FM RDS / TMC

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About Me

- PhD Student @ University of Paderborn
- Distributed Embedded Systems Group
- Work on several OOT Modules
  - WiFi, ZigBee, RDS, WeatherSonde

DF1BBL  NEW
Radio Data System
Radio Data System

L + R 0kHz
Pilot 19kHz
L - R 38kHz
RDS 57kHz
Radio Data System

- Released 1984
  - Last update 2014
- Digital subchannel on FM broadcasts
  - Station name
  - Alternate frequencies
  - Time
  - Traffic program / traffic announcement
Encoding

- Manchester encoded
- 1187.5 bit/s

Group 104 bits

Block 16 bits
Block 10 bits
Block
Block
Block

CRC
CRC
CRC
Why RDS?

- Simple protocol
- Cheap hardware
  - RTL-SDR + 2EUR antenna
- Ubiquitous
- Extension of FM receiver
GR-RDS

- Open Source
- Easy to install
- Tested with RTL-SDR, USRPs, HackRF
- Receive and transmit side

http://www.github.com/bastibl/gr-rds/
RF Gain: 44  Volume: 0
Freq: 97M

FM Demod

Power (dB)
-120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20

Frequency (kHz)
0 20 40 60 80 100 120

Trace Options
- Peak Hold
- Average
- Avg Alpha: 0.8000

- Persistence
- Persist Alpha: 0.1861

- Trace A
- Store
- Trace B
- Store

Axis Options
- dB/Div:
- Ref Level:
- Autoscale

Frequency 97.00  Station Name WDR 3  Program Type Other Music
TA  Music  Stereo  stPTY

Clock Time 25.01.2015, 16:04 (+1.0h)  Alt. Frequencies 92.70MHz, 97.00MHz
Radio Text WDR 3 Musikkulturen Mit Thomas Daun Mazurka-Fieber beim TFF J...
TMC

- Traffic Message Channel
  - RDS group type for traffic information

source: http://commons.wikimedia.org/wiki/File%3AMobiles_Navigationsgeraet_Navigon_im_Einsatz.JPG
TMC Encoding

- National location table
  - #266 Berlin, #11023 Paderborn Center
  - 61456 locations for Germany

- Alert-C for event types
  - #1340 swarm of insects
  - #2022 public transport strike
  - #1456 bull fight
Brilon
Paderborn-Zentrum

Terroranschlag

Paderborn-Schloß Neuhaus
Bielefeld

Abbrechen
Canard? Hacked?

Navigation system reports terrorist attack in Bavaria
Disclaimer

- Please be careful with
  - What you send
  - On which frequency you send it
  - How much power you use

- You never know
  - Who receives it
  - If it triggers automated actions
Conclusion

- Try it
- Improve it
- Build some stuff with it