

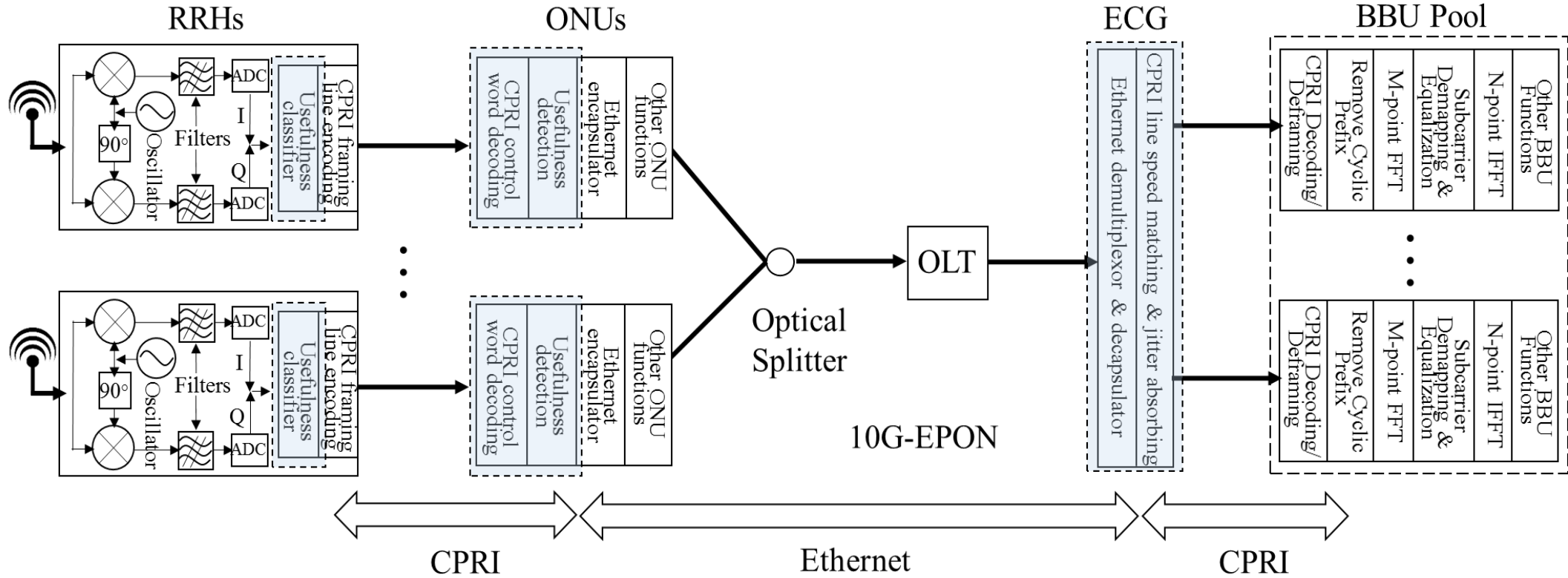


A Study for LTE Uplink Transmission and CPRI Hyper Frame Usefulness Classification

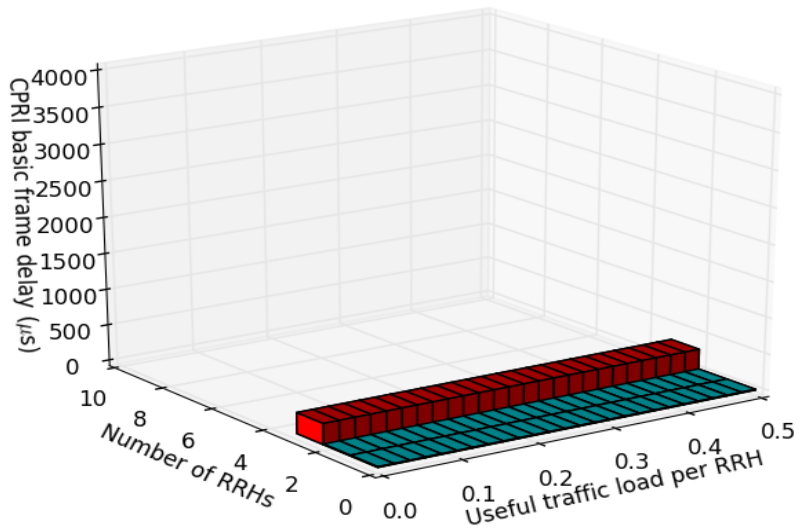
Group Meeting Presentation

Yu Wu
04/28/2017

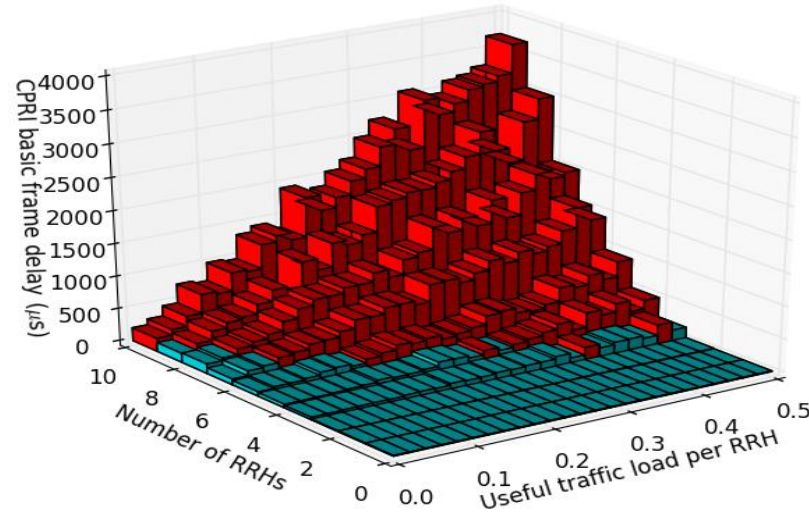
Recap



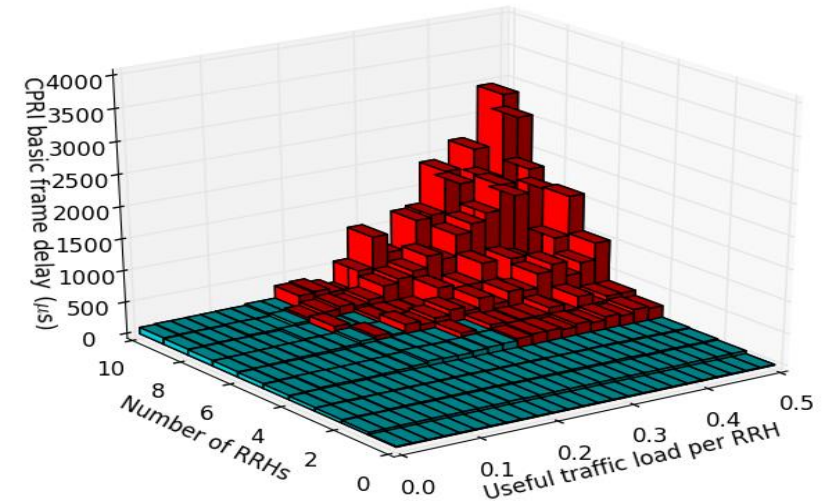
Recap



Usefulness-Unaware-Fixed Bandwidth Allocation scheme (UU-FBA)

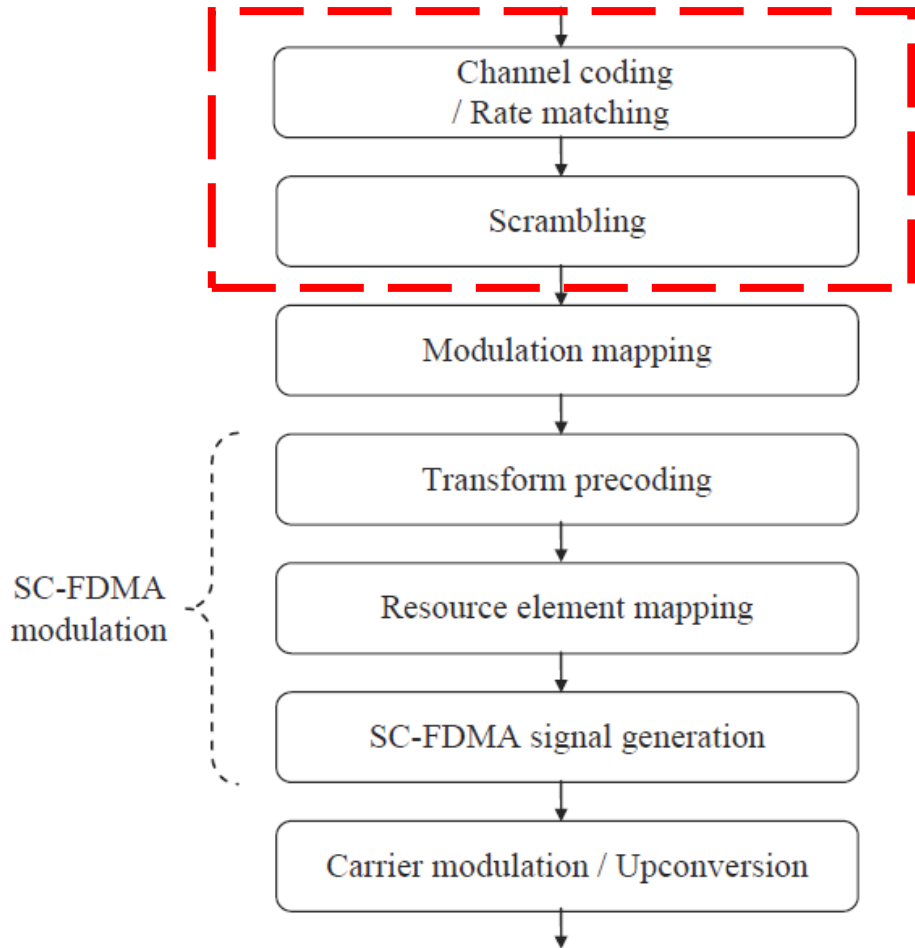


Usefulness-Aware-Fixed Bandwidth Allocation scheme (UA-FBA)



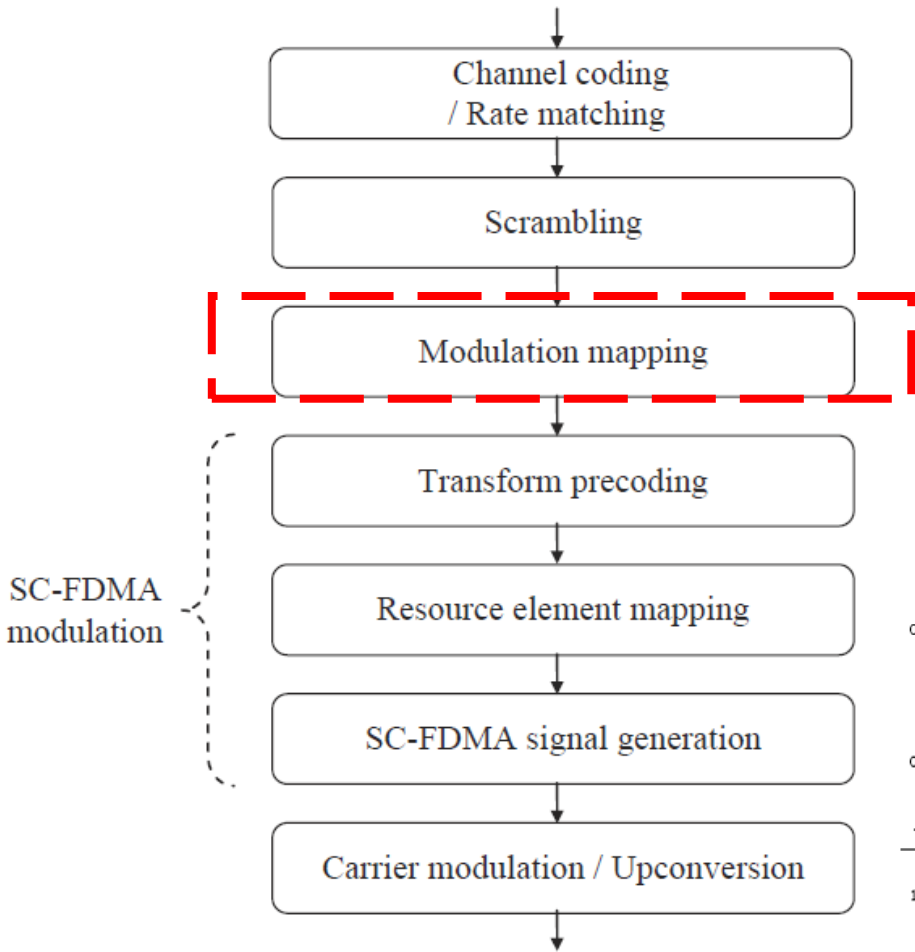
Hybrid Bandwidth Allocation (HBA)

LTE Uplink Physical Signal Processing

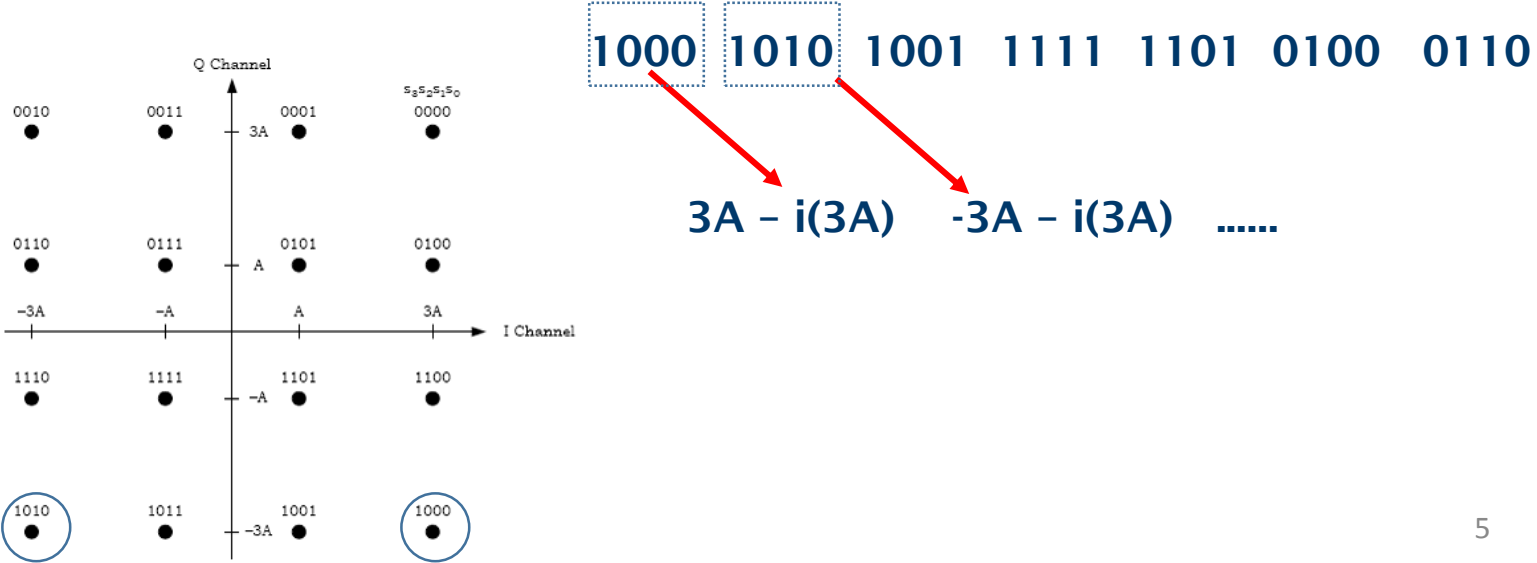


- LTE specifies two channel coding techniques: tail-biting convolution coding and turbo coding.
- Each coder produces three separate bit streams, corresponding to code rate 1/3.
- The bit streams are interleaved separately and the interleaved streams are fed to a circular rate matching buffer.
- The output bits of the circular buffer are scrambled with a length-33 Gold sequence

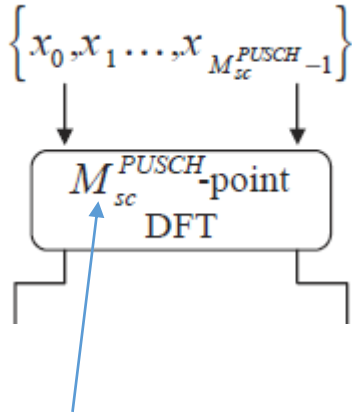
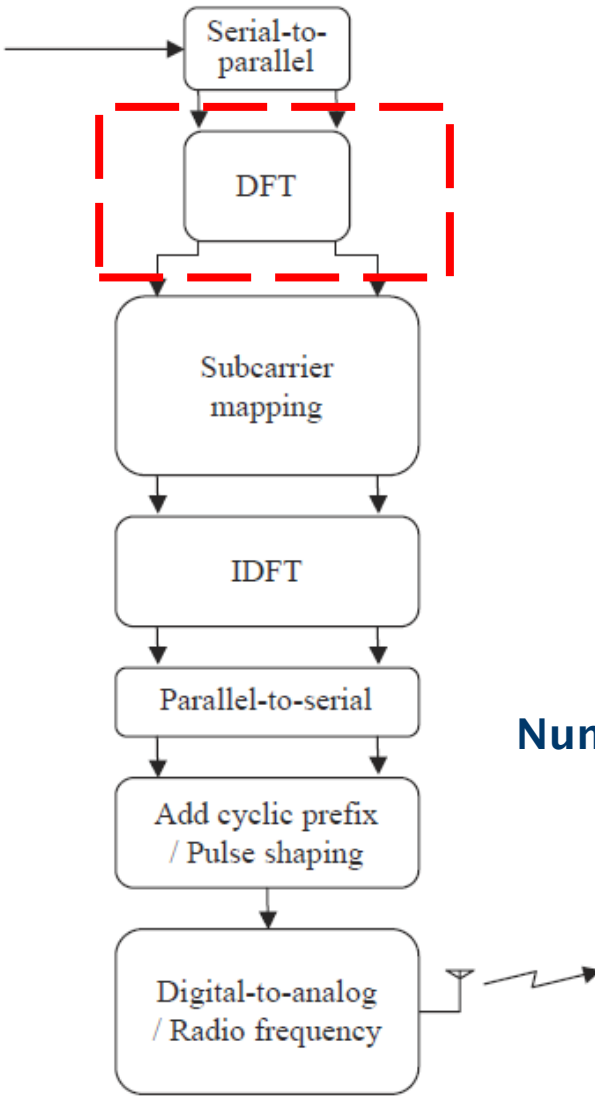
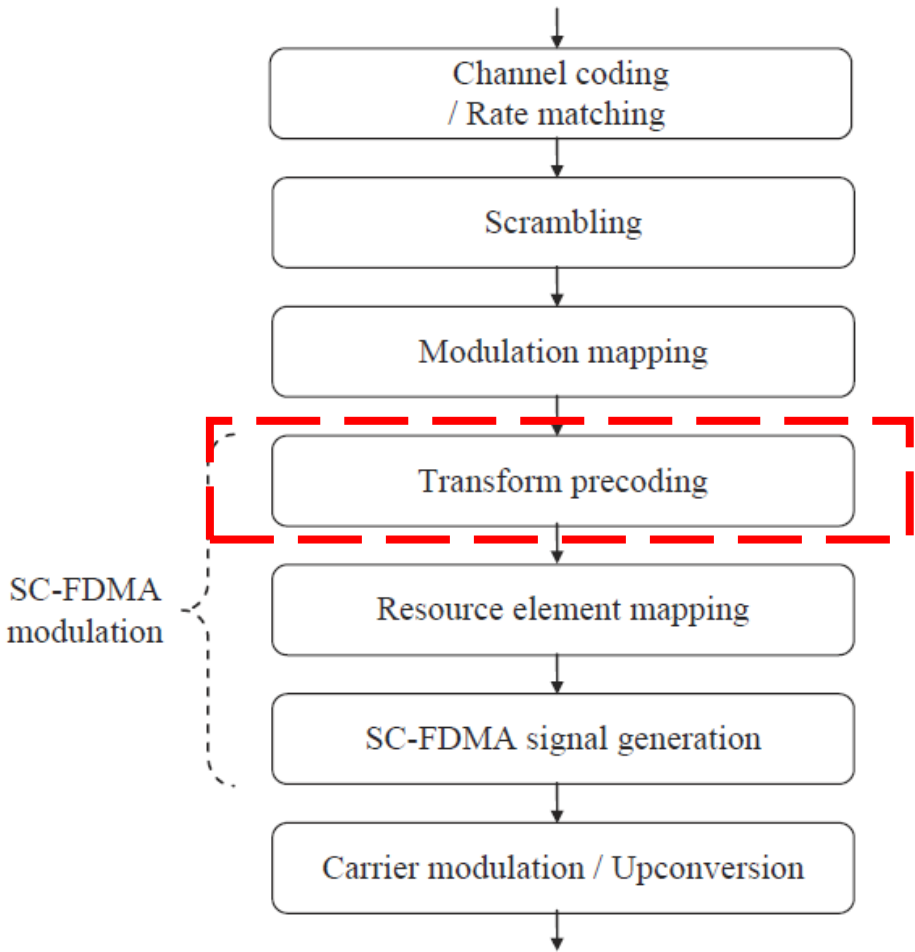
LTE Uplink Physical Signal Processing



- Depending on channel quality, the physical uplink shared channel (PUSCH) can use QPSK, 16-QAM, and 64-QAM modulations.
- The physical uplink control channel (PUCCH) can use BPSK and QPSK modulations.

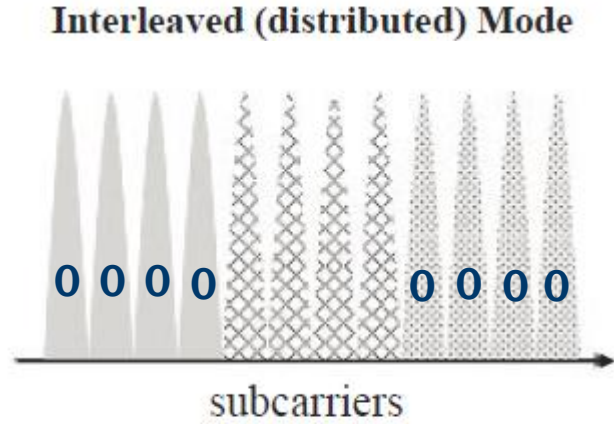
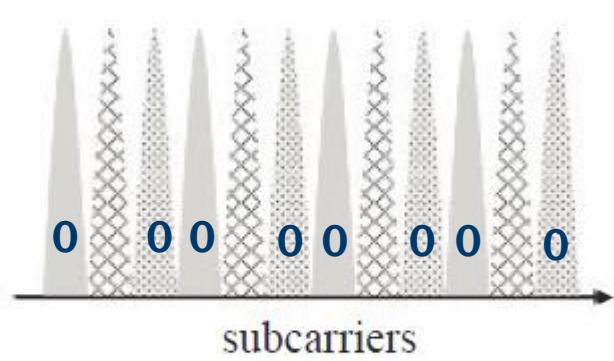
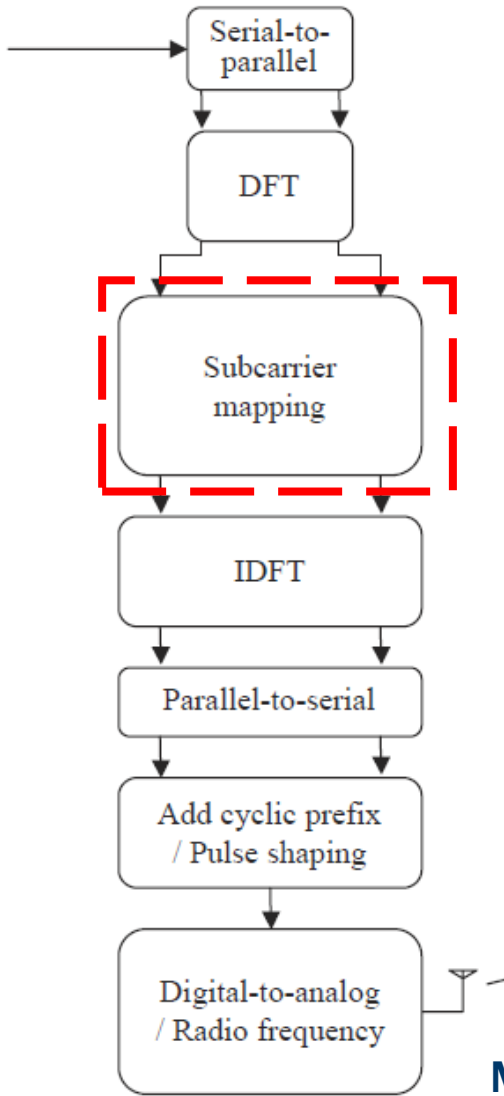
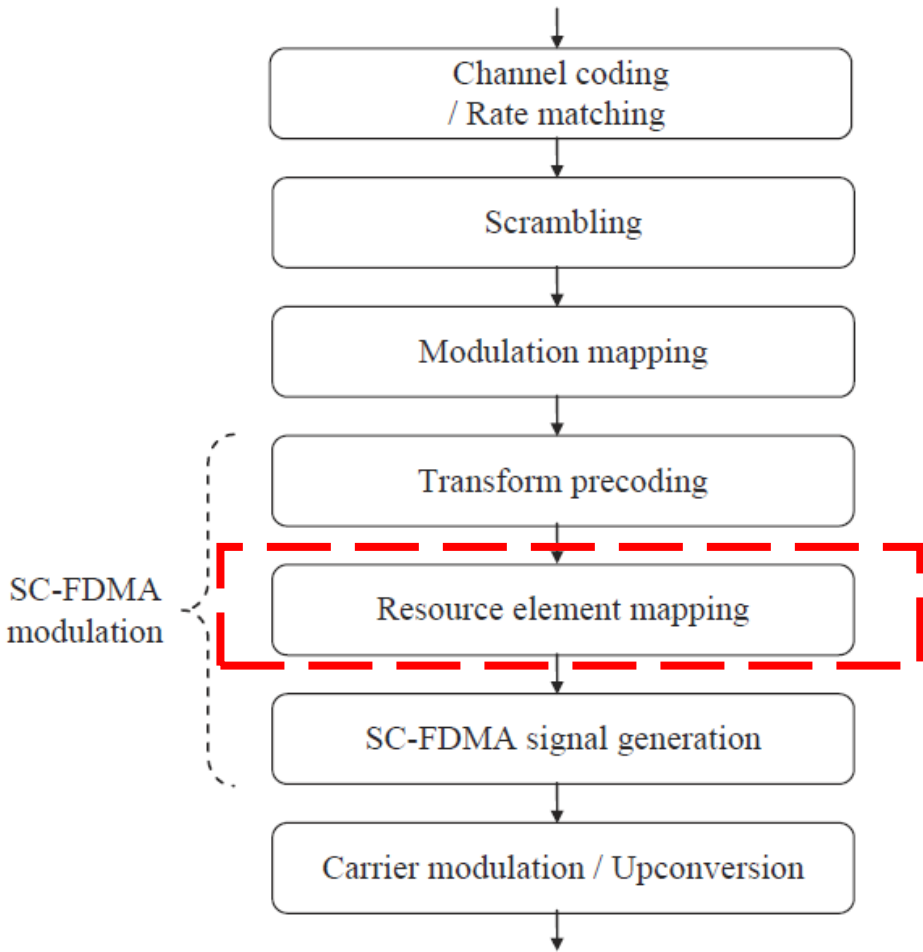


LTE Uplink Physical Signal Processing



Number of subcarriers assigned to one user

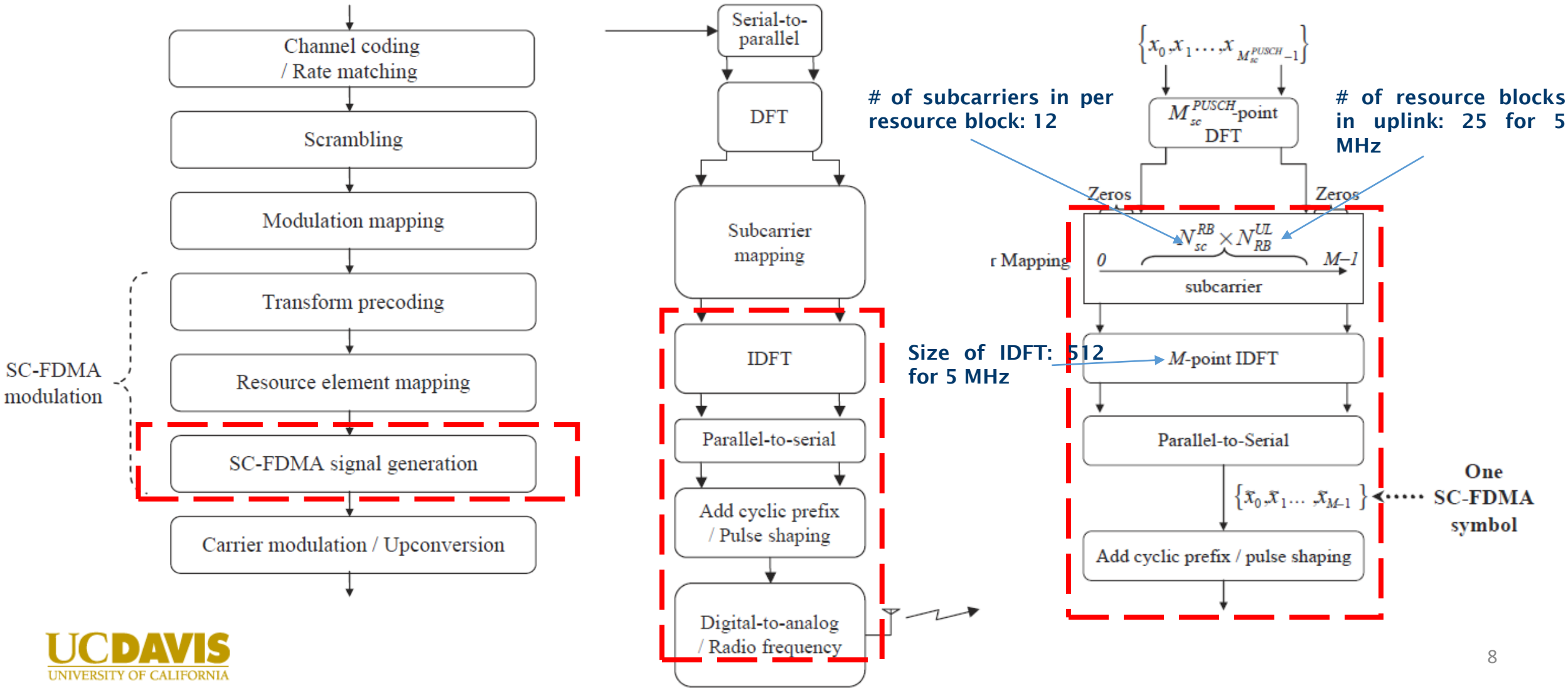
LTE Uplink Physical Signal Processing



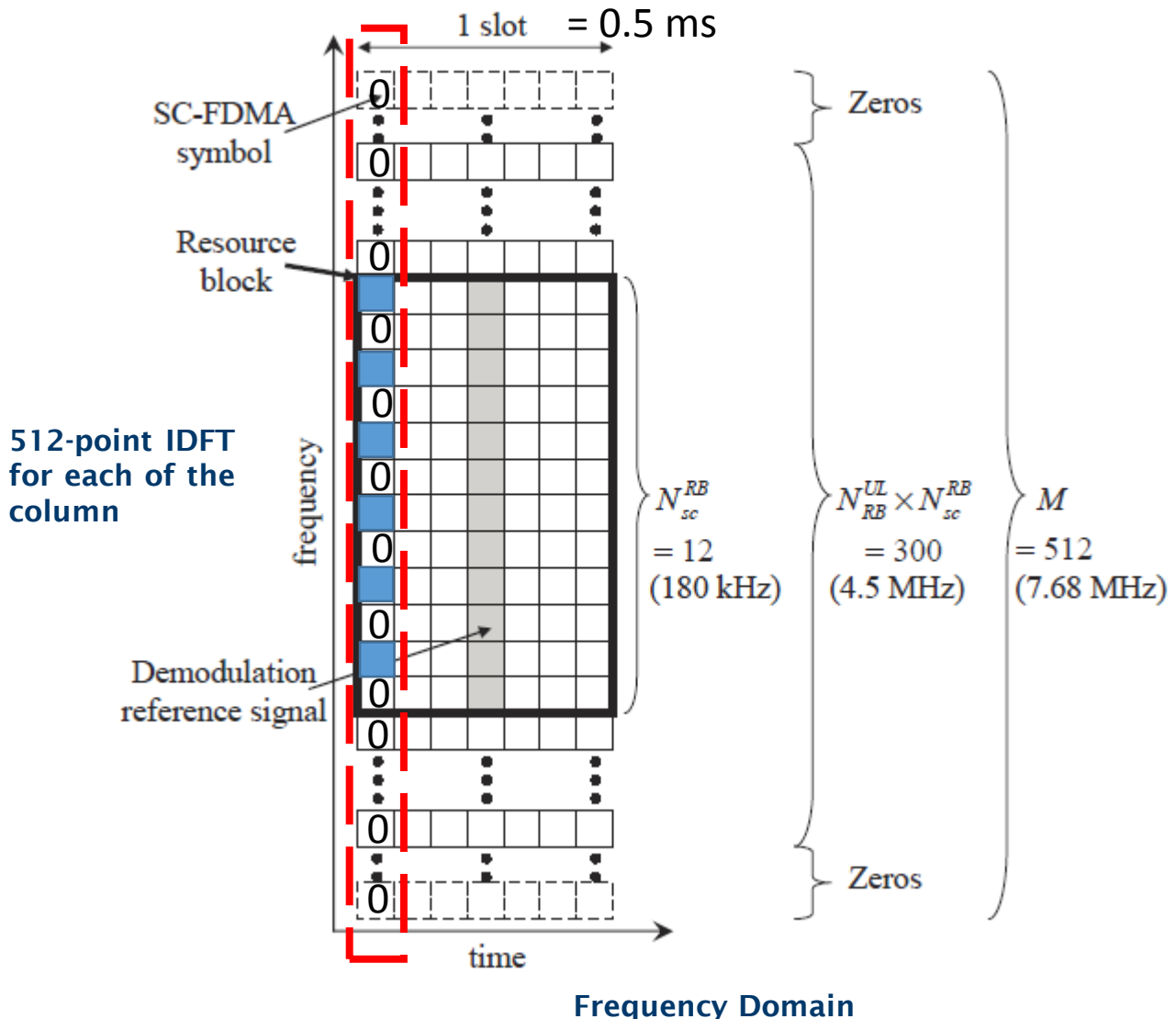
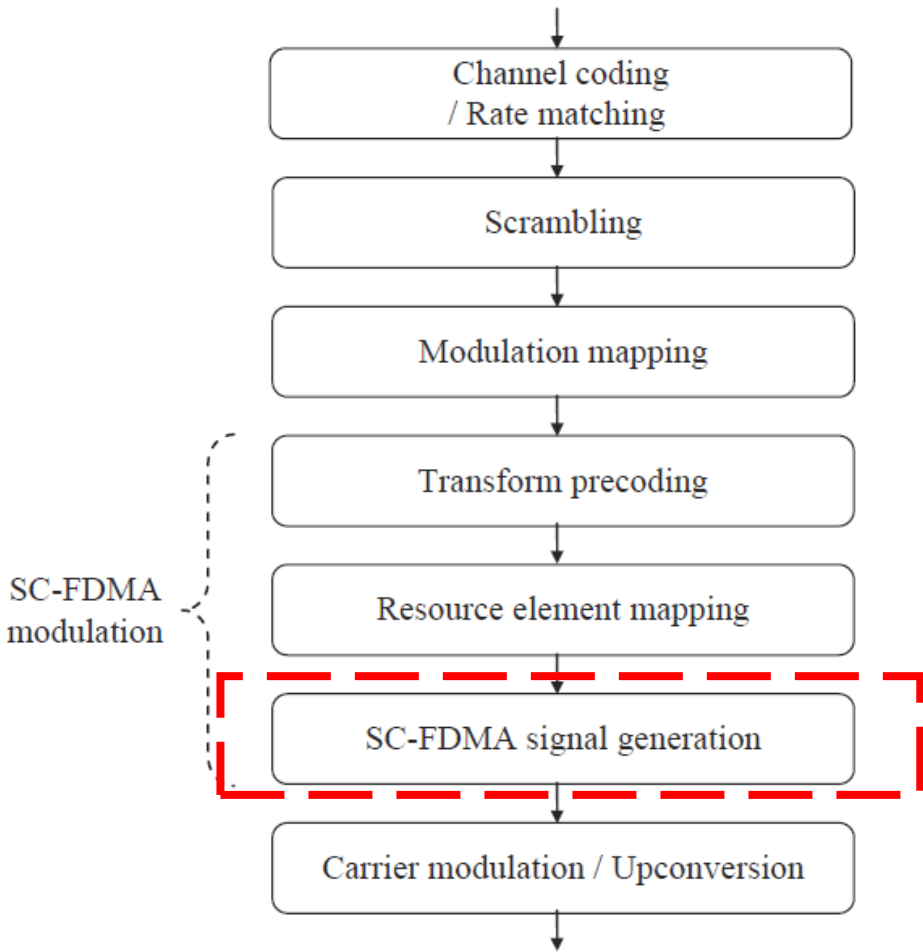
Terminal

Make sure to set all the frequencies⁷ of unused subcarriers to 0 before transmitting

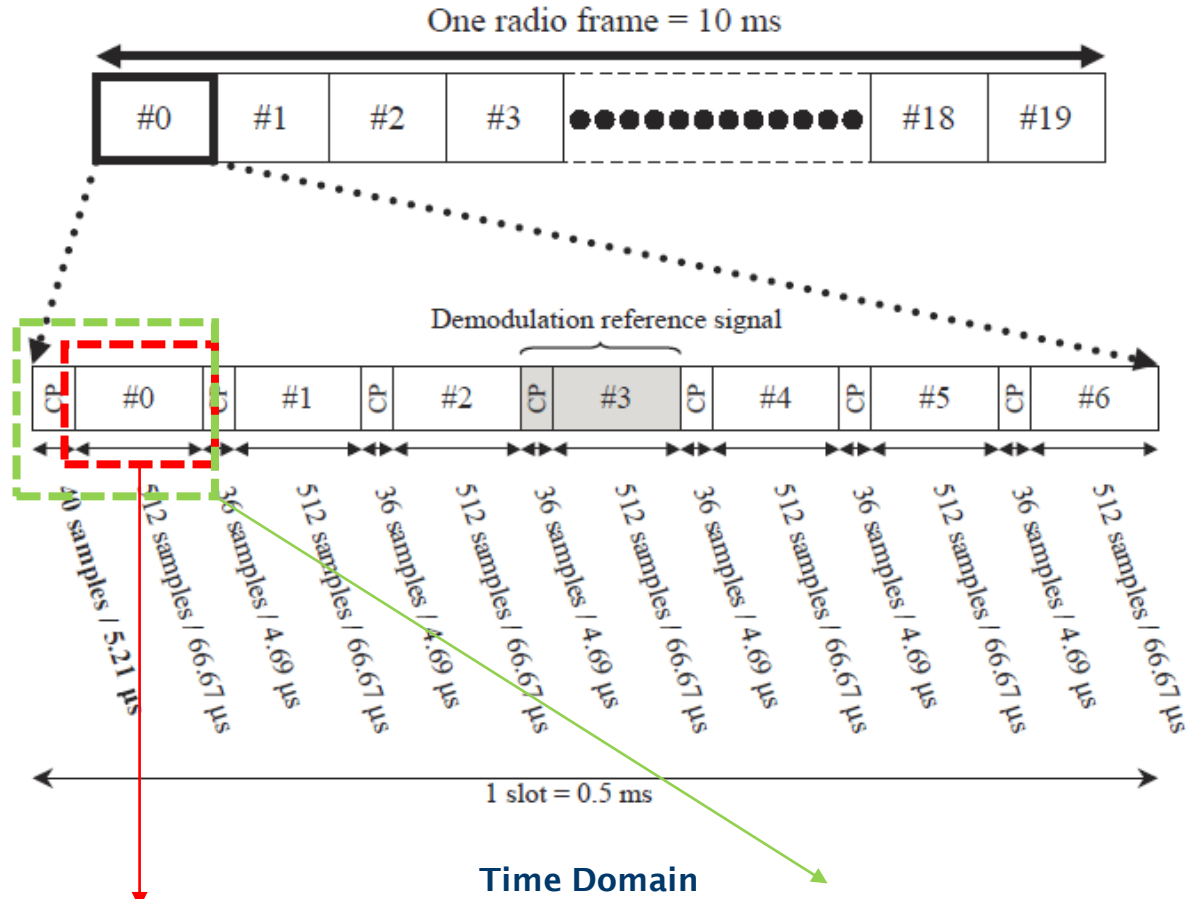
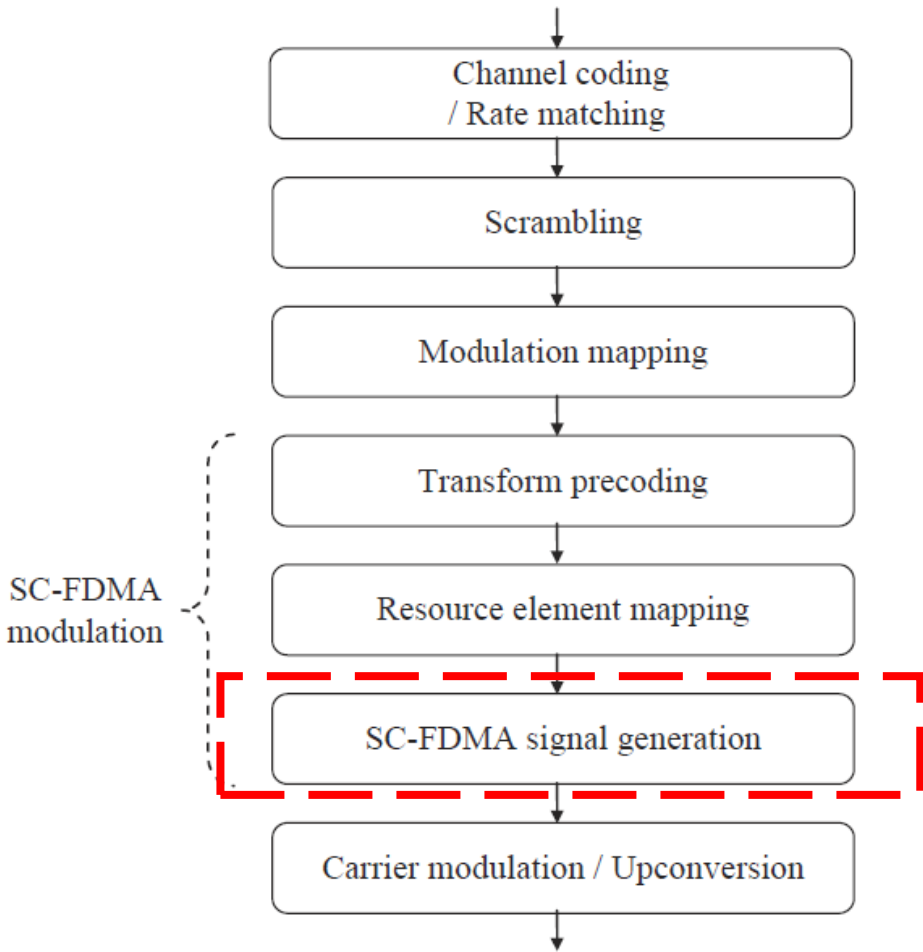
LTE Uplink Physical Signal Processing



LTE Uplink Physical Signal Processing



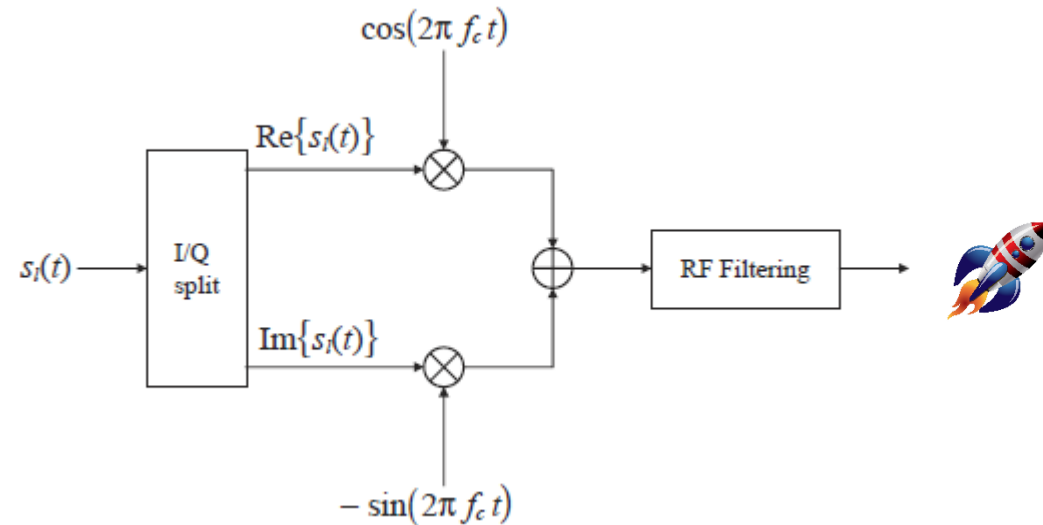
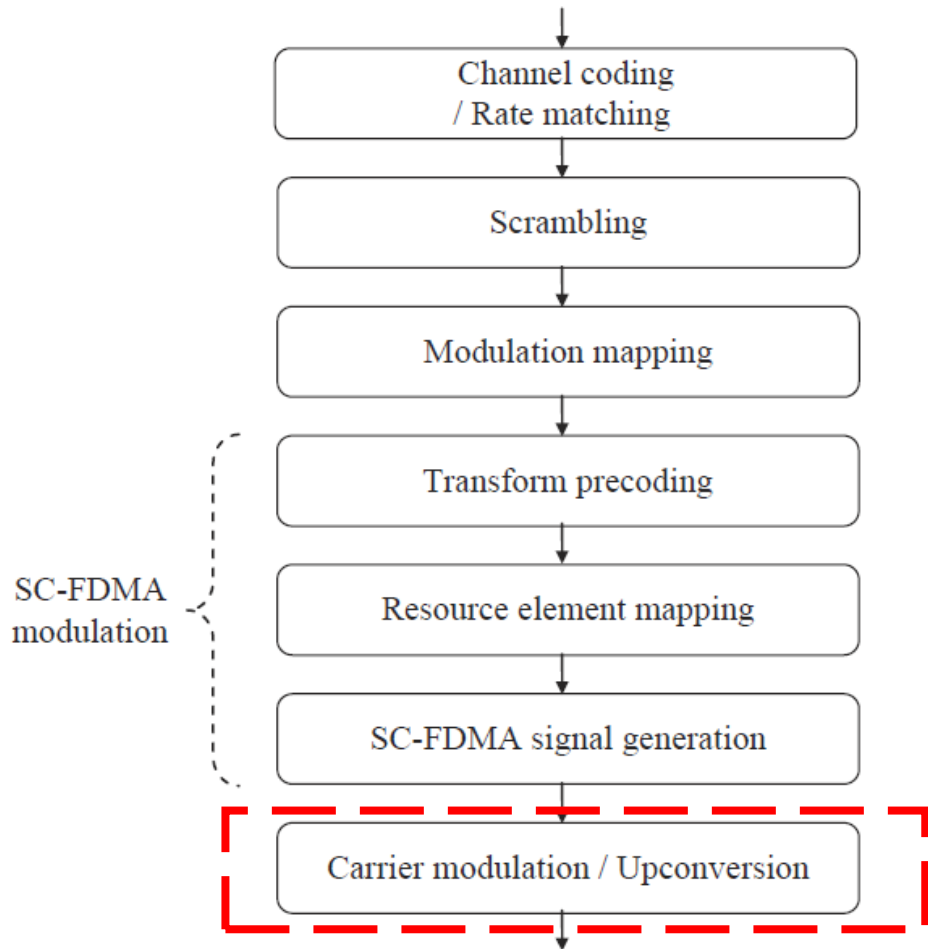
LTE Uplink Physical Signal Processing



At RRH, these 512 samples are going to form a CPRI hyper frame.

Digital-to-analog conversion to generate a continuous signal $s_1(t)$ of duration 0.5/7 ms.

LTE Uplink Physical Signal Processing



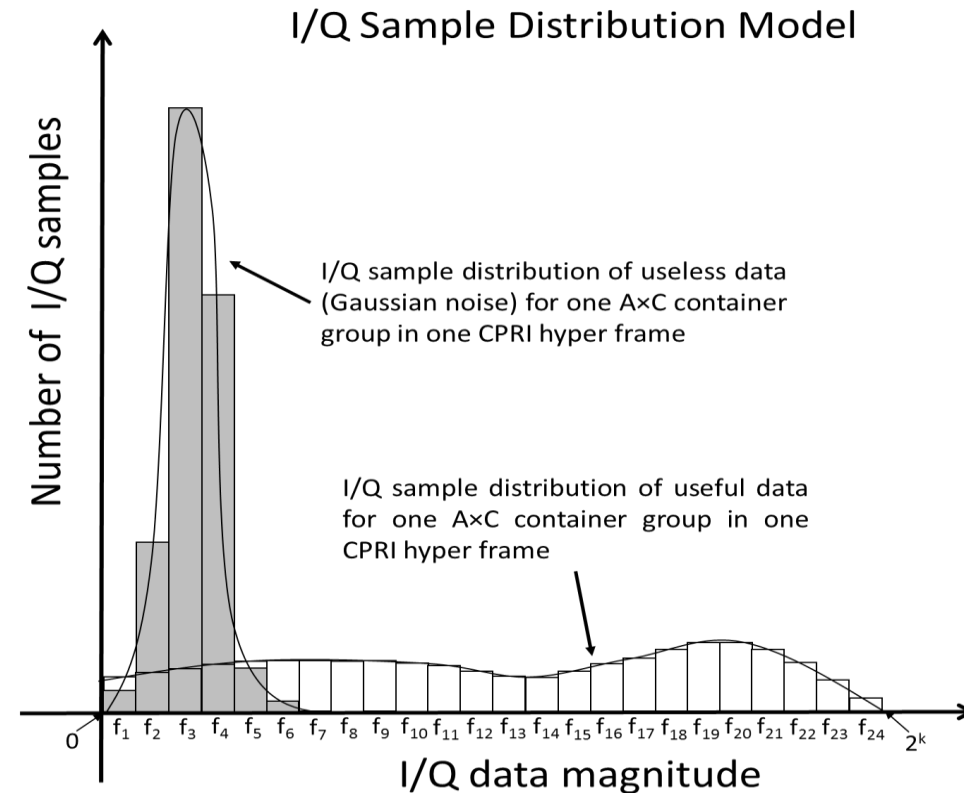
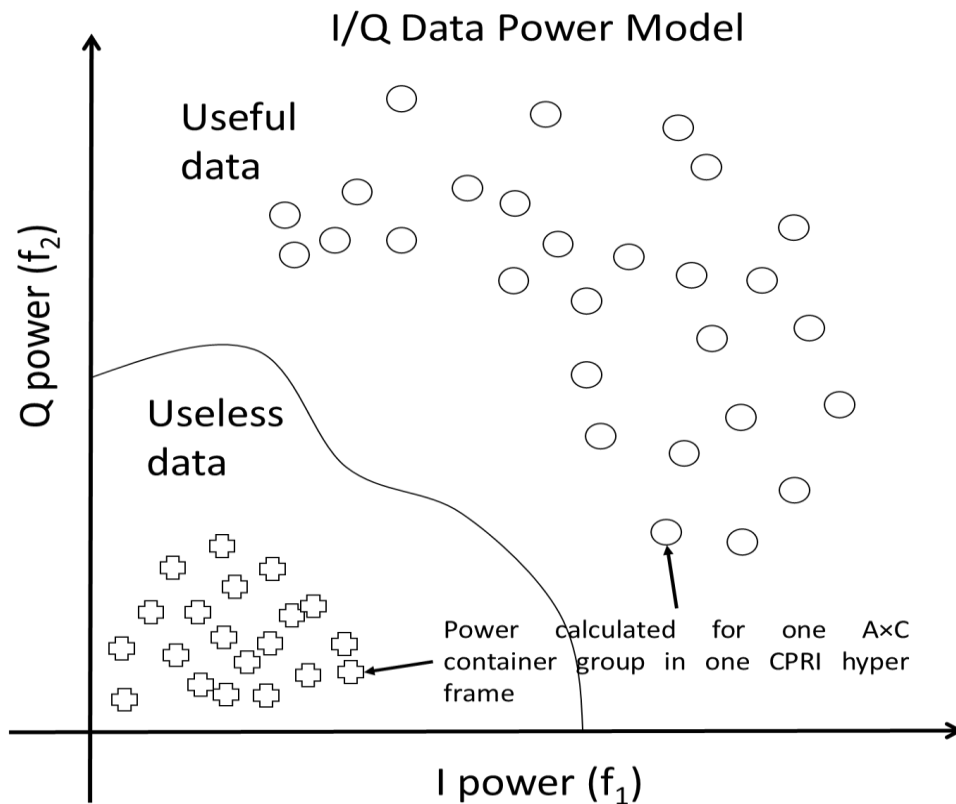
Finally, $s_i(t)$ modulates the radio frequency carrier (f_c Hz) assigned to the mobile terminal.

CPRI Hyper Frame Usefulness Classification

- **If channel is perfect without noise, multi-path transmission, signal attenuation, the classification will be 100 % accurate.**
 - If no user is transmitting, the sampled data at antenna at RRH has no amplitude.
 - As long as there is some user transmitting, the amplitude of sampled data at antenna at RRH is not zero.
- **In reality, we can assume:**
 - Channel is not perfect.
 - A certain number of users are associated with an RRH. They transmit intermittently.
 - Subcarrier mapping is in localized mode by default.
 - The classifier is biased favoring false positive (mistakenly classifying on CPRI hyper frame as useful even if it is useless in reality) to prevent from losing information.

CPRI Hyper Frame Usefulness Classification

Two feature selection models



Journal Plans

- Use Mathwork LTE Toolbox or simuLTE to simulate mobile upstream transmission.
- Choose appropriate ML classification algorithms to perform CPRI hyper frame usefulness classification.
- Improve the performance of the proposed hybrid EPON upstream bandwidth allocation algorithm.