Advantages and Drawbacks for a silicon based ECAL

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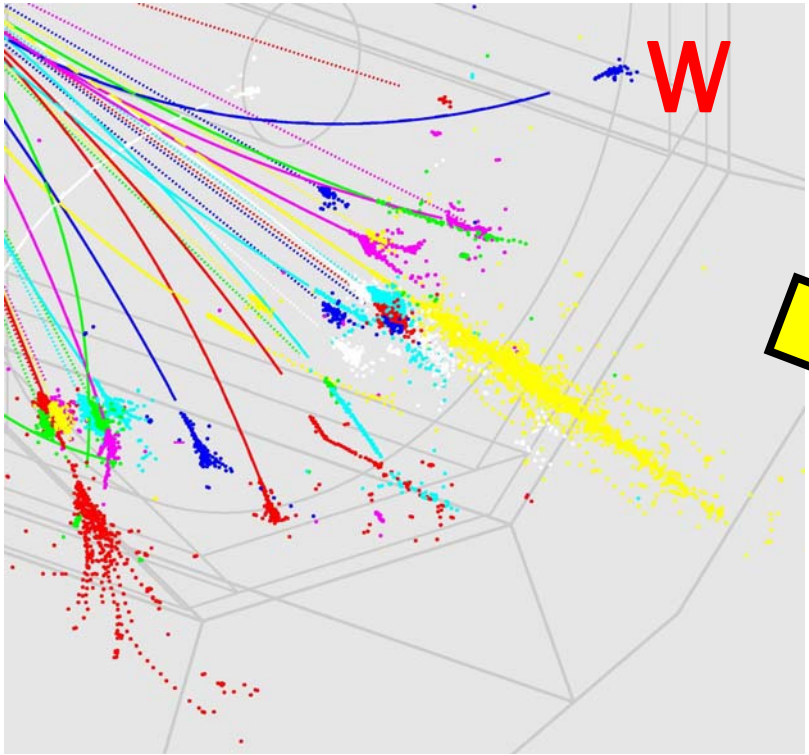
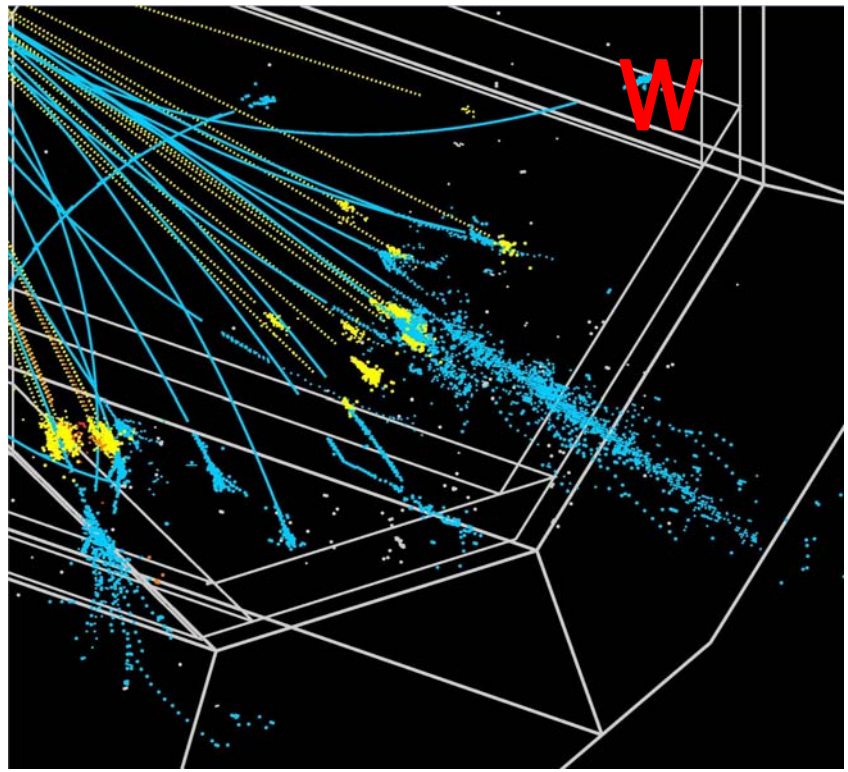


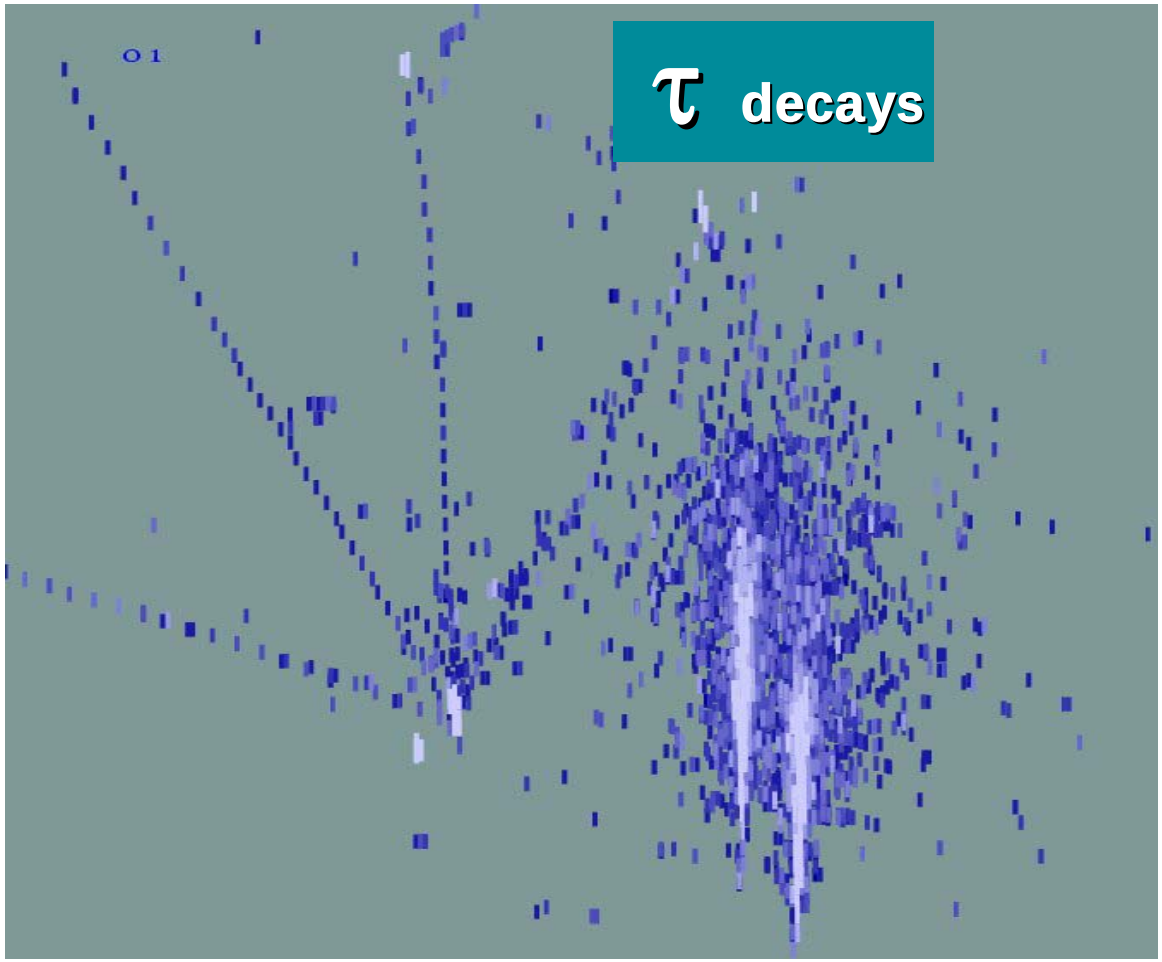
We want PFA to do that,

➔

Segmentation, granularity



We want also analyze the Tau Decays
i.e. for example to study the CP violation in the Higgs sector



PFA reconstruction

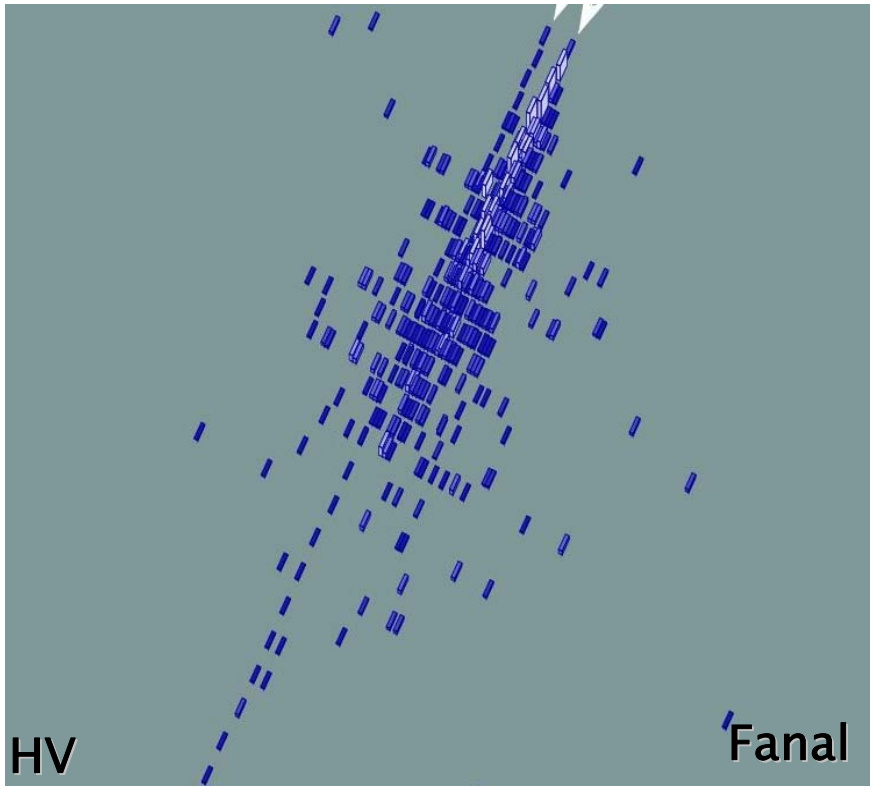
With granularity in the ECAL

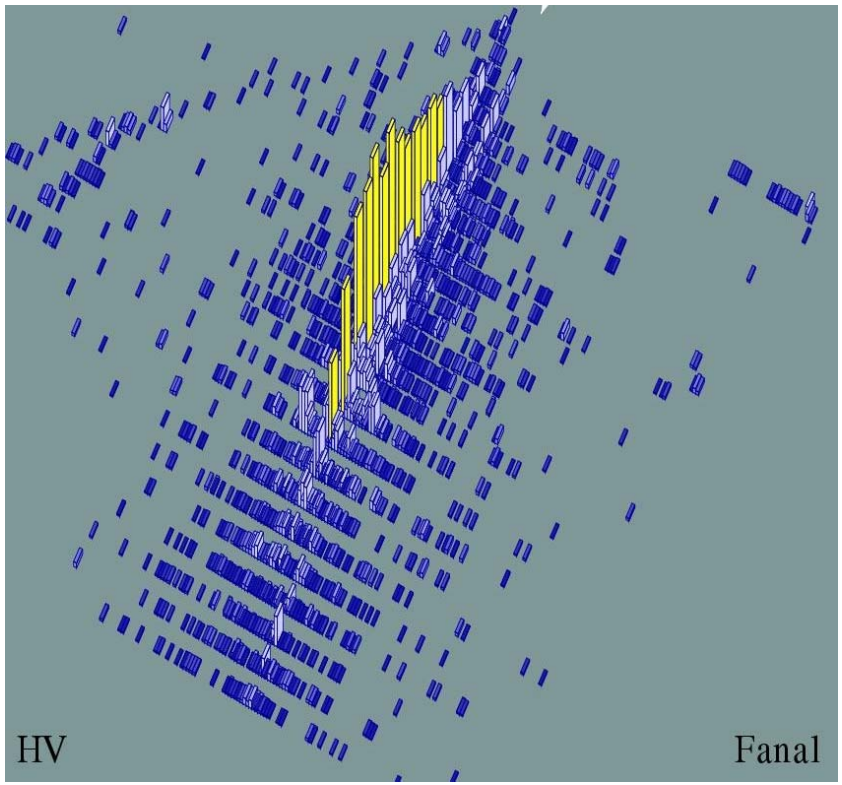
EASY JOB !!

ECAL with pad size of 1x1 mm²

But these ones,

IMPOSSIBLE without granularity





WARNING

The separability is NOT the precision on the position

i.e. going from 1mm to 7mm pad size changes the precision on position by only 15% while the separability is of course totally different (see talk by HV in PFA session)

The ECAL has to have

1) A good separability between close shower
2) A QUASI Perfect efficiency to find photons in jet
3) A QUASI Perfect efficiency to find neutral hadrons in jet
4) A good separability e/π
5) A good reconstruction of photon direction (GMSB, long life particle),
6) An ECAL which allows to analyse the tau decays

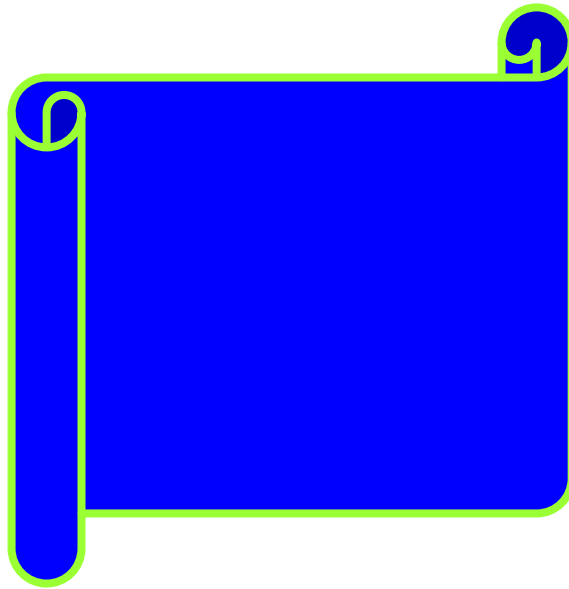
Together with a detector

a) as compact as possible (cost et feasibility of the magnet)
b) A running in a B-field from 3 to 5 T
c) A running stable with time, temperature, noise from machine,…

Separation and reconstruction are more important than the energy resolution itself

Main advantages to use silicon as active device in ECAL

- **Easy to have small pad size** (we want it as small as possible)
- Granularity ➔ large number of channels ➔ calibration problem ..... **Not a problem with a stable behavior** (with time, temp., radiation, etc…)
- A good **uniformity of response**
- **easy to integrate the electronics readout**
- A very good **signal/noise** for a mip at detector level
- **Working in a B-field up to 5T** (whatever the angle)
- Working in **possibly dirty environment** (but not horrible like LHC)
- Doesn't need high voltage, gas, water, coolant,...



At 2-3 $/cm² for the silicon

The jet energy resolution going from $0.3\sqrt{E}$ to $0.6\sqrt{E}$ is equivalent to a loss of

1 year of running every 3 years !!!
that is

about 120 M$

R&D on industrial aspect of the production

> maximise the production rate
> minimise the number of masks
> develop contact with ≧ 3 producers
> minimise the Xtalk , coherent behaviour, etc…

Other R&D and questions

> Gluing or bonding ?

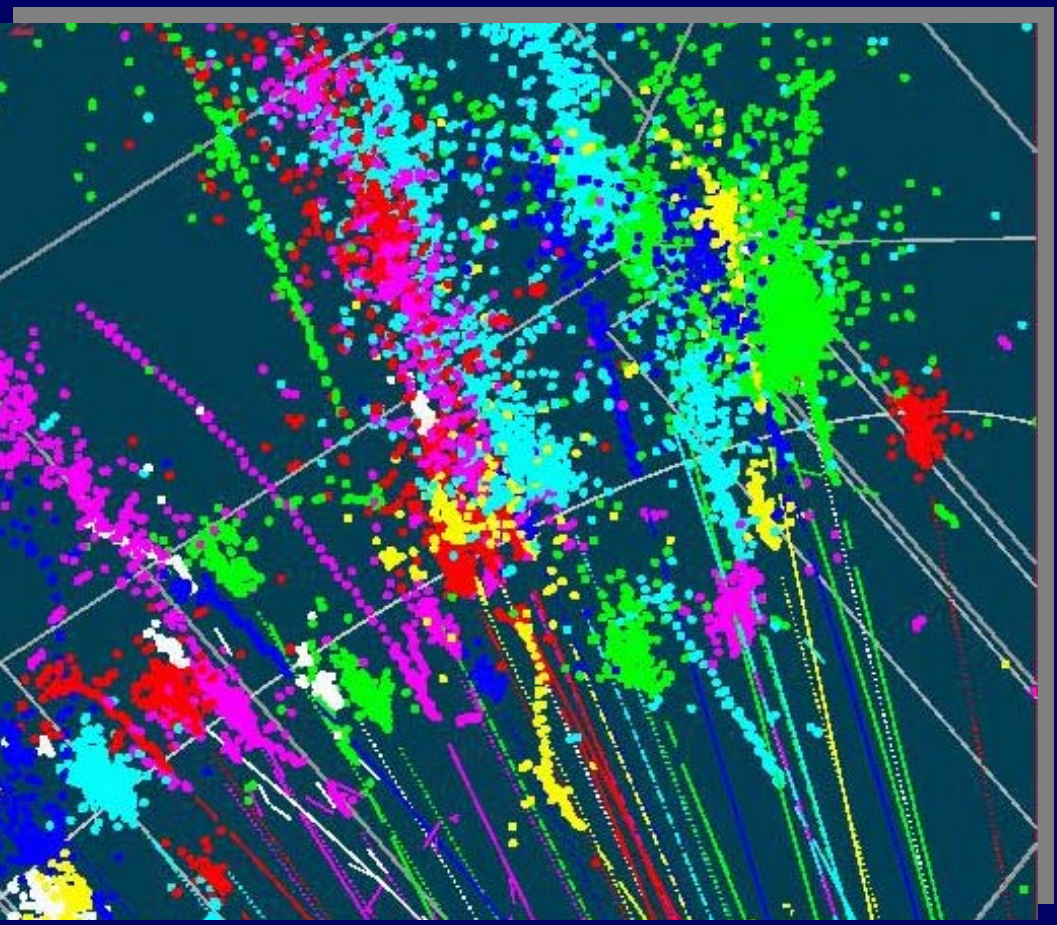
> VFE with/without ADC included ?

> VFE bump-bonded on wafer or not ?

> local storage during bunch train ?
when to do the zero suppress ?

> Optimum pad size for electronics (thermal), physics, …

For the calorimeter



granularity

granularity

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Silicon active device

is there any other choice for granularity??