**Lab Task 1:**

**LED blinking** **with Variable Frequency**

**VHDL Code:**

library ieee**;**

**use** ieee**.**std\_logic\_1164**.all;**

**use** ieee**.**std\_logic\_unsigned**.all;**

entity ledBlinking **is**

port**(**

fpga\_clk **:** **in** std\_logic**;**

switch **:** **in** std\_logic\_vector**(**2 downto 0**);**

led **:** **out** std\_logic\_vector**(**3 downto 0**)**

**);**

**end** ledBlinking**;**

architecture bhv **of** ledBlinking **is**

--signals

signal **count** **:** std\_logic\_vector**(**31 downto 0**)** **:=** X"00000000"**;**

signal top\_clk **:** std\_logic**;**

signal ledout **:** std\_logic\_vector**(**3 downto 0**);**

**begin**

---

process **(**fpga\_clk**)**

**begin**

**if** **(**fpga\_clk 'event' **and** fpga\_clk **=** '1'**)** **then**

**count** **<=** **count** **+** 1**;**

**end** **if;**

**end** process**;**

---

process **(**fpga\_clk **,** **count)**

**begin**

**if** **(**fpga\_clk 'event' **and** fpga\_clk **=** '1'**)** **then**

**case** switch **is**

**when** "000" **=>** top\_clk **<=** **count(**20**);**

**when** "100" **=>** top\_clk **<=** **count(**31**);**

**when** "010" **=>** top\_clk **<=** **count(**15**);**

**when** "001" **=>** top\_clk **<=** **count(**2**);**

**when** **others** **=>** top\_clk **<=** **count(**2**);**

**end** **case;**

**end** **if;**

**end** process**;**

---

process**(**top\_clk**)**

**begin**

**if** **(**top\_clk 'event' **and** top\_clk **=** '1'**)** **then**

ledout **<=** **not** ledout**;**

**end** **if;**

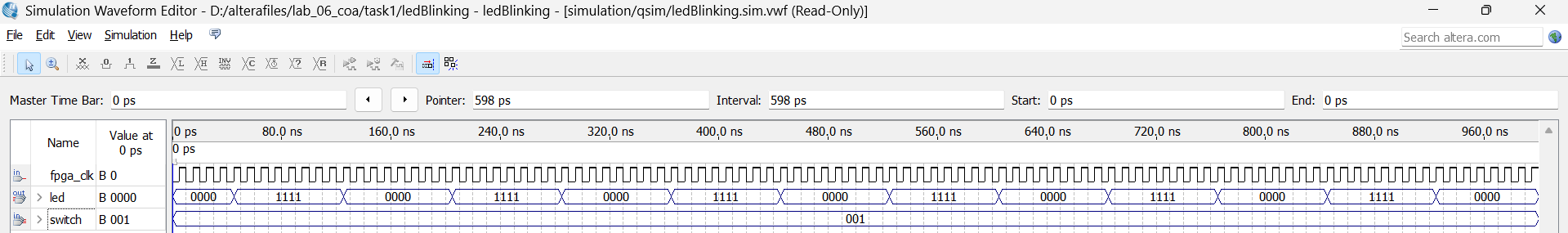
**end** process**;**

---

led **<=** ledout**;**

**end** bhv**;**

**Simulation:**



Simulation 1: LED blinking at variable frequencies based on switch-controlled clock division.

**Control Switch:**

|  |  |
| --- | --- |
| **SELECTION** | **OPERATION (Clock Division Factor)** |
| 000 | |  | | --- | | Slow Blinking(Count(20)) |  |  | | --- | |  | |
| 100 | |  | | --- | | Very Slow Blinking (Count(31)) |  |  | | --- | |  | |
| 010 | |  | | --- | | Medium Blinking (Count(15)) |  |  | | --- | |  | |
| 001 | Fast Blinking (Count(2)) |

Table 1: LED Blinking Frequency Selection Based on Switch Input