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Computation and Analysis of the Extremely Low Frequency Magnetic Fields Generated by High Voltage Overhead Transmission Lines

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Abstract: Such systems should be structured according to the high magnetic fields when designing high voltage power transmission lines. This paper proposes a method for computing and illustrating the magnetic field profile along a three-phase high voltage overhead power line; It proposes to take the aspects of the issues caused by that restriction to the owner of those appears to be working: Calculate the magnetic field intensities in order to know their calculation and measurement. Many spirits asked about this possible physiological action of the magnetic fields. In order to understand this probability, the intensity of the fields produced by transport energy works must be retained; In this work, a method for the evaluation of 50Hz magnetic fields produced by overhead power lines is presented. In the magnetic field calculation, the non -uniform trajectory character described by the conductors between towers, Catenary drawing is known. Using this method, a program for calculation the magnetic field intensity was produced. It can handle any power line geometry. This paper presents a simulation methodology for analyze the distribution of the magnetic field generated by high voltage under three phase overhead transmission line. The effect of sag due to the weight of the line on the values of the magnetic field on ground level has also been discussed. We also give examples of application of the method and program. The analytical results of the calculation of 275kV three-phase transmission line based on image method and obtained by MATLAB numerical software which makes it possible to better analyze and to represent the transverse profile of the magnetic field intensity under and in the vicinity of high voltage overhead electric power transmission lines.

Key words: Magnetic field, energy, extremely low frequency, high voltage, overhead transmission line, 2D computation.

1. Introduction

The electromagnetic fields generated by overhead transmission lines are important for computing the potential effects of extremely low frequency electric and magnetic fields on human health. The amplitudes of these fields are the greatest underneath the transmission lines, and decrease rapidly with the distance from the lines. In the human exposure perspective, the most important considerations are those inside or outside the right of way of the lines. The very low frequency electromagnetic fields generated by the power transmission lines have taken on significant importance in recent years, widely studied by the scientific community due to various concerns about their possible biological health and environmental effects [1]. Dependent on the results and recommendations reported by these research studies. A number of national and international guidelines have been established, to identify the limits of occupational and general public exposure to electrical and magnetic fields at extremely very low frequency generated by overhead power transmission lines [2-4]. The World Health Organization (WHO) had decided that these currents cause less reversible effects that are more noticeable from the current density of 10mA/m^2 [5]. The presence of conducting objects can easily disturb

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electrical fields, such as trees, most building materials and people. The building materials record the electrical fields, by factors usually ranging from 10 to 1000 times [6]. At the other hand, magnetic fields are difficult to shield and most materials, including plants, building materials and people, save for ferromagnetic and highly conductive materials are easily penetrate. One of the interaction mechanisms between magnetic fields and the human body is inducing the tissue currents. There are various experimental and simulation studies on electromagnetic characteristics near the power transmission lines. The majority of the study works are focused on analyzing and comparing the product field along these power lines with international standards [7, 8]. Additional studies have been conducted on the effect of electromagnetic fields intensity for high voltage overhead power lines on health and the environment, the research on field strength education under electrical modeling and simulation of the electromagnetic characteristics of electrical lines also depend on several parameters such as: the properties of the electrical cables (conductivity, wire form, cross-section, etc.), the height of the lines, the architectural and structural characteristics of the pylons, the frequency disrupting signals and the distance between the conductors and the configuration of the circuit lines (horizontal, vertical, triangular.etc). Extra – high voltage (EHV) direct current in recent years has resulted from the economic and electrical benefits it offers over ac [9], One of these advantages is the transmission of larger bulk amounts of electrical power over much longer distances than possible with ac. Some of dc projects have been put into commercial operation. AC and DC transmission lines do run parallel to one another, sharing the same-tower or sharing the same right-of-way (ROW) [10]. The scientists researches have become increasingly concerned about potential risks to human beings and animal health from living close to high-voltage transmission lines (HVTLs) [11]. Exposure to 50-Hz magnetic fields produced by overhead transmission lines were accurate estimated of raising cancer [12]. For around twenty years, the environment has been the subject of social concerns, whose exposure to the electromagnetic fields (EMF) is perhaps the most significant fear expressed by the human population. HVTLs conduct bulk amounts of electric energy and in the other hand effect large currents, which is original high magnetic field values are expected to be generated under this circuit lines. Therefore, one of the important considerations to consider in constructing extra high voltage transmission lines is the distribution of the magnetic field at the ground level or at a height of 1 m above ground surface. From the view point of environmental impact, the magnetic field values below the ground level under the high voltage overhead power lines must be measured [13]. It is well known that the geometric parameters of overhead transmission lines under and around them influence the magnetic field values and its profiles. Many factors affect the magnetic field at any point on ground or along the power lines, such as the loading current, the height of conductors, their size and spacing between phase conductors, together with the distance of observation point where the field is to be calculated. The mathematical formulas for estimating the magnetic fields of power lines were provided, despite the knowledge of electric currents in power line conductors beside the line configuration [14, 15]. Magnetic field calculation and management, using mitigation methods, of several individual circuit lines have been conducted in literature [16]. The effect on magnetic field distribution is carried out by different parameters, such as the line loading, spacing between the lines and the phase arrangements. The code program is established, based on the principle described above. The program allows the user (with a minimum of input data) to generate the overhead transmission lines configuration, to calculate and plot the resulting magnetic flux densities in space around. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has established a continuous electric field exposure limit of 5kV/m and a continuous magnetic field exposure limit of 100µT for general public at 50Hz frequency. These limit values are sometimes approach in close proximity to large transmission lines, although typical exposure is much lower. A way from the power lines field levels are much lower than proposed limits. As we can see, none of regulations are dealing with polarization of electric and magnetic field vectors. With the increase power demand, the power transmission utilities are increased the operate voltage levels for effective magnitude power transmission. The interference of these low frequency (50Hz) electromagnetic fields with human organisms (working personnel and general public) may cause a menace on human health and the environment. This assumption has been the subject and discussed in several researches projects over the last few decades [17]. The results of some studies confirmed the possibility to evaluate the electromagnetic fields created around transmission lines in order to determine their impact.

The purpose of this work is to examine the magnetic field in the vicinity of overhead transmission line horizontal straight parallel to a flat ground, in order to plot the 2D transverse profile of the magnetic field, shows the factors affecting in the magnetic induction. We propose to calculate the magnetic field under and in the vicinity of a very high voltage three-phase overhead power line, using the image method. This paper is organized into four sections, the first of which is introductory. Section II describes the theorical formulas used for calculation of power-line magnetic fields based in Garson method and the superposition theory. Computation results are offered and discussed in Section III. Section IV is devoted to conclusions.

2. Materials and Methods

The ELF electric and magnetic fields originating from overhead power lines change very slowly in time, which means that they can be considered as quasi-static. Hence, these fields can be computed separately in independently manner. In electromagnetic fields 2D analysis, the common practice is to assume that the power line conductors are straight horizontal wires of infinite length, parallel to a flat ground and to each other [18-19]. The electric field is usually computed by finding the linear charge density (electric charge per unit length) on phase conductors, while the magnetic field is usually computed by applying the Biot-Savart law [20-21]. Such an approach has been approved in our proposed study as well taken into acount. Assuming that the ground is perfectly conductive, the electric field in the vicinity of electric power line conductor located at (yi, zi) above the ground and having a linear charge density qi can be obtained by using the image method, where is the distance between the conductor and observation point (y, z) and is the distance between the image conductor and observation point (y, z). The influence of multiple conductors will be taken into account by applying the superposition principle.

2.1 Computation of the Magnetic Flux Density

In 2D analysis, the ELF magnetic fields from overhead power lines can easily be computed using the Biot-Savart law, the image method and the superposition principle. According to [20-22, 23], a simple, yet reasonable formula for calculating the total magnetic flux density at any observation point (y, z) in the vicinity of an overhead power line is:

$$B(y,z) = -\sum_{i=1}^{n} \frac{\mu_0 I_i}{2\pi}\left[\frac{z-z_i}{D_i^2} - \frac{z+z_i+\delta(1-j)}{D_i'^2}\right].i_y + \sum_{i=1}^{n} \frac{\mu_0 I_i}{2\pi}\left[\frac{y-y_i}{D_i^2} - \frac{y-y_i}{D_i'^2}\right].i_z \quad (1)$$

Where I_i represents the phase current carried by the i-th conductor is located at a distance (y_i, z_i) with respect to the coordinate system in Fig. 1. in the positive x-direction of lateral distance from high voltage overhead transmission line proposed study line arranged in three phase single circuit flat configuration, we contain this assumptions for calculate the magnetic flux density under overhead transmission line at ground level in space surface by using image theory we contain this input data:

$$D_i = \sqrt{(y - y_i)^2 + (z - z_i)^2} \quad (2)$$

$$D_i^{'} = \sqrt{(y - y_i)^2 + (z + z_i + \delta(1-j))^2} \quad (3)$$

Where: D_i: is the distance from the observation point (y, z) to the i-th conductor, D'_i : is the complex distance from the observation point (y, z) to the i-th conductors image, $\mu_0 = 4\pi \cdot 10^{-7}$ H/m represents the magnetic permeability of free space(air), and n is the total number of phase conductors in the power line.

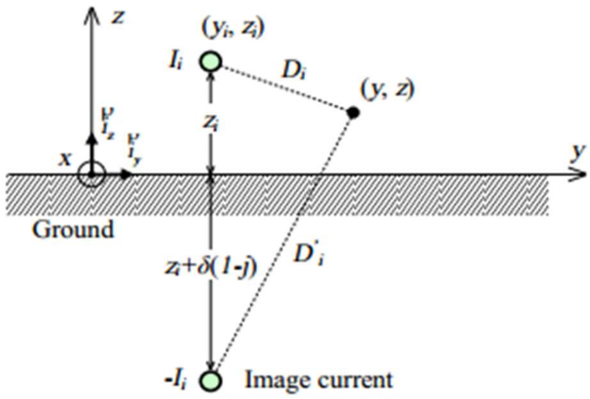


Fig. 1 Single power line conductor model for computing the magnetic flux density in the yz-plane

As it can be seen in the simplified power line model in Fig. 1, the image current for each phase conductor – equal in amplitude and opposite in direction to the conductor current – is buried in the earth at the "complex depth" $z_i + \delta(1-j)$

$$\delta = 503\sqrt{\rho_g / f} \quad (4)$$

Where: δ: represents the skin depth of the earth, ρ_g is the earth resistivity and f is the source frequency. Since the earth resistivity typically ranges from 10Ωm to 1000Ωm, the image currents of power line conductors are normally located at hundreds of meters below the ground plane.

2.2 Computation Software

Based on the theoretical background presented above, two computer programs have been developed to serve as tools for rapid evaluation of the ELF magnetic fields around power line systems. Although most computer programs for calculating electric and magnetic fields generated by overhead power lines are developed in MATLAB, e.g. [24, 21, 25, 26], these tools have been written in script file code, which is a graphical programming environment commonly used for applications that require test, measurement and control [27, 28]. They have been designed with highly interactive user interfaces, featuring simple data entry, advanced field visualization, possibility to export data in multiple formats, etc
The program for computing ELF magnetic fields generated by overhead power lines is called CalcMAG and has already been used in [23] and [29], to investigate the magnetic field exposure from typical high voltage overhead power system. These simulation tools are able to generate quite accurate lateral profiles of the magnetic fields distribution at a specified height above the ground, under overhead power line, between any two sets of user-defined coordinates. As with other simulation programs, the knowledge of the power line geometry, as well as of the voltage and of loading current respectively (amplitude and phase), for each line conductor, is a prerequisite. An open source package software for solving low frequency electromagnetic problems on two dimensional planar and axisymmetric domains Overall, a very good agreement has been observed.

3. Results and Discussion

As already stated, for the purpose of this study, a high voltage single-circuit overhead transmission line with the geometry and arrangement shows in Fig. 2 (SnR 400150) type towers a have been considered. This power line is equipped with three standard ACSR 300/69mm^2 conductors per phase, symmetrically separated by a distance of 0.4m (the radius of an individual conductor is 12.57mm, leading to an equivalent conductor radius of 126.22mm). The influence of the ground wire on the distribution of magnetic fields is neglected and the line is considered exactly balanced, which means that the phase voltages and currents have equal amplitudes and ϕ=120º phase shift with respect to each other (in practice, the overhead transmission lines operate with the phases very nearly balanced). In addition, the single circuit high voltage overhead power line is assumed to carry perfectly balanced currents, but this is rare in reality.

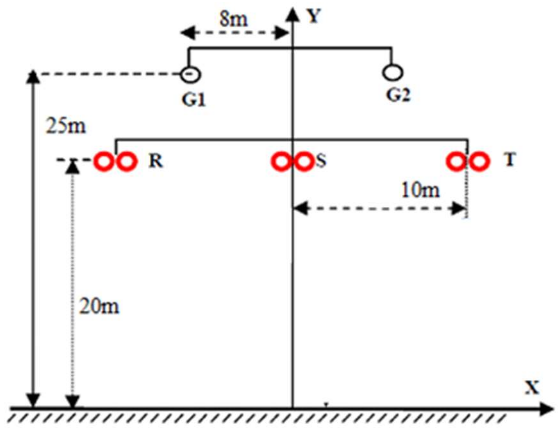


Fig. 2 275kV single circuit proposed three phase overhead power transmission line conductor horizontal configuration

The computation results will be presented in terms of lateral profiles of magnetic field at the height of 1m above the ground (as normally used for human exposure assessments), In this representations, a lateral distance of 100m from the centerline will be considered. We assume the earth is homogenous with resistivity of 100Ωm, the source frequency f=50Hz. the circuit line carry the same amount of load current, and the effects of guard wires are neglected. The lateral profile of magnetic field distribution in the vicinity of overhead line depends on the phases arrangement that is to say the circuit line configuration, underneath power lines the same phase arrangement produces the high magnetic flux density.

3.1 The ELF Magnetic Fields from Three-Phase High Voltage Single-Circuit Overhead Transmission Line

The input data for three-phase high voltage single-circuit transmission line– including the geometrical parameters, as well as the phase voltages and currents (RMS value and phase). The magnetic field depend on the clearance of the line, hg, this parameter will be taken into account by specifying four ground clearances, namely hg = 10m, hg = 13m, hg = 17m and hg = 21m. Note that the maximum magnetic field under the line will refer to the largest field strength for the specified clearance, which is not necessarily on the route center line of transmission line; it is often under one of the conductor bundles.

3.2 The Distribution of the Magnetic Flux Density

Generally, the magnetic field from overhead power line varies widely with time because the current in the conductors depends on the power consumption. Most of the magnetic field computations performed in this study assumes a line current magnitude of 1000A, which is rather large. However, since the magnetic flux density is directly proportional to the current in conductors, the field levels can easily be scaled down for more typical loads. The lateral profiles of the magnitude RMS magnetic flux density at the height of 1m above the ground are shown in these figures below. Fig. 3 shows the horizontal component of the magnetic field in flat horizontal single circuit line arrangement of three-phase high voltage overhead power line at 1m above the ground. On observe the magnetic field increases when the lateral distance decreases. The maximum value of magnetic induction Bmax=5.22µT, is registered at a distance located between the lateral and central conductor x=14m near under the side phase conductor accounting for only 5.22% of the exposure limit established by ICNIRP for the general public 100µT, then it slowly reduces in symmetric manner until the minimum value Bmin=2.28µT in the center distance of power line(x=0m) under the middle phase conductors, accounting for only 2.28% of the exposure limit established by ICNIRP for the general public 100μT, from where the magnetic field it is increases again, to register the maximum value Bmax=5.22μT under the side phase conductor accounting for only 5.22% of the exposure limit established by ICNIRP for the general public 100μT, after decreases rapidly for significant increase of the lateral distance, to reach the lower value around of 0.28μT almost negligible, accounting for only 0.28% of the exposure limit established by ICNIRP for the general public 100μT, in the distance located about 75m very far for the center power line.

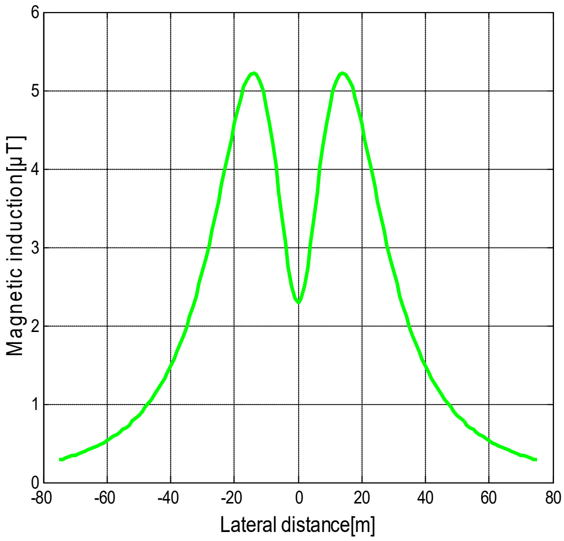


Fig. 3 Horizontal component of the magnetic field under high voltage overhead power line horizontal configuration

Fig. 4 shows the vertical component of the magnetic field in same arrangement of circuit line, On observe the maximum value of magnetic induction Bmax=7.5μT is registered in the center distance of power line (x=0m) under the middle phase, accounting for only 7.5% of the exposure limit established by ICNIRP for the general public 100μT, after the magnetic field reduces rapidly in symmetric manner to reach the minimum value Bmin=0.53μT in the distance x=23m, accounting for only 0.53% of the exposure limit established by ICNIRP for the general public 100μT, where from this point the magnetic induction increases slightly again to register a value about 1.13μT in the distance x=35m, after begins decreases rapidly from the lateral distance increases, to reach a lower value 0.52μT almost negligible accounting for only 0.52% of the exposure limit established by ICNIRP for the general public 100μT, in the distance located about 75m very far for the center line, when a move away from the conductors.

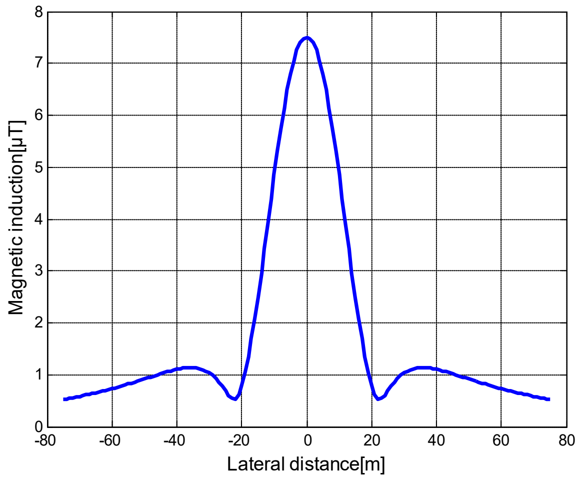


Fig. 4 Vertical component of the magnetic field under high voltage overhead power line horizontal configuration

Fig. 5 shows total component of the magnetic field in same horizontal arrangement of single circuit line, On observe the maximum value of magnetic induction Bmax=7.15μT is registered in the center distance of power line (x=0m) under the middle phase, accounting for only 7.15% of the exposure limit established by ICNIRP for the general public 100μT, after decreases rapidly in symmetric way for significant increase of the lateral distance, to reach the lower value 0.59μT almost negligible when a moves away from the conductors, accounting for only 0.59% of the exposure limit established by ICNIRP for the general public 100μT, in the distance 75m very far from the center power line. The maximum magnetic flux density calculates under three-phase high voltage overhead power line single circuit line horizontal configuration is within the acceptable corridor right of way of the high voltage power transmission line.

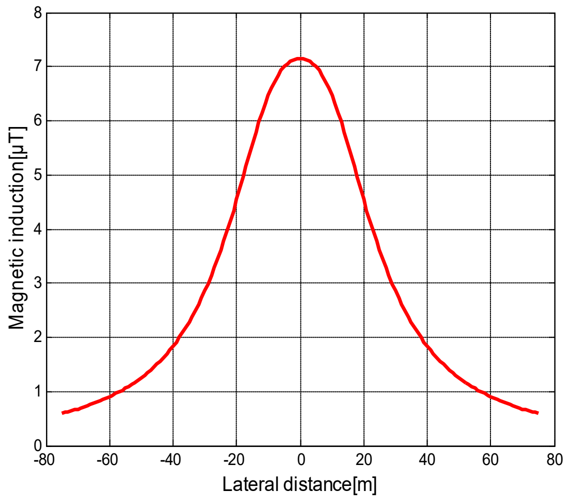


Fig. 5 Total component of the magnetic field under high voltage overhead power line horizontal configuration

Fig. 6 plot the lateral profile of the magnetic field from considered 275kV single-circuit overhead power line at 1m above the ground, for various ground clearances hg=10m, 13m, 17m and 20m. it is clear for hg = 10m, the maximum magnetic flux density under the line is 14.74µT, which is 6.78times below the ICNIRP reference level for the general public, 100µT. At distance 37.69m from the centerline (at the limit of safety / protection zone), the magnetic flux density decreases to 2.48µT, and representing 2.48% of the ICNIRP limit. For hg = 13m, the maximum magnetic flux density under the line is 12.45µT (12.45% of the limit), while at distance 37.69m from the centerline, the magnetic flux density decreases to 2.36µT (2.36% of the limit). At the tower (hg = 20m), the maximum magnetic flux density under the line is 7.15µT (7.15% of the exposure limit). The distance at which the magnetic field B = 0.4µT (cutoff value used in many epidemiological studies) varies only slightly with respect to hg of conductors above ground level, from 93.97m (hg = 10m) to 91.96m (hg = 20m).

On observe the increasing of minimum clearance in power line which reduces the magnetic field intensity.

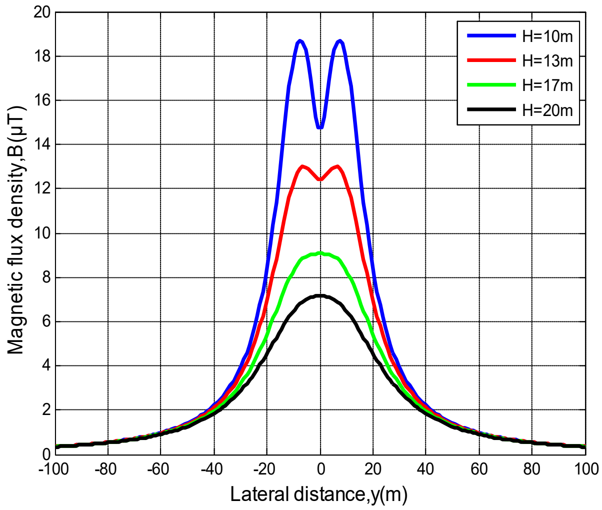
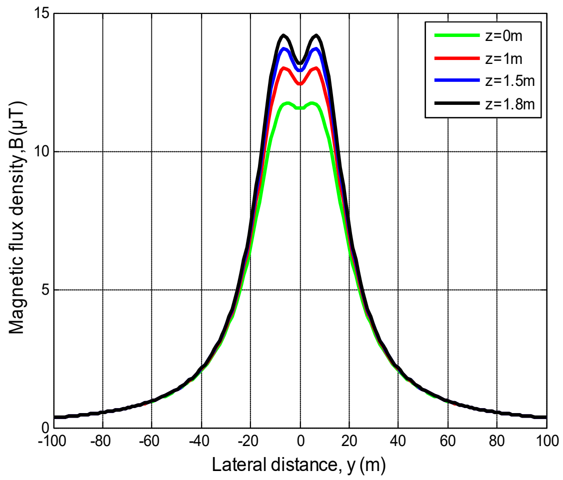


Fig. 6 Lateral profile of the RMS magnetic flux density from the considered 275kV single-circuit line, for various ground clearances (10m, 13m, 17m and 20m)

Fig. 7 shows the lateral distribution of the magnetic flux density from different observation point height z ranging from 0m to 1.8m above the ground, from where hg = 13m. At the centerline, the magnetic flux density varies between 11.54µT and 13.18µT, respectively. Starting from around 60m from the centerline, no significant differences can be observed between the magnetic flux density values calculated at different heights. At 100m from the centerline, the magnetic flux density is approximately 0.35µT, accounting for only 0.35% of the ICNIRP limit for the general public. On note that the magnetic induction values in the vicinity of three-phase high-voltage overhead power line, depending on the distance to several levels starting with the beginning level z=0m above the ground, on observe a 2D plot in the lateral profile of magnetic field distribution for the following levels. This variation is a linearity relationship for all circuit line configuration types and phase conductors arrangement. On reminder the observation point heights above ground level have a great impact in the magnetic field calculation and its deviation of the lateral profile distribution under overhead power transmission line at any desired point in space however optimization of the fields intensity. Which is solution method for minimize and mitigation the magnetic induction generated beneath power plants networks, in other way established safe limit/ security zone in the right of way width transmission line, and caused the minimum values, therefore don't exceed the exposure limit values recommended by many national and international organizations on the strength of magnetic fields of lines for the occupational workers and general public exposure, as well as those of electrical appliances. The height of observed point the position where the magnetic fields are calculated is almost essential parameter in the computation of magnetic fields density, which follows clearly the magnetic field lateral distribution under 275kV three phase single circuit transmission line.



.**Fig. 7 The distribution of the RMS magnetic flux density from different observation point heights above ground level**

Fig. 8 presents the link between the magnetic field and current, it is very clear that as this curve is symmetric of center power line, it is show the currents increase, the magnetic field intensity increases until to reach a maximum values in all four values of electric current flowing the conductors in the center distance under the middle phase conductors, then decreases rapidly in symmetrically and continuous manner with significative increase of the lateral distance, to reach the lower values when a moves away from the right of way corridor transmission line, it see a significant linear relationship between the magnetic induction and current amplitude, more the electric current is higher, the magnetic field is intense, it is proportional to the current intensity that pass them. In addition to the results presented above, Table 1 gives the magnetic flux densities computed for several lower currents, at various distances from the centerline. If considering a normal loading of 350A to 400A, it can be concluded that the typical levels of the magnetic field under 275kV single-circuit overhead power line, at 1m above the ground, are in the order of 3μT. The magnetic field generate under high voltage overhead electric power transmission line have a great dependence in the electric current flow in the conductors, which is rotation creates a magnetic flux. the circulation of the magnetic field along a closed loop is equal to the current flowing through it.

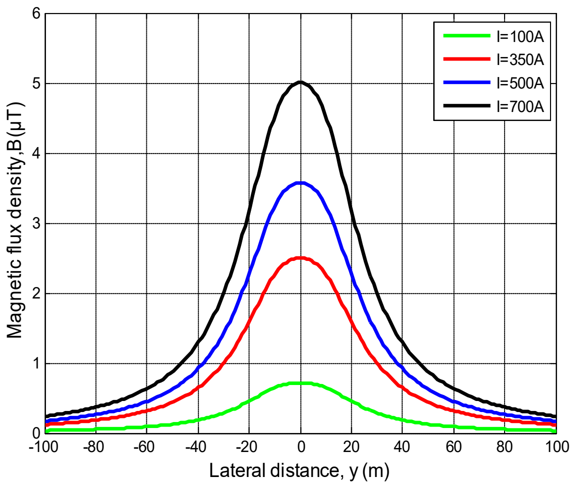


Fig. 8 The distribution of the RMS magnetic flux density from the considered 275kV single-circuit line for various magnitude loading current values flow in the conductors

Fig. 9 plots the lateral profile of magnetic induction as a function of different phase spacing between the conductors 6, 8, 10 and 12m. The maximum magnetic flux density values corresponding to these separation distances of phase conductors are 5.14, 6.31, 7.15 and

7.65µT respectively. It is very clear that as the phase spacing between conductors increases, the maximum magnetic field intensity increases in symmetrically and continuous manner in the two sides positive and negative of single circuit line, to reach the maximum values in the center distance under the middle phase conductors for all this values of separation distances between phase conductors, then decreases rapidly for significative increase of the lateral distance of power circuit line, to reach the low values when one moves away from the conductors, a very far for power transmission line in all corridor right -of -way of the transmission line. in this curve on observe that as the maximum magnetic flux density of overhead power line is found to be about 7.65µT corresponding to maximum separation distance between the phase conductors D=12m. On the other hand, the minimum magnetic flux density is found to be about 5.14µT corresponding to minimum separation distance between the phase conductors D=6m. This is a significant linearity relationship between the phase spacing of conductors and the magnetic induction. the changement of separation distance between phase conductors have a excessive influence in the line design for increases or reduces the magnetic field strength under high voltage overhead power lines, else if the optimization of field intensity in each phases arrangement and all circuit lines configuration in the vicinity of electric power overhead transmission line. The transposition of phases arrangement in the circuit line is one best concept approaches used in optimization algorithms for mitigation the magnetic flux density under the high voltage overhead power transmission lines, which satisfies the range acceptable in full right of way width, else if caused the lowest values of magnetic field below the exposure limit values suggested by the international community for low frequency electromagnetic fields, its simple analysis technique to demonstrate the reduction efficacy. And obtain maximum mitigation in the desired location, then augmented the shield factor in interest area which indicates considerable reduction in the magnetic field strength as phase spacing is decreased. There is of course, a practical limit on conductor spacing depending on the line voltage.

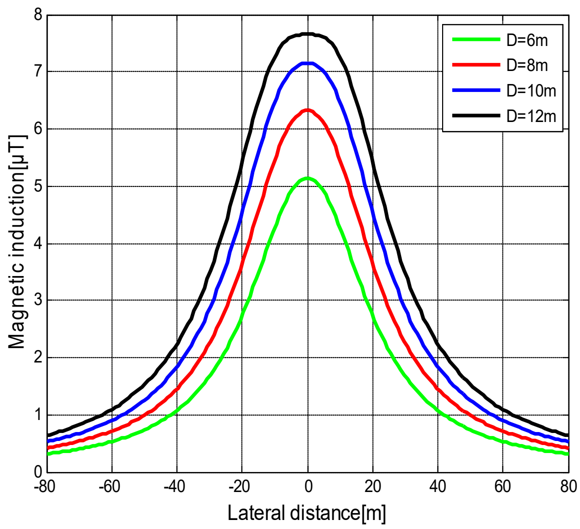


Fig. 9 Variation of the magnetic field at 1m above ground for various separation distances between phase conductors

Table 1 The distribution of the RMS magnetic flux density from the considered 275kV single-circuit line for various load current magnitude flow the conductors

I(A)	B, maximum under line	15m	37.5m	50m	100m
100	0.71	0.56	0.20	0.12	0.03
350	2.5	1.98	0.70	0.42	0.12
500	3.57	2.83	1.01	0.61	0.17
700	5	3.96	1.41	0.85	0.24

.

Figs. 10a, 10b represents the geometry of different single circuit line configurations for calculation the magnetic field at 1m above the ground at point near of high voltage overhead transmission line. Shows the arrangement and geometric coordinates of conductors and the guard cables, is described the coordinates and positions of phase conductors, the height of conductors above ground level. Fig (a): horizontal circuit line; Fig (b): vertical circuit line; Fig (c): triangular circuit line; Fig (d): reverse triangular configuration.

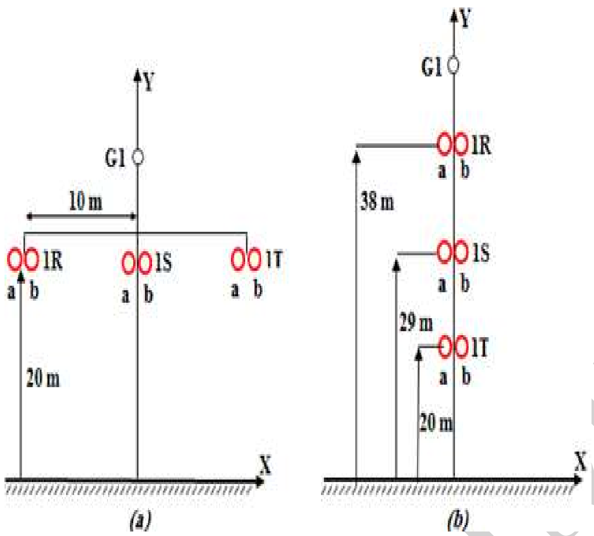


Fig. 10a Geometry of single circuit high voltage three phase overhead transmission line: (a)horizontal, (b)vertical

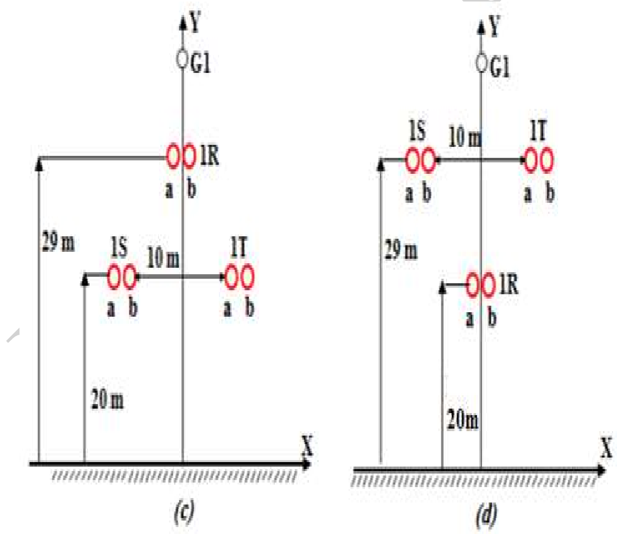


Fig. 10b Geometry of single circuit high voltage three phase overhead transmission line: (c)triangular, (d)reverse triangle circuit line

Fig. 11 shows the lateral profile of magnetic field distribution in 1m above the ground in four different phase conductors arrangement as shown in Figs 10a,b; flat, vertical, delta, and inverse delta, circuit line. it is very clear the magnetic field increases in symmetrically and continuous manner in the two sides positive and negative of the circuit line to register the maximum values in the center distance under the middle phase conductors for all this configuration types of single circuit line, then decreases rapidly for significative increase of the lateral distance in the line.

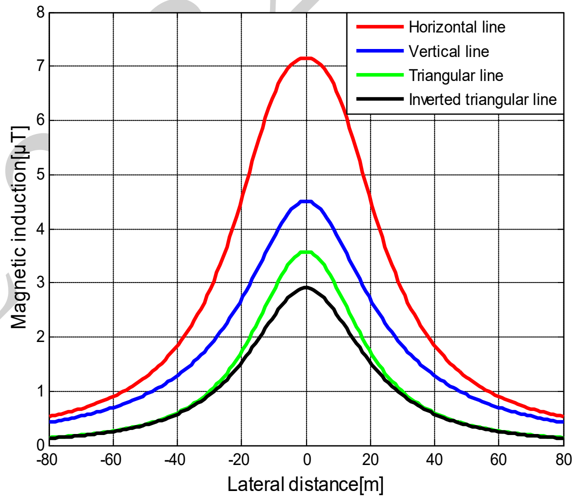


Fig. 11 Lateral magnetic field profile for different phase configurations of single-circuit power transmission line

By comparing the magnetic flux density values obtained for this phases arrangement single circuit power transmission line configuration, it can be observed that the magnetic induction values are higher for horizontal configuration at all points on the right of way corridor of overhead transmission line. In the other hand, on observe the magnetic induction values for the reverse triangular configuration are lower in comparison with the magnetic induction values with other configurations (vertical, triangular) circuit lines. It is very clear that the horizontal circuit line configuration causes the high values of magnetic induction with a maximum value of 7.15µT, while the inverted triangular configuration produces the lower values for the amplitude of magnetic induction with a maximum value of 2.9µT in the center of configuration for the same current value of 1000A. This variation in the magnetic field profile is due to the difference in heights of phase conductors above the ground level in each configuration. The inverted triangular line should be the best solution for obtained the optimization magnetic field intensity, therefore minimization the magnetic flux density values, and achieved the good location of phase conductors, when the changing case the basic geometry of circuit lines.

4. Conclusions

The paper has been focused on the computation and analysis of magnetic fields associated under 275kV overhead transmission lines single-circuit arranged in horizontal configuration. The computations have been carried out with codes programs based on a 2D quasi-static analytical approach based on the image method. According to these computations, the highest magnetic flux density at 1m above the ground is registered under high voltage single-circuit line, 14.74µT (for phase currents of 1000A), but this value is more than 6.78 times below the ICNIRP limit for the general public. Outside the safety /protection zone (37.69m from the centerline), the magnetic fields originating from the single circuit line, not exceeding the value 20µT,which is five times lower of the exposure limit established by ICNIRP for the general public. The calculated ELF fields are similar to those reported for other types of 275kV transmission lines. On the future works we are many suggestions and practices for design new construction structure instead of the additional circuit line, therefore guaranties the safety limits and security for persons and environment.

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