

Minutes of the 1st Meeting of the COSY Beam Time Advisory Committee (CBAC)

December 15, 2014
Physikzentrum Bad Honnef

Participants:

CBAC members:

Aulenbacher, Kurt Univ. Mainz, DE
Chao, Alexander W. SLAC, US (excused, participated online)
Kester, Oliver GSI, DE
Schmidt, Christian Joachim GSI, DE
Steffens, Erhard Univ. Erlangen-Nürnberg, DE (chair)
Trubnikov, Grigory V. JINR Dubna, RU
Weber, Marc KIT, DE

CBAC secretary:

Frank Goldenbaum

CANU representative:

Kai Brinkmann

IKP:

Mei Bai (IKP-4 Director)
Ulf-G. Meißner (IKP-3 Director) (excused)
Dieter Prasuhn (IKP-4 Deputy Director, representative of the IKP staff)
James Ritman (IKP-1 Director, IKP Managing Director)
Hans Ströher (IKP-2 Director, Scientific Coordinator COSY)

Board of Directors FZJ: Sebastian Schmidt (excused)

1. General remarks

The 1st CBAC session was embedded into the CANU/FFE/CBAC 2014 meeting December 15-16th in the Physikzentrum of the DPG in Bad Honnef. A general overview of the EDM and FAIR experiments and campaigns anticipated at the COSY accelerator for 2015 along with the beam requests of the individual groups was given in the open session of the CANU/FFE/CBAC 2014 meeting (for the programme and the list of applications see the Addendum).

The closed session of the CBAC members took place on Monday afternoon 16:00 –18:00 after the beam requests and experiment overviews of the proponents. The closed session was opened by James Ritman (GD-IKP), and Hans Ströher (Scientific Coordinator COSY) welcoming the participants listed above. Alexander Chao (*CBAC member*) is excused for not being able to participate in the CBAC closed session on site, but was connected online during the oral presentations of the participants.

As a very first action, the CBAC members elected unanimously Prof. Dr. Erhard Steffens as the chair of the COSY Beam time Advisory Committee.

The directors of IKP summarized the strategy and projects of IKP in the framework of the PoF3 period (2015-2019) with emphasis on EDM and FAIR (HESR, PANDA) activities and sketched the preliminary outcome the PoF3 evaluation for “Matter and the Universe” which took place February 16-18, 2014 at KIT in Karlsruhe. After discussing the charge of the CBAC committee, the directors of IKP left the closed session.

The COSY Beam time Advisory Committee (CBAC) examines applications for experiments with regard to detector and machine development for FAIR and preparations for the measurement of the electric dipole moment of ions (p, d) to be carried out at the facility. The CBAC makes recommendations and provides advice to the Director of the department "Key Technologies" on the relevance and technical feasibility of the proposals. Based on these recommendations the beam time is allocated and is included into the beam time schedule by the Beam Time Coordinator. With this in mind, the CBAC discussed proposals with three possible ratings: A (should be done), B (would be nice to have in first half of 2015) and C (of a lower priority, can be shifted).

The tentative beam time skeleton prepared by D. Prasuhn on the basis of the IKP Directorate's decision allowed for about 12 weeks in first half of 2015 (I/2015) for EDM and FAIR, after taking into account machine development and maintenance. The second half of 2015 was not subject of the beam time recommendations of the current CBAC#1 session.

An overview of all the applications to CBAC#1 is given as a table in the Addendum. The electronic versions of all proposals and reports as well as the pdf files of all contributions presented in the open session of CBAC#1 are located on the web page

http://www.ikp.fz-juelich.de/CBAC/documents/CBAC01/FFE_Dez_2014.html

2. Summary of the discussion and recommendations:

a) Procedure As the new committee met for the first time, there was no opportunity to organize the writing of individual reports on the various applications in advance. Instead, after the proposals had been presented in talks preceding the CBAC meeting and questions had been put to the proponents by the CBAC members, a comparative discussion took place in the closed session. In particular, the proposals were scrutinized with special emphasis on

- (i) **Feasibility** (here other assessments, like PoF review or accepted proposals, may enter; also boundary conditions imposed by the facility have to be considered)
- (ii) **Importance** (e.g. how important it is that this particular test needs to be done in this period)
- (iii) **Readiness** (e.g. an assessment of possible risks that elements required for the test are not available in time)

All these considerations led to a final Rating A, B, C as explained above. For the 'partial' rating according to criteria (i) – (iii), the Grades a, b, c, are used in the sense that $a > b > c$. The result of the discussion is summarized in Table 1.

b) Comments to Table 1 The relevant figures are listed for all 8 applications (note that the request of D5 in period I/2015 is zero): Number of weeks requested in 1st half of 2015 (I/2015), for comparison also for II/2015; then the partial ratings and the total CBAC rating. In the last column, a number of weeks for I/2015 has been recommended for every application, based on the discussion in the closed session.

For the applications related to FAIR (D1-5, A1-2) the start of the installation of HESR and the time of first beam are decisive for the COSY schedule. For the other part of the program, preparations for the Search of the EDM of Ions (JEDI), a successful 'Precursor experiment', demonstrating the feasibility of this new method within the PoF3 period is of highest importance.

If one compares the requested with the available weeks (11 weeks in I/2015, 12 weeks in II/2015), then an 'overbooking' by two weeks in I/15, and by at least five weeks in II/15 becomes apparent. The committee expects a further increase of time needed for detector and accelerator tests in the future which – according to the present FAIR timelines – may have its peak in 2016/17.

Experiment	Request I/2015	Request II/2015	Feasibility	Importance	Readiness	Rating	Wks recom. I/2015
D1 PANDA MVD	1	2	a	a	a	A	1
D2 PANDA STT	1	3	a	b	a	A	1
D3 PANDA HyperNuclei	1	0	b	b	a	B	0
D4 CBM	2	2	a	a	a	A	2
D5 PANDA KOALA	0	2	-	-	-	-	- *
A1 Machine Stochastic Cooling	1	1	a	a	a	A	1
A2 Machine Electron Cooling	2	2	a	a	a	A	2
E1 Experiment JEDI/EDM	5	5	a	a	a	A	5
SUM	13	17					

Table 1: Summary of Evaluation and Recommendation of CBAC#1 for 1st half of 2015.

*) No recommendation for I/2015 because of no request.

c) Short reports and recommendations on individual proposals:

*Proposal **DI** PANDA-MVD*

The PANDA MVD group proposes a series of three related beam test periods in 2015, including 1 week in April 2015. The panel endorses this request fully and ranks it “triple a” with respect to feasibility, importance and readiness. Assembled pixel modules are already available and have been tested with an early version of the data acquisition system (DAQ). In view of the planned engineering run of the final pixel readout chip in 2015, it is now of utmost importance to characterize the ToPix4 extensively and under realistic conditions. Any unanticipated features or changes of specifications of this important and complex detector element would have the potential to delay the whole project. Likewise, the evaluation and stressing of the new data acquisition system (of which first preliminary results were presented) at high rates is important and timely. The beam time requests for the second half of 2015 will include strip detector systems and the evaluation of the PASTA strip readout chip. Here the final submission is scheduled for 2016 only, but again thorough characterization of the chip in its realistic environment is of utmost importance to the success and schedule of the project. The application is ranked “a” in all aspects, with overall Rating A.

*Rating **A**, Recommendation: 1 week in I/2015.*

Proposal D2 *PANDA-STT*

The PANDA STT will, as a straw tracker, serve PANDA as the central tracking system together with the silicon-based MVD. The working group has long-standing expertise in this well-established straw drift detector technology and on systems based upon it. New, custom made readout electronics is to be tested in the beam time demanded, as well as system tests and optimizations with an extended setup are to be realized. To this end, an overall of 4 weeks at COSY (Big Karl and COSY-TOF area) in 2015 is asked for, 1 week in the first two quarters. A particular focus is given to the evaluation of dE/dx resolution and performance concerning tracking and PID, even though the overall performance has been successfully evaluated in 2014 for several momenta of protons as well as deuterons at COSY.

It is indeed preferable for any tracking detector development to be evaluated on a real beam in as similar a situation to the final use case as possible. From the data available, the overall performance across the band of targeted momenta could be interpolated for the time being. The enhancement of performance of the straw tracker with the new, upgraded readout electronics could most probably be shown and deduced convincingly through the study of individual straw channel performance based upon e.g. a ^{90}Sr source.

The committee assumes that this will be done. The proposed test, although not very urgent at the moment, constitutes an important step in the R&D of the PANDA tracking system.

The PANDA STT collaboration is rated as clearly ready to exploit the requested beam time, the proposal being definitively feasible, as the planned activities rather reflect a steady development and their verification. A high pressure for these beam-tests to be realized in 2015 could not be seen. The CBAC thus rated this application with “b” in ‘importance’ and overall with A. The collaboration plans to newly install their setup at the Big Karl area in Q2. The committee supports this activity by recommending the requested 1 week of beam time so that the new arrangement may be made fully operative soon.

Rating A, Recommendation: 1 week in I/2015.

Proposal D3 *PANDA-Hypernuclei*

The PANDA Hyper Nuclei Group presented an interesting and experimentally very challenging endeavor to detect and study double Λ hypernuclei at PANDA. It is an experimental proposal with a physics case of its own right, relying rather on the anti-proton beam than on the PANDA spectrometer itself. This project and the preparatory, challenging R&D is thus not necessarily an essential prerequisite for the realization of PANDA, it does however definitively augment to the research and physics case of the field around PANDA. The collaboration has shown in past COSY beam times that they are indeed capable of driving the relevant development issues forward and can be considered ready to fully exploit the one week beam time they applied for. In view of the limited amount of beam time overall and the fact that other projects find themselves on the critical path for the success of the respective entire spectrometer system such as PANDA or CBM, the double Λ hypernuclei application cannot be rated with an urgency that would demand granting beam time in the first half of 2015. The request was thus rated B by the CBAC.

Rating B, Recommendation: 0 week in I/2015.

Proposal D4 *CBM Experiment*

The CBM experiment has presented a convincing suite of beam tests from 2015 through 2017 to make the transition from prototyping to series production of the detector. The tests are organized in electronics and detector characterization with a total of 2 weeks of beam time in the first half of 2015. Given the comprehensive program and the large number of subsystems, the requested length of the testing period is

relatively modest, reflecting an experienced and organized team, and should be fully granted. It is extremely important to stress the electronics under realistic load and radiation conditions as suggested since the design and fabrication of ASICs is time-consuming. The panel also endorses the strategy of combining more and more subdetectors into an ever more complex and complete system. This approach makes best use of the beam time, and the experience thus gained will be highly valuable in commissioning the final detector. Since the size of the system is steadily increasing, care should be taken to make the testing area fully accessible. This request is ranked “a” in all categories and Rating A by the panel.

Rating A, Recommendation: 2 weeks in I/2015.

Proposal D5 *KOALA Experiment*

This proposal will be reviewed in session CBAC#2

Recommendation: none (no request in I/2015).

Proposal A1 *Stochastic cooling for HESR*

Stochastic cooling is mandatory for antiproton- as well as for ion-beam experiments at PANDA/HESR. In addition, at FAIR stochastic cooling is mandatory to collect and prepare secondary particle beams in the collector ring (CR). Stochastic cooling in the modularized start version supports barrier bucket injection into the HESR as the RESR for antiproton accumulation is not available. In earlier experiments at COSY unexpected limitations of this cooling method were observed, the reasons of for this behavior have so far not been identified. The proposed beam time serves to clarify these issues, based on the idea that the effects may occur due to imperfections of the sophisticated hardware required. For instance shall be clarified what degree of nonlinearities of the R.f.-amplifiers and which suppression of the notch filter rejection depending on the power level can be tolerated. These experiments will have direct impact for the cooling system at FAIR. The committee is convinced with respect to readiness, feasibility and importance of the experiment (“a”-ranking in all respects, and in summary Rating A). We recommend beam time in period I/2015 as requested.

Rating A, Recommendation: 1 week in I/2015.

Proposal A2 *High energy electron cooling for HESR*

The 2 MeV fully magnetized electron cooler is a unique device and it offers to do very relevant research for FAIR immediately. A main feature of the experiments requested here is that they allow resolving the question of scaling of the cooling times with beam energy in the relativistic regime. Besides representing a considerable gain of scientific knowledge in itself this is a subject of great importance for the planning of experiments at FAIR. The experiment at the well-understood COSY machine allows to investigate the interaction of the cooler with the beam and/or the experiment under different operating conditions including the operation of the internal target very precisely. These experiments should be done as soon as possible, and are sound concerning readiness and feasibility. The committee recommends beam time in period I/2015 as requested.

Rating A, Recommendation: 2 weeks in I/2015.

Proposal E1 JEDI/EDM investigations

The search for EDMs of ions with a competitive sensitivity requires new methods with unprecedented precision. As in the past, the JEDI collaboration needs longer blocks of beamtime filled with measurements and tests at a well-tuned storage ring. The proposal contains seven different studies, which in total add up to five weeks plus one week of MD before. The program represents another step in a systematic approach towards a demonstration experiment which may take place in a couple of years from now. The recent experimental and theoretical results on Spin Coherence Time (SCT) and the fast high-precision spin tune measurement reported in the presentation of the JEDI collaboration indicate a breakthrough. This may lead to a new method for the comparison of the g-factors of proton and anti-proton to 10^{-10} precision, four orders of magnitude more in accuracy than current limits.

The request meets all requirements that are to be examined (see Table 1). The Committee recommends to allocate the requested five weeks of beamtime within the first half of 2015. A partial shift of EDM beam time to the period II/2015, where a higher demand is to be expected, would impose severe problems on the COSY schedule.

Rating A, Recommendation: 5 weeks in I/2015.

3. Conclusions

Eight applications for beam time in 2015 have been presented to CBAC#1 out of which seven have been reviewed and recommendations adopted. One application (D5) did not ask for beam time within the relevant period I/2015. It will be reviewed at the next meeting.

Overall, the applications and presentations were of high quality and importance for the future scientific program of the IKP at FAIR and COSY. In its recommendation, the committee has put emphasis on Feasibility and Importance in this time period, and Readiness for the proposed test. The results of the discussion within the committee are presented in Section 2 and Table 1. A detailed schedule taking into account the current recommendations will be worked out by the Beam Time Coordinator.

A total of 12 weeks of beam time were recommended by CBAC#1 for scheduling in the first half of 2015 which is slightly more than the eleven 'available' weeks according to the present planning which foresees 12 weeks being available for EDM and FAIR weeks in the second half of 2015 indicating an increasing request in the course of 2015. The beam time recommendations for II/2015 are subject of a detailed evaluation of a CBAC session to be scheduled well in advance of the start of the period II/2015.

COSY in its new role as Test Facility for FAIR key technologies and for the study of EDM of ions will continue to be a facility for internal, but also external users. In particular, tests of detector components will result in frequent setting up and dismantling of sensitive equipment. In order to exploit the limited weeks of beam time efficiently, CBAC regards a good technical support for the external groups as mandatory, as it has been a standard practice at COSY in the past. Here storage space for frequent visitors and the usual services are important as well. The committee is confident that the IKP will find a solution compatible with the additional tasks imposed on the machine and service groups and the needs of visitors.

Erhard Steffens

CBAC Chair.

4. Addendum:

AGENDA CANU/FFE/CBAC 2014 Meeting, December 15 and 16, 2014

December 15th, 2014

- 09:00 – 09:15 James Ritman
IKP in transition from using COSY as a precision machine for hadron physics to preparing the HESR and FAIR experiments as well as exploring the potential for a storage ring EDM search
- 09:15 – 09:45 Dieter Prasuhn
Status of COSY
- 09:45 – 10:15 Frank Hinterberger
Life and Times of Theo Mayer-Kuckuk
- 10:15 - 10:45 Coffee**
- 10:45 – 10:55 Intro COSY Beam Advisory Committee
- 10:55 – 11:15 Fritz-Herbert Heinsius
PANDA forward EMC
- 11:15 – 11:35 Peter Wintz
PANDA STT
- 11:35 – 11:55 Daniela Calvo
PANDA MVD
- 11:55 – 12:15 Alicia Sanchez Lorente
PANDA Hypernuclei
- 12:30 – 13:45 Lunch**
- 13:45 – 14:20 Frank Rathmann(TBC): JEDI/EDM
- 14:20 – 14:40 Johann Heuser: CBM
- 14:40 – 15:00 Hans Stockhorst
Accel.: Stochastic cooling for HESR
- 15:00 – 15:20 Vsevolod Kamerzhiev
Accel.: High energy electron cooling
- 15:20 – 15:30 Huagen Xu: KOALA experiment
- 15:30 – 16:00 Coffee**
- 16:00 – 16:30 Mikhail Bashkanov (COSY-129)
Status of $d^(2380)$ and Outlook*
- 16:30 – 17:00 Sedigheh Jowzaee (COSY-130)
Results on hyperon production at COSY-TOF
- 17:00 – 17:30 Sergey Dymov (COSY-070)
Spin observables from the double-polarized $d(pol)p(pol) \rightarrow \{pp\}n$ charge-exchange reaction at ANKE
- 17:30 – 18:00 Lena Heijkenskjöld (COSY-122)
Hadronic decays of the omega meson
- 18:00 – 18:20 CBAC Summary
- 19:00 - Dinner**

December 16th, 2014

- 09:00 – 09:30 Andreas Schaefer (FAIR-014)
Transition form factors $\gamma^\gamma \rightarrow \eta$ and $\gamma^*\gamma \rightarrow \eta'$ in QCD*
- 09:30 – 10:00 Lu Cao (FAIR-020)
Simulations on the Measurement of the Ds semileptonic form factor with the PANDA Detector
- 10:00 – 10:30 Ankita Goswami (COSY-128)
Analysis of the $pp \rightarrow pp\eta$ data set from the WASA-at-COSY campaign
- 10:30 - 11:00 Coffee**
- 11:00 – 11:30 Patrick Musiol (FAIR-022)
Studies on a monitoring system for the Panda EMC
- 11:30 – 12:00 Tobias Triffterer (FAIR-015)
Alarm notifications for the PANDA detector control system
- 12:00 – 12:30 Robert Schnell (FAIR-019)
Contributions to the PANDA MVD strip detector readout
- 12:30 – 12:45 Kai-Thomas Brinkmann
CANU member session
- 12:45 – 14:00 Lunch**
- 14:00 – 14:30 David Mchedlishvili (COSY-080)
Measurement of spin observables in $p(pol)d(pol)$ elastic and inelastic scattering with polarized beam and target at ANKE-COSY
- 14:30 – 15:00 Yutie Liang (FAIR-007)
FPGA Helix tracking for PANDA
- 15:00 – 15:30 Mirian Tabidze (COSY-080)
Measurement of nucleon-nucleon elastic scattering at small angles up to the maximum COSY energies
- 15:30 – 16:00 Krzysztof Pysz (FAIR-023)
Readout system for high spatial and energy resolution of PANDA Central Tracker
- 16:00 – 16:30 Coffee**

COSY Proposals and Beam-Time Requests for CBAC #1 (December 15/16, 2014)

No.	Title of experiment	Spokesperson	Installation	P_{Beam} [GeV/c]	Intensity [1/s] (ext.) [stored](int.)	beam time (weeks)	Earliest date of installation	Remarks/ Recommended time
D001	PANDA-MVD	D.Calvo	JESSICA	0.6-2.9	$> 10^7 \text{ cm}^{-2} \text{ s}^{-1}$ protons	3	Apr 2015	MVD pixel, strips, electronics, irradiation, time-stamp sync.
D002	PANDA-STT (3 beam time requests)	P.Wintz	Big Karl COSY- TOF	0.6-2.95	$> 10^7 \text{ cm}^{-2} \text{ s}^{-1}$ protons / deuterons	4	May 2015	Mech. Setup, electr. read out, high reso.drift time, E-loss, ...
D003	PANDA-Hyp.	A.Sanchez Lorente	JESSICA	2.95	Max int. poss. protons	1	Jan 2015	τ -spec. of double hyper- nuclei, HPGe cluster detectors, emulate neutron irradiation, res. degradation
D004	CBM	J.Heuser	JESSICA / TOF	2.9	$> 10^8 \text{ cm}^{-2} \text{ s}^{-1}$ protons	6	2015-2017	Test of electro. comp., and CBM prototype det. @high load, T0, MVD, STS, MUCH/GEM, TRD, TOF,...
D005	KOALA.	Huagen Xu	ANKE	1.7-3.5	stored 10^{10} protons	2	Jul 2015	commission the recoil detector setup for the Koala experiment at HESR
A001	Acce. stoch. cool	H. Stockhorst	COSY ring	1.965	stored 10^{10} protons	2	early2015	HESR stoch. cooling,...
A002	Acce. elec. cool	V. Kamerdzhev	COSY ring	1.965-3.7	stored 10^{10} protons	4	installed	Comb. Performance of e- and stoch. cooling,...
E001	JEDI-EDM	Frank R et al	COSY ring	0.970	stored 10^{10} deuterons	5	April 2015	
					Total			