



Electronic Communications Committee (ECC)
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A RADIO AMATEUR ENTRY LEVEL EXAMINATION AND LICENCE

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A radio amateur entry level examination and licence

1 PURPOSE OF THIS REPORT

Two Radio Amateur Examination levels have been described by CEPT Recommendation T/R 61-02 and the ERC Report 32 (HAREC and NOVICE). This report describes a third level, the ENTRY-CLASS, an examination syllabus and its administration. Administrations are not required to implement all of the levels. Depending on national circumstances administrations may decide to make use of one, two or all three levels.

2 INTRODUCTION

The ITU Radio Regulations (Article 25) covers the Radio Amateur Service and the Radio Amateur Satellite Service and confirmed its role at the WRC 2003.

The CEPT Recommendations, T/R 61-01 and T/R 61-02, make it possible for CEPT administrations and administrations not being members of CEPT, accepting the provisions of these Recommendation, to facilitate the licencing of radio amateurs who move between participating countries either for short or long stays. T/R 61-02 makes it possible for CEPT administrations and administrations not being members of CEPT, accepting the provisions of these Recommendation, to issue a Harmonised Amateur Radio Examination Certificate (HAREC), which has encouraged similar radio amateur standards and privileges in CEPT and non-CEPT countries. The development of CEPT Recommendations T/R 61-01 and T/R 61-02 was possible because national amateur licences and the national amateur examinations in the CEPT member countries were based on similar starting points. These arrangements have also been extended to the NOVICE-CLASS of Amateur licence through ECC Recommendation 05-06 and ERC Report 32.

Due to the time required for individuals to attain the high technical level of the theory in the HAREC and NOVICE syllabuses, it has been suggested by the International Amateur Radio Union (IARU) that a lower level examination suitable for an amateur radio 'Entry Level' class licence be introduced. Several administrations wish to establish or are establishing such a licence class.

3 LICENCE STRUCTURE

The three licence levels, HAREC, Novice and Entry Level, and their relation to each other, have been reviewed. It is the intention that the two lower levels and their associated operating privileges encourage progression to HAREC, the highest level. Individuals may choose to take examinations at any of the three levels according to national examination arrangements.

The general characteristics of the three examination syllabi are:-

Entry Level: Practical and basic communication techniques and use of equipment together with relevant national and international operating regulations should be covered. The objective being to ensure that the operator should not cause problems to other spectrum users.

Novice: A higher level of understanding of communications technologies and including more detailed regulations and e.m.c. issues as defined in ERC Report 32.

HAREC: All relevant amateur radio regulations, communication technologies and operating procedures as defined in T/R 6102 (HAREC).

The general characteristics of the associated privileges are:-

Entry level licence: Restricted access to spectrum with limited power levels. Essentially a national licence with privileges to suit the local environment. For using of amateur radio station outside native country it is necessary to apply for a licence if bilateral agreements between countries do not foresee some simplified procedure. Limits may be placed on home constructed transmitters.

Novice licence: Wider spectrum access and higher power permitted than with an Entry Level licence. Consistent with the privileges of ECC/REC(05)06 for temporary operation outside native country.

HAREC based licence: Access to all amateur allocations and techniques authorised in the respective country, internationally recognised through T/R 61-02 and fully consistent with the privileges of T/R 61-01 for temporary operation outside native country.

Administrations should ensure that the privileges accorded to Entry Level encourage progression to higher licence levels.

4 BACKGROUND

The argument to initiate a Radio Amateur Entry Level Class can be made with the following target groups in mind:

- For young people with a technical interest;
- For candidates who do not have the educational background to cope with the higher examination levels at the start;
- Older or retired people with an interest in radio communications.

Amateur radio has a role in raising and confirming an individual's longer-term interest in science and engineering. Individuals make decisions about studies which interest them very early in their life. Interesting the young should be a key objective of any new licence. To be effective a new Entry Level should appeal to young people. This represents the balance between them having appreciated sufficient background in basic subjects and the technical requirements of this class. These aspects have a material impact on the way an Entry Level is devised.

The Entry Level should permit all of the target groups to gain experience with

- radio operating practice,
- antenna experiments,
- anomalous propagation modes,
- digital transmission modes in combination with computer techniques,

amongst others. It is also desirable that they are open to gain some experience of practical construction of electronics. At the same time once amateurs have gained an Entry Level licence then it is expected that they will wish to advance to higher licence classes corresponding to CEPT examination levels described by Recommendation T/R 61-02 or ERC Report 32.

5 PRINCIPLES

5.1 Approach

Presently, to obtain an amateur radio licence (or in some countries a certificate), candidates attend a theoretical course, often part time, given by instructors from local amateur radio clubs. An examination is then taken, often undertaken by the national Administration or by an agent on their behalf. This process may take up to one year and during this time often no real practical experience of amateur radio is gained since the candidate is not active 'on the air' and neither is any training given in such aspects.

This is too long. The elapsed time from declaration of interest to obtaining a radio amateur licence should be a few weeks or months at most. It should take a short time to obtain an Entry Level licence. The intention is to get newcomers involved quickly to build up their interest.

The Entry Level course and examination should be much shorter, less theoretical and include a practically oriented, radio operating training such that the candidate will be a 'safe' operator. 'Safe' means that the licence holder will understand the regulations and technical requirements which protect other users of the radio spectrum, and be aware of amateur radio best practice.

Self-education will then be encouraged through operating privileges and peer pressure so that the individual can reach higher levels of understanding typified by NOVICE or HAREC.

The approach adopted should take the form of a training course with inbuilt assessment. Courses would last a few weeks with a final examination of the theoretical and regulatory aspects at the end.

5.2 Suggested Syllabus for Radio Amateur Entry Level Course and Examination

This syllabus has been produced for the **guidance** of administrations so that they may prepare their national amateur radio courses and examinations for their Entry Level licence. The syllabus has two parts, practical operating aspects covered in the first section below, and, technical and regulation aspects covered in the second section. The assessment of the practical part may be undertaken during the training course or in a practical or written examination.

The scope of the course is limited to subjects relevant to tests and experiments with amateur stations conducted by radio amateurs. These include circuits and their diagrams; questions may relate to circuits using both integrated circuits and discrete components.

- a) Where *quantities* are referred to, candidates should know the *units* in which these quantities are expressed, as well as the generally used multiples and sub-multiples of these units.
- b) Candidates must be familiar with the compound of the symbols.
- c) Candidates must know the following mathematical concepts and operations:
 - Adding, subtracting, multiplying and dividing;
 - Fractions.

The detailed topics to be included are shown here.

1. Practical Operating Aspects

- a. Familiarisation with the controls of a receiver, transmitter or transceiver
 - i. Power On/Off, band switch, frequency tuning and display, volume, power level and display, microphone gain etc.
- b. HF operation
 - i. Tuning in USB and LSB,
 - ii. Making initial calls, calling CQ,
 - iii. Ability to make a contact(s) in the accepted format, signal reports, name and station information etc. thus demonstrating how the equipment is used.
- c. VHF operation
 - i. Ability to make a contact(s) as above for HF
 - ii. FM operation
 - iii. Operation through a repeater
- d. Need for a log book and the information to be recorded there.
- e. Demonstrate understanding of antennas matching and the use of SWR meter.
 - i. Understand the importance of correct matching
 - ii. Ability to use the Standing Wave Meter and an Antenna Tuner to match an antenna to a transmitter.
 - iii. Fitting a coaxial connector
- f. Use the phonetic alphabet and common amateur vocabulary as necessary in b) and c).
- g. IARU and National Amateur band plans
 - i. Need for international co-operation on the use of spectrum
 - ii. Interpretation of the IARU and National Amateur band plan tables.
 - iii. Other users of the radio spectrum

2. Technical Content

- a. Basics
 - i. Units and symbols
 - ii. Electrical circuits
 - iii. Power and resistance
 - iv. Ohms Law
 - v. Alternating currents and voltages
 - vi. Frequency and wavelength
- b. Transmitters
 - i. Block diagram of a simple transmitters
 - ii. Modulation types

- c. Receivers
 - i. Simple receiver and detector
- d. Feeders and Antennas
 - i. Feeders, coaxial and suitable plugs
 - ii. Antenna types, dipole, ground plane, end fed wire
 - iii. Antenna matching
 - iv. Antenna Tuning Unit
 - v. Standing waves and SWR meters, radiated power and e.i.r.p.
 - vi. Dummy loads
- e. Propagation
 - i. Wave propagation
 - ii. Range
 - iii. Ionosphere
 - iv. Daily changes in propagation
- f. Electromagnetic Compatibility
 - i. Causes of interference
 - ii. Minimising the problems
 - iii. Earthing, antenna types
 - iv. Power and emission types
 - v. Immunity
 - vi. Social aspects
 - vii. Sources of assistance
- g. Safety Considerations
 - i. High voltages and currents
 - ii. Mains plugs and earthing
 - iii. Accidents
 - iv. Antenna location
 - v. Batteries
 - vi. General shock hazards
- h. Licence Conditions and Spectrum permitted
 - i. Non Commercial and for self training in radio communications
 - ii. Types of licence
 - iii. Format of call signs
 - iv. Requirements for station identification
 - v. Only for communications with other radio amateurs
 - vi. No secret codes to obscure meaning
 - vii. Broadcasting and transmission of music not permitted
 - viii. Licence is personal
 - ix. Change of address requirements
 - x. Right of inspection

5.3 Operating Privileges

Entry Level licencees must have sufficient spectrum and operating privileges so that they can communicate with and learn from, the wider radio amateur community.

The privileges of an Entry Level licence are to be determined by national administrations taking into consideration local conditions and regulations.

Administrations might note that to be effective an Entry Level licence should offer:-

- Spectrum: Access to HF frequencies is crucial to the success of the entry-level licence.
- Transmission modes: All types of modes should be encouraged.
- Power: Levels should be set to avoid EMC issues but permit wide area radio communication to take place.

Spectrum and power should be set to encourage progression to higher classes.

Administrations may limit the possibility of ENTRY-LEVEL Amateurs using transmitters constructed by themselves.

To permit ready identification of the Entry Level operator, administrations may use a separate call-sign series.

5.4 Organisation

The Entry Level syllabus, training course and examinations raises a number of issues which administrations may need to consider: -

- The provision of courses and examination may require a partnership with the amateur radio society who may be asked to lead in the provision of courses and examinations, etc.
- Instructors and Examiners. These need to be properly accredited for quality control purposes. A register of instructors and examiners may be required. Provision may need to be made for the formal training of instructors and examiners to ensure thorough understanding and compliance with the syllabus.
- Quality Control is required to manage the question banks and to ensure that the examinations are being conducted fairly and in accordance with national regulations. This would be the same as is undertaken in national education systems.
- With a heavy emphasis placed on practical operating skills, then most of the practical course and associated tests may need to be undertaken in radio clubs. Approved premises might be required.
- Question Banks. For the theory examination, some administrations already use multiple choice question papers computer generated from agreed question banks. There is considerable scope for automation to reduce administration costs. Administrations are recommended to exchange information on national question banks.

6 CONCLUSION

This report summarises some of the main issues which will need to be considered by administrations who are planning the introduction of an Entry Level Radio Amateur Licence. A suitable syllabus for the practical and theoretical parts of the course is proposed. Comments on licence privileges and the organisation of course and examination are also included.