Design and Evaluation of UWB-MIMO Antenna System Using Transmission System Model Including the Human Body Effects

The focus of this thesis is design and evaluation of UWB-MIMO antenna system using transmission system model including the human body effects. In Chapter 1, the background and the overview of my research are explained as the introduction. After formulation of the simulation method in Chapter 2, ultra wideband transmission characteristics including the human hand effects are evaluated in terms of the auto-correlation function in Chapter 3.

In Chapter 4-5, UWB transmission model including the human body effects is presented in order to evaluate the actual performance of the UWB antennas placed in the vicinity of the human body. As the calculated results, there are two key issues to be examined in terms of the variation of the eigenvalue distribution of UWB-MIMO channel matrix caused by human body: 1) average power of first eigenvalue determined by the human hand, 2) stochastic characteristics of the waves reflected from human torso.

In Chapter 6, a new GCPW-fed asymmetric UWB monopole antenna is proposed. By connecting the radiator to the ground with a short post over the slit-line, the ultra-wideband characteristics and the reduction of the power absorption by the human finger are achieved. By introducing the proposed configuration, the operating bandwidth is expanded from 2.2GHz to 7.3GHz based on the criterion in the radiation efficiency of 50%.

In Chapter 7, the actual performances of the proposed antenna are evaluated by using the transmission model proposed in Chapter 5. As the results, proposed configuration can achieve up to 51% improvement of channel capacity compared to the conventional configuration.