**WIFI-TX C Model Specifications**

1. Input bit stream length: 52 Char bit data.

Reason for using Char bits: occupies less memory.

1. Scrambler:

Output length :52 Char bits

Functional Description:

1. bitwise and operation of 0x0008 with the state (0x0005)

2. bitwise and operation of 0x0001 with the state (0x0005)

3. Exor with the input and with the results above.

Main logic:

y2 = (0x0008 & h) >> 3;

y5 = 0x0001 & h;

y= input ^ y2 ^ y5;

1. Encoder: Convolutional

Encoder does zero padding of 8 bits to the input.

Parameters:

Constraint length(K) =7;

Generator polynomials: MASK0 - 0133 (1011011)

MASK1 - 0171 (1111001)

MASK2 - 0165 (1110101)

Code Rate(R) = 1/2,2/3,1/3

Code Block Size = 56

Survivor Memory = 64 (2^(K-1))

Output length: Depends on R value (Default R =1/2) -> (52+8) \* (1/R)

We consider R =1/2, therefore output length: 120 char bits.

Encoder supports R = 2/3 & 1/3 (puncturing).

1. Interleave: Random

Output length: 120 char bits

Functional Description:

Random interleave with one permutation based on the input length.

Main Logic:

for(ii=0;ii<N;ii++)

{

pp = (N/4) \* (ii % 4) + (ii/4) ; -🡪 permutation

top1[ii] = datain[pp] ; // datain🡪input data to Interleaver

}

1. QPSK Modulation

Output length: 60 complex bits of data.

1. Pilot Insertion

4 bits of complex data in 6,20,24,56 data locations.

Output length: 64 no of complex data

1. IFFT -64

Output length: 64 complex OFDM modulated data

(Note: IEEE standards uses only 52 sub carriers – have to modify my code accordingly. )

1. Cyclic Prefix

16 Complex data – 25 % of the input data to CP.

Output length: 80 complex data

1. Preamble

Length: 64 complex data.

I will modify the preamble according to the IEEE 802.11a Standards, so the length of the preamble (short and long preamble) -320 symbols – refer to IEEE document.

Simulation output of the C model:

**Input bits**

0,0,0,0,0,0,0,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0,1,1,0,0,0,0,0,1,0,0,0,0,0,0,0,1,0,1,0,0,0,0,0,1,1,0,0,0,0,0,

**Scrambler output**

1,1,1,1,1,1,1,0,1,1,1,1,1,1,0,1,1,1,1,1,1,1,0,0,1,1,1,1,1,0,1,1,1,1,1,1,1,0,1,0,1,1,1,1,1,0,0,1,1,1,1,1,

Scrambler = 0.000009 seconds

**Data after encoding**

1,1,1,0,0,1,1,0,1,0,0,0,1,1,0,0,1,0,0,0,0,0,1,1,0,1,0,0,0,0,1,0,0,0,0,0,1,1,0,1,0,0,1,1,0,0,0,1,0,1,1,1,0,0,0,1,1,0,1,1,1,0,0,0,0,0,1,1,0,1,0,0,1,1,0,0,1,0,1,1,0,1,0,0,1,0,0,0,0,1,1,1,0,1,0,1,1,1,0,0,0,1,1,0,1,1,0,1,1,0,0,1,0,1,1,1,0,0,0,0,

Encoder = 0.000102 seconds

**Interleaver output**

1,1,1,1,1,0,0,1,1,0,0,0,0,0,0,1,0,0,0,0,1,0,0,1,1,1,1,1,0,1,1,1,1,0,0,0,0,1,1,0,0,0,0,0,0,0,0,1,1,1,1,1,1,1,1,0,0,0,0,1,0,0,0,1,1,0,1,0,0,1,0,1,0,0,1,1,0,1,1,0,0,1,0,0,0,1,1,1,1,0,0,0,1,0,0,1,0,0,1,1,1,1,0,1,0,1,0,0,0,0,0,0,0,1,0,0,0,1,1,0,

Interleaver = 0.000002 seconds

**QPSK Modulation output**

0.707107,-0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,0.707107,0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,0.707107,-0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,-0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,0.707107,0.707107,0.707107,-0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,0.707107,

Note: 2 values are considered as on Complex symbol(a+ib)

QPSK = 0.000005 seconds

**Data after pilot insertion**

0.707107,-0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,0.707107,0.707107,-0.707107,-0.707107,-1.000000,1.000000,-0.707107,-0.707107,-0.707107,0.707107,-0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,1.000000,1.000000,0.707107,0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,-0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,0.707107,0.707107,0.707107,-0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,0.707107,0.707107,1.000000,1.000000,-0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,0.707107,-0.707107,-0.707107,0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,-0.707107,0.707107,-0.707107,-0.707107,0.707107,-0.707107,0.707107,1.000000,1.000000,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,-0.707107,0.707107,-0.707107,-0.707107,-0.707107,0.707107,0.707107,0.707107,

pilot\_insertion = 0.000002 seconds

**IFFT output**

-0.101333,0.062500,0.008776,-0.009915,-0.116411,-0.000171,0.098196,0.035593,0.024508,0.027491,0.106322,0.047415,0.013053,0.095752,0.084081,0.063991,-0.059819,0.024778,0.236039,-0.101793,0.028720,0.032648,0.024324,-0.129294,0.061139,-0.124232,-0.137562,0.046068,-0.040847,-0.029882,0.291149,-0.039153,0.053347,0.066291,0.097576,0.064394,0.063743,-0.156529,0.021655,-0.049720,0.009975,0.021934,-0.098990,0.032165,0.100207,-0.024409,-0.059740,0.012377,-0.015625,-0.113166,-0.044122,-0.002797,-0.062450,-0.117819,-0.099094,-0.088964,0.066028,-0.174839,0.009131,-0.043089,0.056855,0.118825,0.009291,0.172122,-0.012944,-0.070083,0.063592,0.200067,-0.014628,0.035027,0.049855,-0.016982,-0.074064,-0.128824,-0.070731,0.115918,0.044513,0.101821,0.008964,-0.158533,-0.028569,-0.006472,0.108295,0.079577,-0.025506,0.046864,-0.153433,-0.041904,-0.129001,-0.208794,-0.071604,-0.041465,0.043457,0.179881,0.000173,-0.050677,0.009153,-0.022097,-0.084081,-0.006941,-0.065287,-0.073410,0.091910,-0.001115,0.002969,-0.008989,0.140302,-0.001531,-0.124302,-0.253969,-0.084319,0.154571,0.015625,-0.081916,0.092478,-0.045815,0.051654,0.020000,0.143364,-0.186167,0.178611,0.029312,-0.001867,0.021296,0.047229,0.025370,-0.072822,-0.029699,

64-IFFT = 0.000027 seconds

**Data after Cyclic Prefix**

0.009153,-0.022097,-0.084081,-0.006941,-0.065287,-0.073410,0.091910,-0.001115,0.002969,-0.008989,0.140302,-0.001531,-0.124302,-0.253969,-0.084319,0.154571,0.015625,-0.081916,0.092478,-0.045815,0.051654,0.020000,0.143364,-0.186167,0.178611,0.029312,-0.001867,0.021296,0.047229,0.025370,-0.072822,-0.029699,-0.101333,0.062500,0.008776,-0.009915,-0.116411,-0.000171,0.098196,0.035593,0.024508,0.027491,0.106322,0.047415,0.013053,0.095752,0.084081,0.063991,-0.059819,0.024778,0.236039,-0.101793,0.028720,0.032648,0.024324,-0.129294,0.061139,-0.124232,-0.137562,0.046068,-0.040847,-0.029882,0.291149,-0.039153,0.053347,0.066291,0.097576,0.064394,0.063743,-0.156529,0.021655,-0.049720,0.009975,0.021934,-0.098990,0.032165,0.100207,-0.024409,-0.059740,0.012377,-0.015625,-0.113166,-0.044122,-0.002797,-0.062450,-0.117819,-0.099094,-0.088964,0.066028,-0.174839,0.009131,-0.043089,0.056855,0.118825,0.009291,0.172122,-0.012944,-0.070083,0.063592,0.200067,-0.014628,0.035027,0.049855,-0.016982,-0.074064,-0.128824,-0.070731,0.115918,0.044513,0.101821,0.008964,-0.158533,-0.028569,-0.006472,0.108295,0.079577,-0.025506,0.046864,-0.153433,-0.041904,-0.129001,-0.208794,-0.071604,-0.041465,0.043457,0.179881,0.000173,-0.050677,0.009153,-0.022097,-0.084081,-0.006941,-0.065287,-0.073410,0.091910,-0.001115,0.002969,-0.008989,0.140302,-0.001531,-0.124302,-0.253969,-0.084319,0.154571,0.015625,-0.081916,0.092478,-0.045815,0.051654,0.020000,0.143364,-0.186167,0.178611,0.029312,-0.001867,0.021296,0.047229,0.025370,-0.072822,-0.029699,

CyclicPrefix =0.000001 seconds

**Data after adding preamble**

0.045999 0.045999 -0.132444 0.002340 -0.013473 -0.078525 0.142755 -0.012651 0.091998 0.000000 0.142755 -0.012651 -0.013473 -0.078525 -0.132444 0.002340 0.045999 0.045999 0.002340 -0.132444 -0.078525 -0.013473 -0.012651 0.142755 0.000000 0.091998 -0.012651 0.142755 -0.078525 -0.013473 0.002340 -0.132444 0.045999 0.045999 -0.132444 0.002340 -0.013473 -0.078525 0.142755 -0.012651 0.091998 0.000000 0.142755 -0.012651 -0.013473 -0.078525 -0.132444 0.002340 0.045999 0.045999 0.002340 -0.132444 -0.078525 -0.013473 -0.012651 0.142755 0.000000 0.091998 -0.012651 0.142755 -0.078525 -0.013473 0.002340 -0.132444 0.045999 0.045999 -0.132444 0.002340 -0.013473 -0.078525 0.142755 -0.012651 0.091998 0.000000 0.142755 -0.012651 -0.013473 -0.078525 -0.132444 0.002340 0.045999 0.045999 0.002340 -0.132444 -0.078525 -0.013473 -0.012651 0.142755 0.000000 0.091998 -0.012651 0.142755 -0.078525 -0.013473 0.002340 -0.132444 0.045999 0.045999 -0.132444 0.002340 -0.013473 -0.078525 0.142755 -0.012651 0.091998 0.000000 0.142755 -0.012651 -0.013473 -0.078525 -0.132444 0.002340 0.045999 0.045999 0.002340 -0.132444 -0.078525 -0.013473 -0.012651 0.142755 0.000000 0.091998 -0.012651 0.142755 -0.078525 -0.013473 0.002340 -0.132444 0.045999 0.045999 -0.132444 0.002340 -0.013473 -0.078525 0.142755 -0.012651 0.091998 0.000000 0.142755 -0.012651 -0.013473 -0.078525 -0.132444 0.002340 0.045999 0.045999 0.002340 -0.132444 -0.078525 -0.013473 -0.012651 0.142755 0.000000 0.091998 -0.012651 0.142755 -0.078525 -0.013473 0.002340 -0.132444 0.045999 0.045999 -0.132444 0.002340 -0.013473 -0.078525 0.142755 -0.012651 0.091998 0.000000 0.142755 -0.012651 -0.013473 -0.078525 -0.132444 0.002340 0.045999 0.045999 0.002340 -0.132444 -0.078525 -0.013473 -0.012651 0.142755 0.000000 0.091998 -0.012651 0.142755 -0.078525 -0.013473 0.002340 -0.132444 0.045999 0.045999 -0.132444 0.002340 -0.013473 -0.078525 0.142755 -0.012651 0.091998 0.000000 0.142755 -0.012651 -0.013473 -0.078525 -0.132444 0.002340 0.045999 0.045999 0.002340 -0.132444 -0.078525 -0.013473 -0.012651 0.142755 0.000000 0.091998 -0.012651 0.142755 -0.078525 -0.013473 0.002340 -0.132444 0.045999 0.045999 -0.132444 0.002340 -0.013473 -0.078525 0.142755 -0.012651 0.091998 0.000000 0.142755 -0.012651 -0.013473 -0.078525 -0.132444 0.002340 0.045999 0.045999 0.002340 -0.132444 -0.078525 -0.013473 -0.012651 0.142755 0.000000 0.091998 -0.012651 0.142755 -0.078525 -0.013473 0.002340 -0.132444 0.009153 -0.022097 -0.084081 -0.006941 -0.065287 -0.073410 0.091910 -0.001115 0.002969 -0.008989 0.140302 -0.001531 -0.124302 -0.253969 -0.084319 0.154571 0.015625 -0.081916 0.092478 -0.045815 0.051654 0.020000 0.143364 -0.186167 0.178611 0.029312 -0.001867 0.021296 0.047229 0.025370 -0.072822 -0.029699 -0.101333 0.062500 0.008776 -0.009915 -0.116411 -0.000171 0.098196 0.035593 0.024508 0.027491 0.106322 0.047415 0.013053 0.095752 0.084081 0.063991 -0.059819 0.024778 0.236039 -0.101793 0.028720 0.032648 0.024324 -0.129294 0.061139 -0.124232 -0.137562 0.046068 -0.040847 -0.029882 0.291149 -0.039153 0.053347 0.066291 0.097576 0.064394 0.063743 -0.156529 0.021655 -0.049720 0.009975 0.021934 -0.098990 0.032165 0.100207 -0.024409 -0.059740 0.012377 -0.015625 -0.113166 -0.044122 -0.002797 -0.062450 -0.117819 -0.099094 -0.088964 0.066028 -0.174839 0.009131 -0.043089 0.056855 0.118825 0.009291 0.172122 -0.012944 -0.070083 0.063592 0.200067 -0.014628 0.035027 0.049855 -0.016982 -0.074064 -0.128824 -0.070731 0.115918 0.044513 0.101821 0.008964 -0.158533 -0.028569 -0.006472 0.108295 0.079577 -0.025506 0.046864 -0.153433 -0.041904 -0.129001 -0.208794 -0.071604 -0.041465 0.043457 0.179881 0.000173 -0.050677 0.009153 -0.022097 -0.084081 -0.006941 -0.065287 -0.073410 0.091910 -0.001115 0.002969 -0.008989 0.140302 -0.001531 -0.124302 -0.253969 -0.084319 0.154571 0.015625 -0.081916 0.092478 -0.045815 0.051654 0.020000 0.143364 -0.186167 0.178611 0.029312 -0.001867 0.021296 0.047229 0.025370 -0.072822 -0.029699

Preamble = 0.000001 seconds

Transmitter = 0.001085 seconds