

Effect of Humidity on the Impulse Breakdown Characteristic of Air

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Abstract: In this paper random approach towards the study of breakdown of air under uncontrolled atmospheric condition of temperature and pressure is considered. An attempt has been made to show the breakdown voltage of air increases with the increases in humidity which is in contradiction to the fact that breakdown voltage increases with humidity, when temperature and pressure are kept constant. It is also revealed that the density of air plays an important role to determine the breakdown voltage. Experiment is carried out under different conditions of relative humidity and different values of temperature and pressure for Sphere-Sphere and Rod gaps.

Keywords: Impulse breakdown, characteristic of Air, temperature and pressure.

1. INTRODUCTION

Air breakdown voltage is effect by the humidity .In this paper experiment are carried out to see the effect of humidity on the characteristics of air .In our country during summer when the atmospheric temperature is in the range of (40-46@c) and the relative humidity is 12% ,the air is dry and having a good breakdown strength, Experiments are carried out in the summer season on the different geometry of electrodes and then repeated in the rainy season when the temp varies from (25-20@c) and the relative humidity is as high as 92%.

2. EXPERIMENTAL SETUP

The size and shape of the electrodes to be used to perform the experiment are shown in fig.



1.6 MILLION VOLT IMPULSE GENERATOR

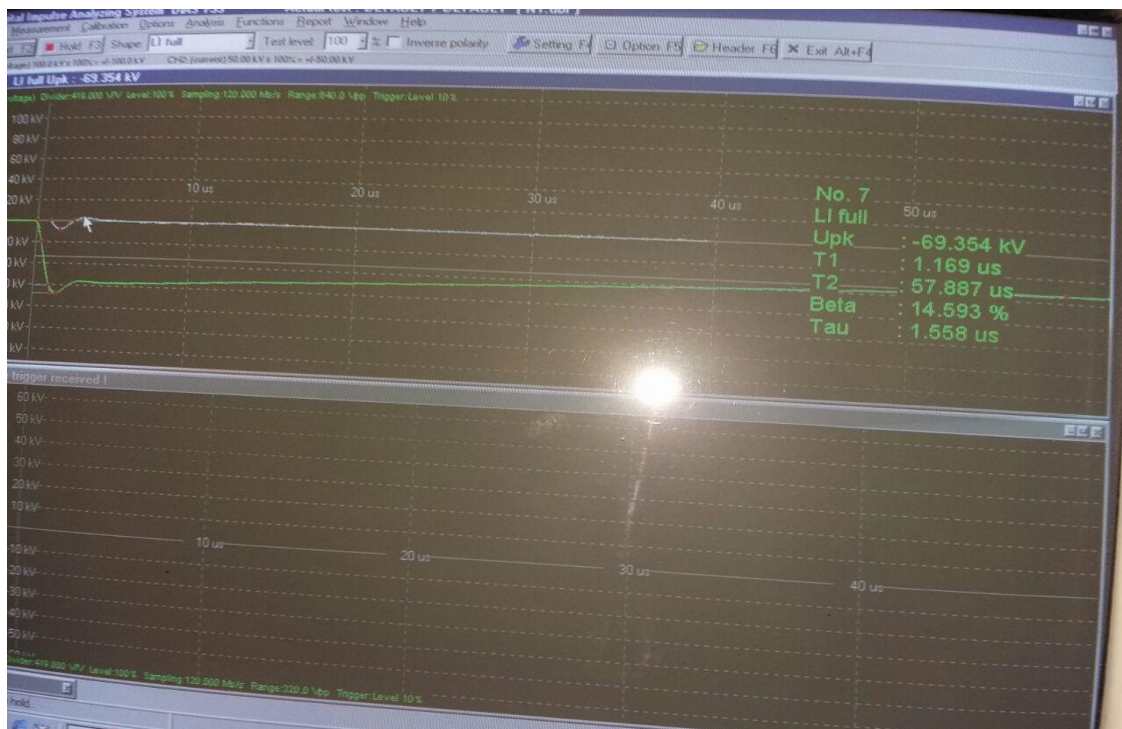


SPHERE-SPHERE GAP ARRANGEMENT



NEEDLE-NEEDLE GAP ARRANGEMENT

The electrodes are subjected to high voltage standard impulse of 1600kv impulse generator the breakdown between the electrodes are recorded on DIAS (digital impulse analyzing system) as shown in fig.



The following table shows the reading obtained by applying standard impulse voltage to different configuration of electrodes and comparing at different humidity, pressure and temperature.

s.no	ELECTRODE TYPE	DISTANCE BETWEEN ELECTRODES	IMPULSE BREAKDOWN VOLTAGE IN KV	
			AT TEMPERATURE 45°C HUMIDITY 12% PRESSURE 721 torr	AT TEMPERATURE 20°C HUMIDITY 92% PRESSURE 715 torr
1	SPHERE-SPHERE	4 (cm)	79.4	76.1
2	PLANE-PLANE	4 (cm)	75.3	73.6
3	ROD-ROD	4 (cm)	71	67.3
4	NEEDLE-NEEDLE	4 (cm)	68.5	62.5

3. CONCLUSION

The above result show that as the humidity increases breakdown occurs at a lower voltage however the effect of humidity is not more in sphere-sphere gap, but it is more predominant in case of needle-needle gap. But in general it is concluded that the breakdown voltage of air decreases in higher condition of relative humidity when temperature and pressure is uncontrolled. This is due to the fact that air density is more under humid condition and higher atmospheric pressure, when more molecules are available for ionization leading to an earlier breakdown.

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