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Research on the effects of the mobile phone radiation on people based on the simulating calculation of specific absorption rate of the model of human brain to mobile phone

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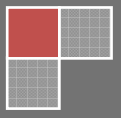
ABSTRACT

The rapid development of modern economy gives opportunity of the development of the modern communication technology. And the steady promotion of the livelihood improves the wider and wider application of mobile phone. Now mobile phone has become the indispensable communication and entertainment tool in people's life and study. However, when people use the telephone, it is close to human brain and this process will produce the near field interaction and radiation. So people always pay attention to the effects of the mobile phone radiation on people simulating calculated based on specific absorption rate of the model of human brain to mobile phone which is also the key of the research. In order to study the harms of the cell phone to human beings, the research conducts the simulating calculation of the specific absorption rate of people to mobile phone with the model of human brain. Considering the distribution character of the specific absorption rate of people's hand during using mobile phone, the research studies the change rule of the value in different cases. The intention and the purpose of the research are based on the simulating calculation of specific absorption rate of the model of human brain to mobile phone. According to the practical situation, the research proposed the effective suggestions which cut down the radiation of electromagnetic wave from the mobile phone to people. In the same situation, the research puts forwards an adaptive filter simultaneously received signal applied in the base station system. Excluding the other factors, ensuring the quality of connection, the research reduces the radiant power of electromagnetic wave 3 dB solving the effects of the mobile phone radiation on people which provide the powerful support of theory to the researchers.

KEYWORDS

Model of human brain; Specific absorption rate; Simulating calculation; Mobile phone radiation.



INTRODUCTION

When the user calls somebody with mobile phone, it will produce the radio wave imperceptibly. And the radio wave cannot be seen by eyes but its radio frequency power does exist. The nearest communication base station would receive the radio wave from mobile phone and transfer them to the switchboard that would transfer them to another communication base station according to its received information. Finally the call is realized in this way. During this process, the radio wave may be received by people more or less and affect the normal running of human tissue and even cause the paralysis. In the new situation, modern communication system includes much valued information that is electromagnetic wave propagation, which would be transferred with the changes of surrounding and causes the departure of the signal. The special absorptivity of the modal of human brain to mobile phone is influenced by several factors: the first is people's organic conductivities. In the special situation, there are currents in human's body and when the high-frequency current become bigger, the special absorptivity will become bigger; the second is the density of the transmission media that is bigger and people receive the less electromagnetic radiation. To some extent, the power of mobile phone or the frequency of using phone is bigger, the effects on people is bigger.

ANALYSIS ON RESEARCH STATUS AND INFLUENCES OF THE MOBILE PHONE RADIATION ON PEOPLE BASED ON THE SIMULATING CALCULATION OF SPECIFIC ABSORPTION RATE OF THE MODEL OF HUMAN BRAIN TO MOBILE PHONE

Research on the damage to people from mobile phone

Induction field refers to the specific range around the field source as a null point or the centre. And induction field has its own features: there are no relation between electric field intensity E and magnetic field intensity H. The specific absorption rate (SAR) the research based on of the modal of human brain to mobile phone is the radiant quantity of electromagnetic wave received by living body including human being. To some extent, it reflects the effects of the electromagnetic wave on people's health and its test values are more exact than other algorism. The SAR both focus on the whole body and the part, and with the different precondition, the SAR is different. The SAR is less means that the effects of the electromagnetic wave on people are less. Now, the American standard and European standard are used widely all over the world. And the American one is 1.6W/Kg and the European is 2.0W/kg. They have been accepted and applied by many countries and have been quoted in the related researches. In order to improve this research, "Regulatory and guide of radiation environmental protection and monitoring instrument and methods of electromagnetic radiation "and "Regulatory and guide of radiation environmental protection and environmental impact assessment method and standard" have been released by the National Environment Protection Agency. In order to comply with the requirements of the development of the society, effectively solving the effects of mobile phone radiation on people and ensuring the quality of communication by phone without damaging the performance of mobile phone are the important issue of present researches.

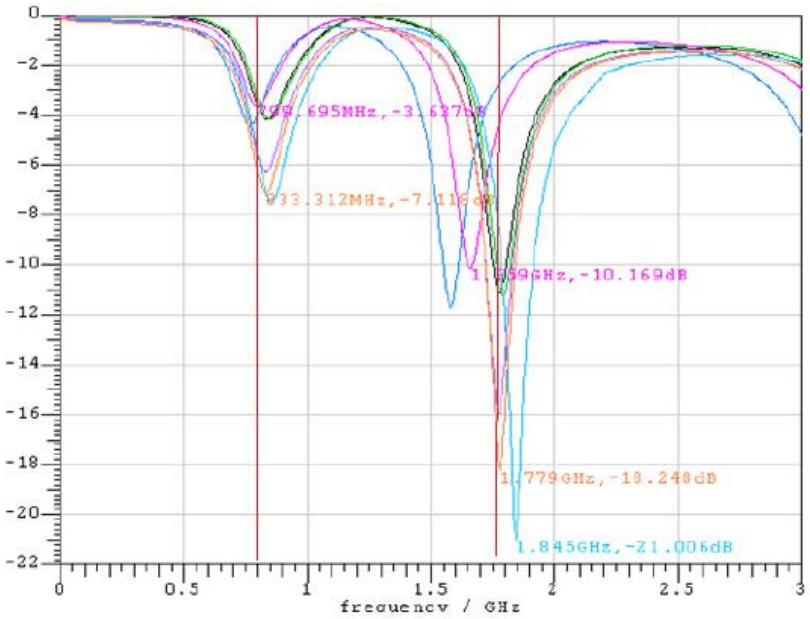


Figure 1 : Simulated picture of return loss of materials of mobile phone

The effects of mobile phone radiation on people

Figure 1 is a simulated picture of return loss of all kinds of materials of mobile phone. The electromagnetic wave produced by mobile phone has two kinds of effects on people: the first is heat effect radiated by high level radiofrequency

which is micro- electromagnetic wave of mobile phone radiation which is received by human's body especially the brain, the part of the body would warm in a short time that leads to the biological damage that refers to the effects on human health. During the research, radiant power of the antenna of GSM mobile phone is more than 2W without disturbances from the external factor but the CDMA is lower than 0.5W. If the communication is too long and the distance between people and the telephone is not changed, the part warming is more serious and even causes the lesion. American Food and Drug Administration have proposed: high level radiation would cause the biological damage. And this thermal effect has been verified and widely acknowledged by scientific community in which gained so many surprising results. The second is the non-thermal effect radiated by the low level radiofrequency. If one use telephone too long, he will suffer from neurasthenia such as headache, dizziness, fatigue and other bad symptom and worse cause memory deterioration and memory loss. Now, many scholars focus on this problem and suggest people to pay attention to the harm of non-thermal effect. The animal experimental study shows that low level radiofrequency radiation would accelerate the growth rate of animal cell and invisibly leads to death. Hylander, a physicist has said in the study: "The true harm brought by mobile phone is the low level radiation that is non-thermal radiation."[4] The low level brings more harm to people than the high level. Because the harm can accumulate continuously. And the low level radiofrequency radiation is the directive factor of cancer that has a long-term incubation. So it is urgent to study the the effects of the mobile phone radiation on people based on the simulating calculation of specific absorption rate of the model of human brain to mobile phone.

SIMULATING CALCULATION OF SPECIFIC ABSORPTION RATE OF THE MODEL OF HUMAN BRAIN TO MOBILE PHONE

Model simulation of human brain and hand mobile phone

TABLE 1 is the SAR simulation data of the inclination of hand which specific absorption rate simulates real situation of head and conducts it in two parts that are inner shell and external protection cover. During the research, in some certain situations people's head would change the form and peak of radiation pattern of mobile phone antenna[5]. It is invisibly improves that the radio wave is bad for people's health. In the practical cases, it is not difficult to find that antenna circuit cannot match the other factors so the return loss is not 0 and bigger than 0, $P_{acc}<P_{ing.}$ According to the SAR operational formula in order to make SAR_{10gn} is less than $SAR_{10ga,}$ it must be 900MHz and head appears downward; SAR_{10gn} is less than 25.9% $SAR_{10ga,}$ and the precondition is same then the SAR10gn is less than SAR10ga26.3%; when the value is 1800MHz and the precondition is same and then the SAR_{10gn} is less than SAR_{10ga}65.7%, only when the head appears is the SAR_{10gn} less than SAR_{10ga}87.3%. To some extent, hand receives some electromagnetic radiation which directivity influences the specific absorption rate. Meanwhile, when all the situations are not changed, the specific absorption rate would obviously less than non-hand model. Because of many factors, hand model changes the direction of radiation.

TABLE 1 : SAR simulation data of the inclination of hand

	(a)900MHz			
	SAR_{10g}(W/kg)	**SAR_{10gn}(W/kg)**	**SAR_{10ga}(W/kg)**	**%**
Set right mobile phone+ head	0.01354	1.354	1.827	25.9
Slope mobile phone+ head	0.005887	0.5887	0.678	13.2
Set right mobile phone+ head+hand	0.01291	1.291	1.753	26.4
Slope mobile phone+ head+ hand	0.005122	0.5122	0.646	20.7
	(a)1800mhz			
	SAR_{10g}(W/kg)	**SAR_{10gn}(W/kg)**	**SAR_{10ga}(W/kg)**	**%**
Set right mobile phone+ head	0.006521	0.326	0.951	65.7
Slope mobile phone+ head	0.001610	0.0805	0.280	71.3
Set right mobile phone+ head+hand	0.001727	0.0863	0.679	87.3
Slope mobile phone+ head+ hand	0.0004276	0.0214	0.190	88.7

The influences of posture using mobile phone on specific absorption rate

Figure 2 shows the radiation caused by many kinds of electric appliance, and the radiation of induction cooker is the biggest and the microwave oven and mobile phone are the least which all exceed range of people withstanding. The specific absorption rate of mobile phone faces the standard of China and Europe, and high-frequent specific absorption rate is lower than low-level specific absorption rate obviously. To some extent, it improves that radiant power of head is lower than any other body. Based on the hand model, there are big differences between data value of specific absorption rate simulation and the one without hand model. In the resonant frequency, the specific absorption rate in the oblique position of mobile phone is less than one in the vertical position. So it proves that the distance between head and telephone is the fundamental reflection of specific absorption rate of brain of human.

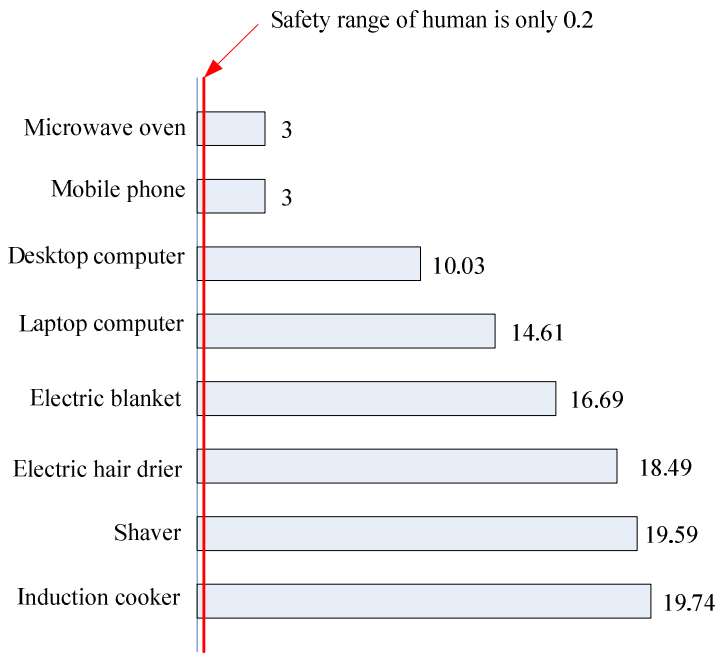


Figure 2 : Influences of electric appliance on people

IMPROVEMENT RESEARCH OF SPECIFIC ABSORPTION RATE OF THE MODEL OF HUMAN BRAIN TO MOBILE PHONE

In Figure 3, there are simulation value and test value. In order to effectively reduce the harm of mobile phone on brain, it cuts down the output power of base station to decrease the received power of mobile phone signal. In this way, the range of base station is shrunk to realize the former covering object and the better base station. And the difficulty is increasing and the work is more complex. So they need technical support and systematical and scientific plan. And the mobile phone is used in the field of public security and business; it need elevate the quality of mobile phone to reduce the mobile phone radiation on people. The transmitted power of mobile phone can be cut down by promoting the benefits of transmission of each base station that unexpectedly point out the direction of decreasing the specific absorption rate.

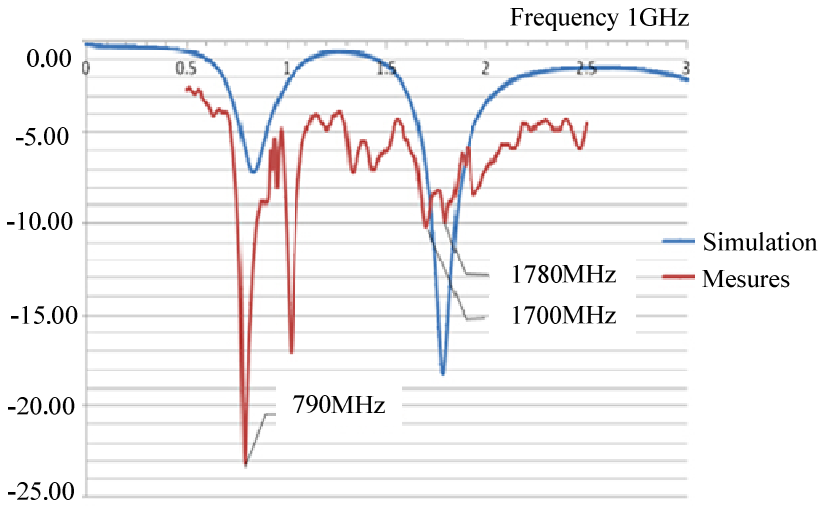


Figure 3 : The compare between simulation value and test value

Modeling of transmission channel

When the mobile phone is used to communicate and the signal is disturbed by external factor, the signal would be received by two base stations at the same time and demodulation would carry out by high speed receiver. Essentially, when two base stations receive the signal at the same time, it will speed up the dealing with signal which directivity influences the turn-on time between two mobile phones, that is to say that the period is less and the effect of mobile phone radiation on people is cut down.

Adaptive filter

In the whole digital transmission system, if the condition allows, base station can set many receiving antenna. In the primary stage, in order to simplify the unnecessary operations, it needs a new antenna. After the test, the number of antenna can be added by the result of test. Excluding the external factors, transmitting signal can receive the information in two or more points in terminal. After dealing with the signal, it will gain 3db Signal to Noise Ratio. And only this way can reach the goal of improving terminal system performance.

In the Figure 4, the algorithm design is: gradient method generally is applied in the adaptive filtering and must consider the computation time and its own convergence. So the most important point is choosing step-by-step coefficient of algorithm. If the coefficient is too big, this algorithm can be defined as fast rate of convergence and the data precision is low. On the contrary, the coefficient is small, the rate of convergence is slow and the data precision is high. Through a lot of simulation study experiments, the step-by-step coefficient of algorithm can be more accurate and accurately decide its convergence and accuracy of output signal to noise ratio[8]. Iterations self-adaption is an important figure and a core in the key calculation. But in order to fundamentally optimize the QPSK planisphere and algorithm convergence, it needs much iteration as theoretical foundation.

In the communication of mobile phone system, the signal received by communication base station cannot be controlled. Meanwhile, its transmitting and channel are also uncertain. In order to ensure the accuracy and robustness of algorithm, it needs a lot of simulated tests on the model of human brain and even the other parts. And only this way can comprehensively understand the structure of filter and choose the lowest order to face the requirements of synchronizing signal, in which choosing the systematical and scientific algorithm and finally synchronously restructuring two lines of asynchronous signals that provide a theoretical basis for required rate of convergence.

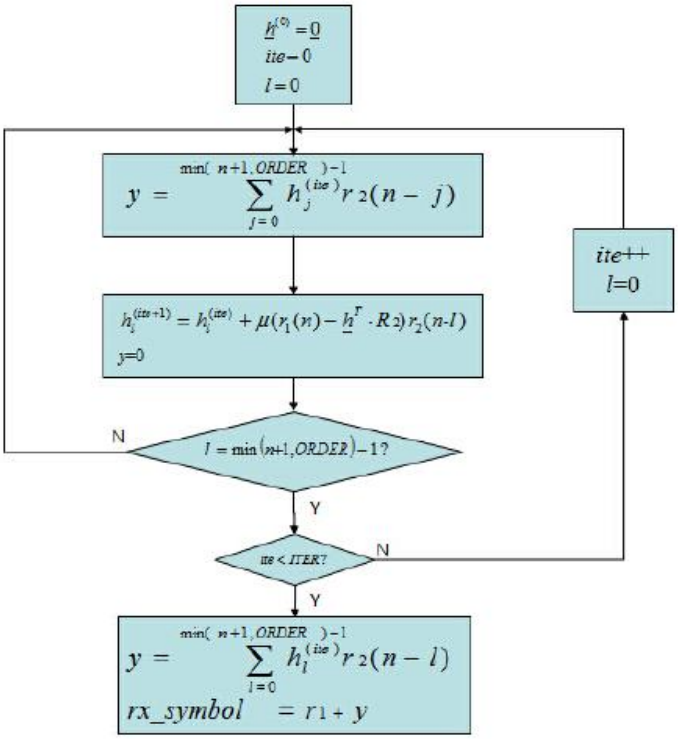


Figure 4 : Algorithm design

The effect on heart of people based on the simulating calculation of specific absorption rate of the model of human brain to mobile phone

As the promotion of livelihood, people realize the harm of mobile phone. And people begin to use the earphone, the Bluetooth headset or the mode of hands-free during calling. However people neglect one problem that holding mobile phone in pocket of coat especially men and few women hang it before breast preventing loosing it. During the communication, though using the earphone or other methods, mobile phone is always placed on one's body. Even though the phone is not used, it also stands by and it still contacts the base station more or less. That is to say that phone is still harmful to people. Because of different cases, the mobile phone radiation causes different harms on people's different parts. In the study, the cylinder simulates arms and legs; ball simulates heart. And the results show that there are many differences between heart and brain of the radiation. And the radiation near heart is less than brain and specific absorption rate is still in range of reference standard. So it is not difficult to find the radiation to brain is far bigger than heart. It should be mentioned that though the radiation to heart is less than brain, it really exist and in a long term, it cannot be neglected.

CONCLUSION

With the rapid development of communication technology, the application of mobile phone and other mobile terminal is wider and wider. Because mobile phone would cause radiation more or less and bring much harm to people, people should pay more attention to this problem. The research focuses on the research status and influence of the effects of the mobile phone radiation on people based on the simulating calculation of specific absorption rate of the model of human brain to mobile phone. Through a lot of simulating calculation, the research tells users the harm and how to use mobile phone that decrease the harm and make mobile phone service for people very well.

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