

Analysis of Using Multiple Reader Antennas in RFID Communication

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Introduction

Radio frequency identification (RFID) systems consist of Radio Frequency (RF) transponders, or tags, RF transceivers, or readers, and a host. Readers are strategically placed to communicate with tags, which are attached to objects identified. The host is a data processing unit, which may be connected to database via Internet. RFID technology, its components and functionality have been reviewed and analysed in several publications of TUT, Institute of Electronics. Several different communication methods exist for RFID. This paper focuses to communication in far field, using backscatter technology. The communication link and the size of identification zone are remarkably dependant on, besides the frequency used, the antenna functionalities. It also depends on is environmental reflections and absorptions, which will be issued in the future. In the following section, the influence of using multiple reader antennas is analysed. The concept of multiple reader antennas, which are expected to be similar and having the same operating frequency, may be realised both having multiple readers with one antenna each and having only one reader with multiple antennas with same phase.

Multiple Reader Antennas

Several applications need the ability to identify large areas. To fill this demand several reader antennas must use. As Fig.1. shows the influence of the reader's functionality to another reader is remarkable. The antennas used for all simulations were patch antennas, with Teflon substrate (Rogers 5870, with dielectric constant of 2,33). The use of several transmitters at the same place at the same time will lead to collision and signal disappearing. The changes of antenna radiation pattern and -3dB beam width are significant when bringing another antenna close to the first one. Radiation patterns are illustrated in Fig.2 and Fig.3. The distance between antennas was 50 cm in Fig.3. Since the backscattered power from tags is much weaker than the power transmitted by readers must this phenomenon been considered very carefully when using multiple antennas in the same near space.

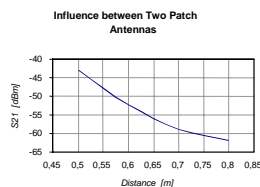


Figure 1. Influence between two patch antennas



Figure 2. Radiation pattern of one patch antenna



Figure 3. Radiation pattern of two patch antennas having same phase

Conclusions

To solve the collisions between readers the division of time slots or frequency channels or both may be used. The solution is always an application-based choice. Environmental reflections and absorptions are problems issued in the future. Following un-ideal environments the reading zone will be shortened. New antenna structures and very carefully considered antenna placements are some key solutions to solve the problems caused by environmental absorptions and reflections. These features will be researched in the future publications.