SDR in ORBIT: LTE-U
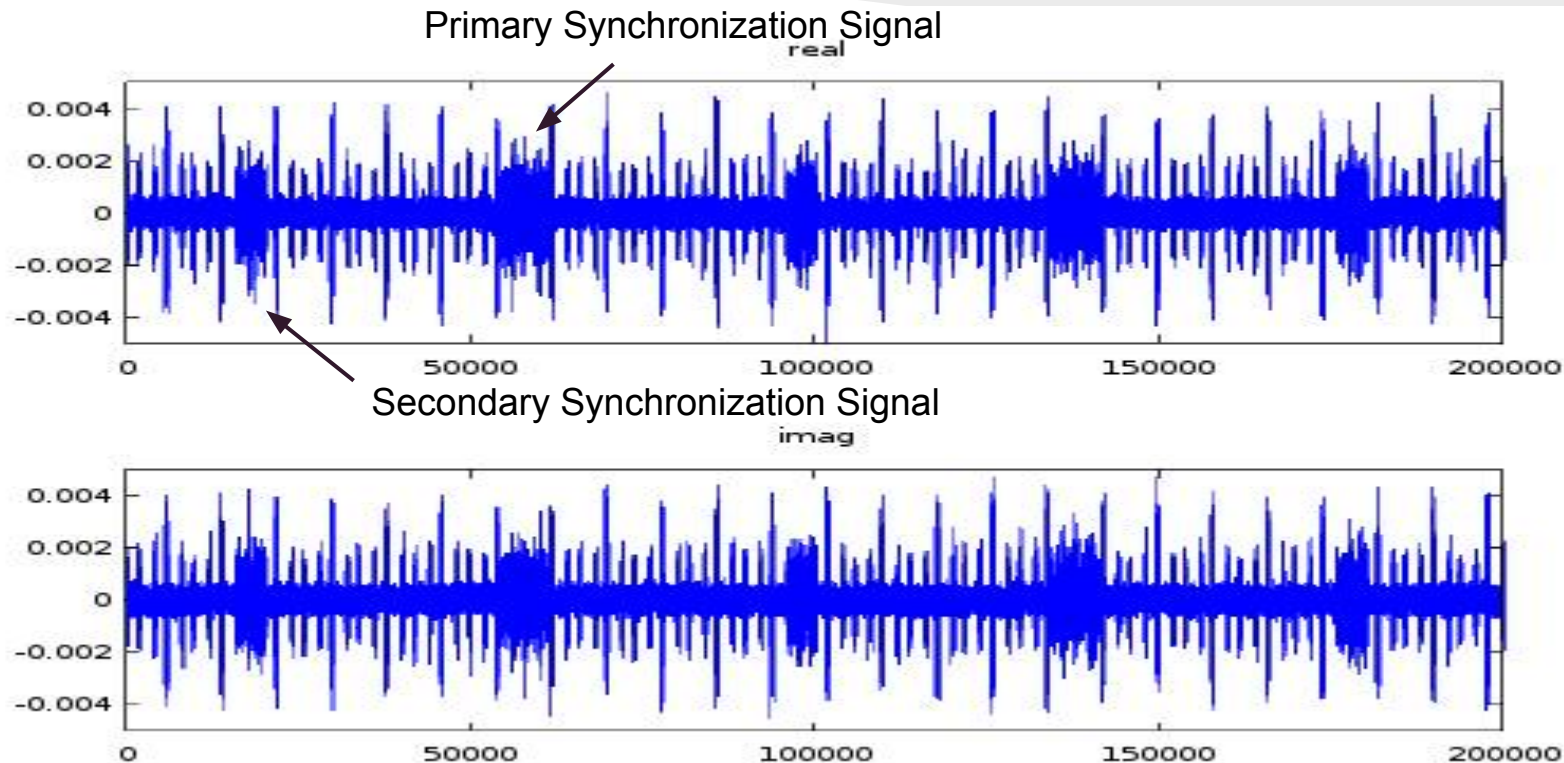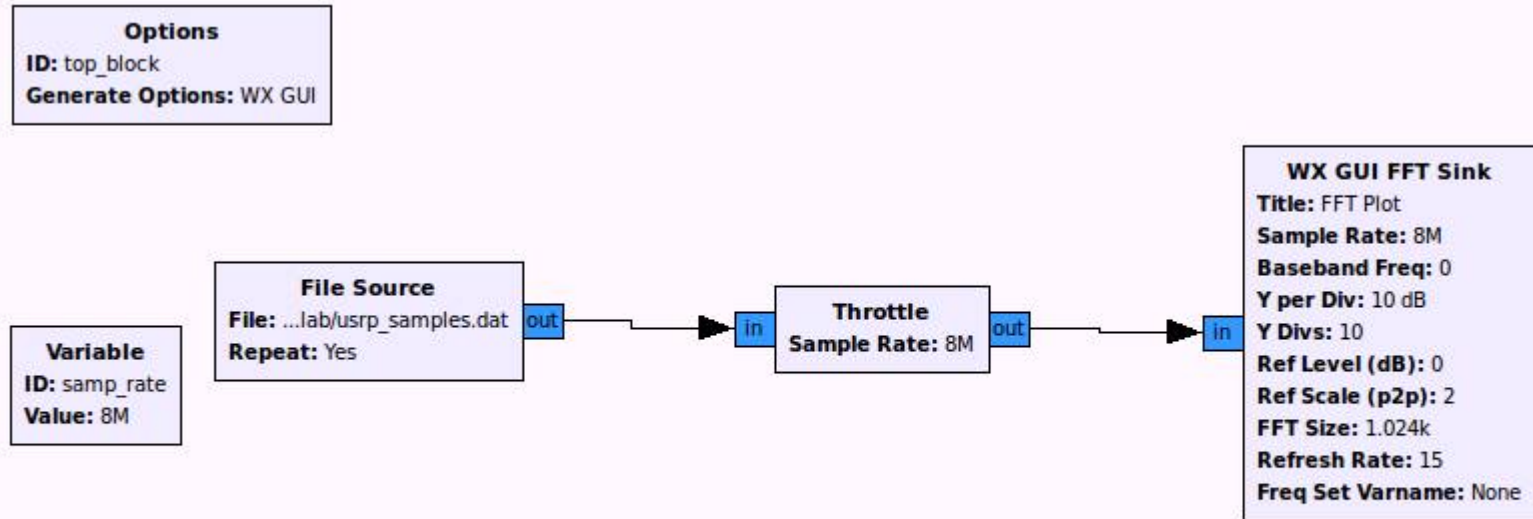
Demetrios Lambropoulos, Cat Le, Steven Cheng
July 23, 2015
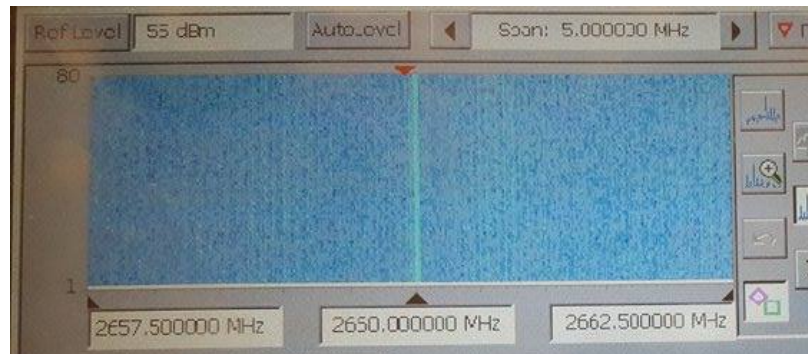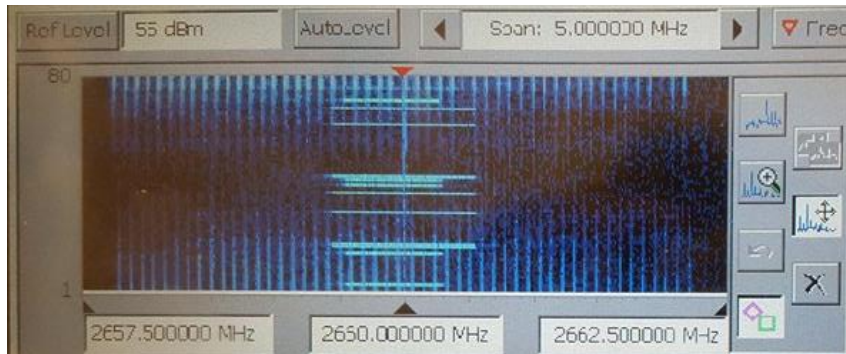
Breakdown of I\Q plot

Primary Synchronization Signal

real

Secondary Synchronization Signal

imag

Block Diagram

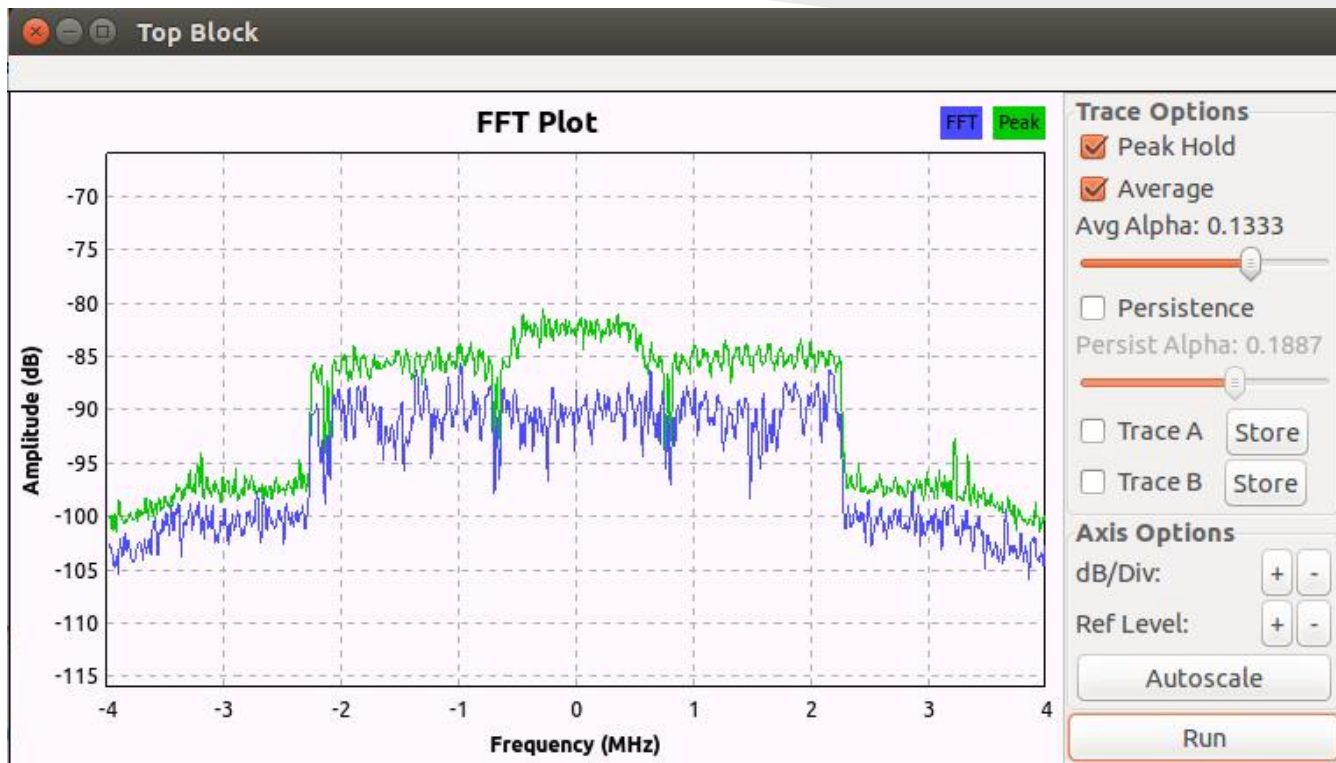# Waterfall Plot
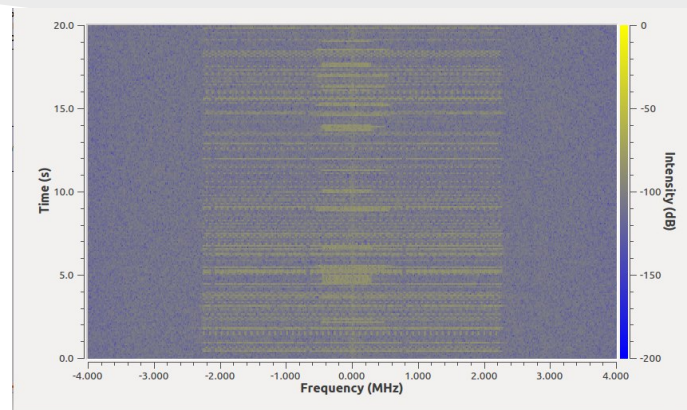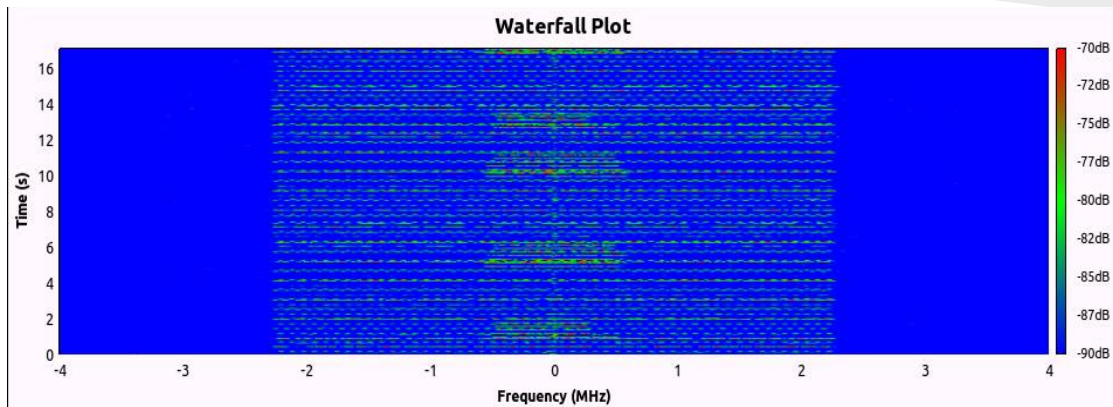
FFT

SNR

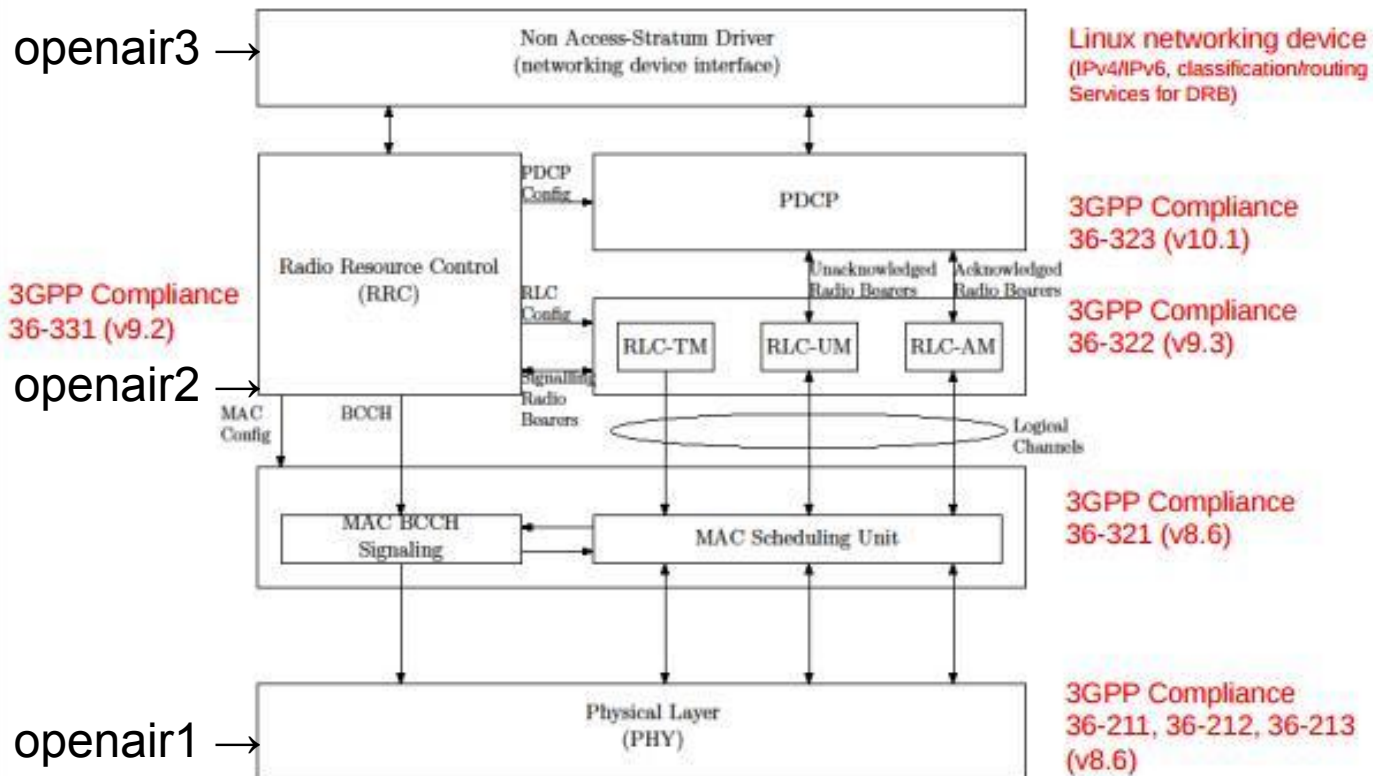- Estimate the noise power by measuring the received signal variance

- variance = mean(signal – mean(signal));
- noise power = power(variance,2);
- noise[dB] = 10 log(noise power);
- SNR[dB] = signal[dB] – noise[dB];

OpenAirInterface

OpenAirInterface is divided into 6 repositories:

- ○ OpenAir1
- ○ OpenAir2
- ○ OpenAir3
- ○ OpenAir0
- ○ OpenAir-CN
- ○ Targets

OpenAirLTE PHY/MAC Protocol Stack

openair3 → Non Access-Stratum Driver (networking device interface)

Linux networking device (IPv4/IPv6, classification/routing Services for DRB)

PDCP Config — PDCP

3GPP Compliance 36-323 (v10.1)

Radio Resource Control (RRC)

3GPP Compliance 36-331 (v9.2)

RLC Config

Unacknowledged Radio Bearers — Acknowledged Radio Bearers

RLC-TM   RLC-UM   RLC-AM

3GPP Compliance 36-322 (v9.3)

openair2 →

MAC Config   BCCH

Signalling Radio Bearers

Logical Channels

MAC BCCH Signaling — MAC Scheduling Unit

3GPP Compliance 36-321 (v8.6)

openair1 → Physical Layer (PHY)

3GPP Compliance 36-211, 36-212, 36-213 (v8.6)

EURECOM

Data Link Layer

- There are 2 sublayers: LLC and MAC

- Data Link Layer Functions
  - **LLC** *establish/control logical links between local devices on a network*
  - **MAC** *control access to the network medium to avoid conflicts*
  - **Data Framing** *responsible for final encapsulation of messages into frames*
  - **Addressing** *label information with a particular destination location*
  - **Error Detection and Handling**

OpenAir2

- Contains MAC/RLC/PDCP and two RRC implementations

- Also contains eNB application (interfaces for user and control planes), X2 Application Protocol (X2AP), and OAI network driver

- OpenAir2 functions is texted by OpenAir1 TestBenches

Next Week

- Continue on OpenAir3 (Network - Layer 3)

- Continue to work on Waterfall plot, and spectrum analyzer

- Continue to work on SNR and SIR