Project 3: SPI Peripheral

Design an general purpose SPI (Serial Peripheral Interface) for the Leon processor that communicates with both the LTC1654 (DAC) and the LTC1865l (ADC) on the Nu-Horizons SP3 development board. The Number of Data bits (16 to 24) and Sample Rate (1 KHz to 100 KHz) for your SPI peripheral should be configured by your C code running on the Leon. You should also be able to enable or disable the peripheral. Instantiate 2 instances of your SPI Peripheral in top, connecting the ADC to APB-13 and the DAC to APB-14.

ADC: Test your ADC interface by collecting 25000 samples from ADC0 (single ended) and ADC1 (single ended) each at 25 K samples per second on each channel (50 K samples per second aggregate). This should be 1 second of data. Use the scope to verify that Sample Rate is correct and that you aren’t missing any samples. Test with the potentiometer on both channels. Print out the 1st 1000 samples to the console and verify the output is correct. Verify all timing requirements with the scope.

DAC: Generate a full scale sine wave or a ramp in your C program and write it to both channels of the DAC configured for 25KHz sampling rate each (50 KHz aggregate) and fast settling. Verify that the output and the timing are correct with the scope.

Report required. Report must include a detailed description of how you guaranteed that you met the timing requirements of the ADC and the DAC running at 50K samples/sec (aggregate), and how you verified the operation.