**ÇANKAYA UNIVERSITY – ECE DEPARTMENT – ECE 376**

**2015 Spring Term April 2015**

**Experiment 12: Construction of** 8 PSK, probability of error curves based onXilinx blocks.

**Experiment constructed from Matlab Simulink Xilinx blocks is given on course webpage with the names PSK\_Exp12\_Pe.mdl” and “CorrMHTE.m”**

1. Download the model file and the m file from the course web page and start Matlab from “System Generator” icon. Open the model file, **“PSK\_Exp12\_Pe.mdl”.**
2. This experiment is for the construction of probability of error (*Pe*) curve for 8 PSK modulator (transmitter) and demodulator (receiver), based on Xilinx blocks and the lecture notes “**Dimensionality of Signals\_ASK\_PSK\_QAM\_FSK\_Jan 2013\_HTE”**.
3. As seen from Fig. 1, the model file is arranged in the form of subsystems shown in while colour. Apart from the error “**Error Rate Counter**” and the “**Display**”, these subsystems are named, “**Transmitter**”, “**Receiver**” and “**Noise Generator**”. By double clicking on the subsystem, it is possible to see the constituents.
4. After double clicking “**Noise Generator**” subsystem, you will see, the blue colured “**AWGN**” block. By again double clicking on that block, on the “**Basic**” tab menu, there will appear “**wgn(1,131072,-20.77)**” across “**Initial value vector**”. The present setting of ,-20.77 corresponds to SNR of 13 dB after subtracting -4.77 dB (due to bit energy being 10\*log10(1/3) = -4.77 dB) and -3 dB (due to the two sidedness of the noise spectral density) from -20.77.
5. This way, running the “**PSK\_Exp12\_Pe.mdl**” file by incrementing -20.77 one by one down to -3.77, you will obtain in the first line of the “**Display**”, the probability of error values covering the SNR range of -4 to 13 dB. Write these values in an m file of Matlab and make the plot of *Pe* against bit SNR. Compare your curve with the Fig. 7.57 of Proakis 2002, which is pasted below as Fig. 2.
6. Bear in mind that the “Display” will contain a residual error, as seen from the Scope output (Fig.3). This residual error will be important particularly at low “Simulation stop time” setting. To subtract its contribution from given in *Pe* the display, a facility is provided in “**Noise Generator**” subsystem. Thus to cancel the effet of residual noise, you should make a run with constant set to zero in “**Noise Generator**” subsystem and subtract this value from the shown when this constant is at unity.



Fig.1 The model file “**PSK\_Exp12\_Pe.mdl**”.



Fig.2 Probability of error curves in Fig. 7.57 of Proakis 2002.



Fig.3 The scope output illustrating the residual error at the beginning of run.