Lab 1: Tone Organ

Author: Ruyi Zhou 49581911

Lab Section: L2C

1. *My SOF file is located at:*

D:\Y3 2021W\CPEN311\Lab1\lab1_template_de1soc\lab1_template_de1soc\rtl
Named: Basic_Organ_Solution.sof

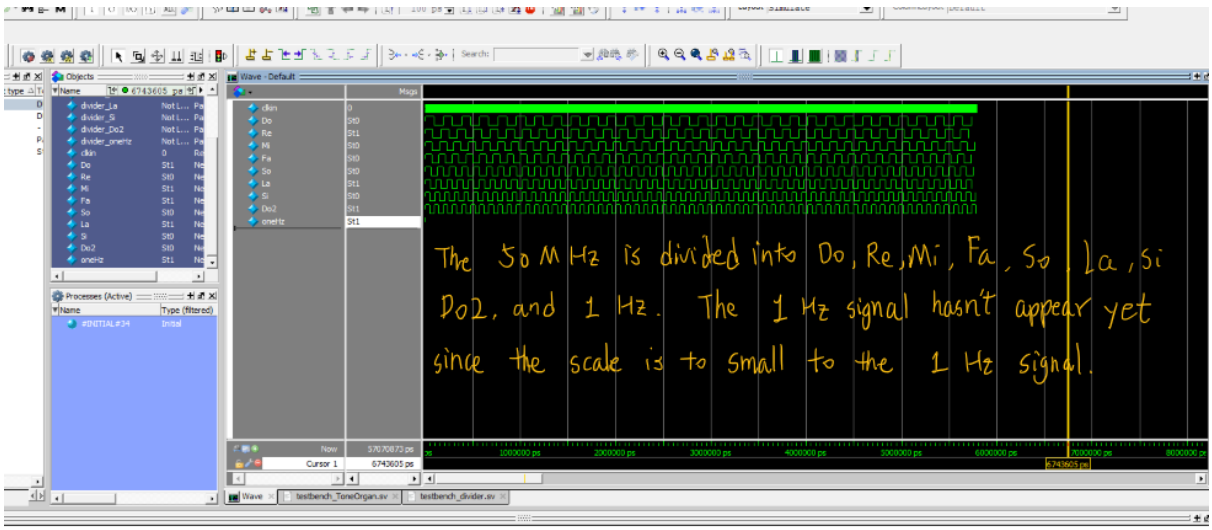
2. *The status of the lab:*

My design can work perfectly and achieves every requirement in the lab handouts. Also the codes are optimized.

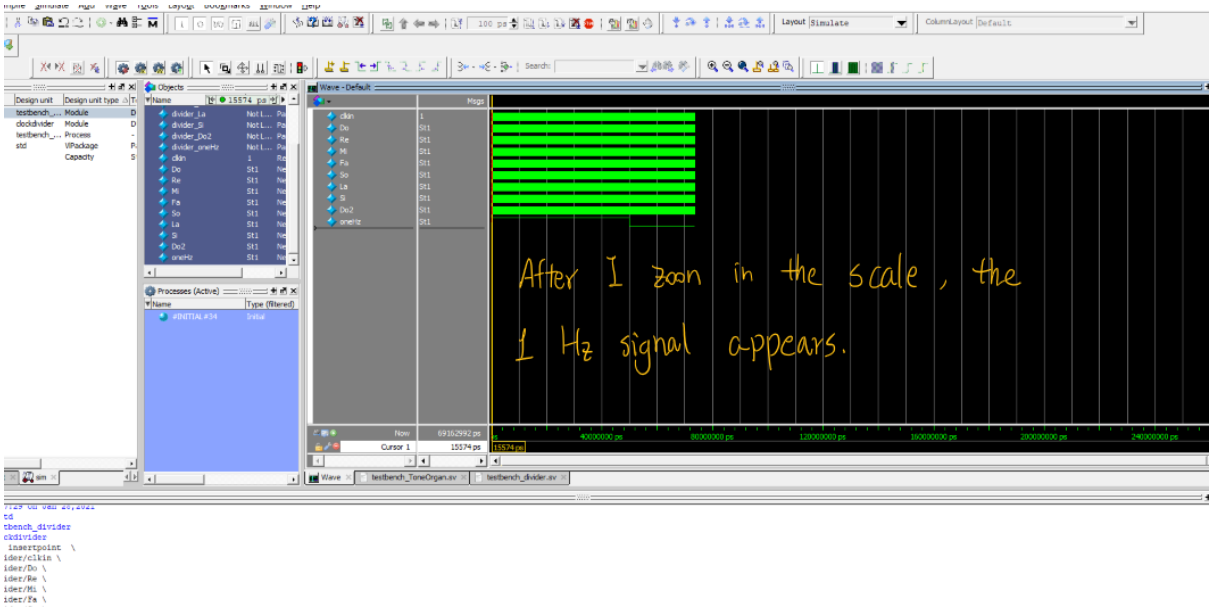
3. *Simulation screenshots:*

I wrote the testbenches for : clockdivider, ToneOrgan, LED control. And I simulated them in ModelSim 10.3c.

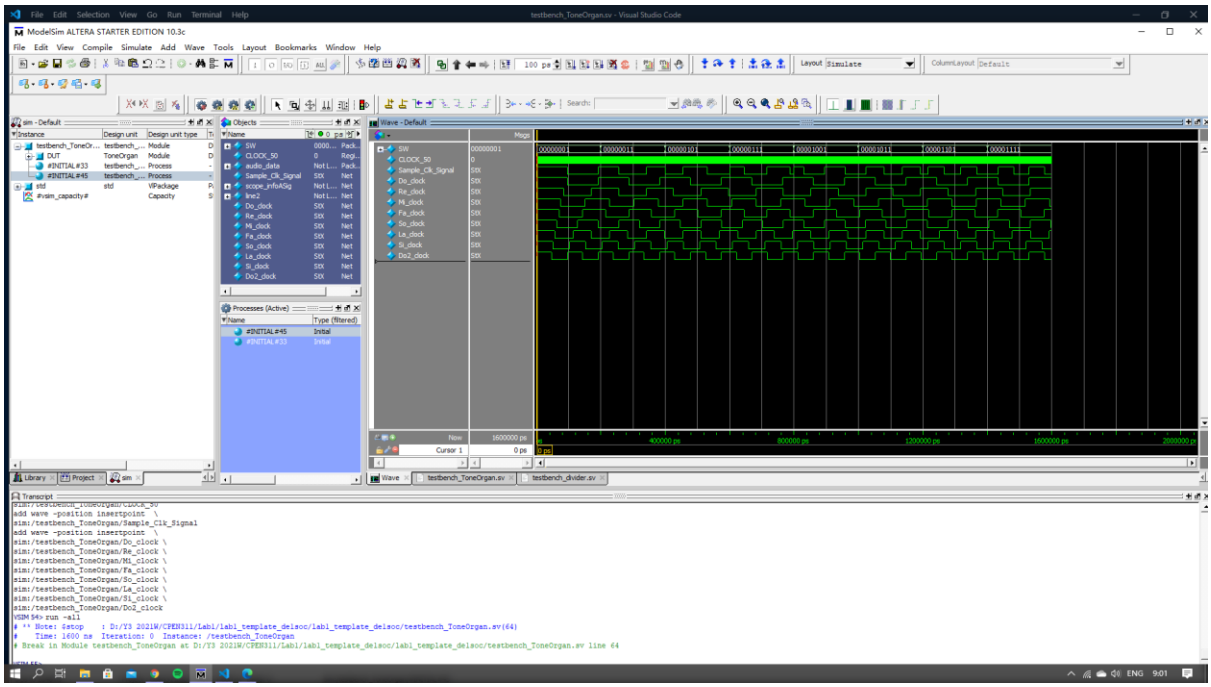
(a) Clockdivider:

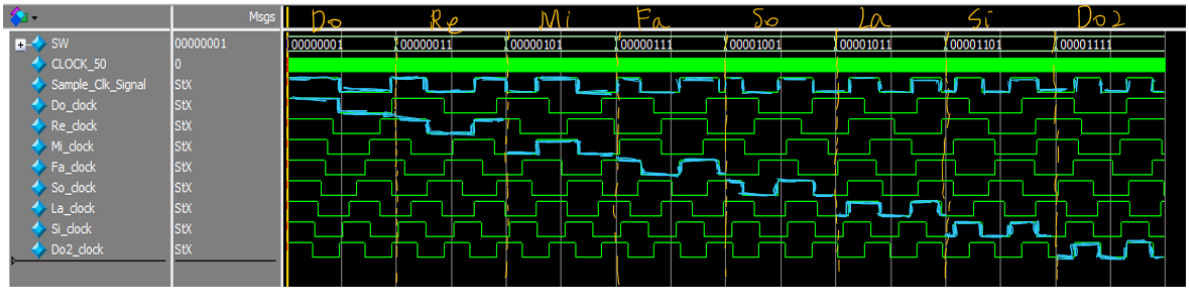


The graph above shows the simulation of the frequencies Do, Re, Mi ….. Do2. To show the 1 Hz frequency, I zoom in the waveform and shows it below:



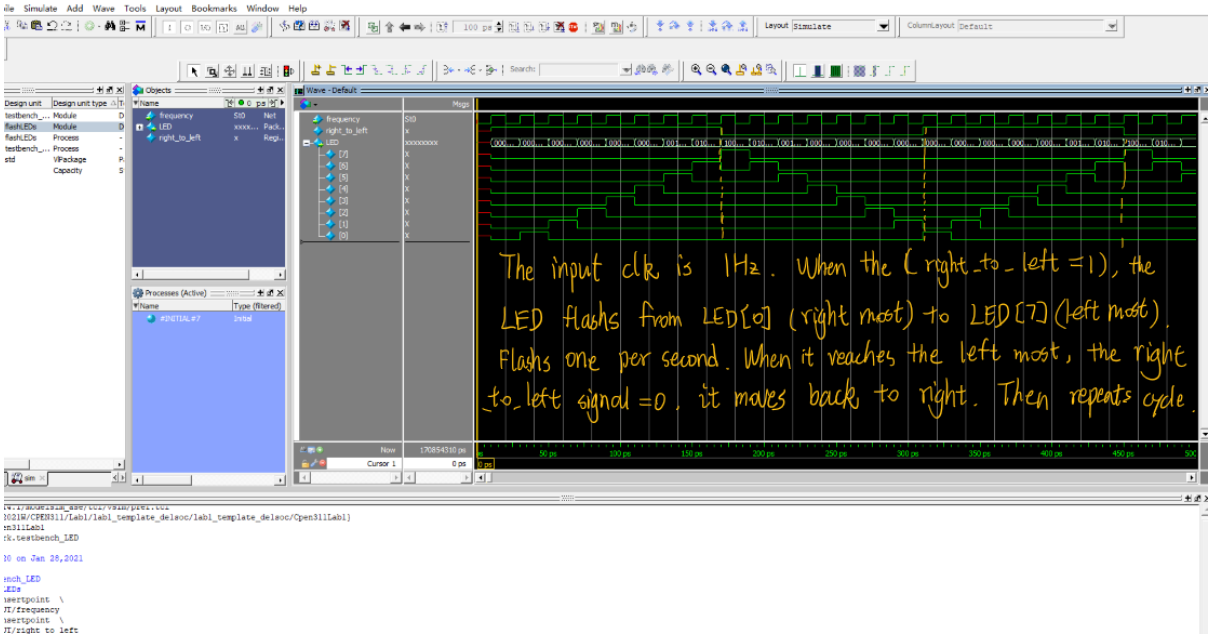
(b) ToneOrgan:



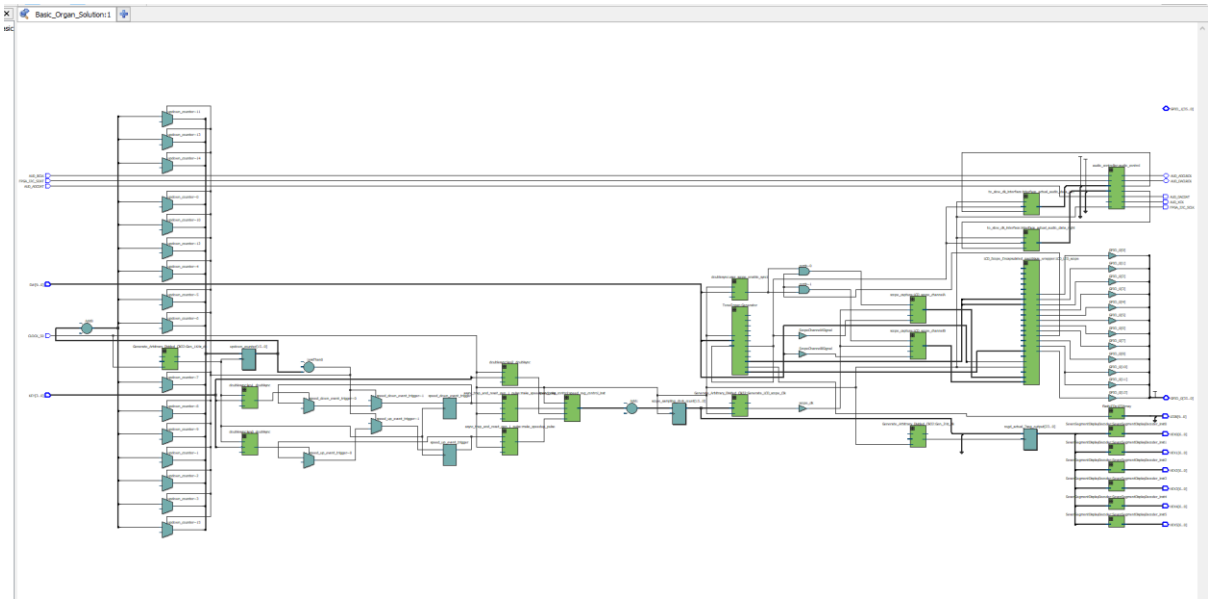


As shown above, when the SW is changed. The output signal (Sample_Clk_Signal) is the same as the corresponding frequency signal.

(c) LED control:



RTL viewer of the design



4. How to run the simulations:

The testbenches for the clockdivider, ToneOrgan and LED control are called testbench_divider.sv, testbench_ToneOrgan.sv and testbench_LED.sv respectively. These testbenches are located at:
D:\Y3 2021W\CPEN311\Lab1\lab1_template_de1soc\lab1_template_de1soc\rtl
I run the simulation in **ModelSim 10.3c** by clicking the 'simulation' button on the tool bar.
If you have my do. files, to simulate, click the 'start simulation' and choose the corresponding testbench. Then input the command 'do <filename>'. Then click 'run all' to get the waveforms.

4. Additional information:

-To decrease the number of instances module in the top-level module (increase the efficiency), I make a multiple outputs clock divider so that I only need to instance it once to get different frequencies.

-All the code files and simulation files (do. Files) are inside **rtl** because I simulate the design using **ModelSim**, which requires all the project files under the same dictionary.

-If you have any questions please let me know during my demo session. I am very willing to demo all the features I have in this lab. Finally, this lab is really fun!