Contest Applications of CW Skimmer and the Reverse Beacon Network

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Dayton Hamvention

Contest Forum

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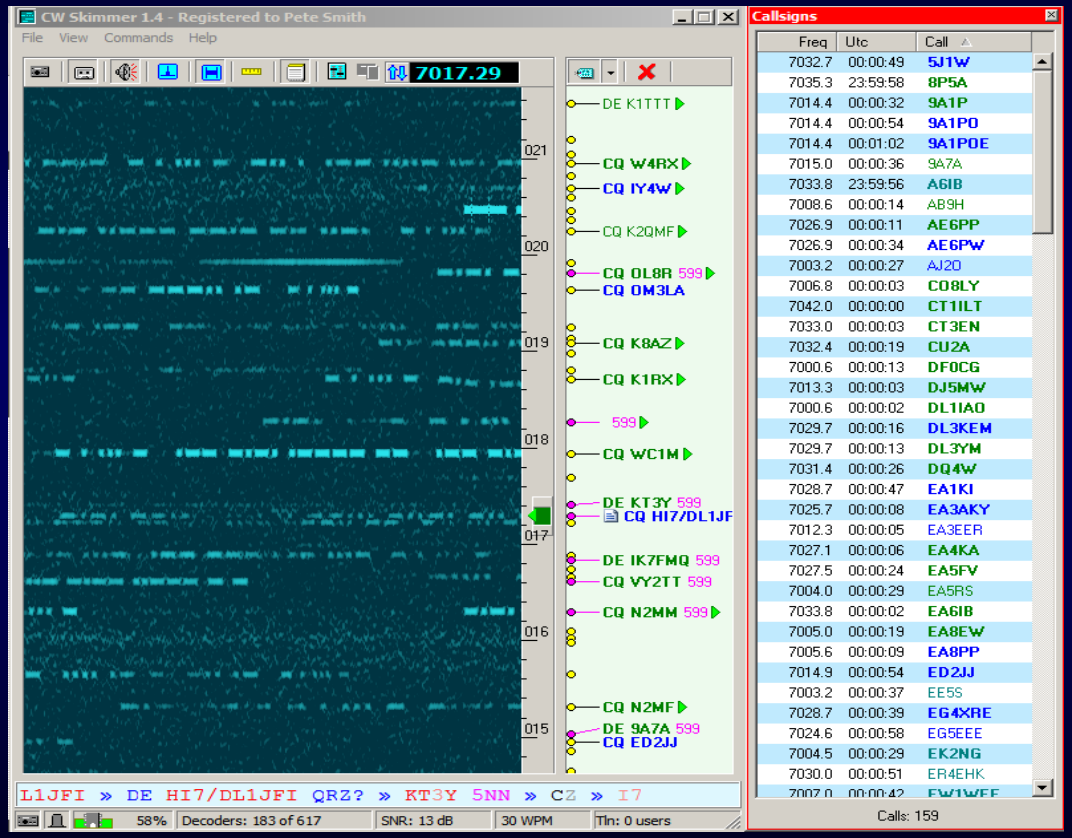
Why A CW Skimmer?

- Originally intended mainly as a DXing tool rather than for contesting
  - automatically copies all the calls in a pileup and flags the one who gets through
  - click on him and move your radio to that frequency

What can *you* copy in a minute and a half?



Softrock

- Simple SDR kitted by http://KB9YIG.com
- Single-band and multi-band versions available - $15-56 in kit form
- 96 KHz bandwidth, determined by sound card
- Requires gain and phase correction to avoid images – CW Skimmer provides

Typical Sound-card-based SDR

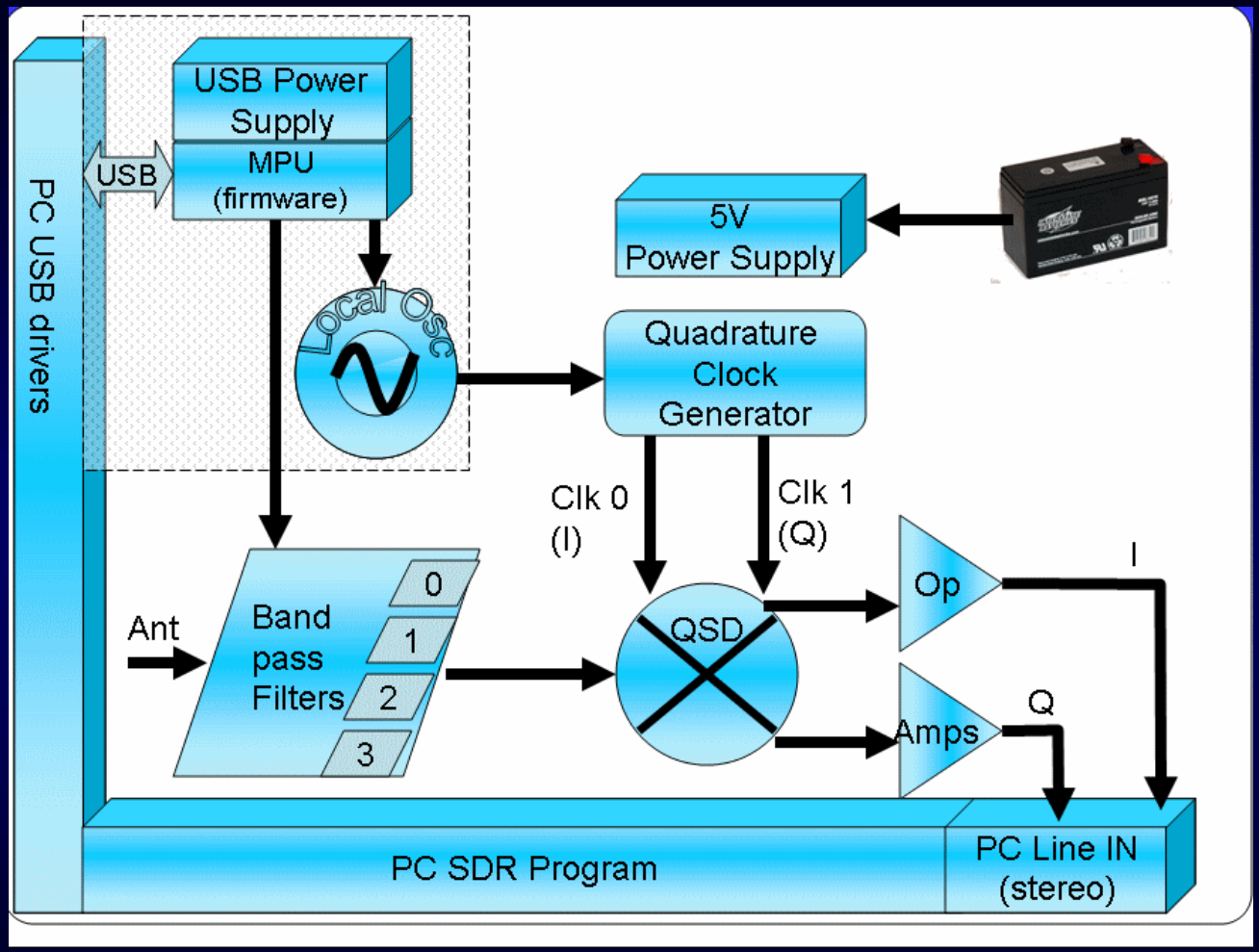
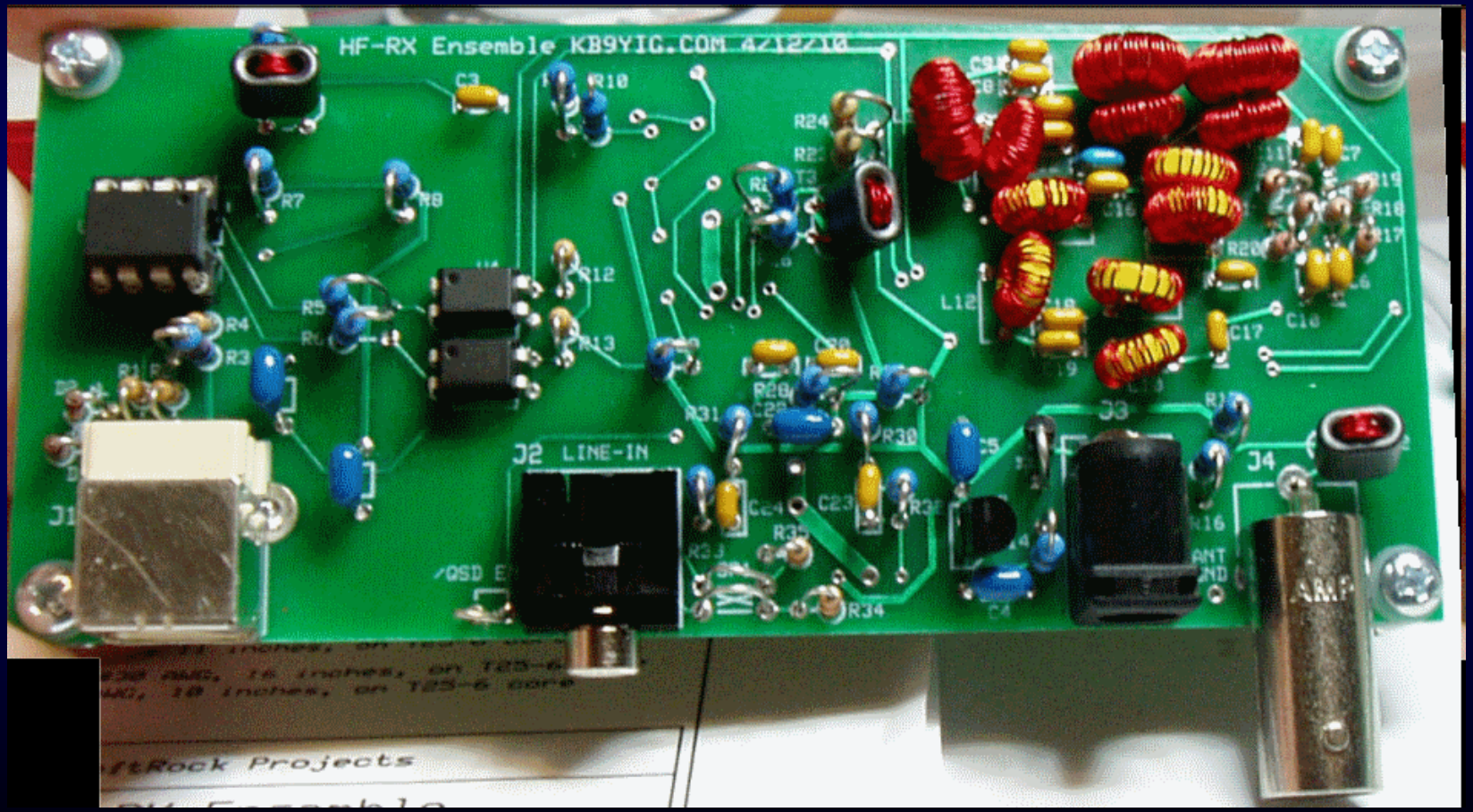


Diagram courtesy WB5RVX

Softrock RX Ensemble II 1.8-30 MHz



Softrock-IF

- Uses Softrock (or other SDR), tapping IF of station transceiver.
- Covers 24-KHz bandwidth centered on transceiver frequency
- Requires CAT; center frequency control via Telnet
- Same image issues

Stand-alone SDRs

- Mercury HPSDR - Supported by CW Skimmer, but availability currently uncertain
- SDR-IQ - Band-switching, up to 196 KHz/band, 500 Hz – 30 MHz; uses Spectravue or CW Skimmer
- QS1-R - With SkimSrv, 7 x up to 192 KHz bands simultaneously, including 6M; uses SDRMAXII or CW Skimmer


ALTERA
Cyclone III


SRL QS1R REVD
DIRECT SAMPLING RECEIVER
RF IN
CLK IN
PWR
CLIP


RF space
SDR IQ

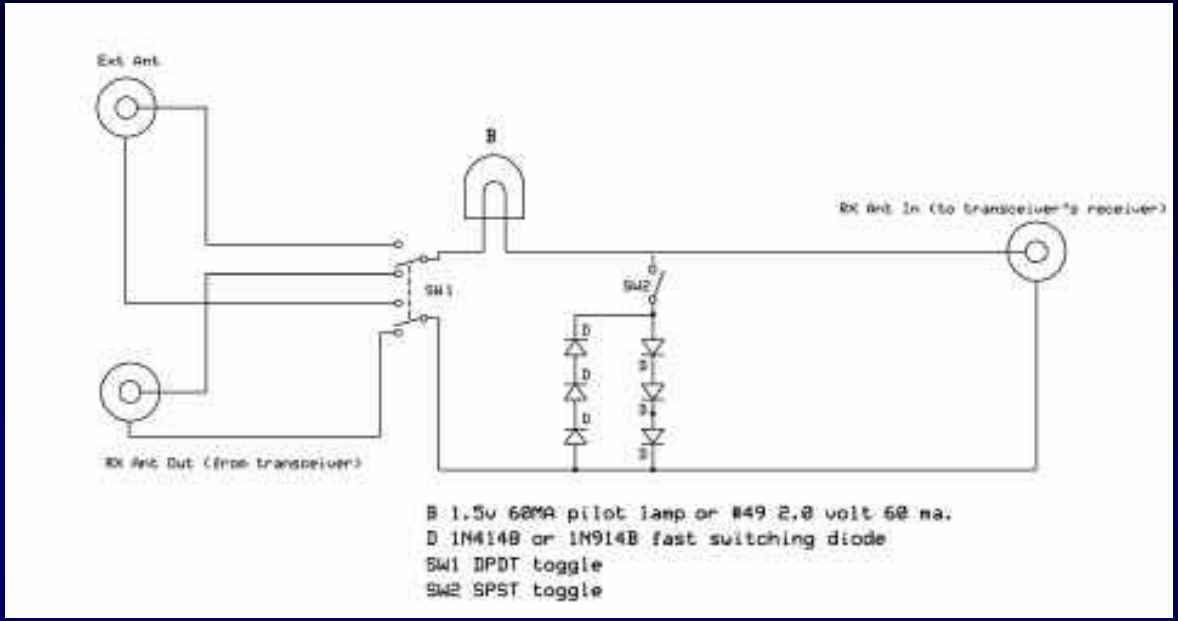
Antennas

- Option 1 – share RX antennas with station radios
- Option 2 – dedicated antenna

Practical Hardware Issues

- RX gain and in/out of band strong signal handling
- TX RF leads to busted spots
- Expensive silicon needs protection
  - Receiver protectors – 1.4 volts or less
  - The best solution - Disconnect/ground SDR antenna when transmitting

An Example of a Protector



- Diodes can cause intermodulation
- Basic problem with SDRs is voltage, not power, so bulb as fuse may not act quickly enough

Receiver Protector Options

- “Fuse” - #47/49 bulb
- Back to back diode strings shunting the antenna to ground – 2 x 1N914s each way
- Series capacitor(s) to block DC
- Gas tube – lightning only

VK1LW's QS1-R "beacon"

Telnet

- Added to CW Skimmer in early 2008
- DX Cluster format accepted by all logging programs – typically Skimmer spots flagged with - #
- Simple server, accepts a few commands
- Adjustable callsign validation level

Callsign validation

- 4 levels – minimal, normal, aggressive and “paranoid.”
- Applies multiple criteria and “tell me again … and again.”
- “Paranoid” uses standard master.dta file

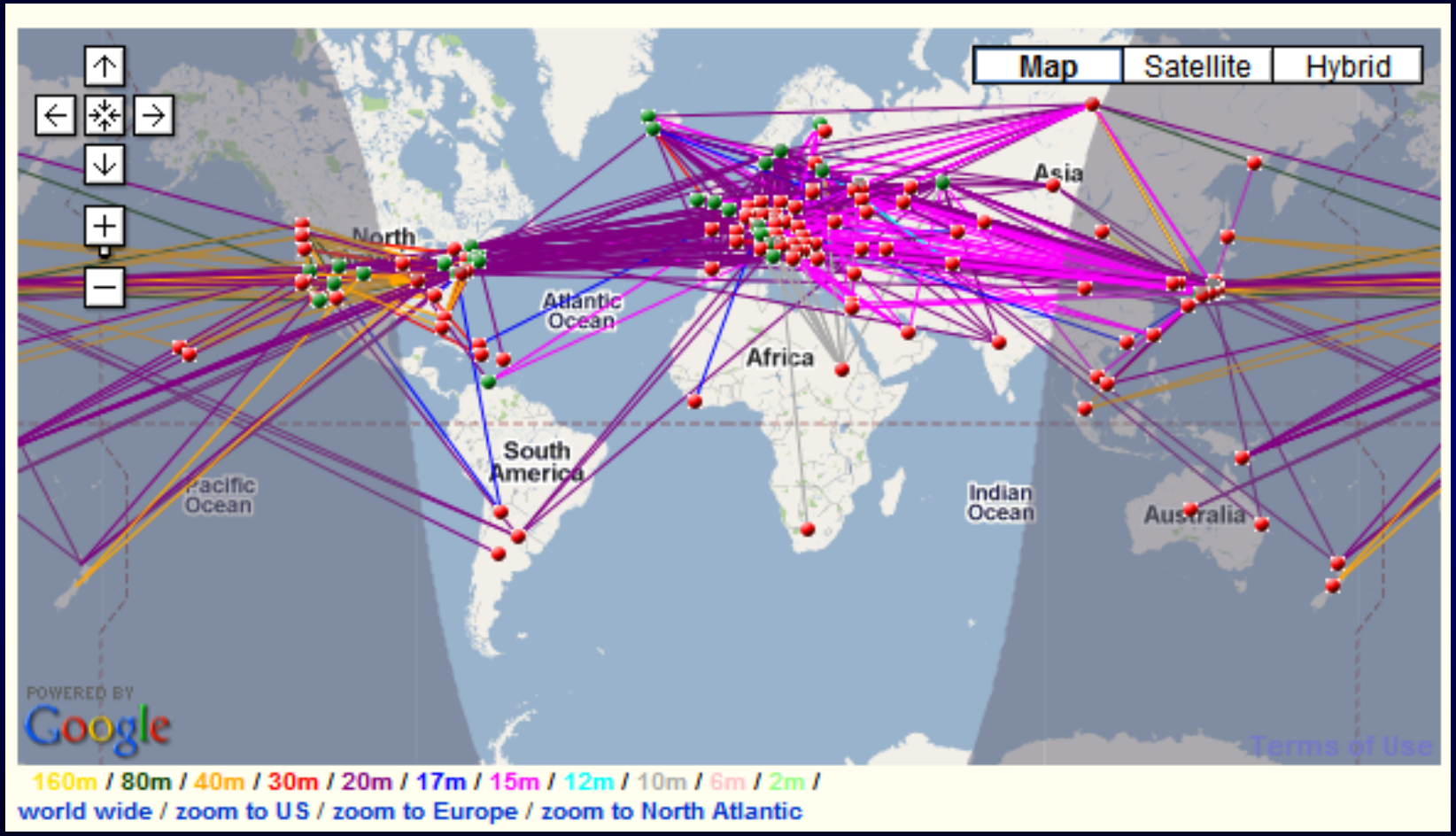
Local Skimmer in Contests

- Even with SO2R will generate many, many spots
- Multi-ops have a problem
- The off-site solution, and how to keep it legal

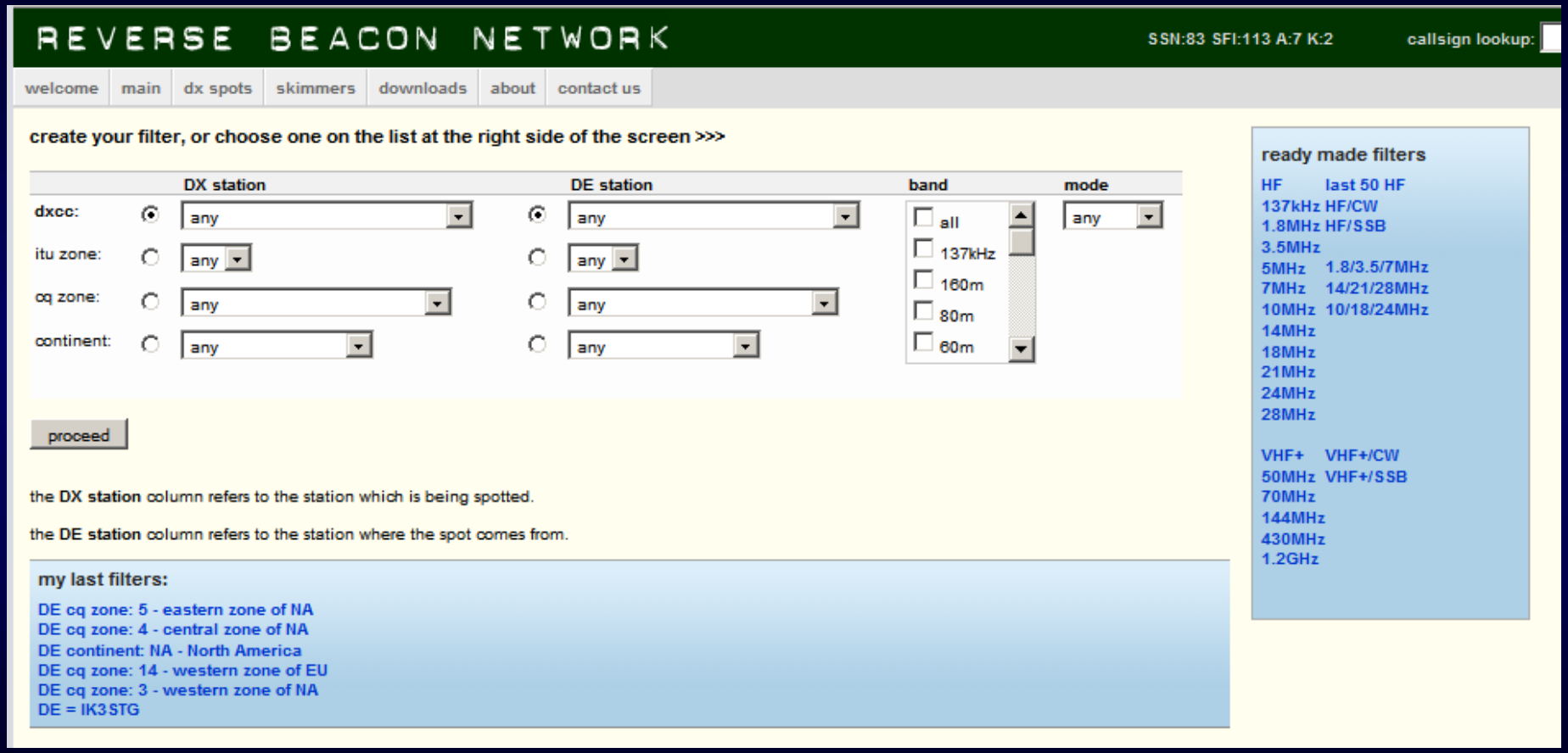
The Reverse Beacon Network

- Original idea by Felipe, PY1NB in March 2008
- He wrote “aggregator” software to transfer spots from individual CW Skimmer/SkimSrv “beacons” to a central database
- Combined spot stream archived and displayed at http://reversebeacon.net

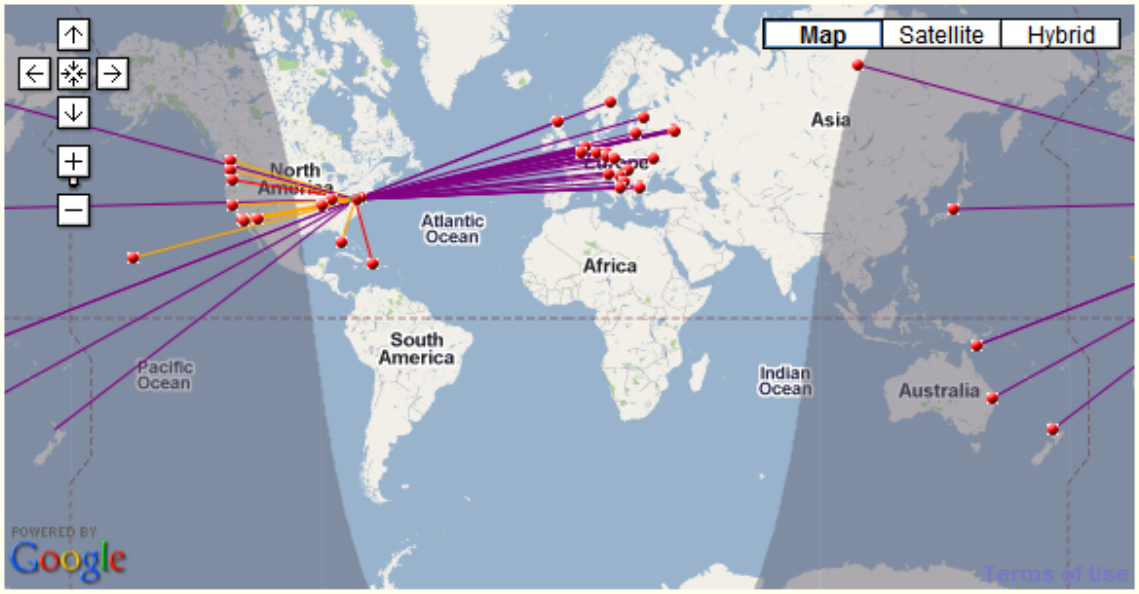
Propagation at a glance



Filtering


REVERSE BEACON NETWORK
SSN:83 SFI:113 A:7 K:2
callsign lookup:
welcome
main
dx spots
skimmers
downloads
about
contact us
create your filter, or choose one on the list at the right side of the screen >>>
DX station
DE station
band
mode
dxcc:
any
any
all
137kHz
160m
80m
60m
any
itu zone:
any
any
cq zone:
any
any
continent:
any
any
proceed
the DX station column refers to the station which is being spotted.
the DE station column refers to the station where the spot comes from.
my last filters:
DE cq zone: 5 - eastern zone of NA
DE cq zone: 4 - central zone of NA
DE continent: NA - North America
DE cq zone: 14 - western zone of EU
DE cq zone: 3 - western zone of NA
DE = IK3STG
ready made filters
HF last 50 HF
137kHz HF/CW
1.8MHz HF/SSB
3.5MHz
5MHz 1.8/3.5/7MHz
7MHz 14/21/28MHz
10MHz 10/18/24MHz
14MHz
18MHz
21MHz
24MHz
28MHz
VHF+ VHF+/CW
50MHz VHF+/SSB
70MHz
144MHz
430MHz
1.2GHz

Who is W3LPL hearing?



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

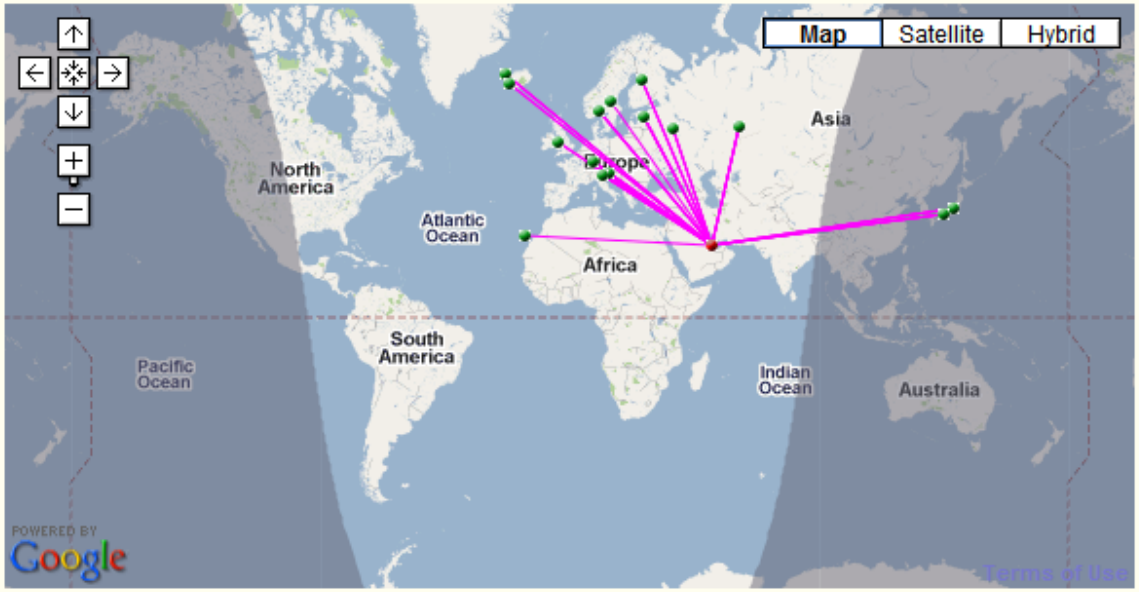
showing spots for spotter call: W3LPL

search spot by callsign

rows to show: 50

de	dx	freq	cq/dx	snr	speed	time
W3LPL	4O3A	14023.0	CQ [LoTW]	14 dB	33 wpm	1213z 09 Apr
W3LPL	PI4DIG	14053.0	CQ	15 dB	24 wpm	1213z 09 Apr
W3LPL	RD3A	14035.0	CQ	22 dB	31 wpm	1213z 09 Apr
W3LPL	K9CM	7037.0	CQ	36 dB	27 wpm	1213z 09 Apr
W3LPL	LZ1YE	14050.0	CQ	19 dB	29 wpm	1213z 09 Apr
W3LPL	HI8A	10106.4	CQ	10 dB	19 wpm	1213z 09 Apr
W3LPL	W1ESE	7007.5	CQ [LoTW]	29 dB	32 wpm	1212z 09 Apr
W3LPL	RK3EEW	14023.6	CQ	20 dB	30 wpm	1212z 09 Apr

Who's Hearing the A71?



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

DX dxcc: A7 - Qatar

rows to show: 50

cancel filter selection / search spot by callsign

de	dx	freq	cq/dx	snr	speed	time
SM7SJR	A71EM	21016.0	CQ [LoTW]	13 dB	37 wpm	1219z 09 Apr
ES5PC	A71EM	21015.8	CQ [LoTW]	35 dB	38 wpm	1219z 09 Apr
IK3STG	A71EM	21015.8	CQ [LoTW]	8 dB	38 wpm	1219z 09 Apr
OH6CT	A71EM	21015.8	CQ [LoTW]	15 dB	37 wpm	1219z 09 Apr
S50ARX	A71EM	21015.8	CQ [LoTW]	15 dB	34 wpm	1219z 09 Apr
UA9CLB	A71EM	21015.9	CQ [LoTW]	36 dB	36 wpm	1219z 09 Apr
DK9IP	A71EM	21015.8	CQ [LoTW]	16 dB	37 wpm	1219z 09 Apr
JH3PRR	A71EM	21016.0	CQ [LoTW]	24 dB	39 wpm	1218z 09 Apr

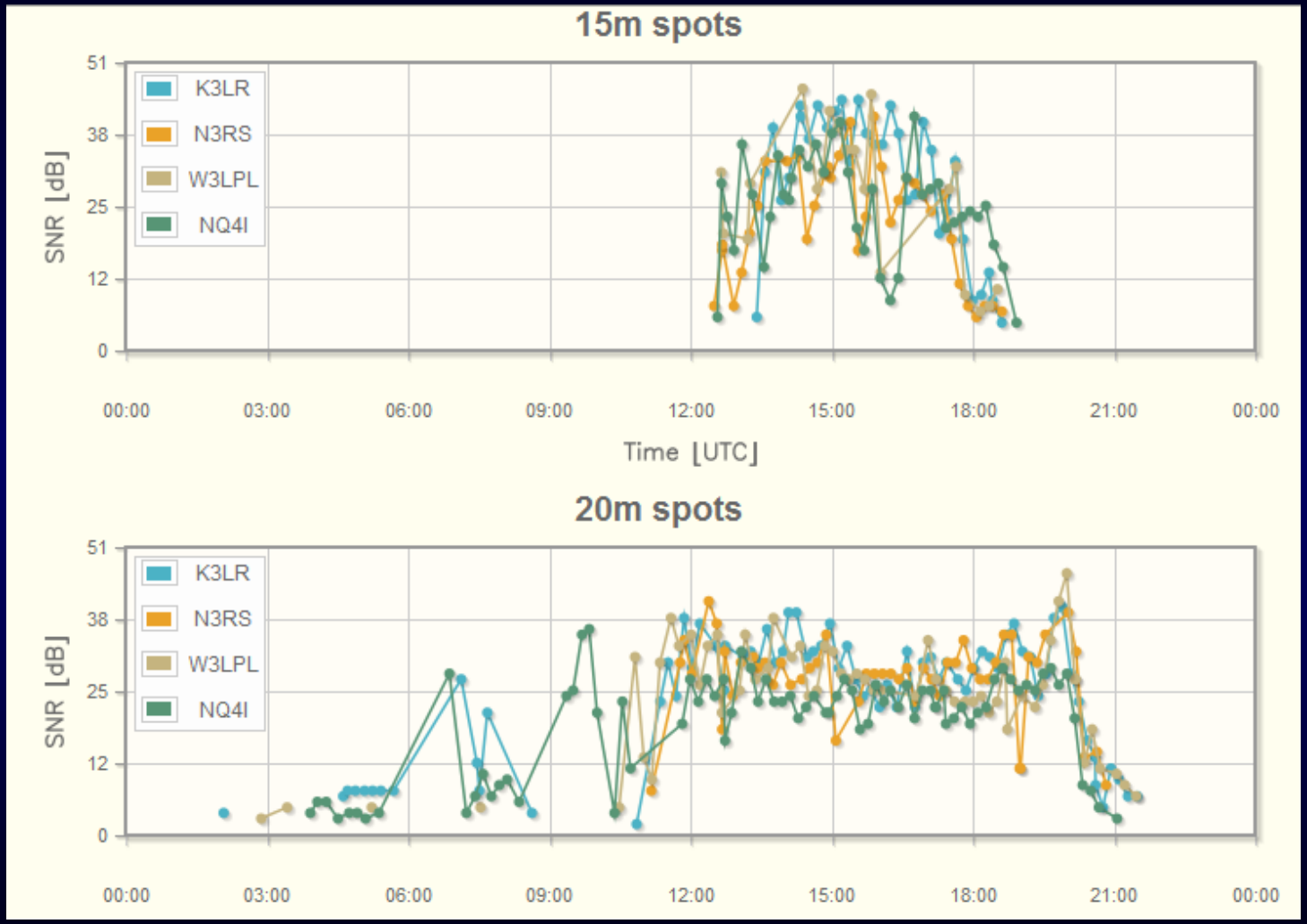
How Am I Getting Out?

- Filter for your call as the DX station
- Send sequence recognized as a “CQ”
  - Example: TEST TEST DE N4ZR N4ZR N4ZR
- Watch the screen for results. Collect all US stations heard in Europe, for example, to compare.

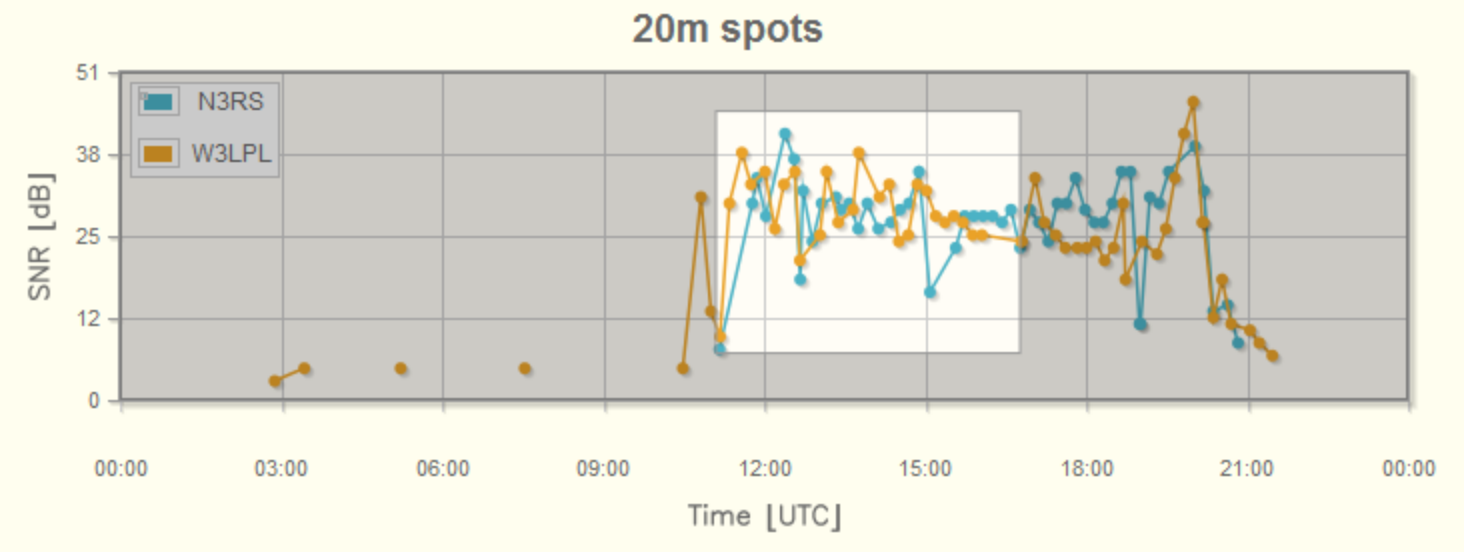
Comparing with others- the Spots Analysis Tool

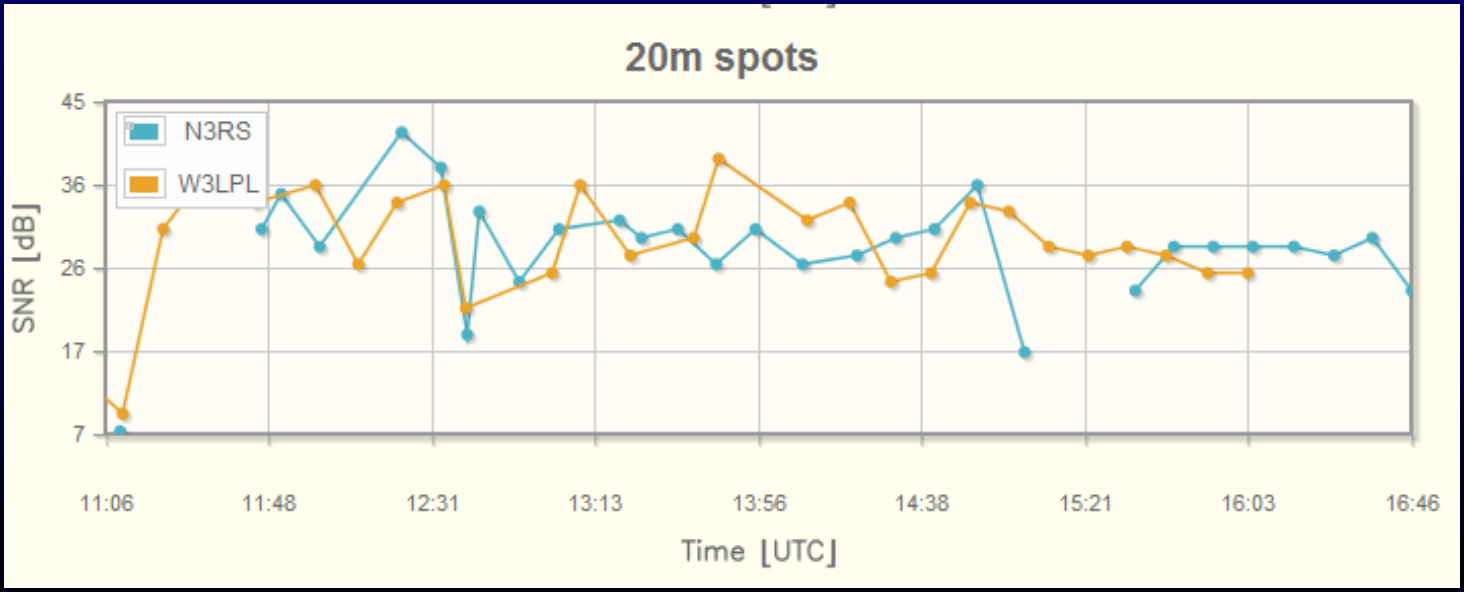
- Created by F5VIH/SV3SJ
- Select a date, a “reverse beacon” station, and calls to compare.
- The tool will produce graphs showing comparative results for up to 10 stations at a given location, over time.
- Example – ARRL DX CW, first day, K3LR, W3LPL, N3RS, NQ4I

A little crowded?



Zooming in


20m spots
N3RS
W3LPL
SNR [dB]
51
38
25
12
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Time [UTC]


20m spots
N3RS
W3LPL
SNR [dB]
45
36
26
17
7
11:06
11:48
12:31
13:13
13:56
14:38
15:21
16:03
16:46
Time [UTC]

Roll Your Own

- Download raw data a day at a time
- Open in Excel or MS Access
- Please share your analytical ideas - we can all learn from each other
- Reflectors
  - skimmertalk@contesting.com
  - RBN-OPS@yahoogroups.com

What About Use *During* Contests?

- Because Skimmers spot everything, ideally suited for Unlimited and multi-op contesting
  - S&P rates >150/hour readily attainable when the bands are full
  - Finding odd-ball openings almost assured, with 50+ stations listening

But…

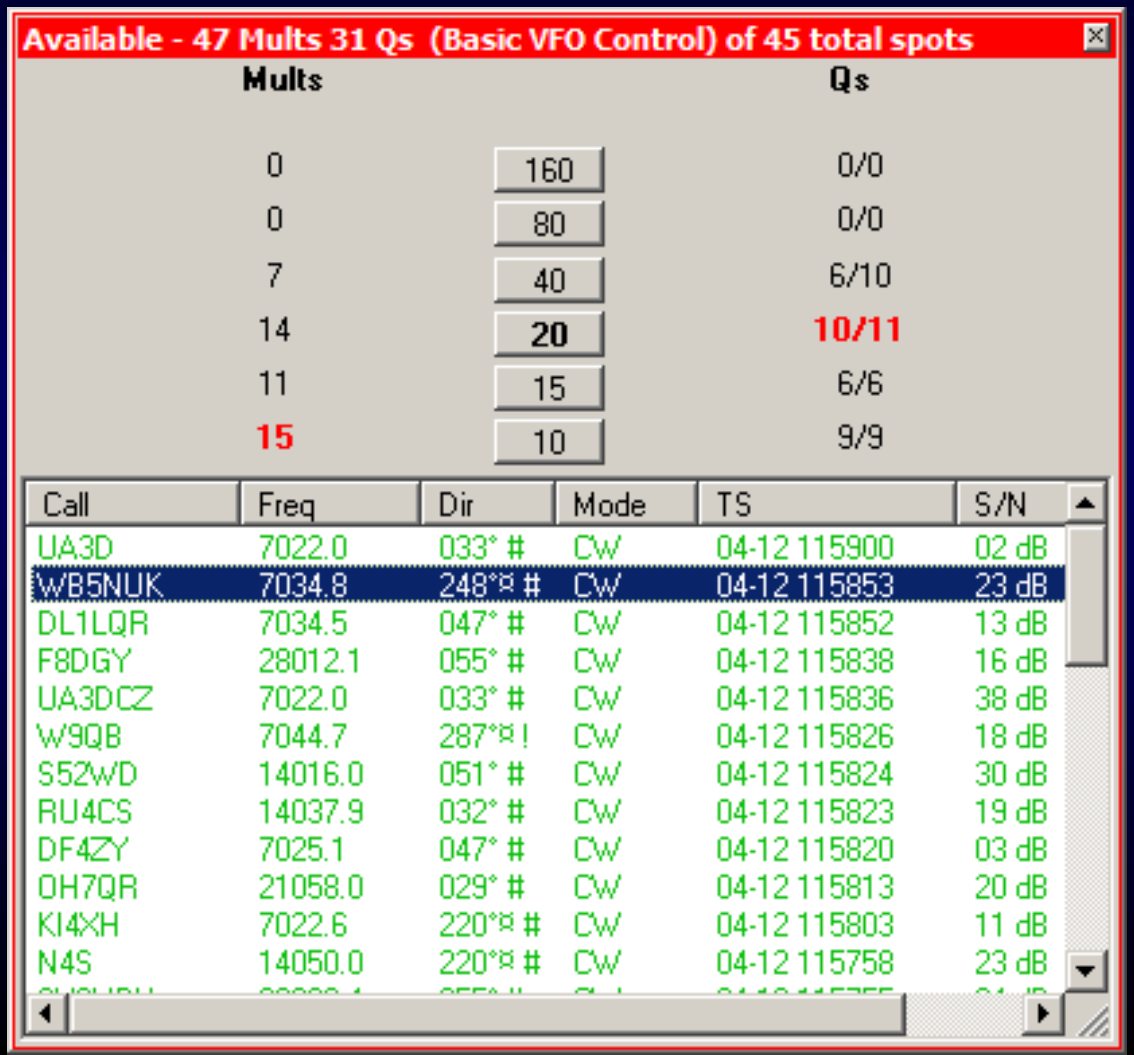
- RBN spot volume reached almost 10 spots per **second** during major contests – will continue to increase.
- The feed contains many duplicate spots

JA4ZRK	9A5MT	14005.0	CQ [LoTW]	9 dB
N7TR	DS5DNO	3512.0	CQ [LoTW]	12 dB
JA4ZRK	DS5DNO	3512.0	CQ [LoTW]	15 dB
JH3PRR	DS5DNO	3512.0	CQ [LoTW]	15 dB
NC7J	VK4SN	14005.2	CQ	10 dB
EI6IZ	R9UT	14027.3	CQ	23 dB
N4ZR	VK4SN	14005.3	CQ	13 dB
ES5PC	VP5/W5CW	18073.2	CQ	29 dB
JH3PRR	OH1RX	21028.3	CQ	23 dB
RN4WA	ZL3TE	14010.0	CQ [LoTW]	5 dB
DK9IP	OH1RX	21028.0	CQ	39 dB
N7TR	W9NGA	7013.5	CQ [LoTW]	51 dB
W0MU	W9NGA	7013.5	CQ [LoTW]	42 dB
NC7J	W9NGA	7013.5	CQ [LoTW]	44 dB
W3UA	W9NGA	7013.6	CQ [LoTW]	11 dB
K3MM	W9NGA	7013.6	CQ [LoTW]	22 dB

How to Use the RBN in a Contest

- Filter **at the node** to meet your needs
  - Spot origin (country, zone, US state, VE province)
- Filter in your logging program
  - Screen out remaining duplicates
  - Select bands, all spots or just new mults

N1MM's "Available Window" - A Unique Tool



The RBN's Future

- Multiple servers and load-balancing to scale for growing demand
- Improved filtering interface for user convenience
- Better analytical tools

The W3LPL-2 Experiment

- Feeding carefully-selected Skimmer spots into the traditional cluster network through custom filtering software
  - Limited in quantity -
  - Carefully checked to ensure no busts
  - Spots limited to list of about 1000 callsigns, with most common excluded
  - Re-spotting interval adjustable by relative rarity

RBN Assets

- http://reversebeacon.net – the RBN web site
- http://reversebeacon.blogspot.com - the RBN blog
- DXSpider node: telnet.reversebeacon.net port 7000
- ARCluster node: arcluster.reversebeacon.net port 7000

Other Resources

- Skimmertalk@contesting.com
- RBN-OPS@yahoogroups.com