SDR/DSP devroom

Software Defined Radio as **discrete time signal processing of radiofrequency signals**

Only allowed to transmit in Industrial, Scientific and Medical (ISM[1]) bands

- 13.56 ± 0.007 MHz
- 27.12 ± 0.163 MHz
- 40.7 ± 0.02 MHz
- 433.92 ± 0.87 MHz (Europe)
- (868 MHz: LoRa)
- 2450 ± 50 MHz
- 5800 ± 75 MHz
- 24000 ± 125 MHz ...

FOSDEM: not a "scientific" conference. All speakers have provided a github repository for reproducing their results.

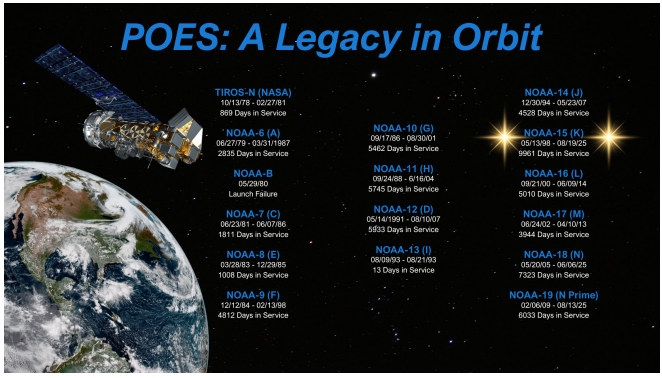
D. Wang, *Breakneck, China's quest to engineer the future*, page 70

... these [American] agencies misunderstood the point of Shenzhen. They were still more interested in individual inventors rather than understanding it as a **community of engineering practice**. The obsession with invention has clouded Silicon Valley's ability to appreciate China's actual strength. Rather than seeing tools and blueprints as the ultimate ends of technological progress, I believe we should view them as milestones in the **training of better scientists and manufacturers. Viewing technology as people and process knowledge** isn't only more accurate; it also empowers our sense of agency to control the technologies we are producing.

[1] Limitation of radiated power from industrial, scientific and medical (ISM) equipment at `https://www.itu.int/dms_pubrec/itu-r/rec/sm/r-rec-sm.1056-1-200704-i!!pdf-e.pdf`

Highlights of 2025

- Open datasets from space: LuGRE[a] GNSS receiver on the Moon (Blue Ghost mission – landed March 2)
- NISAR spaceborne SAR satellite: L (1257.5 ± 40 MHz) and S-band (3200 ± 37.5 MHz [2][3]) (and Umbra/Capella/ICEYE – X-band)
- End of NOAA POES [4](NOAA-15 on August 19, 2025, and NOAA-19 on August 13, 2025 following the emergency passivation of NOAA-18 on June 6, 2025), ends the continuous data collection since 1978[5]... but new Russian Meteor-M2 launches[b]



[a] https://zenodo.org/records/16411687

[b] T. Lavarenne, *Satellites météo: APT s'éteint, que devient le LRPT ?*, submitted Hackable [in French]

[2] https://www.eoportal.org/satellite-missions/nisar

[3] https://syntheticaperturerадar.com/nro-extends-sar-contracts-to-capella-iceye-and-umbra-advancing-commercial-radar-strategy/

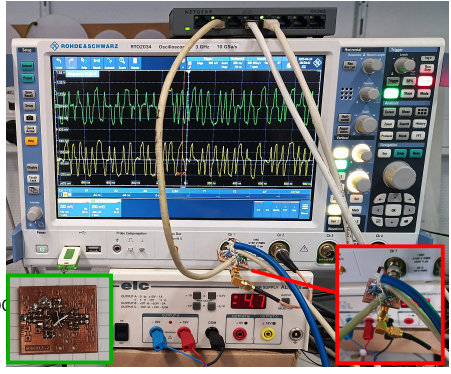
[4] J.-M Friedt, *Satellite image eavesdropping: a multidisciplinary science education project*, European Journal of Physics **26** 969–984 (2005)

[5] www.nesdis.noaa.gov/news/legacy-orbit-noaa-decommissions-the-poes-satellite-constellation

A (second) year of stable GNU Radio

- Stable GNU Radio version (3.10.x), no API change and no need to update OOTs since Debian/Bookworm (June 2023) and now Debian/Trixie (August 2025), even MS-Windows (`https://github.com/radioconda/radioconda-installer`)
- OOT `https://github.com/jmfriedt/gr-oscilloscope` led to `https://github.com/tlavarenne/gr-ethernet/`[6]

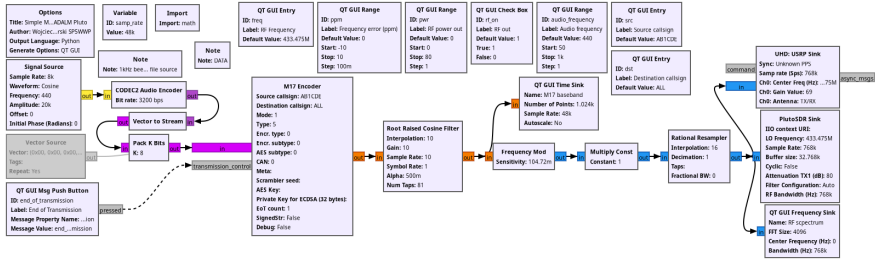
```
Preamble: 55555555555555d5 DEST MAC: 00e03305f474 SOURCE MAC: 20c6eb67cd3e
ETHERTYPE: 0800
DATA: 45000054cdae40004001e8d4c0a8010cc0a801c908000e90004601aa46ae0b680000
0000d3960300000000001011121314151617181911a1b1c1d1e1f2021222324252627282 92a
2b2c2d2e2f30313233343536370b1ed159

Preamble: 55555555555555d5 DEST MAC: 20c6eb67cd3e SOURCE MAC: 00e03305f474
ETHERTYPE: 0800
DATA: 450000d46b78000080014b0bc0a801c9c0a8010c00001690004601aa46ae03680000
0000d3960300000000001011121314155617181911a1b1c1d1e1f2021222324252627282 92a
2b2c2d2e2f30313233343536372b2b65b39

Preamble: 55555555555555d5 DEST MAC: 011b19000000 SOURCE MAC: e06ca6000e58
ETHERTYPE: 88f7
DATA: 0002002c000002000000000000000000000000e06ca6fffe000e540005538200000000

Preamble: 55555555555555d5 DEST MAC: 011b19000000 SOURCE MAC: e06ca6000e58
ETHERTYPE: 88f7
DATA: 0802002c000000000000000000000000000000e06ca6fffe000e5400055382020000063ef9fb6125eda100000b8558daa
```



[6] T. Lavarenne, *Ethernet à la loupe : de la couche physique au décodage des trames*, Hackable **61** (Jul. 2025) [in French]

A (second) year of stable GNU Radio

- Embedded: Buildroot[7] and OpenEmbedded[8] compile 3.10.12
- `gr-m17` by the team of the M17 Foundation: functional TX and RX



- Huge work to improve documentation: `https://wiki.gnuradio.org/index.php/Tutorials`:
  - `https://wiki.gnuradio.org/index.php?title=Special:ActiveUsers` for the main contributors, under supervision of Barry Duggan
  - `http://wiki.gnuradio.org/index.php?title=Special:MediaStatistics` for a statistics on updates (130 text files, $>$ 1400 images)
  - visit `https://chat.gnuradio.org/#/room/#docs:gnuradio.org`

[7] `https://github.com/buildroot/buildroot/blob/master/package/gnuradio/gnuradio.hash`
[8] `https://github.com/balister/sdr-build`

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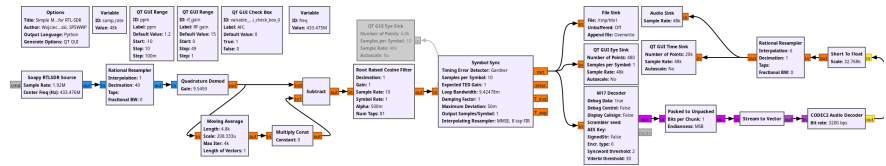

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- Meetings: SDRA (June 28, 2025), EuGRD workshop (July 16–18, 2025 by C. Morin[7]), WHY2025 (Aug. 8–12, 2025), M17 (Sep. 6–7, 2025), GRCon (Sep. 8–12, 2025 $\rightarrow$ **Sep. 21–24, 2026)**

[7] `https://gnuradio.blogspot.com/2025/06/european-gnu-radio-days-2025-updates.html`

Program (9h20–17h):

Open Source Digital Voice for Space and Terrestrial Communications	Abraxas3d (Open Research Institute)
Very low frequency (VLF) time and frequency transfer signal analysis using KiwiSDR recordings	JM Friedt
wSDR – web based SDR processing	Sergey
FIR filter design with Parks-McClellan Remez	D. Estévez
ZigRadio: a lightweight, ergonomic flow graph signal processing framework for SDR	V. Sergeev
Digital RF distribution at CERN	T. Gingold
White Rabbit for the masses: distributed coherent SDR on generic FPGA boards	É. Decoux, JM Friedt
Machine Learning on Air: Overview and Tutorial on Open-Source Machine Learning Frameworks for DSP and Radio	A. Rode
Autonomous SDR platform based on Zynq/AD9361 (extension of PlutoSDR architecture)	F5OEO
VRT IQ tools at the Dwingeloo Radio Telescope	T. Telkamp
MAX2771 broadband SDR: impact of low bit resolution and application to passive radar measurements	JM Friedt