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The infrared conductivity of graphene

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The discovery of graphene is probably one of the most important events in modern condensed matter physics. Besides being a material that is only one atom thick, it has electronic properties which are usual when compared with ordinary metals and semiconductors. These unusual properties are reflected in its infrared conductivity. We will discuss the physical processes that affect the low frequency conductivity of graphene. We show that while the standard model of graphene is capable of explaing most of the features, it also fails in some aspects, indicating that we still do not have a full understanding of the physical mechanisms that control the electronic properties of this amazing material.