Design of QPSK Modulator & Demodulator using FPGA

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QPSK in Brief

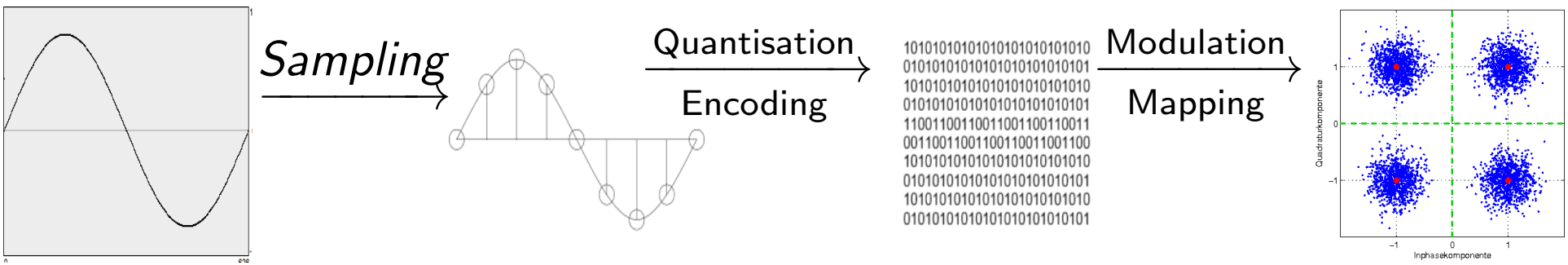
- What is it?
  Quadrature Phase Shift Keying (QPSK) is a form of Phase Shift Keying in which two bits are modulated at once, selecting one of four possible carrier phase shifts (45,135,225 or 315 degrees). It allows the signal to carry twice as much as ordinary PSK using the same bandwidth.

- Why QPSK ?
  QPSK is used for satellite transmission of MPEG2 video, cable modems, video conferencing, cellular phone systems and other forms of digital communication over an RF carrier.

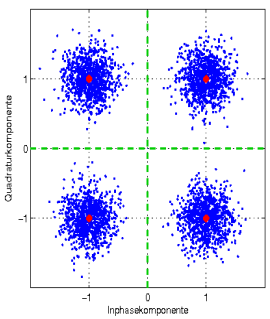
IMPLEMENTATION

- Part-1
  Implementing QPSK Modulator using FPGA
- Part-2
  Implementing QPSK Demodulator using FPGA
- Part-3
  Calculating Bit Error Rate and plotting it using Python

Implementation of Modulator - FPGA

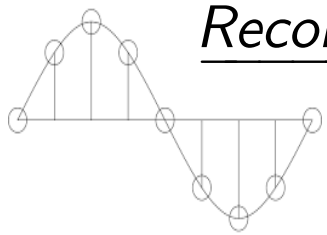


Implementation of Demodulator - FPGA

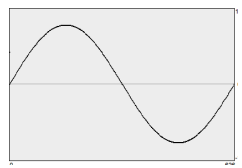


Demodulation →

DAC →



Reconstruction →



Calculating Bit Error Rate

- BER is calculated both theoretically and practically (using simulations)
- Theoretically, it is calculated using the formula :
  BER = qfunc(sqrt(SNR in dB))
- Practically, BER = No. of bits in error/ Total bits transmitted

THANK YOU