

# **IEE1711 Applied signal processing**

## **Practice 1**

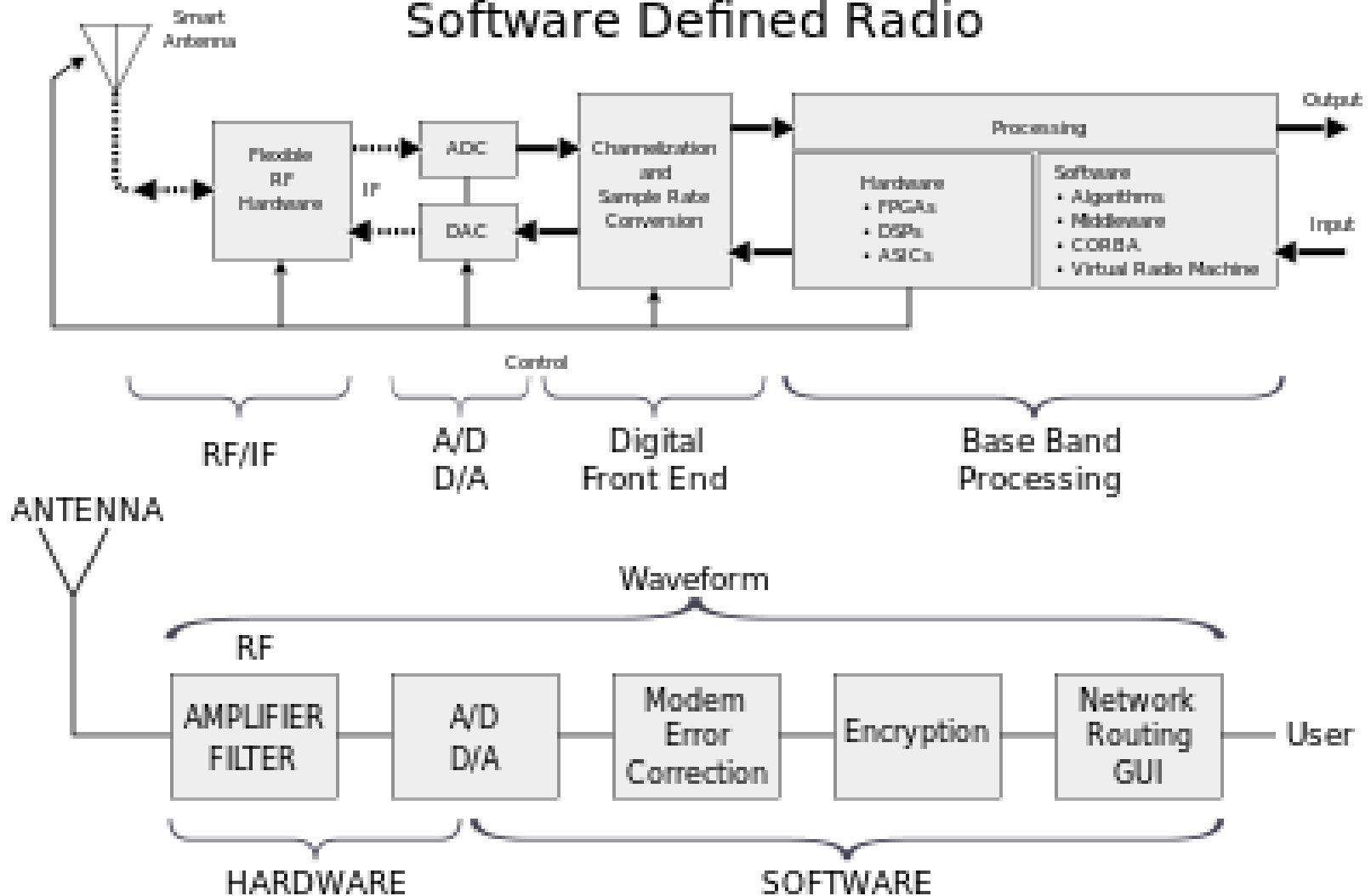
Julia Berdnikova

julia.berdnikova [ät] ttu.ee

# SDR

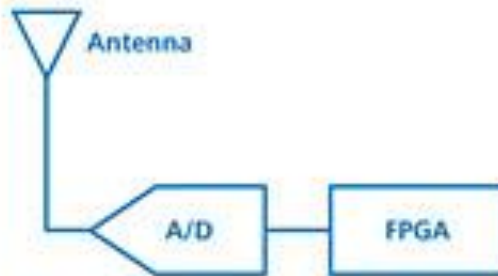
**Software-defined radio (SDR)** is a [radio communication](#) system where components that have been traditionally implemented in hardware (e.g. [mixers](#), [filters](#), [amplifiers](#), [modulators/demodulators](#), [detectors](#), etc.) are instead implemented by means of software on a personal computer or [embedded system](#).

# Software Defined Radio

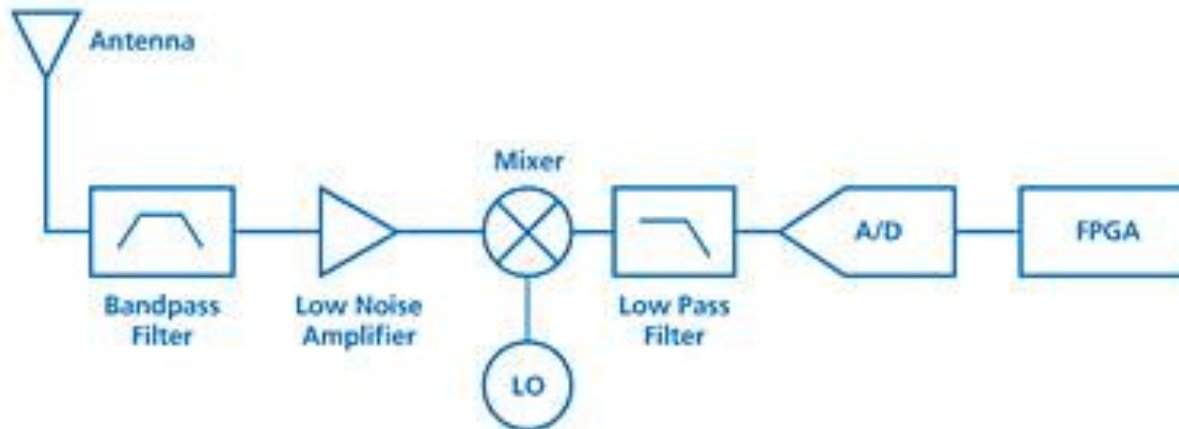


# SDR

**FIGURE 1** THE SOFTWARE-DEFINED RADIO RECEIVER IN ITS IDEAL AND PRACTICAL FORMS



(a) Ideal SDR



(b) Practical SDR

# SDR specification

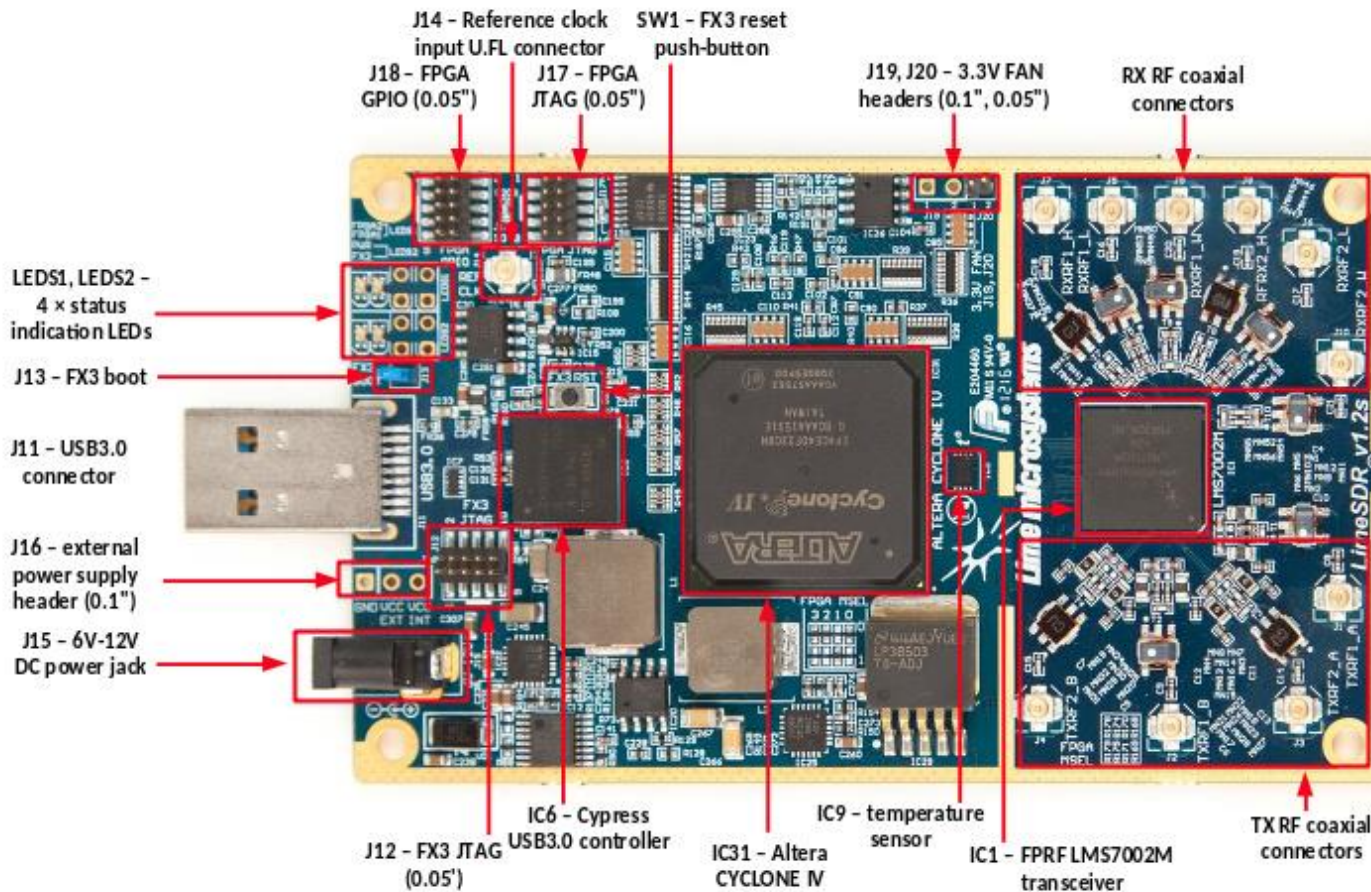
- Frequency range
- Bandwidth (clock rate) (Instantaneous Bandwidth)
- ADC resolution (bits)
- Receiver/Trasmitter (**RX/TX**) (MIMO)
- RF Filters
- Interface (USB, Ethernet etc)
- Software
- Amplifier

<https://www.rtl-sdr.com/roundup-software-defined-radios/>

[https://en.wikipedia.org/wiki/Frequency allocation](https://en.wikipedia.org/wiki/Frequency_allocation)

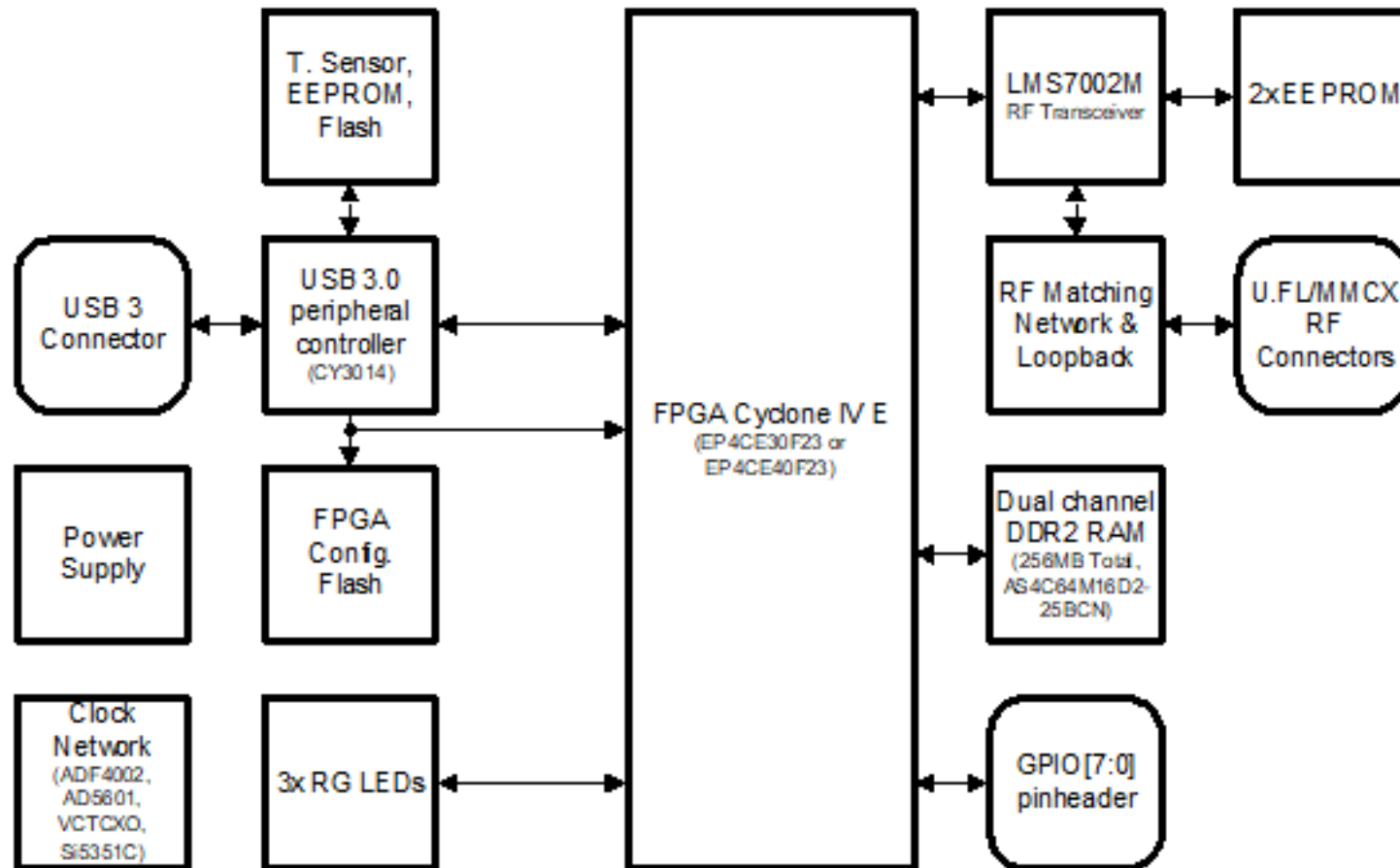
[https://en.wikipedia.org/wiki/File:United States Frequency Allocations Chart 2016 - The Radio Spectrum.pdf](https://en.wikipedia.org/wiki/File:United_States_Frequency_Allocations_Chart_2016_-_The_Radio_Spectrum.pdf)

# Lime SDR



<https://wiki.myriadrf.org/images/3/3b/LimeSDR-USB-Overview.jpg>

# LimeSDR-USB board architecture





# Task 1

- Read the specification of LimeSDR USB
- Locate the Tx and Rx
- Find the frequency range,
- Bandwidth steps
- Gain steps
- Maximum input power (dBm, mW)

# Task2

- Connect LimeSDR and test it with HDSDR software
- Find FM radio stations
- Change the bandwidth and gain
- Find the known signal frequency bands (wifi, dvb-t, etc)

# Task 3

1. Open SDR Console application and find LimeSDR device
2. Find FM radio stations
3. Find the main components of SDR FM radio receiver (for building the receiver in GNU Radio or Matlab)

# Report should include

- Title page
- Lime SDR main parameters (Task 1)
- Picture of the measured FM radio spectrum in HDSDR software (used gains and RX channel)
- FM radio spectrum in SDR Console software (gains and Rx channel)
- FM receiver main blocks and explanations
- Conclusion