

A red logo consisting of three stylized, overlapping shapes resembling the letters 'L', 'M', and 'R' is positioned at the top left. A long red arrow extends horizontally from the right side of the logo across the top of the slide.

Concluding or closing remarks

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I will try not to bother you too long now
And that makes my life easier



Not a summary (too hard for me) but
a partial, biased, limited and personal view
of the conference and of the field.
I will not quote any talk in clear.

An opinion on the conference:

I found a pleasant atmosphere for exchanging and working together.
nothing aggressive, no complacence, questions, remarks.

There may be two reasons for that:

- the field is moving ahead and people feel good working on it,
- the organisers helped the spirit by the abundance and the quality of the wines,
of the food.



Calorimetry for the High Energy Frontier in Lyon

a good place for a conference with a title reminiscent of cooking.

Calorimetry: the art of measuring the energy of the particles, the know-how

The point, though,

is not simply to understand the principles of the measurement but to build calorimeters which bring an adequate response when integrated in detectors adequate to the physics.

But, building a detector adequate for the physics you consider implies (may be) to know how to build a calorimeter (is there a unique solution?), implying in turn an understanding of the art and know-how of calorimetry.

High Energy Frontier makes a rather homogeneous domain but happily there have been few other contributions.



What is the field?

Statistical approach of the conference

Repartition of the about 72 presentations

Sociology: exotica, LHC and p colliders, lepton colliders

More than half the talks on future calorimeters

CMS 15

ATLAS 8

LHCb 2

Alice 2

FCC-CEPC 4

Mu2e 1

Cosmic-neutrinos 3

ILC 15

Crystals, liquids, scintillators, silicon ..

Homogeneous / sampling

A large choice



Totally dominated by the technology, by big technological jumps coming from outside the community

This is evident for the number of cells, which has jumped by orders of magnitude, up to now the LHC experiments were rather shy

or with the time measurement, but here technology is not all the question

but more or less the same happens on the analysis software with the MVA revolution

Considering that now the main systematic is the presence of an analyst, we may have to draw the conclusion.



What is currently “à la mode” in the field

Following the technological trend, it has become very fashionable to season, pepper, your calorimeter with a huge quantity of high granularity, even though the word may cover widely different grain sizes.

LHC which was much less contaminated than LEP is just jumping in.

That gives you unprecedented capability for the separation of showers,
an essential ingredient for getting particle flow out of confusion,
this is what drives the effort,

but also

that gives you a large freedom to be insensitive to shape, to symmetries
(believing in the virtue of symmetries is an essential part of the physicist creed).

It is also an essential ingredient in the quest to precise timing.



What is currently “à la mode” in the field →

There is a strong interplay between cell size and time (t & T , propagation) and energy, the 5-dimensions world.

In particular, as often not noticed, at a given energy, in digital mode, the size controls the compensation.

Energy is the most peculiar dimension since, as a function of cell size, it brings you the number of crossing MIPs (+) which compensates too large a size or the fluctuations of stopping particles or nuclear debris (-) which degrade resolution. This is behind the behaviour of analogue / digital / semi-digital.

What is exactly the relevant information for a sampling calorimeter?

This forgets the longitudinal structure, often reduced to sampling

Introducing a rather precise timing is also fashionable in CMS or Atlas with good reason to try getting out of the mess of superposed events. This is surely a domain where creativity will bring great achievements may be on very different subjects like PFA. A shower is a causal succession of interactions not a radial one. To get rid of cosmic background, of backscatterings... Needs a detailed understanding and simulation of the signal generation.

By the way should we draw any conclusion from the fact that the a priori splendid resolution in CMS did not bring much on top of the sloppier Atlas resolution?

And what the funny toroidal magnets brought to Atlas?

Is it just by chance, does it mean that an armada of physicists is at the end able to extract all the juice? Would we dare to accept that the hardware performances do not weigh much?

Isn't it amazing to see the success of elaborate calibration schemes which, layer of corrections after layers of corrections jugulate a lot of seemingly uncontrolled effects and the associated systematics?

Would have it be better to control this at the level of the hardware design with a bit more imagination?

An interesting case of soft versus hard is the point of “compensation” where sometimes the points of view may look more religious than objective. Do you want to clear up things as early as possible (hard) or keep as much as possible information until you have the leisure to do it (soft). It depends probably on the case and on the way this problematic is integrated in the design.

An example of such a dilemma is the “trigger”. You may want to build “no trigger” experiments like ILD or develop sophisticated triggers as considered for LHC. But this is not a choice, it may be just a need. It is interesting to see that with the developing technology we move from a pure hard trigger to a “firm” trigger. The trend is reasonably to be as soft as possible, changeable, adaptable.



On the conference

96 registered people

The conference was socially very well organised, and is a success

What about the scientific, technical structure?

Two points:

The software seemed to me remarkably almost absent.

In the development of a calorimeter the software (reconstruction) is at least as important as the hardware, it is the key to evaluate the hardware.

Very few contributions,

is it because it is not today the main souci of the LHC people?

Is it because the people involved in the software do not feel that this is their conference?

It has been chosen to look by functions and not by detectors.

This may be a clever way to organise but it would be then very useful to start with global descriptions (hats) of the calorimetric problem rather than jump in the middle of the subtleties of calibration.

On the other way, to favour joined presentations of similar problems is really a plus

A handwritten signature in red ink, consisting of the letters 'L' and 'M' in a cursive style.



The End

Not quite



Than

ks

To the eleven program organisers,
To the local organisers for a conference with excellent spirit
Good and abundant food
Good and abundant alcoholic beverages (wine)
Nice landscapes.

More specifically thanks to those who made our life here nice and easy:

Imad

Gérald

Bernard

Jean

Laurent

and

Nadège

Catherine

Marion

See you next CHEF

In front of the Dirac building

