



Future is Now- The Recent Breakthroughs in Telecom Technology

We are living in an era of rapid technological advancement, and the field of telecom is experiencing significant breakthroughs that are reshaping the way we communicate and transmit data. The recent achievement of 319 terabits per second (Tbps) data rate over optical media in Japan is a testament to the remarkable progress in this field.

This groundbreaking achievement in data transmission speed showcases the immense potential for future telecom technologies. With such high data rates, the possibilities for communication, information exchange, and connectivity are expanding at an unprecedented pace. The current focus on data rates of 1GB/s to 10GB/s, which was considered fast in a recent past, now appears conservative compared to the capabilities demonstrated by this recent breakthrough.

We need high data speed as well as very low latency simultaneously for our several applications. 5G is designed to do that. Earlier technologies had to tradeoff between speed and latency. In 5G we have separated Control Plane and User Plane in its Core network. While the Control Plane sets up and tears down the communication connection, the User Plane handles data and throughput. By permitting data to be stored and processed at the edge closer to the user/application, we have shorter distance to cover for data to and fro application which results in reduced latency. 5G offers one millisecond latency. We need very low latency for quick processing and action in AI

assisted applications. This is so for autonomous vehicles, massive robotic manufacturing, and similar other applications requiring quick response. The data being processed near the application also improves data security.

5G uses high frequency bands to have larger bandwidths per user to enable higher data rates. Maximum data rate possible in a network is directly proportional to the bandwidth available. We are using millimeter waves (30 GHz to 300GHz) as well as sub 6GHz frequencies for 5G for being able to allot larger bandwidths to users to enable higher data rates. We are studying to extend this to terahertz band in 6G to get even higher data speeds. 5G with its enhanced mobile broadband (eMBB), ultra-reliable

low latency communication (URLLC), and able to address large number of devices/customers simultaneously, along with its software centric features like cloud native operation, SDN, Orchestration, Edge Computing, and Network Slicing, it is a totally a new paradigm. Hardware technology also has kept pace with the software technology growth. Earlier we had electronic chips, VLSI, microprocessors, which gave us miniaturized computers. Then solid state RF products miniaturized to be placed on PCBs and wafers, provided as the present mobile phones transmitting and receiving a wide band of radio frequencies. Now we have optical components also miniaturized and placed on wafers, diced into chips. We are now having a complete optical lab on a chip! We have optical components like tunable lasers, optical variable attenuators, modulators, multiplexers/DE multiplexers using Arrayed Waveguide Gratings (AWGs), isolators, delay lines, and gratings specifically meant for acting as test points for feeding optical signals into and out of the optical (photonic) chips. In 5G networks we are using photonic routers, photonic transceivers, AOLTs, AAWGs etc. in the optical network for handling very high speed data transmissions.

With hundreds of IoT devices and sensors apart from voice, data and video from mobile customers simultaneously communicating in the network, we have a tsunami of data to be handled in the 5G network and the advanced fiber optic networks with new photonic hardware components support the same.

Photonic devices and optical networking are going to be very important in coming years as it is predicted that 99.5% of all communications end to end will be on optical media. With all these hardware and software developments, the technology is going to support autonomous vehicles, LiDAR applications, Drones, robotic surgeries, massive robotic manufacturing, AR, VR, XR, video surveillance with analytics, emergency services, E-health, E-education, etc. We are deep into the information age, moving fast towards the Artificial Intelligence Age. It is but natural for all of us to look forward to exciting times. We in Savitri Group are passionate about technology and look forward to a fully Aatmanirbhar Bharat.