Amateur Radio Orientation Seminar

Element II – Rules and Regulations

RA 3846 – Radio Control Law

- National Telecommunications Commission (NTC) government agency is responsible for the regulation of the amateur radio service
- MC 03-08-2012 Revised Amateur Radio Rules and Regulations

- <u>Amateur Fixed Station</u>—installed at a specified and fixed location
- Amateur Mobile Station –installed onboard a vehicle or vessel and intended to be used while in motion or during halts at unspecified points.
- <u>Amateur Portable Station</u> an amateur radio station intended to be used for operation during temporary halts or while in motion.
- Amateur Radio Communications telecommunications by means of radio waves conducted by or among duly authorized amateur operators on a non-commercial basis.

- Amateur Radio Service A radio communications service for the purpose of self-training, intercommunication, and technical investigations carried out by amateurs.
- Amateur Radio Station License (ARSL) a license or written authority to own and operate amateur radio, issued to a qualified person who has passed an appropriate amateur examination, for the period specified.
- Amateur Satellite Service A radio communication service using space stations and earth satellites for the same purposes as those of the Amateur Radio Service

- <u>Club Station License</u> a license issued in favor of a club, society, or association who has at least twenty-five (25) licensed RAOs and/or RALs and a designated trustee
- <u>Radio</u> applied to the use of radio waves.
- Radio Amateur Licensee (RAL) an amateur with a valid ARSL
- Radio Amateur Operator (RAO) A person with a valid RAOC who is interested in radio technique solely with a personal aim to operate an amateur station and without pecuniary interest

- Radio Amateur Operator Certificate (RAOC) a certificate or written authority to operate amateur radio, issued to a qualified person who has passed an appropriate amateur examination, for the period specified.
- Radio Apparatus a reasonably complete and sufficient combination of distinct radio equipment intended for and capable of being used either for transmission or reception of radio signals or both.

- Radio Station One or more transmitters, receivers, or combination of transmitters and receivers at a location for carrying on radio communication
- Repeater Station an unmanned fixed station that receives a signal on one frequency and automatically re-transmits the same signal on another frequency.
- <u>Telecommunications</u> Any transmission, emission, or reception of signs, signal, writings, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.

- Classes of Amateurs
 - ♣A Extra Class
 - ✤B General Class
 - C Technician Class
 - ✤D Foundation Class

Each class has a specific band privileges and maximum power output defined by the NTC

- Amateur Call Sign—The NTC shall grant a *unique amateur call sign* to the applicant who:
 - 1. successfully passes the amateur radio exams
 - 2. meets the minimum conditions for the grant of license
- Effectivity of the Licenses or Certificates –shall be valid for a minimum of one (1) year with the expiration date falling on the licensee's birth date.

✤Lifetime or permanent ARSL shall be valid for the lifetime of the licensee.

- Renewal of License or Certificate A license or certificate without changes in any of its particulars may be renewed provided that the application for renewal has been filed with the NTC at least thirty (30) days before the date of expiration of the license or certificate.
 - \circ If license or certificate is expired less than two (2) years:
 - Pay arrears equivalent to the license fee for every year or a fraction of a year that the license was expired.
 - A penalty equivalent to the annual license fee shall likewise be charged for every year or a fraction of a year that the license has expired.

Renewal of License or Certificate

- If license or certificate expired more than two (2) years, but less than 5 years:
 - Pay arrears equivalent to the license fee for every year or a fraction of a year that the license was expired.
 - A penalty equivalent to the annual license fee shall likewise be charged for every year or a fraction of a year that the license has expired.
 - Applicant will be assigned a different call sign from that previously issued to him if it is no longer available for assignment.

Renewal of License or Certificate

- \circ If license or certificate expired 5 years or more:
 - Pay arrears equivalent to the license fee for every year or a fraction of a year that the license was expired.
 - A penalty equivalent to the annual license fee shall likewise be charged for every year or a fraction of a year that the license has expired.
 - Applicant will be assigned a different call sign from that previously issued to him if it is no longer available for assignment.
 - Applicant shall be required to attend a seminar on current Radio Laws and Radio Ethics with the national amateur radio organization

Modification of License shall be filed with the NTC for:

- $_{\odot}$ Upgrading to a higher class of license
- $_{\rm O}$ Change of name
- $_{\odot}$ Transfer of location of the fixed station
- Addition/deletion of transceiver
- Duplicate License or Certificate A license or certificate which has been lost, mutilated, or destroyed shall be reported immediately and an application for a duplicate copy be filed with the NTC. If the original license or certificate is later found, the duplicate shall be returned immediately to the NTC.

MC 03-08-2012: Sec. III – Technical Regulations

- Authorized Frequencies (https://www.para.org.ph/frequencyallocations.html)
- Stations operating on frequency bands allocated on a secondary basis shall not cause harmful interference to stations authorized to operate in the band of a primary service. Example: 420.000 - 440.000 MHz Secondary

MC 03-08-2012: Sec. III – Technical Regulations

Class	HF		VHF	UHF
	CW	SSB		
Α	1 KW	2 KW	STATE OF THE ART	
В	500 W	1 KW	STATE OF THE ART	
С	100 W	200 W	100 W	
D	-	- 1	100 W	3. 144 1 1 4

MC 03-08-2012: Sec. III – Technical Regulations

Emergency Channel : 145.000 MHz (+/- 25 KHz)

- > Also used for general calling for radiotelephony (voice)
- > All transmissions shall be kept to a minimum and shall not exceed one minute
- A station should listen on this frequency for a reasonable period to make sure that no distress traffic is being sent

Distress Communications: Distress Call

- 1. The distress signal MAYDAY spoken three (3) times
- 2. The words THIS IS (DELTA ECHO in case of language difficulties).

MC 03-08-2012: Sec. IV – Amateur Radio Exams

Applicant must submit application with the NTC

General Qualifications

- 1. Filipino citizen, or a citizen of other countries that provide the same privilege extended to Filipino nationals in their country.
- 2. At least twelve (12) years old for Class A, B, and C. At least nine (9) years old for Class D, with parental consent.
- 3. Able to transmit and/or receive messages either in Filipino, English, or any of the Philippine languages.

MC 03-08-2012: Sec. IV – Amateur Radio Exams

Examination Coverage

Element I - Morse Code Element II - Rules and Regulations Element III - Fundamentals of Electronics and Electricity Element IV - Amateur Radio Practice Element V - Signals, Frequencies, and Emission Element VI - Circuit Components Element VII - Operating Procedures Element VIII - Practical Circuits Element IX - Antennas and Transmission Lines Element X - Radio Wave Propagation

MC 03-08-2012: Sec. IV – Amateur Radio Exams

Written Examination

- Average of 70% to pass the written examination required for a class of amateur license
- No rating of less than 50% is received for any of the prescribed elements
- If a candidate for Class C fails in Elements III or IV, but passes Element II, he shall be eligible for a Class D License.
- Special Candidates qualified to hold an amateur Class "B" provided he shall pass the examination for Element II
 - Registered ECE, commercial first radiotelephone operator, or first- or secondclass commercial radiotelegraph radio operator

- 1. A valid license/certificate
- 2. Transmission must be in *plain language* (English, Filipino, or any Philippine dialects). Q codes *may* be used in voice communication.
- An amateur shall not transmit messages or signals containing music, profane or indecent words or language, or communications intended to facilitate a criminal act.
- 4. Transmissions shall be identified through the use of call signs. The amateur is encouraged to identify itself with its call sign at least once every ten minutes of transmission.

- 5. The call sign(s) of a licensee shall be displayed conspicuously at the authorized location of the station or on the equipment itself if it is a portable station.
- 6. All transmissions with false or misleading identification are prohibited.
- 7. Communications with amateur stations of other countries shall be made in plain language and shall be limited to messages of a technical nature relating to testing and personal remarks
- 8. The amateur shall operate within the privileges allowed in the station license granted to him.
- 9. The license must be posted in a conspicuous place in the radio station or a certified copy thereof be carried by the amateur.

10. The amateur may permit any person to transmit by voice provided:

- a. He directly controls the entire operation in accordance with the proper amateur practice
- b. Only the call sign of the licensee is used to identify the transmission.
- 11. Amateurs shall not receive, levy, or collect a toll fee or other remuneration for a service or services performed by his station.

- 12. Amateurs shall take great effort to regulate and control the use of any channel in the authorized frequency band/s in order to prevent harmful interference to other existing radio communications.
 - a. No harmonics, key clicks and other forms of unwanted signals.
 - Intentional jamming is strictly prohibited, and it shall be a ground for suspension and/or revocation of the license or certificate after due process, or for those who are not licensed, it may be a bar to the issuance of any license or certificate.
- 13. It is absolutely forbidden for amateurs to use their facilities for transmitting music and commercial messages or signals.

- 14. The radio frequencies allocated for amateur stations shall be used strictly in accordance with the class of the operating stations.
- 15. An amateur shall *cease operation immediately* upon knowing that his station is causing harmful interference to the operation of any existing licensed station.
- 16. If harmful interference is being caused by an amateur radio station, the NTC shall take appropriate steps as it may deem proper for the prevention of further interference either by:
 - a. Limiting the power of the station
 - b. Limiting the working hours of the stations
 - c. If necessary, by suspending its operation pending a satisfactory adjustment of the equipment.
 - d. In the event of continued interference, the NTC may order the temporary closure of the interfering station.

- 17. The power output of the equipment shall not exceed the limit prescribed for the particular class of station.
- 18. In radioteletype transmission, the frequency shift shall not exceed 850 hertz. The simultaneous transmission of sound and picture (Amateur Television) on all frequencies above 50 MHz is allowed provided such operation shall be covered by a specific authorization from the NTC.

20. Broadcasting of information intended solely for licensed amateurs as defined under these regulations is authorized within the radio frequency bands allocated for the Amateur Radio Service. *Rebroadcast of radio or television programs originally intended for the entertainment of the general public is not allowed.*

MC 03-08-2012: Sec. IX – Amateur Radio Districts

DISTRICT NO. 1

- National Capital Region (NCR)
- CALABARZON (IV-A)
- MIMAROPA (IV-B)

DISTRICT NO. 2

- Ilocos Region (I)
- Cagayan Valley Region (II)
- Cordillera Autonomous Region (CAR)
- DISTRICT NO. 3
 - Central Luzon (III)

DISTRICT NO. 4

• Bicol Region (V)

DISTRICT NO. 5

• Eastern Visayas (VIII)

DISTRICT NO. 6

• Western Visayas (VI)

DISTRICT NO. 7

• Central Visayas (VII)

DISTRICT NO. 8

- Zamboanga Peninsula (IX)
- Northern Mindanao (X)
- SOCCSKSARGEN (XII)

DISTRICT NO. 9

- Davao Region (XI)
- CARAGA (XIII)
- ARMM

23. Portable or mobile operation

a. Portable or mobile operation must be identified in radiotelephony by the call sign of the station suffixed by the word "portable" or "mobile" followed by the number of the district in which the operation is taking place, if different from the licensee's district. For example:

"DU9RG portable 8" -> DU9RG is operating portable in District 8 "DV2JJT mobile 9" -> DV2JJT is operating mobile in District 9 "DW3ABC portable" -> DW3ABC is operating portable in District 3 "DY1XYZ mobile" -> DY1XYZ is operating mobile in District 1

- b. Portable operation must not exceed one (1) month in any other area without obtaining a specific authority for continued operation
 - i. If the operation will exceed four (4) months continuously in that location, a modification of the station license must be applied for.

23. Portable or mobile operation

- c. The licensee shall make available the portable or mobile equipment of the station for inspection upon reasonable request of the NTC authorized representative.
- d. The licensee of a portable or mobile station may also communicate with his own fixed station provided that said fixed station is *manned by another duly licensed amateur* and identified with the use of the authorized call sign of that fixed station. For example:

"DU1ER portable 3 <==> DU1ER"

"DV4MMB mobile <==> DV4MMB"

24. Amateurs being at the forefront of technology and experimentation *may use the latest technology to enhance their hobby*. This includes, but is not limited to, the use of amateur satellites and the internet within the limits of the law.

MC 03-08-2012: Sec. VI – Sale, Importation, and Use of Amateur Radio Transceivers

- Only NTC accredited radio dealers shall be allowed to sell and import amateur transceivers.
- Licensed amateurs may sell and transfer transceivers previously licensed/registered under his name to another licensed amateur provided that the latter has secured an appropriate permit to purchase.
- Licensed amateurs may import equipment for personal use upon securing the proper permit from the NTC and the payment of the appropriate Customs duties.

MC 03-08-2012: Sec. VII – Installation and Operation of Repeaters

- Only duly recognized amateur associations, clubs, societies or schools are allowed to install/operate a repeater.
- The amateur shall operate the repeaters properly on a noninterference basis. In cases of interference to and between repeaters, the national amateur radio organization may be called by the NTC to mediate and arbitrate.
- A repeater license, which is separate from the ARSL or club station license, shall be issued in favor of a club or association.

MC 03-08-2012: Sec. VIII – Amateur Organization

- An amateur organization, club, society, organized under Philippine Laws and having a minimum membership of twenty-five (25) duly licensed amateur radio operator may be accredited by NTC and granted permission to operate a club station.
- An applicant organization shall execute a Memorandum of Agreement with the NTC. The MoA shall indicate the conditions under which the applicant organization may be accredited.
- The Philippine Amateur Radio Association (PARA) is the only recognized national society of amateurs.

MC 03-08-2012: Sec. VIII – Amateur Organization

- The NTC may authorize an accredited amateur club or association to establish and operate an amateur fixed station (Club Station)
 - o The station license shall be issued only to a trustee designated by the club
 - Club Trustee must be:
 - ✓ Class "A" member of the club
 - \checkmark With a valid ARSL
 - ✓ Has been licensed as Class "A" for at least five (5) years
 - $_{\odot}$ The trustee shall be responsible for the correct and proper operation of the station
 - The trustee may allow amateurs of lower classes to operate the station provided that the same shall be done under his direct supervision only.

MC 03-08-2012: Sec. XI – Grounds for Revocation of RSL/ROC/Permit

- A license or certificate issued under these regulations may be revoked or suspended, after due notice and hearing is afforded to the amateur or trustee for the following acts:
 - 1. Violation of any provisions of the Radio Control Act 3846 concerning the amateur radio service
 - 2. Making any false statement in the application for license and/or operator certificate or any report required to be submitted under these regulations.
 - 3. Failure to comply with any of the conditions under which a license is issued.
 - 4. Intentional harmful interfering or jamming of licensed radio stations.

Office Order 108-12-2012

- Guidelines in the Assignment of Call Sign in the Amateur Radio Service
 - DU, 4F Extra Class (A)
 - DV General Class (B)
 - DW Technician Class (C)
 - DY Foundation Class (D)
 - DX or DZ Club station, DXpeditions, Special Events
Office Order 108-12-2012

Formation of Call Sign



Note: Suffix shall be a minimum of 2 characters, maximum of 3, for individuals. Club stations may have 1 to 3 characters for their suffix. Suffixes will also be serialized.

Office Order 108-12-2012

 The suffix of a call sign shall be reserved for upgrading to higher license class. For example:

DY3BBB ==> DW3BBB, DV3BBB, DU3BBB/4F3BBB

- The following call signs will not be assigned:
 - $_{\odot}$ Obscene sounding suffix, such as DW1SEX.
 - $_{\odot}$ Suffix that could be confused for distress signals, such as DU7SOS, DV9PAN.
 - Suffix that is the same as reserved abbreviations for telecommunications, such DX2QSY, 4G1QRM

Office Order 183-12-2016

- Guidelines in the Additional Allocation of Prefixes in the Amateur Radio Service
 - 4E Extra Class (A)
 - 4I General Class (B)
 - 4G Technician Class (C)
 - 4H Foundation Class (D)

The basic "Radio Control Law" is

- a. Act 3986
- b. Act 3846
- c. Act 3486
- d. Act 3186

What government agency is responsible for the regulation of the amateur radio service?

- a. NSO
- b. NIA
- c. NTC
- d. DFA

The simultaneous transmission of sound and picture (Amateur Television) on all frequencies above _____ is allowed provided such operation shall be covered by a specific authorization from the NTC.

- a. 30 Mhz
- b. 40 Mhz
- c. 50 MHZ
- d. 60 Mhz

What is the radiotelephone urgency signal?

- a. MAYDAY
- b. SECURITE
- c. PAN
- d. VVV

The Philippines is divided into how many amateur districts?

- a. 9 b. 10
- c. 11
- d. 12

When is any person permitted to transmit by voice while operating the amateur station of a licensee?

- a. When a person has undergone training in radio operation
- b. When the licensee controls directly the entire operation in accordance with proper amateur practice
- c. When the licensee is authorized by the radio club
- d. When a person sees the need especially in emergency situations

Maximum term of an amateur radio station license

a. 5 years

b. 3 years

- c. 2 years
- d. 1 year

What is an amateur radio operator?

- a. Someone who broadcasts music
- b. Someone who sells radio equipment
- c. Someone who performs communications for self training and experimentation
- d. Someone who operates a cellphone

Bicol is in what amateur radio district?

- a. District 6
- b. District 5



d. District 3

What type of modification of the amateur license can be filed with the NTC : [Information]

- a. Transfer of location of the fixed station
- b. Installation of additional or change of transmitter/transceiver
- c. Upgrading to a higher class of license
- d. All of the above

What is a document is issued by NTC authorizing the holder to purchase a radio transmitter or transceivers?

- a. permit to own
- b. permit to possess
- c. permit to purchase
- d. permit to transfer

What is an amateur radio station intended to be used for operation during unspecified halts or while in motion?

- a. temporary station
- b. portable station
- c. mobile station
- d. fixed station

If a Class C amateur applies for renewal of his license for another 3 years but is 14 months expired and the prescribed license fee is P144.00 per year, how much shall he pay NTC for his Radio Station License renewal excluding filing fee?

a. P432

b. P576

C.	P648	

d. P720

License fee: 144 x 3 = 432 Arrears: (144 x 1) + (144 x .5) = 216 Total: 432 + 216 = 648

Amateurs from another country may be allowed to operate in the Philippines provided Filipinos are allowed to operate in their country. This formal or informal arrangement is known as

- a. Third Party Agreement
- b. Reciprocal Agreement
- c. Treaty
- d. ITU Requirement

The radio frequencies allocated for amateur stations shall be used strictly in accordance with

- a. The Lottery
- b. Mode

c. The class of operating station

d. Location

_____ is defined as a radio communication service using space stations on earth satellites for the same purpose as those of the Amateur Radio Service

- a. Amateur Space Service
- b. Amateur Satellite Service
- c. Amateur Relay Station
- d. Amateur Repeater Station

If a Class C amateur passes the examination for an upgrade to Class B, how does he effect the upgrade in his license?

- a. Renewal of license
- b. Duplicate license
- c. Modification of amateur license
- d. Cancellation of Class C

What document is issued by NTC authorizing possession of a radio transmitter or receiver

- a. Permit to own
- b. Permit to transfer
- c. Permit to possess
- d. Permit to purchase

An amateur club station is licensed under the name of

- a. the President
- b. the Executive Secretary
- c. the Trustee
- d. the hired Commerical radio operator of the association

The Philippines is under what ITU region?

- a. Region 1
- b. Region 2



d. Region 4

Baguio City belongs to what amateur radio district?

- a. District 2
- b. District 3
- c. District 4
- d. District 5

To qualify for accreditation, amateur radio associations should have at least _____ licensed members.

- a. 55
- b. 45
- c. 35
- d. 25

What is the combination of letters and numbers to identify a radio station known as?

- a. identification
- b. callsign
- c. password
- d. PIN

Amateur class "D" certificate holders are authorized to operate

- a. UHF radio station
- b. VHF radio station
- c. Broadcast radio station
- d. HF only

What is the coverage of Element IV (4) for Class C examination?

- a. Radio Rules and Regulation
- b. Operating Procedures
- c. Amateur Radio Practice
- d. Electrical and Electronics Principles

How long should a logbook with distress traffic entry be kept?

- a. 10 yrs
- b. 8 yrs



Who is authorized to install and operate amateur radio repeaters?

- a. Anyone
- b. Technician
- c. Only duly recognized amateur associations, clubs or societies
- d. None of the above

Who is a Class A amateur duly appointed by the board of a club or association to supervise and control the proper use and operation of the fixed station of that association or club?

- a. Club President
- b. Club Treasurer
- c. Trustee
- d. Club Secretary

A Class A amateur license is also known as _____?

- a. Expert class
- b. General class
- c. Advance class
- d. Extra class

What term means telecommunications by means of radio waves conducted by or among authorized amateurs on a non-commercial basis?

- a. Amateur radio Communications
- b. Amateur radio short wave propagation check
- c. Amateur transceiver testing
- d. Amateur radio morse code practice

Which Element is not prescribed for Class C examination?

- a. Element I
- b. Element II
- c. Element III
- d. Element IV

Holders of Class "C" amateur certificate may possess how many radio stations?

- a. One
- b. As many as they wish
- c. Two
- d. Three

The VHF emergency and general calling frequency for radio telephony

- a. 145 MHz +- 50 kHz
- b. 145 MHz +- 25 kHz
- c. 145 MHz +- 10 kHz
- d. 145 MHz +- 5 kHz
For every year that an amateur license had expired and filed for renewal at NTC, a surcharge equivalent to _____ shall be charged in addition to the regular annual license fee.

- a. 50%
- b. 75%
- c. 80%

d. 100%

Which one below is a valid amateur call sign in the Philippines?

- a. DUA3ABC
- b. 3XYZ



Average passing grade in an amateur examination is 70%, provided no rating below

- a. 70%
- b. 60%
- c. 50%
- d. 40%

The content of a radio message shall be divulged only to the

- a. Club members only
- b. Addressee
- c. Close friends
- d. Bank manager

If an amateur with a DU9XX call sign operates temporarily a portable station in Zamboanga for less than a month, how should he identify his station in radiotelephony?

- a. DU9XX portable 8
- b. DU9XX portable 7
- c. DU9XX portable 6
- d. DU9XX portable

An expired license of not less than how many years may be renewed upon filing of renewal application and payment to NTC of the prescribed fees and surcharges with no requirement to retake the examinations and retaining the assigned call sign?

- a. 2 years
- b. 3 years
- c. 4 years
- d. 5 years

Minimum age requirement for candidates for amateur examination

- a. 21 yrs old
- b. 18 yrs old
- c. 15 yrs old
- d. 12 yrs old

Amateur Class "D" licensee is authorized to operate HF radio stations.

- a. Sometimes
- b. Yes



A Class A licensee shall be allowed to operate HF fixed and mobile radio station with an output power not to exceed

- a. 1000 w on SSB
- b. 500 w on SSB
- c. 2 kw on SSB
- d. 100 kw on SSB

What should an amateur do upon knowing that his station is causing harmful interference to the operation of any existing station?

- a. Increase power
- b. Ignore
- c. Cease operation immediately
- d. Ask for help

A radio station in the amateur service installed at specified fixed location and operated to communicate with an amateur mobile station, amateur portable station or another amateur fixed radio station is an ?

- a. Amateur Mobile Station
- b. Amateur Fixed Radio Station
- c. Amateur Portable Station
- d. Amateur Shortwave Station

What provinces belong to amateur radio District 6?

- a. Bukidnon, Davao del Sur, Surigao del Norte
- b. Camarines Norte, Camarines Sur, Sorsogon

c. Iloilo, Negros Occidental, Capiz

d. Ilocos Sur, La Union, Pangasinan

What frequency range on 2-meter VHF can be used by amateurs in the Philippines?

- a. 144.000-146.000 MHz
- b. 144.000-148.000 MHz
- c. 140.000-146.000 MHz
- d. 138.000-174.000 MHz

What is strictly prohibited under the Rules Governing Operation of Amateur Stations?

- a. Operation without a valid amateur radio operator certificate or radio station license
- b. Transmission of messages or signals containing profane or indecent words or language
- c. Transmission with false or misleading identification

d. All of the above

What may an amateur, whose license has expired for more than 5 years, do to become licensed again (subject to the assignment of a different call sign)?

- a. Pass the appropriate examination and pay prescribed fees for a new license to NTC
- b. Apply for renewal and pay prescribed fees and surcharges to NTC
- c. Pass the appropriate examination and pay surcharges for every year expired to NTC

d. None of the above

In the amateur band, what kind of messages should not be transmitted?

- a. Messages regarding experiments with antennas
- b. Personal messages to another amateur radio operator
- c. Commercial and broadcast messages
- d. Emergency calls on 145MHz

Number and letter combination assigned by NTC to provide positive identification to radio stations

- a. code name
- b. call sign
- c. serial number
- d. call number

_____ is the term for any transmission, emission and reception of signs, signals, writings, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems?

- a. Broadcast
- b. Radio Experimentation
- c. Propagation

d. Telecommunication