Feedback of some iOS and Android usage in HEP and Astronomy

JoSy / October 4, 2016

2010

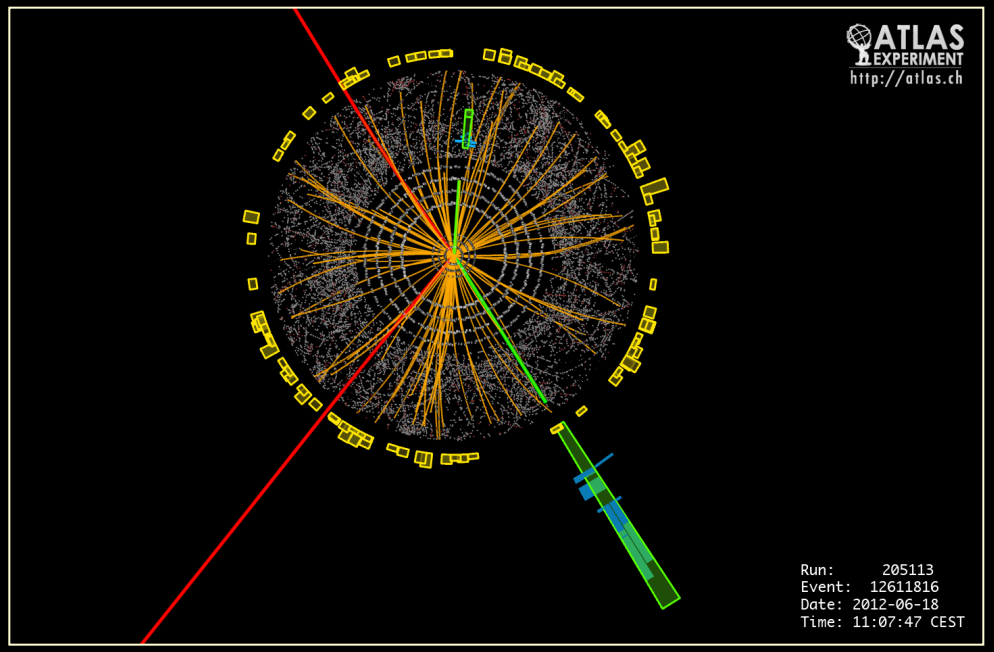
- iPad :  (RIP +5 !)

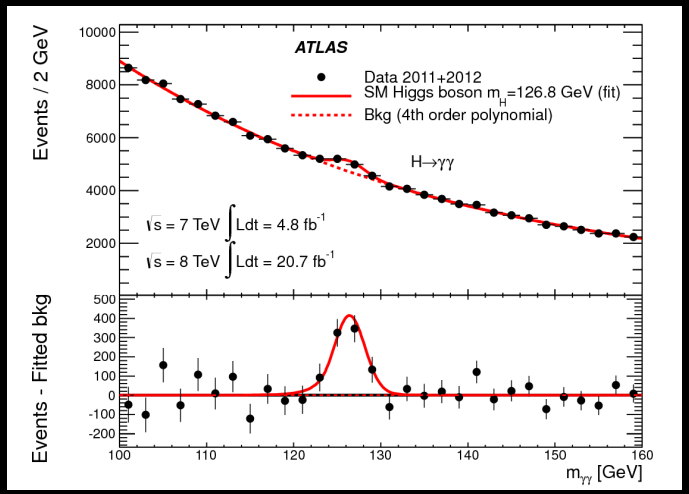
- Android tablets shortly after.
- The « app store » : Apple AppStore, AndroidMarket.
- Little wall of screens at LAL : 

I reconsider the way I do graphics and interactivity in general around my activity in HEP (High Energy Physics).

Redo the graphics ?

- In fact the kind of graphics that we do on our experiments :





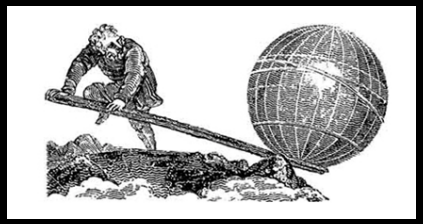
- Then squares, straight lines and points with, let's be crazzy, some text !

mid-2010 / begin 2011 : at work !

- Before : OpenGL, Coin3D, Motif, gtk, Qt, scripting (tcl, python) : none of these were available on iOS & Android.

iOS : Objective-C, UIKit, GL-ES.
Android : java, View, GL-ES.

- But C/C++ and GL-ES are common : we build on that.
  Also available on Linux, macOS, Windows !
- Huge expertise of OpenInventor (Coin3D)
- I redo (refactor) a « scene graph manager ».
- We do also the GUI with that ! (then on GL-ES).
- 99% of the code is common for all platforms.



Then…

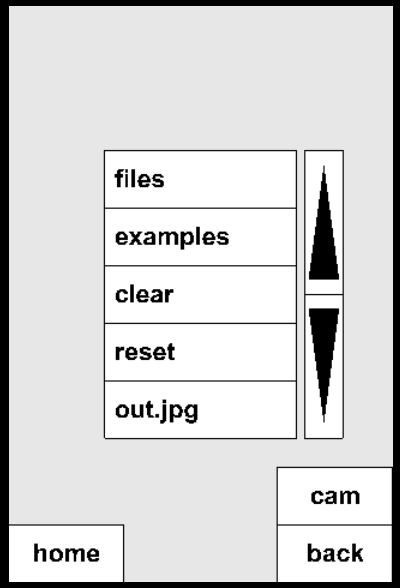
- iOS : we do a minimum of Objective-C.
- Android : we do a minimum of java (a maximum of NDK).

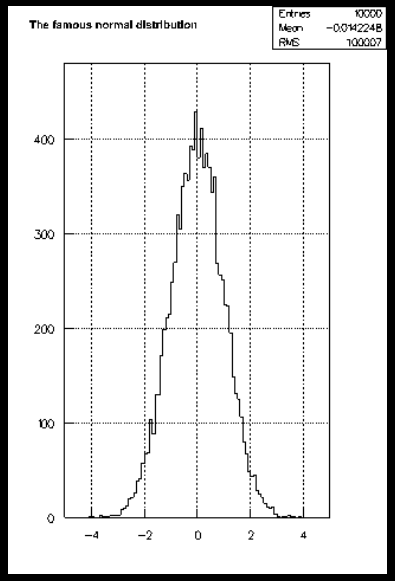
- To Tim, Sundar, Satya, Linus I ask only : one C++ compiler, one area to do some GL-ES and a way to get "touch" (or "pick") events and that's all !

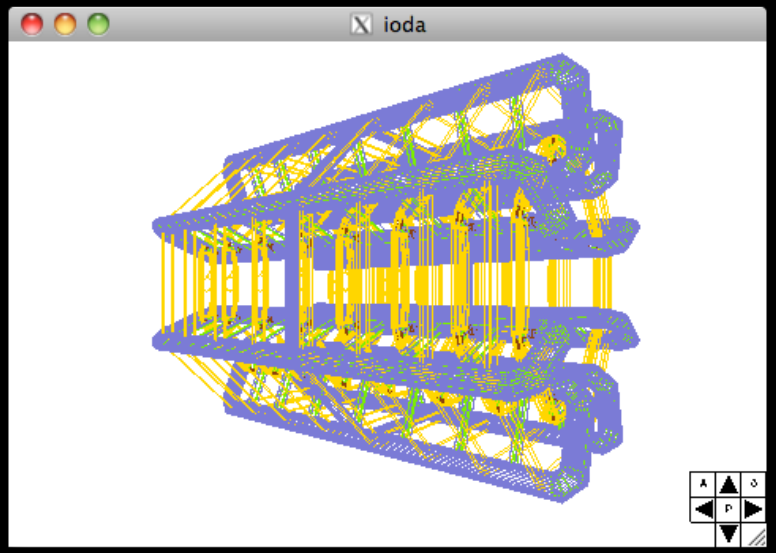
- And with that (and four devices)
  I redo my needed world.
  (which is not all the world)

Begin 2011 / ioda

- IODA : first « app » on the stores oriented « analysis » : visualisation of histograms from a local file at the CERN-ROOT format and a little bit of detector (format Saclay/fog) :







- First of all amazingly easy world wide deployement through the Apple Store and Android Market (now Google Play) : huge progress !
- 99% of the code common to all platforms.

ioda / softinex

- IODA gently evolves toward a viewer of various file formats :
  - HEP : root (histograms, ntuples, geometries), gdml (geometries Geant4), heprep (geometries).
  - Astro : fits (astro images, tables), hdf5 (histograms, ntuples).
  - Also : VRML (with Coin3D finally ported on iOS and Android), png, jpeg.

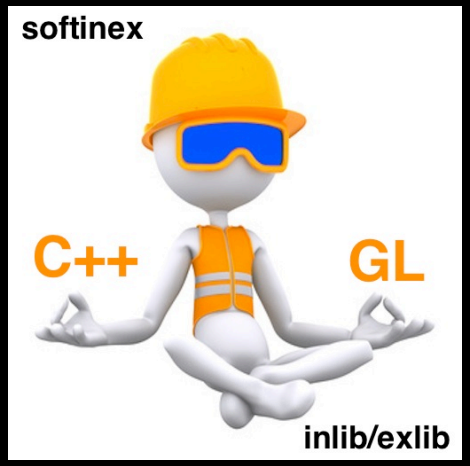
- I do the port of : cfitsio, hdf5, Coin3D, png, jpeg, etc...

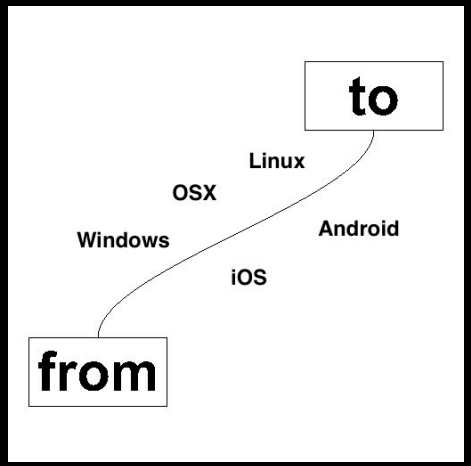
- We build a code toolbox of all that in the softinex libraries (inlib, exlib, ourex). http://softinex.lal.in2p3.fr

softinex

- inlib : code C/C++ « pure header » highly portable.
- exlib : code C/C++ doing the relationship with « external packages ».
- ourex : versions of « critical » external packages as freetype, expat, png, jpeg, zlib, zip for which we master, embark the sources. But also cfitsio, hdf5, Coin3D, lua, Python (2.7) and… Geant4 (yes, yes).

- In softinex, there are strong choices about the developments... (close to a philosophy ☺)

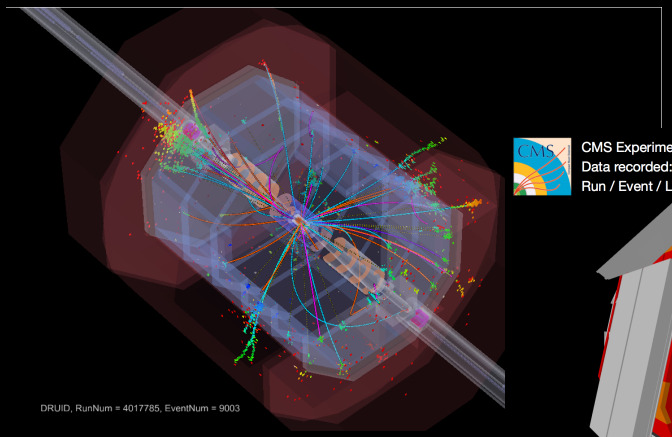


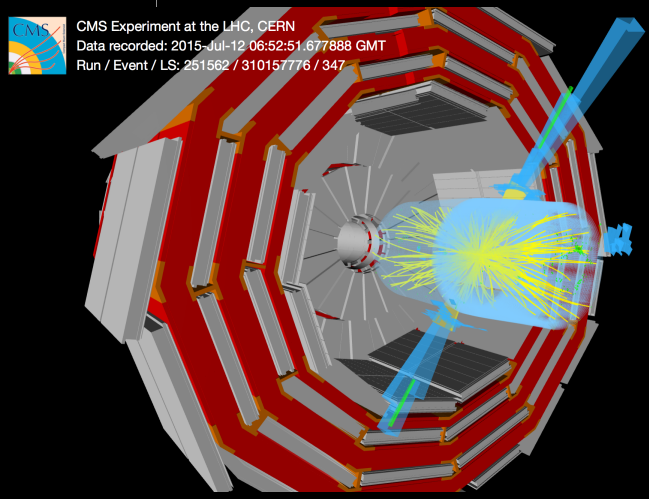


Link with experiments

ioda, g4view are generic apps, but we would like to build dedicated apps for the experiments, in particular « event display » by exploiting local capacities of devices.

- pmx : LHCb.
- agora : ATLAS.
- nemoview : NEMO3.
- TouchSky : LSST.

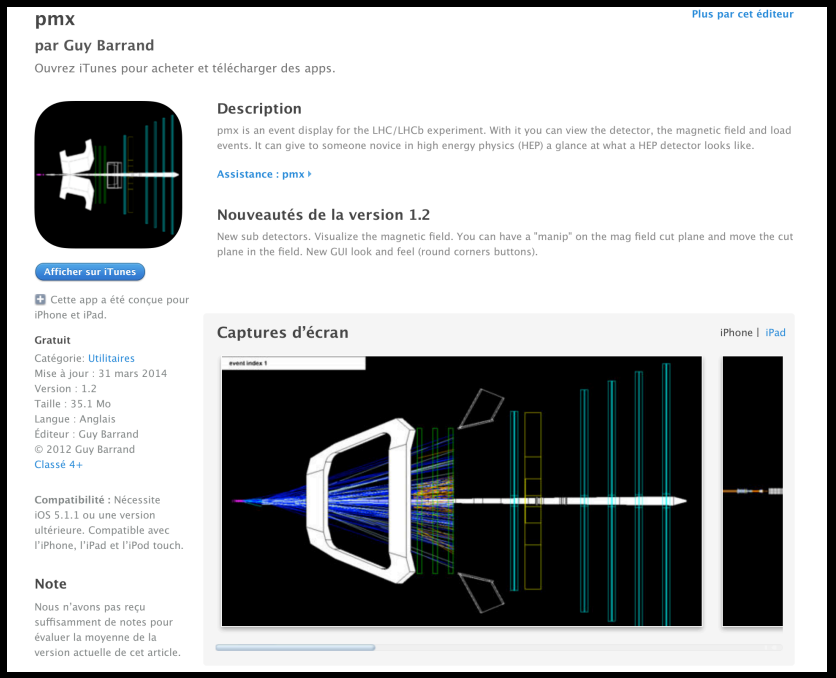


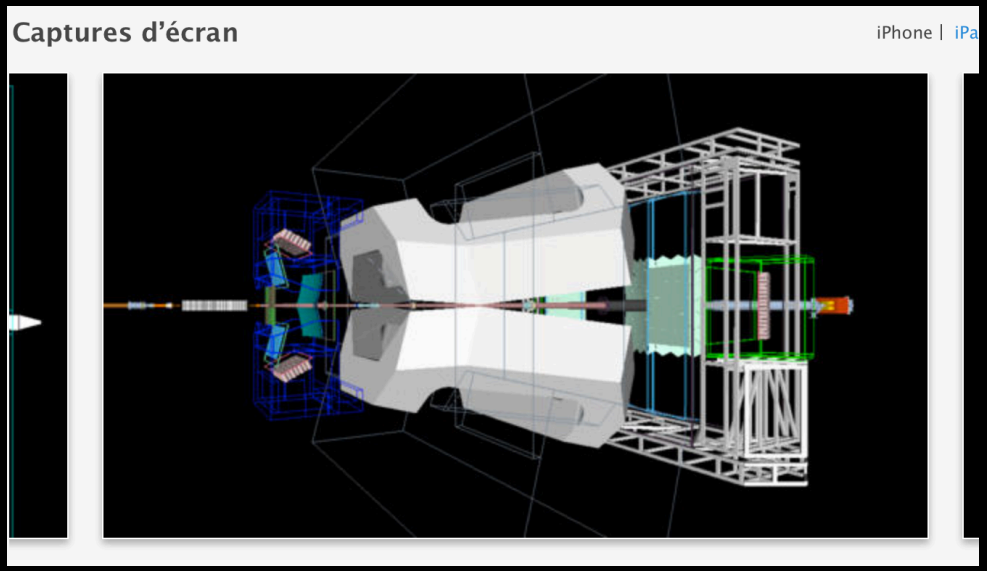


But here, it blocks….

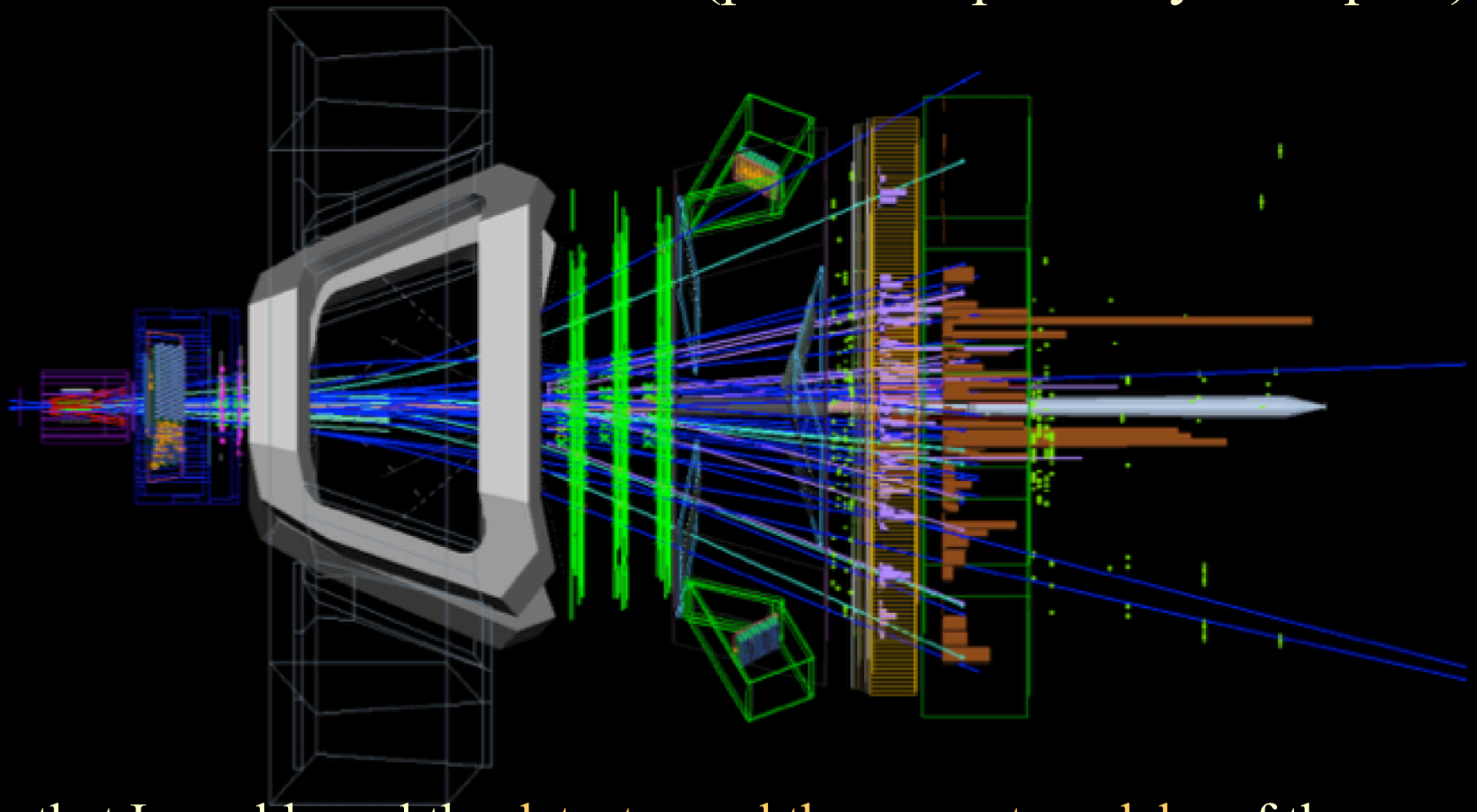
pmx

Demonstrator app that can show the LHCb detector (read from a root file) and can show some tracks of data from a dst root file.





but I would like to have that (produced painfully on lxplus) :



For that I would need the detector and the « event model » of the experiment and I WILL NEVER HAVE THAT ! ☹

Why ?

Software philosophies…

- Applelian approach of the net : we give to people devices with highly added vitamins : intelligence, visualisation and interactive power are in the hands of people, only some data are in the servers. Apple is deeply attached to the « great user experience » with their devices.

- Googlelian approach of the net : all are in the servers (at Google !) (and then at the NSA ☺ ☹), data but also intelligence. For the visu and interactivity we give only to people devices « showing a final picture » (some Kindle would be ok for them).

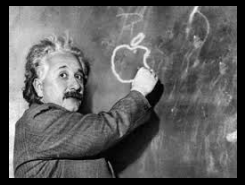
I am an Apple Guy ! ☺

Alas HEP is Googlelian ! ☹

The « blind batch » is preponderant : this came from the nature of the physics which is done which is intrinsically statistics (Heisenberg, God, dice, etc… *). It is needed to « crunch » a lot of events and this is done « server side » (on the « grids »).

Huge impact on the software which is some kind of big « patchwork » heteroclite and highly not portable ! (We even can't say that it is portable Linux since it is highly dependant of a distribution, even of a version of a distribution !).

* Heisenberg was a man with principles but sure of nothing. (Probability of what ?)



Alas HEP is Googlelian ! ☹

But a HEP event display needs the detector and the event models of the experiment that are, alas, « immersed » in these « batchian » codes.

It would be needed to do the effort to « extract » (with forceps now) these parts to be able to embark them on the devices to do display locally. (Only « event files » would be server side and brought locally at need).

Sociological blocking

- Technically, isolate detector and event models is possible ; after all it is only C++ code to reorganise for which we have the source code.
- But there are clearly sociological blockings in particular in labs with a deep Googlelian spirit (CERN).

- HEP goes straight toward « all by the web », including the displays with, alas, web apps with poor reactivity for the (remote) user :

forever poor user experience !

(more or less as « lxplus remote experience » in the afternoon).

A pitty, because already in July 2012 we could have put the Higgs in the pocket of a good part of humankind : huge outreach mishit of CERN & Co !

Interactivity through the web ?

- Arrange as you want, a web approach accumulates hardware and sofware layers between the data and the user ! And each layer introduces a loss of reactivity of the interactivity !

It works but « ça rame » ! ☹

- And the last « cloud » tendency to pass, server side, by virtual machine gaz plant systems adds a huge layer !

- A lot of people understood that and have now dedicated apps : e-commerce, banks, TV programs, Paris vélib, etc…

Interactivity through the web ?

HEP… sigh, deep sigh

Workshop Gaudi 21/Sep/2016

Simplifying development and compilation

Developers would like to be able to compile Gaudi on their own machine

Action item 8:
Port Gaudi to Mac

Action item 9:
Port Gaudi to Ubuntu

Action item 10:
Separate optional subsystems and introduce configuration switches

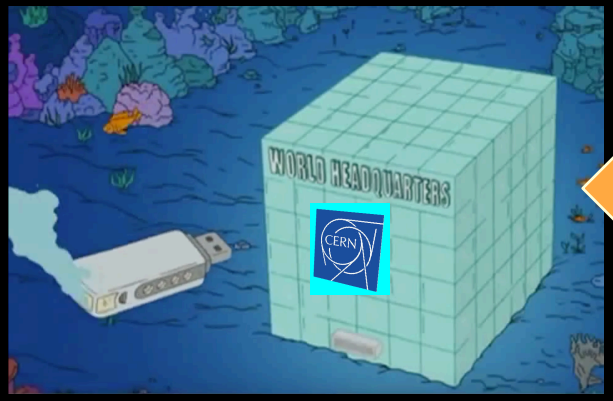
At last ! And iOS, Android then for… 2050 !
But the Mac is more scandalous.

Rodrigue, as tu des coeurs ?

Multicore, GPU, HSF : today buzzwords ! And we add an extra huge layer of complexity ! To gain what ? A factor 2 ?
(The essential of where we pass time in HEP is not parallelisable nor vectorisable ! The CERN Cray revolutionised nothing)

And the code will run only on one type of processor and then only on one platform : the CERN gridaplus.

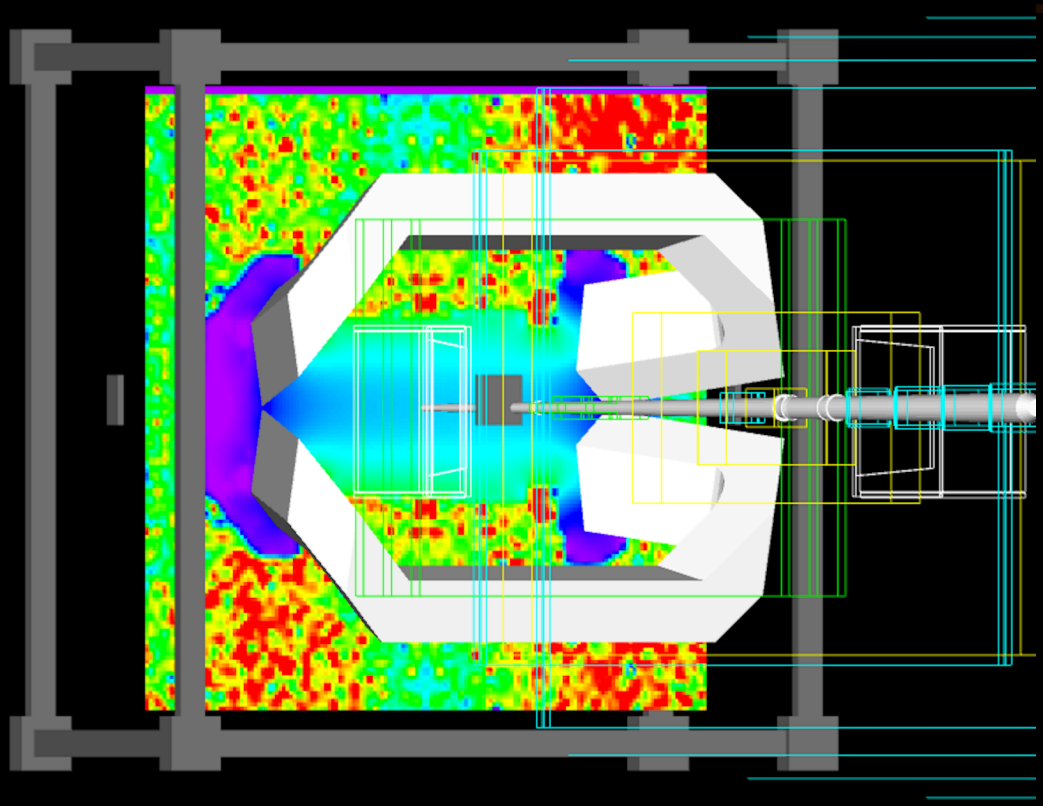
And HEP will have terminated its Googlelisation



Data center under the Lake Geneva

(Yippe, the iPhone7 is water proof !)

A magnetic story



pmx : reading of « field map » : 30 secs => 5 secs ! 6 factor.

Instead of supercomputers, we should equip developers of « HEP frameworks » with iPads !

A little comparison…

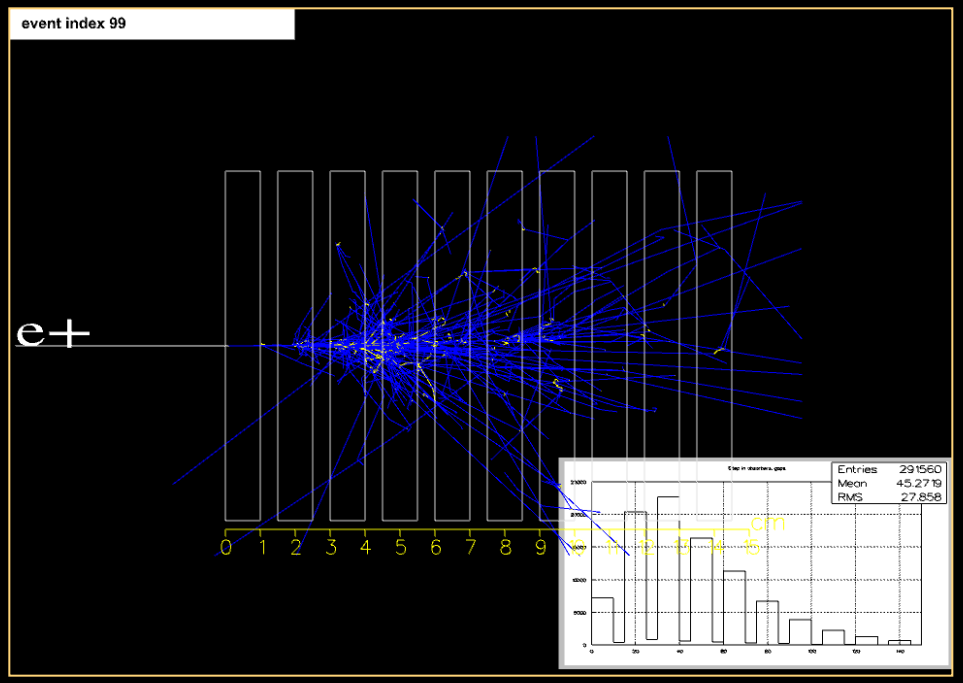
- The .apk of pmx for Android is 25 Megas, fast startup time (< 3secs), code highly portable, fluid 3D (exploiting the local GPU).

- This is to be compared with a display done over a batch patchwork where the distrib does… 30 Gigas ! (3x the size of an OS as macOS !), time to get the GUI of more than one minute ! (yes, yes), and intrinsically not-portable (and on the Mac, we have to pass by a gaz plant virtual machine). ☹ (an interactive disaster).

(Rule of the "3 secs" : if after a click/touch the user has a feedback after more than 3 seconds, he starts to be nervous...)

The Big Geant(4)

- Geant4 : flagship of HEP simulation
- g4view on the stores in 2012. Mainly no blocking points at the level of the code of Geant4 itself ! (on a 9.3 release).
- But iOS & Android still ignored by the « collaboration » and the « vis » group in particular ! ☹



The « collaborations » ?

Huge collaboration  High code quality

- A collaboration permits to be complete (exa : description of the whole detector, all physics processes for a simulation), but it leads toward a « patchworkian » heteroclite assembly hardly maintainable on the long term.
- Tools (as « continuous integration » *) will not be sufficient to raise the level because they do not solve the sociological problems (exa : highly productive people that do not share the same « vision » of things).

* I follow now a « quantised desintegration » process ☺

HEP in a nut… shell !

« event » trapped in a thick and tough software shell (ROOT+Gaudi+…).

uh... me !

sometime receiving lightening strikes

Toward infinitely… big

I look toward the sky !

I change scale : 10^{-15} => 10^{+15} !!! Astro/LSST.

On astro side, visualisation is in the « software equation » from start. (Visualisation was in startup specifications of LSST).

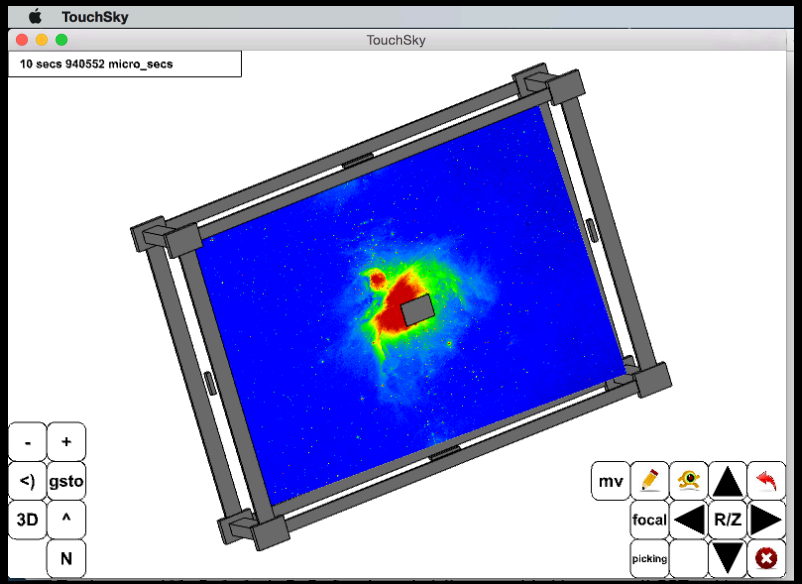
Astro and interactivity

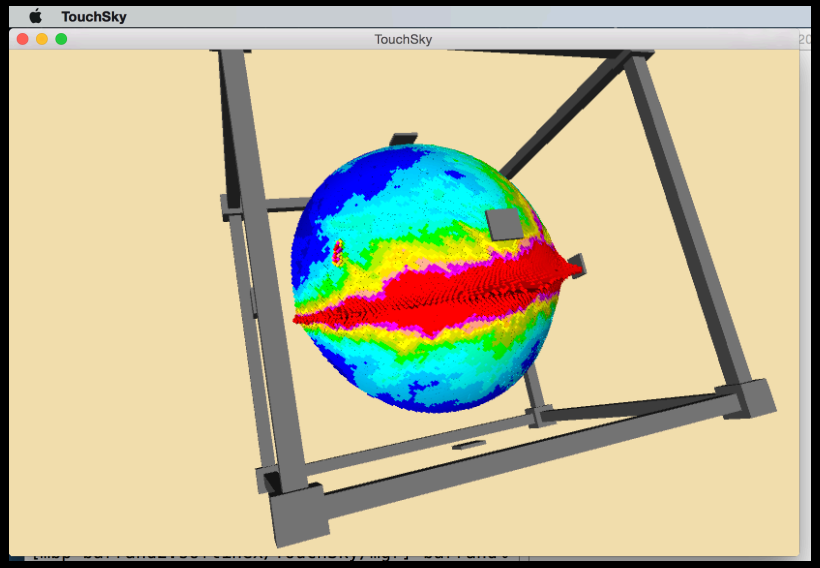
- Applelian community (in particular with hobbyists !) very active on iOS on Android ! With apps exploiting the gyro and magneto meters for localisation and orientation of the device. (I love « SkyMap »).
- BUT the Google spirit is here too around big instruments and around the « surveys ». Clearly there is also a « all by the web » approach for visualisation on LSST (firefly). (Their « stack » is now very « batchian »).
- Wedding possible ? If yes, this community has cards in hands to do very « sexy » things.

A huge différence with HEP, is that they are not trapped by an event and detector model ! And that their file format (fits) is readable everywhere with light sofware dedicated to the IO. (But be careful of the « catalogs »…)

TouchSky

- TouchSky : very « humble » app to play with this kind of data : reading of fits files, HEALPIX visualisation, dynamical spherical cap projection, etc…
- Visualisation of a « big picture » (40x40k) with navigation in some tiled multi-résolution pyramid (yes, yes it exits)
- But connection with the surveys not so clear yet...






EXIT

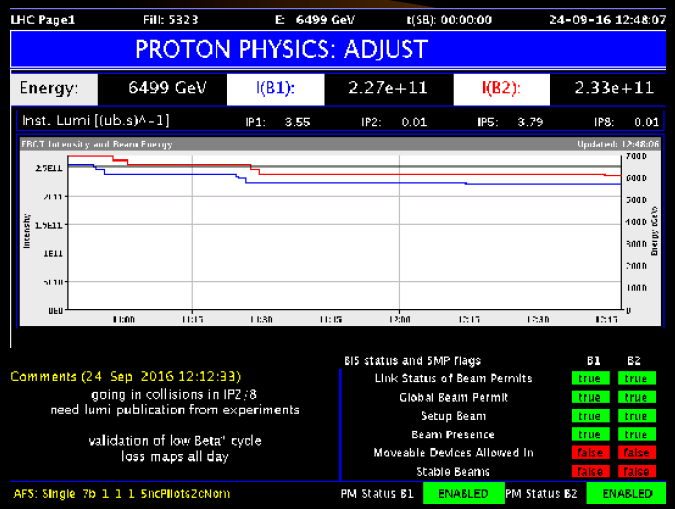
My apps

- ioda : “analysis” viewer.
- pmx : demonstrator (alas) of an event display for LHCb.
- agora : demonstrator (alas too) of an event display for ATLAS.
- g4exa : a Geant4 example.
- g4view : a viewer for Geant4.
- LHCStatus : show the status of the LHC : appli the most simple and the most installed so far ! But rejected by Apple !
- TouchSky : astro.
- ArcheryTune : hobbyist app done with J.E.Campagne for Archery. (Guess what is on my targets ?)

- Difficult to have usage stats, we are going to say between 500 et 1000 installations (people that keep an app).

LHCStatus, one word…

LHCStatus : show the status of LHC



app the most simple and the most installed on GooglePlay !

But rejected by Apple because easily doable in HTML : what ? hell !

Tim : I do not want to pass by a web browser !

But it is available in the agora app and ioda/exemples (hell).

http://softinex.lal.in2p3.fr

- See softinex portal.
- See usage demos on YouTube (search « Guy Barrand »)
  (Ok, ok, it is not Hollywood)

- (take care, I have a British namesake doing presentations about finance) (but me, I may explain how to be from your own pocket to do software for science ☺).

Virtual reality ?

- Cardboard VR : well adapted to the budget « visualisation/ interactivity» of my Googolo-HEPian lab ☺ . I started to write some code...

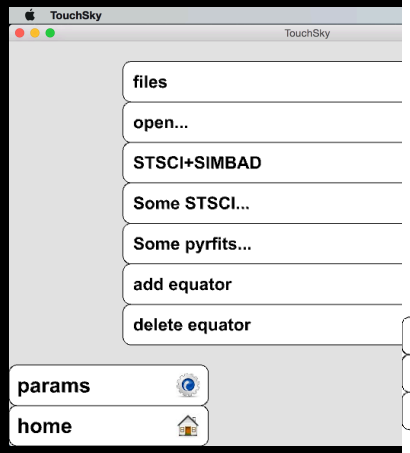
- Phone, Tablet as a base for immersive extensions ?

We may dream…

Conclusions

- Interactivity : reactivity + ergonomy + portability.
- We are going to have more and more power in the pocket of people (1To for 2020 ?) : it would be highly stupid to ignore that, at least for outreach !
- HEP… ? Sigh. At least one Guy tries...
- Astro, other science areas : probably here that sexy and nice things are going to be done !
- Visualisation must be in the starting equation...
- Things (still) move. VR ? Augmented reality ?

Some dessert….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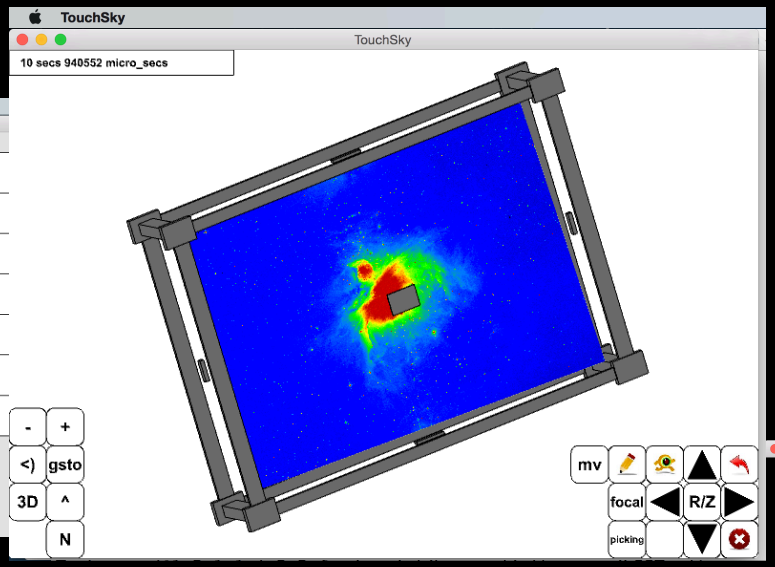
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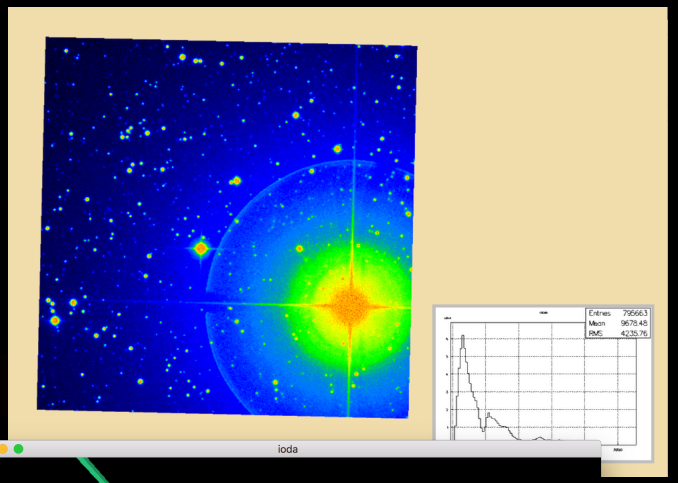

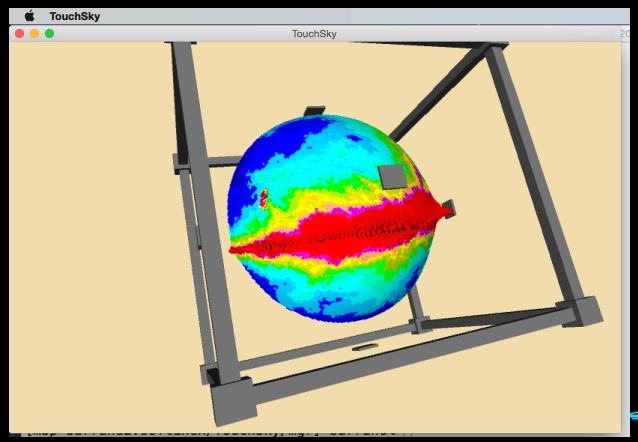
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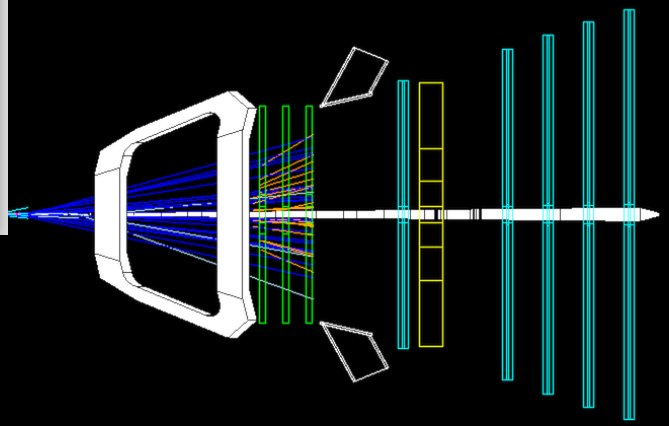
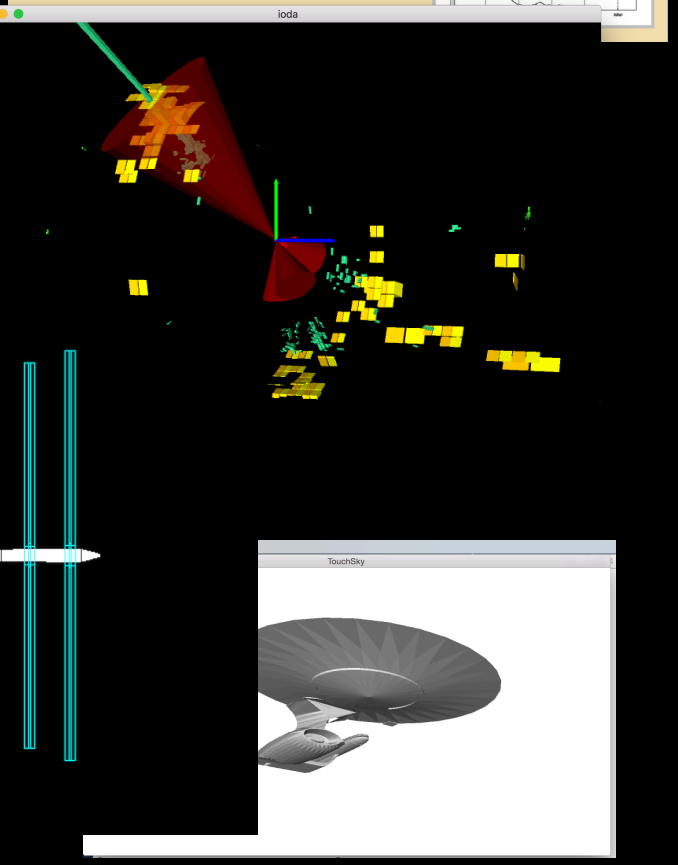
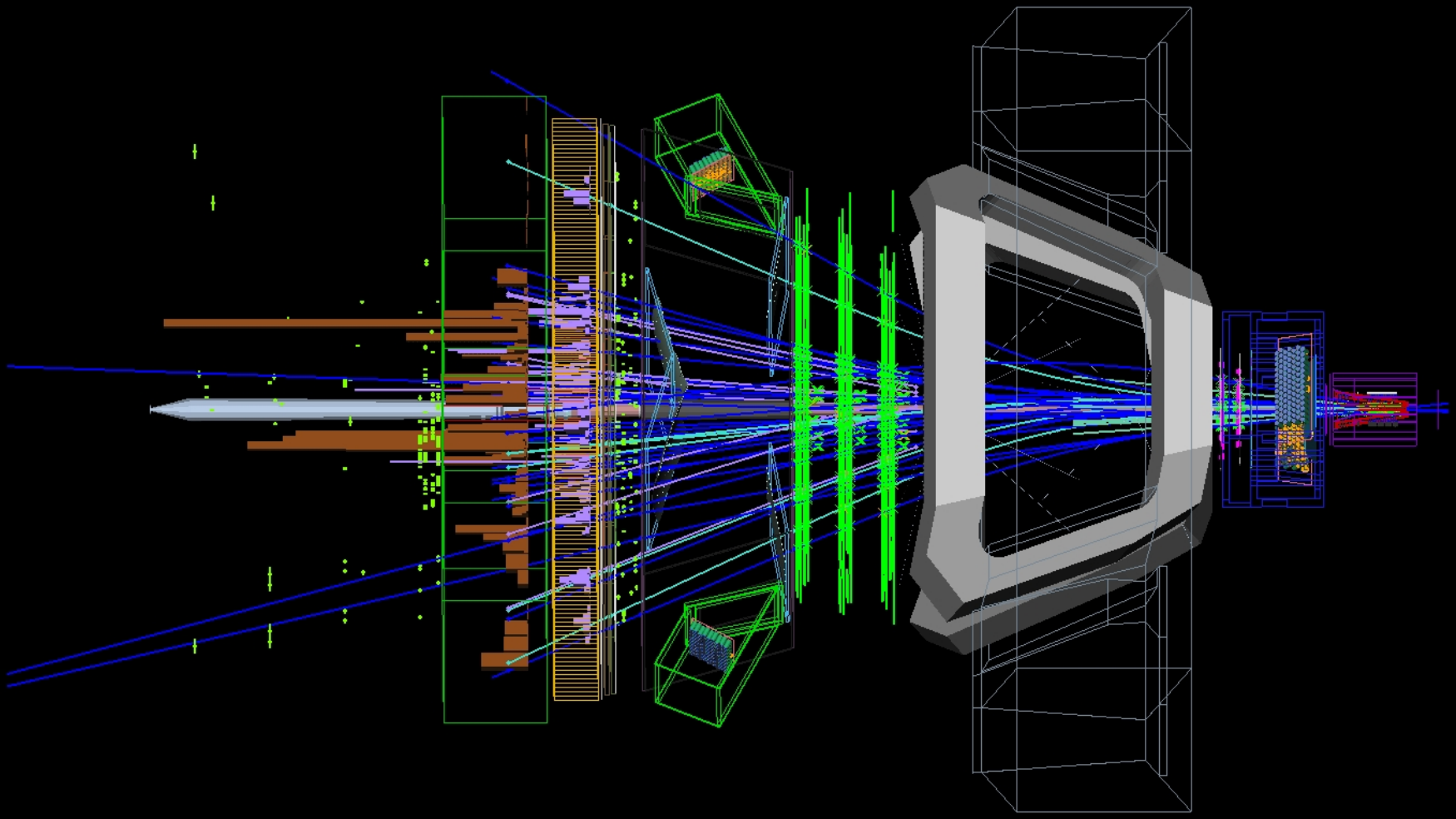
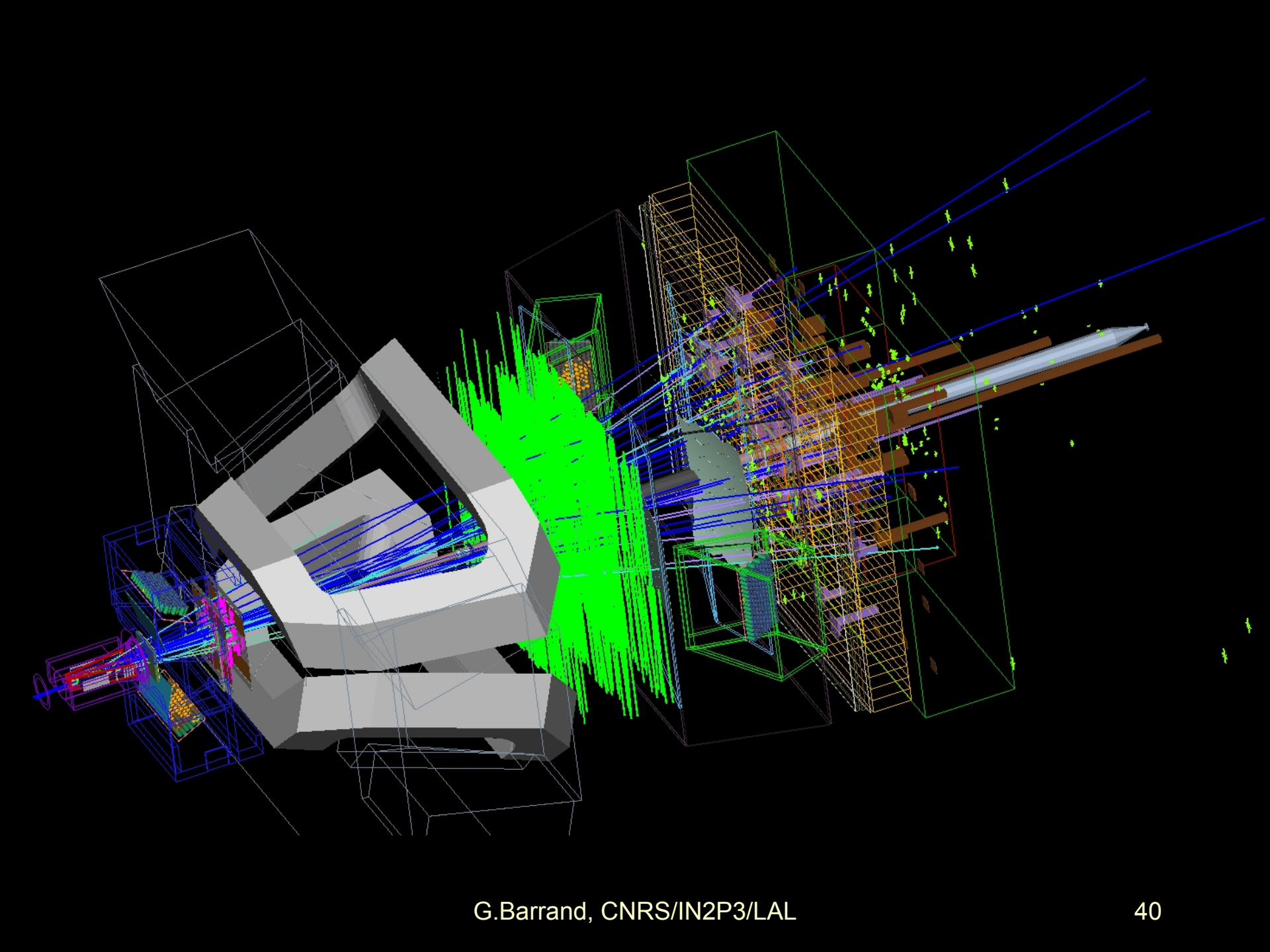
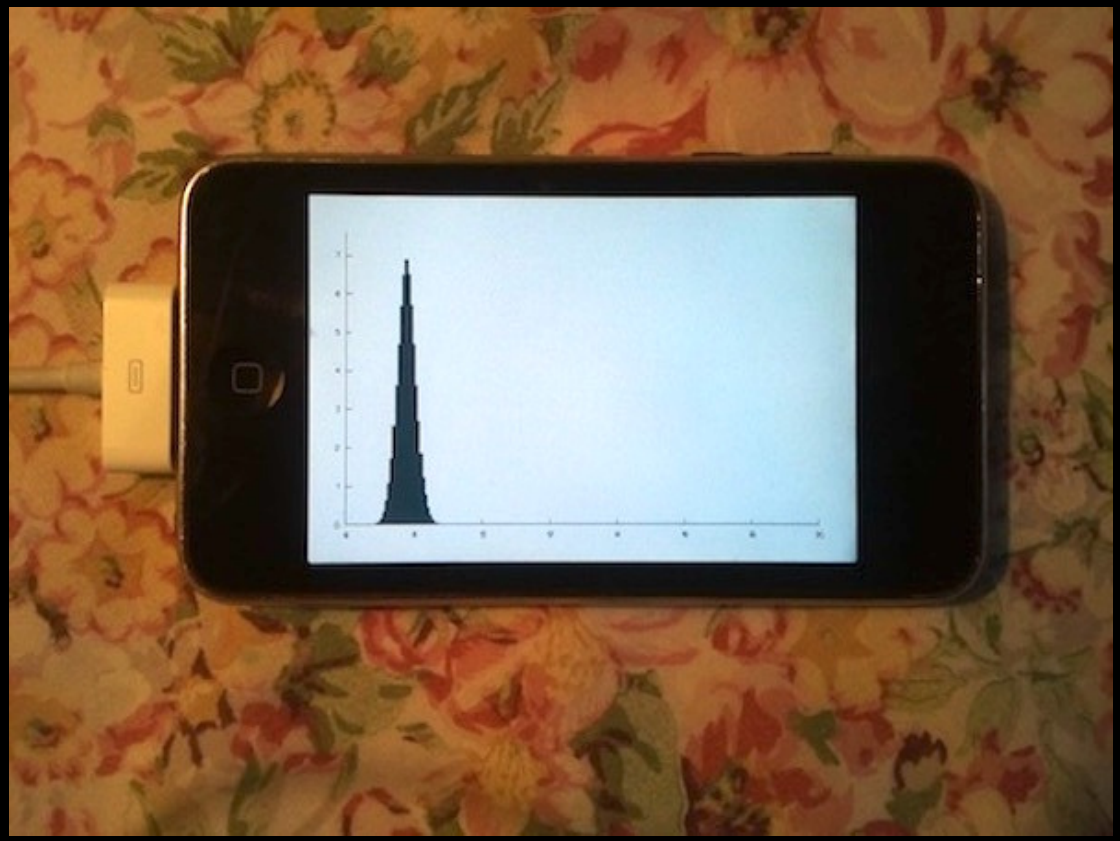



ioda
TouchSky







First plot on an iPod touch, 12 Novembre 2010.