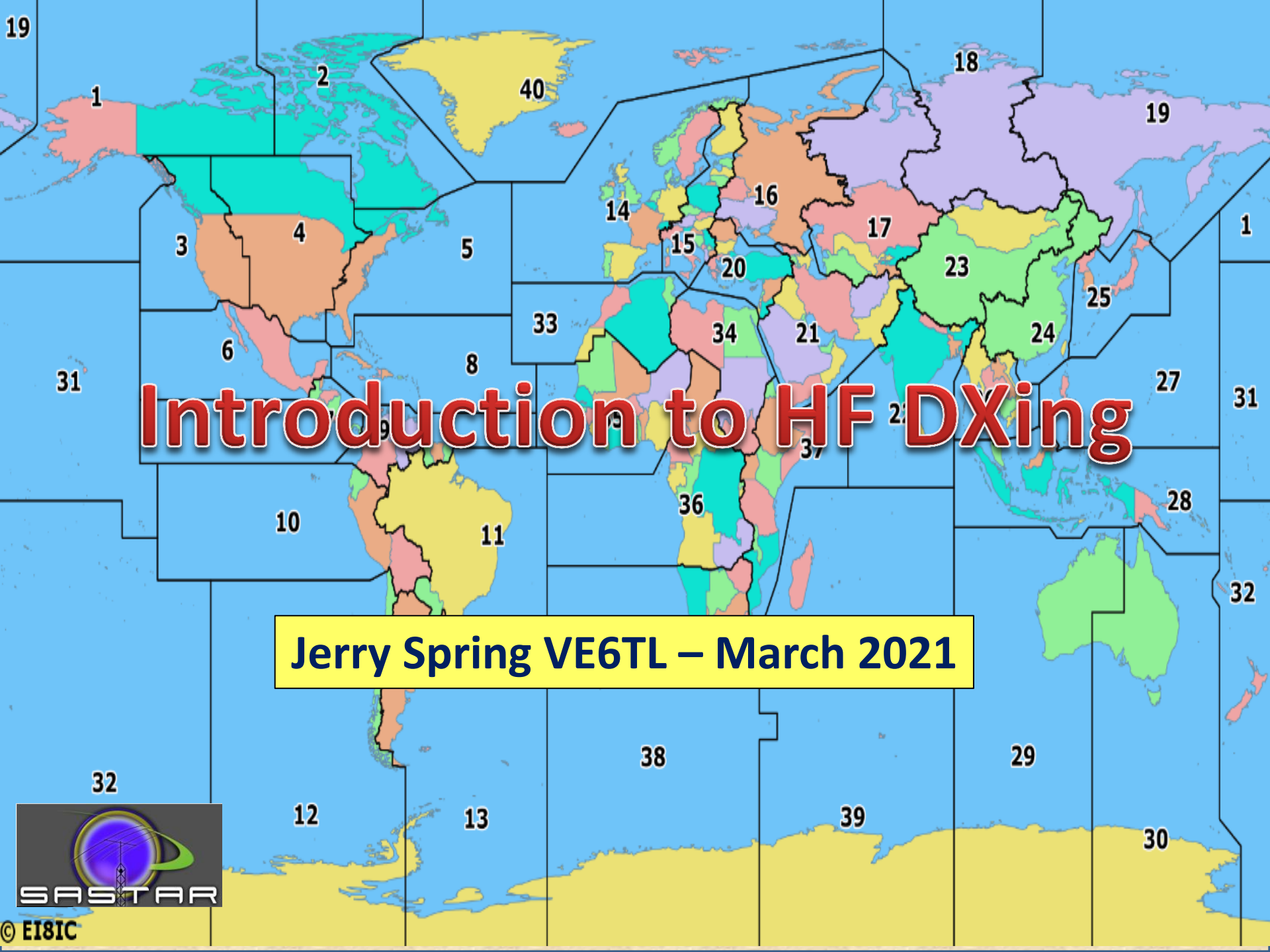
Introduction to HF DXing
Jerry Spring VE6TL – March 2021
SASTAR
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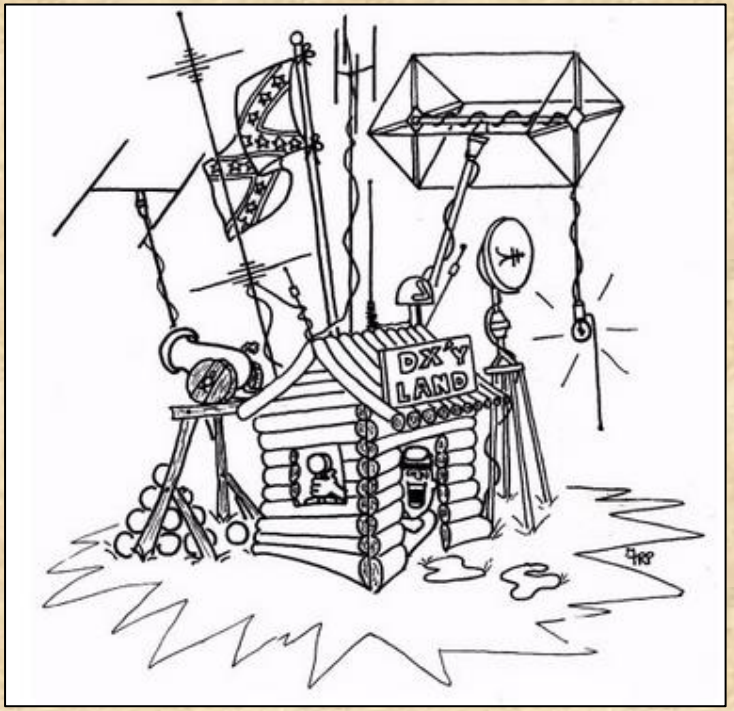
Outline

- What is DX?
- How do I start?
- Modes
- Goals
- World Regions, Zones and Grids
- Station Setup
- Logging and Rig Control
- Prop & Grey Line
- Bands and Windows
- Making contacts
- DXpeditions and Pileups
- DX Aids
- Tips for success
- References



Jerry

What is HF DXing?

- **Different things to different people**
  - **Talking to stations on the other side of the world**
  - **Working the opposite coast on 80m/160m**
  - **2000+ Km with QRP (5W) on CW**
  - **Working Africa from Alberta**

Conclusion: Depends on *band*, *mode*, *power* and *location*

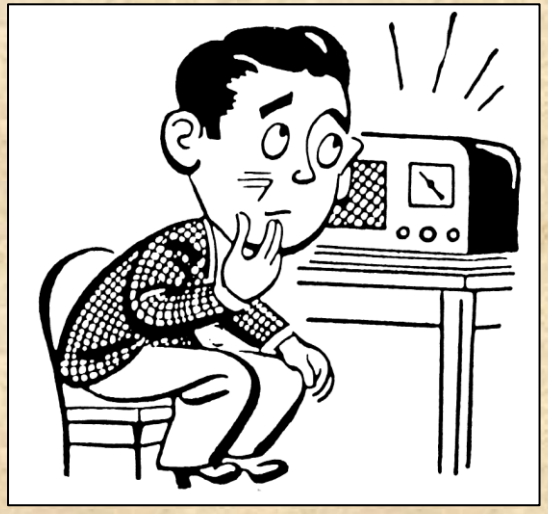
Jerry

- **Why is DXing fun?**

  For the same reasons that fishing, mountain climbing, carpentry and gardening can all be fun. All require knowledge, tools, skill, creativity and dedication in order to derive the most enjoyment. Each one also has its own language. And all can be unpredictable and present an enjoyable challenge.

How Do I Start? – Listening!

Listening is *the most important skill* you can have in order to be a successful DXer. Basic Listening is *learned* behaviour.

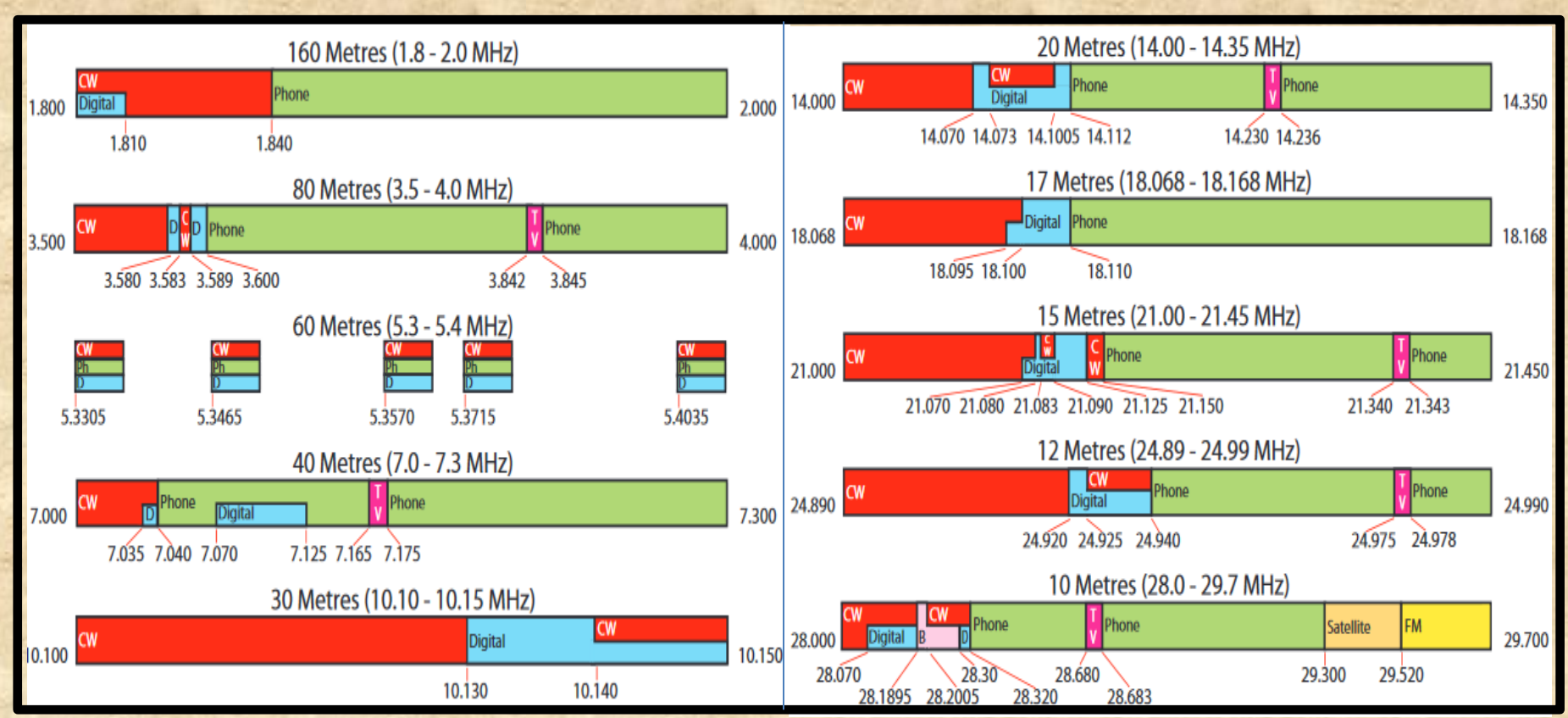


- **Start at the bottom of a band and try to identify *every signal you hear*, no matter how weak, as you tune up the band. If he is "loud", he probably isn't DX.**
- **Learn when to listen. Keep notes in a journal.**
- **Note the different modes and where they occur on the band plan**
- **Try to make out what they are saying through QRM, QRN and QSB**
- **Learn how to use your radio to your best advantage, including filters, noise attenuation, AGC (fast/slow/off), preamplifiers on/off, IF shift, Digital noise reduction, noise blanker (wide/narrow), etc.**

Basic Listening Cont'd

- Get a map of the world with prefixes, CQ Zones and ITU Zones. Keep track of the prefixes you hear and commit them to memory. Next time you hear a VK station you'll know you're hearing Australia.
- Listen to how people contact each other. Is he/she calling CQ? How do people answer them? What does the CQer want as a reply? If there is a pileup, how are people trying to break it?
- Learn the basic "Q Signals" and phonetic alphabet!
- If you don't know CW but your radio is equipped with a CW reader, try it out. It may only work with strong signals, but learning to copy these is still a skill. And it may incentivize you to learn CW for DXing.
- All serious DXers own at least one good headset. Don't skimp! It needs to have good dynamic range, and be comfortable for long periods of time.
- Most serious DXers also invest in a comfortable chair, as they tend to spend a lot of time in it. (Ergonomics are important.)

HF Radio - Modes



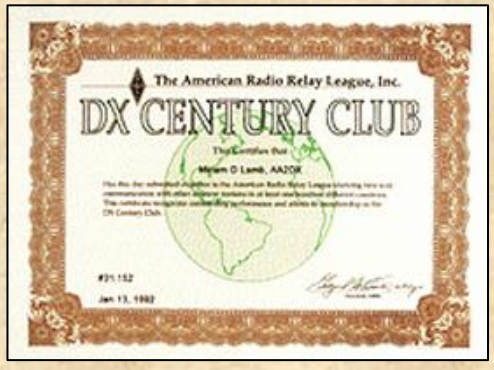
RAC Band Plan – as of Dec 1, 2015

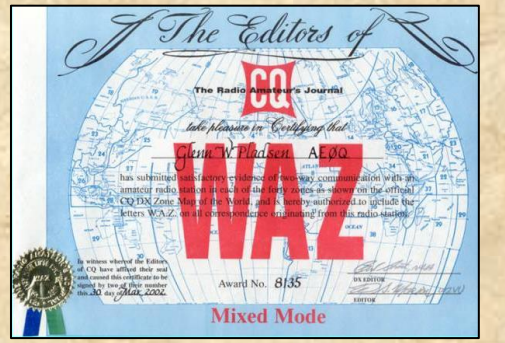
Goal Setting

While learning how to listen, you decide at some point you know enough to make your first QSO. Will this be digital, SSB, or CW? If I keep a log of these contacts, what will I be able to do with them?

- Certificates and plaques
  - WAC, DXCC, WAS, WAZ, WPX, etc.
- QSL Cards
- Bragging rights
- Breaking pileups can be fun
- Become a better operator
- DXCC Honor Roll (Published in QST)
- Collect stamps

Jerry





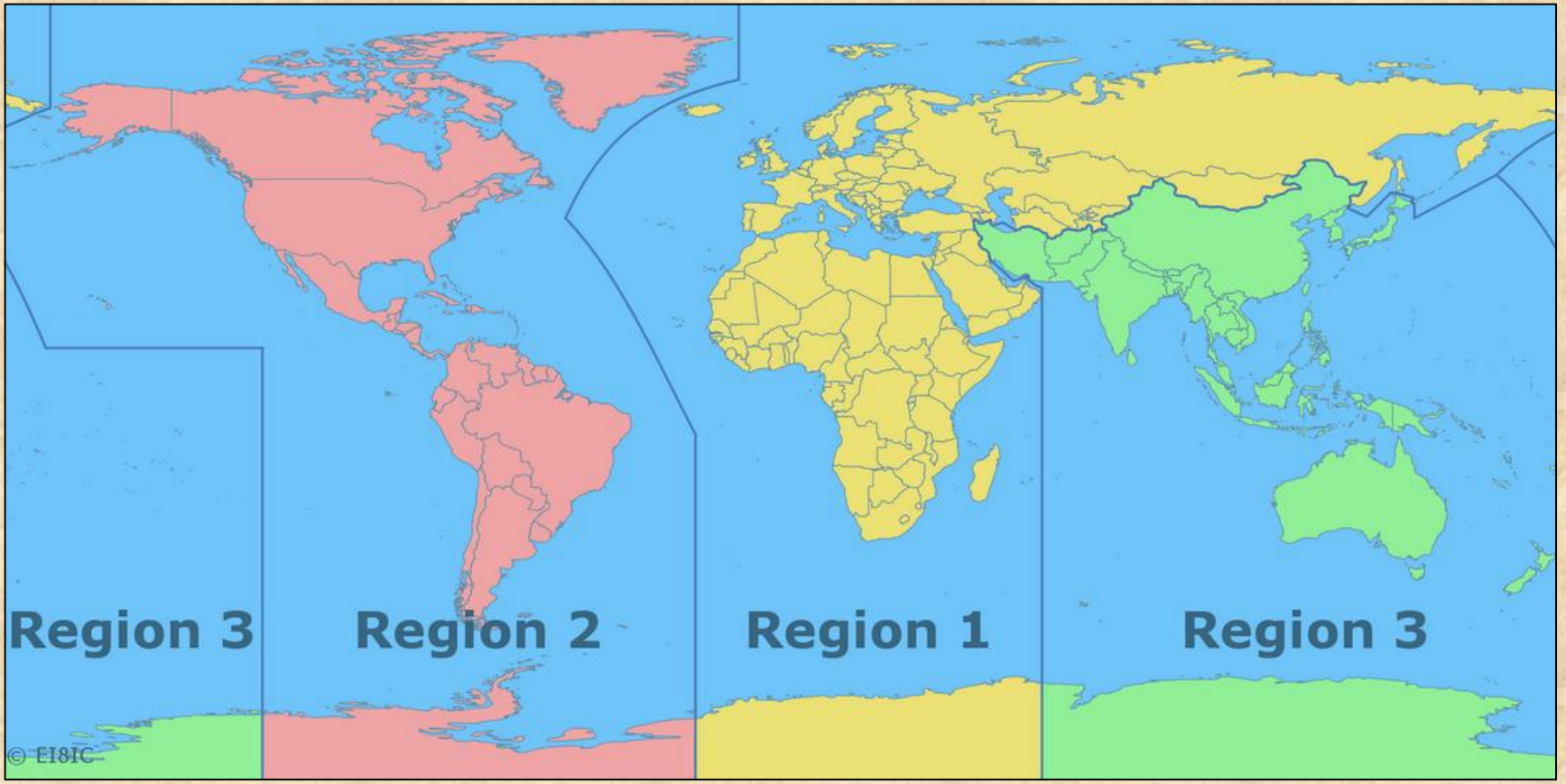
Current DXCC List

- There are 340 current DXCC entities on the ARRL DXCC List
- Note that entities are not necessarily countries. For example, Alaska and Hawaii count for separate entities from the mainland USA
- The top 50 hardest entities to get are mostly uninhabited islands which require DXpeditions to activate. Exceptions include DPRK, Syria and Yemen

Jerry

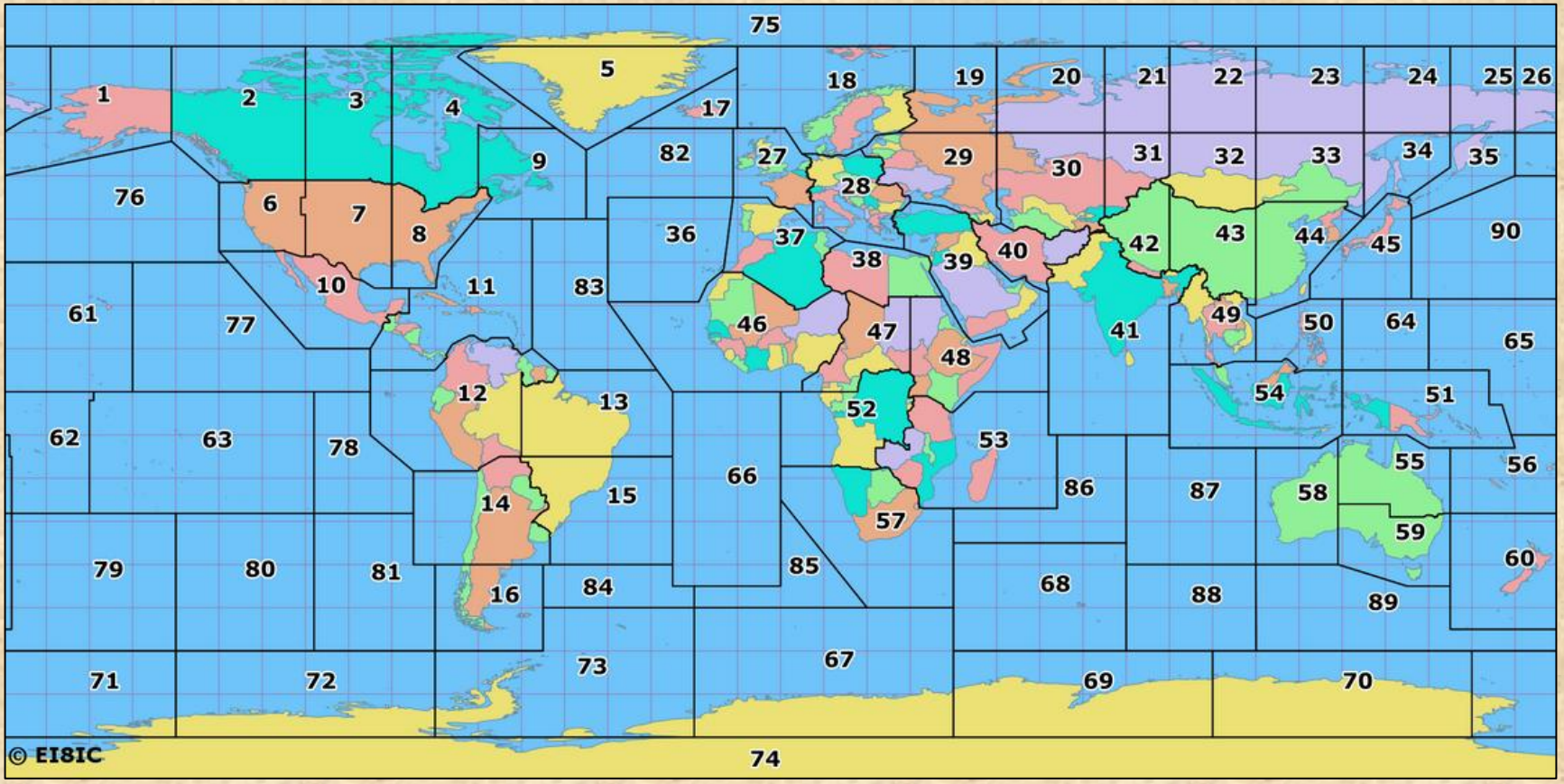
- To attain the DXCC Honor Roll, you need at least 331 entities confirmed
- Even with a modest station (100W and a 20m dipole), you should be able to achieve DXCC within a few years (or less with FT8?!)

IARU World Regions



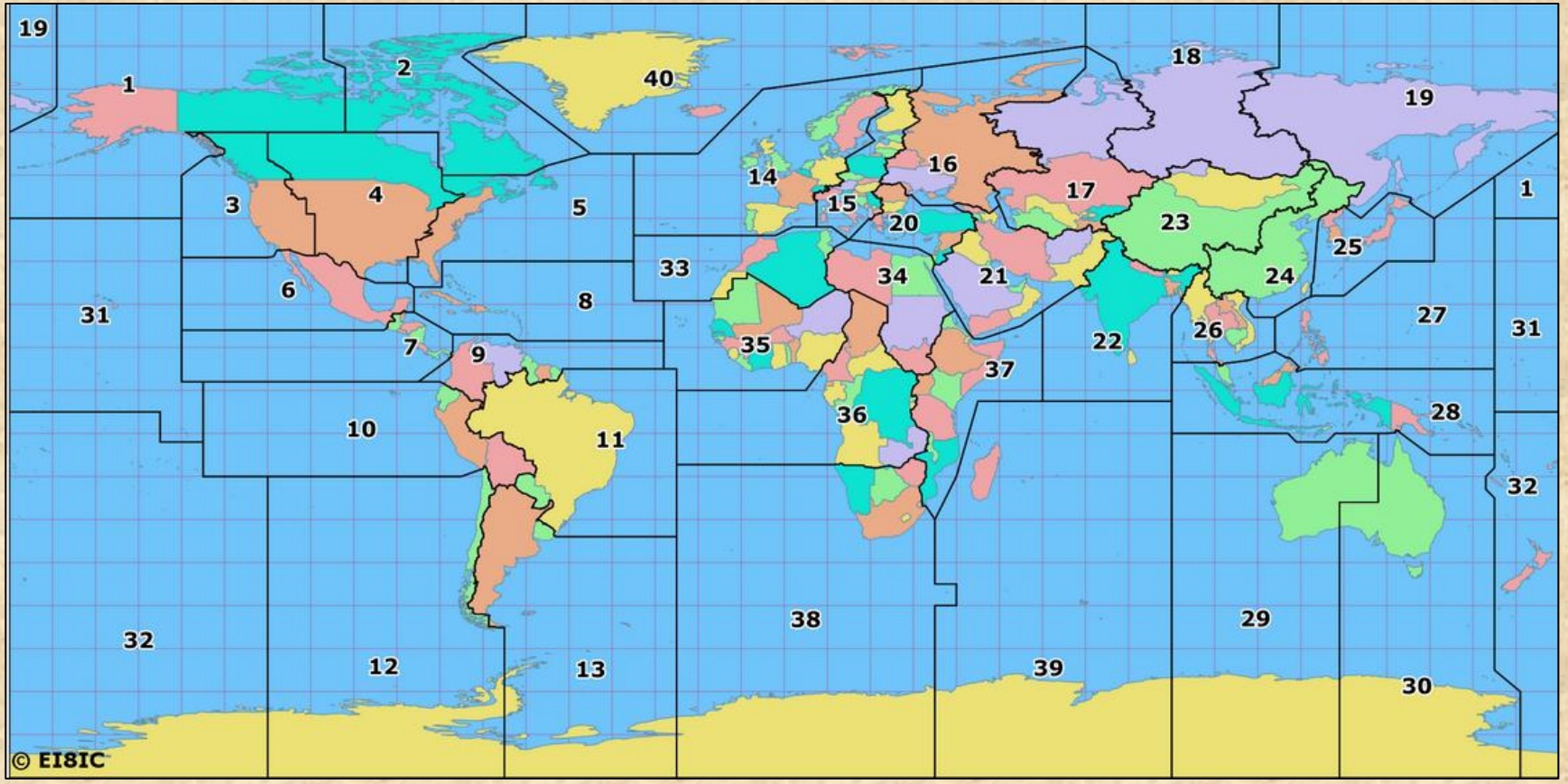
The International Amateur Radio Union (founded 1925) offers guidance as to band plans in each region and represents matters to the ITU on behalf of 172 nations.

ITU World Zones



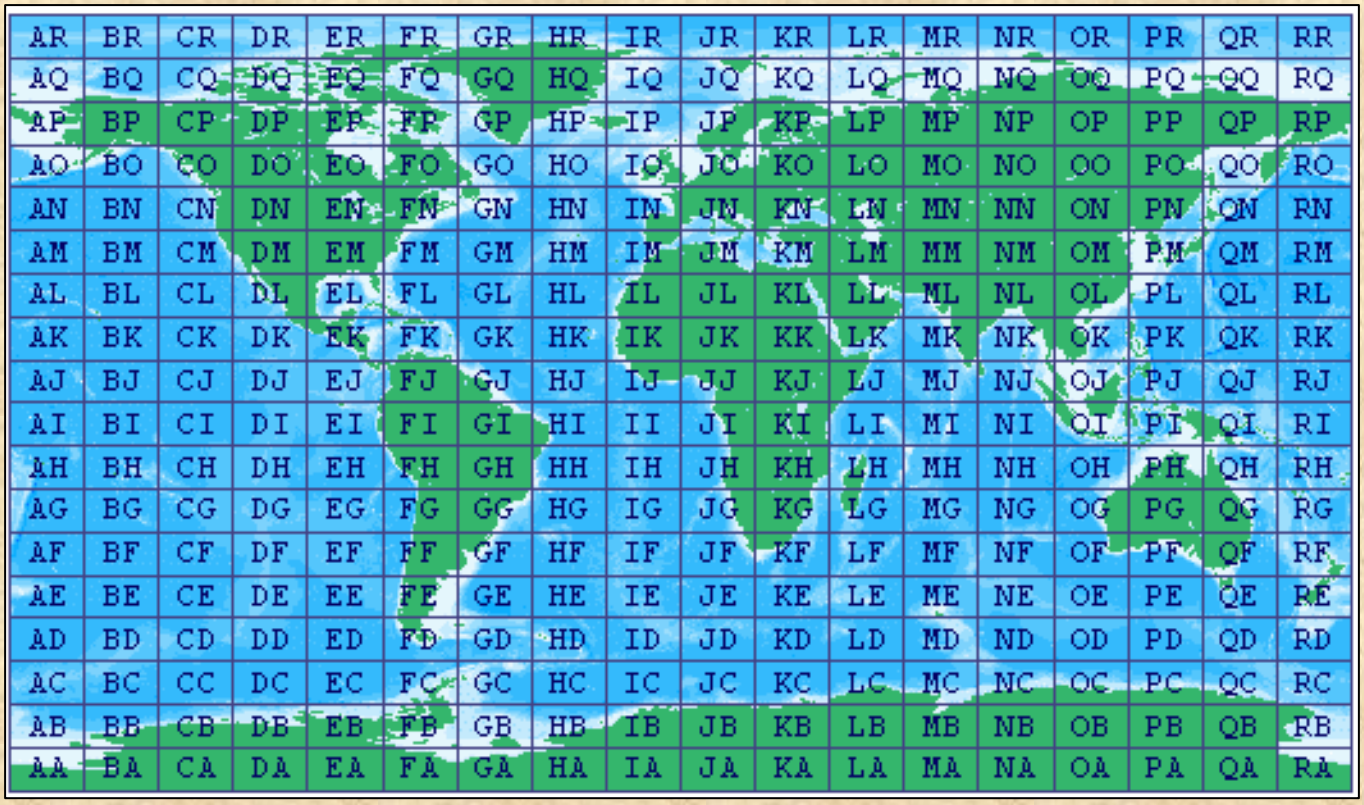
These zones only come into play in certain contests, such as the 'IARU HF Championships'. Some zones go across country borders and some countries have several zones.

CQ World Zones



These zones also are used in contests, as well as zone-hunting awards and competitions. Note that VE6 is in the same CQ zone as Ontario and Texas! Almost nobody lives in CQ Zone 2.

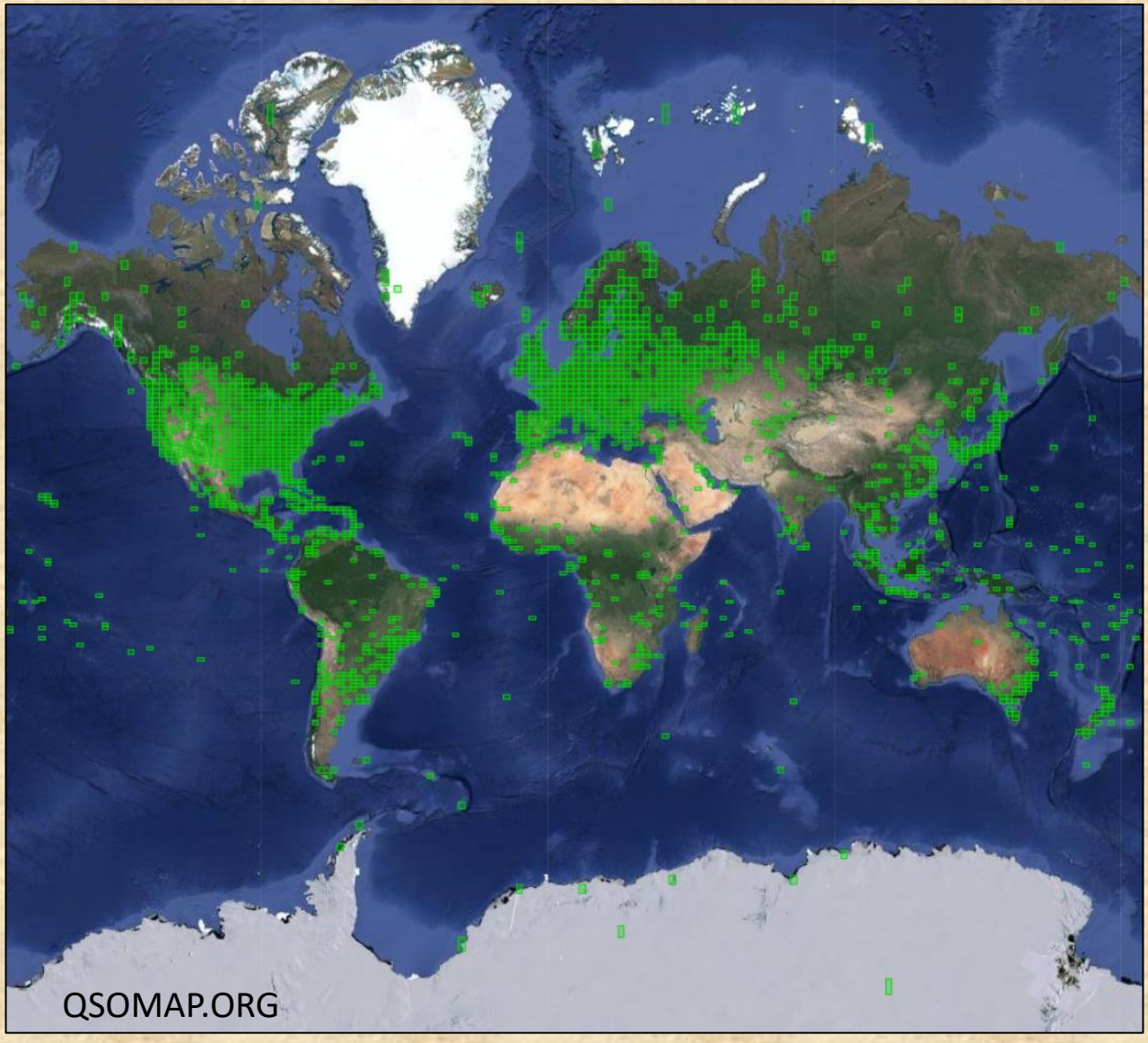
Maidenhead Grid Squares



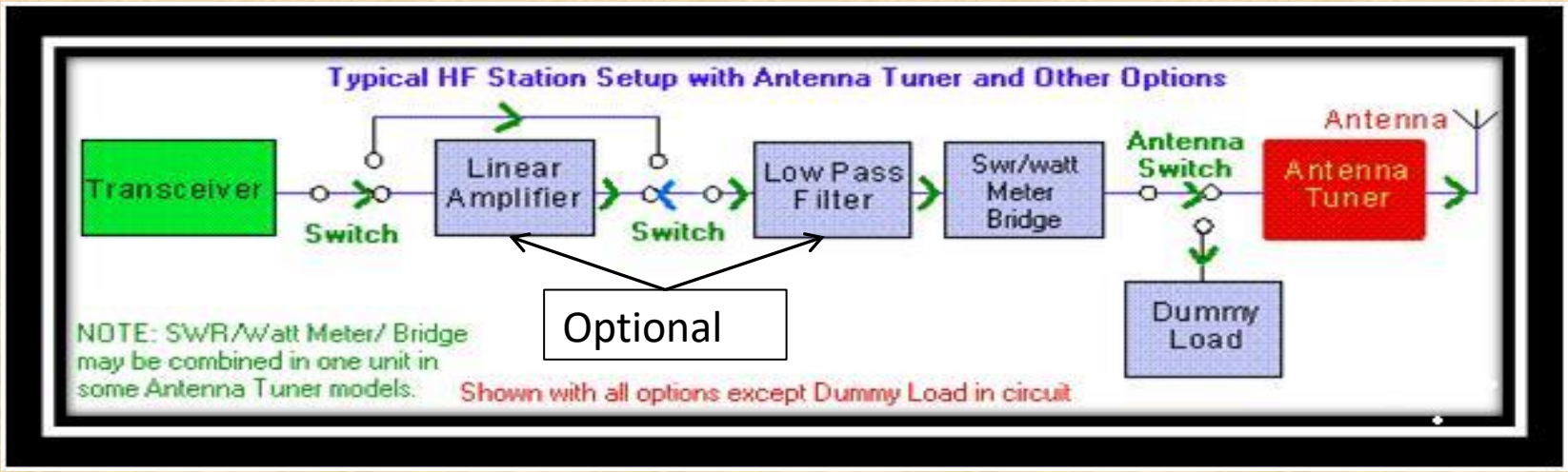
AR	BR	CR	DR	ER	FR	GR	HR	IR	JR	KR	LR	MR	NR	OR	PR	QR	RR
AQ	BQ	CQ	DQ	EQ	FQ	GQ	HQ	IQ	JQ	KQ	LQ	MQ	NQ	OQ	PQ	QQ	RQ
AP	BP	CP	DP	EP	FP	GP	HP	IP	JP	KP	LP	MP	NP	OP	PP	QP	RP
AO	BO	CO	DO	EO	FO	GO	HO	IO	JO	KO	LO	MO	NO	OO	PO	QO	RO
AN	BN	CN	DN	EN	FN	GN	HN	IN	JN	KN	LN	MN	NN	ON	PN	QN	RN
AM	BM	CM	DM	EM	FM	GM	HM	IM	JM	KM	LM	MM	NM	OM	PM	QM	RM
AL	BL	CL	DL	EL	FL	GL	HL	IL	JL	KL	LL	ML	NL	OL	PL	QL	RL
AK	BK	CK	DK	EK	FK	GK	HK	IK	JK	KK	LK	MK	NK	OK	PK	QK	RK
AJ	BJ	CJ	DJ	EJ	FJ	GJ	HJ	IJ	JJ	KJ	LJ	MJ	NJ	OJ	PJ	QJ	RJ
AI	BI	CI	DI	EI	FI	GI	HI	II	JI	KI	LI	MI	NI	OI	PI	QI	RI
AH	BH	CH	DH	EH	FH	GH	HH	IH	JH	KH	LH	MH	NH	OH	PH	QH	RH
AG	BG	CG	DG	EG	FG	GG	HG	IG	JG	KG	LG	MG	NG	OG	PG	QG	RG
AF	BF	CF	DF	EF	FF	GF	HF	IF	JF	KF	LF	MF	NF	OF	PF	QF	RF
AE	BE	CE	DE	EE	FE	GE	HE	IE	JE	KE	LE	ME	NE	OE	PE	QE	RE
AD	BD	CD	DD	ED	FD	GD	HD	ID	JD	KD	LD	MD	ND	OD	PD	QD	RD
AC	BC	CC	DC	EC	FC	GC	HC	IC	JC	KC	LC	MC	NC	OC	PC	QC	RC
AB	BB	CB	DB	EB	FB	GB	HB	IB	JB	KB	LB	MB	NB	OB	PB	QB	RB
AA	BA	CA	DA	EA	FA	GA	HA	IA	JA	KA	LA	MA	NA	OA	PA	QA	RA

Grid squares are also referred to as a QTH locator and are not squares at all. The earth is divided into 18 x 20° longitudes and 18 x 10° latitudes. You will see these in certain contests and digital modes protocols. Precision varies from 4 to 8 alphanumeric characters (e.g. DO21wz is my locator – VE6TL).

Grid Squares – VE6TL



Station Setup for HF DXing

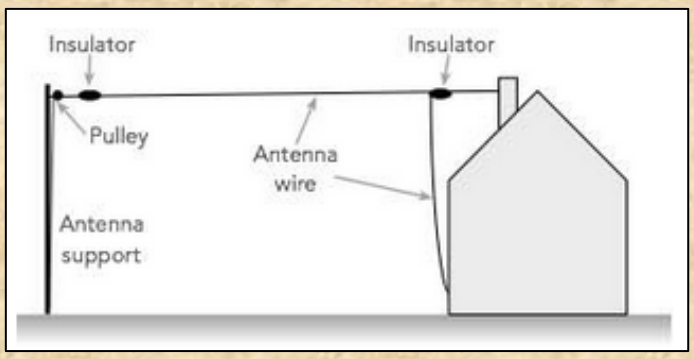


DL7AWY: Transceiver, amplifier, external antenna tuner, paddle, external keyer, microphone, headset. Note the world map and globe. I would also recommend a PTT foot switch for voice communications.
Not shown: Antenna(s).

HF DX Antennas

City lots (Yes it is possible to work *lots* of DX):

- Ground mounted vertical (low angle radiation best for DX)
- Stealth (attics, flagpoles, metallic tape on windows, etc.)
- All sorts of dipoles (single band, fan, OCFD, etc.)
- Roof mounted directional antenna (Hex beam, yagi, etc.)
- Tower and directional antenna (shunt fed for 80/160m)
- Beware of LUAs and limitations Jerry



Mobile/Portable/Condo

- Plenty of options if home QTH inaccessible
  - Hamsticks, campgrounds (wires), etc.

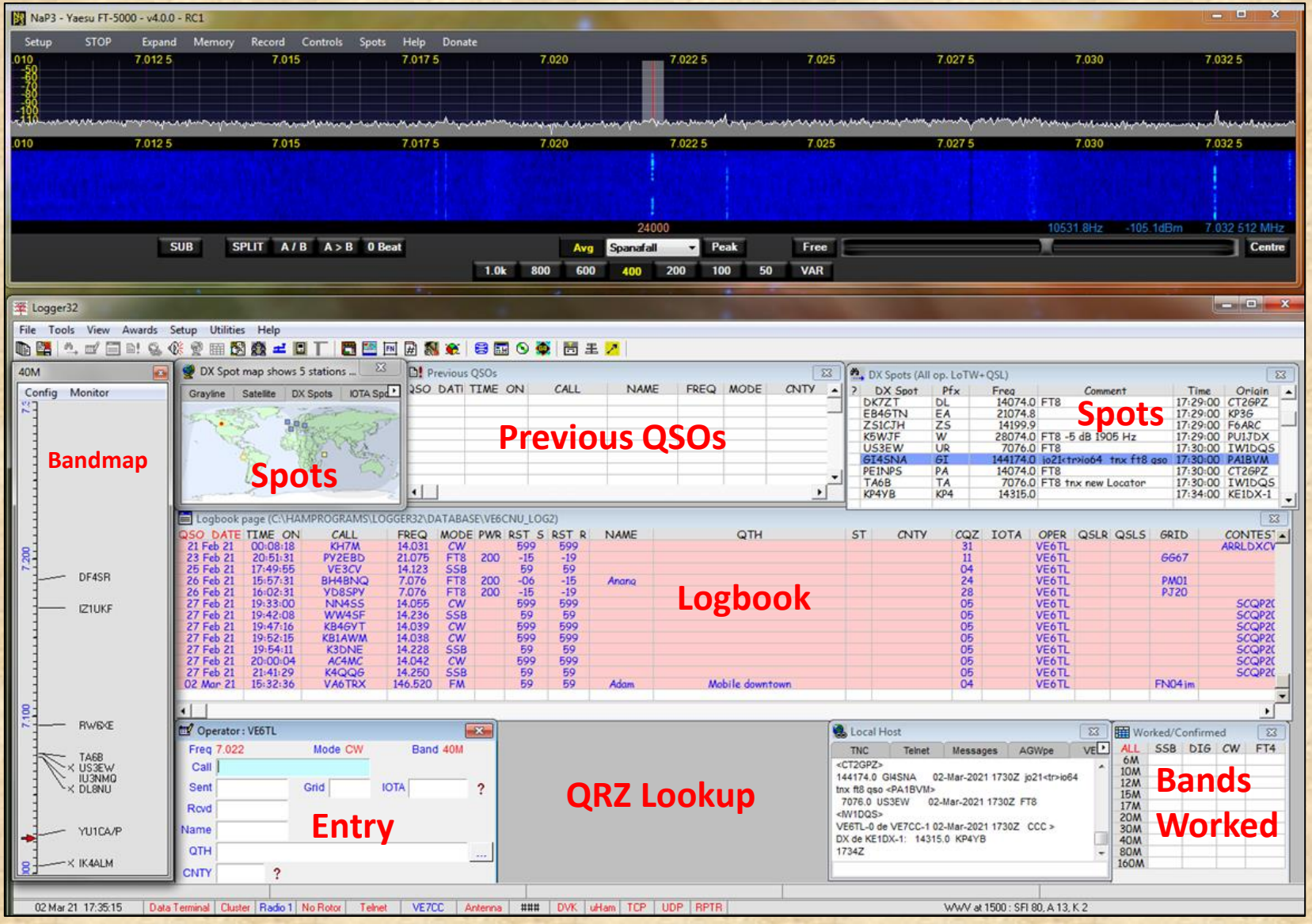
Logging and Rig Control

Most modern rigs connect to a computer to gain a number of advantages:

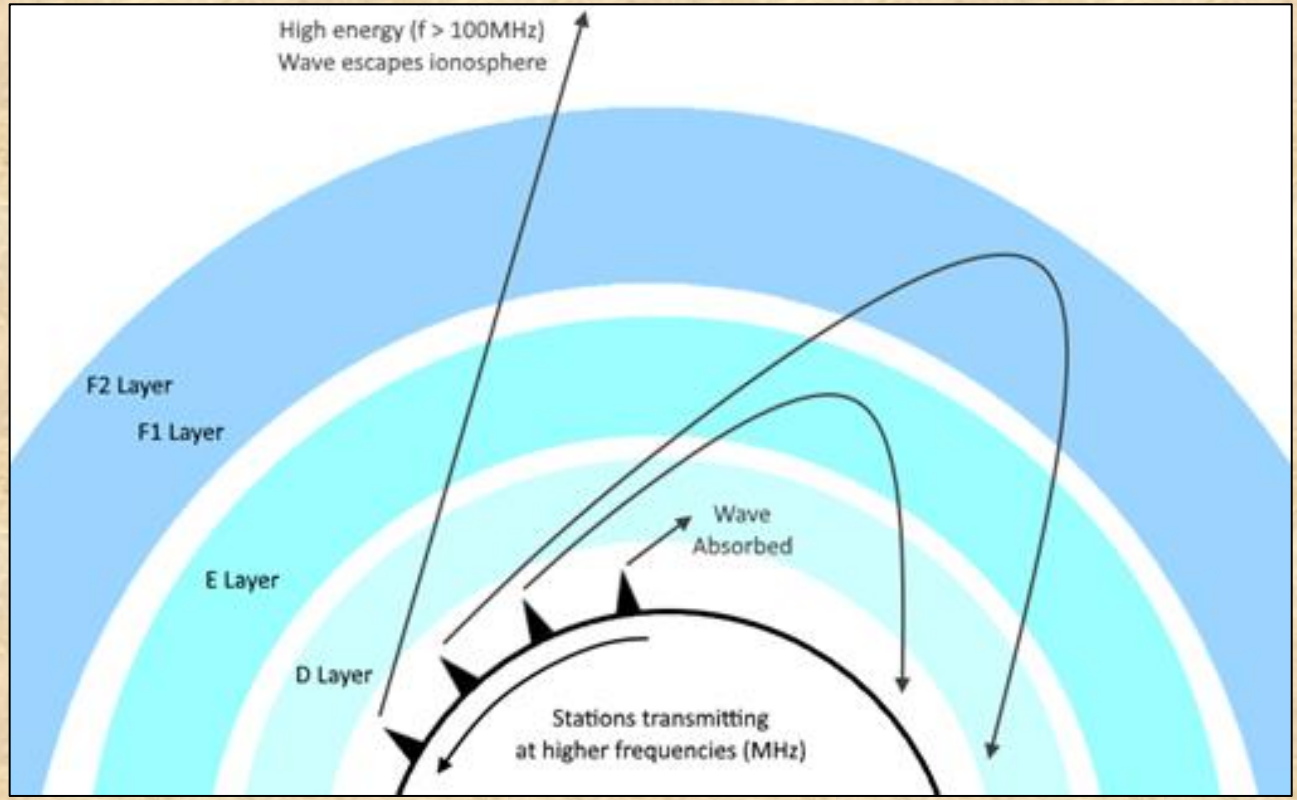
- **Keep track of all your contacts (date, time, band, mode, RST, etc.)**
- **Keep track of your QSLs and awards (sent, received, granted)**
- **Real time rig control (can follow band plan) with integrated packet cluster on bandmap, point and shoot loading of stations**
- **Can plot stations on map with grey line**
- **May integrate with online lookup of station info (QRZ.com)**
- **Statistical analyses/reports by band, mode, time span, etc.**
- **May integrate with digital modes apps (MMTTY, WSJT-X, etc.)**
- **Many free logging programs available online (Logger32, DXKeeper, Aclog (N3FJP), Swisslog, Log40M, Winlog32, BBLogger, etc.)**

Jerry

Sample Logger32 Screen



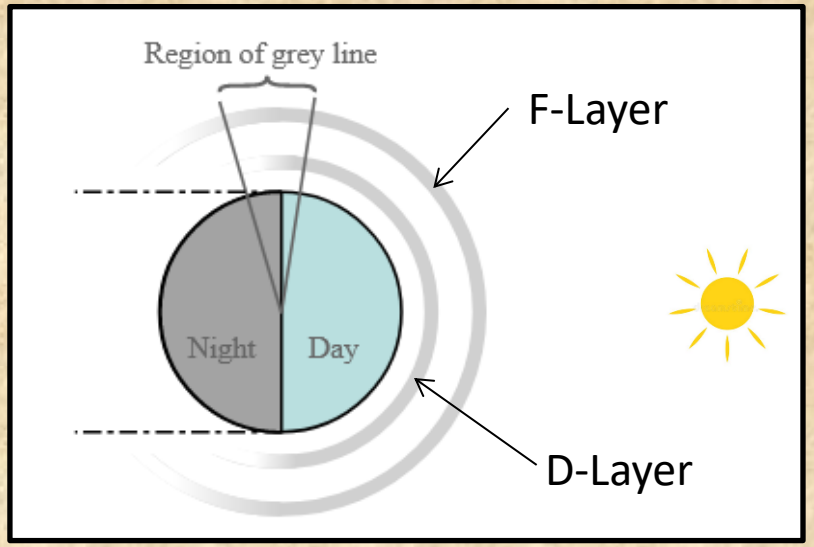
Quick Prop Review



D-Layer: 70 km
E-Layer: 100 km
F-Layer: 300 km
F2 Max: 600 km

Day time: D region absorbs MF/HF signals and F2 responsible for most DX contacts
Night time: D and E layers disappear, F1 and F2 layers combine, with reduced ionization

Grey Line Propagation



- The D-Layer forms at dawn and disappears at dusk. It is closer to the earth than the F-Layer so it is denser and requires stronger radiation to form (dawn) and recombines faster when that radiation disappears (dusk).
- The D-Layer absorbs radio waves up to about 10 MHz, which explains why longer wavelengths don't propagate well during the day.
- Because it is farther away and less dense, the F-Layer stays illuminated longer than the D-Layer.
- For about an hour at dawn or dusk, "magic propagation" can happen on the lower frequency bands. This is when the D-Layer is mostly absent and the F-Layer is mostly present.
- The Grey Line is a line around the earth that separates night from day and may provide only a few minutes of communications with two locations along it. It also depends on the season.

Current Grey Line Map: https://dx.qsl.net/propagation/greyline.html

HF Amateur Bands

Band	Open	Portion of Solar Cycle*
160m (Top band)	Night	Best near bottom, may disappear top half of cycle
80m	Evening & Night	OK throughout but best near bottom
40m	Evening & Night	OK throughout
30m	Evening & Night	OK throughout
20m	Day & Night	Best band throughout
17m	Day	Ok throughout
15m	Day	Poor/Nil SFI < 85
12m	Day	Poor/Nil SFI < 100
10m	Day	Best near peak, may be gone lower third/half of cycle

*Assumes southern Alberta's latitude

DX Window

Frequencies (MHz)	Mode	Comments
1.830 – 1.840	CW	Intercontinental DX window
1.840 – 1.850	LSB	Intercontinental DX window
3.500 – 3.510	CW	
3.590	Digital	RTTY
3.790 – 3.800	LSB	
7.000 – 7.010	CW	
7.040	Digital	RTTY
14.000 – 14.025	CW	
14.190 – 14.200	USB	No US phone 14.100 – 14.150 MHz
21.000 – 21.025	CW	
28.000 – 28.025	CW	

Making Voice Contacts

Choice: Call CQ or call someone else (their CQ or end of QSO)

- **Calling CQ: "CQ 20 CQ 20 CQ 20 meters (3X). This is Victor Echo Six Tango Lima (3X)." Could substitute "CQ DX" for "CQ 20" or "Hello CQ, hello CQ, etc."**
- **Calling another station, give their callsign in phonetics (once) followed by "this is …" (once). Exception: If you are competing with other stations, just give your own callsign phonetically once.**

What to say if someone answers your CQ:

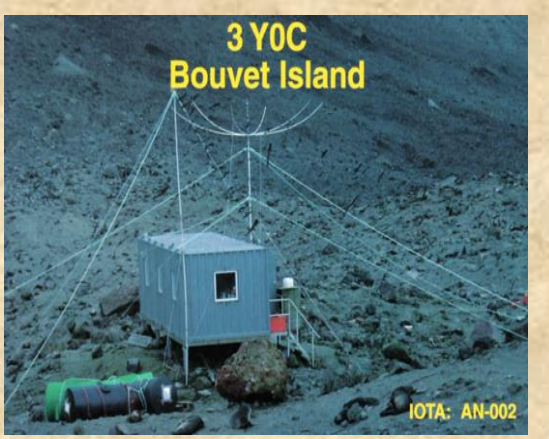
- **Their call sign "this is" my callsign. Thank you for calling. Your report is 5 and 7, 5 and 7, 57 in Calgary, Alberta (2X). My name is Jerry… Juliette Echo Romeo Romeo Yankee (2X). How copy? Repeat their call and your call.**
- **After logging their info, you reply with callsigns followed by additional information or "Thanks for the QSO and 73 OM", followed by callsigns again.**

Note: Valid QSOs (for awards purposes) require the correct callsign, band, mode, date and time of start of QSO (UTC).

DXpeditions

"An expedition to a "rare" or "exotic" place by ham operators for the purpose of providing contacts to DXers worldwide."

- **These are typically to uninhabited islands or places where no ham operators live but have been designated as official entities on the ARRL DXCC list.**
- **CW is normally +35 KHz from band edge, split 1-2 KHz**
- **SSB is normally 3.795/7.055/14.195/21.295/28.495 MHz with split 5 – 10 up. 40m will usually QSX on-frequency and announced.**



Working "Split"

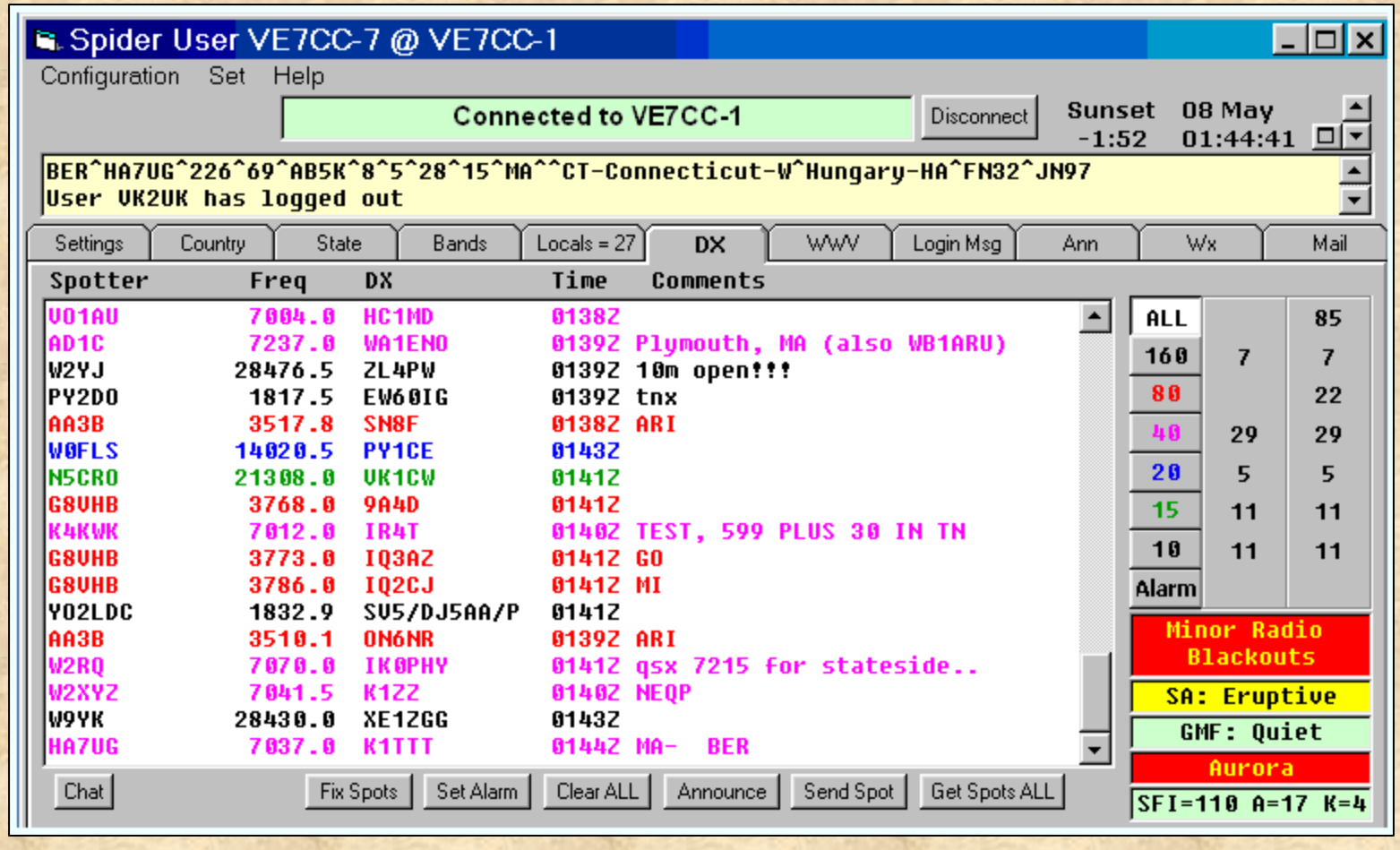
Similar to a VHF Repeater – but different.

- **A repeater listens on one frequency and transmits on a different one, usually a fixed distance apart (600 KHz). On 2m FM, if two stations are transmitting at the same time on the repeater's input frequency, the stronger one is normally "captured" and is heard by all on the receive frequency.**
- **If a rare DX station (DXpedition) transmits AND receives on a single frequency, he might not work anyone through the "pile-up"- via CW, SSB or digital modes on HF. It would sound like one big pile of noise.**
- **The solution is for the DX station to transmit on one frequency and "tune around" for stations calling him on a different frequency. This is referred to as "working split" and requires learning how to use two VFOs or RIT/XIT – Clarifier.**
- **Breaking pile-ups can be extremely frustrating but also very rewarding when you get the hang of how to do it!**

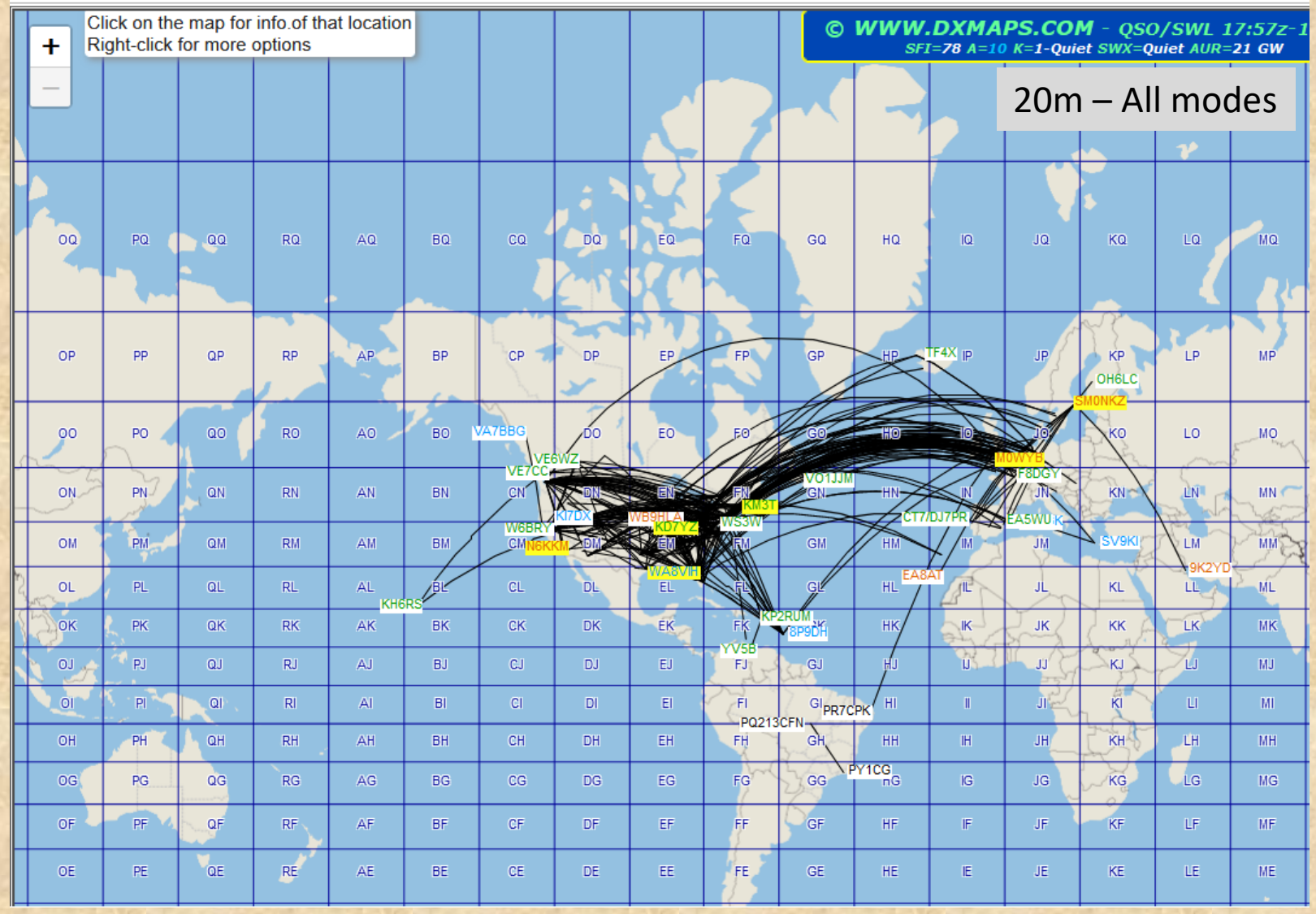
DX Aids

- **DX Packet Clusters**
  - Computer network that gathers and disseminates DX info (PacketCluster, DX Spider, CC Cluster, etc.)
- **Reverse Beacon Network**
  - A network of stations using CW Skimmer software (VE3NEA) that gathers and posts online the callsigns of stations calling CQ (also RTTY).
- **PSKREPORTER**
  - A website that posts (mostly) digital HF stations running FT8, FT4, etc. on a world map by gathering this information from volunteer stations
- **DX MAPS**
  - Real time QSO/SWL Information on a map of the world
- **iDX for Apple (App)**
  - Shows DX packet clusters and RBN on portable devices
- **DX Bulletins (online)**
  - ARRL (W1AW), DX World (free weekly), 425 DX News (Italian Weekly – in English), NCDXF (California)

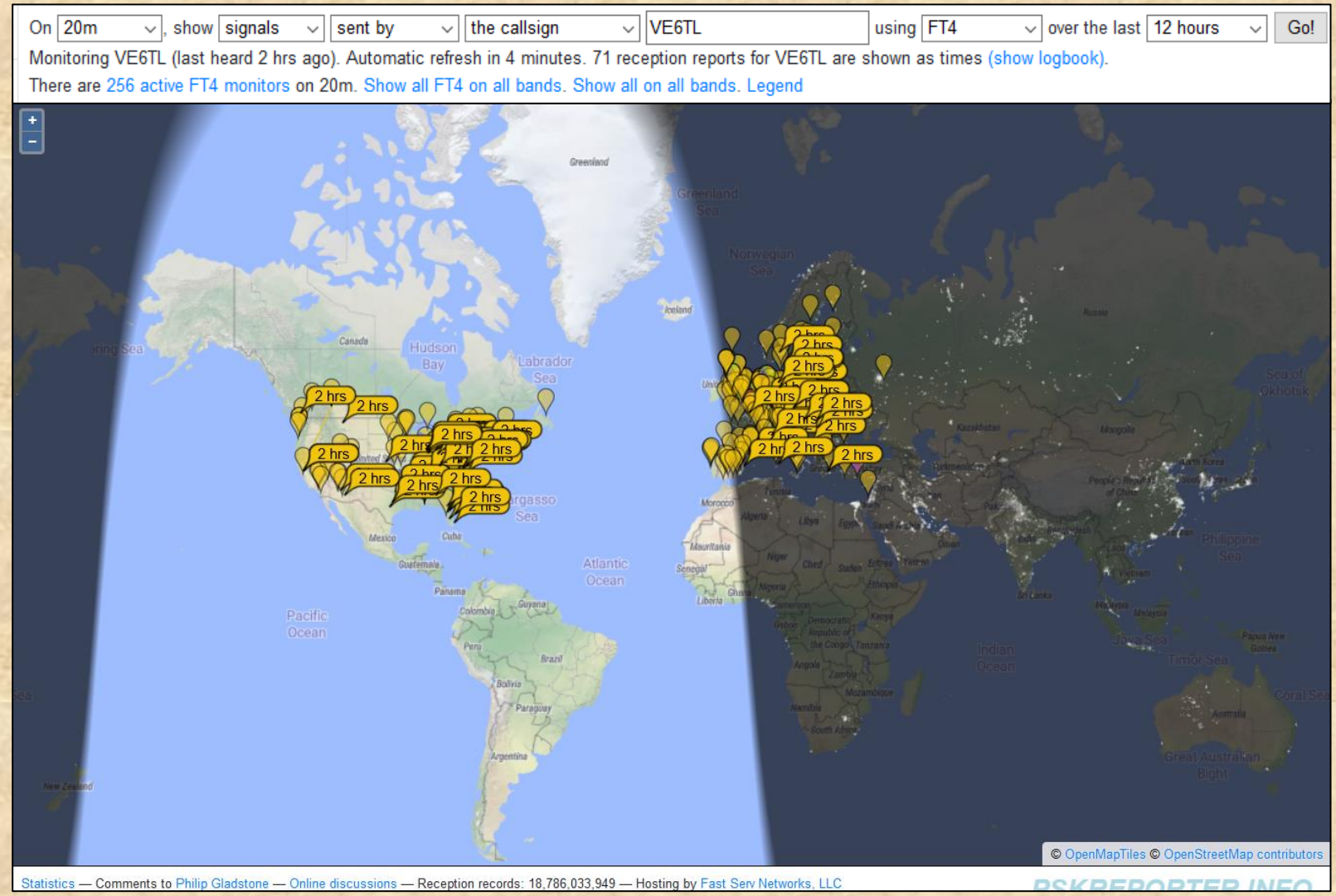
DX Packet Clusters



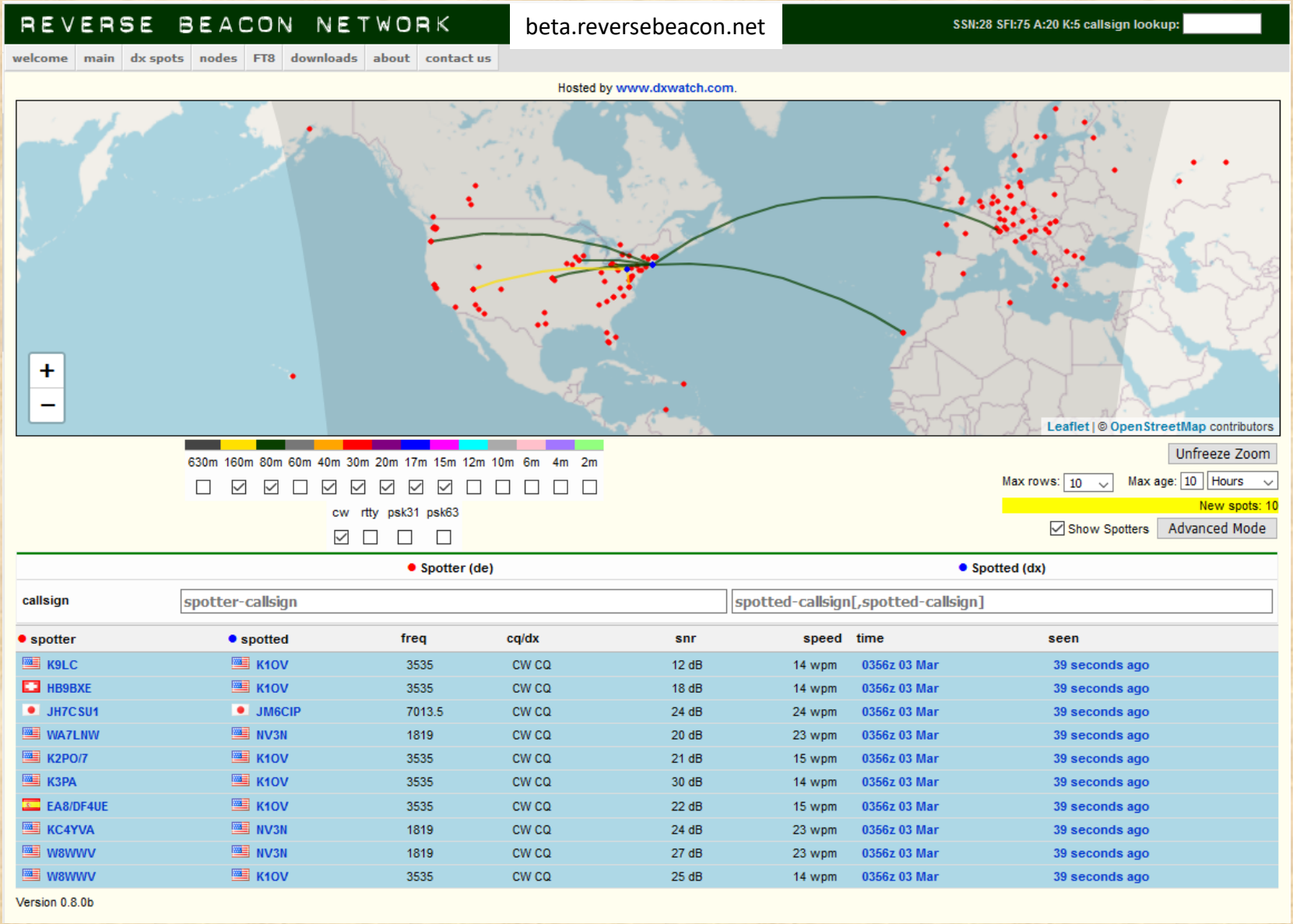
DX Maps


Click on the map for info.of that location
Right-click for more options
© WWW.DXMAPS.COM - QSO/SWL 17:57z-1
SFI=78 A=10 K=1-Quiet SWX=Quiet AUR=21 GW
20m – All modes
VA7BBG
VE6WZ
VE7CC
KI7DX
W6BRY
N6KKM
WB9HLA
KD7YZ
KM3T
WS3W
WA8VIH
KH6RS
KP2RUM
8P9DH
YV5B
PQ213CFN
PR7CPK
PY1CG
TF4X
OH6LC
SM0NKZ
M0WYB
F8DGY
VO1JJM
CT7/DJ7PR
EA5WU
EA8AT
SV9KI
9K2YD

PSK REPORTER



Reverse Beacon Network



spotter	spotted	freq	cq/dx	snr	speed	time	seen
K9LC	K1OV	3535	CW CQ	12 dB	14 wpm	0356z 03 Mar	39 seconds ago
HB9BXE	K1OV	3535	CW CQ	18 dB	14 wpm	0356z 03 Mar	39 seconds ago
JH7CSU1	JM6CIP	7013.5	CW CQ	24 dB	24 wpm	0356z 03 Mar	39 seconds ago
WA7LNW	NV3N	1819	CW CQ	20 dB	23 wpm	0356z 03 Mar	39 seconds ago
K2PO/7	K1OV	3535	CW CQ	21 dB	15 wpm	0356z 03 Mar	39 seconds ago
K3PA	K1OV	3535	CW CQ	30 dB	14 wpm	0356z 03 Mar	39 seconds ago
EA8/DF4UE	K1OV	3535	CW CQ	22 dB	15 wpm	0356z 03 Mar	39 seconds ago
KC4YVA	NV3N	1819	CW CQ	24 dB	23 wpm	0356z 03 Mar	39 seconds ago
W8WWV	NV3N	1819	CW CQ	27 dB	23 wpm	0356z 03 Mar	39 seconds ago
W8WWV	K1OV	3535	CW CQ	25 dB	14 wpm	0356z 03 Mar	39 seconds ago

Version 0.8.0b

iDX for Apple

DX Bulletins

Downloaded from DX-World.net

This week on air

This can change daily, please visit https://www.dx-world.net/ for updates.

3W, VIETNAM Sebastian, SP5FAR is operating as 3W9FAR from Da Nang. Activity until March. QSL via home call.

5V, TOGO Daniel, HB9EHD is QRV as 5V7DE during February. He supports the doctors at the university hospital in Kara. He is operating during his spare time on 40 meter and 20 meter using FT8 and OQ-100 for SSB. All QSO will be confirmed by LoTW. See QRZ.com.

9J, ZAMBIA Brad, 9J2RS is a new operator based in Lusaka. Have been active on 20; 17 and 15 meter with a vertical and an old marine transceiver.

C9, MOZAMBIQUE Bruno, CS7AMN is active as C91BVA. Operation on HF bands, SSB and digi. QSL via home call, LoTW.

HK, COLOMBIA Lothar, DK8LRF extends his stay due to Covid until end April. QRV as HK3JCL. QSL via home call.

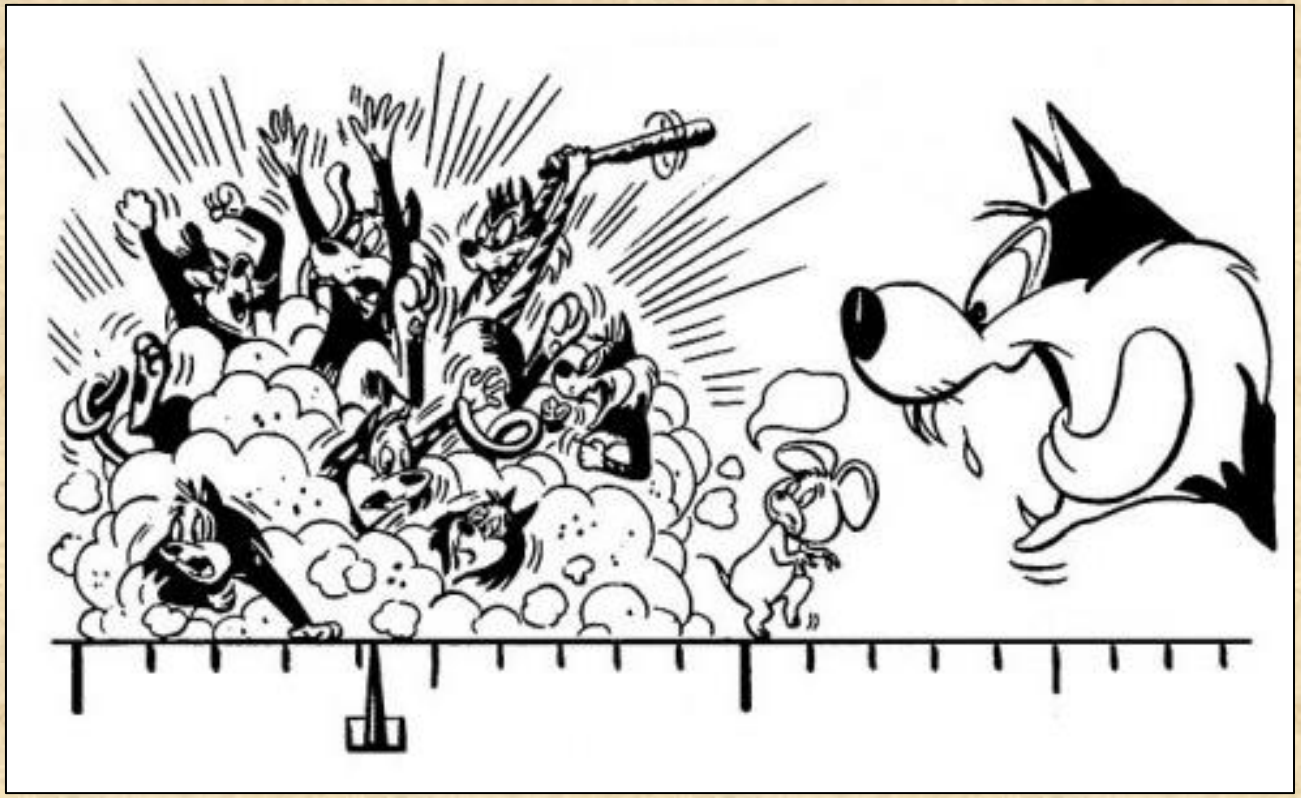
JW, SVALBARD Erling, LB2PG is QRV as JW/call from Bear Island until June 1. Activity during his spare time from 80 to 20 meter using SSB. QSL via home call.

JX, JAN MAYEN Erik LA2US is active as JX2US until April. He operates CW, FT8 and probably some more modes. Focus on 160m, 80m, 40m and 30m.

Tips for Success

- Listen, listen, listen
- Learn your geography (study the world map)
- Learn prefixes and bearings (From southern Alberta: Japan 305°, Argentina 145°)
- Learn CW – It is fun! Try it via keyboard and decoder.
- Start by working on WAS award, then WAC
- Start with a simple dipole for 20m, then keep adding more antennas. You can't have too many.
- Talk to DXers and ask lots of questions
- Start doing DX contests. Many DX stations are active only during contests. Be aware that contesting is not allowed on WARC bands!
- Timing is extremely important in working DX as you may be competing with other stations. Try not calling them right away if there is a big pileup.
- When calling a DX station, always use phonetics and give your full call sign
- Record your call sign (Audacity is free) and wear out your Function keys instead of your voice
- Digital modes are nowhere near as fun as SSB or CW. They are a good substitute during Solar Minimum.
- Search online for appropriate videos, books, tips, codes of conduct.

See you in the pileups!



The End

References

Logger32:	https://www.logger32.net/
IARU Region 2 (English):	https://www.iaru-r2.org/en/
RAC Band Plans:	https://www.rac.ca/operating/bandplans/
Mapping Grid Squares:	https://qsomap.org/
DX Packet Clusters:	http://www.bcdxc.org/ve7cc/
Reverse Beacon Network:	http://beta.reversebeacon.net/main.php
DX World Bulletins:	https://www.dx-world.net/
425 DX News:	https://www.425dxn.org/
NCDXF DX Resources:	https://www.ncdxf.org/pages/dxresources.html

The Complete DXer: Bob Locher, W9KNI – Third Edition, 2003

The New DXer's Handbook: Bryce K. Anderson, K7UA, Second Edition, 2015

How to Chase, Work & Confirm DX The Easy Way! – Craig Buck K4IA, 2016