**HOMEWORK II (Part 2) Report**

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# Summary

What has been done:

* SW/LW instructions
* BEQ/J instructions
* Several test programs
* Machine code for sort program
* nLint check

Required tools:

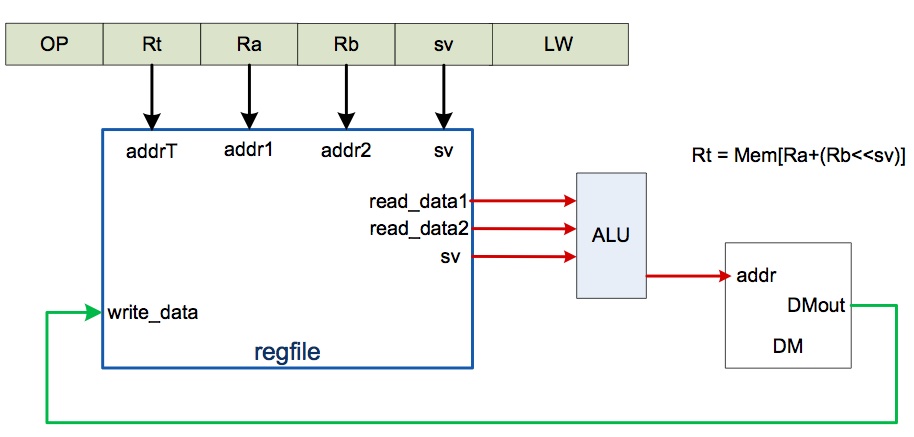
* NC-Verilog, Debussy (nTrace & nWave), Design Compiler(dv), nLint
* Icarus Verilog (iverilog), gtkwave, MS visio

Stuck:

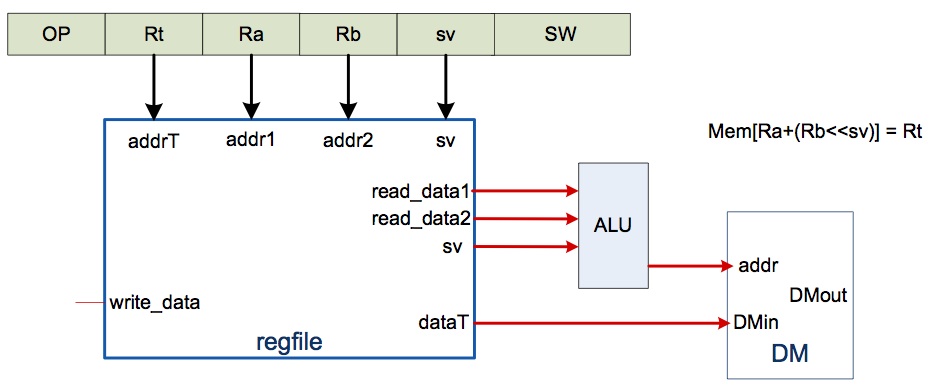
* Incomplete sorting program (There’s something wrong.)
* Synthesis

# Instruction design with block diagram

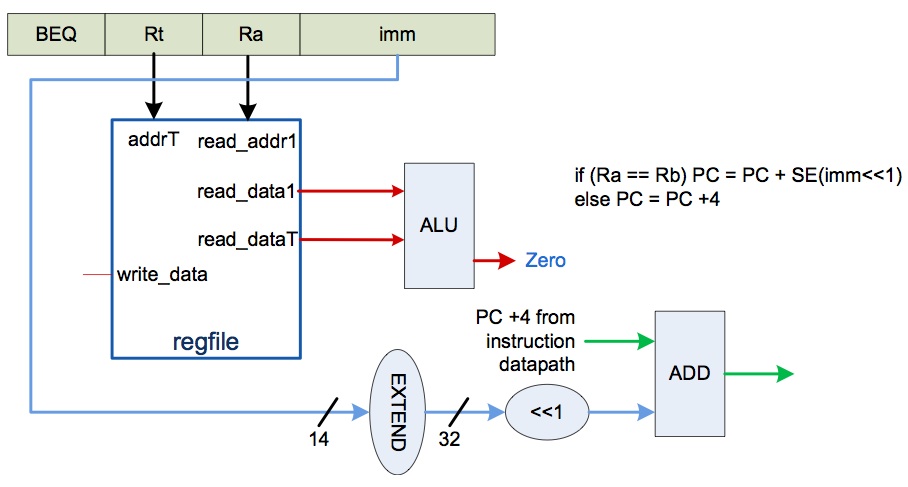
## LW



## SW



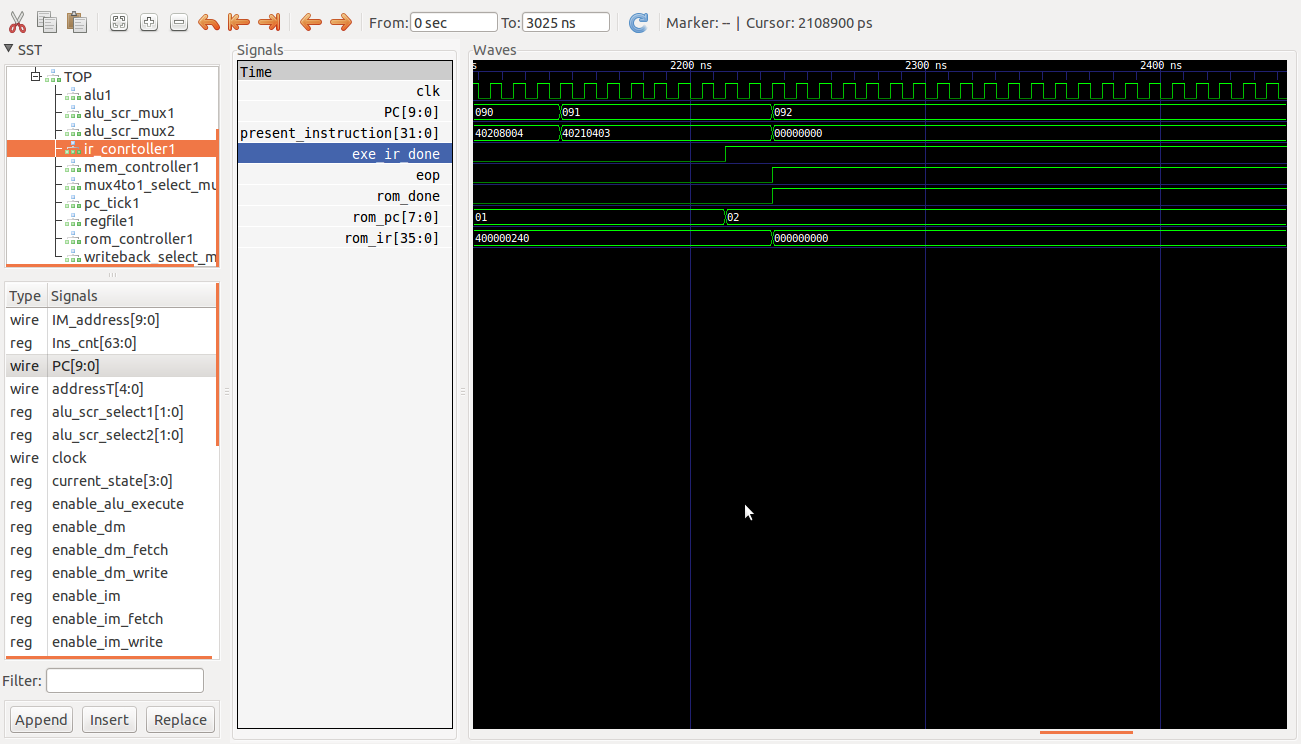
## BEQ



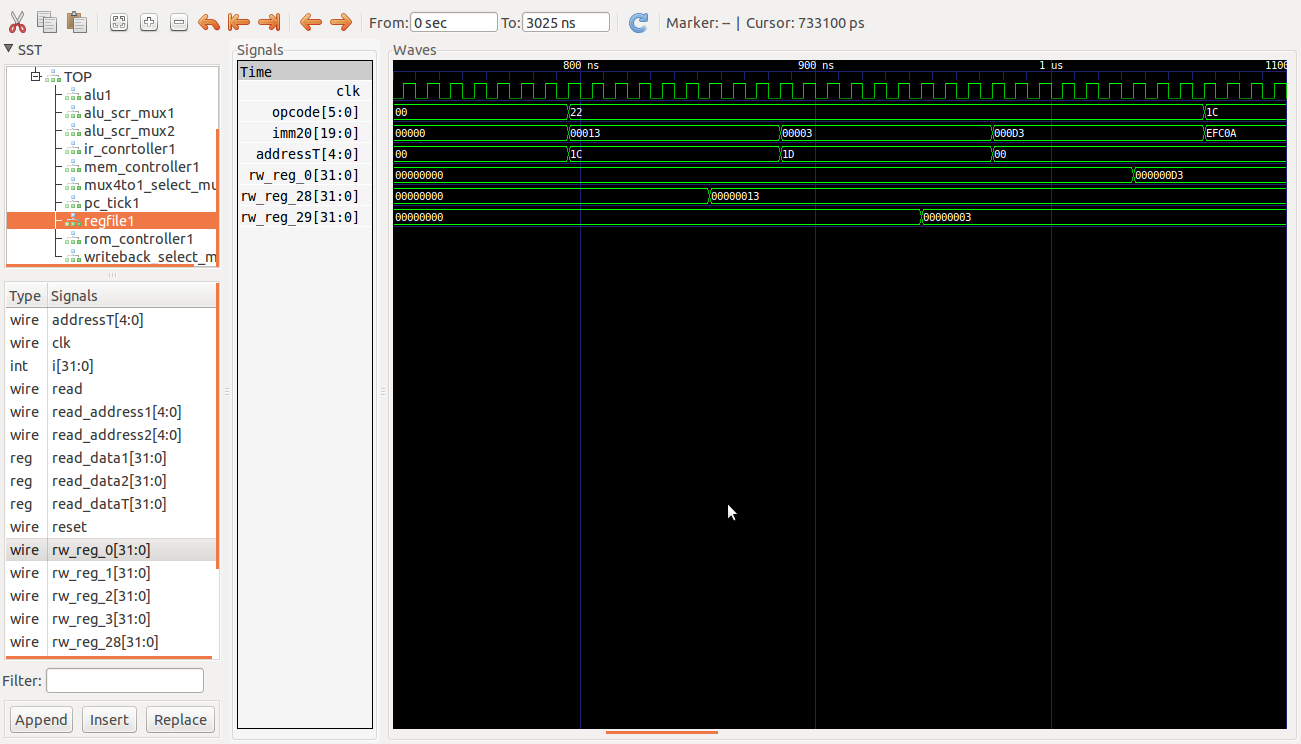
# Pre-simulated waveforms

## P5(a) mins.prog

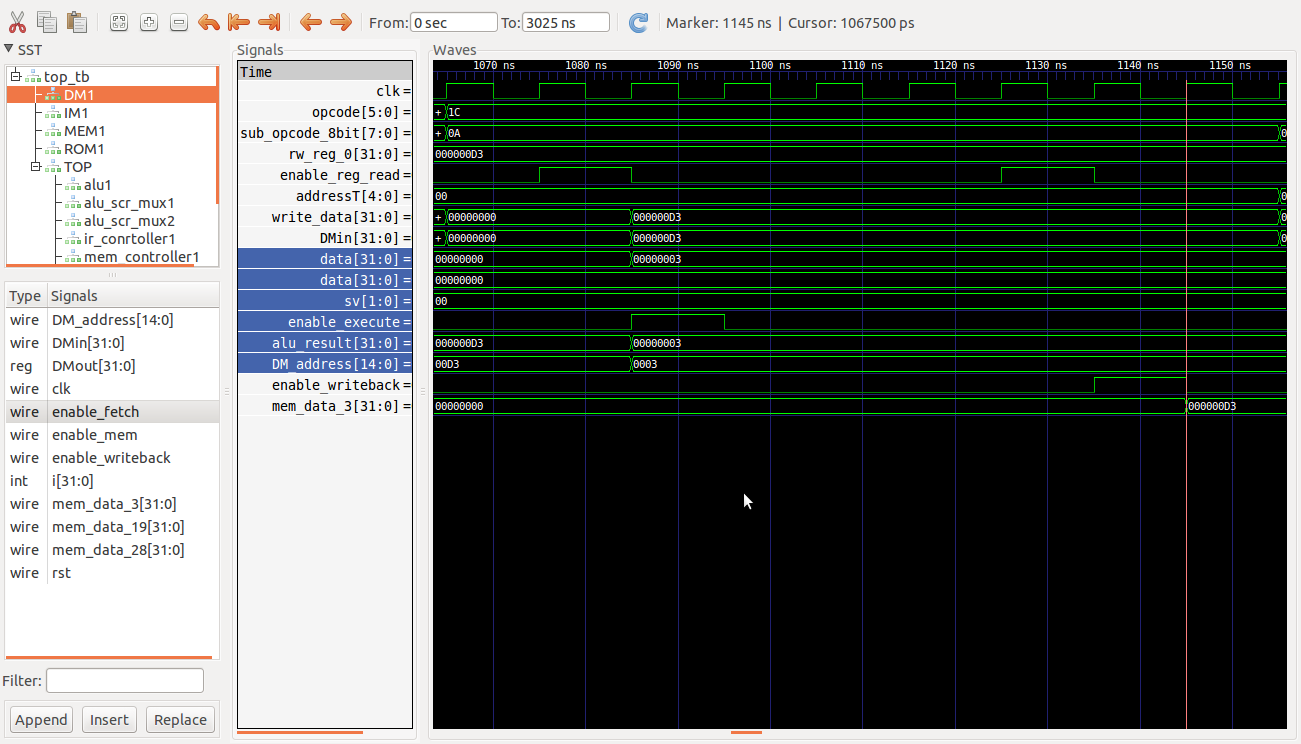
* Recognize “end of program” and raise the “done” flag



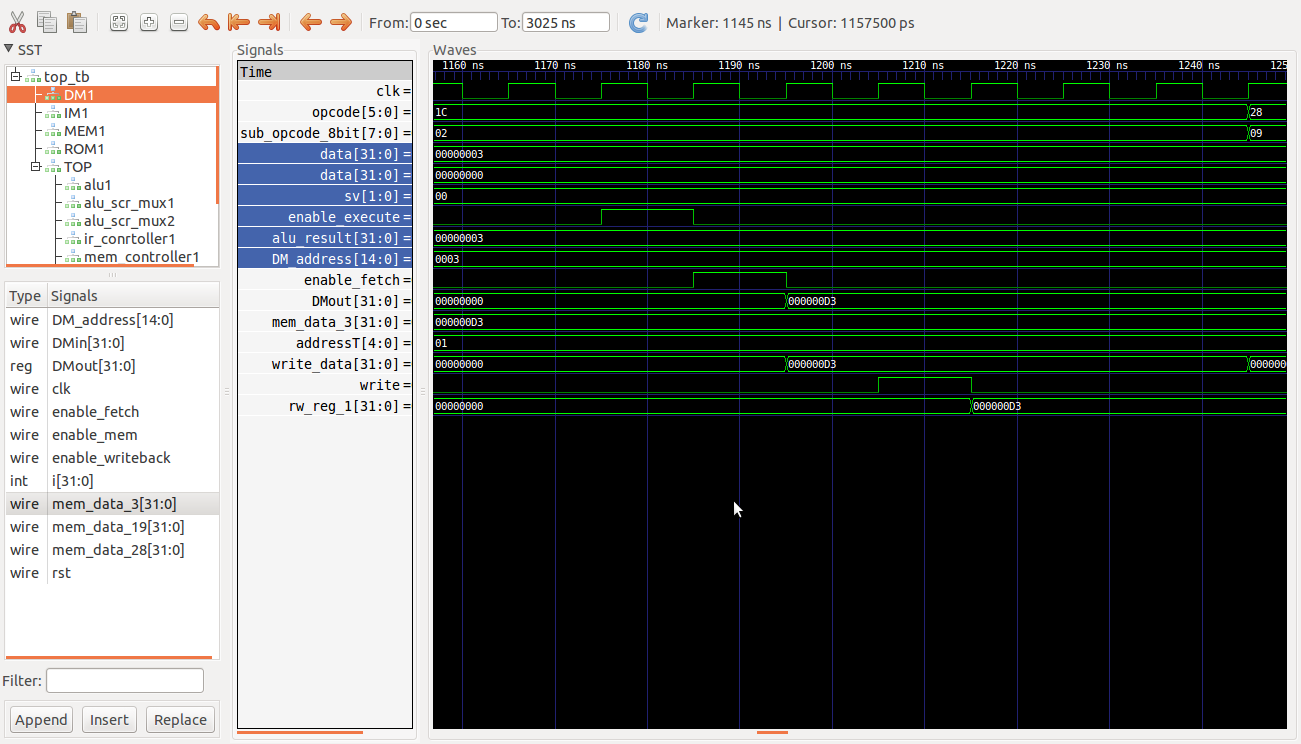
* R28=’h13=’d19
* R29=’h3=’d3
* (0) R0=20'd3 => R0 =’hD3



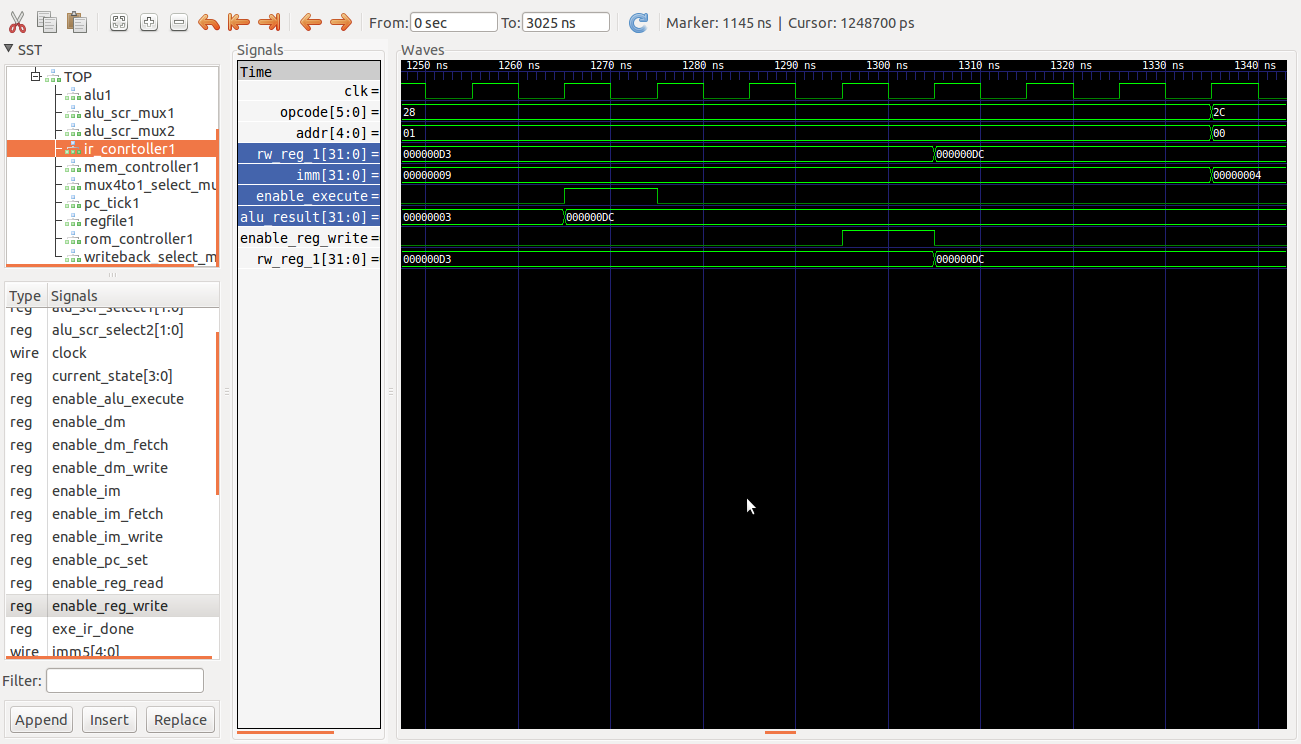
* (1) M3=R0 => M3=’hD3



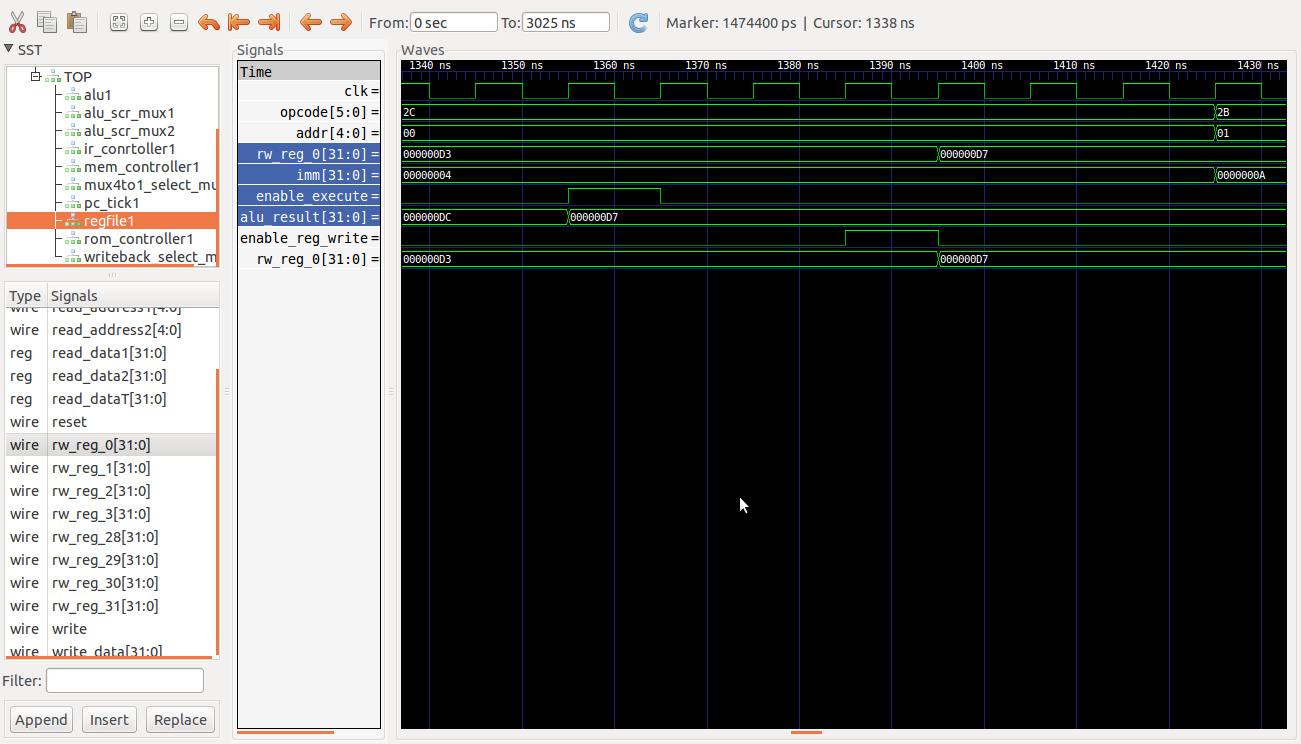
* (2) R1=M3 => R1=’hD3



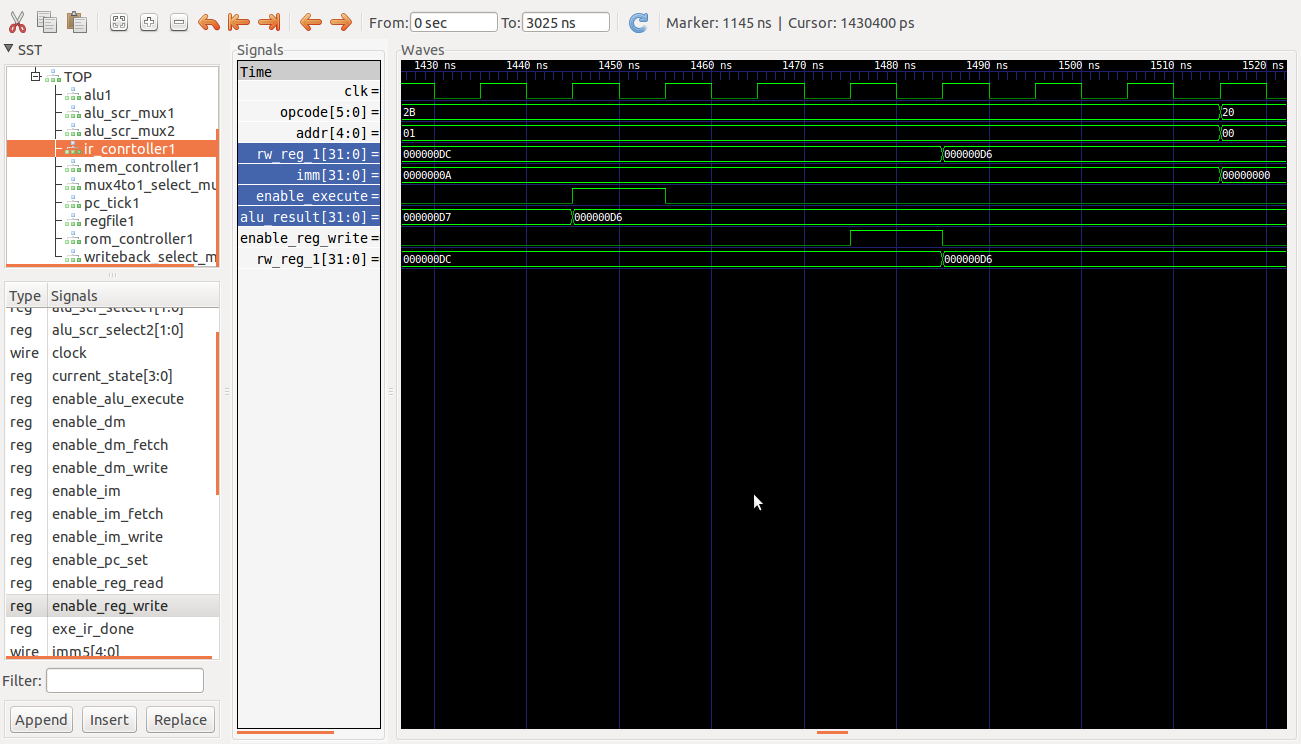
* (3) R1=R1+4’b1001 => R1=’hDC



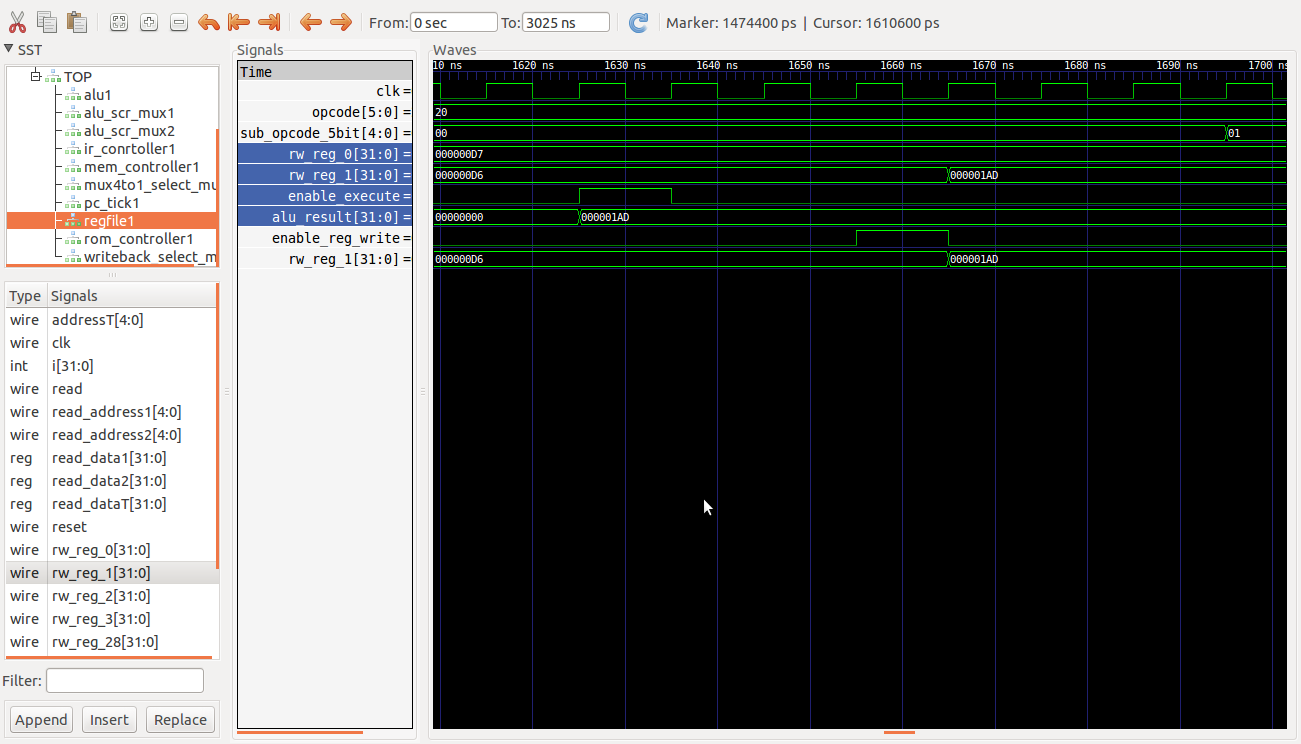
* (4) R0=R0|4'b0100 => R0=’hD7



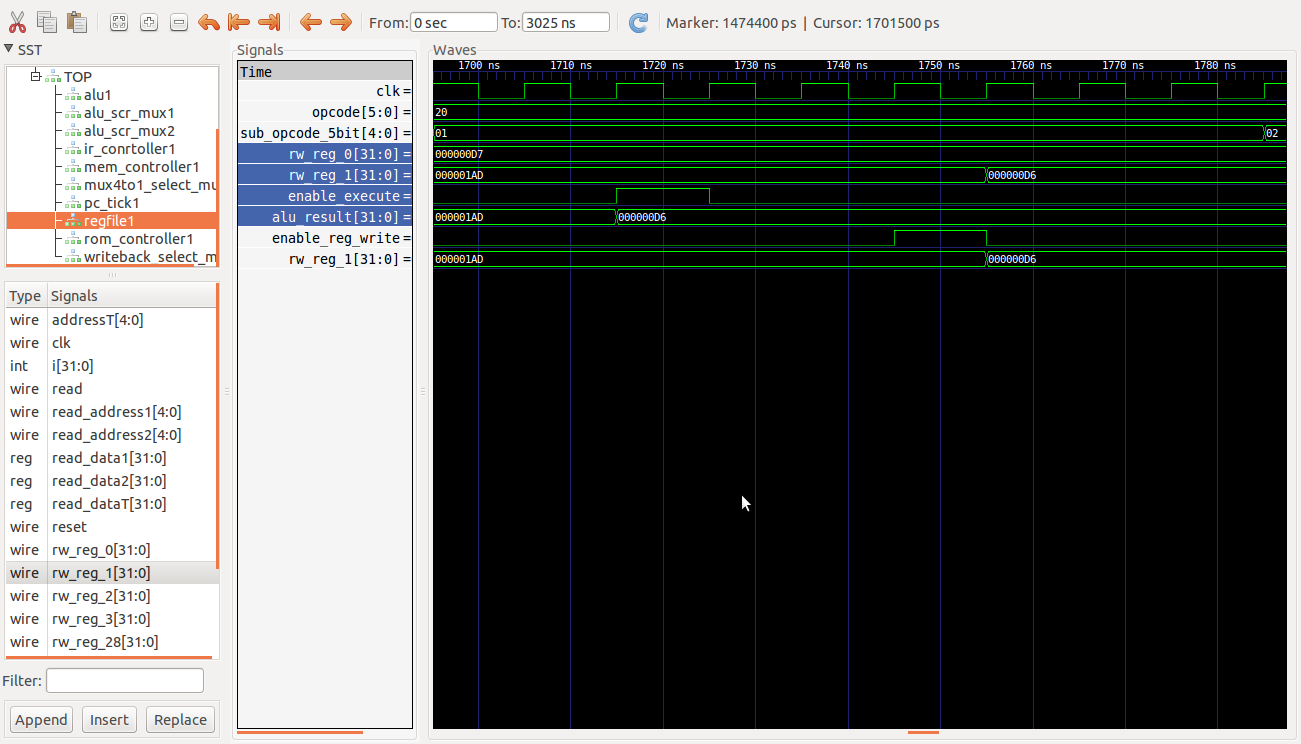
* (5) R1=R1^4’b1010 => R1=’hD6



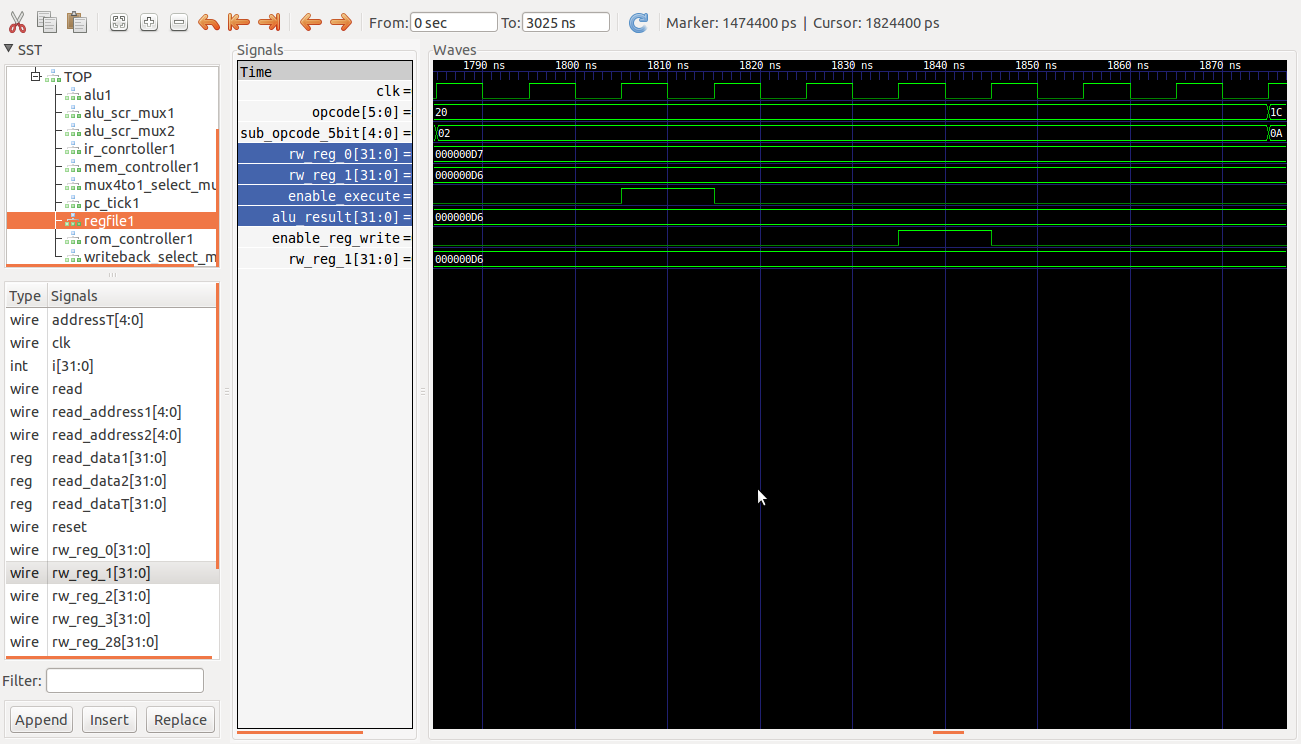
* (6) NOP
* (7) R1=R0+R1 => R1=’h1AD



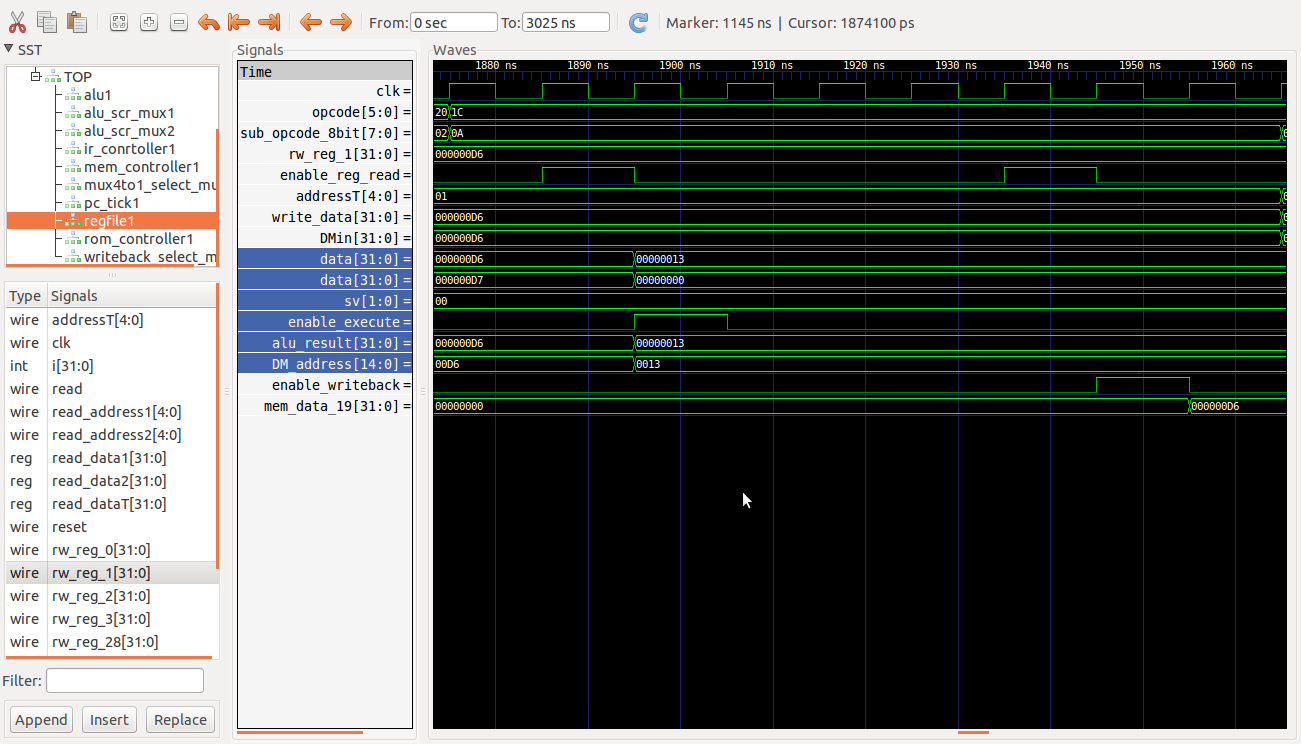
* (8) R1=R1-R0 => R1=’hD6



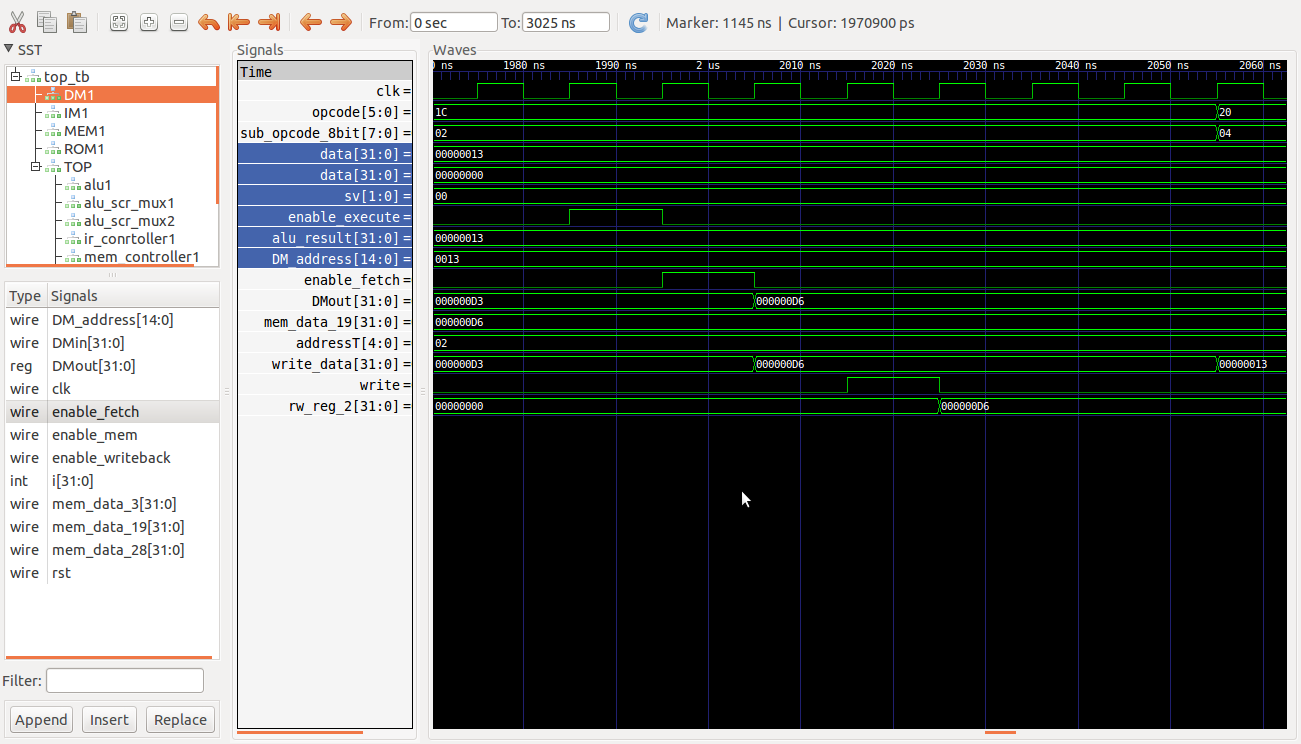
* (9) R1=R1&R0 => R1=’hD6



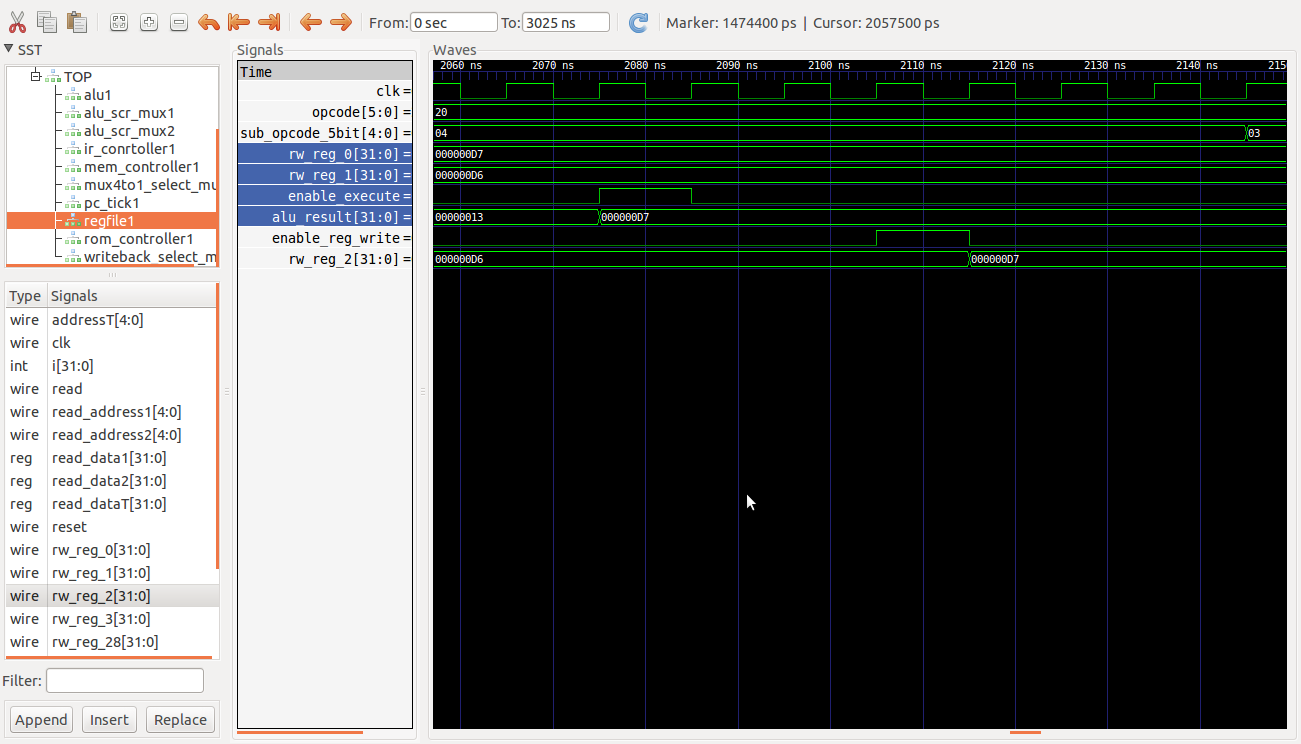
* (10) M19=R1 => M19=’hD6



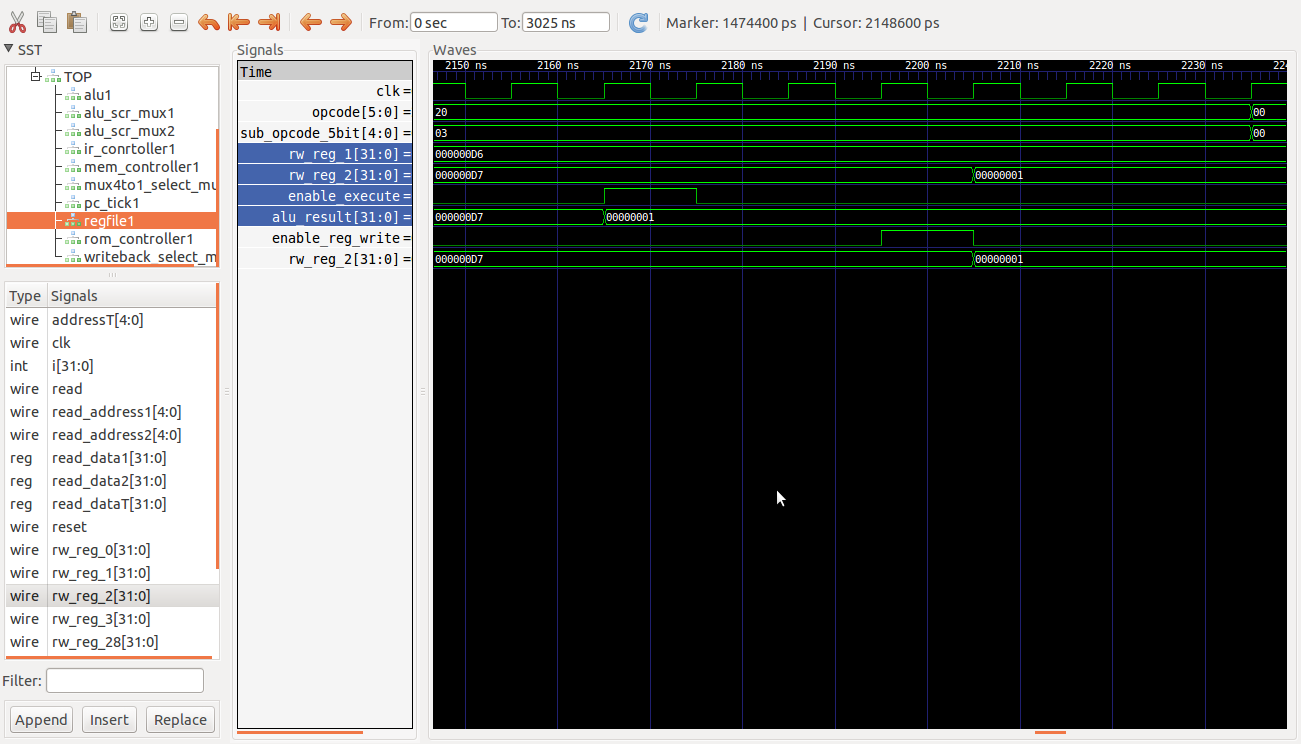
* (11) R2=M19 => R2=’hD6



* (12) R2=R1|R0 => R2=’hD7



* (13) R2=R2^R1 => R2=’h1



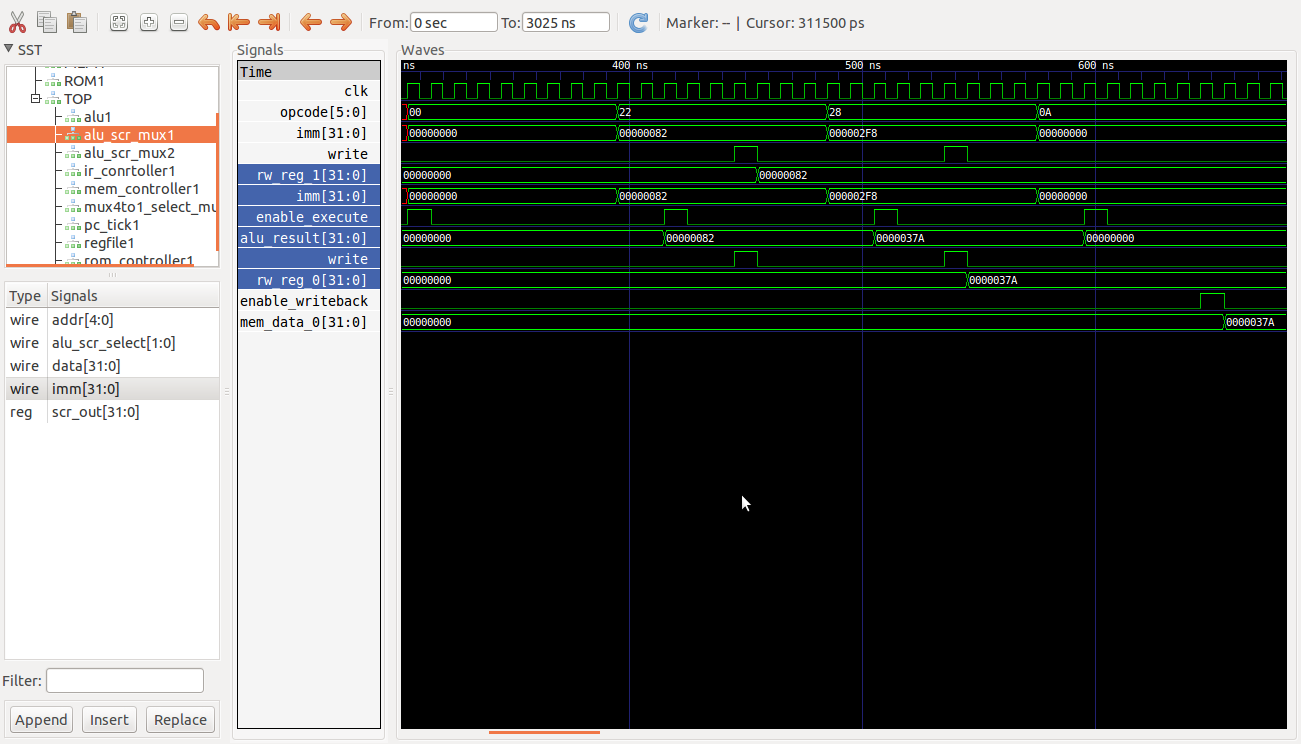
## P5(b) operations

### i. 130+760=890

MOVI (R1=d’130) => R1=’h82

ADDI (R0=R1+d’760) => R0=’h37A

SWI (M0=R0) => M0=’d890

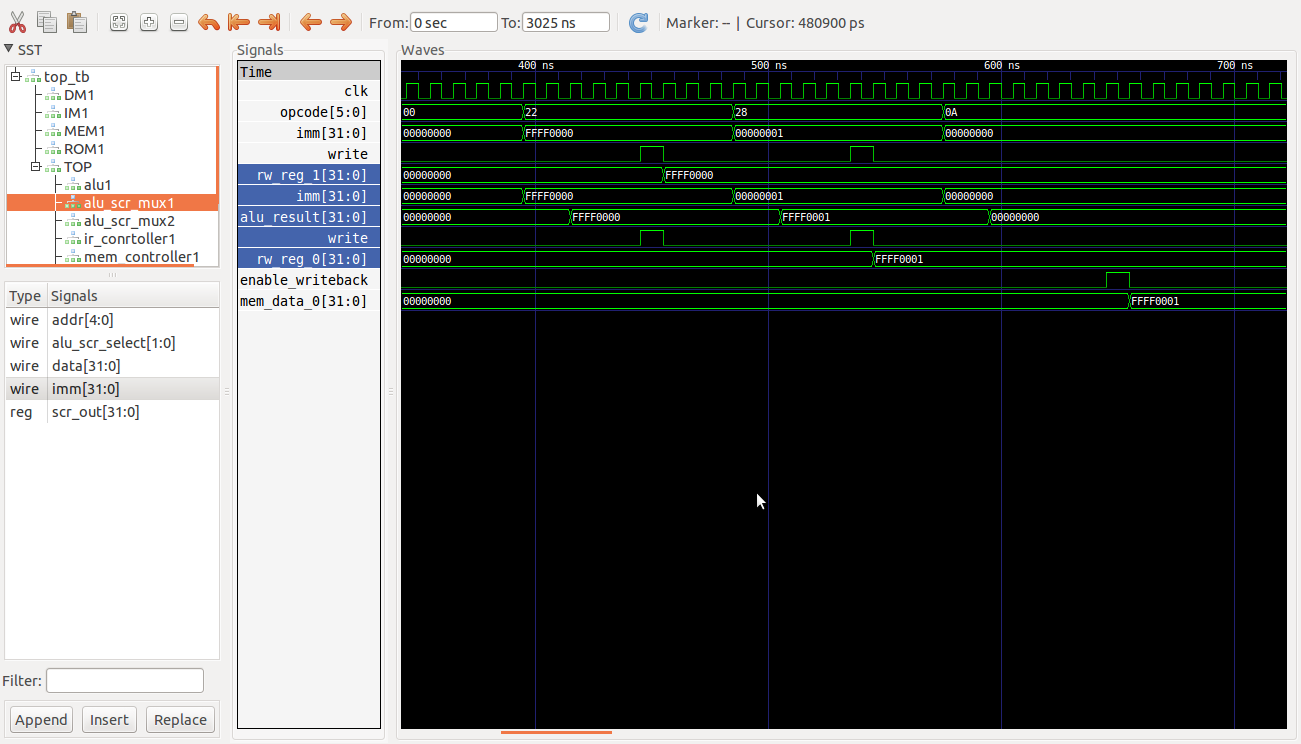


### ii. 1-65536=-65535

MOVI (R1=-d’65536) => R1=’hFFFF0000

ADDI (R0=R1+d’1) => R0=’hFFFF0001

SWI (M0=R0) => M0=-‘d65535



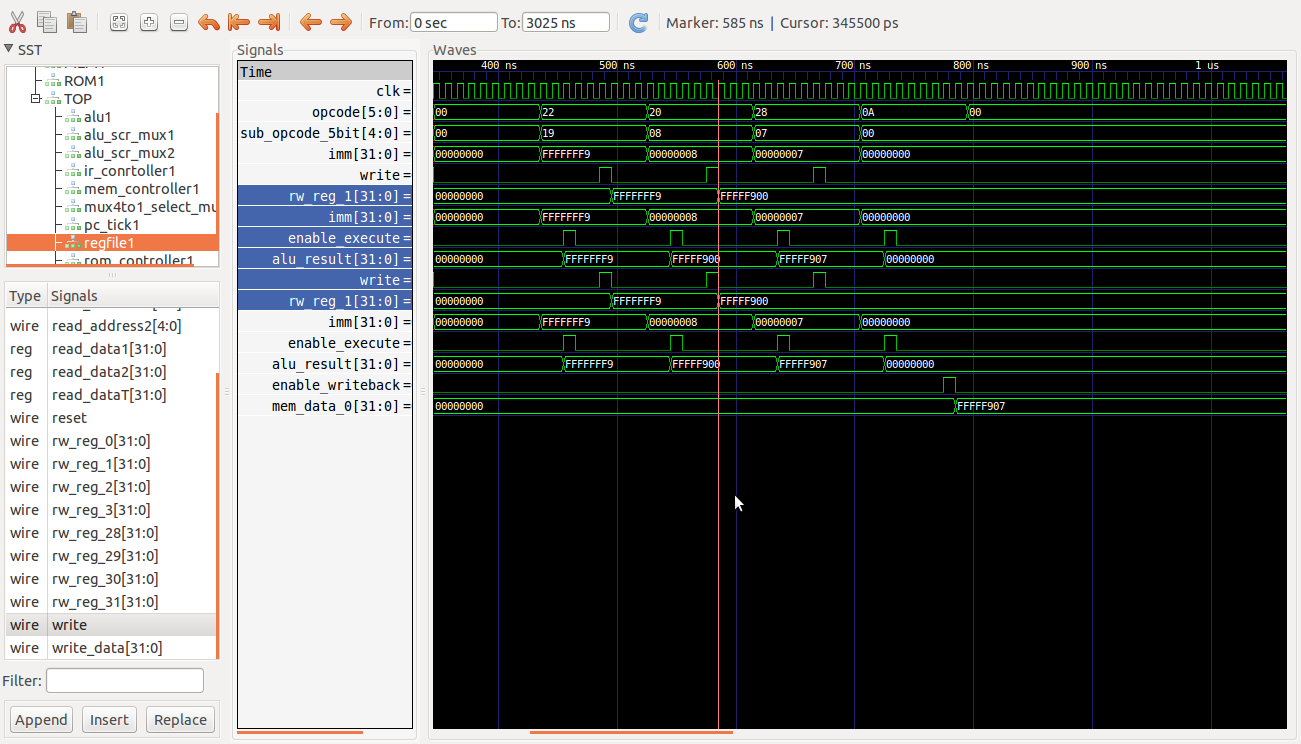
### iii. 255\*(-7)=(-7)\*28+7=-1785

MOVI (R1=-d’7) => R1=’hFFFFFFF9

SLLI (R1=R1<<8) => R1=’hFFFFF900

ADDI (R0=R1+d’7) => R0=’hFFFFF907

SWI (M0=R0) => M0=-‘d1785



### iv. 40\*2-160/4=40

MOVI (R1=d’40) => R1=h’28

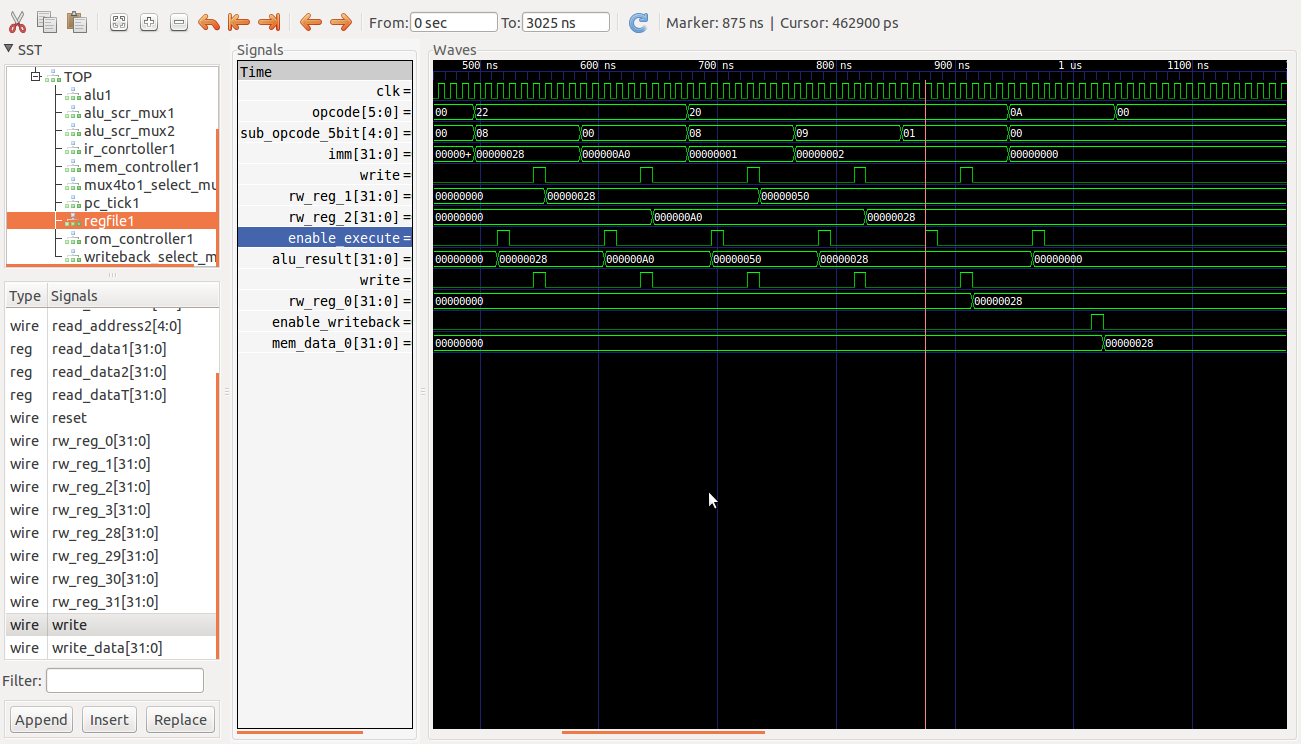
MOVI (R2=d’160) => R2=h’A0

SLLI (R1=R1<<1) => R1=h’14

SRLI (R2=R2>>2) => R2=h’50

SUB (R0=R1-R2) => R0=h’28

SWI (M0=R0) => M0=d’40

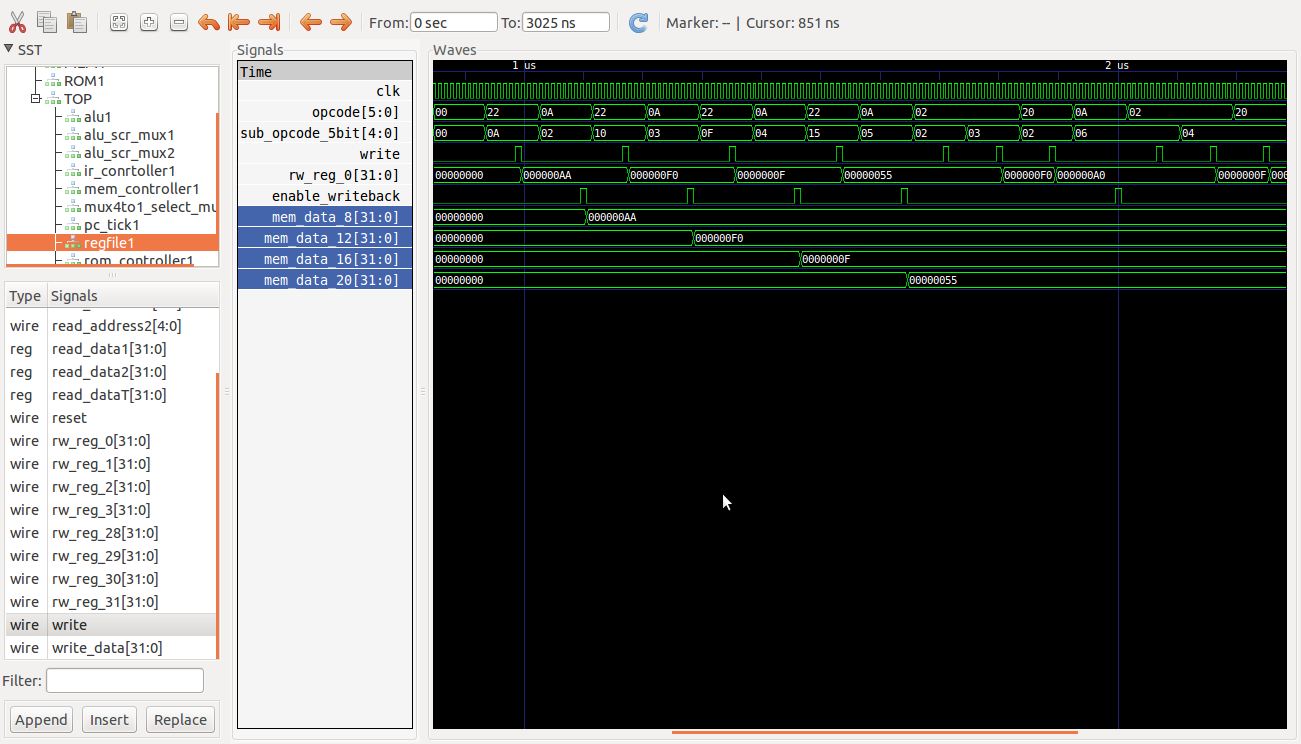


### v. Sort 5 arbitrary numbers in increasing order

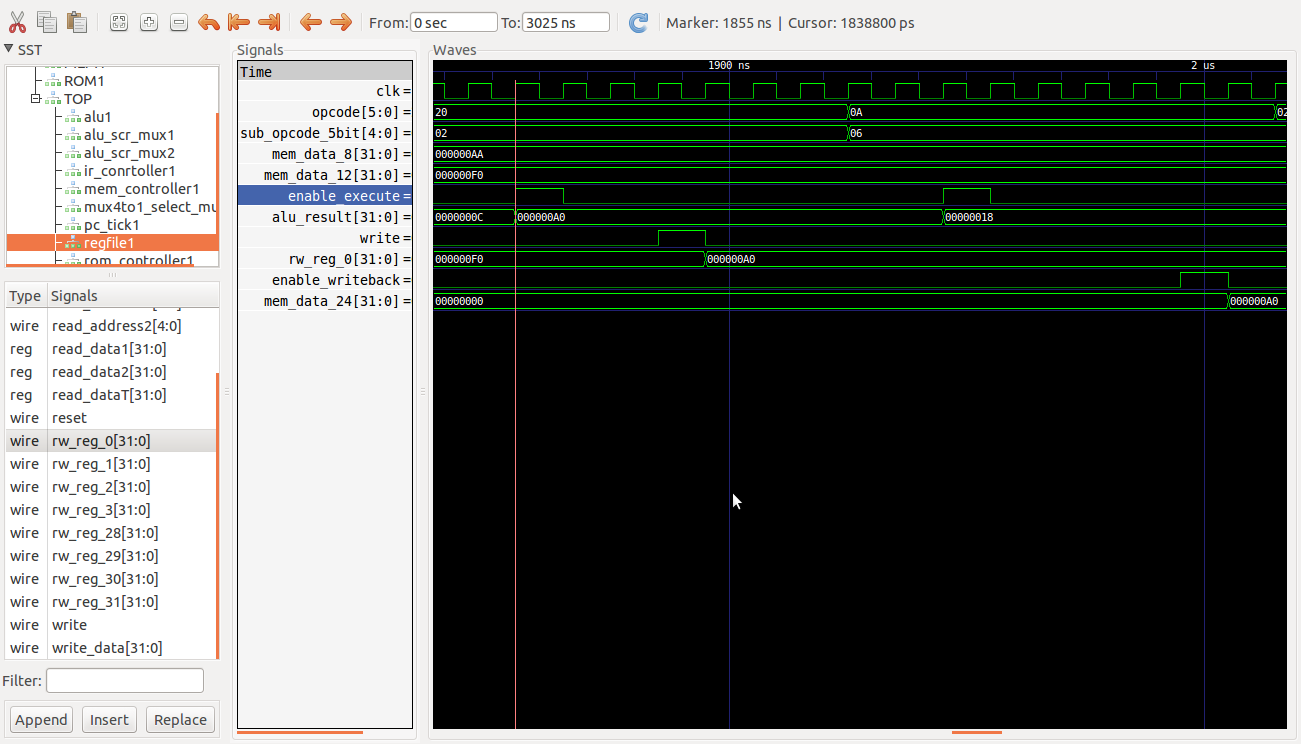
Incomplete

## P6(a) mins1.prog

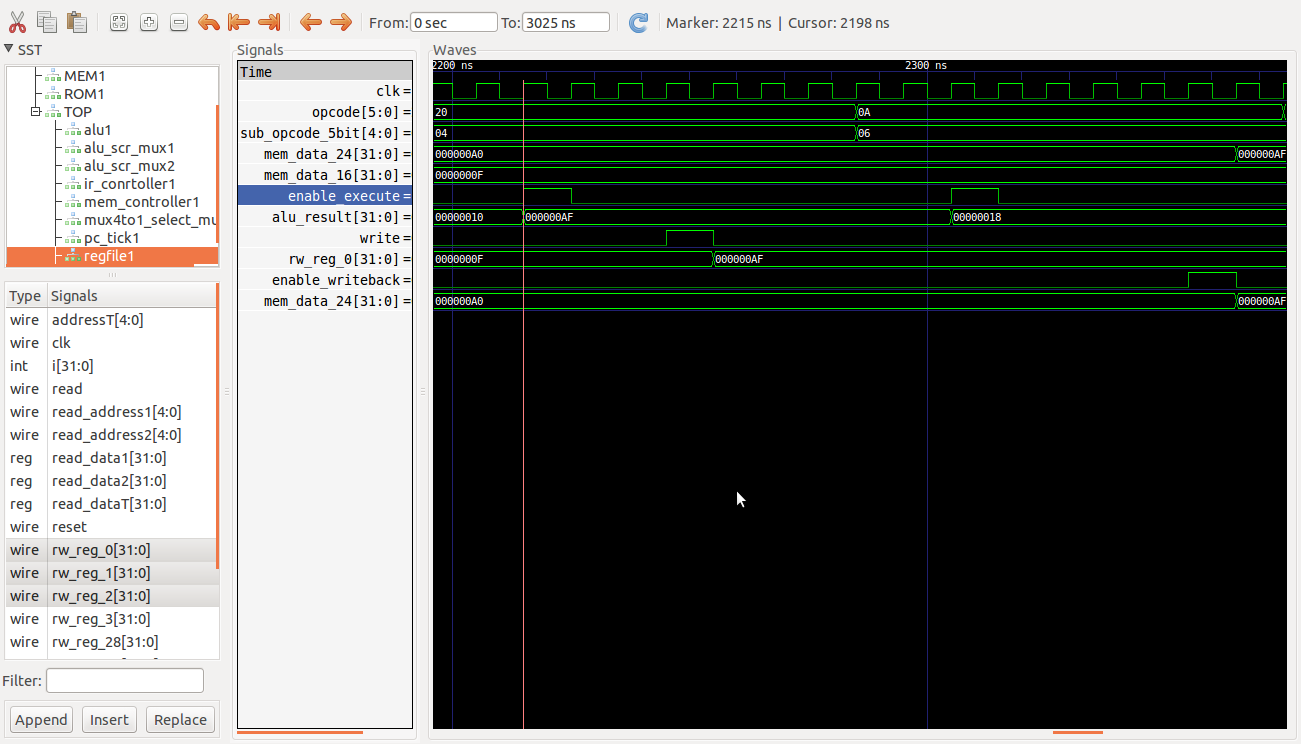
A=h’AA, B=h’F0, C=’hF, D=h’55



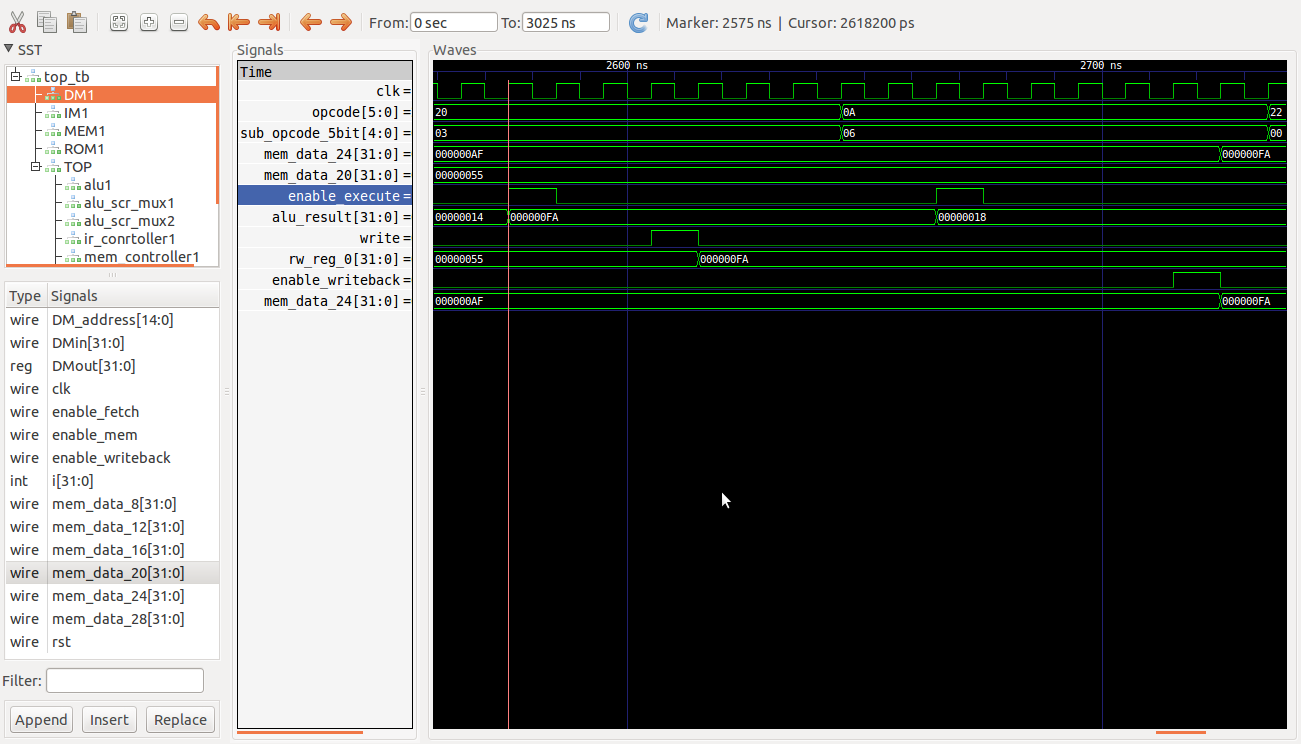
E=A&B=h’A0



E=E|C=h’AF

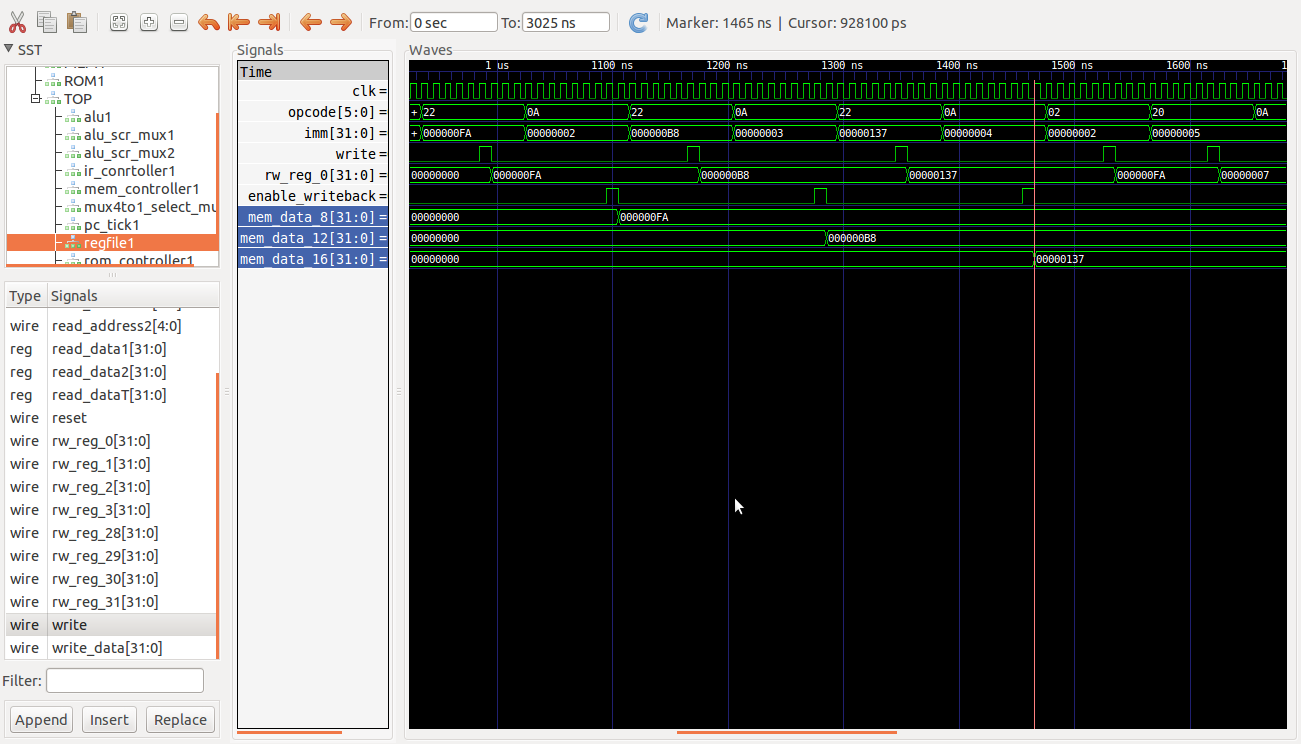


E=’hFA=’d250

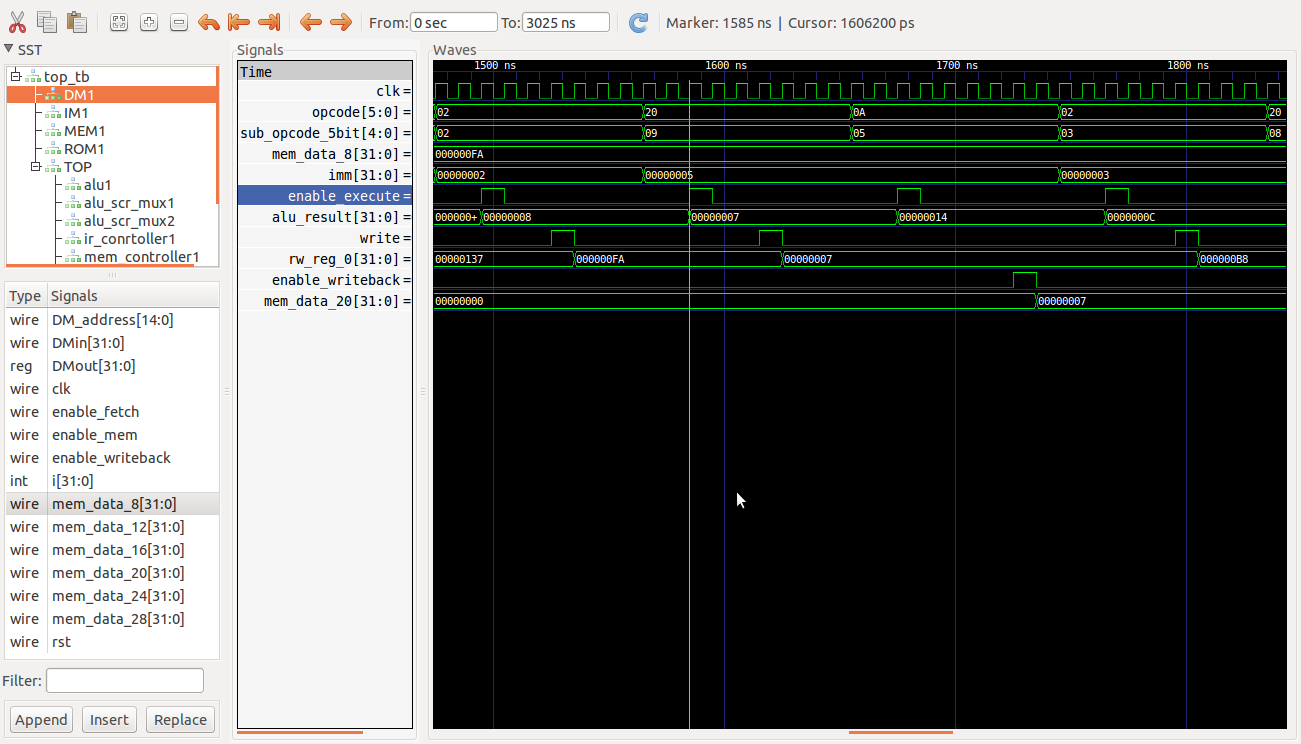


## P6(b) mins2.prog

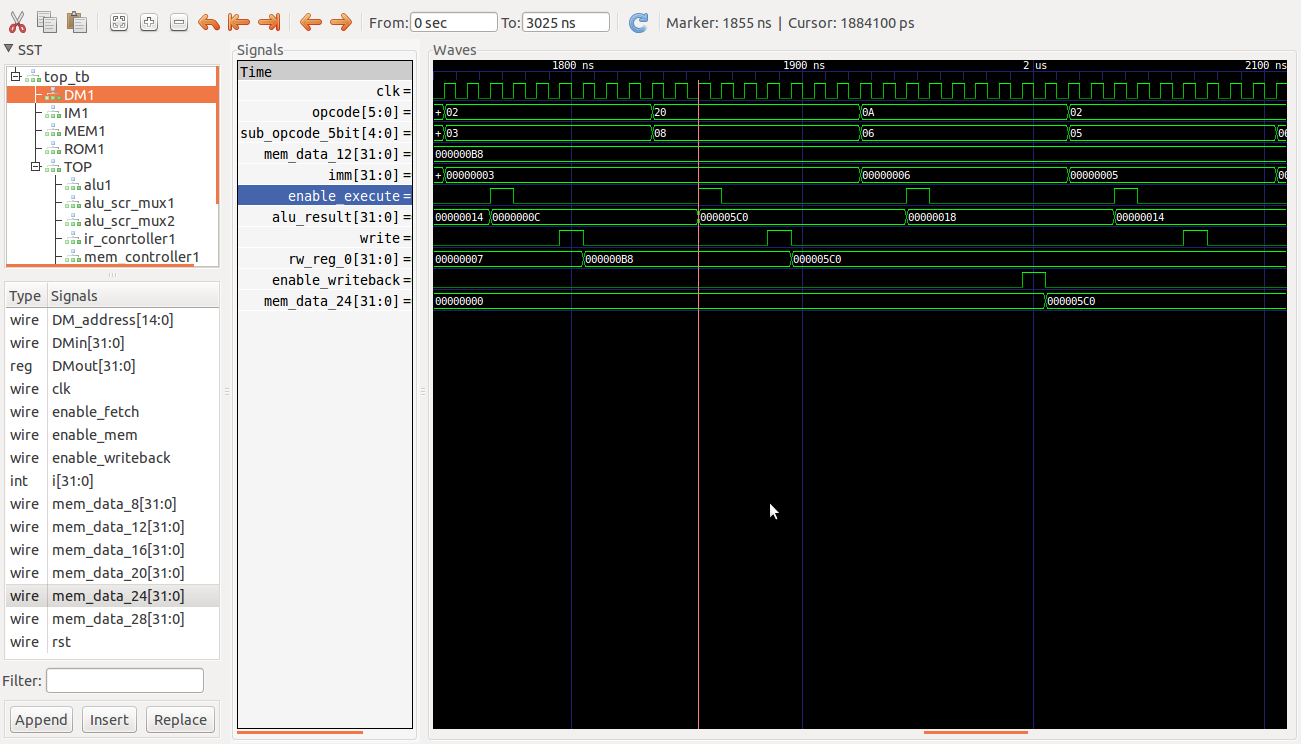
L=’hFA, M=’hB8, N=’h137



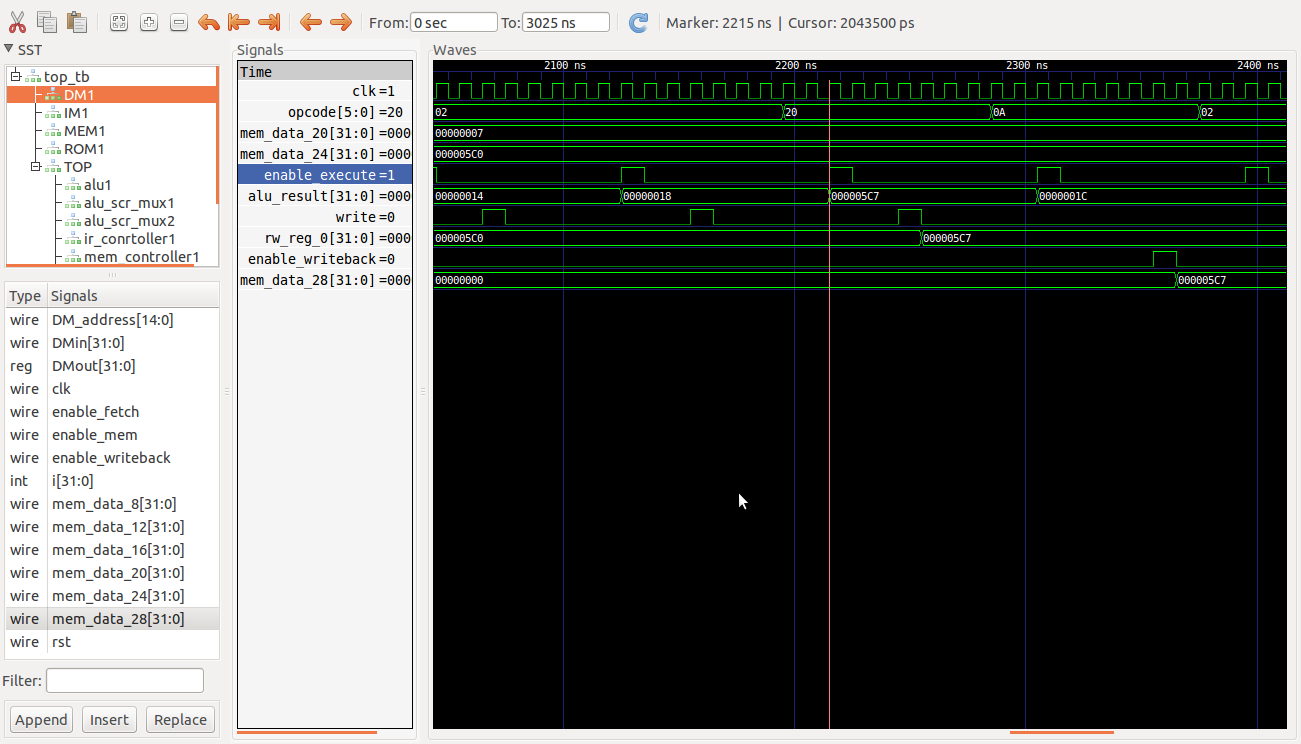
X=’h7=’d7



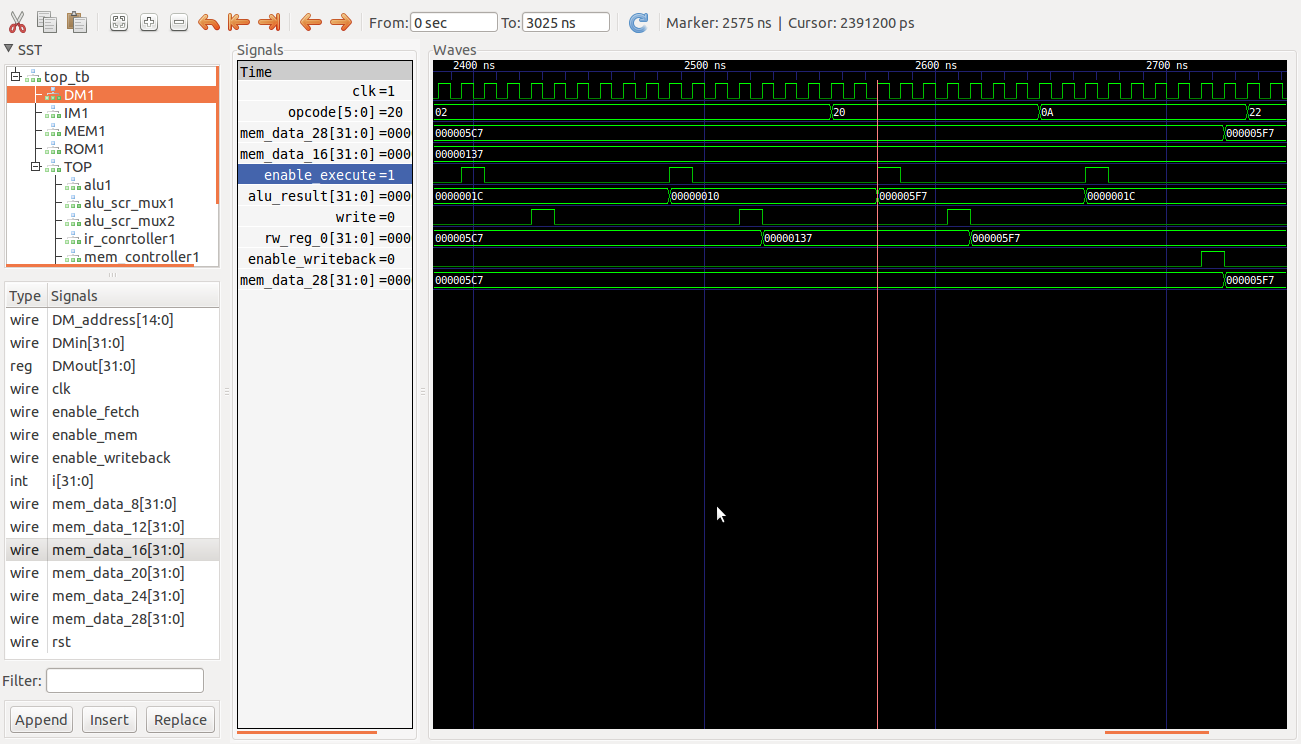
Y=’h5C0=’d1472



Z=X^Y=’h07^’hC0=’h5C7



Z=Z|N=’h5C7|’h137=’h5F7=’d1527



# nLint check

70 Warning(S), 22 Erros(s) in 2079 Line(s)

