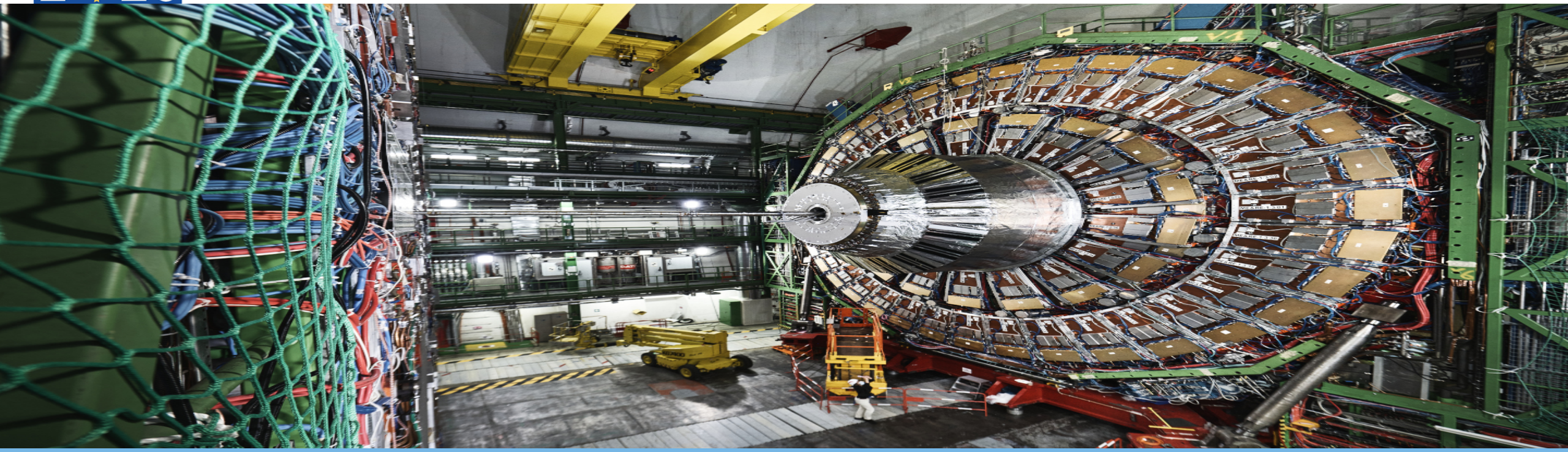

T.C. Jude
Physikalisches Institut
Universität Bonn

TA4 – Transnational Access to FTD/ELSA

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824093

https://www.pi.uni-bonn.de/projects/elsa-ftd/

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Important links

- Events
- Directions
- Conferences
- Outreach
- Library
- Further links

- Elsa
- Atlas
- Bethe Center
- SFB/TR 16
- TR33 Dark Universe
- Netzwerk Teilchenwelt
- Physikshow
- Physikwerkstatt Rheinland

You are here: Home → Projects → FTD-Hadron

FTD-Hadron

This transnational access infrastructure is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement STRONG – 2020 - No 824093

For Approved projects, please ensure all relevant publications and presentations have the following acknowledgement:

"This [infrastructure][publication/article][insert type of result] is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement STRONG – 2020 – No 824093".

Spokesperson & Access Manager
Prof. Dr. Hartmut Schmieden
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Tel.: +49 228 73-2790 or -2341 (secretary)

Spokesperson & access manager - Hartmut Schmieden
Access coordinator - Tom Jude

News

- 4th quarter 2020 - Teilchenwelt Week
- 1st quarter 2021 – The Physics Advent Calendar
- 3rd quarter 2020 - BGOOD Experiment on the title page of EPJ A

More...

Outreach:

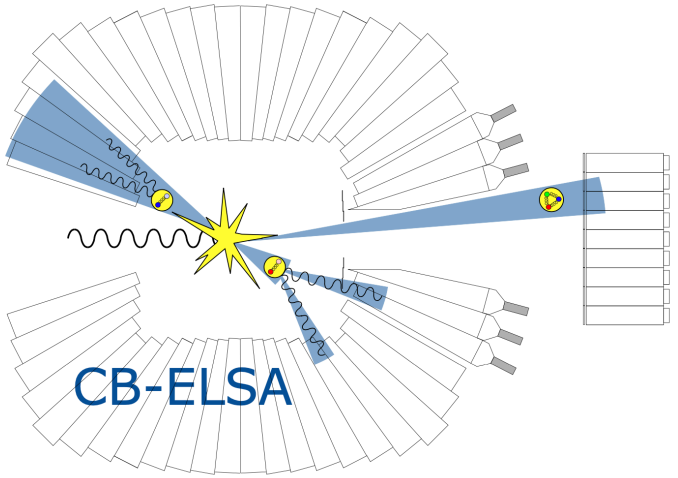
Contact

Institute Director
Prof. Dr. Michael Köhl

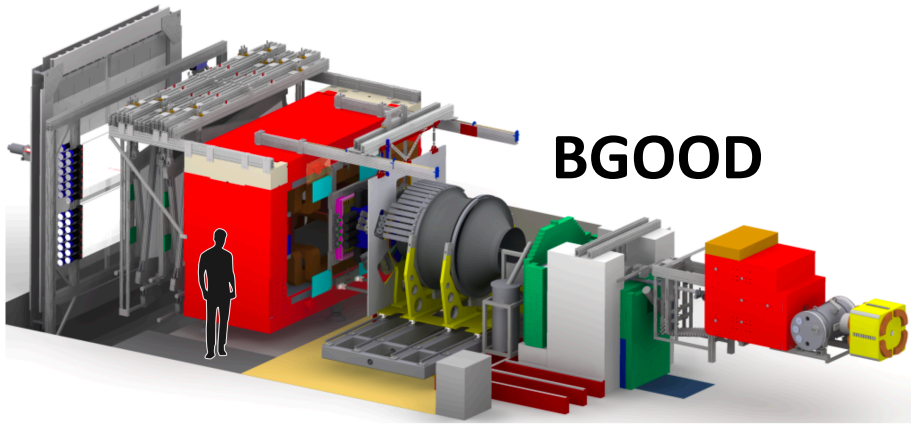
https://www.pi.uni-bonn.de/projects/elsa-ftd/

Transnational access to:

- The FTD research building
- ELSA - 3.2GeV electron accelerator
- Hadron physics experiments - CB-ELSA & BGOOD
- Detector test beam line
- Bonn Isochronous cyclotron



FTD building



Projects prior to the reporting period

No access due to Covid restrictions

Project No.	User-project acronym	Number of users	Number of man/days spent at the infrastructure
TA4-1	Eta beam asymmetry	14	0
TA4-2	Eta prime beam asym.	21	0
TA4-3	Multiquark states	17	0
TA4-4	K* photoproduction	9	0
TA4-5	Aerogel detector	4	0
TA4-6	MWPC upgrade	7	0
TA4-7	Polarised target	5	0

Projects in the reporting period

User Selection Panel - Chaired by Jochen Dingfelder

- Prof. Dr. Philip Cole (Lamar University, Beaumont, TX, USA)
- Prof. Dr. Jochen Dingfelder (Bonn internal)
- Prof. Dr. Bernhard Ketzer (Bonn internal)
- Prof. Dr. Michael Ostrick (Mainz University, Germany)
- Dr. Christoph Rembser (CERN)
- Prof. Dr. Piotr Salabura (Jagiellonian University, Krakow, Poland)
- Prof. Dr. Daniel Watts (University of York, York, UK)

Call for submissions made May 2021

User Selection Panel meeting held September 2021

No.	Project name	Facility/exp.	No. users	Leader	No. Person/days spent	Comments
TA4-1	Eta beam asymmetry & MRPC	BGOOD	32	A. Fantini (Rome)	55 (8 people) during October 2021	Additional users added (USP approved)
TA4-2	Eta prime beam asymmetry	BGOOD	21	P. Levi Sandri (Frascati)		
TA4-3	Multiquark states	BGOOD	35	P. Levi Sandri (Frascati)	55 (8 people) during October 2021	Additional users added (USP approved)
TA4-4	K* photoproduction & Drift chambers	BGOOD	15	G. Mandaglio (Messina)		Additional users added (USP approved)
TA4-5	Aerogel detector	BGOOD	15	G. Mandaglio (Messina)		Additional users added (USP approved)
TA4-6	MWPC upgrade	BGOOD	7	P. Pedroni (Pavia)		
TA4-7	Pi0 off neutron with pol target	CBELSA/TAPS	7	K. Livingston (Glasgow)	72 (4 people during June 2021)	
TA4-8	Eta' off proton with pol target	CBELSA/TAPS	7	K. Livingston (Glasgow)		New project approved by USP
TA4-9	MRPC detector development	FTD	32	A. Fantini (Rome)		New project approved by USP

No.	Project name	Facility/exp.	No. users	No. Person/days spent	Number Of Access Units (AU) used
TA4-1	Eta beam asymmetry & MRPC	BGOOD	32	55 (8 people) during October 2021	
TA4-2	Eta prime beam asymmetry	BGOOD	21		
TA4-3	Multiquark states	BGOOD	35	55 (8 people) during October 2021	368
TA4-4	K* photoproduction & Drift chambers	BGOOD	15		
TA4-5	Aerogel detector	BGOOD	15		
TA4-6	MWPC upgrade	BGOOD	7		
TA4-7	Pi0 off neutron with pol target	CBELSA/TAPS	7	72 (4 people during June 2021)	55
TA4-8	Eta' off proton with pol target	CBELSA/TAPS	7		
TA4-9	MRPC detector development	FTD	32		

- 1 AU = 1 hour access to ELSA with beam or 1 day access to FTD (lab)
- Number of AU for ELSA beam = fraction of users in a project compared to the full participation list x beam hours
- eg, TA4-3: 3 week BGOOD beam time (504 hrs): (35/48) x 504 = 368 hrs

Estimation of deliverables - table (p183) of the Strong 2020 proposal

Deliverables (brief description and month of delivery)

One unit of access (1AU) is 1 beam-hour (1BH) for the accelerators or 1 lab-day (1LD) for the laboratories of the FTD research building. In average, 100 LD + 250 BH = 350 AU shall be provided per year to international UGs.

Deliverable n.	Unit of access	Unit cost (EUR)	Min. quantity of access to be provided	Estimated number of users	Estimated number of days spent at the infrastructure	Estimated number of projects
D-6.1	1 AU	88	525	75	375	15
D-6.2	1 AU	88	525	75	375	15
D-6.3	1 AU	88	1400	200	1000	40

Deliverable description:

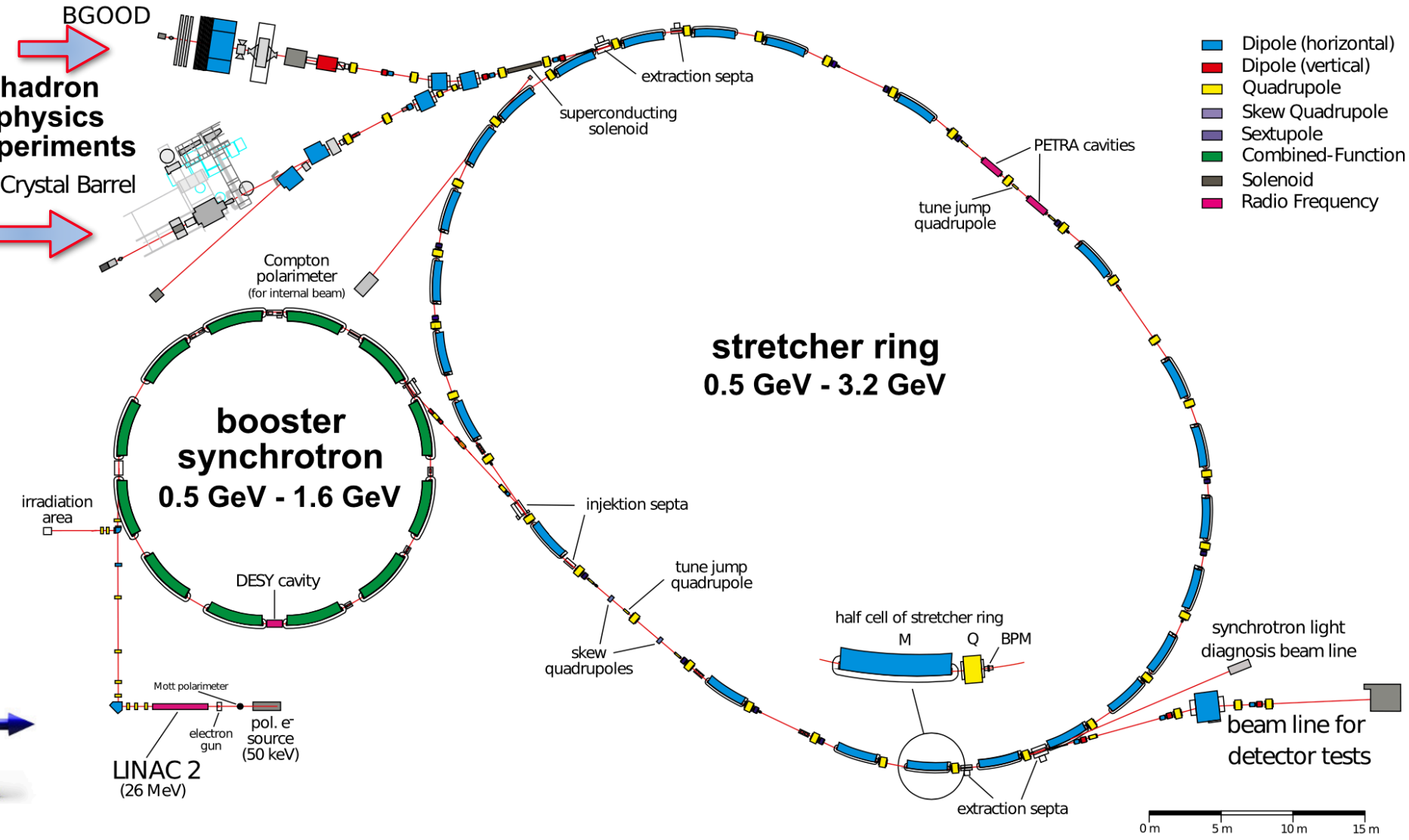
D-6.1) Transnational Access provision - multi annual implementation plan over the first 18 months (month 1-18).
D-6.2) Transnational Access provision - multi annual implementation plan over the next 18 months (month 19-36)
D-6.3) Transnational Access provision - multi annual implementation for the whole duration of the project (month 1-48)

- **Number of AU used = 423 (min quantity 700 halfway through project duration)**
- **Majority of AU used only since September 2021 (post Covid restrictions)!**
- **Despite Corona, we are confident of meeting the deliverables until October 2023**

Projects in the reporting period

TA2-4..6 projects @BGOOD

TA2-7 & 8 projects @CB



TA4-1..6 results during the reporting period

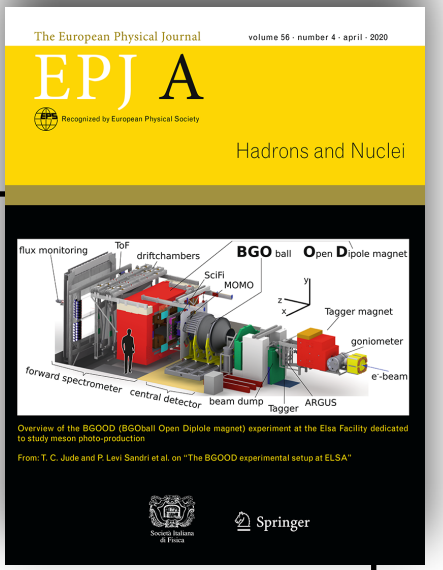
- TA4-1 …. TA4-6 associated with the BGOOD experiment
- Data taking largely simultaneously
- Open hardware triggers
- Multiple physics analyses from same data set

- Covid-19 Lockdown - March 16th 2020 until recently
- Access prohibited and/or difficult for foreign travel

- **October 2021 - 3 weeks of BGOOD deuterium data taken ~ 504 hours**
- **3-4 weeks planned early 2022**

TA4-1..6 results during the reporting period

- "Virtual access" prior to the recent beam time (without TNA funds)
- Publishing BGOOD results, ongoing analyses



Publications

- ***The BGOOD experimental setup at ELSA,***
  S. Alef at al., EPJ A 56 (2020) 104. (Published in the last period)

- $K^+\Lambda$ ***photoproduction at forward angles and low momentum transfer,***
  S. Alef et al. Eur. Phys. J. A (2021) 57:80

- ***Observation of a cusp-like structure in*** $K^+\Sigma^0$ ***photoproduction at forward angles and low momentum transfer,***
  T.C. Jude et al. Phys, Lett. B 820 (2021) 136559

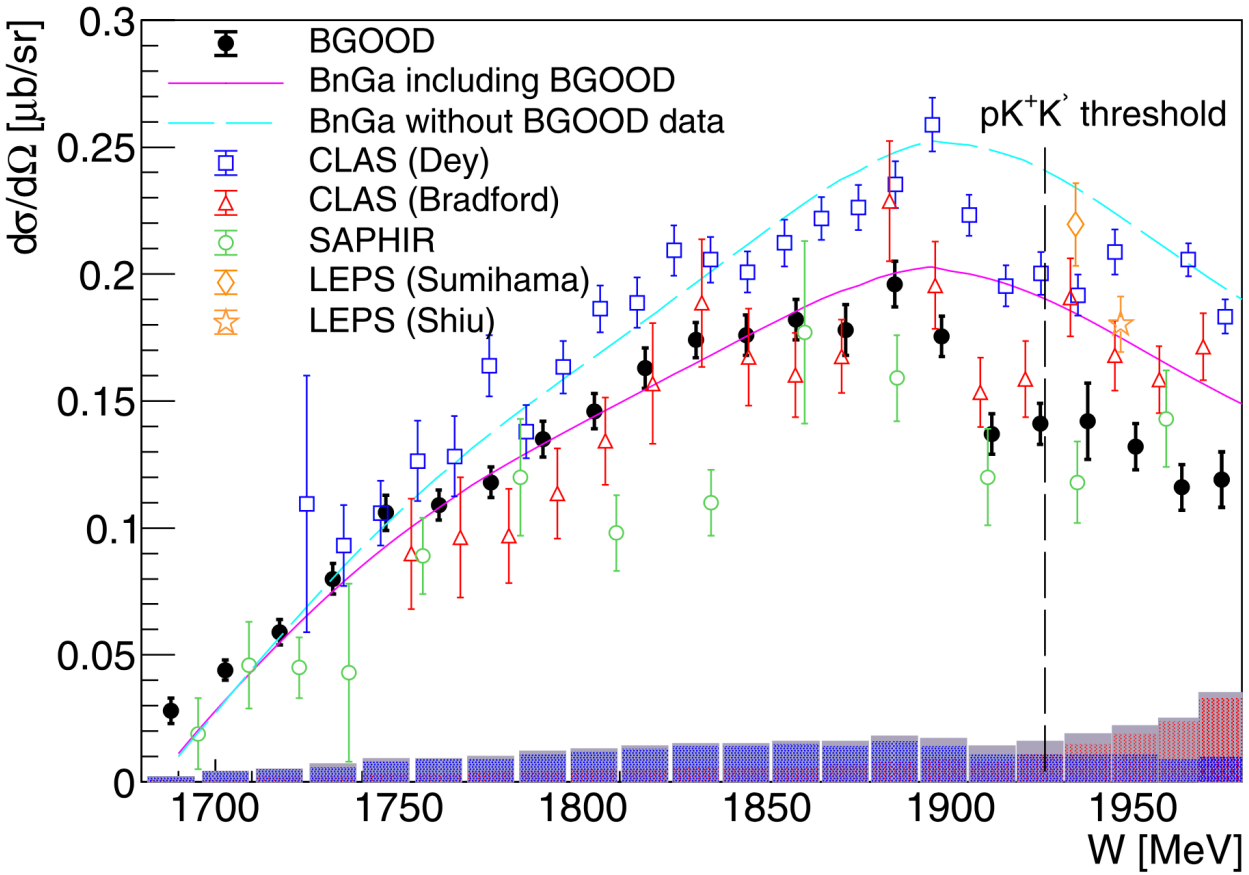
- ***Measurement of the*** $K^0\Sigma^0$ ***photoproduction differential cross section over the K* threshold,***
  K. Kohl et al, arXiv:2108.13319 (2021) (to be submitted to PLB)

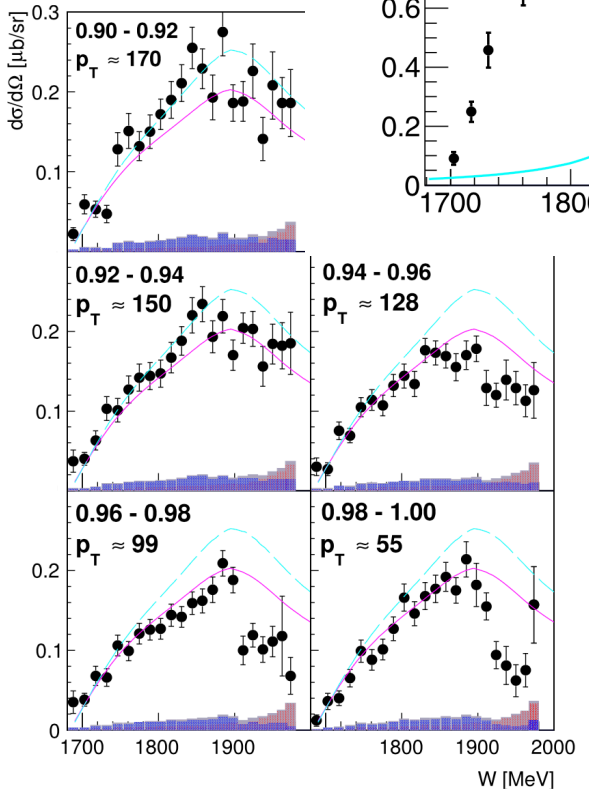
- $\gamma p \rightarrow K^+\Lambda(1405) \rightarrow K^+(\pi^0\Sigma^0)$ *extending to forward angles & low momentum transfer,*
  G. Scheluchin et al, arXiv:2108.12235 (2021) (to be submitted to PLB)

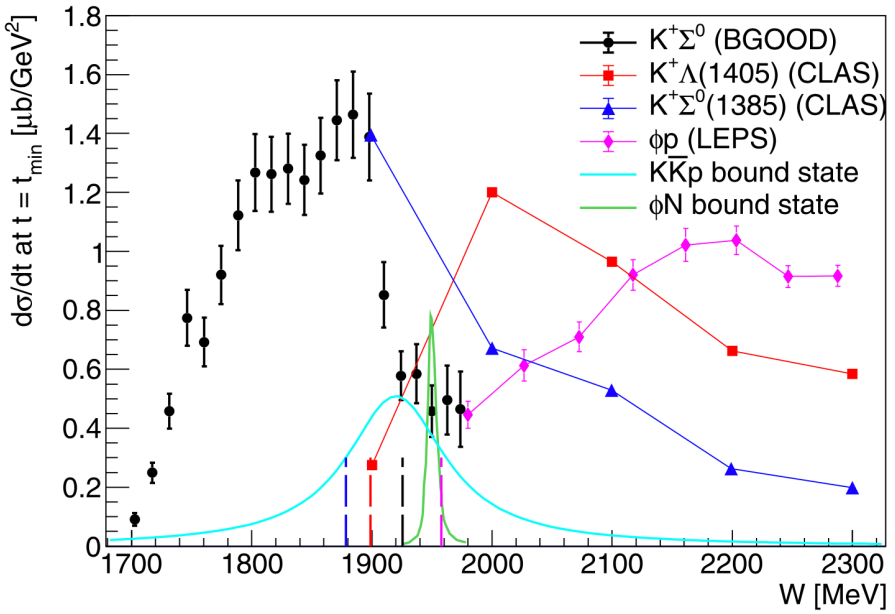
TA4-1..6 results during the reporting period

Highlights from TA4-3 “Multi-quark states“:

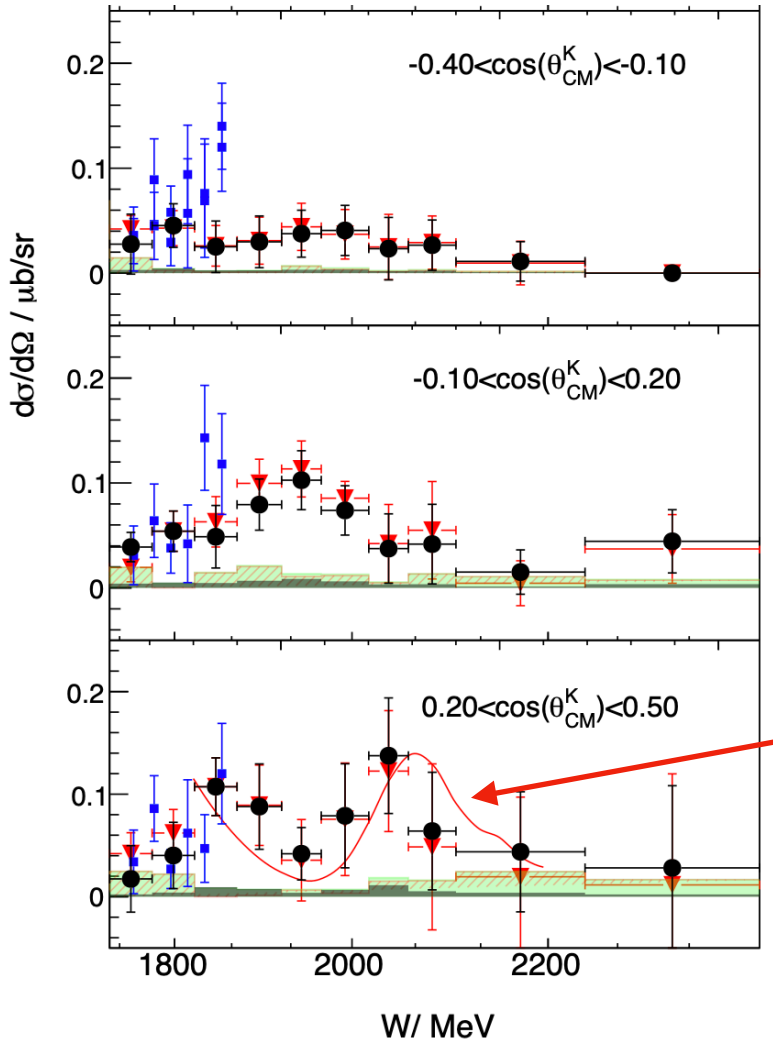
cusp in $K^+\Sigma$ photoproduction (T.C. Jude et al. PLB 820 (2021) 136559)







TA4-1..6 results during the reporting period



Highlights from TA4-3 "Multi-quark states":

indication of pentaquark signal in $K^0\Sigma^0$ photoproduction

data:

C. Akondi et al. [MAMI-A2]
EPJ A 55 (2019) 202

BGOOD simulated bg fit

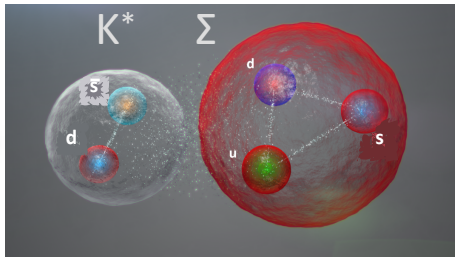
BGOOD real bg fit

- K. Kohl et al, arXiv:2108.13319 (2021) (to be submitted to PLB)

Oset
& Ramos
PLB 727 (2013)

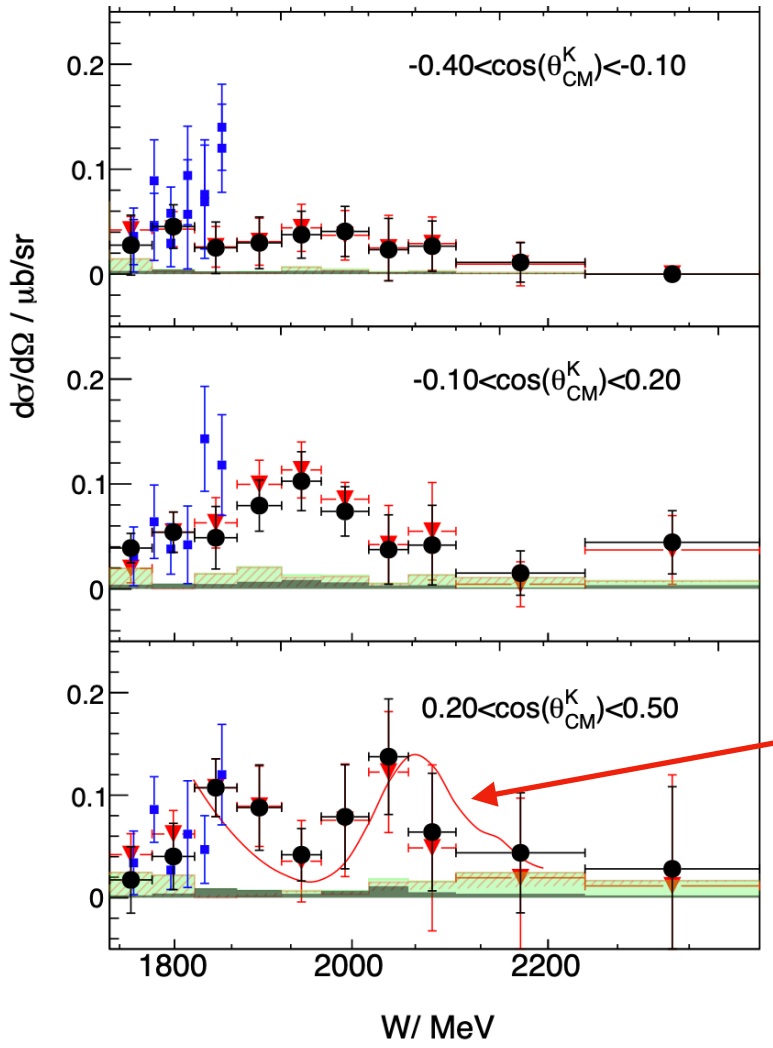
same model which predicted LHCb pentaquark

N*(2030)



see also:
"The molecular nature of some exotic hadrons"
Ramos, Feijoo, Llorens, Montaña
Few Body Sys. 61 (2020) 4, 34
arXiv:2009.04367 (2020)

TA4-1..6 results during the reporting period



Highlights from TA4-3 "Multi-quark states":

indication of pentaquark signal in $K^0\Sigma^0$ photoproduction

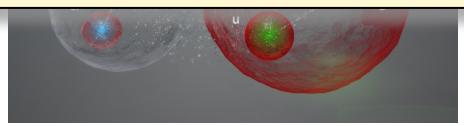
data:

submitted to PLB)

- New data set from October
- Double the statistics available!

& Ramos
PLB 727 (2013)

pentaquark



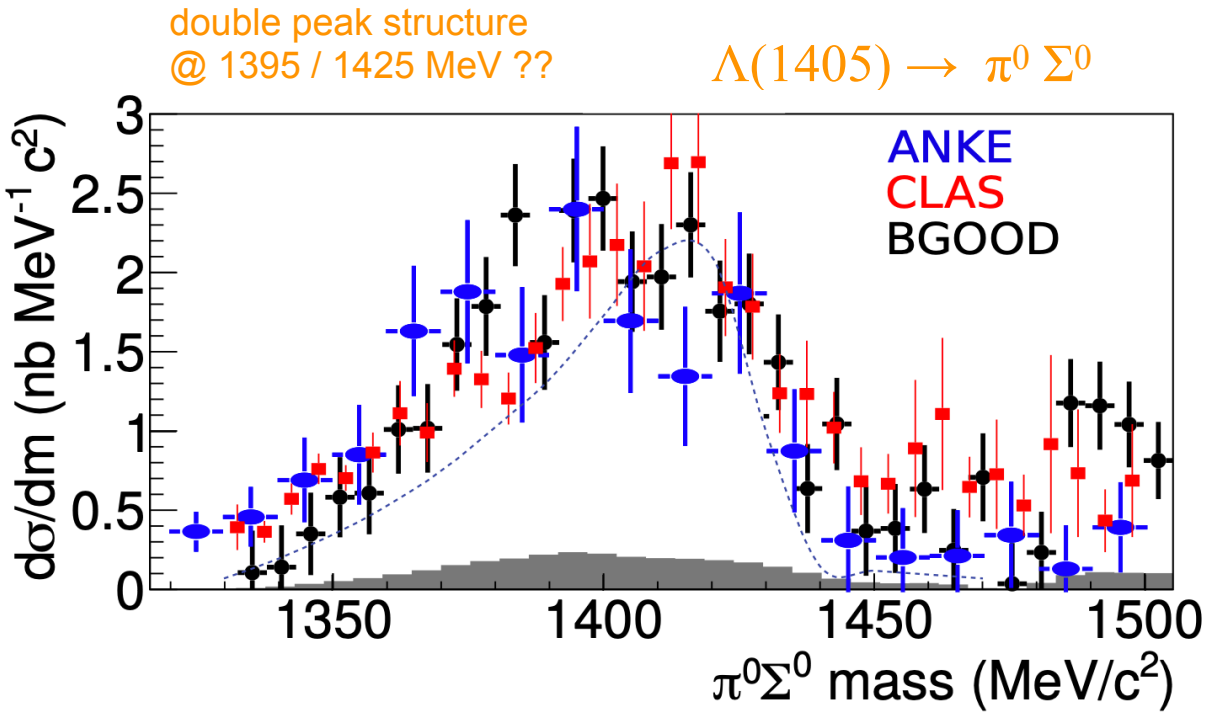
see also:
"The molecular nature of some exotic hadrons"
Ramos, Feijoo, Llorens, Montaña
Few Body Sys. 61 (2020) 4, 34
arXiv:2009.04367 (2020)

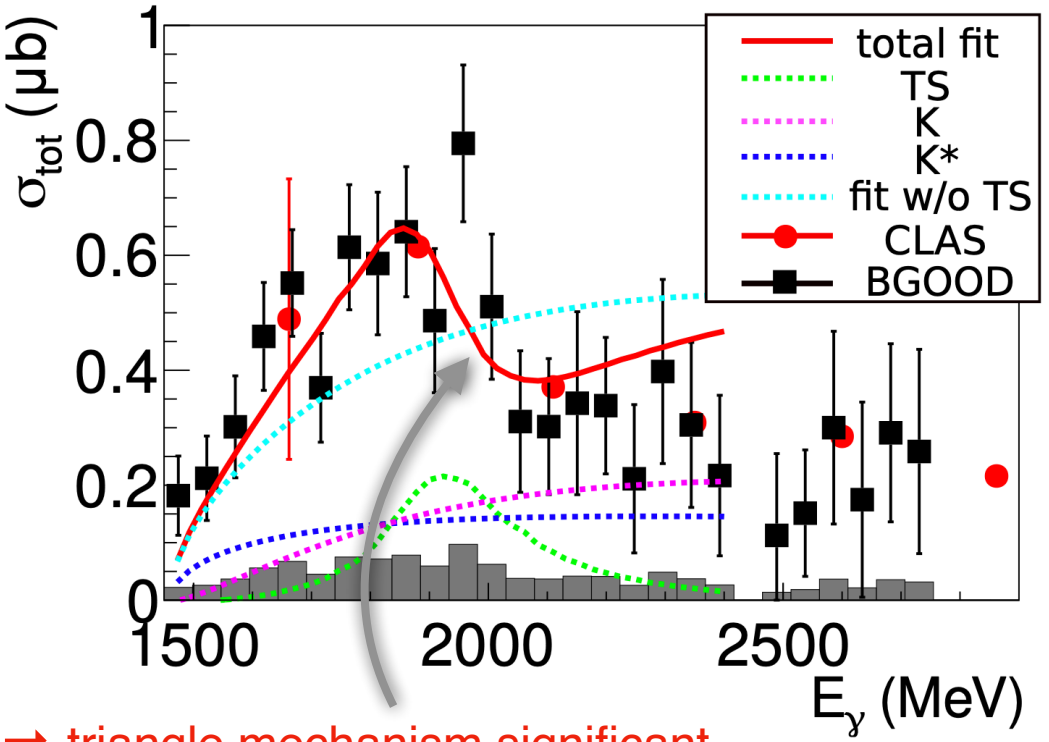
TA4-1..6 results during the reporting period

Highlights from TA4-3 “Multi-quark states“:

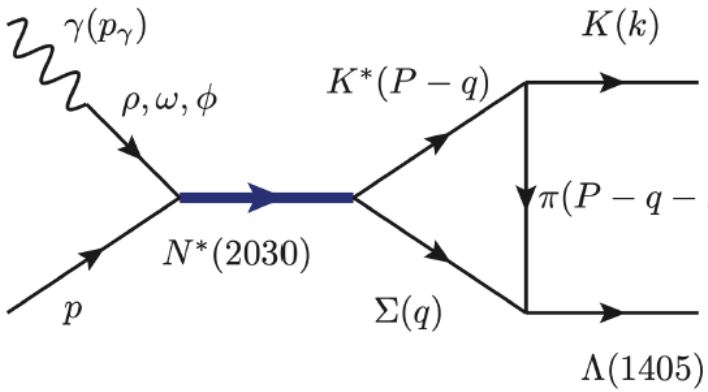
triangle singularity in $K^+\Lambda(1405)$ photoproduction

- G. Scheluchin et al, arXiv:2108.12235 (2021) (to be submitted to PLB)





→ triangle mechanism significant



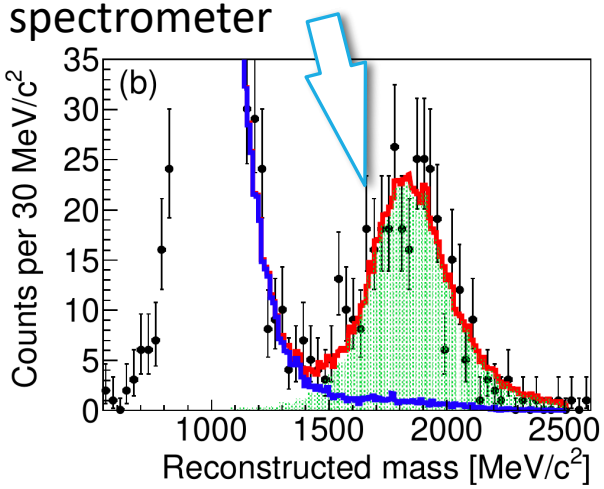
E. Wang, J. Xie, W. Liang, F. Guo, E. Oset, PR C 95 (2017) 015205

TA4-1..6 results during the reporting period

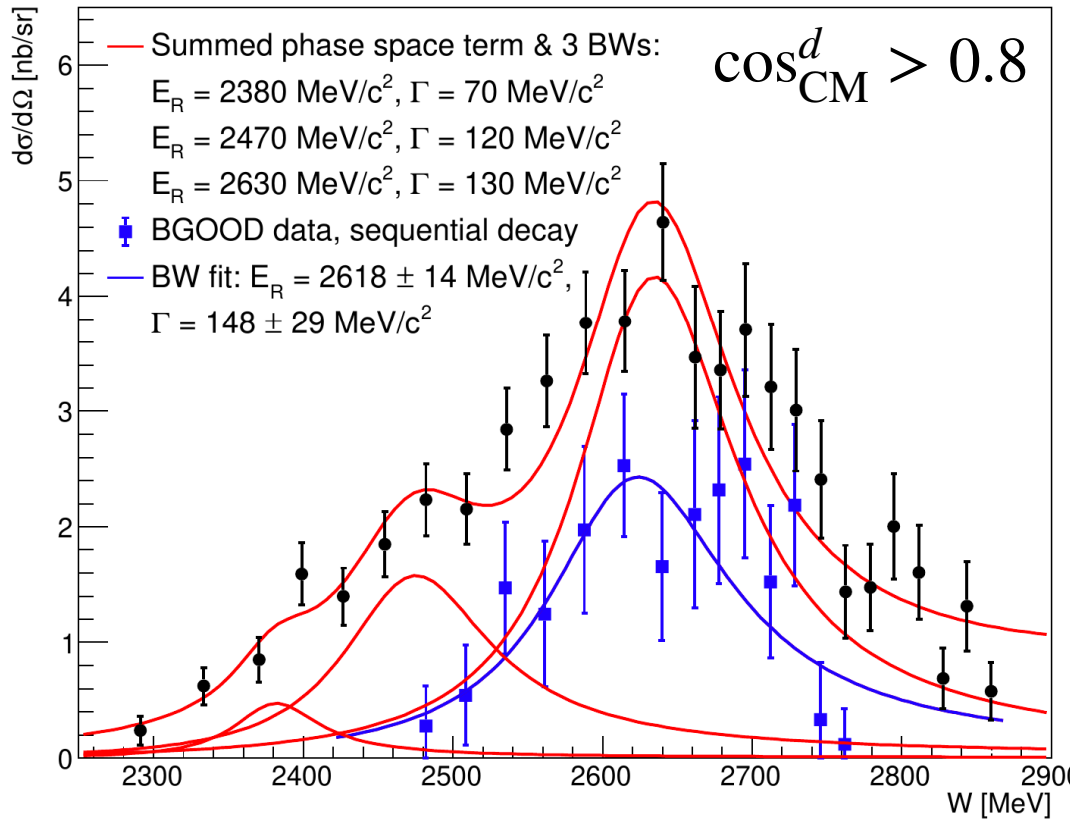
Part TA4-3 “Multi-quark states“:

Coherent 2pi0 photoproduction of the deuteron at forward angles (TJ)

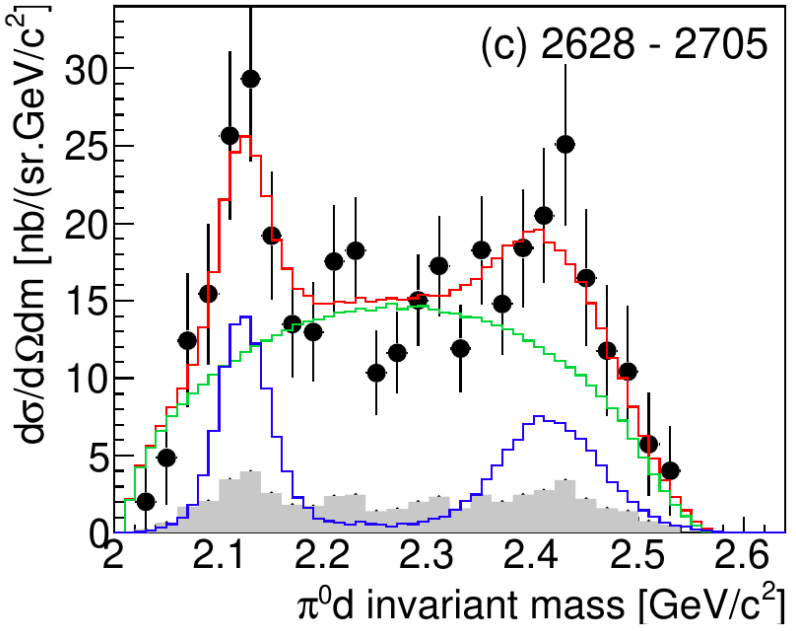
Deuterons in the forward spectrometer



$\gamma d \rightarrow \pi^0\pi^0 d$ Differential cross section



Narrow structure in the pi d system



Internal collaboration review underway

Data consistent with proposed dibaryon spectrum

T. Ishikawa et al. *Phys. Lett. B*, 789:413, 2019.
T. Ishikawa et al. *Phys. Lett. B*, 772:398, 2017.

TA4-1..6 results during the reporting period

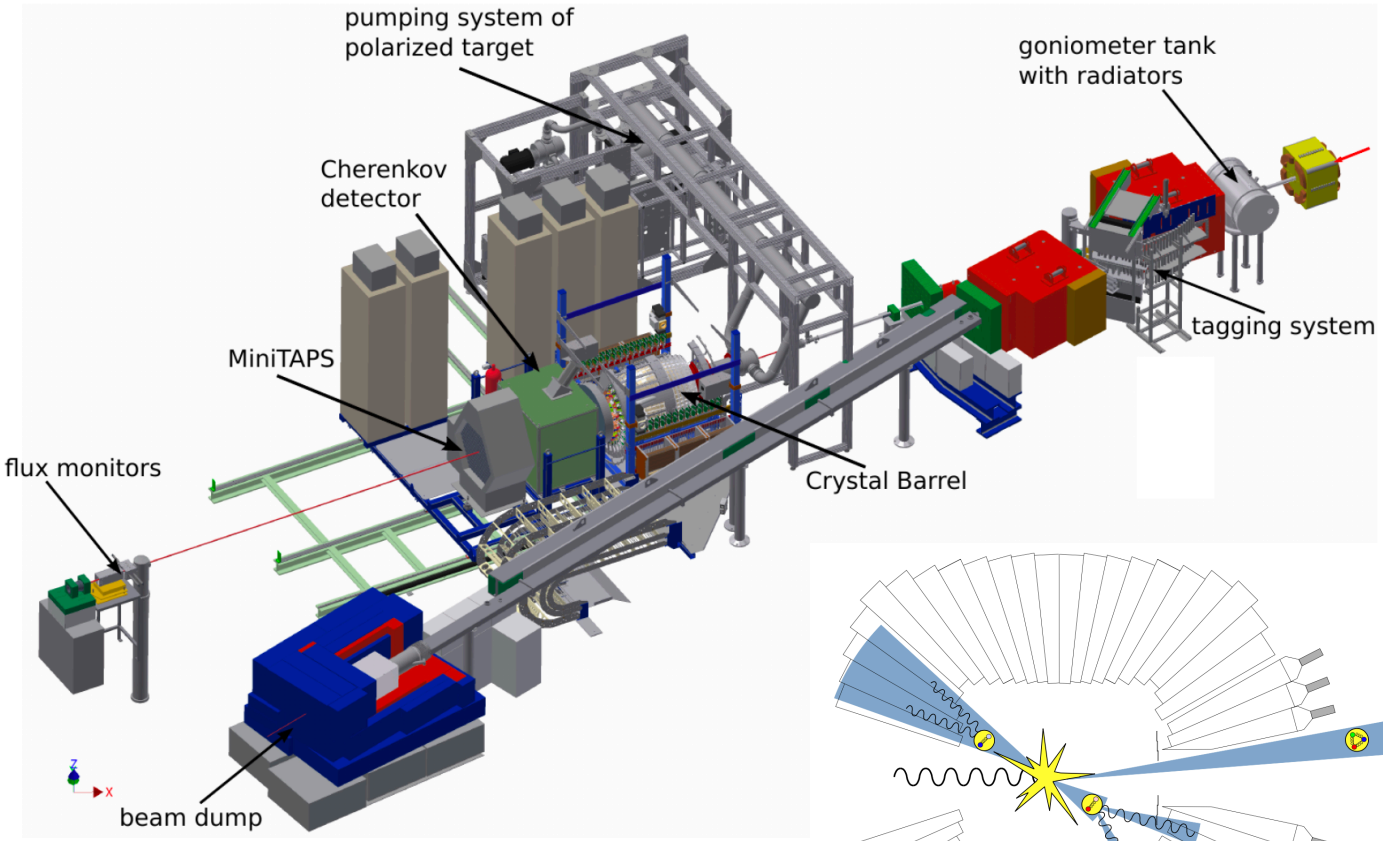
Other ongoing/completed work

- S. Alef PhD thesis - η' beam asymmetry (TA4-2)
- Master's and bachelor theses into other coherent channels off the deuteron (TA4-3)
- Studies of K* photoproduction (TA4-4)
- Charged decay modes of the $\Lambda(1405)$ (TA4-3)
- Master's thesis studying the $a_0(980)$ & $a_1(1260)$ (TA4-3)
- Bachelor's thesis developing and installing the aerogel Cherenkov detector (TA4-5)

TA4-7 & TA4-8 Results during the reporting period

- TA4-7 & TA4-8
- Polarised target for CBELSA/TAPS

- **June 2021 - 36 days, polarised target**
- **October 2021 - 39 days, polarised target**
- **Total ~ 1800 hours**



Summary & next steps …

Projects TA4-1 to TA4-6 - BGOOD

- Publications & ongoing analysis prior to access after Covid restrictions
- Three weeks of deuterium data - “pentaquark” signal in $K^0\Sigma^0$, coherent reactions & η beam asymmetry
- More data taking planned for approved projects early 2022

Projects TA4-7 & TA4-8 - CBELSA/TAPS polarised target

- Data taking under way

Questions

Can we reimburse colleagues while they quarantine upon arrival?
Do we need to inspect invoices when reimbursing with a flat rate?
Calculation of AU based on relative participation in the ELSA user group ok?