

Viel-Teilchen Theorie ultrakalter Atome

Ludwig G. Mathey
ZOQ
(Dated: April 7, 2011)

I. VERANSTALTUNG

66-611
Seminar über Viel-Teilchen Theorie ultrakalter Atome
2st. Di 14.00-15.30 SemRm 6
Beginn: 12.04.2011

Ludwig G. Mathey
lmathey_online@mac.com
Temporäres Dienstzimmer:
Institut für Laserphysik, Rm. 208

II. SPRECHSTUNDE

Sprechstunde: Jederzeit!
Zusätzlich: Im Anschluss an das Seminar, im Dozentenraum 301

III. VORTRAGSTHEMEN, THEMATISCH

A. Thema: From the non-interacting Bose gas to fluctuating condensates

Summary of
Pethick + Smith, Ch. 1+2
Pethick + Smith, Ch. 6.1, 6.2, 6.4, 7.1, 7.2, 7.6
Schwabl 2, Ch. 3.2, esp. 3.2.2 + 3.2.3
Pethick + Smith, Ch. 8.1 + 8.2

Discussion of
C. Mora and Y. Castin, Phys. Rev. A 67, 053615 (2003), general formalism, quadratic terms, homogeneous case, correlation functions.

B. Thema: Phase-fluctuating regime of 3D condensates

D. S. Petrov, G. V. Shlyapnikov, and J. T. M. Walraven, Phys. Rev. Lett. 87, 050404 (2001)

P. Öhberg, E. L. Surkov, I. Tuttonen, S. Stenholm, M. Wilkens, and G. V. Shlyapnikov, Phys. Rev. A 56, R3346 (1997)

S. Dettmer et al., Phys. Rev. Lett. 87, 160406 (2001)

C. Thema: Mott insulating transition

Sachdev Ch. 10
M. Greiner, O. Mandel, T. Esslinger, T. W. Hnsch, and I. Bloch, Nature (London) 415, 39 (2002)

D. Thema: Hardcore bosons

Sachdev, 11.1, 11.2 (esp. 11.2.2), 11.4 (esp. 11.4.2), 14.1 until Eq. (14.5), (cite 14.4, derive 14.5)
see also: Giamarchi, Ch. 3.1, 6.1 and M. A. Cazalilla, J. Phys. B: At. Mol. Opt. Phys. 37, S1 (2004).
B. Paredes, A. Widera, V. Murg, O. Mandel, S. Foelling, I. Cirac, G. V. Shlyapnikov, T. W. Hnsch, and I. Bloch, Nature (London) 429, 277 (2004).

E. Thema: BEC-BCS cross-over

Review of BCS theory:
Pethick-Smith, Ch. 14.1, 14.3, esp. 14.3.3

Experimental realization:
M. Greiner et al., Nature (London) 426, 537 (2003)
S. Jochim et al., Science 302, 2101 (2003)
M.W. Zwierlein et al., Phys. Rev. Lett. 91, 250401 (2003)

F. Thema: Luttinger liquid theory of 1D Fermi systems

Giamarchi, Ch. 2

IV. VORTRAGSTHEMEN, DIDAKTISCH

A. Woche 1, 5. April

Organisatorisches, Kennenlernen

B. Woche 2, 12. April: Bose gas

Pethick + Smith, Ch. 1+2

C. Woche 3, 19. April, Gross-Pitaevskii equation

Pethick + Smith, Ch. 6.1, 6.2, 6.4, 7.1, 7.2, 7.6

D. Woche 4, 26. April: Bogoliubov theory of weakly interacting Bose gases

Schwabl 2, Ch. 3.2, esp. 3.2.2 + 3.2.3
Pethick + Smith, Ch. 8.1 + 8.2

E. Woche 5, 3. Mai: Fluctuating condensates

C. Mora and Y. Castin, Phys. Rev. A 67, 053615 (2003), general formalism, quadratic terms, homogeneous case, correlation functions.

F. Woche 6, 10. Mai: Phase-fluctuating regime of elongated 3D condensates

D. S. Petrov, G. V. Shlyapnikov, and J. T. M. Walraven, Phys. Rev. Lett. 87, 050404 (2001)
P. Öhberg, E. L. Surkov, I. Tuttonen, S. Stenholm, M. Wilkens, and G. V. Shlyapnikov, Phys. Rev. A 56, R3346 (1997)
S. Dettmer et al., Phys. Rev. Lett. 87, 160406 (2001)

G. Woche 7, 17. Mai: Hardcore Bosons

Sachdev, 11.1, 11.2 (esp. 11.2.2), 11.4 (esp. 11.4.2), 14.1 until Eq. (14.5), (cite 14.4, derive 14.5)
see also: Giamarchi, Ch. 6.1

H. Woche 8, 24. Mai: Luttinger liquid theory I

M. A. Cazalilla, J. Phys. B: At. Mol. Opt. Phys. 37, S1 (2004). Part 1-3

Giamarchi, Ch. 3.1

I. Woche 9, 31. Mai: Luttinger liquid theory II

M. A. Cazalilla, J. Phys. B: At. Mol. Opt. Phys. 37, S1 (2004). Part 4-6
Giamarchi, Ch. 3.1

J. Woche 10, 7. Juni: Luttinger liquid theory III

Giamarchi, Ch. 2.1, 2.2

K. Woche 11, 21. Juni: Mott insulator transition

Sachdev Ch. 10
M. Greiner, O. Mandel, T. Esslinger, T. W. Hansch, and I. Bloch, Nature (London) 415, 39 (2002)

L. Woche 12, 28. Juni: MI transition in 1D, Sine-Gordon model

Giamarchi, 11.1
J. B. Kogut, Rev. Mod. Phys. 51, 659 (1979)

M. Woche 13, 5. Juli: Cold fermionic gases, BCS theory

Pethick-Smith, Ch. 14.1, 14.3, esp. 14.3.3

N. Woche 14, 12. Juli: Luttinger liquid theory IV

Giamarchi, Ch. 2.3