Extreme Light Infrastructure – Nuclear Physics (ELI-NP)

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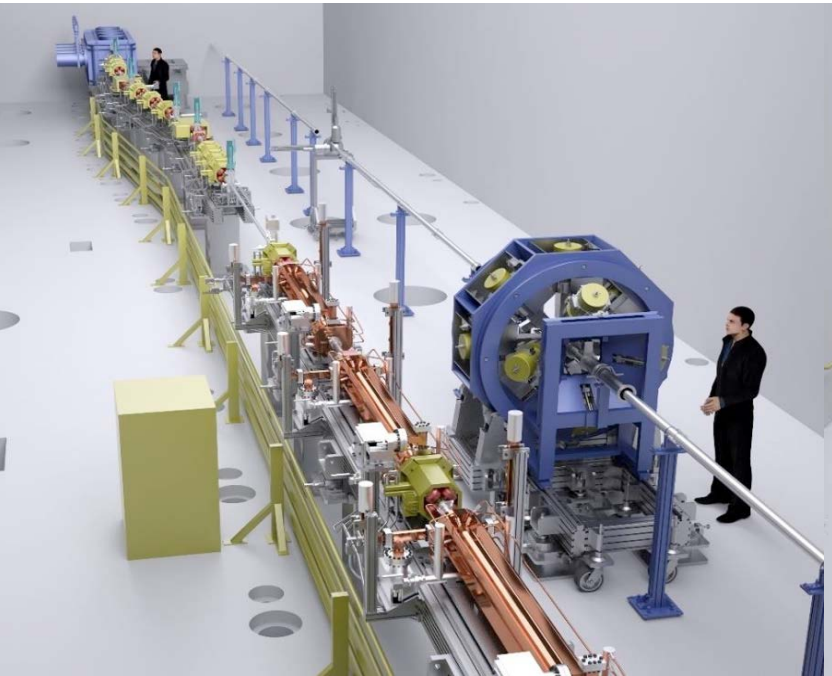
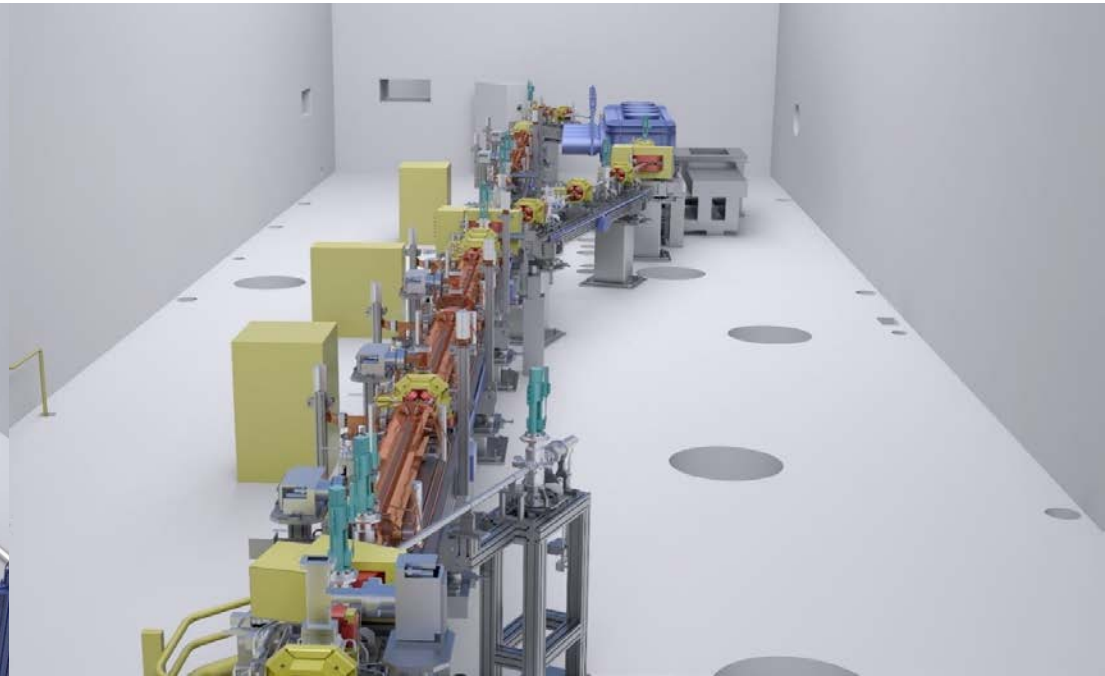
BMBF Verbund 05P2015

Darmstadt – Köln – München

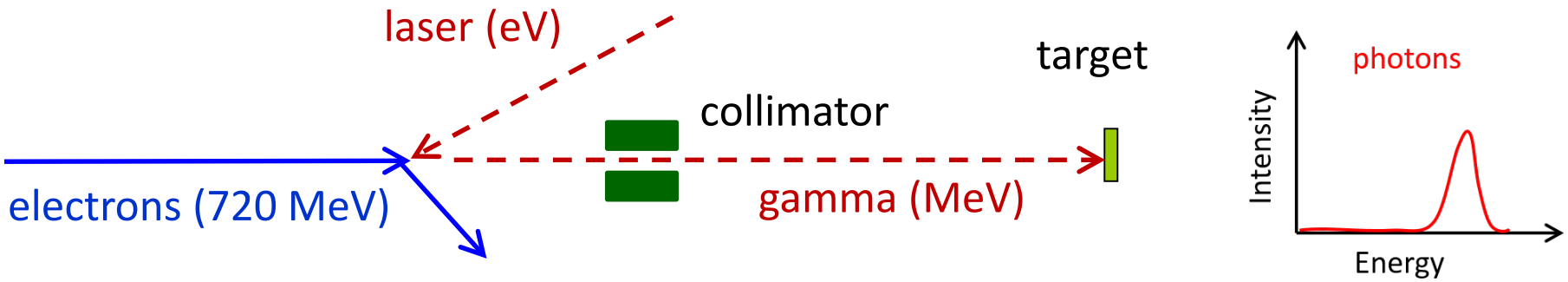
Components of ELI-NP

- high intensity gamma beam system **GBS**,
  E_γ = 0.2-19.5 MeV from laser-Compton backscattering
- high power laser system **HPLS**, 2 x 10 PW maximum
- eight experimental areas





Gamma Beam System GBS @ELI-NP

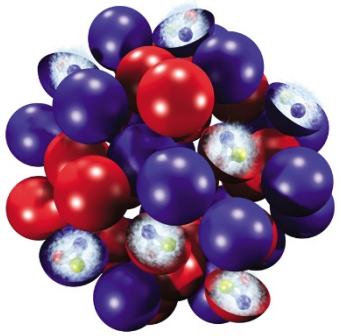


- variable energy (0.2-19.5 MeV)
- quasi-mononenergetic ($\Delta E/E < 0.5\%$)
- high-intensity (10^4 photons/s/eV)
- completely polarized

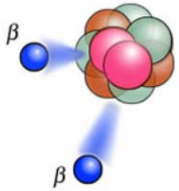
→ „NUCLEAR PHOTONICS“

New horizons at ELI-NP with GBS

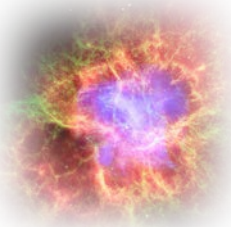
Selective manipulation of excitations in atomic nuclei



How do nuclear excitations violate parity?

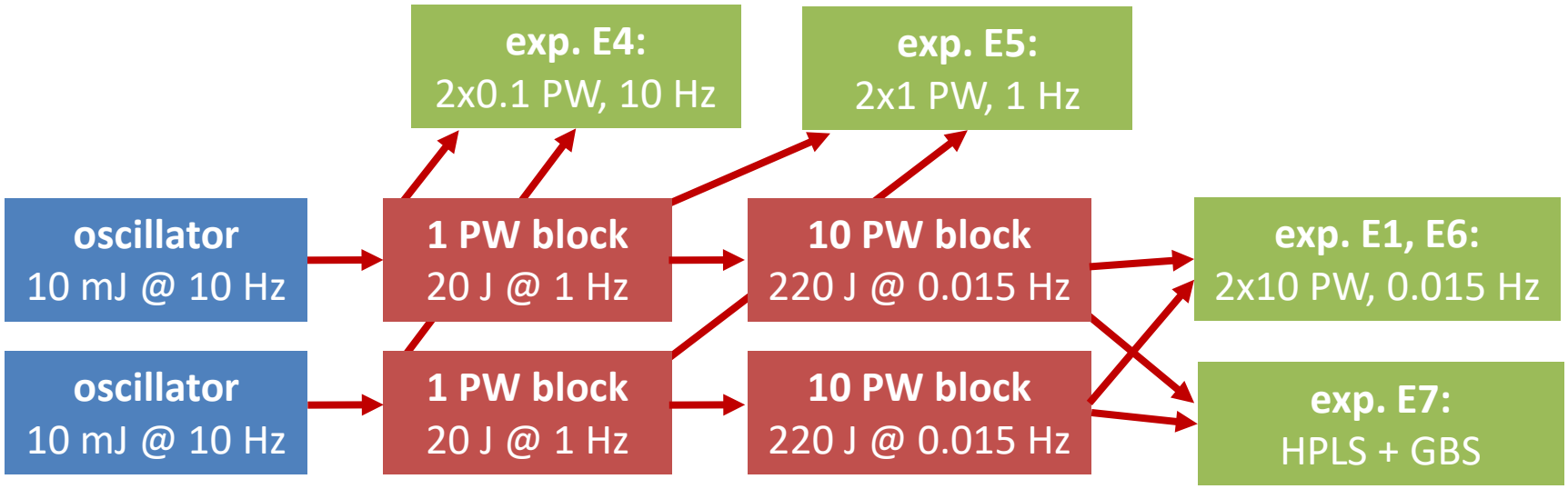


Are there new boundary conditions to the neutrinoless double-beta decay?



What is the equation of state of nuclear matter and of neutron stars?

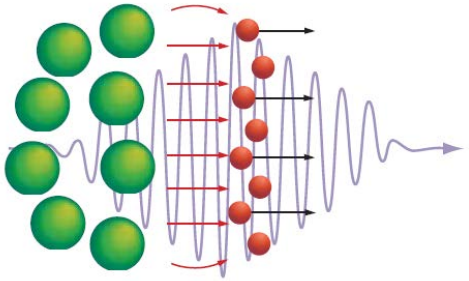
High Power Laser System HPLS @ELI-NP



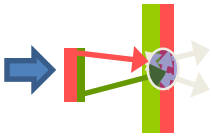
- intensities up to 10^{23} W/cm^2
- electric fields up to 10^{15} V/m
- pulse duration < 50 fs

New horizons at ELI-NP with HPLS

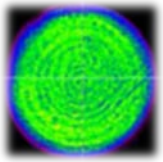
High power laser-matter interaction



How effective is ion acceleration by laser beams?



The fission-fusion mechanism:
A new way to extremely neutron-rich isotopes



Development of ultra-relativistic electron sources

Commissioning of ELI-NP

This is a real photograph, no animation!

Commissioning of ELI-NP

2016/17: installation of components

2018: test experiments

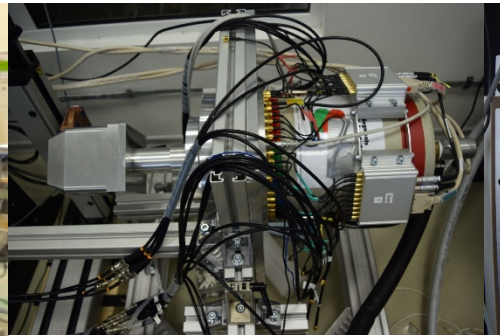
2019: first regular beam time

BMBF network 05P2015: ELI-NP

- Major involvement of German research groups from the beginning.
- ELI-NP is on the BMBF roadmap of research infrastructures.
- Network is supported since July 2015.

05P2015: ELI-NP

subproject GBS 1 – photofission at the barrier (TUD)
subproject GBS 2 – pair spectrometer (TUD)
subproject GBS 3 – online diagnostics and activation experiments (TUD)
subproject GBS 4 – NRF setup and day-one experiments (UoC)
subproject HPLS 1 – laser acceleration of heavy ions (LMU)


Involvement of German research groups

Presently more than 20 German research groups

Prof. Dr. Almudena Arcones (TU Darmstadt) Prof. Dr. Thomas Aumann (TU Darmstadt) Prof. Dr. Joachim Enders (TU Darmstadt) Dr. Christoph Fransen (Universität zu Köln) Dr. Jürgen Gerl (GSI Darmstadt) PD Dr. Christoph Hugenschmidt (TU München) Prof. Dr. Jan Jolie (Universität zu Köln) Prof. Dr. Stefan Karsch (LMU München) Prof. Dr. Thorsten Kröll (TU Darmstadt) Prof. Dr. Horst Lenske (Universität Giessen) Dr. Gabriel Martinez-Pinedo (TU Darmstadt) Dr. Oliver Möller (TU Darmstadt) Prof. Dr. Dr. h.c. Norbert Pietralla (TU Darmstadt) Prof. Dr. Rene Reifarth (Universität Frankfurt) Prof. Dr. Peter Reiter (Universität zu Köln) Prof. Dr. Markus Roth (TU Darmstadt) Prof. Dr. Hartmut Ruhl (LMU München) PD Dr. Deniz Savran (GSI, Universität Mainz) Prof. Dr. Christoph Scheidenberger (Universität Giessen) PD Dr. Heiko Scheit (TU Darmstadt) Prof. Dr. Jörg Schreiber (LMU München) Dr. Ronald Schwengner (HZDR) Prof. Dr. Achim Schwenk (TU Darmstadt) PD Dr. Peter Thirolf (LMU München) Prof. Dr. Peter von Neumann-Cosel (TU Darmstadt) Dr. Andreas Wagner (HZDR) Dr. Volker Werner (TU Darmstadt) Prof. Dr. Andreas Zilges (Universität zu Köln)