BSS 2014 - Notes

Taper

March 20, 2017

Abstract

This is a note for an guide to the video recordings of Boulder Summer School (BSS) 2014, whose major topic is: **Modern Aspects of Superconductivity**. However, after I worked out some outlines of these lectures, I found the Yale's website about BSS, I found here their list of topics. I found nothing relavent to my current study. So I quit this note. The Yale's website is a better guide (in my opinion) to these videos.

Contents

1 Introduction to BSS 2014 - Topic: Superconductivity

sec:intro

Link:Introduction in Youtube.

From 0' 14', introduction about this school, its **success**, its rules, its people (TAs, etc.), Tips, **No Alcohol**.

From 14' end' , introduction to content of this school. balabala.

2 Dessau - ARPES

sec:Dessau

2.1 Dessau 1

sec:Dessau 1

Link: Dessau 1 in Youtube, Skipped.

Dessau (University of Colorado, Boulder. Experimentalist).

3': **ARPES for the studies of superconductivity**, this lecture will tells us about: what it can measure, and its comparison with other spectroscopies.

5'30": **Plan**

- Discussion of technique
- Case studies, mostly from p-type cuprates
- Focus where ARPES made largest initial impacts.
- Early studies using Fermi Liquid theory (failed), Recent ...
- Topics: Evolutin of electronic structure from the parent Mott state, Fermi surfaces and Fermi arcs, superconducting gaps, pseudogaps, self-energy effects.

2.2 Dessau 2

sec:Dessau 2

Link:Dessau 2 in Youtube, Skipped.

Plan:

- Overview of 2D electronic detection
- Studies of gaps (superconducting gaps, pseudogaps)
- Mode coupling (dispersion kinks)

2.3 Dessau 3

sec:Dessau 3

Link:Dessau 3 in Youtube, Skipped.

Plan

- ARPES on n-type cuprate superconductors, esp. "hot spots".
- Pseudogaps and SC gaps in p-type cuprates.
- Competition between pairing and pair-breaking (electron self energies)

Maybe I should watch this.

- Linearity, deviation from linearity, ARPES scattering rates, and transport.

3 Martinis - Desig of Superconducting Quantum Computer

onducting Quantum Computer

sec:Martinis 1

3.1 Martinis 1

Link:Martinis 1 in Youtube, Skipped.

John Martinis, from UC Santa Barbara (UCSB).

How Superconducting gives us a very unique, reasonably feasible, way to build a Quantum Computer.

Outline

- Exponential computing power (why we build)
- Hardware Requirements
- Physics of Qubits, review
- Error correction, the need for fault-tolerant computation.
- Surface code theory (error-correction and architecture)
- Xmon superconducting qubits, integrated circuits for scaling above fidelity threshold.

sec:Martinis 2

3.2 Martinis 2

Link:Martinis 2 in Youtube, Skipped.

(It seems that there is not outline/plan available.)

4 Q & A Week 1

sec:QA Week 1

Link:Youtube, Skipped.

5 Randeria - Phenomenology of Superconducting

sec:Randeria

Links: Randeria 1, Randeria 2, Randeria 3, Randeria 4.

Skipped.

6 Sigris - Symmetry Aspects of Unconventional Superconductivity

sec:Sigris

https://www.youtube.com/watch?v=YtEF9sm03rg&list=PL8mMEmoXNBfajJ15HO5G-PZW_0yWGWBdh&index=12

7 Keimer - Neutron and x-ray scattering studies of superconductors

sec:Keimer

https://www.youtube.com/watch?v=V_Ijobdl-DY&list=PL8mMEmoXNBfajJ15HO5G-PZW_0yWGWBdh&index=16

8 Kvelson - Simples models of Interacting Electrons

sec:Kvelson

https://www.youtube.com/watch?v=k5qZILzmIDA&list=PL8mMEmoXNBfajJ15HO5G-PZW_0yWGWBdh&index=19

I should watch this later too!

9 Paramekanti -

sec:Paramekanti

https://www.youtube.com/watch?v=8g1YAISQhPM&list=PL8mMEmoXNBfajJ15HO5G-PZW_0yWGWBdh&index=24

Plan

- Phase diagram and broad questions
- Some basic microscopics
- Mott transition - entropy arguments
- Mott transport - renormalized mean field theory
- Superconductivity
- Parton (Slave Boson) description (Lec.2)
- Variational Monte Carlo method (Lec.2)

10 Public Lecture - Steven Kivelson from Stanford

sec:Public Lecture

https://www.youtube.com/watch?v=bO1_rs12gpY&index=26&list=PL8mMEmoXNBfajJ15HO5G-PZW_0yWGWBdh

Outreach effort for junior people.

Topic: Emmergence, Macroscopics Quantum Phenomenon and High-T Superconductivity.

watch this later!

11 Q & A Week 2

sec:QA Week 2

https://www.youtube.com/watch?v=j1NgPXq_6QM&list=PL8mMEmoXNBfajJ15HO5G-PZW_0yWGWBdh&index=27

12 Todadri - Superconductivity, its friends and its enemies, near Mott transition

sec:Todadri

T. Senthil from MIT.