CALIFORNIA INSTITUTE OF TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING

EE 163A
Communication Theory I

Winter 2005

http://ee163.caltech.edu

Communication System Analysis Project
Part 3: M-PSK and M-QAM

We will continue our investigation of phase shift keying systems by simulating an MPSK system, assuming the use of Gray coding, for $M = 2, 4, 8, 16$. Error probability range of interest is from $1 - \sim 10^{-5}$, corresponding to SNR from $0 - \sim 20$ dB.

- Compute and plot the simulated and theoretical *symbol* error rate curves for these four systems in a single graph.
- Produce another similar graph for the probability of *bit* error. For the theoretical plots use the approximation given in Eq. 5.2-62 of your text. For what range of signal-to-noise ratios does the approximation hold well, and where does it fail? Why?

You are also to simulate an M-QAM system for $M = 4, 8, 16, 32,$ and 64. Produce two sets of graphs showing the bit error and symbol error rate curves for these five systems. Also show the theoretical results.

Notes:

- Write your simulator in such a way so that you obtain the probability of a bit error and the probability of a symbol error at the same time and in one run, rather than in two separate runs.
- This is not a group project - you must work on this by yourself alone.
- Each individual should hand in a 1-2 page report that presents and discusses the results found. Please hand in (email) your source code as well, in one compressed file (zip or tar).