SATELLITE COMMUNICATION (ECE-815-F)

LAB MANUAL

VIII SEMESTER

Department Of Electronics & Computer Engg

Dronacharya College Of Engineering

Khentawas, Gurgaon – 123506

LIST OF EXPERIMENTS

EXPERIMENT NO. 1

AIM: To set up a satellite communication link and study of change in uplink and downlink frequency
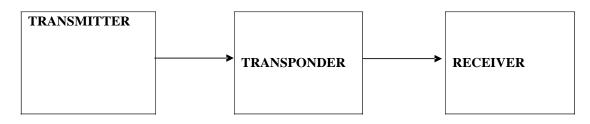
BRIEF THEORY:

UPLINK TRANSMITTER: In up link station the signal has to be sent at a different frequency usually in higher 1GHz band to avoid interference with link signal. Another function performed by uplink station is to control highly internal function of satellite. up links are controlled so that transmitted micro wave beam is extremely narrow in order not to interface with adjacent satellite.

TRANSPONDER: Each satellite has a number of transponder witch access to a pair of receive / transmit antennas and associated electronics for each channel. For example in Europe the uplink sends a signal at a frequency of about 14 GHz. These are received downlink converted in frequency of about 11/ 12 GHz and boosted by high power amplifier for retransmission to earth. Separate transponder are used for each channel and are powered by solar panels with backup batteries for eclipse protection.

DOWN LINK RECIEVER: The medium used to transmit signal from satellite to earth is microwave electromagnetic radiation which is much higher in frequency normal broadcast TV signal in VHF / UHF bands. Microwave still exhibit a wave like nature, but inherit a tendency to serve attenuation by water vapors or any obstruction in line of sight of antenna. The transmitted micro wave power is extremely weak by the time it reaches earth and unless well designed equipment is used and certain installation precaution are taken, the back round noise can ruin the signal.

BLOCK DIAGRAM:

TRANSMITTER	→	TRANSPONDER	→	RECEIVER

PROCEDURE:-

1   Connect the satellite uplink transmitter to AC mains.
1   Switch on the transmitter by mains switch and frequency display will come on.
2   The transmitting frequency can be selected by up –down switch. The frequency can be changed from 1200 -1250-1300 MHz.
3   The transmitter on –off switch will switch on –off the transmission.
4   Connect X1 antenna to uplink transmitter with BNC –BNC cable.
5   Set the o/p gain of uplink transmitter to maximum.
6   Place downlink receiver at a distance of 5-7 m.
7   Connect the downlink receiver to the AC mains and switch it on by mains switch.
8   The downlink receiver frequency can be changed from 1100 -1150 -1200   MHz.
9   The downlink receiver also has tuning potentiometer, which can be use to tune any frequency from 950- 1500 MHz.

10 Keep the tuning POT fully anticlockwise.
11 The downlink receiver on –off switch will switch on –off the receiver.
12 Attach R2 antenna to the downlink receiver with BNC –BNC cables.
13 Align both the transmitter and receiver antenna in line.
14 Place a satellite transponder between transmitter and receiver at a distance of 5-7 m.

RESULT: -The link has been established between Transmitter and Receiver through satellite.

DISCUSSION: - The quality of signal is much improved with active satellite especially when distances between transmitter and receiver are considerable.

PRECAUTIONS: - 1. Connection should be tight.
                         2. Switch off power supply after performing the experiment.

QUIZ:

Q.1.What is passive satellite?

Ans. These satellites simply reflect signal back to earth.

Q 2. What is active satellite?

Ans. These electronically repeat the signal and send it back to earth.

Q .3. What is Non synchronous satellite?

Ans. These satellites rotate around the earth in a low altitude elliptical or circular pattern.

Q. 4. What is geosynchronous satellite?

Ans. These satellite orbits in a circular pattern with an angular velocity equal to that of earth.

Q. 5. Explain ITU?

Ans. International Telecommunication Union.

Q .6. Define Transponder.

Ans. A microwave repeater, which receives, amplies, down converts and retransmits signals at a communication satellite.

Q .7. Define Uplink.

Ans. The earth station electronics and antenna which transmit information to a communication satellite.

Q .8 Explain IFRB.

Ans. International Frequency Registration Board.

Q. 9. What is CCIR?

Ans. International Radio Consultative Committee.

Q .10 What is CCITT?

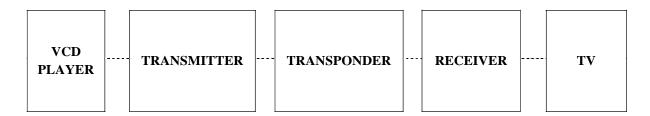Ans: International Telegraph and Telephone consultative Committee.

EXPERIMENT NO.2

AIM:-To establish an Audio-Video satellite link between Transmitter and Receiver.

APPARATUS REQUIRED: - Uplink Transmitter, Downlink Receiver, dish antennas, Transponder, monitor and connecting cables.

BRIEF THEORY: - The Uplink transmitter sends signals at an uplink frequency, which is higher than downlink frequency to avoid the interference. The quality of signal is much improved with active satellite specially when distances between transmitter and receiver are considerable.

BLOCK DIAGRAM:-

VCD PLAYER	----	TRANSMITTER	----	TRANSPONDER	----	RECEIVER	----	TV

PROCEDURE:-

1 Connect the satellite uplink transmitter to AC mains.
2   Switch on the transmitter by mains switch and frequency display will come on.
3   The transmitting frequency can be selected by up –down switch. The frequency can be changed from 1200 -1250-1300 MHz.
4   The transmitter on –off switch will switch on –off the transmission.
5   Connect X1 antenna to uplink transmitter with BNC –BNC cable.
6   Set the o/p gain of uplink transmitter to maximum.
7   Place downlink receiver at a distance of 5-7 m.
8   Connect the downlink receiver to the AC mains and switch it on by mains switch.
9   The downlink receiver frequency can be changed from 1100 -1150 -1200 MHz.
10   The downlink receiver also has tuning potentiometer, which can be used to tune any frequency from 950- 1500 MHz.
11   Keep the tuning POT fully anticlockwise.
12   The downlink receiver on –off switch will switch on –off the receiver.
13   Attach R2 antenna to the downlink receiver with BNC –BNC cables.
14   Align both the transmitter and receiver antenna in line.
15   Place a satellite transponder between transmitter and receiver at a distance of 5-7 m.
16   Connect the satellite transponder to the AC mains and switch it on by mains switch.
17   The receiver side of satellite Transponder has an on –off switch, which will switch off the receiver of the satellite. Similarly on –off switch on transmitter side will switch off transmitter of satellite.
18   Adjust transmitter uplink frequency to 1300 MHz and transponder receiver frequency also to 1300MHz.
19   Keep downlink frequency of Transponder to 1100MHz.
20   Keep the downlink receiver to 1100MHz.
21   Connect the Audio/Video signal at the input socket provided on the Uplink Transmitter, Video at video input and audio at audio 1 input.
22. Connect TV monitor to the Audio/Video o/p of downlink receiver. Set TV in AV mode.

23. The TV monitor will display video and audio signal that you have connected to uplink transmitter input.

RESULT: -The monitor display shows that a successful audio and video link has been establish between Transmitter and Receiver through satellite.

DISCUSSION: - The quality of signal is much improved with active satellite specially when distances between transmitter and receiver are considerable.

PRECAUTIONS: - 1. Connection should be tight.

                             2. Switch off power supply after performing the experiment.

QUIZ:-

Q.1 What is PAL?

Ans. Phase Alternate Line. The European color TV format which evolved from the American NTSC standard.

Q.2 What is Pad?

Ans. A concrete base upon which a supporting pole and antenna can be mounted.

Q.3 What is Q Signal?

Ans. One of two color video signal components used to modulate the color sub carrier. It represents the color range from yellow to green to magenta.

Q.4 What is Raster?

Ans. The random pattern of illumination seen on a television screen when no video signal is present.

Q.5 What is SAW (Surface Acoustic Wave) filter?

Ans. A solid state filter that yields a sharp transition between regions of transmitted and attenuated frequencies.

Q.6 What is Reference signal?

Ans. A highly stable signal used as a standard againsted which other variable signals may be compared and adjusted.

Q.7 What is Vertical Blanking Pulse?

Ans. A pulse used during the vertical retrace period at the end of each scanning field to extinguish illumination from the electron beam.

Q. 8 What is the difference between TV transmission center and Satellite transmission center.

Ans. TV transmitter transmits its signals in VHF/UHF range and Satellite transmitter uses SHF range.
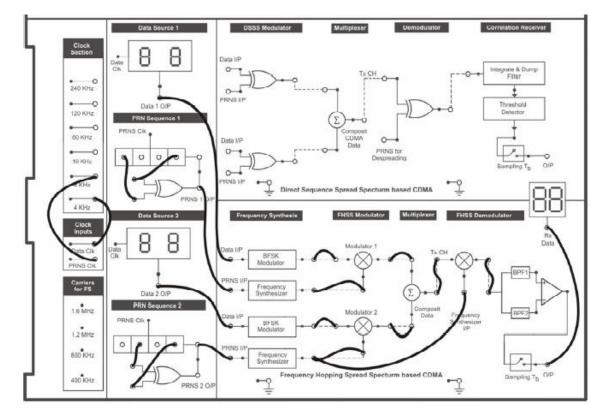
Q.10 What is the function of LNB?

Ans. LNB is mounted on dish antenna so as to minimize the transmission losses, the these signals are sent to satellite receiver.

EXPERIMENT NO:3

AIM: - To Study Frequency Hopping Spread Spectrum (FHSS) Modulation and Demodulation Technique

APPRATUS REQUIRED: - Two Channel CDMA (DSSS and FHSS), 2 mm Banana cable, Oscilloscope

CIRCUIT DIAGRAM:-

BRIEF THEORY: - In Frequency Hoping Spectrum, available channel bandwidth is broken into a large number of non-overlapping frequency slots. Data is modulated onto time-varying, Pseudo random carrier frequencies. Transmitter "hops" between different narrowband Channels with centre frequency fi, and bandwidth B (instantaneous bandwidth). Spectrum BW (bandwidth) over which hopping occurs is called the total hopping. Data sent by hopping transmitter carrier to seemingly random channels which are known only to desired receiver. On each channel, data bursts are sent using conventional narrowband modulation hopping period/hop duration . There are generally two types of hopping schemes employed in FHSS

Fast Hopping: In this scheme the hopping rate is kept equal to or greater than the Data rate. The hopping rate should not be many time faster than the data rate. Generally it can be 2-3 times faster than the data rate.

Slow Hopping: In this scheme the hopping rate is kept lower than the data rate. Also, the data rates which can be supported by FHSS system are quite lower than the data rates supported by DSSS systems.

PROCEDURE:-

1. Connect the power supply to ST2117 trainer board but do not switch ON the Power supply until all the connections is made.

2. Now connect '4 KHz' clock signal from the 'Clock Section' to the 'Data clock' Socket of the 'Clock Inputs' section. This clock will drive the data generators.

3. Connect '8 KHz' clock signal from the 'Clock Section' to the 'PRNS Clock' Socket of the 'Clock Inputs' section. This clock will drive PRN sequence Generators.

4. Connect inputs of the feedback XOR gate of 'PRN Sequence 1' to any two Sockets of the linear shift register.

5. Connect inputs of the feedback XOR gate of 'PRN Sequence 2' to any two Sockets of the linear shift register. Remember that these taping positions should be different from the one used in PRN sequence generator 2.

6. Connect 'Data 1 O/P' of 'Data Generator 1' to the 'Data I/P' of one of the two BFSK modulators under 'Frequency Synthesis' section. Connect the 'PRNS 1 O/P' of the 'PRN Sequence 1' generator to the input of Frequency synthesizer .

7. Connect 'Data 2 O/P' of 'Data Generator 2' to the 'Data I/P' of the second BFSK   modulators under 'Frequency Synthesis' section. Connect the 'PRNS 2 O/P' of the 'PRN Sequence 2' generator to the input of second Frequency Synthesizer.

8. Now connect the output of BFSK modulators and frequency synthesizers to their respective modulators as indicated by the dashed lines.

9. Connect the outputs of the modulators to the respective inputs of the multiplexer.

10. Now switch ON the power supply.

11. Observe the data outputs of data generators and PRN sequence output of PRN sequence generators.

12. Observe the outputs of BFSK modulators and frequency synthesizers.

13. Observe the final multiplexed (composite) FHSS signal at the output of the multiplexer.

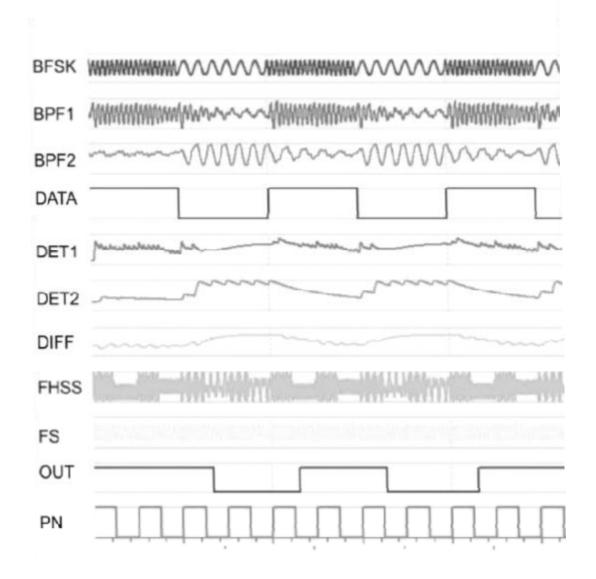14. To demodulate the user data, connect the multiplexed FHSS signal to the input of FHSS demodulator.

15. Now apply the output of that frequency synthesizer for which the corresponding data has to be recovered from the multiplexed data.

16. Make rest of the connections as shown in the connection diagram.

17. Observe the final output and verify that the demodulator demodulates that channel data whose corresponding frequency synthesizer output is applied to the demodulator.

18. Follow the same procedure for slow hopping scheme by changing the data rate and PRN sequence rate as shown in the table above for slow hopping scheme.

OBSERVATIONS DIAGRAM:-

CONCLUSION:-

1. The system efficiently multiplexes and demultiplexes the channels using separate PRN sequence driven Frequency synthesizer output for both the channels.

2. The receiver recovers the data of that particular channel, whose frequency synthesizer output is used for demodulation at the demodulator end.

QUIZ:-

Q1:-What are the two common spread spectrum techniques used to transmit signals?

Ans:-Direct Sequence (DS) and Frequency Hopping (FH).

Q2: What is frequency Hopping method?

Ans:-The data signal is transmitted as a narrow band signal with a bandwidth only wide enough to carry the required data rate. At specific intervals, this narrow band signal is moved, or hopped, to different frequency within the allowed band. The sequence of frequencies follows a Pseudo - random sequence known to both the transmitter and receiver.

Q3:-What is direct Sequence Spread Spectrum?

Ans:-In Direct Sequence Spread Spectrum method, the signal is multiplied by a Pseudo random code sequence having a much faster bit rate. As a result, the bandwidth of the data signal gets spread. On the receiver side, this signal can then be multiplied with the same pseudo random sequence to demodulate the original data.

Q4:- Define Throughput?

Ans:-Throughput means what amount of data is actually carried by the system and is defined, as the average amount of data (per second) carried by the system.

Q5:-What is the rate of the system?

Ans:-The rate of a system is defined as the amount of data (per second) carried by a system when it is active.
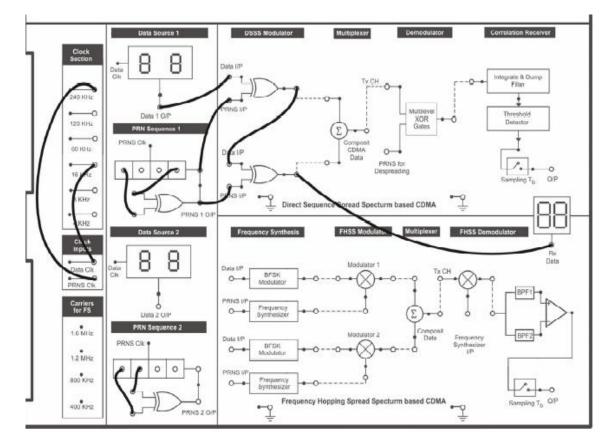
EXPERIMENT NO: 4

AIM:- To study generation(spreading) & demodulation(Despreading) of DSSS modulated signal.

APPRATUS REQUIRED:- Two Channel CDMA (DSSS and FHSSS),2 mm Banana cable, Oscilloscope

BRIEF THEORY:- Direct sequence is a spread spectrum technique in which the bandwidth of a signal is increased by artificially increasing the bit data rate. This is done by breaking each bit into a number of sub-bits called "chips". For example, if this number is 10, each bit in the original signal would be divided into 10 separate bits, or chips. This results in an increase in the data rate by 10. By increasing the data rate by 10, we also increase the bandwidth by 10. The signal is divided into smaller bits by means of a PN sequence. This can be accomplished by using a two-input exclusive OR gate, where one input is the low speed data and the other input is a high speed PN-sequence

.**CIRCUIT DIAGRAM:-**

PROCEDURE: -

DSSS Modulation:

1. Connect the power supply to the ST2117 trainer board

2. Now connect '16 KHz' clock signal from the 'Clock Section' to the 'Data Clock' Socket of the 'Clock Inputs' section. This clock will drive the data generators.

3. Connect '240 KHz' clock signal from the 'Clock Section' to the 'PRNS Clock' socket of the 'Clock Inputs' section. This clock will drive PRN sequence generators.

4. Connect inputs of the feedback XOR gate of 'PRN Sequence 1' to any two sockets of the linear shift register.

5. Connect 'Data 1 O/P' of 'Data Generator 1' to the 'Data I/P' of one of the two XOR gate under 'DSSS Modulator' section. Connect 'PRNS I/P' of the same gate to the 'PRNS 1 O/P' of the 'PRN Sequence 1' generator.

6. Now switch ON the power supply.

7. Check the data output and PRN sequence output using oscilloscope.

8. Observe the output of the XOR gate, which is used as the spreader, on the oscilloscope.

9. Change the data frequency to 8 KHz (or 16 KHz) and then observe the spreaded signal using oscilloscope.

10. Similarly change the PRN sequence clock frequency to 120 KHz (or 60 KHz)and then observe the output
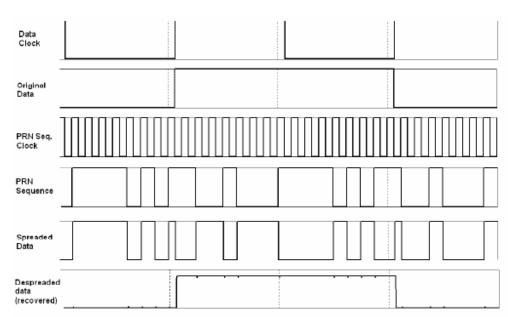
DSSS Demodulation:-

1. Connect the spreaded data output from DSSS modulator (XOR gate) to the 'Data I/P' of the other XOR gate, which will be used here as DSSS-demodulator. Connect 'PRNS I/P' of this gate to the 'PRNS 1 O/P' of the 'PRN sequence 1' generator.

2. Observe the output of demodulator XOR gate.

3. Verify that the O/P of demodulator is same as the input data.

4. Repeat the same experiment with different data clock and PRN sequence clock and then verify the result with each combination. Also take care of the fact that the PRN sequence rate (chip rate) is kept many times higher than the data rate.

OBSERVATIONS DIAGRAM: -

CONCLUSION:

1. Thus we conclude that the data can be spreaded by a PRN sequence using an XOR gate. Similarly Dispreading is done by again XORing the modulated Signal with the same PRN sequence used for spreading.

2. Spreading and Dispreading is done efficiently with different data rates and chip rates in a single user environment. The ratio of data rate to the chip rate is known as Processing Gain. In multi-user environment, the Processing gain should be high enough to recover the particular channel data.

QUIZ:-

Q1:- What is the benefit of spread spectrum?

Ans:-. It's ideally suited to smooth out 'tone' interference or jamming, average over multi-path fading effects, and handle multi-user environments.

Q2:-What is Processing Gain?

Ans:-The ratio of data rate to the chip rate is known as Processing Gain.

Q3:- What is Fast Hopping?

Ans:- In this type of hopping, the hopping rate is kept equal to or greater than the data rate. The hopping rate should not be many time faster than the data rate. Generally it can be 2-3 times faster than the data rate.

Q4:-what is slow hopping?

Ans:-in this type of hopping, hopping rate is kept lower than the data rate.

Q5:-What is Direct sequence is a spread spectrum technique

Ans:- Direct sequence is a spread spectrum technique in which the bandwidth of a signal is increased by artificially increasing the bit data rate. This is done by breaking each bit into a number of sub-bits called "chips".

EXPERIMENT 5

AIM:- To study radiation pattern &calculate beam width for Yagi uda & folded dipole antenna

APPARATUS REQUIRED: - RF Generator, Transmitting Mast, Receiving Mast, RF Detector, Matching Stub,Yagi Uda and folded diopole antenna.

BRIEF THEORY :

RF Generator Delivers a test signal to feed the antennas under test. The RF Generator operates at a frequency of 750 MHz approximately. The antenna is a reciprocal device, means it radiates or receives electromagnetic energy in the same way. Thus, although the radiation pattern is identified with an antenna that is transmitting power, the same properties would apply to the antenna even, if it was receiving power. Any difference between the received and radiated powers can be attributed to the difference between the feed networks and the equipment associated with the receiver and transmitter. The antenna radiates the greatest amount of power along its bore sight and also receives power most efficiently in this direction.

BLOCK DIAGRAM:

| RF GENERATOR | → | Transmitter Mast | → | Receiver Mast | → | RF detector |

PROCEDURE:

1.Place the main unit on the table and connect power cord.

2.Adjust Level Potentiometer of RF generator to middle position. Select switch to 'INT' position and adjust Level

3. Select the switch to 'FWD' position and adjust FS ,ADJ Potentiometer to middle position.

4.Install Transmitting mast, place it beside the main unit and connect it to the .main unit's 'RF OUT' using a BNC to BNC cable of 25" long.

 5.Install Receiving mast and keep it at some distance from the Transmitter mast.

6.Place RF detector Unit beside the Receiving mast and connect it to the Receiving mast using a BNC to BNC cable of 25" long

7.Keep the base of Transmitting mast such that the '0'degree position of Goniometry should be directed towards the RF Detector and also align the marker of the mast with '0' degree position.

8.Install Detector Antenna on the Receiving mast. Keep its direction towards the Transmitting mast by rotating it in counter clockwise direction.

9.Install folded Dipole Antenna on the Transmitting mast. Keep its direction towards the Receiving mast by rotating it in counter clockwise direction

10.Switch on the main unit and check the Display in DPM of Directional Coupler.

 11.It will show some reading according to its level knob at starting.

12. Connect a +7.5 - 9V Adapter to the RF Detector unit, Switch it on and keep the Level knob at middle position. It will show some reading according to its level knob at starting. (In case of over loading, reduce it by level Potentiometer of RF detector)
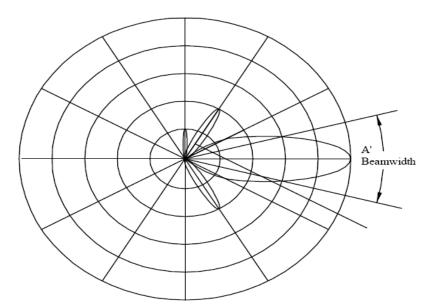
13. Now vary the FS Adjust Potentiometer of Directional Coupler to make the display reading 100 Micro Amp and then adjust the Level of RF detector to show the ¾ reading of the main unit's display.

14.Rotate the transmitting Antenna between 0-360 degrees and observe the display at RF Detector. The variation in reading indicates that the transmitter and receiver are working and radiation pattern is formed.

OBSERVATIONS:

Angles(in degree)	Current (µA)	dB

GRAPH

QUIZ:-

Q .1. What is Multiplexing?

Ans. Transmission of different signal in a form that these do not interfere with each other is termed multiplexing.

Q .2. What is Carson rule?

Ans. B=2(Δf +fm)

Q. 3. What is SCPC?

Ans. Single channel Per Carrier System.

Q. 4. Where it is used for?

Ans. It is used for earth stations with relatively few channels.

Q.5. What are advantage of SCPC?

Ans.It does not require expensive multiplexing and demultiplexing, hence cost reduced.

Q. 6. What is bit?

Ans. It is used for binary digit.

Q.7. What is baud?

Ans. It is unit of signaling speed.

Q.8. What is digital base band signal?

Ans. It is combination of logical ones and zero.

Q.9. What is orthogonal signal?

Ans. If inner product (Sr.Sj) =0

Q.10. What is ASK?
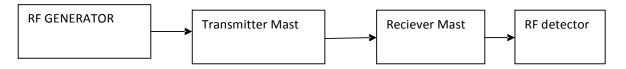
Ans. Amplitude Shift Keying.

EXPERIMENT 6

AIM:- To study radiation pattern & calculate beam width for circular & triangular patch. antenna

APPARATUS REQUIRED:- RF Generator, Transmitting Mast, Receiving Mast, RF Detector, Matching Stub, circular & triangular patch.

BRIEF THEORY :-
RF Generator Delivers a test signal to feed the antennas under test. The RF Generator operates at a frequency of 750 MHz approximately. The antenna is a reciprocal device, means it radiates or receives electromagnetic energy in the same way. Thus, although the radiation pattern is identified with an antenna that is transmitting power, the same properties would apply to the antenna even, if it was receiving power. Any difference between the received and radiated powers can be attributed to the difference between the feed networks and the equipment associated with the receiver and transmitter. The antenna radiates the greatest amount of power along its bore sight and also receives power most efficiently in this direction.

BLOCK DIAGRAM:

RF GENERATOR	→	Transmitter Mast	→	Reciever Mast	→	RF detector

PROCEDURE:

1.Place the main unit on the table and connect power cord.

2.Adjust Level Potentiometer of RF generator to middle position. Select switch to 'INT' position and adjust Level

3. Select the switch to 'FWD' position and adjust FS ,ADJ Potentiometer to middle position.

4.Install Transmitting mast, place it beside the main unit and connect it to the .main unit's 'RF OUT' using a BNC to BNC cable of 25" long.

 5.Install Receiving mast and keep it at some distance from the Transmitter mast.

6.Place RF detector Unit beside the Receiving mast and connect it to the Receiving mast using a BNC to BNC cable of 25" long

7.Keep the base of Transmitting mast such that the '0'degree position of Goniometry should be directed towards the RF Detector and also align the marker of the mast with '0' degree position.

8.Install Detector Antenna on the Receiving mast. Keep its direction towards the Transmitting mast by rotating it in counter clockwise direction.

9.Install folded Dipole Antenna on the Transmitting mast. Keep its direction towards the Receiving mast by rotating it in counter clockwise direction

10.Switch on the main unit and check the Display in DPM of Directional Coupler.

 11.It will show some reading according to its level knob at starting.

12. Connect a +7.5 - 9V Adapter to the RF Detector unit, Switch it on and keep the Level knob at middle position. It will show some reading according to its level knob at starting. (In case of over loading, reduce it by level Potentiometer of RF detector)
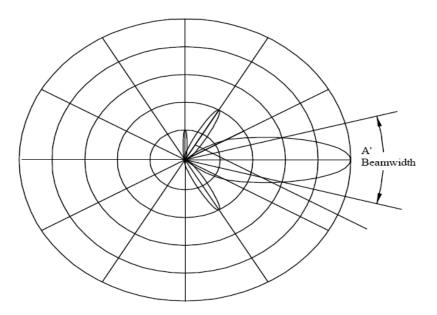
13. Now vary the FS Adjust Potentiometer of Directional Coupler to make the display reading 100 Micro Amp and then adjust the Level of RF detector to show the ¾ reading of the main unit's display.

14.Rotate the transmitting Antenna between 0-360 degrees and observe the display at RF Detector. The variation in reading indicates that the transmitter and receiver are working and radiation pattern is formed.

OBSERVATIONS:

Angles(in degree)	Current (μA)	dB

GRAPH:

QUIZ:-

Q .1. Give another name of ASK.

Ans. OOK: - On Off Keying.

Q .2. What is PSK?

Ans. Phase Shift Keying.

Q. 3. What are main problems with comm. satellite reaching the orbit?

Ans. Launching and putting the satellite in to geostationary orbit maintaining it.

Q. 4. What is apogee?

Ans. The point where the satellite is farthest from the earth.

Q.5. What is perigee?

Ans.The point where satellite is closest from the earth.

Q. 6. What are look angle?

Ans. The look angles are the angles to which an earth station antenna must be pointed to communicate with the geosynchronous satellite.

Q.7. What is trace?

Ans. The movement of the electron beam from left to right on a television screen.

Q.8. What is threshold?

Ans. A minimal signal to noise input required to allow a video receiver to deliver an acceptable picture.

Q.9. What is thermal noise?

Ans. Random, undesired electrical signals caused by molecular motion, known more familiarly as noise.

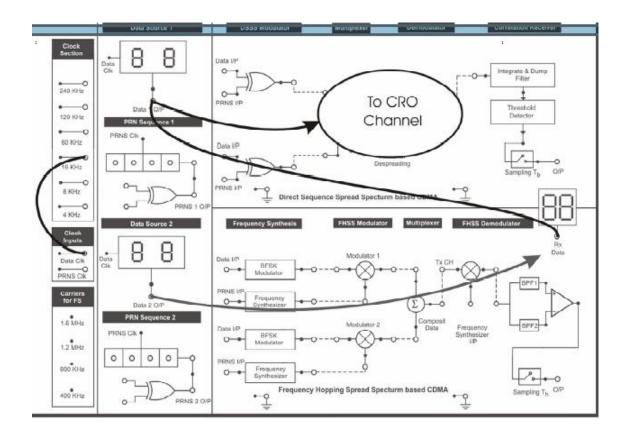Q.10. UHF stands for.

Ans. Ultraviolet High Frequency.

EXPERIMENT NO. 7

AIM:- Study of Data and PN Sequence Generation

APPARATUS REQUIRED:- Two Channel CDMA (DSSS and FHSS) Trainer ST2117, 2 mm Banana cable, Oscilloscope

THEORY :- A Pseudo-random Noise (PN) sequence is a sequence of binary numbers, e.g. ±1, which appears to be random; but is in fact perfectly deterministic.
A software or hardware device designed to produce a PN sequence is called a PN Generator. Pseudo-random noise sequences or PN sequences are known Sequences that exhibit the properties or characteristics of random sequences. They can be used to logically isolate users on the same frequency channel. They can also be used to perform scrambling as well as spreading and dispreading functions. The reason we need to use PN sequences is that if the code sequences were deterministic, then everybody could access the channel. If the code sequences were truly random on the other hand, then nobody, including the intended receiver, would be able to access the channel
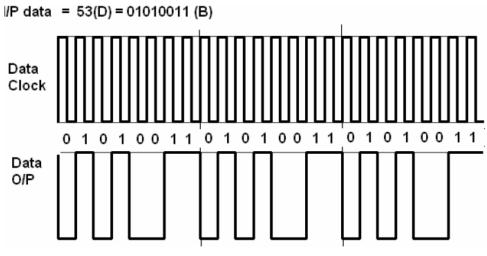
CIRCUIT DIAGRAM:-

PROCEDURE: -
1. Connect the power supply mains cord to the ST2117, but do not turn on the power supply until connections are made for this experiment.
2. From Clock Section, connect 16 KHz Clock output to Data Clock input (Clock inputs).
3. Switch ON the power supply.
4. Observe data output of Data Source 1 on LED display given on-board and verify that correct data output is shown in LED display
5. Change input data through BCD switches and observe the output of Data Source1
6. Observe the data pattern on CRO screen. The data output is a repeating 8 bit serial sequence of the input data selected through BCD switches.
7. Change the clock input to 8 KHz or 4 KHz and then observe the data output.
8. The same sequence of experimental operation can be repeated with Data source 2
9. Connect slot B and Slot D of PRN Sequence 2 to input of XOR (Exclusive OR Gate) of PRN Sequence 2.
10. Connect oscilloscope CH1 to Data 1 O/P (output) and CH2 to PRNS 1 O/P.
11. Rotate the BCD switches of Data Source 1 to set data and observe the Data output wave form.
12. Connect Data 1 O/P to RX Data (Received Data) and observe data directly on display.
13. Connect oscilloscope CH1 to Data 2 O/P (output) and CH2 to PRNS 2 O/P.
14. Rotate the BCD switches of Data Source 2 to set data and observe the Data output waveform.
15. Connect Data 2 O/P to RX Data (Received Data) and observe data directly on display.

OBSERVATION DIAGRAM:-

Verify data O/P waveforms for other BCD inputs.

CONCLUSION:

1. The data output of Data Sources are correct as per the input applied through BCD switches
2. The data output is appearing correctly with different data clock applied and the result is also verified on LED display given on board.

QUIZ:-

Q1:- Define CDMA?
 Ans: - Code division Multiple Access technique

Q2:-Define Process Gain?
Ans:-the process gain is defined as the difference between the output and input signal to noise ratio

Q3:-Write the equation for process gain?
Ans: - Process gain, G_p = $\dfrac{BW_{rf}}{R_{inf}}$

Q4:-What is the advantage of CDMA over other technique?
Ans:- CDMA offers key advantage of flexible allocation of resources. There is no strict limit on number of users that can be supported.

Q5:- What are the basic properties of PN sequences?
Ans:- Balance Property, Run Property, Correlation Property

EXPERIMENT NO :8

AIM: To study GPS data like longitude, latitude using GPS receiver.

APPARATUS REQUIRED : ST 2276 Kit, Connector, Power Supply, Software.
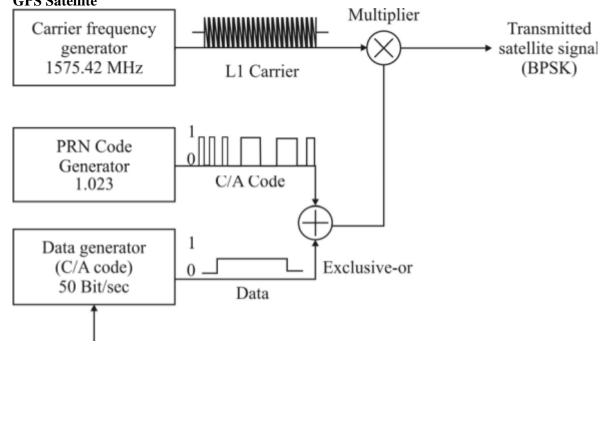
BRIEF THEORY :
Earth Shape :A significant problem when using the GPS system is that there are very many coordinate systems worldwide. As a result, the position measured an calculated by the GPS system does not always coincide with one's supposed position. In order to understand how the GPS system functions, it is necessary to take a look at the basics of the science that deals with the surveying and mapping of the Earth surface, geodesy. Without this basic knowledge, it is difficult to understand why with a good portable GPS receiver the right combination has to be selected from more than 100 different map reference systems. If an incorrect choice is made, a position can be out by several hundred meters.
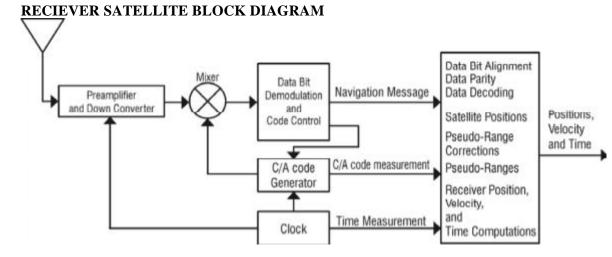Different Earth Shapes like :
1. Geoids
2. Spheroid
3. Worldwide reference ellipsoid WGS-84
Format of latitudes and longitudes : Where a numeric latitude or longitude is given, the two digits immediately to the left of the decimal point are whole minutes, to the right are decimals of minutes, and the remaining digits to the left of the whole minutes are whole degrees. Eg. 4533.35 is 45 degrees and 33.35 minutes. ".35" of a minute is exactly 21 seconds. Eg. 16708.033 is 167 degrees and 8.033 minutes. ".033" of a minute is about 2 seconds.

BLOCK DIAGRAM:
GPS Satellite

RECIEVER SATELLITE BLOCK DIAGRAM

PROCEDURE :

Following steps has to be perform while doing the experiments.

1. Please go through the manual before performing any practical.
2. Install the software from the CD ie. Open WinZip from the CD and run the setup file. If you don't have WinZip then please install WinZip from the CD itself.
3. Connect mains cord to the trainer **ST2276**. Don't switch on the system now.
4. Connect serial cable to the port which is available on the trainer. Connect
5. another end of the cable to PC serial port (COM1, COM2, COM3 etc.).
6. Connect the patch antenna to SMA (subminiature) connector of the **ST2276** trainer.
7. Place the antenna in the open space ie. Place the antenna outside the window.
8. Switch on the trainer **ST2276**.
9. Open software from start / program file /GPS Diag. Now click on option like COM1, if it is not possible to detect then check your PC com port. If your PC com port is COM2 then click COM2 in the software. As soon as you click on any of these com port according to your PC the software will start displaying some signals.

OBSERVATION TABLE

Latitude	Longitude	City	State	Country

PRECAUTION:

1. switch off the power while placing the antenna at different location.
2. Do touch the antenna while taking the reading

CONCLUSION: - The latitude, longitude of the city is calculated while placing the antenna at different location

QUIZ:-

Q.1 What is blanking signal?

Ans. Pulses used to extinguish the scan illumination during horizontal and vertical retrace periods.

Q.2 What is board band?

Ans. A device that processes a signal spanning a relatively board range of input frequencies.

Q.3 What is clamp circuit?

Ans. A circuit that removes the dispersion waveform from the downlink signal.

Q.4 What is Conus?

Ans. An abbreviation for the continental United States.

Q.5 What is Composite Video Signal?

Ans. The complete video signal consisting of the chrominance and luminance information as well as all sync and blanking pulses.
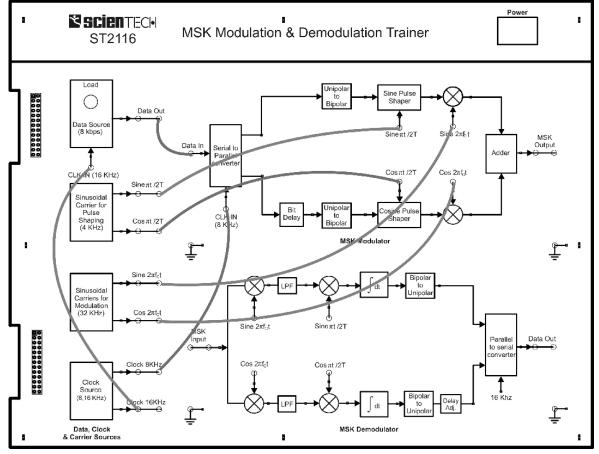
EXPERIMENT NO :9

AIM :TO Study of Minimum Shift Keying Modulation Process

APPARATUS REQUIRED: ST2116, MSK modulation /Demodulation Trainer Board,
 Cathode Ray Oscilloscope, 2MM Patch Cords.

BLOCK DIAGRAM :

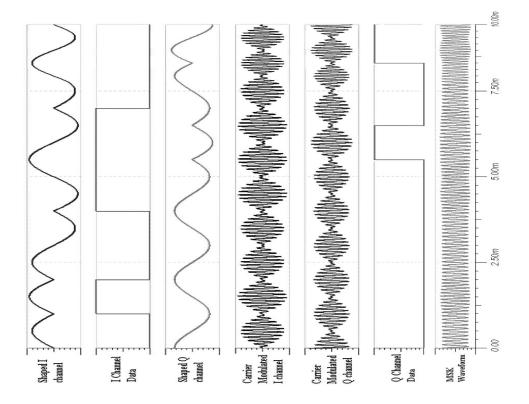Refer to the following figure to configure setup for the present experiment:

PROCEDURE :

1. Before making connections, make sure that power supply is switched off.
2. Refer to the figure 14 shown above while making connections.
3. Connect 16 KHz clock output of clock source to the data generator's 'CLK IN' input.
4. Connect the 'Data Out' of data source to the 'Data In' of serial to parallel converter.
 5. Connect 8 KHz clock out of clock source to the 'CLK In' of serial to parallel converter.
 6. Now connect 'Cos πt/2T' and 'Sin πt/2T' output of 'sinusoidal carrier for pulse shaping
   generator' to the inputs of 'Sin pulse shaper' and 'Cosine pulse shaper'.
7. Connect the Sine and Cosine carrier outputs of 'sinusoidal carrier generator for modulation'

block (32 KHz) to the carrier inputs of the modulators as shown above in the figure 15.

8. Now turn 'On' the Power supply and reset the data source.

9. Repeat the steps 4 to 14 of the Exp.1 and obtain the different waveforms.

10. Now observe the outputs of the multipliers. Compare these results with the theoretical diagram shown in figure 5.

11. Observe the output of the adder block. This is the complete MSK signal waveforms (See figure 16 given below).

12. View both the serial data and modulated signal simultaneously on the CRO screen. Make the waveforms stable by adjusting the time base of the CRO. Observe the frequency shift in the modulated waveform. Also this shift is much lesser then generally seen in an FSK waveform. By our intuitive observation of the modulated signal we can immediately make some conclusions such as the modulated waveform is not having any abrupt phase changes as was seen in BPSK, QPSK and OQPSK which assures that the modulated waveform does not contain very high frequency contents and also the frequency shift is very low. All these features suggest the improvements in the bandwidth of the Modulated signal.

13. Verify the phase continuity of the MSK waveform. Also verify that the modulated waveform has almost constant envelop.

OBSERVATION

RESULT: The MSK modulated wave form has observed

QUIZ:

Q.1 Define AFC?

Ans. A circuit which locks an electronic component in to a chosen frequency.

Q.2 Define AGC?

Ans. A circuit that uses feedback to maintain the o/p of an electronic component at a constant level.

Q.3 What is Back Porch?

Ans. That portion of the horizontal blanking pulse that follows the trailing edge of the horizontal sync pulse.

Q.4 What is Bird?

Ans. Jargon or nickname for communication satellite.

Q.5 What is blanking pulse level?

Ans. The reference level for video signal. The blanking pulses must be aligned at the i/p to the picture tube.
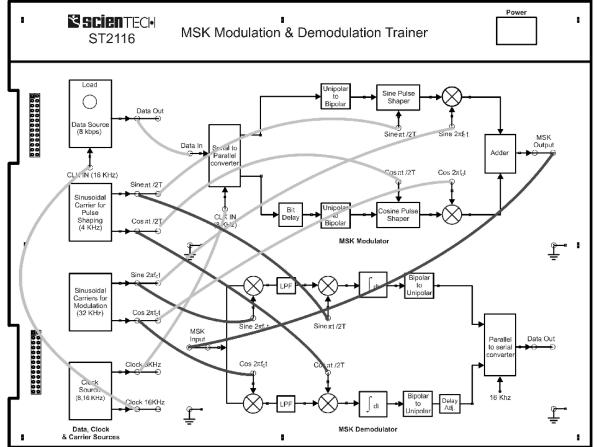
EXPERIMENT :10

AIM : Study of Minimum Shift Keying (MSK) Demodulation Process

APPARATUS REQUIRED: ST2116, MSK modulation /Demodulation Trainer Board,
 Cathode Ray Oscilloscope, 2MM Patch Cords.

BLOCK DIAGRAM :

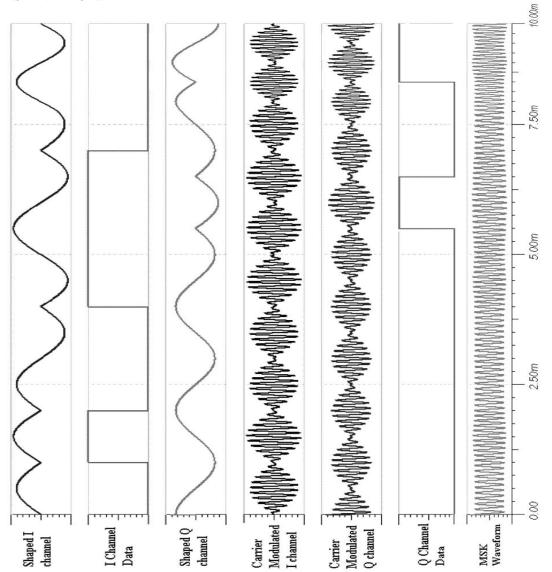Refer to the following diagram to configure your setup for the present experiment Setup for

PROCEDURE :
1. Make the connections for modulation as described in the Experiment 1 and 2. refer to the
figure 15 and figure 16 for making connections.
2. For Demodulation connect the modulated signal to the input of demodulator.
3. Connect the orthogonal sinusoidal carriers to the input of the first stage of multipliers.
4. Connect the Wave shaping carriers to the second stage of multipliers.
5. Now turn 'On' the power supply.
6. Reset the data source and observe the MSK modulated waveform at the modulator Output.
7. Observe the outputs of first stage of multipliers in the demodulator section.
8. Observe the output of Second stage of multipliers in the demodulator section.
9. Observe the output of integrators and try to make some inferences from these waveforms.

10. Finally observe the output of parallel to serial converter and compare this recovered data with original modulating data. Verify that recovered data is received without any error.

OBSERVATION:-

RESULT: The MSK demodulated wave form has observed

QUIZ:-

Q .1. Define VSWR.

Ans. The ratio between the minimum and maximum voltage on a transmission line.

Q .2. What is the Up converter?

Ans. A device that increases the frequency of a transmitted signal.

Q. 3. Define Trace.

Ans. The movement of the electron beam from left to right on a television screen.

Q. 4. What is threshold?

Ans. A minimal signal to noise input required to allow a video receiver to deliver an acceptable picture.

Q.5. What isVTO (Voltage Tuned Oscillator)?

Ans.An electronic circuit whose o/p oscillator frequency is adjusted by voltage.

Q. 6. What is Splitter?

Ans. A device that takes a signal and splits it in to two to more identical but lower power signals.

Q.7. What is Tap?

Ans. A device that channels a specific amount of energy out the main distribution system to a secondary outlet.

Q.8. PSD stands for.

Ans. Polarity Selection Device.

Q.9. What is Raster?

Ans. The random pattern of illumination seen on a television screen when no video signal is present.

Q.10. What is Hum Bars?

Ans. A form of interference seen as horizontal bars or black regions passing across the field of a television.

DISCUSSION: - Three separate signals can be successfully transmitted using satellite comm. link.

PRECAUTIONS: - 1. Connection should be tight.

2. Switch off power supply after performing the experiment.

QUIZ:-

Q.1 What is cross modulation?

Ans. A form of interference caused by the modulation of one carrier affecting that of another signal.

Q.2 What is Dc power Block?

Ans. A device which stops the flow of dc power but permits passage of higher frequency ac signals.

Q.3 What is Detent Tuning?

Ans. Tuning in to a satellite channel by selecting a preset resistance.

Q.4 What is Domsat?

Ans. Abbreviation for domestic communication Satellite.

Q.5 What is Drifting?

Ans. An instability in a preset voltage, frequency or other electronic circuit parameter.

Q.6 What is Elevation Angle?

Ans. The vertical angle measured from the horizontal up to a targeted Satellite.

Q.7 Define F/D Ratio?

Ans. The ratio of an antenna's focal length to diameter. It describes antenna "depth ˝.

Q.8 What is Inclinometer?

Ans. An instrument used to measure the angle of elevation to a satellite from the surface of the earth.

Q.9 What is Insertion Loss?

Ans. The amount of signal energy lost when a device is inserted in to a communication line. Also known as feed – through loss.

Q. 10 Define INTELSAT?

Ans. The International Telecommunication Satellite Consortium, a body of 154 countries working towards a common goal of improved worldwide satellite communications