

Medical Applications of Electromagnetic waves

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The field of RF has undergone a paradigm shift in recent years. From being a technology that had its utilization mainly in Telecommunications and Radar applications, it is today the forefront technology for a myriad of biomedical applications. The market for biomedical applications is expanding and this in turn is constantly driving the demand for a plethora of wireless RF products with smaller sizes, increased functionality, and integration. Consequently, recent years have seen rapid changes in RF techniques as well as technology. This trend is continuing enabling the use of increasingly higher RF frequencies with their inherent advantages of smaller component size and larger bandwidth. In particular, the use millimeter waves, and sub-terahertz frequencies has opened new opportunities in terms of development of non-invasive sensors for variety of biomedical applications including diagnostic and drug delivery systems.

The talk began with an introduction to Electromagnetic Spectrum. The advantages of utilizing higher microwave frequencies were then explained. Next, some of the biomedical applications of RF, Microwave, Millimeter waves and sub-terahertz frequencies were described. Examples and use of body area networks, targeted drug delivery systems, painless diagnostic systems, vital body parameter monitoring, non-invasive blood glucose monitoring sensors, imaging to effectively detect breast cancer etc. were presented. Use of millimeter waves for diagnostics and treatment of certain body parameter disorders was also described. The scope for future research in wearable devices was then briefly presented. In conclusion, it was emphasized that in order to develop low-cost medical wearable devices, we need to work closely as a team with medical doctors, computer scientists, mechanical engineers and material scientists.