Non-contact Human Body Temperature Measurement using Microwave

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The purpose of this research is to study about high sensitivity microwave measurement system to obtain human body temperature. Thermal noise known as Johnson or Nyquist noise is a basic type of noise caused by a change of energy state of charged particles. Therefore, human body with higher than absolute zero temperature radiates electromagnetic wave as a form of thermal noise.

In order to measure human body temperature using the microwave system, several steps are involved. In a typical microwave system, the power spectrum of white noise passing by a cascaded system is changed because the input signal travels through a cascade of many different band pass filter. Therefore, the system has to be characterized by an equivalent noise bandwidth. When an object with certain temperature stands in front of the antenna, arbitrary source noise in the measured signal can be regarded as white noise and modeled as an equivalent thermal noise source. The equivalent noise temperature of the system is obtained by using the Y-factor method. Using pre-calculated an equivalent noise temperature of the system, the reference temperature and equivalent noise bandwidth, the noise power contained in output signal of microwave system can be transmuted as thermal equivalent noise temperature. However, because human bodies don't have perfect black body characteristics, they emit and absorb energy less than black body does in the same frequency range. To solve this problem, emissivity based on the percentage of the components that make up the human body is used in calculating body temperature.