HACETTEPE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Study of HARQ Techniques for 5G New Radio
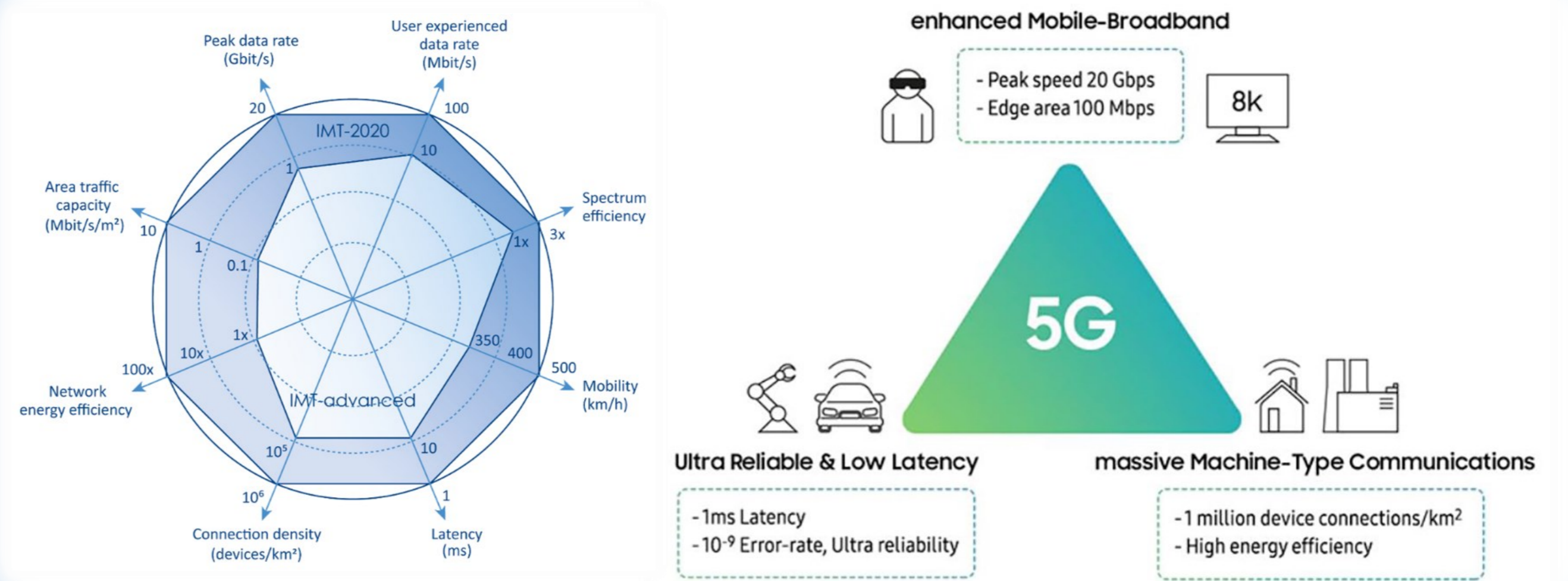
Muhammed Furkan SEDİR   Mustafacan KALDIRIM

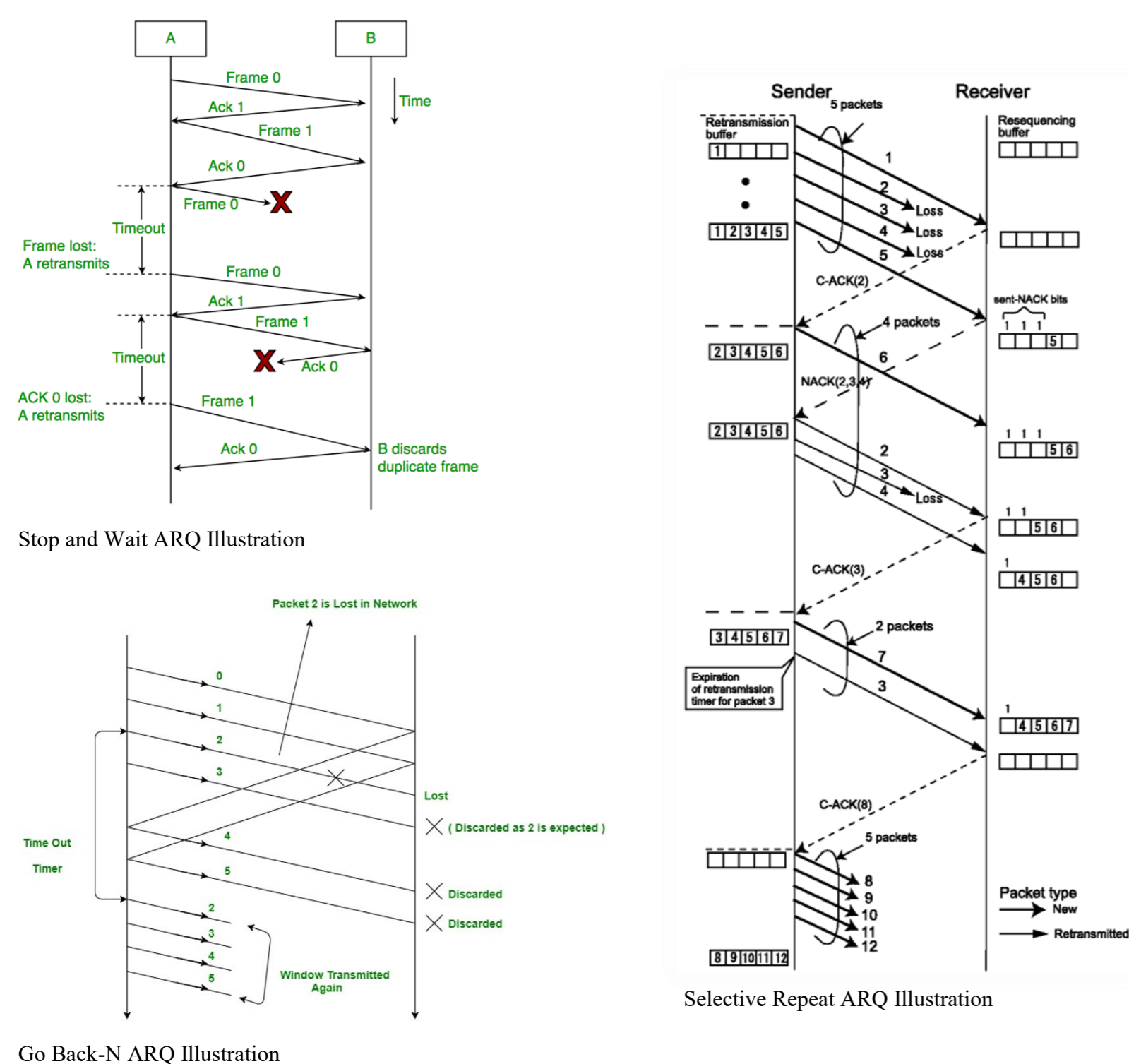Supervisor: Asst. Prof. Dr. Barış YÜKSEKKAYA

Introduction

In this project our goal is to compare the performance of different types of ARQ and HARQ by implementing system-level simulation tool and to understand the effect of HARQ parameters and methods on the system performance for 5G NR.
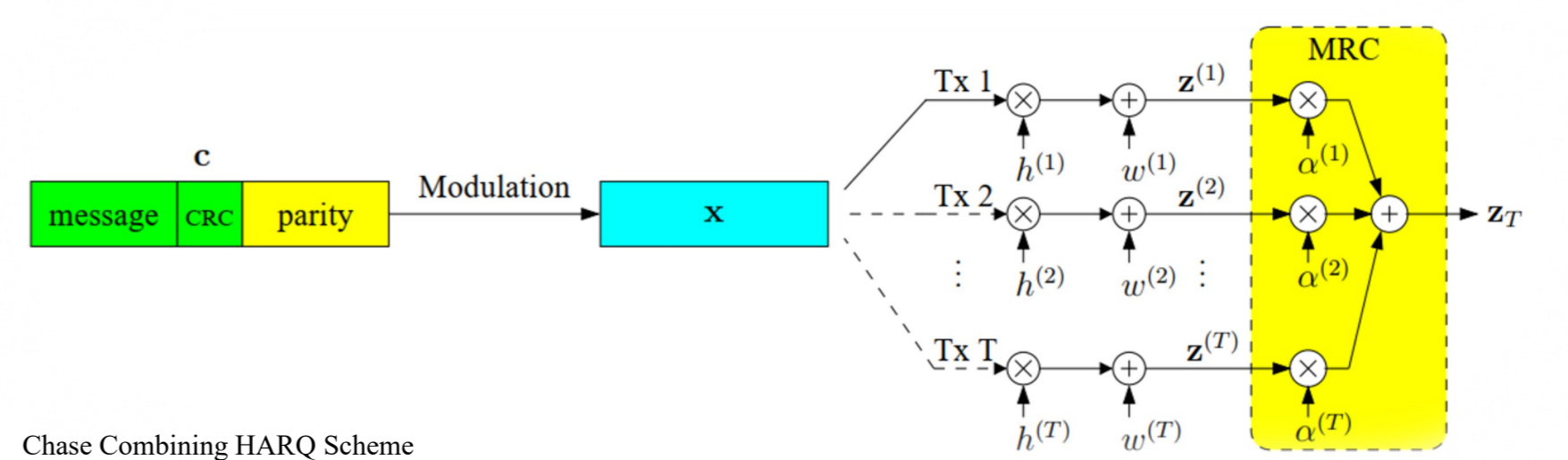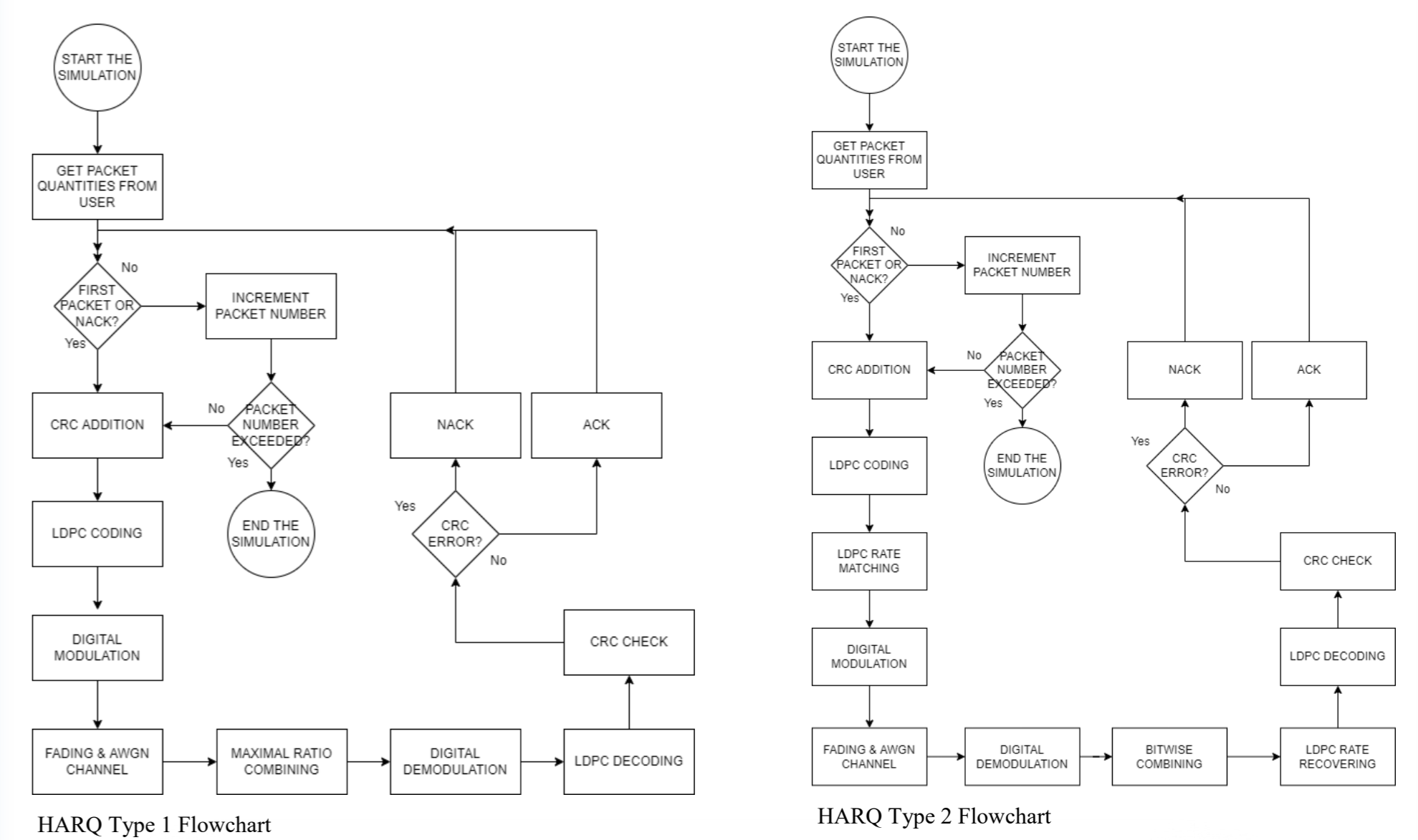
ARQ schemes and hybrid-ARQ (HARQ) schemes (which jointly adopt forward error correction (FEC) and ARQ), are essential to provide reliable data transmission in wireless communications systems. However, the feedback from the receiver to the transmitter and the retransmission process used in ARQ incurs significant costs in terms of power efficiency, throughput, computational power, and delay.
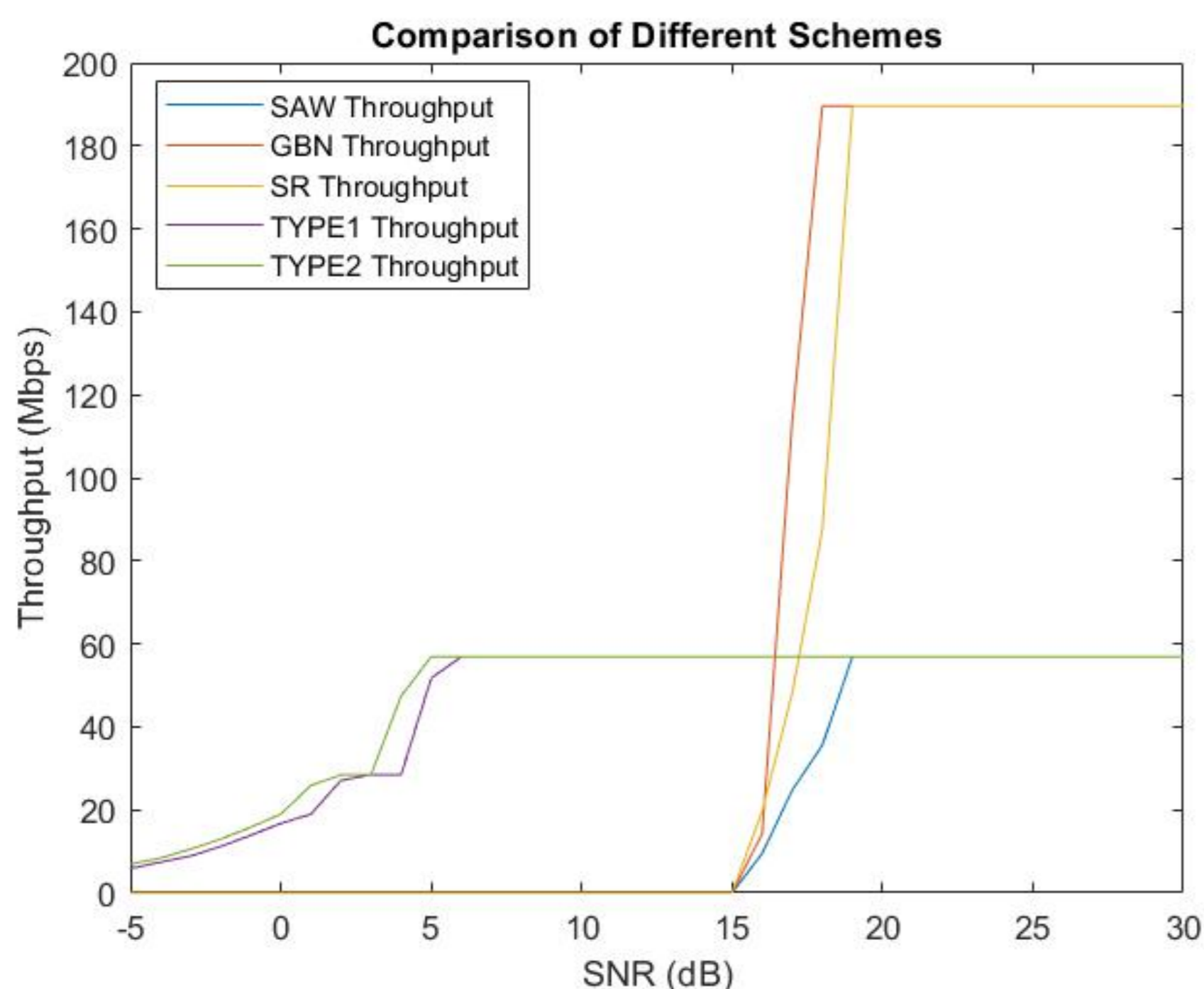

Automatic Repeat Request

Stop and Wait ARQ Illustration

Go Back-N ARQ Illustration

Selective Repeat ARQ Illustration

Hybrid Automatic Repeat Request

HARQ Type 1 Flowchart

HARQ Type 2 Flowchart

Chase Combining HARQ Scheme

Cyclic Buffer with Redundancy Versions
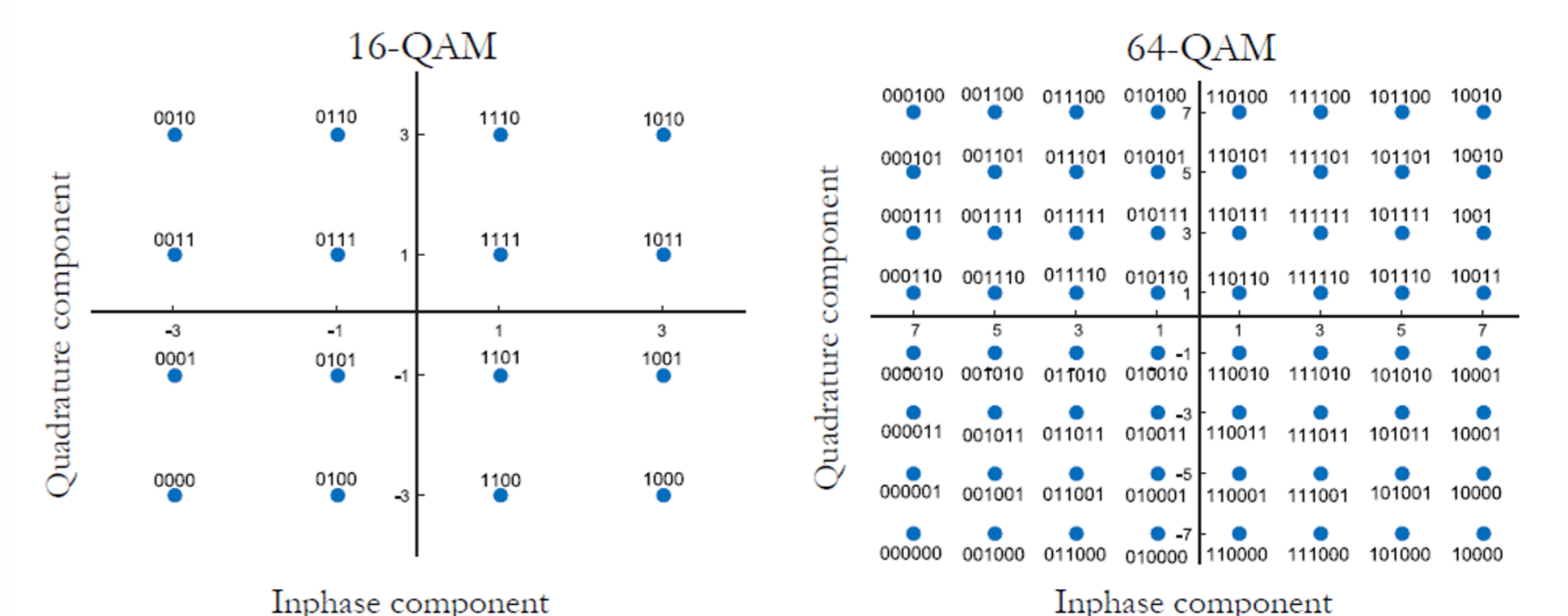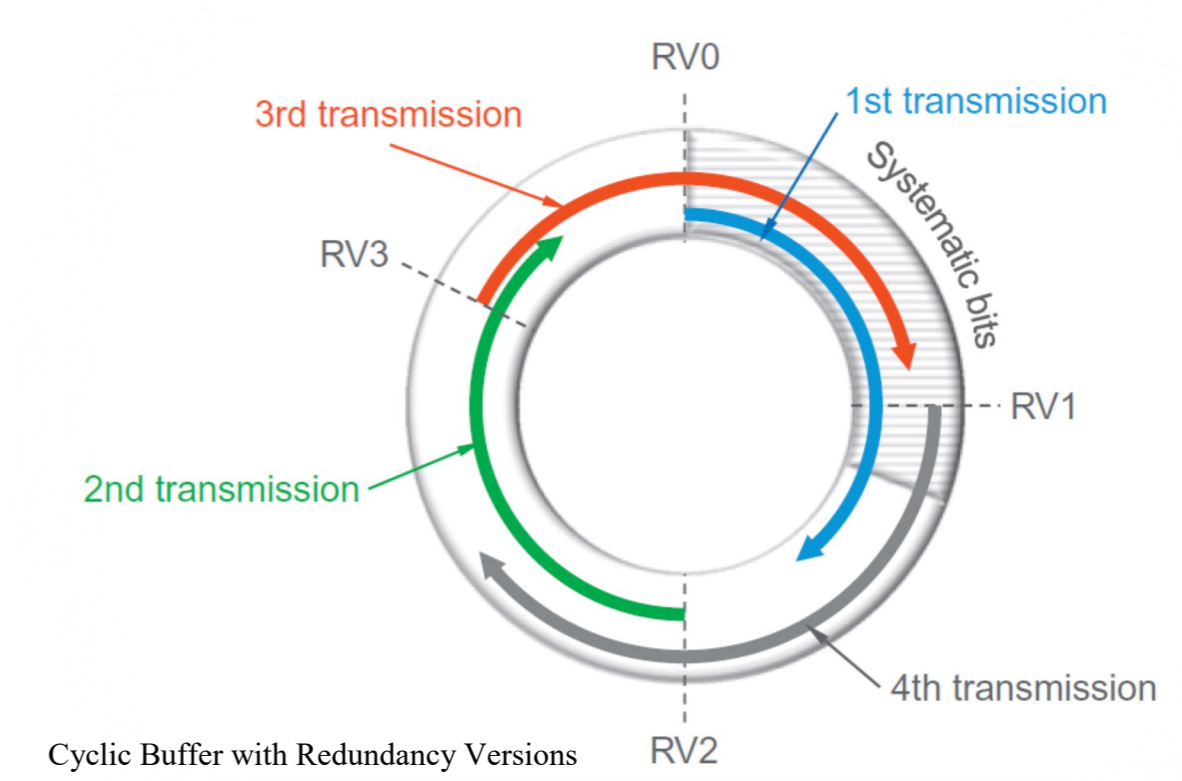

16-QAM

64-QAM

RESULTS

Comparison of Different Schemes

As you can see from the figure, HARQ Type 1 performs better in low quality channel due to Forward Error Correction (FEC) that combines Low Density Parity Check (LDPC) and Maximal Ratio Combining (MRC) capability.

At better channel conditions, GBN and SR ARQ schemes perform better since they do not use FEC method.