MESON 2018


## Poster appetizers

two-minute one-slide advertisments!

12:30-13:30

## Poster Session

14:30-16:00

## Winners

Three best posters will be awarded!

**11th June, 13:30**

# 1

Xinlei GAO

**Study of** $\phi(2170)$ **@ BESIII**

# Study of $\phi(2170)$ at BESIII

- **Introduction of $\phi(2170)/Y(2175)$**
  - ✓ Theory explanations: (1) $s\bar{s}g$ hybrid (2) $2^3D_1$ or $3^3S_1$ $s\bar{s}$ (3) Tetraquark $s\bar{s}s\bar{s}$ (4) Molecular state $\Lambda\bar{\Lambda}$ (5) $\phi f_0(980)$ resonance with FSI (6)Three body system $\phi KK$
  - ✓ Published measurements: (1) Limited decay modes (2) Inconsistence on mass & width
  - ✓ Large $J/\psi$ events and energy scan data at BESIII for further study to $\phi(2170)$
- **$J/\psi \to \eta\phi(2170)$**
  - ✓ Measured $\phi(2170)$ is consistent with previous measurements and improves the precision of mass and width
- **$e^+e^- \to \eta\phi(2170)$**
  - ✓ $\phi(2170)$ observed with significance greater than $10\sigma$
  - ✓ Consistent with the previous measurements with smaller mass
- **$e^+e^- \to K^+K^-$**
  - ✓ Measured mass & width in $K^+K^-$ lineshape are not consistent with $\phi(2170)$
- **$e^+e^- \to \phi K^+K^-$ and $K^+K^-K^+K^-$**
  - ✓ Measured results in $\phi K^+K^-$ & $K^+K^-K^+K^-$ lineshape are not consistent with $\phi(2170)$
- **Summary and outlook**
  - ✓ $\phi(2170)$ is measured in $J/\psi \to \eta\phi(2170)$ and $e^+e^- \to \eta\phi(2170)$
  - ✓ Structures in $K^+K^-$, $\phi K^+K^-$ and $K^+K^-K^+K^-$ lineshape are far away from $\phi(2170)$
  - ✓ Investigations of $\phi\eta$, $\phi\eta'$ and $\omega\eta$ processes are ongoing at BESIII for further study

MESON 2018

3

Ismail SOUDI

**Meson dissociation in hot, dense matter within the Beth-Uhlenbeck approach**

# Meson dissociation in hot, dense matter within the Beth-Uhlenbeck approach

Ismail Soudi[1] and David Blaschke[1,2,3]
[1]Institute for Theoretical Physics, University of Wroclaw, Wroclaw, Poland
[2]Laboratory for Theoretical Physics, Joint Institute for Nuclear Research, Dubna, Russia
[3]National Research Nuclear University (MEPhI) Moscow, Russia

$$\Omega_\pi = -\frac{d_\pi}{2}\int d\omega \int^{\Lambda_\pi} \frac{d^3q}{(2\pi)^3}\eta(\omega,\vec{q};T)[1+2g(\omega)] \quad (1)$$

$$\eta(\omega,\vec{q};T) = \frac{\tanh\left(\frac{\omega - E_\pi(q)}{\Gamma_\pi}\right)+1}{2}\,\frac{1-\tanh\left(\frac{\omega - E_{\rm thr}(q)}{\Gamma_{\rm thr}}\right)}{2} \quad (2)$$

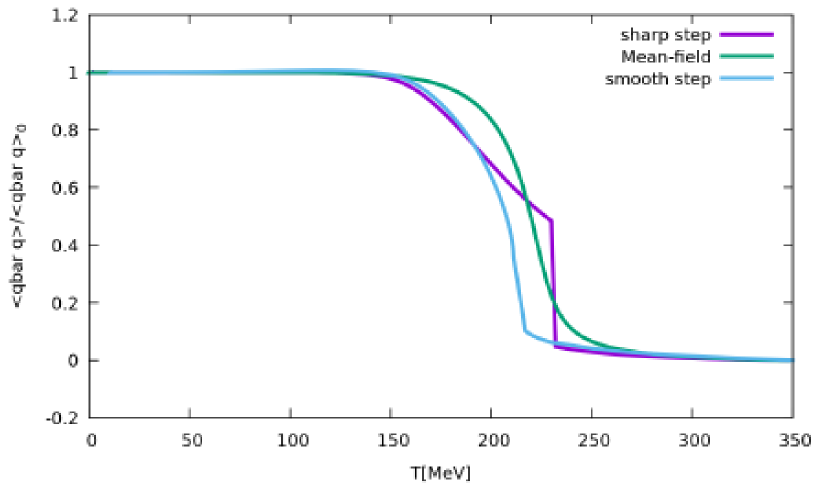


Figure 1: Temperature dependence of the chiral condensate in the schematic PNJL quark-gluon pion model, taking into account the effects from composite pions dominating the medium effects at low temperatures.

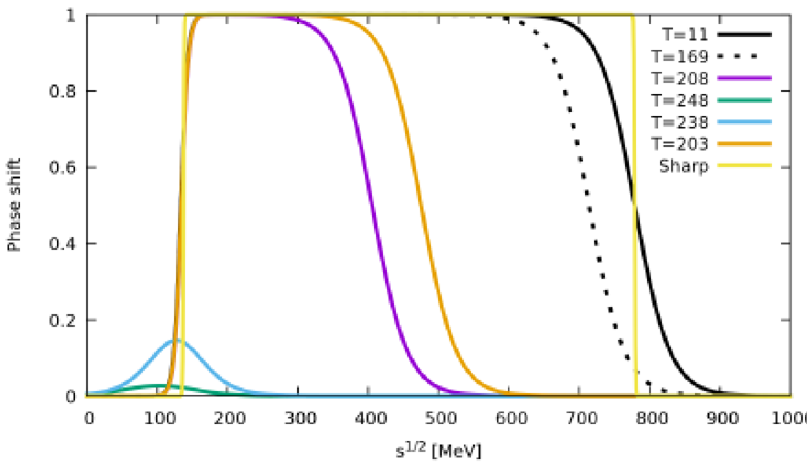


Figure 2: The tanh-ansatz for the pion phase shift as a function of the center of mass energy, for different temperatures (in MeV) compared to the step function ansatz (T=0, yellow line).

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4

Dominika WÓJCIK

# Investigation of $K^+$ emission from Ru+Ru collisions at 1.65A GeV with FOPI

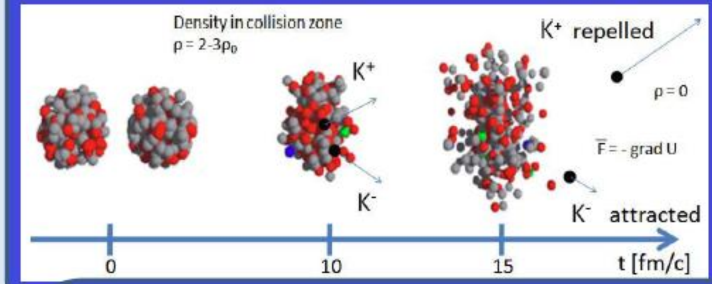
# Investigation of K⁺ emission from Ru + Ru collisions at 1.65A GeV with FOPI

Dominika Wójcik[1] and Krzysztof Piasecki[1]

[1]Institute of Experimental Physics, Faculty of Physics, University of Warsaw, Poland

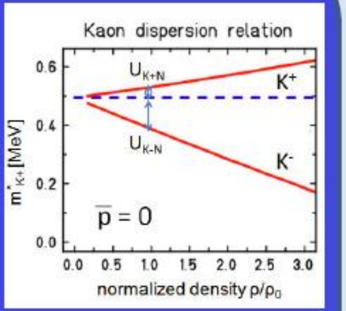
POSTER NUMBER 4

## Physics Motivation

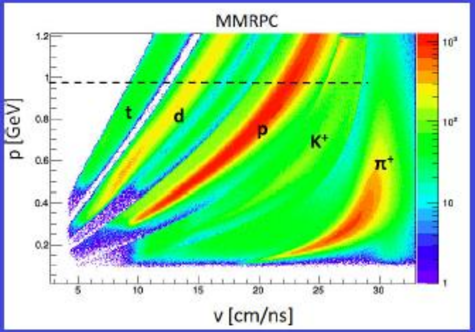



**In highly hot and dense collision zone :**

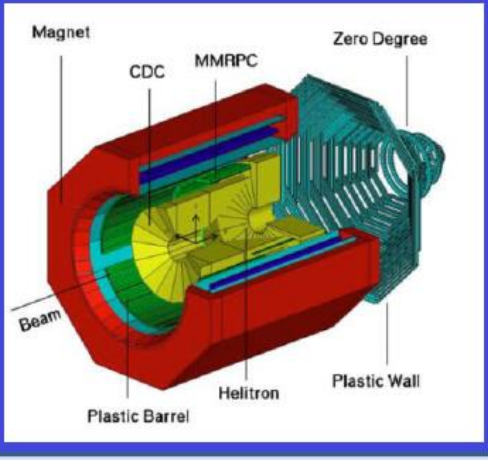
- partial restoration of chiral symmetry
- In-medium modifications of basic properties of K mesons (mass and decay constant)
- After leaving the zone : $K^+$ repelled, $K^-$ attracted




## FOPI & expt




- PID of $K^+$ in ToF detectors
- Central Ru+Ru @ 1.65AGeV
- Statistics: $1.3*10^8$ evts



5

Anastasia MERZLAYA

**Open charm measurements at CERN SPS energies with the new Vertex Detector of the NA61/SHINE experiment**

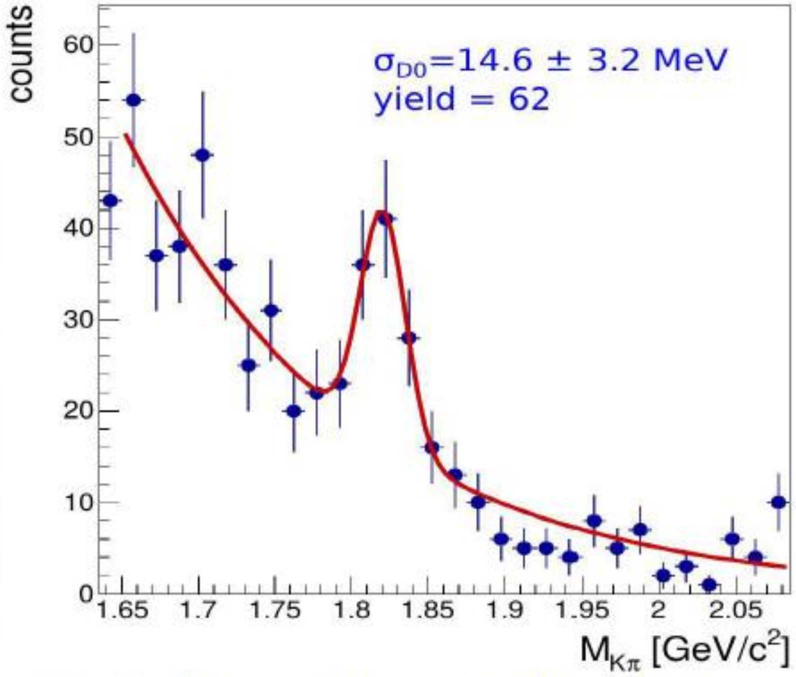
# Open charm measurements at CERN SPS energies with the new Vertex Detector of the NA61/SHINE experiment

Anastasia Merzlaya

- What is the mechanism of open charm production?
- How does the onset of deconfinement impact open charm production?
- How does the formation of quark-gluon plasma impact *J/ψ* production?

To answer these questions direct measurements of open charm yields needed.

→ Vertex Detector project of the NA61/SHINE experiment




**First observation of $D^0$ peak in Pb+Pb collisions at SPS energies**

Test data taking at 150AGeV/c – 140K events

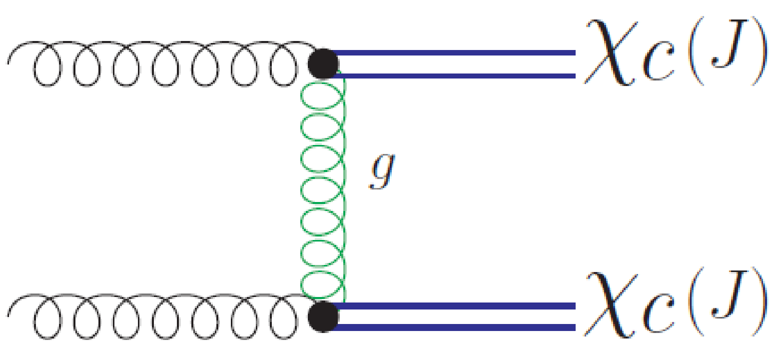
# 6

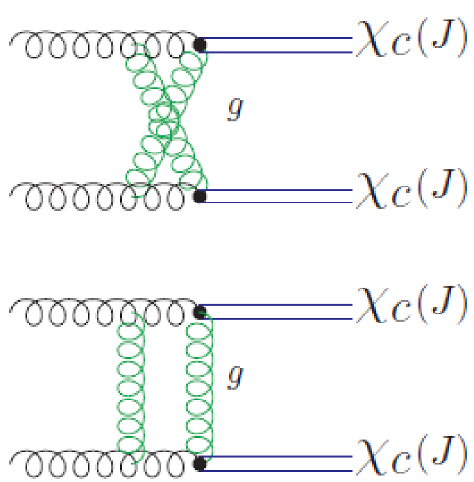
Izabela BABIARZ

**Production of $\chi_c$ meson pairs with additional emission**

# Production of $\chi_c$ meson pairs with additional emission

Izabela Babiarz in collaboration with W. Schafer and A. Szczurek
Institute of Nuclear Physics PAS

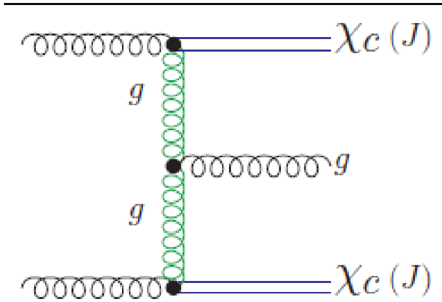



The cross section for the inclusive production of $\chi_C$ pair:

$$d\sigma(gg \to \chi_C(J)\chi_c(J)X) =$$

$$d\sigma^{(0)}(2 \to 2) + d\sigma^{(1)}(2 \to 2) + d\sigma(2 \to 3)$$



# 7

Milena PIOTROWSKA

**Study of the resonance $\psi(4040)$ and its companion poles**

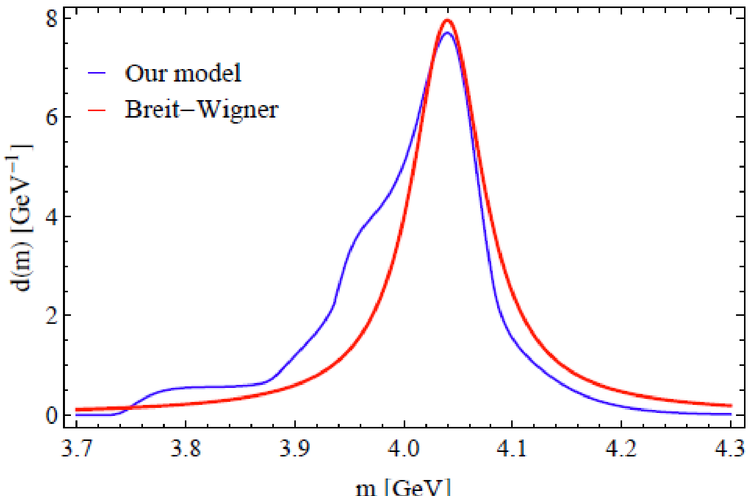
# Study of the resonance $\psi(4040)$ and its companion pole $Y(4008)$

The Belle Collaboration observed a significant enhancement with mass $M = 4008 \pm 40^{+114}_{-28}$ MeV and width $\Gamma = 226 \pm 44 \pm 87$ MeV when measuring the $e^+e^- \to \pi^+\pi^- J/\Psi$ cross section via ISR.

## INTERPRETATIONS OF THE $Y(4008)$ STATE

- **$\psi(3S)$ charmonium state**
  B. Q. Li and K. T. Chao, Phys. Rev. D **79** (2009) 094004
- **$D^*\bar{D}^*$ molecular state**
  W. Xie, L. Q. Mo, P. Wang and S. R. Cotanch, Phys. Lett. B **725** (2013) 148
- **Tetraquark state**
  P. Zhou, C. R. Deng and J. L. Ping, Chin. Phys. Lett. **32** (2015) no.10, 101201.
- **Interference with background**
  D. Y. Chen, X. Liu, X. Q. Li and H. W. Ke, Phys. Rev. D **93** (2016) 014011

- **Our interpretation:**
  $Y(4008)$ is a COMPANION POLE of $c\bar{c}$ $\psi(4040)$



MESON 2018

8

Vladimir LADYGIN

**New results on the vector Ay and tensor Ayy and Axx analyzing powers in deuteron-proton elastic scattering at 400-1800 MeV**

MESON 2018

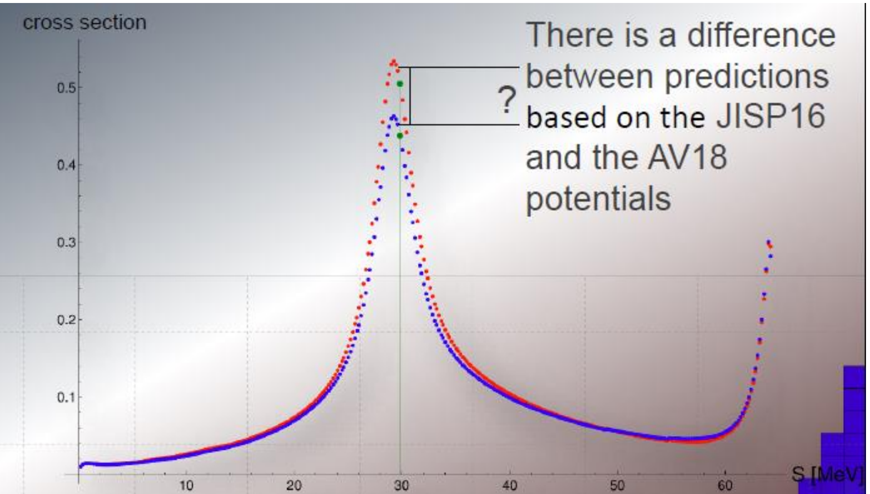
9

Volodymyr SOLOVIOV

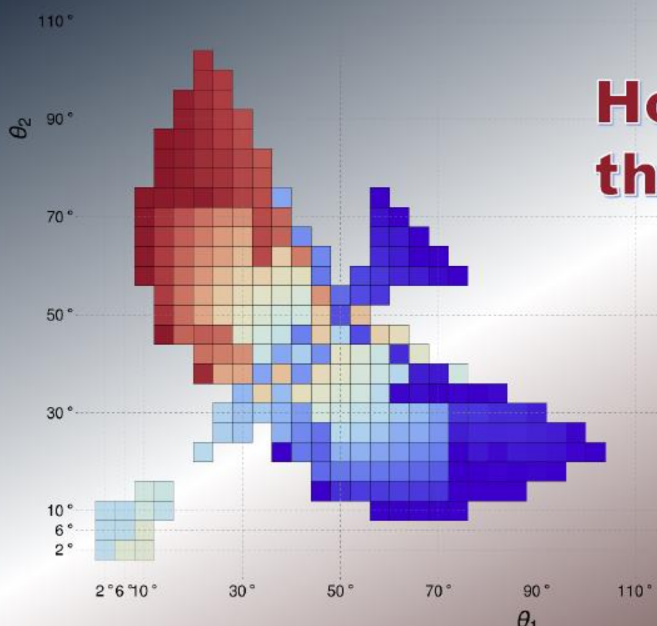
**Systematic study of the nucleon induced deuteron breakup at E=13 MeV with the JISP16 potential**

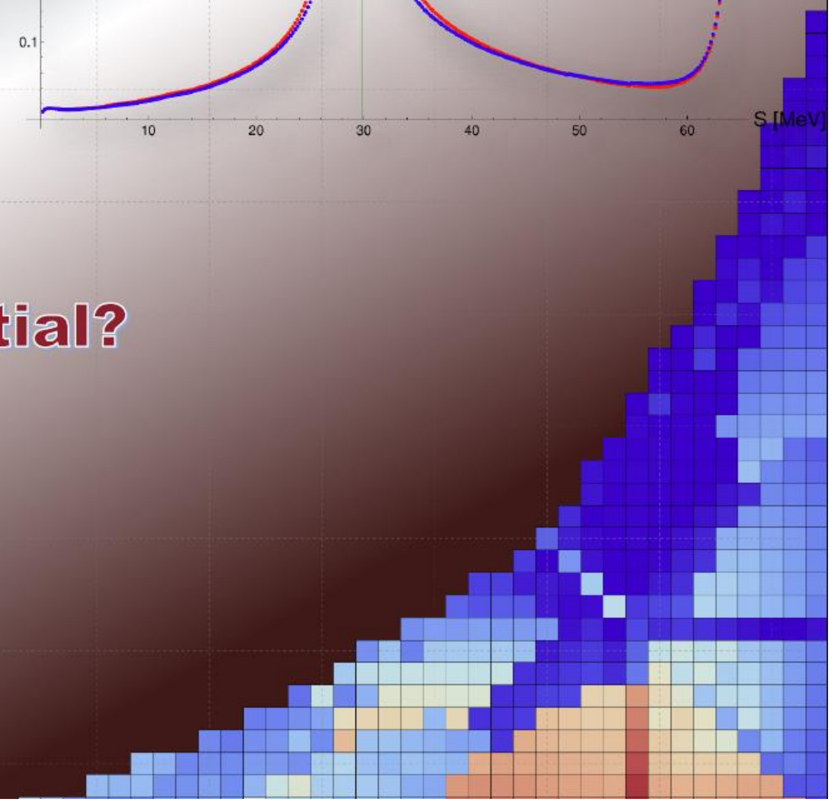
**Systematic study of the nucleon induced deuteron breakup at E = 13 MeV and 65 MeV with the JISP16 potential**

V.Soloviov et al.,
M. Smoluchowski Institute of Physics,
Jagiellonian University,
Kraków, Poland




**How to improve the JISP16 potential?**



10

Bao-Dong SUN

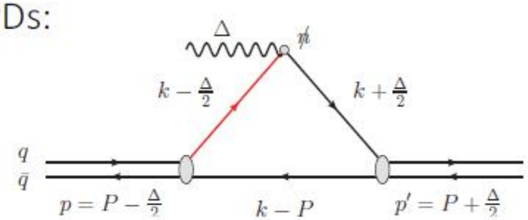
**GPDs of $\rho$ meson from a light-front constituent quark model**

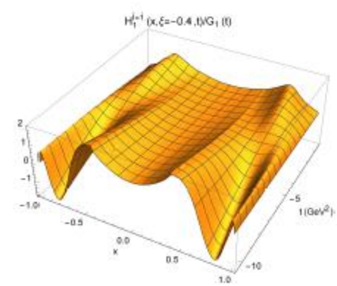
# GPD/IPD/GDA of $\rho(770)$ with a light-front constituent quark model

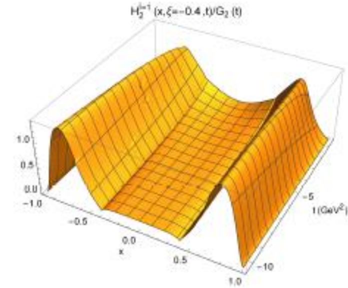
Bao-Dong SUN & Yu-Bing DONG, IHEP CAS

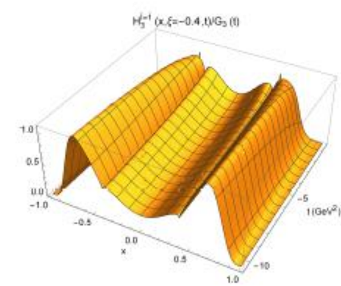
The effective Lagrangian: $\mathcal{L}_I = -\frac{\imath M}{f_\rho}\bar{q}\Gamma^\mu \tau q \cdot \rho_\mu = -\frac{\imath\sqrt{2}M}{f_\rho}\left[\frac{\bar{u}\Gamma^\mu u - \bar{d}\Gamma^\mu d}{\sqrt{2}}\rho^0_\mu + \bar{u}\Gamma^\mu d\rho^+_\mu + \bar{d}\Gamma^\mu u\rho^-_\mu\right]$, $\Gamma^\mu = \frac{\gamma^\mu - (k_q - k_{\bar{q}})^\mu/(M_{\text{inv}} + 2m_q)}{[k_q^2 - m_R^2 + \imath\epsilon][k_{\bar{q}}^2 - m_R^2 + \imath\epsilon]}$

GPDs:

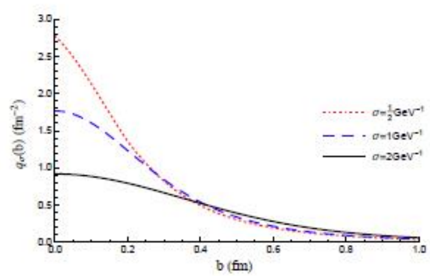


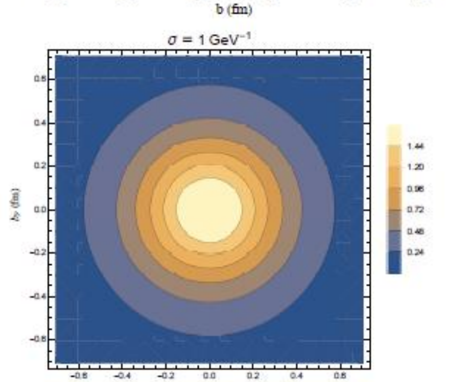





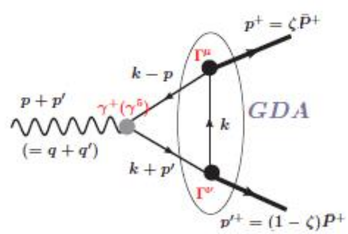


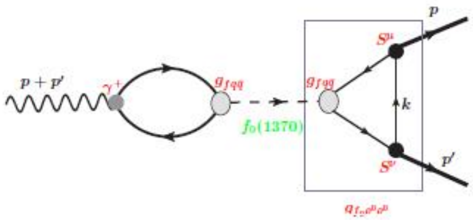
IPDs:

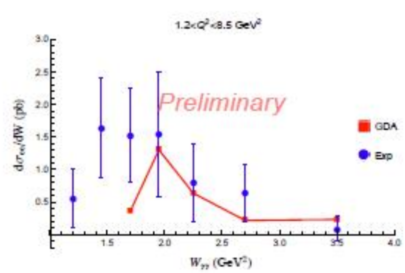


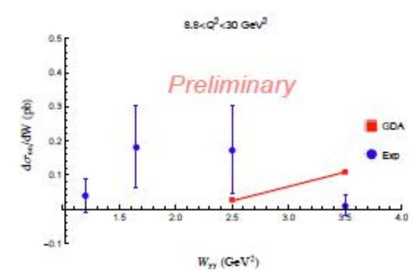




GDAs ($\sigma_{\gamma^*\gamma\to\rho\rho}$):



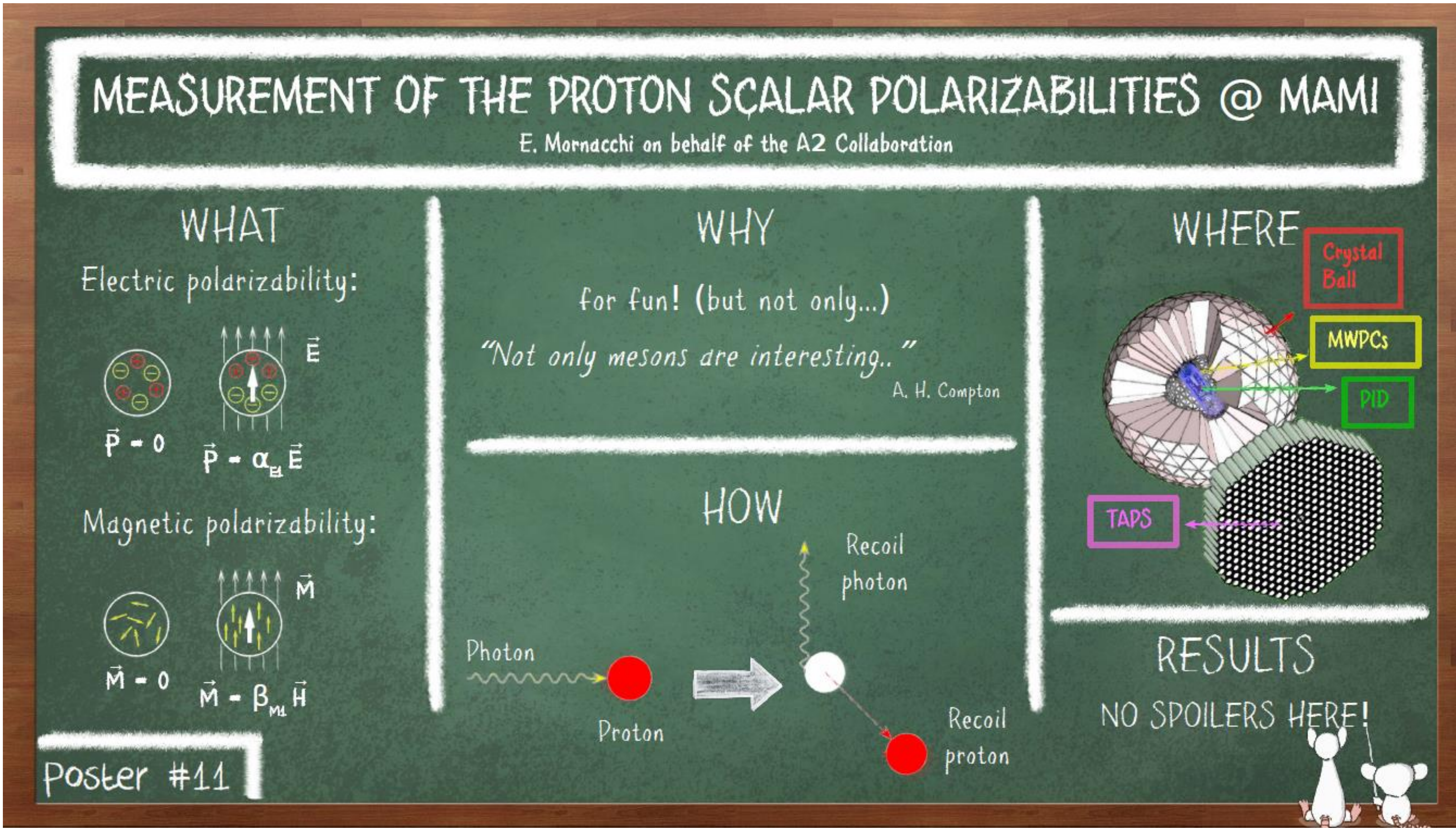


# 11

Edoardo MORNACCHI

**Measurement of the proton scalar polarizabilities at MAMI**


MEASUREMENT OF THE PROTON SCALAR POLARIZABILITIES @ MAMI
E. Mornacchi on behalf of the A2 Collaboration
WHAT
Electric polarizability:
E
P = 0
P = α_E1 E
Magnetic polarizability:
M
M = 0
M = β_M1 H
WHY
for fun! (but not only...)
"Not only mesons are interesting.."
A. H. Compton
HOW
Photon
Proton
Recoil photon
Recoil proton
WHERE
Crystal Ball
MWPCs
PID
TAPS
RESULTS
NO SPOILERS HERE!
Poster #11

# 12

Juhi RAJ

**Study of time reversal symmetry in the decay of Ortho-Positronium atoms using J-PET**

# Study of time reversal symmetry in the decay of ortho-Positronium atoms using J-PET

*Juhi Raj*
*On Behalf of the J-PET Collaboration*

J-PET

Jagiellonian-Positron Emission Tomography

1st PET to be made of plastic scintillators

16 International Patents

Table 1: Symmetry Odd-Operators

| Operator | C | P | T | CP | CPT |
|---|---|---|---|---|---|
| $\vec{S}.\vec{k_1}$ | + | - | + | - | - |
| $\vec{S}.(\vec{k_1} x \vec{k_2})$ | + | + | - | + | - |
| $(\vec{S}.\vec{k_1})(\vec{S}.(\vec{k_1} x \vec{k_2}))$ | + | - | - | - | + |
| $\vec{\epsilon_1}.\vec{k_2}$ | + | - | - | - | + |
| $\vec{S}.\vec{\epsilon_1}$ | + | + | - | + | - |
| $\vec{S}.(\vec{k_2} x \vec{\epsilon_2})$ | + | - | + | - | - |

Where,

$$|\vec{k_1}| > |\vec{k_2}| > |\vec{k_3}| \quad (1)$$

P.Moskal et. al., Acta Phys. Polon. B47 (2016) 509

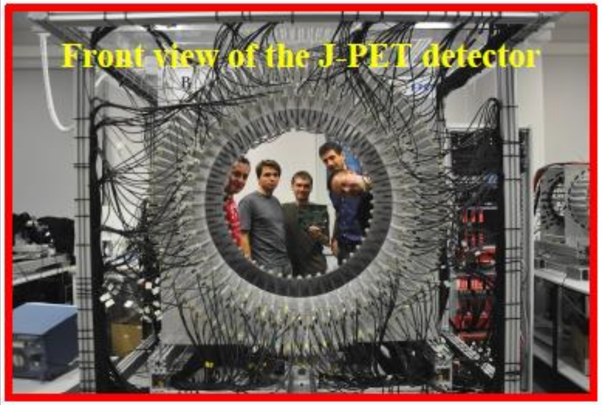
Unique Feature:

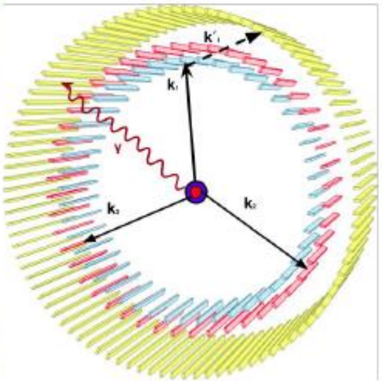
Measurement of polarization of annihilation photon.

Talk by Dr. Michal Silarski,
11/06/2018
16:05 to 16:25
Parallel Session C5

*"The only reason for time is so that everything doesn't happen at once"* - *Albert Einstein*

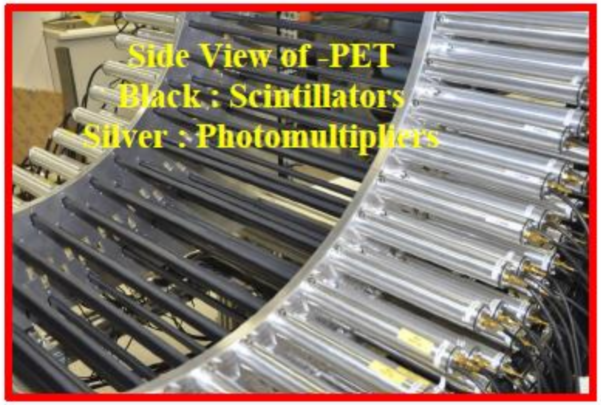
Poster No.
12



Schematic of the J-PET detector with a positron source (red) placed in the center, covered in XAD-4 porous polymer (blue).

The superimposed arrows indicate gamma photon originating from the de-excitation of $^{22}Ne^*$ (γ), annihilation photons from ortho-positronium decay ( $k_1$ , $k_2$ and $k_3$), and scattered photon ($k'_1$).



MESON 2018

13

Kacper TOPOLNICKI

**Three-nucleon bound state calculations using the "three-dimensional" formalism**

## Three-nucleon bound state calculations using the 3D formalism

**Kacper Topolnicki**
Jacek Golak
Roman Skibiński
Henryk Witała
Yuriy Volkotrub
Volodymyr Soloviov
Alessandro Grassi

7-12 VI 2018



- Few (two, three) body (nucleon) systems
- $|\text{ nucleon}\rangle = |\text{ momentum isospin spin}\rangle$
- Use 3D momentum degrees of freedom of the nucleon instead of angular momentum eigenstates
- Directly solve: Schrödinger, Lippmann-Schwinger, **Faddeev**, . . . equations using a numerical approach
- Use effective (two-, three-) nuclear forces (semi - phenomenological or derived from ChEFT)
- Preliminary results for the $^3$He bound state obtained without angular momentum decomposition

MESON 2018

14

Tomas KADAVY

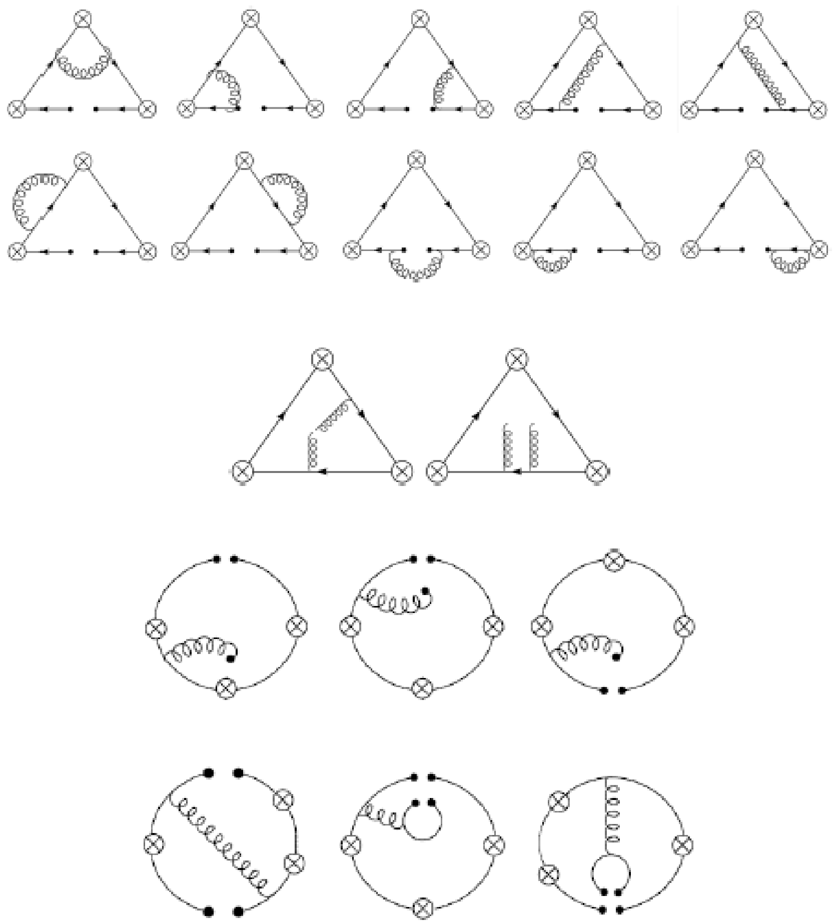
**Contribution of QCD Condensates to the OPE of Green Functions of Chiral Currents**

Tomáš Kadavý, Karol Kampf and Jiří Novotný (Charles University, Prague)

## On QCD Condensates and the OPE of Green Functions of Chiral Currents

- We calculated OPE of all three-point Green functions of chiral currents for all momenta large.
- At high energies, the Green functions are given in terms of QCD condensates (dim $\leq 6$):
  - $\langle \overline{q}q \rangle$,
  - $\langle G_{\mu\nu} G^{\mu\nu} \rangle$,
  - $\langle \overline{q} \sigma_{\mu\nu} G^{\mu\nu} q \rangle$,
  - $\langle \overline{q}\, \Gamma_1\, q \overline{q}\, \Gamma_2\, q \rangle$.
- Our goal:
  - Try to match OPE with R$\chi$T.
- Our interest: odd sector of QCD
  - NLO resonance Lagrangian [K. Kampf and J. Novotný '11]

$$\mathcal{L}^{(6)}_{\mathrm{R}\chi\mathrm{T}} = \sum_X \sum_i \kappa_i^X \widehat{\mathcal{O}}^X_{i\,\mu\nu\alpha\beta} \varepsilon^{\mu\nu\alpha\beta} .$$



15

Muhsin MOHAMMED, Aleksandar GAJOS

**The Tests of CP and CPT Asymmetry using J-PET Detector**

# The Tests of CP and CPT Asymmetry using J-PET Detector

Muhsin Mohammed, Aleksandar Gajos for the J-PET collaboration

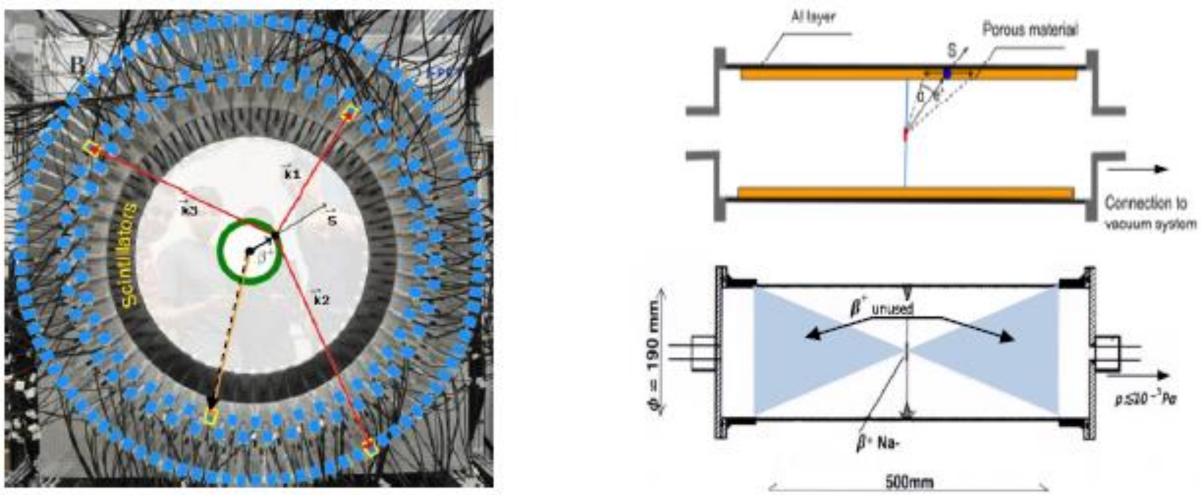



**Fig.1**. (Left) Photo of the Jagiellonian positron emission tomograph (J-PET). J-PET is made of 3 cylindrical layers of EJ-230 plastic scintillator strips (black) with a dimension of 7 × 19 × 500 mm$^3$ and Hamamatsu R9800 photomultipliers (gray). The superimposed rectangles indicate positions of photomultipliers. (Right) Scheme of large annihilation chamber.

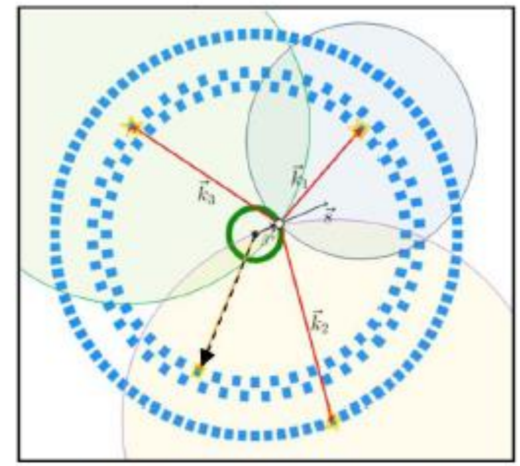
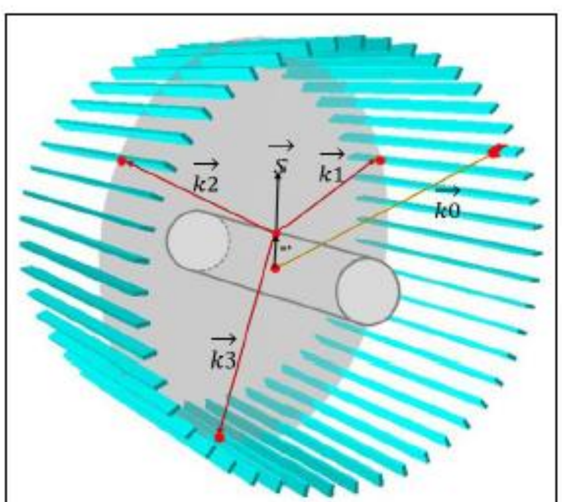


**Fig.2.** Scheme of the trilateration-based reconstruction used to determine the ortho-positronim annihilation point.



In Fig 3: ( $\vec{S}$ ) spin vector of the ortho-positronium atom, linear polarization direction of annihilation photons

( $\vec{k1}$ , $\vec{k2}$ and $\vec{k3}$ ) co-planar momentum vectors of photons originating from the decay of positronium atom.

( $\vec{k0}$ ) vector of prompt gamma photon originating from the source.

| Operator | C | P | T | CP | CPT |
|---|---|---|---|---|---|
| $\vec{S}\cdot\vec{k}_1$ | + | − | + | − | − |
| $\vec{S}\cdot\left(\vec{k}_1\times\vec{k}_2\right)$ | + | + | − | + | − |
| $\left(\vec{S}\cdot\vec{k}_1\right)\left(\vec{S}\cdot\left(\vec{k}_1\times\vec{k}_2\right)\right)$ | + | − | − | − | + |
| $\vec{k}_1\cdot\vec{\epsilon}_2$ | + | − | − | − | + |
| $\vec{S}\cdot\vec{\epsilon}_1$ | + | + | − | + | − |
| $\vec{S}\cdot\left(\vec{k}_2\times\vec{\epsilon}_1\right)$ | + | − | + | − | − |

Table 1:Discrete symmetries test operators for the o-Ps to 3γ process. The odd symmetric operators are marked with " - " and are available for studies at the J-PET

Fig 3. Determination the orientation of the normal to

# 16

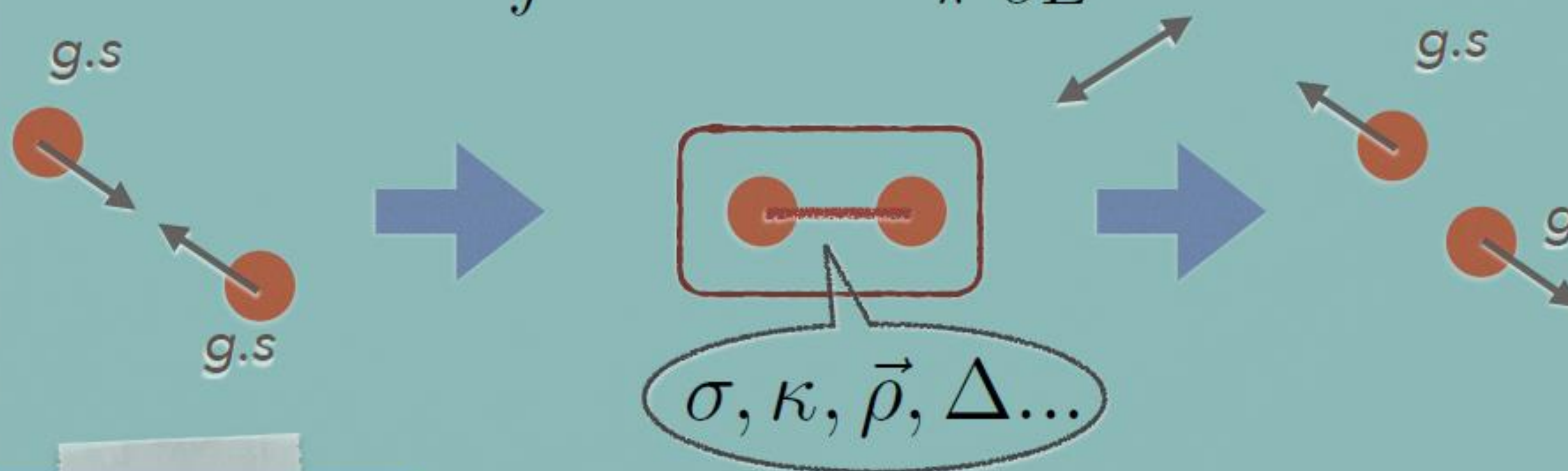
Pok Man LO

**S-matrix approach to the hadron gas**

# S-MATRIX FORMULATION OF STATISTICAL MECHANICS

R. Dashen, S. K. Ma and H. J. Bernstein,
Phys. Rev. 187 (1969) 345.

$$\Delta \ln Z = \int dE\, e^{-\beta E} \times \frac{1}{\pi} \frac{\partial}{\partial E} \mathrm{tr}\left(\delta_E\right).$$




+ *repulsions*

PWA
X
S-matrix thermo.

$$\delta \longrightarrow \mathcal{Q}(M) \equiv \frac{1}{2}\, \mathrm{Im}\,(\mathrm{tr} \ln \mathrm{S})$$

17

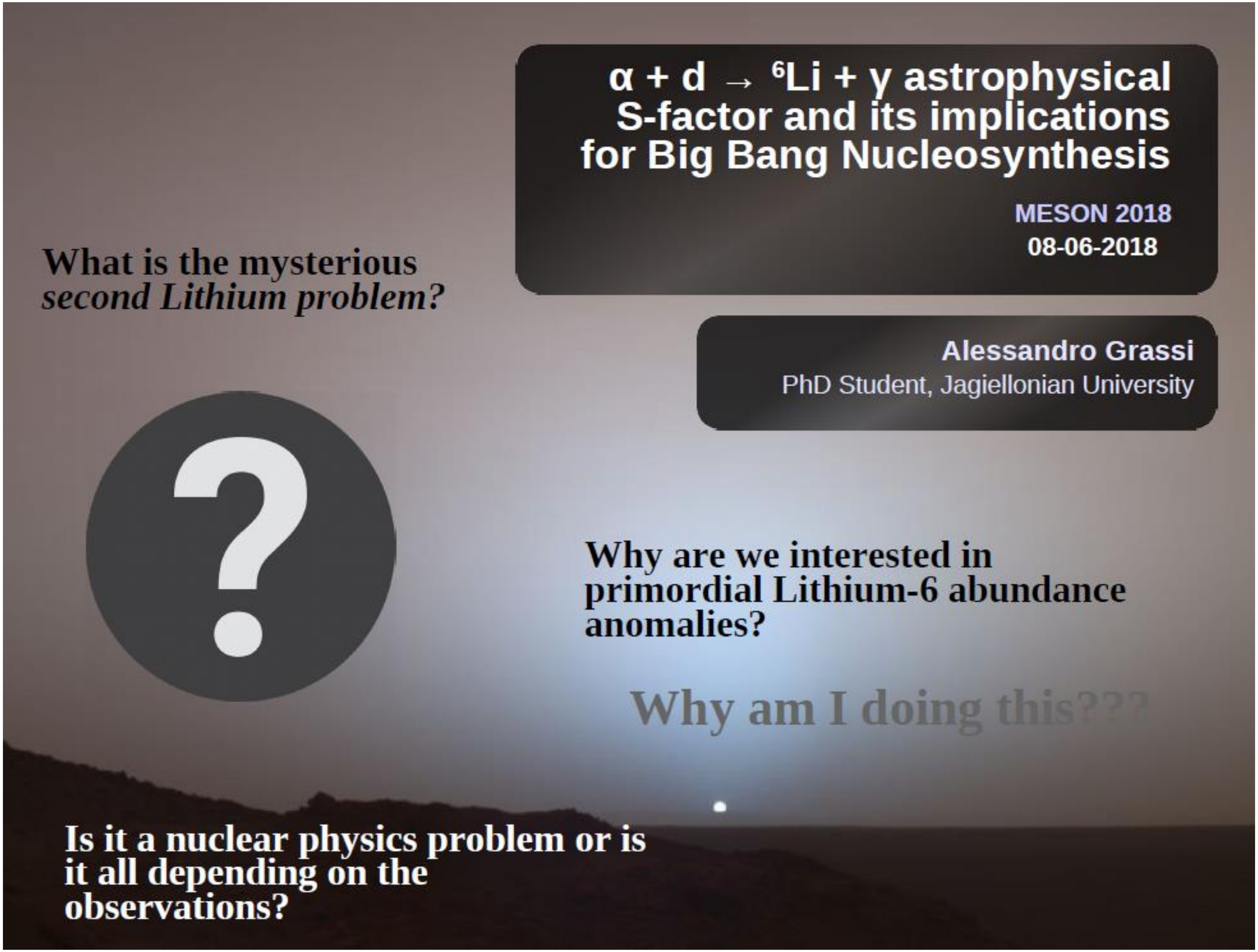
Muhammad AJAZ

**Model predictions of hadron production measurements using proton-carbon interactions at high energies**

# 18

Alessandro GRASSI

## $\alpha + d \to {}^{6}\mathrm{Li} + \gamma$ astrophysical $S$-factor and its implications for Big Bang Nucleosynthesis


α + d → $^{6}$Li + γ astrophysical S-factor and its implications for Big Bang Nucleosynthesis
MESON 2018
08-06-2018
Alessandro Grassi
PhD Student, Jagiellonian University
What is the mysterious *second Lithium problem?*
Why are we interested in primordial Lithium-6 abundance anomalies?
Why am I doing this???
Is it a nuclear physics problem or is it all depending on the observations?

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Aleksander KHREPTAK

**Luminosity Determination for the Quasi-Free Nuclear Reaction in the WASA-at-COSY Experiment**

# 20

Dominika ALFS

**Design of a detector for studies of S = -2 baryon interaction induced by stopped $\bar{p}$ annihilation**

# DESIGN OF A DETECTOR FOR STUDIES OF S = −2 BARYON INTERACTION INDUCED BY STOPPED ANTIPROTON ANNIHILATION

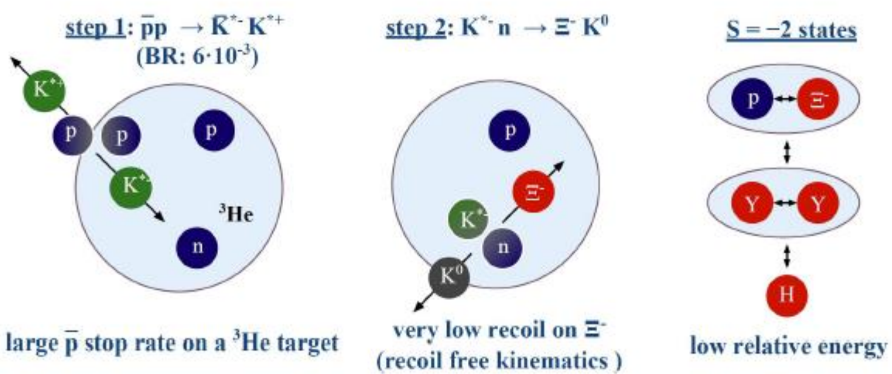
D. Alfs[1,2], D. Grzonka[2]
1. Faculty of Physics, Astronomy and Applied Computer Science, Jagiellonian University in Kraków, Poland
2. Institut für Kernphysik, Forschungszentrum Jülich, Germany

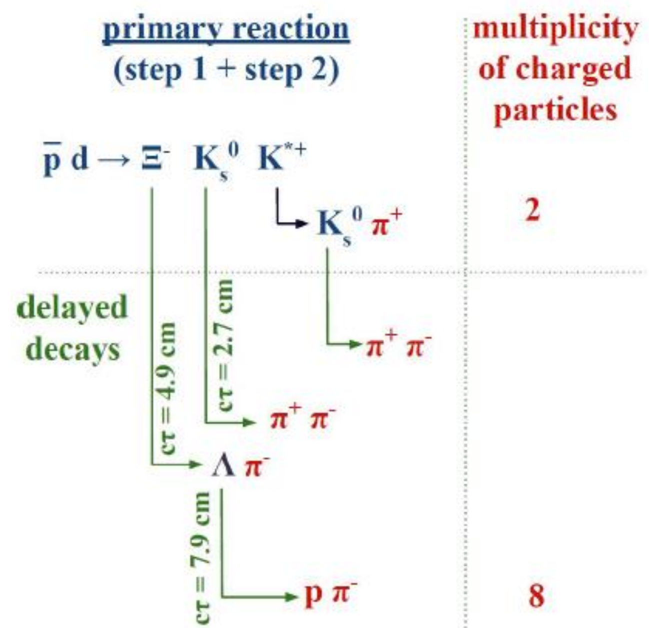
**Limited database for study of Y-N and Y-Y interaction**

→ idea: $\Xi$ production in recoil free kinematics

optimum condition for interacting $\Xi$-N systems

Production will become possible
with low energy, phase space cooled antiproton beam
e.g. from ELENA or FLAIR




Clear event signature:

- 3 delayed decays
- increase of multiplicity

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Marcin ZIELIŃSKI

**Drift chamber calibration and particle identification in the P-349 experiment**

# Drift chamber calibration and track reconstruction in the P-349 Antiproton Polarization Experiment

D. Alfs[1,2], D. Grzonka[2], M. Zieliński[1]
1. Faculty of Physics, Astronomy and Applied Computer Science, Jagiellonian University in Kraków, Poland
2. Institut für Kernphysik, Forschungszentrum Jülich, Germany

### Why polarized antiproton beams?

- Low Energy: additional spin degree of freedom
- High Energy: nucleon quark structure

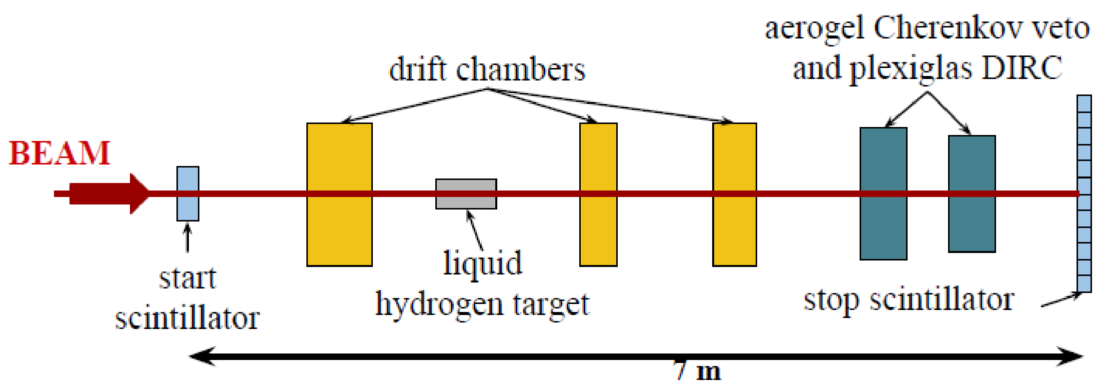
### Measurement - CERN/PS

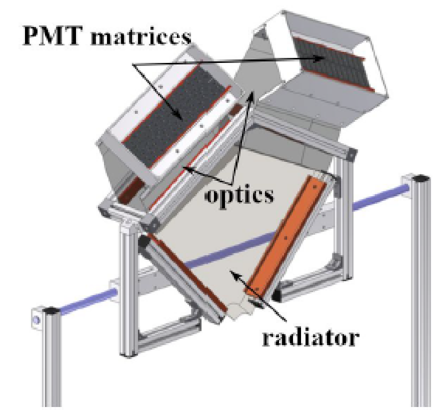
- left-right asymmetry of elastic $\bar{p}p$ scattering in the CNI region (LAB scattering angle 10 - 20 mrad)

$$\sigma = \sigma_0 \left(1 + A_y P \cos(\phi)\right)$$

### The ongoing analysis

- drift chamber calibration, position fine tuning and track reconstruction
  → **precision ~ 1 mrad expected**
- PID with plexiglass DIRC - elimination of dominant pionic background
  → **MC supported**



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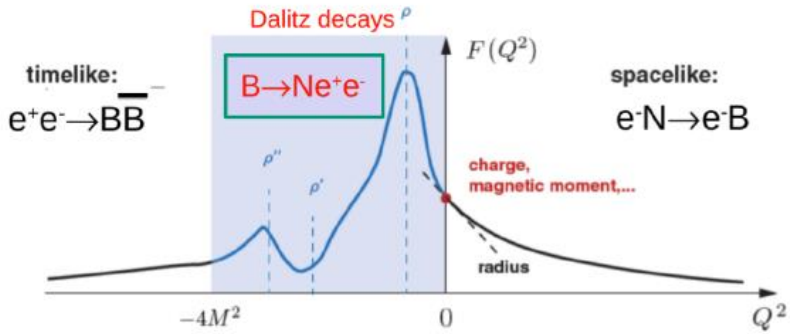
Krzysztof NOWAKOWSKI, Joanna KUBOŚ

# Feasibility studies of production and electromagnetic decay studies of hyperons for HADES

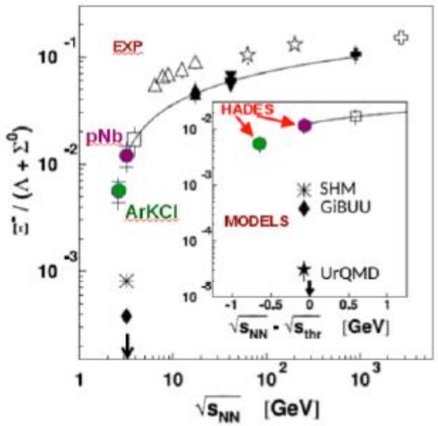
# "Feasibility studies of production and electromagnetic decay studies of hyperons for HADES"

HADES

## Why ?



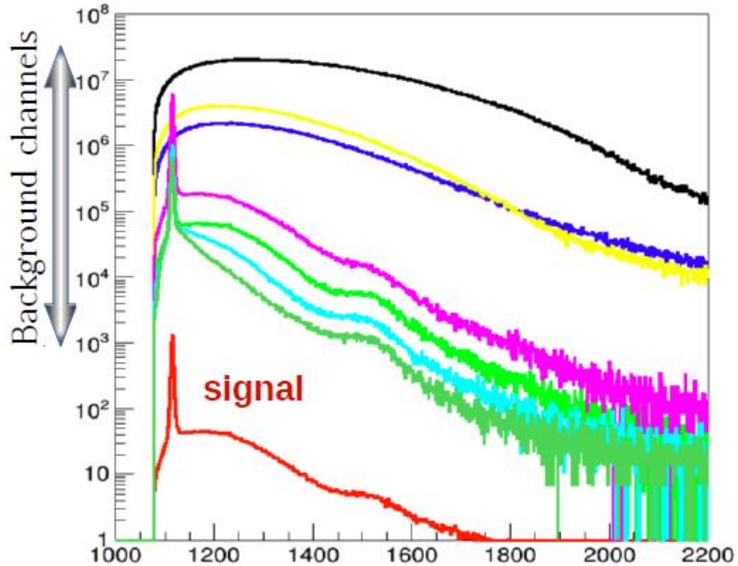

SU 3 ↳ Δ* → p e⁺e⁻ - measured by HADES
Σ (1385) → Λe⁺ e⁻
Λ (1385) → Λe⁺ e⁻ ***Can we do this?***

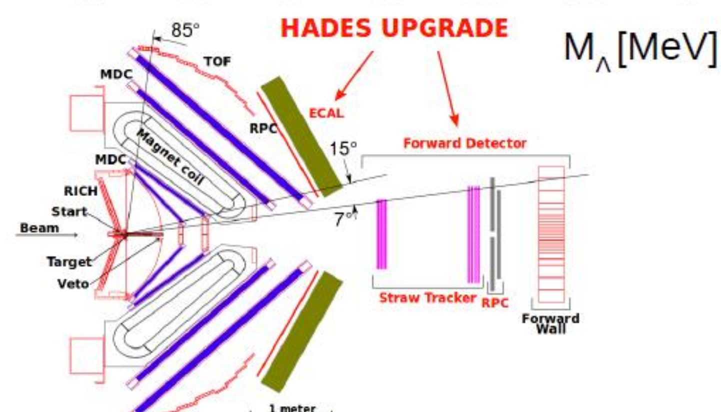



*PRL114(2015)212301*

- Electromagnetic FF for hyperons
- Ksi production mechanism

## Experimental challenges




Joanna Kuboś & Krzysztof Nowakowski

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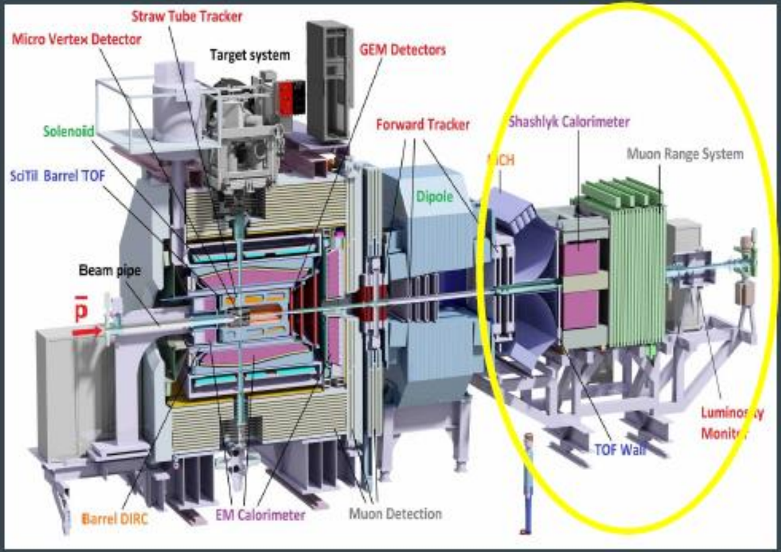
Akshay MALIGE

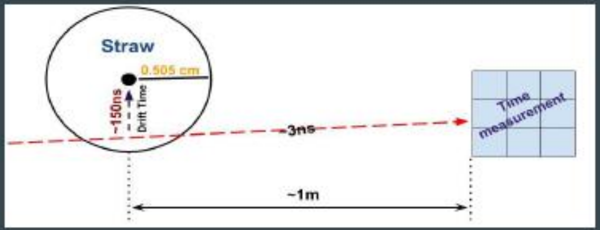
**Study of the performance of FT - EMC combined subsystems by measuring cosmic rays**

# Study of the performance of FT - EMC combined subsystems by measuring cosmic rays

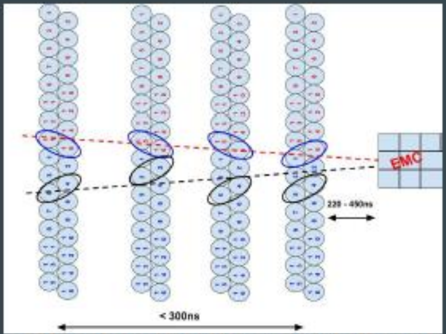
Data management in a triggerless system for combined subsystems.

**Poster No : 23**




EMC used for the drift time measurement




Cluster finding and Track reconstruction

Akshay Malige[1], Grzegorz Korcyl[1] and Narendra Rathod[1]
Jagiellonian University, Krakow, Poland

MESON 2018

# 24

Sushil K. SHARMA

**Time Over Threshold as a measure of energy response of plastic scintillators used in the J-PET detector**

# Time Over Threshold as a measure of energy response of plastic scintillator used in the J-PET detector

J-PET

## Motivation

① J-PET detector is composed of 192 plastic scintillators axially arranged in 3-layers.

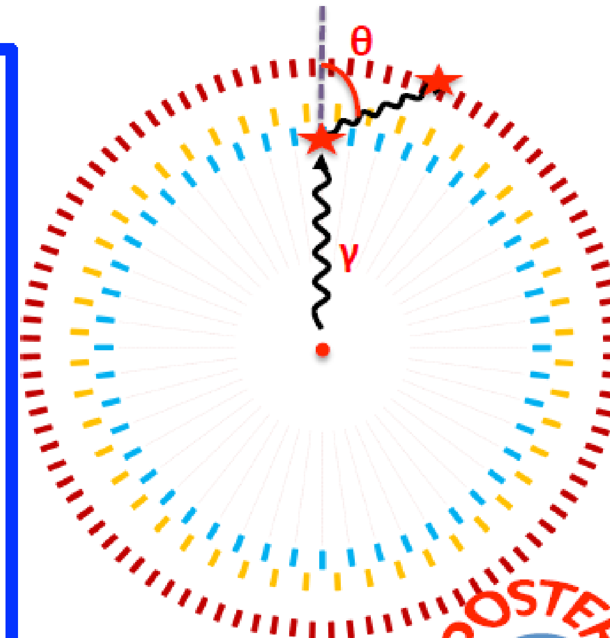
② **Charge collection** is replaced by Time Over Threshold (**TOT**) measurements.

③ In organic scintillation, gamma quanta interact predominantly via **Compton** scattering: only partial energy deposition.

④ Relationship between energy deposition by incident photon and corresponding TOT values is **non-linear**.

⑤ In framework of the J-PET detector, to study the discrete symmetries, relationship between TOT and energy loss will play the **key role**.

J-PET detector front 2-D view

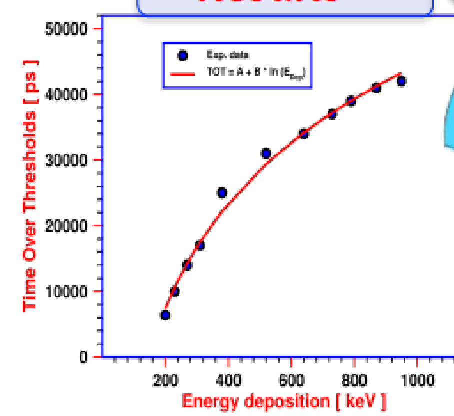



POSTER 24

## Method

- We developed **an algorithm** to tag the ***511 keV*** and ***1275 keV*** (*$^{22}Na$*) gamma quanta.
- **Geometrical acceptance** of the J-PET detector allows us to study the scatterings of these tagged gamma.
- By knowing the energy and the scattering angle of the incoming gamma quanta, the energy loss is evaluated.

## Results

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Narendra RATHOD

**Study of the space charge effect and cross-talk in straw tube detectors for the PANDA experiment**

MESON 2018

JAGIELLONIAN UNIVERSITY IN KRAKÓW

FAIR panda

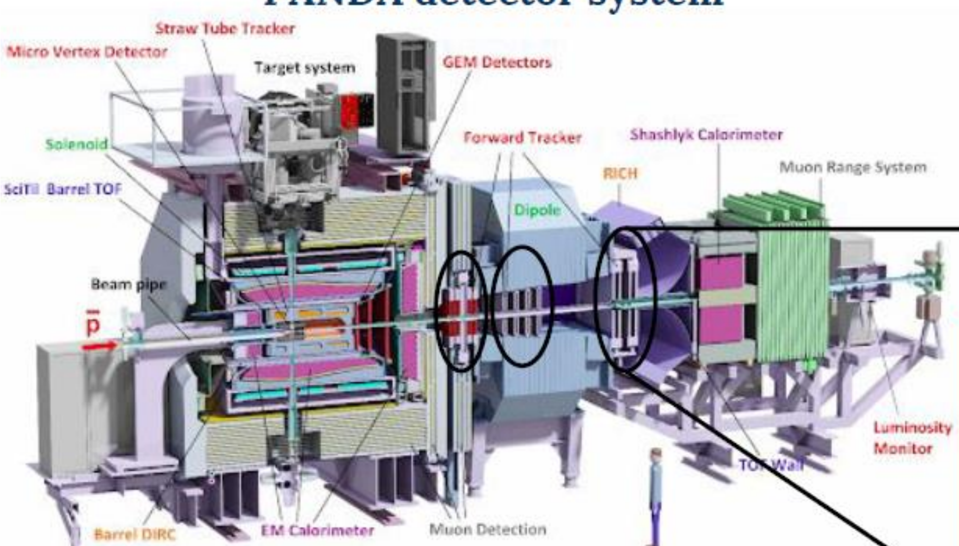
# Study of the space charge effect and cross-talk in straw tube detectors for the PANDA experiment

by Narendra Rathod

Supervisor
Prof. J. Smyrski

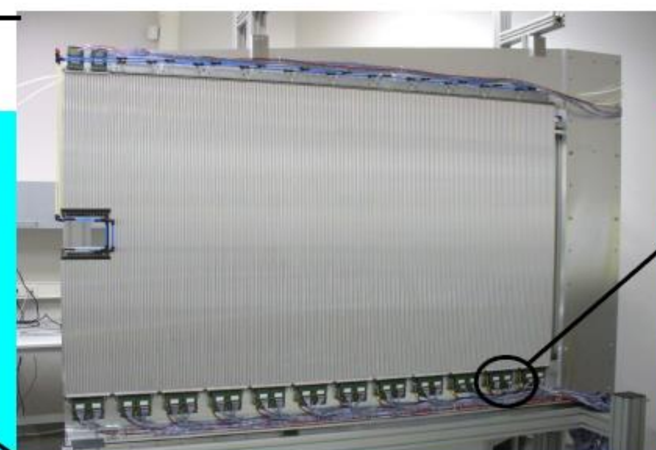
Co-supervisor
Prof. P. Salabura

## PANDA detector system




Target Spectrometer    Forward Spectrometer

Prototype straw tube double layer for the PANDA Forward Tracker



16 channel front-end electronics board

Poster no - 25

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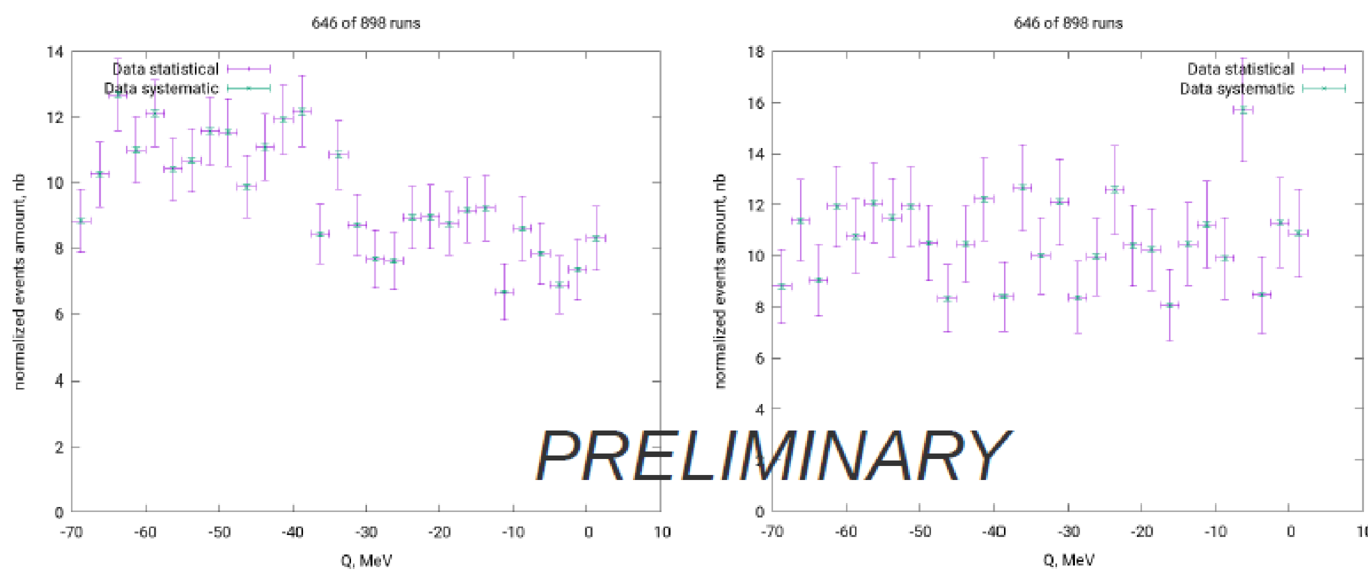
Oleksandr RUNDEL

**Search for the eta-mesic helium in non-mesonic decays**

# Searching for η-mesic $^3$He in non-mesonic final states

O. Rundel, M. Skurzok, A. Khreptak, P. Moskal *for WASA-at-COSY collaboration*
M. Smoluchowski Institute of Physics in Jagiellonian University, Cracow, Poland.

## Does the η-mesic $^3$He exist?



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Raffaele DEL GRANDE

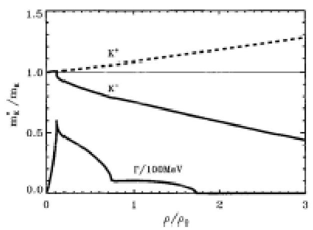
**Low-energy $K^{-}\ {}^{12}C \rightarrow \Lambda\ p\ R$ correlated production studies by AMADEUS**

MESON 2018

# Low-energy $K^- \, ^{12}C \rightarrow \Lambda \, p \, R$ correlated production studies by AMADEUS

**Raffaele Del Grande**
On the behalf of the AMADEUS collaboration

➔ **Measurement of the $K^-$ multi-nucleon absorptions low-energy cross sections in $\Lambda p$ and $\Sigma^0 p$ channels**



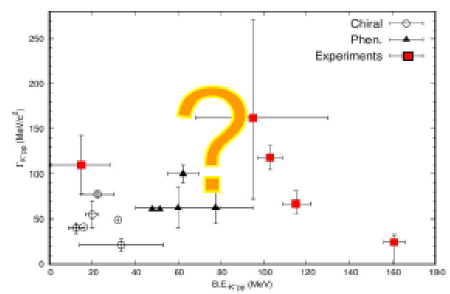

**In medium $\bar{K}$ properties investigation**

In heavy-ion & proton-nuclei collisions, $K^-$ mass modification extrapolated from the $K^-$ production yield → Measurements needed by transport models and collision calculations

➔ **Measurement of the $K^-$ multi-nucleon absorptions Branching Ratios in $\Lambda p$ and $\Sigma^0 p$ channels**

**Kaonic bound states puzzle**

In stopped $K^-$ induced reactions the $K^-$ multi-nucleon absorption represent the "non-resonant" background for eventual bound state formation




➔ **Possible $K^-pp$ bound state contribution is critically investigated**

Please come to visit my poster!