Advanced Electromagnetics

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1. Introduction
Electromagnetics has played one of the most significant roles in our life contributing to technology in many ways; from electricity to communication. There are still developments and improvements yet to be made. Below are few of numerous advanced research which will support us moving forward to make world a better place.

2. Beyond Wireless Charging
Wireless charging is one of the technological mileposts. Some of the devices can already be charged wirelessly by placing mobile device on top of a charging base [1]. Researchers from Department of Physics have developed a system which can efficiently transfer electrical energy between two separate circuits using metamaterials. Once fully developed, it will be able to charge wirelessly at a longer distance than currently possible.

Figure 1: Illustrates Experimental Setup to Transfer Energy between Two Circuits Developed by UAB Researchers [2]

3. Antennas on a Chip
A team of experts from University of Cambridge has solved another mystery of electromagnetism, they designed antennas small enough to be integrated in an electronic chip [3]. These ultra-small antennas are called “Last frontier” of semiconductor design. Once completed this would be a massive leap forward for wireless communications.

4. Absorption of Electromagnetic Radiation
Effective absorption of the energy of electromagnetic radiation is the keystone of a wide range of practical applications. A team of experts from MIPT, Kansas State University and US. Naval Research Laboratory has demonstrated that it is possible to fully absorb electromagnetic radiation by means of an anisotropic crystal. The observations are of fundamental importance for electrodynamics and will provide experts with a totally new technique of absorbing the energy of electromagnetic waves [4].

Figure 2: Illustrates Left Side is an Absorbing Medium Lying on a Reflective Substrate and Right Side is an Absorbing Medium with Anti-Reflective Coating Applied on the Top [5]

5. Force Field from Electromagnetics
Academics have invented a new method to form an Electromagnetic Force Field. It has combined three

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layer structures consisting of first layer as supercharged plasma window, second layer as curtain of high-energy laser beams arranged in lattice-like configuration and third layer as Carbon Nanotube (CNT). Where plasma window fill a volume of space confined by a magnetic shield, laser beams are positioned at equal distances between each other to ensure that at least four laser beams are in the path of the smallest object and Carbon Nanotube (CNT) layer encompasses of several layers of CNT sheets.

When projectile hits Electromagnetic Force field, it has to go through all three layers. First layer reduces the velocity of the projectile, second layer vaporizes the projectile and the third layer repels the debris of the projectile.

6. Electromagnetic Wormhole

With existing technology one can create objects invisible only to microwave radiation, but mathematical theory allows for the wormhole effect for electromagnetic waves of all frequencies. Allan Greenleaf, professor of mathematics at University of Rochester and his coauthors lay out a deviation on the theme of cloaking. They also working on more intricate geometry to specify exactly what properties are required for a wormhole’s meta material in order to create the “Invisible tunnel” effect. Their results open the possibility of constructing a sort of invisible tunnel between two points in a space [6].

In conclusion, this journal will be committed to continue its assignment to focus with the international research community to achieve the clearest possible scientific picture on the coming up prospect for a betterment of human kind.

Figure 3: Illustrates Flow of light through metamaterial [7]

References


