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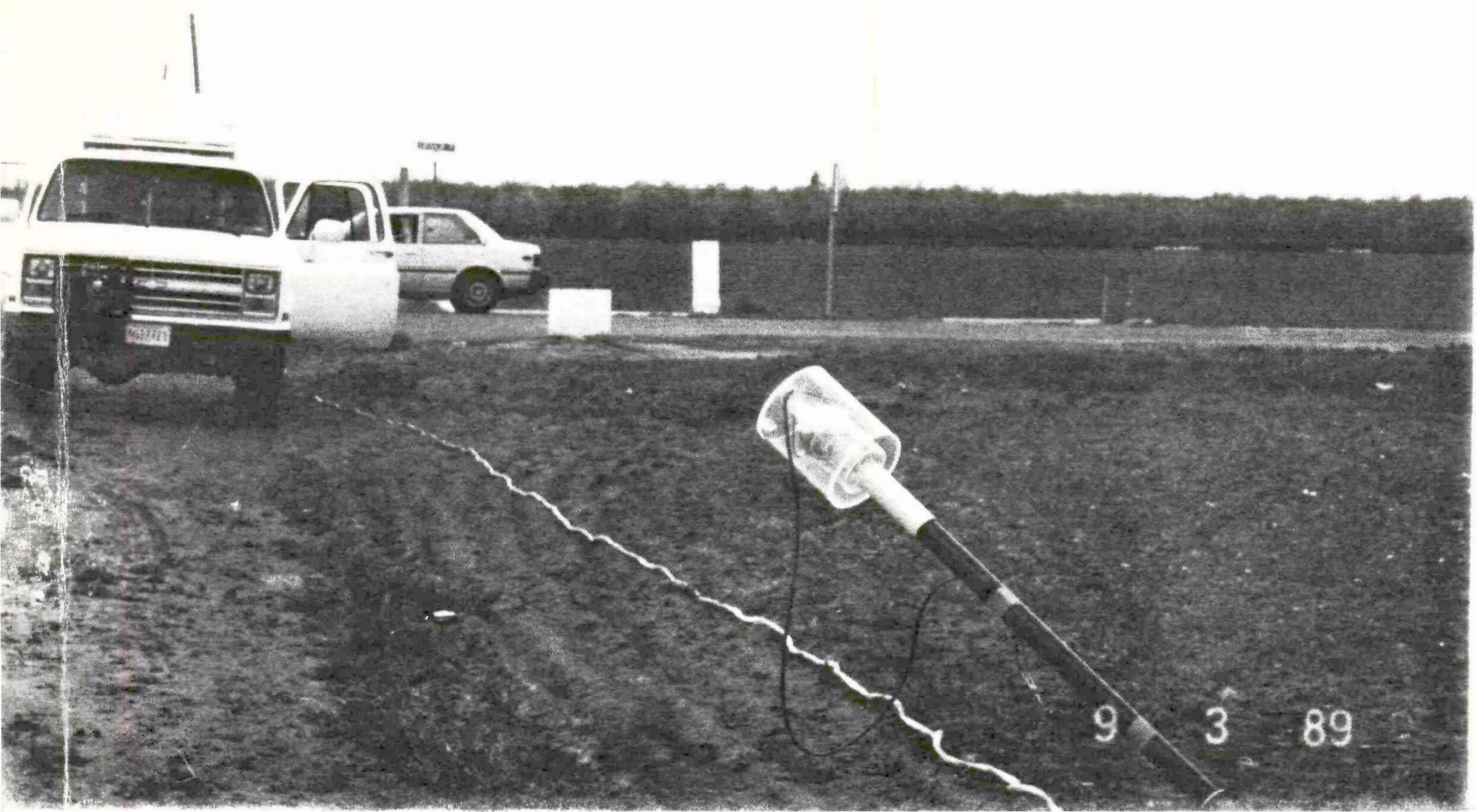
Radiofrequency Radiation Survey in the McFarland, California Area



RADIOFREQUENCY RADIATION SURVEY IN THE McFARLAND, CALIFORNIA AREA

NOVEMBER 1989

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ABSTRACT

During March 6-16, 1989, the U.S. Environmental Protection Agency's (EPA) Office of Radiation Programs measured electromagnetic fields from radiofrequency (RF) radiation sources in the McFarland, California area. The measurements were made at the request of the State of California's Department of Health Services which is investigating a childhood cancer cluster in McFarland. The State asked EPA to conduct this study as part of its investigation of all exposures to potentially harmful physical and chemical agents. There was concern about exposures from a major Voice of America (VOA) shortwave radio facility in nearby Delano.

Examination of EPA's measurements shows that the source of the strongest fields in the McFarland area is UHF television transmission. The ranges of field values measured at six locations in McFarland are:

Source	Power Density (nW/cm^2)*
UHF Television Broadcast	3-19
Standard AM Radio Broadcast	2-8
VOA Shortwave Broadcast	0.2-1.3
FM Radio Broadcast	0.001-0.006
VHF Television Broadcast	none detected

*nanowatts per square centimeter

The median exposure level due to VHF, FM, and UHF broadcast radiation in U.S. urban areas was determined in the late 1970's to be 5 nW/cm^2. About 20% of the U.S. population was exposed to greater than 20 nW/cm^2 [1]. For comparison, the exposure limit recommended by the National Council on Radiation Protection and Measurements is greater than or equal to 200,000 nW/cm^2 and depends on frequency [2]. Measurements were also made along the boundary of the VOA facility, located about six miles from McFarland. The highest off-site field value measured in the survey was along this boundary (30,000 nW/cm^2). Mobile radio base stations were not included in the McFarland study chiefly because of their intermittent operation and low power.

In addition to data on measured fields and their variation over time, data were also collected on amplitude modulation and VOA antenna radiation patterns. The results of the field survey were compared with results of numerical computer models that were used to predict the RF field levels due to the VOA transmitters in Delano. A retrospective analysis using these models for a sample of previously scheduled operations at VOA resulted in calculated fields in McFarland which are not significantly different from the fields measured. EPA uses predictive models to assess exposure to different sources of RF radiation. By providing data to verify the model for an untested shortwave radio source, this study provided an opportunity for EPA to expand and improve its capabilities for environmental radiation exposure assessment.

FIGURES

TABLES

1. INTRODUCTION

The U.S. Environmental Protection Agency's (EPA) Office of Radiation Programs has measured electromagnetic fields from radiofrequency (RF) radiation sources in the McFarland, California area. The main objective of this study was to determine the RF fields to which the residents of McFarland, California are exposed. The study was part of a larger State investigation into a childhood cancer cluster found in McFarland. A second objective was to learn more about RF exposures near shortwave radio transmission systems in general.

The Epidemiological Studies Section of California's Department of Health Services (DHS) is conducting a study in an attempt to identify causes of the cancer cluster. The DHS asked EPA to conduct this RF study as part of its investigation of all exposures to potentially harmful physical and chemical agents. The DHS study was undertaken in response to a Kern County Board of Supervisors request for assistance in 1985.

Because of the proximity of the Voice of America (VOA) shortwave radio broadcast facility in nearby Delano, there was a special concern about RF exposure in McFarland due to VOA. Dr. Kenneth H. Kizer, Director of California's Department of Health Services, requested that EPA measure the electric and magnetic fields in McFarland that result from operation of the VOA facility. In his May 23, 1988, response to Dr. Kizer, Administrator Lee M. Thomas expressed his concern about the suggested link between electromagnetic fields and human cancer and agreed to provide assistance by measuring environmental electromagnetic fields.

In addition, there was historically little information on ground level fields near high power shortwave broadcast antennas. This situation led to discussion between EPA and VOA on how to obtain good estimates of the fields. When the State approached EPA, we considered the request an opportunity to fully investigate by theory and measurement fields near a shortwave broadcast system and resolve uncertainties in this specialized area.

The State had also asked the National Institute for Occupational Safety and Health (NIOSH) for measurement assistance. In May 1988, NIOSH made measurements at five locations surrounding and in McFarland. But relatively insensitive RF survey meters were used, and the fields were below the limits of detection of these instruments. These limits were 1300 nW/cm^2 for the electric field and 190,000 nW/cm^2 for the magnetic field [3].

To discuss these measurements and plan for any future measurements, the State formed an "Ad Hoc Advisory Committee on the Voice of America at McFarland" which met in August 1988. This committee included representatives of EPA and California and researchers in antenna theory and bioelectromagnetics. There was concern about the need to measure the magnetic field with more sensitive devices and the inability to theoretically confirm measurements which could only be specified as below the limit of detection of an instrument. Since VOA's operating schedule and equipment has changed over time, the only method of determining the fields that existed in the past is by calculation. Any model used for such calculations must be confirmed with measurements. Concern was also expressed about the variation over time and low-frequency amplitude modulation of the fields. EPA agreed to use numerical methods to model the antennas at VOA and apply these computer models to calculate ground level fields in McFarland. A measurement plan that contained the results of these numerical models would be submitted for review by the committee. Measurements were to be made at locations which would include the five sites selected by NIOSH. This plan was sent to California and VOA in January 1989; comments were received in February and measurements were made in March.

This study reports the results of measurements of RF field intensities resulting from operation of the VOA facility as well as other RF broadcast sources in the McFarland area. In addition, numerical modeling of the VOA broadcast antennas was done to estimate the value of both the electric and magnetic fields near ground. The models were confirmed and used in a retrospective analysis to calculate RF exposures during past operations at VOA. Measurements were also made to determine the highest exposure along the perimeter of the VOA facility. Quality control checks were made on the variation over time of measured fields and the amplitude modulation of the fields was examined.

Some of the measurements were made in coordination with VOA. VOA operated various transmitters and antennas to simulate normal scheduled operation for short periods while EPA made measurements. Examination of records of signal variations over time as in Section 6.1 showed no difference between these simulations and normal operations.

Appendix A describes the various units of measurement and physical quantities used in this study.

2. AREA DESCRIPTION

McFarland, California is a small agricultural community 25 miles north of Bakersfield and six (6) miles south of Delano on Highway 99 in the San Joaquin Valley. The area is dry and flat. The average annual precipitation is about six (6) inches per year, and the land elevation drops typically 20 feet per mile when moving to the northwest. Most of the land is used for agriculture. An overview showing McFarland and the VOA site is given in Figure 1.

The VOA Delano Relay Station (DRS) is located approximately 2.5 miles west of Delano about 6 miles north northwest of McFarland. The site occupies about 1.25 square miles. The DRS is an international shortwave broadcasting facility operating in the frequency range of 6 to 22 MHz. One 100 kilowatt (kW) and five 250 kW amplitude-modulated transmitters and two 50 kW independent sideband transmitters can be used to power a number of rhombic and curtain antenna systems at the DRS site. Dashed Lines extending from the antennas on Figures 1 and 2 indicate the possible directions of transmission. Transmissions to the northwest are intended to reflect off the ionosphere and reach southeast Asia. Transmissions to the southeast are directed toward the Caribbean and South America. Figure 3 shows an aerial schematic view of a typical rhombic antenna at the DRS. The antenna is constructed from horizontal wires in the form of a rhombus. These wires are supported by vertical towers. The transmitter is connected at one end and a load system is connected to the opposite end of the antenna. The antenna radiates toward the load at an angle of about 10 degrees above the horizon. The curtain antennas consist of arrays of horizontal wire dipole antennas in front of a vertical wire screen. The curtain antennas radiate in the direction from the screen and toward the dipoles. Four of the six rhombic antennas can be switched by reversing the transmitter and load connections to transmit to the southeast. Transmissions on these four rhombics to the southeast may be expected to cause higher fields in the McFarland area than other transmissions from the DRS. The older curtain antennas (A, B, and C on Figure 2) transmit only to the northwest. A new prototype steerable curtain antenna transmits generally to the east. This antenna may cause fields in McFarland comparable to those from the rhombics; however, it has only been put in service during planning for this study and was not been examined in detail.

There are several other broadcast transmitters that may generate fields in McFarland comparable to those from the DRS. A number of high power UHF television transmitters are located 30 to 40 miles to the southeast, and a 50 kilowatt (daytime) AM radio station is located about 9 miles southwest of McFarland. Also, several land-mobile base stations operate in the town. RF fields

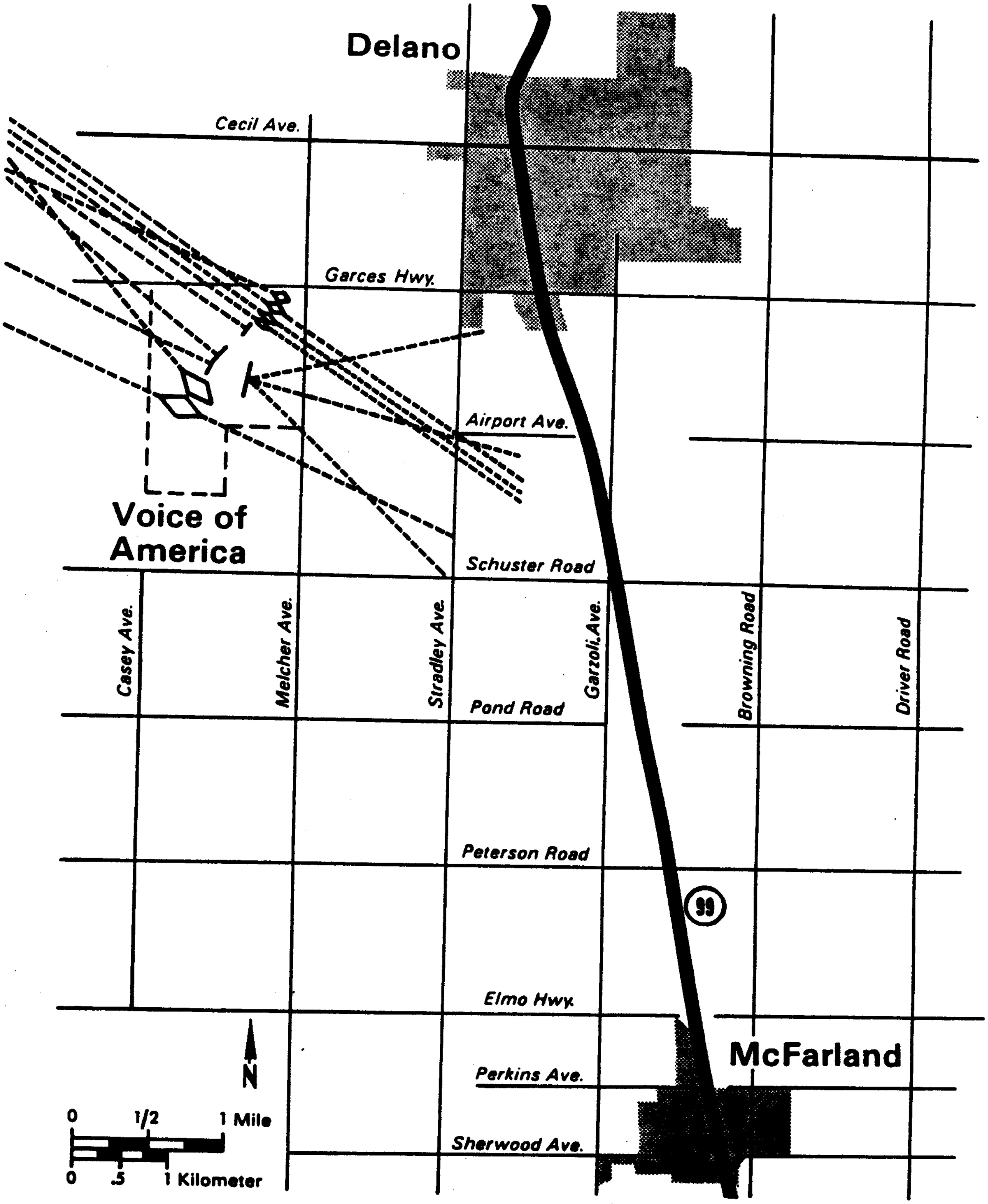


Figure 1. Area Overview. Dashed lines extending from antennas on the VOA site show directions of propagation.

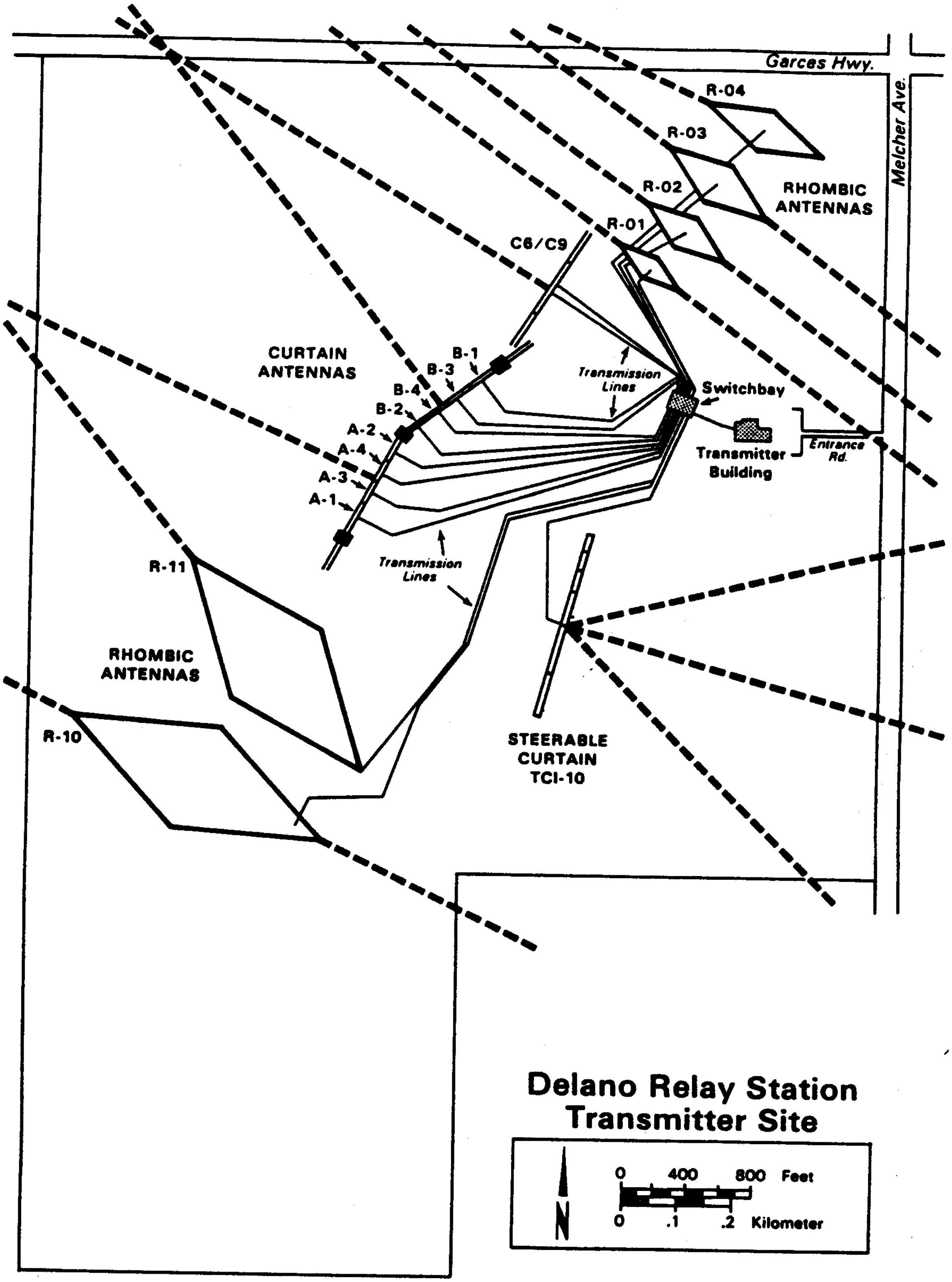


Figure 2. Delano Relay Station. Voice of America site west of Delano. Dashed lines extending from antennas indicate possible directions of propagation.

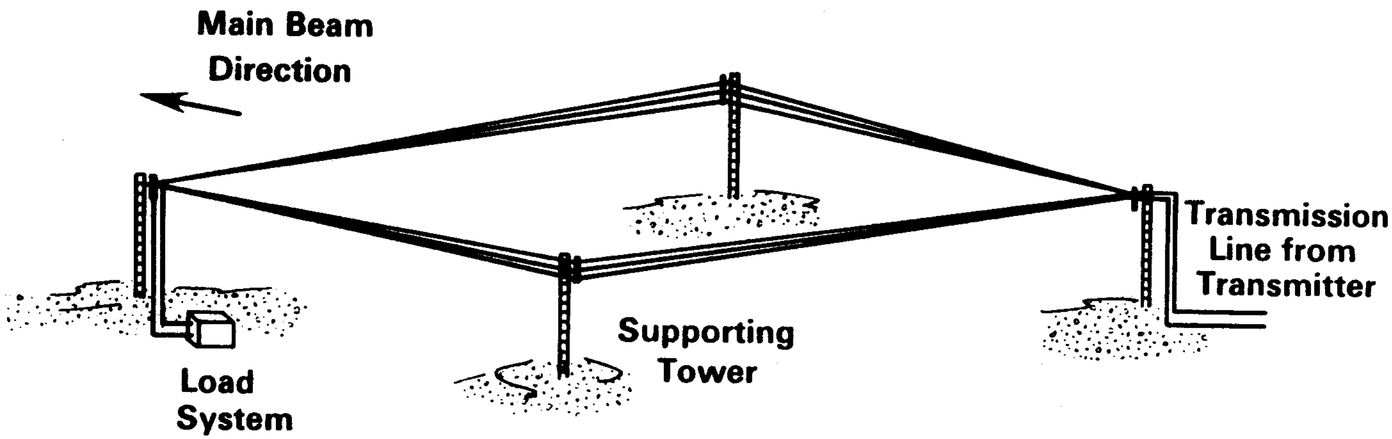


Figure 3. Typical Rhombic Antenna. The antenna is constructed from horizontal wires supported by towers. The main beam is directed about 10° above the horizon to reflect off of the ionosphere. For most of the rhombic antennas, the load and transmission line connections can be reversed in order to reverse the direction of the main beam.

from these base stations were not measured because of their intermittent operation and low power.

3. APPROACH

Both field measurements and theoretical models were used to determine environmental exposures from RF transmitting systems. Both methods were used to compensate for limits in each approach that constrain the usefulness and quality of either method alone. Measurements cannot be made at all locations and under all conditions of interest, and numerical calculations necessarily involve simplifying assumptions that influence the accuracy of the calculations to come unknown degree. Also. since measurements and numerical methods are independent, the agreement of the results of both approaches indicates that each is likely to be correct. A large disagreement between the two indicates some error in one method or the other. Therefore, our approach is to perform the measurements necessary to develop and validate numerical models, which can then be applied to a variety of situations. Measurements are more accurate at a specific location than calculations and may be necessary when calculated fields approach levels of regulatory concern; however, calculated fields may better reflect the average exposure over an area, while measurements at a single site only give the field at that point.

The antennas of primary interest in this study are the rhombic antennas at the DRS. This is because the older curtain antennas transmit only to the northwest, away from McFarland. The rhombic antennas have been modeled and the electric and magnetic fields due to their operation were calculated. Measurements made in the McFarland area were used to confirm the accuracy of these models.

4. McFARLAND COMMUNITY MEASUREMENTS

RF electric and magnetic fields were measured at six specific locations in McFarland. Fields generated by both routine television and radio broadcast and operation of the VOA transmitters at Delano were determined at each site. In addition, measurements of the vertical electric field pattern due to one of the VOA rhombic antennas were made continuously along a road to the west of McFarland which intersects the path of propagation between VOA and McFarland. This pattern measurement was made to validate the results generated by a computer model of the antenna.

4.1 MEASUREMENTS AT SPECIFIC SITES

4.1.1 Measurement Locations

RF field measurements were made at six sites as shown by large dots in Figure 4. Four of these locations were at road intersections that form a rectangle which encompasses McFarland. Two other sites were at the Kern and Browning schools. These locations correspond to sites where NIOSH previously surveyed, except that the Browning School site was added by EPA. Sites are referred to by the intersection or school.

4.1.2 Site and Measurement Codes

Individual measurements at a site are referred to by computer filename. The computer-generated graphs and tables for these measurements are given in Appendix D; the page number in Appendix D is given with each filename. The automated measurement system used to make these measurements is described in detail in Appendix C. Appendix C gives information on the theory of operation, system architecture, calibration and accuracy, and sensitivity of the system.

4.1.3 Measurement Modes

The measurement system can be operated in either of two modes. In <u>spectral</u> mode, the field is measured over a range of frequencies. Spectral results are presented as a graph with frequency along the horizontal axis and field strength along the vertical axis. In <u>discrete</u> mode, the field is measured only at a specified set of selected frequencies. Discrete results are printed in tabular form. Discrete measurements are more accurate and faster than spectral measurements, however, the frequencies of the signals to be measured must be known.

4.1.4 Spectral Screening

Spectral measurements were used to screen for the frequencies of RF sources which were the principal causes of exposure in the McFarland environment. These frequencies were then entered into the program that is used to operate the system in discrete mode. This screening process of using spectral measurements to set up the system in discrete mode required significant effort for the McFarland study. Once the system was configured for discrete measurements, data was obtained in this mode at each of the six measurement sites.

4.1.5 Screening Sites

All of the screening measurements could have been made at a single site taken as representative of the McFarland RF environment. However, these measurements were spread out over

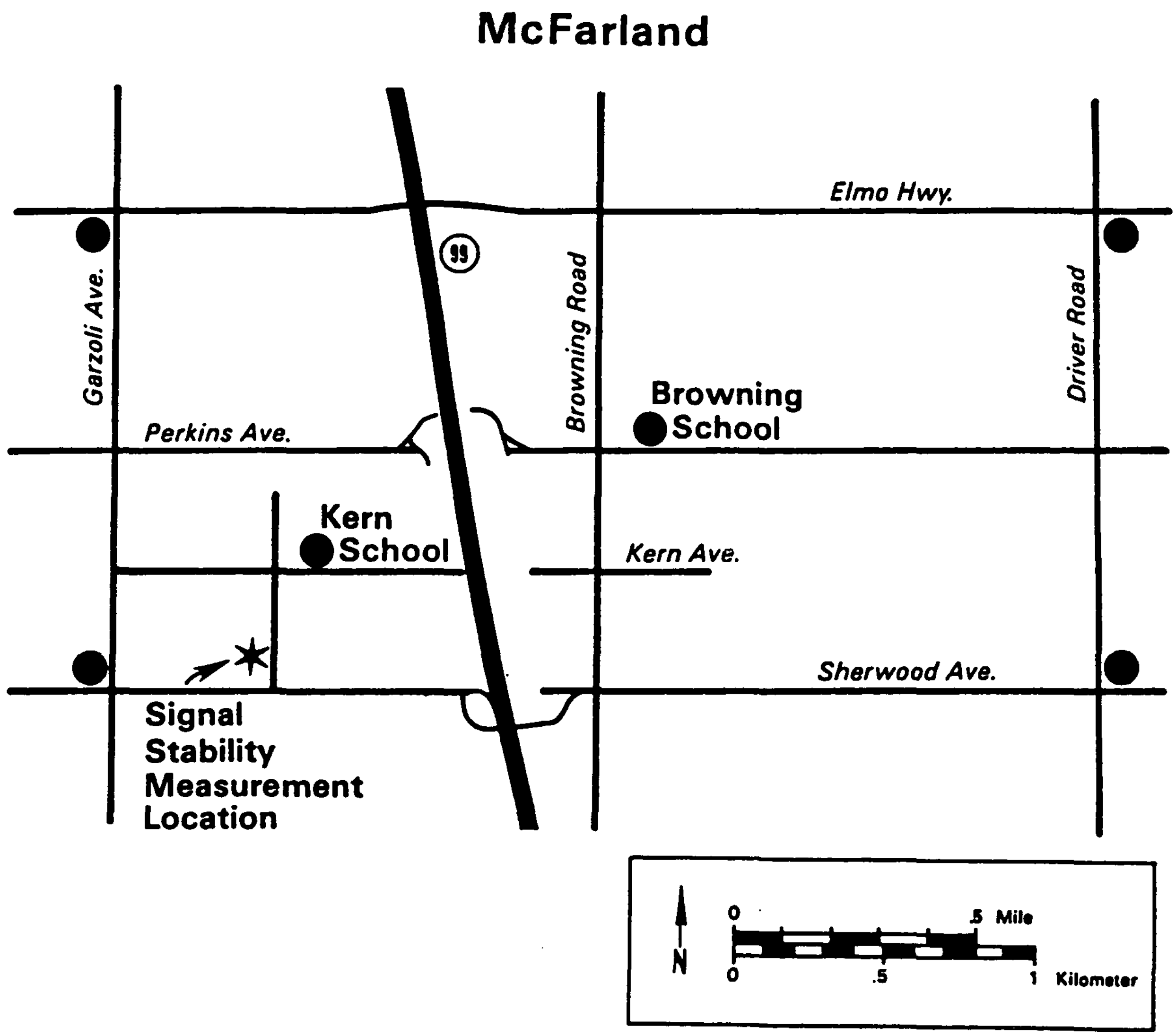


Figure 4. McFarland Measurement Sites. Measurement locations are shown as large dots. Signal variations over time were measured at the location shown by a star.

three sites to avoid overlooking a strong source that might be exhibiting a minimum field at a single site. Because of this, the screening measurements only partially overlap from site to site; i. e., screening measurements at each site are unique and the results are combined to decide which discrete measurements should be made at every site.

4.1.6 VOA Schedule

A copy of the VOA transmitter program schedule which was in effect during the measurements is given in Figure 5. The schedule shows three columns labeled UTC for Universal Time Coordinated on a 24 hour clock. For UTC 0000, local Pacific Standard Time was 4:00 p.m., UTC 0200 is 6:00 p.m., etc. The center three columns show the rhombic antennas operating to the southeast using transmitters DL 6, DL 7, and DL 8 at 250 kW each. In particular, rhombic R-03 operated normally at 11.74 MHz between 3:45 and 6:00 p.m. local time at a bearing of 126 degrees, and at 9.765 MHz between 6:00 and 8:15 p.m. Rhombic R-10 operated at 6.155 MHz between 6:00 to 8:15 p.m. and rhombic R-02 operated at 9.815 MHz between 3:45 and 6:30 p.m. The only other antenna operating to the southeast was the new steerable curtain TCI 10 using transmitter DL 4 (first column) at 9.465 MHz between 4:00 and 8:00 p.m. The last two columns show the 50 kW sideband transmitters DL 9 and DL 10 operating to the northwest, away from McFarland. As discussed previously, it is important to note that the rhombic antennas were operated for short periods at the scheduled power, frequencies, and bearings at other than scheduled times so that EPA would have sufficient time to make measurements.

4.1.7 Measurement Antenna Position

Some measurements were made with the receiving antenna mounted on above the measurement vehicle, while others were made with the antenna above ground and remote from the vehicle. RF electromagnetic waves at lower frequency and longer wavelengths can be strongly affected by the presence of the vehicle. Thus, fields due to regular AM, FM, and VOA broadcasts that are at lower frequencies were measured at a location 1 meter above the ground and at least 50 feet from the measurement vehicle. These measurements were made using a fiber-optically isolated antenna for the electric field and a loop antenna for the magnetic field as described in Appendix C. The biconical antenna which was used primarily for UHF-TV measurements was mounted approximately 1 meter above the vehicle. Because of the higher frequency and shorter wavelength, UHF fields are not strongly affected above the vehicle. In addition, in the tables in Appendix D that give the results of discrete measurements, the power received for the antenna axis oriented in three orthogonal directions x, y, and z is given; these directions correspond to east-west, north-south, and vertical respectively. At lower frequencies the principal

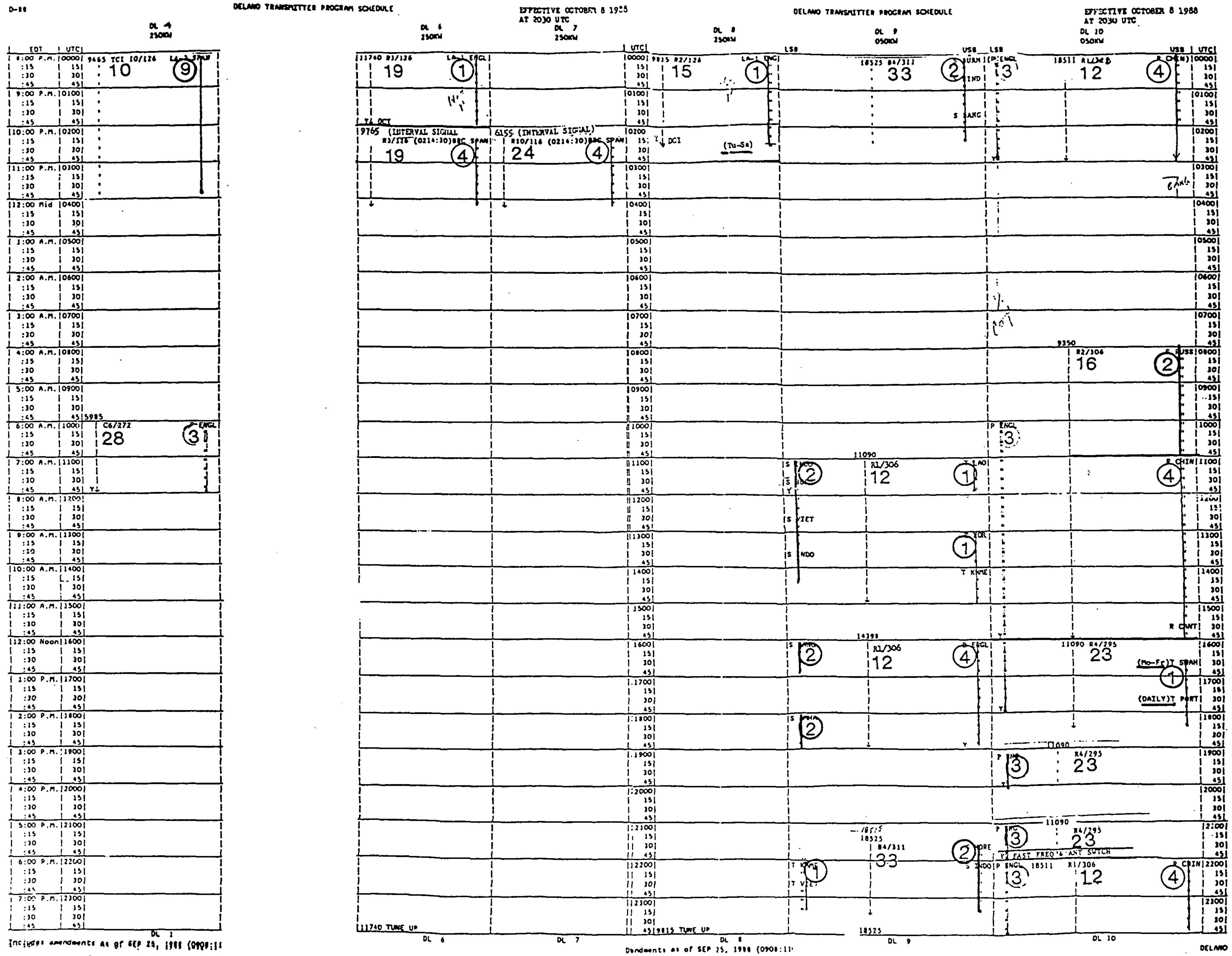


Figure 5. Delano Transmitter Program Schedule. This is a copy of the original VOA program schedule in effect while measurements were being made.

component of the electric field is generally vertical and the magnetic field is horizontal.

4.1.8 Screening Measurements Narrative

The following paragraphs document in narrative detail RF measurements made at specific or fixed locations in McFarland. File names for the spectral measurements begin with a "C" and are presented in Appendix D as plots; file names for the discrete measurements begin with "ZO" and are presented in the appendix as tables; the page number in the appendix is given with each file name, for example (p. D-13) indicates page number D-13 or the 13th page of Appendix D. Spectral screening measurements were began at the intersection of Garzoli and Sherwood at about 6:30 p.m. on March 6, 1989. The fiber-optic antenna was set up and preliminary measurements were made in the standard broadcast bands and at shortwave frequencies. File C06S42 (p. D-1) shows that FM band signals were weak, the total band exposure is only 0.006 nW/cm^2. Scans of the low and high VHF-TV bands are shown as files C06S48 (p. D-1) and C06T17 (p. D-2); any signals present were below the system sensitivity of about 0.00007 nW/cm^2 for these bands. Local residents said that there was no local VHF television coverage and channels from Los Angeles could only be received with high gain antennas. Many UHF-TV channels were observed to be on the air with the spectrum analyzer operated manually. One UHF-TV channel spectral measurement was made using the fiber-optic antenna at this location; the value for channel 26 was 1.8 nW/cm^2 (file C06T40, p. D-2). This fiber-optic antenna measurement was made at one meter above ground and is in good agreement with the biconical antenna discrete measurement made three days later with the antenna on top of the vehicle (file ZOCINV, p. D-3, 1.9 nW/cm^2 for channel 26). Measurements in the shortwave band between 6 and 26 MHz were recorded as files C06S59 (p. D-4) and C06T06 (p. D-4); the strongest signals in this band were on the VOA frequencies of 6.155 and 9.765 MHz; the exposure measured was 0.25 nW/cm^2. These signals were due to operation of two rhombic antennas at VOA. It is important to note that no comparable signal was seen due to operation of the new steerable curtain antenna at VOA at 9.465 MHz. At the time of this measurement, the curtain antenna was in operation to the southeast toward McFarland according to the VOA schedule.

Spectral screening measurements were continued and data was collected in order to set up the discrete measurements program for the next two days at the intersection of Driver and Elmo. On the afternoon of March 7, the biconical antenna was set up on top of the vehicle for spectral measurements at frequencies between 490 MHz and 18 GHz (18000 MHz). The first spectrum was taken between 490 and 1000 MHz (file C07059, p. D-5); a series of UHF-TV signals was seen between 490 and 750 MHz, weaker land mobile signals were observed above 850 MHz. A detailed look at the cellular telephone band between 855.5 and 866.5 MHz (file C07P11,

p. D-5) resulted in a total average exposure of only 0.00051 nW/cm^2. A wide range spectral measurement from 2 to 18 GHz showed no signal above the sensitivity limit (file C07P25, p. D-6). A scan from 1 to 2 GHz revealed two digital radio signals at 1.09 and 1.125 GHz (file C07P59, p. D-6); a detailed examination of these two signals showed peak fields of 0.004 and 0.033 nW/cm^2 respectively (file C07Q18 and C07Q37, p. D-7). At this time, it was apparent that the only important measurement to be made at all sites using the biconical antenna would be at UHF television frequencies. The discrete measurement program was set up to measure all the UHF-TV stations which could be easily detected. The first discrete measurement (file ZOCGSE, p. D-8) was made with the x direction north-south and y east-west which is reversed from the standard orientation defined earlier. The total exposure at this location due to the UHF-TV stations was 2.6 nW/cm^2.

Measurements were continued at the intersection of Driver and Elmo on March 8 by setting up the loop antenna one meter above ground. The loop antenna detects the magnetic field over a frequency range of 0.15 to 32 MHz. This range is divided into eight (8) overlapping frequency bands, requiring eight separate spectral program measurements to cover the entire range; the results are given in Table 1. The dominant signals were due to three local AM radio stations at 1.01 MHz in band 3, and at 1.18, and 1.59 MHz in band 4 and two VOA signals at 9.815 and 11.74 MHz which were on the air when the band 7 measurement was made. Based on this information the discrete program was set up for loop measurements at these three AM frequencies and at the four frequencies at which VOA operated rhombic antennas to the southeast (6.155, 9.765, 9.815, and 11.740 MHz). The discrete program output for the three AM stations are given as files ZOCHRi and ZOCHRl (p. D-9); the total was 3.6 nW/cm^2.

TABLE 1. MAGNETIC FIELD DATA AT THE INTERSECTION OF DRIVER AND ELMO

Band	Frequency Range (MHz)	Equivalent Power Density (nW/cm^2)	File Name
1	0.150-0.305	0.000041	C08Q46 (p. D-10)
2	0.290-0.590	0.014	C08Q55 (p. D-10)
3	0.560-1.150	0.082	C08P05 (p. D-11)
4	1.1-2.3	3.1	C08P36 (p. D-11)
5	2.1-4.3	0.000052	C08R03 (p. D-12)
6	4.1-8.4	0.00083	C08P59 (p. D-12)
7	8.0-16.5	0.087	C08Q21 (p. D-13)
8	15.5-32.0	0.0019	C08Q39 (p. D-13)

The fiber-optic antenna was set up at Driver and Elmo for scanning from 10 kHz to 500 MHz. Manual scans throughout this frequency range with the fiber-optic and with an uncalibrated whip antenna revealed no significant signals other than those already discussed. A spectral measurement was made with the fiber-optic antenna for the FM broadcast band (file C08T12, p. D-14) and gave a total for the band of 0.0029 nW/cm^2. Even though FM band exposures were much less than for other bands, routine measurements were made at every site for the FM band using the spectral program for comparison purposes. A spectral measurement was made from 6 to 12 MHz (file C08T20, p. D-14), three VOA signals due to rhombic antennas were seen at 6.155, 9.765, and 11.74 MHz; the total band exposure was 0.056 nW/cm^2. Again, no strong signal due to the steerable curtain antenna at VOA was seen at 9.465 MHz. Finally, a spectral measurement was made with the fiber-optic antenna at frequencies below the AM band in the frequency range of 10 kHz to 540 kHz at the intersection of Driver and Sherwood (file C09U18, p. D-15); this spectrum showed only weak fields from distant sources.

4.1.9 Routine Measurements

Based on the previous measurements, the following routine measurements were made at every site. A manual scan using the fiber-optic and biconical antennas was made throughout the RF spectrum to determine if any strong signals were present which would not be measured in the routine. The discrete program was used to measure electric fields due to 16 UHF television audio and video signals. Electric and magnetic fields due to 3 AM radio stations were measured in discrete mode during the day while the stations operated at maximum power. Electric and magnetic fields were measured in discrete mode at 4 VOA frequencies either during regularly scheduled programming or in coordination with VOA. A spectral measurement of the electric field was made in the FM broadcast band. Table 2 summarizes the results at the six sites. Total equivalent power densities are given for the regular broadcast bands and the VOA values are shown for each frequency.

TABLE 2. MEASURED EXPOSURES IN MCFARLAND

Site	Source, Field	Equivalent Power Density (nW/cm^2)	File Name
Garzoli & Elmo	UHF-TV, electric	19.2	ZOCIOI(p. D-16)
	Standard AM, magnetic	5.60	ZOCJNk;ZOCJNn (p. D-17)
	Standard AM, electric	2.65	ZOCJLr(p. D-17)
	VOA 6.155 MHz, magnetic	1.00	ZOCJNL(p. D-18)
	VOA 6.155 MHz, electric	1.09	ZOCJME(p. D-18)
	VOA 9.765 MHz, magnetic	0.21	ZOCJNa(p. D-18)
	VOA 9.765 MHz, electric	0.10	ZOCJMg(p. D-19)
	VOA 9.815 MHz, magnetic	0.050	ZOCJNT(p. D-19)
	VOA 9.815 MHz, electric	0.021	ZOCJME(p. D-18)
	VOA 11.74 MHz, magnetic	0.071	ZOCJNT(p. D-19)
	VOA 11.74 MHz, electric	0.045	ZOCJME(p. D-18)
	FM band, electric	0.0041	C10L28(p. D-19)
Garzoli & Sherwood	UHF-TV, electric	13.0	ZOCINV(p. D-3)
	Standard AM, magnetic	7.50	ZOCJPQ;ZOCJPS (p. D-20)
	Standard AM, electric	2.99	ZOCJOb(p. D-20)
	VOA 6.155 MHz, magnetic	0.46	ZOCJ09(p. D-21)
	VOA 6.155 MHz, electric	0.19	ZOCJOe(p. D-21)
	VOA 9.765 MHz, magnetic	0.081	ZOCJPL(p. D-21)
	VOA 9.765 MHz, electric	0.051	ZOCJOx(p. D-22)
	VOA 9.815 MHz, magnetic	0.080	ZOCJPD(p. D-22)
	VOA 9.815 MHz, electric	0.043	ZOCJOe(p. D-21)
	VOA 11.74 MHz, magnetic	0.0011	ZOCJPD(p. D-22)
	VOA 11.74 MHz, electric	0.00065	ZOCJOe(p. D-21)
	FM band, electric	0.0064	C06S42(p. D-22)
Driver & Elmo	UHF-TV, electric	2.63	ZOCGSE(p. D-8)
	Standard AM, magnetic	3.55	ZOCHRi;ZOCHRl (p. D-9)
	Standard AM, electric	1.91	ZOCKOu(p. D-23)
	VOA 6.155 MHz, magnetic	0.13	ZOCKPC(p. D-23)
	VOA 6.155 MHz, electric	0.072	ZOCKOy(p. D-23)
	VOA 9.765 MHz, magnetic	0.064	ZOCKPK(p. D-24)
	VOA 9.765 MHz, electric	0.042	ZOCK07(p. D-24)
	VOA 9.815 MHz, magnetic	0.083	ZOCKPH(p. D-24)
	VOA 9.815 MHz, electric	0.049	ZOCKOy(p. D-23)
	VOA 11.74 MHz, magnetic	0.038	ZOCKPH(p. D-24)
	VOA 11.74 MHz, electric	0.023	ZOCKOy(p. D-23)
	FM band, electric	0.0014	C11041(p. D-25)

(table continued on next page)

TABLE 2. (continued)

Site	Source, Field	Equivalent Power Density (nW/cm^2)	File Name
Driver & Sherwood	UHF-TV, electric	18.9	ZOCIPq(p. D-26)
	Standard AM, magnetic	no day measurement	
	Standard AM, electric	2.48	ZOCIQS(p. D-27)
	VOA 6.155 MHz, magnetic	0.53	ZOCITu(p. D-27)
	VOA 6.155 MHz, electric	0.32	ZOCITj(p. D-27)
	VOA 9.765 MHz, magnetic	0.0075	ZOCITy(p. D-28)
	VOA 9.765 MHz, electric	0.0032	ZOCITj(p. D-27)
	VOA 9.815 MHz, magnetic	0.073	ZOCIQx(p. D-28)
	VOA 9.815 MHz, electric	0.026	ZOCIQS(p. D-27)
	VOA 11.74 MHz, magnetic	0.012	ZOCIQx(p. D-28)
	VOA 11.74 MHz, electric	0.0044	ZOCIQS(p. D-27)
	FM band, electric	0.0034	C09U11(p. D-28)
Kern School	UHF-TV, electric	3.04	ZOCINw(p. D-29)
	Standard AM, magnetic	5.59	ZOCJQ9;ZOCJRB (p. D-30)
	Standard AM, electric	2.63	ZOCJQt(p. D-30)
	VOA 6.155 MHz, magnetic	0.81	ZOCJSv(p. D-31)
	VOA 6.155 MHz, electric	0.54	ZOCJS6(p. D-31)
	VOA 9.765 MHz, magnetic	0.15	ZOCJSq(p. D-31)
	VOA 9.765 MHz, electric	0.049	ZOCJS6(p. D-31)
	VOA 9.815 MHz, magnetic	0.046	ZOCJRD(p. D-32)
	VOA 9.815 MHz, electric	0.016	ZOCJRI(p. D-32)
	VOA 11.74 MHz, magnetic	0.069	ZOCJRD(p. D-32)
	VOA 11.74 MHz, electric	0.059	ZOCJRI(p. D-32)
	FM band, electric	0.0021	C10Q40(p. D-32)
Browning School	UHF-TV, electric	8.64	ZOCIPF(p. D-33)
	Standard AM, magnetic	6.20	ZOCKOK;ZOCKOL (p. D-34)
	Standard AM, electric	3.19	ZOCKNn(p. D-34)
	VOA 6.155 MHz, magnetic	0.25	ZOCKN2(p. D-35)
	VOA 6.155 MHz, electric	0.19	ZOCKNr(p. D-35)
	VOA 9.765 MHz, magnetic	0.016	ZOCKOH(p. D-35)
	VOA 9.765 MHz, electric	0.0066	ZOCKNx(p. D-36)
	VOA 9.815 MHz, magnetic	0.027	ZOCKN9(p. D-36)
	VOA 9.815 MHz, electric	0.013	ZOCKNr(p. D-35)
	VOA 11.74 MHz, magnetic	0.073	ZOCKN9(p. D-36)
	VOA 11.74 MHz, electric	0.058	ZOCKNr(p. D-35)
	FM band, electric	0.0035	C11N35(p. D-36)

4.1.10 Conclusions

From this data, it is apparent that during measurements the strongest fields in McFarland were due to UHF television transmissions. The only television coverage in the area is via

UHF television, no VHF-TV stations are used to cover McFarland. The field strengths due to the UHF-TV stations are not unusual, and correspond to values adequate for good television reception. A single high power AM radio station is the principal source of fields in the AM standard broadcast band. Simple theoretical calculations show that the field strengths due to the UHF stations and the AM station are reasonable. FM radio broadcast fields are weaker than is typical of most urban areas, where the dominant exposure is usually due to FM radio.

The strongest signals in the shortwave band (3 to 30 MHz) in McFarland were due to operation of the VOA rhombic antennas to the southeast toward McFarland. However, these fields were weaker than those due to UHF-TV and AM radio. In units of equivalent power density, the magnetic fields were generally greater than the electric fields, especially at locations where the fields were weaker. This observation as well as the absolute values of the measured field strengths are consistent with the theoretical predictions in the last section of this report. Also, no significant field was seen due to operation of the steerable curtain antenna at VOA to the southeast.

4.2 VOICE OF AMERICA ANTENNA PATTERN MEASUREMENT

Measurements at a few fixed sites are not adequate to validate or critique the numerical antenna models developed for this study and presented in the final section of this report. Local perturbation of the fields by buildings, power lines, and other structures can strongly affect the field value at any point. Also, fields measured due to VOA oscillated or faded at times possibly due to ionospheric propagation. This fading is documented in the section on signal stability and amplitude modulation. Evaluating and extending the antenna models requires measurements of a stable signal made at many locations across a significant portion of the antenna pattern. Garzoli Road conveniently crosses the path of propagation between VOA and McFarland so measurements along this road give a conservative estimate of the fields in McFarland. For these reasons, measurements of the vertical electric field due to rhombic antenna R-10 operating at 6.155 MHz were made at approximately 600 distance intervals for five miles along Garzoli road from the intersection of Pond to the intersection of Whistler. These measurements are compared to the results of the numerical model for rhombic R-10.

4.2.1 Equipment

The equipment configuration for this measurement is shown in Figure 6. The antenna was mounted on top of the measurement vehicle. This antenna consists of a nine foot vertical rod, a matching transformer, and a ground plate. The antenna calibration data supplied by the manufacturer cannot be reliably

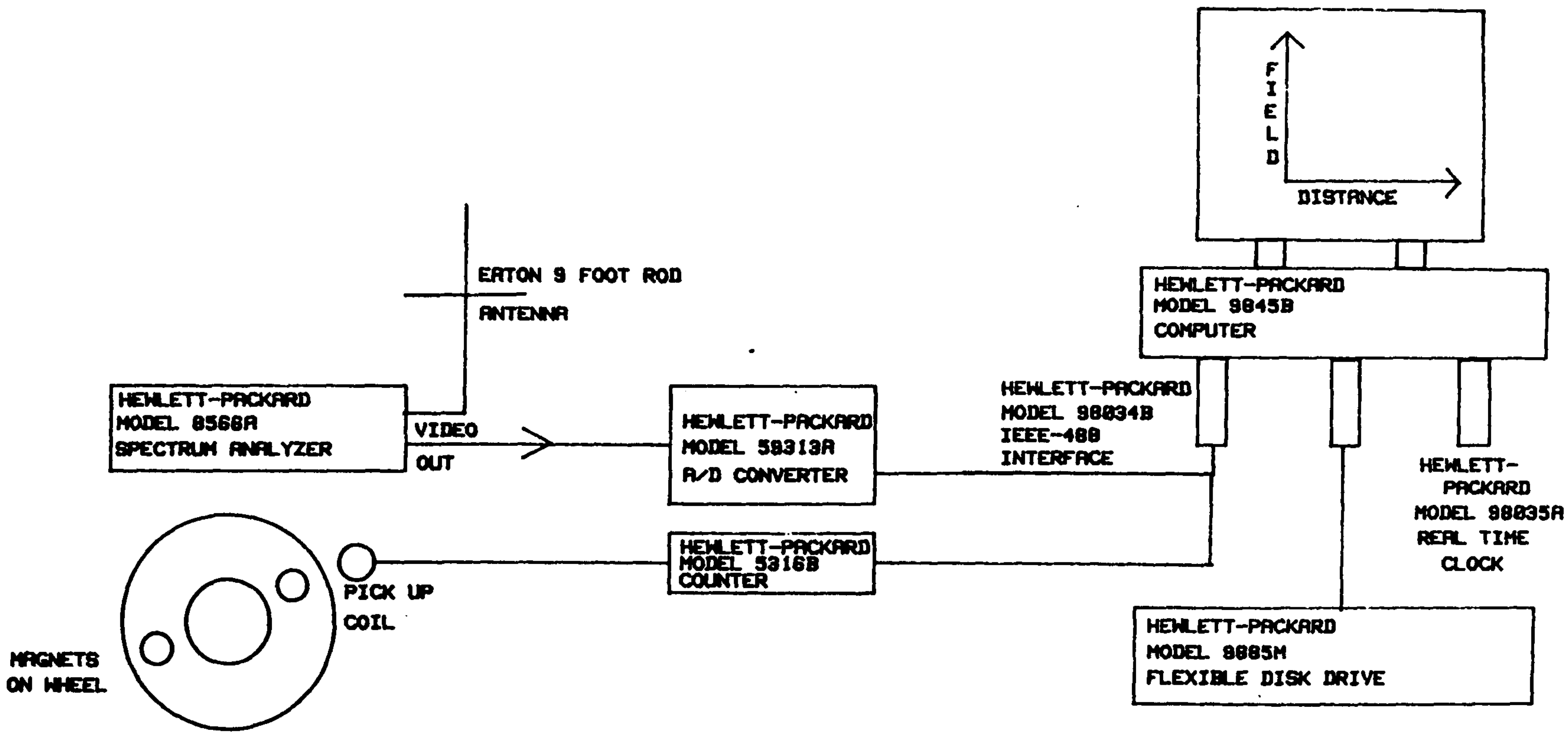


Figure 6. Narrowband Continuous Measurement System. This system allows for measurements at closely spaced intervals of distance.

used with the antenna raised above ground. So, a comparison to the fiber-optic measurement at Garzoli and Sherwood at one meter above ground was used to estimate an effective antenna calibration factor for the antenna and vehicle considered as a system. One assumption here is that the field does not vary with height near ground. The antenna model gives a field which decreases with height by about 0.5% per meter from 0 to 4 meters above ground; probing with a short experimental dipole showed no significant variation up to 3 meters.

The spectrum analyzer was tuned to the single frequency of 6.155 MHz (zero span). The resolution bandwidth was set to 1 kHz and the video bandwidth was set to 3 Hz. The distance traveled is proportional to the number of pulses generated by magnets on the vehicle wheel passing by a pick up coil mounted under the vehicle. The spectrum analyzer output and pulse count are sampled and processed by the computer to display field strength versus distance. Since the vehicle speed varies the and the sampling rate is constant, the distance between samples varies accordingly. The average distance interval was 13.4 meters.

4.2.2 Results

The results of this measurement are shown in Figure 7. The agreement between the measurements and the predicted electric field (bold line) is good considering the number of approximations which have to be made for the model. The roughness of the measurement data shows the amount of local field perturbation in an area where relatively few structures exist. The plot horizontal scale is shown in miles because the road intersections are at even one mile increments; mile two (2) is at the intersection of Garzoli and Elmo and mile three (3) is at the intersection of Garzoli and Sherwood. The three lobes measured are the three strongest side lobes to the south of the main beam. For this measurement the distance from the antenna is increasing while sweeping across the pattern so the pattern differs from the fixed distance calculation made before.

5. MEASUREMENTS NEAR THE PERIMETER OF THE VOICE OF AMERICA SITE

In an effort to find the maximum RF field strength along the VOA property boundary, a vehicle-mounted, continuous, broadband electric field monitoring system was driven along accessible areas of the site boundary. At one location where a relatively high electric field was found, narrowband electric and magnetic field measurements were made. Also, the amount of RF current induced in a person due to the field at this location was measured.

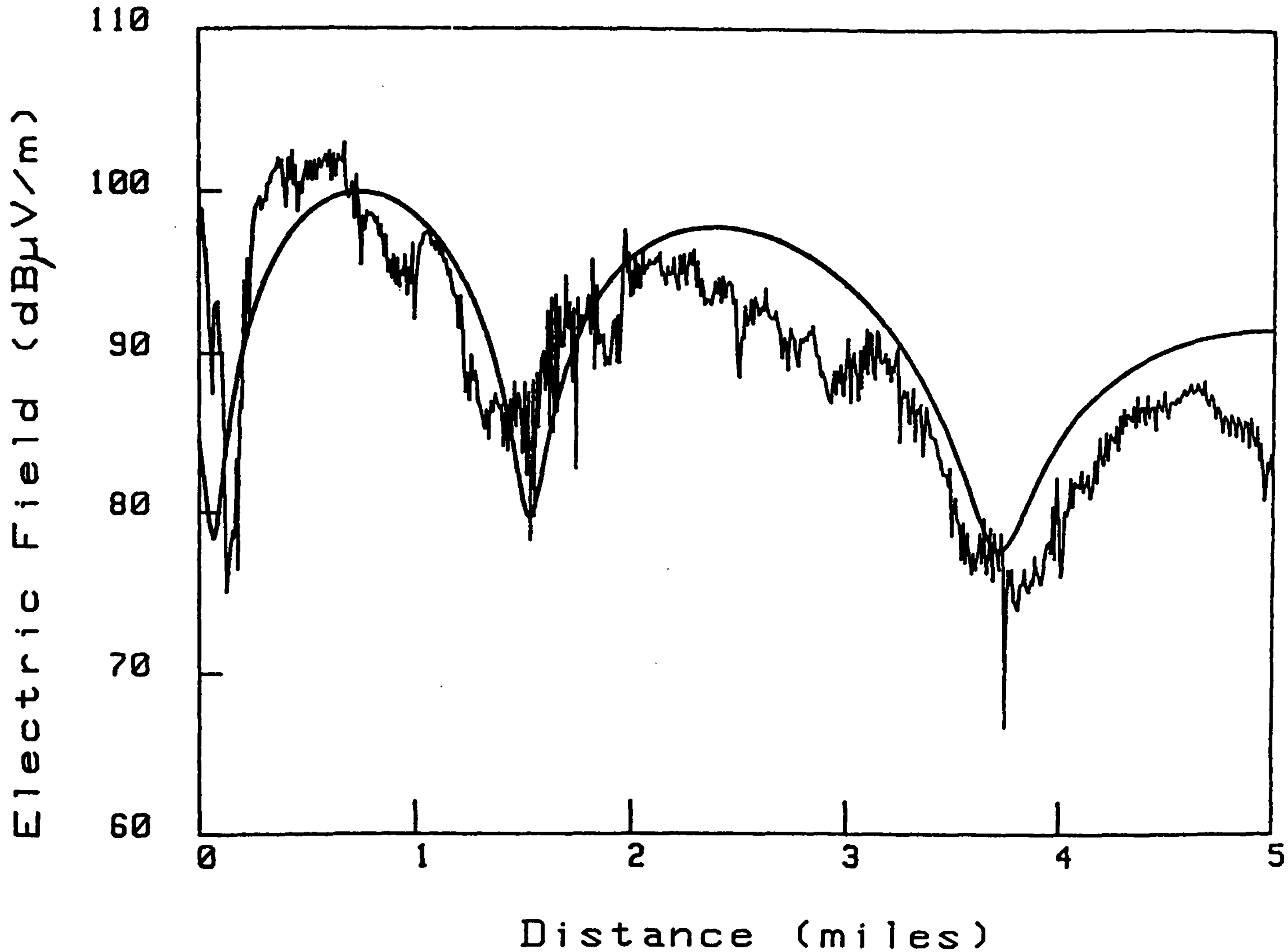


Figure 7. Continuous Measurement Versus NEC Model for Rhombic R-10. Units are in dB with respect to one microvolt per meter. For example 80 dBμV/m = 0.01 V/m. A difference of 20 dB is a difference of a factor of 100 in power density or a factor of 10 in field strength. The smooth curve represents the modeled field strength while the rough line shows the measured field strength.

5.1 BROADBAND CONTINUOUS MEASUREMENTS

5.1.1 Equipment

The broadband system was set up as shown in Figure 8. With this arrangement, the computer can record field strength as a function of distance travelled from a fixed starting point. The field strength probe was mounted on a non-conductive boom extended horizontally behind the vehicle 2 meters at a height of 2 meters above ground. This system is similar to the narrowband system used along Garzoli Road, except a broadband field strength meter was used instead of the antenna and spectrum analyzer. The broadband system has the advantage of detecting all frequencies present, however it is less sensitive and can be interfered with by electric fields from power lines. The meter indicates fields greater than the actual fields because of a problem referred to as potential sensitivity which affects many broadband meters at low frequencies. Based on a single narrowband measurement a correction factor of 0.37 (-8.6 dB) was applied to the broadband field strengths recorded on the computer. Measurements made with such a system are useful for screening purposes only; i.e., to find locations of relatively high field strength where more accurate measurements can be made.

5.1.2 Results

The system exhibited problems with detection of power line fields as well as an expected inability to track sideband modulated signals. Even so, useful data was obtained. The strongest stable readings were found along Melcher Avenue between Garces Highway and the main entrance to the site as shown in Figure 9. This measurement was made by driving south on Melcher from a starting point at the intersection of Garces and stopping at the site boundary, one mile (1600 m) south of Garces (refer back to site map, Figure 2).

5.2 NARROWBAND FIELD MEASUREMENTS

The west edge of Melcher Ave, was probed using broadband portable meters until the peak field location found with the mobile system was established. The fiber-optic and loop antennas were set up at this location and discrete measurements were made (files ZOCPKn and ZOCPK6, p. D-37). Most of the field was due to Rhombic R-03 operating at 11.74 MHz. The maximum equivalent power density was approximately 30 $\mu W/cm^2$.

6. INDUCED BODY CURRENT MEASUREMENT

A system was configured for measuring the induced RF current passing through the feet of an individual (adult male, height 1.73 m) standing on a grounded metal plate (Figure 10). This system was set up at the same peak field location on Melcher Ave.

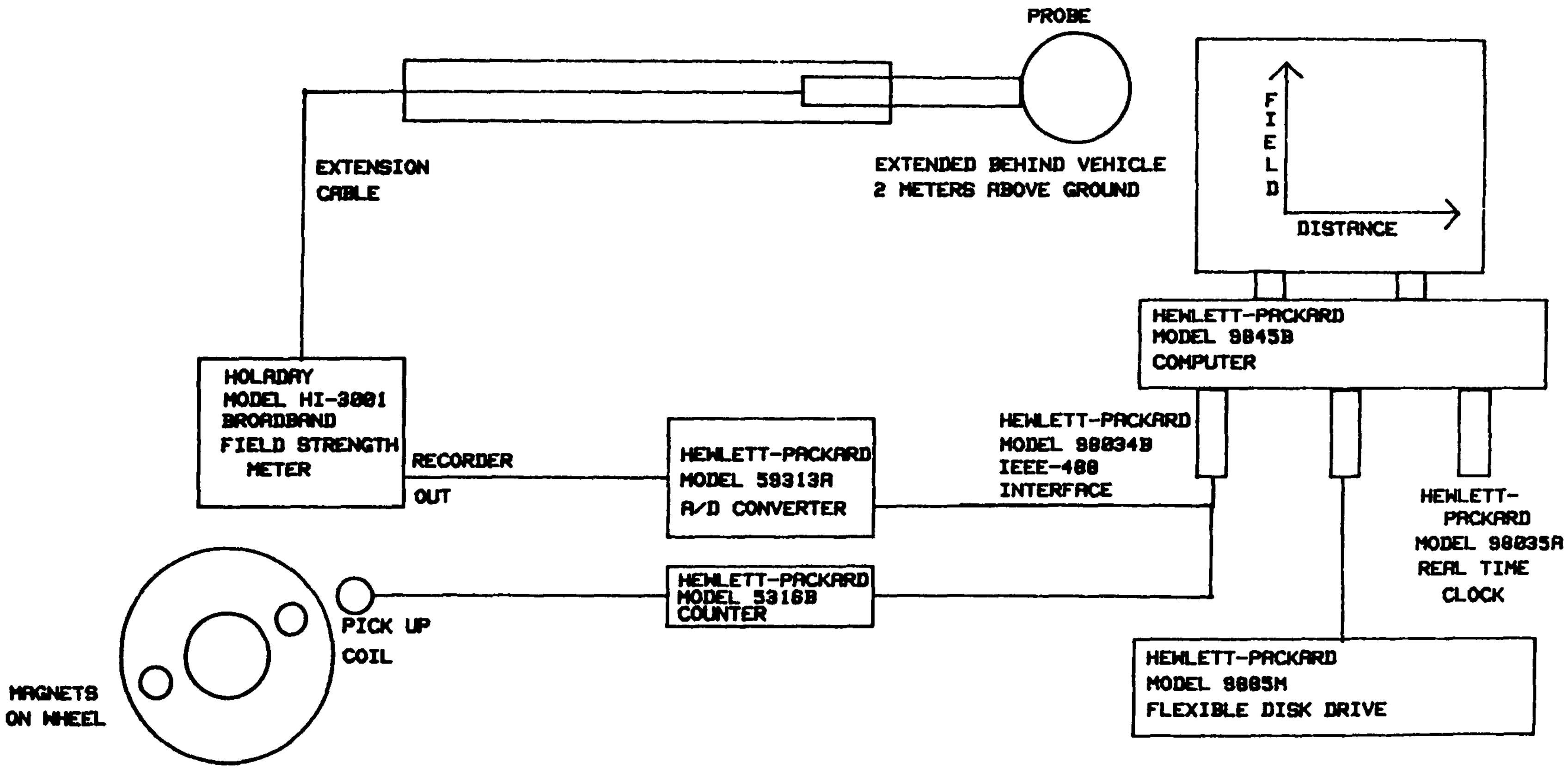


Figure 8. Broadband Continuous Measurement System.

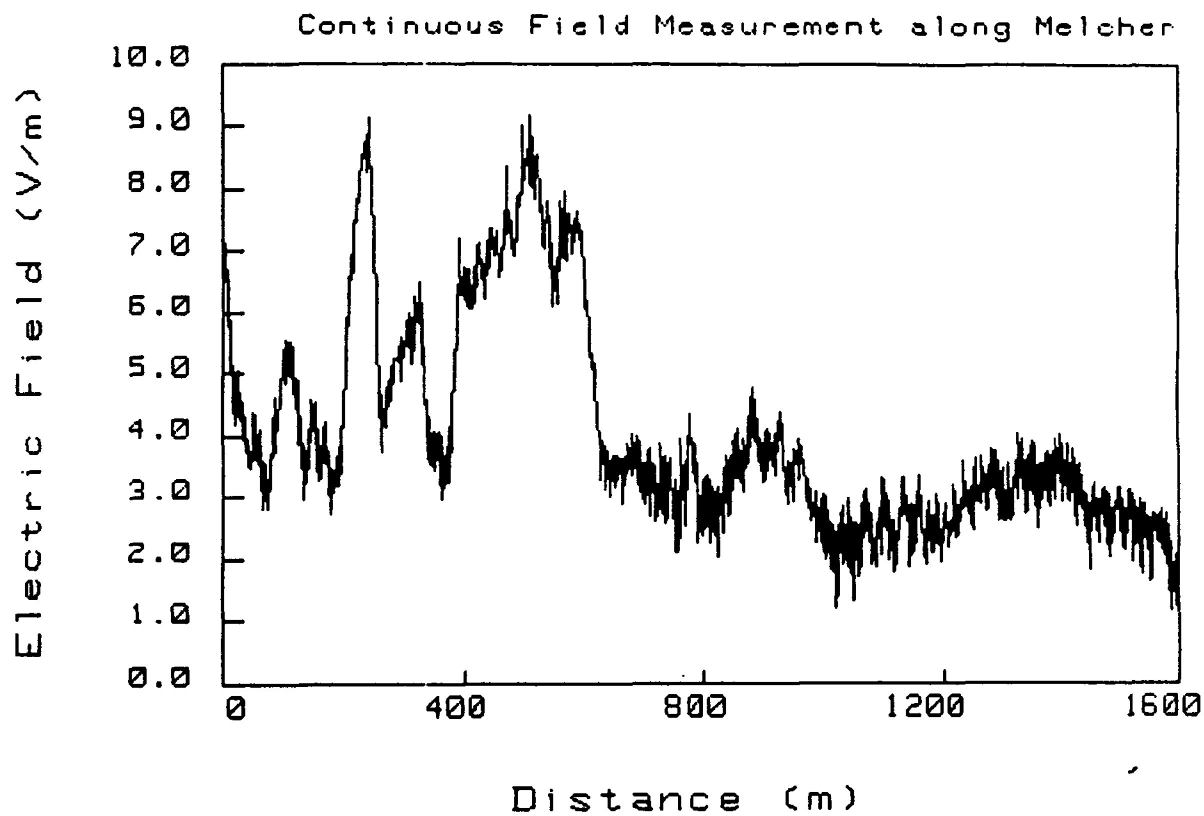


Figure 9. Continuous Measurement along Melcher Ave.

BODY CURRENT

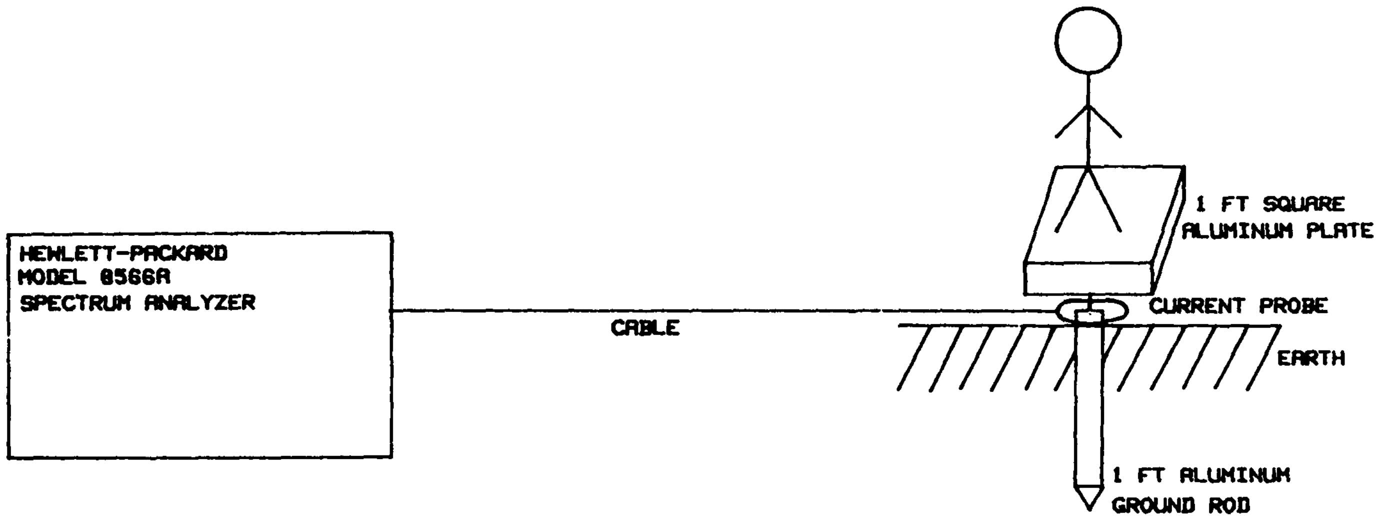


Figure 10. Body Current Measurement System. The current probe is clamped around the ground rod which is in series with ground and the body.

where the previous narrowband measurements were made. Measurements were made while the individual wore shoes and while he was barefoot. The results are given in Table 3.

TABLE 3. BODY CURRENT MEASUREMENTS

Frequency (MHz)	9.815	11.74
Electric Field (V/m)	3.63	7.85
Calculated Body Current (Barefoot) (mA)	11.5	29.8
Measured Body Current (Barefoot) (mA)	11.5	30.2
Measured Body Current (With Shoes) (mA)	4.35	11.0

Based on work by Gandhi and others [4] the induced body current is proportional to the frequency, the vertical electric field, and the square of the height of the individual. For a height of 1.73 m, this calculation gives a value of 0.323 mA per volt/meter of field per MHz of frequency. The calculated values are in good agreement with the measured body current for the barefoot tests. The current was reduced by about a factor of 3 by wearing heavy synthetic sole walking shoes.

7. SIGNAL STABILITY AND AMPLITUDE MODULATION

The variation with time of the amplitude of RF fields can be due to changes in the transmitter power, changes in the antenna, or changes in the propagation paths. The transmitter power is intentionally varied at audio or video frequencies during amplitude modulation, the power may also be varied in the long-term to conform to an operation schedule. For example, many AM radio stations reduce power at night to avoid interference with other stations. The VOA transmitters are not operated at reduced power. In some cases, antennas may be rotated or redirected electronically. Propagation paths typically vary due to changes in the ionosphere or reflections from passing vehicles.

In order to measure these changes, two sets of equipment were used depending on the time scale of the amplitude variations. Using one set of equipment, the amplitude variation was measured over time periods ranging from minutes to days with time resolutions down to about one second. This variation, referred to as signal stability, was measured using a calibrated receiver and a chart recorder. Variation from about one second to less than a millisecond is referred to as amplitude modulation and was measured using a low-frequency spectrum analyzer. Both systems could detect "fading"; i. e., regular oscillations in the field strength, at frequencies near one hertz; these may be due to ionospheric propagation. These systems do not measure absolute field strength but only relative changes in field strength.

7.1 LONG-TERM SIGNAL STABILITY

7.1.1 Equipment

The system shown in Figure 11, consisting of a vertical whip antenna connected to a fixed tuned receiver and recorder was used to measure signal stability. The meter reading on the receiver can be recorded for long time periods on a standard strip chart recorder. Tests in the laboratory showed a long-term drift in the receiver calibration of up to 2 dB. Each minor division on the strip chart corresponds to approximately 0.80 dB of change in signal level. The dynamic range without changing the receiver input attenuation is 40 dB. This system can be left unattended to record changes in the vertical component of the electric field strength at the frequency to which it is tuned.

7.1.2 Procedure and Results

The equipment was set up in a house at 141 6th St. in McFarland. The antenna was placed on top of the metal patio cover behind the house and the antenna cable was routed inside to the receiver. The receiver was adjusted to detect the carrier level with a bandwidth of 5 kHz and an input attenuation of 60 dB for all measurements. The frequencies examined included VOA signals at 11.74 and 6.155 MHz and the AM radio station at 1.180 MHz. Figures 12 and 13, showing the results, are from sections of a long strip chart where time increases to the left with a scale of 1 cm/hr; the signal level increases upward with a scale of 4 dB per major division such that the bottom of the chart corresponds to 40 dBμV and the top corresponds to 80 dBμV from the antenna.

Figure 12 shows the 11.74 MHz signal from the VOA rhombic antenna R-03 coming on at 3:45 p.m. and going off at 6:00 p.m. on two consecutive days as scheduled. The vertical width of the trace of about 2 dB is due to the signal level fading or oscillating at a rate on the order of one cycle per second. This fading is more regular and sinusoidal than that due to distant ionospheric propagation and may be due to the ground wave and the ionospherically reflected wave going in and out of phase as the height above ground of the reflecting layer of the ionosphere changes. The maximum peak to peak variation seen at any carrier frequency was about 8 dB and the fading frequency varied from about 0.125 to 3 Hz (period from 8 sec to 0.33 sec) depending on carrier frequency and date of observation. The discrete frequency measurement program used for community measurements had to be modified to wait for a peak field observation because of this fading. Figure 13 shows the 6.155 MHz signal from the VOA rhombic antenna R-10 coming on at 6:00 p.m. and going off at 8:15 p.m. as scheduled on three different days. The peak field remained essentially constant when compared for each day. However, the fading varied from less than 1 dB to about 6 dB during that time.

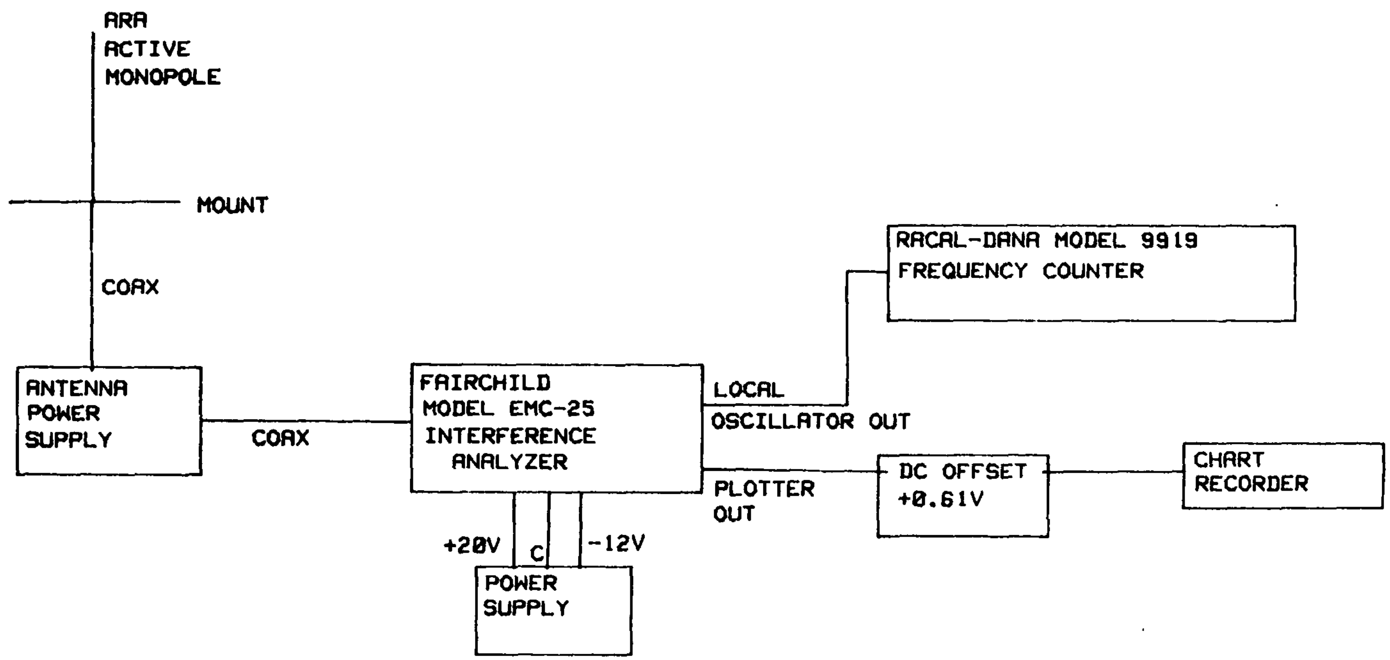


Figure 11. Signal Stability Measurement System. This system can measure the variation over time of RF electric fields for a range of periods of less than one second to days.

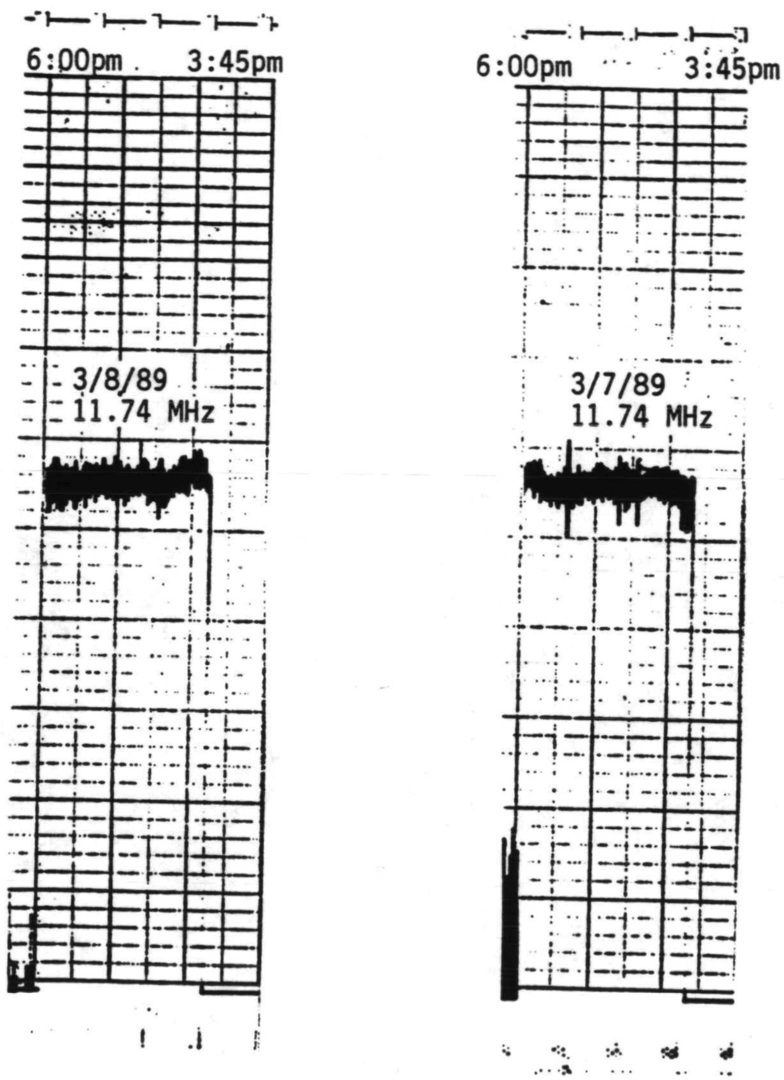


Figure 12. Stability of 11.74 MHz Signal. The signal level increases upward with a scale of 4 dB per major division.

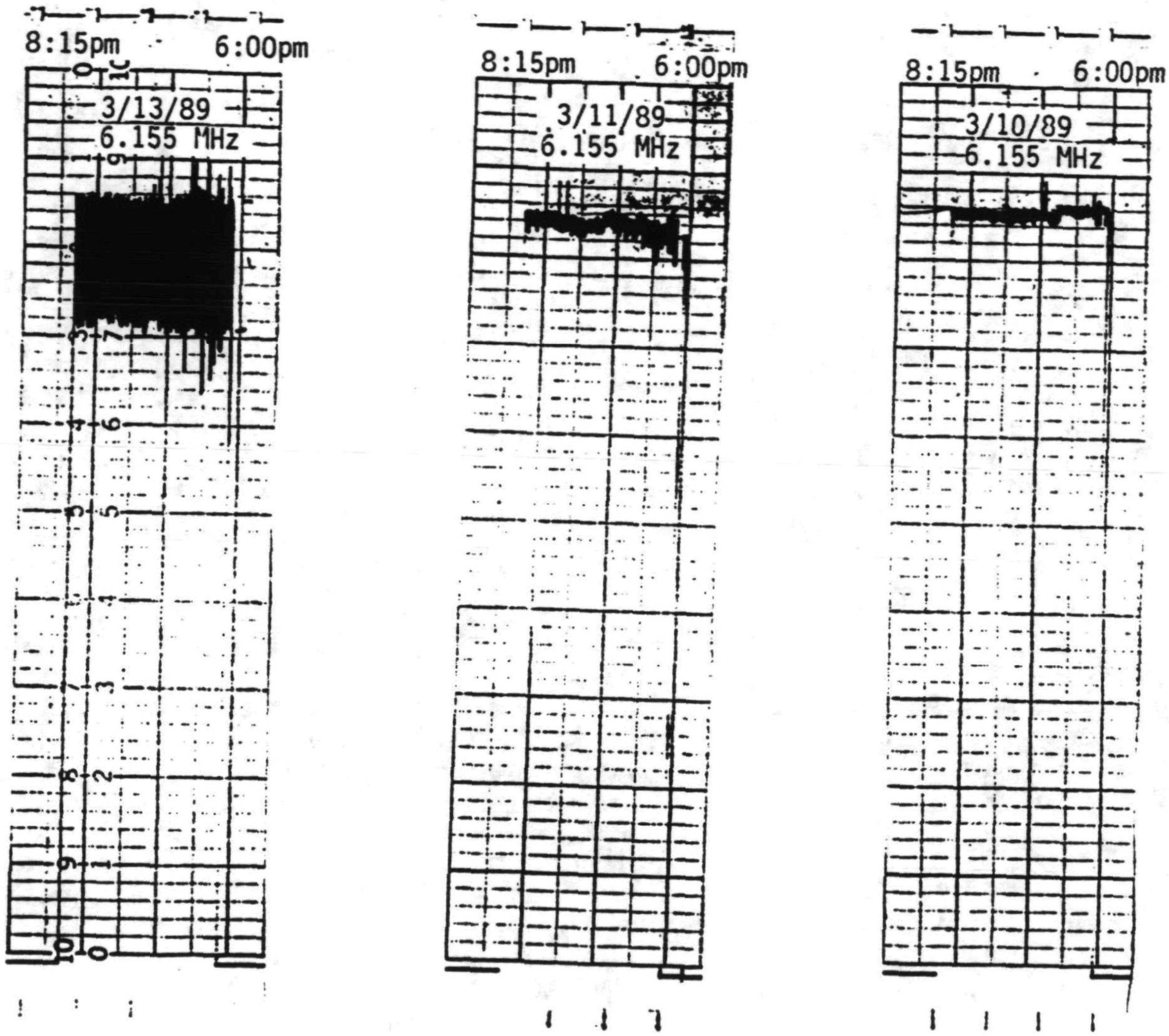


Figure 13. Stability of 6.155 MHz Signal. The signal level increases upward with a scale of 4 dB per major division. Variations of about 6 dB were seen on March 13.

Figure 14 shows the signal of the AM radio station at 1.18 MHz over a 24 hour period. The station goes to high power at 6:15 a.m. changes to low power night time operation at 6:00 p.m. and goes off the air from midnight to 4:30 a.m., when it comes back on the air at low power and finally goes to high power at 6:15 a.m. to complete a 24 hour cycle. The field appears to step up and down by as much as 2 dB during high power operation. This may be due to unstable transmitter operation.

7.2 LOW FREQUENCY AMPLITUDE MODULATION

An AM spectrum analysis is of interest because of laboratory studies which appear to indicate that modulation may have biological impact, even though the average power density of the exposure is held constant. A National Council on Radiation Protection and Measurement (NCRP) report, for example, urges extra caution when high values of low frequency amplitude modulation are present: "If the (amplitude of the) carrier frequency is modulated at a depth of 50 percent or greater at frequencies between 3 and 100 Hz, the exposure criteria for the general population shall also apply to occupational exposures" [2].

7.2.1 Equipment

The modulation measurements were made by detecting the RF field or antenna output voltage with an RF spectrum analyzer (8566A) and analyzing this voltage envelope (video out) in turn with a low-frequency (3582A) spectrum analyzer, Figure 15. Using data from both spectrum analyzers the computer was used to calculate and plot modulation percentage as a function of frequency. The basic formula for calculating the modulation percentage involves the difference of the maximum and minimum envelope voltages divided by the sum of these two voltages. The difference is obtained from the low-frequency analyzer and the sum from the RF analyzer. Finally, the root-sum-square percent of modulation for the frequency range of 3 to 100 Hz was calculated.

7.2.2 Results

An AM spectrum analysis was made for the VOA signal at 9.815 MHz at one location near Kern School in McFarland. The results for the frequency range of 0 to 100 Hz and 0 to 10 Hz are given in Figure 16. Three VOA signals were manually observed in time domain on the RF spectrum analyzer. Of these, only the signal at 9.815 MHz exhibited any apparent fading at low frequencies. This fading can be seen as the peak at 0.5 Hz in the 0 to 10 Hz plot. The other two signals observed manually on the air at 6.155 and 9.765 MHz were not fading at the time of measurement and a spectrum analysis of their modulation was not made.

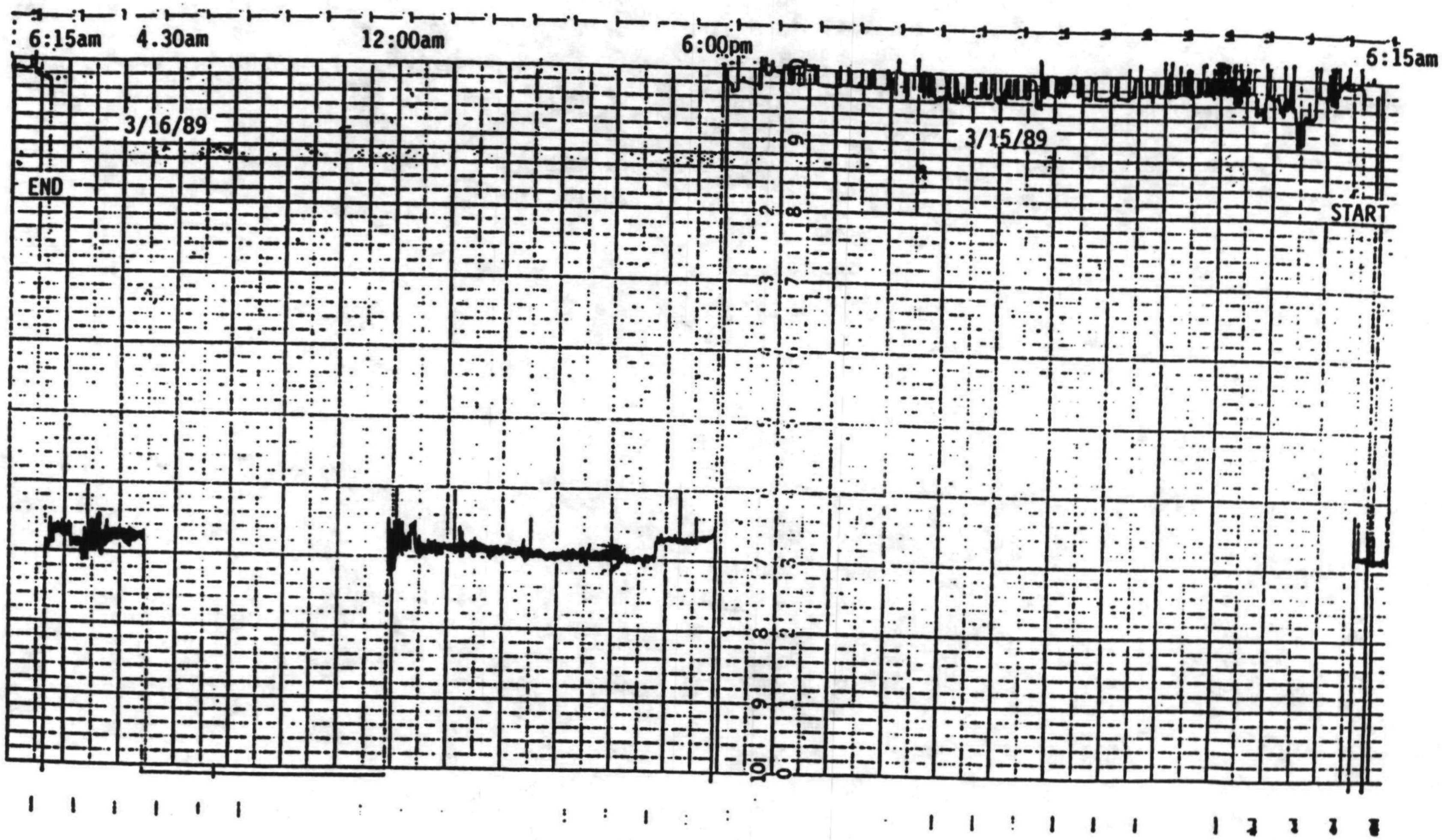


Figure 14. Stability of AM Radio Station at 1.180 MHz. The station operates at full power from 6:15am to 6:00pm. The variation during this operation may be due to unstable transmitter performance.

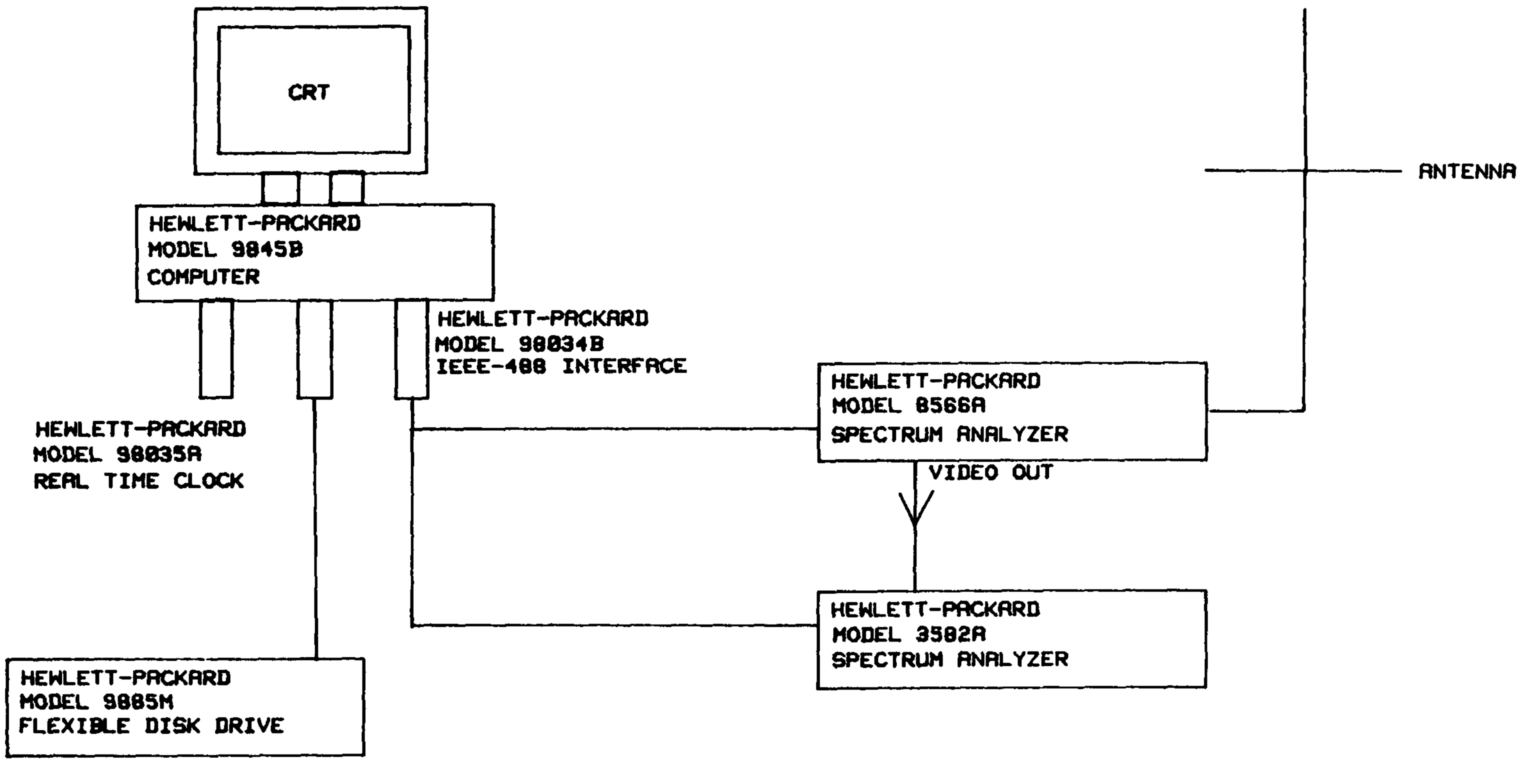


Figure 15. Amplitude Modulation Measurement System. The 8566A Spectrum Analyzer is used as a fixed tuned receiver in linear mode. The video output is proportional to the instantaneous detected RF field strength. Data from the 3582A is used to determine the modulation spectrum.

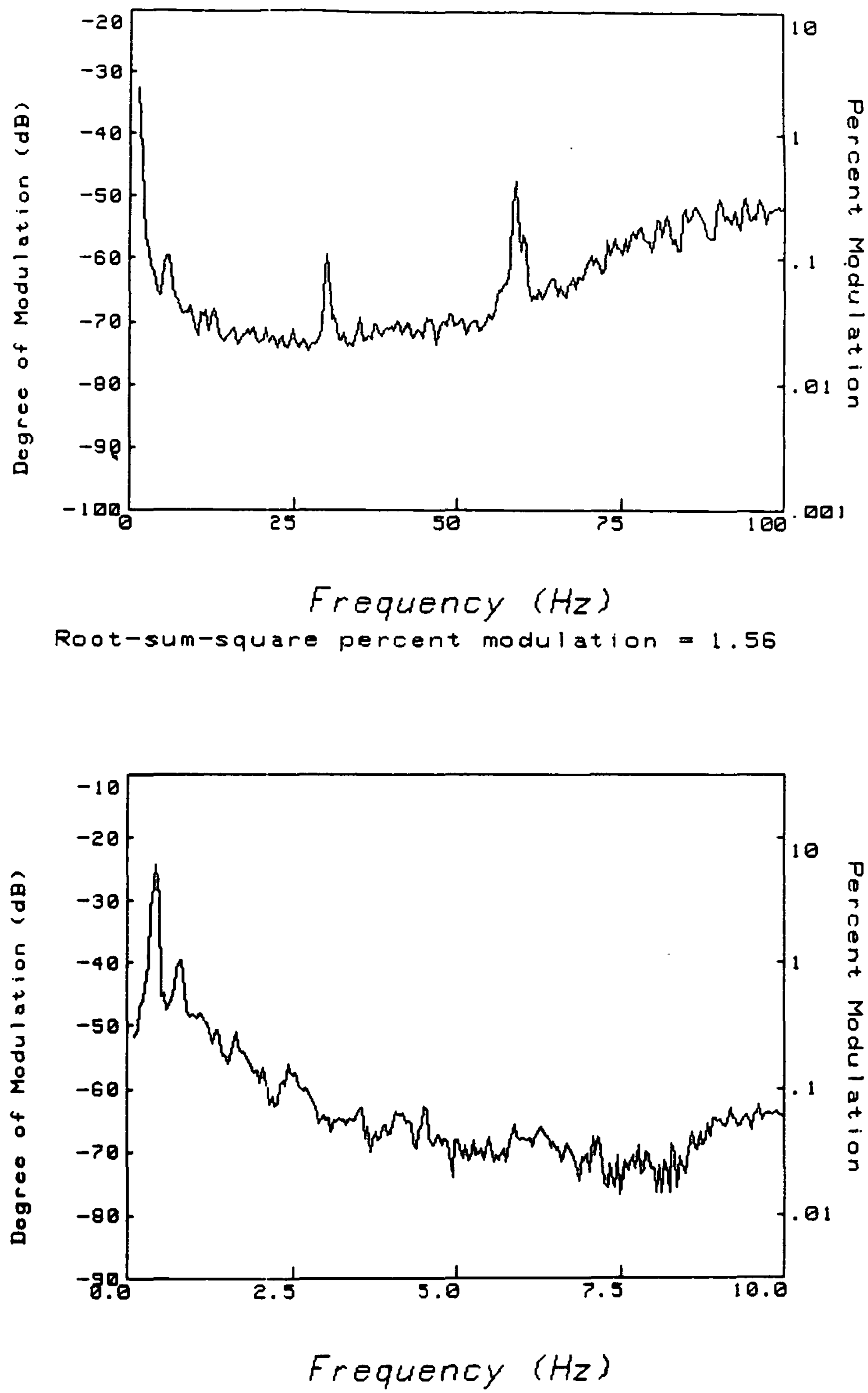


Figure 16. AM Spectrum Analysis of 9.815 MHz Signal.

The average modulation spectrum at audio frequencies for any VOA standard double-sideband amplitude-modulated signal of the type transmitted to the southwest toward McFarland depends only on the programming and should be essentially the same for any carrier frequency at any location. However, the amount of fading apparently due to ionospheric propagation (discussed in the previous section) varies and affects the apparent modulation level at frequencies below a few hertz.

As can be seen in the VOA schedule (Figure 5), a number of dual-independent-sideband signals are transmitted to the northwest. These signals have associated with them higher levels of low-frequency modulation than standard AM signals. According to VOA schedules back to 1975, no sideband transmissions have been directed to the southeast toward McFarland. Also, relatively strong signals at the frequencies of these transmissions were not observed in McFarland. Therefore, no measurements were made of the modulation characteristics of these signals. However, a subsequent laboratory measurement using a voice-modulated amateur transmitter in single-sideband mode is presented in Figure 17.

For purposes of comparison, laboratory measurements were made of the modulation spectra for a standard AM radio broadcast station and for the video signal of a UHF-TV station and are presented in Figures 18 and 19. The peak at approximately 60 Hz for the TV signal is due to the vertical retrace rate for all television signals; the exact frequency is 59.94 Hz. A weaker peak at 60 Hz for the AM station is probably due to the 60 Hz modulation of the transmitter because of imperfections in the transmitter power supply.

The root-sum-square modulation percentage over the range of 3 to 100 Hz varies depending on the type of source. Standard double-sideband AM signals such as those from VOA which are directed to the southeast and regular AM broadcast have values of about 2%. TV video signals vary from about 10 to 20% and single-sideband amateur voice modulation is about 30%. Preliminary data not shown here, indicate that FM radio broadcast modulation levels are near 0.5% and amateur keyed-carrier (code) signals have modulation levels near 100%.

8. MODELING OF VOICE OF AMERICA ANTENNAS

8.1 NUMERICAL ELECTROMAGNETICS CODE

Calculated values of the electric and magnetic fields due to the rhombic antennas at VOA were determined using the Numerical Electromagnetics Code (NEC). NEC is a Fortran computer program developed by Lawrence Livermore National Laboratory for the Department of Defense which can be used to calculate fields near wire antennas of arbitrary shape. The code is readily available

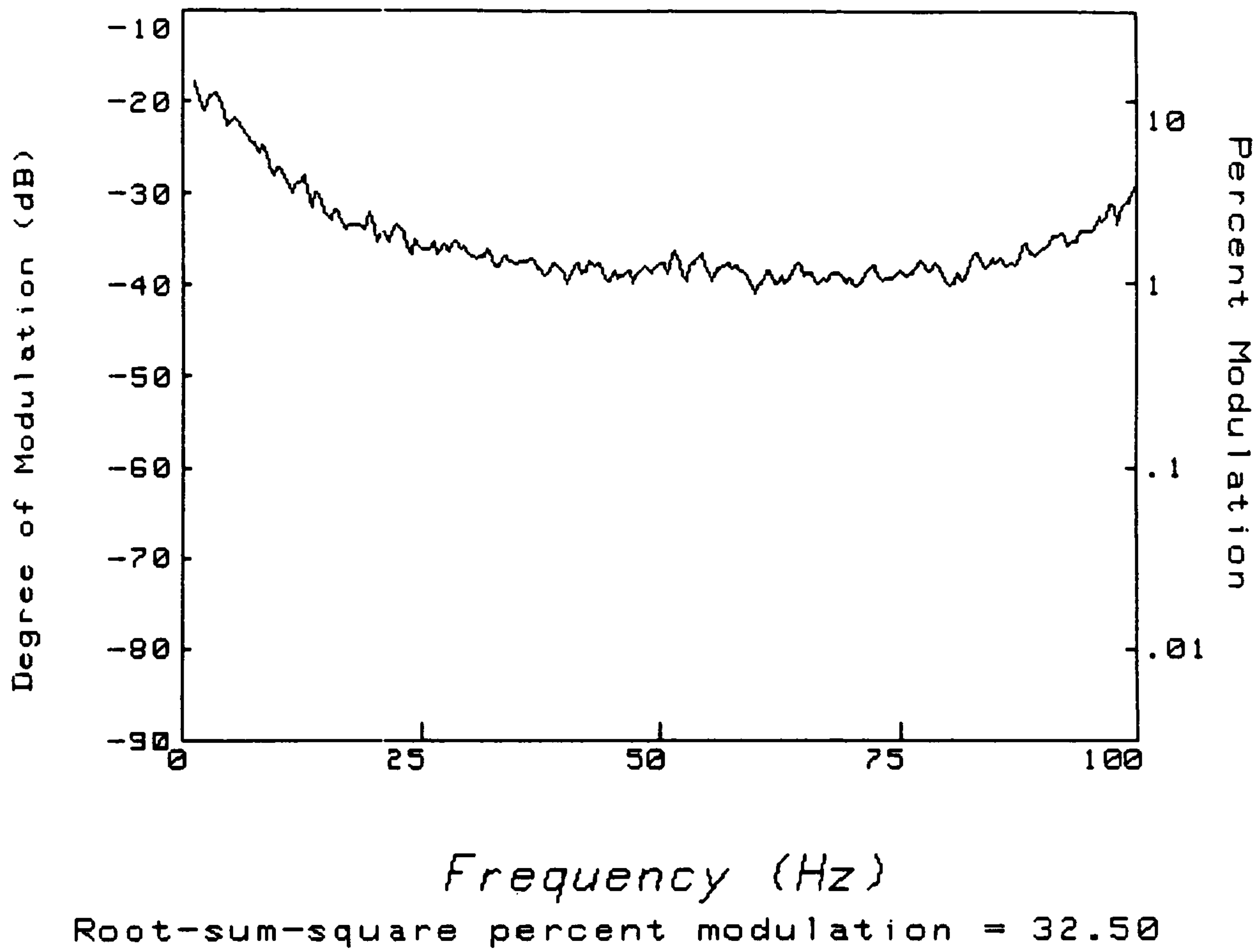


Figure 17. AM Spectrum Analysis of Amateur Sideband Transmission

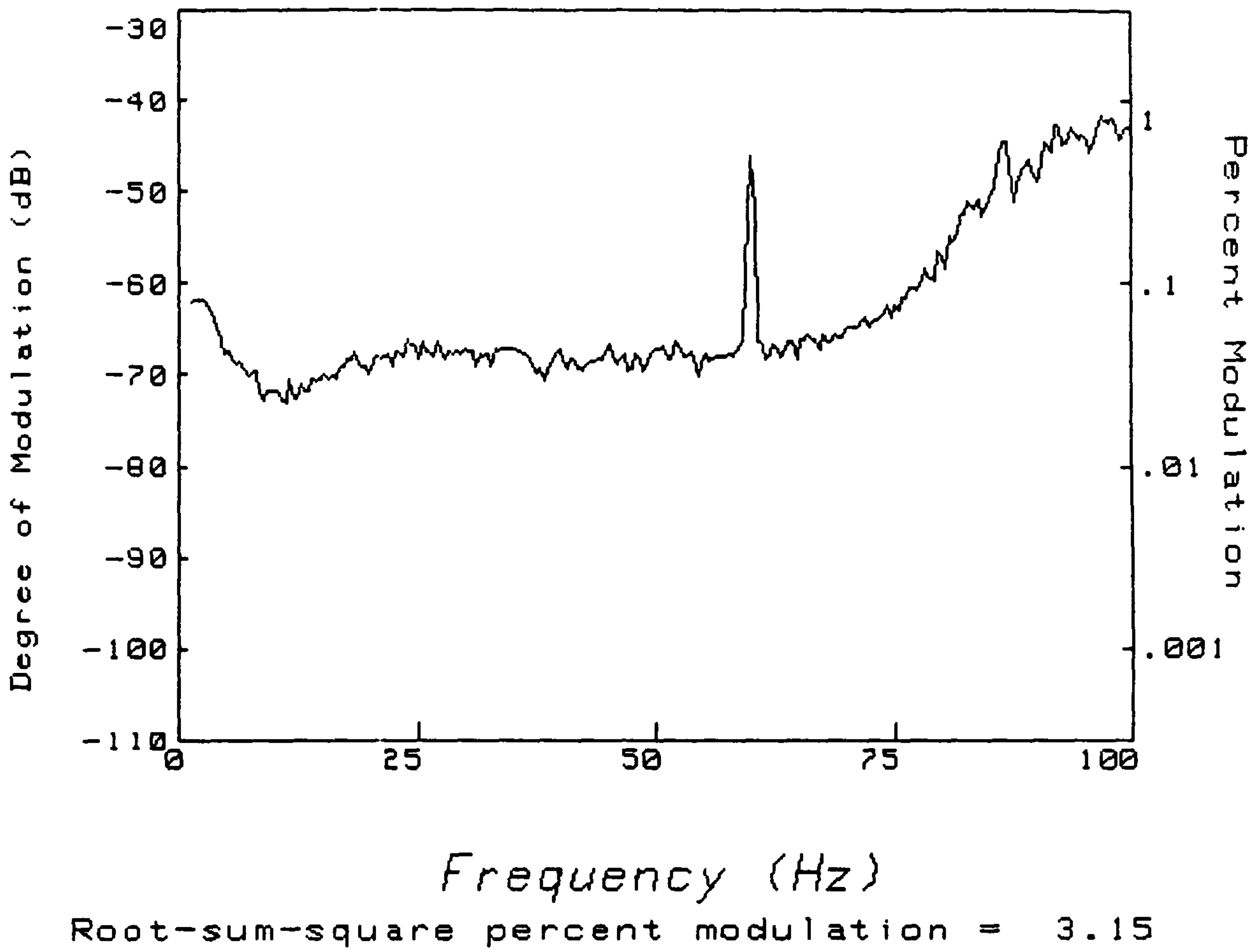


Figure 18. AM Spectrum Analysis of AM Radio Station.

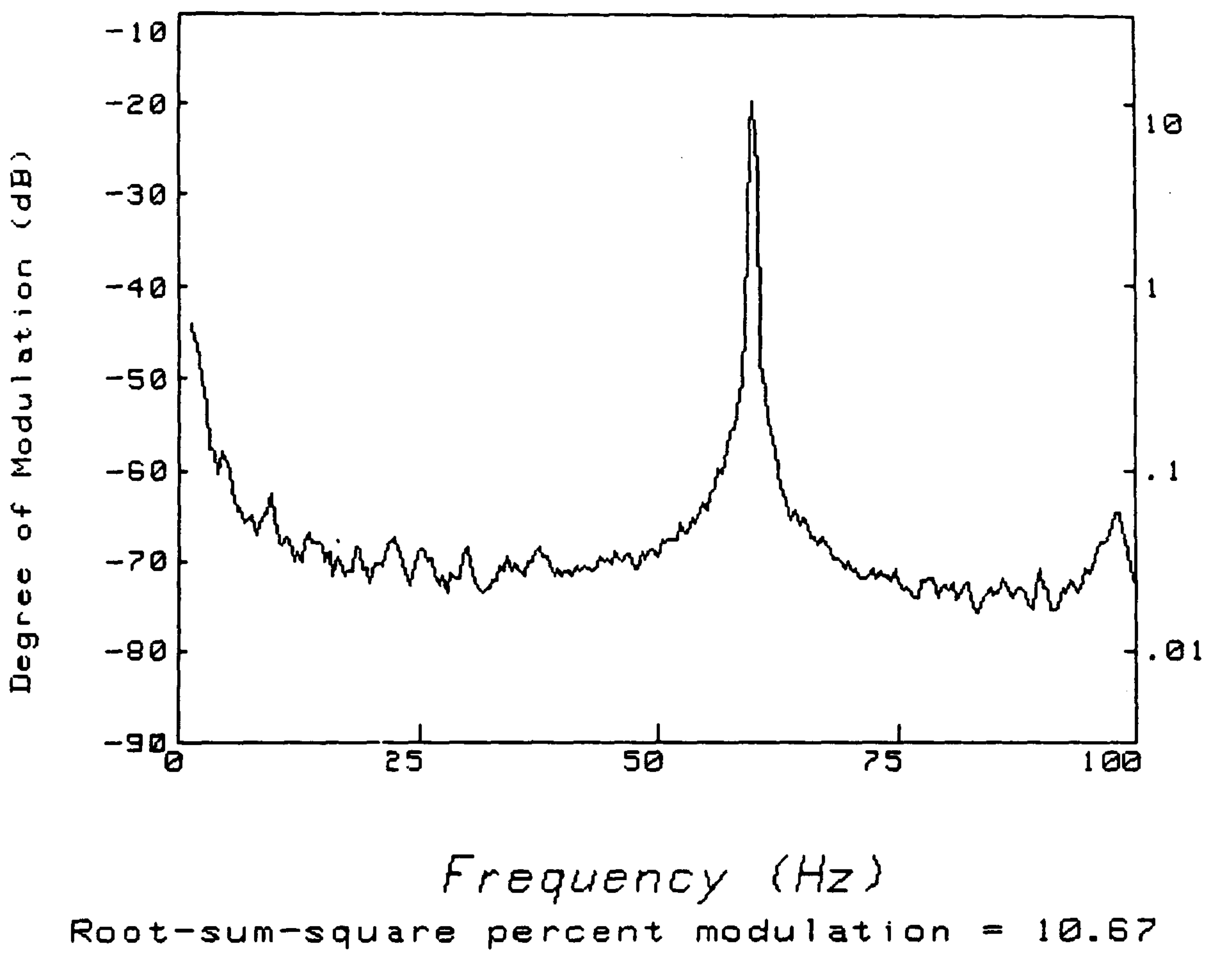


Figure 19. AM Spectrum Analysis of UHF-TV Station.

and represents the state-of-the-art in numerical modeling of wire antennas [5].

Wire antennas are modeled in NEC as a set of segmented straight wires in free space or above a ground plane. This ground plane can model the electrical effects of earth beneath a real antenna. Each wire is specified by three coordinates in space for each wire end, a wire radius, and the number of segments into which the wire is divided. Wire segment lengths are set to less than 0.1 wavelength in order to achieve an accurate solution. Excitation voltages and load impedances can be applied across specified segments. NEC then solves for the magnitude and phase of the current on every segment. These currents are then used to calculate the fields generated by the antenna.

8.2 RHOMBIC ANTENNA MODEL

The NEC program was used to model the rhombic antennas at the VOA site in Delano, CA. A simple rhombic antenna consists of four horizontal straight wires arranged to form a rhombus. The main beam radiates at an angle of about 10 degrees above the horizon and is directed in azimuth along the long axis of the rhombus from the transmitter connection (excitation) and toward the antenna load. The rhombic antennas at VOA are constructed using four systems of three wires each (Figure 3); these four systems were modeled as four individual wires having a radius of 1 centimeter in NEC. The geometry of the rhombic antennas at VOA was determined from blueprints of the site and tabular data supplied by VOA. The coordinates of the ends of each wire were determined and the wires were broken into segments less than 0.1 wavelength long at the operating frequency. The transmitter and load connections were modeled in NEC by applying an excitation voltage across two segments symmetrically at the transmitter end of the antenna and applying two 300 ohm load impedances similarly across two segments at the opposite end of the antenna. The excitation voltage was adjusted such that the power input to the antenna was 250 kW. The ground was modeled as a plane having a uniform conductivity and relative dielectric constant derived from electrical measurements of the soil made at Delano by SRI International [6]. A Sommerfeld Integral method was used to calculate the effect of ground. This ground effect calculation involves running a NEC accessory program called SOMNEC before running NEC.

Some potential sources of error or simplifying assumptions in the model include: (1) one wire rather than three is used to model each side of the rhombus, (2) the perturbing effect of adjacent antennas is not considered. (3) the effects of supporting towers and guy wires are not considered, (4) the load impedance, loss in transmission lines, and absolute power are not exactly known, and (5) the ground is treated as uniform and flat when it is neither. Also, the model does not take into account reflections from the ionosphere or local perturbations and reflections due to buildings or other structures. As distance from the antenna increases, ionospheric effects become more important. The results in the section on VOA antenna pattern measurements show that these errors are typically 5 dB, which is considered good agreement.

8.3 RESULTS

The NEC models for the rhombic antennas were used to calculate the electric and magnetic field and the ratio of these fields at points one meter above ground at every one degree of bearing on a horizontal circle centered on the antenna and having a radius of 10 km. This radius is approximately equal to the distance between the antennas and McFarland, the actual distance between the rhombic antenna centers and measurement sites in McFarland varies from 8.0 to 11.6 km. Neglecting ground losses, the field varies as the inverse of distance, so the maximum error due to setting the distance to 10 km is 20% or 1.6 dB. The four rhombic antennas radiating to the southeast were modeled, the ground-level electric and magnetic fields and field ratios at a distance of 10 km are shown in Figures 20 to 23.

The large rhombic antenna (R-10) at the south end of the VOA site generates the largest calculated fields (Figure 20). The NEC program output for R-10 is given in Appendix B. The values plotted for the fields are the square-root of the sum of the squares of the three field components calculated by NEC. Also, the NEC output values are multiplied by 0.707 to convert from peak to root-mean-square (RMS) fields. The R-10 antenna is reported by VOA to have a main beam gain of 23 dBi (dB with respect to an isotropic radiator) at its operating frequency of 6.155 MHz. NEC gives a value for main beam gain of 18.9 dBi. For an input power of 250 kW, the electric field calculated using 18.9 dBi for the main beam gain at a distance of 10 km is 2.4 V/m in the main beam. Since this beam is directed 10 degrees above the horizon, this location will be 1.7 km above ground. As can be seen in Figure 20, the maximum electric field calculated at 10 km at 1 m above ground is approximately 0.070 V/m and is due to four field maxima or lobes at 20 and 32 degrees on either side of the main beam; there is a field minimum or null at ground beneath the main beam. This ground-level maximum electric field is 31 dB less than the main beam field at 1.7 km above ground. Since the main beam bearing is 116 degrees, the lobes occur at bearings of 84, 96, 136, and 148 degrees. The bearing from the VOA site to McFarland is about 135 to 150 degrees. So, for this antenna, two of these lobes are directed toward McFarland and the maximum calculated electric field at 10 km in the town due to this antenna is 0.070 V/m which is equivalent to a power density value of 1.3 nanowatts per square centimeter (nW/cm^2). The maximum magnetic field calculated is 0.019 milliamp/meter (mA/m) and is also equivalent to 1.3 nW/cm^2. The calculated ratio of the

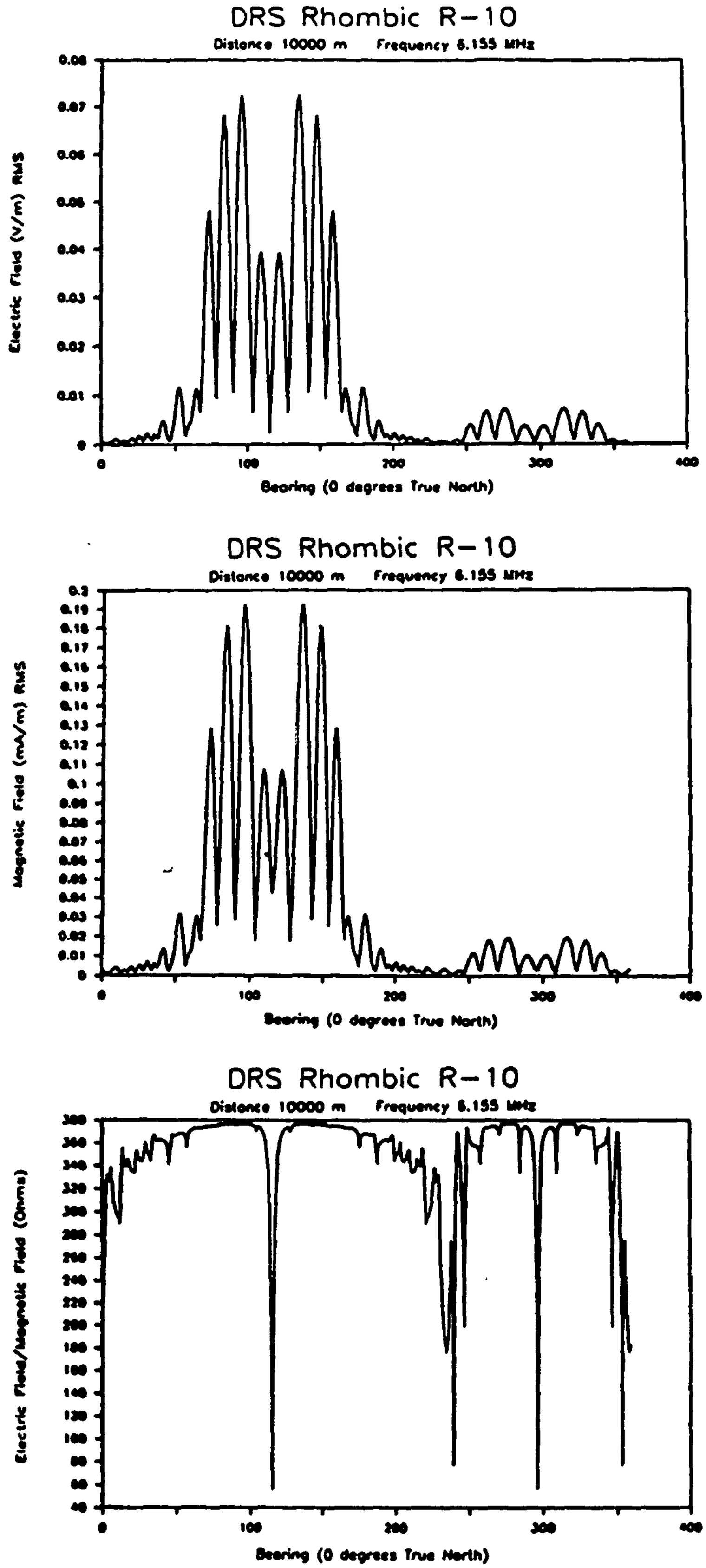


Figure 20. Calculated Fields for Rhombic R-10 at 6.155 MHz.

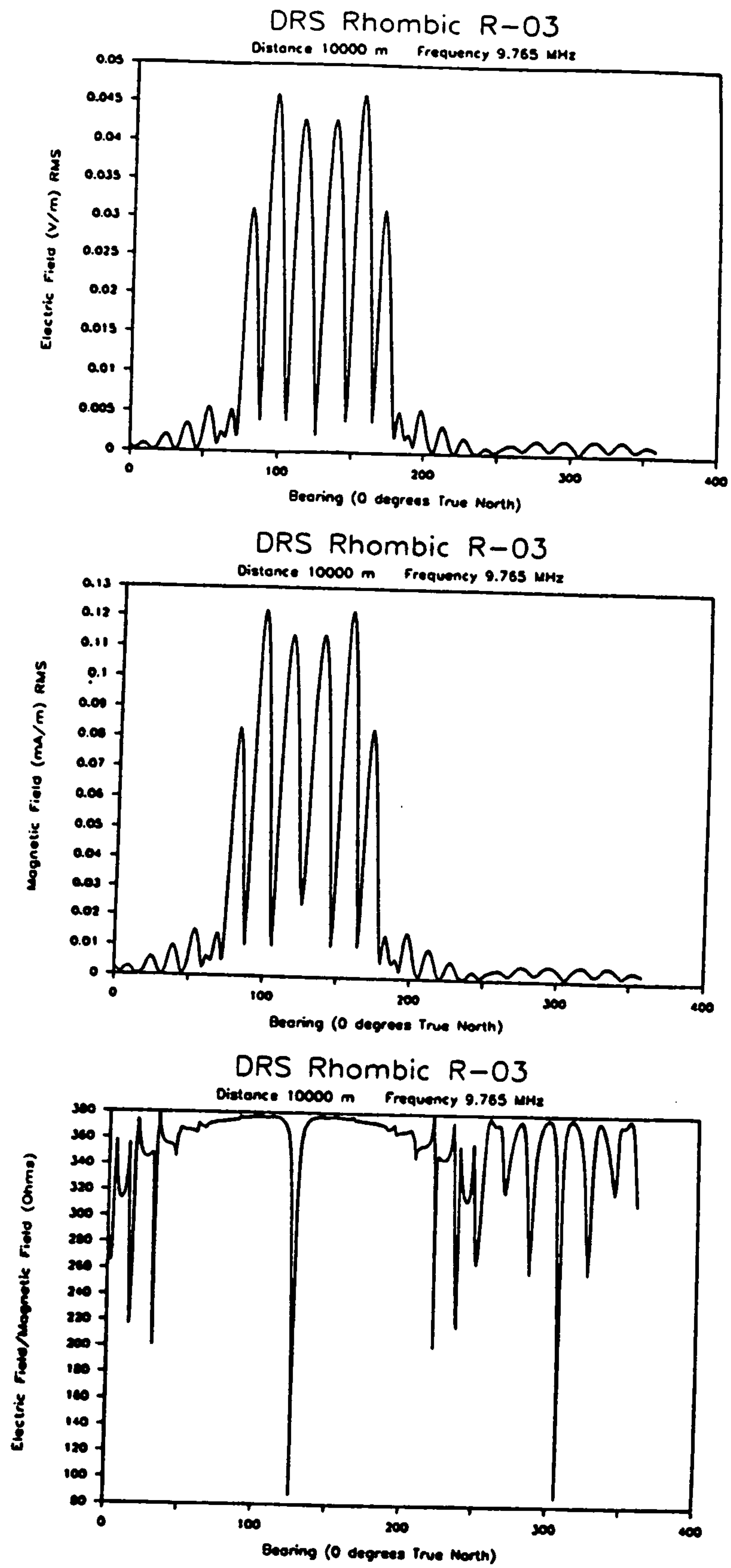


Figure 21. Calculated Fields for Rhombic R-03 at 9.765 MHz.

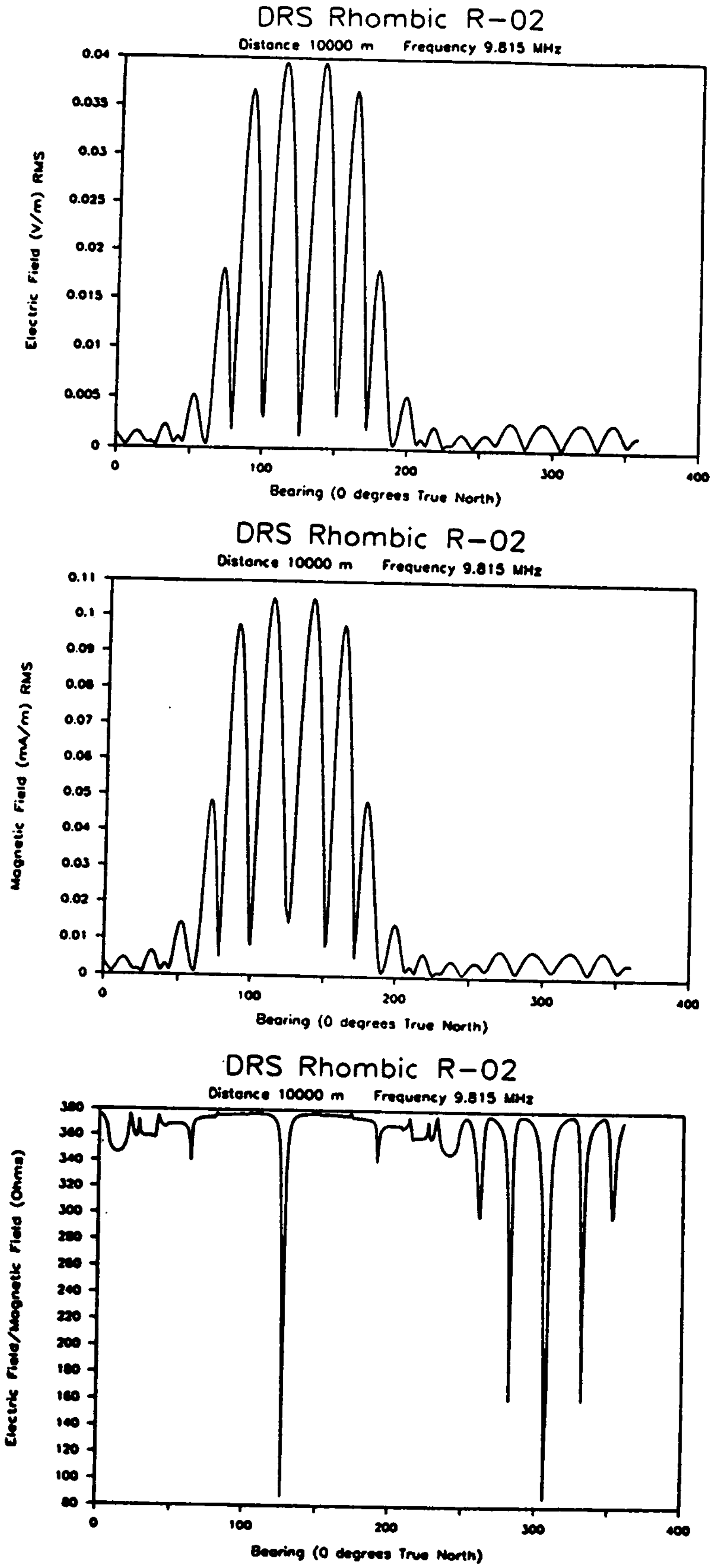


Figure 22. Calculated Fields for Rhombic R-02 at 9.815 MHz

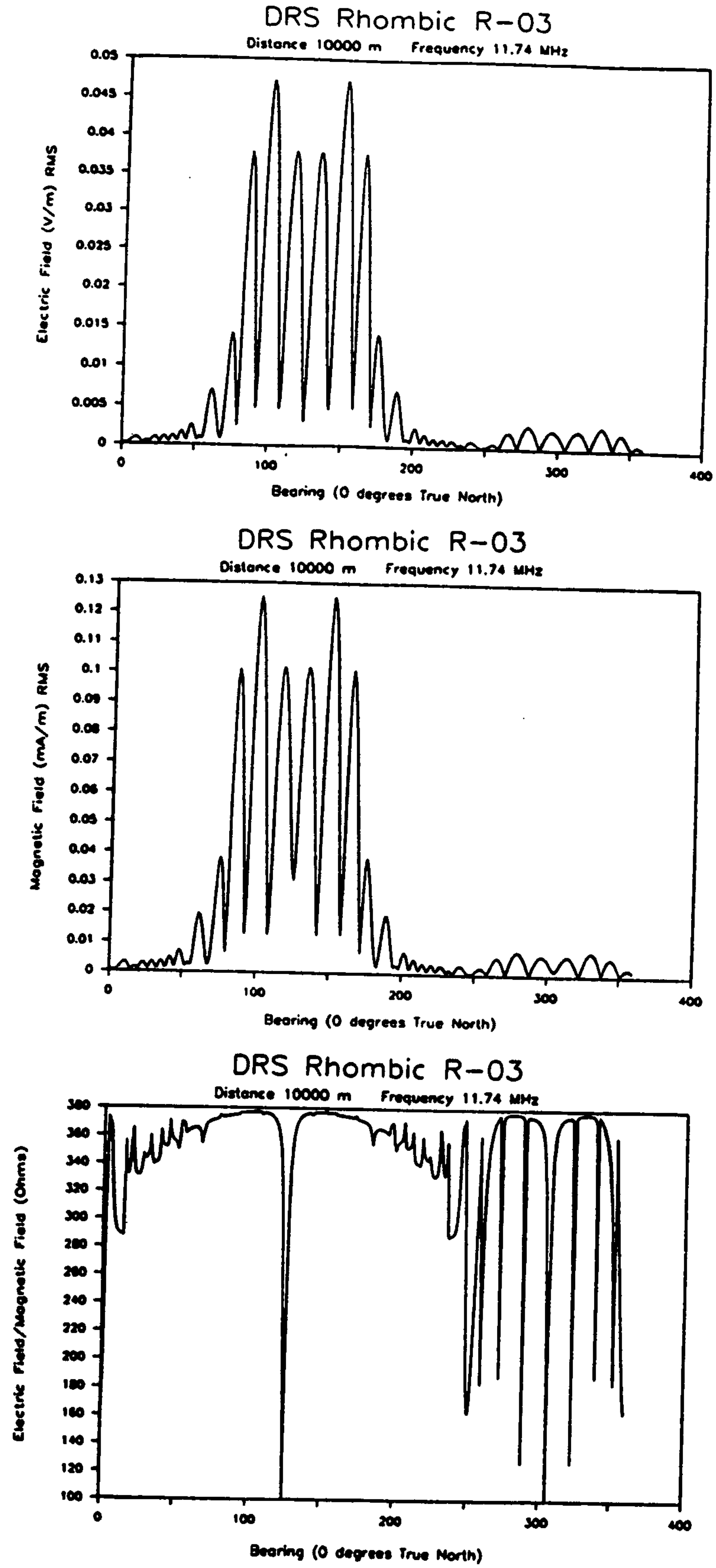


Figure 23. Calculated Fields for Rhombic R-03 at 11.74 MHz.

electric to the magnetic field (wave impedance) is less than or equal to the value for a free space wave (377 ohms). The ratio varies from 55 to 377 ohms. Thus, the calculated equivalent power density for the magnetic field is greater than for the electric field by a factor of 1.0 to 47. However, the low values of wave impedance occur only at nulls in the pattern. Most wave impedance values are greater than 300 ohms and are equal to 377 ohms where both fields are a maximum. This implies that calculating either the maximum electric or magnetic field is adequate for determining the maximum exposure. Because of the boundary conditions on the field vectors at the ground surface, the dominant components of the fields on ground are vertical for the electric field and horizontal for the magnetic field.

8.4 DISCUSSION

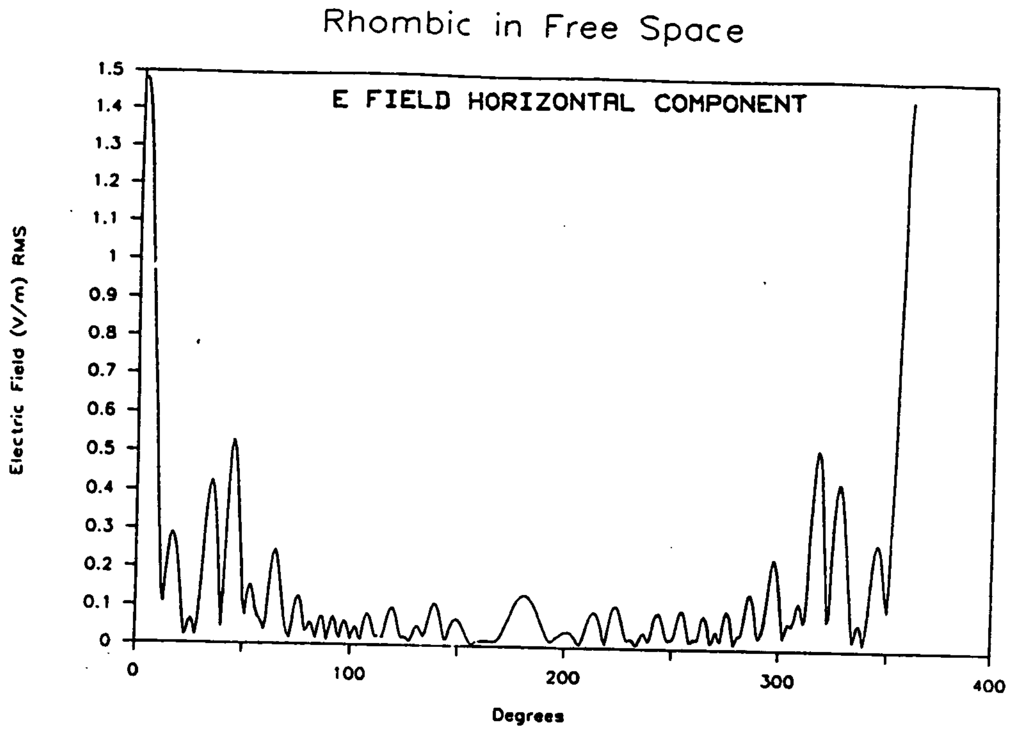
While the data generated by NEC for ground-level fields from the rhombic antennas at VOA were confirmed by measurements, the plausibility of the results is not obvious. For example, it may not seem reasonable that: (1) the maximum fields on ground are not found beneath the main beam and (2) the electric fields generated near ground by an antenna constructed from horizontal conductors are vertical. The purpose of this section is to make the results more tenable. Understanding the data involves an appreciation of the fact that the radiation pattern and field components of the antenna in free space and the effects of ground on these components are both complex. To gain this appreciation, the problem of calculating the fields near ground due to the VOA antennas can be broken into two parts: (1) the radiation pattern and off-axis field components of the antenna in free space and (2) the effect of ground on propagation of these components.

8.4.1 <u>Rhombic Antenna in Free Space</u>

To show the radiation pattern and off-axis field components for a rhombic antenna in free space, the R-10 rhombic antenna was modeled with no ground effect entered into the NEC program. The electric field at a distance of 10 km and 53 m below the plane of the antenna (1 meter above ground if ground were present) was calculated. The vertical and horizontal components of this field are plotted in Figure 24. Here, the main beam direction is zero degrees. The maximum horizontal component is 97 times (39.8 dB) more intense than the maximum vertical component. Note the similarity of the vertical pattern in free space and the total pattern of R-10 near ground in Figure 20; the effect of ground is to suppress the horizontal field component.

8.4.2 <u>Dipole Antenna above Ground</u>

To illustrate the effect of ground on propagation of the horizontal and vertical electric field components, a simple 10 MHz half-wave dipole antenna was modeled (1) in a horizontal and



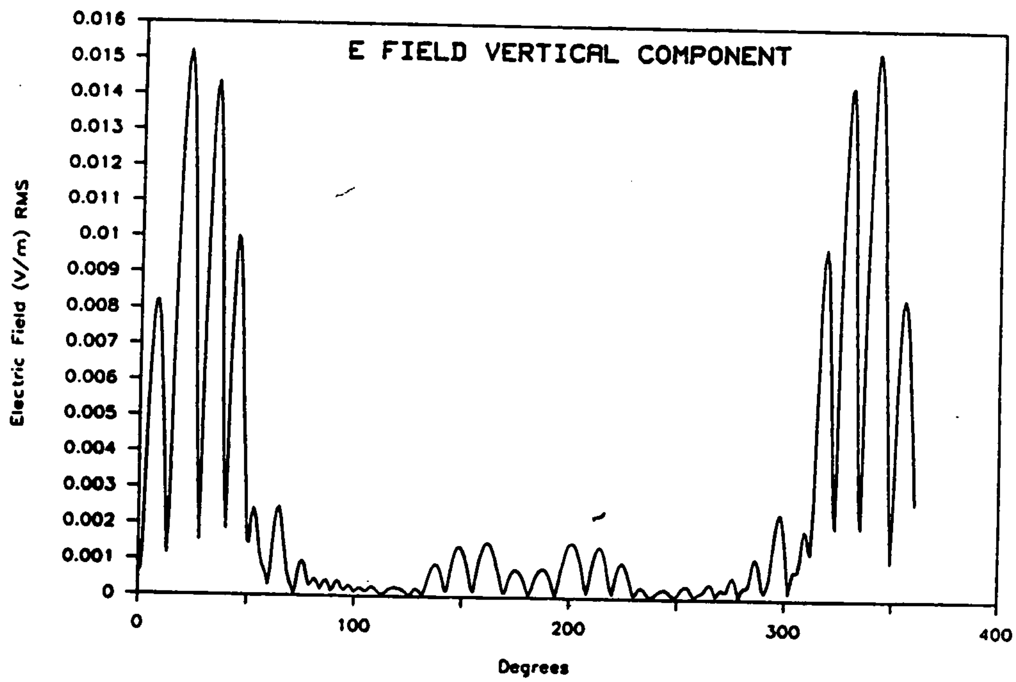


Figure 24. Calculated Electric Field from a Rhombic Antenna in Free Space. Essentially only the vertical component survives the presence of ground.

(2) in a vertical orientation above ground. The height of the antenna center was 50 m above ground and the calculation point was 1 m above ground and 10 km from the antenna. This point was in the direction of main beam propagation where the electric field is strictly horizontally polarized. The ground constants were set based on the electrical properties of the soil at Delano acquired by SRI International [6]. The power into the antenna was set at 25 MW or 100 times greater than the 250 kW into the VOA antennas to compensate for the lack of gain of the dipole relative to a rhombic antenna. The electric field near ground parallel to this imaginary vertical dipole was calculated to be 1.86 V/m and the electric field parallel to the horizontal dipole was 0.00876 V/m.

Here, the vertically polarized component propagates 212 times (46.5 dB) more successfully as a ground wave. So, weak vertical field components such as those slightly below the plane and off to the side of horizontally oriented antennas can become dominant near ground. It is interesting to note that rhombic antennas, curtain antennas, as well as simple horizontal dipoles are strictly horizontally polarized only in certain directions. For the horizontal dipole, finite vertical components exist in directions which are not in the horizontal plane of the antenna and not in the vertical plane intersecting the main beam. This is because the electric field vector is transverse or perpendicular to the direction of propagation away from a transmitting antenna, this transverse direction is only horizontal at certain special directions of propagation for horizontal antennas.

8.5 RETROSPECTIVE ANALYSIS

The operating schedule for the VOA facility at Delano changes regularly. The frequency of operation of any antenna may be changed to meet varying demands of programming, propagation conditions, and frequency coordination. Therefore, the field strengths measured during this field study are not the same as those due to past or future operations at VOA. Copies of the operating schedules back to 1975 for the Delano site were supplied by VOA. Either measuring or modeling the fields for all past operations at Delano could rigorously determine the fields in McFarland in the past. Neither is feasible or necessary. A reasonable approach is to examine the modeling results for trends in the peak ground-level field strength as a function of known antenna characteristics. Then, based on these trends, selectively model past operations at Delano that are expected to create relatively high fields.

Antenna characteristics which are most relevant for the rhombic antennas are the frequency and the electrical length of one of the four sides of the antenna. The electrical length is the length measured in wavelengths. For example, at a frequency of

10 MHz, the wavelength is 30 meters; if the side length were 120 meters then the electrical length would be 4.00 wavelengths. Table 4 shows the frequency, electrical length, and peak ground-level electric field at 10 km for seven rhombic antenna models.

TABLE 4. MODEL RESULTS FOR RHOMBIC ANTENNAS

Rhombic Antenna	Frequency (MHz)	Electrical Length (wavelengths)	Peak Ground Level E Field at 10 km (mV/m)
R-10	6.155	6.07	72
R-03	9.765	4.22	46
R-02	9.815	3.39	40
R-03	11.74	5.07	47
R-10	21.57	21.3	50
R-02	17.765	6.13	22
R-10	11.8	11.63	92

The table entries at 6.155, 9.765, 9.815, and 11.74 MHz correspond to the operation during the field measurements; the results for these models were given in Figures 20 to 23. The entries at 21.57 and 17.765 MHz correspond to the highest past operating frequency and greatest electrical length for the R-10 and R-02 antennas. The results for these two models are given in Figures 25 and 26. It is apparent that, up to some frequency the peak field increases with electrical length, then begins to decrease with frequency possibly due to ground losses which increase with frequency or due to dividing the radiated power into an increasing number of lobes.

An approach to finding the frequency at which the field is a maximum is to examine the main beam gain of the antenna. Calculated data on this gain was supplied by VOA. At frequencies where the gain is a minimum, the lobes that cause the ground-level fields may be stronger. A gain minimum occurs at 11.8 MHz for rhombic R-10; the largest ground-level field of 0.092 V/m was calculated for a model at this frequency. This frequency was not used for scheduled operation of R-10 (so no graph is presented), but may represent the worst-case possible operation of the VOA site in terms of causing the highest field in McFarland. The equivalent power density for this field is 2.2 nW/cm^2. The maximum measured power density was 1.3 nW/cm^2. Thus, there is no indication from these calculations that any operation of the rhombic antennas could generate significantly higher fields in McFarland than those already measured.

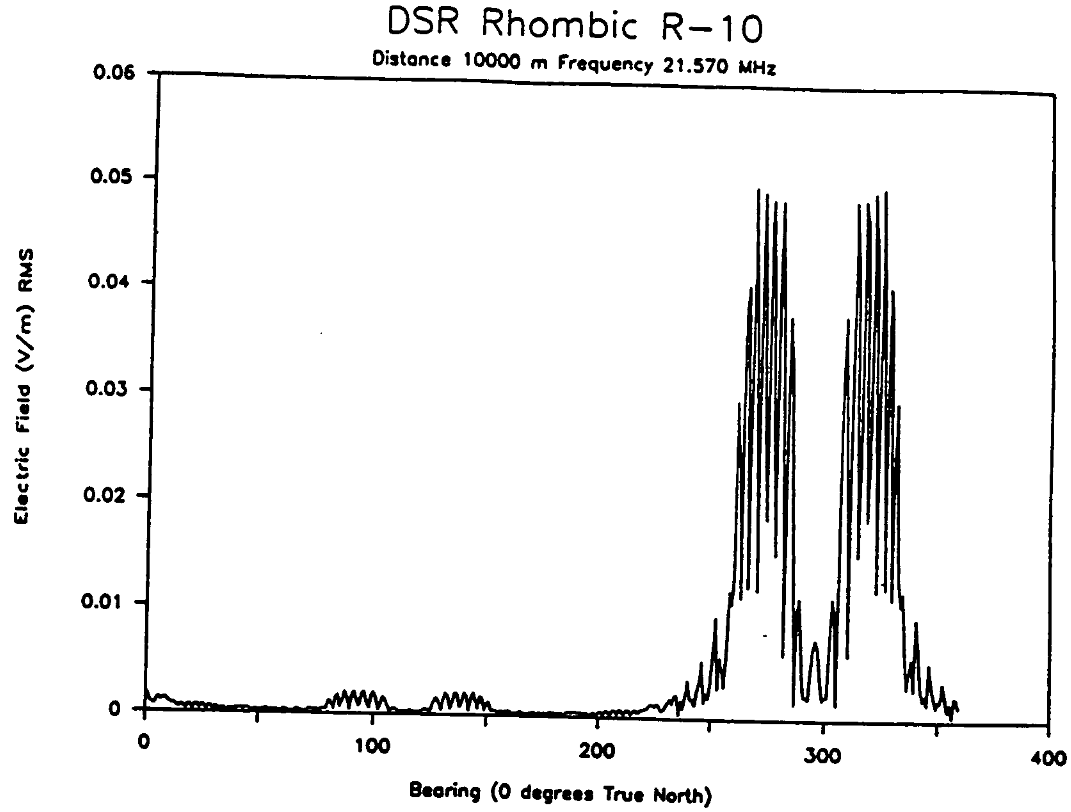


Figure 25. Calculated Electric Field for Rhombic R-10 at 21.57 MHz.

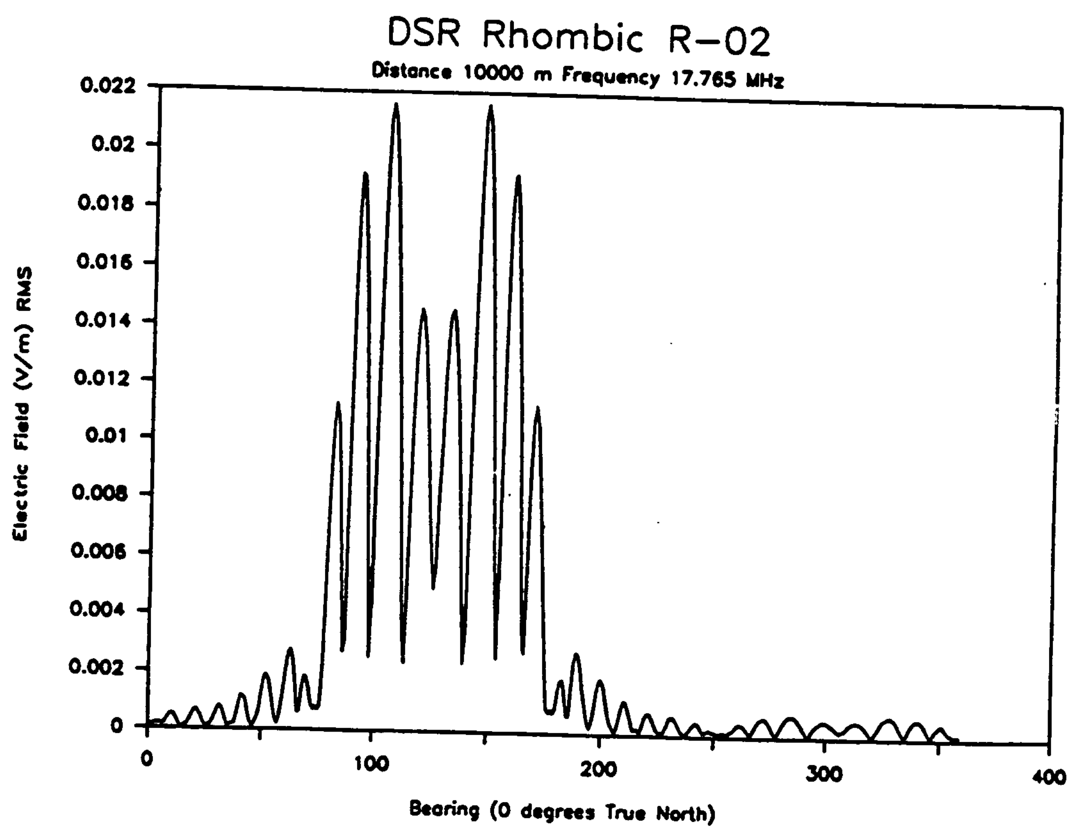


Figure 26. Calculated Electric Field for Rhombic R-02 at 17.765 MHz.

9. CONCLUSIONS

(1) Radiofrequency (RF) field measurements were made at six locations in the McFarland area, about six miles from the Voice of America (VOA) transmitter site in Delano. These measurements were made in the standard broadcast bands as well as at the frequencies used by VOA. The measurements show that the strongest RF fields in the McFarland area were from UHF television transmission. The field strengths are similar to those found in most urban areas and, thus, do not represent a departure from exposures commonly experienced by most people.

(2) The RF electric field near ground due to the largest rhombic antenna on the VOA site was measured continuously (at many intervals of distance) for five miles along a road between VOA and McFarland. This measurement was compared to the results of a numerical model for the antenna. Good agreement was found between the model result and the measurement; however, a difference of up to a factor of 10 in power density was not uncommon at any randomly chosen location.

(3) RF field measurements were made along the boundary of the VOA facility. The highest off-site field value measured in the survey was along this boundary (30 microwatts per square centimeter) and was due to one of the smaller rhombic antennas near the boundary. The induced RF current passing through the feet of a well-grounded individual was measured at this location. The measured RF current was in good agreement with the predicted current derived using previous research.

(4) The variations in time of RF fields at one location in McFarland were measured. The stability of fields from VOA and a local AM radio station were examined. The maximum field strength due to the VOA signals was stable; however, these signals oscillated in strength at times probably due to ionospheric reflections. The field strength due to the AM radio station changed at times, possibly due to unstable transmitter operation.

(5) Low-frequency amplitude modulation may be an important variable in evaluating the risk of RF exposure. This variable was measured for several RF signals. Modulation is dependent on the type of transmitter and does not in general depend on the particulars of any installation. The amount of modulation for one of the VOA signals was measured in McFarland. Further measurements were made for various types of signals after returning to the EPA laboratory. Of the principal signals measured in McFarland, UHF television stations as a class have the highest levels of modulation at

low frequencies. Sideband modulated signals similar to those transmitted by VOA, but in the direction away from McFarland, had greater values of amplitude modulation at low frequencies than the television signals.

(6) Numerical modeling of the VOA rhombic antennas at Delano was used to calculate the maximum power density in McFarland. The predicted result due to the routine operation of one of these antennas was 1.3 nanowatts per square centimeter. This value was in good agreement with measurements. A retrospective analysis using these models for previously scheduled operations at VOA did not result in calculated fields in McFarland greater than those generated by current operations.

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4. Gandhi, O.P., I. Chatterjee, D. Wu, and Y. Gu. Likelihood of High Rates of Energy Deposition in the Human Legs at the ANSI Recommended 3-30 MHz RF Safety Levels. Proceedings of the IEEE, Vol. 73, No. 6, June 1985, pp. 1145-1147.

5. NEC code available through Lawrence Livermore National Laboratory, Engineering Research Division, P.O. Box 5504, Livermore, California, 94550.

6. Hagn, G.H., Faulconer, J.H. HF Ground Constants at the Voice of America (VOA) Station at Delano, California. SRI International, Arlington, VA. July 1985.

APPENDIX A
UNITS OF MEASUREMENT

Various units of measurement are used throughout this report. This tutorial cannot substitute for a course in circuits and electromagnetic theory, but should clarify some of the conventions which have come to be standard practice in electromagnetics measurements and are inevitably used throughout a report of this type.

We hope that the analogy between physical quantities in electrical circuits and in electromagnetic waves will help bridge the gap between the two.

A.1 CIRCUITS

Three basic quantities are of common interest in electrical circuits: (1) the electric potential difference or voltage symbolized by V and measured in volts, (2) the current, I, measured in units of amperes (amps), and (3) the power, P, measured in watts. Electric charge is a basic property of matter; electrons are the negatively charged particles, which under the influence of an applied voltage, produce a current flow in electric circuits. The current is the amount of charge (number of electrons) per unit time passing through a conductor in a circuit; the voltage (similar to pressure in hydraulics) is the amount of work required to move a unit charge between two terminals in a circuit; and finally, the power is the work per unit time expended in a circuit and is the product of the current and voltage. The impedance of a circuit is defined by the ratio of the voltage to the current and is measured in ohms.

For the circuits of interest here the impedance is 50 ohms; the power is equal to the voltage squared divided by 50 ohms or: $P(\text{watts})=V(\text{volts})^2/50$ ohms.

A.2 FIELDS

The distribution and motion of charge creates forces on other charges which may be present. The amount of force per unit charge at a point is called the field strength at that point. If the force is due only to the static position of other charges, the field is called the electric field. If the force is due only to relative motion of the charges, then the field is called the magnetic field. Since the voltage across a circuit is due to the static distribution of charge in the circuit, the electric field near a circuit is proportional to the voltage across the circuit. The electric field E is measured in volts/meter (V/m). Since the current in a circuit is due to the motion of charge in the circuit, the magnetic field near a circuit is proportional to the current in the circuit. The magnetic field H is measured in amperes/meter (A/m).

A.3 RADIATION

Electromagnetic radiation is possible because of the limited speed of light. If a charge is placed at a point in space, its presence or field cannot be detected at another point until the time required for light to propagate between the two points has passed. Similarly, if the source charge is moved rapidly the changes in the field due to the motion must move away from the charge at the speed of light. These field changes can break away from the charge and radiate to form an electromagnetic wave. This wave consists of electric and magnetic fields which are transverse to the direction of propagation and perpendicular to each other.

A.4 FREQUENCY AND WAVELENGTH

If a source charge of an electromagnetic wave moves back and forth regularly or oscillates in time, the wave propagating away from the charge at the speed of light will oscillate at the same rate as the source charge. This rate of oscillation in units of cycles per second or hertz (Hz) is called the frequency. The distance between crests in this wave is called the wavelength and is given by the speed of light divided by the frequency. Most frequencies are expressed in this report in units of megahertz (MHz) or millions of cycles per second. The speed of light is 300,000,000 meters per second; this speed may be expressed as 300 MHz meters. So, for example the wavelength for a 300 MHz wave is 1 meter, and the wavelength for a 10 MHz wave is 30 meters.

A.5 POWER DENSITY AND WAVE IMPEDANCE

A transmitting antenna is a designed to radiate efficiently and control the directional propagation of this radiation. For a wave far (many wavelengths) from the source in free space, the electric and magnetic field directions are transverse to the direction of propagation and the power passing through a unit area is given by the product of the electric and magnetic field and is called the power density S in watts/meter^2 (W/m^2). Under these conditions, the ratio of the electric to the magnetic field is called the "free space wave impedance" and has a value of 377 ohms. During environmental measurements the electric and magnetic fields do not normally have a simple relationship, and the value of the ratio is called the "wave impedance" and can be far from 377 ohms. Either the electric or magnetic field is measured, the true power density is neither measured nor desired. However, in order to compare all measurements in a single unit for both the electric and magnetic field, the fields are converted to the power density which would exist in a free space wave by assuming a wave impedance of 377 ohms. This is called the "equivalent far field power density" or simply "power density". The formulas for equivalent power density from the electric or magnetic field are $S(W/m^2) = E(V/m)^2/377$ ohms and $S(W/m^2) = H(A/m)^2(377$ ohms$)$. For similar reasons, magnetic field measurements in amps/meter are often converted to the electric field which would exist in free space by multiplying the value in amps/meter by 377 ohms to give the "equivalent" electric field in volts/meter.

A.6 ANTENNA FACTORS

Receiving antennas are sensors that detect fields by allowing the field to induce current or voltage in a circuit. Loop receiving antennas generate a voltage proportional to the magnetic field and linear antennas generate a voltage proportional to the electric field. The constant of proportionality which allows the field to be calculated from the voltage is the "antenna factor". These antenna factors are a function of frequency and are determined by calibration with the antenna connected to a 50 ohm impedance circuit. The antenna factors for the magnetic loop antennas are used to convert from voltage to "equivalent" electric field assuming a 377 ohm wave impedance. The antenna factor is in units of reciprocal meters (m^{-1} or 1/m) and may be considered the reciprocal of the effective length of the antenna. The effective length is generally less than the physical length of an antenna and is sometimes used instead of antenna factor.

A.7 METRIC SCALING

The size of a unit may be changed to avoid scientific notation. A prefix is used to change the scale by factors of ten. The prefixes used in this report are listed below.

Prefix (abbreviation)	Factor
giga (G)	10^{9}
mega (M)	10^{6}
kilo (k)	10^{3}
centi(c)	10^{-2}
milli(m)	10^{-3}
micro(μ)	10^{-6}
nano(n)	10^{-9}
pico(p)	10^{-12}

Using these factors, one can see that for magnetic fields 1 mA/m =0.001 A/m, and for power density 1 nW/cm^2 = 10^{-6} mW/cm^2 and 1 mW/cm^2 = 10 W/m^2.

A.8 LOGARITHMIC SCALING (dB)

Electrical engineers use logarithmic scaling or decibel units to show large ranges of electrical quantities on a single scale and to avoid changing units. The decibel (dB) may indicate a ratio only or may be defined with respect to any physical unit. The ratio of two powers or power densities in dB is given by: 10 $\log_{10}$ of the ratio. In order to keep the same ratio in dB for any electrical quantity in a given circuit; voltage, current, and field ratios in dB are given by 20 $\log_{10}$ of the ratio. The factor of 20 instead of 10 is used because the power or power density is proportional to the square of the voltage, current, or field. For example, 20 dB indicates a power or power density ratio of 100 and a voltage or field ratio of 10. If the ratio is taken with respect to a fixed unit, for example, milliwatts (mW), then a suffix is placed after the dB and the value, here in dBm for dB with respect to a milliwatt indicates an absolute value of power. The spectrum analyzer output is normally in units of power in dBm which are defined by $P(dBm) = 10\log_{10}P(mW)$. Field (electric and magnetic) is often specified in dB with respect to a μV/m or dBμV/m and is defined by $E(dB\mu V/m) = 20\log_{10}E(\mu V/m)$ with the magnetic field converted to "equivalent" electric field units. Antenna factor (AF) is generally specified as dB/m or simply dB and may be added to the voltage (V) in dBμV to give the field in dBμV/m. However, since the spectrum analyzer output is power in dBm this can be converted using the 50 ohm impedance to dBμV by adding 107 dBμV/mW.

A.9 SAMPLE CALCULATION

To show the calculations involved in going from a spectrum analyzer reading of power in dBm to power density, given an antenna factor, use:
E or $H(dB\mu V/m)=AF(dB/m)+P(dBm)+107\ dB\mu V/mW$ to obtain the field in dBμV/m. Convert to V/m by using $E(V/m)=[10^{E(dB\mu V/m)/20}]/10^6$ and convert to power density in W/m^2 by using $S(W/m^2)=E(V/m)^2/377$ ohms. Note that 10 to a power is the inverse of the log function. Common power density units in this report are nW/cm^2, to convert use $S(nW/cm^2)=S(W/m^2)(10^5)$.

APPENDIX B
NUMERICAL ELECTROMAGNETICS CODE OUTPUT FOR RHOMBIC R-10

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NUMERICAL ELECTROMAGNETICS CODE (NEC-3)

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- - - - COMMENTS - - - -

RHOMBIC R10 AT VOA
CO-ORDINATES TAKEN FROM CENTER OF RHOMBIC
READING LEFT TO RIGHT AT 0 DEGREES
FREQUENCY 6.155 mHz AT 250 kW
****RHOMR10A****

- - - STRUCTURE SPECIFICATION - - -

COORDINATES MUST BE INPUT IN
METERS OR BE SCALED TO METERS
BEFORE STRUCTURE INPUT IS ENDED

WIRE NO.	X1	Y1	Z1	X2	Y2	Z2	RADIUS	NO. OF SEG.	FIRST SEG.	LAST SEG.	TAG NO.
1	-268.44000	0.00000	54.03000	0.00000	109.59500	54.03000	0.01000	60	1	60	1
2	0.00000	109.59500	54.03000	268.44000	0.00000	54.03000	0.01000	60	61	120	2
3	268.44000	0.00000	54.03000	0.00000	-109.59500	54.03000	0.01000	60	121	180	3
4	0.00000	-109.59500	54.03000	-268.44000	0.00000	54.03000	0.01000	60	181	240	4

THE STRUCTURE HAS BEEN MOVED, MOVE DATA CARD IS -
0 0 0.00000 0.00000 -26.00000 0.00000 0.00000 0.00000 0.00000

TOTAL SEGMENTS USED= 240 NO. SEG. IN A SYMMETRIC CELL= 240 SYMMETRY FLAG= 0

- MULTIPLE WIRE JUNCTIONS -

JUNCTION SEGMENTS (- FOR END 1, + FOR END 2)
NONE

- - - - SEGMENTATION DATA - - - -

COORDINATES IN METERS

I+ AND I- INDICATE THE SEGMENTS BEFORE AND AFTER I

SEG. COORDINATES OF SEG. CENTER SEG. ORIENTATION ANGLES WIRE CONNECTION DATA TAG

NO.	X	Y	Z	LENGTH	ALPHA	BETA	RADIUS	I-	I	I+	NO.
1	-238.86131	117.51658	54.03000	4.83250	0.00000	-3.79146	0.01000	240	1	2	1
2	-234.03938	117.19703	54.03000	4.83250	0.00000	-3.79146	0.01000	1	2	3	1
3	-229.21746	116.87747	54.03000	4.83250	0.00000	-3.79146	0.01000	2	3	4	1
4	-224.39553	116.55792	54.03000	4.83250	0.00000	-3.79146	0.01000	3	4	5	1
5	-219.57361	116.23837	54.03000	4.83250	0.00000	-3.79146	0.01000	4	5	6	1
6	-214.75168	115.91882	54.03000	4.83250	0.00000	-3.79146	0.01000	5	6	7	1
7	-209.92975	115.59927	54.03000	4.83250	0.00000	-3.79146	0.01000	6	7	8	1
8	-205.10783	115.27972	54.03000	4.83250	0.00000	-3.79146	0.01000	7	8	9	1
9	-200.28590	114.96017	54.03000	4.83250	0.00000	-3.79146	0.01000	8	9	10	1
10	-195.46398	114.64062	54.03000	4.83250	0.00000	-3.79146	0.01000	9	10	11	1
11	-190.64205	114.32107	54.03000	4.83250	0.00000	-3.79146	0.01000	10	11	12	1
12	-185.82012	114.00152	54.03000	4.83250	0.00000	-3.79146	0.01000	11	12	13	1
13	-180.99820	113.68197	54.03000	4.83250	0.00000	-3.79146	0.01000	12	13	14	1
14	-176.17627	113.36242	54.03000	4.83250	0.00000	-3.79146	0.01000	13	14	15	1
15	-171.35435	113.04287	54.03000	4.83250	0.00000	-3.79146	0.01000	14	15	16	1
16	-166.53242	112.72332	54.03000	4.83250	0.00000	-3.79146	0.01000	15	16	17	1
17	-161.71049	112.40377	54.03000	4.83250	0.00000	-3.79146	0.01000	16	17	18	1
18	-156.88857	112.08422	54.03000	4.83250	0.00000	-3.79146	0.01000	17	18	19	1
19	-152.06664	111.76467	54.03000	4.83250	0.00000	-3.79146	0.01000	18	19	20	1
20	-147.24472	111.44512	54.03000	4.83250	0.00000	-3.79146	0.01000	19	20	21	1
21	-142.42279	111.12557	54.03000	4.83250	0.00000	-3.79146	0.01000	20	21	22	1
22	-137.60086	110.80602	54.03000	4.83250	0.00000	-3.79146	0.01000	21	22	23	1
23	-132.77894	110.48647	54.03000	4.83250	0.00000	-3.79146	0.01000	22	23	24	1
24	-127.95701	110.16692	54.03000	4.83250	0.00000	-3.79146	0.01000	23	24	25	1
25	-123.13509	109.84737	54.03000	4.83250	0.00000	-3.79146	0.01000	24	25	26	1
26	-118.31316	109.52782	54.03000	4.83250	0.00000	-3.79146	0.01000	25	26	27	1
27	-113.49123	109.20827	54.03000	4.83250	0.00000	-3.79146	0.01000	26	27	28	1
28	-108.66931	108.88872	54.03000	4.83250	0.00000	-3.79146	0.01000	27	28	29	1
29	-103.84738	108.56917	54.03000	4.83250	0.00000	-3.79146	0.01000	28	29	30	1
30	-99.02546	108.24962	54.03000	4.83250	0.00000	-3.79146	0.01000	29	30	31	1
31	-94.20353	107.93007	54.03000	4.83250	0.00000	-3.79146	0.01000	30	31	32	1
32	-89.38160	107.61052	54.03000	4.83250	0.00000	-3.79146	0.01000	31	32	33	1
33	-84.55968	107.29097	54.03000	4.83250	0.00000	-3.79146	0.01000	32	33	34	1
34	-79.73775	106.97142	54.03000	4.83250	0.00000	-3.79146	0.01000	33	34	35	1
35	-74.91583	106.65187	54.03000	4.83250	0.00000	-3.79146	0.01000	34	35	36	1
36	-70.09390	106.33232	54.03000	4.83250	0.00000	-3.79146	0.01000	35	36	37	1
37	-65.27198	106.01277	54.03000	4.83250	0.00000	-3.79146	0.01000	36	37	38	1
38	-60.45005	105.69321	54.03000	4.83250	0.00000	-3.79146	0.01000	37	38	39	1
39	-55.62812	105.37366	54.03000	4.83250	0.00000	-3.79146	0.01000	38	39	40	1
40	-50.80620	105.05411	54.03000	4.83250	0.00000	-3.79146	0.01000	39	40	41	1
41	-45.98427	104.73456	54.03000	4.83250	0.00000	-3.79146	0.01000	40	41	42	1
42	-41.16235	104.41501	54.03000	4.83250	0.00000	-3.79146	0.01000	41	42	43	1
43	-36.34042	104.09546	54.03000	4.83250	0.00000	-3.79146	0.01000	42	43	44	1
44	-31.51849	103.77591	54.03000	4.83250	0.00000	-3.79146	0.01000	43	44	45	1
45	-26.69657	103.45636	54.03000	4.83250	0.00000	-3.79146	0.01000	44	45	46	1
46	-21.87464	103.13681	54.03000	4.83250	0.00000	-3.79146	0.01000	45	46	47	1
47	-17.05272	102.81726	54.03000	4.83250	0.00000	-3.79146	0.01000	46	47	48	1
48	-12.23079	102.49771	54.03000	4.83250	0.00000	-3.79146	0.01000	47	48	49	1
49	-7.40886	102.17816	54.03000	4.83250	0.00000	-3.79146	0.01000	48	49	50	1
50	-2.58694	101.85861	54.03000	4.83250	0.00000	-3.79146	0.01000	49	50	51	1
51	2.23499	101.53906	54.03000	4.83250	0.00000	-3.79146	0.01000	50	51	52	1
52	7.05691	101.21951	54.03000	4.83250	0.00000	-3.79146	0.01000	51	52	53	1
53	11.87884	100.89996	54.03000	4.83250	0.00000	-3.79146	0.01000	52	53	54	1
54	16.70077	100.58041	54.03000	4.83250	0.00000	-3.79146	0.01000	53	54	55	1
55	21.52269	100.26086	54.03000	4.83250	0.00000	-3.79146	0.01000	54	55	56	1
56	26.34462	99.94131	54.03000	4.83250	0.00000	-3.79146	0.01000	55	56	57	1
57	31.16654	99.62176	54.03000	4.83250	0.00000	-3.79146	0.01000	56	57	58	1
58	35.98847	99.30221	54.03000	4.83250	0.00000	-3.79146	0.01000	57	58	59	1
59	40.81040	98.98266	54.03000	4.83250	0.00000	-3.79146	0.01000	58	59	60	1

60	45.63232	98.66311	54.03000	4.83250	0.00000	-3.79146	0.01000	59	60	61	1
61	49.65353	96.70184	54.03000	4.83250	0.00000	-48.20854	0.01000	60	61	62	2
62	52.87401	93.09884	54.03000	4.83250	0.00000	-48.20854	0.01000	61	62	63	2
63	56.09449	89.49585	54.03000	4.83250	0.00000	-48.20854	0.01000	62	63	64	2
64	59.31498	85.89285	54.03000	4.83250	0.00000	-48.20854	0.01000	63	64	65	2
65	62.53546	82.28986	54.03000	4.83250	0.00000	-48.20854	0.01000	64	65	66	2
66	65.75594	78.68686	54.03000	4.83250	0.00000	-48.20854	0.01000	65	66	67	2
67	68.97643	75.08387	54.03000	4.83250	0.00000	-48.20854	0.01000	66	67	68	2
68	72.19691	71.48087	54.03000	4.83250	0.00000	-48.20854	0.01000	67	68	69	2
69	75.41739	67.87788	54.03000	4.83250	0.00000	-48.20854	0.01000	68	69	70	2
70	78.63788	64.27488	54.03000	4.83250	0.00000	-48.20854	0.01000	69	70	71	2
71	81.85836	60.67189	54.03000	4.83250	0.00000	-48.20854	0.01000	70	71	72	2
72	85.07884	57.06889	54.03000	4.83250	0.00000	-48.20854	0.01000	71	72	73	2
73	88.29932	53.46590	54.03000	4.83250	0.00000	-48.20854	0.01000	72	73	74	2
74	91.51981	49.86290	54.03000	4.83250	0.00000	-48.20854	0.01000	73	74	75	2
75	94.74029	46.25991	54.03000	4.83250	0.00000	-48.20854	0.01000	74	75	76	2
76	97.96077	42.65692	54.03000	4.83250	0.00000	-48.20854	0.01000	75	76	77	2
77	101.18126	39.05392	54.03000	4.83250	0.00000	-48.20854	0.01000	76	77	78	2
78	104.40174	35.45093	54.03000	4.83250	0.00000	-48.20854	0.01000	77	78	79	2
79	107.62222	31.84793	54.03000	4.83250	0.00000	-48.20854	0.01000	78	79	80	2
80	110.84271	28.24494	54.03000	4.83250	0.00000	-48.20854	0.01000	79	80	81	2
81	114.06319	24.64194	54.03000	4.83250	0.00000	-48.20854	0.01000	80	81	82	2
82	117.28367	21.03895	54.03000	4.83250	0.00000	-48.20854	0.01000	81	82	83	2
83	120.50416	17.43595	54.03000	4.83250	0.00000	-48.20854	0.01000	82	83	84	2
84	123.72464	13.83296	54.03000	4.83250	0.00000	-48.20854	0.01000	83	84	85	2
85	126.94512	10.22996	54.03000	4.83250	0.00000	-48.20854	0.01000	84	85	86	2
86	130.16561	6.62697	54.03000	4.83250	0.00000	-48.20854	0.01000	85	86	87	2
87	133.38609	3.02397	54.03000	4.83250	0.00000	-48.20854	0.01000	86	87	88	2
88	136.60657	-0.57902	54.03000	4.83250	0.00000	-48.20854	0.01000	87	88	89	2
89	139.82706	-4.18202	54.03000	4.83250	0.00000	-48.20854	0.01000	88	89	90	2
90	143.04754	-7.78501	54.03000	4.83250	0.00000	-48.20854	0.01000	89	90	91	2
91	146.26802	-11.38801	54.03000	4.83250	0.00000	-48.20854	0.01000	90	91	92	2
92	149.48850	-14.99100	54.03000	4.83250	0.00000	-48.20854	0.01000	91	92	93	2
93	152.70899	-18.59400	54.03000	4.83250	0.00000	-48.20854	0.01000	92	93	94	2
94	155.92947	-22.19699	54.03000	4.83250	0.00000	-48.20854	0.01000	93	94	95	2
95	159.14995	-25.79998	54.03000	4.83250	0.00000	-48.20854	0.01000	94	95	96	2
96	162.37044	-29.40298	54.03000	4.83250	0.00000	-48.20854	0.01000	95	96	97	2
97	165.59092	-33.00597	54.03000	4.83250	0.00000	-48.20854	0.01000	96	97	98	2
98	168.81140	-36.60897	54.03000	4.83250	0.00000	-48.20854	0.01000	97	98	99	2
99	172.03189	-40.21196	54.03000	4.83250	0.00000	-48.20854	0.01000	98	99	100	2
100	175.25237	-43.81496	54.03000	4.83250	0.00000	-48.20854	0.01000	99	100	101	2
101	178.47285	-47.41795	54.03000	4.83250	0.00000	-48.20854	0.01000	100	101	102	2
102	181.69334	-51.02095	54.03000	4.83250	0.00000	-48.20854	0.01000	101	102	103	2
103	184.91382	-54.62394	54.03000	4.83250	0.00000	-48.20854	0.01000	102	103	104	2
104	188.13430	-58.22694	54.03000	4.83250	0.00000	-48.20854	0.01000	103	104	105	2
105	191.35479	-61.82993	54.03000	4.83250	0.00000	-48.20854	0.01000	104	105	106	2
106	194.57527	-65.43293	54.03000	4.83250	0.00000	-48.20854	0.01000	105	106	107	2
107	197.79575	-69.03592	54.03000	4.83250	0.00000	-48.20854	0.01000	106	107	108	2
108	201.01623	-72.63892	54.03000	4.83250	0.00000	-48.20854	0.01000	107	108	109	2
109	204.23672	-76.24191	54.03000	4.83250	0.00000	-48.20854	0.01000	108	109	110	2
110	207.45720	-79.84491	54.03000	4.83250	0.00000	-48.20854	0.01000	109	110	111	2
111	210.67768	-83.44790	54.03000	4.83250	0.00000	-48.20854	0.01000	110	111	112	2
112	213.89817	-87.05090	54.03000	4.83250	0.00000	-48.20854	0.01000	111	112	113	2
113	217.11865	-90.65389	54.03000	4.83250	0.00000	-48.20854	0.01000	112	113	114	2
114	220.33913	-94.25688	54.03000	4.83250	0.00000	-48.20854	0.01000	113	114	115	2
115	223.55962	-97.85988	54.03000	4.83250	0.00000	-48.20854	0.01000	114	115	116	2
116	226.78010	-101.46287	54.03000	4.83250	0.00000	-48.20854	0.01000	115	116	117	2
117	230.00058	-105.06587	54.03000	4.83250	0.00000	-48.20854	0.01000	116	117	118	2
118	233.22107	-108.66886	54.03000	4.83250	0.00000	-48.20854	0.01000	117	118	119	2
119	236.44155	-112.27186	54.03000	4.83250	0.00000	-48.20854	0.01000	118	119	120	2

120	239.66203	-115.87485	54.03000	4.83250	0.00000	-48.20854	0.01000	119	120	121	2
121	238.86131	-117.51658	54.03000	4.83250	0.00000	176.20854	0.01000	120	121	122	3
122	234.03938	-117.19703	54.03000	4.83250	0.00000	176.20854	0.01000	121	122	123	3
123	229.21746	-116.87747	54.03000	4.83250	0.00000	176.20854	0.01000	122	123	124	3
124	224.39553	-116.55792	54.03000	4.83250	0.00000	176.20854	0.01000	123	124	125	3
125	219.57361	-116.23837	54.03000	4.83250	0.00000	176.20854	0.01000	124	125	126	3
126	214.75168	-115.91882	54.03000	4.83250	0.00000	176.20854	0.01000	125	126	127	3
127	209.92975	-115.59927	54.03000	4.83250	0.00000	176.20854	0.01000	126	127	128	3
128	205.10783	-115.27972	54.03000	4.83250	0.00000	176.20854	0.01000	127	128	129	3
129	200.28590	-114.96017	54.03000	4.83250	0.00000	176.20854	0.01000	128	129	130	3
130	195.46398	-114.64062	54.03000	4.83250	0.00000	176.20854	0.01000	129	130	131	3
131	190.64205	-114.32107	54.03000	4.83250	0.00000	176.20854	0.01000	130	131	132	3
132	185.82012	-114.00152	54.03000	4.83250	0.00000	176.20854	0.01000	131	132	133	3
133	180.99820	-113.68197	54.03000	4.83250	0.00000	176.20854	0.01000	132	133	134	3
134	176.17627	-113.36242	54.03000	4.83250	0.00000	176.20854	0.01000	133	134	135	3
135	171.35435	-113.04287	54.03000	4.83250	0.00000	176.20854	0.01000	134	135	136	3
136	166.53242	-112.72332	54.03000	4.83250	0.00000	176.20854	0.01000	135	136	137	3
137	161.71049	-112.40377	54.03000	4.83250	0.00000	176.20854	0.01000	136	137	138	3
138	156.88857	-112.08422	54.03000	4.83250	0.00000	176.20854	0.01000	137	138	139	3
139	152.06664	-111.76467	54.03000	4.83250	0.00000	176.20854	0.01000	138	139	140	3
140	147.24472	-111.44512	54.03000	4.83250	0.00000	176.20854	0.01000	139	140	141	3
141	142.42279	-111.12557	54.03000	4.83250	0.00000	176.20854	0.01000	140	141	142	3
142	137.60086	-110.80602	54.03000	4.83250	0.00000	176.20854	0.01000	141	142	143	3
143	132.77894	-110.48647	54.03000	4.83250	0.00000	176.20854	0.01000	142	143	144	3
144	127.95701	-110.16692	54.03000	4.83250	0.00000	176.20854	0.01000	143	144	145	3
145	123.13509	-109.84737	54.03000	4.83250	0.00000	176.20854	0.01000	144	145	146	3
146	118.31316	-109.52782	54.03000	4.83250	0.00000	176.20854	0.01000	145	146	147	3
147	113.49123	-109.20827	54.03000	4.83250	0.00000	176.20854	0.01000	146	147	148	3
148	108.66931	-108.88872	54.03000	4.83250	0.00000	176.20854	0.01000	147	148	149	3
149	103.84738	-108.56917	54.03000	4.83250	0.00000	176.20854	0.01000	148	149	150	3
150	99.02546	-108.24962	54.03000	4.83250	0.00000	176.20854	0.01000	149	150	151	3
151	94.20353	-107.93007	54.03000	4.83250	0.00000	176.20854	0.01000	150	151	152	3
152	89.38160	-107.61052	54.03000	4.83250	0.00000	176.20854	0.01000	151	152	153	3
153	84.55968	-107.29097	54.03000	4.83250	0.00000	176.20854	0.01000	152	153	154	3
154	79.73775	-106.97142	54.03000	4.83250	0.00000	176.20854	0.01000	153	154	155	3
155	74.91583	-106.65187	54.03000	4.83250	0.00000	176.20854	0.01000	154	155	156	3
156	70.09390	-106.33232	54.03000	4.83250	0.00000	176.20854	0.01000	155	156	157	3
157	65.27198	-106.01277	54.03000	4.83250	0.00000	176.20854	0.01000	156	157	158	3
158	60.45005	-105.69321	54.03000	4.83250	0.00000	176.20854	0.01000	157	158	159	3
159	55.62812	-105.37366	54.03000	4.83250	0.00000	176.20854	0.01000	158	159	160	3
160	50.80620	-105.05411	54.03000	4.83250	0.00000	176.20854	0.01000	159	160	161	3
161	45.98427	-104.73456	54.03000	4.83250	0.00000	176.20854	0.01000	160	161	162	3
162	41.16235	-104.41501	54.03000	4.83250	0.00000	176.20854	0.01000	161	162	163	3
163	36.34042	-104.09546	54.03000	4.83250	0.00000	176.20854	0.01000	162	163	164	3
164	31.51849	-103.77591	54.03000	4.83250	0.00000	176.20854	0.01000	163	164	165	3
165	26.69657	-103.45636	54.03000	4.83250	0.00000	176.20854	0.01000	164	165	166	3
166	21.87464	-103.13681	54.03000	4.83250	0.00000	176.20854	0.01000	165	166	167	3
167	17.05272	-102.81726	54.03000	4.83250	0.00000	176.20854	0.01000	166	167	168	3
168	12.23079	-102.49771	54.03000	4.83250	0.00000	176.20854	0.01000	167	168	169	3
169	7.40886	-102.17816	54.03000	4.83250	0.00000	176.20854	0.01000	168	169	170	3
170	2.58694	-101.85861	54.03000	4.83250	0.00000	176.20854	0.01000	169	170	171	3
171	-2.23499	-101.53906	54.03000	4.83250	0.00000	176.20854	0.01000	170	171	172	3
172	-7.05691	-101.21951	54.03000	4.83250	0.00000	176.20854	0.01000	171	172	173	3
173	-11.87884	-100.89996	54.03000	4.83250	0.00000	176.20854	0.01000	172	173	174	3
174	-16.70077	-100.58041	54.03000	4.83250	0.00000	176.20854	0.01000	173	174	175	3
175	-21.52269	-100.26086	54.03000	4.83250	0.00000	176.20854	0.01000	174	175	176	3
176	-26.34462	-99.94131	54.03000	4.83250	0.00000	176.20854	0.01000	175	176	177	3
177	-31.16654	-99.62176	54.03000	4.83250	0.00000	176.20854	0.01000	176	177	178	3
178	-35.98847	-99.30221	54.03000	4.83250	0.00000	176.20854	0.01000	177	178	179	3
179	-40.81040	-98.98266	54.03000	4.83250	0.00000	176.20854	0.01000	178	179	180	3

180	-45.63232	-98.66311	54.03000	4.83250	0.00000	176.20854	0.01000	179	180	181	3
181	-49.65353	-96.70184	54.03000	4.83250	0.00000	131.79146	0.01000	180	181	182	4
182	-52.87401	-93.09884	54.03000	4.83250	0.00000	131.79146	0.01000	181	182	183	4
183	-56.09449	-89.49585	54.03000	4.83250	0.00000	131.79146	0.01000	182	183	184	4
184	-59.31498	-85.89285	54.03000	4.83250	0.00000	131.79146	0.01000	183	184	185	4
185	-62.53546	-82.28986	54.03000	4.83250	0.00000	131.79146	0.01000	184	185	186	4
186	-65.75594	-78.68686	54.03000	4.83250	0.00000	131.79146	0.01000	185	186	187	4
187	-68.97643	-75.08387	54.03000	4.83250	0.00000	131.79146	0.01000	186	187	188	4
188	-72.19691	-71.48087	54.03000	4.83250	0.00000	131.79146	0.01000	187	188	189	4
189	-75.41739	-67.87788	54.03000	4.83250	0.00000	131.79146	0.01000	188	189	190	4
190	-78.63788	-64.27488	54.03000	4.83250	0.00000	131.79146	0.01000	189	190	191	4
191	-81.85836	-60.67189	54.03000	4.83250	0.00000	131.79146	0.01000	190	191	192	4
192	-85.07884	-57.06889	54.03000	4.83250	0.00000	131.79146	0.01000	191	192	193	4
193	-88.29932	-53.46590	54.03000	4.83250	0.00000	131.79146	0.01000	192	193	194	4
194	-91.51981	-49.86290	54.03000	4.83250	0.00000	131.79146	0.01000	193	194	195	4
195	-94.74029	-46.25991	54.03000	4.83250	0.00000	131.79146	0.01000	194	195	196	4
196	-97.96077	-42.65692	54.03000	4.83250	0.00000	131.79146	0.01000	195	196	197	4
197	-101.18126	-39.05392	54.03000	4.83250	0.00000	131.79146	0.01000	196	197	198	4
198	-104.40174	-35.45093	54.03000	4.83250	0.00000	131.79146	0.01000	197	198	199	4
199	-107.62222	-31.84793	54.03000	4.83250	0.00000	131.79146	0.01000	198	199	200	4
200	-110.84271	-28.24494	54.03000	4.83250	0.00000	131.79146	0.01000	199	200	201	4
201	-114.06319	-24.64194	54.03000	4.83250	0.00000	131.79146	0.01000	200	201	202	4
202	-117.28367	-21.03895	54.03000	4.83250	0.00000	131.79146	0.01000	201	202	203	4
203	-120.50416	-17.43595	54.03000	4.83250	0.00000	131.79146	0.01000	202	203	204	4
204	-123.72464	-13.83296	54.03000	4.83250	0.00000	131.79146	0.01000	203	204	205	4
205	-126.94512	-10.22996	54.03000	4.83250	0.00000	131.79146	0.01000	204	205	206	4
206	-130.16561	-6.62697	54.03000	4.83250	0.00000	131.79146	0.01000	205	206	207	4
207	-133.38609	-3.02397	54.03000	4.83250	0.00000	131.79146	0.01000	206	207	208	4
208	-136.60657	0.57902	54.03000	4.83250	0.00000	131.79146	0.01000	207	208	209	4
209	-139.82706	4.18202	54.03000	4.83250	0.00000	131.79146	0.01000	208	209	210	4
210	-143.04754	7.78501	54.03000	4.83250	0.00000	131.79146	0.01000	209	210	211	4
211	-146.26802	11.38801	54.03000	4.83250	0.00000	131.79146	0.01000	210	211	212	4
212	-149.48850	14.99100	54.03000	4.83250	0.00000	131.79146	0.01000	211	212	213	4
213	-152.70899	18.59400	54.03000	4.83250	0.00000	131.79146	0.01000	212	213	214	4
214	-155.92947	22.19699	54.03000	4.83250	0.00000	131.79146	0.01000	213	214	215	4
215	-159.14995	25.79998	54.03000	4.83250	0.00000	131.79146	0.01000	214	215	216	4
216	-162.37044	29.40298	54.03000	4.83250	0.00000	131.79146	0.01000	215	216	217	4
217	-165.59092	33.00597	54.03000	4.83250	0.00000	131.79146	0.01000	216	217	218	4
218	-168.81140	36.60897	54.03000	4.83250	0.00000	131.79146	0.01000	217	218	219	4
219	-172.03189	40.21196	54.03000	4.83250	0.00000	131.79146	0.01000	218	219	220	4
220	-175.25237	43.81496	54.03000	4.83250	0.00000	131.79146	0.01000	219	220	221	4
221	-178.47285	47.41795	54.03000	4.83250	0.00000	131.79146	0.01000	220	221	222	4
222	-181.69334	51.02095	54.03000	4.83250	0.00000	131.79146	0.01000	221	222	223	4
223	-184.91382	54.62394	54.03000	4.83250	0.00000	131.79146	0.01000	222	223	224	4
224	-188.13430	58.22694	54.03000	4.83250	0.00000	131.79146	0.01000	223	224	225	4
225	-191.35479	61.82993	54.03000	4.83250	0.00000	131.79146	0.01000	224	225	226	4
226	-194.57527	65.43293	54.03000	4.83250	0.00000	131.79146	0.01000	225	226	227	4
227	-197.79575	69.03592	54.03000	4.83250	0.00000	131.79146	0.01000	226	227	228	4
228	-201.01623	72.63892	54.03000	4.83250	0.00000	131.79146	0.01000	227	228	229	4
229	-204.23672	76.24191	54.03000	4.83250	0.00000	131.79146	0.01000	228	229	230	4
230	-207.45720	79.84491	54.03000	4.83250	0.00000	131.79146	0.01000	229	230	231	4
231	-210.67768	83.44790	54.03000	4.83250	0.00000	131.79146	0.01000	230	231	232	4
232	-213.89817	87.05090	54.03000	4.83250	0.00000	131.79146	0.01000	231	232	233	4
233	-217.11865	90.65389	54.03000	4.83250	0.00000	131.79146	0.01000	232	233	234	4
234	-220.33913	94.25688	54.03000	4.83250	0.00000	131.79146	0.01000	233	234	235	4
235	-223.55962	97.85988	54.03000	4.83250	0.00000	131.79146	0.01000	234	235	236	4
236	-226.78010	101.46287	54.03000	4.83250	0.00000	131.79146	0.01000	235	236	237	4
237	-230.00058	105.06587	54.03000	4.83250	0.00000	131.79146	0.01000	236	237	238	4
238	-233.22107	108.66886	54.03000	4.83250	0.00000	131.79146	0.01000	237	238	239	4
239	-236.44155	112.27186	54.03000	4.83250	0.00000	131.79146	0.01000	238	239	240	4

240-239.66203 115.87485 54.03000 4.83250 0.00000 131.79146 0.01000 239 240 1 4

***** DATA CARD NO.	1	EX	0	1	1	0	9.32922E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
***** DATA CARD NO.	2	EX	0	4	60	0	9.32922E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
***** DATA CARD NO.	3	FR	0	1	0	0	6.15500E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
***** DATA CARD NO.	4	LD	4	2	60	0	3.00000E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
***** DATA CARD NO.	5	LD	4	3	1	0	3.00000E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
***** DATA CARD NO.	6	GN	2	0	0	0	3.27492E+02	4.71250E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
***** DATA CARD NO.	7	NE	1	1	360	1	1.00000E+04	0.00000E+00	8.99942E+01	0.00000E+00	1.00000E+00	0.00000E+00

- - - - - - FREQUENCY - - - - - -

FREQUENCY= 6.1550E+00 MHZ
WAVELENGTH= 4.8708E+01 METERS

- - - STRUCTURE IMPEDANCE LOADING - - -

LOCATION ITAG	FROM	THRU	RESISTANCE OHMS	INDUCTANCE HENRYS	CAPACITANCE FARADS	IMPEDANCE (OHMS) REAL	IMAGINARY	CONDUCTIVITY MHOS/METER	TYPE
2	60	60				0.3000E+03			FIXED IMPEDANCE
3	1	1				0.3000E+03			FIXED IMPEDANCE

- - - ANTENNA ENVIRONMENT - - -

FINITE GROUND. SOMMERFELD SOLUTION
RELATIVE DIELECTRIC CONST.=327.492
CONDUCTIVITY= 4.713E-01 MHOS/METER
COMPLEX DIELECTRIC CONSTANT= 3.27492E+02-1.37627E+03

APPROXIMATE INTEGRATION EMPLOYED FOR SEGMENTS MORE THAN 48.708 METERS APART

- - - MATRIX TIMING - - -

FILL= 1823.070 SEC., FACTOR= 329.900 SEC.

- - - ANTENNA INPUT PARAMETERS - - -

TAG	SEG.	VOLTAGE (VOLTS)	CURRENT (AMPS)	IMPEDANCE (OHMS)	ADMITTANCE (MHOS)	POWER

NO.	NO.	REAL	IMAG.	REAL	IMAG.	REAL	IMAG.	REAL	IMAG.	(WATTS)
1	1	9.32922E+03	0.00000E+00	2.68046E+01	-1.57160E+00	3.46853E+02	2.03365E+01	2.87319E-03	-1.68460E-04	1.25033E+05
4	240	9.32922E+03	0.00000E+00	2.68046E+01	-1.57160E+00	3.46853E+02	2.03365E+01	2.87319E-03	-1.68460E-04	1.25033E+05

- - - CURRENTS AND LOCATION - - -

LENGTHS NORMALIZED BY WAVELENGTH (OR 2.*PI/CABS(K))

SEG.	TAG	COORD. OF SEG. CENTER			SEG.	- - - CURRENT (AMPS) - - -			
NO.	NO.	X	Y	Z	LENGTH	REAL	IMAG.	MAG.	PHASE
1	1	-4.9039	2.4127	1.1093	0.09921	2.6805E+01	-1.5716E+00	2.6851E+01	-3.355
2	1	-4.8049	2.4061	1.1093	0.09921	1.8255E+01	-1.4165E+01	2.3106E+01	-37.809
3	1	-4.7059	2.3995	1.1093	0.09921	4.0693E+00	-2.2228E+01	2.2597E+01	-79.626
4	1	-4.6069	2.3930	1.1093	0.09921	-1.0743E+01	-2.1568E+01	2.4095E+01	-116.478
5	1	-4.5079	2.3864	1.1093	0.09921	-2.0951E+01	-1.2940E+01	2.4625E+01	-148.300
6	1	-4.4089	2.3799	1.1093	0.09921	-2.3043E+01	2.4110E-01	2.3044E+01	179.401
7	1	-4.3099	2.3733	1.1093	0.09921	-1.6497E+01	1.3021E+01	2.1016E+01	141.716
8	1	-4.2109	2.3667	1.1093	0.09921	-3.9464E+00	2.0697E+01	2.1070E+01	100.795
9	1	-4.1119	2.3602	1.1093	0.09921	9.8220E+00	2.0522E+01	2.2752E+01	64.424
10	1	-4.0129	2.3536	1.1093	0.09921	1.9658E+01	1.2689E+01	2.3397E+01	32.842
11	1	-3.9139	2.3471	1.1093	0.09921	2.1951E+01	2.1803E-01	2.1952E+01	0.569
12	1	-3.8150	2.3405	1.1093	0.09921	1.5952E+01	-1.2185E+01	2.0074E+01	-37.375
13	1	-3.7160	2.3339	1.1093	0.09921	4.0152E+00	-1.9896E+01	2.0297E+01	-78.590
14	1	-3.6170	2.3274	1.1093	0.09921	-9.3117E+00	-2.0083E+01	2.2136E+01	-114.876
15	1	-3.5180	2.3208	1.1093	0.09921	-1.9006E+01	-1.2747E+01	2.2885E+01	-146.150
16	1	-3.4190	2.3142	1.1093	0.09921	-2.1452E+01	-6.9779E-01	2.1463E+01	-178.137
17	1	-3.3200	2.3077	1.1093	0.09921	-1.5782E+01	1.1523E+01	1.9540E+01	143.866
18	1	-3.2210	2.3011	1.1093	0.09921	-4.1792E+00	1.9341E+01	1.9787E+01	102.193
19	1	-3.1220	2.2946	1.1093	0.09921	8.9594E+00	1.9861E+01	2.1788E+01	65.720
20	1	-3.0230	2.2880	1.1093	0.09921	1.8688E+01	1.2937E+01	2.2729E+01	34.693
21	1	-2.9240	2.2814	1.1093	0.09921	2.1365E+01	1.2052E+00	2.1399E+01	3.229
22	1	-2.8250	2.2749	1.1093	0.09921	1.6017E+01	-1.0912E+01	1.9381E+01	-34.267
23	1	-2.7260	2.2683	1.1093	0.09921	4.6807E+00	-1.8875E+01	1.9447E+01	-76.072
24	1	-2.6270	2.2618	1.1093	0.09921	-8.3672E+00	-1.9720E+01	2.1421E+01	-112.992
25	1	-2.5280	2.2552	1.1093	0.09921	-1.8230E+01	-1.3162E+01	2.2485E+01	-144.171
26	1	-2.4290	2.2486	1.1093	0.09921	-2.1227E+01	-1.6889E+00	2.1294E+01	-175.451
27	1	-2.3300	2.2421	1.1093	0.09921	-1.6268E+01	1.0385E+01	1.9300E+01	147.449
28	1	-2.2310	2.2355	1.1093	0.09921	-5.2528E+00	1.8538E+01	1.9268E+01	105.820
29	1	-2.1320	2.2290	1.1093	0.09921	7.6601E+00	1.9736E+01	2.1171E+01	68.788
30	1	-2.0330	2.2224	1.1093	0.09921	1.7618E+01	1.3559E+01	2.2232E+01	37.582
31	1	-1.9340	2.2158	1.1093	0.09921	2.0900E+01	2.3449E+00	2.1032E+01	6.401
32	1	-1.8350	2.2093	1.1093	0.09921	1.6307E+01	-9.6942E+00	1.8971E+01	-30.731
33	1	-1.7360	2.2027	1.1093	0.09921	5.5975E+00	-1.8058E+01	1.8905E+01	-72.777
34	1	-1.6370	2.1962	1.1093	0.09921	-7.1799E+00	-1.9639E+01	2.0911E+01	-110.082
35	1	-1.5380	2.1896	1.1093	0.09921	-1.7220E+01	-1.3885E+01	2.2120E+01	-141.120
36	1	-1.4391	2.1830	1.1093	0.09921	-2.0765E+01	-2.9836E+00	2.0979E+01	-171.824
37	1	-1.3401	2.1765	1.1093	0.09921	-1.6513E+01	8.9595E+00	1.8787E+01	151.518
38	1	-1.2411	2.1699	1.1093	0.09921	-6.0946E+00	1.7471E+01	1.8504E+01	109.231
39	1	-1.1421	2.1634	1.1093	0.09921	6.5513E+00	1.9383E+01	2.0460E+01	71.325
40	1	-1.0431	2.1568	1.1093	0.09921	1.6664E+01	1.4013E+01	2.1773E+01	40.061
41	1	-0.9441	2.1502	1.1093	0.09921	2.0455E+01	3.4074E+00	2.0737E+01	9.458
42	1	-0.8451	2.1437	1.1093	0.09921	1.6525E+01	-8.4392E+00	1.8555E+01	-27.053
43	1	-0.7461	2.1371	1.1093	0.09921	6.3832E+00	-1.7086E+01	1.8240E+01	-69.515
44	1	-0.6471	2.1306	1.1093	0.09921	-6.1319E+00	-1.9314E+01	2.0264E+01	-107.614
45	1	-0.5481	2.1240	1.1093	0.09921	-1.6304E+01	-1.4320E+01	2.1700E+01	-138.705
46	1	-0.4491	2.1174	1.1093	0.09921	-2.0314E+01	-4.0133E+00	2.0707E+01	-168.824
47	1	-0.3501	2.1109	1.1093	0.09921	-1.6675E+01	7.7205E+00	1.8376E+01	155.156

48	1	-0.2511	2.1043	1.1093	0.09921	-6.7831E+00	1.6479E+01	1.7821E+01	112.373
49	1	-0.1521	2.0978	1.1093	0.09921	5.6173E+00	1.8999E+01	1.9812E+01	73.529
50	1	-0.0531	2.0912	1.1093	0.09921	1.5848E+01	1.4369E+01	2.1392E+01	42.197
51	1	0.0459	2.0846	1.1093	0.09921	2.0061E+01	4.3631E+00	2.0530E+01	12.270
52	1	0.1449	2.0781	1.1093	0.09921	1.6682E+01	-7.2386E+00	1.8185E+01	-23.457
53	1	0.2439	2.0715	1.1093	0.09921	7.0011E+00	-1.6077E+01	1.7536E+01	-66.469
54	1	0.3429	2.0650	1.1093	0.09921	-5.3227E+00	-1.8852E+01	1.9589E+01	-105.767
55	1	0.4419	2.0584	1.1093	0.09921	-1.5642E+01	-1.4551E+01	2.1364E+01	-137.070
56	1	0.5409	2.0518	1.1093	0.09921	-2.0074E+01	-4.8210E+00	2.0645E+01	-166.496
57	1	0.6399	2.0453	1.1093	0.09921	-1.6957E+01	6.6647E+00	1.8220E+01	158.544
58	1	0.7389	2.0387	1.1093	0.09921	-7.4763E+00	1.5595E+01	1.7294E+01	115.613
59	1	0.8379	2.0321	1.1093	0.09921	4.7897E+00	1.8642E+01	1.9247E+01	75.591
60	1	0.9368	2.0256	1.1093	0.09921	1.5216E+01	1.4707E+01	2.1162E+01	44.026
61	2	1.0194	1.9853	1.1093	0.09921	1.9913E+01	5.3197E+00	2.0611E+01	14.957
62	2	1.0855	1.9114	1.1093	0.09921	1.7366E+01	-5.9851E+00	1.8369E+01	-19.016
63	2	1.1516	1.8374	1.1093	0.09921	8.5419E+00	-1.5103E+01	1.7351E+01	-60.508
64	2	1.2178	1.7634	1.1093	0.09921	-3.3312E+00	-1.8741E+01	1.9035E+01	-100.079
65	2	1.2839	1.6894	1.1093	0.09921	-1.3921E+01	-1.5604E+01	2.0911E+01	-131.737
66	2	1.3500	1.6155	1.1093	0.09921	-1.9388E+01	-6.8692E+00	2.0569E+01	-160.491
67	2	1.4161	1.5415	1.1093	0.09921	-1.7793E+01	4.2523E+00	1.8294E+01	166.559
68	2	1.4822	1.4675	1.1093	0.09921	-9.7966E+00	1.3699E+01	1.6841E+01	125.570
69	2	1.5483	1.3936	1.1093	0.09921	1.6016E+00	1.8049E+01	1.8120E+01	84.929
70	2	1.6145	1.3196	1.1093	0.09921	1.2187E+01	1.5772E+01	1.9932E+01	52.307
71	2	1.6806	1.2456	1.1093	0.09921	1.8092E+01	7.7771E+00	1.9693E+01	23.261
72	2	1.7467	1.1716	1.1093	0.09921	1.7218E+01	-2.9451E+00	1.7468E+01	-9.706
73	2	1.8128	1.0977	1.1093	0.09921	9.9914E+00	-1.2434E+01	1.5951E+01	-51.217
74	2	1.8789	1.0237	1.1093	0.09921	-8.2086E-01	-1.7230E+01	1.7249E+01	-92.728
75	2	1.9451	0.9497	1.1093	0.09921	-1.1161E+01	-1.5638E+01	1.9213E+01	-125.516
76	2	2.0112	0.8758	1.1093	0.09921	-1.7200E+01	-8.3411E+00	1.9116E+01	-154.129
77	2	2.0773	0.8018	1.1093	0.09921	-1.6754E+01	1.8833E+00	1.6860E+01	173.587
78	2	2.1434	0.7278	1.1093	0.09921	-1.0081E+01	1.1208E+01	1.5074E+01	131.969
79	2	2.2095	0.6538	1.1093	0.09921	2.4588E-01	1.6187E+01	1.6188E+01	89.130
80	2	2.2756	0.5799	1.1093	0.09921	1.0319E+01	1.5026E+01	1.8228E+01	55.523
81	2	2.3418	0.5059	1.1093	0.09921	1.6370E+01	8.2365E+00	1.8325E+01	26.709
82	2	2.4079	0.4319	1.1093	0.09921	1.6178E+01	-1.5863E+00	1.6256E+01	-5.600
83	2	2.4740	0.3580	1.1093	0.09921	9.8833E+00	-1.0745E+01	1.4599E+01	-47.391
84	2	2.5401	0.2840	1.1093	0.09921	-8.8987E-02	-1.5829E+01	1.5829E+01	-90.322
85	2	2.6062	0.2100	1.1093	0.09921	-9.9570E+00	-1.4985E+01	1.7991E+01	-123.603
86	2	2.6723	0.1361	1.1093	0.09921	-1.6014E+01	-8.5915E+00	1.8173E+01	-151.787
87	2	2.7385	0.0621	1.1093	0.09921	-1.6021E+01	9.0305E-01	1.6046E+01	176.774
88	2	2.8046	-0.0119	1.1093	0.09921	-1.0033E+01	9.9155E+00	1.4106E+01	135.336
89	2	2.8707	-0.0859	1.1093	0.09921	-3.6206E-01	1.5078E+01	1.5083E+01	91.376
90	2	2.9368	-0.1598	1.1093	0.09921	9.3082E+00	1.4498E+01	1.7229E+01	57.298
91	2	3.0029	-0.2338	1.1093	0.09921	1.5323E+01	8.4542E+00	1.7500E+01	28.887
92	2	3.0691	-0.3078	1.1093	0.09921	1.5430E+01	-7.2488E-01	1.5447E+01	-2.690
93	2	3.1352	-0.3817	1.1093	0.09921	9.6242E+00	-9.5497E+00	1.3558E+01	-44.777
94	2	3.2013	-0.4557	1.1093	0.09921	1.3369E-01	-1.4689E+01	1.4690E+01	-89.479
95	2	3.2674	-0.5297	1.1093	0.09921	-9.4299E+00	-1.4220E+01	1.7063E+01	-123.550
96	2	3.3335	-0.6037	1.1093	0.09921	-1.5442E+01	-8.3426E+00	1.7551E+01	-151.619
97	2	3.3996	-0.6776	1.1093	0.09921	-1.5632E+01	7.0860E-01	1.5648E+01	177.405
98	2	3.4658	-0.7516	1.1093	0.09921	-9.9367E+00	9.5150E+00	1.3758E+01	136.242
99	2	3.5319	-0.8256	1.1093	0.09921	-5.1411E-01	1.4766E+01	1.4775E+01	91.994
100	2	3.5980	-0.8995	1.1093	0.09921	9.0782E+00	1.4501E+01	1.7108E+01	57.951
101	2	3.6641	-0.9735	1.1093	0.09921	1.5231E+01	8.8410E+00	1.7611E+01	30.133
102	2	3.7302	-1.0475	1.1093	0.09921	1.5646E+01	-6.6775E-02	1.5646E+01	-0.245
103	2	3.7963	-1.1214	1.1093	0.09921	1.0199E+01	-8.8691E+00	1.3516E+01	-41.009
104	2	3.8625	-1.1954	1.1093	0.09921	9.7950E-01	-1.4271E+01	1.4305E+01	-86.074
105	2	3.9286	-1.2694	1.1093	0.09921	-8.5074E+00	-1.4277E+01	1.6620E+01	-120.789
106	2	3.9947	-1.3434	1.1093	0.09921	-1.4669E+01	-8.9335E+00	1.7175E+01	-148.659
107	2	4.0608	-1.4173	1.1093	0.09921	-1.5188E+01	-3.0067E-01	1.5191E+01	-178.866

108	2	4.1269	-1.4913	1.1093	0.09921	-9.8941E+00	8.3327E+00	1.2936E+01	139.896
109	2	4.1931	-1.5653	1.1093	0.09921	-8.2956E-01	1.3696E+01	1.3721E+01	93.466
110	2	4.2592	-1.6392	1.1093	0.09921	8.5302E+00	1.3771E+01	1.6199E+01	58.225
111	2	4.3253	-1.7132	1.1093	0.09921	1.4596E+01	8.5538E+00	1.6918E+01	30.372
112	2	4.3914	-1.7872	1.1093	0.09921	1.5028E+01	4.8305E-02	1.5028E+01	0.184
113	2	4.4575	-1.8612	1.1093	0.09921	9.6307E+00	-8.4890E+00	1.2838E+01	-41.395
114	2	4.5236	-1.9351	1.1093	0.09921	4.3628E-01	-1.3783E+01	1.3790E+01	-88.187
115	2	4.5898	-2.0091	1.1093	0.09921	-9.0523E+00	-1.3776E+01	1.6484E+01	-123.308
116	2	4.6559	-2.0831	1.1093	0.09921	-1.5174E+01	-8.4111E+00	1.7350E+01	-151.001
117	2	4.7220	-2.1570	1.1093	0.09921	-1.5484E+01	3.4442E-01	1.5488E+01	178.726
118	2	4.7881	-2.2310	1.1093	0.09921	-9.6598E+00	9.2193E+00	1.3353E+01	136.337
119	2	4.8542	-2.3050	1.1093	0.09921	4.3942E-01	1.4821E+01	1.4827E+01	88.302
120	2	4.9203	-2.3790	1.1093	0.09921	1.0470E+01	1.5588E+01	1.8778E+01	56.113
121	3	4.9039	-2.4127	1.1093	0.09921	1.0470E+01	1.5588E+01	1.8778E+01	56.113
122	3	4.8049	-2.4061	1.1093	0.09921	4.3942E-01	1.4821E+01	1.4827E+01	88.302
123	3	4.7059	-2.3995	1.1093	0.09921	-9.6598E+00	9.2193E+00	1.3353E+01	136.337
124	3	4.6069	-2.3930	1.1093	0.09921	-1.5484E+01	3.4442E-01	1.5488E+01	178.726
125	3	4.5079	-2.3864	1.1093	0.09921	-1.5174E+01	-8.4111E+00	1.7350E+01	-151.001
126	3	4.4089	-2.3799	1.1093	0.09921	-9.0523E+00	-1.3776E+01	1.6484E+01	-123.308
127	3	4.3099	-2.3733	1.1093	0.09921	4.3628E-01	-1.3783E+01	1.3790E+01	-88.187
128	3	4.2109	-2.3667	1.1093	0.09921	9.6307E+00	-8.4890E+00	1.2838E+01	-41.395
129	3	4.1119	-2.3602	1.1093	0.09921	1.5028E+01	4.8305E-02	1.5028E+01	0.184
130	3	4.0129	-2.3536	1.1093	0.09921	1.4596E+01	8.5538E+00	1.6918E+01	30.372
131	3	3.9139	-2.3471	1.1093	0.09921	8.5302E+00	1.3771E+01	1.6199E+01	58.225
132	3	3.8150	-2.3405	1.1093	0.09921	-8.2956E-01	1.3696E+01	1.3721E+01	93.466
133	3	3.7160	-2.3339	1.1093	0.09921	-9.8941E+00	8.3327E+00	1.2936E+01	139.896
134	3	3.6170	-2.3274	1.1093	0.09921	-1.5188E+01	-3.0067E-01	1.5191E+01	-178.866
135	3	3.5180	-2.3208	1.1093	0.09921	-1.4669E+01	-8.9335E+00	1.7175E+01	-148.659
136	3	3.4190	-2.3142	1.1093	0.09921	-8.5074E+00	-1.4277E+01	1.6620E+01	-120.789
137	3	3.3200	-2.3077	1.1093	0.09921	9.7950E-01	-1.4271E+01	1.4305E+01	-86.074
138	3	3.2210	-2.3011	1.1093	0.09921	1.0199E+01	-8.8691E+00	1.3516E+01	-41.009
139	3	3.1220	-2.2946	1.1093	0.09921	1.5646E+01	-6.6775E-02	1.5646E+01	-0.245
140	3	3.0230	-2.2880	1.1093	0.09921	1.5231E+01	8.8410E+00	1.7611E+01	30.133
141	3	2.9240	-2.2814	1.1093	0.09921	9.0782E+00	1.4501E+01	1.7108E+01	57.951
142	3	2.8250	-2.2749	1.1093	0.09921	-5.1411E-01	1.4766E+01	1.4775E+01	91.994
143	3	2.7260	-2.2683	1.1093	0.09921	-9.9367E+00	9.5150E+00	1.3758E+01	136.242
144	3	2.6270	-2.2618	1.1093	0.09921	-1.5632E+01	7.0860E-01	1.5648E+01	177.405
145	3	2.5280	-2.2552	1.1093	0.09921	-1.5442E+01	-8.3426E+00	1.7551E+01	-151.619
146	3	2.4290	-2.2486	1.1093	0.09921	-9.4299E+00	-1.4220E+01	1.7063E+01	-123.550
147	3	2.3300	-2.2421	1.1093	0.09921	1.3369E-01	-1.4689E+01	1.4690E+01	-89.479
148	3	2.2310	-2.2355	1.1093	0.09921	9.6242E+00	-9.5497E+00	1.3558E+01	-44.777
149	3	2.1320	-2.2290	1.1093	0.09921	1.5430E+01	-7.2488E-01	1.5447E+01	-2.690
150	3	2.0330	-2.2224	1.1093	0.09921	1.5323E+01	8.4542E+00	1.7500E+01	28.887
151	3	1.9340	-2.2158	1.1093	0.09921	9.3082E+00	1.4498E+01	1.7229E+01	57.298
152	3	1.8350	-2.2093	1.1093	0.09921	-3.6206E-01	1.5078E+01	1.5083E+01	91.376
153	3	1.7360	-2.2027	1.1093	0.09921	-1.0033E+01	9.9155E+00	1.4106E+01	135.336
154	3	1.6370	-2.1962	1.1093	0.09921	-1.6021E+01	9.0305E-01	1.6046E+01	176.774
155	3	1.5380	-2.1896	1.1093	0.09921	-1.6014E+01	-8.5915E+00	1.8173E+01	-151.787
156	3	1.4391	-2.1830	1.1093	0.09921	-9.9570E+00	-1.4985E+01	1.7991E+01	-123.603
157	3	1.3401	-2.1765	1.1093	0.09921	-8.8987E-02	-1.5829E+01	1.5829E+01	-90.322
158	3	1.2411	-2.1699	1.1093	0.09921	9.8833E+00	-1.0745E+01	1.4599E+01	-47.391
159	3	1.1421	-2.1634	1.1093	0.09921	1.6178E+01	-1.5863E+00	1.6256E+01	-5.600
160	3	1.0431	-2.1568	1.1093	0.09921	1.6370E+01	8.2365E+00	1.8325E+01	26.709
161	3	0.9441	-2.1502	1.1093	0.09921	1.0319E+01	1.5026E+01	1.8228E+01	55.523
162	3	0.8451	-2.1437	1.1093	0.09921	2.4588E-01	1.6187E+01	1.6188E+01	89.130
163	3	0.7461	-2.1371	1.1093	0.09921	-1.0081E+01	1.1208E+01	1.5074E+01	131.969
164	3	0.6471	-2.1306	1.1093	0.09921	-1.6754E+01	1.8833E+00	1.6860E+01	173.587
165	3	0.5481	-2.1240	1.1093	0.09921	-1.7200E+01	-8.3411E+00	1.9116E+01	-154.129
166	3	0.4491	-2.1174	1.1093	0.09921	-1.1161E+01	-1.5638E+01	1.9213E+01	-125.516
167	3	0.3501	-2.1109	1.1093	0.09921	-8.2086E-01	-1.7230E+01	1.7249E+01	-92.728

168	3	0.2511	-2.1043	1.1093	0.09921	9.9914E+00	-1.2434E+01	1.5951E+01	-51.217
169	3	0.1521	-2.0978	1.1093	0.09921	1.7218E+01	-2.9451E+00	1.7468E+01	-9.706
170	3	0.0531	-2.0912	1.1093	0.09921	1.8092E+01	7.7771E+00	1.9693E+01	23.261
171	3	-0.0459	-2.0846	1.1093	0.09921	1.2187E+01	1.5772E+01	1.9932E+01	52.307
172	3	-0.1449	-2.0781	1.1093	0.09921	1.6016E+00	1.8049E+01	1.8120E+01	84.929
173	3	-0.2439	-2.0715	1.1093	0.09921	-9.7966E+00	1.3699E+01	1.6841E+01	125.570
174	3	-0.3429	-2.0650	1.1093	0.09921	-1.7793E+01	4.2523E+00	1.8294E+01	166.559
175	3	-0.4419	-2.0584	1.1093	0.09921	-1.9388E+01	-6.8692E+00	2.0569E+01	-160.491
176	3	-0.5409	-2.0518	1.1093	0.09921	-1.3921E+01	-1.5604E+01	2.0911E+01	-131.737
177	3	-0.6399	-2.0453	1.1093	0.09921	-3.3312E+00	-1.8741E+01	1.9035E+01	-100.079
178	3	-0.7389	-2.0387	1.1093	0.09921	8.5419E+00	-1.5103E+01	1.7351E+01	-60.508
179	3	-0.8379	-2.0321	1.1093	0.09921	1.7366E+01	-5.9851E+00	1.8369E+01	-19.016
180	3	-0.9368	-2.0256	1.1093	0.09921	1.9913E+01	5.3197E+00	2.0611E+01	14.957
181	4	-1.0194	-1.9853	1.1093	0.09921	1.5216E+01	1.4707E+01	2.1162E+01	44.026
182	4	-1.0855	-1.9114	1.1093	0.09921	4.7897E+00	1.8642E+01	1.9247E+01	75.591
183	4	-1.1516	-1.8374	1.1093	0.09921	-7.4763E+00	1.5595E+01	1.7294E+01	115.613
184	4	-1.2178	-1.7634	1.1093	0.09921	-1.6957E+01	6.6647E+00	1.8220E+01	158.544
185	4	-1.2839	-1.6894	1.1093	0.09921	-2.0074E+01	-4.8210E+00	2.0645E+01	-166.496
186	4	-1.3500	-1.6155	1.1093	0.09921	-1.5642E+01	-1.4551E+01	2.1364E+01	-137.070
187	4	-1.4161	-1.5415	1.1093	0.09921	-5.3227E+00	-1.8852E+01	1.9589E+01	-105.767
188	4	-1.4822	-1.4675	1.1093	0.09921	7.0011E+00	-1.6077E+01	1.7536E+01	-66.469
189	4	-1.5483	-1.3936	1.1093	0.09921	1.6682E+01	-7.2386E+00	1.8185E+01	-23.457
190	4	-1.6145	-1.3196	1.1093	0.09921	2.0061E+01	4.3631E+00	2.0530E+01	12.270
191	4	-1.6806	-1.2456	1.1093	0.09921	1.5848E+01	1.4369E+01	2.1392E+01	42.197
192	4	-1.7467	-1.1716	1.1093	0.09921	5.6173E+00	1.8999E+01	1.9812E+01	73.529
193	4	-1.8128	-1.0977	1.1093	0.09921	-6.7831E+00	1.6479E+01	1.7821E+01	112.373
194	4	-1.8789	-1.0237	1.1093	0.09921	-1.6675E+01	7.7205E+00	1.8376E+01	155.156
195	4	-1.9451	-0.9497	1.1093	0.09921	-2.0314E+01	-4.0133E+00	2.0707E+01	-168.824
196	4	-2.0112	-0.8758	1.1093	0.09921	-1.6304E+01	-1.4320E+01	2.1700E+01	-138.705
197	4	-2.0773	-0.8018	1.1093	0.09921	-6.1319E+00	-1.9314E+01	2.0264E+01	-107.614
198	4	-2.1434	-0.7278	1.1093	0.09921	6.3832E+00	-1.7086E+01	1.8240E+01	-69.515
199	4	-2.2095	-0.6538	1.1093	0.09921	1.6525E+01	-8.4392E+00	1.8555E+01	-27.053
200	4	-2.2756	-0.5799	1.1093	0.09921	2.0455E+01	3.4074E+00	2.0737E+01	9.458
201	4	-2.3418	-0.5059	1.1093	0.09921	1.6664E+01	1.4013E+01	2.1773E+01	40.061
202	4	-2.4079	-0.4319	1.1093	0.09921	6.5513E+00	1.9383E+01	2.0460E+01	71.325
203	4	-2.4740	-0.3580	1.1093	0.09921	-6.0946E+00	1.7471E+01	1.8504E+01	109.231
204	4	-2.5401	-0.2840	1.1093	0.09921	-1.6513E+01	8.9595E+00	1.8787E+01	151.518
205	4	-2.6062	-0.2100	1.1093	0.09921	-2.0765E+01	-2.9836E+00	2.0979E+01	-171.824
206	4	-2.6723	-0.1361	1.1093	0.09921	-1.7220E+01	-1.3885E+01	2.2120E+01	-141.120
207	4	-2.7385	-0.0621	1.1093	0.09921	-7.1799E+00	-1.9639E+01	2.0911E+01	-110.082
208	4	-2.8046	0.0119	1.1093	0.09921	5.5975E+00	-1.8058E+01	1.8905E+01	-72.777
209	4	-2.8707	0.0859	1.1093	0.09921	1.6307E+01	-9.6942E+00	1.8971E+01	-30.731
210	4	-2.9368	0.1598	1.1093	0.09921	2.0900E+01	2.3449E+00	2.1032E+01	6.401
211	4	-3.0029	0.2338	1.1093	0.09921	1.7618E+01	1.3559E+01	2.2232E+01	37.582
212	4	-3.0691	0.3078	1.1093	0.09921	7.6601E+00	1.9736E+01	2.1171E+01	68.788
213	4	-3.1352	0.3817	1.1093	0.09921	-5.2528E+00	1.8538E+01	1.9268E+01	105.820
214	4	-3.2013	0.4557	1.1093	0.09921	-1.6268E+01	1.0385E+01	1.9300E+01	147.449
215	4	-3.2674	0.5297	1.1093	0.09921	-2.1227E+01	-1.6889E+00	2.1294E+01	-175.451
216	4	-3.3335	0.6037	1.1093	0.09921	-1.8230E+01	-1.3162E+01	2.2485E+01	-144.171
217	4	-3.3996	0.6776	1.1093	0.09921	-8.3672E+00	-1.9720E+01	2.1421E+01	-112.992
218	4	-3.4658	0.7516	1.1093	0.09921	4.6807E+00	-1.8875E+01	1.9447E+01	-76.072
219	4	-3.5319	0.8256	1.1093	0.09921	1.6017E+01	-1.0912E+01	1.9381E+01	-34.267
220	4	-3.5980	0.8995	1.1093	0.09921	2.1365E+01	1.2052E+00	2.1399E+01	3.229
221	4	-3.6641	0.9735	1.1093	0.09921	1.8688E+01	1.2937E+01	2.2729E+01	34.693
222	4	-3.7302	1.0475	1.1093	0.09921	8.9594E+00	1.9861E+01	2.1788E+01	65.720
223	4	-3.7963	1.1214	1.1093	0.09921	-4.1792E+00	1.9341E+01	1.9787E+01	102.193
224	4	-3.8625	1.1954	1.1093	0.09921	-1.5782E+01	1.1523E+01	1.9540E+01	143.866
225	4	-3.9286	1.2694	1.1093	0.09921	-2.1452E+01	-6.9779E-01	2.1463E+01	-178.137
226	4	-3.9947	1.3434	1.1093	0.09921	-1.9006E+01	-1.2747E+01	2.2885E+01	-146.150
227	4	-4.0608	1.4173	1.1093	0.09921	-9.3117E+00	-2.0083E+01	2.2136E+01	-114.876

228	4	-4.1269	1.4913	1.1093	0.09921	4.0152E+00	-1.9896E+01	2.0297E+01	-78.590
229	4	-4.1931	1.5653	1.1093	0.09921	1.5952E+01	-1.2185E+01	2.0074E+01	-37.375
230	4	-4.2592	1.6392	1.1093	0.09921	2.1951E+01	2.1803E-01	2.1952E+01	0.569
231	4	-4.3253	1.7132	1.1093	0.09921	1.9658E+01	1.2689E+01	2.3397E+01	32.842
232	4	-4.3914	1.7872	1.1093	0.09921	9.8220E+00	2.0522E+01	2.2752E+01	64.424
233	4	-4.4575	1.8612	1.1093	0.09921	-3.9464E+00	2.0697E+01	2.1070E+01	100.795
234	4	-4.5236	1.9351	1.1093	0.09921	-1.6497E+01	1.3021E+01	2.1016E+01	141.716
235	4	-4.5898	2.0091	1.1093	0.09921	-2.3043E+01	2.4109E-01	2.3044E+01	179.401
236	4	-4.6559	2.0831	1.1093	0.09921	-2.0951E+01	-1.2940E+01	2.4625E+01	-148.300
237	4	-4.7220	2.1570	1.1093	0.09921	-1.0743E+01	-2.1568E+01	2.4095E+01	-116.478
238	4	-4.7881	2.2310	1.1093	0.09921	4.0693E+00	-2.2228E+01	2.2597E+01	-79.626
239	4	-4.8542	2.3050	1.1093	0.09921	1.8255E+01	-1.4165E+01	2.3106E+01	-37.809
240	4	-4.9203	2.3790	1.1093	0.09921	2.6805E+01	-1.5716E+00	2.6851E+01	-3.355

- - - POWER BUDGET - - -

INPUT POWER = 2.5007E+05 WATTS
RADIATED POWER= 1.4429E+05 WATTS
STRUCTURE LOSS= 1.0578E+05 WATTS
NETWORK LOSS = 0.0000E+00 WATTS
EFFICIENCY = 57.70 PERCENT

- - - NEAR ELECTRIC FIELDS - - -

- LOCATION -			- EX -		- EY -		- EZ -	
X METERS	Y METERS	Z METERS	MAGNITUDE VOLTS/M	PHASE DEGREES	MAGNITUDE VOLTS/M	PHASE DEGREES	MAGNITUDE VOLTS/M	PHASE DEGREES
9999.9999	0.0000	1.0076	3.9777E-04	-23.25	7.3888E-05	-36.21	1.5073E-02	-61.77
9998.4769	174.5241	1.0076	4.8355E-04	73.62	5.9580E-05	-139.51	1.7997E-02	35.44
9993.9082	348.9950	1.0076	1.0633E-03	95.12	2.0011E-04	-176.96	3.9828E-02	57.50
9986.2953	523.3596	1.0076	1.6178E-03	101.13	3.9085E-04	174.68	6.0876E-02	63.85
9975.6405	697.5647	1.0076	2.0712E-03	103.98	6.0027E-04	170.92	7.8295E-02	67.06
9961.9469	871.5574	1.0076	2.3829E-03	105.74	8.0122E-04	168.82	9.0541E-02	69.24
9945.2189	1045.2846	1.0076	2.5260E-03	107.07	9.6526E-04	167.58	9.6544E-02	71.03
9925.4615	1218.6934	1.0076	2.4872E-03	108.30	1.0654E-03	166.95	9.5722E-02	72.78
9902.6806	1391.7310	1.0076	2.2691E-03	109.72	1.0793E-03	166.85	8.8052E-02	74.75
9876.8834	1564.3446	1.0076	1.8908E-03	111.73	9.9315E-04	167.41	7.4121E-02	77.37
9848.0775	1736.4818	1.0076	1.3878E-03	115.37	8.0429E-04	169.13	5.5158E-02	81.58
9816.2718	1908.0899	1.0076	8.1620E-04	124.44	5.2448E-04	174.02	3.3171E-02	90.89
9781.4760	2079.1169	1.0076	3.2191E-04	168.11	1.9637E-04	-160.54	1.3313E-02	131.19
9743.7006	2249.5105	1.0076	5.3804E-04	-108.27	2.7124E-04	-45.93	2.0391E-02	-141.11
9702.9572	2419.2189	1.0076	1.0065E-03	-91.97	6.4502E-04	-29.42	3.9371E-02	-122.45
9659.2582	2588.1904	1.0076	1.3773E-03	-86.73	9.8487E-04	-24.83	5.4948E-02	-115.90
9612.6169	2756.3735	1.0076	1.5980E-03	-84.04	1.2393E-03	-22.26	6.4768E-02	-112.00
9563.0475	2923.7170	1.0076	1.6537E-03	-82.13	1.3763E-03	-20.14	6.8017E-02	-108.85
9510.5651	3090.1699	1.0076	1.5525E-03	-80.28	1.3801E-03	-17.86	6.4812E-02	-105.69
9455.1857	3255.6815	1.0076	1.3225E-03	-77.93	1.2542E-03	-14.93	5.6103E-02	-101.94
9396.9262	3420.2014	1.0076	1.0073E-03	-74.19	1.0218E-03	-10.57	4.3539E-02	-96.71
9335.8042	3583.6795	1.0076	6.6116E-04	-66.88	7.2453E-04	-2.94	2.9309E-02	-87.89
9271.8385	3746.0659	1.0076	3.5026E-04	-48.02	4.2408E-04	14.09	1.6201E-02	-68.17
9205.0485	3907.3113	1.0076	2.0177E-04	8.72	2.3870E-04	61.82	9.4084E-03	-14.54
9135.4545	4067.3664	1.0076	2.8176E-04	56.60	2.9769E-04	116.37	1.2385E-02	36.06
9063.0778	4226.1826	1.0076	3.5641E-04	73.39	3.9616E-04	138.19	1.5792E-02	56.03
8987.9404	4383.7114	1.0076	3.5829E-04	83.26	4.1962E-04	150.53	1.6133E-02	68.16
8910.0652	4539.9050	1.0076	3.0038E-04	93.69	3.6639E-04	162.64	1.3731E-02	80.35
8829.4759	4694.7156	1.0076	2.1811E-04	110.02	2.7223E-04	-179.38	1.0034E-02	97.99

8746.1970	4848.0962	1.0076	1.5562E-04	137.37	1.9628E-04	-148.49	7.0207E-03	127.20
8660.2540	5000.0000	1.0076	1.3330E-04	166.81	1.7974E-04	-113.68	5.9405E-03	161.52
8571.6730	5150.3807	1.0076	1.1448E-04	-179.34	1.7392E-04	-95.90	5.3095E-03	-178.40
8480.4809	5299.1926	1.0076	6.9675E-05	167.29	1.2692E-04	-100.13	3.4202E-03	-179.99
8386.7056	5446.3903	1.0076	7.2339E-05	87.19	9.2132E-05	-159.76	2.2634E-03	102.64
8290.3757	5591.9290	1.0076	1.7495E-04	60.05	2.1143E-04	156.85	6.4142E-03	65.02
8191.5204	5735.7643	1.0076	2.8495E-04	54.24	3.7129E-04	149.03	1.1192E-02	61.19
8090.1699	5877.8525	1.0076	3.6701E-04	52.42	5.0175E-04	148.15	1.4825E-02	62.19
7986.3551	6018.1502	1.0076	4.0136E-04	52.15	5.6772E-04	149.69	1.6424E-02	64.91
7880.1075	6156.6147	1.0076	3.8180E-04	53.12	5.5523E-04	152.95	1.5715E-02	69.04
7771.4596	6293.2039	1.0076	3.1645E-04	55.80	4.7296E-04	158.32	1.3059E-02	75.19
7660.4444	6427.8761	1.0076	2.2546E-04	61.55	3.4955E-04	167.24	9.3479E-03	85.07
7547.0958	6560.5903	1.0076	1.3563E-04	73.54	2.2544E-04	-177.21	5.7592E-03	102.64
7431.4482	6691.3060	1.0076	7.1541E-05	96.87	1.3750E-04	-152.15	3.3696E-03	133.10
7313.5370	6819.9836	1.0076	3.5854E-05	122.56	8.6956E-05	-128.24	2.1648E-03	165.85
7193.3980	6946.5837	1.0076	1.4273E-05	48.56	4.1482E-05	-143.82	8.1821E-04	171.89
7071.0678	7071.0678	1.0076	6.9099E-05	8.28	7.6501E-05	138.46	1.5034E-03	44.03
6946.5837	7193.3980	1.0076	1.3980E-04	8.96	1.7041E-04	129.72	4.0235E-03	43.38
6819.9836	7313.5370	1.0076	1.9869E-04	11.25	2.5076E-04	131.11	6.1161E-03	47.78
6691.3060	7431.4482	1.0076	2.2497E-04	14.00	2.8747E-04	134.70	7.0757E-03	52.98
6560.5903	7547.0958	1.0076	2.0828E-04	18.01	2.6769E-04	140.21	6.6015E-03	59.63
6427.8761	7660.4444	1.0076	1.5320E-04	25.81	1.9910E-04	149.90	4.9037E-03	70.29
6293.2039	7771.4596	1.0076	8.2083E-05	48.11	1.1197E-04	173.67	2.7460E-03	95.21
6156.6147	7880.1075	1.0076	5.5150E-05	118.40	7.5902E-05	-122.57	1.8822E-03	160.81
6018.1502	7986.3551	1.0076	8.5860E-05	159.21	1.0775E-04	-80.00	2.7225E-03	-155.78
5877.8525	8090.1699	1.0076	9.1400E-05	174.30	1.1525E-04	-63.32	2.9835E-03	-137.59
5735.7643	8191.5204	1.0076	5.7662E-05	-167.15	7.8451E-05	-48.42	2.2014E-03	-120.09
5591.9290	8290.3757	1.0076	3.3426E-05	-71.48	2.6209E-05	20.73	1.0397E-03	-68.00
5446.3903	8386.7056	1.0076	9.5720E-05	-27.17	7.8303E-05	102.82	1.7880E-03	12.45
5299.1926	8480.4809	1.0076	1.4743E-04	-18.10	1.3217E-04	115.28	2.9897E-03	32.82
5150.3807	8571.6730	1.0076	1.5912E-04	-13.42	1.4730E-04	121.97	3.3680E-03	43.07
5000.0000	8660.2540	1.0076	1.2353E-04	-8.81	1.1871E-04	128.87	2.7558E-03	53.17
4848.0962	8746.1970	1.0076	5.1496E-05	3.76	5.8863E-05	144.14	1.4577E-03	74.07
4694.7156	8829.4759	1.0076	4.1749E-05	146.12	2.9326E-05	-104.53	8.7379E-04	167.32
4539.9050	8910.0652	1.0076	1.1319E-04	162.39	8.2104E-05	-66.51	1.9656E-03	-149.42
4383.7114	8987.9404	1.0076	1.4783E-04	167.38	1.0973E-04	-57.10	2.5857E-03	-136.49
4226.1826	9063.0778	1.0076	1.3332E-04	172.40	1.0027E-04	-49.20	2.3742E-03	-126.11
4067.3664	9135.4545	1.0076	7.6373E-05	-176.24	6.1122E-05	-34.93	1.4926E-03	-109.00
3907.3113	9205.0485	1.0076	2.8123E-05	-81.12	2.4668E-05	36.29	6.9478E-04	-42.63
3746.0659	9271.8385	1.0076	9.2771E-05	-27.12	5.7228E-05	104.73	1.3636E-03	24.60
3583.6795	9335.8042	1.0076	1.3983E-04	-17.77	8.5534E-05	119.66	2.0047E-03	42.81
3420.2014	9396.9262	1.0076	1.4378E-04	-11.19	8.7462E-05	129.75	2.0473E-03	55.22
3255.6815	9455.1857	1.0076	1.0638E-04	-1.24	6.6029E-05	143.63	1.5485E-03	71.79
3090.1699	9510.5651	1.0076	5.0851E-05	30.33	3.7398E-05	177.27	9.0764E-04	109.73
2923.7170	9563.0475	1.0076	5.1522E-05	115.66	3.4716E-05	-116.44	9.1794E-04	175.13
2756.3735	9612.6169	1.0076	8.5583E-05	142.11	4.8752E-05	-84.59	1.2783E-03	-152.90
2588.1904	9659.2582	1.0076	8.5586E-05	151.02	4.8824E-05	-70.16	1.2987E-03	-135.31
2419.2189	9702.9572	1.0076	4.3882E-05	158.03	3.1265E-05	-55.56	9.0739E-04	-114.25
2249.5105	9743.7006	1.0076	2.8461E-05	-30.90	9.7132E-06	23.29	4.8596E-04	-51.03
2079.1169	9781.4760	1.0076	1.0812E-04	-22.65	3.3223E-05	100.13	9.1881E-04	17.26
1908.0899	9816.2718	1.0076	1.7124E-04	-19.10	5.6296E-05	112.51	1.4808E-03	38.14
1736.4818	9848.0775	1.0076	1.9928E-04	-15.56	6.6282E-05	120.53	1.7508E-03	51.07
1564.3446	9876.8834	1.0076	1.8611E-04	-10.89	6.2427E-05	129.17	1.6780E-03	63.84
1391.7310	9902.6806	1.0076	1.3993E-04	-3.01	4.8971E-05	141.38	1.3574E-03	80.15
1218.6934	9925.4615	1.0076	8.1944E-05	14.78	3.3061E-05	161.80	9.6570E-04	104.39
1045.2846	9945.2189	1.0076	4.6685E-05	60.90	2.1968E-05	-164.21	6.7931E-04	140.41
871.5574	9961.9469	1.0076	4.7718E-05	102.49	1.7437E-05	-124.48	5.4234E-04	-176.83
697.5647	9975.6405	1.0076	3.8215E-05	102.62	1.4063E-05	-88.05	4.6498E-04	-131.91
523.3596	9986.2953	1.0076	3.3315E-05	30.06	1.1230E-05	-38.92	4.7021E-04	-80.84
348.9950	9993.9082	1.0076	9.0857E-05	-5.12	1.4686E-05	11.73	6.2055E-04	-39.21

174.5241	9998.4769	1.0076	1.6130E-04	-10.40	2.1216E-05	35.53	8.0212E-04	-13.20
0.0000	9999.9999	1.0076	2.1738E-04	-10.58	2.5329E-05	46.52	8.9970E-04	5.63
-174.5241	9998.4769	1.0076	2.4306E-04	-8.89	2.5218E-05	53.46	8.8222E-04	23.25
-348.9950	9993.9082	1.0076	2.3205E-04	-5.73	2.1380E-05	60.87	7.8945E-04	43.16
-523.3596	9986.2953	1.0076	1.8871E-04	-0.39	1.5845E-05	73.81	6.8990E-04	65.95
-697.5647	9975.6405	1.0076	1.2680E-04	9.86	1.1623E-05	98.05	6.0719E-04	87.68
-871.5574	9961.9469	1.0076	6.8452E-05	35.34	1.0396E-05	125.14	4.8909E-04	104.08
-1045.2846	9945.2189	1.0076	4.8043E-05	92.38	9.2472E-06	137.93	2.7401E-04	115.44
-1218.6934	9925.4615	1.0076	5.8063E-05	128.46	4.8421E-06	127.95	5.3763E-05	-78.06
-1391.7310	9902.6806	1.0076	5.3027E-05	140.81	5.9295E-06	3.35	4.4859E-04	-61.92
-1564.3446	9876.8834	1.0076	2.5115E-05	140.80	1.9276E-05	-14.62	8.4527E-04	-61.23
-1736.4818	9848.0775	1.0076	1.9747E-05	-7.98	3.4597E-05	-19.57	1.1600E-03	-62.98
-1908.0899	9816.2718	1.0076	6.5309E-05	-16.08	4.7818E-05	-22.85	1.3165E-03	-66.53
-2079.1169	9781.4760	1.0076	1.0028E-04	-15.90	5.4451E-05	-25.81	1.2552E-03	-72.01
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-2588.1904	9659.2582	1.0076	6.2277E-05	-21.56	7.1483E-06	-107.18	6.3180E-04	135.44
-2756.3735	9612.6169	1.0076	1.8693E-05	-93.21	4.2611E-05	162.95	1.6453E-03	113.88
-2923.7170	9563.0475	1.0076	7.2537E-05	-165.77	9.2149E-05	156.53	2.8055E-03	105.74
-3090.1699	9510.5651	1.0076	1.4008E-04	-171.03	1.4215E-04	153.87	3.9585E-03	100.40
-3255.6815	9455.1857	1.0076	1.9676E-04	-171.07	1.8507E-04	152.21	4.9523E-03	96.22
-3420.2014	9396.9262	1.0076	2.3393E-04	-169.61	2.1395E-04	150.98	5.6344E-03	92.64
-3583.6795	9335.8042	1.0076	2.4710E-04	-167.38	2.2345E-04	149.99	5.8725E-03	89.36
-3746.0659	9271.8385	1.0076	2.3577E-04	-164.60	2.1072E-04	149.13	5.5755E-03	86.07
-3907.3113	9205.0485	1.0076	2.0287E-04	-161.30	1.7580E-04	148.35	4.7117E-03	82.21
-4067.3664	9135.4545	1.0076	1.5385E-04	-157.40	1.2155E-04	147.61	3.3229E-03	76.14
-4226.1826	9063.0778	1.0076	9.5396E-05	-152.55	5.3236E-05	146.77	1.5755E-03	58.12
-4383.7114	8987.9404	1.0076	3.4380E-05	-143.91	2.2276E-05	-32.78	1.1237E-03	-48.49
-4539.9050	8910.0652	1.0076	2.4145E-05	24.66	9.7466E-05	-34.02	3.1689E-03	-80.01
-4694.7156	8829.4759	1.0076	7.4238E-05	36.31	1.6511E-04	-34.74	5.3025E-03	-87.03
-4848.0962	8746.1970	1.0076	1.1409E-04	42.97	2.1911E-04	-35.44	7.1685E-03	-90.33
-5000.0000	8660.2540	1.0076	1.4226E-04	49.27	2.5503E-04	-36.16	8.5791E-03	-92.42
-5150.3807	8571.6730	1.0076	1.5857E-04	55.56	2.7050E-04	-36.92	9.4031E-03	-93.97
-5299.1926	8480.4809	1.0076	1.6354E-04	61.80	2.6521E-04	-37.73	9.5656E-03	-95.28
-5446.3903	8386.7056	1.0076	1.5802E-04	67.86	2.4074E-04	-38.64	9.0509E-03	-96.52
-5591.9290	8290.3757	1.0076	1.4296E-04	73.56	2.0021E-04	-39.68	7.8997E-03	-97.91
-5735.7643	8191.5204	1.0076	1.1939E-04	78.63	1.4777E-04	-40.95	6.2026E-03	-99.81
-5877.8525	8090.1699	1.0076	8.8553E-05	82.56	8.8153E-05	-42.85	4.0928E-03	-103.36
-6018.1502	7986.3551	1.0076	5.2036E-05	83.51	2.6267E-05	-49.23	1.7632E-03	-115.89
-6156.6147	7880.1075	1.0076	1.3609E-05	57.66	3.4141E-05	143.01	1.0642E-03	120.94
-6293.2039	7771.4596	1.0076	3.3522E-05	-63.08	8.8192E-05	138.20	3.3675E-03	95.08
-6427.8761	7660.4444	1.0076	7.5146E-05	-67.91	1.3354E-04	136.10	5.5909E-03	90.44
-6560.5903	7547.0958	1.0076	1.1428E-04	-67.00	1.6811E-04	134.33	7.4994E-03	88.46
-6691.3060	7431.4482	1.0076	1.4820E-04	-65.19	1.9087E-04	132.60	8.9847E-03	87.33
-6819.9836	7313.5370	1.0076	1.7481E-04	-63.25	2.0166E-04	130.81	9.9784E-03	86.57
-6946.5837	7193.3980	1.0076	1.9251E-04	-61.41	2.0109E-04	128.91	1.0447E-02	85.99
-7071.0678	7071.0678	1.0076	2.0031E-04	-59.76	1.9038E-04	126.87	1.0391E-02	85.51
-7193.3980	6946.5837	1.0076	1.9786E-04	-58.35	1.7118E-04	124.67	9.8393E-03	85.05
-7313.5370	6819.9836	1.0076	1.8547E-04	-57.25	1.4540E-04	122.28	8.8487E-03	84.56
-7431.4482	6691.3060	1.0076	1.6406E-04	-56.59	1.1506E-04	119.67	7.4955E-03	83.97
-7547.0958	6560.5903	1.0076	1.3511E-04	-56.61	8.2109E-05	116.86	5.8719E-03	83.13
-7660.4444	6427.8761	1.0076	1.0058E-04	-58.04	4.8369E-05	113.93	4.0797E-03	81.63
-7771.4596	6293.2039	1.0076	6.3029E-05	-63.35	1.5399E-05	111.92	2.2274E-03	77.84
-7880.1075	6156.6147	1.0076	2.7634E-05	-88.08	1.5607E-05	-76.69	4.9006E-04	46.44
-7986.3551	6018.1502	1.0076	2.7200E-05	-178.10	4.3708E-05	-79.63	1.3521E-03	-81.16
-8090.1699	5877.8525	1.0076	5.8836E-05	157.73	6.8444E-05	-84.24	2.8143E-03	-88.23
-8191.5204	5735.7643	1.0076	8.9173E-05	152.83	8.9669E-05	-89.51	4.0072E-03	-90.27
-8290.3757	5591.9290	1.0076	1.1381E-04	152.00	1.0756E-04	-95.33	4.8690E-03	-91.23
-8386.7056	5446.3903	1.0076	1.3126E-04	152.89	1.2255E-04	-101.64	5.3661E-03	-91.78
-8480.4809	5299.1926	1.0076	1.4085E-04	154.94	1.3517E-04	-108.32	5.4867E-03	-92.13

-8571.6730	5150.3807	1.0076	1.4256E-04	158.13	1.4600E-04	-115.24	5.2390E-03	-92.36
-8660.2540	5000.0000	1.0076	1.3703E-04	162.75	1.5545E-04	-122.20	4.6509E-03	-92.52
-8746.1970	4848.0962	1.0076	1.2569E-04	169.41	1.6373E-04	-129.00	3.7675E-03	-92.63
-8829.4759	4694.7156	1.0076	1.1093E-04	179.18	1.7076E-04	-135.48	2.6488E-03	-92.70
-8910.0652	4539.9050	1.0076	9.6509E-05	-166.50	1.7622E-04	-141.49	1.3663E-03	-92.75
-8987.9404	4383.7114	1.0076	8.7592E-05	-146.93	1.7959E-04	-146.93	2.4743E-10	130.29
-9063.0778	4226.1826	1.0076	8.8645E-05	-125.03	1.8030E-04	-151.76	1.3663E-03	87.25
-9135.4545	4067.3664	1.0076	9.9254E-05	-106.18	1.7780E-04	-155.95	2.6488E-03	87.30
-9205.0485	3907.3113	1.0076	1.1459E-04	-92.57	1.7168E-04	-159.50	3.7675E-03	87.37
-9271.8385	3746.0659	1.0076	1.2958E-04	-83.22	1.6171E-04	-162.37	4.6509E-03	87.48
-9335.8042	3583.6795	1.0076	1.4054E-04	-76.67	1.4794E-04	-164.53	5.2390E-03	87.64
-9396.9262	3420.2014	1.0076	1.4503E-04	-71.90	1.3068E-04	-165.83	5.4867E-03	87.87
-9455.1857	3255.6815	1.0076	1.4149E-04	-68.24	1.1058E-04	-166.00	5.3661E-03	88.22
-9510.5651	3090.1699	1.0076	1.2912E-04	-65.28	8.8609E-05	-164.40	4.8690E-03	88.77
-9563.0475	2923.7170	1.0076	1.0775E-04	-62.68	6.6203E-05	-159.57	4.0072E-03	89.73
-9612.6169	2756.3735	1.0076	7.7831E-05	-59.98	4.5701E-05	-147.80	2.8143E-03	91.77
-9659.2582	2588.1904	1.0076	4.0454E-05	-55.46	3.1839E-05	-121.38	1.3521E-03	98.84
-9702.9572	2419.2189	1.0076	5.5194E-06	65.82	3.1253E-05	-84.60	4.9006E-04	-133.56
-9743.7006	2249.5105	1.0076	5.0908E-05	115.53	4.0227E-05	-62.23	2.2274E-03	-102.16
-9781.4760	2079.1169	1.0076	9.9809E-05	118.90	4.9948E-05	-53.26	4.0797E-03	-98.37
-9816.2718	1908.0899	1.0076	1.4765E-04	120.53	5.6539E-05	-50.78	5.8719E-03	-96.87
-9848.0775	1736.4818	1.0076	1.9157E-04	121.65	5.8780E-05	-52.08	7.4955E-03	-96.03
-9876.8834	1564.3446	1.0076	2.2876E-04	122.51	5.6640E-05	-56.51	8.8487E-03	-95.44
-9902.6806	1391.7310	1.0076	2.5662E-04	123.24	5.0975E-05	-64.60	9.8393E-03	-94.95
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-9975.6405	697.5647	1.0076	2.3892E-04	125.90	3.6243E-05	-147.43	8.9847E-03	-92.67
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-9998.4769	174.5241	1.0076	8.9042E-05	133.38	3.1194E-05	156.11	3.3675E-03	-84.92
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-9925.4615	-1218.6934	1.0076	2.3825E-04	-61.08	2.0385E-04	0.85	9.4031E-03	86.03
-9902.6806	-1391.7310	1.0076	2.1273E-04	-60.39	2.0007E-04	-2.20	8.5791E-03	87.58
-9876.8834	-1564.3446	1.0076	1.7283E-04	-58.90	1.7650E-04	-5.51	7.1685E-03	89.67
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-9271.8385	-3746.0659	1.0076	3.8011E-05	145.85	2.6839E-05	-164.85	1.6453E-03	-66.12
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-8829.4759	-4694.7156	1.0076	1.5546E-05	-28.61	3.6677E-05	-14.68	1.1600E-03	117.02

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-8480.4809	-5299.1926	1.0076	2.5022E-05	-99.62	4.2042E-05	97.93	2.7401E-04	-64.56
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-8090.1699	-5877.8525	1.0076	1.3705E-04	167.79	1.8847E-04	-2.06	7.8945E-04	-136.84
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-7660.4444	-6427.8761	1.0076	4.4987E-05	170.60	8.0292E-05	-3.25	6.2055E-04	140.79
-7547.0958	-6560.5903	1.0076	1.9205E-05	-124.46	2.9448E-05	17.40	4.7021E-04	99.16
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-5150.3807	-8571.6730	1.0076	1.4318E-04	143.66	7.9790E-05	8.74	2.0047E-03	-137.19
-5000.0000	-8660.2540	1.0076	9.3451E-05	131.81	5.6111E-05	0.76	1.3636E-03	-155.40
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-4539.9050	-8910.0652	1.0076	1.5060E-04	-27.99	7.1746E-05	-152.77	2.3742E-03	53.89
-4383.7114	-8987.9404	1.0076	1.6429E-04	-34.26	8.3095E-05	-157.89	2.5857E-03	43.51
-4226.1826	-9063.0778	1.0076	1.2235E-04	-41.09	6.7701E-05	-163.37	1.9656E-03	30.58
-4067.3664	-9135.4545	1.0076	3.9852E-05	-67.05	3.1855E-05	178.45	8.7379E-04	-12.68
-3907.3113	-9205.0485	1.0076	7.3636E-05	160.08	2.6351E-05	65.04	1.4577E-03	-105.93
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-3583.6795	-9335.8042	1.0076	1.9814E-04	142.29	8.8073E-05	32.89	3.3680E-03	-136.93
-3420.2014	-9396.9262	1.0076	1.7909E-04	136.90	8.4448E-05	26.34	2.9897E-03	-147.18
-3255.6815	-9455.1857	1.0076	1.0933E-04	127.21	5.7791E-05	12.55	1.7880E-03	-167.55
-3090.1699	-9510.5651	1.0076	2.9715E-05	64.53	3.0352E-05	-39.40	1.0397E-03	112.00
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-2079.1169	-9781.4760	1.0076	2.2383E-04	170.33	1.1407E-04	88.68	4.9037E-03	-109.71
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-1736.4818	-9848.0775	1.0076	3.2022E-04	156.53	1.7525E-04	74.26	7.0757E-03	-127.02
-1564.3446	-9876.8834	1.0076	2.7943E-04	153.42	1.5582E-04	70.48	6.1161E-03	-132.22
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523.3596	-9986.2953	1.0076	3.5350E-04	178.67	3.0675E-04	102.19	1.1192E-02	-118.81
697.5647	-9975.6405	1.0076	2.0883E-04	-172.34	1.7804E-04	106.60	6.4142E-03	-114.98
871.5574	-9961.9469	1.0076	9.8923E-05	-135.29	6.2733E-05	143.50	2.2634E-03	-77.36
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1218.6934	-9925.4615	1.0076	1.4678E-04	-67.41	1.4768E-04	-133.26	5.3095E-03	1.60
1391.7310	-9902.6806	1.0076	1.5021E-04	-81.19	1.6587E-04	-152.19	5.9405E-03	-18.48
1564.3446	-9876.8834	1.0076	1.5812E-04	-112.84	1.9428E-04	174.12	7.0207E-03	-52.80
1736.4818	-9848.0775	1.0076	2.1192E-04	-142.68	2.7708E-04	144.81	1.0034E-02	-82.01
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2249.5105	-9743.7006	1.0076	2.9542E-04	-179.58	4.4350E-04	103.23	1.5792E-02	-123.97
2419.2189	-9702.9572	1.0076	2.1010E-04	161.88	3.5194E-04	83.34	1.2385E-02	-143.94
2588.1904	-9659.2582	1.0076	1.5085E-04	103.02	2.7374E-04	34.15	9.4084E-03	165.46
2756.3735	-9612.6169	1.0076	3.0123E-04	53.33	4.6021E-04	-17.92	1.6201E-02	111.83
2923.7170	-9563.0475	1.0076	5.3614E-04	40.06	8.2135E-04	-37.68	2.9309E-02	92.11
3090.1699	-9510.5651	1.0076	7.6759E-04	35.80	1.2123E-03	-46.49	4.3539E-02	83.29
3255.6815	-9455.1857	1.0076	9.5355E-04	34.62	1.5534E-03	-51.64	5.6103E-02	78.06
3420.2014	-9396.9262	1.0076	1.0649E-03	34.86	1.7835E-03	-55.30	6.4812E-02	74.31
3583.6795	-9335.8042	1.0076	1.0843E-03	35.86	1.8583E-03	-58.39	6.8017E-02	71.15
3746.0659	-9271.8385	1.0076	1.0064E-03	37.21	1.7541E-03	-61.50	6.4768E-02	68.00
3907.3113	-9205.0485	1.0076	8.3746E-04	38.44	1.4716E-03	-65.41	5.4948E-02	64.10
4067.3664	-9135.4545	1.0076	5.9325E-04	38.54	1.0378E-03	-72.12	3.9371E-02	57.55
4226.1826	-9063.0778	1.0076	2.9949E-04	32.52	5.2284E-04	-91.84	2.0391E-02	38.89
4383.7114	-8987.9404	1.0076	1.0412E-04	-62.53	3.6242E-04	178.10	1.3313E-02	-48.81
4539.9050	-8910.0652	1.0076	3.9242E-04	-108.86	8.8728E-04	140.52	3.3171E-02	-89.11
4694.7156	-8829.4759	1.0076	7.0107E-04	-111.45	1.4427E-03	131.44	5.5158E-02	-98.42
4848.0962	-8746.1970	1.0076	9.6959E-04	-110.07	1.9030E-03	127.12	7.4121E-02	-102.63
5000.0000	-8660.2540	1.0076	1.1770E-03	-107.65	2.2201E-03	124.28	8.8052E-02	-105.25
5150.3807	-8571.6730	1.0076	1.3083E-03	-104.92	2.3685E-03	121.98	9.5722E-02	-107.22
5299.1926	-8480.4809	1.0076	1.3537E-03	-102.21	2.3409E-03	119.84	9.6544E-02	-108.97
5446.3903	-8386.7056	1.0076	1.3085E-03	-99.74	2.1467E-03	117.57	9.0541E-02	-110.76
5591.9290	-8290.3757	1.0076	1.1736E-03	-97.79	1.8091E-03	114.81	7.8295E-02	-112.94
5735.7643	-8191.5204	1.0076	9.5557E-04	-96.88	1.3627E-03	110.88	6.0876E-02	-116.15
5877.8525	-8090.1699	1.0076	6.6779E-04	-98.53	8.5136E-04	103.44	3.9828E-02	-122.50
6018.1502	-7986.3551	1.0076	3.3800E-04	-110.73	3.5090E-04	76.89	1.7997E-02	-144.56
6156.6147	-7880.1075	1.0076	1.8860E-04	160.73	3.5792E-04	-24.88	1.5073E-02	118.23
6293.2039	-7771.4596	1.0076	5.2586E-04	120.98	8.0642E-04	-49.84	3.6081E-02	88.91
6427.8761	-7660.4444	1.0076	9.1305E-04	115.28	1.2177E-03	-57.54	5.7217E-02	81.68
6560.5903	-7547.0958	1.0076	1.2768E-03	114.24	1.5404E-03	-62.16	7.5348E-02	78.35
6691.3060	-7431.4482	1.0076	1.5908E-03	114.54	1.7583E-03	-65.90	8.9321E-02	76.32
6819.9836	-7313.5370	1.0076	1.8351E-03	115.32	1.8672E-03	-69.47	9.8479E-02	74.85
6946.5837	-7193.3980	1.0076	1.9946E-03	116.27	1.8714E-03	-73.19	1.0253E-01	73.64
7071.0678	-7071.0678	1.0076	2.0595E-03	117.24	1.7823E-03	-77.31	1.0150E-01	72.52
7193.3980	-6946.5837	1.0076	2.0253E-03	118.14	1.6163E-03	-82.07	9.5703E-02	71.37
7313.5370	-6819.9836	1.0076	1.8929E-03	118.86	1.3931E-03	-87.80	8.5710E-02	70.06
7431.4482	-6691.3060	1.0076	1.6691E-03	119.24	1.1340E-03	-95.00	7.2283E-02	68.36
7547.0958	-6560.5903	1.0076	1.3656E-03	118.99	8.6029E-04	-104.62	5.6349E-02	65.83
7660.4444	-6427.8761	1.0076	9.9945E-04	117.25	5.9346E-04	-118.94	3.8980E-02	61.25
7771.4596	-6293.2039	1.0076	5.9514E-04	110.77	3.6403E-04	-145.02	2.1593E-02	49.65
7880.1075	-6156.6147	1.0076	2.2770E-04	72.86	2.5708E-04	161.19	9.0978E-03	-5.07
7986.3551	-6018.1502	1.0076	3.7985E-04	-16.69	3.6171E-04	109.34	1.7262E-02	-75.65
8090.1699	-5877.8525	1.0076	7.7877E-04	-31.37	5.5992E-04	82.75	3.0534E-02	-90.21
8191.5204	-5735.7643	1.0076	1.1588E-03	-34.44	7.8654E-04	65.85	4.1782E-02	-95.34
8290.3757	-5591.9290	1.0076	1.4862E-03	-34.70	1.0335E-03	52.87	4.9932E-02	-97.91
8386.7056	-5446.3903	1.0076	1.7435E-03	-33.69	1.3005E-03	42.20	5.4552E-02	-99.44
8480.4809	-5299.1926	1.0076	1.9202E-03	-31.85	1.5844E-03	33.27	5.5490E-02	-100.43

8571.6730	-5150.3807	1.0076	2.0112E-03	-29.26	1.8771E-03	25.79	5.2812E-02	-101.12
8660.2540	-5000.0000	1.0076	2.0177E-03	-25.84	2.1660E-03	19.52	4.6783E-02	-101.59
8746.1970	-4848.0962	1.0076	1.9470E-03	-21.36	2.4363E-03	14.26	3.7844E-02	-101.92
8829.4759	-4694.7156	1.0076	1.8136E-03	-15.45	2.6719E-03	9.84	2.6582E-02	-102.14
8910.0652	-4539.9050	1.0076	1.6392E-03	-7.57	2.8576E-03	6.12	1.3705E-02	-102.27
8987.9404	-4383.7114	1.0076	1.4536E-03	2.98	2.9803E-03	2.98	6.4513E-10	-55.62
9063.0778	-4226.1826	1.0076	1.2936E-03	16.76	3.0298E-03	0.33	1.3705E-02	77.73
9135.4545	-4067.3664	1.0076	1.1953E-03	33.36	2.9999E-03	-1.90	2.6582E-02	77.86
9205.0485	-3907.3113	1.0076	1.1751E-03	50.70	2.8889E-03	-3.76	3.7844E-02	78.08
9271.8385	-3746.0659	1.0076	1.2151E-03	66.18	2.6993E-03	-5.26	4.6783E-02	78.41
9335.8042	-3583.6795	1.0076	1.2739E-03	78.61	2.4384E-03	-6.40	5.2812E-02	78.88
9396.9262	-3420.2014	1.0076	1.3095E-03	88.26	2.1173E-03	-7.15	5.5490E-02	79.57
9455.1857	-3255.6815	1.0076	1.2908E-03	95.96	1.7507E-03	-7.36	5.4552E-02	80.56
9510.5651	-3090.1699	1.0076	1.1987E-03	102.56	1.3564E-03	-6.75	4.9932E-02	82.09
9563.0475	-2923.7170	1.0076	1.0253E-03	109.06	9.5416E-04	-4.49	4.1782E-02	84.66
9612.6169	-2756.3735	1.0076	7.7297E-04	117.23	5.6790E-04	2.27	3.0534E-02	89.79
9659.2582	-2588.1904	1.0076	4.6296E-04	133.45	2.4654E-04	30.25	1.7262E-02	104.35
9702.9572	-2419.2189	1.0076	2.4298E-04	-163.59	2.4269E-04	113.54	9.0978E-03	174.93
9743.7006	-2249.5105	1.0076	5.1783E-04	-101.71	4.6752E-04	138.46	2.1593E-02	-130.35
9781.4760	-2079.1169	1.0076	9.5787E-04	-86.68	6.5847E-04	144.71	3.8980E-02	-118.75
9816.2718	-1908.0899	1.0076	1.4113E-03	-80.36	7.8302E-04	146.80	5.6349E-02	-114.17
9848.0775	-1736.4818	1.0076	1.8365E-03	-76.65	8.3616E-04	147.27	7.2283E-02	-111.64
9876.8834	-1564.3446	1.0076	2.2023E-03	-74.07	8.2095E-04	146.81	8.5710E-02	-109.94
9902.6806	-1391.7310	1.0076	2.4814E-03	-72.08	7.4610E-04	145.58	9.5703E-02	-108.63
9925.4615	-1218.6934	1.0076	2.6509E-03	-70.41	6.2498E-04	143.42	1.0150E-01	-107.48
9945.2189	-1045.2846	1.0076	2.6936E-03	-68.89	4.7470E-04	139.78	1.0253E-01	-106.36
9961.9469	-871.5574	1.0076	2.5989E-03	-67.39	3.1543E-04	133.02	9.8479E-02	-105.15
9975.6405	-697.5647	1.0076	2.3649E-03	-65.72	1.7125E-04	117.34	8.9321E-02	-103.68
9986.2953	-523.3596	1.0076	1.9990E-03	-63.57	8.4249E-05	69.32	7.5348E-02	-101.65
9993.9082	-348.9950	1.0076	1.5189E-03	-60.19	9.6838E-05	10.72	5.7217E-02	-98.32
9998.4769	-174.5241	1.0076	9.5647E-04	-52.94	1.0955E-04	-12.76	3.6081E-02	-91.09

***** DATA CARD NO. 8 NH 1 1 360 1 1.00000E+04 0.00000E+00 8.99942E+01 0.00000E+00 1.00000E+00 0.00000E+C

- - - NEAR MAGNETIC FIELDS - - -

- LOCATION -			- HX -		- HY -		- HZ -	
X METERS	Y METERS	Z METERS	MAGNITUDE AMPS/M	PHASE DEGREES	MAGNITUDE AMPS/M	PHASE DEGREES	MAGNITUDE AMPS/M	PHASE DEGREES
9999.9999	0.0000	1.0076	3.2541E-06	-167.28	4.0012E-05	118.31	2.4787E-07	-21.26
9998.4769	174.5241	1.0076	3.2351E-06	150.03	4.7874E-05	-144.69	1.1056E-07	-119.46
9993.9082	348.9950	1.0076	7.0118E-06	103.96	1.0565E-04	-122.66	4.6490E-07	-167.83
9986.2953	523.3596	1.0076	1.4300E-05	90.02	1.6114E-04	-116.32	9.3647E-07	-174.02
9975.6405	697.5647	1.0076	2.3280E-05	85.08	2.0676E-04	-113.12	1.4377E-06	-176.11
9961.9469	871.5574	1.0076	3.2542E-05	82.94	2.3843E-04	-110.96	1.9068E-06	-176.97
9945.2189	1045.2846	1.0076	4.0630E-05	82.01	2.5340E-04	-109.18	2.2807E-06	-177.26
9925.4615	1218.6934	1.0076	4.6111E-05	81.76	2.5030E-04	-107.44	2.5008E-06	-177.16
9902.6806	1391.7310	1.0076	4.7731E-05	82.07	2.2925E-04	-105.46	2.5199E-06	-176.70
9876.8834	1564.3446	1.0076	4.4608E-05	83.00	1.9204E-04	-102.81	2.3096E-06	-175.76
9848.0775	1736.4818	1.0076	3.6408E-05	85.06	1.4215E-04	-98.52	1.8666E-06	-173.93
9816.2718	1908.0899	1.0076	2.3518E-05	90.35	8.5063E-05	-88.93	1.2178E-06	-169.59
9781.4760	2079.1169	1.0076	8.0195E-06	120.27	3.4593E-05	-47.92	4.4477E-07	-148.57
9743.7006	2249.5105	1.0076	1.4436E-05	-123.95	5.2588E-05	37.65	5.6933E-07	-23.41

9702.9572	2419.2189	1.0076	3.3287E-05	-110.41	9.9727E-05	56.44	1.4292E-06	-7.92
9659.2582	2588.1904	1.0076	5.0538E-05	-106.19	1.3773E-04	63.07	2.2057E-06	-3.63
9612.6169	2756.3735	1.0076	6.3659E-05	-103.63	1.6082E-04	67.00	2.7893E-06	-1.12
9563.0475	2923.7170	1.0076	7.0891E-05	-101.43	1.6728E-04	70.17	3.1090E-06	1.02
9510.5651	3090.1699	1.0076	7.1282E-05	-99.06	1.5783E-04	73.35	3.1293E-06	3.31
9455.1857	3255.6815	1.0076	6.4867E-05	-96.05	1.3521E-04	77.14	2.8562E-06	6.19
9396.9262	3420.2014	1.0076	5.2744E-05	-91.65	1.0380E-04	82.46	2.3395E-06	10.34
9335.8042	3583.6795	1.0076	3.7028E-05	-83.93	6.9116E-05	91.49	1.6692E-06	17.39
9271.8385	3746.0659	1.0076	2.0999E-05	-66.08	3.7949E-05	111.71	9.7681E-07	32.77
9205.0485	3907.3113	1.0076	1.1711E-05	-12.08	2.2342E-05	165.13	5.0931E-07	78.61
9135.4545	4067.3664	1.0076	1.6440E-05	42.28	2.8849E-05	-145.61	6.2219E-07	138.94
9063.0778	4226.1826	1.0076	2.2302E-05	61.92	3.5983E-05	-125.71	8.6129E-07	162.05
8987.9404	4383.7114	1.0076	2.3737E-05	73.37	3.6153E-05	-113.47	9.3115E-07	174.59
8910.0652	4539.9050	1.0076	2.0827E-05	84.98	3.0354E-05	-101.11	8.2389E-07	-173.18
8829.4759	4694.7156	1.0076	1.5537E-05	102.33	2.1968E-05	-83.38	6.1995E-07	-155.04
8746.1970	4848.0962	1.0076	1.1094E-05	132.32	1.5256E-05	-54.60	4.5520E-07	-124.22
8660.2540	5000.0000	1.0076	9.8967E-06	167.47	1.2590E-05	-21.09	4.2327E-07	-90.31
8571.6730	5150.3807	1.0076	9.4156E-06	-173.63	1.0811E-05	-0.82	4.1320E-07	-73.76
8480.4809	5299.1926	1.0076	6.6214E-06	-177.54	6.5057E-06	-1.33	3.1125E-07	-80.16
8386.7056	5446.3903	1.0076	4.8767E-06	115.44	4.0974E-06	-88.76	2.5541E-07	-136.05
8290.3757	5591.9290	1.0076	1.2295E-05	75.48	1.2519E-05	-122.56	5.4334E-07	-175.61
8191.5204	5735.7643	1.0076	2.1687E-05	69.44	2.1400E-05	-125.00	9.3452E-07	175.94
8090.1699	5877.8525	1.0076	2.9329E-05	69.31	2.7654E-05	-123.47	1.2620E-06	174.59
7986.3551	6018.1502	1.0076	3.3203E-05	71.29	2.9856E-05	-120.47	1.4357E-06	175.79
7880.1075	6156.6147	1.0076	3.2454E-05	74.83	2.7803E-05	-116.13	1.4159E-06	178.68
7771.4596	6293.2039	1.0076	2.7545E-05	80.43	2.2452E-05	-109.73	1.2180E-06	-176.47
7660.4444	6427.8761	1.0076	2.0140E-05	89.67	1.5584E-05	-99.40	9.0862E-07	-168.47
7547.0958	6560.5903	1.0076	1.2675E-05	106.29	9.2985E-06	-80.89	5.8646E-07	-154.66
7431.4482	6691.3060	1.0076	7.5299E-06	135.07	5.3037E-06	-48.57	3.4604E-07	-132.10
7313.5370	6819.9836	1.0076	4.8539E-06	165.22	3.3415E-06	-12.59	2.0423E-07	-110.31
7193.3980	6946.5837	1.0076	1.9964E-06	160.62	1.1535E-06	13.13	1.0421E-07	-137.81
7071.0678	7071.0678	1.0076	3.8939E-06	56.09	2.0798E-06	-162.00	2.4023E-07	161.90
6946.5837	7193.3980	1.0076	9.8043E-06	51.19	5.5634E-06	-151.99	4.9859E-07	156.33
6819.9836	7313.5370	1.0076	1.4901E-05	54.13	8.1675E-06	-145.17	7.2325E-07	158.19
6691.3060	7431.4482	1.0076	1.7368E-05	58.52	9.0756E-06	-138.85	8.3021E-07	161.86
6560.5903	7547.0958	1.0076	1.6351E-05	64.52	8.1111E-06	-131.29	7.7830E-07	167.21
6427.8761	7660.4444	1.0076	1.2240E-05	74.54	5.7806E-06	-119.21	5.8305E-07	176.38
6293.2039	7771.4596	1.0076	6.8496E-06	98.71	3.2121E-06	-91.51	3.2508E-07	-161.19
6156.6147	7880.1075	1.0076	4.6536E-06	165.20	2.3410E-06	-29.81	2.0796E-07	-95.31
6018.1502	7986.3551	1.0076	6.8958E-06	-151.39	3.0354E-06	10.51	3.0727E-07	-50.31
5877.8525	8090.1699	1.0076	7.6048E-06	-133.99	3.1061E-06	30.87	3.3160E-07	-33.50
5735.7643	8191.5204	1.0076	5.5201E-06	-117.45	2.3330E-06	53.48	2.1535E-07	-17.27
5591.9290	8290.3757	1.0076	2.3790E-06	-61.03	1.5707E-06	99.77	8.4359E-08	76.94
5446.3903	8386.7056	1.0076	4.8523E-06	21.42	1.8970E-06	151.97	2.9475E-07	135.17
5299.1926	8480.4809	1.0076	8.2483E-06	38.93	2.3913E-06	175.48	4.7712E-07	145.15
5150.3807	8571.6730	1.0076	9.3283E-06	47.84	2.2753E-06	-170.72	5.2594E-07	150.75
5000.0000	8660.2540	1.0076	7.6336E-06	56.75	1.5847E-06	-153.76	4.1813E-07	156.27
4848.0962	8746.1970	1.0076	3.9457E-06	75.77	8.8112E-07	-108.73	1.8973E-07	168.49
4694.7156	8829.4759	1.0076	2.2580E-06	175.87	1.1173E-06	-47.88	1.1185E-07	-53.36
4539.9050	8910.0652	1.0076	5.5295E-06	-142.86	1.5430E-06	-28.20	3.3837E-07	-30.69
4383.7114	8987.9404	1.0076	7.3562E-06	-131.28	1.5309E-06	-20.80	4.5262E-07	-24.26
4226.1826	9063.0778	1.0076	6.7752E-06	-121.82	1.0811E-06	-13.74	4.1409E-07	-18.21
4067.3664	9135.4545	1.0076	4.2259E-06	-105.73	4.5854E-07	16.60	2.4429E-07	-6.31
3907.3113	9205.0485	1.0076	1.8751E-06	-37.29	5.8951E-07	104.71	8.4073E-08	80.13
3746.0659	9271.8385	1.0076	3.9439E-06	30.49	1.0936E-06	119.20	2.6741E-07	143.26
3583.6795	9335.8042	1.0076	5.8616E-06	47.49	1.3223E-06	119.39	4.0960E-07	154.23
3420.2014	9396.9262	1.0076	6.0073E-06	59.10	1.1946E-06	117.29	4.2468E-07	161.83
3255.6815	9455.1857	1.0076	4.5433E-06	74.81	7.5534E-07	117.38	3.1818E-07	172.60
3090.1699	9510.5651	1.0076	2.6200E-06	111.78	1.8562E-07	153.29	1.5784E-07	-156.52
2923.7170	9563.0475	1.0076	2.6146E-06	178.35	5.0335E-07	-98.07	1.4850E-07	-73.63

2756.3735	9612.6169	1.0076	3.6833E-06	-149.83	8.4188E-07	-94.23	2.4410E-07	-44.41
2588.1904	9659.2582	1.0076	3.7331E-06	-133.05	7.6514E-07	-96.84	2.4690E-07	-34.36
2419.2189	9702.9572	1.0076	2.5410E-06	-113.11	2.3059E-07	-115.10	1.3253E-07	-26.92
2249.5105	9743.7006	1.0076	1.2549E-06	-45.12	7.0153E-07	94.06	6.7852E-08	144.25
2079.1169	9781.4760	1.0076	2.6828E-06	23.98	1.7172E-06	88.66	2.8890E-07	154.01
1908.0899	9816.2718	1.0076	4.3704E-06	42.69	2.5400E-06	87.27	4.6450E-07	158.06
1736.4818	9848.0775	1.0076	5.1523E-06	54.45	2.9085E-06	87.40	5.4352E-07	162.03
1564.3446	9876.8834	1.0076	4.9053E-06	66.34	2.7086E-06	89.23	5.0934E-07	167.09
1391.7310	9902.6806	1.0076	3.9262E-06	81.90	2.0250E-06	94.44	3.8451E-07	175.29
1218.6934	9925.4615	1.0076	2.7506E-06	105.65	1.1469E-06	109.91	2.2681E-07	-166.87
1045.2846	9945.2189	1.0076	1.9097E-06	141.64	6.2249E-07	159.50	1.2892E-07	-121.51
871.5574	9961.9469	1.0076	1.5170E-06	-176.06	7.0558E-07	-159.29	1.2992E-07	-79.25
697.5647	9975.6405	1.0076	1.2671E-06	-132.10	6.0156E-07	-167.25	1.0502E-07	-77.74
523.3596	9986.2953	1.0076	1.2372E-06	-79.66	6.9167E-07	123.74	8.7613E-08	-148.15
348.9950	9993.9082	1.0076	1.6596E-06	-36.83	1.6994E-06	94.16	2.3856E-07	174.86
174.5241	9998.4769	1.0076	2.1723E-06	-11.74	2.9192E-06	88.02	4.2640E-07	169.44
0.0000	9999.9999	1.0076	2.4212E-06	5.57	3.9048E-06	87.02	5.7649E-07	169.31
-174.5241	9998.4769	1.0076	2.3183E-06	21.66	4.3688E-06	88.17	6.4560E-07	171.07
-348.9950	9993.9082	1.0076	1.9908E-06	40.75	4.1912E-06	91.04	6.1671E-07	174.30
-523.3596	9986.2953	1.0076	1.6707E-06	64.45	3.4409E-06	96.30	5.0135E-07	179.71
-697.5647	9975.6405	1.0076	1.4664E-06	87.85	2.3544E-06	106.46	3.3636E-07	-169.90
-871.5574	9961.9469	1.0076	1.2170E-06	104.07	1.3083E-06	130.53	1.8160E-07	-144.00
-1045.2846	9945.2189	1.0076	7.1481E-07	111.40	8.6616E-07	-174.93	1.2933E-07	-87.07
-1218.6934	9925.4615	1.0076	1.1656E-07	-30.05	1.0129E-06	-133.24	1.5515E-07	-51.95
-1391.7310	9902.6806	1.0076	1.1367E-06	-56.32	9.7855E-07	-113.25	1.3826E-07	-40.34
-1564.3446	9876.8834	1.0076	2.2141E-06	-59.44	6.0762E-07	-92.11	5.9063E-08	-43.53
-1736.4818	9848.0775	1.0076	3.1249E-06	-63.29	3.0122E-07	-3.55	6.7655E-08	169.84
-1908.0899	9816.2718	1.0076	3.6582E-06	-68.27	8.2489E-07	52.64	1.9461E-07	163.06
-2079.1169	9781.4760	1.0076	3.6279E-06	-74.68	1.3256E-06	66.31	2.9033E-07	162.90
-2249.5105	9743.7006	1.0076	2.9018E-06	-84.23	1.5694E-06	75.20	3.2373E-07	162.99
-2419.2189	9702.9572	1.0076	1.5160E-06	-109.34	1.5282E-06	84.15	2.7915E-07	161.98
-2588.1904	9659.2582	1.0076	1.5300E-06	144.94	1.2772E-06	95.46	1.5950E-07	155.57
-2756.3735	9612.6169	1.0076	4.2950E-06	114.83	9.5170E-07	110.92	5.3942E-08	49.57
-2923.7170	9563.0475	1.0076	7.6121E-06	105.62	6.6889E-07	129.21	2.4776E-07	4.40
-3090.1699	9510.5651	1.0076	1.0938E-05	100.26	4.3426E-07	138.80	4.5707E-07	0.67
-3255.6815	9455.1857	1.0076	1.3802E-05	96.38	2.6677E-07	100.81	6.3202E-07	0.24
-3420.2014	9396.9262	1.0076	1.5749E-05	93.24	5.7173E-07	50.08	7.4574E-07	0.81
-3583.6795	9335.8042	1.0076	1.6402E-05	90.48	1.1215E-06	40.61	7.8271E-07	1.90
-3746.0659	9271.8385	1.0076	1.5523E-05	87.82	1.6473E-06	37.08	7.3976E-07	3.42
-3907.3113	9205.0485	1.0076	1.3059E-05	84.80	1.9760E-06	32.45	6.2522E-07	5.51
-4067.3664	9135.4545	1.0076	9.1617E-06	80.22	1.9979E-06	22.90	4.5663E-07	8.72
-4226.1826	9063.0778	1.0076	4.2488E-06	66.86	1.7921E-06	1.31	2.5794E-07	15.51
-4383.7114	8987.9404	1.0076	2.4348E-06	-51.16	1.9177E-06	-37.87	6.9986E-08	56.44
-4539.9050	8910.0652	1.0076	7.9277E-06	-81.53	3.0023E-06	-69.86	1.5991E-07	166.16
-4694.7156	8829.4759	1.0076	1.3390E-05	-87.19	4.7601E-06	-85.13	3.1515E-07	177.95
-4848.0962	8746.1970	1.0076	1.7992E-05	-89.78	6.7510E-06	-92.57	4.2873E-07	-177.44
-5000.0000	8660.2540	1.0076	2.1299E-05	-91.39	8.6403E-06	-96.72	4.9256E-07	-174.27
-5150.3807	8571.6730	1.0076	2.3037E-05	-92.58	1.0142E-05	-99.34	5.0714E-07	-171.46
-5299.1926	8480.4809	1.0076	2.3088E-05	-93.56	1.1016E-05	-101.23	4.7850E-07	-168.56
-5446.3903	8386.7056	1.0076	2.1492E-05	-94.48	1.1091E-05	-102.88	4.1638E-07	-165.21
-5591.9290	8290.3757	1.0076	1.8426E-05	-95.48	1.0273E-05	-104.66	3.3260E-07	-160.89
-5735.7643	8191.5204	1.0076	1.4176E-05	-96.83	8.5629E-06	-107.20	2.3966E-07	-154.46
-5877.8525	8090.1699	1.0076	9.1104E-06	-99.32	6.0609E-06	-112.16	1.5023E-07	-142.78
-6018.1502	7986.3551	1.0076	3.6677E-06	-108.44	3.0489E-06	-128.39	8.0780E-08	-114.45
-6156.6147	7880.1075	1.0076	2.2017E-06	110.59	1.8939E-06	137.42	6.4374E-08	-56.10
-6293.2039	7771.4596	1.0076	7.2762E-06	92.79	5.2213E-06	99.20	9.0893E-08	-21.07
-6427.8761	7660.4444	1.0076	1.1831E-05	89.69	8.9698E-06	91.64	1.1310E-07	-6.64
-6560.5903	7547.0958	1.0076	1.5522E-05	88.33	1.2465E-05	88.63	1.1987E-07	1.89
-6691.3060	7431.4482	1.0076	1.8180E-05	87.53	1.5430E-05	87.04	1.1168E-07	9.09
-6819.9836	7313.5370	1.0076	1.9728E-05	86.96	1.7662E-05	86.05	9.2231E-08	17.47

-6946.5837	7193.3980	1.0076	2.0167E-05	86.52	1.9021E-05	85.36	6.7160E-08	30.72
-7071.0678	7071.0678	1.0076	1.9566E-05	86.15	1.9426E-05	84.81	4.5320E-08	57.38
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-7431.4482	6691.3060	1.0076	1.2998E-05	85.21	1.5063E-05	82.98	6.7631E-08	140.14
-7547.0958	6560.5903	1.0076	9.8617E-06	84.92	1.2076E-05	81.84	7.5671E-08	141.91
-7660.4444	6427.8761	1.0076	6.5998E-06	84.68	8.6013E-06	79.67	7.6516E-08	136.70
-7771.4596	6293.2039	1.0076	3.4094E-06	84.68	4.8678E-06	74.03	7.3359E-08	123.18
-7880.1075	6156.6147	1.0076	4.6762E-07	90.01	1.3952E-06	36.19	7.5061E-08	100.43
-7986.3551	6018.1502	1.0076	2.0899E-06	-98.89	3.0333E-06	-72.36	9.2609E-08	75.85
-8090.1699	5877.8525	1.0076	4.1423E-06	-98.89	6.3037E-06	-83.32	1.2787E-07	58.54
-8191.5204	5735.7643	1.0076	5.6229E-06	-99.63	9.1257E-06	-86.36	1.7537E-07	48.38
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-8386.7056	5446.3903	1.0076	6.7783E-06	-102.39	1.2685E-05	-88.20	2.8681E-07	38.89
-8480.4809	5299.1926	1.0076	6.5030E-06	-104.74	1.3239E-05	-88.36	3.4327E-07	36.65
-8571.6730	5150.3807	1.0076	5.7516E-06	-108.36	1.2938E-05	-88.21	3.9620E-07	35.21
-8660.2540	5000.0000	1.0076	4.6401E-06	-114.50	1.1814E-05	-87.72	4.4311E-07	34.28
-8746.1970	4848.0962	1.0076	3.3471E-06	-126.53	9.9485E-06	-86.72	4.8187E-07	33.68
-8829.4759	4694.7156	1.0076	2.2438E-06	-154.09	7.4654E-06	-84.70	5.1079E-07	33.31
-8910.0652	4539.9050	1.0076	2.1522E-06	158.71	4.5395E-06	-79.55	5.2865E-07	33.10
-8987.9404	4383.7114	1.0076	3.1581E-06	128.32	1.5403E-06	-51.68	5.3468E-07	33.04
-9063.0778	4226.1826	1.0076	4.4203E-06	115.22	2.3875E-06	63.28	5.2865E-07	33.10
-9135.4545	4067.3664	1.0076	5.5493E-06	108.78	5.4746E-06	77.71	5.1079E-07	33.31
-9205.0485	3907.3113	1.0076	6.3942E-06	105.18	8.3241E-06	81.57	4.8187E-07	33.68
-9271.8385	3746.0659	1.0076	6.8811E-06	103.06	1.0666E-05	83.39	4.4311E-07	34.28
-9335.8042	3583.6795	1.0076	6.9786E-06	101.86	1.2320E-05	84.51	3.9620E-07	35.21
-9396.9262	3420.2014	1.0076	6.6876E-06	101.36	1.3147E-05	85.33	3.4327E-07	36.65
-9455.1857	3255.6815	1.0076	6.0376E-06	101.56	1.3054E-05	86.05	2.8681E-07	38.89
-9510.5651	3090.1699	1.0076	5.0835E-06	102.67	1.1996E-05	86.80	2.2972E-07	42.47
-9563.0475	2923.7170	1.0076	3.9033E-06	105.38	9.9829E-06	87.79	1.7537E-07	48.38
-9612.6169	2756.3735	1.0076	2.6022E-06	111.92	7.0798E-06	89.57	1.2787E-07	58.54
-9659.2582	2588.1904	1.0076	1.3657E-06	132.52	3.4210E-06	95.22	9.2609E-08	75.85
-9702.9572	2419.2189	1.0076	9.5809E-07	-157.84	1.1169E-06	-128.36	7.5060E-08	100.43
-9743.7006	2249.5105	1.0076	1.8150E-06	-118.31	5.6591E-06	-100.93	7.3358E-08	123.18
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-9816.2718	1908.0899	1.0076	3.4688E-06	-103.57	1.5200E-05	-96.59	7.5670E-08	141.91
-9848.0775	1736.4818	1.0076	3.8860E-06	-101.60	1.9512E-05	-95.85	6.7630E-08	140.14
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-9998.4769	174.5241	1.0076	6.0269E-07	43.23	8.9354E-06	-84.91	9.0893E-08	-21.07
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-9986.2953	-523.3596	1.0076	2.4180E-06	-66.66	1.6384E-05	79.85	2.3966E-07	-154.46
-9975.6405	-697.5647	1.0076	3.5926E-06	-74.41	2.0788E-05	81.74	3.3260E-07	-160.89
-9961.9469	-871.5574	1.0076	4.7603E-06	-78.92	2.3712E-05	83.11	4.1638E-07	-165.21
-9945.2189	-1045.2846	1.0076	5.7300E-06	-81.88	2.4931E-05	84.36	4.7850E-07	-168.56
-9925.4615	-1218.6934	1.0076	6.3172E-06	-84.01	2.4365E-05	85.70	5.0714E-07	-171.46
-9902.6806	-1391.7310	1.0076	6.3654E-06	-85.70	2.2086E-05	87.33	4.9256E-07	-174.27
-9876.8834	-1564.3446	1.0076	5.7692E-06	-87.21	1.8330E-05	89.58	4.2873E-07	-177.44
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-9816.2718	-1908.0899	1.0076	2.6081E-06	-92.10	8.0660E-06	101.13	1.5991E-07	166.16
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-9702.9572	-2419.2189	1.0076	4.9704E-06	95.69	7.9514E-06	-107.26	4.5663E-07	8.72
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-9612.6169	-2756.3735	1.0076	8.7933E-06	94.38	1.2898E-05	-95.67	7.3975E-07	3.42
-9563.0475	-2923.7170	1.0076	9.5525E-06	94.54	1.3380E-05	-91.78	7.8271E-07	1.90
-9510.5651	-3090.1699	1.0076	9.3727E-06	95.12	1.2670E-05	-87.85	7.4574E-07	0.81
-9455.1857	-3255.6815	1.0076	8.2881E-06	96.27	1.1040E-05	-83.56	6.3202E-07	0.24
-9396.9262	-3420.2014	1.0076	6.4703E-06	98.38	8.8303E-06	-78.66	4.5707E-07	0.67
-9335.8042	-3583.6795	1.0076	4.2087E-06	102.74	6.3779E-06	-72.90	2.4776E-07	4.40
-9271.8385	-3746.0659	1.0076	1.8967E-06	116.38	3.9692E-06	-65.74	5.3942E-08	49.57
-9205.0485	-3907.3113	1.0076	8.1750E-07	-145.69	1.8177E-06	-54.26	1.5950E-07	155.57
-9135.4545	-4067.3664	1.0076	2.1231E-06	-101.73	3.5555E-07	32.55	2.7915E-07	161.98
-9063.0778	-4226.1826	1.0076	2.9763E-06	-92.63	1.4231E-06	109.57	3.2373E-07	162.99
-8987.9404	-4383.7114	1.0076	3.1155E-06	-86.87	2.2831E-06	118.32	2.9033E-07	162.90
-8910.0652	-4539.9050	1.0076	2.6455E-06	-80.44	2.6578E-06	121.17	1.9461E-07	163.06
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-8746.1970	-4848.0962	1.0076	9.9430E-07	-44.37	2.0695E-06	114.96	5.9063E-08	-43.53
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-8571.6730	-5150.3807	1.0076	8.1757E-07	41.86	6.0926E-07	55.20	1.5515E-07	-51.95
-8480.4809	-5299.1926	1.0076	7.0047E-07	42.15	8.7780E-07	-32.94	1.2933E-07	-87.07
-8386.7056	-5446.3903	1.0076	4.9096E-07	-6.65	1.7180E-06	-63.87	1.8160E-07	-144.00
-8290.3757	-5591.9290	1.0076	1.0403E-06	-57.46	2.5713E-06	-81.78	3.3637E-07	-169.90
-8191.5204	-5735.7643	1.0076	1.9162E-06	-67.25	3.3105E-06	-95.82	5.0135E-07	179.71
-8090.1699	-5877.8525	1.0076	2.6903E-06	-68.44	3.7805E-06	-107.58	6.1671E-07	174.30
-7986.3551	-6018.1502	1.0076	3.1576E-06	-67.34	3.8066E-06	-117.94	6.4560E-07	171.07
-7880.1075	-6156.6147	1.0076	3.2134E-06	-65.68	3.2838E-06	-128.05	5.7649E-07	169.31
-7771.4596	-6293.2039	1.0076	2.8502E-06	-64.44	2.2621E-06	-140.21	4.2640E-07	169.44
-7660.4444	-6427.8761	1.0076	2.1523E-06	-64.84	1.0051E-06	-165.03	2.3856E-07	174.86
-7547.0958	-6560.5903	1.0076	1.2804E-06	-69.93	6.0815E-07	84.19	8.7613E-08	-148.15
-7431.4482	-6691.3060	1.0076	4.7802E-07	-97.29	1.3187E-06	38.59	1.0502E-07	-77.74
-7313.5370	-6819.9836	1.0076	4.3245E-07	162.17	1.6162E-06	8.39	1.2992E-07	-79.25
-7193.3980	-6946.5837	1.0076	7.2464E-07	129.66	1.8734E-06	-34.76	1.2892E-07	-121.51
-7071.0678	-7071.0678	1.0076	7.9498E-07	100.80	2.8721E-06	-73.31	2.2681E-07	-166.87
-6946.5837	-7193.3980	1.0076	9.2673E-07	59.95	4.3193E-06	-94.51	3.8451E-07	175.29
-6819.9836	-7313.5370	1.0076	1.3416E-06	28.10	5.4405E-06	-106.81	5.0934E-07	167.09
-6691.3060	-7431.4482	1.0076	1.7645E-06	9.50	5.6473E-06	-115.62	5.4353E-07	162.03
-6560.5903	-7547.0958	1.0076	1.8906E-06	-5.31	4.6881E-06	-123.77	4.6450E-07	158.06
-6427.8761	-7660.4444	1.0076	1.6270E-06	-24.77	2.7384E-06	-135.60	2.8890E-07	154.01
-6293.2039	-7771.4596	1.0076	1.2445E-06	-62.00	7.1971E-07	157.98	6.7852E-08	144.25
-6156.6147	-7880.1075	1.0076	1.3828E-06	-112.85	2.1442E-06	66.76	1.3253E-07	-26.92
-6018.1502	-7986.3551	1.0076	1.8466E-06	-144.17	3.3335E-06	51.74	2.4690E-07	-34.36
-5877.8525	-8090.1699	1.0076	1.9704E-06	-165.96	3.2238E-06	37.79	2.4410E-07	-44.41
-5735.7643	-8191.5204	1.0076	1.6142E-06	164.22	2.1175E-06	6.71	1.4850E-07	-73.63
-5591.9290	-8290.3757	1.0076	1.5066E-06	108.09	2.1515E-06	-66.21	1.5784E-07	-156.52
-5446.3903	-8386.7056	1.0076	2.3929E-06	65.12	3.9353E-06	-100.61	3.1818E-07	172.60
-5299.1926	-8480.4809	1.0076	3.3006E-06	45.08	5.1595E-06	-113.94	4.2468E-07	161.83
-5150.3807	-8571.6730	1.0076	3.4312E-06	30.71	4.9329E-06	-123.49	4.0960E-07	154.23
-5000.0000	-8660.2540	1.0076	2.5581E-06	10.81	3.1947E-06	-137.34	2.6741E-07	143.26
-4848.0962	-8746.1970	1.0076	1.5472E-06	-47.95	1.2124E-06	153.33	8.4073E-08	80.13
-4694.7156	-8829.4759	1.0076	2.8116E-06	-111.96	3.1881E-06	78.57	2.4429E-07	-6.31
-4539.9050	-8910.0652	1.0076	4.5089E-06	-132.17	5.1712E-06	65.20	4.1409E-07	-18.21
-4383.7114	-8987.9404	1.0076	5.0784E-06	-144.14	5.5377E-06	57.89	4.5262E-07	-24.26
-4226.1826	-9063.0778	1.0076	4.0647E-06	-158.64	4.0540E-06	49.43	3.3837E-07	-30.69
-4067.3664	-9135.4545	1.0076	2.1157E-06	159.15	1.3679E-06	16.23	1.1185E-07	-53.36
-3907.3113	-9205.0485	1.0076	3.1219E-06	74.77	2.5688E-06	-103.28	1.8973E-07	168.49
-3746.0659	-9271.8385	1.0076	5.8102E-06	50.49	5.1985E-06	-117.78	4.1813E-07	156.27
-3583.6795	-9335.8042	1.0076	7.2320E-06	38.95	6.3160E-06	-124.22	5.2594E-07	150.75
-3420.2014	-9396.9262	1.0076	6.5752E-06	27.56	5.5244E-06	-130.52	4.7712E-07	145.15
-3255.6815	-9455.1857	1.0076	4.1188E-06	5.41	3.1903E-06	-142.43	2.9475E-07	135.17
-3090.1699	-9510.5651	1.0076	2.6648E-06	-69.81	1.0128E-06	137.28	8.4359E-08	76.94
-2923.7170	-9563.0475	1.0076	5.2220E-06	-120.63	2.9403E-06	66.96	2.1535E-07	-17.27

-2756.3735	-9612.6169	1.0076	7.0736E-06	-139.18	4.1767E-06	52.87	3.3160E-07	-33.50
-2588.1904	-9659.2582	1.0076	6.5613E-06	-157.89	3.7034E-06	37.62	3.0727E-07	-50.31
-2419.2189	-9702.9572	1.0076	4.6713E-06	159.33	2.3054E-06	-5.49	2.0796E-07	-95.31
-2249.5105	-9743.7006	1.0076	6.7231E-06	94.88	3.4691E-06	-75.49	3.2508E-07	-161.19
-2079.1169	-9781.4760	1.0076	1.2009E-05	69.37	6.2461E-06	-97.67	5.8305E-07	176.38
-1908.0899	-9816.2718	1.0076	1.6309E-05	58.39	8.1934E-06	-105.92	7.7830E-07	167.21
-1736.4818	-9848.0775	1.0076	1.7648E-05	51.57	8.5184E-06	-110.19	8.3021E-07	161.86
-1564.3446	-9876.8834	1.0076	1.5396E-05	46.19	7.1907E-06	-112.51	7.2324E-07	158.19
-1391.7310	-9902.6806	1.0076	1.0213E-05	41.46	4.7714E-06	-112.41	4.9859E-07	156.33
-1218.6934	-9925.4615	1.0076	3.8232E-06	40.76	2.2070E-06	-102.93	2.4023E-07	161.90
-1045.2846	-9945.2189	1.0076	2.0545E-06	174.37	1.0464E-06	-40.78	1.0421E-07	-137.81
-871.5574	-9961.9469	1.0076	5.6204E-06	166.25	1.7709E-06	-17.32	2.0423E-07	-110.31
-697.5647	-9975.6405	1.0076	8.8108E-06	133.34	2.6830E-06	-40.51	3.4604E-07	-132.10
-523.3596	-9986.2953	1.0076	1.5101E-05	102.82	4.3675E-06	-64.27	5.8646E-07	-154.66
-348.9950	-9993.9082	1.0076	2.4603E-05	85.16	6.5728E-06	-77.02	9.0862E-07	-168.47
-174.5241	-9998.4769	1.0076	3.4515E-05	75.24	8.4580E-06	-82.83	1.2180E-06	-176.47
0.0000	-9999.9999	1.0076	4.1699E-05	69.10	9.3536E-06	-84.80	1.4158E-06	178.68
174.5241	-9998.4769	1.0076	4.3738E-05	64.99	8.9882E-06	-84.06	1.4357E-06	175.79
348.9950	-9993.9082	1.0076	3.9602E-05	62.32	7.5203E-06	-80.62	1.2620E-06	174.59
523.3596	-9986.2953	1.0076	2.9979E-05	61.38	5.4349E-06	-73.38	9.3452E-07	175.94
697.5647	-9975.6405	1.0076	1.7223E-05	65.26	3.3556E-06	-59.21	5.4334E-07	-175.61
871.5574	-9961.9469	1.0076	6.0929E-06	102.89	1.8566E-06	-30.71	2.5540E-07	-136.05
1045.2846	-9945.2189	1.0076	9.1981E-06	-179.65	1.2495E-06	14.68	3.1125E-07	-80.16
1218.6934	-9925.4615	1.0076	1.4288E-05	-177.91	1.1662E-06	51.95	4.1319E-07	-73.76
1391.7310	-9902.6806	1.0076	1.5972E-05	162.17	1.1615E-06	70.85	4.2327E-07	-90.31
1564.3446	-9876.8834	1.0076	1.8820E-05	127.90	1.2737E-06	69.51	4.5520E-07	-124.22
1736.4818	-9848.0775	1.0076	2.6845E-05	98.65	1.8131E-06	54.39	6.1995E-07	-155.04
1908.0899	-9816.2718	1.0076	3.6695E-05	81.01	2.9397E-06	42.56	8.2389E-07	-173.18
2079.1169	-9781.4760	1.0076	4.3034E-05	68.85	4.3078E-06	35.37	9.3115E-07	174.59
2249.5105	-9743.7006	1.0076	4.2003E-05	56.78	5.2784E-06	28.06	8.6129E-07	162.05
2419.2189	-9702.9572	1.0076	3.2788E-05	36.82	5.2406E-06	14.53	6.2219E-07	138.94
2588.1904	-9659.2582	1.0076	2.4809E-05	-14.06	4.5601E-06	-20.52	5.0931E-07	78.61
2756.3735	-9612.6169	1.0076	4.2825E-05	-67.62	6.8584E-06	-73.61	9.7682E-07	32.77
2923.7170	-9563.0475	1.0076	7.7210E-05	-87.16	1.3667E-05	-98.33	1.6692E-06	17.39
3090.1699	-9510.5651	1.0076	1.1414E-04	-95.87	2.2963E-05	-108.26	2.3395E-06	10.34
3255.6815	-9455.1857	1.0076	1.4628E-04	-101.01	3.3050E-05	-113.42	2.8562E-06	6.19
3420.2014	-9396.9262	1.0076	1.6798E-04	-104.67	4.2152E-05	-116.78	3.1293E-06	3.31
3583.6795	-9335.8042	1.0076	1.7511E-04	-107.74	4.8418E-05	-119.52	3.1090E-06	1.02
3746.0659	-9271.8385	1.0076	1.6552E-04	-110.79	5.0183E-05	-122.36	2.7893E-06	-1.12
3907.3113	-9205.0485	1.0076	1.3922E-04	-114.54	4.6270E-05	-126.17	2.2057E-06	-3.63
4067.3664	-9135.4545	1.0076	9.8653E-05	-120.85	3.6349E-05	-133.01	1.4292E-06	-7.92
4226.1826	-9063.0778	1.0076	4.9952E-05	-139.13	2.1879E-05	-151.80	5.6933E-07	-23.41
4383.7114	-8987.9404	1.0076	3.2109E-05	130.28	1.5168E-05	136.98	4.4477E-07	-148.57
4539.9050	-8910.0652	1.0076	8.1509E-05	90.94	3.3840E-05	91.46	1.2178E-06	-169.59
4694.7156	-8829.4759	1.0076	1.3439E-04	82.08	5.8909E-05	79.74	1.8666E-06	-173.93
4848.0962	-8746.1970	1.0076	1.7867E-04	78.08	8.3339E-05	74.74	2.3096E-06	-175.76
5000.0000	-8660.2540	1.0076	2.0982E-04	75.59	1.0397E-04	71.83	2.5199E-06	-176.70
5150.3807	-8571.6730	1.0076	2.2530E-04	73.72	1.1837E-04	69.75	2.5008E-06	-177.16
5299.1926	-8480.4809	1.0076	2.2428E-04	72.06	1.2476E-04	67.97	2.2807E-06	-177.26
5446.3903	-8386.7056	1.0076	2.0739E-04	70.37	1.2205E-04	66.15	1.9068E-06	-176.97
5591.9290	-8290.3757	1.0076	1.7660E-04	68.33	1.1001E-04	63.90	1.4378E-06	-176.11
5735.7643	-8191.5204	1.0076	1.3493E-04	65.34	8.9251E-05	60.47	9.3648E-07	-174.02
5877.8525	-8090.1699	1.0076	8.6276E-05	59.43	6.1381E-05	53.59	4.6490E-07	-167.83
6018.1502	-7986.3551	1.0076	3.6937E-05	38.12	3.0628E-05	30.98	1.1056E-07	-119.46
6156.6147	-7880.1075	1.0076	3.1051E-05	-65.25	2.5443E-05	-56.12	2.4787E-07	-21.26
6293.2039	-7771.4596	1.0076	7.5508E-05	-92.38	5.8915E-05	-89.01	3.8681E-07	-11.47
6427.8761	-7660.4444	1.0076	1.1763E-04	-98.96	9.5998E-05	-97.41	3.8738E-07	-8.31
6560.5903	-7547.0958	1.0076	1.5173E-04	-102.05	1.3019E-04	-101.16	2.5379E-07	-6.02
6691.3060	-7431.4482	1.0076	1.7594E-04	-103.98	1.5879E-04	-103.36	1.3989E-08	53.15
6819.9836	-7313.5370	1.0076	1.8948E-04	-105.43	1.7996E-04	-104.89	3.2107E-07	169.84

6946.5837	-7193.3980	1.0076	1.9239E-04	-106.67	1.9241E-04	-106.10	6.8952E-07	170.96
7071.0678	-7071.0678	1.0076	1.8541E-04	-107.84	1.9546E-04	-107.19	1.0556E-06	171.03
7193.3980	-6946.5837	1.0076	1.6981E-04	-109.07	1.8904E-04	-108.29	1.3753E-06	170.66
7313.5370	-6819.9836	1.0076	1.4730E-04	-110.47	1.7360E-04	-109.56	1.6081E-06	169.90
7431.4482	-6691.3060	1.0076	1.1985E-04	-112.27	1.5015E-04	-111.20	1.7191E-06	168.63
7547.0958	-6560.5903	1.0076	8.9608E-05	-114.90	1.2017E-04	-113.69	1.6822E-06	166.54
7660.4444	-6427.8761	1.0076	5.8758E-05	-119.58	8.5631E-05	-118.23	1.4832E-06	162.81
7771.4596	-6293.2039	1.0076	2.9808E-05	-131.68	4.9447E-05	-129.58	1.1268E-06	154.90
7880.1075	-6156.6147	1.0076	1.1323E-05	161.48	2.1880E-05	-179.83	6.7930E-07	131.45
7986.3551	-6018.1502	1.0076	2.5231E-05	95.07	3.8647E-05	108.45	6.0166E-07	62.07
8090.1699	-5877.8525	1.0076	4.1697E-05	82.71	7.0197E-05	92.56	1.2733E-06	25.36
8191.5204	-5735.7643	1.0076	5.2950E-05	77.42	9.8718E-05	87.16	2.1954E-06	14.53
8290.3757	-5591.9290	1.0076	5.8205E-05	73.76	1.2116E-04	84.60	3.2142E-06	9.84
8386.7056	-5446.3903	1.0076	5.7529E-05	70.25	1.3607E-04	83.22	4.2675E-06	7.30
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8571.6730	-5150.3807	1.0076	4.1065E-05	58.98	1.4059E-04	82.18	6.2773E-06	4.72
8660.2540	-5000.0000	1.0076	2.8174E-05	44.73	1.3016E-04	82.26	7.1421E-06	4.03
8746.1970	-4848.0962	1.0076	1.7964E-05	6.67	1.1207E-04	82.80	7.8594E-06	3.57
8829.4759	-4694.7156	1.0076	2.2445E-05	-48.29	8.7477E-05	84.08	8.3965E-06	3.27
8910.0652	-4539.9050	1.0076	3.7263E-05	-71.85	5.7997E-05	87.20	8.7289E-06	3.10
8987.9404	-4383.7114	1.0076	5.3294E-05	-81.19	2.5993E-05	98.81	8.8415E-06	3.04
9063.0778	-4226.1826	1.0076	6.7626E-05	-85.84	1.3373E-05	-144.53	8.7289E-06	3.10
9135.4545	-4067.3664	1.0076	7.8909E-05	-88.48	4.3925E-05	-113.22	8.3965E-06	3.27
9205.0485	-3907.3113	1.0076	8.6331E-05	-90.06	7.3684E-05	-107.95	7.8594E-06	3.57
9271.8385	-3746.0659	1.0076	8.9441E-05	-90.96	9.8676E-05	-105.62	7.1421E-06	4.03
9335.8042	-3583.6795	1.0076	8.8115E-05	-91.33	1.1700E-04	-104.08	6.2773E-06	4.72
9396.9262	-3420.2014	1.0076	8.2530E-05	-91.22	1.2722E-04	-102.75	5.3044E-06	5.74
9455.1857	-3255.6815	1.0076	7.3142E-05	-90.54	1.2835E-04	-101.33	4.2675E-06	7.30
9510.5651	-3090.1699	1.0076	6.0655E-05	-89.02	1.1995E-04	-99.52	3.2142E-06	9.84
9563.0475	-2923.7170	1.0076	4.5993E-05	-85.96	1.0214E-04	-96.80	2.1954E-06	14.53
9612.6169	-2756.3735	1.0076	3.0343E-05	-79.12	7.5800E-05	-91.70	1.2733E-06	25.36
9659.2582	-2588.1904	1.0076	1.5757E-05	-58.37	4.3381E-05	-77.64	6.0166E-07	62.07
9702.9572	-2419.2189	1.0076	1.0870E-05	12.02	2.2108E-05	-7.26	6.7930E-07	131.45
9743.7006	-2249.5105	1.0076	2.0637E-05	52.29	5.3923E-05	49.51	1.1268E-06	154.90
9781.4760	-2079.1169	1.0076	3.1325E-05	63.33	9.9015E-05	61.14	1.4832E-06	162.81
9816.2718	-1908.0899	1.0076	3.9555E-05	68.00	1.4459E-04	65.72	1.6822E-06	166.54
9848.0775	-1736.4818	1.0076	4.4562E-05	70.57	1.8688E-04	68.25	1.7191E-06	168.63
9876.8834	-1564.3446	1.0076	4.6145E-05	72.25	2.2294E-04	69.97	1.6081E-06	169.90
9902.6806	-1391.7310	1.0076	4.4450E-05	73.53	2.5019E-04	71.29	1.3753E-06	170.66
9925.4615	-1218.6934	1.0076	3.9908E-05	74.67	2.6644E-04	72.45	1.0555E-06	171.03
9945.2189	-1045.2846	1.0076	3.3197E-05	75.92	2.7006E-04	73.58	6.8951E-07	170.96
9961.9469	-871.5574	1.0076	2.5183E-05	77.63	2.6010E-04	74.80	3.2107E-07	169.84
9975.6405	-697.5647	1.0076	1.6860E-05	80.63	2.3640E-04	76.27	1.3989E-08	53.15
9986.2953	-523.3596	1.0076	9.2964E-06	87.75	1.9971E-04	78.31	2.5379E-07	-6.02
9993.9082	-348.9950	1.0076	3.7983E-06	113.61	1.5178E-04	81.64	3.8738E-07	-8.31
9998.4769	-174.5241	1.0076	2.7381E-06	-179.41	9.5733E-05	88.89	3.8681E-07	-11.47

***** DATA CARD NO. 9 XQ 0 0 0 0 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+0
***** DATA CARD NO. 10 EN 0 0 0 0 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+0

RUN TIME = 19348.800

APPENDIX C
AUTOMATED MEASUREMENT SYSTEM

C.1 THEORY OF OPERATION

An RF electric or magnetic field is a vector quantity which may have components in three orthogonal directions. The approach used is to always measure these three orthogonal components of the field. The square root of the sum of the squares of the components is the field strength. To achieve this measurement, an antenna having an approximate short-dipole or cosine pattern is rotated successively to three orthogonal directions, the three powers detected by a spectrum analyzer for each orientation are added together, and the summed power is converted to field strength or power density by using the antenna calibration factor. Since power is proportional to the square of the field, this calculation is equivalent to taking the square root of the sum of the squares of the field components.

C.2 SYSTEM DESCRIPTION

Measurements at fixed sites were made using the automated spectrum-analyzer-based measurement system installed in a four-wheel-drive vehicle and shown in Figure C-1. This system consists of three antennas, cables, amplifier, spectrum analyzer, antenna rotator system, and the controlling Hewlett Packard (HP) 9845B computer with peripherals and software.

A fiber-optically isolated spherical dipole antenna (FOISD) was used for electric field measurements and covered the frequency range of 10 kHz to 700 MHz. An omni-directional biconical antenna was used for the frequency range of 0.49 to 18 GHz. Magnetic fields in the frequency range of 0.15 to 32 MHz were measured using a standard single turn shielded loop antenna. The antenna calibration factors are corrected for cable loss and amplifier gain as necessary.

The system can be operated in either of two modes depending on the software used. In the first or spectral mode, measurements are made by repeatedly scanning the spectrum analyzer over a specified frequency band, taking the average or peak of these scans, applying antenna factors, and displaying the results graphically. The advantage of this mode is that all sources in a specified band are measured and the data is displayed graphically. In the second or discrete mode, the spectrum analyzer is tuned to a pre-determined set of frequencies and the results are printed in tabular form. This method has the advantage of greater accuracy and speed of measurement. During normal procedures, initial screening measurements in spectral

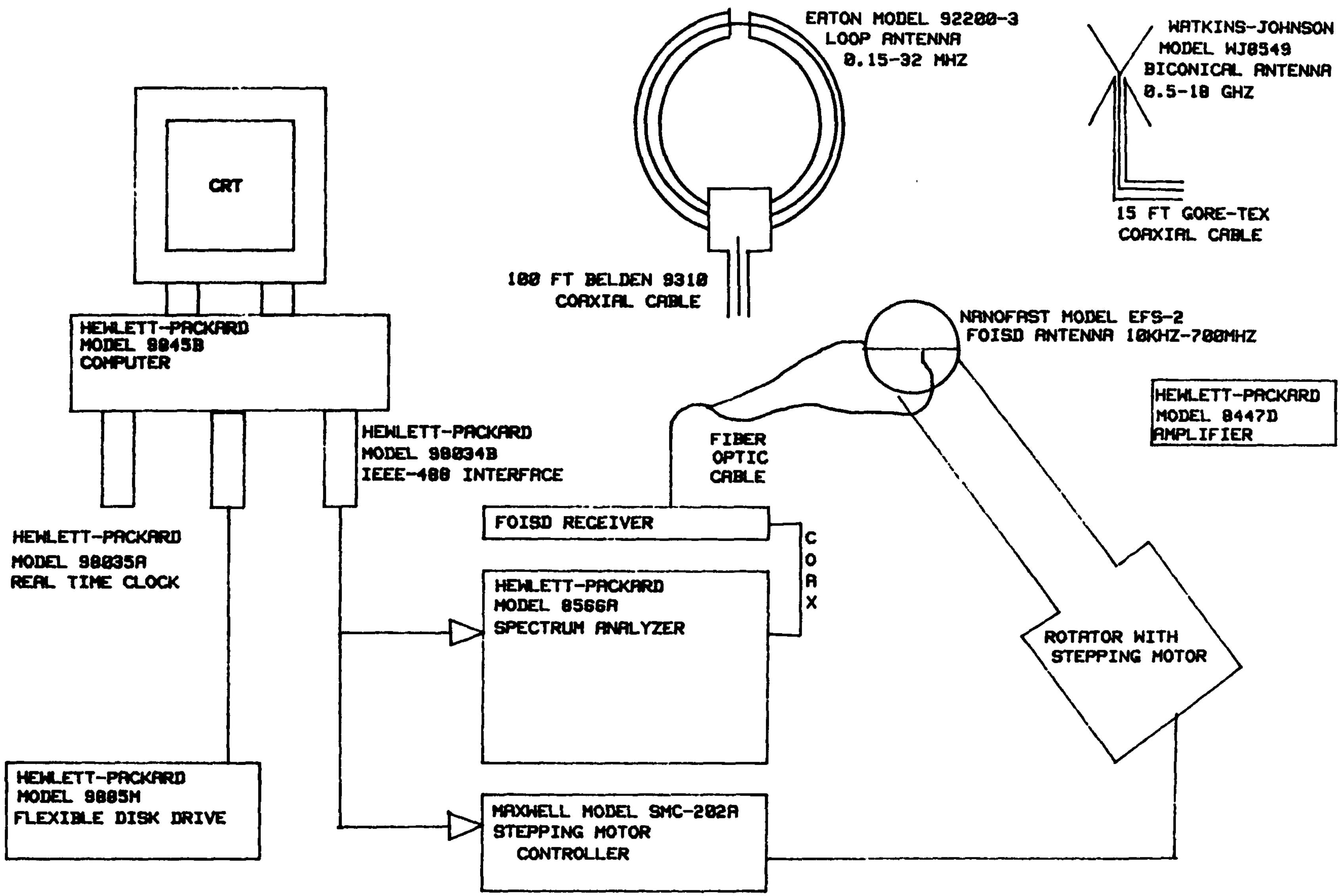
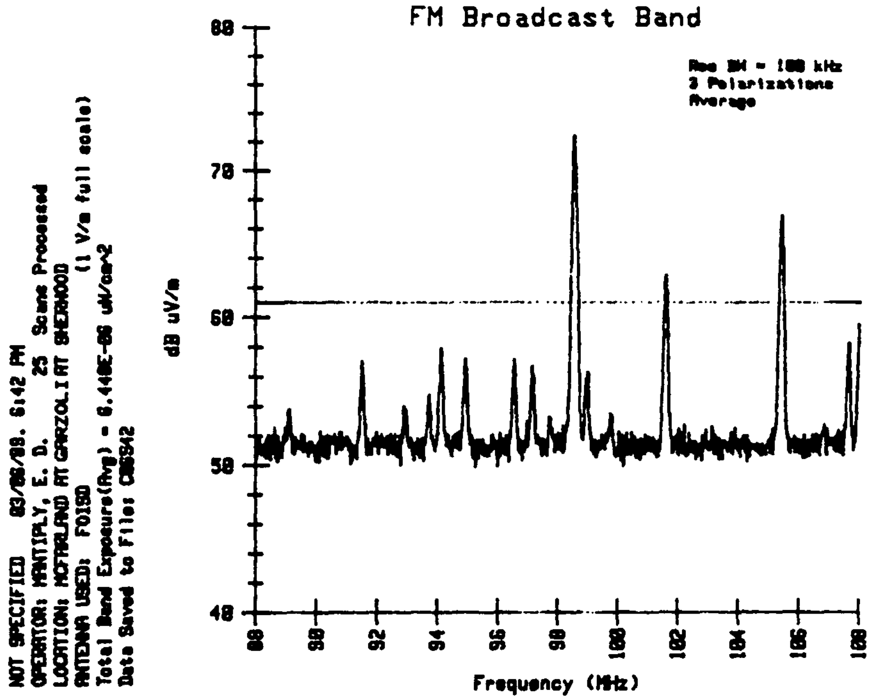
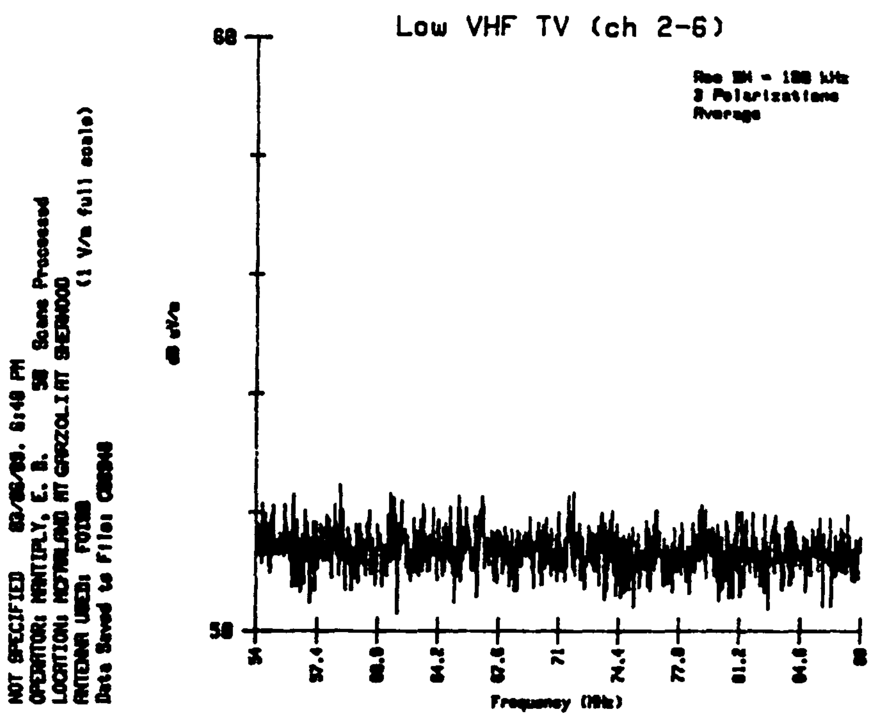


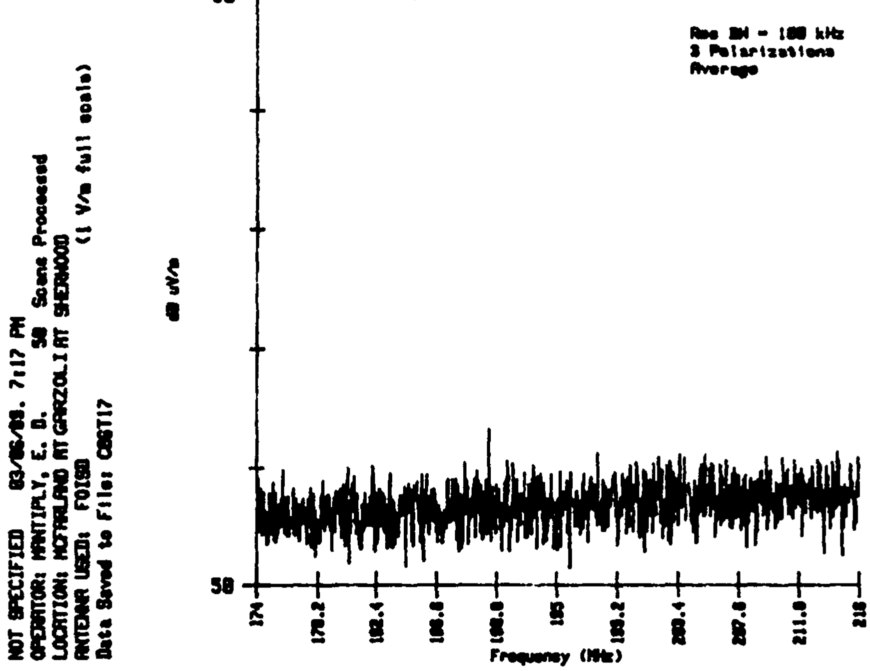
Figure C-1. Automated Field Measurement System. Three different antennas may be connected to the spectrum analyzer. The fiber optically isolated antenna (FOISD) for measuring electric fields at lower frequencies is shown connected. The amplifier can be used to achieve greater sensitivity with the loop and biconical antennas.

APPENDIX D
DETAILED NARROWBAND RESULTS

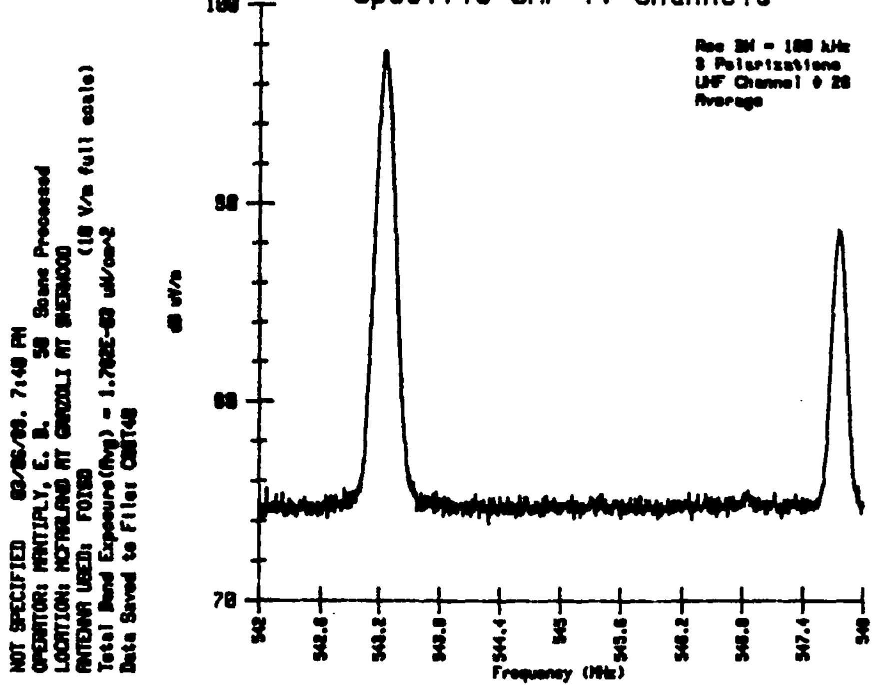

FM Broadcast Band
Res BW = 100 kHz
3 Polarizations
Average
dB uV/m
Frequency (MHz)
NOT SPECIFIED 03/08/88. 6:42 PM
OPERATOR: MANTIPLY, E. D. 25 Scans Processed
LOCATION: MCFARLAND AT GARZOLI AT SHERWOOD
ANTENNA USED: FOI50 (1 V/m full scale)
Total Band Exposure(Avg) = 6.440E-06 uW/cm^2
Data Saved to File: CB0542


Low VHF TV (ch 2-6)
Res BW = 100 kHz
3 Polarizations
Average
dB uV/m
Frequency (MHz)
NOT SPECIFIED 03/08/88. 6:40 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: MCFARLAND AT GARZOLI AT SHERWOOD
ANTENNA USED: FOI50 (1 V/m full scale)

High VHF TV (ch 7-13)



Specific UHF TV Channels



File Name: ZOCINV

Garzoli and Sherwood Loran 35 40.47 119 14.46

Biconical Antenna with Amplifer 03/09/89 1:21 PM

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	* Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	489.25	-15.79	-9.33	-12.68	-7.06	3.10	99.05	2.13056
CH18	495.26	-27.35	-28.50	-27.53	-22.99	2.87	82.88	.05143
CH21	513.25	-33.20	-50.95	-35.22	-31.04	2.20	74.17	.00692
CH23	525.24	-24.13	-11.22	-15.94	-9.79	1.79	95.00	.83821
CH24	531.25	-29.57	-30.27	-36.85	-26.48	1.59	78.12	.01719
CH26	543.26	-10.35	-9.72	-19.66	-6.78	1.21	97.43	1.46812
CH29	561.25	-30.94	-11.48	-19.20	-10.76	.69	92.93	.52065
CH30	567.26	-28.76	-34.36	-29.18	-25.37	.52	78.16	.01734
CH39	621.24	-56.81	-47.48	-54.51	-46.29	-.72	55.99	.00011
CH45	657.25	-13.91	-8.28	-21.76	-7.08	-1.34	94.58	.76209
CH47	669.25	-25.50	-41.27	-39.62	-25.23	-1.51	76.27	.01123
CH49	681.25	0.74	-6.46	-10.46	1.77	-1.66	103.11	5.42514
CH53	706.25	-40.89	-52.67	-54.18	-40.42	-1.92	60.65	.00031
CH55	717.25	-47.13	-41.82	-45.56	-39.47	-2.02	61.51	.00038
CH57	729.25	-33.25	-34.65	-50.83	-30.84	-2.11	70.05	.00269
CH59	741.25	-31.67	-40.88	-43.69	-30.94	-2.18	69.88	.00258

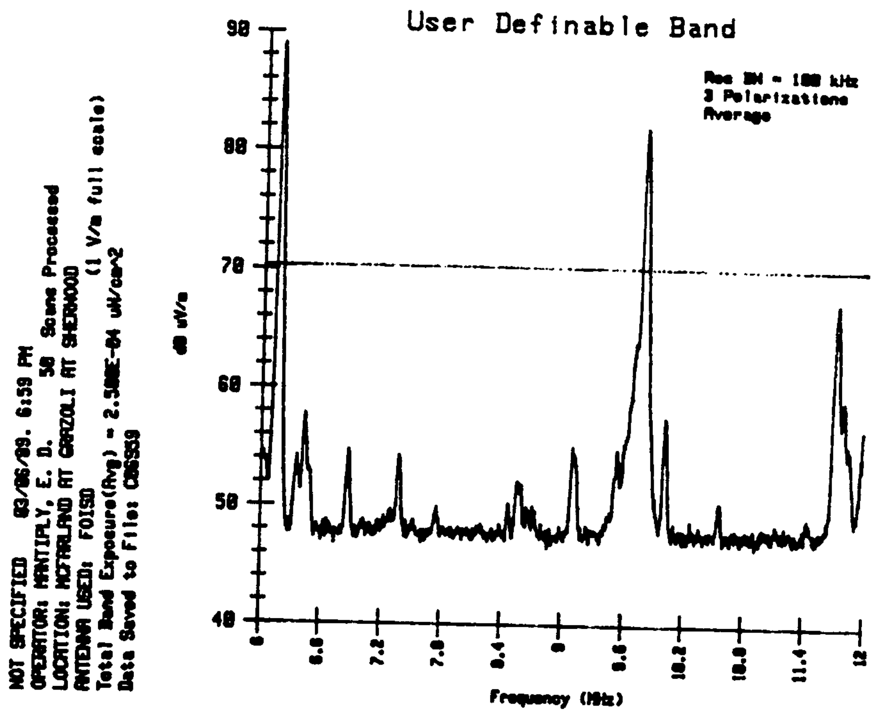
Total Video Power Density: 11.25494

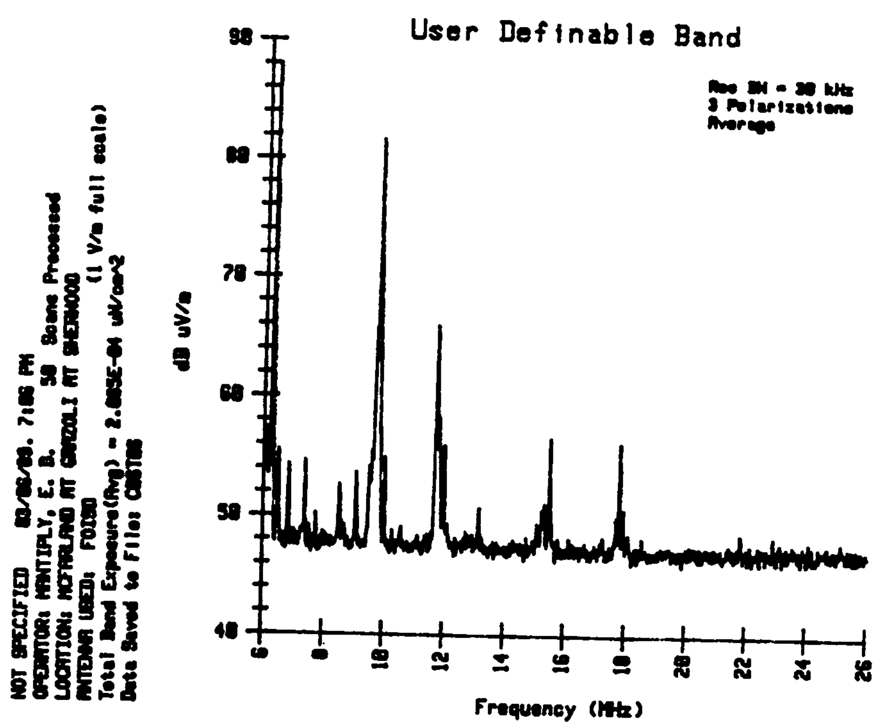
* 4 dB subtracted from peak electric field to obtain RMS electric field

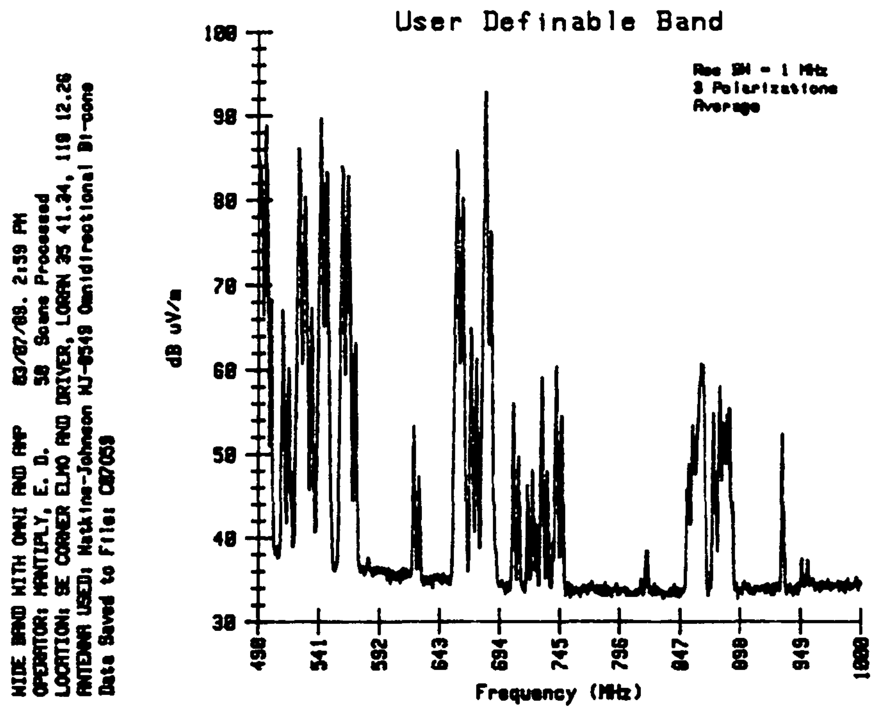
TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	493.75	-24.65	-20.56	-23.88	-17.88	2.93	92.05	.42550
CH18	499.76	-36.20	-42.20	-37.42	-33.18	2.70	76.52	.01191
CH21	517.75	-48.44	-48.02	-50.31	-44.04	2.05	65.00	.00084
CH23	529.74	-35.83	-20.31	-27.38	-19.43	1.64	89.21	.22123
CH24	535.75	-34.58	-42.04	-43.68	-33.43	1.45	75.02	.00842
CH26	547.76	-20.85	-18.44	-30.91	-16.32	1.08	91.76	.39798
CH29	565.75	-34.28	-18.50	-24.15	-17.36	.56	90.20	.27775
CH30	571.76	-36.69	-49.63	-39.37	-34.68	.40	72.73	.00497
CH39	625.74	-70.00	-61.15	-68.82	-60.01	-.81	46.19	.00001
CH45	661.75	-21.65	-19.35	-23.94	-16.48	-1.40	89.12	.21647
CH47	673.75	-38.87	-47.29	-45.72	-37.57	-1.57	67.87	.00162
CH49	685.75	-18.62	-24.60	-26.68	-17.13	-1.71	88.16	.17353
CH53	709.75	-43.95	-52.09	-54.06	-42.98	-1.95	62.07	.00043
CH55	721.75	-57.59	-49.33	-58.14	-48.26	-2.05	56.69	.00012
CH57	733.75	-45.68	-47.02	-59.73	-43.19	-2.14	61.67	.00039
CH59	745.75	-39.21	-60.31	-56.09	-39.09	-2.20	65.71	.00099

Total Audio Power Density: 1.74216


User Definable Band
Res BW = 100 kHz
3 Polarizations
Average
dB uV/m
Frequency (MHz)
NOT SPECIFIED 03/06/89. 6:59 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: MCFARLAND AT GRAZOLI AT SHERWOOD
ANTENNA USED: FOISD (1 V/m full scale)
Total Band Exposure(Avg) = 2.500E-04 uW/cm^2
Data Saved to File: C06S59


User Definable Band
Res BW = 30 kHz
3 Polarizations
Average
dB uV/m
Frequency (MHz)
NOT SPECIFIED 03/06/89. 7:06 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: MCFARLAND AT GRAZOLI AT SHERWOOD
ANTENNA USED: FOISD (1 V/m full scale)
Total Band Exposure(Avg) = 2.005E-04 uW/cm^2


WIDE BAND WITH OMNI AND AMP 03/07/89. 2:59 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: SE CORNER ELMO AND DRIVER, LORAN 35 41.34, 119 12.26
ANTENNA USED: Watkins-Johnson WJ-9549 Omnidirectional Bi-cone
Data Saved to File: CB7O59
User Definable Band
Res BW = 1 MHz
3 Polarizations
Average
dB uV/m
Frequency (MHz)
100
90
80
70
60
50
40
30
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541
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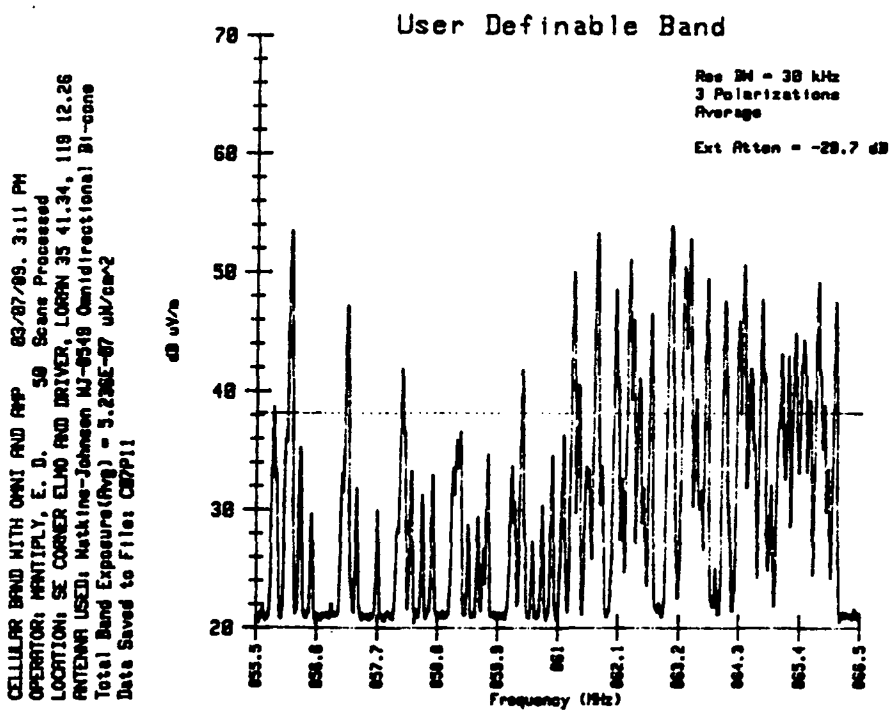
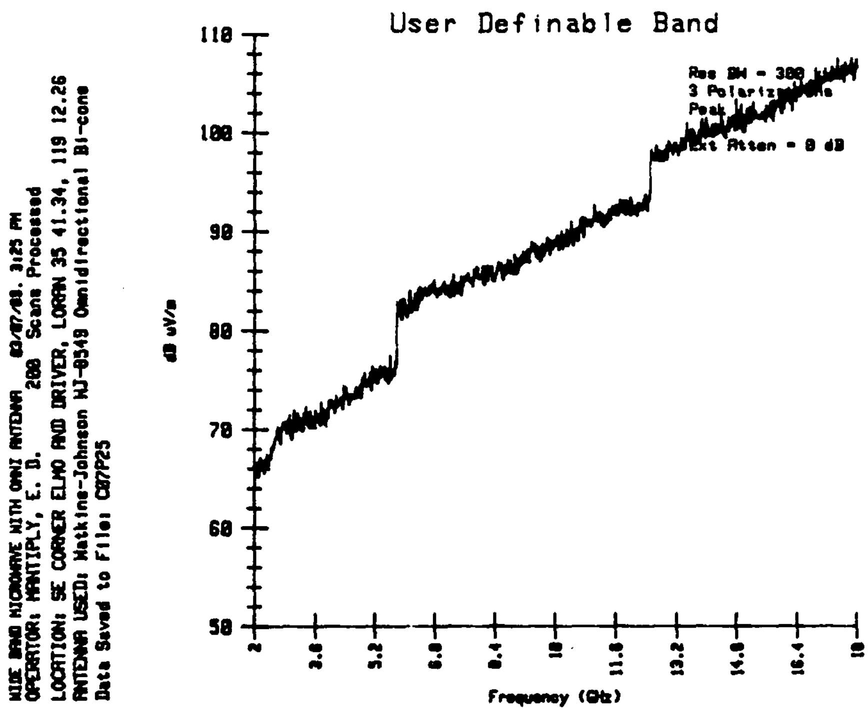
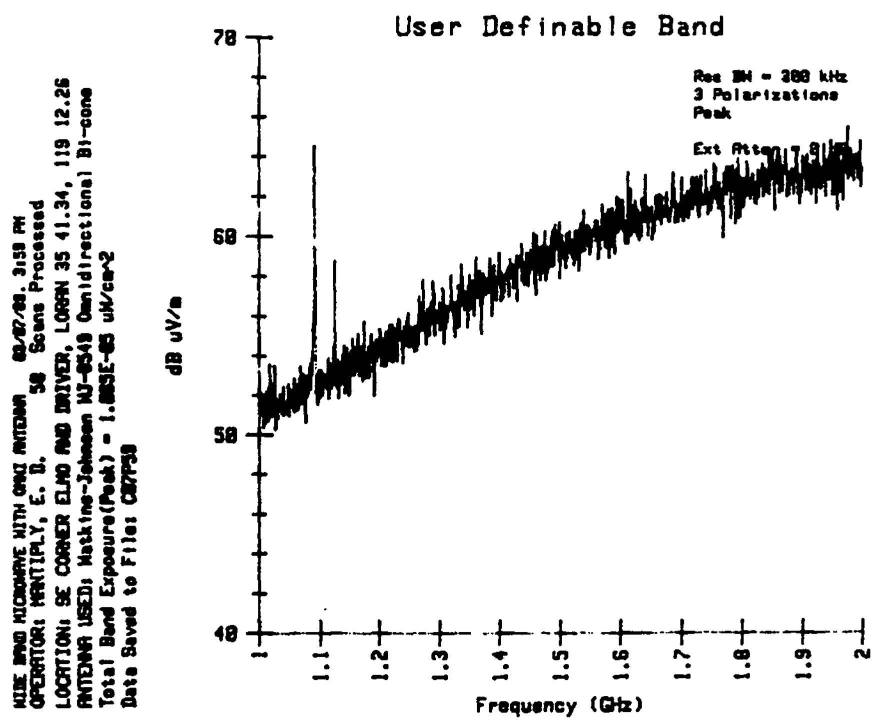
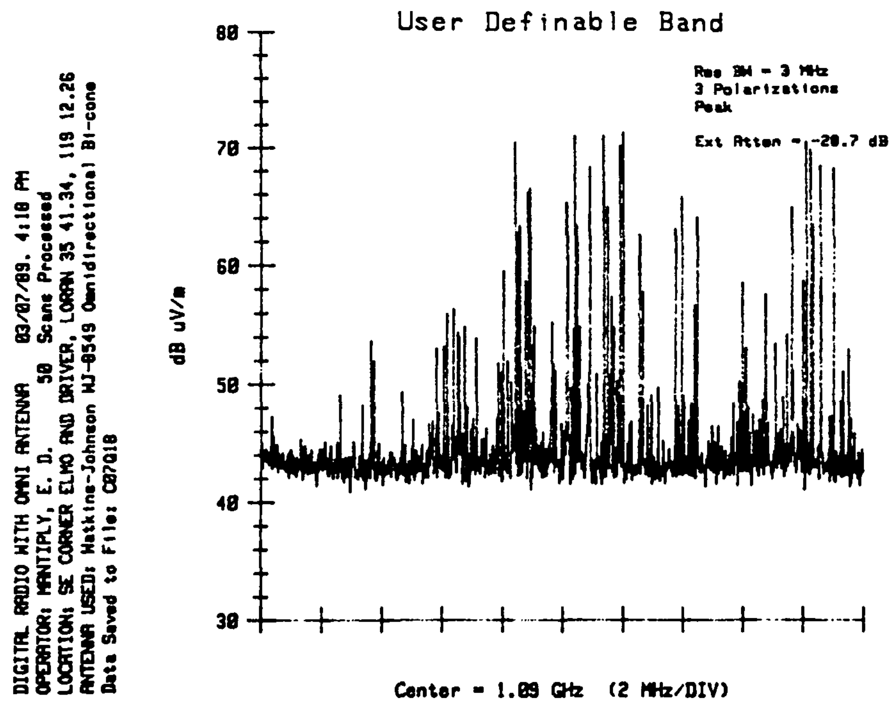
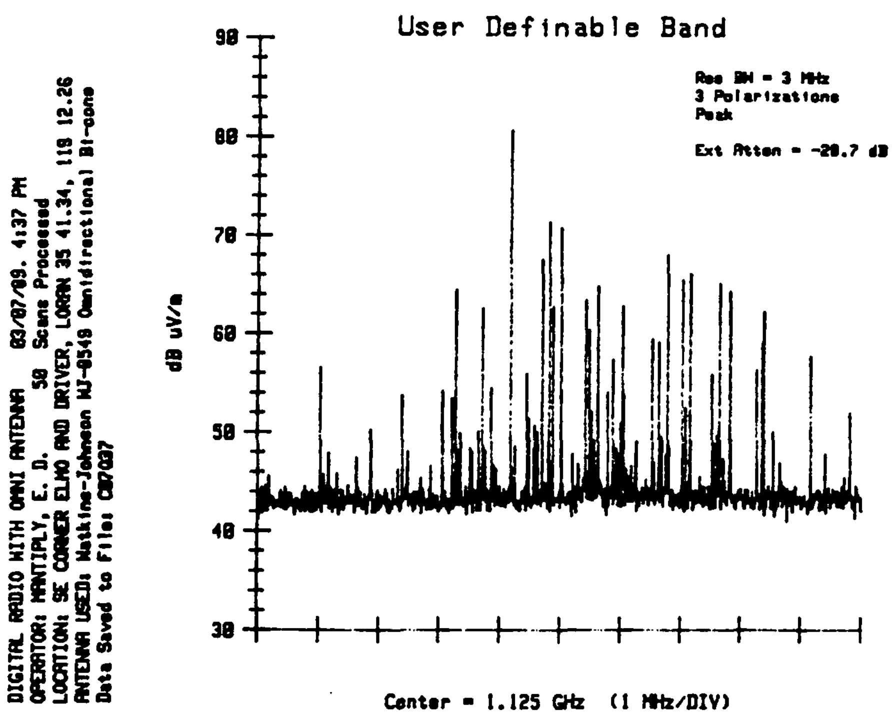
643
694
745
796
847
898
949
1000


CELLULAR BAND WITH OMNI AND AMP 03/07/89. 3:11 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: SE CORNER ELMO AND DRIVER, LORAN 35 41.34, 119 12.26
ANTENNA USED: Watkins-Johnson WJ-9549 Omnidirectional Bi-cone
Total Band Exposure(Avg) = 5.236E-07 uW/cm^2
Data Saved to File: CB7P11
User Definable Band
Res BW = 30 kHz
3 Polarizations
Average
Ext Atten = -20.7 dB
dB uV/m
Frequency (MHz)
70
60
50
40
30
20
853.5
856.6
857.7
858.8
859.9
861
862.1
863.2
864.3
865.4
866.5


WIDE BAND MICROWAVE WITH OMNI ANTENNA 03/07/88. 3:25 PM
OPERATOR: MANTIPLY, E. D. 200 Scans Processed
LOCATION: SE CORNER ELMO AND DRIVER, LORAN 35 41.34, 119 12.26
ANTENNA USED: Watkins-Johnson WJ-8549 Omnidirectional Bi-cone
Data Saved to File: C07P25
User Definable Band
110
100
90
80
70
60
50
dB uV/m
Res BW = 300
3 Polarizations
Peak
Ext Atten = 0 dB
2
3.6
5.2
6.8
8.4
10
11.6
13.2
14.8
16.4
18
Frequency (GHz)


WIDE BAND MICROWAVE WITH OMNI ANTENNA 03/07/88. 3:59 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: SE CORNER ELMO AND DRIVER, LORAN 35 41.34, 119 12.26
ANTENNA USED: Watkins-Johnson WJ-8549 Omnidirectional Bi-cone
Total Band Exposure(Peak) = 1.
Data Saved to File:
User Definable Band
70
60
50
40
dB uV/m
Res BW = 300 kHz
3 Polarizations
Peak
Ext Atten
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Frequency (GHz)


DIGITAL RADIO WITH OMNI ANTENNA 03/07/89. 4:10 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: SE CORNER ELMO AND DRIVER, LORAN 35 41.34, 119 12.26
ANTENNA USED: Watkins-Johnson WJ-9549 Omnidirectional Bi-cone
Data Saved to File: C07018
User Definable Band
Res BW = 3 MHz
3 Polarizations
Peak
Ext Atten = -20.7 dB
dB uV/m
80
70
60
50
40
30
Center = 1.09 GHz (2 MHz/DIV)


DIGITAL RADIO WITH OMNI ANTENNA 03/07/89. 4:37 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: SE CORNER ELMO AND DRIVER, LORAN 35 41.34, 119 12.26
ANTENNA USED: Watkins-Johnson WJ-9549 Omnidirectional Bi-cone
Data Saved to File: C07037
User Definable Band
Res BW = 3 MHz
3 Polarizations
Peak
Ext Atten = -20.7 dB
dB uV/m
90
80
70
60
50
40
30
Center = 1.125 GHz (1 MHz/DIV)

File Name: ZOCGSE

McFarland at Elmo and Driver Loran 35 41.33 119 12.26 x n-s, y e-w, z vert.

Biconical Antenna with Amplifer 03/07/89 6:04 PM

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field * (dBuV/m)	Power Density (nW/cm^2)
CH17	489.25	-17.22	-16.96	-24.48	-13.70	3.10	92.40	.46148
CH18	495.26	-37.46	-28.50	-36.42	-27.40	2.87	78.47	.01865
CH21	513.25	-45.90	-34.24	-44.17	-33.56	2.20	71.65	.00387
CH23	525.24	-20.16	-37.76	-21.48	-17.72	1.79	87.08	.13526
CH24	531.25	-39.84	-31.25	-41.74	-30.36	1.59	74.23	.00703
CH26	543.26	-15.64	-13.54	-30.21	-11.40	1.21	92.82	.50751
CH29	561.25	-39.64	-21.76	-30.57	-21.16	.69	82.53	.04747
CH30	567.26	-38.17	-28.68	-34.96	-27.38	.52	76.14	.01091
CH39	621.24	-49.64	-50.76	-56.21	-46.64	-.72	55.63	.00010
CH45	657.25	-14.56	-36.11	-20.97	-13.64	-1.34	88.02	.16820
CH47	669.25	-39.52	-28.54	-43.51	-28.08	-1.51	73.41	.00582
CH49	681.25	-17.27	-6.69	-22.05	-6.21	-1.66	95.13	.86445
CH53	706.25	-58.00	-48.32	-61.41	-47.69	-1.92	53.39	.00006
CH55	717.25	-45.62	-62.67	-60.83	-45.41	-2.02	55.57	.00010
CH57	729.25	-46.83	-43.18	-55.36	-41.44	-2.11	59.45	.00023
CH59	741.25	-44.18	-34.85	-49.87	-34.25	-2.18	66.57	.00120

Total Video Power Density: 2.23233

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	493.75	-29.45	-22.33	-29.15	-20.86	2.93	89.07	.21389
CH18	499.76	-49.72	-40.70	-46.72	-39.32	2.70	70.38	.00290
CH21	517.75	-56.31	-42.99	-51.59	-42.25	2.05	66.79	.00127
CH23	529.74	-33.44	-32.36	-35.93	-28.90	1.64	79.74	.02501
CH24	535.75	-45.98	-37.14	-45.78	-36.11	1.45	72.34	.00454
CH26	547.76	-32.48	-27.24	-38.42	-25.86	1.08	82.22	.04425
CH29	565.75	-27.06	-29.39	-34.68	-24.61	.56	82.95	.05237
CH30	571.76	-58.68	-40.09	-47.00	-39.24	.40	68.17	.00174
CH39	625.74	-59.78	-67.44	-66.44	-58.36	-.81	47.83	.00002
CH45	661.75	-31.05	-25.85	-34.85	-24.30	-1.40	81.29	.03574
CH47	673.75	-51.18	-36.99	-49.89	-36.62	-1.57	68.82	.00202
CH49	685.75	-34.38	-27.64	-46.46	-26.76	-1.71	78.53	.01891
CH53	709.75	-61.03	-48.86	-62.71	-48.44	-1.95	56.61	.00012
CH55	721.75	-57.11	-62.12	-75.77	-55.87	-2.05	49.07	.00002
CH57	733.75	-57.10	-64.92	-65.75	-55.96	-2.14	48.91	.00002
CH59	745.75	-55.16	-44.25	-60.48	-43.82	-2.20	60.98	.00033

Total Audio Power Density: .40315

Elmo and Driver Loran 35 41.34 119 12.26

Loop antenna band setting 4 03/08/89 5:34 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
KERI	1180	-28.52	-32.01	-46.83	-26.87	20.63	100.76	3.15948
KXEM	1590	-38.25	-38.41	-55.29	-35.28	19.09	90.81	.31966

Total Power Density: 3.47914

Total Magnetic Field (mA/m): 9.60824

File Name: ZOCHRi

Elmo and Driver Loran 35 41.34 119 12.26

Loop antenna band setting 3 03/08/89 5:37 PM

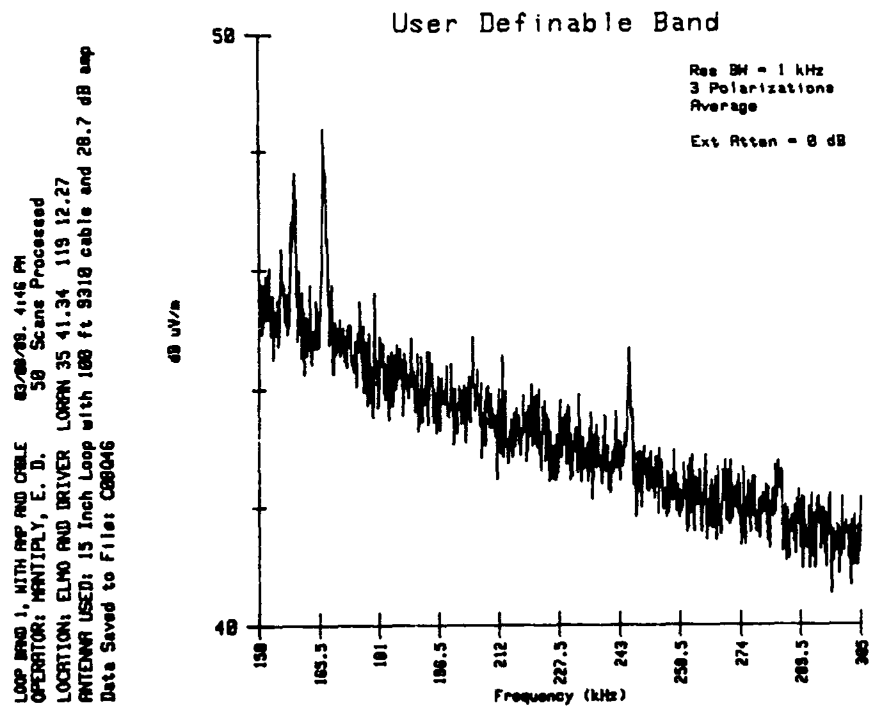
AM Radiofrequency Measurements Using Loop with Amp

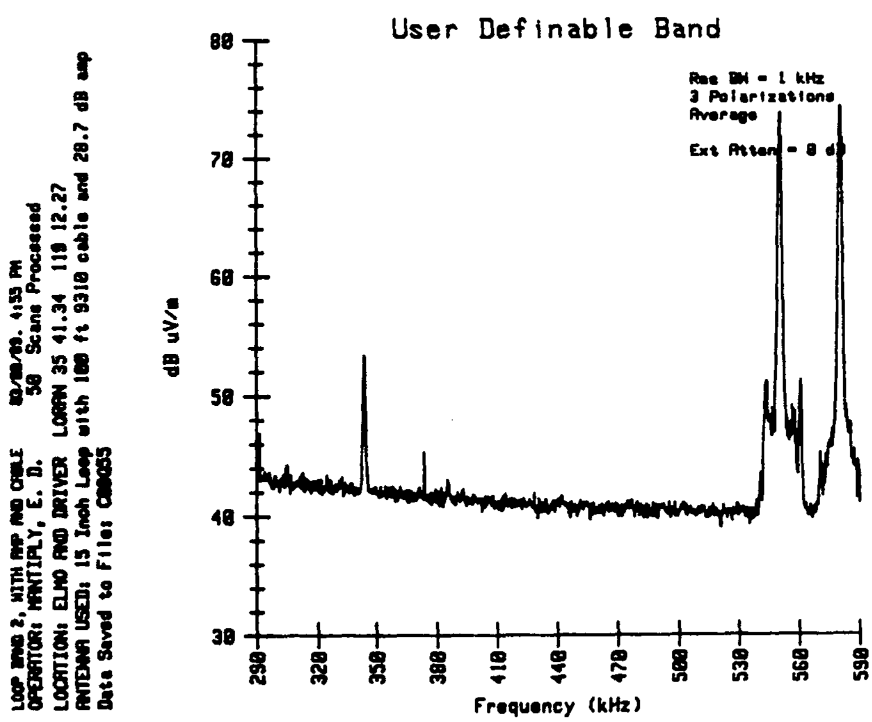
Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field. (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-48.60	-49.58	-86.20	-46.05	23.06	84.01	.06671

Total Power Density: .06671

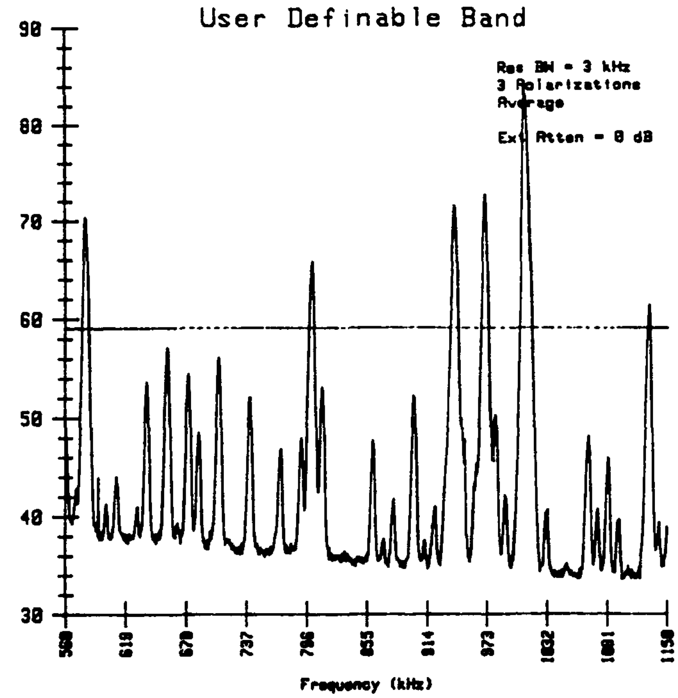
Total Magnetic Field (mA/m): 1.33045

File Name: ZOCHR1

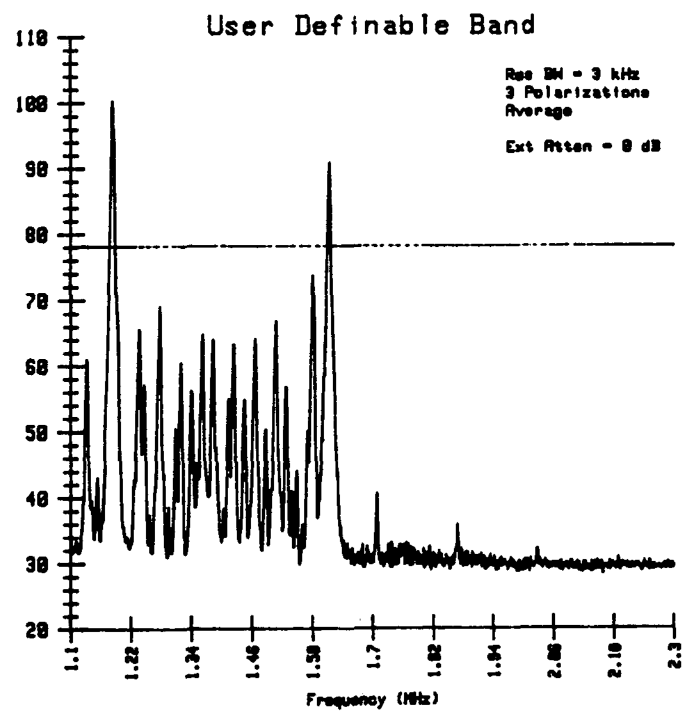

User Definable Band
Res BW = 1 kHz
3 Polarizations
Average
Ext Atten = 0 dB
dB uV/m
50
40
150
165.5
181
196.5
212
227.5
243
258.5
274
289.5
305
Frequency (kHz)
LOOP BAND 1, WITH AMP AND CABLE
4:46 PM
OPERATOR: MANTIPLY, E. D.
50 Scans Processed
LOCATION: ELMO AND DRIVER LORAN 35 41.34 119 12.27
ANTENNA USED: 15 Inch Loop with 100 ft 9310 cable and 28.7 dB amp
Data Saved to File: C08046

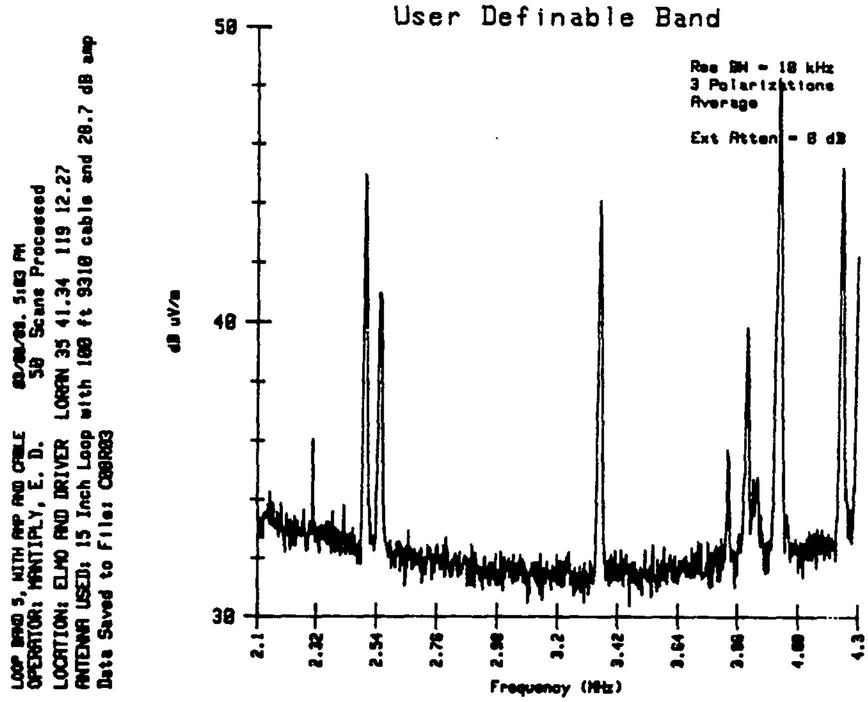

User Definable Band
Res BW = 1 kHz
3 Polarizations
Average
Ext Atten = 0 dB
dB uV/m
80
70
60
50
40
30
290
320
350
380
410
440
470
500
530
560
590
Frequency (kHz)
LOOP BAND 2, WITH AMP AND CABLE
4:55 PM
OPERATOR: MANTIPLY, E. D.
50 Scans Processed
LOCATION: ELMO AND DRIVER LORAN 35 41.34 119 12.27
ANTENNA USED: 15 Inch Loop with 100 ft 9310 cable and 28.7 dB amp
Data Saved to File: C08055

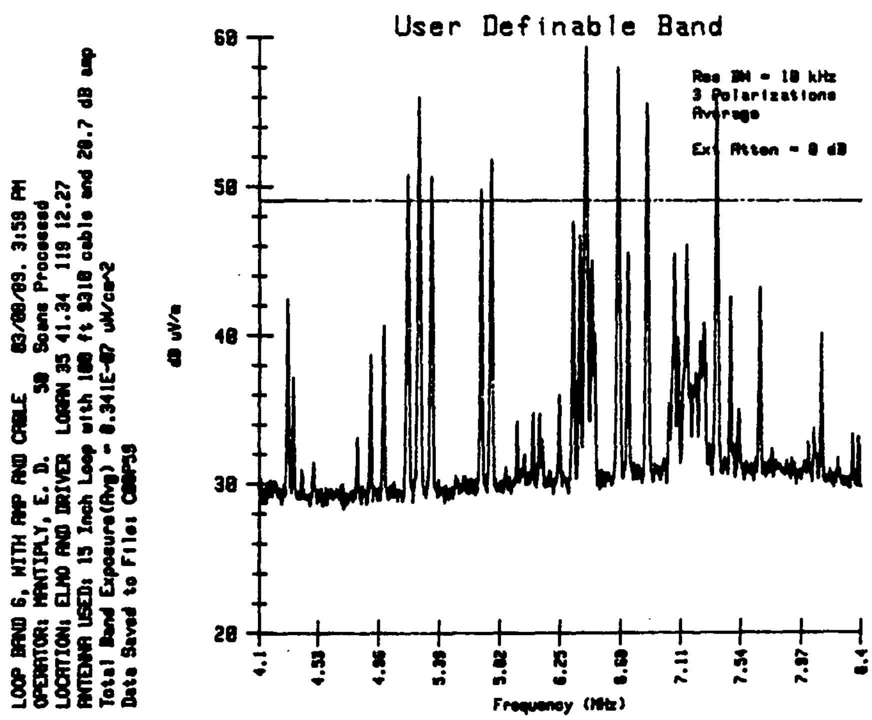
LOWER AM BAND, LOOP WITH AMP   03/08/89. 3:05 PM
OPERATOR: MANTIPLY, E. D.   50 Scans Processed
LOCATION: ELMO AND DRIVER LORAN 35 41.34 119 12.27
ANTENNA USED: 15 Inch Loop with 100 ft 9310 cable and 20.7 dB amp
Total Band Exposure(Avg) = 8.240E-05 uW/cm^2
Data Saved to File: C08P05

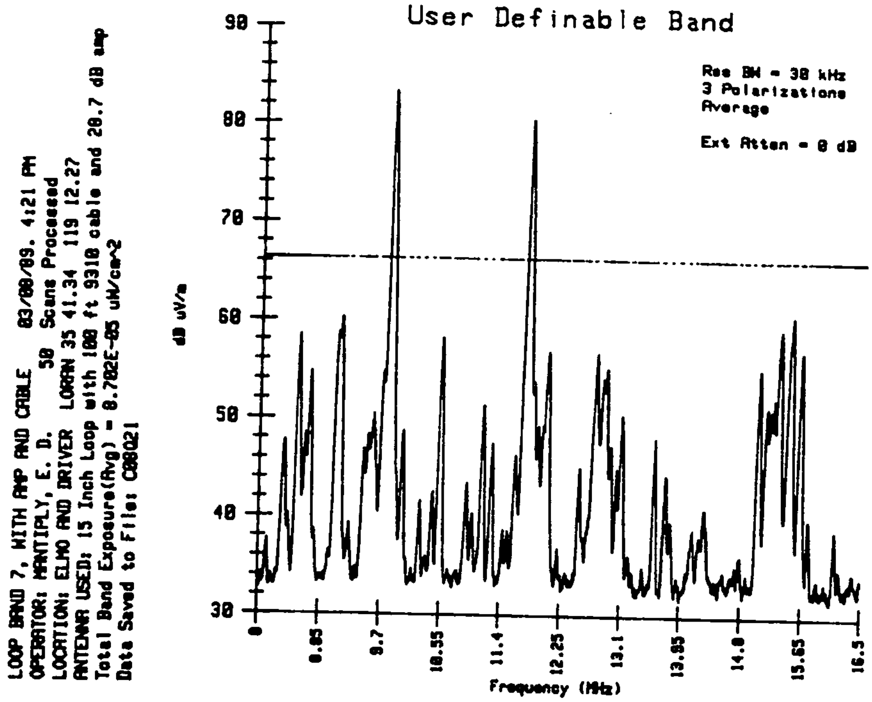


UPPER AM BAND, LOOP WITH AMP   03/08/89. 3:36 PM
OPERATOR: MANTIPLY, E. D.   50 Scans Processed
LOCATION: ELMO AND DRIVER LORAN 35 41.34 119 12.27
ANTENNA USED: 15 Inch Loop with 100 ft 9310 cable and 20.7 dB amp
Total Band Exposure(Avg) = 3.144E-03 uW/cm^2
Data Saved to File: C08P36

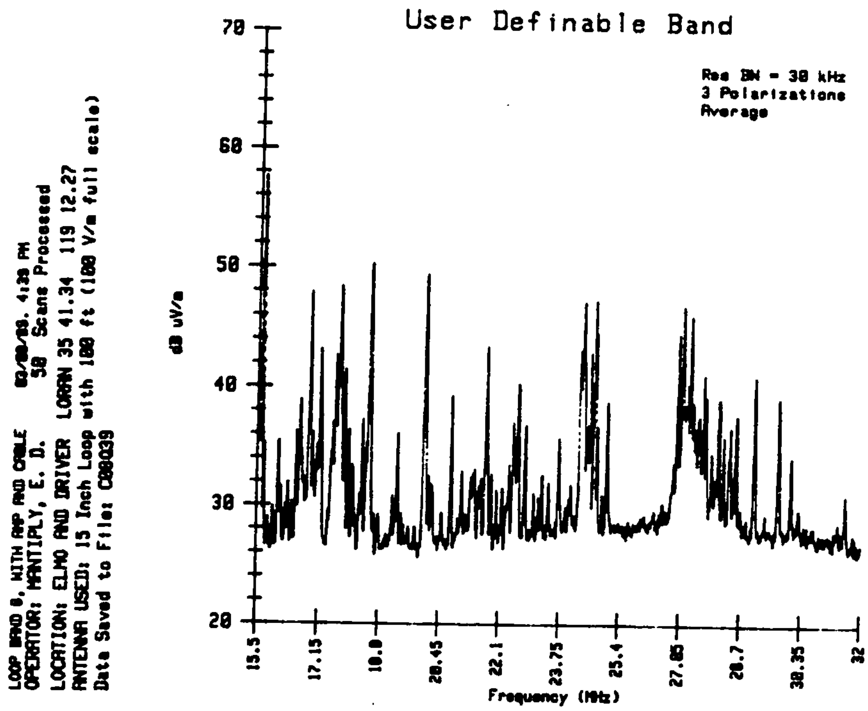



User Definable Band
Res BW = 10 kHz
3 Polarizations
Average
Ext Atten = 0 dB
50
40
30
dB uV/m
2.1
2.32
2.54
2.76
2.98
3.2
3.42
3.64
3.86
4.08
4.3
Frequency (MHz)
LOOP BAND 5, WITH AMP AND CABLE
OPERATOR: MANTIPLY, E. D.
50 Scans Processed
LOCATION: ELMO AND DRIVER LORAN 35 41.34 119 12.27
ANTENNA USED: 15 Inch Loop with 100 ft 9310 cable and 20.7 dB amp
Data Saved to File:

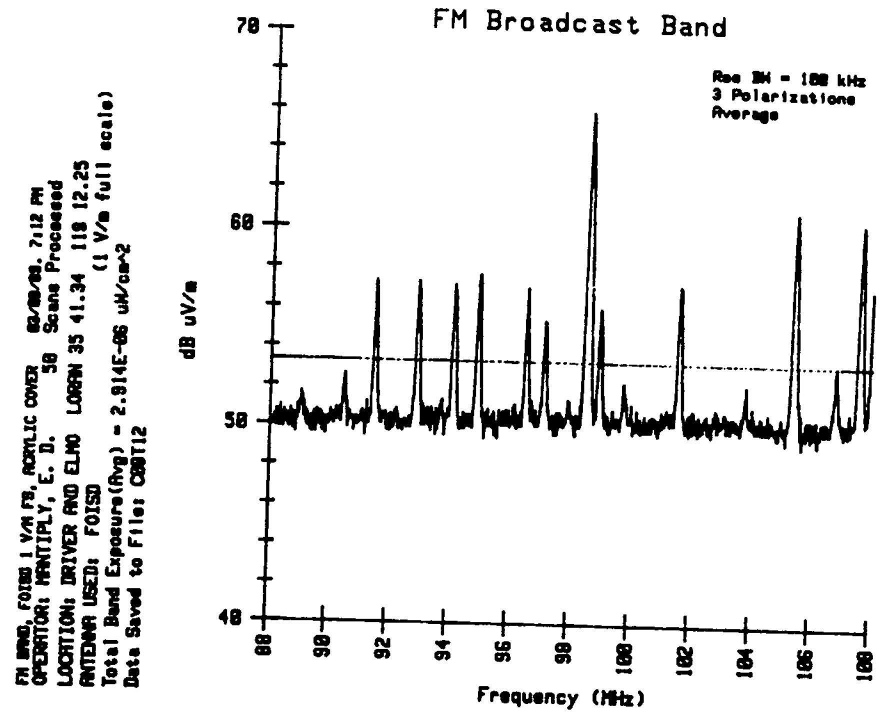

User Definable Band
Res BW = 10 kHz
3 Polarizations
Average
Ext Atten = 0 dB
60
50
40
30
20
dB uV/m
4.1
4.53
4.96
5.39
5.82
6.25
6.68
7.11
7.54
7.97
8.4
Frequency (MHz)
LOOP BAND 6, WITH AMP AND CABLE 03/08/89. 3:59 PM
OPERATOR: MANTIPLY, E. D.
50 Scans Processed
LOCATION: ELMO AND DRIVER LORAN 35 41.34 119 12.27
ANTENNA USED: 15 Inch Loop with 100 ft 9310 cable and 20.7 dB amp
Total Band Exposure(Avg) = 0.341E-07 uW/cm^2
Data Saved to File:

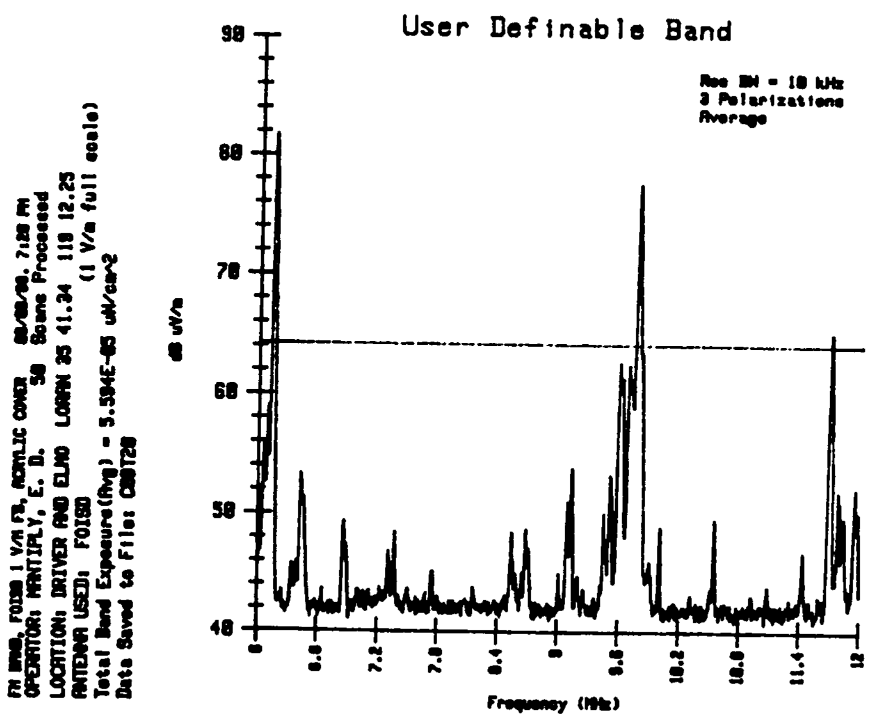


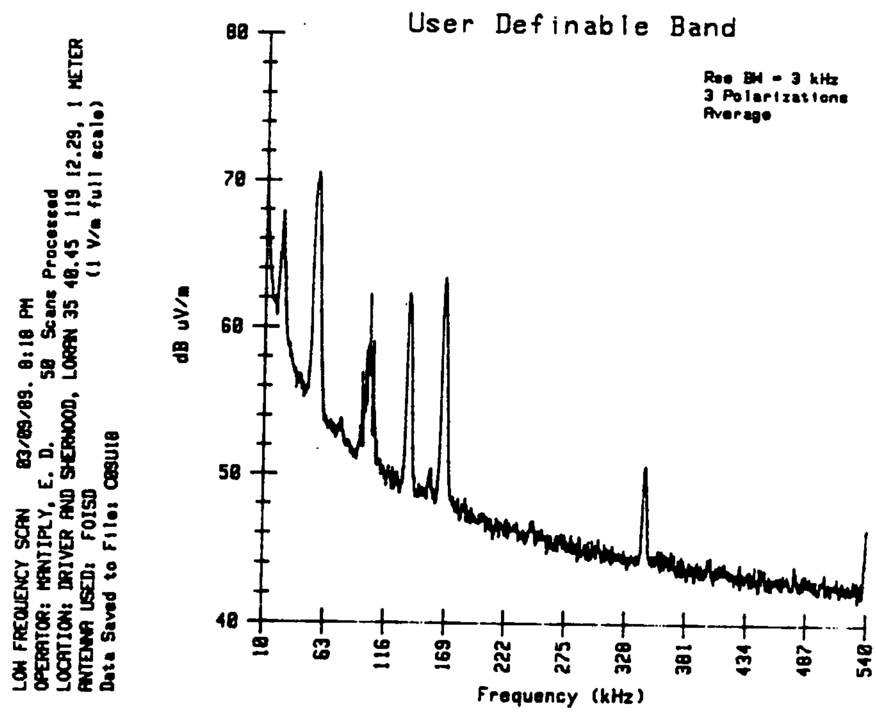
LOOP BAND 7, WITH AMP AND CABLE 03/08/89. 4:21 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: ELMO AND DRIVER LORAN 35 41.34 119 12.27
ANTENNA USED: 15 Inch Loop with 100 ft 9310 cable and 20.7 dB amp
Total Band Exposure(Avg) = 8.702E-05 uW/cm^2
Data Saved to File: C08021
User Definable Band
Res BW = 30 kHz
3 Polarizations
Average
Ext Atten = 0 dB
dB uV/m
Frequency (MHz)



LOOP BAND 8, WITH AMP AND CABLE
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: ELMO AND DRIVER LORAN 35 41.34 119 12.27
ANTENNA USED: 15 Inch Loop with 100 ft (100 V/m full scale)
Data Saved to File: C08039
User Definable Band
Res BW = 30 kHz
3 Polarizations
Average
dB uV/m
Frequency (MHz)


FM Broadcast Band
Res BW = 100 kHz
3 Polarizations
Average
dB uV/m
Frequency (MHz)
70
60
50
40
88
90
92
94
96
98
100
102
104
106
108
FM BAND, FOISD 1 V/M FS, ACRYLIC COVER
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: DRIVER AND ELMO LORAN 35 41.34 118 12.25
ANTENNA USED: FOISD (1 V/m full scale)
Total Band Exposure(Avg) = 2.914E-06 uW/cm^2
Data Saved to File: C88T12


User Definable Band
Res BW = 10 kHz
3 Polarizations
Average
dB uV/m
Frequency (MHz)
90
80
70
60
50
40
6
6.6
7.2
7.8
8.4
9
9.6
10.2
10.8
11.4
12
FM BAND, FOISD 1 V/M FS, ACRYLIC COVER
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: DRIVER AND ELMO LORAN 35 41.34 118 12.25
ANTENNA USED: FOISD (1 V/m full scale)
Total Band Exposure(Avg) = 5.584E-05 uW/cm^2


LOW FREQUENCY SCAN 03/09/89. 0:10 PM
OPERATOR: MANTIPLY, E. D. 50 Scans Processed
LOCATION: DRIVER AND SHERWOOD, LORAN 35 40.45 119 12.29, 1 METER
ANTENNA USED: FOISD (1 V/m full scale)
Data Saved to File: C89U10
User Definable Band
Res BW = 3 kHz
3 Polarizations
Average
dB uV/m
80
70
60
50
40
10
63
116
169
222
275
328
381
434
487
540
Frequency (kHz)

File Name: ZOCIOI

Garzoli and Elmo Loran 35 41.32 119 14.46

Biconical Antenna with Amplifer

03/09/89 2:08 PM

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m) *	Power Density (nW/cm^2)
CH17	489.25	-8.81	-10.83	-15.43	-6.15	3.10	99.96	2.62561
CH18	495.26	-24.51	-30.52	-30.43	-22.73	2.87	83.14	.05465
CH21	513.25	-51.73	-47.98	-52.87	-45.56	2.20	59.65	.00024
CH23	525.24	-11.63	-2.90	-15.42	-2.14	1.79	102.65	4.87916
CH24	531.25	-26.47	-27.81	-40.68	-23.98	1.59	80.61	.03052
CH26	543.26	-12.81	-16.48	-22.58	-10.95	1.21	93.27	.56260
CH29	561.25	-7.80	-7.41	-12.39	-3.92	.69	99.77	2.51295
CH30	567.26	-30.46	-24.74	-34.80	-23.38	.52	80.14	.02740
CH39	621.24	-38.78	-33.21	-46.66	-32.00	-.72	70.28	.00283
CH45	657.25	-4.34	-5.70	-21.76	-1.91	-1.34	99.75	2.50502
CH47	669.25	-51.00	-46.70	-49.16	-43.82	-1.51	57.67	.00016
CH49	681.25	-15.74	-21.25	-31.20	-14.57	-1.66	86.77	.12618
CH53	706.25	-57.50	-59.42	-64.43	-54.84	-1.92	46.24	.00001
CH55	717.25	-36.64	-32.30	-54.81	-30.92	-2.02	70.06	.00269
CH57	729.25	-37.86	-41.11	-48.78	-35.95	-2.11	64.95	.00083
CH59	741.25	-40.91	-51.77	-52.61	-40.30	-2.18	60.52	.00030

Total Video Power Density: 13.33114

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	493.75	-17.31	-17.92	-21.73	-13.83	2.93	96.10	1.08095
CH18	499.76	-35.43	-44.13	-42.45	-34.18	2.70	75.52	.00945
CH21	517.75	-60.35	-60.35	-60.84	-55.74	2.05	53.31	.00006
CH23	529.74	-19.17	-12.44	-32.72	-11.57	1.64	97.07	1.35171
CH24	535.75	-35.03	-52.04	-50.45	-34.82	1.45	73.62	.00611
CH26	547.76	-27.85	-28.18	-36.33	-24.69	1.08	83.39	.05783
CH29	565.75	-16.93	-8.66	-18.44	-7.68	.56	99.89	2.58519
CH30	571.76	-48.85	-57.72	-55.50	-47.56	.40	59.84	.00026
CH39	625.74	-51.83	-51.96	-61.46	-48.65	-.81	57.54	.00015
CH45	661.75	-16.89	-12.55	-36.49	-11.18	-1.40	94.42	.73420
CH47	673.75	-55.18	-56.06	-54.54	-50.44	-1.57	54.99	.00008
CH49	685.75	-34.73	-43.77	-43.43	-33.73	-1.71	71.56	.00380
CH53	709.75	-53.89	-67.68	-63.74	-53.30	-1.95	51.74	.00004
CH55	721.75	-48.87	-44.80	-67.58	-43.35	-2.05	61.60	.00038
CH57	733.75	-51.05	-53.93	-68.04	-49.19	-2.14	55.68	.00010
CH59	745.75	-48.23	-56.15	-56.81	-47.09	-2.20	57.71	.00016

Total Audio Power Density: 5.83047

Garzoli and Elmo, Loran 35 41.32 119 14.47

Loop antenna band setting 3 03/10/89 1:36 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-47.01	-49.36	-67.66	-44.99	23.06	85.06	.08510

Total Power Density: .08510

Total Magnetic Field (mA/m): 1.50272

File Name: ZOCJNk

Garzoli and Elmo, Loran 35 41.32 119 14.47

Loop antenna band setting 4 03/10/89 1:39 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
KERI	1180	-25.50	-33.65	-45.76	-24.85	20.63	102.78	5.03422
KXEM	1590	-33.87	-45.81	-57.48	-33.58	19.09	92.50	.47199

Total Power Density: 5.50621

Total Magnetic Field (mA/m): 12.08744

File Name: ZOCJNn

File Name: ZOCJLr

Garzoli and Elmo Loran 35 41.32 119 12.47

FOISD 03/10/89 11:43 AM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-61.74	-50.17	-37.76	-37.50	10.70	80.20	.02777
KERI	1180	-41.88	-33.54	-18.21	-18.07	10.70	99.63	2.43788
KXEM	1590	-48.91	-42.56	-29.50	-29.24	10.70	88.46	.18592

Total Power Density: 2.65157

Garzoli and Elmo, Loran 35 41.32 119 14.47

Loop antenna band setting 3 03/10/89 1:11 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-28.27	-29.51	-48.66	-25.81	14.56	95.75	.99589

Total Power Density: .99589

Total Magnetic Field (mA/m): 5.14059

File Name: ZOCJNL

File Name: ZOCJME

Garzoli and Elmo, Loran 35 41.32 119 14.47

FOISD 03/10/89 12:04 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-44.59	-33.56	-21.88	-21.57	10.70	96.13	1.08735
R-02	9815	-59.91	-49.48	-39.16	-38.74	10.70	78.96	.02087
R-03	11740	-62.26	-46.99	-35.74	-35.42	10.70	82.28	.04487

Total Power Density: 1.15310

Garzoli and Elmo, Loran 35 41.32 119 14.47

Loop antenna band setting 3 03/10/89 1:26 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-34.96	-33.34	-60.12	-31.06	13.03	88.97	.20941

Total Power Density: .20941

Total Magnetic Field (mA/m): 2.35723

File Name: ZOCJNa

File Name: ZOCJMg

Garzoli and Elmo, Loran 35 41.32 119 14.47

FOISD

03/10/89 12:32 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-53.09	-43.26	-32.15	-31.79	10.70	85.91	.10334

Total Power Density: .10334

Garzoli and Elmo, Loran 35 41.32 119 14.47

Loop antenna band setting 4 03/10/89 1:19 PM

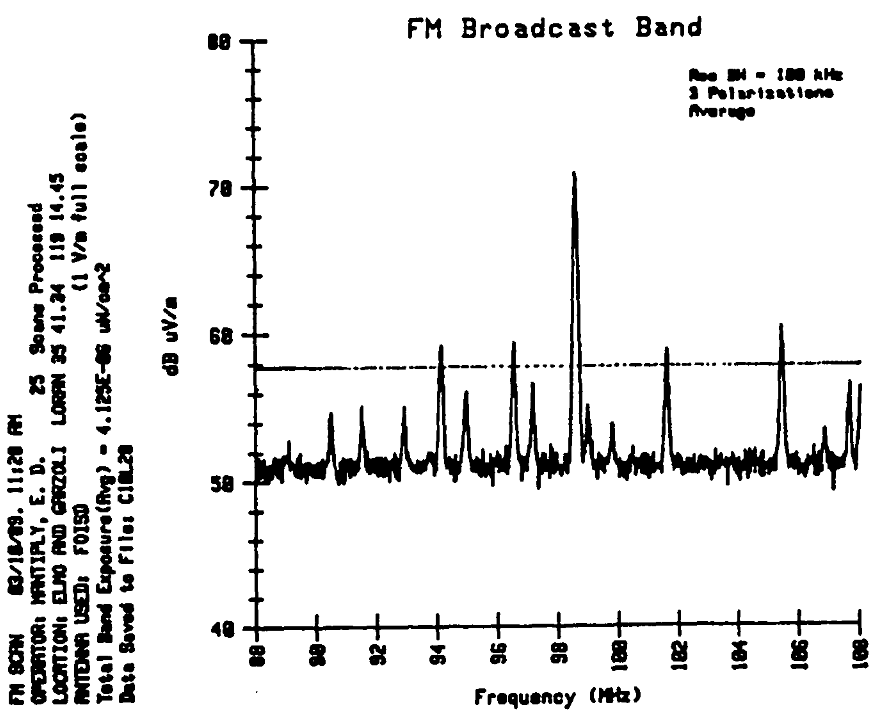
AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-02	9815	-40.84	-39.74	-66.68	-37.24	13.03	82.79	.05041
R-03	11740	-37.86	-39.27	-64.39	-35.49	12.77	84.28	.07104

Total Power Density: .12145

Total Magnetic Field (mA/m): 1.79516

File Name: ZOCJNT



Garzoli and Sherwood Loran 35 40.48 119 14.45

Loop antenna band setting 3 03/10/89 3:16 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-46.49	-50.39	-83.53	-45.01	23.06	85.05	.08488

Total Power Density: .08488

Total Magnetic Field (mA/m): 1.50079

File Name: ZOCJPQ

Garzoli and Sherwood Loran 35 40.48 119 14.45

Loop antenna band setting 4 03/10/89 3:18 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
KERI	1180	-24.89	-31.40	-43.58	-23.97	20.63	103.66	6.16390
KXEM	1590	-33.54	-32.15	-39.46	-29.34	19.09	96.75	1.25514

Total Power Density: 7.41903

Total Magnetic Field (mA/m): 14.03077

File Name: ZOCJPS

File Name: ZOCJOb

Garzoli and Sherwood Loran 35 40.48 119 14.45

FOISD 03/10/89 2:27 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-78.75	-64.22	-37.72	-37.71	10.70	79.99	.02646
KERI	1180	-50.22	-39.45	-18.34	-18.30	10.70	99.40	2.30828
KXEM	1590	-49.59	-43.54	-23.81	-23.75	10.70	93.95	.65825

Total Power Density: 2.99299

Garzoli and Sherwood Loran 35 40.48 119 14.45

Loop antenna band setting 3

03/10/89 2:59 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-30.15	-36.01	-56.94	-29.14	14.56	92.42	.46281

Total Power Density: .46281

Total Magnetic Field (mA/m): 3.50435

File Name: ZOCJ09

File Name: ZOCJOe

Garzoli and Sherwood Loran 35 40.48 119 14.45

FOISD

03/10/89 2:30 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-54.27	-52.80	-29.15	-29.12	10.70	88.58	.19136
R-02	9815	-58.41	-52.77	-35.74	-35.63	10.70	82.07	.04270
R-03	11740	-68.77	-73.99	-54.01	-53.83	10.70	63.87	.00065

Total Power Density: .23471

Garzoli and Sherwood Loran 35 40.48 119 14.45

Loop antenna band setting 3

03/10/89 3:11 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-36.45	-41.31	-55.22	-35.18	13.03	84.85	.08109

Total Power Density: .08109

Total Magnetic Field (mA/m): 1.46687

File Name: ZOCJPL

File Name: ZOCJOx

Garzoli and Sherwood Loran 35 40.48 119 14.45

FOISD

03/10/89 2:49 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-57.48	-55.80	-34.88	-34.82	10.70	82.88	.05147

Total Power Density: .05147

Garzoli and Sherwood Loran 35 40.48 119 14.45

Loop antenna band setting 4

03/10/89 3:03 PM

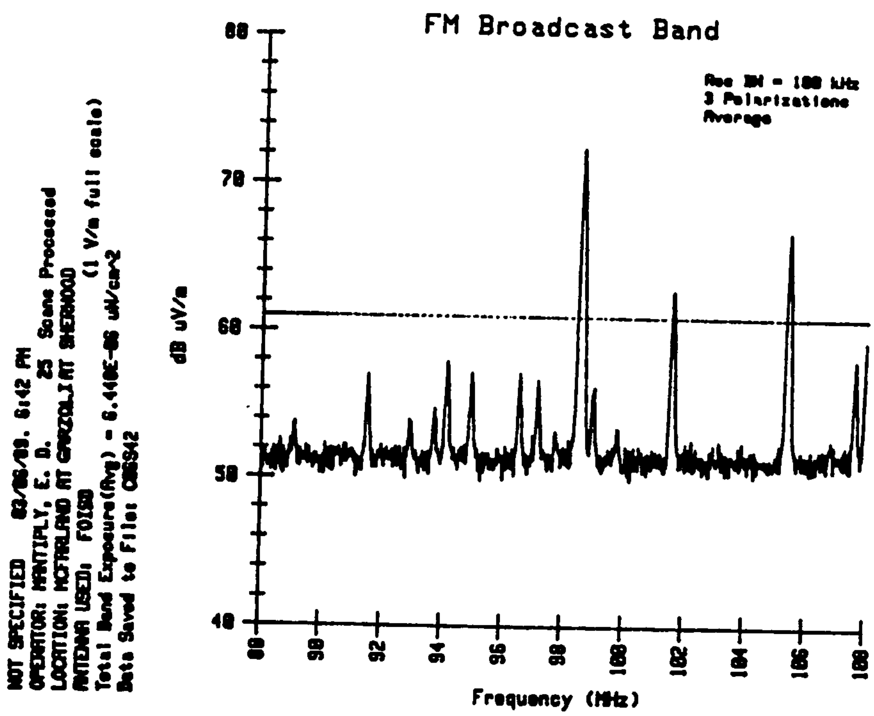
AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-02	9815	-36.54	-41.19	-57.46	-35.23	13.03	84.79	.08000
R-03	11740	-56.52	-56.73	-68.52	-53.48	12.77	66.30	.00113

Total Power Density: .08113

File Name: ZOCJPD

Total Magnetic Field (mA/m): 1.46727



File Name: ZOCKOu

Elmo and Driver, Loran 35 41.35 119 12.25

FOISD 03/11/89 2:46 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-57.59	-57.78	-32.47	-32.44	10.70	85.26	.08897
KERI	1180	-50.60	-52.95	-19.97	-19.96	10.70	97.74	1.57490
KXEM	1590	-60.34	-63.09	-27.98	-27.98	10.70	89.72	.24891

Total Power Density: 1.91278

Elmo and Driver, Loran 35 41.35 119 12.25

Loop antenna band setting 3 03/11/89 3:02 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-37.71	-37.60	-67.12	-34.64	14.56	86.92	.13041

Total Power Density: .13041

Total Magnetic Field (mA/m): 1.86023

File Name: ZOCKPC

File Name: ZOCKOy

Elmo and Driver, Loran 35 41.35 119 12.25

FOISD 03/11/89 2:50 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-58.33	-53.10	-33.42	-33.36	10.70	84.34	.07206
R-02	9815	-55.62	-53.09	-35.12	-35.01	10.70	82.69	.04924
R-03	11740	-60.16	-55.90	-38.45	-38.34	10.70	79.36	.02287

Total Power Density: .14417

Elmo and Driver, Loran 35 41.35 119 12.25

Loop antenna band setting 3 03/11/89 3:10 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-39.47	-38.99	-67.17	-36.21	13.03	83.82	.06397

Total Power Density: .06397

Total Magnetic Field (mA/m): 1.30282

File Name: ZOCKPK

File Name: ZOCK07

Elmo and Driver, Loran 35 41.35 119 12.25

FOISD 03/11/89 2:57 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna .Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-58.65	-54.09	-35.84	-35.75	10.70	81.95	.04153

Total Power Density: .04153

Elmo and Driver, Loran 35 41.35 119 12.25

Loop antenna band setting 4 03/11/89 3:07 PM

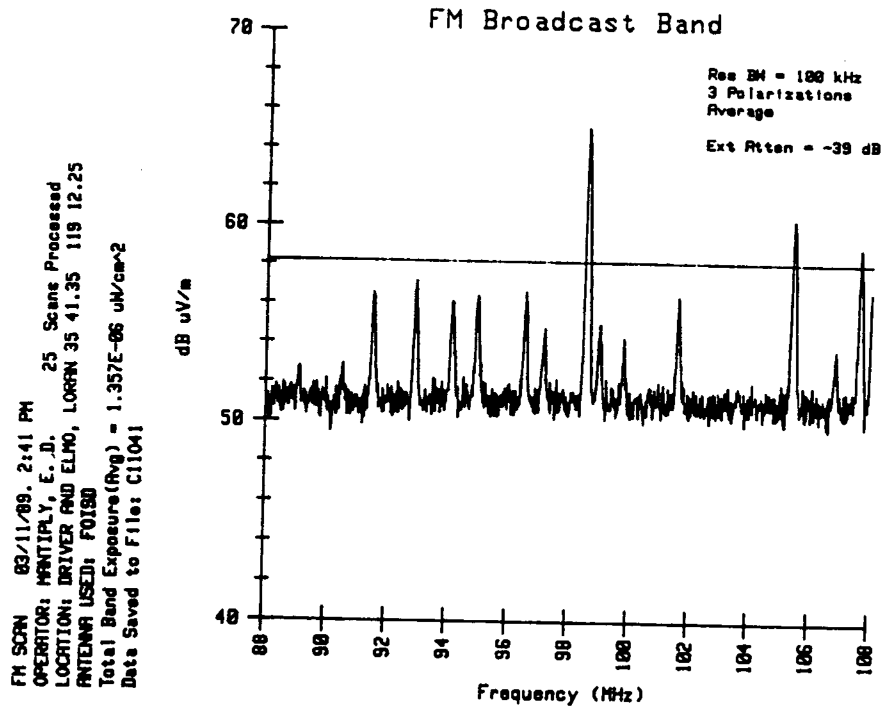
AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-02	9815	-37.75	-38.51	-65.31	-35.10	13.03	84.93	.08253
R-03	11740	-41.18	-41.22	-61.55	-38.17	12.77	81.60	.03835

Total Power Density: .12088

Total Magnetic Field (mA/m): 1.79094

File Name: ZOCKPH


FM SCAN 03/11/89. 2:41 PM
OPERATOR: MANTIPLY, E. D. 25 Scans Processed
LOCATION: DRIVER AND ELMO, LORAN 35 41.35 119 12.25
ANTENNA USED: FOI90
Total Band Exposure(Avg) = 1.357E-06 uW/cm^2
Data Saved to File: C11041
FM Broadcast Band
Res BW = 100 kHz
3 Polarizations
Average
Ext Atten = -39 dB
70
60
50
40
dB uV/m
88
90
92
94
96
98
100
102
104
106
108
Frequency (MHz)

File Name: ZOCIPq

Driver and Sherwood Loran 35 40.46 119 12.29

Biconical Antenna with Amplifer 03/09/89 3:42 PM

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	* Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	489.25	-15.54	-6.16	-15.80	-5.28	3.10	100.82	3.20491
CH18	495.26	-30.91	-28.81	-31.76	-25.54	2.87	80.33	.02862
CH21	513.25	-40.12	-49.24	-42.67	-37.87	2.20	67.33	.00144
CH23	525.24	-29.17	-5.08	-12.87	-4.40	1.79	100.39	2.90465
CH24	531.25	-31.96	-29.99	-33.30	-26.76	1.59	77.83	.01609
CH26	543.26	-9.44	-9.07	-19.92	-6.06	1.21	98.16	1.73480
CH29	561.25	-19.37	-3.95	-17.72	-3.65	.69	100.04	2.67418
CH30	567.26	-28.25	-25.94	-32.57	-23.38	.52	80.15	.02745
CH39	621.24	-41.52	-34.46	-44.90	-33.36	-.72	68.91	.00207
CH45	657.25	-10.79	-4.66	-26.31	-3.69	-1.34	97.97	1.66373
CH47	669.25	-29.43	-46.46	-36.78	-28.62	-1.51	72.87	.00514
CH49	681.25	-3.01	-8.70	-18.04	-1.87	-1.66	99.48	2.35058
CH53	706.25	-45.99	-56.67	-53.49	-44.97	-1.92	56.10	.00011
CH55	717.25	-43.12	-37.19	-47.95	-35.92	-2.02	65.06	.00085
CH57	729.25	-35.46	-37.58	-58.39	-33.37	-2.11	67.53	.00150
CH59	741.25	-32.90	-49.89	-47.60	-32.67	-2.18	68.15	.00173

Total Video Power Density: 14.61784

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	493.75	-21.73	-14.81	-24.88	-13.67	2.93	96.26	1.12181
CH18	499.76	-40.54	-49.77	-45.16	-38.88	2.70	70.82	.00320
CH21	517.75	-46.58	-58.08	-52.57	-45.37	2.05	63.68	.00062
CH23	529.74	-32.18	-13.61	-22.53	-13.03	1.64	95.61	.96524
CH24	535.75	-37.43	-52.42	-44.67	-36.56	1.45	71.88	.00409
CH26	547.76	-20.83	-21.67	-36.34	-18.15	1.08	89.93	.26072
CH29	565.75	-23.22	-10.52	-24.43	-10.13	.56	97.44	1.46995
CH30	571.76	-39.40	-58.84	-44.73	-38.25	.40	69.16	.00219
CH39	625.74	-59.37	-50.66	-62.22	-49.85	-.81	56.34	.00011
CH45	661.75	-19.91	-16.25	-34.87	-14.65	-1.40	90.94	.32965
CH47	673.75	-38.20	-54.83	-44.77	-37.26	-1.57	68.18	.00174
CH49	685.75	-20.91	-25.63	-38.66	-19.59	-1.71	85.70	.09845
CH53	709.75	-46.16	-60.51	-54.70	-45.45	-1.95	59.59	.00024
CH55	721.75	-52.97	-48.30	-61.77	-46.88	-2.05	58.07	.00017
CH57	733.75	-48.11	-51.42	-70.76	-46.43	-2.14	58.43	.00018
CH59	745.75	-43.33	-57.84	-53.86	-42.82	-2.20	61.97	.00042

Total Audio Power Density: 4.25879

File Name: ZOCIQS

Driver and Sherwood Loran 35 40.46 119 12.29

FOISD

03/09/89 4:18 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-65.07	-58.36	-35.61	-35.58	10.70	82.12	.04320
KERI	1180	-49.20	-52.88	-18.96	-18.95	10.70	98.75	1.98722
KXEM	1590	-55.30	-50.22	-25.35	-25.33	10.70	92.37	.45762
R-02	9815	-64.22	-54.85	-37.86	-37.76	10.70	79.94	.02614
R-03	11740	-92.04	-57.67	-45.82	-45.55	10.70	72.15	.00436

Total Power Density: 2.51853

Driver and Sherwood, Loran 35 40.47 119 12.28 1 meter

Loop antenna band setting 3

03/09/89 7:46 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-31.63	-31.67	-47.50	-28.58	14.56	92.97	.52620

Total Power Density: .52620

File Name: ZOCITu

Total Magnetic Field (mA/m): 3.73667

File Name: ZOCITj

Driver and Sherwood, Loran 35 40.47 119 12.28 1 meter

FOISD

03/09/89 7:35 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-72.62	-54.17	-34.58	-34.53	10.70	83.17	.05501
KERI	1180	-83.50	-69.28	-44.57	-44.55	10.70	73.15	.00547
KXEM	1590	-56.72	-49.34	-25.66	-25.64	10.70	92.06	.42644
R-02	6155	-51.69	-43.67	-26.97	-26.86	10.70	90.84	.32157
R-03	9765	-67.67	-62.31	-47.06	-46.90	10.70	70.80	.00319

Total Power Density: .81169

Driver and Sherwood, Loran 35 40.47 119 12.28 1 meter

Loop antenna band setting 3

03/09/89 7:50 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-47.36	-50.31	-66.39	-45.54	13.03	74.49	.00746

Total Power Density: .00746

File Name: ZOCITy

Total Magnetic Field (mA/m): .44485

Driver and Sherwood, 1 m above ground on tripod

Loop antenna band setting 4

03/09/89 4:49 PM

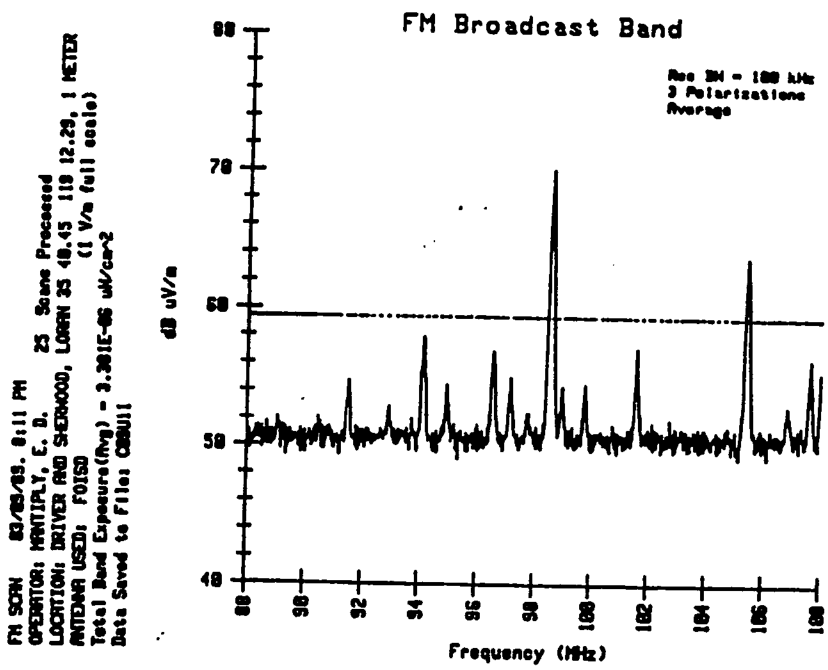
AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-02	9815	-37.38	-40.49	-65.16	-35.65	13.03	84.38	.07274
R-03	11740	-45.48	-47.64	-61.09	-43.34	12.77	76.43	.01165

Total Power Density: .08439

File Name: ZOCIQx

Total Magnetic Field (mA/m): 1.49644



File Name: ZOCINw

Kern School, Kern and S th, Loran 35 40.69 119 14.00

Biconical Antenna with Amplifer 03/09/89 1:48 PM

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	* Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	489.25	-14.10	-17.26	-19.04	-11.54	3.10	94.57	.75893
CH18	495.26	-26.00	-36.29	-40.59	-25.48	2.87	80.39	.02904
CH21	513.25	-35.68	-44.78	-44.86	-34.73	2.20	70.47	.00296
CH23	525.24	-25.59	-15.13	-31.72	-14.67	1.79	90.12	.27282
CH24	531.25	-25.57	-35.02	-37.07	-24.84	1.59	79.76	.02509
CH26	543.26	-16.71	-19.99	-27.28	-14.79	1.21	89.43	.23257
CH29	561.25	-25.55	-11.16	-32.84	-10.98	.69	92.71	.49532
CH30	567.26	-30.37	-35.32	-46.35	-29.08	.52	74.44	.00738
CH39	621.24	-45.40	-45.31	-52.63	-41.96	-.72	60.32	.00029
CH45	657.25	-18.75	-14.70	-26.53	-13.06	-1.34	88.60	.19234
CH47	669.25	-35.39	-43.67	-45.47	-34.43	-1.51	67.06	.00135
CH49	681.25	-11.96	-15.22	-31.10	-10.24	-1.66	91.10	.34147
CH53	706.25	-44.45	-57.53	-62.21	-44.17	-1.92	56.90	.00013
CH55	717.25	-45.39	-49.18	-57.50	-43.69	-2.02	57.29	.00014
CH57	729.25	-38.47	-47.40	-54.29	-37.85	-2.11	63.05	.00053
CH59	741.25	-35.68	-46.24	-48.77	-35.12	-2.18	65.70	.00098

Total Video Power Density: 2.36133

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	493.75	-24.03	-26.54	-28.60	-21.22	2.93	88.71	.19702
CH18	499.76	-35.59	-56.60	-43.01	-34.84	2.70	74.86	.00812
CH21	517.75	-44.44	-52.32	-56.23	-43.54	2.05	65.50	.00094
CH23	529.74	-46.77	-24.38	-40.92	-24.26	1.64	84.38	.07276
CH24	535.75	-34.01	-46.57	-43.60	-33.35	1.45	75.10	.00859
CH26	547.76	-22.71	-45.27	-33.84	-22.37	1.08	85.71	.09885
CH29	565.75	-35.33	-18.83	-33.09	-18.58	.56	88.99	.21009
CH30	571.76	-40.64	-57.91	-63.77	-40.54	.40	66.87	.00129
CH39	625.74	-59.25	-65.09	-67.93	-57.80	-.81	48.39	.00002
CH45	661.75	-27.38	-24.71	-30.03	-22.07	-1.40	83.52	.05969
CH47	673.75	-38.99	-59.77	-51.37	-38.71	-1.57	66.72	.00125
CH49	685.75	-28.23	-34.32	-46.28	-27.22	-1.71	78.07	.01700
CH53	709.75	-49.46	-63.99	-66.30	-49.22	-1.95	55.82	.00010
CH55	721.75	-55.97	-58.75	-68.17	-53.96	-2.05	50.98	.00003
CH57	733.75	-53.43	-58.56	-69.82	-52.19	-2.14	52.67	.00005
CH59	745.75	-43.70	-53.45	-61.77	-43.20	-2.20	61.59	.00038

Total Audio Power Density: .67619

Kern School, Kern and 5 th, Loran 35.40.69 119 14.00

Loop antenna band setting 3

03/10/89 4:59 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-46.85	-50.61	-68.36	-45.30	23.06	84.75	.07925

Total Power Density: .07925

File Name: ZOCJQ9

Total Magnetic Field (mA/m): 1.45015

Kern School, Kern and 5 th, Loran 35.40.69 119 14.00

Loop antenna band setting 4

03/10/89 5:01 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
KERI	1180	-27.42	-29.14	-50.22	-25.17	20.63	102.46	4.67067
KXEM	1590	-35.41	-33.24	-48.20	-31.10	19.09	94.99	.83698

Total Power Density: 5.50765

File Name: ZOCJRB

Total Magnetic Field (mA/m): 12.08902

File Name: ZOCJQt

Kern School, Kern and 5 th, Loran 35.40.69 119 14.00

FOISD

03/10/89 4:45 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-64.35	-62.26	-38.79	-38.76	10.70	78.94	.02079
KERI	1180	-43.77	-45.09	-18.35	-18.33	10.70	99.37	2.29520
KXEM	1590	-53.05	-59.66	-26.96	-26.95	10.70	90.75	.31547

Total Power Density: 2.63146

Kern School, Kern and 5 th, Loran 35 40.69 119 13.99

Loop antenna band setting 3

03/10/89 6:47 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-28.62	-31.51	-42.31	-26.70	14.56	94.86	.81235

Total Power Density: .81235

File Name: ZOCJSv

Total Magnetic Field (mA/m): 4.64279

File Name: ZOCJS6

Kern School, Kern and 5 th, Loran 35 40.69 119 14.00

FOISD

03/10/89 6:56 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-41.45	-39.10	-24.88	-24.63	10.70	93.07	.53816
R-03	9765	-51.10	-44.88	-35.63	-35.03	10.70	82.67	.04901

Total Power Density: .58717

Kern School, Kern and 5 th, Loran 35 40.69 119 13.99

Loop antenna band setting 3

03/10/89 6:42 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-33.51	-39.13	-59.65	-32.45	13.03	87.58	.15204

Total Power Density: .15204

File Name: ZOCJSq

Total Magnetic Field (mA/m): 2.00857

Kern School, Kern and 5 th, Loran 35.40.69 119 14.00

Loop antenna band setting 4 03/10/89 5:03 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-02	9815	-39.10	-43.16	-65.68	-37.65	13.03	82.37	.04582
R-03	11740	-36.91	-41.93	-52.78	-35.64	12.77	84.13	.06871

Total Power Density: .11453

Total Magnetic Field (mA/m): 1.74328

File Name: ZOCJRD

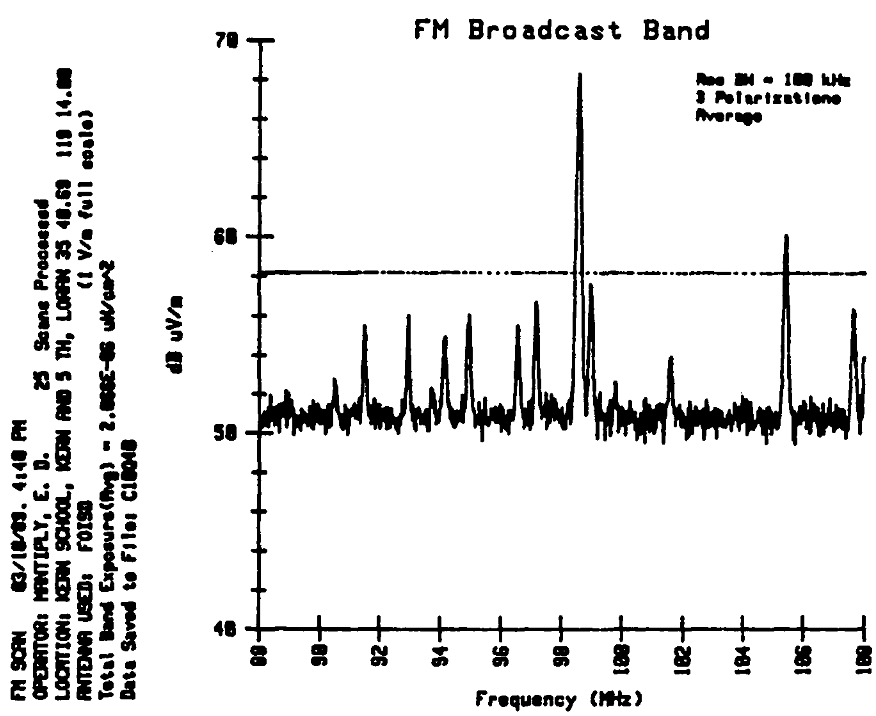
File Name: ZOCJRI

Kern School, Kern and 5 th, Loran 35.40.69 119 14.00

FOISD 03/10/89 5:08 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-02	9815	-51.77	-48.55	-40.85	-39.88	10.70	77.82	.01606
R-03	11740	-51.71	-46.32	-34.56	-34.20	10.70	83.50	.05936

Total Power Density: .07542



File Name: ZOCIPF

Browning School Loran 35 40.93 119 13.27

Biconical Antenna with Amplifer 03/09/89 3:05 PM

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	* Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	489.25	-17.24	-19.03	-26.87	-14.76	3.10	91.35	.36165
CH18	495.26	-22.61	-32.61	-33.49	-21.89	2.87	83.98	.06639
CH21	513.25	-31.54	-39.08	-40.91	-30.43	2.20	74.78	.00797
CH23	525.24	-15.40	-11.51	-17.61	-9.33	1.79	95.47	.93390
CH24	531.25	-24.15	-30.39	-36.62	-23.03	1.59	81.56	.03802
CH26	543.26	-14.59	-7.18	-19.85	-6.26	1.21	97.95	1.65572
CH29	561.25	-12.01	-12.70	-29.50	-9.29	.69	94.40	.73044
CH30	567.26	-25.34	-32.98	-47.69	-24.63	.52	78.90	.02057
CH39	621.24	-46.47	-39.30	-53.60	-38.40	-.72	63.87	.00065
CH45	657.25	-15.30	-17.21	-28.21	-13.01	-1.34	88.66	.19463
CH47	669.25	-33.06	-37.82	-43.44	-31.52	-1.51	69.97	.00264
CH49	681.25	-1.09	-10.32	-20.24	-.55	-1.66	100.79	3.18065
CH53	706.25	-41.46	-54.15	-56.77	-41.11	-1.92	59.96	.00026
CH55	717.25	-49.78	-47.86	-53.50	-45.04	-2.02	55.95	.00010
CH57	729.25	-27.97	-51.81	-51.06	-27.93	-2.11	72.96	.00525
CH59	741.25	-30.72	-46.38	-57.98	-30.60	-2.18	70.22	.00279

Total Video Power Density: 7.20163

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
CH17	493.75	-24.99	-22.68	-34.56	-20.50	2.93	89.43	.23256
CH18	499.76	-30.65	-43.19	-36.87	-29.53	2.70	80.17	.02758
CH21	517.75	-42.33	-53.66	-45.27	-40.34	2.05	68.71	.00197
CH23	529.74	-23.20	-18.92	-27.63	-17.14	1.64	91.51	.37521
CH24	535.75	-32.11	-43.09	-48.19	-31.68	1.45	76.77	.01261
CH26	547.76	-17.65	-22.06	-30.54	-16.15	1.08	91.93	.41383
CH29	565.75	-20.21	-21.15	-38.56	-17.61	.56	89.96	.26255
CH30	571.76	-36.39	-44.56	-57.62	-35.75	.40	71.66	.00389
CH39	625.74	-61.33	-55.35	-70.24	-54.26	-.81	51.93	.00004
CH45	661.75	-32.99	-30.06	-33.89	-27.22	-1.40	78.38	.01826
CH47	673.75	-38.38	-43.75	-52.82	-37.15	-1.57	68.28	.00179
CH49	685.75	-21.63	-26.26	-31.27	-20.01	-1.71	85.28	.08950
CH53	709.75	-43.27	-55.20	-65.20	-42.97	-1.95	62.07	.00043
CH55	721.75	-65.41	-57.16	-65.38	-56.02	-2.05	48.93	.00002
CH57	733.75	-46.50	-52.20	-59.89	-45.31	-2.14	59.55	.00024
CH59	745.75	-41.50	-52.11	-64.24	-41.12	-2.20	63.68	.00062

Total Audio Power Density: 1.44108

NE of Browning School, Loran 35 41.03 119 13.23

Loop antenna band setting 3

03/11/89 2:10 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-40.88	-41.52	-66.15	-38.17	23.06	91.89	.40950

Total Power Density: .40950

File Name: ZOCKOK

Total Magnetic Field (mA/m): 3.29634

NE of Browning School, Loran 35 41.03 119 13.23

Loop antenna band setting 4

03/11/89 2:11 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
KERI	1180	-25.82	-33.93	-47.28	-25.17	20.63	102.46	4.67317
KXEM	1590	-33.14	-34.38	-37.30	-29.85	19.09	96.24	1.11608

Total Power Density: 5.78925

File Name: ZOCKOL

Total Magnetic Field (mA/m): 12.39421

File Name: ZOCKNn

NE of Browning School, Loran 35 41.03 119 13.23

FOISD

03/11/89 1:39 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
KCHJ	1010	-57.28	-53.77	-30.70	-30.67	10.70	87.03	.13389
KERI	1180	-43.04	-47.96	-17.57	-17.55	10.70	100.15	2.74337
KXEM	1590	-54.41	-56.76	-26.97	-26.96	10.70	90.74	.31470

Total Power Density: 3.19196

NE of Browning School, Loran 35 41.03 119 13.23

Loop antenna band setting 3 03/11/89 1:52 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-35.30	-34.35	-53.55	-31.76	14.56	89.80	.25323

Total Power Density: .25323

Total Magnetic Field (mA/m): 2.59219

File Name: ZOCKN2

File Name: ZOCKNr

NE of Browning School, Loran 35 41.03 119 13.23

FOISD

03/11/89 1:43 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-10	6155	-51.14	-47.46	-29.13	-29.04	10.70	88.66	.19484
R-02	9815	-55.20	-54.93	-41.12	-40.78	10.70	76.92	.01304
R-03	11740	-54.76	-50.68	-34.42	-34.28	10.70	83.42	.05831

Total Power Density: .26619

NE of Browning School, Loran 35 41.03 119 13.23

Loop antenna band setting 3 03/11/89 2:07 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-43.90	-47.25	-77.77	-42.25	13.03	77.78	.01593

Total Power Density: .01593

Total Magnetic Field (mA/m): .65006

File Name: ZOCKOH

File Name: ZOCKNx

NE of Browning School, Loran 35 41.03 119 13.23

FOISD

03/11/89 1:49 PM

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (nW/cm^2)
R-03	9765	-64.48	-57.79	-43.98	-43.77	10.70	73.93	.00656

Total Power Density: .00656

NE of Browning School, Loran 35 41.03 119 13.23

Loop antenna band setting 4

03/11/89 1:59 PM

AM Radiofrequency Measurements Using Loop with Amp

Call Sign	Frequency (kHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Magnetic Field (dBuV/m)	Power Density (nW/cm^2)
R-02	9815	-41.96	-44.39	-63.42	-39.98	13.03	80.05	.02684
R-03	11740	-37.86	-39.03	-59.52	-35.38	12.77	84.39	.07292

Total Power Density: .09976

Total Magnetic Field (mA/m): 1.62700

File Name: ZOCKN9