

GNU Radio as a FOSS Project

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Objectives

- Exposing free and open source software (FOSS) projects in SDR.
- Learning both tech and FOSS world concepts.
- Understanding the scope and purpose of FOSS projects.
- Thinking about the role FOSS (more than just technology).

Outline

- Presentations**
 - Tom Rondeau: The GNU Radio Ecosystem
 - Philip Balister: Embedded systems support
 - Tim O'Shea: Leveraging GNU Radio and FOSS for Academic Research
 - Rick Mellendick: FOSS in RF Penetration Testing
 - Ben Hilburn: FOSS & Industry
- Q&A

** WANL: We Are Not Lawyers

Tom Rondeau

- Maintainer and lead developer for GNU Radio
- Consults through Rondeau Research
- Visiting Researcher at UPenn with Prof. Jonathan Smith
- www.trondeau.com
- gnuradio.org

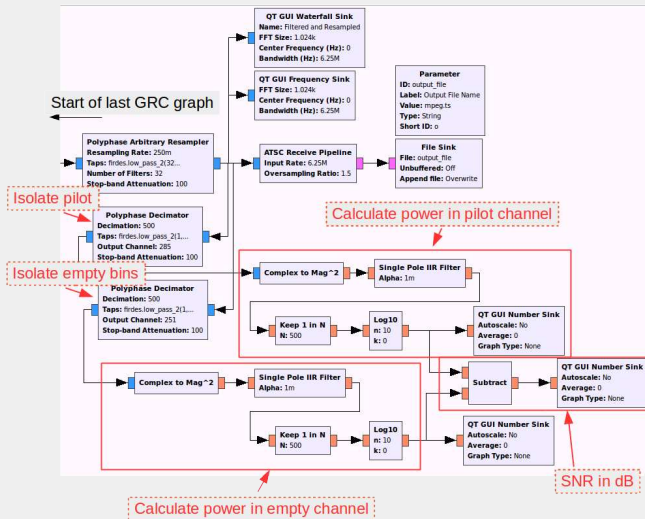


GNU Radio: Library of DSP Blocks

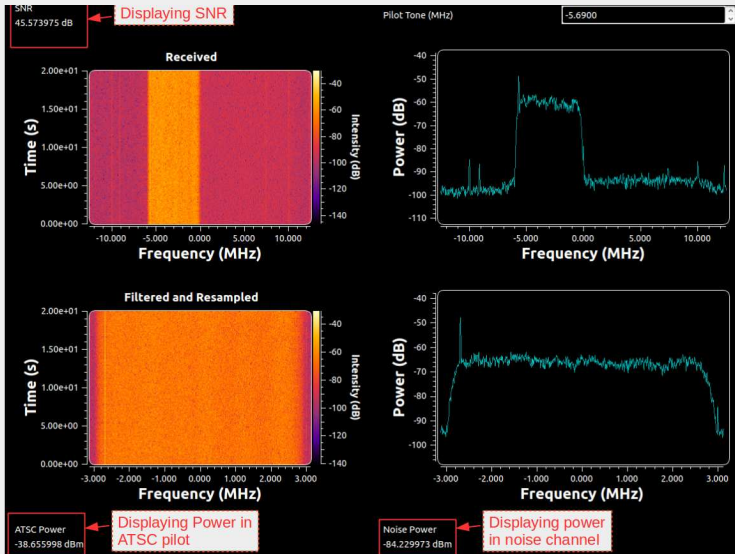
- Many blocks for fundamental signal processing algorithms.
- Tuned performance.
 - Vector-Optimized Library of Kernels (VOLK)
 - <http://libvolk.org>
- Still, not all algorithms available.
- Out-of-Tree (OOT) project model is very important.

[Audio]	[Measurement Tools]
[Boolean Operators]	[Message Tools]
[Byte Operators]	[Misc]
[Channelizers]	[Modulators]
[Channel Models]	[Networking Tools]
[Coding]	[NOAA]
[Control Port]	[OFDM]
[Debug Tools]	[Packet Operators]
[Deprecated]	[Pager]
[Digital Television]	[Peak Detectors]
[Equalizers]	[Resamplers]
[Error Coding]	[Sinks]
[FCD]	[Sources]
[File Operators]	[Stream Operators]
[Filters]	[Stream Tag Tools]
[Fourier Analysis]	[Symbol Coding]
[GUI Widgets]	[Synchronizers]
[Impairment Models]	[Trellis Coding]
[Instrumentation]	[Type Converters]
[IQ Balance]	[UHD]
[Level Controllers]	[Variables]
[Math Operators]	[Waveform Generators]

GNU Radio: Framework to Connect Blocks

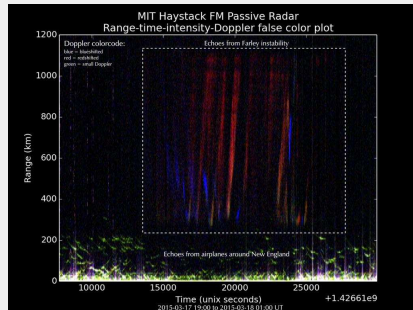


GNU Radio: Visualizing Signals



Science

- Discussion and debate.
- Easy to get things wrong.
- Prevent duplication.



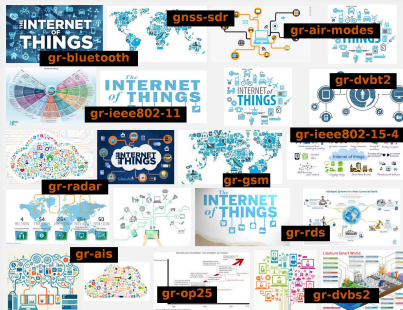
Engineering

- Implementation details.
- Discovery through experimentation (playing).
- Evolving tools and platforms



Industry

- New signals, new challenges.
- Rapid response.
- Spectrum as a Service.



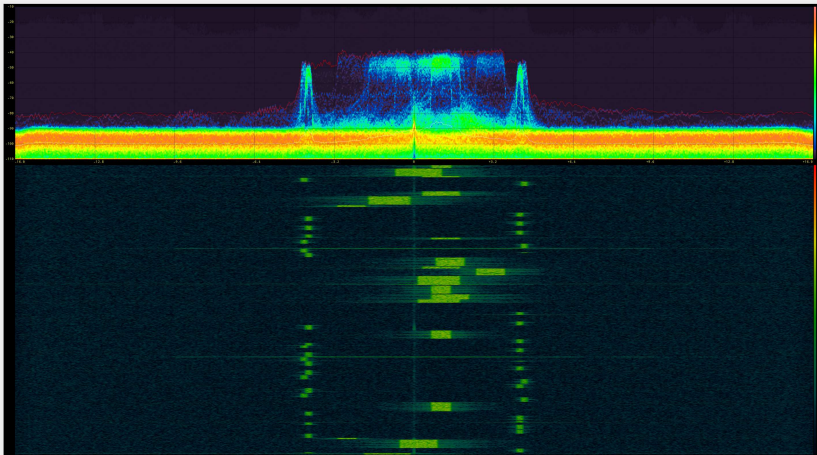
CGRAN: Collecting Second-Party Projects

- Comprehensive GNU Radio Archive Network
 - <http://cgran.org>
- Develop your own set of blocks.
- We provide a standard model for OOT projects.
- PyBOMBS to simplify installation.
 - <http://gnuradio.org/pybombs>

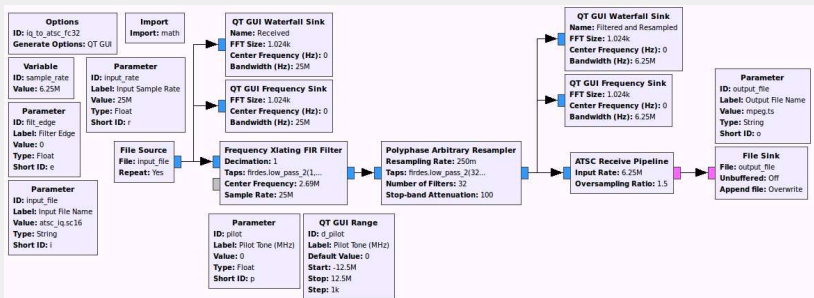
Selection from CGRAN:

Name	Description ▾
gr-eventstream	The event stream scheduler
gr-pcap	PCAP recording and playback
gr-lte	LTE downlink receiver blocks
gr-ieee802-11	IEEE 802.11 a/g/p Transceiver
An IEEE 802.15.4 (ZigBee) Transceiver	gr-ieee802-15-4
gr-radar	GNU Radio Radar Toolbox
GR fosphor	GNU Radio block for RTSA-like spectrum visualization using OpenGL and OpenGL acceleration
gr-rds	FM RDS/TMC Transceiver
gr-drm	DRM/DRM+ transmitter
gr-theano	blocks leveraging the theano library to run code in graphics cards
gr-ieee802-15-4	An IEEE 802.15.4 (ZigBee) Transceiver
GR Benchmark	a performance measurement tool for GNU Radio
gr-dvbt2	A DVB-T2 transmitter.
gr-dvbs2	A DVB-S2 and DVB-S2X transmitter.

gr-fosphor

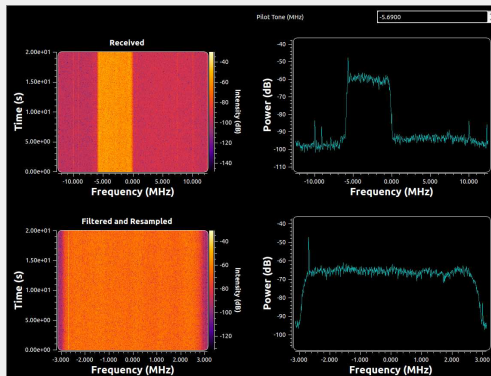


ATSC (in gr-dtv)



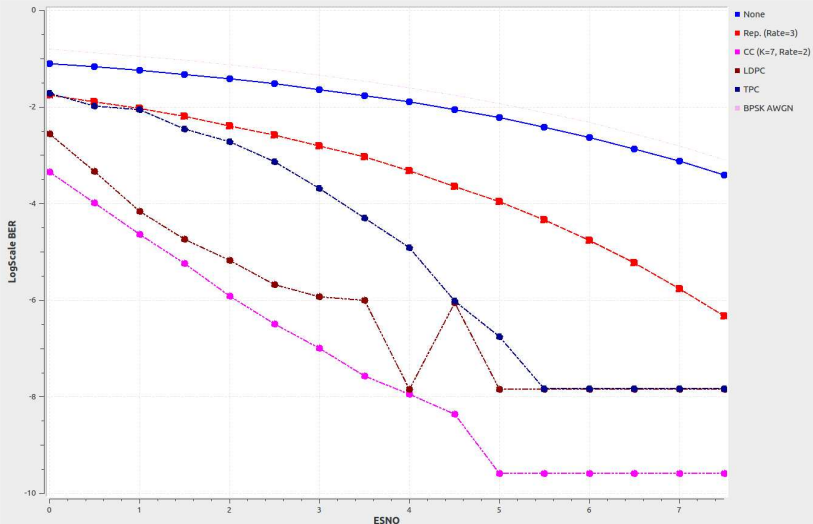
- Frequency shifts, filters, and resamples to isolate the ATSC channel.
- Outputs an MPEG transport stream after ATSC decoding.
- Part of DTV developed by others for us.

Running ATSC Receiver

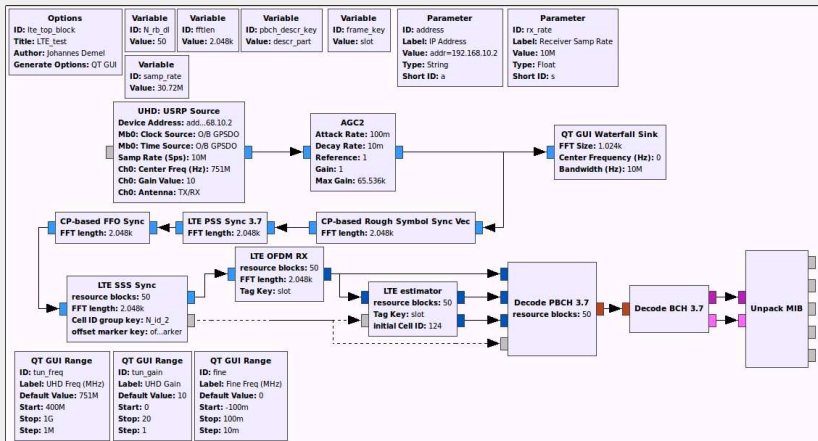


- Top plots are the input showing the pilot at -5.69 MHz.
- Bottom is centered, filtered, and resampled.

FEC API: General support for FEC



gr-lte: Simple info from downlink



GNU Radio Community

- gnuradio.org
- Manual and documentation:
 - gnuradio.org/docs/doxygen
- Mailing list:
 - gnuradio.org/redmine/projects/gnuradio/wiki/MailingLists
- My blog/announcements:
 - www.trondeau.com
- GRCon Conferences:
 - www.trondeau.com/grcon15
- IRC: #gnuradio on chat.freenode.net
- Three to Four hackfests a year.

GRCOn15



➤ GNU Radio Intro Day

➤ Hacker Space Filled with the Latest Hardware

➤ Tutorials for New and Experienced Users

➤ Presentations on Advanced Research

➤ Poster and Demo Lounge

➤ Working Groups

August 24-28

Washington, DC



WWW.TRONDEAU.COM/GRCON15

Issues working with FOSS

- Understand licenses and what they mean.
 - They probably don't mean what you've been told they mean.
- Understand copyright issues.
 - And how this differs from licenses.
- Versions
 - Source revision control!
 - Released versions.
 - Accessibility of source and versions.
- Community is key
 - If you build it... they won't necessarily come.
 - This takes work and time.
 - Give and take – the more of one, the more of both.

We also have a bit of fun

