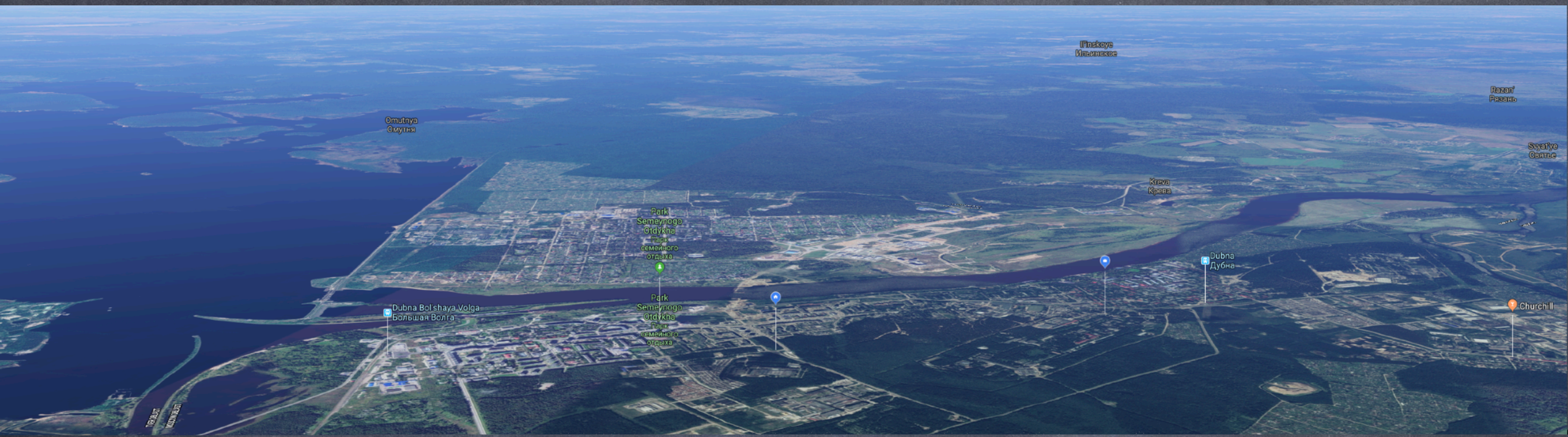
Joint Institute for Nuclear Research

Dmitry V.Naumov

Dubna


Ilinskoye
Ильинское
Rezan'
Рязань
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Святье
Kreva
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семейного
отдыха
Dubna
Дубна
Dubna Bol'shaya Volga
Большая Волга
Churchill

JINR. DLNP campus

JINR. LHEP campus

JINR

- New elements 102, (103, 104, 105(Db), 107), 114, 115, 116, 117, 118 are synthesized
- Hypothesis of neutrino oscillations (1957г.)
- New particles: anti-sigma-minus hyperon
- And many other discoveries

JINR

- Employed ~ 5000: 1200 - scientists, 2000 - engineers
- 7 labs. Each lab is as a big research institute
- 18 member-states and 6 associated members
- 1500 scientific publications/year
- Collaboration with 800 scientific centers and universities in 64 countries
- Expected budget in 2017-2023 1, 472 billion USD

- Veksler and Baldin Laboratory of High Energy Physics
- Dzhelepov Laboratory of Nuclear Problems
- Bogoliubov Laboratory of Theoretical Physics
- Frank Laboratory of Neutron Physics
- Flerov Laboratory of Nuclear Reactions
- Laboratory of Information Technologies
- Laboratory of Radiation Biology

Organized March 26, 1956 on the basis of (now) DLNP and LHEP

Four examples

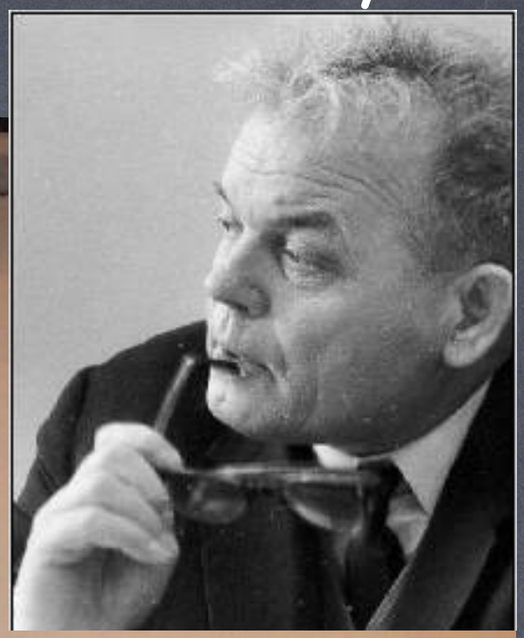
- Veksler and Baldin Laboratory of High Energy Physics
- Frank Laboratory of Neutron Physics
- Flerov Laboratory of Nuclear Reactions
- Dzhelepov Laboratory of Nuclear Problems

History

- **May, 7 1946. First discussion of «construction of a power cyclotron» at special committee of the government**
- **18 August 1946.** Soviet government approved the proposal of Academician Igor Kurchatov to construct in USSR „the installation M” for fundamental studies in nuclear physics.
- **14 December 1949.** The 480 MeV proton synchrocyclotron started operation at the Hydrotechnical Laboratory in Dubna, the most powerful accelerator in the world at that time.
- **26 March 1956.** Laboratory of Nuclear Problems of JINR has been founded.

Synchrocyclotron 680 MeV (1953)

M.G.Meshcheryakov



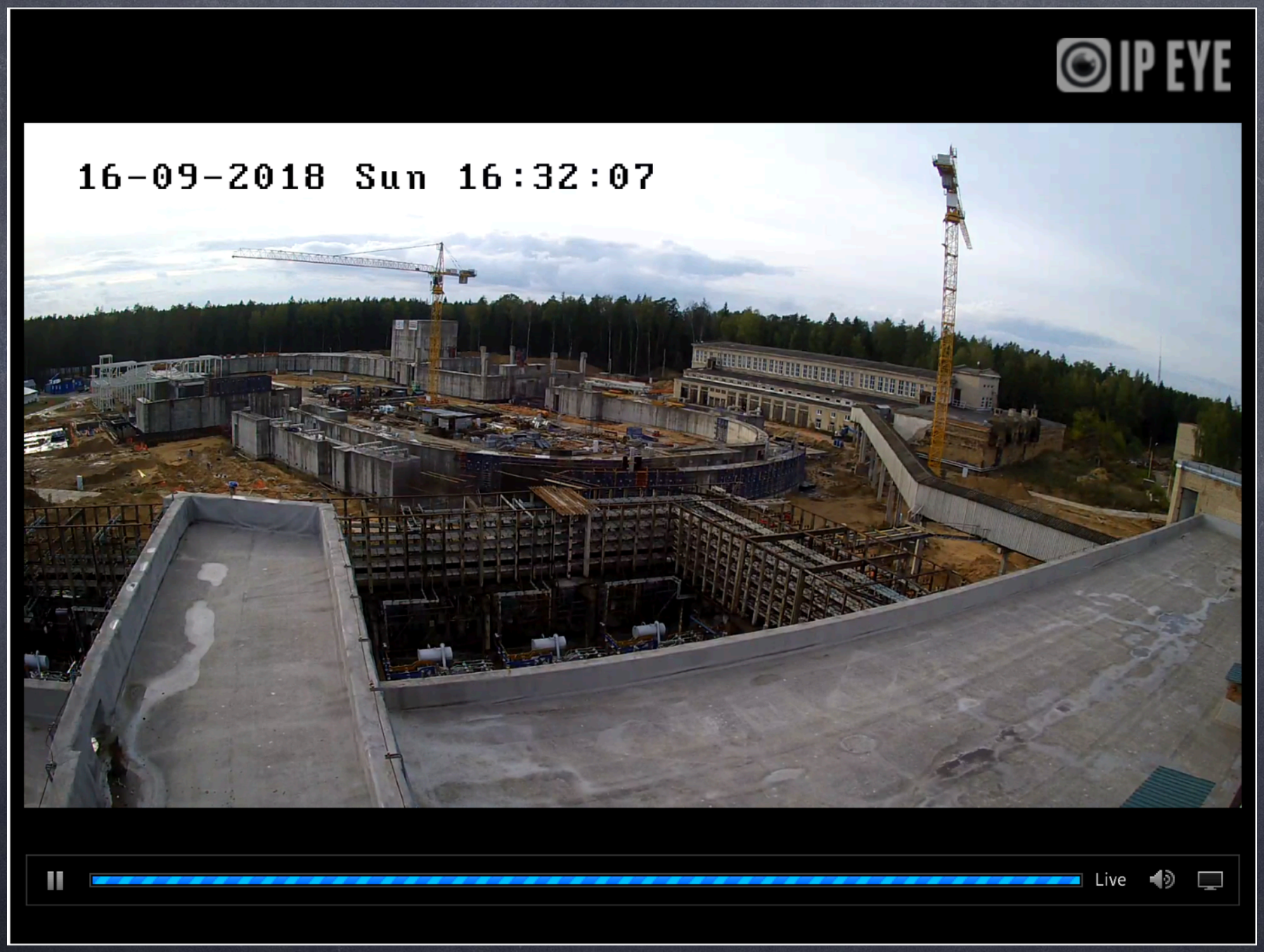
Veksler and Baldin Laboratory of High Energy Physics

Mega-Science project NICA

Search for phase transitions in quark-gluon plasma

Mega-Science project NICA

http://nucloweb.jinr.ru/nucloserv/205corp.htm

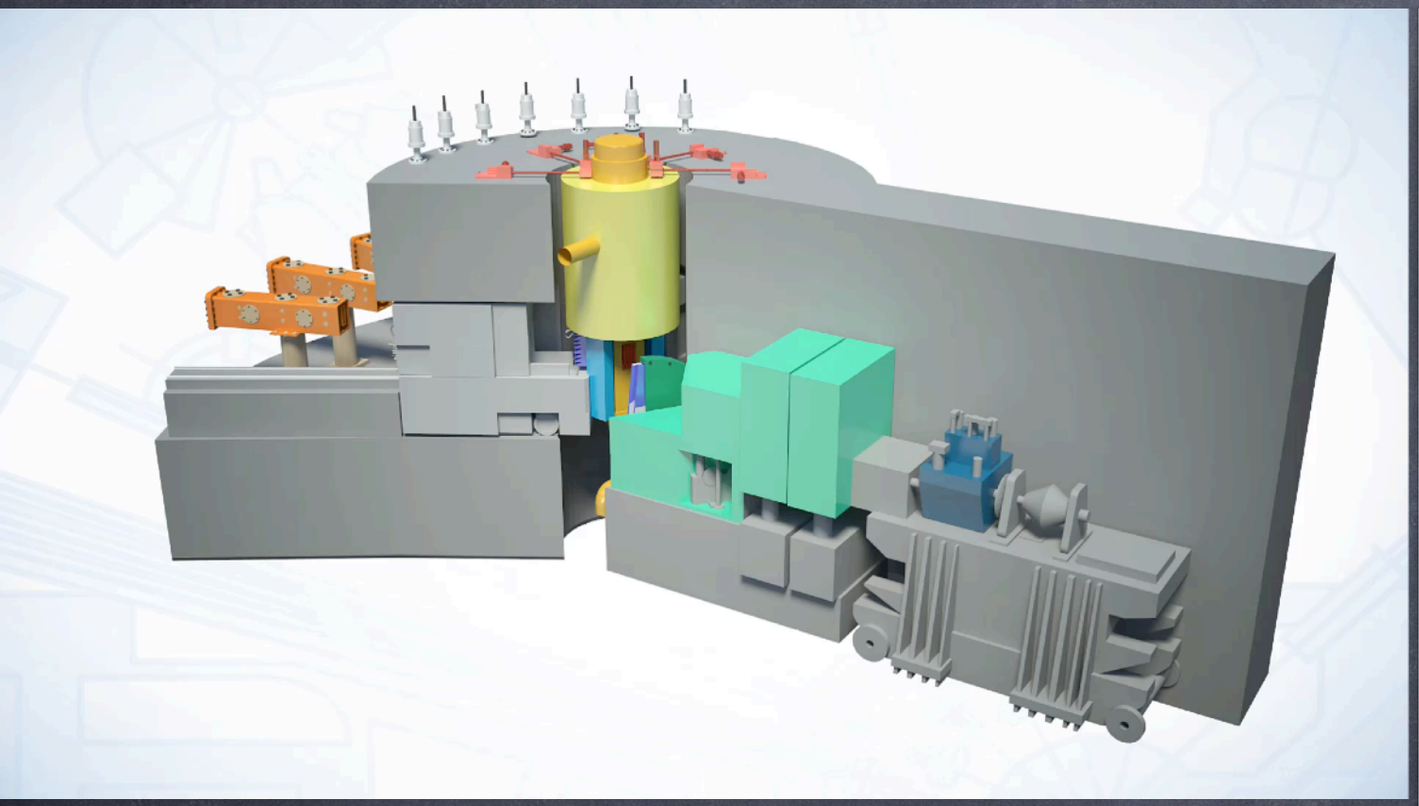


Search for phase transitions in quark-gluon plasma

Factory of superconducting magnets

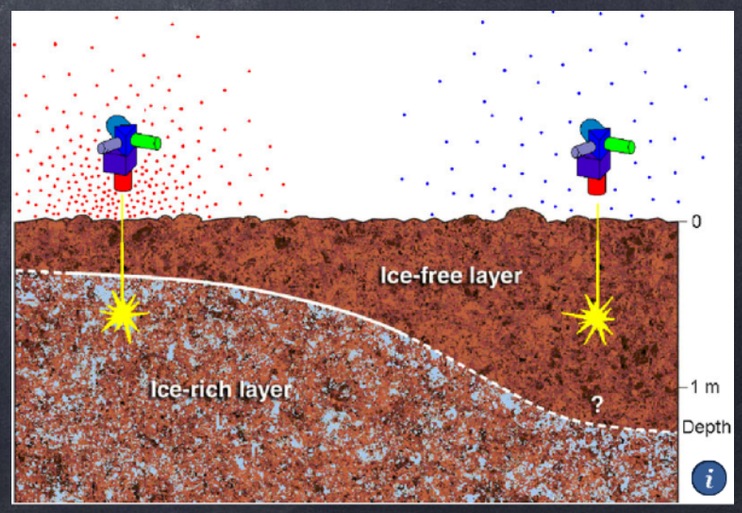
Frank Laboratory of Neutron Physics

IBR-2



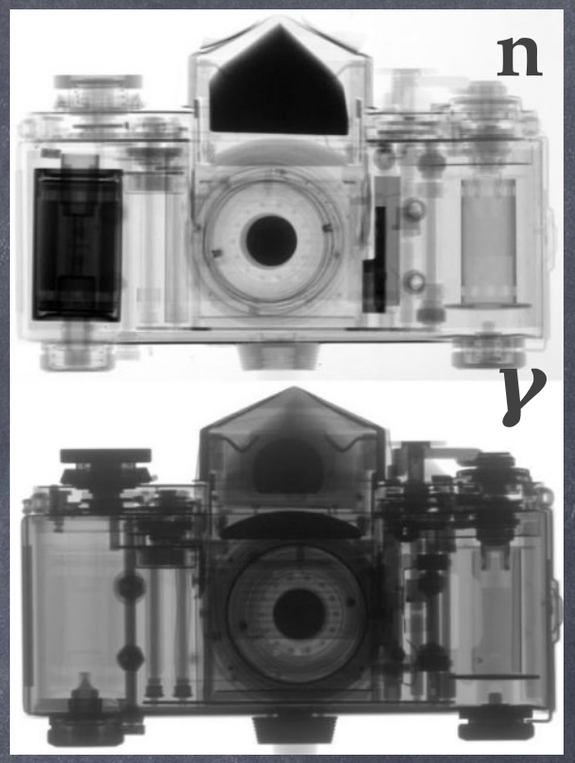
Next project: IREN

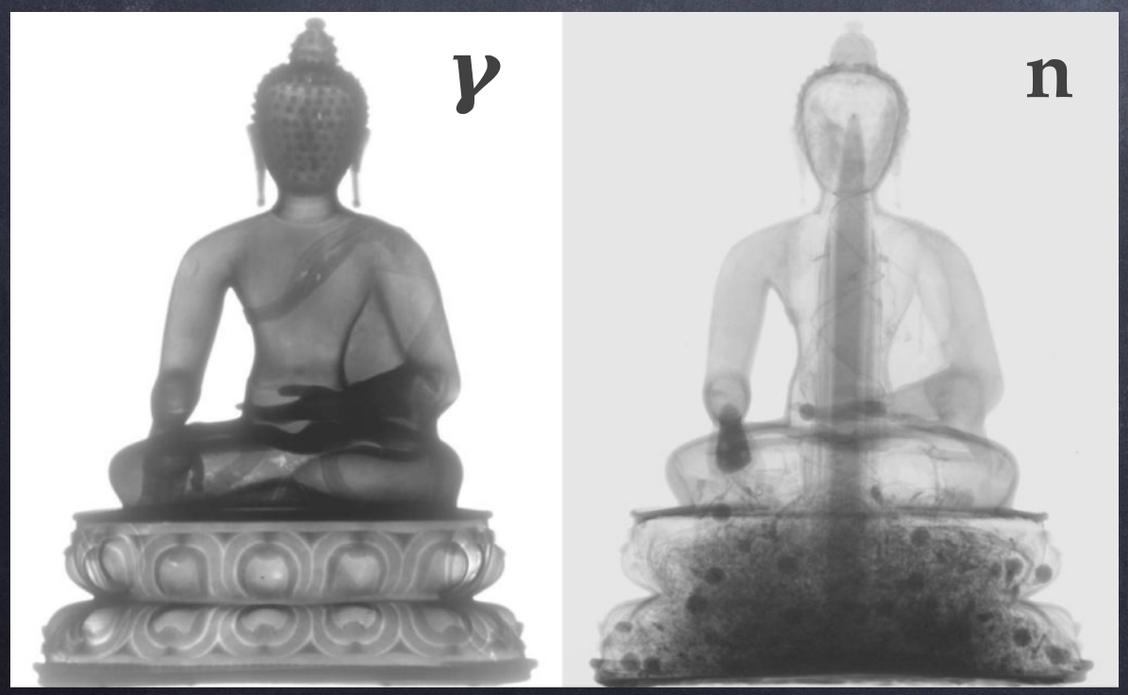
Search for water on Mars



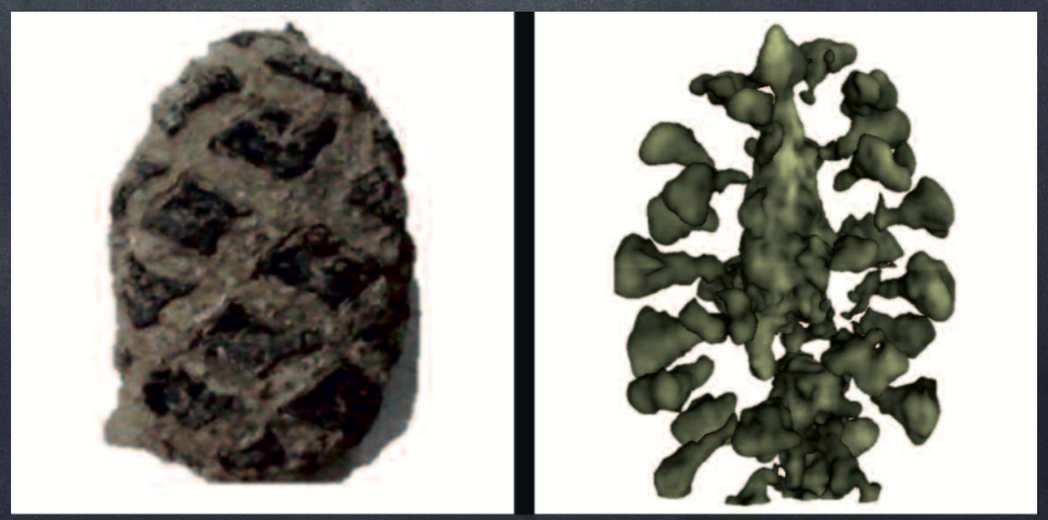
Neutron radiography

Organic structure is seen better with help of neutrons



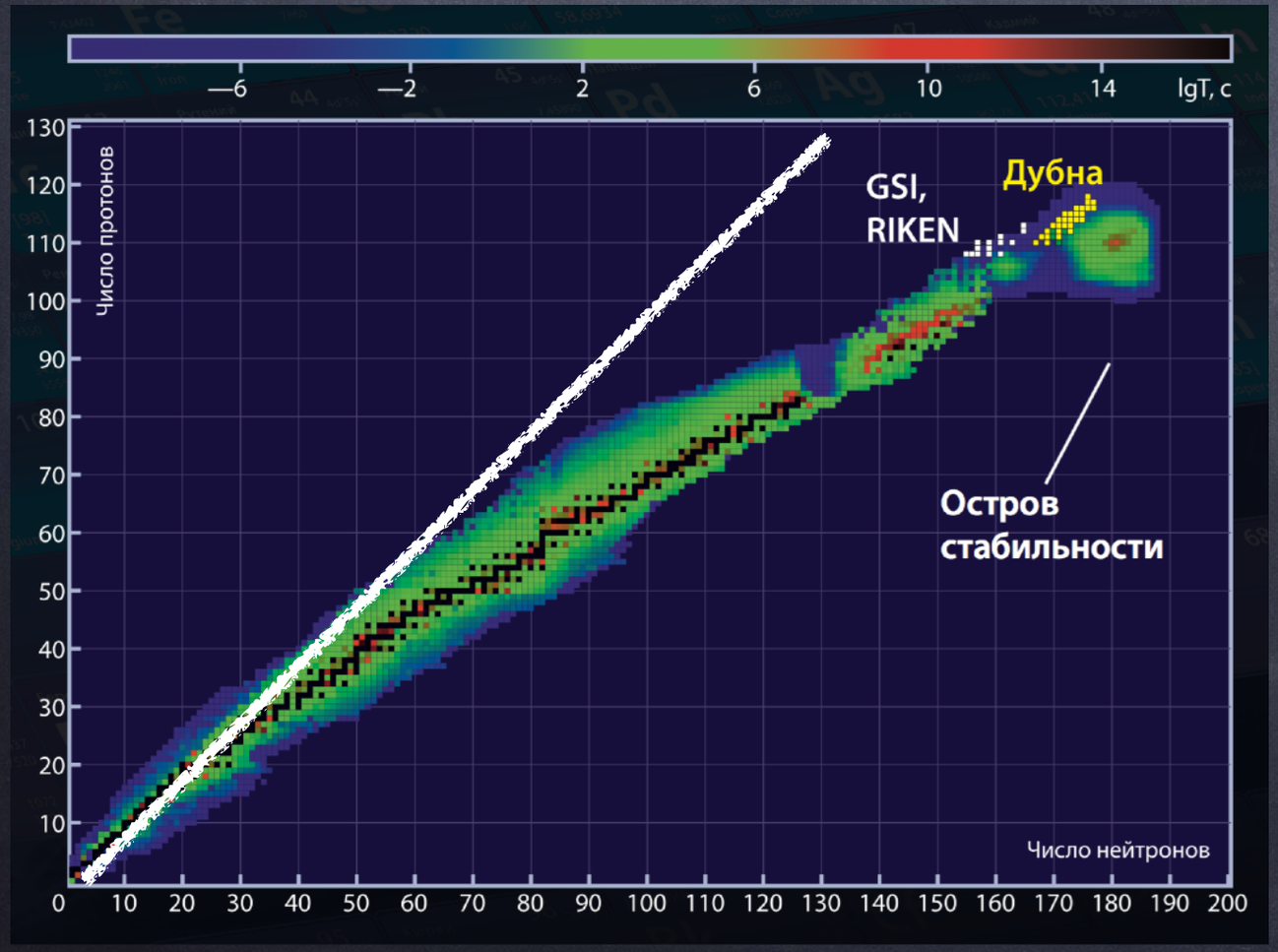


Effective for paleontology



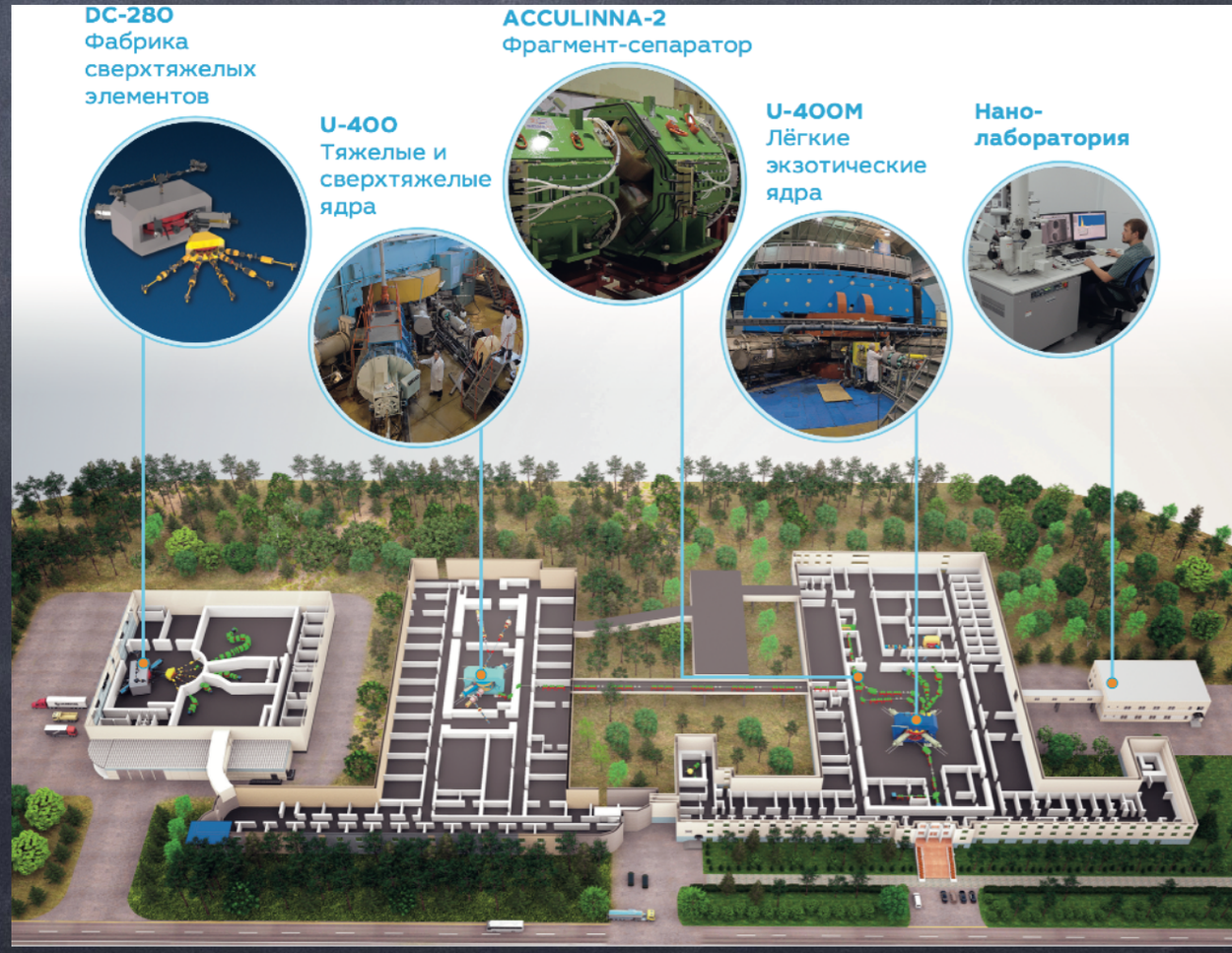
Flerov Laboratory of Nuclear Reactions

Search for stability island



Elements synthesized in Dubna

FLNR facilities



Dzhelopov Laboratory of Nuclear Problems

Structure of DLNP

- Particle Physics
- Accelerator Technologies
- Neutrino Physics & Astrophysics
- Radiation Medicine, Genetics, Molecular Genetics
- Radiochemistry & Nuclear Spectroscopy
- IT, design office, workshop, services, etc
- Education & Outreach

- about 650 employees
- among them about 500 scientific staff

SCEINCE & TECHNOLOGIES

Particle Physics

- ATLAS
- Mu2e, g-2
- COMET
- BES-III
- PANDA

Neutrino Physics & Astrophysics

- BAIKAL GVD
- Daya Bay/JUNO
- NOVA
- BOREXINO
- GERDA
- GEMMA/vGEN
- SuperNEMO
- TUS/Nucleon/TAIGA
- EDELWEISS

Technologies

- Precise Laser Metrology
- New semiconductor detectors
- Ultra cold temperatures

SCEINCE & TECHNOLOGIES

Medicine & Molecular Genetics

- Proton Therapy
- Medical-biological studies
- Radiation genetics

Education & Outreach

- Schools, conference, seminars
- Web-site of DLNP, social networks
- Lecturing at MSU, MIPT, «Dubna» University and others

Bruno Pontecorvo worked in JINR (1950-1993) establishing a School of Neutrino Physics

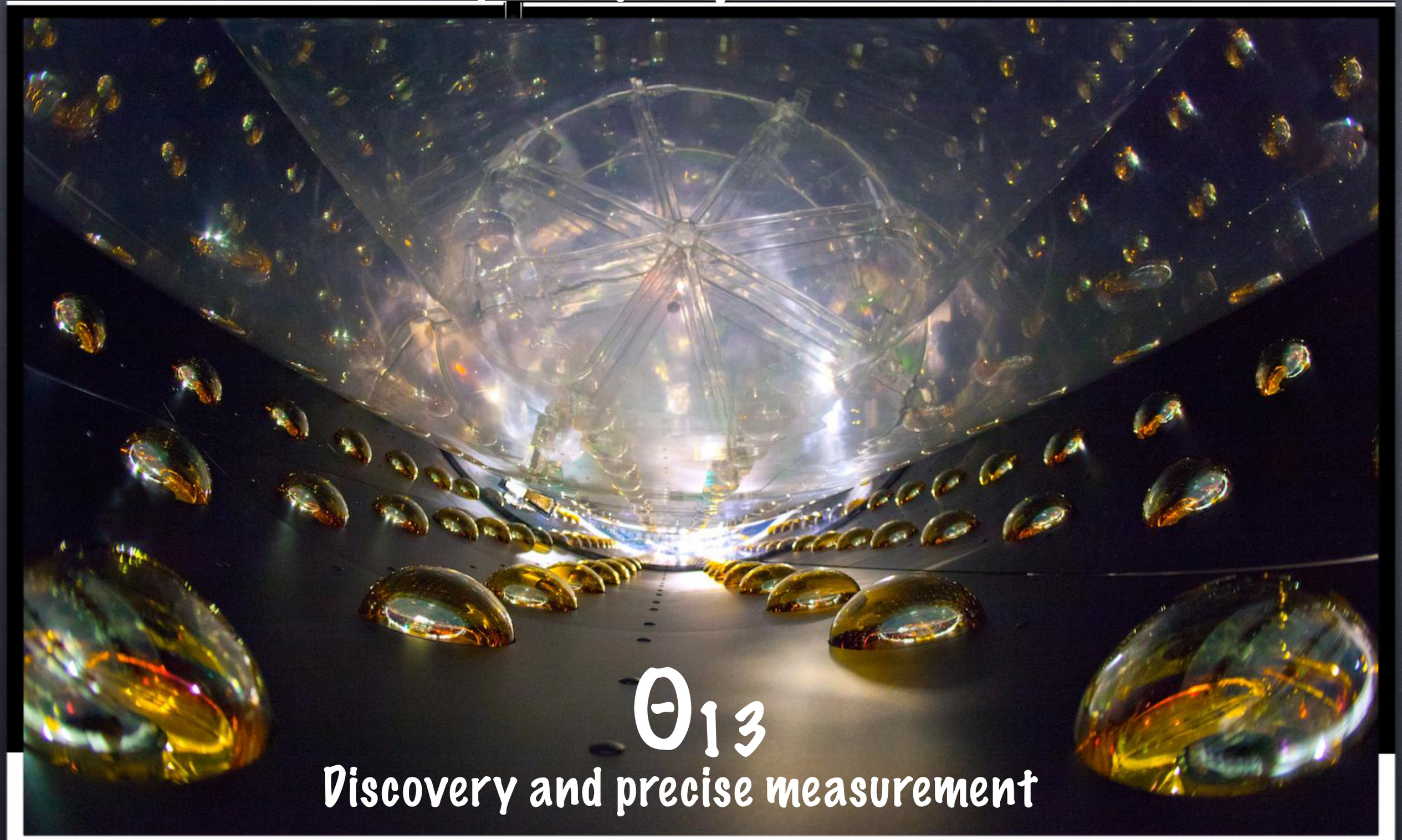
Experiments, theory, technologies, IT

- Reactor neutrinos: Daya Bay, JUNO, Kalinin NPP (nuGEN, DANSS, GEMMA)
- Accelerator neutrinos: NOvA, OPERA, DUNE
- Atmospheric and astrophysical neutrinos: BAIKAL GVD
- Solar neutrinos: BOREXINO
- Neutrinoless double beta decays: SuperNEMO, GERDA
- Gamma Ray Telescope: TAIGA (100 TeV gamma)

Experiments, theory, technologies, IT

- Quantum field theory of neutrino oscillations in vacuum and matter (in collaboration with theory lab)
- Theory of neutrino interactions with matter
- Global neutrino analysis of world data (GNA)

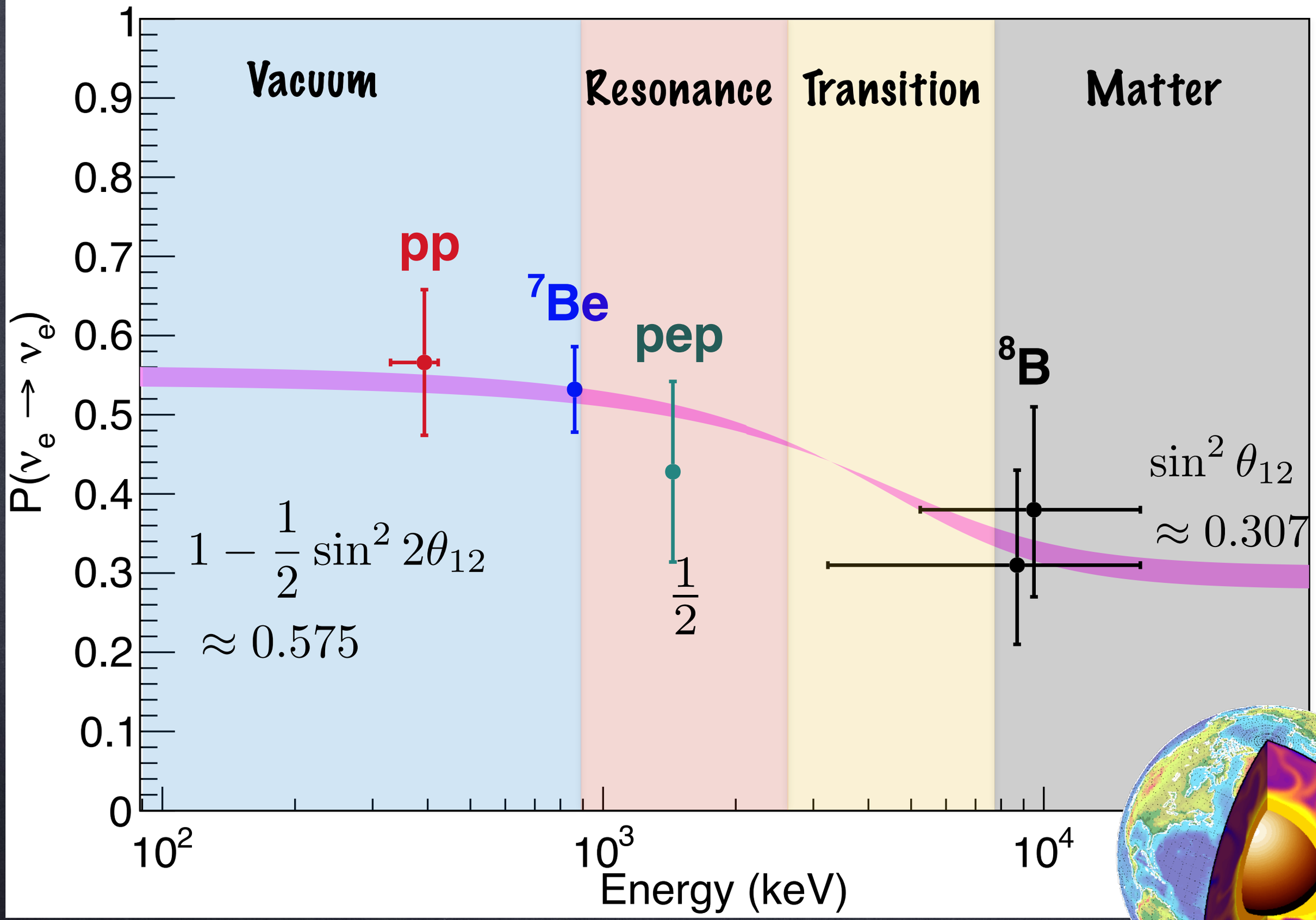
Daya Bay experiment

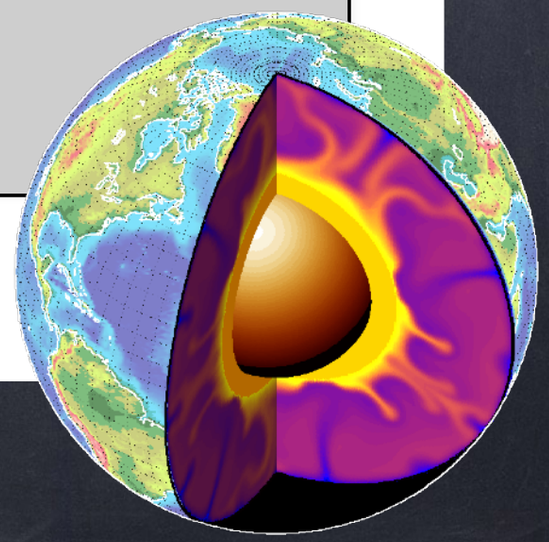


θ_{13}

Discovery and precise measurement

BOREXINO experiment

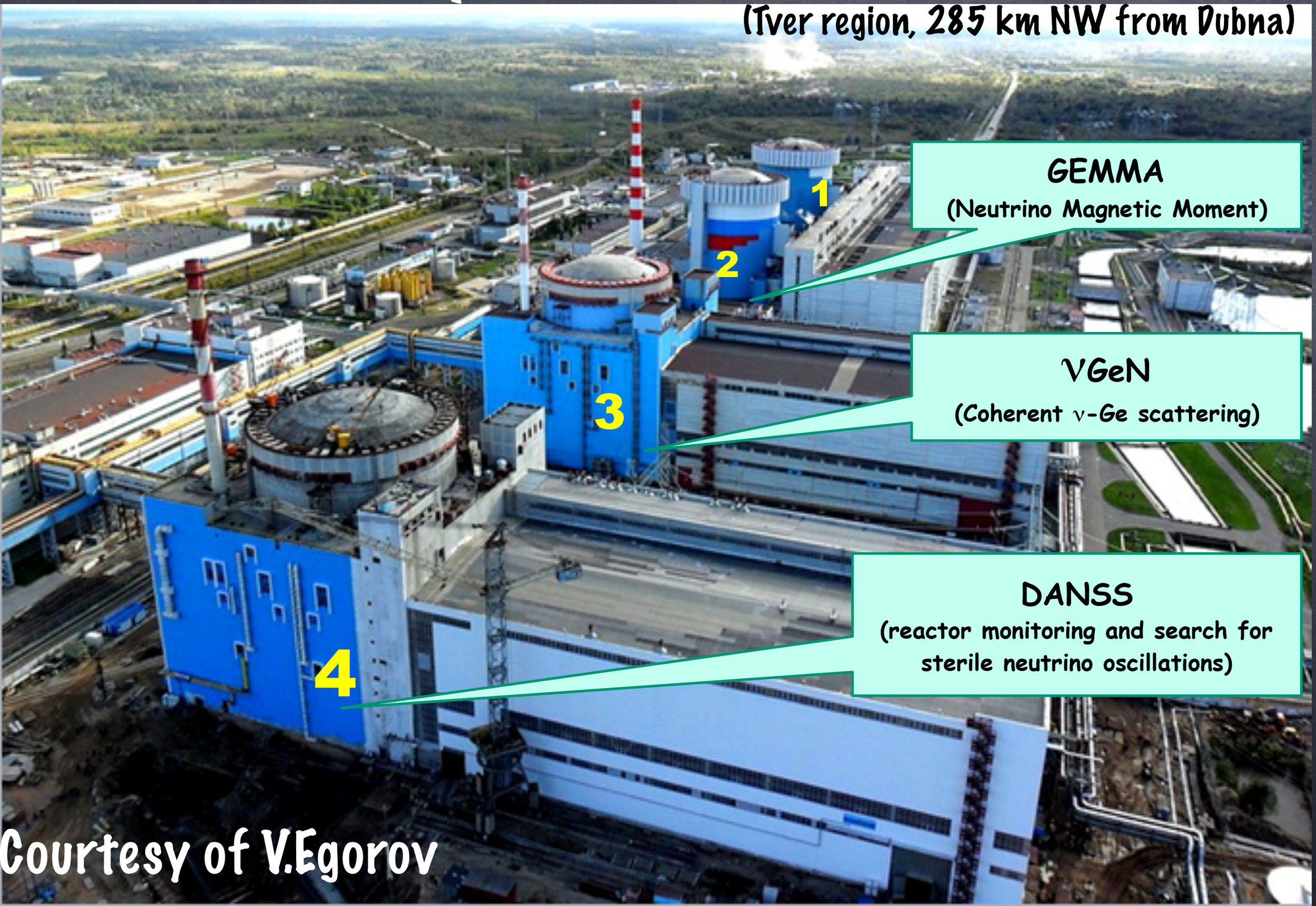




arXiv: 1707.09279

Neutrino experiments at the Kalinin NPP

(Tver region, 285 km NW from Dubna)



Courtesy of V.Egorov

BAIKAL Gigaton Volume Detector

2018: Three clusters installed

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