

Comments related to:
Revision of Part 15 of the Federal Communications Commissions Rules
Regarding Ultra-Wideband Transmission Systems
ET Docket No. 98-153

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There have been many comments submitted to this web site describing the importance of ground penetrating radar (GPR) surveys for environmental, geotechnical, and other subsurface investigations. I wish to strongly support these comments concerning the value of GPR for applications of critical importance to society.

Nevertheless, there is some potential for interference of GPR surveys with licensed users of the radio spectrum. For example, I conducted a simple experiment using a commercial GPR antenna with center frequencies of 16-to-80 MHz (GSSI Model 3200). This antenna is in contact with the ground and uses relatively low power. There is no shielding above the antenna, since it is impractical to shield GPR antennas at such low frequencies. Frequencies in this range are required for many subsurface investigations at depths of meters to tens of meters. When I operated the GPR unit, I noted the change in reception with a portable receiver (AR8000), at various frequencies and distances from the GPR. I found that this low-power GPR transmitter produced interference on business-band frequencies and Government-Agency radio frequencies at distances up to 128 m from the GPR antenna. Interference in this case is defined as interfering with normal ability to comprehend voice transmissions.

I conducted a similar experiment using a 500 MHz center-frequency GPR antenna (GSSI Model 3102). The bandwidth is approximately 250 MHz to 750 MHz. This antenna has excellent shielding above the antenna, since it is possible to effectively shield the antenna at these frequencies. Frequencies in this range are typically used for depths of investigation of the order of meters. When I operated the GPR unit, I again noted the change in reception with the AR8000 radio, at various frequencies and distances from the GPR. Interference with business-band signals and Government-Agency radio stations was detected at a distance of five meters over certain ground conditions. Although 5 meters is not a large distance, a public-safety user could unexpectedly encounter a GPR unit at this distance in an urban setting, where GPR surveys are frequently used along city streets.

To date, I am not aware of any reports of GPR surveys that have led to actual harm to licensed users of the radio spectrum. As the use of GPR increases and other users of the spectrum expand operations, the chances of interference with vital public-safety communications may increase.

I would like to suggest that there are alternatives to transmission of ultrawideband signals for GPR surveys. It is possible to record signals over a narrow bandwidth (e.g. in the bands reserved for Industrial, Scientific, and Medical users), and then synthesize a wideband pulse. It is also possible to use arrays of sensors for imaging at even a single frequency. The Laboratory for Advanced Subsurface Imaging is currently conducting research on these techniques and we believe that these proposed methods hold promise for providing effective GPR imaging, using narrow-band measurements, and which completely avoid the potential for interference with other critical frequency transmissions. These same techniques may be useful for many other imaging applications, in addition to GPR.

I understand that there may be strong opposition to considering alternatives to wideband GPR. The most common objection is that this will put current manufacturers and users out of business. I would suggest that quite the contrary, these alternatives should be viewed as providing exciting new opportunities for both users and manufacturers. In addition to avoiding potential interference, there would be an opportunity to use much larger transmitted powers than are currently available.

In summary, I would like to argue for a balanced middle ground in this matter. Clearly GPR is a vital tool. It would be extremely damaging if rules were created that seriously impeded GPR surveys. At the same time, I believe that innovative research should be carried out, which explores alternatives to wideband measurements.