Report of the SPD spokespersons

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3.10.2022

SPD Conceptual Design Report

CDR was presented on the meeting of the JINR Program Advisory Committee for particle physics in Jan, 2021

JOINT INSTITUTE FOR NUCLEAR RESEARCH

February 3, 2021

arXiv:2102.00442

Conceptual design of the Spin Physics Detector

Version 1.0

The SPD proto-collaboration*

International Detector Advisory committee was formed to review the CDR

Andrea Bressan, INFN/ University of Trieste
chair

Peter Hristov, CERN

Pasquale di Nezza, INFN, Frascatti

SPD DAC presented the report on the CDR at the PAC session in Jan, 2022

CDR was approved by the JINR Program Advisory Committee for particle physics in Jan, 2022

PAC recommendations

The PAC notes with interest the evaluation report presented by A. Bressan on behalf of the SPD DAC. The Committee held several meetings with the SPD team and asked several questions concerning the SPD detector concept. In addition to that, issues related to the NICA complex infrastructure for polarized beams and possible interactions between the SPD and MPD experiments were discussed in depth. The answers to the DAC's questions were satisfactory and the presentations during the joint meetings were well received by the committee. The DAC particularly appreciated the improvements in the SPD conceptual design with respect to the original CDR, namely changing the magnet location to be outside the ECAL, the possible use of a full MAPS inner tracker, and the clarifications on the straw detectors and the ZDC. On the basis of all that, and following the recommendation of the DAC, the PAC approves the SPD CDR and asks the SPD team to move forward to the TDR preparation. The PAC appreciates the important role of the DAC in the SPD project evaluation and requests periodic DAC reports.

SPD Technical Design Report

JOINT INSTITUTE FOR NUCLEAR RESEARCH

October 2, 2022

Technical Design Report of the Spin Physics Detector

The SPD collaboration

TDR is almost ready. Just 3 significant updates are expected:

- magnet
- MCP detectors
- MAPS vertex detector

We hope to compete the document within a few weeks and make it available for everyone at spd.jinr.ru

At arxiv - in the beginning of the next year

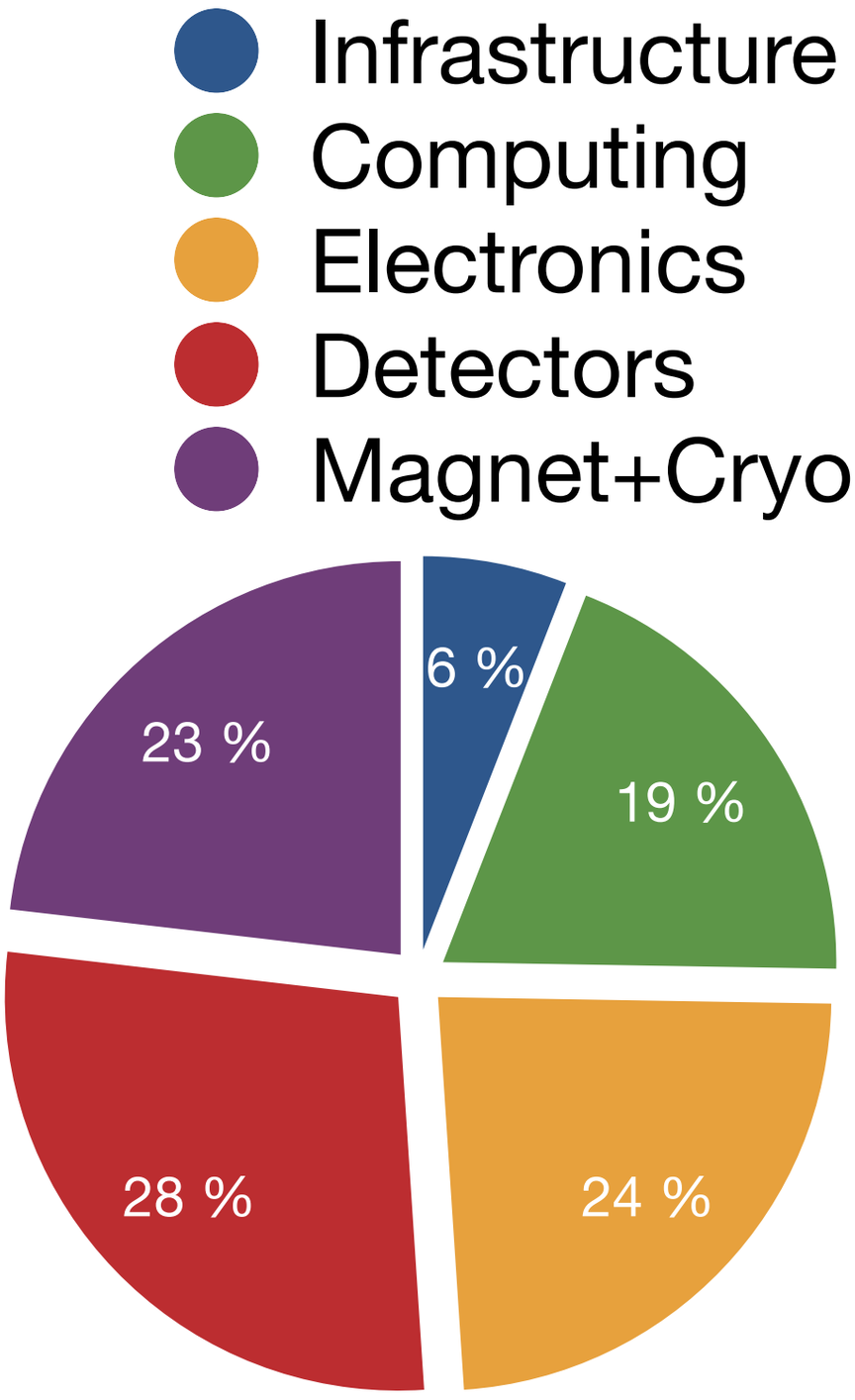
SPD Magnetic System

two concepts:

- PANDA-like by Novosibirsk
- Nuclotron cable based by JINR

Decision should be taken by the SPD Technical Board based on the external expertise of two projects (both are presented in TDR) till the end of November

Cost estimate



Subsystem	Option	Phase	Cost, M$
SPD setup	Vertex detector:		
	– DSSD	II	11.3
	– MAPS	II	15
	Micromegas Central Tracker	I	0.8
	Straw tracker	I+II	3.0
	PID system:		
	– TOF	II	2.0
	– Aerogel PID system	II	2.4
	ECAL		
	– Phantom	I	0.4
		I+II	9.4
	Range system	I+II	16.1
	ZDC	I+II	0.6
	BBC	I+II	0.5
	Magnetic system		
	Novosibirsk option	I+II	8.2
	JINR option	I+II	7.6
	& cryogenic infrastructure	I+II	
	Novosiborsk option	I+II	3.4
	JINR option	I+II	3.1
	Beam pipe		
	– Al	I	0.1
	– Be	II	0.4
General infrastructure		I	1.2
		I+II	1.7
Slow control system		I	1.0
		I+II	1.8
Data acquisition system		I	0.8
		I+II	1.9
Computing		I	4
		I+II	12
TOTAL COST	stage I		40.1
	stage I+II		79.3

	2022	2023	2024	2025	2026	2027	2028	2029
NICA Collider commissioning		Commissioning runs						
MPD extended config. construction and opration			System design and production		Detector extended mode operation			
Consruction of NICA collider extended config.								
Prep. and start of polarized beam operation		SC-solenoids production and tests			Spin transparency mode operation			
SPD construction and commissioning	R & D, prototyping, testing			SPD systems production and assembly		SPD operation		
Nuclotron modernization	R & D, prototyping, testing			Magnets production, ring assembly		New Nuclotron operation		

SPD and in JINR 7-year plan

The nucleon spin structure and other polarization phenomena in nucleon–nucleon and nucleon–nucleus interactions
The SPD research programme will extend the ongoing research programmes of the COMPASS++/AMBER experiment (at SPS, CERN) on hadron structure and spectroscopy investigations with high-intensity muon and hadron beams, as well as with polarized proton beams at the STAR facility (RHIC), in which teams of VBLHEP and DLNP scientists of JINR will continue to take part during 2024–2028.

JINR's participation in these programmes will be coordinated with the JINR's efforts on the creation of the SPD detector and its research programme.

Scientific projects	Material costs for development and modernization of facilities	Material costs for operation and maintenance of facilities	Electricity costs for operation of facilities	**Total 2024–2030**
NICA accelerator complex	211.3	49.0	32.7	**293.0**

Prolongation of the SPD project at JINR

- **We were ready to do that for the period 2023-2025 at the summer PAC meeting. The project passed successfully through the VBHEP Scientific and Technical Council.**

- **Since the summer meeting of the PAC was not convened, the SPD project was prolongated automatically for 2023 according to a special procedure.**

- **We will think about further prolongation of the project as soon as we know the schedule of the PAC meetings next year.**

MoU signing

- **5 MoUs are fully signed:**
  - **PNPI, Gatchina**
  - **AANL, Yerevan**
  - **INR, Troitsk**
  - **SamSU, Samara**
  - **INP MSU, Moscow**
- 2 MoUs are agreed
  - **LPI (Moscow)**
  - **SPbSU (St. Petersburg)**

24 researchers

6 PhD students

11 students

New group from MEPhI

Experience:

STAR
ATLAS
LHC-b

Group leader Grigory Nigmatkulov

Points of interest

Hardware

- Beam-Beam Counters (scintillation part) in cooperation with JINR
- Other possibilities can be discussed

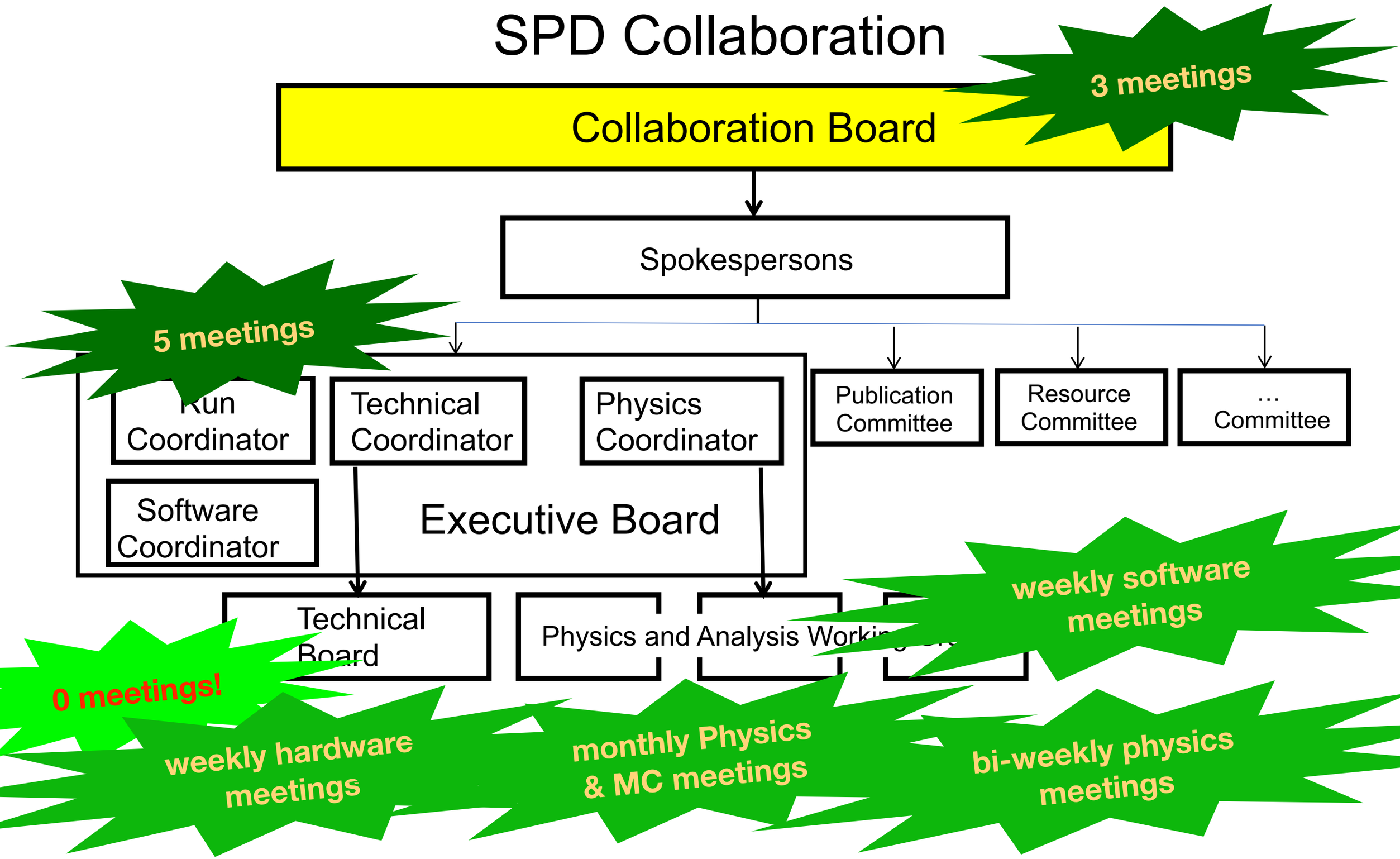
Software & Computing

- BBC model
- Adoption of heavy ion MC generators to SpdRoot
- Distributed computing system

Physics

- Spin physics (J/ψ polarization)
- Search for exotic particles
- Physics of relativistic heavy-ion collisions

Collaboration in 2023



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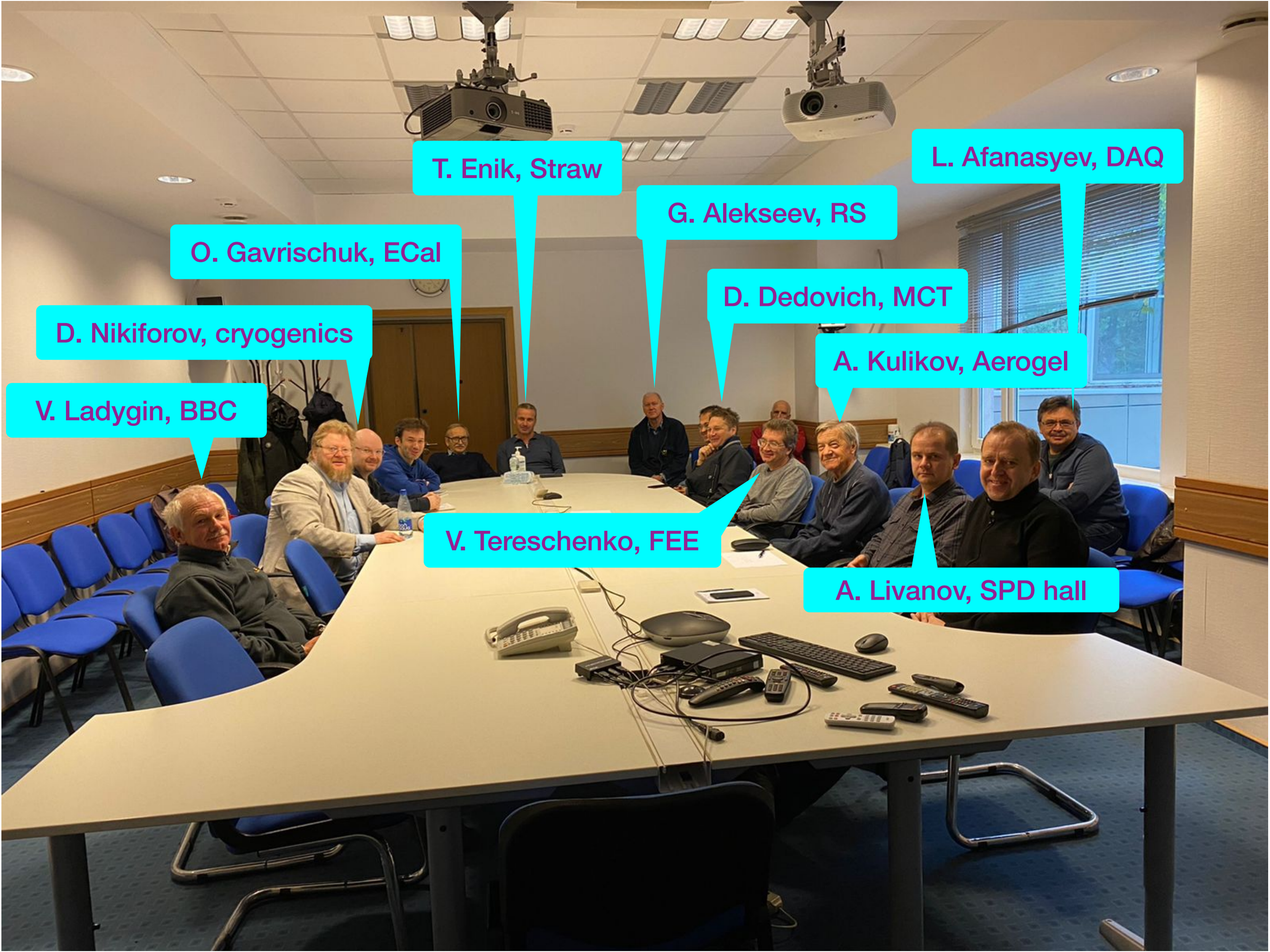
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