

Minutes PANDA Collaboration Meeting (March 2021 – online)

Plenary Meetings

Monday, March 8, 2021

Report from the Speaker (Ulrich Wiedner)

- The Collaboration Board will have monthly information meetings. The minutes from these meetings will be made available to the whole collaboration.
- The Corona situation causes worries. Companies may go out of business, deliveries may be delayed and detector components may not be available any more. This may lead to the necessity of new designs of detector components.
- COSY will end its operation in 2024. This puts pressure on the foreseen EMC calibration, in-beam tests of the luminosity detector and DAQ tests.
- The PANDA MoU and Construction Common Fund needs to be to be agreed on a s a p since CCF fund are necessary from 2022 on.
- Good progress on publications. Five physics publication have been published or been submitted since the last Collaboration Meeting.
- The Jülich group will be transferred to GSI.
- An analysis exercise in Hadron Physics has been developed at Uni. Bochum for outreach purposes.

2:00 PM	Report from the Speaker - Ulrich Wiedner (U Bochum) () Spokesperson_Report.pdf
2:30 PM	Report from the Technical Coordinator - Lars Schmitt (GSI Darmstadt) () lschmitt_panda_tc-report_20210308.pdf
3:30 PM	--- Coffee break ---
4:00 PM	Plenary - Matthias Steinke (U Bochum) (until 5:30 PM) () ZOOM coordinates
4:00 PM	FAIR Phase 0: PWA-Preparation for PANDA - Bertram Kopf (U Bochum) () PANDA2103PWA.pdf
4:55 PM	FAIR Phase 0: KOALA @COSY - Miriam Fritsch (U Bochum) () Coil_KOALA-Status_2021_03.pdf

Report from the Technical Coordinator (Lars Schmitt)

Recent progress of the FAIR facility was reviewed.

All FAIR Council members have confirmed their commitment to the full MSV0-3. The German contribution enables the construction of all accelerators and the construction of all buildings with the exception of the CR, HESR and p-Linac buildings.

Recent progress for PANDA were presented.

- A rebasing of the timeline for PANDA gives that the installation of the experiment will be made in two periods, starting summer 2024 and be finished by the end of 2026.
- The FAIR council has approved funds for the Barrel Muon Detectors.
- The status of the different detector components were presented including following achievements:
 - The Detector Control System TDR is approved by the ECE. The DAQ TDR and
 - Infrastructure TDR's are in review at the ECE. First version of the GEM TDR is ready.
 - The Solenoid magnet yoke is completed.
 - The Phase0 PANDA@HADES Straw Tracker has been commissioned.
 - All Barrel DIRC bars have been delivered and the MCP PMT's are ordered.
 - The first slice of the Barrel EMC is assembled.
 - The design of the target beam pipe, with the inclusion of a cryo pump, is decided.

PWA Preparation for PANDA (Bertram Kopf)

The first presentation on PANDA Phase-0 activities was given by Bertram Kopf on "PWA Preparation for PANDA". Bertram showed why a partial wave analysis will be mandatory in many of the upcoming analyses in PANDA. The PWA package PAWIAN is already in a quite advanced state. The design allows to analyse data from different types of experiments, as $\bar{p}p$ and e^+e^- annihilation, $\gamma\gamma$ fusion and $\pi\pi$ scattering. It allows to use several spin formalisms and several dynamics like Breit-Wigner, K-matrix, or 2 potential decomposition and supports coupled channel analysis.

PAWIAN is already in use in several analyses of BES III data, of $\bar{p}p$ data from Crystal Barrel at LEAR, of COMPASS and $\pi\pi$ scattering data, and in feasibility studies for PANDA. Bertram presented a rich set of results, which are compatible with other results in cases where those are available. He closed the presentation with a list of candidates of "first PWAs at PANDA".

KOALA@COSY (Miriam Fritsch)

Especially for line scans but also for other measurements, a precise determination of the time-integrated luminosity is needed. The PANDA Luminosity Detector LMD aims to measure the absolute luminosity with a systematical error of better than 5% and the relative luminosity with a systematical error of better than 1%. At very small t and θ the elastic $\bar{p}p$ cross section is dominated by Coulomb scattering which can be calculated, but at somewhat larger t and θ the hadronic cross section becomes dominant. The description of the hadronic part by models has large uncertainties, so that the elastic cross section has to be measured prior to the start of PANDA. At HESR a measurement of the antiproton-proton elastic scattering cross section is planned, where both ejectiles are detected. As a PANDA Phase 0 experiment KOALA@COSY will measure the proton-proton elastic scattering cross section. In a first step only the recoil proton at 90° is detected by a "recoil detector". In a second step a simple tracking detector at small angles will be added, and in a third step a LMD prototype will be used as tracking detector.

Miriam presented results from a first step measurement with a recoil detector consisting of Silicon and Germanium strip sensors. The data are in good agreement with results from E760. The angular resolution is limited by the alignment error of the beam to the recoil detector. A forward detector and the detection of both protons in coincidence will improve the situation. A simple forward detector consisting of two sets of 6 mm scintillators will be used. In simulations a good separation of signals from background could be obtained. The next measurements are planned for spring this year, and for end of 2021 step 3 measurements with the Luminosity Detector prototype are scheduled.

Thursday, March 11, 2021

The spokesperson, U. Wiedner, has announced the winners of the PANDA awards for outstanding achievement. Three groups have received this price which acknowledges outstanding achievements for the PANDA collaboration.

The winners were:

- Jost Lühning, Stefan Koch and Daniel Glaab from GSI. The three engineers performed a significant concerted effort to work out the detailed specifications of the PANDA infrastructure regarding support structures and supply infrastructures.
- The Outreach group consisting of Miriam Kümmel, Michael Papenbrock, Mustafa Schmidt and Rebecca Seip has given strong momentum to the outreach

2:30 PM	Plenary - Frank Maas (HI/U Mainz) (until 3:35 PM) (0)	ZOOM coordinates
2:30 PM	Outstanding Achievement Award Announcement (U. Wiedner) (0)	
2:35 PM	GEM TDR - Bernd Voss (GSI Darmstadt) (0)	PANDA_GEM-Tracker_TDR-Submission@CM.pdf
3:35 PM	--- Coffee break ---	
4:00 PM	Plenary - Frank Maas (HI/U Mainz) (until 5:30 PM) (0)	ZOOM coordinates
4:00 PM	FAIR Phase 0: Cluster-Target-Beam Tests @ COSY - Benjamin Hetz (WWU Münster) (0)	2021_01_target_phase0_hetz.pdf
4:45 PM	Can we resolve the Nature of $\chi_{c1}(3872)$ with PANDA? - Klaus Götzen (GSI Darmstadt) (0)	Goetzen_X3872_CM21_1_v5_update_upload.pdf

activities and their efforts will help spreading knowledge and interest about PANDA in society.

- The groups from Institute of High Energy Physics, CAS, Beijing; University of Science and Technology of China, Hefei and Nankai University, Nankai led by Sun Shengsen did extraordinary work on updating the EMC software.

Bernd Voss from GSI, Darmstadt has presented the status of the GEM TDR. He presented different aspects of the successful research and development work, which is now at a stage that a 122 page TDR has been finalized. The discussion has concentrated on different aspects like availability of GEM foils, on a clear strategy for test with particle beams at accelerators and very few other remaining issues. The collaboration has formally endorsed that the next steps in the process for submitting the GEM TDR to the FAIR ECE can be taken: The internal PANDA refereeing process is completed now and the present draft of the GEM TDR can go to external referees.

Benjamin Hetz from WWU Münster has present recent results from the tests of the hydrogen cluster jet target at the COSY accelerator at FZ Jülich. He has presented the impressive progress of the research and development work concerning the cluster jet target. At the COSY accelerator, the test setup has been constructed in a way, that many aspects concerning the interaction region and cooling systems are very similar to the situation which we will have at the HESR a FAIR. New results on the performance of the target and the interaction with the proton beam at COSY have been presented in the frame work of the FAIR-Phase-0 activities. One prominent example is neutral pion production in proton proton collisions. Another example are the four different Hydrogen cluster jet scanning techniques giving information on target thickness and the absolute target thickness. Another test with the beam from the COSY accelerator is foreseen for mid of April where high target thickness and interaction with the beam and the stochastic cooling system will be tested.

Klaus Götzen from GSI Darmstadt presented analysis work comparing the recently published work from LHCb concerning the $\chi_{c1}(3872)$. The resolution in the LHCb Experiment is dominating any width measurement and stems from the detector resolution. In PANDA the resolution is dominated by the energy spread of the antiproton beam which is much smaller as compared to a detector resolution. A broad range of parameters had been studied in the analysis of $\chi_{c1}(3872)$ production in order to study whether the nature of the $\chi_{c1}(3872)$ can be studied by PANDA by making a precise measurement of the $\chi_{c1}(3872)$ line shape. By optimizing the data taking over the line shape it had been possible to increase the sensitivity for the discrimination of different line shapes up to a factor of 5. The result of this study shows very clearly that antiproton annihilation reactions with a cooled stored antiproton beam is the only method to clarify the nature of the $\chi_{c1}(3872)$.

Friday, March 12, 2021

The first presentation given by *Rafal Lalik* (Jagiellonian University, Cracow) dealt with the plans of the HADES spectrometer for FAiR phase 0, among them experiments on elementary hadron structure in cooperation with PANDA groups. They showed results on various hyperon channels from the lambda to double-strange hyperons and correlations between nucleons and hyperons as well as hyperon pairs. Recent detector upgrades, also involving PANDA-type straw detector modules, their performance and further developments were discussed in detail.

The second presentation of the morning was given by *Luigi Capozza* (HIM and JGU Mainz) on the FAIR phase 0 activities at MAMI. An experiment employing the PANDA EMC modules of the backward endcap is being planned and prepared for 2023/24 and shall measure electroproduction of pi-0 in order to precisely determine the pi-0 transition form factor that also has large implications for the hadronic contributions of $(g-2)$ of the muon.

Report from the Computing Coordinator *Tobias Stockmanns*

In this presentation four topics were covered: the outcome of the PandaRoot users questionnaire, an overview of the active PandaRoot developers, a list of features which will be part of the new PandaRoot release and a summary of the Computing Parallel Session.

In general, the users of PandaRoot are happy with the installation process and the running of PandaRoot. Nevertheless, especially the documentation of PandaRoot and the dependency management of PandaRoot needs improvements.

The overview of active developers and the topics they are working on covers those who have participated in presenting their work at the beginning of the year or are present at the PandaRoot online meetings. Most activity is ongoing in the EMC and the tracking part of PandaRoot with some additional activities on the general framework. Which is worrying is that many parts of the code have no active development like STT, FTS, DIRCs, TOFs and Muon detectors or are not touched like the Experiment Control System. Here desperately new and experienced developers are needed.

The new PandaRoot release will be launched this spring after FairRoot version 18.6 was released this week. It will contain many new features in the EMC software and in the tracking part, some new features for the event generation and the analysis and the new possibility to do animated event displays. Furthermore, a long list of bugs have been fixed.

A written summary of the Computing Parallel Session will be in a separate document for the Computing Session.

9:00 AM	Plenary - Kai-Thomas Brinkmann (U Bonn) (until 10:45 AM) ()	ZOOM coordinates
9:00 AM	FAIR Phase 0: HADES plans - Rafal Lalik (Jagiellonian University) ()	2021.03.12_CM_PANDA_Phase0.pdf
10:00 AM	FAIR Phase 0: PANDA EMC @ MAMI - Luigi Capozza (Helmholtz-Institut Mainz) ()	capozza-Plenary-2021-03.pdf
10:45 AM	--- Coffee break ---	
11:15 AM	Plenary - James Ritman (FZ Jülich) (until 1:25 PM) ()	ZOOM coordinates
11:15 AM	Report from the Computing Coordinator - Tobias Stockmanns (FZ Jülich) ()	2021-03-12_ComputingStatus.pdf
12:00 PM	News for PANDA Physics - Johan Messchendorp (KVI-CART/U Groningen) ()	Physics_Report_March2021.pdf
12:30 PM	Report from the Young Scientist Convent - Gabriela Pérez Andrade (FZ JUELICH) ()	
12:50 PM	Summary from the Collaboration Board - Frank Goldenbaum (FZ Jülich) ()	CB_080321_open.pdf

News for PANDA Physics by *Johan Messchendorp*

A status report was given of recent PANDA publications and ongoing MC studies analysis that were reported in this meeting. This includes the referee response to the Phase-1 manuscript. These activities were placed in light of the planned Phase Two paper. Main topics there are a PWA in pbarp spectroscopy, S=2,3 dynamics and spectroscopy and the structure of the proton and beyond. Moreover, a summary was given on recent discussions that have taken place in the Phys- and PubComs. This included a summary of the review process, and the current publications:

- “Feasibility studies of time-like e.m. FFs from the di-muon channel” - EPJA 57, 30 (2021).
- “The potential of hyperon studies with PANDA” - accepted by EPJA (arXiv:2009.11582).
- “Study of excited cascade baryon with PANDA” - rebuttal to EPJA in preparation (arXiv:2012.01776).
- “PANDA Phase One” - rebuttal to EPJA in preparation (arXiv:2101.11877).

Report from the Young Scientist Convent by *Gabriela Pérez Andrade*

In the first part of this talk, the general scheme of the Young Scientists Convent taking place in each collaboration meeting was described: these are sessions which usually include short talks and discussions about topics that are relevant to the attendants as members of the collaboration. The conclusions from the discussions are then communicated by the YS representatives to the Collaboration Board.

In the second part of the talk, specific contents of the YSC held in the ongoing collaboration meeting were shown. This time, a discussion about the individual recognition of young members of large collaborations was opened up. Since this is an ongoing discussion, there are only a couple of conclusions that will be iterated in following sessions. However, so far the general opinion is that currently there are no issues about young members recognition within PANDA. It

was expressed that the YS should be given as much participation as possible in international conferences.

Summary from the Collaboration Board by Frank Goldenbaum

A summary from the collaboration board sessions on Monday March 8th and Thursday March 11th was given in plenary on Friday by Frank Goldenbaum. As also the previous two CB-meetings, due to persistent covid-19 restrictions, the CB-sessions on Monday and Thursday took place online using the conference tool „zoom“. The online meeting was hosted by Münster and credit is due to Philipp Brand for setting up the sessions and all votings. Typical attendance to both sessions was up to 50 Collaboration Board members logged in. After formally approving the Agenda and the minutes of last CB meeting (October 2020), the decisions and actions since October 2020 were presented.

With the current Award Committee, a conflict of interest for the Outstanding Achievement Award exists, i.e. there was 100% overlap of the Award Committee in home institutes with the nominees for outstanding achievements. In order to avoid this conflict of interest, an ad-hoc Outstanding Achievement Award committee was proposed by SP, deputy SP and CB chair and approved by the CB.

The Membership confirmation was completed end of 2020 but a few missing feedbacks are still being checked.

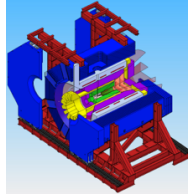
There was no specific talk presented exclusively in Collaboration Board. Instead, the spokesperson's report was given in plenary directly subsequent to this CB-session by Ulrich Wiedner.

Propositions were presented and discussed on Monday March 8th. To this the following decisions were taken in the CB-session on Thursday 11th:

- The following dates and locations for 2022 are endorsed by the CB: CM 22/1 at GSI: March 7-11, 2022 CM 22/2 in Prague: May 30-June 3, 2022 CM 22/3 at GSI: October 10-14, 2022
- Annexes A3-A13 as part of our Governance Rules Version 3.07 were ratified by the CB.
- Grzegorz Korcyl as DAQT System Manager successor of Myroslav Kavatsyuk was appointed (starting 1.1.2022)
- Propositions on PANDA regular management reports and PANDA Meeting Minutes came into effect

A Resource Coordination Report was presented by Ralph Böhm. Ralph reported on the RRB#10, funding status, recent developments in terms of costs and resources, news from National Representatives and in particular on the Construction MoU which is aimed to be drafted by summer 2021. The Technical Coordination Report given by Lars Schmitt included the recent situation on milestones and progress, addressed critical issues and risk management, and the infrastructure schedule. Reports on CB-relevant issues were also presented by the Computing Coordinator Tobias Stockmanns and the Outreach Commissioner Mustafa Schmidt. News from young scientist convent was summarized by Gabriela Perez Andrade. A dedicated presentation of the news from young scientists convent also took place on Friday in plenary. The question was raised to the CB on the exact definition of the term "Young Scientist" and the idea was brought up to have more visibility on the PANDA web page. On the TOP "Clarification of the charges and rights of the new contact person-like position", it was proposed to define the mandate and role of the contact person-like position until next CB in CM21/2. The discussion on the TOP "External experts in internal simulation paper reviews." was proposed to be shifted to the PANDA Physics session of Friday March 12th

Subgroup (parallel) Meetings



Magnets

Magnet Session at CM 21/1

📅 Wednesday Mar 10, 2021, 11:00 AM → 1:00 PM Europe/Berlin
📍 online

11:00 AM → 11:30 AM	PANDA Solenoid Status	🕒 30m
	Speaker: Evgeniy Pyata (Budker Institute for Nuclear Physics(BINP)) 📎 Status_production_...	
11:30 AM → 11:50 AM	Solenoid Platforms	🕒 20m
	Speaker: Stefan Koch (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI))	
11:50 AM → 12:10 PM	HESR-PANDA-Dipole Status ⓘ	🕒 20m
	Speakers: Evgeniy Antokhin (Budker Institute for Nuclear Physics(BINP)), Jost Lühning (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)) 📎 PANDA CM 100320... 📎 PANDA CM 100320...	

Solenoid

With the completion of the Yoke assembly and test end of 2020 a major milestone was reached. In the meantime, the yoke parts are in storage at BINP. For cryostat and cold mass, the design is ready, and production was subcontracted to VZA, Votkinsk. Most raw materials have been procured and are being shipped to Votkinsk. For the conductor the production of the SC strands has started. A 4th prototype coil is in preparation with another Epoxy resin to compare to the successful 3rd prototype. The FDR of the Control Dewar is planned for May. Power systems are ready, cables in procurement. The KEDR area at BINP shall be prepared for operation tests of the PANDA solenoid.

Dipole

The design contract for the HESR-PANDA Chicane Dipole Magnet is approaching the final report. A safety risk assessment and installation instructions were compiled. Final optimisations concerned the safe-guards of the support structure against seismic events. The construction contract is in the signing procedure.



Targets and Beam

Target Session at CM 21/1			
Wednesday Mar 10, 2021, 2:00 PM → 4:05 PM Europe/Berlin online			
2:00 PM	→ 2:20 PM	A proposal to apply an embedded MicroBlaze Processor in FPGA module of the cRIO target Speaker: Jerzy Tarasiuk (National Center for Nuclear Research(NCBJ)) r2021c10.pdf	🕒 20m
2:20 PM	→ 2:35 PM	Status of preparations of the Cluster Jet Target Control Final Design Report Speaker: Bogdan Zwiegliniski (Soltan Institute for Nuclear Studies (IPJ)(IPJ)) B.Z.10.03.pdf	🕒 15m
2:35 PM	→ 3:05 PM	PANDA cluster target activities in Münster Speaker: Christian Mannweiler (Universität Münster(UMs)) Mannweiler_2021_...	🕒 30m
3:05 PM	→ 3:30 PM	Target Profile Determination in the Data Analysis of KOALA Speaker: Yong Zhou (Forschungszentrum Jülich(FZJ)) target_profile_deter...	🕒 25m
3:30 PM	→ 3:40 PM	Status of Pellet target activity in ITEP Speaker: Pavel Fedorets (Institute for Theoretical and Experimental Physics(ITEP)) Fedortes_2021_1.p...	🕒 10m
3:40 PM	→ 4:05 PM	Status of pellet tracking developments Speaker: Magnus Wolke (Uppsala University(IKP-U)) pellet_2103.pdf	🕒 25m

1.) Slow control of the Cluster-Jet Target (J. Tarasiuk, B. Zwiegliniski)

The possibility to implement a (software) MicroBlaze processor in the FPGA module of the CompactRio control unit is presented. Such an implementation would lead to a save operation even if the real-time part of the CompactRio shows a malfunction. The status of the slow control design report is presented. The design report will consist of two parts, where the first one will give an overview about the devices and interfaces to be controlled. The delivery of this part is promised for March 2021, while the second part with the description of the planned slow-control system can be expected in April 2021.

2.) PANDA Cluster Target activities in Münster (C. Mannweiler)

Results from detailed numerical simulations on a special cryopump to be installed inside of the HESR vacuum pipe are presented. The presented symmetric arrangement will meet the required specifications on pumping speed and regeneration intervals. CAD drawings of the cryopump vacuum chamber are provided in order to discuss the integration at PANDA and at HESR. The planned modifications of the target beam dump are presented and discussed. The complete vacuum chamber will be replaced in order to allow for new diagnostic tools as well as for adjustable orifices between the differential pumping stages. For the planned MCP system for target beam and vertex zone

visualization, a set of new electron guns is required. Design studies are presented and discussed. Based on these studies, the final electron guns are currently in preparation. In order to further optimize the final vacuum situation at PANDA, new simulation studies on cluster evaporation and evaporation cooling are performed, considering different cluster sizes. In parallel, new and improved nozzle production techniques are studied. In case of glass nozzles, new nozzles with the full length of 18 mm are now available and are currently tested. The galvanic production of monolithic copper nozzles is significantly improved, leading better nozzle growing and much higher inner surface quality.

3.) Target Profile Determination in the Data Analysis of KOALA (Y. Zhou)

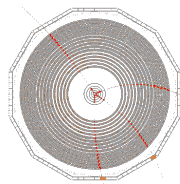
Recent results from the KOALA@COSY experiment are presented and discussed. It was found that measurements at low momentum transfers were limited by the effective longitudinal width of the target beam, being larger than the one measured using a scanning rod system. A new method to determine the target profile at the KOALA@COSY experiment using the proton-proton elastic scattering is presented. The results suggest that the effective target beam width originates from the large COSY beam diameter in combination with a slight rotation of the target collimator.

4.) Status of Pellet target activity in ITEP (P. Fedorets)

Despite the current Covid19 restrictions, new measurements on especially the adjustment system relevant for the transfer of droplets through the injection sluice are performed. The work on the pellet target TDR is ongoing.

5.) Status of pellet tracking developments (M. Wolke)

Results from recent studies on the alignment of the pellet tracking system components are presented. It is found that the alignment of a complete detection module is stable within the required limits when mounted at the target chamber. In a next step it is planned to investigate the alignment of two detection modules. Furthermore, system tests with two or more fully equipped detection modules with pellet operation are planned. The planned actions on the camera readout and data acquisition using a camera link board as well as a Zynq Board are presented. While full funding for a complete tracking system is still missing, infrastructure funding at Uppsala for upcoming system tests are available.



Tracking

Peter Wintz (FZ Jülich) – STT Status and News

Peter presented the updated STT project timelines. The completion of the STT construction phase is planned for Sep. 2025 and followed by the STT installation in PANDA in 2026. An important milestone for the project was reached with the delivery of the final number of all PASTTREC readout chips for the FT and STT. He also reported about the successful commissioning beam time carried out in Feb. 2021 for the new Straw Stations STS1 and STS2 in the HADES spectrometer for the phase 0 experiment program at SIS18. The first production experiment with four weeks of proton beam time is scheduled to start in Feb. 2022.

Tracking Session at CM 21/1			
Tuesday Mar 9, 2021, 4:30 PM → 6:30 PM Europe/Berlin online			
4:30 PM	→ 4:50 PM	Welcome and news Speaker: Peter Wintz (Forschungszentrum Jülich) PW-STT-Status-Mar...	🕒 20m
4:50 PM	→ 5:10 PM	QA tests of PASTTREC boards for FT and STT Speaker: Aleksandra Molenda (AGH University of Science and Technology(AGH)) Molenda_2021030...	🕒 20m
5:10 PM	→ 5:30 PM	Status of STS1 at HADES Speaker: Gabriela Pérez (FZ Jülich) Status of STS1.pdf	🕒 20m
5:30 PM	→ 5:50 PM	Status of STS2 at HADES Speaker: Akshay Malige (Jagellonian University Krakow(JUK)) Status_of_STS2_H...	🕒 20m
5:50 PM	→ 6:10 PM	ADC-based DAQ / implementation of feature extraction Speaker: Liubov Jokhovets (Forschungszentrum Jülich(FZJ)) DAQ_implementati...	🕒 20m

Aleksandra Molenda (AGH Krakow) – Quality Assessment (QA) Tests of PASTTREC Boards for FT and STT

Aleksandra reported about the status of the PASTTREC readout boards. All PASTTREC chips for FT and STT are produced. The readout board design with now packed chips was further optimized. One LDO regulator (instead of four used before) was tested to be sufficient without difference in noise level. The PCB length was reduced by about 1 cm and power consumption of 600 mW at 3.5 V supply voltage was measured. A multi-channel injection circuitry was developed to measure the s-curve function of input amplitude vs count number for each channel, which serves as a complete board characterization (baseline, noise level, gain and uniformity of each channel). The definition of the procedures for the final board series production QA is in progress.

The readout board tests with connected straw module showed a significant improvement in the noise level by about a factor of 2-3 when both ends of the detector module were shielded. Further tests will be conducted as soon as the new boards will be available for the straw test systems. Different PASTTREC parameter settings (gain, peakttime, tail cancellation) and influence on the noise level were studied.

Gabriela Perez (FZ Jülich) – Status of STS1 at HADES

Gabriela summarized the installation of the STS1 straw detector in HADES and showed first results from the commissioning beam time. The operation of the STS1 under experiment conditions was very stable and a very low noise level was achieved. No single straw failure was observed and few faulty PASTTREC boards were already identified in the pre-tests done in Julich. These boards will be replaced by new boards for the experiment beam time in 2022. A rich data basis with different PASTTREC settings was taken for further analysis and to develop the calibration and track reconstruction algorithms.

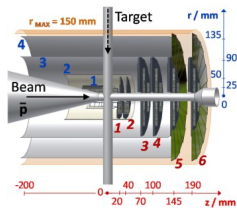
Akshay Malige (JU Krakow) – Status of STS2 at HADES

Akshay gave a similar status report for the STS2 straw detector in HADES and the STS1/2 detector slow control, which also includes the gas system set up by the IFJ PAN Krakow group. The STS2 operation during the beam time was also very stable without failures and at a low

noise level. He showed first drift time and time-over-threshold spectra, where the drift time measurement was corrected for the particle time of flight (5.5 m distance of STS2 to the target) using the hits in the RPC detector behind the STS2.

Liubov Jokhovets (FZ Jülich) – ADC Based Data-acquisition and Implementation of Feature Extraction

Ljuba summarized the status of the development of the SADC-based readout system connected to a straw test detector in Julich. An in-beam test at COSY is planned for April 2021. The current pulse shape analysis includes the signal leading edge time, pile-up detection and pulse shape integration for a dE/dx measurement. A sampling frequency of 150 MSPS is preferred. All hardware components for the complete readout system are set up.



Micro Vertex

Micro Vertex Detector Session at CM 21/1

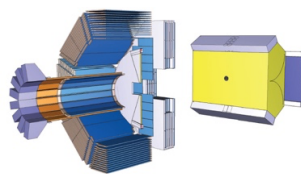
Tuesday Mar 9, 2021, 2:00 PM → 4:00 PM Europe/Berlin

online

2:00 PM → 2:20 PM **ToAST ASIC development status** 🕒 20m

Speaker: Daniela Calvo (Istituto Nazionale di Fisica Nucleare (INFN)(INFN-Torino))

ToAST_slides_2021...



PID Čerenkov

Ilknur Koeseoglu & Lisa Brueck, Giessen, The updates on the EDD project

Tests with the recent TOFPET-ASIC which works with positive and negative signals were performed. The EDD radiator equipped with liquid cooled read-out modules was setup in the Giessen Cosmic Station (GCS) and the Čerenkov pattern measured. The cooling was done with heat pipes. Simulation of the cooling was validated with measurements and the help of a heat camera.

Simon Bodenschatz, Giessen, GCS Status Update - Simulations and Measurements

Simon gave an update on the status of the GCS. The light tightness was improved by a housing for the MCP-PMTs and a box for the radiator. The simulation of the radiator is done in Geant4. Internal reflection photons are not yet realistic, eg. with a reflection probability.

Georg Schepers, GSI, Status of the Q&A-measurement of the Nikon radiators at GSI

The radiator bars from Nikon were delivered (98+14) to GSI. All bars meet fabrication specs, and Georg is now performing detailed QA in the GSI DIRC lab. He improved the measuring quality of the internal reflection probability by searching the maximum light intensity over the photo diode which has an inhomogeneous spatial sensitivity. He observes a shift of the internally reflected laser beam when scanning the radiator bar. The amount of the shift does not affect the performance of the DIRC. Five Nikon bars are to be measured for the later use in the pollution setup.

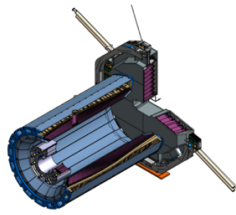
The screenshot shows a Zoom meeting agenda for 'PID Cherenkov Session at CM 21/1' on Tuesday, Mar 9, 2021, from 2:00 PM to 6:30 PM in Europe/Berlin. The meeting is online. A note indicates that minutes are attached to the event. The agenda includes the following items:

- 2:00 PM → 2:25 PM: The updates on the EDD project** (25m)
Speakers: Ilknur Köseoglu (Justus-Liebig-Universität Gießen(JULGI)), Lisa Marie Brück (Justus-Liebig-Universität Gießen(JULGI))
Attachment: CM_PID(1).pdf
- 2:25 PM → 2:35 PM: Very short overview of present measurements with the Giessen test setup and its simulation.** (10m)
Speaker: Simon Bodenschatz (Justus-Liebig-Universität Gießen(JULGI))
Attachment: presentation_en.pdf
- 2:35 PM → 3:05 PM: Status of the Q&A-measurement of the Nikon radiators at GSI** (30m)
Speaker: Georg Schepers (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI))
Attachment: 20210903_PANDA_...
- 3:05 PM → 3:30 PM: Properties of the MCP-PMTs for the Endcap Disc Dirac** (25m)
Speaker: Katja Gumbert (Universität Erlangen(UERl))
Attachment: Panda_2021_MCP-...
- 3:30 PM → 3:45 PM: Update on Lifetime Measurements and short look on CE measurement setup** (15m)
Speaker: Daniel Miehling (Universität Erlangen(UERl))
Attachments: 2021_03_Panda_M..., 2021_03_Panda_M...
- 3:45 PM → 4:00 PM: Discussion about MCP-PMT mass production** (15m)
Speaker: Jochen Schwiening (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI))

PID-TOF subgroup meeting, Wednesday, 10th March, 16:30h

Sebastian Zimmermann, SMI Vienna, Status Update B-TOF

He showed the last measurements of amplitude attenuation and signal rise time increase with the railboard. The measurements with the railboard were summarized and a document which contains the BTOF status is in preparation. In addition, many details are described in Sebastians PhD-thesis. SMI stops the development of the Barrel-TOF and new groups for the continuation are searched.



EMC

EMC Session at CM 21/1			
Wednesday Mar 10, 2021, 11:00 AM → 4:00 PM Europe/Berlin			
online			
11:00 AM	→ 11:05 AM	News Speaker: Fritz-Herbert Heinsius (Ruhr-Universität Bochum(RUB))	🕒 5m
11:05 AM	→ 11:25 AM	Status of the Forward Endcap Speaker: Thomas Held (Ruhr-Universität Bochum(RUB)) EMC_0321_Held.pdf	🕒 20m
11:25 AM	→ 11:35 AM	Precalibration results from measurements using the Bonn detector module teststation Speaker: Tobias Seifen (HISKP, Uni Bonn) PandaMeeting_seif...	🕒 10m
11:40 AM	→ 12:00 PM	Status of the Backward Endcap Speaker: Sahra Alrune Wolff (GSI, Darmstadt) BWEC_status_03_2...	🕒 20m
12:00 PM	→ 12:10 PM	Simulations for the Dynamic Range of the EMC Speaker: Kim Giebenhain (Justus-Liebig-Universität Gießen) DynamicRange_KL...	🕒 10m
12:10 PM	→ 12:30 PM	Study of the Cluster Splitting Algorithm in EMC Reconstruction Speaker: Qing Pu (Nankai University) 20210310-QingPu-...	🕒 20m
12:30 PM	→ 12:40 PM	Activity at IHEP Speaker: Andrey Ryazantsev (Institute for High Energy Physics (IHEP)(IHEPProtvino)) status16.pdf	🕒 10m
12:45 PM	→ 12:55 PM	Slice Assembly Status Speaker: Markus Moritz 2021_03_PANDA_C...	🕒 10m
1:00 PM	→ 2:00 PM	Lunch break	🕒 1h
2:00 PM	→ 2:10 PM	Slice Cooling Speaker: Thorsten Erlen (Ruhr-Universität Bochum(RUB)) panda_march_202...	🕒 10m
2:15 PM	→ 2:35 PM	Prototype Measurements for the Revision of the Barrel Front-End Operation Parameter Speaker: Aniko Falk (Justus-Liebig-Universität Gießen(JULGI)) Vortrag_PANDACol...	🕒 20m
2:40 PM	→ 3:20 PM	SADC Firmware developments Speaker: Oliver Noll PANDA_CM_21_1...	🕒 40m
3:25 PM	→ 3:45 PM	Answers to review committee Speaker: Fritz-Herbert Heinsius (Ruhr-Universität Bochum(RUB)) heinsius-emc-ECEf... Questions Regardl...	🕒 20m

News – F.-H. Heinsius

Hamamatsu restarted the APD production line. The delivery of 4500 APDs will start end of March. Valera mentioned, that for new orders of crystals the dose rate conditions need to be adjusted in the specifications due to the life time of the radioactive source at Gießen.

Status Forward Endcap EMC – Th. Held

The constructions of the forward endcap proceeds with medium speed due to Covid-19 restrictions. One third of the APD modules are produced. Recently more students were hired to improve the production speed. First submodules of VPTT type will be transported to Jülich end of March. A NIM A paper about the PANDA lightpulser system is published.

Precalibration Results from Measurements using the Bonn Detector Module Teststation – T. Seifen

Tobias presented the results of the precalibration for all VPTT-equipped submodules and the first 25 APD-equipped modules. The required range of 12.5 GeV can be achieved with an adjustment of the HV. He checked the maximum detectable energy for four temperatures in the range of -25.5 °C to -23 °C.

Status of the Backward Endcap EMC – S. Wolff

Sahra presented the available parts for the assembly of the backward endcap for phase-0. Of the APFEL boards 40 short ones are missing and the optical fibre assembly prototype was tested and the delivery of the first 10 of 48 bundles starts next week. Assembly will commence as planned.

Simulations for Dynamic Range of the EMC – K. Giebenhain

To improve the energy resolution for the barrel by increasing the APD gain Kim did simulations for the angle dependent energy deposits. A gain of 220 could be used for lower angles and a gain of 500 is suggested for angles above 57°.

Study of the Cluster Splitting Algorithm in EMC Reconstruction – Q. Pu

For the cluster splitting the lateral development of the cluster was simulated with Geant4. Both the angle and energy dependence is considered. Several checks were done, including determination of the splitting efficiency, the energy resolution for di-photon samples and the mass resolution for pi0 samples. Good improvements are seen. The code is being finalized.

Activity at IHEP – A. Ryzantsev

Andrey showed how a test assembly with the technological beam can be done at Protvino and discussed the assembly at FAIR. The final reassembly and test of the first slice is delayed due to travel restrictions. Once possible, the engineers will apply for visa.

Status Barrel EMC of the PANDA Target Spectrometer – M. Moritz

All backplane adapters are produced and a test assembly will be done soon. Mass production of the HV backplane can start. For the transportation and storage rigid and tight boxes are foreseen for each slice. More than 50% of the crystals for the 3rd slice are available.

Barrel EMC Slice Cooling and Monitoring Update – Th. Erlen

Thorsten presented new CAD designs on the fiber routing, the coupling of the fibers to the crystal fronts and a sealing box to keep the volume dry. One lightpulser will be mounted downstream in the support beam and one outside at the position of the SADC crate.

Revision of the Barrel Front-End Operation Parameter – A. Falk

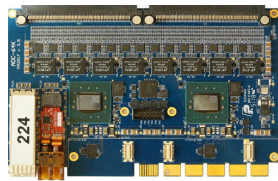
Aniko presented results of beam tests at MAMI with a 3x3 PWO-II matrix. At an APD gain of 500 the optimal threshold is 0.5 MeV, for a gain of 150 it is 1-2 MeV.

SADC Firmware Developments – O. Noll

Oliver gave a detailed presentation of the digital signal processing for the APFEL preamplifier pulses and an update of the PANDA SADC firmware for the backward endcap. The firmware is available on GitLab by request to Oliver.

Answers to Review Committee – F.-H. Heinsius

The EMC TDR update was presented to the ECE on October 27, 2020. The Review committee chaired by Craig Woody sent us questions end of November. The answers will be sent back after the collaboration meeting.



Front-end-electronics

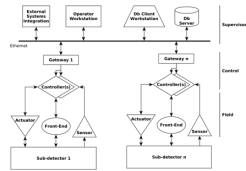
FEE Session at CM 21/1

Tuesday Mar 9, 2021, 9:00 AM → 10:30 AM Europe/Berlin

online

9:00 AM → 9:20 AM **Status of the LVDS-DC** 🕒 20m

Speaker: Pawel Marciniewski (Uppsala University)



Detector control system

Detector Control System Session at CM 21/1

📅 Tuesday Mar 9, 2021, 11:00 AM → 1:00 PM Europe/Berlin
📍 online

11:00 AM → 11:20 AM **Application of an embedded MicroBlaze processor in FPGA-based cluster-jet target slow-control system** 🕒 20m

Speaker: Jerzy Tarasiuk (National Center for Nuclear Research(NCBJ))

📎 [r2021c09.pdf](#)

We had a report from the Cluster-Jet controls group about new concept based on Microblaze processor on the FPGA. So far no tests have been made to show, that the control is actually working with the hardware of the target. It was discussed that such tests have to be made in the near future. The connection to the PANDA DCS system was also discussed as it still follows a too complicated Ansatz which can easily break the whole DCS system.

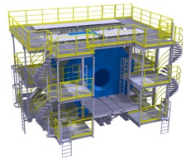


Computing

During the session of Tuesday Morning in total 7 presentations were given. The first two presenters reported about their work on the EMC reconstruction software. Jonas Kohlen showed a new method how to treat spit-off events in the MC assignment and showed a possibility to identify them by comparing the shower mass vs. the cluster energy. In the second EMC presentation Qing Pu showed the improvements he could achieve in his cluster splitting algorithm. By calculating the weight each bump would have onto a test crystal he could improve the energy resolution of a di-photon by more than 1% $\sigma(E)/E$. Sarah Gaiser presented the progress she has made in refactoring the Panda PID correlator. This method combines the measurement from all sub-detectors of one particle into one data object. The original implementation did this in one big class which made it difficult to maintain and extend it. The new version subdivided it into many singular classes, reduced the number of lines of code by 60% with the same functionality and strongly reduced the dependencies between them. Here the next step will be to test a different propagation method for charged tracks in PID combiner to reduce the runtime of it. In the next presentation by Viktor Rodin his developments on the online event building and filtering algorithms were presented. He used, for the first time, the complete time-based simulation sequence with mixed signal and background events. With his approach of using the time gap between consecutive hits for event building he was able to perform a reconstruction of the J/Psi with almost the same resolution as with an event based analysis.

Computing Session at CM 21/01			
📅 Tuesday Mar 9, 2021, 9:00 AM → 1:00 PM		Europe/Berlin	
📍 online			
9:00 AM → 9:20 AM	Split-Off Recognition for the Forward Endcap	Speaker: Jonas Kohlen (Universität Bonn)	🕒 20m
	📎 SplitoffRecognition...		
9:20 AM → 9:40 AM	Study of the Cluster Splitting Algorithm in EMC Reconstruction	Speaker: Qing Pu (IHEP Beijing)	🕒 20m
	📎 20210309-QingPu...		
9:40 AM → 10:00 AM	Refactoring of the PndPidCorrelator	Speaker: Sarah Gaiser (Universität Bonn)	🕒 20m
	📎 RefactoringOfPndP...		
10:00 AM → 10:20 AM	Online event building and filtering	Speaker: Viktor Rodin (Energy and Sustainability Research Institute Groningen (ESRIG))	🕒 20m
	📎 PANDA_CM_21_1.p...		
10:20 AM → 11:00 AM	Coffee Break		🕒 40m
11:00 AM → 11:20 AM	Comparison of Tracking Algorithms in PandaRoot	Speaker: Anna Aliche (Forschungszentrum Jülich(FZJ))	🕒 20m
	📎 PandaMeeting202...		
11:20 AM → 11:40 AM	Implementing Graph Neural Network for Track Finding	Speaker: Waleed Esmail (Forschungszentrum Jülich(FZJ))	🕒 20m
	📎 PandaMeeting.pdf		
11:40 AM → 12:00 PM	Language Model Training with STT Toy Data Generator	Speaker: Jakapat Kannika (Forschungszentrum Jülich(FZJ))	🕒 20m
	📎 pcm_9mar2020.pdf		

The next three presentations were focusing on charge particle tracking. Anna Aliche compared the Apollonius-Hough Tracking algorithm, she has developed, with the other barrel tracking algorithms in PandaRoot. She showed that the current standard tracking algorithms only has a track finding efficiency of 65 %, while the BarrelTrackFinder has an efficiency of almost 85 %. Annas algorithm could compete with this values with even a better ghost ratio but with a longer runtime. She is currently studying how to improve the speed of her algorithm by using GPUs. Waleed Esmail uses a Graph Neural Network for track finding in the forward spectrometer of PANDA. His network connects all hits of one layer with all hits of the next layer creating a graph network. It then calculates the weights between the connections and only those matching to a track survive a variable cut value. He could achieve excellent values from above 98 % efficiency and purity with his machine learning based method. The training of the model is done in python but a C++ interface exists, which allows the usage in PandaRoot. A slightly different approach is pursued by Jakapat Kannika for the barrel track finding. He uses a language model which predicts the next hit in a track by neighborhood and moving directions pattern. For this approach he developed a toy data generator to produce in a fast way the needed input data for the training of his model.



Mechanics

MEC Session at CM 21/1

Tuesday Mar 9, 2021, 11:00 AM → 1:00 PM Europe/Berlin
online

11:00 AM → 11:30 AM	Update additional solenoid supports and AUX platform Speaker: Stefan Koch (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)) Update additional s... Update additional s...	30m
11:30 AM → 12:00 PM	Layout of the leakless cooling system for PANDA electronic racks Speaker: Daniel Glaab (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)) 1st_Draft_Leakless...	30m
12:00 PM → 12:30 PM	Update Central Space Frame(CSF) Speaker: Stefan Koch (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)) Update Central Spa... Update Central Spa...	30m

Three talks were given at the MEC session on (a) updates of the additional solenoid supports and AUX platform by S. Koch (GSI), (b) status on the layout of the leakless cooling system for electronic racks by D. Glaab (GSI) and (c) updates on the Central Space Frame (CSF) by S. Koch (GSI).

First examples shown how to realize the additional solenoid support structures with various consoles and angle profiles to be connect to the yoke via screws seem feasible. The next steps are to proof that it will not compromise the static stability of the yoke.

The talk on the leakless cooling included actual CAD drawings of the hall with the layout of piping and flexible tubes to/from the racks. Pipe routing and diameters suggested for anticipated heat loads were presented, as well feedthroughs in the concrete wall addressed including space requirements for pipe and tank access. Next steps involve clarifying location and space constraints for the pressurized water manifolds, the water tank and also checks on suggested piping, sizes and fixtures. The use of numeric CFD tool may be possibly employed.

Updates on the CSF design now requires only two different parts of carbon composite, thus a more cost-effective manufacturing. Various aluminum brackets and fixings are used and with ceramic rollers and horizontal guides attached to hold and move the MVD and STT. Upstream of the IP identical structures attached with brackets provide space for all MVD services required. A total of five points, three horizontal (wedge fixation) and two vertical (shell clamping), are provided for attaching the target pipe. This requires careful checks to avoid stresses on the target cross in consultation with the colleagues at FZ Jülich.

TEC Forum 11-Mar-21

Pellet Target

Work continues on the droplet adjustment system but, due to the pandemic, laboratory access restrictions and quarantines of personnel fewer tests are being conducted. TDR writing is ongoing.

Cluster Jet Target

Target tests at COSY are scheduled for Apr/May 2021. At WWU Münster nozzle developments are ongoing besides copper toward glass nozzles with full length. The vacuum simulations for the IP region include cryopump with carbon coated cold sheets. The beam-dump for cluster jets and pellets is planned to be modified with new diagnostic tools. Status and progress is shown in plenary talk.

MVD

Work on ToASt ASIC at Turin continued targeting submission in April 2021 for a full-size version with complete functionality. Developments of mechanic supports for sensor supports is ongoing at FZ- Jülich and at Giessen Uni. a new batch of barrel Si-strip sensors has been ordered.

STT

In the Phase 0 commissioning beam time with PANDA@HADES, at GSI, Feb'21 there was great success of both STS detectors. Rich data sets acquired will be used for operational optimization, FEE baseline tuning and further s/w developments for tracking. All straw tubes operated well without problems despite the long spills with up to 100 kHz per straw, and no EMI or HV problems were encountered in this STS setup. Physics data taking is planned for Feb'22.

GEM

The GEM TDR draft has been released to the collaboration for comments and feedback prior to initiating the internal review process leading to ECE submission still in 2021. TDR presented in plenary talk.

Barrel DIRC

All radiator bars have been received at GSI from Nikon Corp., five months ahead of schedule, and the extensive quality tests show that all specifications are being met or exceeded. Ongoing QA tests at GSI with a laser scanning system focus on the quality of internal reflections.

Already in Dec. 2020 all photosensors, the MCP-PMTs have been ordered by GSI, 128 pcs. full-spec at the Photonis company, which got the contract awarded after a detailed evaluation at FAU Erlangen, of both manufacturers involved. In addition, 27 sub-spec but fully functional MCP-PMTs of the production series will be delivered for partially destructive testing and as spares.

Further work continues on testing outgassing of materials used in the bar-box, on the mechanics and the readout electronics. A spherical lens prototype was received and is tested at ODU in USA.

Barrel TOF

The design changes and updates since the TDR are being compiled in a document along with test results of prototypes developed so far. Unfortunately, the SMI Vienna group departs from PANDA and other/new groups need to step-in and continue on this subsystem.

FT

Great success of both STS detectors in the Phase 0 commissioning beam time with PANDA@HADES, at GSI, Feb'21 which use modules of the actual FT3/4 and FT5/6 stations. The contract for FT1-4 has been agreed and is now in the signing procedure starting at FAIR. Also, about 5000 packaged PASTTREC chips have been delivered. FE board design is being optimised. The drift-tube aging tests continue, and mitigation measures are being explored.

OT

The OT appears now as a full-fledged project, akin to the FT, with milestones in the project plan. A consolidated version of the prototype FEE interface board at GSI is due for production in Q2/2021.

FTOF

Work on the LED calibration system prototype continued with electronics systems developed at electronics department at PNPI. Also, a few PMTs have been bought for tests at PNPI. Yet, due to the pandemic, laboratory access restrictions and quarantines of personnel are in place.

Barrel EMC

All modifications are done for the pre-series support beam, threads and opening, and also positioning of all backplane adapters and all adapters produced for full barrel. The HV distribution and regulation board mass production due to start soon. Design of box for slice transportation and storage started, for storage at GSI/Weiterstadt, until the installation. Monitoring system with new fibre routing are in progress and producing cooling envelopes from deep drawing process are being considered. APD gain optimization studies continue, a test experiment was done at MAMI to quantify the improvement in resolution with a gain of up to 500. Regarding crystal status, now the second slice is complete and for the third slice production is ongoing.

BWE EMC

At HIM most components for the Phase 0 design are ready, yet, due to the pandemic, production of alveoli, restricted workshop access and deliveries of fibre-bundles, from external companies, cause delays of a few months. Mounting plate is ordered and cooling shells defined. On electronics the HV and discriminator prototype boards are ready with tests ongoing. The Phase 0 status and progress is shown in plenary talk.

FWE EMC

The APD submodule production at RUB continues, albeit with half its capacity, about 5 every 2 weeks, due to the pandemic, with 65/193 produced. Transports to Bonn continue and will resume end of March also to FZ Jülich for storage before final assembly. Likewise, the APD screening proceeds with one shift per day. 19500 APDs were screened. Cooling, pressure change, measurements are made on the actual frame and thermal coupling tests in the SADC crates started using an actual SADC card.

EDD

Tests being prepared using the TOFPET ASIC version with the required polarity and the MCP-PMT in the Giessen Cosmic Station and in a dedicated magnet box to validate performance and operational parameters. Designs of light-tight enclosures for the radiator plate and cooling concepts are progressing well. All the updates and optimizations done since the TDR will be documented.

LMD

Work is ongoing on bonding MuPix8 chips although with some known bugs and preparing for the beam time in April. The large MuPix10 are available and being tested and prepared to possibly use them as well in the test beam in April along with the MuPix8. Regarding the DAQ system for beam tests based on evaluation boards of Kintex-7 and Ultrascale, the latter to be replaced due to broken JTAG connection, and a re-write to use UDP rather than optical links is in progress.

Muon System

With the important and encouraging recommendation from the JINR Advisory Committee (international body) to continue over the maximal period with the work on the PANDA Muon System, and the funding release to Dubna, the muon detector construction to instrument the yoke is starting. Toward procurement of detector parts and construction the contacts with producers for several components (such as Aluminium walls for the MDT, plugs and connectors) are being re-established. Also, hardware readout tests and detector simulations continue.

Solenoid

With the completion of the Yoke assembly and test end of 2020 a major milestone was reached. In the meantime, the yoke parts are in storage at BINP. For cryostat and cold mass, the design is ready, and production was subcontracted to VZA, Votkinsk. Most raw materials have been procured and are being shipped to Votkinsk. For the conductor the production of the SC strands has started. A 4th prototype coil is in preparation with another Epoxy resin to compare to the successful 3rd prototype. The FDR of the Control Dewar is planned for May. Power systems are ready, cables in procurement. The KEDR area at BINP shall be prepared for operation tests of the PANDA solenoid.

Dipole

The design contract for the HESR-PANDA Chicane Dipole Magnet is approaching the final report. A safety risk assessment and installation instructions were compiled. Final optimisations concerned the safe-guards of the support structure against seismic events. The construction contract is in the signing procedure.

Controls

Regarding the DCS for the CJT the interface EPICS-LabView could possibly be resolved.

DAQ

SODANET support is taken over by Greg Korcyl, who also will head the DAQT system from January 2022. New programming techniques based on SYCL were tested to implement high-level access to FPGAs and GPUs. The KIT group works on RDMA for data transfer from interfaces to processing cards employing standardised hardware after the data concentrator. A time-based simulation of gap-based event-building for EMC at RU Groningen showed good results. The DAQT TDR review is in its last stages working on replies to the written questions from ECE.

No reports from FRICH, FSC, Hypernuclei

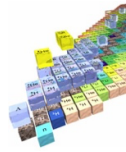
Minutes TEC Meeting during PANDA CM 21/1 on March 10, 2021

The project risk register update was done during the month of February and completed on March 5, 2021. The information was collected via the PANDA web frontend. The risk registers for BWE EMC and FWE EMC could be closed. The risks of B-TOF, FT, Luminosity Detector, Solenoid, Supports and Controls remained unchanged, small changes of wording and dates were done for STT, FSC and Muon System. The risks of Cluster Jet Target, MVD, GEM Tracker, Barrel DIRC, Barrel EMC and DAQT were updated in their content. Overall, the top risk remains the funding for the Barrel EMC crystals. Major personnel risks exist for MVD, GEM Tracker and DCS. One major technical risk is the quality of the vacuum at the IP.

The recent decisions concerning the Interaction Region were summarized: The beam pipe shall be elongated in the upstream direction to allow for the implementation of a cryo pump, which is currently under development at WWU Münster. This could lower the integral of rest gas interactions by a factor 2. Furthermore, the outer diameter of the downstream beam pipe inside the TS shall be increased to 79 mm to increase pumping and reduce the integral rest gas by another 20%. The shape of the IP region shall remain unchanged. The Central Space Frame (CSF) holding beam-target-pipe, MVD and STT shall be adapted accordingly. It is planned to produce a prototype of the CSF at GSI and a prototype of the beam-target-cross at FZ Jülich that should fit into the CSF prototype.

The procedure to work out a safety risk assessment was explained in steps. Categories of hazards, a method for the evaluation of risks, and a previously completed example for the Cluster Jet Target were shown, which can serve as template for others. The safety risk assessment is required to be completed before installation can be started and a system's final design review can be accepted. It is a prerequisite for any operation permit and has to be performed for all systems.

A further topic for 2021 is the compilation of the occupancy of all racks at PANDA with modules and crates to obtain a more precise specification of power and cooling requirements as well as input for the planning of cables and pipes. The method of data collection and the location of the available racks was recalled. The current status of the data collection was shown and the missing information was reflected in a round table discussion.



Physics – Hyperons / Hypernuclei

Hyperons Session at CM 21/1		
Wednesday Mar 10, 2021, 9:00 AM → 1:35 PM Europe/Berlin online		
Hyperon_Session...		
9:00 AM → 9:30 AM	Lambda(1520) production and decays in p+Nb @ 3.5 GeV Speaker: Krzysztof Nowakowski (Jagiellonian University)	⌚ 30m
9:30 AM → 10:05 AM	Sigma9 production in p(3.5 GeV)p collision Speaker: Waleed Esmail (Forschungszentrum Jülich(FZJ)) Sigma_Analysis_C...	⌚ 35m
10:05 AM → 10:25 AM	Inclusive Sigma(1385) production in p+p@3.5 GeV Speaker: Konrad Sumara (Jagiellonian University)	⌚ 20m
10:25 AM → 10:50 AM	Hadronic environment for p+p @ 4.5 GeV within JAM and GiBUU/SMASH models Speaker: Krzysztof Piasecki (University of Warsaw (UW)) kpiasecki_210310,...	⌚ 25m
10:50 AM → 11:10 AM	Simulations for trigger in p+p@4.5 GeV Speaker: Izabela Ciepał (Instytut of Nuclear Physics, PAS Krakow) iciepal_march2021...	⌚ 20m
11:30 AM → 11:50 AM	Kinematic Fitter for Hydra -- Update Speaker: Jana Tamara Rieger (Uppsala University (UU)) KinFit_Update_jrieg...	⌚ 20m
11:50 AM → 12:10 PM	Developments and first tests of a decay vertex fitting procedure for HADES Speaker: Jenny Regina (Uppsala University(UU)) VertexFitter_PAND...	⌚ 20m
12:10 PM → 12:30 PM	Quasi-free pi-+p elastic scattering from pi-+C reaction at 0.69 GeV/c Speaker: Ms Fatima HOJEIJ	⌚ 20m
12:30 PM → 12:50 PM	Study of a PWA of the Xibar+ Lambda K- Final State with PAWIAN Speaker: Jennifer Ingrid Pütz (GSI / FZ Jülich) StudyOfXibarLamK...	⌚ 20m
12:50 PM → 1:10 PM	LLbar analysis using extended target Speaker: Adeel Akram (Uppsala University(UU)) main.pdf	⌚ 20m

For this collaboration meeting, the hyperon session was merged with the corresponding session of the HADES collaboration meeting. The led to a rich a program and a broad selection of talks.

Lambda(1520) production and decays in p+Nb @ 3.5 GeV – K. Nowakowski
 Krzysztof presented his analysis of the $\Lambda(1520)$ production in the $p\text{Nb} \rightarrow pK^+\Lambda(1520)[\Lambda(1116)\pi^+\pi^-]$ reaction channel at 3.5 GeV. A signal has been identified and a thermal source has been used to extract the production cross section of approximately 1.5 mb. However, larger data samples are required for the background. The INCL prediction, which is based on an excitation function provided by HADES, gives a lower cross section at about 1.05 mb. Hence, other transport models that also include in-medium effects might be needed.

Sigma0 production in p(3.5 GeV)p collision – W. Esmail

Waleed showed the first measurement of the Σ^0 production at 3.5 GeV beam energy in pp collisions. He found that the production cannot be described with a pure phase space description. The resonant production of N^* appears dominant, but interference effects were not considered here, neither has been the final state interaction in the simulation model. Nevertheless, this analysis is an important step towards measuring radiative and Dalitz decays of excited states with HADES, and it illustrates the importance of the PANDA forward tracking stations as part of the HADES setup to analyse these channels. An analysis note is currently in preparation and in the future, a partial wave analysis will be carried out.

Inclusive Sigma(1385) production in [p+p@3.5 GeV](#) – K. Sumara

Konrad studied $\Sigma^+(1385)$ production in pp collisions, with the Σ decaying to $\Lambda(1115)\pi^+$. A neural network was implemented to classify signal events and its performance, especially with respect to the suppression of background, was investigated in detail. In the future, the reaction channel will be evaluated with respect to its transverse momentum and rapidity distributions. Ultimately, the cross section will be calculated. In addition, the analogous reaction channel will be studied in pNb scattering.

Hadronic environment for p+p @ 4.5 GeV within JAM and GiBUU/SMASH models – K. Piasecki
Krzysztof investigated a variety of models to generate a realistic hadronic background for embedding Pluto-generated dileptons into. In general, the hadronic environment for pp scattering at 4.5 GeV beam energy is moderately compatible for JAM/RQMD, GiBUU, and SMASH with the available data. However, there are significant differences in several channels. Qualitative differences in the implementation of the different models exist and could be a reason for their varying performance.

Simulations for trigger in p+p @ 4.5 GeV – I. Ciepal

Izabela carried out simulations to study the trigger performance. The goal is to study the trigger bias and reduction factors using different event generator models, i.e. RQMD (JAM) / SMASH (see above). Preliminary studies have shown that certain trigger conditions do indeed induce a bias, and alternative configurations to mitigate that issue have been suggested.

Kinematic Fitter for Hydra – Update – J. Rieger

Jana presented an update for her developments on the kinematic fitter for the Hydra software framework. The 4C fitter was applied to the $p(3.5 \text{ GeV})p \rightarrow pK^+\Lambda$ reaction channel, and the missing particle fitter to the $p(4.5 \text{ GeV})p \rightarrow pK^+\Sigma^0[\Lambda e^+e^-]$ reaction channel. The consideration of momentum dependent uncertainty estimates led to a slight improvement of the fitting performance. With minor modification, the fitter can also be applied to older beam time data. Meanwhile, the missing particle fitter enables improvements for studies of events where one particle is lost, making it a powerful analysis tool. In the future, tests with long-lived particles and the displaced vertex fitter will be carried out. Furthermore, the forward detector will be included and the fitters will be integrated in Hydra.

Developments and first tests of a decay vertex fitting procedure for HADES – J. Regina

Jenny presented her work on the displaced vertex fitter, which is being implemented as an external package to the Hydra framework. The present studies suggest that the vertex finding procedure is working well. However, the pull distributions after the fitting need to be investigated further. In the future, the vertex finding and fitting will be tested with larger data samples. A stopping criterion based on the χ^2 will be developed. Eventually, the work will be merged with that of Waleed and Jana.

Quasi-free π^+p elastic scattering from π^+C reaction at 0.69 GeV/c – F. Hojeij

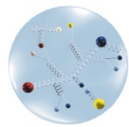
Fatima presented her studies on the quasi-elastic selection in π^+C reaction, comparing Pluto with INCL and performing a normalisation procedure. INCL appears to work well for the kinematics of π^+p , but underestimates the missing momentum. Pluto, on the other hand, gives an overall good description except for the pion kinematics. After further efficiency corrections and estimation of systematic uncertainties, the final cross section for the quasi-free process is to be obtained. Furthermore, the difference between INCL++ and the participant-spectator model will be studied to discuss the results with the INCL++ experts. Further models, such as GiBUU, UrQMD, etc., will also be tested, followed by other reaction channels.

Study of a PWA of the Xibar+ Lambda K- Final State with PAWIAN – J. Puetz

Jenny gave an update on partial wave analysis studies for the $\Xi^+\Lambda K^-$ final state using PAWIAN. In the tests it was possible to reproduce the quantum numbers of the simulated states. The lookout is promising for both single resonances and crossed channels. A combination of PandaRoot and PAWIAN proved to be in good agreement with the first feasibility study and also here the quantum numbers that had been given as input could be reproduced. A first test of a combined sample looks also promising, but larger data samples are needed here. In the future, the results for the combined sample will be verified with other quantum numbers, also using PandaRoot and PAWIAN. The same tests should then be done for the charge conjugate particles. A release note for this work is currently under review and a paper is in preparation.

LLbar analysis using extended target – A. Akram

Adeel presented an update for his studies on the hyperon pair production using a realistic modelling of the target and residual gas density distributions. The first results are mainly of qualitative nature, but already show a significant impact on background suppression methods that rely on the displacement of secondary vertices. These studies are currently ongoing. In the future, they will be expanded to different density distributions based on various vacuum scenarios and with larger data samples.



Physics – Electromagnetic Processes

EMP Session at CM 21/1

Tuesday Mar 9, 2021, 2:00 PM → 4:00 PM Europe/Berlin

online

2:00 PM	→ 2:25 PM Feasibility studies for GDA measurements based on pi0 gamma	🕒 25m
Speaker: Faiza Khalid (Justus-Liebig-Universität Gießen(JULGI))		
FaizaKhalid_PAND...		
2:25 PM	→ 2:55 PM New Fit of Time-like form factors from e+e- collider	🕒 30m
Speaker: Egle Tomasi-Gustafsson (Institut de Physique Nucleaire d'Orsay (IPN)(PNO))		
ETG-PANDAEM-2.pdf		
2:55 PM	→ 3:15 PM EMP current and planned PANDARoot analyses	🕒 20m
Speaker: Alaa Dbeyssi (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI))		
EMP_March2021F...		
3:15 PM	→ 3:25 PM Presentation of the group from the University of Tehran	🕒 10m
Speaker: Kazem Azizi (DOGUS University (DOGUS))		
Suggestions_Kaze...		

Feasibility study of Generalized Distribution Amplitude of the channel $p\bar{p} \rightarrow \pi^0 \gamma$ with PANDA (Faiza Khalid)

PANDARoot simulations for the process proton-antiproton annihilation into a real photon and a neutral pion, including descriptions of the event generation and selection, are presented. The studies are performed at 3 beam momenta between 2.5 and 10 GeV/c. The detector acceptance and resolution for the final state angular distribution are determined. The suppression and the subtraction studies of the main background process are also shown. The expected statistical uncertainties on the measurement of the differential cross section, based on the existing cross section calculations and assuming different values for the luminosity (Phases1, 2 and 3), are determined. The work is in progress.

About new data and BESIII individual determination of time-like form factors (Egle Tomasi-Gustafsson)

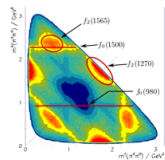
A study of the recent and precise data on the time-like proton form factors that aims for a better understanding of the nucleon structure is presented. The data are from BaBar, CMD-3 and BESIII experiments based on electron-positron annihilation processes and allows, based on a global fit presented in this talk, for a good description of the proton form factors. In particular, first determination of the individual proton form factors ($|G_E|$ and $|G_M|$) is provided by BESIII. The characteristics of the data, like the regular oscillations of the cross section, the steeper momentum-dependence of the electric FF compared to the magnetic FF, and the FF values at threshold are highlighted. The possible observation of these characteristics in proton-antiproton annihilation processes at PANDA is discussed.

EMP current/planned PANDARoot analyses

An overview on the achieved and ongoing PANDARoot analyses of the electromagnetic channels is given in connection with their feasibility measurements at the different PANDA Phases. The possible input to the planned PANDA-Phase 2 paper is discussed. A list of electromagnetic channels that can be further studied at PANDA is presented.

Collaboration with PANDA-EMP (Kazem Azizi)

Kazem presented his group at the university of Tehran, which together with his group at the university of Istanbul have interest to join the activities of the EMP working group. Their possible contributions and suggestions related to the measurements of the form factors and the structure functions in hard processes at PANDA are discussed.



Physics – Charmonium / Exotics

Charmonium and Exotics Session at CM 21/1

📅 Wednesday Mar 10, 2021, 11:00 AM → 1:00 PM Europe/Berlin

📍 online

11:00 AM	→ 11:35 AM	Status of the η_c-tilde analysis	🕒 35m
		Speaker: Áron Kripkó (JLU Giessen)	
		AKripko_etac_PAN...	
11:35 AM	→ 12:00 PM	Update on the analysis of feasibility study of Zc(3900)	🕒 25m
		Speaker: Dr Ali Yilmaz (Giresun University(GIUn))	
		aliylmaz10032021...	
12:00 PM	→ 12:25 PM	Feasibility study of Z(4430)	🕒 25m
		Speaker: Umut Keskin (Bolu Abant Izzet Baysal University(AIBÜ))	
		UmutKeskin-10-03-...	

We had three (CCE related) talks on our parallel session agenda, and (after it was presented at the PWG meeting already beforehand of the CM) one contribution in the plenary session on Thu afternoon.

- o Status of the η_{c1} -tilde analysis, Aron Kripko (JLU Giessen)
- o Update on the analysis of feasibility study of Z_c (3900), Ali Yilmaz (Giresun University)
- o Feasibility study of $Z(4430)$, Umut Keskin (Bolu Abant Izzet Baysal University (AIBÜ))
- o Can we resolve the nature of χ_{c1} (3872) with PANDA? Klaus Goetzen (GSI Darmstadt)

Short Summaries:

1) *Aron, Status of the η_{c1} -tilde analysis*

Aron presented an update of the study of the production of a spin-exotic charmonium hybrid state in anti-proton proton annihilations at a beam momentum of 15 GeV/c. The study is aiming to multi-photon final states. A genetic algorithm is utilized for the optimization of event selection criteria. Besides the decay into $\chi_{c1} \pi^0 \pi^0$, which was studied previously, Aron started to investigate additionally the decay into $\chi_{c1} \eta$, which might yield better efficiency. In the discussion it was mentioned to investigate the impact of the applied momentum cut and the MC truth matching procedure.

2) *Ali, Update on the analysis of feasibility study of Z_c (3900)*

Ali is studying the production of the charmonium-like Z_c (3900) in the decay of the $Y(4260)$ with a recoiling charged pion. The Z_c (3900) is reconstructed from its decay to $J/\psi \pi$, where $J/\psi \rightarrow \mu^+ \mu^-$. The events are exclusively reconstructed and a 4C kinematic fit is applied to suppress backgrounds. A small DPM sample of 3M events is used for preliminary background studies and optimization of the event selection. After applying a Monte Carlo truth match of the reconstructed events, an efficiency of about 18% is obtained. In the future, statistics will be improved and more realistic decay models will be employed. The production of larger DPM samples at the Virgo cluster is recommended.

3) *Umut, Feasibility study of $Z(4430)$*

Umut is addressing the feasibility to study further charmonium-like Z_c states in anti-proton proton annihilations, namely e.g. the $Z_c(4430)$. The events are exclusively reconstructed and a 4C fit is utilized. His work is closely related to Ali's studies and extends the Z_c studies the Turkish group lead by Haluk is interested in. Firstly, Umut is looking at $Z_c(4430)$ in the process $p\bar{p} \rightarrow \psi(2S) \pi^+ \pi^-$ with $\psi(2S) \rightarrow e^+ e^-$ or $\mu^+ \mu^-$. Secondly the new exotic states $Z_c(3985)$ is considered in $p\bar{p} \rightarrow J/\psi K^+ K^-$. Umut has started to produce signal events on the institute's local machine. With this samples Umut has shown that the general selection of events is working. Background studies will be addressed in the future. Again, the Virgo cluster is recommended for the production of larger data samples.

4) *Klaus Goetzen, Can we resolve the nature of χ_{c1} (3872) with PANDA?*

Klaus and Frank reported on detailed studies concerning the last year's LHCb result on the $X(3872)$ line shape. Based on toy MC studies, the published LHCb results have been reproduced and the uniqueness of PANDA for model-independent line shape measurements was illustrated and quantified for the concrete case of the published LHCb result, in which the data is described by two models (Breit-Wigner and Flatté) at same quality. As an addendum to the previous release note and EPJ-A publication, they quantified the feasibility to distinguish between the two line shape models. Depending on the different PANDA phases (beam momentum resolution and luminosity), the different models can correctly be assigned with a probability better than about 90% (P1) and 98% (HL), corresponding to a 10x higher

chance for correct assignment than LHCb. The obtained performances include a first attempt of scan optimisation developed and applied. These results are based on the full PANDA MC simulation studies carried out and released for our EPJ-A publication. A selection of plots have been proposed and accepted to be official PANDA plots that can be shown at conferences.