A SIMPLE CDMA SPREADER
DIGITAL SIGNAL PROCESSING with FPGA
ECE 641

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Walsh Codes

- Walsh codes are a type of PN-code used in CDMA technology
- They provide orthogonality
- They are generated from Hadamard Matrix in the following pattern:

$$W_{2n} = \begin{bmatrix} W_n & W_n \\ W_n & \overline{W_n} \end{bmatrix}$$

-1	-1
-1	1

For n = 2, implies W4

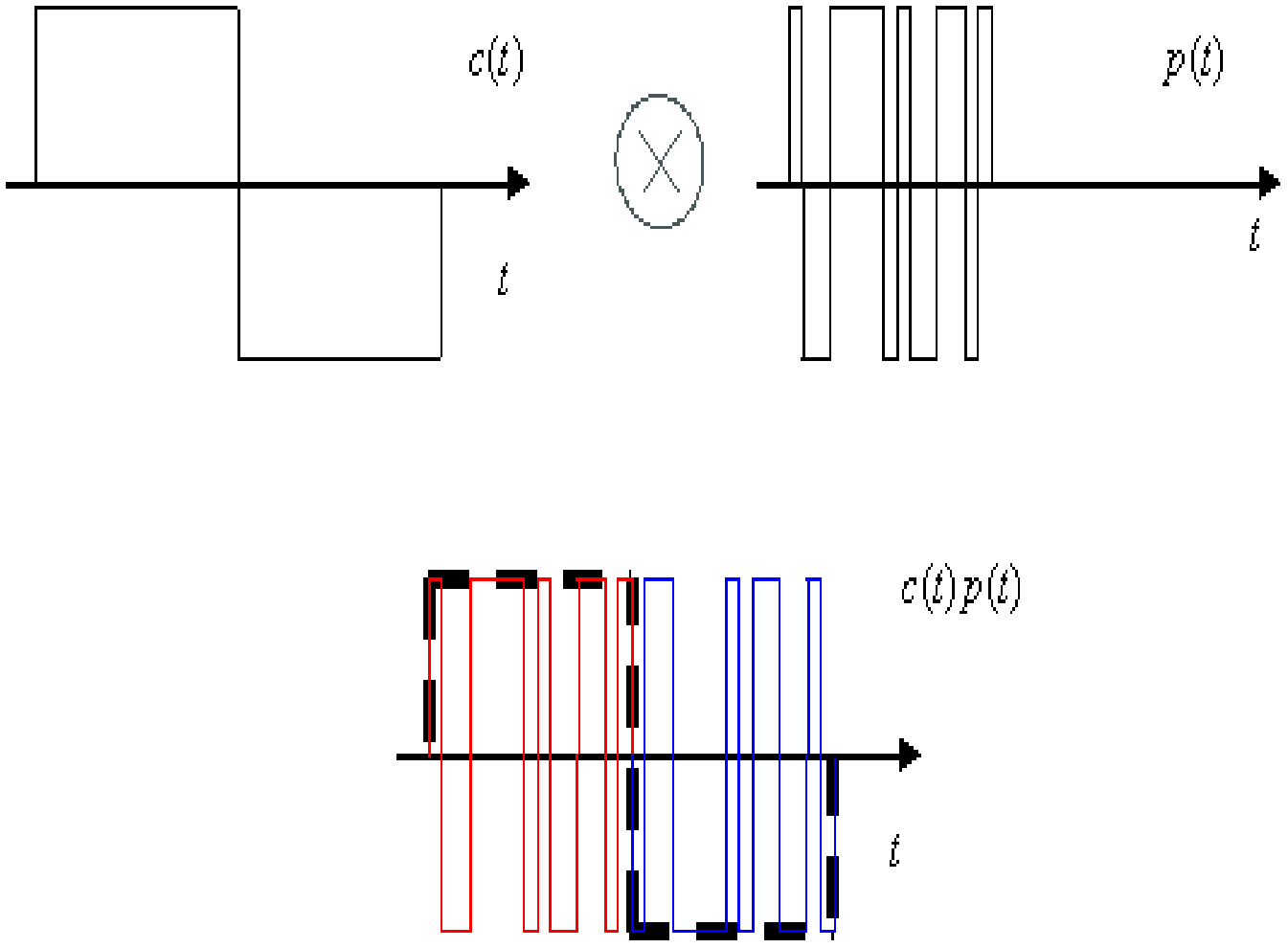
For n = 4, implies W8

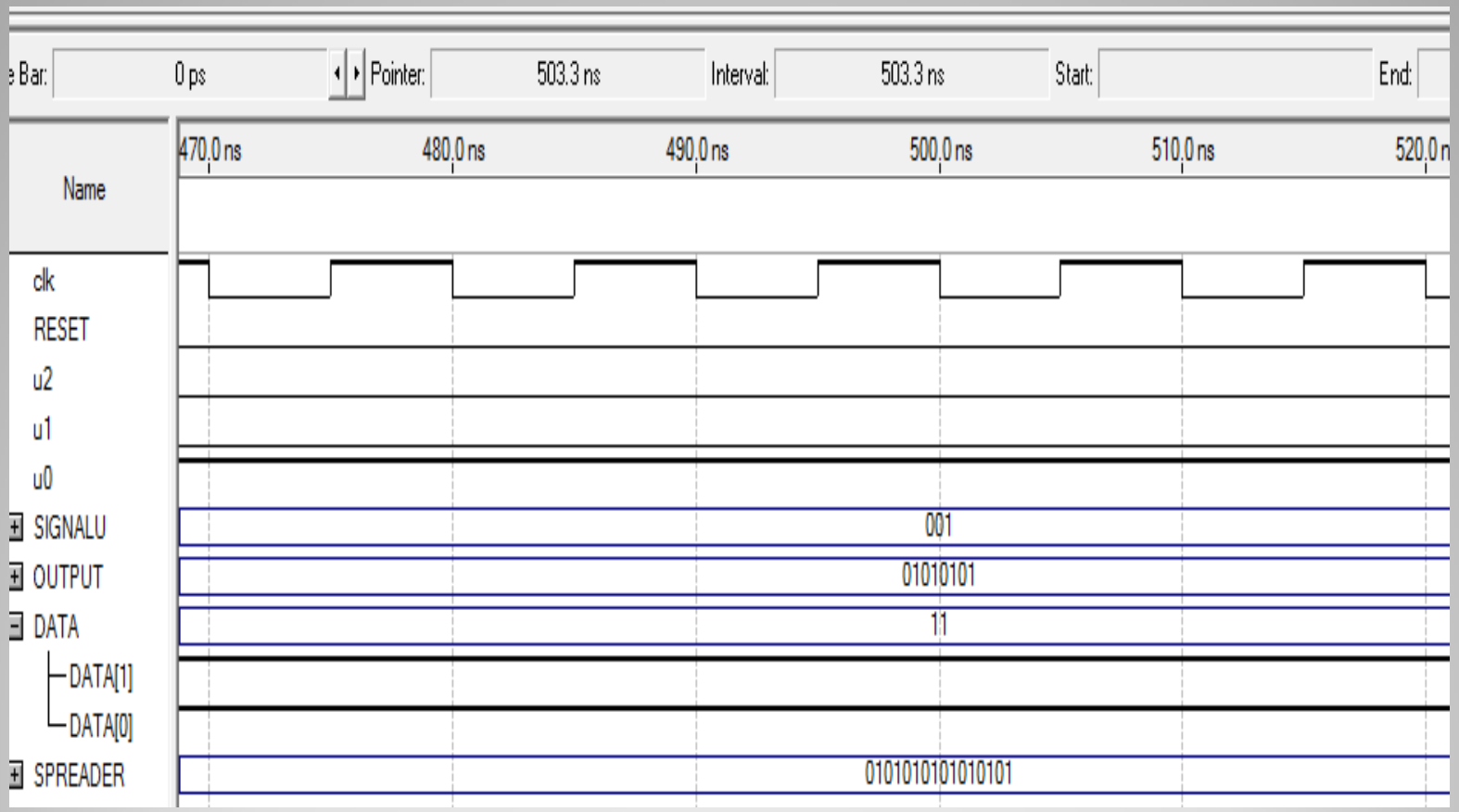
-1	-1	-1	-1
-1	1	-1	1
-1	-1	1	1
-1	1	1	-1

-1	-1	-1	-1	-1	-1	-1	-1
-1	1	-1	1	-1	1	-1	1
-1	-1	1	1	-1	-1	1	1
-1	1	1	-1	-1	1	1	-1
-1	-1	-1	-1	1	1	1	1
-1	1	-1	1	1	-1	1	-1
-1	-1	1	1	1	1	-1	-1
-1	1	1	-1	1	-1	-1	1

Spreading

- Executes spreading of data energy in real time
- This is done by multiplying the data signal with the code chip i.e. Walsh code
- The result is the coded signal or transmit signal which it then further modulated in the CDMA system


c(t)
t
p(t)
t
c(t)p(t)
t



Simulation Results

DEMO!