On the road with 77 GHz collision avoidance systems
RF A moment with...

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Theodore S. Rappaport is the James S. Tucker professor of engineering at Virginia Polytechnic Institute and State University. He is also director of the Mobile and Portable Radio Research Group (MPRG). He is also president and chief executive officer (CEO) of Wireless Communications in Blacksburg, VA.

Rappaport has authored, co-authored, edited or co-edited 11 books. He has also authored and co-authored more than 60 technical journal papers and 70 technical conference papers and presentations. Rappaport has three patents awarded in the wireless communications field.

In 1996, he received the Virginia Tech Alumni Award for research excellence.

Previously, he received the 1992 President Faculty Fellow Award (National Science Foundation) and the IEEE Marcon Young Scientist Award. Rappaport is a member of the American Society for Engineering Education, The American Radio Relay League and a Fellow of the IEEE and The Radio Club of America.

He was an IEEE distinguished lecturer from 1996–1997, and served on a National Research Council Panel to project future untethered communications in the United States and is a proposal, program and fellowship reviewer for the National Science Foundation.

The interview was conducted by Roger Lesser, Senior Associate Editor.

RF Design: The International Telecommunications Union (ITU) is expected to announce its selection of a third generation standard in October. Who are the players?
Rappaport: There are a number of different players that represent both governments and companies that champion a particular technology. For example, South Korea is probably the leading code division multiple access (CDMA) market. So, there are many different players. But there are still four or five players that are very pro-GSM. There is a very different view, the European view, which is all intellectual property needs to belong to the company that invented it. The European view is that all intellectual property will be shared and made available to all wireless manufacturers on a royalty free basis.

RF Design: What other issues will affect the selection?
Rappaport: One is the ability to support high speed data and inbuilding and wireless local area network applications. Also, the ability to support user capacity through the technology without major modification. It must also be able to integrate with adaptive antennas and satellite systems.

RF Design: Who is driving all this? Is it a strategy of "build it and they will come" by the manufacturers? Or is it customer driven?
Rappaport: The customer is not driving it. It is not a "pull" market by the end consumer on these new standards. These new standards are being pushed by the government and manufacturers. It is a great advantage for a government to generate jobs and prosperity in its country through manufacturing in the telecommunications industry. We have seen it since the explosion of cellular. So, it is the manufacturers who "push" the technology of their choice. They come up with standards that support greater data rates, or more capacity, or more capability.

RF Design: Once the ITU makes its decision, what will be the impact on manufacturers and design engineers?
Rappaport: There is enormous stress on the design engineers to have to support multiple technologies. Companies have to make conscious business decisions, they have to guess at the likelihood of technology adoption. Companies have made it or not made depending on the gambles they made on where to place their engineering resources.

RF Design: Where is the next technology breakthrough going to come from that will impact the wireless industry?
Rappaport: The key will be rapid prototyping of digital signal processing (DSP). That is a breakthrough that must happen if we are to develop multimode handsets.

RF Design: How close are we? This field is in reality new. The tools are really not keeping up with the demand for the rate of change the technology is seeing. The fact is, commercial chips at the baseband level, dedicated to a specific standard take so long to make, the only hope of offering multimode capability that will support more than one standard is through DSPs. Unfortunately, the standards are so sophisticated with a great deal of error control coding and synchronization issues. It takes a large engineering team a great deal of energy to develop a solution. What has to happen is we have to have software radios. But, it is very difficult. Each standard is unique and that requires a standard specific solution. The ideal platform will be ultra low power with high speed DSP capability and computing engines that facilitate multiple standards.

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