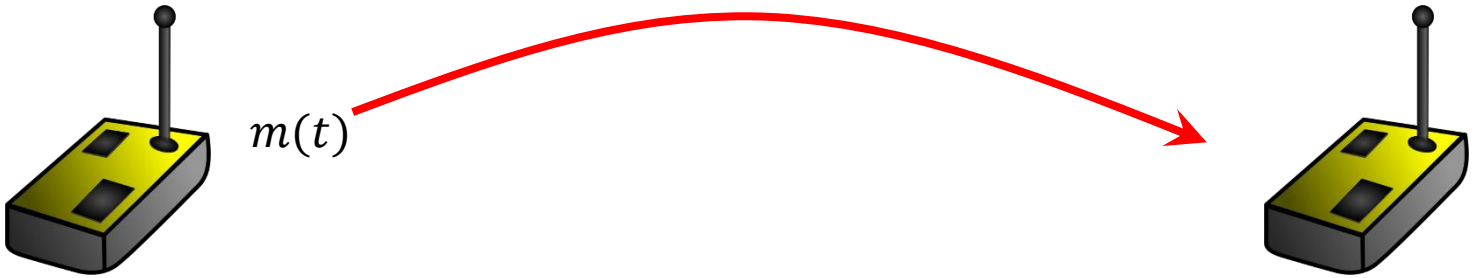
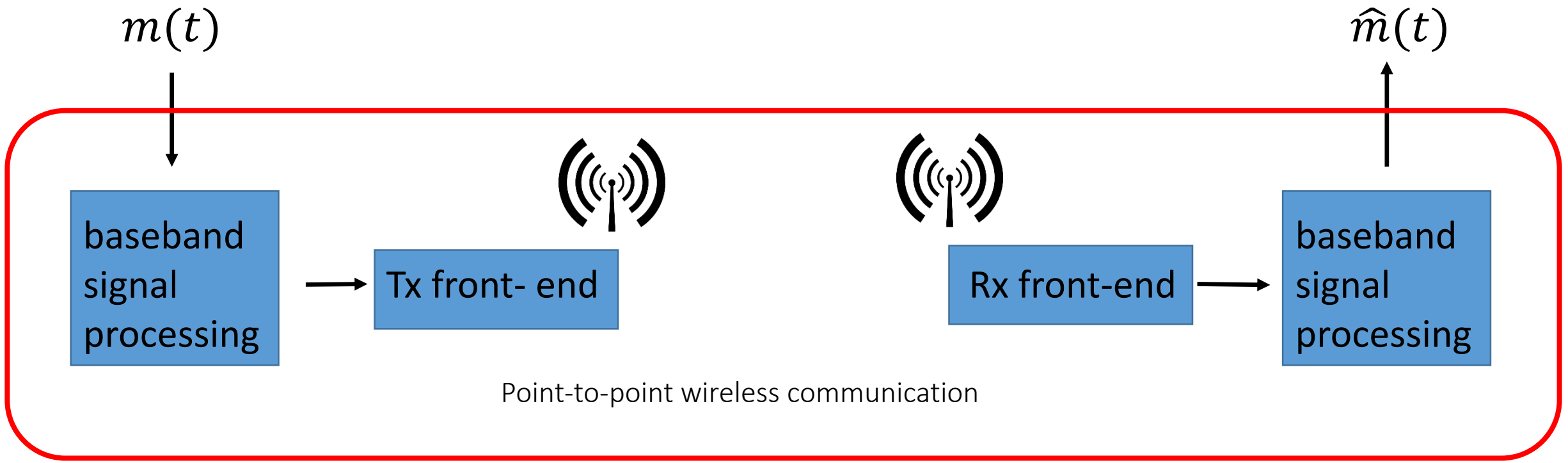
EE340: Communications Lab

Spring 2021

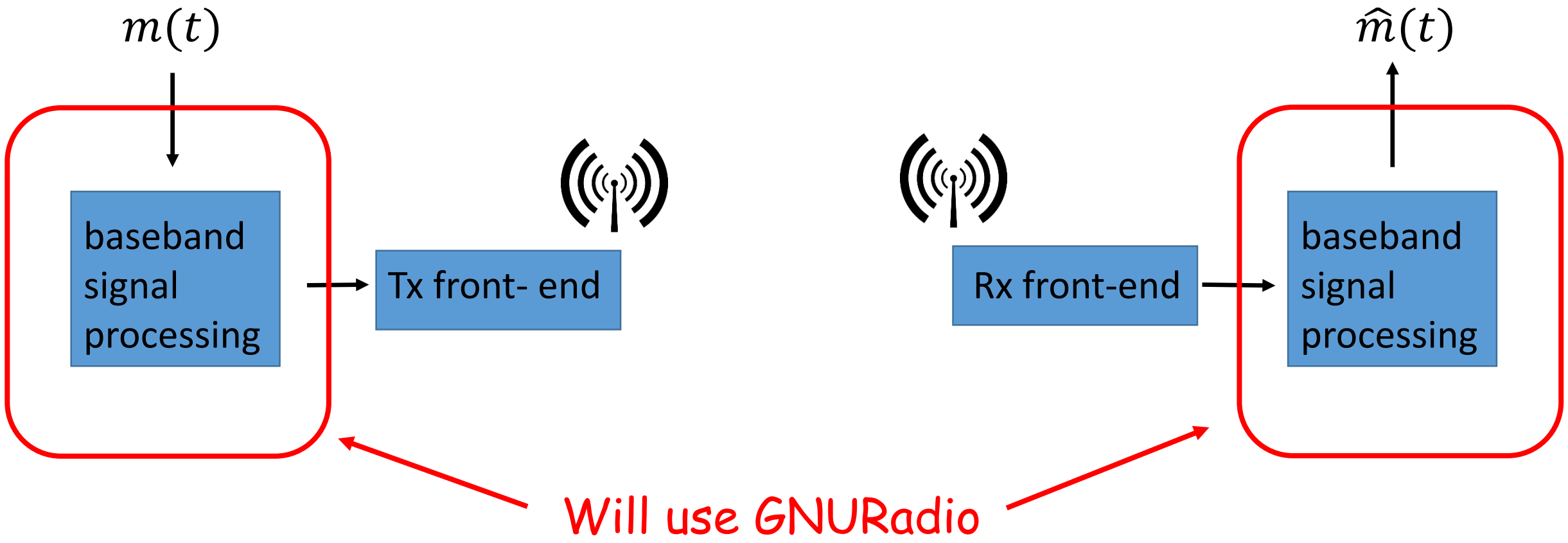
Instructor: Jayakrishnan Nair



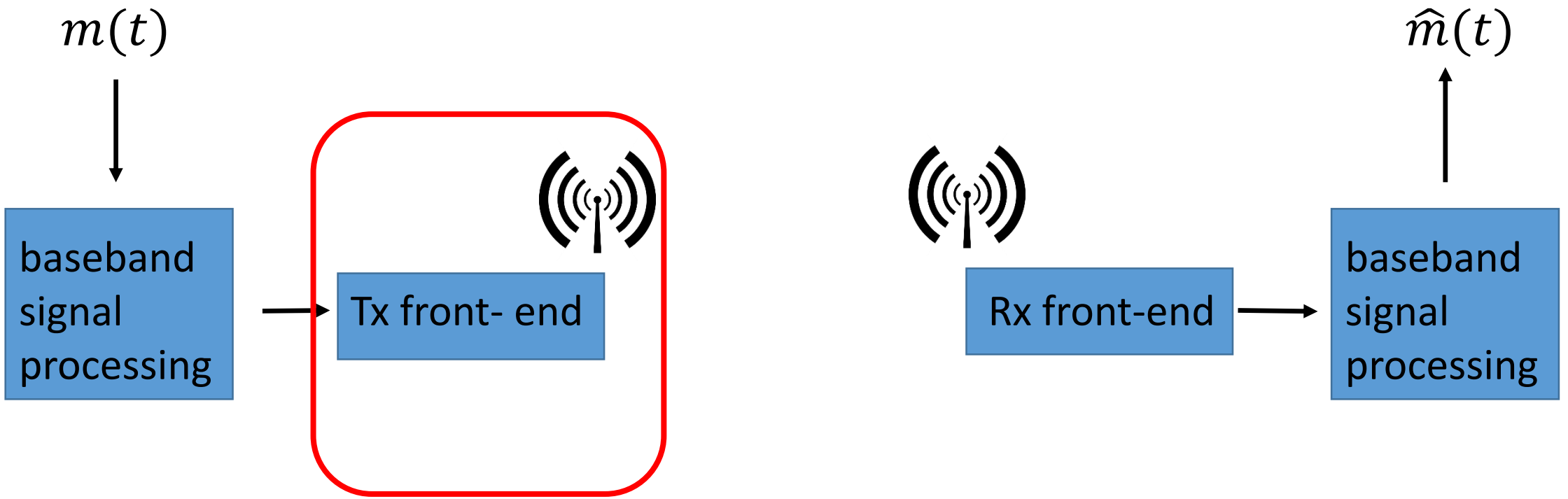
Point-to-point wireless communication

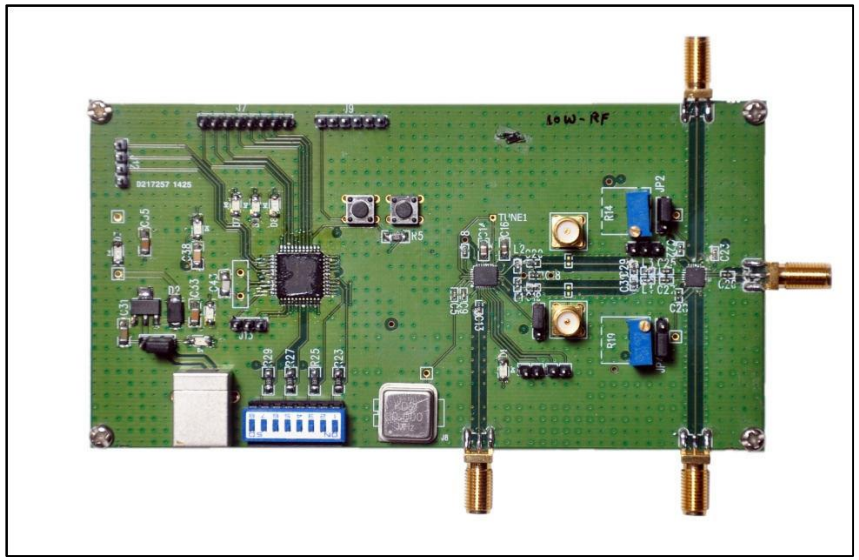


Goal of the EE340: To build and understand these blocks


$m(t)$
baseband signal processing
Tx front- end
Rx front-end
baseband signal processing
$\hat{m}(t)$
Will use GNURadio

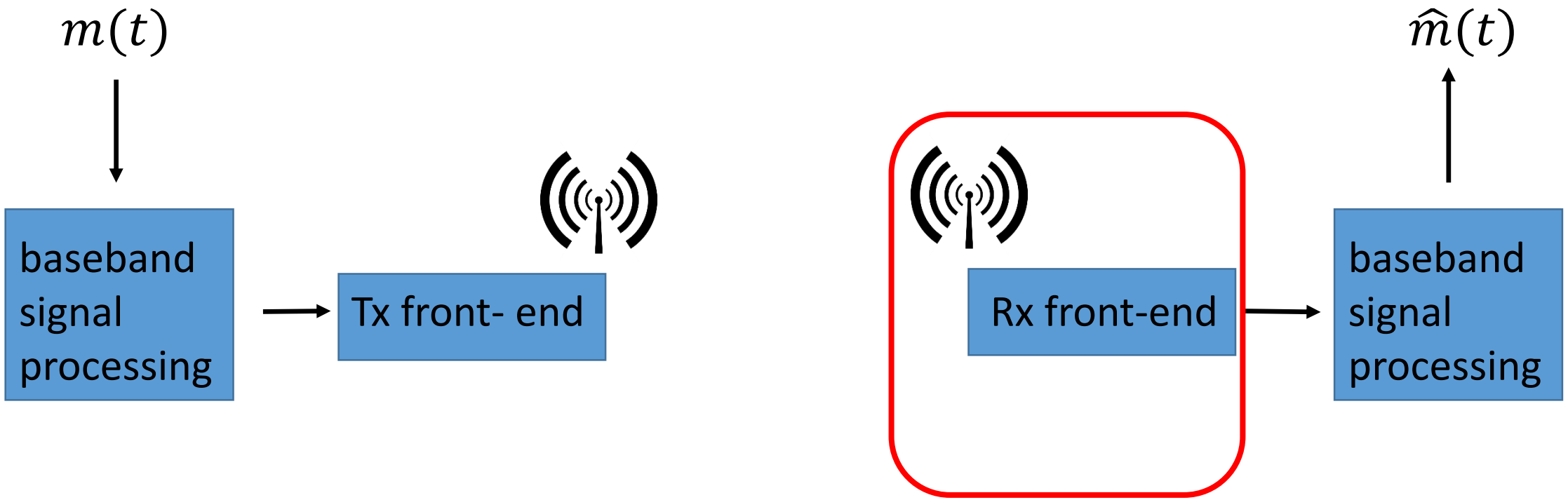
- Free software for baseband signal processing and software-defined radio
- Provides built-in blocks for signal generation and processing tasks
- Many standard communication modules implemented, allows you to write your signal processing blocks in python





I-Q modulator board

- 4 layer PCB designed and fabricated in WEL
- Can convert baseband signals (I & Q components) to RF and transmit
- Will be unable to use this semester; we will simulate the up-conversion performed by this board on GNURadio



- Affordable SDR receiver
- Compatible with SDR software like GNU Radio
- Tuning range: 25MHz – 1700 MHz
- Will be unable to use the dongle this semester; we will instead either mimic the down-conversion operation on GNU Radio, or provide the raw data read from the dongle as a data file that you can process GNU Radio

RTL-SDR dongle

Experiments

- Will involve analog and digital communication
- Topics include:
  - Different modulation schemes
  - Noise reduction
  - Channel non-linearity
  - Frequency (and phase) synchronisation
  - Multipath propagation

Lab organisation

- Class will be divided into groups; each group will be present on a separate channel on MS Teams (along with one/two TAs)

- You will perform the lab work *individually,* though interaction with one another in the group and with TAs is permitted

- Lab timings: 2.00-5.00 pm Tuesdays

Lab organisation (contd.)

- Pre-lab reading material will be posted on moodle (typically before the previous weekend)
- You have to read *and internalise* this before your weekly session

- There will be a 10 minute quiz at the start and/or end of each session to test your understanding of the pre-lab material, and of the experiments from that session

- Credit for each lab week:
  - 50% pre/post-lab quiz
  - 50% in-lab assessment
- Attendance for every session is compulsory

Lab organisation (contd.)

Grading policy:

In session performance:	50%
Mid-sem:	20%
End-sem:	30%

***This policy is subject to change given the special nature of the semester we are in.*

Pre-lab assignment for Week 1

- Install GNURadio on your laptops (instructions posted on Moodle)
- Go over the GNURadio tutorials posted on Moodle – should take about 2 hours
- You will be tested on your GNURadio familiarity during the lab session next week