Brainwave: A Multidisciplinary Journal (ISSN: 2582-659X), Vol. 3, No. 3, September 2022, pp. 222-237

VARIATION OF ATMOSPHERIC ELECTROMAGNETIC EXPOSURE FOR BASE STATION ANTENNA

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Received on: August 17, 2022 | Accepted on: September 09, 2022

Abstract

The effect of electromagnetic radiated emissions has dangerous outcome on human health. Meanwhile, telecom service providers are anxious about quality of service of mobile services after accomplishment of severe standards concerning cell tower radiations. So, an implementation has been prepared to quantify cell tower radiations at several dwellings. In this paper, the study of two Mobile Towers has been made. This assignment deals with practically observed radiated emissions levels (electric field strength, magnetic field strength and power density). Evaluations has been occupied by using Electromagnetic field strength Meter- KM 195. A worldwide rise in the level of electromagnetic background has taken place most important to its ongoing existence in the atmosphere. The present study targets for investigating the level of exposure to non-ionizing radiation for the inhabitants inside significant housing area of Burdwan and Ramsagar, India. This type of electromagnetic radiation) is caused generally by GSM (Global System for Mobile Communication) technology of wireless communication founded on the electromagnetic emitters (GSM antennas) required for comprising wider territorial areas. Base Transceiver Stations (BTS) create non-ionizing Radio Frequency (RF) energy that is radiated around its antennas into space. The health effects related with exposure from telecommunication masts is challenging consideration due to the enlargement of telecommunication networks and base station installation.

Keywords: Electromagnetic Radiation, RF-EMF, Exposure assessment, mobile phone handset

1. Introduction

The EMF released from mobile base station is excessively lesser to split the bonds between molecules in human cells and, consequently, cannot harvest ionization contrasting the ionizing radiation (such as cosmic rays and X-rays). So EMF of mobile base station is called 'non-ionizing radiations' (NIR). Owing to the continually rising mandate for mobile communications and the always cumulative requirement for capability, mobile operators have to set up a big amount of base stations. The power density depends on three factors: the transmitted power of base station, the distance of the people between the base station, and the surrounded obstacles. Cell phone technology has raised exponentially in the last few decades. Maximum countries have accepted the radiation standards as recommended by the International Commission on Nonionizing Radiation Protection (ICNIRP). As per the ICNIRP, the quantity of power density at common public exposure zone should be less then f/200 Watt/m^2 for 400-2000 MHz band. Here f is the frequency used by the mobile operator in MHz [1]. Some researchers theoretically ascertained that occurrence of great quantity of antennas on single tower with numerous carriers from each antenna may reason fluctuating of safe zone desperately away from the tower and common community exposure area arises in risk zone where power density is greatly upper than the recommended value. A study has been also completed to determine radiation level at numerous spans for various sets of BTS /mobile towers [2].

At the present time metropolises are in front of great level electromagnetic pollution due to

GSM technology for wireless communication. In this regard, metropolises tackle the maximum intense electromagnetic pollution in terms of non-ionizing radiation due to the existence of transmitters for mobile communication in congested regions. This type of sources registered continually rising in last years because of the large number of mobile services providers and antennas sites. Mobile phone technology has completely reformed the telecommunication industry in India. Because of its incredible profits, mobile phone technology has grown exponentially in the last 10 years. The Global System of Mobile (GSM) communication has exhibited remarkable profit to the culture particularly in an emerging country like India, where other methods of communication occur to a very inadequate amount. GSM technology of wireless communication gives continuous pulsed microwave radiation [3]. The cellular base stations are transmitting uninterruptedly even when nobody is with the phone. The quantity of cell towers is enormously growing deprived of taking into consideration its drawbacks. BTS is a module of a wireless communication arrangement that retains the radio that outlines a cell and coordinates the radio link protocols with mobile devices such as GSM phones. A typical BTS contains of radios, amplifiers, combiners, duplexers, splitters, power supplies, an antenna system, and the software that runs the base station [4]. Telecommunication masts or towers are high erections intended to support antennas or aerials liable for the transmission of telecommunication signal. These masts make use of electromagnetic radiation in transmission of this signal [5]. It has been revealed that we are now virtually living within a microwave oven [6]. Even though the effects of the radiation that mobile phone towers radiate are dangerous, there are ever more towers being permitted by the municipal governments [6]. Scientifically, there were numerous reports that the electromagnetic radiation released by mobile telecommunications, has now become the key artificial basis of environmental radiation [6-8]. The mobile phones and their base stations are two-way radios, they yield RF radiation to communicate and therefore expose the people near them to RF radiation [9]. Mobile phone is not pioneering scientifically relevant, but it of the most important habits of twenty-first century is projected to progress its use of a tool for audio only to become a multipurpose tool with the facility to send and receive audio, image, and receive information, which unlocks a new age of methods of personal contact. Mobile phone base stations are also recognized as base Transceiver stations or telecommunications erections. They are low-power, multi-channel two-way radios [10-13]. Antennas, which harvest RF radiation, are fixed on either transmission towers or roof mounted structures. These structures require to be of a definite height satisfactory to have a broader coverage. When mobile consumers connect on a mobile phone, they are linked to a nearby base station. From that base station their phone call goes into the regular fixed-line phone system [14-16].

2. Methodology

The intensity of EM field and power density is measured in some parts in the vicinity of base station antenna situated at Ramsagar village and Burdwan city of West Bengal state in India under different time of a single day by showing different atmospheric parameters. Taking into account the standard height of the Indian people the EM field exposure was measured at height 1.5 m by means of a three axis electromagnetic field meter model KM-195 by KUSAM-MECO® brand. This meter can directly measure the electric field strength and then converts the measurement values to the equivalent magnetic field strength units and power density units by means of the regular far-field formulate for electromagnetic radiation. The meter has an electrical field (E) sensor type. Electric field was measured in mV/m, magnetic field in mA/m and power density in $\mu W/m^2$. Figure 1 and Figure 2 show the proposed base station antenna site of Burdwan city and Ramsagar village while Table 1 and

Table 2 show the base station antenna parameters of these two sites.

3. Results And Discussion

Figure 3 depicts graphical display of the Variation in EM radiation of base station antenna in Burdwan, India (Coordinates Vs Power Density, Electric Field and Magnetic Field at different time of a single day) along with different atmospheric parameters. From Figure 3 it is seen that power density is high during evening time when temperature, humidity and wind speed becomes high and precipitation becomes low and power density reaches its maximum value of 27.465 mW/m^2 at a time of 7 pm. Power density is low during morning time when temperature is low and humidity is high and also wind speed is low. Power density reaches its minimum value of 5.676 mW/m^2 at a time of 7:30 am. Now Figure 4 to Figure 13 show the variation of electromagnetic radiation of base station antenna in Burdwan, India under the specific increase and decrease of separate atmospheric parameters. From Figure 4 and Figure 5, it is seen that there are no significant changes of power density when temperature is high or low. From Figure 6 and Figure 7, it is seen that when humidity is high power density becomes high and when humidity is low power density becomes low. From Figure 8 and Figure 9, it is seen that when wind speed is high at that time power density becomes high and when wind speed is low at that moment power density becomes low. From Figure 10 and Figure 11, it is seen that when precipitation is high then power density becomes very low and when precipitation is low then power density becomes high. From Figure 12 and Figure 13, it is seen that when pressure is high at that instance radiation becomes low and when pressure is low at that instance radiation becomes high. Now Figure 14 depicts the same graphical display of the Variation in EM radiation of base station antenna in Ramsagar, India (Coordinates Vs Power Density, Electric Field and Magnetic Field at different time of a single day) along with different atmospheric parameters. Now Figure 15 to Figure 24 shows the variation of electromagnetic radiation of base station antenna in Ramsagar, India under the specific increase and decrease of separate atmospheric parameters. The same results are obtained as in case of Burdwan base station antenna site of previous results.

Figure 1 Cellular Base Transceiver Station (BTS) in Burdwan, West Bengal

Sl. No.	Parameters	Value
1	Latitude / Longitude	23° 15' 17.3628" N/ 87° 51' 29.3976" E
2	Type	Ground Level Antenna
3	Antenna Height	60 m
4	MCC / MNC / LAC	405 / 51 / 8108
5	CID	45161

Table 1 Parameters of used Base Trans – Receiver Station (BTS) Burdwan

Figure 2 Cellular Base Transceiver Station (BTS) in Ramsagar, Bankura, WB – 722147

Sl. No.	Parameters	Value
1	Latitude / Longitude	23° 5' 57.48" N/87° 16' 23.52" E
2	Type	Ground Level Antenna
3	Antenna Height	43 m
4	MCC / MNC / TAC	405 / 51 / 53
5	eNodeB ID / CID / PCI	63551 / 2 / 34

Table 2 Parameters of used Base Trans-Receiver Station Ramsagar

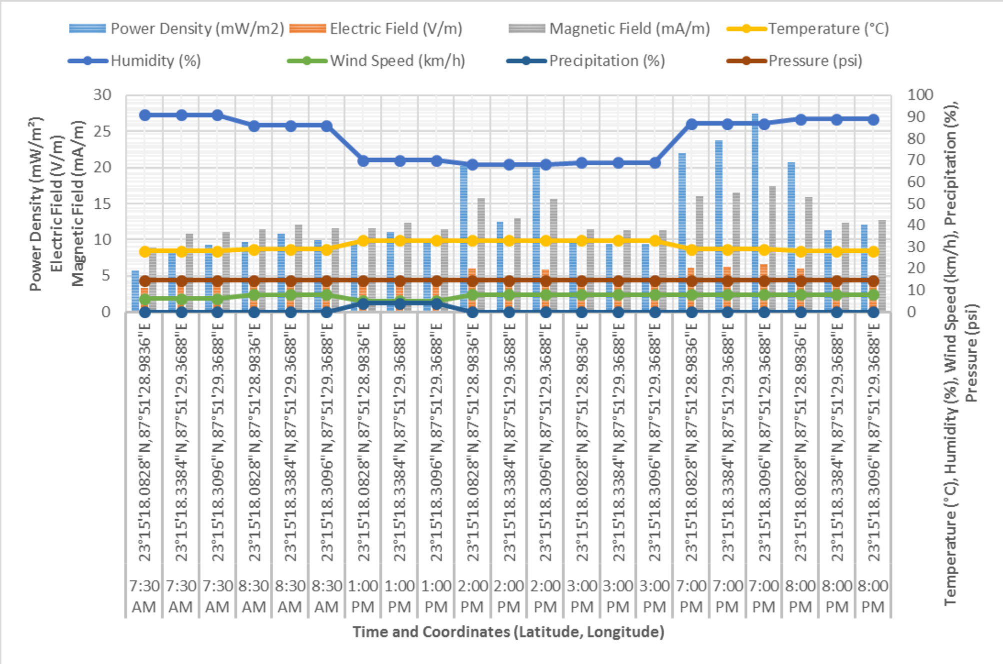

Figure 3 EMR of Burdwan

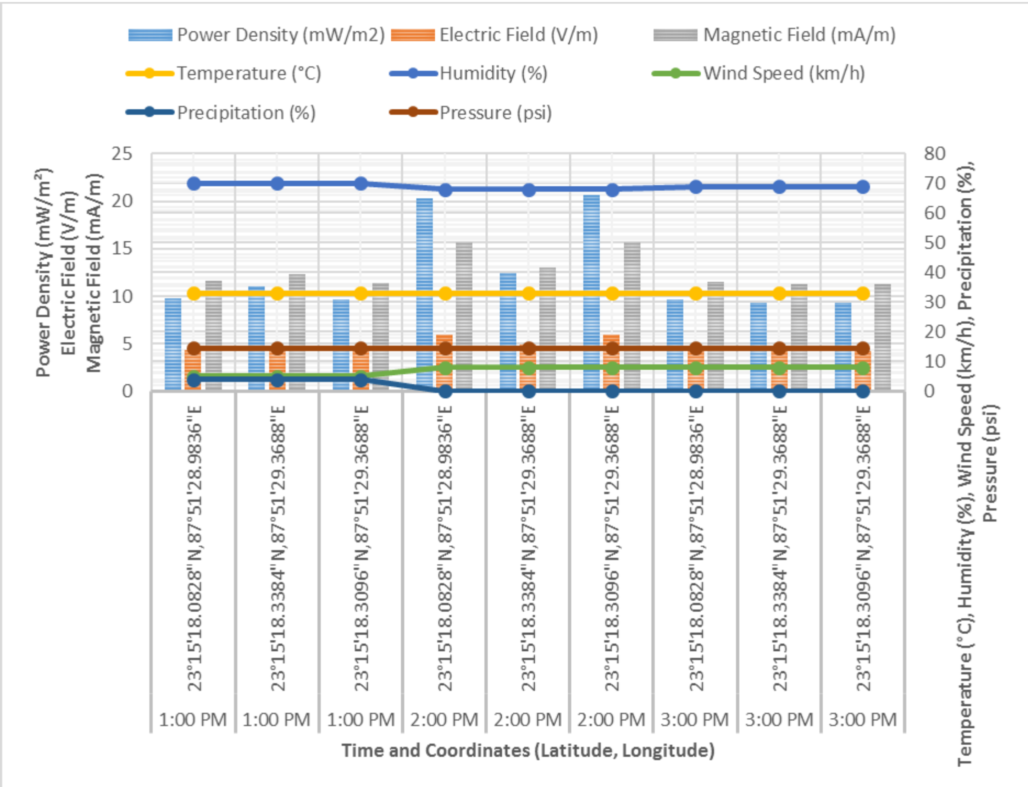

Figure 4 EMR of Burdwan when Temperature High

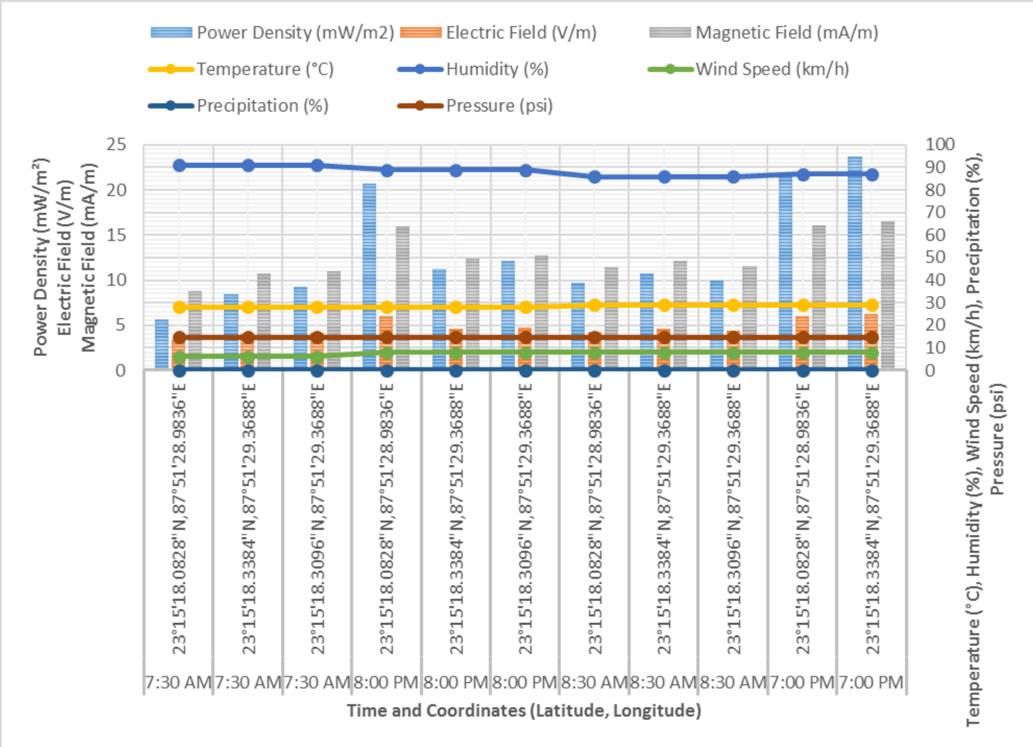

Figure 5 EMR of Burdwan when Temperature Low

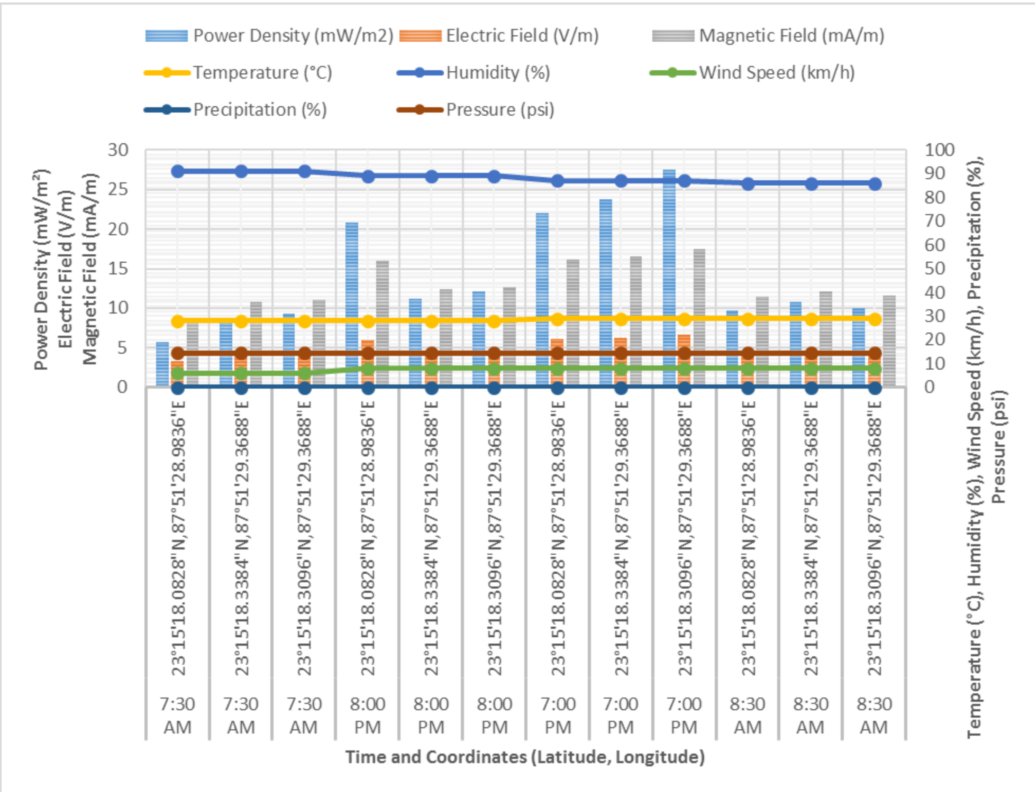

Figure 6 EMR of Burdwan when Humidity High

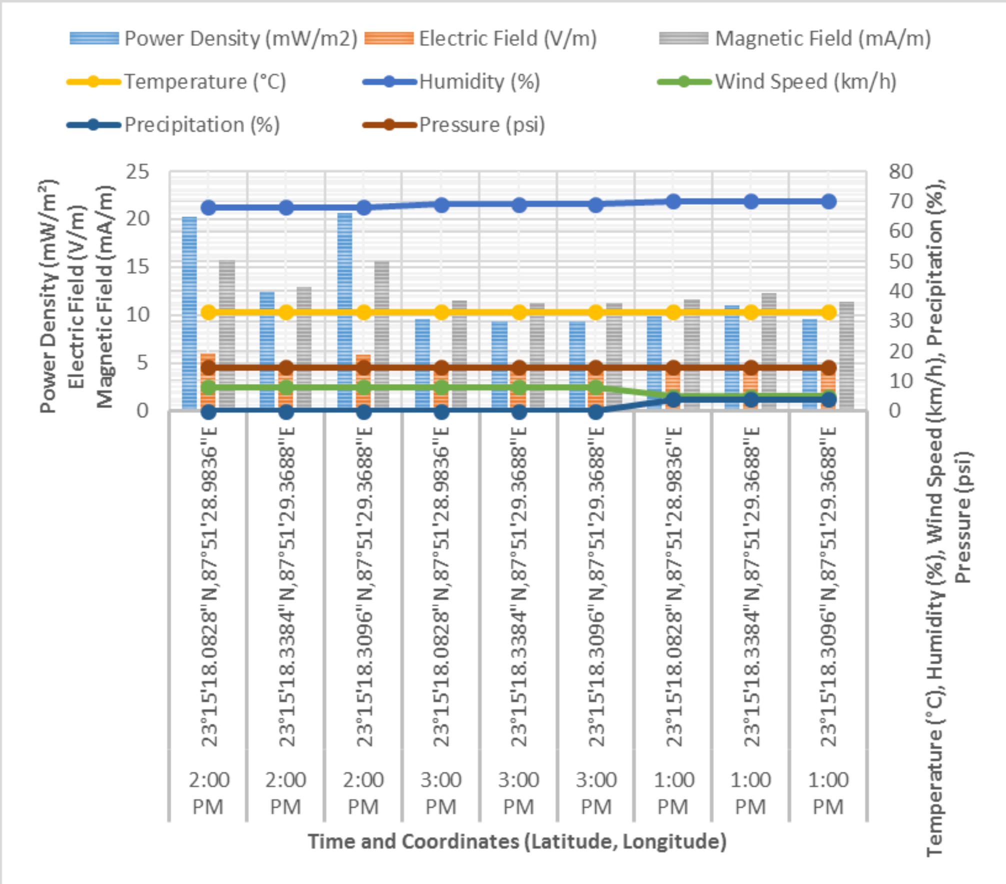

Figure 7 EMR of Burdwan when Humidity Low

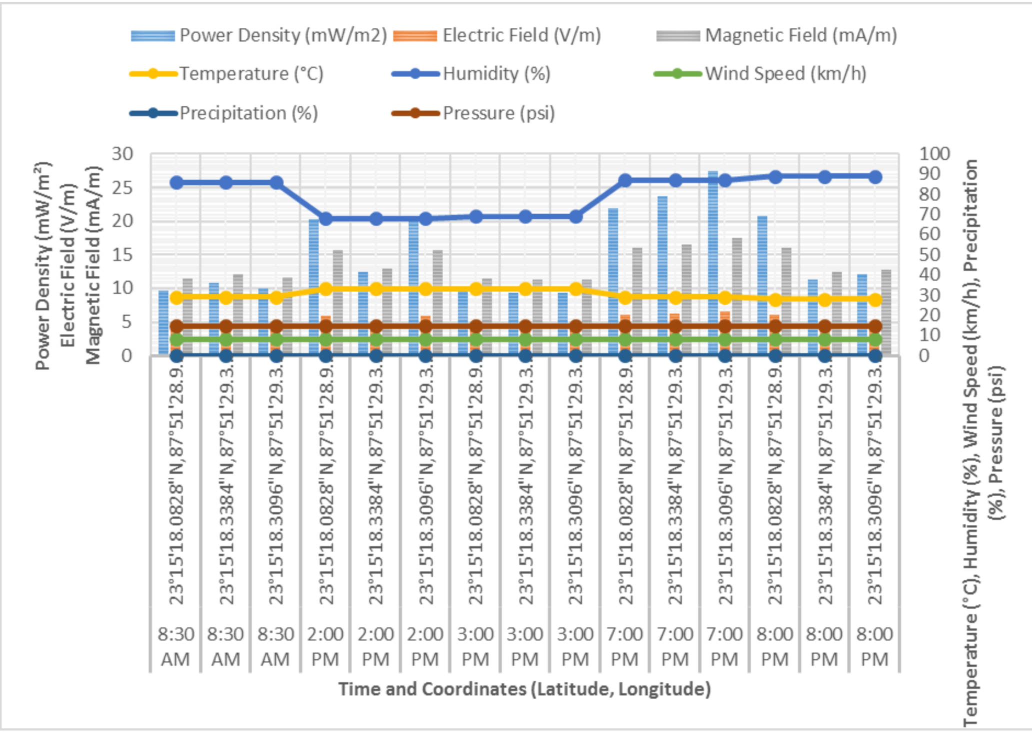

Figure 8 EMR of Burdwan when Wind Speed High

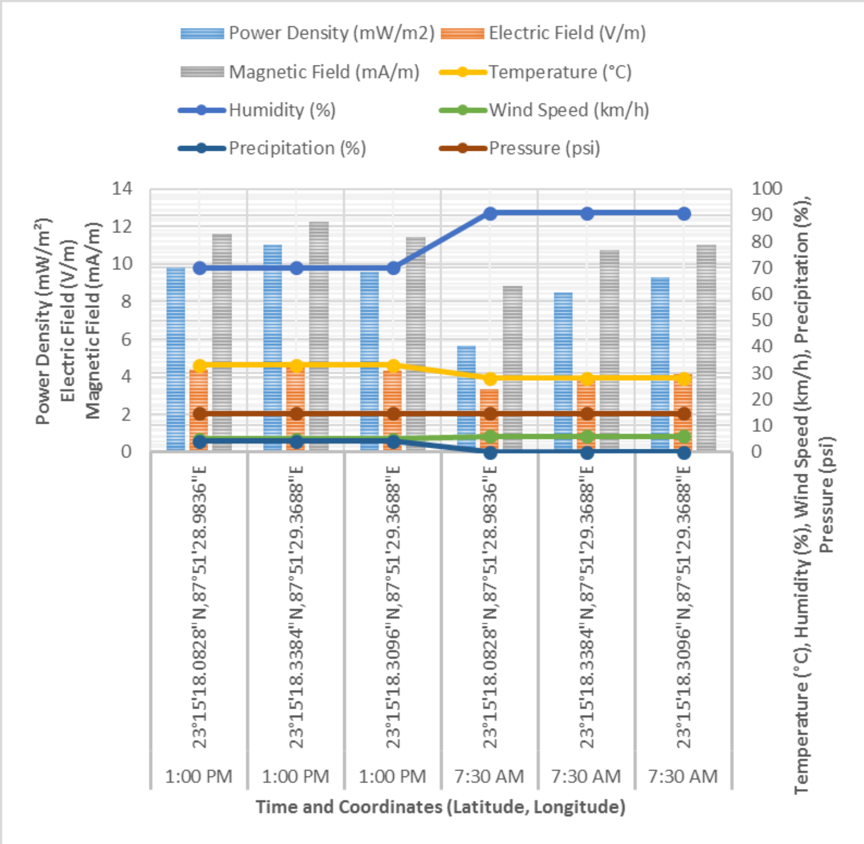

Figure 9 EMR of Burdwan when Wind Speed Low.

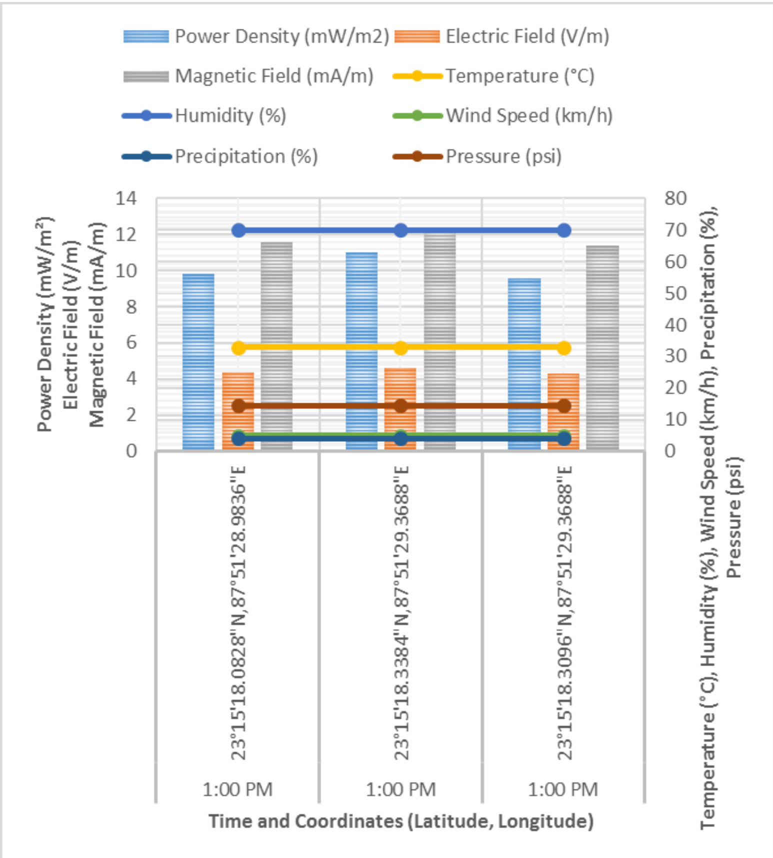

Figure 10 EMR of Burdwan when Precipitation High

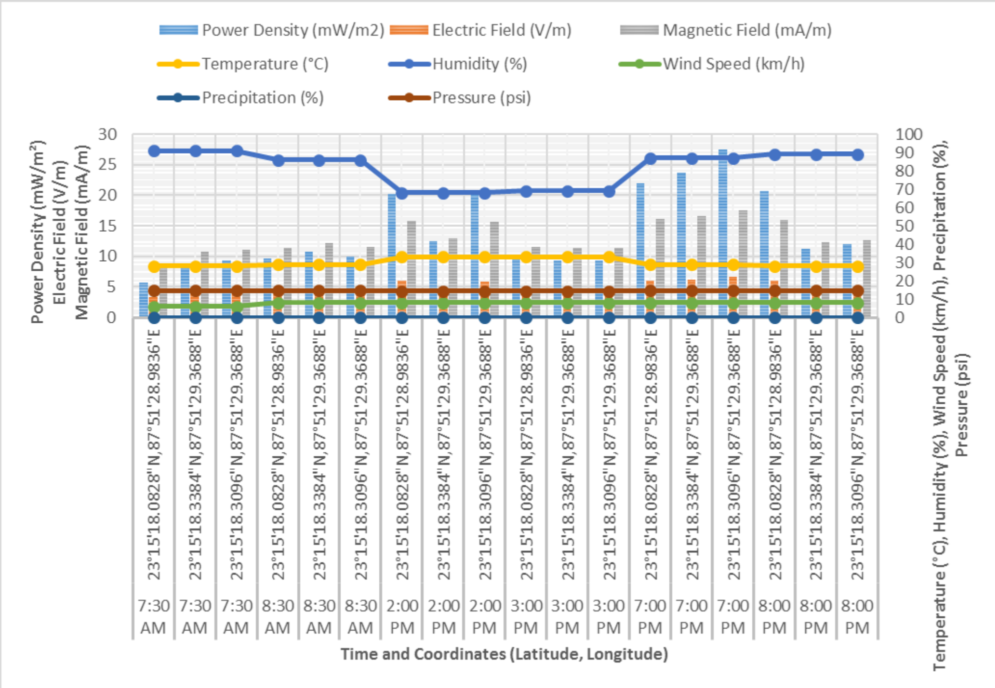

Figure 11 EMR of Burdwan When Precipitation Low

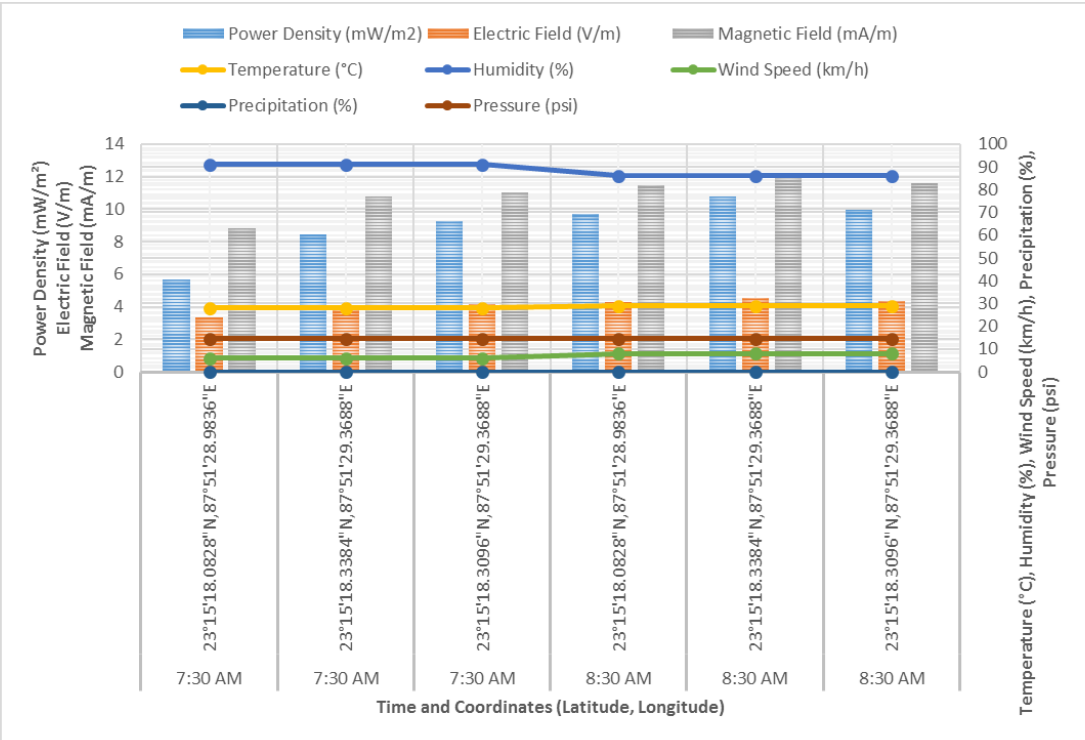

Figure 12 EMR of Burdwan when Pressure High.

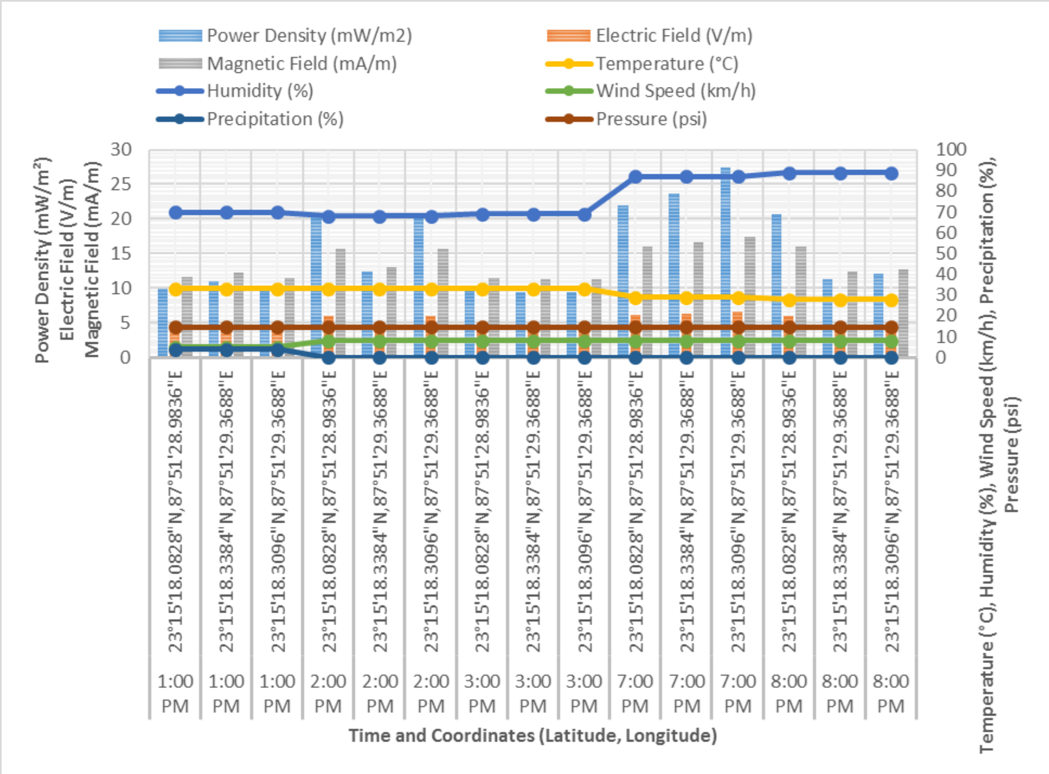

Figure 13 EMR of Burdwan when Pressure Low

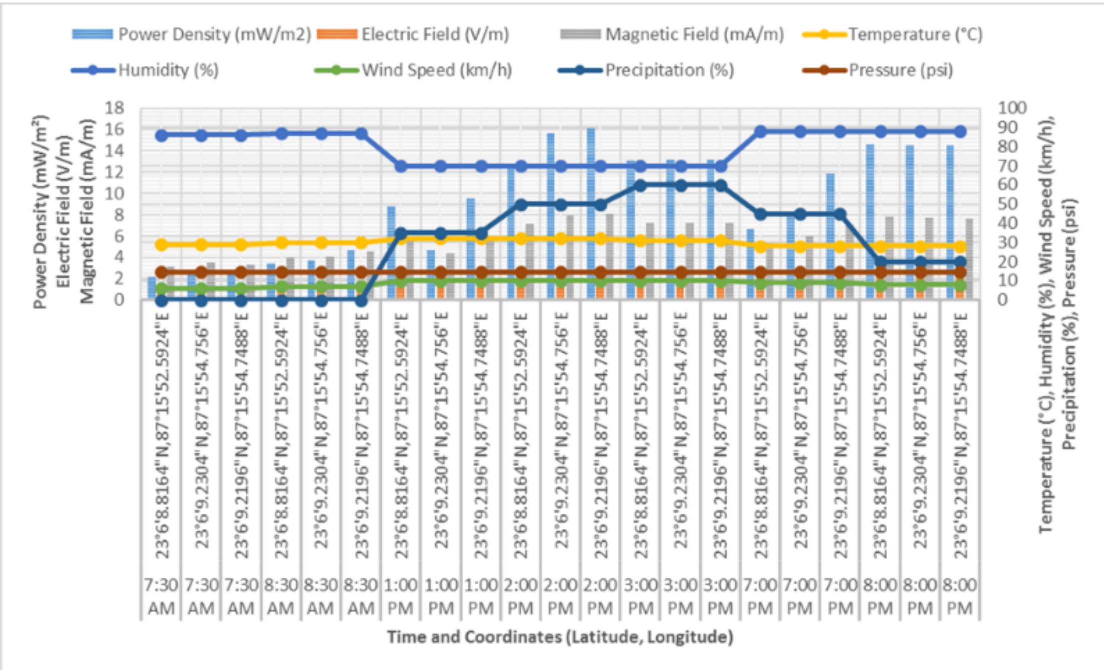

Figure 14 EMR of Ramsagar

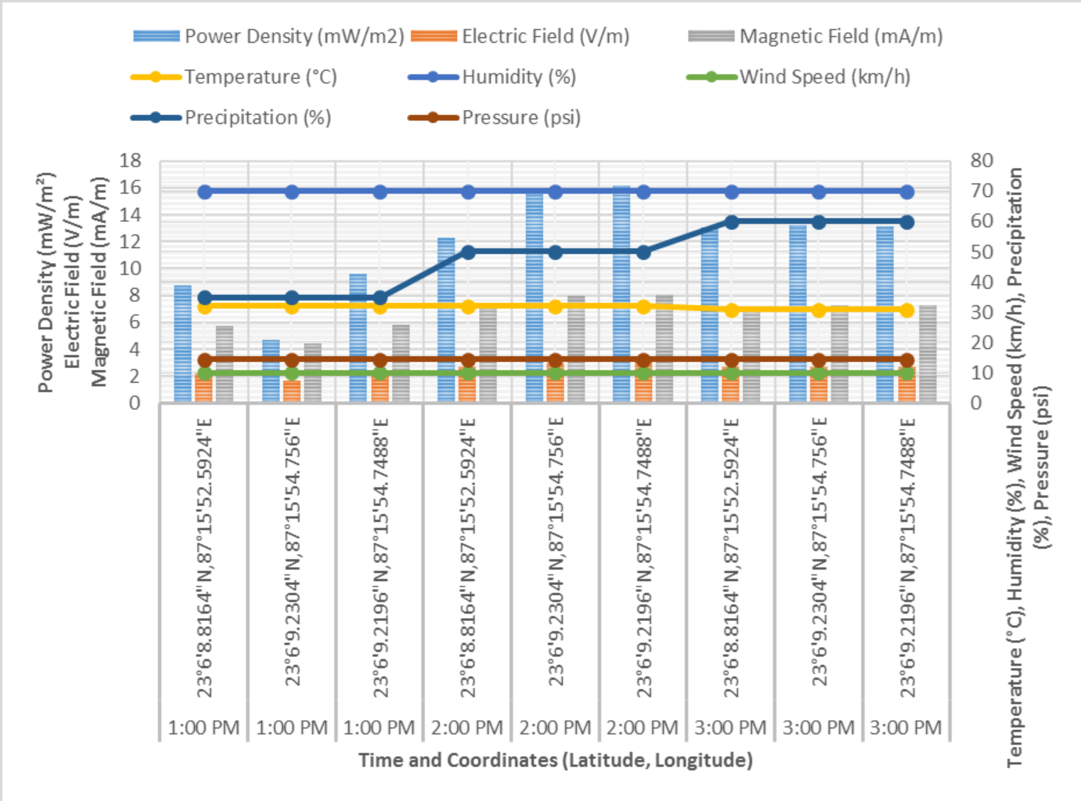

Figure 15 EMR of Ramsagar when Temperature High

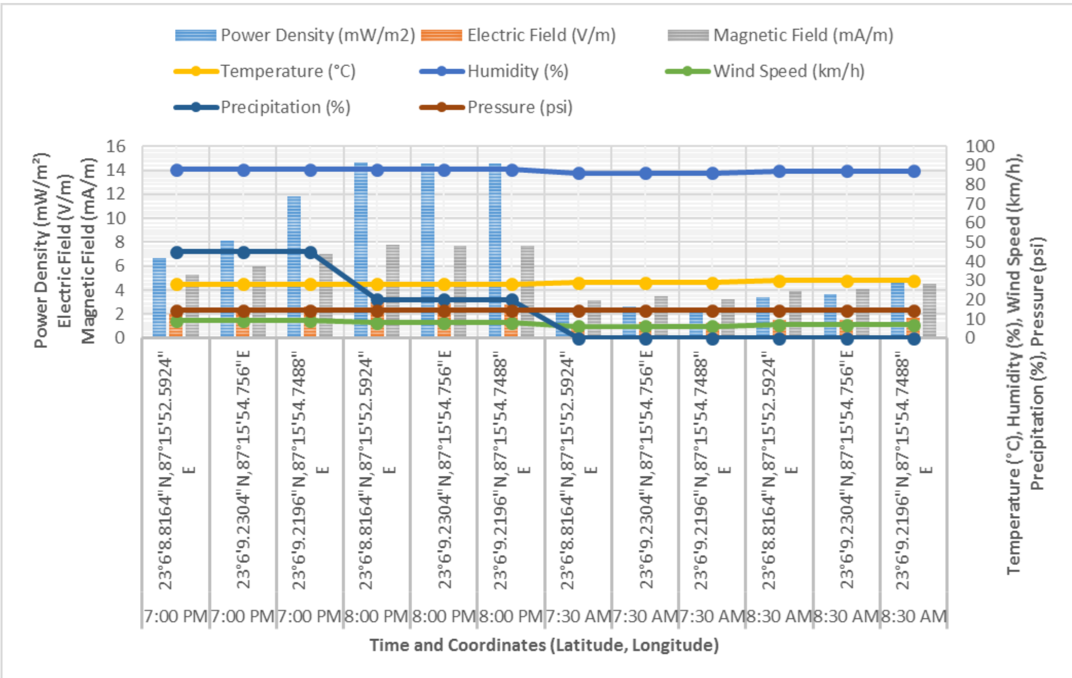

Figure 16 EMR of Ramsagar when Temperature Low

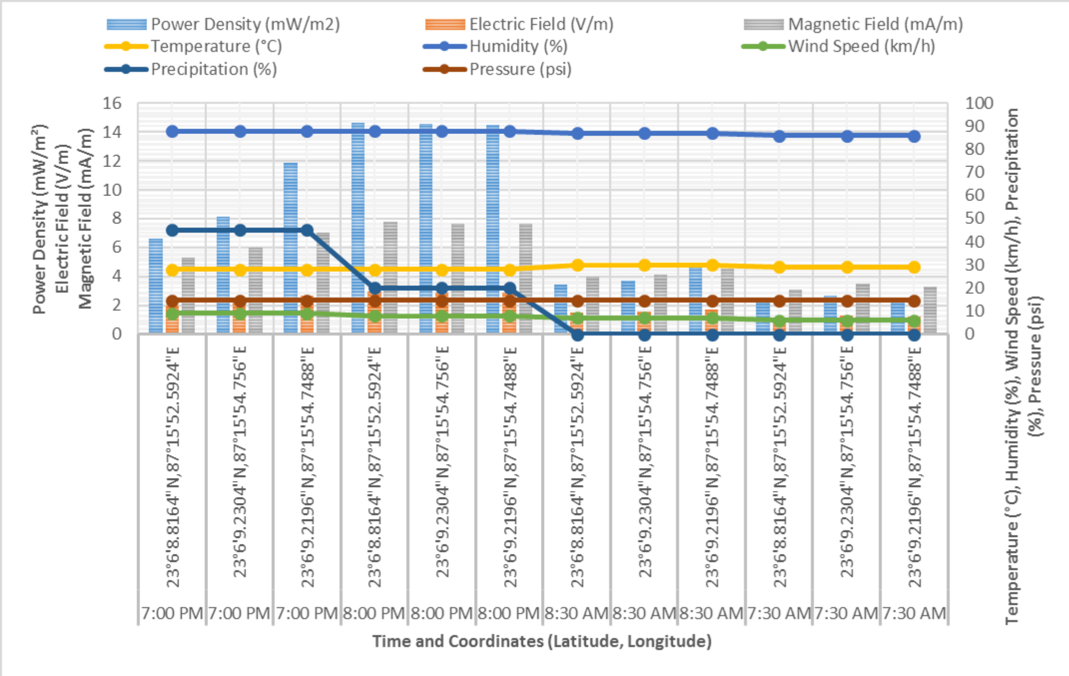

Figure 17 EMR of Ramsagar when Humidity High.

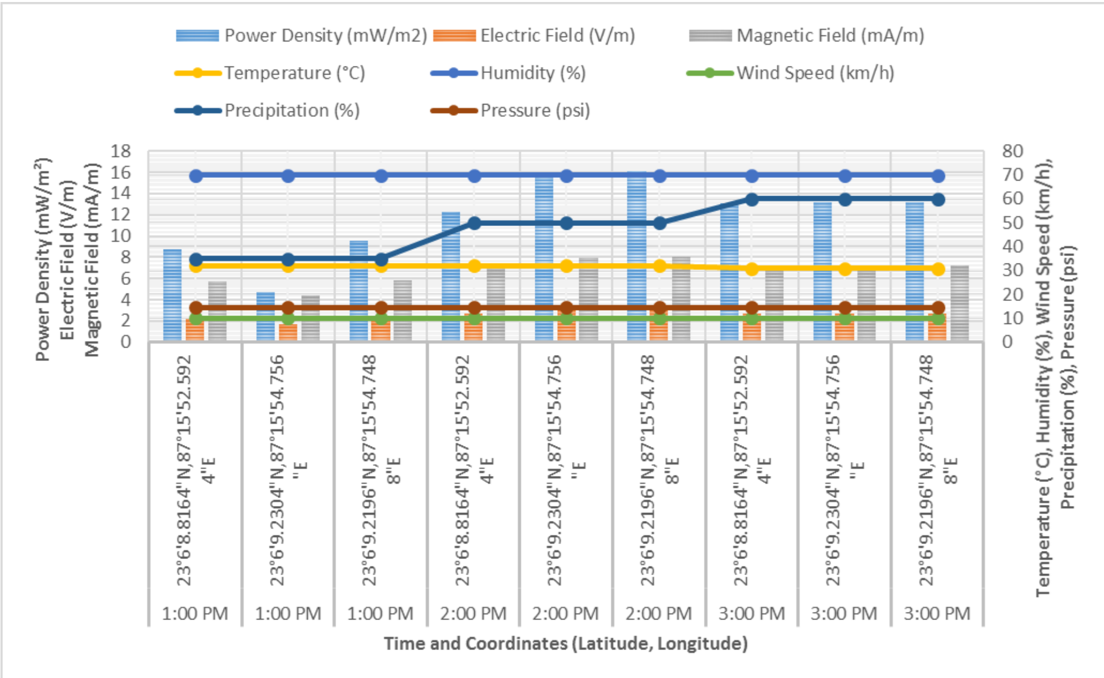

Figure 18 EMR of Ramsagar when Humidity Low

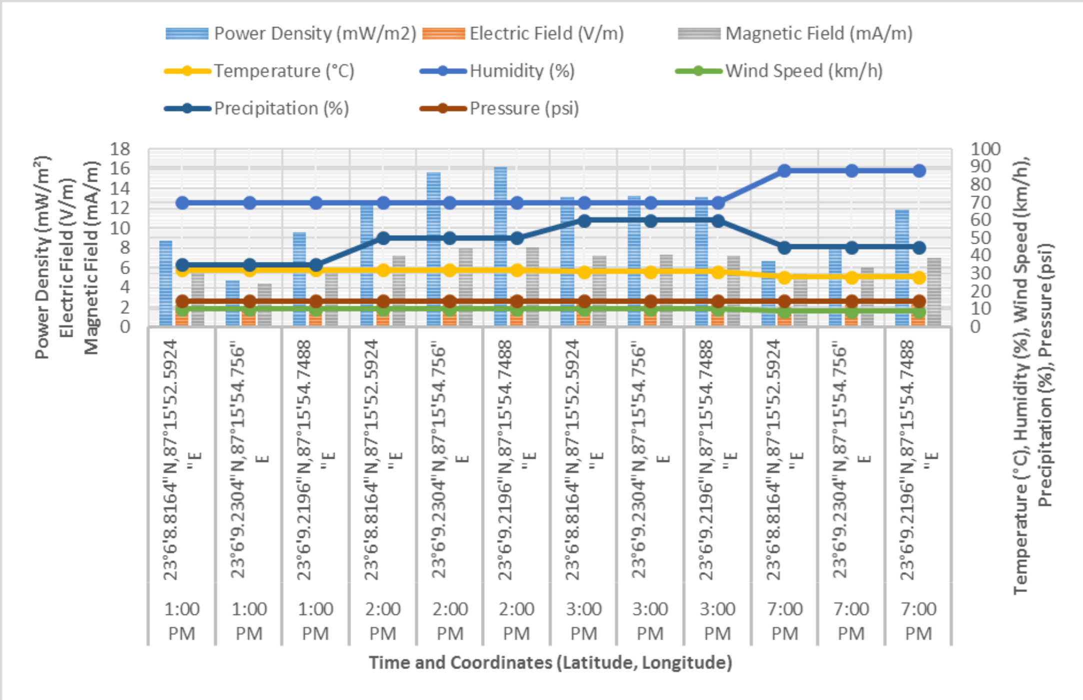

Figure 19 EMR of Ramsagar when Wind Speed High

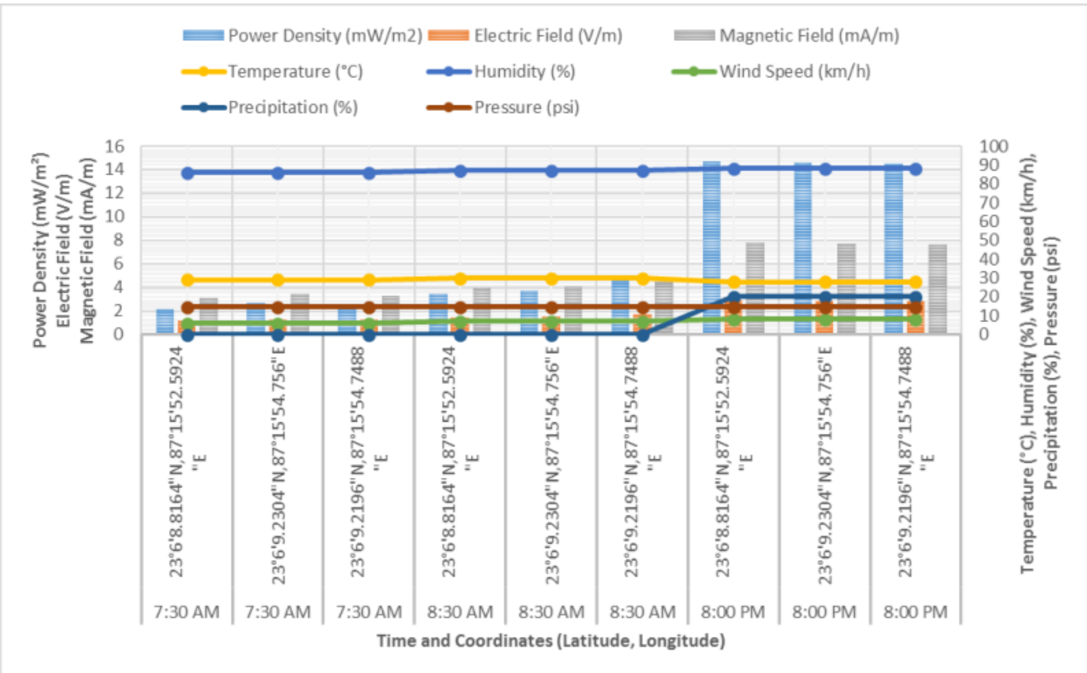

Figure 20 EMR of Ramsagar when Wind Speed Low.

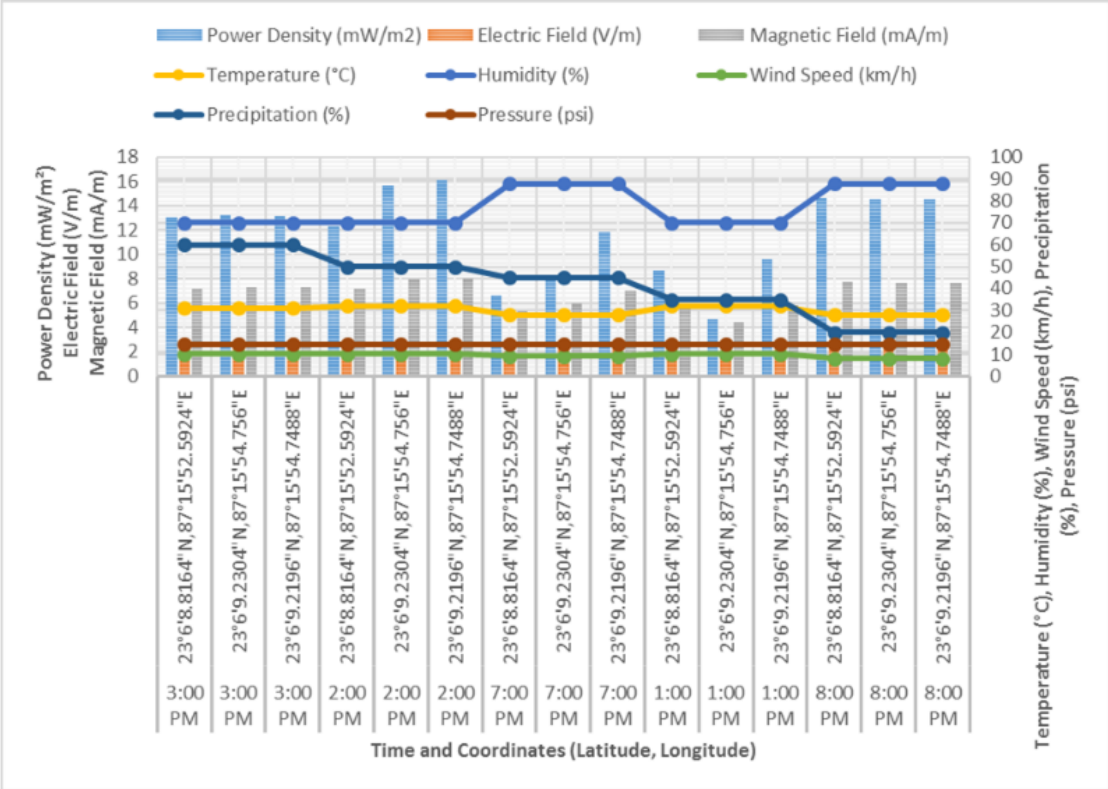

Figure 21 EMR of Ramsagar when Precipitation High

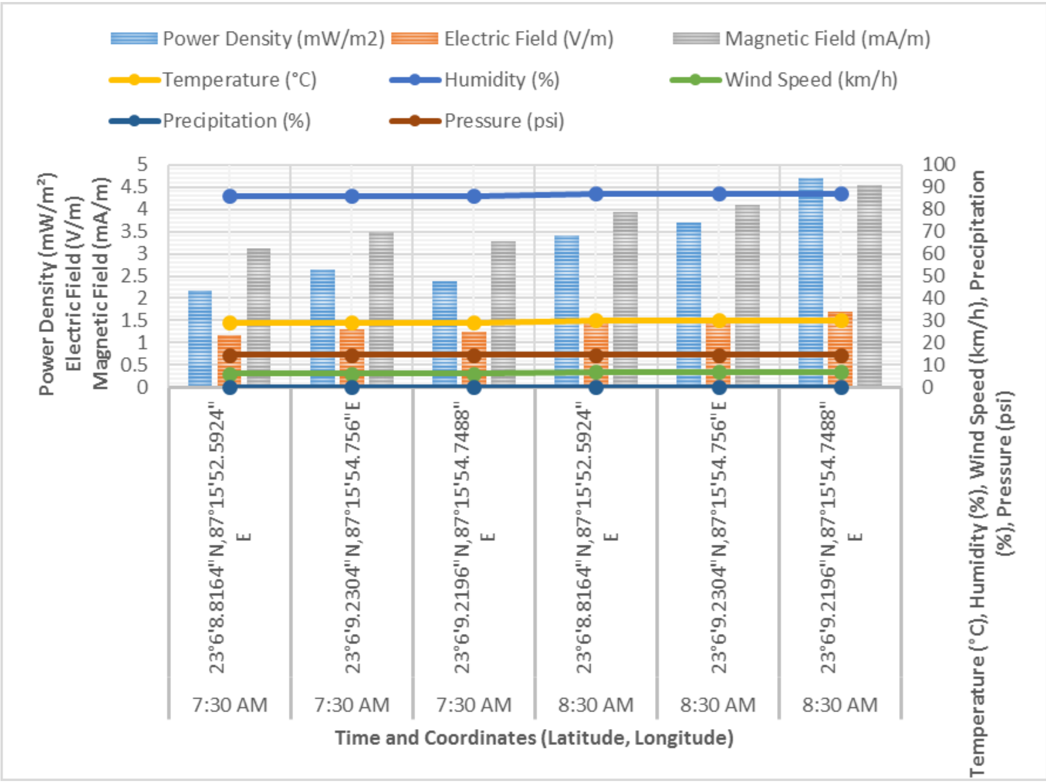

Figure 22 EMR of Ramsagar when Precipitation Low.

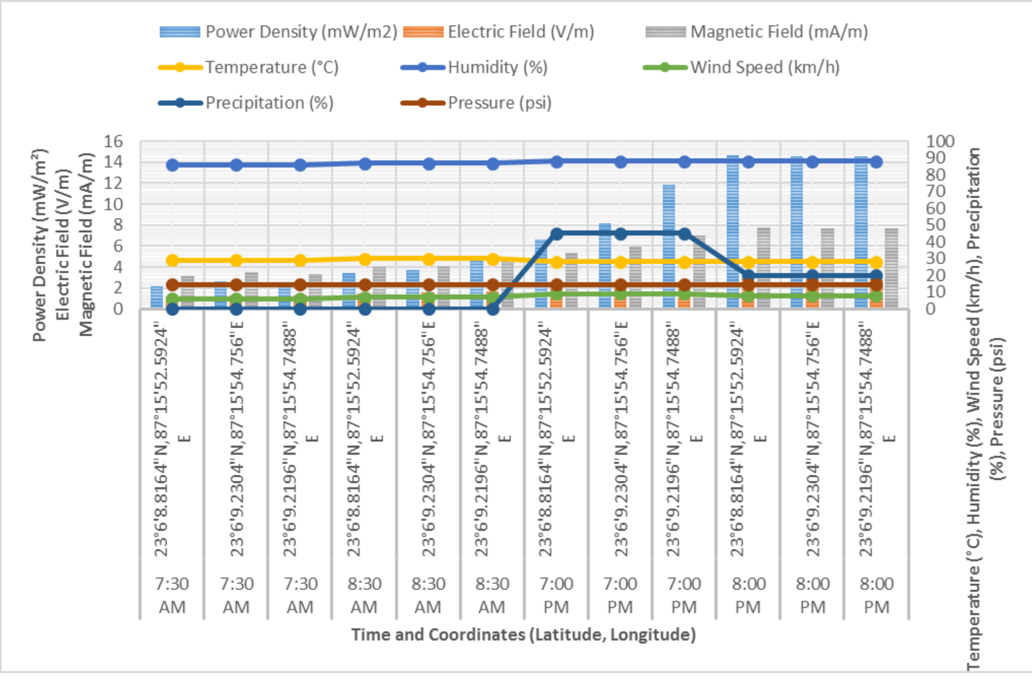

Figure 23 EMR of Ramsagar when Pressure High.

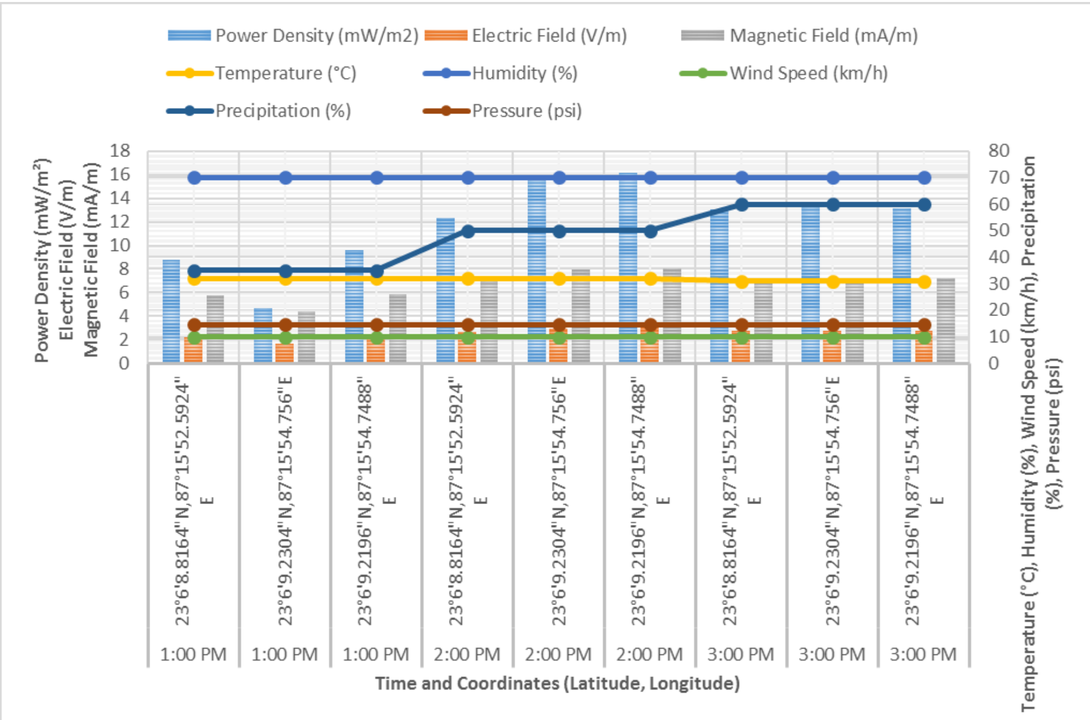

Figure 24 EMR of Ramsagar when Pressure Low.

4. Conclusions

From this analysis we derive to a conclusion that EM exposures of these base station antennas are excessively high in the case of afternoon and evening times than the morning times. It is noticed that radiations were enlarged when temperature, humidity and wind speed are augmented. It is also detected that radiations were diminished when precipitation and pressure are boosted. So we can conclude that the pressure and precipitation play major role to control this EM exposure level and on the other hand the temperature, humidity and wind speed play medium role to control this EM exposure level.

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