Dayton Contest Forum
2012

Using the Reverse Beacon Network and CW Skimmer As a Contesting Advantage

by N6TV
n6tv@arrl.net

Overview

- **What is CW Skimmer?**
- **What is the Reverse Beacon Network (RBN)?**
- **How can I use the RBN to improve my score?**
- **How can I use the RBN to check my antennas?**
- **Skimmer Accuracy**
- **What's next?**

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)

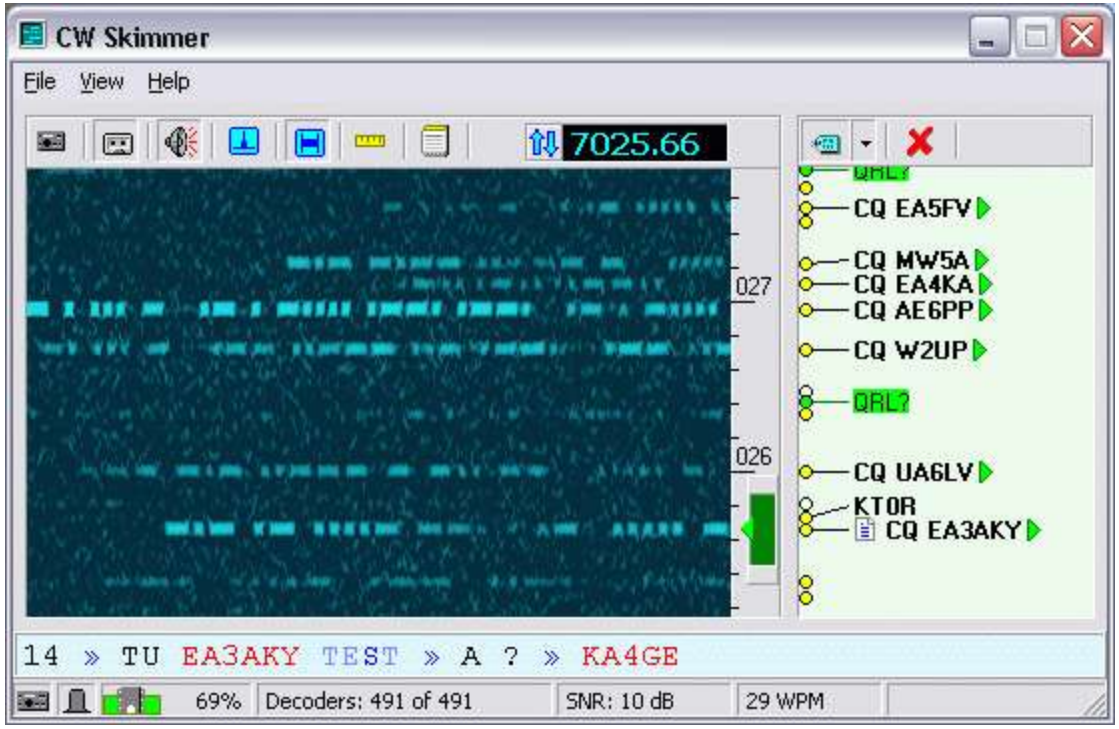






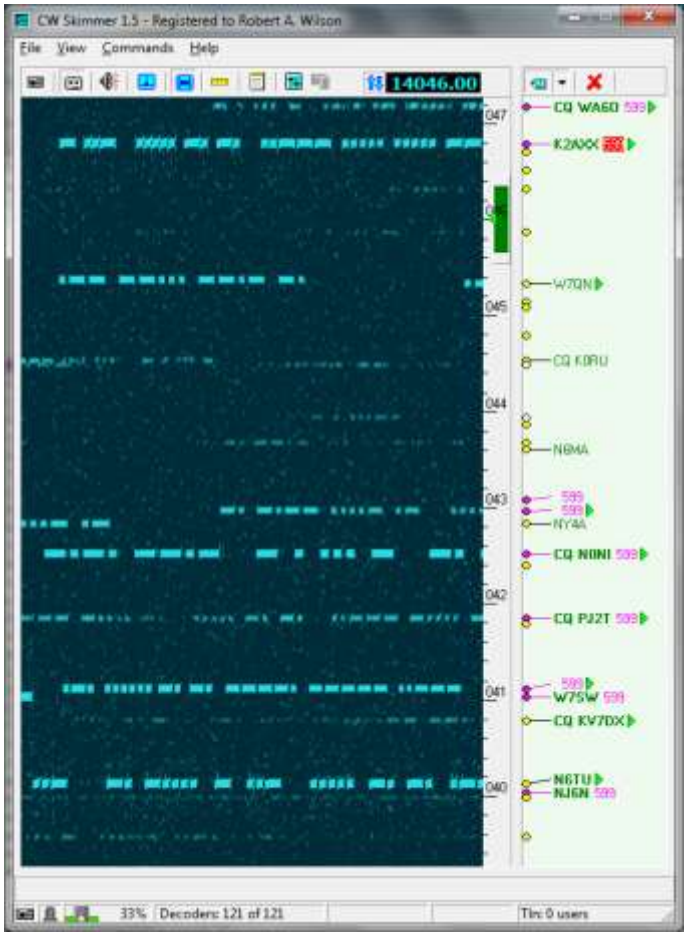
Software

2. CW Skimmer *or* Skimmer Server



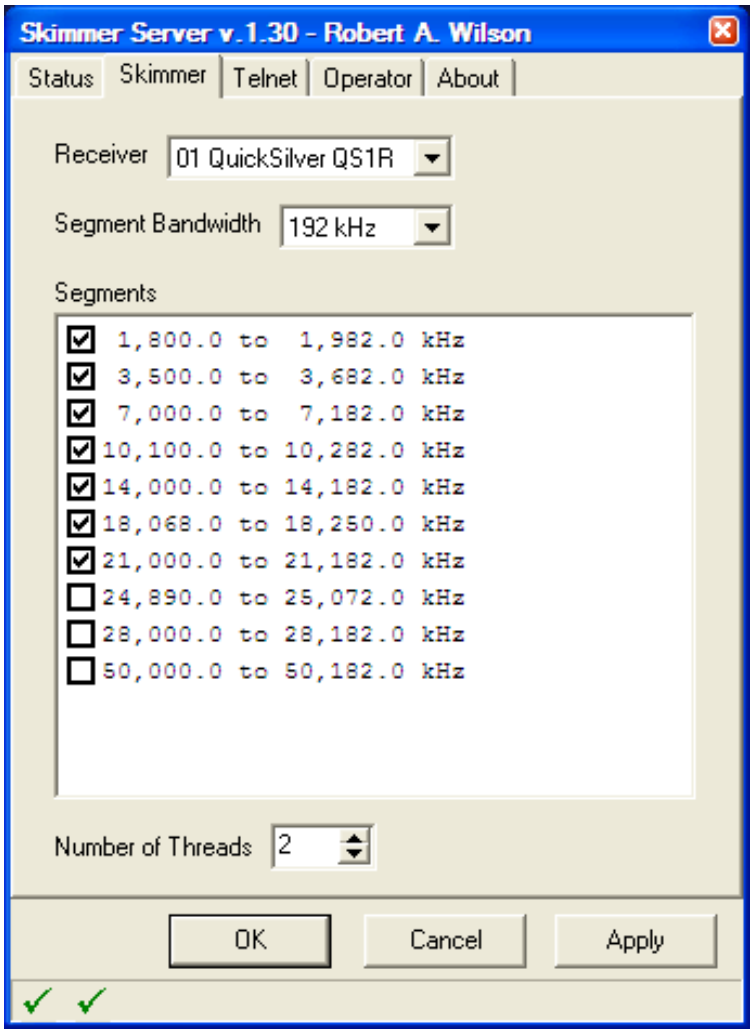


CW Skimmer by VE3NEA



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

Skimmer Server by VE3NEA



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

Telnet server

- DX Cluster Emulation:

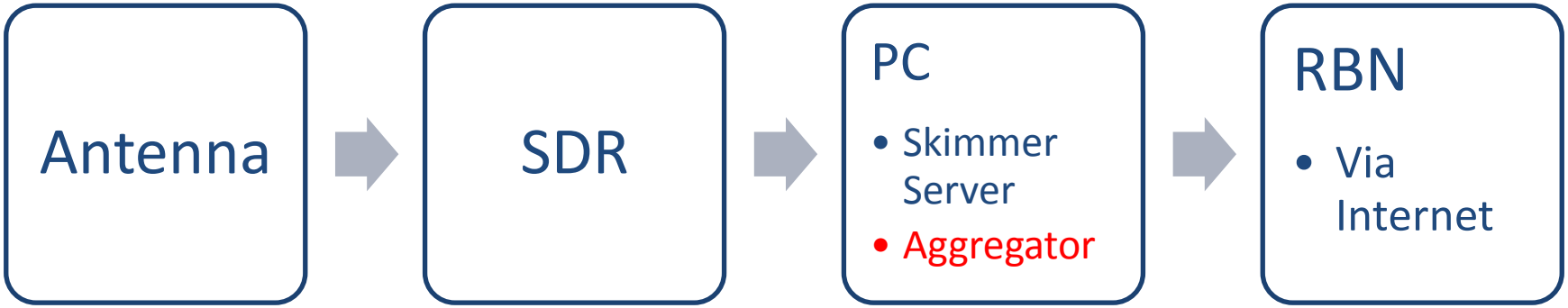
```
DX de N6TV-#:     14058.7  WR7HE          24 dB  31 WPM  CQ          2350
DX de N6TV-#:     14029.6  NM7D           29 dB  25 WPM  CQ          2350
DX de N6TV-#:     14059.5  YW4D           35 dB  31 WPM  CQ          2350
DX de N6TV-#:     14022.6  J39BS          11 dB  25 WPM  CQ          2350
DX 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?

- Originated and operated by PY1NB
- Uses *any* decoded CW signal as a beacon
- Multiple Skimmers world-wide decode your callsign and S/N ratio
- An “Aggregator” program forwards Skimmer spots to a central server
- Central server distributes spots via web site www.reversebeacon.net, and public telnet servers

How do spots get to the RBN server?



How do I access the RBN?

- telnet.reversebeacon.net port 7000
  (DX Spider software, hosted by K5TR)

- arcluster.reversebeacon.net port 7000
  (V6 AR-Cluster software, hosted by W2QO)

- http://www.reversebeacon.net

How can I use RBN to improve my score?

- Make sure the Skimmers find *you*
- When permitted, use RBN as primary DX Cluster for CW contests
  - Far more spots, smaller pileups
  - Fills up your band map *fast*
  - Helps you find clear spots (between stations you can't hear)
  - Shows where *you* are being heard
    - E.g. at K3LR on 15m: "Spotted by S50ARX-#"
    - First EU answered our 15m CQs 25 minutes later

RBN Most Spotted
2011 CQ WW CW

USA (SO HP)

K0DQ	6724
K1RX	6681
K3CR	6439
K5ZD	5684
K4ZW	5606
NN1N	5543
N2NT	5052
N9RV	4829
K1DG	4400
K1TO	4218

DX (SO HP)

VY2TT	3639
VY2ZM	3541
P40W	2695
P40F	2249
A45XR	2162
PZ5T	1864
8P5A	1647
NH2T	1439
CR3E	1430
CR6K	1253
4O3A	447

José Nunes, CT1BOH

- “PZ5T was lucky”

- “I think I had +++TEST--- CR3E.
  Next year I will have TEST CR3E.”

How to be easily spotted by a CW Skimmer

- Send *everything* at the *same consistent speed*
  - Do *not* use +++/--- or >/< to speed up/slow down
- Call CQ or TEST and send your call twice
  - CQ N6TV N6TV
- Use proper spacing (let computer send)
  - Don’t send by hand and rusheverythingtogether
- Change freq. slightly to get spotted again

Use as Main DX Cluster
But Filter The Spots

- telnet.reversebeacon.net port 7000

```
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.reversebeacon.net port 7000

```
set dx filter call=N6TV or (unique>2 and
  (spotterstate=CA or spotterstate=NV or
  spotterstate=UT))
```

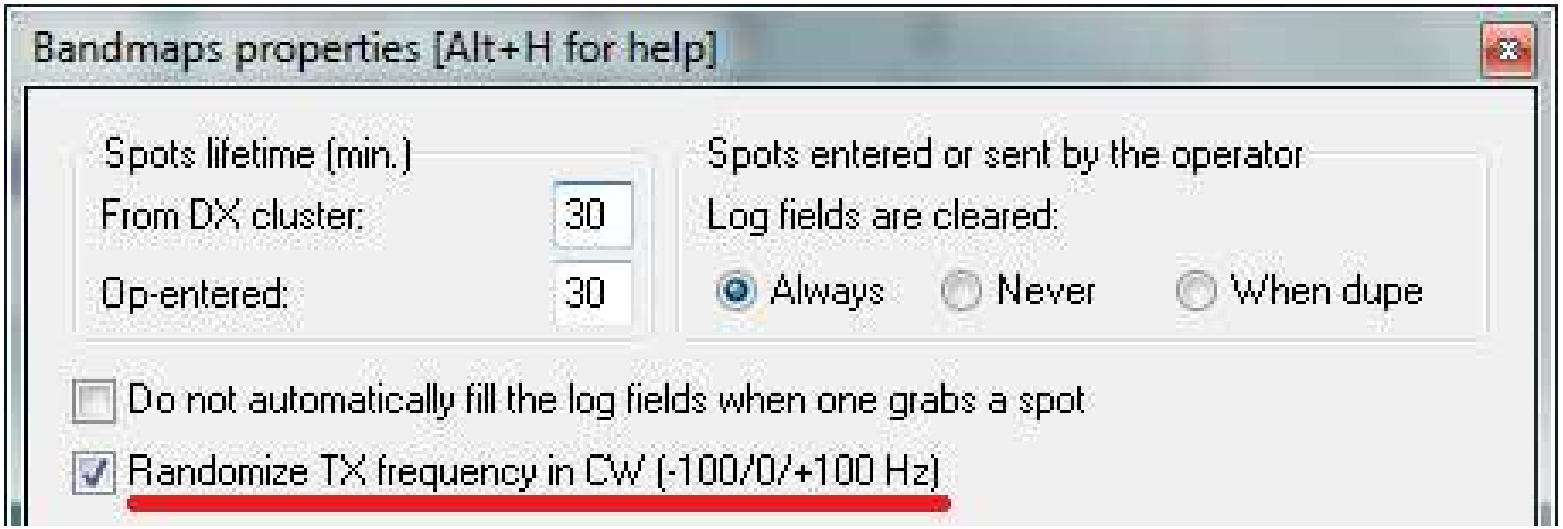
http://www.ab5k.net/ArcDocsVer6/UserManual/ArcDx.htm

Some servers combine RBN with “legacy” (human) spots

- dxc.w9zrx.net port 7373
- dxc.n7tr.com port 7373
  - Pre-filters to show only spots from Zones 3 and 4
- dxc.k1ttt.net port 7373

How to improve your chances in a Skimmer-generated pileup

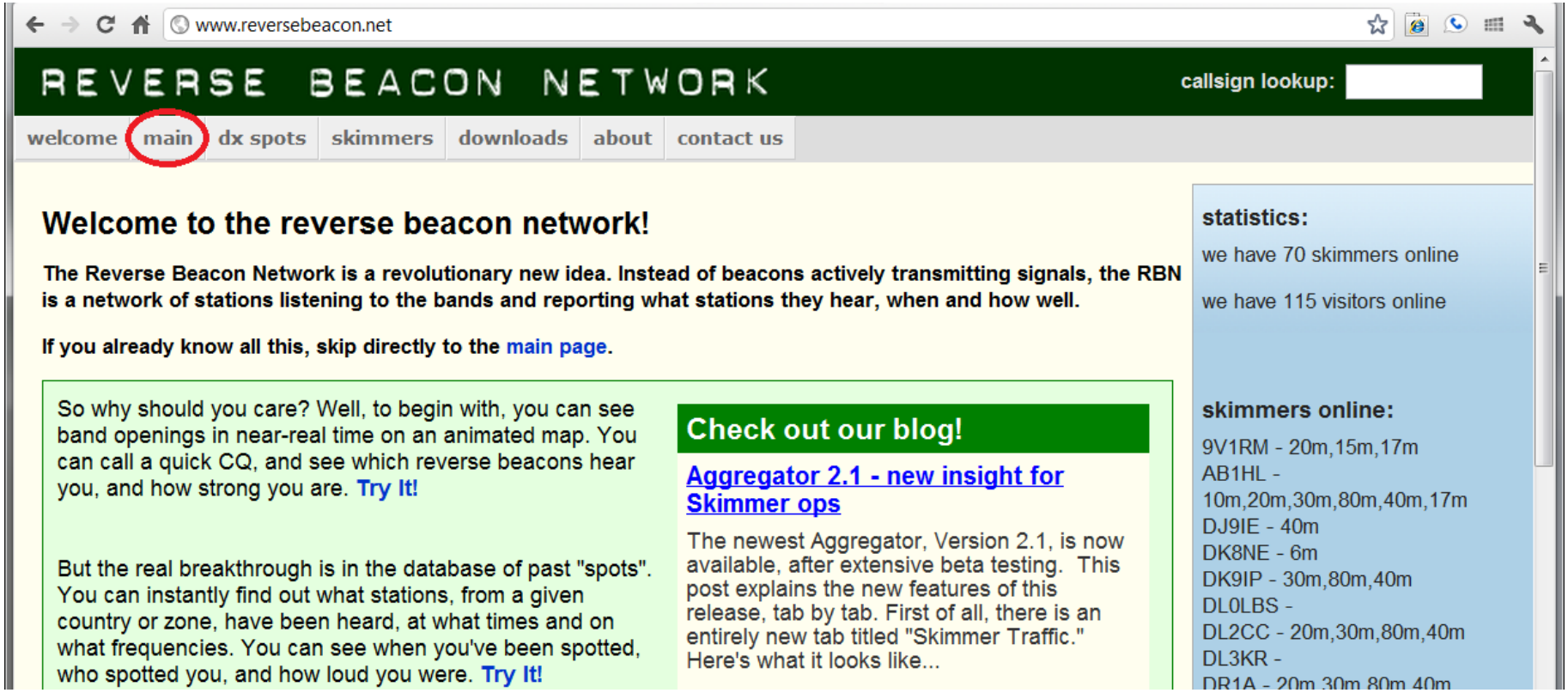
- Use XIT or the “randomize TX” feature of your logging program to call a bit off frequency.



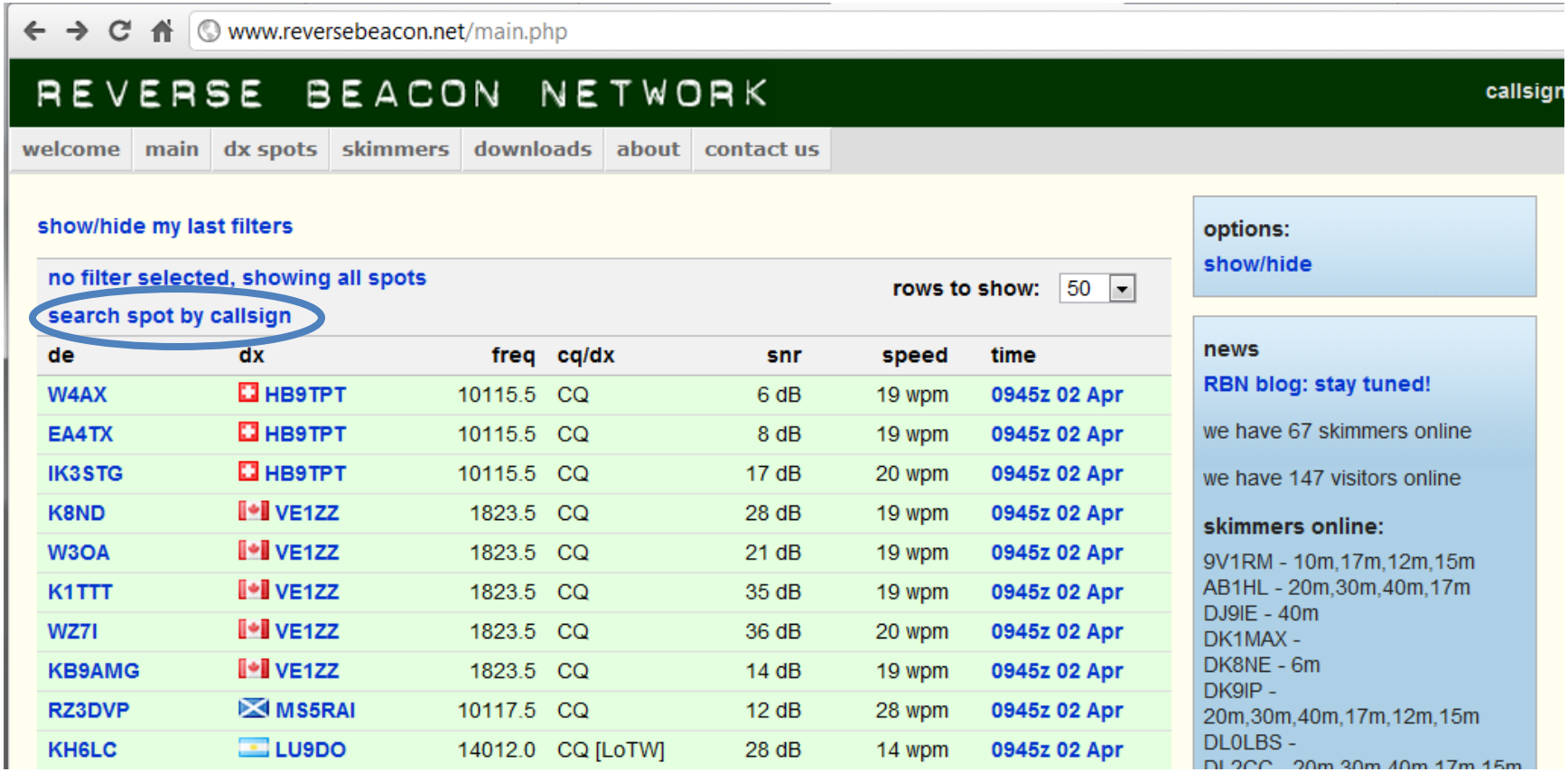
How do I use the RBN to Check My Antennas?

- 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 site

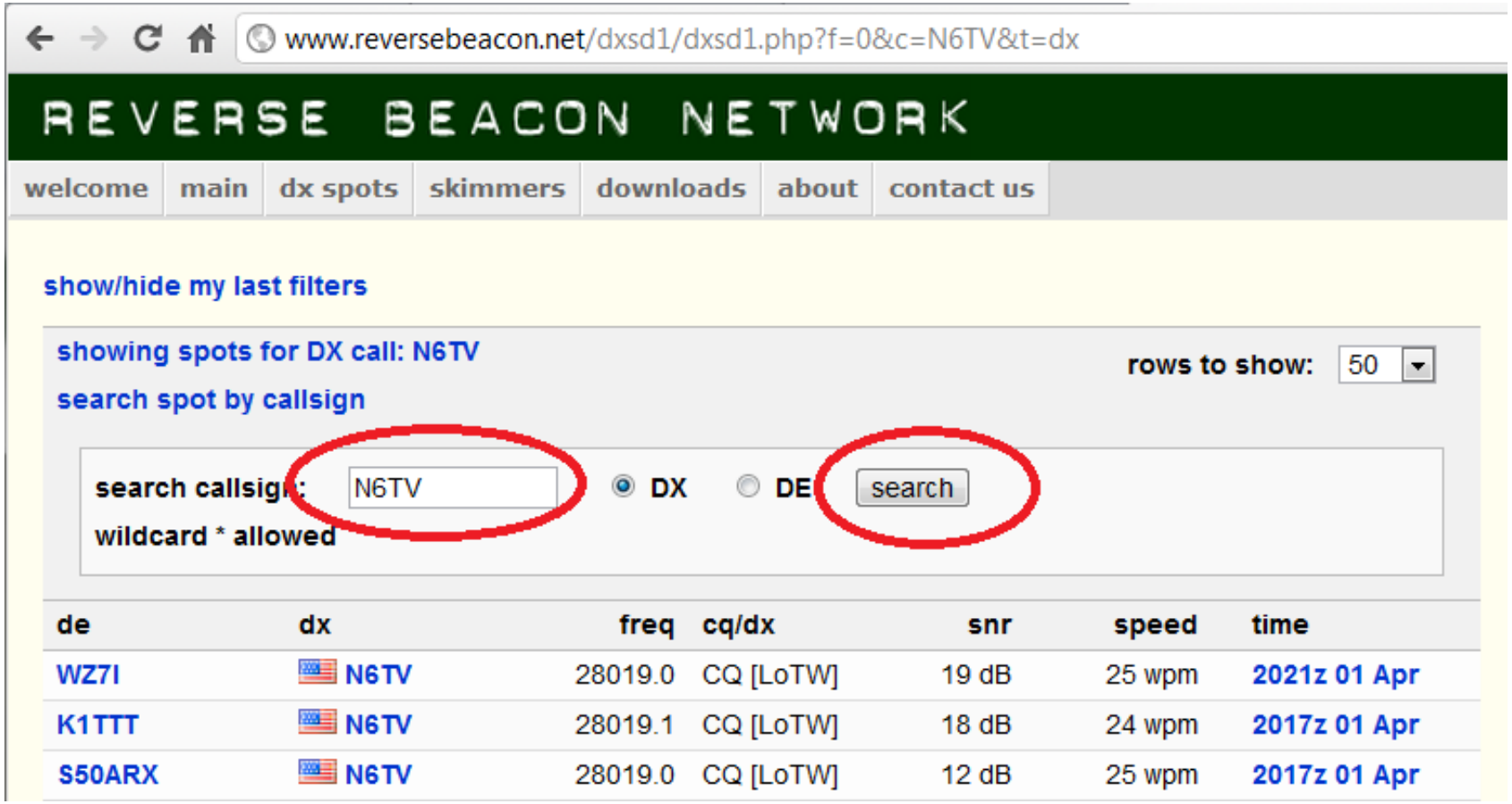
www.reversebeacon.net



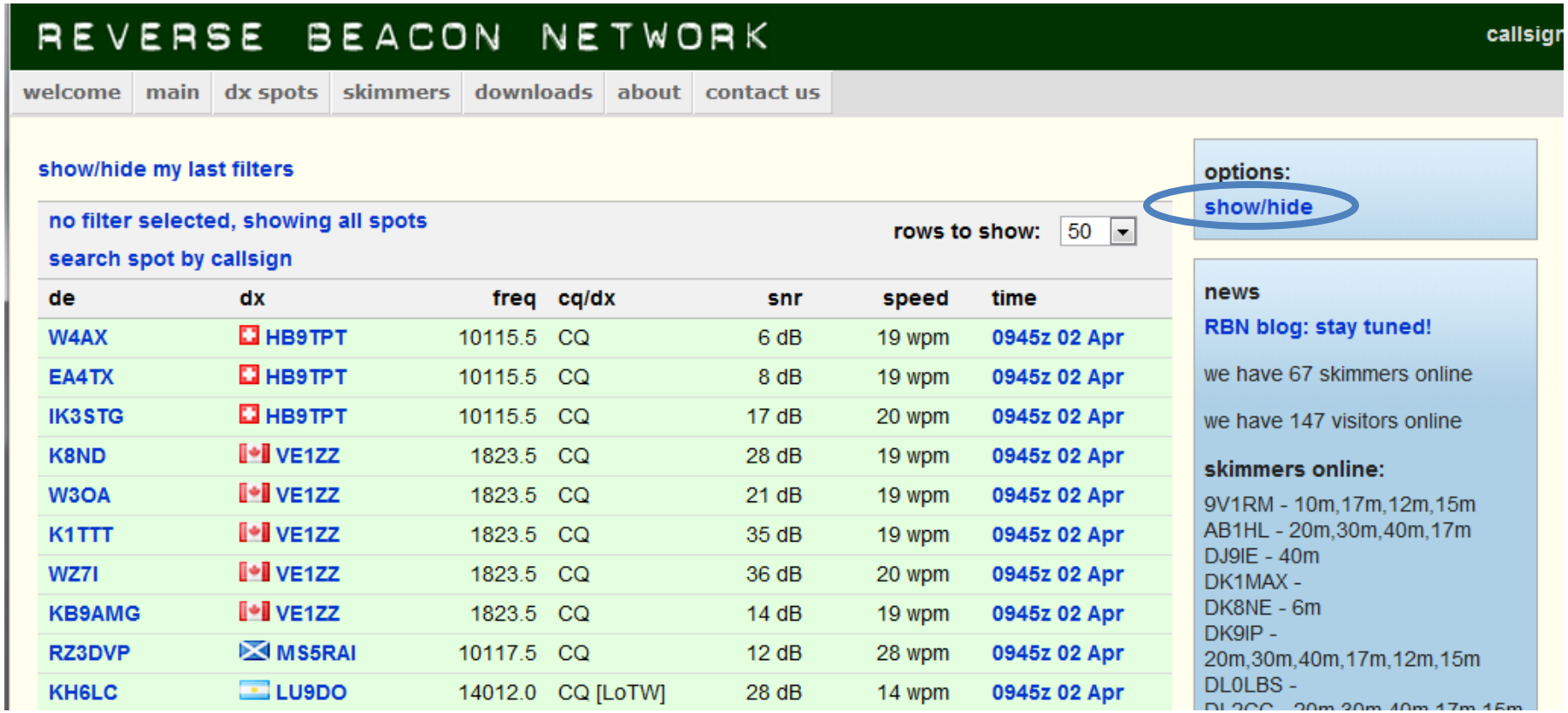
www.reversebeacon.net main



Where was I heard?



Plot spots on a map

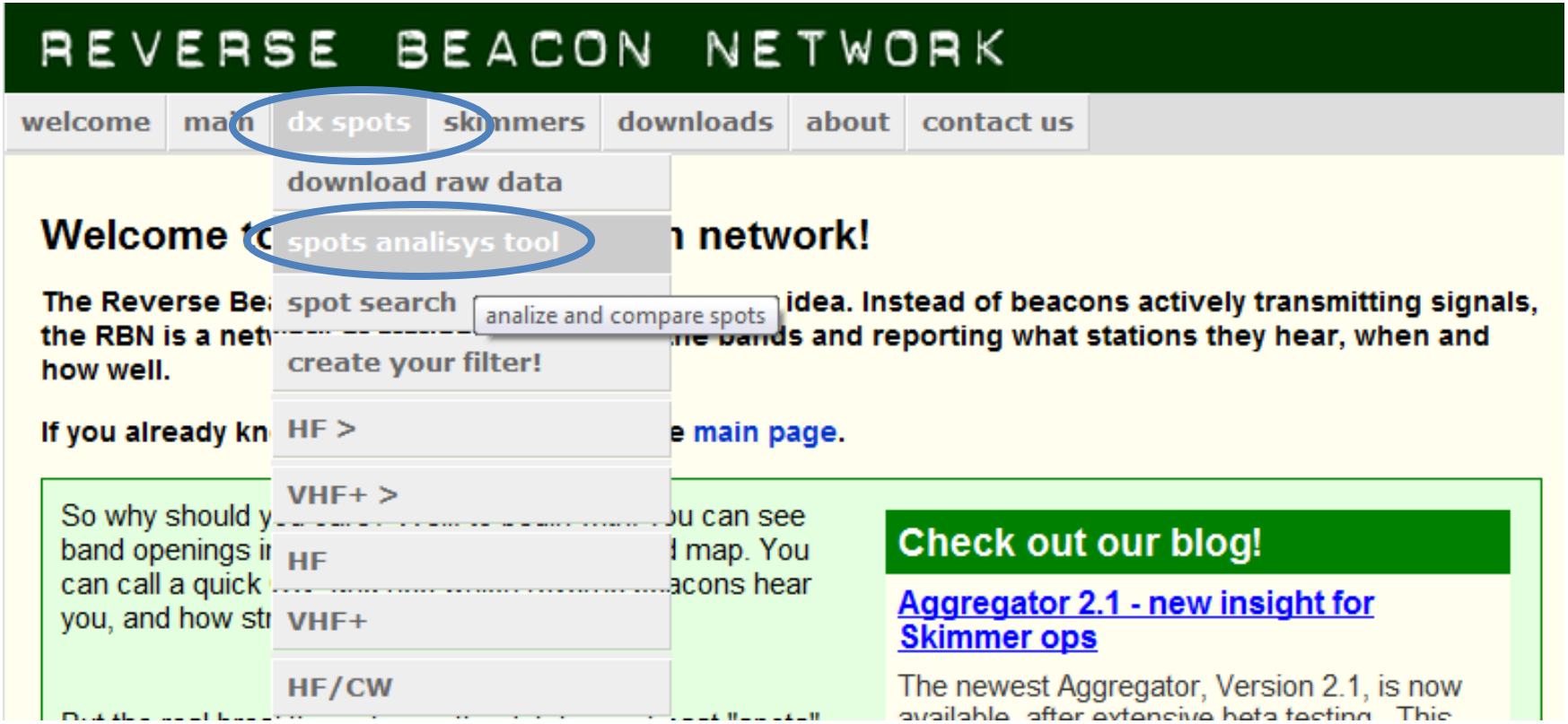


de	dx	freq	cq/dx	snr	speed	time
W4AX	HB9TPT	10115.5	CQ	6 dB	19 wpm	0945z 02 Apr
EA4TX	HB9TPT	10115.5	CQ	8 dB	19 wpm	0945z 02 Apr
IK3STG	HB9TPT	10115.5	CQ	17 dB	20 wpm	0945z 02 Apr
K8ND	VE1ZZ	1823.5	CQ	28 dB	19 wpm	0945z 02 Apr
W3OA	VE1ZZ	1823.5	CQ	21 dB	19 wpm	0945z 02 Apr
K1TTT	VE1ZZ	1823.5	CQ	35 dB	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

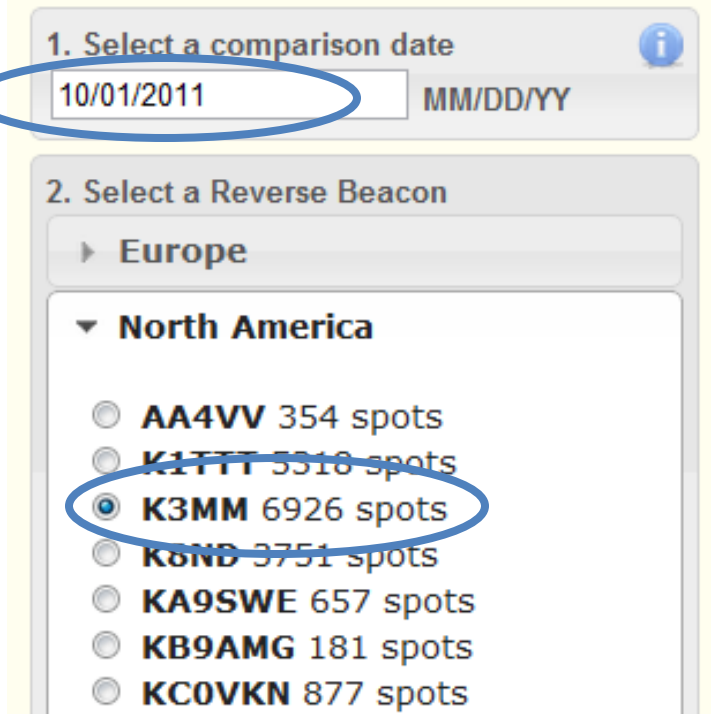
Typical “where heard” Google map

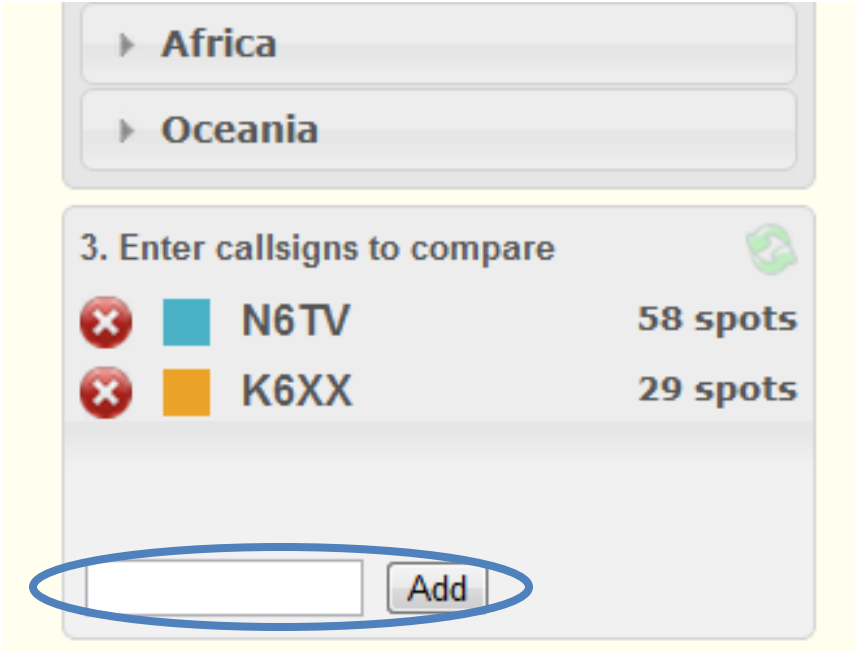


Spots analysis tool

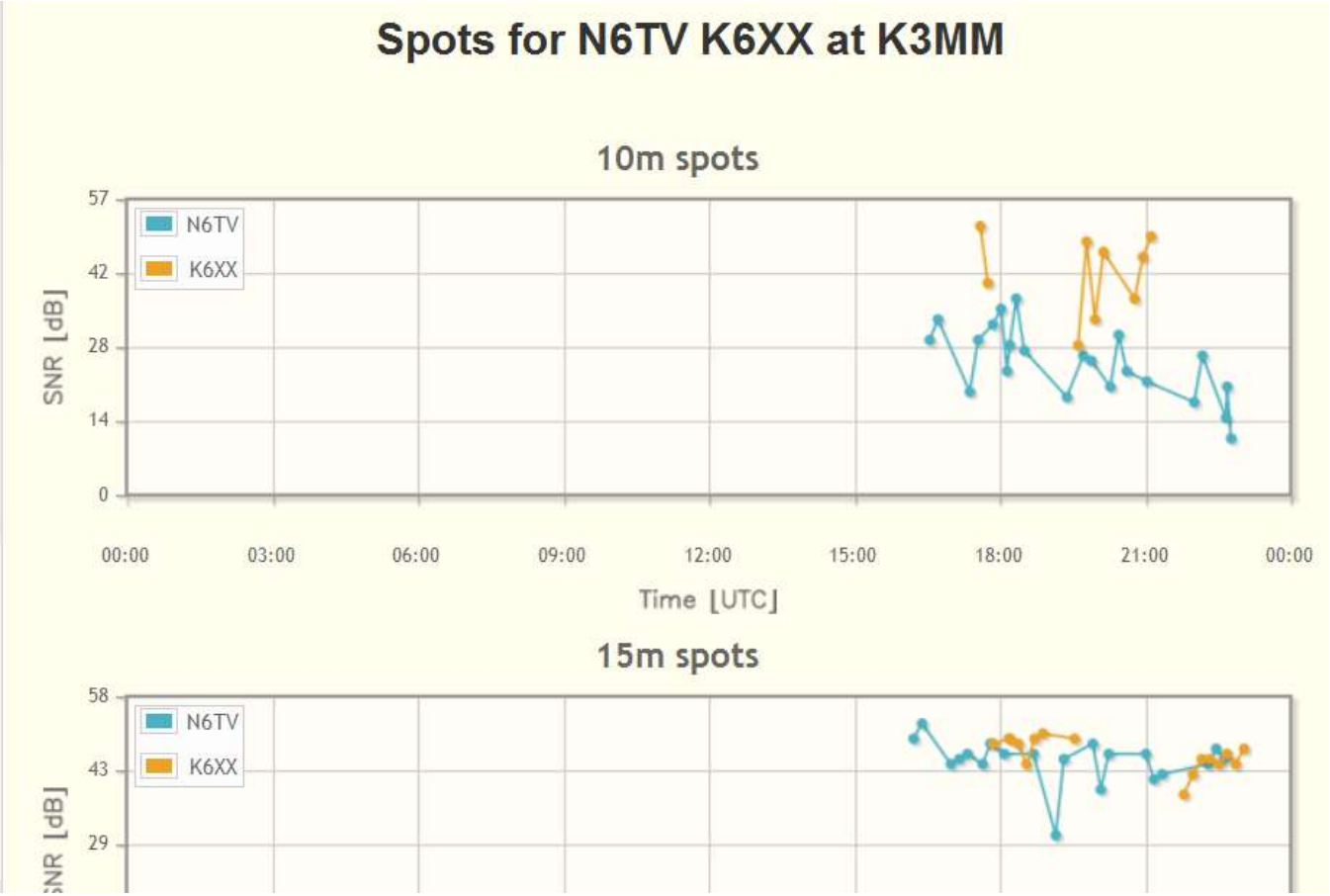


Pick a Date, a Skimmer, add callsigns to compare

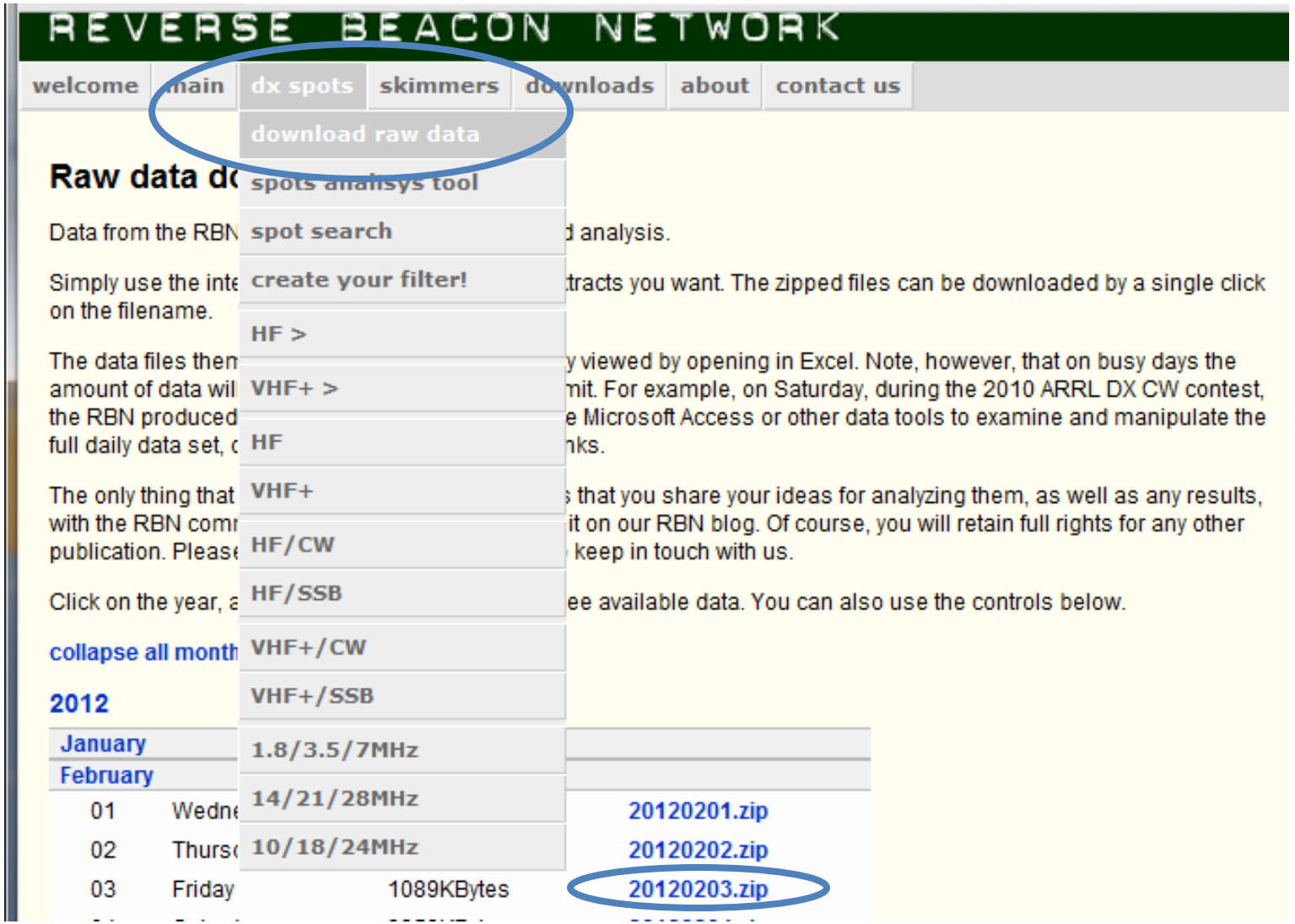




And the winner is … K6XX!



Download raw data files



Raw data is text file, Comma Separated Values

```
callsign,de_pfx,de_cont,freq,band,dx,dx_pfx,dx_cont,mode,db,date
   VK6IA,VK,OC,28028.4,10m,W6YI,K,NA,CQ,14,2011-11-26 00:00:00
   ON5KQ,ON,EU,7005.5,40m,K2QMF,K,NA,CQ,40,2011-11-26 00:00:00
   ON5KQ,ON,EU,7005.5,40m,K2QMF,K,NA,CQ,40,2011-11-26 00:00:00
   N4ZR,K,NA,7011.7,40m,OM5NS,OM,EU,CQ,22,2011-11-26 00:00:00
   N4ZR,K,NA,7020.6,40m,S50R,S5,EU,CQ,40,2011-11-26 00:00:00
   N4ZR,K,NA,7023,40m,NQ4I,K,NA,CQ,56,2011-11-26 00:00:00
   WA7LNW,K,NA,7051.5,40m,YR1C,YO,EU,CQ,15,2011-11-26 00:00:00
```

Total World-Wide RBN spots, 2011 CQ WW:

3,268,434 (18.9 spots per *second*)

2012 ARRL DX CW:

2,451,276 (51,068 spots per hour)

(1,242,715 by DX Skimmers, outside USA)

Skimmer Accuracy

- Frequency accuracy is very good, so
  - **Call a bit off frequency!**
  - **Specify 100 Hz "Spot bandwidth" for band map**
- For an individual skimmer, >99% of calls are copied correctly (proper spacing helps)
- But 500 spots/hour = 5 "busted spots" per hour, per skimmer
- The more skimmers you monitor, the higher the total number of busted spots

Summary of Recommendations

- Make sure Skimmers copy *you*
- Call spots *off frequency*
- Limit monitored skimmers to those within your geographical area, plus any spots of yourself
- Use new unique>*n* filter to eliminate most busted spots

What's Next?

- N6TV further data analysis, work in progress:
  - Compare spots heard, Ant. A vs. Ant. B, w/2 SDRs
  - Sort spotted stations by avg. and peak S/N ratio, as reported by each Skimmer
  - "Score" the Skimmers

“Scoring” the Skimmers (2011 CQ WW CW)

Skimmer	Gross QSOs	Dupes	Unique Calls	Prob. Busts	Pct Busts	Best 60 min rate(QS/Hr)
K3LR-#	82552	72469	5398	702	0.85%	811
W3LPL-#	66663	58306	4607	1251	1.88%	627
KM3T-#	66668	59020	4225	702	1.05%	461
N6TV-#	43935	39102	2666	634	1.44%	706

Skimmer	Net QSOs	Zones	Countries	Sim. Score
K3LR-#	10083	189	744	16,903,161
W3LPL-#	8357	191	734	14,828,675
KM3T-#	7648	175	687	11,961,112
N6TV-#	4833	173	491	4,226,360

Acknowledgements

- 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 Propagandist"
- Telnet server support by K5TR, W2QO, KM3T

For more information

- http://www.reversebeacon.net
- http://www.pvrc.org/n4zr/rbn.pdf
- http://reversebeacon.blogspot.com
- http://www.bcdxc.org/ve7cc/default.htm#download
- http://www.dxatlas.com/CwSkimmer
- http://www.qrz.com/db/n6tv