

# Carriers Everywhere

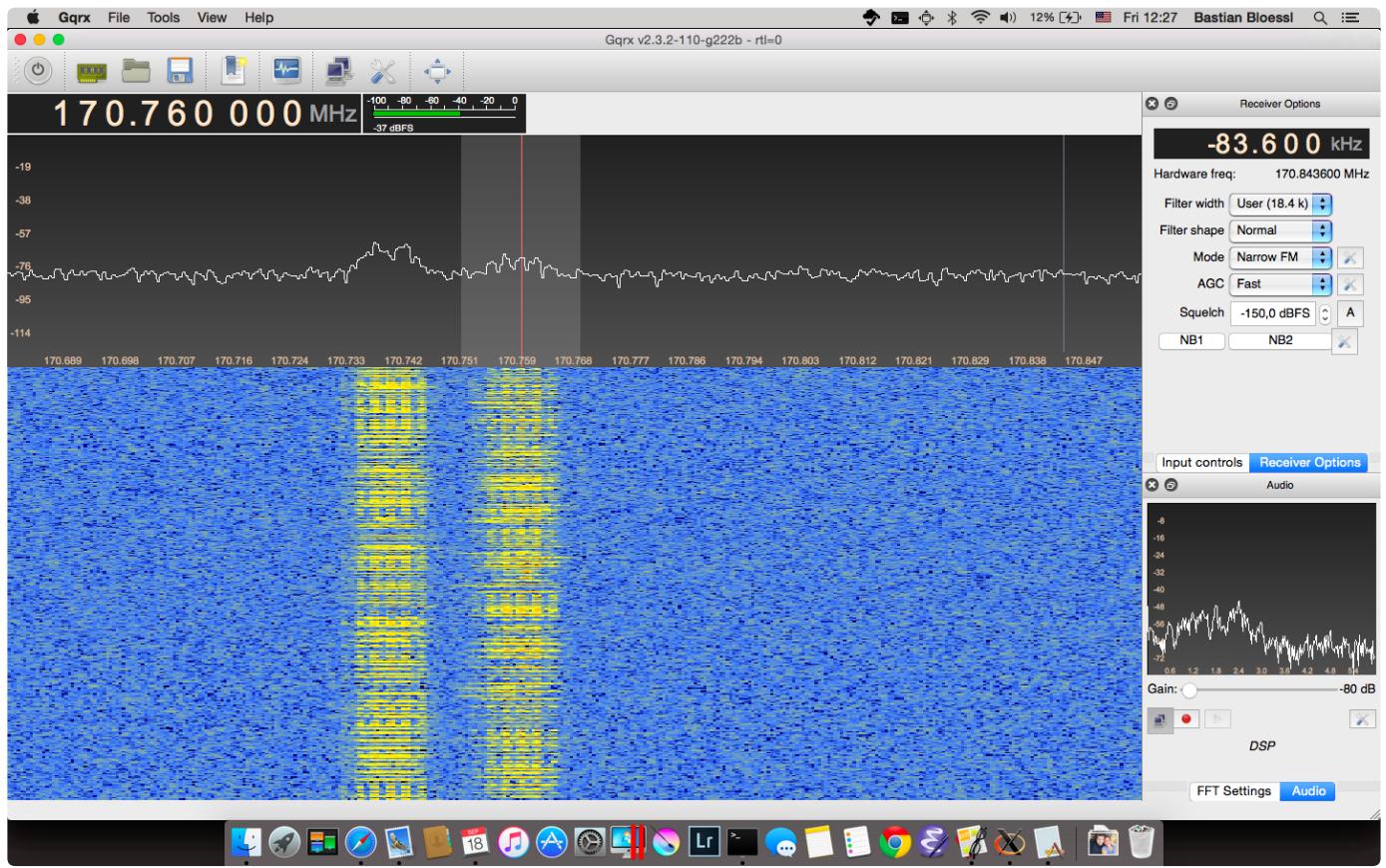
## Reversing Mobile Traffic Lights (/traffic-lights/)

 Fri September 18, 2015  Reverse Engineering (/tags/Reverse-Engineering/) / SDR (/tags/SDR/) / Traffic Lights (/tags/Traffic-Lights/)

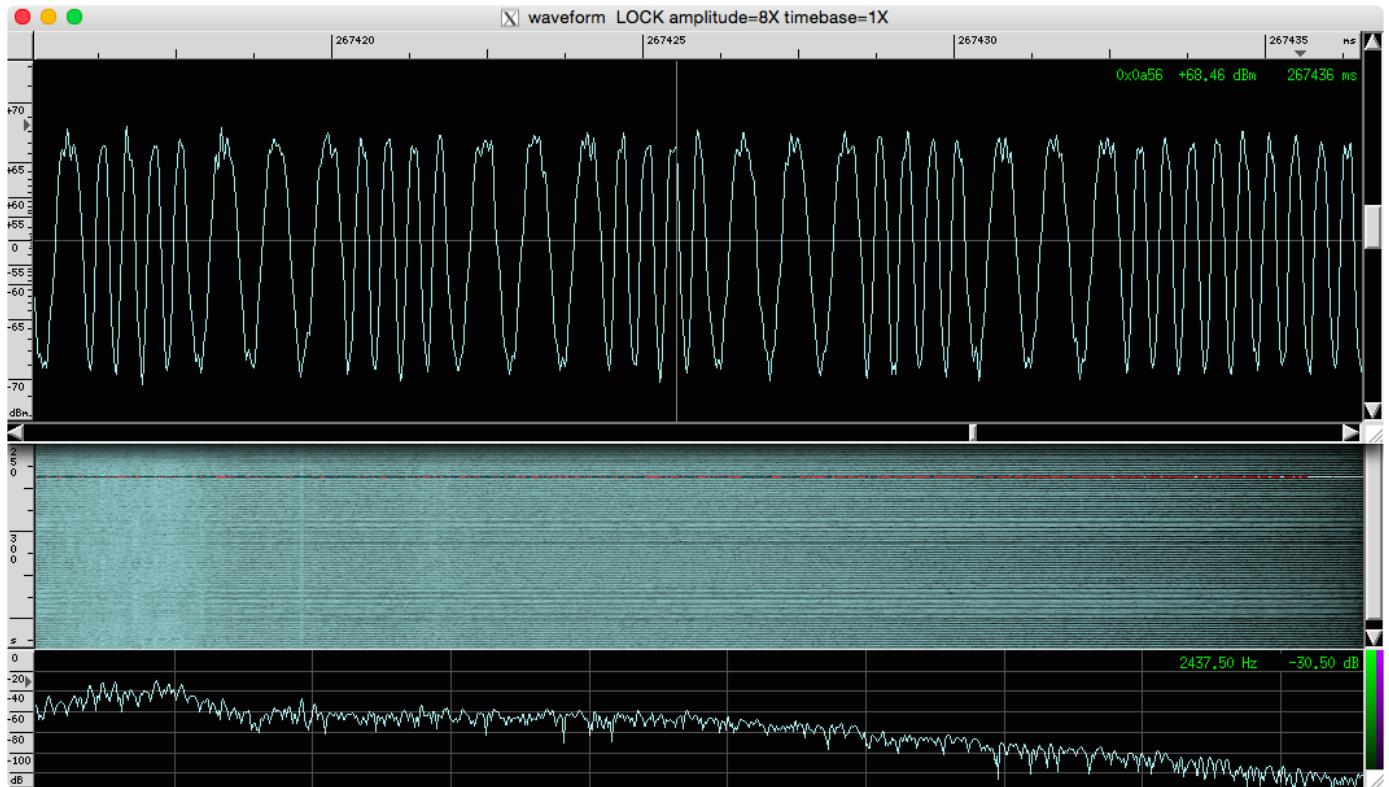
Yesterday, they started digging up the street in front of my girlfriends house to put some fibre cables for faster internet (yay!). At the construction site, they placed two pairs of mobile traffic lights, which I could receive perfectly fine without leaving home (yaaay!).



Of course, I wanted to have a look at the signal. I once heard that they transmit in the 2 meters band and that turned out to be true. With GQRX I found them at around 170MHz. The screenshot shows the two channels corresponding to the two pairs of traffic lights that operate independently.

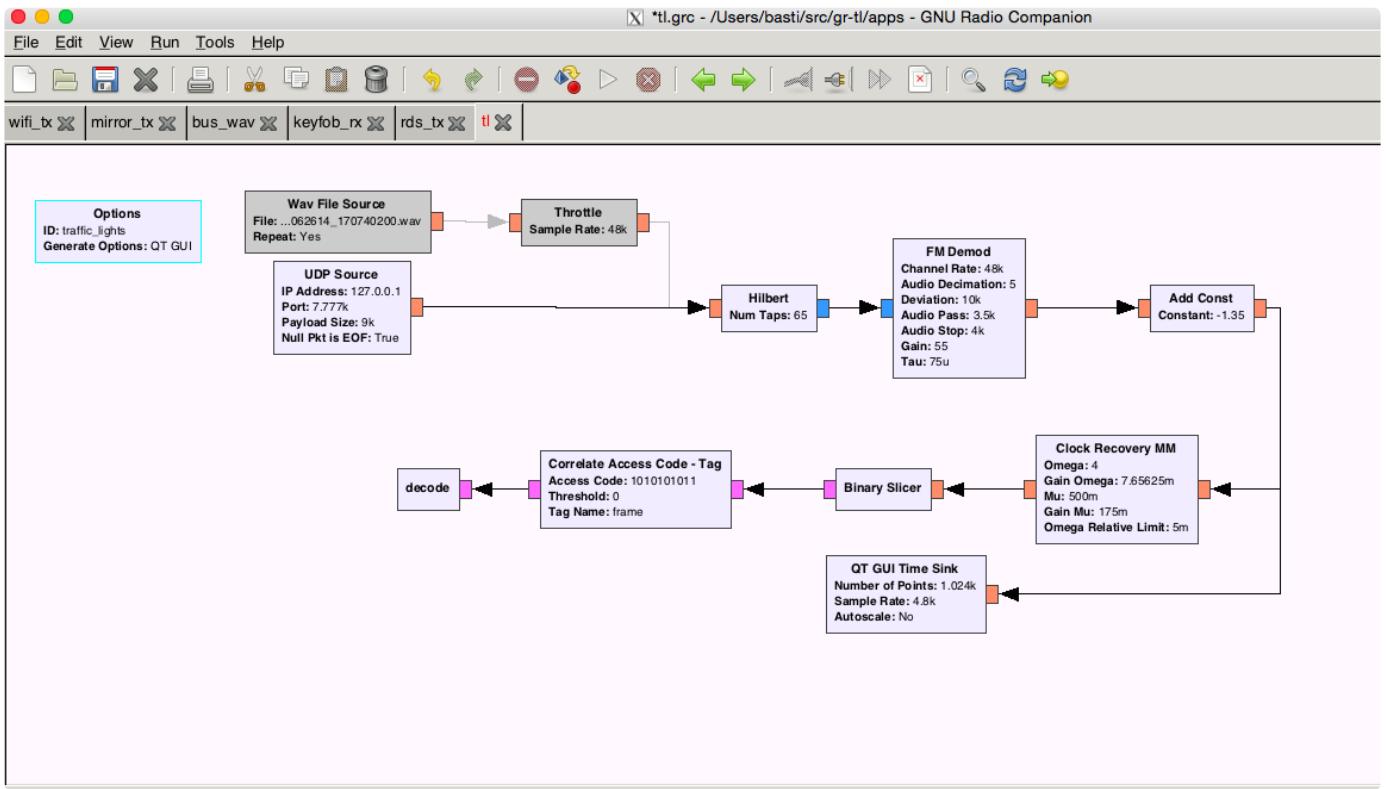


As usual on that band, FM modulation with a bandwidth of around 18kHz was used. Using Baudline and Audacity, I studied the demodulated signal.



It was very easy to see that this is AFSK1200 alternating between 1200Hz and 2400Hz.

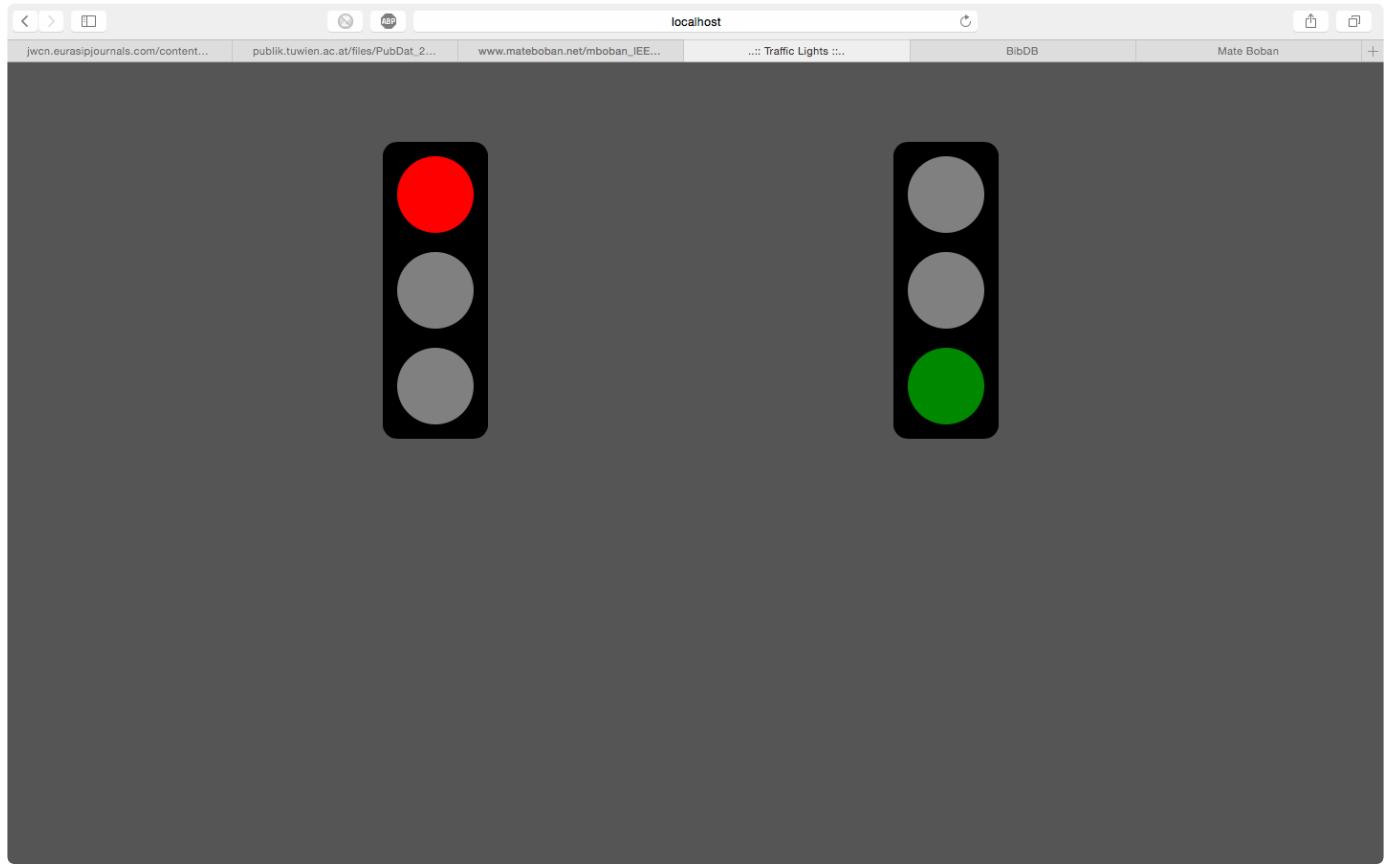
Knowing the parameters I created a very simple and suboptimal GNU Radio receiver that I used to output some bits.



The frame structure was rather obvious.

```
vim test.txt - ~/src/gr-tl - basti@tronr
1 1442557141.660 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
2 1442557141.981 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
3 1442557142.322 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
4 1442557142.640 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
5 1442557143.035 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
6 1442557143.361 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
7 1442557143.685 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
8 1442557144.020 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
9 1442557144.342 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
10 1442557144.729 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
11 1442557144.880 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
12 1442557145.198 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
13 1442557145.585 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
14 1442557145.912 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
15 1442557146.243 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
16 1442557146.574 1010000100011111111111000011111 01 1111000111 1111000101 011100000011110000001111000000111
```

...and with a little patience I could make some sense of the bits. I created an ugly web interface to visualize the data.



Putting everything together we get something like this.

Traffic Lights + GNU Radio + RTL SDR



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## GitHub Repos

[gr-ieee802-11](https://github.com/bastibl/gr-ieee802-11) (<https://github.com/bastibl/gr-ieee802-11>)

IEEE 802.11 a/g/p Transceiver

[gr-ieee802-15-4](https://github.com/bastibl/gr-ieee802-15-4) (<https://github.com/bastibl/gr-ieee802-15-4>)

IEEE 802.15.4 ZigBee Transceiver

[gr-rds](https://github.com/bastibl/gr-rds) (<https://github.com/bastibl/gr-rds>)

FM RDS/TMC Transceiver

[gr-rstt](https://github.com/bastibl/gr-rstt) (<https://github.com/bastibl/gr-rstt>)

Vaisala Radiosonde Telemetry Receiver

## Recents

[Reversing Mobile Traffic Lights](/traffic-lights) (/traffic-lights/)

[Reversing Bus Telemetry](/reversing-bus-telemetry) (/reversing-bus-telemetry/)

[RDS Code in GQRX](/rds-in-qqr) (/rds-in-qqr/)

[BATS Project Review](/bats-review) (/bats-review/)

[DAAD Scholarship Accepted](/daad-accepted) (/daad-accepted/)