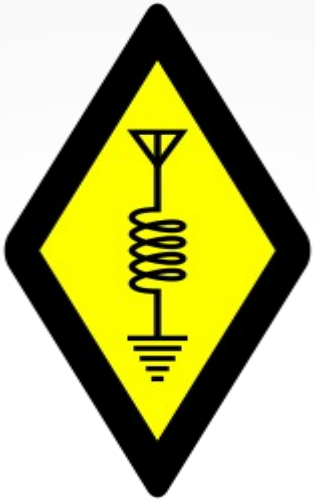


Amateur radio

IEEE Stammtisch meeting EPFL (online)
Yves OESCH / HB9DTX / 26 April 2021

Definition

Amateur radio, also known as ham radio, is the use of radio frequency spectrum for purposes of ***non-commercial*** *exchange of messages, wireless* ***experimentation***, ***self-training***, *private recreation, radiosport, contesting, and* ***emergency communication***

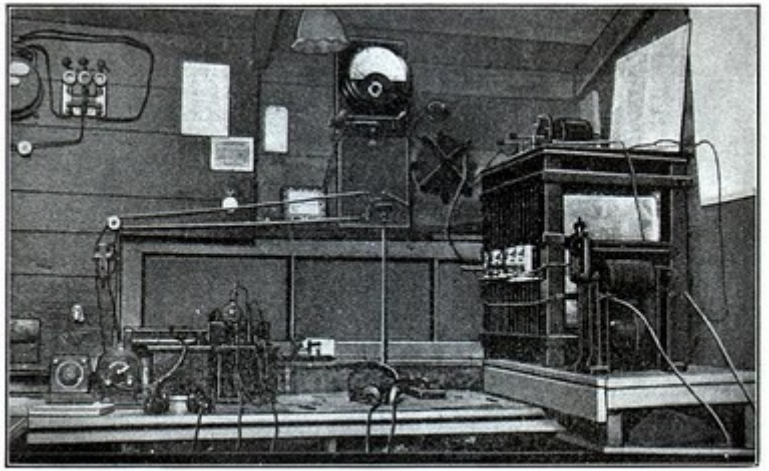
Source : https://en.wikipedia.org/wiki/Amateur_radio

History of amateur radio

Sources :

- https://en.wikipedia.org/wiki/History_of_amateur_radio
- https://web.archive.org/web/20070121051935/http://www.fcc.gov/cgb/evol.html
- https://www.iaru.org/
- https://commons.wikimedia.org
- https://www.uska.ch

History



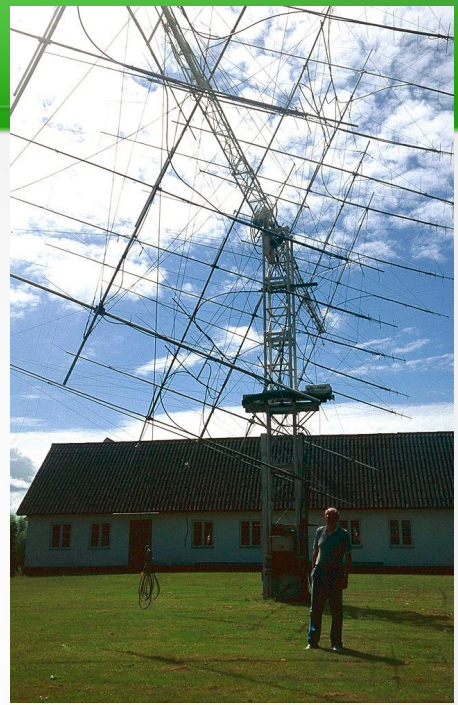
FRONTISPIECE.—An Amateur's Set Heard Over a 500-Mile Range. I. K. W. Station Built by Mr. Ralph Batcher, at Toledo, Iowa, with the Assistance of the 1916 Edition of this Book.

- Hertz formulation (1888)
- Marconi first experiments (1890)
- Publication of simple TX/RX setup (1901)
- Wireless Telegraph Club of Columbia University (1908)
- >x000 transmitters, interferences probem with commercial and military stations (1910)
- Titanic sunk ⇒ Radio Act of 1912. Amateur stations allowed only >200m/1500 kHz

History

- WW1, emission ban (1917 – 1919)
- First transatlantic contact USA - France (27.11.1923)
- First International Radiotelegraph Conference. Attribution of 80, 40, 20 and 10m bands. Callsign prefix system (1927 – 1928)
- WW2, emission ban (1939 – 1945)
- After the war, lot of inexpensive surplus material available ⇒ boom of operators

History

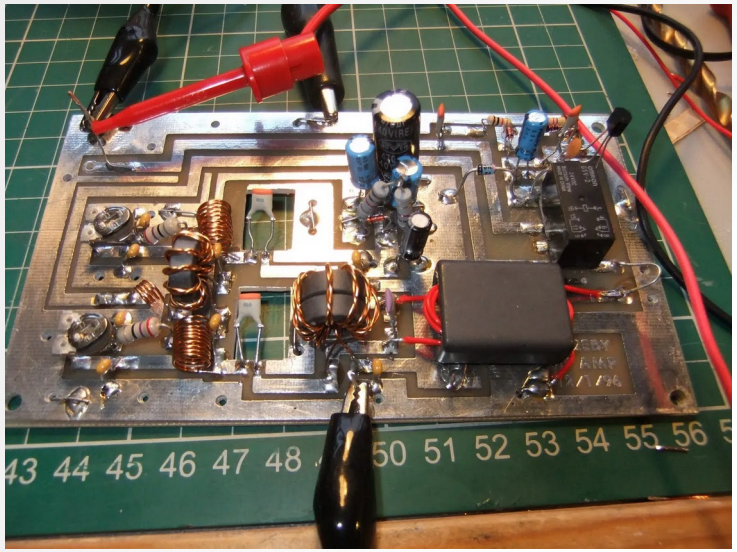


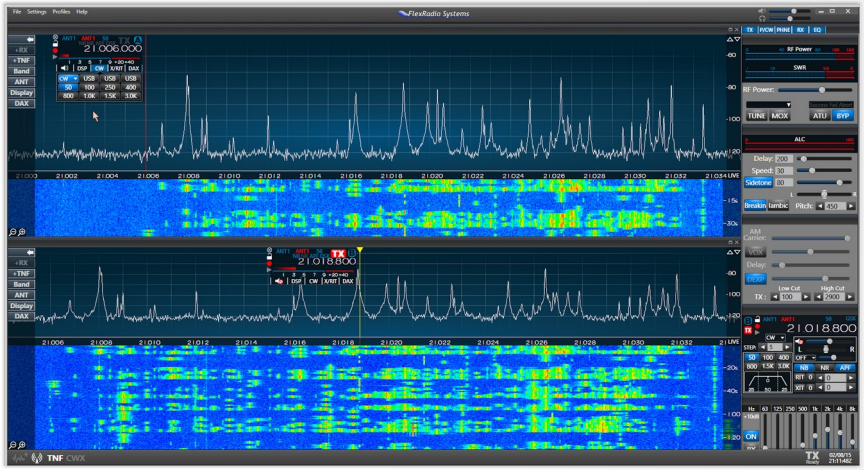
- 40’ : Amateur television and UHF
- 50’ : Single Side Band modulation
- 60’ : Space age (first Earth-Moon-Earth)
- 70’ : Amateur radio Satellites
- 80’ : Microprocessors, Packet radio
- 90’ : Low bandwidth / Low SNR modulations
- 20xx’ : Software defined radio. Emergency communications
- 2021 : 3 MIO radio amateurs WW,
  5’000 in Switzerland

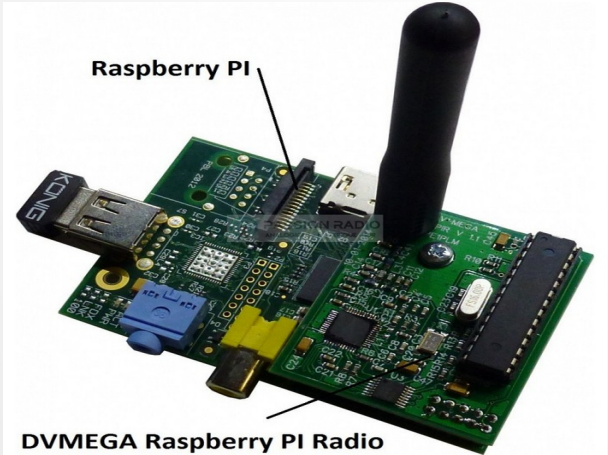
Some amateur radio activities

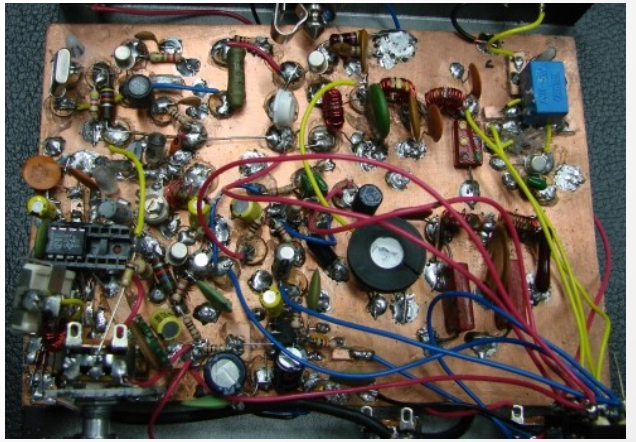
Sources :
Diverse pictures from internet

Self education / Technology development

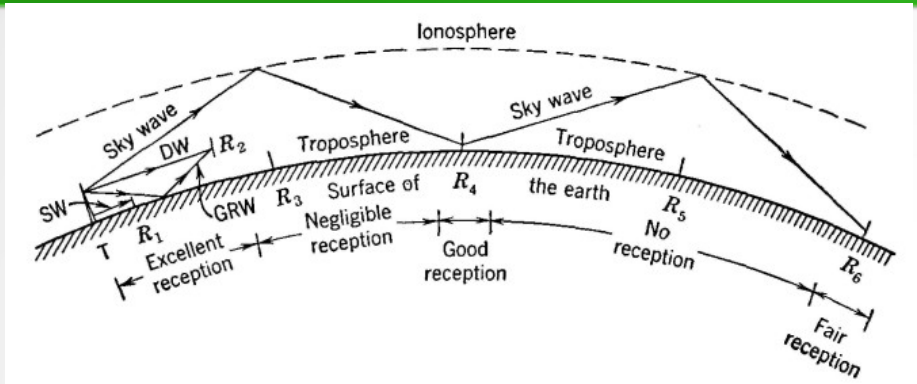








RF waves propagation study



Tropo/Ionospheric ducting

Meteor scatter

Earth – Moon - Earth

Emergency / disaster communications

Radio sport

Amateur radio direction finding

Contests

Social aspects

Fleamarkets

Communication with peers

Education

Licence

Licence exam

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Office fédéral de la communication
OFCOM

- Main goal : Ensure interference free operation according to CEPT / OFCOM regulation
- Technical exam requiring basic knowledge of electronics, antennas, transmission lines, radio waves propagation
- Regulation exam on Electrical safety, frequency bands, power limits, operational procedures
- Morse code is not mandatory anymore

Callsigns

Sources :

- https://en.wikipedia.org/wiki/Amateur_radio_call_signs

International call sign system

- Each station or operator can apply for an unique callsign (worldwide)
- «Address» of the station

HB 9 DTX

1..2 digits prefix :
Country code assigned by ITU

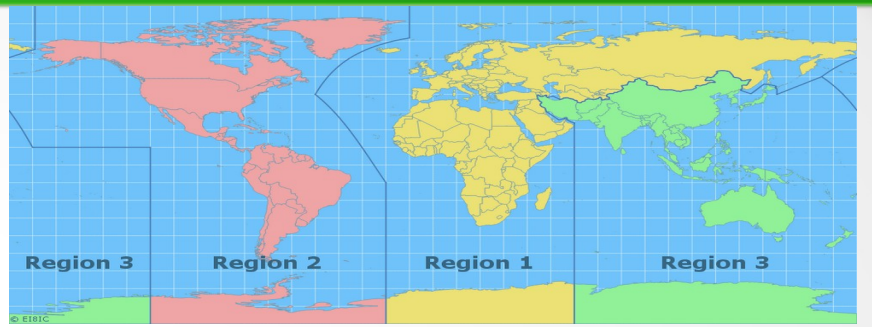
HB, HE	Switzerland
F	France
DL, DG, DH…	Germany
K, W, A…	USA
9A	Croatia
…	

Numeral + 1...4 digit suffix :
Unique ID
Assigned by contry authority (OFCOM)

Organizations - structure

Organization

International Amateur Radio Union



National associations

...

Local clubs, cantons,
Specific interest

...

Frequency bands and power

Sources :

- https://www.bakom.admin.ch/bakom/fr/page-daccueil/frequences-et-antennes/utilisation-des-frequences-avec-ou-sans-concessions/radiocommunication-pour-radioamateur.html
- https://www.fedlex.admin.ch/eli/cc/2020/1024/fr#chap_5/sec3

Frequency bands

- 11 % of the RF spectrum is available for amateur radio purposes
- P max : 1000 W (60 dBm), limitations on certain bands
- Certain bands are shared with other services

Frequency bands

Frequency	Wavelength
136 kHz	2200 m
475 kHz	630 m
1.8 MHz	160 m
3.5 MHz	80 m
7 MHz	40 m
10 MHz	30 m
14 MHz	20 m
18 MHz	17 m
21 MHz	15 m
28 MHz	10 m
50 MHz	6 m

Frequency	Wavelength
144 MHz	2 m
430 MHz	70 cm
1300 MHz	23 cm
2300 MHz	13 cm
3.4 GHz	9 cm
5.7 GHz	6 cm
10 GHz	3 cm
24 GHz	12 mm
47 GHz	6 mm
76 GHz	4 mm
134 GHz	2 mm
247 GHz	1 mm

Conclusion

Conclusion (part 1)

- Amateur radio has historically pioneered the development of wireless technologies
- Still a huge playground for experimentation today
- Brings «biodiversity» in the modern wireless industry

Thank you for your attention

18 April 2010, reception in Neuchâtel of 432 MHz signal from Arecibo reflected by the moon. (HB9DTX)