

## 1 Introduction

In this project you will implement the digital baseband portion of a MIMO-CDMA system conforming to the IS-95 CDMA standard in MATLAB. IS-95 CDMA systems were first developed in the 1990s and are still widely used in North American 2G cellular networks (often as a fall-back mode and in rural areas).

You are expected to write a suitable structure and framework for the simulator and to justify the design decisions. Measurements of the performance (e.g., BER and capacity) should be included for various channel scenarios, so design your system accordingly.

## 2 Implementation of the IS-95 Standard

In this part of the project you will implement the forward-link (i.e., basestation to mobile) of a single antenna IS-95 system. The implementation is similar to the laboratory exercises on CDMA, but you will need to include convolutional encoding and design your system (e.g., spreading rates and PN sequences) to conform to the IS-95 standard.

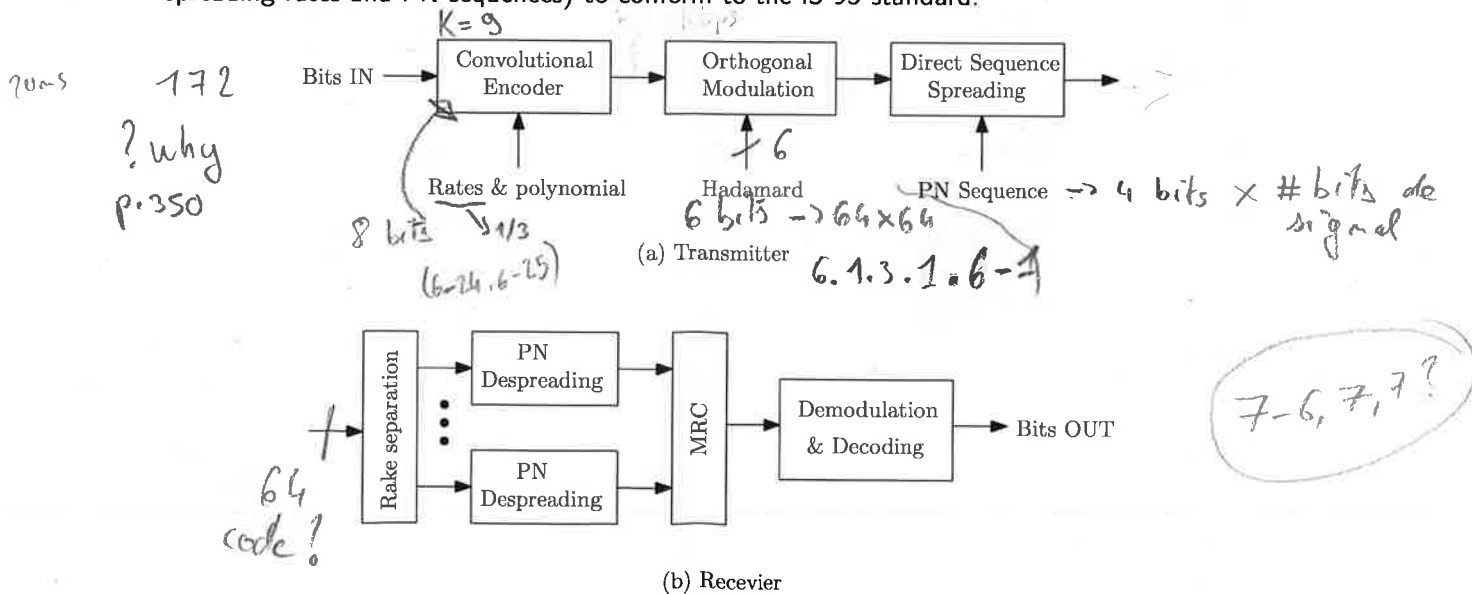


Figure 1: High-level block diagram of an IS-95 forward-link.

A high-level block diagram of the IS-95 forward-link is shown in Fig. 1. There is a lot of information contained within the Standard (which is available on Moodle) and you will need to extract the relevant information about the:

- size of the frames;

Main functions:

\* Conv encoder

\* Hadamard why do they choose 6?  
6  $\rightarrow$  64  
why not 1  $\rightarrow$  64

\* PN: XOR like exercise, then use  
the proprietary one and  
n-users etc...  $\rightarrow$  differences  
etc

Bonus:

\* CRC

\* interleaver not necessary with  
random bits, but there might be  
correlation somewhere (convolution)

\* spread by two (complex) (1-Q)

param files!  $\rightarrow$  modularity

explain 172 bits - 20ms (for voice)

what we use or not, why, and what difference

Hadamard or PN to distinguish users?

explain the difference with exercise (slightly different)

Hadamard doesn't spread the same for all lines,

the PN does?

1-Q channel sequence?

Read the book!