Reactor PIK - facility

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CREMLIN PLUS
Connecting Russian and European Measures
for Large-scale Research Infrastructures

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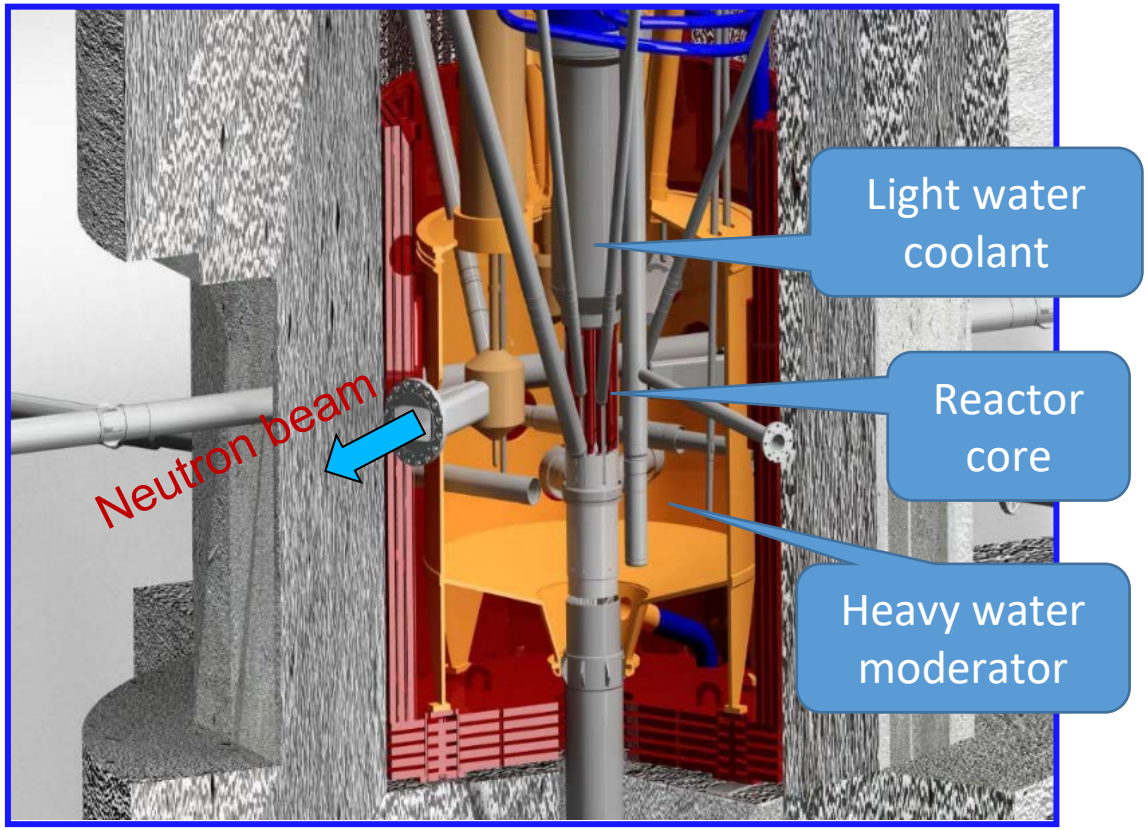
High flux research reactor PIK

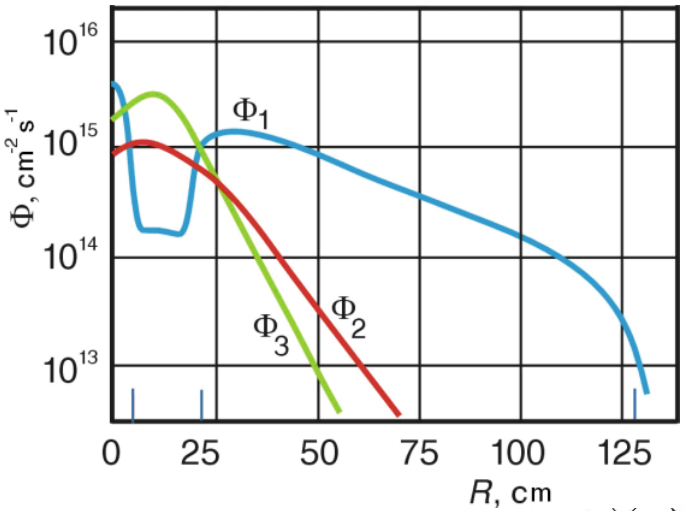
The purpose of PIK is a production neutron beams with the maxima possible fluxes.

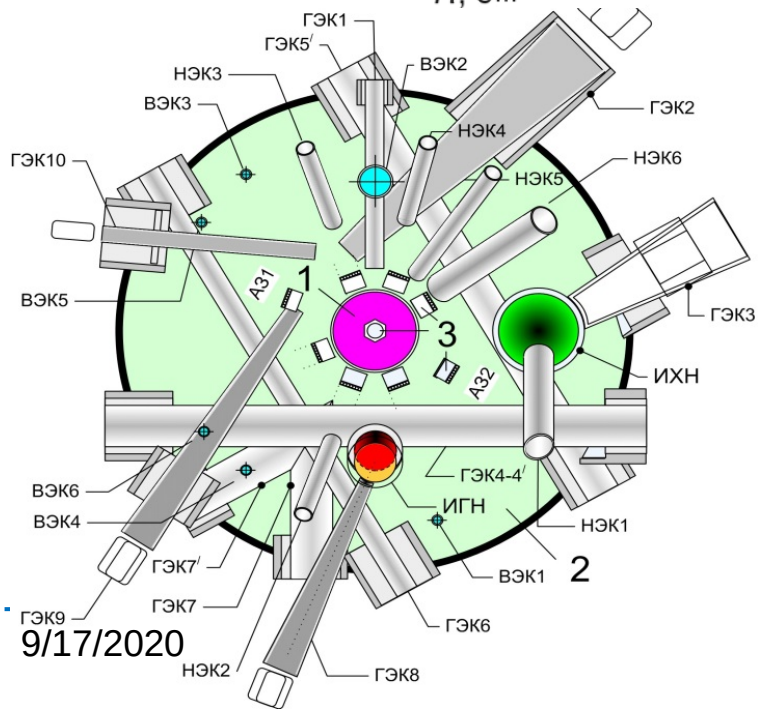
We need:

1. High neutron fluxes inside reactor
2. System of neutron thermalization to get required energy
3. System of neutron transportation
4. Station of neutron scattering



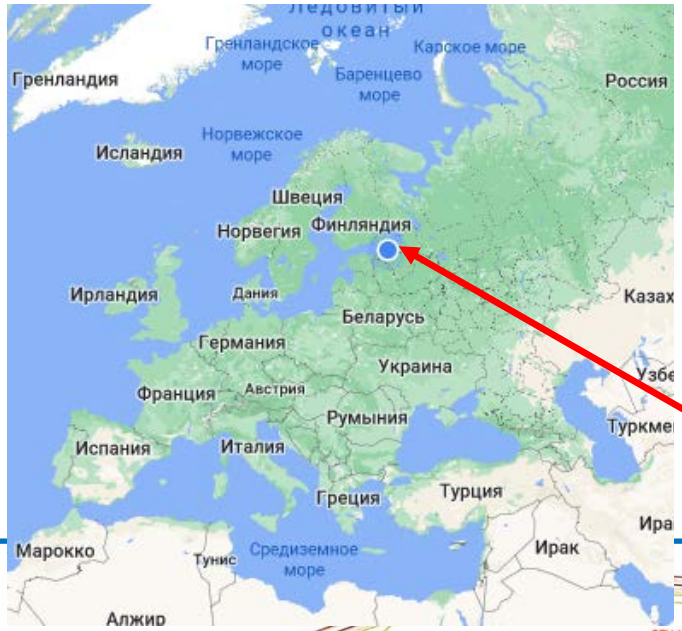
Reactor PIK parameters

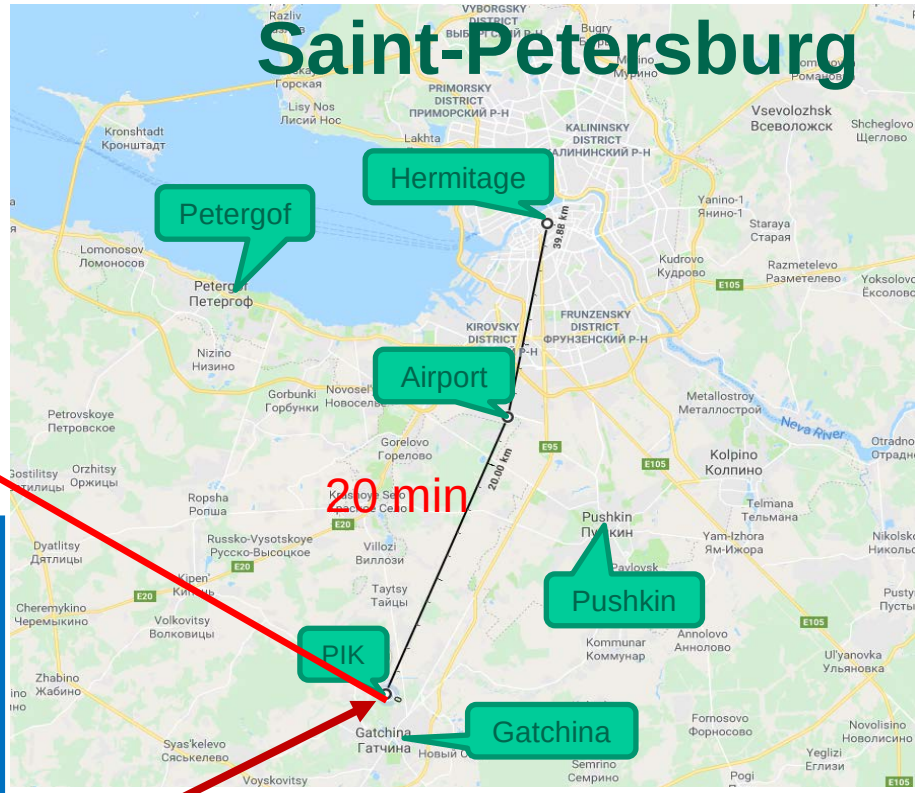


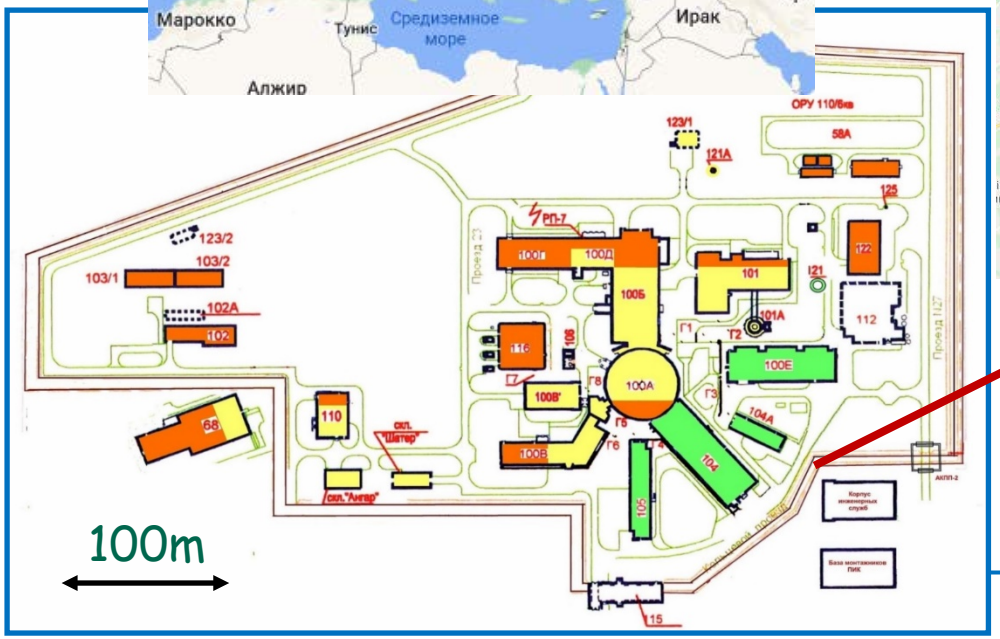


	Value
Power	100 MW
Reactor core volume	50 l
Core height	500 mm
Coolant	H_2O
Reflector	D_2O
Maximal neutron flux in moderator	**1.3×10^{15} n/cm^{2}c**
Maximal neutron flux in central trap	**5×10^{15} n/cm^{2}c**
Operation cycle	~30 day
Experimental channels	
- Horizontal (HEC)	10 (3 throughout)
- Vertical (VEC)	6
- Inclined (IEC)	6
- Central (CEC)	1

Location of the reactor PIK complex (NRC "Kurchatov institute"-PNPI, Gatchina, Russia)

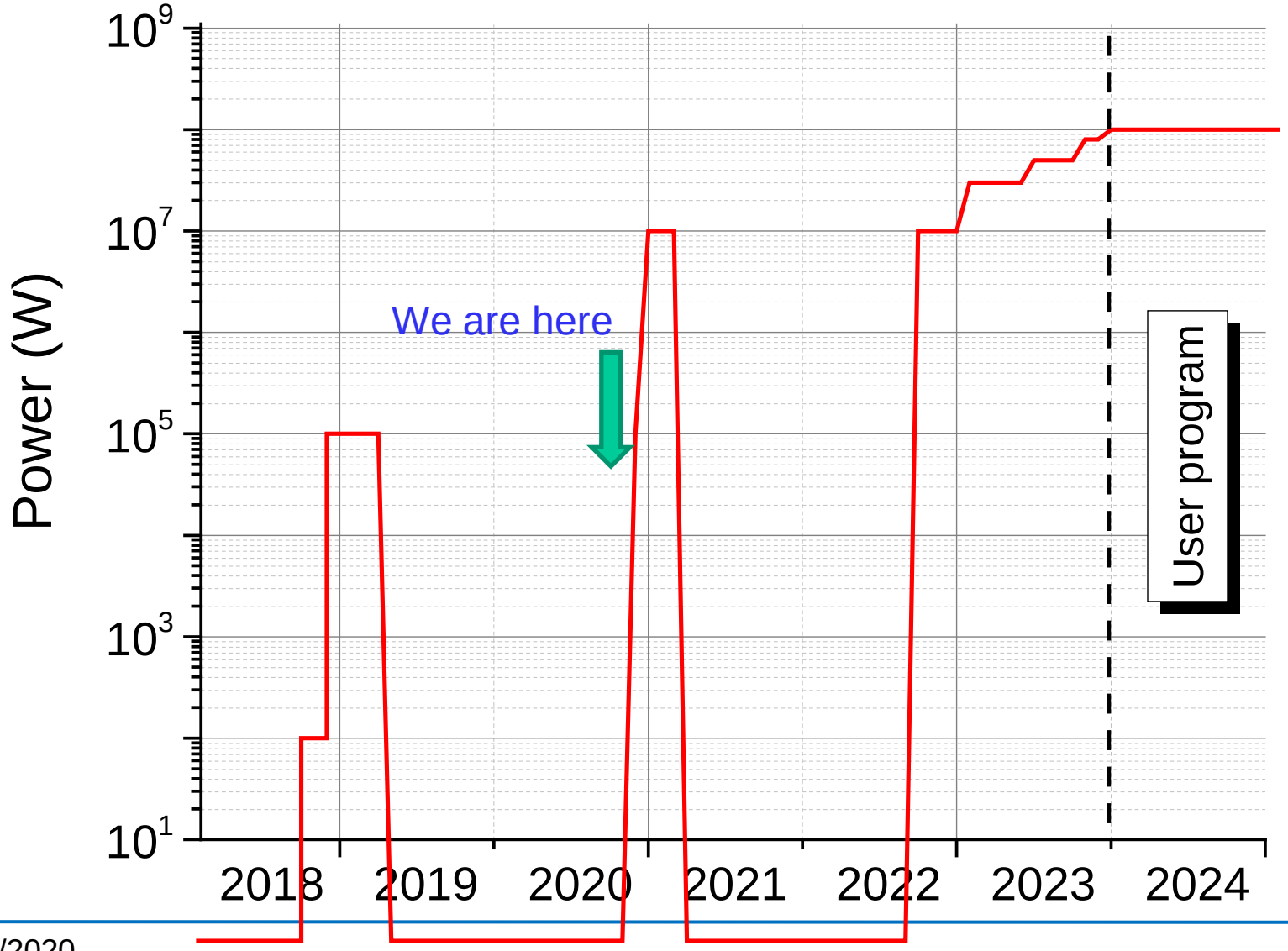






PIK reactor (NRC "Kurchatov institute"-PNPI, Gatchina, Russia).

Reactor PIK commissioning (Plan)



Instrumentation Program

Neutron sources –

Two cold neutron source (HEC 2 and HEC 3)

Hot neutron source – HEC 8

Ultra cold neutron source – HEC 4

Instrumentation base (20 stations)

Experimental stations for condensed matter (13)

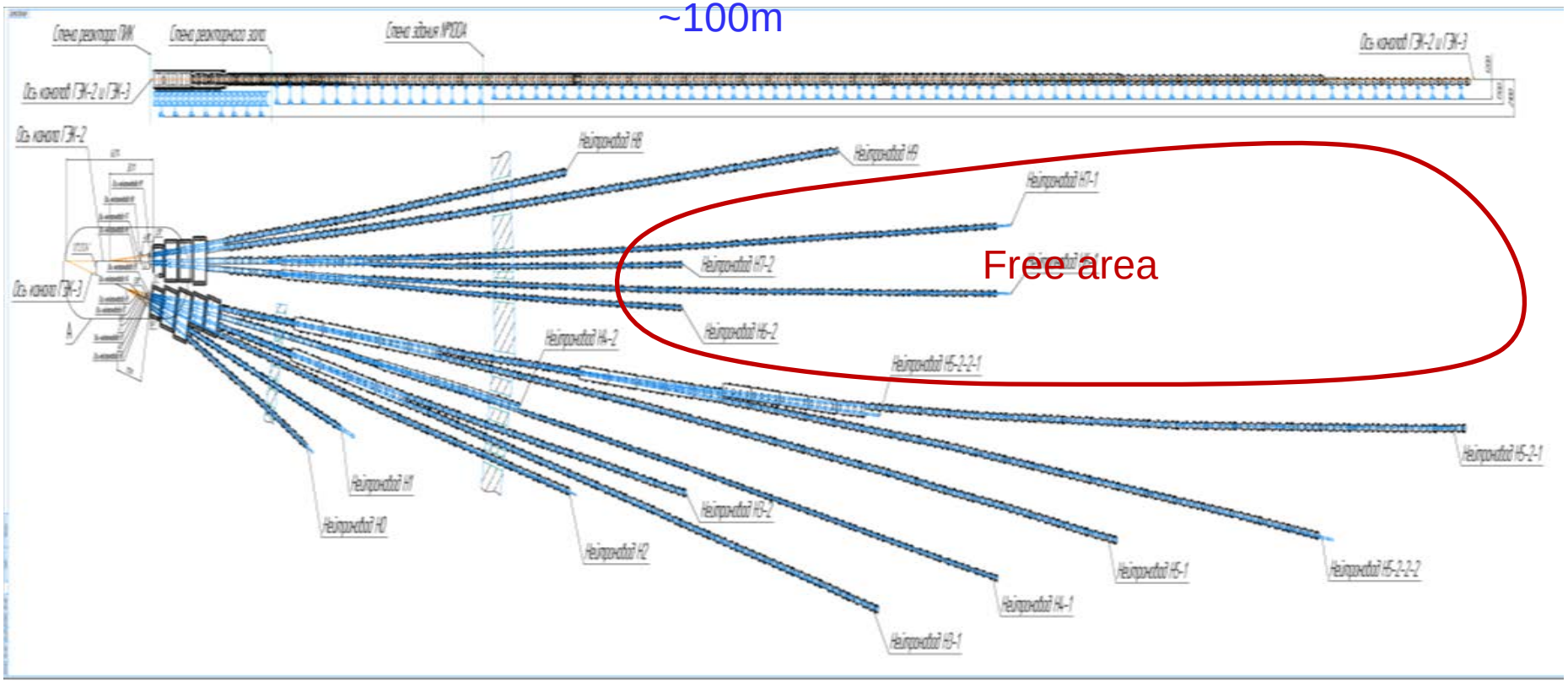
- Diffractometers (3)
- Spectrometers of inelastic scattering (5)
- SANS machines (3)
- Reflectometers (2)

Experimental stations for fundamental physics (7)

- Stations with CN (2)
- Neutrino physics facility (1)
- Stations for nuclear spectroscopy (3)
- Fission physics (1)

5 test stations of the first order

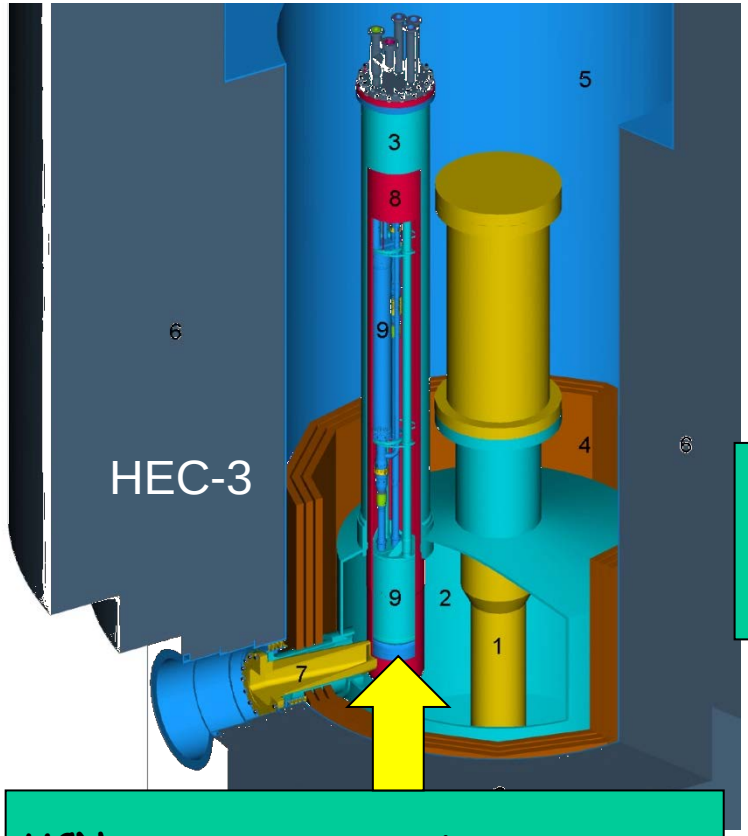
Neutronguide complex



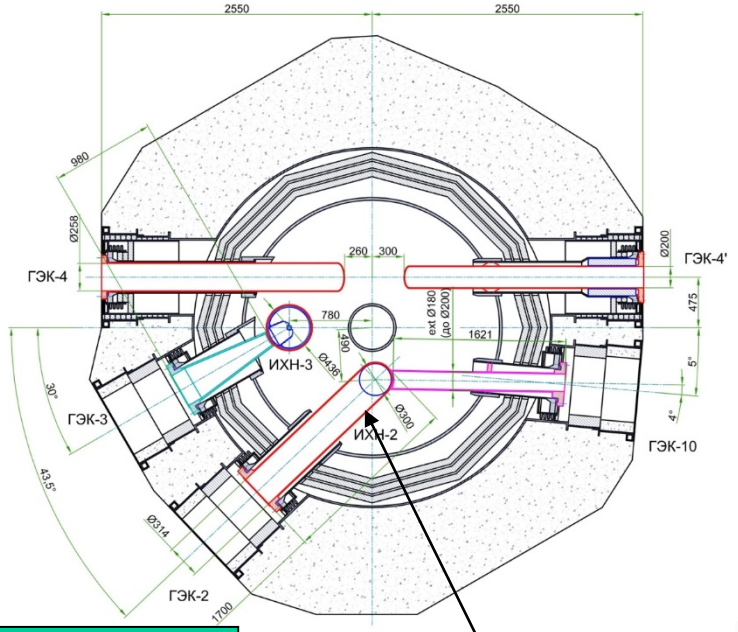
Length ~ 1 km.

Up to 40 experimental positions (neutron flux (3-12) 10^{10} n/cm^{2}s)

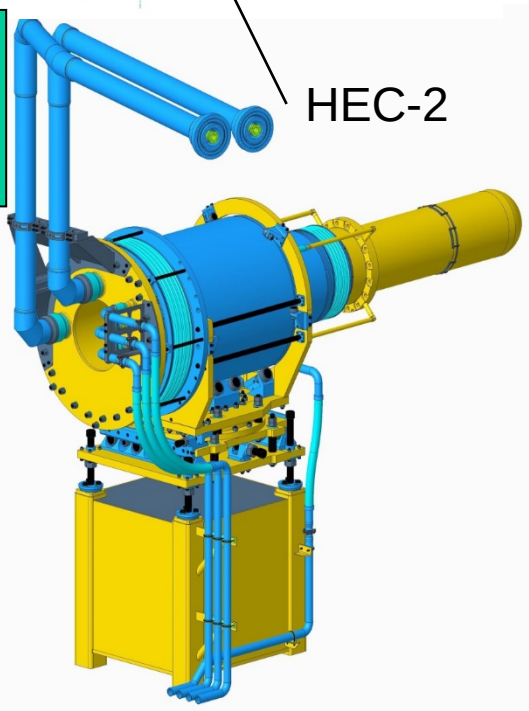
Cold neutron sources (CNS)



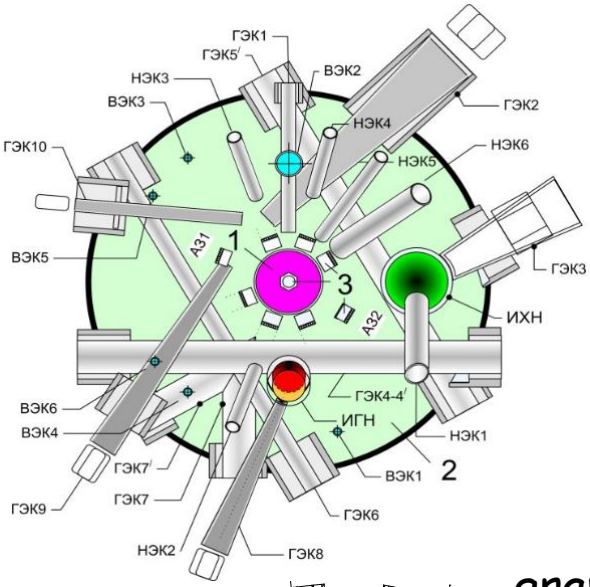
UCN source - parameters
Liquid deuterium - 25 L, **T = 20 K**
The distance from the active zone of the reactor-60cm
Heat release – 5-6 kW.

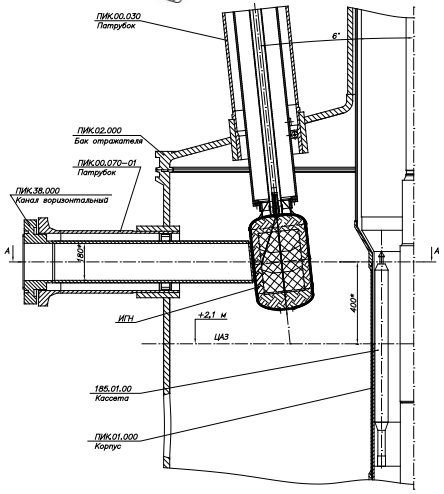


UCN source - parameters
Liquid deuterium - 20 L,
T = 20 K
Heat release – 7 kW.



Hot neutron source

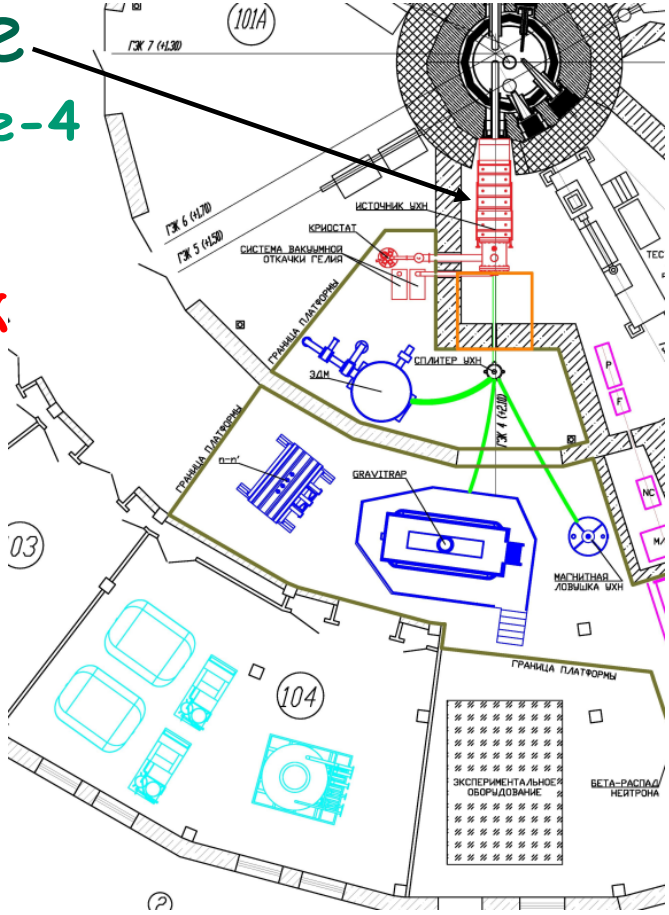




graphite radiation heating
T=1500-2000 K
V ~ 5 liter

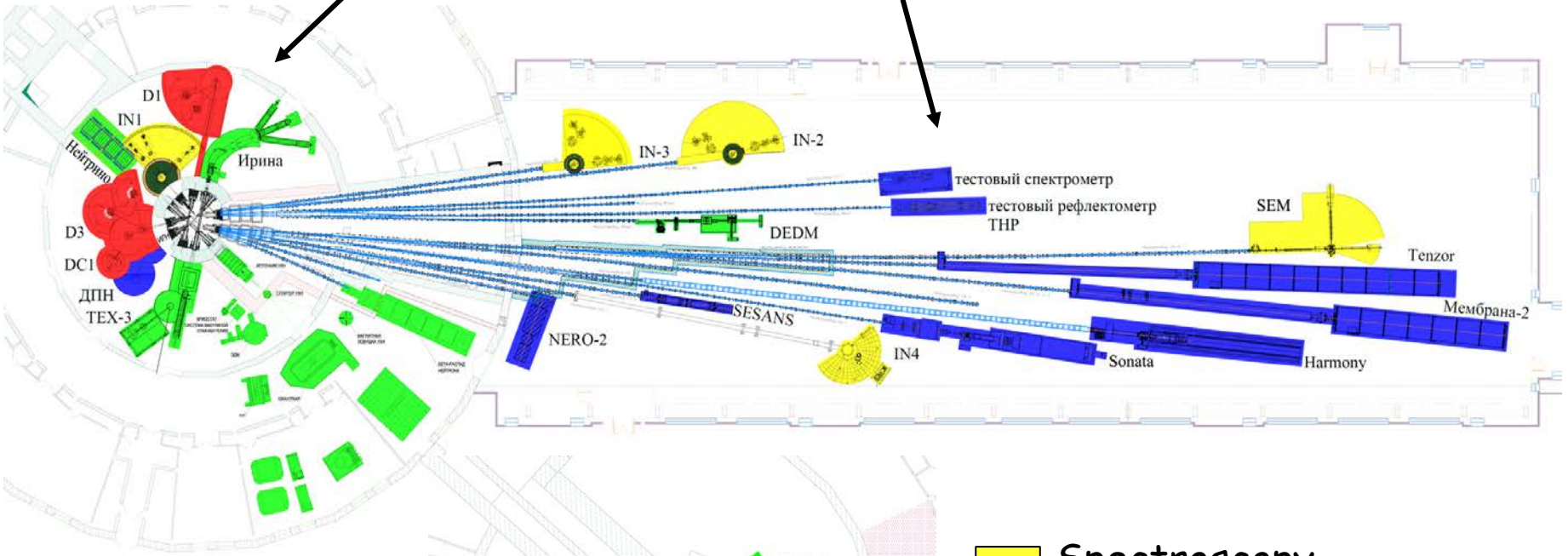
Ultra cold neutron source

Superfluid He-4 converter on beam HEC-4
T-(0,7-0.9)K
V~35л

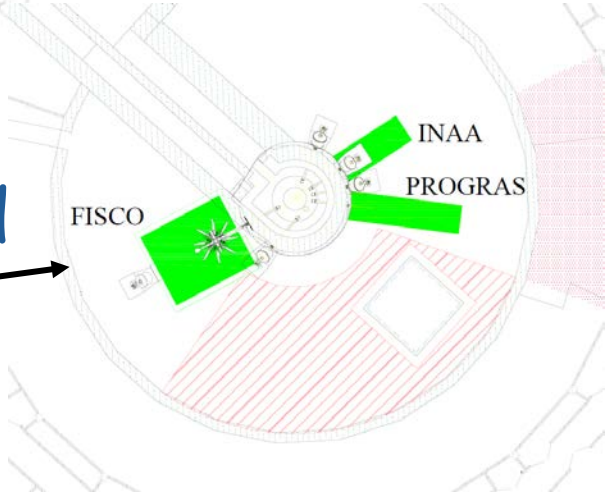


UCN density ~ $2 \cdot 10^3 n/cm^3$
(100 times better wherever)

Layout of experimental PIK station (hall of HEC and neutronguide hall)



Hall of inclined channel



- Spectroscopy
- Diffraction
- SANS and reflectometers
- Fundamental physics

Road map of instrumentational program

#		2019		2020				2021				2022				2023				2024			
		III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
0	**Reactor PIK commissioning**	**100 kW**						**10MW**								**10-100MW**				**~100MW**			
1	**Project**																						
2	**Experimental channel**																						
3	**HNC HEC-8**																						
4	**UCNS HEC-4**																						
5	**CNS HEC-2**																						
6	**CNS HEC-3**																						
7	**Neutronguide system**																						
	Нейтронные станции																						
1	IN-1																						
2	SESANS																						
3	SONATA										**Phase 1**												
4	INAA																						
5	«Нейтрино» (Neutrino)																						
6	D1																						
7	Мембрана – 2 (Membrane – 2)																						
8	DC-1																						
9	IN-3											**Phase 2**											
10	ИРИНА (IRINA)																						
11	«Бета-распад нейтрона» (neutron beta decay)																						
12	Tenzor																						
13	IN-2																						
14	IN-4																						
15	D3																						
16	SEM															**Phase 3**							
17	FISCO																						
18	Harmony																						
19	PROGRAS																						
20	DEDM																						

THE END