Çankaya University – ECE Department – ECE 376

2013 Spring Term **April 2013**

Experiment 8 : Probability of error , P_e, for ASK, PSK , QAM

Experiment files : MallPeMdl_2012.m, Allmodd.mdl, AllDmodd.mdl, PeMaryPSK.m and quade.m

1. From the course webpage, download the MATLAB files, MallPeMdl_2012.m, Allmodd.mdl, AllDmodd.mdl, PeMaryPSK.m and quade.m and run MallPeMdl_2012.m with the present settings. You will get a graph as shown in Fig. 1.
2. This experiment (equivalent to Exercise 6.1 of lecture notes entitled, "ECE376_ Dimensionality of Signals_ASK_PSK_QAM_FSK_Jan 2013_HTE") is intended to demonstrate the probability of error rankings for different modulation types at different M ary levels. This is done by experimentally counting errors and comparing those to the theoretical ones as well.
3. Related explanations can be found on pages 46 and 47 of lecture notes entitled, "ECE376_ Dimensionality of Signals_ASK_PSK_QAM_FSK_Jan 2013_HTE".
4. By using the MATLAB m and the model files, find the P_e curves at $M = 2,\ 4,\ 8,\ 32,\ 64,\ 128$ for ASK, PSK, QAM. Compare your results with Figs. 7.55, 7.57 and 7.62 of Proakis 2002 (also pasted here in Figs. 2, 3 and 4). Make comments the dependency of P_e on M, n_s and modulation type. Explain why theoretical and experimental curves differ in some runs. Sample graphs are provided below in Fig. 6.13 and 6.14 for $M = 4$ and $M = 16$. Record the various waveforms on your notebook, labelling each of them.

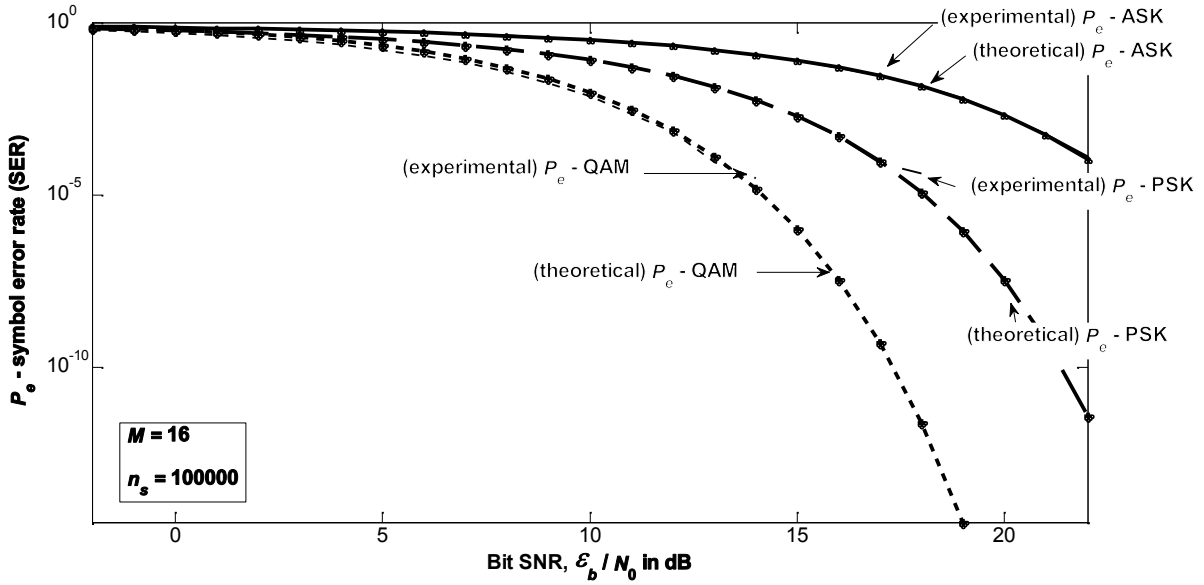

Fig. 1 Typical output from the m file MallPeMdl_2012.m.

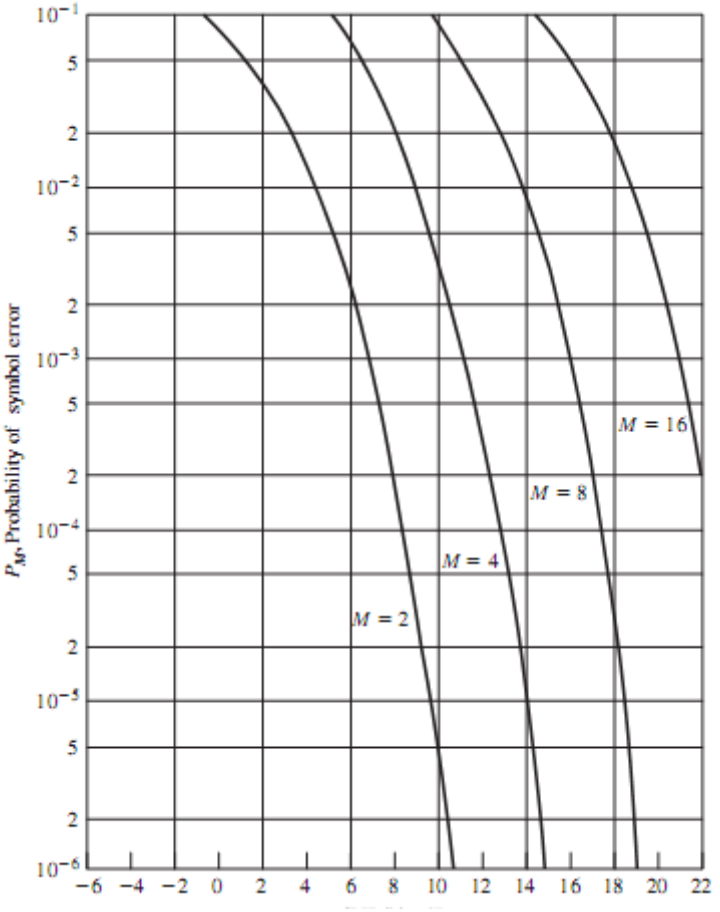

Fig 2. Probability of error P_e, curves for ASK at different M ary levels (Fig. 7.55 of Proakis 2002).

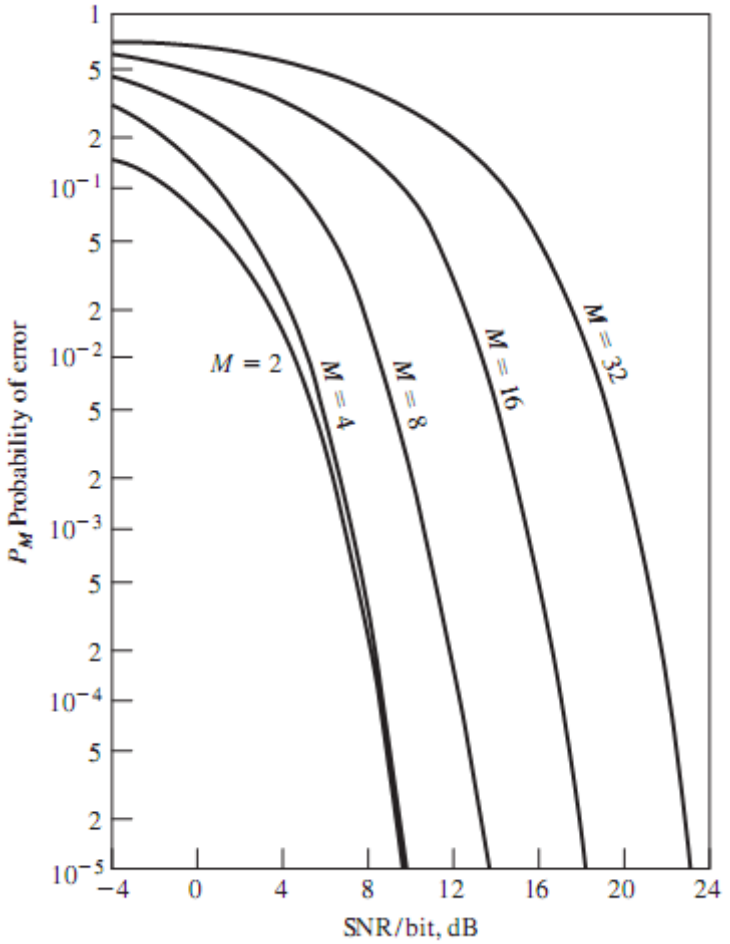

Fig 3. Probability of error P_e, curves for PSK at different M ary levels (Fig. 7.57 of Proakis 2002).

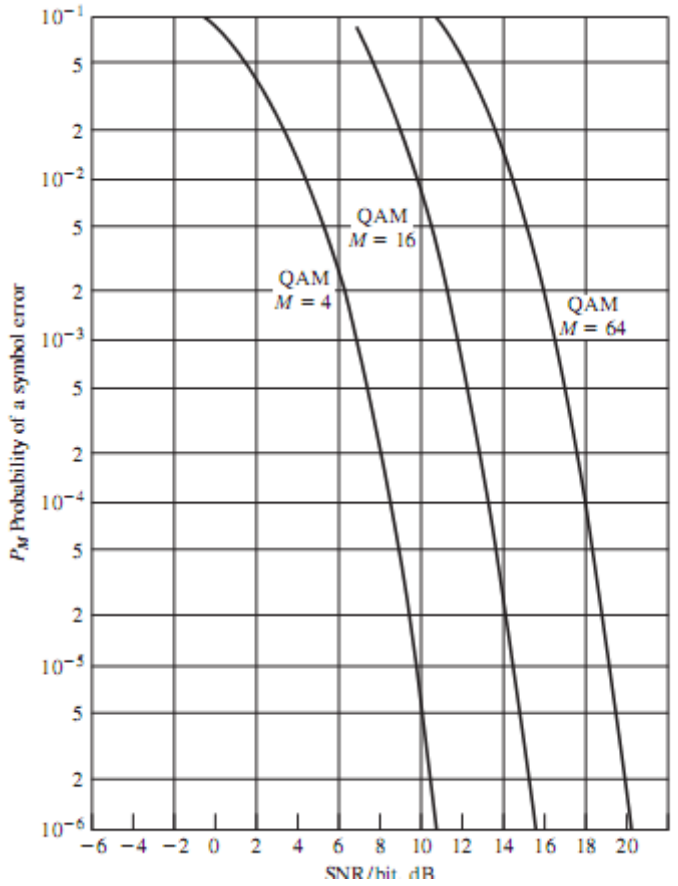

Fig 4. Probability of error P_e, curves for QAM at different M ary levels (Fig. 7.62 of Proakis 2002).