PSK-31
Ham Radio Instant Messaging?

Talk around the world with your laptop, a ham radio running on AA Batteries, and a piece of wire.

by WA5ZNU Leigh Klotz Leigh@WA5ZNU.ORG

Field Day 2004

http://wa5znu.org/psk

What is PSK-31?

PSK 31 …

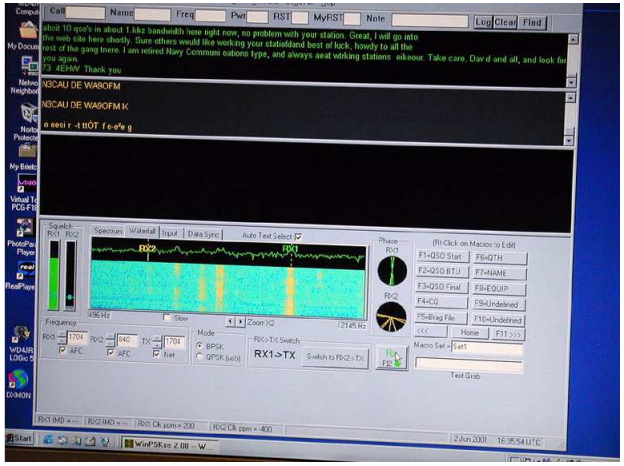
- lets two or more ham operators type text messages to each other, in real time, anywhere around the world.
- is designed for use on radio frequencies in the High Frequency bands (3MHz to 30MHz).
- uses a very small *bandwidth* of this space: about 31 Hz.
- is especially suited for QRP (low powered radios).

How do I use it?

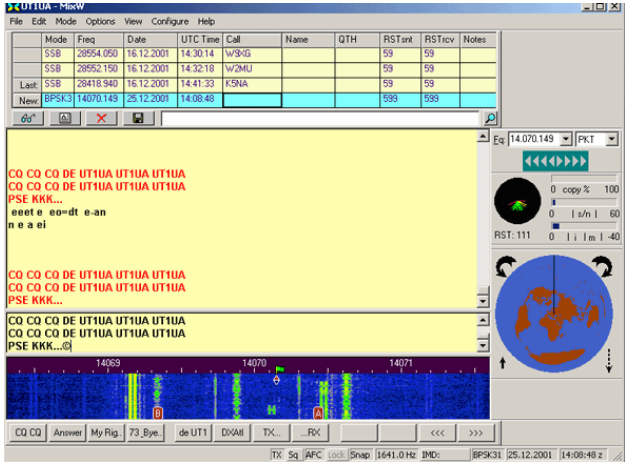
First, get a radio, a computer, and a ham license ;-)

- To transmit
  - Run a PSK 31 program on the computer and type text.
  - The program *encodes* the text into tones, and sends them to the computer's sound,
  - which is hooked through a small interface box to your radio.
- To receive
  - The PSK-31 program receives the same kinds of tones from the radio, *decodes* them, and displays the text on the screen.
- To tune or pick a station to talk
  - Clicking on the trace screen display called a "waterfall."

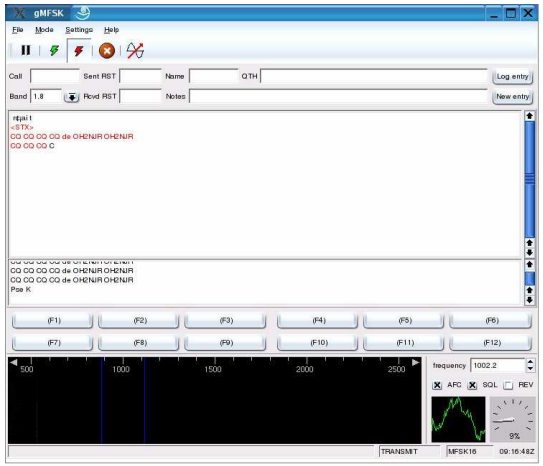
What does it look like?



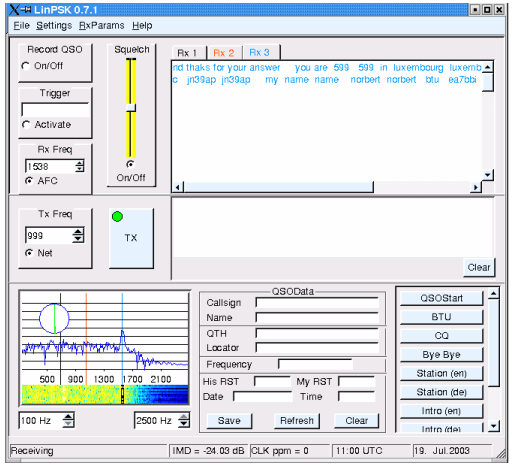
WinPSK *(photo by WD4R)*



MixW – Commercial for Windows



gMFSK for Linux



LinPSK for Linux

How does it work?

- PSK 31 uses “Phase Shift Coding.” The sound card generates an audio tone at a particular frequency (e.g., 1000 Hz). This is called a “sine wave”.
- Each letter (e.g., “e”) is represented a sequence of digital bits (e.g., 1110111). Common letters are represented by shorter sequences.
- Every 31.25 milliseconds, another bit is sent in the audio tone:
  - For every 0 value, the audio tone is reduced in volume to 0, and then started up again in reverse *phase*.
  - For every 1 value, the audio tone is left at full volume and the same phase.
- When you aren’t typing, it sends 0’s.
- When you are done talking, press the Receive button.

OK, what does it *really* look like?

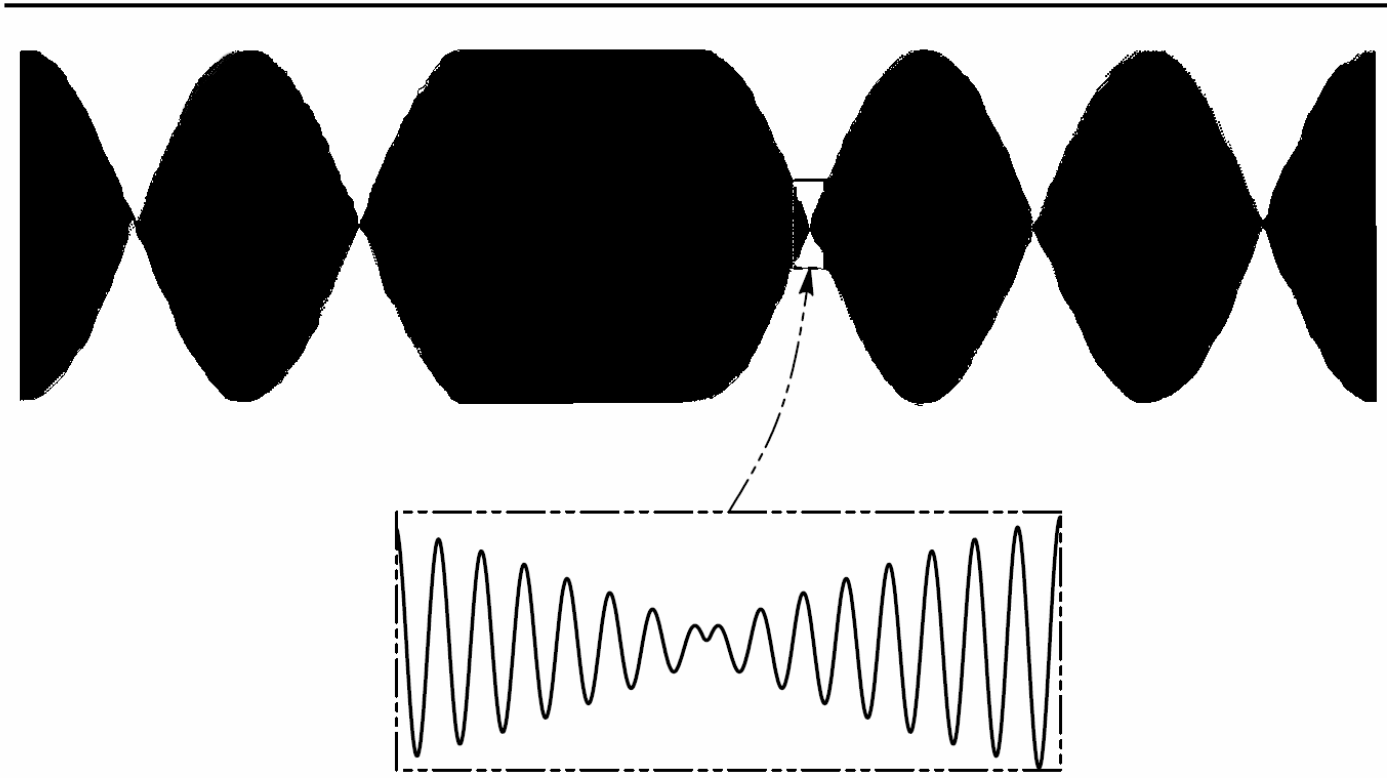


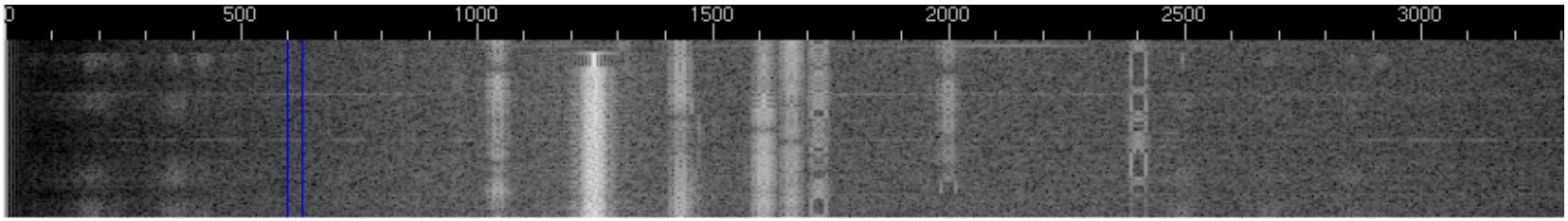
Fig 2—The waveform of BPSK sending the Varicode space symbol., with a close-up of the detail during a phase reversal.

Adapted from PSK 31: A New Radio-Teletype Mode, by Peter Martinez G3PLX, QEX July August, 1999

Where is it?

- **The most popular frequencies are**
  - 14.070 MHz (20 Meters)
  - 7.070 MHz (40 meters) (*7.035 outside US*)
  - 21.070 (15 Meters)
  - 28.120 (10 Meters)
  - 3.580 (80 Meters)

- Set your radio to one of the above frequencies
  - "tune" around the different QSO's (conversations) by picking different tones from the sound card on the "waterfall" display with your mouse.
  - The numbers on the scale are the number of Hz above the tuned frequency, assuming you are using Upper Side Band.
  - This example shows at least 8 QSO's in progress on 20 Meters!

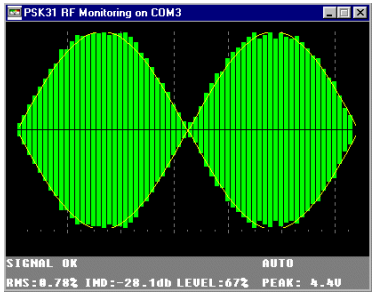


How good is it?

- All of the radio frequency energy is in a narrow bandwidth, and low-power operation works well. **Most stations are 2.5 to 20 watts.**
- Your computer can copy signals that you can see on the display, but can't hear with your ears in the speaker!
- High frequency, long-distance radio communication is made possible by bouncing signals off of the ionosphere, and this mode preserves the *phase* well in most cases, and the narrow bandwidth reduces the susceptibility to *selective fading*.
- Unfortunately, signals that pass over the polar regions are disturbed by the characteristics of the ionosphere there, so performance from, say, California to Europe, is poor.

What hardware do I need?

- Required: A Computer-Radio Interface
  - HamStop.com EZ-PSK
    - http://www.hamstop.com/
  - BuxComm GLx
    - http://www.packetradio.com/psk31.html
  - RigBlaster
    - http://www.westmountainradio.com/
  - Homebrew (e.g. http://tinyurl.com/322b5)
    - Shielded cable and connectors for your sound card and rig
    - Two isolation transformers and a pot (variable resistor)
    - A $0.50 Optoisolator chip to key the transmitter
    - Some radios require a DC-blocking capacitor
    - Parts available at Radio Shack or BuxComm
  - Others: http://home.att.net/~n8st/ etc.
- Recommended: **PSK Meter**
  - If your sound card is too loud, you will QRM (interfere with) the entire PSK band!
    http://www.ssiserver.com/info/pskmeter/

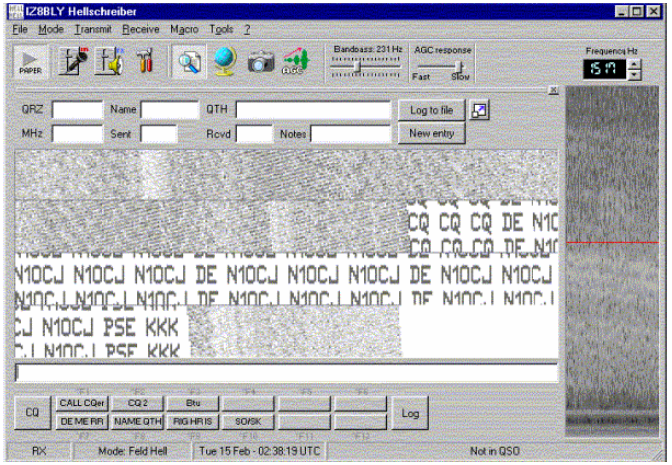


What software do I need?

- For Windows, try PSK Deluxe
  - **http://tinyurl.com/35g5q**
- For Linux, try gMFSK
  - http://gmfsk.connect.fi/
- For Mac OS, try MultiMode
  - http://www.blackcatsystems.com/software/multimode3.html/

Is that all there is?

- The same rig, interface, and software can often be used for other digital modes:
  - **MFSK16** (wider bandwidth but better performance over the north pole, for example)
  - **SSTV** for sending photos (F6GOV photo received by M1CTK)
  - **Hellschcreiber** for sending text in fonts (and dating from the 1930's!)
  - **PSK63** (twice as fast as PSK31)
  - … and more …



Where do I get more information?

- The ARRL PSK31 Page
  - http://www.arrl.org/tis/info/psk31.html
- The “official” PSK-31 page
  - http://www.kender.es/~edu/psk31.html
- An easy-to-remember page:
  - http://www.psk31.com