



## SAR Calculation in Human Body Close to Wireless LAN Router

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Along with the remarkable informationization in recent years, the spread of wireless communication devices has progressed, and opportunities to expose the human body from electromagnetic waves have become increasing. The biological effects of electromagnetic waves on wireless terminals have been evaluated by various research organizations around the world. In Japan, it is known from the survey conducted by Ministry of Internal Affairs and Communications [1], the penetration rate of wireless LAN (Local Area Network) routers in households have become rising. Wireless LAN routers are often installed in the vicinity of the ceiling, however in the home it is installed at a height of 1 - 2 m from the floor as on the shelf, and in this case, it is assumed that they are close to the human head or chest. Nevertheless, few examples of evaluating biological effects due to electromagnetic wave exposure from wireless LAN routers have been reported.

In addition, recent wireless LAN routers have been adapted to the beamforming function. Beam forming is a function of strengthening radio waves in a certain direction of a terminal. It is thought that this function changes the electric field in the vicinity of the wireless LAN router, and the exposure environment will be different from the normal environment.

Therefore, in this study, SAR evaluation in the human body in the vicinity of the wireless LAN router when applying beamforming was performed by simulation using a numerical wireless LAN router model and numerical human body model. The simulation model is shown in Fig. 1. The wireless LAN router numerical model is located 30 mm away from the surface of the phantom which is considered to human body. As shown in Fig. 2, the beam was controlled so that  $\theta = 0$  to  $90^\circ$  with reference to the antenna A, and exposure to the phantom was performed. In this result, we confirmed that SAR may be higher than in normal case when the beam is controlled by beam forming. We also confirmed that all SARs obtained as a result of simulation were below the 2 W / kg prescribed in the ICNIRP guideline [2].

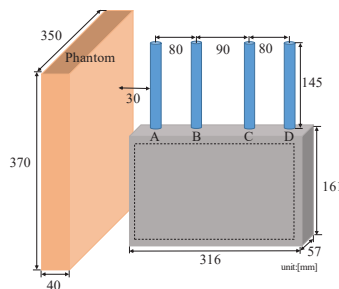


Figure 1. Simulation model

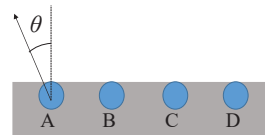


Figure 2. Beam direction

1. Ministry of Internal Affairs and Communications, "Results of Heisei 25-year communication use trend survey", June 2014, in Japanese.  
[[http://www.soumu.go.jp/main\\_content/000299330.pdf](http://www.soumu.go.jp/main_content/000299330.pdf)]
2. ICNIRP, "Guidelines for limiting exposure to time-varying electric magnetic, and electromagnetic fields (0 Hz to 300 GHz)," *Health Phys.*, **74**, 4, 1998, pp. 494-522.