Dedication

This research work is dedicated to my parents, brothers, sisters, husband and teachers.

Acknowledgements

I would like to express my deep gratitude and sincere thanks to my supervisor Professor Mubarak Dirar Abdallah. Deep thanks to him for his faithful help and assistance. My thanks are also extended to the Department of Physics, Faculty of Science of Sudan University and Technology, the Faculty of Engineering and Technology of Al-Jazeera University and the Faculty of Education, Hantoub, Department of Physics and Mathematics which made their libraries available to me.My gratitude goes also to my family for their patience and financial support, especially my father. At last, but not at least, I thank everyone that helped me in the course of undertaking this research work.Firstly and finally, thanks and praise be to Allah, the almighty.

Abstract

The physics of conduction by hopping in superconductivity is not yet well established. This work is concerned with trying to throw light on conduction by hopping in superconductivity. It uses Schrödinger equation for energy wave function which time and spatial dependent or spatial dependent only. It is found that the wave function is highly localized in most cases which means that electrons conduct through hopping to adjacent atoms only. One solution shows the possibility to electron travelling which agrees with Cooper model. The critical temperature is shown to depend on binding energy. Plasma equation is also used to find new Schrödinger temperature dependent equation. The solution of these equations are based on free particle solution beside quantum expression for resistance. This expression for resistance splits into real and imaginary or positive and negative one. The real positive superconductivity resistance, which represents super resistance vanishes beyond a certain critical temperature, which requires large binding energy and hopping mechanism. This work can be extended to use a new quantum model applications in nano particles, thermodynamics properties and the super fluidity behavior.

مستخلص

تعتبردراسة التوصيل بالقفزمن الدراسات الغير ناضجة. تهدف هذه الدراسة إلي تسليط الضوء علي كيفية التوصيل بالقفزعبر المواد فائقة التوصيل.تستخدم الدراسة معادلات (شرودنجر) لموجات فراغ الطاقة المعتمدة علي الزمان والمكان أو المكان فقط.توصلت الدراسة إلي أن الموجات تتموضع في أغلب الحالات مما يعني أن توصيل الالكترونات يكون بالقفزللذرات المجاورة فقط. تظهر أحد الحلول إمكانية انتقال الالكترونات وهذا يتسق مع نموذج كوبر،حيث تعتمد درجة الحرارة الحرجة علي طاقة الربط .استخدمت معادلات البلازما أيضا للحصول علي معادلة (شرودنجر) جديدة تعتمد علي درجة الحرارة.حيث تعتمد حلول هذه المعادلة علي حل الجسيمات الحرة بجانب التعبير الكمي للمقاومة.وهذا التعبير للمقاومة ينقسم إلي حقيقي وتخيلي أو موجب وسالب حيث ينعدم الجزء الحقيقي والموجب الممثل للمقاومة الفائقة عند درجات الحرارة الاقل من الحرجة وهذا يتطلب طاقة ربط عالية وتوصيل بالية القفز.هذا العمل يمكن أن يمتد باستخدام تطبيقات نماذج الكم في جزيئات النانو، والخصائص الديناميكية الحرارية و حالة الميوعه الفائقة.

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