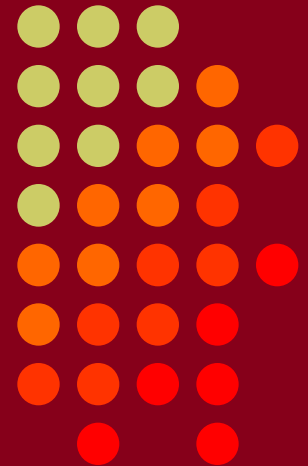


CW Skimmers, DX Cluster, and the Reverse Beacon Network

Presented by N6TV

n6tv@arrl.net

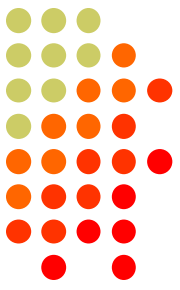


Overview



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

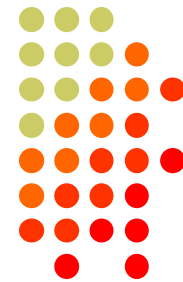
It all starts with one developer



- 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

Pixel Tech.
Loop
RF Pro-1B:



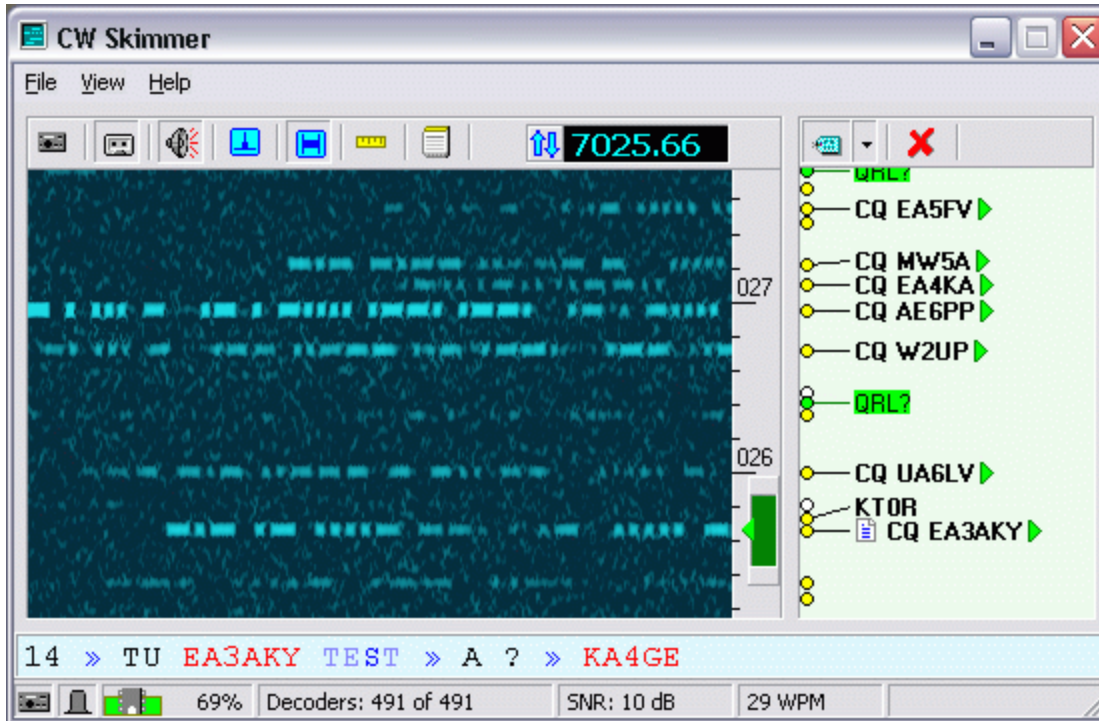
DX Engineering
Active Horizontal
ARAH3-1PE:



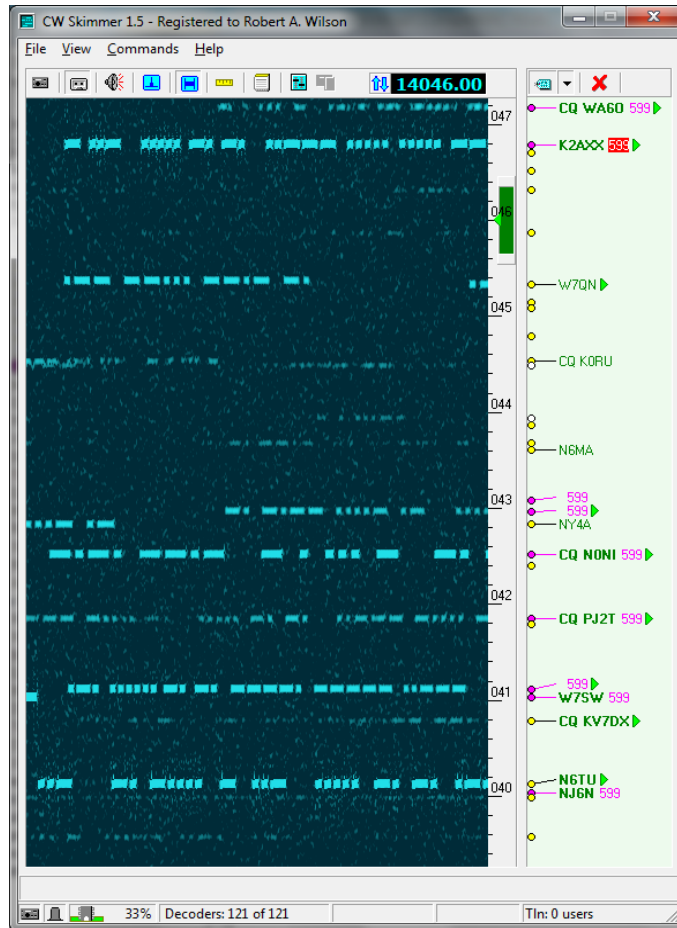
Software



3. CW Skimmer or Skimmer Server

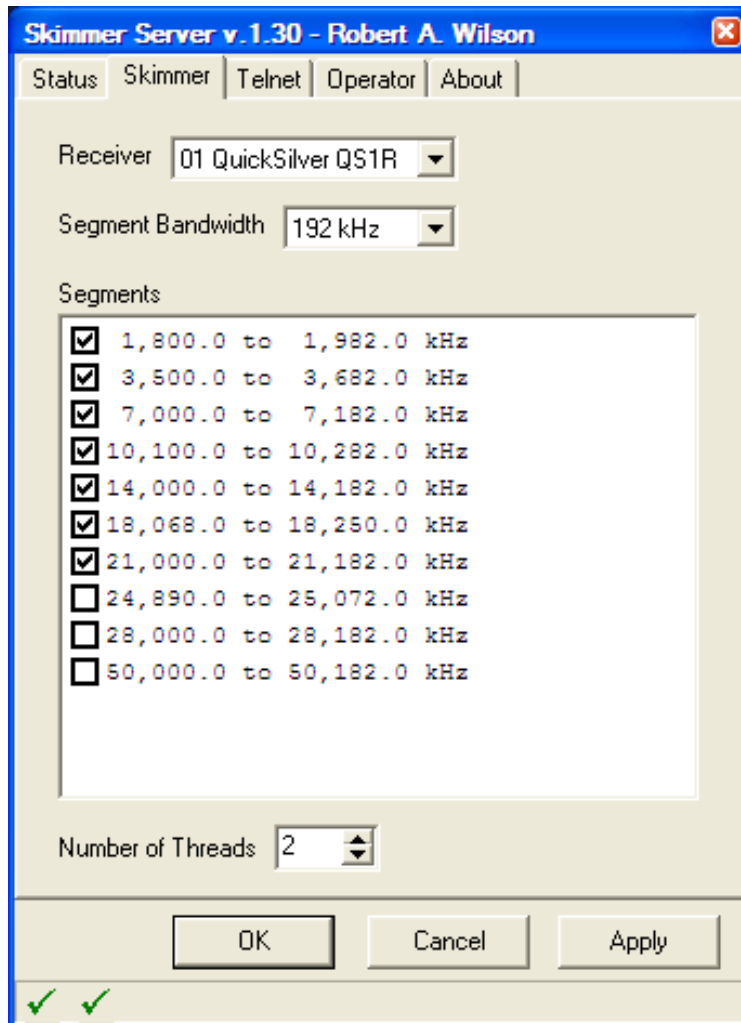


CW Skimmer by VE3NEA



- 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 (localhost port 7300)



- Emulates a DX Cluster Node

```
DX de N6TU-#: 14058.7 WR7HE 24 dB 31 WPM CQ 2350
DX de N6TU-#: 14029.6 NM7D 29 dB 25 WPM CQ 2350
DX de N6TU-#: 14059.5 YW4D 35 dB 31 WPM CQ 2350
DX de N6TU-#: 14022.6 J39BS 11 dB 25 WPM CQ 2350
DX de N6TU-#: 14066.8 NF6A 38 dB 30 WPM CQ 2350
DX de N6TU-#: 14054.4 N5UM 26 dB 28 WPM CQ 2350
DX de N6TU-#: 14021.2 NN5J 35 dB 31 WPM CQ 2350
DX de N6TU-#: 14061.4 WX5S 12 dB 28 WPM CQ 2350
DX de N6TU-#: 14064.2 WQ5L 15 dB 28 WPM CQ 2350
DX de N6TU-#: 14032.2 UE7XF 18 dB 27 WPM 2350
DX de N6TU-#: 14042.9 NT5C 45 dB 31 WPM 2350
DX de N6TU-#: 14032.2 UE7XF 18 dB 27 WPM CQ 2350
DX de N6TU-#: 14039.2 EA3FP 15 dB 31 WPM CQ 2350
DX de N6TU-#: 14052.5 W0YR 20 dB 28 WPM CQ 2350
DX de N6TU-#: 14022.9 AB7E 32 dB 25 WPM CQ 2350
DX de N6TU-#: 14028.4 WH6R 7 dB 29 WPM 2350
DX de N6TU-#: 14065.6 KH7B 25 dB 29 WPM CQ 2350
To ALL de SKIMMER <0952Z> : Clicked on "UE7XF" at 14032.2
DX de N6TU-#: 14069.6 KF6T 13 dB 28 WPM CQ 2350
DX de N6TU-#: 14069.1 NK0M 25 dB 28 WPM CQ 2350
To ALL de SKIMMER <0952Z> : Clicked on "" at 14031.4
DX de N6TU-#: 14035.5 KF8GE 12 dB 26 WPM 2350
DX de N6TU-#: 14028.4 WH6R 7 dB 29 WPM CQ 2350
DX de N6TU-#: 14036.1 NZ1U 16 dB 28 WPM CQ 2350
DX de N6TU-#: 14062.7 N4QS 11 dB 29 WPM CQ 2350
DX de N6TU-#: 14045.1 YU1FM 20 dB 32 WPM CQ 2350
DX de N6TU-#: 14059.6 YW4D 35 dB 31 WPM 2350
```

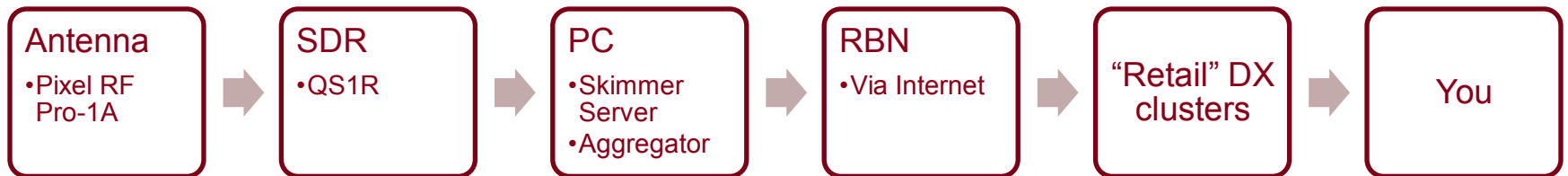
Reports Signal to Noise ratio, CW Speed, CQers

What is the Reverse Beacon Network (RBN)?



- Uses *any* CW signal as a beacon
- Multiple CW Skimmers world-wide record signal strength (S/N ratio in dB) and CW speed (WPM)
- A free “Aggregator” program forwards CW 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

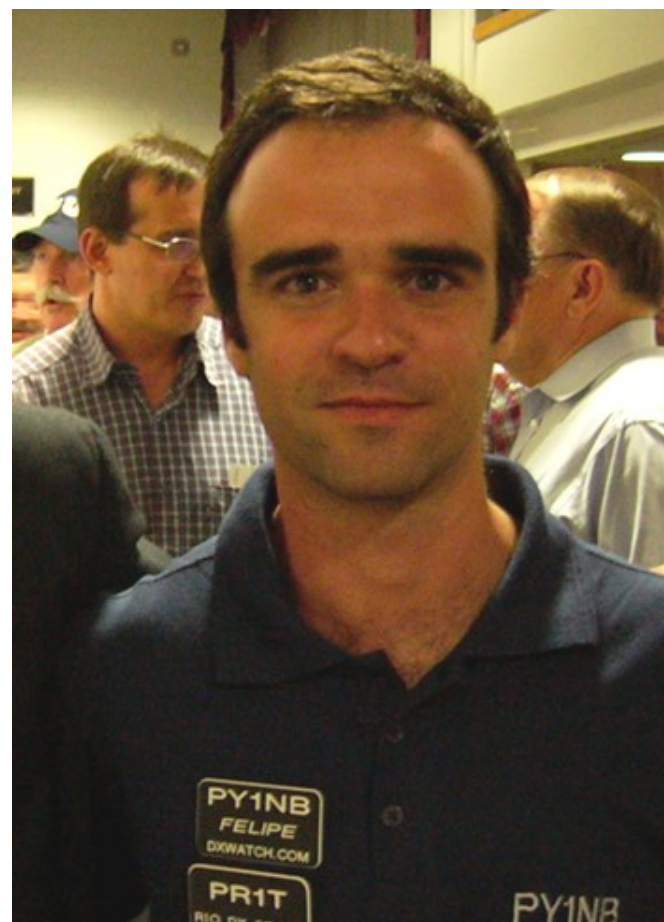


- RBN web site and first aggregator originated by PY1NB (similar to his other web site, www.dxwatch.com). Felipe pays all the bills.
- Lots of code by W3OA (aggregator), F5VIH (Spots analysis tool)
- CW Skimmer evangelized and tested by N4ZR (also publishes [RBN blog](#)) – “RBN Chief Evangelist”
- Telnet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

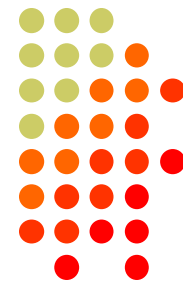
Felipe Ceglia, PY1NB



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



Dick Williams, W3OA



- Created the newest RBN Aggregator software



Nick Sinanis, F5VIH



- Wrote the RBN Spots Analysis Tool



Pete Smith, N4ZR

- RBN Chief Evangelist
- Skimmertalk Reflector:
<http://dayton.contesting.com/mailman/listinfo/skimmertalk>



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 CQ “properly”
- Entering a contest?
 - Before: Check antenna F/B, signal strength
 - During: See where you are being heard
 - After: Compare signal strength with the competition

How can I use RBN to improve my score?



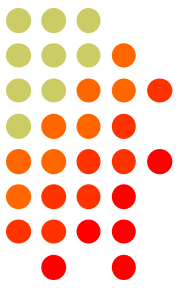
- Make sure the Skimmers find *you*
- Use RBN spots on your favorite **DX Cluster** for CW and RTTY contests when allowed
 - Far more spots, with smaller pileups than human-posted Cluster spots
 - Quickly fills up your logging software **band map**
 - Helps you find **clear spots** (between stations 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)

How do I CQ “properly”?

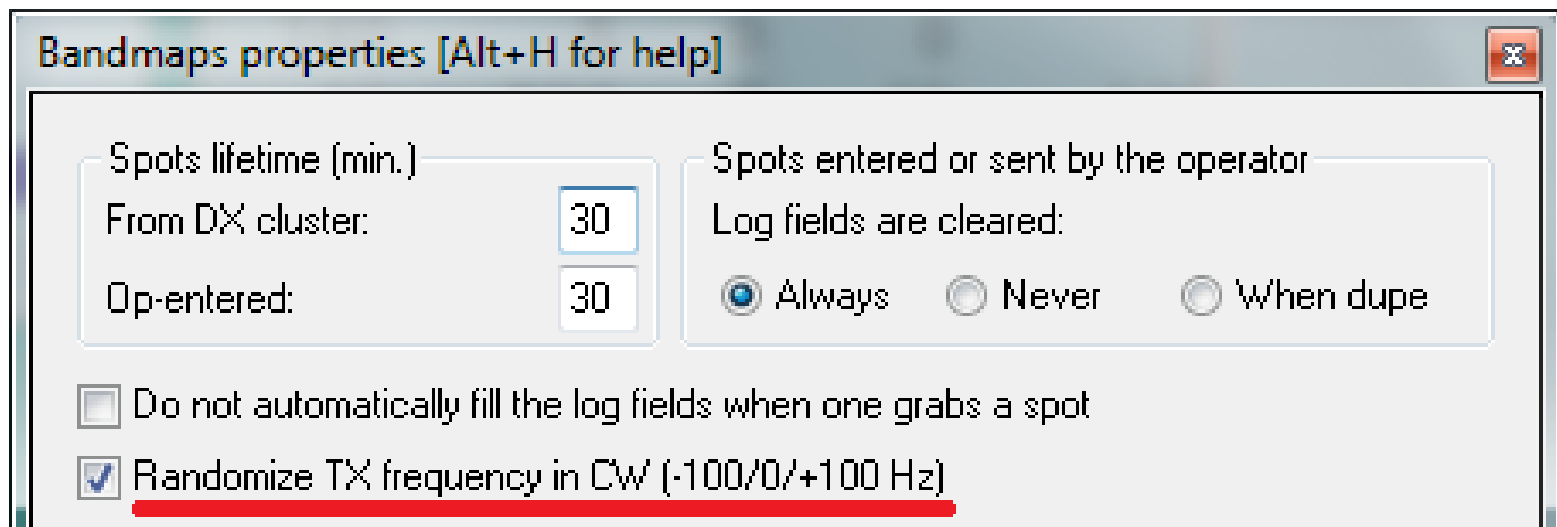


- Send *everything* at the *same consistent speed*
 - Never use $>/<$ or $+++/-$ to change speed in messages
- Call CQ or TEST and send your call twice
 - CQ N6TV N6TV
 - TEST N6TV N6TV
 - CQ N6TV N6TV TEST
- Use proper spacing (let computer send)
 - Don't send with paddles and rush everything together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

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?



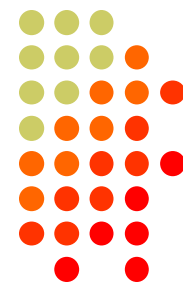
- To test performance, just call CQ on CW, check RBN web site (turn beam, repeat)
- Use RBN web site's "Spots Analysis Tool" to compare your signal to the competition
- Download raw data files for deeper analysis
 - Every RBN spot posted since February, 2009 is archived on the site

Accessing the RBN (SOA, Multi)



1. Many DX clusters combine RBN and human spots using AR-Cluster V6 (see www.dxcluster.info for listing).
Some ARC V6 clusters offer CT1BOH spot quality filters (busts, bad frequencies)
2. dxc.ve7cc.net port 23
(CC Cluster software – removes many bad spots, 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.ab5k.net/ArcDocsVer6/UserManual/ArcDx.htm>

Filtering Spots (new way)



- Use **CC User** software by VE7CC to log in to dxc.ve7cc.net and program filters with a full-feature Graphical User Interface
- CC Cluster nodes *automatically* reject “unique” (busted) spots
- Tutorial:
 - <http://reversebeacon.blogspot.com/2010/11/using-rbn-telnet-server-brief-tutorial.html>
- Reference:
 - <http://www.bcdxc.org/ve7cc/default.htm#download>

CC User Filter Dialogs



Settings **Country** State Bands Locals = 11 DX WWV = 4 Login Msg Ann = 5 Wx Mail

filter7 reject not_by_dxcc @VE7CC-1

<input type="checkbox"/> 4U1U	<input type="checkbox"/> FO/c	<input type="checkbox"/> J8	<input type="checkbox"/> TG	<input type="checkbox"/> VP5
<input type="checkbox"/> 6Y	<input type="checkbox"/> FP	<input checked="" type="checkbox"/> K	<input type="checkbox"/> T1	<input type="checkbox"/> VP9
<input type="checkbox"/> 8P	<input type="checkbox"/> HH	<input type="checkbox"/> KG4	<input type="checkbox"/> T19	<input type="checkbox"/> XE
<input type="checkbox"/> C6	<input type="checkbox"/> HI	<input type="checkbox"/> KL	<input type="checkbox"/> V2	<input type="checkbox"/> XF4
<input type="checkbox"/> CM	<input type="checkbox"/> HK0/a	<input type="checkbox"/> KP1	<input type="checkbox"/> V3	<input type="checkbox"/> YN
<input type="checkbox"/> CY0	<input type="checkbox"/> HP	<input type="checkbox"/> KP2	<input type="checkbox"/> V4	<input type="checkbox"/> YS
<input type="checkbox"/> CY9	<input type="checkbox"/> HR	<input type="checkbox"/> KP4	<input checked="" type="checkbox"/> VE	<input type="checkbox"/> YV0
<input type="checkbox"/> FG	<input type="checkbox"/> J3	<input type="checkbox"/> KP5	<input type="checkbox"/> VP2E	<input type="checkbox"/> ZF
<input type="checkbox"/> FJ	<input type="checkbox"/> J6	<input type="checkbox"/> OX	<input type="checkbox"/> VP2M	
<input type="checkbox"/> FM	<input type="checkbox"/> J7	<input type="checkbox"/> PJ7	<input type="checkbox"/> VP2V	

NA 2
 EU
 AF
 AS
 SA
 OC

Filter Type

DX Origination
 Announce
 DX Country

Pass Reject

Ask Cluster Tell Cluster Set Clear

Settings Country **State** Bands Locals = 40 DX = 9 WWV L

States and Provinces

<input type="checkbox"/> W1	<input type="checkbox"/> W2	<input type="checkbox"/> W3	<input type="checkbox"/> W4	<input type="checkbox"/> W5	<input type="checkbox"/> W6	<input type="checkbox"/> W7	<input type="checkbox"/> W8	<input type="checkbox"/> W9	<input type="checkbox"/> W0	<input type="checkbox"/> VE	
<input type="checkbox"/> CT	<input type="checkbox"/> NJ	<input type="checkbox"/> DC	<input type="checkbox"/> AL	<input type="checkbox"/> AR	<input type="checkbox"/> CA	<input checked="" type="checkbox"/> AZ	<input type="checkbox"/> MI	<input type="checkbox"/> IN	<input type="checkbox"/> CO	<input type="checkbox"/> NB	<input checked="" type="checkbox"/> SK
<input type="checkbox"/> MA	<input type="checkbox"/> NY	<input type="checkbox"/> DE	<input type="checkbox"/> GA	<input type="checkbox"/> LA		<input checked="" type="checkbox"/> ID	<input type="checkbox"/> OH	<input type="checkbox"/> IL	<input type="checkbox"/> IA	<input type="checkbox"/> NS	<input checked="" type="checkbox"/> AB
<input type="checkbox"/> ME		<input type="checkbox"/> MD	<input type="checkbox"/> KY	<input type="checkbox"/> MS		<input checked="" type="checkbox"/> MT	<input type="checkbox"/> WV	<input type="checkbox"/> WI	<input type="checkbox"/> KS	<input type="checkbox"/> PE	<input checked="" type="checkbox"/> BC
<input type="checkbox"/> NH		<input type="checkbox"/> PA	<input type="checkbox"/> NC	<input type="checkbox"/> NM		<input checked="" type="checkbox"/> NV			<input type="checkbox"/> MN	<input type="checkbox"/> NL	<input type="checkbox"/> NT
<input type="checkbox"/> RI			<input type="checkbox"/> FL	<input type="checkbox"/> OK		<input checked="" type="checkbox"/> OR			<input type="checkbox"/> MO	<input type="checkbox"/> QC	<input type="checkbox"/> NU
<input type="checkbox"/> VT			<input type="checkbox"/> SC	<input type="checkbox"/> TX		<input checked="" type="checkbox"/> WA			<input type="checkbox"/> NE	<input type="checkbox"/> ON	<input type="checkbox"/> YT
			<input type="checkbox"/> TN			<input checked="" type="checkbox"/> WY			<input type="checkbox"/> ND	<input type="checkbox"/> MB	
			<input type="checkbox"/> VA			<input checked="" type="checkbox"/> UT			<input type="checkbox"/> SD		

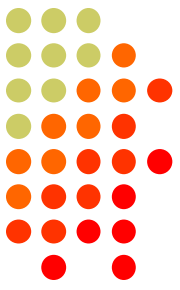
Ask Cluster Tell Cluster Clear

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)
- dxc.n7tr.com port 7373 (AR Cluster, but pre-filters to show only spots from Zones 3 and 4)

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 ☆ 📄 🔄 🗄️ 🔧

REVERSE BEACON NETWORK

callsign lookup:

welcome **main** dx spots skimmers downloads about contact us

Welcome to the reverse beacon network!

The Reverse Beacon Network is a revolutionary new idea. Instead of beacons actively transmitting signals, the RBN is a network of stations listening to the bands and reporting what stations they hear, when and how well.

If you already know all this, skip directly to the [main page](#).

So why should you care? Well, to begin with, you can see band openings in near-real time on an animated map. You can call a quick CQ, and see which reverse beacons hear you, and how strong you are. [Try It!](#)

But the real breakthrough is in the database of past "spots". You can instantly find out what stations, from a given country or zone, have been heard, at what times and on what frequencies. You can see when you've been spotted, who spotted you, and how loud you were. [Try It!](#)

Check out our blog!

[Aggregator 2.1 - new insight for Skimmer ops](#)

The newest Aggregator, Version 2.1, is now available, after extensive beta testing. This post explains the new features of this release, tab by tab. First of all, there is an entirely new tab titled "Skimmer Traffic." Here's what it looks like...

statistics:

we have 70 skimmers online

we have 115 visitors online

skimmers online:

9V1RM - 20m,15m,17m
AB1HL -
10m,20m,30m,80m,40m,17m
DJ9IE - 40m
DK8NE - 6m
DK9IP - 30m,80m,40m
DL0LBS -
DL2CC - 20m,30m,80m,40m
DL3KR -
DR1A - 20m 30m 80m 40m

www.reversebeacon.net main



← → ↻ 🏠 🌐 www.reversebeacon.net/main.php

REVERSE BEACON NETWORK callsign

welcome | main | dx spots | skimmers | downloads | about | contact us

[show/hide my last filters](#)

no filter selected, showing all spots rows to show: 50

[search spot by callsign](#)

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

options:
[show/hide](#)

news
[RBN blog: stay tuned!](#)
we have 67 skimmers online
we have 147 visitors online

skimmers online:
9V1RM - 10m,17m,12m,15m
AB1HL - 20m,30m,40m,17m
DJ9IE - 40m
DK1MAX -
DK8NE - 6m
DK9IP -
20m,30m,40m,17m,12m,15m
DL0LBS -
DL2CC - 20m,30m,40m,17m,15m

Where was I heard?



← → ↻ 🏠 www.reversebeacon.net/dxsd1/dxsd1.php?f=0&c=N6TV&t=dx

REVERSE BEACON NETWORK

welcome main dx spots skimmers downloads about contact us

[show/hide my last filters](#)

showing spots for DX call: N6TV rows to show: 50

search spot by callsign

search callsign: DX DE

wildcard * allowed

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



REVERSE BEACON NETWORK callsign

welcome | main | dx spots | skimmers | downloads | about | contact us

[show/hide my last filters](#)

no filter selected, showing all spots rows to show: 50

search spot by callsign

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
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DK1MAX -
DK8NE - 6m
DK9IP -
20m,30m,40m,17m,12m,15m
DL0LBS -
DL2CC - 20m,30m,40m,17m,15m

Which bands are open at *my* QTH?



REVERSE BEACON NETWORK callsign

welcome main dx spots skimmers downloads about contact us

Map Satellite Hybrid

POWERED BY Google

/ 160m / 80m / 40m / 30m / 20m / 17m / 15m / 12m / 10m / 6m / 2m
world wide / zoom to US / zoom to Europe / zoom to North Atlantic

show/hide my last filters

showing spots for spotter call: N6TV rows to show: 50

search spot by callsign

de	dx	freq	cq/dx	snr	speed	time
----	----	------	-------	-----	-------	------

options:
[show/hide](#)

language:
english

spots format:
dxwatch

tracking mode on
 show flags
 show lotw users

tag new spots:
since last update

map (beta version):
 show with grayline
 show
 hide

spots lifetime:
10 minutes

watch list:
no watchlist

Spots analysis tool



REVERSE BEACON NETWORK

welcome main **dx spots** skimmers downloads about contact us

download raw data

Welcome to **spots analysis tool** network!

The Reverse Beacon Network (RBN) is a network of stations that listen to the HF bands and reporting what stations they hear, when and how well.

If you already know what you are looking for, you can see the main page.

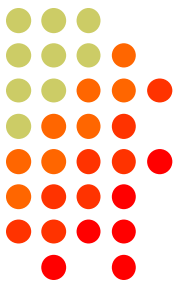
So why should you use the RBN? You can see band openings in real time. You can call a quick map. You can see what stations hear you, and how strong they are.


Check out our blog!

[Aggregator 2.1 - new insight for Skimmer ops](#)

The newest Aggregator, Version 2.1, is now available after extensive beta testing. This

Pick a Date, a Skimmer, add callsigns to compare



1. Select a comparison date 

MM/DD/YY

2. Select a Reverse Beacon


▶ Europe

▼ North America

- AA4VV 354 spots
- K1TTT 5318 spots
- K3MM 6926 spots
- K6ND 3751 spots
- KA9SWE 657 spots
- KB9AMG 181 spots
- KC0VKN 877 spots

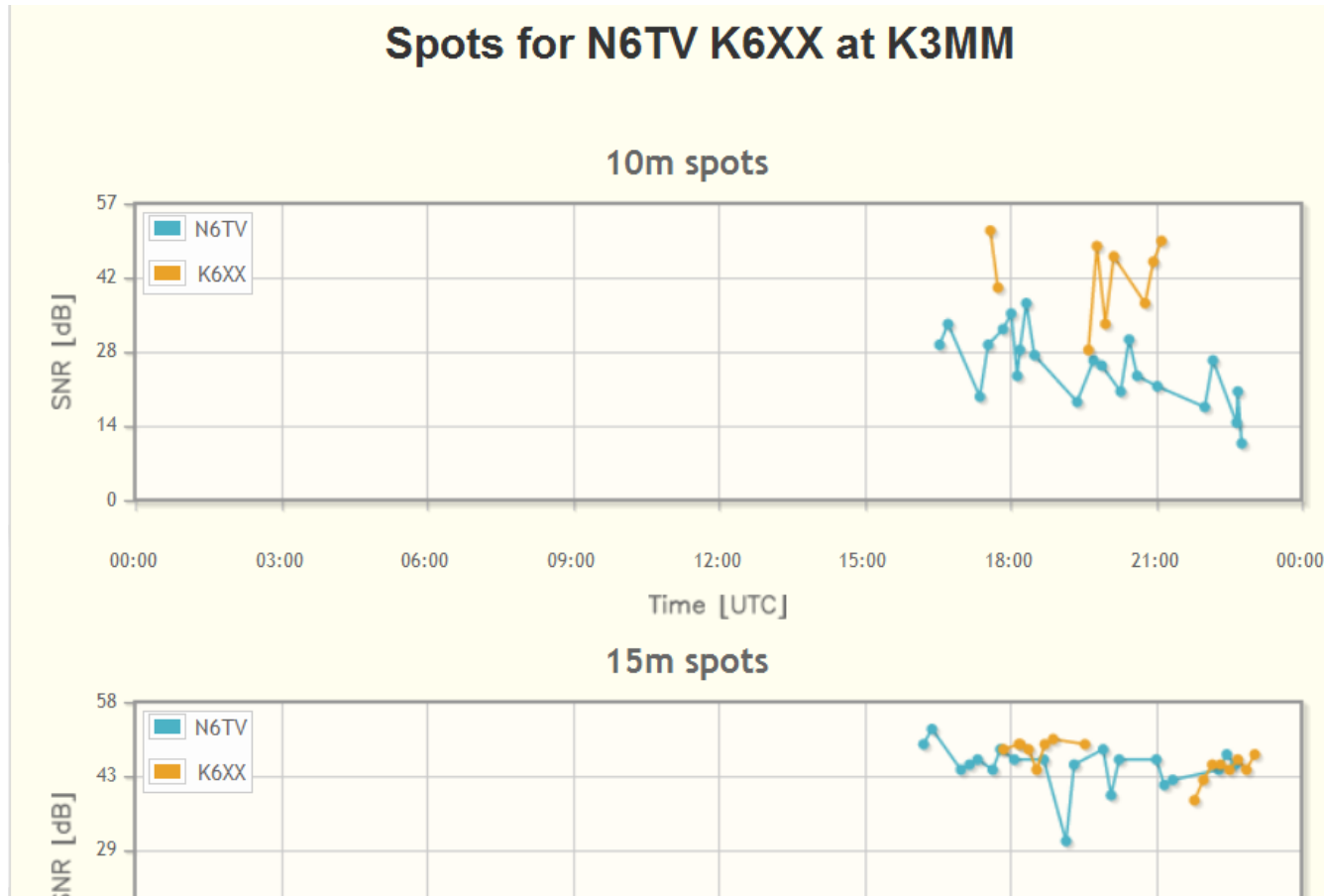
▶ Africa

▶ Oceania

3. Enter callsigns to compare 

<input checked="" type="checkbox"/>	<input type="checkbox"/>	N6TV	58 spots
<input checked="" type="checkbox"/>	<input type="checkbox"/>	K6XX	29 spots

And the winner is ... K6XX!



Raw data downloads



REVERSE BEACON NETWORK

welcome main dx spots skimmers downloads about contact us

download raw data

Raw data downloads

spots analysis tool

spot search

create your filter!

HF >

VHF+ >

HF

VHF+

HF/CW

HF/SSB

VHF+/CW

VHF+/SSB

1.8/3.5/7MHz

14/21/28MHz

10/18/24MHz

20120201.zip

20120202.zip

20120203.zip

1089KBytes

Dayton 2014

UNIVERSITY

.COM 36

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  
NC7J,K,NA,7020,40m,N0NI,K,NA,CQ,27,2014-02-15 00:00:00,27,CW  
NC7J,K,NA,7000.9,40m,W1VE,K,NA,CQ,14,2014-02-15 00:00:00,35,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%

ARRL DX CW:

2013: 3,937,108 (82,023 spots per hour)

2014: 4,146,399 (86,383 spots per hour) – up 5.3%

What's the Average CW Speed?



- 2013 CQ WW CW: 30.6 WPM
- 2014 ARRL DX CW: 29.6 WPM
- How did I calculate these statistics?
- Simple one line Unix/Cygwin command:

```
gawk -F, '/,CW *$/{sum+=$12} END { print "2013 CQ  
WW CW Spots = ",NR; print "Avg Speed = ",sum/NR}  
' 2013112?.csv
```

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 (see RBN blog)
- CW Skimmer 1.83 Released
- Aggregator v3.0 Released

For more information



- <http://www.reversebeacon.net>
- <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.pixelsatradio.com/product/shortwave-magnetic-loop-antenna/> (RF Pro-1B loop antenna)
- <http://www.dxengineering.com/parts/dxe-arah3-1pe> (ARAH3-1PE horizontal antenna)

For more information



- <http://www.pvrc.org/~n4zr/rbn.pdf>
- <http://reversebeacon.blogspot.com>
- <http://www.ve7cc.net/>
- <http://www.qrz.com/db/n6tv>

Questions?

