Tomonaga Center for the History of the Universe

Division of Quark-Nuclear Matters

Lattice QCD group

- **Center for Computational Sciences at Tsukuba**

Nuclear Synthesis group

- **RIBF at RIKEN, HIMAC at QST, Tandem at Tsukuba**

Quark-Gluon Plasma group

- **LHC/CERN, RHIC/BNL, FAIR/GSI, J-PARC/KEK-JAEA**

Div. of Quark Nuclear Matters Chair: Prof. S. Esumi

Member: Prof. A. Ozawa, Assi.Prof. T. Chujo, Assi.Prof. T. Niida, Assi.Prof. T. Nonaka, Assi.Prof. T. Todoroki, Prof. Y. Miake††, Prof. K. Kanaya††, Prof. Th. Peitzmann* (PI: Utrecht U.), Prof. M. van Leeuwen* (PI: Utrecht U.), Assi.Prof. J. Park* (Utrecht U.)

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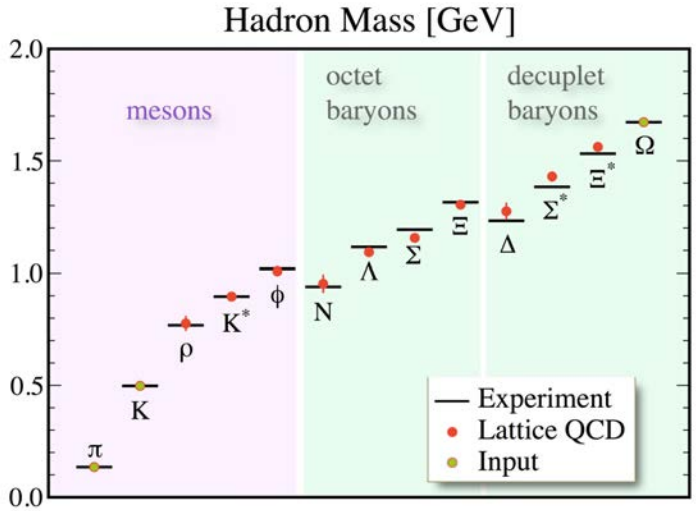
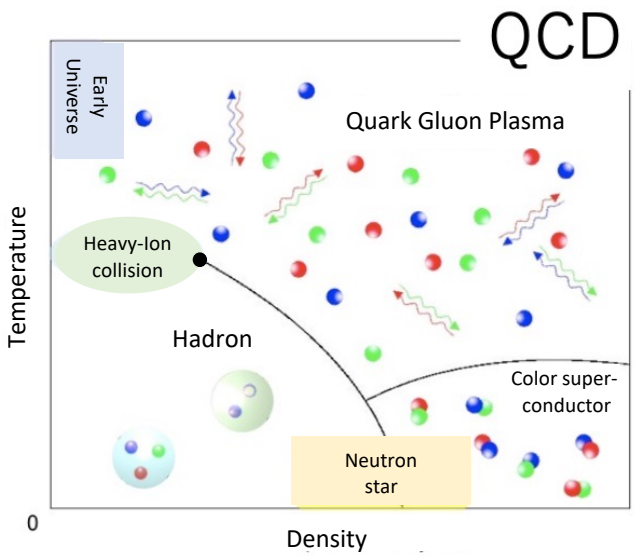
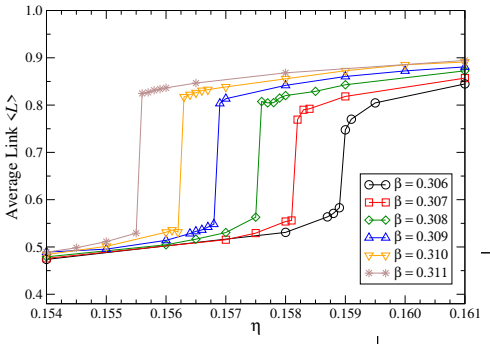
Res.Fellow: S. Sakai

QCD phase-transition and diagram via Lattice QCD

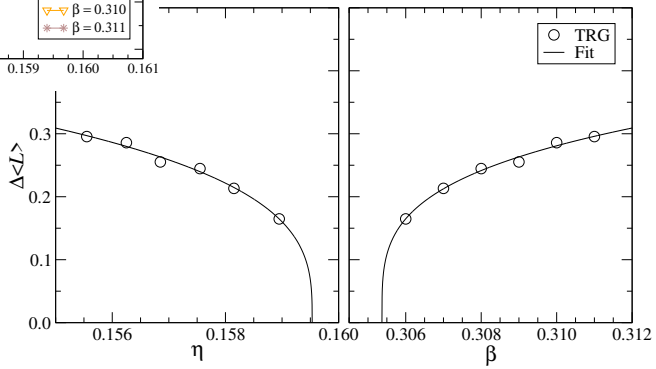




From the hadron masses and interactions to the thermodynamic properties of the QCD phase, using the 1st principle QCD calculations in Lattice.



1st order phase transition

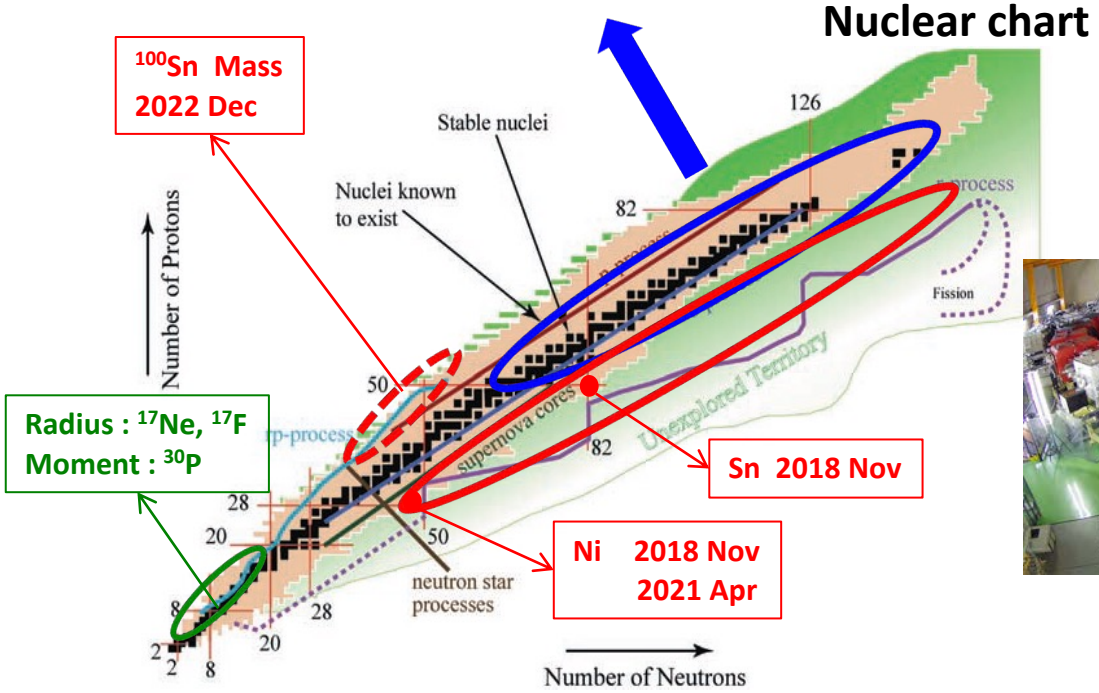


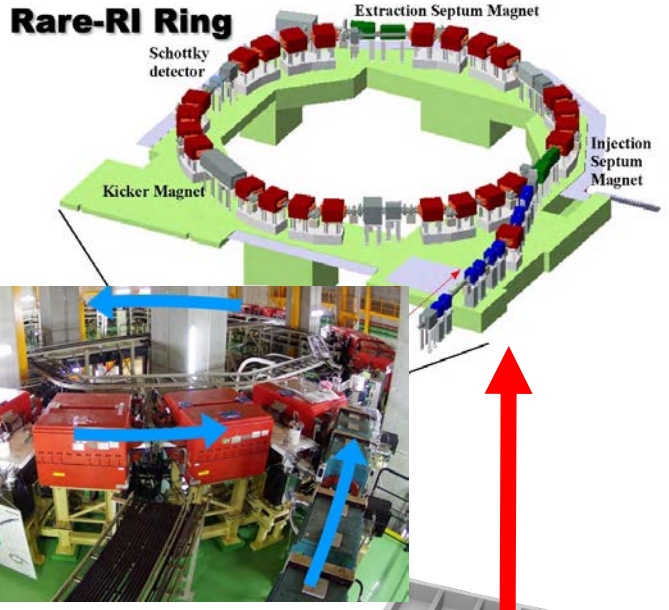
critical end point

Nuclear Synthesis and Property of Unstable Nuclei

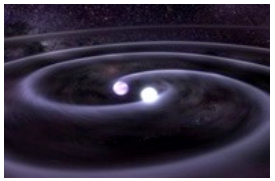
How are these heavy elements created in the universe?

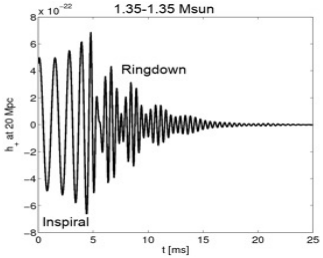
rare RI ring at RIBF (RIKEN)



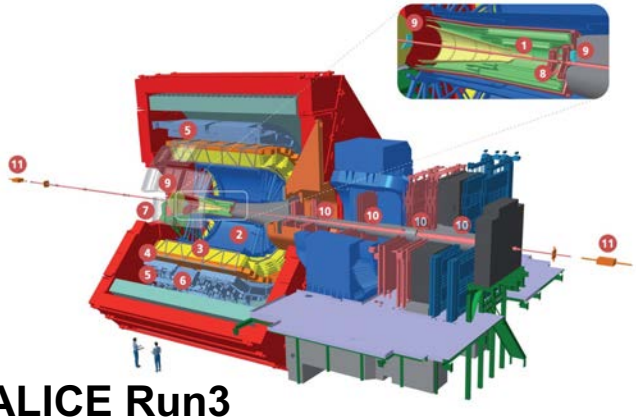


Mass and life measurements of unstable nuclei are crucial for understandings of the heavy elements synthesis in R-process.



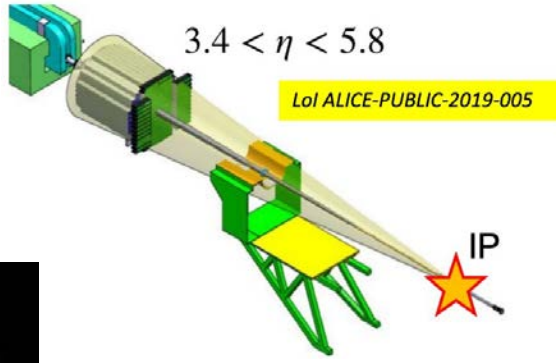


Quark Gluon Plasma and QCD phase structure from TeV to GeV

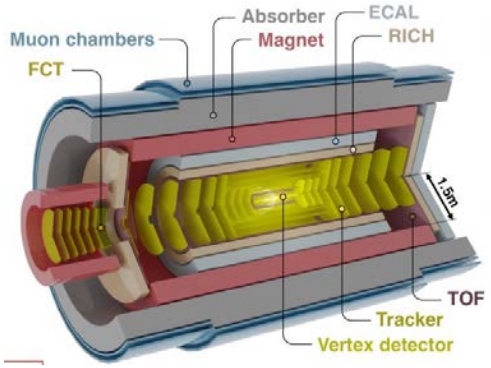


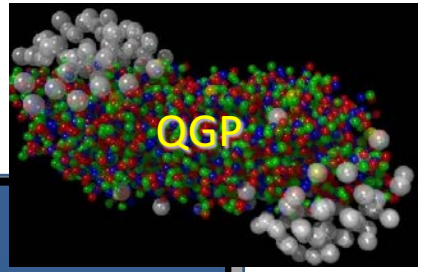
ALICE Run3
with upgrades

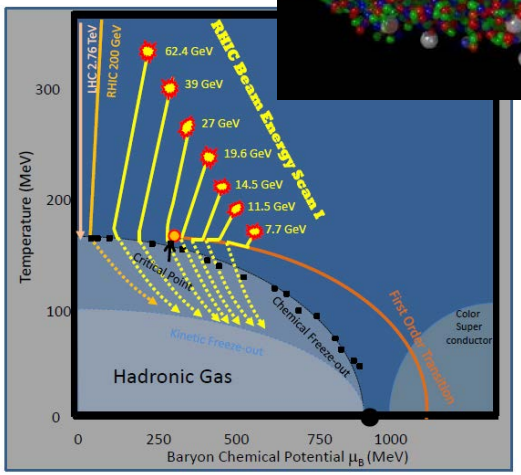
ALICE-Focal for RUN4



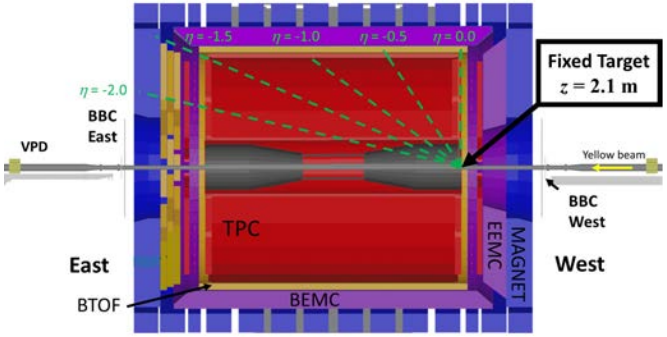
ALICE3 proposal for RUN5





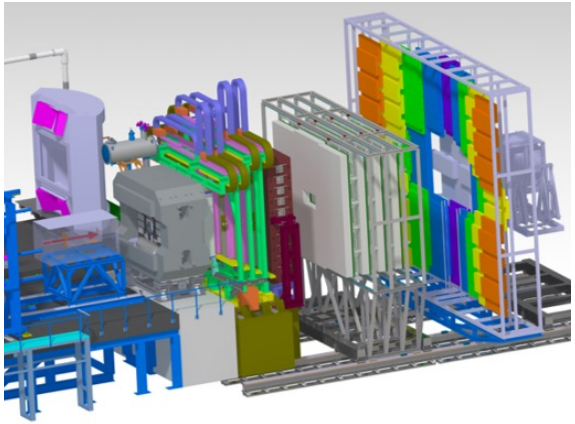


Beam Energy Scan
at RHIC-STAR

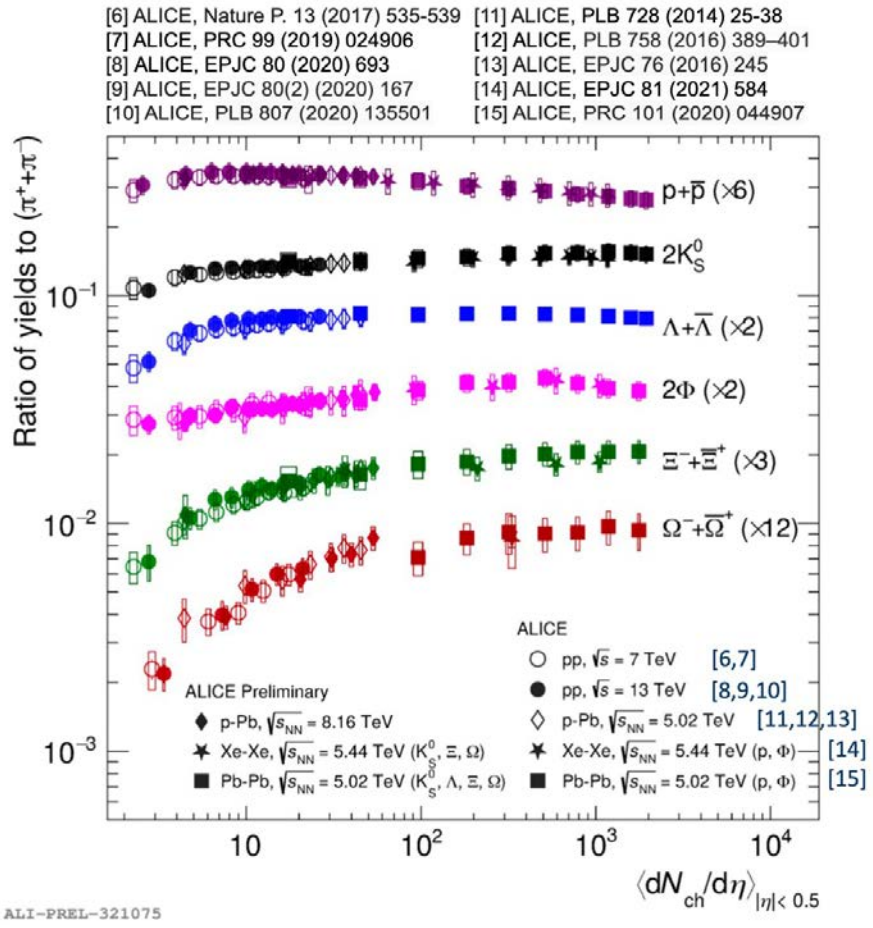


Fixed Target mode

CBM experiment at FAIR/GSI



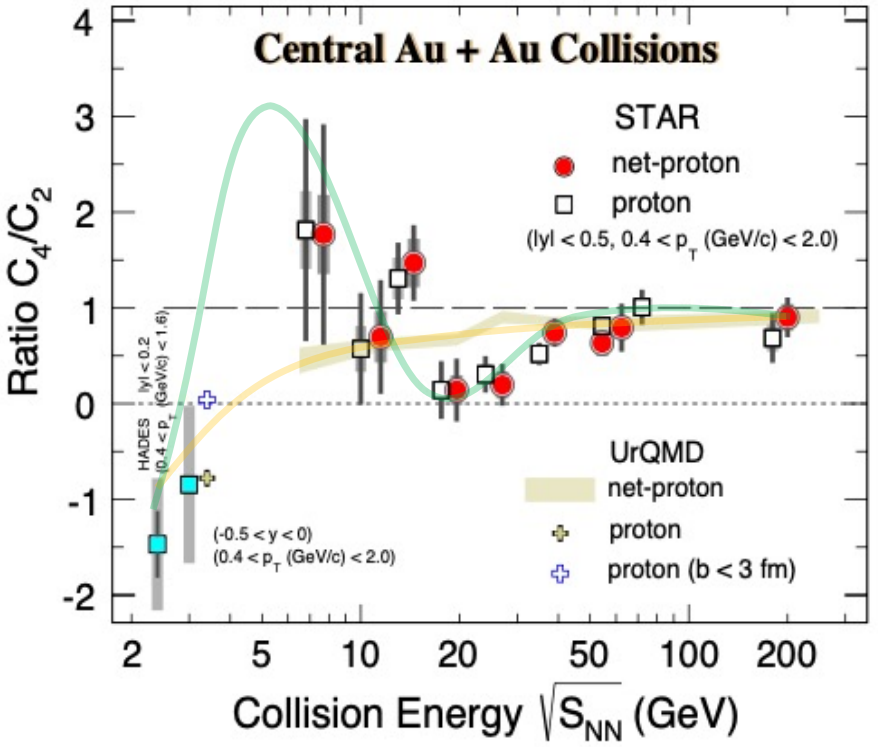
Thermalization including strangeness from small to large system



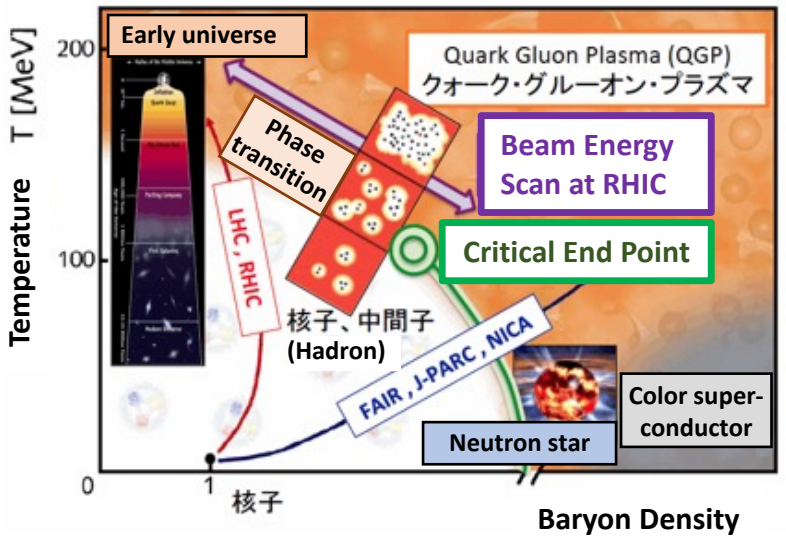
ALICE at LHC

Search for Critical Point and 1st Order Phase Transition

PRL 128 (2022) 202303

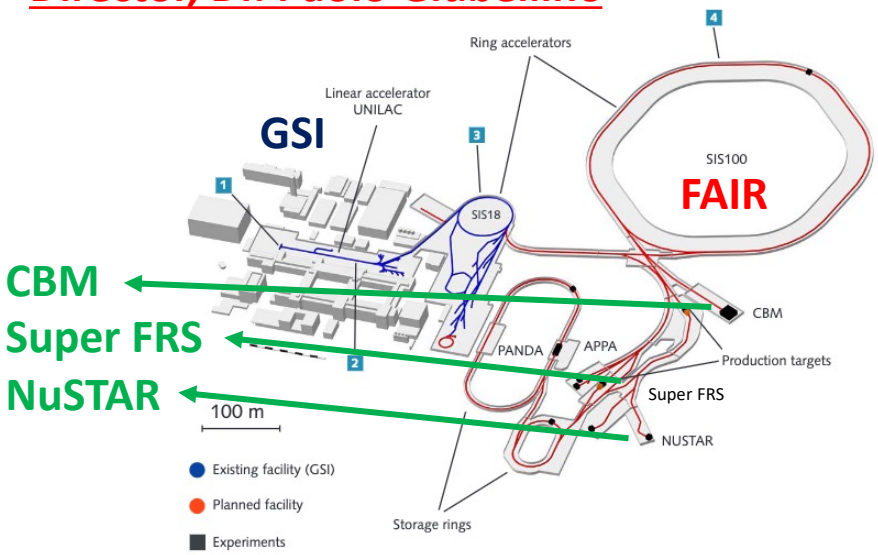


STAR/BES-II at RHIC



From the high temperature region to the high density region in the QCD diagram, looking for a critical point and 1st order phase transition

Director, Dr. Paolo Giubellino



FAIR at GSI, Darmstadt, Germany

Director, Dr. Takashi Kobayashi

J-PARC at KEK/JAEA, Tokai, Japan