STATUS OF PHYSICS & MC (for CDR preparation)

A. Guskov

18.5.20

SPD CDR must be presented at winter PAC (Jan, 2021)

MANPOWER

MC for physics

MC for detectors

Physics predictions

Generators study

Software development

Lebedev institute

- A. Terkulov
- S. Gerasimov
- V. Andreev

Samara Univ.

- V. Saleev
- A. Shipilova
- A. Karpishkov
- M. Nefedov
- N. Ivanov

SPDroot users

- A. Tkachenko
- A. Maltsev
- A. Gridin
- S. Shimansky
- A. Ivanov ?
- A. Guskov
- I. Denisenko
- V. Alexakhin
- K. Shtejer
- A. Gribovski ?
- A. Rymbekova
- V. Bleko ?
- A. Skachkova ?
- R. El-Kholy

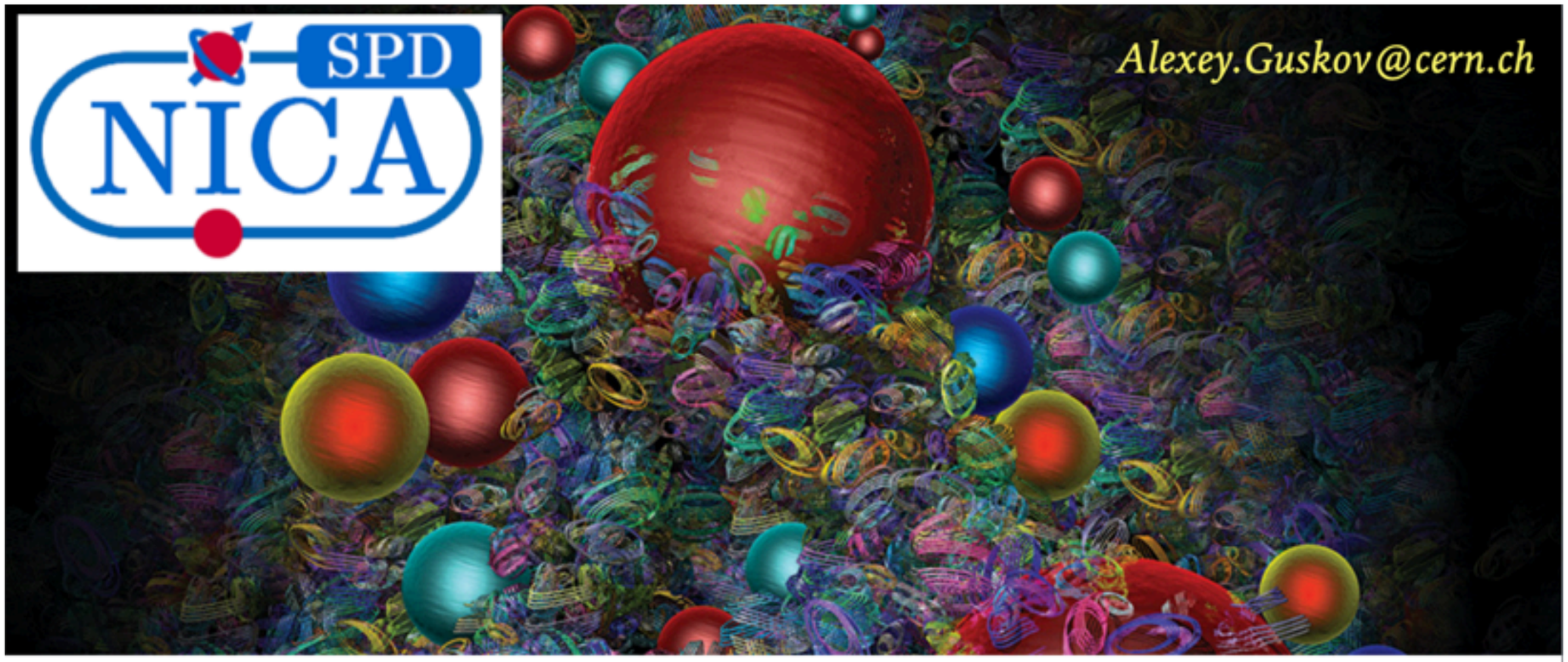
Cairo Univ.

- R. Akhunzyanov ?

Ural State Univ.

- V. Uzhinsky
- A. Galoyan
- N. Trunov

SEMINAR ON GLUON PHYSICS AT SPD (A. GUSKOV) 15.5.20



Spin Physics Detector at NICA as a universal facility for study of polarized and unpolaried gluon content of proton and deuteron.

A. Guskov (DLNP, JINR) on behalf of the working group:

A. Arbuzov, I. Denisenko, A. Efremov, A. Guskov, N. Ivanov, Ya. Klopot, A. Kotzinian, M. Nefedov, B. Parsamyan, A. Rymbekova, A. Shipilova, V. Saleev, O. Teryaev

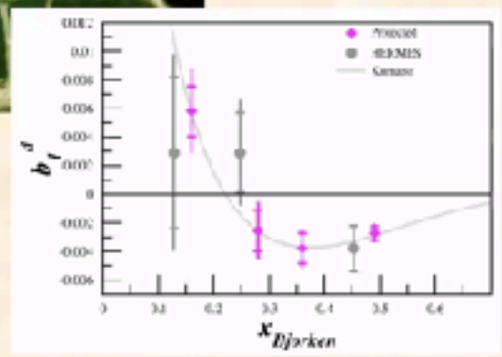
SEMINAR "POSSIBLE STUDIES OF POLARIZED STRUCTURE FUNCTIONS FOR THE SPIN-1 DEUTERON AT HADRON ACCELERATOR FACILITIES" (S. KUMANO) 21.5.20

Recording

Experimental possibilities

© JLab

Approved experiment! (PR12-11-110)



E1039 experiment

© Fermilab

EIC (arXiv:1212.1701)

NICA

© JINR

Linear Collider (with fixed target)

Possibilities: Spin-1 projects are possible in principle at other hadron facilities.

© BNL

© J-PARC

© GSI

© CERN-COMPASS

PHYSICS

Gluon physic

- paper (~20 pages) is under preparation ⇒ CDR

Dibarions in central collisions

- from V. I. Komarov

AOB (DY, GPDs etc.)

Yield of $\bar{p}$ for DM in astrophysics

- from R. El-Kholy

Multipartons

- from S. Shimansky

Polarized FFs

PHYSICS WITH GLUONS

Unpolarized gluons at high x in proton and deuteron

Gluon helicity

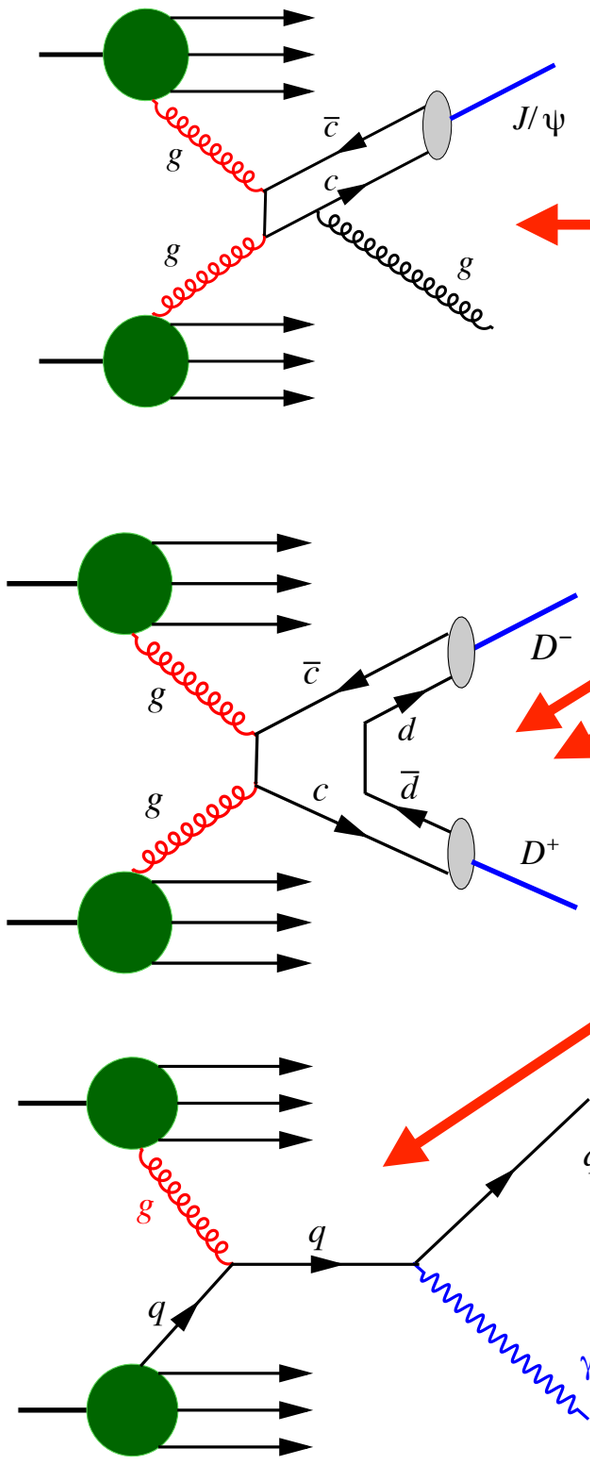
Gluon Boer-Mulders function

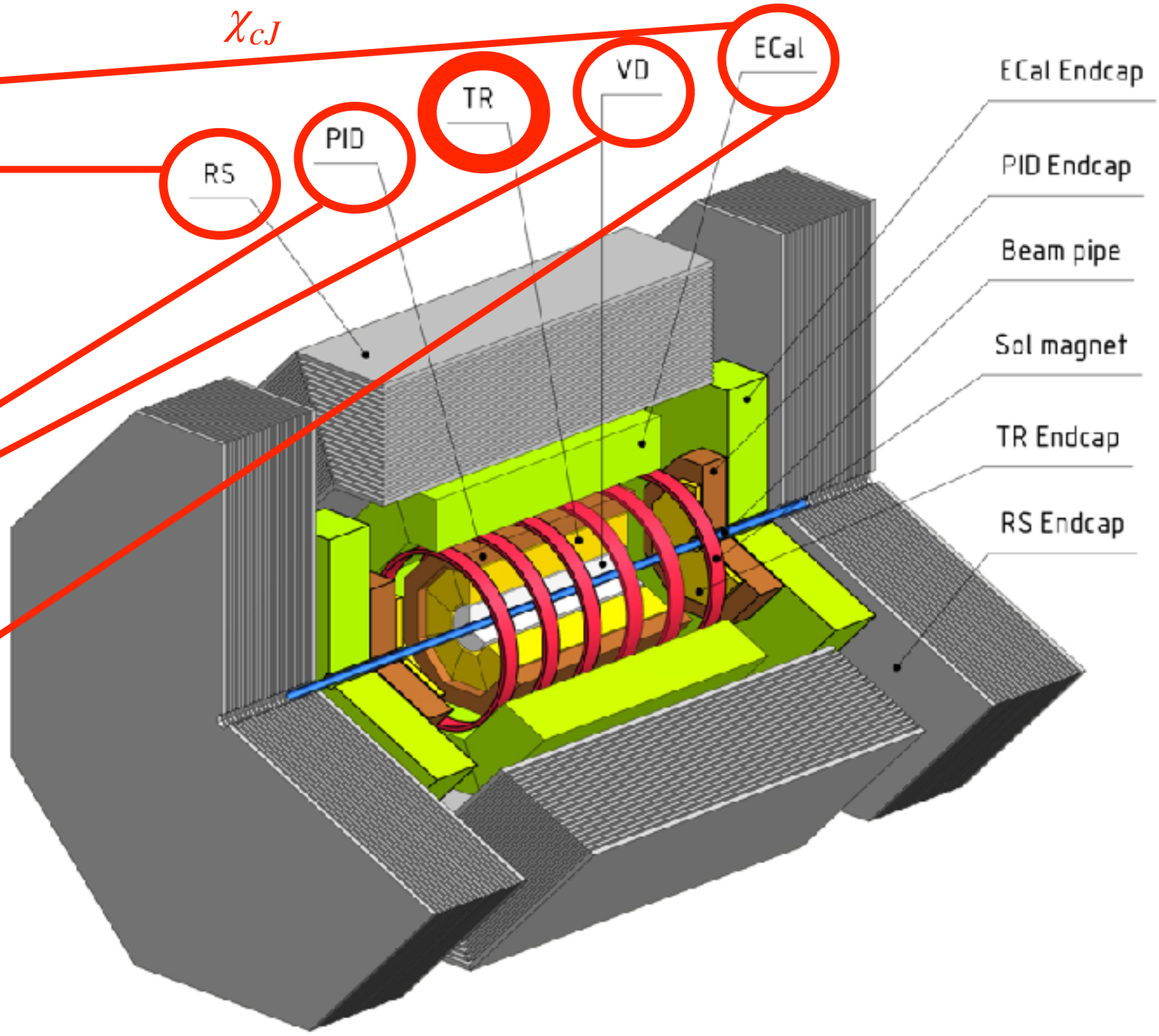
GLUONS	*unpolarized*	*circular*	*linear*
U	f_1^g		$h_1^{\perp g}$
L		g_{1L}^g	$h_{1L}^{\perp g}$
T	$f_{1T}^{\perp g}$	g_{1T}^g	$h_{1T}^g, h_{1T}^{\perp g}$

Gluon Sivers function

Gluon transversity in deuteron

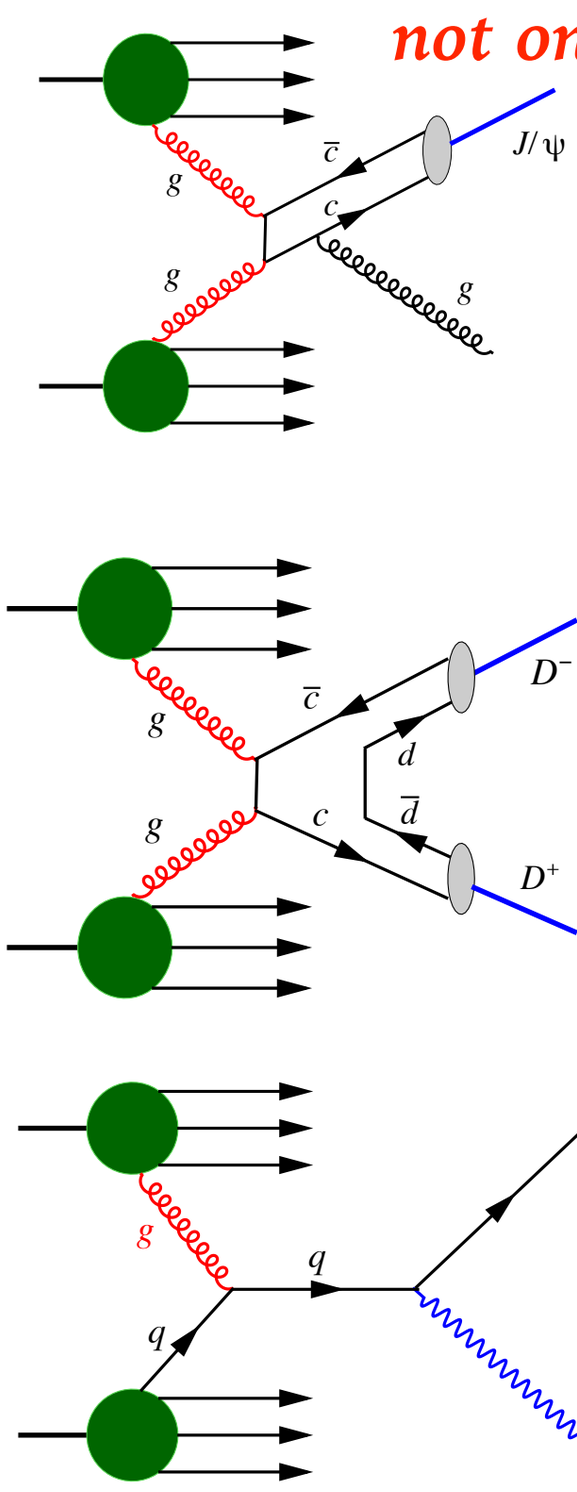
GLUON PROBES AT SPD

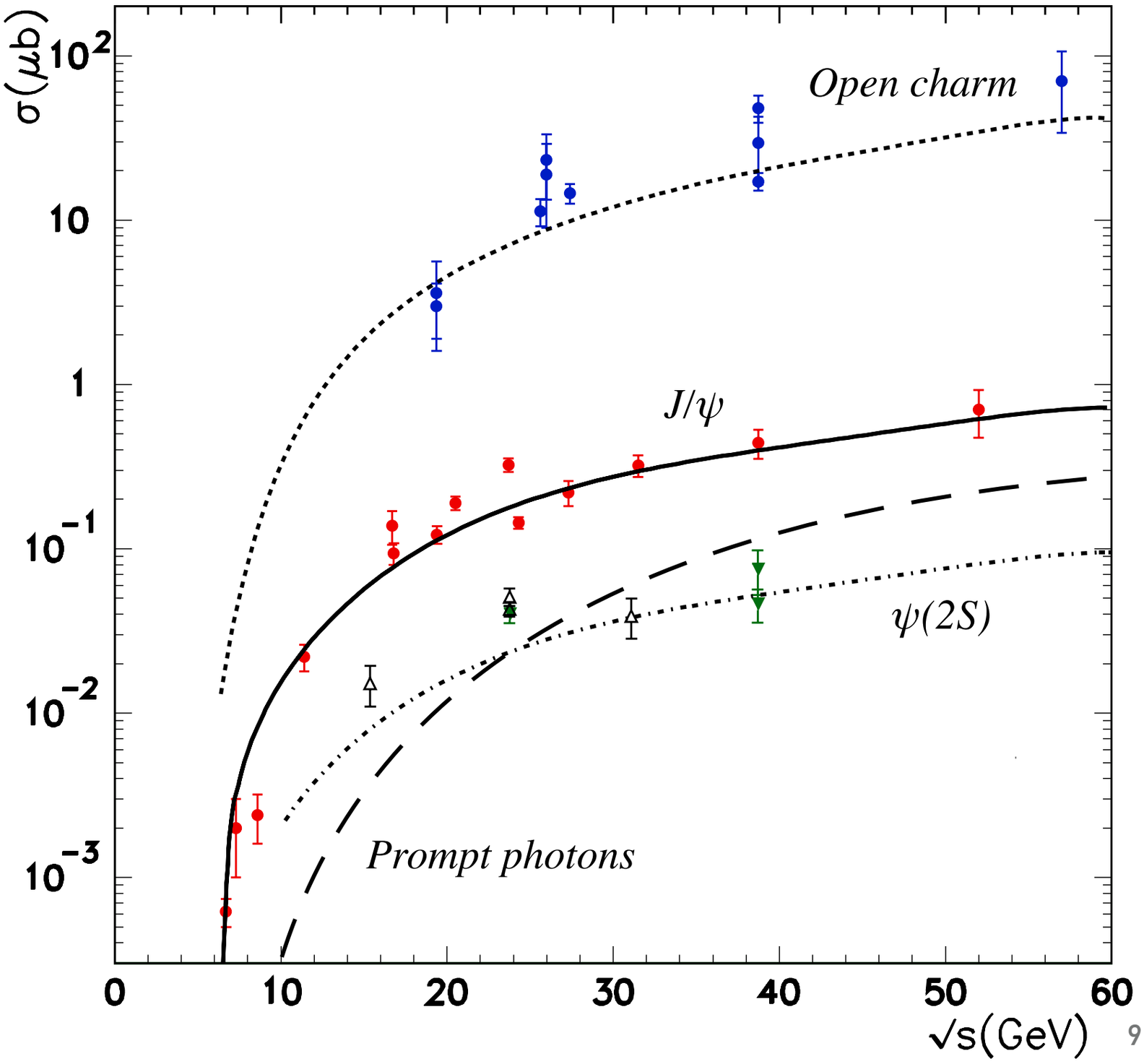




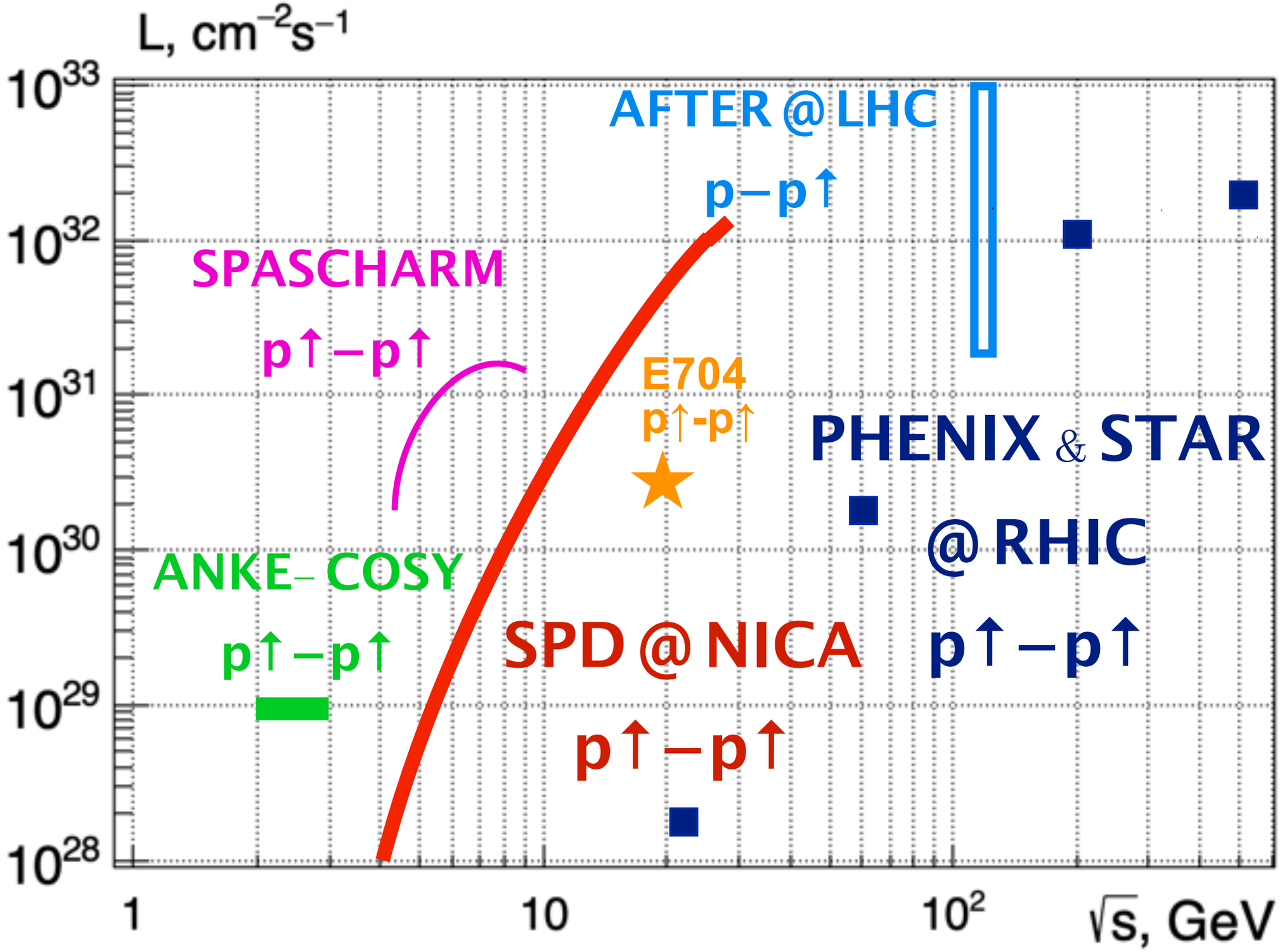
GLUON PROBES AT SPD

not only J/ψ!

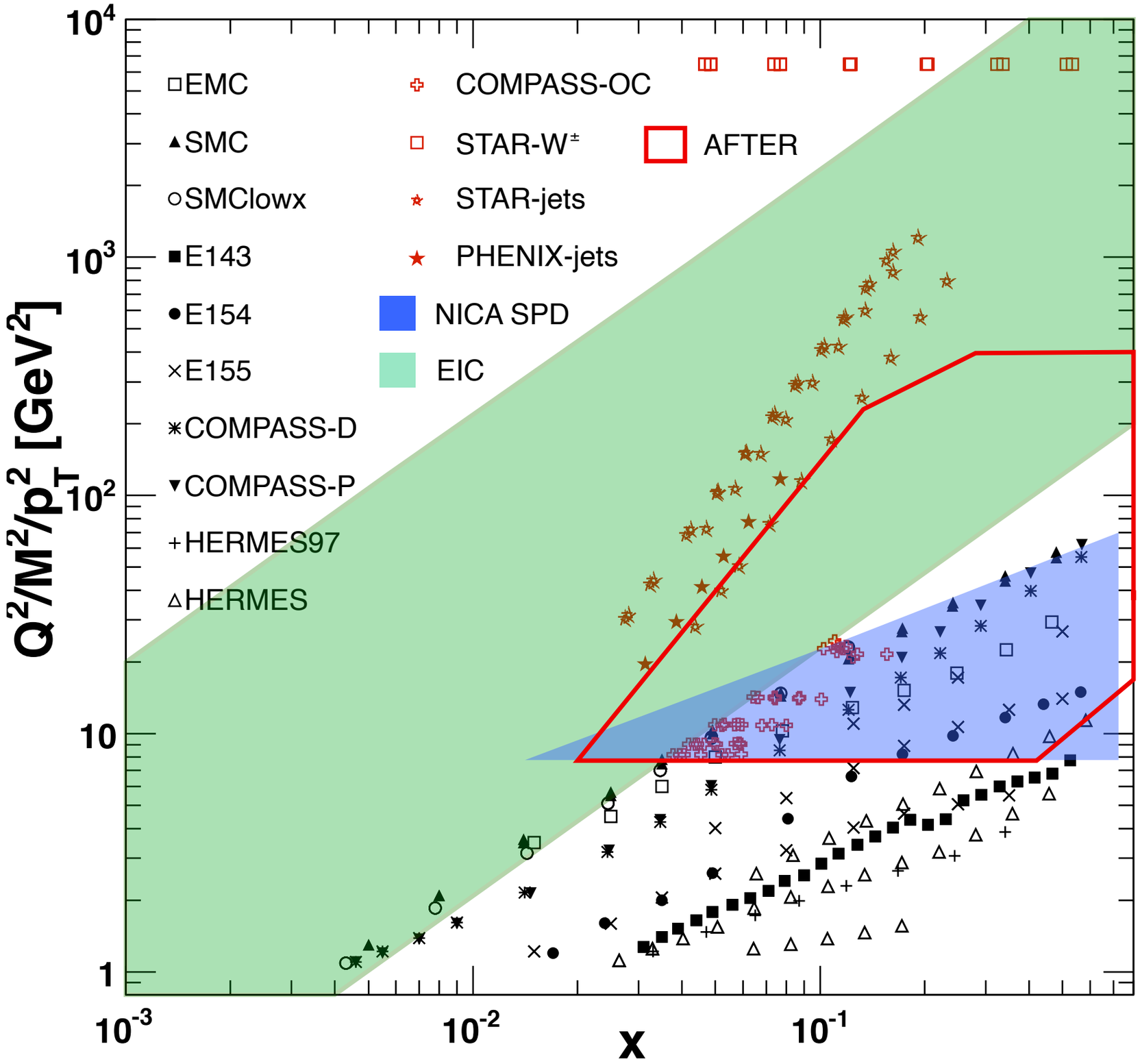




SPD – VS OTHER POLARIZED p–p EXPERIMENTS



MAIN PLAYERS IN POLARIZED GLUON PHYSICS



SPD can cover this range for polarised gluon studies in p↑-p↑ interactions!

Open charm

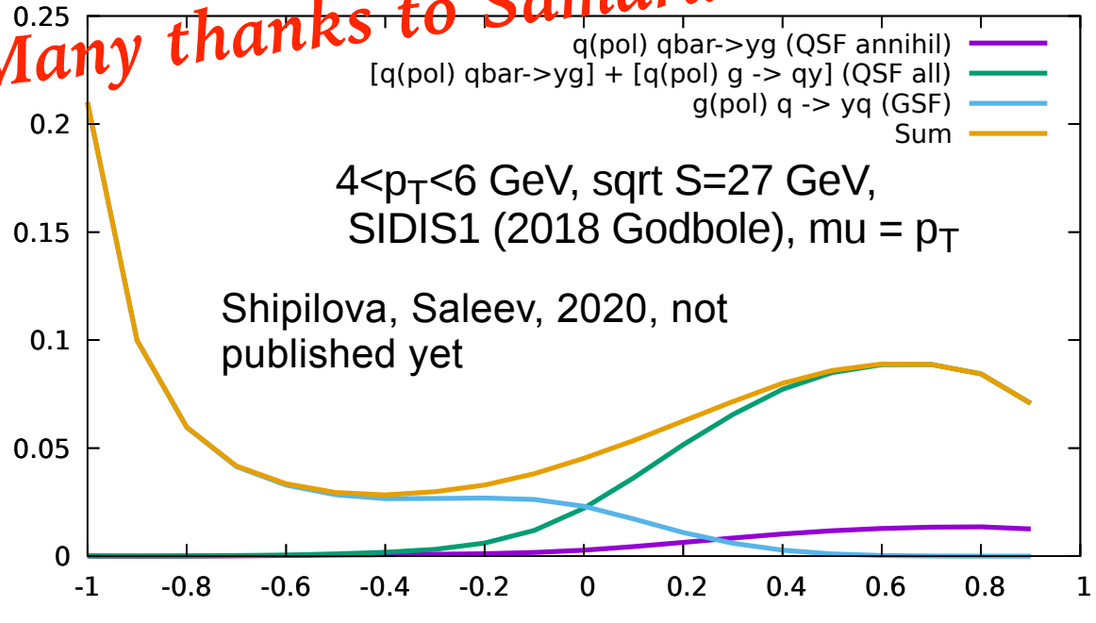
charmonia

high-p_T prompt photons

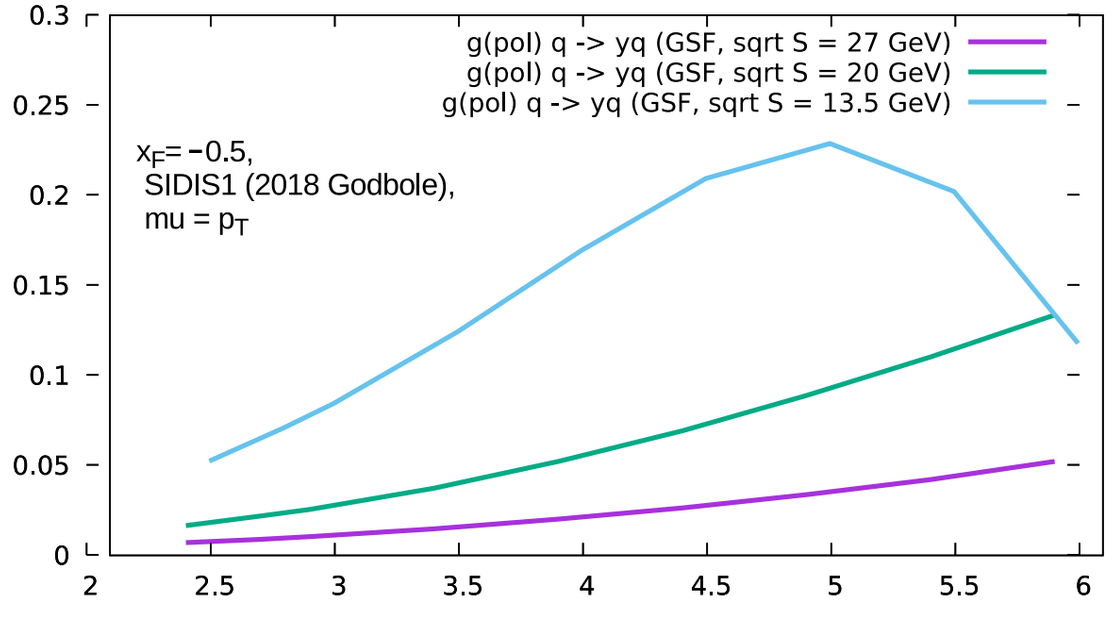
PREDICTIONS FOR SPD

Many thanks to Samara University group!

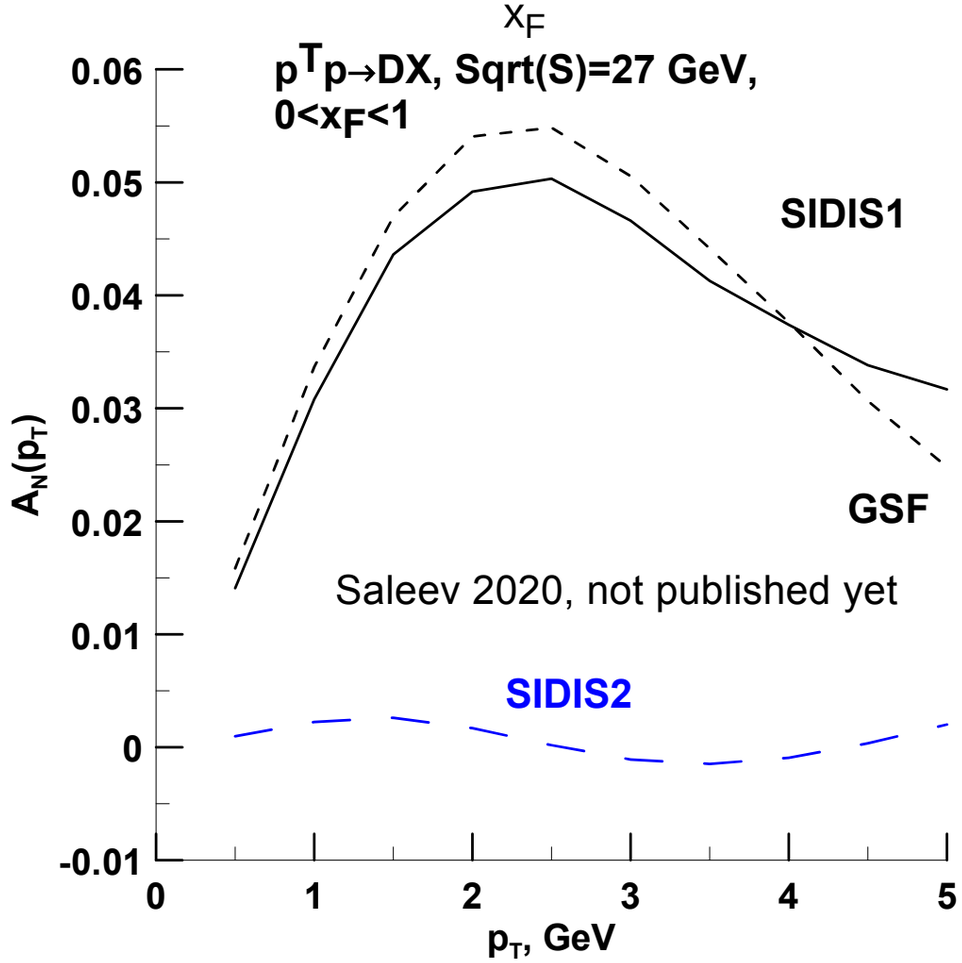
Gluon Sivers function

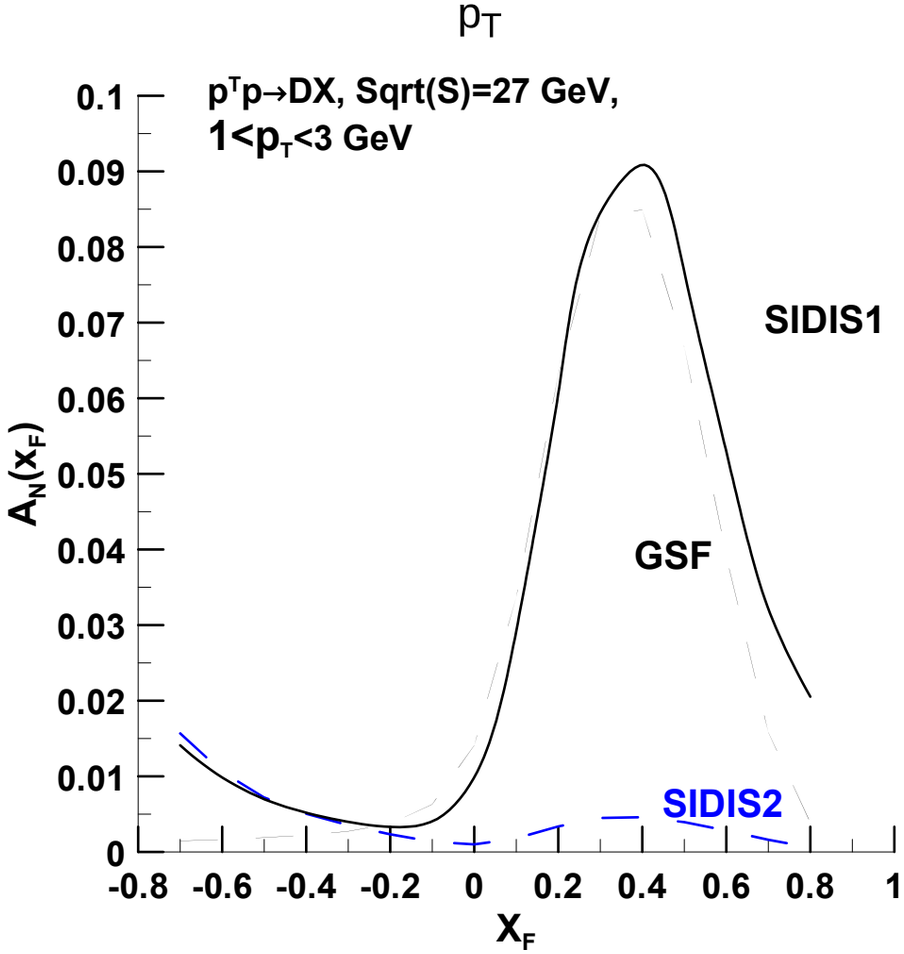


Y



D-mesons





REGULAR SPD PHYSICS & MC MEETINGS

Meeting	Date	Talks	N of participants
1	March, 11 offline, vidyo	8	~30
2	April, 8 vidyo only	7	24*
3	May, 13 zoom only	13	45
4 (plan)	June, 17 offline, online	Send me your requests	

MC RESULTS: MUST HAVE FOR CDR

dp/p

S/B for J/ψ

D-meson decay vertex reconstruction

D-mesons peaks

π^0 peak

Λ peak

γ detection eff.

Event rates for all involved processes

Kinematic coverage plots

Accuracy for asymmetries & cross sections

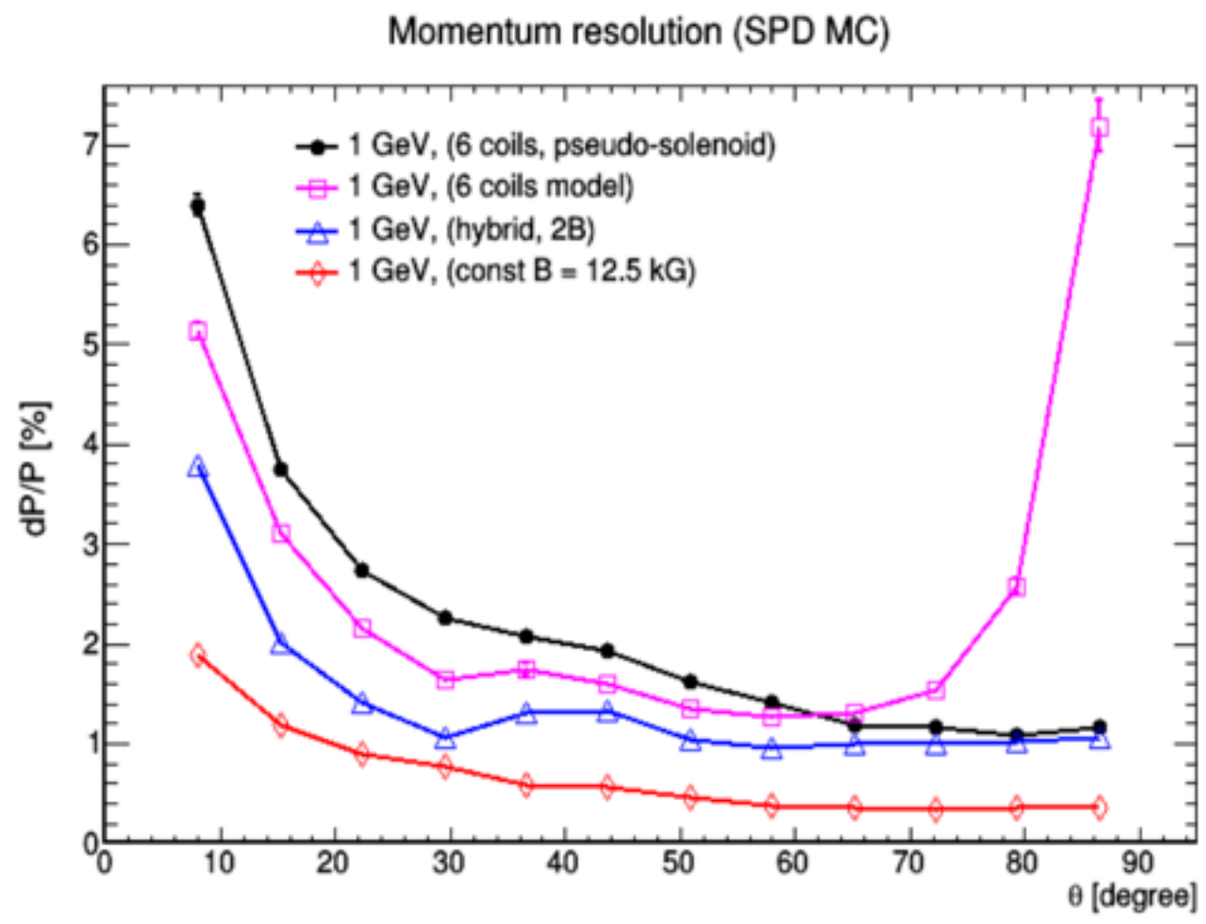
γ

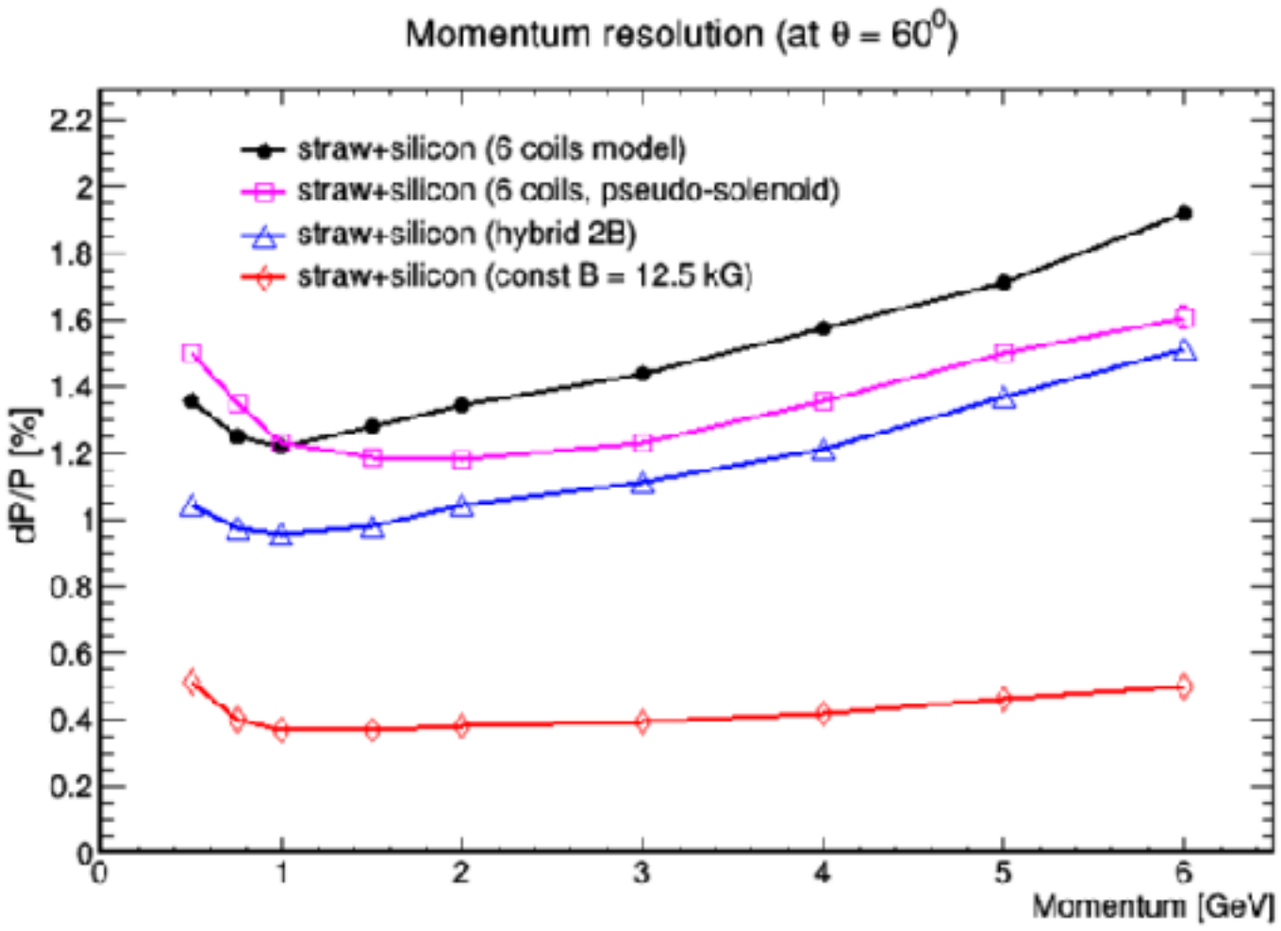
J/ψ

D

$\pi^{+/0/-}$, …

dp/p





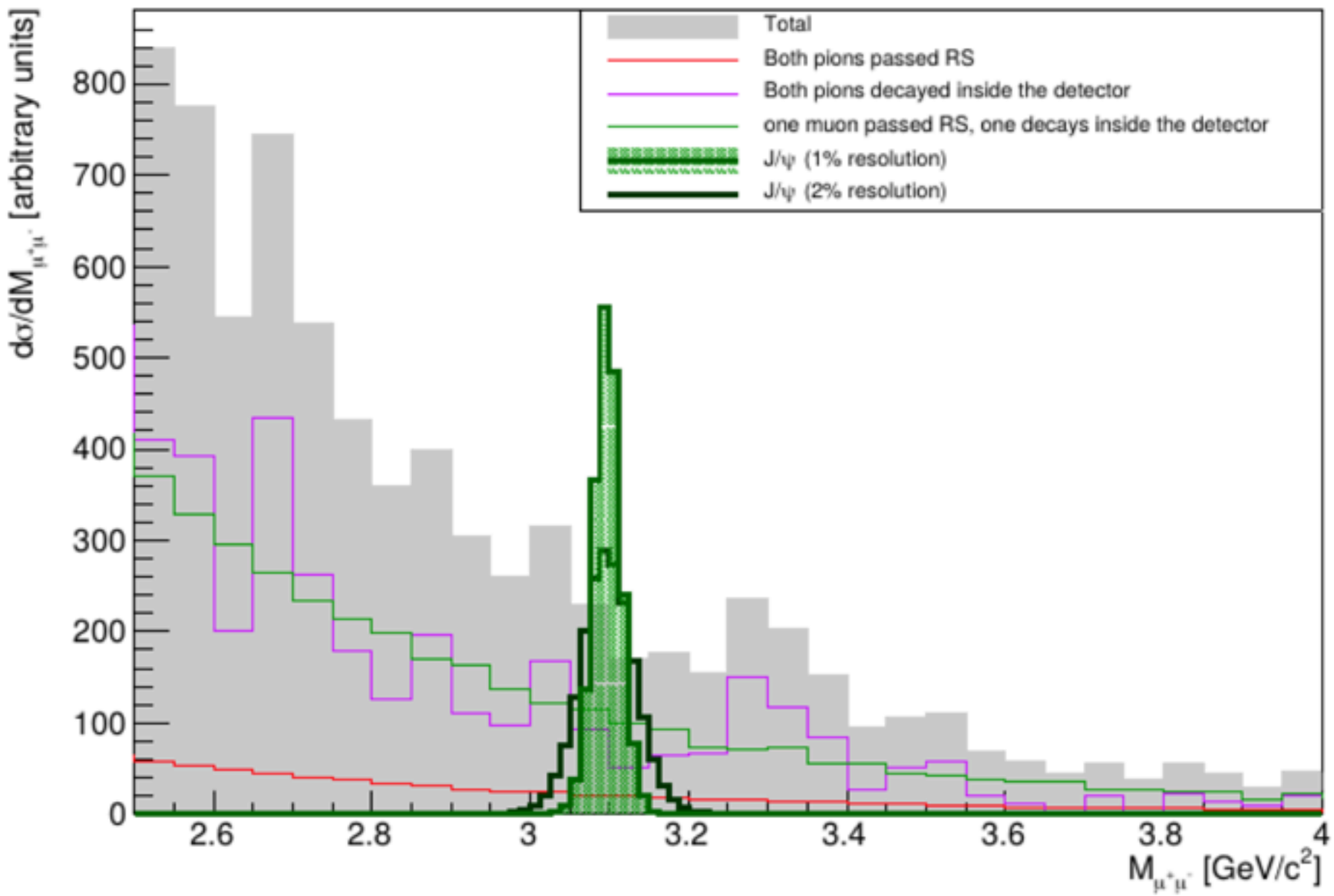
Optimization of the SPD tracking system

Andreev V. (LPI), Gerassimov S. (LPI), Guskov A. (JINR), Ivanov A. (JINR),

Tkachenko A. (JINR), Tsenov R. (JINR)

25.08.2019

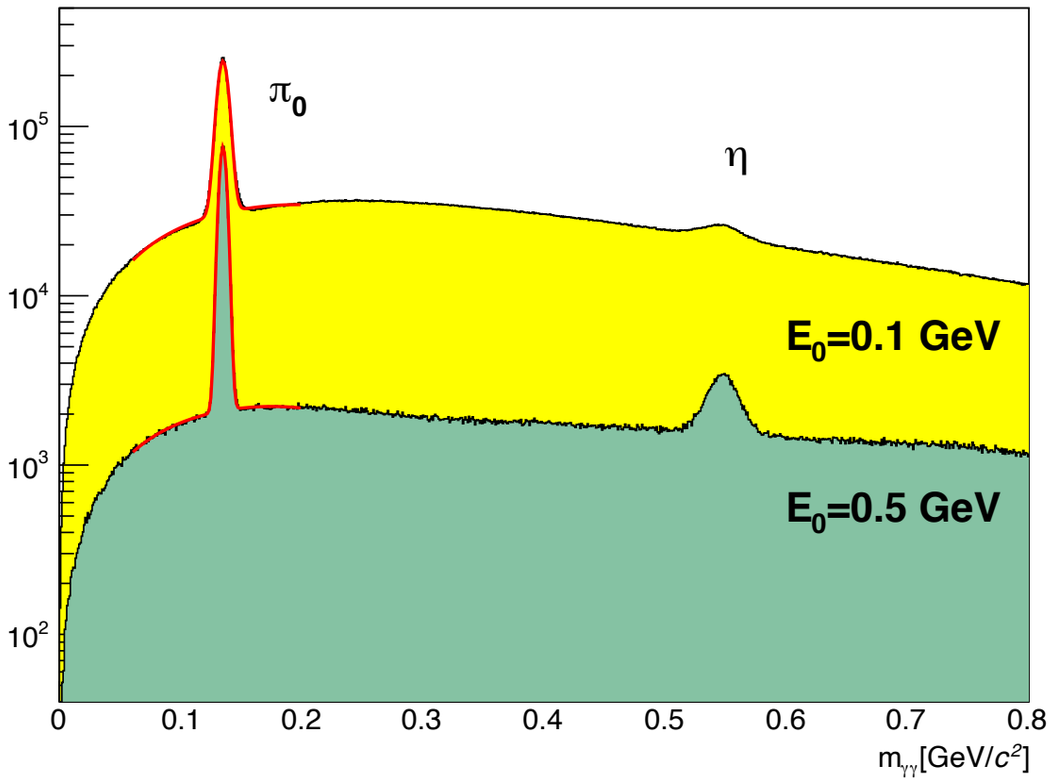
S/B for J/ψ

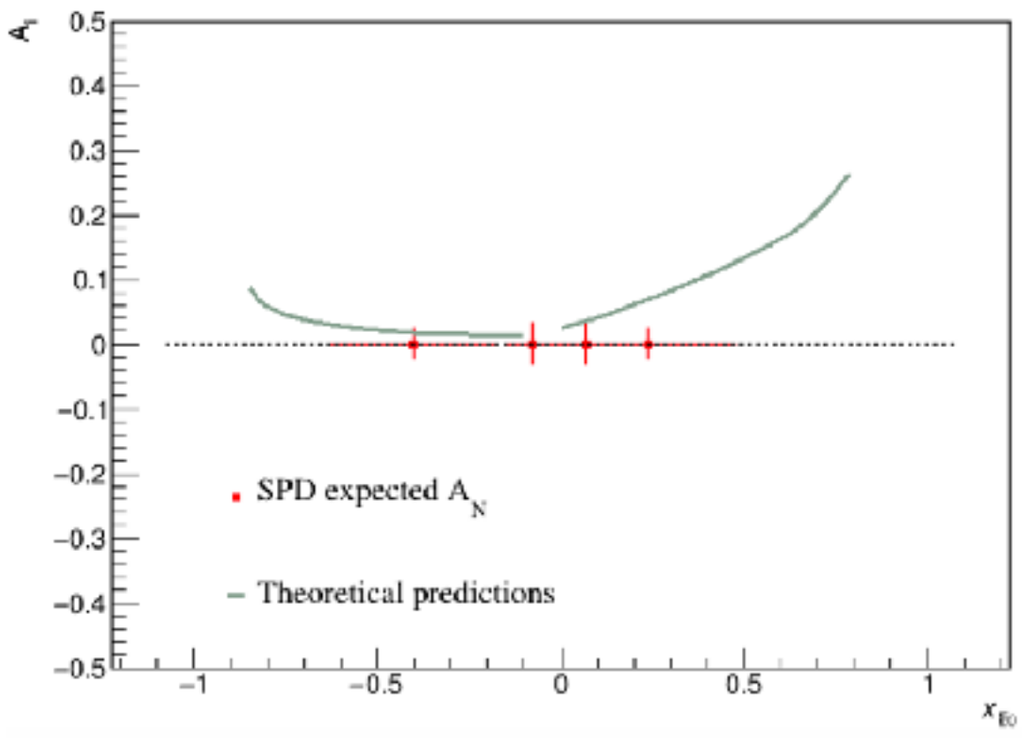


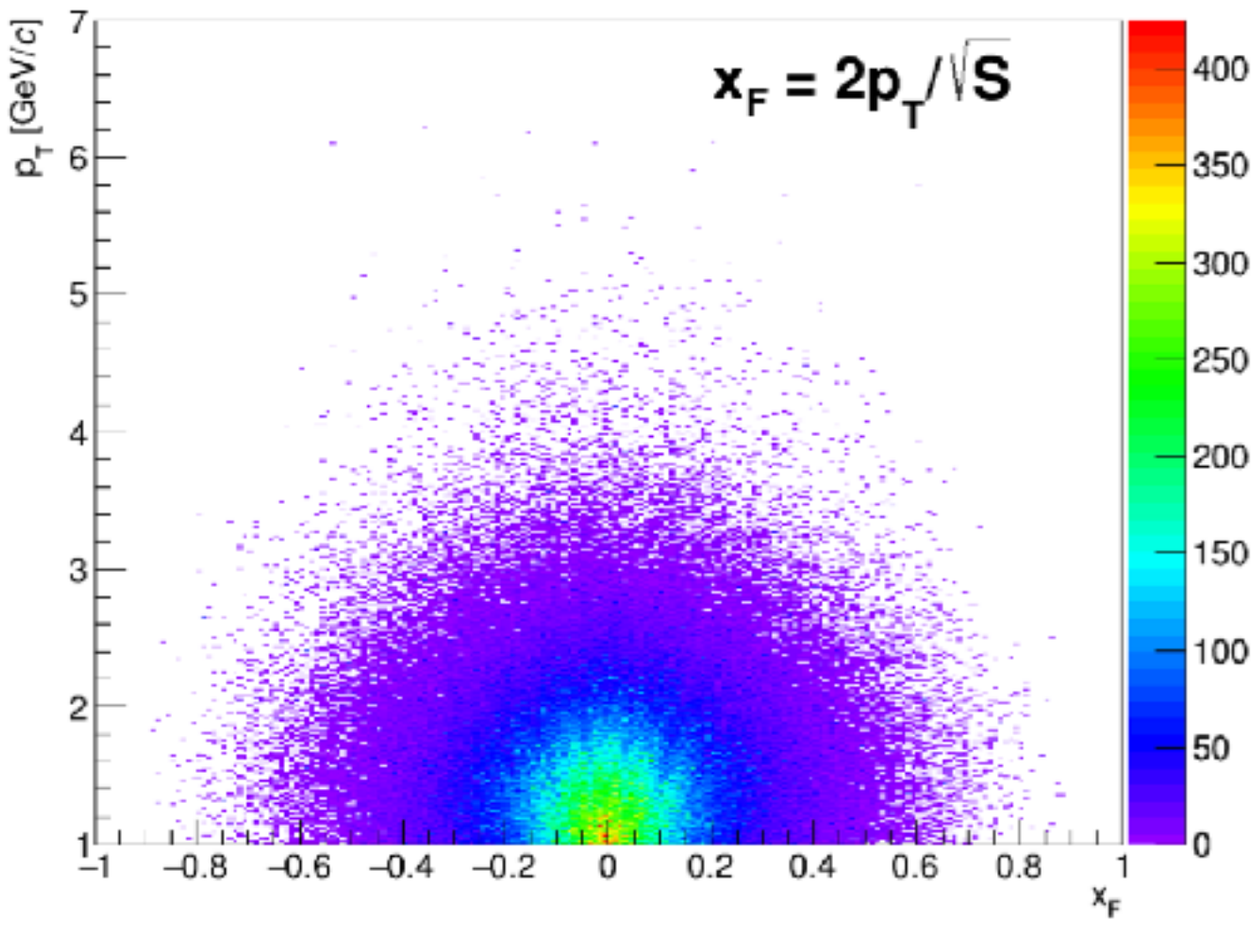
I. Denisenko

π^0 peak

γ

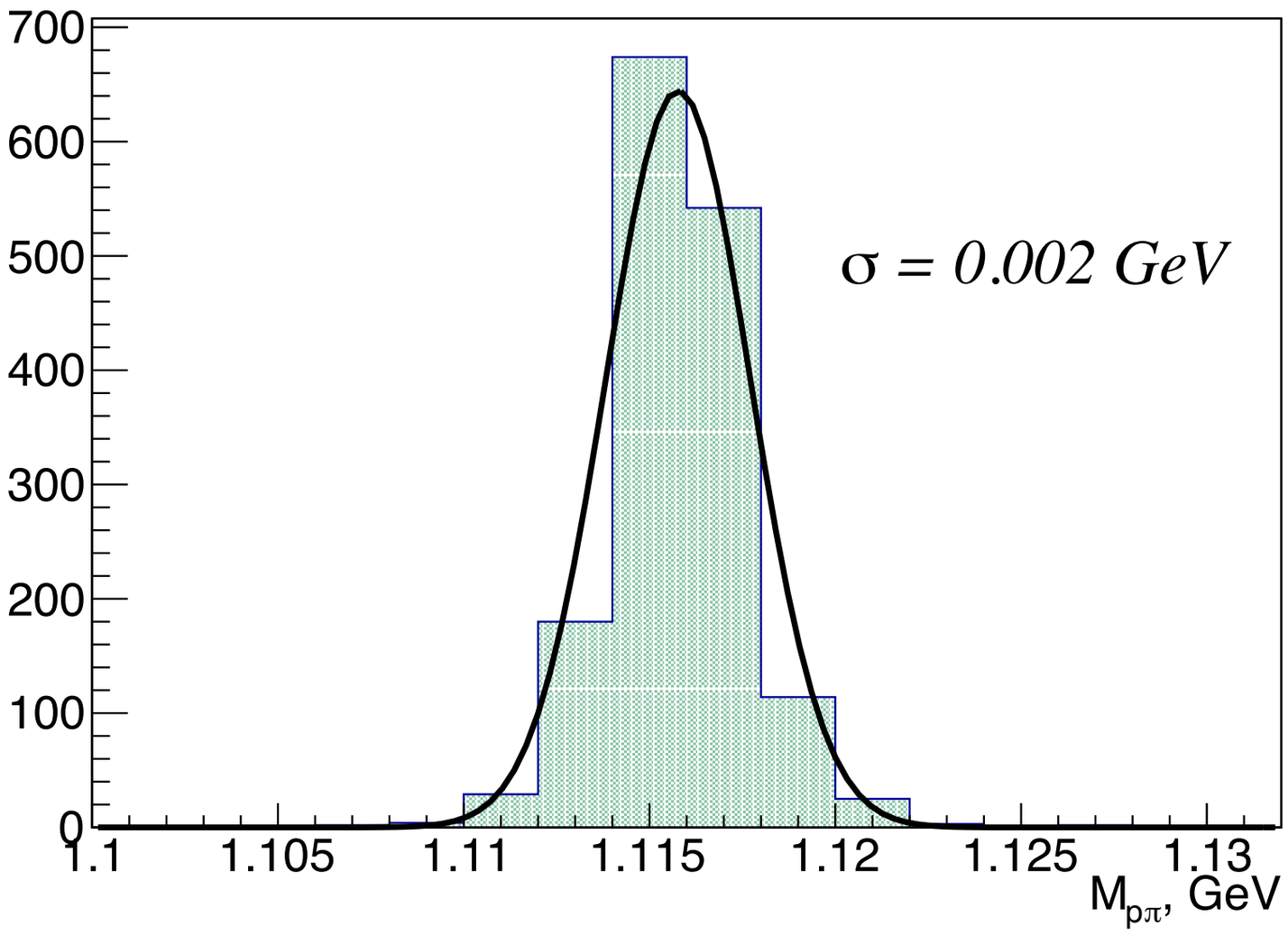






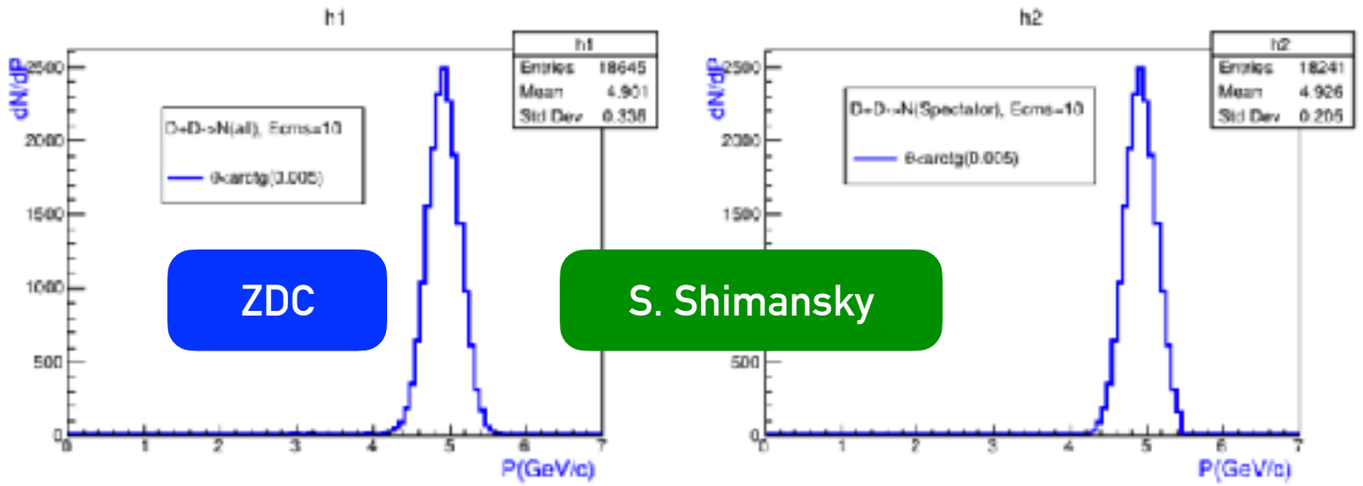
A. Rymbekova

Λ peak



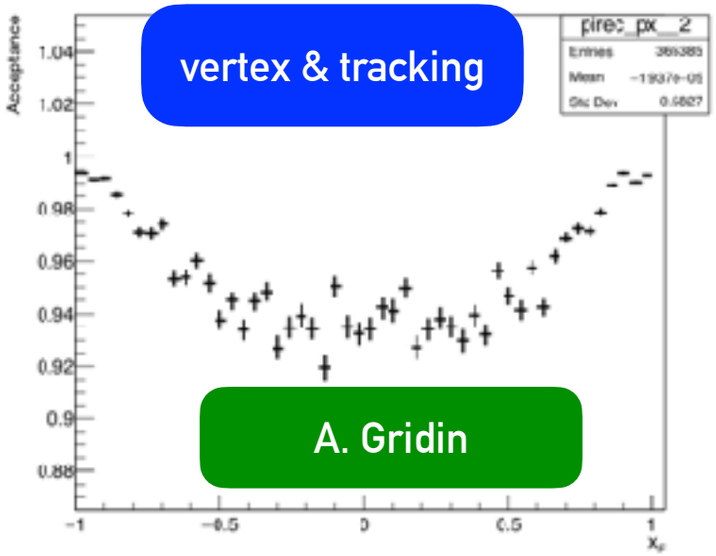
V. Alexakhin

DETECTORS (OCCUPANCY, RESPONSE, RESOLUTION ETC.) AND GENERATORS



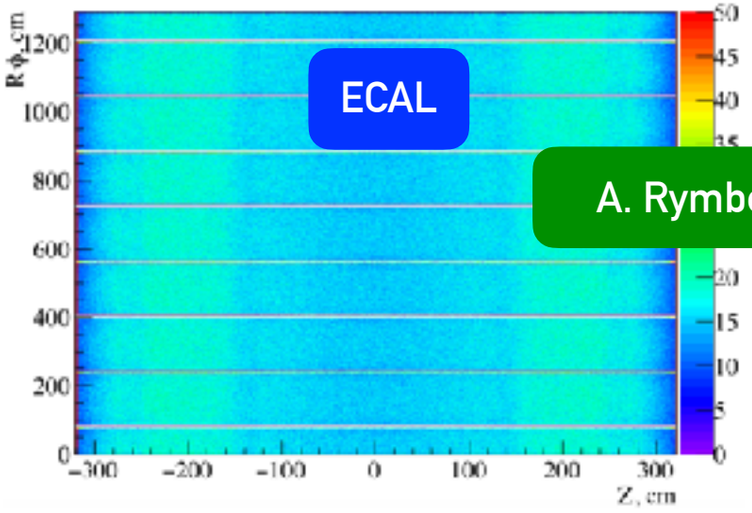
ZDC

S. Shimansky



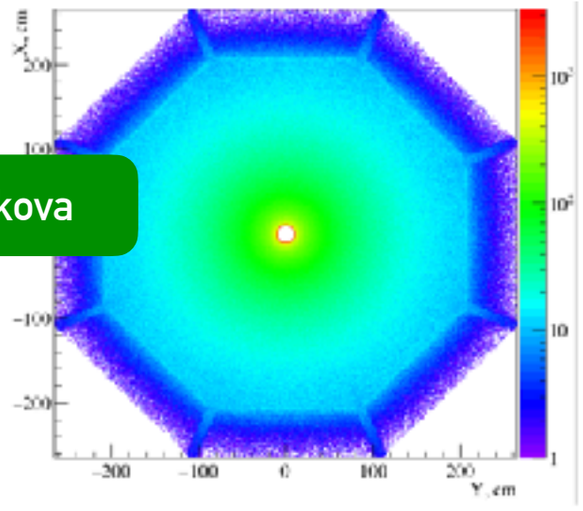
vertex & tracking

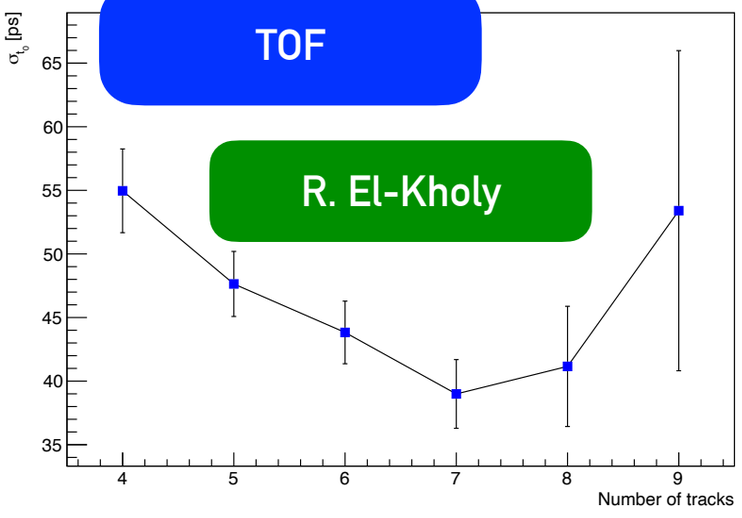
A. Gridin



ECAL

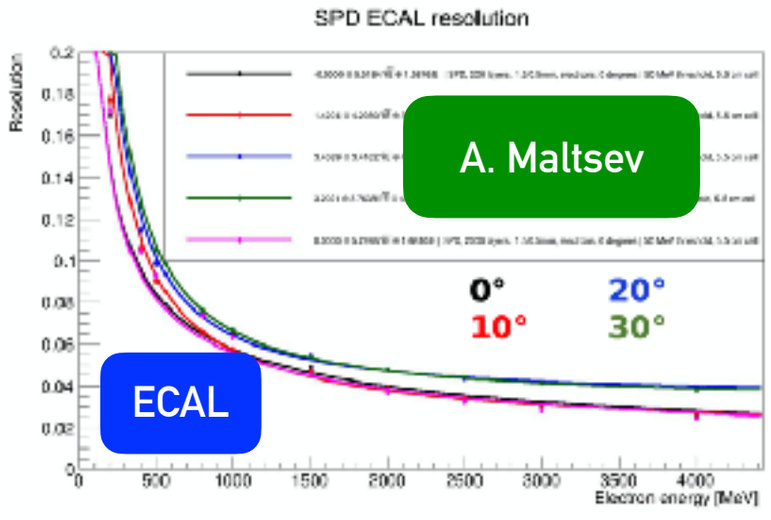
A. Rymbekova





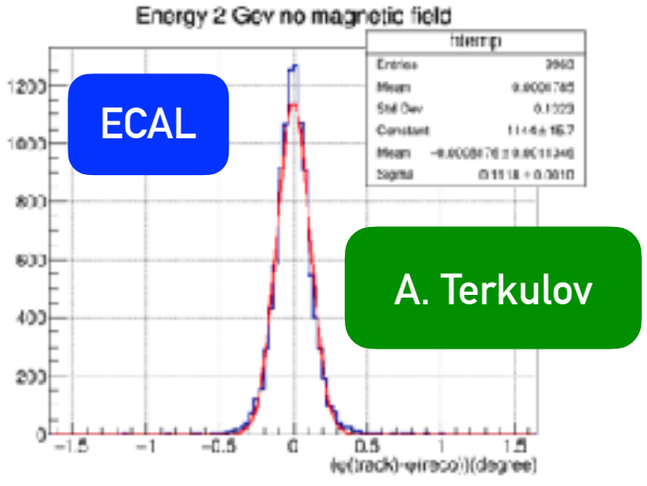
TOF

R. El-Kholy



ECAL

A. Maltsev

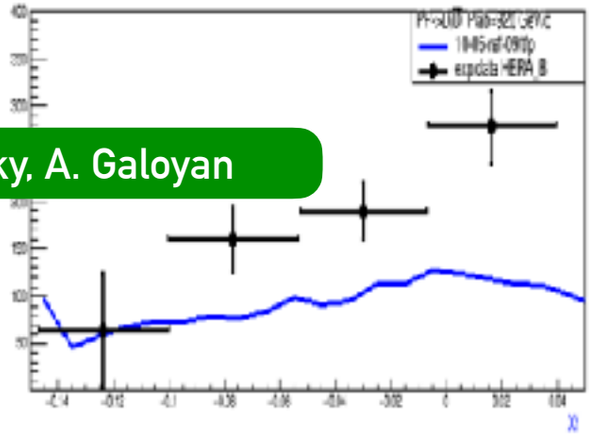


ECAL

A. Terkulov

FTF

V. Uzhinsky, A. Galoyan



SUMMARY

- We have quite large and qualified Physics and MC team. It is able to perform the task of CDR preparation.
- Physics part that defines our setup is almost ready.
- For significant part of our physics MC simulation chain is almost ready. But the SPD setup configuration should be fixed for final results. D-mesons is our main problem at the moment.
- I do not see the reason that could prevent us to prepare the physic & MC part of the CDR till the end of November.

PLANS

	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan
New detector description for SPDROOT									
MC studies									
Physics predictions									
CDR drafting									
CDR presentation at PAC									