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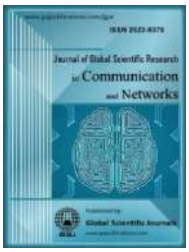

Effect of Antenna Types on Frequency Hopping at Cell Network

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ABSTRACT

The frequency hopping and signal to noise ratio are both critical issue in our life especially we are in the development word of communication techniques where the better performance is the firstly chosen. This paper study the effect of antenna types used in celluler network on frequency hopping (FH). In this paper a comparison made between antenna types used in bazyan, takia,tasluja and FH at towers base station in Asia cell at Kurdistan. This paper study the FH diagram system. Then discussed the related method which worked on the Simulation results indicate that antenna types depends on the effect of FH and the signal to noise ratio (S/N) on cell coverage area, which mean that difference at frequency services are better for different uses . The simulation results from studying the characteristics of the antenna types performance indicates that the FH and S/N are shows that coverage area location analysis best compare to Kathrin antenna K742225 than other types, Kathrin antennas type k742225 still have better performance in term of coverage enhancement and interference control. K742225. Increasing sectors of cell site regions is a suitable solution for light urban coverage. The important question is the performance for these antenna type effect on the coverage area. The answer will be found in this paper by depending on the real data for the chooses site in bazyan , takia , tasluja.

1. Introduction

The mobile optimization for communication network is very complicated to obtaine high quality of service explained as speech distortion. Speech signals transmitted through telecommunication systems suffer from significant call quality degradation caused by channel noise, interferences, echo, codec used, speech level, noise level and bit error ratio. These impairments have become a major setback in mobile communication system[1],[2],[3]. From the figure 1 show the Frequency Hopping (FH) diagram system. is a transmitting method which radio signals early switching a carrier around of many frequency channels, using a PS (pseudorandom sequence) known for transmitter and receiver_together_by using a multiple access method in the frequency-hopping code division multiple access (FH-CDMA) scheme [4].

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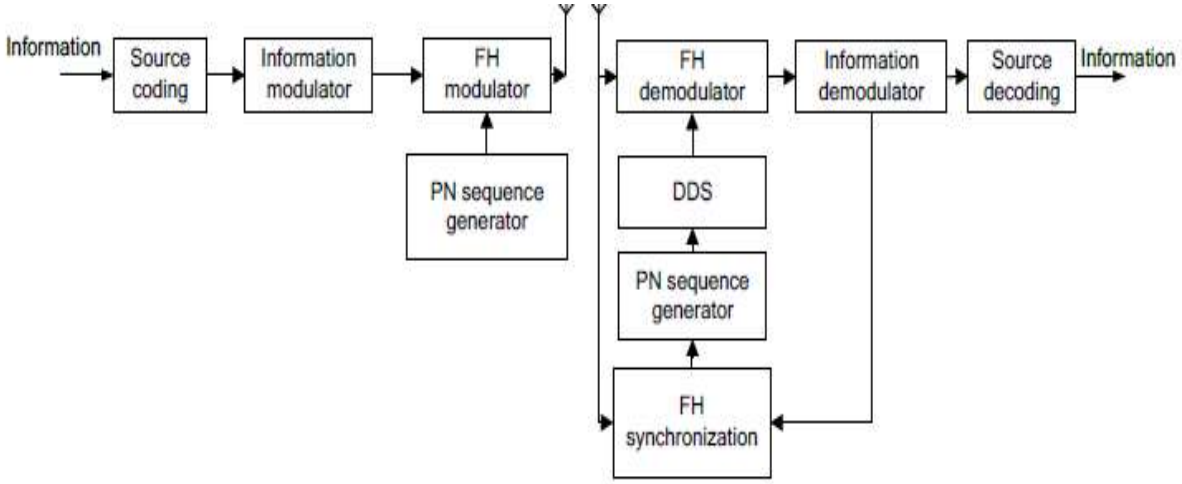

Figure (1) the diagram of frequency hopping system

Assuming that the PRN waveform is BPSK modulated
onto the carrier and that the carrier frequency and the code are not coherent, the
resulting power spectrum is given by [4]:

$$S_L(\omega) = \frac{1}{2}\left[P_c S_{PN}(\omega + \omega_c) + P_c S_{PN}(\omega - \omega_c)\right]$$

Where:
Pc unmodulated carrier power
ω*c* carrier frequency (radians)
SPN(ω*c*) power spectrum of the PRN code(s) (plus data) at baseband.

2. Literature Review

There is a several amount of literature from related works that contains papers and articles methods of the performance discussions on frequency hopping working from different international journals in the word like IEEE acsess, MDPI and Hindawi.

In 2013[1] the proposition of Goodfelow paper were maxout network model, which can minimized the computational costs by minimizing the number of important neurons and the number of network parameters for each maxout layer, while at 2015 Schroff [2] applied a maxout networks too , which gain high recognition accuracy rates on challenging the face of datasets. the [2] is designed as a real-time distinctive features extraction model, also the generative method is combined to realize the frequency hopping (FH) signal network station by sort it at the end.

In 2017 Zhang[4] propose a nearly blind estimation approach to estimate signal parameters based on sparse Bayesian reconstruction. By taking the sparsity in the spatial frequency domain of multiple FH signals into account, he proposed a sparse Bayesian algorithm for estimating the spatial frequency parameters, which the simulation results, the frequency and direction of arrival (DOA) parameters could been obtained. Under condition by improving the accuracy of the estimation parameters, weemploymorphological filter methods to better cleaning the data poisoned by the noise. Also, their method was applicable to the wideband signal models with few prior information. Moreover, they conducted extensive numerical simulations to verify the performance of Zhang method's. the proposed method worked well with low signal-to-noise ratio (S/N) environment. And he proved in his work after a lot of experments where multiple wideband FH signals are successfully achieved and precise estimation of parameters in low S/N conditions is conducted by the proposed method. In October 2017 Ping Sui, Ying Guo, Kun-feng Zhang, and Honguang Li suggests in [5] the solution for (FH transmitter recognition problem) an another method for Kun-feng Zhang and Ying Guo in the same year where FH transmitter fingerprint feature classification were based on kernel collaborative representation classifier. Then there

measurement results was on the real world (5FH) transmitters showing their method "achieves obviously better performance than CRC and several state of the art methods in terms of accuracy and efficiency".

In February 2018 Yongchul Kim[6], proposed a robust asynchronous rendezvous scheme which enhanced robustness under jamming attacks conditions. His evaluation results demonstrate that the performance of the proposed scheme vastly outperforms the Asynchronous Channel-Hopping (ACH) scheme when there are security concerns about a sequence sensing jammer. They proposed a new FRARS algorithm for allowing randomized permutation in every period of the sender's CH sequence. Their results demonstrate that the rendezvous probability of the Asynchronous Channel-Hopping (ACH) under (SSJA) is dramatically decreased from 100 percent to less than 40 percent. by the other side, the rendezvous probability of their (FRARS) is almost steady under jamming attacks and close to 100 percent as the number of available channels increases. So (FRARS) vastly outperforms other recently proposed schemes under a sophisticated jamming attack.

On 23 February 2018 S1800657[7] the authors of this paper proposed a method on designing of communication solutions under dynamic channel interference (DCI) conditions, by implementing a dynamic management policies for (FH) technique and channel selection at runtime. The method considers several standard frequency hopping (FH) techniques , quality metrics, quality ,and status of the available frequency channels by proposing the best solution to minimize the side effects of interferences. By developing a simulation tool and used in this paper to validate the method. That is, the received signal strength indicator in a real environment could be measured and used as input for the method implementation, and the channel selection and the hopping sequence would be obtained from the tool.

In August 2018 Ziwei Lei , Peng Yang and Linhua Zheng [8] proposeed a channelized MWC scheme which solve the problems. Simulations results show the development method can detect the channel, which contains frequency hopping speared spectrum (FHSS) signals in the case of a low (S/N). by adding, the estimation method leaded to a successful estimation of the frequency hopping speared spectrum carrier frequency. Which Ziwei Lei's results that the method is also effective by broadbanding Non cooperative spectrum sensing.

In November 2018 Farrukh Aslam Khan paper [9], performed a performance analysis of a hierarchical routing protocol for cell networks called Location aware Grid-based Hierarchical Routing (LGHR). And Farrukh rationate that LGHR is more stable than GRID by considering the position of a node as well as its velocity for electing gateways in a grid. In all cases, LGHR outperforms GRID routing protocol and works in a more stable manner.

In 2019 Hongguang Li and etal proposed [14] a good network-station by sorting method of frequency hopping (FH) signal with Maxout network performance extraction and generative-based assessment method, a lot of experiments on truly frequency hopping (FH) data sets found that the proposed method in [13] not only outperforms the competitive feature extraction methods with a higher accuracy of FH signal network-station sorting but also has a better robustness against noise, especially Gaussian noise. And Hongguang Li shows that method have got better performance than other methods in accuracy, which was our start point in our work. In 2019 IEEE access 2958619[15] they proposed an improved frequency offset synchronization scheme for MTC over long term evolution system. The auther proposed method is based on repetitive nature and frequency hopping of the physical downlink shared channel, which is integrated with weighted least-squares estimation to eliminate the effect of channel fading. This design makes it possible to effectively estimate the residual frequency offset when there is frequency selective fading. Where the results showed that the frequency-hopped (FH) for the physical downlink shared channel signal is perfectly used to reduce the estimation error for coverage enhancement of MTC UEs in poor channel conditions. Where they demonstrated simulations that the repetitive property of frequency-hopped physical downlink shared channel signal can be effectively used for synchronization purpose when the MTC UE is in low coverage areas. By mean, the

proposed method in [15] can benefit from the band selection and achieve better performance than the conventional DDE scheme. In [9] through 2019 in (DISE) Department of Information Security Engineering\Soonchunhyang University at the South of Korea country. Choudhary et al discussed the potential design issues and key challenges of the secure 5G mobile backhaul architecture. The trails of research challenges and future directions have been presented for the upcoming solutions which should revolve around the currents issues and overcome the subsisting constraints of 5G mobile backhaul networks.

3. Methods

Mobile radio systems are allowed to operate portions intheradio spectrum [8].For a frequency reuse pattern based on clusters of N sites, each of cell radius R, the reuse distance, D is:Typical cluster sizes are:3, 4, 7, 12, 21Larger cluster sizes give better C/I (carreier to interference) Ratios[3]

$$D = R\sqrt{3N} \qquad (1)$$

Where :
R :radious in cell in a corner
N : number of sites

Around each cell, there are 6 cells in adjacent clusters using the same CarriersThese cells will cause mutual co-channel interferenceThe C/I due to these cells canbe found from the reuse distance, DD can be calculated from thegeometry of the clusters as[3]:

Table I. the sites at Bazyan, Takia, Tasluja regions

Site	Antenna type	HSN	No. of Sectors
Allahi_0648	K742225	21	6
Bayenjan_0650	K739684	29	3
Bazyan_0671	K742225	60	6
Tainal_0844-1	K739684	35	3
BZCFc_0626	K739684	51	3
TakiaMt_0612	K739623	11	3
Takia_0649	K739684	53	2
Takia2_0665	K742225	8	6
Tasluja_0601	K739684	29	2
Tasluja2_0651	K742225	7	6
Cement_0688	K736347	7	2
Factory_0655	K739684	5	3

The signal is broad cast over seemingly random series of frequencies the definition of Frequency hopping spread spectrum (FHSS) and the figure 1 show an example of frequency hopping. The figure 2 show the Classification of FH techniques.

A ccording to a certain hopping pattern the (FH) signals were generated by varying the carrier frequencies, which is typically pseudo-random (PR). Caused by the (PR) inherent capability of low interception, good confidentiality, and strong anti-interference, frequency hopping (FH) signals have become an important tactical means of anti-reconnaissance and anti-jamming in military communication. frequency hopping (FH) transmitter identification is a traditional significant but challenging issue in the electromagnetic war domain, precisely under serious noise and noncooperation conditions. By reason of the individual nuances of frequency hopping (FH) transmitters, there exist the inherent features, where could be used to identify the transmitter individuals. This inherent issues that based on the individual nuances can be called the “fingerprint of the transmitters”.

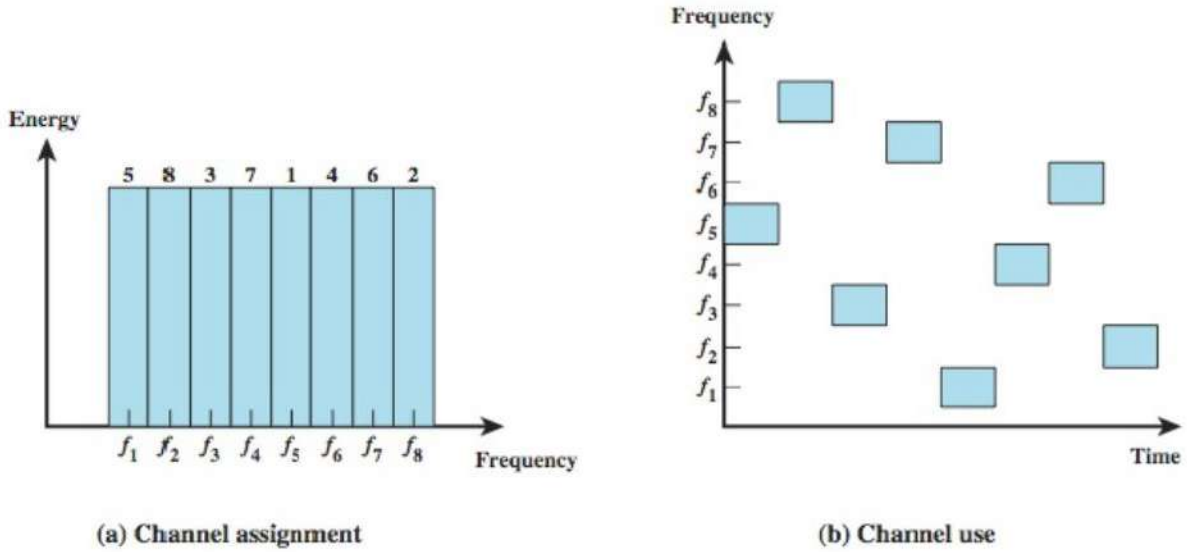

Figure -2 frequency hopping example

From figure -2(a,b) an example of the FH (frequency hopping) respectively. Where as clear from the figure-2 (a) th e channel assignment between the frequency and the energy, while in figure 2-(b) showing the channel use between the time and the frequency.

$$c = \frac{1}{R^x} \quad (2)$$

$$I = 6\left(\frac{1}{D^x}\right) \quad (3)$$

$$\frac{c}{I} = 10\ log\left(\frac{1}{6}\left(\frac{D}{R}\right)^x\right) \quad (4)$$

4. Simulation Result

As shown from table I, choosing the sites at Bazyan, Takia, Tasluja regionsrespectively, From the above table in the first column the site names which represent the places of towers belong the region name. the second column showes the type antenna used shown that the antenna type K742225 holding by Allahi_0648, Bazyan_0671 sites have freguency hopping ranges between 21 MHZ - 60 MHz respectively. While for Takia2_0665 and Tasluja2_0651site holding the same last antenna type the value of frequency hopping are 8 and 7 MHz respectively.Note that each the above mentioned sites have six sectors. Butfor Bayenjan_0650, Tainal_0844-1, Takia_0649 Factory_0655sites holding antenna type K739684 have frequency hopping ranges 29 ,35,53,5 MHz respectively. it's clear that frequency hopping dependent on sectors more than antenna type.

In bazyan the antenna type K742225 uses in two sites in this place are Allahi_0648, Bazyan_0671 they have freguency hopping for . but the antenna K739684 uses in Bayenjan_0650, Tainal_0844-1, Takia_0649 sites. While the site TakiaMt_0612 uses antenna. K739623. And the site BZCFc_0626 hold the antenna type K739686. For Takia all sites uses K742225. And in Taslujauses K742225 in site Tasluja2_0651. And the sites Factory_0655Tasluja_0601 uses the antenna K739684. Where for site Cement_0688

hold antenna type K739686. Also when the frequency hopping be 55Hz or 1Hz. While the frequency be zero the electrical tilt not exist but the mechanical tilt will have a value.

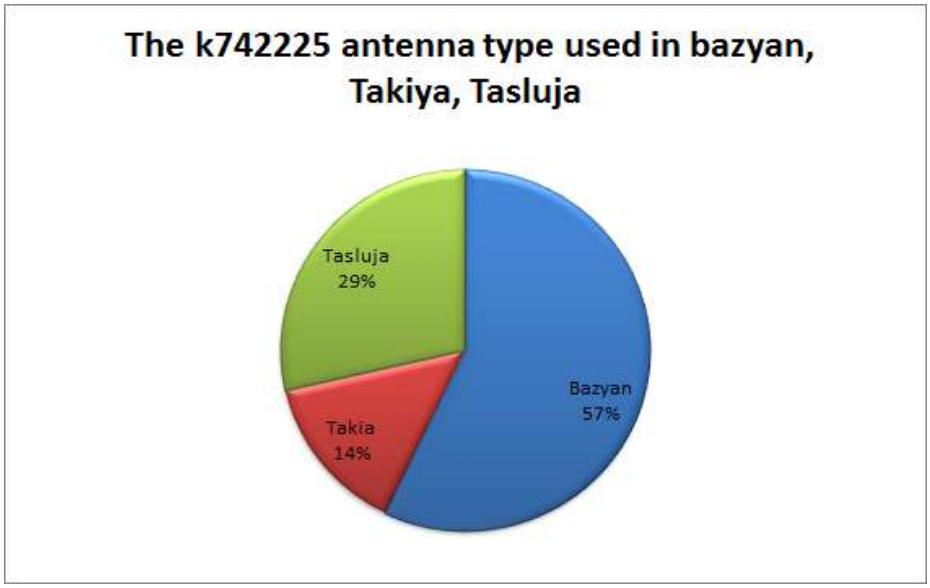

Figure-3 k742225 antenna type percentage used in bazyan,Takiya, Tasluja

As shown from figure 3. The k742225 antenna type percentage used in bazyan,Takiya, Tasluja the blue color represent the bazyan sites in 57 % which more using the k742225 antenna type in that region, while the green color for Tasluja 29 % and at last for Takiya the red color by 24%.

This pattern we can see the first null of Kathrin antenna type k742225 show better attenuation than Kathrin antenna other types and also it have bigger vertical beam width and under the antenna Kathrin have more propagation.

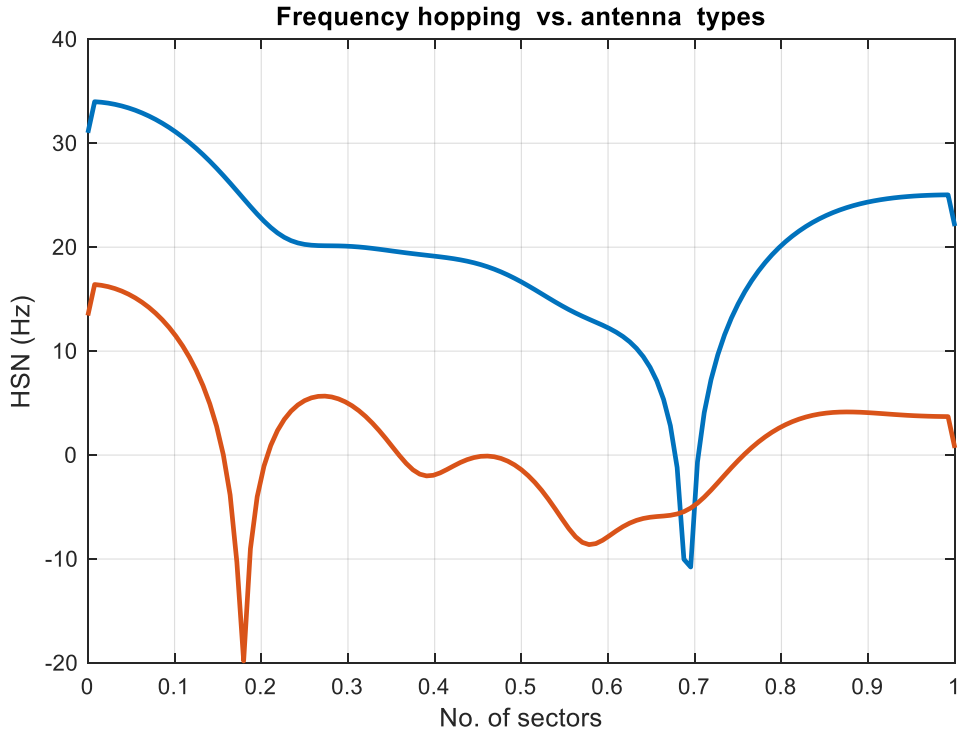

Figure-4 Frequency hopping vs. antenna types

As shown from figure 4. The curve line for the frequency hopping for the k742225 antenna type used in bazyan,Takiya, Tasluja comparing with the number of sectors for each site. It's clear from the blue curve line the frequency hopping (HSN) by unit of hertz (Hz) started high quality than the red curve line which h represented by the number of sector (means how many antenna the union site have), the results shows that the number of sectors didn't effect on frequency hopping measurement data, but if we compare the frequency hopping with the type used of antenna as shown from table I it's showed how much its effect on the coverage. where each type if these antenna have adiferance performance which make it choosin for the special place were I with other two author studied these types carefully in another paper.

5. Conclusion

This study is performed the effect of antenna types used in cellular network on frequency hopping. In this paper a comparison made between antenna types used in bazyan, takia,tasluja reagions respectively from the data site master which measured the freque in by frequency hopping with number of sectors for each site at towers base station in Asia cell at Kurdistan. Simulation results indicate that antenna types depends on the effect of frequency on cell coverage, means that different frequencies serve better for different uses. results shows from studying the characteristics of the antenna types, that coverage analysis best compare to Kathrin antenna k742225 than other types, Kathrin antennas type k742225 still have better performance in term of coverage enhancement and interference control. K742225. The simulation results from studying the characteristics of the antenna types performance indicates that the FH and S/N are shows that coverage area location analysis best compare to Kathrin antenna K742225 than other types, Kathrin antennas type k742225 still have better performance in term of coverage enhancement and interference control. K742225. Increasing sectors of cell site regions is a suitable solution for light urban coverage. The important question is the performance for these antenna type effect on the coverage area. The answer will be found in this paper by depending on the real data for the chooses site in bazyan , takia , tasluja. In the future work we will study the effect of the environment wheather on the cell

network performance by depending on the mechanical and electrical tilt angle measurment and comared between.

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