International Conference

Strongly Coupled Coulomb Systems

30 July – 4 August 2017, Kiel

Keynote Speakers

Gordon Baym (Illinois, USA)
Siegfried H. Glenzer (Stanford, USA)
Stefan Kuhr (Strathclyde, UK)
Stephane Mazevet (Paris, France)
Carlo Pierleoni (L'Acquila, Italy)
Andrea Tomadin (Genoa, Italy)

Invited Speakers

Bernard Bernu (Paris, France)
Ben van Duppen (Antwerp, Belgium)
Tobias Dornheim (Kiel, Germany)
Yan Feng (Soochow, China)
V.E. Fortov (Moscow, Russia)
Martin French (Rostock, Germany)
Fabian Heirich-Meisner (Munich, Germany)
Y.E. Lozovik (Moscow, Russia)
Manoel Manghi (Toulouse, France)
Andrea Perali (Camerino, Italy)
Alessandro Principi (Nijmegen, Netherlands)
Niclas Schlünzen (Kiel, Germany)
Luciano Silvestri (Boston, USA)
Jan Vorberger (Dresden, Germany)
Ulf Zastrau (Hamburg, Germany)

Local Organizing Committee SCCS 2017
Michael Bonitz, Patrick Ludwig & Zhandos Moldabekov
e-mail: sccs2017@physik.uni-kiel.de

Deutsche Forschungsgemeinschaft DFG

C | A | U

http://www.uni-kiel.de/sccs2017

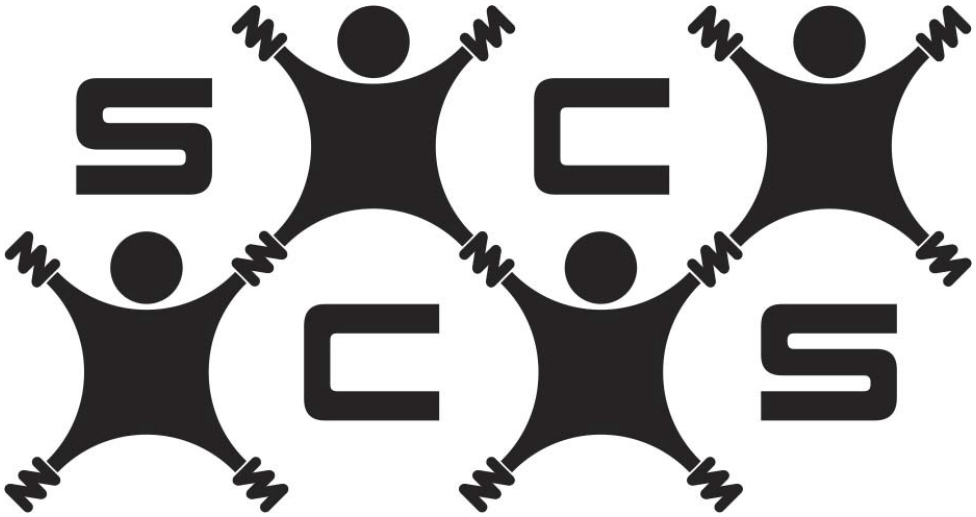
Local Organizing Committee of SCCS 2017
Michael Bonitz, Chair (Kiel University)
Patrick Ludwig (Kiel University)
Zhandos Moldabekov (Kiel University)

Program Committee
Ronald Redmer, Chair (Rostock University)
Angel Alastuey (École Normale Supérieure de Lyon)
Michael Bonitz (Kiel University)
David Neilson (Universitá degli studi di Camerino)

Executive Committee
Michael Bonitz, Chair (Kiel University)
Vladimir Fortov (Russian Academy of Sciences)
John Goree (University of Iowa)

Chair of International Advisory Board
David Neilson (Universitá degli studi di Camerino)

Sponsors
German Science Foundation (DFG)
Kiel Nano, Surface and Interface Science (KiNSIS)
WE Heraeus Travel Grant
Springer Science + Business Media
ShareLaTeX.com
ADDITIVE Software



STRONGLY COUPLED COULOMB SYSTEMS

Final Program & Book of Abstracts

Kiel, July 30–August 4, 2017
Wissenschaftszentrum Kiel

Topics of SCCS 2017

1. Dense and astrophysical plasmas
2. Plasmas in condensed matter
3. Confined and mesoscopic Coulomb systems
4. High-energy-density plasmas in the laboratory
5. Classical charged systems
6. Developments in theoretical methods and numerical techniques
7. Dynamics of correlated quantum Coulomb systems

Conference website
http://www.uni-kiel.de/sccs2017

Welcome to SCCS 2017

'Strongly Coupled Coulomb Systems' (SCCS) is a major series of international conferences for scientists drawn from a large variety of fields including plasma physics, astrophysics and condensed matter physics. In all these fields the behavior of charged many-particle systems and the role of their correlations play a central role, and many results from one area have been found useful in other areas as well. The idea of a conference bringing together experts from such diverse fields is due to Gabor Kalman who organized the first meeting in 1977. 40 years back it was not foreseeable that this would become such a successful conference series.

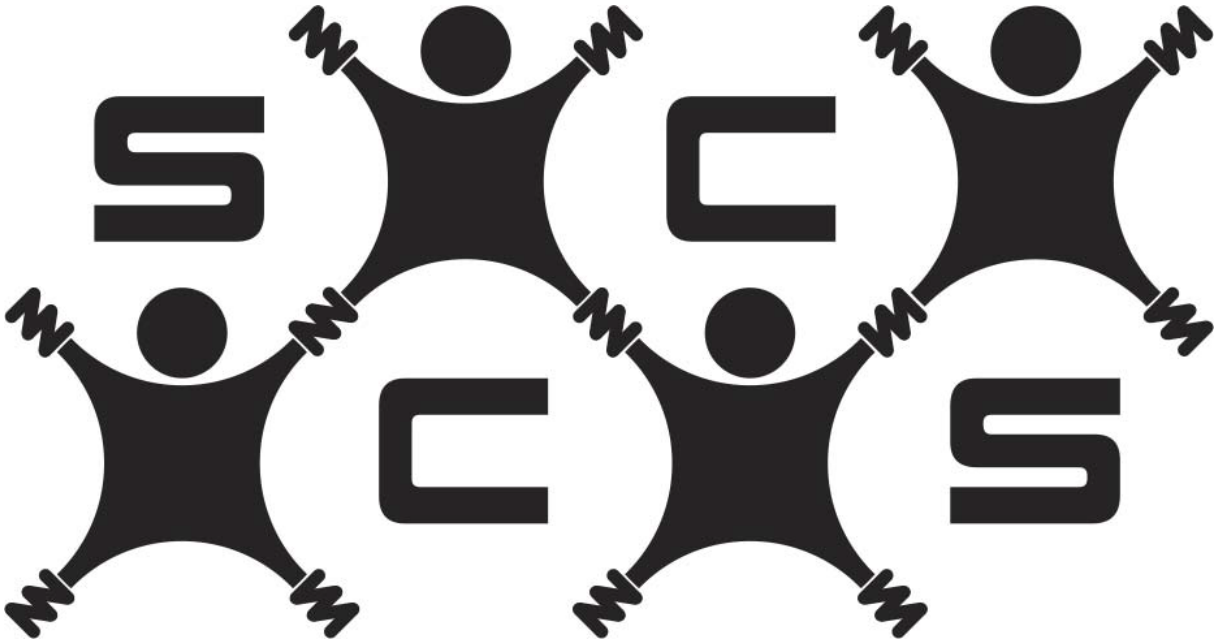
In the mean time the SCCS conferences have become an important event held in 3 years intervals in locations all over the world. The goal is to provide a regular international forum for the presentation and discussion of research achievements and ideas relating to a variety of plasma, liquid and condensed matter systems that are dominated by strong Coulomb interactions between their constituents. Each meeting has seen an evolution of topics that have followed in the steps of new discoveries and new methods. In recent years the field has seen the emergence of new experimental tools and access to new strongly coupled conditions including e.g. dusty plasma, ultracold neutral plasmas. Each time novel topics emerge. This time these are the topics of dynamics of correlated quantum systems, including cold fermionic atoms and plasma-surface interaction.

The program committee and the local organizers have managed to form an excellent and exciting collection of talks and posters, and we have created best possible conditions for a stimulating exchange of ideas. The conference has attracted a very diverse international group of researchers – from leading experts with long research experience – to the next generation: young scientists and students. To support participants financially, the organizers have obtained substantial funds from the German Science Foundation (DFG) and Kiel University (KiNSIS). But we are equally grateful to our keynote and invited speakers who have returned part of our travel support in order to make participation of young researchers possible.

We wish all participants a successful SCCS conference and a memorable stay in Kiel.

Michael Bonitz, Patrick Ludwig & Zhandos Moldabekov
Local organizing committee

SCCS 2017
Conference Schedule



Monday, July 31

08:30 Opening

Session I: Dense and astrophysical plasmas

10:15 Coffee break and informal discussions

Session II: Classical charged particle systems

12:30 Lunch and informal discussions

Session III: Dynamics of correlated quantum Coulomb systems

16:15 Coffee break and informal discussions

Poster introductions and poster session I

16:30–18:00

Tuesday, August 1

Session IV: Dense and astrophysical plasmas

10:15 Coffee break and informal discussions

Session V: Confined and mesoscopic Coulomb systems

12:30 Lunch and informal discussions, IAB meeting

Session IV: Dynamics of correlated quantum Coulomb systems

16:15 Coffee break and informal discussions

Poster introductions and poster session II

16:30–18:00

Historical remarks

17:45 W. Ebeling

What is the correct choice of the plasma partition function and the lowering of the ionization energy–on contributions by Planck and Unsöld 52

Wednesday, August 2

Session VII: High-energy-density plasmas in the laboratory

08:45 S.H. Glenzer
[keynote] *Ultrafast probing of dense plasmas–visualizing dynamics of Strongly Coupled Coulomb Systems* 53

09:30 D.H.H. Hoffmann
Accelerator driven high energy density science: status of HED physics at FAIR and GSI 54

09:45 T. Döppner
Ionization measurements in 30-fold compressed, near-degenerate plasmas . 55

10:00 G. Norman
Ionization of molecules at the fluid-fluid phase transition in warm dense hydrogen 56

10:15 Coffee break and informal discussions

Session VIII: Confined and mesoscopic Coulomb systems

10:45 A. Perali
[invited] *Strong electron correlations in graphene and related materials* 57

11:15 E.H. Hwang
Coupled plasmon modes in vertically stacked 2D nanomaterials 58

11:30 H. Totsuji
Strongly coupled fine particle clouds in fine particle plasmas 59

11:45 H. Pan
Strongly coupled dusty plasma in a 2D harmonic trap 60

12:00 P. Hartmann
Diffusion in two-dimensional quasi-magnetized rotating dusty plasmas 61

12:15 K. Müller-Dethlefs
Observation of a periodic many-body system 62

12:30 Lunch and informal discussions

Conference excursion to Lübeck

14:00–20:00

Thursday, August 3

Session IX: Developments in theoretical methods and numerical techniques

08:45 C. Pierleoni
[keynote] *Coupled electron-ion Monte-Carlo methods for warm dense hydrogen* 63
09:30 T. Dornheim
[invited] *Ab initio Quantum Monte Carlo results for the warm dense electron gas* . . . 64
10:00 F. Heidrich-Meisner
[invited] *Nonequilibrium dynamics in the Hubbard model* 65

10:30 Coffee break and informal discussions

Session X: High-energy-density plasmas in the laboratory

11:00 V.E. Fortov
[invited] *Quasi-adiabatic multi-shock compression of strongly coupled plasmas: correlations and degeneracy* 66
11:30 D.N. Nikolaev
Brightness temperature and specific conductivity of multiple shocked initially gaseous protium and deuterium up to 0.4 TPa 67
11:45 U. Zastrau
[invited] *High energy density plasmas diagnosed with X-ray free electron lasers* 68
12:15 P. Sperling
Exploring the physical properties of warm dense water by using Free-Electron-Laser 69

12:30 Lunch and informal discussions

Session XI: Electron liquids and complex plasmas

14:30 A. Principi
[invited] *Viscosity, thermal conductivity and violation of the Wiedemann-Franz law in hydrodynamic electron liquids* 70
15:00 A. Bataller
2D plasma condensation in monolayer semiconductors 71
15:15 L. Silvestri
[invited] *Collective behavior of Yukawa systems* 72
15:45 T.S. Ramazanov
Structural and dynamic properties of strongly coupled dusty plasma of RF discharges 73
16:00 H. Charan
Bow shock formation by supersonic flows in the presence of an obstacle in a two dimensional strongly coupled complex plasma 74

16:15 Coffee break and informal discussions

Poster introductions and poster session III

16:30–18:00

Conference dinner

19:30–23:00

Friday, August 4

Session XII: Plasmas in condensed matter

10:15 Coffee break and informal discussions

Session XIII: Transport properies of dense plasmas

12:30 Lunch and informal discussions

Session XIV: Thermodynamics of strongly coupled plasmas

15:00 Concluding discussion. Closing remarks

Direct determination of dynamic properties of strongly coupled plasmas

I.M. Tkachenko*[1], Yu.V. Arkhipov[2], A.B. Ashikbayeva[2], A. Askaruly[2], L. Conde[3], A.E. Davletov[2], Z. Donkó[4], D.Yu. Dubovtsev[2], P. Hartmann[4], I. Korolov[4], S. Syzganbayeva[2]

[1] Universidad Politécnica de Valencia, Valencia, Spain
[2] Al-Farabi Kazakh National University, Almaty, Kazakhstan
[3] Universidad Politécnica de Madrid, Madrid, Spain
[4] Wigner Research Centre for Physics, Budapest, Hungary

A closed algorithm is suggested which allows the determination of dynamic characteristics of various strongly coupled plasmas (one- and two-component plasmas, electron gas, etc.) within the non-perturbative model-free moment approach without any data input from simulations or direct experiments. The standard Nevanlinna formula (see [1,2] and references therein) for the loss function (LF) which incorporates its independently calculated power frequency moments or the sum rules is complemented with an observation with respect to the LF low-frequency behavior [2]. Thus, the constructed LF satisfies all involved sum rules automatically and permits to determine the system's dynamic structure factor (DSF), the dispersion, the decay, and other characteristics of the collective modes using only the (partial) static structure factors obtained numerically or theoretically. For one-component plasmas it also provides a model for the dynamic local-field correction [3]. Simplified interpolation formulas for the LF moments, which do not need the external static data, are also suggested whose validity confirms the robustness of the present approach. A good quantitative agreement with molecular dynamics simulation data is achieved in a wide realm of variation of the system parameters, see, for example, the following figures where our results computed on the basis of static characteristics obtained by the molecular-dynamics (MD) method are compared to the MD dynamic data.

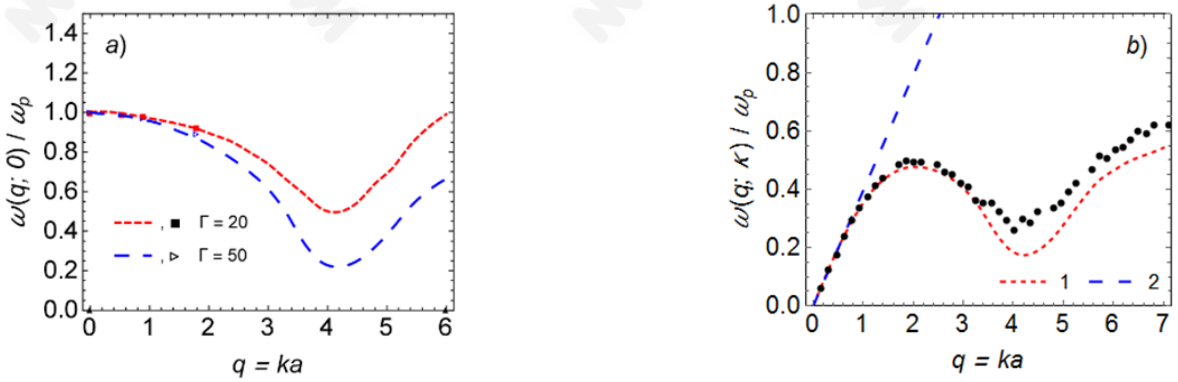


Figure: *Dispersion of plasma modes compared to MD data (figures): a) Coulomb OCP, b) Yukawa OCP at Γ=100 and κ=2. Line 2 stands for the sound mode. a is the Wigner-Seitz radius.*

[1] I. M. Tkachenko, Y. V. Arkhipov, and A. Askaruly, *The Method of Moments and its Applications in Plasma Physics* (Lambert, Saarbrücken, 2012)
[2] Yu. V. Arkhipov et al., Phys. Rev. E **90**, 053102 (2014), *ibid*, **91**, 019903 (2015)
[3] Yu.V. Arkhipov et al., Phys. Rev. E **81**, 026402 (2010)

* email: imtk@mat.upv.es