

## **Design Idea for a Headband to Protect Brain Area Using an Electromagnetic Shielding Material from Electromagnetic Pollution**

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### **Abstract**

Advancement in different product technologies by using radiations has created a new type of problem which can be addressed as electromagnetic pollution .Human body is exposed to large amounts of radiation due to presence of tech products in near vicinity which can affect the biological state of many organs. The human body has started getting adapted to such environments of largest electromagnetic pollution but with that nowadays different products are being designed and produced to help in protecting organs from radiation .A similar product design is being discussed in the following paper

### **Introduction**

The present application relates to a method and System for reducing the exposure of the human head to electromagnetic radiation resulting from the use of a hands cellular phone or other radio communications device. An antenna of a cellular phone is known as a EM radiation emitter, and various Systems exist to protect users from exposure to EM radiation emitted from the antennae of cellular phones . [5]

A] One method for reducing the exposure of users of cellular phones to EM radiation is the use of an EM Shield around the antenna[5]

B] Other known method for reducing the exposure of users of cellular phones is to distance the antenna of the phone from the user's head when the phone is in use the phone with its antenna in a docking compartment remote from the user and additionally provides an EM shield for the docking compartment. Distancing the telephone from the user requires either a speaker phone or a headset.

C] Since the use of Speaker phones destroys the privacy of the conversation and may annoy others in the vicinity, a headset is often preferred .A headset, i.e., a device which includes a speaker designed to be worn in the ear cavity of or adjacent to the ear while the phone is in use, allows the user to carry the phone and associated antenna Some distance away from the head, e.g., on a belt, and reduces the intensity of the EM radiation reaching the ear from the antenna. However, it does not eliminate the exposure of the user to the EM radiation emanating from the headset Speaker and/or the electrically conducting wire connecting the Speaker to the cellular phone. Moreover, locating the Speaker of the headset in or immediately adjacent to the ear cavity places aSource of the EM radiation in the place that allows maximum EM radiation exposure to the brainIt is accordingly an object of the paper to provide a novel method and System for reducing the potential injury from EM radiation to the user of a radio communications device. EM Shielded components for a radio communications device which may be used individually or in combination to decrease the risk of injury from electromagnetic radiation.

### Electromagnetic waves and their effect on human body

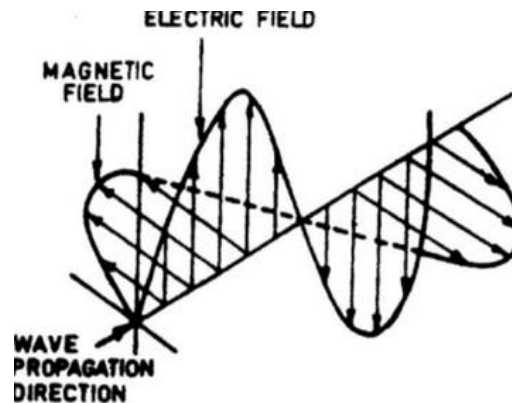


FIGURE 1 Electromagnetic radiation vector,[1]

Electromagnetic radiation has both electric and magnetic fields. The waves have characteristics like frequency, period and wavelength etc. [1] The EM waves can cause health hazards in human beings of all age groups. Let's discuss some of them -

A] Cellular phones have an impact on body cells growth making a risk of tumors, excessive use of phones for at least 10 years or more in the past increase the risk for ipsilateral tumors for both rural or mixed rural/urban residence and also the parotid gland tumors.[5]

B] These EM radiations from cellular phones get absorbed by human tissues. Specific absorption rate (SAR) is the EM energy absorbed per kilogram tissue. SAR values of tissues suggest how much it will affect the body organs. Studies have reported that head and hands absorb about 40% of the EM energy from cellular phones.[5]

C] It can also increase the risk of leukemia when the body is exposed to signals 100 kHz and below frequencies. The exposure of less than 4W/kg on the body for 30 minutes can result in increasing the body temperature by 1 degree.[5]

#### Proposed methodology

The word shielding means to protect. Here, the shielding means to protect the body organ tissues from absorbing radiations and changing the chemistry of the body. The electromagnetic energy is made to absorb or reflect when it is passed through EM shield material. [2] Let's discuss some of the shielding raw material -

A] The composites of boron carbide and epoxy (Tub coat CRO) made a fabric based composite which shows commendable results for electromagnetic shielding for frequencies between 1.9 to 2.9 GHz. [4]

B] But for the case of knitted fabrics metal fibers can be very beneficial. [2] Increasing the metal fibers can actually help in reflecting much of the EM energy.

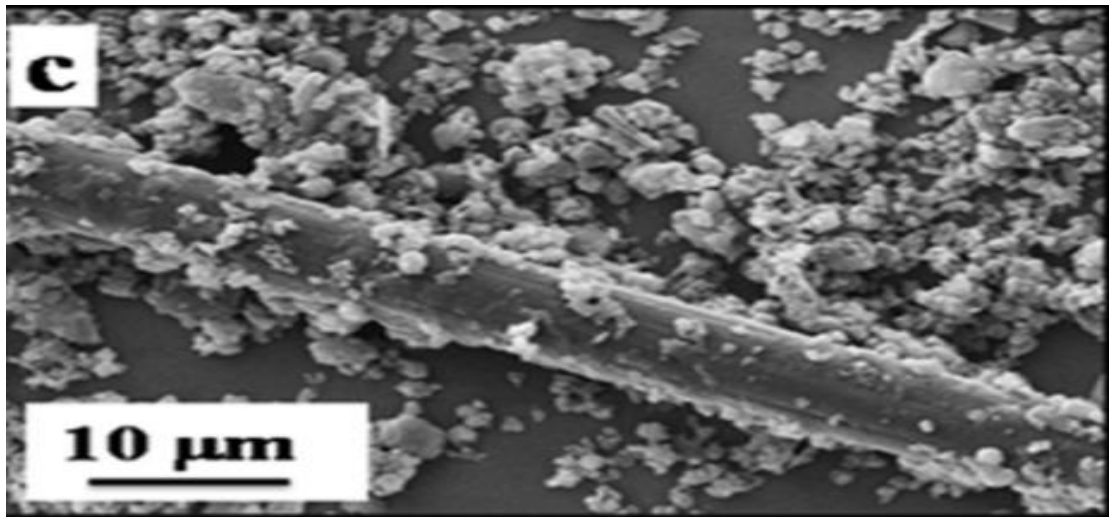
C] It is also found that composite containing continuous carbon fiber have shown better EM shielding behavior than discontinuous carbon fibers which is even more than the epoxy matrix.

D] The problem with metal shields is that it has less mechanical flexibility because of high stiffness, high weight density, susceptibility to corrosion and limited tuning of SE. The electromagnetic pollution called EMI is also not completely mitigated using metal shields since the electromagnetic signals are almost reflected at the surface of metals defending the environment outside the shield.

E] The intrinsically conducting polymers (ICP) [4,6] and their composites apart from the theory potential applications in optoelectronic devices, electronic charge dissipations, super capacitors and superconductors, OLEDs, plastic solar cells have added perspective to the technology of protective shield

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Amongst all icp, polyaniline[6] (Pani) is the most intractable polymer due to its main feature environment stability and unique proto – electronic conduction mechanism .Its environment stable nature makes it fit for the purpose we want to solve .The design idea for head band needs a similar material which is environment friendly and can show great shielding effectiveness . The material is used in industries to shield certain hardware components whose functioning gets disturbed due to electromagnetic pollution in close vicinity. Such an application of such material clearly shows that it does not disturb the working of other electrical components in its near vicinity. PANI exhibit poor processibility and mechanical properties which confine their fabrication and hence it is used in powder form .[3]a



**Figure 1- SEM micrograph of PANI-CF Powder ,[3]**

### **Formation of head band**

The PANI–CF POWDER[3] is made to fill in a nylon fiber and made to be stitched .The sack of nylon fiber containing is also made to go under the process of compression press for a very short duration to time so that the it takes the form of head band .

A elastic band is attached to the PANI –CF Composite sack according to the required size of the person head .The nylon fiber is only in direct contact with the skin .There is no side effect of the product when in use. The PANI-CF composite does electromagnetic shielding by the phenomena of absorption rather than reflection. Hence, the product will not reduce the working efficiency of nearby present objects whose operations depend on the EM waves. Hence, it is can be an easy to use product for the people especially working in IT industry.

### **Conclusion and Future Scope**

The following design idea can help people working in the IT industry to have less strain on brain and less absorption of raidition in cerebrospinal fluid and other body issues . Moreover to improve the mechanical properties of ICP shielding material can help in making further innovative designs[4] for head band as well as for other organs and can easily reduce the cost and processing capabilities of such products if launched in the market

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