



Power Working Group Summary

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Agenda POWER WG

- Status and plans of the EMC CMS-tracker upgrade project
- Status of the switched capacitor DC-DC converters for the upgraded LHC trackers
- DC-DC developments: future plans
- DC-DC modules: gained experience, material budget improvements, grounding aspects
- Integrated DC-DC converter in the FE-I4
- Coordinated developments for bulk supplies?
First discussion

Content

- Mainly DC/DC
 - Switched Capacitor DC/DC converters
 - Step-down
 - $\frac{1}{2}$ * input voltage
 - Step-up
 - 2 * input voltage
 - proposed in conjunction with serial power where you really prefer to regulate every node to the voltage required by the main consumer
 - Buck converters

Talks

- Cristina Esteban presented status and plans of the EMC CMS-tracker upgrade project

Talks

- Michal Bochenek presented status of switched capacitor DC/DC converters for tracker upgrades
- Two step-up and two step-down converters on die
- Tests on chips delivered in Feb2011 successful and Results are promising
 - radiation tolerance need to be improved
 - noise emission appear controllable by layout tricks and mounting options
- Plans
 - increase capacity and improve the radiation tolerance
 - System tests: larger system tests with more than one converter on a feed line etc.

Talks

- Stefano Michelis presented more details about issues with Amis4 and plans for Amis5
 - Integration
 - change pull-up voltage to 2.5V for power enable
 - change power good to open drain
 - Correct the Over Current protection
- The amis4 chip is perfectly suitable to do system tests
 - over-current detection can be disabled
 - in case too much current is demanded the chip will fail gently: voltage drop and or over-heat 😊

Talks

- Stefano presented slides of George Blanchot
 - DC/DC converter modules with the AMIS2 chip are available in small quantity
 - AMIS4 modules soon available
 - material budget reduction is given attention and a factor 3 appear to be reachable
 - E.g. decreased PCB thickness, change capacitor type, etc
 - Discussion between CERN and Aachen will continue in order to explain the somewhat different results concerning shielding efficiency v.s. shield copper thickness

Talks

- Laura Gonella presented the switched capacitor regulator of the FE-I4 chip
 - Good results
 - External configuration appear critical for noise performance

Switched Capacitor Converters

- Note that these are “raw” converters
 - An LDO needed for precision voltage which cuts into the overall efficiency

Conclusion

- Very good progress
- Reaching the moment when application specific tuning is required
 - Balance material, efficiency, reliability, cost, etc.
- The detector layout and grounding need to be re-tuned in for noise performance when changing between serial power and DC/DC converter power making it very difficult to compare the performance of the two schemes.
 - No big surprise...

Conclusion

- Competitive collaboration is fruitful
 - E.g. Aachen and CERN developing DC/DC modules, EMC shields, etc. is likely to yield better working detectors
- Ample time for large scale power system test before module production is highly desirable
- Philippe Farthouat initiated a discussion for common development of bulk supplies, discussion to be resumed during the next WG meeting in the spring 2012.