

**Questionnaire** concerning the realization schedule of the **PANDA FEE**

The questionnaire has two parts.

We request a response time until May 9 for questions 1-5, compiled in part 1.

For part 2 of the questionnaire, we ask a response until May 30.

The scrutiny group, appointed to review the project status and make physics-driven suggestions for a possibly stretched installation schedule towards the full PANDA detector, has worked out this questionnaire. This includes an understanding of the current status and progress of all PANDA components.

We assume an intimate relation between DAQ and the back-end of the Front End Electronics (FEE). Thus, the DAQ responsibility includes the hard- and firmware of Data Concentrators incl. TRBs, Multiplexers, the SODA system, Compute Nodes, and Data Storage, as well as the software for the Event Filter. Complementary, the FEE coordination would cover the digitization of the primary detector signals, the online data processing, feature extraction algorithms, and optical-link data transport to the Data Concentrators. While FEE is an integral part of any detector system, we consider the coordination of FEE activities of crucial importance for an efficient progress. In particular we need to know the status of commonly used hardware modules and whether all needed FEE activities are sufficiently well covered.

Please understand the following:

- Depending on the progress you have achieved some of the questions may appear obsolete and some of the answers may appear evident. Anyhow, in order to get a complete overview, we ask your brief answers which may be amended with your special notes.
- None of the following questions is intended to question your expertise. On the contrary we trust and rely on your qualified response. If any of the wordings is not to your liking, take our sincere apologies. The questions are meant and designed to scrutinize the progress of PANDA.
- You may not feel like answering all questions because sometimes several questions may touch upon the same issue, as you understand it. In these cases, just indicate briefly where you put the information.
- While some of the questions may be perceived as very demanding, we feel that most information is not different from what you might provide with a TDR, a funding application or the like. If you think that some of our requests are not necessary, just let us know and please add a brief explanation of your views.

Thank you for the cooperation and your valued input to the process needed to consolidate PANDA.

## Part 1

FEE coordinator(s):

1. List the research groups collaborating in FEE developments:
  - cooperations within PANDA
  - cooperations within or outside of FAIR
  
2. How have the research groups involved in FEE developments documented their progress and disseminated relevant information?
  - FEE relevant theses
  - FEE relevant papers
  - Contributions to specialized conferences (e.g. IEEE, Realtime Comp. conf.)
  - Availability (e.g. PANDA wiki) of internal (technical) reports (PANDA notes)
  
3. Have you exploited synergies to achieve the most efficient progress?
  - On which level have you sought synergy within various PANDA FEE developments?  
*Example: joint ASIC developments, joint test beams.*
  - On which level have you sought synergy with other FAIR systems?  
*Example: joint developments of ASICs or electronics modules*
  - On which level have you sought synergy with relevant systems outside FAIR?
  
4. Groups and manpower involved:
  - How many persons (FTE) in which groups are engaged in FEE developments for PANDA sub-systems?
  - How many persons (FTE) in which groups are involved in simulations of the data processing firmware and feature extraction algorithms?
  - How many persons (FTE) in which groups are involved in firmware developments?
  - How many persons (FTE) in which groups are involved in hardware developments?

5. FEE system design:

- Are the PANDA standards of the FEE system clearly defined?
- How are the PANDA standards of the FEE system documented?
- How have you ensured that Interfaces of the various detector systems with the Data Concentrators are properly designed?
- Is the responsibility for FEE interfaces for all PANDA detector systems clearly assigned? (To whom in which group?)

## Part 2

6. Timelines of work packages for the FEE developments:

- Please provide the resource-loaded schedule for required ongoing or planned FEE developments (cf. attached example).
- What are the shortcomings on FTE or other non-invest resources?
- Which time-consuming part could be shortened by distributing work, e.g. to companies (added expenses?)?
- Which time-consuming workpackage could be accelerated with additional money?

*Explanation: Please provide the tables as an attachment. An example for a toy project is attached. If you feel that any of the suggested ways of compiling these tables are too fine or too coarse (e.g. the time bins), please use your project's native granularity!*

7. Availability of key components:

- Has the technology of key components for the FEE in various detector systems been developed to satisfy your needs?
  - What is the schedule for additional developments?
- Is there a (at least 1) manufacturer who can deliver?
  - Are you in contact with alternative manufacturers?
- What may be possible risks of delivery?
- What may be possible risks of the production quality?
- What is the delivery rate agreed upon with the main manufacturer compared to the scheduled use in the project?
- Do you have fallback solutions in case of delivery failure, or if necessary additional developments will not succeed or will not be finished in time?

8. Technical feasibility of the FEE:

- Is sufficient lab equipment available for prototype evaluations?
- Is sufficient workshop capacity available for hard- and firmware construction, and where?

*Explanation: We assume that e.g. VHDL programming of FPGA firmware is done by experienced engineers in electronics workshops. If your situation is different, please explain how you get the job done.*

- Are results available from prototype studies? (attach key results)
- What is the manpower available for system tests at FZJ in 2015/16?
- Do you foresee that the FEE for all detector systems can be installed and tested until 1.1.2018? (or until when?)
  - Which detector systems might be late? By how much?
  - Which companies are involved?
  - Which research labs are involved?

9. Do you see an option for only partly installing the FEE of some detector systems on day-1 (of the physics program) and a later upgrade?

- Which are the parts that definitely have to be in place on day-1?
- Which components could be added or expanded later?
- Would this reduced setup lead to savings in finances?
  - How much on day-1?
  - How much on the long run?
- What would be the consequences for manpower resources?
- What would be the penalty
  - i. in rate performance?
  - ii. in online data-selection quality?
- What would be the penalty on the long run in terms of extra manpower or loss of time?
- What would be the penalty or advantage for your funding situation?

*Explanation: please quantify "penalty" in terms of % degradation w.r.t. optimum performance.*

10. Risk assessment:

- When were possible risks signaled?
- Are there serious risks for any particular detector system?
- Which of the risks may prevent a completion of PANDA before 2018?
- Which measures were already taken to counteract possible risks?

*Example: explore alternative FPGA solutions.*

- Which additional measures are envisaged?

*Example: alternative firm- or software algorithms*

*Explanation: We will make use of risk tables collected by the Technical Management. However, the input here may serve to judge the situation of the FEE developments in particular sub-systems and for PANDA as a whole. We need to see the status of the risk evaluation and whether counter-measures have already been initiated.*