DESIGNING A COMPENSATOR UNIT FOR HIGH VOLTAGE MEASUREMENT

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ABSTRACT

This thesis describes the studies and research of the development of a compensating unit that will be used to calibrate any attenuation or distortion of an impulse voltage waveshape during transmission.

The compensating unit is modeled by an R-C circuit configuration, which is able to suppress reflection or unwanted signal. By adding this compensating unit to the set up for high voltage measurement, precise measurement can be achieved for the purposes of testing and research works. Simulations of the transmission line modeling as well as R-C circuit configuration had been conducted to observe the theoretical performance of the individual circuit.

The project also involved in fabricating a transmission cable. Comparisons were made between a commercial standard probe cable, which is a one-meter in length of Tektronix Oscilloscope Model TDA 420S, and the fabricated cable. From the results, it could be concluded that for short length of cable, the latter achieved same commercial standard.

The experiment found out that with the addition of one meter of the transmission cable which was connected between the oscilloscope and the developed compensator will introduce further distortion on the output waveshape therefore it was decided that the developed compensator would be attached directly to the oscilloscope.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The transient voltages impinging on apparatus or equipment show wide variation in magnitudes and waveshapes. The severity of stress on the apparatus or equipment insulation will be properly represented during testing if these voltages are standardized on their magnitudes and waveshapes [1]. It is essential to measure these voltages and currents accurately, in order to ensure safety to personnel as well as protecting apparatus against overvoltages and induced voltages.

Before any measurement can be made, scaling down the generated impulse voltages is very essential. The scaling down of the impulse voltages was carried by the employment of the potential divider. The most appropriate potential divider to be used for scaling down the fast rising impulse voltage is the capacitor divider. The capacitor divider is independent of frequency. Although resistive divider is independent of frequency too, serious heating problem limits the utilization of this type of potential divider. The resistance must be low enough to prevent the impedance of stray capacitance from affecting the measurement [2]. The impulse voltages from the lower voltage arm of the capacitor divider were then fed into the transmission cable which was connected to the cathode ray oscilloscope. Normally in the high voltage testing facilities, the locations of the high voltage testing hall and measurement site are separated in a distance of 10 meter or more, depending on the type of tests and its maximum voltage. For lightning impulse test, maximum test voltages can reach as high as 7000kV and the clearances rise linearly with the voltage where clearance of 2 meter for each 1000kV is required[2].