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Lab 1 ReadMe

1. SOF file is located in /rtl/Basic\_Organ\_Solution.sof
2. Everything should be implemented
3. Annotated Simulations:

Waveforms for clock divider:

A computer screen shot of a computer program

AI-generated content may be incorrect.

A computer screen shot of a video game

AI-generated content may be incorrect.A screenshot of a computer

AI-generated content may be incorrect.

My clock divider divides the input clock such that each “high 1” and “low 0” lasts for exactly “n” cycles of the input clock, where n is the input divisor

Waveforms for LED mover

A computer screen with green and black squares

AI-generated content may be incorrect.

On each rising edge of the input clock, we can see that the LEDSIM signal travels left and right using a one hot signal.

Waveform for Tone Organ

clkSIM, is set to have a period of 20 ns, converted to frequency is 50 Mhz, so the produced waveforms can be used for accurate calculation of produced frequency.

A screenshot of a video game

AI-generated content may be incorrect.

SelDo, input 000, results in the clock of outclkDo, we can see that the time between two rising edges is around 1912040 ns, which when converted to frequency, is approximately 523 Hz.

A screen shot of a computer

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selRe, (001) results in a period of 1703460 ns, which is approximately 587 Hz.

A screen shot of a computer

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selMi, (010) results in a period of 1517440 ns, which is approximately 659 Hz.

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selFa (011)results in a period of 1432640 ns, which is approximately 698 Hz.

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selSo (100) results in a period of 1277120ns, which is approximately 783 Hz.

A screen shot of a computer

AI-generated content may be incorrect.

selLa (101) results in a period of 1136360 ns, which is approximately 880 Hz.

A screen shot of a computer

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selSi (11) results in a period of 1013220 ns, which is approximately 987 Hz.

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selDO (111) results in a frequency of 956000 ns, which is approximately 1046 Hz.

1. Annotated Signaltap

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sw[0] is down, which means that there is no sound playing and therefore Line-2 is a constant value that’s not fluctuating.

A screenshot of a computer

AI-generated content may be incorrect.

sw[0] is then turned on, Line-2 fluctuates with the rising/falling of ScopeChannelASignal. “0001”, the first 4 hex characters represent the switches that are up or down. In this case, only sw0 is flipped on, therefore its displaying “0001”. Also, note how on Info\_ChannelA, it says “Do”. We currently have sw[3:1] set to 000, which is equal to the “Do” frequency.

A screenshot of a graph

AI-generated content may be incorrect.

Switches 0 and 1 are on for Re, which translates to “0003”

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AI-generated content may be incorrect.

Switches 2 and 0 are on for Mi, which translates to “0005”

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AI-generated content may be incorrect.

Switches 0 1 2 are on for Fa, which translates to “0007”

A screenshot of a computer

AI-generated content may be incorrect.

Switches 3 and 0 are on for So, which translates to “0009”

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AI-generated content may be incorrect.

Switches 3, 1, and 0 are on for La, which translates to “000B”

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AI-generated content may be incorrect.

Switches 3, 2 and 0 are on for Si, which translates to “000D”

A screenshot of a computer

AI-generated content may be incorrect.

Switches 3, 2, 1 and 0 are on for the higher pitched Do, which translates to “000F”

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1. How to run simulations

All required items are in /rtl, such as Basic\_Organ\_Solution.v, NDivider.sv, ToneOrgan.sv, and LedMover.sv

Furthermore, NDivider\_tb, ToneOrgan\_tb and LedMover\_tb are also in /rtl, which you would import into a modelsim project to simulate each individually.

NDivider\_Wave.do, ToneOrgan\_Wave.do, and LedMover\_Wave.do are also included in /rtl.

Furthermore, the modelsim project file is also located in /rtl, with name “Lab1ModelSim.mpf”.