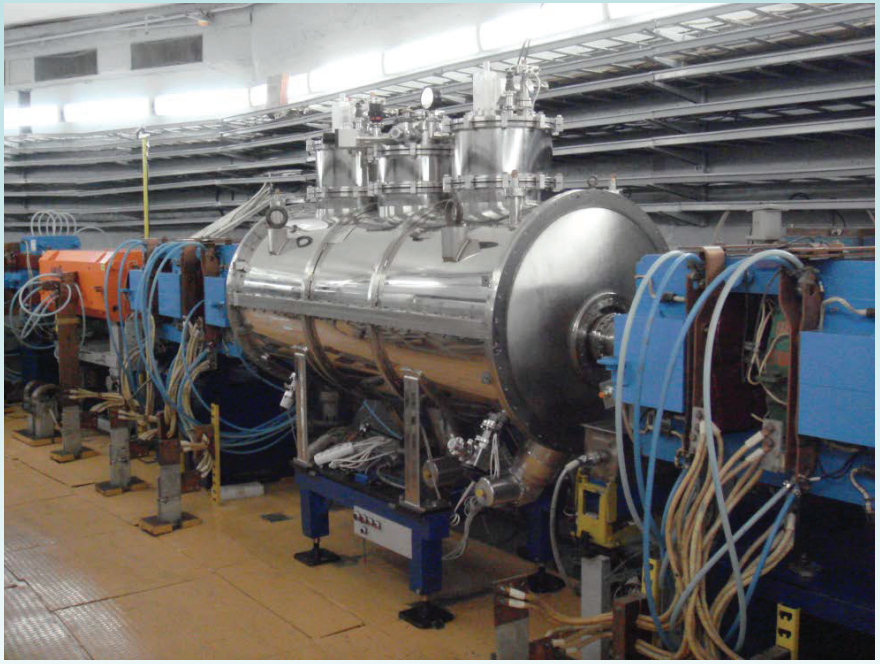


Status of Kurchatov Synchrotron Radiation Source

A.Valentinov, A.Belkov, Y.Fomin, E.Kaportsev, V.Korchuganov, Yu.Krylov, V.Moiseev, K.Moseev, N.Moseiko, D.Odintsov, S. Pesterev, A.Smygacheva, A. Stirin, V. Ushakov

NRC Kurchatov Institute

RuPAC-2021, 28 September 2021

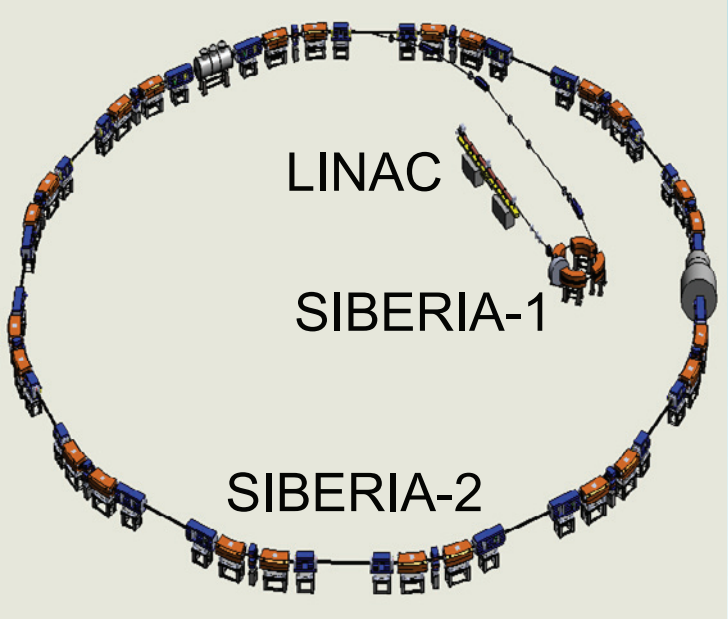
Content:

1. KSRS operation

2. Federal Program for KSRS modernization (Program1) 2013 – 2022
   - maintenance of existing accelerators
   - modernization of its subsystems

3. Federal Program for Scientific Infrastructure Development (Program2) 2019 – 2027
   - new low-emittance SR source

KSRS



3 electron accelerators:

- **80 MeV LINAC**
- **450 MeV** storage ring **SIBERIA-1**
- **2.5 GeV** storage ring **SIBERIA-2**

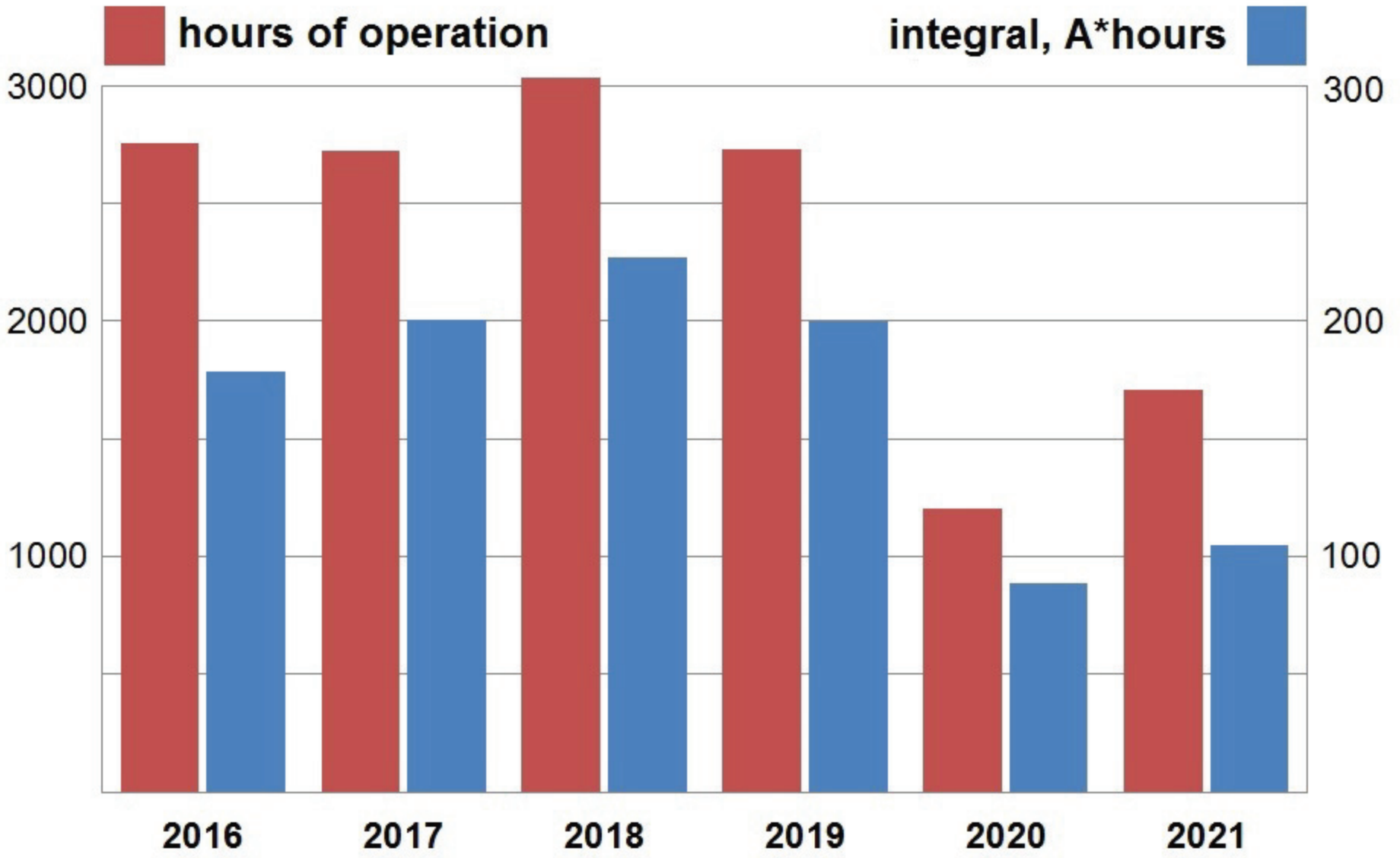
14 experimental stations (SIBERIA-2)

Experiments in physics, chemistry, biology, medicine, nanotechnologies and many more…

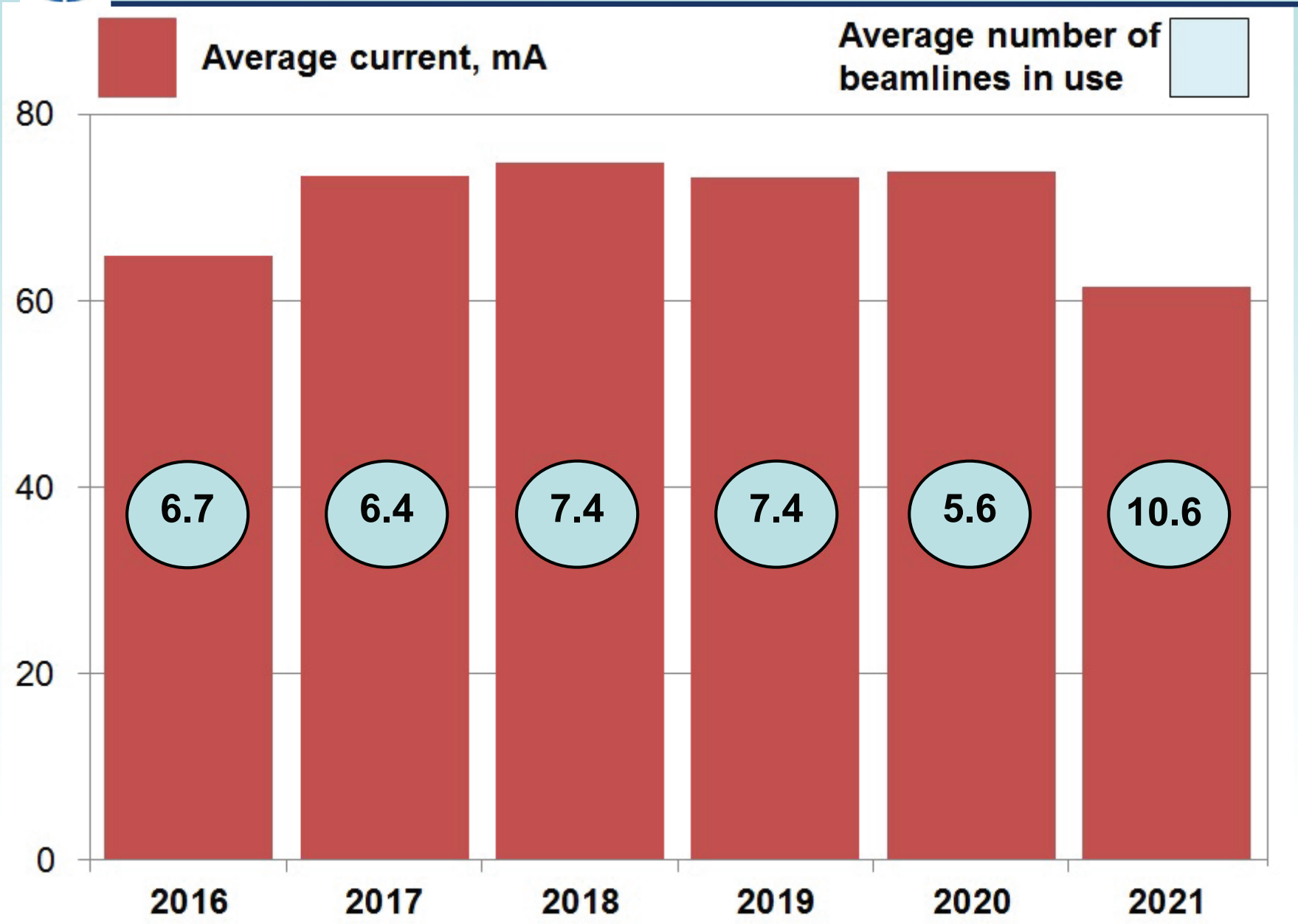
Accelerators' parameters

	SIBERIA-1	SIBERIA-2
Energy, GeV	0.45	2.5
Circumference, m	8.68	124.13
Horizontal. emittance, nm·rad	860	98
Energy spread, σE/E	$3.8 \cdot 10^{-4}$	$9.54 \cdot 10^{-4}$
Electron current, mA	up to 200	up to 150
Lifetime, hours (at 100 mA)	1.1	up to 20
SR power, kW (at 100 mA)	0.36	68.5
Time for users per year, hours	-	2700 – 3000
Consumed electric power at working energy, MW	0.4	2.5

KSRS operation in 2016 - 2021



KSRS operation in 2016 - 2021



Federal Program for KSRS modernization

1. RF system

2. Vacuum system

3. Superconducting wigglers

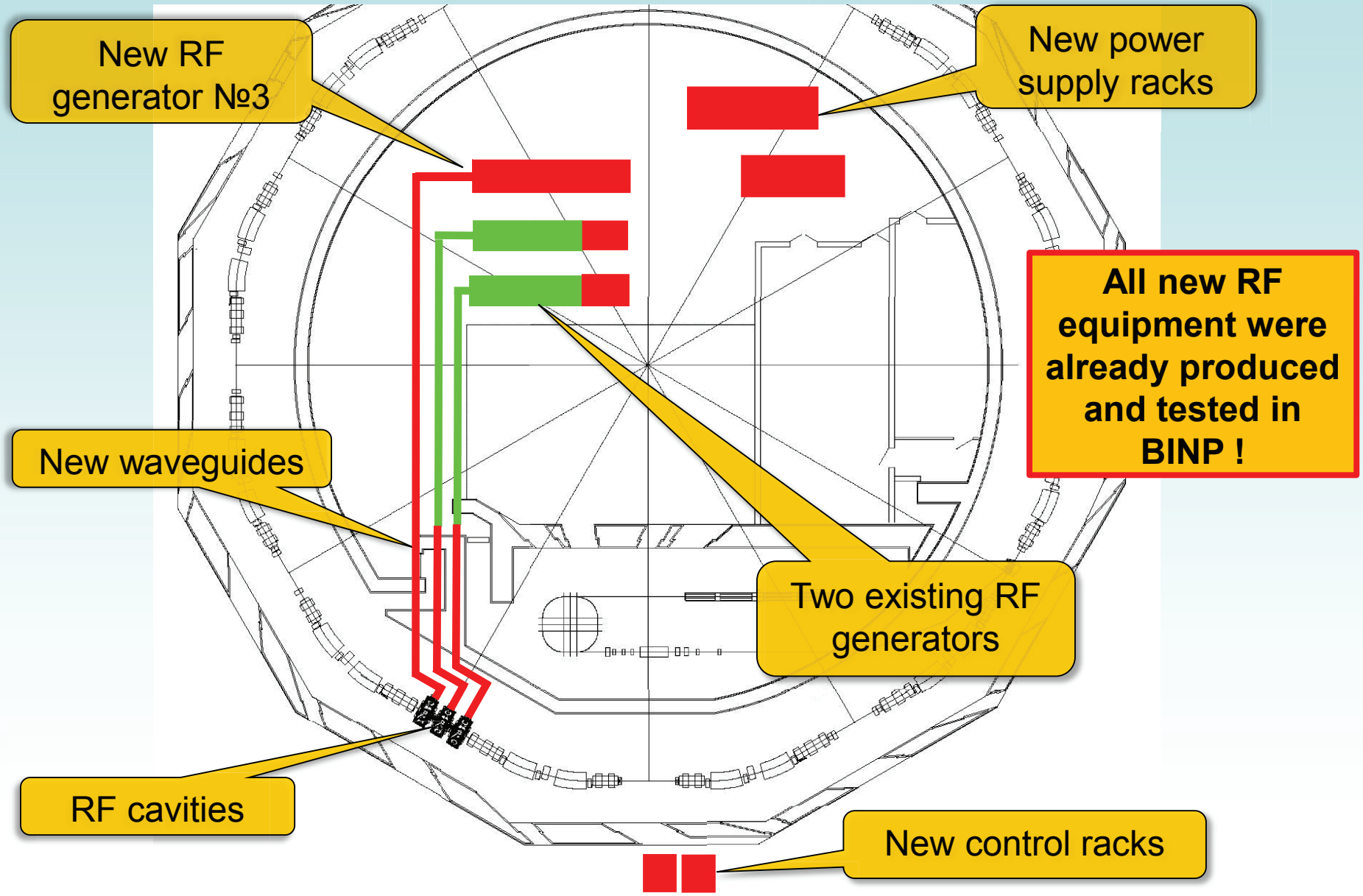
4. Control system

General contractor – FINPROMATOM

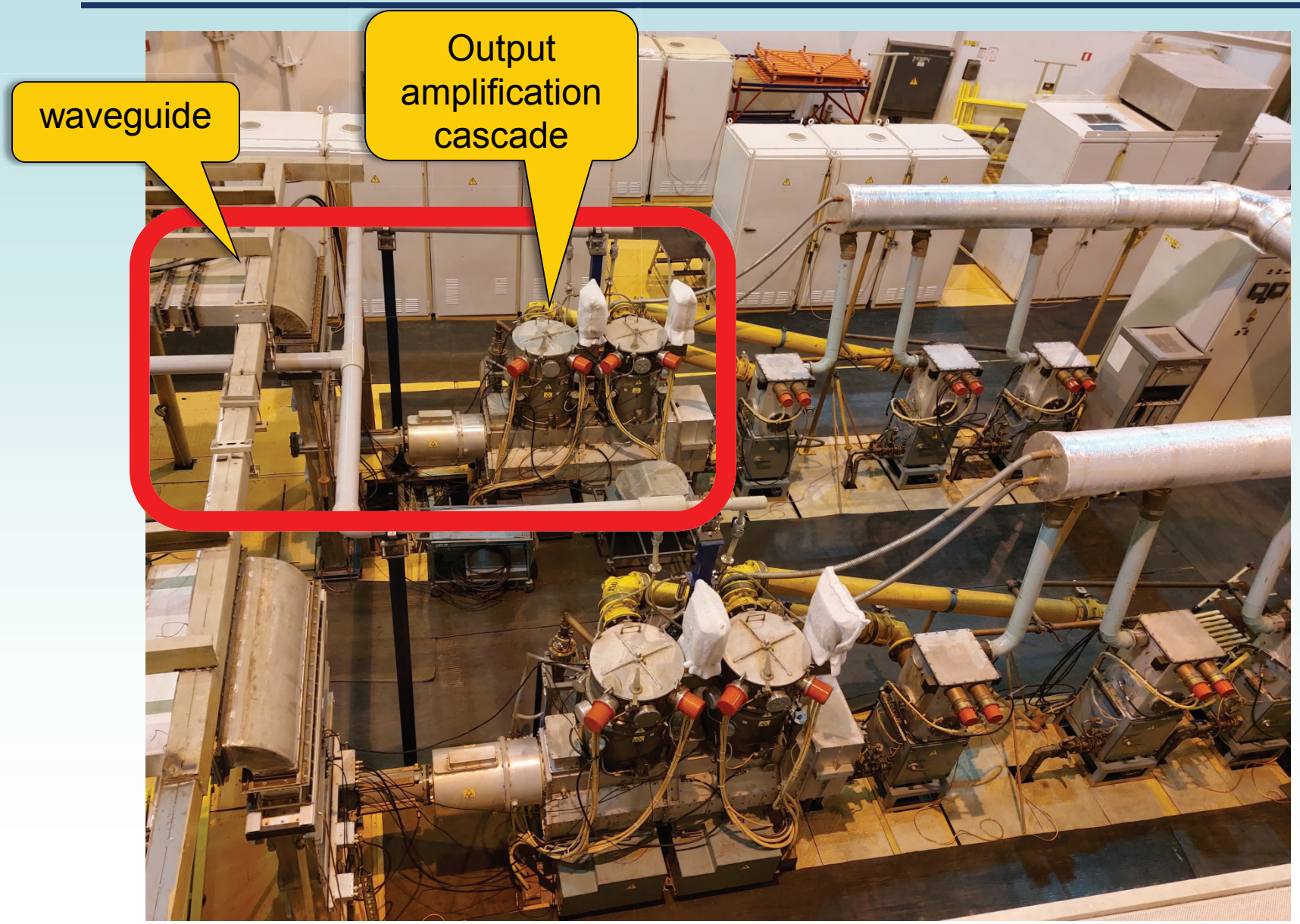
1 – 3: Budker Institute of Nuclear Physics

4: RTSoft

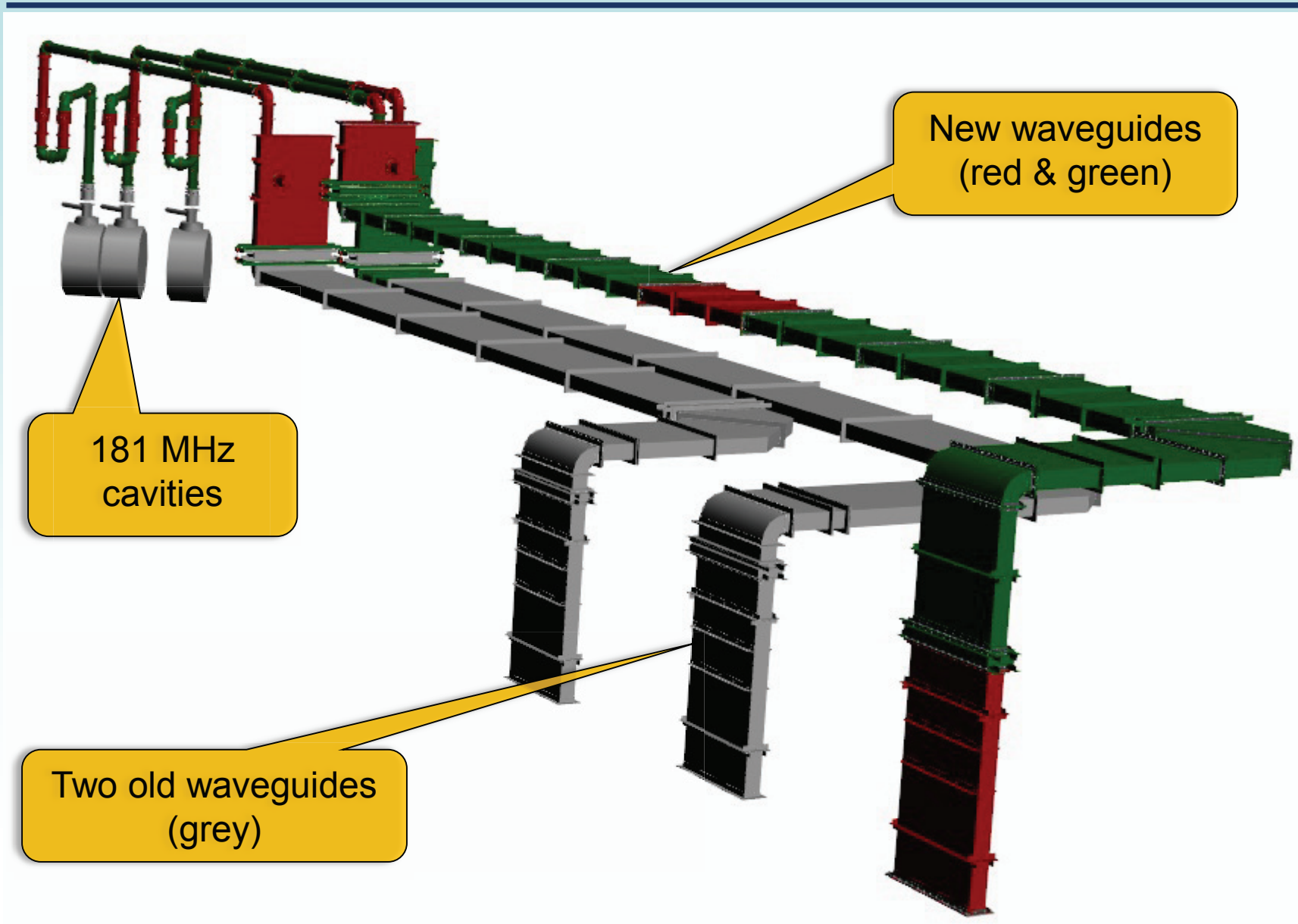
Future scheme of RF system



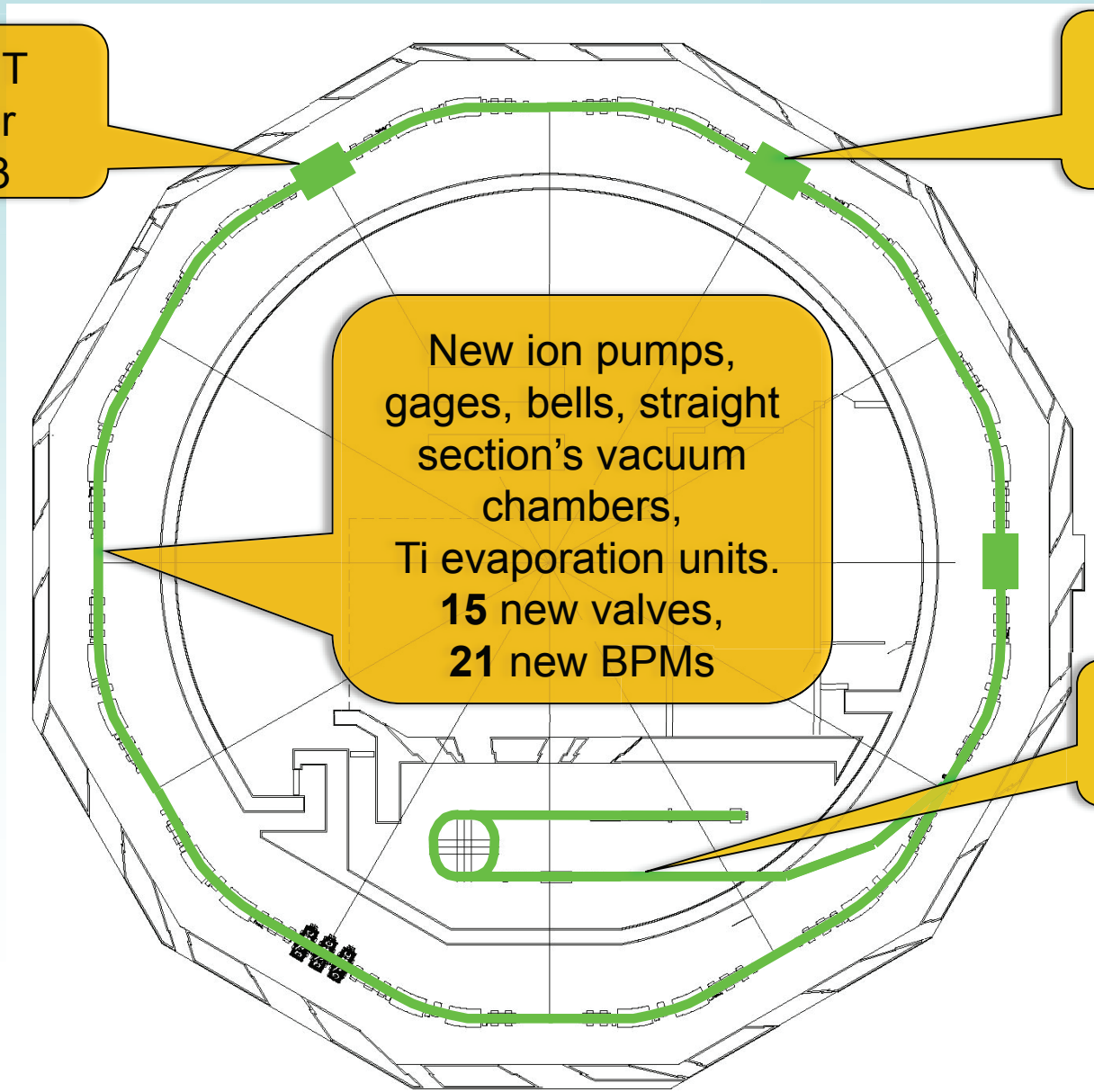
RF system – future 3rd 181 MHz generator

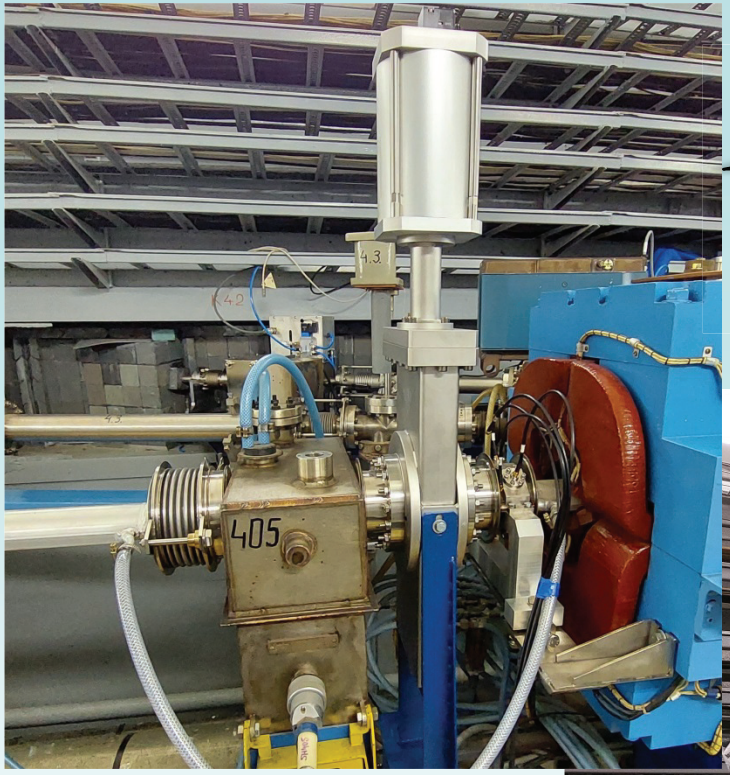


RF system – new waveguides

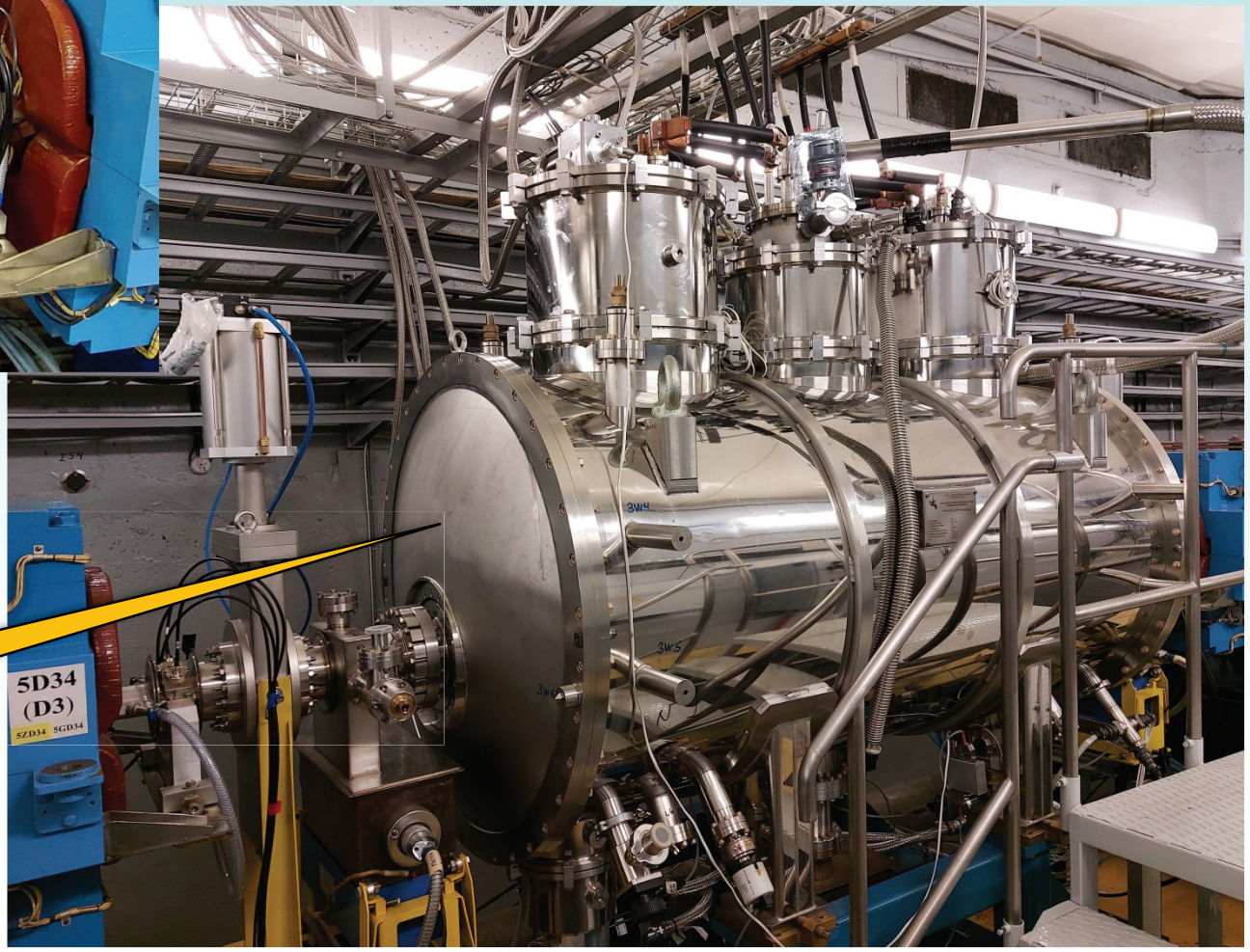


Works on vacuum system in 2019-2020



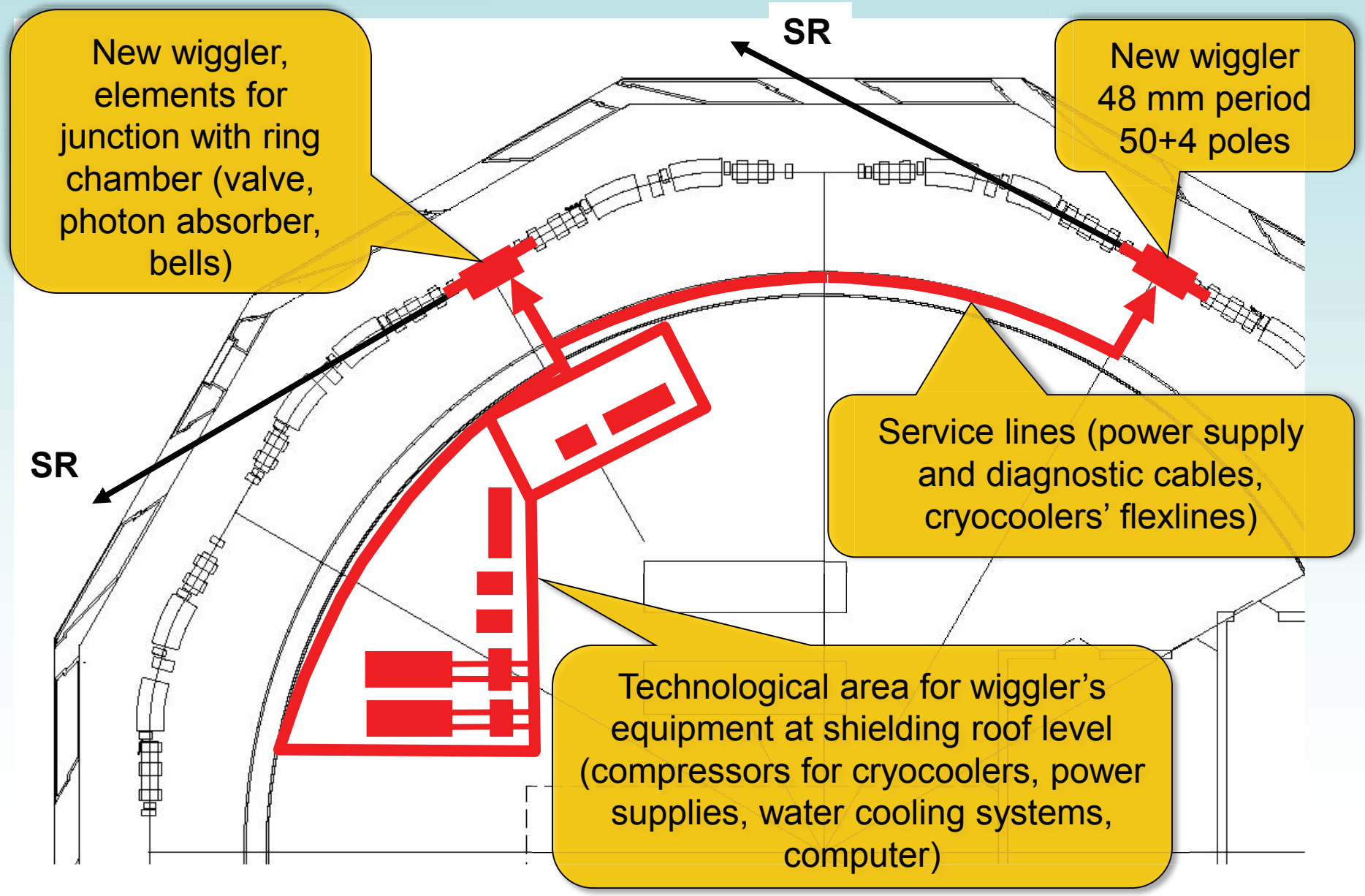


New ion pump, BPM, pneumatic valve, bell



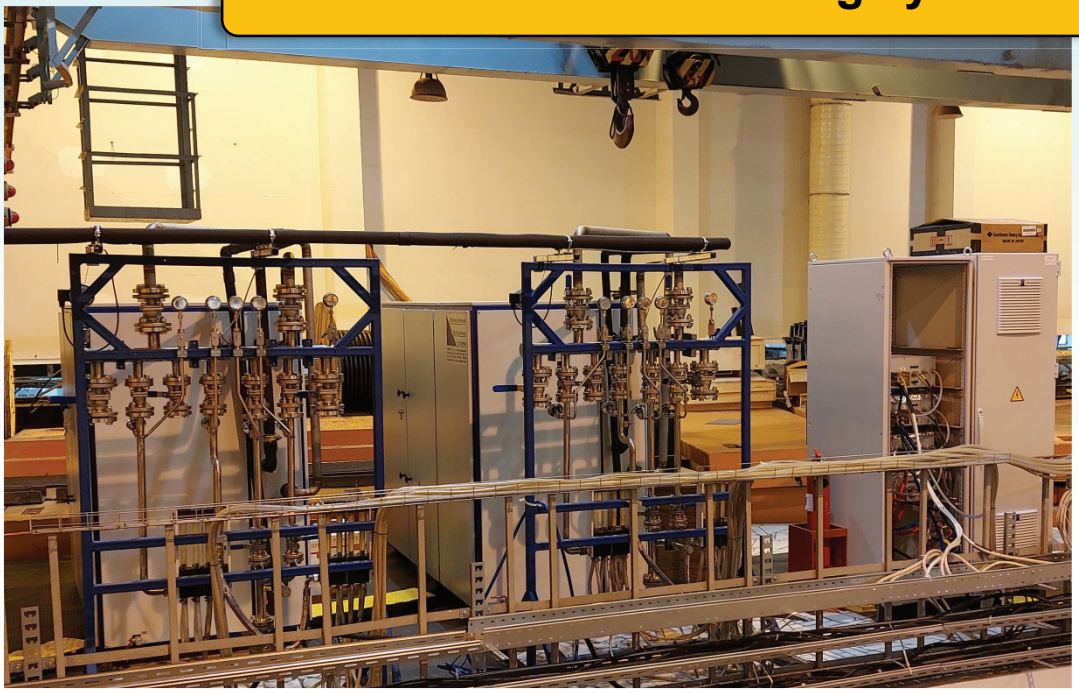
New 3 T wiggler

New 3 T superconducting wigglers (SCW) 2019-2021

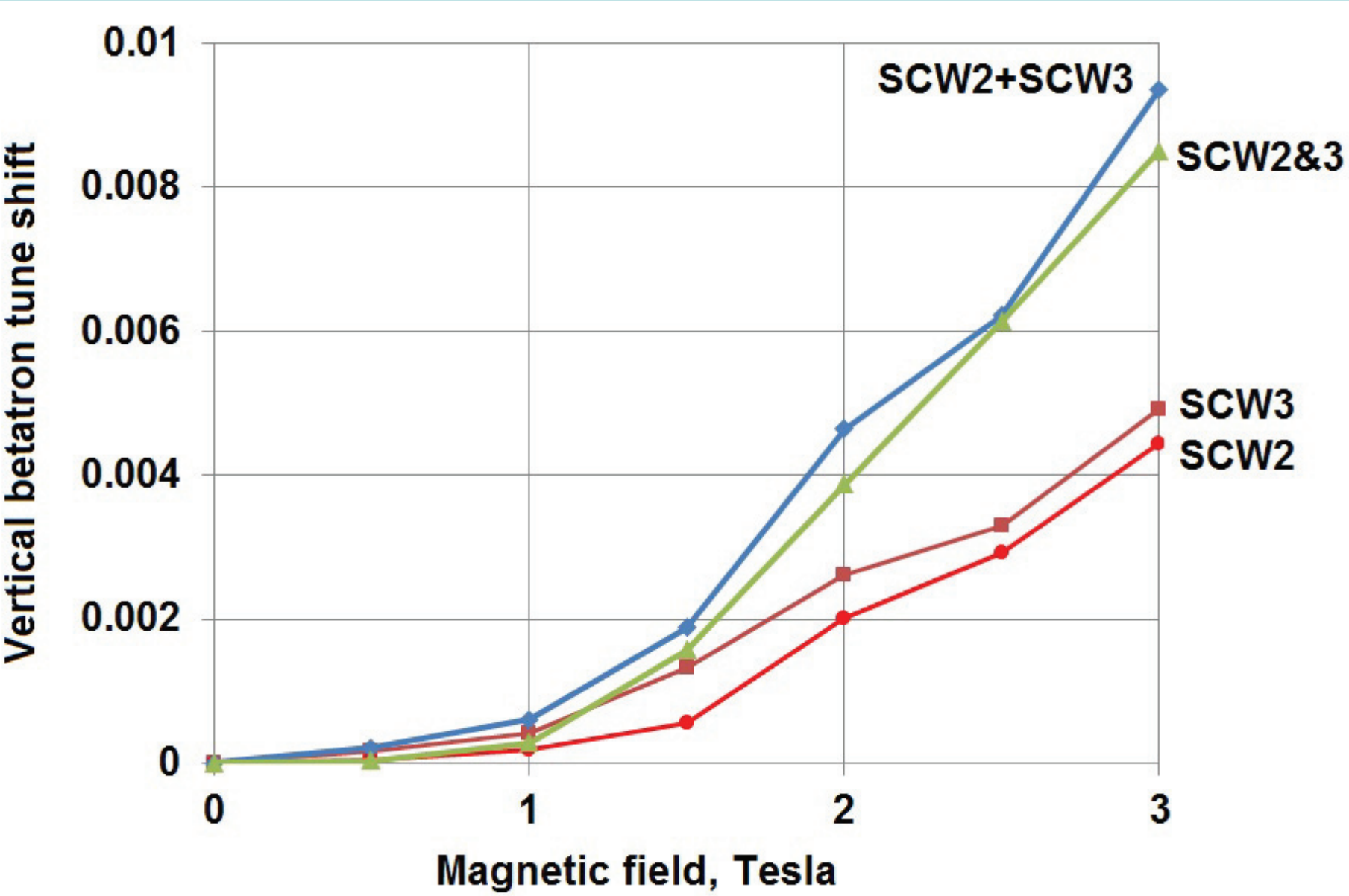


SCW power supplies, control rack & compressors

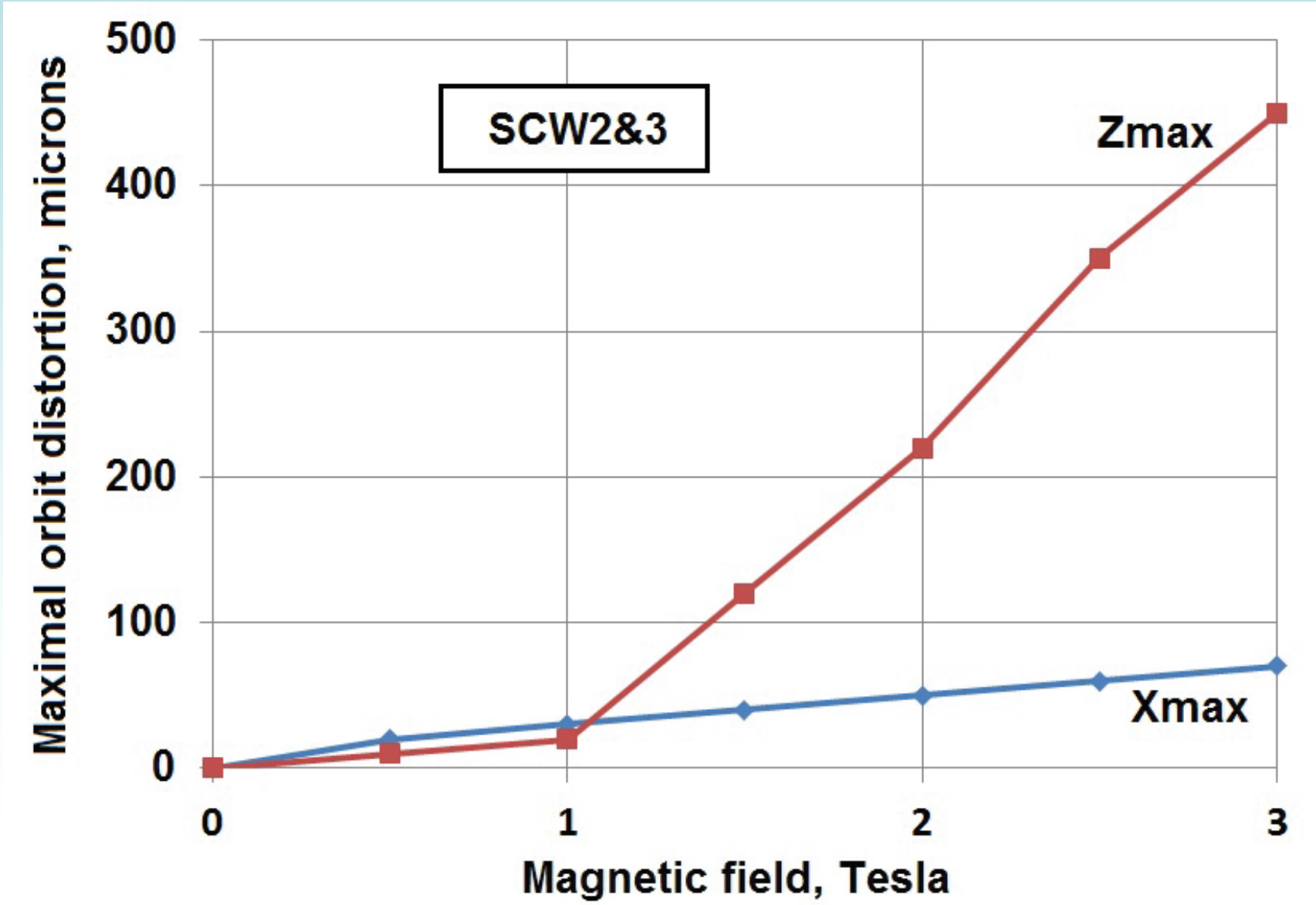
Autonomous water cooling systems



Wigglers influence on beam parameters



Wigglers influence on beam parameters



KSRS control system 2020 - 2021

Problems:

- Complicated structure (CitectSCADA + CANServer + …)
- Old modules (including CAMAC)
- CAN-bus with low speed
- Synchronization problems

Modernization goals:

- Unified structure (under new version of CitectSCADA)
- New modules (vacuum and magnet systems, BPMs…)
- Ethernet
- Optic synchronization
- New software

Contractor: RTSoft

KSRS control system 2020 - 2021

- Vacuum system: 65 new modules BUP-M for ion pumps control (contractor - MARAFON), 12 new racks in Siberia-2 hall for Ti evaporation units and vacuum valves control.
- RF system: new modules for all RF generators control, measurement of RF power in waveguides and temperature of RF cavities.
- New pulse synchronization system using optic cables; removal of old CAMAC modules.
- Magnet system: 60 new modules BUK-M for high- and low-current power supplies control (contractor - MARAFON).
- New thermal stabilizing scheme for linac structure.
- 6 new modules Libera Brilliance for Siberia-2 closed orbit measurement, 5 new modules Libera Spark for trajectory measurements in electron transport line. 7 new racks for Libera modules in Siberia-2 hall. All these modules are manufactured by International Technology (Slovenia).
- New server hardware and terminal devices.

KSRS control system

Libera Brilliance
(BPM controlling)

New control system racks

KSRS control system

65

BUP-27M (4 ion pumps controlling)

48

BUK-M1 (8 low-current power supplies controlling)

BUK-M2 (high-current power supply controlling)

12

Federal Program for Scientific Infrastructure Development

Main features for KSRS:

- All three KSRS accelerators disassembling
- New low-emittance 2.5 GeV storage ring as bright SR source
- More information in TUC02 report

Items moved from Program1 to Program2:

- Mounting of RF generators, waveguides, supplying and control racks;
- Modernization of water and air cooling systems;
- Modernization of electric power supplying system.

Items cancelled from Program1:

- Modernization of high-current power supplies.

Thank you for your attention!