**ENEL 453 LAB 4 – SUBMISSION**Bilal Dawood – 30092405  
Yahia Abrini - 30090288  
Zaid Mujtaba - 30095352

**Top level RTL Schematic:**

*Note: the first figure shows the full RTL design, and the second figure is zoomed into the right portion (where we’ve added a new final for lab 4). The PWM output comes from the period\_changer component.*

**Chart

Description automatically generated**

**Diagram, waterfall chart

Description automatically generated**

**Screenshot of timing analysis:  
Graphical user interface, text, application, email

Description automatically generated**

**Graphical user interface, application

Description automatically generated**

**Screenshot of Waveform Simulation:**

*Note: random binary values were placed inside a newly-created input called “test\_input” to verify the correct operations of “buzzer\_out” for the ModelSim simulation. Buzzer\_out can be seen to be changing in accordance with the specified requirements to generate the desired pitch. As can be seen, the bigger the test\_input the lower frequency buzzer\_out has (and thus, pitch is lower representing further distance). The opposite is also true. Reset can also be seen working (buzzer\_out = 0 when reset = 1).*

**Graphical user interface

Description automatically generated**

**Diagram

Description automatically generated with medium confidence**

**Diagram

Description automatically generated**