

Date: 2009-05-11

### **Minutes of Meeting**

**Topic: MACS Power Supply Controls Workshop 1**

Date: May 11, 2009

Place: 865-1-B03

Participants: Maria Elena Angoletta, André Beuret, Etienne Carlier, Ulrich Dorda, Adrian Fabich, Tony Fowler, Johannes Gutleber, Quentin King, Fabian Moser, Marcus Palm, Werner Pirkl

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## 1. Outline

The meeting started at 09:00 and ended at 17:00.

J. Gutleber gave an introduction.

The goals of the workshop were outlined:

- Identification of basic requirements for controlling power supplies
- Possible use of the technology for controlling other subsystems
- Is a generic interface achievable that for instance also works for RF?
- Strict separation of power supply and controls responsibilities or some overlapping?
- Common understanding of the time scale
- Definition of next steps

Full digital control is envisaged.

The control system's responsibility includes and does not go beyond

- Providing waveforms
- Providing timing events
- Sending set-points
- Reading out status
- Providing configuration values

Power supply systems may have internal interlocks. A system wide interlock system takes care of handling and combining interlock signals from subsystems. Such a system is required due to safety certification needs and needs to be developed independently in cooperation with the subsystems. Responsibility for the system is still to be identified.

The introduction was followed by presentations from

U. Dorda on the optics point of view

A. Beuret on an overview of power converters in MedAustron

Q. King on the overview of the FGC3 developments at CERN

M.E. Angoletta on waveform generation for RF cavities in LEIR, PSB and CNAO

After a break A. Fabich presented the top-level time line of MedAustron: Start of accelerator installation 2012, Accelerator commissioning is supposed to start in January 2013. The first patient (trial treatment) is expected in January 2014. The Technical Design Report is due this summer.

Finally the solutions for waveform generation at PSI/SLS were shown by F. Moser.

A. Gutleber presented the waveform generation system used at CNAO.

After lunch break, the meeting was taken up at 15:00

The afternoon was used for a brainstorming discussion on the needs for power converter controls, waveform generation, B-train (or more generally spoken B-field measurement) signals, technology options pros and cons.

The meeting ended at 17:00.

## 2. Outcome

A generic solution for pattern/waveform generation is envisaged.

The following elements can be controlled with a generic solution:

- Power supplies with waveforms
  - Conventional magnets
  - RF cavities
  - Others to be identified
- Power supplies with set points
  - Scanning magnets
  - Chopper magnets
  - Others to be identified
- Low speed control (on/off)
  - RF power supplies
- Radio Frequency cavities
  - waveforms

The so-far collected requirements for waveforms and set point timing have been confirmed.

DC power low-power converters 10V/30A are to be controlled using RS422.

Custom DC power converters 30V/50A need to include a function generator.

The CNAO cPCI crate based solution is discouraged due to price and space requirements.

The PSI controls solution was positively received. The EPICS based system suggests a lower effort in development software ("re-use").

The CERN FGC3 is available as hardware. The software is under stabilisation. The DSP board performing the PWM is under development and should at latest be available by summer 2010 (one year from now). A daughter board will be developed for White Rabbit (CERN timing system under development) that could be used as a template for a MedAustron daughter board for receiving configuration and timing signals. It was pointed out that the support software would be a major enterprise for MedAustron and that O(10) manyears have been invested by CERN in their solution.

A long discussion took place on the B-train system. It is not clear if MedAustron will have such a system and what the interface to the equipment control layer will be to transmit the values (up/down signals or values). Generally the trend goes into the direction of a link that transmits field

values instead of field changes only. Message latency of 100  $\mu$ sec is a good indication. O(10) clients should be considered for the information.

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### 3. Issues

- A number of issues were identified during the workshop that need **immediate attention**:
- Does MedAustron have a B-train (B-field measurement and control loop)?
- Who is in charge of such a B-field based correction system?
- What will be the interface to the equipment control (B-train up/down, B-field values)?
- What are the requirements for the scanning system concerning power supply controls?
- What are the requirements concerning power supply controls for the special magnets?
- What are the requirements concerning power supply controls for the injector?
- How is the RF subsystem organized?
- Definition of requirements for current measurement accuracy.
- Can the PSI control system fulfil the needs for measurement accuracy wished for MedAustron?
- Can the PSI control system senders be produced in PCI form factor?
- What timing system will MedAustron use?

Comment [UDO1]: Mir ist nicht klar welche measurements du hier meinst.

### 4. Action Items

- U. Dorda for accelerator, W. Pirkl for injector coordination:
  - Ask for missing requirements from subsystems
  - Clarify B-train existence and suggest to settle on an interface
  - Clarify power convertor responsibility of special magnets.
- A. Beuret for power supplies:
  - Determine if PSI solution fits measurement needs
  - Provide list of exemplary low-voltage DC power converters and suppliers (RS422 interface type).
- Q. King
  - has kindly agreed to contact White Rabbit team about finding information about their time plans to produce a daughter board for FGC3.
  - may be able to determine the maximum possible RAM quantity that can be installed on the FGC3.
- F. Moser will ask if PSI controls have capability to accept auxiliary signals for B-train.
- J. Gutleber
  - will ask if PSI controls can be produced in form factor different than VME.

- Will ask A. Fabich to help placing the work item “interlock system” when revising the WBS of the control system into the organisational hierarchy
- J. Gutleber/F. Moser
  - update power supply technical survey with updated values.
  - will initiate “Pattern Generator Requirements” document that will reflect the input from the workshop and the requirements collected so far.

The location of the presentations will be communicated a.s.a.p.  
Iteration of the topic is planned before September 2009 and will be announced.

Comment [UDO2]: Welche presentation?