Linux® in Your Ham Shack

Andy Stewart
KB1OIQ
May 15, 2019

Presented to the
Boston Linux and Unix User Group
Cambridge, MA

kubuntu

Biographical Info

Tech: 1/07, General 1/08, Extra 1/09

President: PART of Westford, MA (9/09)

ARRL EMA: Assistant Section Manager (2016), ACC (2017)

Founder: Worcester Linux Users' Group (1997)

Founder and Acting President:
Chelmsford Linux Meetup Group (2006-present)

Linux Instructor:
Chelmsford Community Education (2004 - 2011)

Linux user since 1997

Computer Engineer – digital logic verification

kubuntu

What do hams do?

- Many ways to communicate with one another via radio:
  - Morse code: more common that you'd think
  - Voice: AM, FM, SSB, digital
  - Text: keyboard to keyboard (no internet):
    Many, many different digital modes
  - Via Satellite (voice and telemetry)
  - Mixed radio/internet: Echolink
- Logging: keep track of these communications (often for awards)
- Locate hidden transmitters (fox hunting or ARDF)
- Tinker: restore old radios, soldering kits, repair broken power supplies, alternative power, program Arduinos, etc.
- Design, build, and install antennas
- Perhaps the original "makers"

Goals

- Promote Linux
- Give back to ham radio and Linux communities
- Build on top of an existing Linux distribution
- Create a software collection containing as much ham radio software as possible – nothing proprietary
- Goal: Everything just works!
- Focus on the radio hobby!
- The idea of ”Andy’s Ham Radio Linux” began this way

kubuntu

Andy's Ham Radio Linux

- V22 is Ubuntu Linux 18.04.* remastered
- Download the ISO file from SourceForge
  - Search for: Andy's Ham Radio Linux
  - Software is GPL or similarly free license
- Ways to get started:
  - Download the ISO first, then…..
  - Boot it in Virtualbox, or…..
  - Create a DVD, or…..
  - Create a bootable USB thumb drive
- Install to the hard drive once you decide you like it

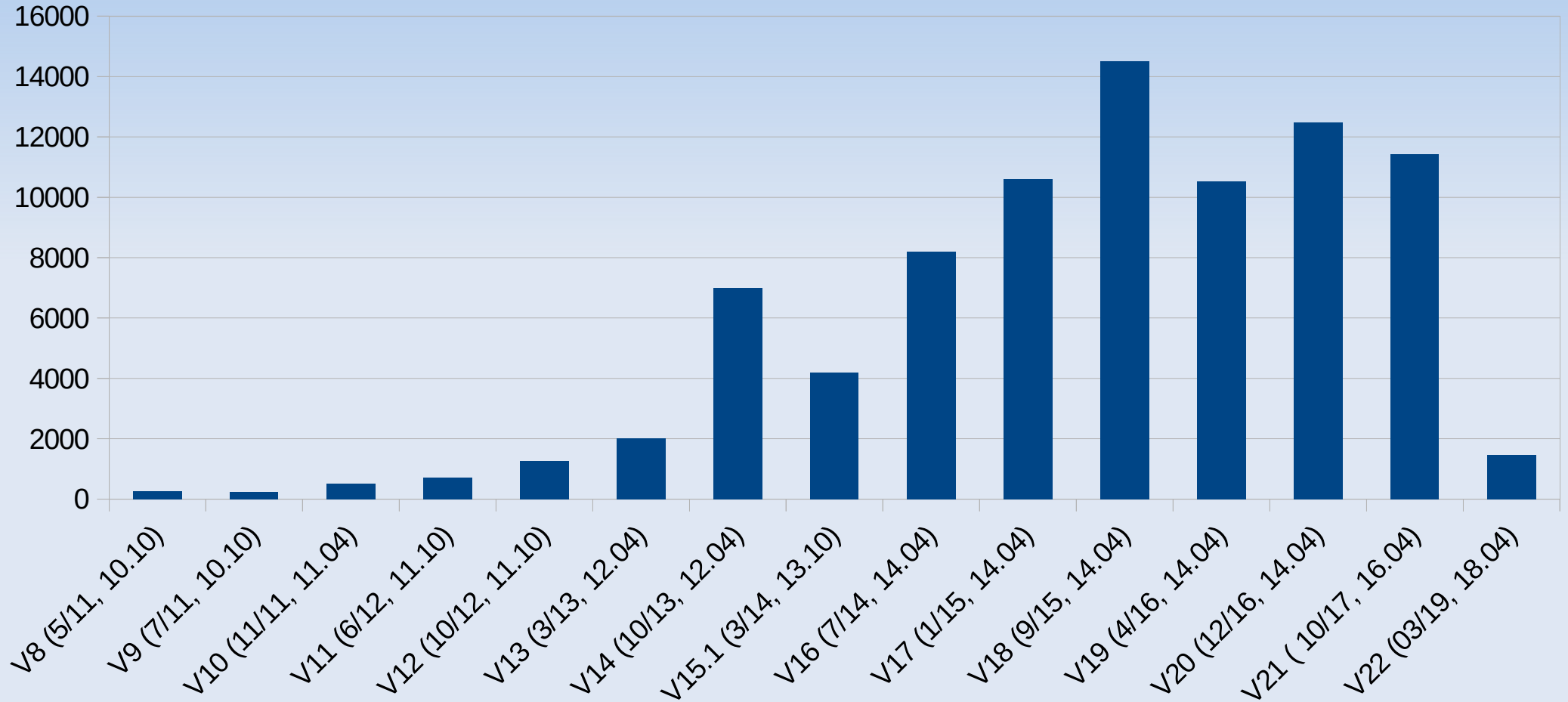
kubuntu

Development Environment

- Live CD Customization: https://help.ubuntu.com/community/LiveCDCustomizationFromScratch
- I created scripts to automate this process
- Jump into the chroot jail
- Install software, customize menus, update docs, etc.
- Get out of the chroot jail
- ./do_it to build the ISO file
- Test it in Virtualbox
- Iterate until release
- For some reason, I've never released these files, just the resulting ISO file

kubuntu

Downloads

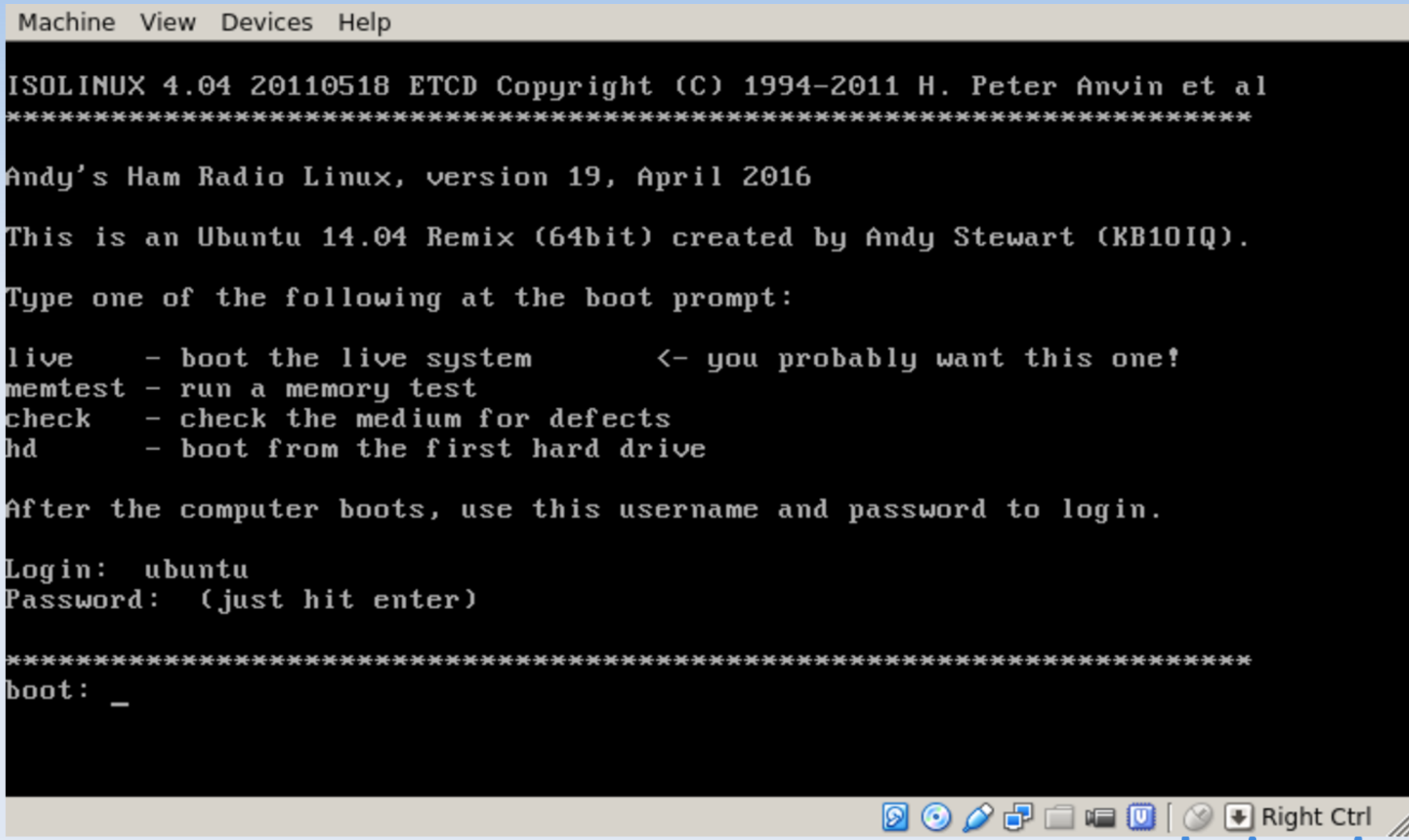


kubuntu

Target Computer

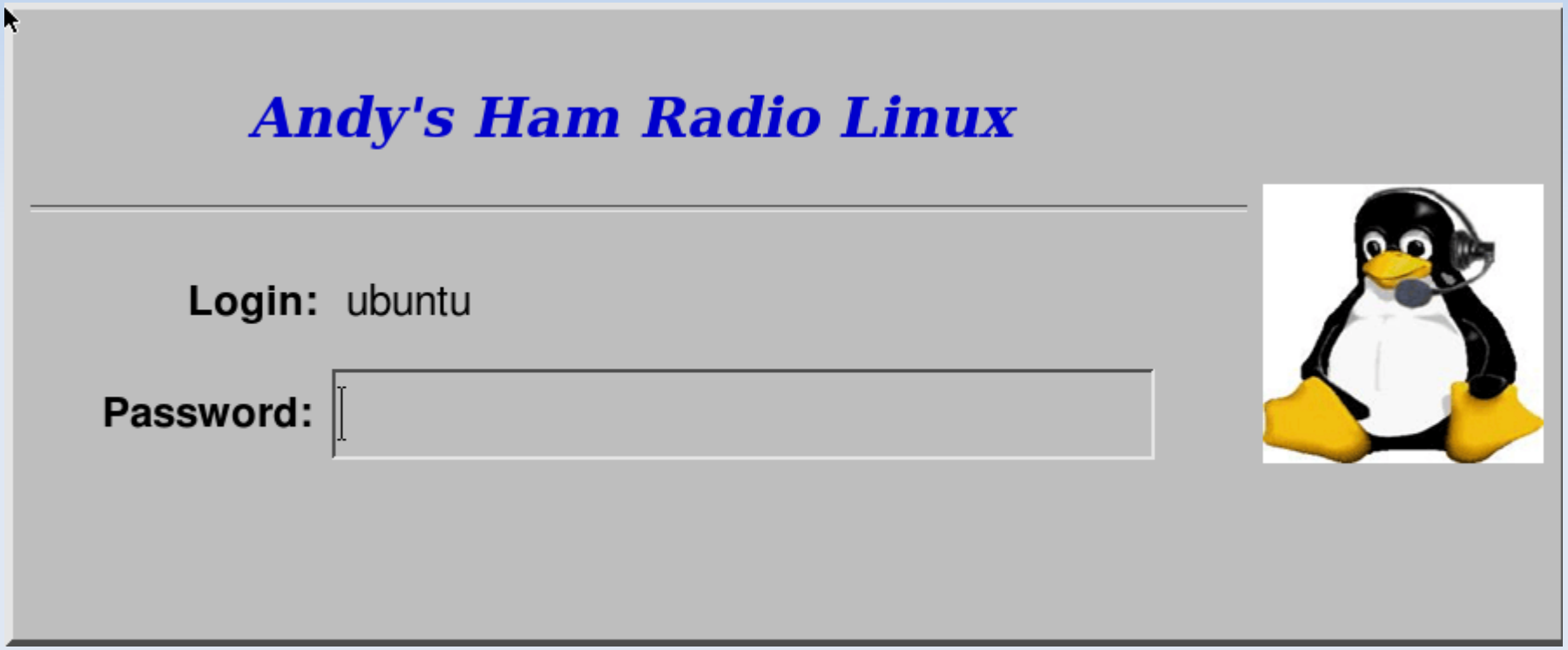
- Older computer (but newer works, too!)
- Has been run on 7-10 year old computers
- Bare minimum requirements
  - 1-2 GB of memory
  - Network for hard drive installation
  - 1GHz x86 processor (more for SDR)
  - 8-12 GB for hard drive install

Initial Boot Screen



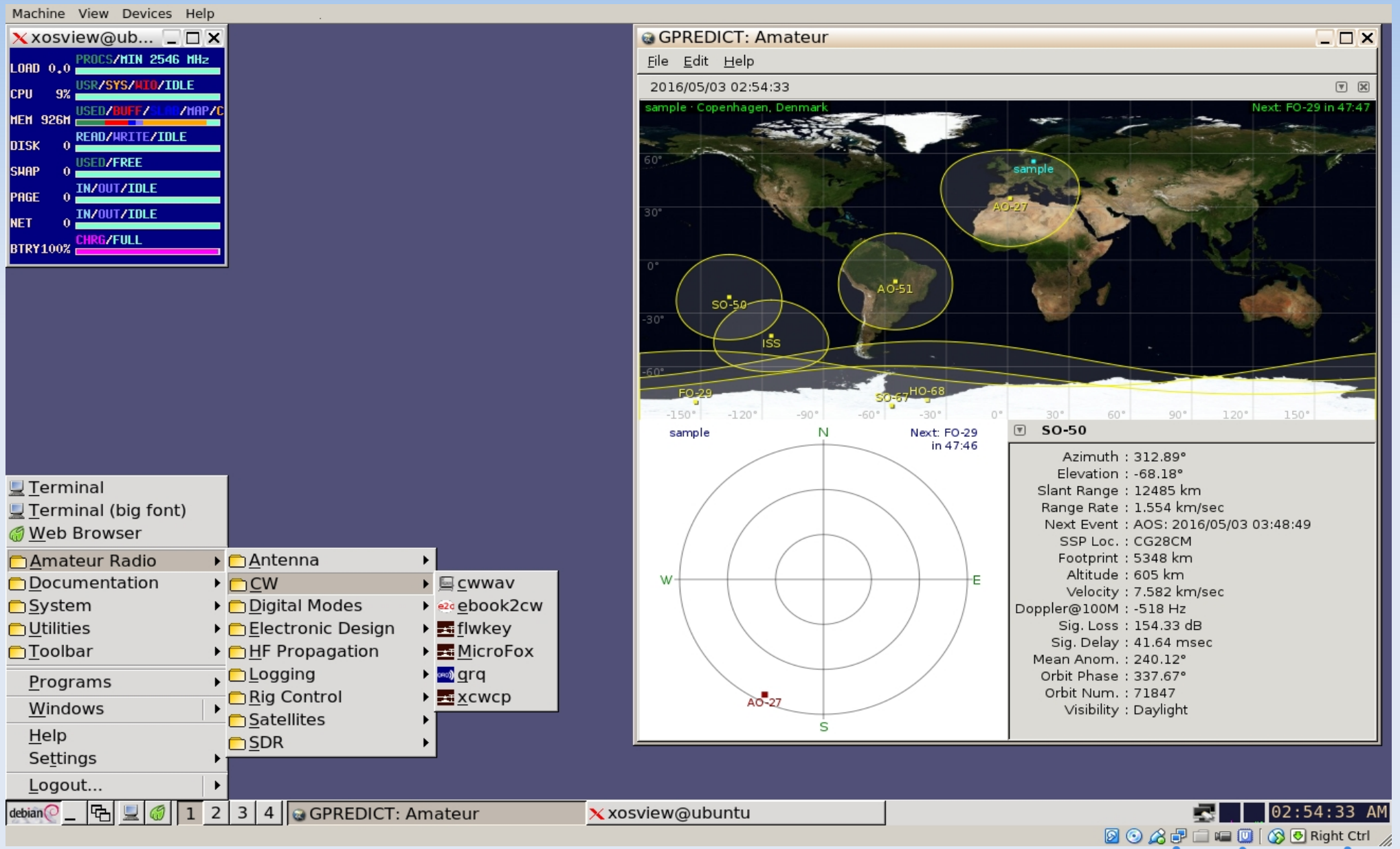
kubuntu

Initial Login Screen



kubuntu

Initial Desktop



kubuntu

Desktop

- Icewm
  - Light on system resources
  - Virtual desktops
  - Easy customization, many themes available
- Menus
  - Customized for amateur radio use
- Toolbar
  - Menu, quickly start apps, status monitors, clock

System Software Highlights

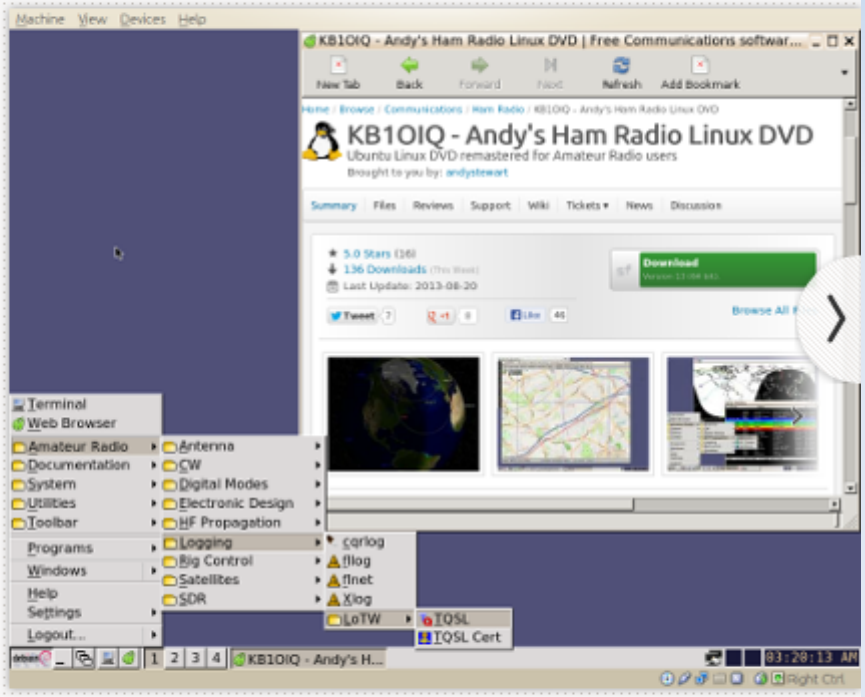
- Network Configuration: wicd
- Browsers: Firefox and Dillo
- Installation: Ubiquity, multibootusb, and brasero (DVD)
- Printing: CUPS
- Graphical file manager (Xfe), PDF viewer (evince)
- Text editors (LeafPad, nano, vi), I install emacs later… :-)
- PulseAudio sound and utilities
- Smart package manager
- Email: Sylpheed (it works great with Fldigi)

Hard Drive Installer

Andy's Ham Radio Linux

Chosen with older computers in mind, the icewm window manager provides modern features while requiring relatively few system resources.

* Virtual desktops
* Desktop themes
* Easily customized
* Help files included!

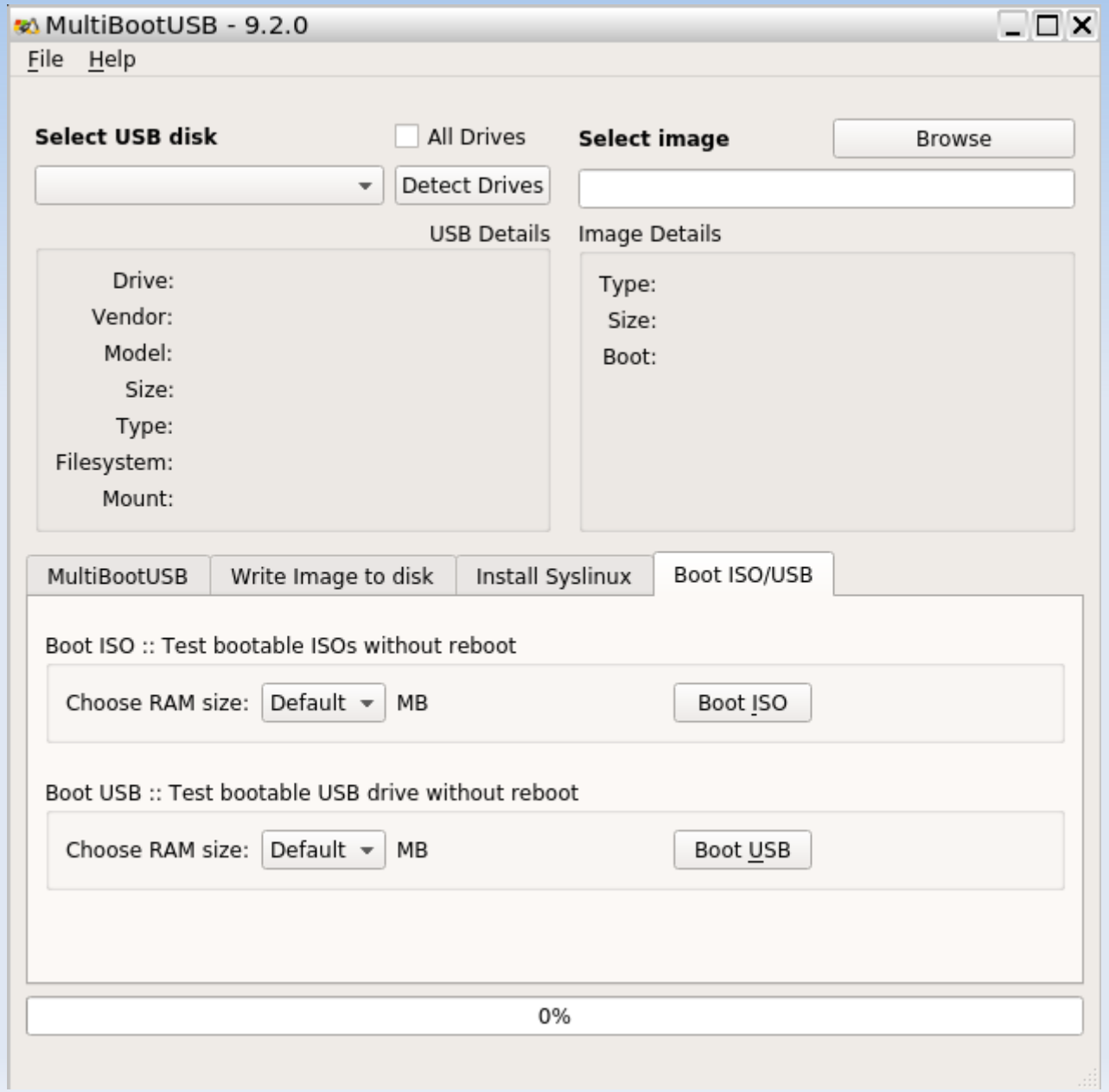


▶ Copying files...

Skip

kubuntu

multibootusb



kubuntu

Documentation

- Updated for V22 (Jan 2019), uses Dillo to read docs
- Docs specific to this software collection:
  - Menu->Documentation->
    - Andy's Ham Radio Linux
      - RELEASE_NOTES
      - CHANGES (from release to release)
      - Miscellaneous HOWTOs by KB1OIQ
    - Icewm documentation
    - Ham Radio software documentation
  - See also files in this directory: /usr/local/share/doc/Andy_Ham_Radio_Linux

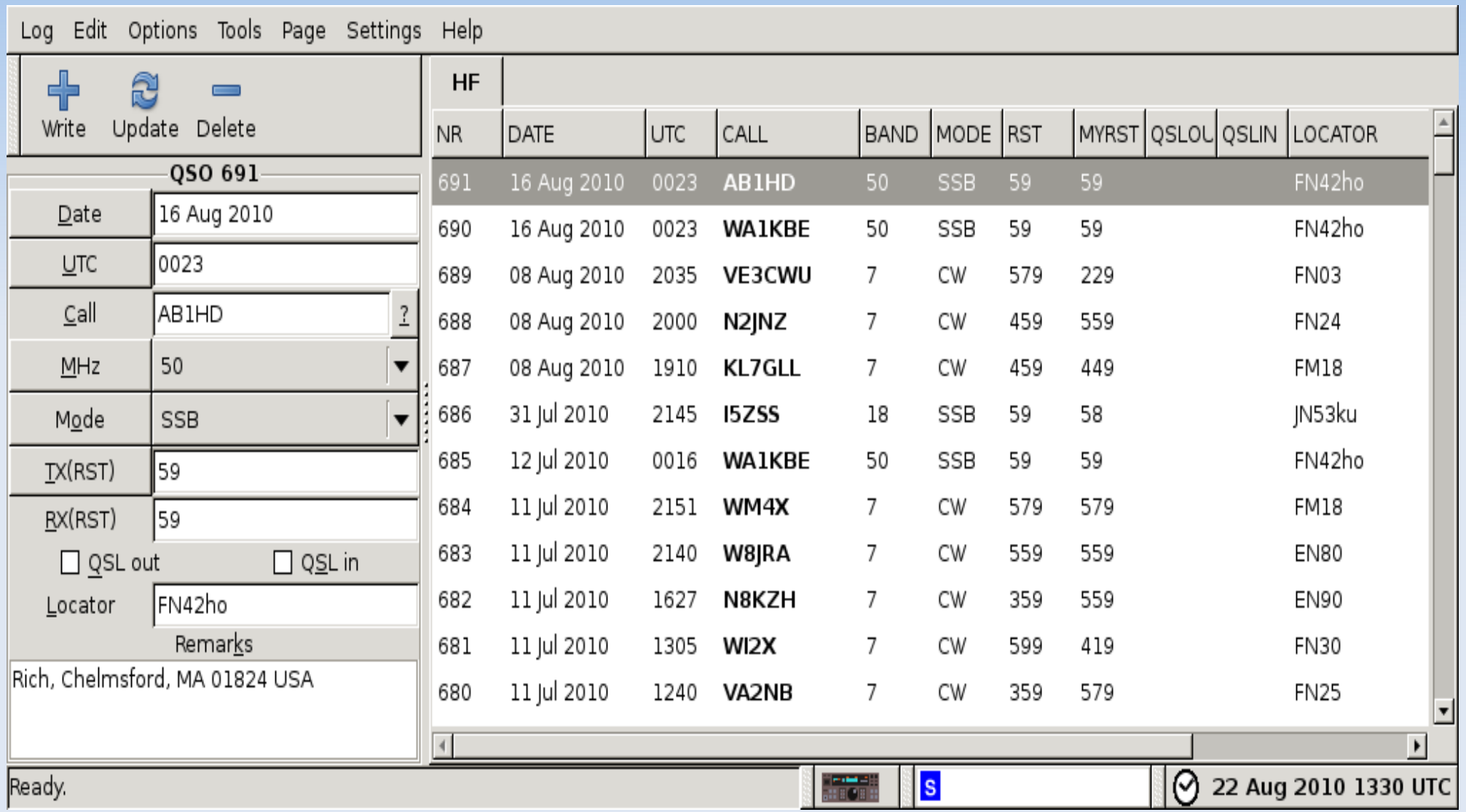
Ham Radio Software Summary

- Logging: cqrlog, xlog, TQSL (for LoTW)
- APRS: Xastir, soundmodem, direwolf
- Digital modes: Fldigi and friends (NBEMS)
  - Qsstv, wsjt(-x), Echolink client
- CW: xcwcp, qrq, cwwav (text to CW)
- Antenna analysis:
  - Xnec2c, Fl_Moxgen, aa-analyzer
- Satellite: Gpredict, Fox 1A telemetry decoder
- Program your handheld radio: CHIRP

More Ham Radio Software

- EDA Software
  - gschem – schematic capture
  - pcb – board layout
  - Spice and GUI with waveform viewer (gwave)
- SDR
  - gqrx – sdr radio receiver used with USB dongle
  - Gnuradio companion
- FreeDV / Codec2
- Pskmail client and server

Logging SW: Xlog

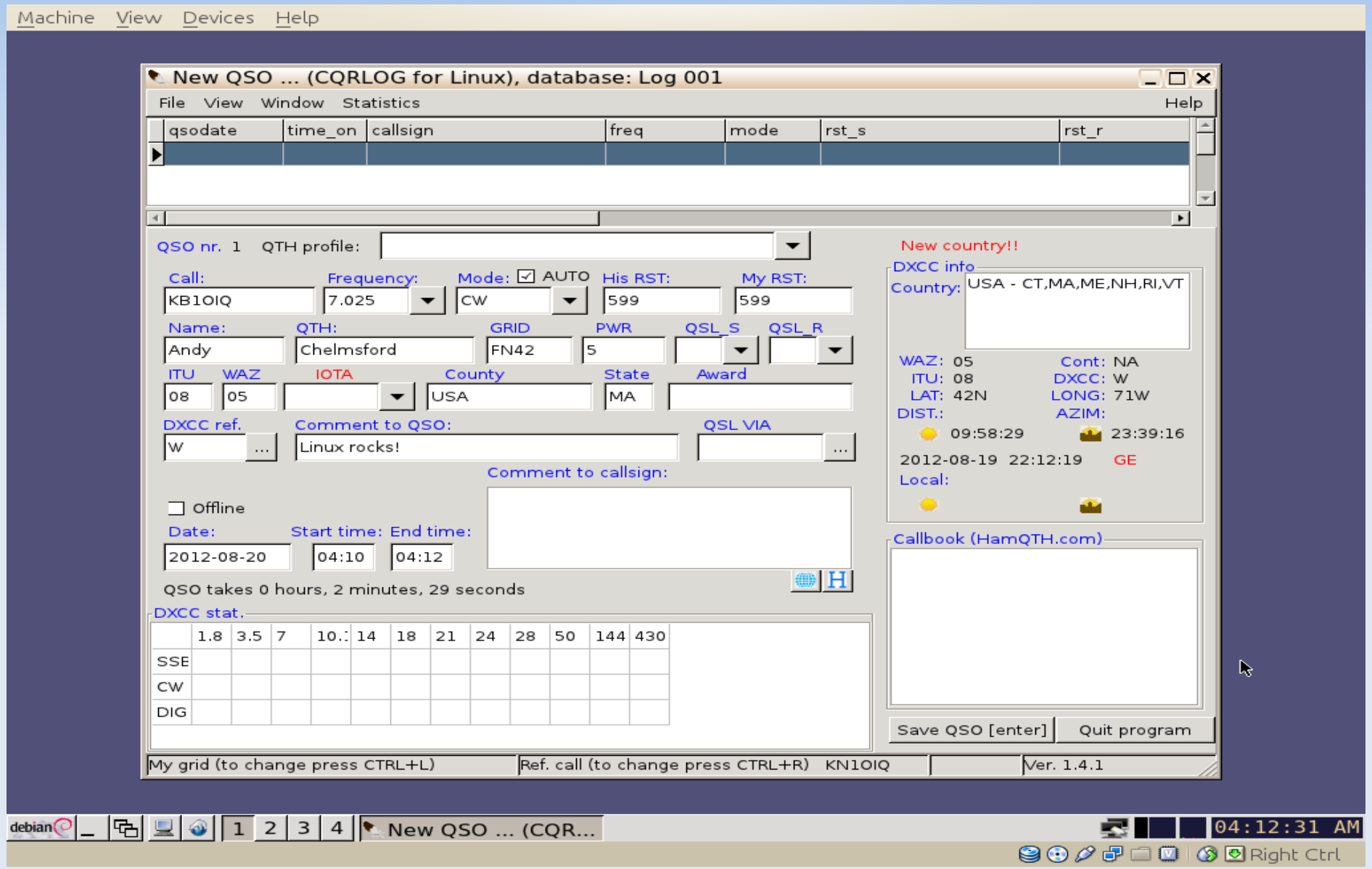


kubuntu

Xlog Development

- Maintained by KB1OIQ
- Most recent version: 2.0.17, released Jan. 2019
- Added support for JS8 mode
- Updated to ADIF 3.0.9

CQRLOG



kubuntu

APRS™

Automatic Packet Reporting System

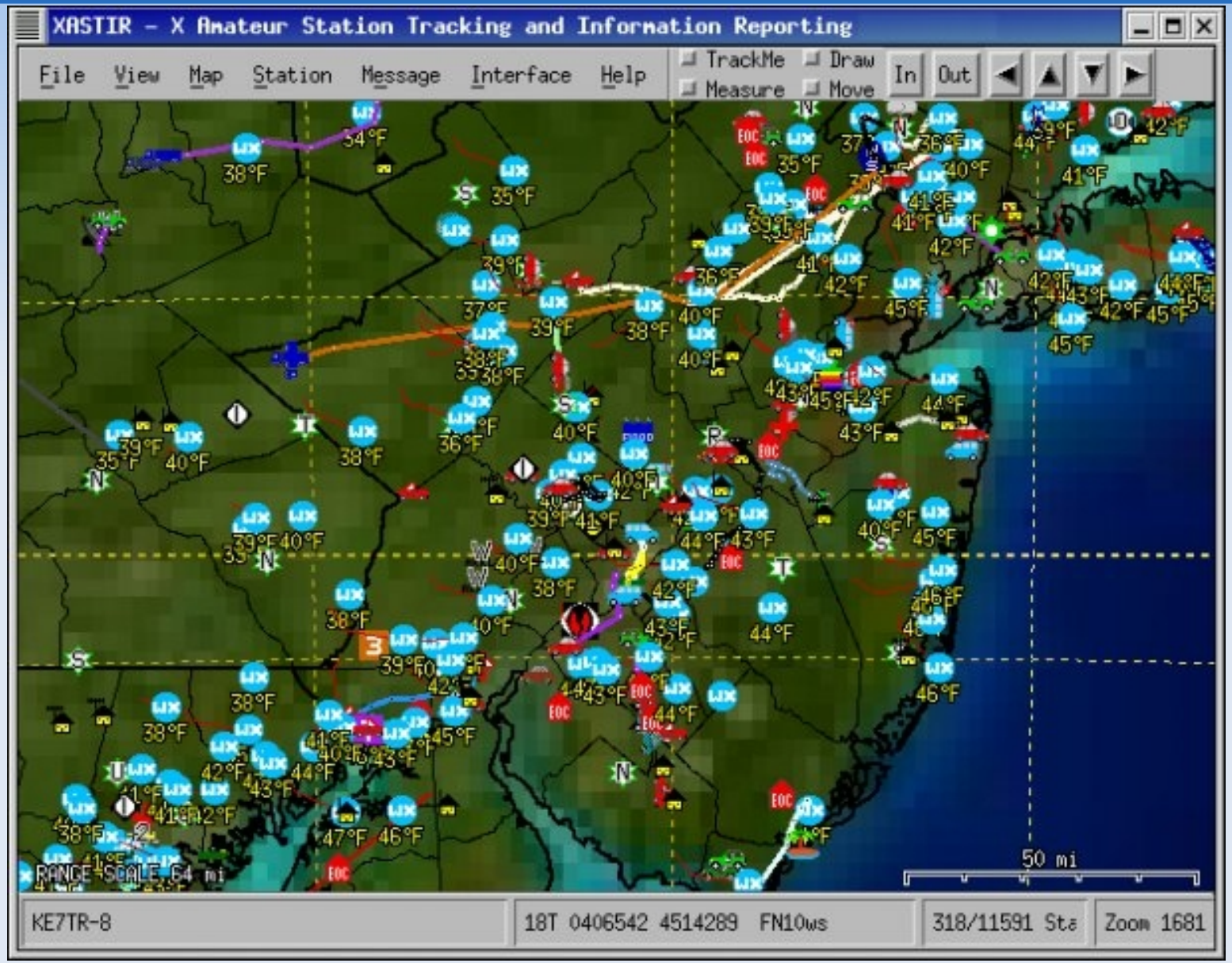
- Bob Bruninga WB4APR

Xastir

- X Amateur Station Tracking and Information Reporting
- http://www.xastir.org
- Supports many, many map formats
- Including OpenStreetMap !

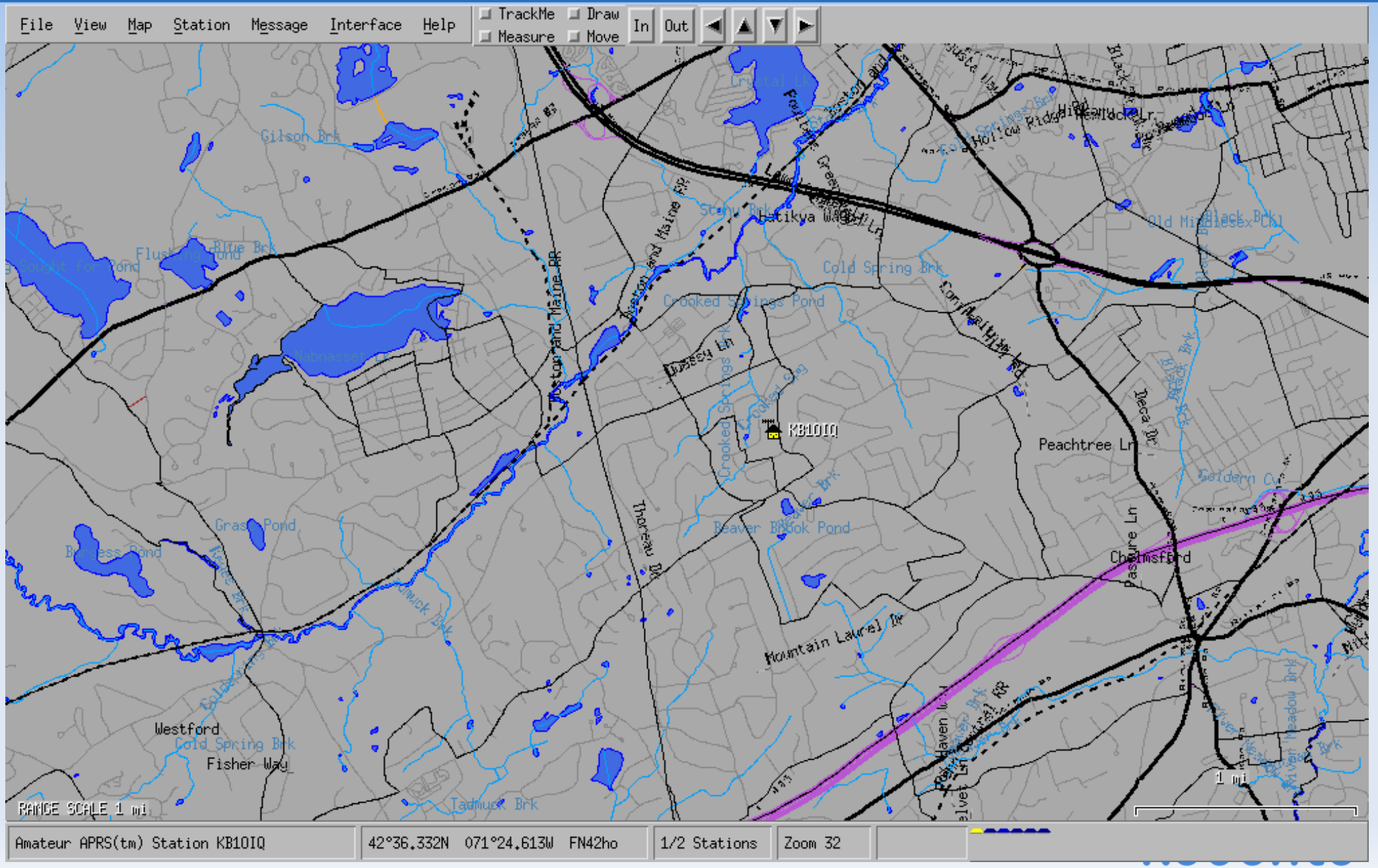
kubuntu

Xastir

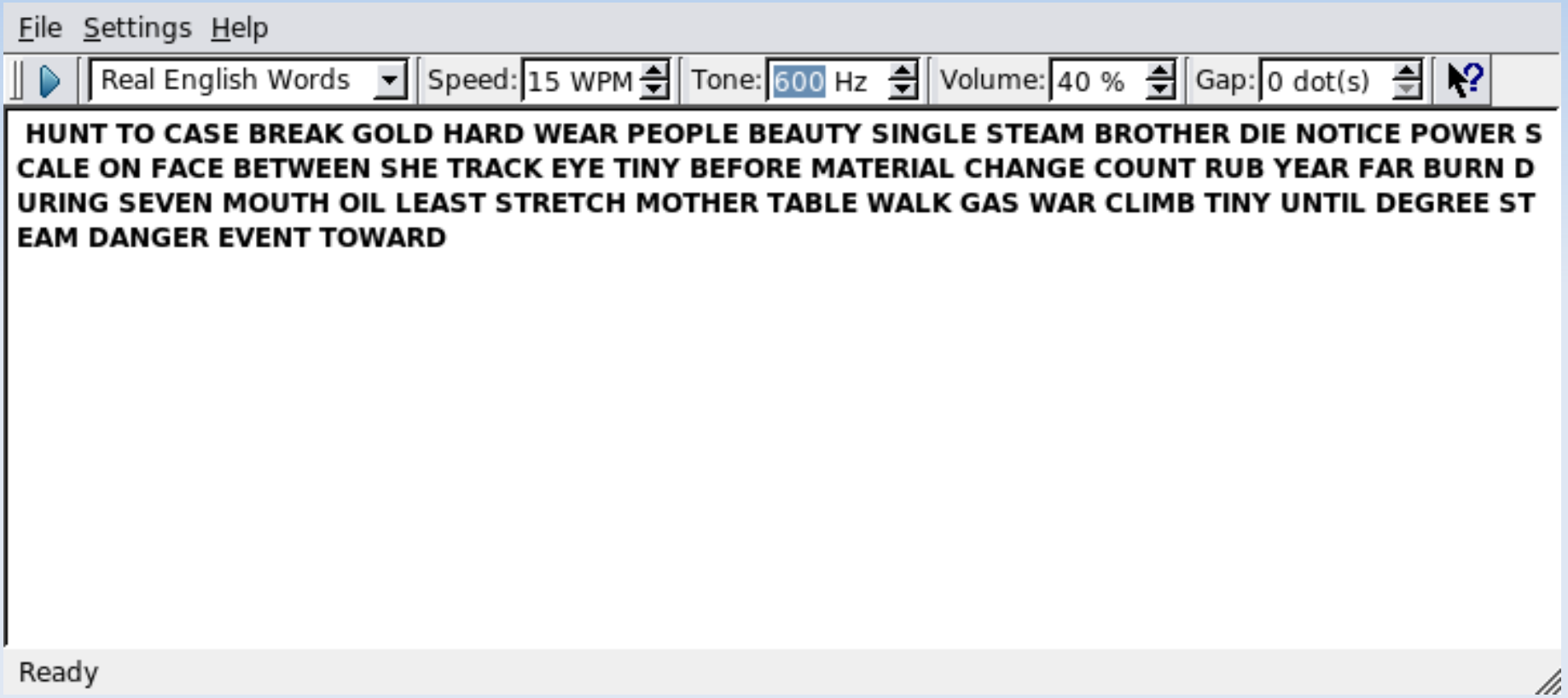


kubuntu

Xastir Screenshot

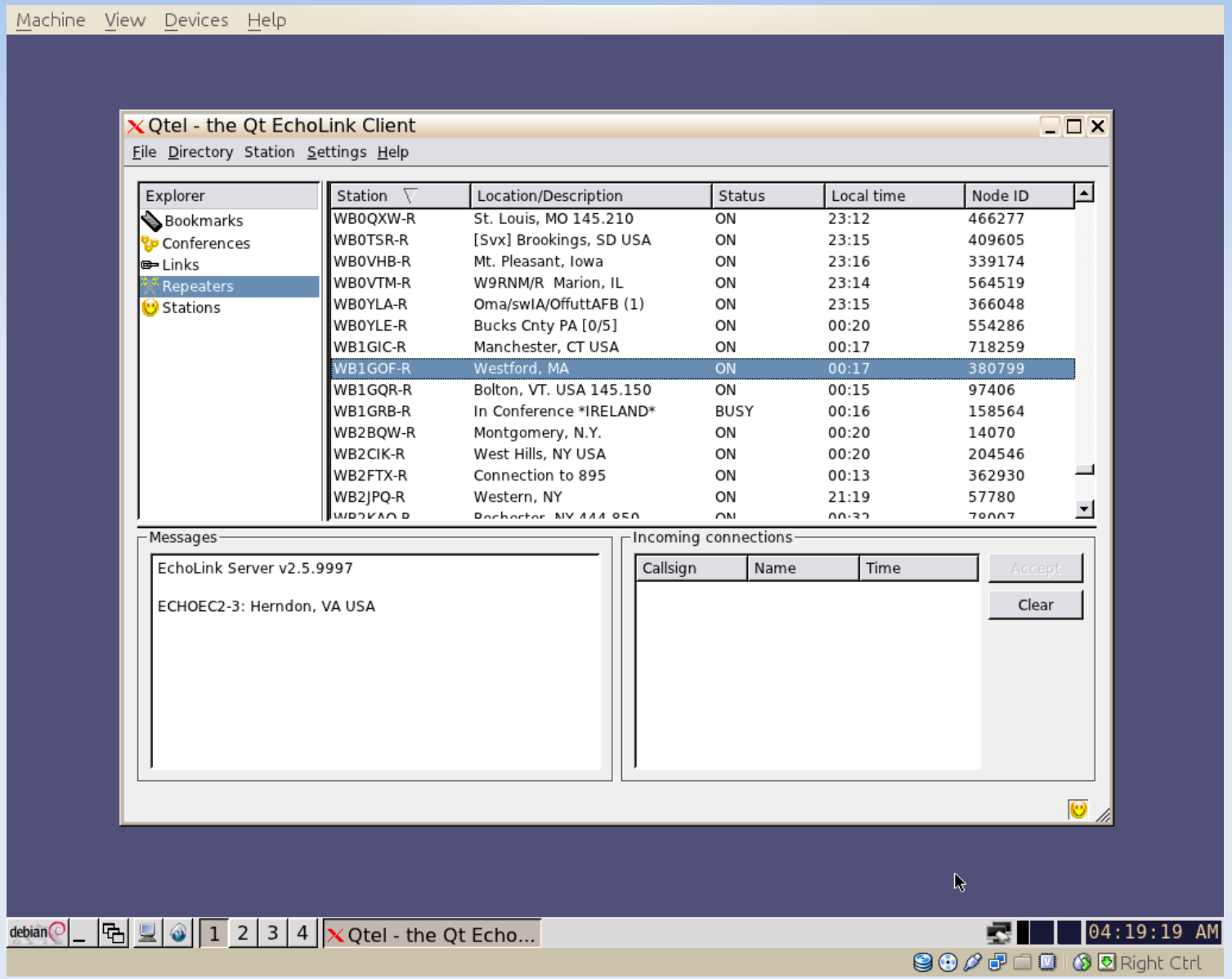


Practice Morse Code: xcwcp



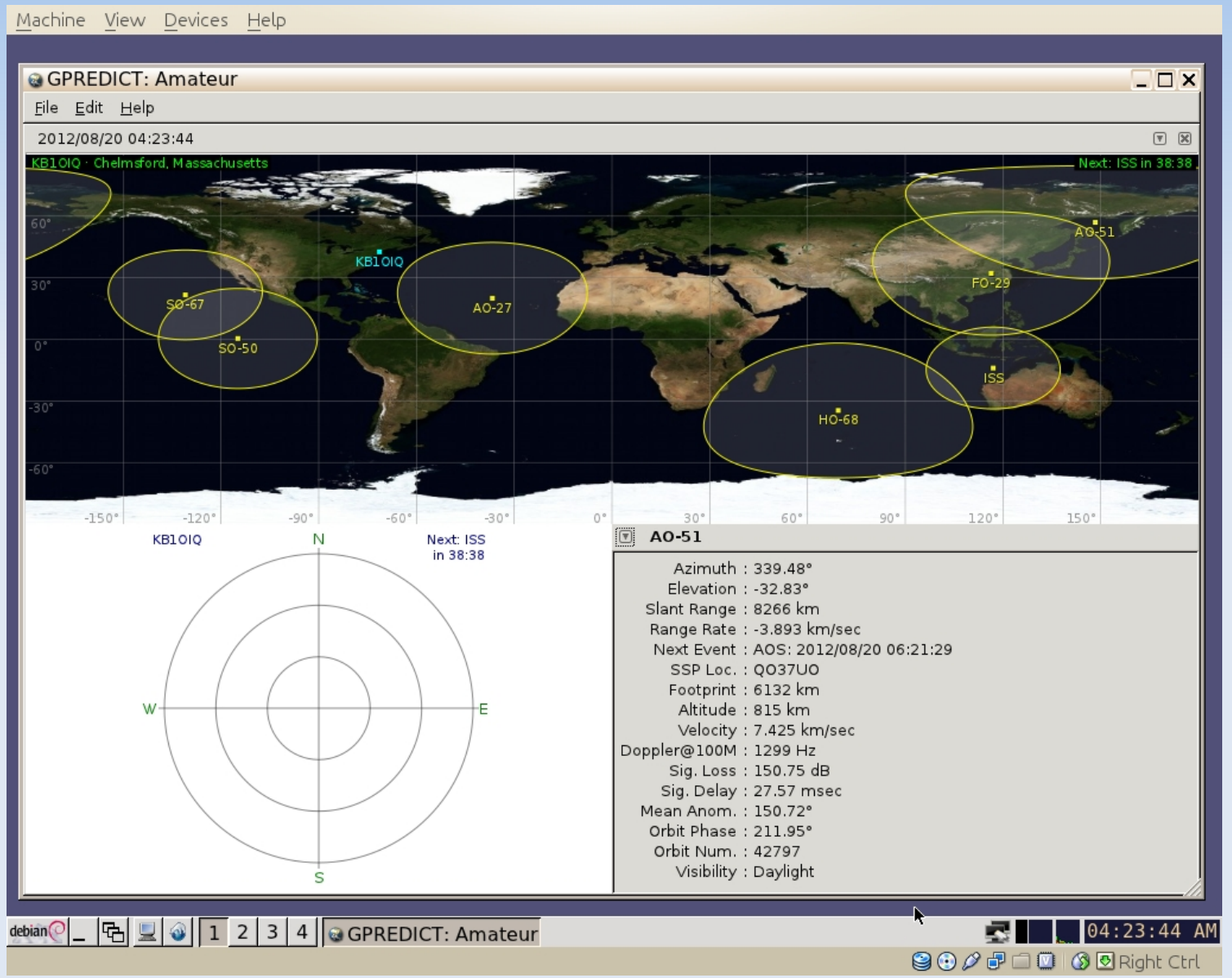
kubuntu

Qtel Echolink Client



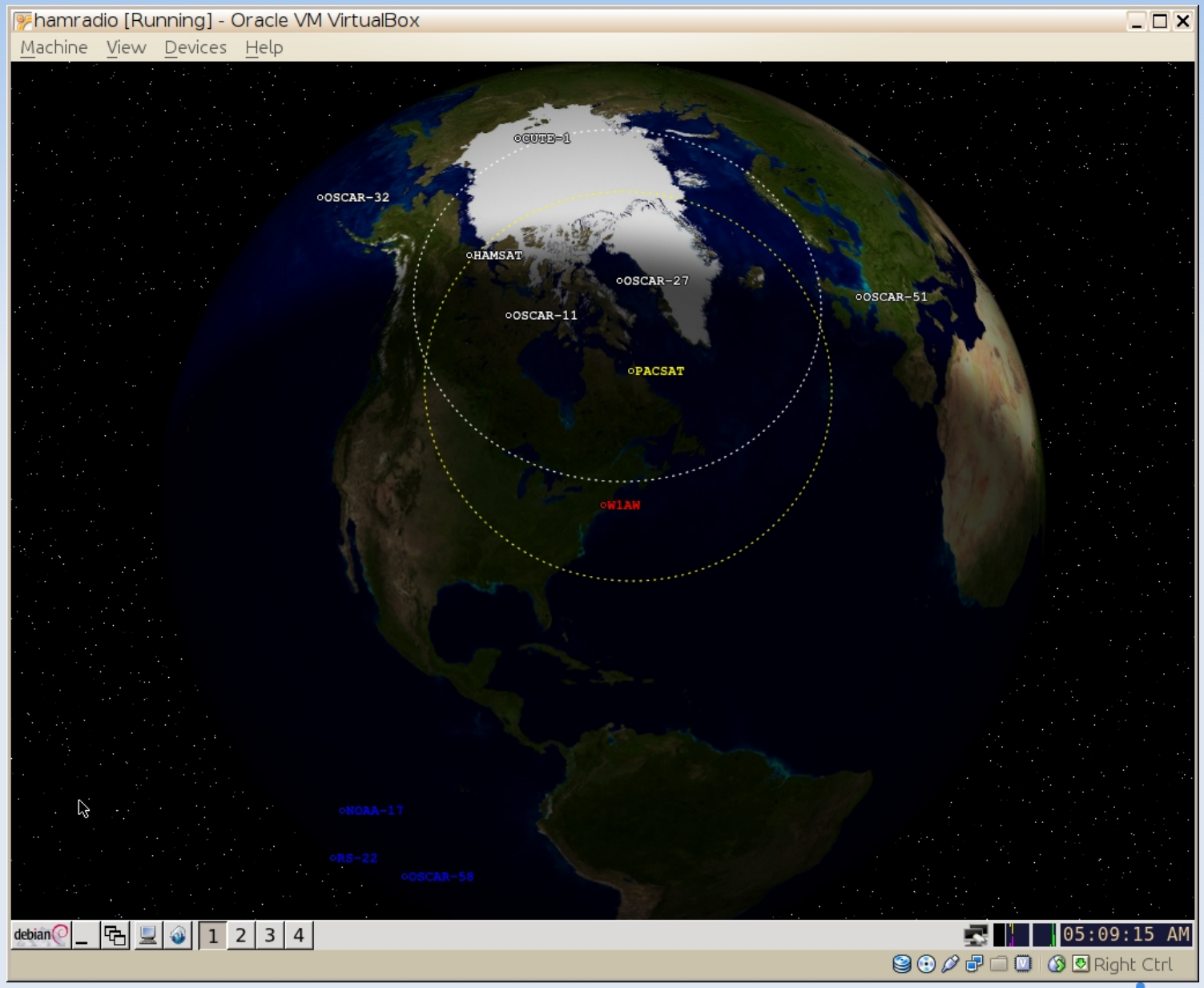
kubuntu

Satellites: Gpredict



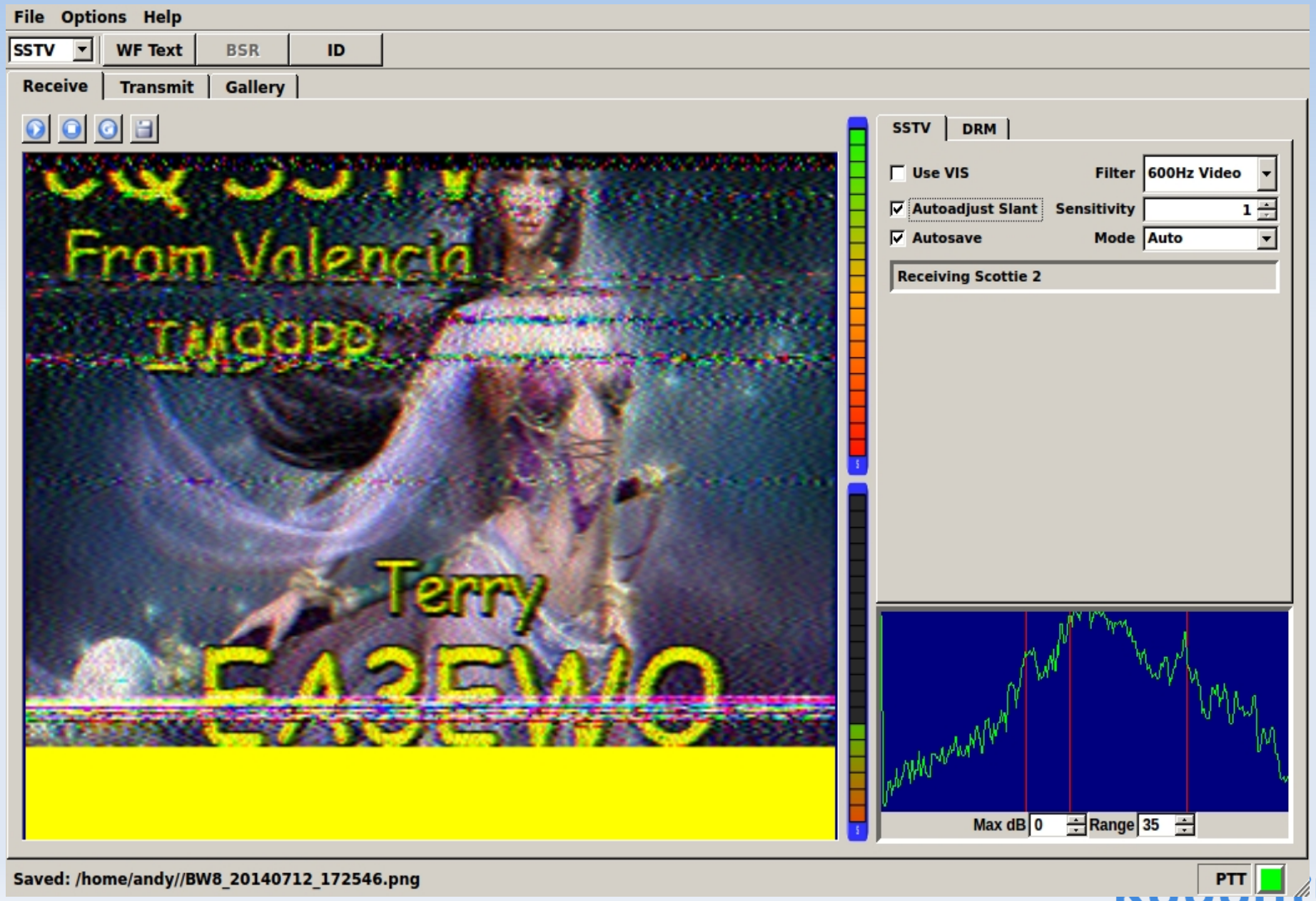
kubuntu

Earthtrack

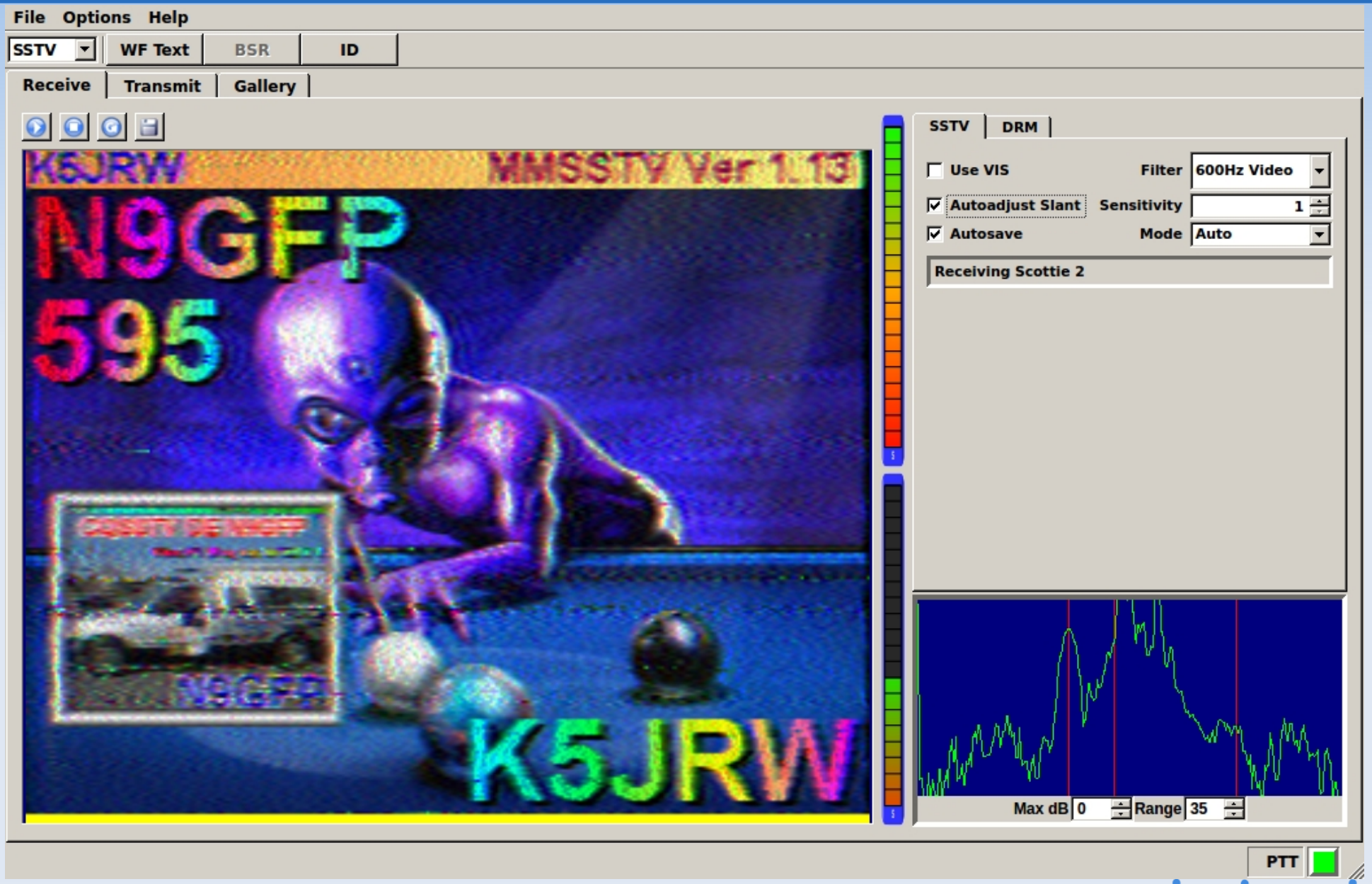


kubuntu

Slow Scan TV: QSSTV



Slow Scan TV: QSSTV



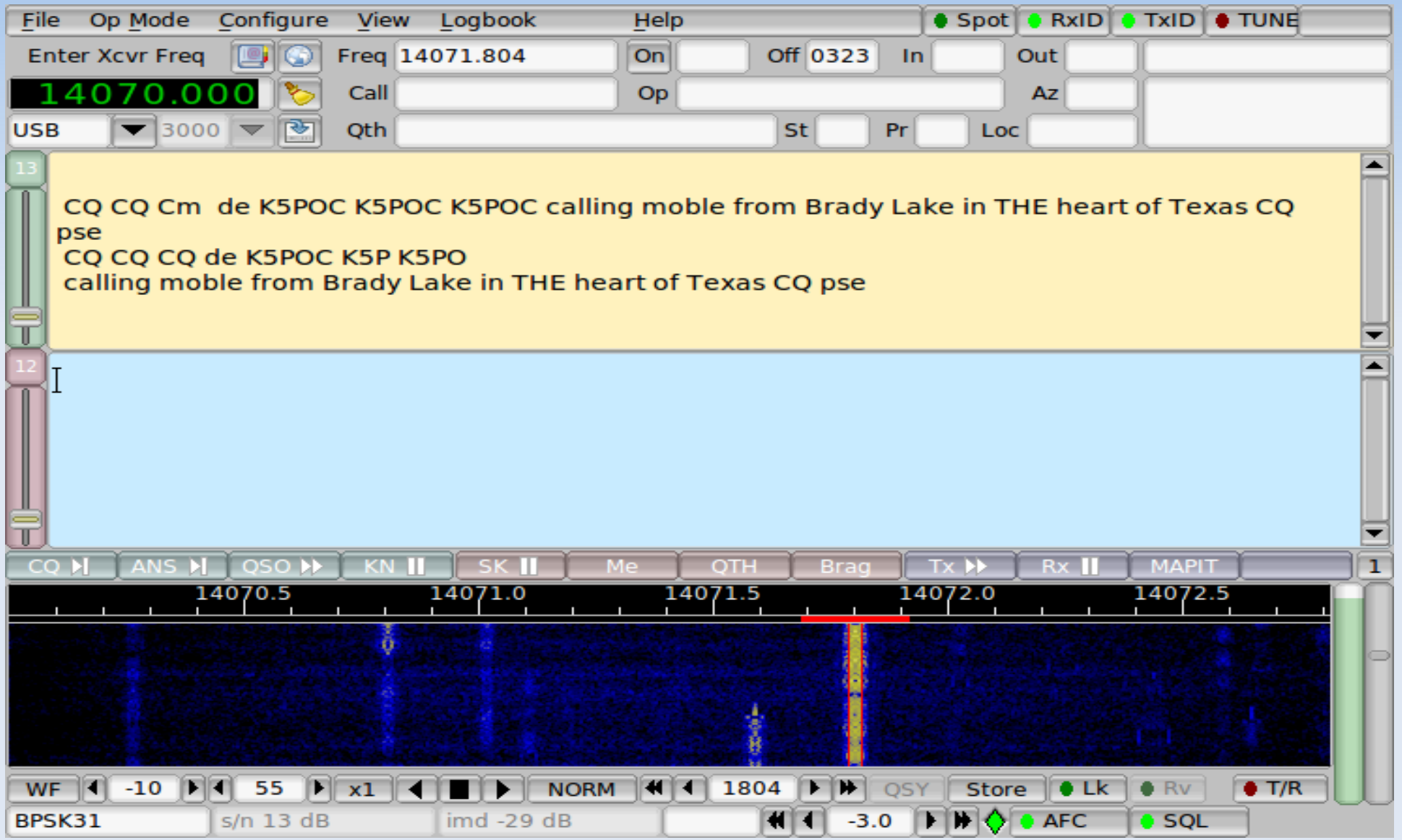
kubuntu

Keyboard Digital Modes

Fldigi – W1HKJ and friends

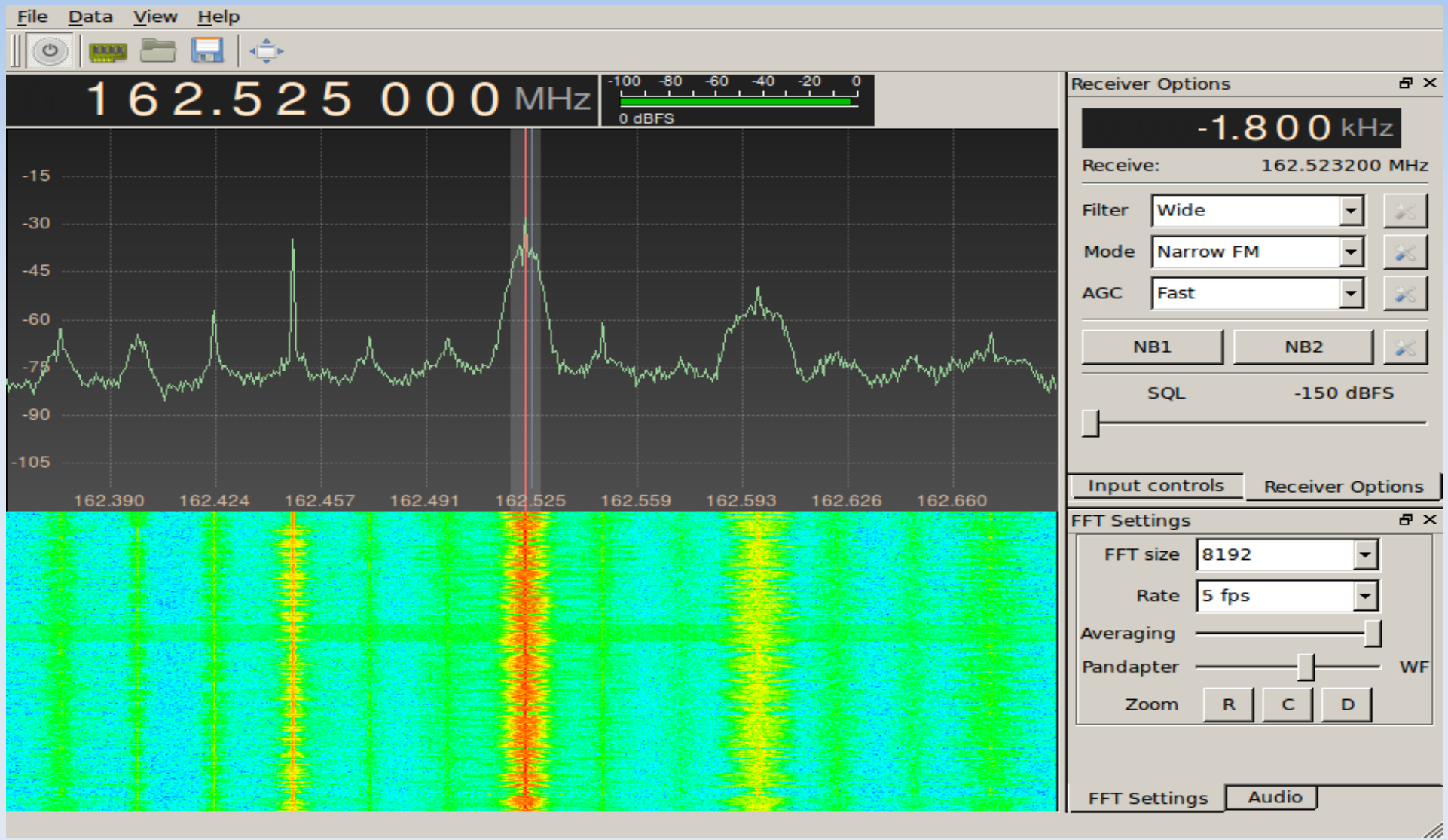
- Supports a large(!) number of digital modes
- Keyboard to keyboard communications
- BPSK-31, RTTY, Hellschreiber, and more!
- ARQ file transfers (auto repeat request)
- NBEMS – Narrow Band Emergency Messaging System
- Great support! Yahoo Group: linuxham
- Fldigi, fllog, flmsg, flrig, flarq, flwrap, flwkey

Fldigi



kubuntu

SDR: gqrx



kubuntu

Digital Voice: FreeDV

- Free Digital Voice
- Originally written in response to proprietary D-Star
- Codec2: David (VK5DGR) Rowe
- Compress speech down to 700-1600 bits/sec
  - Modulated onto a 1.25 kHz signal
  - Audio is sent to the mic input of an SSB radio
  - Commonly found here: 14.236 MHz
- Requires 2 soundcards
- Very actively developed
- Linux, Windoze, and OSX versions are available

SM1000

- Free Digital Voice – hardware in a box
- No computer required – everything is in the box
- Connect it to your rig with your own cable
- Cost: $200
- My setup:
  - Heil Headset (Pro Set Plus)
  - ICOM 746PRO
  - 3 stereo audio cables: Speaker, Mic, PTT
  - Could also make a cable with RJ-45 connector and internal jumpers

SM1000

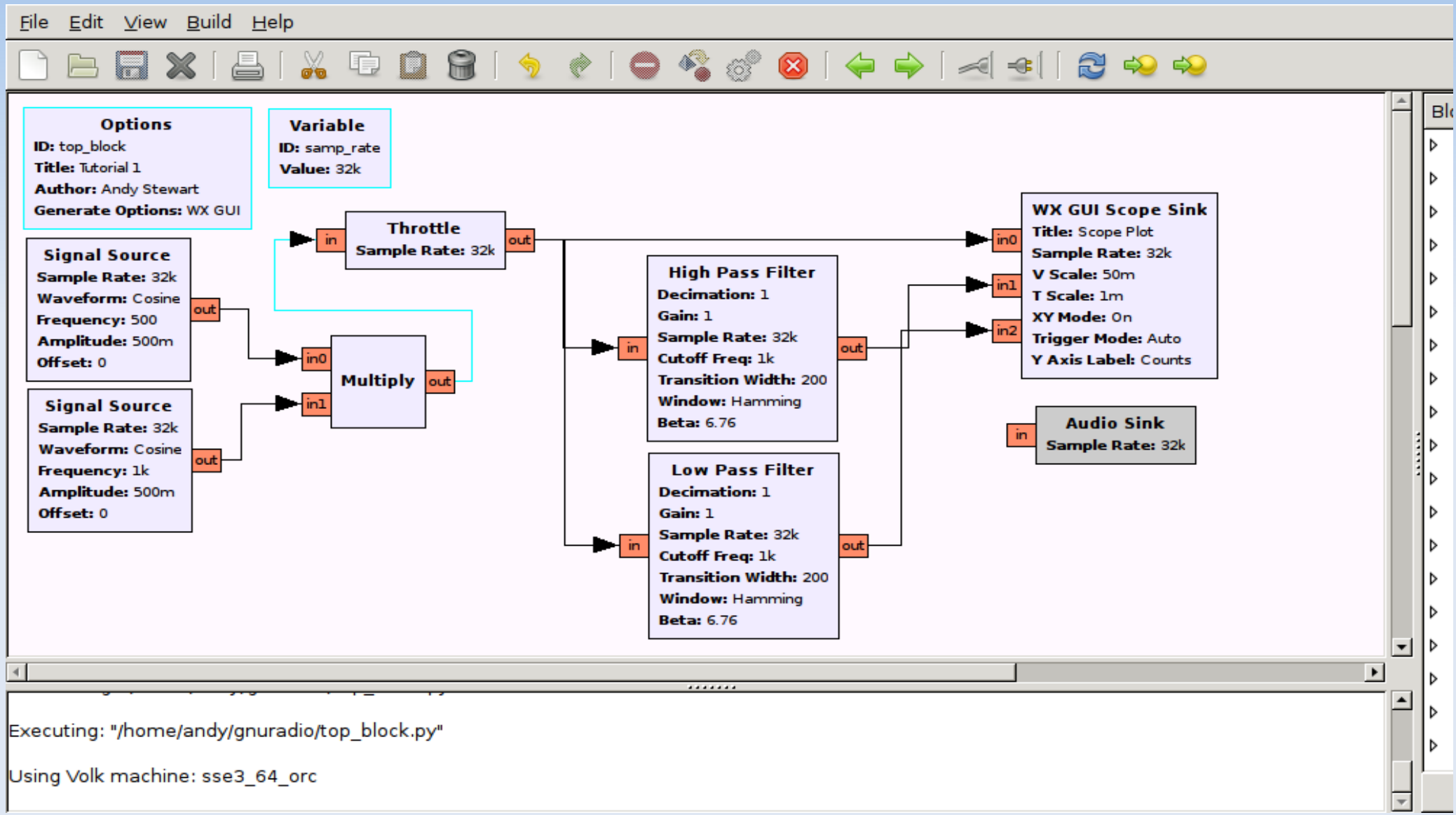
kubuntu

GNU Radio Companion

- Visual programming language
- Used for signal processing
- Uses the GNU Radio libraries
- Many tutorials on the internet

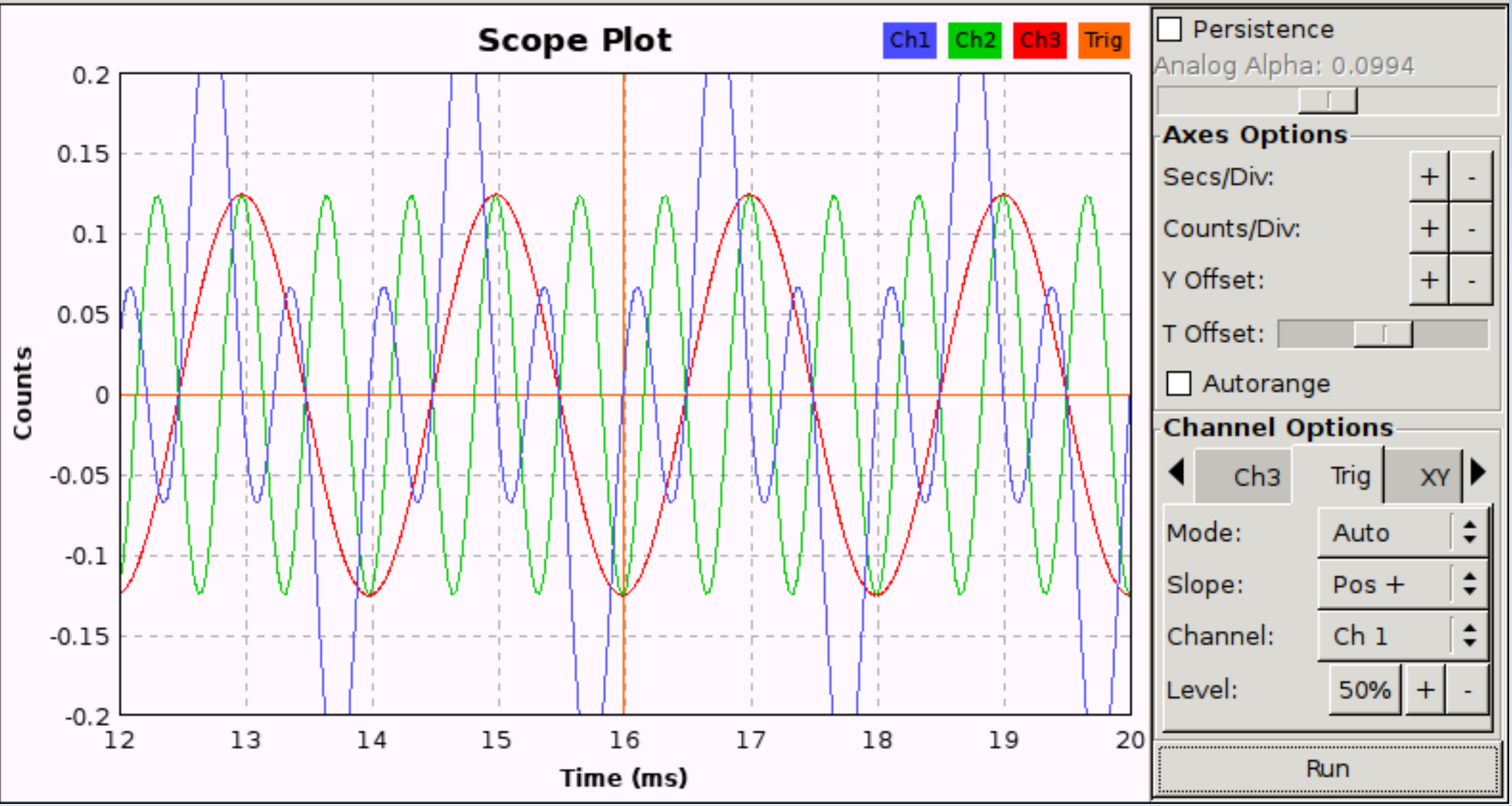
kubuntu

GNU Radio Companion



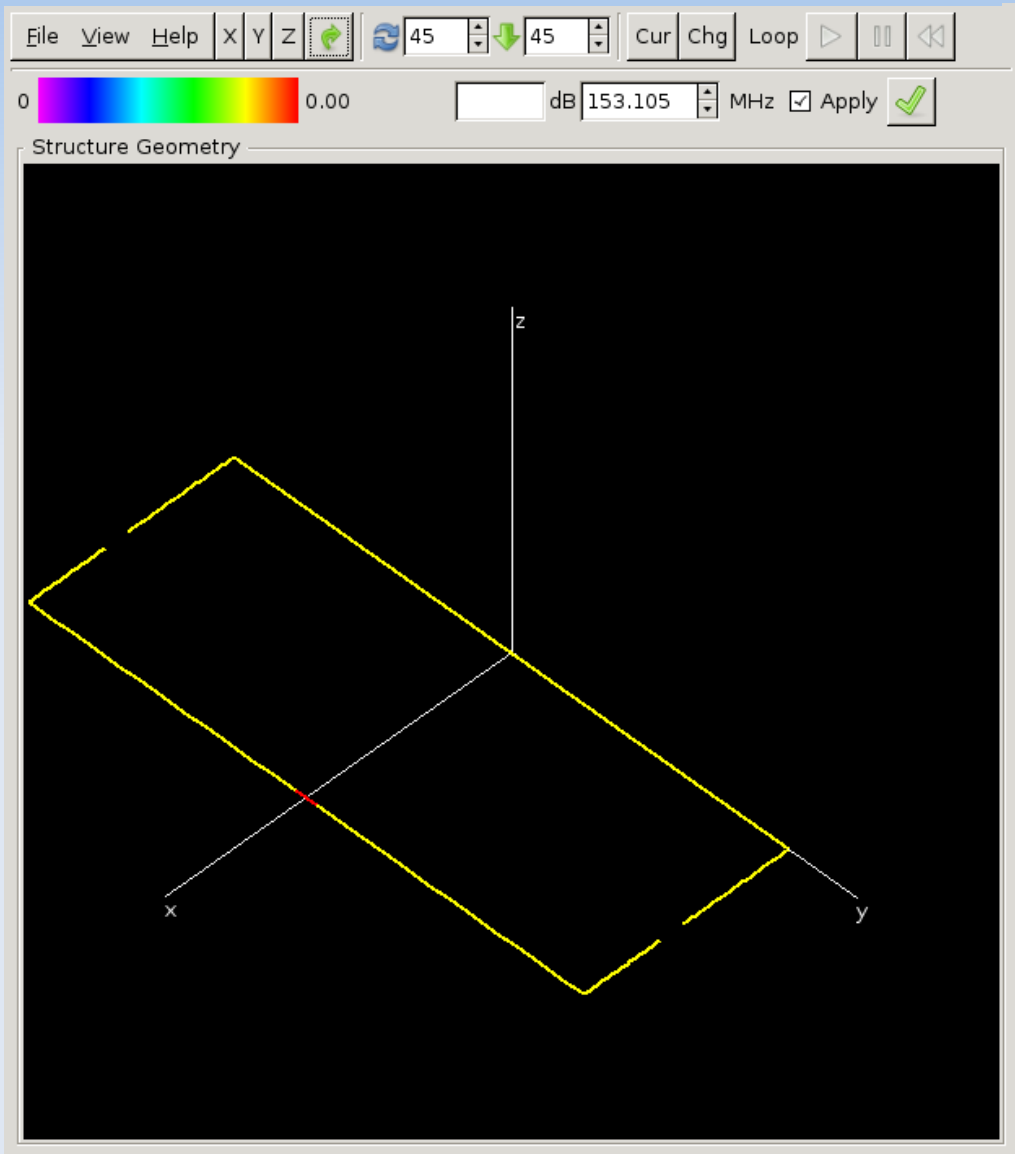
kubuntu

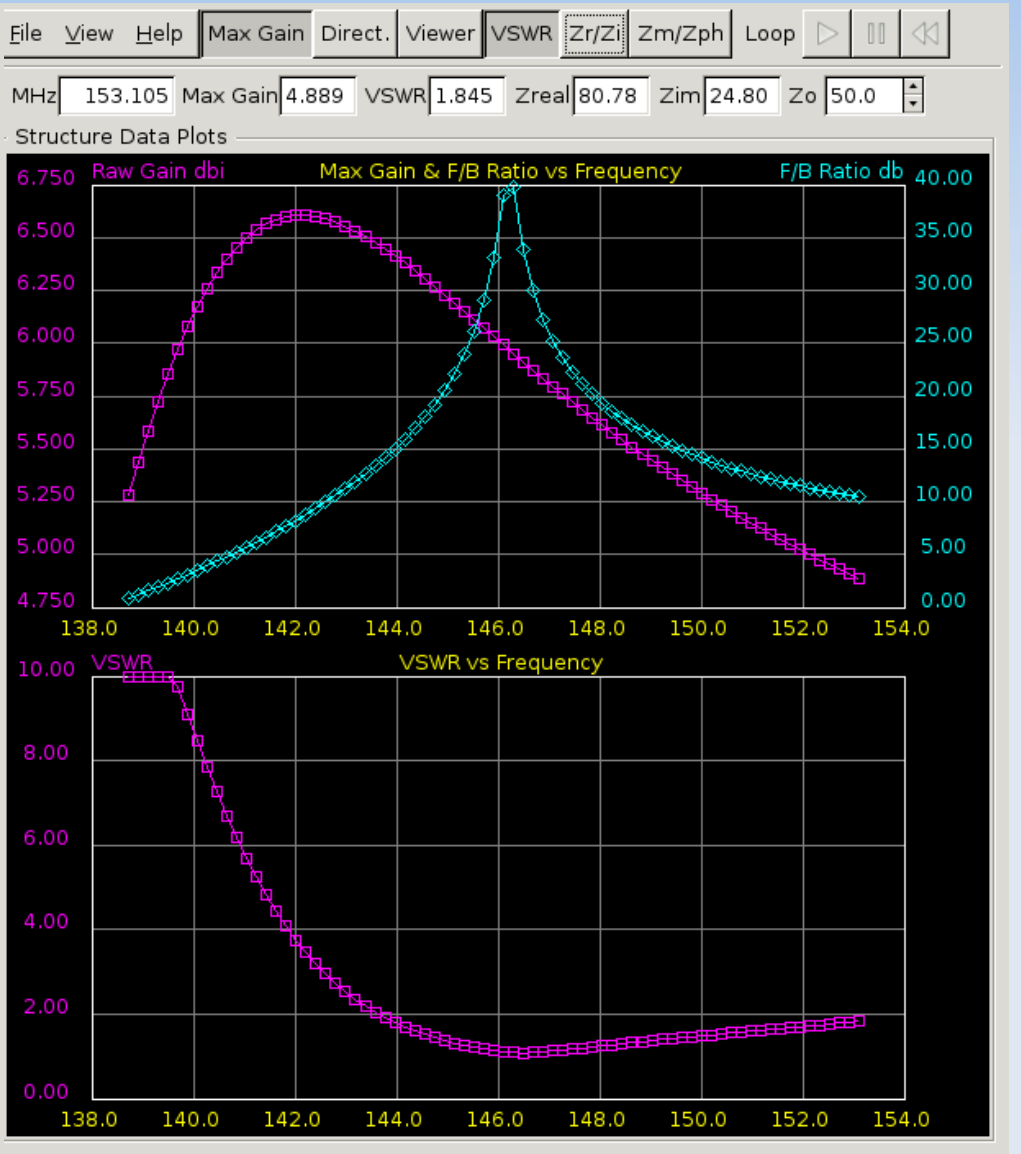
GRC Scope Plot



kubuntu

xnec2c





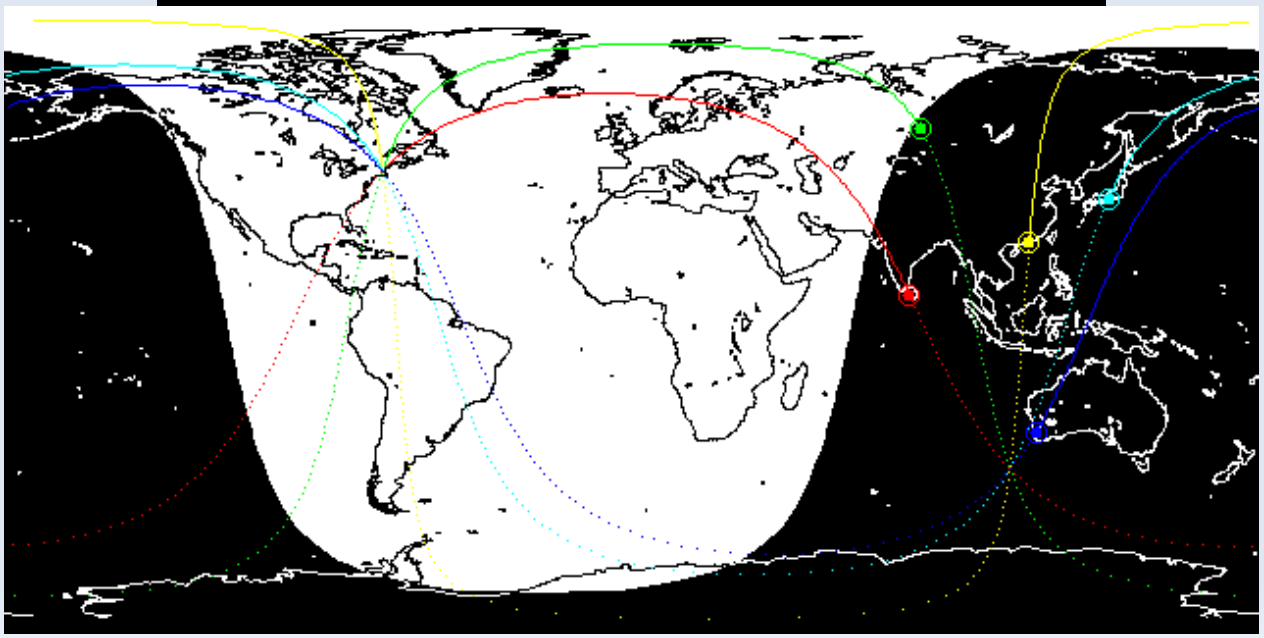
kubuntu

HF Beacons

```
13:46:21z                        FN42ho                          IBP v0.21

                 4U1UN   United Nations    New York City      298km 227/ 47deg
                 VE8AT   Canada           Eureka, Nunavut    4200km 356/176deg
                 W6WX    United States    Mt. Umunhum        4290km 279/ 99deg
                 KH6WO   Hawaii           Laie               8128km 284/104deg
28.200 MHz       ZL6B    New Zealand      Masterton         14615km 248/ 68deg
24.930 MHz       VK6RBP  Australia        Rolystone         18677km 328/148deg
21.150 MHz       JA2IGY  Japan            Mt. Asama         10981km 337/157deg
18.110 MHz       RR9O    Russia           Novosibirsk        8894km  15/195deg
14.100 MHz       VR2B    Hong Kong        Hong Kong         12780km 354/174deg
                 4S7B    Sri Lanka        Colombo           13789km  35/215deg
                 ZS6DN   South Africa     Pretoria          12676km 104/284deg
                 5Z4B    Kenya            Kilifi            11582km  78/258deg
                 4X6TU   Israel           Tel Aviv           8817km  56/236deg
                 OH2B    Finland          Espoo              6261km  36/216deg
                 CS3B    Madeira          Santo da Serra     4842km  84/264deg
                 LU4AA   Argentina        Buenos Aires       8689km 169/349deg
                 OA4B    Peru             Lima               6106km 187/  7deg
                 YV5B    Venezuela        Caracas            3606km 172/352deg

Keys:   1...5: select band   m: toggle multi-band                  q: quit
```

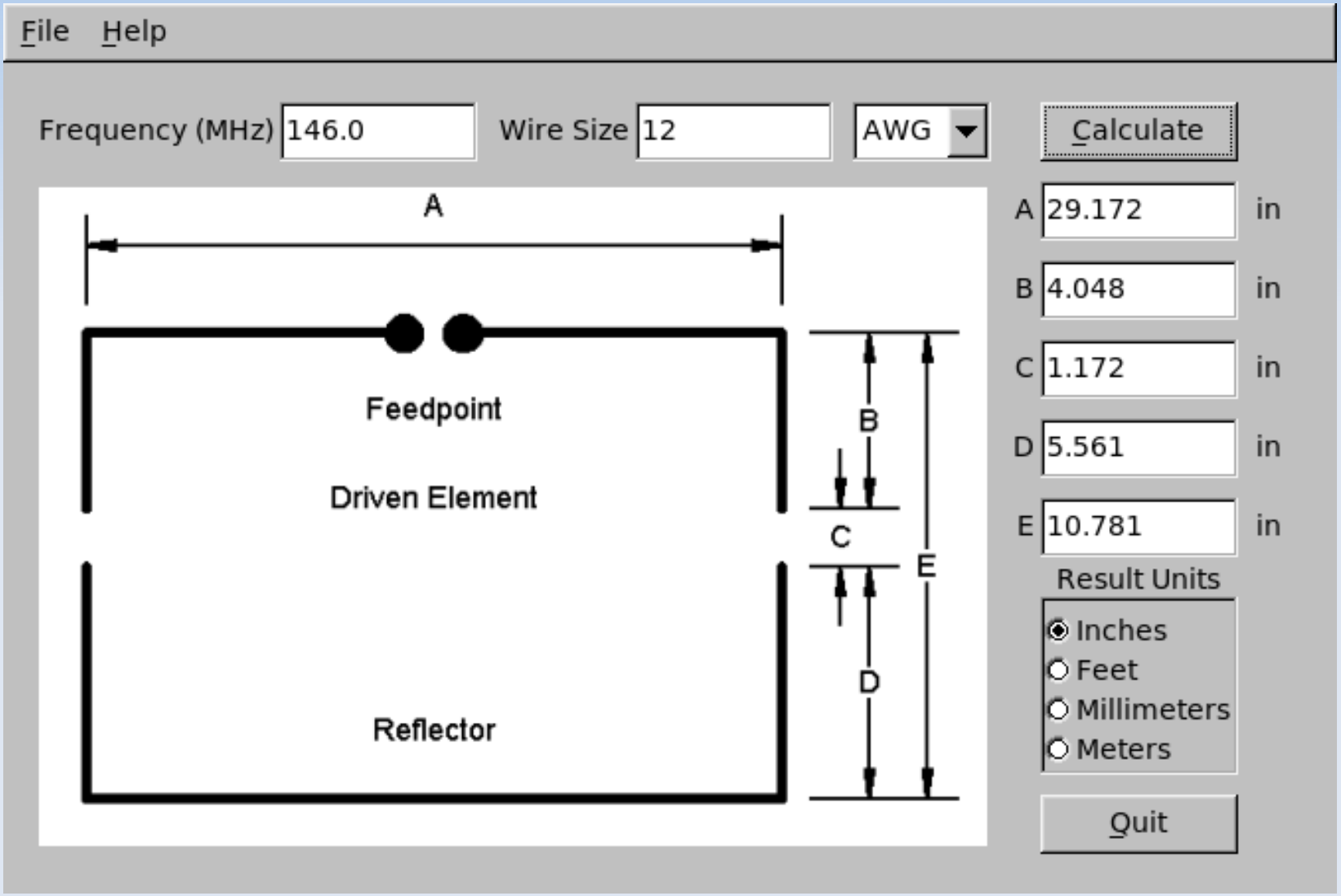


kubuntu

Software Created by KB1OIQ

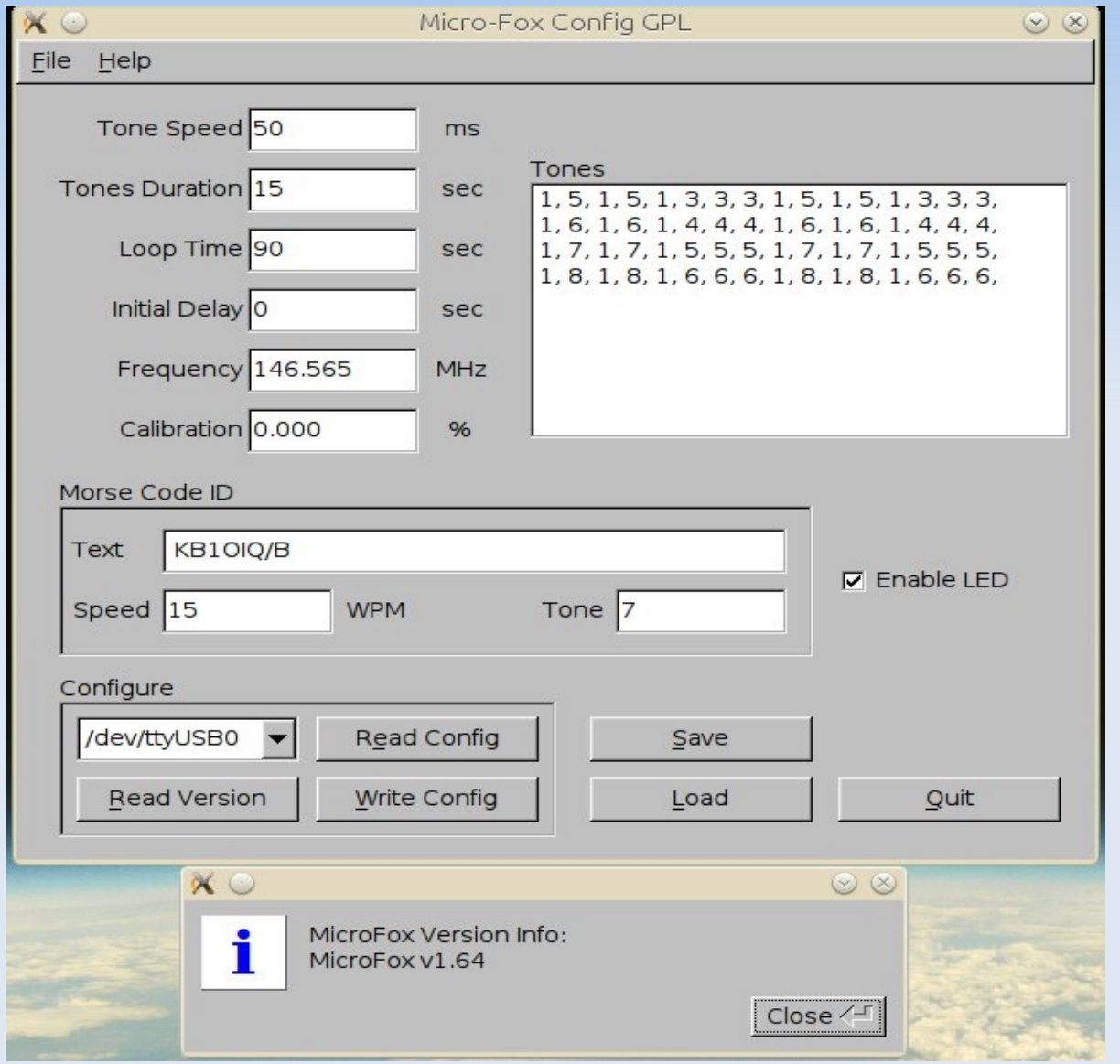
- Fl_MoxGen – Moxon Rectangle design aid
- Aa-analyzer (for RigExpert analyzers)
- Micro-Fox Config GPL (Fox hunting transmitter)
- TinyTrak3 Config GPL (APRS GPS position encoder)
- Perl scripts for Wordsworth
  - K1IG earned Cover Plaque Award, QST 5/2017
- All are freely available on SourceForge

Fl_MoxGen



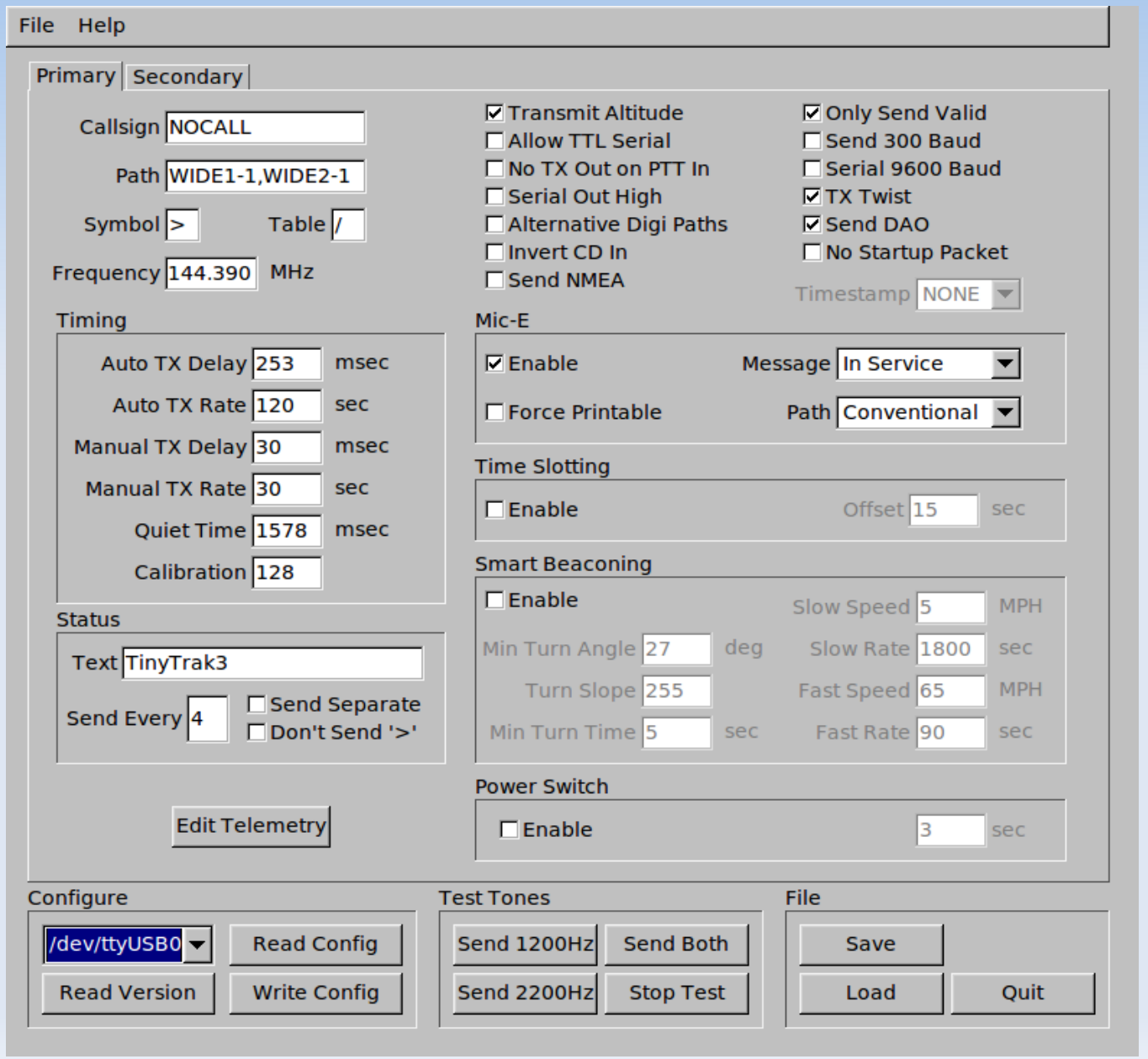
kubuntu

Micro-Fox Config GPL



kubuntu

TinyTrak 3 (tt3_gpl)



kubuntu

Companies to Thank #1

- RigExpert Ukraine Ltd.
- KB1OIQ asked for information to retrieve data from the device
- They said YES!
  - Info is posted on RigExpert website.
- Many thanks to Denis Nechitailov!!!
- aa-analyzer.pl was created
- Works on many/most/all(?) AA-xxx analyzers
  - If it works for you, send me email: kb1oiq@arrl.net
- Download from Sourceforge.net

Companies to Thank #2

- Byonics, LLC in Chandler, AZ
- MicroFox 15 and TinyTrak3
- Many thanks to Allen Lord and Byon Garrabrant!
- Download from Sourceforge.net

Release Schedule

- Most recent release V22: January 2019
- Next release (V23): Fall/Winter 2019 (predicted)
- Sticking with LTS releases of Ubuntu
- No major additions planned, just minor stuff
  - Send email if you'd like to see something added!
  - kb1oiq@arrl.net

kubuntu

Things to Add/Change

- Might also customize Xfce
- Personal PPA on my own computer
- Suggestions? Email: kb1oiq@arrl.net

kubuntu

Last Slide!

- Questions?
- Slides available:
  - Email: kb1oiq@arrl.net
- Thanks for coming to this talk!
- Have a lot of fun, and 73 de Andy KB1OIQ

kubuntu

Attributions

RigExpert® is a registered trademark of Rig Expert Ukraine Ltd in Ukraine and in the USA.

APRS™ is a trademark of Bob Bruninga

Linux® is the registered trademark of Linus Torvalds in the U.S. and other countries.

Other trademarks are the property of their respective owners.

kubuntu

References

PART of Westford, MA
http://www.wb1gof.org

Worcester Linux Users' Group
http://www.wlug.org

Chelmsford Linux Meetup Group
http://linux.meetup.com/393

kubuntu