Name:

Ultrasonic intra-body communication system

Introduction:

The purpose of this system is to simulate the human body communication link and lay the foundation for the development of body network communication. Since 65 percent of the human body is water, traditional RF waves will be absorbed and attenuated by the body. In contrast, ultrasound has slow attenuation and far transmission distance in the human body and so on, therefore we chose to use ultrasound to achieve transmission. However the human body has many organs and tissues that reflect and scatter ultrasonic signals, and some general approaches could not achieve a correct and complete transmission successfully.

In our system, we build the circuit independently, and utilize an ultrasonic multiple access technology--ultrasound Wideband(UsWB), to overcome the difficulties in human communication. (UsWB is a technique in which a signal is transmitted through a time-hopping spread spectrum to transmit an ultrashort pulse. The ultrashort pulse duration produces limited reflection and scattering effects, and its low duty cycle reduces the thermal and mechanical effects that are detrimental to human health. Superimpose the spreading code into the time hopping to further resist the effects of multipath.)

Finally, we design the circuits independently and use FPGA to realize the spread spectrum, processing of digital signals and external device control. As a result, we achieve the transmission of the hex documents and images through synthetic phantom mimicking the ultrasonic propagation characteristics of biological tissues, like Kidney, and our data rates also up to about 700Kbit/s.

That’s all, thanks for your reading.

Picture: