Leakage current (LC) measurements are widely employed to monitor surface electrical activity, surface condition, site pollution and overall performance of insulators, which are all strongly correlated with local conditions. The advantage of field measurements is that they provide an actual view of the phenomena experienced during field service, under the specific service conditions. However, the required long term monitoring results to the accumulation of vast amounts of data. An effective solution to this problem has been proposed by several researchers: the extraction of several values from the waveform is performed, thus reducing the full data set to a fully representative value. This technique has been used in this paper. The target is to extract a representative value of the waveform for the purpose of investigating the role played by the monitored insulators and signal processing, which is the subject of this paper. It is of interest to note that the obtained experience, related to long term field LC waveform monitoring, is presented in this paper.

**RESULTS AND DISCUSSION**

Investigation of the recorded waveforms showed that the majority portrayed low peak LC values. This was expected due to the nature of the phenomenon (high frequency, short periods of activity). Several different thresholds exist ranging from 1 mA to 2.5 mA and were also combined with the other techniques. Results are shown in Figures 7, 8, 9, 10, 11. The number of waveforms portrayed in these figures is the number of waveforms that are not discarded after the application of the threshold. It is shown that low threshold values do not offer an effective solution to the data size problem. The 1 mA threshold, proposed in the literature for similar test sites [28], is proved insufficient for the considered site. The value of 2.5 mA offers the best results and is less than half of the amplitude of the smallest recorded discharge, and therefore is presented in this paper as a threshold value. It is shown that the efficiency of any threshold value is enhanced with the application of the M.M.P.S. technique since a significant number of waveforms exceeded the predefined threshold by just a single point. The enhancement is rather significant in the case of 1 mA and 1.5 mA and smaller in the case of the 2.5 mA, which is another reason why this threshold was considered.

**CONCLUSION**

In this paper, a number of 5000 leakage current waveforms recorded in the field, during a period exceeding 6 years, are investigated in order to obtain an exact image of expected data and problem. The 1 mA threshold, proposed in the literature, is located in a proximity to the sea coast [21-22]. Therefore, a large monitoring project has been issued in order to investigate the performance of different insulator materials and types employed by the Greek Public Power Corporation. Part of the obtained experience, related to long-term field LC waveform monitoring, is presented in this paper.

**EVALUATED TECHNIQUES**

The basic stages of activity and the corresponding LC waveform shapes have been well documented in the literature. The basic discrete stages of activity consist of: sinusoidal waveforms due to the presence of a conductive layer on the insulator surface, distorted sinusoidal waveforms as an intermediate stage and dry band arcing that causes a time lag of current onset. Pulses due to local discharges may also superpose on waveforms at the maximum absolute value of the pivotal cycle. A large number of LC waveform shapes in agreement to the typical shapes suggested in the literature have been recorded in the considered site. The same basic stages are met on both materials, but it should be noted that surface activity is rarer on RTV SIR coated insulators and appears during hydrophobicity loss periods [21-22]. Typical activity portrayed waveforms are illustrated in Figure 2.

**PROBLEM DESCRIPTION**

Noise is a factor of significant influence in the case of field measurements. The monitored insulators and the measuring system are located in a proximity to the sea coast [21-22]. Therefore, a large monitoring project has been issued in order to investigate the performance of different insulator materials and types employed by the Greek Public Power Corporation. Part of the obtained experience, related to long-term field LC waveform monitoring, is presented in this paper. The monitoring site is the 150 kV Transmission Substation of Rio. The location is north next to the sea coast, in Heraklion, Crete. A large number of LC waveform shapes corresponding to the well established stages of surface activity have been recorded in this paper. A number of waveforms portrayed in these figures is the number of waveforms that are not discarded after the application of the threshold. It is shown that low threshold values do not offer an effective solution to the data size problem. The 1 mA threshold, proposed in the literature for similar test sites [28], is proved insufficient for the considered site. The value of 2.5 mA offers the best results and is less than half of the amplitude of the smallest recorded discharge, and therefore is presented in this paper as a threshold value. It is shown that the efficiency of any threshold value is enhanced with the application of the M.M.P.S. technique since a significant number of waveforms exceeded the predefined threshold by just a single point. The enhancement is rather significant in the case of 1 mA and 1.5 mA and smaller in the case of the 2.5 mA, which is another reason why this threshold was considered.

**KEY REFERENCES**


In this paper, a number of 5000 leakage current waveforms recorded in the field, during a period exceeding 6 years, are investigated in order to obtain an exact image of expected data and problem. The 1 mA threshold, proposed in the literature, is located in a proximity to the sea coast [21-22]. Therefore, a large monitoring project has been issued in order to investigate the performance of different insulator materials and types employed by the Greek Public Power Corporation. Part of the obtained experience, related to long-term field LC waveform monitoring, is presented in this paper. The monitoring site is the 150 kV Transmission Substation of Rio. The location is north next to the sea coast [21-22]. Therefore, a large monitoring project has been issued in order to investigate the performance of different insulator materials and types employed by the Greek Public Power Corporation. Part of the obtained experience, related to long-term field LC waveform monitoring, is presented in this paper.

**EVALUATION TECHNIQUES**

The techniques incorporated in field LC monitoring systems should be fast and easily applied in hardware in order to be used online in the field. The Time-Windows (T.W.) technique is a technique commonly used in long term field measurements [14, 25] to cope with the data size problem, and is incorporated in the DAS used in this paper. Further, three techniques are employed in this paper: the Neutralization F.F.C. Technique, the Fundamental Frequency Criteria (F.F.C.) Technique and the Maximum and Minimum Point Smoothing (M.M.P.S.) Technique. Using the N.T. technique, all waveforms that portray peak value under a predefined threshold are discarded, with the definition of the threshold being an issue. Using the M.M.P.S. technique, the maximum and minimum points of the waveform are replaced by their neighboring point with the largest absolute value. Using the F.F.C. technique, all LC waveforms with a fundamental frequency other than 50 Hz are discarded. The T.W. technique is left unaltered. The T.W. technique is left unaltered.