Electromagnetic Field (EMF) Emissions

Why in News?

Recently, in a written reply to a question in **Rajya Sabha**, the Minister of State for Communications stated that there is no impact on the Environment due to Electromagnetic Field levels in India.

What are Electromagnetic Field (EMF) Emissions?

- **About:**
  - Electromagnetic fields are a **combination of invisible electric and magnetic fields of force.**
    - Electric fields are **created by differences in voltage:** the higher the voltage, the stronger will be the resultant field.
    - Magnetic fields are **created when electric current flows:** the greater the current, the stronger the magnetic field.
  - **Natural Sources of EMF:**
    - Electromagnetic fields are **present everywhere in our environment but are invisible to the human eye.**
    - Electric fields are produced by the local build-up of electric charges in the atmosphere associated with thunderstorms.
  - **Human-Made Sources of EMF:**
    - Besides natural sources, the electromagnetic spectrum also includes **fields generated by human-made sources: X-rays** are employed to diagnose a broken limb after a sport accident.
    - The **electricity that comes out of every power socket** is associated with low frequency electromagnetic fields.
    - Various kinds of **higher frequency radio waves** are **used to transmit information** – whether via TV antennas, radio stations or mobile phone base stations.
- **Issues:**
  - **Impacts on Humans:**
    - Numerous worldwide studies link EMFs to serious **health problems such as leukemia, miscarriages, chronic fatigue, weakened immune system, forgetfulness,** depression**, nausea and loss of libido.**
  - **Impacts on the Environment:**
    - Radars are used for navigation, weather forecasting **emit pulsed microwave signals, which are detrimental to health of flora and fauna present around these radars.**

What are the Initiatives Taken by the Government to Curb EMF Emissions?

- As per the Government, **EMF emissions** from Mobile towers are non-ionizing Radio frequencies having very minuscule power and are **incapable of causing any adverse environmental impact.**
- The **International EMF Project** of the **World Health Organisation (WHO)** published an information sheet in 2005 on the effect of EMF emissions on animals, insects, vegetation, and aquatic life and has concluded that the **exposure limits in the Non-Ionizing Radiation**

Protection (ICNIRP) guidelines for the protection of human health are also **protective of the environment.**
    - The present norms for Electromagnetic Field (EMF) emissions from mobile towers in **India are already ten times more stringent (even lower) than the safe limits prescribed by ICNIRP and recommended by WHO.**
- The government has put in place a **well-structured process and mechanism for monitoring any violation** so that **Telecom Service Providers (TSPs)** adhere to the prescribed norms including the submission of a self-certificate before the commercial start of the **Base Transceiver Station (BTS)** site.
- The field units of the **Department of Telecommunications (DoT)** regularly carry out the EMF audit of up to 10% of BTS Sites annually on a random basis.
    - DoT also **imposes a financial penalty on TSPs whose BTSs are found to exceed the prescribed EMF emission limits.**
- In addition, if emission levels of such non-compliant BTSs are not brought within prescribed limits within 30 days, the same is liable to be shut down as per the prescribed procedure.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. With reference to Visible Light Communication (VLC) technology, which of the following statements are correct? (2020)

1. VLC uses electromagnetic spectrum wavelengths 375 to 780 nm.
2. VLC is known as long-range optical wireless communication.
3. VLC can transmit large amounts of data faster than Bluetooth.
4. VLC has no electromagnetic interference.

Select the correct answer using the code given below:

(a) 1, 2 and 3 only
(b) 1, 2 and 4 only
(c) 1, 3 and 4 only
(d) 2, 3 and 4 only

Ans: (c)

Exp:

- Visible Light Communication (VLC) systems employ visible light for communication that occupy the electromagnetic spectrum from 375 nm to 780 nm. **Hence, statement 1 is correct.**
- VLC is known as short-range optical wireless communication. Hence, statement 2 is not correct.
- Li-Fi, a kind of VLC, has a range of approximately 10 meters and it cannot pass through walls or any solid object.
- VLC can transmit large amounts of data faster than Bluetooth. The VLC uses visible light for communication to provide high speed internet up to 10 Gb/s while Bluetooth 4.0 promises speeds up to 25 Mb/s. **Hence, statement 3 is correct.**
- **VLC has no electromagnetic interference. The radio frequency (RF) based signals have the problem of interference** with other RF signals such as its interference with pilot navigational equipment signals in aircraft. Therefore, in the areas that are sensitive to electromagnetic radiation (such as aircrafts) VLC can be a better solution. **Hence, statement 4 is correct. Therefore, option (c) is the correct answer.**

Q. Assertion (A): Radio waves bend in a magnetic field.

Reason (R): Radio waves are electromagnetic in nature. (2008)

Ans: (A)

- **The electromagnetic (EM) spectrum is the range of all types of EM radiation. Radiation is energy that travels and spreads out. The visible light that comes from a lamp in houses and the radio waves that come from a radio station are two types of electromagnetic radiation.** The other types of EM radiation that make up the electromagnetic spectrum are microwaves, infrared light, ultraviolet light, X-rays and gamma-rays.
- In 1873, Scottish physicist James Clerk Maxwell developed a unified theory of electromagnetism, which dealt with electrically charged particle interacting with each other and with magnetic fields. He proved that magnetic poles come in pairs that attract and repel each other, much like electric charges through his Maxwell equations.
- Electromagnetic waves are formed when an electric field is coupled with a magnetic field. Magnetic electric fields of an electromagnetic wave are perpendicular to each other and to the direction of the wave.
- Radio waves are at the lowest range of the EM spectrum, with frequencies of up to about 30 GHz, and wavelengths greater than about 10 millimetres (0.4 inches).
- Radio waves are waves of the electromagnetic spectrum (electro magnetic in nature), thus these waves bend in both magnetic and electric fields. **Hence, Assertion (A) is correct and Reason (R) is correct explanation of Assertion (A). Therefore, option (a) is the correct answer**

Source: PIB