

# **DIGITAL COMMUNICATION**

## **UE21EC241B**



# **QPSK AND QAM MODULATION AND DEMODULATION**



# INTRODUCTION

*Digital Modulation (DM) is a process of encoding a digital information signal into the amplitude, phase, or frequency of the transmitted signal. It removes communication noise as well as provides enhanced strength for the signal intrusion and can be considered as digital-to-analogue conversion and the corresponding demodulation or detection as analog-to-digital conversion*



# QPSK

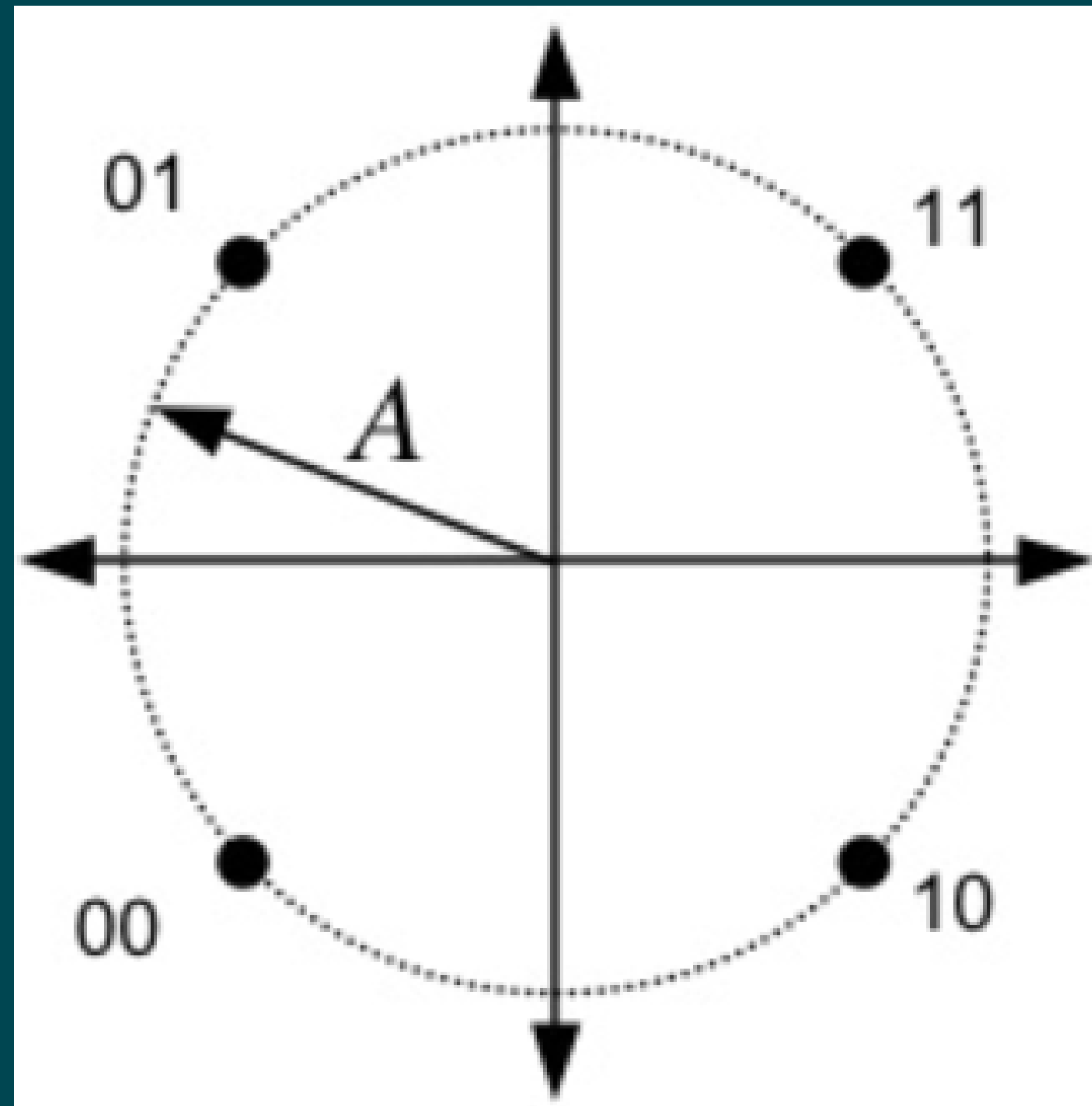
*In QPSK, the phase of the carrier signal is shifted by 90 degrees for each symbol that is being transmitted. Each symbol represents a bit of digital data, and the carrier signal can take on one of four possible phase states, which correspond to the four possible bit combinations: 00, 01, 10, and 11.*

# QPSK

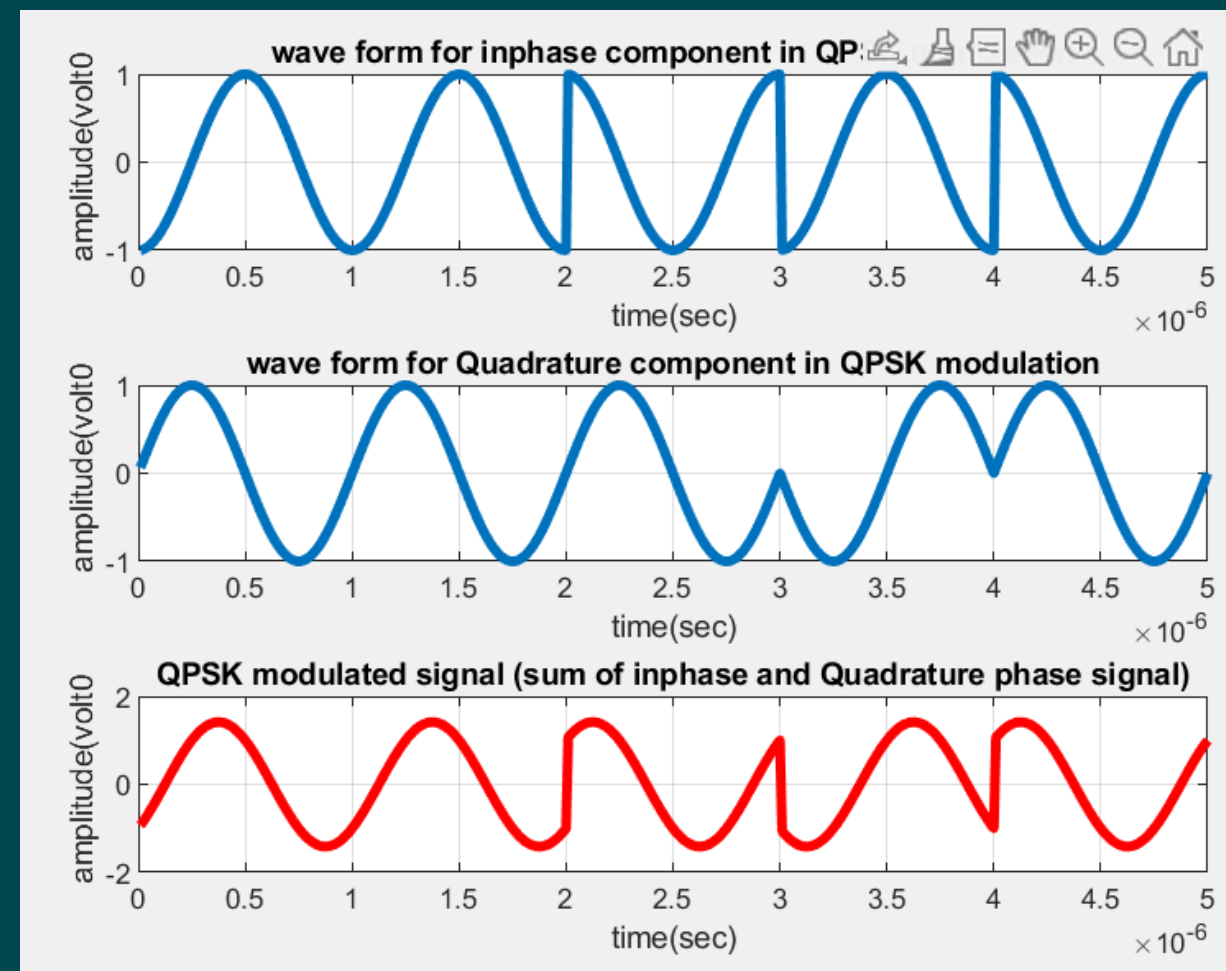
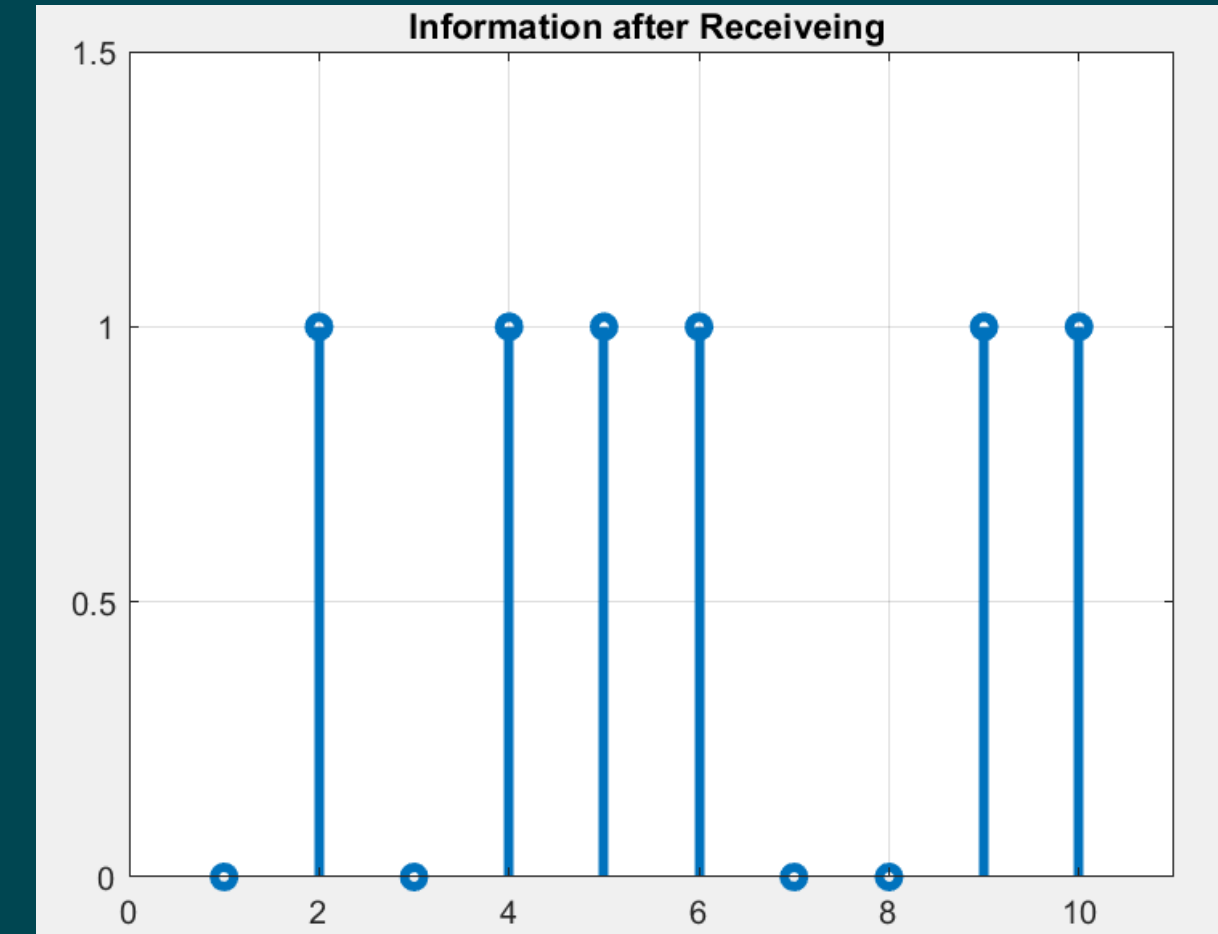
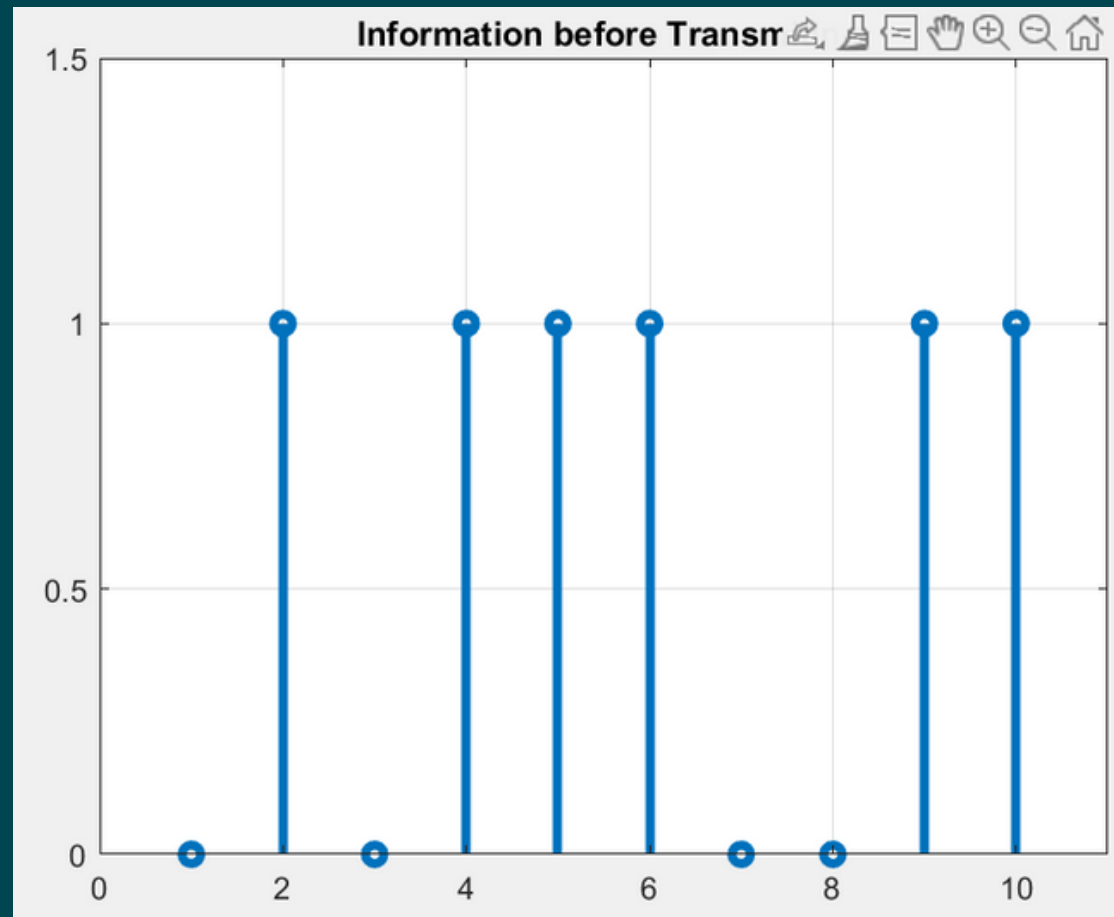
*QBPSK is similar to Binary Phase-Shift Keying (BPSK), but it uses two carrier signals that are 90 degrees out of phase with each other, while BPSK uses only one carrier signal. This allows QBPSK to transmit twice as much data per unit of time as BPSK.*



# QPSK



# QPSK OUTPUT



# QPSK APPLICATIONS

1. *Satellite Communication*
2. *Wireless Communication*
3. *Radio Frequency Identification (RFID)*
4. *Military Communication*





# QAM

Quadrature Amplitude Modulation (QAM) is a type of digital modulation technique used to transmit digital data over a communication channel. QAM combines two carriers, each modulated by a separate bit stream, into a single signal that is transmitted over the channel. The amplitude and phase of each carrier signal can take on a number of possible values, which allows for a large number of possible signal states and higher data rates.



# QAM

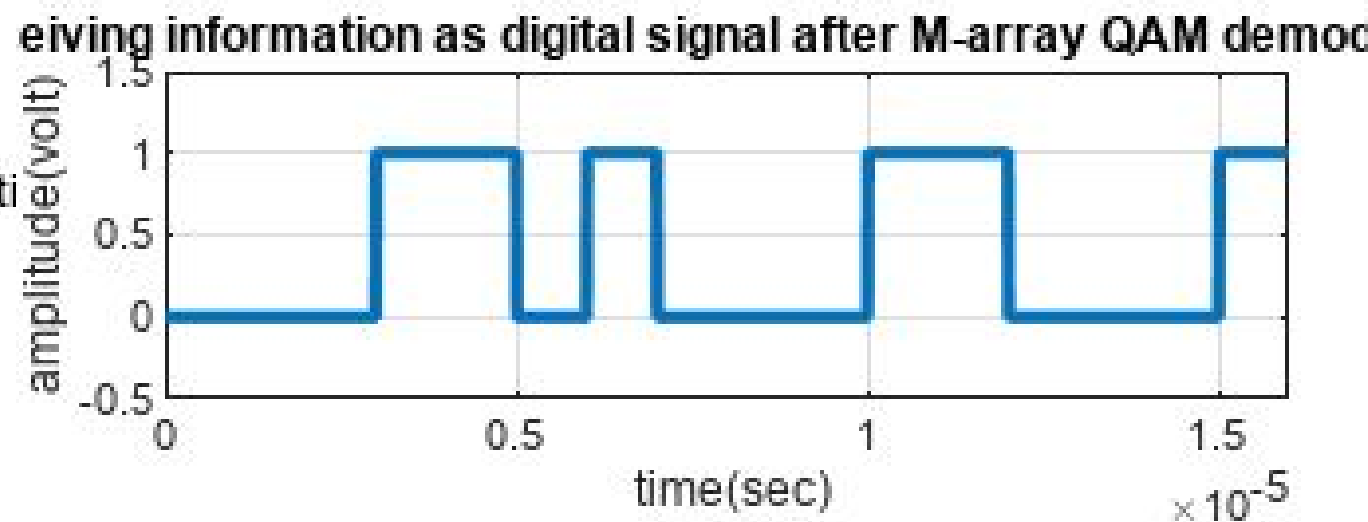
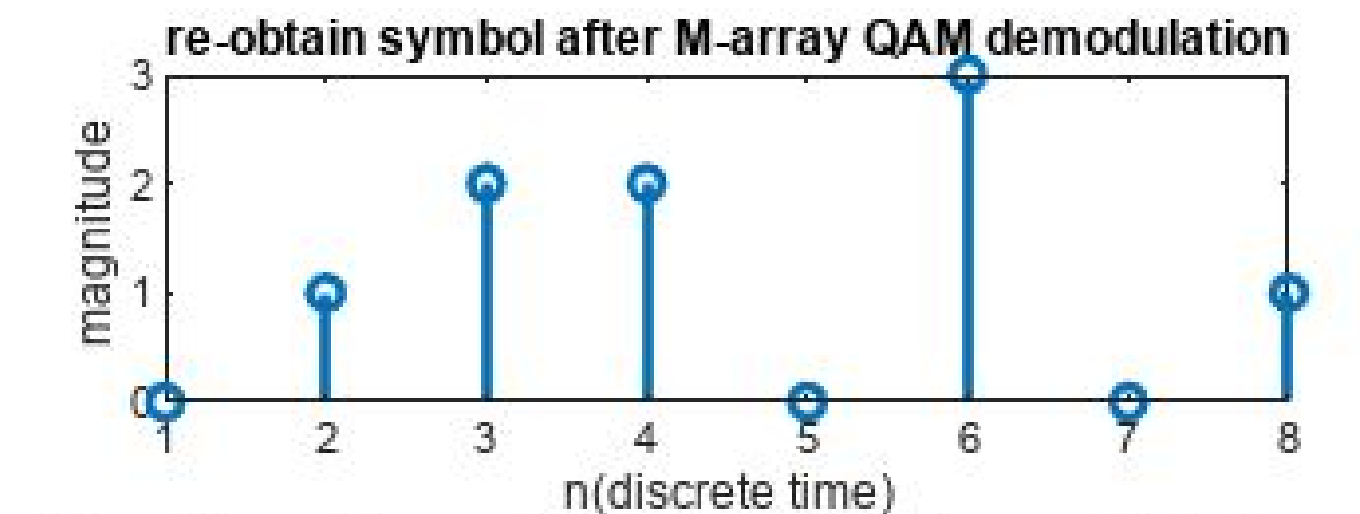
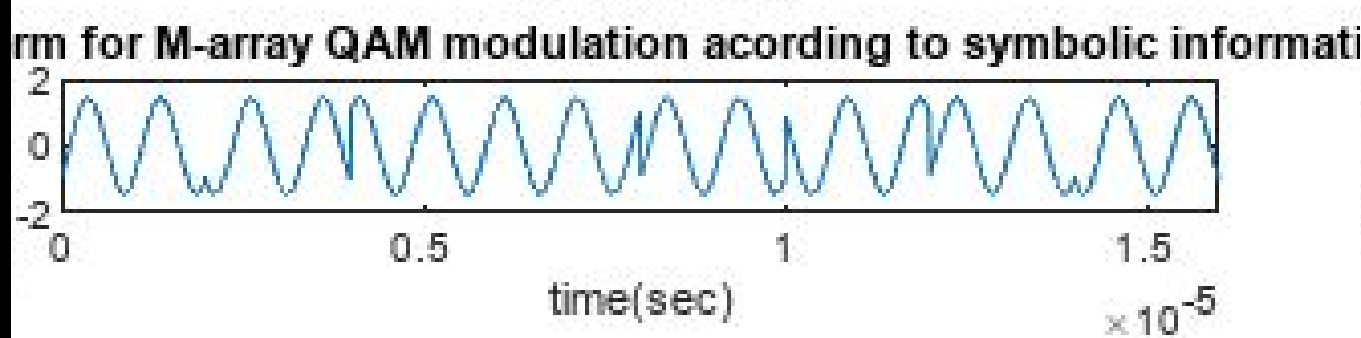
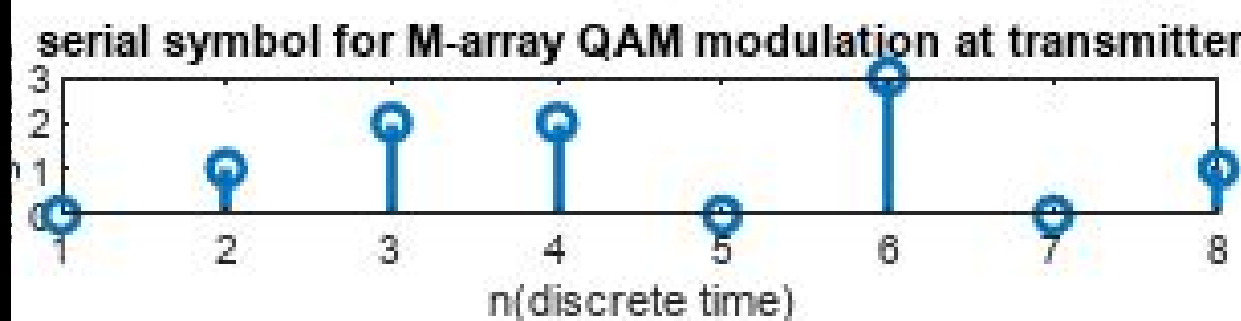
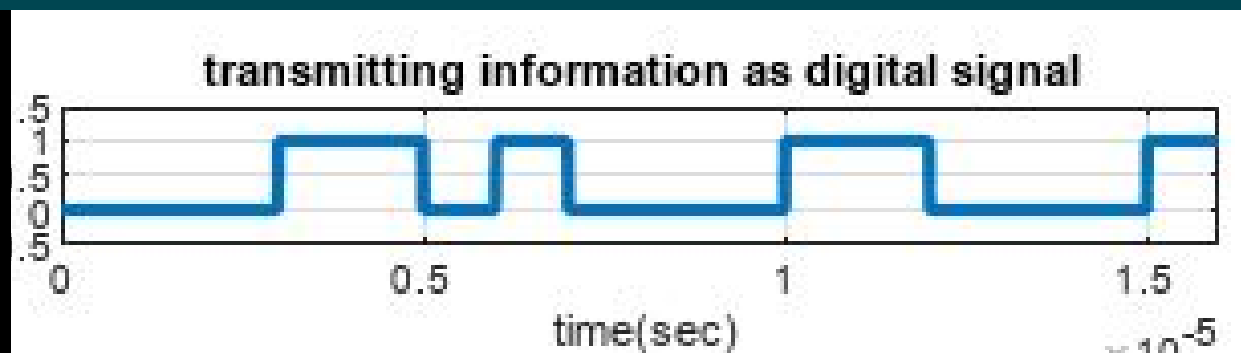
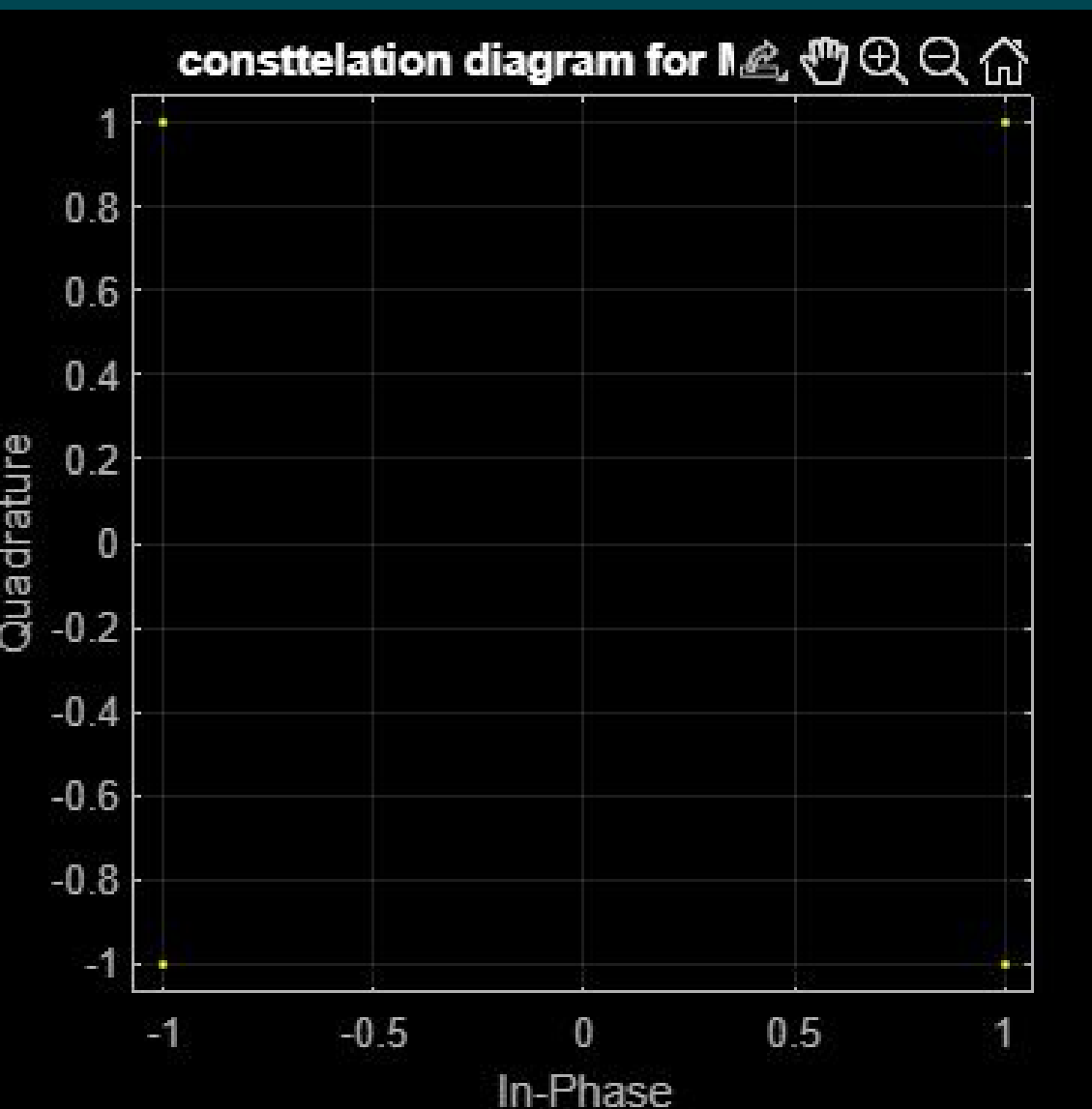
QAM is similar to amplitude modulation (AM), in which the amplitude of a carrier signal is modulated by a modulating signal, such as a voice or music signal. However, in QAM, the amplitude and phase of two carriers are modulated by two separate bit streams, which allows for a larger number of possible signal states.



# QAM

There are two types of QAM modulation: rectangular and circular. Rectangular QAM uses a rectangular constellation diagram, in which the points are equally spaced along the horizontal and vertical axes. Circular QAM uses a circular constellation diagram, in which the points are evenly spaced around a circle.

# QAM OUTPUT



# QAM APPLICATIONS

1. Cable Television
2. *Wireless Communication*
3. Satellite Communication
4. *Military Communication*

# THANK YOU

## *TEAM MEMBERS :*

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