ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

New Transmission Coding Scheme for MIMO-OFDM System

Shrikant G. Vaidya [1], Sonal Honale [2]

PG Student [WCC], Dept. of WCC, ABHA Gaikwad Patil Engineering College, Nagpur, India[1]

Assistant Professor, Dept. of WCC, ABHA Gaikwad Patil Engineering College, Nagpur, India[2]

ABSTRACT*:* In this paper presentation on pilot data coding in channel for MIMO-OFDM (Multiple Input Multiple Output- Orthogonal Frequency Division Multiplexing) combination of both are increases the bit error rate performance for mobile wireless cellular system. We developed a new transmission coding scheme for MIMO-OFDM system for inter sub channel interference (ICI) self cancellation over high mobility fading channels between transmission and receiving processing .We transmit pilot data through the transmitting antennas signal via encoding system through the channel at receiver end this encoding data are decoding by decoding system than it use by the user.

KEYWORDS: Inter Sub channel interference, MIMO-OFDM, rate reduction factor, Time varying channel
.

I.INTRODUCTION

MIMO-OFDM is one of the most promising broadband technology for wireless network. OFDM modulation avoids intersymbol interference (ISI) by dividing a broadband channel into a narrowband subchannle. In this process split incoming signal into multiple lower rate signal and transmitted them simultaneously. However the various of a wireless channel with in an OFDM symbol destroys the orthogonally it causes inter subchannle interference (ISI) is reduce or self cancellation in channels. MIMO modulation has easily implemented with minimum increases in cost so it much popular by introducing multiple antennas at the transmitter and Receiver, we can achieve higher data rates with moderate complexity by using channels multipath to transmitted different signal simultaneously. We will simplify channel coding scheme in MIMO-OFDM system, which is to the best knowledge of the authors. The proposed scheme estimate interference gain and performance ICI cancellation itself.

In literature, various time varying channels have been established in a multipath channels so that the estimation performance can be increased in [1], [2] a polynomial model has been developed in [3],[4] and [5]. Recently in [5] the time varying channel vector has been modelled as a matrix. We developed a general structure of transmitter and receiver processing matrices system share the same average signal to interference ratio (SIR) for the developed structure, we further optimize the transmitter and the receiver processing coefficient. The reminder of this paper is organized as follows in section II we introduced coded MIMO-OFDM system. Than we present the principle of new transmission coding scheme for MIMO-OFDM system in section III. Simulation Result are present in section IV to demonstrate the performance of proposed channel coding for MIMO-OFDM scheme, finally section V conclude

II. CODED MIMO-OFDM SYSTEM

In the fig 1, it shows the system considered for transmission of pilot data in to a transmitting antennas trough the channel and it received by the received antenna for user required format or required parameters are not in due to channel interferences scattering environment so it convert in to a proper format.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

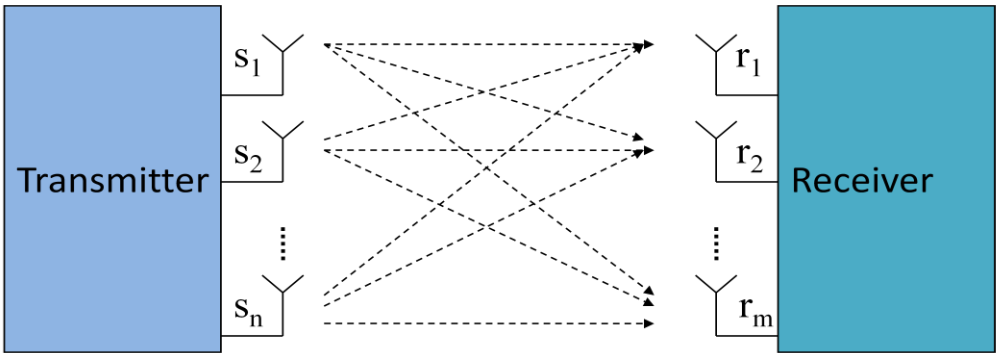

Fig. 1 MIMO-OFDM system model

III. PRINCIPLE OF TRANSMISSION CODING SCHEME OF MIMO-OFDM SYSTEM

AS described in section II the channel model estimation for a wireless channel with in an OFDM symbol cause ICI and estimate is converted block to the frequency domain operation. Figure 2 shows the system consider in this paper to maintain a practical system by following IEEE standard 802.11 a [6] establish a general reduced rate and design in the blocks OFDM transmission framework with inherent ICI self cancellation capability with transmitter and receiver processing in which first bit of data are pass to a channel encoder which is either SNR (2,4,6…) correlation encoder transmitter are made up of formatter which is use to give proper shape and size for source encoder after receiving pilot data by source encoder from source information it converting the source data into encoding by using random data and give to mapping block than pass it to a channel encoder in which combining conventional coding with VBLAST(vertical Bell Labs Layerd Space-Time) are performing in slow fading environment converter which splits the incoming signal to a number of streams equal to the number of transmitter antennas and OFDM transmission framework with inherent ICI self cancellation capability the OFDM system is transformed into an equivalent one. We are able to design the transmitter signal structure with inherent ICI self cancellation capability without requiring the instantaneous channel state information.

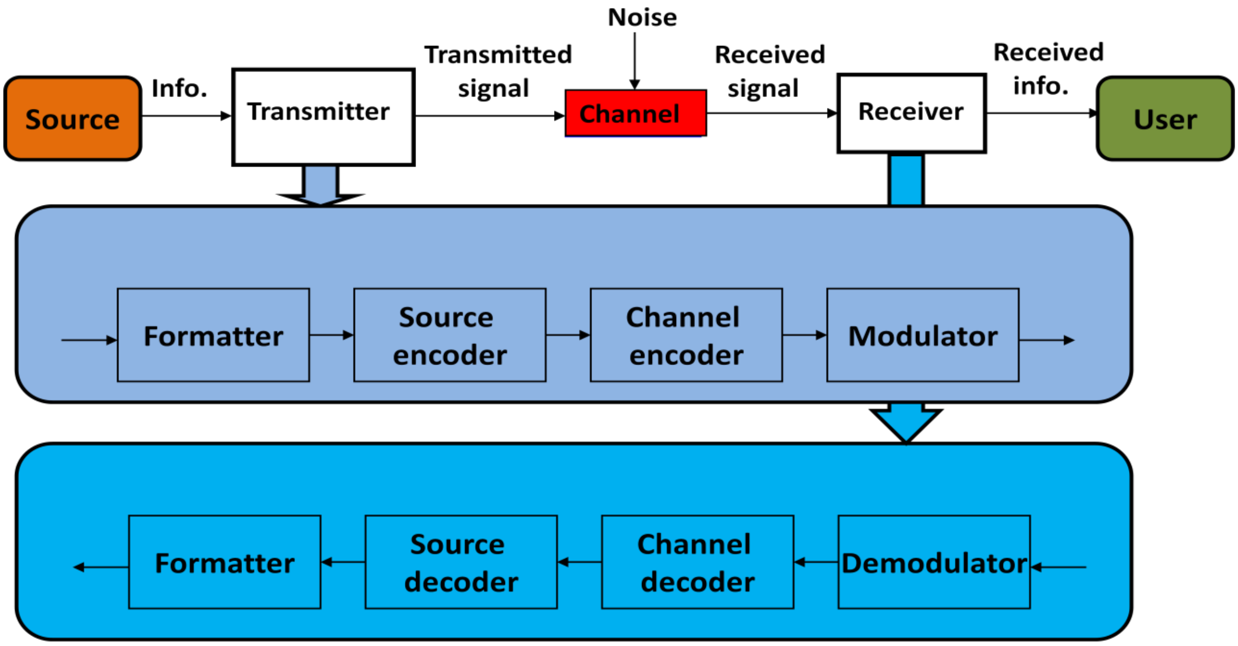

Fig. 2 MIMO-OFDM module structure

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

In the fig 2, it shows the MIMO-OFDM module structure in which source information in the form of data rate or bit error rate are given to the formatter for proper size and shape of the signal data than transfer it into the source encoder it is a device which transforms the data into some bits this bits are given to channel encoder in which channel estimate and design as per proper estimated coding technique channel encoder are design in such a way that source encoder is to eliminate redundant binary digits from the digitized signal the strategy of the transmitted signal at the receiver the process of encoding for protection against channel than this signal given to the modulator. Modulator is a device which are to modulating signal or carrier signal that contains information to be transform in to the channel. Channel are the Heart of the system in which the data are arranges in matlab coding process properly and it convert properly as per user requirement to farther improvement to the estimator of channel we employ the FFT method introduces in [11] . primary we take an L-IFFT of the LS channel estimate and than pass it to a rectangular window of length equal to channel prefix Channel have noise signal which generated from scattered environment are process by coding scheme by MIMO-OFDM system which are discuss earlier, channel plot data are transmit to the receiver. Receiver are received data which are carries by channel. Receiver are made up of no of blocks like Demodulator, channel decoder, source decoder and finally formatter, receiver process are known as Decrypted, in terms of transmitter Encrypted data. Or vice-versa to the transmission processes and finally piloted data are proper for user required format.

A.CHANNLE MODEL

In our system we use preambles that are orthogonal in time by forcing each antenna to transmission alone. Assume, matrix of transmitting system symbol given by
P=[P1…..P2]…………….(1)
Size Mt x L.
Where L is the number of training symbols in the preamble transmitted from each antenna the received matrix can be given by
R=HP+V………………... (2)
Where R=(r_1…………r_2) is the M_R x L matrix of received signal and MR is it he number of received antennas and V be the M_R x L noise matrix for reducing rate, inter subchannle interference self cancellation over high mobility fading channels . The effect of this whole variance is finally reduced by δ^2Cp/L is the length of channel matrix. Where Cp is the length of the channel prefix.
Consider an N- subcarrier OFDM system with the sampling interval Ts and the subcarrier spacing 1/Ts N Assume that the maximum delay of the multipath channel is (L-1) Ts without loss of generality.

IV. SIMULATION RESULTS

In this section we present Simulation results to demonstrate the performance of the proposed New Transmission Coding Scheme for MIMO-OFDM system. It also reduced rate OFDM Transmission in ICI cancellation.
A. Program for Fig.3 Capacity Vs Number of antenna for a MxM MIMO system, 1XM SIMO system, Mx1 MISO system, SISO system.
In this graph we take maximum number of transmit and receive antenna M_{max}=10, number of channel realization It=1000 % initialize variables: ergodic capacity for each number of antennas

```
Cmimo  = zeros(1, Mmax);
Csimo  = zeros(1, Mmax);
Cmiso  = zeros(1, Mmax);
Csiso  = zeros(1, Mmax);

SNRdB  = 0;  % in dB
SNR = 10.^(SNRdB./10);  % linear scale

for kk=1:It

   for M = 1:Mmax
      % MIMO
      Hmimo = ( randn(M)   + j*randn(M)   )/sqrt(2);
```

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

```
        Cmimo(M) = Cmimo(M) + log2(real(det( eye(M) + SNR/M*Hmimo*Hmimo' )));

        %% SIMO
        hsimo = ( randn(M,1) + j*randn(M,1) )/sqrt(2);
        Csimo(M) = Csimo(M) + log2( 1 + SNR*norm(hsimo)^2);

        %% MISO
        hmiso = ( randn(M,1)  + j*randn(M,1)  )/sqrt(2);
        Cmiso(M) = Cmiso(M) + log2( 1 + SNR/M*norm(hmiso)^2);

        %% SISO
        hsiso = ( randn + j*randn )/sqrt(2);
        Csiso(M) = Csiso(M) + log2( 1 + SNR*abs(hsiso)^2);

    end
    end
 % Compute average over all channel realizations
Csiso = Csiso/It
Csimo = Csimo/It
Cmiso = Cmiso/It
Cmimo = Cmimo/It
```

Finally, we plot the graph,

All our simulation results are in excellent agreement with the theoretical results, to keep the paper with in the length ,we only present some of the simulation results are as follows.

In Fig 3, Throughput of Capacity Vs Number of antenna are as follows

- Csiso =

0.8706 0.8615 0.8514 0.8571 0.8615 0.8631 0.8572 0.8653 0.8695 0.8593

- Csimo =

0.8554 1.4375 1.8684 2.2151 2.4858 2.7130 2.9180 3.0924 3.2563 3.3938

- Cmiso =

0.8539 0.9288 0.9463 0.9556 0.9602 0.9711 0.9710 0.9787 0.9836 0.9798

- Cmimo =

0.8587 1.6811 2.5282 3.3555 4.1851 5.0339 5.8517 6.7062 7.5454 8.3736

In the fig 3, it shows the graph of Capacity Vs Number of antenna for a MxM MIMO system, 1XM SIMO system, Mx1 MISO system, SISO system.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

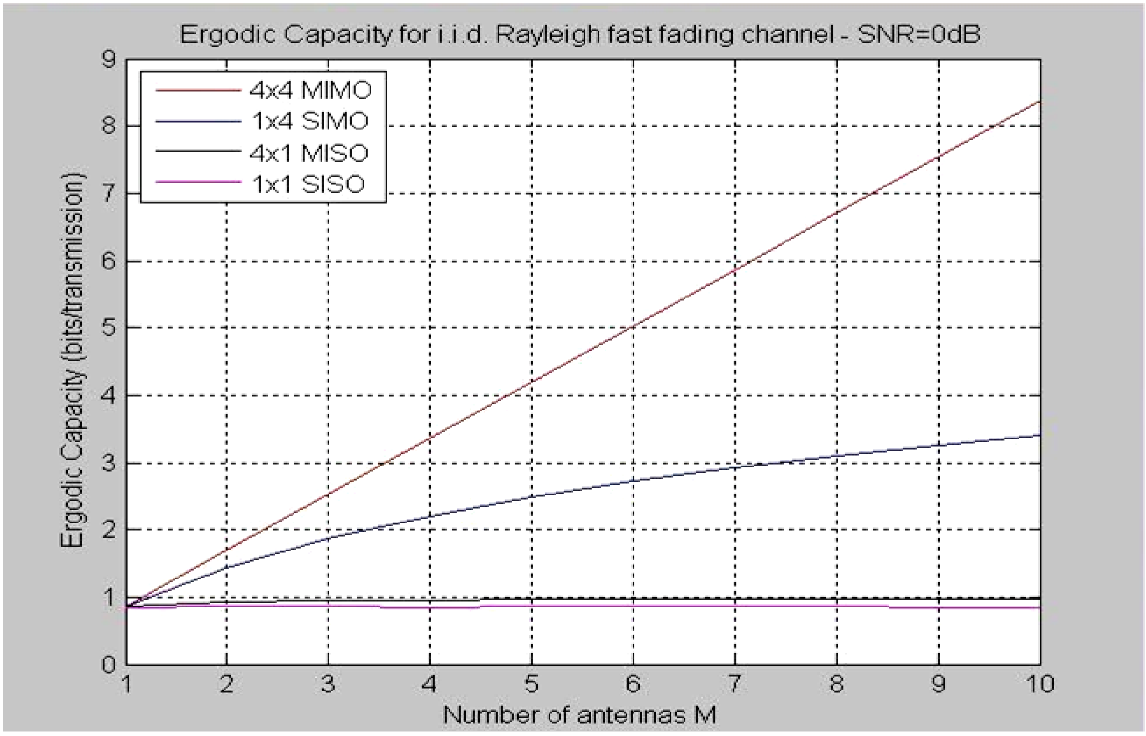

Fig.3 Capacity Vs Number of antenna

From graph, it is observed that every simulation curve is in excellent agreement with the corresponding theoretical curve comparing the capacity of the different system, we can see that the ergodic capacity increases as the number of antennas The inter tap uncorrelated freq-selective channel has the some capacity as that of the frequency flat fading channel we now examine the performance of the system in different fading environment.
Figure 4 shows the Capacity Vs Number of Antennas for a 4xM and a Mx4 MIMO system. In this we take Maximum number of transmit and receive antennas M_{max} = 8;

B. Program for Fig.4 Capacity Vs Number of Antennas for a 4xM and a Mx4 MIMO system

```
% number of channel realization
It = 90000;

% initialize variables: ergodic capacity for each value of SNRdB range
Cmimo4xM  = zeros(1, Mmax);
CmimoMx4  = zeros(1, Mmax);

SNRdB  = 80;  % in dB
SNR = 10.^(SNRdB./10);  % linear scale

for kk=1:It

  for M = 1:Mmax

      % MIMO tx=5 , rx = M
      Hmimo4xM = ( randn(M,4)   + j*randn(M,4)   )/sqrt(2);
      Cmimo4xM(M) = Cmimo4xM(M) + log2(real(det( eye(M) + SNR/4*Hmimo4xM*Hmimo4xM' )));
```

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

```
    % MIMO  tx=M , rx = 4
    HmimoMx4 = ( randn(4,M)   + j*randn(4,M)   )/sqrt(2);
    CmimoMx4(M) = CmimoMx4(M) + log2(real(det( eye(4) + SNR/M*HmimoMx4*HmimoMx4' )));

  end

end

% Compute average over all channel realizations
Cmimo4xM = Cmimo4xM/It
CmimoMx4 = CmimoMx4/It

% plot
figure(1)
plot(1:Mmax, Cmimo4xM,'k')
hold on
plot(1:Mmax, CmimoMx4,'k--')
xlabel('Number of tx or rx antennas M')
ylabel('Ergodic Capacity (bits/transmission)')
title('Ergodic Capacity for i.i.d. Rayleigh fast fading channel at high SNR (80dB)')
text(2.1,62,'slope = 4', 'rotation',56)
text(6,110,'MIMO 4xM')
text(6,100,'MIMO Mx4')
axis([1 8 20 120])
```

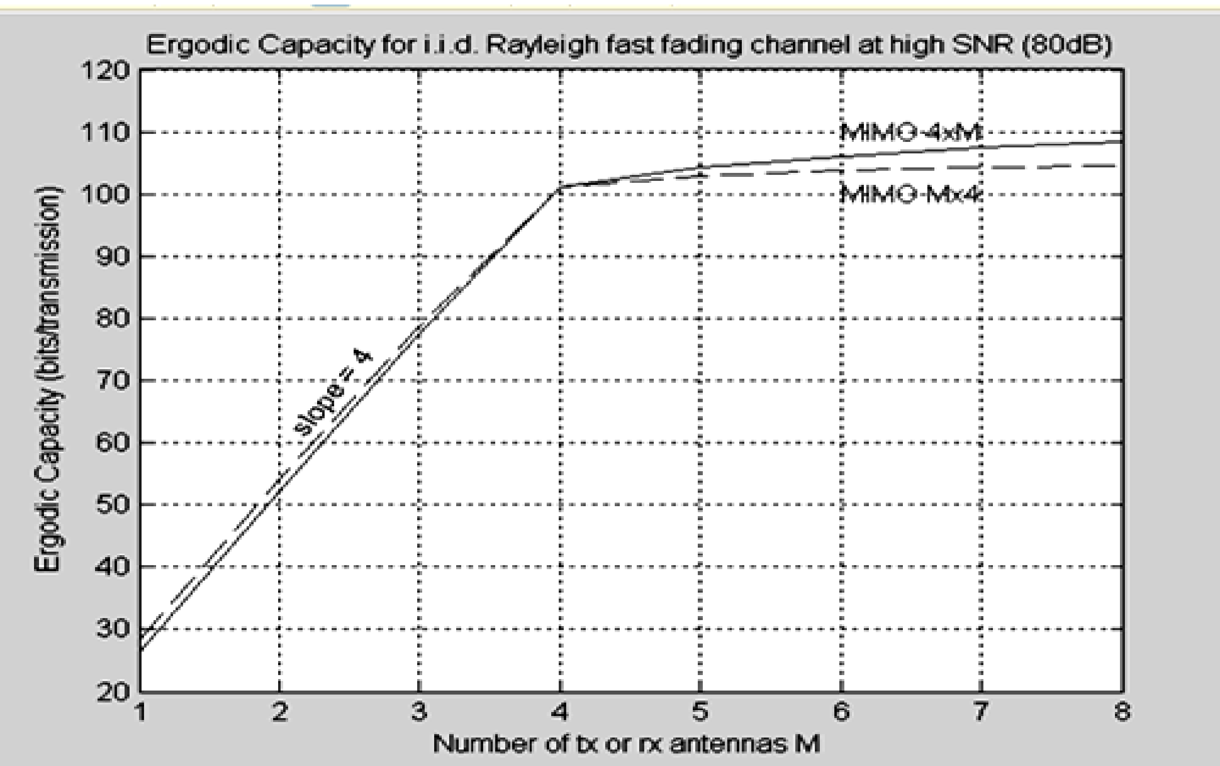

Fig.4 Capacity Vs Number of Antennas for a 4xM and a Mx4 MIMO system

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

From graph, it is observed that every simulation curve is in excellent agreement with the corresponding theoretical curve comparing the Capacity Vs Number of Antennas for a 4xM and a Mx4 MIMO system

In Fig 4, Throughput are as follows.

- Cmimo4xM = 26.3906 52.2942 77.4719 101.2127 104.2304 106.0708 107.4487 108.5434
- CmimoMx4 = 28.3885 54.2951 78.7284 101.2094 102.9522 103.7399 104.2160 104.5448

V.CONCLUSION

In this paper, we have presented a new channel coding scheme based on capacity and the probability distribution on the instantaneous capacity upper bound for MIMO,MISO,SISO,SIMO wireless system under time varying and frequency selective relight fading channel and develop general reduce rate OFDM transmission scheme for ICI self cancellation over high fading channel. By transmitter and receiver processing the system performance was investigated through computer simulation showing the proposed coding scheme to that of the commonly used convolution coding and error propagation problem has been avoided in our coding scheme.

On the other hand both analysis an analytical and simulation results have indicated that the variation of a wireless channel can be well eliminated we have also investigate the performance of the system under different fading environment. Simulation result have shown that the system performance better under reach scattering environment.

REFERENCES

[1] W. Jeon, K. Chang, and Y. Cho, "An equalization technique for orthogonal frequency-division multiplexing systems in time-variant multipath channels," *IEEE Trans. Commun.*, vol. 47, pp. 27–32, Jan. 1999.

[2] A. Stamoulis, S. Diggavi, and N. Al-Dhahir, "Intercarrier interference in MIMO OFDM," *IEEE Trans. Signal Process.*, vol. 50, pp. 2451–2464, Oct. 2002.

[3] H. Hussein and R. Laurent, "Polynomial estimation of time-varying multipath gains with intercarrier interference mitigation in OFDM systems," *IEEE Trans. Veh. Technol.*, vol. 58, pp. 140–151, Jan. 2009.

[4] Z. J. Tang, R. C. Cannizzaro, G. Leus, and P. Banelli, "Pilot-assisted time-varying channel estimation for OFDM systems," *IEEE Trans Signal Process.*, vol. 55, pp. 2226–2238, May 2007.

[5] T. Y. Al-Naffouri, K. M. Z. Islam, N. Al-Dhahir, and S. Lu, "A model reduction approach for OFDM channel estimation under high mobility conditions," *IEEE Trans. Signal Process.*, vol. 58, pp. 2181–2193, Apr.2010.

[6] IEEE Standard 802.11a – 1999 "Supplement to IEEE standard for information technology telecommunications and information exchange between systems - local and metropolitan area networks - specific requirements. Part 11: wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: high-speed physical layer in the 5 GHz band."

[7] Y. Zhao and S. G. Haggman, "Intercarrier interference compression in OFDM communication systems by using correlative coding," *IEEE Commun. Lett.*, vol. 2, pp. 214–216, Aug. 1998.

[8] H. Zhang and G. Y. Li, "Optimum frequency-domain partial response encoding in OFDM system," *IEEE Trans. Commun.*, vol. 51, pp. 1064–1068, July 2003.

[9] J. Ma, P. Orlik, J. Zhang, and G. Y. Li, "Statistics-based ICI mitigation in OFDM over high-mobility channels with line-of-sight components," *IEEE Trans. Wireless Commun.*, vol. 10, pp. 3577–3582, Nov. 2011.

[10] Y. Zhao and S. G. Haggman, "Intercarrier interference self-cancellation scheme for OFDM mobile communication systems," *IEEE Trans. Commun.*, vol. 49, pp. 1185–1191, July 2001.

[11] A. N. Mody and G. L. Stuber, "Parameter estimation for OFDM with transmit receive diversity," IEEE Vehicular Technology Conference (VTC), volume 2, May 2001, page(s):820 – 824.