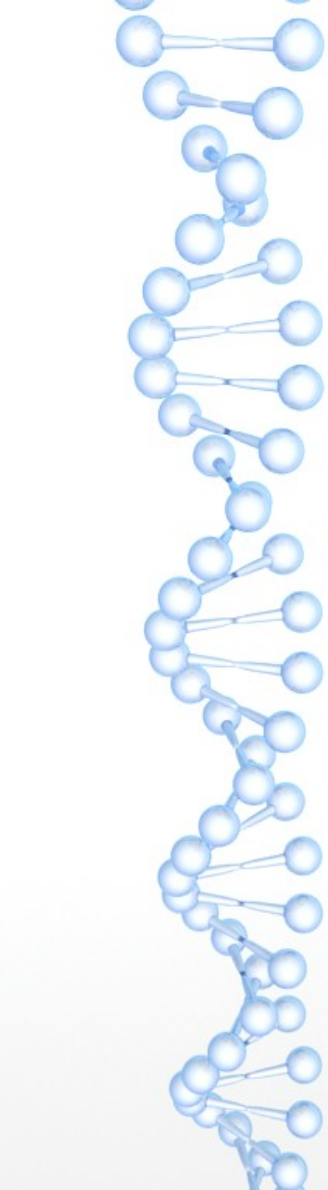
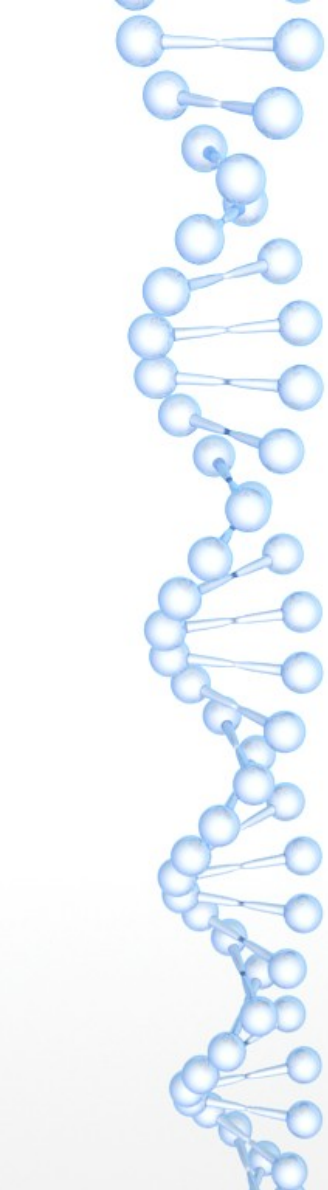


Trabajo Final - Técnicas Avanzadas de Diseño Digital

Implementación de un canal LVDS con codificación 8b10b

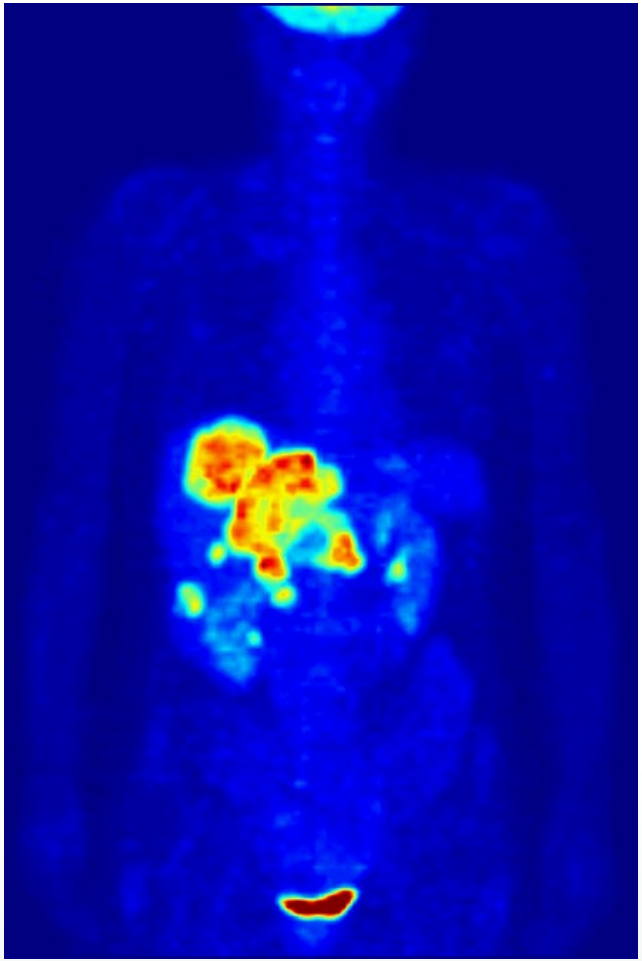
Docente: Ing. Guillermo Jaquenod

Alumno: Ing. Federico De La Cruz Arbizu



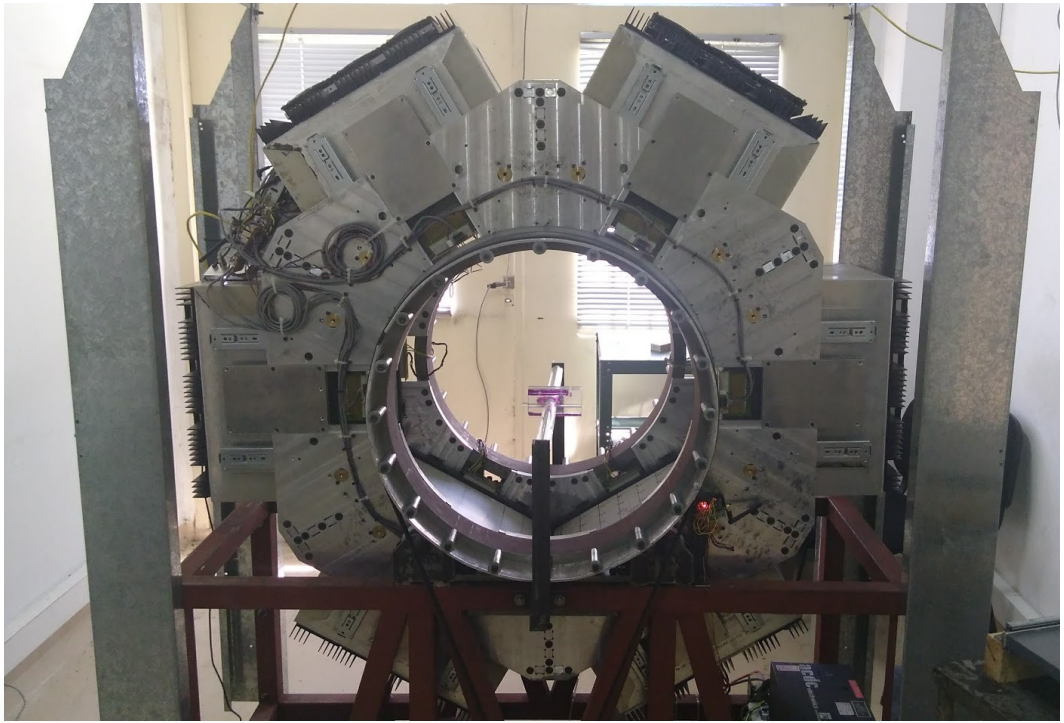
Qué es un PET?

Qué es un PET?

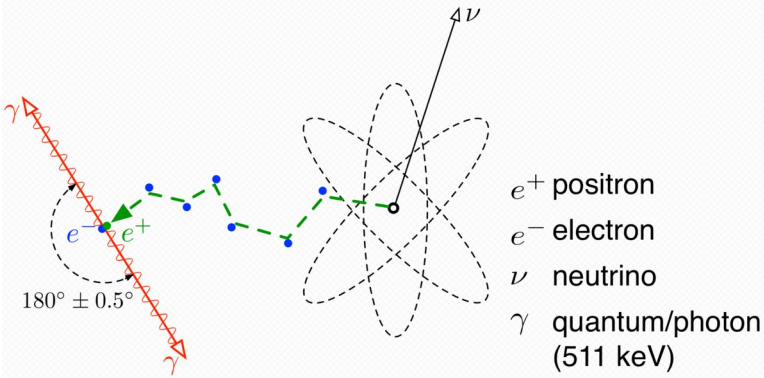


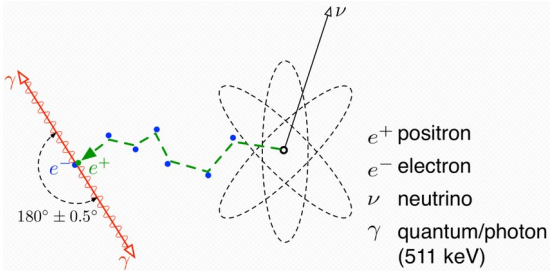
AR-PET

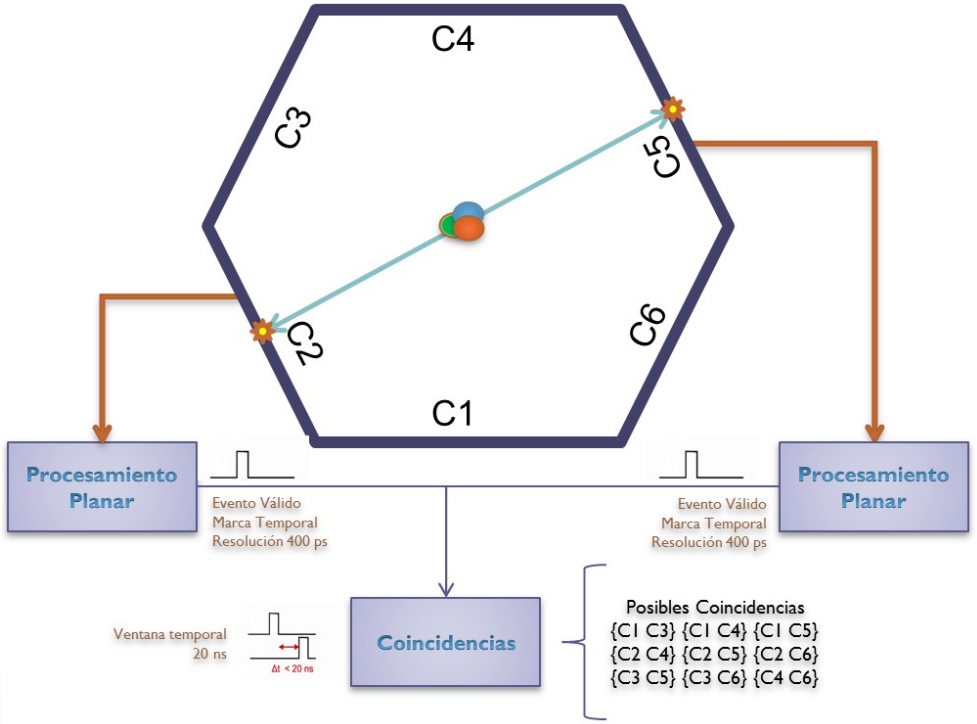
AR-PET

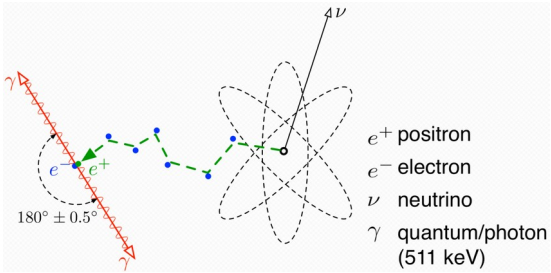


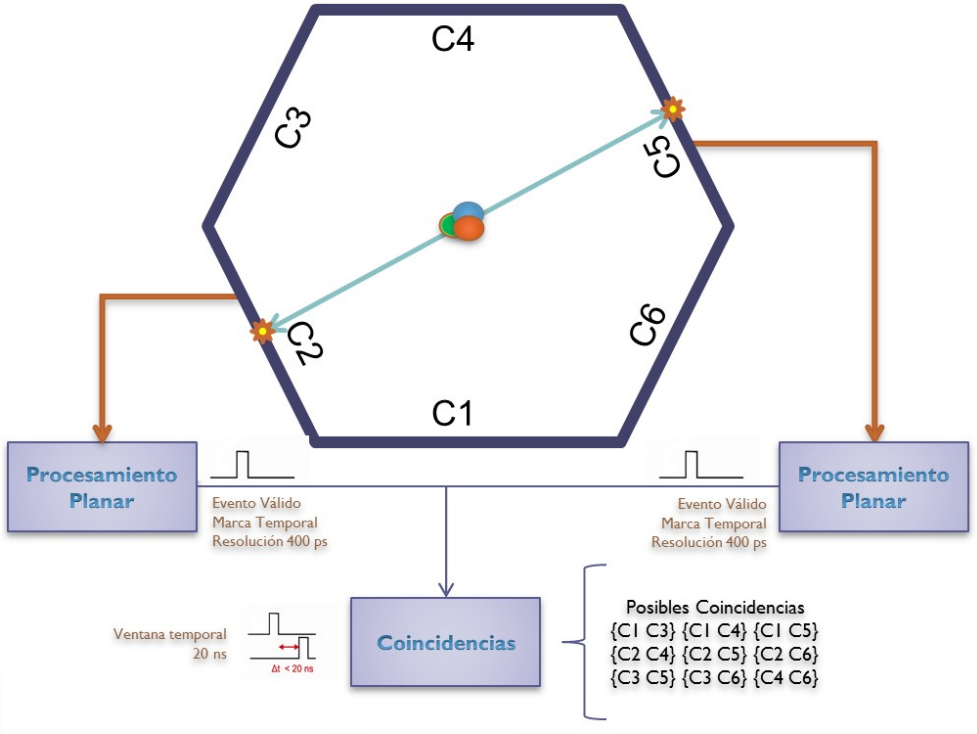
Emisión y aniquilación de positrones?

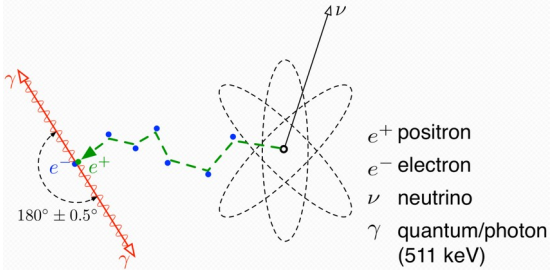


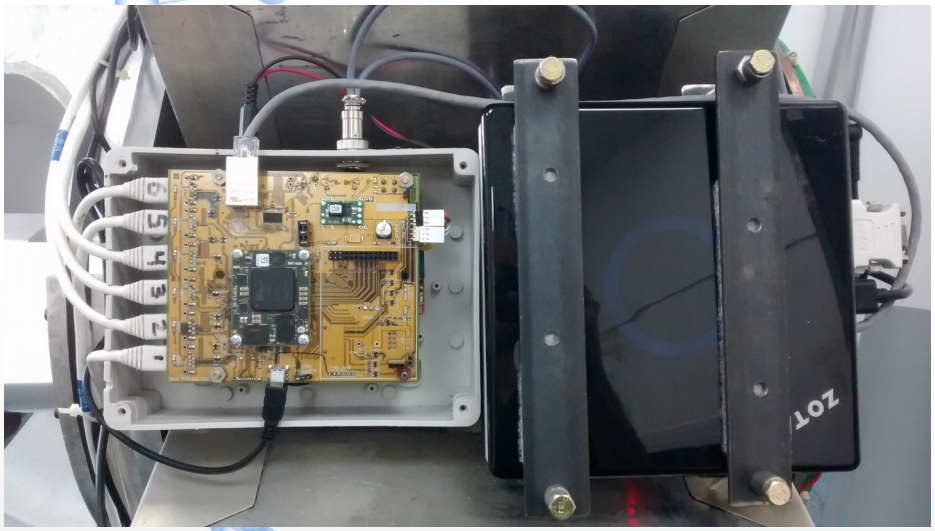

ν
γ
e^-
e^+
$180° \pm 0.5°$
γ
e^+ positron
e^- electron
ν neutrino
γ quantum/photon
(511 keV)

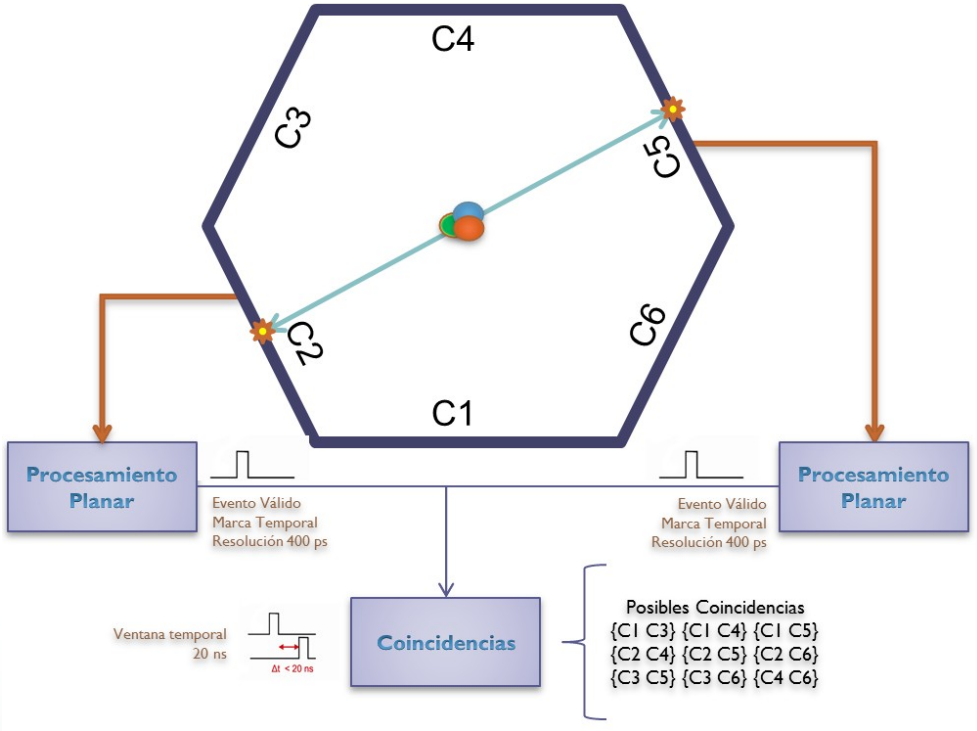

C4
C3
C5
C6
C2
C1
Procesamiento Planar
Evento Válido
Marca Temporal
Resolución 400 ps
Evento Válido
Marca Temporal
Resolución 400 ps
Procesamiento Planar
Ventana temporal
20 ns
Δt < 20 ns
Coincidencias
Posibles Coincidencias
{C1 C3} {C1 C4} {C1 C5}
{C2 C4} {C2 C5} {C2 C6}
{C3 C5} {C3 C6} {C4 C6}

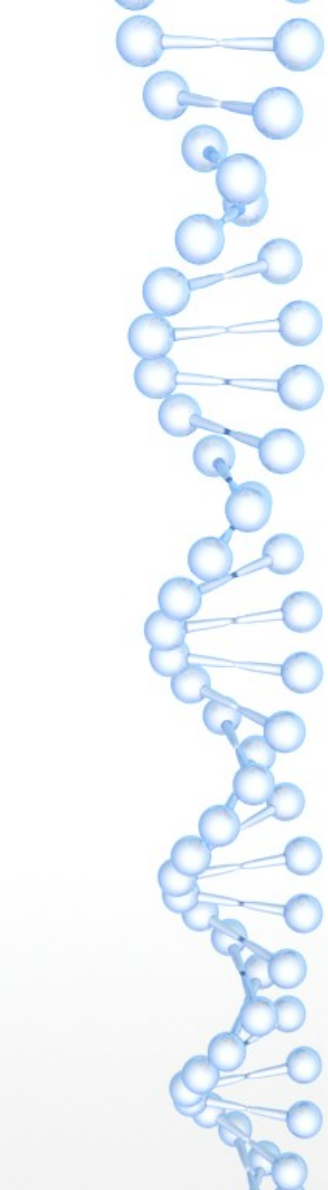

ν
γ
e^-
e^+
$180° \pm 0.5°$
γ
e^+ positron
e^- electron
ν neutrino
γ quantum/photon
(511 keV)


C4
C3
C5
C6
C2
C1
Procesamiento Planar
Evento Válido
Marca Temporal
Resolución 400 ps
Evento Válido
Marca Temporal
Resolución 400 ps
Procesamiento Planar
Ventana temporal
20 ns
Δt < 20 ns
Coincidencias
Posibles Coincidencias
{C1 C3} {C1 C4} {C1 C5}
{C2 C4} {C2 C5} {C2 C6}
{C3 C5} {C3 C6} {C4 C6}

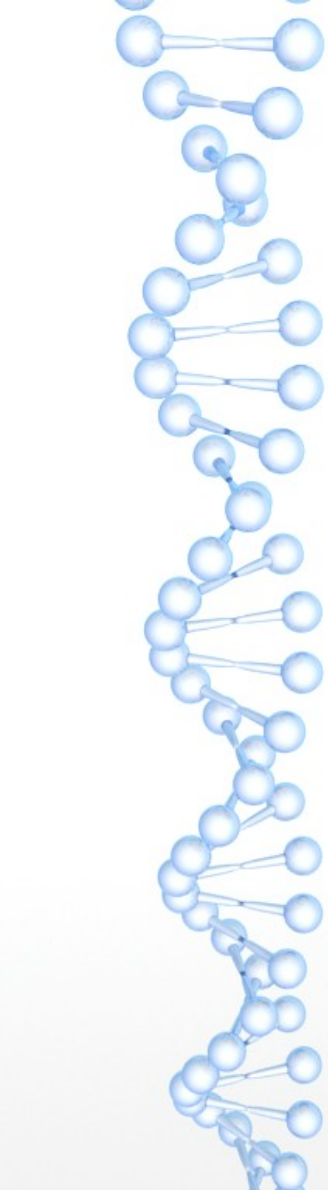

ν
γ
e^-
e^+
$180° \pm 0.5°$
γ
e^+ positron
e^- electron
ν neutrino
γ quantum/photon
(511 keV)

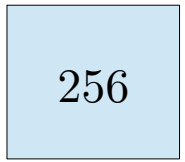


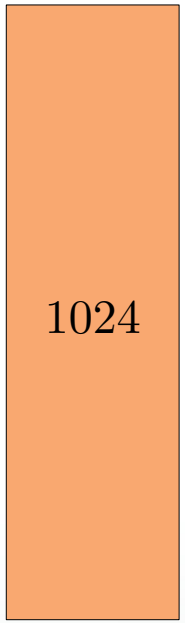

C4
C3
C5
C6
C2
C1
Procesamiento Planar
Evento Válido
Marca Temporal
Resolución 400 ps
Evento Válido
Marca Temporal
Resolución 400 ps
Procesamiento Planar
Ventana temporal
20 ns
Δt < 20 ns
Coincidencias
Posibles Coincidencias
{C1 C3} {C1 C4} {C1 C5}
{C2 C4} {C2 C5} {C2 C6}
{C3 C5} {C3 C6} {C4 C6}

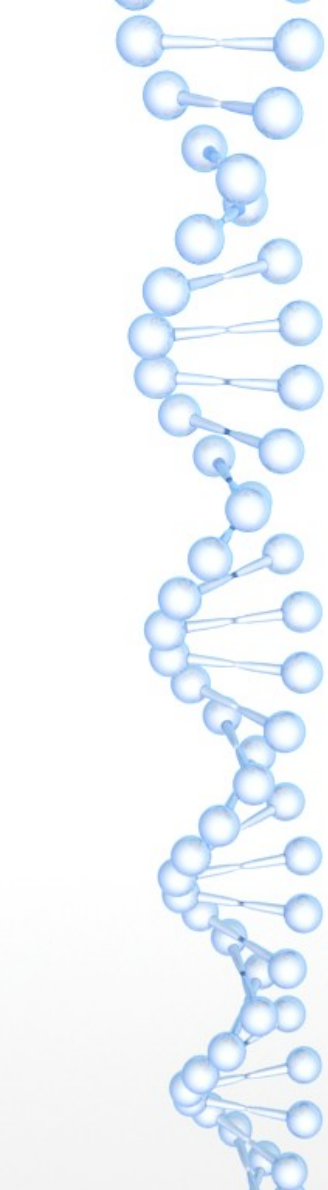


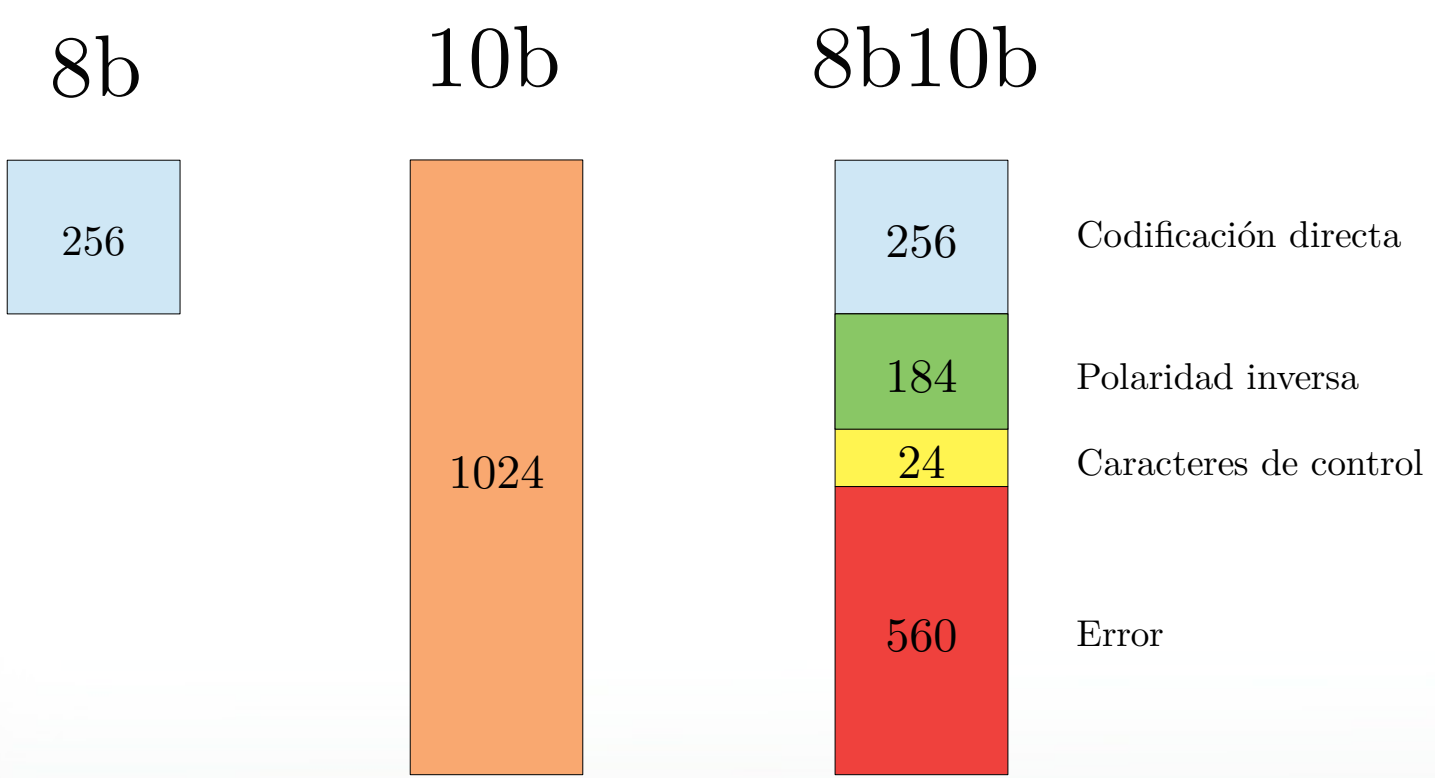
Codificación 8b10b?

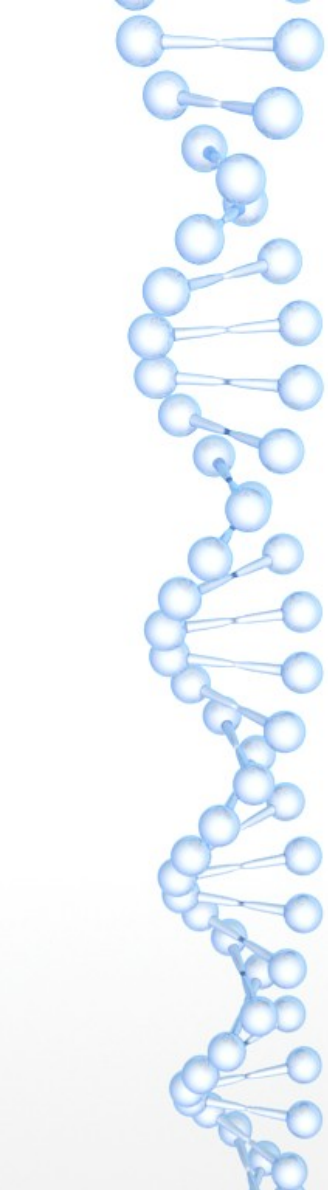



8b
256


10b
1024

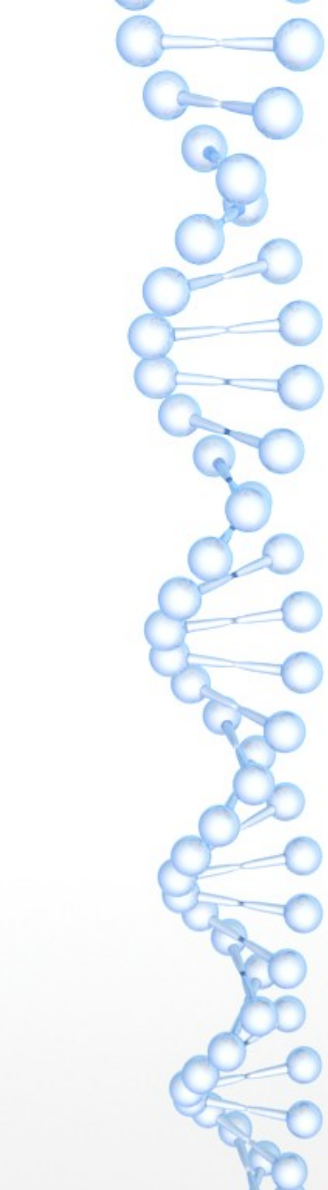



8b
10b
8b10b
256
1024
256
184
24
560
Codificación directa
Polaridad inversa
Caracteres de control
Error



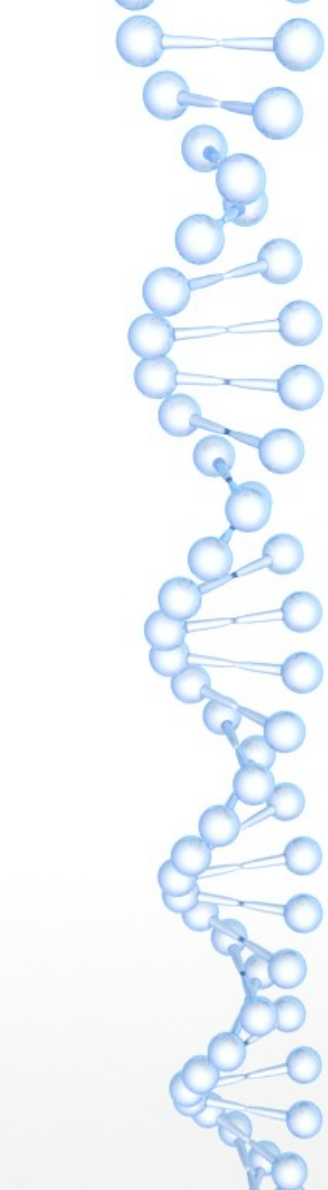
Data Character

- Son 440 en ambas polaridades
- Las palabras codificadas podrán ser 6/4 (6 unos y 4 ceros), 5/5 o 4/6
- No podrán contener más de 4 símbolos (unos o ceros) iguales consecutivos

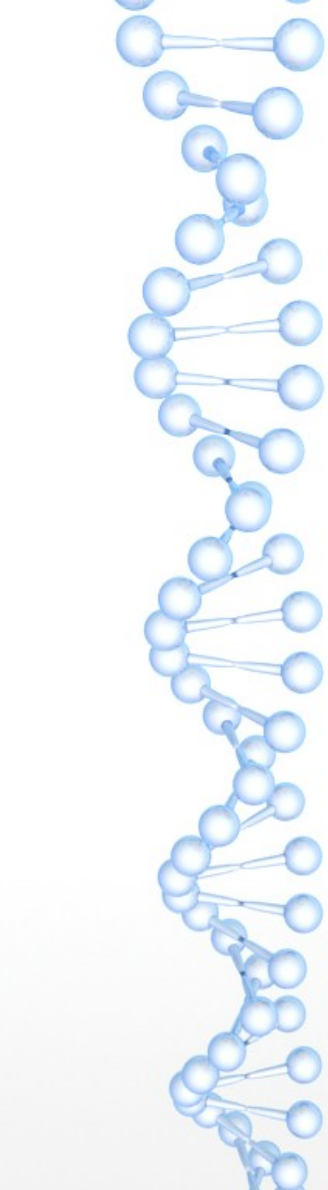


Comma Character

- Son 12 (cada uno con doble polaridad)
- Se utilizan para realizar pausas de transmisión, avisos de inactividad, sincronización de tramas, etc
- Permiten tener más de 4 símbolos (unos o ceros) iguales consecutivos



Nomenclatura



Nomenclatura

$$W_{8b} = b_7 b_6 b_5 b_4 b_3 b_2 b_1 b_0$$

Nomenclatura

$$W_{8b} = b_7 b_6 b_5 b_4 b_3 b_2 b_1 b_0$$

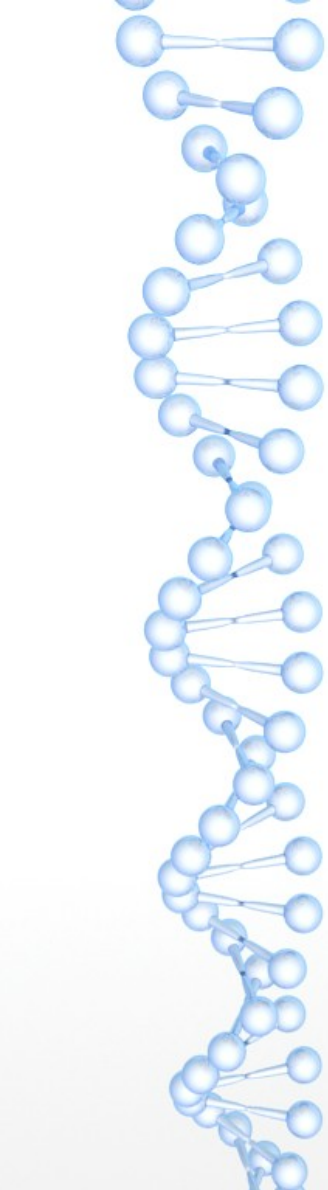
$$D_{CH} = D.x_2 x_1.x_0 \qquad K_{CH} = K.x_2 x_1.x_0$$

Nomenclatura

$$W_{8b} = b_7 b_6 b_5 b_4 b_3 b_2 b_1 b_0$$

$$D_{CH} = D.x_2 x_1.x_0 \qquad K_{CH} = K.x_2 x_1.x_0$$

$$[x_2 x_1]_{10} = [b_4 b_3 b_2 b_1 b_0]_2 \qquad [x_0]_{10} = [b_7 b_6 b_5]_2$$



Nomenclatura

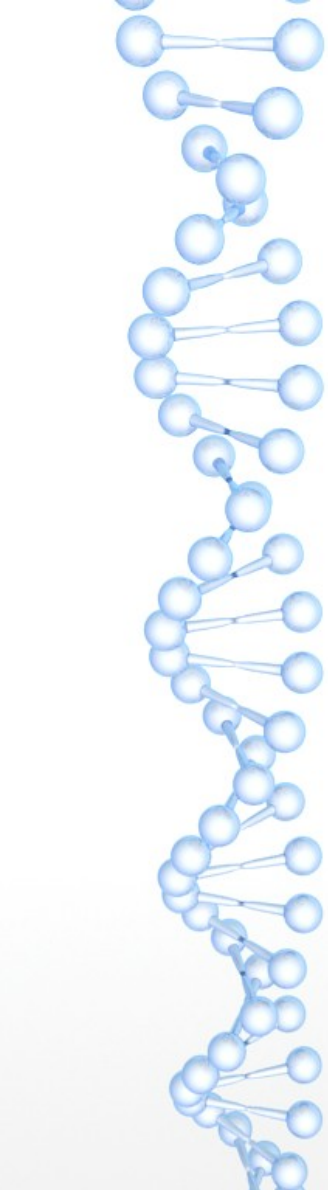
$$W_{8b} = b_7 b_6 b_5 b_4 b_3 b_2 b_1 b_0$$

$$D_{CH} = D.x_2 x_1.x_0 \qquad K_{CH} = K.x_2 x_1.x_0$$

$$[x_2 x_1]_{10} = [b_4 b_3 b_2 b_1 b_0]_2 \qquad [x_0]_{10} = [b_7 b_6 b_5]_2$$

$$D.10.3 = 01101010$$

$$K.28.5 = 10111100$$



Codificación 8b10b

- Se realiza por tabla de manera ordenada y paralela
- Las tablas para los *Data Characters* es diferente que la de los *Comma Characters*
- El transmisor gestionará la polaridad de los datos no solo para optimizar la contínua del canal sino para asegurar que nunca habrán 6 símbolos (ceros o unos) iguales consecutivos

Data Character		RD-	RD+
D.16	100		
D.17	100		
D.18	100		
D.19	100		
D.20	101		
D.21	101		
D.22	101		
D.23	101		
D.24	110		
D.25	110		
D.26	110		
D.27	110		
D.28	111		
D.29	111		
D.30	111		
D.31	111		

Data Character		RD-	RD+
D.00	00000	100111	011000
D.01	00001	011101	100010
D.02	00010	101101	010010
D.03	00011	110001	
D.04	00100	110101	001010
D.05	00101	101001	
D.06	00110	011001	
D.07	00111	111000	000111
D.08	01000	111001	000110
D.09	01001	100101	
D.10	01010	010101	
D.11	01011	110100	
D.12	01100	001101	
D.13	01101	101100	
D.14	01110	011100	
D.15	01111	010111	101000

Data Character		RD-	RD+
D.x.0	000	1011	0100
D.x.1	001	1001	
D.x.2	010	0101	
D.x.3	011	1100	0011
D.x.4	100	1101	0010
D.x.5	101	1010	
D.x.6	110	0110	
D.x.7	111	1110	0001
D.x.7*	111	0111	1000

Data Character		RD-	RD+
D.16	100		
D.17	100		
D.18	100		
D.19	100		
D.20	101		
D.21	101		
D.22	101		
D.23	101		
D.24	110		
D.25	110		
D.26	110		
D.27	110		
D.28	111		
D.29	111		
D.30	111		
D.31	111		

Data Character		RD-	RD+
D.00	00000	100111	011000
D.01	00001	011101	100010
D.02	00010	101101	010010
D.03	00011	110001	
D.04	00100	110101	001010
D.05	00101	101001	
D.06	00110	011001	
D.07	00111	111000	000111
D.08	01000	111001	000110
D.09	01001	100101	
D.10	01010	010101	
D.11	01011	110100	
D.12	01100	001101	
D.13	01101	101100	
D.14	01110	011100	
D.15	01111	010111	101000

Data Character		RD-	RD+
D.x.0	000	1011	0100
D.x.1	001	1001	
D.x.2	010	0101	
D.x.3	011	1100	0011
D.x.4	100	1101	0010
D.x.5	101	1010	
D.x.6	110	0110	
D.x.7	111	1110	0001
D.x.7*	111	0111	1000

D.10.3

Data Character		RD-	RD+
D.16	100		
D.17	100		
D.18	100		
D.19	100		
D.20	101		
D.21	101		
D.22	101		
D.23	101		
D.24	110		
D.25	110		
D.26	110		
D.27	110		
D.28	111		
D.29	111		
D.30	111		
D.31	111		

Data Character		RD-	RD+
D.00	00000	100111	011000
D.01	00001	011101	100010
D.02	00010	101101	010010
D.03	00011	110001	
D.04	00100	110101	001010
D.05	00101	101001	
D.06	00110	011001	
D.07	00111	111000	000111
D.08	01000	111001	000110
D.09	01001	100101	
D.10	01010	010101	
D.11	01011	110100	
D.12	01100	001101	
D.13	01101	101100	
D.14	01110	011100	
D.15	01111	010111	101000

Data Character		RD-	RD+
D.x.0	000	1011	0100
D.x.1	001	1001	
D.x.2	010	0101	
D.x.3	011	1100	0011
D.x.4	100	1101	0010
D.x.5	101	1010	
D.x.6	110	0110	
D.x.7	111	1110	0001
D.x.7*	111	0111	1000

D.10.3

Data Character		RD-	RD+
D.16	100		
D.17	100		
D.18	100		
D.19	100		
D.20	101		
D.21	101		
D.22	101		
D.23	101		
D.24	110		
D.25	110		
D.26	110		
D.27	110		
D.28	111		
D.29	111		
D.30	111		
D.31	111		

Data Character		RD-	RD+
D.00	00000	100111	011000
D.01	00001	011101	100010
D.02	00010	101101	010010
D.03	00011	110001	
D.04	00100	110101	001010
D.05	00101	101001	
D.06	00110	011001	
D.07	00111	111000	000111
D.08	01000	111001	000110
D.09	01001	100101	
D.10	01010	010101	
D.11	01011	110100	
D.12	01100	001101	
D.13	01101	101100	
D.14	01110	011100	
D.15	01111	010111	101000

Data Character		RD-	RD+
D.x.0	000	1011	0100
D.x.1	001	1001	
D.x.2	010	0101	
D.x.3	011	1100	0011
D.x.4	100	1101	0010
D.x.5	101	1010	
D.x.6	110	0110	
D.x.7	111	1110	0001
D.x.7*	111	0111	1000

D.10.3

0101011100 RD-

Data Character		RD-	RD+
D.16	100		
D.17	100		
D.18	100		
D.19	100		
D.20	101		
D.21	101		
D.22	101		
D.23	101		
D.24	110		
D.25	110		
D.26	110		
D.27	110		
D.28	111		
D.29	111		
D.30	111		
D.31	111		

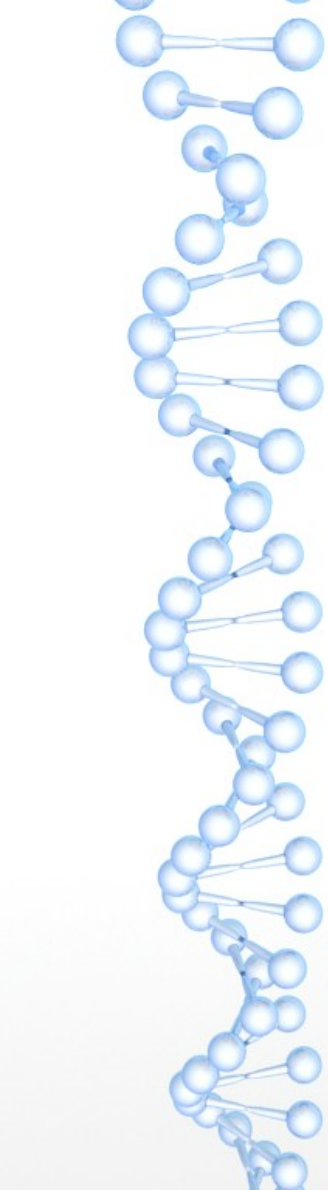
Data Character		RD-	RD+
D.00	00000	100111	011000
D.01	00001	011101	100010
D.02	00010	101101	010010
D.03	00011	110001	
D.04	00100	110101	001010
D.05	00101	101001	
D.06	00110	011001	
D.07	00111	111000	000111
D.08	01000	111001	000110
D.09	01001	100101	
D.10	01010	010101	
D.11	01011	110100	
D.12	01100	001101	
D.13	01101	101100	
D.14	01110	011100	
D.15	01111	010111	101000

Data Character		RD-	RD+
D.x.0	000	1011	0100
D.x.1	001	1001	
D.x.2	010	0101	
D.x.3	011	1100	0011
D.x.4	100	1101	0010
D.x.5	101	1010	
D.x.6	110	0110	
D.x.7	111	1110	0001
D.x.7*	111	0111	1000

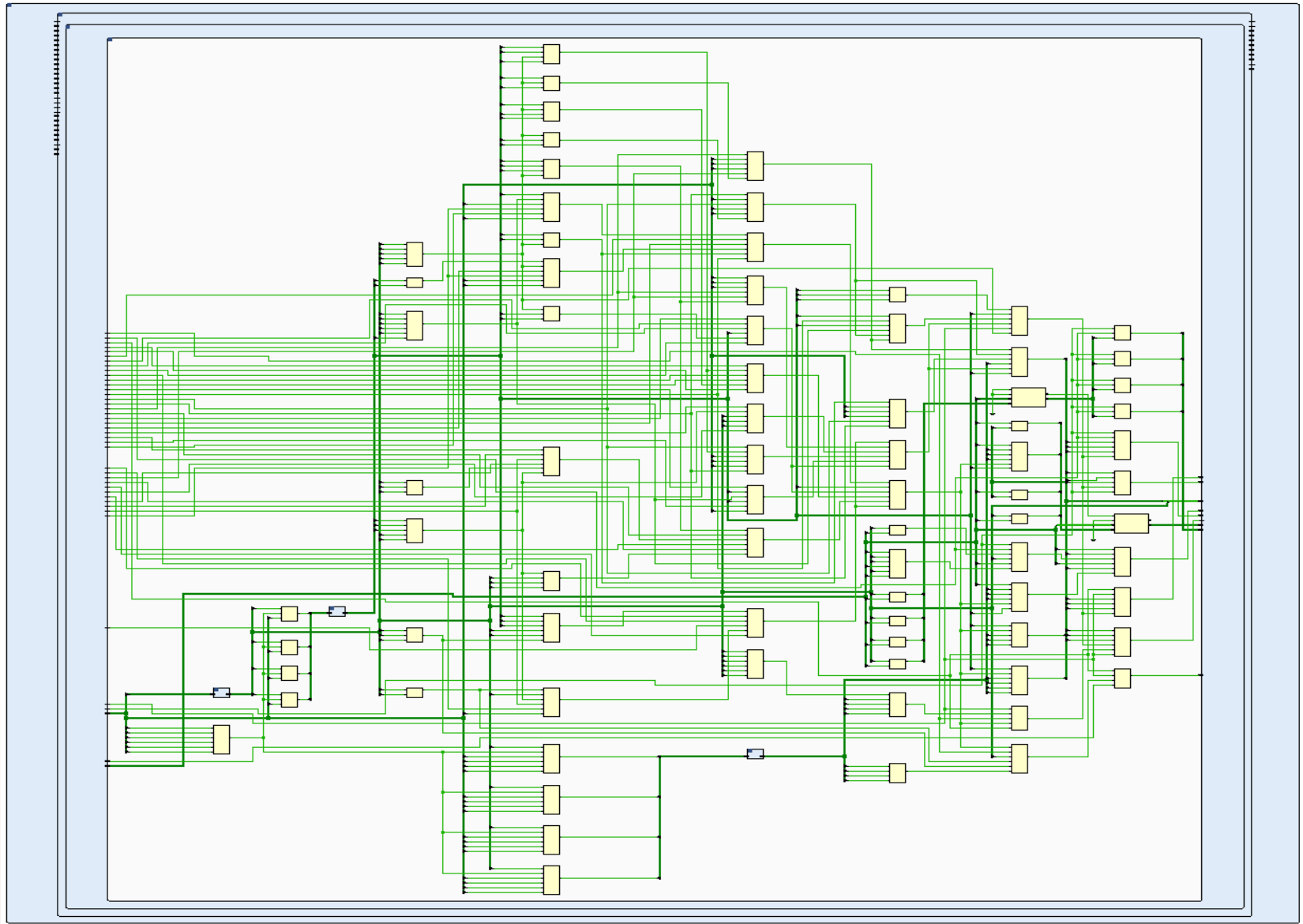
D.10.3

0101011100 *RD-*

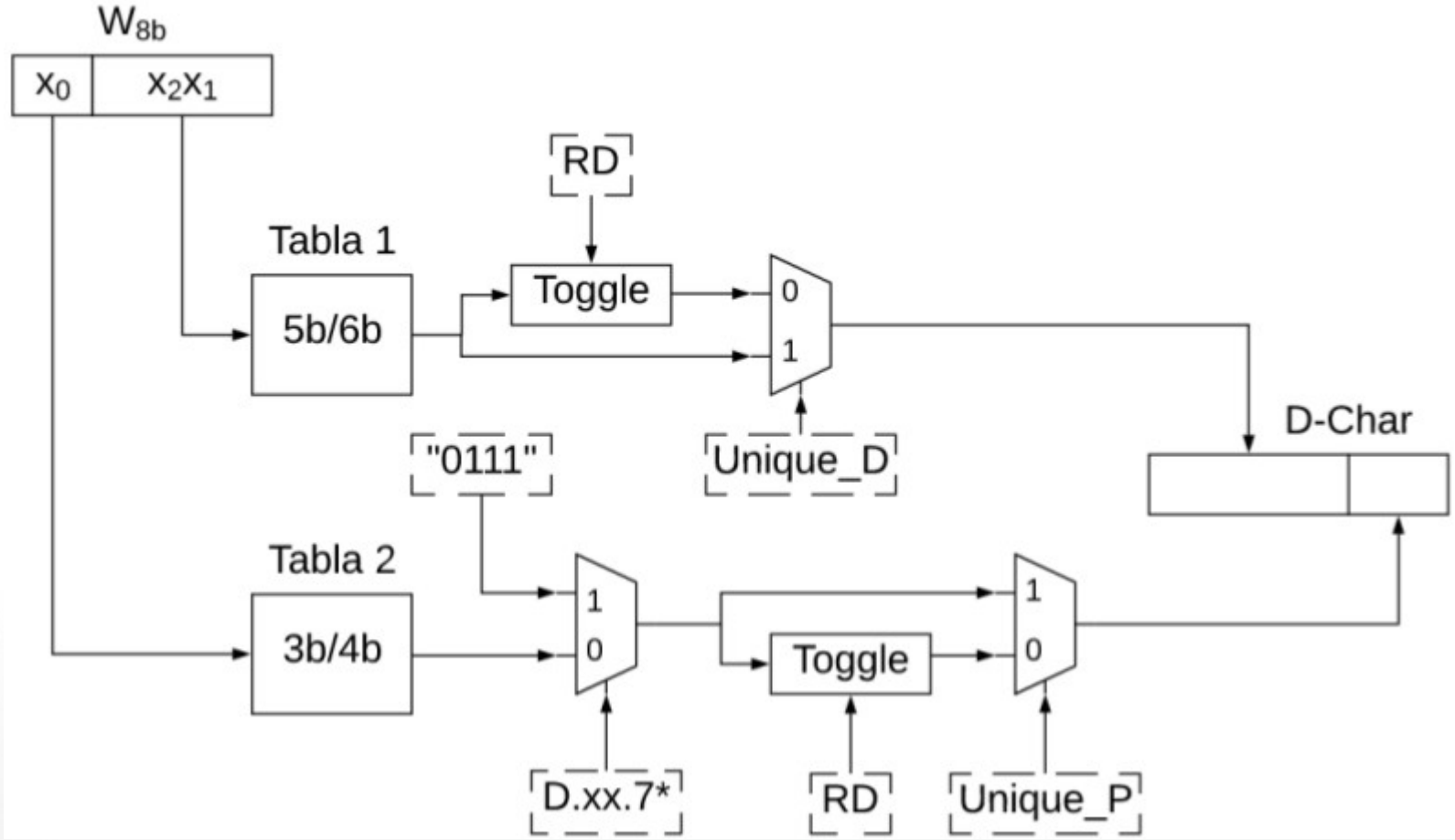
0101010011 *RD+*



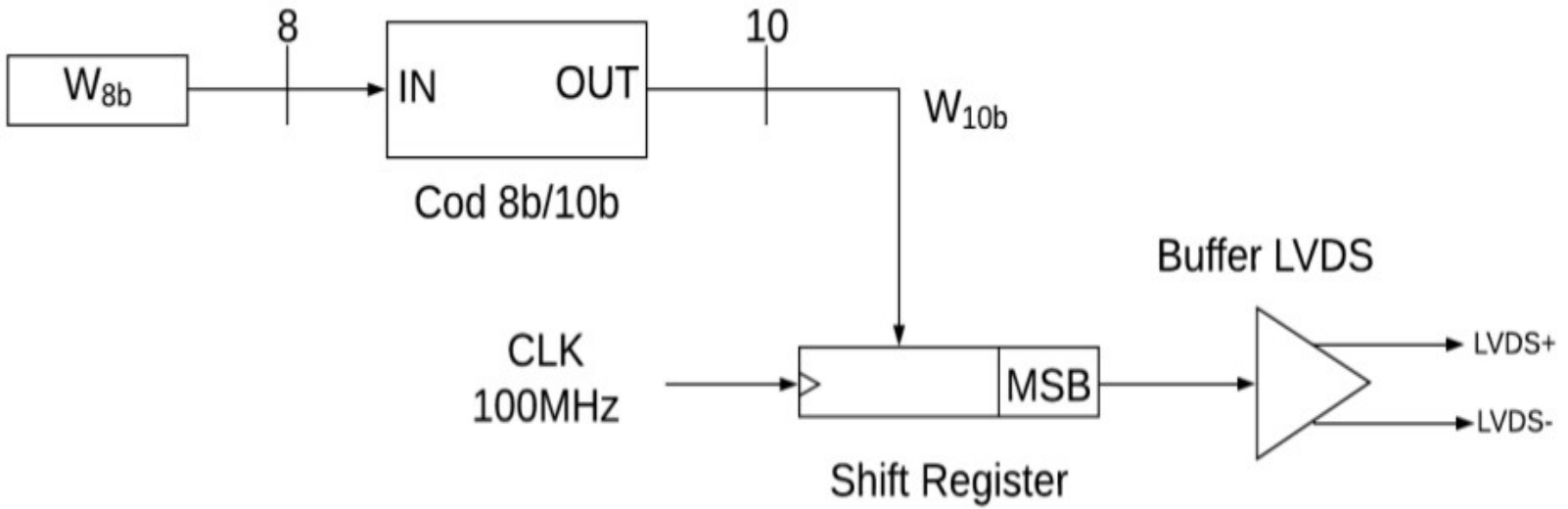
Comma Character		RD-	RD+
K.23.7	11110111	1110101000	0001010111
K.27.7	11111011	1101101000	0010010111
K.28.0	00011100	0011110100	1100001011
K.28.1	00111100	0011111001	1100000110
K.28.2	01011100	0011110101	1100001010
K.28.3	01111100	0011110101	1100001010
K.28.4	10011100	0011110010	1100001101
K.28.5	10111100	0011111010	1100000101
K.28.6	11011100	0011110110	1100001001
K.28.7	11111100	0011111000	1100000111
K.29.7	11111101	1011101000	0100010111
K.30.7	11111110	0111101000	1000010111



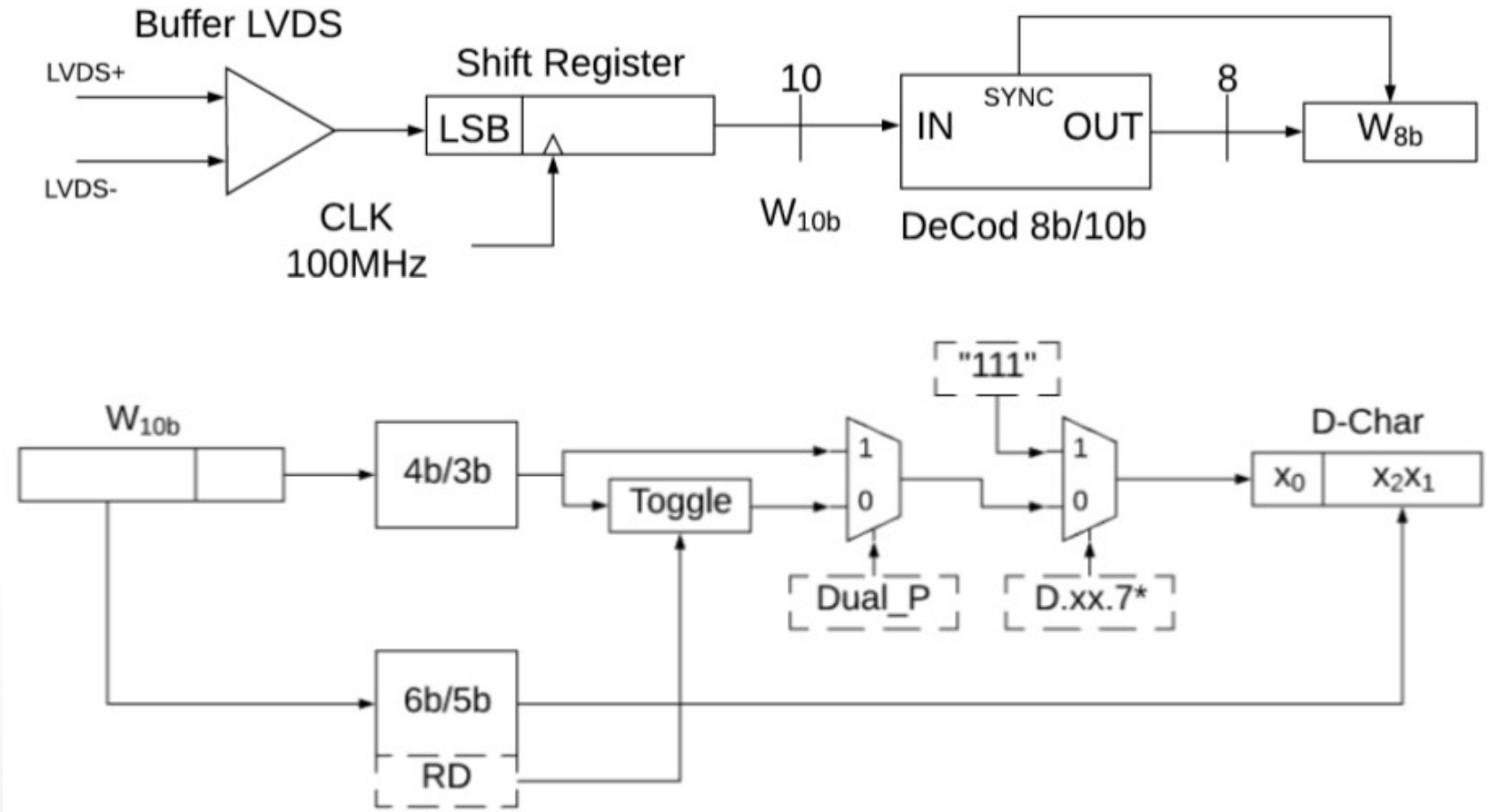
Codificación D-Character

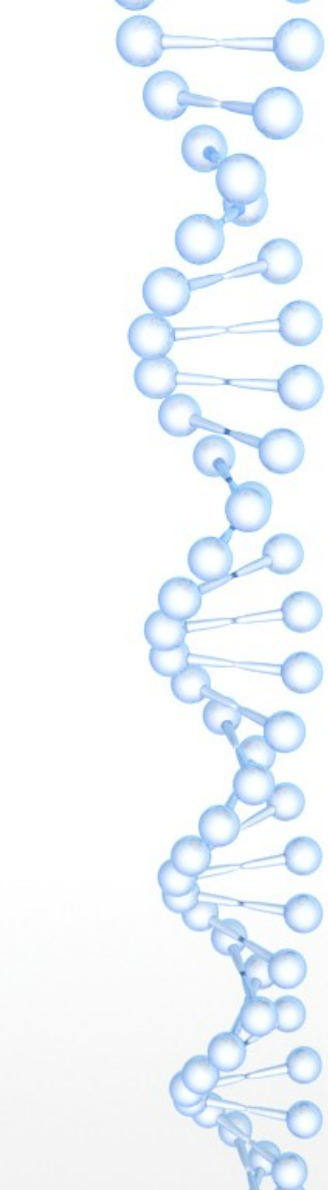


Transmisor LVDS

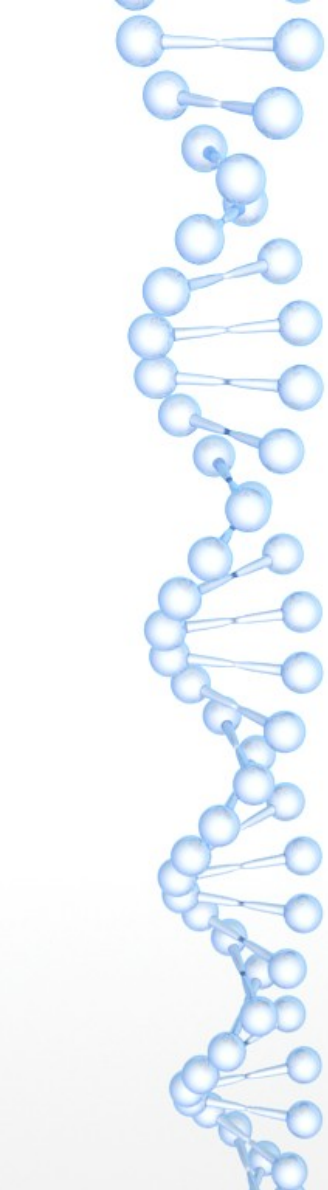


Receptor LVDS y decodificación D-Ch





Preguntas?

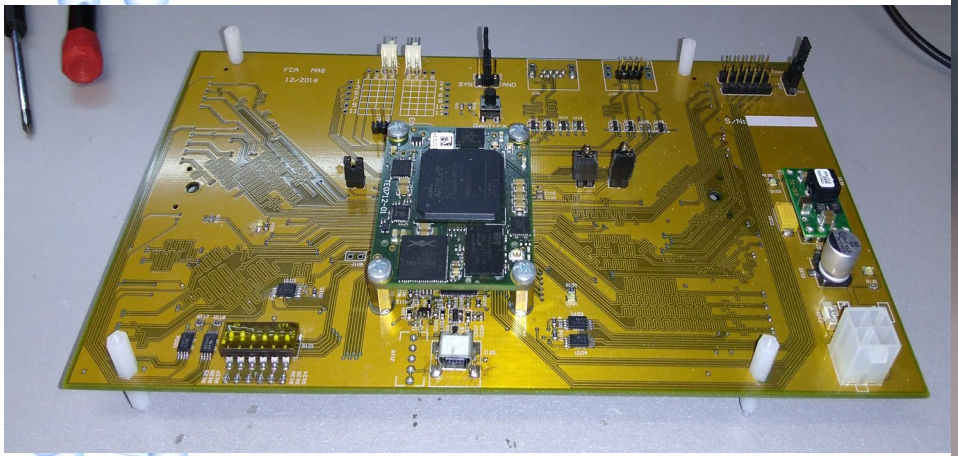


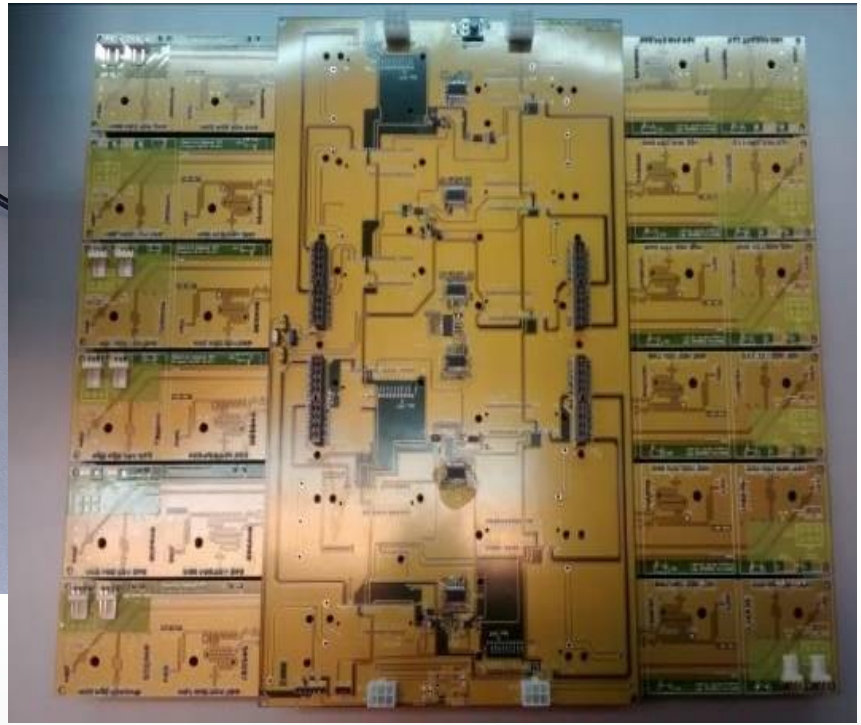
Gracias!

ARTIX-7

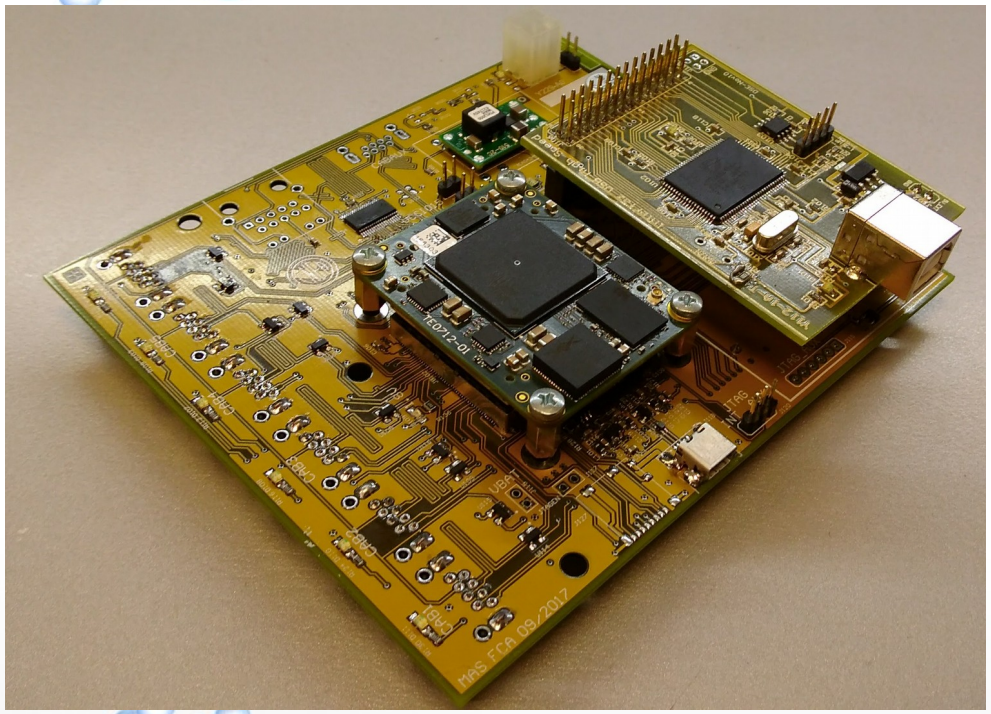

XILINX
ARTIX-7
XC7A100T
FGG484ABX1529
D5092980A
2C
TAIWAN
TBH131.00-00
T£0712-02

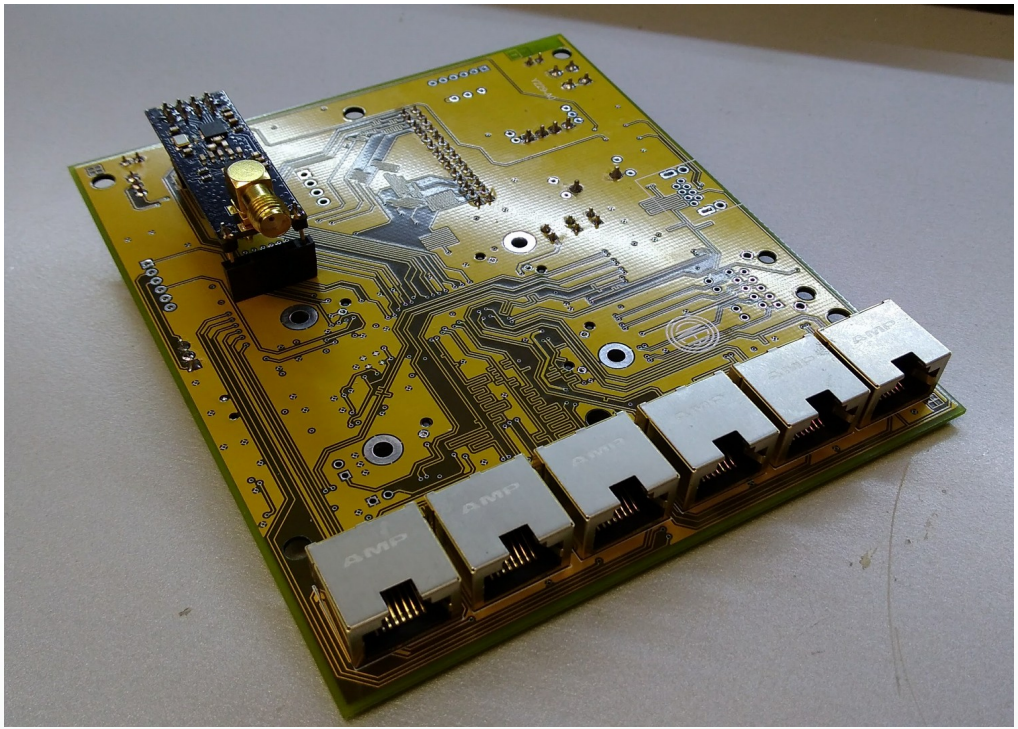
Planar

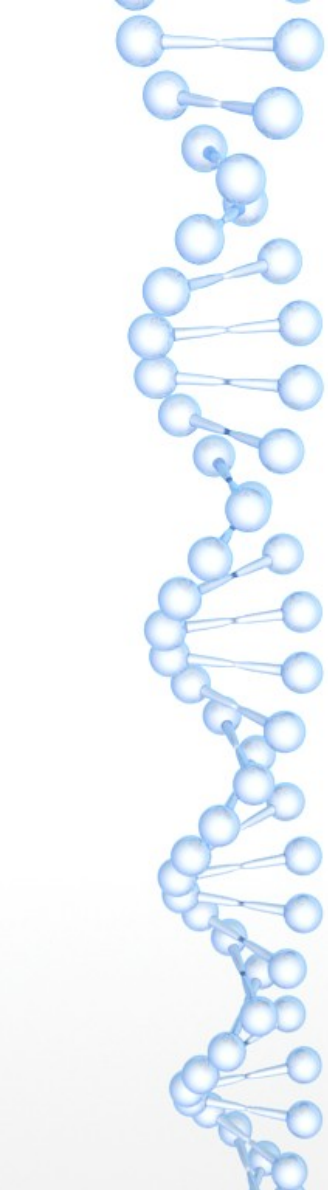




Coincidencias



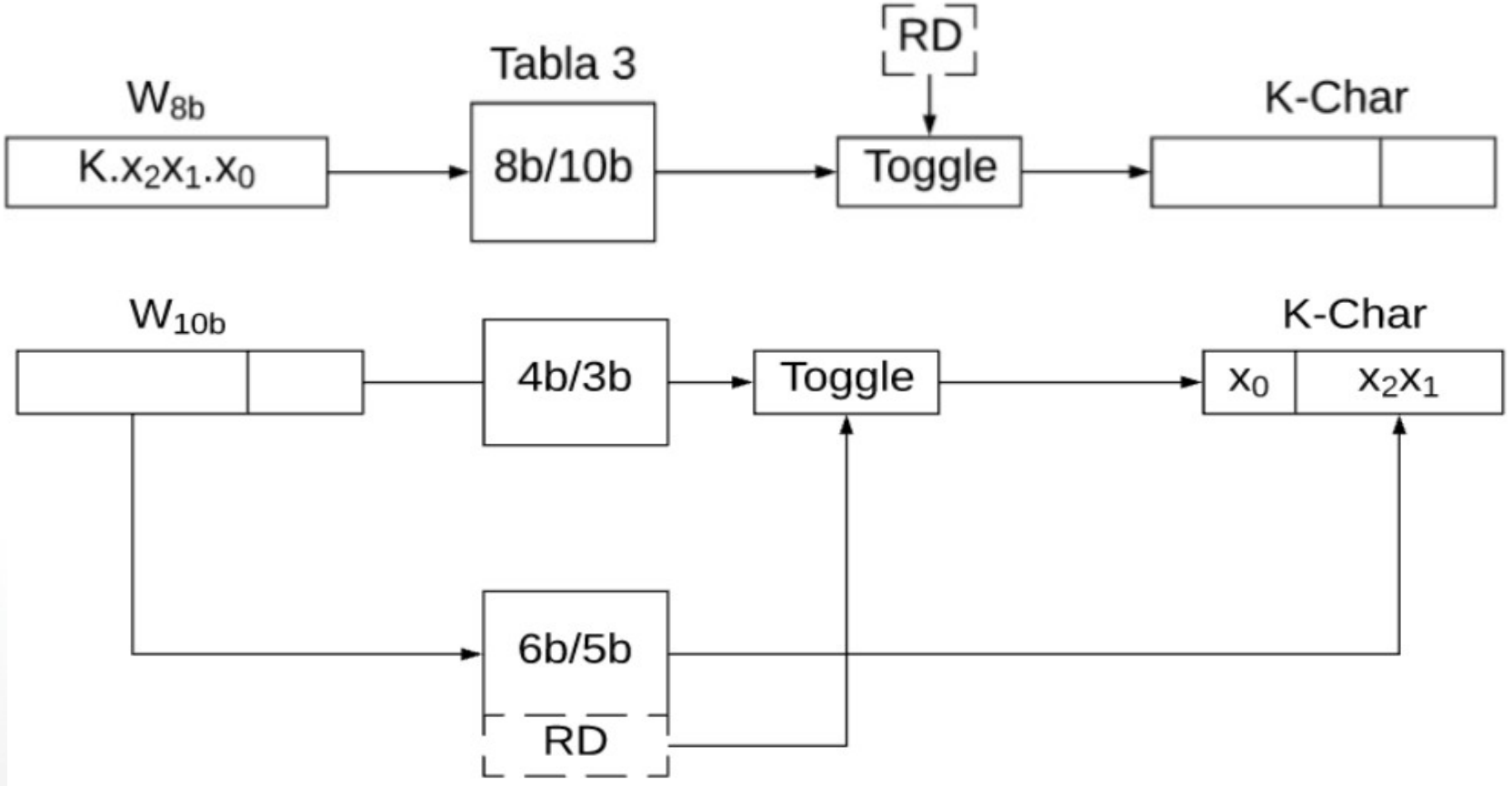




Reporte de síntesis temporal

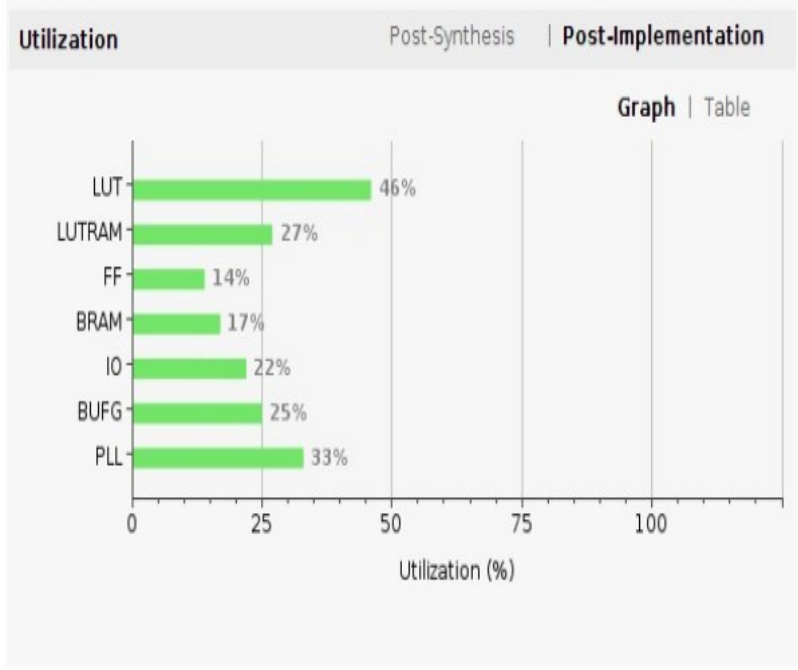
- Minimum period: 7.797ns (Maximum Frequency: 128.263MHz)
- Minimum input arrival time before clock: 1.734ns
- Maximum output required time after clock: 1.661ns

K-Character


RD
Tabla 3
W_{8b}
K.x_2x_1.x_0
8b/10b
Toggle
K-Char
W_{10b}
4b/3b
Toggle
K-Char
x_0
x_2x_1
6b/5b
RD

Utilización de recursos

- Sin codificación



Con codificación