Detection of Active and Passive RF Devices

A major concern in a variety of security situations is the detection of RF devices. These devices may include cell phones, tags, and PDAs.. In many cases these devices may not be activated, though not specifically designed for passive use. The use of cell phones and PDAs has long been known to be tools for cheating in college classrooms. It is said that some countries have developed detection systems for such active devices, monitoring the beacon mode of the device or the local oscillators built into the systems. Thus the detection of active devices is often simplified by the process of monitoring the spectrum for the identification of such devices. Close proximity to such devices enables the detection, even if the modulation is low-level CDA that would normally be below the noise level. In close proximity, the rise in noise level would be sufficient for the detection. Antennas are not a major issue in such active detection, other than useful designs for the reader antenna. The emphasis would be in the signal processing to analyze the spectrum.

Passive devices offer a much more challenging problem and have created a major new industry associated with RFID tags. Though the concepts have been available for years, the RFID industry took a leap with the advent of ASIC that performed both RF scavenging and impedance modulation, enabling content transmission through a bit stream. We are not dealing with the RFID problem, but systems that are not designed for detection. Simple measurements have demonstrated the ability to detect the presence of a cell phone using both transient and ultra-wideband techniques. However, the identification of the phone is an issue.

A proposed effort has several tasks: 1. Evaluate the strength of detection, using a range of phones and other devices. The difference between open and closed phones would also be of interest, though most inactive phones would be stored in the closed condition and thus have properties similar to the candy-bar or razor design. Use of transmission versus reflection techniques will also be considered; 2. Evaluate the most useful response characteristics, considering the complex resonances of the devices and potential specular reflection with late-time residual ringing. The performance should also be evaluated from both transient and frequency domain viewpoints to determine the most useful detection response; 3. Simulate potential configurations, evaluate the necessary Reader transmit level, and optimize Reader antennas.

Future work would be needed to evaluate the effects of the environment, include the interaction with the human body. The potential for being able to detect both active and passive devices in a security situation offer a major potential for improvement of current security systems.

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