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D.3.5. Application in situ des mesures de décharges partielles très large bande aux câbles 230 kV PR

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Résumé

La technique de mesure de décharges partielles à bande extra large offre de nombreux avantages et pourrait déplacer les détecteurs conventionnels dans certaines applications critiques, par exemple les cables. Il faudra pourtant maintenir une continuité avec les pratiques conventionnelles et établir les relations nécessaires entre ces techniques. Nous présentons des résultats obtenus en plein air durant des essais de qualification de boucles de cables 230 kV. Nous avons atteint une sensibilité équivalente à 4 pC en mesure conventionnelle. L'applicabilité de la norme CEI 270 est aussi discutée.

D.3.5. Ultra-wide bandwidth PD measurements application to open-air testing of 230 kV XLPE cables

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Abstract

The ultra-wide bandwidth (UWB) partial discharge measurement technique has many inherent advantages in enhancing signal to noise ratio and thus has the potential of displacing conventional PD detectors in a number of critical applications, including cables, gas insulated switchgear and rotating machinery. However, it is essential that, in the evolution to such UWB measurements, continuity with past practice and experience be maintained and a clear relationship established between conventional and UWB measurements. Results are presented for UWB measurements performed during qualification testing of 230 kV XLPE cables in an open air environment. The advantages of the technique in achieving an equivalent 4 pC sensitivity in such an environment and the calibration requirements with respect to IEC 270 are presented.

Introduction

Utilities in Canada and elsewhere are under increasing pressure to underground their new transmission facilities in urban areas. Although undergrounding is aesthetically acceptable, the consequences of failure can be extremely severe in financial terms, because of loss of revenue in addition to repair costs. Consequently, there is an increasing need for more searching tests during installation, commissioning and operation of the cable. Such tests are required to ensure the reliability of the entire cable system, and especially joints and terminations.

Testing of installed high-voltage power cables is generally performed at the time of commissioning and thereafter as a routine maintenance or diagnostic test. These tests are made to verify the installation process and to detect defects or deterioration in the cable that could cause problems during service. DC testing has been preferred due to ease and economy of use, but continued use is being questioned due to limited effectiveness. When practical, Ontario Hydro has performed ac testing of short lengths of extruded cables using a resonant test set [1]. In addition to withstand testing, ac excitation also affords the possibility of performing more searching partial discharge (PD) diagnostic testing.

The purpose of this paper is to describe recent efforts at Ontario Hydro in the development of a UWB partial discharge test technique for transmission class cables. Key aspects of the work that will be discussed include its application to open-air testing of 230 kV XLPE cables as part of a qualification and long term aging test program.

Qualification Test Program

Qualification testing is performed on two 230 kV cable designs. Both cables designs featured 500 mm^2 copper conductors, XLPE insulation, an extruded