**Experiment 1a**

**Aim :** To find the Carrier to Interface ratio in directional antenna system of 3-sector and 6-sector case:

**Apparatus:**

MATLAB

**Program Code:**

clc;

clear all;

close all;

Y=4; % path loss exponent

K=7

q= sqrt (3\*K)

CI =(q^-Y+(q+0.7)^-Y)^( -1) % C/ I for 3-sector case

CIdB =10\* log10 (CI);

disp('cochannel interference ratio C/ I in dB for K=7 of 3-sector case :')

disp(CIdB)% ,

CI1 =((q+0.7)^-Y)^( -1) % C/ I for 6-sector case

CI1dB =10\* log10 (CI1);

disp('cochannel interference ratio C/ I in dB for K=7 of 6-sector case :')

disp(CI1dB)

**Experiment 2a**

**Analysis of Free Space Propagation Path Loss**

**Aim :** To analyze the free space path loss

**Apparatus:**

MATLAB

**Program Code:**

clc;

clear all;

fc =900\*10^6;

r =1000;

c =3\*10^8;

Yc=c/fc;

l =((4\*pi\*r)/Yc)^2 ;

Lpf =10\* log10 (l);

disp('free space path loss in dB ')

disp(Lpf)

**Experiment 2b**

**Analysis of Propagation Path Loss Using Two Ray Model**

**AIM :** To analyze the propagation path loss using two-ray model

**Apparatus:**

MATLAB

**Program Code:**

clc;

clear all;

close all;

fcMhz =800;

ht =30;

hr =2;

r =10\*10^3;

rkm =10;

LpmdB =40\* log10 (r) -20\* log10 (ht\*hr);%path loss using 2 ray model in dB

LpfdB =32.44+20\* log10 (rkm) +20\* log10 ( fcMhz ) ;%// path loss using free space model

disp('path l oss using 2 ray model=')

disp(LpmdB)

disp('path los s using free space model=')

disp(LpmdB)

**Experiment - 3**

**Analyze the AT COMMANDS of 4G LTE Smart Phone**

**Aim :** To study and perform AT commands using 4G VoLTE Smart Phone

**Apparatus** :

1. 4G LTE Smart Phone TechBook
2. SIM card(s) of any 4G service provider supporting 4G LTE frequency band
3. Power Supply for Scientech 2139 with Mains Cord

**Procedure:**

1. Connect Scientech 2139 with PC using USB Cable and check in Device Manager, Hardware should be detected.
2. Go to mobile phone “**Setting”** and then in “**Developer Options”** check **“USB debugging”** option should be enable.
3. After that click on Scientech 2139 icon on desktop to run software.
4. If everything is ok thenScientech 2139 Understanding 4G VoLTE Smart Phone window will display when software start.
5. Run Basic Set of AT Commands and Check Output on Right side in **“**Response window”
6. 7. List of Supported Commands are:

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Command Format** | **Response** | **Description** |
| 1 | **AT** | OK | Test Command |
| 2 | **ATD95XXXXXX99;** | OK | To dial a Number |
| 3 | **ATA** | OK | Attend Voice Call |
| 4 | **AT+CHUP** | OK | Voice Call End |
| 5 | **ATI** | Manufacturer: Motorola Mobility  Model: 4108  Revision: MPSS.JO.2.0.c1.8-00016-  8937\_GENNS\_PACK-1 1 [Mar 13 2017  23:00:00]  SVN: 05  IMEI: 351898083184319  +GCAP: +CGSM  OK | Request Identification Information of Mobile |
| 6 | **AT+GMI** | Motorola Mobility  OK | Request Manufacturer ID |

**Experiment - 4**

**Study and Analyze the Buzzer in 4G LTE Smart Phone**

**Aim:** ToStudy and analyze the Buzzer in 4G LTE Smart Phone TechBook

**Apparatus :**

1. 4G LTE Smart Phone TechBook
2. SIM card(s) of any 4G service provider supporting 4G LTE frequency band
3. Power Supply for Scientech 2139 with Mains Cord

**Theory:**

This is the circuit which informs the incoming call by ringing the bell or ringtone. This is also used to here the other tones of the mobile phone like Key tone, alarm tone, alert tone etc. Ringer/ buzzer control circuit gets the signal form CPU at the time of incoming call. These control signals activate the ringer circuit to provide the pulses to buzzer and it starts ringing. Alerting tones or melodies are generated by a buzzer. Ringing driving circuit is mainly made by CPU, Buzzer driving circuit and Buzzer. Whenever there is an incoming call or message else ringing is software activated. Ringing Driving Control signal that’s a PWM signal is obtained from Central Processing Unit (CPU) and given driver circuit. After amplification it reaches at one tapping of buzzer.

**Procedure:**

1. Once the TechBook is initially ready and if it detects the 4G service provider network(s) with sufficient network strength, further experiment can be done with this TechBook as follows.
2. Press “Menu” button.
3. Use scroll keys to until you get the option ‘Settings’.
4. Select ‘Sound profiles’ using Up/Down key.
5. Select ‘Normal’ and press ‘Edit’. Select ‘Call alert type’ and press ‘Change’.

Select ‘Melody’ mode and save.

1. Go back and select the ‘Voice call ring tone’. Press ’Change’ and select any ring tone.
2. Make a Call to the TechBook.
3. You will observe that the Buzzer starts to ring when TechBook is called.
4. Observe the Buzzer signal at test point in User Interface Section. It is a PWM signal which is converted to sound as shown in figure.

**Experiment - 5**

**Study and Analyze the Vibrator in 4G LTE Smart Phone**

**Aim:** ToStudy and analyze the vibrator in 4G LTE Smart Phone

**Apparatus:**

1. 4G LTE Smart Phone TechBook
2. SIM card(s) of any 4G service provider supporting 4G LTE frequency band
3. Power Supply for Scientech 2139 with Mains Cord

**Theory:**

The function of the Vibrator section is to inform the user at the time of incoming call by vibrations. Vibrator control circuit receives the control signal form the CPU and activates the controlling circuit to provide the operating voltage to the vibrator and vibrator starts to vibrate until it gets the signals from the CPU.The vibrator driving circuit is similar to that of ringer circuit. It is used for giving silent information to user for incoming calls. This is also called Vibra Alert Device. When an incoming call comes then this device gives its information to user by vibrating. V BATT supply is given at other tapping of this vibrator. Operation of turning ‘On’ Vibrator is controlled by software. A vibra alerting device is similar to the DC motor. In the mobile phone it is used to generate a vibration signal for an incoming call.

**Procedure:**

1. Once the TechBook is initially ready and if it detects the 4G service provider network(s) with sufficient network strength, further experiment can be done with this TechBook as follows.
2. Press “Menu” button.
3. Use scroll keys to until you get the option ‘Settings’.
4. Select ‘Sound profiles’ using Up/Down key.
5. Select ‘Normal’ and press ‘Edit’.
6. Select ‘Normal’ and press ‘Edit’. Select ‘Call alert type’ and press ‘Change’. Select ‘Vibration’ mode and save. Go back to initial window.
7. Make a Call to the TechBook.
8. You will observe that the vibrator starts to vibrate when TechBook is called.
9. Observe the Vibrator signal at test point in User Interface Section. It is a DC voltage which drives the vibrator to vibrate. It is approximately 1.5V to 3V.