Milestones for TDR preparation

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Background

The result of our communication with the SPD DAC will be the presentation of a report at the winter session of the PAC for Particle Physics (~ Jan. 20 2022).

Dear Alexey and colleagues,
we congratulate the collaboration for the progress made over the summer about the points raised in the previous meeting.
The answers to our questions were satisfactory and the presentations during this second meeting were well received by the committee.
Concerning the SPD detector we particularly appreciated the improvements in the design with respect to CDR, i.e.:
- the magnet placed outside the ECAL
- the possible use of a full silicon inner tracker
- the clarifications on the straws and ZDC

On the basis of this and on the previous discussion **we will propose the PAC to approve the SPD CDR** and move forward to the TDR preparation.

Timescale

Presentation at the summer session of the PAC for Particle Physics: ~20.6.2022

All the materials should be provided 2 months before: ~20.4.2022

The TDR should pass through the Scientific & Technical Board(s) ~10.4.2022

Main changes with respect to CDR

- Magnetic system outside ECAL
- No DSSD+MAPS combination for the vertex detector (disproved by DAC)
- No aerogel detector in barrel
- New DAQ concept
- …

First stage

It seems, we will not have money for the whole detector at once. So, we should think about the minimal configuration of the SPD setup to start.

Absolutely needed: Range system, magnet and tracker.

It would be nice to have: BBC, ZDC, ECAL at least in one end-cap.

We need to put something to the central part instead of the silicon vertex detector to improve momentum reconstruction (now we discuss 2 or 3 layers of Micromegas detector

We need to compensate the absence of the ECAL for muon filtering.

Preliminary timescale of the project

2022 2024 2026 2028

TDR | Detector construction | Detector assembling | RUN

Physics goal	Required time	Experimental conditions
First stage		
Spin effects in p-p scattering dibaryon resonanses	0.3 year	$p_{L,T}$-$p_{L,T}$, $\sqrt{s}$ <7.5 GeV
Spin effects in d-d scattering hypernuclei	0.3 year	d_{tensor}-d_{tensor}, $\sqrt{s}$ <7.5 GeV
Hyperon polarization, SRC, ... multiquarks	0.3 year	ions up to Ca
Second stage		
Gluon TMDs, SSA for light hadrons	1 year	p_T-p_T, $\sqrt{s}$ =27 GeV
TMD-factorization test, SSA, charm production near threshold, onset of deconfinment, $\bar{p}$ yield	1 year	p_T-p_T, 7 GeV< $\sqrt{s}$ <27 GeV (scan)
Gluon helicity, ...	1 year	p_L-p_L, $\sqrt{s}$ =27 GeV
Gluon transversity, non-nucleonic structure of deuteron, "Tensor porlarized" PDFs	1 year	d_{tensor}-d_{tensor}, $\sqrt{s_{NN}} = 13.5$ GeV or/and d_{tensor}-p_T, $\sqrt{s_{NN}} = 19$ GeV