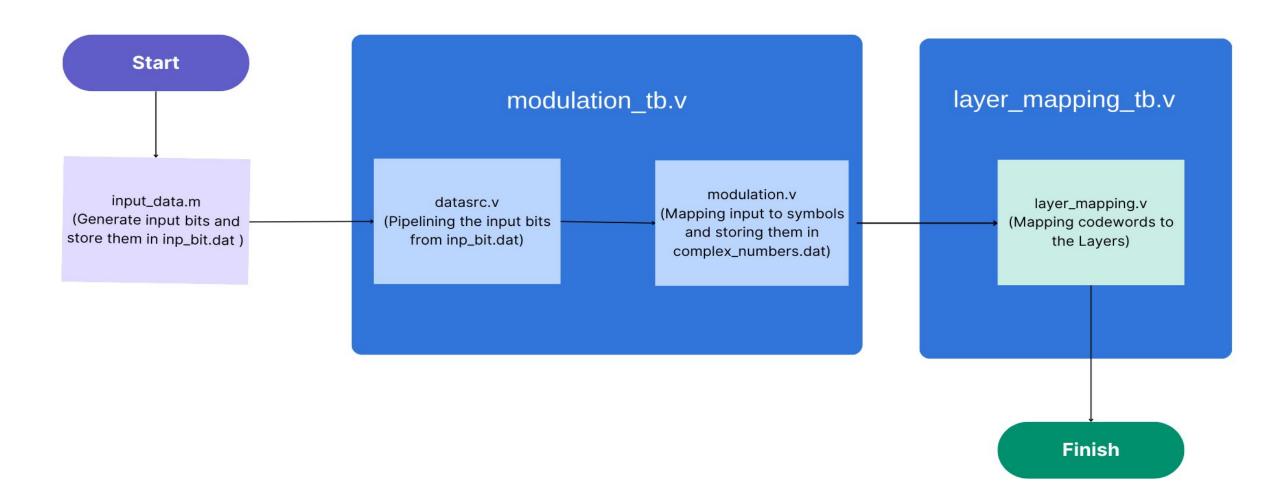
Implementation of different Modulations with layer mapping FPGA Project



BY:

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Block Diagram:



BPSK:

$\frac{\pi}{2}$ BPSK:

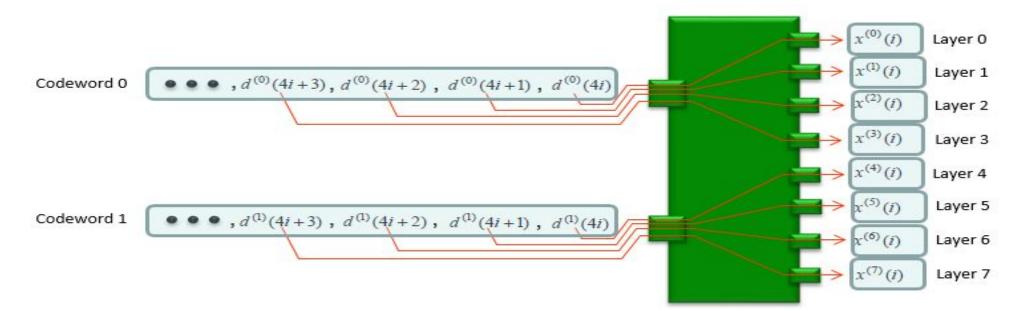
	INPUT x=0	INPUT x=1
Position i: even		
Position i: odd		

• Modulation Mapper:

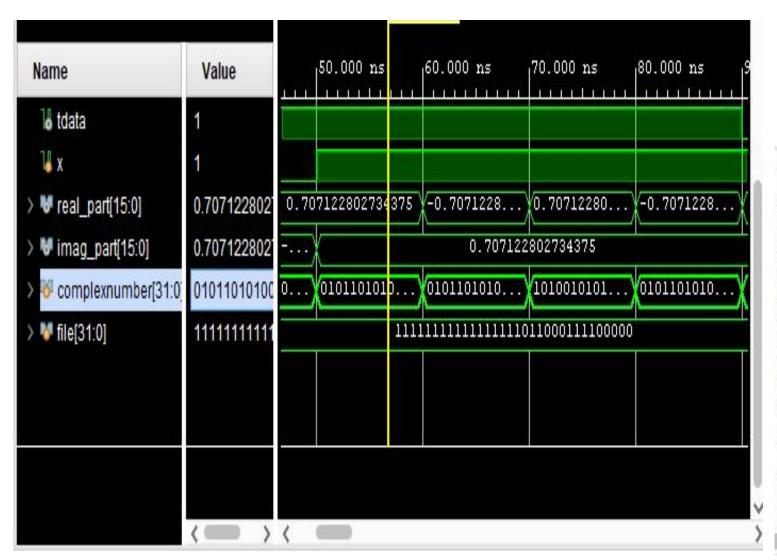
- The modulation mapper takes binary digits, 0 or 1, as input and produces complex-valued modulation symbols as output:
- $d(i) = \frac{1}{\sqrt{2}} [(1 2b(i)) + j(1 2b(i))]$ $\frac{\pi}{2}$ BPSK:
- $d(i) = \frac{e^{j\frac{\pi}{2}(i \mod 2)}}{\sqrt{2}}[(1 2b(i)) + j(1 2b(i))]$

Layer Mapping:

Number of layers	Number of codewords	Codeword-to-layer mapping $i = 0,1,, M_{\text{symb}}^{\text{layer}} - 1$		
8	2	$x^{(0)}(i) = d^{(0)}(4i)$ $x^{(1)}(i) = d^{(0)}(4i+1)$ $x^{(2)}(i) = d^{(0)}(4i+2)$ $x^{(3)}(i) = d^{(0)}(4i+3)$ $x^{(4)}(i) = d^{(1)}(4i)$ $x^{(5)}(i) = d^{(1)}(4i+1)$ $x^{(6)}(i) = d^{(1)}(4i+2)$ $x^{(7)}(i) = d^{(1)}(4i+3)$		



Simulation Result for $\frac{\pi}{2}$ BPSK Modulation:



```
tvalid=1 ,Input x = 1, Position = 0 :
Real part = 23171, Imaginary part = 23171
tvalid=1 , Input x = 0, Position = 1:
Real part = 23171, Imaginary part = -23171
tvalid=1 , Input x = 1, Position = 0:
Real part = 23171, Imaginary part = 23171
tvalid=1 ,Input x = 1, Position = 1:
Real part = -23171, Imaginary part = 23171
tvalid=1 ,Input x = 1, Position = 0 :
Real part = 23171, Imaginary part = 23171
tvalid=1 ,Input x = 1, Position = 1:
```

Simulation Result for Layer Mapping:

Name	Value		5.000	ns	10.000 ns	15.000 ns	20.000
> W compl1:0]	0101101010000011010	хх	01011	01010000	01101011010	0101101010000	001101
> W codew:255]	0101101010000011010	xx	01011	01010000	01101011010	0101101010000	001101
> 😻 codew:255]	1010010101111101101	хх	10100	10101111.	0110100101	0101101010000	001101
¹₄ clk	1						
> 1 layer1[0:63]	0101101010000011010	хх	01011	01010000	01101011010	0101101010000	001101
> W layer2[0:63]	0101101010000011101	хх	01011	01010000	01110100101011	11101101001010	11111
> W layer3[0:63]	0101101010000011010	xx	01011	01010000	01101011010100	00011010110101	.00000
> W layer4[0:63]	1010010101111101010	xx	10100	10101111	10101011010	0101101010000	001110
> W layer5[0:63]	1010010101111101101	xx	10100	10101111	10110100101	0101101010000	001101
> W layer6[0:63]	0101101010000011101	хх	01011	01010000	01110100101	0101101010000	001110
\ M lover7[0:62]	10100101011111101101	~	10100	10101111	10110100101	V010110101000	201101
	/ - \	/					

codewords:	^_
$\verb codeword0 = 010110101000001101011010100000110101101$	01010
$\verb codeword1 = 1010010101111101101001010111110101010$	01010 _
codewords:	
codeword0 = 010110101000001101011010100000110101101	10101
codeword1 = 010110101000001101011010100000110101101	01010
codewords:	
codeword0 = 010110101000001101011010100000110101101	10101
codeword1 = 0101101010000011010101010000011101001010	10101
codewords:	_
codeword0 = 010110101000001101011010100000111010010	01010
Codeword1 - 101001010111110110101010111111010101101	01010

THANK YOU