WORLD SCOUTING

Jota-Joti - Manual for amateur radio activity

2024 Edition

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What is "Amateur Radio"?

Amateur Radio is a technology that allows two people - called amateur radio operators - to communicate directly through the air.

Most of the time, when people talk about "radio," they mean broadcast radio: A station sends out a program like music or news, and countless people listen to that same station using a receiver, it is often also just called "radio".

In amateur radio, everybody can be the sender and the receiver - just like a phone call, the two sides take turns talking. While many other technologies allow this, for example, the internet or the public phone network, amateur radio is unique. It does not require any network or central function to operate - the two stations exchange signals directly through the air.

There is a wide range of amateur radio devices. They range from toy radios for kids, which in most countries can be used by anyone, all the way to large stations that require special licenses and that can send their signals halfway around the world and even up to the International Space Station.

Amateur Radio is a fascinating world, full of technology and with its own language. All newcomers are very welcome, and all experienced amateur radio operators love nothing more than introducing someone new to this exciting world. JOTA-JOTI is the perfect event to explore Amateur Radio!

What is JOTA-JOTI?

A Jamboree is a large gathering of Scouts, either global or national, and traces its roots back to the early days of Scouting in the last century. The first World Scout Jamboree was held in 1920, and it still takes place every four years, next time in 2027 in Poland.

As amateur radio became popular among Scouts, the idea of holding a Jamboree remotely, using amateur radio: the "Jamboree on the Air" was born and first held in 1957. Later, when the internet became increasingly popular, the first official Jambore-On-The-Internet was organized on 18 and 19 October 1997. Today, the two events have merged into a single experience called JOTA-JOTI.

JOTA-JOTI is a fantastic event during the 3rd weekend of October. We are making and exploring old and new friendships on a weekend of experiences, connections, and communications with Scouts worldwide.

Important: Amateur radio regulations differ from country to country. This manual is not a replacement for local rules. We recommend that all Scouts work with a local amateur radio operator who has all the required licenses.

In this manual, we teach and guide you as a Scout or Scout leader about participating in JOTA-JOTI using amateur radio technology: How it works, amateur radio operator practice, technical background, activities and ideas, rules and regulations, specific amateur radio language, handy tools, and links.

The activity of amateur radio operators is like driving a car; it must obey a code whose objective is to allow people to travel on the airwaves without hindrance because everyone knows the rules and follows them.

After passing an exam, one is granted the right to use an amateur radio station and talk over the air, possibly over long distances.

However, you will be able to speak on the microphone yourself under the conditions described below:

- *the station is under the effective control and in the presence of a licensed amateur radio operator;*
- *you can say your first name and a few words using the international alphabet;*
- *you know how to use the CQ calling procedures and the Q code;*
- *you have prepared one or two sentences or a question to ask your listener.*

CONVERSATION STARTERS
Starting a conversation with a Scout from another country for the first time may be a little scary. Don't worry! In the following article you will several suggestions to start a conversation during JOTA-JOTI: https://www.scout.org/news/conversation-starters
Print the list of questions and keep it in the amateur radio station during JOTA-JOTI; get prepared in advance to answer those same questions, especially if you are going to talk in a foreign language.

Here is an additional list of questions to stimulate conversation:

- What is your favorite sport?
- How do you save water?
- Share something unique about yourself.
- Which SDG do you know better?
- How can you contribute to peace in your community?
- What is the best thing about recycling?
- How would you describe a healthy lifestyle?
- How do you avoid using single plastic bags?
- For you, what does be a leader mean?
- How are you contributing to the SDGs? Do you have any project in your community?
- Do you know how to spell your name using the NATO/ICAO alphabet? For example: MARIA – MIKE-ALPHA-ROMEO-INDIA-ALPHA

JOTA-JOTI is about having fun!

JOTA-JOTI is not a competition.

JOTA-JOTI is about meeting Scouts around the world!

JOTA-JOTI is about conversations not just contacts.

JOTA-JOTI is about connecting with other Scouts.

Amateur Radio Code of Conduct

Basic principles that should govern our conduct during amateur radio operations:

SOCIAL FEELING, FEELING OF BROTHERHOOD/SISTERHOOD, BROTHERLY/SISTERLY SPIRIT: large numbers of us are all playing amateur radio on the same airwaves (our playing field). We are never alone. All other amateur radio operators are our colleagues, our brothers and sisters, our friends. Act accordingly. Always be considerate.

TOLERANCE: not all amateur radio operators necessarily share your opinions, and your opinions may also not be the best ones. You shall understand there are other people with different opinions on a given subject. Be tolerant. This world is not for you exclusively.

POLITENESS: never use rude language or abusive words on the bands. Such behavior says nothing about the person it is addressed to, but a lot about the person behaving that way. Keep yourself under control at all times.

COMPREHENSION: please understand that not everyone is as smart, as professional or as much an expert as you. If you want to do something about it, act positively (how can I help, how can I correct, how can I teach) rather than negatively (cursing, insulting etc.).

Amateurs Radio Operators are:

CONSIDERATE: they never deliberately operate in such a way to reduce the pleasure of others.

LOYAL: they offer loyalty, encouragement and support to other amateur radio operators, local clubs, the IARU Radio Society in their country, through which Amateur Radio in their country is represented nationally and internationally.

PROGRESSIVE: they keep their amateur radio station up to date. It is well-built and efficient. Their operating practice is above reproach.

FRIENDLY: they operate slowly and patiently when requested; offers friendly advice and counsel to the beginner; kind assistance, cooperation and consideration for the interests of others. These are the marks of the amateur radio spirit.

BALANCED: amateur radio is a hobby, never interfering with duties owed to family, job, school or community.

PATRIOTIC: their amateur radio station and skills are always ready for service to country and community.

For more please read: Ethics and operation procedures for the Amateur radios (Edition 3, 2010)

Be safe DURING JOTA-JOTI

With all of its opportunities and enriching content, using the Internet and Amateur Radio also comes with many risks, including threats to personal data, wellbeing or safety.

We strongly encourage all participants to take our Be Safe Online e-learning course to learn more about online safety and to be fully prepared for JOTA-JOTI and other online activities.
https://www.scout.org/elearning_beingsafeonline

More information can be found at:
https://www.jotajoti.info/be-safe

No young people at the station?

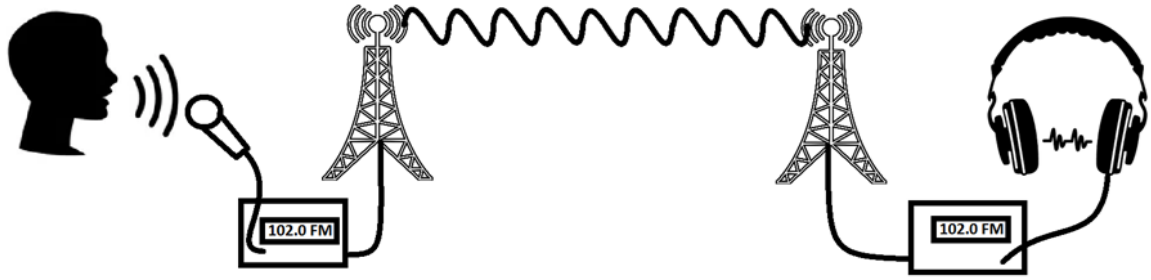
If you are an adult and do not have young people at your station, you can still answer JOTA-JOTI stations but advise the operator that you currently do not have any youth members, but you are happy to talk to their youth members.

What is Radio, and how does it work?

Radio is the technology of signaling and communicating using radio waves. A radio wave is made by a transmitter and will be received by a receiver. A radio transmitter is an electronic device that converts communication like spoken words via an antenna into electromagnetic signals.

In between the Transmitter and the Receiver, there could be distortion that could affect understanding in communication. All kinds of different types of transmission on various frequencies are possible. You will be familiar with broadcast radio, e.g., to listen to your favorite music in the car. The critical point is that the transmitter and the receiver have to be on the same frequency.

For decoding the message, they should be in the same mode to understand the communication (for example, two different countries using one language to understand each other). They could make an appointment about how and when they planned to have a conversation by following the international regulations for Amateur Radio.

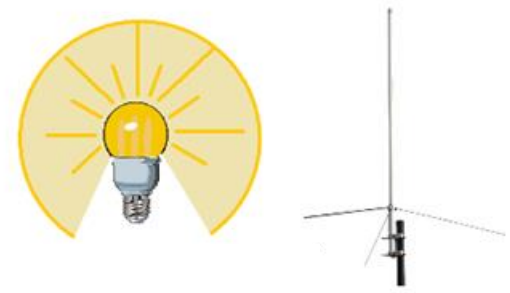
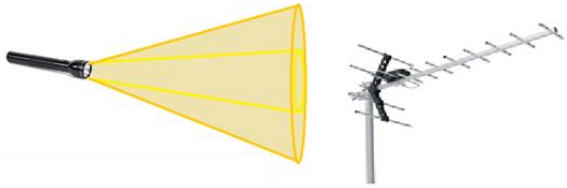


Point to Point communication

In general, the higher the transmission frequency (>50MHz), the shorter the possible receiving distance. The lower the frequency (<50MHz,) the more efficiently the transmission could travel worldwide. It is just like audio signals. If there is a music festival with a rock band in a park, the low frequency (bass) sound could be heard at a much greater distance than the higher tones.

Most common frequencies as used in radio waves by Amateur Radio.

There are 2 groups: High Frequency (HF <50Mhz) or Very High Frequency, Ultra High Frequency (VHF-UHF >50Mhz). Radio waves could be compared to (visual) light. Light is also a 'frequency' but it is much higher in frequency and visible to the human eye. An antenna can be directed, like a light source (light bulb or torch). So, depending on the type of antenna, radio signals can be directed in all directions or sent as a beam in one direction, just like light.

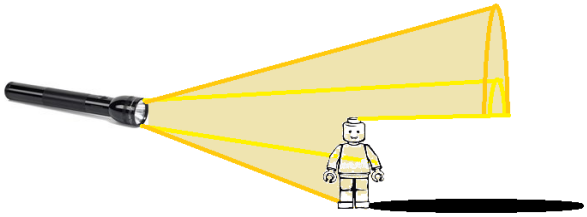
	
Omnidirectional	**Directional (beam)**

In "Appendix C" we spend some time to go deeper in detail about antennas

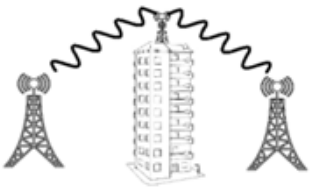
VHF and UHF Radio Signals

Radio transmitter

For higher frequencies from 30MHz to 300MHz (Very High-Frequency VHF), 300MHz-3GHz (UHF, Ultra High Frequency), an object could hinder clear reception of a signal. The object could "reflect" the radio signal, just like a light source. If you are using a lamp and something is standing in the middle of the beam, this will result in a "Shadow". There will be less or no light behind the object.



High-rise buildings, cities, or even the curvature of mother earth could be 'an issue' for UHF and VHF. Satellites, repeaters or high antenna towers can solve this issue by receiving and repeating the signal.

		
Issue with reflection	**Repeater via land**	**Repeater via satellite**

	
Bouncing via the moon	**Repeater via internet / cable**

HF Radio signals

For lower frequencies in the HF spectrum (<30MHz), the magnetic protection shield around the earth can help reflect signals and make it possible to use these layers for really long distances. The way this protection shield helps or disrupts a radio signal is a combination of the earth's magnetic field and the magnetic transmission of the sun, and it changes like the weather: Every day or hour, conditions can differ.

The reason behind this is that when the sun produces a 'solar flare' (an electro-magnetic radiation), they disturb these shielding layers. We can see this solar activity with our own eyes as the Northern Lights or aurora borealis. So, the earth has a layer around the planet to protect us from incoming magnetic fields.

You can see the solar forecast on YouTube here:
https://www.youtube.com/channel/UCkXjdDQ-db0xz8f4PKgKsag

When HF radio signals are transmitted, the transmission goes from earth to these F-Layers. The system works in reverse. The protection (F) layer around the planet reflects the signals from inside and tries to keep the signal inside these layers. So, the earth is helping the HF signal travel around the world. If there is an "opening" in the F-layer reflecting the signal back to land somewhere around the world, it would be possible to receive this signal many kilometers away.

https://www.nsta.org/science-teacher/science-teacher-novemberdecember-2020/aurora-borealis

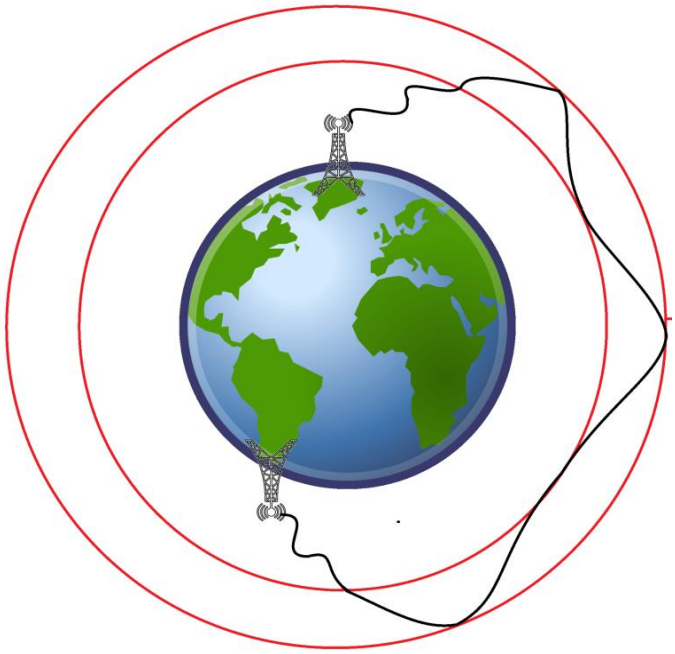


Diagram of how HF signals can travel around the world. The red line is the (F) layer

In JOTA-JOTI, an amateur radio station can be used to connect. In this guide, we are trying to provide some basic skills and conventions that are helpful for amateur radio communication (during JOTA-JOTI). If you are speaking a different language, understanding could be an issue. So, with amateur radio communication, we have a global tool to talk to each other.

Operator practice & code of ethics

During JOTA-JOTI, we are talking to other stations. As mentioned earlier, to use an amateur radio transmitter, you need to have a license or a licensed amateur radio operator next to you to make the amateur radio transmission. You cannot play music with an amateur radio license (that requires a different license).

During the conversation, you can talk about the weather, techniques, school, your Scouting games, or talk about the JOTA-JOTI event. It is an excellent way to make friends every day around the world, sharing knowledge and the love of technology to connect with one another other!

Basic principles of transmitters and receivers

(On / Off, Volume, Frequency, Mode, Squelch, PTT)

There are amateur radios for mobile or stationary use. There are all kinds of transceivers, and just like a car, there are many different models ranging from minivans to sports cars. They are all 'cars,' and all require the same driver's license, but they all work a bit differently or have different buttons at different places and have specific functions for applications. But overall, they all have a steering wheel, wheels, tires, engines, and headlights to bring you to the finish line.

The same is the case with amateur radios. There are many different types and brands. In this part, we want to show some basics of transceivers that can be used. The main difference between a transceiver and a receiver is that the transceiver can transmit (send out your message via the antenna) and receive signals. A receiver can only receive radio signals (as the name says).

Overview of an Amateur Radio

To turn the radio on (or off), find the 'on-off' button. Be sure before powering 'on', the power supply should be connected, and the correct antenna for a specific band connected to the radio. This power ON/OFF could be a power button or a knob (volume).

With the radio ON, before we make a connection or listen to radio signals, we need to talk about some of the functions of these devices.

On the radio's display, there could be a lot of information. Some of the essential elements are:

To ‘Tune in’ a frequency, you must select the same frequency as the receiving station or choose an empty frequency to start a conversation. This is usually done with the large main dial (large rotary knob).

Now you need to choose your operating mode. {MODE SELECT} This is like language. If you are talking in English and the other station is talking Russian, you can hear but not understand each other. Mode is a sort of language to transmit how the signal is being modified by the transceiver to the antenna. The transceiver is just like a big translation machine.

USB is the MODE

FM Mode (Frequency Modulation)
AM Mode (Amplitude Modulation)
SSB (USB - LSB) (Upper or Lower Sideband of an AM signal)
CW (Morse code)
Data modes (Packet or digital modes with a computer)

There are certain main (most used) Modes for specific frequencies. They are listed for each region and frequency. Worldwide this can be found in the Amateur Radio ‘band plan’ of (together with the maximum power allowed for transmission).

You can select a band (e.g., 20m - 14.190 MHz) and the {USB MODE} turn on the volume and listen to the signals. (If nothing else, you will hear noise, maybe. There is no one there, tune in to another frequency).

For voice communications in the HF spectrum, broadcasting stations use AM while amateur radio operators use SSB (LSB below 10 MHz, USB above 10 MHz). Above 30 MHz, broadcasting stations and amateur radio mostly use FM (WFM for broadcasting, NFM for amateur radio operators).

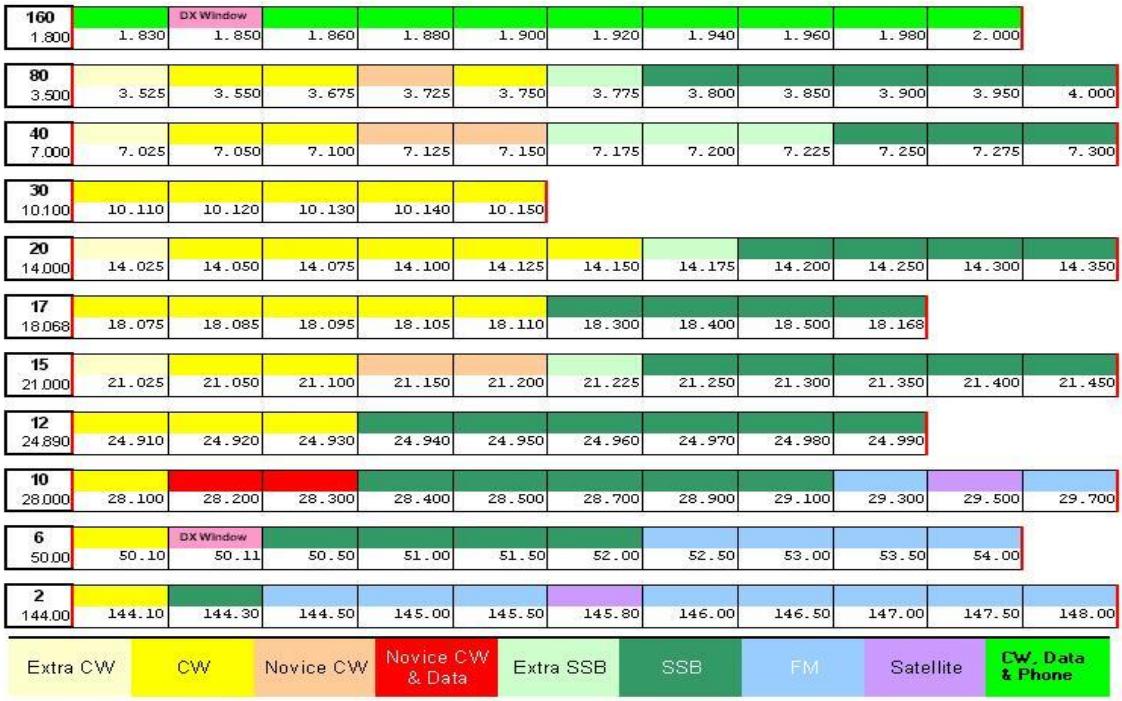
If you have selected a frequency and mode (matching with your antenna), you will be able to contact the other station by pushing the {PTT} button on your microphone (Push to Talk).

Do not be afraid of the microphone. It is ok to speak directly into it.

You have to talk close to the microphone (10cm away, but you can still see the micro in your hand); first PUSH the button; then TALK; otherwise, the other station will not be able to hear you because the transmitter in the radio {TX} will not have been activated yet). After you are finished talking, you must release the button to listen to the other station.

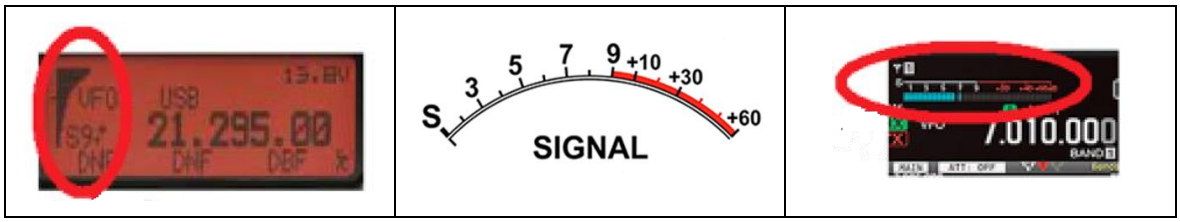
The SQUELCH function blocks the audio output if the signal is below a selectable level; in this way, the annoying noise in between communication is silenced, with the further advantage of saving battery. Be careful! If the squelch is too high, you may not hear weak radio signals.

An example of the USA region Band Plan for Amateur Radio frequencies:



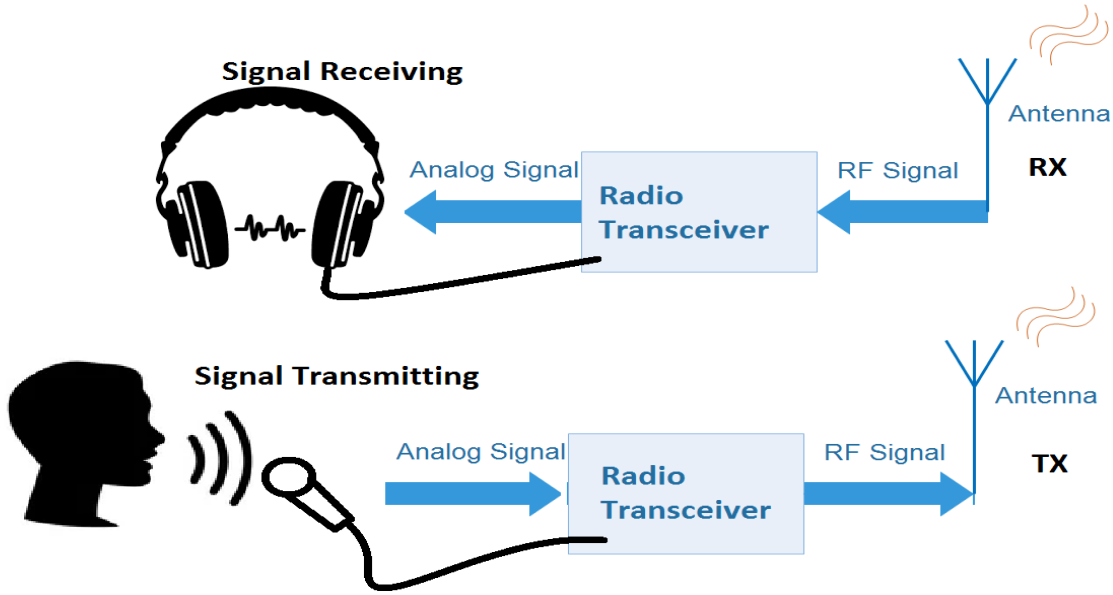
Finally - To provide the other amateur radio station a receiving report, on the radio you will find a 'VU meter' or 'level meter' in the display to give the received signal strength in 'RST'.

More about these reporting numbers is shown later on this manual.



Signal Level

Because every amateur radio station has a different radio and antenna and a unique distance, every signal is different. Amateur radio operators are interested in how strongly the signals are being received.



Transmitting and receiving a signal separately from each other is called a Simplex connection. A connection like a telephone (listening and talking at the same time) is called Duplex.

With many radios nowadays you can use a wide variety of 'Filters' to make the reception or transmitting signal much easier to understand. Common filters are {CWfilter} - Bandwidth filter, {DNR} -digital noise filter and {Notch filter} -to clear unwanted audio signals like interfering tones or heavy background noise signals.

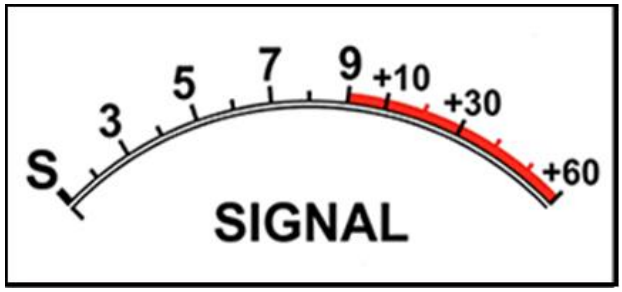
Signal Report RST

This information is used to indicate to correspondents the quality of the signals received. In their jargon, amateur radio operators call it a 'Report'.

(RS for phone/ spoken words, RST for {Mode} cw)
For example, FIVE and NINE+ indicates: (R) Perfectly readable, (S) Extremely strong signals

R - Readability

R1 - Unreadable.
R2 - Barely readable, occasional words distinguishable.
R3 - Readable with considerable difficulty.
R4 - Readable with practically no difficulty.
R5 - Perfectly readable.



Signal strength

S - Strength

S1 - Faint, signals barely readable
S2 - Very weak signals
S3 - Weak signals
S4 - Fair signals
S5 - Fairly good signals
S6 - Good signals
S7 - Moderately strong signals
S8 - Strong signals
S9 - Extremely strong signals

T - Tone
T: for dial tone, is only used for Morse code and digital communications. Values go from 1 (very irregular) to 9 (crystal clear) and provide information on the quality of the sound heard.

T1 - Extremely rough hissing note
T2 - Very rough ac note, not musical
T3 - Rough, low-pitched ac note, mod. music
T4 - Rather rough ac note, mod. musical
T5 - Musically modulated note
T6 - Modulated note, slight trace of whistle
T7 - Near dc note, smooth ripple
T8 - Good dc note, just a trace of ripple
T9 - Purest dc note

Now you have some basic knowledge of the techniques behind radio equipment for operating during JOTA-JOTI! Next, we will look at what we could tell the other amateur radio stations and how we talk to each other over amateur radio connections.

Of course, during JOTA-JOTI, a Scout leader or the amateur radio operator could help you make the connection to another amateur radio station happen. Making connections with the magic of amateur radio is pretty cool!

Amateur Radio Practice

How to 'set up' a radio connection?

For a radio connection, we need the following:

- a radio transmitter;
- an antenna;
- a license and or licensed amateur radio operator to help you out.

Every amateur radio station has its own 'call sign'. This is just like the number plate of a car. The first letters (called the prefix) show the country or the region, followed by a number. The following letters are random or could be chosen by the amateur radio station.

For example, let's look at call sign LX9S: LX stands for Luxembourg, 9 is locally regulated as a club station, and S has been chosen for Scout. So, in this example, LX9S is the European station during JOTA-JOTI. The amateur radio operator needs to announce the amateur radio station's name (call sign) at least every 5 minutes if it is active (ON AIR).

Setting up a connection by amateur radio: What to say

One of the rules is always to state your caller's code and then the code of the station you are using (you from me) at the start and end of your program.

This is a general call for JOTA-JOTI for the Scout example station LX9S in Luxembourg, EU.

CQ Jamboree CQ Jamboree this is LX9S ("LIMA X-RAY NINE SIERRA") calling and listening for any call. LX9S is calling CQ and standing by

Once an amateur station reacts.

LX9S this is PI4RS how do you copy?

What to say during a conversation (QSO)?
You can have a normal conversation.

PI4RS this is LX9S returning (good afternoon, night,) to you.
My name is Toni, like *TANGO OSCAR NOVEMBER INDIA*
My QTH (location) is *LUXEMBOURG*, like *LIMA UNIFORM X-RAY ECHO MIKE BRAVO OSCAR UNIFORM ROMEO GOLF*
Your signal report (RST) is 5 and 9, Microphone back to you, PI4RS from LX9S

Your station is returning the microphone. The other station could then answer like this:

Thanks, you for ……bla bla……Mic back to you LX9S from PI4RS

After the reaction; this station has returned the microphone to you:

Very fine copy dear JOHN. We are a scout station and enjoy the JOTA-JOTI Weekend. The weather here is … and my age is … years. Thank you for this conversation micro back to you for the final. PI4RS from LX9S

The microphone is going back from you again to the other station.

LX9S this is PI4RS
Thank you for the information, hope you are enjoying the JOTA-JOTI weekend. For now, 73's (*Greetings*) back to you LX9S from PI4RS

Ok, Fine John, Thank you for the conversation. Our QSL Card is 100% via the Bureau. Thank you for the nice contact and 73's to you and your family, PI4RS from LX9S. 73's

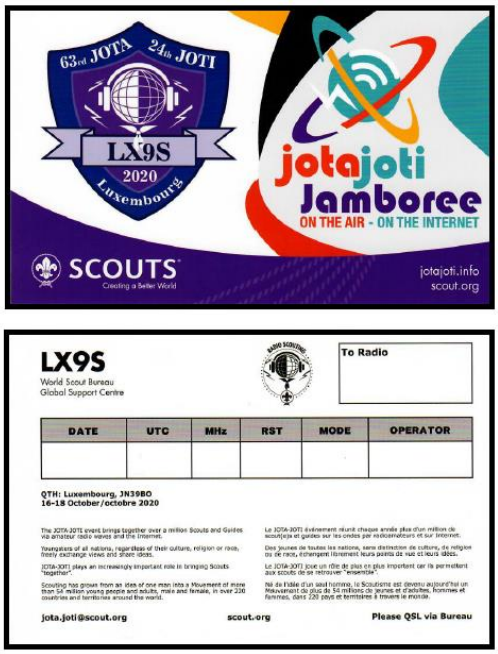
Now, you can register the conversation in the logbook and write a "QSL" card to the station to confirm the connection you just made. And you can start all over to request any call.

CQ Jamboree CQ Jamboree this is…

You will find a model of this conversation in ***Appendix A*** *and a model of logbook in* ***Appendix B*** *at the end of this handbook.*

Sending QSL cards for confirmation

After a connection with an amateur station has been made, you can send a confirmation card directly (by mail) to the QSL Bureau. All cards sent to the bureau are sorted by country and district handed over to the central organization. These cards will be handed over from person to person to save the bureau postage!



Example: QSL cards sent for Scouting-related activities and a sample QSL Card

The QSL card is to confirm that you have 'worked' the other station. A lot of amateur radios collect these paper QSL Cards. Some of these cards are unique and designed only for an event or a special call sign. It is just like a postcard from summer camp to confirm you are there, having fun. The QSL cards are also available digitally with E-QSL or LOTW. This is a much quicker way to send your card + Confirmation.

The (paper or electronic) QSL Card should contain the information collected and shared. Such as:

- ***Receiver info*** — *Call sign you are sending to*
- ***Date*** — *Date of the QSO*
- ***Time*** — *Time of the QSO*
- ***Frequency*** — *for example 14.190Mhz or 20M*
- ***Signal Report (RST)*** — *599*
- ***Mode*** — *Mode of transmission (such as FM, AM, SSB)*
- ***Your (operator) name*** — *Personal name(s)*

NOTE: *If there is some space left on the card you can write a short comment or personal message such as "Thank you it was my first QSO ever!".*

Amateur Radio Games

The described activities here are meant to give new ideas to support the preparation and the carrying out of JOTA-JOTI local events.

While the JOTA-JOTI involves amateur radio worldwide communications, these ideas can be used for complementary activities, to make the local event more varied and interesting, and to help scout leaders to teach amateur radio techniques and good communication practice.

The activities presented here are useful during the JOTA-JOTI, but they can also be proposed at any time of the year by scout and leaders to use amateur radio techniques as effective pedagogical means for the scout education.

Most activities can be carried out without the need of an amateur radio license.

Using receiving-only devices does not generally require any kind of authorization. Please verify the specific laws of your country before using listening devices or amateur radios.

The JOTA-JOTI platform offers a variety of ideas that can be used for complementary activities to make the JOTA-JOTI local event more varied and exciting and help Scout leaders teach amateur radio techniques and good communications practice.

The activities have their description at the Appendix D (games and activities).

Commonly used HF frequencies for Scouting events

Bands	SSB (phone)	CW (morse)
80 m	3.690 & 3.940	3.570 MHz
40 m	7.090 & 7.190 MHz	7.030 MHz
20 m	14.290 MHz	14.060 MHz
17 m	18.140 MHz	18.080 MHz
15 m	21.360 MHz	21.140 MHz
12 m	24.960 MHz	24.910 MHz
10 m	28.390 MHz	28.180 MHz
6 m	50.160 MHz	50.160 MHz

Language in Amateur Radio

Here is a short list to help you understand what Amateur radios are saying:

Abbreviations

- **CQ**: general call (addressed to all stations)
- **CW:** Carrier wave used for Morse code
- **DX:** distant contact (different continents)
- **R or Rgr:** Roger - Ok
- **RST:** Readable Signal Tone - To identify in numbers the quality of the signal as received
- **RX:** Receive
- **SDR:** Software Defined Radio - A receiver for (radio) signals in a Personal Computer
- **TNX or TKS:** Thanks - this amateur radio abbreviation is widely used for Morse / CW transmissions
- **TX:** Transmit
- **UTC:** Universal Time Coordinated is the primary time standard

Words

- **Buro (Bureau):** QSL by Buro (Bureau) - a well-established system for sending amateur radio QSL cards in bulk from amateur to amateur. It does take more time than mail, but the QSL bureau provides a much more cost-effective way of sending cards.
- **Call (or call sign):** Registration number of an amateur radio or amateur organization.
- **Contest:** an event in which people compete for supremacy in amateur radio.
- **JOTA-JOTI:** Jamboree on the Air -, Jamboree on the Internet - World largest Scouting event every 3rd weekend of October.
- **Pile-up**: accumulation of calls to a single station.
- **QSL card:** A postcard-sized card used to confirm contact or a report of a station that has been heard. These cards are often exchanged between amateur radios or CB enthusiasts. They are also frequently sent out by short-wave broadcast stations to confirm a reception report.
- **S Meter:** A Signal meter on a receiver or transceiver indicates the signal strength of incoming signals. It is normally marked in "S" units from 1 to 9.
- **Shack:** A radio room originally a ship's radio room, but now often used to describe an amateur radio's station.
- **Squelch:** A control on a receiver or transceiver used to mute or turn off the audio when no signal is present. This prevents large noise levels from being present on the output when there is nothing to be heard.
- **Vertical:** A vertical antenna.
- **VSWR** (or SWR): Voltage standing wave ratio. A measure of the power returned from the antenna when the antenna and feeder are not correctly matched.
- **Yagi:** A type of beam antenna. (Most television antennas are Yagis).
- **YOTA:** Youngsters on the Air - an organization (non-Scouting) of amateur radio encouraging young people to enjoy making radio contacts.
- **POTA:** Parks on the - An international radio sport award program that encourages licensed amateur radio operators to visit, enjoy and operate portable equipment in a variety of parks and public lands, always respecting other park users and local regulations.
- **SOTA:** Summit on the Air – an amateur radio operating award program launched in Great Britain in 2002 by John Linford. The aim of SOTA is to encourage licensed amateur radio operators to operate temporarily from mountainous locations using any method of travel including hiking, mountain climbing, and cycling while operating their amateur radio station from the summits of hills and mountains.

Numbers

- **59**: Given a lot as a standard answer for signal reporting "RST" (and still asking what is your call sign).
- **73:** "I send you my best regards".

NATO/ICAO Phonetic Alphabet

The NATO/ICAO alphabet is useful to make the voice spelling of a word or of a sequence of letters and numbers; it turns out useful in case of bad reception: weak signals or strong noise/interfering communications.

The International Phonetic Code was created by the ICAO (International Civil Aviation Organization) and is very commonly used by those who use radio communication: military, security agencies, aviation, navigation and us, Amateur Radio operators.

It is an important convention that serves to increase the ability to communicate between different languages and also ensures greater clarity in communications in which it is necessary to spell out names, places, coordinates and other information that can be very important in case of emergencies.

NATO Phonetic Alphabet

A	Alpha	N	November
B	Bravo	O	Oscar
C	Charlie	P	Papa
D	Delta	Q	Quebec
E	Echo	R	Romeo
F	Foxtrot	S	Sierra
G	Golf	T	Tango
H	Hotel	U	Uniform
I	India	V	Victor
J	Juliett	W	Whiskey
K	Kilo	X	X-ray
L	Lima	Y	Yankee
M	Mike	Z	Zulu

Morse Code

A •–	J •–––	S •••	2 ••–––
B –•••	K –•–	T –	3 •••––
C –•–•	L •–••	U ••–	4 ••••–
D –••	M ––	V •••–	5 •••••
E •	N –•	W •––	6 –••••
F ••–•	O –––	X –••–	7 ––•••
G ––•	P •––•	Y –•––	8 –––••
H ••••	Q ––•–	Z ––••	9 ––––•
I ••	R •–•	1 •––––	0 –––––

Morse Code is a system of representing letters, numbers and punctuation marks through a coded signal sent intermittently through Long and Short SOUNDS.

It was developed by Samuel Morse in 1835, creator of the electric telegraph, a device that uses electric currents to control electromagnets that act in the emission and reception of signals.

A message encoded in Morse can be transmitted in several ways in short and long pulses (or tones).

When visualizing a point, say or think "Di". Likewise, when visualizing a stroke, don't say or think "dash", but think or say aloud "daá".

Before worrying about streaming, it's more important to start dealing with morse code just by listening.

Morse Specials Codes

Abbreviation	Mnemonic	code		Comment
	SOS	...---...	▄ ▄ ▄ ▬ ▬ ▬ ▄ ▄ ▄	International Emergency
K (k)		-.-	▬ ▄ ▬	Contact, request to send
	HH	....	▄ ▄ ▄ ▄ ▄ ▄ ▄ ▄	issue in decoding on the receiver side (8 points)
=	BT	-...-	▬ ▄ ▄ ▄ ▬	Separation (stop), new paragraph
+	AR	.-.-.	▄ ▬ ▄ ▬ ▄	In message/ transmission (“over to you”). I’m waiting for a response from you
?	IMI	..--..	▄ ▄ ▬ ▬ ▄ ▄	Not understood, please repeat!
	VA, SK	...-.-	▄ ▄ ▄ ▬ ▄ ▬	End of contact, I am not expecting an answer from you

Q code

Q-Code	Used as a Question	Used as a Statement
QRA	What is the name of your station?	My name is ...
QRB	How far approximately are you from my station?	The distance between our stations is about ... your nautical miles (or kilometers).
QRG	What is my exact frequency?	Your exact frequency is ... kHz (Or MHz).
QRK	What is the intelligibility of my signals?	The intelligibility of your signals is ... (scale of 1 to 5).
QRL	Are you busy?	I'm busy Please do not interfere.
QRM	Are you bothered by noise?	I am disturbed by interference.
QRN	Are you bothered by noise of natural origin (storms, lightning)?	I am disturbed by natural origin noise
QRO	Shall I increase transmitter power?	Increase (or increase) the transmission power.
QRP	Shall I decrease transmitter power?	Decrease the transmission power.
QRQ	Shall I send faster?	Increase the transmission speed [... Words per minute].
QRS	Shall I send more slowly?	Send more slowly [... Words per minute].
QRT	Shall I stop transmissions?	Close (or I close) transmissions.
QRV	Are you ready?	I'm ready.
QRX	When you call me again?	I'll get back at ... on ... kHz (or MHz).
QRZ	Who is calling me?	You are called by ... on ... kHz (or MHz).
QSA	What is the strength of my signals?	The strength of your signals is ... (Scale from 1 to 5).
QSB	Does my signal strength fade?	The strength of your signals varies.
QSK	Can you hear me? If so, can I interrupt you?	I hear you, speak up.
QSL	Can you receive?	Confirmed, received.
QSO	Can you communicate with ... directly or through support?	I can communicate with ... directly NOTE: It is also synonymous of direct communication or direct connection.

Link to the complete list of Q codes: https://amateurradioprep.com/amateur-radio-q-codes/

Q-Codes (also called Q-Signals) are three letter combinations that begin with the letter Q that CW operators use in place of common phrases. Originally intended for use only by radiotelegraph operators, Q-codes have become a permanent part of the hobby's jargon, and many amateurs use them on phone as well as in face-to-face conversations.

The Q Code is internationally recognized in all telecommunications services. It consists of a series of three letters, always starting with the letter Q, with combinations ranging from QAA to QUZ. The Q code series can be used to ask, answer, affirm or deny. When followed by a question mark, they refer to questions. If there is no question mark, they are affirmations or answers.

Because they shorten messages and make questions and answers easier to understand, they do not require the construction of long sentences and extensive knowledge of another language.

Obviously, the use of this code is appropriate for telegraphic communications, where messages are naturally spelled out.

Although there is no impediment to using the Q Code using the microphone (speech), its use is only advisable and necessary when stations have time limitations or difficulties with language differences.

Addressing your location - The QTH locator

To address the location of the amateur radio station, instead of providing latitude and longitude, the World-Wide Locator (also known as QRA locator or Maidenhead locator) is used. With this technique, the world surface is divided into many small squares. With only six characters, it is possible to define squares within which the maximum distance is 10.4 km. The code is made by two letters (A to R), two numbers (0 to 9) and two letters (a to X).

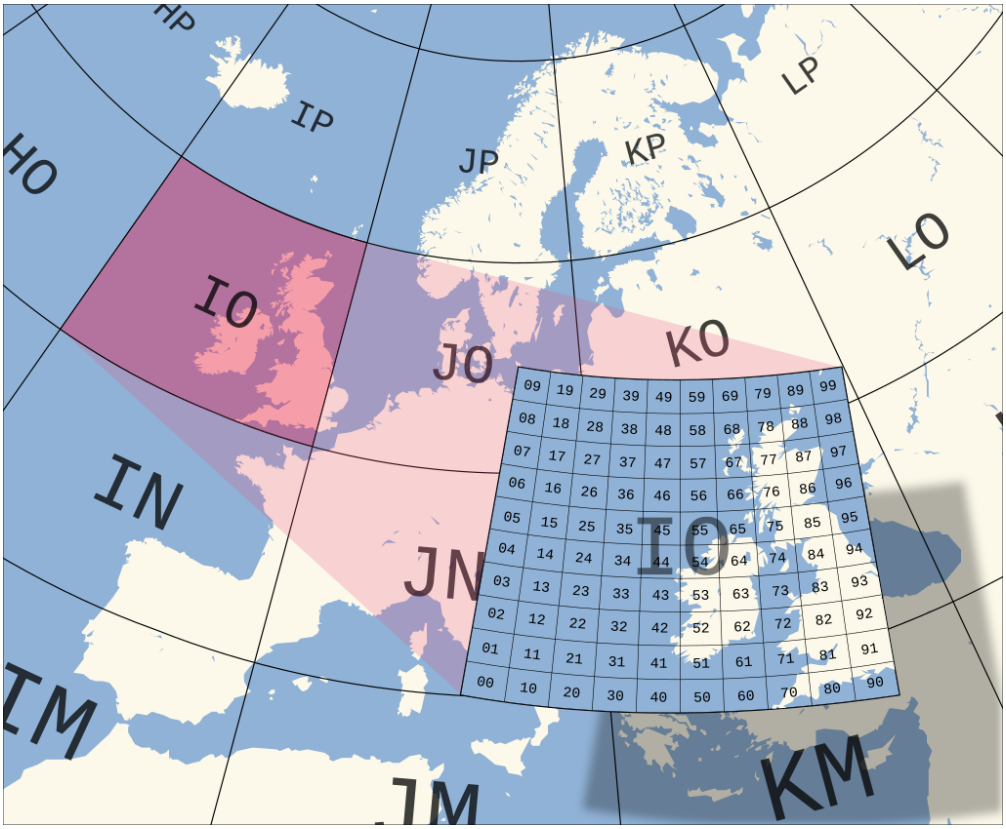
The first pair of letters define large square fields over the globe. The first letter defines the longitude (18 intervals, 20° each), the second one the latitude (18 intervals, 10° each).
As shown in the image, the second pair of characters (two numbers) divides each of the previous field into smaller squares. The first number defines longitude intervals inside the square (10 intervals, 2° each), the second one the latitude (10 intervals, 1° each).

These squares are then further subdivided in sub squares, codified by the last pair of letters (first letter: 24 intervals of longitude, second letter: 24 intervals of latitude).
More details are provided in https://en.wikipedia.org/wiki/Maidenhead_Locator_System

To find the locator of a place, or see what's inside a specific locator code, you can use free tools as https://www.voacap.com/qth.html or https://k7fry.com/grid/

What about a little challenge? Which monuments are present in the following locators?

- KL59NX
- KM17UX
- JN61FV
- JN18BT
- FN20XQ
- OM89EW
- PM95VQ
- ML97AE
- DG52IU
- FH36RU



(Source: Wikipedia. Image by Oona Räisänen, CC BY-SA 3.0)

JOTA-JOTI Dx Cluster

How do I find a JOTA-JOTI station on the amateur radio bands quickly?
Well, help is available through the JOTA-JOTI Dx Cluster (a database for amateur radios) used during JOTA-JOTI to see exactly on which frequency a Scout station somewhere in the world is transmitting.

How does this work?
If one amateur radio station hears a Scout station on the air, it can enter the date, time, frequency, and call sign in the database. The information is immediately visible worldwide. You can also enter your transmitting frequency. Other Scout stations can use the info to tune to the published frequency and make contact.

What do you need for this?
- A computer, a packet radio terminal program, Amateur net or Internet connection;
- Electricity or battery pack;
- An enthusiastic Scout to survey the cluster (the JOTA-JOTI contact manager).

Webpage to use:
To see:
https://www.dxwatch.com/

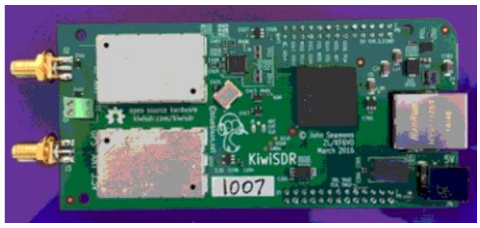
To add some info (Share a spot):
http://www.dxsummit.fi/#/

The map:
https://www.dxmaps.com/spots/mapg.php?Lan=E

SDR and WebSDR

Software-defined radio (SDR) is a radio made from software instead of hardware.

SDR receivers are mostly low-cost and readily available. It could be a USB Dongle (RTLSDR). There are two main (components) chips as used. For HF RT820 (band with 0 - 50mHz) and E4000 or RTL2832U for UHF-VHF (30 - 2 GHz)

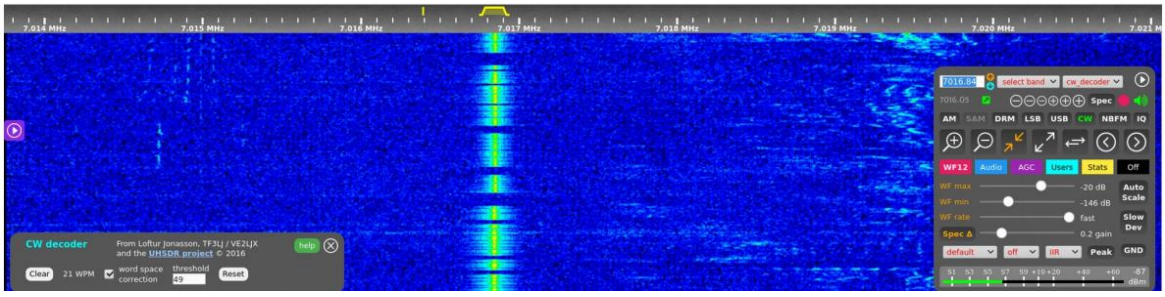


Besides some hardware such as a USB dongle as a receiver, a PC with software will be needed to "decode" the received signals. Available software: HDSDR, Airspy, or KiwiSDR.

KiwiSDR or WebSDR: this is what you see—the signal in a "waterfall display," mode, and the frequency. Noise is represented with dark colors, while strong signals are displayed with bright colors.

To listen to a signal, you need to move the yellow trapezoid along the frequency bar and align it with a bright trace; you can alternatively do the same by manually changing the frequency in the control panel.

If the alignment is imperfect, the sound may have an unnatural too low or high pitch. Remember to select a valid mode (CW - Morse, LSB - voice below 10 MHz, USB - voice above 10 MHz, AM - broadcasting stations, FM - voice and broadcasting, mostly above 30 MHz, etc.). Other tools will help you in recording the signal or decoding digital modes.



With SDR, you can make the receiver online available to others (only with a PC). In the links below, you will find WebSDR receivers and receiving websites. You can listen to JOTA-JOTI stations via the internet.

Try these links:

- http://kiwisdr.com/public/
- http://rx.linkfanel.net/
- http://www.Websdr.org

Direct link to a receiver in the Netherlands: http://websdr.ewi.utwente.nl:8901/

QO-100

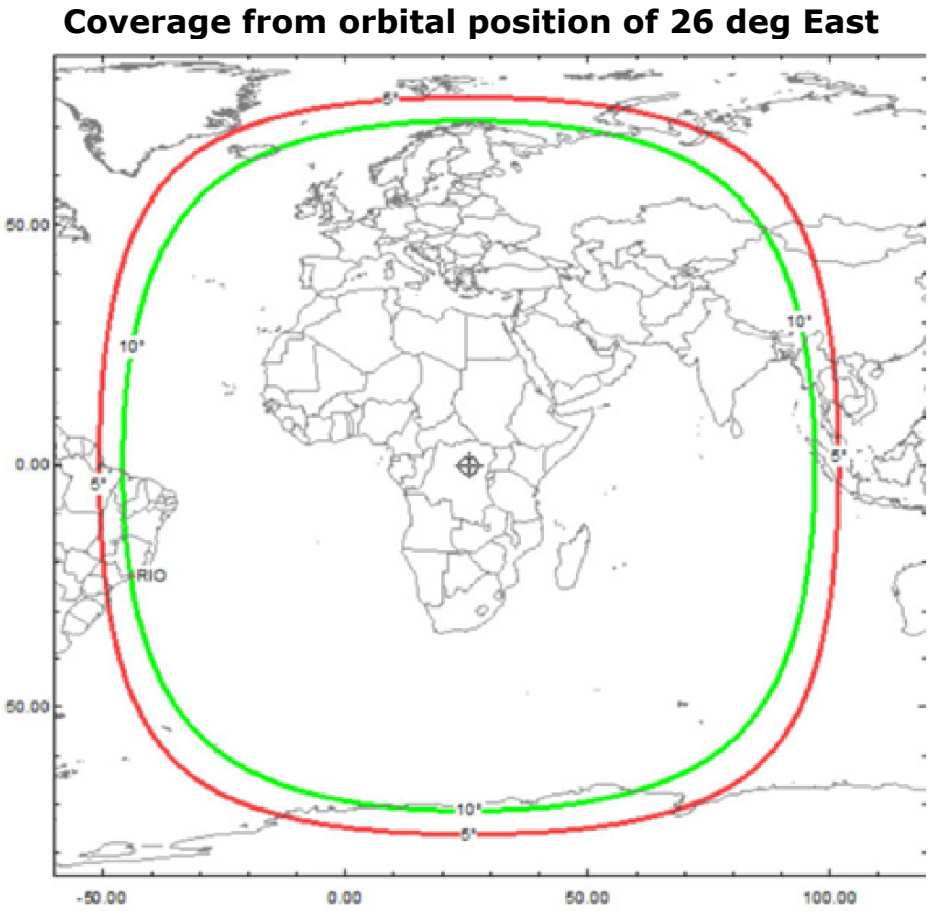
Qatar OSCAR-100 is a first geostation amateur radio transponder, a joint project between the Qatar Satellite Company (Es'hailSat), the Qatar Amateur Radio Society (QARS), and AMSAT Deutschland (AMSAT-DL), which provided the technical lead.

OSCAR-100 is hosted on Es'hail-2, a Broadcast Transponder Satellite owned by the Es'hailSat Qatar Satellite Company; the satellite is now in geostationary orbit at 25.9° E.

Communication via OSCAR100 Satellite

You can also listen to Oscar 100 satellite via WebSDR.

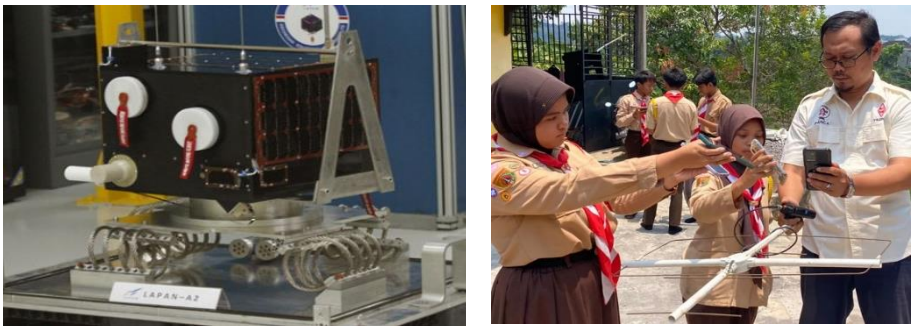
INFO Link: https://eshail.batc.org.uk/nb/
SSB Frequency **10.489.890 RX, TX 2400.390**



IO-86/LAPAN A2

Indonesian Oscar-86 or LAPAN A2 is a micro-satellite developed by the National Institute of Aeronautics and Space (LAPAN) of Indonesia, in collaboration with the Indonesian Amateur Radio Organization (ORARI). It was launched in 2015 by Satish Dhawan Space Centre at India as a successor to the previous satellite, LAPAN/TUBSAT. This satellite is equipped with various radio modules and cameras, primarily used as disaster mitigation purpose and the Automatic Identification System (AIS) for vessels in Indonesian waters.

IO-86/LAPAN A2 is operated by LAPAN ground stations in conjunction with AMSAT-ID at Jakarta and is widely used by amateur radio operators around the world for communication and other educational purposes.



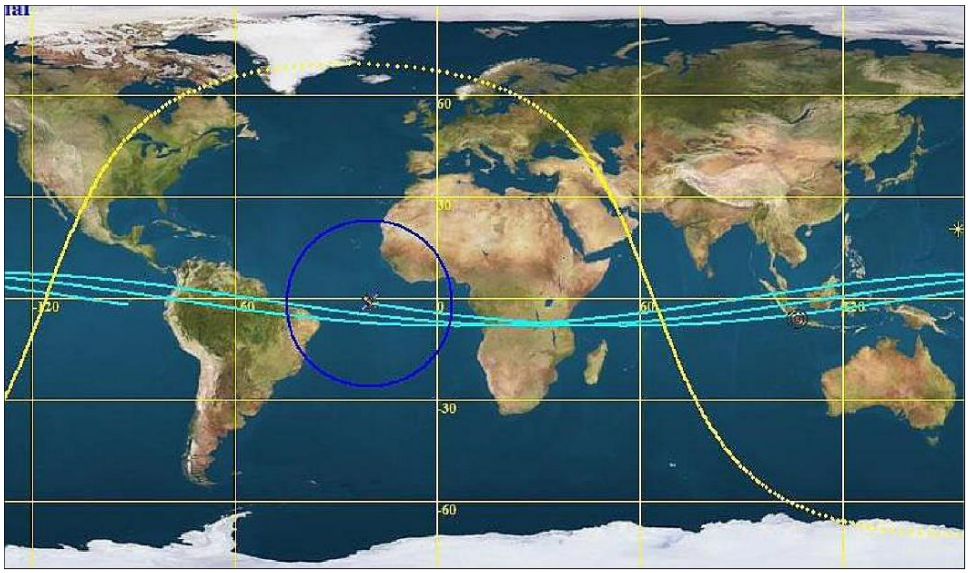
IO-86/LAPAN A2 Module and Scouts practicing SSTV reception activities during JOTA.
Source: LAPAN & Teritorial Ungaran

More information (in Indonesian):

- https://brin.go.id/orpa/pusat-riset-teknologi-satelit/page/satelit-lapan-a2

Frequency UHF-VHF

Uplink : **145.880/145.825**
Downlink : **435.880/145.825**
Beacon : **437.425**
Tone : FM tone 88,5Hz/APRS
Callsign : YBSAT/YBOX-1



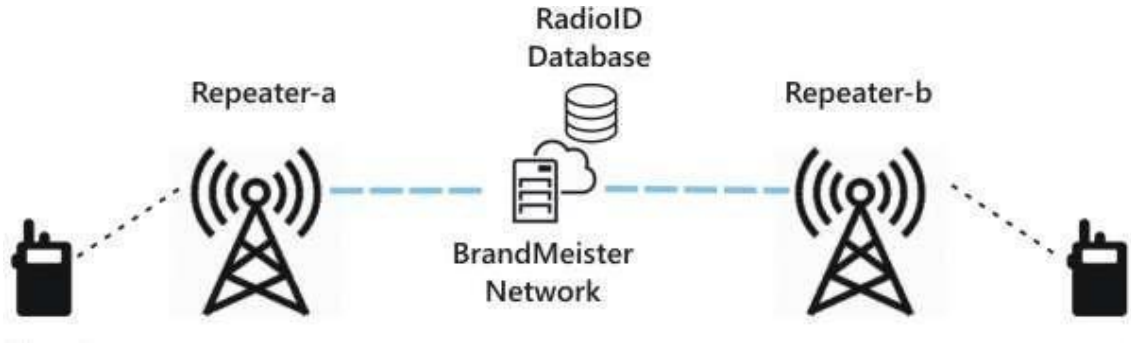
IO-86/LAPAN A2 Orbital position (blue) with LAPAN-A3/IPB Orbital Position (yellow)
Source: LAPAN

DMR

Digital mobile radio (DMR) is a limited open digital mobile radio standard defined in the European Telecommunications Standards Institute (ETSI) Standard TS 102 361 parts 1–4 and used in commercial products around the world. DMR, along with P25 phase II and NXDN, are the main competitor technologies in achieving 6.25 kHz equivalent bandwidth using the proprietary AMBE+2 vocoder. DMR and P25 II use two-slot TDMA in a 12.5 kHz channel, while NXDN uses discrete 6.25 kHz channels using frequency division, and TETRA uses a four-slot TDMA in a 25 kHz channel.

DMR was designed with three tiers. DMR tiers I and II (conventional) were first published in 2005, and DMR III (trunked version) was published in 2012, with manufacturers producing products within a few years of each publication.

The primary goal of the standard is to specify a digital system with low complexity, low cost, and interoperability across brands, so radio communications purchasers are not locked into a proprietary solution. In practice, given the current limited scope of the DMR standard, many vendors have introduced proprietary features that make their product offerings non-interoperable with other brands.



How DMR works from https://www.n4nrv.org/dmr-radio-made-me-cross/

DMR amateur radio with hotspot

Brandmeister

The 907 Talk Group ->will be used to let Scouts make contacts worldwide, under appropriate supervision, following individual country's guidelines.

Please request an ID here in advance (it takes a little time to get a valid number)
https://www.radioid.net/

Open 24 hours a day, 7 days a week, 365 days a year)

List of the different lounges reserved for JOTA on the Brandmeister network

TG 907 - JOTA Call, when contact is established, you will have to go to one of the chat rooms below:

TG 9071 - JOTA Room 1	TG 9072 - JOTA Room 2
TG 9073 - JOTA Room 3	TG 9074 - JOTA Room 4
TG 9075 - JOTA Room 5	TG 9076 - JOTA Room 6
TG 9077 - JOTA Room 7	TG 9078 - JOTA Room 8

TG 90737 - JOTA French

TG 90710 - JOTA German Deutsch (jeden 4. Donnerstag im Monat, 20:30 Uhr Berlin)

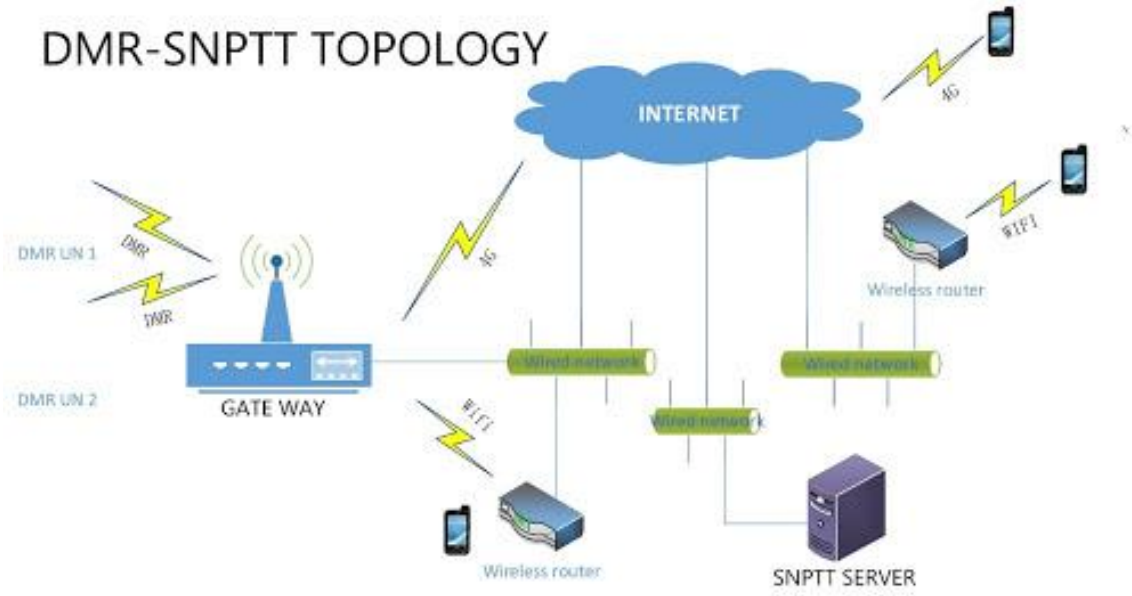
TG 235907	JOTA United Kingdom,	in English
TG 272907	JOTA Ireland,	in English
TG 250907	JOTA Russia,	на Русском
TG 268907	JOTA Portugal,	em Português
TG 2229405	JOTA Italy,	in Italiano
TG 204907	JOTA The Netherlands,	in het Nederlands
TG 50297	JOTA Malaysia,	di Malaysia
TG 50298	JOTA Malaysia,	di Malaysia
TG 748907	JOTA Uruguay,	en Español
TG 748918	JOTA Uruguay,	en Español
TG 33457	JOTA Mexico,	en Español
TG 724907	JOTA Brazil,	em Português
TG 263907	JOTA Germany,	auf Deutsch
TG 510907	JOTA Indonesia,	di Indonesia

TG 918 - YOTA Call (Only for young amateur radio operators) when contact is established, you will have to move to another TG chat room to release TG 918

TG 510 – JOTA Indonesia, lounge/room for Jota-Joti participants from Indonesia or participants from other countries who speak Indonesian. After the contact has been successfully created, you can join TG 510907 or other Talk Group.

D-STAR

D-STAR (Digital Smart Technologies for Amateur Radio)



http://www.dstarinfo.com

D-STAR is a digital mode that allows users to be connected through repeaters and personal hotspots.

There are two D-star reflectors for which REF33A and XLX005J can be used.

REF033A has been assigned as a full-time D-STAR JOTA / Radio Scouting reflector.

Once contact is made, stations should disconnect from REF033A and connect to either repeater or migrate to an unused reflector.

https://freestar.network

XLX005J is linked to the FreeDMR TG907, which is the dedicated JOTA / Radio Scouting Talkgroup.

Connect to XLX005J through your D-STAR radio or your hotspot.

On your Hotspot, set the mode to D-STAR and select DCS005 or XLX005, and then select Node J.

To monitor XLX005J Visit http://xlx005.freedmr.uk/

C4FM / fusion

C4FM is a digital modulation technique used to transmit digital voice and data information over a radio channel. C4FM is the acronym for Continuous 4-level Frequency Modulation.

Accordingly, four frequencies are used for frequency-shift keying. These are in frequency ranges such as the ultra-short wave and the decimeter wave below 1 GHz.

The modulation method is used, among other things, in APCO P25 (Radio Land Mobile Communications, Project 25), a higher-level transmission network for digital authority radio for police and rescue services in North America and worldwide in amateur radio.

C4FM is specified for this application by the Telecommunications Industry Association (TIA), an association of government agencies in the United States, in the ANSI / TIA-102.CAAB-C standard.

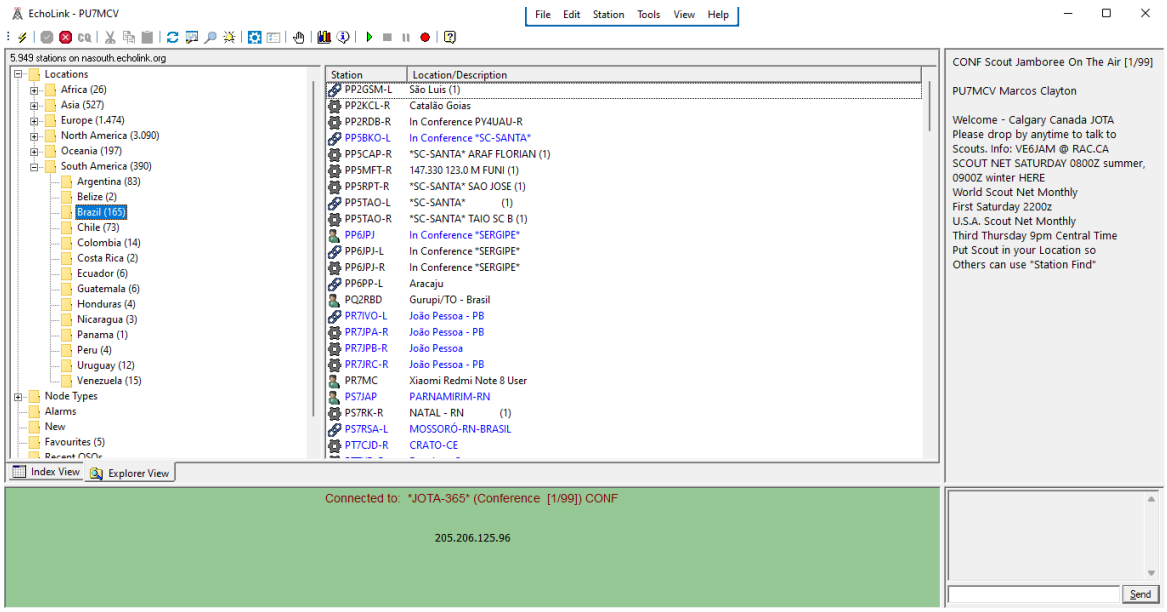
ID: IT-RADIO Scouting DTFM ID: 87202 Catania, Sicily, Italy
ID: N2TPA-ND 271432 N2TPA Digital Hudson, Florida, USA N:28 20' 36"W:082 42' 10"Supporting International Scouting and disaster response

UK:

- Fusion Hotspot or Local Repeater FCS004, Room 27 Available 24/7
- Fusion Wires-X Hotspot or Local Repeater JOTA-365-Scouts Available 24/7

EchoLink

EchoLink is a computer-based Amateur Radio system distributed free of charge.



If you have an internet connection available at your amateur radio station, we recommend using the EchoLink system. Its main advantage allows you to make radio contacts over considerable distances, regardless of the radio propagation conditions, using even small handheld radios.

EchoLink works via computers that are connected both to the internet and to an amateur radio station. By contacting one of these, your signals can go from the airwaves onto the internet and vice-versa. Suppose you are at a location that does not allow you to put up antennas or have easy access to the computer classroom in a school building.

You will now have the chance to participate in JOTA-JOTI from the school's PCs simply by connecting to EchoLink. There is a primary conference node on EchoLink where Scout stations meet: JOTA-365.

Your amateur radio operator has to register with EchoLink beforehand. This takes a few days, so don't wait until the last moment to prepare your EchoLink station.

Register with www.EchoLink.org before 1 October if you intend to use it for JOTA-JOTI.

Scheduled Amateur Radio Meetings

Net	Time	Frequency/Channel	Notes
UK HF Scout Net	Every Saturday 09:00 AM UK Local time	HF SSB LSB 3.690/7.190 kHz	During the UK EchoLink Scout Net, the exact frequency is agreed.
UK EchoLink Scout Net	Every Saturday 09:00 AM UK Local time	EchoLink conference: JOTA-365	
World Scout Net	1st Saturday of Month 10:00 PM UTC	EchoLink conference: JOTA-365	
USA Radio Scouting Net Monthly	2nd Thursday of month 9 PM CST (UTC-6)	EchoLink conference: JOTA-365	
	2nd Thursday of month 7 PM MST (UTC-7)	EchoLink conference: JOTA-365	
German Radio Scouting net	4th Thursday of month 8:30PM local time	EchoLink conference: JOTA-365	The spoken language is German.
Brazilian Caio Vianna Martins Radio Scouting NET	Every Friday 8:00 PM to 9:00 PM Local time	EchoLink conference: JOTA-P	If you would like a Certificate of Participation, please email: velhooyaguara68@gmail.com/ or craembrasil@gmail.com
Brazilian Alertino Radio Scouting NET	Every Thursday 8:00 PM or 8:30 PM Local time	EchoLink conference: SCOUT-SP	

Brazilian Sempre Alerta Paraná Radio Scouting NET	Every Tuesday 8:00 PM Local time	EchoLink conference: JOTA-P	
Brazil - Patrulha BP	Last Sunday of the month 5:00 PM Local time	14.290 kHz	
	Every Sunday 9:30 AM Local time	7.090 kHz	
	Every Sunday 10:00 AM Local time	EchoLink conference: JOTA-P	
	Every Wednesday 6:00 PM Local time	3.740 kHz	
	Every Wednesday 8:00 PM Local time	7.090 kHz	
Radio Scout Net	Every Sunday 9:30 AM local time	7.090 kHz	


INTERNATIONAL SCOUTING NET
USA - MON 5PM PDST CALIFORNIA | MON 8PM EDST FLORIDA
PHILIPPINES - TUE 9AM PHILIPPINES | UTC - TUE 1AM
WIRES-X KAPIHAN 62145
YSF KAPIHAN 10482
DMR TG 51547
FCS00347
ALLSTAR LINK 40364
ECHOLINK *KAPIHAN* 515940
PEANUT WMS / PH / YSF-KPHN
KAPIHAN NETWORK
CALLED BY: N2TPA DOC JASON
Image from jotajoti.info


ESCOTEIROS
DO BRASIL
PATRULHA BADEN POWELL
RODADA SEMPRE ALERTA PARA SERVIR
18H 3740
20H 7090
kHz
WEDNESDAYS

SSTV

Slow-scan television is a picture transmission method to transmit and receive static pictures via radio. Basically, the image is converted to a sound, similarly to a fax, which is transmitted via radio instead of voice; the received sound is then converted back into an image.
In this way, it is possible to exchange personalized images, and perform complete radio communications by adding text on it. The same images represent the QSL cards of your communication.

Few advices:

- Be prepared in advance, creating images that represent something peculiar about your group or your city.
- The natural noise or underlying communication can spoil part of the image during the transmission; because of this:
    - Don’t use images with small details that would be easily lost.
    - Images with high contrasting colors are easy to be interpreted with noise.
    - Text messages should be simple and large, with a high color contrast with respect to the background images. Outlining text can be effective as well.

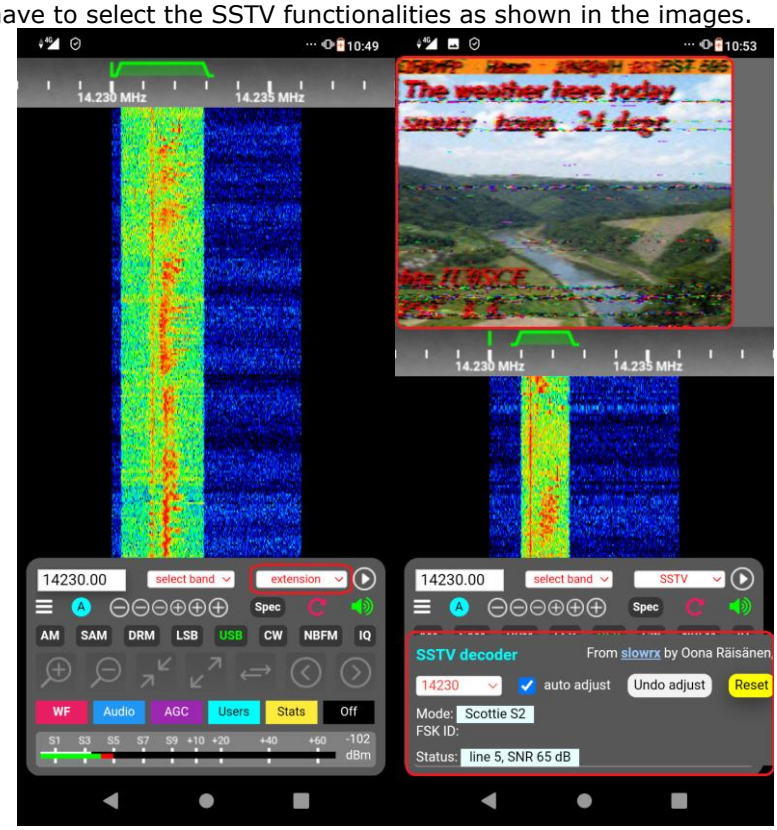
Operating SSTV communications

PC/LAPTOP and transceiver
To create and decode SSTV images you can use the MMSSTV software. There are several ways to encode an image into a sound. The most used modes are Scottie 2 or Martin 2. In phase of reception, the software will automatically detect the SSTV mode.

The easiest way to connect PC and radio is to put the radio microphone close to the PC speaker when transmitting, and the radio speaker close to the PC microphone when receiving. This solution is however prone to several risks: a too loud PC sound into the radio microphone might get distorted, and vice versa. Moreover, environmental sounds (e.g. people chatting around the radio) will be collected by the microphones, spoiling the results. The most professional way is to purchase or build an audio interface between PC and transceiver.

PC/LAPTOP and SDR receiver
When using SDR dongles or WebSDR receivers, the MMSSTV software can be used. However, you need to feed the audio input of your computer with its same output. This can be easily done by software virtual devices, like the free Virtual Cable. Once the software is installed and you have tuned the receiver to a SSTV frequency (see below), you will need to select the virtual input/output audio devices in the settings program.

With KiwiSDR online receivers, SSTV reception is simpler, both by PC and mobile phone. In this case, you just have to select the SSTV functionalities as shown in the images.



Mobile Phone and Transceiver
A number of apps are available to decode (e.g. Robot36) and encode (e.g. SSTV encoder) SSTV images (check the Mobile apps chapter). Mobile phones can be used for games with PMR/CB radios, simply by putting the phone close to the transceiver (with the limitations described before). The environment should be as silent as possible when transmitting or receiving. Scavenger hunt games, looking for specific people or monuments, can be done in this way.

SSTV Frequencies (kHz):

- **80 m: 3,730 (LSB)**
- 40 m: 7,033-7,040 (LSB)
- **20 m: 14,230 (USB)** **(commonly used)**
- 17 m: 18,160 (USB)
- **15 m: 21,340 (USB)**
- 10 m: 28,680 (USB)
- **6 m: 50,300 (USB)**
- 2 m: 144,500 - 144,525 (FM)
- **70 cm: 433,700 - 433,925**

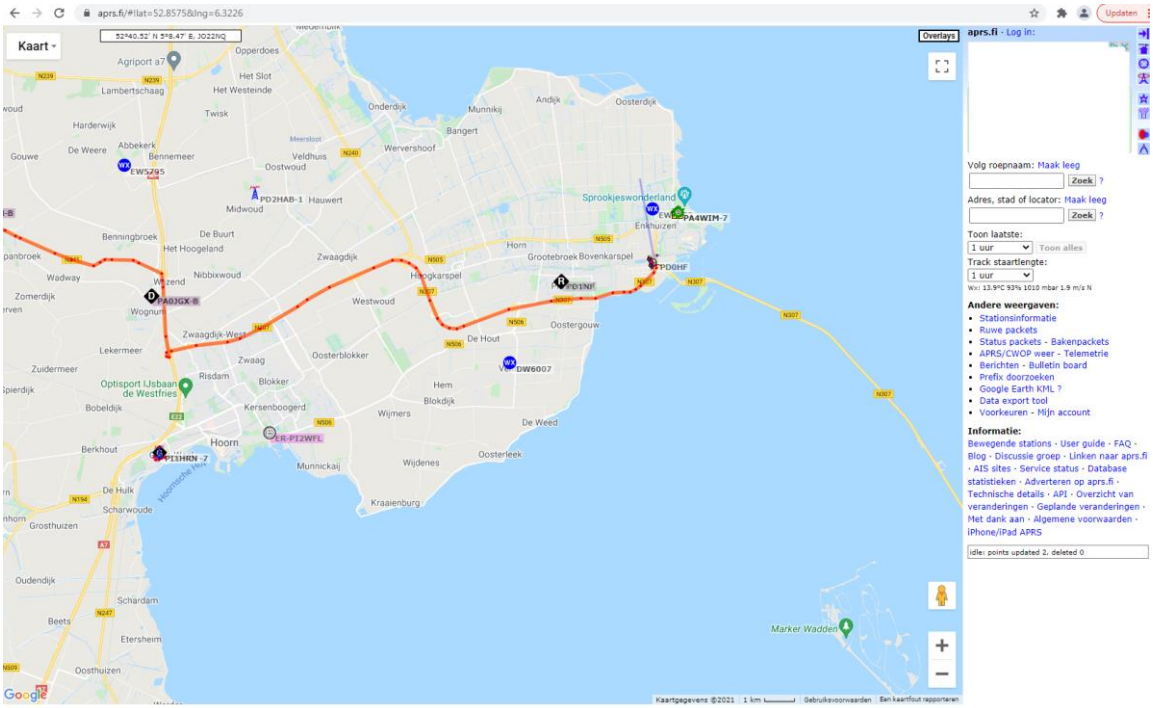
SSTV simplex repeater network 2m (EU) 144.88750

ARISS regularly sends SSTV images from space from the ISS. https://www.ariss.org/

Automated Packet Reporting System (APRS)

APRS is a method of tracking a radio station. It could be done using a mobile device with GPS. A fixed receiving/antenna system collects the location data and puts it on the internet. This is an amateur radio application like AIS for boats or ACARS for airplanes (used for the professional market).

APRS can be used over JOTA-JOTI but has limited applications with direct JOTA-JOTI activities; you may use it to show your site location, as a TXT service, and so on. It would most likely be best used as part of another activity, not in the radio shack. You can also use the APRS.fi page to show APRS information.



A link to a website where you can spot APRS stations. www.aprs.fi

APRS frequencies:

- 144.390 MHz - North America, Colombia, Chile, Indonesia, Malaysia, Thailand (VHF)
- 144.575 MHz - New Zealand (VHF)
- 144.640 MHz - Taiwan (VHF)
- 144.660 MHz - Japan (VHF)
- 144.800 MHz - South Africa, Europe, Russia (VHF)
- 144.930 MHz - Argentina, Uruguay (VHF)
- 145.175 MHz - Australia (VHF)
- 145.570 MHz - Brazil (VHF)
- 145.825 MHz - International Space Station (VHF)
- 432.500 MHz - Europe (UHF)

Mobile Apps

EchoLink:

https://apps.apple.com/us/app/EchoLink/id350688562

https://play.google.com/store/apps/details?id=org.EchoLink.android

QRZ Call sign search:

https://apps.apple.com/us/app/callsign-search/id680180116

https://www.qrz.com

SSTV apps:

https://play.google.com/store/apps/details?id=xdsopl.robot36

https://apps.apple.com/us/app/sstv-slow-scan-tv/id387910013

https://play.google.com/store/apps/details?id=om.sstvencoder

Satellite Finder:

https://play.google.com/store/apps/details?id=com.heavens_above.viewer

https://play.google.com/store/apps/details?id=com.noctuasoftware.stellarium_free

https://apps.apple.com/us/app/stellarium-mobile-star-map/id1458716890

APPENDIX A - CQ code communication Example

One of the rules is always to state your caller's code and then the code of the station you are using ("you" from "me") at the start and end of your program.

CQ Jamboree CQ Jamboree this is (Your callsign) ……
Calling and listening for any call. (Your callsign) ….**is calling CQ and standing for any call.**

Wait for a reaction from an amateur station to your call.

(Your callsign) this is (Other callsign) how do you copy?

What to say during a conversation (QSO)?
You can have a normal conversation.

(Other Callsign) **This is** (Your Callsign) **returning. Thank you for picking up my station call and a very good morning/afternoon/night to you. My name is** ……,
spelling like (NATO)……
My QTH (location) **is** ……, **spelling like** (NATO)……
Your signal is (RST 5 and 9) Microphone back to you, (other callsign) **from** (your callsign)

Your station is returning the microphone. The other station could then answer like this:

Very fine copy (your callsign) ……. **this is** (other callsign) …….**. We are a scout station and enjoy the JOTA-JOTI Weekend. The weather here is** ……**and my age is** ……**years old. Thanks, you for this conversation microphone back to you for the final** (your callsign) …… **this is** (other callsign) …….

Microphone is going back again to the other station.
For now, 73's (Greetings) back to you.

Ok, thank you for the conversation. Our QSL Card is 100% via the Bureau. Thank you for the Nice Contact and 73's to you and your family, (other callsign) ……
this is (your callsign) …… **73's**

END OF CONNECTION.

Now, you can register the conversation in the logbook and write a "QSL" card to the station to confirm the connection you just made. And you can start all over to request for any call.

CQ Jamboree CQ Jamboree this is…

APPENDIX B – Amateur Radio Logbook

Amateur Radio Logbook _____Page ____

STATION – NAME CALLSIGN	
OPERATOR:	

QSO	Date	Time	Callsign	Name	QRG	Rst	Comments
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

APPENDIX C - Antenna's for JOTA-JOTI

Introduction

An antenna is the connection between the radio transmitter (TX) or receiver (RX) and the electromagnetic radio wave. The electromagnetic waves are reacting to the metal of the antenna and are connected to the radio with a coaxial (shielded) cable. As spoke before there are many different antenna types. Such as Verticals, Beams, Dipoles, long wire antennas.

In this appendix we will speak about some quite simple antenna's which could be build and used during JOTA-JOTI.

Antenna Basics

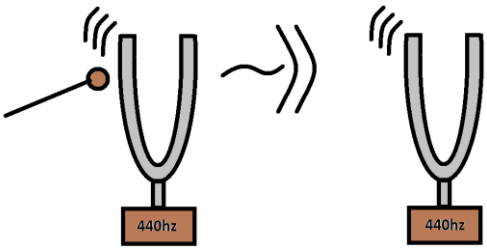
A radio wave is the effect of a frequency and modulated signal such as speech, radiated or received with a metal construction called radio antenna.

For the best performance in receiving and transmitting an antenna should be resonant to the frequency. In example we could think about sound waves.

If a tuning fork has been placed on a table the sound will transport due to vibration thru the air.

If we place a copy of the tuning fork beside the first one which produce the sound wave, the second will make the same sound too.

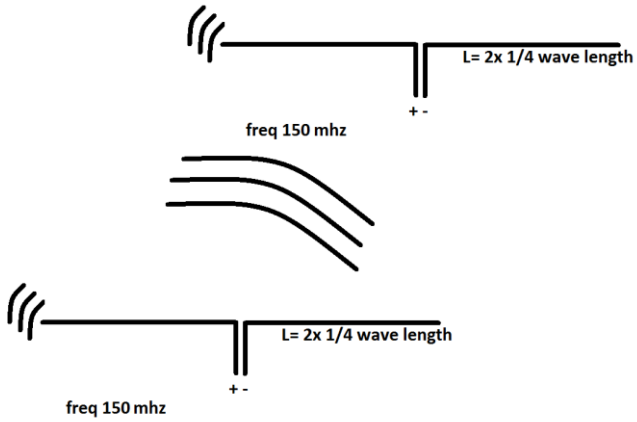
This is called resonance. If we place another random format tuning fork this one will not resonate on the same frequency and would not pick up the same sound.



So, they should be matched. Antenna's work the same.

If a transmitter antenna is sending out on a frequency, the antenna should be resonant to the transmitting frequency (for maximum performance).

Signals to be received should be matched (resonant) to the transmitting frequency.



To understand what will happen, it will be easy to compare an electromagnetic radio wave with sound waves. They behave almost the same.

Before we jump into the making of antennas for JOTA-JOTI it will be necessary to understand what actually is happening.

The radio transmitter is converting speech into magnetic radio waves. Therefore, the speech of the audio has been converted and modulated in a wave form.

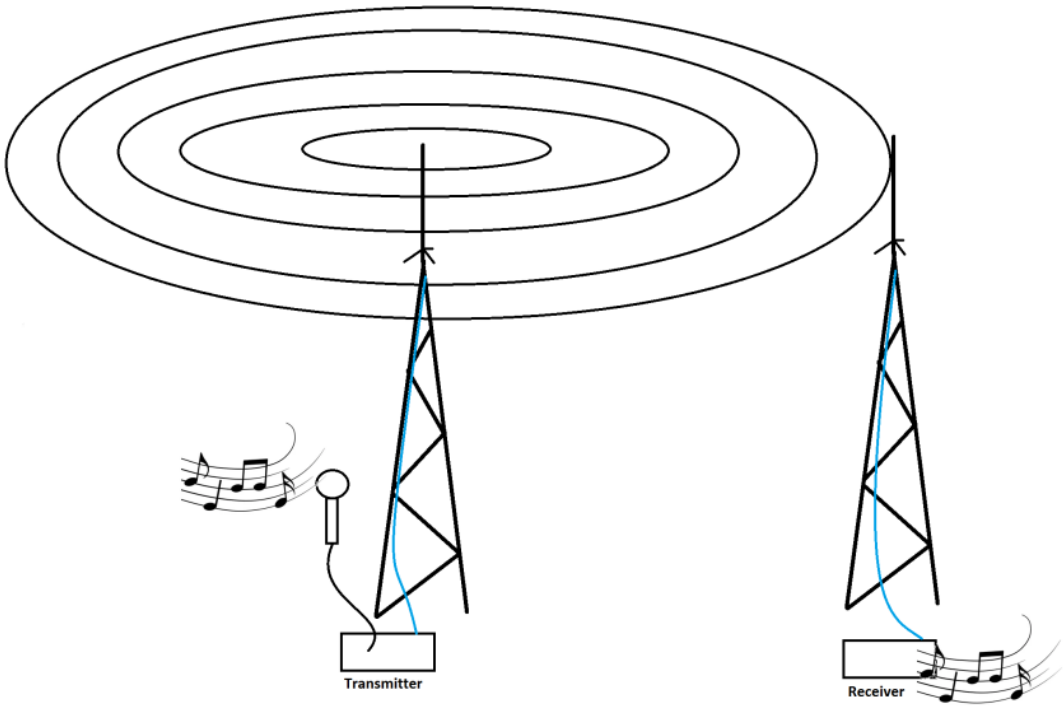
This waveform as electrical current comes out of the transmitter (TX) to the antenna. The resonant antenna reacts on the electrical current and changes the signal from this electrical to an electromagnetic wave.

The electromagnetic signal now transposes through the air. Depending on the type of antenna (and the strength of the wave) as described earlier, the signal will "propagate" through the air.

The propagation of the signal can be easily imagined as if you throw a stone in water and we could see the ripple move forward.

So, you can imagine that is there is now something in the path of the ripple, it gives an effect of reflection and the path of the wave will change.

If you are in the path of this ripple (with your JOTA-JOTI antenna) you can receive the signal and the radio receiver shall decode it.

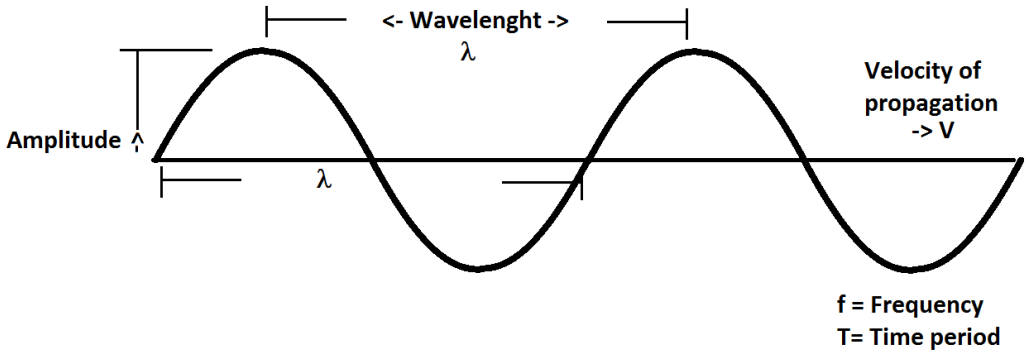


Calculate the (resonance) frequency into wavelength to match the antenna to the frequency as been transmitting you need to calculate the wavelength of the signal.

Electromagnetic Signals of waves are transporting thru the air with a speed of light = 300,000 kilometer per second.

Wavelength = Velocity (wave speed in m/s) / Frequency (vibrations per second in Hertz)

If a transmitter is transmitting at 150 MHz the wavelength of one wave = 300,000 / 150,000 = 2-meter length.



The formula to calculate the Length of one wave in one Time period

$$\lambda = V : f$$

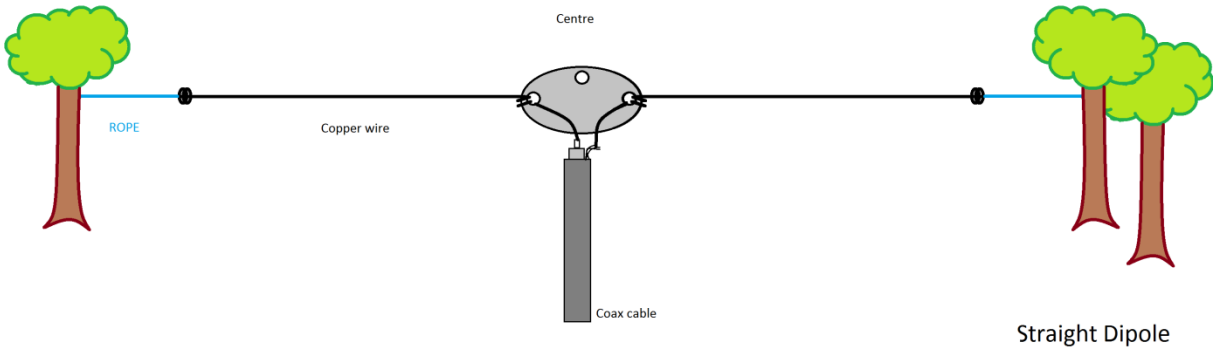
Dipole antenna (single frequency)

A dipole antenna is a simple antenna. The length of the two legs is 2x ¼ of a wavelength.

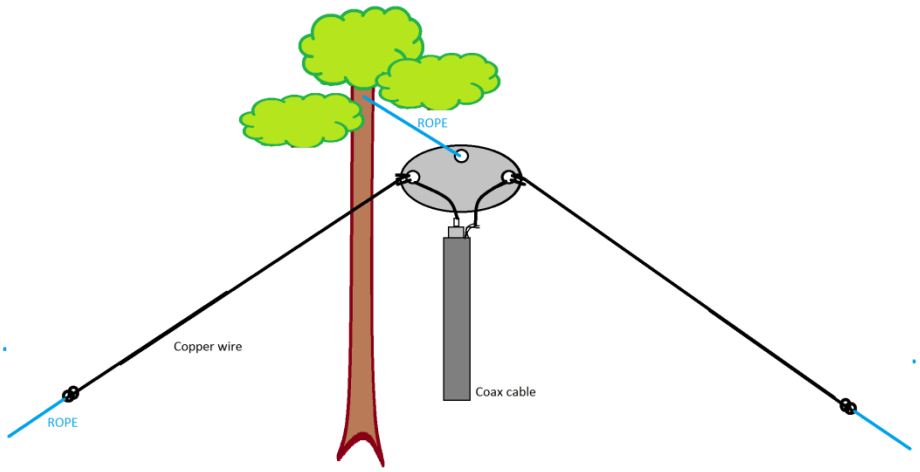
For the example above for an antenna for 150 MHz we have seen the wavelength is 2 meters. So, both lengths of the electrical (copper) wire are 0.5 meters.

If we split up the feeding line (coax cable) of the transmitter or the receiver into 2x a ¼ wavelength the antenna is resonant to the calculated frequency. At the end of the length of the wire you need some electrical isolation.

Technically this will work as Dipole antenna. But for (outdoor) use we need some mounting materials.



Straight Dipole
Both ends at high point

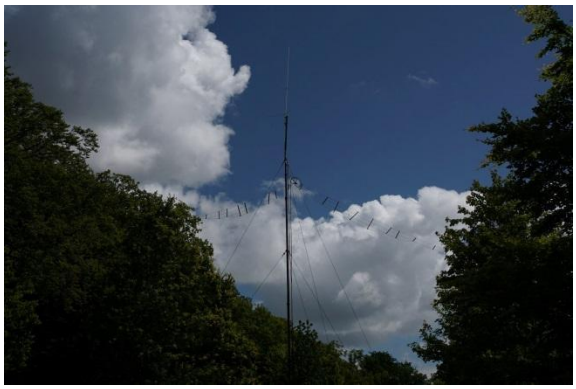


Inverted V
Only middle point high

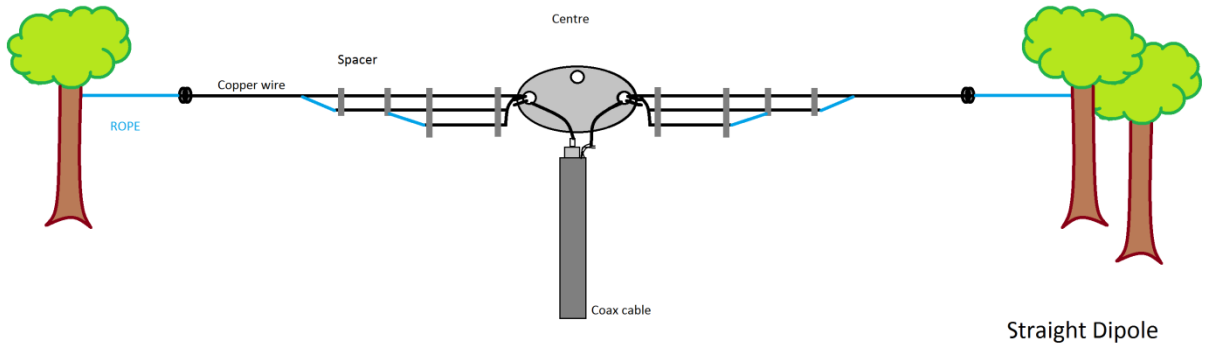
Depending on the angle the impedance of this antenna is in between 30 Ohm and 150 Ohm (should be as close to 50 Ohm because of the transceiver) Angles for an inverted Vee shape are in between 90 degrees and 120 degrees. A horizontal dipole is stretched over 180 degrees.

Fan Dipole (multiband dipole)

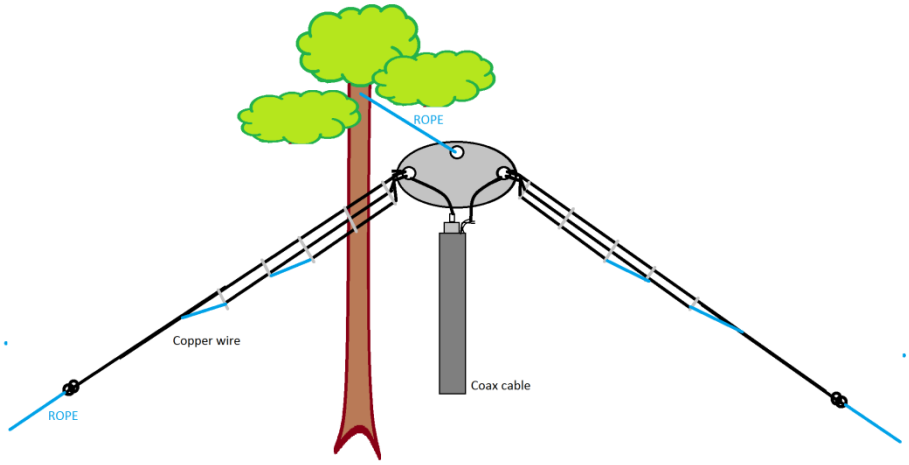
If we want to use an antenna for many different frequencies or different bands it will be possible to combine several dipoles with one feeding line to the transmitter or receiver.



Only one rule we need to think about, that the frequency as used has to be harmonic. So, for example for HF frequencies we could combine multiple dipoles for 40m – 20m – 10m (to one feeding line to the transmitter or receiver). In between the electrical (copper) wires we need isolation material, spacers (at least 10cm apart). This could be done by an electrical isolation pipe. The length of the copper wires (legs) is the same as the single dipole, but every frequency has its own wire of ¼ wavelength.



Straight Dipole
Both ends at high point



Inverted V
Only middle point high

Depending on the angle the impedance of this antenna is in between 30 Ohm and 150 Ohm (should be as close to 50 Ohm because of the transceiver) Angles for an inverted Vee shape are in between 90 degrees and 120 degrees. A horizontal dipole is stretched over 180 degrees.

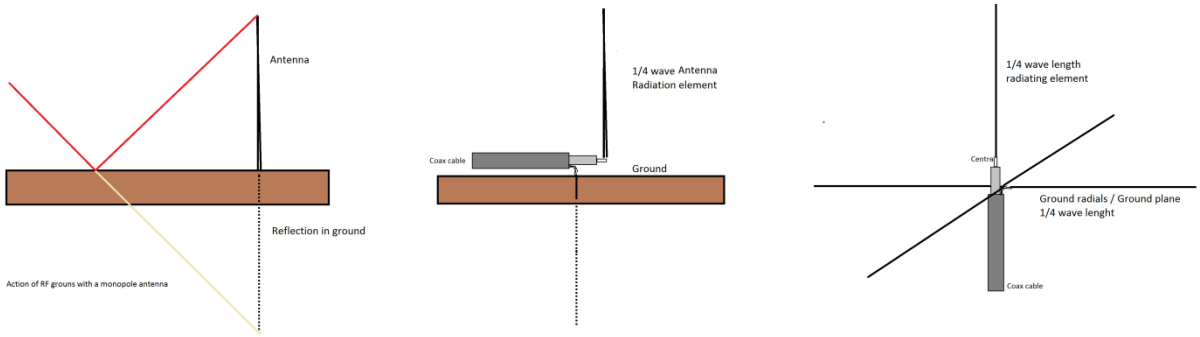
Vertical (1/4 wave) antenna

Quarter wave verticals are widely used in view of its simplicity and convenience.

Basics of this type of antenna are that the length of the "radials" of the antenna are a ¼ wavelength.

So, the radiator is a ¼ length and also for the ground radials. As the name suggested the antenna is in a vertical position.

The pattern of this type of antenna is that signals could be transceiver and received around (omnidirectional) other than a horizontal dipole which has a different radiation pattern. At the ground plane (earth) this type of antenna will reflect the signal.



In fact, the quarter wave dipole can be considered as a dipole in which one half is the radiating monopole, and the other half is a reflection seen in the ground. The antenna is what they called unbalanced, using a vertical radiation element and a ground plane.

Vertical antennas, especially for HF where separate ground or radial system is used will have a matching assembly in the base feed point to accommodate the mismatch as they are normally fed with 50Ω coaxial feeder.

This matching arrangement normally consists of a tapped coil which gives the required impedance transformation. The impedance of this antenna is typically around 20 Ohm.

Hardware safety

The radio signal is transferred from the antenna to the transceiver and vice versa through a coaxial cable. This cable is able to transfer the signal with minimal loss and without picking up external interferences along the way.

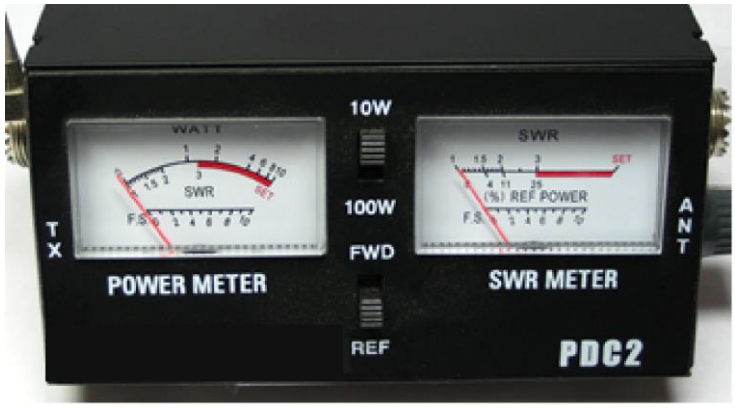
Never transmit if the coaxial cable is damaged or disconnected at some point. The radio will suffer heavy, irreversible (and expensive) damage).

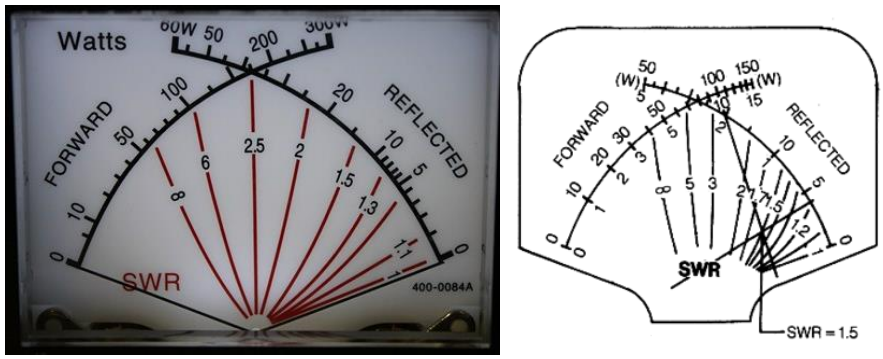
Always use coaxial cable with proper impedance. Most amateur radio systems need 52 Ω cables, while TV ones usually have 75 Ω impedance. Choosing the wrong cable could lead to heavy damages.

Antennas usually cover one or few radio bands. Be sure that the antenna you have connected is designed to work in the frequencies you want to use.

For the safest and most efficient transmission, transceiver and antenna must be properly tuned. All the power from the transmitter must be radiated by the antenna, without coming back to the transceiver. In technical terms, this means to have a Standing Wave Ratio (SWR) at 1.

The higher the SWR, the less efficient is the communication and the higher is the probability of damage to the equipment. A SWR meter must be connected in between transceiver and antenna. Always check it whenever the frequency is varied. If the SWR is too high, adjust the antenna. Some SWR meters are equipped with matching units (controllable with two knobs), that allow them to correct the transmission line and take the SWR back to 1.





In the figure, a cross-needle SW meter display is shown. The SWR is read finding where the two needles intersect, with respect to the SWR lines.

Never touch the antenna when transmitting. Very high voltages can be reached.

Disconnect from the antenna if storms are approaching. Be also sure to connect the radio system to a good ground connection.

Practical Antenna tips and hazards

- Antenna towers should be steady and rock solid (also if they are only for a weekend).
- Antennas for low frequencies (HF) are setup at a minimum height of ¼ wavelength for optimal performance.
- Antennas for VHF UHF are placed as high as possible. Because the signals are (mostly) traveling till the horizon.
- Antennas should be tested with an analyzer. Before use you need to check if the SWR is as closed as possible to 1:1 not more than 3:1 ratio.
- An antenna tuner (ATU) could be used to match antennas to the transceiver's frequency.
- Antenna (system) Impedance should be as close as possible to 50 Ohm.
- Be aware of the Hazard of radiation of the antenna and do NOT touch the antenna elements during transmitting. AN electrical shock could Occur and could be really dangerous to people!

Other useful antennas for JOTA-JOTI

There are many antennas and types we could choose and use for JOTA-JOTI. In this appendix we try to keep it a little bit simple and a bit short. In this part we only suggest some other antennas which could be useful for activities during JOTA-JOTI. If you are interested to know how you could build your own, the internet is full of suggestions how to build or where to buy.

Suggestions for other (simple) antennas for use during JOTA-JOTI

- HB9CV antenna;
- Vertical 5/8 wave antenna;
- Vertical UHF VHF antenna;
- End Fed antenna;
- G5RV antenna;
- ZS6BKW antenna;
- Long wire antenna.

More complex antennas for use during JOTA-JOTI

- Yagi;
- Cross Yagi;
- NVIS antenna;
- Four Square antenna;
- Delta Loop;
- Magnetic loop antenna.

APPENDIX D – Games and activities

The described activities here are meant to give new ideas to support the preparation and the carrying out of JOTA-JOTI local events.

While the JOTA-JOTI involves amateur radio worldwide communications, these ideas can be used for complementary activities, to make the local event more varied and interesting, and to help scout leaders to teach amateur radio techniques and good communication practice.

The activities presented here are useful during the JOTA-JOTI, but they can also be proposed at any time of the year by scout and leaders to use amateur radio techniques as effective pedagogical means for the scout education.

Most activities can be carried out without the need of an amateur radio license.

Using receiving-only devices does not generally require any kind of authorization. Please verify the specific laws of your country before using listening devices or amateur radios.

The JOTA-JOTI platform offers a variety of ideas that can be used for complementary activities to make the JOTA-JOTI local event more varied and exciting and help Scout leaders teach amateur radio techniques and good communications practice.

Basic activities

How to build a Morse key

Transmit in Morse from anywhere, with few simple materials.

Duration: 20-30 minutes

Learning targets: Get the basic skills needed to make an electrical circuit! Here's how to get started with Morse code.

Materials:

- Wood, thick cardboard, or a plastic box that can provide a solid base for the Morse key.
- Clothespin/clothes peg and an upholstery nail (thumb tack). Alternatively, you can use thick cardboard and thin aluminum/copper foil.
- 4.5 V/9V ACTIVE buzzer (it must NOT be passive). Alternatively, a 9V led can be used for light signaling.
- Battery to fits the buzzer's voltage range. If a 9V battery is used, please get a suitable connector, as per the following example (see image below).

- Soldering iron and solder wire. If leaders prefer not to let Scouts or Guides use a soldering iron, one "mammoth" terminal block will be provided for each Morse key.
- Cork
- Nipper and (small) hammer
- Glue

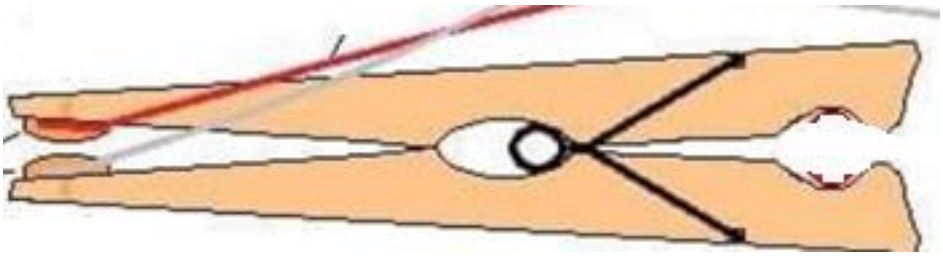
Time needed and location specifications:

30 minutes. If a soldering iron is used, the activity should take place on a robust heat-resistant table, close to a 110/220 V socket.

Instructions:

The Morse key can be built as shown in below.

1. Disassemble the clothes peg/clothespin.
2. Glue one of the two main parts of the clothes peg/clothespin to the Morse key base.
3. Partially push or hammer the upholstery nail into the part of the clothespin that is normally held by your hands. Before completely fastening the nail completely, the metal tip of the buzzer's red wire should be placed under the nail's head or twisted around the nail.



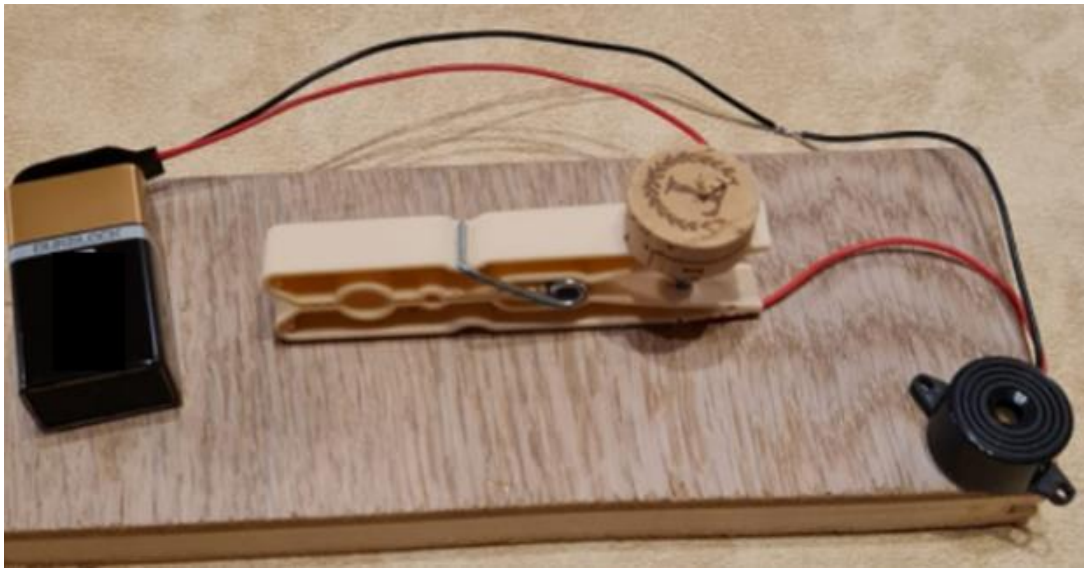
4. A similar thing is done using the other piece of the clothespin, the cork (that will be fastened to the clothespin by nail) and the battery's red wire.

5. Solder together the ends of the two wires.
6. Reassemble the clothespin.

Your Morse key is ready to be used! Be sure that the heads of the nails do not touch each other when the Morse key is not being pressed.

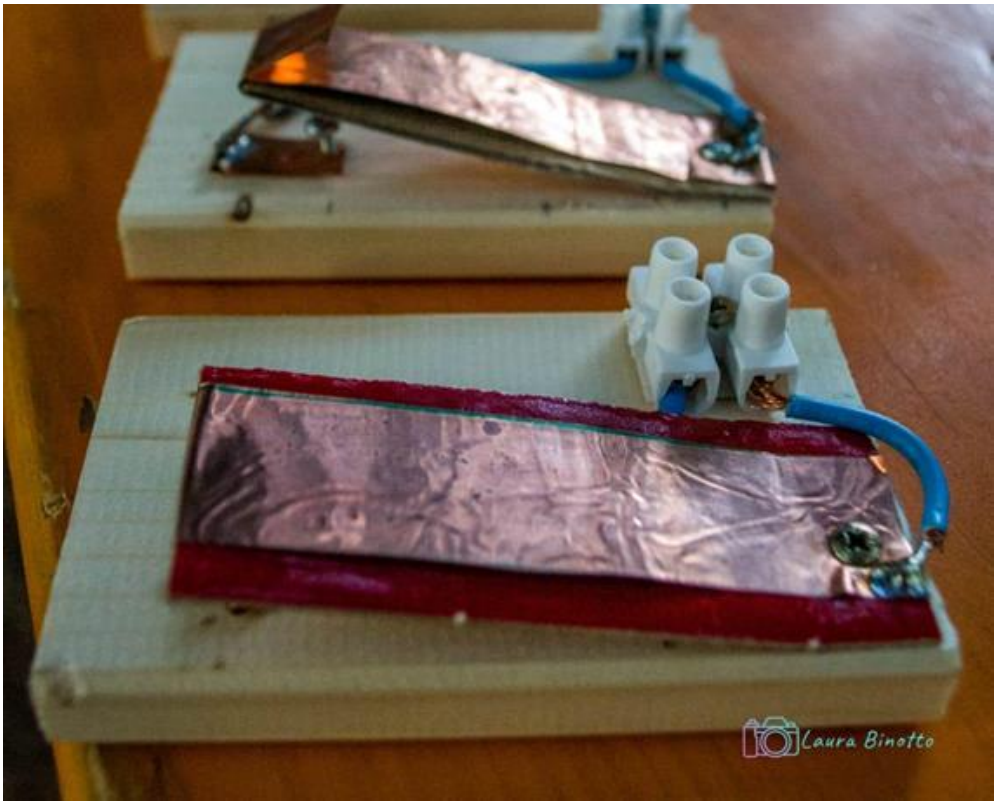
Note:

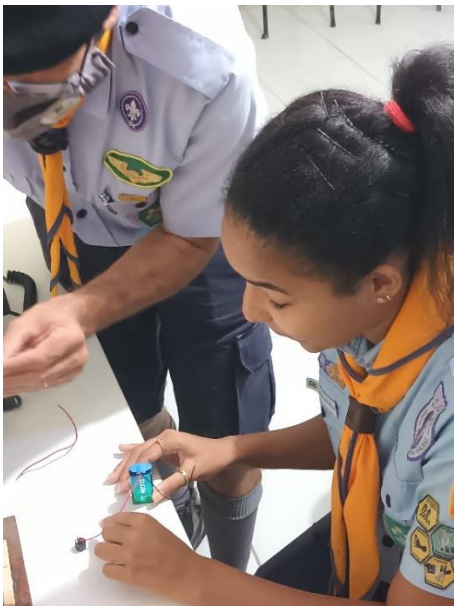
Red and black wires can be swapped. If this happens, connect the nails to the black battery wire and the black buzzer wire, and solder together the red wires.

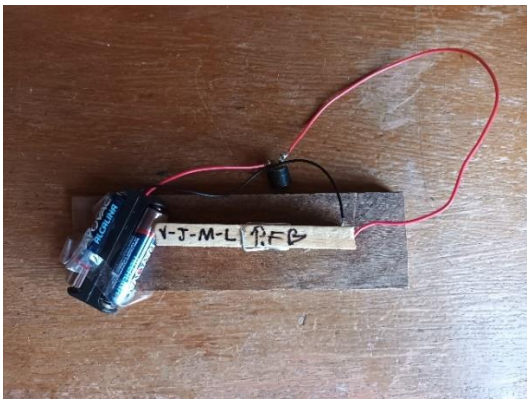


Alternately you can use a "mammoth" terminal block

A simpler model can be built as shown in the following photo. In this case, the "mammoth" terminal block should be connected to the two red wires or to the two black wires.


Laura Binotto





It’s possible to find lots of projects online, here two examples:

- https://youtu.be/mxVfPyc0HRQ - In Portuguese
- https://youtu.be/6HRIHzPDmAs

After building the device, try to use it. Start with small words or your name and ask a Scout or Guide friend to decipher the message.

On the video below, try to figure out what is been transmitted:
https://youtu.be/c9C9zMNJTmA

How to play Amateur Radio using Zello

Thanks to Zello, even with bad propagation or no radio at all, it is possible to teach and learn the operating practice of radio communications.

Learning targets:

- Train to the correct management of radio communications with all its educational implications.
- Get used to listening to everyone.
- Don’t talk over someone else.
- Don’t shout in conversations to impose one’s point of view.
- Keep a polite speech.

Material:

Mobile phone with Internet connection (possibly one for each Scout).

Software: Zello for Android, iOS or Windows PC:

https://zello.com/personal/download/

Description:

The Zello app works like a transceiver, using the Internet to connect the mobile phones. Thanks to this app it is possible to teach the correct practices for radio communications even without transceivers.

All the games which involve CBs or PMRs can be alternatively played using Zello instead.

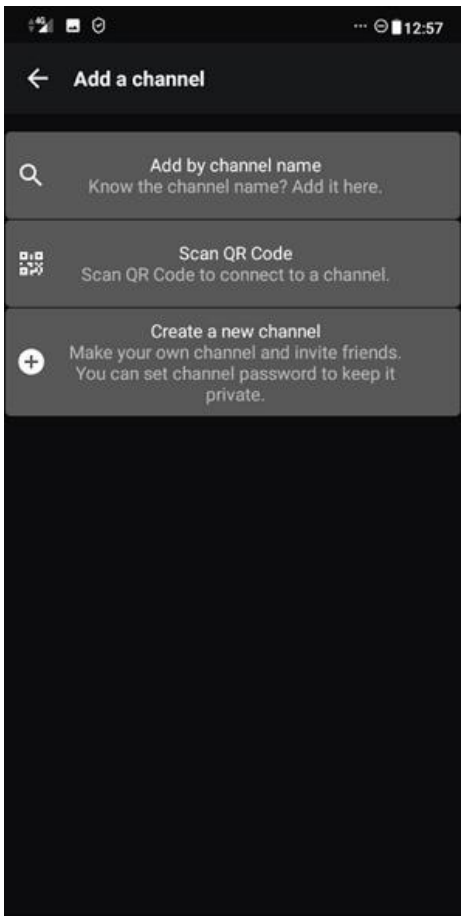
To find information on how to manage a radio communication, please check a separately dedicated activity on the pack.

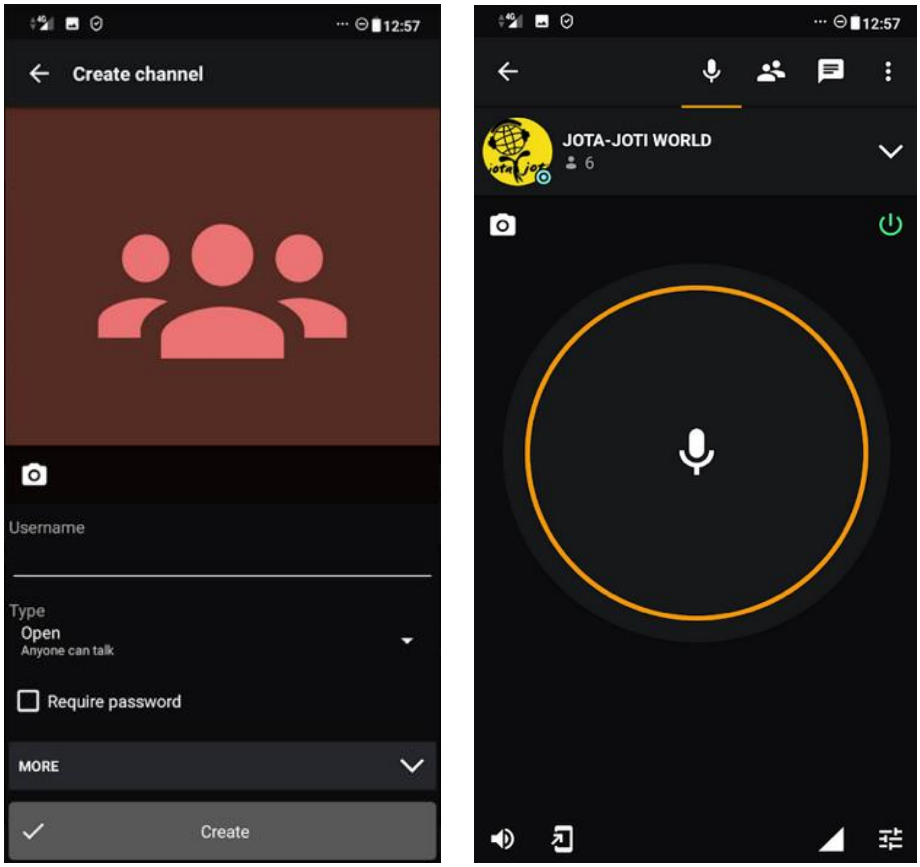
Once the app is installed in the phone, it is necessary to create an account and log in.

Once logged in the application, you can talk with single users or in a common channel (which is better suited to a Scout activity).

You can search and enter an existing channel or create one.

For safety reasons, channels can be protected by a password.





Once inside a channel it is possible to "transmit" a voice message by pushing the central button, which is the equivalent of a PTT (Push to Talk) button in a radio.

The button must be pushed and kept pushed until the button's border becomes green, only then you can start talking (the PTT button must be kept pressed for the entire duration of the speech).

If the button's border is red then the transmission is refused, most likely because someone else is speaking or about to speak.

All vocal messages are recorded and can be re-listened, it is also possible to send text messages (bubble icon).

The application is always listening for incoming messages, even when it seems not active. Channels can be muted by using on-off icons; to completely stop the application, please tap on Disconnect.

Game: prisoners

Your patrol was captured and you've been confined in separate cells. Will you still be able to communicate?

Learning targets:

- Learn basic science concepts related to radio waves.
- Practice with Morse code signaling.
- Learning to be silent and skilled in listening.

Material:

- Paper and pen.
- Morse Code chart/identification diagram.
- AM/FM radio receivers (commonly used to listen to broadcasting transmissions), one for each patrol.

Time: Around 1 hour.

Preferred place: the game is meant to be indoor, in a building with at least as many rooms as the patrols.

Description:

Radio waves are generated by high frequency oscillations of electric voltage or current. The easiest way to produce them, and the first in history to be used, is generating electric sparks.

The radiofrequency interferences caused by sparks can be easily picked up by close receivers, especially in amplitude modulation (AM) reception mode; to listen to these signals, the radio should be tuned to a frequency where no broadcasting stations are transmitting.

In everyday life, sparks are generated by switches, in the instants in which they are opened or closed. In nature, long range disturbances are generated by storm lightning, so that listening to these signals can be used, also at a scout camp, to foresee the approaching of a storm.

Before the game or in a previous activity this technique should be taught to Scouts, with the possibility for them to practice. At the beginning of the game, patrols are kidnapped by scout leaders, disguised the enemy spies.

Each patrol is blindfolded (so they cannot understand where they and the other patrols are being moved) and put in a separate room; blindfolded people may be taken outside for a while, so that they are more confused and can't understand that each patrol is put in close rooms.

What they can find in the room is: paper, pen (to write their last prayers!!!) and an AM/FM radio. On the walls there are light switches.

Patrols can then communicate with each other in Morse code, using the switches and the radio in AM mode.

While making dots is straightforward, dashes can be made with rapidly repeated on-off movements of the switch, or by keeping the switch in an intermediate position which causes continuous sparks (people can hear them "fry" inside the switch).

The target of the communications can be chosen among different options:

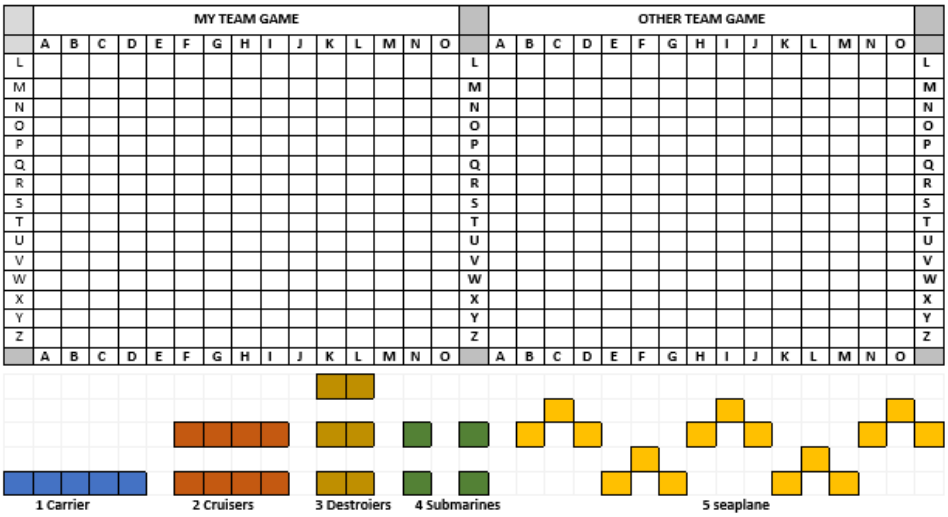
- They have to understand where they are and where the other patrols are (particularly effective if Scouts are in a building they usually don't go in, or if windows are closed so that people cannot see outside).
- At the beginning of the game, a scout leader gives each patrol a secret message to be delivered to a secret agent (with a given, short secret name), which is being hunted by the enemy spies. When the patrols are blocked in the rooms, the patrols have to deliver their message to the agent by radio, or ask help to the agent by radio.
- At the beginning of the game, a scout leader gives the patrols the mission to free a secret agent (with a given, short secret name). The agent was captured by enemy spies and can only talk via radio. In this case, the patrols have to listen to the spy's messages and possibly ask questions to understand where he/she is.

- Following the previous point and varying the game's rules, patrols are free to move in the building. Inside the rooms they are safe, but in the corridors, they can be hunted and captured by the enemy spies.

Whatever option is chosen, the key point is that PATROLS MUST BE SILENT, whatever they do!

Note that radio signals generated by switches are short ranged, in a building they could pass through a couple of adjacent rooms (vertically or horizontally); as consequence, checking the strength of the received signals can be used to locate where the transmitting switch is.

Navy Battle Game using the International Phonetic Alphabet



This Navy Battle Game is about having fun!

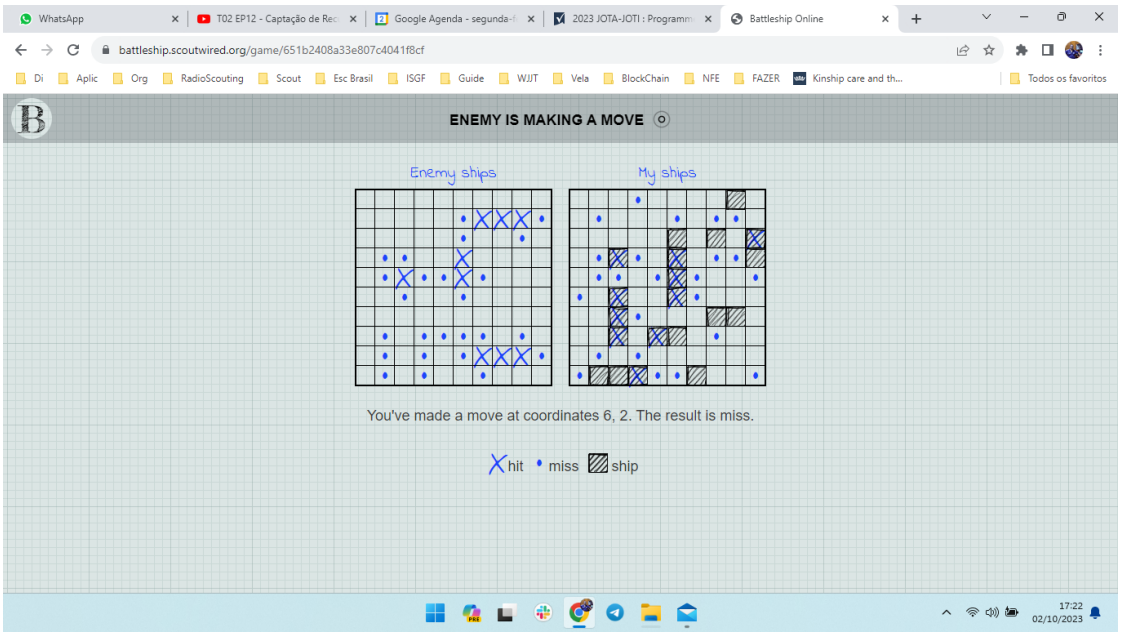
NAVAL BATTLE RULES:

Points: Carrier: 5 points; Cruisers: 4 points; Destroyers: 2 points; Seaplanes: 3 points; Submarines: 6 points

Distribute your "battle fleet" on the board that says "my team game". Leave at least 1 space blank between each of the ships/submarines and seaplanes. Do this as a team. You can rotate the figures without any problems. Once the distribution is complete, let's play. Do: Rock, paper, scissors to see who starts.

When it is your team's turn to take a shot, you must speak over the radio the Cartesian coordinates that indicate the square you want to be marked by the other team, for example (ALFA, ROMEO), where ALPHA is the axis of the "X" and ROMEO is the "Y" axis. Attention: Always in this order. Shots are made alternately (once for each team), until one team wins or obtains the most points during the game time (minutes). Use what you have already learned in operational ethics and confirm communications using "QSL" = "Ok understood" every time you understand the communication that was given/forwarded to you. If the shot does not hit the fleet, you will respond with the word "Water". If you get it right, answer with the word of the equipment that was bombed, for example: "You got it right: Cruiser. The team that made a shot can repeat the shot until they miss again. Good game and be a good sport!

An alternative is to use an electronic board



Game: maps and paths

Radio communication and topography, together in an open-air game to strengthen both the techniques.

Learning targets:

- Learn the use of transceivers.
- Learn how to use maps and GPS coordinates (latitude and longitude).

Material:

- Map and compass, or mobile phone with a GPS mapping application.
- PMR/CB, one per group.
- PC/mobile phone and internet connection for video conference (if it is not possible to meet altogether).

Time: Around 2 or 3 hours.

Preferred place Any outdoor place is ok, provided that sufficient topographical documentation about it is available.

Description:

Using a mapping application (e.g. Google Maps) or map and compass, every group will have to complete a specific path on the land, reaching points whose coordinates are communicated via radio in sequence (only after having reached a point the coordinates of the next positions are communicated).

In the end, the path of each group will form a letter on the map, to be put together with the other ones to create a word.

Game: red moose

An advanced hide-and-seek game, in which transceivers cannot be missing

Learning targets:

Learn and memorize the NATO/ICAO alphabet or the Morse code.

Material:

- CB/PMR, one for each patrol
- Headbands with alphanumeric codes, higher than the number of participants (headbands can be made with cloth or with red/white warning tape).
- Morse key, one for each patrol (see the separate activity to build them).

Time: Around 2 or 3 hours.

Preferred place: Open countryside.

Description:

Red moose is a variation of the classic “hide and seek” game.

People can get caught if the opponent is able to read and shout the alphanumeric code (not more than 5 letters/numbers) on their headbands.

A person is not allowed to hide his/her headband using his/her own body, but can use everything around him/her: a tree, the ground, even the body of an allied.

The game is a challenge between patrols, which move in groups. A participant cannot be touched, hit or lifted by an opponent.

In this variant of the red moose game, the headband codes of each patrol are known to the scout leaders.

When a patrol finds the code of an opponent in another patrol, it must communicate that code to the leaders by radio, using the NATO/ICAO alphabet or the Morse key.

If correctly communicated, that code gives a point to the patrol; the code is then unavailable, patrols giving that code again won’t earn a point.

When a person is caught, there are different options:

- If the game area is relatively small, the person can detach from the patrol, reach the leaders and receive a new headband.
- Every patrol has a limited number of spare headbands, whose codes are known to the leaders.

The caught person hides the headband and follows his/her patrol.

Word Search

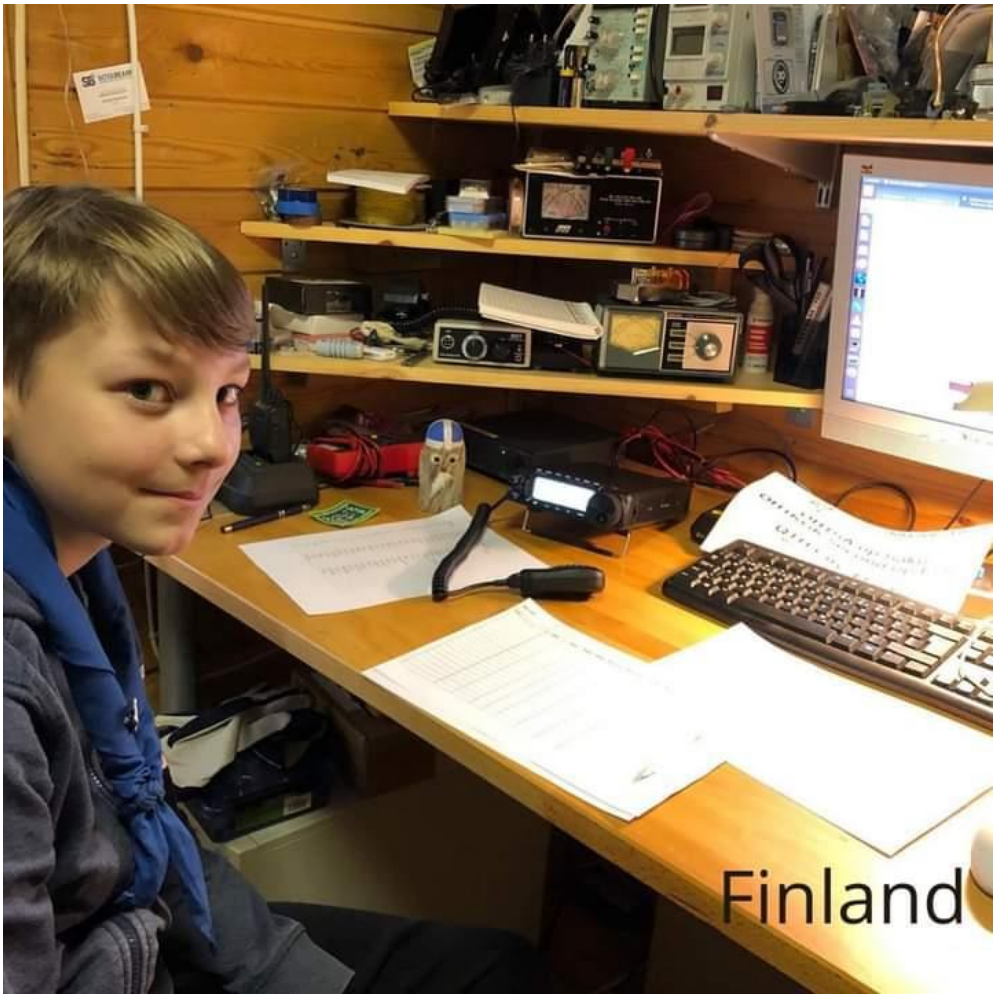
Some **word search** puzzles to print out, covering amateur radio topics.

Duration: 20-30 minutes

Preparation: Print the Word Puzzle to each participant

How to play: A number of hidden words written in various directions is on the grid. Each participant should find the words on the right side on the grid.

Download word search puzzle sheets



Word Search Puzzle 01

AIRWAVES	YAESU	FREQUENCY
SCOUT	COAX	FRIENDSHIP
ANTENNA	DIPOLE	ICOM
RADIO	YAGI	JAMBOREE

M	A	O	I	A	Q	C	M	O	C	I	G	H	F
R	C	A	C	F	V	C	M	A	O	A	P	A	S
D	C	I	I	J	R	H	O	O	I	R	J	M	B
I	Y	R	C	A	I	I	O	A	R	A	E	R	U
P	E	W	C	M	W	I	E	O	X	P	Y	A	O
O	U	A	O	B	V	U	E	N	U	L	H	D	I
L	R	V	A	O	R	S	N	O	D	O	A	I	N
E	Q	E	M	R	I	E	S	Q	I	S	E	O	R
A	N	S	E	E	A	A	D	A	U	E	H	N	B
Y	N	U	N	E	D	Y	E	A	V	I	P	I	I
I	Y	Q	F	R	E	Q	U	E	N	C	Y	E	P
W	A	W	I	F	E	Y	O	D	S	E	J	M	A
O	G	N	R	A	N	N	E	T	N	A	A	A	E
X	I	Y	T	U	O	C	S	T	Y	W	B	Y	A

Word Search Puzzle 02

MEGABYTE	DESKTOP	WORLD WIDE
LAPTOP	MINECRAFT	INTERNET
JAMBOREE	CHAT ROOM	SKYPE
COMPUTER	GIGABYTE	FRIENDSHIP
RASPEBERRY PI		

Y	B	M	R	A	S	P	B	E	R	R	Y	P	I
E	M	I	N	E	C	R	A	F	T	L	E	E	I
J	R	I	N	T	E	R	N	E	T	E	E	M	G
A	S	R	I	R	D	S	O	R	T	L	B	O	P
M	K	T	P	E	E	E	D	R	D	I	L	O	I
B	Y	A	O	T	S	T	M	W	P	I	N	R	H
O	P	H	T	U	K	E	N	Y	P	E	R	T	S
R	E	I	P	P	T	E	E	R	T	P	T	A	D
E	E	T	A	M	O	A	P	Y	E	O	T	H	N
E	E	J	L	O	P	E	B	T	O	G	E	C	E
H	D	M	O	C	A	A	R	T	E	B	T	F	I
S	I	T	O	B	G	C	I	G	E	R	T	R	R
E	T	R	O	E	T	Y	B	A	G	I	G	O	F
A	S	R	M	W	O	R	L	D	W	I	D	E	I

Intermediate activities

How to build a dipole antenna for the Citizen Band (CB)

The dipole, one of most effective and simple antennas to build.

Learning targets:

- Acquire basic practical skills on the use of electric material.
- Acquire basic notions on the principles of operation of antennas.

Material for each antenna:

- 1 connector PL259.

- Soldering iron and relative accessories. Solder wire.
- Coaxial cable RG58, at least 5 m long.
- 6 m unipolar wire.
- Plastic or wooden plaque.
- Small insulated box for electrical connections.
- 4 wire blockers.
- Electrical tape/cable ties.
- Nippers/plier.
- Multimeter.
- Rope.
- Meter tape.
- CB, with SWR meter/antenna tuner and a RG58 patch cable to connect the two devices.

Time: Around 30 minutes.

Preferred place:

The building of the antenna can take place in any space, provided that there are electrical connections for the soldering irons.

The testing of each antenna requires an outdoor place of about 10 m dimensions, with the possibility to fasten the antenna ends or the antenna center to a high point (trees, buildings, etc.).

Description:

First, the PL259 connector must be installed on the end of the coaxial cable that should be connected to the SWR meter/antenna tuner (or directly to the CB).

Cut a few centimeters of the plastic jacket surrounding the coaxial cable, the metal braid shield should be visible.

Slightly open the braid shield and turn it backwards.

Cut part of the inner plastic shield that was covered by the braided shield, to expose the center conductor of the cable (not more than 1 cm).

Twist the wires of the center conductor and insert it in the back side of the PL259 connector, so that it enters the center pin of the connector and is visible from its top hole.

To do this some strength is needed and the connector should be turned, as if the connector were being screwed on the naked braided shield.

To complete the installation of the connector, heat the head of the connector central pin for a few seconds, then put the soldering wire to melt some alloy and block the central wire in the central pin.

The mass of melt alloy should not be bigger than the central pin, or the connector could not be connected!

Beware of stray little wires that could connect the metal body of the connector with the central pin.

Verify with the multimeter that no short circuit exists between those two components: select the option and touch the two components with the multimeter tips, the instrument must not beep.

A short circuit is as dangerous to the CB as transmitting with no antenna!

Now let's talk about the antenna.

Each CB channel corresponds to a frequency of oscillation of electromagnetic waves; these waves travel at light speed, so in the time of a single oscillation the waves cover a distance called wavelength (λ).

In its simplest form, a dipole antenna consists of two wires connected to the two poles of the coaxial cable; to correctly match the transceiver and the coaxial cable to the antenna, their wires, in total, must be a half wavelength long.

The wavelength can be calculated as the ratio between the speed of light and the frequency; in practice, 300/(frequency in MHz) gives the wavelength in meters.

In most countries CB channels extend between 26,965 MHz and 27,405 MHz, so a half wavelength is about 5.5 m and the two wires composing the dipole should be 2.75 m long.

Always cut the wires a bit longer: it's always easier to shorten the wires than lengthening them.

To assemble the antenna, use the plaque, the wire blockers and the cable ties to fasten one end of each wire close to the coaxial cable end.

Similarly to what was done for the PL259 connector, expose the braided shield and the central conductor of the cable, soldering these poles with the two wires ends.

Perform these actions so that you can then close the plaque in an insulated box, to protect the electrical connections from the rain.

Again, check that no short circuit exists between the two long wires.

Finally, just below the connections, wind the coaxial cable in a few turns and block them with a cable tie.

This is called an RF choke; it substitutes a more advanced device, a 1:1 BALUN, to improve the matching between the antenna and the coaxial line.

The antenna can be put in horizontal, as high as possible from the ground.

The wires should not be directly attached to their support, but to (not metallic) ropes and then these ropes to the supports (trees, buildings, etc.).

The wires ends can indeed be electrically dangerous: never touch them when someone is transmitting!

Alternatively, the antenna center can be fastened to a high pole and the wires ends are fastened to the ground, forming an angle between 90° and 120°.

In this way it's easier to trim the wires and tune the antenna. In this configuration, the antenna is also called an inverted V.

Finally, the two wires must be trimmed in length.

Connect the antenna to the SWR meter/antenna tuner and this to the CB.

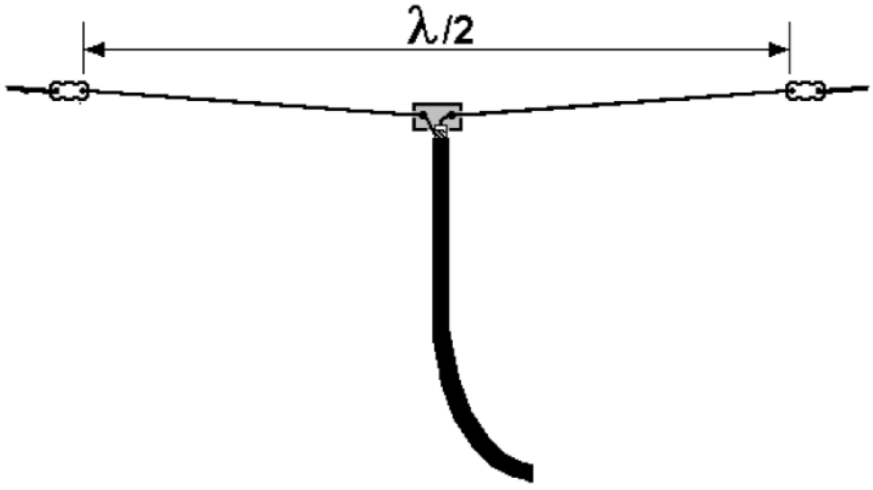
Transmit and check the SWR level over the several channels.

Shorten the wires, step by step, and test if the SWR gets closer to 1.

The orientation of the two wires and their distance from the ground can be used to vary the SWR. The SWR should never ever exceed 2 in any channel.

This type of antenna is useful also during the JOTA-JOTI, to make international contacts. Its length should be calculated according to the amateur radio bands.

As a final note, remember that the dipole is more able to receive and transmit in perpendicular direction (that is, in and out the paper in the figure below) than in parallel direction.



Radio Scout station hunt

Explore the invisible sea of radio communications all around us and find Radio Scout stations participating to JOTA-JOTI!

For this activity, you don't need any radio license or expensive equipment; you just need a device with Internet connection (tablets, PCs or laptops are preferred), earphones and a silent place.

1. Learn the basics of radiocommunications;
2. Learn how to use a web-controlled radio receiver (WebSDR);
3. Catch at least 10 Radio Scout stations, log all the relevant information (amateur radio callsign, frequency, time, but also the name of the scout group, etc.).
4. Fill the form with the collected data and get the activity code to mark this activity as done.

Let's start!

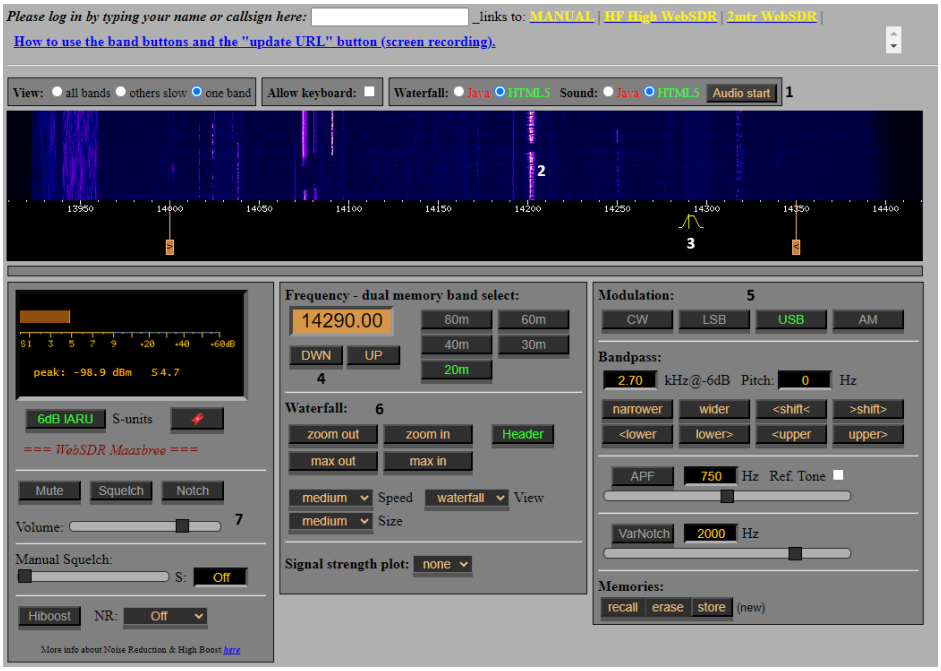
Here is the basic information to focus on:

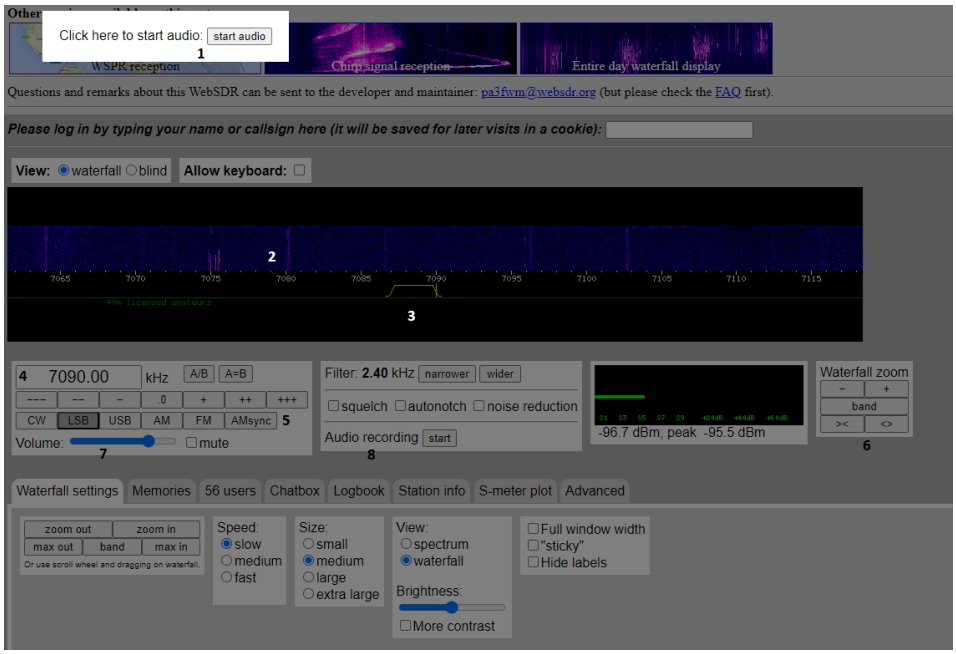
- Two-way communications are defined by a frequency; all the frequencies here are expressed in kHz. At evening/night, listen preferably below 10000 kHz, at daytime above this threshold.
- Radio communications are also characterized by a mode. Use LSB below 10000 kHz, USB above this threshold. For Morse code, use CW.
- Every radio station has a unique callsign code, spelled using the NATO/ICAO alphabet. Every station repeatedly gives its own callsign during communications. You can learn about a specific amateur radio station using services like https://www.qrz.com/ and typing the found callsign.
- The time of a communication is given in a universal UTC time. You can convert your local time to UTC using services like https://dateful.com/convert/utc
- JOTA-JOTI amateur radio Scout stations will call in radio saying "CQ JAMBOREE CQ JAMBOREE CQ JAMBOREE".

How to use a WebSDR (web radio receiver)

To listen to radio signals, several receivers, controllable with a webpage, are available across the world. A list of receivers is available at http://websdr.org/

A WebSDR may have fancy appearances, but what you will find consists mainly of:





1. A button to start audio (sometimes it's called "Chrome start", "Firefox start")
2. A waterfall showing the radio signals. The horizontal axis shows the frequencies, radio signals are colored with hotter/brighter colors, while noise is in blue.
3. The indicator that shows which frequencies you are listening to. You should align it with bright-colored traces to listen to a signal.
4. You can directly change the frequency with this text box and typing <enter>. In some receivers you can change the amateur radio bands (80 m, 40 m, 20 m, etc.).
5. Modulation type. LSB below 10000 kHz, USB above. CW for Morse code. (AM is for broadcasting stations only)
6. Buttons to zoom in or out the waterfall.
7. Volume settings.
8. Some radio receivers have also tools to record the audio of your signals.

Find the Amateur Radio Scout stations!

In order to find the Amateur Radio Scout stations, remember that there are default scout frequencies in every amateur radio band. Start from these frequencies, then search around. As example, by clicking on the frequencies below you will be automatically redirected to a WebSDR in the Netherlands.

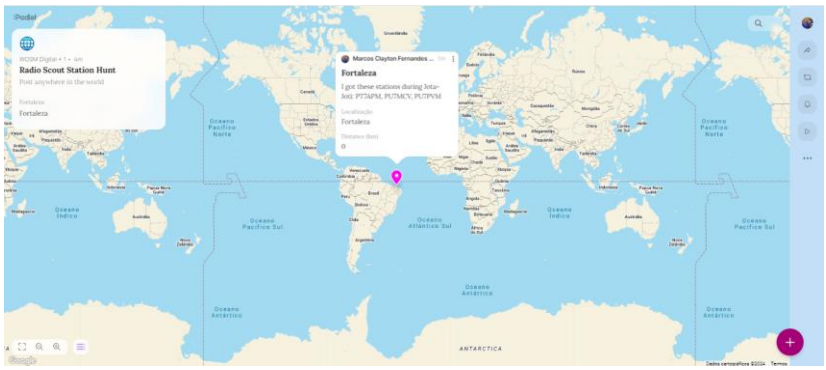
Band	Voice	CW
80 m	3.690 & 3.940	3.570
40 m	7.090 & 7.190	7.030
20 m	14.290	14.060
17 m	18.140	18.080
15 m	21.360	21.140
12 m	24.960	24.910
10 m	28.390	28.180
6 m	50.160	50.160
Geostationary satellite QO100	10.409.890	

To log the information of the Amateur Radio Scout stations you receive, you can use the logbook, as show on this manual in Appendix B. Don't just catch the callsign, but also the name of the scout group, the names of the participants, something interesting about the place (QTH), etc.

The challenge

To complete this activity, you must add a list of contacts on a Padlet at:

https://padlet.com/worldscouting/radio-scout-station-hunt-emmq5m65l4vrql6t



To add your post, follow these steps:

1. After opening the Padlet page, click on the PLUS SIGN on the right bottom of the page;
2. Choose your location, typing the city, state, country. When you start typing a list will appear and you can choose;
3. Add your information – the list of stations you listen on WebSDR;
4. If you want you can also add a picture of your team or Scout/Guide group;
5. Click on PUBLISH in the right up corner.

Game: spy story!

No game can be a real spy game without radios and awesome communication methods!

Learning targets:

- Get familiar with the use of transceivers.
- Get familiar with the SSTV technique for exchanging images via radio.
- Improve observations skills.

Material:

Hardware:

- Disguise clothes for spies and Scouts.
- PMR/CB and Android phone for each patrol.
- Secret messages.
- PC/mobile phone and Internet connection for videoconferencing (if meeting altogether is not allowed).

Software:

Robot36: https://play.google.com/store/apps/details?id=xdsopl.robot36&hl=it&gl=US

SSTV encoder: https://play.google.com/store/apps/details?id=om.sstvencoder&hl=it&gl=US

Time: Around 2 or 3 hours.

Preferred place: This is an outdoor activity.

Description:

One or more spies are wandering through the village/city, leaving messages in some places.

The patrols have just few hints about the suspected people: staying in radio contact with the base (or even among them, if multiple radios are available per patrol), they must identify the spies and the secret messages they are hiding; the patrols must not be identified by the spies.

In the end, altogether in presence or in videoconference, the people in the base will summarize the secret messages and the identikits given by the patrols via radio.

By surprise, the spies will also show up, giving the identikits of the people they recognized as their pursuers.

The points earned by each patrol will be: number of secret messages plus number of identified spies, less the number of patrol people discovered by the spies.

Identikits can be exchanged by putting the mobile phone close to the radio in a sufficiently silent place; with the app Robot 36 it is possible to decode sound messages into images, while SSTV encoder transforms an image into a sound, to be transmitted by radio.

More points can be assigned to the secret message if they are transmitted in Morse code in a dedicated channel.

Game: monument hunt

A funny way to refine radio communication practice and to learn more about the historical and cultural heritage of your country.

Learning targets:

- Get familiar with the use of transceivers.
- Get familiar with the SSTV technique for exchanging images via radio.
- Learn more about the history and cultural heritage of your land.

Material:

Hardware:

- PMR/CB and Android phone for each patrol.
- PC/mobile phone and Internet connection for video conferencing (if meeting altogether is not allowed).

Software:

Robot36: https://play.google.com/store/apps/details?id=xdsopl.robot36&hl=it&gl=US

SSTV encoder: https://play.google.com/store/apps/details?id=om.sstvencoder&hl=it&gl=US

Time: Around 2 or 3 hours.

Preferred place: This is an outdoor activity (city/village).

Description:

Scout leaders send the photo of a specific monument/place of interest of the city.

Patrols must receive the photo, identify the monument, reach it as soon as possible, take a selfie with it and send it to the leaders.

The exchange of images is performed in SSTV.

The radio and the mobile phone are put close together in a sufficiently silent place; with the app Robot 36 it is possible to decode sound messages into images, while the SSTV encoder transforms an image into a sound, to be transmitted by radio.

The first patrol which sends a good image earns a point, all the other patrols must stop to not create a large crowd close to the monument, and they must wait for the next target.

Multiple targets can be given at once, so that the patrols must find the most efficient way to reach them in time.

Game: triangulation

Scouts have just been teleported in an unknown world! All they have is a map, a compass and a transceiver! Will they be able to meet again?

Learning targets:

- Get familiar with the use of transceivers.
- Get familiar with the SSTV technique for exchanging images via radio.
- Learn the triangulation technique to identify your own position in a map.

Material:

Hardware:

- PMR/CB and Android phone for each Scout couple.
- PC/mobile phone and Internet connection for video conferencing (if meeting altogether is not allowed).
- Map with rigid support.
- Compass.
- Optionally, a goniometer.
- Pencil, rubber.

Software:

Robot36: https://play.google.com/store/apps/details?id=xdsopl.robot36&hl=it&gl=US

SSTV encoder: https://play.google.com/store/apps/details?id=om.sstvencoder&hl=it&gl=US

Time: Around 2 or 3 hours.

Preferred place: This is an outdoor activity (city/village), possibly in places where a wide sight of the landscape is available (no cities with high buildings and narrow streets).

Description:

Scouts are divided into couples.

Each person in the couple goes (or is taken, blindfolded to make things more difficult) in a place where it is possible to spot relevant elements of the landscape that may be identifiable on a map.

The person measures the azimuth (the angle in clockwise sense between the north and that object, as seen from his/her point of view) of these objects (not less than 2) and transmits them to the other person of the couple.

Each person in the couple must identify the position of the other one using the triangulation technique: if the other person sees a hill at 20° N, then that hill must be identified on the map and a line at 180°+20°=200°N must be drawn departing from the hill; that's indeed the azimuth with which the hill would see that person.

If azimuth angles greater than 180°N are reported, then calculate 180°-azimuth.

After this operation was done for at least 2 objects, the lines should intersect in one point: that's the position of the other person!

Using this technique, the two people must meet together, take a photo of themselves and send it via radio to the base.

The exchange of images is performed in SSTV.

The radio and the mobile phone are put close together in a sufficiently silent place; with the app Robot 36 it is possible to decode sound messages into images, while the SSTV encoder transforms an image into a sound, to be transmitted by radio.

It's forbidden to call each other by phone, or use geolocalization apps such as Google Maps.

Possible alternative:

Scout leaders transmit the position of some places that must be identified and reached by Scouts.

Once in the place, a photo must be taken and sent via radio.

Game: number stations

An intriguing activity to learn about the encoding and decoding of secret messages, and to get introduced to the mysterious world of radio espionage.

Learning targets:

- Get familiar with the techniques of ciphering and deciphering of messages.
- Get familiar with Morse code or NATO/ICAO alphabet.

Material:

- PMR/CB or mobile phone with internet connection, one for each group/patrol.
- Paper and pen.

Time: Around 1 or 2 hours.

Preferred place: Open countryside.

Description:

Patrols receive an amateur radio frequency or CB/PMR channel to listen to, together with a deciphering key (one for each patrol).

At a certain hour, the patrols must listen to a message, transmitted in Morse code or in NATO/ICAO alphabet.

Using their own key, the patrols can decipher the message and they must execute the orders contained in it (go to a specific place, attack another patrol to steal them a specific object, etc.).

Multiple orders can be transmitted.

The last of them is to listen to a specific frequency at a given hour. In this way, the patrol will listen to a real number station, used in real espionage activities.

A list with stations and times to listen to number stations is available here:

https://priyom.org/number-stations/station-schedule

Number stations are radio stations that transmit, at given frequencies and hours, encrypted Morse or voice messages.

Everyone can listen to them, but only few people can understand their messages: spies!

This method of communication, particularly active during the Cold War, is really effective because it's totally impossible to find traces of the person able to decode the message.

The only way to understand a message is to catch the spy with his/her deciphering keys.

Several information on the topic can be found over the Internet.

Here are some examples of number stations:

https://youtu.be/GUQUD3IMbb4

https://youtu.be/0Xfc4LjKi1w

https://youtu.be/QnXPqUU6fI0

https://youtu.be/tFm7Q9-17w0

How to cypher/decipher a message?

The easy way. Each letter is numbered according to the alphabet:

A	B	C	D	E	F	G	H	I	J
0	1	2	3	4	5	6	7	8	9
K	L	M	N	O	P	Q	R	S	T
10	11	12	13	14	15	16	17	18	19
U	V	W	X	Y	Z				
20	21	22	23	24	25				

The numbering may be optionally extended to include numbers, a word separator, punctuation, etc. In this way, any message can be converted in a sequence of numbers.

For example, DOG is 3 - 14 - 6.

Now, let's say that the key is a letter, for example P (that equals to 15).

To encrypt DOG, 15 is added to the number of each letter, and the final numbers are converted back to letters. If the above table is used and the sum exceeds 25, 26 must also be subtracted.

D(3) + P(15) = S(18)

O(14)+P(15) =29 → 29-26=D(3)

G(6)+P(15) =V(21)

So, DOG becomes SDV. To decrypt the message, the inverse operations must be performed:

S(18)-P(15) =D(3)

D(3)-P(15) =-12 → -12+26= O(14)

V(21)-P(15) =G(6)

An easy way to perform these actions without arithmetic is using the Alberti disk:

https://en.wikipedia.org/wiki/Alberti_cipher

Two disks, pinned on a common center, have the alphabet letters indicated on their circumference.

By rotating one disk over the other, it's quite easy to find the correspondence of original and encrypted letters. The less easy way.

The encryption method described above can be easily broken: all the same letters give the same final letters, so that knowing the language (the most recurring letters, words with 1-2 letters, etc.) it is possible to guess the letters as in an encrypted crossword. In any case, not more than 25 attempts are necessary to find the correct key.

To make the encryption practically unbreakable, the key must be composed of at least as many letters as the message. The letters of the key are chosen randomly.

The first letter of the message is encrypted with the first letter of the key using the method described above, and so for all the following letters. If the key is random, a 100 letters message may become any, literally any message of 100 letters, using an ad hoc key.

This is called the Vernon cyphrary.

Each message has a separate key (the equivalent of an OTP, one time password), which is given in advance to the spy, so that no relation can be established between messages.

Game: subtone telephone game

James can be only received from Anne, Anne only from Carlos, Carlos only from Philippe...will the message reach its destination?

Learning targets:

Get familiar with the use of transceivers and with the good practices for managing radio communications.

Material: PMR, one for each person or patrol.

Time: Around 1 or 2 hours.

Preferred place This is an outdoor activity. There should be enough space to place individuals or patrols far enough to not hear each other.

Description:

Thanks to the CTCSS technique an audio subtone can be included in voice transmissions.

Transceivers can be set so that only transmissions with a certain subtone are heard through the radio.

Transmission and reception subtones are usually the same. In this way, it is possible to filter the radio communications and only hear those of the people you are interested in.

The only attention is that no one should transmit over someone else's transmission, that would spoil both communications.

CTCSS tones can be used to propose any game that involves some kind of chain communication.

Each individual or patrol receives a PMR which is programmed to transmit with a subtone and receive in one another, in a way that only a certain person/patrol can successfully send a message to a certain person/patrol.

The distances between the transceivers should be large enough to avoid any direct voice communication, but short enough to ensure that all PMRs can listen to themselves.

The game is that one station starts with a word, the second station receives the word, appends a second word to create a meaningful sentence and transmits the two words to the third station, and so on.

Once the transmissions arrive at the final station, this could communicate with the first one.

The individuals/groups could be divided into two macro-groups competing with each other.

The winner is the macro-group completing a sentence with the highest number of words, or reaching a certain number of words in the shortest time.

Advanced activities

How to build a crystal radio

The simplest radio receiver ever existed and it does not use batteries!

Learning targets:

Acquire manual skills in building simple electrical circuits.

Material:

For each radio:

- Cardboard or PVC cylinders, about 10 cm in diameter.
- Unipolar wire (12 m).
- Short wires with "crocodile" connectors.
- Enameled copper wire, 0.5 mm diameter.
- Variable capacitor, 350-400 pF.
- 47 kΩ resistor.
- Germanium diode (e.g. OA91, 1N34).
- High impedance (>1 kΩ) or piezoelectric earphones; if the earphones cable is terminated by a jack, provide a suitable plug.
- Wooden or plastic support for the circuit.
- Sandpaper.
- Nippers.
- Soldering iron and relative accessories (preferred) or "mammoth connectors" or clips.

The electronic components can be easily found over the Internet or in an electronics fair.

Time: Around 1 or 2 hours.

Preferred place: the building of the receiver can be done in almost any place. If the soldering irons are used, 110/220 V sockets should be available. To use the radios, an open space of some tens of meters should be available.

Description:

Believe it or not, it's possible to build a radio receiver that works without batteries!

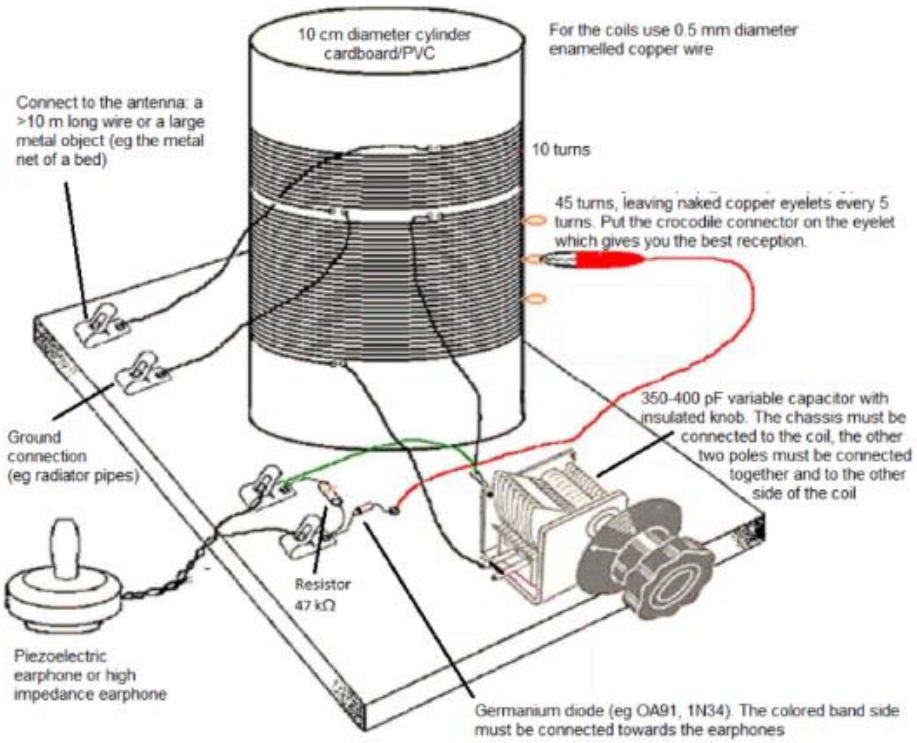
The so-called crystal radio uses the only energy of radio waves to work; it can receive broadcasting radio stations in medium wave range (MW, 526 kHz -1626 kHz).

The radio needs a long wire (>10 m) to collect radio signals and ground connections.

Don't use the ground pole of 110/220 V sockets, but connect to radiator pipes. In a scout camp, you can realize a ground connection by putting a long metal pole or a metal net in a wet ground.

For a practical demonstration to an audience, you can use PC active loudspeakers in place of the earphones.

Crystal radios can be used at the camp to remain updated on the news from the world or on the weather forecasts.



An alternative with no antenna and ground connection:

On a square support of 50-60 cm side length (even an extra-large pizza box could be ok) create two windings, one of 4 turns the other of 12 turns.

The first winding must be connected to the diode, resistor and earphones, the other one must be connected to the variable capacitor. In this crystal radio the windings are so large that directly collect the radio waves.

Many other crystal radio projects can be easily found over the internet.

SSTV images from space

Prepare your radio shack and get ready to receive images from the International Space Station!

Learning targets:

- Discover the world of the International Space Station and of satellite communications
- Learn how to set up a receiving radio station.
- Learn how to build simple antennas for VHF-UHF reception.

Description:

During certain periods of the year, the International Space Station (ISS) transmits SSTV images to earth, as a reception challenge for radio enthusiast.

Most details can be found in the following websites, dedicated to amateur radio communications with satellites and with the ISS. Dates and frequencies of SSTV transmissions are announced on these websites:

https://www.amsat.org/

https://www.ariss.org/

https://amsat-uk.org/

https://amsat-uk.org/beginners/iss-sstv/

Here the basics steps to receive SSTV images from space are covered.

Timings and ISS path:

The ISS orbit is such that the space station completes an orbit of Earth every 90 minutes. In practice, the ISS will be visible from a point on the ground for not more than 15 minutes.

While a receiving station might be left working continuously, waiting for a good signal, it's still useful, especially at the beginning, to concentrate efforts exactly when the ISS is passing.

Several programs (e.g. gpredict) and mobile phone apps can be easily found and used to get the ISS pass predictions and the exact path of the ISS above the point of observation.

Remember that these predictions are based on orbit information that should be regularly downloaded from the web, at least weekly.

The easiest way to start is to use an amsat web tool available at:

https://www.amsat.org/track/index.php

You will have to enter your longitude and latitude data, that can be easily found from Google Maps. Here is an example of predictions:

AMSAT Online Satellite Pass Predictions - ISS View the current location of ISS							
Date (UTC)	AOS (UTC)	Duration	AOS Azimuth	Maximum Elevation	Max El Azimuth	LOS Azimuth	LOS (UTC)
18 Sep 22	17:09:29	00:08:49	221	10	161	114	17:18:18
18 Sep 22	18:46:09	00:10:39	224	30	133	73	18:56:48
18 Sep 22	20:22:57	00:10:20	241	26	295	24	20:33:17
19 Sep 22	11:27:32	00:10:14	339	23	36	118	11:37:46
19 Sep 22	13:03:55	00:10:42	290	32	197	136	13:14:37
19 Sep 22	14:42:22	00:08:54	248	10	188	139	14:51:16
19 Sep 22	16:20:39	00:08:21	223	8	164	123	16:29:00
19 Sep 22	17:57:34	00:10:14	222	20	163	84	18:07:48
19 Sep 22	19:34:10	00:10:46	235	51	327	38	19:44:56
19 Sep 22	21:12:41	00:05:55	270	3	296	336	21:18:36

AOS and LOS mean Acquisition of Signal and Loss of Signal, respectively.

The first refers to the point and time from which the ISS appears from the horizon, the second refers to the point and the time of disappearance.

With a compass and the azimuth data, it will be easy to locate these points. Regarding time, be careful of the fact that they are given in UTC, Universal Coordinated Time.

Check how this time is related to your time zone and to the season. For example, in the CEST time zone (Germany, Italy, etc.), 8:00 UTC means 9:00 (+1:00) in winter, but 10:00 (+2:00) in the summer.

Several websites at the present time can help you identify the correct offset to apply.

A really important information is given by the maximum elevation (data are in degrees from the horizon).

If the maximum elevation is below 30°, it's quite unlikely that you can catch the ISS, since several obstacles may be present above the horizon.

Also, at low elevation values the distance between your position and the ISS is larger.

Attempts to receive the ISS should be made at high points, where the horizon is not blocked by trees, buildings or even hills and mountains.

The receiver:

To receive ISS signals, you will need a SDR dongle. Several models are available on general ecommerce websites.

They appear as USB keys or small boxes that can be connected via USB. Once the device is connected to the PC, the first thing to be done is to download the reception software.

The most used one is SDR#:

https://airspy.com/download/

Several alternative software's can be found for any operating system.

Once the software package is downloaded, in the resulting folder it is possible to find the program ZADIG, which must be used first to install the proper drivers.

Details about this operation can be found at these links:

https://www.rtl-sdr.com/rtl-sdr-quick-start-guide/

https://zadig.akeo.ie/#

At this point, you can put the receiver into operation opening the SDR# main program (SDRSharp.exe); you will have to select the proper reception device clicking on the gear button (with the SDR key connected, the device should appear as RTL-SDR).

Clicking on the play button, reception will start. The spectrum waterfall, the reception mode, the frequency selection work similarly to the online receivers that are described in the broadcasting station listening activity (LINK).

To listen to the ISS, select the FM mode and the latest frequency indicated in the mentioned websites (usually it's 145.8 MHz).

SSTV signals are heard as repetitive, fax-like sounds.

To decode them into images, there are two main ways:

The easy but dirty way: put the PC volume as high as possible, but avoiding audio distortion. On a mobile phone, install and start the Robot36 app

https://play.google.com/store/apps/details?id=xdsopl.robot36

Place the mobile phone close to the PC loudspeakers and wait. The noise around should be as minimal as possible.

The complex but clean way: the audio is decoded from a software in the same PC. To do this, install:

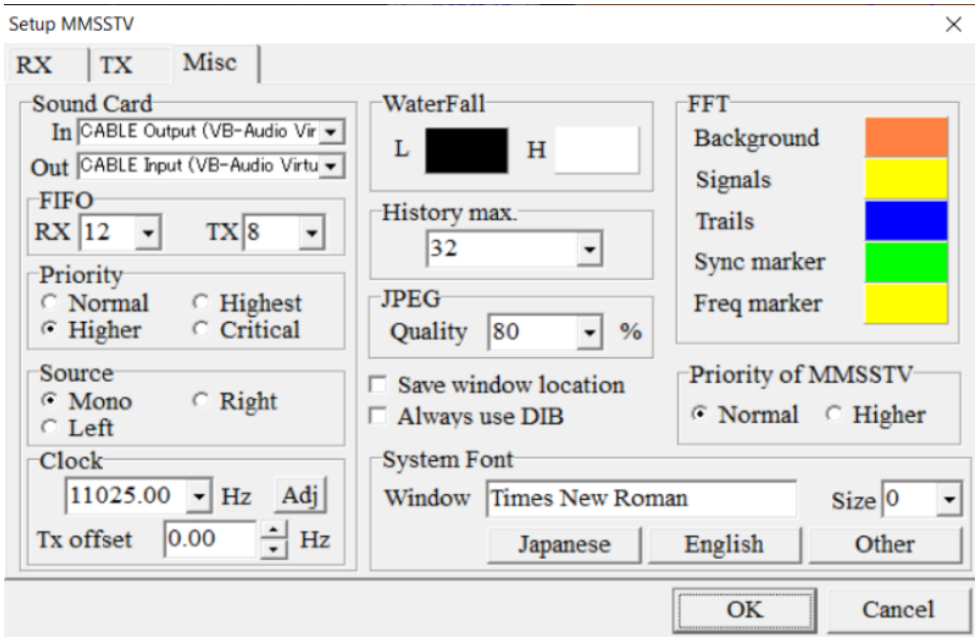
Virtual cable: https://vb-audio.com/Cable/

MMSSTV: https://hamsoft.ca/pages/mmsstv.php

The first program creates two virtual audio devices, "Cable input" and "Cable output", that allow you to direct the output sound of SDR# towards the input line to be decoded.

In the audio settings, activate the two devices among the input and output devices. In this condition, it's normal that no audio comes from the loudspeakers.

At this point, open MMSSTV→ Option→ Setup MMSSTV and select the input device.



The antenna:

To receive the ISS, experts often build complex antennas as QFH antennas.

For beginners, Scouts may start with a simple dipole, or directly try to build a YAGI antenna.

First get a coaxial cable of suitable length with 52 Ω impedance (e.g. RG58) and one end with an SMA connector.

This is the end that must be connected to the SDR receiver.

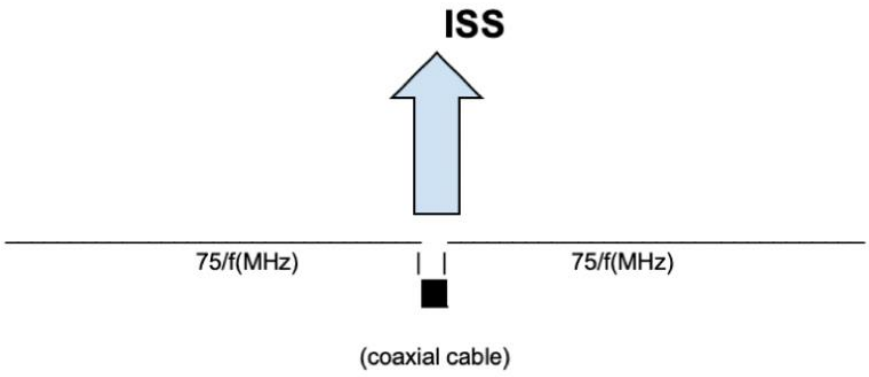
On the other side, work with a nipper to detach the central conductor from the braided shield.

These two poles must be connected to two rigid metal wires (you can recycle a metal crutch, or even use a meter metal tape), one put adjacent to the other one.

The length of each wire must be (in meters) 75/(frequency in MHz).

Fasten these two wires to a PVC pipe, so that you can hold the antenna.

Remember that the antenna best receives perpendicularly to the axis of the wires.



A YAGI antenna is much more directional than a simpler dipole, in the sense that it's much more sensitive in one direction (and much less in the others).

This is very important, because you need to get a signal that comes from several hundred kilometers above you!

A YAGI is essentially a dipole, with a reflector wire behind and a number of director wires in front.

You can find several projects online. For the 2 m band (about 145 MHz), you can check this project: https://www.amsat.org/articles/n2spi/SepOct06AmsatJournal.pdf (dimensions of the components are given in inches; remember that 1-inch equals about 25.4 mm).

Call (QSO) the International Space Station via Amateur Radio

Don't miss the chance to get in touch with the ISS astronauts!

Learning targets:

- Discover the world of the International Space Station and of satellite communications.
- Learn how to build simple antennas for VHF-UHF reception.

Description:

The international Space Station is equipped with a transceiver that allows astronauts to communicate with amateur radio operators and, thanks to them, Scouts, schools and other educational institutions.

Astronauts mostly answer only to scheduled contacts, but it's always possible to make an attempt to contact them.

Even when they are not active at the radio, their transceiver can work as a radio repeater, so that if you send a radio message to the ISS then the ISS irradiates the messages to the face of Earth in front of itself. In this way, the ISS can be used to contact people that would be unreachable in a direct ground-to-ground communication, because of obstacles and of the curvature of Earth.

Whatever you want to do, remember that the ISS transceiver/repeater works on different frequencies for transmitting and receiving.

The Uplink frequency (145.99 MHz) is the one Earthlings should use to send radio messages to the ISS; the downlink frequency (437.8 MHz) is the one to be used to listen to ISS messages.

Detailed and updated information can be found here:

https://www.amsat.org/

https://www.ariss.org/

https://amsat-uk.org/

In particular, ARISS is in charge of organizing radio contacts with the ISS.

Timings and ISS path:

The ISS orbit is such that the space station completes an orbit of Earth every 90 minutes.

In practice, the ISS will be visible from a point on the ground for not more than 15 minutes.

This is also the limit of your potential conversation, so be concise. Several programs (e.g. gpredict) and mobile phone apps can be easily found and used to get the ISS pass predictions and the exact path of the ISS above the point of observation.

Remember that these predictions are based on orbit information that should be regularly downloaded from the web, at least weekly.

The easiest way to start is to use an amsat web tool available at

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View the current location of ISS

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19 Sep 22	16:20:39	00:08:21	223	8	164	123	16:29:00
19 Sep 22	17:57:34	00:10:14	222	20	163	84	18:07:48
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With a compass and the azimuth data, it will be easy to locate these points.

Regarding time, be careful of the fact that they are given in UTC, Universal Coordinated Time.

Check how this time is related to your time zone and to the season.

For example, in the CEST time zone (Germany, Italy, etc.), 8:00 UTC means 9:00 (+1:00) in winter, but 10:00 (+2:00) in the summer.

Several websites at the present time can help you identify the correct offset to apply.

A really important information is given by the maximum elevation (data are in degrees from the horizon).

If the maximum elevation is below 30°, it's quite unlikely that you can catch the ISS, since several obstacles may be present above the horizon.

Also, at low elevation values the distance between your position and the ISS is larger.

Attempts to contact the ISS should be made at high points, where the horizon is not blocked by trees, buildings or even hills and mountains.

The transceiver:

Contacts with the ISS can only be made by licensed amateur radio operators. Contact your nearest amateur radio association to get instrumentation and practical support.

During the contact, you may need to slightly adjust the transmission/reception frequencies, because of the Doppler effect caused by the extreme speed of the ISS.

The antenna:

Uplink and downlink frequencies that two different YAGI antennas must be built and operated to follow the ISS position. In these articles you can find details on how to build them:

https://www.amsat.org/articles/n2spi/JulAug06AmsatJournal.pdf

https://www.amsat.org/articles/n2spi/SepOct06AmsatJournal.pdf

https://www.amsat.org/articles/n2spi/NovDec06AmsatJournal.pdf

Game: radio listening - digital modes

Let's learn to know and decode the strangest and most complex messages that populate the radio waves!

Learning targets:

- Make Scouts discover amateur radio advanced telecommunication techniques that they could use.
- Make Scouts discover the exploration of the radio spectrum by means of online receivers.

Material:

Hardware:

- PC.
- Internet connection.

Software:

- Browser (pref. Chrome).
- FLDIGI: https://sourceforge.net/projects/fldigi/
- Virtual cable: https://vb-audio.com/Cable/

Time: Around 1 hour.

Preferred place: Home activity.

Description:

An amateur radio operator transmits some instructions via amateur radio using digital modes: among them, RTTY, BPSK31, Hellschreiber, etc.

Scouts, connected from home in videoconference, must connect to an online receiver.

Lists of receivers are available at:

- http://websdr.org/
- http://kiwisdr.com/

Tune to the amateur radio operator frequency, decode the digital message and execute the received instructions in videoconference: wear clothes of a specific color, show a specific object, etc.

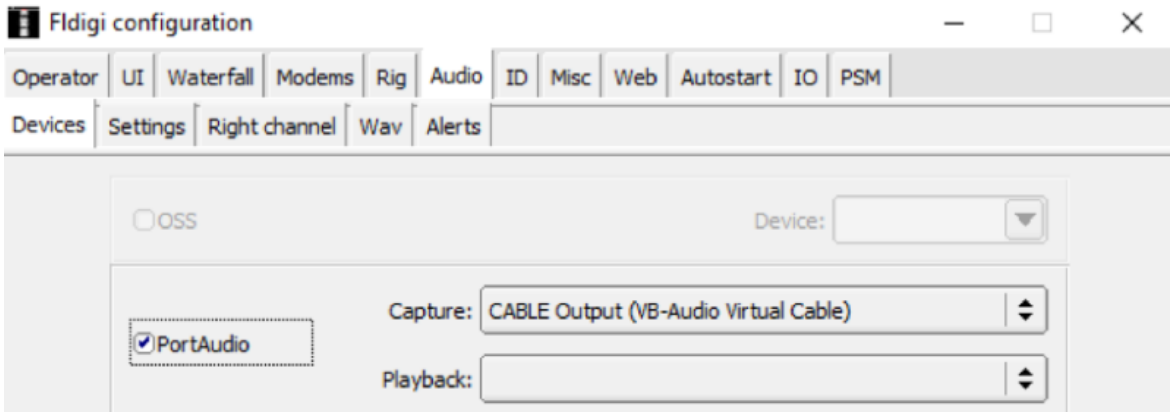
For specific instructions on how to listen to online receivers, please check the separate activity on the listening of broadcasting stations.

To decode the audio signal coming out of the loudspeakers, first it must be turned from an audio output to an audio input.

This is done by Virtual Cable. In your PC settings, among input and output audio devices, you must activate the virtual devices "Cable Input" and "Cable Output".

Beware that this will mute your PC, up to the moment you restore the previous audio settings.

Now it's the turn of opening FLDIGI: it's the software that will decode the audio signal. First, in its settings, you must select the correct audio input device, that is Cable Output.



Now you have to select the correct digital mode from the available list and click, in the downwards waterfall, the track of the digital mode.

More information on recognizing and using digital modes can be found on this website:

https://www.sigidwiki.com/wiki/Category:Amateur_Radio

As a subsequent step, Scouts could be encouraged to exchange secret messages using FLDIGI: the software is useful for both decoding and encoding digital modes.

In this case, remember to set your PC loudspeakers as a playback device in the FLDIGI configuration window.

Game: radio listening - naval messages

The Coast Guards of all countries regularly send radio messages about navigation activities and dangers, weather forecasts, etc. Let's discover how to receive and interpret them.

Learning targets:

- Let Scouts discover the radio spectrum using online receivers.
- Discover and interpret weather forecasts and danger/emergency communication in Nautic
- Get familiar with latitude and longitude in topography.

Material:

Hardware:

- PC.
- Internet connection.

Software:

- Browser (pref. Chrome).
- FLDIGI (optional).
- Virtual cable (optional)

Time: 1 day (not continuously).

Preferred place: Home activity.

Description:

Individuals or patrols, using online receivers, must listen, decode and interpret NAVTEX text messages from the coast guard.

When the coordinates of ships or elements of danger are indicated, the Scouts must locate that point on a map.

All this information must be reported to the Scout leaders.

Two lists of online receivers are available at:

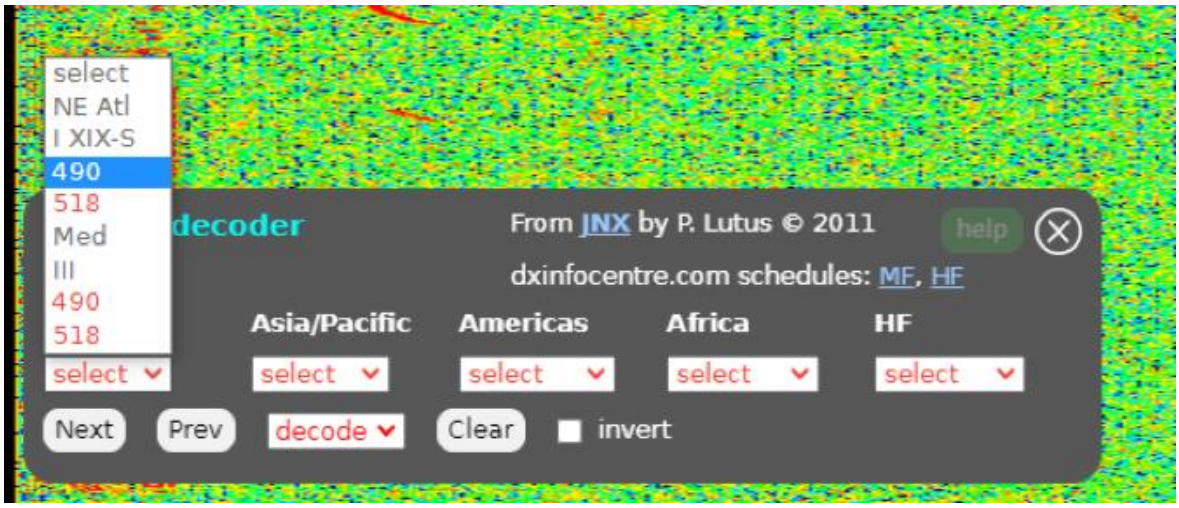
http://websdr.org/

http://kiwisdr.com/

The use of online receivers is described in a separate activity (listening to broadcasting stations).

With the online receivers of the first list, it will be necessary to use Virtual Cable and FLDIGI, as described in a separate activity (digital modes).

With KiwiSDR the decoding functionality is embedded in the receiver:



At 490 kHz national messages are transmitted, while the 518 kHz frequency is used for international communication. Listening is suggested during the evening and the night.

For more information:

http://www.navtex.lv/navtex/MainTable

https://en.wikipedia.org/wiki/List_of_Navtex_stations

http://www.iderc.cu/documents/10523/48304/Manual+NAVTEX+2018/d5200fd8-21dd-4a02-ae7d-feb0a2ff4626

https://www.sdrplay.com/resources/decoding_navtex.pdf

Game: fox hunting

Secret radio transmitters are hidden all over the place: will you be able to find them?

Learning targets:

- Improve topography and orienteering skills.
- Learn how to exploit the directionality of antennas to locate a radio emitting object.

Description:

Fox hunting is a well-known structured sport activity among amateur radio operators, developed from orienteering.

The sport is also known as Amateur Radio Direction Finding (ARDF).

While widespread among amateur radio operators, this activity does not necessarily require an amateur radio license, since participants only need radio receivers.

In ARDF competitions, several transmitters are hidden in a natural area. Basic or no information is given about the rough position of them.

Similarly to an orienteering competition, the participants must find the transmitters and mark their personal badge with a tool available in the same place of the transmitters.

The winner is established on the basis of the number of located transmitters and or on the elapsed time.

To locate the transmitters, the participants have portable receivers equipped with a directional antenna, that is an antenna that can collect radio signals much better in some directions than in others.

The strength of the collected signal is also used to understand the proximity to the transmitter.

Here below are some links about this sport activity.

The devices required to participate can be expensive, so an interested Scout group should ask for support from the nearest amateur radio association.

https://www.iaru-r1.org/about-us/committees-and-working-groups/ardf/

https://en.wikipedia.org/wiki/Amateur_radio_direction_finding

https://www.youtube.com/watch?v=tl4HztSY8Mo

It’s also possible to recreate this game in a smaller area, using cheap programmable devices as transmitters or receivers. The instructions are reported here below:

https://microbit.org/projects/make-it-code-it/treasure-hunt/

Fox hunts are an excellent JOTA-JOTI activity. It´s a good way of keeping younger members occupied while not on the radio.

Commercial “Foxes” are available, and scouts could even build receivers or the fox as part of another activity.

Fox hunting is a game where a transmission signal has been hidden.

The game is to search and spot the transmitter.

This could be done as a ‘walking’ foxhunt in, for example, a park or forest during JOTA-JOTI or could be done with a larger transmission signal (a static hidden transceiver or a moving (high altitude) weather balloon) over a wider area where you need a car to reach the foxhunt hiding or landing spot.

Setting blocks through Radio Communication

Love to build? Up for a challenge? Try this fun activity with your Scout or Guide Group, where you can put your communication skills to the test with a LEGO-building project!

Duration: 20-30 minutes

Preparation:

- Divide participants in two teams: Alpha and Delta.
- Team Alpha sits at a table with a walkie-talkie and a box of Lego blocks. Team Alpha will start with construction.
- Meanwhile, Team Delta will move further away. It's important that they are out of sight and out of earshot. Team Delta has to have the exact same set of LEGO blocks (identical colors and shapes) as well as a walkie-talkie. This team will start by following instructions.

How to play

- First, Team Alpha makes a construction with their LEGO blocks. They can replicate a reference image or create their own structure.
- When Team Alpha has finished building, they call Team Delta by walkie-talkie to walk them through step-by-step how to build the LEGO structure.
- After this is done, Team Alpha moves to check the result built by team Delta. Then the teams reverse their roles.

Look at the resulting structure and reflect on the following:

- Is it what the teams were expecting?
- What was easy and what was difficult to communicate and understand? What makes you say that?
- What can the teams do to improve their communication in the next round to build an even more complex structure?

Variations

Depending on the age group and skills, the Scout/Guide Leader can adapt difficulty level:

- If colors are an issue, you can just send commands about shape and not use color.
- You can also play with another group over a longer distance by amateur-radio. Make sure you have the same set of LEGO blocks. Check the result by sending pictures or participating in a video call.

Example in video: https://youtu.be/6swX6y1RB2I

BINGO (BRAVO - INDIA - NOVEMBER - BRAVO – OSCAR)

Try this fun bingo session with your Scout or Guide Group, where you'll learn the International Phonetic Alphabet! Whiskey; Oscar; Sierra; Mike. Want to learn what this spell? After this game, you'll be able to spell messages like this and more. (P.S. The answer is "WOSM!")

Objective:

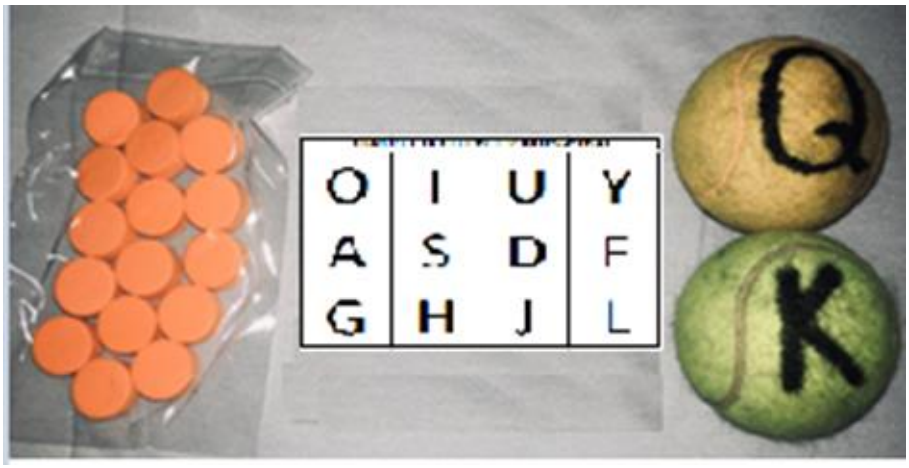
Help Scouts and Guides memorize the International Phonetic Alphabet by playing bingo!

Time: Approx. 20 minutes

Materials:

- 26 balls - Write a different letter of the alphabet on every ball using a marker. Balls can be requested at tennis, paddle, or ping pong clubs or made out of paper that is crumpled into the shape of a ball.
- Bingo cards - Print 12 blocks (3 columns x 4 rows) on pieces of plain card. Each block must contain a different LETTER. In total, each card should have 12 different letters on it (see example at the end). Each participant must have one bingo card.
- Something to mark your cards with, such as beans, a pen, or small circles.
- A non-transparent bag big enough to hold all 26 balls.

Examples of materials used:



Instructions:

1. A Scout or Guide is chosen as the leader of the game.
2. Distribute one card to each participant.
3. Distribute a small amount of beans (or other way of marking the cards) to each card holder.
4. Ask the leader to remove a ball from the bag and say the letter written on it using ONLY the International Phonetic Code.
    - In the first few rounds, the leader should pronounce the letters drawn more slowly, giving participants time to identify the letter that was drawn. In the next rounds, the leader can gradually increase their speed.
5. Participants must check their card and mark it if their letter has been drawn.
6. Repeat steps 4 and 5.
7. The Scout or Guide who marks all the letters on their card first and shouts loudly and clearly “BRAVO-INDIA-NOVEMBER-GOLF-OSCAR” wins the round!

Example of Bingo CARD:

G	R	E	A
V	P	I	M
J	C	D	O

Material to download:

Download the BINGO Cards here!

Communication during emergencies

Are you good at keeping cool under pressure? Want to put your Scout skills to the test? This is exciting activity with your Scout or Guide group to practice communication in an emergency

About this activity:

Do you wonder how it feels to have to act immediately in the middle of an emergency like a natural disaster? This is your chance to practice and understand what really takes place to step up and help out during a crisis. Several natural disasters in the past have led to immediate action from local Scout groups and amateur radio operators to help and offer humanitarian relief support. Why? Because Scouts and amateur radio enthusiasts are almost everywhere, have the skills, the mindset and the equipment to support and help.

An educational and fun way to discover what an actual Scout group can do. **A Scout is always prepared!**

One important task on an emergency communication is to be ready for listening, decipher and can forward a message received.

The scouts and guides will receive a CW and VOICE message. An amateur radio operator or Scout/Guide Leader will transmit the messages and the scouts and guides will try to decipher.

ACTIVITY 1: "Radio contact"

We received a radio transmission. Below the audio file of the message.

Voice Message part 1 - SOS Scoutonia

Voice Message part 2 - SOS Scoutonia

"PU7MCV – CQ CQ CQ - I am calling from a Scout group in the Balucharia region of East-Scoutonia where we've just been hit AGAIN by an earthquake – a big one, about 7.4 on the Richter scale – PU7MCV, over."

"PU7MCV – CQ CQ CQ - earthquake in East-Scoutonia - we urgently need doctors, warm clothing, food, water and transportation for the wounded – PU7MCV, over."

NOTE: A Scout leader or Amateur Radio Operator can send the message in their own language to facilitate to the participants.

ACTIVITY 2: CW transmission

We received a Message in Morse Code and we must decipher it. Below is the name of the audio file for the full message.

File 00 - Full Message - SOS Scoutonia

To make it easier, audio files of each part of the message in Morse Code are also available.

File 01 - VVV - means attention

File 02 - SOS

File 03 - VVV

File 04 - Earthquake

File 05 - In

File 06 - Scoutonia

File 07 - We

File 08 - Urgently

File 09 - Need

File 10 - Doctors

File 11 - Warm

File 12 - Clothing

File 13 - Food

File 14 - Water

File 15 - And

File 16 - Transport

File 17 - For

File 18 - The

File 19 - Wounded

Only for Morse Code in English. The representation below in dots (short sound - di) and dashes (long sound – dah) is the same as in the sound files above. We recommend using the sound files.

1. ...- ...- ...-
2. ... --- ...
3. ...- ...- ...-
4. . .- .-. - .... --.- ..- .- -.- .
5. .. -.
6. ... -.-. --- ..- - --- -. .. .-
7. .-- .
8. ..- .-. --. . -. - .-.. -.—
9. -. . . -..
10. -.. --- -.-. - --- .-. ...
11. .-- .- .-. –
12. -.-. .-.. --- - .... .. -. --.
13. ..-. --- --- -..
14. .-- .- - . .-.
15. .- -. -..
16. .-. .- -. ... .--. --- .-. –
17. ..-. --- .-.
18. .... .
19. .-- --- ..- -. -.. . -..

Scouting's Global Humanitarian Action

Scouting empowers young people with the leadership skills and resilience to help other people when disaster strikes, both in the short-term delivering vital aid and logistical support and importantly also in the long-term by rebuilding communities, integrating refugees into society, and helping children and families who have suffered immense hardship to rebuild their lives and experience joy, compassion and belonging in Scouting.

Learning humanitarian action skills like you did today means you've learned new skills to help you respond and create a better world when it's needed most!

Scouting's Global Humanitarian Action - https://youtu.be/VuYGwgX35I8

Pictures by radio - SSTV World

Scouts are briefly introduced to SSTV communication practice (an image is converted to a sound, which is transferred by radio and finally back-converted into an image) and invited to install one of the suggested applications for SSTV.

Scouts are subsequently required to listen to some SSTV audio files, convert them into images and then share the images in a Padlet, moderated by the WOSM JOTA-JOTI team.

What is SSTV?

Slow-Scan Television (SSTV) is a technique to transmit and receive static pictures via radio. Basically, the image is converted to a sound, which is transmitted via radio; the received sound is then converted back into an image.

In this way, it is possible to exchange personalized images, and perform complete radio communications by adding text on it. SSTV images can finally be stored or printed as a nice "souvenir" of the radio contact.

How to convert SSTV images

Several applications are available to convert SSTV sounds into images. As example, MMSSTV (https://hamsoft.ca/pages/mmsstv.php) is available for Windows, while in Android the Robot36 app (https://play.google.com/store/apps/details?id=xdsopl.robot36) is available.

Most applications are automatically able to detect the correct SSTV codification format (e.g. Robot36, Martin 1, Scottie 1, etc.).

Expert amateur radio operators are equipped with interfaces to connect the radio receiver to the device that decodes SSTV. In your case, you may find yourself in three alternative conditions:

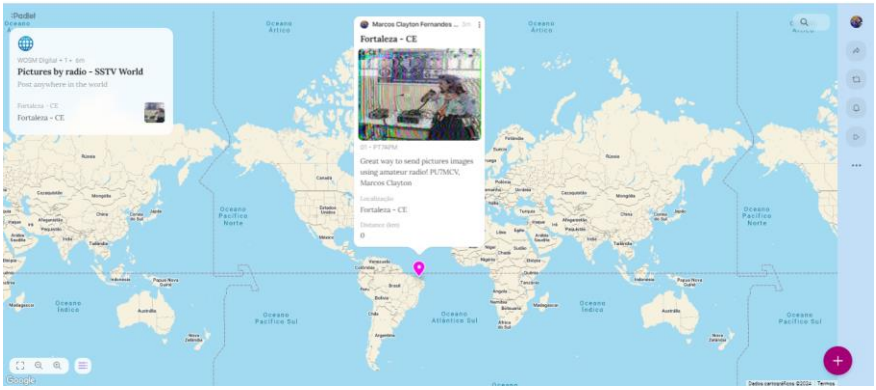
- If the SSTV sound is emitted from the loudspeaker of a device (e.g. a radio), you should put the microphone of the decoding system (PC/laptop or mobile phone) as close as possible to the source of the sound. The environment should be as quiet as possible, every collected noise will spoil part of the decoded image!

- The device which emits the SSTV sound is the same that should collect and decode it. To work this out with a PC/laptop, you need to install a software (Virtual Cable, https://vb-audio.com/Cable/) that virtually injects the sound output into the sound input. The software creates two virtual audio devices (CABLE input, Cable output), one for the input and one for the output. When decoding SSTV images, these devices should be contemporarily selected; during this activity you will hear no sounds anymore…but the computer will.

The challenge

To complete this activity, you must decode the sounds and upload the images on a Padlet at:

https://padlet.com/worldscouting/pictures-by-radio-sstv-world-56j1ph7yd740amoo



To add your images, follow these steps:

1. After opening the Padlet page, click on the PLUS SIGN on the right bottom of the page;
2. Choose your location, typing the city, state, country. When you start typing a list will appear and you can choose;
3. Add your image;
4. Write something about the activity;
5. Click on PUBLISH in the right up corner.

You can add as many images you want. Let´s show our skills to the world.

Here you will find 10 audio files containing SSTV sounds to be used to convert into images.

01 - PT7APM	02 - HB100JAM
03 - Girl on the radio – 01	04 - 1920 - Olympia
05 - 1924 – Ermelunden	06 - 1955 - Niagara
07 - LX95	08 - QSL Cards
09 - Radio Scouting activity	10 - Girl on the radio - 02

Download the zip file with all sounds for the challenge

Jota-Joti Amateur Radio Card Challenge

Let's board this Challenge Cards! Choose how you will participate and prepare the materials. The activity aims to encourage young people to experience the world of amateur radio and can be applied as a group activity or as an individual.

The activity aims to encourage young people to experience the world of amateur radio and can be applied as a group activity or as an individual.

Let's board this carousel together! Choose how you will participate and prepare the materials.

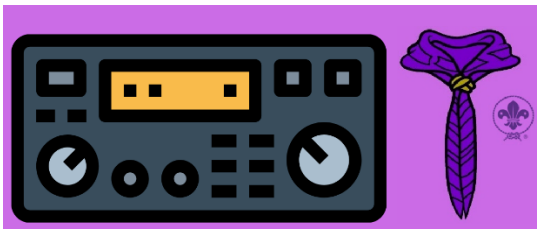
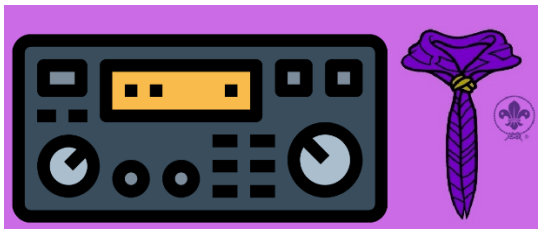
Purpose: To offer a variety of fun and engaging activities to Scouts taking part in JOTA-JOTI, while they experience and explore the magical world of amateur radio.

Set up

1. Most activities will benefit from the (technical) support of an amateur-radio operator.
2. Here you will find suggestions of different activities, but the Scout/Guide Leader can also develop others, adding more cards or substituting some

On the pack you will find Numbered Cards (one file with the cards ready to print), files with the full description of the activity, template for spinning wheel and template for the dice.

Each card has a brief description of a **fun** and/or **discovery activity**.

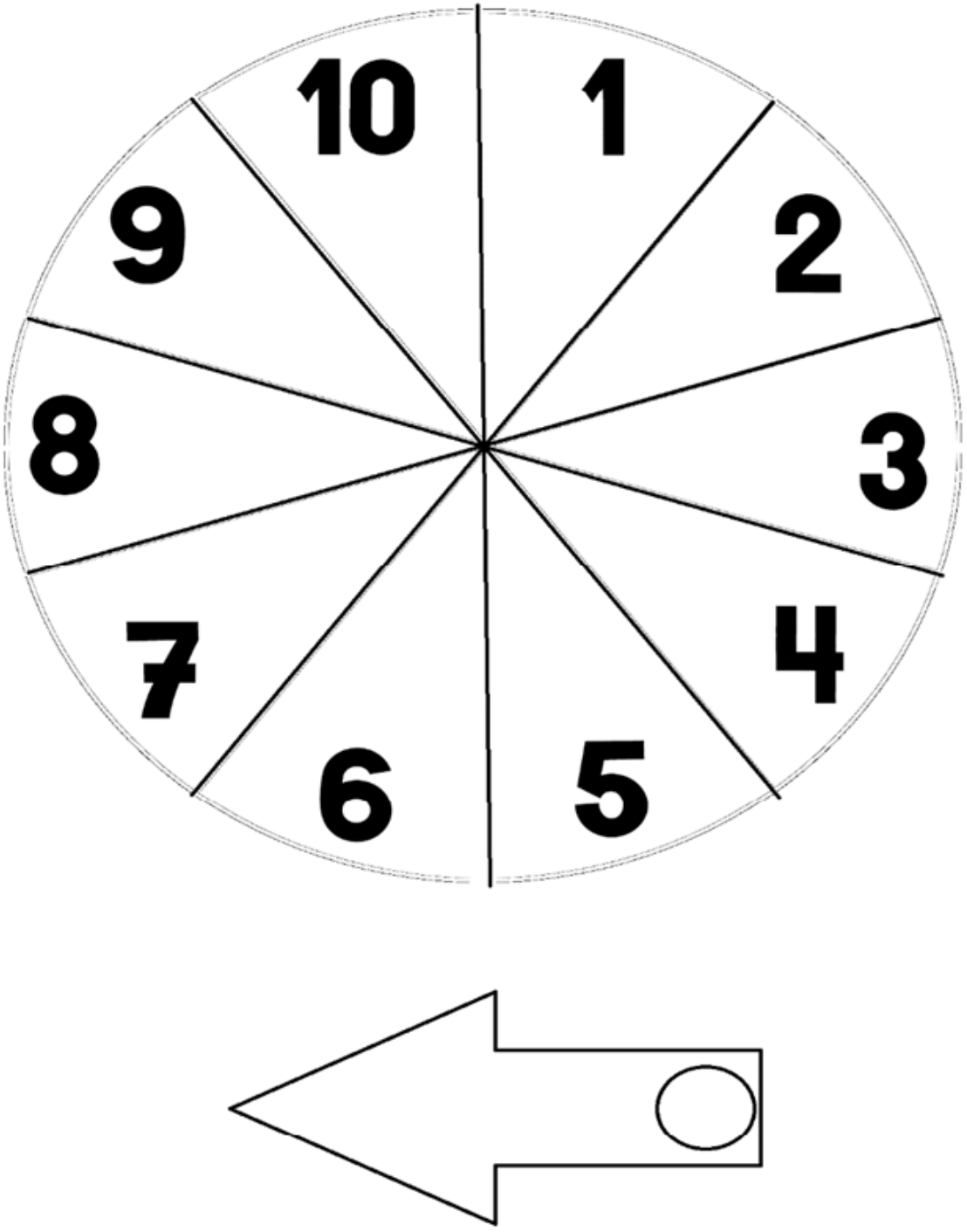
CARD 01 This activity is worth 5 "carousel points" Every member of the team will spell your name using the International Code For Example: MARIA Mike – Alpha – Romeo – India – Alpha 	CARD 02 This activity is worth 5 "carousel points" The team will find a way to describe what mean the follow "Q CODE" QSL QTH QTR 

After choosing the set of cards, mix them up and dispose of them as a Carousel. To determine which activity the patrol gets to work, let each patrol pick a card randomly using a carousel or other method of raffle.

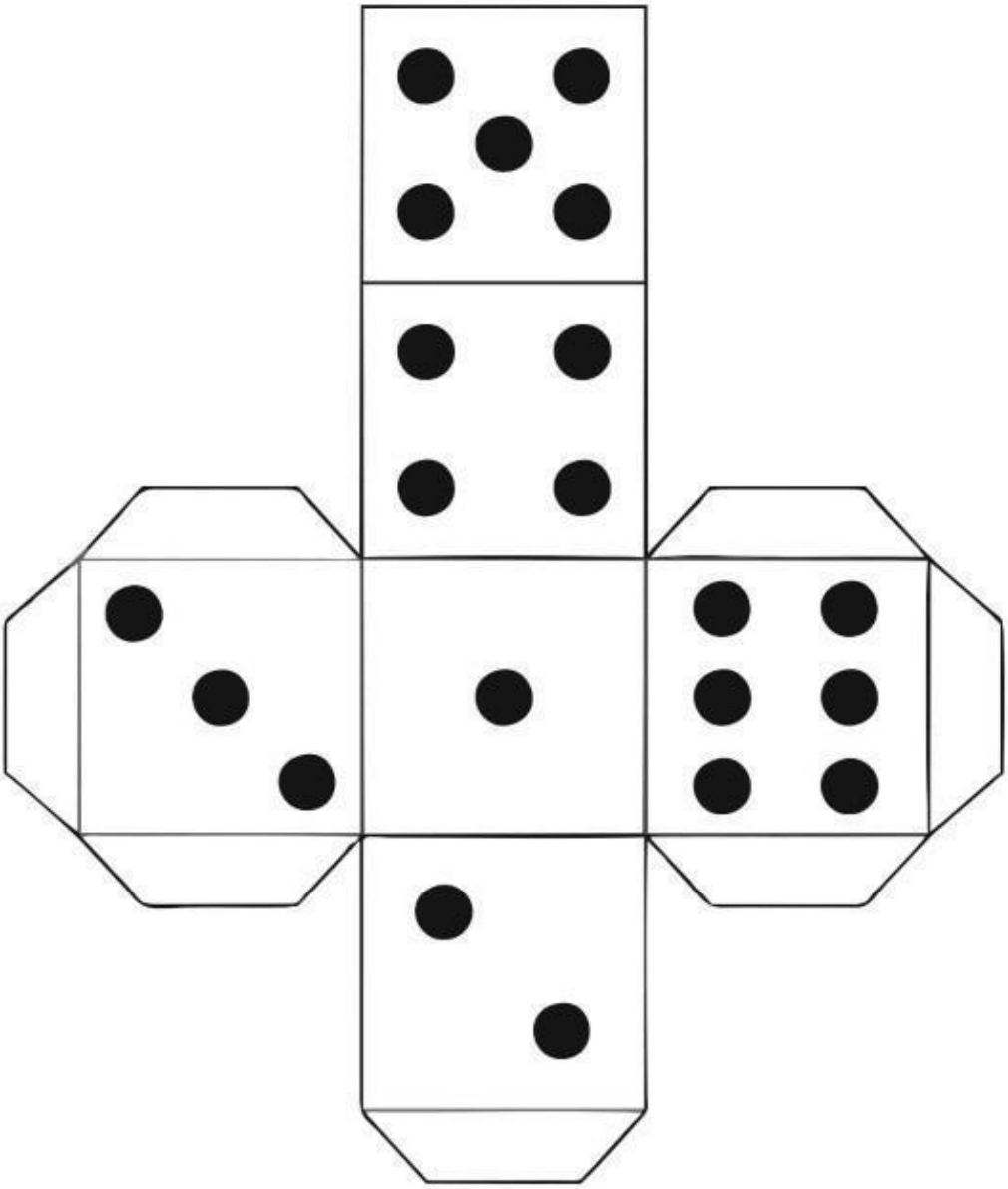
There are many models that help to draw cards. It can look like this:

or this:

or use a spinning wheel. Depending on the number of cards, you will need one or two spinning wheels. So before starting the draw, the Scout/guide Leader must say if will use one or two spinning wheels. If the objective was to get a lower number just use one. If the objective was to get a higher number use two spinning wheels.



Alternatively, you can roll some dice. Depending on the number of cards, you will need one to five dice. So, before starting the draw, the Scout/Guide Leader must say how many dice will be used. If the objective was to get a lower number just use one. If the objective was to get a higher number use more dice.



How to play

Each team will take turns to choose a card. Then, the patrol has to complete the activity and will get "carousel points" (described in the CARD) once they have completed the challenge, the other team or a leader will evaluate if they did it right and earned or not the "carousel points".

Each team should complete five or more activities during JOTA-JOTI.

Download resources:

- English - Radio Challenge Cards
- Indonesian - Radio Challenge Cards
- Portuguese - Radio Challenge Cards
- Polish - Radio Challenge Cards


jota joti