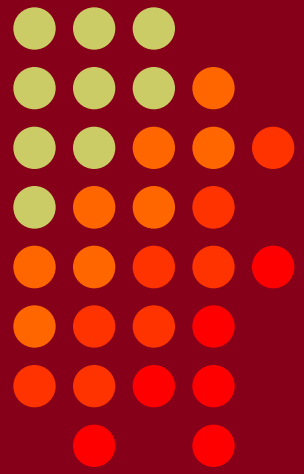
CW and RTTY Skimmer and the Reverse Beacon Network

Presented by N6TV

n6tv@arrl.net

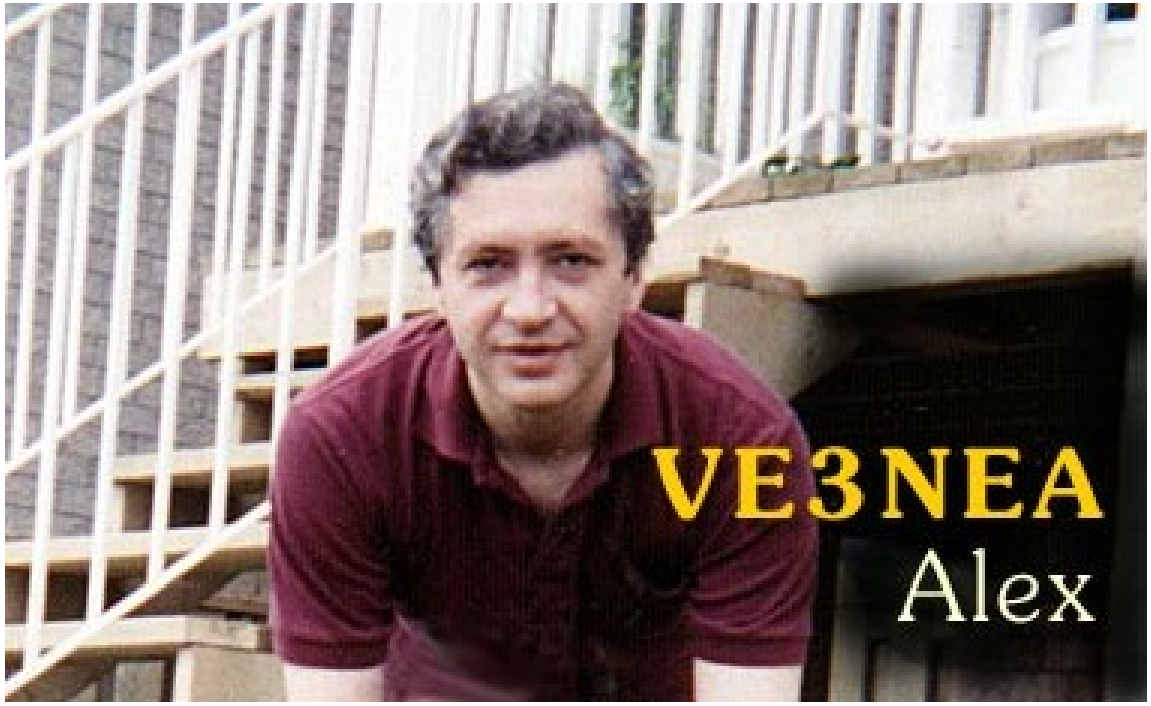


Overview

- What is CW Skimmer and RTTY Skimmer?
- What is the Reverse Beacon Network?
- How does it work?
- What can the RBN do for *me*?
- How can I use it?
- How can I help?
- What's new?

It all starts with one developer

- Alex Shovkoplyas, VE3NEA
  (b. 1965, ex-UR5EMI, in Canada since 1998)



What is CW Skimmer?

1. Hardware: PC + Software Defined Radio (SDR)

SDR Antenna

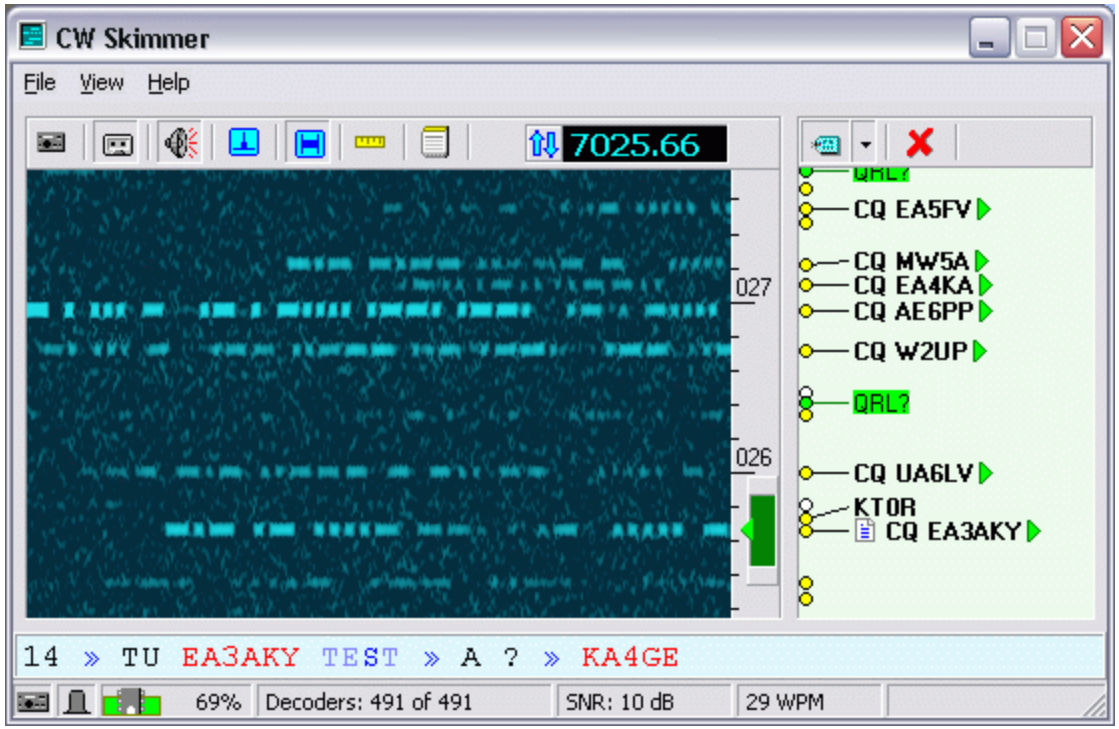
2. Wideband RX Antenna, 1.8-30 MHz

InLogis (formerly Pixel Loop) RF Pro-1B:

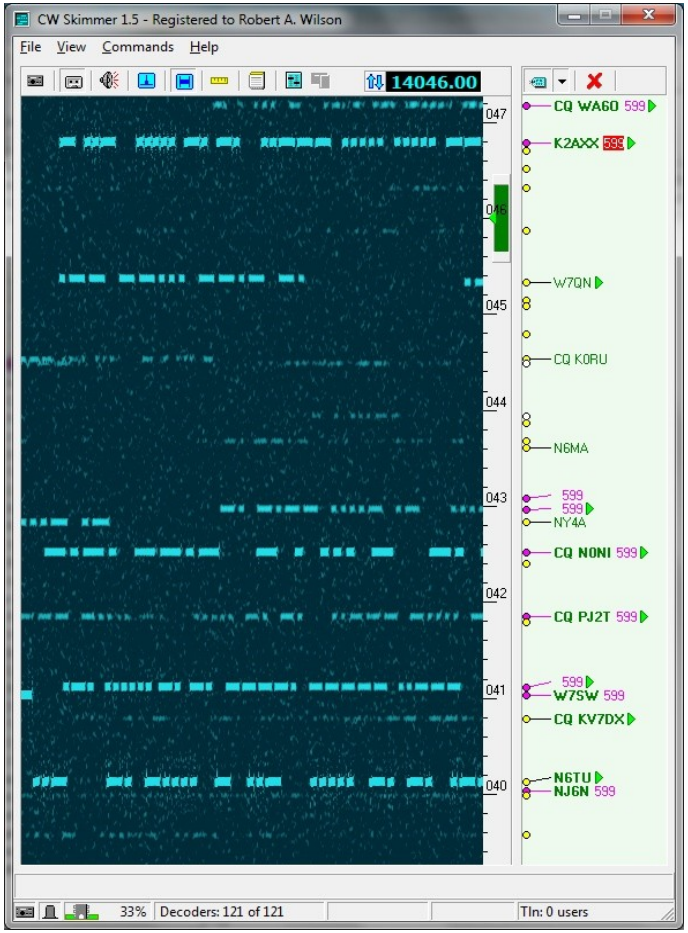
DX Engineering Active Horizontal: ARAH3-1P:

Software

3. CW (or RTTY) Skimmer *or* Skimmer Server

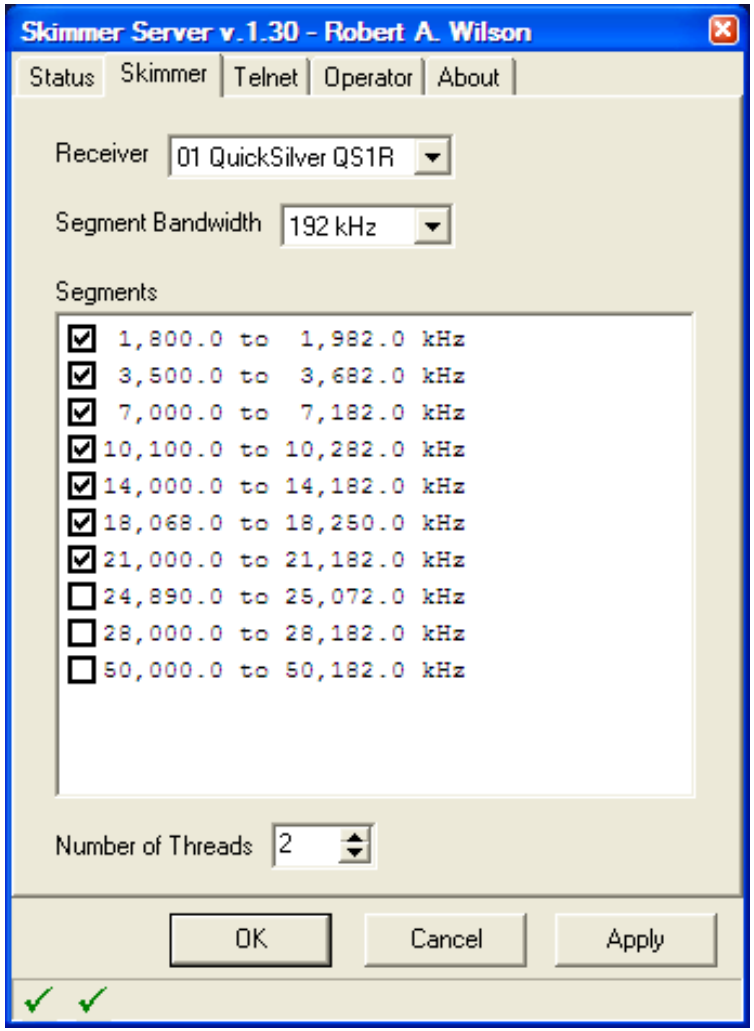


CW Skimmer by VE3NEA



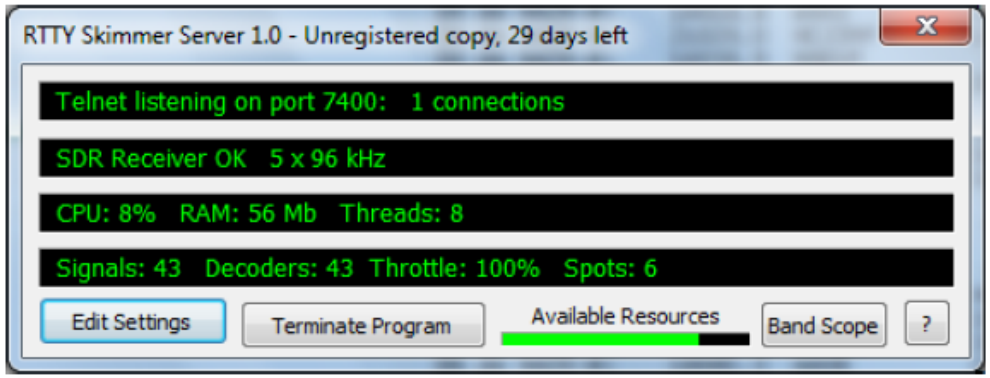
- Works with many SDRs
- Decodes *multiple* CW signals in real time
- Can monitor *entire* CW band
- Waterfall Display
- Band Scope
- Uses MASTER.DTA
- Telnet Server (emulates a DX Cluster)

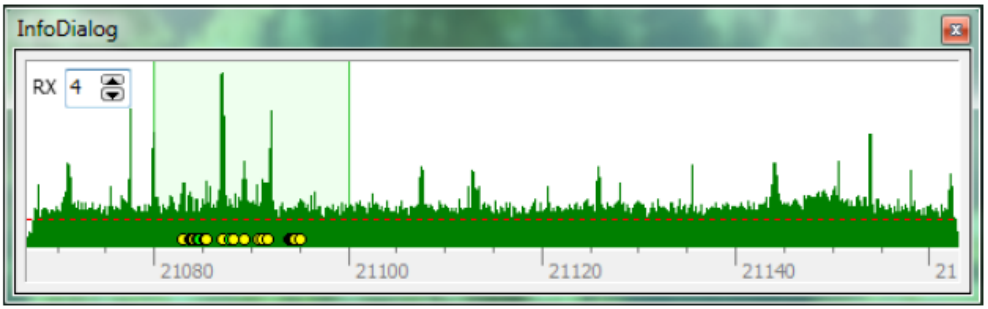
Skimmer Server by VE3NEA



- Natively supports *only* the QS1R SDR
- Decodes multiple CW signals in real time
- Monitors *multiple bands* with single SDR
- *No* Waterfall Display
- *No* Band Scope
- *No* MASTER.DTA
- Telnet Server

RTTY Skimmer Server (new)





- Natively supports only the QS1R SDR
- Decodes multiple RTTY signals in real time
- Monitors *multiple bands* with single SDR
- Limited Band Scope
- Can use MASTER.DTA
- Telnet Server

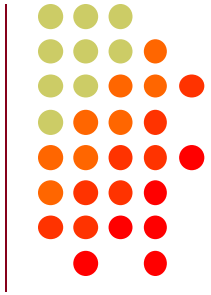
Telnet server (localhost port 7300)

- Emulates a DX Cluster Node

```
DX de N6TV-#:     14058.7  WR7HE          24 dB  31 WPM  CQ          2350
DX de N6TV-#:     14029.6  NM7D           29 dB  25 WPM  CQ          2350
DX de N6TV-#:     14059.5  YW4D           35 dB  31 WPM  CQ          2350
DX de N6TV-#:     14022.6  J39BS          11 dB  25 WPM  CQ          2350
DX de N6TV-#:     14066.8  NF6A           38 dB  30 WPM  CQ          2350
DX de N6TV-#:     14054.4  N5UM           26 dB  28 WPM  CQ          2350
DX de N6TV-#:     14021.2  NN5J           35 dB  31 WPM  CQ          2350
DX de N6TV-#:     14061.4  WX5S           12 dB  28 WPM  CQ          2350
DX de N6TV-#:     14064.2  WQ5L           15 dB  28 WPM  CQ          2350
DX de N6TV-#:     14032.2  VE7XF          18 dB  27 WPM              2350
DX de N6TV-#:     14042.9  NT5C           45 dB  31 WPM              2350
DX de N6TV-#:     14032.2  VE7XF          18 dB  27 WPM  CQ          2350
DX de N6TV-#:     14039.2  EA3FP          15 dB  31 WPM  CQ          2350
DX de N6TV-#:     14052.5  W0YR           20 dB  28 WPM  CQ          2350
DX de N6TV-#:     14022.9  AB7E           32 dB  25 WPM  CQ          2350
DX de N6TV-#:     14028.4  WH6R            7 dB  29 WPM              2350
DX de N6TV-#:     14065.6  KH7B           25 dB  29 WPM  CQ          2350
To ALL de SKIMMER <0952Z> : Clicked on "VE7XF" at 14032.2
DX de N6TV-#:     14069.6  KF6T           13 dB  28 WPM  CQ          2350
DX de N6TV-#:     14069.1  NK0M           25 dB  28 WPM  CQ          2350
To ALL de SKIMMER <0952Z> : Clicked on "" at 14031.4
DX de N6TV-#:     14035.5  KF8GE          12 dB  26 WPM              2350
DX de N6TV-#:     14028.4  WH6R            7 dB  29 WPM  CQ          2350
DX de N6TV-#:     14036.1  NZ1U           16 dB  28 WPM  CQ          2350
DX de N6TV-#:     14062.7  N4QS           11 dB  29 WPM  CQ          2350
DX de N6TV-#:     14045.1  YV1FM          20 dB  32 WPM  CQ          2350
DX de N6TV-#:     14059.6  YW4D           35 dB  31 WPM              2350
```

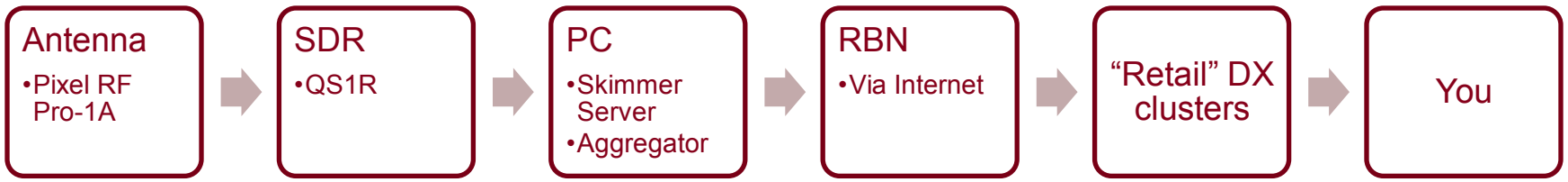
Reports Signal to Noise ratio, CW Speed, CQers

What is the Reverse Beacon Network (RBN)?



- Uses *any* CW or RTTY signal as a beacon
- Multiple Skimmers world-wide record signal strength (S/N ratio in dB) and CW speed (WPM)
- A free “Aggregator” program forwards Skimmer spots to a central server
- Central server distributes spots via web page and public telnet servers
- You don’t need to have an SDR to use it

How do spots get to you?

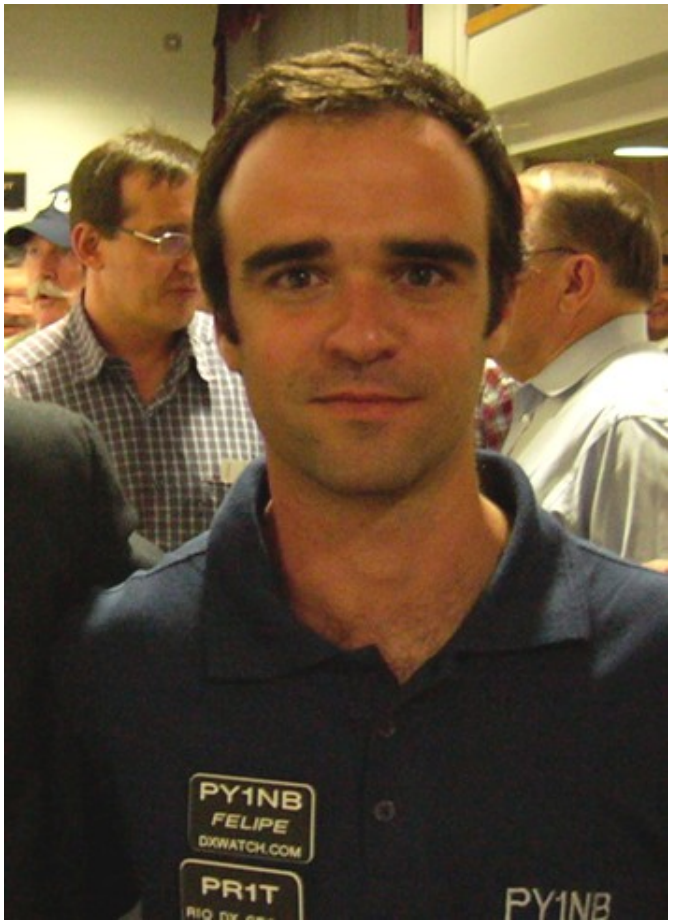


Acknowledgements

- RBN web site and first aggregator originated by PY1NB (similar to his other web site, www.dxwatch.com). Felipe pays all the bills.
- Lots of code by W3OA (aggregator), F5VIH (Spots analysis tool)
- CW Skimmer evangelized and tested by N4ZR (also publishes RBN blog) – "RBN Chief Evangelist"
- Telnet server support by K5TR, W2QO, KM3T

Felipe Ceglia, PY1NB

- Created and maintains the Reverse Beacon Network
- Hosts dxwatch.com and reversebeacon.net



Dick Williams, W3OA

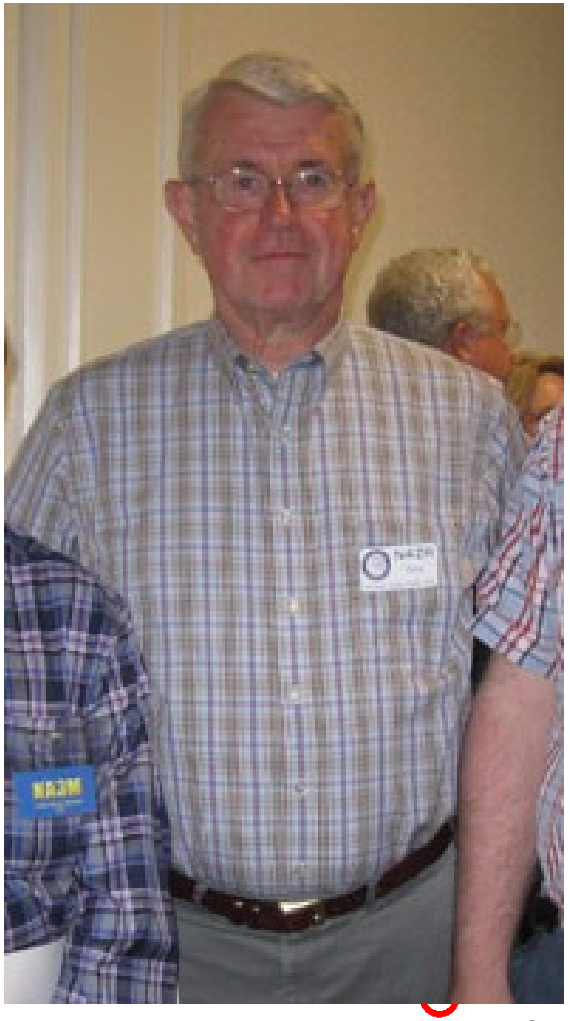
- Created the newest RBN Aggregator software; now adding enhancements.

Nick Sinanis, F5VIH

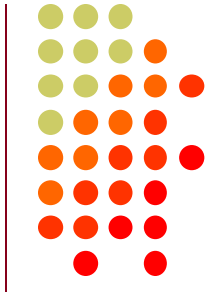
- Wrote the RBN Spots Analysis Tool

Pete Smith, N4ZR

- RBN Chief Evangelist
- Skimmertalk Reflector: http://dayton.contesting.com/mailman/listinfo/skimmertalk
- Yahoo Group: RBN-OPS https://groups.yahoo.com/neo/groups/RBN-OPS/info (130+ members)



What can the RBN do for *me*?

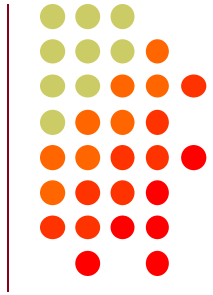


- It can improve your score
  - Fills spots in band map (SOA, Multi-op)
  - Spots *you* (very often, *if* you call CQ *properly*)
- Entering a contest?
  - Before: Check antenna F/B, signal strength
  - During: See where you are being heard, view skimmer-generated propagation maps
  - After: Compare signal strength with the competition

How can I use RBN to improve my score?

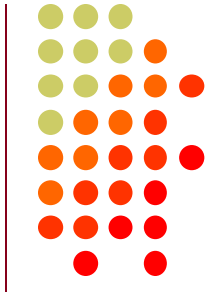
- Make sure the Skimmers find and spot *you*
- Access RBN via your favorite DX Cluster, for CW and RTTY contests (when allowed)
- RBN will post far more spots than DXers
  - With smaller pileups, less competition
- RBN quickly fills the band map in your logging software
- RBN helps locate clear spots to call CQ (between stations that you may not hear)

How can I use RBN to improve my score (cont'd):



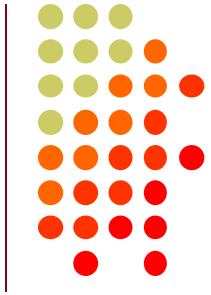
- The RBN reveals band openings, shows where *you* are being heard
  - At K3LR, sunrise on 15m: "Spotted by S50ARX-#"
  - First EU answered our 15m CQs 25 minutes later

How do I CQ “properly”?



- Send *everything* at the *same consistent speed*
  - *Never* use >/< or +++/--- to change speed in messages
- Call CQ or TEST and send your call twice
  - CQ N6TV N6TV
  - TEST N6TV N6TV
  - CQ N6TV N6TV TEST
- Use proper spacing (let computer send)
  - Don’t send with paddles and rusheverythingtogether
- Change your freq. *slightly* to get spotted again

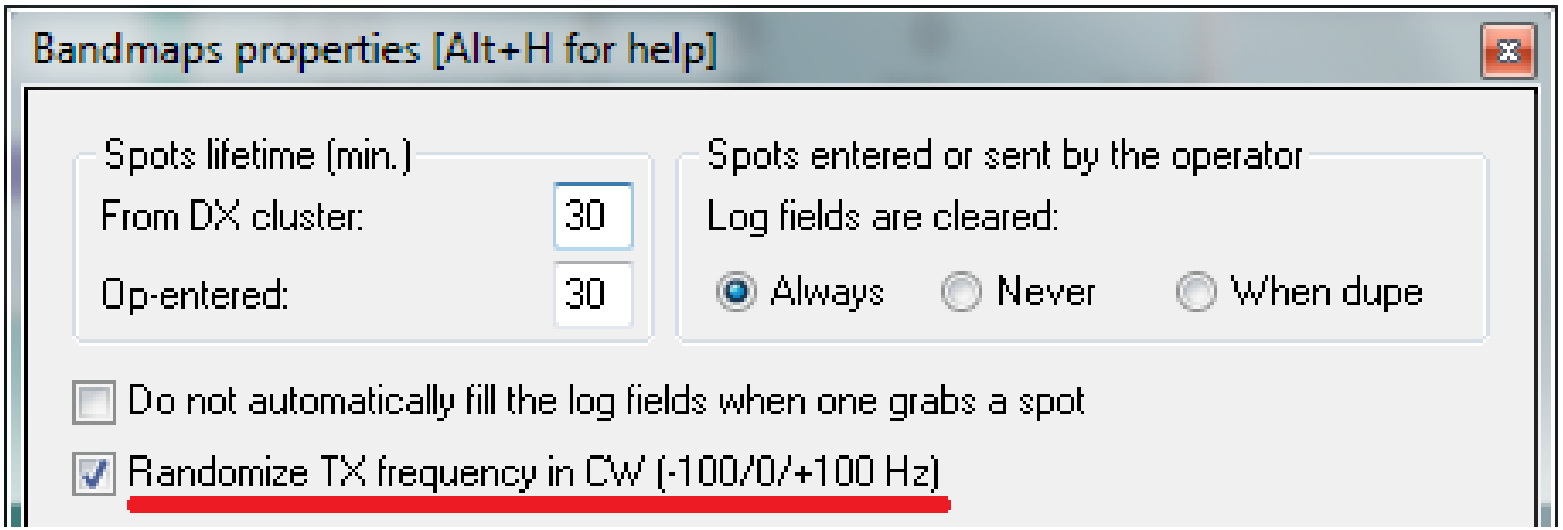
What counts as “CQ”?



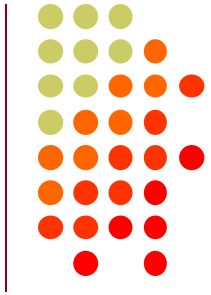
- Originally just: “CQ”, “TEST”, and “QRZ”
- VE3NEA Added: “FD”, “SS”, “NA” and “UP”
- Examples:
  - P5DX P5DX UP
  - SS N6TV N6TV
  - NA N6TV N6TV
  - FD N6TV N6TV FD
- Short calls like “W1F” should always be sent twice to help Skimmer identify it quickly

How to improve your chances in a Skimmer-generated pileup

- Use XIT or the “randomize TX” feature of your logging program to call a bit off frequency.

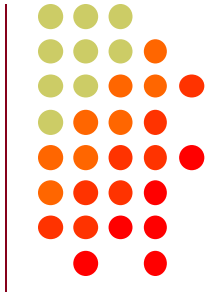


How do I use the RBN to Check My Antennas?



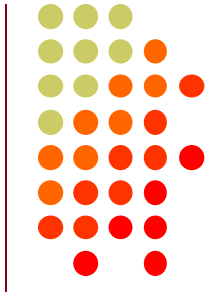
- To test performance, just call CQ on CW, check RBN web site (turn beam, repeat)
- Use RBN web site's "Spots Analysis Tool" to compare your signal to the competition
- Download raw data files for deeper analysis
  - Every RBN spot posted since February, *2009* is archived on the RBN web site

Accessing the RBN (SOA, Multi)



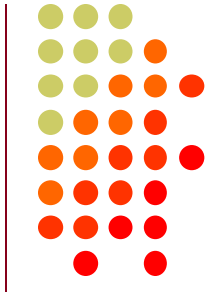
1. Many DX clusters combine RBN and human spots using AR-Cluster V6 (see www.dxcluster.info for address listing).
   - Some ARC V6 clusters offer CT1BOH spot quality filters (flags busts, uniques)
2. dxc.ve7cc.net port 23
   CC Cluster software – removes many bad spots (uniques) and dupes

Filtering Spots (old way)



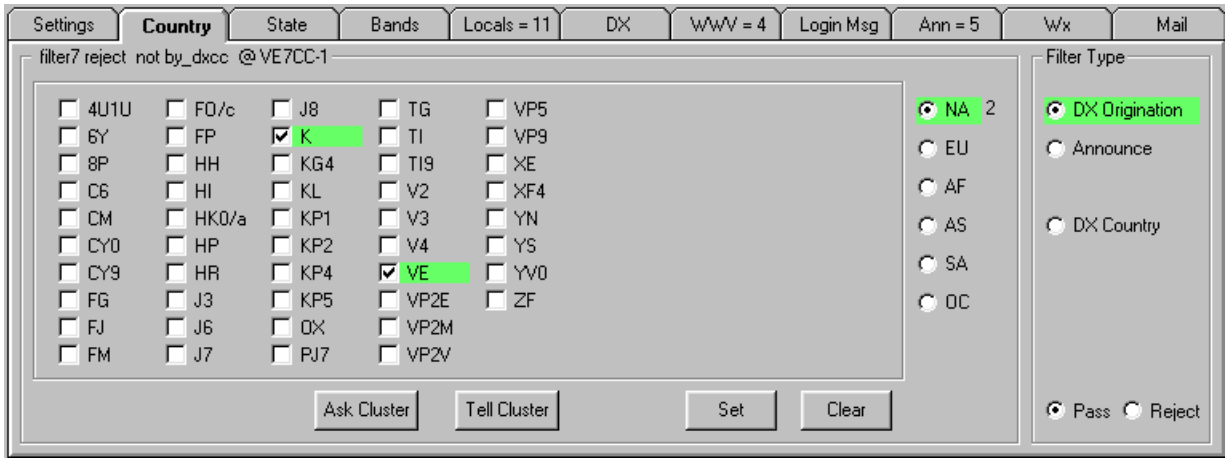
- DXSpider
  - `accept/spots by_zone 1,3,4,6,7,31 and not by WZ7I or call N6TV`
  - http://www.dxcluster.org/main/filtering_en.html#toc1
- ARCluster V6
  - `set dx filter call=N6TV or (unique>1 and (spotterstate=CA or spotterstate=NV or spotterstate=UT))`
  - http://www.n8noe.us/ARC.html

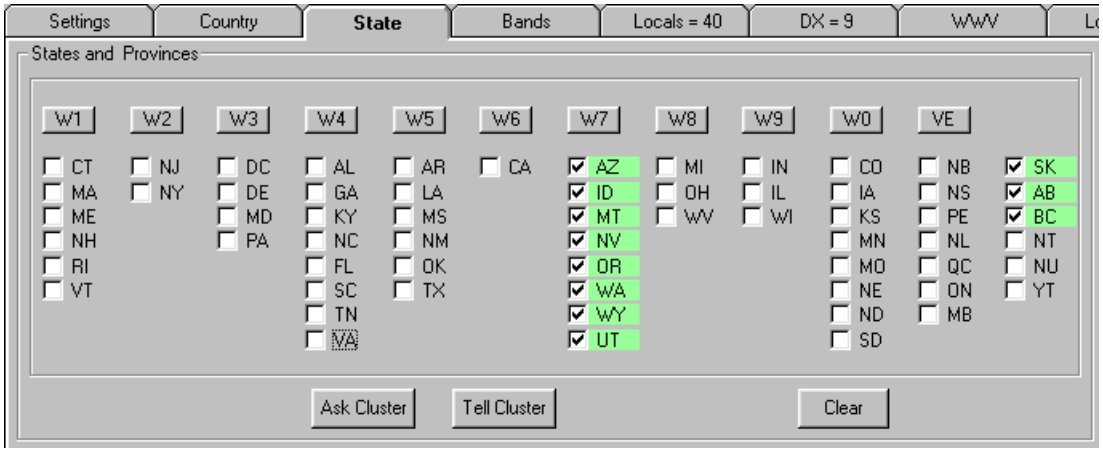
Filtering Spots (new way)



- Use CC User software by VE7CC to log in to dxc.ve7cc.net port 23
- CC User sets filters with a full-feature, Graphical User Interface (GUI)
- CC Cluster nodes *automatically* reject "unique" (busted) spots, eliminates dupes
- New AR-Cluster Client by AB5K
- Updated Tutorial:
  - http://reversebeacon.blogspot.com/2013/12/a-new-tutorial-on-using-rbn.html

CC User Filter Dialogs





AR-Cluster Client by AB5K

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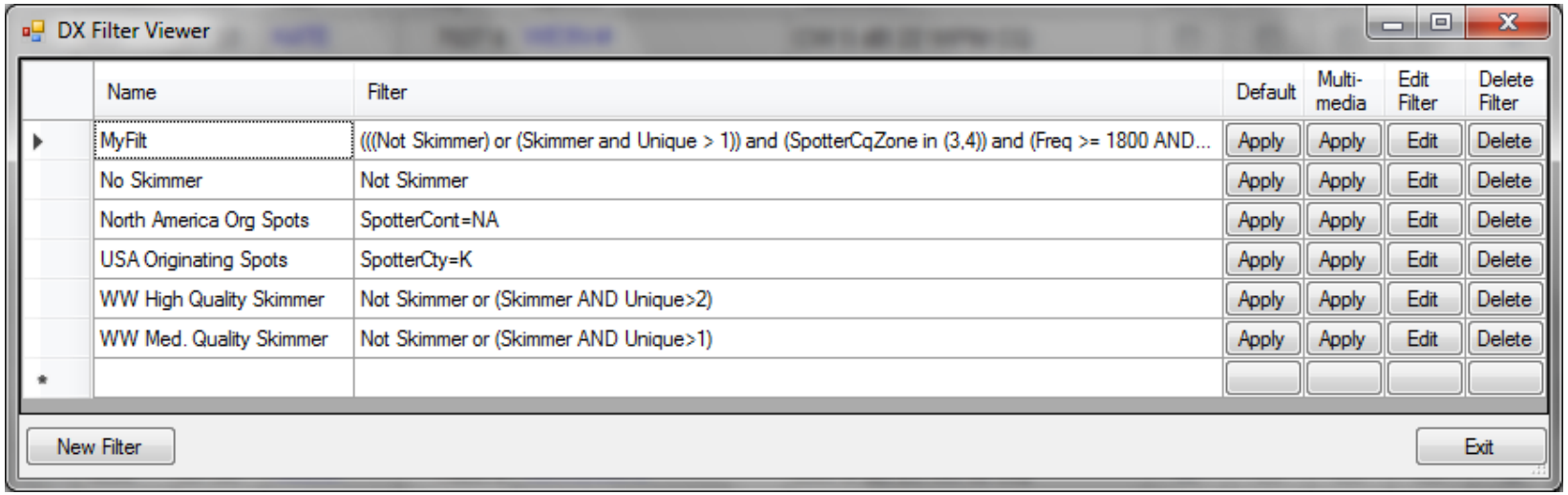
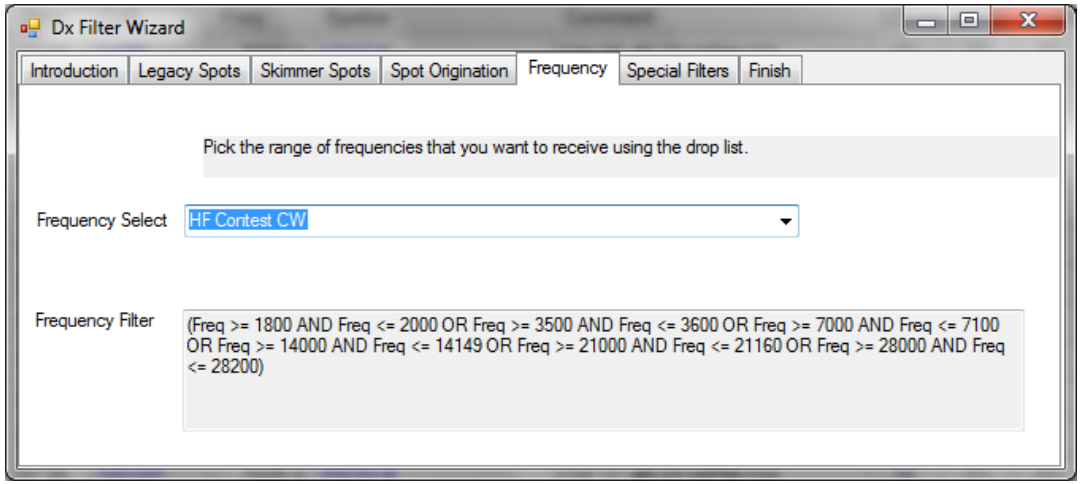
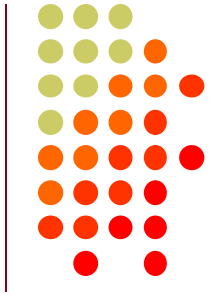


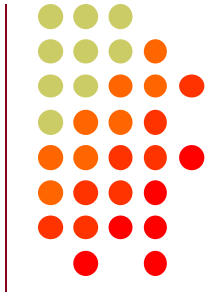


Many nodes combine RBN and "legacy" (human) spots



- dxc.ve7cc.net port 23 (CC Cluster, many filtering options, use CC User to set them)
- dxc.w9pa.net port 7373 (AR Cluster)
  `set dx extension skimmerquality`
- dxc.n7tr.com port 7373 (AR Cluster, but pre-filters to show only spots from Zones 3 and 4)

Real-time propagation maps



- http://www.dxmaps.com
- Click “HF” and band of interest
- Leave page open, it refreshes automatically

DXMAPS 2.6 - QSO/SWL real time maps

Map | List | Graph

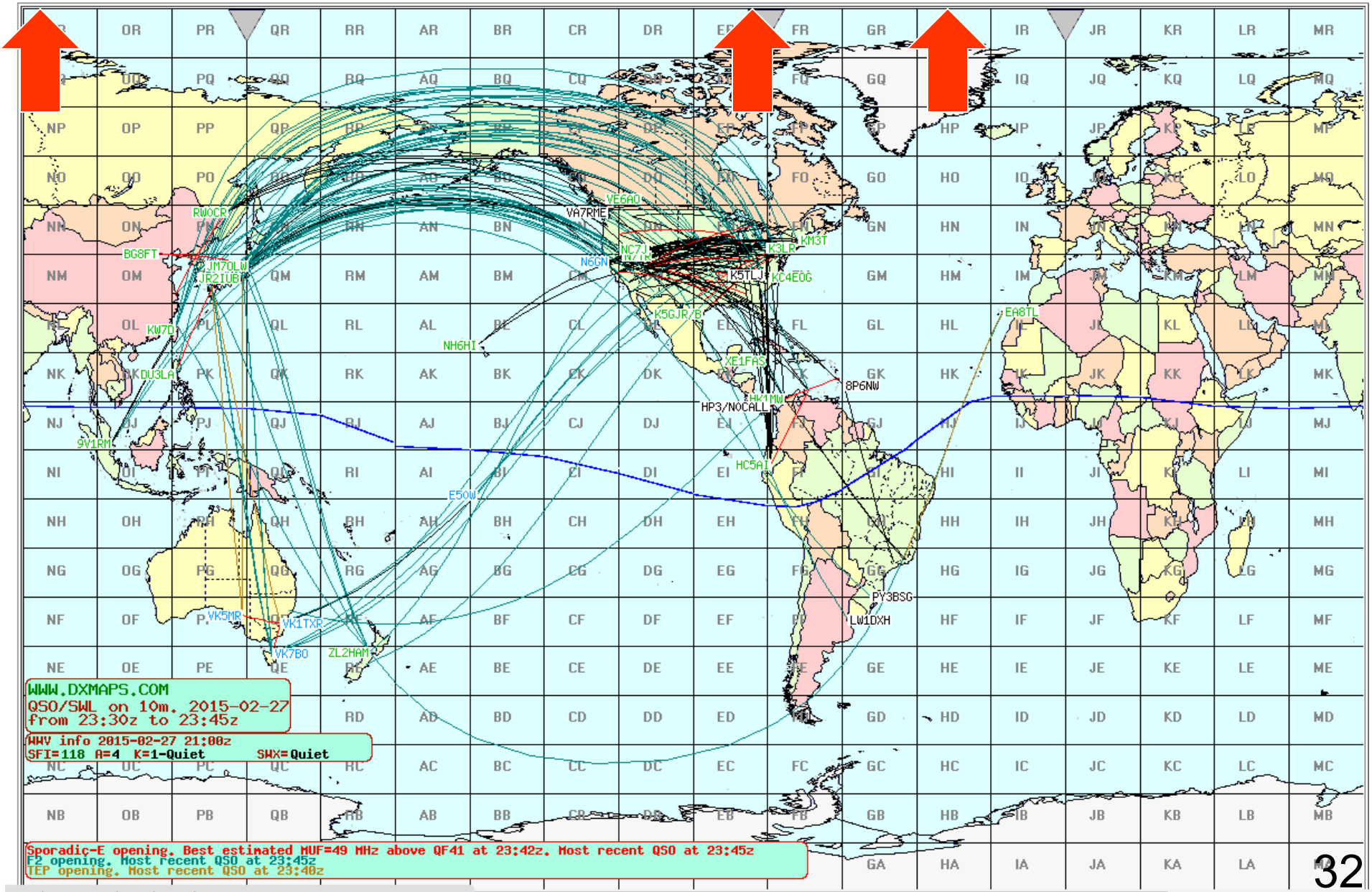
LF - HF | VHF & up

Europe | Africa | North America | South America | Asia | Oceania | World

2200 m | 600 m | 160 m | 80 m | 60 m | 40 m | 30 m | 20 m | 17 m | 15 m | 12 m | 10 m | All bands

Grey line

Only DX-Cluster



WWW.DXMAPS.COM
QSO/SWL on 10m, 2015-02-27
from 23:30z to 23:45z

WWV info 2015-02-27 21:00z
SFI=118 A=4 K=1-Quiet SWX=Quiet

Sporadic-E opening. Best estimated MUF=49 MHz above QF41 at 23:42z. Most recent QSO at 23:45z
F2 opening. Most recent QSO at 23:45z
TEP opening. Most recent QSO at 23:40z

DXMAPS 2.6 - QSO/SWL real time maps

Map | List | Graph

LF - HF | VHF & up

Europe | Africa | North America | South America | Asia | Oceania | World

2200 m | 600 m | 160 m | 80 m | 60 m | 40 m | 30 m | 20 m | 17 m | 15 m | 12 m | 10 m | All bands

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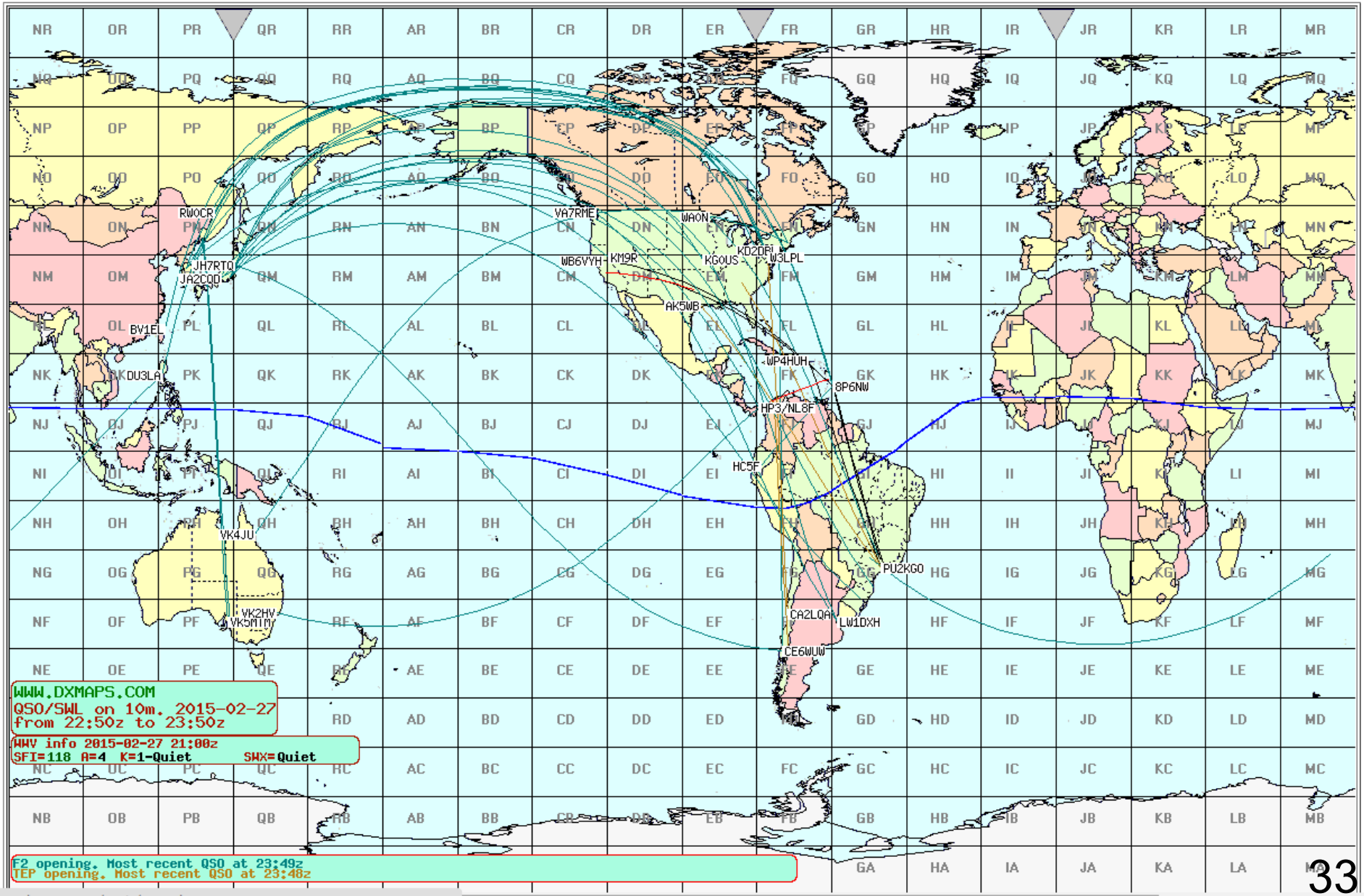
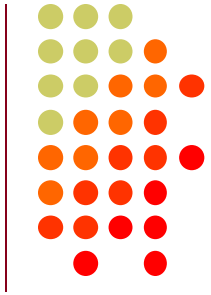
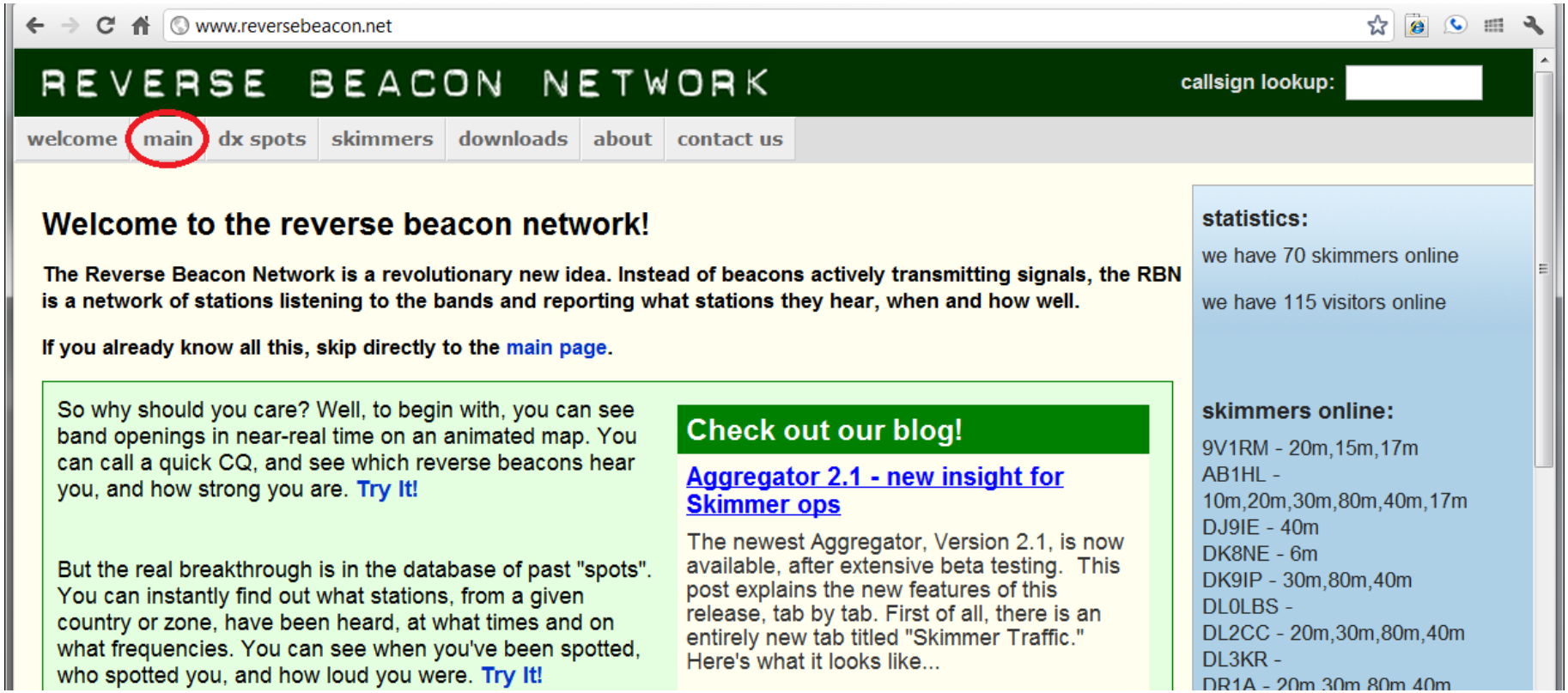


Using www.reversebeacon.net

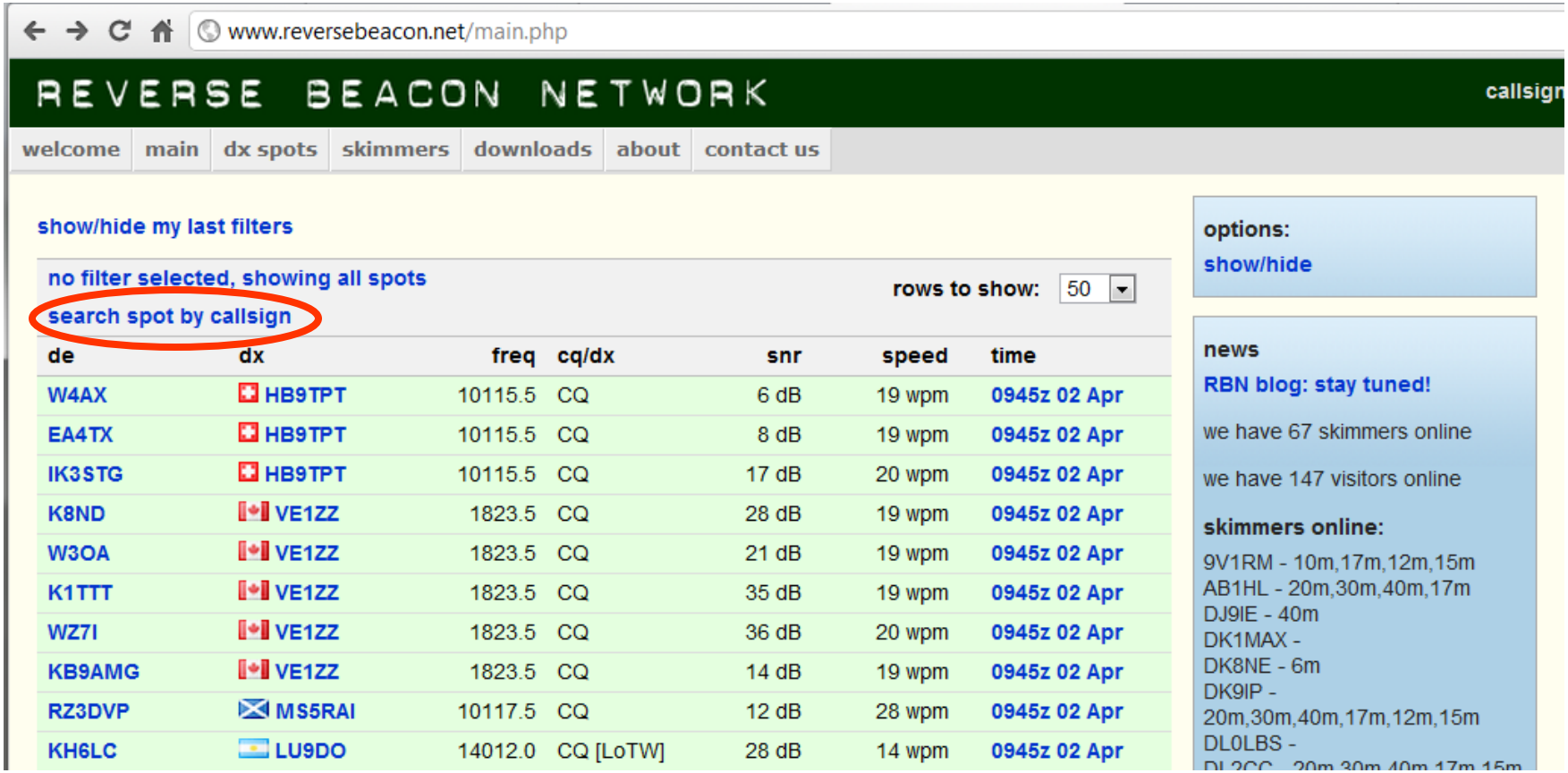


- Great for post-contest analysis
- Plot signal strengths
- Raw data files can be downloaded / analyzed
  - Millions of spots archived

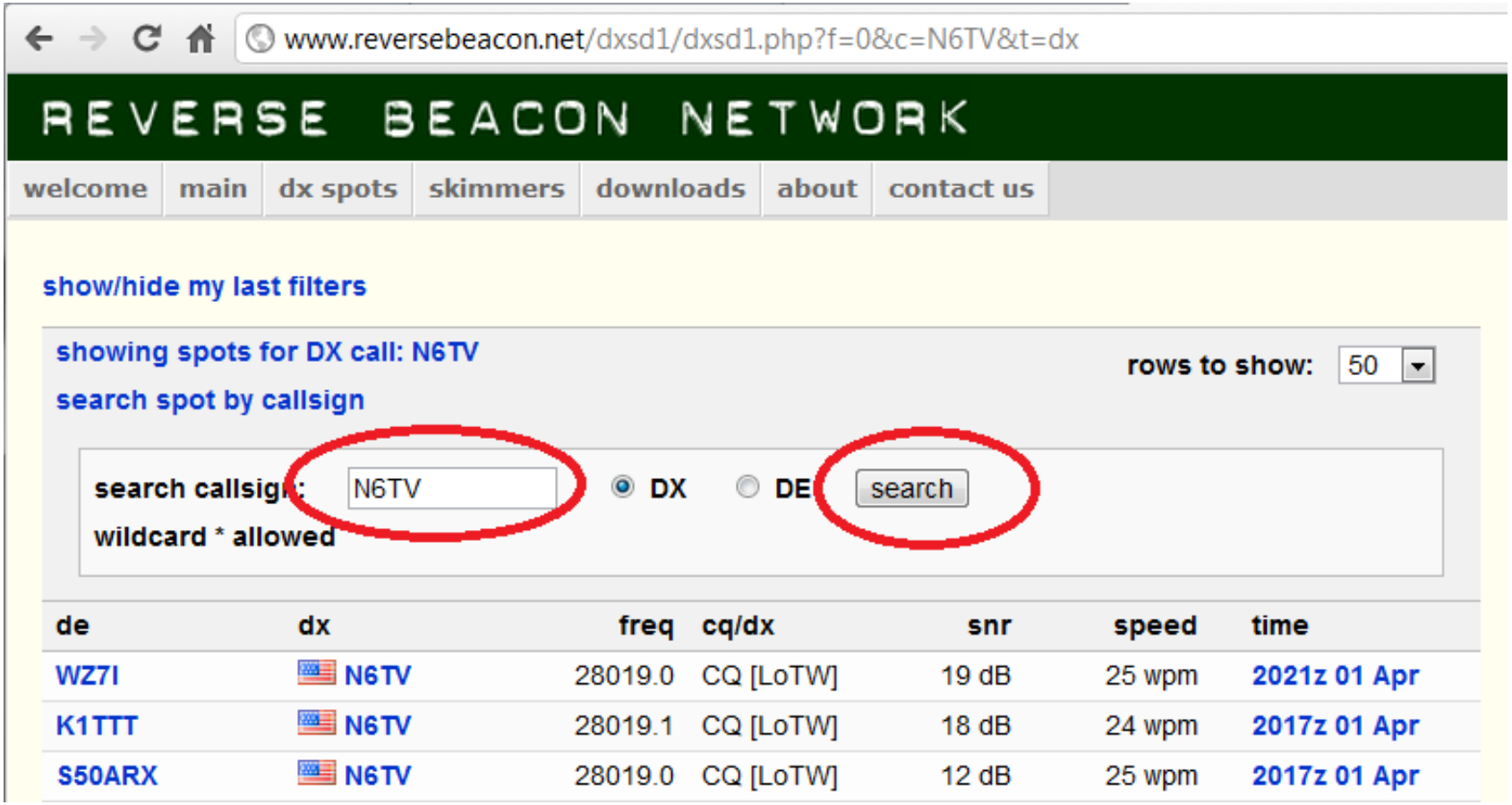
www.reversebeacon.net



www.reversebeacon.net main

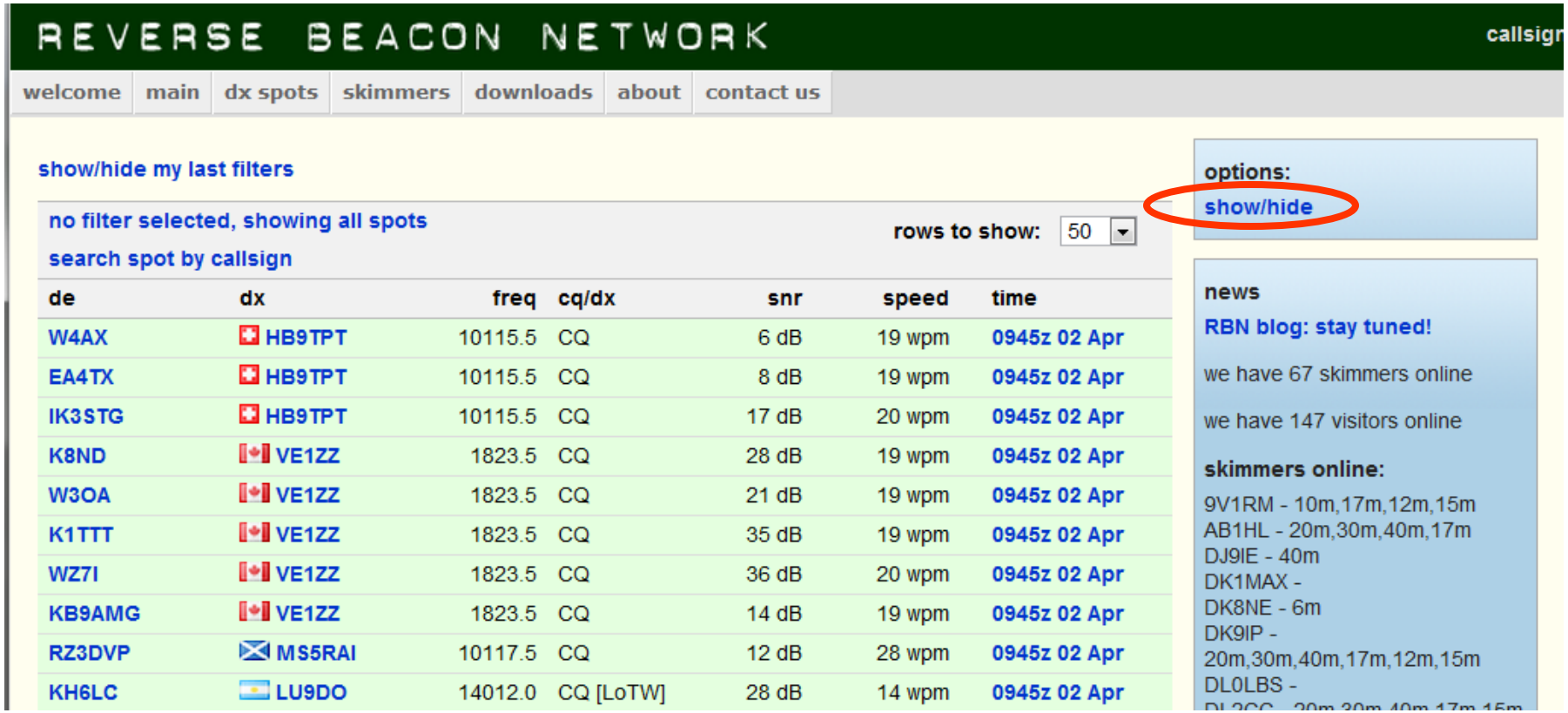


Where was I heard?



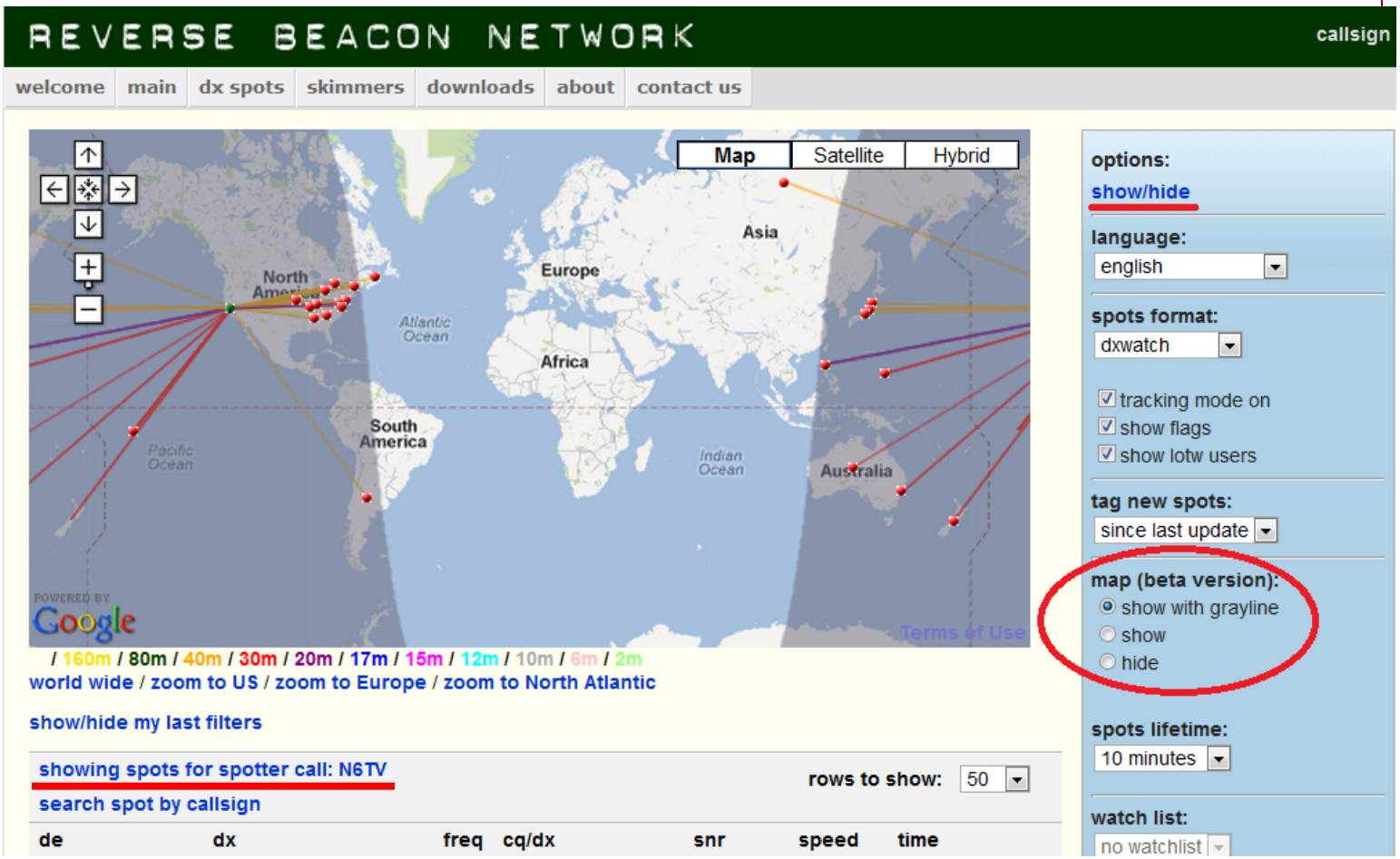
de	dx	freq	cq/dx	snr	speed	time
WZ7I	N6TV	28019.0	CQ [LoTW]	19 dB	25 wpm	2021z 01 Apr
K1TTT	N6TV	28019.1	CQ [LoTW]	18 dB	24 wpm	2017z 01 Apr
S50ARX	N6TV	28019.0	CQ [LoTW]	12 dB	25 wpm	2017z 01 Apr

Plot spots on a map

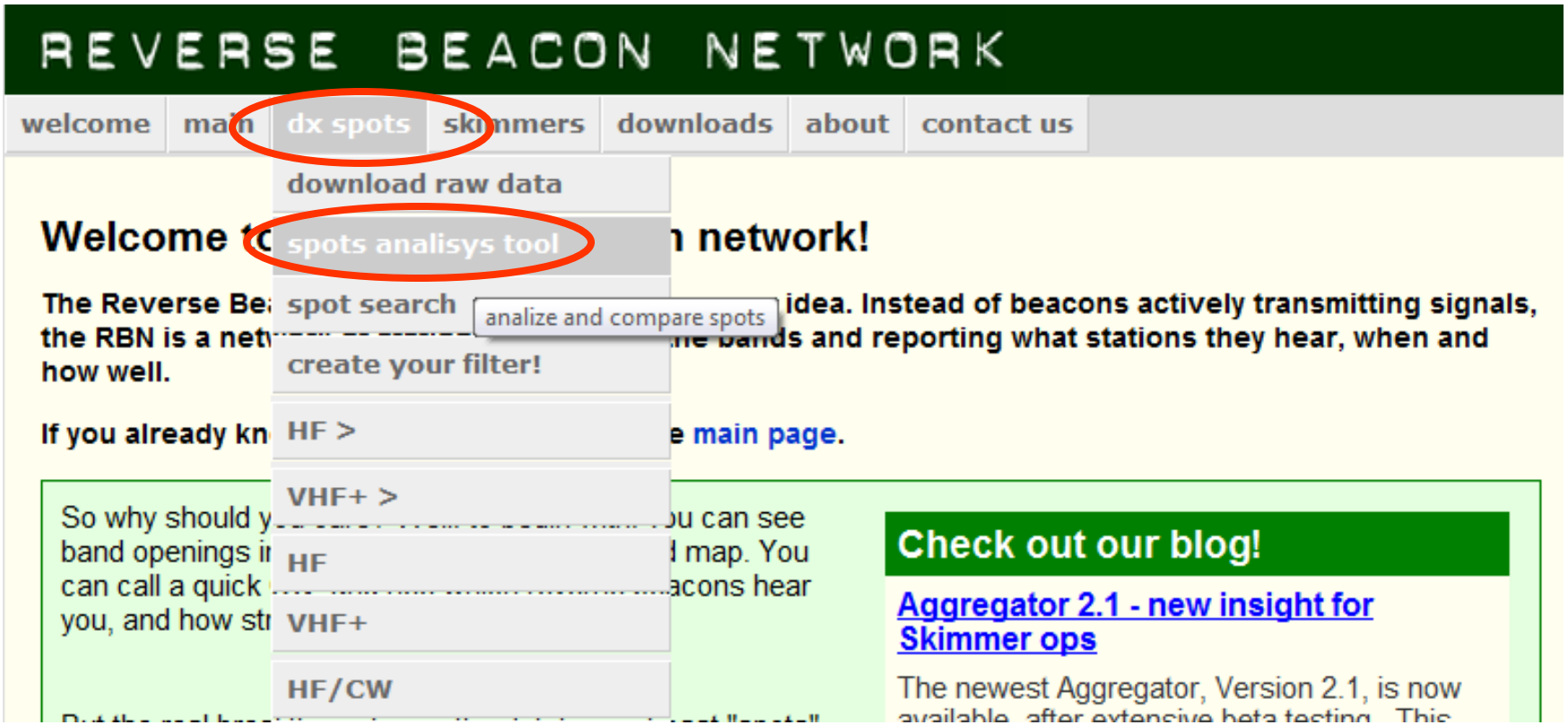


de	dx	freq	cq/dx	snr	speed	time
W4AX	HB9TPT	10115.5	CQ	6 dB	19 wpm	0945z 02 Apr
EA4TX	HB9TPT	10115.5	CQ	8 dB	19 wpm	0945z 02 Apr
IK3STG	HB9TPT	10115.5	CQ	17 dB	20 wpm	0945z 02 Apr
K8ND	VE1ZZ	1823.5	CQ	28 dB	19 wpm	0945z 02 Apr
W3OA	VE1ZZ	1823.5	CQ	21 dB	19 wpm	0945z 02 Apr
K1TTT	VE1ZZ	1823.5	CQ	35 dB	19 wpm	0945z 02 Apr
WZ7I	VE1ZZ	1823.5	CQ	36 dB	20 wpm	0945z 02 Apr
KB9AMG	VE1ZZ	1823.5	CQ	14 dB	19 wpm	0945z 02 Apr
RZ3DVP	MS5RAI	10117.5	CQ	12 dB	28 wpm	0945z 02 Apr
KH6LC	LU9DO	14012.0	CQ [LoTW]	28 dB	14 wpm	0945z 02 Apr

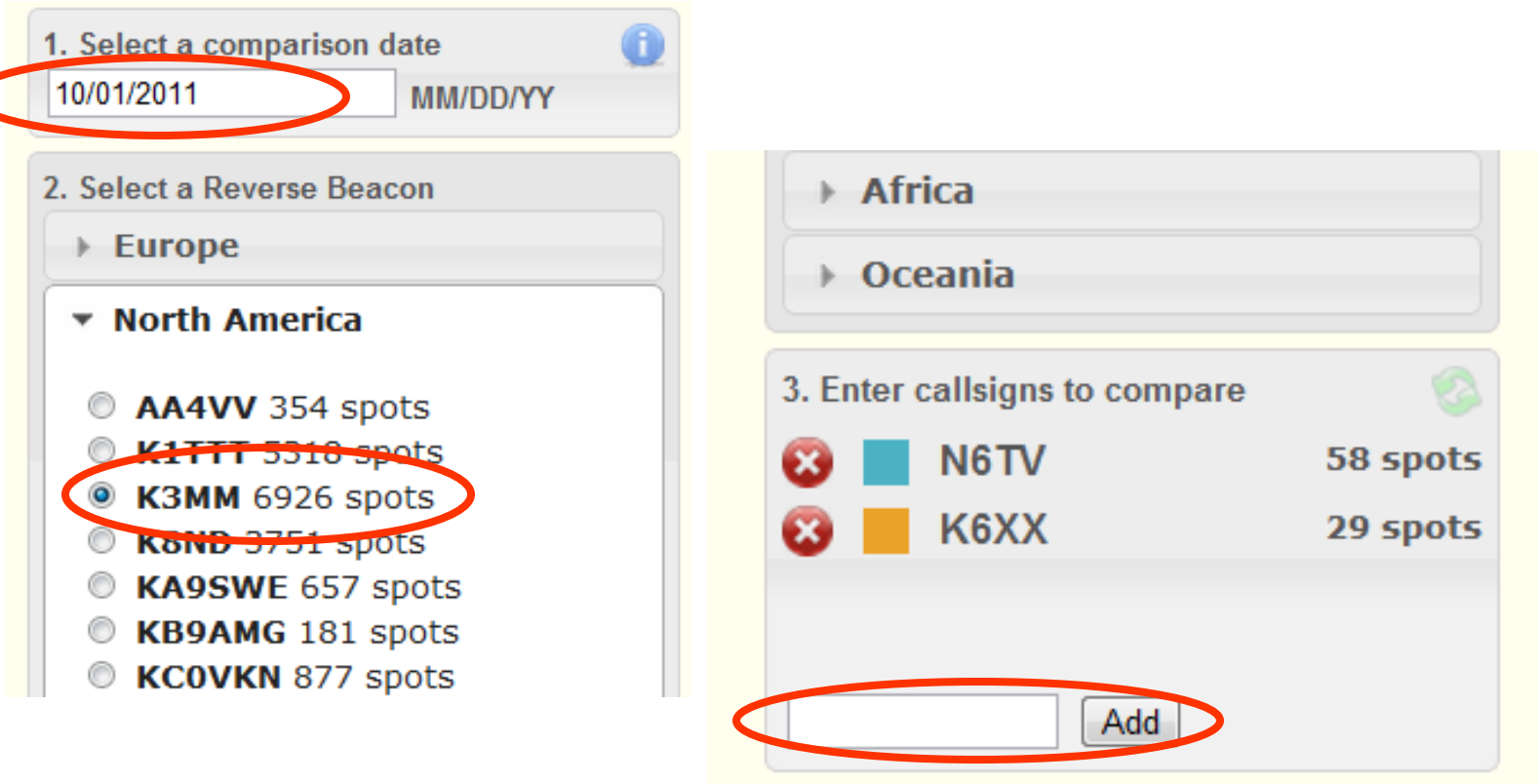
Which bands are open at *my* QTH?



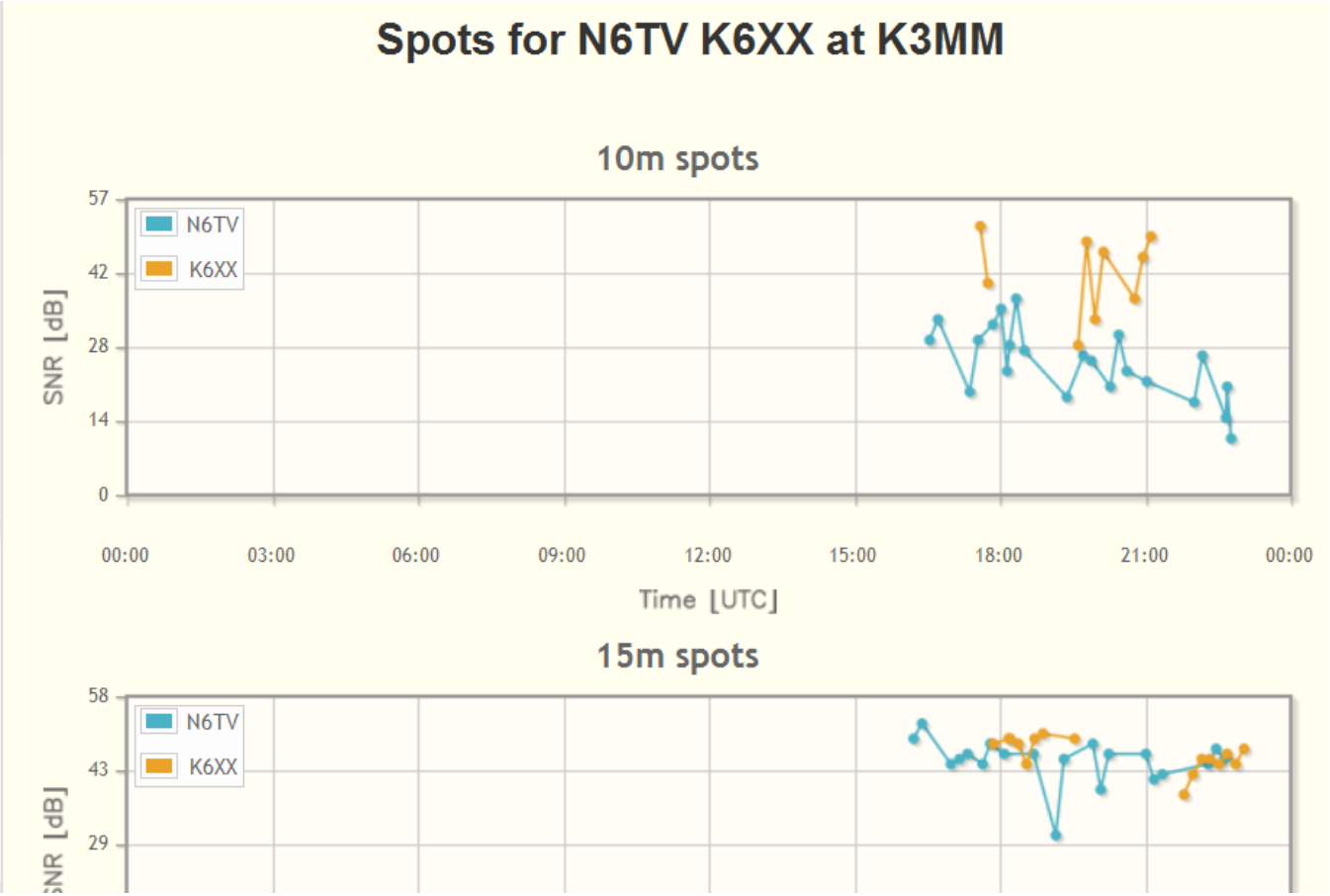
Spots analysis tool



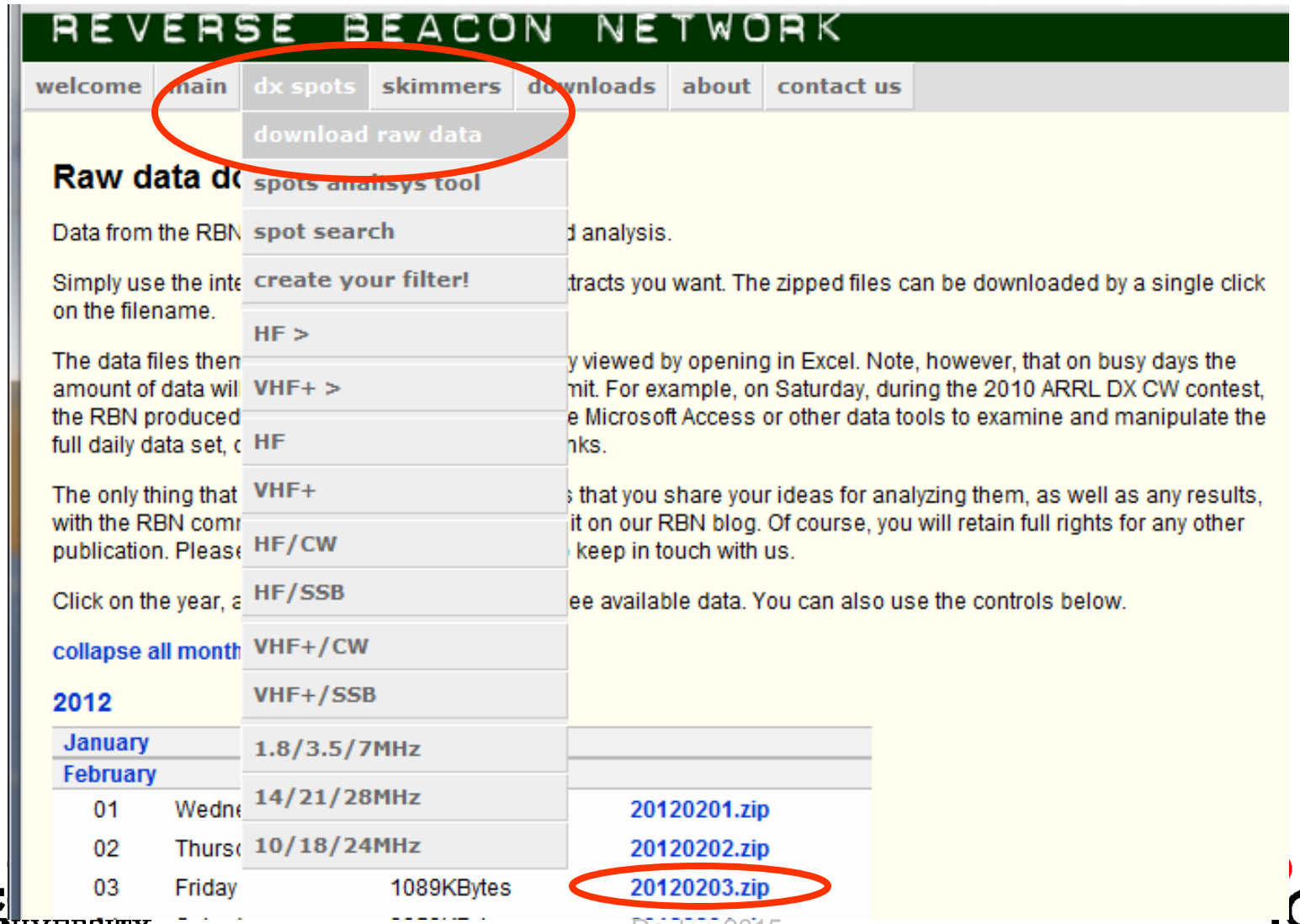
Pick a Date, a Skimmer, add callsigns to compare



And the winner is … K6XX!



Raw data downloads



Raw data is text file, Comma Separated Values

```
callsign,de_pfx,de_cont,freq,band,dx,dx_pfx,dx_cont,mode,db,date,speed,tx_mode
    JE1SGH,JA,AS,28032.6,10m,K6UW,K,NA,CQ,29,2014-02-15 00:00:00,32,CW
    XV4Y,3W,AS,14041.1,20m,PT5T,PY,SA,CQ,22,2014-02-15 00:00:00,28,CW
    XV4Y,3W,AS,14021,20m,PX2F,PY,SA,CQ,23,2014-02-15 00:00:00,23,CW
    NC7J,K,NA,28005.5,10m,N2IC,K,NA,CQ,11,2014-02-15 00:00:00,33,CW
```

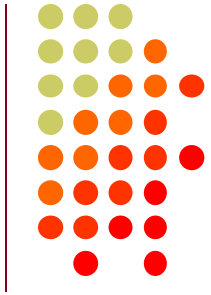
Total World-Wide RBN CW spots, CQ WW:

- 2012: 3,163,126 (18.3 spots per *second*)
- 2013: 5,743,545 (33.2 spots per second) – up 81.5%
- 2014: 6,200,340 (35.9 spots per second) – up 8.0%

ARRL DX CW:

- 2013: 3,937,108 (82,023 spots per hour)
- 2014: 4,146,399 (86,383 spots per hour) – up 5.3%
- 2015: 5,537,017 (115,354 spots per hour) – up 33.5%

What's the Average CW Speed?



- 2013 CQ WW CW: 30.6 WPM
- 2014 CQ WW CW: 30.8 WPM
- 2014 ARRL DX CW: 29.6 WPM
- 2015 ARRL DX CW: 30.1 WPM

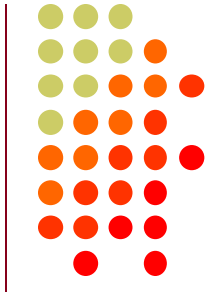
How can I help?

- Set up an SDR, feed Skimmer Spots to the RBN, using the Aggregator program
  - More skimmers needed in Asia/Africa/South America
- Call a bit off frequency (Win-test and N1MM both provide automatic randomization if desired)

What's New?

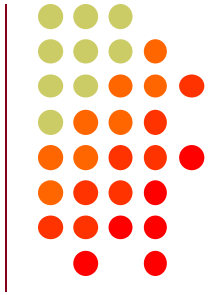
- NCDXF and other HF Beacons can be spotted on RBN
  - reversebeacon.blogspot.com/2014/02/ncdxf-beacon-spotting-redux.html
- RTTY Skimmer Server 1.0
- CW Skimmer 1.83
- Aggregator v4.0

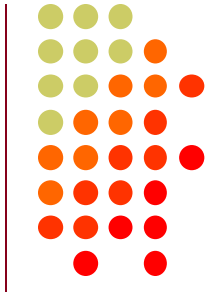
For more information



- http://www.reversebeacon.net
- http://www.dxmaps.com
- http://www.bcdxc.org/ve7cc/default.htm#download
- http://www.dxatlas.com/CwSkimmer
- http://www.dxatlas.com/SkimServer
- http://www.srl-llc.com/ (QS1R SDR)
- http://microtelecom.it/perseus/ (Perseus SDR)
- http://www.dxengineering.com/parts/ins-rf-pro-1b (RF Pro-1B loop antenna)

For more information



- http://www.dxengineering.com/parts/dxe-arah3-1p (Active Broadband Dipole antenna)
- http://www.pvrc.org/~n4zr/rbn.pdf
- http://reversebeacon.blogspot.com/2013/12/a-new-tutorial-on-using-rbn.html
- http://reversebeacon.blogspot.com
- http://www.ve7cc.net/
- http://www.qrz.com/db/n6tv

Questions?