April File Copy

# Feed Back

# VE3OSR

**146.34 - 146-94**

GEORGIAN BAY AMATEUR RADIO CLUB VE3OSR

| | |
|---|---|
| **President:** | **Laverne Wyville VE3LPD** |
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| **Sec.-Treas:** | **Don Richards VE3IDS** |
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| **Technical Director:** | **Don Rowe VE3LXZ** |

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## MEETING MINUTES MARCH 82

At 8:26 VE3LPD called the meeting to order. VE3MAY Jerry Munroe, and VE3AUB Jack Barrett, were introduced as newcomers. Meeting minutes were moved as correct as printed in Feed Back by Fred VE3WF and seconded by Jack VE3DTS. VE3LCZ read a report submitted by VE3EFX. Report consisted of a proposal to move ONTARS from 80 MTRS to 40 MTRS. Various reasons were included for this proposal. Meeting was moved adjourned by VE3LPK Terry.

Don VE3IDS

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## FINANCIAL REPORT

| | |
|---|---|
| Balance March 1/82 | $764.81 |
| Dues Receipts | $ 12.00 |
| Expenditures | -$ 30.00 |
| Balance March 31/82 | $746.81 |

VE3IDS
Sec-Treas

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## MEMBERSHIP ADDITION

VE3MAY Jerry Munroe Box 75 Meaford NOH 1YO 538-2124

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## CLUB ACTIVITIES

A hearty note of thanks to Bruce Beach and his son for coming out to our meeting and giving us such interesting points of view on variety of subjects. Bruce's quest for development of universal language; Torpet World's largest computer club; Radiological Defence; Electromagnetic Pulse and its effects on semiconductors made very interesting topics for the evening. Thanks also to Walter IYW for arranging this.

Program for the April meeting has not been decided at the time of this writing, but I will have something by the 15th. Hope to see you all.

73's
Andy VE3LCZ

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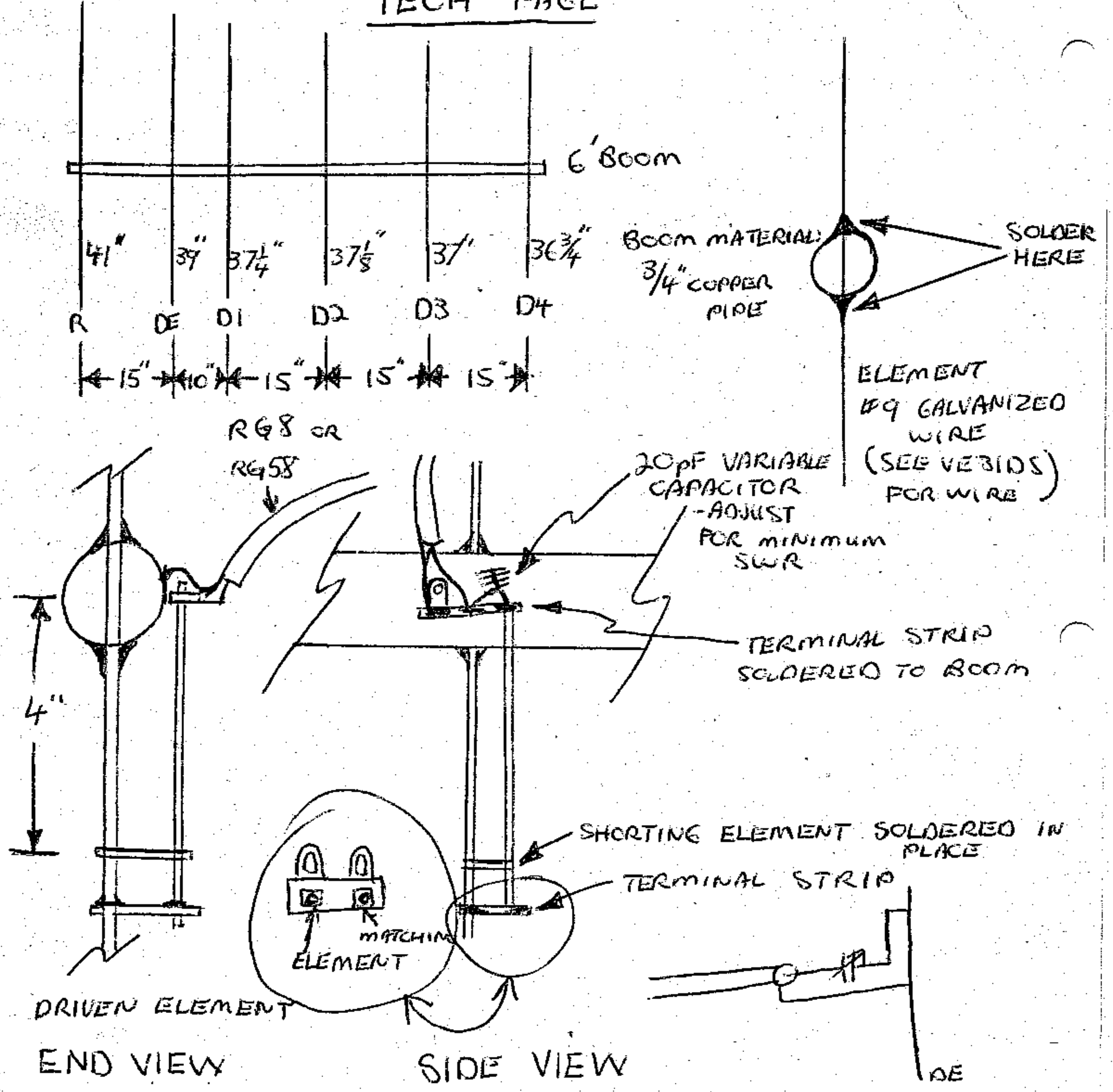
NOTE:

The next GBARC meeting will be on 15 April 1982, 8 PM, Owen Sound Tourist Information Center, Springmount intersection of Hwy's 21 & 70.

# TECH PAGE




IF ADDITIONAL GAIN IS REQUIRED, ADD ELEMENTS AT 15" SPACING AND DECREASE EACH ADDITIONAL ELEMENT BY ¼".

IF YOU WANT TO BUILD THIS BEAM AND HAVE ANY QUESTIONS ABOUT IT, I CAN HELP OUT AT THE MEETING.

73's Don VE3IDS

*Charging*

Basic charging requirements are quite specific, although control of charging current is highly desirable. Thus, ideally, the output voltage supplied by the charger should be about twice that of the on-charge nickel–cadmium battery voltage (1·45 V per cell) but with a resistance included to limit the current to the desired value. This resistance can be fixed, or variable, according to the set-up. Thus Fig. 31 shows a variable resistance being used, together with a milliammeter to determine the resistance setting.

The generally recommended charging current is $I_{10}$—i.e. capacity in ampere-hour divided by 10 to give current in amps (or milliamps).

The time to complete the charge with the cell fully discharged initially (indicated by a terminal voltage of less than 1·0 V is then 14 hours.

An alternative recommendation is to use a charging current of $1{\cdot}4 \times I_{10}$ when charging is completed in 10 hours.

Of the two, charging at $I_{10}$ is generally safer, particularly in the case of smaller button cells, and rectangular cells. In fact a much lower charging current may be specifically recommended for such types by the manufacturer(s).

As a general rule the lowest possible charging current should be used—e.g. if time is not important, charge at a rate lower than $I_{10}$ and adjust the time accordingly. The use of constant potential charging units is also inadvisable as these can lead to very high current values developing, due to the low internal resistance of nickel–cadmium cells. This can lead to serious overheating of the cells.

Normally when cells are in use they are never fully discharged, so a full recharge is seldom required—only a partial charge. The difficulty here is in deciding just how much charge is needed. Ideally this can be calculated as 1·4 times the ampere-hour capacity drawn from the cell on the previous discharge, but this may be difficult, or impossible, to estimate accurately. The problem is not as difficult as it appears, however, since all such cells are designed to accommodate a fairly large overcharge without damage, providing the charging current is kept low.

Typical charge characteristics for a nickel–cadmium cell are shown in Fig. 32, where it is seen that the safe overcharge period is more or less the same as the full charge time, at the $I_{10}$ charging rate. A normal 'full charge' time can, therefore, usually be given to a cell (or battery) which is known to be fairly well discharged.

In case of doubt on the amount of charge remaining a cell, or battery, can, of course, always be discharged through a suitable load until it shows an end voltage of 1·1 or less. It can then be regarded as fully discharged.

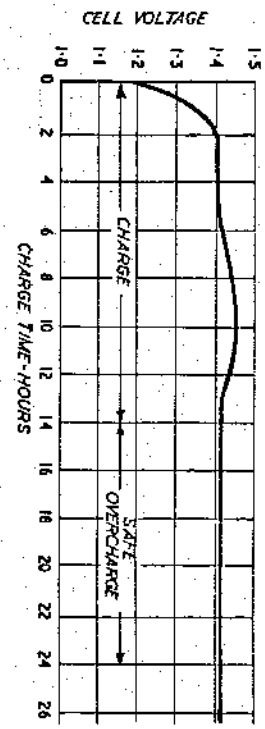



**Fig 32** Charge characteristics of a typical nickel-cadmium cell, charged at the 10 hour rate. Note that a considerable overcharge is possible at this rate with no harm to the cell.

*Rapid Charging*

Rapid charging can be used for 'emergencies', although the cell or battery may suffer some loss of life cycles as a consequence. It is possible to charge at a current of up to 20 times $I_{10}$, provided this current is properly controlled—i.e. not allowed to rise at any time to higher values. A lower charging current would be preferred, particularly in the case of button cells, if sufficient time is available.

Rapid charging can be done directly from an accumulator of suitable voltage—associated with a variable resistance and an ammeter for current control; or preferably from a constant current charger. Fig. 33 shows a basic circuit of this type, using a power transistor as the control element.

With vented cells extremely rapid charging rates are possible, the charging current being adjusted to provide 1·4 × capacity rating charge in a matter of a few minutes only. Attempts to use very rapid charging rates on sealed cells, however, will almost certainly result in swelling, overheating, and permanent damage to the cells.

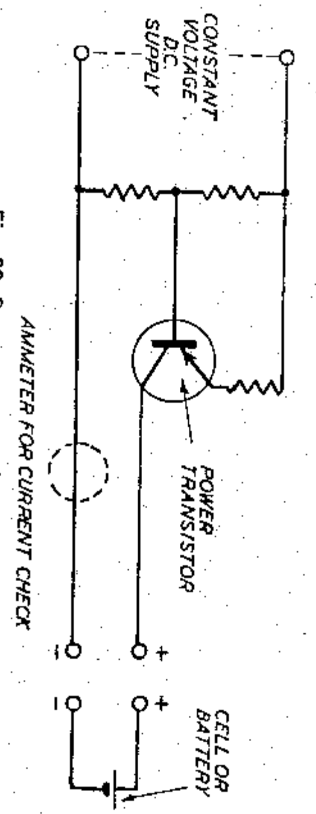



**Fig 33** Constant current charging circuit.

*Trickle Charging*

In applications where nickel–cadmium cells have to be maintained in a fully charged condition at all times, trickle charging can be employed. All the cells can be floated across the mains with a permanent trickle charge current of the order of one tenth $I_{10}$.

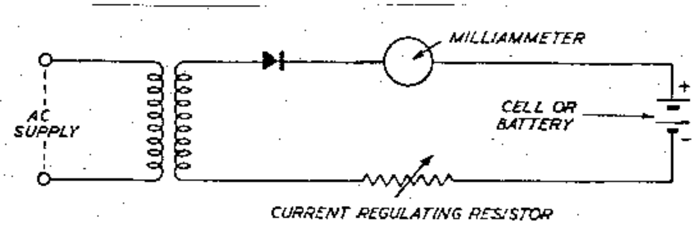
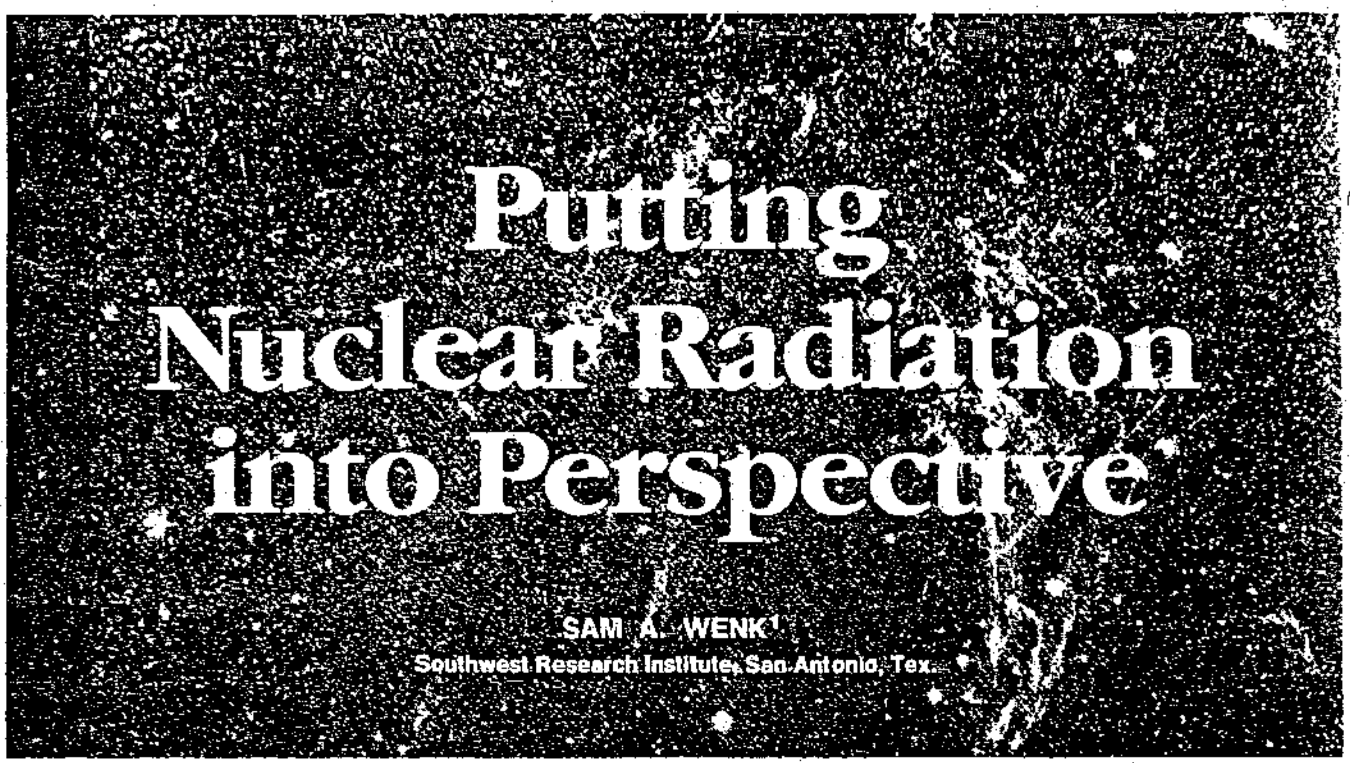



**Fig. 31.** Basic circuit for charging nickel-cadmium cells where close control over current is important.



# Putting Nuclear Radiation into Perspective

SAM A. WENK[1]
Southwest Research Institute, San Antonio, Tex.

***"In the beginning God created the Heaven and the Earth . . ." and in creating the earth he added a pinch of nuclear seasoning . . . "and God said let there be light, and there was light . . . and the evening and the morning were the first day . . ."[2] To create the light, He built the world's first and only operating fusion reactor, the sun. Thus, when upon the sixth day He created man in His own image, He had already created the radiation environment man was to live in forever.***

What comes to us from the heavens above? Cosmic radiation. Called cosmic radiation because it emanates from the cosmos, its contribution to our radiation environment varies with both altitude and latitude. Table 1 illustrates this influence. The altitude effect is caused by the absorption of radiation in the earth's atmosphere. Since there is less atmosphere shielding Colorado than there is shielding Florida, residents of Colorado receive almost 3.5 times as much radiation as do Floridians. The latitude effect is more complicated, but is caused by the variations in the magnetic field strength of the Van Allen Belt,[3] which provides shielding by diverting and trapping many of the heavier charged cosmic particles from their predetermined paths. Without the Van Allen Belt protection, we would be receiving much more radiation than we do.

At this point, let's define the units of radiation shown in Table 1: mrem stands for millirem—1/1000 (milli) of a rem, an arbitrary unit of measurement of absorbed radiation energy in human tissue established by the International Committee on Radiation Protection. Rem is the abbreviation of Radiation Equivalent Man and is the equivalent to absorbing 100 ergs of radiation energy for each gram of body tissue. Since a gram is 1/30 of an ounce, and an erg is the amount of energy it takes to lift a mosquito 3/8 in., we are dealing with an extremely small unit. The heat generated by absorbing 1 REM in the body will raise the body temperature about 4 millionths of a degree Fahrenheit. The average chest x-ray results in an absorbed radiation dose of 20–25 mrem (2 mosquitos).

## Radiation: It's Everywhere!

Air travel is a way of life for many of us, and this high-altitude mode of travel adds to our radiation exposure. To figure an individual dose, we can use a base figure of a 500-mrem average for a jet crew flying 600 hr/yr (0.83 mrem/h). For Concorde SST flights, the number is 1.66 mrem/h. During 1979 I logged 158 air hours in conventional jets for an accumulated dose of 131 mrem, in addition to my annual 45 mrem for living deep in the heart of Texas.

If we were involved with planning space travel, the flight plan for crossing the Van Allen Belt would be very important. The radiation level of the inner belt is 22 rem/h, dropping off to 5.4 rem/h for the outer belt. The astronauts in Apollo VIII on a 147-hr circumlunar flight received 150 mrem, while those on Apollo X received 480 mrem during a 192-hr flight. The difference was attributed to a different trajectory through the Van Allen Belt.

Having explained the rem and the mrem, let's shorten the abbreviation of the latter to the more familiar mr and take a look at that bouquet garni of nuclear seasoning that the Master Chef added. Its principal ingredients are uranium, thorium, and potassium. Uranium 238 has a half-life of 4½ billion yr, meaning that every 4½ billion yr it is only half as radioactive. Incidentally, this period coincides with current estimates of the age of the earth. Thorium has a half-life of 14 billion yr, and potassium a little over 1 billion yr. So

[1] Institute Engineer.
[2] *Holy Bible, Book of Genesis*, Chapter 1.
[3] Named after the discoverer, Dr. Van Allen.

our daily doses of radiation from these sources are constant from birth to death unless we're mathematical purists. The average annual dose in the U. S. is 60 mr; and again, as with cosmic radiation, there are local variations based on geology. Table 2 shows that my exposure dropped from 75 mr to 30 mr by moving from Boston to San Antonio. South Dakota is high with 115 mr, almost four times more than Texas. But both are rather low in comparison with a couple of other places in the world where the garni was not stirred in too well and the uranium and thorium levels in the soil are high. Brazil has a coastal region with an average annual dose of 550 mr and a high of 2800 mr (2.8 rem). India has an area where a population of 70,000 persons receives an average dose each of 380 mr.[4]

Naturally, the earth's radiation enters our food chain. This adds up to 20–35 mr/yr,[5] depending on locality. In addition to the natural geologic radiation, man further increases it by the addition of phosphate fertilizer used to produce our fruits and vegetables, and the fodder and grain for the meat animals we consume. Our consumption of water-based liquids rounds out our total ingested radioactivity. Consequently we are all mildly radioactive, with or without nuclear power.

Maybe at this point we'd better go inside the house for protection from the heavens and the earth. This does help somewhat; on the average it reduces the exposure by 20–25 percent in a wood/brick-veneer house. However, the average radiation emitted by that same house is 40 mr/yr. The exposure comes from the products that man takes from the earth to produce brick, concrete, and wall board. Also, we are subjected to radon, which is a gaseous decay product of radium. Radon is given off from these same building materials and, in addition, by the water we use and the natural gas we burn.

The present trend toward energy-efficient homes and buildings has created a new problem. By sealing our homes and buildings to prevent the leakage of heat, we are bottling up the radon. Instead of a typical air exchange every 1–2 hr, it has been decreased in some cases to 10 hr. At present a half dozen or so federal agencies are examining the problem; and most are being cautious about identifying this as a serious threat. However, the EPA deputy assistant administrator for radiation programs, David Rosenbaum, calls indoor radon exposure "by far the biggest radiological problem in the country."[6] A related but nonradiation health problem is the gas given off by the formaldehyde used in the manufacture of carpets, drapes, furniture, and foam insulation.

The amount of radon in water varies widely depending on the radium content of the rock/soil formation surrounding the water source. Tests to date indicate that in some localities exposures of up to 500 mr/yr are possible. Tests have also shown that a significantly greater amount of radon is released from the water when taking a shower as opposed to a tub bath.

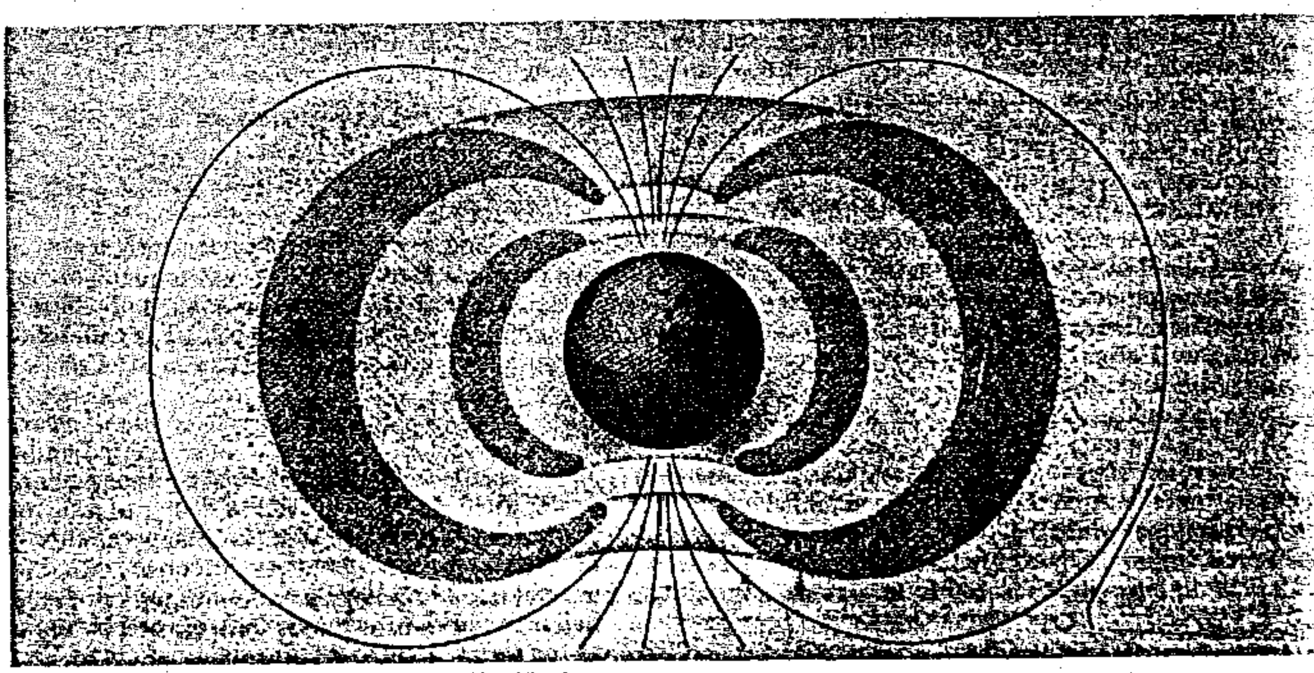
Other, but not significantly high, man-made radiation sources in the average home are color TV sets, smoke detectors, luminous dial clocks and watches, red and yellow ceramic tile, and antique glazed dinnerware. All of these will add up to a few more millirems per year.

The U.S. has the world's greatest highway system, which also contributes to our radiation background as well as our high accident death toll. Driving 10,000 mi/yr (16,000 km) will result in an exposure of 4 mr from the aggregate used in the pavement.

**TMI Radiation Dose**

Now that we have established the background radiation we live in, let's compare it to what the media called the Three Mile Island Nuclear Holocaust. The President's Commission on the Three Mile Island Accident reported that during the period between Mar. 28 and Apr. 15, 1979, the radiation dose to persons living

[4] United Nations Scientific Committee on the Effects of Atomic Radiation, 1977 Report to the General Assembly.
[5] *Health Physics*, Vol. 32, 1977, p. 324.
[6] *Nucleonics Week*, Oct. 25, 1979, p. 2.



Cross section of the earth's magnetic field and the Van Allen layer.

**TABLE 1 Estimated Annual Cosmic-Ray Whole-Body Doses (mrem /person)**

| Political Unit | Average Annual Dose |
|---|---|
| Alabama | 40 |
| Alaska | 45 |
| Arizona | 60 |
| Arkansas | 40 |
| California | 40 |
| Colorado | 120 |
| Connecticut | 40 |
| Delaware | 40 |
| Florida | 35 |
| Georgia | 40 |
| Hawaii | 30 |
| Idaho | 85 |
| Illinois | 45 |
| Indiana | 45 |
| Iowa | 50 |
| Kansas | 50 |
| Kentucky | 45 |
| Louisiana | 35 |
| Maine | 50 |
| Maryland | 40 |
| Massachusetts | 40 |
| Michigan | 50 |
| Minnesota | 55 |
| Mississippi | 40 |
| Missouri | 45 |
| Montana | 90 |
| Nebraska | 75 |
| Nevada | 85 |
| New Hampshire | 45 |
| New Jersey | 40 |
| New Mexico | 105 |
| New York | 45 |
| North Carolina | 45 |
| North Dakota | 60 |
| Ohio | 50 |
| Oklahoma | 50 |
| Oregon | 50 |
| Pennsylvania | 45 |
| Rhode Island | 40 |
| South Carolina | 40 |
| South Dakota | 70 |
| Tennessee | 45 |
| Texas | 45 |
| Utah | 115 |
| Vermont | 50 |
| Virginia | 45 |
| Washington | 50 |
| West Virginia | 50 |
| Wisconsin | 50 |
| Wyoming | 130 |
| Canal Zone | 30 |
| Guam | 35 |
| Puerto Rico | 30 |
| Samoa | 30 |
| Virgin Islands | 30 |
| District of Columbia | 40 |
| Total U.S. | 45 |

EPA Report, *Radiological Quality of the Environment in the United States*, 1977, EPA 520/1-77-009.

**TABLE 2 Estimated Annual External Gamma Whole-Body Doses from Natural Terrestrial Radioactivity (mrem /person)**

| Political Unit | Average Annual Dose |
|---|---|
| Alabama | 70 |
| Alaska | 60* |
| Arizona | 60* |
| Arkansas | 75 |
| California | 50 |
| Colorado | 105 |
| Connecticut | 60 |
| Delaware | 60* |
| Florida | 60* |
| Georgia | 60* |
| Hawaii | 60* |
| Idaho | 60* |
| Illinois | 65 |
| Indiana | 55 |
| Iowa | 60 |
| Kansas | 60* |
| Kentucky | 60* |
| Louisiana | 40 |
| Maine | 75 |
| Maryland | 55 |
| Massachusetts | 75 |
| Michigan | 60* |
| Minnesota | 70 |
| Mississippi | 65 |
| Missouri | 60* |
| Montana | 60* |
| Nebraska | 55 |
| Nevada | 40 |
| New Hampshire | 65 |
| New Jersey | 60 |
| New Mexico | 70 |
| New York | 65 |
| North Carolina | 75 |
| North Dakota | 60* |
| Ohio | 65 |
| Oklahoma | 60 |
| Oregon | 60* |
| Pennsylvania | 55 |
| Rhode Island | 65 |
| South Carolina | 70 |
| South Dakota | 115 |
| Tennessee | 70 |
| Texas | 30 |
| Utah | 40 |
| Vermont | 45 |
| Virginia | 55 |
| Washington | 60* |
| West Virginia | 60* |
| Wisconsin | 55 |
| Wyoming | 90 |
| Canal Zone | 60* |
| Guam | 60* |
| Puerto Rico | 60* |
| Samoa | 60* |
| Virgin Islands | 60* |
| District of Columbia | 55 |
| Others | 60* |
| Total U.S. | 60 |

* Assumed to be equal to the U.S. average.

EPA Report, *Radiological Quality of the Environment in the United States,*" 1977, EPA 520/1-77-009.

**TABLE 3 Estimated Radiation Exposure of the U.S. General Population[a]**

| 1978 | |
|---|---|
| Source | Average Individual Dose[b] (mrem/yr) |
| Natural background | 100 |
| Technologically enhanced[c] | 5 |
| Healing arts | 85 |
| Nuclear weapons development including fallout | 6.5 |
| Nuclear energy[d] | 0.28 |
| Customer products | 0.03 |
| Total | 197 |

[a] Adapted from *Report of the Work Group on Radiation Exposure Reduction*, Interagency Task Force on Ionizing Radiation, HEW, Feb. 20, 1979.

[b] Total annual average whole body dose.

[c] Mainly from naturally occurring radionuclides redistributed by human activities, such as mining and milling of phosphate, extracting and burning coal, using granite and brick as construction materials. The contribution from mining and milling of uranium is included below.

[d] Estimates of whole body equivalents, including 184,000 organ-rem (bronchial epithelium) from radon.

within a 50-mi (80-km) radius was somewhat less than 1 percent of annual *natural* background radiation.[7] For those persons living within 5 mi (8 km) of the plant, the dose was calculated to be no more than 10 percent of annual *natural* background, and was probably less.

This was confirmed later by the Bureau of Radiological Health, U.S. Public Health Service. They collected six rolls of unexposed, high-speed color film from five pharmacies and camera shops located within 5 mi (8 km) of the plant. The film had been on the shelf at the time of the released radiation. The film was processed and the fog level verified earlier estimates, in that none of the film had a fog level above the detection threshold of 5 mr.

The media have given widespread coverage to the recommendations of the President's Commission affecting nuclear utilities and the NRC; however, no mention has been made of the following recommendations by the Commission regarding the media:

*The coverage of nuclear emergencies places special responsibilities on the news media to provide accurate and timely information. The Commission therefore recommends that:*

a *All major media outlets (wire services, broadcast networks, news magazines, and metropolitan daily newspapers) hire and train specialists who have more than a passing familiarity with reactors and the language of radiation. All other news media, regardless of their size, located near nuclear power plants should attempt to acquire similar knowledge or make plans to secure it during an emergency.*

b *Reporters discipline themselves to place complex information in a context that is understandable to the public and that allows members of the public to make decisions regarding their health and safety.*

c *Reporters educate themselves to understand the pitfalls in interpreting answers to "what if" questions. Those covering an accident should have the ability to understand uncertainties expressed by sources of information and probabilities assigned to various possible dangers.*

### Medical Radiation

Most of us at one time or another will require radiation for medical diagnosis. Our exposures will vary widely according to the required procedure and, in the case of X-rays, the equipment used, the skill and knowledge of the operators, and the supervising radiologist or dentist. A few example estimates are:[8]

| | |
|---|---|
| Chest X-ray (one film) | 20–25 mr |
| Dental X-ray, whole mouth | 900 mr |
| Breast mammography (one film) | 1500 mr |
| Barium enema, GI series | 8000 mr |
| Heart catheterization before bypass surgery | 45,000 mr (9-yr NRC allowance for a radiation worker) |

Nuclear medicine uses a wide variety of radioactive substances which, interestingly enough, are produced in nuclear reactors. Radiactive iodine is widely used for the diagnosis and treatment of thyroid conditions. The NRC regulations permit a patient to be discharged from a hospital with up to 30 millicuries of radioiodine remaining in his body. Thus, the patient becomes another source of external radiation. If the patient were classified as a "package of radioactive material," he could not be accepted for air transport in the baggage compartment of an airplane in accordance with the NRC regulations, which limit radiation at the surface of the package to 200 mr/h. However, as a passenger, he can expose those sitting next to him to a dose of radiation in excess of NRC packaging requirements.[9]

If the patient is retained in the hospital, about one-half the ingested dose will be excreted within the first 24 hr. This excretion carries the radioactivity into the sewage system for treatment. In addition to 700,000 radioactive iodine procedures in the U.S. each year, there are some 9,000,000 to 10,000,000 other patients receiving radioactive substances yearly. To put this in perspective, a city of 1,000,000 residents with the most modern sewage treatment system available will discharge wastewater having twice the radioactivity permitted to be discharged from a nuclear power plant.

But let's not blame the sick folks; the 200 million healthy citizens in the U.S. make minute contributions of radioactivity to our respective sewage systems. We are all born mildly radioactive, and the 20–35 mr each year we ingest from our food and water is, of course, not all retained. One example is our nation's consumption of 200 million gal (750 million L) of whiskey each year. Even with the minuscule amounts of radioactivity that whiskey contains, the whiskey drinkers of America's contribution to radioactivity is equivalent to 1 ton of low-level waste from the nuclear industry.

### The Radiation Boxscore

So, toting up the boxscore so far, Table 3 shows the average individual exposure to all forms of radiation in the U.S. This table was adapted from the *Report of the Work Group on Radiation Exposure Reduction* by the Interagency Task Force on Ionizing Radiation, HEW, February 1979. Like EPA mileage estimates, these numbers will vary in accordance with your life style.

As we are all probably aware, nuclear wastes and their disposal are receiving considerable attention and have become a political as well as technical issue. One result has been the introduction of some rather peculiar bills in certain states. Last year in Colorado, for example, one bill[10] read as follows: "No radioactive waste or material shall be disposed of in any manner within the State of Colorado. For purposes of this article, radioactive means any material, solid, liquid or gas which emits ionizing radiation spontaneously."

Fortunately, the bill was defeated; otherwise, every resident of Colorado would be guilty of a misdemeanor for each trip to the bathroom.

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[7] Report of The President's Commission on the Three Mile Island Accident, Oct. 1979.

[8] *U.S. News and World Report*, May 14, 1979, p. 25.

[9] *American Journal of Public Health*, Vol. 68, No. 3, Mar. 1978, p. 219.

[10] Colorado Legislature, Article 10.5, 1979 Session.

The State of Oregon did pass a bill[11] so severely limiting radioactive emissions that, if enforced to the letter of the law, it would prohibit the cremation of human remains, since the radioactive level of the bone ashes is above the law's permissible maximum. If this law is administered from the State Office Building in Portland, it will definitely apply to the building, which is faced with granite, and has a reading of 180 mr/yr.[12]

More than half of all nuclear wastes are generated by the field of nuclear medicine in the form of such items as containers, syringes, bandages, contaminated clothing, surgical gloves, and cleaning utensils. The great majority of nuclear power plant waste is in the same category—coveralls, gloves, rags, etc. Together they contribute 99 percent of the volume, but only 1 percent of the radioactivity. These are classed as low-level wastes. Conversely, high-level nuclear wastes account for 1 percent of the volume and 99 percent of the radioactivity; consequently, the real concern is the safe disposal of this 1 percent of nuclear waste.

On the other hand, the waste disposal for the highly touted energy source to immediately replace nuclear energy receives little public or political attention. Unlike nuclear fission, the burning of coal is a chemical process in which, according to nature's laws, the mass of the input is equal to the mass of the output. One ton of coal burned produces 1 ton of gases and solids. Solid wastes in a 1000-MW coal-fired unit are produced at the rate of 30 lb/s (14 kg/s). These include toxic metals such as arsenic as well as from 50 to 400 times as much radioactivity as permitted from a nuclear plant. In disposing of the fly ash, the choice is either radioactive landfill or use as a substitute for sand in cement construction, which, in turn, will add more radioactivity to roads and buildings.[13]

Getting back to nuclear waste for a moment, a few words about what some in the media call the world's most deadly and toxic substance—plutonium. During World War II, 25 men who worked with plutonium at Los Alamos ingested quantities ranging from 5 to 420 nanocuries. (Nano is a one billionth unit of measurement, and a curie is a base unit of radioactivity.) They have been medically monitored over the years, and there are currently 23 survivors.[14] One member was killed in an automobile accident, and the other death was caused by a heart attack.

One of the group is a close friend of mine who has 14 nanocuries of plutonium. By contrast, the much publicized Silkwood case award was based on 7 nanocuries. In addition, considerable publicity has been given to a study that concluded that there was a significantly higher incident rate of cancer among workers at the Hanford Washington Nuclear complex (also a repository for nuclear waste). However, the vital statistics for the state of Washington show the following death rates by occupation:[15]

| Deaths per 100,000 per year due to malignant neoplasma (tumors) | |
|---|---|
| Hanford workers | 111 |
| Brick masons | 116 |
| Postal clerks | 119 |
| Plumbers | 130 |
| Students | 172 |

| Deaths per 100,000 per year due to leukemia | |
|---|---|
| Atomic workers | 49 |
| Bus drivers | 172 |
| Bankers | 183 |
| Dairymen | 188 |
| Poultrymen | 269 |

The Hanford workers, like all other radiation workers, are permitted a maximum exposure of 5000 mr/yr by NRC regulations. Consequently, it is likely that they all received radiation in excess of bankers, plumbers, and bus drivers. In his testimony before the House Subcommittee on Natural Resources and Environment on June 13, 1979, Dr. Donald S. Fredrickson, director of NIH, stated that the total contribution from both natural background and medical radiation accounts for better than 90 percent of the total radiation exposure in the U.S., and causes between 1 and 6 percent of all cancer deaths.

An interesting study would have been on the workers at the Millstone, Conn., quarry, which operated from 1830 to 1960. The granite from this quarry was used to build Grand Central Station in New York City, which has a radiation level of 525 mr/yr. The quarry also produced the granite for the base of the Statue of Liberty and the facing of the United Nations Building. By contrast, Millstone Unit 1, located in close proximity to the quarry, reported a maximum whole body dose of 0.1 mr from plant releases to an individual standing at the station boundary fence for the entire year of 1979. Natural background radiation for the area is 130 mr/yr.

This equates to the 0.1 mr/yr that is received by sleeping 8 hr/day with another person—and can be extrapolated to prove that nuclear power is at least three times safer than sleeping, and much safer when you take into account all the people who don't wake up.

## Conclusion

Hopefully, this distillation of extensive published information will help put natural and man-made radiation more in perspective and serve to prove that radiation does not come in black hats and white hats—only gray hats!

## Additional References


National Council on Radiation Protection and Measurements: (NCRP)

*Report No. 45*, "Natural Background Radiation in the United States"

*Report No. 56*, Radiation Exposure from Consumer Products and Miscellaneous Sources"


[11] ORS 469,525.

[12] *Energy Observations*, report prepared by Portland General Electric's Public Affairs Department, Nov. 1978.

[13] For more information on waste, see *The Non-Problem of Nuclear Waste*," by Peter Beckman, the Golem Press, Box 1342, Boulder, Colo. 80306, $2.00 prepaid.

[14] Los Alamos Report, *LA-5148-MS*, Jan. 1973.

[15] *Access to Energy Newsletter*, Vol. 6, No. 1, Sept. 1, 1978.


**Based on a paper presented at the 1980 National Board-ASME Meeting, Los Angeles, Calif., May 5, 1980.**

# ONTARIO TWO METER REPEATERS

Effective January 9, 1982

| Repeater Loc. | Call Sign | Input | Output |
|---|---|---|---|
| Aurora | VE3YRC | 147.225 | 147.825 |
| Bancroft | VE3TBF | 147.840 | 147.240 |
| Barrie | VE3RAG | 146.070 | 146.670 |
| Belleville | VE3QAR | 146.430 | 147.030 |
| Belleville | VE3KBR | 146.985 | 146.385 |
| Bracebridge | VE3MLR | 147.690 | 147.090 |
| Bracebridge | VE3MRT | 146.280 | 146.880 |
| Brampton | VE3MHZ | 146.280 | 146.880 |
| Brampton | VE3SSS | 146.835 | 146.235 |
| Brantford | VE3TCR | 147.750 | 147.150 |
| Brighton | VE3LGX | 147.165 | 147.765 |
| Brockville | VE3BAT | 146.220 | 146.820 |
| Burlington | VE3SRB | 147.810 | 147.210 |
| Burlington | VE3RAE | 146.895 | 146.295 |
| Campbellford | VE3KFR | 146.370 | 146.970 |
| Carleton Place | VE3FXE | 147.870 | 147.270 |
| Chatham | VE3SOR | 144.590 | 145.190 |
| Chatham | VE3KCR | 147.720 | 147.120 |
| Chelmsford | VE3JIQ | 146.160 | 146.760 |
| Clairmont | VE3TNT | 144.850 | 145.450 |
| Collingwood | VE3MTR | 146.190 | 146.790 |
| Cornwall | VE3SVC | 147.780 | 147.180 |
| Dwight | VE3MUS | 146.220 | 146.820 |
| Elliot Lake | VE3NSR | 146.160 | 146.760 |
| Finch | VE3SDG | 147.840 | 147.240 |
| Fonthill | VE3WCR | 147.900 | 147.300 |
| Goderich | VE3GOD | 147.630 | 147.030 |
| Georgetown | VE3OD | 147.135 | 147.735 |
| Grimsby | VE3TVI | 146.805 | 146.205 |
| Grand Bend | VE3RGB | 146.160 | 146.760 |
| Guelph | VE3ZMG | 147.960 | 147.360 |
| Hamilton | VE3NSF | 146.160 | 146.760 |
| Hamilton | VE3DRW | 144.890 | 145.490 |
| Hamilton | VE3MBR | 147.105 | 147.705 |
| Hensall | VE3OBC | 146.310 | 146.910 |
| Ingersol | VE3OHR | 147.870 | 147.270 |
| Kenora | VE3LWR | 146.460 | 147.060 |
| Kincardine | VE3KIN | 146.460 | 147.060 |
| Kingston | VE3KER | 146.340 | 146.940 |
| Kingston | VE3KNR | 146.190 | 146.790 |
| Kirkland Lake | VE3KLR | 146.280 | 146.880 |
| Kitchener | VE3KSR | 146.370 | 146.970 |
| Kitchener | VE3IC | 146.865 | 146.265 |
| Kitchener | VE3XRX | 146.190 | 146.790 |
| Leamington | VE3TOM | 147.900 | 147.300 |
| London | VE3LAC | 147.660 | 147.060 |
| London | VE3NDT | 146.340 | 146.940 |
| London | VE3TTT | 148.780 | 147.180 |
| Lucan | VE3MCR | 147.600 | 147.000 |
| Montreal River | VE3LSP | 146.460 | 147.060 |
| Morrisburg | VE3SVR | 146.160 | 146.760 |
| Newmarket | VE3YRC | 147.225 | 147.825 |
| New Liskeard | VE3TAR | 146.370 | 146.970 |
| North Bay | VE3NFM | 146.340 | 146.940 |
| North Bay | VE3NBR | 147.750 | 147.150 |
| Oakville | VE3OAK | 147.015 | 147.615 |
| Orangeville | VE3RSO | 146.625 | 146.025 |
| Orillia | VE3ORR | 147.810 | 147.210 |
| Orillia | VE3LSR | 146.250 | 146.850 |
| Oshawa | VE3OSH | 147.720 | 147.120 |
| Elliot Lake | VE3WRR | 147.60 | 147.000 |
| Kitchener | ? | 144.69 | 145.29 |
| London | VE3MGI | 144.87 | 145.47 |
| London | ? | 144.63 | 145.23 |

| Repeater Loc. | Call sign | Input | Output |
|---|---|---|---|
| Ottawa | VE3CPC | 147.750 | 147.150 |
| Ottawa | VE3OCR | 146.250 | 146.850 |
| Ottawa | VE3OEA | 146.070 | 146.670 |
| Ottawa/Hull | VE2CSO | 146.100 | 146.700 |
| Ottawa | VE3ORA | 146.280 | 146.880 |
| Ottawa/Hull | VE2KPG | 147.960 | 147.360 |
| Ottawa | VE3OXM | 147.720 | 147.120 |
| Ottawa | VE3TEL | 146.430 | 147.030 |
| Ottawa/Hull | VE2RBG | 146.010 | 146.610 |
| Ottawa | VE3TWO | 147.900 | 147.300 |
| Ottawa/Hull | VE2CRA | 146.340 | 146.940 |
| Owen Sound | VE3OSR | 146.340 | 146.940 |
| Penetang | VE3MGB | 147.780 | 147.180 |
| Pembroke | VE3NRR | 146.160 | 146.760 |
| Peterborough | VE3PBO | 146.340 | 146.940 |
| Petrolia | VE3MGK | 144.770 | 145.370 |
| Renfrew | VE3STP | 146.460 | 147.060 |
| Ridgeway | VE3LJJ | 147.165 | 147.765 |
| St. Catharines | VE3NRS | 147.840 | 147.240 |
| St. Joseph Is. | VE3SJI | 146.280 | 146.880 |
| St. Thomas | VE3STR | 147.930 | 147.330 |
| Sarnia | VE3SAR | 146.340 | 146.940 |
| Sault Ste. Marie | VE3YAK | 147.750 | 147.150 |
| Sault Ste. Marie | VE3SSM | 146.340 | 146.940 |
| Sault Ste. Marie | VE3SAP | 146.460 | 147.060 |
| Shelburne | VE3ZAP | 146.220 | 146.820 |
| Smith Falls | VE3RLR | 147.810 | 147.210 |
| Sudbury | VE3NRB | 146.460 | 147.060 |
| Sudbury | VE3SSI | 146.100 | 146.700 |
| Sudbury | VE3SRS | 146.460 | 147.060 |
| Sudbury | VE3JIQ | 146.160 | 146.760 |
| Stouffville | VE3TDX | 147.930 | 147.330 |
| Thunder Bay | VE3YQT | 146.460 | 147.060 |
| Temagami | VE3TEM | 146.310 | 146.910 |
| Timmins | VE3TIS | 146.340 | 146.940 |
| Timmins | VE3TIR | 146.460 | 147.060 |
| Tiverton | VE3TIV | 146.010 | 146.610 |
| Toronto | VE3RPT | 147.660 | 147.060 |
| Toronto | VE3TDO | 146.430 | 147.030 |
| Toronto | VE3MOT | 147.780 | 147.180 |
| Toronto | VE3MPU | 147.870 | 147.270 |
| Toronto | VE3TOR | 146.340 | 146.940 |
| Toronto | VE3TTY | 146.100 | 146.700 |
| Toronto | VE3SKY | 146.985 | 146.385 |
| Toronto | VE3WHO | 144.750 | 145.350 |
| Toronto | VE3GER | 144.770 | 145.370 |
| Toronto | VE3SSB | 144.870 | 145.470 |
| Toronto | VE3PIC | 146.070 | 146.670 |
| Toronto | VE3WAS | 147.315 | 147.915 |
| Waterloo | VE3WFM | 147.690 | 147.090 |
| Waterloo | VE3WWW | 146.835 | 146.235 |
| Wawa | VE3WAW | 146.340 | 146.940 |
| Whitney | VE3WPR | 146.400 | 147.000 |
| White River | VE3WRR | 146.160 | 146.760 |
| Windsor | VE3III | 147.660 | 147.060 |
| Windsor | VE3RRR | 147.900 | 147.300 |
| Windsor | VE3WIN | 146.400 | 147.000 |
| Windsor | VE3IIE | 144.870 | 145.470 |
| Windsor | ? | 146.835 | 146.235 |
| Windsor | VE3WER | 147.285 | 147.885 |
| McGregor | VE3SOT | 144.69 | 145.29 |
| Mississauga | VE3RBW | 144.83 | 145.43 |
| Penetang | VE3SGB | 146.16 | 146.76 |
| Pickering | VE3SPC | 147.373 | 147.975 |

List provided courtesy of John Riddell, VE3AMZ, Western New York and Southern Ontario Repeater Council.

ARTICLES FOR SALE

Amateur Receiver - RME Electrovoice Model 4350 $ 70.00)
- 160 to 10 MTRS - Manual Incl. or best offer)
Microphone - Desk Style Turner with Pre-Amp $ 20.00
2 - Position Coax Switch - Radio Shack $ 2.00

Contact - Don VE3IDS

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Heathkit FET Transistor Tester Model IT3120 $ 100.00
(Also Try Good Trade or Negotiate)
Lampkin Modulation and Deviation Indicator $ 100.00
Model 205 A/B, Mint Condition including new Instruction Manual
Drake R4B T4XB P/S and speaker (negotiate) $1000.00
Home Brew Electronic Keyer - Vibroplex Paddle $100.00
GE Pacer 2MTR Less Xtals - Needs two tubes Rig 15W $ 50.00
(assortment of five - Marconi - DT34 2 Mtr
- Solid state except 2 final tubes - DT75 2 Mtr $ 50.00
Shure 444 - Microphone - Desk Mic $ 50.00
Ten meter Mono Band in carton - 3 Elements $ 100.00
15 Mtr Mono Band in carton - 3 Elements $ 125.00

Contact - Walter Stoyko VE3FFN
519-923-3544

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GBARC Crest for your Jacket $ 2.00

Contact - Fred VE3WF

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Yaesu FT101E - CW Filter - Maintenance Manual - Landliner - Speaker / Phone Patch $ 850.00
FT202R - 6 Channel Hand Held - 5/8 Whip - Crystals for 5 Channels $ 125.00

Contact - Fred Gibson VE3KHQ
368-7952

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4 - 811A Tubes With Sockets and Caps $ 20.00
Kenwood R-1000 30 Band General Coverage Receiver $ 600.00
Contact - Jim Herron VE3BFV
371-1209

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Multi 2000 - Multi Mode 2 Meter Rig $ 500.00

Contact - Bill Hardie VE3EFX
368-7822

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Drake TR3 Transceiver complete with Home Built Power Supply - $ 400.00
D104 Mike - Key, Old Airforce Type - Bud low pass filter - Speaker. Excellent Condition

Contact - VE3EFX

## TECH QUIZ

1. Name three elements in a bi-polar transistor.
2. How many grids does a pentode tube have?
3. Is there a phase inversal of a signal through a cathode-follower amp?
4. In a resonate half-wave dipole antenna, which is a high impedance point; an end or the middle?
5. In a series resistive circuit, if the source voltage is doubled, does the current double or halve?
6. If two 1 mfd capacitors are joined in parallel, what is their combined capacitance?
7. What effect does joining the capaciters in question 6 have on their voltage rating?
8. What does EME stand for?
9. If an antenna's SWR measures 1.2:1 at 3.5mhz, 1.8:1 at 3.6mhz, and 2.5:1 at 3.7mhz, is it too long or too short for optimum operation on 80 mtr phone?
10. A In a Yagi beam antenna, how many elements are driven?
    B How many are driven in a collinear antenna?

If you wish, bring your answers to the club meeting. A prize will be awarded for the highest score.

73's Don VE3IDS
Assist. Tech. Director