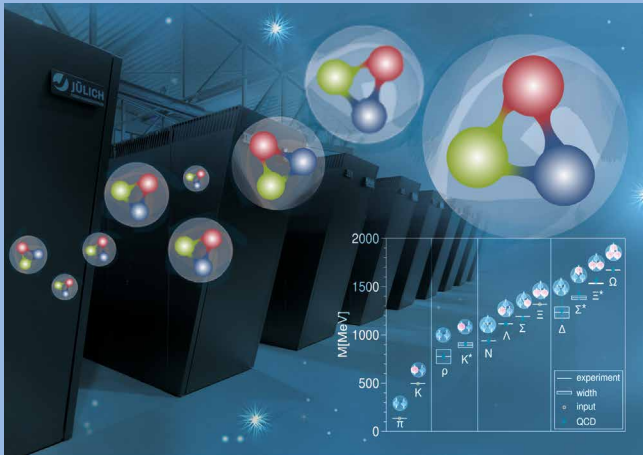




SIMLAB NUCLEAR & PARTICLE PHYSICS

WITH CASTORC, THE CYPRUS INSTITUTE & DESY, ZEUTHEN



Research on numerical field theory

- Particle physics, nuclear physics
- Carbon nano systems
- Algorithms with exascale perspective
- Optimized software and libraries

Community support

- User training: lectures, workshops and schools
- Collaboration with user groups
- Data management and analysis tools

Numerical field theory

Particle physics:

- Standard model and χ PT parameters from ab-initio simulations
- Phenomenology from lattice simulations of QCD + QED
- Equation of state
- Phenomenology of the phase transition region

Nuclear physics:

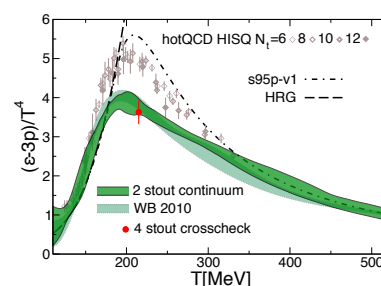
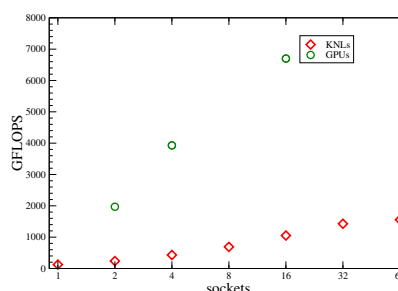
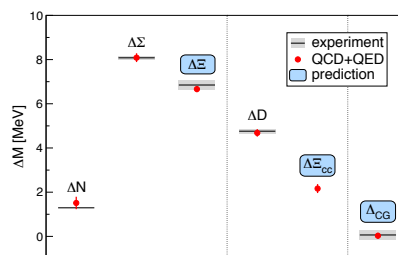
- Phenomenological properties of the nucleon
- Nuclear potentials from lattice QCD simulations

Carbon nano systems:

- Graphene, nano tubes
- Hubbard, phenomenological potentials

Highlight

Ab initio calculation of the neutronproton mass difference *Science*, 347 (2015), 1452



HPC research and development

- Algorithms for modular and heterogeneous supercomputers
- Multilevel methods
- Highly scalable implementations
- Kernel identification and low level (assembly, intrinsics) optimization
- Custom-tailored low-level communication libraries
- Exascale research and co-development with HPC hardware vendors

Community support

- Workshops and schools ("Lattice practices")
- Lectures (Bonn, Wuppertal)
- Optimized implementations
- Data repositories (ILDG, DESY)

Collaboration partners

- CaStoRC, DESY, Bonn, BUW, Mainz, RU, CNRS, MIT, BNL, SUNY, UA, NMSU