ABSTRACT

Microwave photonics is the arena of research in the 21st century due to ever-increasing ultra-large bandwidth and the meticulous availability of data with very low cost. In this context, conventional optoelectronic devices are replaced by novel photonic counterparts, both in transceiver design as well as devices and systems. The major objective of this replacement is to reduce noise by means of lower scattering, where photons are only responsible for propagation of electromagnetic wave. With introduction of novel materials, low-loss communication system can now be designed at beyond THz range, mainly due to the physical realization of electromagnetic bandgap structure. This chapter is extended towards plasmonics with the intension of making sensors for beyond THz applications.
INTRODUCTION

Twenty-first century is the epoch of technology, where evolution and disappearance of a new product takes within a very small time-interval. Due to ever-changing societal need, different new branches of engineering are sprouting day-by-day, may be termed as technological renaissance; where re-invention and re-engineering are the other sides of the same coin in the need of survival of civilization. Along with the change of industry requirement, need of the time is also to amend the curriculum in engineering discipline, where once signified and highlighted contributions are considered as basic and fundamentals after a few years, ultimately may be eliminated from the higher-level academics in order to include into lower-level syllabi so that later re-engineered concepts are incorporated to upgrade the academic framework. However, in such turbulence of technical innovations, a very few concepts are still remains equally acceptable in all forms of learners, researchers, scientists without which we can’t even think of progress of Society. To pay homage to those great path-finders, who have paved the way a long ago even with the unavailability of sophisticated instruments and computational advancements, there path-breaking works is tribute in various forms after a sufficient long time-interval. But rarest of rare works are celebrated after hundred or hundred-fifty years of their first publication/announcements, owing to their novelty, consequence, connotation, implication and with possibility of making more fruitful exploration even after that. Year of 2015 was such a year in the history of human civilization when all parts of the scientific community across the world celebrate a particular noble contribution which may be treated as the peer driving force of scientific advancement even at twenty-first century. Yes, dear readers, we are talking about Maxwell’s Equation, whose hundred-and-fifty years are celebrated worldwide in 2015, after the first publication in 1865 preceded by its first public announcement at Royal Society of London at 1863 (Sengupta & Sarkar, 2003; Selvan, 2007; Sarkar, 2006). Probably the direction of chariot for civilization is destined at that very moment, which is later extrapolated by Erwin Schrodinger.

Looking approximately twenty-five years behind through the window of 2018, one landmark in the experimental communication engineering was made at 900 MHz radio spectrum, when former Finnish prime minister made conversation with mayor at Tampere (Andreas, 2005). The communication has historical importance as it was the world’s first interaction through 2G GSM network, built by Telenokia and Siemens; operated by Radiolinja. If we further look back twenty-five years, pioneering result was published in the Proceedings of IEE entitled as “Dielectric-fibre Surface Waveguide for Optical Frequencies” (Kao & Hockham, 1986); for which Charles Kao obtained Nobel prize in 2009. The study reveals the suitability of using glass-fiber to implement optical communication; and is regarded as “The
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