

LPNHE/ILP Research Highlights

ILP in the next 12 months

Reynald Pain /LPNHE

LPNHE/ILP research highlights

- ▶ A word on LPNHE
- ▶ LPNHE ILP research focus
- ▶ Past and current ILP supports to LPNHE teams
- ▶ Future directions/priorities

Laboratoire de Physique Nucléaire et de Hautes Energies UMR 7585 - CNRS/IN2P3 UPMC et UPD

Located NW corner of Jussieu Campus [(partial) view on Notre-Dame]
Tour 12-22 floors SS-RC-1-2 and Tour 12-13 floors SS-RC-1



LPNHE in one slide

- ▶ ~25 permanent CNRS Researchers
- ▶ ~25 permanent UPMC (16) and UPD Professors
- ▶ ~40 post-docs and students

- ▶ 3 “disciplines” : **Particle Physics, Particle Astrophysics and Cosmology**

- ▶ Mostly **Experimental** and **Observational** Physics
“Our theoretical experts are at nearby LPTHE (Particle Physics, Cosmology) and IAP (Particle Astrophysics and Cosmology)”

- ▶ ~50 Administrative and Technical staff

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Experimental Context

INTERNATIONAL INFRASTRUCTURES



LARGE ACCELERATORS

- CERN/LHC : ATLAS and LHCb
- SLAC, Fermilab : BaBar, D0 & CDF
- TOKAI : T2K



LARGE OBSERVATORIES

- Namibie : HESS
- Argentina : Auger
- Hawaii, Chili, Australia : SN, LSST



LPNHE research

- ▶ Focus on (solving) 4 (fundamental) scientific questions:
 - What are the **Fundamental Interactions** and what is the origin of Particle **masses** (Higgs)? :
 - projects : D0, LHC (ATLAS, LHCb, ..)
 - Understanding Matter–Antimatter **Asymmetry** (CP violation) and **flavor** physics (heavy quarks, neutrino mixing and masses, ..)?
 - projects : LHCb, T2K, ..
 - What are the Nature and Origin of **Cosmic Ray** (charged and neutral)?
 - projects : Auger, HESS, CTA
 - What are **Dark Matter** and **Dark Energy**?
 - projects : Supernova Cosmology, LSST, EUCLID, ...

LPNHE research focus in ILP context

- ▶ Primordial Universe, Inflation and non gaussianity
- ▶ Reionisation, first objects and **structure formation**
- ▶ String theory and black holes
- ▶ **Dark Energy and Dark Matter**
- ▶ **Higgs Boson and standard Model**

ILP support to LPNHE teams

- ▶ PhD :
 - Mattieu Chretien (Particle Astrophysics / HESS)
Dark Matter search
 - Ayan Mitra (Cosmology/SN)
Lensing of Supernovae
 - Matej Pavin (Particle Physics/ T2K)
Neutrino mixing (θ_{13} angle)

- ▶ Post-Docs :
 - Ioana Maris → Mariangela Settimo (Particle Astrophysics/ Auger)
CR composition from Cosmogenic Photons
 - Paolo Francavilla (Particle Physics / ATLAS)
Higgs and new physics at LHC

ILP support to LPNHE teams

- ▶ Other supports:

Visitors (short and longer term) :

several each year in all themes

Scientific “Animation” :

funding of several workshops

funding help for schools and conferences

Communication

These items (in particular funding for visitors and workshops) are very much appreciated

ILP LPNHE scientific Highlights

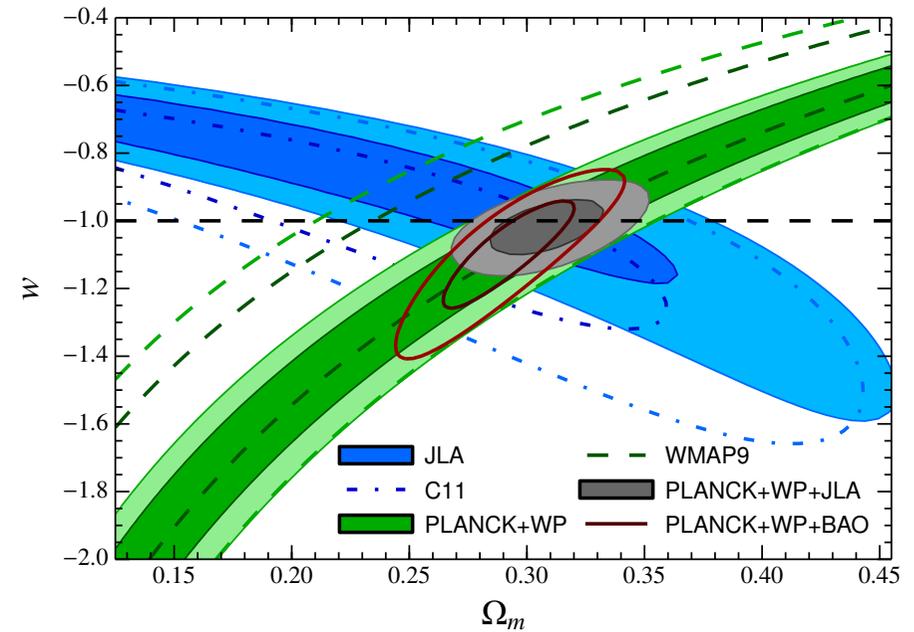
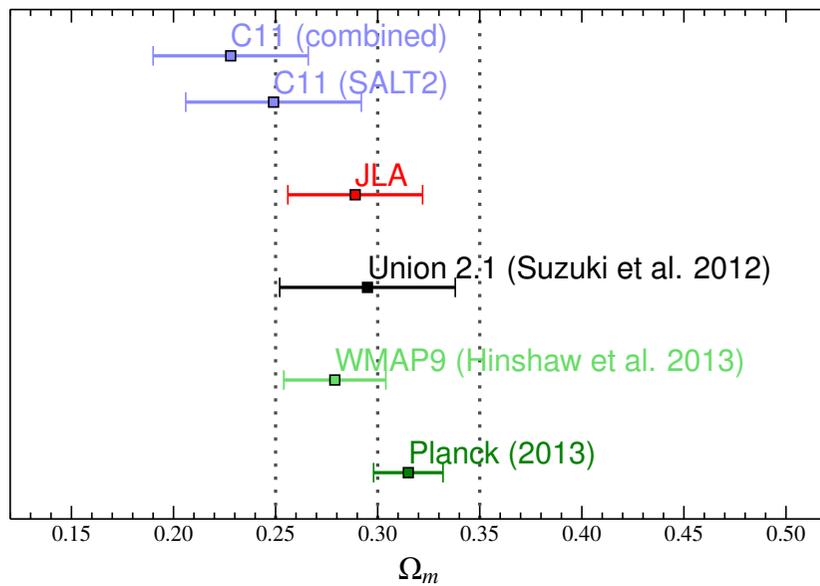
- ▶ **Particle Physics** : discovery of the Higgs -> enhanced collaboration with LPTHE team (thesis co-direction + post-doc) - Nobel 2012
First measurement of Θ_{13} (neutrino mixing)
- ▶ **Particle Astrophysics** : Cosmic Rays physics with decisive postdoc contributions in design of detector upgrade, cosmogenic photons

Colloquiums V. HESS, QCD from colliders to super-high energy CR

- ▶ **Cosmology**: Nobel 2011
Visit S. Perlmutter (colloquium+public talk)
Workshop Big-Boss -> future development ?
Joint analysis of SDSS and SNLS Snc (-> world best precision on w , Ω_m better agreement with Planck)

ILP LPNHE scientific Highlights (cont')

Example of (very) recent highlight in Cosmology



Future directions/ priorities

- ▶ LPNHE Research focus in the coming months:
 - **Particle Physics**: is the newly found particle the standard model Higgs, is there new physics at twice the cms energy (restart early 2015) ?
will benefit from enhanced collaboration with LPTHE teams
 - **Particle Astrophysics** :
Decide on Auger upgrade to solve CR composition enigma
Search hints of Dark Matter with HESS2
 - **Cosmology** : can a precision of 5% on w be reached, is there any sign of non constant w ?
will benefit from enhanced collaboration with IAP teams
- ▶ Develop Collaboration agreements with partner universities (Berkeley Stanford, Cambridge, ..)
- ▶ Develop Education and Training aspect from ILP ?
MOOCS or even NOOCS (Not Open Online Courses)