

## WHY DO CELLULAR NETWORKS & Wi-Fi DO GETS DISRUPTED BY PASSING TRAIN NEARBY?

Suraj Mandal<sup>1</sup>, Udit Sharma<sup>2</sup>, Mr. Vinay Kumar<sup>3</sup>  
<sup>1,2</sup>Student, <sup>3</sup>Project Guide

Department of Mechanical Engineering, MVSIT Sonipat  
MAHAVIR SWAMI INSTITUTE OF TECHNOLOGY, SONIPAT, HARYANA-131030

**Abstract:** In this research paper, we will try to find out a solution for a very weird issue which we face frequently but we ignore that, the question or doubt that we have is “Why do cellular network and Wi-Fi connections gets disrupted while a train is passing nearby?”. With the help of some simple physics theories, we will find out the reason of the question mentioned above and get knowledge about the whole issue which will later help to rectify the problem.

### I. INTRODUCTION

For finding the solution of our question, we should first know how the stuffs work that are related to our questions. First, we should know how does a cellular network works? Mobile phone network works on a system of geographical distinguished zones called cells. Each mobile phone has its own base station that both receives as well as emits electromagnetic waves. When a call is placed from a mobile phone, a signal is sent from that mobile phone antenna to that cell's base station antenna. The base station responds to the mobile signal by taking the phone at available radio frequency channel. When the radio frequency channel is taken, modulated radio signals are simultaneously received and transmitted, allowing voice call to be carried between the mobile phone and the base. The base station transfers the call to a switching centre, where the call can be transferred to a local carrier or another mobile phone.



Figure 1 cellular network system

Now after getting to know how a cellular network works, we should now have a brief idea about how train runs?

In this case, we are focusing on especially electric trains, so a general electric train run from electricity which it gets from overhead high-tension wires which have 25kV AC voltage

with a help of device known as Pantograph which is located on the roof of an engine and some coaches which taps the electricity from those overhead wires and runs the electric motor inside.

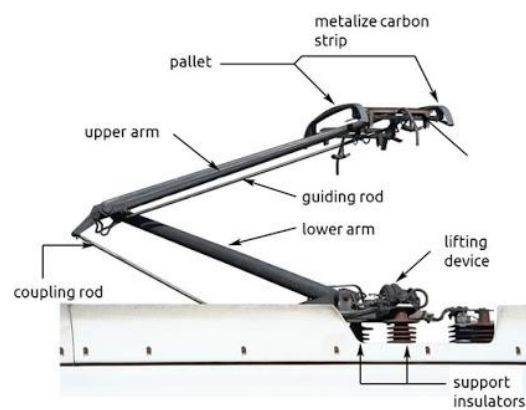


Figure 2 Pantograph

Now, as we know how both the main objects in our question works, it becomes easy to get solution of our question. As we know according to general laws of electrostatic physics, a current carrying conductor has electromagnetic field around it. Also, the mobile phone depends on exposure to the electromagnetic waves coming from the mobile tower to induce currents in its antenna, so that those electromagnetic waves can be converted into sound signals which they stand for (the voice from the other end).

Now, suppose a train passes by. When you have such electric fields (from the wires above), and moving charges (the electricity flowing from the overhead lines to the pantograph to the train and then into the metallic rails), a lot of electromagnetic waves are emitted. These electromagnetic waves spread out from its source and find its way near you where it is picked up by the antenna of your mobile phone. When a metal comes across by an electromagnetic wave, electric currents are set up within it. Same thing happens with any antenna. Now when the antenna picks up these electromagnetic waves, it's not picking up the signals coming from the mobile tower, rather it is picking up the waves generated by the train. Hence, you do not hear the voice on the other end. This is also the reason we lose your internet connectivity or our internet speed when a train passes by. This interference set up by the electromagnetic waves is called Repetitive Electrical Impulse Noise or REIN for short.

## **II. RESULT**

Hence, we get to know that it's all due to electromagnetic waves which generates from current carrying conductor as well as gets transmitted by mobile towers and disturbs each other resulting in bad network connections until the whole train passes by.

## **III. CONCLUSION**

Above research helps to find out the reason of a simple daily life observation, using above research, we can further find out a solution to solve this issue because this can cause problems in the times where mobile network is very important or we are having a very important work on internet at that time.

## **REFERENCES**

- i. Wikipedia (working of cellular network REIN and train),  
[https://en.wikipedia.org/wiki/Cellular\\_network](https://en.wikipedia.org/wiki/Cellular_network) ,  
[https://en.wikipedia.org/wiki/Electric\\_locomotive](https://en.wikipedia.org/wiki/Electric_locomotive) ,  
[https://en.wikipedia.org/wiki/Repetitive\\_electrical\\_impulse\\_noise](https://en.wikipedia.org/wiki/Repetitive_electrical_impulse_noise) .
- ii. <https://www.youtube.com/watch?v=iW0ZXh5pIoA>
- iii. <https://www.youtube.com/watch?v=ZdrsphTjUY&t=31s>