OPERATING FOR SUCCESS

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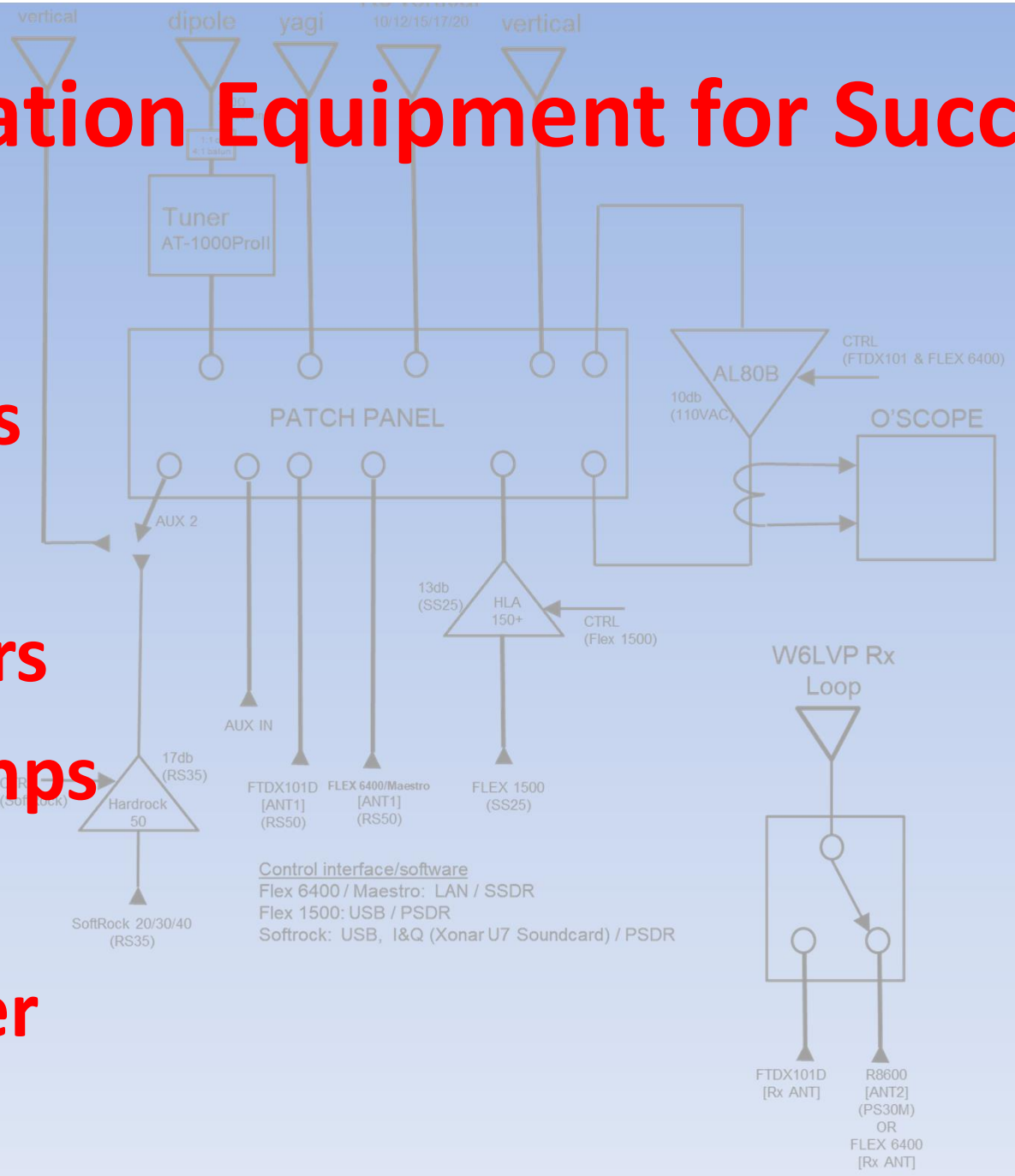
Operating for Success

- Choose Station Equipment for Success
- Optimize Station Performance
- Operating Technique
  - Understanding Propagation
  - Style of Operation
- Additional Operating Aids

Choose Station Equipment for Success

- Antennas
- Feedline
- Amplifiers
- Rx Preamps
- Rig
- Computer



Choose the Right Station Equipment for Success

ANTENNAS

- The antenna is the single most important part of your station
  - This is the area that has the greatest latitude for creativity and innovation for radio amateur experimenters
- **The best antenna is the one that is mounted as high and in the clear as possible.**
- HF operation, choose:
  - **Resonant dipoles**, best results at 1/2 λ above ground
  - Horizontally polarized, **multi-band beam** antennas - take off angles vary by band. A compromise height is in the range of 65 - 100 feet
  - **Resonant Verticals**: ground plane or ground mounted w/ radial field
    - Verticals have a favorable take off angle
- VHF/UHF, choose:
  - Vertical antennas for point to point local comm
  - Horizontally polarized antennas for weak signal work

Choose the Right Station Equipment for Success

FEEDLINE

- The feedline is the second most important part of your station
  - choose the right feedline for the application
- Feedline loss vs frequency and power handling capability are the important factors - **READ THE SPEC SHEET**
- Should be used as appropriate for:
  - Minimizing loss at frequency of use (db loss / 100')
    - Keep runs at VHF/UHF <50 feet , if possible
  - Ease of access into shack
  - Ease of use / flexibility
    - Stranded center conductor coax is preferred
  - Burial rated?

AMPLIFIERS

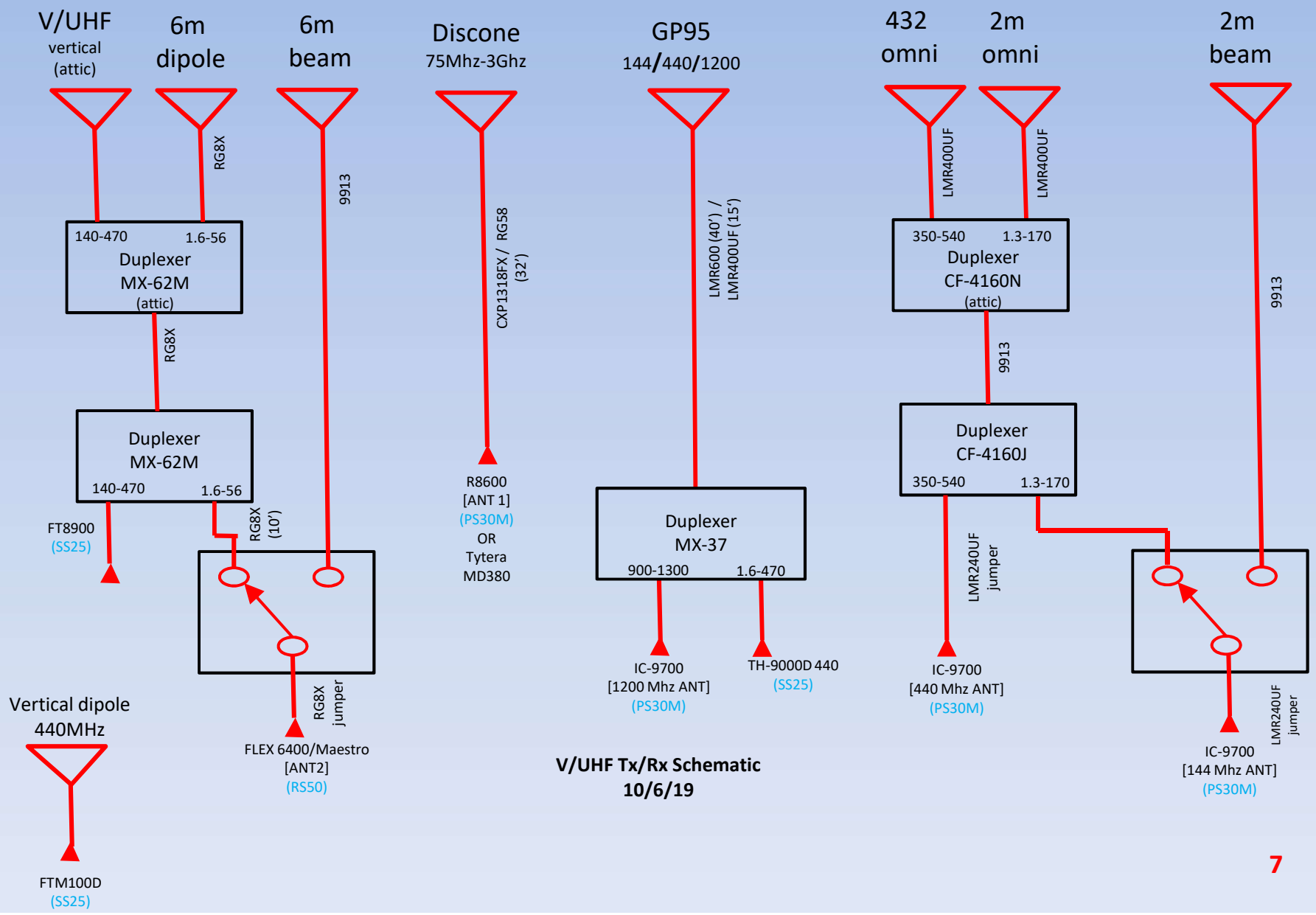
- For casual HF rag chewing and casual contesting, a 100W transmitter may be enough.
- For HF DX and "hard core" contesting, a typical installation would include a 10dB (1000W) amp
  - note: a 1500W amp only adds 1.7dB over the 1000W amp
- VHF/ UHF – amplifiers are typically used for weak signal work

Choose the Right Station Equipment for Success

- **Rx Preamps**
  - Use of preamps starting with the upper HF bands and higher is beneficial. Modern HF/6m radios have preamps built in.
  - At VHF and above, preamps need to be mounted at the antenna due to feedline loss. This is the case for weak signal work…. VHF/UHF DX, Satellite and EME
- **Modern rigs**
  - Can be used for any type of operating / mode
    - DX modes: SSB, CW, WSJTx
    - Weak signal modes: CW, WSJTx
    - Rag Chewing modes: AM, SSB, CW, RTTY, PSK31
    - Contest modes: all modes
  - Have versatile features such as state-of-the-art noise reduction, wide range band scope, touch screen, etc.
  - Easy to interface to a computer with a single USB cable
- **Computer**
  - Rig control and audio interface for digital modes
  - Logging
  - Propagation reports and prediction
  - Signal spotting, reporting and testing
  - QRZ.com

Computers are an integral part of modern ham stations

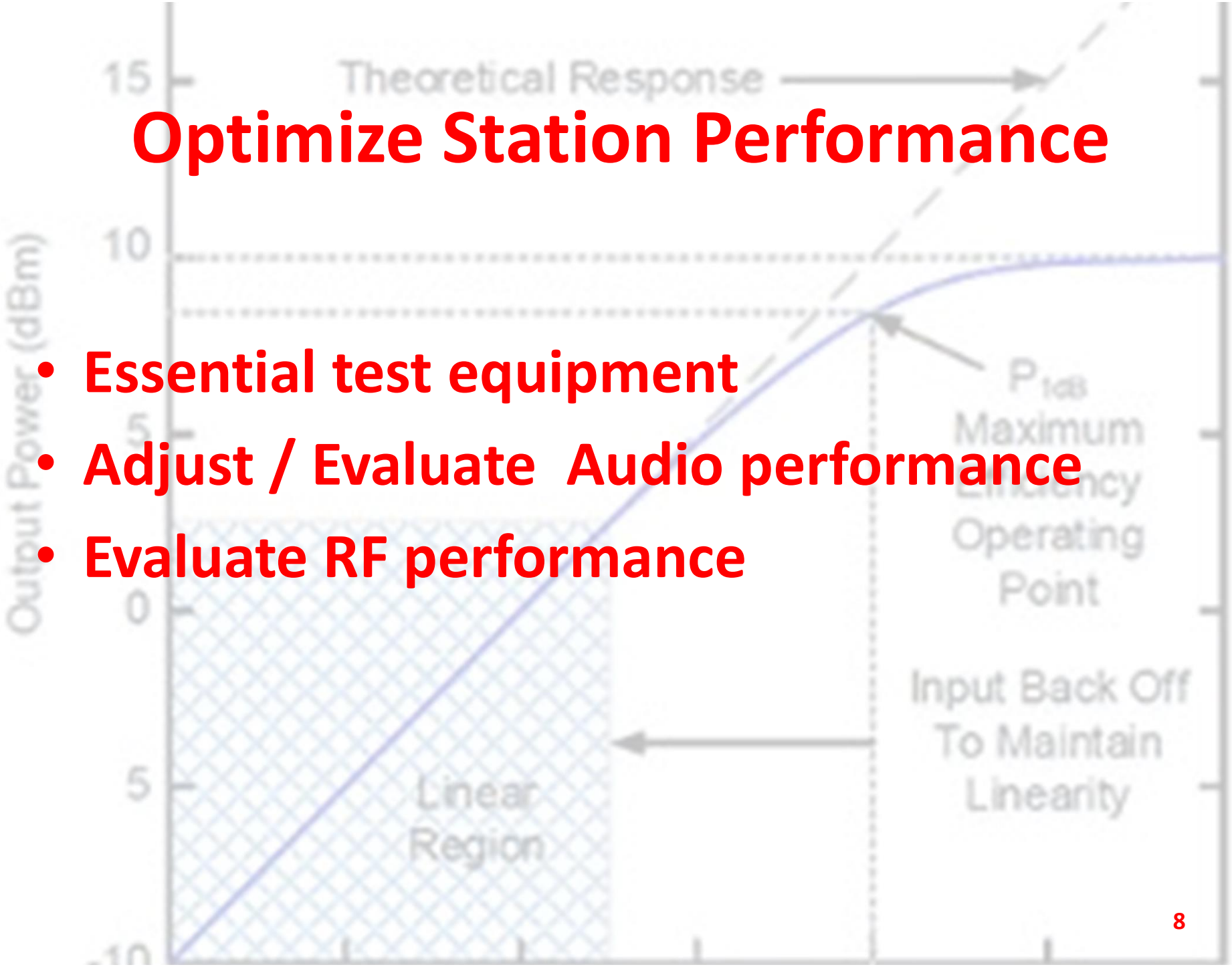
Make a record of your setup



V/UHF Tx/Rx Schematic
10/6/19

Optimize Station Performance

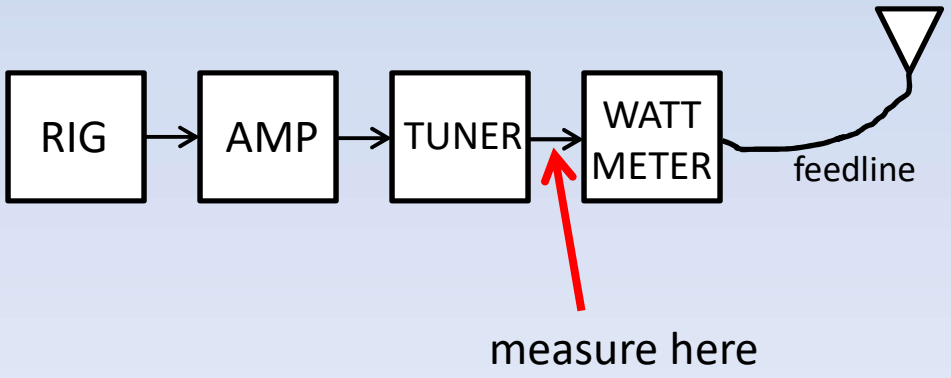
- Essential test equipment
- Adjust / Evaluate Audio performance
- Evaluate RF performance



Essential Test Equipment

- **Wattmeter / SWR meter**
  - Most modern rigs have P_{out} and SWR measuring capability
    - Some rigs can measure both at the same time
  - Amps generally have P_{out} capability and maybe SWR / P_{ref} meters
  - Antenna tuners may have one or both
  - An external watt meter/SWR meter is an important station accessory
  - General good practice:
    - Continuously monitor P_{out} and **SWR / P_{ref}** at the end of the RF chain to detect any real time anomalies

Bird 43 watt meter



W2ZQ power meters

Amp P_o = 200W

Tuner P_o = 200W

Tuner P_{ref} (SWR) = 0W (1:1)

The wattmeter, in the tuner, is at the end of the RF chain

Essential Test Equipment

- **Dummy Load**
  - The second most useful piece of test equipment
  - Useful for troubleshooting
    - P_{out} from rig / amp?
    - Transmission line good? / transmission line loss
- **Antenna Analyzer / (VNA)**
  - Sweep / tune an antenna – makes this much easier to do than using a power/swr meter
  - Measure SWR
  - Check coax for loss
  - DVRA has an MFJ 259 analyzer available for use by club members
    - FYI - an antenna analyzer is a one port VNA

Proper Adjustment of Power Amp

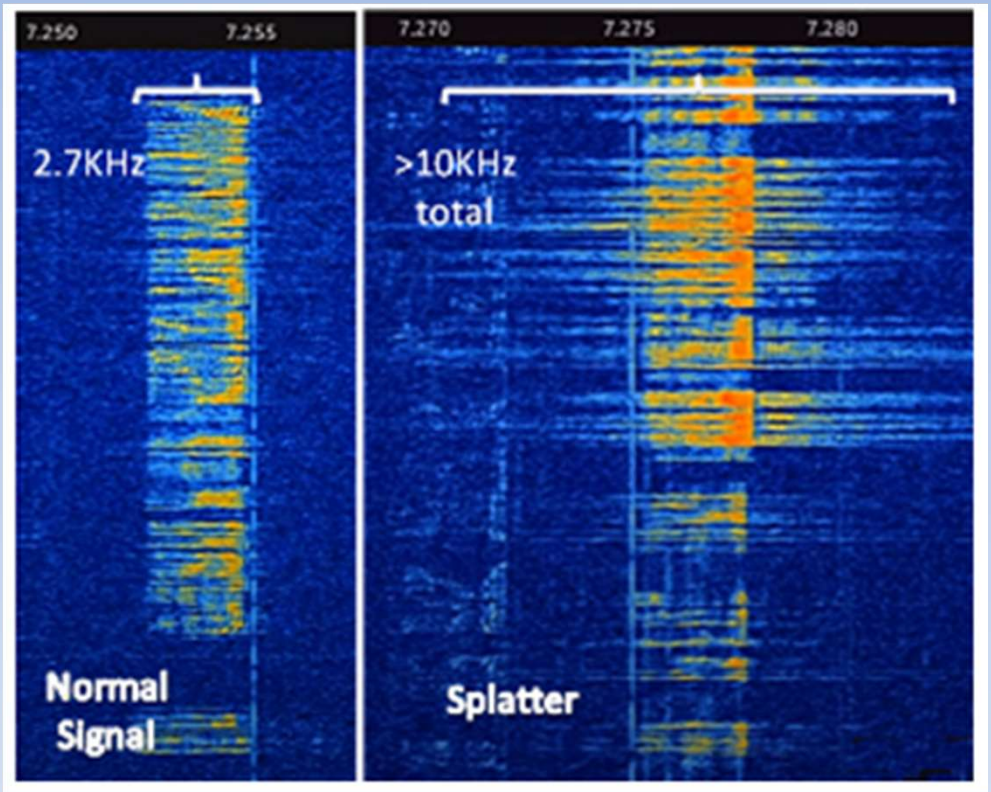
- **Power amp adjustment**
  - Station monitor scope or an oscilloscope, can be used to:
    - Check modulation for flat topping
    - Check linearity
  - For lack of measurement capabilities: use ALC feedback to avoid running the amp into gain compression or saturation, causing distortion and spurious emissions.

Adjust Audio Settings

- Set up **microphone gain, ALC** and **compression settings** per your radio's user manual
  - If controls are available, set tx audio equalization profile per microphone vendor suggestions / online info
- For digital modes, audio levels are adjusted from the sound card controls.
  - As a rule of thumb, increase the sound card's audio output to the point where the RF output power no longer increases, then back off a little below that point.

A proper audio setup will avoid distortion and splatter (IMD)

The Good and the Bad



Part 97.307 (b) Emissions outside the necessary bandwidth must not cause splatter ….. to operations on adjacent frequencies.

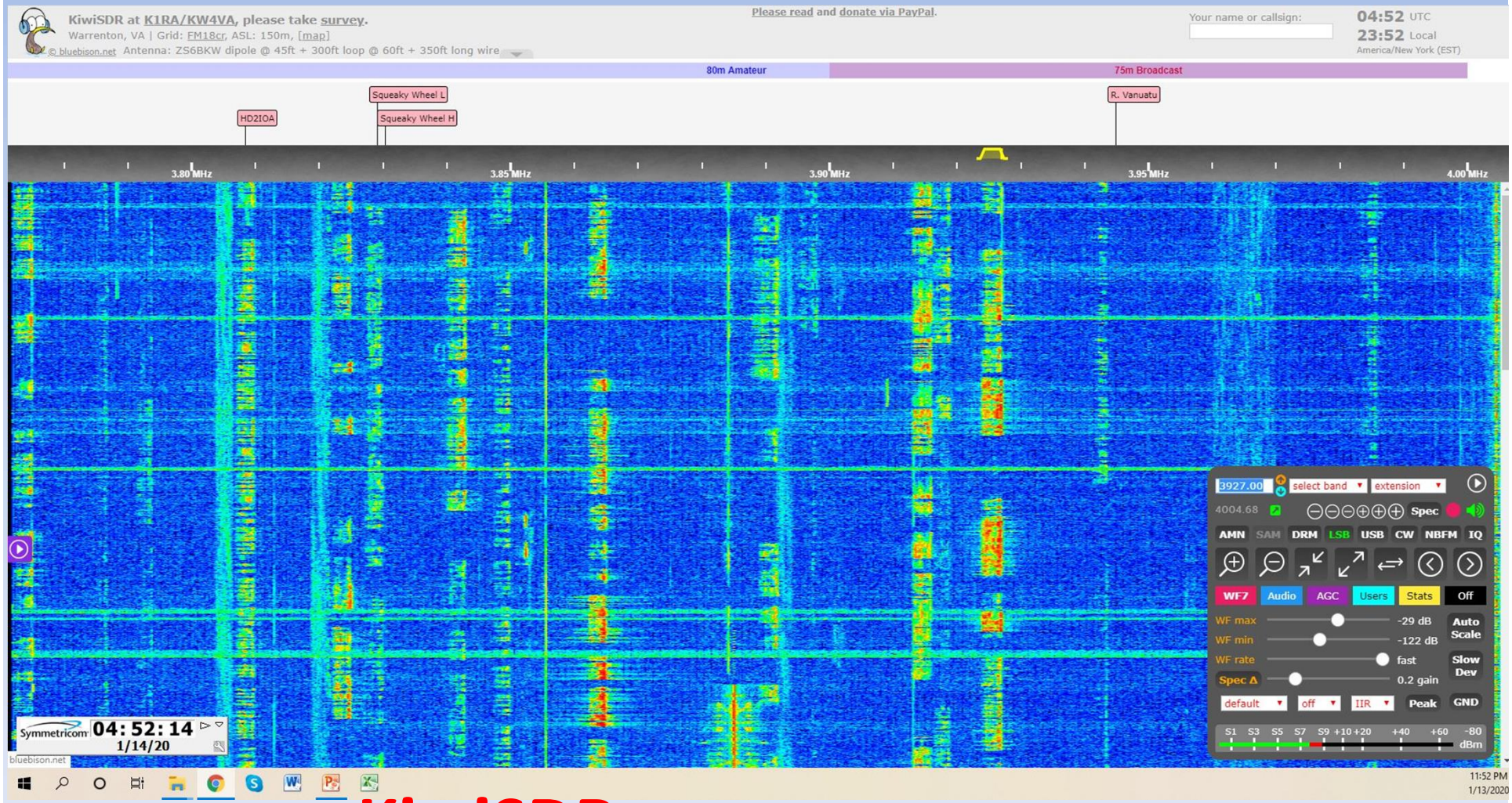
Evaluate Audio Performance

- Use monitor function on radio **(good)**
  - Good for self-monitoring in all modes
- Use a separate receiver to monitor your signal **(better)**
- Solicit on air evaluation **(best)**
  - A nearby ham who “knows” your voice
  - Call CQ
  - Join a net
  - Listen to, view and record your signal from an online SDR, i.e. kiwisdr.com, websdr.org

Use an online SDR to monitor your signal

Others uses:

- Receive outside your skip zone
- Receive from a less noisy location

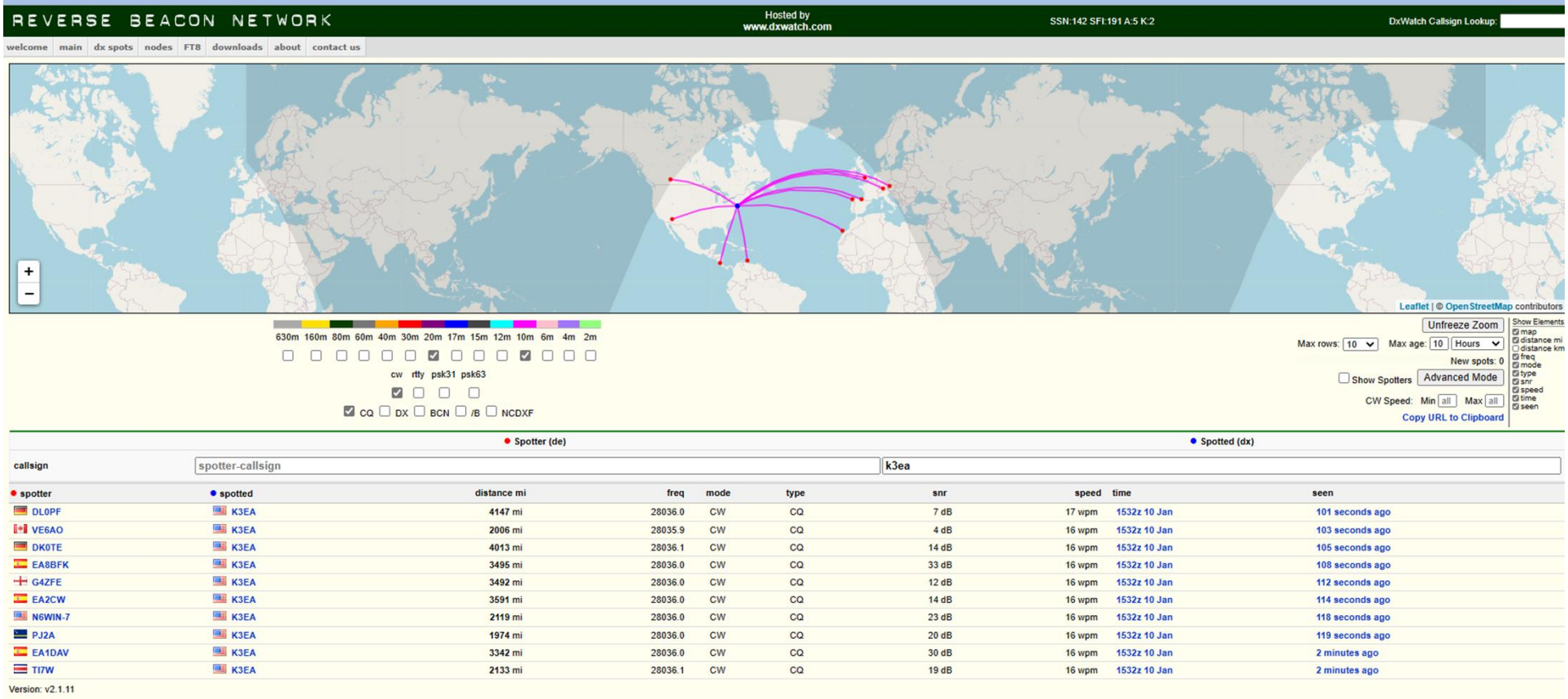


KiwiSDR: 3.77 – 4.0 MHz, SSB signals

Evaluate RF Performance

- Evaluate your signal strength with:
  - Reverse Beacon Network (CW)
  - PSK Reporter (digital modes)
  - Online SDRs
  - Other operators
- Additional testing can include evaluating signal strength with:
  - different antennas
  - varying power levels

Reverse Beacon Network



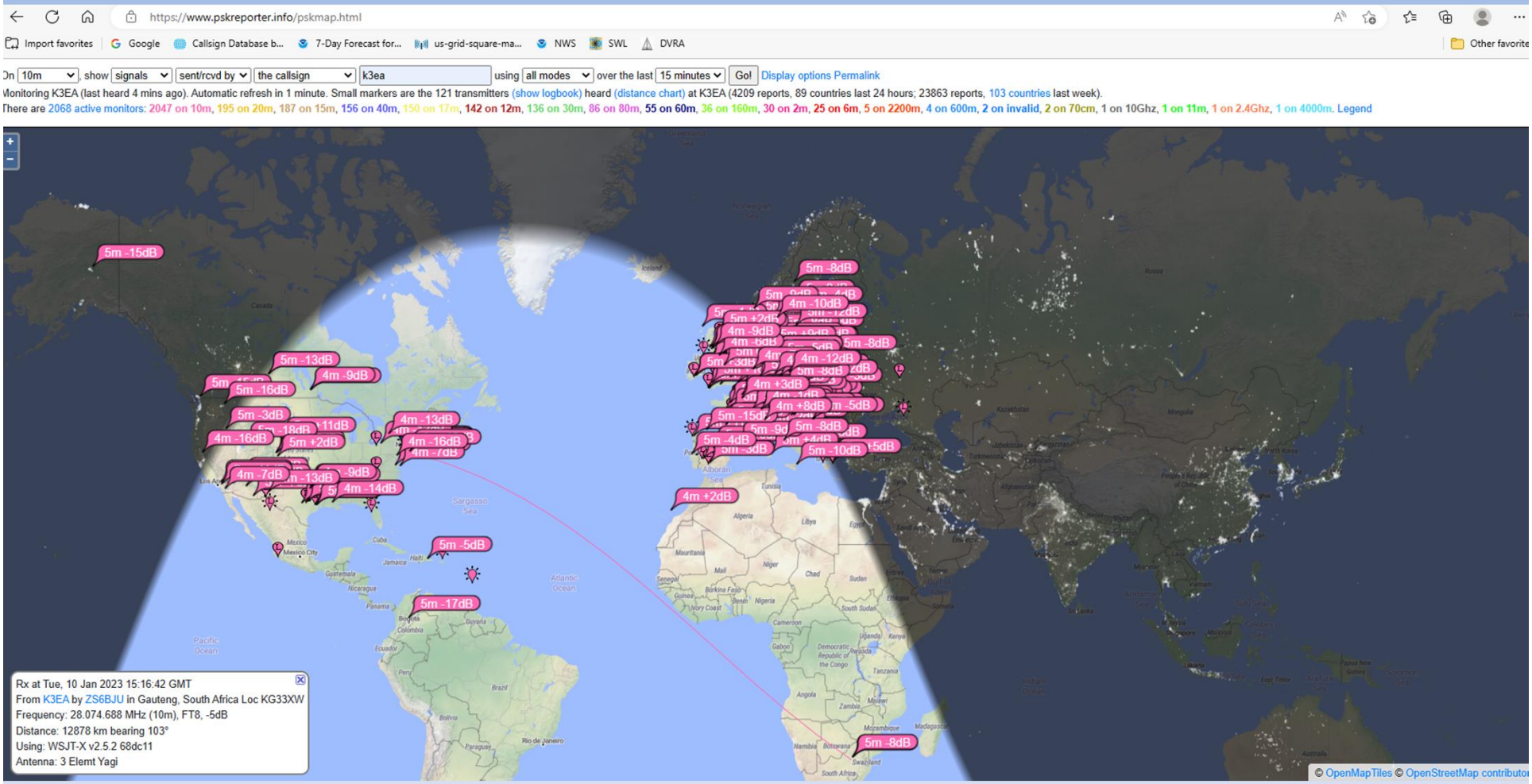
- Called CQ CQ de K3EA 2x on 10m, around 1030am EST
- Received 10 “hits”: graphical and data info

Reverse Beacon Network

spotter	spotted	distance mi	freq	mode	type	snr	speed	time
DL0PF	K3EA	4147 mi	28036.0	CW	CQ	7 dB	17 wpm	1532z 10 Jan
VE6AO	K3EA	2006 mi	28035.9	CW	CQ	4 dB	16 wpm	1532z 10 Jan
DK0TE	K3EA	4013 mi	28036.1	CW	CQ	14 dB	16 wpm	1532z 10 Jan
EA8BFK	K3EA	3495 mi	28036.0	CW	CQ	33 dB	16 wpm	1532z 10 Jan
G4ZFE	K3EA	3492 mi	28036.0	CW	CQ	12 dB	16 wpm	1532z 10 Jan
EA2CW	K3EA	3591 mi	28036.0	CW	CQ	14 dB	16 wpm	1532z 10 Jan
N6WIN-7	K3EA	2119 mi	28036.0	CW	CQ	23 dB	16 wpm	1532z 10 Jan
PJ2A	K3EA	1974 mi	28036.0	CW	CQ	20 dB	16 wpm	1532z 10 Jan
EA1DAV	K3EA	3342 mi	28036.0	CW	CQ	30 dB	16 wpm	1532z 10 Jan
TI7W	K3EA	2133 mi	28036.1	CW	CQ	19 dB	16 wpm	1532z 10 Jan

- Called CQ CQ de K3EA 2x
- Received 10 “hits”: Rx station (spotter), signal report, distance

PSK reporter – digital mode

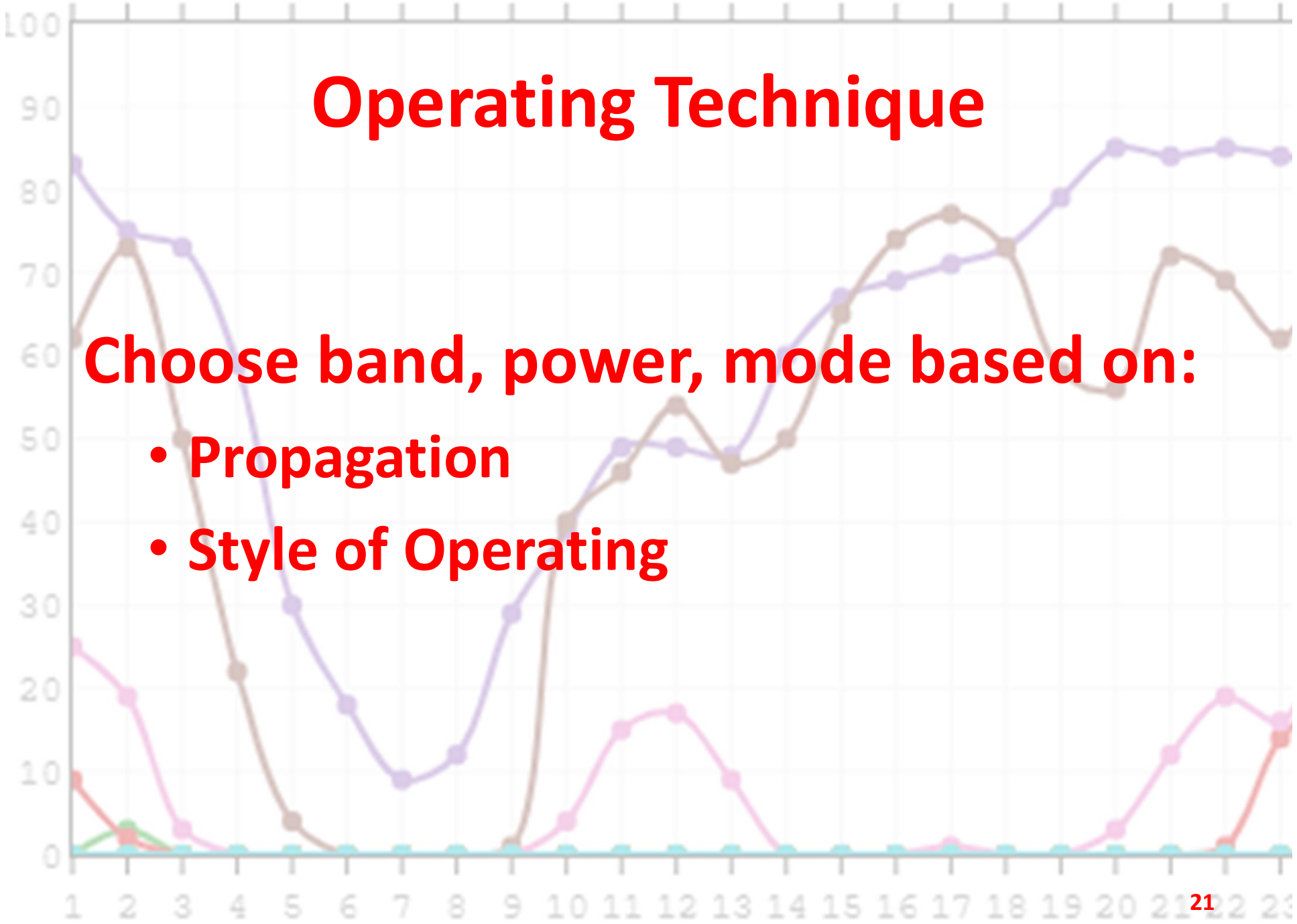


Stations w /time and sig reports that decoded K3EA after 9 transmissions for QSO with Greece, 10m FT8

Operating Technique

Choose band, power, mode based on:

- Propagation
- Style of Operating



Propagation

- Understanding Propagation
  - Propagation depends on the solar cycle and daily changes in solar activity
    - Basic info on solar indices
    - WM7D, Spaceweather websites, etc
  - Weak signal digital modes may offer success during solar cycle minimums
  - Choose band for most success
    - Low bands at night (30, 40, 80, 160mm)
      - » Seasonal noise may limit operation – lower frequencies (esp. 80 and 160) are noisy in summer
    - High bands during daylight (10 thru 20m)
      - » What is MUF?
    - Understanding Grey Line

Key solar indices and what they mean

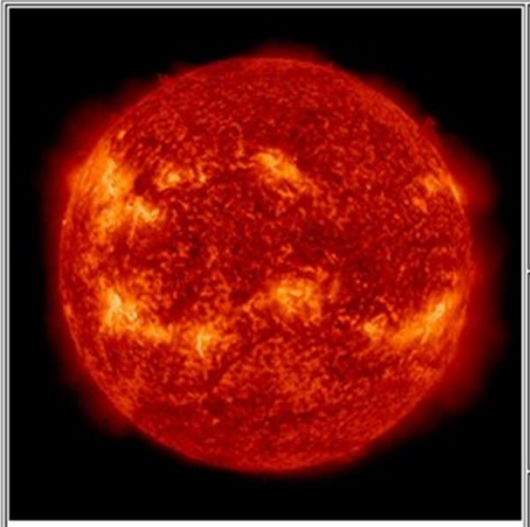
- SFI – Solar Flux Index: daily 10.7 cm solar flux, range: 65 to 350
- SN – daily sunspot number, range: 0 to 450
- K index – 3-hr index: activity of the Earth's magnetic field, range: 0 to 9; 0 is quiet, 9 is extremely disturbed
- A index – daily index: average of eight 3-hr K indices, range: 0 to 400; 0 is quiet, 400 is extremely disturbed

- High SN and SFI over a long period (several weeks) supports propagation on the higher bands - above 15m, need SFI>100 and SN >70
- Spikes in the K index >3 indicate a higher probability of geomagnetic disturbances that affect propagation negatively

Key Solar Indices and Space Weather Forecast

WM7D's Solar Resource Page

Monday, 16-Jan-2023 05:12:44 GMT



Current Solar Image from SDO

Current Solar Flux report:
SFI: **234** A-index: **30**
K-Index: **4.00**
Report last updated: 03:11utc 16 Jan 23
Current Sunspot Count: 177

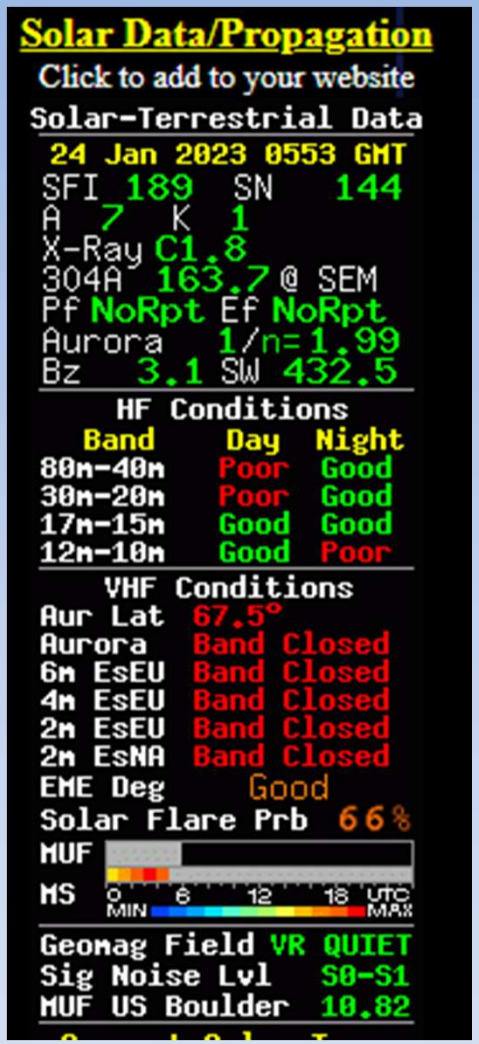
Highs for Cycle 25
Flux: 234 - 15 Jan 2023
Sunspots: 201 - 10 Jan 2023

Summary for the past 24 hours:
Space weather for the past 24 hours has been moderate.
Geomagnetic storms reaching the G1 level occurred.
Radio blackouts reaching the R2 level occurred.

Forecast for the next 24 hours:
Space weather for the next 24 hours is predicted to be minor.
Geomagnetic storms reaching the G1 level are expected.
Radio blackouts reaching the R1 level are likely.

wm7d.net/hamradio/solar/

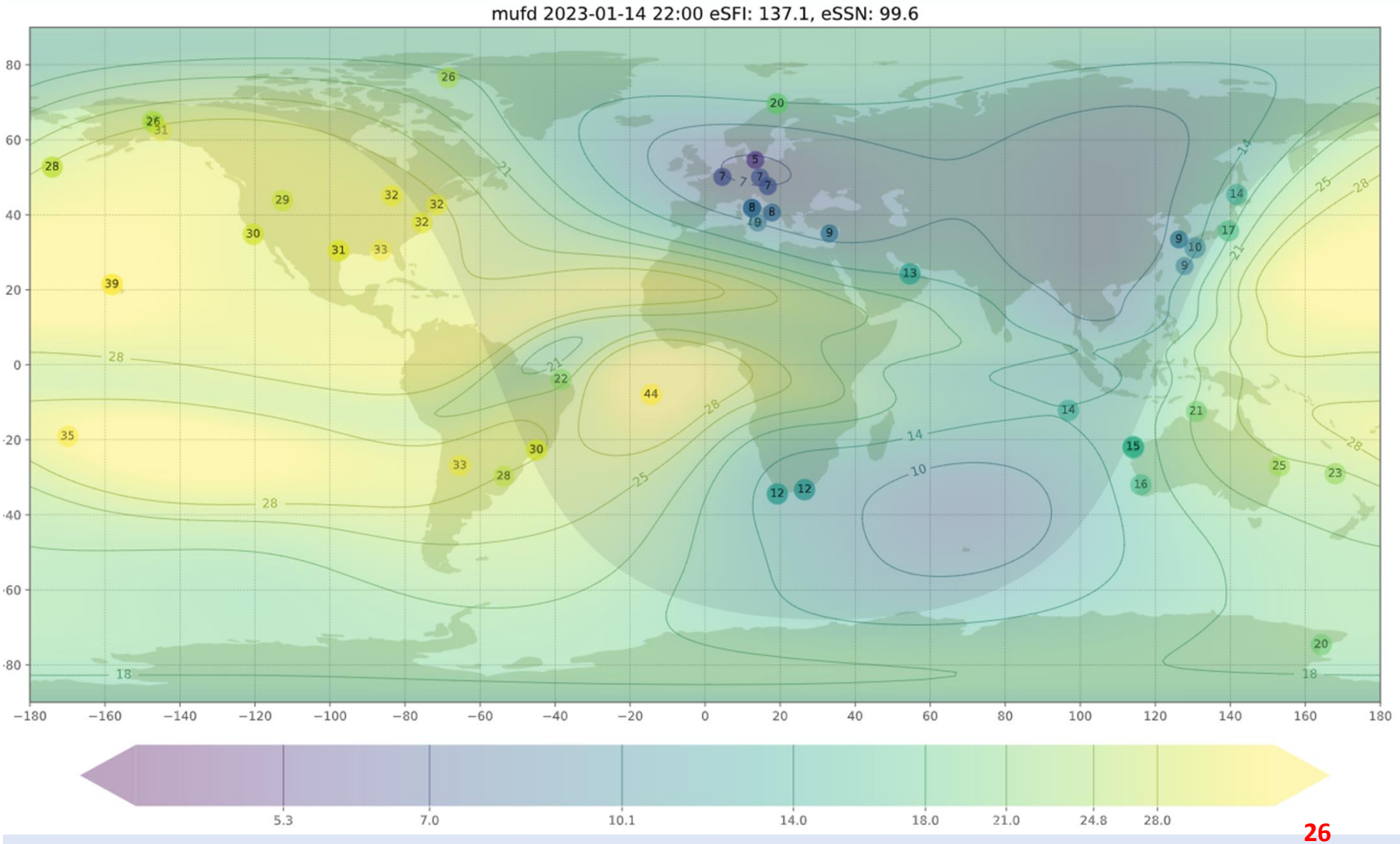
Solar Data and Propagation Predictions



https://www.hamqsl.com/

High SFI and SN = better propagation at higher bands
Low A and K index = lower chance of geomagnetic storms

MUF Map prop.kc2g.com



Understanding Greyline

- Generally propagation on:
  - The low bands (1.8 through 10 MHz) exhibit best long-distance propagation from just before sunset, through darkness, to just after sunrise.
  - The high bands (14 through 28 MHz) tend to open near sunrise, stay open throughout the day, and close after darkness.

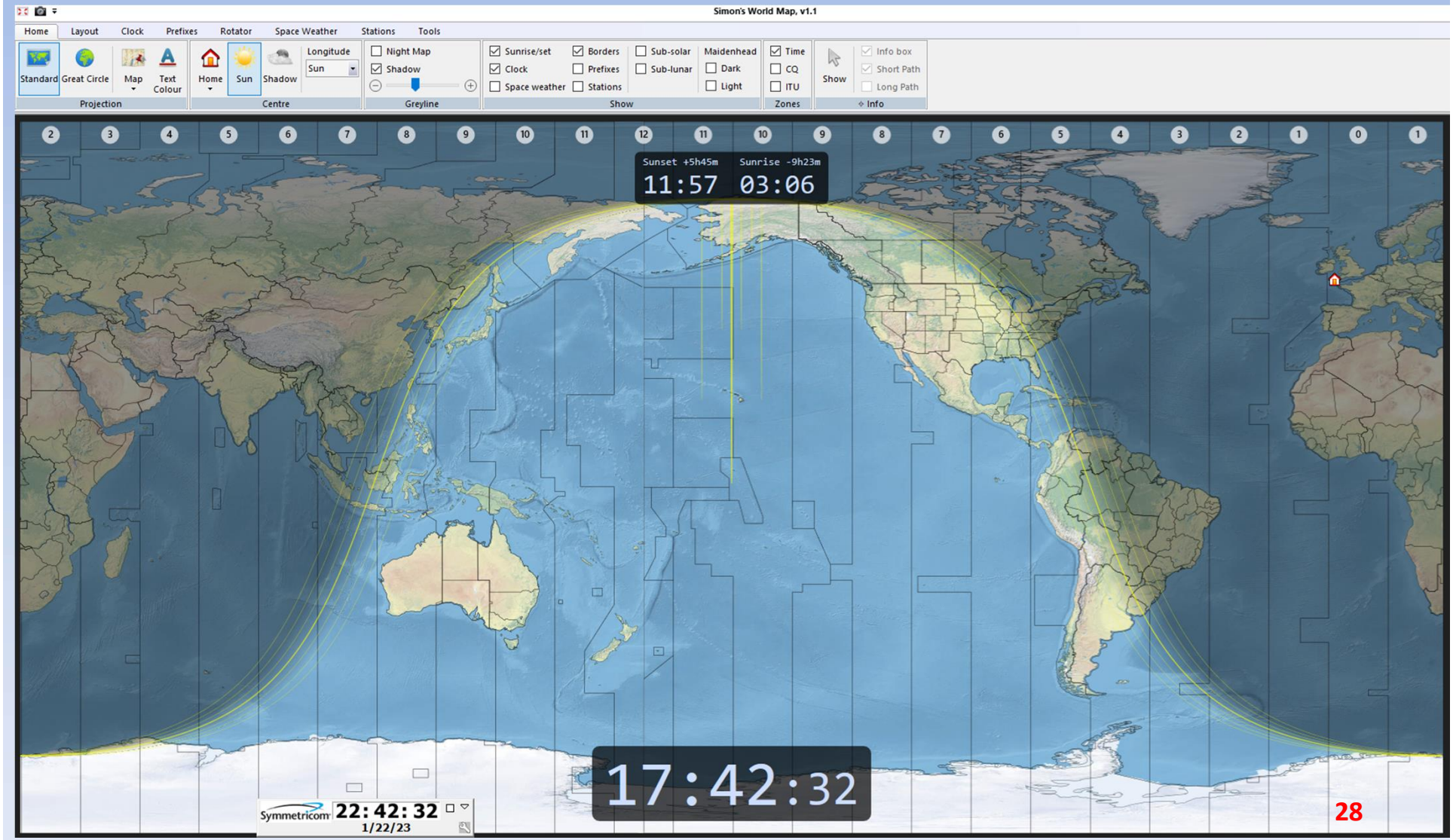
GREYLINE:

- Along the terminator, (the “twilight zone”) the MUF is rising rapidly on the sunrise side and is still high on the sunset side of the earth.
- With suitable ionospheric conditions, stations along the terminator can communicate with any other station along the terminator:
  - for a period of a few minutes on the low and high frequencies (160 and 10m) to..
  - one or two hours at intermediate frequencies (20m)
- The position of the terminator will change with the seasons, allowing access to different parts of the world throughout the year.

Simons World Map

https://www.sdr-radio.com/simon-s-world-map-v1-1

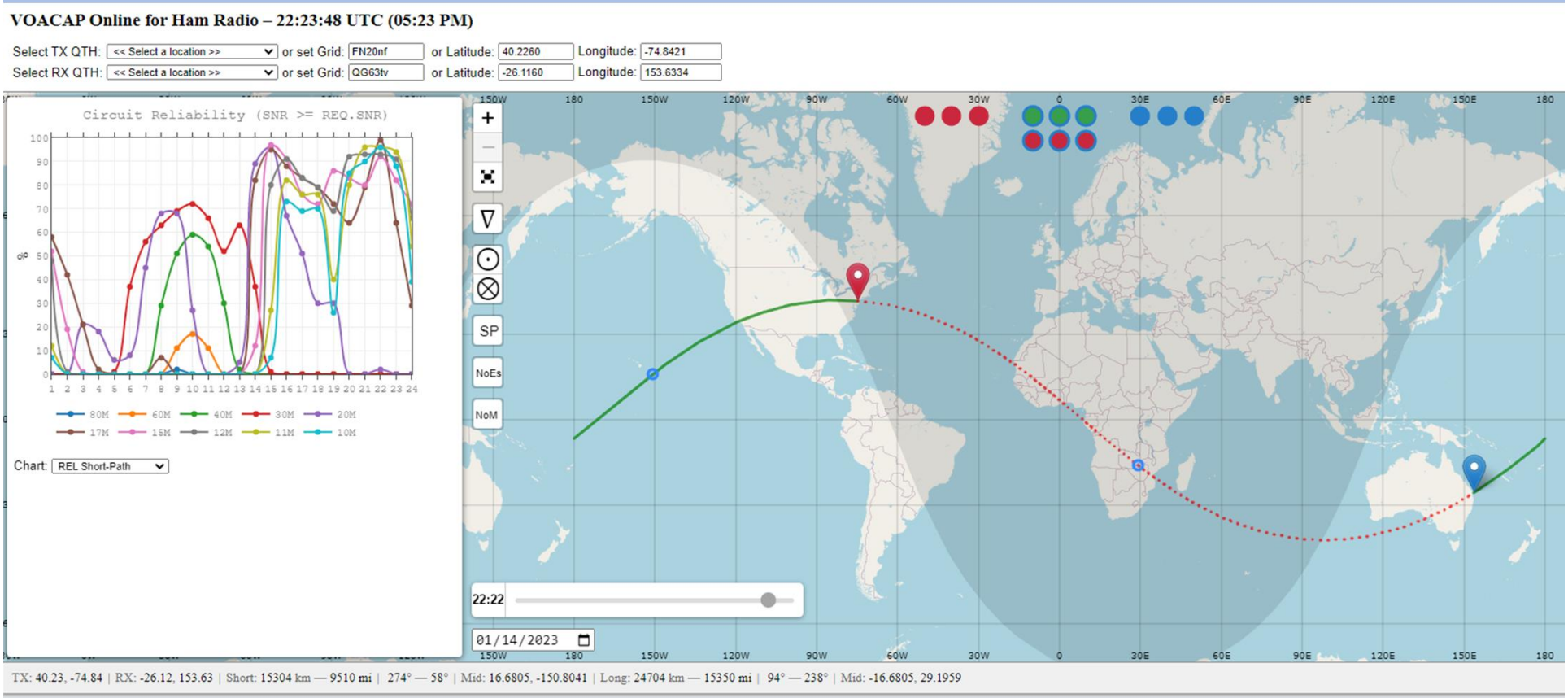
Terminator shown is just after sunset on East Coast USA and just after sunrise in Japan



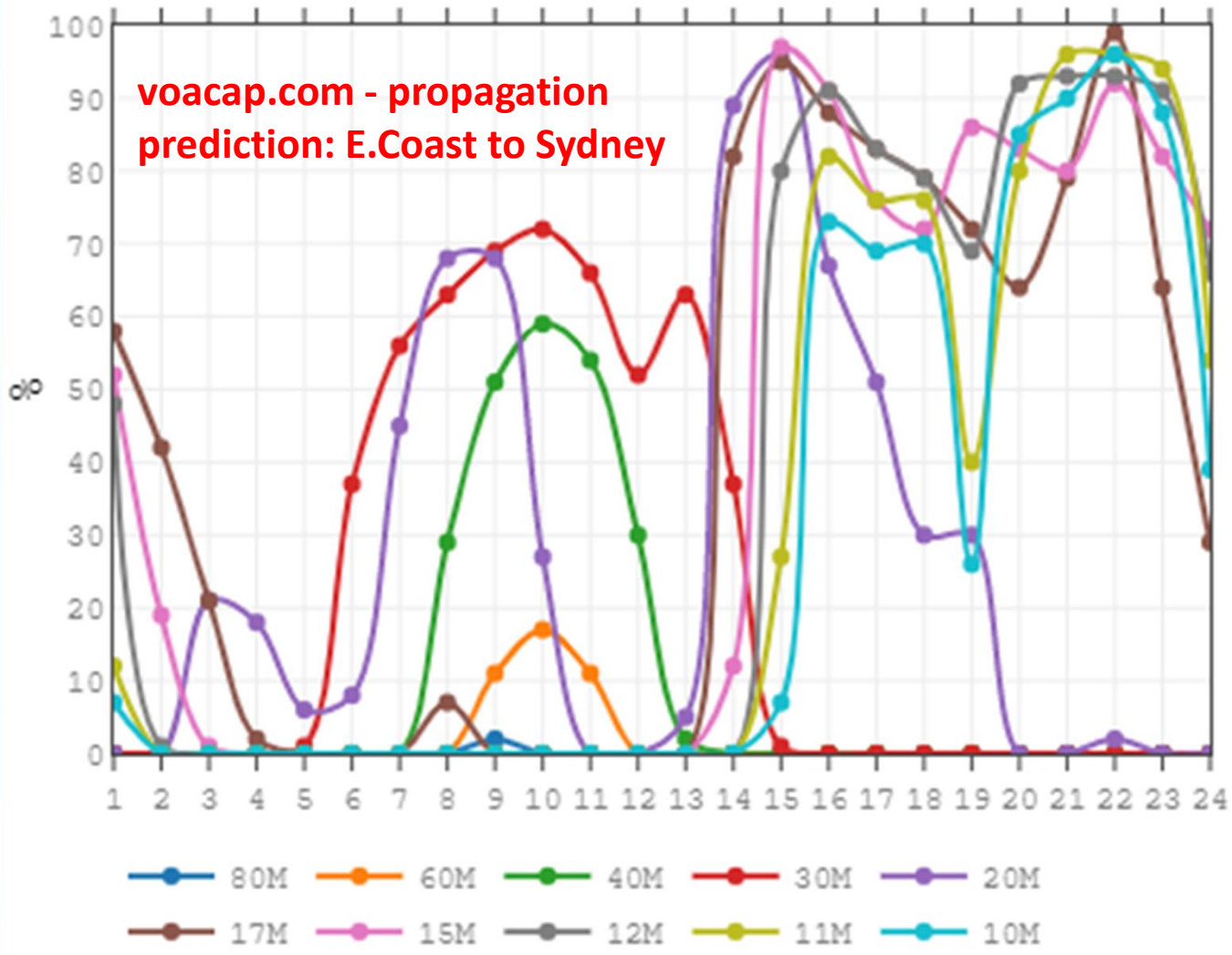
Online Propagation Tools

- Target areas by using the following:
  - VOACAP, online propagation prediction
  - PSK Reporter, digital mode and CW reporting
  - Reverse Beacon Network, CW skimmer reporting
  - DX Clusters/spotting networks: DX Watch, DX summit, etc.
    - Mostly DX
    - also: QSO parties, Special Events, POTA
  - HamAlert, DX Alert: online apps that use DX clusters, PSK Reporter, RBN, POTA, SOTA
  - WSPR, low power beacon reporting
  - 10m and 6m beacons
    - beacons transmit in CW

Propagation prediction from E. Coast to Sydney

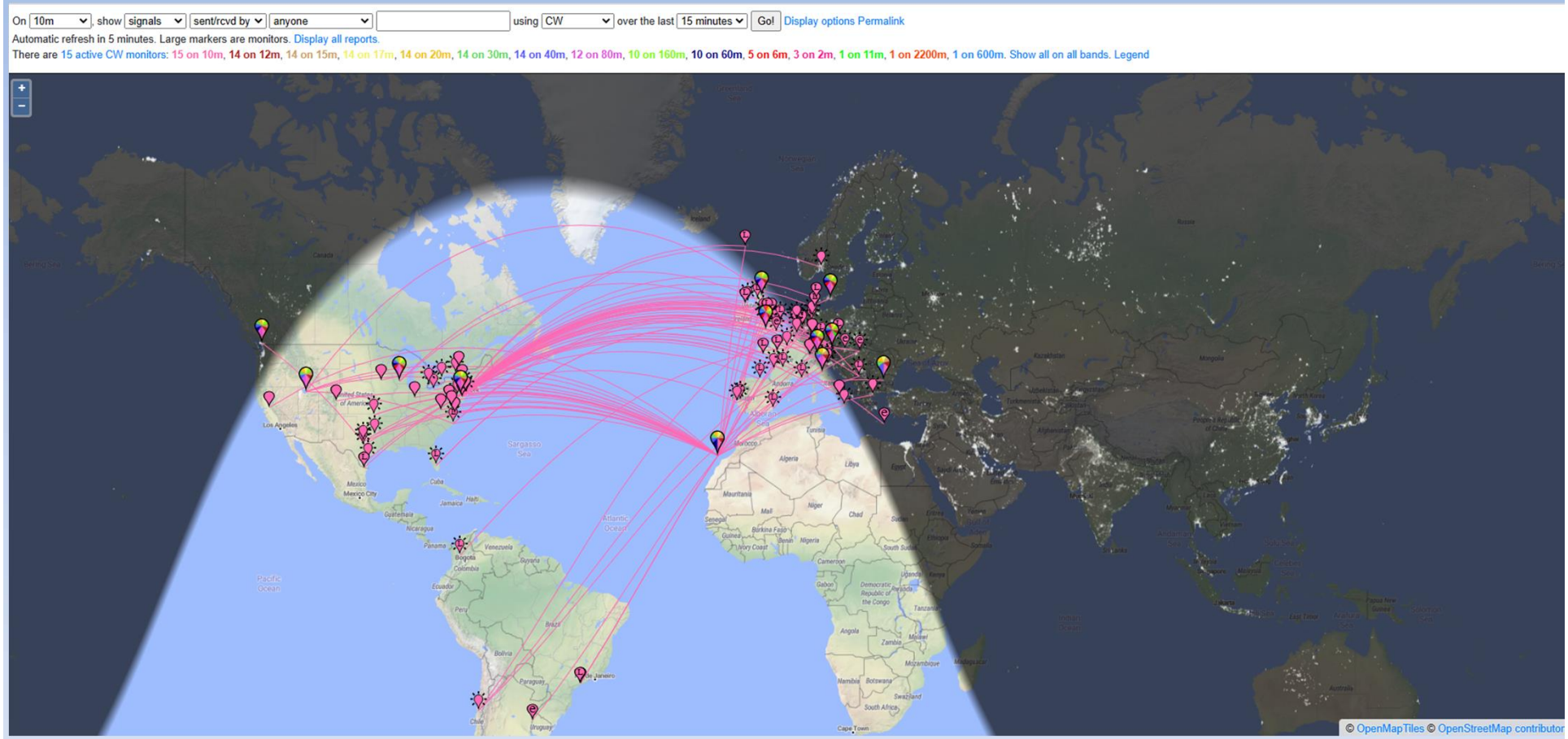


voacap.com/hf



- Vertical axis is probability of success (reliability %)
- Horizontal axis is time in UTC
- Graph lines are color coded by band

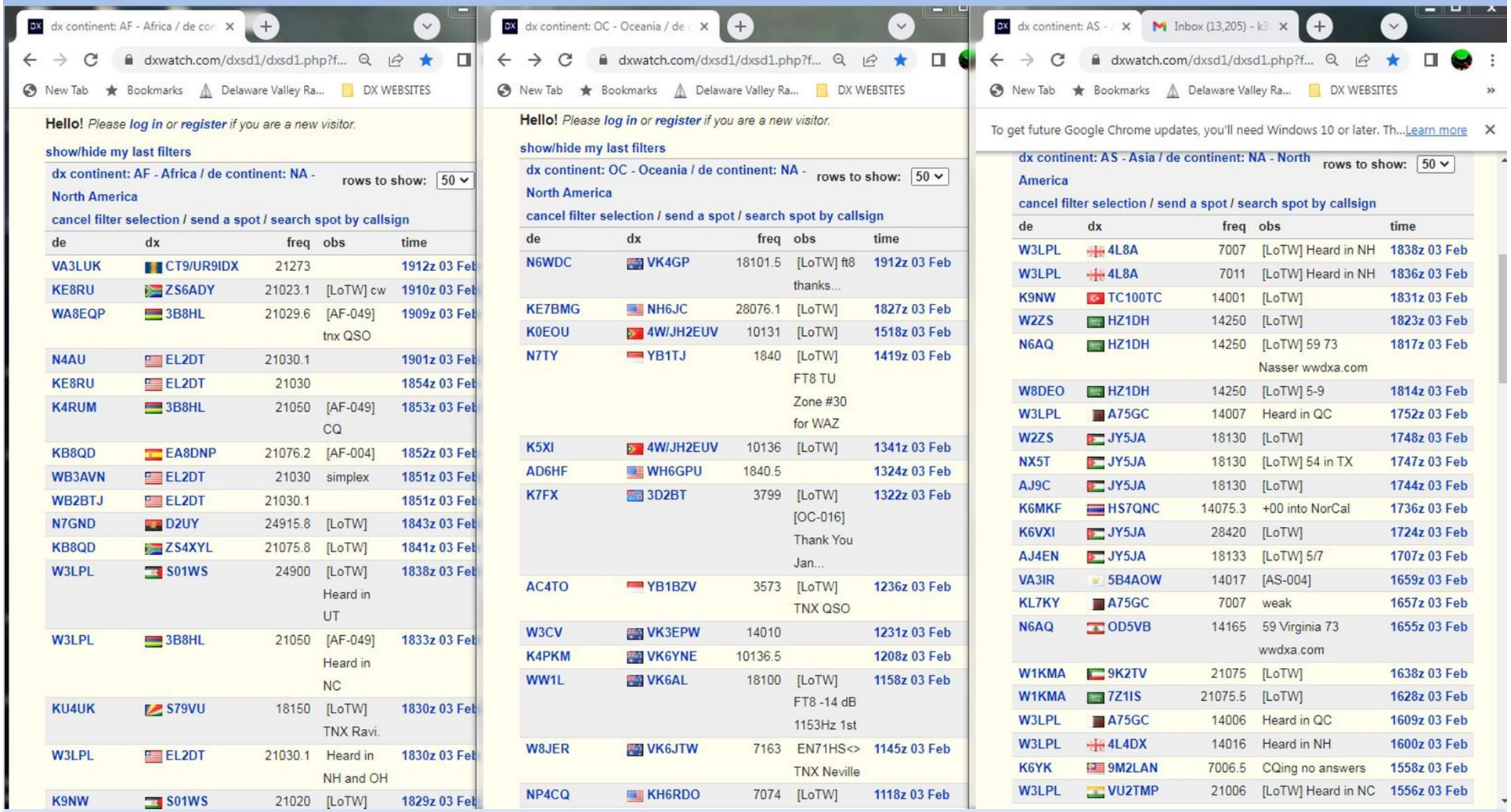
PSK Reporter



Selection is 10m CW sent/rx by anyone in the last 15 minutes

Spotting Network example - dxwatch.com

filtered for Africa, Oceania, Asia spotted by N. American stations



dx continent: AF - Africa / de con

dxwatch.com/dxsd1/dxsd1.php?f...

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show/hide my last filters

dx continent: AF - Africa / de continent: NA - North America — rows to show: 50

cancel filter selection / send a spot / search spot by callsign

de	dx	freq	obs	time
VA3LUK	CT9/UR9IDX	21273		1912z 03 Feb
KE8RU	ZS6ADY	21023.1	[LoTW] cw	1910z 03 Feb
WA8EQP	3B8HL	21029.6	[AF-049] tnx QSO	1909z 03 Feb
N4AU	EL2DT	21030.1		1901z 03 Feb
KE8RU	EL2DT	21030		1854z 03 Feb
K4RUM	3B8HL	21050	[AF-049] CQ	1853z 03 Feb
KB8QD	EA8DNP	21076.2	[AF-004]	1852z 03 Feb
WB3AVN	EL2DT	21030	simplex	1851z 03 Feb
WB2BTJ	EL2DT	21030.1		1851z 03 Feb
N7GND	D2UY	24915.8	[LoTW]	1843z 03 Feb
KB8QD	ZS4XYL	21075.8	[LoTW]	1841z 03 Feb
W3LPL	S01WS	24900	[LoTW] Heard in UT	1838z 03 Feb
W3LPL	3B8HL	21050	[AF-049] Heard in NC	1833z 03 Feb
KU4UK	S79VU	18150	[LoTW] TNX Ravi.	1830z 03 Feb
W3LPL	EL2DT	21030.1	Heard in NH and OH	1830z 03 Feb
K9NW	S01WS	21020	[LoTW]	1829z 03 Feb

dx continent: OC - Oceania / de

dxwatch.com/dxsd1/dxsd1.php?f...

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dx continent: OC - Oceania / de continent: NA - North America — rows to show: 50

cancel filter selection / send a spot / search spot by callsign

de	dx	freq	obs	time
N6WDC	VK4GP	18101.5	[LoTW] ft8 thanks...	1912z 03 Feb
KE7BMG	NH6JC	28076.1	[LoTW]	1827z 03 Feb
K0EOU	4W/JH2EUV	10131	[LoTW]	1518z 03 Feb
N7TY	YB1TJ	1840	[LoTW] FT8 TU Zone #30 for WAZ	1419z 03 Feb
K5XI	4W/JH2EUV	10136	[LoTW]	1341z 03 Feb
AD6HF	WH6GPU	1840.5		1324z 03 Feb
K7FX	3D2BT	3799	[LoTW] [OC-016] Thank You Jan...	1322z 03 Feb
AC4TO	YB1BZV	3573	[LoTW] TNX QSO	1236z 03 Feb
W3CV	VK3EPW	14010		1231z 03 Feb
K4PKM	VK6YNE	10136.5		1208z 03 Feb
WW1L	VK6AL	18100	[LoTW] FT8 -14 dB 1153Hz 1st	1158z 03 Feb
W8JER	VK6JTW	7163	EN71HS<> TNX Neville	1145z 03 Feb
NP4CQ	KH6RDO	7074	[LoTW]	1118z 03 Feb

dx continent: AS -

Inbox (13,205) - k3

dxwatch.com/dxsd1/dxsd1.php?f...

New Tab | Bookmarks | Delaware Valley Ra... | DX WEBSITES

To get future Google Chrome updates, you'll need Windows 10 or later. Th... Learn more

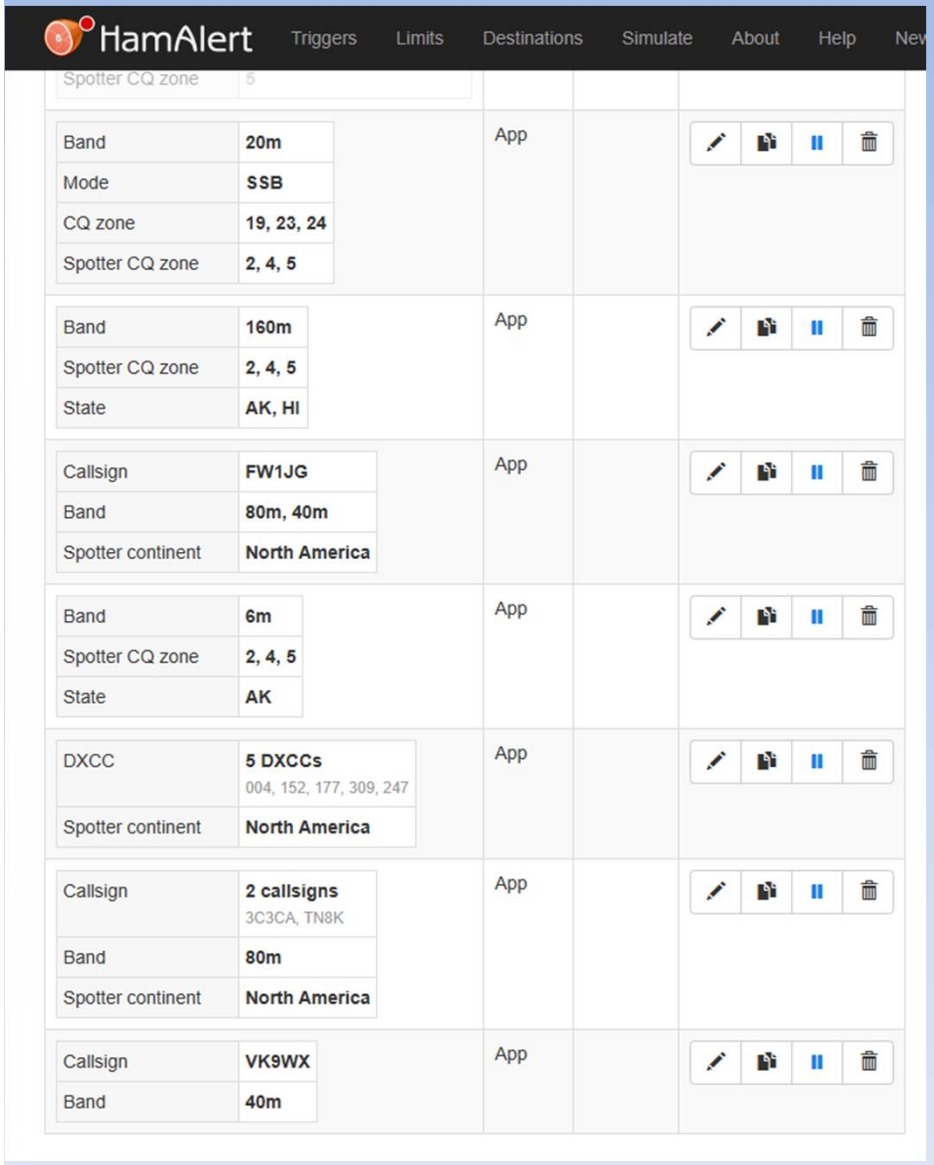
dx continent: AS - Asia / de continent: NA - North America — rows to show: 50

cancel filter selection / send a spot / search spot by callsign

de	dx	freq	obs	time
W3LPL	4L8A	7007	[LoTW] Heard in NH	1838z 03 Feb
W3LPL	4L8A	7011	[LoTW] Heard in NH	1836z 03 Feb
K9NW	TC100TC	14001	[LoTW]	1831z 03 Feb
W2ZS	HZ1DH	14250	[LoTW]	1823z 03 Feb
N6AQ	HZ1DH	14250	[LoTW] 59 73 Nasser wwdxa.com	1817z 03 Feb
W8DEO	HZ1DH	14250	[LoTW] 5-9	1814z 03 Feb
W3LPL	A75GC	14007	Heard in QC	1752z 03 Feb
W2ZS	JY5JA	18130	[LoTW]	1748z 03 Feb
NX5T	JY5JA	18130	[LoTW] 54 in TX	1747z 03 Feb
AJ9C	JY5JA	18130	[LoTW]	1744z 03 Feb
K6MKF	HS7QNC	14075.3	+00 into NorCal	1736z 03 Feb
K6VXI	JY5JA	28420	[LoTW]	1724z 03 Feb
AJ4EN	JY5JA	18133	[LoTW] 5/7	1707z 03 Feb
VA3IR	5B4AOW	14017	[AS-004]	1659z 03 Feb
KL7KY	A75GC	7007	weak	1657z 03 Feb
N6AQ	OD5VB	14165	59 Virginia 73 wwdxa.com	1655z 03 Feb
W1KMA	9K2TV	21075	[LoTW]	1638z 03 Feb
W1KMA	7Z1IS	21075.5	[LoTW]	1628z 03 Feb
W3LPL	A75GC	14006	Heard in QC	1609z 03 Feb
W3LPL	4L4DX	14016	Heard in NH	1600z 03 Feb
K6YK	9M2LAN	7006.5	CQing no answers	1558z 03 Feb
W3LPL	VU2TMP	21006	[LoTW] Heard in NC	1556z 03 Feb

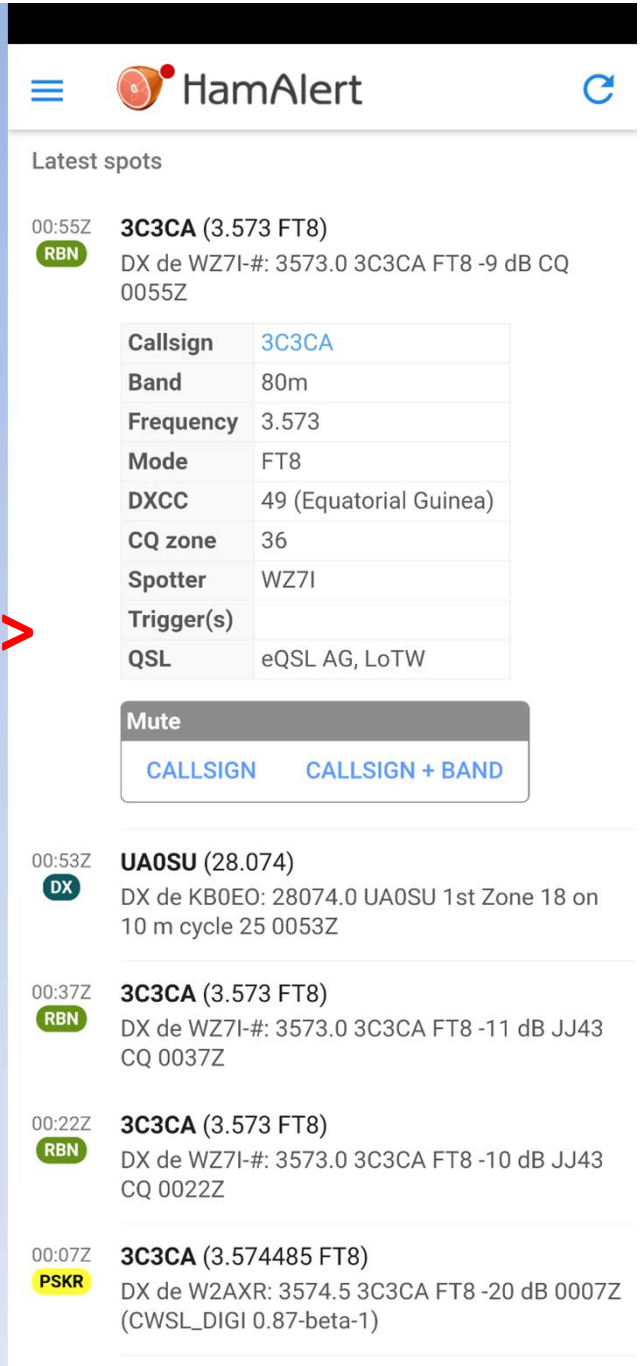
filters are versatile: band(s), modes(s), location, etc

HAM ALERT online app



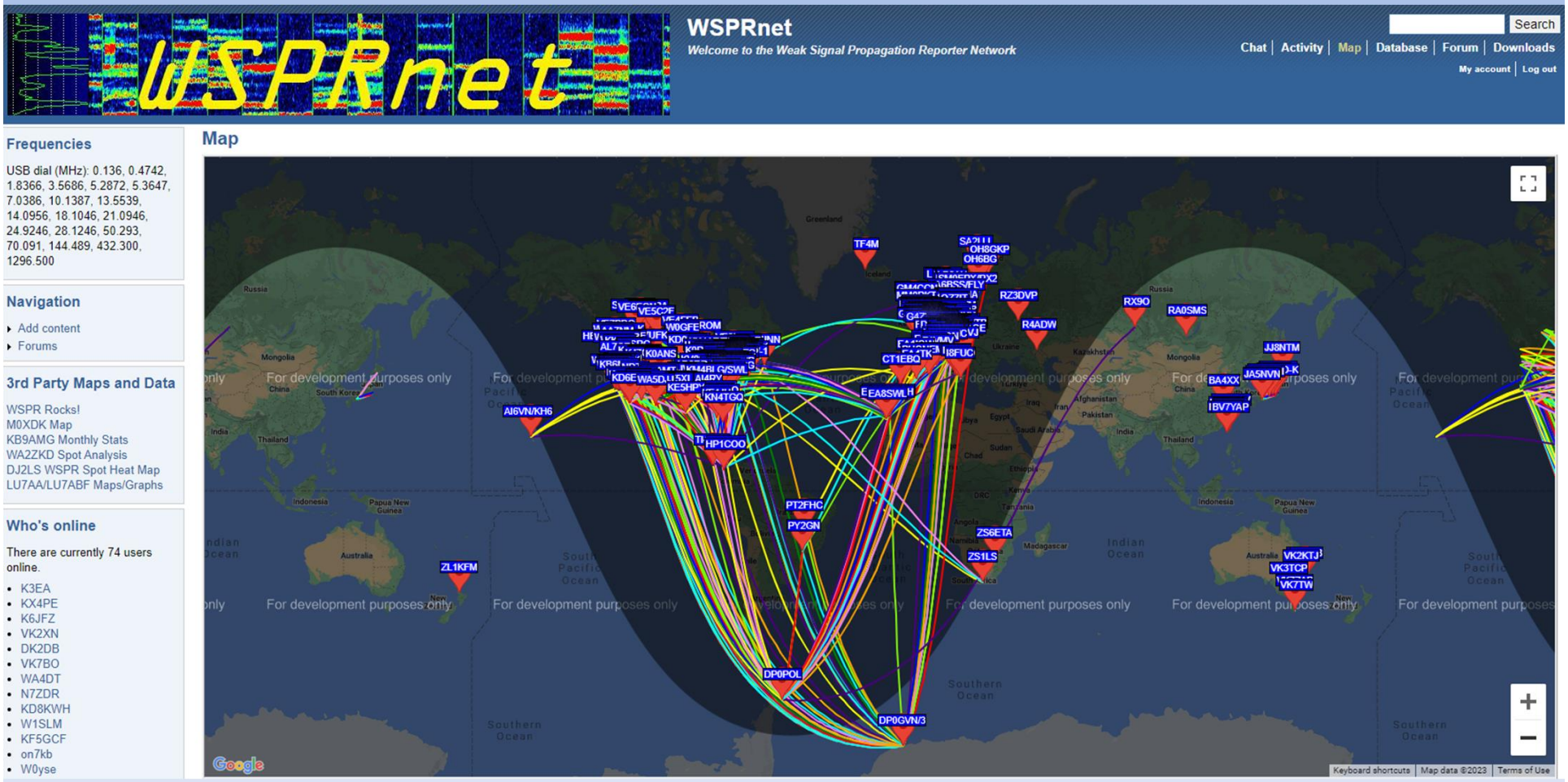
setup menu

smart phone alerts -->



wsprnet.org beacon network

10 minutes of data on 30m



10m, 6m beacons

TEN METER PROPAGATION BEACONS

8 September 2016 13:00 UTC

C=CONTINUOUS I=INTERMITTENT #=CONFIRMED AS ACTIVE OR HEARD
(*)=NCDXF/IARU BCN [SEE END OF LIST]
IARU Region 2 Beacons un-reported past year w/no Email contact will be determined QRT

FREQ.	CALL		OPERATION	LOCATION		OPER NOTES
28.0663	PY4ROE	?	AEROPORTO II, MG,BRAZIL	#	?W,? Uncoordinated Beacon reported 28 May 13
28.115	PY4YYF	C	BELO HORIZONTE, MG BR	#	15W VERTICAL 24/7 7 June 2011
28.145	DL2WB		NR SAARBRUCKEN, GERMANY		2W, VERTICAL QSY from 28.245 11 Aug 12 QRT
28.1475	IWØCPK	C	ROME, ITALY		2W. OMNI new April 2012
28.150	XE1UXT	C	VERACRUZ, MEXICO	#	20W, VERTICAL Expect drop to 5W New 25 May 14
28.150	W2DLL/B2		BUFFALO, NEW YORK		5 W, VERTICAL (*)attended Beacon QRT 31 March 16
28.154	AC7GZ/B	*	Near CHANDLER,ARIZONA	#	2W, VERTICAL (*) When camping-new 7 March 14
28.1595	HP1RIS	C	PANAMA CITY, PANAMA	#	3W, VERTICAL New club beacon 10 Apr 16 (WJ5O)
28.161	VE3SWS	C	CALLANDER ONTARIO, CAN	#	8W, VERTICAL new 16 April 2011 Temp QRT before June 1
28.162	VE7SL	?	MAYNE, BC, CANADA	#	?,? Un-coordinated beacon reported 22 Nov 13
28.163	VA3CBE		KITCHENER, ON, CANADA		5W, OMNI Experimental New 29 Dec 11 QRT 8 April 2012
28.164	VE3DJI	I	BURINGTON, ON, CANADA	#	2W, ATTIC DIPOLE New 7 Apr 13 Temp QRT 23 Oct 15
28.165	DL2WB	*	NR SAARBRUCKEN, GERMANY	#	2W, VERTICAL (* 1 or 2 hours weekends only)
28.165	XE1XRM		SATELLITE CITY, MEXICO		?,? Un-coordinated reported 2 Mar 12 QRT June 14
28.165	XE1KPB		ATZACOALCO, MEXICO		?,? Un-coordinated reported 29 Feb 12 QRT June 14
28.165	FY1FV		CACAO, FRENCH GUIANA		?, ? NEW ? QRT Feb 2012
28.166	F5VIZ	I	LAMBACH, FRANCE	#	5W, VERTICAL NEW 28 March 2014
28.166	XE2O	C	ALLENDE, NL, MEXICO	#	5W, VERTICAL NEW 30 Aug 2010 new call 7 Aug 11
28.1674	LU3DBJ	?	QUILMES,BUENOS AIRES,AR	#	5W, VERTICAL
28.168	VA3KAH	C	KAH-SHE ISLAND, ONTARIO	#	5W, DIPOLE new June 2011 QSY from 28.172 4 May 15
28.169	PY8MM	?	BELEM-PA, PA, BRAZIL	#	?,? Un-coordinated beacon Reported 21 Sept 13
28.169	PY8WW	I	BELEM-PA, PA, BRAZIL	#	5W, VERTICAL New 11 April 2011 new Call 24 Apr 13
28.1697	ZB2TEN	C	COALING ISLAND, GIBRALTAR	#	4W, VERTICAL New 4 April 13
28.170	XE2LVM	?	SALINAS de HIDALGO, MEX	#	?,? un-coordinated beacon reported 22 March 15 (WJ5O)
28.170	XE1KPB	?	Near MEXICO CITY, MEXICO	#	?,? Un-coordinated beacon reported April 14
28.170	VA3XCD	C	CAMDEN EAST, ONTARIO	#	1.5W, OCF DIPOLE Reactivated 10 August 2010K4DYR
28.171	XE1FAS	C	PUEBLA, MEXICO	#	5W, VERTICAL NEW 30 Sept 10
28.1711	IW1AVR	C	CRAVANZANA, ITALY	#	2W, VERTICAL New 3 April 15 (reported WJ5O)
28.172	VA2MO		OTTERBURN PK, QUEBEC, CA		5W, VERTICAL Tentative coordination 1 Aug 15
28.172	VE3DJI		BURLINGTON, ON,CANADA		2W, ATTIC DIPOLE QSY to 28.163 MHz 7 Apr 13
28.173	IZ1EPM	C	CHIVASSO CITY , ITALY	#	20W, VERTICAL (update F6CBZ 12 Aug 13)
28.1731	VA5LF	C	SASKATOON, SASKATCHEWAN	#	5W, VERTICAL New 4 July 2010 Temp QRT 13 Jan 11
28.174	VE1VDM	C	TRURO, NOVA SCOTIA, CA	#	5W, VERTICAL QSY from 28.1835 13 August 2015
28.174	9H1IA		MALTA		7.5W,VERTICAL QRT
28.175	PY2EX	?	SAN PAULO, BRAZIL	#	?,? un-coordinated beacon reported 22 Aug 14 (DL8WX)
28.175	VE3TEN	C	OTTAWA,ONTARIO CANADA	#	10W, GP Activated before 1975
28.176	VE7LAD		BURNBY, BC CANADA		4W, VERTICAL 17 Aug 08 determined QRT before June 14
28.177	IW1AVR	C	CRAVANZANA, ITALY	#	5W, VERTICAL new 26 Mar 15
28.177	HP1RCP	C	PANAMA CITY, PANAMA	#	4W, VERTICAL relocated 17 Jan 2011

50MHz Beacons

50000	GB3BUX	Nr Buxton	IO93BF	25	HTurnstiles	Omni	A1	24	0220	
50000.5	YO7AQF	Pitesti	KN24KV	1	GP	Omni		?	0519	
50000.2	F1ZGD	Toulon	JN23XD	2	GP	Omni	A1	24?	0320	
50001	BV2B	Taipei	PL05SA	10	GP	Omni	A1	Op?	0617	
50001	VE1UW	Pictou NS	FN85QN				A1	24?	0819	
50001	VE9SIX	Keswick Ridge NB	FN21TR				A1	NonOp	0517	
50003	VO1FRR	40k NW St John NL	GN37JS	10	Fold Dip	Omni	A1	IRREG	0819	
50004	A47RB	Oman	LL93FO					24?	0518	
50004	I0JX	Rome	JN61GW	10	5/8 Vert	Omni	cw	Sep-May	1017	
50004.7	I0JX						FT8	Sep-May	0919	
50004.5	AH2G	Mt Barrigada Guam	QK23	50	Horiz Loop	Omni	A1	24	0718	
50005	OZ4BMS		JO75KB				Sync	cw/MGM	0619	
	OZ4BHM?							4min	0619	
50005	EI0SIX	Enniskerry	IO63VE	30	OA50 Horiz	Omni	PI4/cw	24	0719	
							Sync	1/5min	0519	
50006	GB3MCB	St Austell	IO70OJ	40	Dipole	E/W	Sync	cw/PI4	08180120	
50006	GB3NGI	Ballycastle	IO65VB				Sync	cw/PI4	0519	
50006	A71A	Doha	LL55SH	10	Vertical	Omni	A1	IRREG	0819	
50006	IW9GDC	Messina 9	JM78SD		Big Wheel		P14+cw		0719	
50007	EA7URC	Cordoba	IM77RQ				A1	24	0519	
50007	HG1BVB	Horman	JN87FI	20	X-Dip	Omni	F1	24	0220	
50007.8	DU1EV	Metro-Manila	PK04MP	10	1/2 GP	Omni	A1	24	0719	
50008.0	K0GUV	Park Rapids MN	EN26	8			A1	24	1119	
50008	HI8W	Ft Resolue	FK48	5	Halo	Omni	A1	24	0319	
50008	CE1BB							?	0319	
50008.6	J88ARC	St Vincent	FK93				A1	IRREG	0919	
50008.84	VA2ZFN	Mt Kanasuta QC	FN08HE	4	Halo	Omni	A1	24	0919	
50009	4S7B	Colombo	MJ96XV	25	GP	Omni	A1	24	0419	
50009.5	VE3WCC	Nr Ottawa	FN15WC	1	KU4AB Horiz	Omni	A1	24?	0719	
50010	LU7FTF	Castelar SF	FF88XK	5	Dipole		A1	24	0220	
50010	SV9SIX	Iraklio	KM25NH	30	Vert. Dip.	Omni	F1	24	0818	
50010	JA2IGY	Mie	PM84JK	10	5/8 GP	Omni	A1	24	0519	
50010.5	K8MMM	Novelty OH	EN91	90	H.Dip@50ft	N-S	A1	24	0220	
50011.2	ZL1SIX	Bay of Islands	RF64VS	25	2xDips	E-W	A1	24?	1119	
50011.9	OX3SIX	Tasiilaq	HP15EO	100	Dipole			?	0819	
50012	OH1SIX	Ikaalinen	KP11QU		XoverX Dip	Omni	A1	NonOp	1018	
50012	V73SIX	Roi Namur I.	RJ39RJ	40	2xH Loops	Omni	A1	24	0519	
50013	BG6CJR	Ningguo	OM90LO					OP?	0619	
50015.9	XE2K	Mexicali	DM22FP	20	1/2 V@30m	Omni	A1	24	1219	
50016	GB3BAA	Nr Tring	IO91PS	10	Vert Dip	Omni	A1	24	1019	
50016	HP1AFF		FJ09GB	5	Rotary Dip	N/S	A1		0419	
50017	JA6YBR	Miyazaki	PM51RT		Turnstile	Omni	A1	24	0819	

Style of Operating

- Ragchewing
- Contesting
- Dx-ing
- Cadence
- Other Modes

Style of Operating – Rag Chewing

- Rag chewing
  - Majority of extended conversations will be with US or EU Amateurs.
    - Propagation at these distances can be attained almost any time of day..... 40 and 80m at night, 20 m during the day
  - Any mode can be used for rag chewing:
    - SSB / Voice, digital voice
    - CW
    - Digital conversational modes: PSK31, RTTY, JS8Call, etc

Style of Operating - Contesting

- Comprehensive contest info can be found at contestcalendar.com
- Evaluate mode and your capabilities
  - Do I have the equipment, software, etc?
- Understand the scoring system and the contest exchange
- Casual or competitive
  - Keep a log and submit your contacts – N1MM and N3FJP are the most popular logging programs
- As before, choose bands for most success

Style of Operating - DXing

- CW and some digital modes are good weak signal modes
- Where is the band open?
  - Beacons / MUF
  - Spotting Networks – Dxwatch, DX Summit, etc
  - Ham Alert
- Keep track of your contacts/confirmations
  - Logging program – too many to list
    - Popular logging programs tie into spotting networks and keep track of states, countries, grid squares, zones needed for awards
  - LOTW
  - Club Log

Style of Operating - Cadence

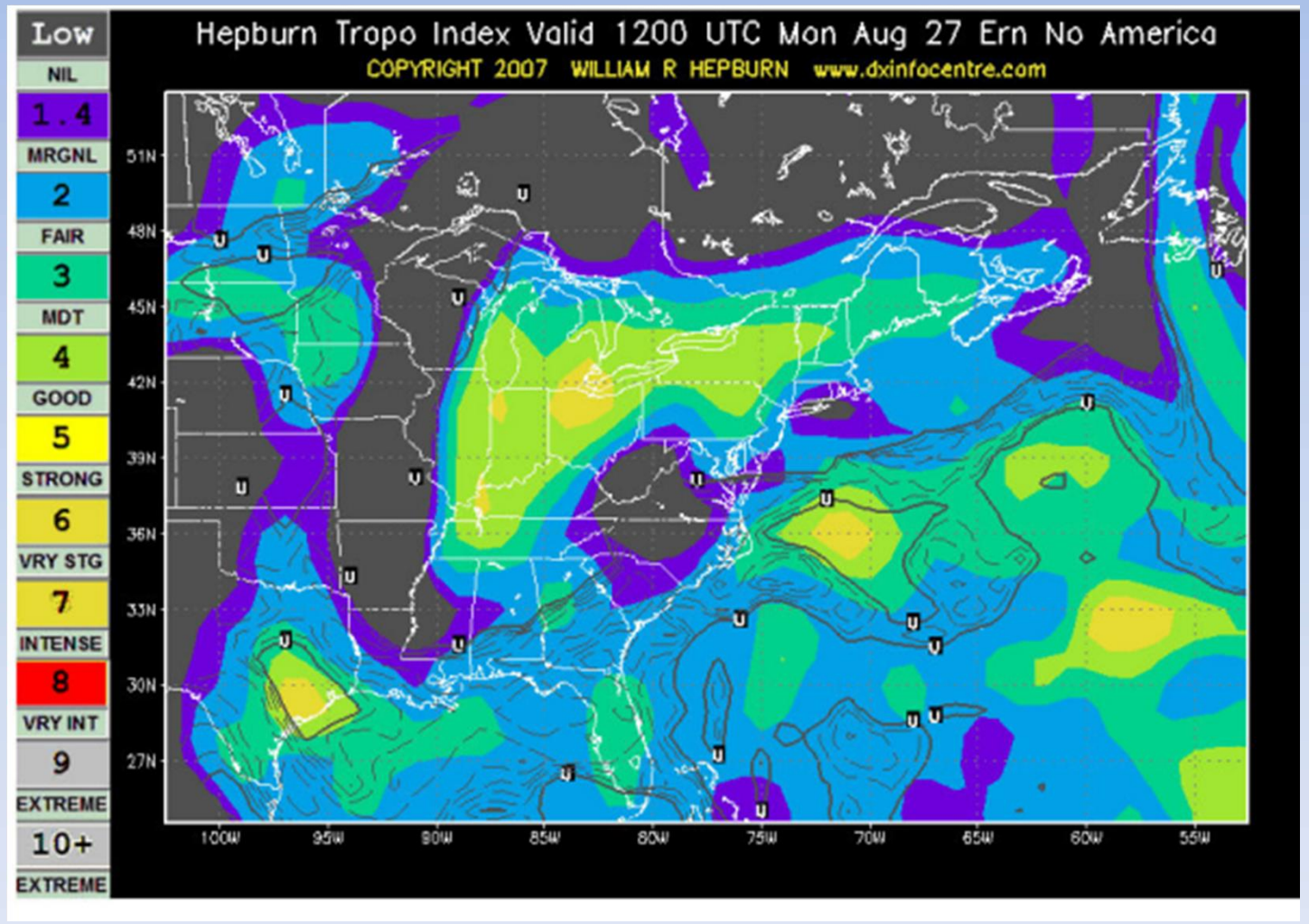
Determine the cadence or rhythm of the intended operation:

- Always listen first
- DX - may have instructions: up 5, by call area, NA only, etc
  - may only want 59 report and 73
  - look up the “DX Code of Conduct”
- Contest – look at rules on line, contestcalendar.com
  - bands/modes
  - hours & limit on hours
  - exchange
  - entry category: single op, multi-op, multi transmitter, QRP, etc
  - multipliers
  - log submittal requirements

Other Types of Operating

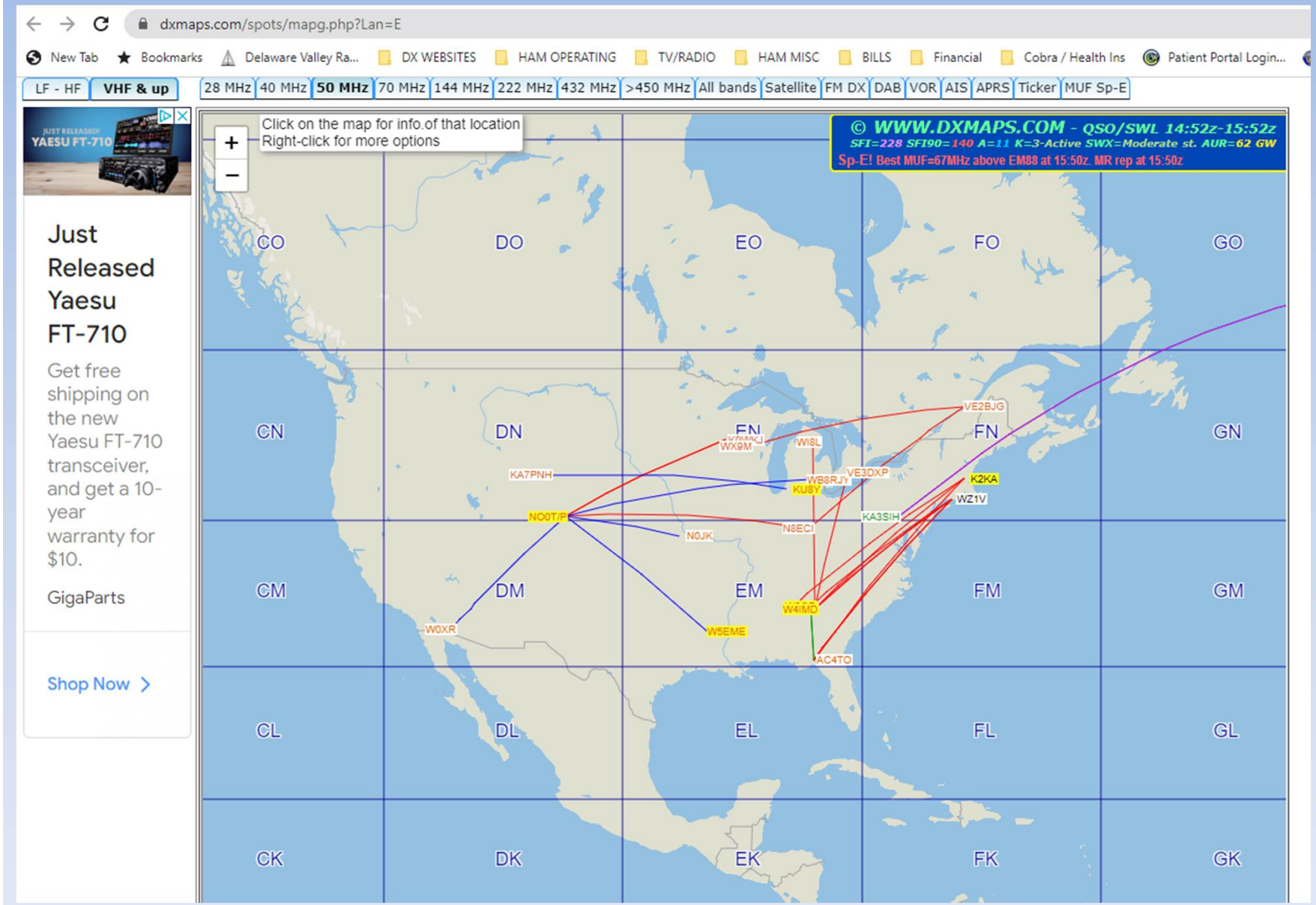
- VHF / UHF
  - Tropospheric ducting Hepburn Maps
    - Learn more at:
      - » https://3fs.net.au/tropospheric-propagation/
      - » https://www.dxinfocentre.com/propagation/tr-modes.htm
  - 6m tropo & sporadic-E propagation, DX Maps
  - Weak signal modes – FT8
- 6m meteor scatter – MSK144
- WSPR beacon, any band

Hepburn Maps for tropospheric VHF/UHF ducting

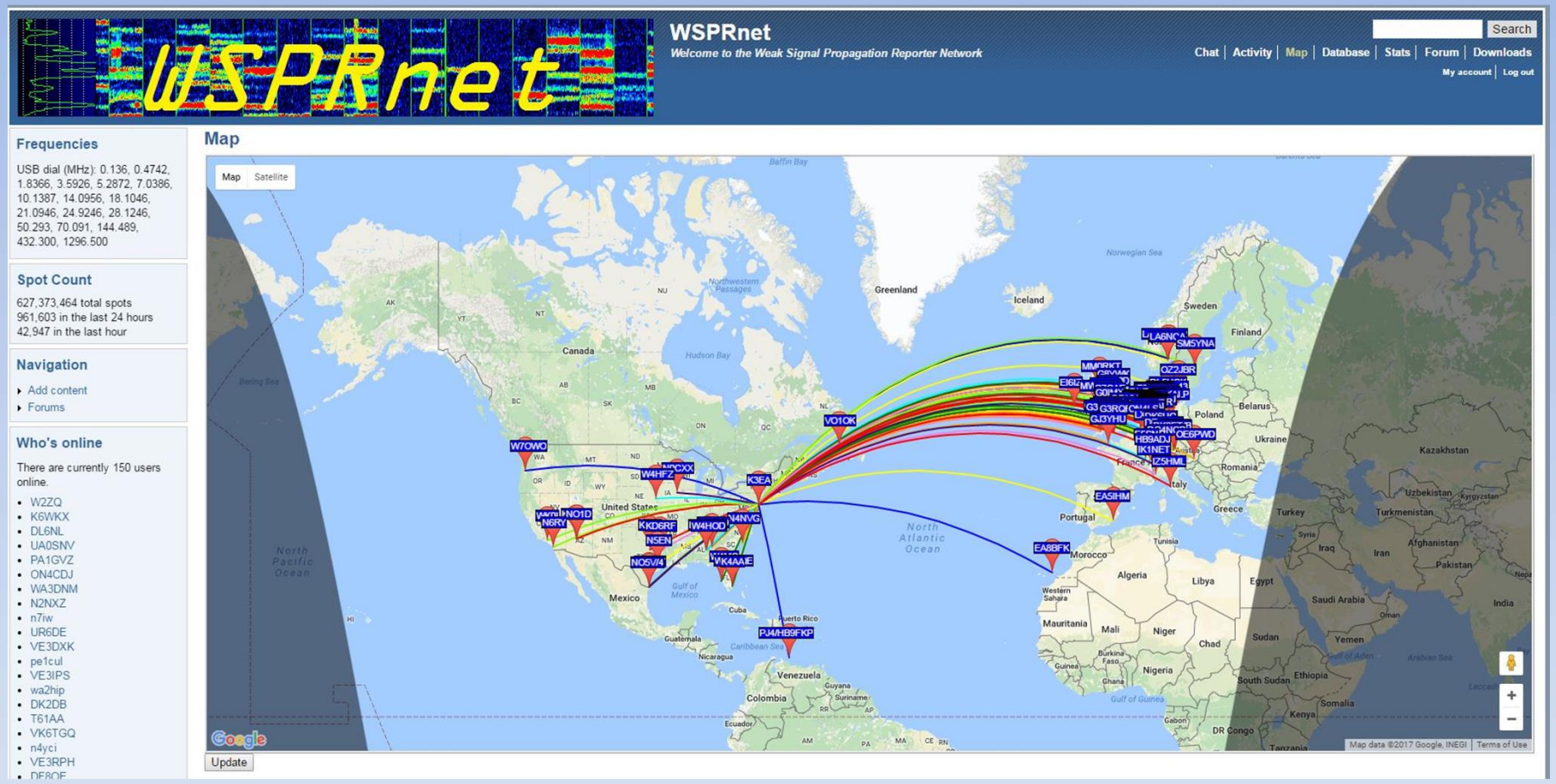


dxmaps.com– alerts and maps

6 meter activity on 1/15/23



K3EA - WSPR beacon



- WSPR is one of the WSJT-X suite of programs
- Most stations are low power, <1W
- 20 meters, one hour of data from Eastern PA

Try a new band, mode, activity, etc:

Band Worked	Mode Worked	Activity (or mode of op)
☐ - 2,200 M (135 kHz)	☐ - SSB	☐ - Repeater QSO (2 M and up)
☐ - 630 M (472 kHz)	☐ - CW	☐ - Repeater QSO (10 or 6 M)
☐ - 160 M (1.8 MHz)	☐ - AM	☐ - Simplex FM QSO (VHF/UHF)
☐ - 80/75 M (3.5/3.8 MHz)	☐ - FM	☐ - SSB QSO (VHF/UHF)
☐ - 60 M (5.3 MHz)	☐ - PSK (31, 63)	☐ - CW Contact
☐ - 40 M (7 MHz)	☐ - FT4	☐ - Contest Contact
☐ - 30 M (10.1 MHz)	☐ - FT8	☐ - Satellite and/or EME Contact
☐ - 20 M (14 MHz)	☐ - Other WSJT- X Modes (FSK441, JT6M, JT65, etc.)	☐ - Fox Hunt (ARDF)
☐ - 17 M (18 MHz)	☐ - JS8call	☐ - WinLink Contact
☐ - 15 M (21 MHz)	☐ - Packet radio (AX25)/APRS	☐ - EchoLink Contact
☐ - 12 M (24.9 MHz)	☐ - SSTV or Fast Scan ATV	☐ - WAS (work all 50 states)
☐ - 10 M (28 MHz)	☐ - Digital FM- DMR, D-Star, Fusion, etc.) including Hotspots	☐ - Work 50 countries
☐ - 6 M (50 MHz)		☐ - Work 100 countries
☐ - 2 M (144 MHz)	☐ - Pactor, Clover, Olivia, Throb, DominoEX, MT63, Thor, AMTOR, etc.	☐ - WAC- Work All Continents
☐ - 1.25 M (222 MHz)		☐ - POTA (Parks On The Air) or SOTA (Summits On The Air) Chaser Contact
☐ - 75 cm (440 MHz)	☐ - FAX or Hellschreiber	
☐ - 33 cm (902 MHz)		☐ - POTA or SOTA Activation
☐ - Higher Microwave Bands		☐ - POTA Activator
		☐ - Work you State QSO party

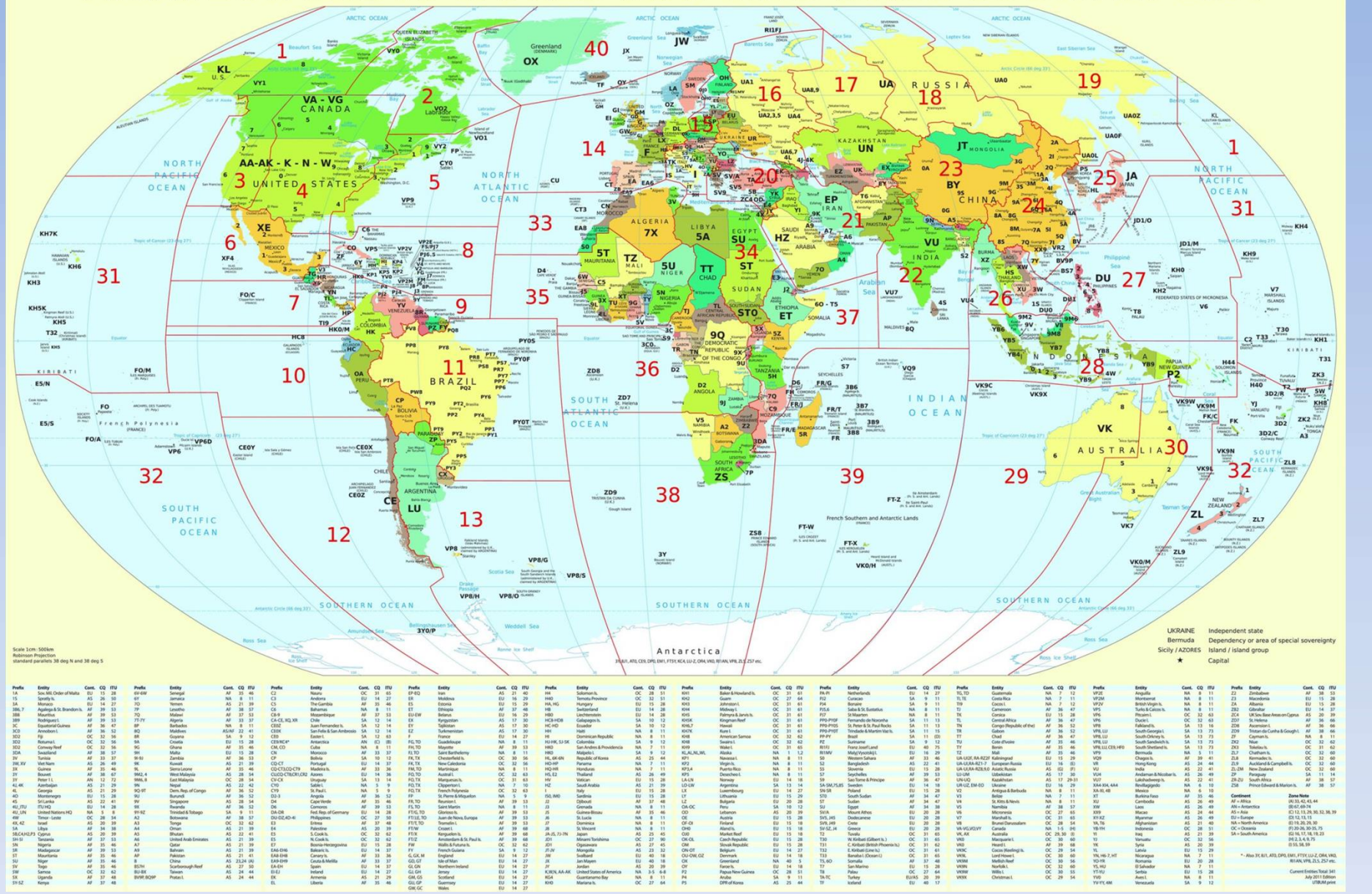
Build or Install
☐ - New VHF/UHF Antenna
☐ - New HF|Antenna
☐ - New Mobile Radio
☐ - New Mobile Antenna
☐ - Computer/Radio Interface
☐ - Club building project

Additional Operating Aids

- DXCC/WAZ wall map
- DXCC/Beam Heading list
- CQ Worked All Zone (WAZ) list
- WAS map
- Grid Square map
- Band plan

These are essential aids at the operating position

AMATEUR RADIO WORLD MAP AND DXCC COUNTRY LIST



CQ Zones are shown in red

DXCC Country List / Beam Headings

Created at - http://ok2pbq.host.sk

Headings centered on FN10ng : Latitude 40.27N Longitude 76.88W

Prefix	Country	Short Path	Long Path	Miles	Lati-tude	Longi-tude	Conti-nent	QTH Locator
1A	Sov. Mil. Order of Malta	57	237	4440	41N	12E	EU	JN61aa
1S	Spratly Is.	350	170	9074	8N	111E	AS	OJ58ma
3A	Monaco	57	237	4148	43N	7E	EU	JN33ma
3B6, 7	Agalega & St. Brandon Is.	67	247	8893	10S	56E	AF	LI80aa
3B8	Mauritius	77	257	9399	20S	57E	AF	LH80ma
3B9	Rodriguez I.	70	250	9659	19S	63E	AF	MH11ma
3C	Equatorial Guinea	92	272	5963	1N	9E	AF	JJ41ma
3C0	Annobon I.	96	276	5842	1S	5E	AF	JI29ma
3D2	Fiji	265	85	7809	18S	178E	OC	RH92aa
3D2	Conway Reef	265	85	8142	21S	174E	OC	RG79aa
3D2	Rotuma I.	271	91	7607	12S	177E	OC	RH88ma
3DA	Swaziland	100	280	8272	26S	31E	AF	KG54ma
3V	Tunisia	63	243	4535	36N	10E	AF	JM56aa
3W, XV	Vietnam	356	176	8968	10N	106E	AS	OK30aa
3X	Guinea	100	280	4451	9N	13W	AF	IJ39ma
3Y	Bouvet	140	320	8049	54S	3E	AF	JD16ma
3Y	Peter I I.	185	5	7520	68S	90W	SA	EC52aa
4J, 4K	Azerbaijan	38	218	5936	40N	49E	AS	LN40ma
4L	Georgia	41	221	5714	41N	44E	AS	LN21aa
4O	Montenegro	53	233	4704	42N	19E	EU	JN92ma
4S	Sri Lanka	31	211	8837	7N	79E	AS	MJ97ma
4U_ITU	ITU HQ	54	234	4008	46N	6E	EU	JN36aa
4U_UN	United Nations HQ	96	276	153	40N	74W	NA	FN30aa
4W	Timor - Leste	323	143	9842	8S	125E	OC	PI22ma
4X, 4Z	Israel	53	233	5871	31N	35E	AS	KM71ma
5A	Libya	65	245	4786	32N	12E	AF	JM62aa
5B, C4, P3	Cyprus	51	231	5595	35N	33E	AS	KM65ma
5H-5I	Tanzania	78	258	7896	7S	39E	AF	KI93ma

WAZ Zone/Country/Entities List

Zone 1. Northwestern Zone of North America: **KL** (Alaska), **VY1** Yukon, **VE8** the Northwest and **VY0** Nunavut Territories west of 102 degrees (Includes the islands of Victoria, Banks, Melville, and Prince Patrick).

Zone 2. Northeastern Zone of North America: **VO2** (Labrador), the portion of **VE2** Quebec north of the 50th parallel, and Nunavut Territories east of 102 degrees (Includes the islands of King Christian, King William. Prince of Wales, Somerset, Bathurst, Devon, Ellesmere, Baffin and the Melville and Boothia Peninsulas, excluding Akimiski Island, Bear Islands and East Pen Island in Hudson Bay).

Zone 3. Western Zone of North America: **VE7** (British Columbia), **W6**, and the **W7** states of Arizona, Idaho, Nevada, Oregon, Utah, and Washington.

Zone 4. Central Zone of North America: **VE3** (Ontario), **VE4** (Manitoba), **VE5** (Saskatchewan), **VE6** (Alberta), **VY0** Akimiski Island, and Bear Islands, and Fox Island and East Pen Island in Hudson Bay. The **W7** states of Montana and Wyoming, **W0, W9, W8** (except West Virginia), **W5**, and the **W4** states of Alabama, Tennessee, and Kentucky.

Zone 5. Eastern Zone of North America: **4U1UN, CY9** (St. Paul Is.), **CY0** (Sable Is.), **FP** (St. Pierre Miquelon), **VE1** (Nova Scotia) and **VE9** (New Brunswick), **VY2** (Prince Edward Is.), **VO1** (Newfoundland) and the portion of **VE2** Quebec south of the 50th parallel. **VP9** (Bermuda), **W1, W2, W3** and the **W4** states of Florida, Georgia, South Carolina, North Carolina, Virginia and the **W8** state of West Virginia.

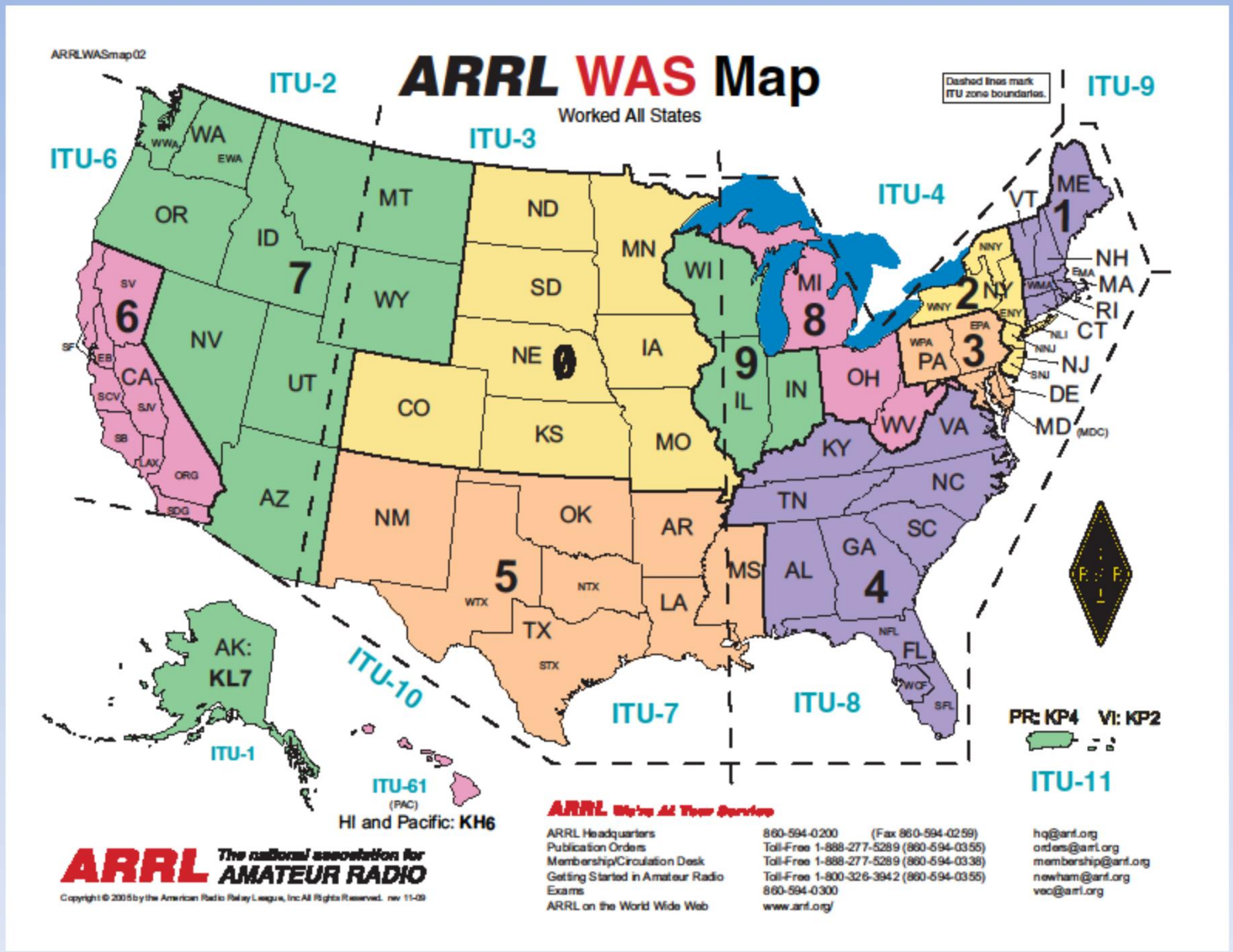
Zone 6. Southern Zone of North America**: XE** (Mexico), **XF4** (Revilla Gigedo).

Zone 7. Central American Zone: **FO** (Clipperton), **HK0** (San Andres Is.), **HP** (Panama), **HR** (Honduras), **TG** (Guatemala), **TI** (Costa Rica), **TI9** (Cocos Is.), **V3** (Belize), **YN** (Nicaragua) and **YS** (El Salvador).

Zone 8. West Indies Zone: **C6** (Bahamas), **CO** (Cuba), **FG** (Guadeloupe), **FJ** (St. Barts), **FM** (Martinique), **FS** (Saint Martin), **HH** (Haiti), **HI** (Dominican Republic), **J3** (Grenada), **J6** (St. Lucia), **J7** (Dominica), **J8** (St. Vincent), **KG4** (Guantanamo Base), **KP1** (Navassa Is.), **KP2** Virgin Islands), **KP4** (Puerto Rico), **KP5** (Navassa Is.), **PJ5** (Eustatius), **PJ6** (Saba), **PJ7** (Sint Maarten). **V2** (Antigua and Barbuda), **V4** (St. Kitts and Nevis), **VP2E** (Anguilla), **VP2M** (Montserrat), **VP2V** (British Virgin Is.), **VP5** (Turks and Caicos Is.), **YV0** (Aves Is.), **ZF** (Cayman Is.), **6Y** (Jamaica), and **8P** (Barbados).

Zone 9. Northern Zone of South America: **FY** (French Guyana), **HK** (Colombia), **HK0** (Malpelo Is.), **PJ2** (Curacao), **PJ4** (Bonaire), **PZ** (Surinam), **YV** (Venezuela), **8R** (Guiana), **P4** (Aruba) and **9Y** (Trinidad and Tobago Is.).

Zone 10. Western Zone of South America: **CP** (Bolivia), **HC** (Ecuador), **HC8** (Galapagos Is.), and **OA** (Peru).


ARRLWASmap02
ARRL WAS Map
Worked All States
Dashed lines mark ITU zone boundaries.
ITU-2
ITU-3
ITU-4
ITU-6
ITU-7
ITU-8
ITU-9
ITU-10
ITU-11
ITU-1
ITU-61
(PAC)
WA
EWA
OR
ID
MT
ND
MN
SD
WY
NV
UT
CO
NE
KS
IA
MO
AZ
NM
OK
AR
TX
LA
MS
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PA
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IN
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MI
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NY
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ME
NH
MA
RI
CT
NJ
DE
MD
(MDC)
FL
AK:
KL7
HI and Pacific: KH6
PR: KP4
VI: KP2
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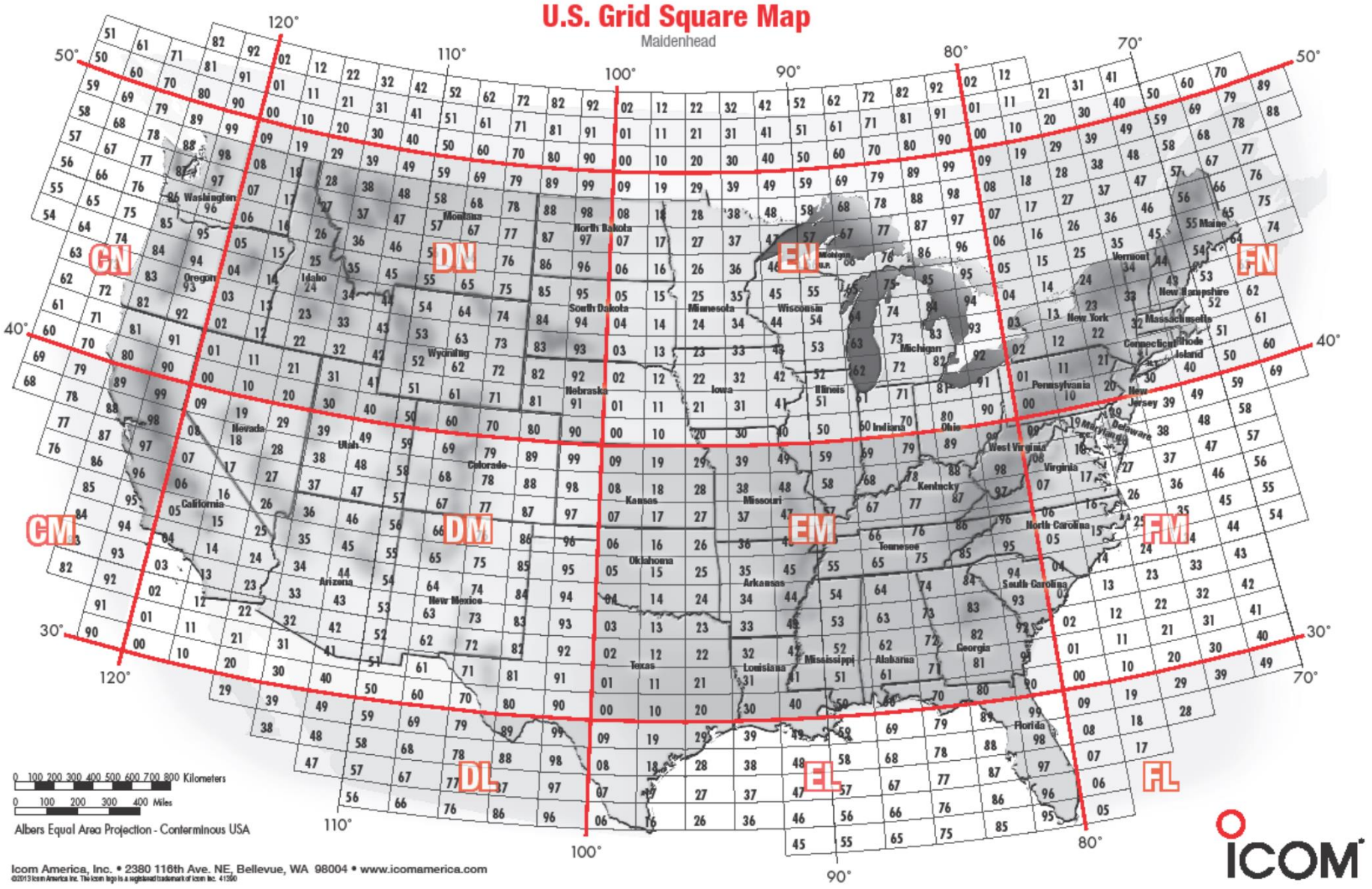
U.S. Grid Square Map
Maidenhead
CN
DN
EN
FN
CM
DM
EM
FM
DL
EL
FL
120°
110°
100°
90°
80°
70°
50°
40°
30°
Washington
Oregon
California
Idaho
Nevada
Montana
Wyoming
Utah
Arizona
Colorado
New Mexico
North Dakota
South Dakota
Nebraska
Kansas
Oklahoma
Texas
Minnesota
Iowa
Missouri
Arkansas
Louisiana
Wisconsin
Illinois
Michigan
Indiana
Ohio
Kentucky
Tennessee
Mississippi
Alabama
Georgia
Florida
South Carolina
North Carolina
Virginia
West Virginia
Pennsylvania
New York
Maine
Vermont
New Hampshire
Massachusetts
Connecticut
Rhode Island
New Jersey
Delaware
0 100 200 300 400 500 600 700 800 Kilometers
0 100 200 300 400 Miles
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ICOM

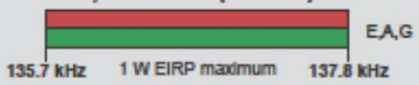
US Amateur Radio Bands

US AMATEUR POWER LIMITS — FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

ARRL The national association for AMATEUR RADIO®

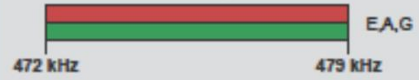
Amateurs wishing to operate on either 2,200 or 630 meters must first register with the Utilities Technology Council online at https://uto.org/pio-database-amateur-notification-process/. You need only register once for each band.

2,200 Meters (135 kHz)



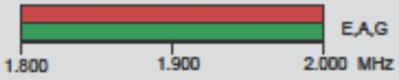
630 Meters (472 kHz)

5 W EIRP maximum, except in Alaska within 496 miles of Russia where the power limit is 1 W EIRP.

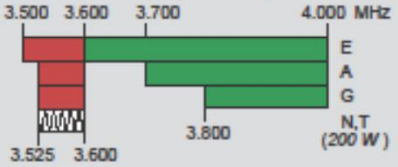


160 Meters (1.8 MHz)

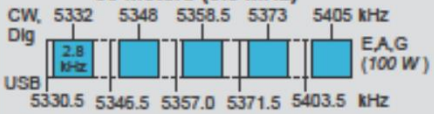
Avoid interference to radiolocation operations from 1.900 to 2.000 MHz



80 Meters (3.5 MHz)

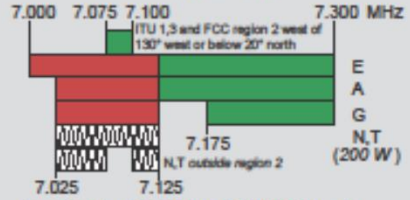


60 Meters (5.3 MHz)



General, Advanced, and Amateur Extra licensees may operate on these five channels on a secondary basis with a maximum effective radiated power (ERP) of 100 W PEP relative to a half-wave dipole. Permitted operating modes include upper sideband voice (USB), CW, RTTY, PSK31 and other digital modes such as PACTOR III. Only one signal at a time is permitted on any channel.

40 Meters (7 MHz)



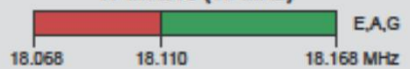
See Sections 97.305(c), 97.307(f)(11) and 97.301(e). These exemptions do not apply to stations in the continental US.

30 Meters (10.1 MHz)

Avoid interference to fixed services outside the US.

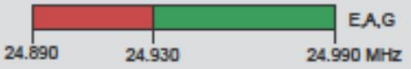
20 Meters (14 MHz)

17 Meters (18 MHz)

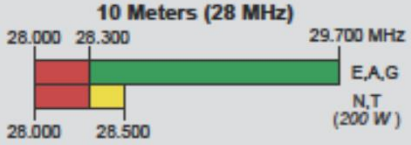


15 Meters (21 MHz)

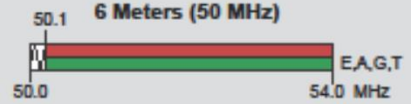
12 Meters (24 MHz)



10 Meters (28 MHz)

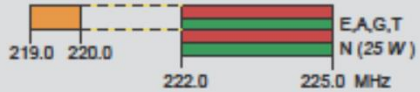


6 Meters (50 MHz)



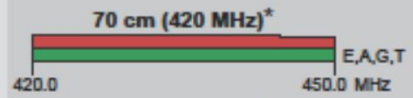
2 Meters (144 MHz)

1.25 Meters (222 MHz)

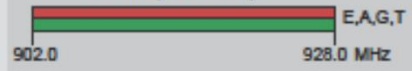


*Geographical and power restrictions may apply to all bands above 420 MHz. See *The ARRL Operating Manual* for information about your area.

70 cm (420 MHz)*



33 cm (902 MHz)*



23 cm (1240 MHz)*

All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz	10.0-10.5 GHz ‡	122.25-123.0 GHz
2390-2450 MHz	24.0-24.25 GHz	134-141 GHz
3300-3500 MHz	47.0-47.2 GHz	241-250 GHz
5650-5925 MHz	76.0-81.0 GHz	All above 275 GHz

‡ No pulse emissions

KEY

Note:
CW operation is permitted throughout all amateur bands.

MCW is authorized above 50.1 MHz, except for 144.0-144.1 and 219-220 MHz.

Test transmissions are authorized above 51 MHz, except for 219-220 MHz

- RTTY and data
- phone and image
- CW only
- SSB phone
- USB phone, CW, RTTY, and data
- Fixed digital message forwarding systems only

E = Amateur Extra
A = Advanced
G = General
T = Technician
N = Novice

See *ARRLWeb* at www.arrl.org for detailed band plans.

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FIN

- Hopefully some of the tips were helpful for your style of operating and will increase your FUN!
- Takeaways
  - Determine your operating goals / style
  - Optimize your station equipment and performance
  - Understand propagation and how it affects your goals
  - Use online tools to:
    - Gather information
    - Understand band conditions and predictions

Operate W2ZQ – a variety of modes and operating styles can be utilized with an already optimized station