The power supplies for the calo upgrade

Only ideas and rough estimations
Some questions related to DCDC

Electronics Upgrade Meeting

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Thursday April 14th, 2011

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Introduction

- The upgrade concerns the front-end electronics only
  - Want to keep unchanged the rest of the electronics
  - Do not change the corresponding power supplies
    - HV for the CW
    - HCAL Calibration system with Cs source

- The constraints for the front-end electronics
  - Purpose is to keep unchanged as many systems as possible
  - The front-end boards have to be re-designed
    - Used linear regulators → availability for the upgrade is doubful
    - DC-DC converters being designed at CERN could be a replacement

- I will discuss only the DC-DC converter solution
  - The first discussions (Georges Blanchot) indicate
    - Magnetic field should be ok in the electronics vicinity
    - Radiation is not a problem either
    - Noise is expected to be low enough → this has to be tested
      - G. Blanchot agrees to provide a few samples to be integrated to our prototypes → We would like to perform rapidly some tests

DC-DC converters : main potential issue

- In order to reduce the cost, we would like to use the present Maraton (Wiener) power supplies to power the DC-DC converters
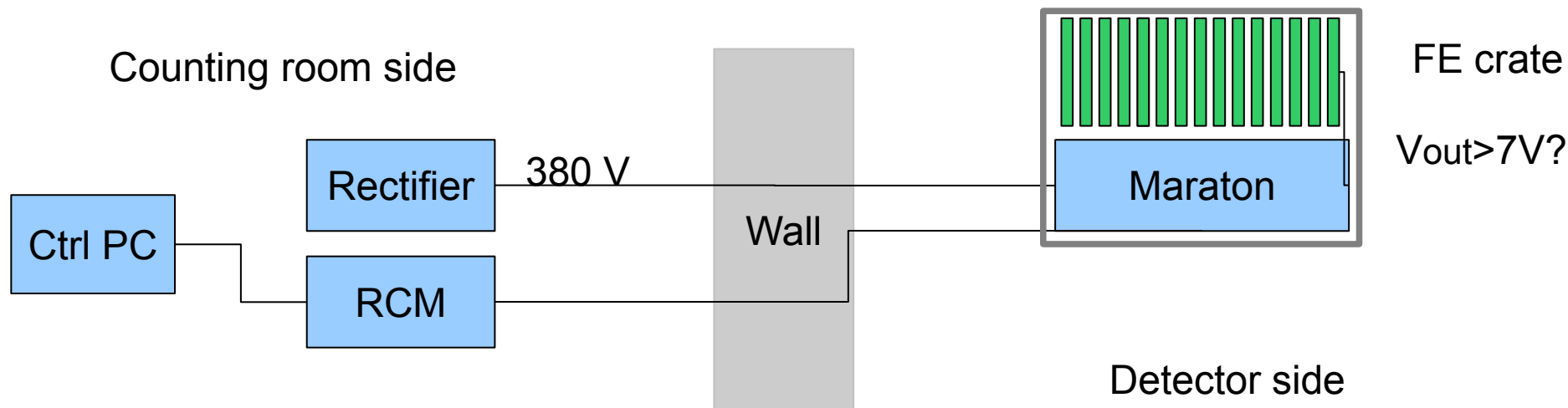
- Wiener designed several types of modules for the Maraton PS
  - Most of them have an output voltage larger or equal to 8V
  - One module is limited to 7V
    - This is probably the case of ours
    - DC-DC converters may not be guaranteed to function with such a low V_{input} (???)
    - Could not find any clear indication on the type of Wiener modules we have
- Several paths followed and questions raised
  - Test a spare Maraton on the PH-ESE test bench (V. Bobillier)→ Test planned Friday
  - Question : is 7V really not enough (Blanchot) ? Does-it depend on V_{output} ?
  - To which extent can we power directly from the Maraton ?

DCDC conv. main potential issue (continue) and LEDTSB

- We need to power chips with voltages from 5V to 1.5V
  - Can we have such a ranges of V_{output} out of the DCDC converters?

- From the time being consider the present Wiener Maraton solution only
  - With DCDC converters
  - With an hybrid system → not all voltages provided through DCDC converters

- LEDTSB : LED calibration system control board
  - But there is an extra complication
    - We have a couple of boards to drive the LED calibration system
    - Plugged in sames crates as FEB
    - We do not want to re-design them
  - If no SPD/PRS
    - Spare PS (same Maraton as for ECAL/HCAL)
    - Spare crates on the calorimeter platform
    - if cannot share crate between LEDTSB and FEB
      - Could use a dedicated spare crate/Maraton from SPD/PRS
      - But new cables may eventually have to be pulled ?

VERY ROUGH ideas of what is needed

- 1 board
  - Analog part
    - Shaper
      - ASIC design $\rightarrow$ 1 DCDC converter (V_{ouput}=3.3V / total I~1.6A)
      - COTS design $\rightarrow$ 2 DCDC converters (V_{ouput}=3.3V / total I~3.2A)
    - ADC $\rightarrow$ 1 DCDC converter (V_{ouput}=3.3V / total I~1.92A)
  - Digital part
    - PGA
      - 1.5 V (Core)
      - 2.5 – 3.3 V (I/Os)
      - No current estimation yet
        - ▷ Simply started to use A3PE on a prototype
    - Other components
      - 3.3 V $\rightarrow$ No current estimation yet
      - +5V or -5V $\rightarrow$ to be confirmed (NIM translators, etc...)
- ECAL/HCAL $\rightarrow$ ~ 260 boards (including spares)
- Most of the cabling is already in place
  - But this assumes we keep on using the Maraton

Alternative solution

- We may envisage to power our system only partially with DC-DC Converters
  - Keep the present Maraton
    - 6 modules
  - But change the configuration in order to power
    - partly our electronics directly
    - Partly the electronics through the DCDC converters

- Present PS configuration
  - +5 (Analog) / 100 A (2 modules)
  - -5 (Analog) / 50 A (1 module)
  - +3.3 (Digital) / 100 A (2 modules)
  - +5 (Digital) / 50 A (1 module)

- Upgrage : mixed power configuration
  - +3.3 (Analog) / 100 A (2 modules)
  - +7 / 50 A (1 module) → DCDC
  - +3.3 (Digital) / 100 A (2 modules)
  - +7 / 50 A (1 module) → DCDC

- Actually our ADC are directly powered by the Maraton (no regulator)
  - Works well

- Could imagine to power part of our system with Maraton directly
  - DCDC would produce only some V
  - This has to be tested (prototypes)