



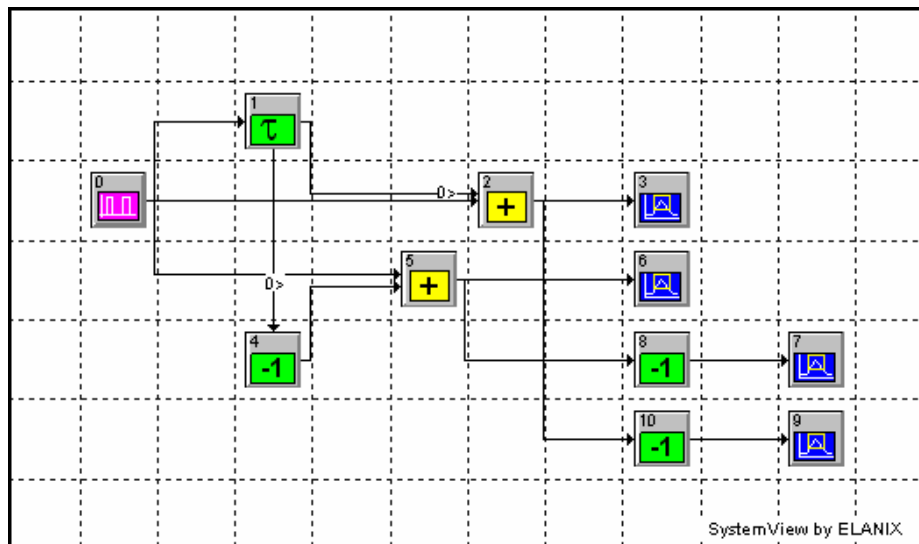
EE301 Analog and Digital Communications Laboratory

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Simulated Energy Spectral Density of a 3-bit Rectangular PAM Data Sequence

The simulated energy spectral density (ESD) of a di-bit rectangular PAM data sequence is described in the text (S&M p. 79-84) and simulated in *SystemVue* as presented in the Chapter 3 Lecture Notes. The *SystemVue* simulated model from the Lecture Notes is shown in the Figure below. Note that this is not a *SystemVue Textbook Edition* model.

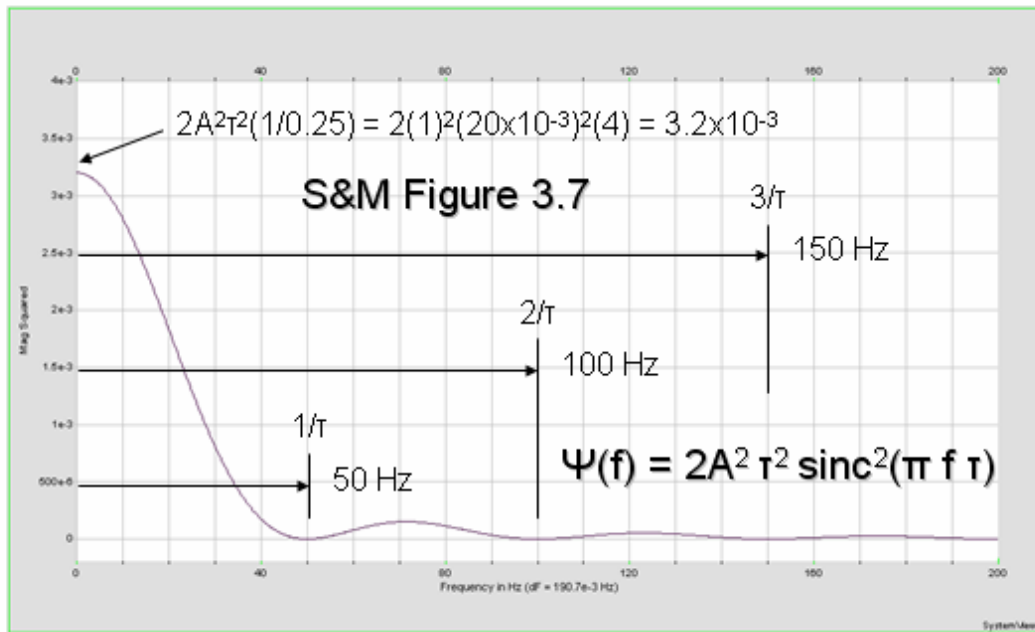


This example uses a basic pulse width of 20 msec for a single bit with 40 msec for the di-bit, pulse amplitudes of ± 1 V and a long pulse period of 10 sec to simulate the ESD from the $| \text{FFT} |^2$.

Your task is to simulate the ESD from the $| \text{FFT} |^2$ of a 3-bit sequence (000, 001, 010 ... 111) as a rectangular PAM signal and to verify its performance as was accomplished for the di-bit sequence. The magnitude of the pulse amplitude should be a randomly selected value between 1.5 and 5 V. The basic pulse width should also be a randomly selected value between 1 and 10 msec. The long pulse period can remain as 10 sec. The data sequence is equally likely with a probability of 0.125. Note that these values will require a modification of the simulation model and a recalculation of the ESD as shown in the Figure below.

The expected sinc peak amplitude and periodic zeros in the ESD can be calculated before the Laboratory. The conceptual design of the 3-bit sequence generator can be considered beforehand also to facilitate your work in the Laboratory.

- Sum of the *equally likely* simulated ESD for data 00, 01, 10 and 11 *unscaled* by probability $p = 0.25$



Produce an *engineering report* with your results. An engineering report is a concise description of the task at hand, the results and conclusions in an *expository style*. The report is due at the next meeting of the Laboratory.

Questions or comments? email: silage@temple.edu

