

# W5YI

Nation's Oldest Ham Radio Newsletter

## REPORT

Up to the minute news from the world of amateur radio, personal computing and emerging electronics. While no guarantee is made, information is from sources we believe to be reliable. May be reproduced providing credit is given to The W5YI Report.

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October 1, 1993

## New RF Exposure Standard Could Impact Ham Radio

The *Committee on Man and Radiation* (COMAR) is the IEEE Board which sets the U.S. standards on what is considered to be safe RF exposures to humans. The IEEE, of course, is the 300,000 member *Institute of Electrical and Electronics Engineers, Inc.*, with headquarters in Washington, DC. Their United States Activities Board consists of five Councils (Technology, Government, Member, Professional and Career) - each with several working committees. The Chairman of COMAR is Dr. John M. Osepchuk, a research physicist for the Raytheon Company in Lexington, Massachusetts. We contacted Dr. Osepchuk last summer in our capacity as Vice Chairman of the VECs Question Pool Committee.

The FCC has proposed updating the guidelines it uses for evaluating radiofrequency (RF) radiation from FCC-regulated transmitters. According to the *National Environmental Policy Act of 1969*, the FCC must take environmental effects into consideration when performing its rule making function. The RF safety guidelines were replaced last year with a new more stringent RF safety standard (C95.1-1992) which looks at exposure in different surroundings - under both controlled and uncontrolled conditions. Amateur radio, which was previously excluded from the standards, will now be included if the FCC adopts the latest C95 standard.

Our primary interest was in updating our amateur examination questions which deal with RF exposure to amateur operators and the public

who may be in close proximity to amateur radio stations. We pointed out that "Passing a simple multiple-choice examination allows the public (many of whom are youngsters) to operate amateur radio transmitters ...with power levels up to 1.5 kW.... Furthermore, all amateurs are free to construct their own equipment without limitation ...or FCC type acceptance."

We specifically asked a question concerning the HF, VHF and UHF ham bands. The answer to each would be used as guidance for our participation as Vice Chairman of the VECs Question Pool Committee. We wanted to know what is considered the maximum safe effective radiated power (ERP) levels for:

- (1) HF operation (3-30 MHz) in a residential neighborhood? What is safe for the operator? For the residents next door? ...and at what distance away from the antenna? (ERP takes antenna gain into consideration.)
- (2) VHF operation (30-300 MHz) for mobile, base station and hand held transceivers. We were particularly interested in hand-held radios that are held close to the head, especially those operating in the 1 1/4 and 2 meter bands.)
- (3) UHF operation (300-3000 MHz) ...especially 70-cm and 1240 MHz hand held operation.

In short, we wanted to know what is safe for the ham operator and residential neighbors of the ham operator. "What are the power, frequency and distance guidelines?"

We have now received two letters in response to our inquiry. One from Dr. Osepchuk and another from COMAR member, Richard A. Tell - who is also K5UJU. Rick Tell is a nationally known scientist in the field of ionizing radiation. Here is his response:

"This letter responds to your letter of June 11, 1993, requesting information from the IEEE Committee on Man and Radiation relevant to electromagnetic fields produced by amateur radio stations. Your letter contained numerous questions which, because of the very complex nature of the issue, cannot be readily answered. For example, you posed several questions related to maximum safe effective radiated power levels that would insure safe exposures of both the amateur radio operator as well as adjacent neighbors in a residential setting.

"Such a question cannot be answered in a straightforward manner since the resulting RF fields depend upon the frequency of the field, antenna height, lateral distance from the antenna and antenna radiation patterns and, of course, power. In general, then, the assessment of the maximum safe effective radiated power will become a case specific analysis and cannot be answered without details of the particular situation. To help illustrate this difficulty, consider the situation of a directive amateur antenna which is mounted just over the roof of the amateur's home. It is possible that this antenna might be comparable with the upper floors of the next-door home and hence, capable of producing substantial RF field strengths inside the upper floors of the adjacent home. Clearly, an amateur using only 100 watts of output power will be far less likely to cause high RF field levels at the other home but another amateur using the full authorized power of 1,500 watts would result in substantially greater fields.

"To help you place this in perspective, the RF fields near ground from an overhead half-wave dipole antenna fed with 100 watts would reach the most restrictive control level specified in the IEEE standard (an equivalent power density of 0.2 mW/cm<sup>2</sup> applicable to uncontrolled environments) with the dipole situated between 2.55 m (8.4') and 5.10 m (16.8') above ground. The range of height is due to the fact that ground reflections will, generally, lead to an elevation of the field strength at certain distances above ground due to phase addition of the field over the simply computed free-space value (no ground reflections assumed). If the dipole input power was 1,500 watts, as permitted by the Federal Communications Commission (FCC) for amateur stations, the antenna would have to be between 9.9 m (32.5') and 19.8 m (64.9') in height. Were the amateur to use a directive antenna with a gain of 10 dBi (a power gain of 10), the free space power density would reach the 0.2 mW/cm<sup>2</sup> value at 6.31 m (20.7') for 100 watts input and at 24.4 m (80.1') for 1,500 watts input. Hence, you can see the difficulty in making general statements as to safe distances for amateur facilities because of the wide range of factors involved.

"Attached to this letter is a chart that has been prepared showing the IEEE standard maximum permissible exposure (MPE) values for each of the various amateur bands. Detailed calculations were carried out for the actual range of frequencies of each band and the more restrictive MPE applicable to each band is shown. It may be of interest to you to know that the FCC is presently seeking public comment on their

proposal to amend the FCC regulations regarding environmental processing of license applications by adopting use of the new IEEE standard (IEEE C95.1-1991). One issue that the FCC has identified as particularly important is whether certain types of RF sources that have been categorically excluded from their environmental processing rules in the past, which include amateur radio stations, should continue to be excluded. This is not a issue since the new IEEE standard is, at least in certain frequency ranges, considerably more stringent than the older ANSI C95.1-1982 standard presently used by the FCC.

"With respect to the use of hand-held amateur radio transmitters, the IEEE standard indicates that in a controlled environment (i.e., with an aware user), the unit may employ powers up to 7 watts up to a frequency of 450 MHz without showing compliance with the specific field strength limits of the standard. At 1,240 MHz, the unit's power must be limited to 2.54 watts for the aware user. If the hand-held unit power exceeds these values, then the RF fields, or resulting specific absorption rates, must be evaluated to show compliance with the MPEs established in the standard-i.e. specifically the SAR limits (specific absorption rate).

"In reviewing the sample questions you submitted, we would suggest that in Question T4D11 [Technician Class question pool], now that the American National Standards (ANSI) has endorsed the IEEE standard as an ANSI standard also, the question be revised to reflect this difference, i.e. **both** the ANSI and IEEE have published safety guidelines for the maximum limits of RF energy near the human body.

"Also in question T4D15, because of the new frequency dependence of the low power exclusion section of the ANSI/-IEEE standard, the question should be revised to reflect the power of VHF radios only, **not both VHF and UHF**.

"Finally, we offer for your consideration two possible questions that might be determined to be useful in the question pools used by volunteer examiners:

**"(1) What have most scientific studies shown that biological effects of RF fields determined at different frequencies used by most amateur radio operators are correlated with? [ANSWER C]**

- (A) RF field strength (V/m)
- (B) RF power density (mW/cm<sup>2</sup>)
- (C) Specific absorption rate (W/kg)
- (D) Percentage modulation

**"(2) To avoid excessively high human exposure to RF fields, how should amateur antennas generally be mounted? [ANSWER B]**

- (A) with a high current point near ground.
- (B) as high and away from accessible areas as possible
- (C) on a non-metallic mast
- (D) with the elements in a horizontal polarization

"I hope that this information is helpful in your work to develop updated information in the testing of amateur radio operator applicants. If COMAR can be of further assistance, please let us know.

Respectfully yours,  
**Richard A. Tell, K5UJU, Member**  
IEEE Committee on Man and Radiation.

# W5YI REPORT

Nation's Oldest Ham Radio Newsletter

Page #3

October 1, 1993

**Simplified ANSI/IEEE MPEs [Maximum Permissible Exposure] for Amateur Radio Bands**  
Derived from IEEE C95.1-1991

### CONTROLLED ENVIRONMENTS

Band/MHz	E(V/m)	H(A/m)	S(mW/cm <sup>2</sup> )
1.8	614	8.2	-
3.5	526	4.1	-
7.0	252	2.2	-
10.1	181	1.6	-
14	128	1.1	-
18	101	0.90	-
21	85.9	0.76	-
24.8	73.7	0.65	-
28	62.0	0.55	-
50	61.4	0.30	-
144	61.4	0.30	1.0
220	61.4	0.15	1.0
440	-	-	1.4
900	-	-	3.0
1240	-	-	4.1
2300	-	-	7.7

### UNCONTROLLED ENVIRONMENTS

Band/MHz	E(V/m)	H(A/m)	S(mW/cm <sup>2</sup> )
1.8	614	8.2	-
3.5	206	4.1	-
7.0	113	2.2	-
10.1	81.2	1.6	-
14	57.4	1.1	-
18	45.3	0.90	-
21	38.4	0.76	-
24.8	33.0	0.65	-
28	27.7	0.55	-
50	27.5	0.20	-
144	27.5	0.073	0.20
220	-	-	0.20
440	-	-	0.28
900	-	-	0.60
1240	-	-	0.83
2300	-	-	1.5

Note: Contact currents for all frequencies from 0.1 to 100 MHz are limited to 100 mA for controlled environments and 45 mA for uncontrolled environments.

Dr. Osephchuk also mentioned in his letter "As Rick Tell indicated, the FCC is considering the adoption of the latest C95 standard for use in its licensing procedures. Under review also are the exemptions from licensing requirements for various groups including radio amateurs. The comment period was recently extended to November 12, 1993 at the request of the NAB (National Association of Broadcasters.)

"The new C95 standard, designated IEEE C95.1-1991, is available for purchase from the IEEE. Simply call 1-800-678-IEEE."

### JUNE 1993 VE PROGRAM STATISTICS

June	1991	1992	1993
<b>No. VEC's</b>	<b>18</b>	<b>18</b>	<b>18</b>
<b>Testing Sessions</b>	<b>572</b>	<b>880</b>	<b>1109</b>
<b>VEC</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>
ARRL	50.9%	53.8%	54.7%
W5YI	30.9	31.4	33.1
CAVEC	3.3	3.4	3.2
WCARS	1.9	1.8	1.6
GtLakes	4.4	2.3	1.0
SunV	0.9	1.8	0.7
Others (12)	8.6	5.5	5.7
<b>Year-to-Date Sessions</b>	<b>3716</b>	<b>5110</b>	<b>5501</b>
<b>Elements Administ.</b>	<b>12913</b>	<b>16811</b>	<b>21140</b>
<b>VEC</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>
ARRL	56.1%	56.8%	57.1%
W5YI	22.8	25.1	26.3
CAVEC	4.7	3.3	3.2
WCARS	1.9	1.7	1.9
SunV	2.2	3.8	2.0
GtLakes	3.8	2.1	1.2
Others (12)	8.5	7.2	8.3
<b>Year-to-Date Elements</b>	<b>83845</b>	<b>108510</b>	<b>106256</b>
<b>Applicants Tested</b>	<b>7867</b>	<b>10180</b>	<b>12378</b>
<b>VEC</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>
ARRL	56.5%	56.1%	56.3%
W5YI	22.7	25.3	26.5
WCARS	2.1	1.7	1.7
SunV	2.0	3.4	1.9
CAVEC	4.0	3.3	3.2
GtLakes	4.3	2.1	1.2
Others (12)	8.4	8.1	9.2
<b>Year-to-Date Tested</b>	<b>50279</b>	<b>64683</b>	<b>62278</b>
<b>June</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>
Pass Rate - All	66.7%	64.9%	64.5%
Applicants/Session	13.8	11.6	11.2
Elements/Applicant	1.6	1.7	1.7
Sessions Per VEC	31.8	48.9	61.6
<b>Administrative Errors by VE's/VEC's</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>
Defect. Applications	0.5%	0.2%	0.2%
Late Filed Sessions	2.6%	1.3%	2.6%
Defective Reports	0.3%	0.1%	0.1%

**Note:** During the first six months of 1993 there was about 4% less applicants testing (at 2% fewer exam sessions) than in 1992. The good news is that the number of applicants taking ham tests is still nearly double (up 82%) than before "code-free" hamming.

[Source: Personal Radio Branch/FCC; Washington, D.C.]

● Like the Clinton Health Plan, the administration's **Information Super-highway Plan** is vague on key points. We do know, however, that the NTIA, the *National Telecommunications and Information Administration* will be given the lead role in its formation. Technology-neutral strategy calls for competing multiple cable, telephone and computer networks. Commerce Secretary Ron Brown will steer an industry advisory council. You can expect major modifications to existing cable legislation and telephone restrictions.

● On Sept. 23rd, the FCC gave birth to the **Personal Communications Service (PCS)** industry. It promises low cost over-the-air digital voice, data and video to portable phones, fax machines and pocket computers. One lightweight phone will do triple duty! It will be a cordless phone at home, will plug into your car and can be used at work. Like ham radio, your communications system goes with you. Your call sign is a phone number that follows you.

PCS will be to the 1990's what cellular was to the 1980's. There will be a major difference, however. Firms won't get the spectrum free. It will cost them dearly! The Clinton administration hopes the U.S. Treasury will benefit to the tune of \$10 billion from frequencies that will be auctioned to the highest bidder. It is sure to drive up the cost of PCS service.

The growth rate of PCS is estimated to be four times that of cellular! By the year 2010, 60 million subscribers will generate some \$40 billion in revenue. Big business indeed!

It doesn't look like the new rules will create huge national firms. Instead, the FCC will license as many as seven new wireless carriers in every American city and town. The idea is to foster competition which will hopefully translate to lower prices for the public.

The Commission's plan carves the nation into 51 regions called MTAs (Major Trading Areas) and 492 BTA (Basic Trading Area) subdivisions. Some say there is too much competition.

The Commission allocated a total of 160 MHz at 1850-1970, 2130-2150 and 2180-2200 MHz for PCS services. This is four times the spectrum originally allocated for the cellular telephone service. The major elements of the complex Commission PCS decision are:

□ 120 MHz was allocated for licensed PCS services (1850-1890/1930-1970

MHz and 2130-2150/2180-2200 MHz);

□ 40 MHz was allocated for unlicensed PCS devices (1890-1930);

□ The (10 year) licensed allocation was channelized into two 30 MHz, one 20 MHz and four 10 MHz channel blocks.

□ The unlicensed allocation was channelized into two 20 MHz blocks, one for devices that will provide voice-like services and one for devices that will provide data-like services.

□ Technical standards were also adopted for PCS operations. These include antenna height and power limits; and standards for protecting existing microwave users and other PCS operations from interference.

□ The Commission also encouraged industry to continue its efforts to develop standards that will promote interoperability, roaming and enhanced emergency 911 capability for PCS.

□ 2 GHz PCS licensees will be required to offer service to at least one-third of the population in each market area within five years of being licensed, two-thirds within seven years and 90 percent within ten years.

● The FCC has published a **"Policy on Private Printing of FCC Forms."** Blank forms may be reproduced by private companies at their own expense provided:

□ Form must be comparable in quality to original document without change to page size, image size, configuration of pages, folds or perforations and matching as closely as possible the paper weight, paper color and ink color.

□ Reference to U.S. Government Printing Office must be deleted. Accept as above, do not delete from or add to any part of the form, or attach anything to it.

□ Do not add any special personalized symbols, word, phrase or advertising.

□ Be sure current version of form is being duplicated.

● Jim Wills, N5HCT, of Tyler, Texas has filed a **Petition for Rule Making** with the FCC seeking to **reinstate the 1st Class (Commercial) Radiotelephone Operator License.**

He argues: "The FCC ceased to administer the 1st Class and 2nd Class Radiotelephone License on June 15, 1984. This action was viewed by technicians and the technical community as an effort to make everybody the same, regardless of qualifications. That's

exactly what it did. The blow to morale in the technical world was widespread and still exists today. No longer can a technician be respected because he holds a 1st or 2nd Class License. Everyone now is in a General Class category. This effort to create a classless society of radio technicians should and must be reversed."

Wills notes that the 1st and 2nd Class Radiotelegraph License were strangely left intact even though there is a decreasing demand and requirement for Morse code communications.

He asks the Commission to "...assign COLEMs (Commercial Operator License Examination Managers) to write a new test element, number the new exam as Element 4, award all present holders of the General Radiotelephone Operator License (GROL) a 2nd Class Radiotelephone License for a fee (otherwise they could continue to hold the GROL with no further action) and restore availability of the 1st Class Radiotelephone Operator License. All radiotelephone operator licenses would carry a ten year term and would be renewable for a fee. "This new class of license (1st Class Radiotelephone) will create critically needed revenue for the FCC to augment their already strangled budget."

Jim Wills is the same fellow that is largely responsible for Congress approving "vanity" (special ham operator selected) call signs for amateurs at a cost of \$7 annually. (By the way, we hear rumors of an effort to get this annual cost changed to a lump sum amount as part of a "Technical Corrections" bill to be adopted later on this fall

● When the gun goes off for this year's **New York City Marathon** on Nov. 14, there will be one runner who is racing for a different goal. **Fred Doob, AA8FQ**, will cross the starting line and in the 26.2 miles that ensue through five boroughs, he hopes to talk with as many hams possible. His objective is to raise funds for kids with cancer.

For every contact he makes along the route, Icom America will contribute \$5 to the Memorial Sloan-Kettering Cancer Center (MSKCC). Special commemorative QSL cards are being created for this event and will be mailed to all who respond to the challenge. Fred has a volunteer backup to log the calls. Fred will strap the portable Icom IC-W21AT handi-talkie to his waist, wear a headset with a boom mike and carry a PTT button in his hand.

- Rodney E. Bocock, age 27 of Roanoke, VA has been charged in federal court that he **knowingly and willfully communicated false information by radio, endangering the safety of aircraft in flight.** He allegedly transmitted false air traffic control instructions and other information to aircraft flying into or near Roanoke Regional Airport. He is also charged with using obscene, indecent, or profane language in a radio transmission.

If convicted on all counts, Bocock faces a maximum penalty of twenty-two years imprisonment and a \$500,000 fine. The investigation was jointly conducted by the FAA, FCC, FBI and the Allegheny County Sheriff's Dept.

- The Miami based *Sociedad Internacional de Radio Aficionados* (SIRA) **activated its emergency 20 meter net during hurricane "Gert"** when 100 mph winds slammed into the Atlantic coast of Central America on Sept. 15. Net control station **WB4ESB (Rafael Estevez)** handled relief communications with many amateur stations as 65,000 people were evacuated along the Costa Rican and Nicaraguan coastline. In addition, weather bulletins issued by the National Hurricane Center in Coral Gables, Florida, was translated into Spanish and transmitted to Central America.

- The new Part 97 Rules **"Relaxing Restrictions on the Scope of Permissible Communications in the Amateur Service"** went into effect on Sept. 13th - a month after being published in the *Federal Register*. While limited business communications are now permitted, there has generally been no noticeable change in communications content on the amateur airwaves.

On Sept. 8th, the FCC caused an omitted paragraph (§97.113(f) to be published in the *Federal Register*. This paragraph states: "(f) No amateur station, except as auxiliary, repeater, or space station, may automatically retransmit the radio signals of other amateur stations." There is no change in this rule from the previous §97.113(f).

- *Industry and Science Canada* (ISC) which used to be called *Communications Canada* (ComCan) and the *Dept of Communications* (DOC) before that - has put out a discussion paper on **"Proposed Spectrum Allocation and Utilization in the Range of 30-960 MHz."** According to the RAC News Service, it appears that ISC may be

interested in reallocating **220-222 MHz away from the Canadian Amateur Service** in much the same fashion that the United States did some three years ago. RAC (*Radio Amateurs of Canada*) says they need this spectrum to meet the tremendous growth of amateur radio operators with a BASIC (no-code) qualification to operate above 30 MHz ...and for voice and digital linking systems. "In less than 3 years Canada's amateur population has grown over 55% to a total of 40,000 licensed stations." RAC is also concerned about TR-86, a proposal which **allows the ISC to shut down a licensed ham station using a legal linear amplifier** if the signal exceeds the minimum field strength level quoted in TRC-86 and causes interference to a neighbor's radio-sensitive equipment - even if the ham equipment is perfectly clean..

- The "Newton MessagePad" is the **\$700 video-cassette size device** that uses a penlike pointer to take notes, keep a calendar, act as a pager, retrieve electronic mail and send faxes. It has been a long time in coming to market and seems to have three problems. It can't recognize some handwriting, has short battery life and is over-priced. Still Apple PIE (Personal Interactive Electronics) has sunk millions into its development and promotion! It is also licensing some of its Newton technology to other companies such as Sharp and Motorola to make Newton the industry standard. Newton comes at a time when parent, Apple Computer is not doing very well. They are suffering financial losses, massive job cuts and a corporate reorganization. AT&T, Casio and Tandy Corp also have similar notepad devices.

- If you **Can't Fight'em, Join'em Department.** IBM will design and market a line of low-cost IBM-clone PCs (called Ambra) via a direct mail subsidiary. IBM wants some of the low-overhead mail order market now dominated by Dell. They will not be IBM labeled.

- The FCC has selected 18 IVDS (**Interactive Video and Data Service**) licensees by lottery - two each in the nation's largest markets. IVDS frequencies provide a return path for interactive TV systems. The next round of IVDS licenses will be awarded under the recently passed spectrum auction law.

- *Prodigy* Information Service and

*WordPerfect* word Processing from your cable company? **Zenith Electronics** has developed a new **"Home-works" computing system.** It allows a cable operator to convert a single 6 MHz TV channel into four separate computer networks. Users simply plug their PC into a \$500 base unit lashed to their cable converter.

- **DBS (Direct Broadcast Satellite) TV service is right around the corner.** Two firms (Hughes DirecTV and Hubbard's USSB) say they will be on the air next Spring. A DBS satellite which will be shared by Hughes and Hubbard is scheduled for launch in December. Both Hughes and Hubbard have moved into new DBS Control Centers in Colorado and Minnesota.


- **The first privatized Commercial Radio Operator examinations administered under the FCC's new COLEM System** took place on Sept. 25th in Irvine, California. *National Radio Examiners*, a division of The W5YI Group, Inc., was the coordinator. Nine applicants were administered the requirements for the General Radiotelephone Operator License (GROL), Elements 1 and 3. Four of the nine passed both examinations and qualified for the GROL. The COLEM (Commercial Operator License Examination Manager) System is the commercial radio counterpart of the amateur service VEC.

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## "THE VERNALL REPORT ON MODERNIZATION OF AMATEUR RADIO..." A perspective from New Zealand

The Vernall Report and an earlier publication, *Morse Testing in the Amateur Service*, are rather interesting and comprehensive studies of amateur radio in New Zealand. The author of these 1993 papers is researcher **R. B. "Bob" Vernall, ZL2CA**, of Wellington. The basic premise of these well documented reports is that ham radio is broken in New Zealand and needs repair. As Bob says, "...the objective ...is to facilitate making several changes to the way that amateur radio is currently administered in New Zealand."

Much of the material contained in these reports applies primarily to New Zealand. But some of the observations and conclusions - particularly in the area of required Morse Code proficiency - is of general interest.

ZL2CA gave us special permission to excerpt from these copyrighted reports which run to nearly forty single-spaced typewritten pages. The very professionally completed examination includes many supporting surveys, charts and appendices. While we have greatly summarized his findings, the words are his own.

### INTRODUCTION

Amateur radio operating privileges are directly related to success in examinations. Relationships between regulations, examination results and resulting operating privileges are the fundamental subject of this report.

The International Radio Regulations define and describe the Amateur Service. Apart from RR2735 (on mandatory Morse code testing), the international regulations governing the amateur service are satisfactory for existing conditions.

**RR2735** "Any person seeking a license to operate the apparatus of an amateur station shall prove that he is able to send correctly by hand and to receive correctly by ear texts in Morse code signals. The administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 30 MHz."

**RR2736** "Administrations shall take such measures as they judge necessary to verify the operational and technical qualifications of any person wishing to operate the apparatus of an amateur station."

**RR2737** "The maximum power of amateur stations shall be fixed by the administrations concerned, having regard to the technical qualifications of the operators and to the conditions under which these stations are to operate."

A dictionary meaning of "verify" is "examine for the purpose of establishing the truth". This is conventionally achieved by conducting formal examinations of

notified subjects, to notified standards. Candidates who pass can then be awarded certificates and seek an appropriate amateur license.

Amateur radio is an international hobby and it would be reasonable to expect international parity of qualifications for given operating privileges. The following tables summarize the examinations and pass marks set in various countries:

[At this point ZL2CA inserts charts showing the amateur classes and examination requirements for New Zealand, Australia, Germany, the United Kingdom, Canada and the United States. All - that is except the United States - have three grades of ham tickets. They require passing written multiple choice examinations on regulations and technical subjects. Each has two Morse Code speeds: a 5-6 words-per-minute level and another at 10-12 wpm. The three grades are essentially (1) Beginning HF (Novice), (2) All amateur privileges (General) and (3) Limited (No-Code VHF) to spectrum above 30 MHz.]

### MORSE CODE POLICIES

This report would be incomplete without dealing with regulatory policies behind mandatory Morse code testing for amateurs to obtain licenses to operate on frequencies below 30 MHz. Just what is the fundamental purpose of RR2735? Genuine purpose has progressively diminished over the years. The [New Zealand] *Minister Of Communications* has already made statements in this regard, of the regulation now being anachronistic.

Some support for mandatory testing within the amateur community is mainly from those who are already qualified. "Closed shop" attitudes are alleged to be the factor leading to apparent exclusivity sought by some amateurs.

While reform is under way to reduce mandatory requirements for Morse code qualifications, there will continue to be a need to offer Morse code tests for those candidates who choose to qualify in what could be regarded as a traditional way.

There is no conflict between simultaneously lobbying for repeal of the mandatory aspect of Morse code testing, while on the other hand being a supporter for Morse code tests to continue to be offered in the syllabus, but with suitable parallel options. The candidates should do the choosing, not the administrators.

Morse code is a useful part of amateur radio, as are various other modes, but there is no longer a need for mode related regulations, nationally or internationally. The future of Morse code in the Amateur Service is with interest groups and not as a regulatory tool.

The future of Morse code tests will ultimately be decided by candidates and not by artificial policies. Amateurs who qualify by other means can learn and use Morse code without needing a certificate of proficiency (they do not need one for any other mode.)

Morse code is over-emphasized as a regulatory component.

## MORSE CODE EXAMINATIONS

Recreational communication generally has no need for word-perfect relay of original text. Overall content and intended meaning of communicated information is more important than perfection of sending or receiving individual characters.

It is inappropriate to test amateur candidates to equivalent standards for commercial radio-relay of messages (such as for a telegram service). Surely the fundamental objective is to test candidates for beginner skills in manual telegraphy techniques actually used within the Amateur Service.

The two established speeds for testing are 6 and 12 words per minute. Reciprocal licensing factors and continuing to match standards used by several other countries means it would be folly to deviate from testing at 6 and 12 wpm. The need for any sending test is questionable, but so is RR2735.

Morse code as a mandatory requirement to access certain frequencies is an increasingly purposeless regulatory tool. However, while RR2735 remains in force, some Morse code proficiency is required to access amateur bands below 30 MHz.

Novice operators [in New Zealand] are required to pass a Morse code test at 6 words per minute to access parts of various bands below 30 MHz. This confirms that 6 wpm is accepted in New Zealand as being minimum but sufficient competency to satisfy the requirements of RR2735. This is also the case in many other countries that have similar Novice qualifications.

Recognizing that 6 wpm satisfies RR2735, it follows that accessing all frequencies below 30 MHz can be achieved within existing regulations, by providing at least one additional qualification requirement. This also forms a compatible platform to progress to future options, when regulations permit, to issue a General Amateur Certificate with no Morse code component. At least two parallel choices need to be offered in the syllabus to achieve full code-less options.

In order to limit overheads for administering separate examinations, use could be made of setting higher pass marks in the likes of the technical examination. A mark of say 85% in the technical examination could be regarded as equivalent attainment to increased proficiency from 6 wpm to 12 wpm in Morse code. Once this parallel option is available, the combination of passing both 6 wpm and attaining 85% in the technical examination could be accepted as equivalent to 12 wpm in obtaining a General [all privilege] Amateur Certificate. As this is within the scope of current regulations, it can be implemented nationally without delay (and if not a full explanation should be given, as conservatism on this type of issue is holding back the modernization of amateur radio).

For HF bands between 5 and 24 MHz, access has to be earned by obtaining additional qualifications. Morse code testing is the traditional way, but by no means the only way possible. Timely repeal of RR2735 will remove regulatory distortions from qualifying requirements to access any amateur band, and qualifications can be expanded to cater for a mixture of circumstances.

The basic method of conducting examinations in regulations and radiotechnology is supported as being fundamentally appropriate for a technical hobby accessing radio spectrum. Amateur operators have the flexibility to select frequencies as required, and use powers that are selected for a range of short to long distance communication. Having personal qualifications that are relevant to the activity is what sets amateur radio aside from other types of radio service.

[We should] Continue with regulatory reform to repeal the mandatory aspect of Morse code testing. When regulations permit [we should] further expand syllabus options so that full operating privileges can be attained with no Morse code component.

## MORSE CODE TESTING

Morse code policies can be a controversial subject. Opinions of amateurs vary depending on individual experience. However, this is no reason to inhibit issues from being discussed. The mandatory aspect of Morse code testing is considered to be the major regulatory issue in amateur radio today. Regulatory practices for amateur radio are basically applications of the international radio regulations, with national interpretation and implementation.

In 1990 the author organized a private petition [survey]. Those with an interest in amateur radio were asked to state their reaction to mandatory Morse code testing. Petition documents were presented to the *Ministry of Commerce*. Summary results are 75.3% in favor of repeal of RR2735, while 24.7 % are in favor of no change.

*New Zealand Association of Radio Transmitters* (NZART) is the only amateur radio society in New Zealand. NZART conducted a multi-question survey of members views on Morse code and statistics were published in their official journal (*Break-In*, 1993, July: 9). The author acknowledges the NZART published information as a source for analyses and findings presented in subsequent sections.

Information on the age profile of amateurs [in New Zealand] can be gained from a published NZART survey (*Break-In*, 1992, October: 16). The sample of age distribution, with age range on the top line and percentage below, is:

16-25	25-35	36-45	46-55	56-65	over 65
1.9%	6.0%	11.6%	20.4%	27.2%	32.9%

Is amateur radio a hobby mainly for older people? What is happening in the younger age range? What

will happen in the future? Why emphasize proficiency with telegraphy in qualifications? What are effective ways to lobby for change? Concern for such issues is a basic stimulus to publish views.

## STATISTICS FROM NZART SURVEY

Development of national policy requires consideration of national factors. The following table lists ...national totals for each category of license (national data supplied by MOC [Ministry of Commerce,] as at 2 July 1993). The right hand column shows survey returns as a percentage of the national number for each category of license:

Category	NZART Returns	Total Licenses	% Returns National
General [All band]	710	4097	17.3%
Limited/Novice [VHF]	29	75	38.7%
Limited (No code)	181	2111	8.6%
Novice [HF]	4	41	9.8%

In terms of numbers involved, overall statistics are dominated by general [all privilege] and limited (no-code VHF) licensees, both in the survey as well as nationally. Comparison of tabled figures shows the NZART survey under-represents limited licensees relative to national totals. To compensate, NZART results have been scaled to estimate national results.

NZART respondents with general or limited licenses are considered to be of sufficient numbers and be typical enough to be able to project the results into the overall amateur population.

## ANALYSIS NZART SURVEY QUESTIONS

**Question 1** "I am happy with [NAZRT] Council's actions on Morse code: Definitely, Supportive or Disagree".

Definitely	Supportive	Disagree	Unknown
17%	45%	28%	9%

**Question 2** "In my opinion competency in Morse code for full privileges is: Essential, Desirable or Unnecessary".

Essential	Desirable	Unnecessary	Unknown
28%	42%	30%	0%

Combined returns of answers indicate whether or not amateurs themselves would be comfortable with regulatory change. It is obvious from these results that they reflect some opposing views:

- 62% of limited respondents, none of whom have passed a Morse test, regard proficiency in Morse code to be unnecessary for full privileges.
- General [all band] respondents, all whom have passed a Morse test, generally support the requirement (38% for essential, 49% for desirable).

Passing a Morse test appears to polarize amateurs in their viewpoint of qualifying requirements. It would be easy to endorse conservatism by adding the "desir-

able" to "essential" and claim that some 70% of amateurs support continuance of the existing regulation. On the other hand, a result with only 28% of amateurs for "essential" could hardly be regarded a "foundation of rock" on which to build international rule making.

**Question 3** "In my opinion other tests should be available parallel to Morse: Essential, Desirable, Acceptable, Perhaps or Unacceptable".

Essential	Desirable	Acceptable	Perhaps	Unacceptable	Unknown
10%	18%	14%	30%	21%	4%

Results of Question 3 show quite a wide spread of views on the emphasis of having parallel tests. The spread occurred in each category of respondents. While there is a spread in Question 3 results, it is also apparent that only 21% find that the possibility of parallel tests are unacceptable.

**Question 4** "If the general [all privilege] license is to continue to require Morse code proficiency the minimum standard should be: 15 wpm, 12 wpm, 10 wpm, 6 wpm or other".

15 wpm	12 wpm	10 wpm	6 wpm	Other	Unknown
5%	52%	22%	14%	3%	3%

The question clearly asks about a minimum standard, and it would seem that only a few respondents considered the possibility of having some combination of tests. Instead, these results appear to be reflecting respondents understanding of the existing syllabus and traditional 12 wpm standard rather than providing views on variations or alternatives to the current syllabus.

**Question 5** "In my opinion NZART should seek abandonment of the CW test: Now, In 5 years, In 10 years, When Possible or Never".

Now	In 5 Years	In 10 Years	When Possible	Never	Unknown
17%	2%	1%	27%	48%	2%

If there is any indicator, it once again demonstrates polarization. The highest component (38%) from Limited [no-code VHF] respondents is for immediate abandonment, yet the highest component (63%) from General [all privilege] respondents is for never abandoning the test in Morse code.

**Question 6** "We should have an HF no-code license even if this means isolating ourselves from world standards: Immediately, Very soon, When We Can, Perhaps or Never".

Immediately	Very Soon	When We Can	Perhaps	Never	Unknown
9%	6%	9%	16%	58%	1%

There is clear support to "never isolate" from world standards. In any event, the Minister has indicated in a statement made since the survey that New Zealand will abide by the regulations agreed to in [WARC] 1979, while that treaty is in force.

**Question 7** "I think Morse is an important mode that should be encouraged even if it is not needed to obtain a license: Definitely, Neutral or Opposed".

Definitely	Neutral	Opposed	Unknown
72%	20%	4%	2%

Morse code is viewed as being an important mode



that should be encouraged, even if it is not needed to obtain a license. Substituting "Morse" in the question with a number of topics, such as "keeping up with technology" or "good operating procedures", would draw similar support. Amateur radio has many facets and natural interest will ultimately determine what the future holds.

It seems that CW interest groups will be well supported even in a future when Morse code is no longer sheltered by regulatory factors. Such survival on merit is a good sign, for any aspect of amateur radio. Nobody needs heavy handed regulations when voluntary support is willing and able.

Emotion, prejudice and polarization are factors in the survey results. In other words, some irrational response is inevitable to questions on Morse code, especially from those who have already passed a test.

The principle of an "exclusivity filter" is suggested as an appropriate explanation. Many fully qualified amateurs appear to seek some kind of endorsement of exclusivity or elitism by supporting retention of Morse code proficiency as a mandatory qualifying requirement. This exclusivity preference could be fostered by any of several factors, such as:

- a belief that CW is the best way to communicate
- inflexible attitude, "I did it so you can too!"
- military experiences
- being employed as a telegraphist, past or present
- discrimination, that you are not a "real ham" until you know CW
- selfishness, seeking to limit participating numbers
- lack of appreciation of changing technology and circumstances, 1990s style
- as an artificial way of inducing a supply of CW operators

If this "exclusivity filter" is a viable explanation, then conducting a survey within a group dominated by fully qualified amateurs could be expected to result in a reinforcement of conservatism. ...75.4% of all respondents to the NZART survey are from General [all privilege] licensees. On the other hand, the 1990 private petition was conducted over a wider interest group and gave clear majority favoring repeal of the international regulation.

An exclusivity filter of course only functions effectively within the control of an exclusive group. As long as such a group can continue to exclude the influence of others, then it continues to operate within the rules of agreed exclusivity. This is more commonly known as a "closed shop". Exclusivity practices may also appear elsewhere in the community, such as in a regulated occupation.

It would appear to be reasonable to put this suggested exclusivity filter to the test, by requesting administrations to also seek views outside of amateur societies, such as from the radio and telecommunications

industry, who employ would-be-amateurs, so as to add breadth to policies for the administration of amateur radio.

## CONSERVATISM VERSUS DEVELOPMENT

Age distribution information shows the average age of amateurs in New Zealand is around 60, and there is only a small minority of young amateurs.

A list of published contestants in a recent CW contest was checked from call sign information to seek stated occupation in the 1993 Electoral Roll. This confirmed that some 58% were "retired", and it is unknown how many were near retirement (in New Zealand retired usually means aged 65 or over). As best as could be determined, no young amateurs entered the contest, yet young amateurs are known to enter many other contests.

This information supports the allegation that most interest in CW operation is with the older age group. From general discussion with amateurs, it is also a reasonable assumption that greatest support to continue with mandatory Morse code testing comes from the older age group.

Policies that are generally supported by older amateurs but generally rejected by the young are not likely to be ones for productive future development. For how many years will recruitment make up for attrition? Why can't we attract more youth? In New Zealand, some 2% of all amateurs are aged 25 or less, yet the number of computer enthusiasts aged 25 or less is likely to exceed the total number of amateurs for all ages (and by several times.)

Are amateur radio policies in need of adjustment? Future recruitment is more likely to be linked to technology and computing interests than a natural interest in using CW. There is no need to distort the level playing field with artificial factors that are not supported by the bulk of candidates pursuing amateur radio qualifications.

Other amateurs have been heard to allege "that there are too many bald heads and hearing aids" in influential positions. While such allegations may be rather brave, they may also have some truth.

Telecommunications technology has been developing at an increasing rate in recent years. Widespread deregulation of administrative arrangements has given further stimulation to development of radio technology. We now have general community acceptance of mobile cell phones and personal communication services (PCS) by radio. PCS is growing rapidly and there are even plans for future systems to be supported by low Earth orbit satellites.

An increasing percentage of the public (many more times than the amateur population) will use portable two-way telephone systems, with sophisticated voice, data and even video features. A credibility gulf will develop between the real world and the amateur

world, and end up being to the detriment of amateur radio.

The present image of amateur radio candidates being required to pass one or more tests in Morse code to progress to greater operating privileges is already laughable outside amateur circles, and will become increasingly so. Yuppie telephones and commercial services have captured a better technology image than amateur radio. Some years ago it was the reverse, where a local amateur was often regarded as being a technical guru on radio and electronic matters.

Just what is the purpose in requiring prior training in telegraphy to access certain frequency bands? The radio industry places little or no importance on manual telegraphy techniques these days. Even the maritime service, once a classic for safety of life based on CW proficiency, no longer has a use for CW in the new *Global Maritime Distress And Safety System* (GMDSS), which is already being phased into service in many countries. GMDSS distress frequencies will be monitored for digital selective calls on robot-like receiving stations, with tireless automated operation, despite the static. That is what the maritime industry wants.

## CONCLUSION

Amateurs can communicate on any band without using manual telegraphy, or the need to have any CW proficiency. Internationally endorsed amateur band plans all allow for a selection of modes. But if individuals choose to use CW, they can, just as they can choose other modes (that are within the scope of each license).

There are some fundamental philosophical issues to address as to what amateur radio is all about in a changing world. Amateur radio ranges from experimental communications to recreational activities. It is also recognized as a training ground for future technologists, and national economies can be influenced by knowledge and practical skills in technology and communication. Data communications is a case in point and HF data communications is an interesting and challenging subject.

It would be a worthwhile task to survey new amateurs to find what attracted them to amateur radio. This could be part of overall strategic development to assess what individuals seek to achieve by participating in amateur radio. In turn this information can be used to optimize recruitment campaigns.

There is a very great difference between lobbying for repeal of a regulation and having any objection to individual choice to the use of CW. Anyone is free to learn, use or revisit CW. There is no intention to oppose use of CW in amateur bands. There is a future for CW in the amateur service, fostered by interest groups and without regulatory shelter.

All amateur radio activities require access to spectrum. Few amateur radio activities require proficiency

with Morse code. It is irrational to associate accessing certain frequencies with compulsory proficiency in one specific mode of communication.

The development of international regulation RR2735 appears to have a curious formulation. Successive versions of this regulation have required amateurs to be proficient in Morse code to obtain full privileges for operation below a specified frequency. The first generation of this regulation specified a waiver frequency of 1000 MHz, then in 1959 it was amended to a waiver frequency of 144 MHz and again in 1979 amended to a waiver frequency of 30 MHz.

There are no technical or physical factors that logically associate telegraphy techniques with a frequency limit, yet this is being attempted by the regulation. Not one of several other radio services attempts to use this curious formulation, let alone dabble with the composition. It would appear that exclusivity is the basic administrative intention, even if the formulation itself is irrational.

An indication of instability in the formulation of RR2735 is that former versions were amended at every available opportunity that an international conference was convened for making general changes to international regulations.

Amateur radio is acknowledged as being useful for low cost hands-on training that has spin-off benefits for industry. Therefore it is entirely reasonable for administrations to survey the radio manufacturers and radiocommunications service providers for views on amateur regulations and examination syllabus. This is one practical way of expanding the coverage of views beyond the circle of exclusivity that may be echoed within some amateur radio societies.

The longer term future of amateur radio is vitally dependent on future recruitment but not so vitally dependent on the beliefs of older aged amateurs. Administrations should also include coverage of youth, such as by surveying views on amateur radio at schools and computer clubs.

There are many possible topics, such as international call sign prefixes, that are also relevant to amateur radio and could easily be incorporated as one of several parallel options for full qualifications. Amateur radio surely must place some value on recruiting members with specialist skills in the likes of advanced mathematics, software engineering, digital modulation techniques or satellite technology (and others). Why can't defined external qualifications be accepted as having equivalence to some or all of the amateur examinations? Is it not desirable to attract a rich mixture of knowledge and skills into amateur radio? Does a telegraphy apprenticeship attract the same richness?

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