An introduction to Amateur Radio / Ham Radio

by Trivandrum Amateur Radio Society (TARS)

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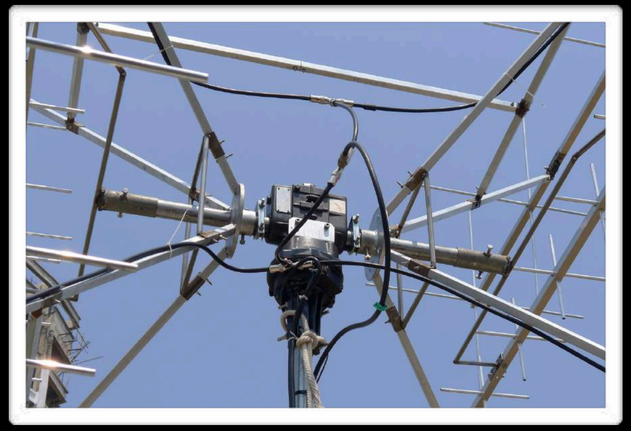
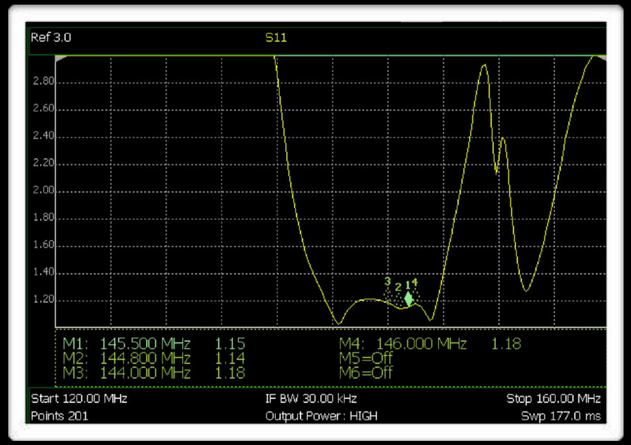
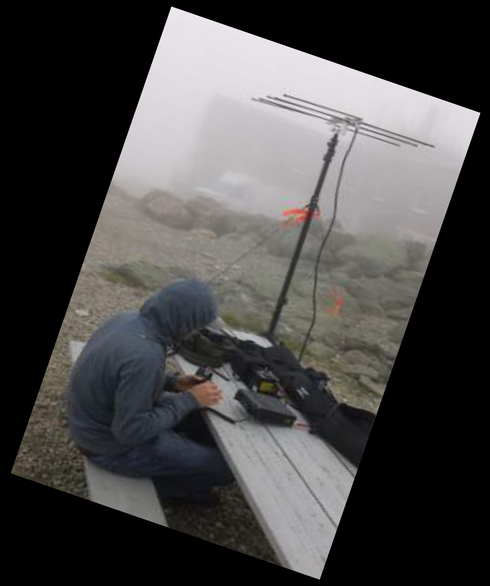




What is Amateur Radio?



Amateur radio is a regulated, non-commercial radio service where self trained skills are used for intercommunication among similar licensed amateurs. Prime purpose is experimentation on wireless communication techniques. Public Services are usually extended during emergencies and disasters, without any pecuniary interest.

Communicate, Experiment, Interact, Compete

- Amateur radio is a regulated, non-commercial radio service. Unlike other radio services, Hams have a wide range of frequencies and reasonable RF power to use.

- Experimentation is not only allowed, but it's encouraged. Ham radio is truly a service. It is an activity of Self-Learning, Inter-Communication, and Technical Investigation.

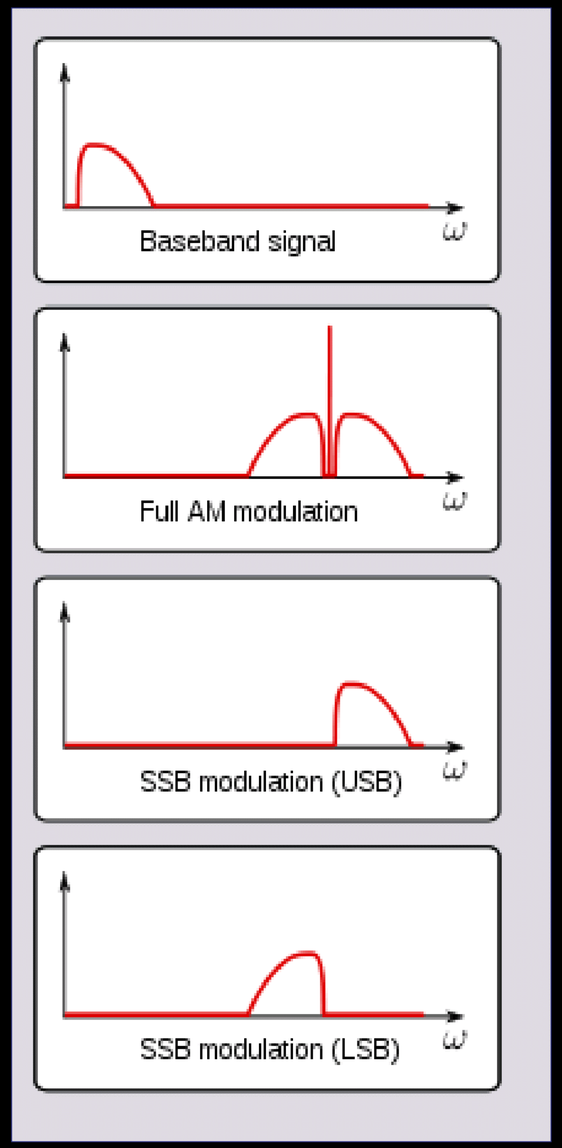
- Amateurs talk to local friends over the radio waves using hand-held transceivers, communicate digitally using packet, to exchange personal messages, or vital information in an emergency, talk to other Hams anywhere in the world, or engage in contests over the airwaves.

- There is truly something for everyone. In the U.S. there are over 700,000 licensed radio amateurs, and this number is steadily increasing. In India there are over 5000 active Hams.

What are the benefits?

- ☑ Gets self trained in various technologies
- ☑ Improves communication skills
- ☑ Gets a strong identity
- ☑ Can make world-wide friendship
- ☑ Gets opportunity to serve the community

Modes of Communication in Ham Radio



Continuous Wave (CW) - A wave of constant amplitude and frequency. Morse code is transmitted by this means when a carrier wave is switched on and off.

Amplitude Modulation (AM) - AM works by varying the strength of the transmitted signal in relation to information being sent. Power is concentrated on the carrier frequency and two adjacent sidebands.

Frequency Modulation (FM) - Frequency modulation conveys information over a carrier wave by varying its instantaneous frequency. This is the popular mode of voice communication in the VHF and UHF amateur bands, as well as most utility and public service radios.

Single Sideband (SSB) - A refinement of Amplitude Modulation, that more efficiently uses transmitter power and bandwidth by suppressing the carrier and concentrating power to a single sideband. SSB has become the standard for long distance voice communications.

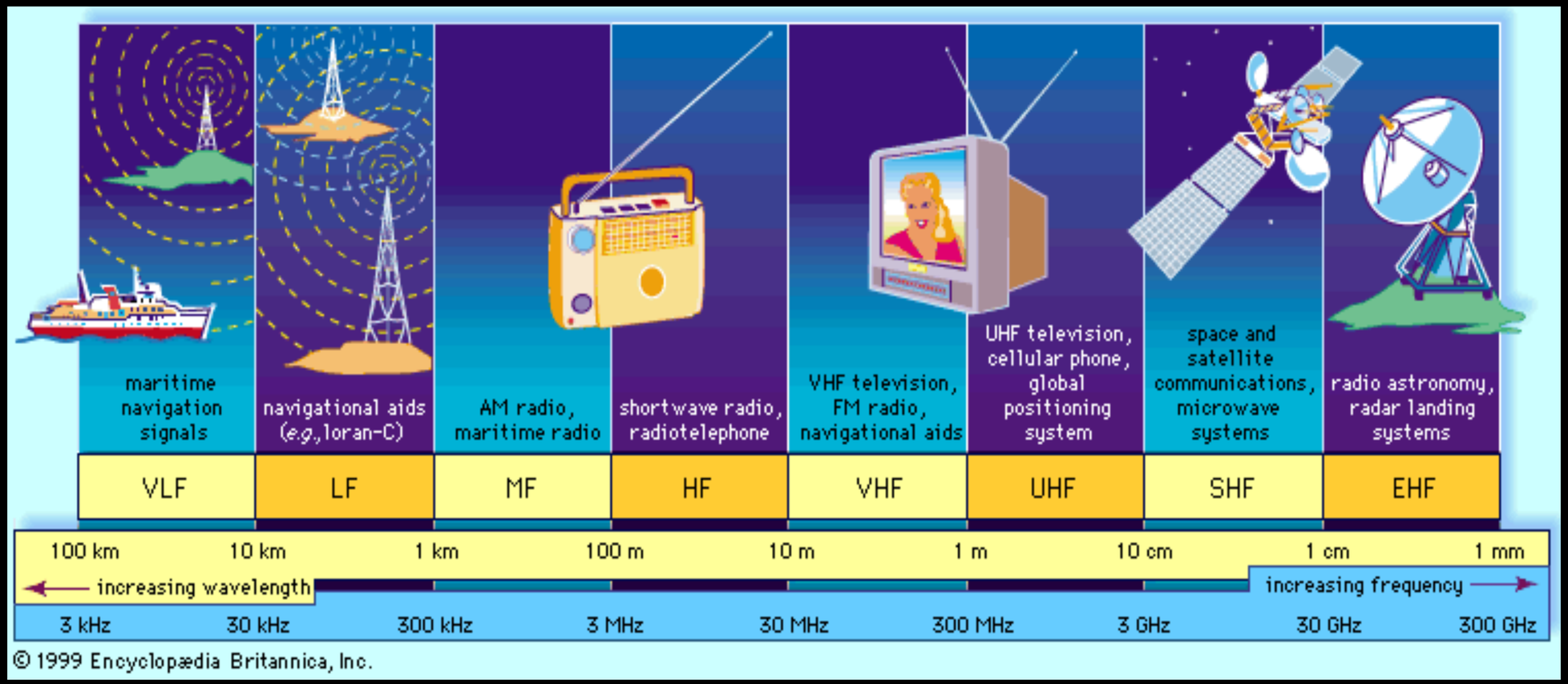
Modes of Communication ....contd

Frequency Shift Keying (FSK) - a frequency modulation scheme in which digital information is transmitted through discrete frequency changes of a carrier wave. The simplest form uses a pair of discrete frequencies to transmit binary (0s and 1s) information. An example would be the digital mode, MFSK-16

Phase Shift Keying (PSK) - a digital modulation scheme that conveys data by changing or modifying the phase of a carrier wave. An example would be the popular digital mode, PSK-31.

Hams use Amtor, Pactor, Clover and FT-8 on HF bands and protocols such as JT 65 B for EME communications. FT8 is another digital mode being frequently used.

The Radio Spectrum



Radio Amateurs have privileges from 160 meters (MF) to the Microwave bands (SHF)

Morse code (CW)

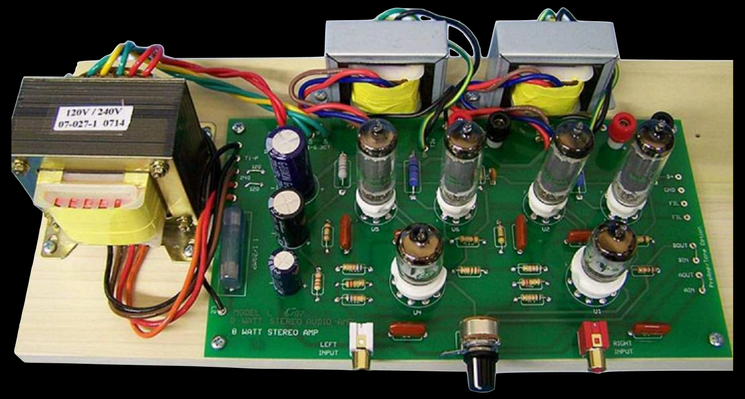
A ·— B —··· C —·—·

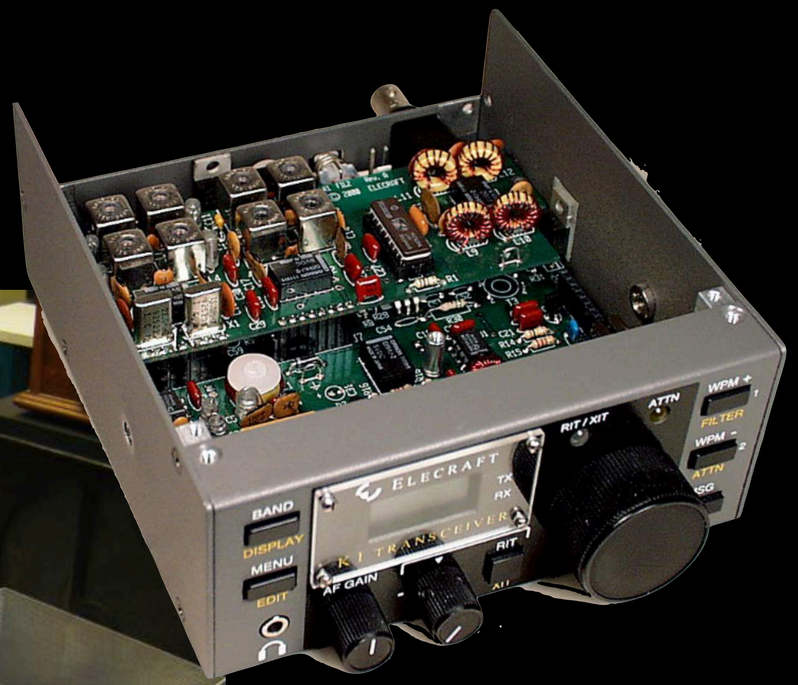
Morse Code is the simplest and cheapest form of Radio Communication. Just 10 watts of HF power is sufficient to connect globally under favorable conditions.

QRP (Low Power Operations) on HF Bands

Communicating with 'very low power' is a challenge that many hams enjoy. QRP is usually practiced on the HF bands.

Technical Experimenting & Kit Building





Hams come from all walks of life, ranging from technicians to engineers, teachers to scientists and students to retirees. For many of them, the attraction to the hobby is to build their own equipment whether it is just a simple antenna, something as complex as a transceiver, or an interface between their radio and a computer.

HF Transceivers are used to communicate even to the other side of the globe

Hams use simple wire antenna / sophisticated beam antennae to achieve long range communications

Antennae for HF operations

Wire Antenna

HF Yagi antenna

VHF and UHF transceivers

- Hams enjoy extremely reliable communications within their local community using simple VHF/UHF sets.

Dual band mobile transceiver

Hand-held VHF-UHF transceivers

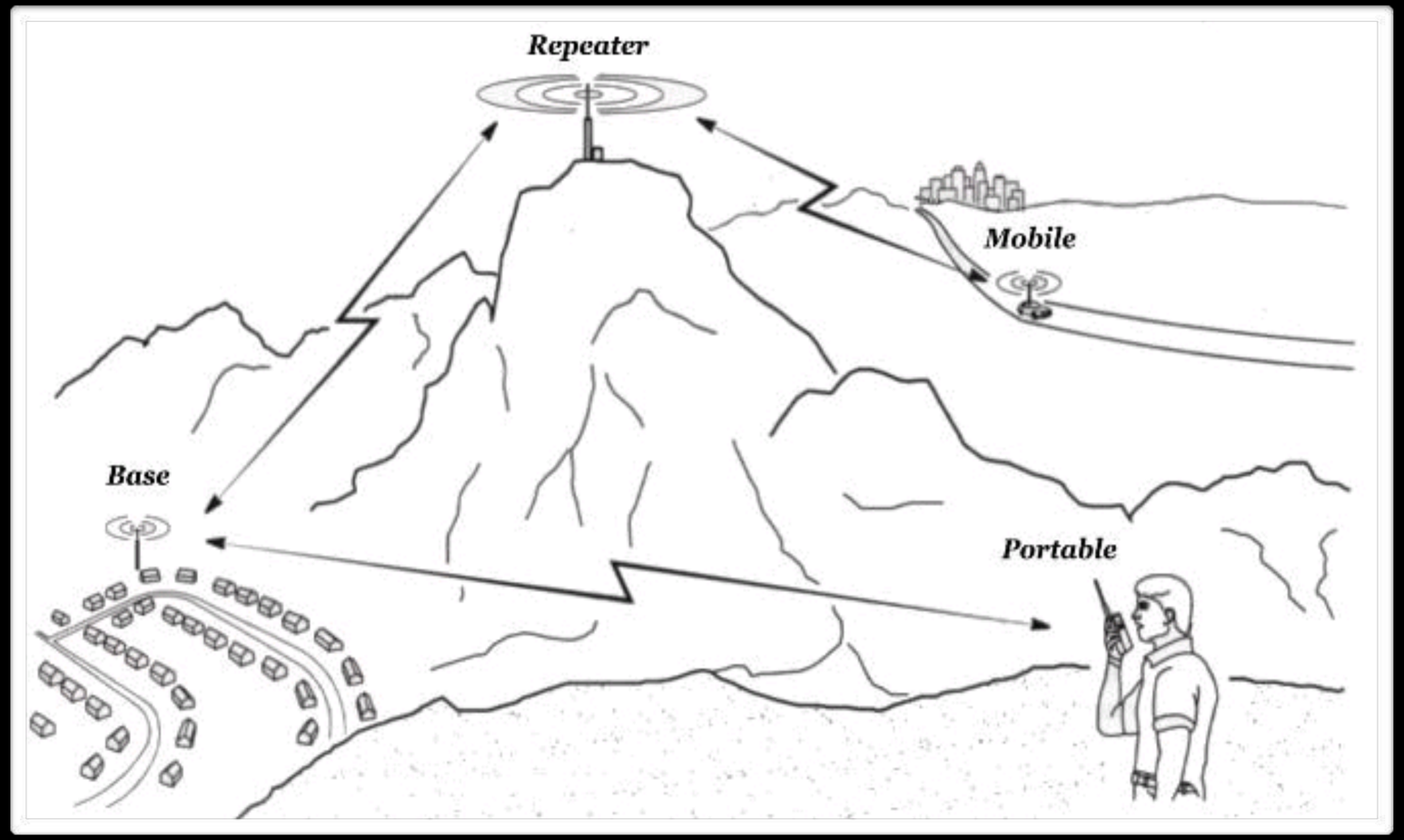
Directional Antennae

The range of VHF and UHF can be extended by using simple directional antennae

Cables and connectors

Use of good coaxial cables and connectors and practices in soldering or crimping them are critical in achieving good results in communication

Repeaters increase the range of VHF/UHF communication



Hams also use VHF/UHF repeaters that can extend the range up to several hundred kilometers

Linear Amplifiers are used to increase power to legal limits

VHF Linear Amplifier

HF + 6m Linear Amplifier

Enjoy Mobile Operations

During motor rallies and disaster management, radio equipment fitted on cars and bikes serve great purposes

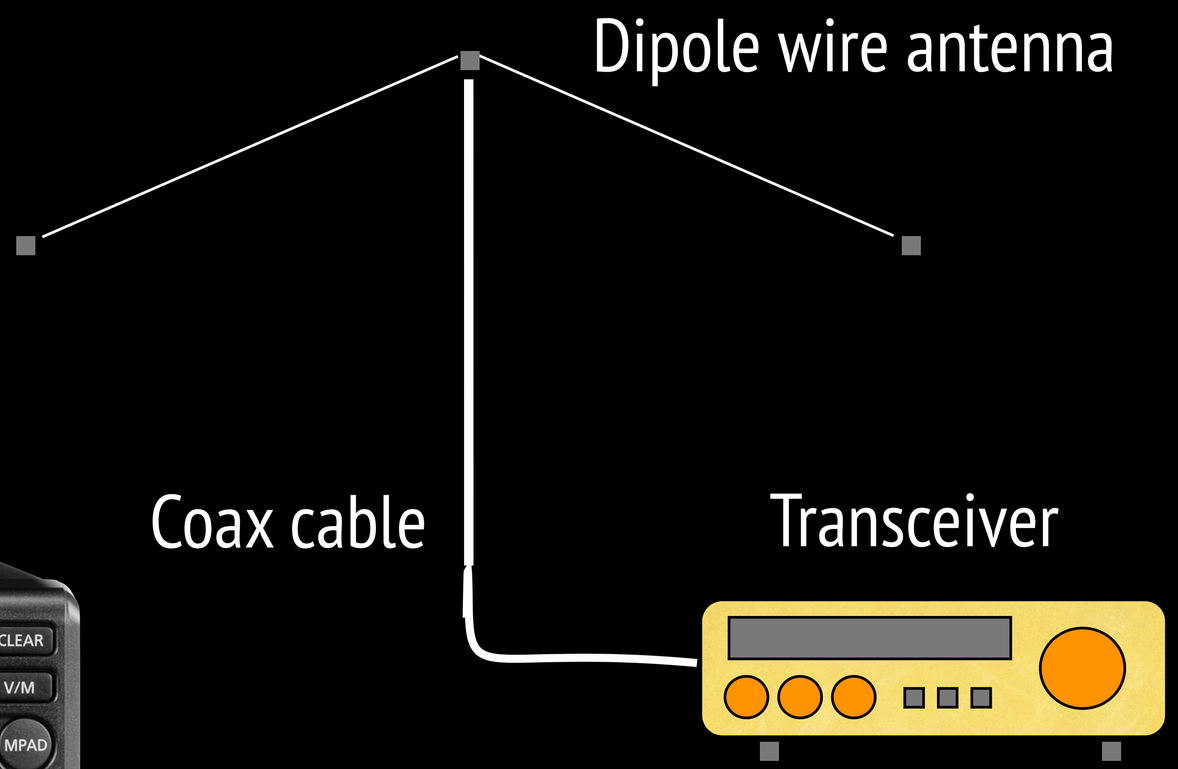
Your first Radio

To get started, all you need is a hand-held transceiver. These come in several varieties and cost between Rs. 3000/- to Rs. 8000/-

Most common sets are mono band 2 meter or 70 cm transceivers, or dual band handys. With a dual band handy, you can even work orbiting satellites with properly designed antennas if you acquire the skills.

Basic Test Equipment for a station

Your first HF Radio station



A compact Ham Station

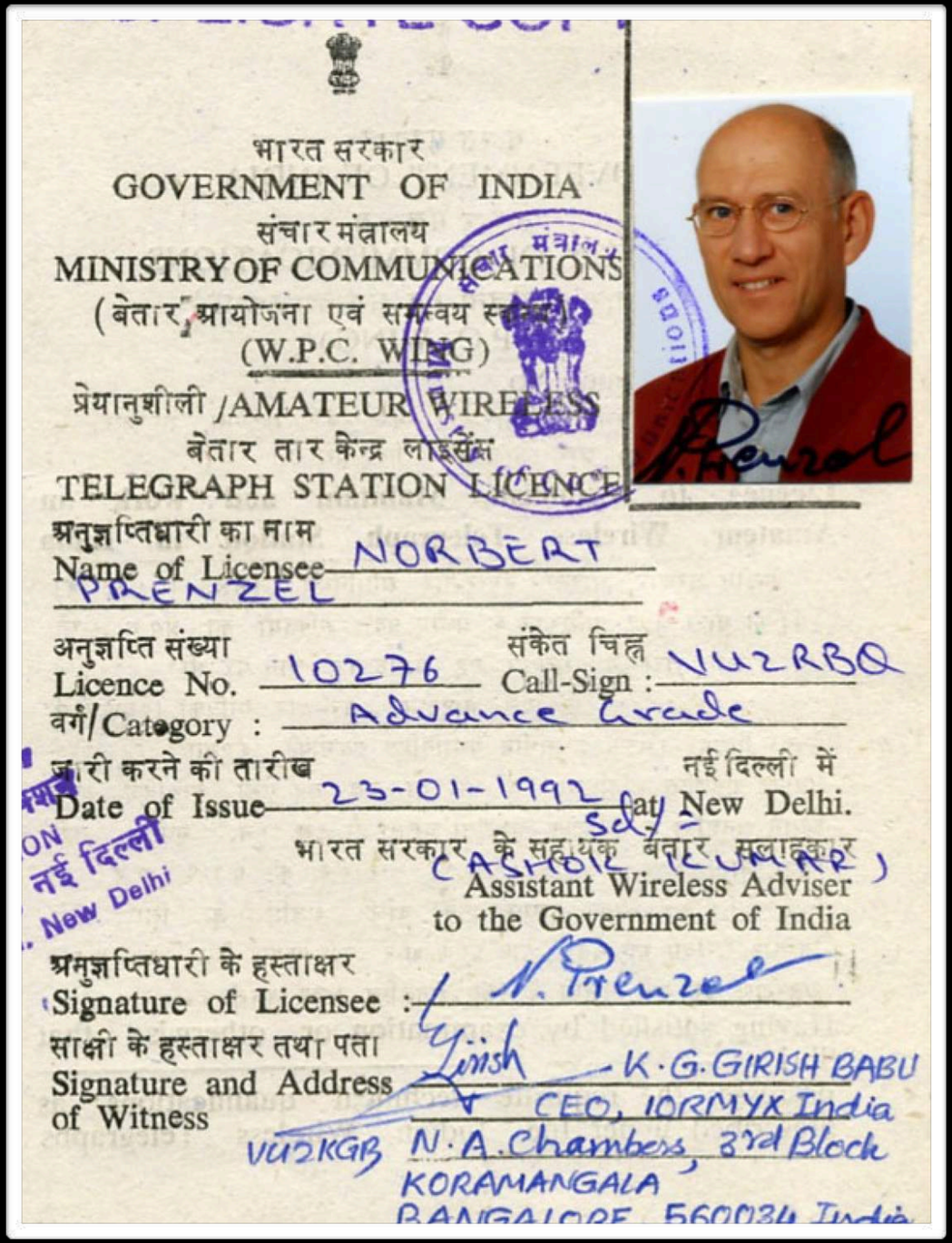
A Ham Station with Software Defined Radio

How to get the Amateur Radio License in India?

- ☑ You shall be a Citizen of India above 14 years.
- ☑ Visit the radio shack of a local Ham and understand the operations. Preferably join a local club.
- ☑ Need to study basic electronics and appear for a test conducted by the Ministry of Electronics, Communications & IT (WPC wing).
- ☑ The test will be objective type with practical test on Morse Code for regular license.
- ☑ If you pass, license will be issued in about 8 months time.

How does a License look like?

Most important part of the license is the call sign which consists of the country prefix and personal suffix usually separated by a number which usually denote a geographical region. VU 2 and VU 3 are for Indian main land. VU 7 is for Lakshadweep, VU 4 is for Andaman Islands



भारत सरकार
GOVERNMENT OF INDIA
संचार मंत्रालय
MINISTRY OF COMMUNICATIONS
(बेतार आयोजना एवं समन्वय स्कन्ध)
(W.P.C. WING)
प्रेयानुशीली /AMATEUR WIRELESS
बेतार तार केन्द्र लाइसेंस
TELEGRAPH STATION LICENCE

अनुज्ञप्तिधारी का नाम
Name of Licensee NORBERT PRENZEL

अनुज्ञप्ति संख्या
Licence No. 10276
संकेत चिह्न
Call-Sign : VU2RBQ
वर्ग/Category : Advance Grade

जारी करने की तारीख
Date of Issue 23-01-1992
नई दिल्ली में
at New Delhi.

भारत सरकार के सहायक बेतार सलाहकार
Sd/- (ASHOK KUMAR)
Assistant Wireless Adviser
to the Government of India

अनुज्ञप्तिधारी के हस्ताक्षर
Signature of Licensee : N. Prenzel

साक्षी के हस्ताक्षर तथा पता
Signature and Address of Witness
Girish K.G. GIRISH BABU
CEO, IORMYX India
VU2KGB N.A. Chambers, 3rd Block
KORAMANGALA
BANGALORE 560034 India

नई दिल्ली
New Delhi

Emergency and other Volunteer Services

Flood, landslide, earthquake, hurricane, accidents (Rail / Road / Air), etc.

Whenever regular communications fail, Hams are ready to use their radio to provide emergency communication services to the affected community.

DX- ing

DX means long distance communication, and with the right equipment, worldwide communication on the HF bands (10 through 160 meters) is a regular possibility.

Many DXers and Island hunters like to contact stations on rare islands and countries which aren't frequently present on the airwaves.

Contesting

Contesting is often called the ‘sport’ of ham radio. Almost every weekend there is some form of amateur radio contest. Hams get on the air and compete to see who can make the most contacts in a limited period of time.

Amateur Radio Direction Finding (ARDF)/ Fox Hunt

Radio Direction Finding has many purposes, both practical and fun. It can be used to track down interference, assist in search and rescue, find hidden transmitters in a fox hunt, or even track animals that have been equipped with radio transmitting devices. In some places, ARDF competitions are organized, which awards those who can locate hidden transmitters the fastest. Fox Hunting (locating hidden transmitters) is a very interesting group event which will sharpen the radio direction finding skills of Hams.

Talk to Astronauts

Yes, it is really possible. Space stations do have ham radio equipment and licensed ham astronauts often take the time to make contacts with amateurs on earth. Hams also can use satellites as 'repeaters in the sky' to make contacts with other earth stations over great distances.

Communication through orbiting satellites

Amateur Radio satellites are built by Radio Amateurs and launched with the support of space agencies. These satellites can be used for free by licensed amateur radio operators for voice and data communications. Currently, satellites in orbit act as repeaters, linear transponders, or store and forward digital relays. These orbiting satellites use specially allocated frequencies to facilitate communication between amateur radio stations on VHF/UHF with low power, with specially built antennae.

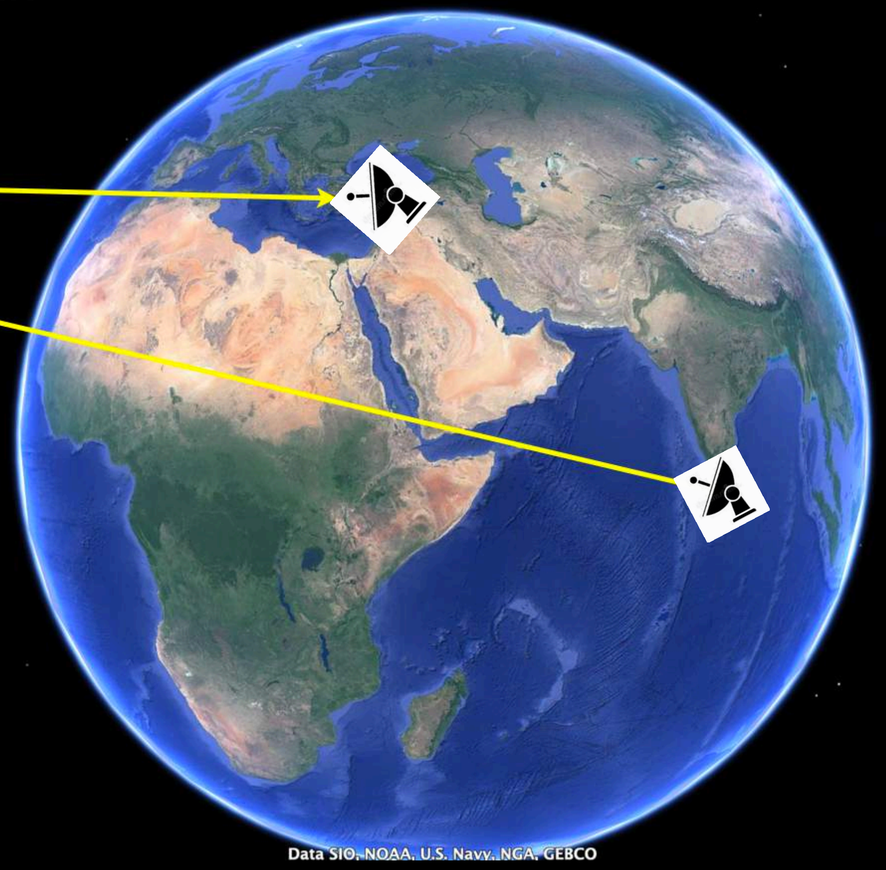
Simple Satellite antenna
using dual bander cross Yagi

An orbiting Ham satellite

Communication using QO-100 Geo stationary Satellite

2.4 GHz uplink
10 GHz downlink

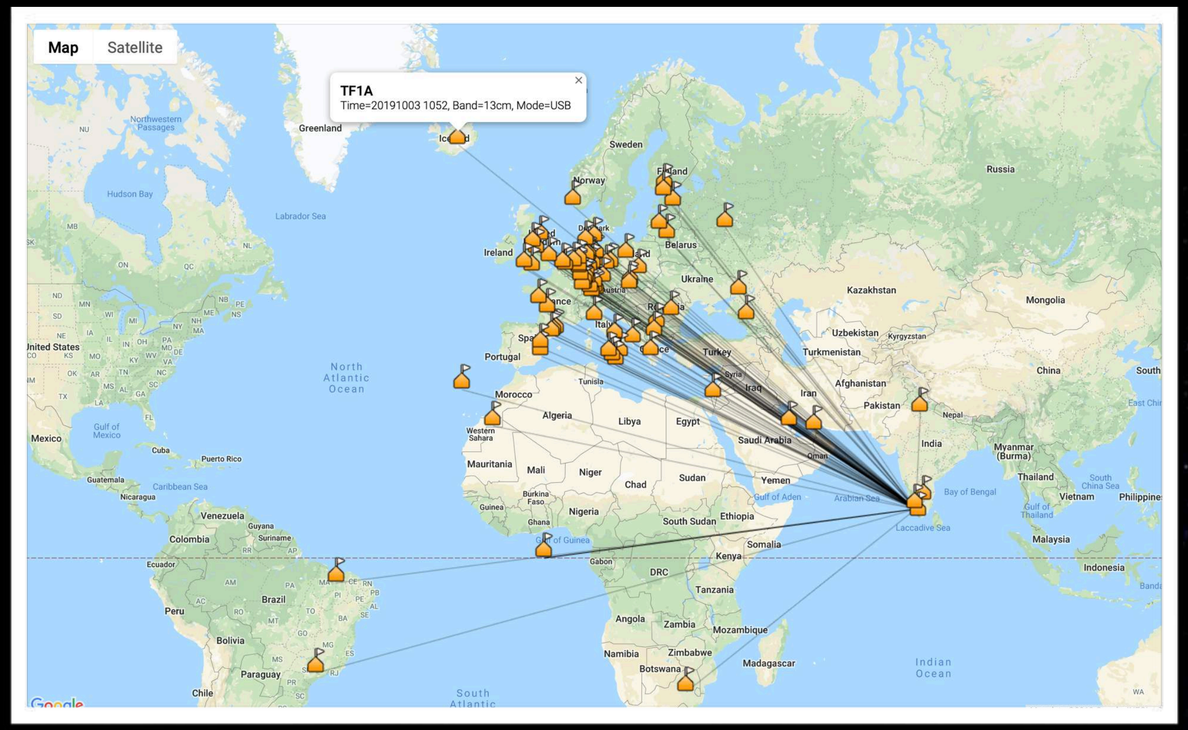
E’shail QO-100



QO-100 was launched by Qatar on 15th November 2018. This satellite is positioned 26 degree East over Central Africa. Radio Amateurs have a free access and can work on digital and voice.

The QO-100 Geo stationary Satellite

Ideal for disaster management communication

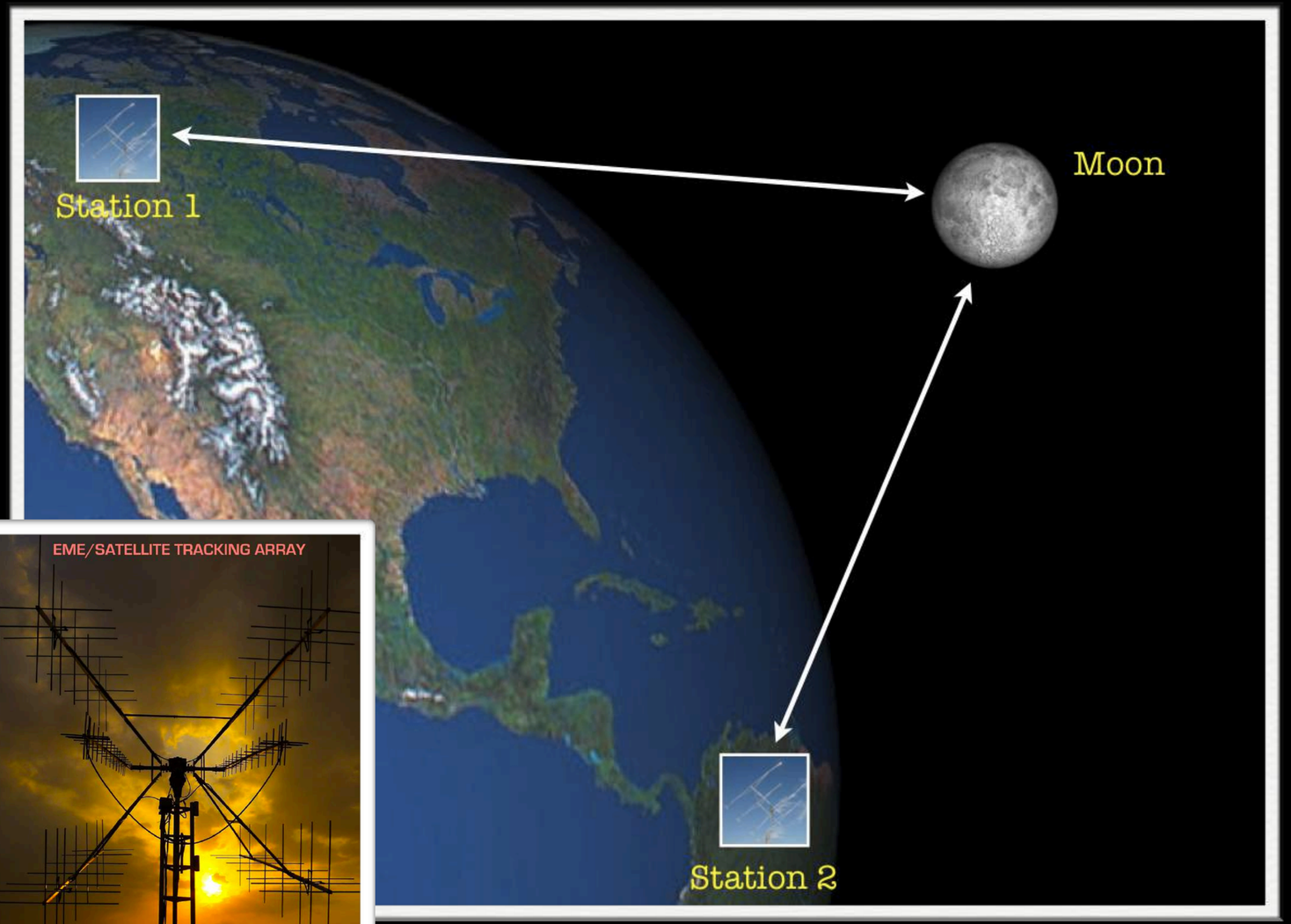


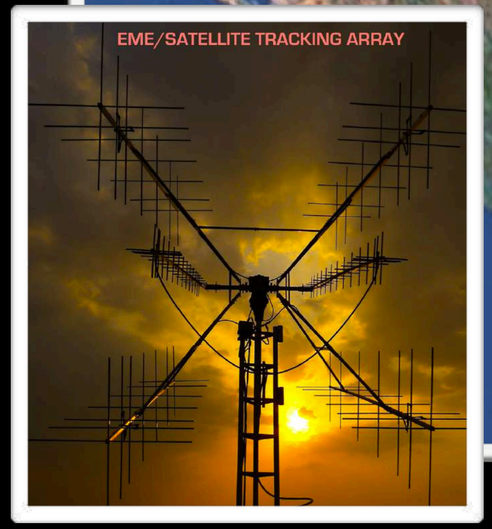
The E'shail QO-100 satellite has a foot print that covers Brazil to Thailand and entire Europe. It does not cover North America. With less than 2 watts of RF power on 2.4 GHz, Hams can communicate within this footprint.

QO-100 system is ideal for disaster communication.

During disasters, the QO-100 station can be set up and made operational within 30 minutes.

Antenna for Earth-Moon- Earth communication

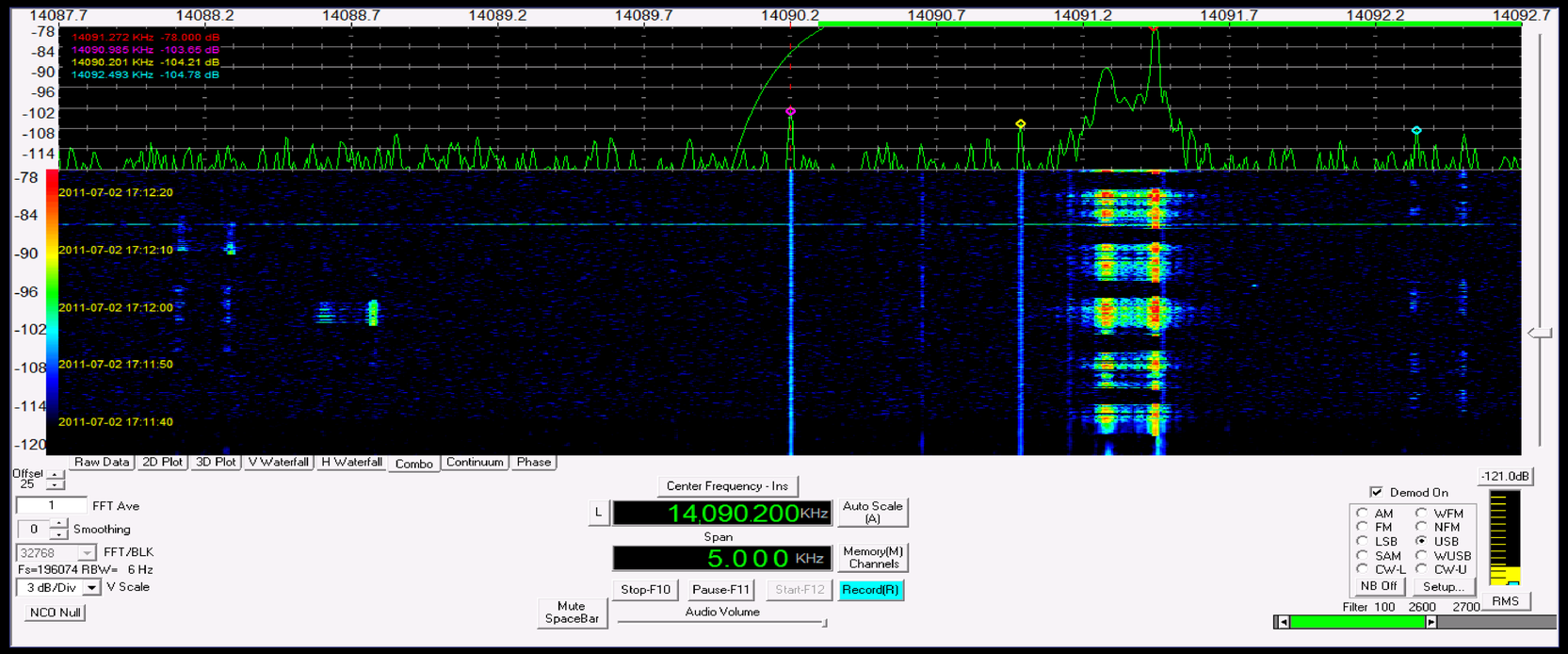




EME is the method of bouncing of high power radio signals on the surface of the moon. EME requires careful tracking of the moon with highly directional arrays and high RF power. On digital modes such as JT65B, even 100 Watts is sufficient on VHF to make a contact with the other side of the globe.

Digital Communication

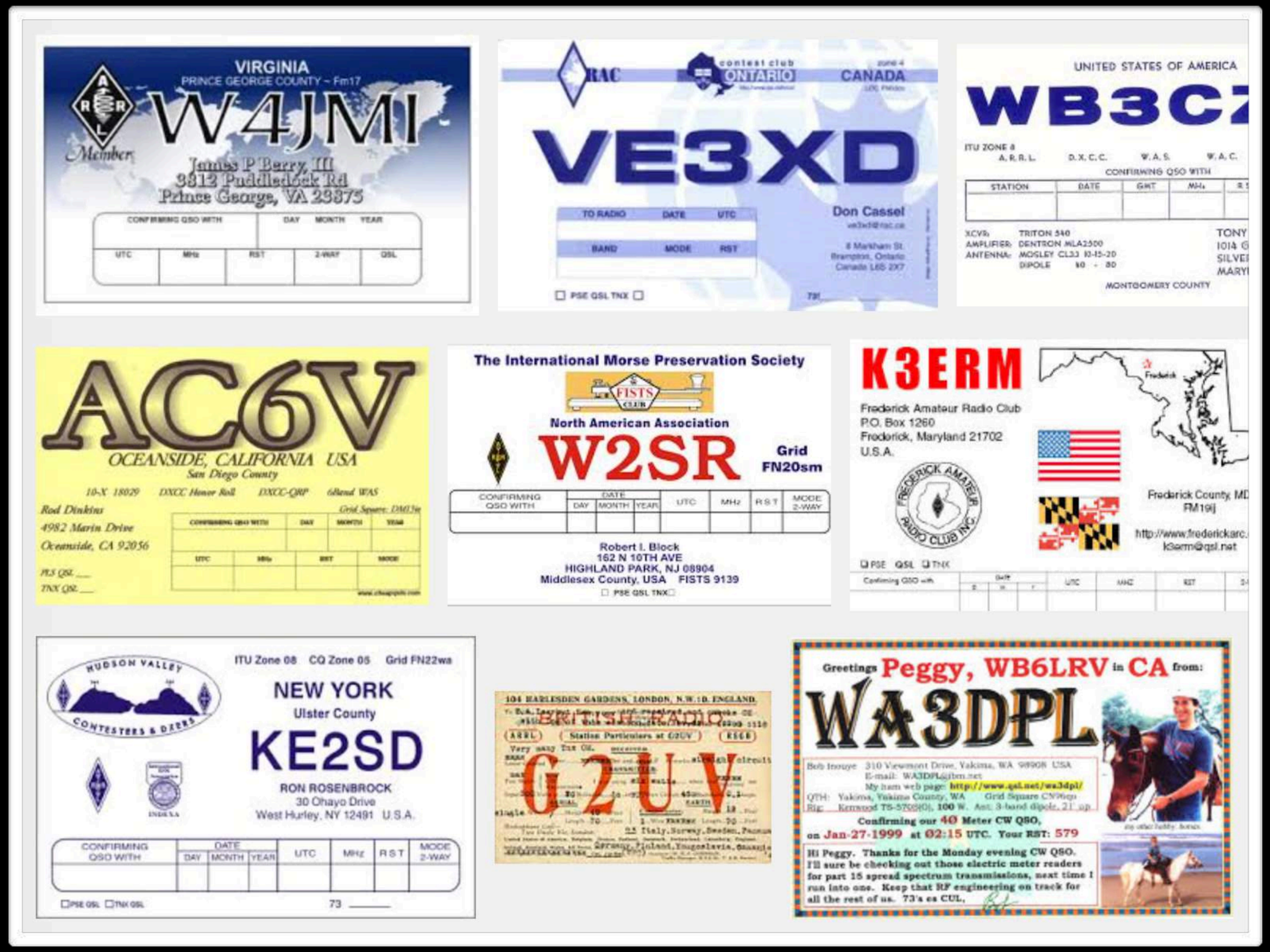
Connect a computer to your radio and install some software and you can be communicating digitally over the air. Some of these digital modes can be more effective in marginal transmission conditions and achieve error free transmission, using methods of Forward Error Correction.



QSL cards

QSL cards are exchanged for the first radio contact on a band between two stations. Collecting QSL card itself is a hobby.

QSL cards become proof of contact during the evaluation of contest results. Present trend is to exchange the cards digitally.



Why join a local Club?

- Can build Intimate Friendship
- Fastest information gathering
- Idea and equipment sharing
- Antenna erection support from friends
- Organizing Field days, Fox hunts etc
- Easy planning for Disaster Management

Thank you for watching!