LAB EXPERIMENT 7

NAME: RAHIL SHARMA

PRN: 18070123062

BATCH: EA-3;G2

AIM: To study Rician Fading Parameter for non centrality.

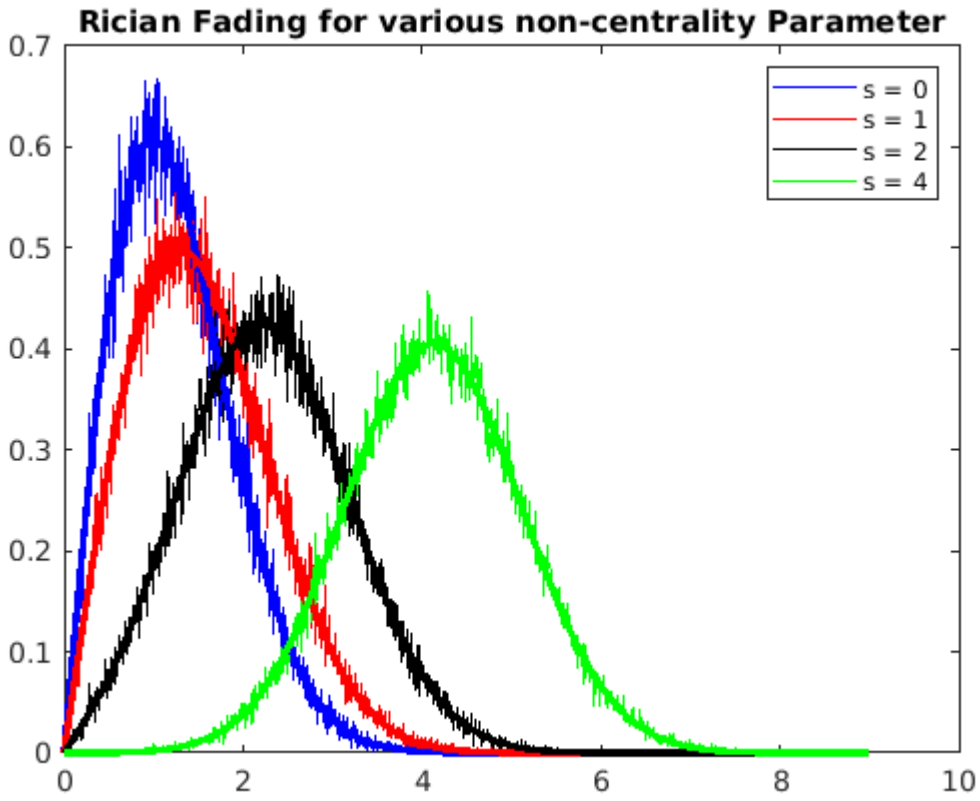
THEORY: The model behind Rician fading is similar to that for Rayleigh fading, except that in Rician fading a strong dominant component is present. This dominant component can for instance be the line-of-sight wave. Refined Rician models also consider that the dominant wave can be a phasor sum of two or more dominant signals, e.g. the line-of-sight, plus a ground reflection. This combined signal is then mostly treated as a deterministic (fully predictable) process, and that the dominant wave can also be subject to shadow attenuation. This is a popular assumption in the modelling of satellite channels.

Rician fading or Ricean fading is a stochastic model for radio propagation anomaly caused by partial cancellation of a radio signal by itself — the signal arrives at the receiver by several different paths, and at least one of the paths is changing (lengthening or shortening). Rician fading occurs when one of the paths, typically a line of sight signal or some strong reflection signals, is much stronger than the others

Code and Output of the Program:

```
N=100000; %No. of samples
sigma=1; %Variance of undelying Gaussian Variables
s=[0 1 2 4]; %Non-centrality parameter
plotStyle={'b-', 'r-', 'k-', 'g-'};
%simulating the PDF from two Gaussian Random Variables
for i = 1: length(s)
X = s(i) + sigma.*randn(1,N); %Gaussian RV with mean=s and given sigma
Y = 0 + sigma.*randn(1,N); %Gaussian RV with mean= and same sigma as Y
Z = X+1i*Y;
[val,bin]=hist(abs(Z),1000); %pdf of generated Raleigh Fading samples
plot(bin,val/trapz(bin,val),plotStyle{i}); %Normalizing the PDF to matchtheoretica
%Trapz function gives the total are under the PDF curve. It is used as thenormaliz
hold on;
end
%Theoretical PDF computation
for i=1:length(s)
x=s(i);
m1=sqrt(x);
m2=sqrt(x*(x-1));
r=0:0.01:9;
ss=sqrt(m1^2+m2^2);
x=r.*ss/(sigma^2);
f=r./(sigma^2).*exp(-((r.^2+ss^2)./(2*sigma^2))).*besseli(0,x);
plot(r,f,plotStyle{i},'LineWidth',2.5);
legendInfo{i} = ['s = ' num2str(s(i))];
title ('Rician Fading for various non-centrality Parameter');
hold on;
```

```
end
legend(legendInfo);
```



CONCLUSION: From this experiment we understood the concept of Rician Fading of Waves.