8-PSK modulator/demodulator

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Outline

- Modulation/Demodulation
- PSK
- 8-PSK
- Specific methods
- Simulation

Modulation/Demodulation

- Modulation

- Demodulation

PSK

- PSK stands for Phase-shift keying
- Digital modulation scheme
- Use a finite number of phases

PSK

- BPSK

  Binary phase-shift keying
- DPSK

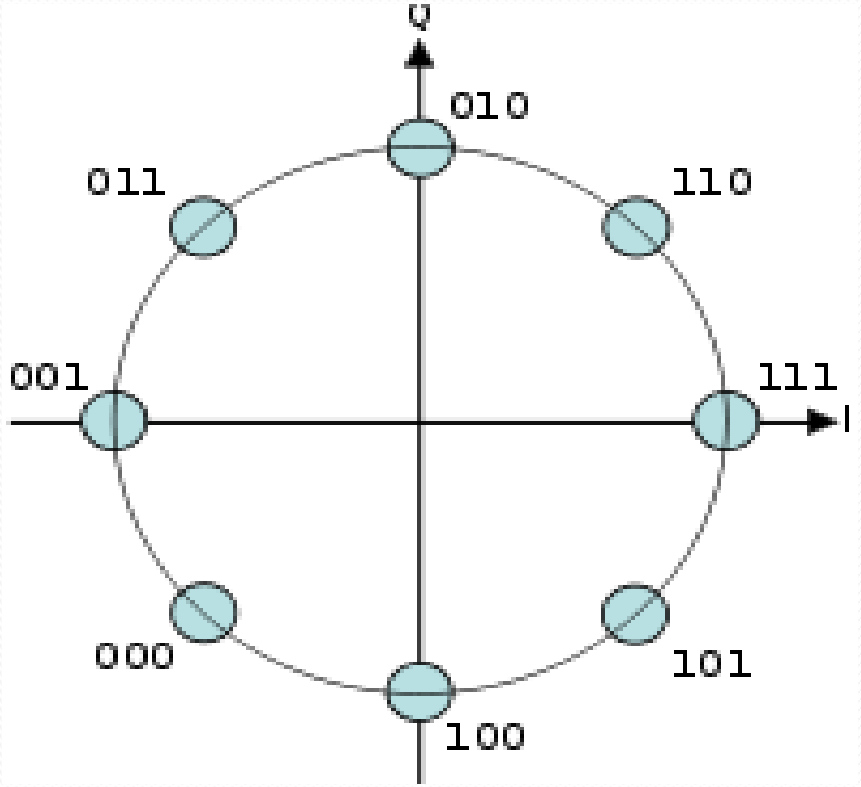
  quaternary phase-shift keying
- 8-PSK

  8 phase-shift keying

8-PSK

- 8-PSK is usually the highest order PSK
- Full use of bandwidth
- Strong resistance to noise

8-PSK



Specific methods-modulation(1)

$$Si(t) = A\cos[2\pi fct + 2\pi(i-1)/M], i = 1, 2, 3\cdots, M$$

Here M=8

Mapping

000=0, 001= π/4, 011=2π/4,

010=3π/4, 110=4π/4, 111=5π/4,

101=6π/4, 100=7π/4

Specific methods-modulation(2)

- Sample a sine wave to 100 points
- *2π-------100*

  *π/4=100/8=13=*00001101

  2 π/4=200/8=25= 00011001

  3 π/4=300/8=38= 00100110

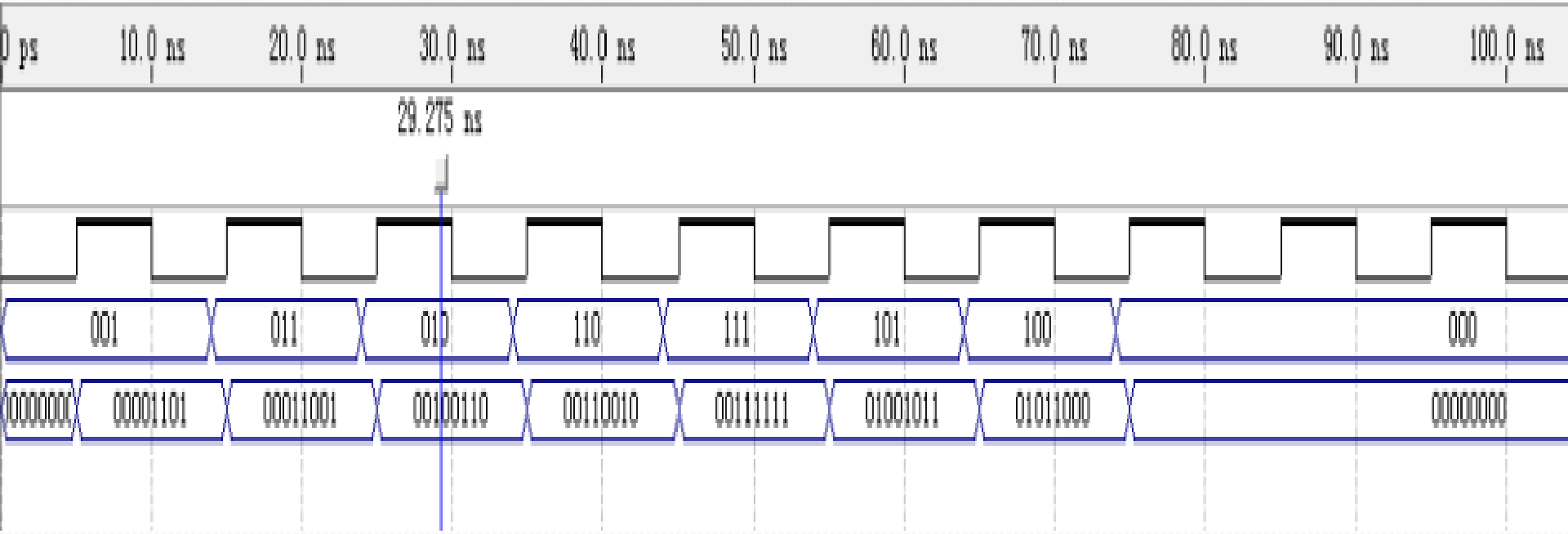
  4 π/4=400/8=50= 00110010

  5 π/4=500/8=63= 00111111

  6 π/4=600/8=75= 01001011

  7 π/4=700/8=88= 01011000

Coding simulation



Specific methods-modulation(3)

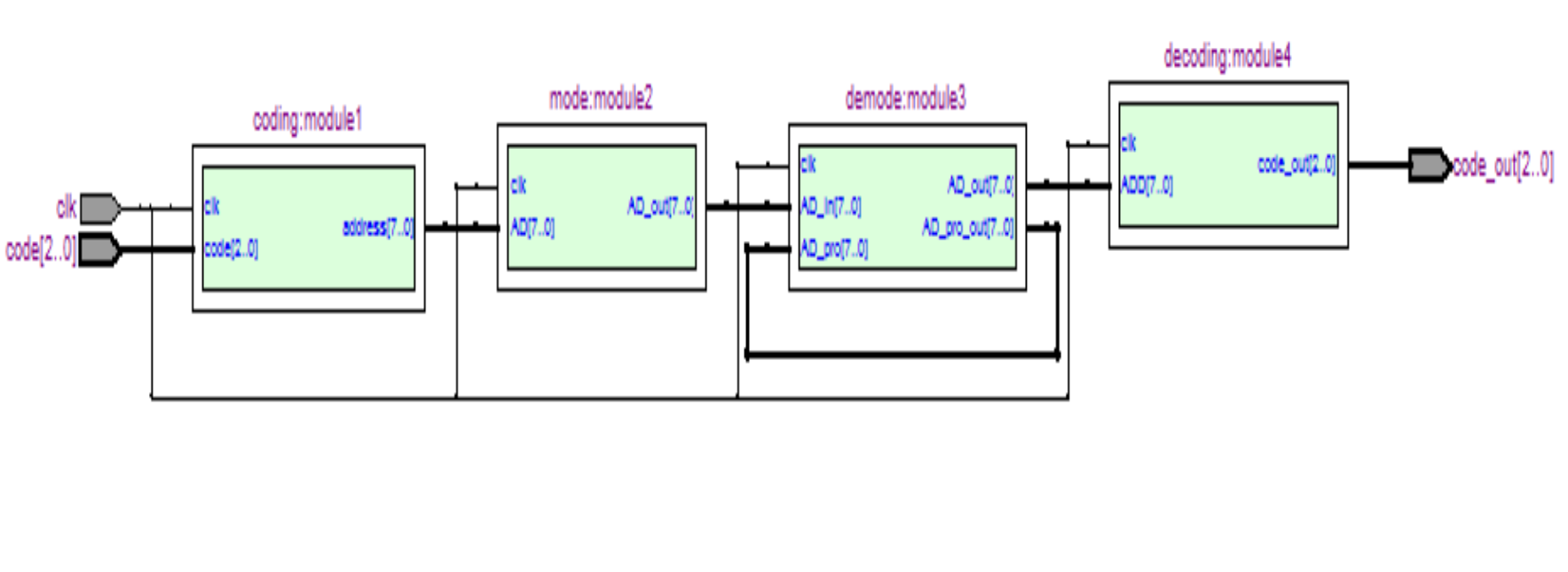
When the input clock rising edge arrives(1), we add the input phase and the value(previous address) stored in the accumulator(AD_pro), then put the sum into the intermediate variable(temp).

If the intermediate variable(temp) is not larger than maximum value 99(01100011), sending temp to output port(AD_out), else minus 100(01100100), then send out the signal.

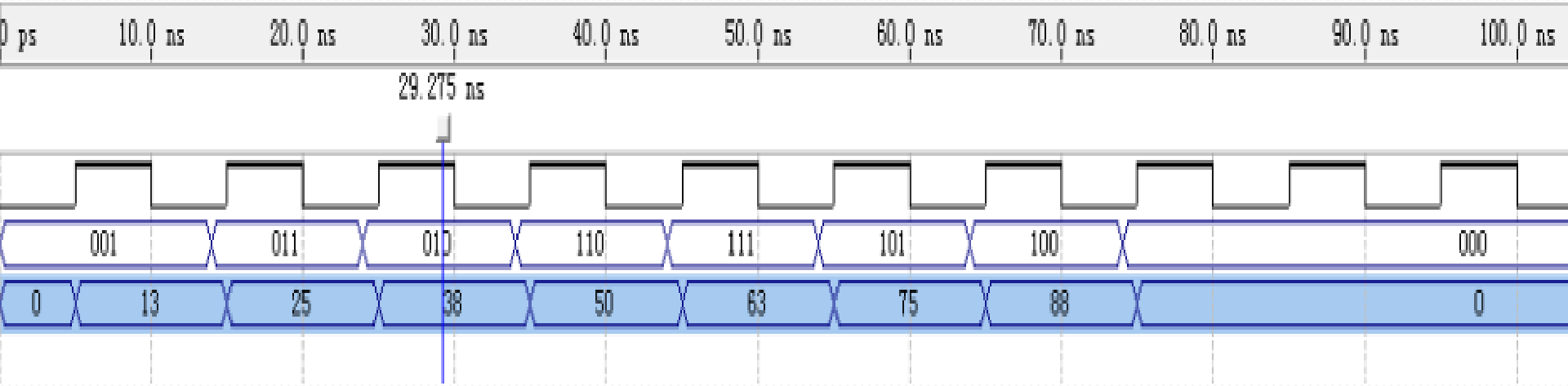
Specific methods-demodulation

- When receiving the signals, we demodulate the first phase received, and send the address to a buffer(AD_pro_out), then the next received phase will minus the phase in the buffer(AD_pro_out), getting the differential address for the next moment, then send this address to the buffer, and mapping the address to the symbol.
- If the previous phase is larger than the current one, the current one add 100(01100100), then minus the previous one.

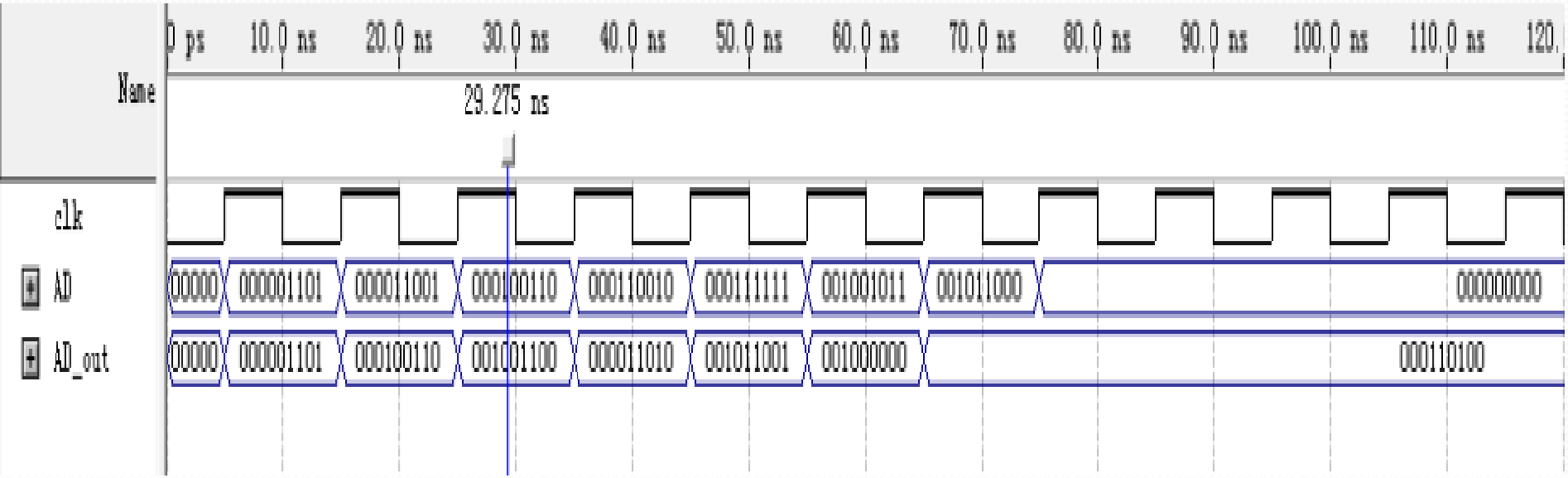
Block diagram



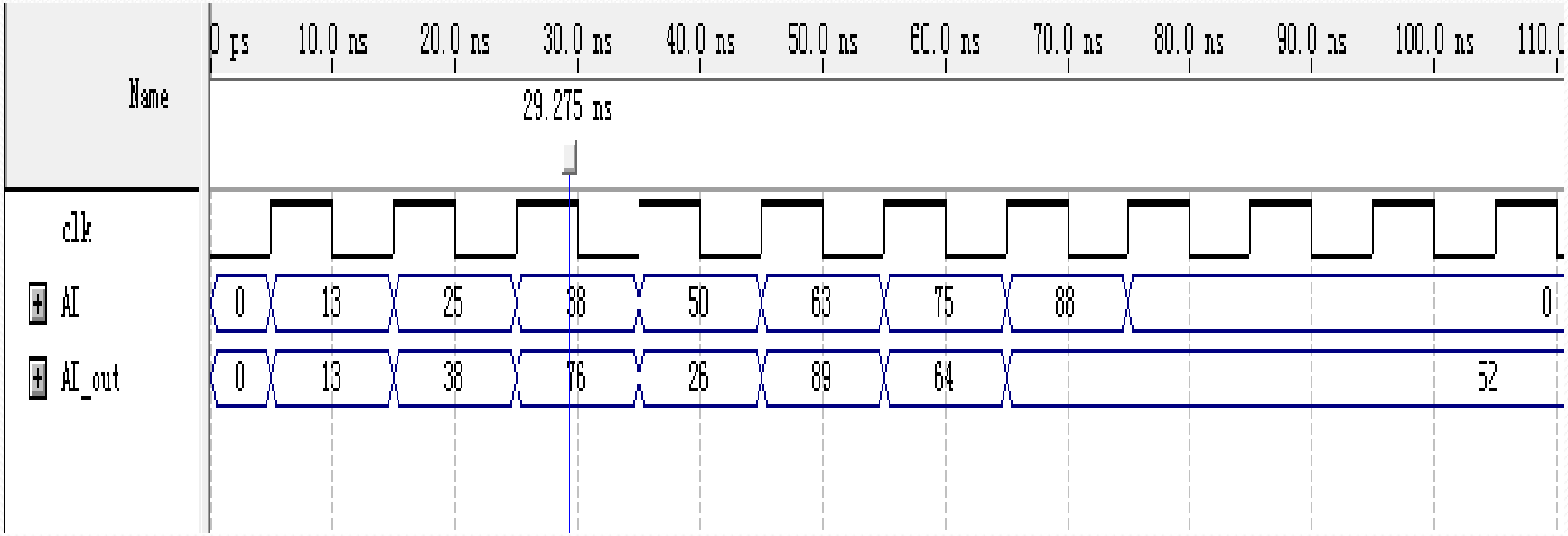
Simulation(1)



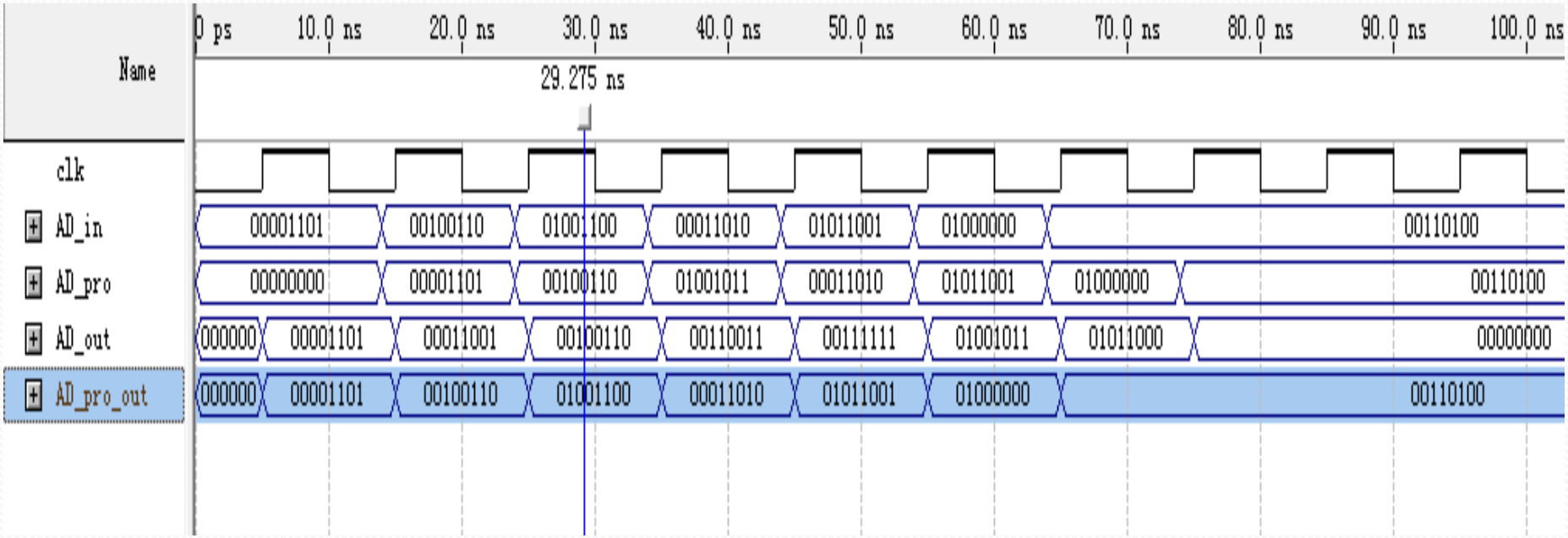
Simulation(2)



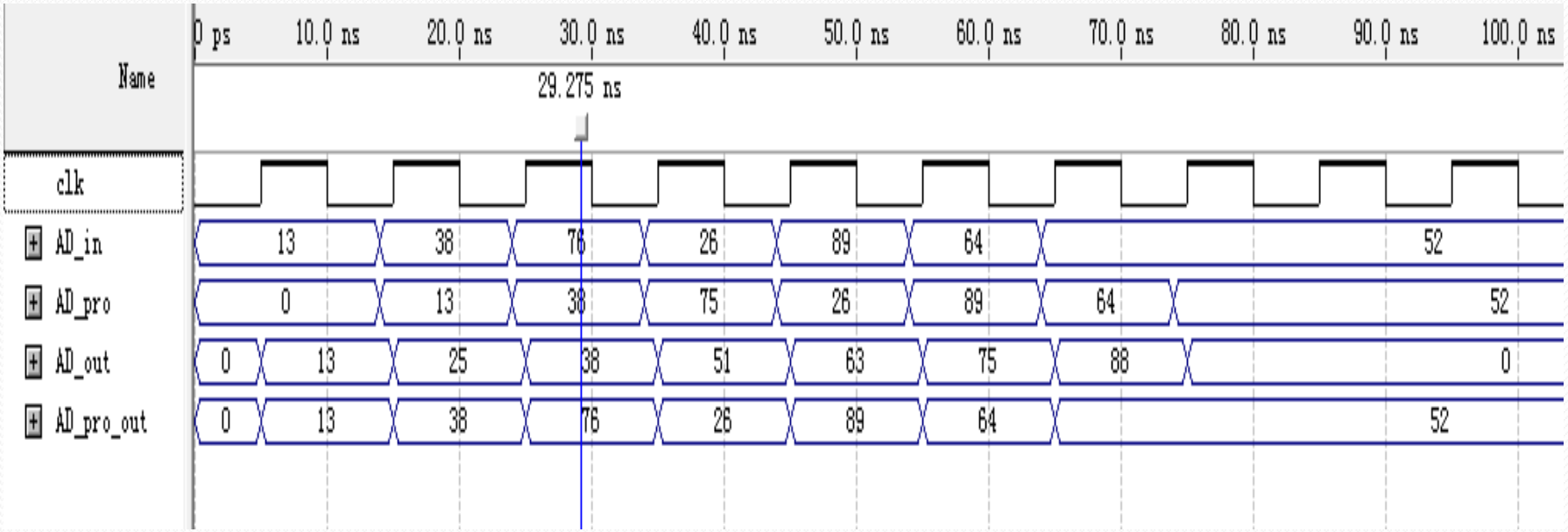
Simulation(3)



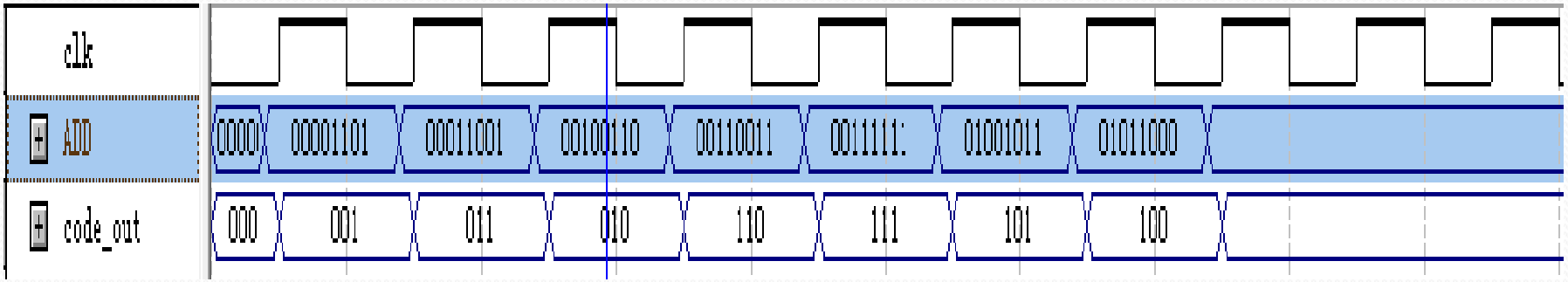
Simulation(4)



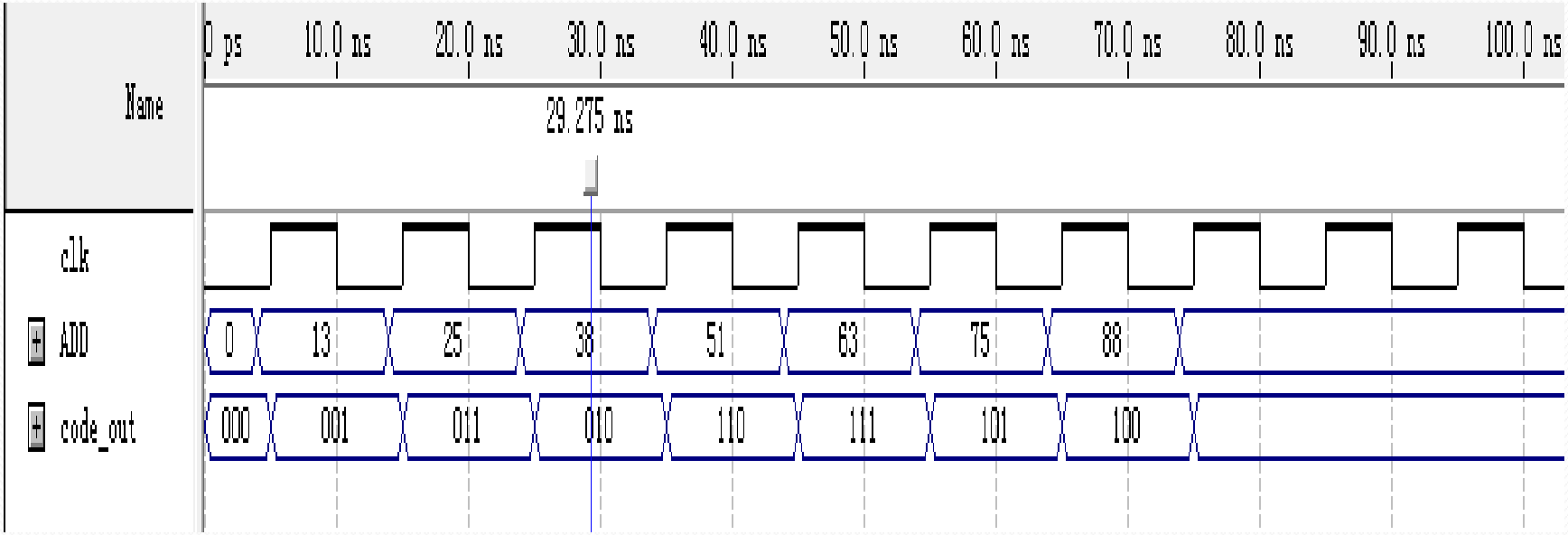
Simulation(5)



Simulation(6)



Simulation(7)



Thank you!

Questions?