Research Article *ISSN: 2319-507X*
Avni Alidemaj, IJPRET, 2013; Volume 1(10): 36-46 *IJPRET*

INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

INTERRUPTIONS IN RADIO AND TV WAVING AS A RESULT OF CORONA DISCHARGE

AVNI ALIDEMAJ, LINDITA LATIFAJ, KJANI GURI, SADIK LATIFAJ

IJPRET-QR CODE *PAPER-QR CODE*

Kosovo Electricity Distribution and Supply Company J.S.C, KEDS, Pristina, Kosovo.

Accepted Date:
27/06/2013

Publish Date:
01/07/2013

Keywords

Radio and TV Waves,
Conductor,
Discharge Corona,
Noise,
Barriers,
Critical Areas,
Critical Voltage.

Corresponding Author

Mr. Avni Alidemaj

Abstract

Energy high voltage conductors when they are under such voltage action, generate discharges followed by air ionizing around them. These ionizing - partial discharges (corona discharge) cause high frequency voltage wave, gritting and lighting around the phase conductors. The speed of the spread of corona discharges through conductors reaches nearly the speed of light. Such traveling waves in neighboring antennas of radio and TV induce voltages resounding (rattle). Critical areas of submission of the corona on the surface of conductors are determined not only by the transmission voltage (110kV), but also by their dimensions. Complete elimination of the impact of corona discharges in spread of radio and television waves is impossible. All that can be done is to limit their value by carrying high voltage lines with greater diameter of phase conductors. In addition, the corona may be submitted by discharges between phase conductors and insulators surface. However, those cases are less important when the chain insulators and insulator nodes are best constructed or metallization of the majority of the surface of the insulator. With various researches has come to the conclusion that the intensity of discharge corona significantly reduced with conductive obsolescence (as well as the intensity of the corona decreases).

ENTRY

Countries with highly developed network radio and television, among others have increasingly greater demand for quality acceptance of such waves. Because the interruptions that are induced by the discharge corona on broadcasting waves spread, more and more increasing number of claims - claims such influences. Therefore it is necessary to relax as much impact corona projecting high voltage lines and branching switchgears with minimal effects of partial discharges (complete elimination of the phenomenon of the corona is impossible). High voltage power lines cause significant high frequency broadcasting interruptions. Lines of current and future high-voltage energy seeking the best solution to the problem of interruptions described above. Based on a large number of international scientific researches made for different regions and climatic conditions, the main causes of the appearance of barriers to the spread of broadcast waves are:

1. Discharge of corona on the surface linear conductors.

2. Discharge arising from bad contacts with apparatus and breakers.

3. Surface discharge in insulators.

GENERATION OF RADIO NOISE

When free electrons are found in the vicinity of the strong electric field spaces that exist in near the conductors, get speeded up in this area forming the avalanches of electrons. These avalanches of electrons are carriers of discharges of the Corona in high-voltage lines and are a source of electro-magnetic barriers called radio phonic barriers or electrical radio noise.

Noise-corona discharge caused in a cylinder-shaped conductor depends not only on the intensity of the electric field on the surface of the conductor, but also by the diameter of the conductor. Since the electric field in the vicinity of the conductor is inversely proportional to approximately the distance between that point and the center of the conductor, logically follows that discharge of the corona of a small diameter conductor will be much slower than that of a conductor with a diameter of more large, if the potential gradient remains the same. In addition, corona discharge appears on the unsmoothed surfaces of conductors. So if the surface of the conductor is directly proportional to the diameter, a larger conductor has a larger discharge than the smallest.

The intensity of the electric field in the vicinity of the conductor represents the decisive factor for the appearance of the corona. It is known that the visible corona is connected with the so-called critical electric field intensity. If the intensity of the field exceeds that of its critical value, corona will grow power losses as well. It is worth mentioning that even without visible corona appearance, small discharges are announced on the surface of the conductor, (the so-called partial corona) which can cause considerable interruptions to the spread of radio and television waves. Interruptions in radio-television are intensified at the time of submission of the visible corona. Radio-rate interruptions increase approximately at eight degree of conductor voltage, if it does not exceed the critical value.

After the intensity of the electric field depends on many factors, it is interesting to examine the impact of each of them in the intensity of the electric field, ie the generation of radio noise, after finding that the generation is growing, among others, with increased voltage gradient.

In this context, the diameter of the conductor is the most important of all parameters. With increasing diameter to one percent (1%) in relation to the previous causing a decrease of the electric field to 0.8%. However, reducing the intensity of the field by increasing the diameter is the most expensive method, as the cost of material increases with the square of the diameter.

When dealing with dual transmission lines can then be used most suitable choice of organizing phase conductors in the pole. In fact, if the organization of phases on both sides of the column is the same (eg ABC going from the top down) then such an organization gives the greatest generation of radio noise, therefore, has the smallest stage of inductivity . If on one side of the column we take the ABC organization, and on the other hand CBA, then such a setup gives smaller generation, therefore, has greater inductivity. The effect of lowering the radio noise generation by changing the order of phases to double conductors is not so important, but in some cases can still be sufficient. Will this method be applied or not, depends on the impact of changing conductor inductivity on the dropping voltage and decrease in static stability limit.

Especially when it comes to radio interruptions in certain point of route side band, then the height of the conductor can play an important role and the organization of phase conductors. In fact, if we calculate the intensity of the magnetic field or electric field on the surface of the earth, in the direction normal to the direction of the route, then the intensity of the field drops by a factor which is equal to:

$$\gamma = \frac{h^2}{h^2 + d^2}$$

So, with the growing conductor height the field factor increases, therefore, from the perspective of radio interruptions more convenient is the horizontal organization of phase conductors, what is most commonly used nowadays to high voltage conductors.

The most suitable way for U_{kr} growth and decrease of the generation of radio noise is use of batch conductors instead of one by one aligned conductors.

RADIO TELEVISION INTERRUPTIONS CAUSED BY HIGH VOLTAGE

Suppose that at some point in the conductor line the corona discharge is taking place. Waves that are created here are divided into two equal parts and spread along a line in space on the left and right of the point of discharge. As noted, the interruptions arising from discharge which appear on the non-flat surfaces of the conductor (scratches, drops of rain, ice, etc..). Those discharges are formed on the short term striking waving lines (duration t = 10^{-8}sec). They spread along the line forming around a parasitic field. Striking wave form caused by weak electricity discharges is not fixed; it's only known that their duration is very short, of order 0.01 x10^{-6}sec.

In Figure 1 are given three possible forms of impulse and their spectral curves (amplitude is a function of frequency). Its apparent that the different spectra have similar flow at the beginning and not significantly different until reaching the frequency of the order of approximately 100 MHz. Radio waves frequency are much lower than these values.

Spectrum stream which corresponds to the left part of trias (triad) of the lines in the first part is quite horizontal, for lower frequencies, until it starts to fall, for higher frequencies. Experiments show that field spectrums with higher interruptions have really that mainstreaming. Therefore, that horizontal part of the spectrum plays an important role.

SPREADING INTERRUPTIONS

When the quiet electric discharge is done at some point of the conductor, then:

1. A part of energy radiates directly.
2. The rest of interruptions are spread along the lines.

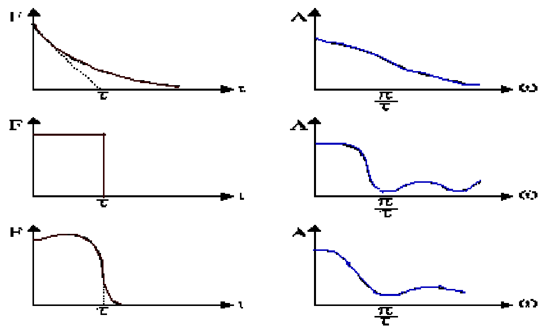

Figure 1.

Prevalence of barriers can be divided into two parts:

One between the conductor (the conductor which creates interruptions and two other phases).

Second one between the conductor and earth.

These two forms of spread interruptions respond to the spread of energy transferred between the phase conductors and between conductors and earth. So, it can be considered that the radio receiver is under the influence of three different parasite fields which spread and weakened in various ways. These fields are:

Electric Discharging field,

Field which lies between phase conductors,

Field which lies between the conductor and earth.

Briefly, the obstructive field to which the receiver is subjected in the vicinity of the line flows from the electrical discharge which arises in the major or minor unflattened areas in the surface of conductors. Each elementary barrier is carried by a wave between the conductor and earth.

Breakdown of course there is.

CHANGE OF BARRIERS FIELD AS A FUNCTION OF VOLTAGE

Radio and television interruptions are the factor which limits the choice of adequate conductor for a given voltage.

Radio barriers a function to the voltage are characterized with linear separation coordinate system, with a gradual increase, to the voltage which is slightly lower than the voltage at which the corona losses are measurable. On this voltage increased influence in the spread of radio and television waves is very fast. Above a certain voltage the intensity of the field of interruptions starts to be "saturated". This saturation decreases much more slowly than the losses. Losses and interruptions in dry areas and rain are shown in Figure 2, and with 45 mm conductor per phase.

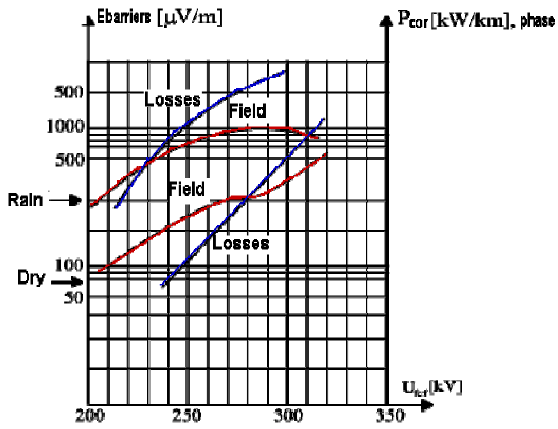

Figure 2.

The same phenomena against a small-diameter conductors (d =26.4mm) are shown in Figure 3.

As seen, the saturation field of interruptions ($E_{Pengesave}$) is achieved much faster with small rather than large conductors, but the intensity of the border field is not great. Here the field is saturated much faster than the losses.

These observations confirm the fact that interruptions field production mechanism differs from the mechanism of losses production.

In the case of designing a very high voltage power lines need to be considered the radio-television interruptions and projected

ISSN: 2319-507X
IJPRET

as such that its corresponding voltage to be lower than the voltage on which rapidly increasing of interruptions starts in good time.

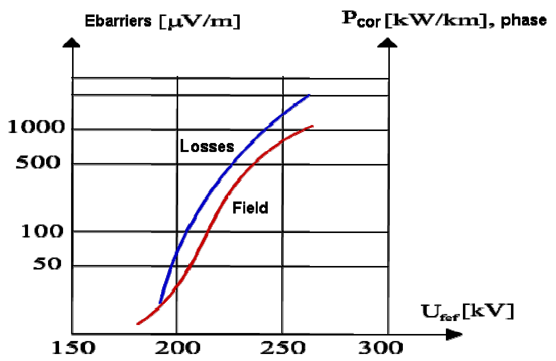

Figure 3

IMPACT OF ATMOSPHERIC CONDITIONS TO RADIO-TELEVISION INTERRUPTIONS

The rain significantly increases the electrical discharging, thus the obstructive field in large proportions in the obstructing line. Disruptive field e.g. amounts 3-10 times higher in the rainy than in good times. In fogy field below the line is weaker than in good times. Obviously, the water droplets tend to absorb part of the energy of the high frequency field.

If we are close to a three-phase high voltage conductor will feel the acoustic noise (bangs) that are released from the three phases. Attenuation increases more if the lines are covered with ice layers. Fe conductor line to130kV were measured attenuations at about 0.7dB/km for 0.15MHz. This is the biggest attenuation with increased resistance of the conductor. Sounds presented in broad boundaries are voltage depending, conductor dimensions and meteorological conditions. For 220 and 380kV lines are measured areas under the line where the values range between a few dozen and a few hundredµV/min good times.

When the rattling field under line reaches values 200µV/m the following distances are obtained which correspond to early noticing of the sound, (the ratio of signal/noise 40dB and 30dB).

Practical experiments have been carried out for some signals, and the results obtained are arranged in Table 1.

These experiments show that a sound relatively robust arrives at a distance of 200 to 300 meters. If other lines (low voltage and telephone) are in the vicinity of the HV conductor (high voltage) can reach the rattle spreading in greater distances

Table 1.

Signal S (μV/m)	D (m)	
	s/n=40dB	s/n=30dB
20	43	18
100	68	31
500	100	50
1000	250	132
2000	-	315

Where: s main signal n noise

It was found that the intensity of interference, which stem from the line, grow at strong rain. There is a close relationship between the speed of precipitation and radio interruptions.

With different measurements is determined that the scope of interference in strong rain increases to about 10 dB for all frequencies from 0.1 to 30 MHz. It was found that the noise that comes from 132 kV power lines, is much weaker in good times than in wet conditions that increases from (25-30) dB.

Field intensity measurements were performed for three conductor arrangements, for a range of voltages from 250 to 300 kV. Growing speed of radio interruptions changes in this range of voltages for different types of conductors and different weather conditions. Noise increased by 5 dB when the voltage increases from 1 to 100 kV.

So far we have observed that the transmission lines (conductors) are the only source of interruptions; however, there are many other sources of interruptions. However, it is very difficult to measure this noise at distances greater than 100 m because it is masked by other noise.

At short lines together are conducted electricity and magnetic field measurements. Spectra of these two areas have the same flow, but depending on the position of the receiver, one or the other have larger amplitude, ie shape of the spectrum varies with the position of the receiver in relation to the line.

Short lines although not respond to practical conditions, are of interest for determining the scope of the interruptions encountered at high or very high voltages. As to the account distortions, it should only be taken into those that occur as a result of reflections respectively to work with lower frequencies (below 1 MHz) in the horizontal part of the spectrum which creates stronger field of interruptions.

1. **INTERFERENCE IN RADIO COMMUNICATIONS**

Interferences are one of the forms of barriers according to the different nature of the noise, linked to a range of frequencies, unlike noise which has a continual spectrum from 0 to ∞.

Underlying causes of interference are:

1. Discharges due to corona.
2. Insulators breakdowns.
3. Weak contacts in line breakers.

4. In some cases, transformers, especially pole mounted. Interference is negligible as for the energy losses. Interference characteristics are also manifested in conductors where the corona is negligible, eg, 130 kV power lines. Depth of field very quickly decreases with distance in the direction normal to the line and with increased frequency. In dry times interferences are very weak, but close to the line, while wet they significantly increase (from 25-30) dB due to the registration of the discharges to the conductor.

Conclusions:

The purpose of this study was to better understand the corona as undesirable phenomenon in the high voltages. Such a phenomenon is impossible to be completely eliminated but can only be minimized. Corona occurs when the intensity of the electric field on the surface of the conductor exceeds the dielectric strength of air. Corona appearance depends very much on the atmospheric weather conditions. In rainy corona is rolled up with a less voltage than in good times.

In case of transfer of electricity with very high voltages, losses incurred due to the Corona are considerable. Their calculation is a pretty hard problem.

Corona feature is the bright discharging with purple, gritting and smell of ozone. This phenomenon has a negative effect on propagation of radio waves and TV.

Based on the theory previously given to radio interruptions the following conclusions can be drawn:

1. Radio interruptions appear and in the event of partial corona (incomplete) but significantly are intensified with the appearance of visible corona (full).
2. Radio barriers increase with increase working voltage in power lines.
3. Weather conditions significantly affect the level of radio interruptions since the obstructing field amounts 3-10 times higher in the rainy than in good times.
4. Low voltage lines and telephone in the vicinity of high voltage conductors significantly impact on the spread of field of resounding (noise).
5. It should be noted that as a result of the Corona the barriers significantly impact more on radio than on TV reception, so in this text more attention has been paid to the radio than the television interruptions.

Literature

1. Dr.sc. Jusuf F. KRASNIQI, Mr.sc. Gani R.LATIFI "TEKNIKA E TENSIONEVE TË LARTA", Prishtinë, 1996

2. Khalil DENNO, "HIGH VOLTAGE ENGINEERING IN POWER SYSTEMS", New Jersey

3. Ing. Petraq VASILI, "TENSIONET E LARTA", Tiranë, 1975

4. Lackowski, M., Jaworek, A., Krupa, A., Current-voltage characteristics of alternating electrical field charger, Journal of Electrostatics, 58 77- 89 2003

5. Jusuf KRASNIQI, "ELEKTROTEHNIKA", Zagreb, 1978

6. Sandborn C. BROWN,"INTRODUCTION TO ELECTRICAL DISCHARGES IN GASES"

7. S.LIMARI, Rrjetet Elektrike, Ligjeratat e autorizuara, UP FIEK, Prishtinë, 1996.

8. S.LIMARI, F.ISMAILI, K.BAKIČ, ''Development of the Model of Transmission and Market Operator in Open

Electrcity Market Environment for Small Poëer System'', Case of Kosovo, Konfrenca Slovenskih Elektroenergetikov, Čatežke Toplice, 2007.