Extreme Light Infrastructure – Nuclear Physics (ELI-NP)

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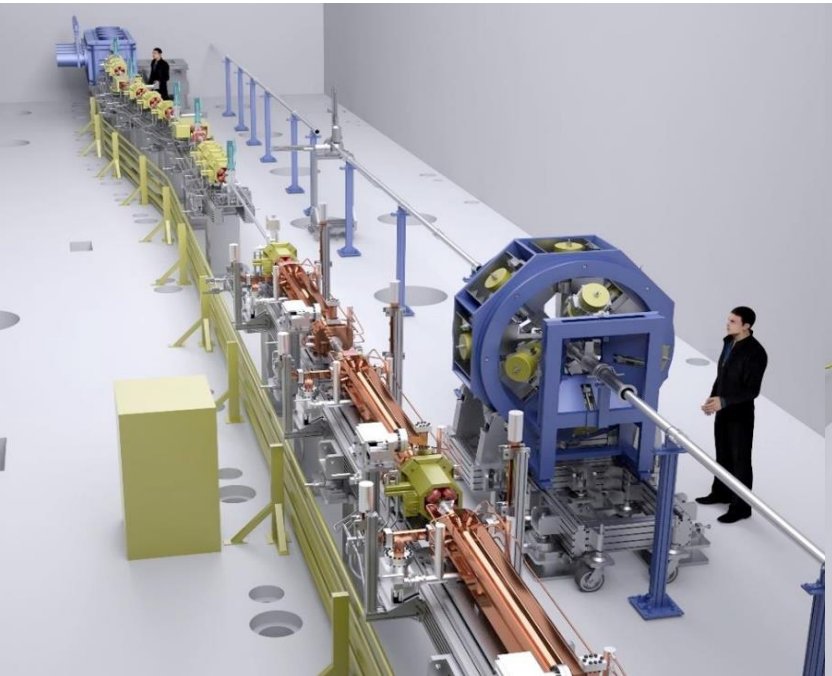
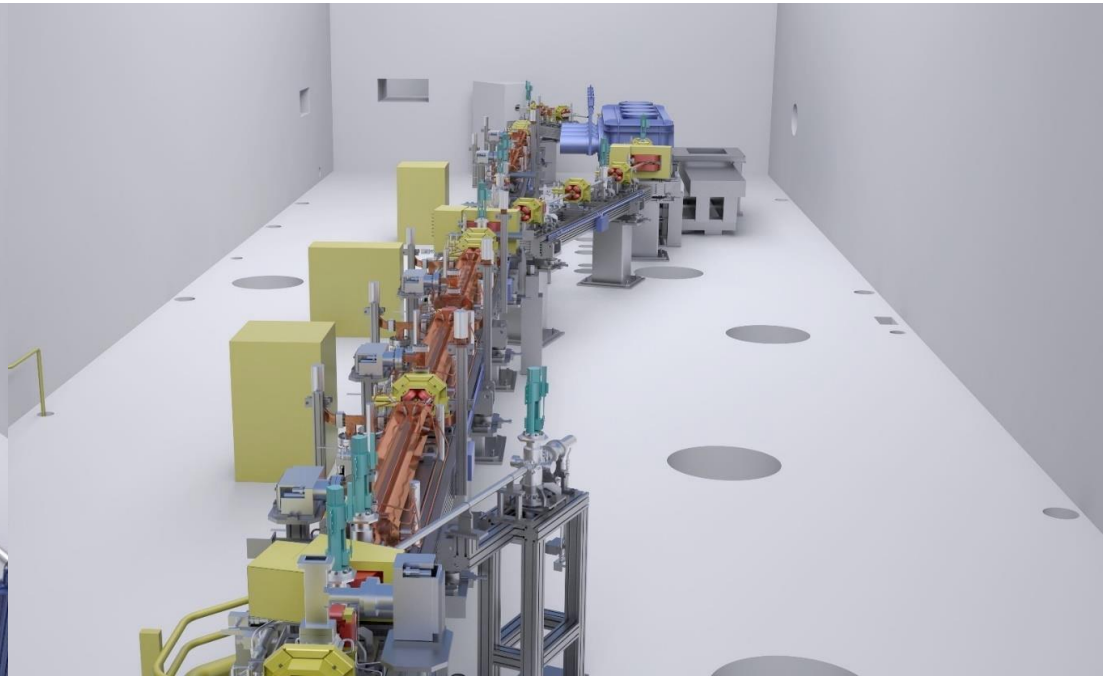
BMBF Verbund 05P2015

Darmstadt – Köln – München

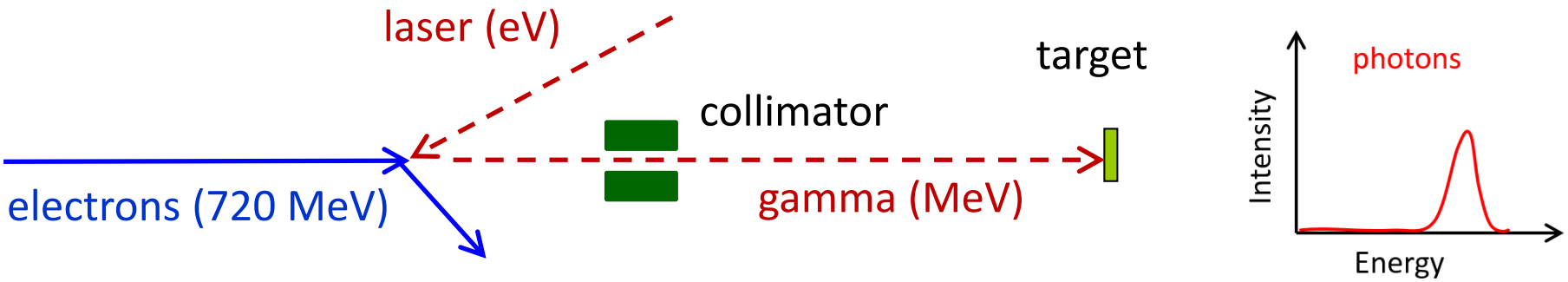
Components of ELI-NP

- 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

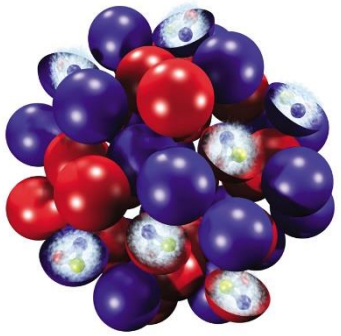


- variable energy (0.2-19.5 MeV)
- quasi-mononenergetic ($\Delta E/E < 0.5\%$)
- high-intensity (10^4 photons/s/eV)
- completely polarized

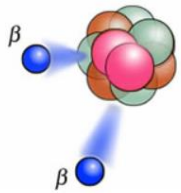
→ „NUCLEAR PHOTONICS“

New horizons at ELI-NP with GBS

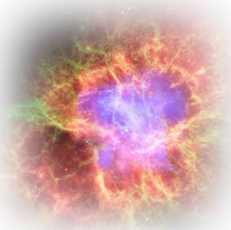
Selective manipulation of excitations in atomic nuclei



How do nuclear excitations violate parity?

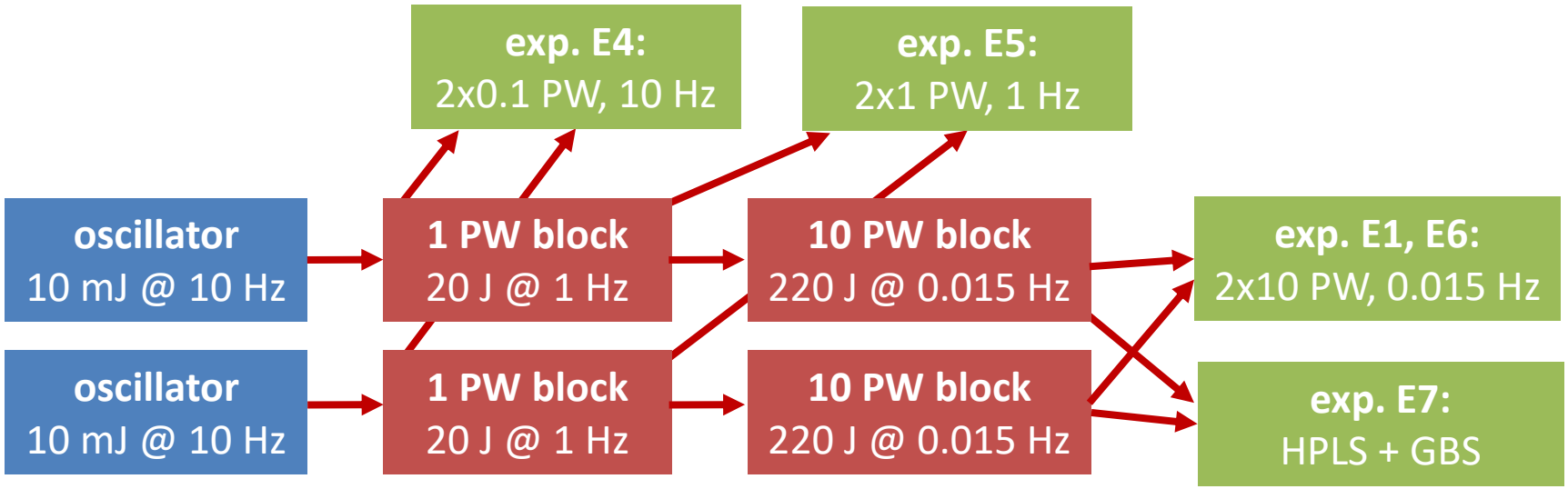


Are there new boundary conditions to the neutrinoless double-beta decay?



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

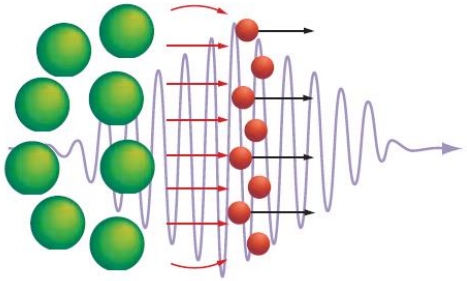
High Power Laser System HPLS @ELI-NP



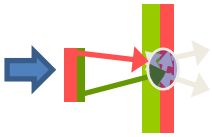
- intensities up to 10^{23} W/cm^2
- electric fields up to 10^{15} V/m
- pulse duration < 50 fs

New horizons at ELI-NP with HPLS

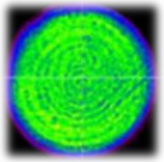
High power laser-matter interaction



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)