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An optical model for non-invasive measurements of human blood glucose level

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Numerous technical challenges preventing the development of non-invasive blood measurement techniques involve the interfaces between the primary skin layers. The ability to accurately and non-invasively measure human glucose level characteristics potentially lies within optical-based systems. Current reliable blood analysis techniques invariably require intravenous blood extraction. A much preferred blood flow measurement setup would utilizes harmless levels of electromagnetic radiation that penetrates beneath the skin and provides feedback which corresponds with important properties of red blood cells, the hemoglobin and hence glucose levels. However, there exist numerous major technical challenges, which include the lack of accurate models that describe light interaction and characteristics of the skin, particularly at the interface between the primary layers: the epidermis, and dermis. It remains essential to explore alternative approaches that may evolve into reliable, accurate, and pain-free blood analysis techniques that account for the interactions between these critical skin layers. The development of a physical model of the skin will provide a framework for exploring integrated optoelectronic systems. In this work, the optical response of the skin layers is explored.