**Advanced Communication Technologies**

Introduction

## Advanced communications can dramatically change how information is provided and consumed, business is transacted and essential services are undertaken. They enhance wireless technologies giving higher speeds, better connectivity, and more pervasive access to communications systems. The insatiable societal demand for an intelligent, automated, and ubiquitous digital world accompanying decreased cost of extracting, processing, storing, and transmitting data has enabled extensive interconnectedness of devices. It is predicted that by 2022, 29 billion devices will be connected globally and 500 million of these will be through 5G wireless networks which is the next wave of fast mobile broadband networks. The AJ Paulraj Steering Committee on 5G predicted the economic impact of 5G to be over $1 trillion by 2035. Global telecom industry body GSMA expects India to have 920 million unique mobile subscribers by 2025 that include 88 million 5G connections. The transition to 6G with a speed of 1 Tbps over 5G’s 1 Gbps compared to 20-100 Mbps of 4G will be swift.  High-speed wireless communications accompanied by security and reliability are critical to India’s economic and overall competitiveness. Such advanced communication technologies include- Satellite Communication, Navigation systems, Quantum, and Molecular Communication.

## Advanced communications Topics

* [**Quantum communications**](https://www.nist.gov/quantum-communications)
* [**Wireless Systems**](https://www.nist.gov/wireless-systems)

## Key Accomplishments

* **Radio:** NIST began operating radio stations [more than 100 years ago](https://www.nist.gov/blogs/taking-measure/nist-radio-station-wwv-celebrates-century-service), initially providing stable frequency signals to promote early development of the field and since then offering many other public benefits, including time signals to synchronize clocks and geophysical alerts for amateur (ham) radio users.
* **Closed captioning:** NIST invented TvTime, an Emmy-award-winning method for broadcasting time and frequency information, which evolved into closed captioning. The technology benefits the deaf and hard of hearing and created an industry of suppliers of closed captioning services.
* **Antenna testing:** NIST pioneered testing of high-performance antennas — crucial communications tools — for radar, aircraft and satellites. NIST's key contributions to the field included a cost-saving approach and software for computing an antenna's complex outdoor radiation pattern using data collected indoors.

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