Sinhgad Institutes

Sinhgad Technical Educational Society's
SINHGAD COLLEGE OF ENGINEERING
VADGAON, PUNE-41

Department of Electronics and Telecommunications

Experiment No. – 07

Subject: - Mobile Computing

Name of the Student: Manas Patil **Roll No.** 404B041

Date: 5/3/24 **Marks & Signature: -**

Subject Teacher

Aim:

To study the outage probability, LCR & ADF in SISO for Selection Combining and MRC.

Theory

Small scale fading characterizes the fluctuation of signal (strength) over a spatial distance of fraction of wavelength. The fluctuation is also observed in both time and frequency domain at a gain location. The variation of signal (strength) at the receiver is due to random interference between the different copies of the transmitted signal. The interference is sometimes constructive and sometimes destructive. The multiple copies of the transmitted signal are generated due to scattering, reflection, and diffraction due to obstacle present in the path of radio signal between the Tx and Rx movement of the Tx and Rx or the obstacle cause time domain variation of the signal (strength) and the phenomenon is called Doppler effect. Since each path of the radio wave may exhibit difference doppler its cumulative effect results in spread of the carrier/ frequency content of the signal and hence is also known as Doppler spread.

If v is the maximum velocity (m/s) then the maximum Doppler shift is given by

$$fm=\upsilon(m/s)c=$$

Where,

- c=velocitylight=3∗108m/s.=h=3∗10*8
- fc=carrierequency.

Coherence time is defined as interval in time over which the signal remains correlated. It is defined

$$Tc= 9/16\Pi fm\ (s)$$

If symbol duration $T_s << T_c$ it experience slow fading while if Ts>Tc it experience fast fading. T
enveloped level crossing rate is defined as the rate at which the signal envelope crosses a specified le
R in the positive (or negative) going direction.
It requires the joint pdf (α,.α) of the enveloped level α=|r| and enveloped slope .α=|r|

$$LR=\sqrt{2\pi}(k+1)fm\rho e-k-(k+1)\rho 2I0(2\rho\sqrt{k(k+1)})\rho=R\sqrt{\Omega p}=RRrms$$

Rrms=$\sqrt{\Omega p}$ is the enveloped level

yleigh fading (k=0) and isotropic scattering $LR=\sqrt{2\pi}f_m\rho e-\rho 2$

evel Crossing Rate For Selection Combining

$=fm\sqrt{\pi}M\gamma\sqrt{\sigma}\exp(-\gamma 22\sigma)[1-\exp(-\gamma 22\sigma)]M-1$

Where,

- fm is the Maximum doppler frequency.
- σ is the r.m.s value of the received signal voltage.
- γ is the threshold voltage.
- M = No. of channels

Average enveloped fade duration

The average duration the enveloped remains below a specified level R.

$=1NRPr[r\leq R]$

Average fade duration For Selection Combining

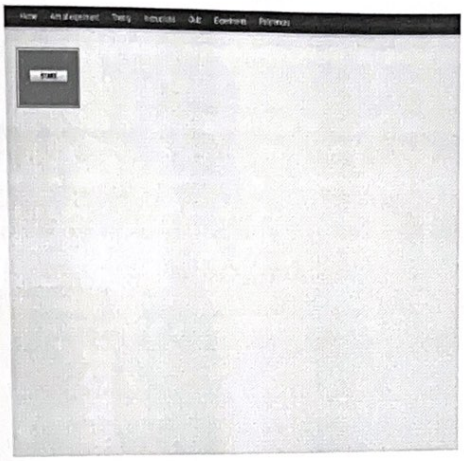
$ADF=\sqrt{\rho}*\exp(\gamma 22\sigma-1)\sqrt{2\pi}fdM\gamma$

For Rayleigh distribution fading

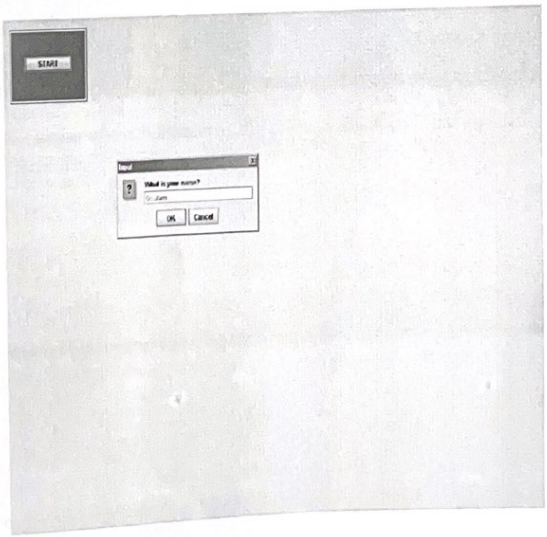
$Pr[r\leq R]=\int R0Pr(dr)=1-\exp(-\rho 2)$

$\bar{}t=e\rho 2-1\rho fm\sqrt{2\pi}$

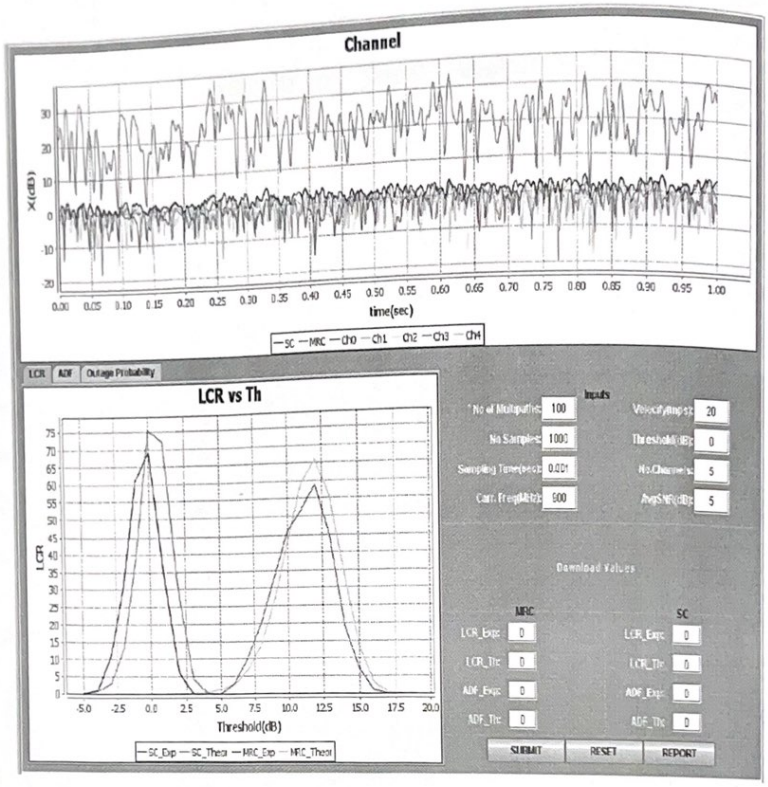
Step1:- Click on the button START. A page appears with a dialogue box asking for your name.

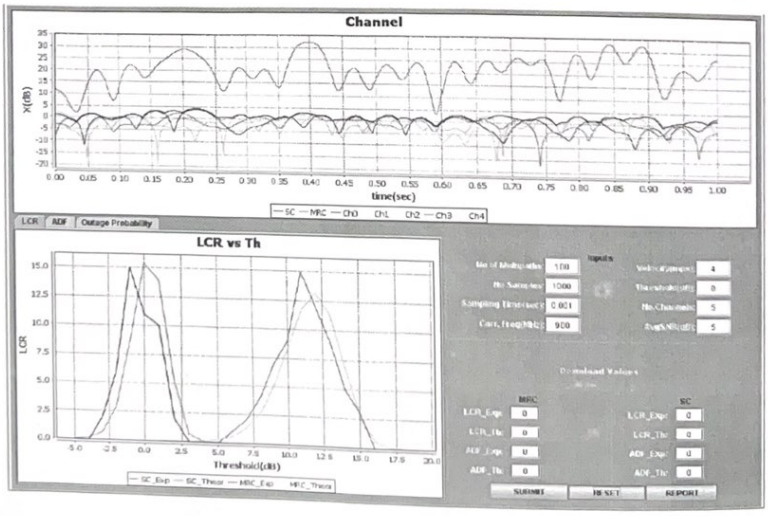


Step 2:- Enter your name then Click Ok.

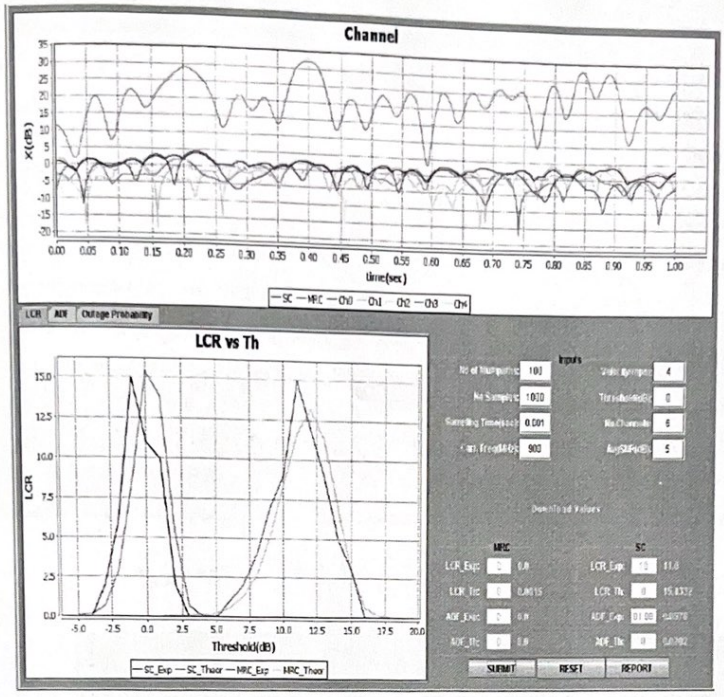


Step3: - Enter the input parameters value. Then click on "RESET" Button. Observed the waveform.

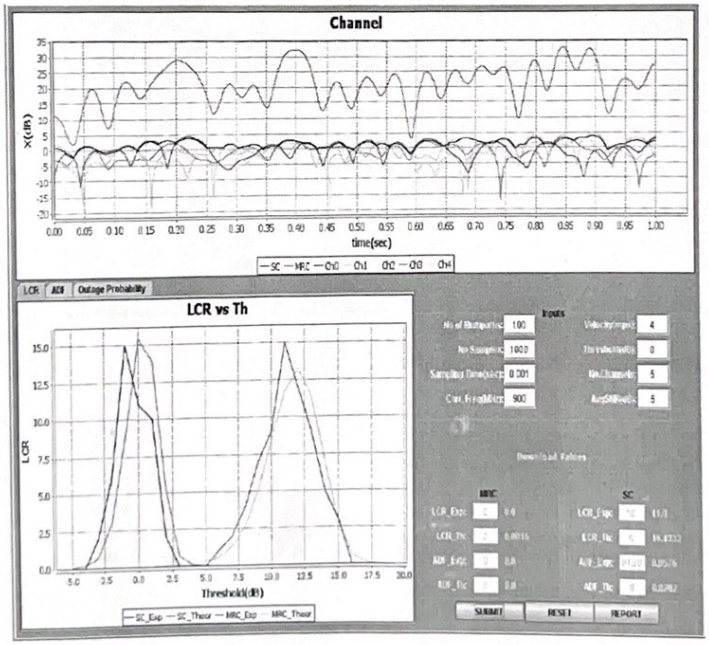




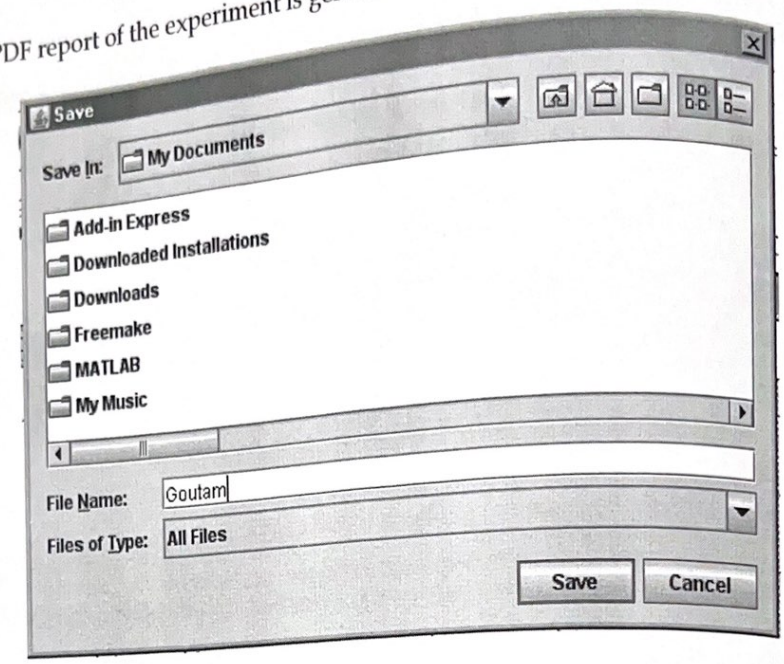
- Step4: - Enter value of LCR Exp and ADF Exp in both MRC and SC from the waveform. Then Click on "SUBMIT" Button.



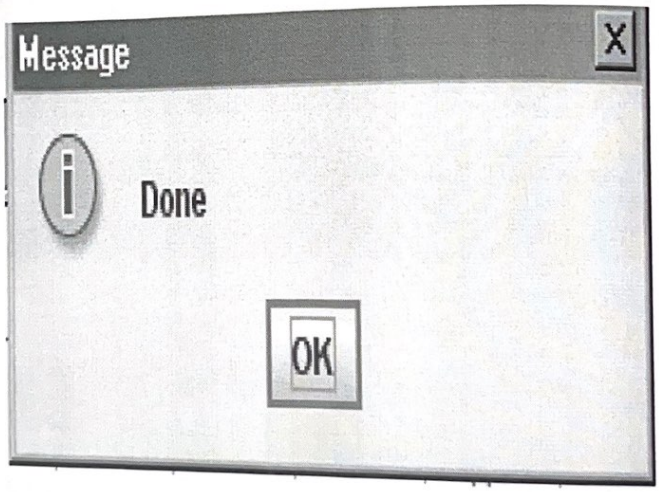
- Step5:- Click on the "Report" button.



- Step6:- PDF report of the experiment is generated.



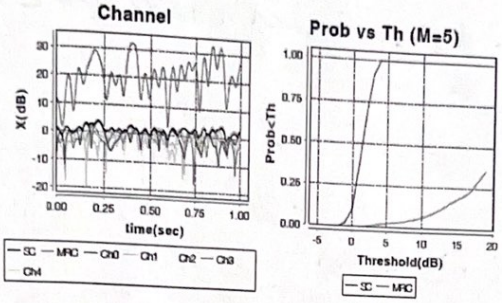
- Step7:-After generation of the Report you will get following message.

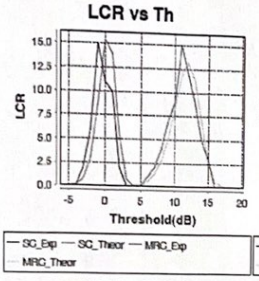


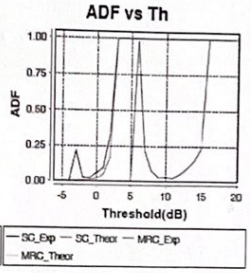
Step8:- Click on the "Ok" and you will get your Report.

Fading Channels &Mobile Communications
IIT Kharagpur
Date: Nov/6/2012

Exp9: Flat Fading
Name: GOUTAM







Input Parameters	
No.of Multipaths	100
No.Samples	1000
Sampling Time(sec)	0.001
fc(Hz)	9.0E8
Velocity(mps)	4.0
Threshold(dB)	0.0
No.of Branches	5
Avg SNR(dB)	5.0

Results

Type	LCR(Exp)	LCR(Th)	ADF(Exp)	ADF(Th)
SC(Actual)	11.0	15.4332	0.0570	0.0202
SC(Entered)	10.0	0.0	1.0	0.0
MRC(Actual)	0.0	0.0015	0.0	0.0
MRC(Entered)	0.0	0.0	0.0	0.0

(Signature of GOUTAM)

(Signature of Faculty)

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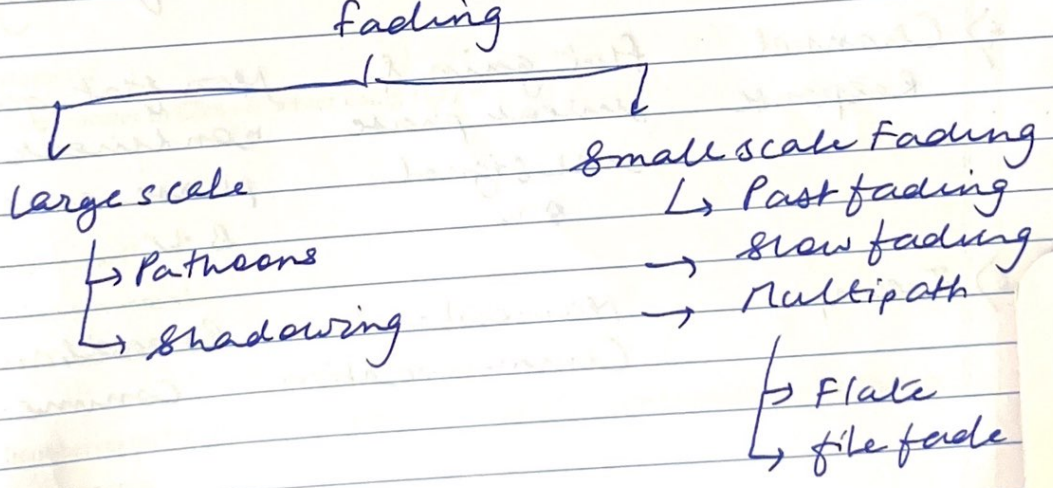
1) what is Flat fading

Flat fading occurs when symbol strength is significantly longer than the maximum excess delay

Flat fading is also described in the freq domain as being the case where signal bandwidth is smaller than the channel B.W coherence

2) What are the types of Fading



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e) Difference

feature	Flat fading	Selective Fading
1) Signal Bandwidth	less than Channel B·W	Greater than Channel B·W
2) Delay spread (σ_τ)	Less than symbol period (T_s)	Greater than symbol period (T_s)
3) Effect on signal	All freq experiences the same fading	Diff freq experience diff levels of fading
4) Channel Response	flat gain & linear phase over signal B·W	Non flat gain & non linear phase over signal B·W
5) Example	Narrowband Communication	Broadband Comms-