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THE RESEARCH OF WI-FI CHANNEL FOR MULTIMEDIA TRAFFIC

In this paper, we study the influence of environmental parameters on the transmission channel network standard Wi-Fi, to be able to gain access to new formats multimedia services. It was received transmission rate depending on the distance and transmission rate depending on the signal strength for channels 20 MHz and 40 MHz. Take into account the impact of external interferences.

Keywords: wireless channel, Wi-Fi networks, transmission medium.

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ДОСЛІДЖЕННЯ WI-FI КАНАЛУ ДЛЯ ПЕРЕДАЧІ МУЛЬТИМЕДІЙНОГО ТРАФІКУ

Анотація. В теперішній час спостерігається значний ріст кількості та якості інформації яка передається, що обумовлено значним розвитком об'єктів інтернету речей та переходу на нові формати мультимедійного трафіку. Така ситуація призводить до виникнення значних навантажень на існуючі канали передачі інформації, та зумовлює необхідність пошуку оптимальних рішень при проектуванні та розгортанні безпроводних мереж. Тому, в даній роботі проведено дослідження впливу параметрів середовища передачі у каналах мереж стандарту Wi-Fi, для можливості отримання доступу до нових форматів інфокомунікаційних послуг.

Ключові слова: безпроводний канал, Wi-Fi мережа, середовище передачі.

Introduction

Design and deployment of wireless networks, at present, have been the most rapid development in Ukraine and abroad. First, it's contributed by the development and expansion of the number of devices that have the ability to connect to wireless networks that are cost effective and easy to use. Wireless technologies become particularly widespread in the concept of the internet of things, and implement in the construction of digital houses [1].

Moreover, at present there is a significant increase in the amount and quality of information being transmitted, due to significant development of objects of the Internet of things and the transition to the new formats of multimedia traffic [2]. This situation leads to significant pressures on existing channels of information transmission, and necessitates the search for optimal solutions in the design and deployment of wireless networks.

In the designing of modern wireless networks, there is a major problem – the influence of many factors and environmental parameters on the characteristics of data transmission, which leads to a significant reduction in bandwidth. This means that there is a probability of interference at any point in time during the same session data, executed in different environments or at different times and may have different characteristics. Therefore, to determine the actual characteristics of the network, it is necessary to conduct experimental research channels to the possibility of carrying multimedia traffic without delay.

Main part

In our case, as environmental research, uses wireless network standard Wi-Fi 802.11n for digital house concept [3]. When deploying such a network, we consider the possibility of users' access to new types of

information and communication services, such as access and formation of high-quality high-definition video format HD and UltraHD [2], which are directly introduced to the Internet of things.

Whereas, on Wi-Fi channel information can be transferred only in half-duplex mode, to study the characteristics of the transmission of multimedia traffic over wireless channels has been constructed network as shown in Fig. 1.

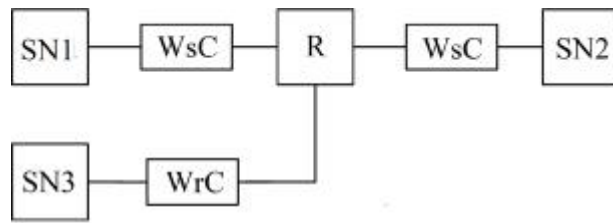


Fig. 1. Structural diagram of the LAN

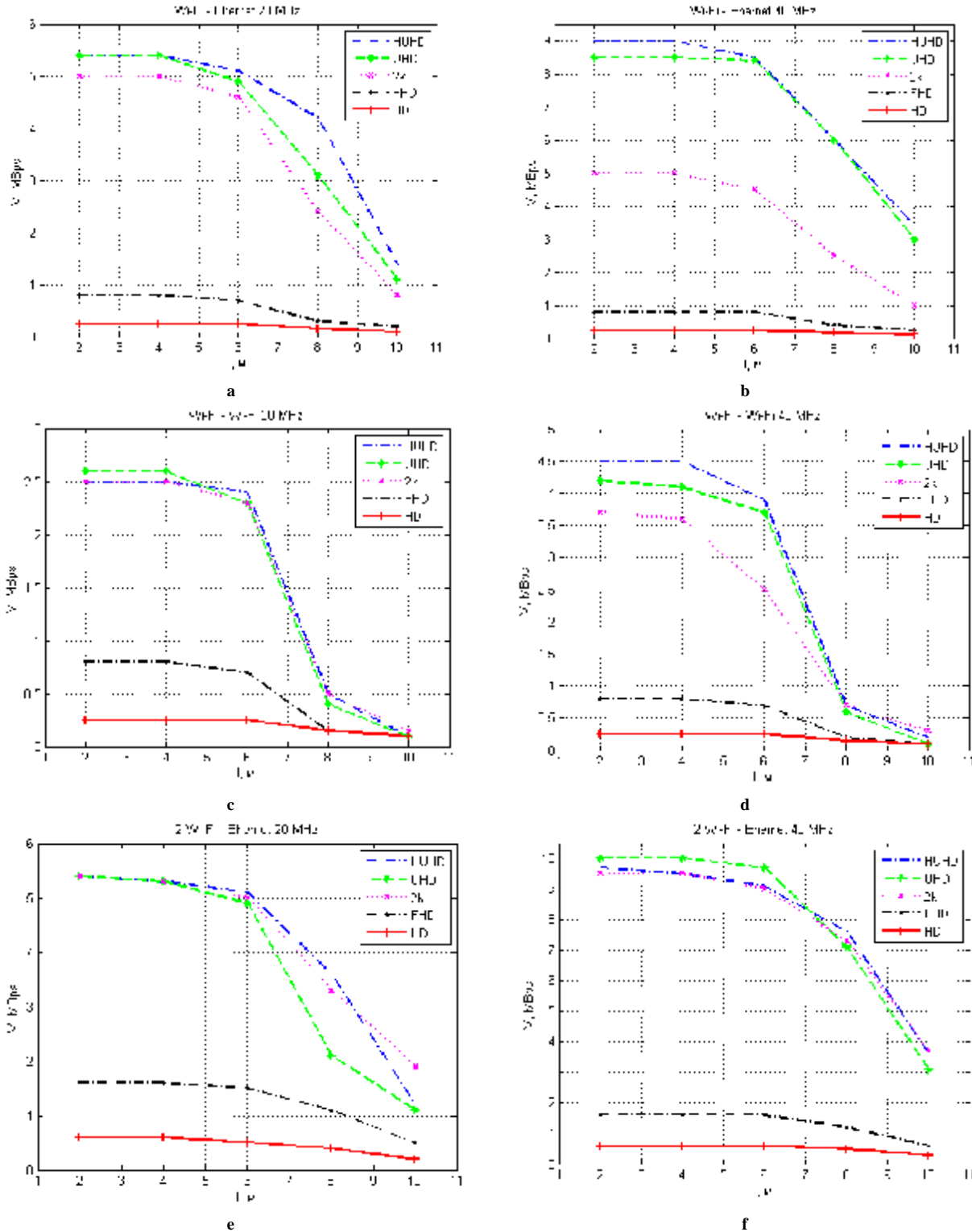


Fig. 2. Dependence of the transmission channel from a distance using the circuit connection:
 a) SN1-SN3 for channel width 20 MHz; b) SN1-SN3 for channel width 40 MHz;
 c) SN1-SN2 for channel width 20 MHz; d) SN1-SN2 for channel width 40 MHz;
 e) SN1-SN2-SN3 for channel width 20 MHz; f) SN1-SN2-SN3 for channel width 40 MHz.

The main node is the router (R) standard 802.11n. For research use three subscriber node (SN), which are connected to the router via wireless (WsC) and wired (WrC) channels. To study the channels to connect subscribers SN3-SN1, SN2-SN1, SN2-SN1-SN3 with channel bandwidths of 20 MHz and 40 MHz. The research results transfer speeds and signal strength are shown in Fig. 2 and Fig. 3, respectively.

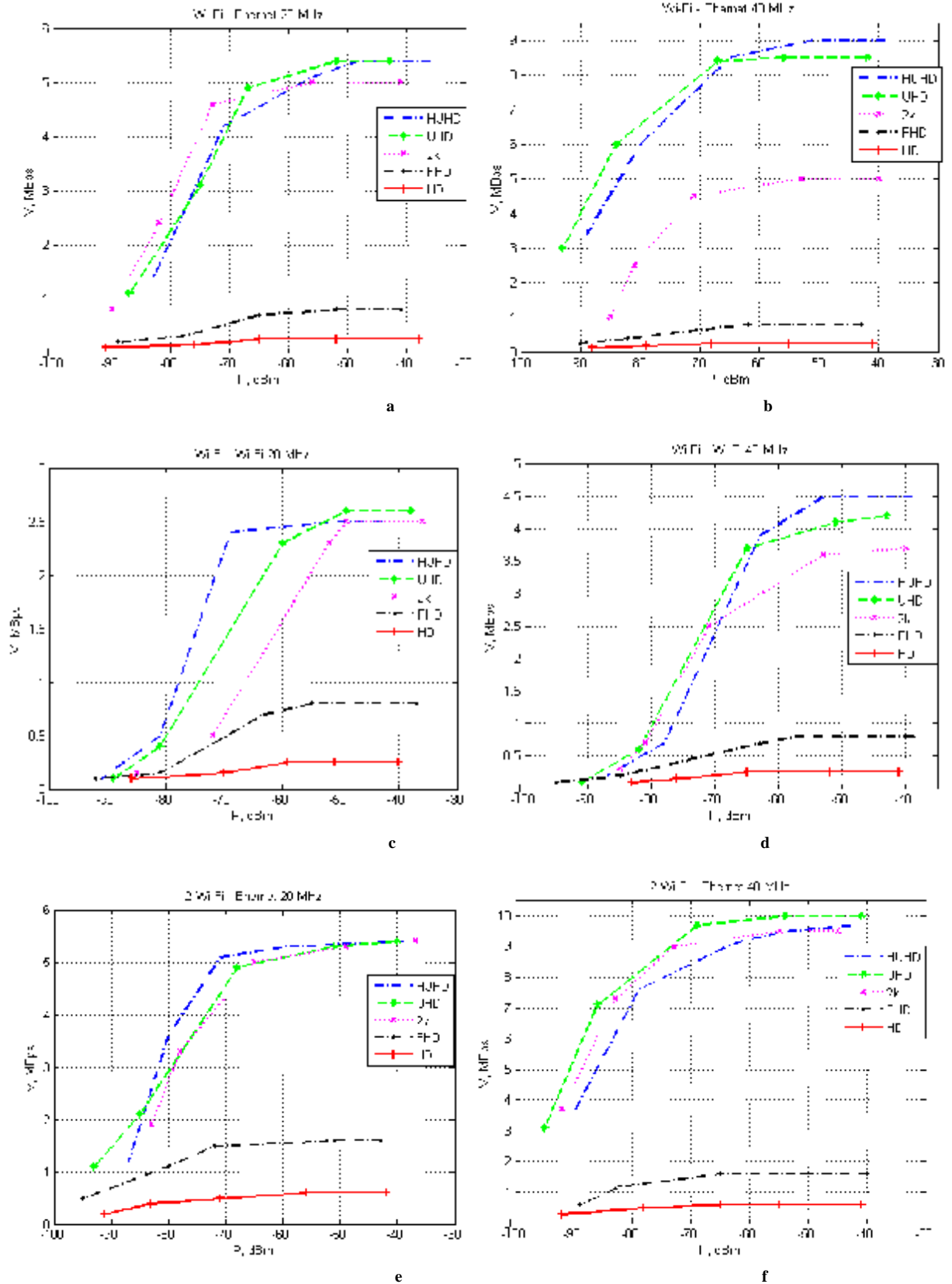


Fig. 3. Dependence of the transmission channel from a power using the circuit connection:
 a) SN1-SN3 for channel width 20 MHz; b) SN1-SN3 for channel width 40 MHz;
 c) SN1-SN2 for channel width 20 MHz; d) SN1-SN2 for channel width 40 MHz;
 e) SN1-SN2-SN3 for channel width 20 MHz; f) SN1-SN2-SN3 for channel width 40 MHz.

In order to study the possibility of transferring modern formats of multimedia traffic in the concept of digital house five types of video files from the usual format of HD 720p resolution to 4K format UltraHD 2160p (normal and high quality) were established. In addition, the network is set so that at a distance of six meters exists architectural obstacle for wireless channels. For all studies considered that if the video file is played in real time with no delay and distortion, the transfer of such traffic is possible, and channel sufficient.

Consider the results of research. As shown in Fig. 2 a and b, using a single wireless channel, if SN1-SN3, the maximum speed was an average of 5 MB/s for 20 MHz channel width, and 8.5 Mb/s for 40 MHz. This makes it possible to get access to all of the above mentioned formats (channel enough) except UltraHD 4K high quality.

Typically, the wireless network is not limited to one person, so the study was conducted for the simultaneous use of two wireless channels scheme SN1-SN2 (Fig. 2 c and d). In this case, transmission rate, for each subscriber is reduced by about half, which is insufficient for use traffic formats UltraHD by two devices simultaneously.

Considering the third variant of network SN1-SN2-SN3 (Fig. 2 e and f), which is most common in the construction of networks of digital home proved the following feature: the average speed for the two channels is 1 Mb/s higher than the SN1-SN3 for the channel width in 40 MHz.

Investigation of the dependence of transmission speed from the signal strength (see Fig. 3) showed that the channel width with MHz is more stable to reduction of the signal strength at the receiving side (lower slope of decline curves) as an obstacle (to - 70 dBm) and after obstacle.

Conclusions

Thus, to gain access to new information and communication services in 4K UltraHD formats, in wireless network, Wi-Fi in the first place, it is necessary to provide direct visibility and possible expansion of the channel width up to 40 MHz.

When transferring large amounts of information, a number of drawbacks are arised, such as the lack of duplex transmission, which leads to the division of bandwidth between the number of subscribers, and characteristics of traffic flows, characterized by irregularity and self-similarity effects arising from accidental changes of the transmission medium.

From the study found that for channels of standard Wi-Fi 802.11n, the presence of obstacles, such as walls, reduces bandwidth, as a result the transmission of multimedia traffic in UltraHD formats in real time is not possible, but if decrease the format to 720p, consistent reception range is doubled.

When using a spread spectrum, channel width with 40 MHz, it is possible to increase the speed twice and provide better signal stability, but this is achieved in the absence of external interference such as neighboring access points, electromagnetic interference and so on.

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