

# ExtreMe Matter Institute EMMI



[www.gsi.de/emmi](http://www.gsi.de/emmi)



# EMMI

- founded in 2008 in framework of Helmholtz Alliance (2008 - 2015)  
*Cosmic Matter in the Laboratory*

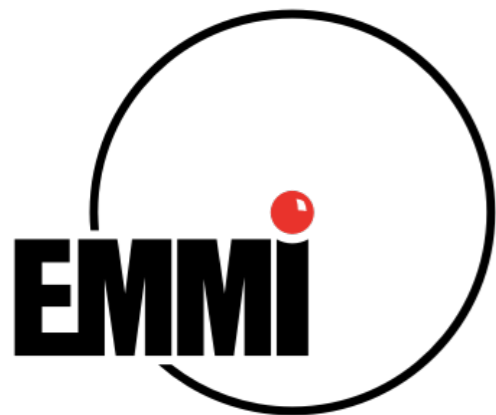


Alliance on Cosmic Matter  
in the Laboratory

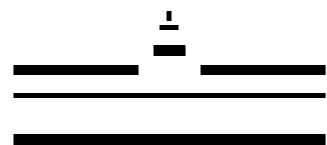
- since 2016 continued as part of GSI:  
taking the momentum of the alliance into the future

# EMMI Partner Institutions

- GSI Helmholtz Centre for Heavy Ion Research
- Forschungszentrum Jülich
- Technische Universität Darmstadt
- Goethe-Universität Frankfurt
- Ruprecht-Karls-Universität Heidelberg
- Universität Münster
- Max-Planck-Institut für Kernphysik (MPIK), Heidelberg
- FIAS Frankfurt Institute for Advanced Studies
- Université VI (Pierre et Marie Curie), Paris
- Lawrence Berkeley National Laboratory, Berkeley
- Joint Institute for Nuclear Astrophysics (JINA)
- University of Tokyo
- RIKEN, Saitama



# ... and its Partners



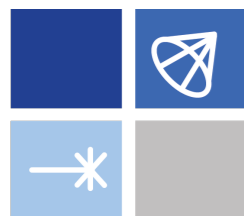
WESTFÄLISCHE  
WILHELMS-UNIVERSITÄT  
MÜNSTER



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT



BERKELEY LAB  
Lawrence Berkeley National Laboratory



JINA-CEE



東京大学  
THE UNIVERSITY OF TOKYO



UPMC  
SORBONNE UNIVERSITÉS



FIAS Frankfurt Institute  
for Advanced Studies



UNIVERSITÄT  
HEIDELBERG  
ZUKUNFT  
SEIT 1386



MAX-PLANCK-INSTITUT  
FÜR KERNPHYSIK



HGSFP



HGS-HIRe for FAIR  
Helmholtz Graduate School for Hadron and Ion Research



# Organisation

## 13 Partner Institutions

### Management:

Scientific Director: Peter Braun-Munzinger

Scientific Coordinator: Carlo Ewerz

+ administrative support (EMMI Office)

31 further experts as **Associated Partners**

**Steering Committee** (representatives of Partners)

as main steering body

**Scientific Advisory Committee** (8 external experts)

# Budget

During Alliance funding period:

18.745 MEuro for 6 years or

3.12 MEuro per year

matched by the partner institutions with

63.111 MEuro in 6 years

Since 2016 as department of GSI

(without partner institutions):

500 kEuro per year

# Main Research Areas of EMMI

Matter under extreme conditions of temperature, density and pressure, in particular

- quark-gluon plasma, phase diagram of strongly interacting matter, and hadron physics
- structure and dynamics of neutron-rich systems from the laboratory to the stars
- plasma physics
- atomic physics and ultracold gases

... and related topics

Aim:

bringing together the best minds from these communities

# Emergence of common concepts

Common underlying theoretical concepts for strongly coupled systems, and systems requiring combination of different theoretical methods

- BEC and BCS
- QGP and ultracold Fermi gases
- holographic duality relating QCD to black holes
- multi-messenger astronomy: neutron star mergers, kilonovas, ...
- hydrodynamics, turbulence, ...
- ...



# Goals

## **central goal of EMMI:**

act as think tank & provide intellectual environment  
for extreme matter research (at GSI and beyond)

aiming at:

- interdisciplinary scientific events of highest quality
- strong promotion of early-career researchers
- network among two Helmholtz centres and eleven top national and international laboratories and universities

# EMMI Scientists

- more than 100 senior researchers participating in EMMI, more than 400 scientists in total
- 14 new positions (professorships / tenured) created by partners:
  - 10 at TUD, F, MPI-K, MS, HD, LBNL
  - 4 EMMI Fellow positions at GSI
- EMMI PhD students associated with surrounding graduate schools (HGS-HIRe, HGSFP)

## Decoding the phase structure of QCD via particle production at high energy

Anton Andronic<sup>1,2</sup>, Peter Braun-Munzinger<sup>1,3,4\*</sup>, Krzysztof Redlich<sup>1,5</sup> & Johanna Stachel<sup>3</sup>



Vol 466 | 8 July 2010 | doi:10.1038/nature09250

nature

## LETTERS

### The size of the proton

Randolf Pohl<sup>1</sup>, Aldo Antognini<sup>1</sup>, François Nez<sup>2</sup>, Fernando D. Amaro<sup>3</sup>, François Biraben<sup>2</sup>, João M. R. Cardoso<sup>3</sup>, Daniel S. Covita<sup>3,4</sup>, Andreas Dax<sup>5</sup>, Satish Dhawan<sup>5</sup>, Luis M. P. Fernandes<sup>3</sup>, Adolf Giesen<sup>6†</sup>, Thomas Graf<sup>6</sup>, Theodor W. Hänsch<sup>1</sup>, Paul Indelicato<sup>2</sup>, Lucile Julien<sup>2</sup>, Cheng-Yang Kao<sup>7</sup>, Paul Knowles<sup>8</sup>, Eric-Olivier Le Bigot<sup>2</sup>, Yi-Wei Liu<sup>7</sup>, José A. M. Lopes<sup>3</sup>, Livia Ludhova<sup>8</sup>, Cristina M. B. Monteiro<sup>3</sup>, Françoise Mulhauser<sup>8†</sup>, Tobias Nebel<sup>1</sup>, Paul Rabinowitz<sup>9</sup>, Joaquim M. F. dos Santos<sup>3</sup>, Lukas A. Schaller<sup>8</sup>, Karsten Schuhmann<sup>10</sup>, Catherine Schwob<sup>2</sup>, David Taqq<sup>11</sup>, João F. C. A. Veloso<sup>4</sup> & Franz Kottmann<sup>12</sup>

## LETTER

doi:10.1038/nature12226

### Masses of exotic calcium isotopes pin down nuclear forces

F. Wienholtz<sup>1</sup>, D. Beck<sup>2</sup>, K. Blaum<sup>3</sup>, Ch. Borgmann<sup>3</sup>, M. Breitenfeldt<sup>4</sup>, R. B. Cakirli<sup>3,5</sup>, S. George<sup>1</sup>, F. Herfurth<sup>2</sup>, J. D. Holt<sup>6,7</sup>, M. Kowalska<sup>8</sup>, S. Kreim<sup>3,8</sup>, D. Lunney<sup>9</sup>, V. Manea<sup>9</sup>, J. Menéndez<sup>6,7</sup>, D. Neidherr<sup>2</sup>, M. Rosenbusch<sup>1</sup>, L. Schweikhard<sup>1</sup>, A. Schwenk<sup>7,6</sup>, J. Simonis<sup>6,7</sup>, J. Stanja<sup>10</sup>, R. N. Wolf<sup>1</sup> & K. Zuber<sup>10</sup>

### Radio-Frequency Association of Efimov Trimers

Thomas Lompe,<sup>1,2,3\*</sup> Timo B. Ottenstein,<sup>1,2,3</sup> Friedhelm Serwane,<sup>1,2,3</sup> Andre N. Wenz,<sup>1,2</sup> Gerhard Zürn,<sup>1,2</sup> Selim Jochim<sup>1,2,3</sup>

The quantum mechanical three-body problem is one of the fundamental challenges of few-body physics. When the two-body interactions become resonant, an infinite series of universal three-body bound states is predicted to occur, whose properties are determined by the strength of the two-body interactions. We used radio-frequency fields to associate Efimov trimers consisting of three distinguishable fermions. The measurements of their binding energy are consistent with theoretical predictions that include nonuniversal corrections.

Under certain conditions, the long-range behavior of a physical system can be described without detailed knowledge of its short-range properties; few-body systems with resonant interactions are a prime example of this concept of universality (*1*). Ultracold gases, where

resonant scattering may be achieved by tuning the interactions with the use of Feshbach resonances (*2*), have been used extensively to test the predictions of universal theory.

If the parameter describing the interactions, the s-wave scattering length  $a$ , is much larger than the characteristic length scale  $r_0$  of the interaction potential, the few-body physics in such ultracold gases is predicted to become universal. For two particles with a large positive scattering

<sup>1</sup>Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, 69120 Heidelberg, Germany. <sup>2</sup>Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg, Germany. <sup>3</sup>ExtreMe Matter Institute EMMI, GSI Helmholtzzentrum für Schwerionenforschung, 64291 Darmstadt, Germany.

\*To whom correspondence should be addressed. E-mail: thomas.lompe@mpi-hd.mpg.de

## LETTER

### High-precision measurement of the atomic mass of the electron

S. Sturm<sup>1</sup>, F. Köhler<sup>1,2</sup>, J. Zatorski<sup>1</sup>, A. Wagner<sup>1</sup>, Z. Harman<sup>1,3</sup>, G. Werth<sup>4</sup>, W. Quint<sup>2</sup>, C. H. Keitel<sup>1</sup> & K. Blaum<sup>1</sup>

# EMMI Programs

- EMMI Workshops
- EMMI Programs
- EMMI Rapid Reaction Task Force meetings (RRTFs)
- joint workshops with ECT\* Trento



- Visiting Professor program
- Visiting Researcher program

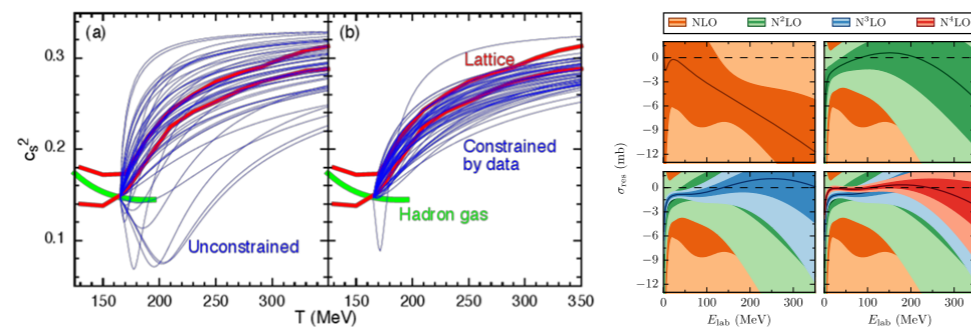
# Interdisciplinary Events: examples

## ExtreMe Matter Institute EMMI

EMMI Workshop

### Uncertainty Quantification at the Extremes (ISNET-6)

GSI, Darmstadt, Germany  
October 8-12, 2018



#### Goals

- Facilitate cross communication, fertilization, and collaboration on statistical applications among the nuclear sub-fields
- Provide the opportunity for nuclear physicists unfamiliar with Bayesian methods to start applying them to new problems
- Learn from experts about innovative and advanced uses of Bayesian statistics, and best practices in applying them
- Learn about advanced computational tools and methods
- Critically examine the application of Bayesian and frequentist methods to particular physics problems in the subfields

#### Information

[www.gsi.de/emmi/workshops](http://www.gsi.de/emmi/workshops)

#### Organizers

Dick Furnstahl, Ohio State U.  
David Ireland, U. Glasgow  
Daniel Phillips, Ohio U.  
Ian Vernon, Durham U.

#### More about EMMI

[www.gsi.de/emmi](http://www.gsi.de/emmi)

## ExtreMe Matter Institute EMMI

EMMI Workshop

### Functional Methods in Strongly Correlated Systems

Darmstädter Haus, Hirschegg, Austria  
March 31 - April 6, 2019



#### Speakers:

Laura Classen (Brookhaven National Lab & University of Minnesota)  
Sebastian Diehl (University of Cologne)  
Joaquin Drut (UNC Chapel Hill)  
Nicolas Dupuis (Université Pierre et Marie Curie)  
Stefan Flörchinger (Heidelberg University)  
Kenji Fukushima (Tokyo University)  
Daniel Litim (University of Sussex)  
Hans-Werner Hammer (TU Darmstadt)  
Urko Reinosa (CPHT, Ecole Polytechnique)  
Fabian Rennecke (Brookhaven National Lab)  
Michael Scherer (University of Cologne)  
Malo Tarpin (Université Grenoble Alpes & Heidelberg University)  
Ralf-Arno Tripolt (Goethe University Frankfurt)  
Corbinian Wellenhofer (TU Darmstadt)  
Nicolas Wink (Heidelberg University)

#### Information:

[www.gsi.de/emmi/workshops](http://www.gsi.de/emmi/workshops)

#### Organizers:

Jens Braun  
Michael Buballa  
Stefan Flörchinger  
Jan M. Pawłowski  
Dirk H. Rischke  
Bernd-Jochen Schaefer  
Lorenz von Smekal

#### Registration Deadline:

February 28<sup>th</sup>, 2019

#### More about EMMI:

[www.gsi.de/emmi](http://www.gsi.de/emmi)



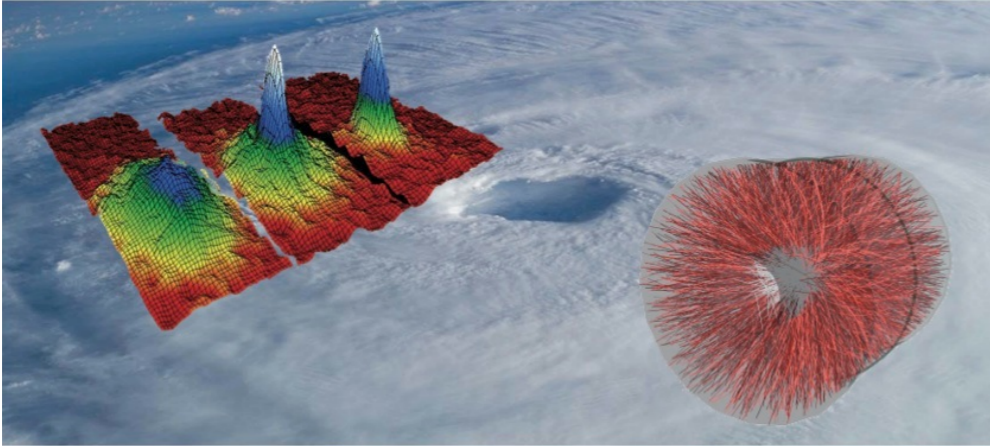
# Interdisciplinary Events: examples

Helmholtz Alliance  
Extremes of Density and Temperature: Cosmic Matter in the Laboratory

## ExtreMe Matter Institute EMMI

### Quark-Gluon Plasma meets Cold Atoms - Episode III

Workshop at Waldemar-Petersen-Haus  
Hirschegg, Austria  
August 25 - 31, 2012



**Lecturers**  
Jens Braun, TU Darmstadt  
Peter Braun-Munzinger, EMMI, GSI  
Kenji Fukushima, Keio University  
Thomas Gasenzer, Heidelberg University  
Larry McLerran, Brookhaven National Lab  
Thomas Schäfer, North Carolina State University  
Florian Schreck, Innsbruck University & IQOQI  
Achim Schwenk, EMMI, TU Darmstadt  
Lorenz von Smekal, TU Darmstadt  
Johanna Stachel, Heidelberg University  
Michael Thies, Erlangen University  
John Thomas, North Carolina State University

**Organizers**  
Michael Buballa  
Selim Jochim  
Jan M. Pawłowski  
Dirk Rischke

**Registration deadline**  
July 15<sup>th</sup>, 2012

**Registration and further information**  
<http://www-aix.gsi.de/conferences/emmi/QGPmCA2012>

**More about EMMI**  
[www.gsi.de/emmi](http://www.gsi.de/emmi)

## ExtreMe Matter Institute EMMI

### EMMI Workshop

### Interdisciplinary Workshop on Supersolidity

September 20-22, 2021

Aula Silvestri - Economics and Management Department of the University of Trento, via Antonio Rosmini 44

**Scientific Organizers:**  
Francesca Ferlaino (University of Innsbruck; IQOQI Innsbruck)  
Alessio Recati (INO-CNR, Trento)  
Sandro Stringari (University of Trento)

**Logistics and Local Organization:**  
Monica Cosi (University of Trento)  
Silvia Bonazza (University of Innsbruck)  
Communication and Event Office,  
Polo Collina (University of Trento)

Following recent advances in the field, we are organizing an **Interdisciplinary Workshop on Supersolidity**. The workshop will explore, in an interdisciplinary fashion, various aspects of supersolidity, focusing on different mechanisms and experimental platforms. The latter include dipolar and spin-orbit-coupled quantum gases, Rydberg atoms, light-induced dipoles, as well as solid Helium and nuclear systems.

**Speakers:**  
Blair Blakie (ONLINE)  
Jordi Boronat  
Fabio Cinti  
Tilman Esslinger  
Randy Hulet (ONLINE)  
Massimo Mannarelli  
Giovanni Modugno  
Matthew Norcia  
Christopher Pethick (ONLINE)  
Tilman Pfau  
Thomas Pohl  
Nikolay Prokof'ev (ONLINE)  
Guido Pupillo  
Alessio Recati  
Carlos Sa de Melo (ONLINE)  
Luis Santos  
Gora Shlyapnikov  
Giancarlo Strinati  
Sandro Stringari  
Leticia Tarruell  
Michael Urban  
Martin Zwierlein




image: ©AG\_Ferlaino\_Group

**Information:**  
[www.gsi.de/emmi/workshop](http://www.gsi.de/emmi/workshop)

[www.erbium.at/workshopTN](http://www.erbium.at/workshopTN)  
[supersolid.physics@unitn.it](mailto:supersolid.physics@unitn.it)

**More about EMMI:**  
[www.gsi.de/emmi](http://www.gsi.de/emmi)



# EMMI RRTFs

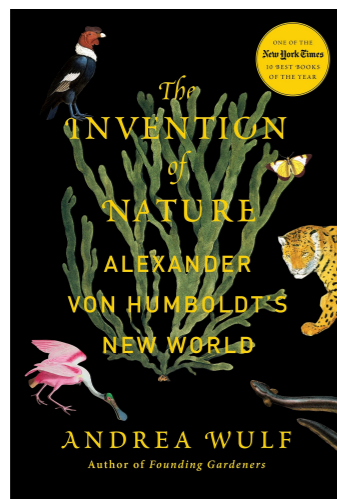
- concentrate on focussed problem in intense discussion
- 15 - 25 expert participants
- aim: summary of results, optimally with publication on arXiv and/or in journal



# EMMI RRTFs

RRTF concept goes back to **Alexander von Humboldt**:

*Humboldt was revolutionizing the sciences. In September 1828 he invited hundreds of scientists from across Germany and Europe to attend a conference in Berlin. Unlike previous such meetings at which scientists had endlessly presented papers about their own work, Humboldt put together a very different program. **Rather than being talked at, he wanted the scientists to talk with each other.** [...] ‘Without a diversity of opinion, the discovery of truth is impossible’, he reminded them in his opening speech.*



in Andrea Wulf, *The Invention of Nature*, 2016

# EMMI RRTFs: examples

- Thermalization in a Nonabelian Plasma (2011)
- Quark Matter in Compact Stars (2013)
- Direct-Photon Flow Puzzle (2014)
- Non-Exponential Two-Body Weak Decays (2014)
- Resonances in QCD (2015)
- Extraction of heavy-flavor transport coefficients in QCD Matter (2016)
- The physics of neutron star mergers (2018)
- Electromagnetic Structure of Strange Baryons (2018)
- Direct reactions and nuclear structure (2018)
- Space-time structure of jet quenching: theory and experiment (2019)
- Real and virtual photon production at ultra-low transverse momentum and low mass at LHC (2022)

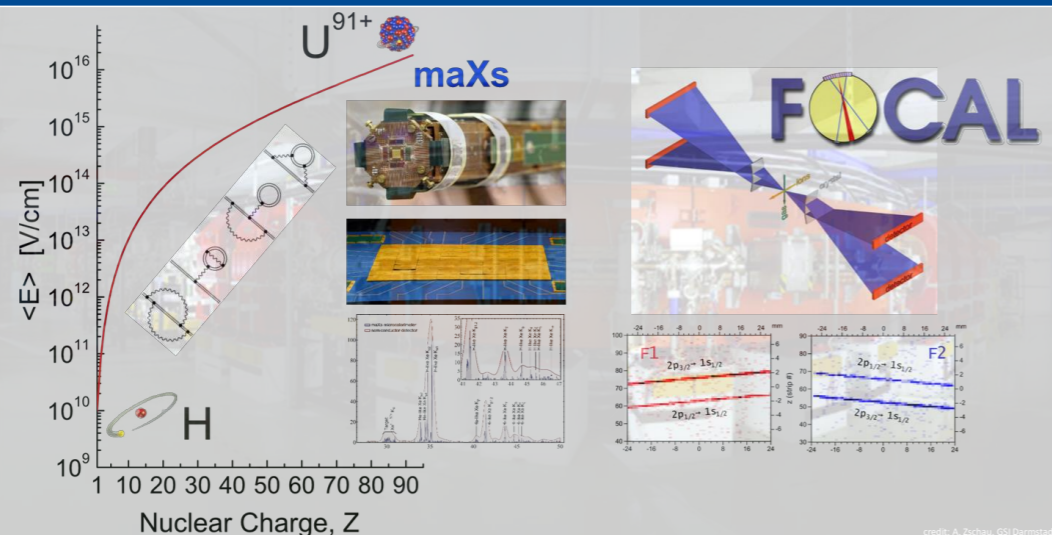
# Recent RRTFs

## ExtreMe Matter Institute EMMI

EMMI Rapid Reaction Task Force

### 1s Lamb shift in heavy H-like ions: towards an accuracy of <1 eV

Rosensäle, Jena, Germany  
September 17-19, 2018



#### Topics

- High-resolution X-ray microcalorimeters and crystal spectrometers
- Precision X-ray spectroscopy of stored and cooled heavy highly-charged ions
- Bound-state QED

#### Information

[www.gsi.de/emmi/rrtf](http://www.gsi.de/emmi/rrtf)

#### Organizers

Alexandre Gumberidze (GSI, U Frankfurt)  
Yuri Litvinov (GSI, U Heidelberg)  
Günter Weber (HI Jena)  
Thomas Stöhlker (HI Jena, GSI, U Jena)

#### More about EMMI

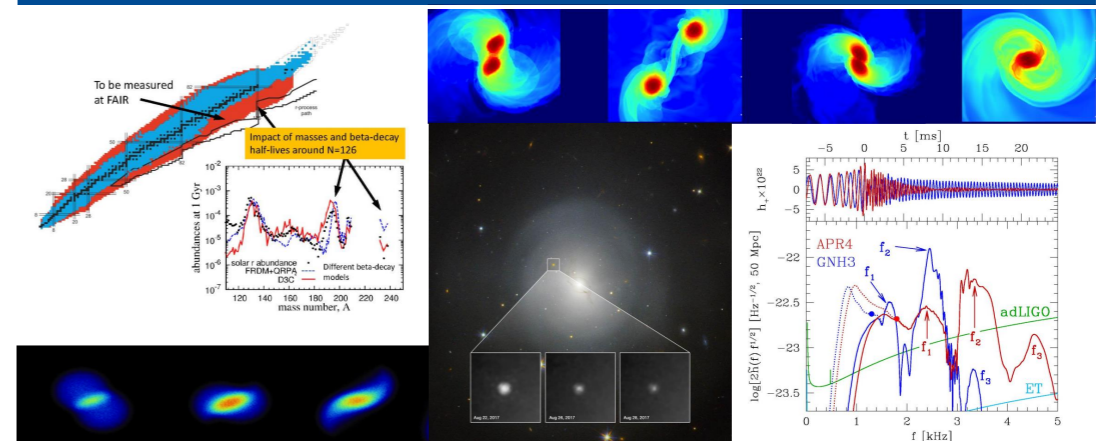
[www.gsi.de/emmi](http://www.gsi.de/emmi)

## ExtreMe Matter Institute EMMI

EMMI Rapid Reaction Task Force

### The physics of neutron star mergers at GSI/FAIR

GSI, Darmstadt, Germany  
June 3 -15, 2018



#### Topics

Dense matter equation of state  
Gravitational wave observations  
R-process nucleosynthesis  
Astrophysical simulations of mergers  
Electromagnetic signatures of the r-process

#### Information

[www.gsi.de/emmi/rrtf](http://www.gsi.de/emmi/rrtf)

#### Organizers

Gabriel Martinez Pinedo (GSI & TU Darmstadt)  
Tetyana Galatyuk (TU Darmstadt & GSI)  
César Domingo Pardo (IFIC)  
Brian Metzger (Columbia University)  
Luciano Rezzolla (U Frankfurt)  
Samaya Nissanke (Radboud University)

#### More about EMMI

[www.gsi.de/emmi](http://www.gsi.de/emmi)

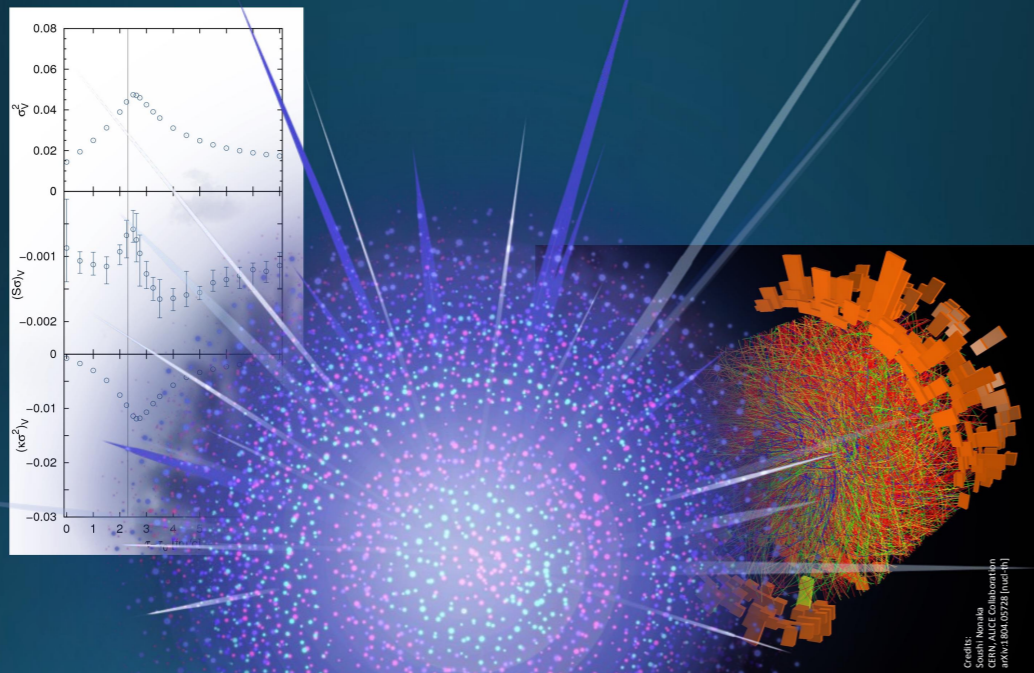
# Recent RRTFs

## ExtreMe Matter Institute EMMI

EMMI RRTF

### Dynamics of critical fluctuations: theory – phenomenology – heavy-ion collisions

GSI, Darmstadt, Germany  
April 8-12, 2019



#### Topics:

- dynamical modelling of critical fluctuations in QCD
- coupling of the critical dynamics to the bulk evolution in HIC
- proper treatment of the order parameter(s) in and out of the scaling region
- experimental observables and challenges
- connection with cold atomic gases at phase transitions

#### Organizers:

Marcus Bluhm, Subatech  
Alexander Kalweit, CERN  
Marlene Nahrgang, Subatech

#### Information:

[www.gsi.de/emmi/workshops](http://www.gsi.de/emmi/workshops)

#### More about EMMI:

[www.gsi.de/emmi](http://www.gsi.de/emmi)

## ExtreMe Matter Institute EMMI

EMMI Rapid Reaction Task Force

### Nuclear Physics Confronts Relativistic Collisions of Isobars

Heidelberg University, Germany, May 30 – June 3 & October 12 – 14, 2022

High-energy collisions of the A=96 isobars  $^{96}\text{Zr}$  and  $^{96}\text{Ru}$  have been performed in 2018 at the Relativistic Heavy Ion Collider (RHIC) as a means to probe effects of local parity violation in the strong sector, that would manifest as deviations from unity in the ratio of observables taken between  $^{96}\text{Zr}+^{96}\text{Zr}$  and  $^{96}\text{Ru}+^{96}\text{Ru}$  collisions. Recently released measurements of such ratios reveal deviations from unity. However, such observations are primarily caused by the two collided isobars having different radial profiles and intrinsic deformations. To make progress in understanding RHIC data, we will gather nuclear physicists across the energy spectrum to answer the following question: Does the combined effort of state-of-the-art low-energy nuclear structure physics and high-energy heavy-ion physics allow us to understand the observations made in isobar collisions at RHIC?

#### Heavy Ion Collisions:

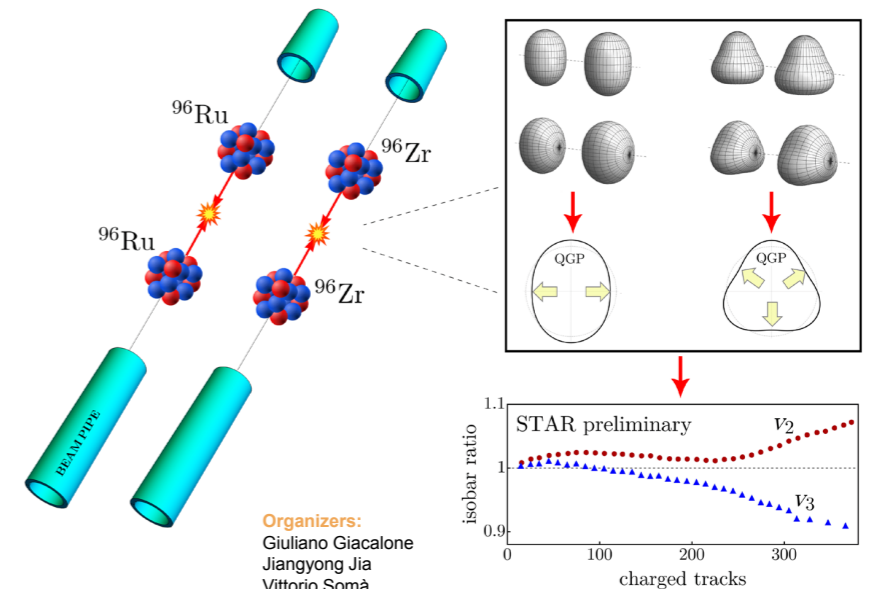
Federica Capellino  
Hannah Elfner  
Frédérique Grassi  
Eduardo Grossi  
Jan Hammelmann  
Andreas Kirchner  
Matthew Luzum  
Jaki Noronha-Hostler  
Jean-Yves Ollitrault  
Niels Saß  
Björn Schenke  
Chun Shen  
Huichao Song  
Derek Teaney  
Wilke van der Schee

#### Nuclear Structure:

Anatoli Afanasjev  
Benjamin Bally  
Jean-Paul Ebran  
Dean Lee  
Tamara Nikšić  
Takaharu Otsuka  
Luis Robledo  
Tomas Rodriguez  
Wouter Ryssens  
Yusuke Tsunoda

#### Organizers:

Giuliano Giacalone  
Jiangyong Jia  
Vittorio Somà  
You Zhou



#### Website:

<https://indico.gsi.de/event/14430/>

#### Information:

[www.gsi.de/emmi/rtrf](http://www.gsi.de/emmi/rtrf)

#### More about EMMI:

[www.gsi.de/emmi](http://www.gsi.de/emmi)

# Publication: from RRTF



Contents lists available at [ScienceDirect](#)

Physics Letters B

[www.elsevier.com/locate/physletb](http://www.elsevier.com/locate/physletb)



New test of modulated electron capture decay of hydrogen-like  $^{142}\text{Pm}$  ions: Precision measurement of purely exponential decay



F.C. Ozturk<sup>a,\*</sup>, B. Akkus<sup>a</sup>, D. Atanasov<sup>b</sup>, H. Beyer<sup>c</sup>, F. Bosch<sup>1</sup>, D. Boutin<sup>d,e</sup>, C. Brandau<sup>c,f</sup>, P. Bühler<sup>g</sup>, R.B. Cakirli<sup>a</sup>, R.J. Chen<sup>c,h</sup>, W.D. Chen<sup>h,i</sup>, X.C. Chen<sup>c,h</sup>, I. Dillmann<sup>j</sup>, C. Dimopoulou<sup>c</sup>, W. Enders<sup>c</sup>, H.G. Essel<sup>c</sup>, T. Faestermann<sup>k</sup>, O. Forstner<sup>l</sup>, B.S. Gao<sup>c,h</sup>, H. Geissel<sup>c</sup>, R. Gernhäuser<sup>k</sup>, R.E. Grisenti<sup>c,m</sup>, A. Gumberidze<sup>c</sup>, S. Hagmann<sup>c,m</sup>, T. Heftrich<sup>m</sup>, M. Heil<sup>c</sup>, M.O. Herdrich<sup>l</sup>, P.-M. Hillenbrand<sup>c</sup>, T. Izumikawa<sup>n</sup>, P. Kienle<sup>1</sup>, C. Kraushofer<sup>g</sup>, C. Kleffner<sup>c</sup>, C. Kozhuharov<sup>c</sup>, R.K. Knöbel<sup>c,d</sup>, O. Kovalenko<sup>c</sup>, S. Kreim<sup>b</sup>, T. Kühl<sup>c</sup>, C. Lederer-Woods<sup>o</sup>, M. Lestinsky<sup>c</sup>, S.A. Litvinov<sup>c</sup>, Yu.A. Litvinov<sup>c,\*</sup>, Z. Liu<sup>h</sup>, X.W. Ma<sup>h</sup>, L. Maier<sup>k</sup>, B. Mei<sup>m</sup>, H. Miura<sup>p</sup>, I. Mukha<sup>c</sup>, A. Najafi<sup>k</sup>, D. Nagae<sup>q</sup>, T. Nishimura<sup>p</sup>, C. Nociforo<sup>c</sup>, F. Nolden<sup>c</sup>, T. Ohtsubo<sup>r</sup>, Y. Oktem<sup>a</sup>, S. Omika<sup>p</sup>, A. Ozawa<sup>q</sup>, N. Petridis<sup>c</sup>, J. Piotrowski<sup>s</sup>, R. Reifarth<sup>m</sup>, J. Rossbach<sup>c</sup>, R. Sánchez<sup>c</sup>, M.S. Sanjari<sup>c</sup>, C. Scheidenberger<sup>c</sup>, R.S. Sidhu<sup>c</sup>, H. Simon<sup>c</sup>, U. Spillmann<sup>c</sup>, M. Steck<sup>c</sup>, Th. Stöhlker<sup>c,l,t</sup>, B.H. Sun<sup>u</sup>, L.A. Susam<sup>a</sup>, F. Suzuki<sup>p,v</sup>, T. Suzuki<sup>p</sup>, S.Yu. Torilov<sup>w</sup>, C. Trageser<sup>c,f</sup>, M. Trassinelli<sup>x</sup>, S. Trotsenko<sup>c,l</sup>, X.L. Tu<sup>c,h</sup>, P.M. Walker<sup>y</sup>, M. Wang<sup>h</sup>, G. Weber<sup>c,l</sup>, H. Weick<sup>c</sup>, N. Winckler<sup>c</sup>, D.F.A. Winters<sup>c</sup>, P.J. Woods<sup>o</sup>, T. Yamaguchi<sup>p</sup>, X.D. Xu<sup>h</sup>, X.L. Yan<sup>h</sup>, J.C. Yang<sup>h</sup>, Y.J. Yuan<sup>h</sup>, Y.H. Zhang<sup>h,z</sup>, X.H. Zhou<sup>h</sup> and the FRS-ESR, ILIMA, SPARC, and TBWD Collaborations

# ExtreMe Matter Institute EMMI

## Call for Proposals

### EMMI Workshops, Programs, Rapid Reaction Task Forces

The ExtreMe Matter Institute EMMI invites proposals for workshops, programs, and Rapid Reaction Task Forces in the research areas of EMMI:

- quark gluon plasma, phase diagram of strongly interacting matter, and hadron physics
- structure and dynamics of neutron-rich systems
- electromagnetic plasmas of high energy density
- ultracold quantum gases and extreme states in atomic physics

all understood in a broad sense.

Further information at [www.gsi.de/emmi](http://www.gsi.de/emmi)

