Example of um(t) = amcgt (t) cos 2pfct + amsgt (t) sin 2pfct; m = 1; 2; m report

Art & Culture, Symbolism

Lab reports on Quadrature amplitude modulation and Demodulation

Introduction

Quadrature amplitude modulated is an electro-magnetic wave signal that employs two Quadrature signal carriers cos 2pfct, sin 2pfct, of which each of the signal carriers are modulated by an independent sequence of information bits. The transmitted signal assumes a wave form of this nature.

the values Amc and Amg are the two sets of amplitude that need to modulated.

QAM can be viewed as a form of combined amplitude digital phase modulation and digital amplitude. The resultant transmitted QAM signal is a cosine wave which is expressed as shown below.

umn(t) = AmgT (t) cos(2pfct + øn); m = 1; 2; :::; M1; n = 1; 2; :::; M2

This means, if M1 = 2k1 and M2 = 2k2 the resultant combined amplitude and the phase modulation is the simultaneous transmission of k1 + k2 = log2M1M2 binary digits occurring at a symbol rateRb=(k1 + k2)

Sm= (EsAmc) (EsAms) m = 1, 2, , M

Objectives

Examine sensitivity of the QAM to phase errors

Apparatus

Phasescope signal simulator

Procedures

This practical is to be done in three phases.

Phase 1

For the 16-QAM on the phase scope, switch to constellation mode, persistent mode and high persistent mode. Again on the same, set the Phi-offset to -57 and the Ref(dBfs) to -0. 7. Observe the constellation made.

Without changing the constellation and the persistent modes adjust the phi offset to -60 and Ref(dBfs) to -0. 7.

For the 255-QAM adjust as above to obtain similar constellation.

Connect the output signal to the Oscilloscope and observe the signal behavior.

Without changing anything on the phase scope set the amplitude to the maximum to give a symbol separation.

Adjust the Phasescope to 64-QAM and observe the constellation formed.

Phase 2

Again on your phase scipe make the connections as shown in the figure below.

Adjust the phase phi offset to 90.

Add some noise in form of a sinusoidal curve and observe the difference on the screen.

Phase 3: Demodulation

Make the connections as shown in the figure below

Set the modulation data signal level controls to two thirds. Observe the constellation made.

On the same Phasescope, change the Phi-offset to 900 and observe the resultant constellation.

Switch to Constellation mode and set Hi persist on and Persistence on.

Use the buttons at the bottom of the block diagram, set the modulation to

16-QAM. Adjust the signal level controls to equal square QAM signal with

minimum radius of about 0. 7.

Use the Phi Offset control on the Phasescope to rotate the constellation so it is square with the graticule.

Open the oscilloscope to see the signal data being received from the I and Q

channels.

Switch the oscilloscope to X-Y mode and observe the constellation. If needful

set the oscilloscope to lower rate time-base. If you want to see all the points

of the constellation, set the signal control level to a third of the full scale of

the control.

Adjust the carrier and local oscillator IQ phase differences and observe the changes.

Results and analysis

Phase I Results

The constellations observed are as shown below at 570 16-QAM

At 600 and 64-QAM the constellation is as shown below

At 255QAM the constellation looked as follows

The signal out put on the oscilloscope was a square wave of this kind

For the 16 QAM the signal output on the oscilloscope was a square wave of

this manner.

The square wave implies that the signal is digital.

Phase 2 results

After setting the phase to 900 the constellation was as shown below

The constellation rotated and a graticule was obtained

After adding some noise this constellation was obtained this was different

from the previous one because of the noise signal that was added.

Adding some more noise the signal was as shown below.

Phase 3 results and analysis

After changing the probes to 900 this were the observed results the output

signal was trapezoidal as recorded in the oscilloscope is as shown below

after reconnection the constellation begun to rotate

the circular rotating constellation is as shown below

Conclusion

The best constellation does not occur exactly when measured oscillator

phase differences are 900. This is because minimal phase offsets are added

by the non-ideal components in the electronics. These effects need to be

compensated in real life system. This report simply builds a simple

simulation model to illustrate the QAM techniques and how the

Communication Block Set can be implemented in real life situation.

References

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