

# **The noninvasive measurement of x-ray tube potential**

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In this thesis I briefly describe the design of clinical x-ray imaging systems and also the various methods of measuring x-ray tube potential, both invasive and noninvasive. I also discuss the meaning and usage of the quantities tube potential (kV) and peak tube potential (kVp) with reference to x-ray systems used in medical imaging. I propose that there exist several quantities which describe different important aspects of the tube potential as a function of time. These quantities are measurable and can be well defined. I have developed a list of definitions of these quantities along with suggested names and symbols.

I describe the development and physical principles of a superior noninvasive method of tube potential measurement along with the instrumentation used to implement this method. This thesis research resulted in the development of several commercial kVp test devices (or "kVp Meters") for which the actual measurement procedure is simple, rapid, and reliable compared to other methods, invasive or noninvasive. These kVp test devices provide measurements with a high level of accuracy and reliability over a wide range of test conditions. They provide results which are more reliable and clinically meaningful than many other, more primary and invasive methods. The errors inherent in these new kVp test devices were investigated and methods to minimize them are discussed.