Telecommunications Theory

The rapid growth of telecommunications in the last 50 years has caused crowding in the radio spectrum and high levels of loading in many telecommunications networks, both wireless and wireline. New radio technologies must be developed and implemented to alleviate spectrum crowding. The parameters that limit network performance need to be thoroughly understood, and that knowledge needs to be brought to bear on improving the performance of existing and new networks. Tools to monitor the quality of audio and video information on communication channels also need to be developed and used so that network mechanisms can be adjusted in realtime to achieve maximal quality with minimal use of available bandwidth.

To achieve these goals for the U.S. government as well as the private sector, the Institute's Telecommunications Theory Division performs research in both wireless and wireline telecommunications, seeking to understand and improve telecommunications at the most fundamental level. Strong ongoing investigations are maintained in the major areas of broadband wireless systems performance; advanced antenna designs; noise as a limiting factor for advanced communication systems; audio and video quality assessment; advanced spectrum sharing concepts; and radio propagation.

ITS transfers the results of its work in all these technology areas to both public and private users, where the knowledge can be transformed into better telecommunications, new and better products, and new opportunities.

Areas of Emphasis

Advanced Antenna Testbed
The Institute has developed an advanced antenna testbed to be used in the investigation of "smart" antennas, which can greatly increase the capacity of wireless communications systems. The project is funded by NTIA.

Applied Electromagnetics
The Institute conducts research on the radio propagation channels that will be employed in new wireless communication technologies such as personal communications services and third generation (3G) wireless. Projects are funded by NTIA and DoD.

Audio Quality Research
The Institute conducts research and development leading to standardization and industry implementation of perception-based, technology-independent quality measures for voice and other audio communication systems. Projects are funded by NTIA.

Effects of Radio Channel on Networking Performance
The Institute, a recognized leader in radio channel measurement and modeling, is involved in research to assess the effects of the wireless communications channel on communications network performance. The project is funded by NTIA.

Video Quality Research
The Institute develops perception-based, technology-independent video quality measures and promotes their adoption in national/international standards. Projects are funded by NTIA.