Milli meter Wave MIMO-OFDMA Scheme with MMSE-based VEMF in 6G Wireless Technology

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Abstract: Millimetre Wave (MmWave) massive multiple-input multiple-output (MmWave-massive-MIMO) has developed as beneficial for gigabit-per-second data broadcast into 6G digitized wireless technology. The collection of low-rate and energy-efficient (EE) types of machinery, low power consumptions, multi-bit quantized massive MIMO-Orthogonal Frequency Division Multiplexing Access (OFDMA) structure have been planned for the receiver manner. The main concentration effort is the minimization of a state-of-the-art pilot-symbol quantized (PSQ) massive MIMO-OFDMA system (m-MIMO-OFDM-S). Accordingly, in this analysis, by minimizing many advantages of the Variational Estimated Message Fleeting (VEMF) algorithm. A modified low complexity manner VEMF algorithm is invented for the utilization of the ASQ-m-MIMO-OFDM-S structure. Hence, two new modules improve the energy efficiency and spectrum efficiency for wireless smart 6G technology of pilot bits allocation process for MmWave connections of the hybrid MIMO-OFDM receiver structural design. Several technologies such as massive MIMO-OFDMA, 3GPP & 4G& 5G technology, the device-to-device communication (D2D), GREEN communication have increasingly important consideration in assisting spectrum consumption along with power consumption during simulations. The proposed VEMF algorithm has achieved higher capacity, sum rate, Energy Efficiency (EE), and throughput for the receiver section. Finally, we present a greater number of user's data transmissions MmWave-massive-MIMO-OFDMA system.

Keywords: pilot-symbol quantized, VEMF, m-MIMO-OFDM-S, message passing

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I. Introduction

Millimetre-wave m-MIMO-OFDM-S has turned into a valuable technology for Giga b/s information transmission in 5G remote correspondence as a result of its gigantic potential in improving range use, in general throughput, and vitality effectiveness [1]. Such more quantities number of antenna elements of base position bring about tremendous equipment use and vitality utilization. To accomplish minimal effort and EE hardware mechanisms, small-data quantization [2] and multi-bit quantization [3] are proposed recipient equipment design, e.g., multi-bit weight calculation m-MIMO-OFDM framework [4]. The creators explore the utilization of one-symbol AD-DC with unbounded goals bit AD-DC in an m-MIMO framework [5-6]. Our thought is to use the upsides of a best-in-class multi-symbol quantized (MSQ) m-MIMO information for the plan of a versatile bit massive MIMO design. Initially, we offer an ephemeral literature work of MSQ m-MIMO design. message to sign discovery in a PSQ m-MIMO information be not quite the same as to customary MIMO design. A high falsification of MSQ makes it hard to do exact channel state information (CSI) sufficient [7]. one more strategy for joint-channel decision and signal discovery received [8], the pilot's example with information examples towards improving the channel assessment creators structure preparation for discovery method while utilizing a lot more rapid pilot succession. The main objective variable in complex representations by minimizing adjacent symbols utilizing VE. similarly, our proposed modules can perform channel estimation, to predict and estimate all ADC power minimization at the receiver. Our activity results calculation together with MMSE-based VAMP can accomplish the higher limit, throughput rate, and EE are the most powerful communication systems.

II. System Model

In an existing algorithm, we had debated a 32×32 m-MIMO-OFDMA-S transmission using BPSK communication in the Rayleigh channel (RC) with MIMOCEM [21] and JAG6G [22] procedures. The simulated results with the 32×32 MIMO-OFDM system have limited specifications in wireless communication systems. In this proposed model, we discuss a different equalization approach to energy efficiency, spectrum efficiency, and power reduction also. We will reschedule that channel is a flat fading RC multipath channel and the major

modulation is QAM/QPSK. our system model design below. In a 64×64 MIMO-OFDM channel, the possible tradition of the presented 64 transmitting antennas can be as follows:

A. Study that we have a transmission symbol for example S1, S2, S3…….Sn.

B. In standard transmission, we will be transfer S_1 in the first-time symbol slot, S_2 in the second time symbol slot, S_n and up to the end.

C. Yet, take 64 transmitting antennas at a time. In the primary symbols slot, send S_1 and S_2 from the primary and secondary antenna. In secondary time symbols slot send S_3 and S_4 from the primary and secondary antenna send S_5 and S_6 in the third time packet slot and up to end.

D. Now grouping 8 or 16 symbols at a time and sending them in a one-time packet slot, we need only $\frac{N}{4}$ time packet slots to the whole transmission.

E. This modest clarification of a smart m-MIMO-OFDMA-S transmission 6G technology with 64 transmit antennas and 64 receive antennas at a time.
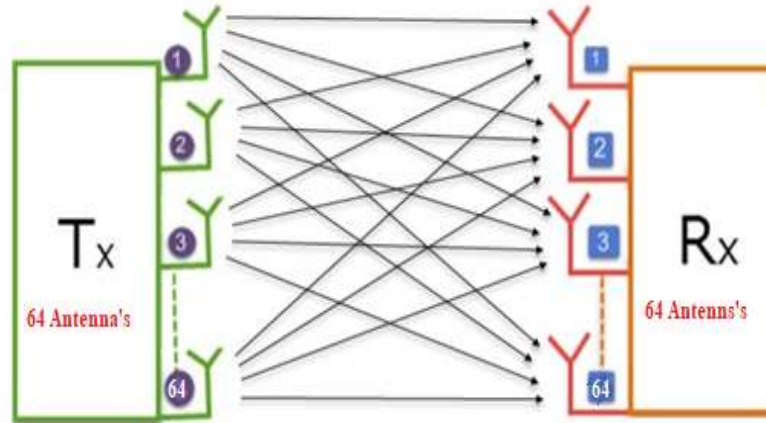

Fig. 1. Block diagram for (64 x 64) both Transmitting and receiving.

$$\mu = \frac{1}{\sqrt{2^\pi \sigma^2}} c \frac{cn-\mu}{2\sigma} x^2 \qquad 1$$

The main channel involvement by each transmitting antenna is the self-based station determine from the free space channel for only transmitting antenna. For transmitting pilots i^{th} to receiving pilots j^{th} , each transmitting and receiving packet are travel free space in random data and finally n has random noise is automatically added in our free space.

We study the JAGSRC [13] is a quantization model joint analysis for both transmit and receive for short-range of communication protocols determined. The rationale JAGSRC is to minimize enough ISNR, so, we have the quantized symbol's data Markov analysis equation below

$$Y=Q(y)+ Dy +nq \qquad 2$$

In mainly to dive real and imaginary parts individually why because to remove noise data for

D= $(1-\lambda_0)$I number of pilot symbols corresponding in ADC's. For a speckle input distribution, correspondent in ADC s. For a random input delivery, the values of λ for λ > 0.5 can be approached by $\lambda = \frac{\pi\sqrt{3}}{2} 2^{-2b}$. The weighted output at the y_g receiver is

$$y_g = Q (\sqrt{g_{1g_2}} h_g^H v_g s_g + n_g) \qquad 3$$

Q is the quality of packets to transfer in free space in distributed antenna system for basic base stations

SWR = $\sum_{i=1}^c h_v^n v_t s_t + (1 - \lambda_b) ng + nq$ 4

Therefore Signal-to-interference weighted Ratio (SWR) at the gth receiver and total information transit free space in the wireless communication process is

$$R = \frac{(1-\lambda_b)\sqrt{g_1}g_2|h_g^H|}{\lambda_{b\sqrt{g_1g_2}}|h_g^H|+\sqrt{g_1g_2}} \qquad 5$$

and we use the impartiality $\sqrt{g_1}g_2$ are gain vector data of mutually transmitter and receiver and h_g^H Quantization information packet pilots for total vector, given below

$$\text{E}[\![h_g^H v_g]\!]=\text{E}[\![h_g]\!]\text{E}[\![h_g^H v_g]\!]= (2^b \frac{F}{F-1}) \qquad 6$$

Next, calculate ΔR as the vector-matrix CSI and defective free space channel feedback. We present estimate effects CSI- ΔR difference as follows

$$\Delta\text{R}=£\left[log_2(1+\frac{1-\lambda_b \pm \sqrt{g^1 g2|h_g^H v_g|}}{\lambda_b \sqrt{g^1 g2|h_g^H v_g|}+\sigma^2})\right] \qquad 7$$

$$\text{V}^{\,E} = log_2 \int_0^m \sqrt[2]{\frac{1-\lambda_b \pm \sqrt{g^1 g2|h_g^H v_g|}}{(\sqrt{g_1 g_2}\sum_{i=1}^c h_v^h V_t S_t + n_q)}} \qquad 8$$

The throughput of user $g_{......n}$ with VE bit distribution R is pilot bit calculation for total matrix and optimize power with constant variable's data

$$Power^C = \frac{1}{\lambda_b}2^{F-1} =\frac{\sqrt[2]{3}}{3\,\pi}2^{2(b-\frac{B}{2(G-1)})} \qquad 9$$

The VEMF algorithm deliberates both power consumption and adaptive ADC symbol allocation and it can guarantee that the Low power consumption of total hardware.

III.   Proposed Method

In the proposed methodology to transmit a greater number of user's data transmit at a time. So, the signal indicates ∟W and calculates the weighted matrix. Each complex-valued are optimized and includes two real and imaginary ADCs, which perform separately dividing as fallows

$$∟\text{W}=sgn(\tilde{y})=sgn\,(y^R)+\text{I x } sgn(y^I) \qquad 10$$

where ∟W is calculated modulation process to up to IFFT analysis for total pilot symbols with overall packets transmission in free space channel. Here QAM/QPSK modulation process transfer four bits of data transmission at a time, thus compared to existing modulation techniques.

The IFFT out weight matrix is given below

$$\text{P}\,(∟\text{W}|\text{H, X}) = \pi_{f=1}^F \,\pi_{j=1}^j \text{P}(y_{fj}|z_{fj}) \qquad 11$$

Where P (∟W|H, X) is cyclic prefix analysis means we are adding guard intervals for total pilot symbols for all packets. here we adding only 0's (zeros).

$$\text{P}(y_{fj}|z_{fj}=\text{P}(y_{fi}^R|z_{fj}^R)\text{P}(y_{fi}^I|z_{fj}^I) \qquad 12$$

$$P_H(\text{H}|\delta_g) = \pi_{f=1}^F \pi_{g=1}^G P_H(h_{fg}|\delta_g) \qquad 13$$

$$P_H(\text{h}_{fg}|\delta_g) = £N(h_{fg}; 0, \delta_g^{-1}) \qquad 14$$

The collective effect of transmit power $\boldsymbol{P_H}$, channel fading for free-space communication analysis, and adaptive AD-DC weighted determination parameter **δ** is for overall weighted matrix calculation for total FFT analysis of overall communication. Here P is the total pilot symbol analysis of all random input pilot bits equations (10)-(14).

$$P_\delta(\delta_g)=\acute{\Gamma}\,(\delta_g; a_0, b_0) \qquad 15$$

Where $\boldsymbol{P_\delta}$ is the receiving pilot bits for total throughput data and **δ** is a combination of original bits and random noise? so, equations (14) and (15) are analyses of receiving pilot data with a low error rate for calculating minimum mean square error data.

Algorithm steps:

Step 1: first random pilot symbols generated like no. of bits.

Step 2: Applying QAM/QPSK modulation process.

Step 3: Applying serial to parallel process which are applying our random data.

Step 4: IFFT & FFT analysis for the transformation of all random pilot symbols.

Step 5: Reverse process for parallel to serial communication and minimizing noise data.

Step 6: Finally calculate MMSE and throughput for total input bits.

IV.   Simulation Results

In this segment, we show the exhibition of our proposed calculation and dissect the best offloading technique for calculation offloading hybrid multiple access methods based on users' power and energy budgets. Here to optimize the improved signal to noise ratio and reduction of mean square error receiver distributed antenna system.
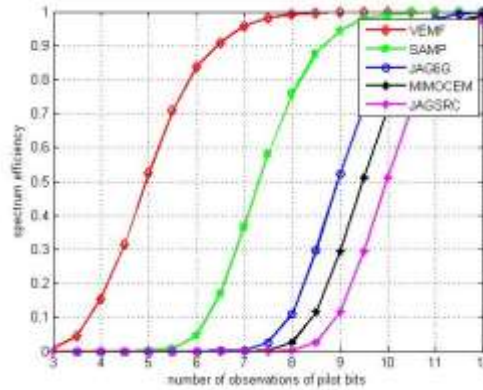

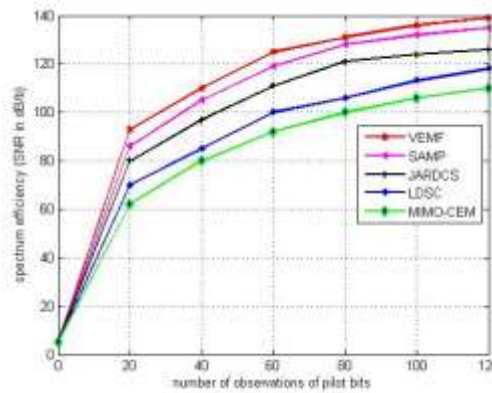**Fig 2.** Spectrum Efficiency performance: throughput vs no. of base stations.

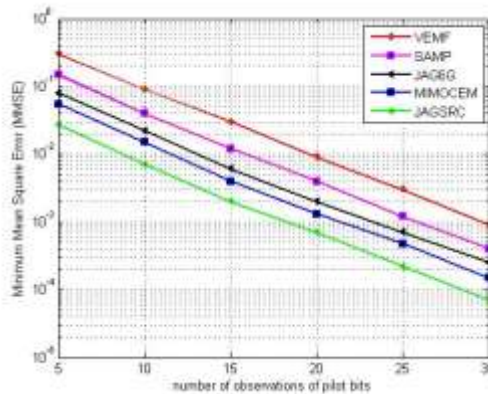**Fig 3.**Spectrum Efficiency (ISNR): SNR vs number of base station users

Fig 4. MMSE performance vs. no. of bits parameter initialization.

The above figure 3 describes spectrum efficiency as up to the max limit '1' in existing algorithms are below. Figures 4 and 5 are spectrum efficiency and bit error rate analysis for VEMF proposed one.
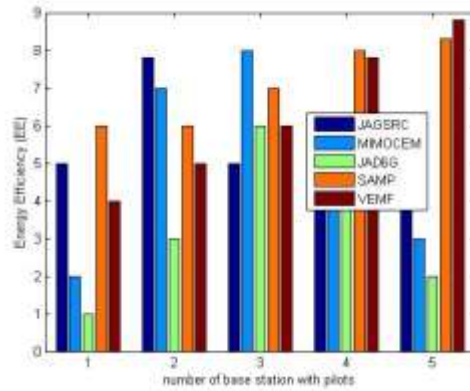
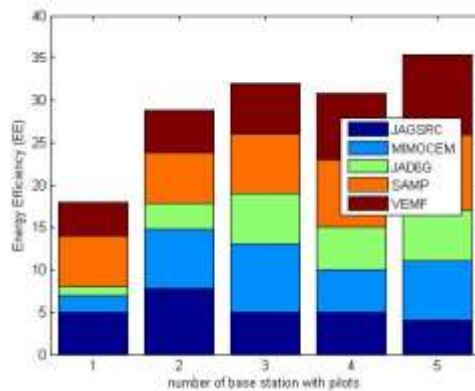**Fig 5.** Number of Base stations vs. Energy Efficiency

Fig 6. Several Base stations vs. Energy Efficiency with 6G technology.

The above figures 5 and 6 are calculated no. of base station user's vs improved signal to noise ratio. Next, we associate the presentation of four extrapolation detectors with our proposed MMSE-based VAMF, JAGSRC [20], MIMOCEM [21], JAG6G [22], SAMP [24], To choose the same simulation restrictions as used in existing works. we estimation the adaptive m-MIMO-OFDM-S with 64 antennas, 1 lakh users, and a pilot length of J_{pilot}=64. The outcomes show that MMSE-based VAMF could perform the channel approximation and throughput optimization with power minimization. It can attain improved concert JAGSRC and JAG6G, but MEMOCEM in high SNR. On the other hand, MMSE-based VAMF delivers well trustworthiness in assessment with MEMOCEM. When symbol pilot length is satisfactory, the performance of MMSE-based VAMF is better than JAGSRC, JAG6G but it is inferior to MEMOCEM.

V. Conclusion

This paper article, a novel VEMF algorithm proposed to a greater number of user's data transmission in wireless communication for 6G technology. Note our proposed compared four methods in existing massive MMIO systems. As we study an urban and rural deployment setup with the urban macro cell radius of 1 km. The energetic pilot users in the communication network form spectrum efficiency and energy efficiency pairs conditional on a threshold distance criterion. In future work developed low complexity design for machine learning and deep learning with artificial intelligence system in high-quality images and live video data transmission.

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