

MarlinTPC Review

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LC-TPC Collaboration Meeting
September 21/22, 2009
DESY

Large prototype and software

Benefits of large prototype effort from software point of view:

- Offers good opportunity to validate software
 - With realistic data
 - For different technologies (e. g. GEMs/Micromegas, pads/pixels, ...)
- Requires more realism in software
 - Multi-module reconstruction
 - Larger detector size calls for inclusion of more corrections
- Unprecedented chance to strengthen common software efforts (in parallel to hardware efforts)

Need for common software

- Finally use **validated software** to
 - Scale test beam performance to even larger TPCs
 - Compare performance of different technologies
- Evaluate/simulate **combined performance** of TPC with other sub-detectors
- Eventually **integrate TPC code in overall detector software** to evaluate TPC performance in collider environment and make physics analyses more realistic (e. g. proper consideration of pile-up)
- **Mutual benefit**
- **The devil is in the details**
("90 % of the software is written in 10 % of the time")
- Ensure **reproducibility** of results by collaborators

Software options

Could have used any software framework (e. g. GAUDI/ROOT based) but LC-TPC decided to use **LCIO** and **ILCSoft tools**

Advantages:

- Lightweight (rather easy to use)
- LCIO common basis for (almost) all LC related work (implementations in C++, Java, Fortran77)
- Can share as much functionality as possible with LC colleagues working on other sub-detectors or analyses (e. g. geometry and conditions data handling)
- Eventually simplifies integration of TPC code into overall detector software

MarlinTPC

- Development started in spring 2006 with first agreement on data format details, units, coordinate systems, etc.
- So far contributions by 15-20 people from several institutions
- Majority of developers work(ed) only part-time on MarlinTPC. Most of the work done by very few people.
- Most recent status report with description of working principles of available processors: [EUDET-Report-2008-09](#)

Need for action

- MarlinTPC still plagued by many bugs. **Validation** with real data and development of more **validation tools** essential.
- Handling of **conditions data** still unsolved issue (e. g. central DB server, ...)
- Lack of **alignment/calibration/correction** algorithms
- Better **task sharing** and **communication** between groups (some processors can only be developed by people with specific hardware expertise)
- **Diversify functionality** (technology specific processors are often only available for one particular technology)
- Write/improve **documentation**

Mismatch between hardware and software efforts

$O(\text{amount of software work}) \approx O(\text{amount of hardware work})$

Recommendation

My recommendation:

Ensure reproducibility and validation of results by collaborators

Benefits:

- Strengthens motivation to act in concert on software development
- Encourages people/groups to communicate more with each other
- Increases common interest to improve and contribute to MarlinTPC

As a consequence the pending issues will probably be addressed with higher priority and by more people