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Bandwidth management in the HAPS

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Abstract— ***Today the demand for sending data at high speed is increasing, so we propose variety of modulations to accelerate the speed. One technique is OFDM that contains sending data high byte rate frequency in gigahertz. However this data is presented in two forms: broadcast and multi-broadcast. These two forms help the applicants apply different ways such as satellites and communication towers. The need to use different services at high speed is increasing, this has made challenges for both planetary and aerial stations in which HAPS can be a good substitution. In this paper we analyze the wave band with OFDM modulation in the areas covered by HAPS to provide the applicants multi- media services with high speed.***

Keywords— QOS ; band with ; OFDM modulation ; HAPS

I. Introduction

Over the past few years mobile radio communications have changed a lot because of the increasing number of applicants and network expansion. According to studies done on satellites and communication towers, researchers have come into a conclusion that these methods provide restrictions. Regarding satellites, developing a satellite complex requires a circuit. For instance a set of iridium consists of 66 satellites which cause long delays in signal [1][2]. Signal influence and also the time is limited in buildings. In this case aerial stations are good answers to these questions.
Such stations are able to load and be active at favorite height. But the need to communicate at high speed has become so challenging for the HAPS[1] aerial stations so that researchers have decided to manage this case in a better way. This article shows how to manage areas under HAPS cover to provide the applicants multi-media services at high speed. As multi-media communications such as audio, video and data in wireless systems grow, we try more to propose systems to send high byte rate on mobile channels with high efficiency. a multi-carrier modulation can be a good choice to for wireless system with high capacity. OFDM[2] is one of those multi-carrier systems in which the information at high byte rate can be separated into low byte rates and all of them will be modulated by different sub carriers. The main reason to use OFDM is its resistance in multi-path channels. As byte rate decreases the symbol period increases whereas signal interference period is stable. So the symbol interference decreases and its efficiency improves [3][4]. Sending information and frequency division or FDM dates back to 1950 and was proposed in 1960 [5].Unlike other multi-carrier systems, the OFDM carriers are vertical [3]. The advantage of this method is its more spectral efficiency. In 1971 Weinstein and Ebert proposed the immediate Discrete Fourier Transform (DFT) which was a new way to avoid its complexity [6]. In 1980 another step was taken by Peled and Ruiz [7]. Many researches have been done on OFDM efficiency. In this paper we analyze the wave band with OFDM modulation in the areas covered by HAPS to provide the applicants multi- media services with high speed.
The paper is organized as follows; Theory in section II and HAPS evolution in section III. In section IV Material and Methodology. Then the Results and Tables are taken up in section V. Finally, section VI, conclusion of this work.

II . Theory

due to increasing number of people using wireless services, high altitude systems were proposed. In compare with planetary and aerial stations these systems have many advantages. Among these systems HAPS is the best at presenting multi-media services. HAPS can be best substitute with satellites.
It can also present planetary communication systems. HAPS can be a good way of communication among the systems especially in hard situations[8].
It can also be used in telecommunication applications like BWA, or integrating 3G or 4G mobile phones and also DVB-H. This project presents how to manage wave band under HAPS coverage to provide the applicants use multi-media services at high speed.

III . HAPS evolution

In 1980 the first project on these platforms was conducted by communication research center in Canada named SHARP. After that the sky station project was proposed in the U.S. that could support third generation of new cellphones. Data rate for the calls in sky station is 9.6-16 kilobyte per second and 384 kilobytes for transferring information. This variety continues to improve services and applications. As Table 1:[9]

Table 1: HAPS evolution

	Height	payloads weighing	Coverage
HAPs	17-22Km	200 pounds	ı200Km^2
LMAPs	Max. 5km	2,400 pounds	
LAPs	0.3-4Km	5-10Kg	
Tethered Balloon	0.07-0.44Km	5-10Kg	'2Km^2
EBAN Balloon	0.1-0.5Km	5-10Kg	'2Km^2

Many researchers have worked on HAPS wave band management such as Araniti and Molinaro who worked on

1 High Altitude Platform Station
2 Orthogonal Frequency Division Multiplexing

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integrating planetary systems and HAPS to improve communication structures [1]. Another analysis done by Goodchild and Rhind in 2007 was to increase antenna efficiency by using a network [10]. Researchers such as Alsamhi analyzed handoff which is one of the priorities in this system [9] [11].

IV . Material and Methodology

First of all the OFDM modulator is proposed. It has great influence on wave band. As seen in Figure 2.

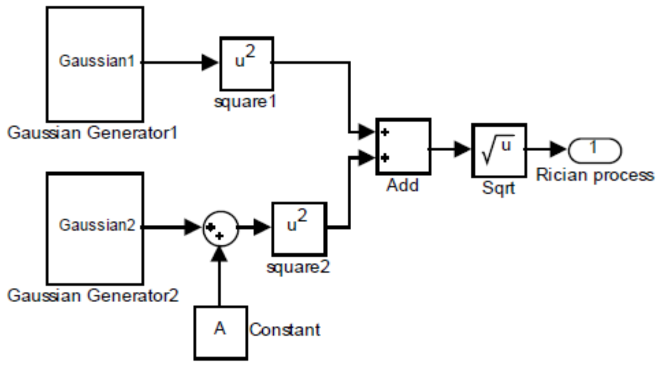


Figure 1 : Simulink channel rician

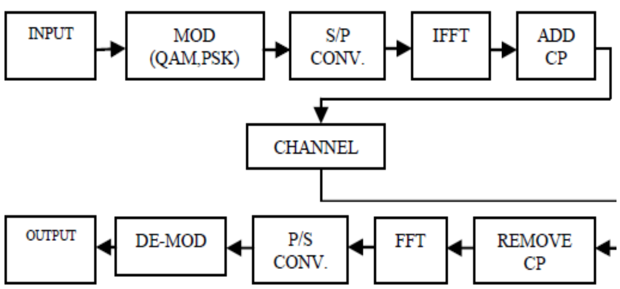


Figure 2 : OFDM modulator

the transferring channel is HAPS, in this channel the sender and the receiver are both direct sights and we can see the results using OFDM modulator in Figure2. As shown in Figure 1 and Figure 2 show that rician channels using the channel OFDM modulation show.

The proposed scheme is novel in the sense that the multimedia traffic is identified according to their transmission rate and is more accurate than existing works that divide multimedia into real-time and non real-time traffic [12].

We divide multimedia into three classes: CBR real time traffic (such as voice call), VBR real time traffic (such as video teleconference stream) and VBR non real time traffic (such as Email, picture/data message, etc.). Secondly, we use a weight-based bandwidth partition approach to efficiently allocate the bandwidth for each class of multimedia traffic. We also use this method to reserve part of the bandwidth for hand off calls or streams. The allocated and reserved bandwidth for each class of multimedia traffic is proportional to the product of arrival rate and transmission rate. This approach could be said to be more accurate than the one that allocates bandwidth only according to the arrival rate. VBR real-time traffic has a lower arrival rate, but also has a higher transmission rate. If we allocate bandwidth only based on the arrival rate of each traffic class, then VBR real-time traffic will be allocated with least bandwidth due to its lowest arrival rate as compared to other traffic. In fact, VBR real-time traffic needs more bandwidth than VBR non-real-time traffic due to its high transmission rate. The combination of arrival rate and transmission rate of traffic is more precise in characterizing the traffic demand for each class of traffic [17].

In our system, we divide multimedia traffic into three classes: CBR real-time traffic (such as voice call), VBR real-time traffic (such as video teleconference stream) and VBR non real-time traffic (such as Email, ftp etc data call).

Table 2: Classification of multimedia Traffic

3-4 Traffic Type	Priority Level	Bandwidth Properties(for new originating calls or streams	
		Sharing with	Borrowing From
CBR real-time	High	Cannot Share	VBR real-time
VBR real-time	Medium	Cannot Share	VBR real-time
VBR non real-time	Low	With CBR real-time	VBR non real-time

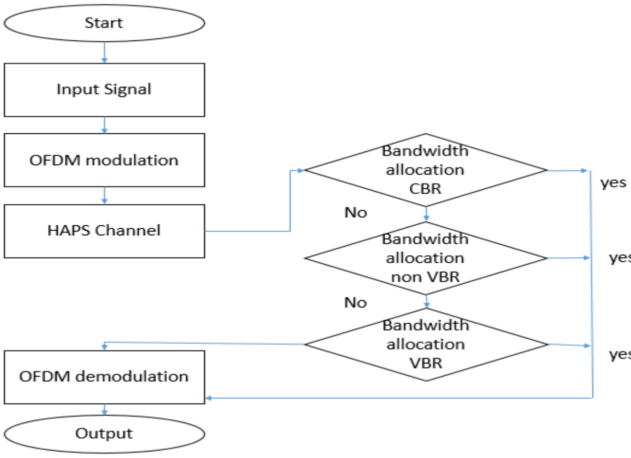
The CBR real time traffic is allocated with static amount of bandwidth for the constant transmission rate when admitted into the system. The VBR real-time and non real-time traffic which can be transmitted at variable bit rate, therefore, are allocated with an elastic amount of bandwidth when admitted into system. Due to high sensitivity of real-time traffic to delays, real-time traffic always has higher priority over the non real-time traffic in our scheme. Moreover, since the CBR traffic needs constant transmission rate while VBR traffic can tolerate some transmission rate changes during their transmission, the CBR traffic usually has the higher priority than VBR traffic. Thus, the priority of three classes of traffic is given as: CBR real-time traffic > VBR real-time traffic > VBR non real-time. Details are given in Table 2[17].

Of course a comprehensive comparison has been made between the channels to have a better understanding of this method. So with the use of OFDM modulation sending information would be easier in HAPS[18][19].

V . Results and Tables

Due to an increasing number of applicants using multi-media services, it is important to use better communication tools, so that HAPS has presented services in which it can divide wave band. OFDM technique divides sending symbols to protect the system from multi-path contribution. As the number of systems increases, this technique gets better and better. OFDM system with CDMA is presented for next generation of mobile phones, because this helps efficiency in HAPS wave band.

This diagram shows the procedure. Wireless wave band causes high data rates. HAPS range to present BWA which consists a 300 megahertz band in 48/47 gigahertz all around the world but 31/28 in Asia with IEE802.16 standards. This paper proposed flowchart is shown below.



The service time of each class of multimedia traffic is assumed to follow an exponential distribution with different mean rate.

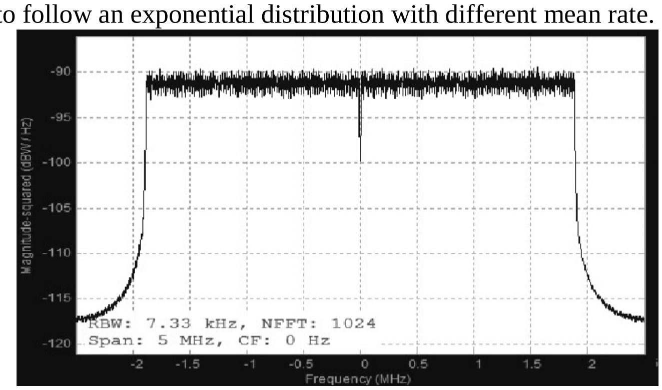


Figure 3 : Transmission

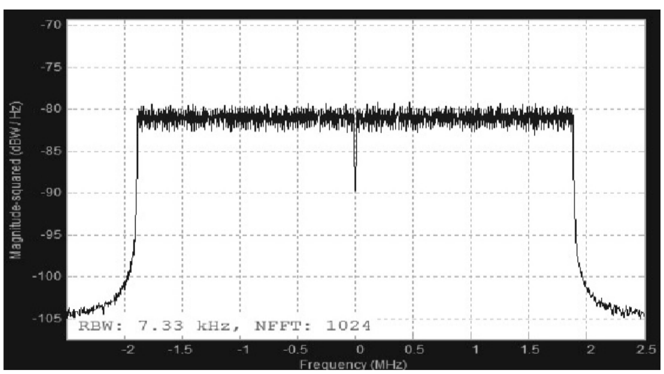


Figure 4: Receive

Total bandwidth B (unit: bps) in a cell is 6400. Transmission rate per call for CBR real-time traffic is 64kbps. Mean transmission rate per call for VBR non real-time traffic is 32kbps peak transmission rate per call for VBR non real-time traffic is 128kbps. Mean transmission rate per stream for VBR real-time traffic is 128, peak transmission rate per stream for VBR real-time traffic is 256kbps. Hand of calls or hand of streams are assumed to be only 1% of total calls for each class of traffic. As you see in Figure 3 and 4 the SNR has changed a lot.

VI . Conclusion

In this paper we consider to manage a wave band with OFDM modulation under HAPS system to provide the applicants multi-media services at high speed, wide range of multimedia services placed at the disposal of users.

we introduced a fair bandwidth partitioning method and proposed an adaptive bandwidth allocation scheme for the optimal bandwidth allocation for different

classes of multimedia traffic in mobile broadband wireless network. OFDM modulation in multipath channel, the narrow-band noise and interference resistant was thus to optimize bandwidth communication channel is used, it is clear that the difference between the use of this modulation in the other modulation tradeoffs.

OFDM modulation in multi-path channels is resistance and that is its specific feature among any other modulation. As seen in Figure 3 and 4 the wave band is optimized by this method. So with the use of OFDM modulation sending information would be easier in HAPS.

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