave, cellular, PCS and Paging
- UHF and VHF Television Systems
- Interference and Electromagnetic Compatibility Issues
- Non-Ionizing Electromagnetic Radiation (NIER) Issues
- Electromagnetic Engineering & Analysis

H&D has a long history of innovative use of computational electromagnetic techniques for the design, analysis, testing and implementation of antenna systems. Our experience in medium wave antennas is unequaled. The same analysis methods are applicable to longwave and HF antennas. We have a record of successful work with both conventional and unusual antennas at frequencies to the Ghz region. The firm makes extensive use of computer technology to access allocation databases and digitized terrain data, for CAD-system design, and automated propagation studies.

Our clients include private broadcasting companies, telecommunications common carriers, industrial communications users, educational institutions, cable television systems, cities, counties, states and agencies of the United States and foreign governments.

The firm maintains a fully equipped laboratory, and its library, containing more than 1500 volumes, is one of the most complete private collections of telecommunications related material in the United States. In addition, we maintain a full complement of specialized measurement equipment with calibration traceable to National Bureau of Standards.

Non-Ionizing Electromagnetic Radiation (NIER) Matters

Mounting public concern over the potential health effects of exposure to electromagnetic fields from sources ranging from communications installations to power transmission lines and ordinary office equipment has prompted numerous clients to engage our services in the measurement and analysis of these fields. Our experience bears out the unique capability of H&D to perform environmental assessments of this type for clients of all sizes, from the US Navy to individual homeowners.

H&D has provided education, expert testimony, analysis, predictions, calculations and measurements on electromagnetic fields for all types of radio telecommunications users. These services have been to quantify hazards and alleviate concerns about electromagnetic fields and fulfill the requirements of various government regulations.

H&D is the logical choice for these investigations due to our established reputation in the field of

environmental assessments of electromagnetic fields. The principals of H&D are active in the establishment of electromagnetic exposure and measurement criteria, and in the establishment of standards for the reduction of radio frequency interference (RFI).

Benjamin F. Dawson has been the chairman of the Rules and Standard Committee of the Association of Federal Communications Consulting Engineers. He also has been a technical representative to the United Nations International Telecommunications Union's agency ITU-R study groups, responsible for evaluating the international technical standards for broadcasting and intersystem electromagnetic compatibility.

Mr. Hatfield serves on IEEE Standards Coordinating Committee SCC28, Non-Ionizing Radiation and its subcommittees SC-1, SC-2, SC-4 and SC-5 of SCC28 charged with revision of **IEEE C95.1-1999 Edition, "Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz"**, is current chair of the C95.1-1999 Interpretations Working Group of SC4, , and a member of the SC4 Engineering Working Group RFR Literature Review.

Electromagnetic Compatibility and Interference Mitigation

H&D has extensive experience in the analysis, identification, and mitigation of interference to communications facilities, consumer electronics, and industrial equipment caused by both intentional and unintentional radiators of electromagnetic energy. Our experience includes solving problems involving systems operating at vastly different power levels that exist at communications sites. Our approach to the analysis and prevention of potential interference at multi-user

communications sites is based on our unique experience with both high power broadcast and land mobile engineering matters.

An analysis of interference from intermodulation products at any communications site must account for the actual characteristics of the transmitting and receiving equipment in use at the site under study. An intermodulation study is a “two-step” process: The first step defines all the mix products that are mathematically possible, based on all the combinations of transmitting frequencies that produce mix products at or near the frequencies of the receivers being analyzed; the second step is an analysis of the likelihood of the actual occurrence of any of these predicted products, based on the actual equipment in use and the configuration of the site or sites involved. Virtually every type of intermodulation problem can be solved by appropriate equipment reconfiguration.

Land Mobile and Broadcast Planning and Implementation

H&D provides frequency planning and selection, propagation analysis and measurement, and facility commissioning and performance verification for both land mobile and broadcast systems. Our experience ranges from underground tunnels to mountaintop transmitting complexes, from campuses to entire regions, and from milliwatts to Megawatts.

Medium Wave (“AM”) Antenna Analysis for Potential Re-radiation Effects

H&D’s engineers are among the world’s most experienced and knowledgeable in the design and analysis of medium wave antenna systems. The firm’s principal engineers have pioneered the use of modern computational analysis methods for the design and implementation of medium wave

antenna systems. Among the many features of this type of analysis is its applicability to situations where there is potential re-radiation from nearby structures, including other communications towers. The FCC rules for cellular telephone base station have requirements for this type of analysis with respect to construction of new towers near AM antennas.

Many land mobile and common carrier technical personnel are unfamiliar with the requirements for field intensity and antenna impedance measurements as outlined in the FCC Rules. As a result they may deliberately avoid choosing sites that are close to AM antennas. This unnecessary restriction on site location is an impediment to good land mobile and cellular system design. H&D maintains a complete current database of all AM antenna facilities so that quick calculations of the distance from a proposed new land mobile or cellular antenna structure can be made to determine if the FCC restrictions apply.

H&D has helped in the co-location of cellular, PCS and ESMR type equipment on AM towers. The problems generally associated with this type of co-location can be avoided with the correct understanding of the process and good project management. This is an option for site location if the proper procedures are taken to protect both the AM station and the cellular provider.

PROFILE

HATFIELD & DAWSON **Consulting Electrical Engineers**

*Specializing in
Telecommunications and
Electromagnetic Engineering*

James B. Hatfield, PE
Benjamin F. Dawson, PE
Thomas M. Eckels, PE
Stephen S. Lockwood, PE
David J. Pinion, PE

Paul W. Leonard, PE
Erik C. Swanson, EIT
Thomas S. Gorton, PE

Hatfield & Dawson
9500 Greenwood Avenue North
Seattle, WA 98103

Telephone: (206) 783-9151
Facsimile: (206) 789-9834
E-mail: hatdaw@hatdaw.com