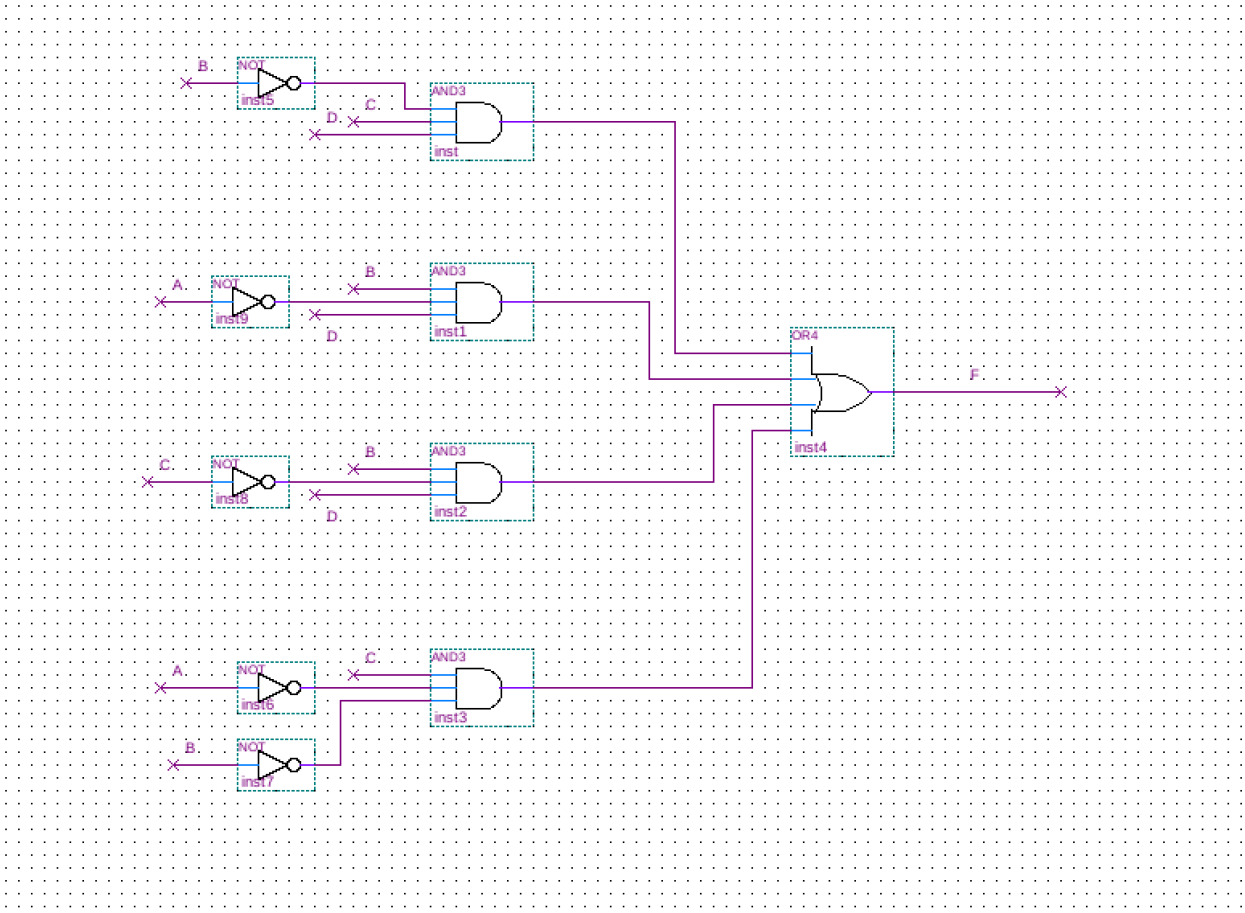
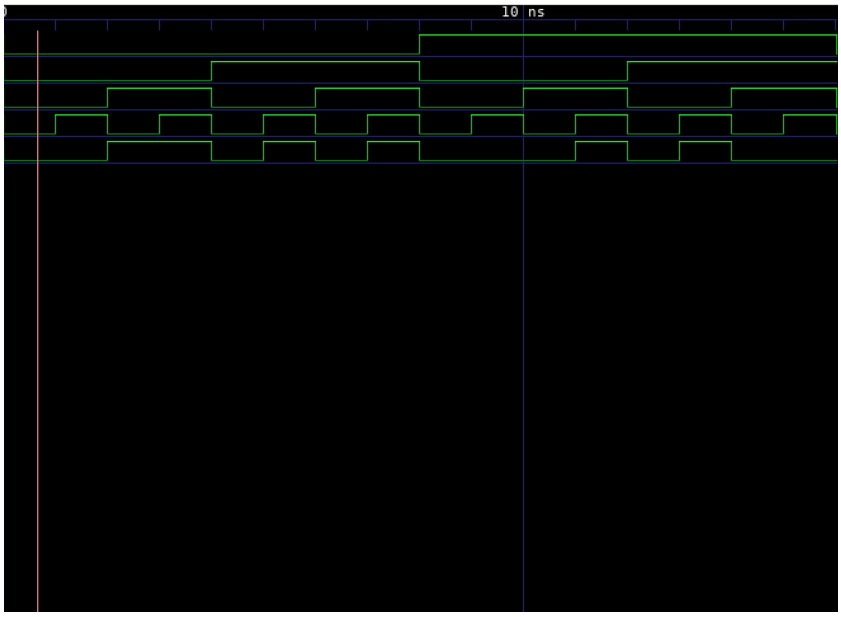
1. **Prime-finder**

This task was intended to create a circuit that checks whether numbers 0 through 15 are prime numbers. If it is, then there will be an output of 1 and if it isn't, there will be an output of 0. This was done using GHDL.

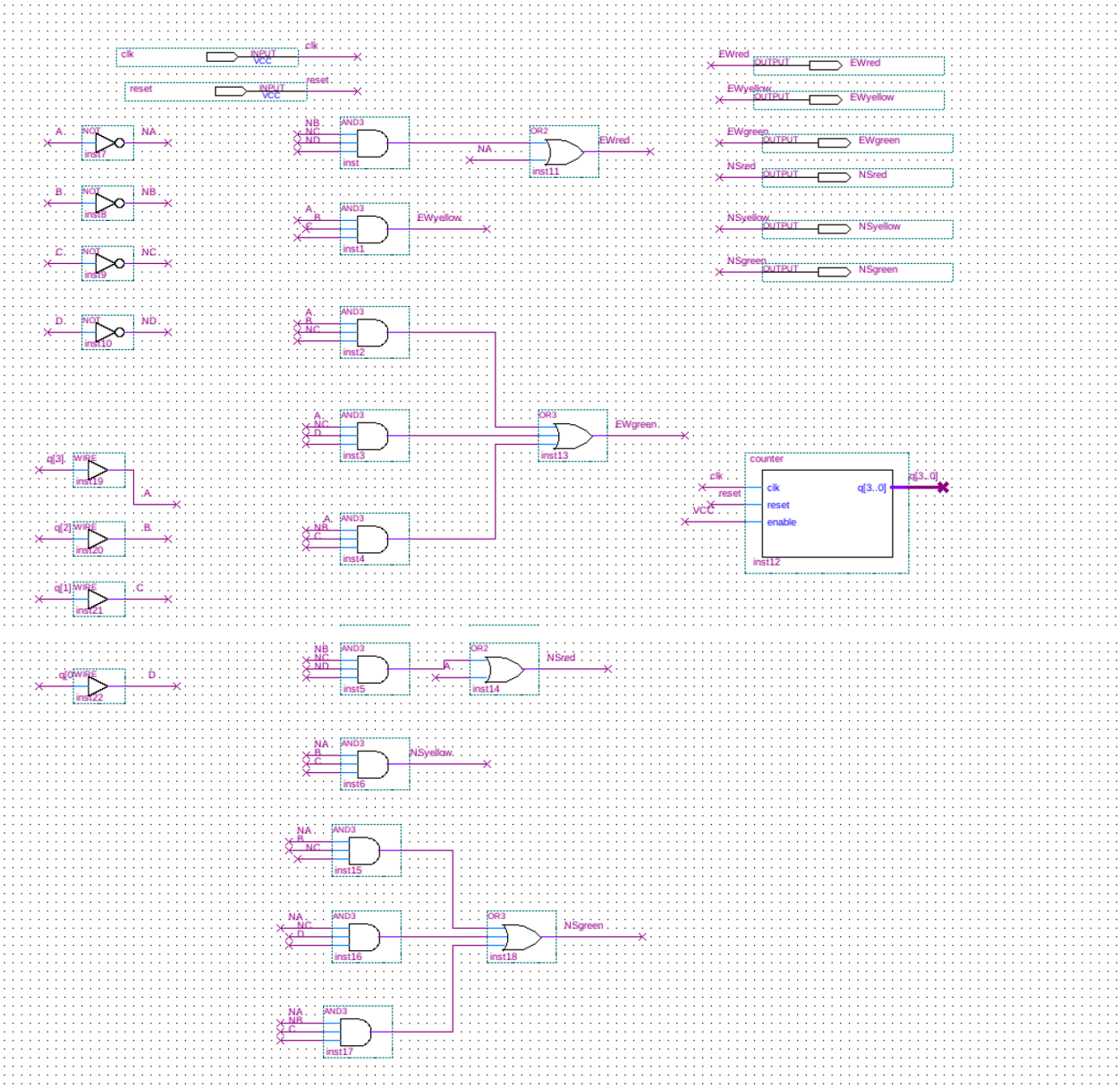


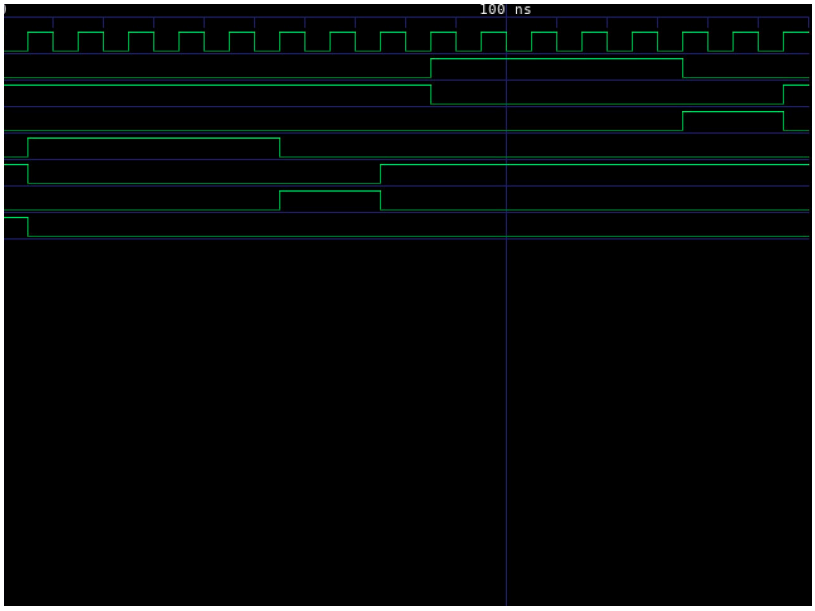


The simulation proves that my circuit works because it checked all the 4 bit inputs from 0 to 15 and all of them checked the prime numbers correctly. This proves the circuit correctness because in comparison to the expected output, all the outcomes were the same.

2. Traffic lights

This task was intended to simulate a 4 bit system for traffic lights at an intersection. This was to be done through a 4 bit circuit with 16 states controlling 3 different light colors in different directions, making a total of 6 lights. This was done using GHDL.


clk
INPUT
VCC
reset
EWred
OUTPUT
EWyellow
EWgreen
NSred
NSyellow
NSgreen
A
NOT
NA
inst7
B
NB
inst8
C
NC
inst9
D
ND
inst10
AND3
inst
inst1
inst2
inst3
inst4
inst5
inst6
inst15
inst16
inst17
OR2
inst11
OR3
inst13
inst14
inst18
EWred
EWyellow
EWgreen
NSred
NSyellow
NSgreen
q[3]
q[2]
q[1]
q[0]
WIRE
inst19
inst20
inst21
inst22
counter
clk
reset
enable
q[3..0]
inst12



The simulation proves that my circuit works because the counter increased as intended originally and the lights changed when they were supposed to, following the timing rules.