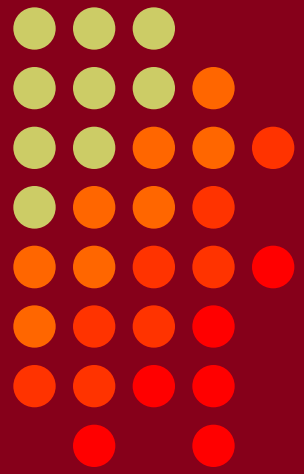
# CW and RTTY Skimmer and the Reverse Beacon Network

Presented by N6TV

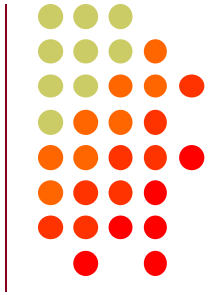
n6tv@arrl.net



• CTU •
CONTEST UNIVERSITY

ICOM

# 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?

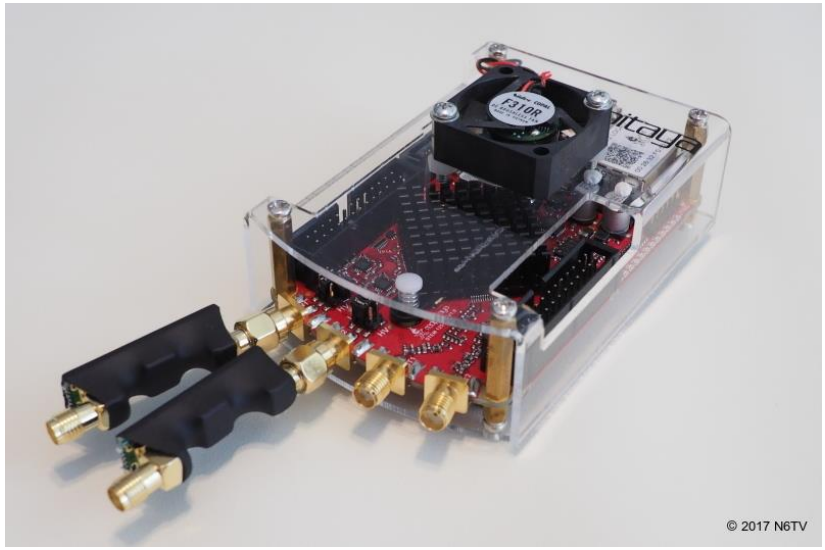
# It all starts with one developer

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


- Honored as RAC *Radio Amateur of the Year* for 2014

# What is CW Skimmer?

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

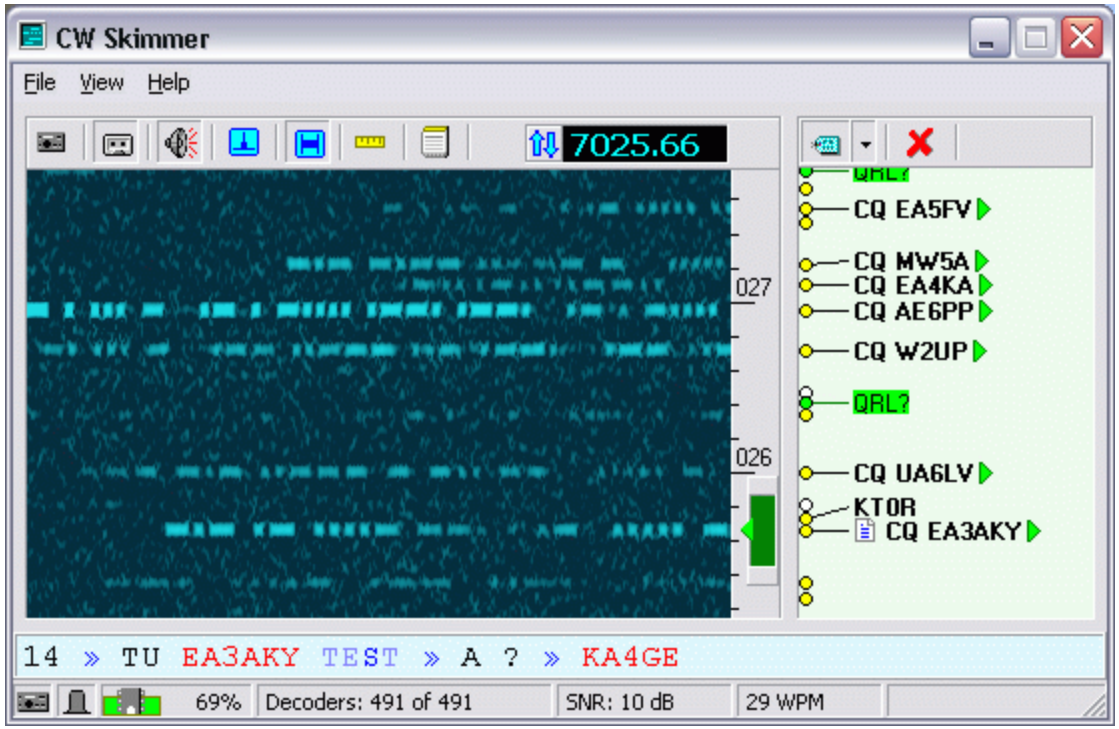



# SDR Antenna

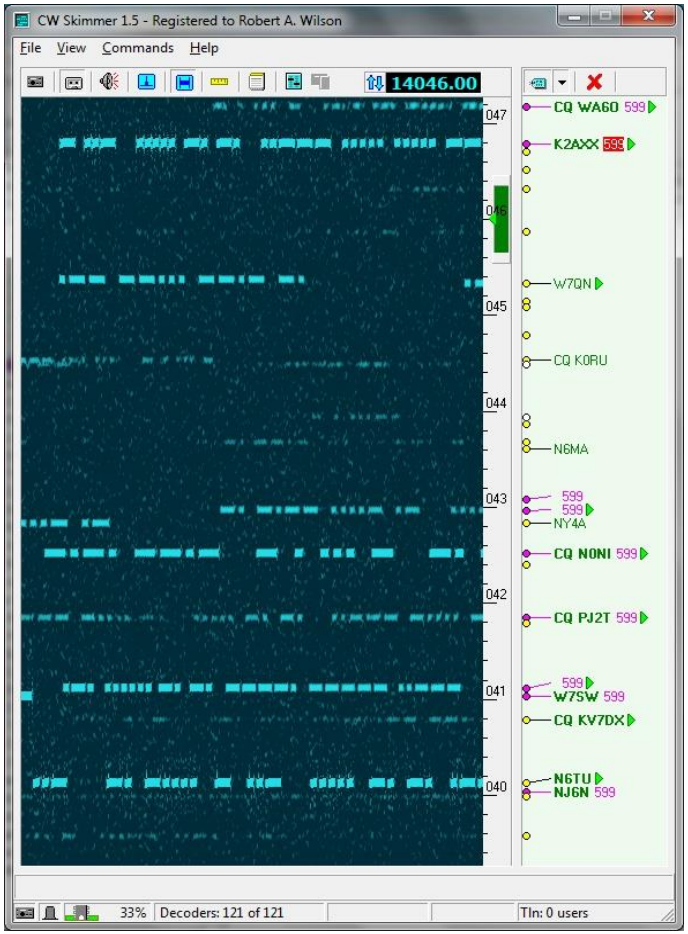
2. Wideband RX Antenna, 1.8-30 MHz, e.g. DX Engineering ARAH3-1P Active Dipole or DXE (formerly Pixel) Magnetic Loop RF-PRO-1B®:

# Software

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

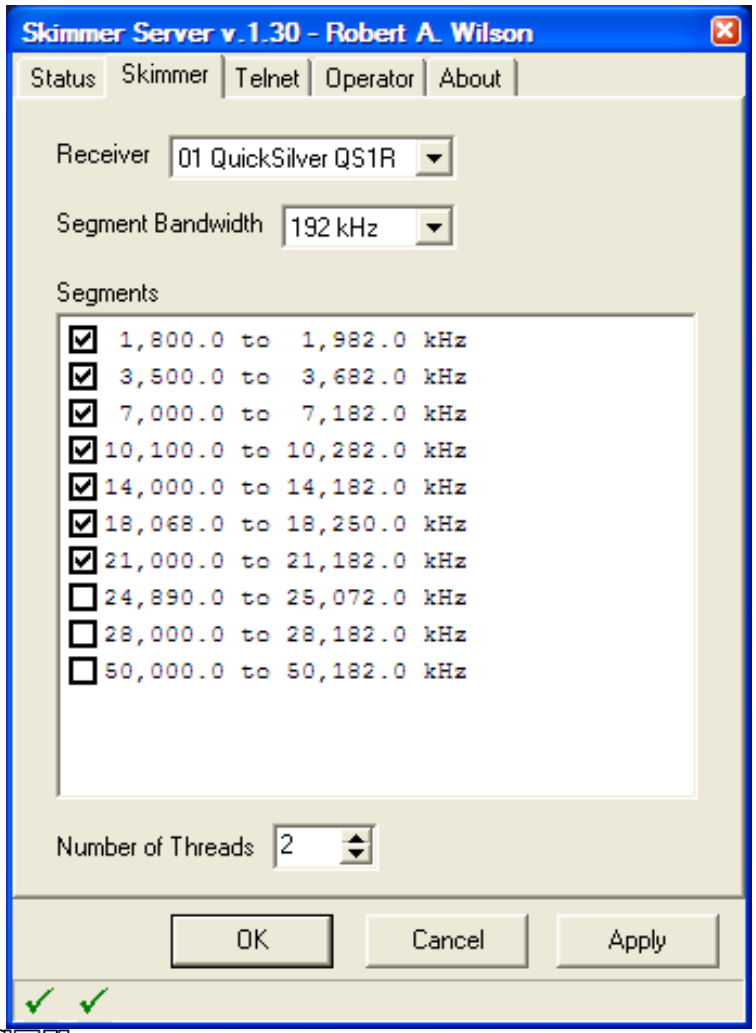



# CW Skimmer by VE3NEA



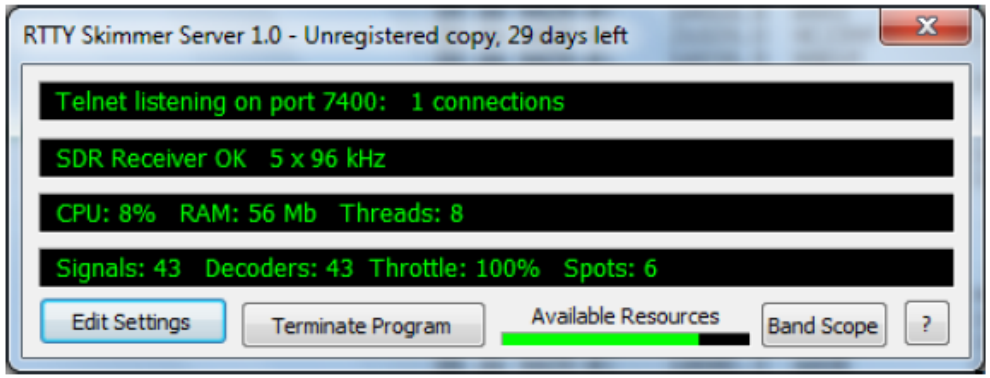

- Works with many SDRs
- Decodes *multiple* CW signals in real time
- Can monitor *entire* CW band (one at a time)
- Waterfall Display
- Band Scope
- Uses MASTER.DTA
- Telnet Server (emulates a DX Cluster)

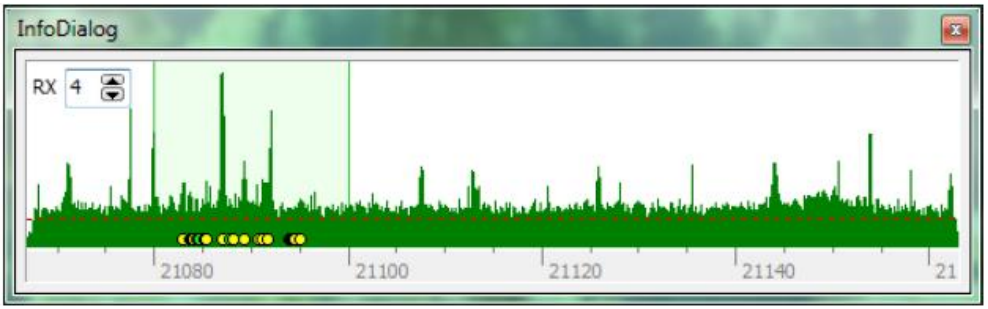
# Skimmer Server by VE3NEA




- Natively supports *only* the QS1R SDR (no longer made)
- Supports Red Pitaya running free SDR receiver software
- Decodes multiple CW signals in real time
- Monitors *up to 8 bands* at once with a single SDR
- *No* Waterfall Display
- *No* Band Scope
- *No* MASTER.DTA
- Telnet Server

# RTTY Skimmer Server




- Natively supports only the QS1R SDR (no longer made)
- Supports Red Pitaya running free SDR receiver software
- Decodes multiple RTTY signals in real time
- Monitors *up to 8 bands* with single SDR
- Requires high-end CPU
- Limited Band Scope
- *No* MASTER.DTA
- Telnet Server

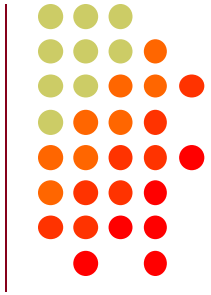
# Telnet server (localhost port 7300)

- 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
```

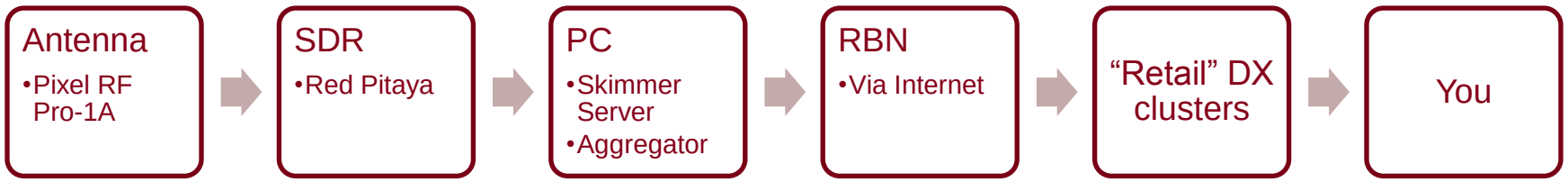
Reports Signal to Noise ratio, CW Speed, CQers

# 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?

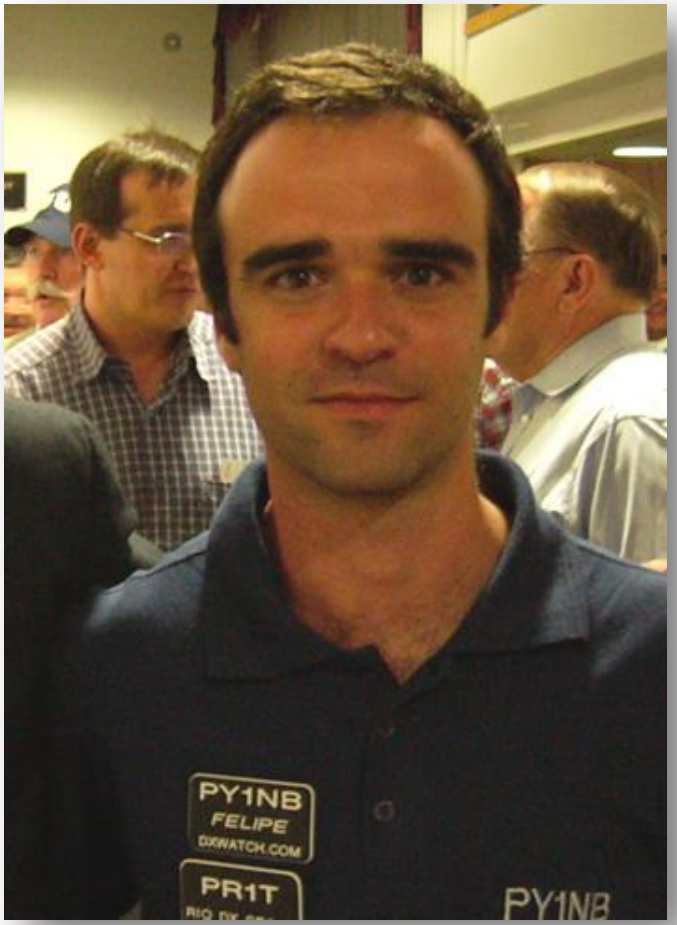


# Acknowledgements

- RBN web site and first aggregator originated by PY1NB (similar to his other web site, www.dxwatch.com). Felipe pays most of 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

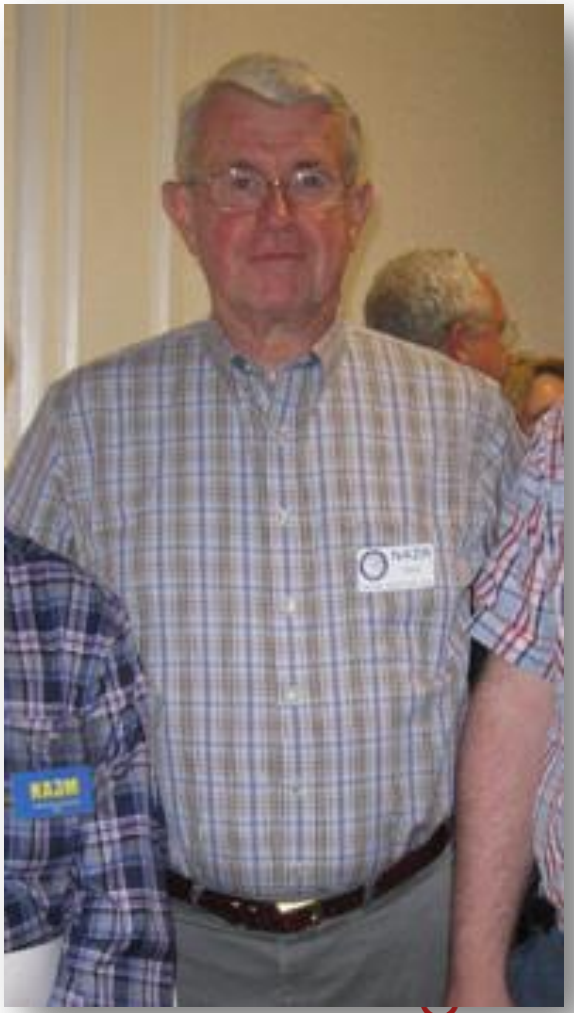
- Created and maintains the current RBN Aggregator software

# Nick Sinanis, F5VIH

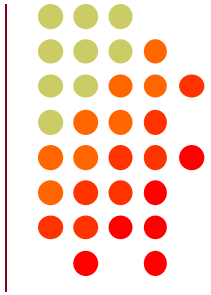
- Wrote the RBN Spots Analysis Tool

# Pete Smith, N4ZR

- RBN Chief Evangelist
- Presenter at Contest Forum this Saturday
- Skimmertalk Reflector: http://dayton.contesting.com/mailman/listinfo/skimmertalk
- Groups.IO Group: RBN-OPS https://groups.io/g/RBN-OPS (187+ 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

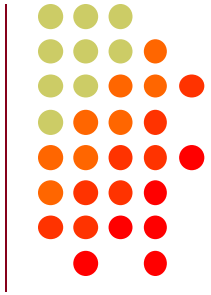
# How can I use RBN to improve my score?

- 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):

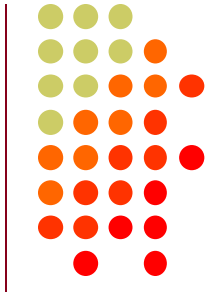
- The RBN reveals band openings, shows where *you* are being heard
- At K3LR, sunrise on 15m: "Spotted by S50ARX-#"
- First EU answered our 15m CQs 25 minutes later

# 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 *rush-everything-together*
- Change your freq. *slightly* to get spotted again

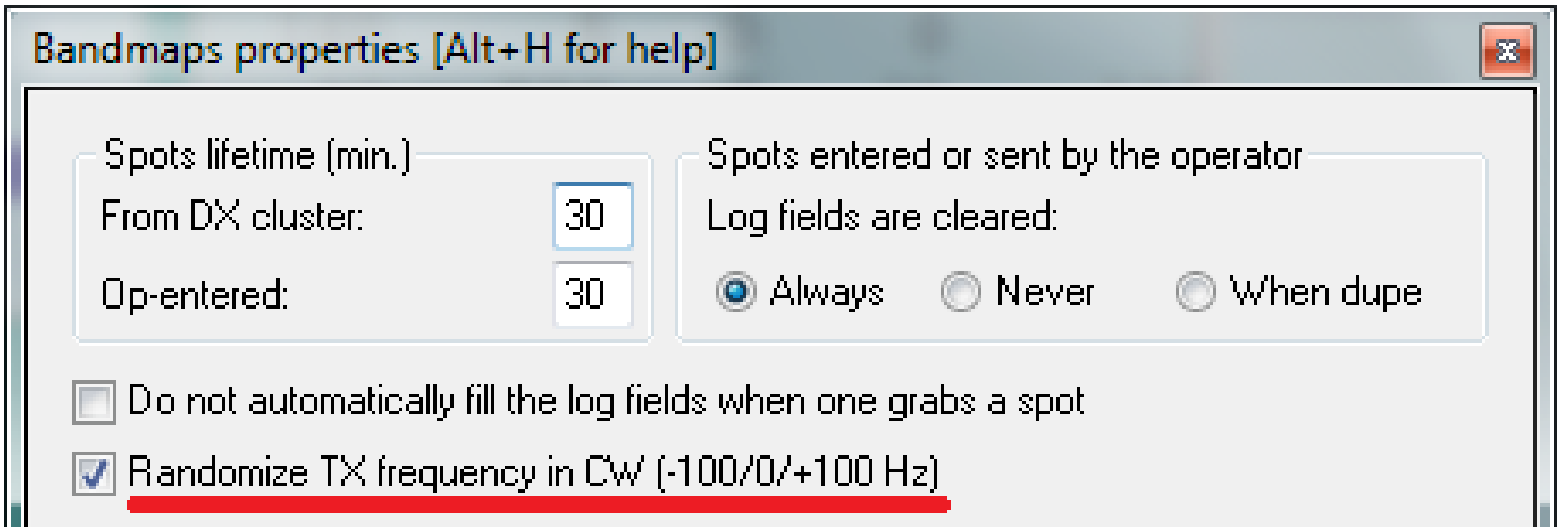
# What counts as “CQ”?



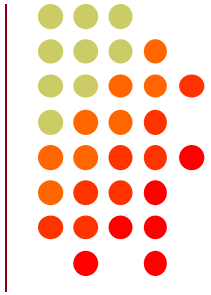
- Originally just: “CQ”, “TEST”, and “QRZ”
- VE3NEA Added: “FD”, “SS”, “NA” and “UP”
- Examples:
  - P5DX P5DX UP
  - SS N6TV N6TV
  - NA N6TV N6TV
  - FD N6TV N6TV FD
- Short calls like “W1F” should always be sent twice to help Skimmer identify it quickly

# 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.

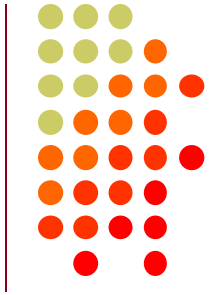


# How do I use the RBN to Check My Antennas?



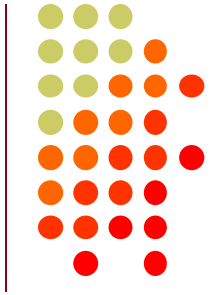
- To test performance, just call CQ on CW or RTTY, check RBN web site (turn beam, repeat)
- Use RBN web site's "Spots Analysis Tool" to compare your signal to the competition
- Download raw data files for deeper analysis
  - Every RBN spot posted since February, *2009* is archived on the RBN web site

# Accessing the RBN (SOA, Multi)



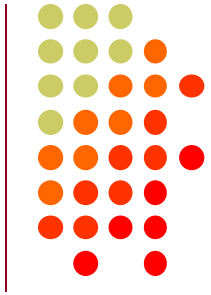
1. Many DX clusters combine RBN and human spots using AR-Cluster V6 (see www.dxcluster.info for address listing).
   - Some ARC V6 clusters offer CT1BOH spot quality filters (flags busts, uniques)
2. dxc.ve7cc.net port 23
   CC Cluster software – removes many bad spots (uniques) and dupes

# Filtering Spots (old way)



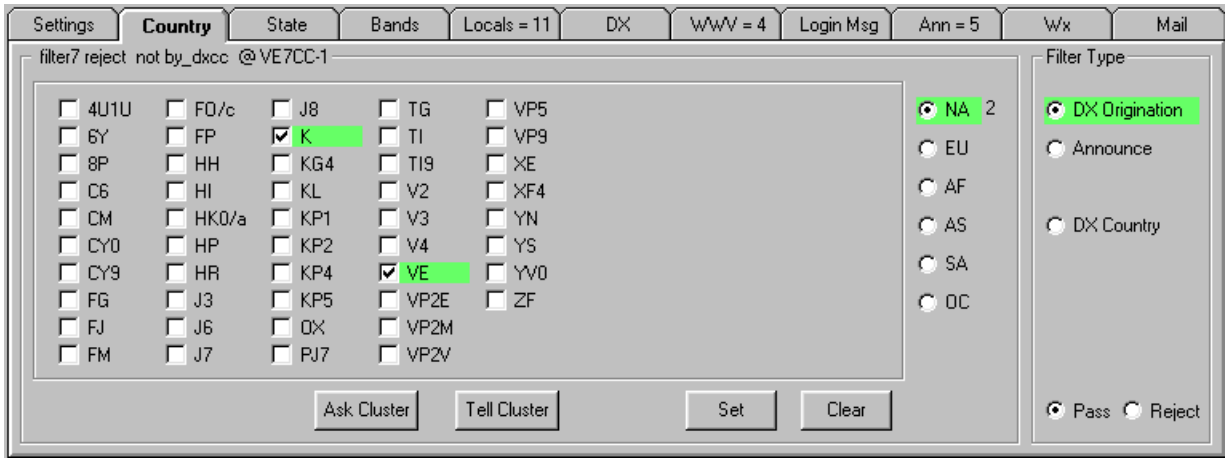
- DXSpider
  - `accept/spots by_zone 1,3,4,6,7,31 and not by WZ7I or call N6TV`
  - http://www.dxcluster.org/main/filtering_en.html#toc1
- ARCluster V6
  - `set dx filter call=N6TV or (unique>1 and (spotterstate=CA or spotterstate=NV or spotterstate=UT))`
  - http://www.n8noe.us/ARC.html

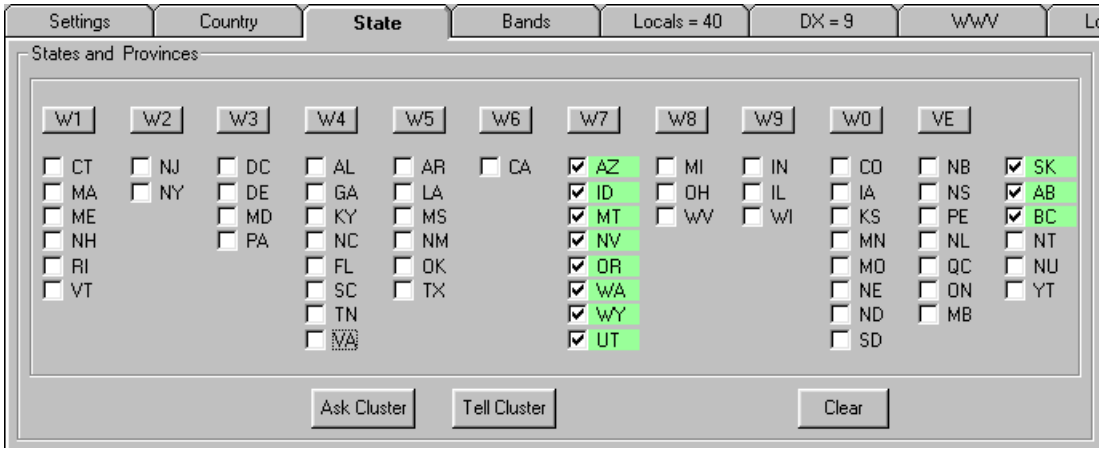
# Filtering Spots (new way)



- 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

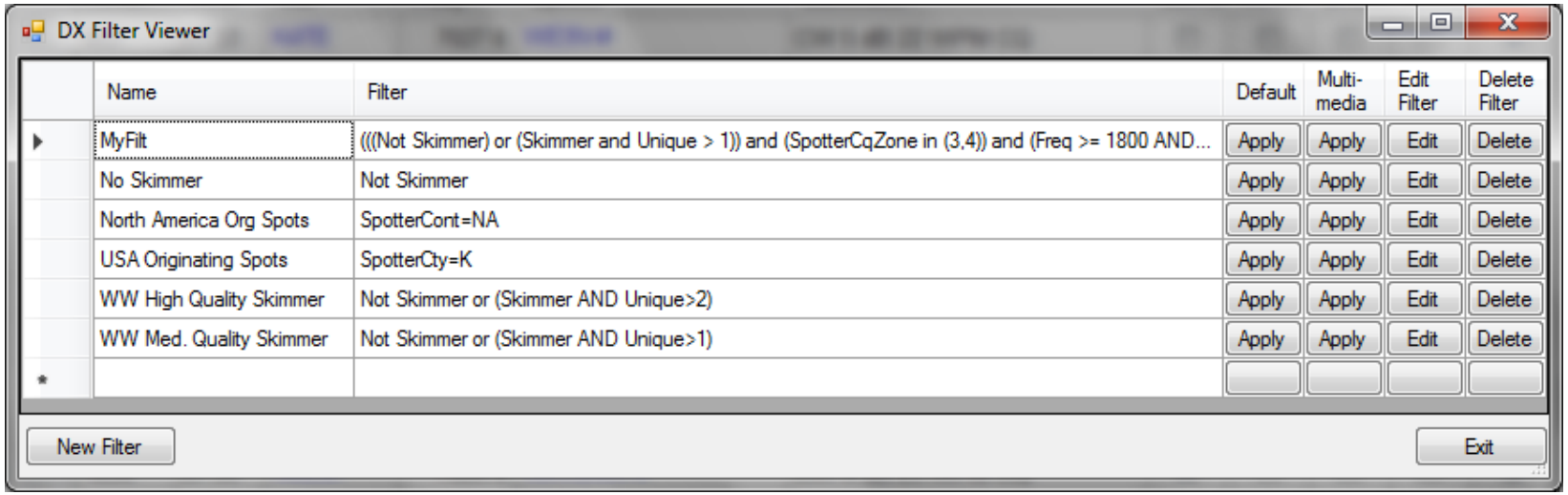
# CC User Filter Dialogs

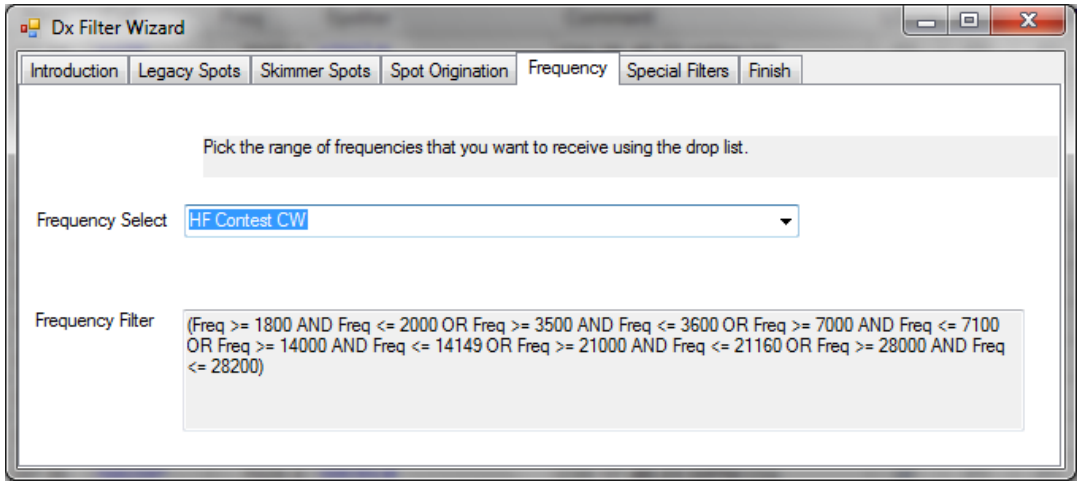


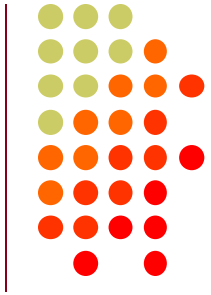
# AR-Cluster Client by AB5K

www.n8noe.us/ARC.html



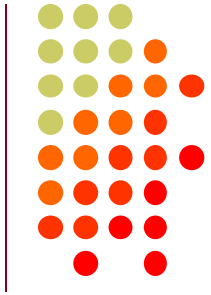



# Many nodes combine RBN and “legacy” (human) spots



- 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

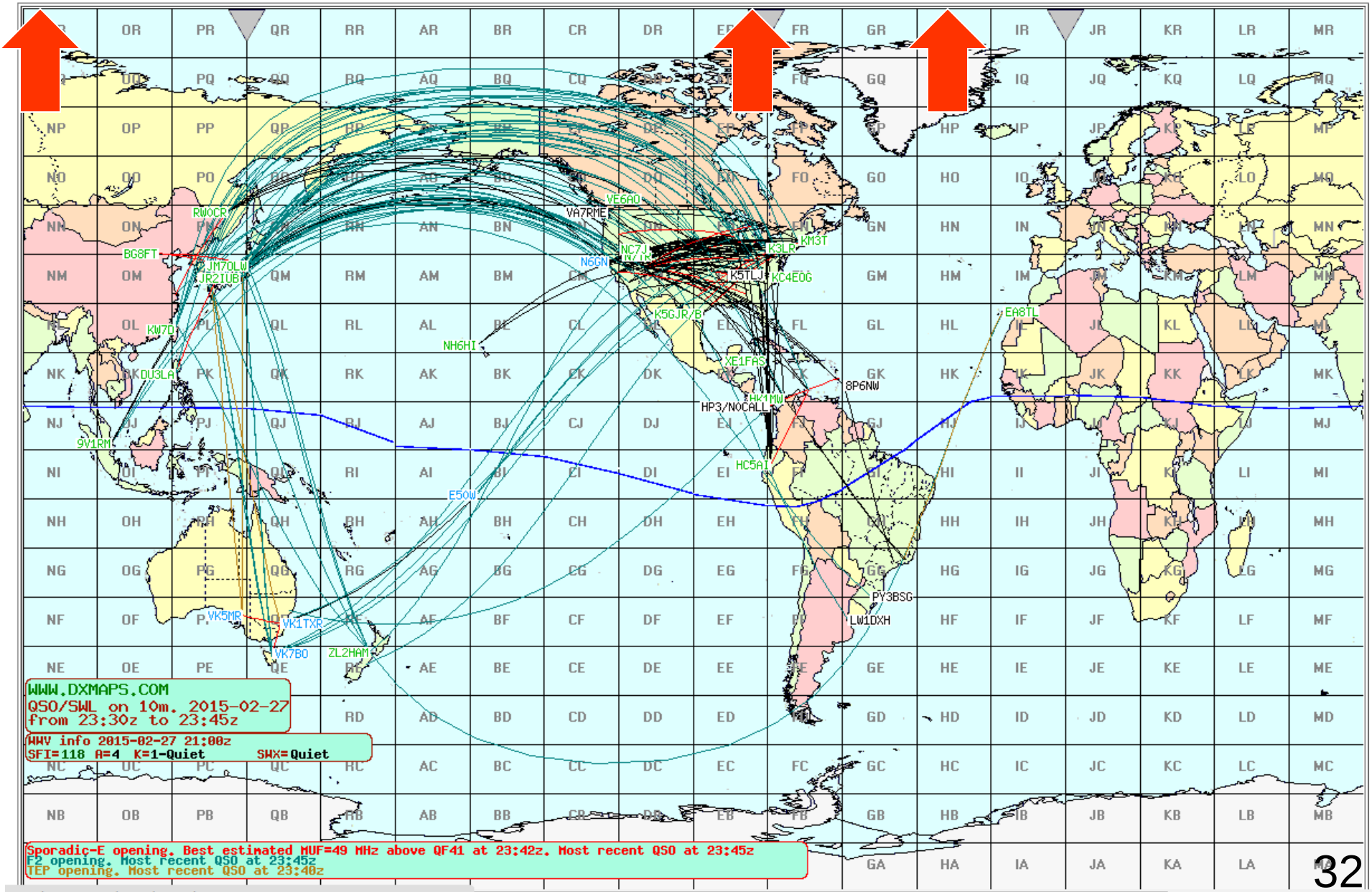
LF - HF | VHF & up

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



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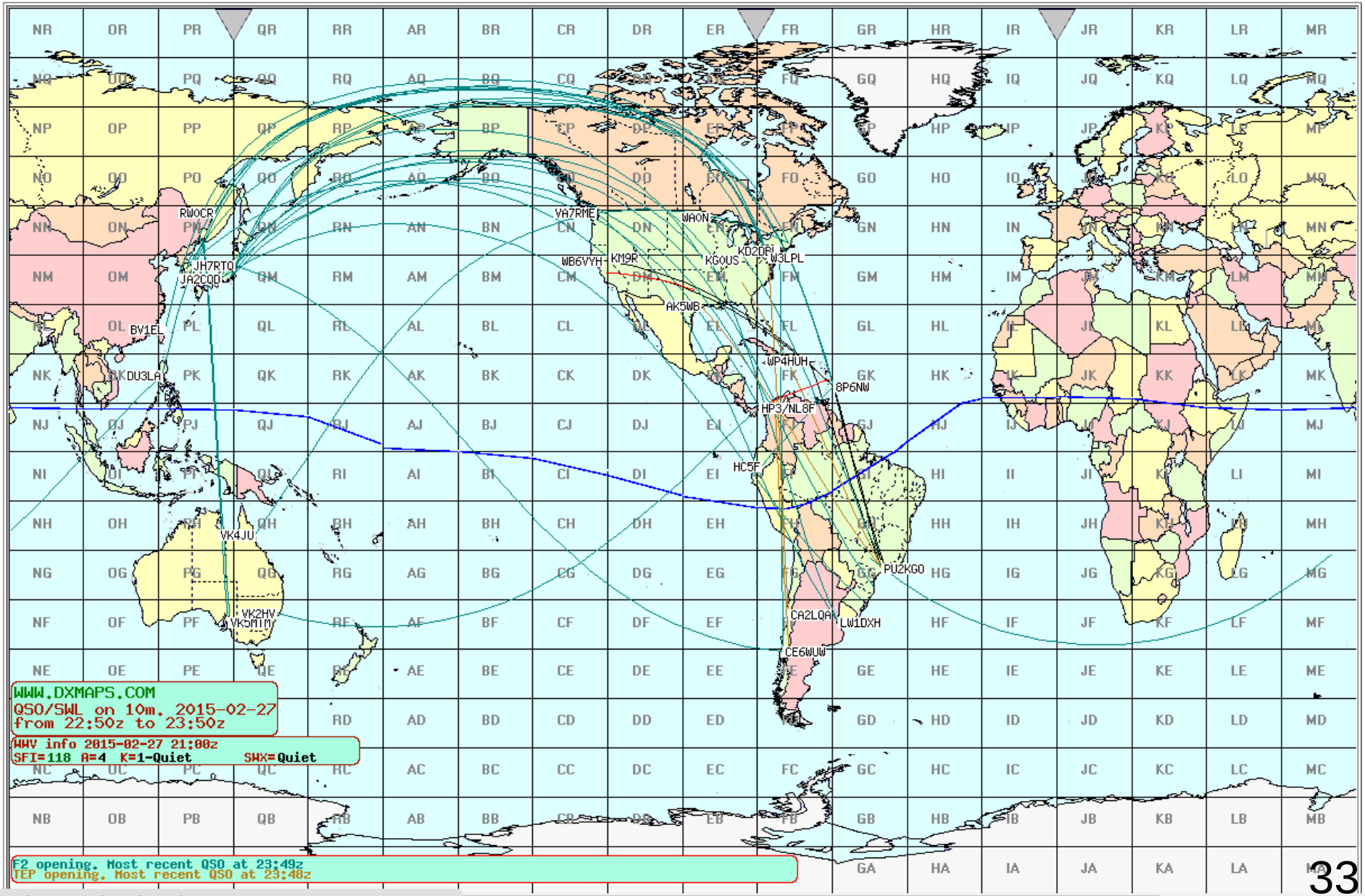
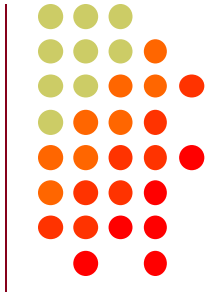
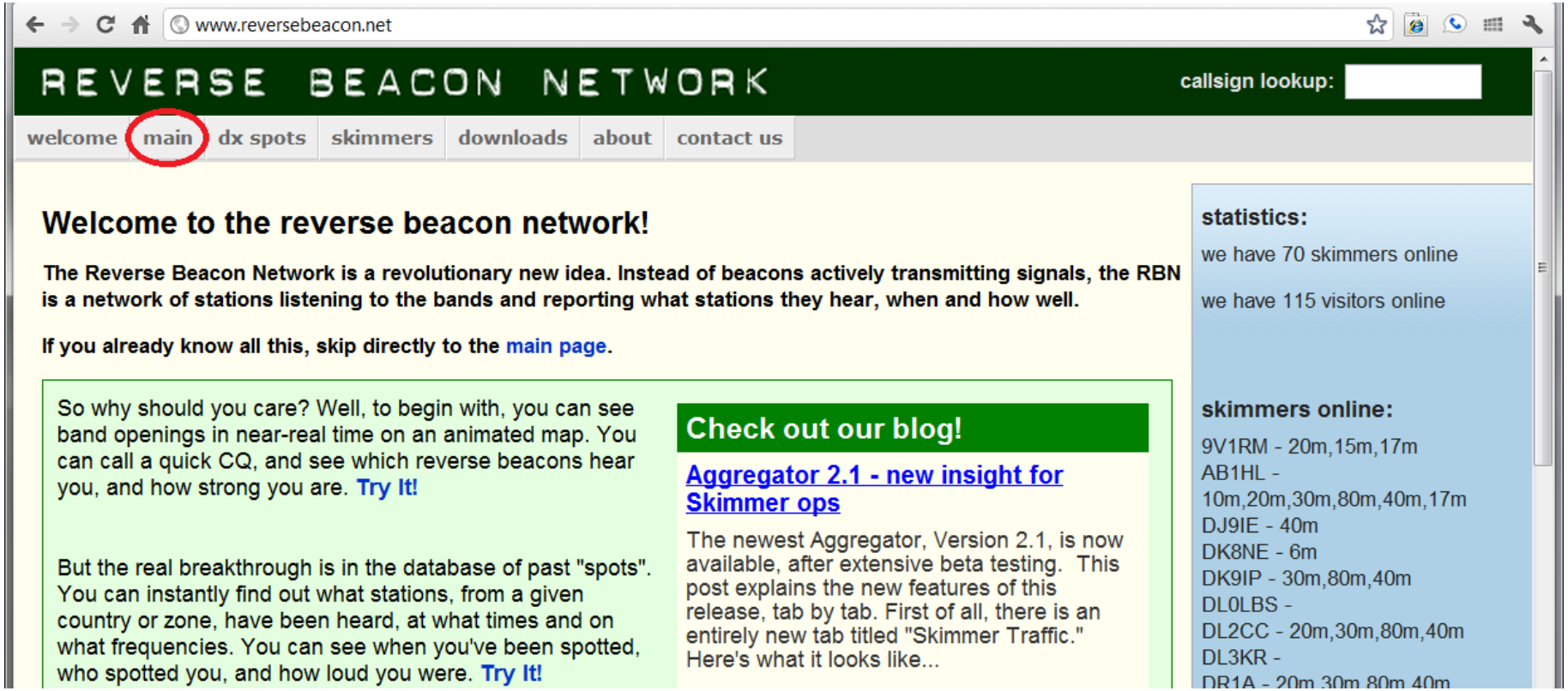


# Using www.reversebeacon.net

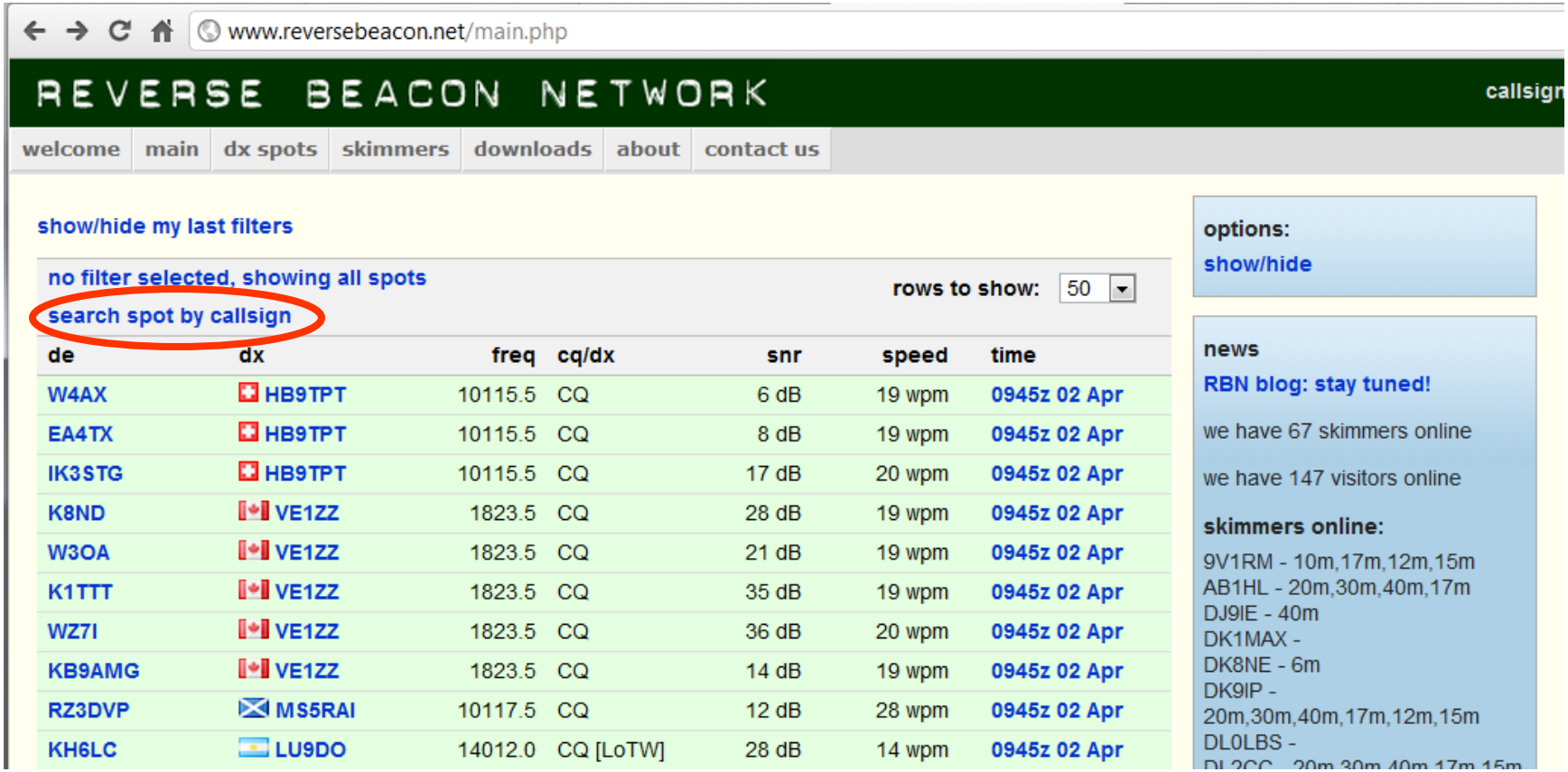


- Great for post-contest analysis
- Plot signal strengths
- Raw data files can be downloaded / analyzed
  - Millions of spots archived

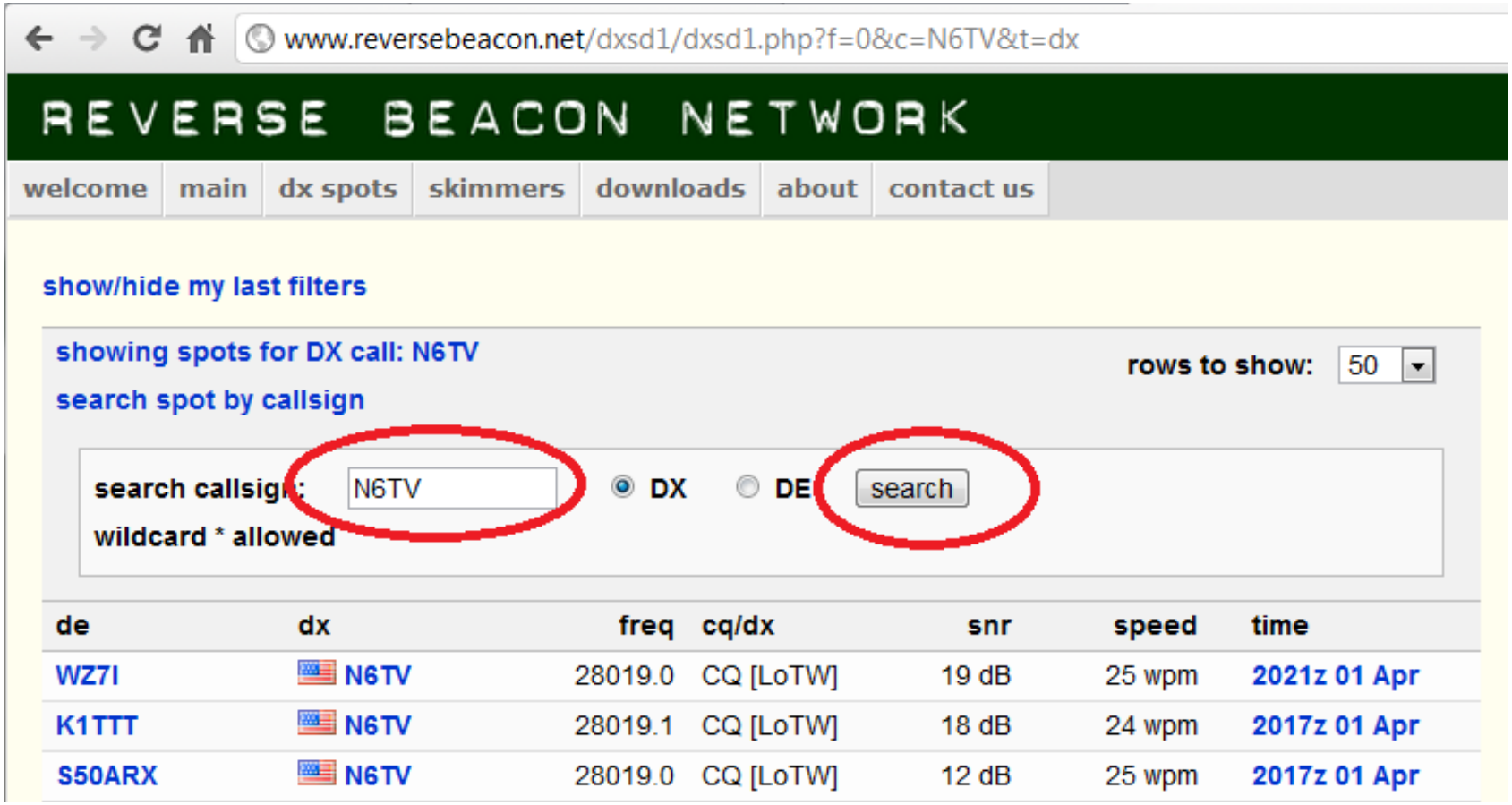
# www.reversebeacon.net



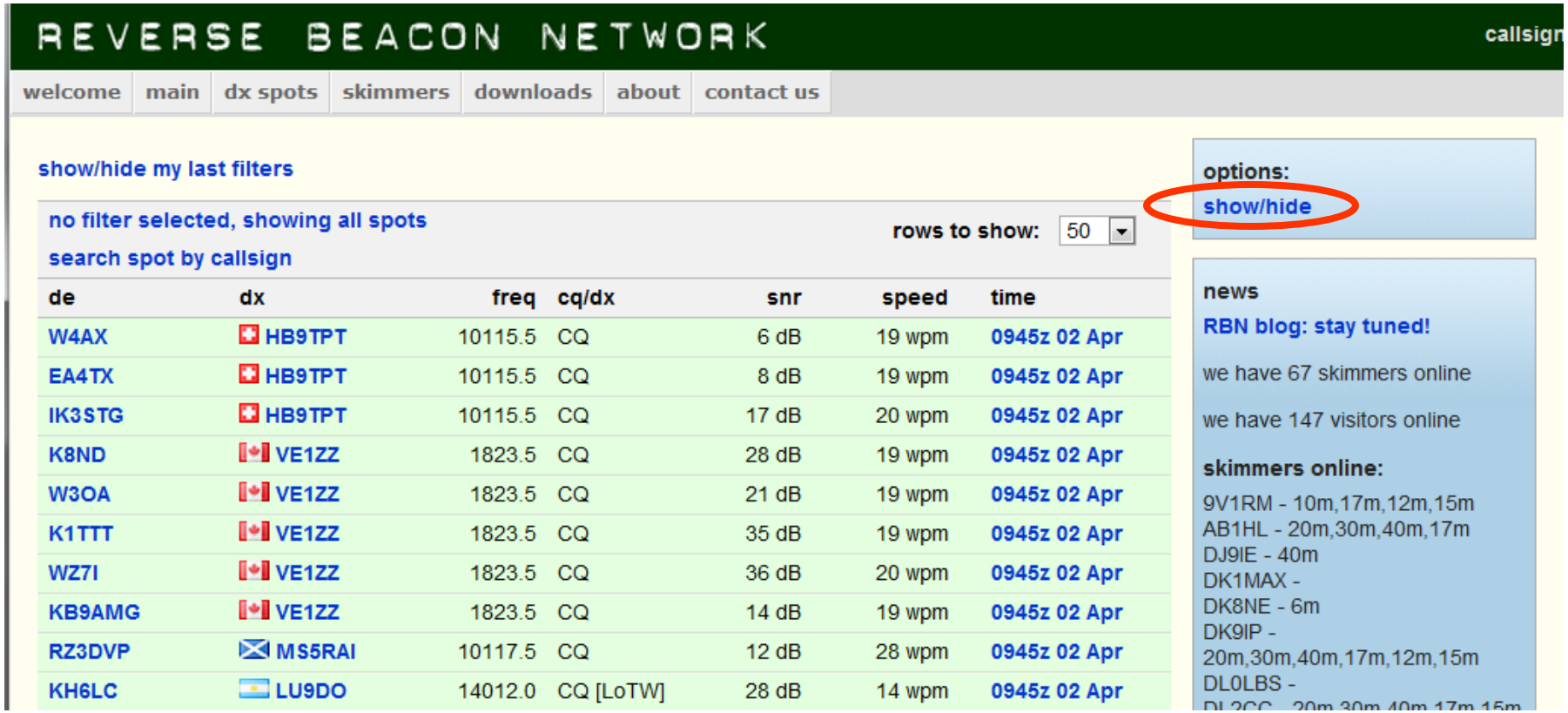
# www.reversebeacon.net main



# Where was I heard?

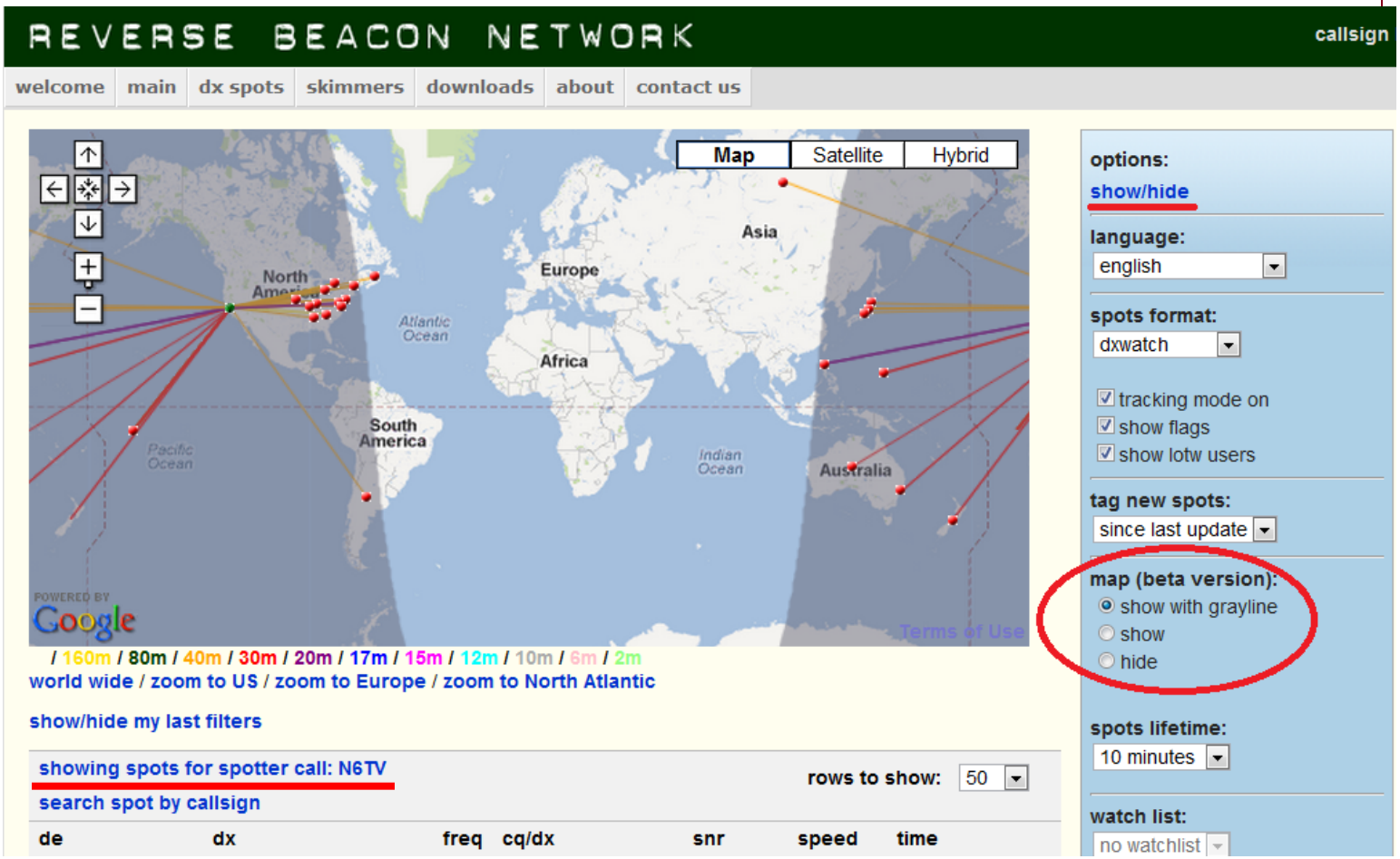


# Plot spots on a map

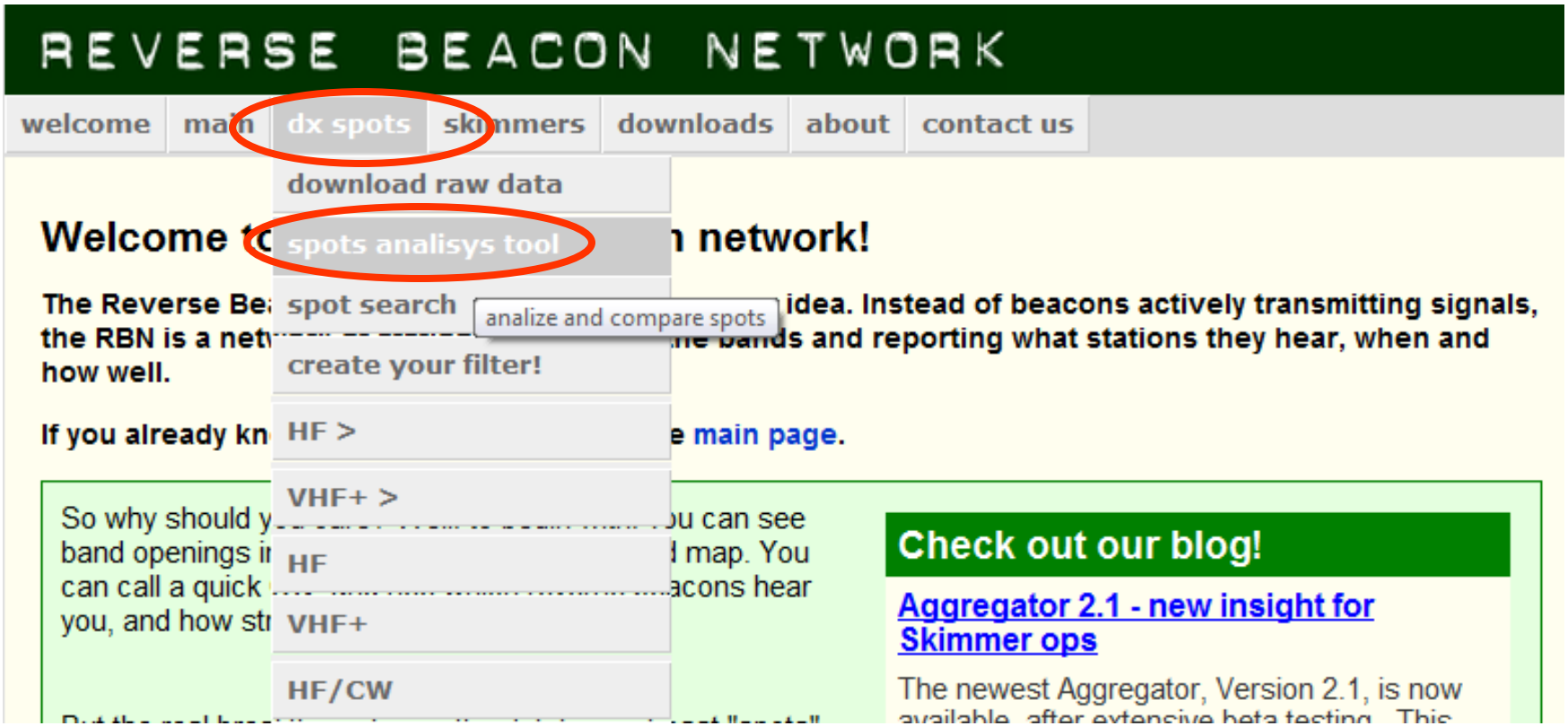



| de | dx | freq | cq/dx | snr | speed | time |
|---|---|---|---|---|---|---|
| W4AX | HB9TPT | 10115.5 | CQ | 6 dB | 19 wpm | 0945z 02 Apr |
| EA4TX | HB9TPT | 10115.5 | CQ | 8 dB | 19 wpm | 0945z 02 Apr |
| IK3STG | HB9TPT | 10115.5 | CQ | 17 dB | 20 wpm | 0945z 02 Apr |
| K8ND | VE1ZZ | 1823.5 | CQ | 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 |

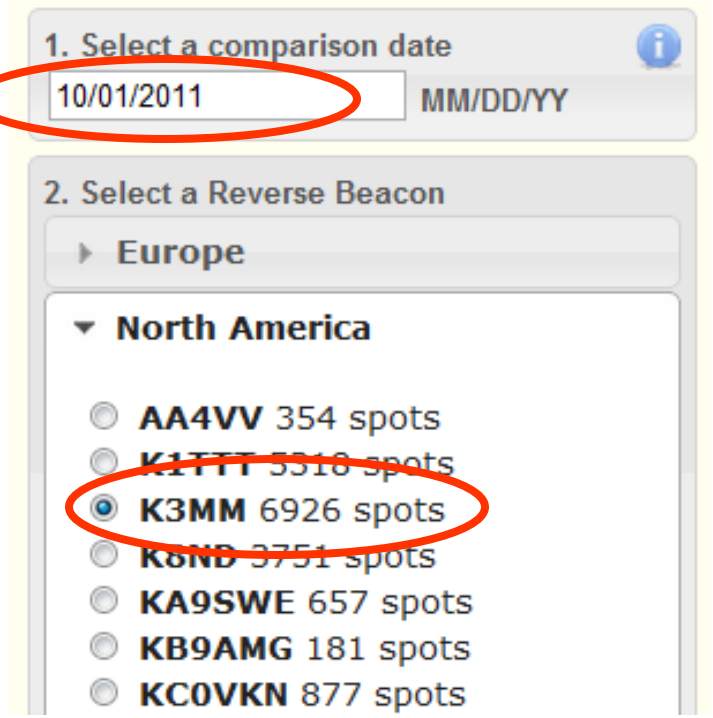
# Which bands are open at *my* QTH?

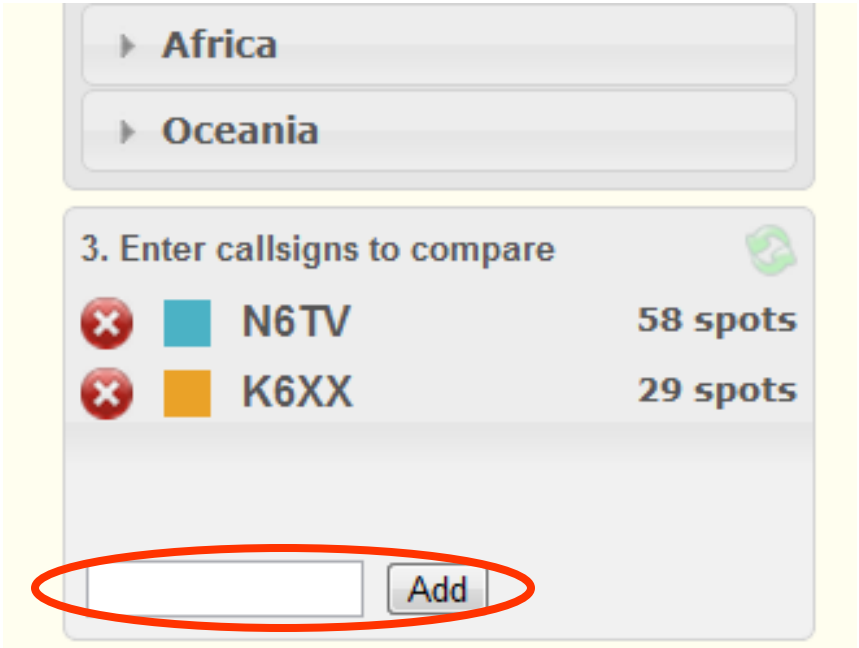


# Spots analysis tool

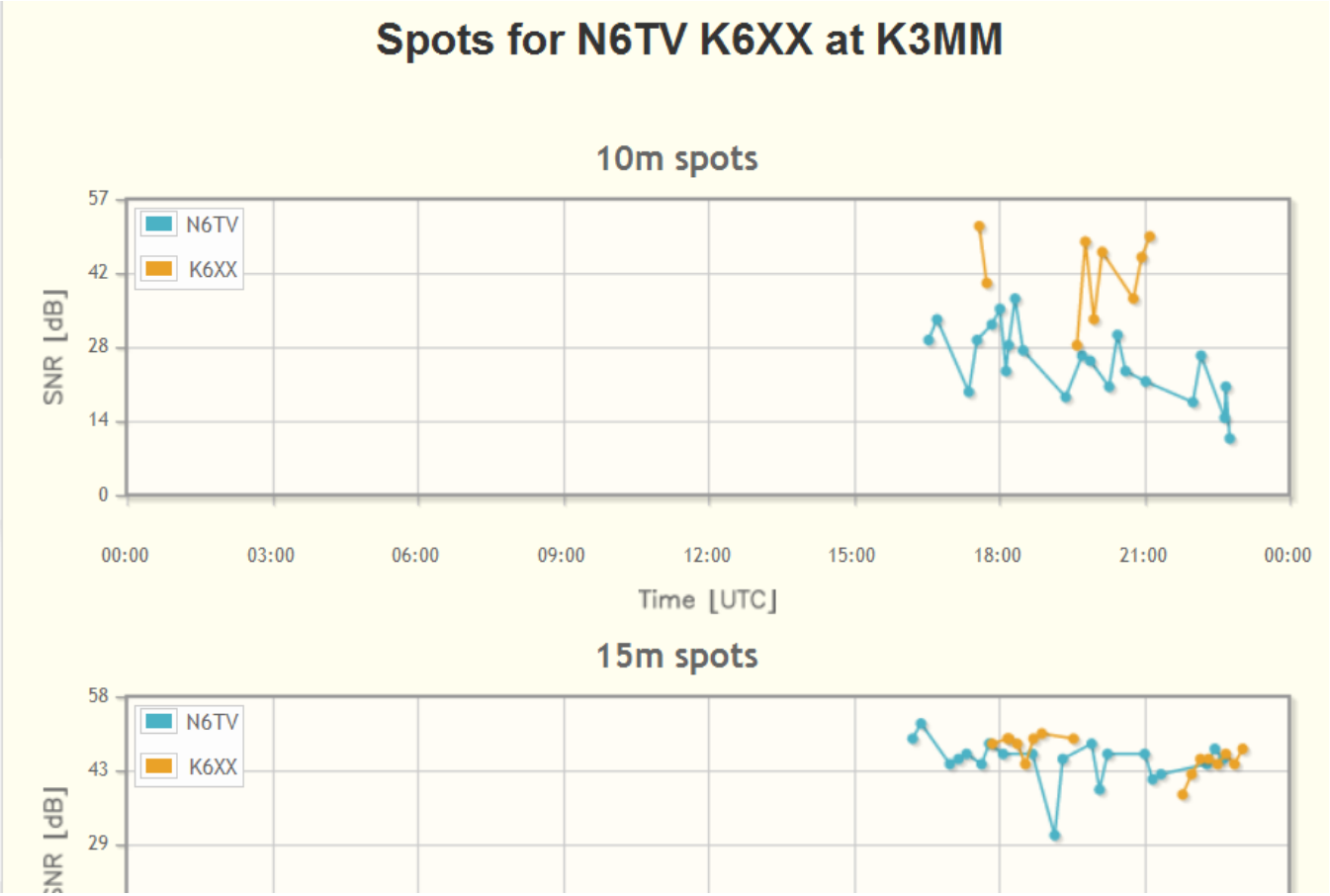


# Pick a Date, a Skimmer, add callsigns to compare

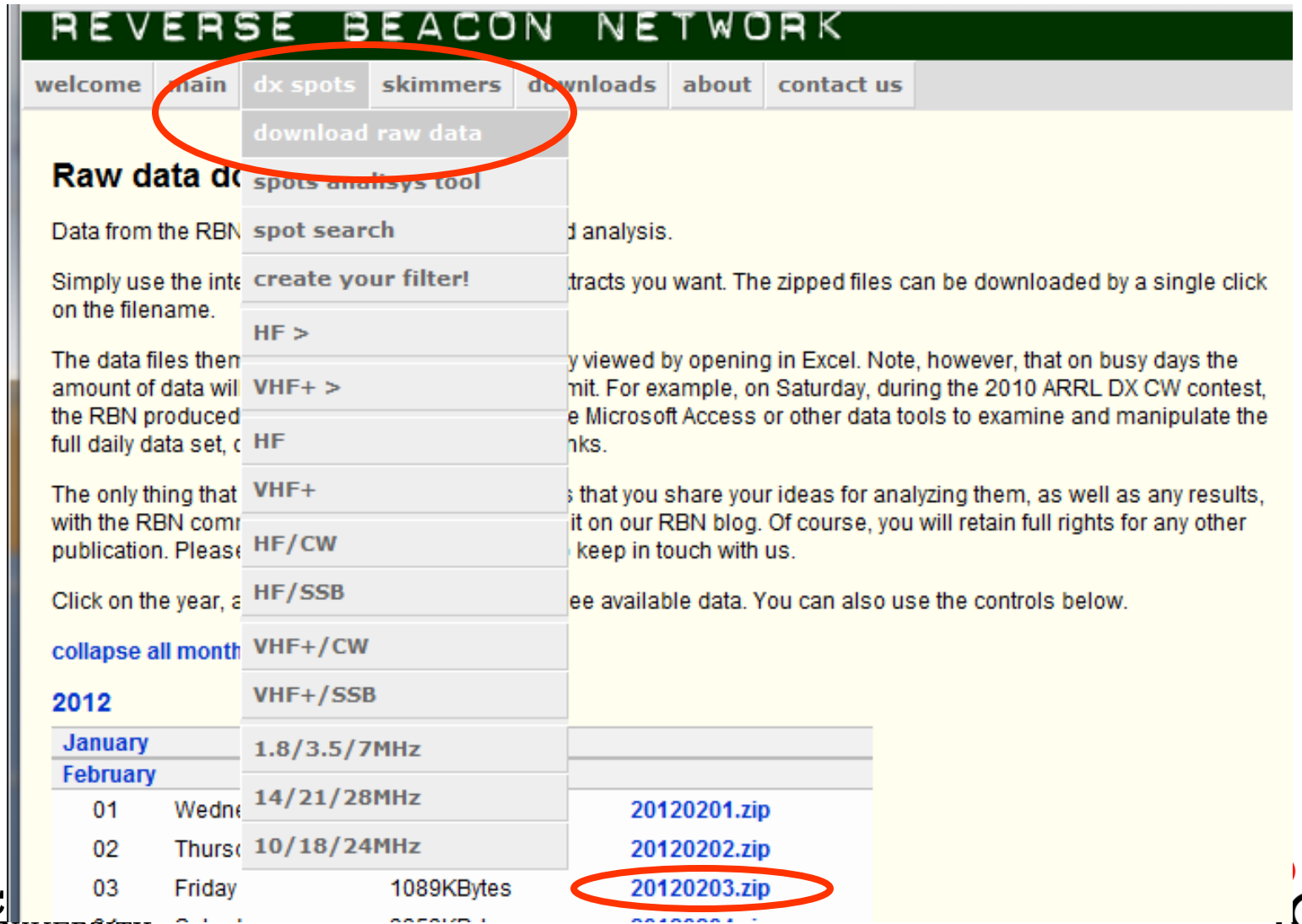


# And the winner is … K6XX!



# 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:
  2013: 5,743,545 (33.2 spots per *second*)
  2014: 6,200,340 (35.9) – up 8.0%
  2015: 7,085,553 (41.0) – up 14.0%
  2016: 6,060,130 (35.1) – down 14.5%
  2017: 7,004,509 (40.5) – up 15.6%
- ARRL DX CW:
  2014: 4,146,399 (86,383 spots per *hour*)
  2015: 5,537,017 (115,354) – up 33.5%
  2016: 3,924,585 (81,762) – down 29.1%
  2017: 4,285,719 (89,286) – up 9.2%
  2018: 4,474,188 (93,212) – up 4.4%

# What's the Average CW Speed of a Spot?

- CQ WW CW:
  - 2013: 30.6 WPM
  - 2014: 30.8
  - 2015: 30.7
  - 2016: 30.8
  - 2017: 30.8
- ARRL DX CW:
  - 2014: 29.6 WPM
  - 2015: 30.1
  - 2016: 29.9
  - 2017: 29.6
  - 2018: 29.4

# RTTY Skimmer Stats

- CQ World-Wide RTTY (48 hours):

  2015: 922,311 (5.3 spots per *second*)
  2016: 994,212 (5.8) – up 7.8%
  2017: 1,154,444 (6.7) – up 16.1%

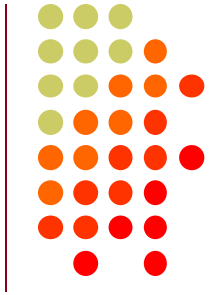
- ARRL January RTTY Roundup (30 hours):

  2016: 457,033 (15,234 spots per *hour*)
  2017: 470,377 (15,679) – up 2.9%
  2018: 566,063 (18,869) – up 20.3%

# 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
- CW Skimmer 2.0
- CW Skimmer Server 1.6
- RTTY Skimmer Server 1.3
- Aggregator v4.4
- Skimmer Server using Red Pitaya on 8 bands

# 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://microtelecom.it/perseus/ (Perseus SDR)
- https://redpitaya.com/ (Red Pitaya)
- http://hamsci.org/n6tv-red-pitaya-combine-cw-rtty-skimmer-hdsdr

# For more information

- http://www.dxengineering.com/parts/ins-rf-pro-1b (RF Pro-1B loop antenna)
- 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?