

Exploring the World of 10 Meter Beacons

By Ken Reitz KS4ZR

Tune through the 10 meter band almost any time of day, any day of the week during the doldrums of this sunspot cycle and you'll come to one conclusion: The band is dead! Now tune from 28.200 to 28.300 MHz and you'll hear something very interesting: low power beacons sending out their endless messages and giving you vital information on the real status of the band.

Beacon Rules

Ten meter beacons are used to study propagation in the atmosphere and help indicate the Maximum Usable Frequency (MUF) for the HF bands. The Federal Communications Commission makes a special note of beacon operations in FCC Rules part 97.203. Here are the basics: 1) Any amateur holding a technician level license or higher may operate a beacon station. 2) You can't operate on more than one channel in the

same band from the same station location. 3) Transmitted power must be less than 100 watts. 4) The specified band segment for 10 meters is 28.200-28.300 MHz. 5) A beacon may transmit one-way communications. There are a few other items covering setting up a beacon in the "national quiet zone" around the National Radio Astronomy Observatory in West Virginia and at Arecibo in Puerto Rico.

While FCC rules confine U.S. amateur beacon operations from 28.2-28.3 MHz, other countries make beacon frequencies available much lower. In fact, there are some 48 international beacons operating from 28.115 to 28.200MHz transmitting from Europe, the Mideast, South America, Canada, Japan, and West Africa (see International Beacon Chart).

Beacon Construction & Operation

The FCC leaves the 10 meter beacon band open to operating almost any kind of transmitter (as long as the basic rules are obeyed). That's the fun side of the band. The result is that there are almost no two beacons alike. Dozens of approaches to building and operating these beacons can be found. What beacon operators are looking for in a transmitter is low power output, easy construction, and tough as a brick. These rigs have to endure 24/7 operating conditions year 'round. They have to take driving rain, lightning, ice storms, searing summer heat and still keep going. You might think this means that only MilSpec radios would be capable of this sort of duty. But, that's not the case.

Many beacon operators use old CB radios converted to operate in the 10 meter band. These rigs are further modified so that the transmissions use one side-band of the original AM signal to send CW via a microchip. Some operators use home-brew CW QRP (low power) transmitters, others use older low power 10 meter ham rigs such as the Radio Shack HTX-100 and the Uniden HR2510. Most use simple vertical antennas, often not more than 10 or 20 feet off the ground.

There is an unofficial list of current 10 meter beacons kept up to date by Bill Hays, WJ50

(www.qsl.net/wj50/bcn.htm). Check out his own home page (<http://home.stx.rr.com/wj50>) and you'll find tons of tips for 10 meter DXers, as well as quite a few ideas about building your own 10 meter beacon. You can also tune in to the 10 meter beacon operator calling frequency at the top of the hour on 28.327 MHz and see what's happening. Listen for Bill's own beacon on 28.289 MHz.

There is also a "beacon reflector," which is an automatic e-mail service that delivers the latest reception reports from contributors to the reflector from around the world. To join, send an e-mail to hfbeacons@explore.plus.com and in the subject write: subscribe. Then sit back and wait; you'll get tons of beacon reports and conversations about beacons from some of the world's top 10 meter beacon band monitors.

Sampling the 10 Meter Beacons

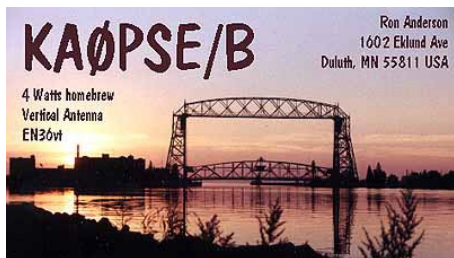
Last summer I spent a few weeks monitoring the 10 meter beacon band and was amazed to log dozens of stations throughout the period, despite generally dismal HF conditions. This seeming contradiction is the main thing that keeps beacon listeners tuned in. I sent reception reports via e-mail to a number of operators and received some great QSLs and a lot of information about these stations and their operators. I asked each to describe his or her beacon station, how long it had been in operation, how many signal reports they receive each week, and where they come from. Here's a round-up of a few of the beacon operators' replies:

Ron Anderson KA0PSE/B
(28.218.5) Duluth, MN

"The rig is a home-brew right out of *QST* magazine, March 2000, with a couple of modifications, mainly a little CPU fan to cool the finals. It puts out a faithful 3.85 watts into an AR-10 vertical antenna at about 40 feet on the roof of my work QTH (WDSE-TV Public Broadcast Studio). The rig was fun to build and I think it sounds pretty good ... The beacon has been on the air since December 1, 2001. When the band is up ... I have received reports from California



This QSL is from IY4M the beacon/robot from the Associazione Radioamatori Italiani commemorating Guglielmo Marconi's beginning of radio in Bologna, Italy. (Courtesy: Associazione Radioamatori Italiani)

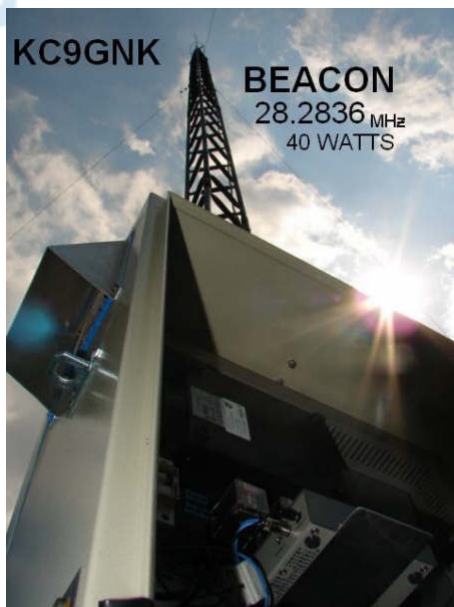


QSL card from Ron Anderson KA0PSE/B runs 4 watts from a home-brew into a AR-10 vertical at 40' from his workplace at WDSE-TV Public TV Broadcast Studio in Duluth, MN. (Courtesy: Ron Anderson KA0PSE)

to Germany to Uruguay to South Africa and Australia, usually about 6 per month."

Domenic Bianco KC9GNK/B
(28.2836) Madison, WI

For two years Domenic ran a 10 watt beacon using an attic mounted antenna and received 1-3 reports per week. Then he reconfigured the beacon to use an Icom 718 feeding a Ringo AR10 antenna on a 43 foot tower (see QSL photo). The extra power nets an amazing 5-10 signal reports a day from beacon monitors. Domenic's new beacon, on the air for just a year, is the easiest catch on the band. He uses a Logikey K-5 keyer to run the beacon.



Domenic Bianco KC9GNK/B sends this QSL for received reports. His 40 watts is the easiest catch on the band. Let him know what you are using to tune in. (Courtesy: KC9GNK)

Bruce Burkeen KM4GS/B
(28.292.5) Gainesville, KY

Bruce's beacon is celebrating 20 years on the air: "I started the beacon in 1987 using a ... CB rig and a Commodore VIC20 that keyed a relay to send CW. It worked pretty well for several years 'til the relays were worn out (a relay has to make a lot of cycles to send CW 24/7). In those days it was 100% solar powered to a ground mounted Antron 99 CB antenna.

"I have switched my beacon transmitter to a Kenwood TS-130 feeding a Hustler 4BTV



Bruce Burkeen's KM4GS/B beacon is in here among his other ham gear and is currently running 4 watts output into a Hustler 4BTV antenna mounted on a barn roof. (Courtesy: Bruce Burkeen)

vertical mounted in the center of a 72 foot long metal barn roof. The controller is a ComSpec ID-8 board in a metal Bud box on top of the radio. As for reports ... I get 4 or 5 a week. Most everything is in the 400-500 mile range ... When the cycle is at its peak the reports will run 25-50 per week with VK's (Australia) and ZL's (New Zealand) sending most of the DX reports."

Ronnie Casey K4JDR/B
(28.298) Raleigh, NC

Ronnie uses a Uniden HR2510 10 meter rig in CW mode controlled by a ComSpec ID-8 and feeding a Solarcon A99 cut to the frequency and mounted at 26-ft. He notes that there are a number of shortwave listeners who send QSL reports to him. His beacon has been on the air continuously since 1998.



Ronnie Casey's K4JDR beacon uses a Uniden 2510 10 meter rig and has been in operation 24/7 since 1998. (Courtesy: Ronnie Casey K4JDR)

Les Ellis WB0FTL/B (28.217)
Alden, MN

Les has been a loyal subscriber to *Monitoring Times* since day one and says he still has every issue! He uses a Radio Shack HTX-100 10 meter transceiver in the 5 watt output CW mode. He uses a Power-One HE15-9 power supply and an Embedded Research TiCK CMOS keyer for a controller. His antenna is an AR-10 vertical at 25-ft above ground.

Allan Gallo W0ERE/B (28.2828)
Hillandville, MO

Allan's beacon hit the air in May 1996, also using a Radio Shack HTX-100 ten meter rig (which is a testimony to that old rig!) run-

ning 5 watts into a 1966 Supermag antenna from Antenna Specialists. He uses an Autek Research MK-1 controller to send CW. Allan reports that he hasn't received a DX report in 6 years but received many during the peak of the last solar cycle.

Bill Hays WJ50/B (28.289 MHz)
Corpus Christi, TX

The aforementioned Bill Hays has operated his beacon since 1992. His original converted CB rig lasted 11 years and was replaced with another which still runs 3 watts into a home-brew vertical on top of his roof. He uses a PIC based 12F629 keyer to run the beacon.

WJ50/B

This card confirms with Ken KS4ZR
that the WJ50 beacon was operating at 18:26 Z
on 16 June 2006 19:26
Thank You for the reception report.



The beacon has been in continuous operation since June 1992

73 de WJ50

2 W Vertical Antenna 28.289MHz Grid EL17 *Bill*

Bill Hays sends this QSL for reports of his WJ50/B. Even with just 2 watts into a roof mounted vertical he still gets DX reports even at the bottom of the solar cycle. Ten is alive! (Courtesy: Bill Hays WJ50)

SWLers Test Your Gear

The 10 meter band presents an excellent opportunity for SWLers to test their radio and antenna set-up. A number of automated beacons are situated throughout the U.S. and the world which lets you see how good your system is and just how good or bad band conditions are. Check out the following four automated 10 meter systems.

The PropNet Project

PropNet uses the digital format known as PSK31 for transmitting and receiving signals on a specific frequency on 10 meters. Their motto is: "If the band is open and nobody is transmitting, can anybody hear it?" Here's how the PropNet project works: "Participants, known as Probes, will periodically transmit on an anchor frequency [on 10 meters its 28.131 MHz]. Any station that receives that transmission forwards the 'catch' to an Internet server that plots the event on a map hosted at findU [the Automatic Position Reporting System (APRS) database access site]. While an amateur radio license is required in order to be a transmitting participant, unlicensed individuals are encouraged to participate as receive-only stations reporting what they capture."

You can get more information and see the latest "catches" on propNet at www.propnet.org.

The 250 Synchronized Propagation Beacon Project

Begun in May 2005, the 250 Synchronized Propagation Beacon Project is a work in prog-

ress. According to their web site (www.wb4wor.net/sync) the project was started "...by several 10 meter beacon operators in an ad-hoc fashion to experiment with operating 10 meter beacons, similar in concept to the IARU beacon project on the other amateur HF bands to help with the crowding of recent years in the 10 meter beacon band."

The project uses 28.250 MHz, hence the name, and is run by WB4WOR, a club station of which Charles Layno, W4CL of Greensboro, NC, is trustee. The idea is to have a set list of stations at various locations in the U.S. automatically transmitting for 10 seconds each at decreasing power levels starting out at 20 watts going to 2 watts, 200 mw and finally 20 mw. What you can and cannot hear tells you everything you need to know about where propagation on 10 meters is happening. Check out their frequency, and for more developments keep checking out their web site for updates.

IY4M Robot

The first amateur radio robot beacon, IY4M, operates on 28.195 MHz. Known as the Guglielmo Marconi Memorial Beacon Robot, IY4M is located in Bologna, Italy. QSLs are handled by IK4UPU. To celebrate the 100th anniversary of Marconi's revolutionary radio activities from Bologna, the Associazioni Radioamatori Italiani redesigned the IY4M robot for automatic transmission of beacon information every 30 seconds and then stands by for automatic QSO mode in which the robot station will engage in two way exchange of information in CW from 10 to 60 wpm.

For detailed information about how to do a QSO with IY4M go here: www.ari-bo.it/iy4me_2.htm. The robot will send you all kinds of information including your signal report and current weather conditions at the IY4M location. When the solar cycle improves this will be a great frequency to monitor.

NCDX/IARU 28.200 Beacons

The Northern California DX Foundation in conjunction with the International Amateur Radio Union (IARU) have established a system of 18 beacons around the world (see list below) all operating on 28.200 MHz. To ensure that propagation tests are equal, each NCDX beacon station is identical. They use standard HF ham transceivers and antennas. The controller, which times the transmissions and steps the power output up and down, was devised by Bob Fabry, N6EK, who uses an Intel 8748 microprocessor in the controller. Details and schematics are found on the NCDX web site (www.ncdxf.org/Beacon/BeaconController.html).

Here's how the 28.200 beacon system works (from the NCDXF page): "...Each beacon transmits every three minutes night and day...A transmission consists of the call sign of the beacon sent at 22 wpm followed by four one-second dashes. The call sign and the first dash are sent at 100 watts. The remaining dashes are sent at 10 watts, 1 watt and 100 milliwatts."

DIY 10 Meter Beacon

As with many other aspects of amateur radio, the 10 meter beacon band is a niche with

ardent devotees. It presents a great opportunity for experimenters, home-brewers, and SWLers alike. And, as with so many other aspects of this hobby, opinions are divided. Some fear that there are too many beacons on the band. Others believe you can't have too many. My own feeling after monitoring the beacon band for quite some time is that as long as operators stick to the "gentleman's agreement" regarding beacon operating on 10 meters it will be a useful resource for a long time to come.

If you decide to start your own 10 meter beacon operation, here are some tips: When you pick an operating frequency, check with the WJ50 list and try to avoid being on top of an existing station. Be able to monitor your transmission to insure that it's functioning properly. Keep the transmission output as low as possible. If every beacon on the band is operating at under 5 watts there'll never be a problem with overcrowding. According to the WJ50 list, very few stations operate over 10 watts with many in the mW range.

When planning your beacon, you may want to isolate the transmitter and antenna from your main radio operations and antenna location to avoid interfering with yourself. And, finally, make sure your beacon is operating 24/7. There's little point in a beacon which is on intermittently. The exception is when you're 100% direct solar power and the power is only up when the sun is up.

Monitoring the Beacon Band

I've used a variety of receivers to listen to the 10 meter beacon band. Any receiver with SSB/CW capability will work. I've used a number of portables with only the built-in telescoping whip antenna and had excellent results. I've used my ham rig with a beam antenna and, not surprisingly, was able to copy beacon stations which were much weaker with an omni-directional antenna. Still, you don't need much of a signal to receive these little workhorses.

Most beacons use a programmable microchip to send their message in an unending loop of CW typically at 10 or 15 wpm. Many start the loop with a series of three attention getting V's. This is typically followed by the letters "de" (Morse code for "from") and the call sign of the station which adds /B to the suffix to indicate it's a beacon. Even if you don't know Morse code, you can copy the station call signs, because they are repeated over and over. Concentrate on getting one letter at a time. If you can only copy the first letter or two and the number in the call, you have all you need to determine what station you're receiving. For example, if I copy W0 and my receiver shows I'm tuned to 28.282 then I check out the WJ50 list and see I'm copying W0ERE/B, Highlandville, MO, which is running 5 watts into a vertical antenna. It's just that simple!

You can QSL beacon stations either via e-mail or via postal mail. Some stations will send their e-mail address as part of the transmission. If not, simply go to www.qrz.com and look up the call sign. Then click on the place where it is indicated for the e-mail address. To receive a paper QSL card, use the mailing address at the same web site and don't forget to include an SASE. As indicated above, some beacon operators receive many QSL requests per month and at \$.39 each, the postage can add up.

In your report, use the RST reporting method, where R=Readability (on a scale of 1-5), S=Signal Strength (on a scale of 1-9) and T=Tone (also on a 1-9 scale). A great signal report would be 599; a weak signal report would be 519; and a poor signal report would be 419. On your report list the day, time, year, frequency and RST along with a run-down on your receiving equipment and your location.

The 10 meter band is a slave to the sun. When the ionosphere is energized there'll be propagation. After the sun goes down, propagation will be limited to ground wave, typically 5-10 miles. At sundown you can "ride the terminator" (the line between those areas lit by the sun and those not) for some interesting DX.

Beacon monitoring is a year 'round activity. In the winter months you may hear more DX stations and in the summer you'll generally hear more stations within a 500 mile radius. But, sometimes, without any warning the band will open up and you'll get some really great catches. As the new solar cycle builds, you'll hear more and more beacons throughout the day. The more you listen to the 10 meter beacons the more intrigued you'll be with the whole subject of propagation.

If you're a ham and you see the band is open why not just move up the band to the SSB segment or down to 28.120 (the BPSK31 segment) or the bottom of the band where the CW ops lurk, or 28.680 (the SSTV calling frequency) or 29.600 (the FM calling frequency) on this multi-faceted band and get a QSO going? You know the band is open!

LOG THE INTERNATIONAL 10 METER BEACONS

You can log nearly 50 DXCC countries and at least 40 states by just listening to the 10 meter beacon band. Check out the unofficial 10 Meter Beacon List at www.qsl.net/wj5o/ben.htm for the current list. Here's the official NCDXF/IARU list:

NCDXF/IARU

INTERNATIONAL BEACON PROJECT

(All stations transmit on 28.200MHz)

4U1U	United Nations, NYC
VE8AT	Nunavut, Canada
W6WX	San Jose, CA
KH6WO	Laie, Oahu, HI
ZL6B	Masterton, New Zealand
VK6RBP	Rolystone, Australia
JA2IGY	Mt. Asama, Japan
RR9O	Novosibirsk, Russia
VR2B	Hong Kong, China
4S7B	Columbo, Sri Lanka
ZS6DN	Pretoria, South Africa
5Z4B	Kiambu Kenya, Africa
4X6TU	Tel Aviv, Israel
OH2B	Karkkila, Finland
CS3B	Medeira Island
LU4AA	Buenos Aires, Argentina
OA4B	Lima, Peru
YV5B	Caracas, Venezuela

OTHER RESOURCES:

Gunter DF4PV, has a weathercam on DM0ING on 28.213 has created a map of Europe with the 10 meter beacons here: <http://freenet-homepage.de/df4pv10/Baken.jpg>

Enrico, IW3FZQ has updated beacon audio files on his web page. <http://www.qsl.net/iw3fzq>

Rodney, AC6V has an extensive beacon page at <http://www.ac6v.com/beacons.htm>