Frank Laboratory of Neutron Physics presents


FLNP

Frank Laboratory of Neutron Physics

FLNP 7-Year Research Program

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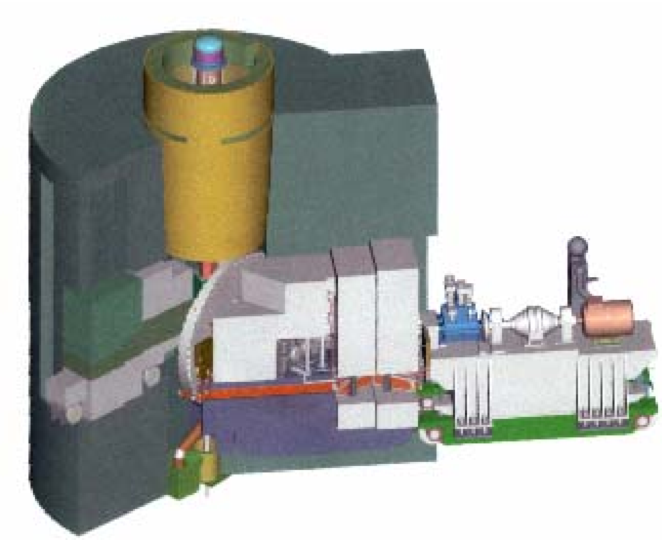
IBR-2 Reactor Modernization Program



IBR-2 is included into 20 years strategic program of neutron scttering research in Europe.

Main Parameters:

Peak power in pulse	*– 1500 MW*
Flux in moderator	*– $2.4 \cdot 10^{16}$ n cm^{-2} s^{-1}*
Pulse width	*– 200 μs*

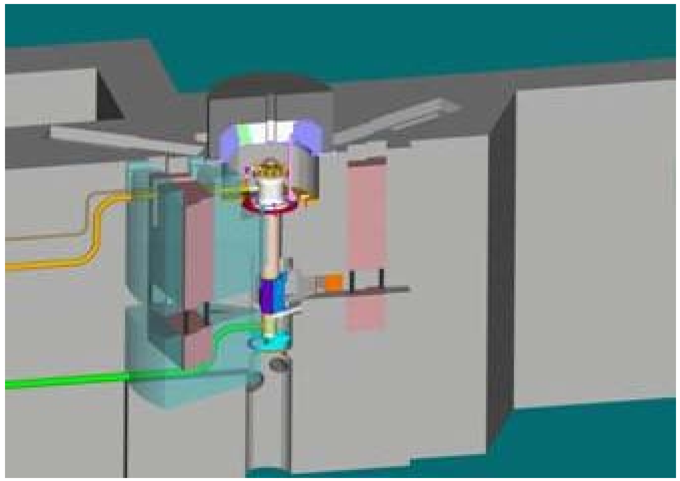
of modernization: higher nuclear safety, reliability and stability, longer life-time of major equipment

2003	2004	2005	2006	2007	2008	2009	2010
	IBR-2 operation						
MR-3							
Fuel elements							
Manufacturing of main equipment							
				Dismantling			
					Equipment Installation		
						IBR-2M startup	Operation for expt.

$\Sigma^{2003\text{-}2009}$ = 4620 k$ JINR = 2100 k$

MAE = 2520 k$

Plan for Creation and Operation of IREN source



Main Parameters:

Electron beam energy – 200 MeV

Neutron flux – 10^{15} n/s

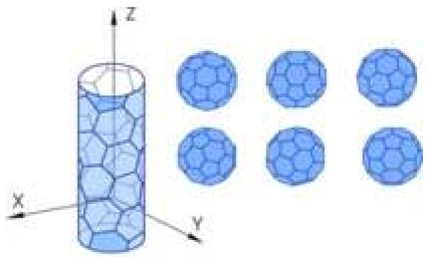
Neutron pulse duration – 400 ns

Repetition rate – 150 Hz

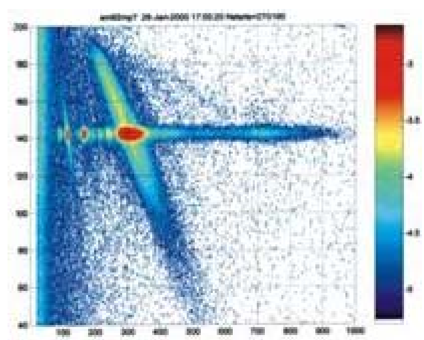
2002	2003	2004	2005	2006-2009	
Creation and start, first stage					**1572 K$**
			Full completion		**350 K$**
	Modernization of spectrometers				**950 K$**
				Data taking	**760 K$**

Neutron Investigations of Structure and Dynamics of Condensed Matter.

Scientific Research



Nano-structures. Biopolymers. Fullerenes in solutions. Medical and biological applications



Systems with strong electron correlations. Magnetism of layered nano-structures and organic compounds

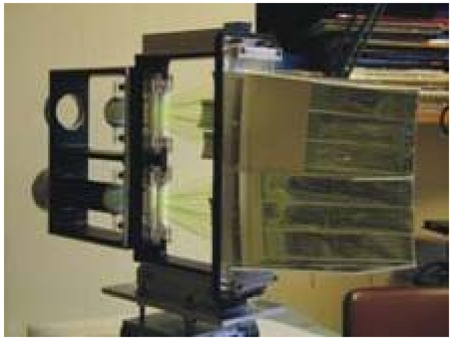
Crystalline structure and defects in constructional materials for nuclear power engineering

Neutron Investigations of Structure and Dynamics of Condensed Matter.

Experimental Methods

Neutron optics with polarized and cold neutrons. Reflectometry and small angle scattering

Diffractometry of internal stresses and textures of materials



High-efficiency neutron detectors

Nuclear Physics with Neutrons.
Fundamental Research

Fundamental symmetries investigation

Establishing the upper limit for the T - violating term in the forward scattering neutron amplitude, which is proportional to T - violation matrix element

Near **3.2 eV** p - wave resonance in **^{131}Xe** the experimental effect to be expected

$$R \approx \sqrt{\frac{\Gamma_n^p}{\Gamma_n^s}} \cdot \frac{v_{PT}}{E_s - E_p} \cdot \frac{(E_s - E_p)^2}{\Gamma^2} \leq 10^{-6}$$

This value corresponds to

$$\lambda^{QCD} = \frac{v_{PT}}{v_P} \leq 10^{-4}$$

where $v_P \approx 10^{-3}$eV

nn-Scattering Direct Measurements

The global goal is obtaining new results concerning the **charge symmetry of nuclear forces**. The expected specific results are as follows:

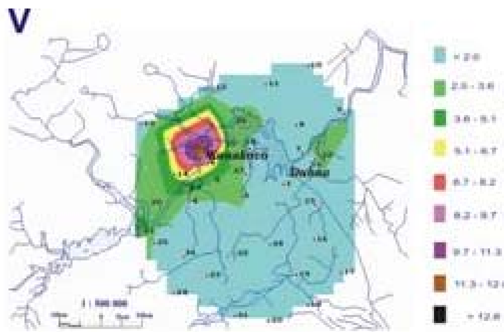
- Performing for the first time a direct measurement of neutron-neutron scattering.
- Determining the neutron-neutron scattering length at **3-5% level**.

Indirect measurements a_{nn}:

2000: a_{nn}= -(18.7±0.4) fm (mean value)
a_{pp} - a_{nn} = -(1.3±0.6) fm

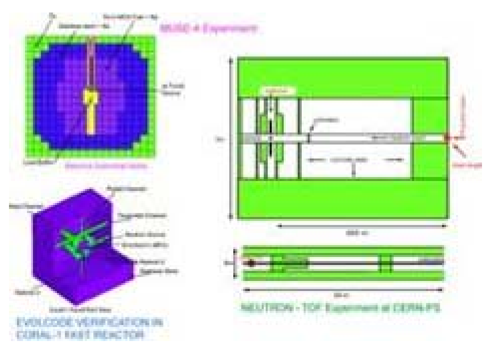
2001: a_{nn}= -(16.3±0.4) fm (Bonn group)
a_{pp} - a_{nn} = (1.1±0.6) fm

Applied Research



Moss Biomonitoring and
Nuclear Relative Technique

Se and I containing pharmaceuticals
based on *Spirulina Platensis*

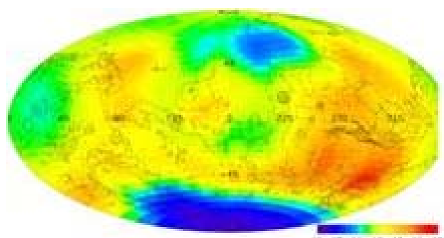


Creation of Subcritical Assembly
Driven by proton accelerator
(project SAD)

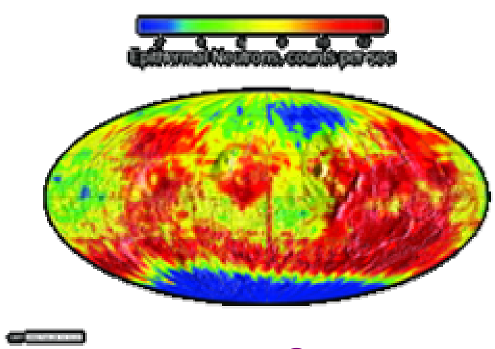
R & D on Advanced Detectors

HEND: High Energy Neutron Detector. First Results

HEND has 4 signals of neutrons from sensors SD, MD, LD and SC/IN, and for each of them the map of orbital measurements is currently produced



The map of MD sensor is contributed by epithermal neutrons mainly left



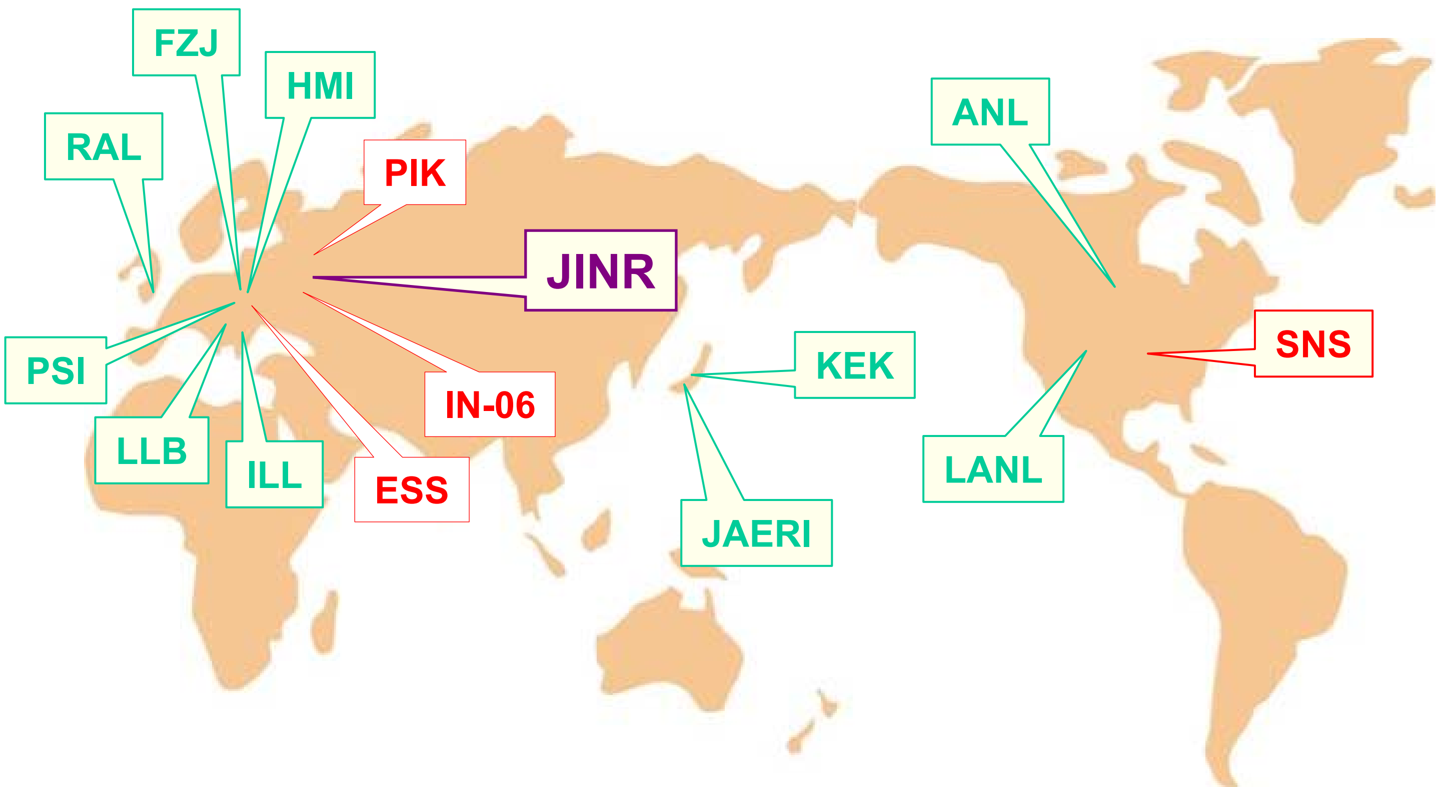
This MD map is consistent with the map for epithermal neutrons from Neutron Spectrometer

Count rate over the South Pole is 5-10 times lower (blue region) – doubtless water presence

International Cooperation

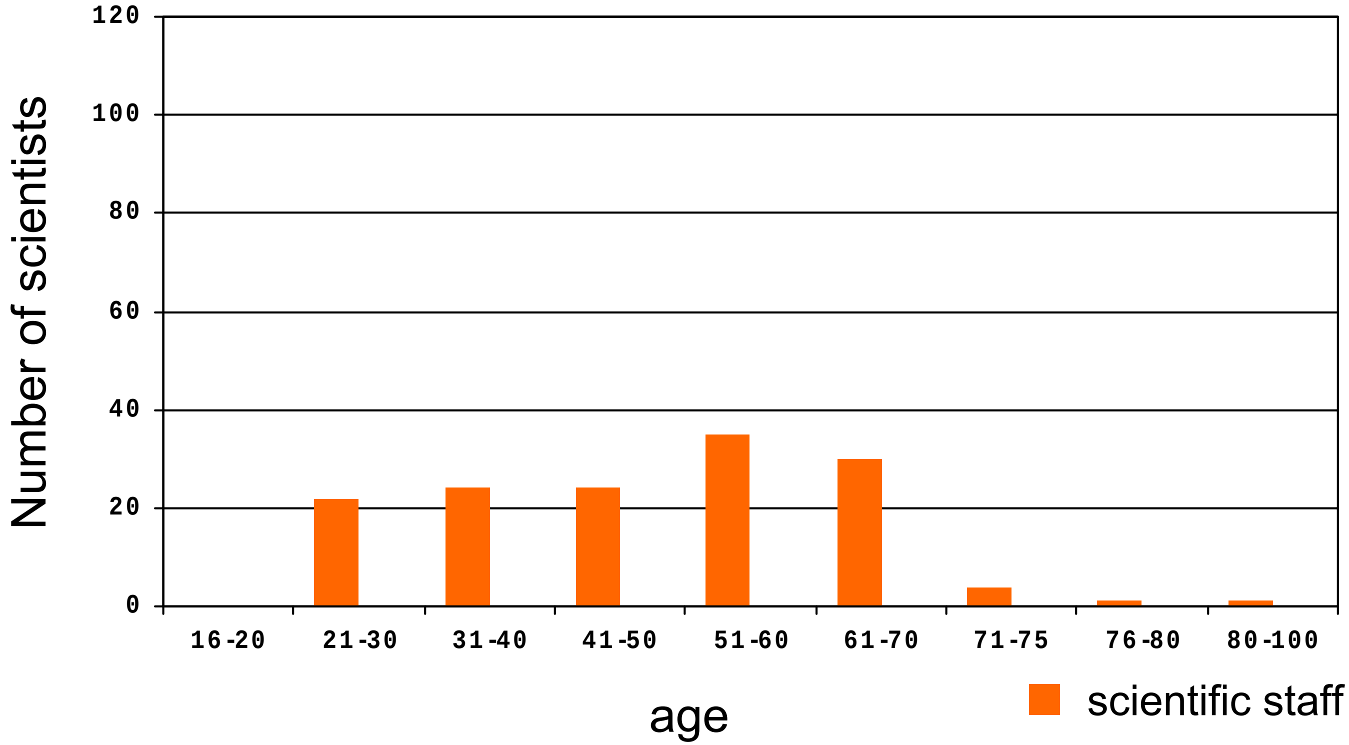
JINR member-states

Collaboration with other neutron centers



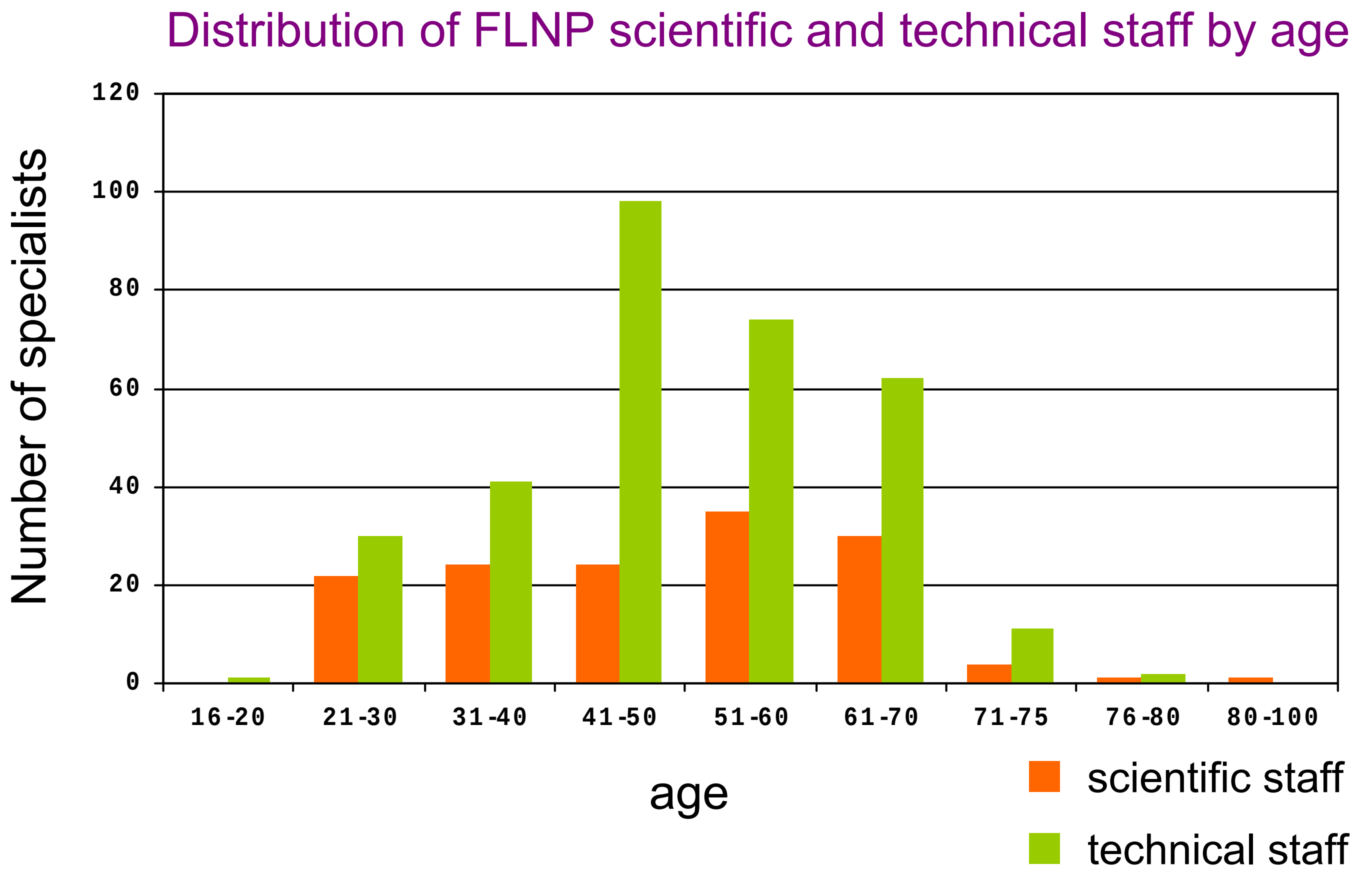
Personnel

Distribution of FLNP scientific and technical staff by age



JINR University Center, MSU Interfaculty Center,
MSU Chair on neutron scattering, etc.
Regular Schools on neutron scattering and synchrotron radiation for students and young scientists

Personnel



Similar training programs are needed for young engineers and technicians

Conclusions

- It is mandatory to complete the IBR-2 modernisation by 2009. This requires to follow strictly the approved working and financing plans according to JINR-MINATOM agreement

- IREN project should be realised to provide unique possibilities for the JINR member-states to develop nuclear physics research with neutrons

- FLNP research program focuses on the most efficient use of JINR basic facilities with the aim of obtaining new results of the world class in fundamental and applied sciences in the interests of JINR member-states

- Training of young engineering and technical staff should be among the first priority issues. JINR Directorate should continue work on salaries increase and solution of accommodation problem

- All FLNP plans could be realized in the frame of full planned JINR budget