Indian Institute of Information Technology, Allahabad

Electronics and Communication Engineering Department

Course Name: Radar & Satellite Communication

Experiment No. 9

Aim :- To study the effect of fading and measure the fading margin of a received signal.

FADING

OBJECTIVE:

To study the effect of fading and measure the fading margin of a received signal.

EQUIPMENT REQUIRED:

- Satellite uplink transmitter, satellite downlink receiver and satellite link emulator
- RHCP & LHCP axial mode helix antennas, Dish Antennas, Patch antennas
- Antenna stands with connecting cables, PC monitor(from Lab) , Video to VGA converter card provided, Camera, Function generator (from lab), CRO X 2 (from lab), spectrum analyzer (from lab)

PROCEDURE:

1. Setup the link in same fashion with Tx, Rx and Satellite link emulator at 3 vertices of a triangle. If switching ON the 1kHz tone on transmitter will make the receiver sound to 1KHz test tone via satellite, PLL of complete link are O.K. and a successful sat link is said to be established.
2. Now, connect a T connector at video in of Tx so that the video signal from CCD camera can be simultaneously viewed on CRO. Similarly connect another CRO at Rx end using T connector for visualizing the received video signal via satcom link. Also view both the audio channels one by one on the other channel of CRO at both Tx and Rx end using T connectors. Use a function generator to feed sine waves at Tx end.
3. See if you can receive clearly video as well as both audio frequencies. Now increase the path loss at both ends and see if you can receive both audio as well as video simultaneously. Why does video signal remain hardly disturbed whereas audio reception is highly susceptible to path loss and multipath effect?
4. Now, observe on CRO, how does video, audio/sine waves behaves on fading the carrier by introducing the Fading from satellite link emulator.
5. Connect the IF out of Rx to spectrum analyzer and tune the spectrum at 479.5 MHz, which is IF of Rx. IF level can be read from spectrum analyzer. Thus except for conversion gain of RF to IF, behavior of RF is same as IF i.e., IF follow RF.
6. Make sure the Rx is not saturated with carrier otherwise effect of fading might not be visible. This can be done by increasing path loss at Rx.
7. Vary the Fading pot and measure the variation of the carrier level on spectrum analyzer. **Make sure the path loss at satellite down link is high**. This time varying variation of carrier is fading. Fading can be read as fluctuations in RSSI readings. The difference between maximum and minimum reading of RSSI converted into power level(from chart) will give fading in dB's. If received signal strength is reduced to its minimum, one can see the fading in audio and video. **Fading margin** is the variation of carrier allowed during link which doesn't affect the corresponding audio or video. Find Fading Margins of video and audio.

RESULT:

Fading is an effect in which carrier level received tends to change with respect to time slowly. Level variation results in changing C/N which can result in a decrease in communication quality. The link may be disrupted entirely if the variation reduces the C/N to below threshold. Enough margin of C/N has to be allocated to allow for fading margins so that no noticeable change is observed in signal.
Fading in video is difficult because of better S/N(because of more bandwidth) but it is much pronounced in audio as audio subcarrier is already 25 dB down from video carrier level plus S/N for audio is much less as compared to video because of little FM deviation allowed.