

# REPORT

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## PROJECT DESCRIPTION:

Please design a simulation reference system for GPDCH subject to Rician flat fading using MATLAB, and design a classifier for such a fading channel with QPSK modulation. Provide a report describe your design with the following performance plots:

(1) When the Rician flat fading channel  $K = 7dB$ , doppler shift (fading bandwidth)  $f_d = 20Hz$ , plot the probability of classification error at  $\frac{E_b}{N} = 20, 22, 24, \dots, 30dB$  obtained in your simulation.

2. (2) When the Rician flat fading channel  $K = 12dB$ ,  $f_d = 100Hz$ , plot the probability of classification error at  $\frac{E_b}{N} = 20, 22, 24, \dots, 30dB$  obtained in your simulation.

3. (3) When the Rician flat fading channel  $K = 200dB$ ,  $f_d = 0Hz$ , plot the probability of classification error at  $\frac{E_b}{N} = 20, 22, 24, \dots, 30dB$  obtained in your simulation.

## STEPS TO EXECUTE THE APPLICATION (IMPLEMENTATION):

### Step 1:

Open the Mathworks R2016b and design a code from MATLAB and navigate to that path where you have your source code.

### Step 2:

Start the Modulation of Random bits by using the command "`codedData=[guard1 UW output(1:970*2) guard2];`" on the Matlab. Here we have used a specific number i.e 970 to run random bits.

### Step 3:

Similarly, run the Burst Builder parallelly by using the command "`trellis = poly2trellis(5,[37 33])`  
`codedData = convenc(data,trellis);`".

#### **Step 4:**

Once the two participants are done then QPSK Modulation should be done using guard symbols and Coded data and we use " `if codedData(m)==0 & codedData(m+1)==0`

```
moddata((m+1)/2)=sqrt(0.5)+j*sqrt(0.5);".
```

#### **Step 5:**

When we choose Unique word 48 symbols for modulation we get response with respect to that particular modulation.

#### **Step 6:**

Now we do bit mapping for each type of modulation consider QPSK. Then we will perform Up sampling and pulse shaping filter to remove any kind of noise generated by QPSK modulation.

#### **Step 7:**

Now we will implement Rician and Rayleigh fading channels with the help of bandpass filter and then we will plot them with respect to time, probability density function, doppler frequency and fading bandwidth.

#### **LEARNING OUTCOMES:**

We have learnt how to implement Rician and Rayleigh fading channels with given doppler shift and learnt how to simulate QPSK modulation and to plot probability of classification error.

#### **CHALLENGES FACED:**

We faced difficulty understanding how to implement the concept of Rician and Rayleigh fading using the command " `trellis = poly2trellis(Constraintlength, Codegenerator)l`". It was challenging to implement random failures of Mathworks.

#### **REFERENCES:**

<https://www.mathworks.com/help/deeplearning/ug/modulation-classification-with-deep-learning.html>

#### **DONE BY:**

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