

MEASURING ACOUSTIC NOISE EMITTED BY POWER TRANSFORMERS

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Abstract - This paper proposes a new Measurement Standardization Procedure to measure and quantify the acoustic noise produced by power transformers in audio and video equipment under normal and adverse mains conditions. These conditions and the physical mechanisms that cause the noise are discussed. A new measurement set up and units are proposed to measure and quantify the transformer noise. Examples of measurements on four transformers are given for comparison and illustration.

INTRODUCTION

The aim of this preprint is to propose a new standard procedure for the measurement and quantifying of the acoustical noise produced by power transformers in audio and video equipment under normal and adverse mains conditions.

There is "zero tolerance" among consumers and professional users of audio and video equipment for audible noise of any kind. Nothing is more distressing than the sound of a transformer "buzzing". This is understandable since anyone paying thousands of dollars for a quality system to reproduce music or video wants to hear only music. High end amplifier and studio equipment manufacturers work very hard to ensure the transformers in their products will not make noise under any operating condition. Specifying and selecting a properly designed and manufactured transformer is a critical issue in the design of high quality video and audio products. Power transformers should be dead silent, under no circumstances they should produce any noise.

However, reality is totally different! Transformers may suddenly become noisy. They begin to hum, buzz or rattle, not because they are happy, but because they suddenly operate in a magnetic region where a transformer behaves as an acoustic transducer. This unpleasant feature is known worldwide, and has lead to the need for the development of a new range of "low noise" transformers.

Why does a transformer make noise? Section 1 explains the acoustic noise generating mechanism inside power transformers. Section 2 defines the theory of measuring and quantifying the acoustical power transformer noise. A new set of units for quantifying transformer noise is introduced. A new absorbing type noise test chamber is proposed. Section 3 introduces a measurement setup for emulating adverse mains conditions and defines the calibrated measurement of the acoustical noise levels produced by power transformers under various adverse mains conditions. Section 4 shows and discusses measurements. Conclusions are in section 5.