Ole Virginia Times

The OVH ARC Newsletter

"OLE VIRGINIA HAMS" AMATEUR RADIO CLUB, INC.
Post Office Box 1255, Manassas, VA 22110

Repeater: WA4FPM -- 146.97
WA4FPM -- 224.66

Digipeater: WA4FPM-1 -- 145.09
WA4FPM-3 -- 223.40

JANUARY 1990 ISSUE

FROM THE PRESIDENT'S SHACK

989 IS GONE! Did you get the new rig fixed? The antenna up? WAS? DXCC? Well, if not, here is a new year for you to get them all done in, and, then next year at this same time, you can answer YES!

Anyone who has been contemplating a new antenna sure missed a good chance! The weather during the last three weeks of 1989 sure was good erection weather according to the standards of the old saying. You know ... The worse the weather the antenna is put up in, the better it will function!

I encountered a problem with my mobile rig and I'd like to submit it here in the hope of helping someone else. The mobile rig concerned is a Kenwood TW4000. This type of rig uses a Lithium battery to sustain the programming while the primary power is off. My rig lost all memories and the tuning became quite erratic. I estimated the Lithium battery had reached the end of its life. Quite correctly as a telephone call to Ham Radio Outlet got a concurrence from the repair person there! There was one drawback — the Lithium battery is a button-type unit which is soldered into the radio. A new one is to be installed shortly and hopefully all will be well. I suspect the handheld rigs have the ssame type of arrangement to maintain their status while the main battery is replaced.

I send all my best wishes for a Happy New Year!

73's

Harry (W4PVA)

Listen to the Westlink Report at 8:00 pm Thursday Evenings during the OVH Weekly Bulletin.

CLUB OFFICERS AND COMMITTEES

DIRECTORS
Bob McCann (N4RL)
Tim Wayne (KB4NR)
Mike Feher (N4FS)
Butch Blasdell (W4HJL)

OFFICERS
President – Harry Vohauer (W4PVA)
V. Pres – Joe Tutino (AB4QV)
Secretary — Ken Moan (KM4UH)
Treasurer — Steve Frick (N4OGR)

OVH WEEKLY NET
Harry Vohauer (W4PVA)

REPEATER TRUSTEE
Art Whittum (W1CRO)

EMERGENCY COORDINATOR
Harry Vohauer (W4PVA)

REPEATER CONTROLLERS
Art Whittum (W1CRO)
Tim Wayne (KB4NR)
Milt Warnock (N4SN)
Jim Lascaris (WA2QEJ)
Steve Meade (KB4OF)
Russ Stevens (WB4HHN)
Butch Blasdell (W4HJL)
Mary Lou Blasdell (KB4EFP)
Jack Gunsett (KI4VP) Digipeater

FINANCE COMMITTEE
Tim Wayne (KB4NR)
Jim Lascaris (WA2QEJ)
Al Picard (K4IQH)
Lisa Miller (KA4RKJ)
Steve Frick (N4OGR)

TECHNICAL COMMITTEE
Butch Blasdell (W4HJL)
Jim Lascaris (WA2QEJ)
Tim Wayne (KB4NR)
Bob McCann (N4RL)

SUNSHINE COMMITTEE
Bernice Miller (KA4SCA)

REFRESHMENTS
Woody Woodworth (N4MQ)

FIELD DAY 1990 CHAIRMAN
Bonnie Frick (N4QPB)

PROGRAM CHAIRMAN
Jeff Barr (KB4IWD)

CLUB NEWSLETTER
Bonnie Frick (N4QPB)

HISTORIAN
Greg Brunacci (N4RKV)

F.A.R. REPRESENTATIVE
Mike Squires (N4REI)

PUBLICITY CHAIRMAN
Greg Brunacci (N4RKV)

1990 HAMFEST CHAIRMAN
Jim Lascaris (WA2QEJ)

GENERATORS
Tom Watts (KA4AFU)

COMPUTER COMMITTEE
Dick Miller (WD4AZG)
Milt Warnock (N4SN)
Tim Wayne (KB4NR)

MEMBERSHIPS
Jim McKinley, WD4OJY

SCHOLARSHIPS
Mike Feher (N4FS)

MAIL LIST
Dick Miller (WD4AZG)

WESTLINK REPORT
Jack Gunsett (KI4VP)

EDUCATIONAL COMMITTEE
Dick Miller (WD4AZG)

CLUB PICNIC
Bernice Miller (KA4SCA)
Mary Lou Blasdell (KB4EFP)

The Ole Virginia Times is published monthly by the Ole Virginia Hams Amateur Radio Club, and is mailed free to members of the OVHARC. Permission is granted for use of material contained in this Newsletter, provided proper credit is given. This Editor will exchange Newsletters with other Clubs and Associations upon request. Newsletter deadline for submission of articles is the 5th of each month. The Newsletter is entered as First Class Mail at the Manassas Post Office, Manassas, Virginia.

We are always looking for interesting items for the Newsletter. If you see articles, have shack tips, items for sale, items wanted, brain teasers, etc., please send them to the Newsletter Editor, c/o Ole Virginia Hams, Post Office Box 1255, Manassas, Virginia 22110; or, give us a landline (361-0008 or 690-6547). If it is interesting to you, chances are it will be interesting to others!

WORLD WIDE FRIENDSHIP THROUGH AMATEUR RADIO

Ole Virginia Hams Amateur Radio Club, Inc.

GENERAL INTEREST ITEMS

ARRL Instructer of the Year:

Do you know a good volunteer instructor or excellent teacher who uses Amateur Radio in the school classroom? Honor them by nominating them for the ARRL 1989 Instructor of the Year Award. To nominate someone, contact your Section Manager. Nomination deadline is the 31st of January 1990.

The Section Manager for Virginia is:

Claude Fiegly (W3ATQ)
135 The Maine
Williamsburg, VA 23185
Telephone: (804) 253-0658

****

HANDI-HAM WAS!?!

Bill Taylor, a student in Reston, VA, has come up with what seems like a wonderful on-the-air idea. He is interested in doing his W.A.S. but doing it with HANDI-HAM participants from each state. Anyone interesed in setting up a schedule with Bill to help him with this project can contact him at 2212 Castle Rock square, 21-C, Reston, VA 22091. At present, Bill is using only CW.

Remember, if you would like to contact HANDI-HAM participants, these calling frequencies have been suggested as good spots for meeting HANDI-HAM members:

CW Frequencies

28.112, 21.112, 7.112, 3712

On Phone
(When nets are not in session)

28390, 21390, 14290
7290, 3990

(HAND-HAM World, Winter 1989.)

****

Number of Radio Stations Exceeds 5,000,000 in Japan:

According to the bulletin issued by the Minisstry of Posts and Telecommunications, the number of radio stations licensed in accordance with the regulations of Radio Law reached 5,107,175 in Japan as of June 30th.

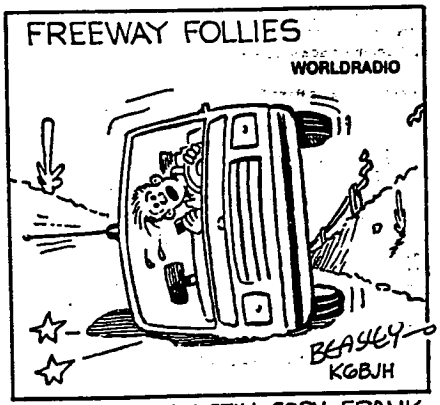
By classification, the number of Conventional Radio Stations (CB, etc.) is 2,390,000; Portable Radio Stations (Automobile Radio, MCA Radio, etc.) comes to 1,540,000 and Amateur Radio Stations to 950,000. The total of three kinds of stations occupy 93.5% of the radio stations.

(HAND-HAM World. Winter 1989.)

FCC Perturbed at Hams Wanting/ Not Wanting Change of Call Signs:

Because the FCC has run into a rash of requsts for change of calls and then they get letters from dismayed hams that they didn't want their calls changed that they have now issued a guidance directive. IF an Amateur checks block 2E on the 610 form asking for a call sign change, he/she is also to put their initials besides the check mark using the same pen they signed the 610 application. This will eliminate a lot of verbal OKs at VEC examinations to have 2E checked and then the applicant doesn't get a call they like as well as the one they gave up. This may help eliminate the excuse that they did not ask for a call change. (FCC-ARRL NEWS, BNT Bulletin, November 1989.)

****



I HOPE YOU CAN STILL COPY, FRANK, I JUST SWITCHED TO HORIZONTAL POLARIZATION!

SPREAD THE WORD ABOUT AMATEUR RADIO!!!

ARTICLES FROM THE MEMBERS

USA – CA

The United States of America Counties Award (USA–CA) is sponsored by CQ Magazine and issued for confirmed contacts with all 3,076 U.S. counties. The USA–CA is issued in seven (7) different classes, from USA–500 to USA–3076–CA for all counties. The award is available to all licensed Amateurs and S.W.L.'s on a heard basis. All contacts must be confirmed by QSL or MRC (Mobile Reply Card). On an MRC, several contacts can be listed for the same station. A contact with a fixed station or a mobile is a valid contact.

USA–CA Record Books are available from CQ Magazine for $1.25 each. The Mobile Amateur Radio Awards Club (MARAC) offers all sorts of awards to county hunters. (Note: MARAC is not connected to CQ.) MARAC promotes mobile amateur radio efficiency and awards outstanding accomplishments with emphasis on mobile operation, both phone and CW. MARAC also serves as the communication and social arm of the county hunters. Numerous conventions are held each year at various locations around the country.

Working all the US counties is not an easy task. Ro (WB4NWG) and myself are the only active local county hunters we know of. Ro says he has approximately 2,300 counties confirmed and has been at it for 3 1/2 years. I have approximately 2,965 confirmed which has taken me over four years.

You don't need fancy equipment or huge antennas to work counties, as contacts can be claimed on any band, any mode, as long as no repeater is used for the contact. I went through all my old CW contacts from my Novice activities and found many counties I could claim.

The most difficult counties to work seem to be the Islands — Dukes and Nantucket, MA, the Hawaiian Island (5 counties) — some counties in which no hams reside, and sparsely populated counties such as Loving, Texas (It has 50 times more cattle than people)! Counties far from the interstate system are also a problem.

"Running Mobile" can be alot of fun. On several trips out west, we "ran" as many counties as we could and took many non–interstate, basic roads. On one trip to California, we made over 2,500 contacts, which were logged on tape. Ro has also made several trips and ran some good ones!

The easiest way to QSL is through the Mobil QSL Bureau in Florence, SC. They will process a "MRC" card for 20 cents — 8 to 10 contacts with the same stastion can be entered on the card. The MRC's are sent to the mobile station who put out the counties. He signs the MRC and returns it to the Bureau. There is no cost to the mobile operator who puts out the counties (thank goodness)!

If you wish more info on County Hunting, send a business size, SASE with a 25 cent stamp to: MARAC, P.O. Box 64, Newport, MN 55055, and request the info packet. Listen in some time, the net frequencies are: 3.865; 14.336; 21.336 & 28.336 (14.336 usually stays active from early morning till the band folds).

George (N4IXV)

HAM RADIO MEMORIES
Art Whittum, W1CRO

I recently enjoyed the brief respite that the Christmas "vacation" can provide from aggravation, pain and stress of everyday work-work (it's all relative...a jack hammer operator can really relax swinging number one shovel on the ditch-digging detail [I know this to be true, I've done both]. This is a lousy lead in, but - bear with me.

One of the long-standing-never-finished-projects FINALLY accomplished was: I reviewed, sorted and filed every QSL card that I could find. Not that many, really, for 35 years with a ticket. But - the memories. That's what I'd like to pass along.

How about 1952? Joined the South Shore Amateur Radio Club (still have a dog-eared membership card around here somewhere - gotta find it) and then spent two years with various Elmers whipping me slowly into action. Frank Baker, W1ALP (SK); Burgess (Ruddy) Rudderham W1MME (SK); Sam Shon, W1OTZ (SK); Ralph Toye, W1GPL; Irv Shaw (my dentist) W1KWD (SK); Uncle Adshade, W1GOU (SK)...I miss 'em...every one. They succeeded in turning me into a ham operator in spite of me - After a sweat-filled morning at the FCC office in Boston, Massachusetts, I walked out with a passing score. Didn't know it at the time. The next month was a blur. Then! WN1CRO! It had to be real because "C. B. Plummer" issued it.

I had one year to upgrade, or else! All I had was a Hallicrafters S-38 receiver. Oh boy, now what! The Elmers had an answer: For starters, try Page 168 of the 1948 "The Radio Amateur's Handbook." A Simple Single-Tube Transmitter. It worked. And power out? The dummy load was a ten watt bulb. First antenna? All the wire I could spread around the yard. First QSO? A school chum across town - Phil Wood, WN1VTT...and he had a Hallicrafters S-40B with a Viking transmitter (damn rich kids!!). Oh boy, talk about frustration! The QSLs were few and far between...but the QSOs were good ones (any QSO, by definition, is a good one!).

I can remember sitting on the living room floor during Hurricane Carol, trying to put the finishing touches on a "lunch box" two meter AM rig (candle wax on the coils) so I could get going with the local emergency net - no dice that time. Later, I did better, although the water dripping down the granite house foundation into the shack did not make operating a transmitter a totally safe operation (+250 VDC on the Plate).

Different rigs passed through the shack...some surplus AN/ARC-5 receivers and transmitters, boy were they Classy!...and making the required modifications provided a wealth of knowledge. Not so much from what I did alone, but mostly from all the guys in the club that were making the same modifications. One question: "How did you do that?" was good for a half-hour

explanation and discussion of alternatives. Even used a "spy radio" - it used a single English version 6L6GT with multi-band switching capability (up to 15 MHz). Then I entered the big time with a Heath-kit DX-40 (finally gave up the DX-40 at a Manassas Hamfest not too long ago). Each step of the way dumped new bits of knowledge in my lap - SWR?...you mean that's important!??

During that time, I admit, I enviously slobbered over everyone else's rigs. Leon Wood's, W1...(Sorry Woody - I forgot), tri-bander (40-20-10) constructed of solid wooden members with wire elements - that sucker looked like it could turn the house instead of vice versa! And, his **each band** kilowatt rigs filled the room! The guys with the Gonset converters and dynamotor driven transmitters in their cars. My gracious! It was salivation time! Then, suddenly, or so it seemed - the ticket ran out! Panic time for procastinators.

I don't remember how it happened - rules changes and all, but several months later, I nailed down a Technician Class license (new stuff back then). The guys in the club did their part. Good for five years...no sweat, I could get a General in no time. But then, things got in the way. High School graduation, and the need to get a job, took priority. The job turned out to be a Coast Guard career - mostly electronics...and the Elmers that coaxed, cajoled and "whacked on me" had a heck of a lot to do with that. The ticket got upgraded in due time (but it could have been a lot quicker, I must admit).

It used to be ('60s) that extended periods of portable operation had to be reported to the FCC. Every Ocean Station patrol and every new duty station meant a new letter to the FCC. But, what fun! Maritime Mobile Region 2. 125 watts CW - now that was class! A tour of duty in Alaska hooked me up to a BC-610. That thing would feed a wet string without too much complaining (hey! we had spares.). Even the local BC station used BC-610's as their primary transmitters (KTKN, Ketchikan, Alaska); the "Green" transmitter was OK, but the "Red" transmitter used to hash up 2182 kHz and earn them nasty words from the Coast Guard and Fox Charlie Charlie. A tour in Greenland uncovered a complete Collins S-line rig - Boy-oh-Boy! Try 20 meters on CW from Greenland and you get to feeeeel PILE-UPs!

In between tours, home to Quincy, Massachusetts and the DX-40. If you can't boost the power, try another antenna. Limited space. Dipoles, Windoms, wire everywhere. Modest results. But! results. If no one answers, keep at it. Eventually, contact!

After fifteen years with a ticket, a real QTH (i.e., I "owned" it)! The Windom gave way to a 40 meter coax dipole (also called a "double bazooka") which worked fantastically. Sunday mornings on 7133 kHz with Coast Guard buddies...crawl into the lower edge of a Canadian BC signal, notch it out, shoot the breeze - no QRM from other amateurs. Dream about new antennas,

rigs, etc. Start making QSOs regularly, having fun. Contests yield many contacts...ham radio is a gas! Then... orders to a new duty station.

While stationed on Governors Island in New York Harbor, I tried sneaking a 40 meter dipole out the window of a row house. It was supposed to be an inverted VEE, with each end tied off to a clothesline pole. The Senior Officer of the Building (SOB) didn't think much of it. I should have used smaller guage wire, it wouldn't have been so noticeable. Maybe a slinky in the attic... oh well! The rig, by then, was Hallicrafters (SX-110 receiver and HT-37 transmitter) hidden in a walk-in closet. Use headphones please, people like to sleep.

Then back to Virginia. I'm working on the third QTH in Virginia now - and, looking back - it's been frustrating sometimes...and two or three DX cards a month will never put me in the BIG GUN category...but overall it's always been fun. The occasional things that pop up (Market Reef, Mauritius, etc.) keep excitement in the fore. The things you learn, talking to people from everywhere (and they seem to pop up when you least expect it), are invaluable.

Most of my QSOs, over the last few years, have been with guys on the American Eagle Net (28340 kHz @ 1700 Local Time). **All** of those QSOs don't fill a standard ARRL Log Book...the day job and remodelling the cellar seem to get in the way at inopportune moments. But, I'm ready for Spring! New antenna projects, finish the new Ham Shack...build some projects that have been "dusting away" on the shelf...Come On April!!

I guess, if I could sum it up, the biggest thing to remember is, it's a **shared** experience. And, whether it's on one of the low bands or on a VHF/UHF repeater, there's someone there somewhere...**and you belong...and it's great!**

W1MME DE W1CRO TNX RUDDY ES 73 SK

DE W1CRO QRV K

Computers as Victims of RF Interference

By Daryl Gerke, P.E.
Kimmel Gerke Associates, Ltd.

Most RF engineers are well aware of the potential for interference to computers and microprocessors due to nearby radio transmitters. Often lacking, however, are quantitative tools to actually predict such problems. This article provides some specific guidelines and methods to predict and assess this particular EMI (electromagnetic interference) threat.

For computer and microprocessor systems, interference problems generally fall into one of several categories: power disturbances, electrostatic discharge, lightning, FCC/VDE/MIL-STD regulations; and electromagnetic fields due to nearby radio transmitters. Several of these threats have been covered in previous articles (1,2). This article addresses the effects of high-level electromagnetic fields on modern computers and microprocessor-based equipment.

Due to these multiple threats, one of the first troubleshooting challenges is to prioritize them. Much can be learned by simply observing and asking questions. Has anyone felt static discharges? Do the lights flicker? Any thunderstorms recently? Any nearby radio, television, or radar transmitters? Anyone using handheld radios? Watch out for this last case — even low power, when it's nearby, is a big threat.

If radio transmitters are present, additional questions should be asked. First, are they powerful enough to cause a problem? If not, they can be ruled out. Second, what are typical symptoms? Third, what are typical failure modes?

When analyzing and trying to understand any EMI situation, it helps to divide the problem into categories. At the highest level, the three categories are the source, the victim and the coupling path. At the second level, typical categories address the coupling path. These include electromagnetic radiation, power and signal lines, crosstalk, and grounding. An example is when the source is a nearby radio transmitter, the victim is a computer/microprocessor system, and the coupling path is electromagnetic radiation.

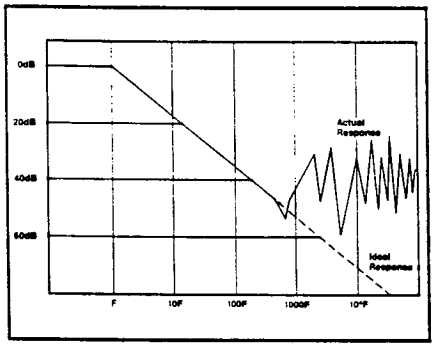


Figure 1. Analog amplifier frequency response.

Computers as Interference Victims

The first point to be made is that digital circuits behave as broadband receivers, with a bandwidth of $1/(\pi \times \text{risetime})$. For example, logic with a 3 nsec rise/fall time responds to energy from DC to about 100 MHz with no rejection; for 1 nsec logic, that frequency rises to over 300 MHz.

The second point is that the connecting cables act as receiving antennas, and can become very effective in the HF and VHF ranges. At about 1/20 wavelength, cables start to become quite effective as antennas. Thus, at 150 MHz (a wavelength of 2 meters), even a few inches of wire can be effective in picking up radiated energy. Even in the 27 MHz Citizens Band (11 meters), two feet of cable can cause problems.

It is this combination of high frequency response and efficient antennas that make modern computer equipment so susceptible to HF and VHF fields. The problems will get worse, no doubt, as rise/fall times become shorter and thus frequency responses go even higher.

Failure Modes

A primary failure mode for digital circuits is the creation of false signals due to exceeding circuit noise margins. Since most digital circuits have worst case noise margins of under 1/2 volt, a relatively low induced voltage at a logic circuit can cause a gate to switch states. The effect can be immediate, such as changing a control line, or latent, such as changing a memory location. In either case, the computer system has been corrupted.

A primary failure mode for analog circuits is rectification at the signal input. Here, the RF energy can be well outside the intended frequency range and still cause problems. If the induced voltage forward-biases a diode junction, the energy is demodulated and moved down in frequency. A demodulated CW carrier results in a DC bias, which can drive a low-level analog circuit into cutoff or saturation.

Rectification explains how a VHF radio at 150 MHz can jam a 100 Hz sensor, or a how a CB radio at 27 MHz

Military	1-200 volts/meter
Automotive	20-200 volts/meter
Industrial	1-10 volts/meter
Local Area Nets	2-5 volts/meter
Medical	400 volts/meter

Table 1. Typical electric field susceptibility specifications.

	1W	10W	100W	1kW	10kW	100kW
1 volt/meter	5.5 m	17 m	55 m	170 m	550 m	1.7 km
10 volts/meter	55 cm	1.7 m	5.5 m	17 m	5.5 m	170 m

Three Guidelines:

1 W @ 1 meter = 5.5 volts/meter

30 W @ 10 meters = 3 volts/meter

100 kW @ 1 km = 1.7 volts/meter

Table 2. Electric field levels vs. distance and power.

Frequency	λ	λ/(2π)	λ/20
1 MHz	300 m	48 m	15 m
10 MHz	30 m	4.8 m	1.5 m
30 MHz	10 m	1.6 m	50 cm
100 MHz	3 m	50 cm	15 cm
150 MHz	2 m	30 cm	10 cm
450 MHz	67 cm	10 cm	3.3 cm
1 GHz	30 cm	5 cm	1.5 cm

λ = wavelength
λ/(2π) = near-field to far-field transition
λ/20 = cable becomes effective antenna

Table 3. Frequency, wavelength and critical lengths.

can interfere with a 20 kHz audio amplifier. In fact, it is quite usual for rectification to occur when the frequency of the source is 100 to 1000 times the frequency of the victim, due to parasitic effects. This is shown in Figure 1, which compares the theoretical and the real-world rejection of a hypothetical analog amplifier. The high-frequency degradation is due to parasitic capacitances and inductances (3).

Another failure mechanism that should not be overlooked is undesired coupling into a circuit's power or ground. These two sneak paths can allow undesired high-frequency energy into a circuit and cause upsets to both digital and analog devices.

Typical Failure Levels

It is difficult to predict the exact failure levels and mechanisms, and to predict which type of failure will occur first. In the author's experience, analog circuits such as sensors are usually more susceptible, but each system is unique. Note that upsets are a function of cable length (antenna), circuit margins (sensitivity), and frequency (bandwidth). Add in nonlinear effects such as rectification, and it's a tossup.

Guidelines do exist, however, and are based on practical experience. For today's microprocessor-based systems, a good rule of thumb is an electric field level of 1 to 10 volts per meter. In field levels below 1 volt/meter, most equipment will work; at greater than 10 volts/meter, equipment will likely fail unless special precautions, such as shielding and high-frequency filtering, are taken.

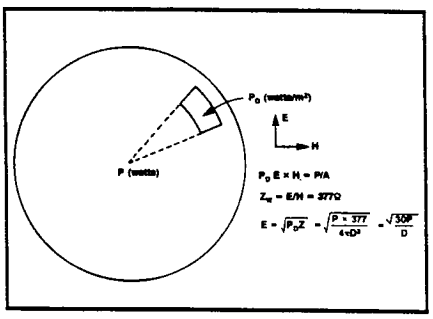


Figure 2. Electric field vs. power and distance.

How do these levels compare with the real world? It's not unusual to have field levels of 10 to 100 volts/meter near commercial radio or television transmitters. Levels of several hundred volts per meter have been reported on cars and trucks due to on-board land mobile transmitters. Near airports or topside of naval vessels, the fields can easily reach hundreds of volts per meter due to the plethora of communications and radar systems.

Recognizing this, a number of specifications limits have evolved, which are summarized in Table 1. For equipment to operate in any of these severe environments, the designer will likely need to perform susceptibility tests.

Predicting and Assessing Threats

To make a quick assessment of a potential threat, the following example questions should be considered. Is that 100 kW radio station two miles away a problem? What about the security guard's 1 watt hand-held radio? Is the microwave link on the next skyscraper a potential problem?

Fortunately, it is relatively easy to make that initial prediction if some simplifying assumptions are made. First, assume a point source; second, assume far-field conditions; and third, assume free space. Then, the electric field at any distance, knowing the radiated power of the source, can be predicted by the following formula:

$$E = \sqrt{30P}/d$$

where E is the electric field in volts/meter, P is the effective radiated power in watts, and d is the distance from the source to the victim in meters. The simplified model is shown in Figure 2. The formula was derived using the surface area of a sphere and using 377 ohms as the wave impedance of free space.

To illustrate the levels, Table 2 shows distances vs. transmitter power levels at the 1 and 10 volts per meter guidelines. To answer the questions posed above, the 100 kW transmitter at 2 miles is not a threat, but the 1 watt hand-held radio is. For the microwave link, the engineer only needs to know the power and the direct distance to make a quick assessment.

Are the assumptions valid? For a first approximation of radio transmitters, they are. The free space assumption should give a worse case that neglects reductions for shielding. The far-field assumption is valid if the distance between the source and victim is greater than $\lambda/2\pi$, or about 1/6 wavelength. The point source assumption is valid if the effective radiated power (transmitter output power multiplied by the antenna gain in the direction of the victim) is used rather than transmitter power.

Incidentally, precision is not required here, just a quick go/no-go decision. If more precision is needed, tests can be run with a spectrum analyzer or receiver and antennas.

For reference, Table 3 shows frequency, wavelength, the near-field/far-field distance of $\lambda/2\pi$, and $\lambda/20$, a criteria for when cables become effective antennas. It lists frequencies from 1 MHz to 1 GHz, resulting in wavelengths from 300 m to 30 cm.

Case Histories

This material has been used numerous times to predict and assess potential problems with nearby radio transmitters. The following situations are examples.

1. Power Disturbances

The computers controlling a production line were failing at random, resulting in production halts. In fact, occasionally the computer power supplies were being destroyed.

The computer vendor's field engineer was insisting that a radio station two miles away was the source of the problem, and was recommending extensive shielding. (Have any of you hams out there been blamed like this because of your big antennas?) A quick assessment predicted a field level well below the 1 volt/meter criteria.

The real problem was due to power disturbances, and was resolved with isolation transformers and some changes in the system design (4).

2. Mobile Radio Interference

In this case, a new fire truck worked fine, until the on-board mobile radio was used. At that point, the water pressure in the pumper would abruptly increase when the transmitter was keyed. In fact, even a nearby hand-held radio would cause the system to malfunction.

A quick assessment showed field levels easily in excess of 1 volt/meter. Not known, however, was the actual failure mode. Was it the analog pressure transducer, the microprocessor controller, or the engine control electronics?

Since the pressure transducer was connected to the microprocessor via a long cable (also acting as an undesired antenna), it was immediately suspected. Further investigation with a hand-held radio confirmed that rectification in the transducer was probably the problem.

This case had a second problem. After clearing up the transducer rectification, it was discovered that the DC voltage to the transducer was also being affected by the transmitter. Not an RF problem, this was simply a common impedance power distribution problem. Nevertheless, it's believed this second problem contributed to the first, since the op amp transducer was on the very edge of its operational range, and thus more susceptible to RF.

3. Microwave Links and Software

The manager of a law firm had problems with a newly networked computer system. The obvious possibilities included software, hardware, power disturbances and electrostatic discharge.

But, what about that microwave link on the next building, at eye level with the law offices? After finding the power level, a quick assessment showed that the field levels could be in the 1 volt/meter range. Ferrites were installed on several cables as a precaution against this potential threat.

In this situation, however, it was finally determined that software was the problem. Fortunately, not every computer malfunction is an EMI problem.

Summary

Computers can indeed be victims of electromagnetic fields from nearby radio transmitters. A quick assessment of potential threats can be made with a simple formula that predicts a free space field intensity. If this prediction is greater that 1 volt/meter, the threat is real.

Both digital and analog circuits can be affected. Digital circuits are vulnerable because of their broad bandwidth, while analog circuits are vulnerable due to rectification and circuit parasitics. Cables act as pick-up antennas for both types of circuits, and any cable longer than 1/20 wavelength is a possible suspect.

Finally, expensive test equipment or complicated calculations are not necessary to make a quick assessment of the problem. Checking some vital signs can provide a lot of information and insight into the problems with very little effort.

References

1. D.R. White, "Audio Rectification—The Nemesis of Many EMI Problems," *EMC Technology*, January 1982.
2. D.D. Gerke, "Electrostatic Discharge as an EMI Issue," *RF Design*, November 1988.
3. D.D. Gerke, "A Fundamental Review of EMI Regulations," *RF Design*, April 1989.
4. W.D. Kimmel, "Zero Crossing Errors May Cause Errors in Thermocouple Readings," *EMC Technology*, September 1988.
5. W.D. Kimmel, "VHF Radio Interference to Microprocessor Controlled Systems: A Case History," *EMC Technology*, May-June 1989.

About the Author

Daryl Gerke, P.E., is a principal at Kimmel Gerke Associates, Ltd. The firm specializes in preventing and solving electromagnetic interference and compatibility (EMI/EMC) problems. Mr. Gerke can be reached at 1544 North Pascal, St. Paul, MN 55108. Tel: (612)-330-3728.

MANASSAS HAMFEST

JUNE 3, 1990

Submitted by Keith Bennington (KM4AA)

SWAP & SHOP

FOR SALE:

SOLD 4 JAN ~~KENWOOD VFO-820 - Designed for use with the TS-820 Transceiver, this VFO worked great with a TS-520. Makes split operation a breeze. Interconnecting cable and operating manual included.~~

AMDEK 310A MONITOR - 12" Monochrome (amber) monitor with operating manual and interconnecting cable. Original box.

MAGNAVOX CM80 MONITOR - 12" Monochrome (green) composite monitor (color compatible). With manufacturer's data and interconnecting cables for C64, C16, Plus 4 and Atari computers; also cable for Commodore 128. Used as a color compatible monitor with a AT286 until I could afford a real color monitor. Original box.

WDXT-GEN Hard Drive Controller Card. Bought this to control a 30 Megabyte Hard Drive in my XT. Upgraded to an AT and don't need it any more. No manual, but will provide copy of XT or AT Advanced Diagnostics Disk to get you going.

GRAPHICSMITH Monochrome Printer Card. Removed from AT when I went to color monitor. Supports Monochrome display (720 X 348), parallel printer and light pen. In box with User's Manual.

DELUXE RS-232 INTERFACE. For VIC-20, C64, C128, SX64 and Plus 4 Computers. Used for packet TNC interface. Good for 300, 1200 and 2400 baud. Original box and User's Manual.

POOR MAN'S CW/RTTY/ASCII/PACKET SET UP. The following items make up a complete dedicated CW/RTTY/Packet control system:

VIC-20 with power supply, TV Modulator (modified for separate video and audio outputs) and keyboard dust cover. Commodore 1530 Datassette with cable for VIC-20. VIC-1525 Graphics Printer with VIC-20 cable. Microlog AIR-1 CW/RTTY plug-in module for VIC-20. MFJ-1274 Packet TNC Controller with cable and terminal program for VIC-20. Also throw in VIC-20 "Six-Pack" includes Personal Finance 1 & 2, Loan/Mortgage Calculator, Home Inventory and Expense Calendar programs (all Basic).

WANTED:

TRS-80 MODEL 3 Operating/User's Manual. I have a TRS-80 Model 3 that is being cleaned up and "prepped" for donation to a local school. I need a manual to go with the computer.

TRS-80 PC-2 Pocket Computer Printer Interface. I need a TRS-80 PC-2 Printer or printer motor to use in repairing my unit.

TRS-80 PC-2 Pocket Computer. Need to get my hands on the diagram(s) or tables showing the PC-2 pin-outs.

ALL THE ABOVE: Call Art Whittum, W1CRO, at 791-4330 - 7PM to 9PM week days or most any time week-ends.

"OLE VIRGINIA HAMS"

PROGRAM FOR THE NEXT OVH MEETING:

Nancy Draheim (NK4U), the QSL Manager in charge of the Fourth Call area, will be presenting a program on how the QSL Bureau works, how to QSL, and how to do so through a QSL Manager to a DX station. She will also discuss the recent PJ2 DXpedition conducted by people from the EEB Store.

Hope to see you there!

73's

Jeff (KB4IWD)

****

NOVICE/TECH CLASSES

Novice/Tech classes sponsored by the Woodbridge Wireless ARC will be held at Our Lady of Angels Church, Woodbridge, VA The starting date is 2/1/90 and will run about 10 weeks. The time will be from 7:00 p.m. through 9:00 p.m. There is no charge for the class, but there is a charge for text books. For more info contact: Loyd Davis (K8EI) at 360-0248 or John Kendra (N4LJS) at 590-3373.

Check your license expiration date.

TREASURER'S CHEST

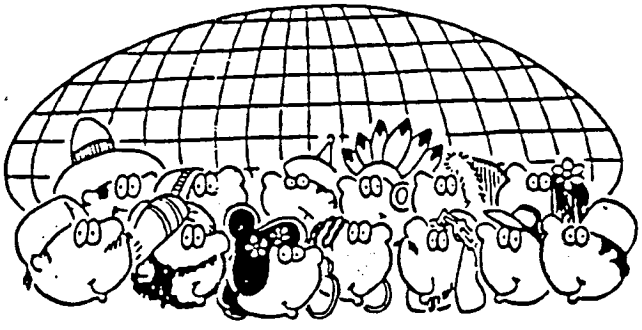
1990 dues are due now!!!!! Dues are $6.00 per person and $3.00 for each additional family member living at the same address. Please make checks payable to the O.V.H.

Steve (N4OGR)

MEG? I'LL HAVE TO DRIVE GEORGE HOME MYSELF---HE'S BEEN STANDING OUTSIDE STARING UP AT MY NEW 175 FOOT TOWER

NEXT MEETING

The next meeting of the OVHARC will be held on Monday night, January 15th, 1990 at 8:00 p.m., in the basement Meeting Room of the Northern Virginia Electric Co-Op, 10323 Lomond Drive, Manassas, Virginia.



WORLD WIDE FRIENDSHIP THROUGH AMATEUR RADIO

CALENDAR FOR JANUARY AND FEBRUARY

14 AMER EAGLE NET @ 1700 ON 28.340 --- RICHMOND FROSTFEST	**15** **OVH CLUB MEETING**	**16**	**17** NVFMA NET @ 2000 146.19/79	**18** OVH NET @ 2000 146.97 224.66	**19**	**20** WOODBRIDGE NET @ 2100 28.440 --- VEC EXAM ANNAPOLIS, MD & SALISBURY, MD
21 AMER EAGLE NET @ 1700 ON 28.340 --- ARRL VHF SWEEPSTAKES 20 & 21 JAN	**22**	**23**	**24** NVFMA NET @ 2000 146.19/79	**25** OVH NET @ 2000 146.97 224.66 --- W1AW QUALIFYING RUN	**26** VEC EXAMS PENTAGON, ARC STAFFORD, VA	**27** WOODBRIDGE NET @ 2100 28.440
28 AMER EAGLE NET @ 1700 ON 28.340 --- VEC EXAM HAGERSTOWN, MD	**29**	**30**	**31** NVFMA NET @ 2000 146.19/79	**1** OVH NET @ 2000 146.97 224.66	**2**  	**3** WOODBRIDGE NET @ 2100 28.440 --- VEC EXAMS COLLEGE PARK, MD --- 10-10 INTERNATIONAL
4 AMER EAGLE NET @ 1700 ON 28.340 --- 10-10 INTERNATIONAL	**5** NEWSLETTER DEADLINE	**6**	**7** NVFMA NET @ 2000 146.19/79	**8** OVH NET @ 2000 146.97 224.66 --- W1AW QUALIFYING RUN	**9**	**10** WOODBRIDGE NET @ 2100 28.440
11 AMER EAGLE NET @ 1700 ON 28.340	**12**	**13**	**14** NVFMA NET @ 2000 146.19/79  VALENTINE'S DAY	**15** OVH NET @ 2000 146.97 224.66	**16**	**17** WOODBRIDGE NET @ 2100 28.440 --- ARRL INTERNATIONAL DX CONTEST (CW)

NOTES: 1. For more information on VEC testing, contact Harry W4PVA.
2. The Powwow net meets daily at 2100 on 28.400.
3. 27 Jan - 04 Feb, Novice Roundup