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Infrared Thermometer: Temperature Sensing Device

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Abstract

Temperature sensing devices such as thermometers are in continuous demand. As, Temperature is a common symptom of many infections. There has been a need to constantly check temperatures. It is essential to select the perfect type of device for temperature readings. There are infrared thermometers (e.g., forehead Digital thermometers) specially made for temperature reading from a safe distance with better precision. After COVID-19 outbreak, to prevent risk, infrared thermometer has recently seen an increase in popularity offering a safe and effective technique to monitor

human body temperatures. Infrared thermometers are temperature sensing devices that use electromagnetic radiation to make non-contact surface temperature readings. This allows for contactless, fast measurements of temperature from a safe distance of multiple individuals. An infrared thermometer proposed a suitable way to ensure accuracy in temperature Monitoring. To recognize the infected persons, IR thermometer can accomplish Forehead temperature measurement.

Keywords: Human Body Temperature, Infrared Forehead Thermometer

1. Introduction

After COVID-19 outbreak, to avoid risk, it is essential to routinely check temperatures of individuals. Contact and non-contact are the two categories of Temperature measurement. Forehead thermometers, are also known as an infrared thermometer. Now adays you will find anywhere such as public places, offices, Hospitals etc., the contactless thermometers and temperature guns. There are plenty of choices available. These latest tools are being positioned to check the temperature of human body making use of an infrared wave, which succeed on contactless technology. There are a lot of certified methods which were developed after years of research and definitely, the highest accuracy is achieved by some sort of physical contact between the measurement device and the patient. However, as recent events have shown, there are cases such as virus pandemics, in which avoidance of direct contact with objects that may be used by other people is strongly suggested. The high contagion rate of viruses such as the recent COVID-19 can be best dealt with by achieving highest degree of prevention possible^[1].

Infrared waves or Infrared radiation is a part of the electromagnetic spectrum. Infrared radiation (IR), sometimes referred to simply as infrared. The radiation is characterized by wavelength. The infrared wavelengths range from about 700 nanometers (nm) to 1 millimeter (mm). Every day, we all encounter Infrared radiations. In the electromagnetic spectrum, infrared (IR) is invisible to the human eye as its wavelength is longer than that of visible light. Infrared radiation (IR) is less harmful. The human eye cannot see it, but humans can detect it as heat.

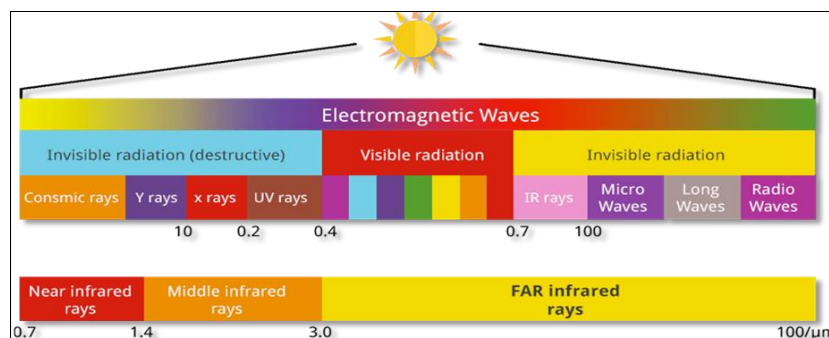


Fig 1: Electromagnetic Spectrum

This region of the spectrum is divided into near, mid, and far-infrared. The region from 8 to 15 microns (μm) is referred to by Earth scientists as thermal infrared since these

wavelengths are best for studying the longwave thermal energy radiating from our globe. The wavelength range of infrared radiation lies between 0.7 μm and 1000 μm .

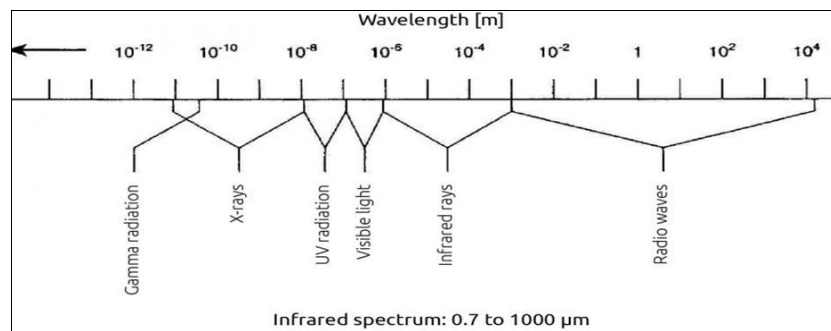


Fig 2: Electromagnetic radiation Spectrum characterized by wavelength

Infrared thermometers measure temperature by sensing the infrared energy which every material or object with a temperature above absolute zero (0°K) will radiate. In the simplest configuration, a lens will focus the infrared radiation onto a detector which in turn will convert this energy into an electronic signal. After compensating for the ambient temperature this signal will be displayed as a temperature reading^[2].

In daily life, the measurement of body temperature is a basic way to determine the normal life of the human body^[3].

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and or the detecting infrared radiation. By knowing the amount of infrared energy emitted by the object, it permits temperature measurement from distance without contact with the object to be measure^[4].

Measurements of forehead temperature are convenient, fast and involve a low risk of infection. Forehead Infrared thermometers (IRTs) are suited to quick screening but are not be used to represent the actual body temperature as tympanic(ear) temperature measurements^[5].

2. Literature review

The coronavirus (COVID-19) has spread globally and temperature measurement is used rapidly to screen people. Handheld forehead IRTs are easy to use, rapid, noncontact, and inexpensive, so they are widely used^[6]. Both electronic thermometers (rectal, oral, axillary sites) and infrared thermometers (forehead and tympanic membrane) accurately measure body temperature, although variability is greatest with the tympanic thermometer. A temperature reading of 37.8°C or more using any of these instruments is abnormal and indicates fever^[7]. Two types of infrared thermometers are uses to measure body temperature: tympanic(ear) and forehead. With the spread of COVID-19 coronavirus, forehead temperature measurement is used widely to screen people for the illness. The performance of this type of device and the criteria for screening are worth studying^[8]. When the temperature of a natural object is higher than the absolute temperature, the surface emits thermal radiation. The infrared thermometer (IRT) detects this radiant energy that is released by the object via sensing elements and converts it into an electrical signal. After signal processing, the measured temperature is displayed on the IRT. This principle is used to develop an IRT to measure body temperature^[9-12]. Many factors affect the temperature measurement of the human body^[13, 14]. Recent technological

advancements have made infrared (IR) thermometers the choice for contactless screening of multiple individuals. Yet, even so, the measurement accuracy of such thermometers is affected by many factors including the distance from the volunteers' forehead, impurities (such as sweat), and the location measured on the volunteers' forehead. While minimal, temperature differences between the center and lateral areas of the forehead highlight the importance of the user in targeting the right area, which is the center of the forehead. It is necessary for the user to take precaution in ensuring that the forehead is dry and the skin surface temperature is restored before accurate measurements can be taken^[15]. Some non-contact infrared thermometers (NCITs) devices may not be consistently accurate enough to be used as a stand-alone temperature measurement tool to determine if the temperature exceeds a specific threshold (e.g., 38°C) in an adult population. Model-to-model variability and individual model accuracy in the displayed temperature are a major source of concern. Users should be aware of the consequences of false negatives and false positives when using NCITs as a screening tool. Accuracy and credibility of the NCITs should be thoroughly evaluated before using them as an effective screening tool. Factors affecting NCIT temperature measurement and their interpretations should be considered when developing the temperature measurement protocol and screening criteria^[16].

Temperature measurement provides information about the internal energy of an object, and its determination and control are of significant diagnostic importance.

The human body temperature values are distributed accordingly: constant temperature inside the body (deep temperature), variable temperature of the skin and extremities (surface temperature). From the surface of the body, heat is dissipated into the environment in several mechanisms: radiation, conduction, convection, evaporation. In the case of checking a large number of people in public places, the first choice is noncontact thermometers that allow temperature measurement without any contact with the person. The temperatures measured with contact thermometers in the upper armpit were higher than the temperatures measured noncontact on the forehead. In the armpit, with the arm closed, there are different thermal conditions than on the surface of the forehead, which is exposed. To correctly interpret the result of measuring human body temperature, it is necessary to specify the place of measurement and the type of thermometer used^[17].

The use of forehead thermometers has increased because

they are easy to operate, and it is possible to take a reading without any contact between people. However, they may be less accurate than other thermometers, such as oral or ear thermometers, particularly if people do not use them properly. To ensure they get the most accurate reading, a person should read the manufacturer's instructions and make sure the forehead is clean and free of hair or headwear in the measurement area [18].

3. Result and discussion

Infrared and Contactless Thermometer Guns are extremely easy to operate and are used to get instant and exact temperature measurement with a one-touch button. It has Low battery consumption. It can quickly return a temperature result. It has a distance sensing capability. So, the chances of infection and transferable diseases automatically get reduced. You can adjust the settings to get accurate readings, whenever you are measuring the temperature. You can easily adjust the readings between Celsius and Fahrenheit to be easy while checking the temperature. When an object comes close to the sensor, the infrared light from the LED reflects off, of the object and is detected by the receiver. You should press a button to start the reading and wait until the device toots or flashes the temperature reading on a screen. This should only take a few seconds [19].



Fig 3: Infrared and Contactless Forehead Thermometer Gun

You can measure the body temperature easily at everywhere. We can use it at home. Every one Even a Kid Can Measure the Temperature Easily. A traditional thermometer has to be disinfected or wash after every measurement or use. Don't necessarily send radiation inside the body and hence affect you, since Infrared thermometers guns work by using Infrared radiation. However, because of their ability to measure temperature from a safe distance range, these devices have a wider scope of application than just checking whether you have a fever.

4. Conclusion

This paper does review on human body temperature measurement by Forehead Digital Infrared Thermometer. IR forehead thermometers check the human temperature by sensing the infrared energy radiated by the body. Forehead Digital Infrared Thermometer is a good measure in controlling the spread of the disease. Forehead thermometers could help to scan large number of peoples. Making use of forehead thermometers regularly is not terrifying. It is essential to specify the place of measurement and the type of thermometer used in order to correctly interpret the result of measuring human body temperature. The chances of infection and disease transmission, without bringing the device in contact, automatically get reduced by

using IR thermometer. Read the instructions before you start measuring the temperature since the range can vary depending upon the thermometer you are using.

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